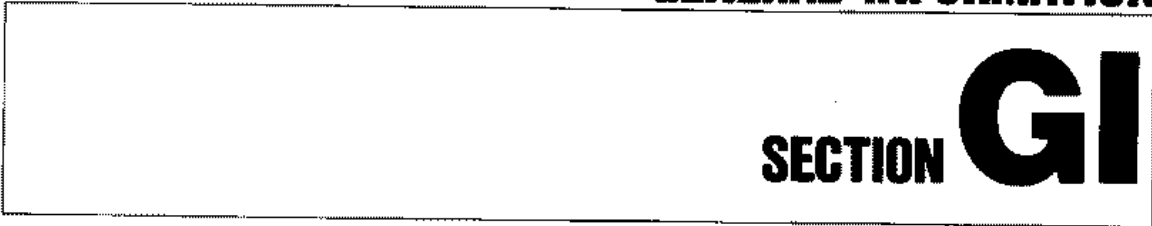


GENERAL INFORMATION

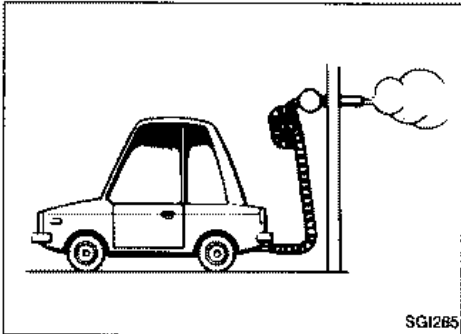


CONTENTS

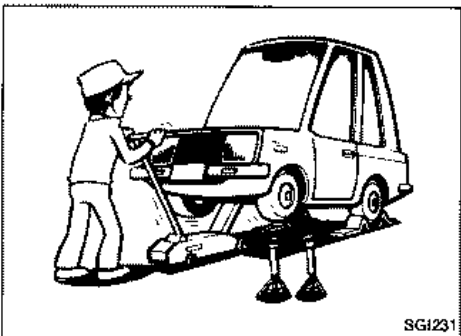
PRECAUTIONS	GI- 2
HOW TO USE THIS MANUAL	GI- 6
HOW TO READ WIRING DIAGRAMS	GI- 8
HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES	GI-12
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LIFTING POINTS AND TOW TRUCK TOWING	GI-22
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PRECAUTIONS

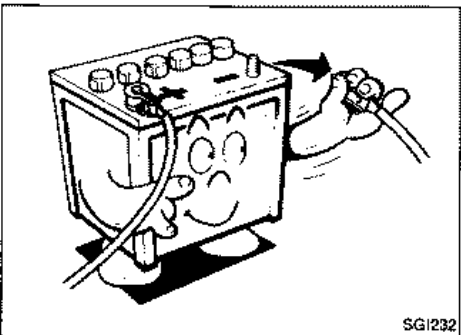
Observe the following precautions to ensure safe and proper servicing. These precautions are not described in each individual section.



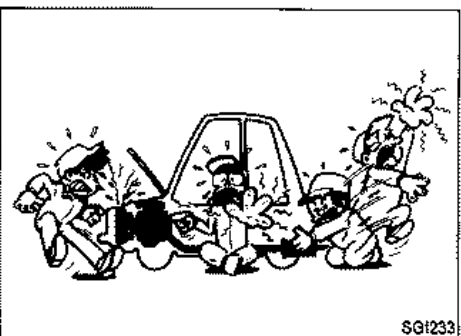
1. Do not operate the engine for an extended period of time without proper exhaust ventilation. Keep the work area well ventilated and free of any inflammable materials. Special care should be taken when handling any inflammable or poisonous materials, such as gasoline, refrigerant gas, etc. When working in a pit or other enclosed area, be sure to properly ventilate the area before working with hazardous materials. Do not smoke while working on the vehicle.



2. Before jacking up the vehicle, apply wheel chocks or other tire blocks to the wheels to prevent the vehicle from moving. After jacking up the vehicle, support the vehicle weight with safety stands at the points designated for proper lifting and towing before working on the vehicle. These operations should be done on a level surface.
3. When removing a heavy component such as the engine or transaxle/transmission, be careful not to lose your balance and drop them. Also, do not allow them to strike adjacent parts, especially the brake tubes and master cylinder.

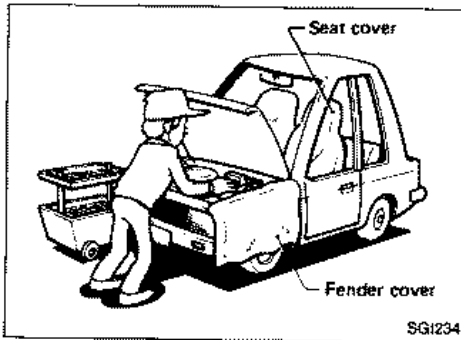


4. Before starting repairs which do not require battery power, always turn off the ignition switch, then disconnect the ground cable from the battery to prevent accidental short circuit.



5. To prevent serious burns, avoid contact with hot metal parts such as the radiator, exhaust manifold, tail pipe and muffler. Do not remove the radiator cap when the engine is hot.

PRECAUTIONS



6. Before servicing the vehicle, protect fenders, upholstery and carpeting with appropriate covers. Take caution that keys, buckles or buttons on your person do not scratch the paint.

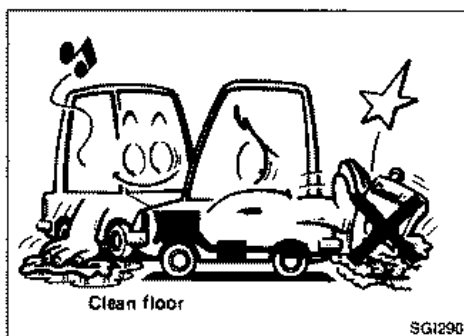
7. Clean all disassembled parts in the designated liquid or solvent prior to inspection or assembly.
8. Replace oil seals, gaskets, packings, O-rings, locking washers, cotter pins, self-locking nuts, etc. with new ones.
9. Replace inner and outer races of tapered roller bearings and needle bearings as a set.
10. Arrange the disassembled parts in accordance with their assembled locations and sequence.
11. Do not touch the terminals of electrical components which use microcomputers (such as electronic control units). Static electricity may damage internal electronic components.
12. After disconnecting vacuum or air hoses, attach a tag to indicate the proper connection.
13. Use only the lubricants specified in MA section.
14. Use approved bonding agent, sealants or their equivalents when required.
15. Use tools and recommended special tools where specified for safe and efficient service repairs.
16. When repairing the fuel, oil, water, vacuum or exhaust systems, check all affected lines for leaks.
17. Dispose of drained oil or the solvent used for cleaning parts in an appropriate manner.



Precautions for E.F.I. or E.C.C.S. Engine

1. Before connecting or disconnecting E.F.I. or E.C.C.S. harness connector to or from any E.F.I. or E.C.C.S. control unit, be sure to turn the ignition switch to the "OFF" position and disconnect the negative battery terminal. Otherwise, there may be damage to control unit.
2. Before disconnecting pressurized fuel line from fuel pump to injectors, be sure to release fuel pressure to eliminate danger.
3. Be careful not to jar components such as control unit and air flow meter.

PRECAUTIONS



Precautions for Catalyst

If a large amount of unburned fuel flows into the converter, the converter temperature will be excessively high. To prevent this, follow the procedure below:

1. Use unleaded gasoline only. Leaded gasoline will seriously damage the catalytic converter.
2. When checking for ignition spark or measuring engine compression, make tests quickly and only when necessary.
3. Do not run engine when the fuel tank level is low, otherwise the engine may misfire causing damage to the converter.
4. Do not place the vehicle on inflammable material. Keep inflammable material off the exhaust pipe.

Precautions for Turbocharger

The turbocharger turbine revolves at extremely high speeds and becomes very hot. Therefore, it is essential to maintain a clean supply of oil flowing through the turbocharger and to follow all required maintenance instructions and operating procedures.

For proper operation of the system, follow the procedure below.

1. Always use the recommended oil. Follow the instructions for proper time to change the oil and proper oil level.
2. Avoid accelerating engine to a high rpm immediately after starting.
3. If engine had been operating at high rpm for an extended period of time, let it idle for a few minutes prior to shutting it off.

Asbestos Safety Instructions (Based on United Kingdom and Republic of Ireland regulations)

This vehicle uses parts containing asbestos. Most are not hazardous but Brake and Clutch linings can be. Consult the manufacturer or his agent for further details. When working with these please observe the "Garage Workers' Asbestos Code" available through your Nissan Dealer, Local Authority or Health and Safety Executive. In particular, work in a well-ventilated place using, where possible, appropriate dust extraction equipment, and avoid creating dust. Dampen all asbestos/dust where possible prior to machining, cutting, cleaning, etc. Use only hand or low speed tools.

Dispose of all asbestos waste, wet rags, etc., in a closed container as directed by your local waste disposal authority.

PRECAUTIONS

Precautions for Fuel

For Australia

Unleaded gasoline of at least 91 octane (RON)

For optimum engine performance, Nissan recommends the use of premium unleaded petrol above 95 octane (RON). However if this petrol is not available, your Nissan vehicle will also operate with 91 to 93 octane (RON) fuel.

CAUTION:

Do not use leaded gasoline. Using leaded gasoline will damage the catalytic converter.

For Europe

Unleaded premium gasoline with an octane rating of at least 95 (RON) must be used.

If premium gasoline is not available, unleaded regular gasoline with an octane rating of 91 (RON) may be temporarily used, but only under the following precautions:

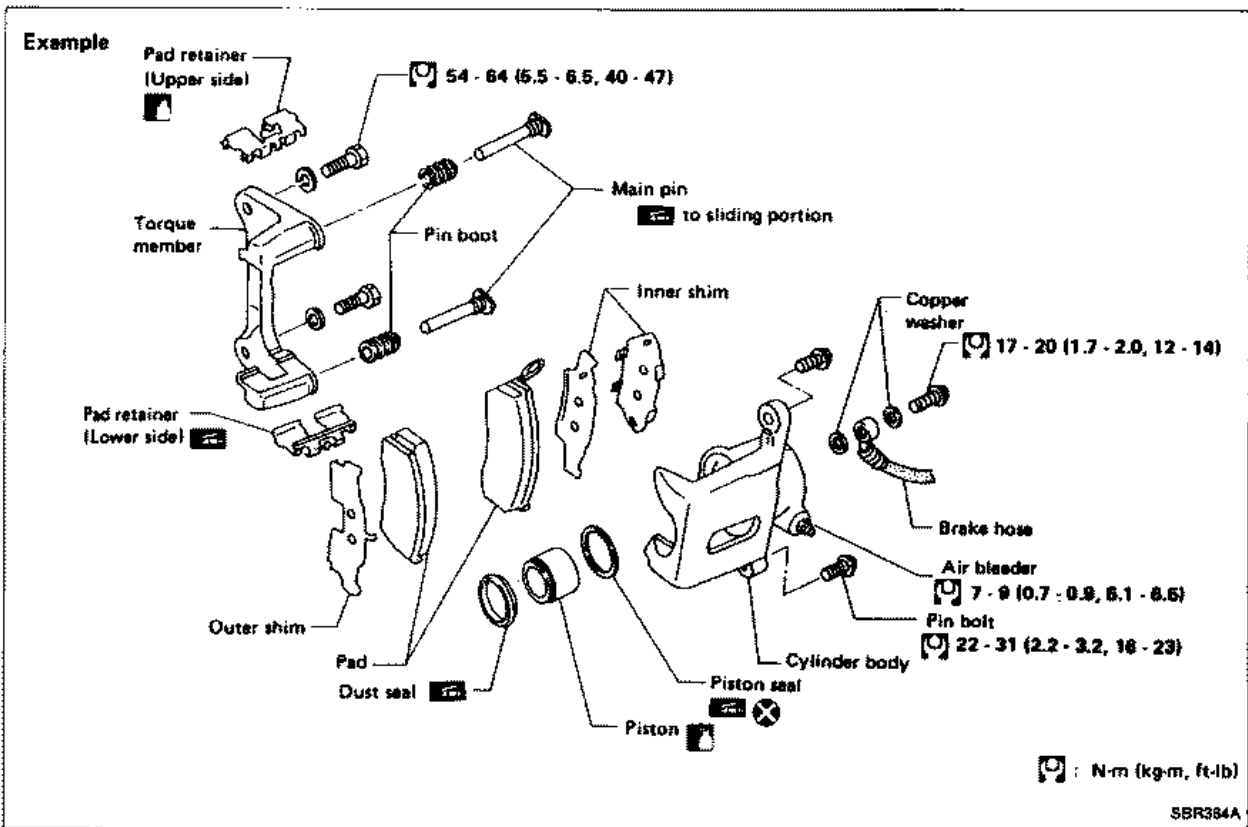
- Have the fuel tank filled only partially with unleaded regular gasoline, and fill up with premium unleaded gasoline as soon as possible.
- Avoid full throttle driving and abrupt acceleration.

CAUTION:

Do not use leaded gasoline. Using leaded gasoline will damage the catalytic converter.

HOW TO USE THIS MANUAL









1. **A QUICK REFERENCE INDEX**, a black tab (e.g. **BR**) is provided on the first page. You can quickly find the first page of each section by mating it to the section's black tab.
2. **THE CONTENTS** are listed on the first page of each section.
3. **THE TITLE** is indicated on the upper portion of each page and shows the part or system.
4. **THE PAGE NUMBER** of each section consists of two letters, which designate the particular section, and a number (e.g. "BR-5").
5. **THE LARGE ILLUSTRATIONS** are exploded views (See below.) and contain tightening torques, lubrication points and other information necessary to perform repairs. The illustrations should be used in reference to service matters only. When ordering parts, refer to the appropriate **PARTS CATALOG**.



6. **THE SMALL ILLUSTRATIONS** show the important steps such as inspection, use of special tools, knacks of work and hidden or tricky steps which are not shown in the previous large illustrations. Assembly, inspection and adjustment procedures for the complicated units such as the automatic transaxle or transmission, etc. are presented in a step-by-step format where necessary.

HOW TO USE THIS MANUAL

7. The following **SYMBOLS AND ABBREVIATIONS** are used:

	: Tightening torque	A/T	: Automatic Transaxle/Transmission
	: Should be lubricated with grease. Unless otherwise indicated, use recommended multi-purpose grease.	A/C	: Air Conditioner
	: Should be lubricated with oil.	P/S	: Power Steering
	: Sealing point	S.S.T.	: Special Service Tools
	: Checking point	S.D.S.	: Service Data and Specifications
	: Always replace after every disassembly.	SAE	: Society of Automotive Engineers, Inc.
L.H., R.H.	: Left-Hand, Right-Hand	G.C.C.	: Gulf Cooperation Council
FR, RR	: Front, Rear	L.H.D.	: Left-Hand Drive
2WD	: 2-Wheel Drive	R.H.D.	: Right-Hand Drive
 (P)	: Apply petroleum jelly.	A.T.F.	: Automatic Transmission Fluid
 (ATF)	: Apply A.T.F.	D ₁	: Drive range 1st gear
★	: Select with proper thickness.	D ₂	: Drive range 2nd gear
☆	: Adjustment is required.	D ₃	: Drive range 3rd gear
M/T	: Manual Transaxle/Transmission	D ₄	: Drive range 4th gear
		O.D.	: Overdrive
		2 ₂	: 2nd range 2nd gear
		2 ₁	: 2nd range 1st gear
		1 ₂	: 1st range 2nd gear
		1 ₁	: 1st range 1st gear

8. The **UNITS** given in this manual are primarily expressed as the SI UNIT (International System of Unit), and alternatively expressed in the metric system and in the yard/pound system.

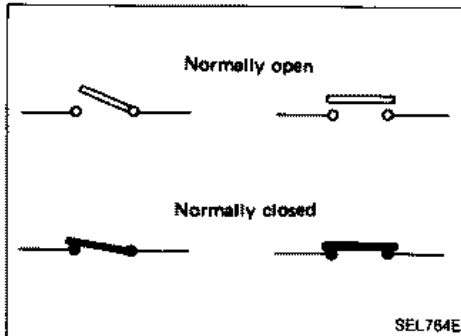
“Example”

Tightening torque:

59 - 78 N-m (6.0 - 8.0 kg-m, 43 - 58 ft-lb)

9. **TROUBLE DIAGNOSES** are included in sections dealing with complicated components.
10. **SERVICE DATA AND SPECIFICATIONS** are contained at the end of each section for quick reference of data.
11. The captions **WARNING** and **CAUTION** warn you of steps that must be followed to prevent personal injury and/or damage to some part of the vehicle.
- **WARNING** indicates the possibility of personal injury if instructions are not followed.
 - **CAUTION** indicates the possibility of component damage if instructions are not followed.
 - **BOLD TYPED STATEMENTS** except **WARNING** and **CAUTION** give you helpful information.

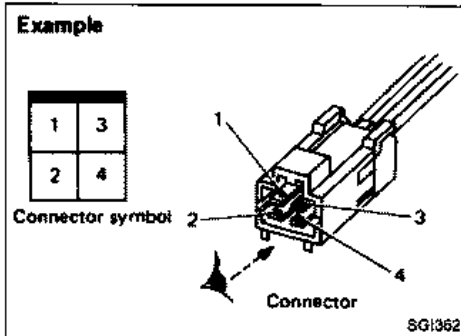
HOW TO READ WIRING DIAGRAMS



SWITCH POSITIONS

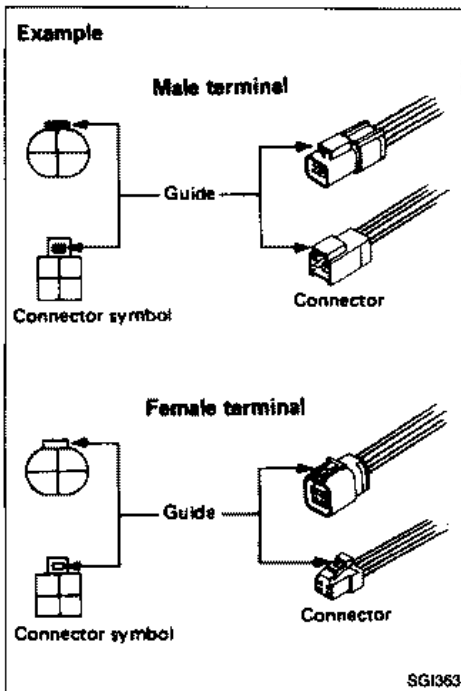
Wiring diagram switches are shown with the vehicle in the following condition.

- Ignition switch "OFF".
- Doors, hood and trunk lid/back door closed.
- Pedals are not depressed and parking brake is released.



CONNECTOR SYMBOLS

- All connector symbols in wiring diagrams are shown from the terminal side.



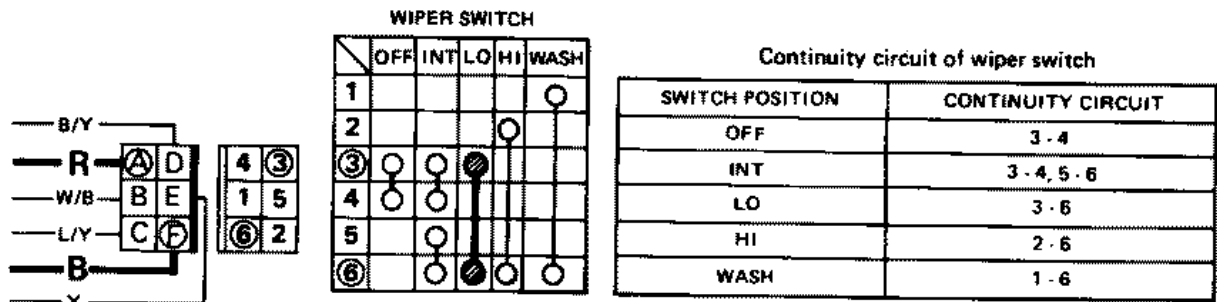
- Male and female terminals
Connector guides for male terminals are shown in black and female terminals in white in wiring diagrams.

HOW TO READ WIRING DIAGRAMS

MULTIPLE SWITCH

The continuity of the multiple switch is identified in the switch chart in wiring diagrams.

Example



Example: Wiper switch in LO position

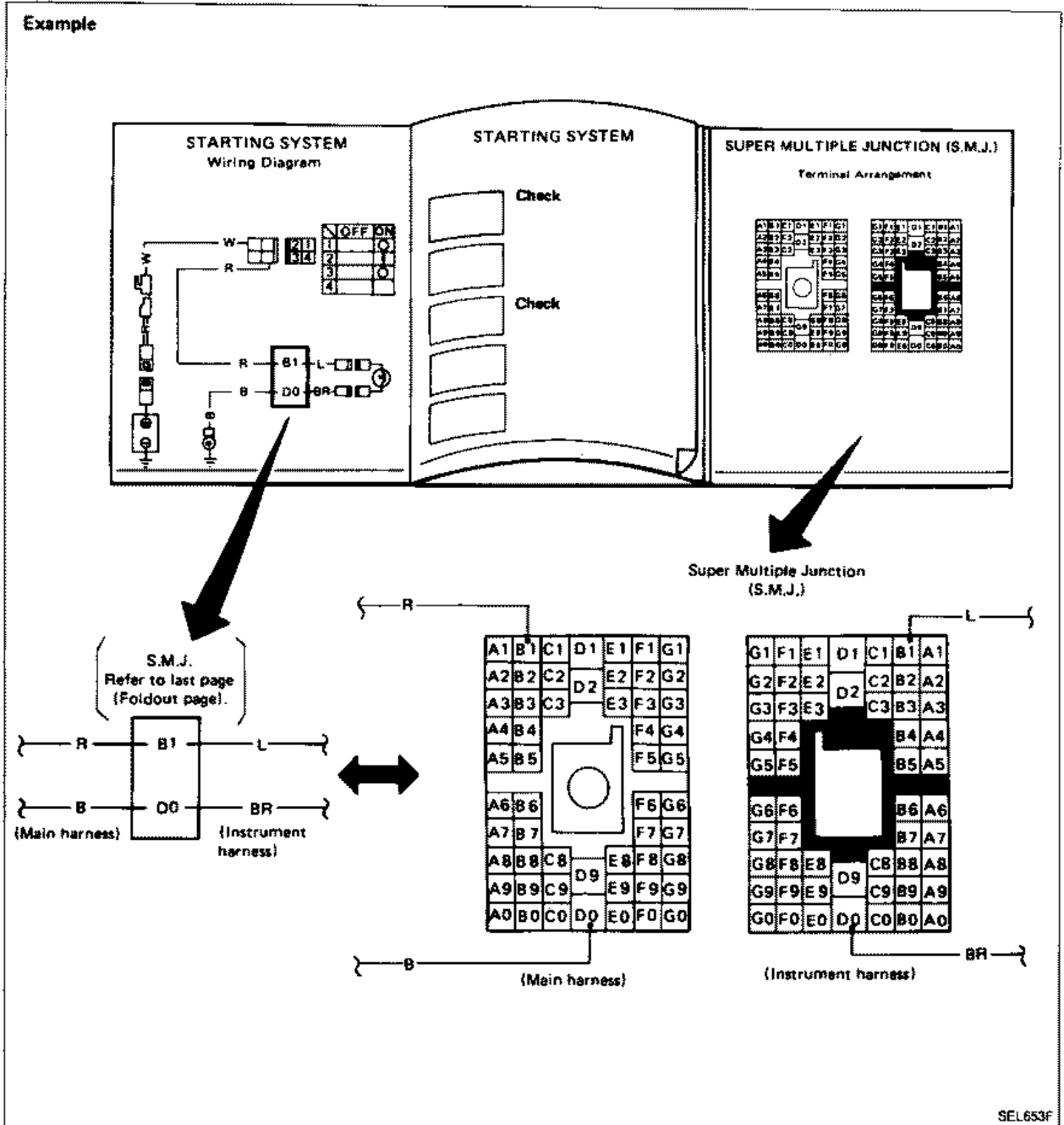
Continuity circuit: Red wire - (A) terminal - (3) terminal - Wiper switch (● - ●) : LO) - (6) terminal - (F) terminal - Black wire

SG1365

HOW TO READ WIRING DIAGRAMS

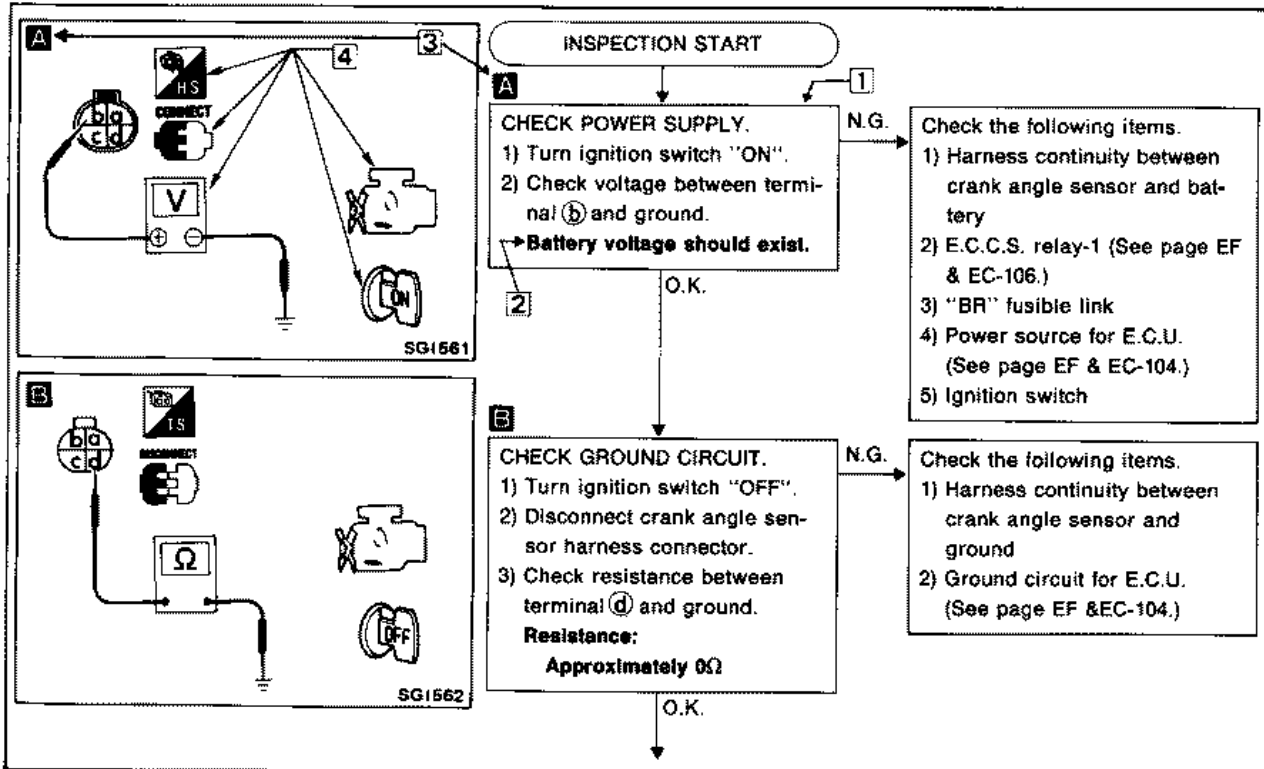
SUPER MULTIPLE JUNCTION (S.M.J.)

- The "S.M.J." indicated in wiring diagrams is shown in a simplified form. The terminal arrangement should therefore be referred to in the foldout at the end of the Service Manual.
- The foldout should be spread to read the entire wiring diagram.



HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES

Example



NOTICE

The flow chart indicates work procedures required to diagnose problems effectively. Observe the following instructions before diagnosing.

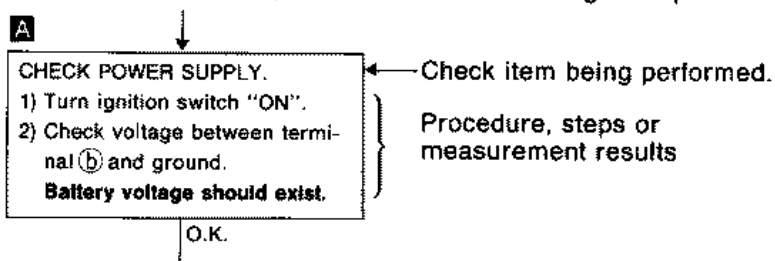
- 1) Use the flow chart after locating probable causes of a problem following the "Preliminary Check" or the "Symptom Chart".
- 2) After repairs, re-check that the problem has been completely eliminated.
- 3) Refer to Component Parts Location and Harness Layout for the Systems described in each section for identification/location of components and harness connectors.
- 4) Refer to the Circuit Diagram for Quick Pinpoint Check.
If you must perform circuit continuity between harness connectors more detail, such as in case of sub-harness is used, refer to Wiring Diagram and Harness Layout in EL section for identification of harness connectors.
- 5) When checking circuit continuity, ignition switch should be "OFF".
- 6) Before checking voltage at connectors, check battery voltage.
- 7) After accomplishing the Diagnostic Procedures and Electrical Components Inspection, make sure that all harness connectors are reconnected as it was.

HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES

HOW TO FOLLOW THIS FLOW CHART

1 Work and diagnostic procedure

Start to diagnose a problem using procedures indicated in enclosed blocks, as shown in the following example.



2 Measurement results

Required results are indicated in bold type in the corresponding block, as shown below:

These have the following meanings:

Battery voltage → 11 - 14V or approximately 12V

Voltage: Approximately 0V → Less than 1V

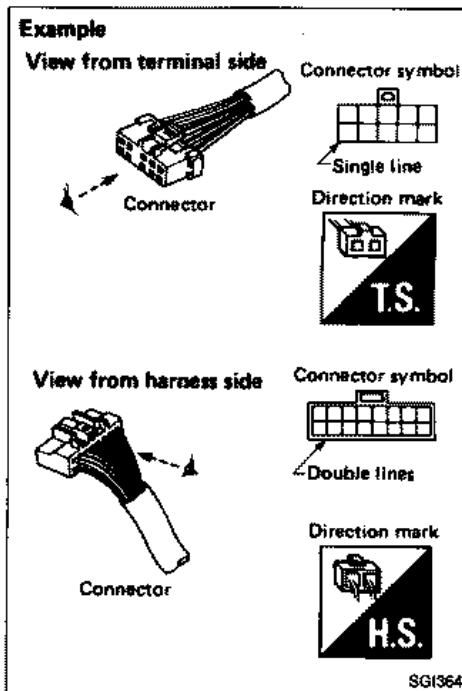
3 Cross reference of work symbols in the text and illustrations

Illustrations are provided as visual aids for work procedures. For example, symbol **A** indicated in the left upper portion of each illustration corresponds with the symbol in the flowchart for easy identification. More precisely, the procedure under the "CHECK POWER SUPPLY" outlined previously is indicated by an illustration **A**.

4 Symbols used in illustrations

Symbols included in illustrations refer to measurements or procedures. Before diagnosing a problem, familiarize yourself with each symbol.

HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES



Direction mark

A direction mark is shown to clarify the side of connector (terminal side or harness side).

Direction marks are mainly used in the illustrations indicating terminal inspection.



: View from terminal side ... T.S.

- All connector symbols shown from the terminal side are enclosed by a single line.












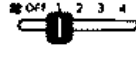

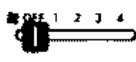










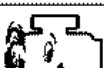




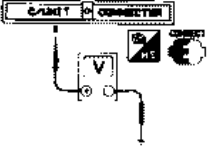


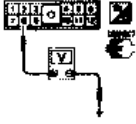



: View from harness side ... H.S.

- All connector symbols shown from the harness side are enclosed by a double line.

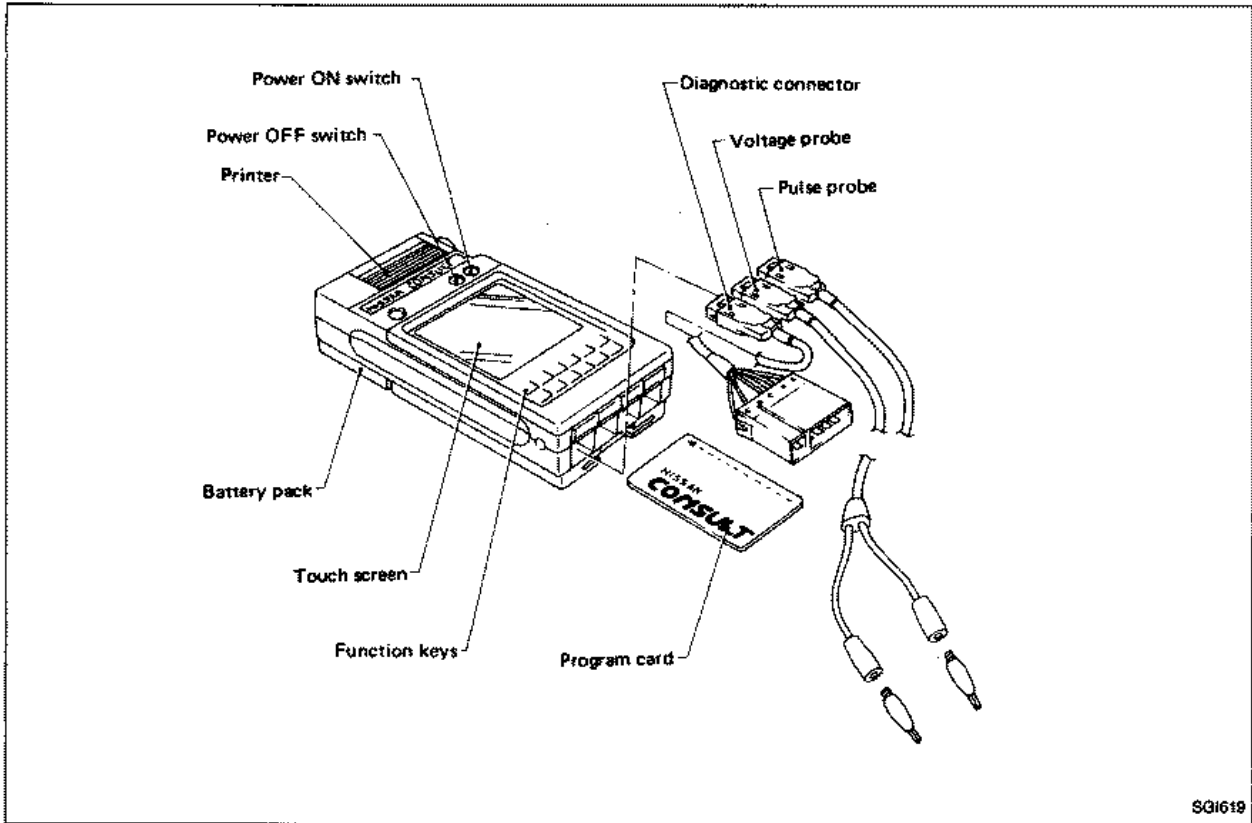
HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES

Key to symbols signifying measurements or procedures

Symbol	Symbol explanation	Symbol	Symbol explanation
	Check after disconnecting the connector to be measured.		Current should be measured with an ammeter.
	Check after connecting the connector to be measured.		Procedure with CONSULT
	Insert key into ignition switch.		Procedure without CONSULT
	Remove key from ignition switch.		A/C switch is "OFF".
	Turn ignition switch to "OFF" position.		A/C switch is "ON".
	Turn ignition switch to "ON" position.		Fan switch is "ON". (At any position except for "OFF" position)
	Turn ignition switch to "START" position.		Fan switch is "OFF".
	Turn ignition switch from "OFF" to "ACC" position.		Apply battery voltage directly to components.
	Turn ignition switch from "ACC" to "OFF" position.		Drive vehicle.
	Turn ignition switch from "OFF" to "ON" position.		Disconnect battery negative cable.
	Turn ignition switch from "ON" to "OFF" position.		Depress brake pedal.
	Do not start engine, or check with engine stopped.		Release brake pedal.
	Start engine, or check with engine running.		Depress accelerator pedal.
	Apply parking brake.		Release accelerator pedal.
	Release parking brake.	<p>Pin terminal check for S.M.J. type E.C.U. and A/T control unit connectors. For details regarding the terminal arrangement, refer to the foldout page.</p> 	
	Check after engine is warmed up sufficiently.		
	Voltage should be measured with a voltmeter.		
	Circuit resistance should be measured with an ohmmeter.		

CONSULT CHECKING SYSTEM

Outside View



SGI619

System Application

System	E.C.C.S.	Auto A/C*	A/T	HICAS*
Diagnostic mode	X	X	—	—
Work support	X	X	X	X
Self-diagnostic results	X	X	X	X
Data monitor	X	X	X	X
Active test	X	X	—	X
E.C.U. part number	X	—	X	X

X: Applicable
*: For Europe

CONSULT CHECKING SYSTEM

Function

Diagnostic mode	Function
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on CONSULT.
Self-diagnostic results	Self-diagnostic results can be read and erased quickly.
Data monitor	Input/Output data in the control unit can be read.
Active test	Mode in which CONSULT drives some actuators apart from the control units and also shifts some parameters in a specified range.
E.C.U. part number	E.C.U. part number can be read.

Checking Equipment

Tool name	Description
<p>NISSAN CONSULT kit</p> <ul style="list-style-type: none"> ① CONSULT unit and accessories ② Program card ③ Operation manuals ④ Binder ⑤ Carrying case ⑥ Thermal paper (Rolls) 	

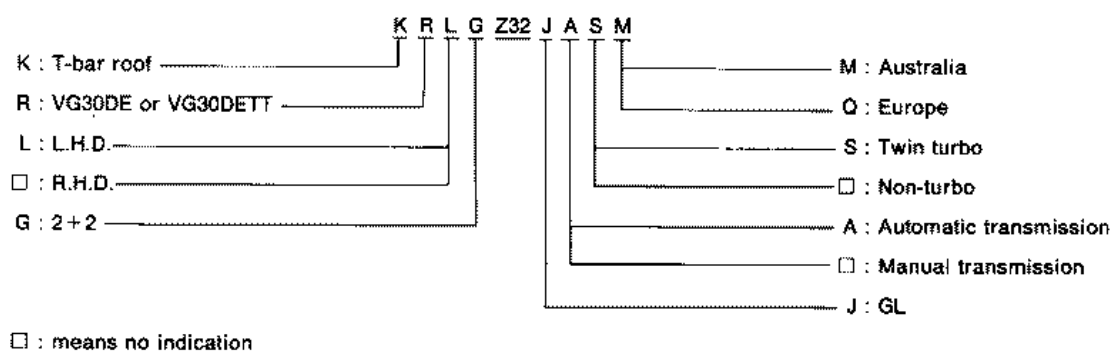
When ordering the above equipment, contact your NISSAN distributor.

IDENTIFICATION INFORMATION

Model Variation

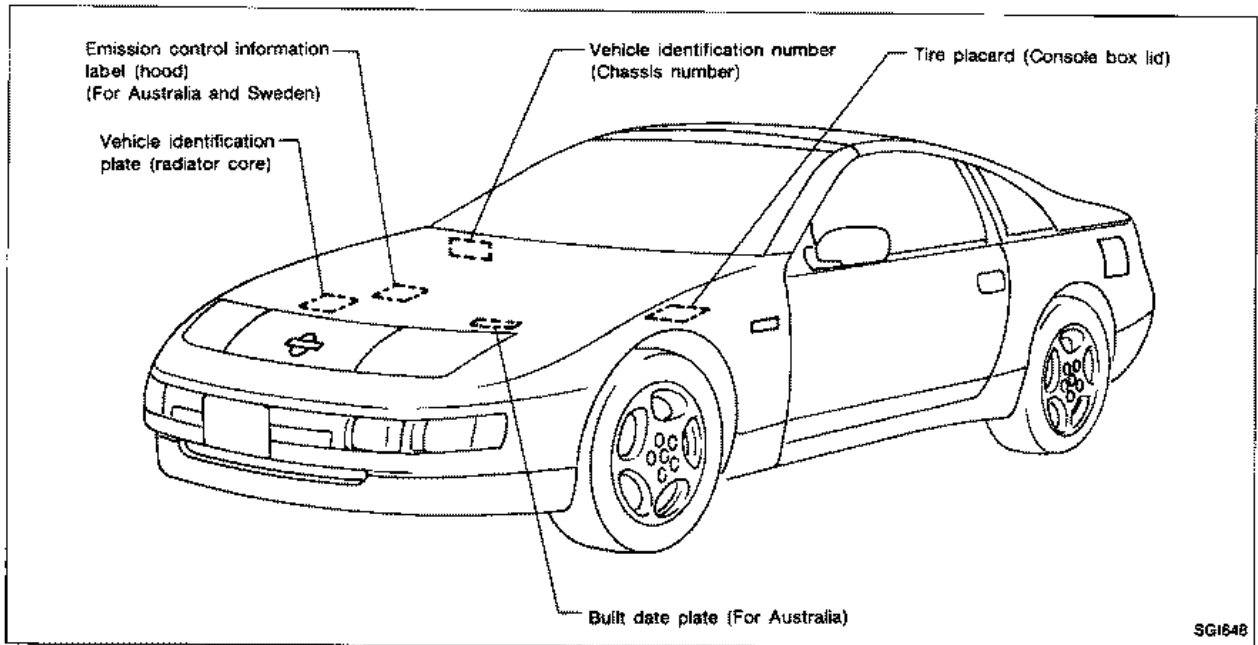
Body	Destination	Model		Engine	Transmission	Differential carrier
T-bar roof	Europe	2+2	KRG-JSQ	VG30DETT	RS5R30A	R230V
			KRG-JASQ		RE4R03A	
			KRLG-JSQ		RS5R30A	
			KRLG-JASQ		RE4R03A	
T-bar roof	Australia	2+2	KRG-JM	VG30DE	RS5R30A	R200V
			KRG-JAM		RE4R01A	

Prefix and suffix designations:

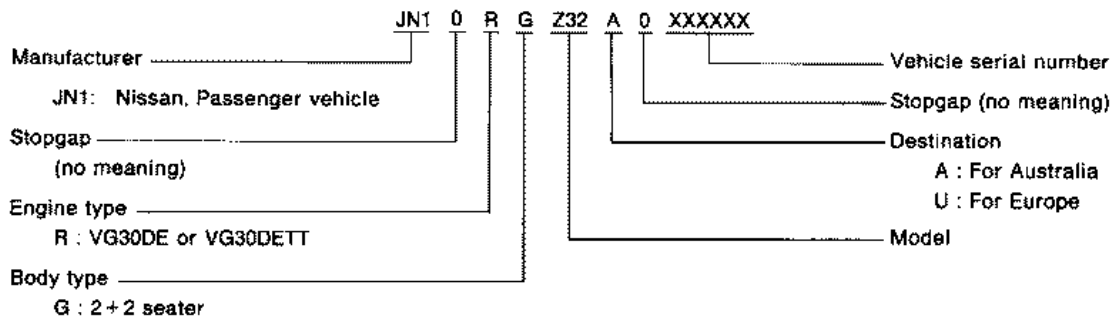


IDENTIFICATION INFORMATION

Identification Number



VEHICLE IDENTIFICATION NUMBER ARRANGEMENT



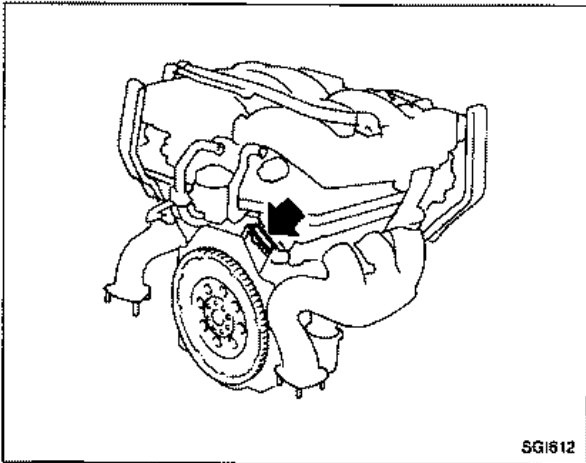
IDENTIFICATION INFORMATION

Identification Number (Cont'd)

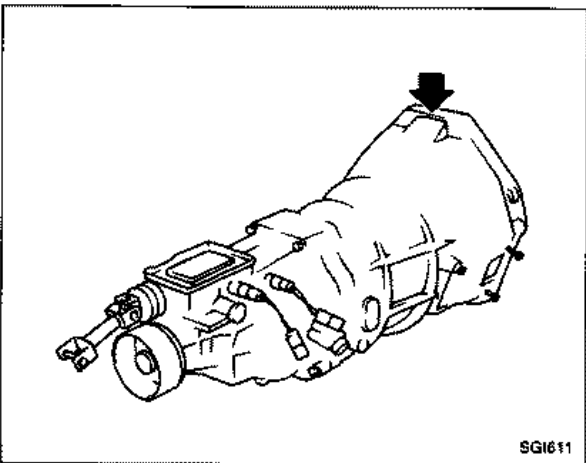
IDENTIFICATION PLATE

Europe	Except Europe	Legend
<p style="text-align: center;">SG1025</p>	<p style="text-align: center;">SG1316</p>	<ol style="list-style-type: none"> 1 Type approval number 2 Vehicle identification number (Chassis number) 3 Gross vehicle weight 4 Gross combination weight + Gross trailing capacity (Weight) 5 Gross axle weight (Front) 6 Gross axle weight (Rear) 7 Type 8 Body color code 9 Trim color code 10 Model 11 Engine model 12 Engine displacement 13 Transmission model 14 Axle model

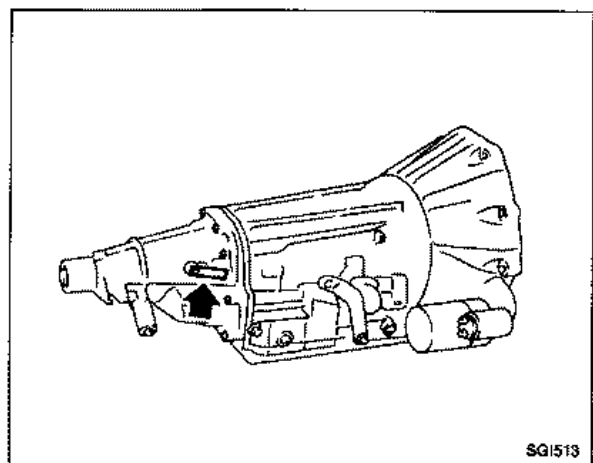
ENGINE SERIAL NUMBER



MANUAL TRANSMISSION NUMBER



AUTOMATIC TRANSMISSION NUMBER



IDENTIFICATION INFORMATION

Dimensions

	Unit: mm (in)
	2 + 2
Overall length	4,525 (178.1)
Overall width	1,800 (70.9)
Overall height (T-bar roof)	1,255 (49.4)
Front tread	1,495 (58.9)
Rear tread	1,535 (60.4)*1 1,555 (61.2)*2
Wheelbase	2,570 (101.2)

*1: For Australia

*2: For Europe

Wheels and Tires

Road wheel			
	Aluminum	Steel	Offset mm (in)
Conventional	16 x 7.5JJ*1	—	45 (1.77)
	16 x 8.5JJ*2	—	35 (1.38)*1
Spare T-type	—	16 x 4T	30 (1.18)
Tire size			
Conventional	P225/50R16 91V*3		
	225/50ZR16*4		
	245/45ZR16*5		
Spare T-type	T125/90D16		

*1: For Australia and front wheel for Europe

*2: Rear wheel for Europe

*3: For Australia

*4: Front tire for Europe

*5: Rear tire for Europe

LIFTING POINTS AND TOW TRUCK TOWING

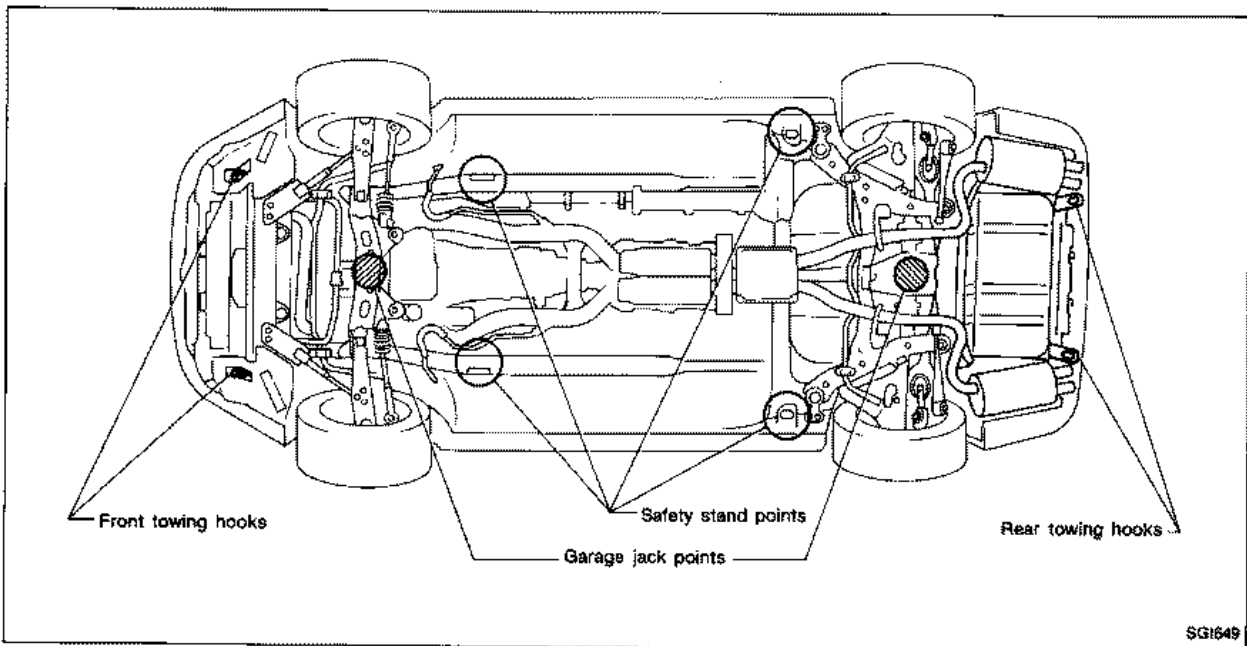
Garage Jack and Safety Stand

WARNING:

- Never get under the vehicle while it is supported only by the jack. Always use safety stands to support the frame when you have to get under the vehicle.
- Place wheel chocks at both the front and rear of the wheels on the ground.

CAUTION:

Place a wooden or rubber block between safety stand and vehicle body when the supporting body is flat.



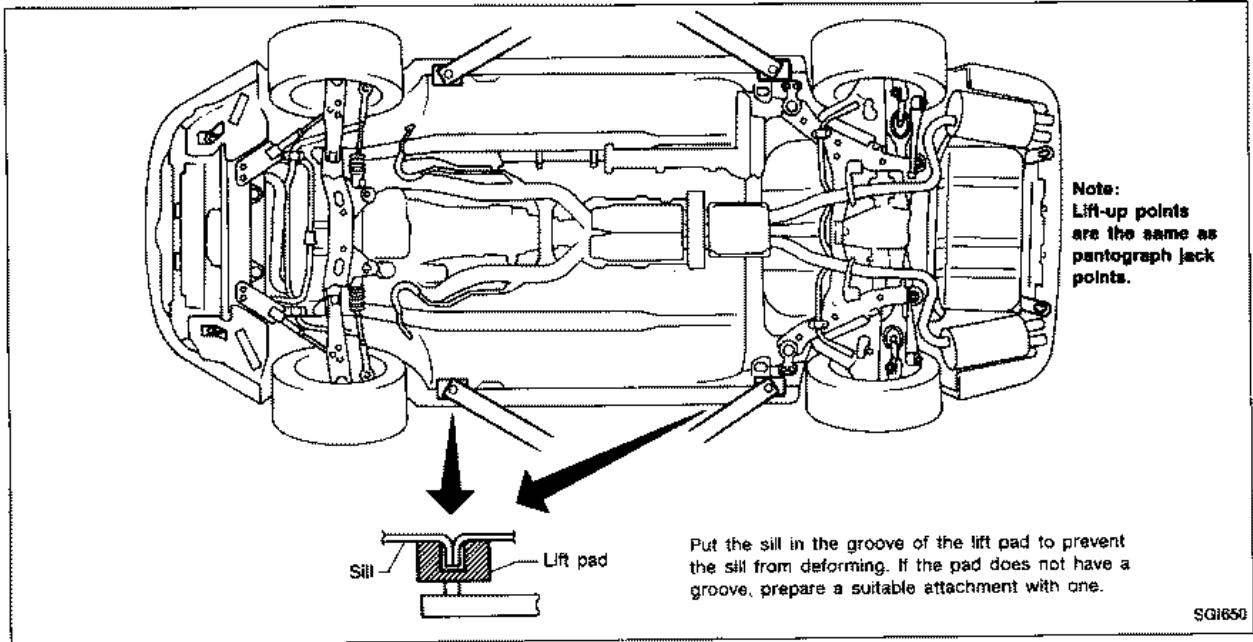
LIFTING POINTS AND TOW TRUCK TOWING

2-pole Lift

WARNING:

When lifting the vehicle, open the lift arms as wide as possible and ensure that the front and rear of the vehicle are well balanced.

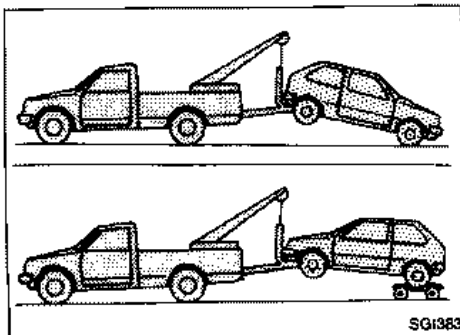
When setting the lift arm, do not allow the arm to contact the brake tubes and fuel lines.



Tow Truck Towing

CAUTION:

- All applicable local laws regarding the towing operation must be obeyed.
- It is necessary to use proper towing equipment to avoid possible damage to the vehicle during towing operation. Towing is in accordance with Towing Procedure Manual at dealer.
- When towing with the rear wheels on the ground, release the parking brake and move the gearshift lever to neutral ("N" position).



NISSAN recommends that vehicle be towed with the driving (rear) wheels off the ground as illustrated.

LIFTING POINTS AND TOW TRUCK TOWING

Tow Truck Towing (Cont'd)

TOWING AN AUTOMATIC TRANSMISSION MODEL WITH FOUR WHEELS ON GROUND OR TOWING WITH FRONT WHEELS RAISED (With rear wheels on ground)

Observe the following restricted towing speeds and distances.

Speed:

Below 50 km/h (30 MPH)

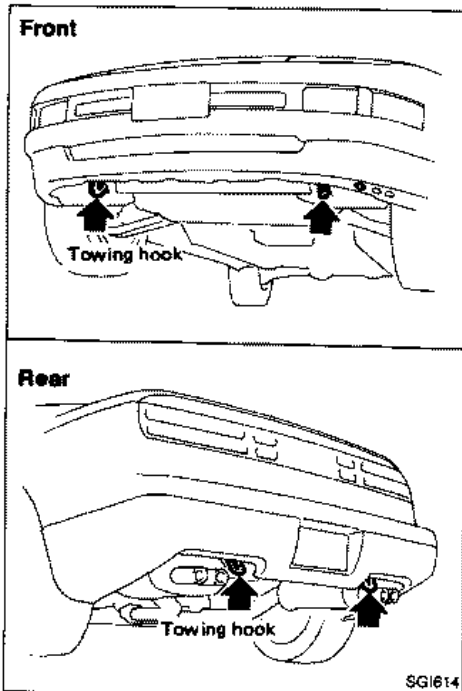
Distance:

Less than 65 km (40 miles)

If the speed or distance must necessarily be greater, remove the propeller shaft beforehand to prevent damage to the transmission.

TOWING POINT

- Always pull the cable straight out from the vehicle. Never pull on the hook at a sideways angle.
- Remove the first bolt under the front fender protector when using the front towing hooks.



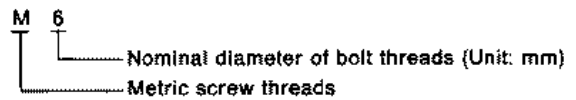
TIGHTENING TORQUE OF STANDARD BOLTS

Grade	Bolt size	Bolt diameter* mm	Pitch mm	Tightening torque (Without lubricant)					
				Hexagon head bolt			Hexagon flange bolt		
				N·m	kg·m	ft·lb	N·m	kg·m	ft·lb
4T	M6	6.0	1.0	5.1	0.52	3.8	6.1	0.62	4.5
	M8	8.0	1.25	13	1.3	9	15	1.5	11
			1.0	13	1.3	9	16	1.6	12
	M10	10.0	1.5	25	2.5	18	29	3.0	22
			1.25	25	2.6	19	30	3.1	22
	M12	12.0	1.75	42	4.3	31	51	5.2	38
1.25			46	4.7	34	56	5.7	41	
M14	14.0	1.5	74	7.5	54	88	9.0	65	
7T	M6	6.0	1.0	8.4	0.86	6.2	10	1.0	7
	M8	8.0	1.25	21	2.1	15	25	2.5	18
			1.0	22	2.2	16	26	2.7	20
	M10	10.0	1.5	41	4.2	30	48	4.9	35
			1.25	43	4.4	32	51	5.2	38
	M12	12.0	1.75	71	7.2	52	84	8.6	62
1.25			77	7.9	57	92	9.4	68	
M14	14.0	1.5	127	13.0	94	147	15.0	108	
9T	M6	6.0	1.0	12	1.2	9	15	1.5	11
	M8	8.0	1.25	29	3.0	22	35	3.6	26
			1.0	31	3.2	23	37	3.8	27
	M10	10.0	1.5	59	6.0	43	70	7.1	51
			1.25	62	6.3	46	74	7.5	54
	M12	12.0	1.75	98	10.0	72	118	12.0	87
1.25			108	11.0	80	137	14.0	101	
M14	14.0	1.5	177	18.0	130	206	21.0	152	

1. Special parts are excluded.
2. This standard is applicable to bolts having the following marks embossed on the bolt head.

Grade	Mark
4T	4
7T	7
9T	9

* : Nominal diameter



MAINTENANCE

SECTION MA

MA

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PRE-DELIVERY INSPECTION ITEMS

Shown below are Pre-delivery Inspection Items required for the new vehicle. It is recommended that necessary items other than those listed here be added, paying due regard to the conditions in each country.

Perform applicable items on each model. Consult text of this section for specifications.

UNDER HOOD — engine off

- Radiator coolant level and coolant hose connections for leaks
- Battery fluid level, specific gravity and conditions of battery terminals
- Drive belts tension
- Fuel filter for water or dusts, and fuel lines and connections for leaks
- Engine oil level and oil leaks
- Clutch and brake reservoir fluid level and fluid lines for leaks
- Windshield and rear window washer and headlamp cleaner reservoir fluid level
- Power steering reservoir fluid level and hose connections for leaks

ON INSIDE AND OUTSIDE

- Remove front spring/strut spacer (if applicable)
- Operation of all instruments, gauges, lights and accessories
- Operation of horn(s), wiper and washer
- Steering lock for operation
- Check air conditioner for gas leaks
- Front and rear seats, and seat belts for operation
- All moldings, trims and fittings for fit and alignment
- All windows for operation and alignment
- Hood, trunk lid, door panels for fit and alignment
- Latches, keys and locks for operation
- Weatherstrips for adhesion and fit
- Headlamp aiming
- Tighten wheel nuts (Inc. inner nuts if applicable)
- Tire pressure (Inc. spare tire)
- Check front wheels for toe-in
- Install clock/voltmeter/room lamp fuse (if applicable)
- Install deodorizing filter to air purifier (if applicable)
- Remove wiper blade protectors (if applicable)

UNDER BODY

- Manual transmission/transaxle, transfer and differential gear oil level
- Brake and fuel lines and oil/fluid reservoirs for leaks
- Tighten bolts and nuts of steering linkage and gear box, suspension, propeller shafts and drive shafts
- Tighten rear body bolts and nuts (Models with wooden bed only)

ROAD TEST

- Clutch operation
- Parking brake operation
- Service brake operation
- Automatic transmission/transaxle shift timing and kickdown
- Steering control and returnability
- Engine performance
- Squeaks and rattles

ENGINE OPERATING AND HOT

- Adjust idle mixture and speed (and ignition timing*1)
- Automatic transmission/transaxle fluid level
- Engine idling and stop knob operation (Diesel only)

FINAL INSPECTION

- Install necessary parts (outside mirror, wheel covers, seat belts, mat, carpet or mud flaps)
- Inspect for interior and exterior metal and paint damage
- Check for spare tire, jack, tools (wheel chock), and literature
- Wash, clean interior and exterior

*1: Not required on models with a direct ignition system

ix: Not applicable to this model.

GENERAL MAINTENANCE

General maintenance includes those items which should be checked during the normal day-to-day operation of the vehicle. They are essential if the vehicle is to continue operating properly. The owners can perform the checks and inspections themselves or they can have their NISSAN dealers do them for a nominal charge.

Item	Reference pages
OUTSIDE THE VEHICLE	
The maintenance items listed here should be performed from time to time, unless otherwise specified.	
Tires Check the pressure with a gauge periodically when at a service station, including the spare, and adjust to the specified pressure if necessary. Check carefully for damage, cuts or excessive wear.	—
Windshield wiper blades Check for cracks or wear if they do not wipe properly.	—
Doors and engine hood Check that all doors, the engine hood, the trunk lid and back door operate properly. Also ensure that all latches lock securely. Lubricate if necessary. Make sure that the secondary latch keeps the hood from opening when the primary latch is released. When driving in areas using road salt or other corrosive materials, check for lubrication frequently.	MA-29
Tire rotation Tires should be rotated every 10,000 km (6,000 miles) for non-turbo models.	MA-26
INSIDE THE VEHICLE	
The maintenance items listed here should be checked on a regular basis, such as when performing periodic maintenance, cleaning the vehicle, etc.	
Lights Make sure that the headlights, stop lights, tail lights, turn signal lights, and other lights are all operating properly and installed securely. Also check headlight aim.	—
Warning lights and chimes Make sure that all warning lights and chimes are operating properly.	—
Steering wheel Check for change in the steering conditions, such as excessive free play, hard steering or strange noises. Free play: Less than 35 mm (1.38 in)	—
UNDER THE HOOD AND VEHICLE	
The maintenance items listed here should be checked periodically e.g. each time you check the engine oil or refuel.	
Windshield washer fluid Check that there is adequate fluid in the tank.	—
Engine coolant level Check the coolant level when the engine is cold.	MA-14
Engine oil level Check the level after parking the vehicle on a level spot and turning off the engine.	MA-17
Brake and clutch fluid level Make sure that the brake and clutch fluid level is between the "MAX" and "MIN" lines on the reservoir.	MA-21, 24
Battery Check the fluid level in each cell. It should be between the "MAX" and "MIN" lines.	—

PERIODIC MAINTENANCE (Except for Europe)

The following tables show the normal maintenance schedule. Depending upon weather and atmospheric conditions, varying road surfaces, individual driving habits and vehicle usage, additional or more frequent maintenance may be required.

Periodic maintenance beyond the last period shown on the tables requires similar maintenance.

MAINTENANCE OPERATION	MAINTENANCE INTERVAL										Reference page
	km x 1,000	1	10	20	30	40	50	60	70	80	
	(Miles x 1,000)	(0.6)	(6)	(12)	(18)	(24)	(30)	(36)	(42)	(48)	
Perform either at number of kilometers (miles) or months, whichever comes first	Months	---	6	12	18	24	30	36	42	48	
ENGINE AND EMISSION CONTROL Underhood and under vehicle											
Check drive belts for cracks, fraying, wear & tension						X				X	MA-12
Change engine anti-freeze coolant (Ethylene glycol base, LLC)						X				X	MA-13
Check cooling system			X		X		X		X		MA-14
Check fuel lines						X				X	MA-15
Replace air cleaner filter (Viscous paper type)*						X				X	MA-16
Change engine oil (Use API SF or SG oil)*			X	X	X	X	X	X	X	X	MA-16
Change engine oil filter*			X	X	X	X	X	X	X	X	MA-17
Replace fuel filter*						X				X	MA-18
Replace spark plugs (PLATINUM-TIPPED type)					Every 100,000 km (60,000 miles)						MA-18
Check exhaust gas sensor							X			X	MA-20
Check vapor lines							X			X	MA-19
Replace timing belt					Every 100,000 km (60,000 miles)						EM-13
CHASSIS AND BODY Underhood											
Check brake, clutch & automatic transmission fluid level & leaks*			X	X	X	X	X	X	X	X	MA-21, 22, 24
Change brake fluid*						X				X	MA-25
Check brake booster vacuum hoses, connections & check valve						X				X	MA-25
Check power steering fluid & lines				X		X		X		X	MA-27
Under vehicle											
Check brake, clutch & exhaust systems for proper attachment, leaks, cracks, chafing, abrasion, deterioration, etc.			X	X	X	X	X	X	X	X	MA-21, 24, 28
Check oil level in manual transmission & differential gear*				X		X		X		X	MA-21, 24
Check steering gear & linkage, axle & suspension parts & propeller shaft for damage, loose & missing parts & lubrication*		X		X		X		X		X	MA-23, 27 FA-6, RA-5
Outside and inside											
Check wheel alignment, if necessary, rotate & balance wheels				X		X		X		X	MA-26, FA-7
Check brake pads, discs & other brake components for wear, deterioration & leaks*			X	X	X	X	X	X	X	X	MA-25
Lubricate locks, hinges & hood latch				X		X		X		X	MA-28
Check seat belts, buckles, retractors, anchors & adjuster				X		X		X		X	MA-28
Check foot brake, parking brake & clutch for free play, stroke & operation				X		X		X		X	CL-7, BR-7, 22

NOTE: Maintenance items with "*" should be performed more frequently according to "Maintenance under Severe Driving Conditions".

Check: Check. Correct or replace if necessary.

PERIODIC MAINTENANCE (Except for Europe)

Maintenance under Severe Driving Conditions

The maintenance intervals shown on the preceding page are for normal operating conditions. If the vehicle is mainly operated under severe driving conditions as shown below, more frequent maintenance must be performed on the following items as shown in the table.

SEVERE DRIVING CONDITIONS

- A — Driving under dusty conditions
- B — Driving repeatedly short distances
- C — Towing a trailer
- D — Extensive idling
- E — Driving in extremely adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high
- F — Driving in high humidity areas or in mountainous areas
- G — Driving in areas using salt or other corrosive materials
- H — Driving on rough and/or muddy roads or in the desert
- I — Driving with frequent use of braking or in mountainous areas

Driving condition	Maintenance item	Maintenance operation	Maintenance interval	Reference page
A	Air cleaner filter	Replace	More frequently	MA-16
A B C D	Engine oil & oil filter	Replace	Every 5,000 km (3,000 miles) or 3 months	MA-16, 17
A E	Fuel filter	Replace	Every 20,000 km (12,000 miles) or 12 months	MA-16
. F	Brake fluid	Replace		MA-25
. . . C H	Automatic & manual transmission oil, & differential gear oil	Replace	Every 40,000 km (24,000 miles) or 24 months	MA-22, 23, 24
. G H	Steering gear & linkage, axle & suspension parts & propeller shaft	Check	Every 10,000 km (6,000 miles) or 6 months	MA-23, 27 FA-6, RA-5
. G	Locks, hinges & hood latch	Lubricate		MA-29
A . C G H I	Brake pads, discs & other brake components	Check	Every 5,000 km (3,000 miles) or 3 months	MA-25

Maintenance operation: Check = Check. Correct or replace if necessary.

PERIODIC MAINTENANCE (For Europe except U.K.)

The following tables show the normal maintenance schedule. Depending upon weather and atmospheric conditions, varying road surfaces, individual driving habits and vehicle usage, additional or more frequent maintenance will be required.

Periodic maintenance beyond the last period shown on the tables requires similar maintenance.

STANDARD & THE FIRST FREE SERVICES

MAINTENANCE OPERATION	MAINTENANCE INTERVAL						Reference page
	Months	—	12	24	36	48	
Perform the standard service on a yearly basis, but on a mileage basis when driving more than 20,000 km (12,000 miles) a year.	km x 1,000 (Miles x 1,000)	1 (0.6)	20 (12)	40 (24)	60 (36)	80 (48)	
Engine							
Underhood and under vehicle							
Check drive belts for cracks, fraying, wear & tension				X		X	MA-12
Change engine anti-freeze coolant (Ethylene glycol base)				X		X	MA-13
Check cooling system		X	X	X	X	X	MA-14
Check fuel lines			X			X	MA-15
Replace air cleaner filter (Viscous paper type)*				X		X	MA-16
Replace timing belt			Every 100,000 km (60,000 miles)				EM-13
Replace fuel filter*				X		X	MA-16
Replace spark plugs (Use PLATINUM-TIPPED type.)			Every 100,000 km (60,000 miles)				MA-18
Check exhaust gas sensor (Except models for Sweden)				X		X	MA-20
Check vapor lines	See NOTE (1)			X		X	MA-19
Chassis and body							
Underhood							
Check brake & clutch fluid level & leaks		X	X	X	X	X	MA-21, 24
Check automatic transmission fluid level & leaks*				X		X	MA-22
Change brake fluid*				X		X	MA-25
Check brake booster vacuum hoses, connections & check valve				X		X	MA-25
Check power steering fluid & lines		X	X	X	X	X	MA-26
Check A.S.C.D. vacuum hoses		X	X	X	X	X	MA-21
Under vehicle							
Check brake & clutch for proper attachment, leaks, cracks, chafing, abrasion, deterioration, etc.		X	X	X	X	X	MA-21, 24
Check oil level in manual transmission & differential gear*				X		X	MA-21, 24
Check steering gear & linkage, axle & suspension parts, propeller shaft, drive shafts & exhaust system for damage, loose & missing parts, lubrication & leaks*	X			X		X	MA-23, 26, 27, 28
Check SUPER HICAS linkage*				X		X	MA-27
Outside and inside							
Check wheel alignment, if necessary balance wheels		X	X	X	X	X	MA-26 FA-7
Check brake pads, discs & other brake components for wear, deterioration & leaks*		X	X	X	X	X	MA-25
Check seat belts, buckles, retractors, anchors & adjuster				X		X	MA-29
Check foot brake, parking brake & clutch for free play, stroke & operation		X	X	X	X	X	CL-7, BR-7, 22
Check body corrosion				Annually			MA-30

NOTE: (1) For models for Sweden perform at the first 80,000 km (48,000 miles), and then every 40,000 km (24,000 miles) or 24 months, whichever comes first.

(2) Maintenance items with "★" should be performed more frequently according to "Maintenance under severe driving conditions".

Check: Check. Correct or replace if necessary.

PERIODIC MAINTENANCE (For Europe except U.K.)

ENGINE OIL SERVICE

MAINTENANCE OPERATION	Months	MAINTENANCE INTERVAL								Reference page
		12	24	36	48	60	72	84	96	
Perform at the specified time generally, but perform at the specified mileage when driving more than 10,000 km (6,000 miles) a year.	km x 1,000	10	20	30	40	50	60	70	80	
	(Miles x 1,000)	(6)	(12)	(18)	(24)	(30)	(36)	(42)	(48)	
Underhood										
Change engine oil (Use API SG oil only)*		X	X	X	X	X	X	X	X	MA-16
Change engine oil filter (Use Nissan PREMIUM type or equivalent.)*		X	X	X	X	X	X	X	X	MA-17

NOTE: Maintenance items with "*" should be performed more frequently according to "Maintenance under severe driving conditions".

MAINTENANCE UNDER SEVERE DRIVING CONDITIONS

The maintenance intervals shown on the preceding pages are for normal operating conditions. If the vehicle is mainly operated under severe driving conditions as shown below, more frequent maintenance must be performed on the following items as shown in the table.

Severe driving conditions

- A — Driving under dusty conditions
- B — Driving repeatedly short distances
- C — Towing a trailer
- D — Extensive idling
- E — Driving in extremely adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high
- F — Driving in high humidity areas or in mountainous areas
- G — Driving in areas using salt or other corrosive materials
- H — Driving on rough and/or muddy roads or in the desert
- I — Driving with frequent use of braking or in mountainous areas

Driving condition	Maintenance item	Maintenance operation	Maintenance interval	Reference page
Standard service				
A	Air cleaner filter	Replace		MA-16
A E	Fuel filter	Replace		MA-16
. F	Brake fluid	Replace	Every 12 months or 20,000 km (12,000 miles)	MA-25
. G H	Steering gear & linkage, axle & suspension parts, propeller shaft, drive shafts, exhaust system & SUPER HICAS linkage	Check		MA-23, 26, 27, 28 FA-6, RA-5, 7
. C H	Automatic & manual transmission oil, & differential gear oil	Replace	Every 24 months or 40,000 km (24,000 miles)	MA-22, 23, 24
A C G H I	Brake pads, discs & other brake components	Check	Every 6 months or 10,000 km (6,000 miles)	MA-25
Engine oil service				
A B C D	Engine oil	Replace	Every 6 months or 5,000 km (3,000 miles)	MA-16
A B C D	Engine oil filter	Replace	5,000 km (3,000 miles)	MA-17

Maintenance operation: Check = Check. Correct or replace if necessary.

PERIODIC MAINTENANCE (For U.K.)

The following tables show the normal maintenance schedule. Depending upon weather and atmospheric conditions, varying road surface, individual driving habits and vehicle usage, additional or more frequent maintenance will be required.

Periodic maintenance beyond the last period shown on the tables requires similar maintenance.

MAINTENANCE OPERATION	MAINTENANCE INTERVAL										Reference page
	Miles x 1,000	0.6	9	18	27	36	45	54	63	72	
	(km x 1,000)	(1)	(15)	(30)	(45)	(60)	(75)	(90)	(105)	(120)	
Perform either at number of miles (kilometers) or months, whichever comes first.	Months	—	6	12	18	24	30	36	42	48	
ENGINE MAINTENANCE											
Under bonnet and under vehicle											
Replace timing belt		Every 60,000 miles (100,000 km)									EM-13
Change engine anti-freeze coolant (Ethylene glycol base)						X				X	MA-13
Check cooling system		X		X		X		X		X	MA-14
Check fuel lines						X				X	MA-15
Check drive belts for cracks, fraying, wear & tension		X		X		X		X		X	MA-12
Replace air cleaner filter (Viscous paper type)*						X				X	MA-16
Change engine oil (Use API SG oil only)*		Every 6,000 miles (10,000 km) or 12 months									MA-16
Change engine oil filter (Use Nissan PREMIUM type or equivalent)*		Every 6,000 miles (10,000 km) or 12 months									MA-17
Replace fuel filter		X		X		X		X		X	MA-16
Replace spark plugs (Use PLATINUM-TIPPED type)		Every 60,000 miles (100,000 km)									MA-18
CHASSIS AND BODY MAINTENANCE											
Under bonnet											
Check brake & clutch fluid level & leaks*		X	X	X	X	X	X	X	X	X	MA-21, 24
Check automatic transmission fluid level & leaks*		X				X		X		X	MA-22
Change brake fluid		X				X		X		X	MA-25
Check brake booster vacuum hoses, connections & check valve						X				X	MA-25
Check power steering fluid & lines		X	X	X	X	X	X	X	X	X	MA-26
Check A.S.C.D. hoses		X				X		X		X	MA-21
Under vehicle											
Check brake & clutch for proper attachment, leaks, cracks, chafing, abrasion, deterioration, etc.		X	X	X	X	X	X	X	X	X	MA-21, 24
Check oil level in manual transmission & differential gear*		X				X		X		X	MA-21, 24
Check steering gear & linkage, axle & suspension parts, propeller shaft, drive shafts & exhaust system for damaged, loose & missing parts, lubrication & leaks*		X		X		X		X		X	MA-23, 26, 27, 28 FA-6, RA-5, 7
Check SUPER HICAS linkage*		X				X		X		X	MA-27
Outside and inside											
Check wheel alignment, if necessary balance wheels		X				X		X		X	MA-26 FA-7
Check brake pads, disc & other brake components for wear, deterioration & leaks*		X	X	X	X	X	X	X	X	X	MA-25
Check seat belts, buckles, retractors & adjuster		X				X		X		X	MA-29
Check foot brake, hand brake & clutch for free play, stroke & operation		X	X	X	X	X	X	X	X	X	CL-7, BR-7, 22
Check body corrosion		Annually									MA-30

NOTE: Maintenance items with "*" should be performed more frequently according to "Maintenance under severe driving conditions".

Check: Check. Correct or replace if necessary.

PERIODIC MAINTENANCE (For U.K.)

MAINTENANCE UNDER SEVERE DRIVING CONDITIONS

The maintenance intervals shown on the preceding page are for normal operating conditions. If the vehicle is mainly operated under severe driving conditions as shown below, more frequent maintenance must be performed on the following items as shown in the table.

Severe driving conditions

- A — Driving under dusty conditions
- B — Driving repeatedly short distances
- C — Towing a trailer
- D — Extensive idling
- E — Driving in areas using salt or other corrosive materials
- F — Driving on rough and/or muddy roads or in the desert
- G — Driving with frequent use of braking or in mountainous areas

Driving condition	Maintenance item	Maintenance operation	Maintenance interval	Reference page
A	Air cleaner filter	Replace	More frequently	MA-16
A B C D	Engine oil & oil filter	Replace	Every 3,000 miles (5,000 km) or 6 months	MA-16, 17
. . . C . . . F .	Automatic & manual transmission oil, differential gear oil	Replace	Every 36,000 miles (60,000 km) or 24 months	MA-22, 23, 24
. E F .	Steering gear & linkage, axle & suspension parts, propeller shaft, drive shafts, exhaust system & SUPER HICAS linkage	Check	Every 9,000 miles (15,000 km) or 6 months	MA-23, 26, 27, 28 FA-5, RA-5, 7
A . . C . . E F G	Brake pads, discs & other brake components	Check	Every 4,500 miles (7,500 km) or 3 months	MA-25

Maintenance operation: Check = Check. Correct or replace if necessary.

RECOMMENDED FLUIDS AND LUBRICANTS

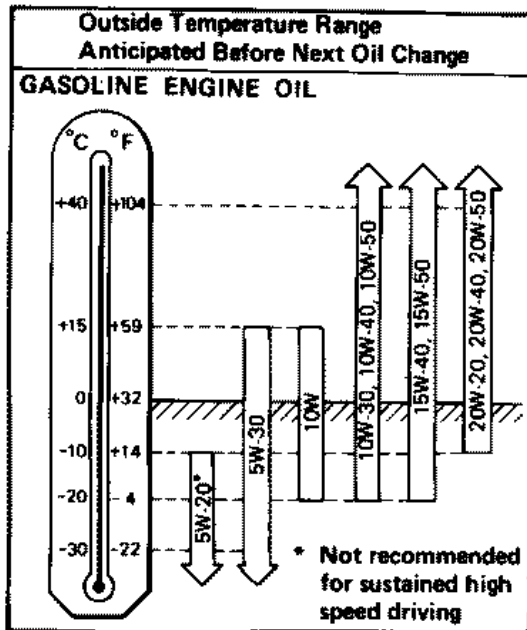
Fluids and Lubricants

	Capacity (Approximate)		Recommended fluids and lubricants
	Liter	Imp measure	
Engine oil (Refill)			
With oil filter	3.4	3 qt	For models for Europe: API SG* Except for models for Europe: API SF or SG*
Without oil filter	3.0	2-5/8 qt	
Cooling system (With reservoir)	10.0	8-3/4 qt	Anti-freeze coolant (Ethylene glycol base)
Manual transmission gear oil	2.8	4-7/8 pt	API GL-4*
Europe model	3.1	5-1/2 pt	
Differential gear oil	1.5	2-5/8 pt	API GL-5*
Europe model	2.1	3-3/4 pt	
Automatic transmission fluid	7.7	6-3/4 qt	Type DEXRON™
Europe model	8.7	7-5/8 qt	
Power steering fluid	1.3	1-1/8 qt	Type DEXRON™
With SUPER HICAS	2.0	1-3/4 qt	
Brake and clutch fluid	---	---	DOT 3 (US FMVSS No. 116)
Multi-purpose grease	---	---	NLGI No. 2 (Lithium soap base)

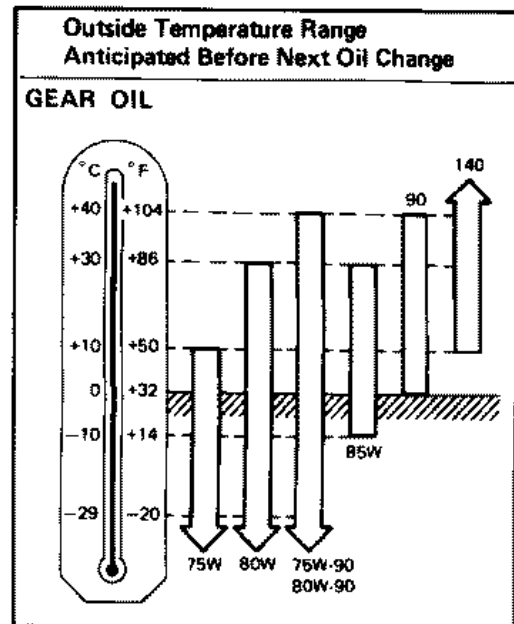
*For further details, see "Recommended SAE viscosity number".

RECOMMENDED FLUIDS AND LUBRICANTS

SAE Viscosity Number



T10005

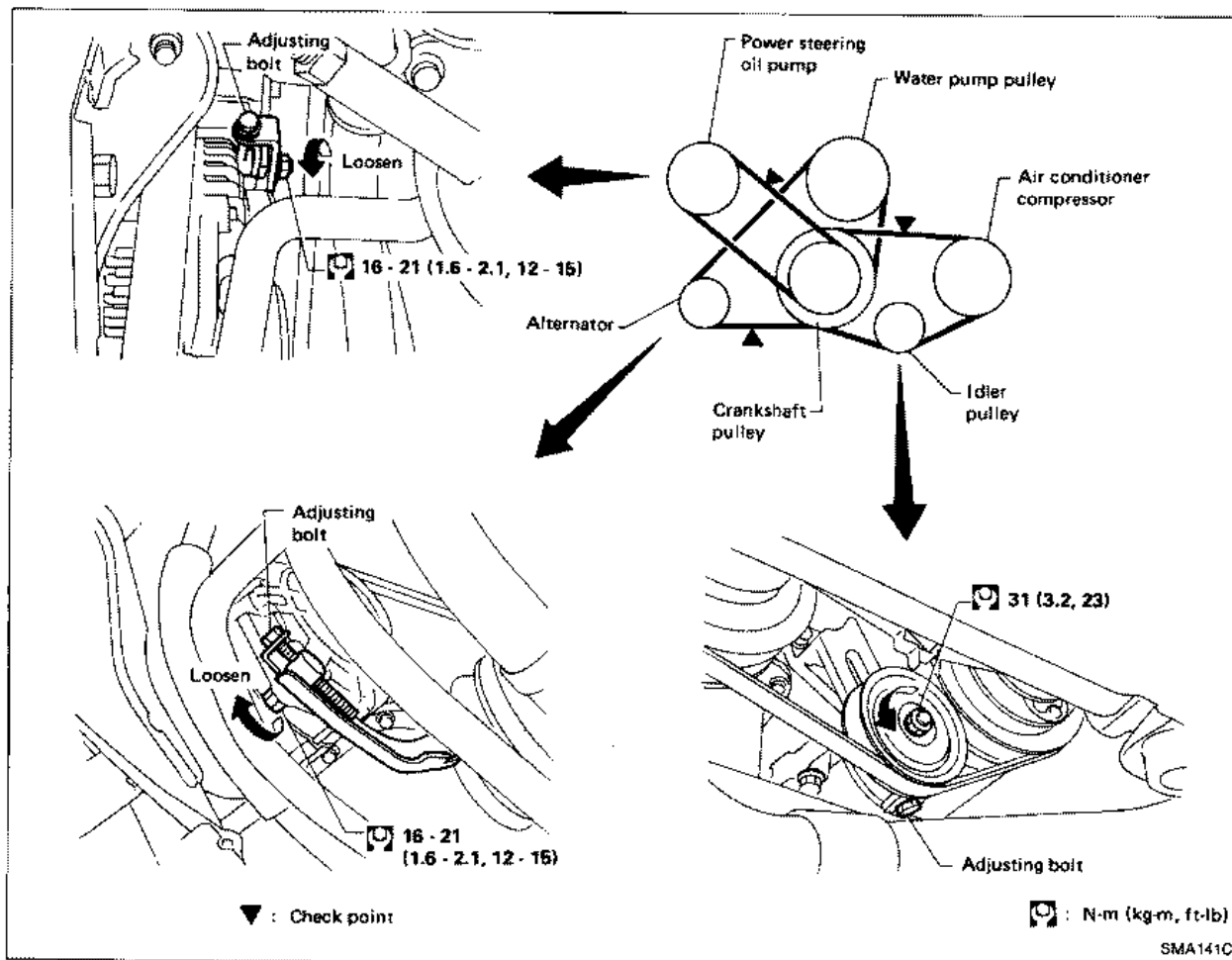


T10003

- For warm and cold areas: 10W-30 is preferable for ambient temperatures above -20°C (-4°F).
 - For hot areas: 20W-40 and 20W-50 are suitable.
 - On turbo engines, 5W-20 is not recommended. 5W-30 should be used only under extremely cold conditions.
- For warm and cold areas: 75W-90 for the transmission and 80W-90 for the differential gear are preferable.
 - For hot areas: 90 is suitable for ambient temperatures below 40°C (104°F).

ENGINE MAINTENANCE

Checking Drive Belts



1. Inspect for cracks, fraying, wear or oil adhesion. If necessary, replace with a new one.
2. Inspect drive belt deflection by pushing on the belt midway between pulleys.

Adjust if belt deflection exceed the limit.

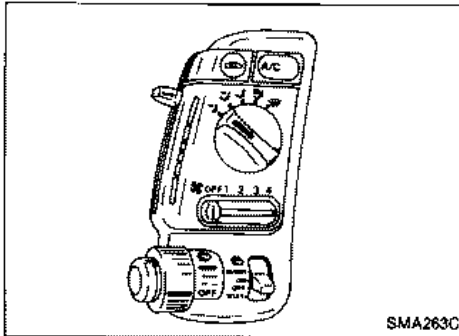
Belt deflection:

Unit: mm (in)

	Used belt deflection		Deflection of new belt
	Limit	Deflection after adjustment	
Alternator	11.5 (0.453)	7 - 8 (0.28 - 0.31)	6.5 - 7.5 (0.256 - 0.295)
Air conditioner compressor	12.5 (0.492)	8 - 9 (0.31 - 0.35)	7 - 8 (0.28 - 0.31)
Power steering oil pump	19 (0.75)	12 - 13.5 (0.472 - 0.531)	10.5 - 11.5 (0.413 - 0.453)
Applied pushing force	98 N (10 kg, 22 lb)		

Inspect drive belt deflection when engine is cold.

ENGINE MAINTENANCE



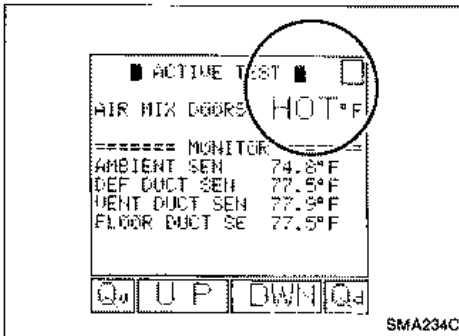
Changing Engine Coolant

WARNING:

To avoid the danger of being scalded, never change the coolant when the engine is hot.

MANUAL CONTROL

1. Turn ignition switch "ON" and set temperature control lever of manual air conditioner to maximum hot position.

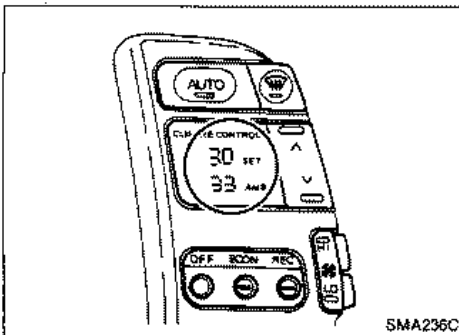


AUTOMATIC CONTROL

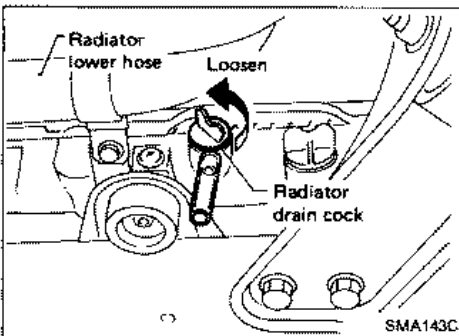


1. Perform "AIR MIX DOORS" test in "ACTIVE TEST" mode of "AUTO A/C" (Automatic Air Conditioner) system.

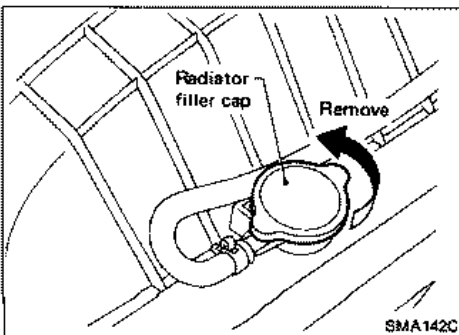
Set "AIR MIX DOORS" at (full) HOT and wait 10 seconds before turning ignition switch off.



1. Perform self-diagnosis step 2 of Automatic Air Conditioner system, referring to the following notes:
 - 1) Turn ignition switch from "OFF" to "ON".
 - 2) Press both "AUTO" and "OFF" switches for at least 5 seconds.
 - 3) Press "AUTO" switch 2 times.
 - 4) Confirm indication of the A/C display shown at left.
 - 5) Wait 10 seconds before turning ignition switch off.

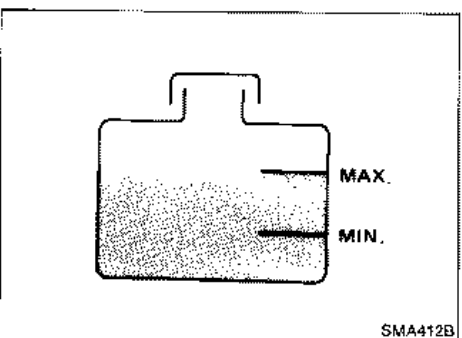
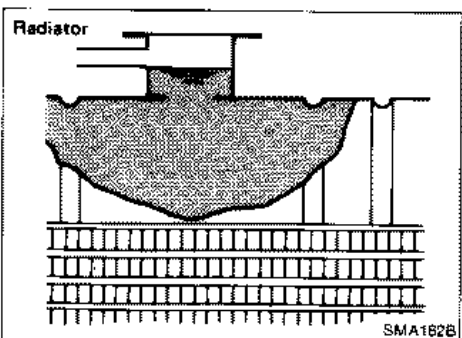
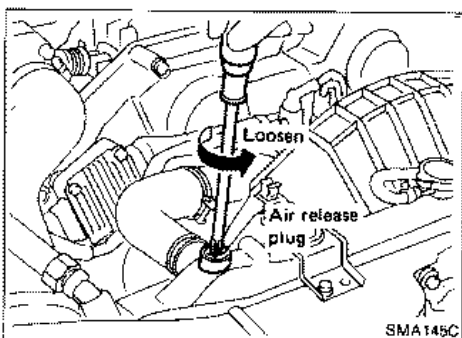
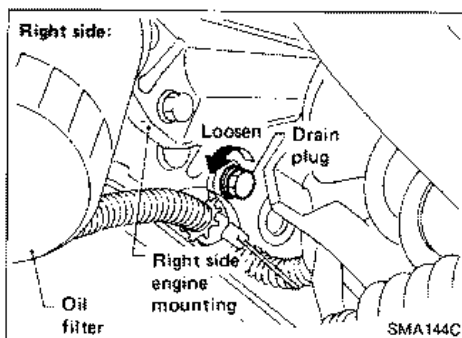


2. Open drain cock at the bottom of radiator, and remove radiator cap.



ENGINE MAINTENANCE

Changing Engine Coolant (Cont'd)



3. Open drain plugs on both sides of cylinder block.
 - **Left side drain plug is located beside the left side engine mounting.**

4. Open air release plug to drain coolant.
5. Flush cooling system by running fresh water through radiator.
6. Close drain cock and tighten drain plugs securely.
 - **Apply sealant to the drain plug thread.**
⊞: 34 - 44 N·m
(3.5 - 4.5 kg-m, 25 - 33 ft-lb)

7. Fill radiator slowly with proper mixture of coolant and water. Fill reservoir tank up to the "H" level. Then install radiator cap and close air release plug.
 - Coolant capacity (With reservoir tank):**
10.0ℓ (8-3/4 Imp qt)
 - Reservoir tank:**
0.6ℓ (1/2 Imp qt)

Pour coolant through coolant filler neck slowly to allow air in system to escape.

8. Start engine and warm it up until it reaches normal operating temperature. Then race engine 2 or 3 times under no-load. Watch coolant temperature gauge for signs of overheating.
9. Stop engine. After it completely cools down, refill radiator up to filler opening. Fill reservoir tank up to the "H" level.
10. Check drain cock and drain plug for any sign of leakage.

Checking Cooling System

CHECKING HOSES

Check hoses for improper attachment and for leaks, cracks, damage, loose connections, chafing and deterioration.

ENGINE MAINTENANCE

Checking Cooling System (Cont'd)

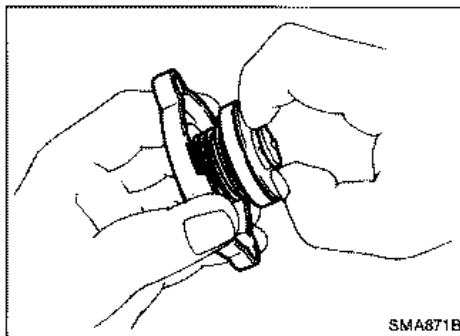
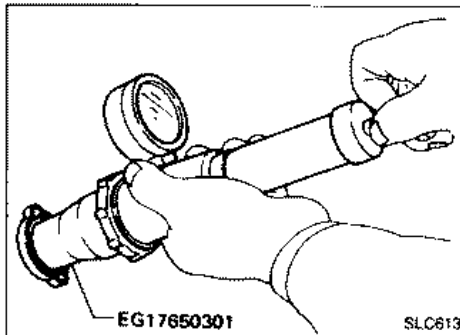
CHECKING RADIATOR CAP

Apply pressure to radiator cap with cap tester to see if it is satisfactory.

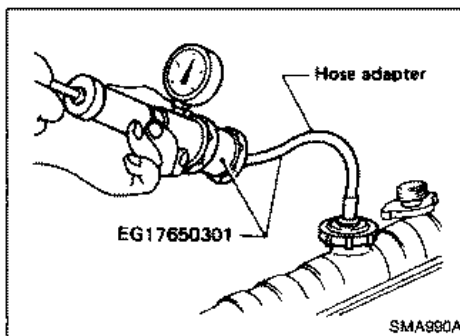
Radiator cap relief pressure:

78 - 98 kPa

(0.78 - 0.98 bar, 0.8 - 1.0 kg/cm², 11 - 14 psi)



Pull the negative-pressure valve to open it. Check that it closes completely when released.



CHECKING COOLING SYSTEM FOR LEAKS

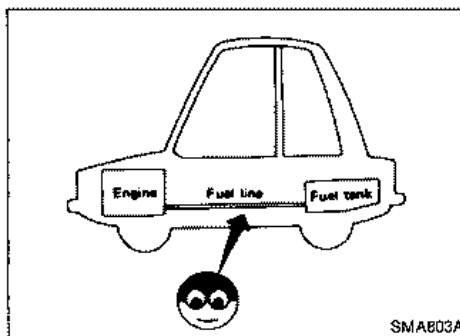
Apply pressure to the cooling system with cap tester to check for leakage.

Testing pressure:

98 kPa (0.98 bar, 1.0 kg/cm², 14 psi)

CAUTION:

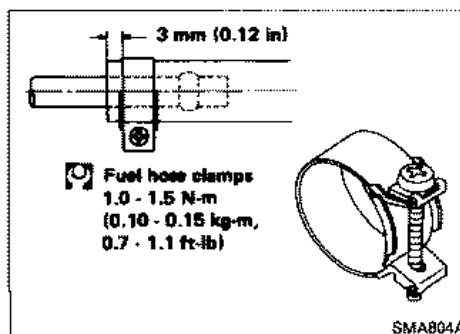
Higher pressure than the specified value may cause damage to radiator.



Checking Fuel Lines

Inspect fuel lines and tank for improper attachment and for leaks, cracks, damage, loose connections, chafing and deterioration.

If necessary, repair or replace faulty parts.



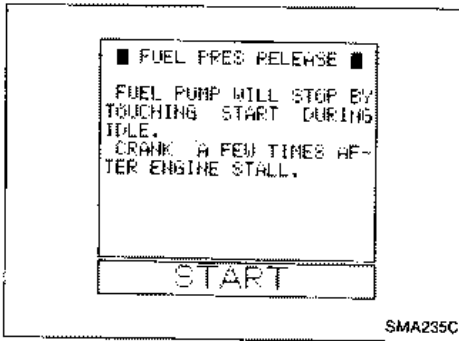
CAUTION:

Tighten high-pressure rubber hose clamp so that clamp end is 3 mm (0.12 in) from hose end.

Tightening torque specifications are the same for all rubber hose clamps.

Ensure that screw does not contact adjacent parts.

ENGINE MAINTENANCE



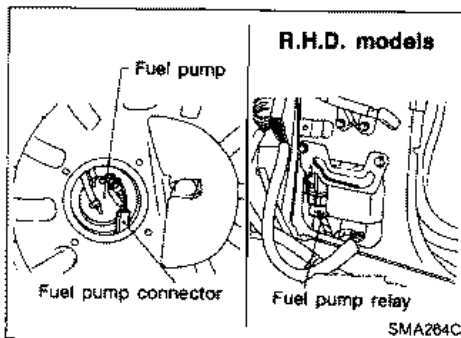
Changing Fuel Filter

WARNING:

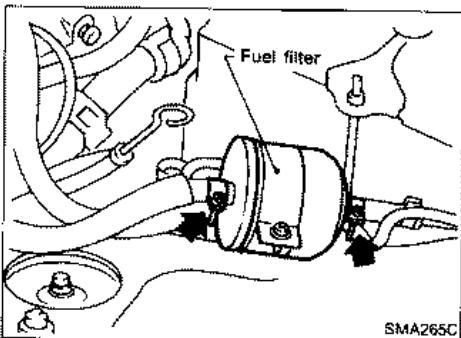
Before removing fuel filter, release fuel pressure from fuel line to eliminate danger.



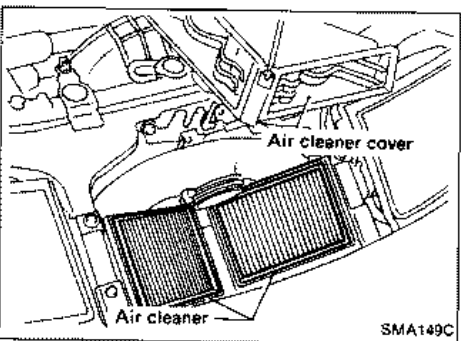
1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode and release fuel pressure to zero.
2. Turn ignition switch off.



1. Disconnect fuel pump relay or fuel pump connector.
2. Start engine.
3. After engine stalls, crank engine two or three times to make sure that fuel pressure is released. Then turn ignition switch off and reconnect fuel pump relay or fuel pump connector.

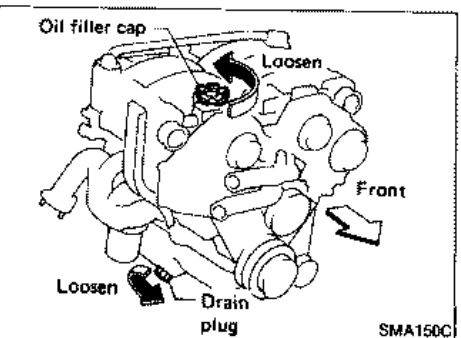


4. Loosen fuel hose clamps.
 5. Replace fuel filter.
- Be careful not to spill fuel over engine compartment. Place a shop towel to absorb fuel.
 - Use a high-pressure type fuel filter. Do not use a synthetic resinous fuel filter.
 - When tightening fuel hose clamps, refer to "Checking Fuel Lines".



Changing Air Cleaner Filter

The viscous paper type filter does not need cleaning between renewals.



Changing Engine Oil

WARNING:

Be careful not to burn yourself, as the engine oil is hot.

1. Warm up engine, and check for oil leakage from engine components.
2. Remove drain plug and oil filler cap.

ENGINE MAINTENANCE

Changing Engine Oil (Cont'd)

3. Drain oil and refill with new engine oil.

Oil capacity (Refill): *ℓ* (Imp qt)

Non-Turbo

With oil filter

3.4 (3)

Without oil filter

3.0 (2-5/8)

Turbo (Without oil cooler)

With oil filter

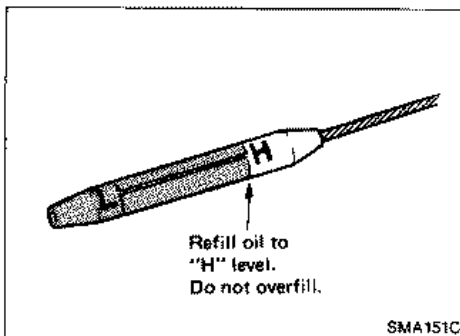
3.4 (3)

Without oil filter

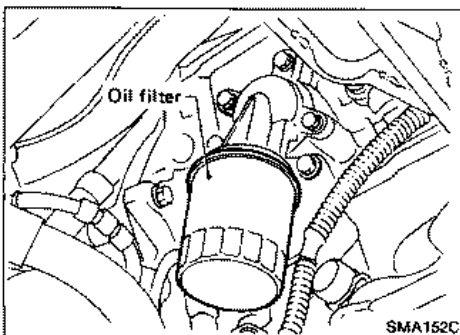
3.0 (2-5/8)

CAUTION:

- Be sure to clean drain plug and install with new washer.
Oil pan drain plug:
⌚: 29 - 39 N·m
(3.0 - 4.0 kg·m, 22 - 29 ft·lb)
- Use recommended engine oil "API SG".
- Since the oil refill capacity changes depending on the oil temperature and drain time (more than 2 minutes is recommended), use these values as a reference and be certain to check with the dipstick when changing the oil.



4. Check oil level.
5. Start engine and check area around drain plug and oil filter for oil leakage.
6. Run engine for a few minutes, then turn it off. After several minutes, confirm oil level again.



Changing Oil Filter

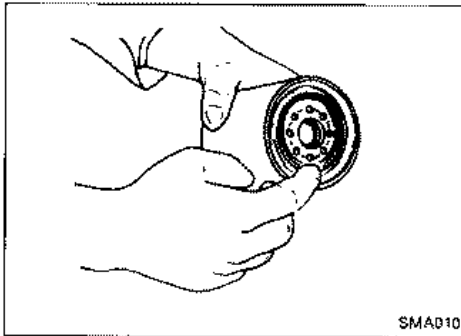
1. Remove oil filter with a suitable tool.

WARNING:

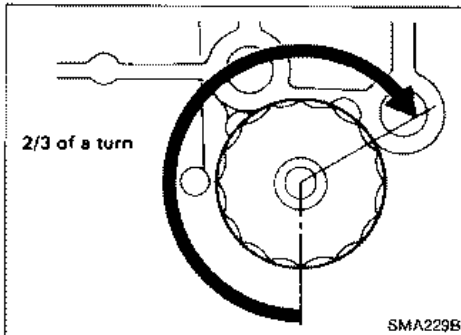
Be careful not to burn yourself, as the engine and engine oil are hot.

ENGINE MAINTENANCE

Changing Oil Filter (Cont'd)

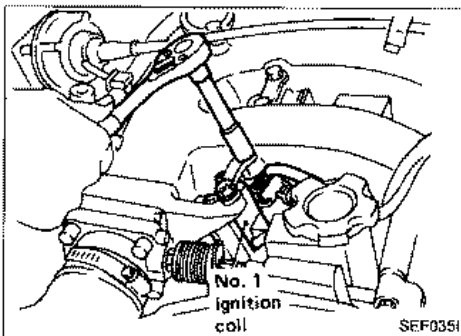


- Before installing a new oil filter, clean the oil filter mounting surface on cylinder block, and coat the oil filter rubber seal with a little engine oil.



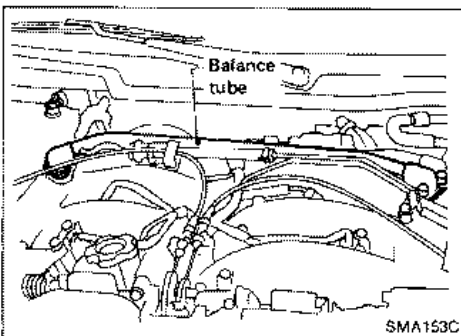
- Screw in the oil filter until a slight resistance is felt, then tighten an additional 2/3 turn.
- Add engine oil.

Refer to Changing Engine Oil.

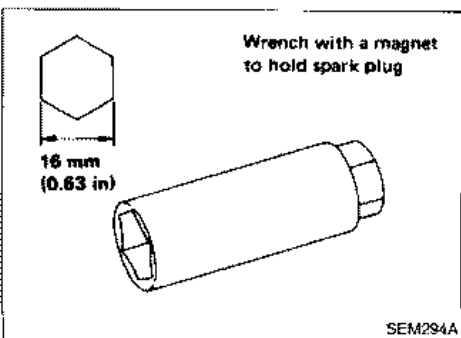


Changing Spark Plugs

- Disconnect ignition coil harness connector.
- Loosen ignition coil fixing bolts and pull out coil from intake manifold collector.



- When changing No. 5 and No. 6 cylinder spark plugs, remove balance tube first. (O-rings of balance tube may be reused, if they are not worn.)



- Remove spark plugs with suitable spark plug wrench.

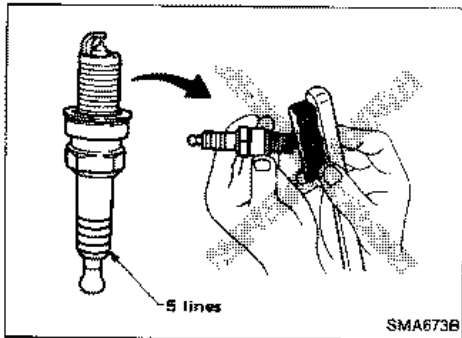
Spark plug (Platinum-tipped type):

	Non-turbo	Turbo
Standard type	PFR6B-11	PFR6B-11C
Hot type	PFR5B-11	PFR5B-11C
Cold type	PFR7B-11	PFR7B-11C

: 20 - 29 N·m (2 - 3 kg-m, 14 - 22 ft-lb)

ENGINE MAINTENANCE

Changing Spark Plugs (Cont'd)



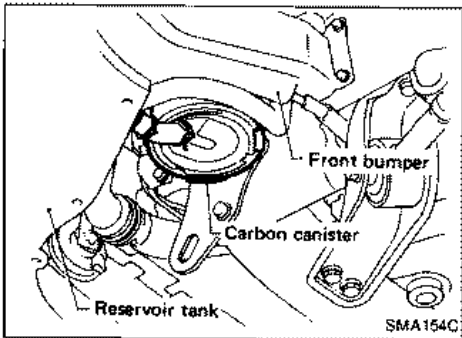
- Checking and adjusting plug gap are not required between renewals.
- Do not use a wire brush for cleaning.
- If plug tip is covered with carbon, spark plug cleaner may be used.

Cleaner air pressure:

Less than 588 kPa (5.9 bar, 6 kg/cm², 85 psi)

Cleaning time:

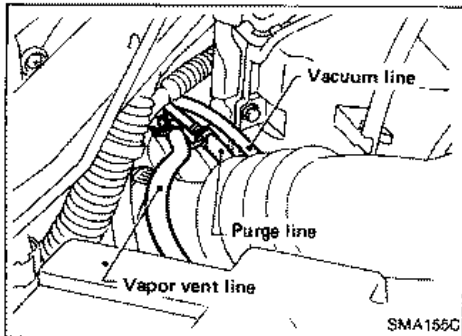
Less than 20 seconds



Checking Vapor Lines

1. Visually inspect vapor lines for improper attachment and for cracks, damage, loose connections, chafing and deterioration.
2. Inspect vacuum relief valve of fuel tank filler cap for clogging, sticking, etc.

Refer to "EVAPORATIVE EMISSION CONTROL SYSTEM" in EF & EC section.

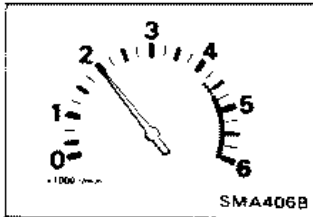


ENGINE MAINTENANCE

Checking Exhaust Gas Sensor

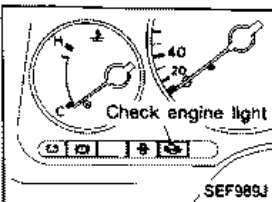
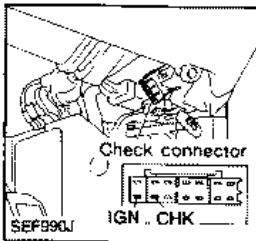
Checking procedure

- The check engine light normally blinks 5 times at 0.4 second intervals and 5 times at 0.2 second intervals. (No malfunction in Self-diagnostic results mode)
Refer to Self-diagnosis in EF & EC section.

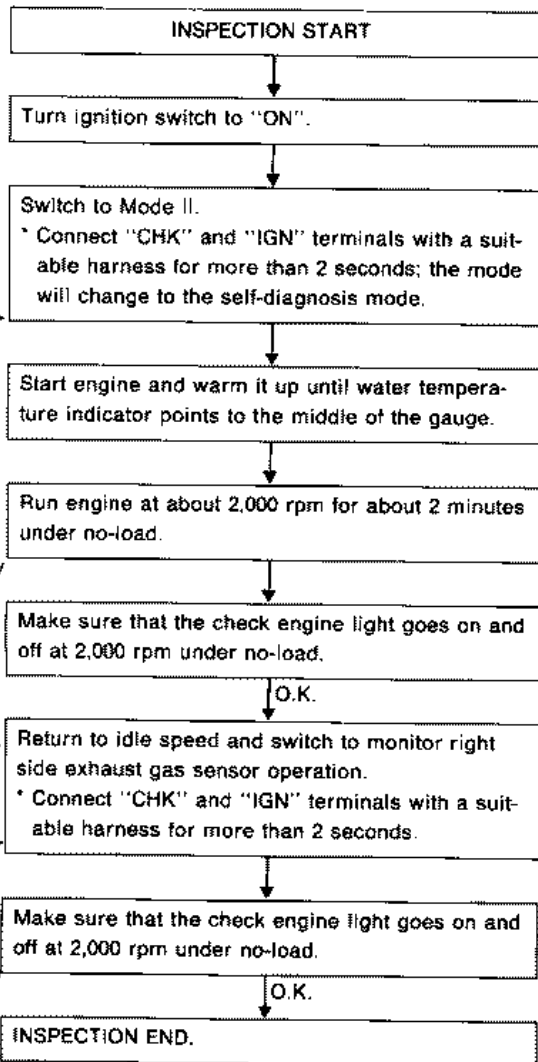
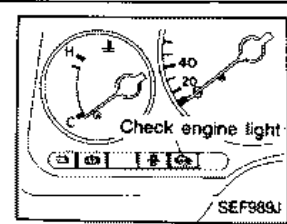
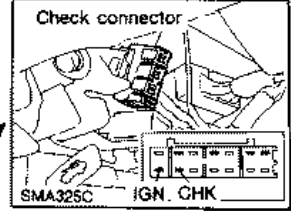


- The light normally indicates left side exhaust gas sensor operation.
- The check engine light blinks twice, then indicates right side exhaust gas sensor operation.
Refer to Self-diagnosis in EF & EC section.

R.H.D. models



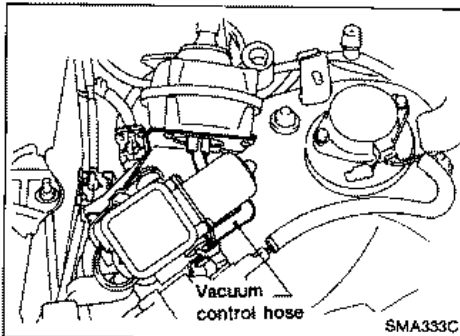
L.H.D. models



Check and adjustment should be made by referring to TROUBLE DIAGNOSES-EXHAUST GAS SENSOR and IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION in EF & EC section.

- For help in the checking procedure, refer to Self-diagnosis in EF & EC section.

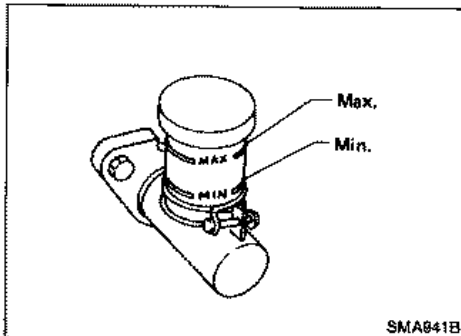
CHASSIS AND BODY MAINTENANCE



Checking A.S.C.D. Vacuum Line

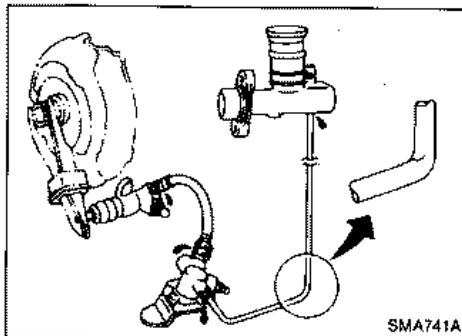
Check vacuum control hose and connections for airtightness, improper attachment, breakage, chafing, cracks, clogging, deformation and deterioration.

If necessary, replace A.S.C.D. actuator assembly.



Checking Clutch Fluid Level and Leaks

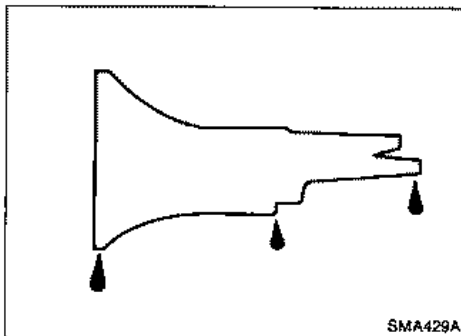
If fluid level is extremely low, check clutch system for leaks.



Checking Clutch System

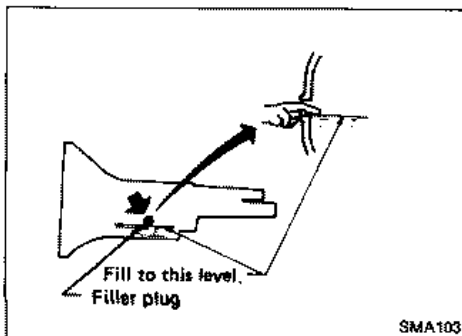
HYDRAULIC TYPE

Check fluid lines and operating cylinder for improper attachment, cracks, damage, loose connections, chafing and deterioration.



Checking M/T Oil

1. Check for oil leakage.



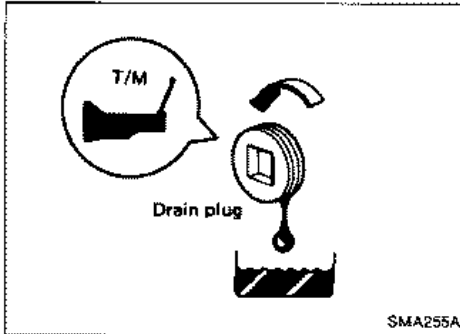
2. If leakage is found, check oil level.

Never start engine while checking oil level.

Filler plug:

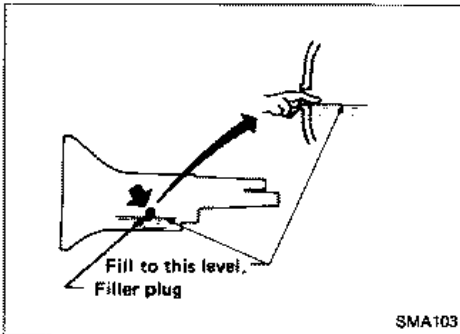
\square : 25 - 34 N·m (2.5 - 3.5 kg·m, 18 - 25 ft·lb)

CHASSIS AND BODY MAINTENANCE

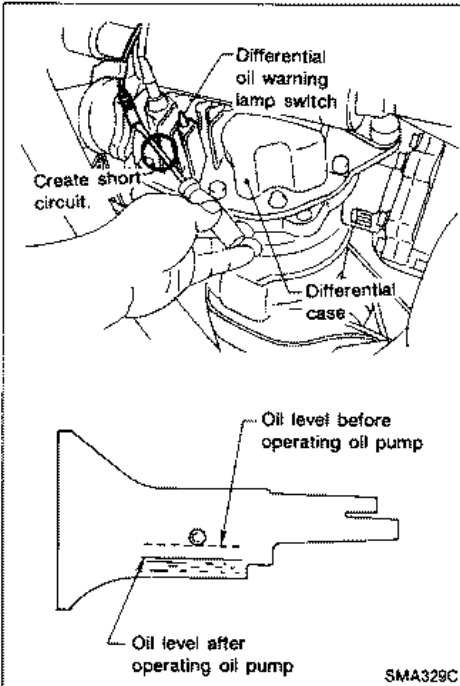


Changing M/T Oil

1. Drain oil.



2. Refill with recommended new gear oil and check oil level.



For turbo models

3. Turn ignition switch ON and short the circuit between the terminals for differential oil warning lamp switch on differential case.

Keep oil pump operating for 1 minute to circulate oil in transmission oil cooler system. (Oil pump for differential oil cooling system operates at the same time.)

4. Top up with recommended new gear oil.
5. Check oil level.

Oil capacity:

For turbo

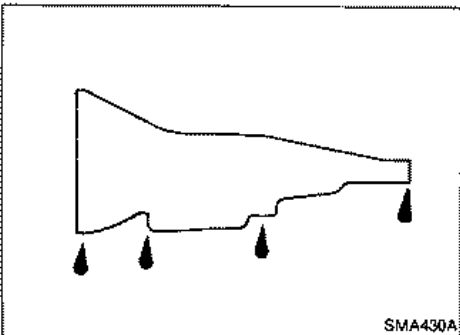
3.1 ℓ (5-1/2 Imp pt)

For non-turbo

2.8 ℓ (4-7/8 Imp pt)

Filler and drain plugs:

⌘: 25 - 34 N·m (2.5 - 3.5 kg·m, 18 - 25 ft·lb)

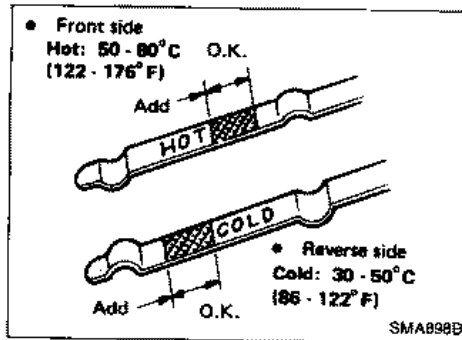


Checking A/T Fluid

1. Check for fluid leakage.

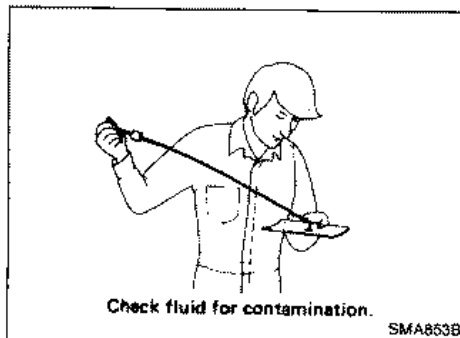
CHASSIS AND BODY MAINTENANCE

Checking A/T Fluid (Cont'd)

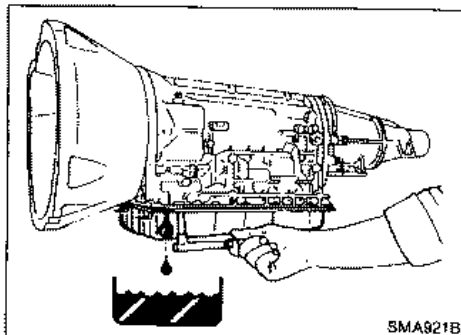


2. If leakage is found, check fluid level.
Fluid level should be checked using "HOT" range on dipstick at fluid temperatures of 50 to 80°C (122 to 176°F) after vehicle has been driven approximately 5 minutes in urban areas after engine is warmed up. But it can be checked at fluid temperatures of 30 to 50°C (86 to 122°F) using "COLD" range on dipstick for reference after engine is warmed up and before driving. However, fluid level must be rechecked using "HOT" range.
 - 1) Park vehicle on level surface and set parking brake.
 - 2) Start engine and then move selector lever through each gear range, ending in "P".
 - 3) Check fluid level with engine idling.
 - 4) Remove dipstick and wipe it clean with lint-free paper.
 - 5) Reinsert dipstick into charging pipe as far as it will go.
 - 6) Remove dipstick and note reading. If level is at low side of either range, add fluid to the charging pipe.

Do not overfill.



3. Check fluid condition.
Check fluid for contamination. If fluid is very dark or smells burned, or contains frictional material (clutches, band, etc.), check operation of A/T.
Refer to section AT for checking operation of A/T.



Changing A/T Fluid

1. Drain fluid by removing oil pan.
2. Replace gasket with a new one.
3. Refill with recommended A/T fluid and then check fluid level.

Oil capacity (With torque converter):

VG30DE

8.3 ℓ (7-1/4 Imp qt)

VG30DETT

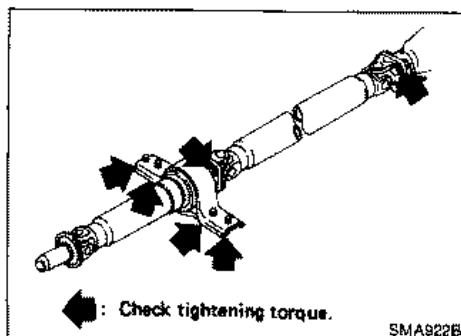
8.7 ℓ (7-5/8 Imp qt)

Checking Propeller Shaft

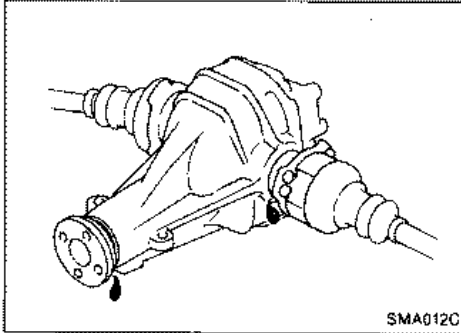
Check propeller shaft and center bearing for damage, looseness or grease leakage.

If greasing points are provided, supply grease as necessary.

Refer to section PD.

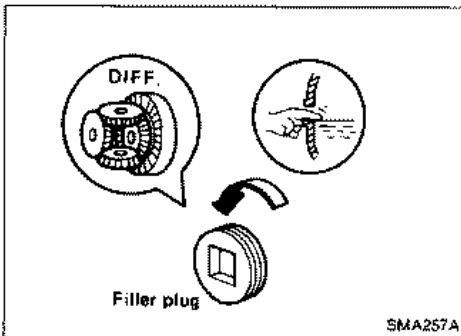


CHASSIS AND BODY MAINTENANCE



Checking Differential Gear Oil

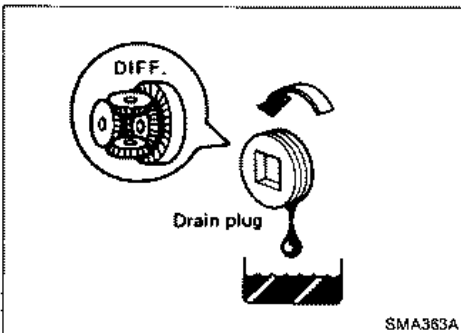
1. Check differential carrier for oil leakage.



2. If leakage is found, check oil level.

Filler plug:

⌚: 39 - 59 N·m (4 - 6 kg-m, 29 - 43 ft-lb)



Changing Differential Gear Oil

1. Drain oil and refill with recommended new gear oil.
2. Check oil level.

Oil capacity:

For non-turbo

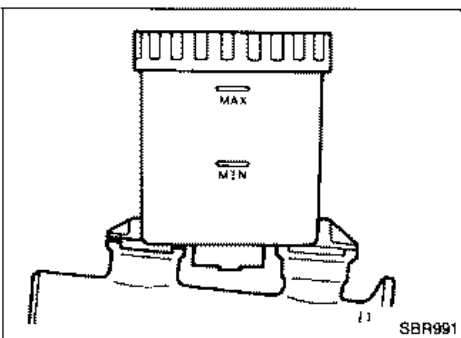
1.5 ℓ (2-5/8 Imp pt)

For turbo

2.1 ℓ (3-3/4 Imp pt)

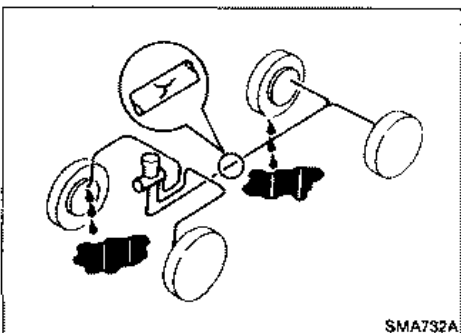
Drain plug:

⌚: 39 - 59 N·m (4 - 6 kg-m, 29 - 43 ft-lb)



Checking Brake Fluid Level and Leaks

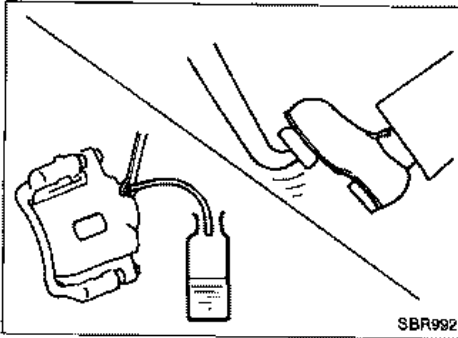
- If fluid level is extremely low, check brake system for leaks.



Checking Brake Lines and Cables

- Check brake fluid lines and parking brake cables for improper attachment and for leaks, chafing, abrasions, deterioration, etc.

CHASSIS AND BODY MAINTENANCE



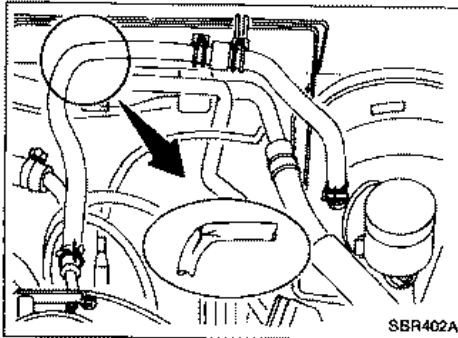
Changing Brake Fluid

1. Drain brake fluid from each air bleeder valve.
2. Refill until new brake fluid comes out from each air bleeder valve.

Use same procedure as in bleeding hydraulic system to refill brake fluid.

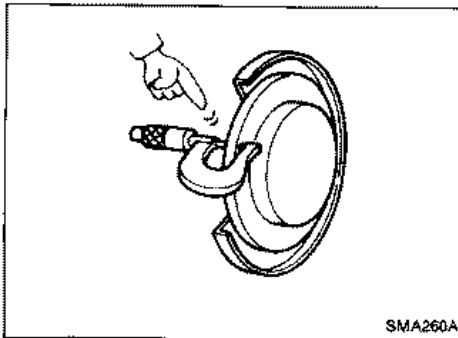
Refer to section BR.

- Refill with recommended brake fluid "DOT 3".
- Never reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas.



Checking Brake Booster Vacuum Hoses, Connections and Check Valve

Check vacuum lines, connections and check valve for improper attachment, air tightness, chafing and deterioration.



Checking Disc Brake

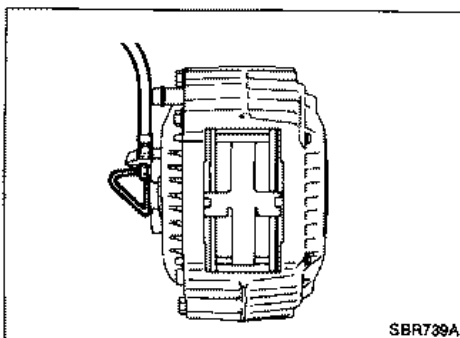
- Check condition of disc brake components.

ROTOR

- Check condition and thickness.

Unit: mm (in)

	Front		Rear
	OPZ25V	OPF25V	OPZ11VB
Standard thickness	26.0 (1.024)	30.0 (1.181)	18 (0.71)
Minimum thickness	24.0 (0.945)	28.0 (1.102)	16.0 (0.630)

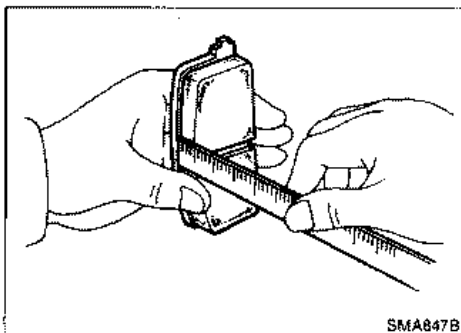


CALIPER

- Check operation and for leakage.

CHASSIS AND BODY MAINTENANCE

Checking Disc Brake (Cont'd)



PAD

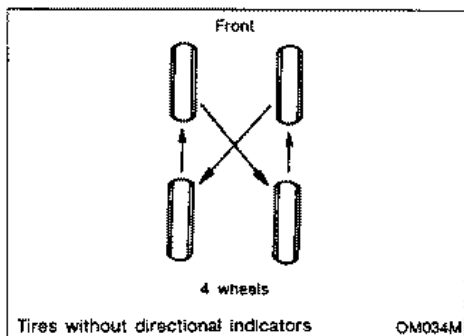
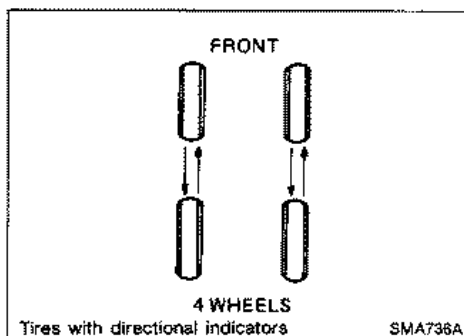
- Check for wear or damage.

Unit: mm (in)

	Front	Rear
Disc brake type	OPZ25V OPF25V	OPZ11VB
Standard thickness	10.0 (0.394)	11.5 (0.453)
Minimum thickness	2.0 (0.079)	

Balancing Wheels

- Adjust wheel balance using road wheel center.
Wheel balance (Maximum allowable unbalance at rim flange):
Refer to S.D.S.
Tire balancing weight: Refer to S.D.S.



Tire Rotation

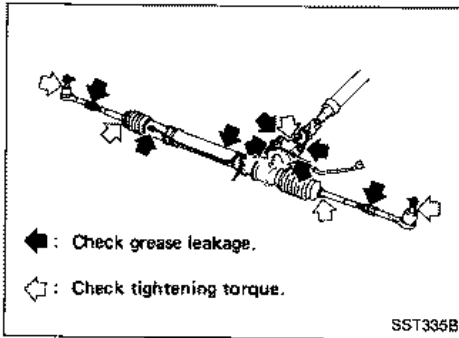
FOR NON-TURBO

- Do not include the T-type or space saver spare tire when rotating the tires.
Wheel nuts:
: 98 - 118 N·m
(10.0 - 12.0 kg·m, 72 - 87 ft·lb)
- Tires marked with directional indicators can only be rotated between front and rear.

FOR TURBO

The front and rear tires cannot be rotated because they are different sizes.
The left and right side tires can be swapped only when the tires do not have directional indicators.

CHASSIS AND BODY MAINTENANCE



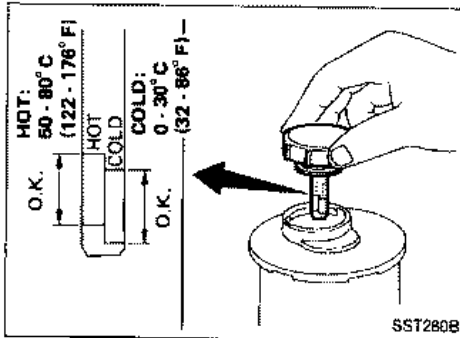
Checking Steering Gear and Linkage

STEERING GEAR

- Check gear housing and boots for looseness, damage or oil leakage.
- Check connection with steering column for looseness.

STEERING LINKAGE

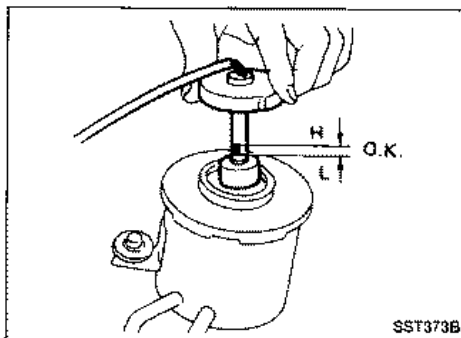
- Check ball joint, dust cover and other component parts for looseness, wear, damage or grease leakage.



Checking Power Steering Fluid and Lines

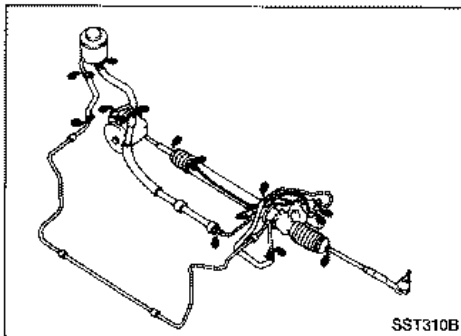
- Checking fluid level (Without SUPER HICAS system)
Fluid level should be checked using "HOT" range on dipstick at fluid temperatures of 50 to 80°C (122 to 176°F) or using "COLD" range on dipstick at fluid temperatures of 0 to 30°C (32 to 86°F).

CAUTION:
Do not overfill.

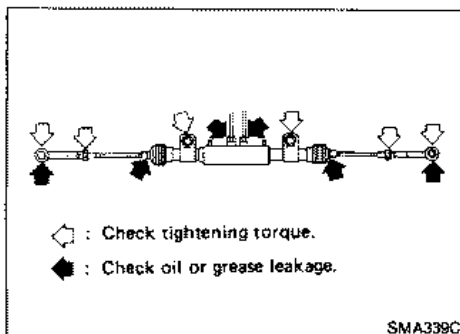


- Checking fluid level (With SUPER HICAS system)
Maintain the fluid level so that the lower surface of the float is maintained between the "L" and "H" marks on the gauge rod. The fluid level should be checked when the engine is stopped and the fluid temperature is normal.

CAUTION:
Do not overfill.



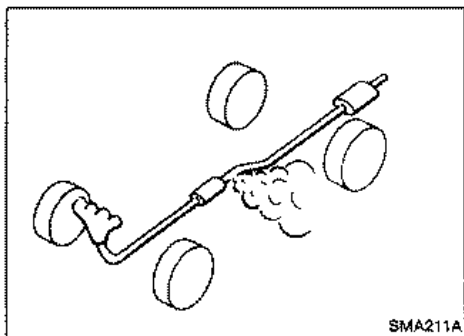
- Check lines for improper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.



Checking Power Cylinder (With SUPER HICAS system)

- Check power cylinder and linkage for damage, looseness and leakage of oil or grease.

CHASSIS AND BODY MAINTENANCE



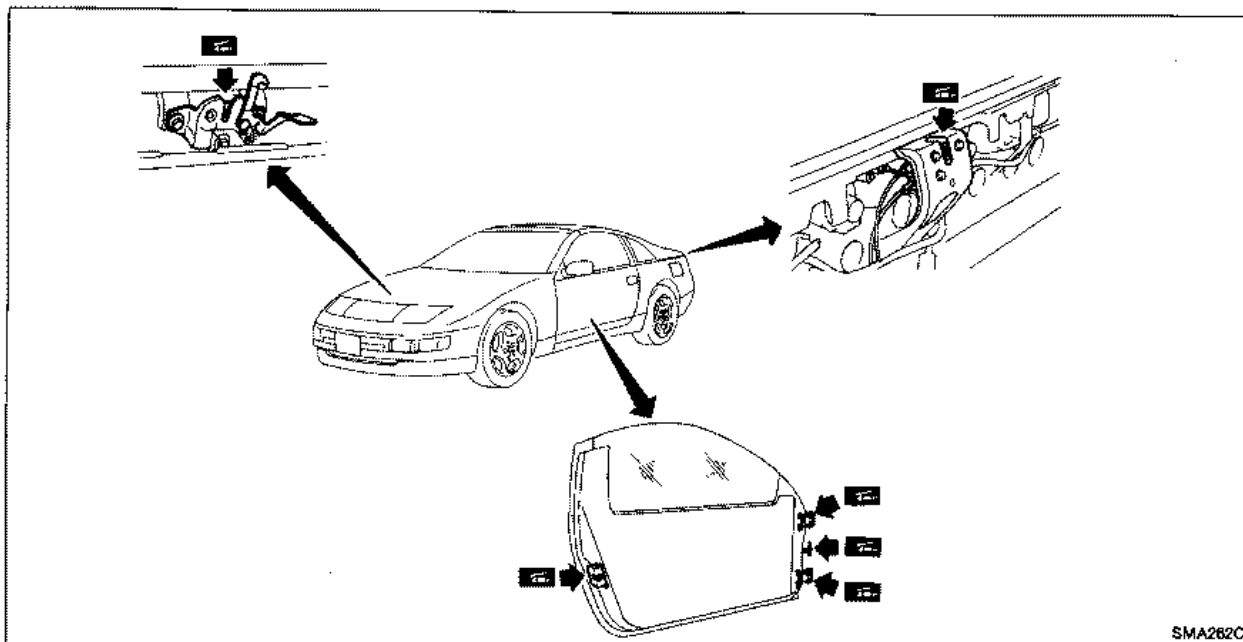
SMA211A

Checking Exhaust System

- Check exhaust pipes, muffler and mounting for proper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.

CHASSIS AND BODY MAINTENANCE

Lubricating Locks, Hinges and Hood Latches




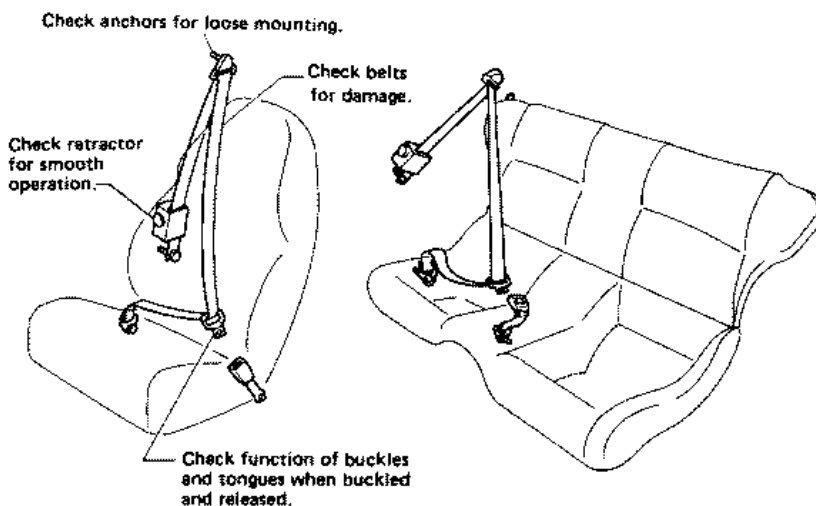
SMA262C

Checking Seat Belts, Buckles, Retractors, Anchors and Adjusters

CAUTION:

1. All seat belt assemblies, including retractors and attaching hardware such as guide rail set, etc., should be inspected after any collision. Nissan recommends that all seat belt assemblies in use during a collision be replaced unless the collision was minor and the belts show no damage and continue to operate properly. Seat belt assemblies not in use during a collision should also be inspected and replaced if either damage or improper operation is noted.
2. If the condition of any component of seat belt assembly is questionable, do not have it repaired, but replaced as seat belt assembly.
3. If webbing is cut, frayed, or damaged, replace belt assembly.
4. Do not spill drinks, oil, etc. on inner lap belt buckle. Never oil tongue and buckle.
5. Use a NISSAN genuine seat belt assembly.

 Anchor bolt
43 - 55 N·m
(4.4 - 5.6 kg·m, 32 - 41 ft·lb)



SMA171C

CHASSIS AND BODY MAINTENANCE

Checking Body Corrosion

Visually check the body sheet metal panel for corrosion, paint damage (scratches, chipping, rubbing, etc.) or damage to the anti-corrosion materials. In particular, check the following locations.

Hemmed portion

Hood front end, door lower end, trunk lid rear end, etc.

Panel joint

Side sill of rear fender and center pillar, rear wheel housing of rear fender, around strut tower in engine compartment, etc.

Panel edge

Trunk lid opening, sun roof opening, fender wheel-arch flange, fuel filler lid flange, around holes in panel, etc.

Parts contact

Waist moulding, windshield moulding, bumper, etc.

Protectors

Damage or condition of mudguard, fender protector, chipping protector, etc.

Anti-corrosion materials

Damage or separation of anti-corrosion materials under the body.

Drain holes

Condition of drain holes at door and side sill.

When repairing corroded areas, refer to the Corrosion Repair Manual.

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Engine Maintenance

INSPECTION AND ADJUSTMENT

Drive belt deflection

Unit: mm (in)

	Used belt deflection		Deflection of new belt
	Limit	Deflection after adjustment	
Alternator	11.5 (0.453)	7 - 8 (0.28 - 0.31)	6.5 - 7.5 (0.256 - 0.295)
Air conditioner compressor	12.5 (0.492)	8 - 9 (0.31 - 0.35)	7 - 8 (0.28 - 0.31)
Power steering oil pump	19 (0.75)	12 - 13.5 (0.472 - 0.531)	10.5 - 11.5 (0.413 - 0.453)
Applied pushing force	98 N (10 kg, 22 lb)		

Spark plug

Non-Turbo

Standard type	PFR6B-11
Hot type	PFR5B-11
Cold type	PFR7B-11

Turbo

Standard type	PFR6B-11C
Hot type	PFR5B-11C
Cold type	PFR7B-11C

Oil capacity (Refill)

Non-Turbo

Unit: ℓ (Imp qt)

With oil filter	3.4 (3)
Without oil filter	3.0 (2-5/8)

Turbo (Without oil cooler)

Unit: ℓ (Imp qt)

With oil filter	3.4 (3)
Without oil filter	3.0 (2-5/8)

Coolant capacity

Unit: ℓ (Imp qt)

With reservoir tank	10.0 (8-3/4)
Reservoir tank	0.6 (1/2)

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Chassis and Body Maintenance

INSPECTION AND ADJUSTMENT

Clutch

Applied model	L.H.D.	R.H.D.	
		VG300E	VG30DETT
		Pedal free height	183 - 193 (7.20 - 7.60)
Pedal free play	1 - 3 (0.04 - 0.12)		

Unit: mm (in)

Front axle and front suspension (Unladen)*

Camber	degree	-1°35' to -0°05'
Caster	degree	9°00' - 10°30'
Toe-in	mm (in)	0 - 2 (0 - 0.08)
(Total toe-in angle)	degree	0' - 11'
Kingpin inclination	degree	12°10' - 13°40'
Front wheel turning angle		
Full turn		
Inside/outside	degree	32° - 36°/27° - 31°

*: Fuel, radiator coolant and engine oil full.
Spare tire, jack, hand tools and mats in designated positions.

Rear axle and rear suspension (Unladen)*

Camber	degree	-1°35' to -0°35'
Toe-in	mm (in)	0 - 4 (0 - 0.16)
(Total toe-in angle)	degree	0' - 22'

*: Fuel, radiator coolant and engine oil full.
Spare tire, jack, hand tools and mats in designated positions.

Wheel bearing

	Front	Rear
Wheel bearing axle end play	0.05 (0.0020) or less	
Wheel bearing lock nut		
Tightening torque	206 - 284	206 - 275
N·m (kg·m, ft·lb)	(21 - 29, 152 - 210)	(21 - 28, 152 - 203)

Brake

Unit: mm (in)

Disc brake	
Pad	
Standard thickness	
OPZ25V	10.0 (0.394)
OPF25V	
OPZ11VB	11.5 (0.453)
Minimum thickness	
OPZ25V	2.0 (0.079)
OPF25V	
OPZ11VB	2.0 (0.079)
Rotor	
Standard thickness	
OPZ25V	26.0 (1.024)
OPF25V	30.0 (1.181)
OPZ11VB	18 (0.71)
Minimum thickness	
OPZ25V	24.0 (0.945)
OPF25V	28.0 (1.102)
OPZ11VB	16.0 (0.630)
Pedal	
Free height	
M/T	186 - 196 (7.32 - 7.72)
A/T	195 - 205 (7.68 - 8.07)
Free play at clevis	1 - 3 (0.04 - 0.12)
Depressed height (under force of 490 N (50 kg, 110 lb) with engine running)	
M/T	
Without A.B.S.	95 (3.74) or more
With A.B.S.	105 (4.13) or more
A/T	
Without A.B.S.	105 (4.13) or more
With A.B.S.	110 (4.33) or more
Parking brake	
Number of notches (at pulling force 196 N (20 kg, 44 lb))	6 - 7

Wheel balance

Wheel balance (Maximum allowable unbalance at rim flange)	g (oz)	10 (0.35)
Tire balance weight	g (oz)	5 - 60 (0.18 - 2.12) Spacing 5 (0.18)

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Chassis and Body Maintenance (Cont'd)

TIGHTENING TORQUE

Unit	N-m	kg-m	ft-lb
Clutch			
A.S.C.D. cancel switch and clutch switch lock nut	12 - 15	1.2 - 1.5	9 - 11
Manual transmission			
Drain and filler plugs	25 - 34	2.5 - 3.5	18 - 25
Final drive			
Drain plug	39 - 59	4 - 6	29 - 43
Filler plug	39 - 59	4 - 6	29 - 43
Front axle and front suspension			
Tie-rod lock nut	78 - 98	8.0 - 10.0	58 - 72
Rear axle and rear suspension			
Toe adjusting pin	69 - 88	7.0 - 9.0	51 - 65
Camber adjusting pin (Models without SUPER HICAS)	69 - 88	7.0 - 9.0	51 - 65
Lower link lock nut (Models with SUPER HICAS)	37 - 46	3.8 - 4.7	27 - 34
Brake system			
Air bleed valve	7 - 9	0.7 - 0.9	5.1 - 6.5
Brake lamp switch lock nut	12 - 15	1.2 - 1.5	9 - 11
Brake booster input rod lock nut	16 - 22	1.6 - 2.2	12 - 16
Wheel and tire			
Wheel nut	98 - 118	10.0 - 12.0	72 - 87

ENGINE MECHANICAL

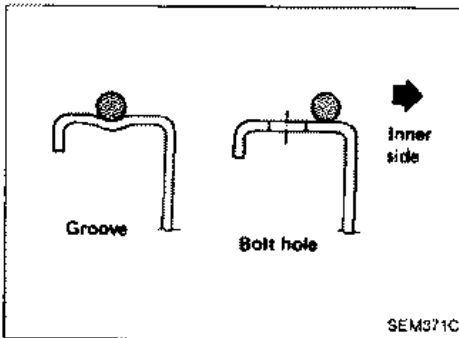
SECTION **EM**

EM

CONTENTS

PRECAUTIONS	EM- 2
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OIL SEAL REPLACEMENT	EM-21
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ENGINE REMOVAL	EM-45
CYLINDER BLOCK	EM-49
SERVICE DATA AND SPECIFICATIONS (S.D.S.)	EM-62

PRECAUTIONS



Liquid Gasket Application Procedure

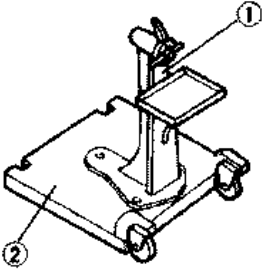
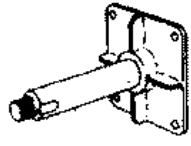
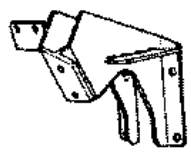

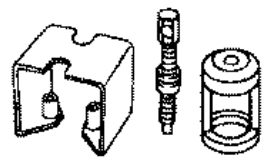
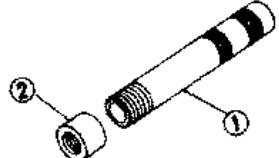
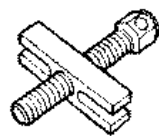
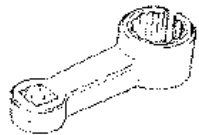
- a. Before applying liquid gasket, use a scraper to remove all traces of old liquid gasket from mating surface.
- b. Apply a continuous bead of liquid gasket to mating surfaces. (Use Genuine Liquid Gasket or equivalent.)
 - Be sure liquid gasket is 3.5 to 4.5 mm (0.138 to 0.177 in) wide (for oil pan).
 - Be sure liquid gasket is 2.0 to 3.0 mm (0.079 to 0.118 in) wide (in areas except oil pan).
- c. Apply liquid gasket to inner sealing surface around entire perimeter area. (Assembly should be done within 5 minutes after coating.)
- d. Wait at least 30 minutes before refilling engine oil and engine coolant.

Parts Requiring Angular Tightening

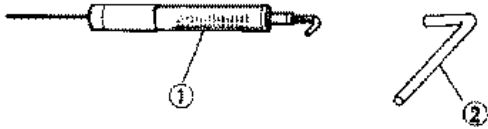
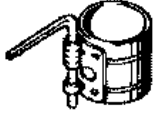
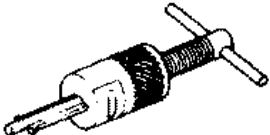
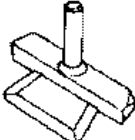
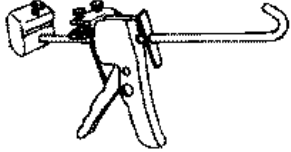
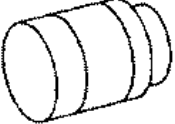
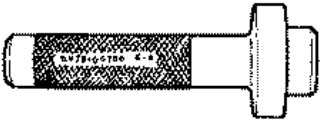
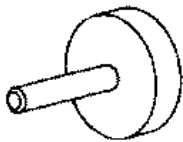
- Some important engine parts are tightened using an angular-tightening method rather than a torque setting method.
- If these parts are tightened using a torque setting method, dispersal of the tightening force (axial bolt force) will be two or three times that of the dispersal produced by using the correct angular-tightening method.
- Although the torque setting values (described in this manual) are equivalent to those used when bolts and nuts are tightened with an angular-tightening method, they should be used for reference only.
- To assure the satisfactory maintenance of the engine, bolts and nuts must be tightened using an angular-tightening method.
- Before tightening the bolts and nuts, ensure that the thread and seating surfaces are clean and then coated with engine oil.
- The bolts and nuts which require the angular-tightening method are as follows:
 - (1) Cylinder head bolts
 - (2) Connecting rod cap nuts

PREPARATION

SPECIAL SERVICE TOOLS

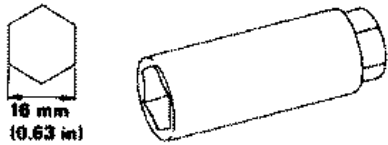
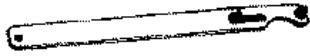


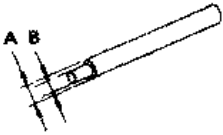
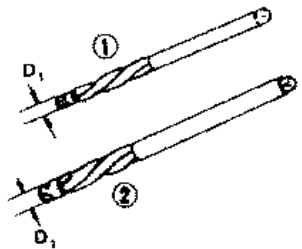

Tool number Tool name	Description	
ST0501S000 Engine stand assembly ① ST05011000 Engine stand ② ST05012000 Base	Disassembling and assembling	
KV10106500 Engine stand shaft		
KV10110001 Engine sub-attachment		
ST10120000 Cylinder head bolt wrench	Loosening and tightening cylinder head bolt	
KV10111300 Valve spring compressor	Disassembling and assembling valve components	
① KV10107501 Valve oil seal drift ② KV10111400 Attachment	Installing valve oil seal	
ST27180001 Steering wheel puller	Removing crankshaft pulley	
KV10114400 Exhaust gas sensor wrench	Loosening or tightening exhaust gas sensor	

PREPARATION

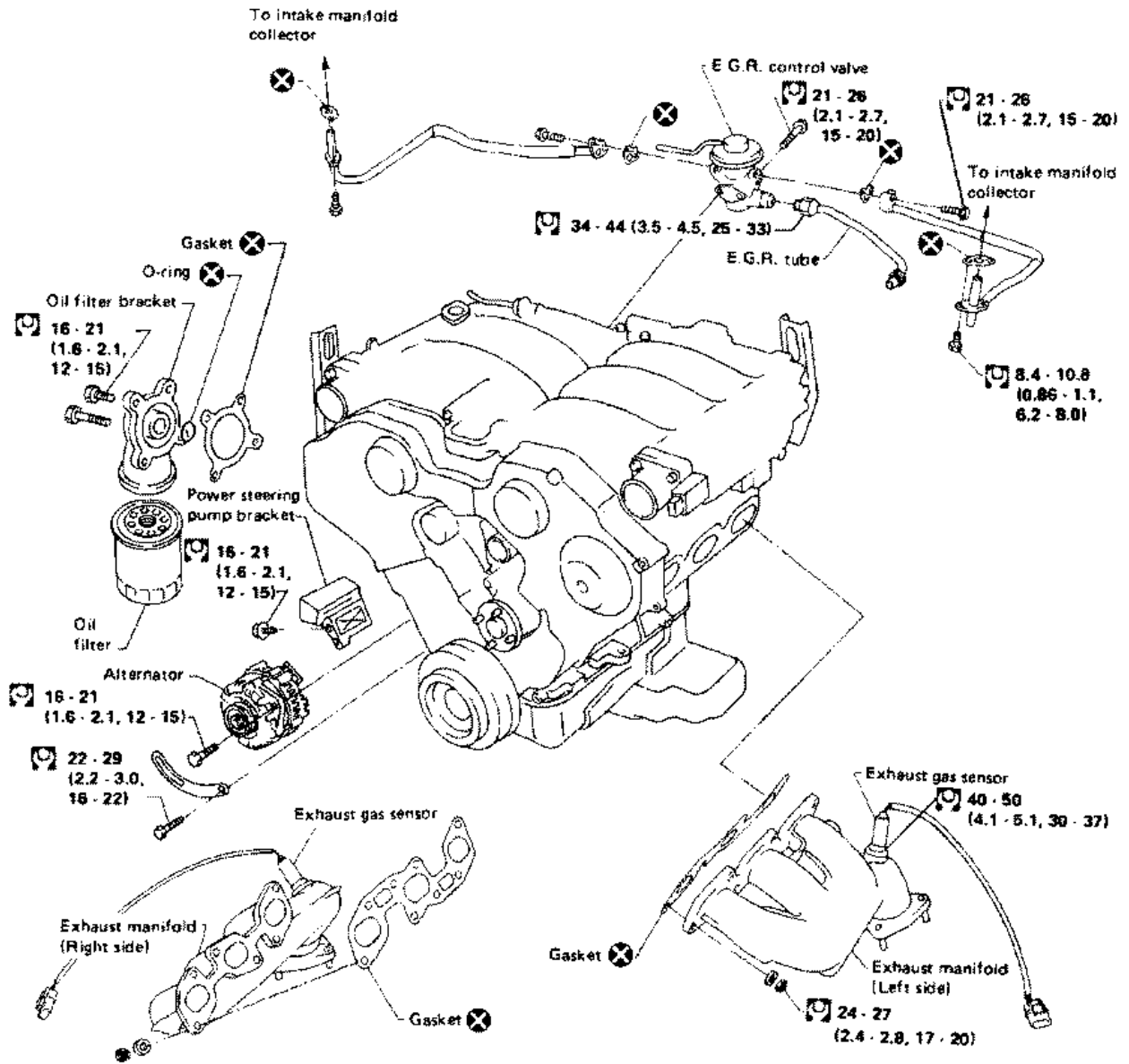
Tool number Tool name	Description
① EG14860000 Push-pull gauge ② KV10112000 Hook	Adjusting timing belt tension 
EM03470000 Piston ring compressor	Installing piston assembly into cylinder bore 
ST1661000f Pilot bushing puller	Removing crankshaft pilot bushing 
KV10111100 Seal cutter	Removing oil pan 
WS39930000 Tube presser	Pressing the tube of liquid gasket 
ST33200000 Drift	Installing camshaft oil seal 
KV38100300 Drift	Installing front oil seal 
ST15310000 Drift	Installing rear oil seal 

PREPARATION

COMMERCIAL SERVICE TOOLS

Tool name	Description
Spark plug wrench	Removing and installing spark plug <div style="text-align: right; margin-top: 10px;">  <p>16 mm (0.63 in)</p> </div>
Pulley holder	Holding camshaft pulley while tightening or loosening camshaft bolt <div style="text-align: right; margin-top: 10px;">  </div>
Valve seat cutter set	Finishing valve seat dimensions <div style="text-align: right; margin-top: 10px;">  </div>
Piston ring expander	Removing and installing piston ring <div style="text-align: right; margin-top: 10px;">  </div>
Valve guide drift	Removing and installing valve guide <div style="text-align: right; margin-top: 10px;">  <p>Intake & Exhaust: A = 9.5 mm (0.374 in) dia. B = 5.5 mm (0.217 in) dia.</p> </div>
Valve guide reamer	Reaming valve guide ① or hole for oversize valve guide ② <div style="text-align: right; margin-top: 10px;">  <p>D₁ = 6.0 mm (0.236 in) dia. D₂ = 10.2 mm (0.402 in) dia.</p> </div>
Valve oil seal remover	Removing valve oil seals <div style="text-align: right; margin-top: 10px;">  </div>

OUTER COMPONENT PARTS

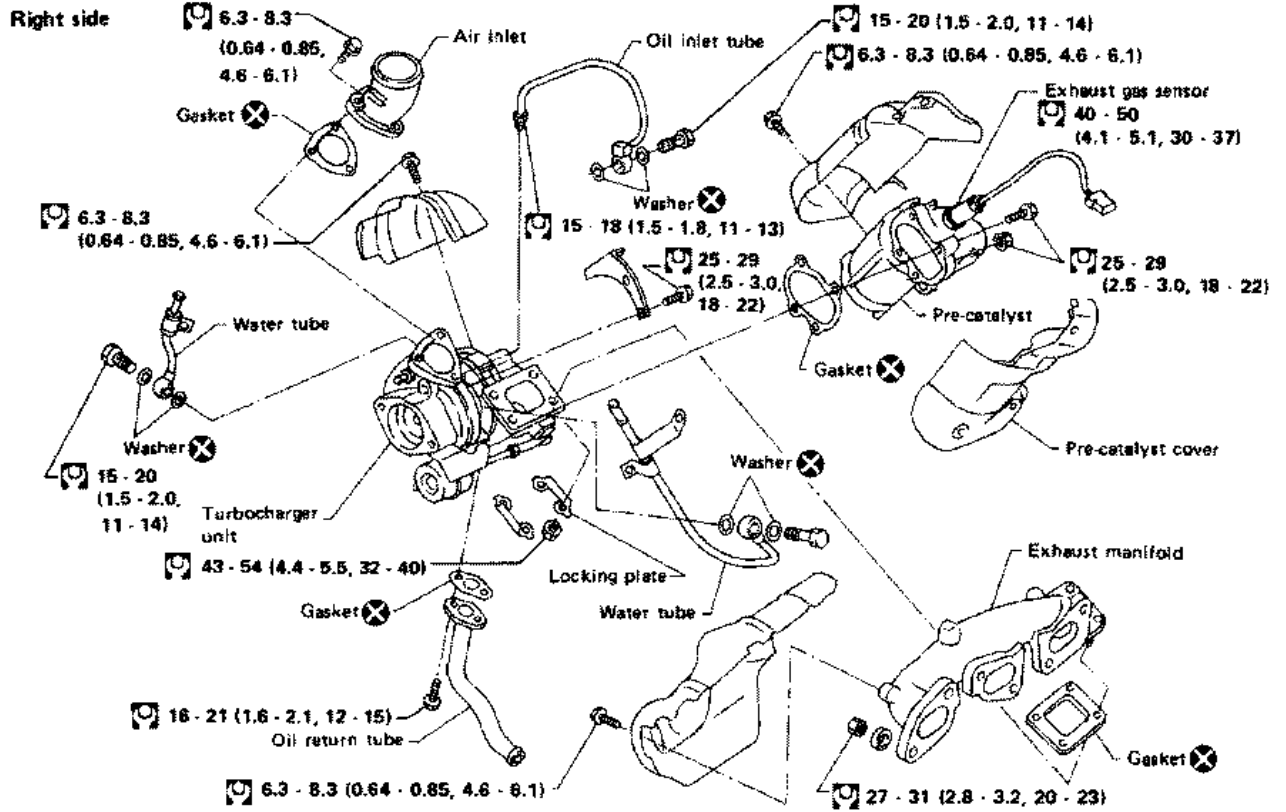


: N·m (kg·m, ft·lb)

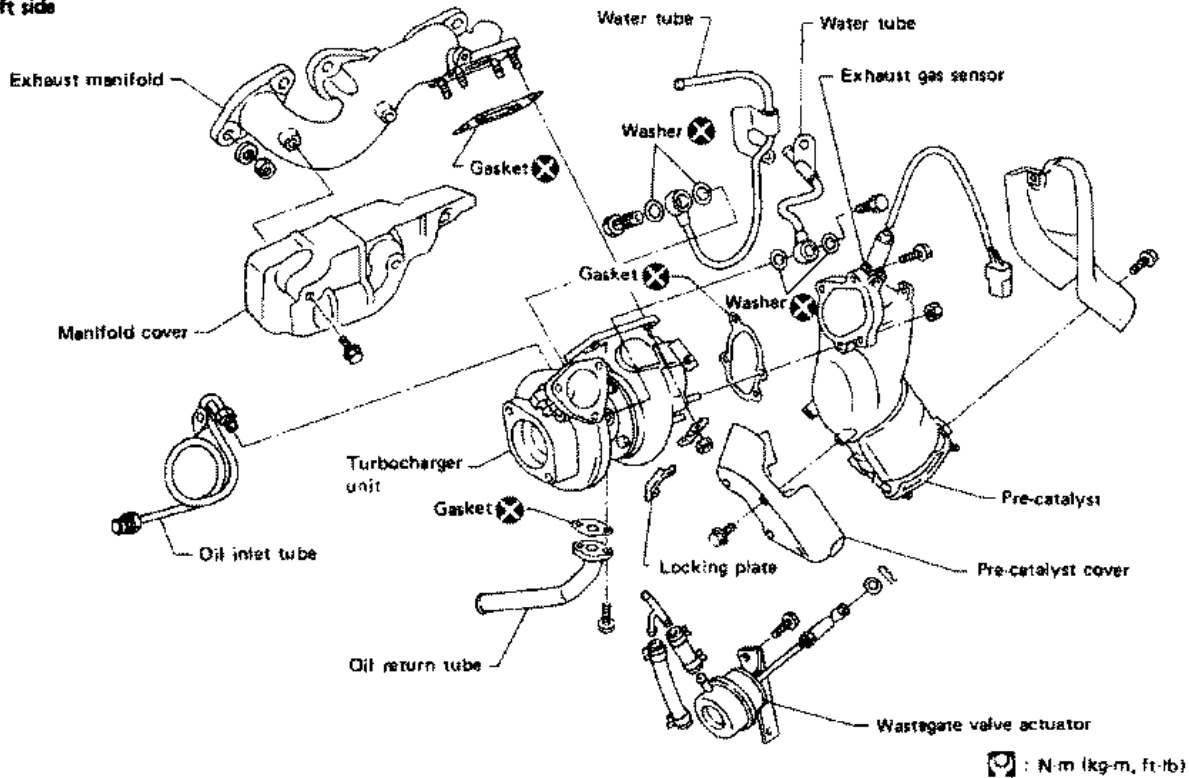
SEM964C

OUTER COMPONENT PARTS

Turbo model

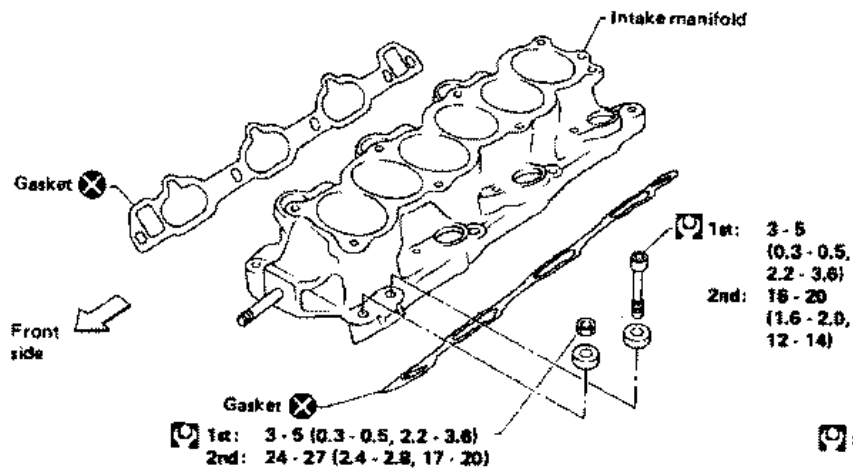
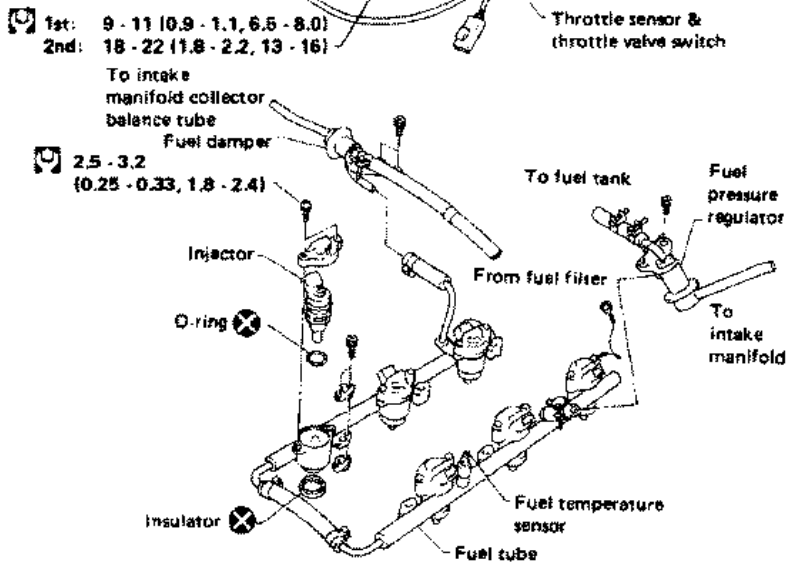
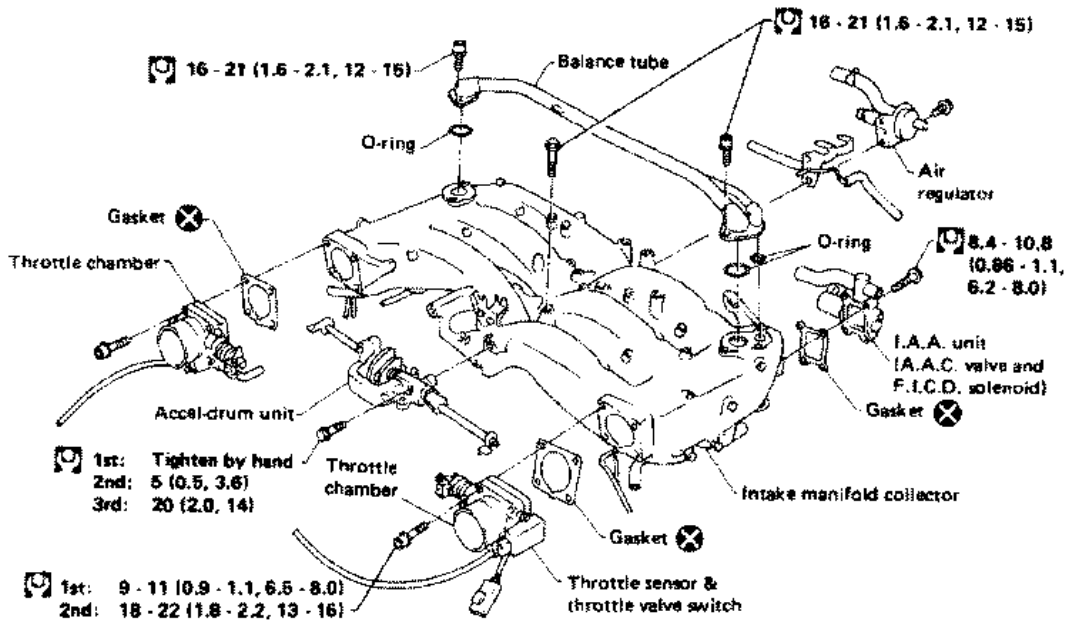


Left side



BEM773C

OUTER COMPONENT PARTS



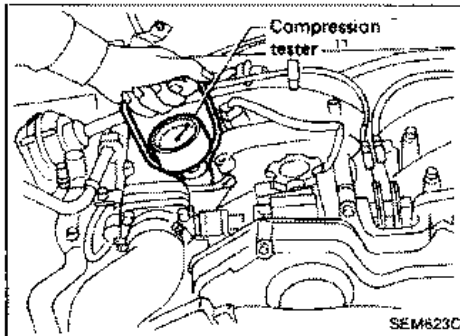
: N·m (kg·m, ft·lb)

SEM618C

COMPRESSION PRESSURE

Measurement of Compression Pressure

1. Warm up engine.
2. Turn ignition switch off.
3. Release fuel pressure.
Refer to "Releasing Fuel Pressure" in section EF & EC.
4. Remove all spark plugs.
5. Disconnect crank angle sensor harness connector.



6. Attach a compression tester to No. 1 cylinder.
7. Depress accelerator pedal fully to keep throttle valve wide open.
8. Crank engine and record highest gauge indication.
9. Repeat the measurement on each cylinder as shown.

Always use a fully-charged battery to obtain specified engine revolution.

Compression pressure: kPa (bar, kg/cm², psi)/300 rpm

Standard

1,285 (12.85, 13.1, 186)

Minimum

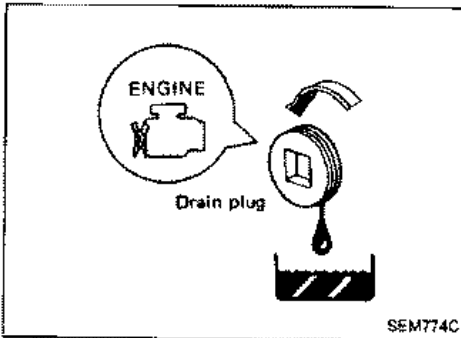
981 (9.81, 10.0, 142)

Difference limit between cylinders

98 (0.98, 1.0, 14)

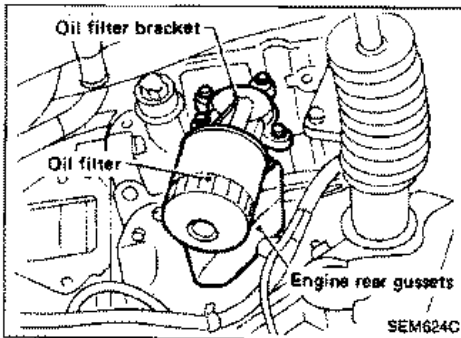
10. If cylinder compression in one or more cylinders is low, pour a small amount of engine oil into cylinders through the spark plug holes and retest compression.
 - If adding oil helps compression, piston rings may be worn or damaged. If so, replace piston rings after checking piston.
 - If pressure stays low, a valve may be sticking or seating improperly. Inspect and repair valves and valve seats. (Refer to S.D.S.) If valves or valve seats are damaged excessively, replace them.
 - If compression in any two adjacent cylinders is low and if adding oil does not help compression, there may be leakage past gasket surface. If so, replace cylinder head gasket.

OIL PAN

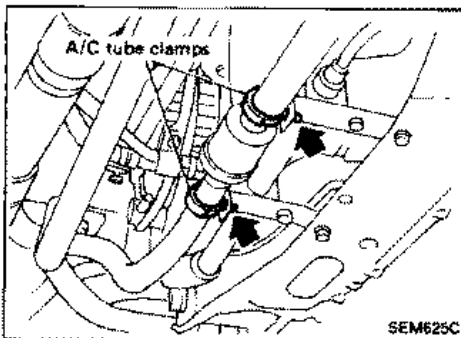


Removal

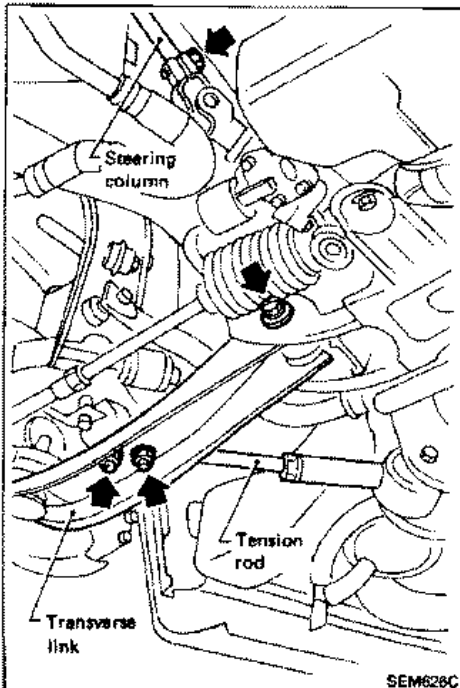
1. Drain engine oil.
2. Remove engine under cover.



3. Remove oil filter and bracket.
4. Remove engine rear gussets from both sides.



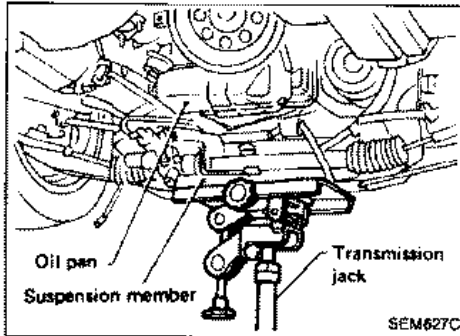
5. Disconnect A/C tube clamps as shown.



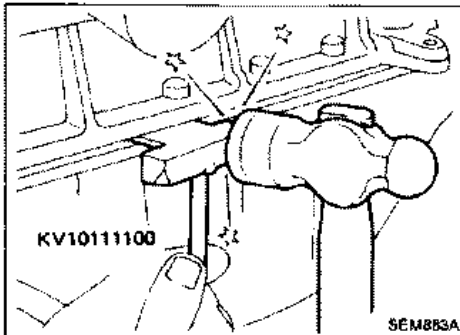
6. Disconnect steering column lower joint.
7. Remove tension rod fixing bolts from both sides.
8. Loosen transverse link bolts on both sides.

OIL PAN

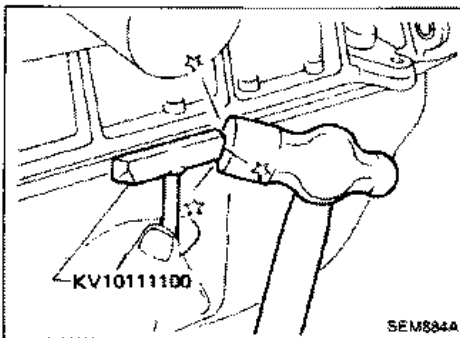
Removal (Cont'd)



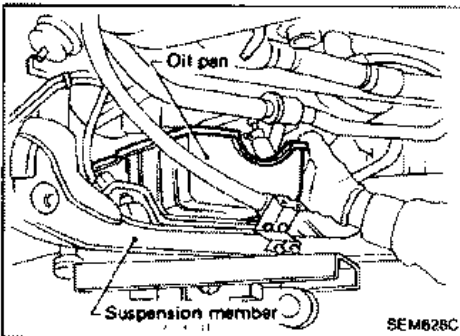
9. Set a suitable transmission jack under the suspension member.
 - At this time, hoist engine with engine slingers.
10. Remove suspension member fixing bolts.
11. Remove engine mounting bolts from both sides and then slowly lower transmission jack.
12. Remove oil pan bolts.



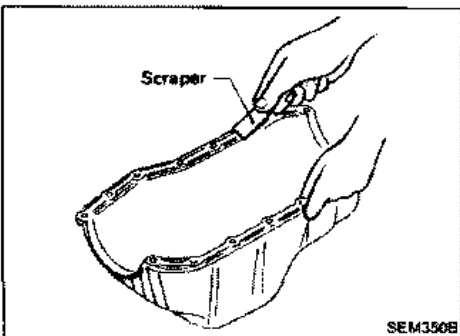
13. Remove oil pan.
 - (1) Insert Tool between cylinder block and oil pan.
 - Do not drive seal cutter into oil pump or rear oil seal retainer, as aluminum mating surfaces may be damaged.
 - Do not insert screwdriver, or oil pan flange may be deformed.



- (2) Slide Tool by tapping its side with a hammer, and remove oil pan.



- (3) Remove oil pan.

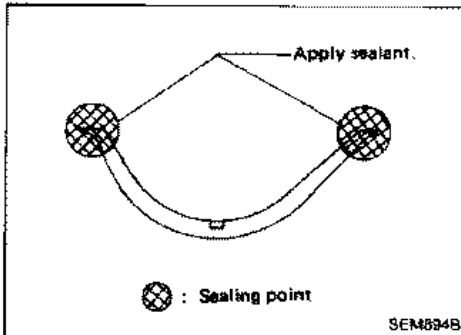


Installation

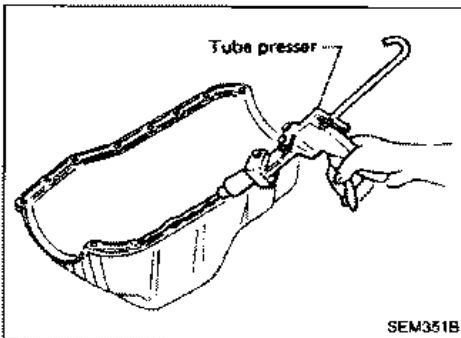
1. Before installing oil pan, remove all traces of liquid gasket from mating surface using a scraper.
 - Also remove traces of liquid gasket from cylinder block mating surface.

OIL PAN

Installation (Cont'd)

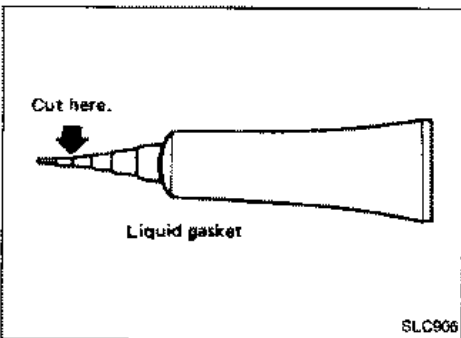


2. Apply sealant to oil pump gasket and rear oil seal retainer gasket.

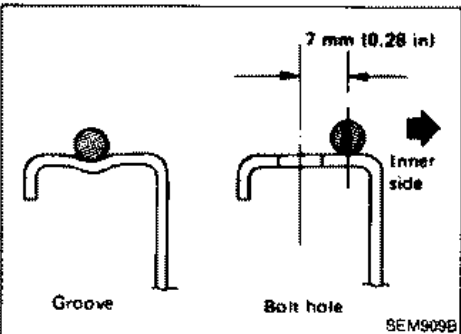


3. Apply a continuous bead of liquid gasket to oil pan mating surface.

Use Genuine Liquid Gasket or equivalent.

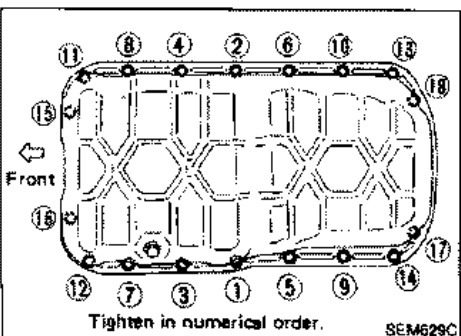


- Be sure liquid gasket is 3.5 to 4.5 mm (0.138 to 0.177 in) wide.



4. Apply liquid gasket to inner sealing surface as shown in figure.

- Attaching should be done within 5 minutes after coating.



5. Install oil pan.

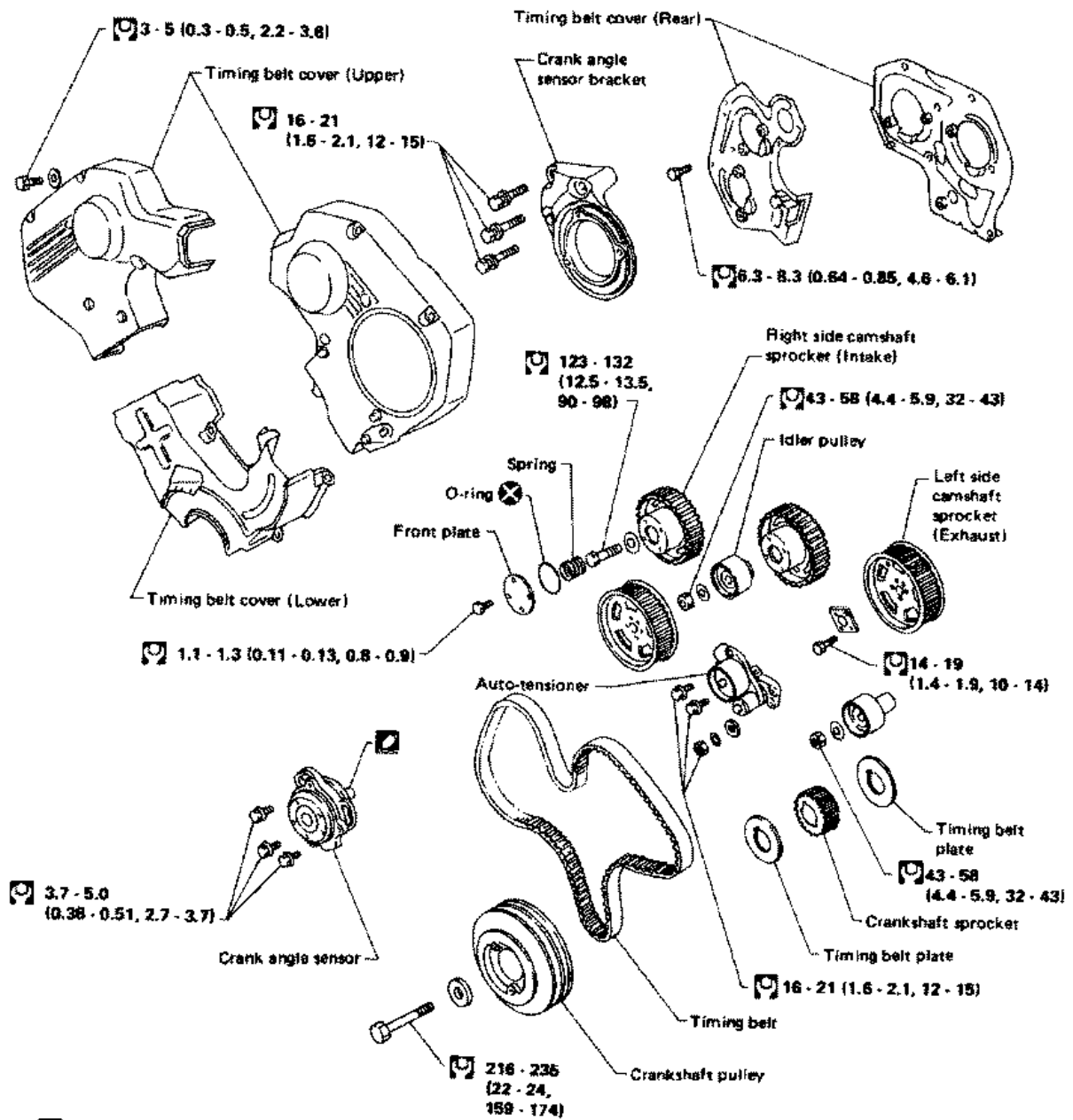
- Install bolts/nuts in their reverse order of removal.

- Wait at least 30 minutes before refilling engine oil.

TIMING BELT

CAUTION:

- a. Do not bend or twist timing belt.
- b. After removing timing belt, do not turn crankshaft and camshaft separately because valves will strike piston heads.
- c. Make sure that timing belt, camshaft sprocket, crankshaft sprocket, idler pulley and auto-tensioner are clean and free of oil and water.

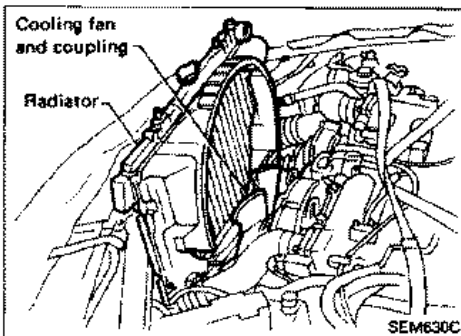


: N·m (kg·m, ft·lb)

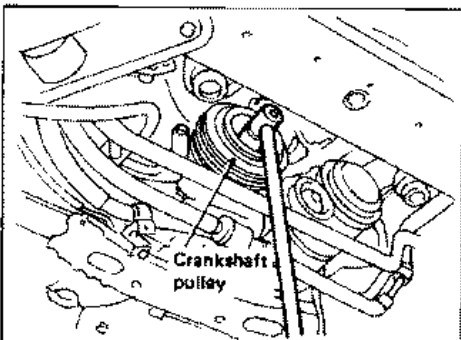
TIMING BELT

Removal

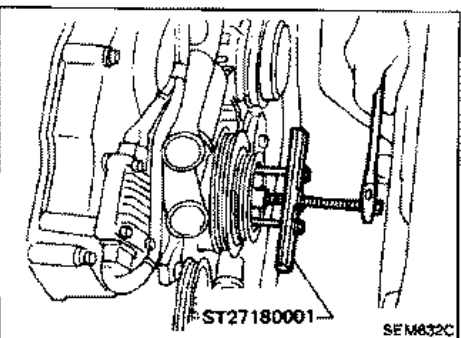
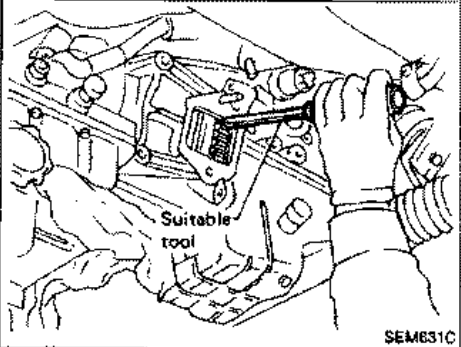
1. Remove engine under cover.
2. Drain coolant from both cylinder block drain plugs, and radiator drain cock.



3. Remove radiator.
4. Remove drive belts, cooling fan and coupling.



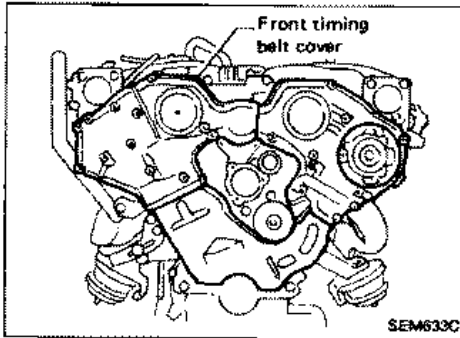
5. Remove crankshaft pulley bolt.
(At this time, remove starter motor and set a suitable tool to ring gear so that crankshaft cannot rotate.)



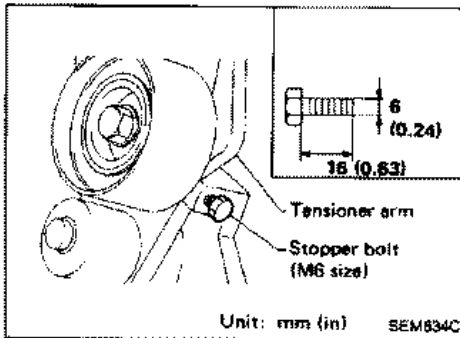
6. Remove crankshaft pulley using Tool.

TIMING BELT

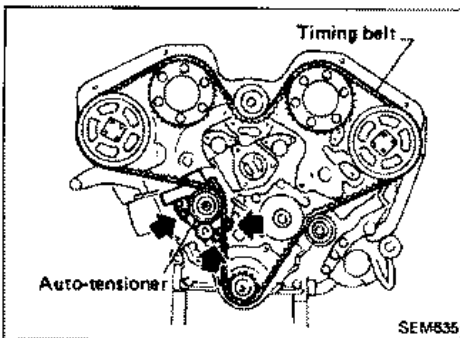
Removal (Cont'd)



7. Remove water inlet and outlet.
8. Remove front timing belt covers.



9. Install a suitable stopper bolt into tensioner arm of auto-tensioner so that projection of auto-tensioner pusher does not change.




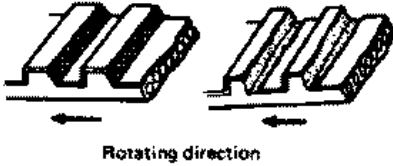


10. Set No. 1 cylinder at T.D.C. on its compression stroke.
11. Remove auto-tensioner and timing belt.

TIMING BELT

Inspection

Visually check the condition of timing belt.
Replace if any abnormality is found.

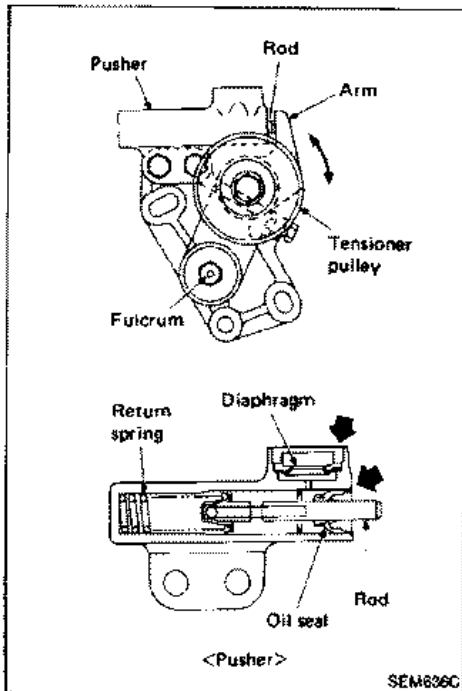
Item to check	Problem	Cause
Tooth is broken/ tooth root is cracked.	 <p style="text-align: right; font-size: small;">SEM394A</p>	<ul style="list-style-type: none"> ● Camshaft jamming ● Distributor jamming ● Damaged camshaft/crankshaft oil seal
Back surface is cracked/worn.	 <p style="text-align: right; font-size: small;">SEM395A</p>	<ul style="list-style-type: none"> ● Tensioner jamming ● Overheated engine ● Interference with belt cover
Side surface is worn.	 <ul style="list-style-type: none"> ● Belt corners are worn and round. ● Wicks are frayed and coming out. <p style="text-align: right; font-size: small;">SEM396A</p>	<ul style="list-style-type: none"> ● Improper installation of belt ● Malfunctioning crankshaft pulley plate/timing belt plate
Teeth are worn.	 <p style="text-align: center; font-size: small;">Rotating direction</p> <ul style="list-style-type: none"> ● Canvas on tooth face is worn down. ● Canvas on tooth is fluffy, rubber layer is worn down and faded white, or welt is worn down and invisible. <p style="text-align: right; font-size: small;">SEM397A</p>	<ul style="list-style-type: none"> ● Poor belt cover sealing ● Coolant leakage at water pump ● Camshaft not functioning properly ● Distributor not functioning properly ● Excessive belt tension
Oil/Coolant or water is stuck to belt.		<ul style="list-style-type: none"> ● Poor oil sealing ● Coolant leakage at water pump ● Poor belt cover sealing

TIMING BELT

Inspection (Cont'd)

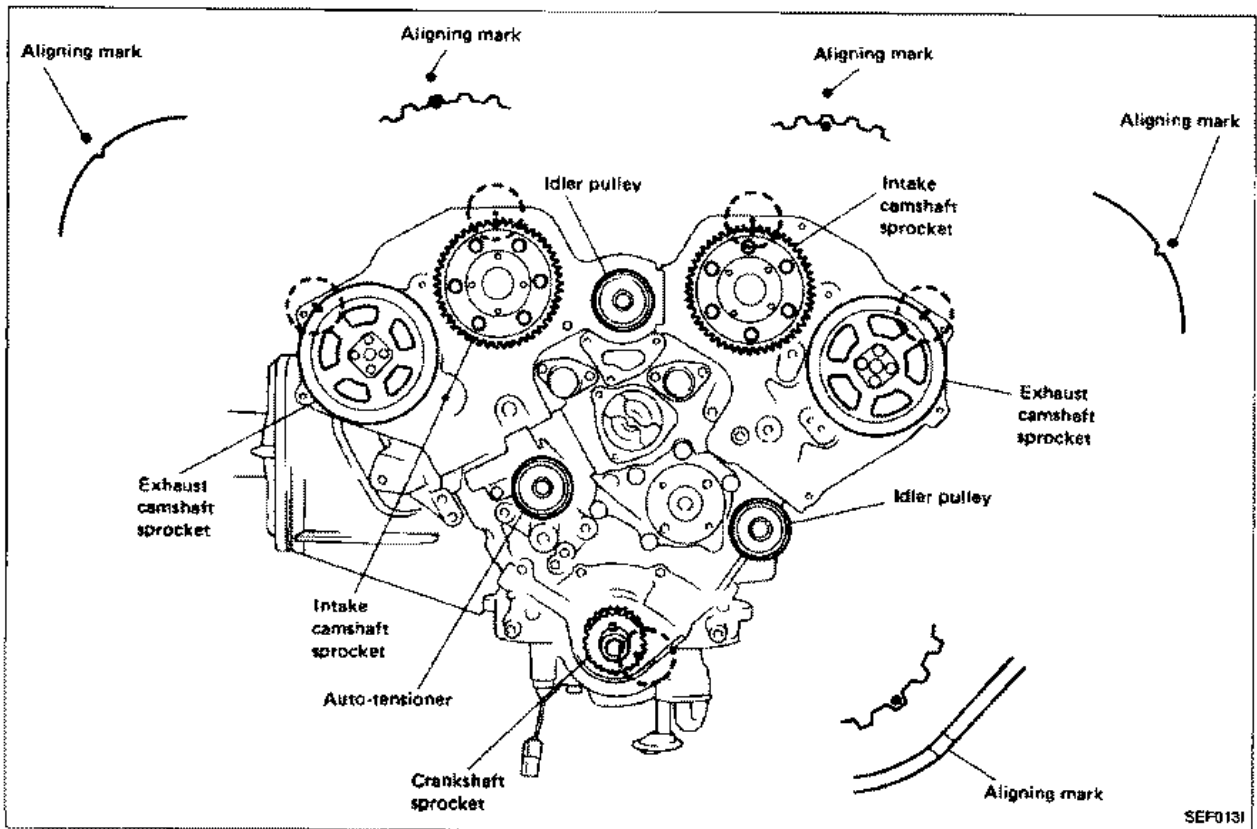
AUTO-TENSIONER

Check for oil leaks from pusher rod and diaphragm.



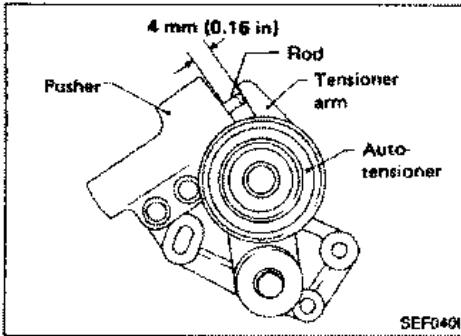
Installation

1. Confirm that No. 1 cylinder is set at T.D.C. on its compression stroke.
2. Align matching marks on camshaft and crankshaft sprockets with aligning marks on rear belt cover and oil pump housing.
3. Remove all spark plugs.



TIMING BELT

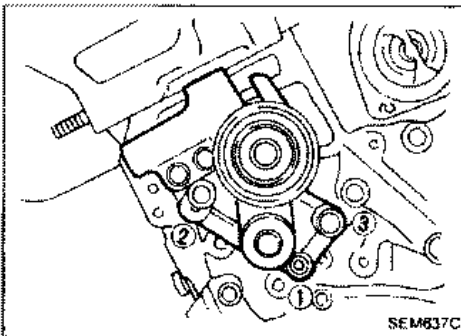
Installation (Cont'd)



4. Check clearance between tensioner arm and pusher of auto-tensioner is 4 mm (0.16 in).

If not, adjust it in a suitable vise, and then insert stopper bolt into tensioner arm in order that clearance does not change.

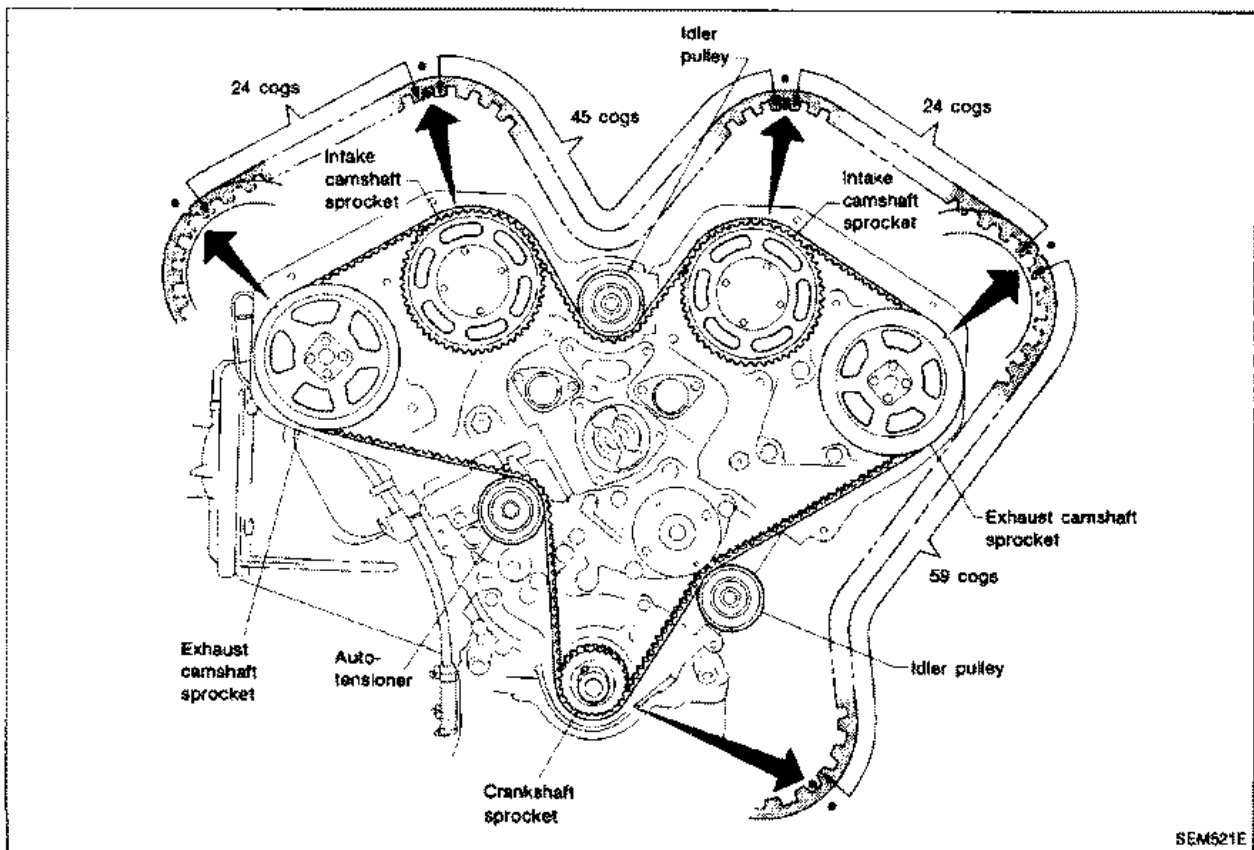
When adjusting clearance, do not push tensioner arm with stopper bolt fitted because it will damage thread portion of stopper bolt.



5. Install auto-tensioner and tighten nut (①) and bolts (②, ③) slightly by hand.

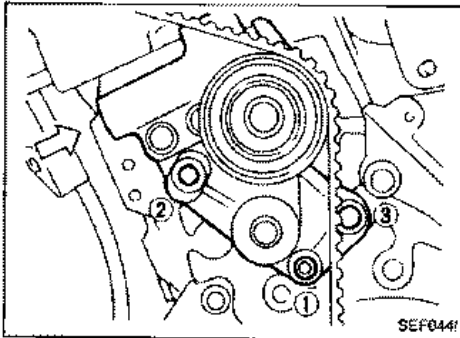
6. Set timing belt.

- Ensure timing belt and sprockets are clean and free from oil or water. Do not bend or twist timing belt.
- Align white lines on timing belt with matching mark on camshaft sprocket and crankshaft sprocket.
- Point arrow on timing belt towards the front.



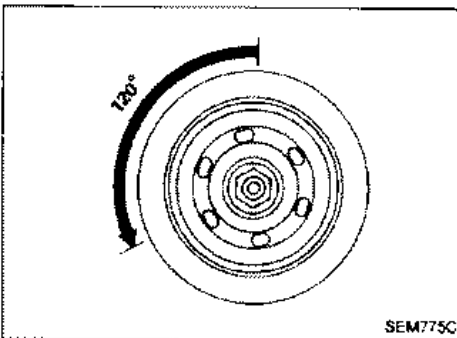
TIMING BELT

Installation (Cont'd)

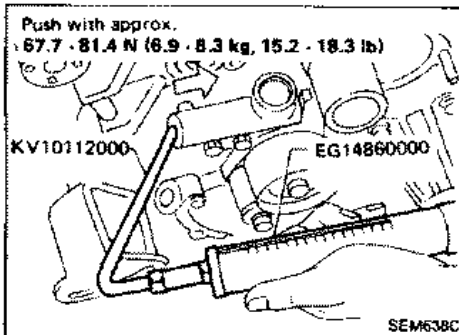


7. Push auto-tensioner slightly towards timing belt to prevent belt from slipping. While pushing, turn crankshaft 10 degrees clockwise and tighten nut (1) and bolts (2, 3) to 16 to 21 N·m (1.6 to 2.1 kg-m, 12 to 15 ft-lb).

At this time, do not push auto-tensioner hard or belt will be adjusted too tightly.

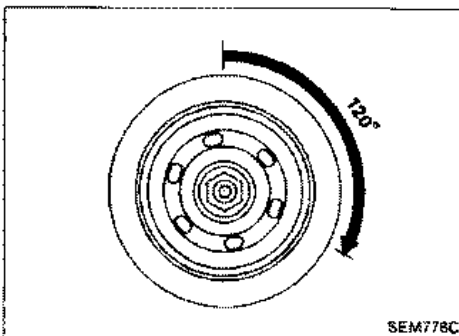


8. Turn crankshaft 120 degrees counterclockwise.
9. Turn crankshaft clockwise and set No. 1 cylinder at T.D.C. on its compression stroke.
10. Loosen nut (1) and bolts (2, 3) 1/2 turn.

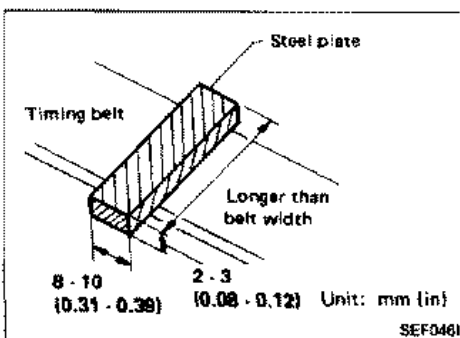


11. Push the end of pusher with approx. 67.7 to 81.4 N (6.9 to 8.3 kg, 15.2 to 18.3 lb) force using Tool (push-pull gauge) and tighten nut (1) and bolts (2, 3) to 16 to 21 N·m (1.6 to 2.1 kg-m, 12 to 15 ft-lb).

If deflection of timing belt exceeds specification in procedure 15., change applied pushing force.



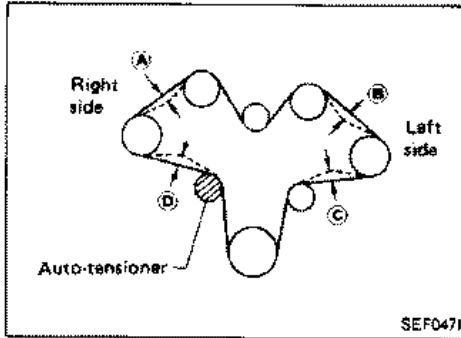
12. Turn crankshaft 120 degrees clockwise.
13. Turn crankshaft 120 degrees counterclockwise and set No. 1 cylinder at T.D.C. on its compression stroke.



14. Prepare a suitable steel plate as shown.

TIMING BELT

Installation (Cont'd)



15.

- (1) Set plate on each position of timing belt mid-way between pulleys as shown.
- (2) Push it with 49 N (5 kg, 11 lb) force using Tool (push-pull gauge) and check deflections.

Deflection:

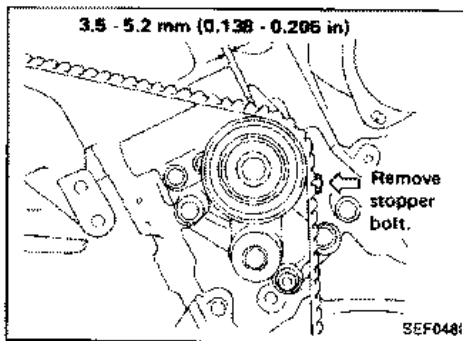
5.5 - 6.5 mm (0.217 - 0.256 in) or the average of each portion

$$\frac{A + B + C + D}{4}$$

Is 5.5 - 6.5 mm (0.217 - 0.256 in)

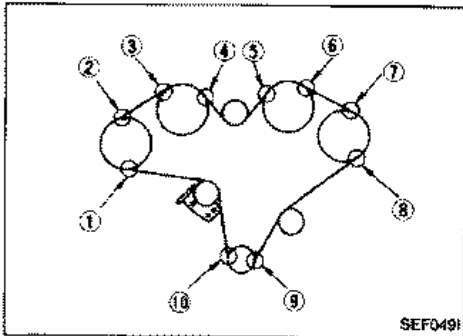
If not within specification, repeat procedure from step 7 through step 15.

16. Confirm auto-tensioner fixing nuts and bolts are tightened to 16 to 21 N·m (1.6 to 2.1 kg·m, 12 to 15 ft·lb).

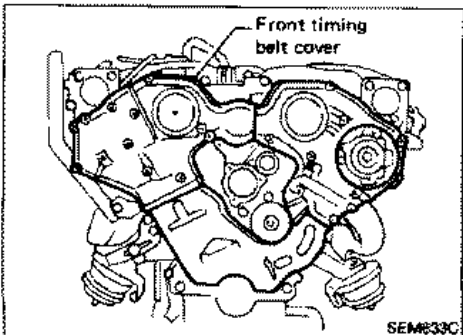


17.

- Remove the auto-tensioner stopper bolt.
- After 5 minutes check the projection of the rod (clearance between tensioner arm and pusher) stays at 3.5 to 5.2 mm (0.138 to 0.205 in).

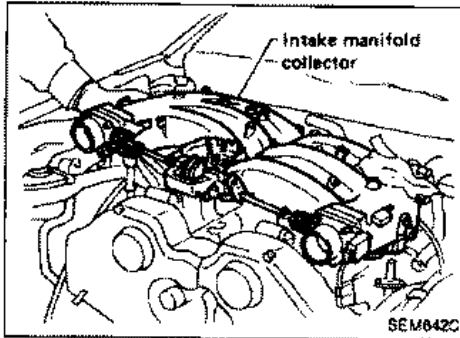


18. Check the proper installation (no slip or misplacement) of timing belt at each position as shown.



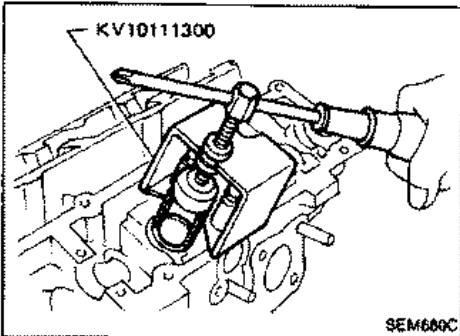
19. Install timing belt covers.

OIL SEAL REPLACEMENT

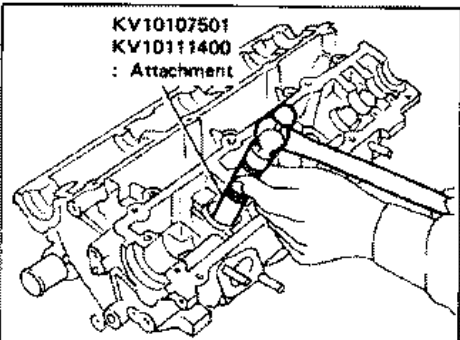


VALVE OIL SEAL

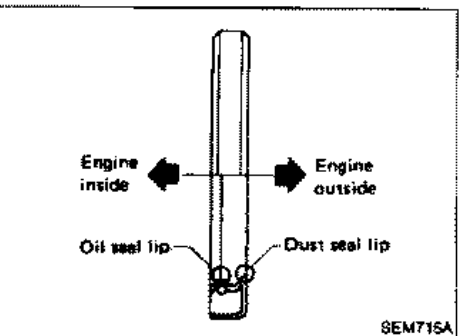
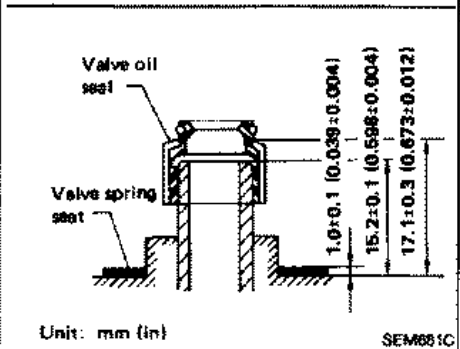
1. Remove intake manifold collector and valve cover.
2. Remove timing belt, camshaft sprocket and rear belt cover.
3. Remove camshaft brackets, camshaft and valve lifter.



4. Remove valve spring using Tool or a suitable tool.
 - Piston concerned should be set at T.D.C. to prevent valve from falling.
5. Pry out valve oil seal.

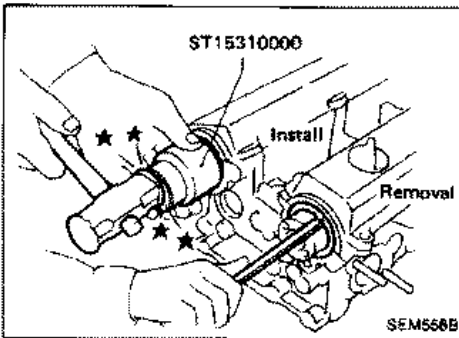


6. Apply engine oil to new valve oil seal and install it.
 - Before installing valve oil seal, install inner valve spring seat.



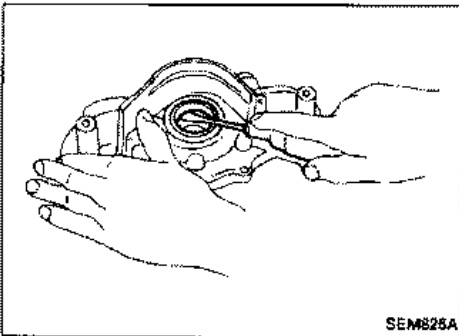
OIL SEAL INSTALLATION DIRECTION

OIL SEAL REPLACEMENT



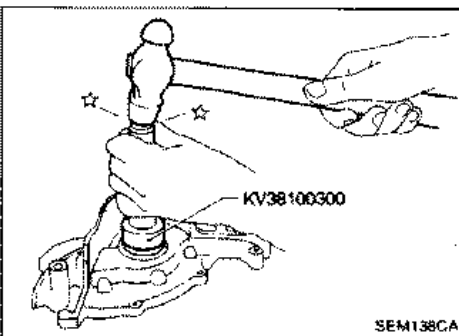
CAMSHAFT OIL SEAL

1. Remove timing belt and camshaft sprocket.
 2. Remove rear belt cover and camshaft oil seal.
- Be careful not to scratch camshaft.**
3. Apply engine oil to new camshaft oil seal and install it using Tool or a suitable tool.

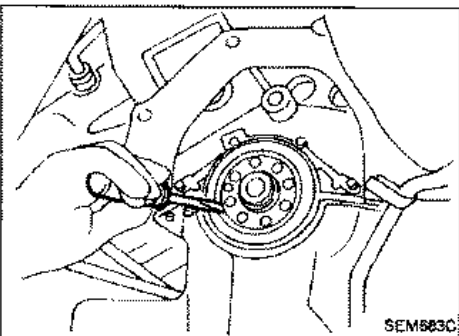


FRONT OIL SEAL

1. Remove timing belt and crankshaft sprocket.
2. Remove oil pan and oil pump assembly.
3. Remove front oil seal from oil pump body.

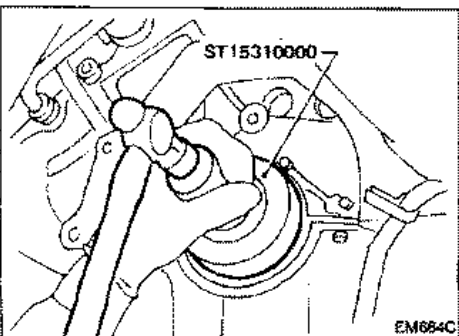


4. Apply engine oil to new oil seal and install it using Tool or a suitable tool.



REAR OIL SEAL

1. Remove flywheel or drive plate.
 2. Remove rear oil seal from retainer.
- Be careful not to scratch crankshaft.**

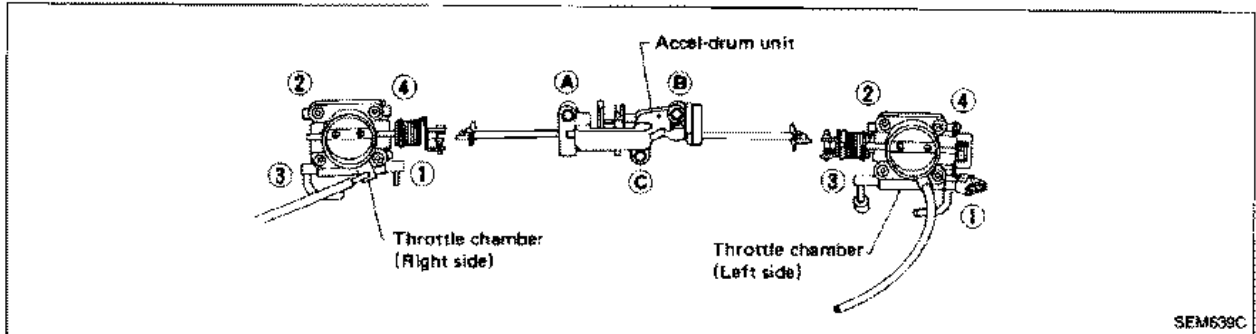


3. Apply engine oil to new oil seal and install it using Tool or a suitable tool.

THROTTLE CHAMBERS

Installation

The intention of this installation and adjustment procedure is to assure accurate synchronization of the throttle chamber opening points.

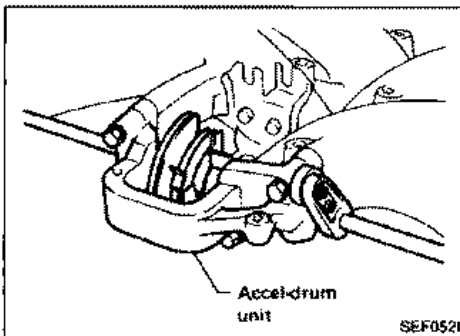


SEM639C

1. Install accel-drum unit and throttle chambers (right side and left side).

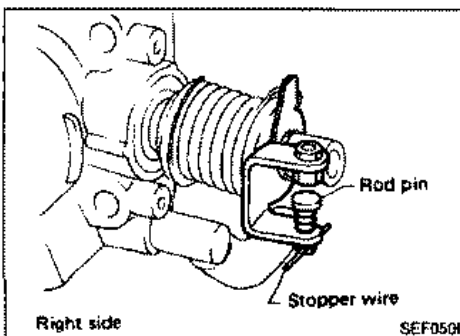
Tightening order:

- (1) ① → ② → ③ → ④ :
9 - 11 N·m (0.9 - 1.1 kg-m, 6.5 - 8.0 ft-lb)
- (2) ① → ② → ③ → ④ :
18 - 22 N·m (1.8 - 2.2 kg-m, 13 - 16 ft-lb)
- (3) A → B → C : Tighten by hand
- (4) A → B → C :
5 N·m (0.5 kg-m, 3.6 ft-lb)
- (5) A → B → C :
20 N·m (2.0 kg-m, 14 ft-lb)



SEF052I

- When tightening bolts, free accel-drum unit so that drum unit is left under its own weight. Do not apply external force to accel-drum unit.
- When replacing throttle chambers only, you need not perform procedures (3), (4) and (5).



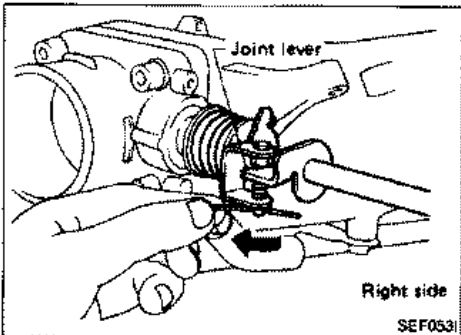
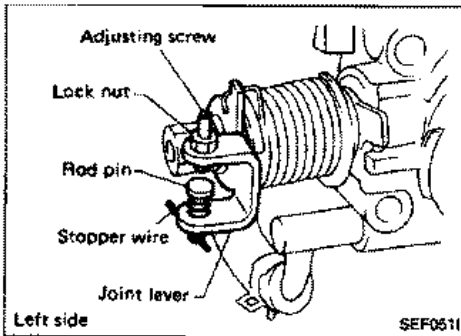
Right side

SEF050I

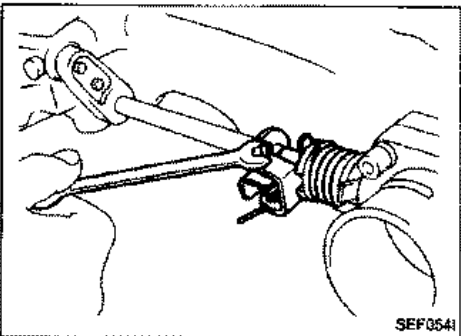
- Before installing each throttle chamber, confirm that stopper wire is installed in hole of rod pin. If not, install suitable wire.

THROTTLE CHAMBERS

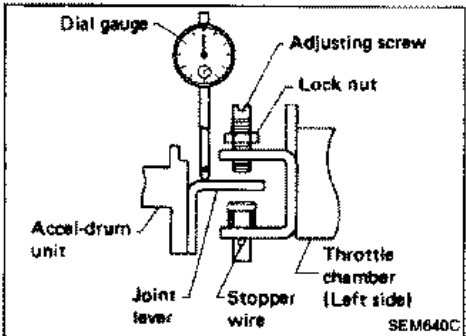
Installation (Cont'd)



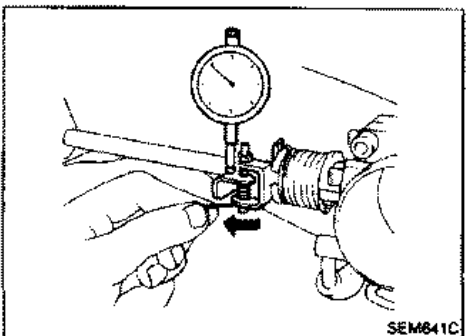
2. Pull out stopper wire of right side throttle chamber in order to secure right side joint lever.



3. Loosen left side throttle chamber lock nut and back off adjusting screw until there is clearance between the screw and joint lever.

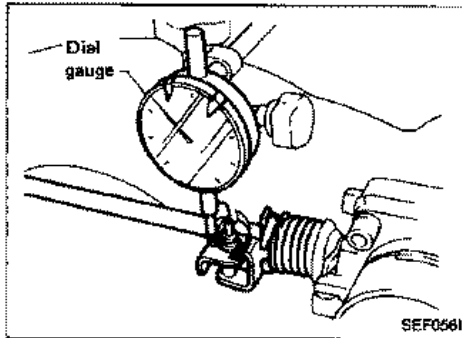


4. Set dial gauge on joint lever and set indicator to zero. Confirm that bottom end of adjusting screw is not in contact with joint lever of accelerator drum unit.



5. Pull out left side throttle chamber stopper wire from rod pin.

THROTTLE CHAMBERS



Installation (Cont'd)

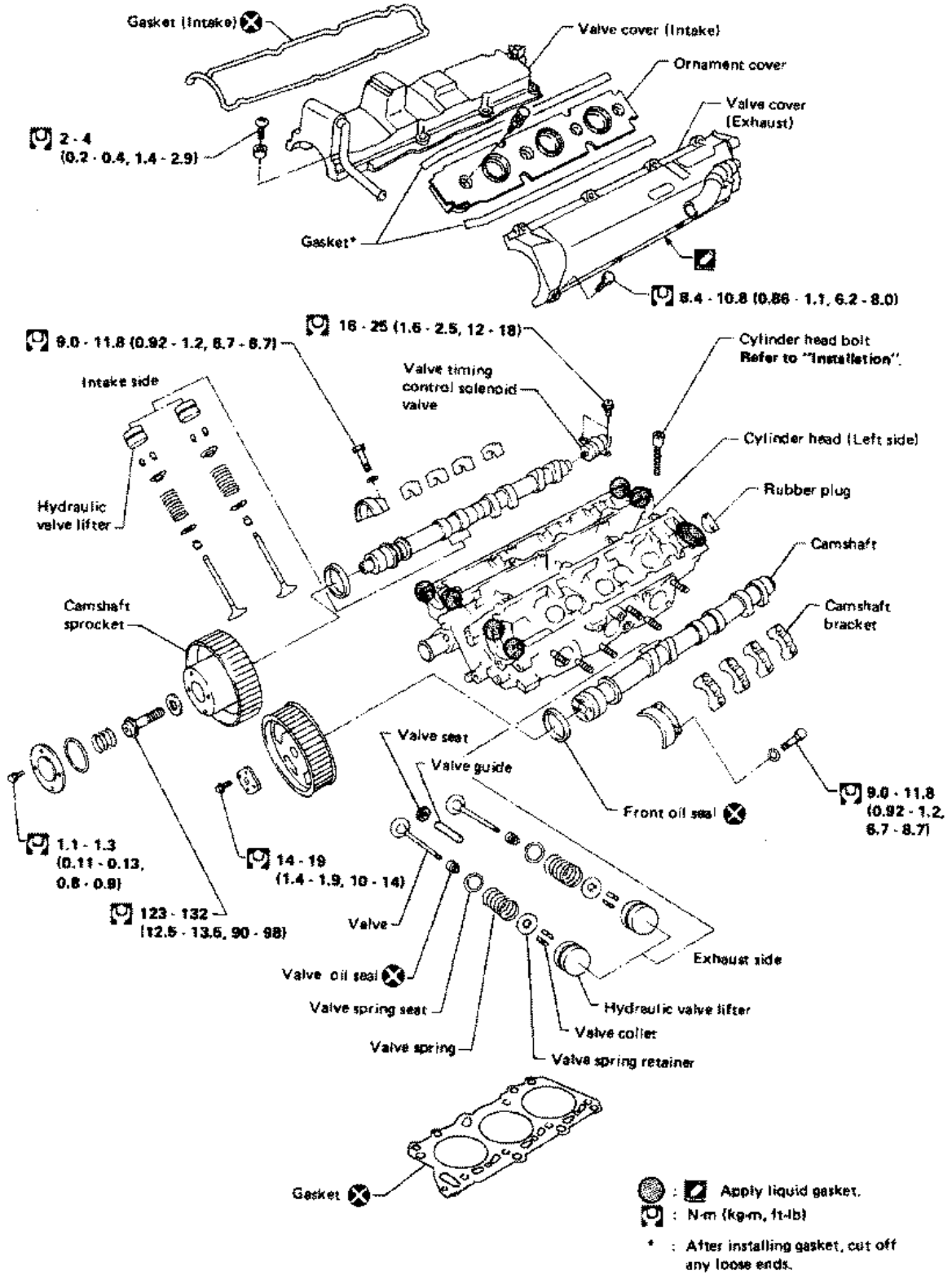
6. Turn adjusting screw until dial gauge indicator is within the following range.

Range: 0.07 - 0.13 mm (0.0028 - 0.0051 in)

Then tighten lock nut.

7. Confirm that the dial gauge indicator is still within the above range.

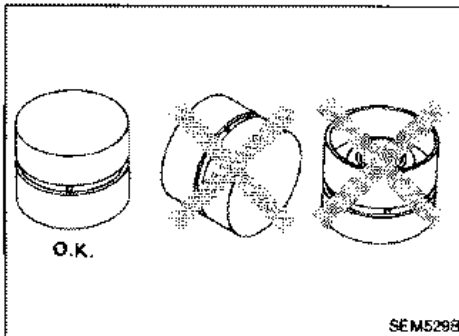
CYLINDER HEAD



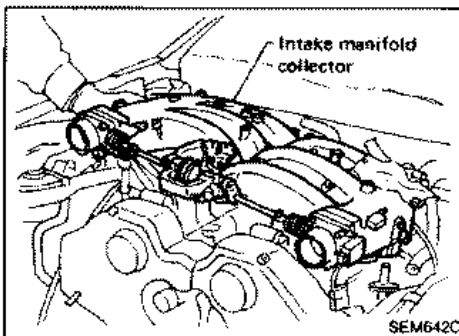
CYLINDER HEAD

CAUTION:

- When installing sliding parts such as camshaft, camshaft bracket and oil seal, be sure to apply new engine oil on their sliding surfaces.
- When tightening cylinder head bolts, intake camshaft sprocket bolts and camshaft bracket bolts, apply new engine oil to thread portions and seat surfaces of bolts.
- Before removing camshaft brackets, identify each one with a punch mark so that they may be reinstalled in their original positions.

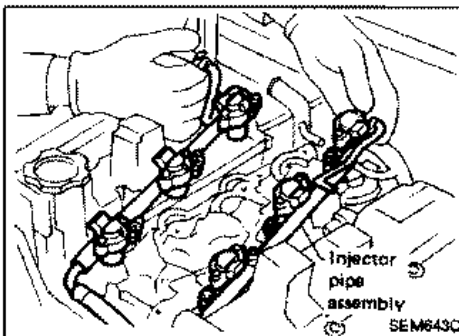


- Do not put hydraulic valve lifters upside down, otherwise air will enter valve lifter, causing it to make a noise.
- Do not disassemble hydraulic valve lifter.
- Attach tags to valve lifters so as not to mix them up.
- Valve lifters should be immersed in engine oil.

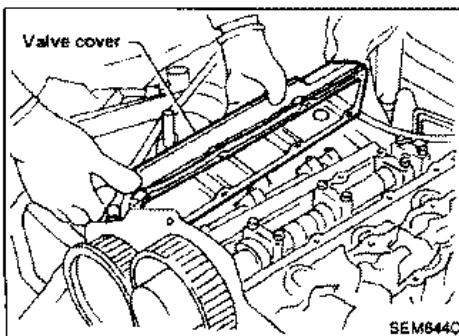


Removal

1. Remove intake manifold collector.



2. Remove injector pipe assembly.



3. Remove valve covers.

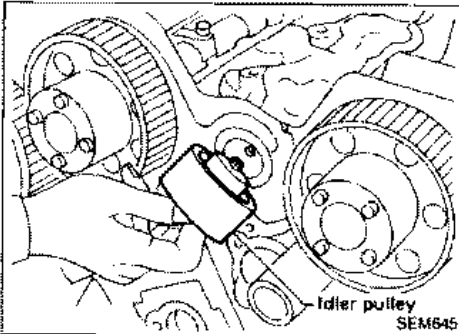
CYLINDER HEAD

Removal (Cont'd)

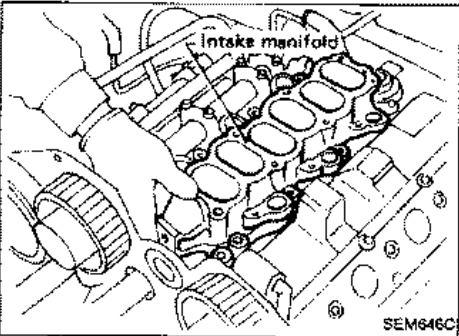
4. Remove timing belt.

Refer to "Removal" of TIMING BELT.

5. Remove idler pulley and its stud bolt.



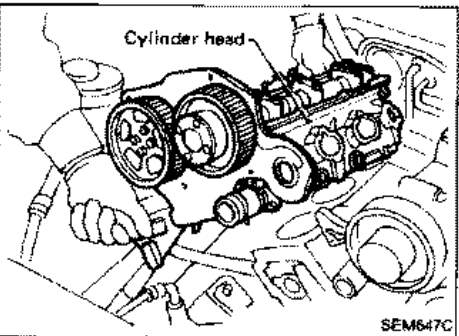
6. Remove intake manifold.



7. Disconnect front exhaust tube from exhaust manifold.

8. Remove cylinder head with exhaust manifold.

Cylinder head bolts should be loosened in two or three steps.

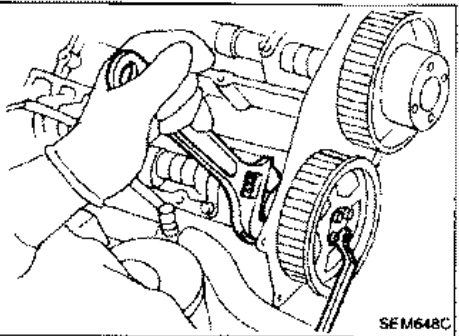


Disassembly

1. Remove exhaust manifold from cylinder head.

2. Remove camshaft sprockets.

3. Remove timing belt rear cover.



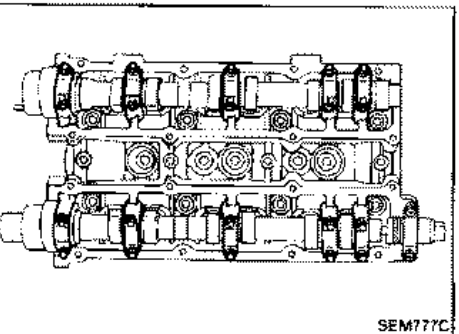
4. Punch an identification mark on each camshaft bracket.

5. Remove camshaft brackets.

Bolts should be loosened in two or three steps.

Before removing camshaft, measure camshaft end play.

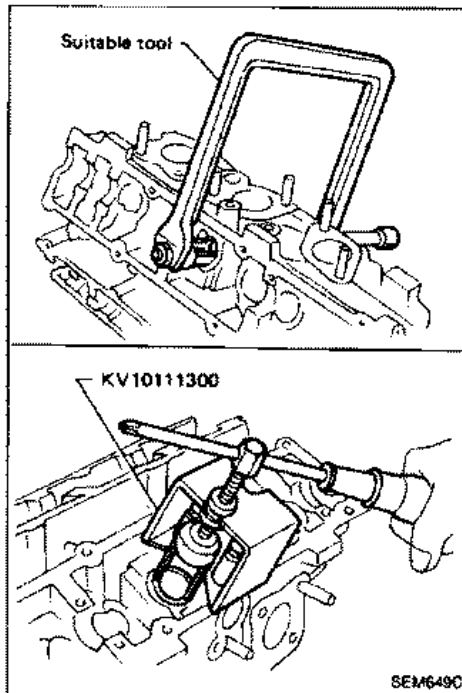
6. Remove oil seals, camshafts and hydraulic valve lifters.



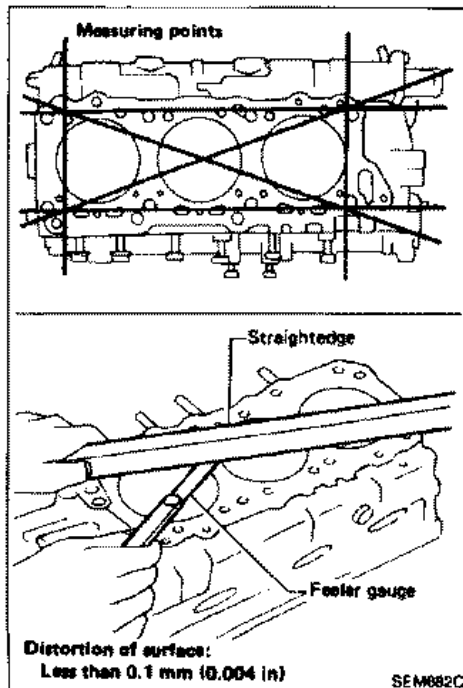
CYLINDER HEAD

Disassembly (Cont'd)

7. Remove valve springs with Tool or a suitable tool.



8. Pry out valve oil seals.



Inspection

CYLINDER HEAD DISTORTION

Head surface flatness:

Less than 0.1 mm (0.004 in)

If beyond the specified limit, replace it or resurface it.

Resurfacing limit:

The resurfacing limit of cylinder head is determined by the cylinder block resurfacing in an engine.

Amount of cylinder head resurfacing is "A".

Amount of cylinder block resurfacing is "B".

The maximum limit is as follows:

$A + B = 0.2 \text{ mm (0.008 in)}$

After resurfacing cylinder head, check to make sure that camshaft rotates freely by hand. If resistance is felt, cylinder head must be replaced.

Nominal cylinder head height from camshaft center:

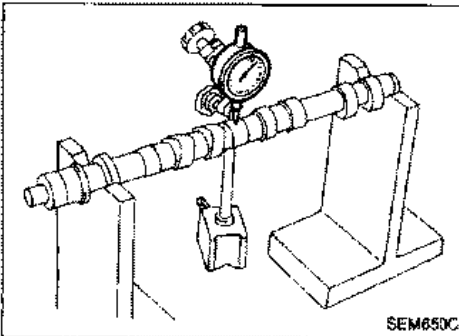
169.5 - 169.7 mm (6.673 - 6.681 in)

CYLINDER HEAD

Inspection (Cont'd)

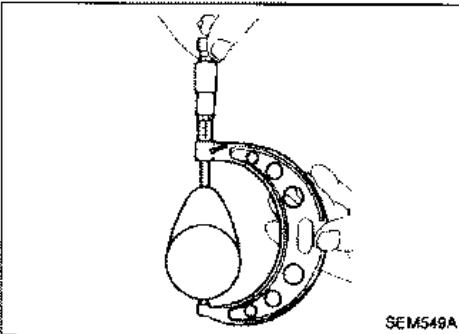
CAMSHAFT VISUAL CHECK

Check camshaft for scratches, seizure and wear.



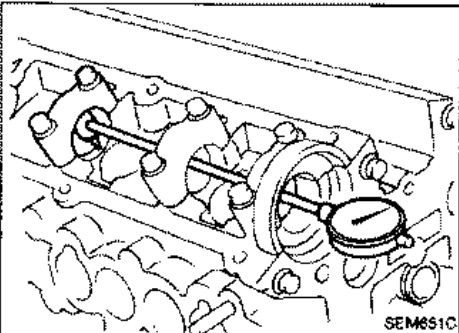
CAMSHAFT RUNOUT

1. Measure camshaft runout at the center journal.
Runout (Total Indicator Reading):
Limit 0.1 mm (0.004 in)
2. If it exceeds the limit, replace camshaft.



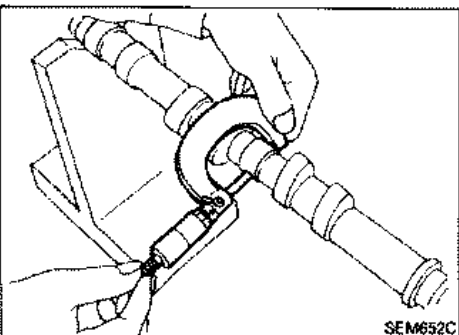
CAMSHAFT CAM HEIGHT

1. Measure camshaft cam height.
Standard cam height:
40.405 - 40.595 mm (1.5907 - 1.5982 in)
Cam wear limit:
0.15 mm (0.0059 in)
2. If wear is beyond the limit, replace camshaft.



CAMSHAFT JOURNAL CLEARANCE

1. Install camshaft bracket and tighten bolts to the specified torque.
2. Measure inner diameter of camshaft bearing.
Standard inner diameter:
28.000 - 28.021 mm (1.1024 - 1.1032 in)

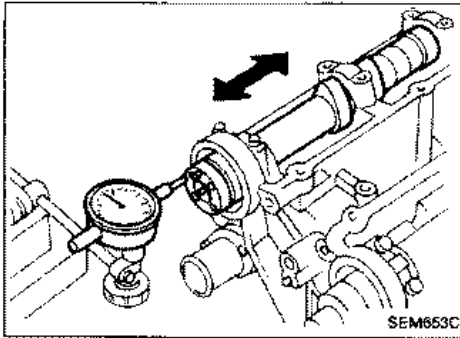


3. Measure outer diameter of camshaft journal.
Standard outer diameter:
27.935 - 27.955 mm (1.0998 - 1.1006 in)
4. If clearance exceeds the limit, replace camshaft and/or cylinder head.
Camshaft journal clearance limit:
0.15 mm (0.0059 in)

CYLINDER HEAD

Inspection (Cont'd)

CAMSHAFT END PLAY



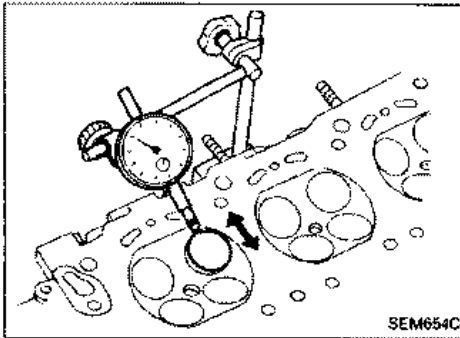
1. Install camshaft in cylinder head.
2. Measure camshaft end play.

Camshaft end play:

Standard

0.03 - 0.08 mm (0.0012 - 0.0031 in)

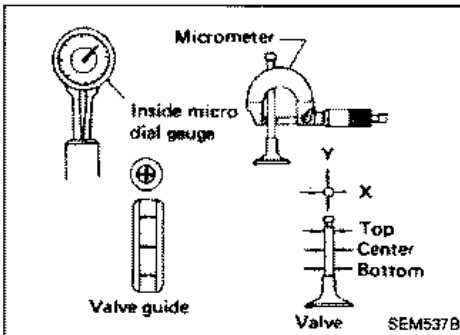
VALVE GUIDE CLEARANCE



1. Push valve stem out so that its end is even with valve guide height. Measure valve runout by moving valve.

Valve deflection limit (Dial gauge reading):

0.2 mm (0.008 in)



2. If it exceeds the limit, check valve to valve guide clearance.
 - a. Measure valve stem diameter and valve guide inner diameter.

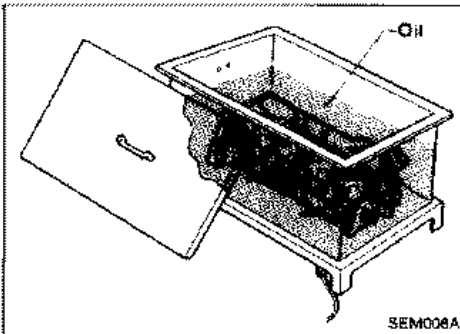
- b. Check that clearance is within specification.

Valve to valve guide clearance limit:

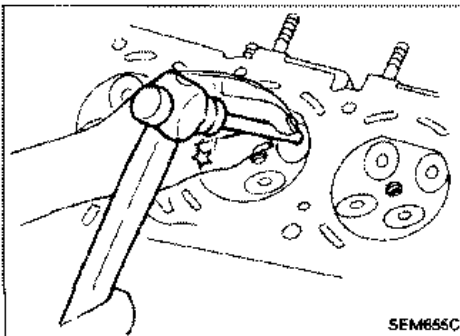
0.10 mm (0.0039 in)

- c. If it exceeds the limit, replace valve or valve guide.

VALVE GUIDE REPLACEMENT



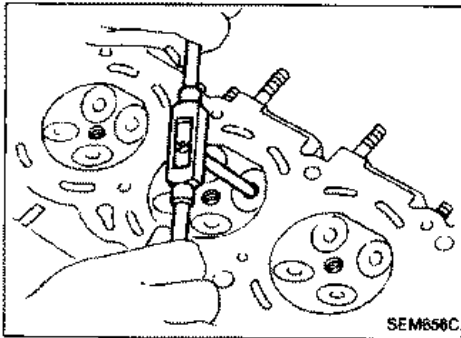
1. To remove valve guide, heat cylinder head to 150 to 160°C (302 to 320°F).



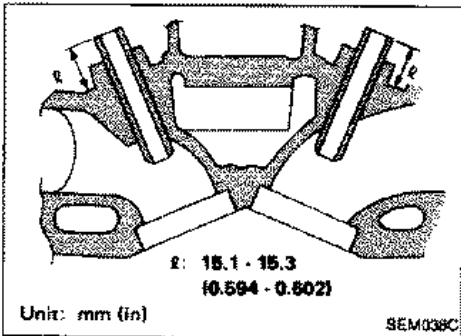
2. Drive out valve guide with a press [under a 20 kN (2 t, 2.2 US ton, 2.0 Imp ton) pressure] or hammer and suitable tool.

CYLINDER HEAD

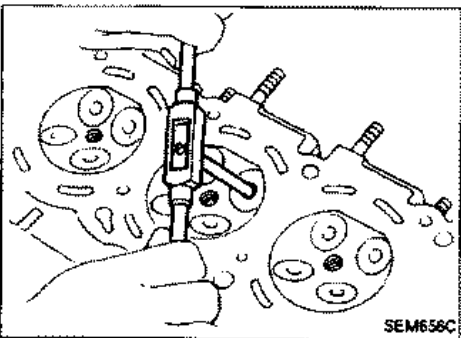
Inspection (Cont'd)



3. Ream cylinder head valve guide hole.
**Valve guide hole diameter
(for service parts):**
Intake and Exhaust
10.175 - 10.196 mm (0.4006 - 0.4014 in)



4. Heat cylinder head to 150 to 160°C (302 to 320°F) and press service valve guide onto cylinder head.
Projection "A":
15.1 - 15.3 mm (0.594 - 0.602 in)



5. Ream valve guide.
Finished size:
Intake and Exhaust
6.000 - 6.018 mm (0.2362 - 0.2369 in)

VALVE SEATS

Check valve seats for evidence of pitting at valve contact surface, and reseat or replace if it is worn excessively.

- Before repairing valve seats, check valve and valve guide for wear. If they have worn, replace them. Then correct valve seat.
- Cut with both hands to assure a uniform surface.

CYLINDER HEAD

Inspection (Cont'd)

REPLACING VALVE SEAT FOR SERVICE PARTS

1. Bore out old seat until it collapses. The machine depth stop should be set so that boring cannot continue beyond the bottom face of the seat recess in cylinder head.
2. Ream cylinder head recess.

Reaming bore for service valve seat

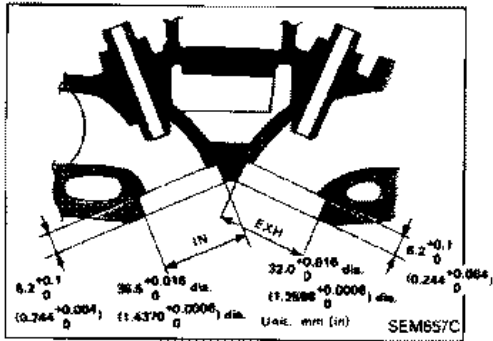
Overize [0.5 mm (0.020 in)]:

Intake

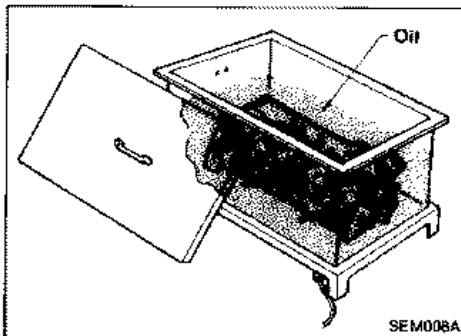
36.500 - 36.516 mm (1.4370 - 1.4376 in)

Exhaust

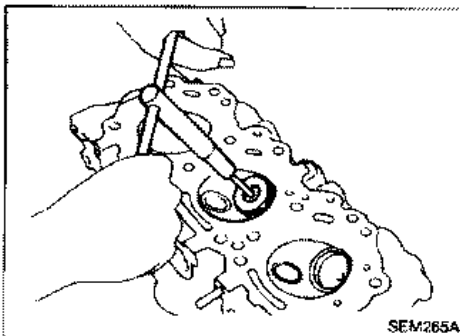
32.000 - 32.016 mm (1.2598 - 1.2605 in)



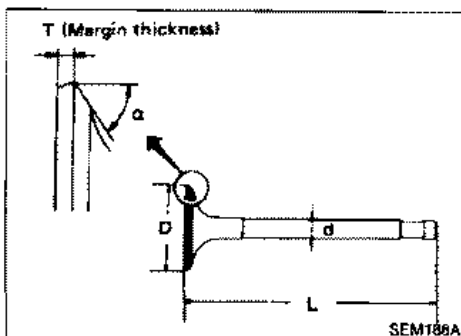
Reaming should be done to the concentric circles to valve guide center so that valve seat will have the correct fit.



3. Heat cylinder head to 150 to 160°C (302 to 320°F).
4. Press fit valve seat until it seats on the bottom.



5. Cut or grind valve seat using suitable tool at the specified dimensions as shown in S.D.S.
6. After cutting, lap valve seat with abrasive compound.
7. Check valve seat contact condition.



VALVE DIMENSIONS

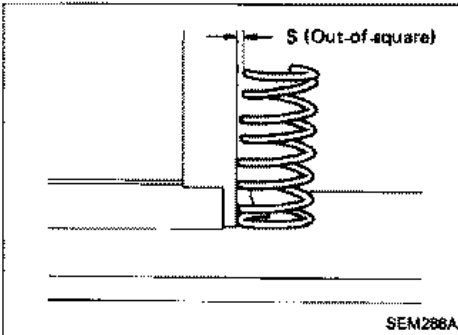
Check dimensions in each valve. For dimensions, refer to S.D.S. When valve head has been worn down to 0.5 mm (0.020 in) in margin thickness, replace valve.

Grinding allowance for valve stem tip is 0.2 mm (0.008 in) or less.

CYLINDER HEAD

Inspection (Cont'd)

VALVE SPRING



Squareness

1. Measure "S" dimension.

Out-of-square:

Less than 1.8 mm (0.071 in)

2. If it exceeds the limit, replace spring.

Pressure

Check valve spring pressure.

Pressure: N (kg, lb) at height mm (in)

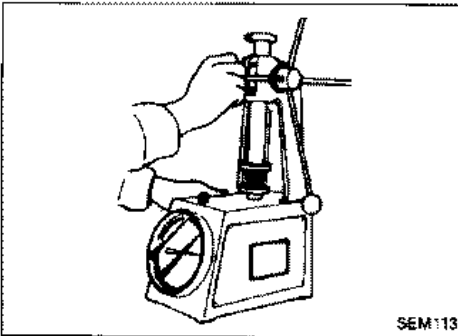
Standard

536.4 (54.7, 120.6) at 26.5 (1.043)

Limit

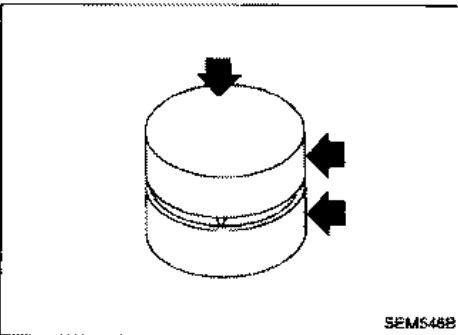
More than 452.79 (46.17, 101.80) at 26.5 (1.043)

If it exceeds the limit, replace spring.



HYDRAULIC VALVE LIFTER

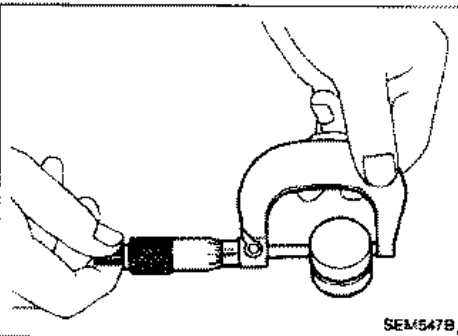
1. Check contact and sliding surfaces for wear or scratches.



2. Check diameter of valve lifter.

Outer diameter:

30.955 - 30.965 mm (1.2187 - 1.2191 in)



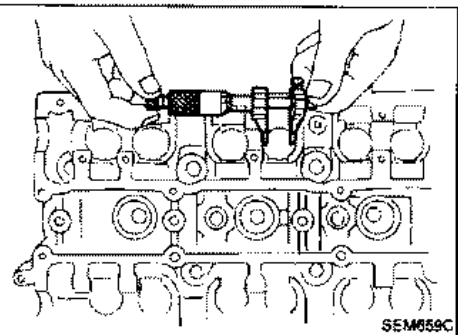
3. Check valve lifter guide inner diameter.

Inner diameter:

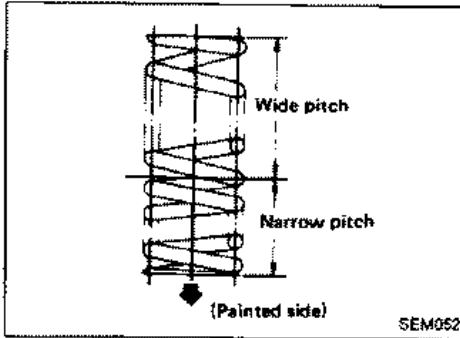
31.000 - 31.020 mm (1.2205 - 1.2213 in)

Standard clearance between valve lifter and lifter guide:

0.035 - 0.065 mm (0.0014 - 0.0026 in)

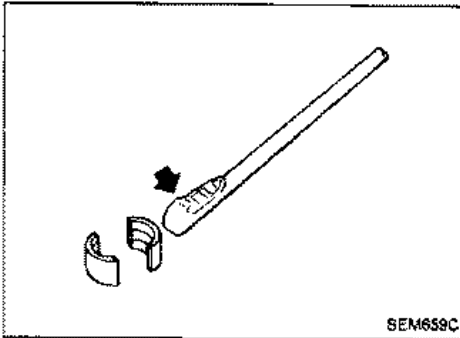


CYLINDER HEAD

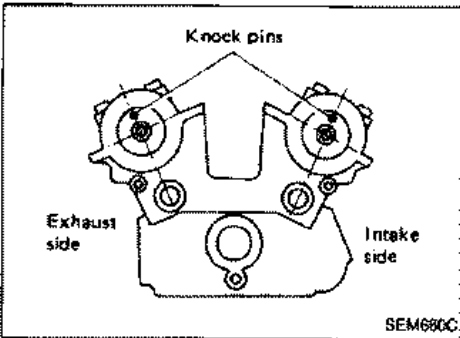


Assembly

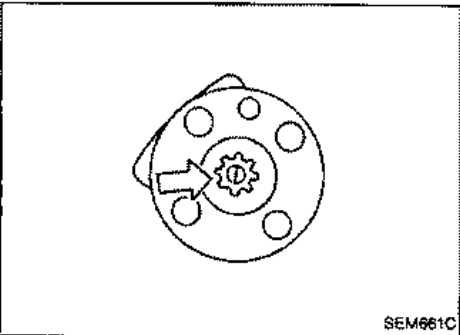
1. Install valve component parts.
 - Always use new valve oil seal. (Refer to OIL SEAL REPLACEMENT.)
 - Install valve spring (uneven pitch type) with its narrow pitch side (painted side) toward cylinder head side.



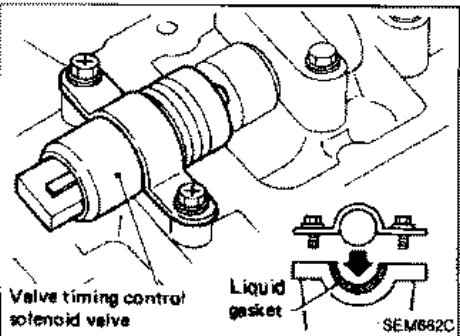
- To facilitate installation of collet, apply a small amount of grease to a piece of wire or a pencil and attach collet to wire or pencil, as shown.



2. Install camshafts as shown.



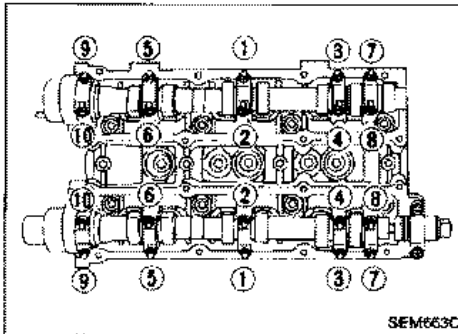
- Exhaust camshaft (left side) has spline for crank angle sensor.



- When installing valve timing control solenoid valves, apply liquid gasket as shown.

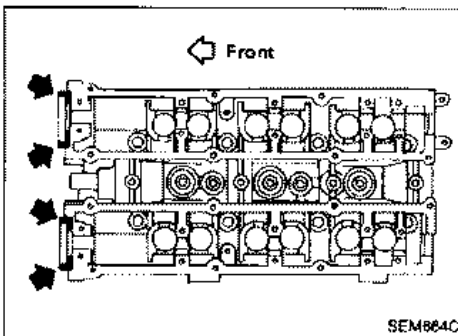
CYLINDER HEAD

Assembly (Cont'd)



3. Install camshaft brackets.

Tighten camshaft bracket bolts gradually in two or three stages.



When installing front side camshaft brackets, apply liquid gasket as shown.

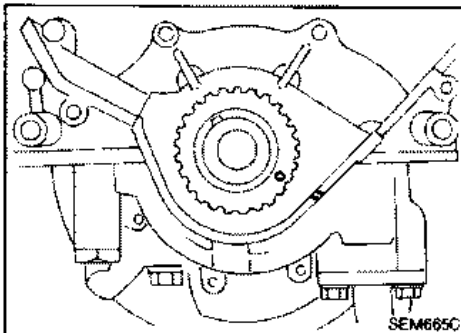
4. Apply engine oil to camshaft oil seal lip and install it in place.

Always use new camshaft oil seal.

5. Install rear timing belt cover.

6. Install camshaft sprockets.

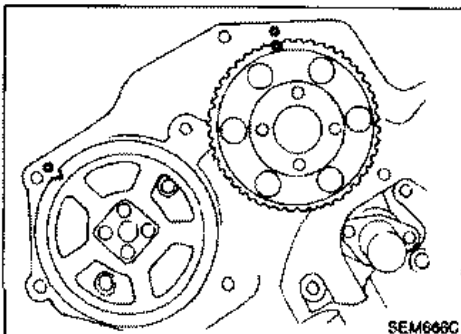
When tightening bolts, fix camshaft to prevent it from rotating.



Installation

1. Set No. 1 piston at T.D.C. on its compression stroke as follows:

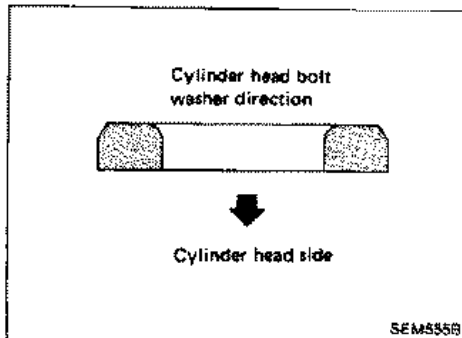
(1) Align crankshaft sprocket aligning mark with mark on oil pump body.



(2) Align camshaft sprocket aligning mark with mark on timing belt rear cover.

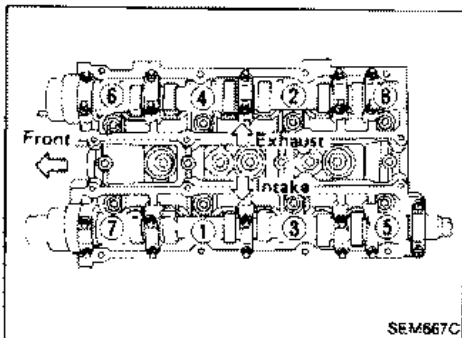
CYLINDER HEAD

Installation (Cont'd)



2. Install cylinder head with new gasket.

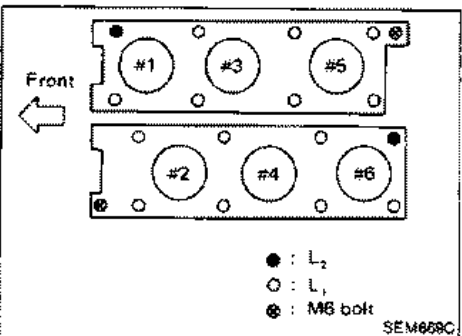
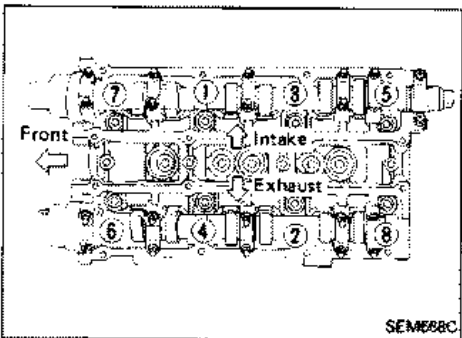
- Be sure to install washers between bolts and cylinder head.
- Do not rotate crankshaft and camshaft separately, or valves will hit piston heads.



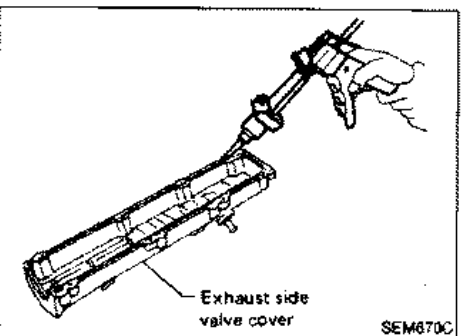
3. Tighten cylinder head bolts in numerical order.

- Tightening procedure

- (1) Tighten all bolts to 39 N·m (4.0 kg-m, 29 ft-lb).
- (2) Tighten all bolts to 123 N·m (12.5 kg-m, 90 ft-lb).
- (3) Loosen all bolts completely.
- (4) Tighten all bolts to 34 to 44 N·m (3.5 to 4.5 kg-m, 25 to 33 ft-lb).
- (5) Turn bolts 65 to 75 degrees (L₁), 60 to 70 degrees (L₂) clockwise or, if an angle wrench is not available, tighten all bolts to 123 N·m (12.5 kg-m, 90 ft-lb).



(6) Tighten bolts (⊗) as shown to 10 to 12 N·m (1.0 to 1.2 kg-m, 7 to 9 ft-lb).

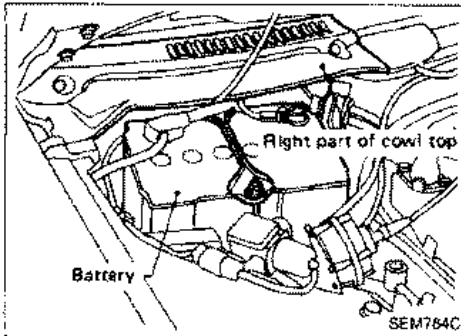


4. Install valve covers.

When installing exhaust side valve covers, apply liquid gasket as shown.

5. Install remaining parts.

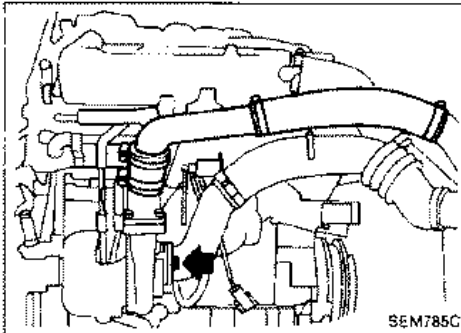
TURBOCHARGERS



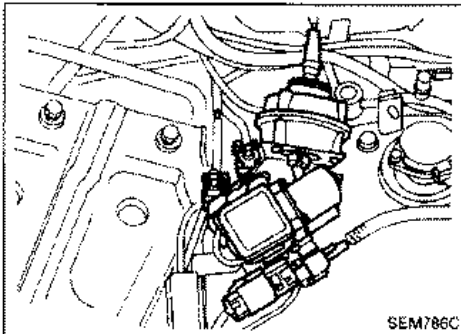
Removal

RIGHT SIDE UNIT

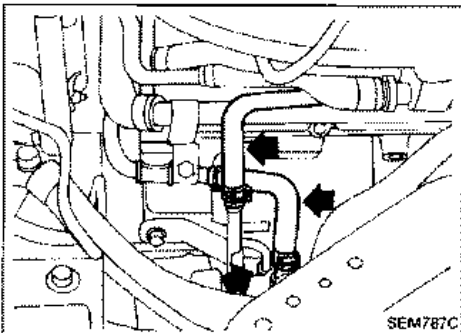
1. Remove right part of cowl top.
2. Remove battery.



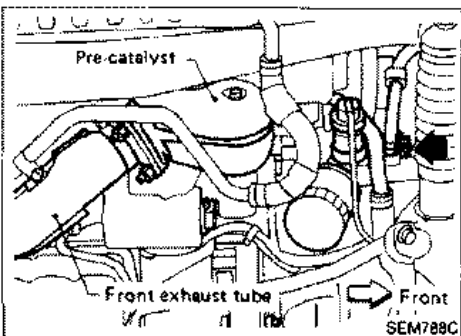
3. Remove air inlet hose and pipe.
4. Disconnect lower pipe from turbocharger unit.



5. Remove A.S.C.D. bracket with wiper motor and solenoid valves.
6. Disconnect exhaust gas sensor harness connector.



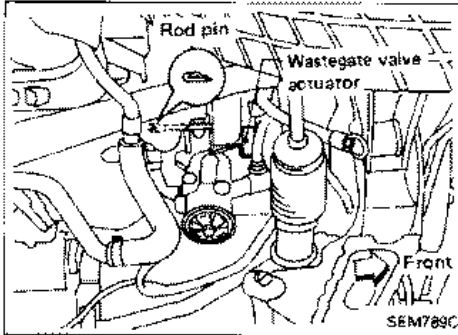
7. Remove turbocharger water hoses, and disconnect turbocharger oil inlet tube.
8. Remove two bolts fastening pre-catalyst to turbocharger unit.



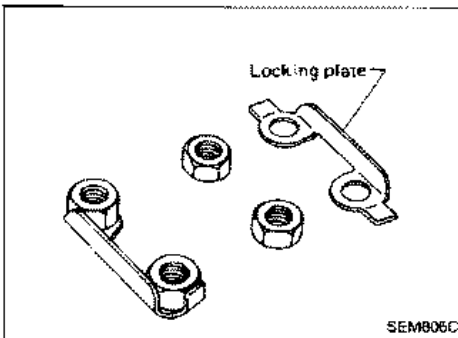
9. Remove the following parts:
 - oil pressure switch,
 - oil filter,
 - turbocharger oil return tube,
 - front exhaust tube,
 - pre-catalyst
10. Disconnect oil hose from oil filter bracket, and turbocharger water tubes from turbocharger unit.

TURBOCHARGERS

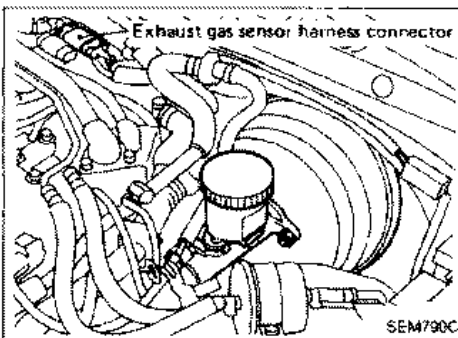
Removal (Cont'd)



11. Remove rod pin of wastegate valve actuator.
12. Remove oil filter bracket.

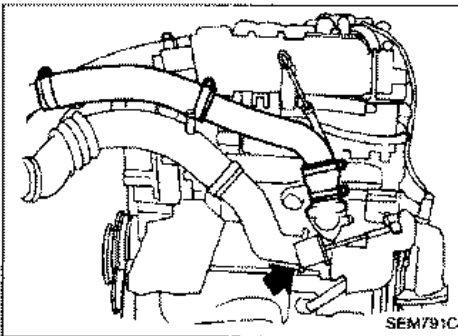


13. Unbend locking plates for fastening nuts of turbocharger unit.
14. Remove turbocharger unit.

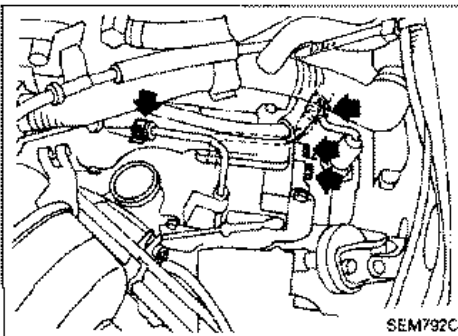


LEFT SIDE UNIT

1. Remove brake master cylinder and brake booster.
2. Disconnect exhaust gas sensor harness connector.



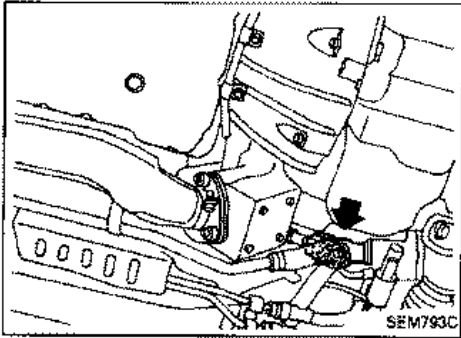
3. Remove air inlet hose and pipe.
4. Disconnect lower pipe from turbocharger unit.



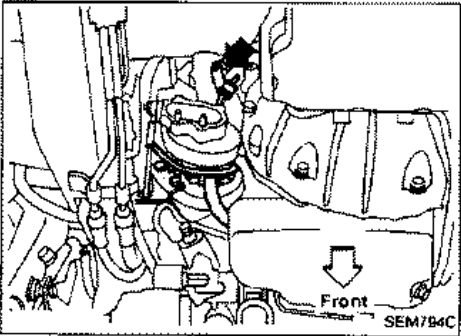
5. Disconnect water tubes.
6. Remove two bolts fastening pre-catalyst to turbocharger unit.

TURBOCHARGERS

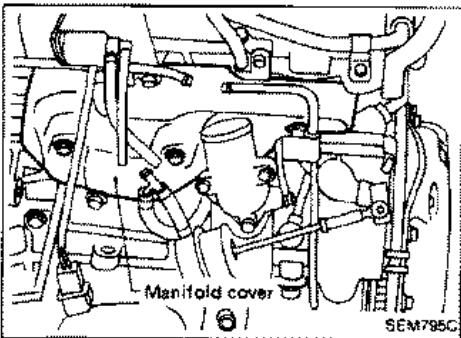
Removal (Cont'd)



7. Remove front exhaust tube and pre-catalyst.
8. Disconnect steering lower joint.



9. Remove turbocharger oil return tube and water tubes.
10. Disconnect E.G.R. tube and actuator bracket of turbocharger wastegate valve.

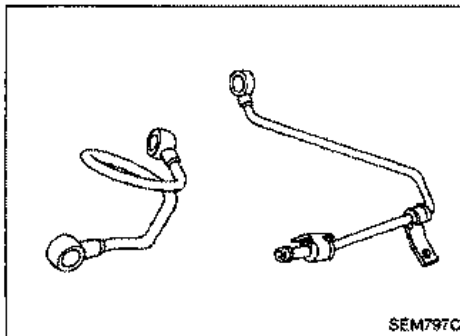
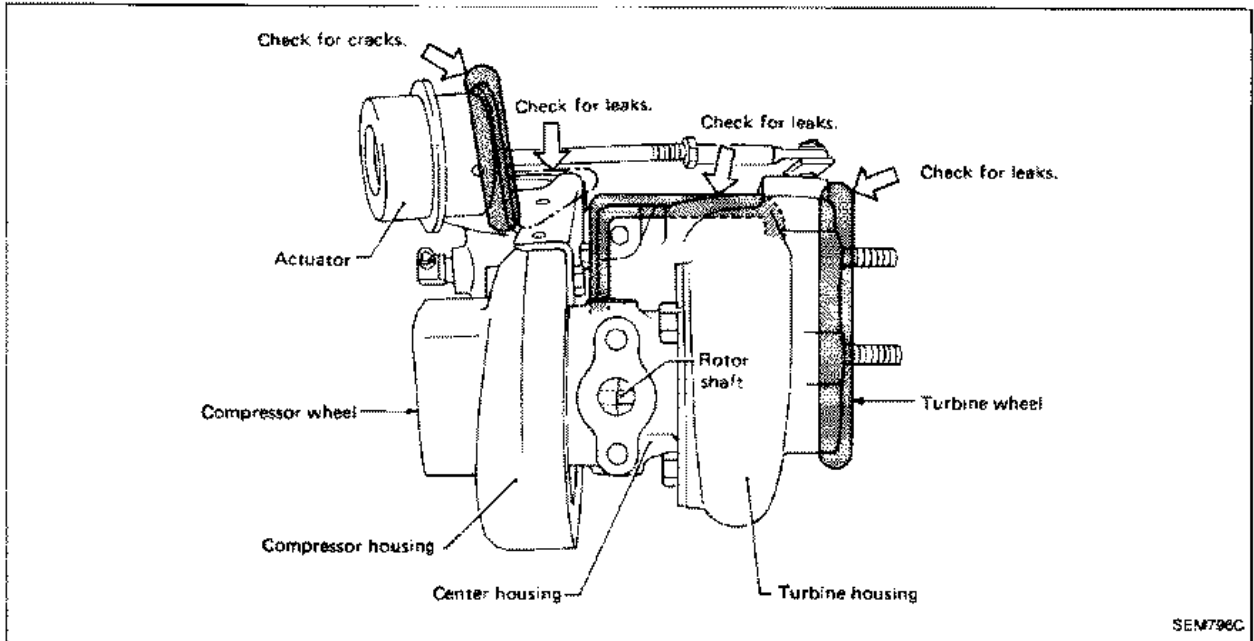


11. Remove manifold cover and fastening nuts.
12. Remove turbocharger unit with exhaust manifold.

TURBOCHARGERS

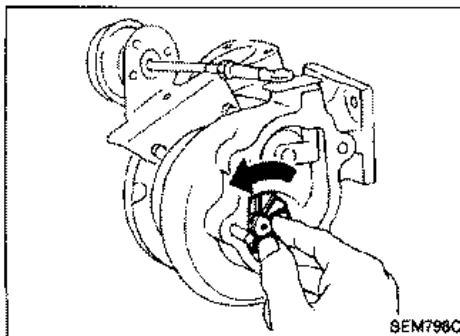
Inspection

Proceed the following checks. If N.G., replace turbocharger units.



OIL AND WATER TUBES

Check tubes for clogging.

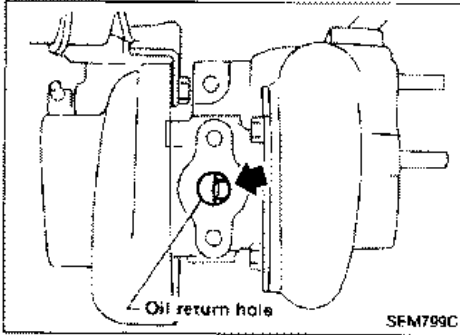


ROTOR SHAFT

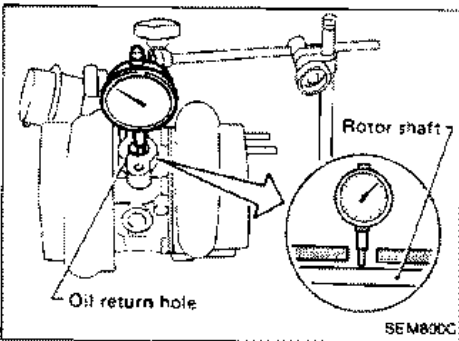
1. Check rotor shaft for smooth rotating.

TURBOCHARGERS

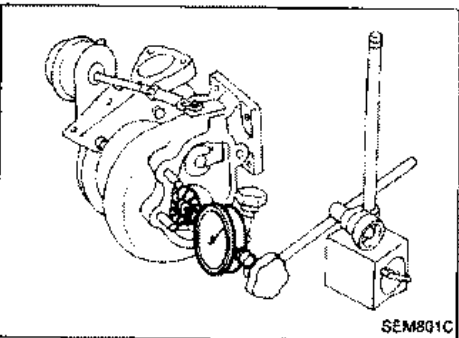
Inspection (Cont'd)



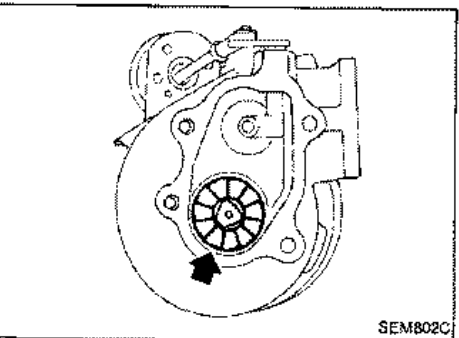
2. Check rotor shaft for carbon deposits.



3. Measure runout of rotor shaft.
Runout (Total indicator reading):
0.056 - 0.127 mm (0.0022 - 0.0050 in)



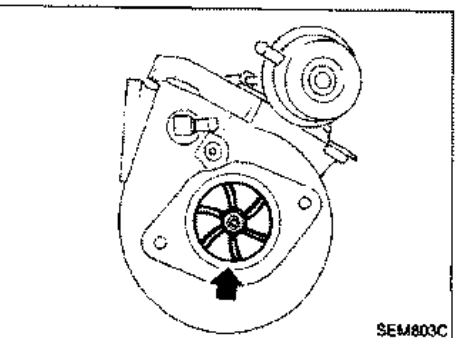
4. Measure end play of rotor shaft.
End play:
0.013 - 0.096 mm (0.0005 - 0.0038 in)



TURBINE WHEEL

Check turbine wheel for the following:

- Oil
- Carbon deposits
- Deformed fins
- Contact with turbine housing



COMPRESSOR WHEEL

Check compressor wheel for the following:

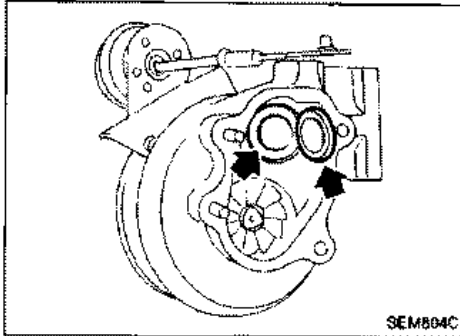
- Oil
- Deformed fins
- Contact with compressor housing

TURBOCHARGERS

Inspection (Cont'd)

WASTEGATE VALVE

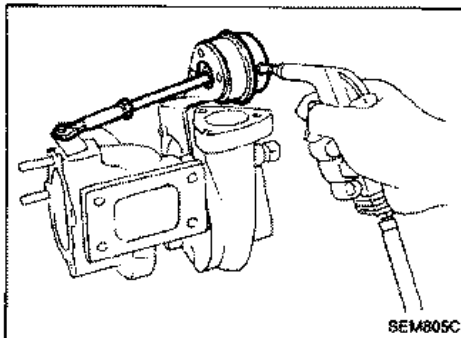
Remove rod pin and check wastegate valve for cracks, deformation and smooth movement.
Check valve seat surface for smoothness.



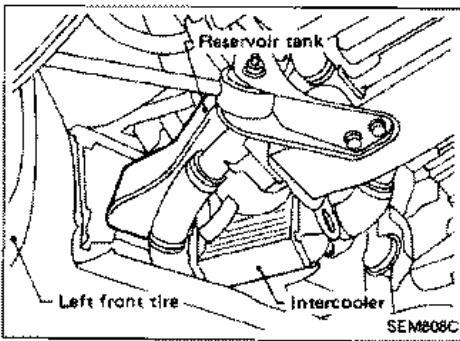
WASTEGATE VALVE ACTUATOR

Apply air pressure to wastegate valve actuator and check it for smooth movement.

- Do not keep applying air pressure to the actuator.
- The air pressure should be in the range of 78 to 88 kPa (0.78 to 0.88 bar, 0.8 to 0.9 kg/cm², 11 to 13 psi).

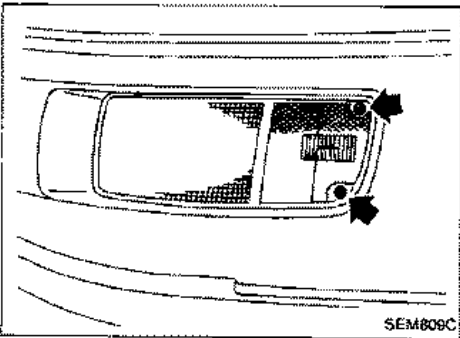


INTERCOOLERS

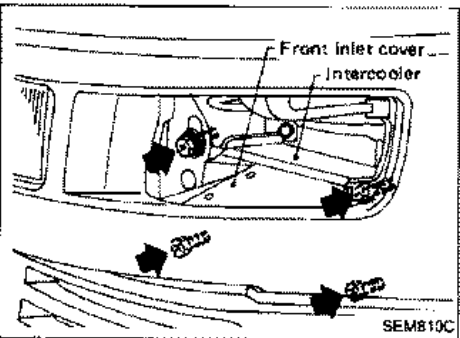


Removal

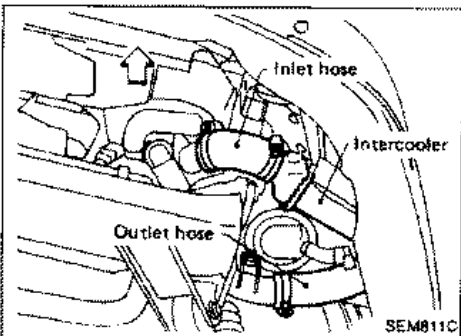
1. Remove front part of front fender protector.
2. Remove reservoir tank (left intercooler service only).



3. Remove front combination lamp.

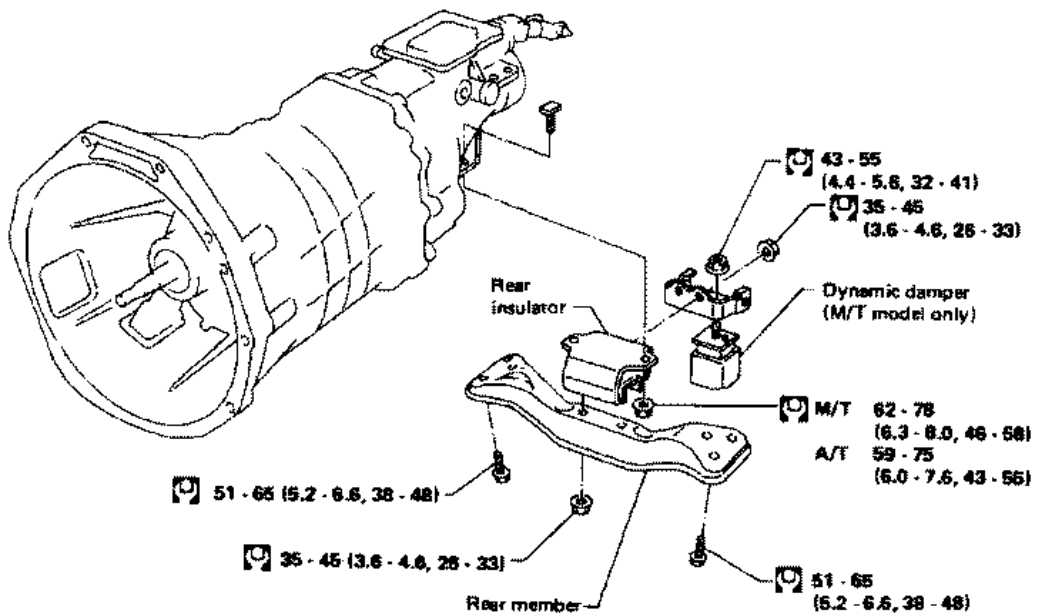
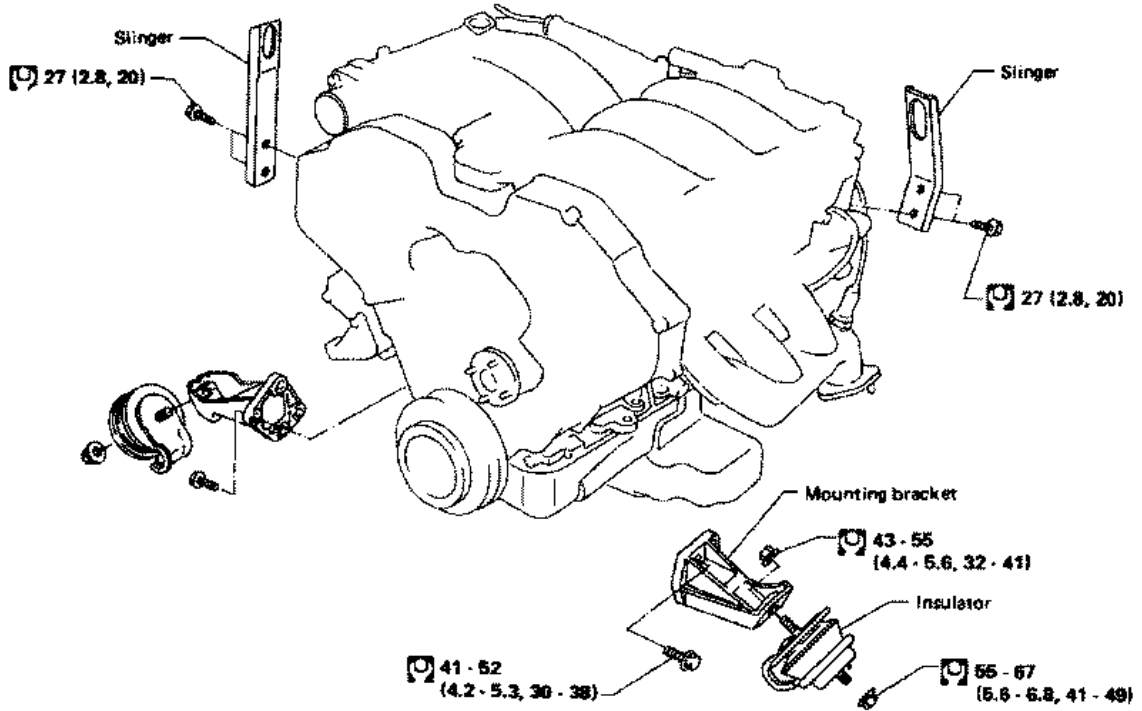


4. Remove bolts fastening intercooler and front inlet cover.



5. Remove inlet and outlet hoses.
6. Remove intercooler unit.

ENGINE REMOVAL



: N-m (kg-m, ft-lb)

9EM621C

EM-45

ENGINE REMOVAL

WARNING:

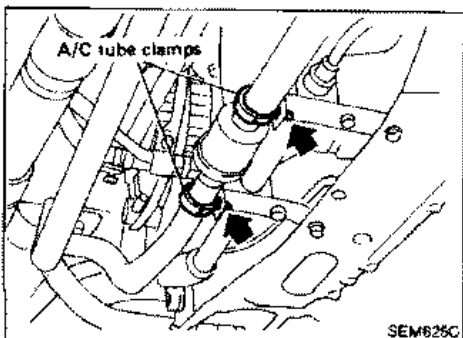
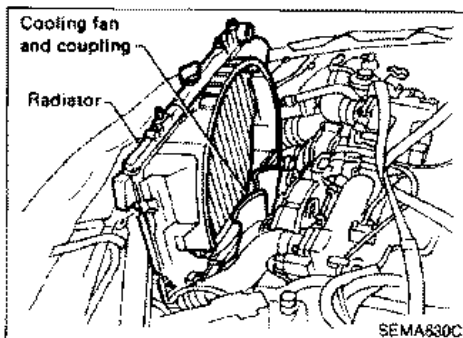
- a. Situate vehicle on a flat and solid surface.
- b. Place chocks at front and back of rear wheels.
- c. Do not remove engine until exhaust system has completely cooled off. Otherwise, you may burn yourself and/or fire may break out in fuel line.
- d. For safety during subsequent steps, the tension of wires should be slackened against the engine.
- e. Before disconnecting fuel hose, release fuel pressure from fuel line.
Refer to "Releasing Fuel Pressure" in section EF & EC.
- f. Be sure to hoist engine and transmission in a safe manner.
- g. For engines not equipped with engine slingers, attach proper slingers and bolts described in PARTS CATALOG.

CAUTION:

- When lifting engine, be careful not to strike adjacent parts, especially accelerator wire casing, brake lines, and brake master cylinder.
- In hoisting the engine, always use engine slingers in a safe manner.

M/T model

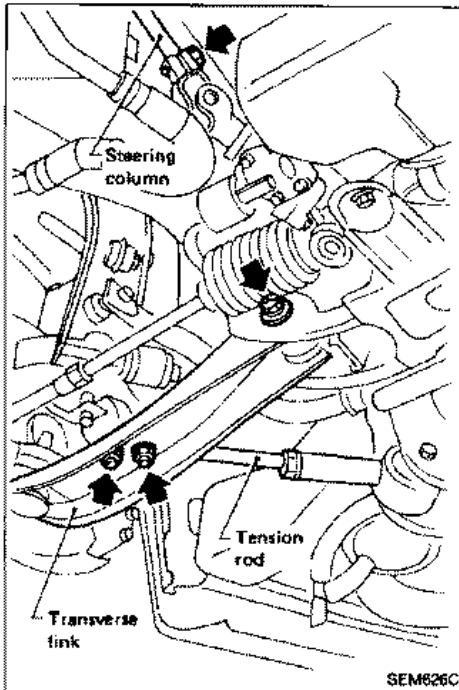
1. Remove engine under cover and hood.
2. Drain coolant from both cylinder block drain plugs, and radiator drain cock.
3. Drain engine oil from drain plug of oil pan.
4. Remove vacuum hoses, fuel tubes, wires, harnesses and connectors and so on.
5. Remove front exhaust tubes and propeller shaft.
6. Remove radiator.
7. Remove drive belts, cooling fan and coupling.
8. Remove P/S oil pump, alternator, A/C pump from engine, and starter motor, and clutch operating cylinder.



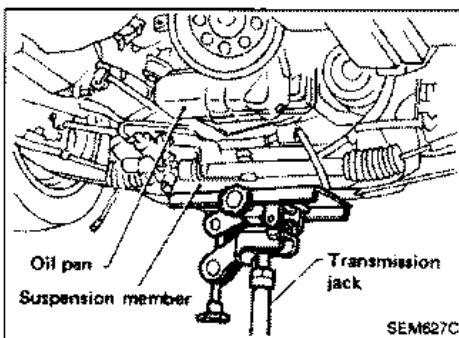
9. Disconnect A/C tube clamps as shown.

ENGINE REMOVAL

M/T model (Cont'd)



10. Disconnect steering column lower joint.
11. Remove tension rod fixing bolts from both sides.
12. Loosen transverse link bolts on both sides.

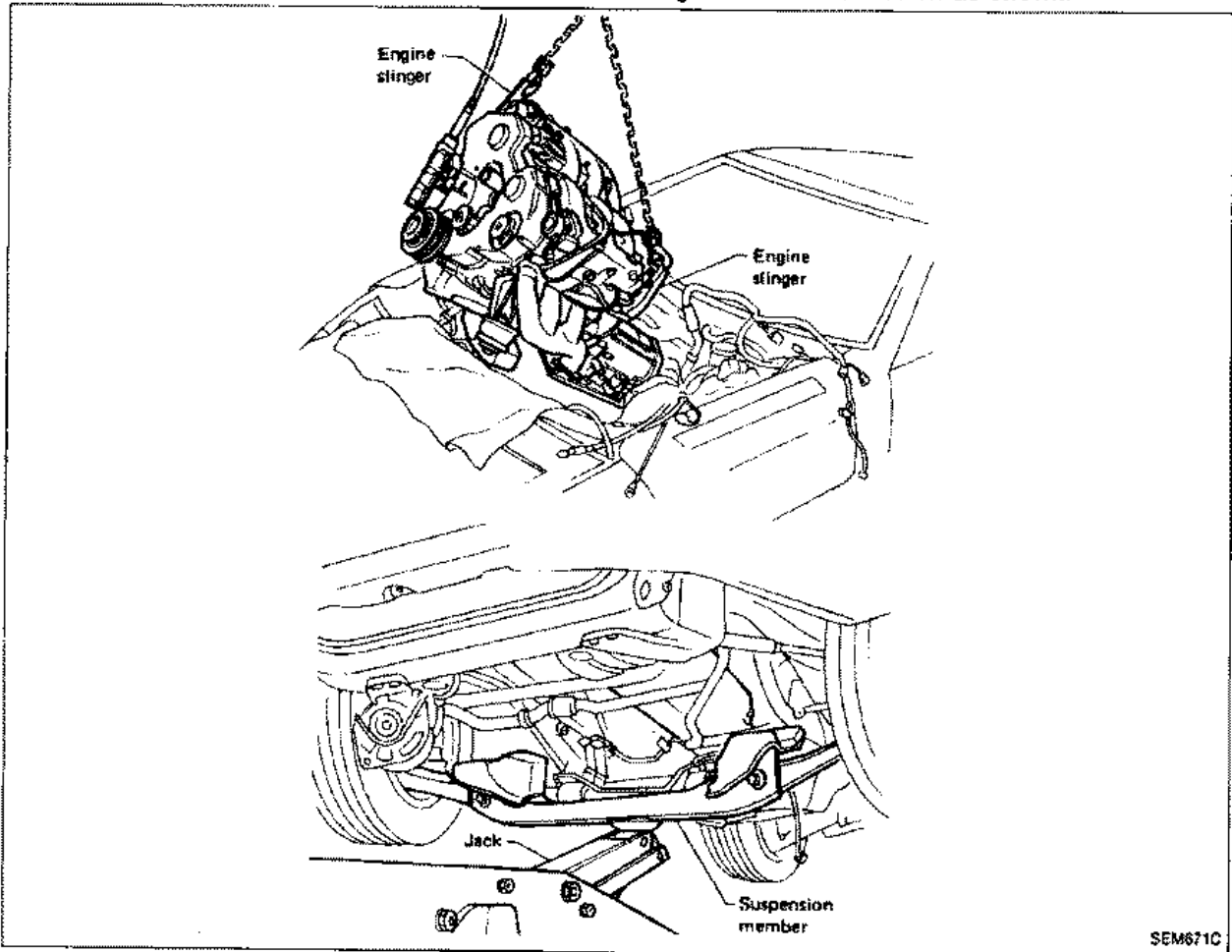


13. Set a suitable transmission jack under suspension member.
 - At this time, hoist engine with engine slinger.
14. Remove suspension member fixing bolts.
15. Remove engine mounting bolts from both sides and then slowly lower transmission jack.

ENGINE REMOVAL

M/T model (Cont'd)

16. Remove engine with transmission as shown.



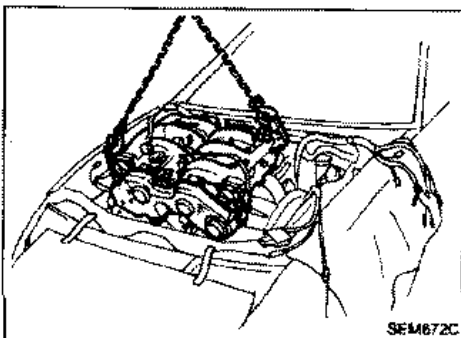
SEM671C

A/T model

1. Perform the same procedures (1 to 8) as for M/T model.
2. Remove transmission from vehicle.

Refer to AT section.

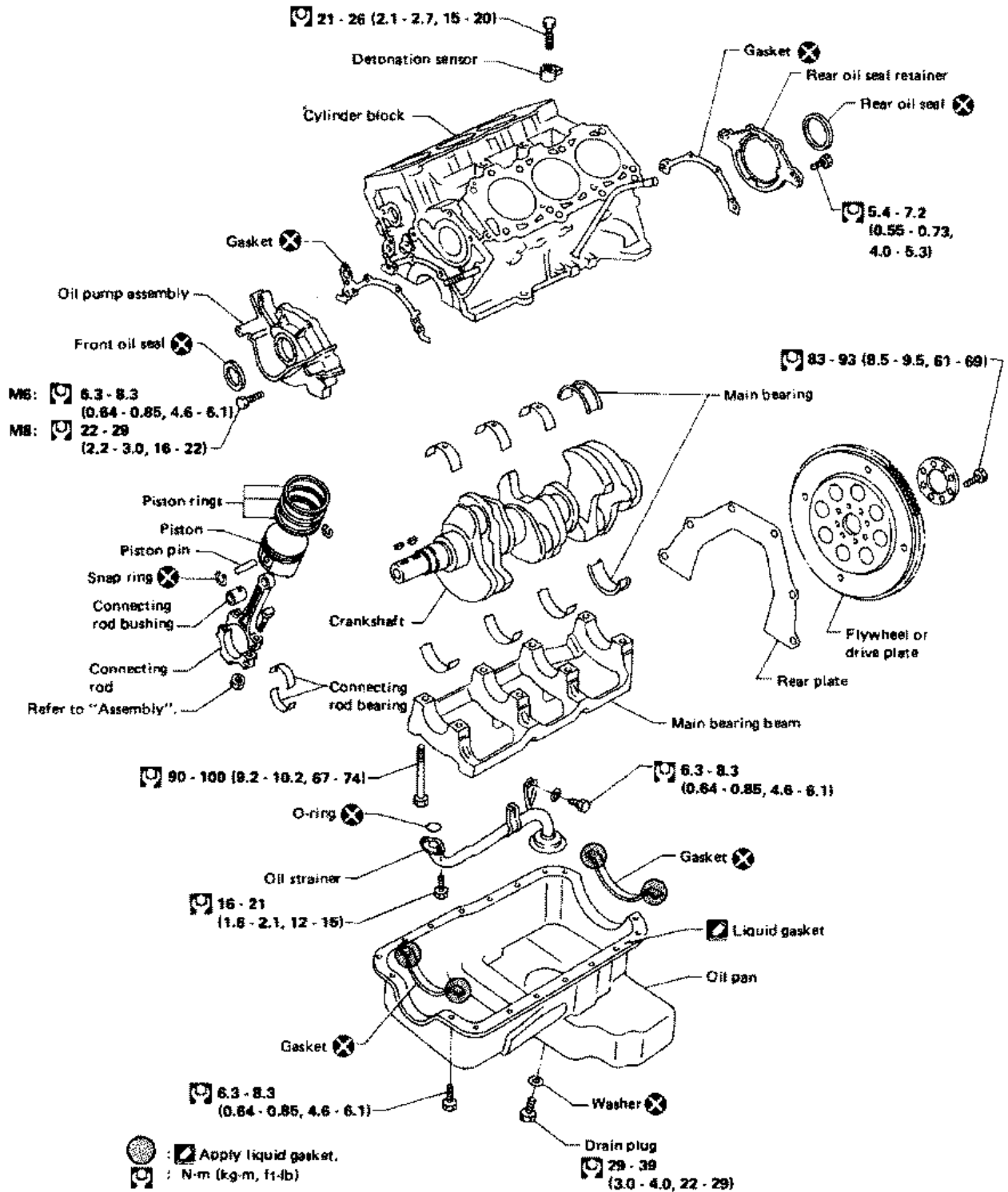
3. Hoist engine with engine slingers and remove engine mounting bolts from both sides.



SEM672C

4. Remove engine from vehicle as shown.

CYLINDER BLOCK

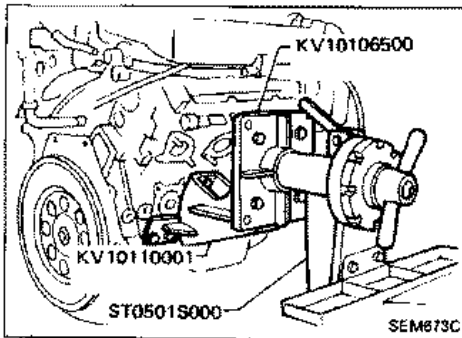


SEM622C

CYLINDER BLOCK

CAUTION:

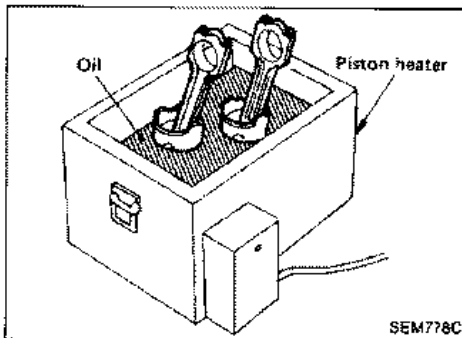
- When installing sliding parts such as bearings and pistons, be sure to apply engine oil on the sliding surfaces.
- Place removed parts such as bearings and bearing caps in their proper order and direction.
- When tightening connecting rod bolts and main bearing cap bolts, apply engine oil to thread portion of bolts and seating surface of nuts.



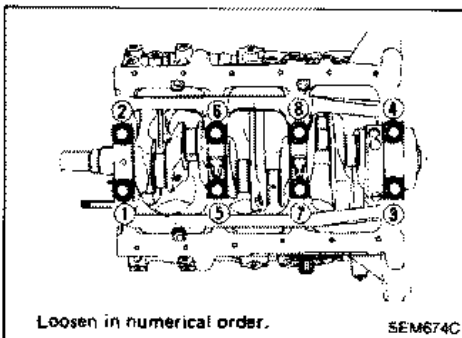
Disassembly

PISTON AND CRANKSHAFT

1. Place engine on a work stand.
 2. Remove timing belt.
 3. Drain coolant and remove water pump.
 4. Drain oil.
 5. Remove oil pan, oil pump and rear oil seal retainer.
 6. Remove intake manifold collector, intake manifold and cylinder head.
 7. Remove pistons.
- When disassembling piston and connecting rod, remove snap ring first, then heat piston to 60 to 70°C (140 to 158°F) or use piston pin press stand at room temperature.



8. Remove bearing cap and crankshaft.
- Before removing bearing cap, measure crankshaft end play.
 - Bolts should be loosened in two or three steps.

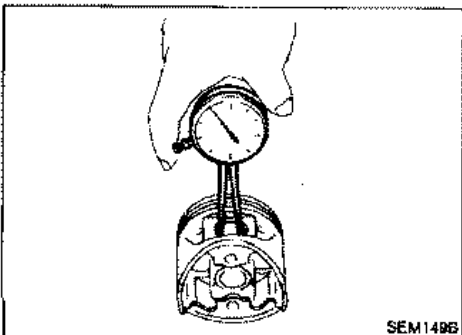


Loosen in numerical order.

Inspection

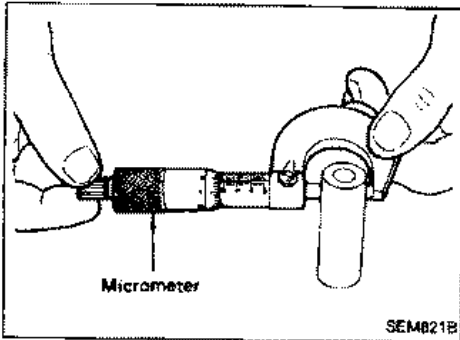
PISTON AND PISTON PIN CLEARANCE

- Confirm the fitting of piston pin into piston pin hole by checking if it can be pressed in smoothly by finger pressure at room temperature.
1. Measure inner diameter of piston pin hole "dp".
Standard diameter "dp":
21.987 - 21.999 mm (0.8656 - 0.8661 in)

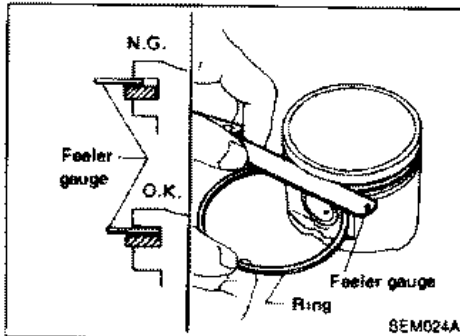


CYLINDER BLOCK

Inspection (Cont'd)



2. Measure outer diameter of piston pin "Dp".
Standard diameter "Dp":
 21.989 - 22.001 mm (0.8657 - 0.8662 in)
3. Calculate piston pin clearance.
 $dp - Dp = -0.004 \text{ to } 0 \text{ mm } (-0.0002 \text{ to } 0 \text{ in})$
 If it exceeds the above value, replace piston assembly with pin.



PISTON RING SIDE CLEARANCE

Side clearance:

Top ring

0.040 - 0.073 mm (0.0016 - 0.0029 in)

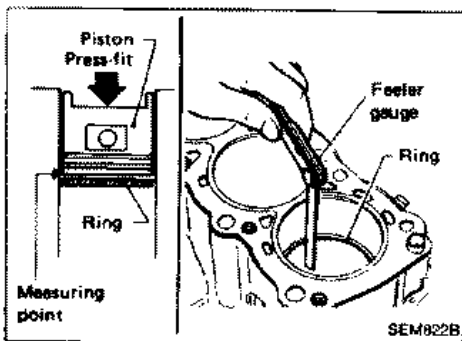
2nd ring

0.030 - 0.063 mm (0.0012 - 0.0025 in)

Max. limit of side clearance:

0.1 mm (0.004 in)

If out of specification, replace piston and/or piston ring assembly.



PISTON RING END GAP

End gap:

Top ring

0.21 - 0.40 mm (0.0083 - 0.0157 in)

2nd ring

0.50 - 0.76 mm (0.0197 - 0.0299 in)

Oil ring

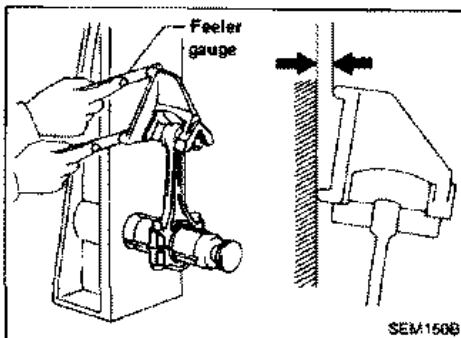
0.20 - 0.76 mm (0.0079 - 0.0299 in)

Max. limit of end gap:

1.0 mm (0.039 in)

If out of specification, replace piston ring. If gap still exceeds the limit even with a new ring, rebore cylinder and use oversized piston and piston rings.

Refer to S.D.S.



CONNECTING ROD BEND AND TORSION

Bend:

Limit 0.15 mm (0.0059 in) per 100 mm (3.94 in) length

Torsion:

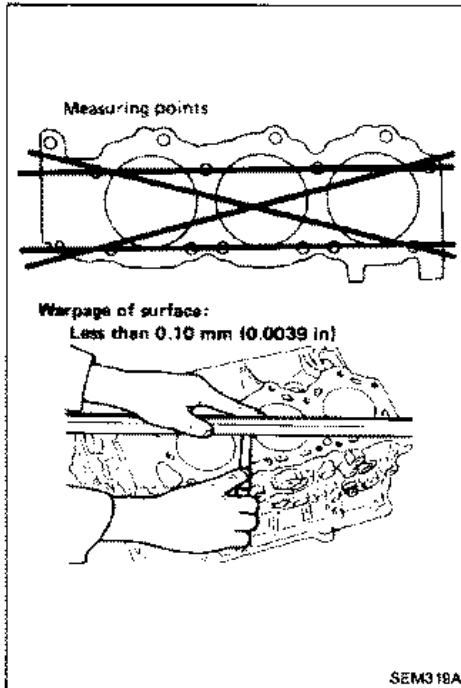
Limit 0.3 mm (0.012 in) per 100 mm (3.94 in) length

If it exceeds the limit, replace connecting rod assembly.

CYLINDER BLOCK

Inspection (Cont'd)

CYLINDER BLOCK DISTORTION AND WEAR



1. Clean upper face of cylinder block and measure the distortion.

Limit:

0.10 mm (0.0039 in)

2. If out of specification, resurface it.
The resurfacing limit is determined by cylinder head resurfacing in engine.

Amount of cylinder head resurfacing is "A".

Amount of cylinder block resurfacing is "B".

The maximum limit is as follows:

$$A + B = 0.2 \text{ mm (0.008 in)}$$

3. If necessary, replace cylinder block.

PISTON-TO-BORE CLEARANCE

Method A (Using bore gauge and micrometer)

1. Using a bore gauge, measure cylinder bore for wear, out-of-round and taper.

Standard inner diameter:

87.000 - 87.030 mm (3.4252 - 3.4264 in)

Wear limit:

0.20 mm (0.0079 in)

Out-of-round (X - Y) limit:

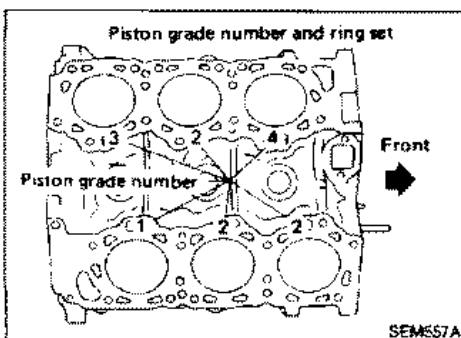
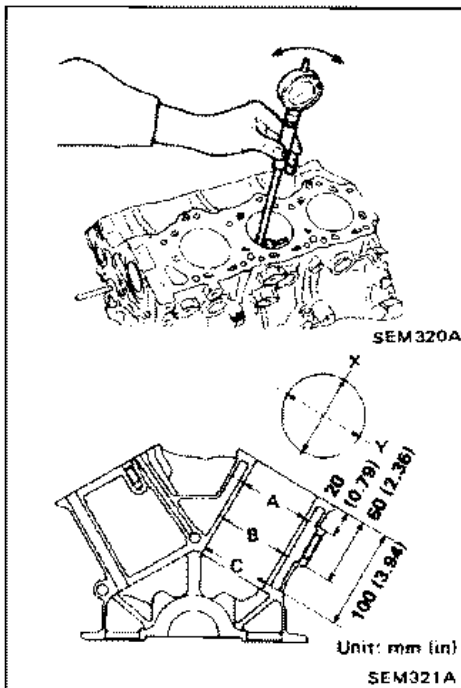
0.015 mm (0.0006 in)

Taper (A - B - C) limit:

0.010 mm (0.0004 in)

If it exceeds the limit, rebore all cylinders. Replace cylinder block if necessary.

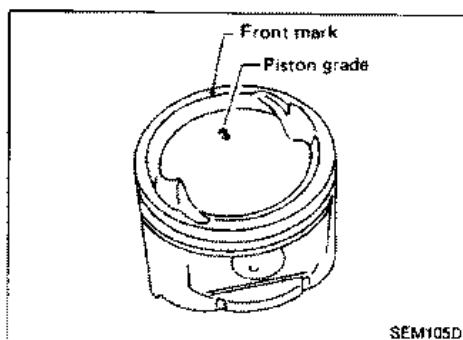
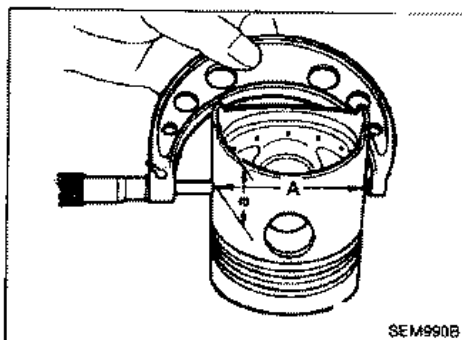
2. Check for scratches and seizure. If seizure is found, hone it.



- If both cylinder block and piston are replaced with new ones, select piston of the same grade number punched on cylinder block upper surface.

CYLINDER BLOCK

Inspection (Cont'd)



3. Measure piston skirt diameter.
Piston diameter "A":
Refer to S.D.S.
Measuring point "a" (Distance from the bottom):
 11.5 mm (0.453 in)
4. Check that piston-to-bore clearance is within specification.
Piston-to-bore clearance "B":
Non-turbo
 0.015 - 0.035 mm (0.0006 - 0.0014 in)
Turbo
 0.025 - 0.045 mm (0.0010 - 0.0018 in)
5. Determine piston oversize according to amount of cylinder wear.

Oversize pistons are available for service. Refer to S.D.S.

6. Cylinder bore size is determined by adding piston-to-bore clearance to piston diameter "A".

Rebored size calculation:

$$D = A + B - C$$

where,

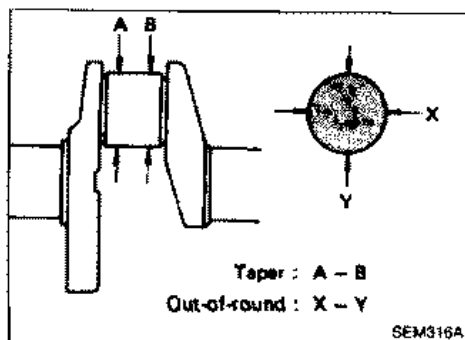
D: Bored diameter

A: Piston diameter as measured

B: Piston-to-bore clearance

C: Honing allowance 0.02 mm (0.0008 in)

7. Install main bearing caps, and tighten to the specified torque to prevent distortion of cylinder bores in final assembly.
8. Cut cylinder bores.
 - **When any cylinder needs boring, all other cylinders must also be bored.**
 - **Do not cut too much out of cylinder bore at a time. Do not cut more than 0.05 mm (0.0020 in) in diameter at a time.**
- 9.hone cylinders to obtain specified piston-to-bore clearance.
10. Measure finished cylinder bore for out-of-round and taper.
 - **Measurement should be done after cylinder bore cools down.**



CRANKSHAFT

1. Check crankshaft main and pin journals for score, wear or cracks.
2. With a micrometer, measure journals for taper and out-of-round.

Out-of-round (X - Y):

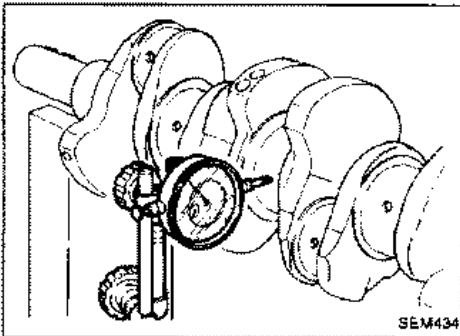
Less than 0.005 mm (0.0002 in)

Taper (A - B):

Less than 0.005 mm (0.0002 in)

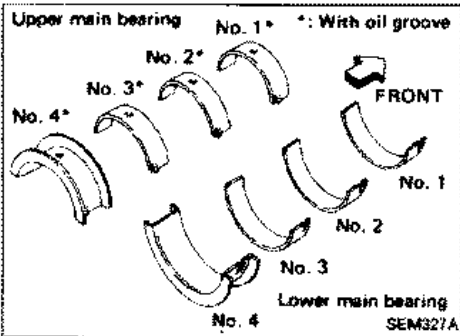
CYLINDER BLOCK

Inspection (Cont'd)



3. Measure crankshaft runout.

Runout (Total indicator reading):
Less than 0.10 mm (0.0039 in)



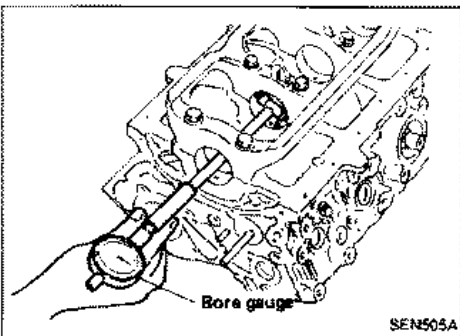
BEARING CLEARANCE

- Either of the following two methods may be used; however, method "A" gives more reliable results and is preferable.

Method A (Using bore gauge & micrometer)

Main bearing

1. Set main bearings in their proper positions on cylinder block and main bearing cap.
2. Install main bearing cap to cylinder block.
3. Measure inner diameter "A" of each main bearing.



4. Measure outer diameter "Dm" of each crankshaft main journal.

5. Calculate main bearing clearance.

Main bearing clearance (A - Dm):

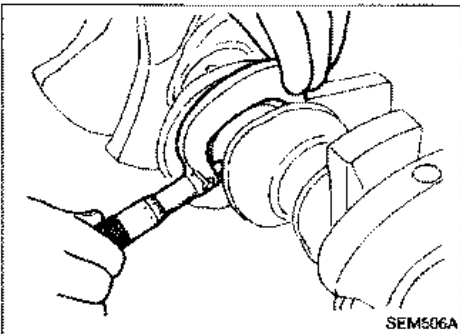
Standard

0.028 - 0.055 mm (0.0011 - 0.0022 in)

Limit

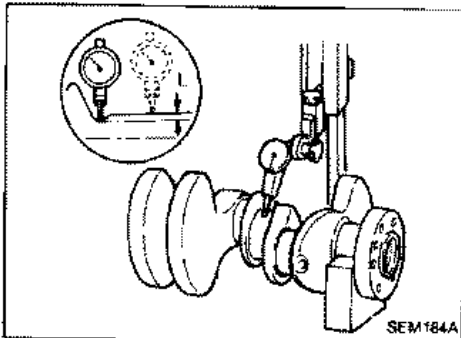
0.090 mm (0.0035 in)

6. If it exceeds the limit, replace bearing.
7. If clearance cannot be adjusted within the standard of any bearing, grind crankshaft journal and use undersized bearing.

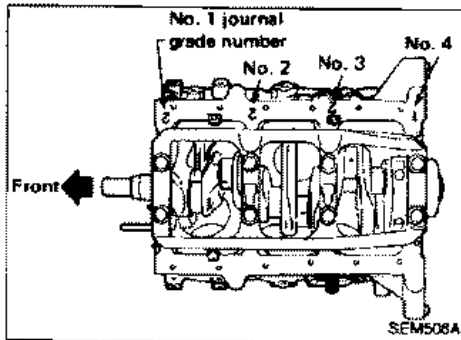


CYLINDER BLOCK

Inspection (Cont'd)

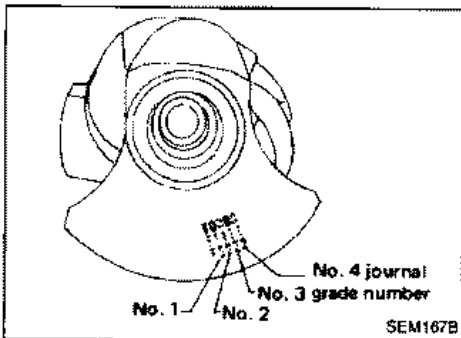


- a. When grinding crankshaft journal, confirm that "L" dimension in fillet roll is more than the specified limit.
"L": 0.1 mm (0.004 in)
- b. Refer to S.D.S. for grinding crankshaft and available service parts.



8. If crankshaft, cylinder block or main bearing is reused again, measure main bearing clearance.
If crankshaft, cylinder block and main bearings are replaced with new ones, it is necessary to select thickness of main bearings as follows:

- a. Grade number of each cylinder block main journal is punched on the respective cylinder block.



- b. Grade number of each crankshaft main journal is punched on the No. 1 counter weight of crankshaft.

- c. Select main bearing with suitable thickness according to the following table.

Main bearing grade number:

Crankshaft journal grade number \ Main journal grade number	Main journal grade number		
	0	1 (I)	2 (II)
0	0	1	2
1 (I)	1	2	3
2 (II)	2	3	4

For example:

Main journal grade number: 1

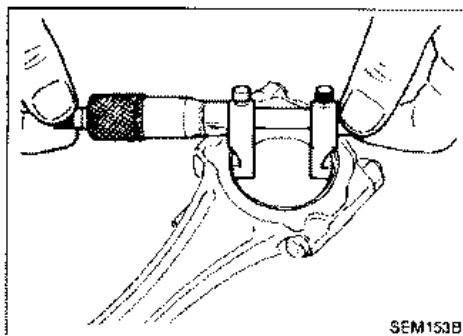
Crankshaft journal grade number: 2

Main bearing grade number = 1 + 2

= 3

CYLINDER BLOCK

Inspection (Cont'd)

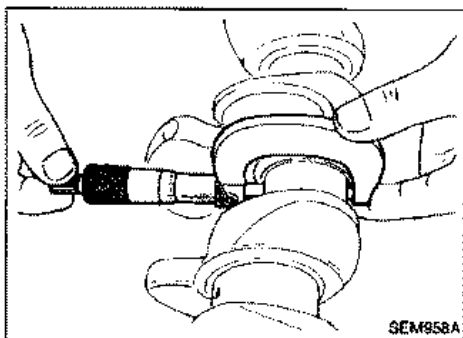


Connecting rod bearing (Big end)

1. Install connecting rod bearing to connecting rod and cap.
2. Install connecting rod cap to connecting rod.

Tighten bolts to the specified torque.

3. Measure inner diameter "C" of each bearing.



4. Measure outer diameter "Dp" of each crankshaft pin journal.

5. Calculate connecting rod bearing clearance.

Connecting rod bearing clearance (C - Dp):

Standard

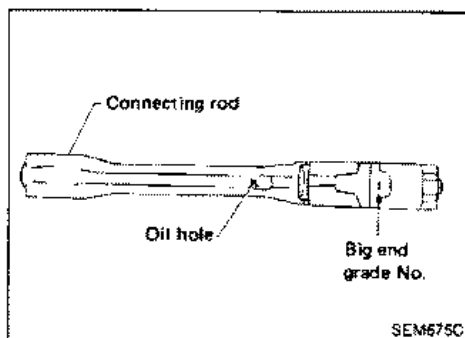
0.028 - 0.048 mm (0.0011 - 0.0019 in)

Limit

0.090 mm (0.0035 in)

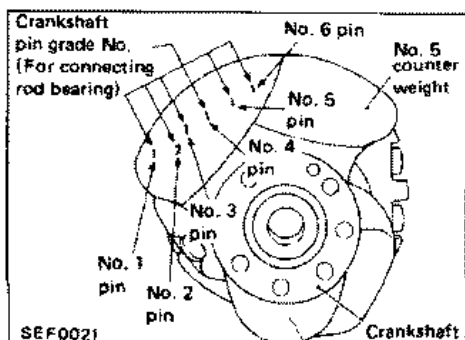
6. If it exceeds the limit, replace bearing.
7. If clearance cannot be adjusted within the standard of any bearing, grind crankshaft journal and use undersized bearing.

Refer to step 7 of "BEARING CLEARANCE — Main bearing".



8. If crankshaft, connecting rods or bearings are replaced with new ones, it is necessary to select thickness of connecting rod bearings as follows:

- a. Grade number of each connecting rod big end is punched on the respective connecting rod.



- b. Grade number of each crankshaft pin journal is punched on the No. 5 counter weight of crankshaft.

CYLINDER BLOCK

Inspection (Cont'd)

- c. Select connecting rod bearing with suitable thickness according to the following table.

Connecting rod bearing grade number:

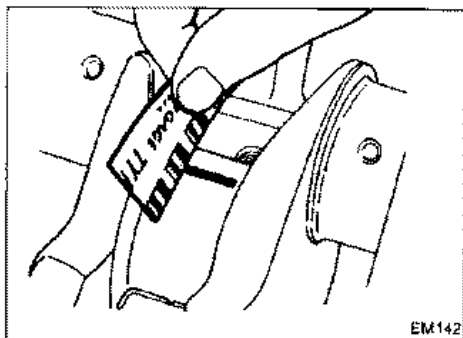
Crankshaft pin grade number \ Connecting rod big end grade number	0	1 (I)
	0	0
1 (I)	1	2
2 (II)	2	3

For example:

Connecting rod big end grade number: 1

Crankshaft pin grade number: 2

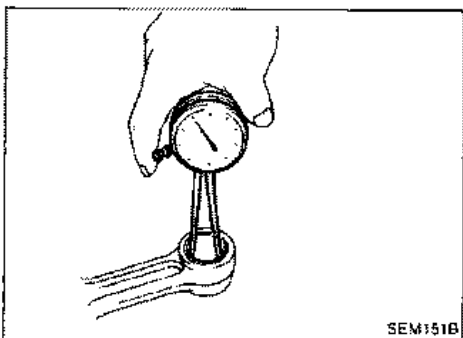
$$\begin{aligned} \text{Connecting rod bearing grade number} &= 1 + 2 \\ &= 3 \end{aligned}$$



Method B (Using "plastigage")

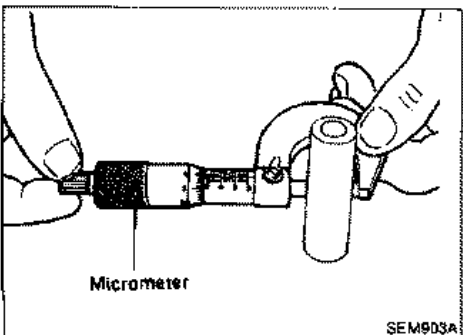
CAUTION:

- Do not turn crankshaft or connecting rod while plastigage is being inserted.
- When bearing clearance exceeds the specified limit, ensure that the proper bearing has been installed. Then if excessive bearing clearance exists, use a thicker main bearing or undersized bearing so that the specified bearing clearance is obtained.



CONNECTING ROD BUSHING CLEARANCE (Small end)

1. Measure inner diameter "C" of bushing.



2. Measure outer diameter "Dp" of piston pin.
3. Calculate connecting rod bushing clearance.

$$C - Dp = 0.005 - 0.017 \text{ mm (0.0002 - 0.0007 in)}$$

Limit: 0.023 mm (0.0009 in)

If it exceeds the specified value, replace connecting rod bushing and/or piston set with pin.

CYLINDER BLOCK

Inspection (Cont'd)

REPLACEMENT OF CONNECTING ROD BUSHING (Small end)

1. Drive in small end bushing until it is flush with end surface of rod.

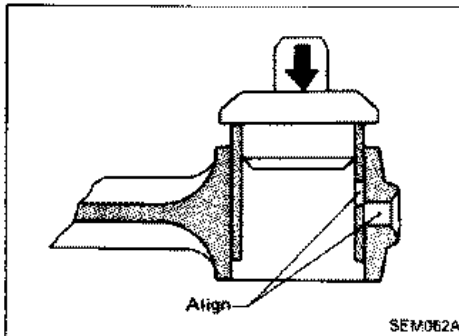
Be sure to align the oil holes.

2. After driving in small end bushing, ream the bushing.

Small end bushing inside diameter:

Finished size

22.000 - 22.012 mm (0.8661 - 0.8666 in)



FLYWHEEL/DRIVE PLATE RUNOUT

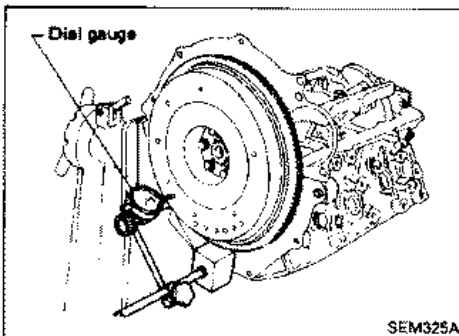
Runout (Total indicator reading):

Flywheel (M/T model)

Less than 0.15 mm (0.0059 in)

Drive plate (A/T model)

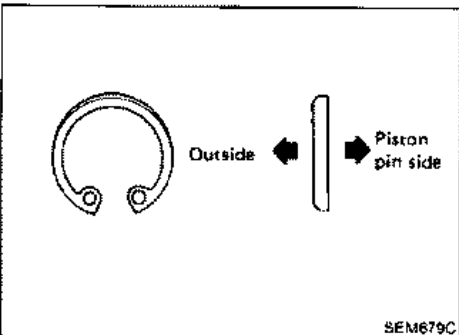
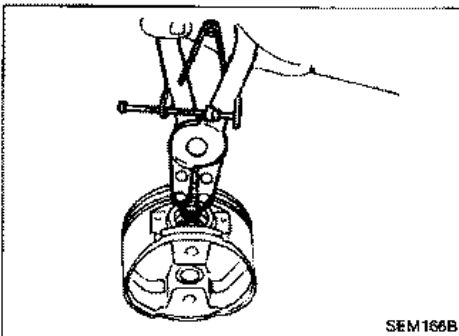
Less than 0.15 mm (0.0059 in)



Assembly

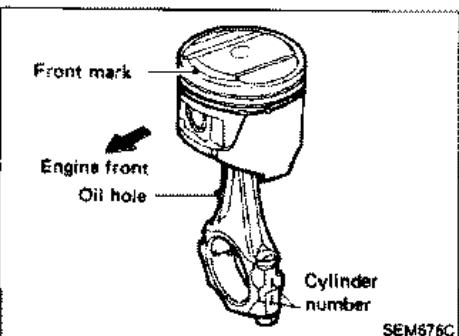
PISTON

1. Install new snap ring on one side of piston pin hole.



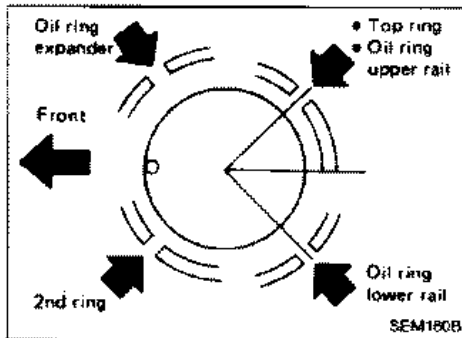
2. Heat piston to 60 to 70°C (140 to 158°F) and assemble piston, piston pin, connecting rod and new snap ring.

- **Align the direction of piston and connecting rod.**
- **Numbers stamped on connecting rod and cap correspond to each cylinder.**
- **After assembly, make sure connecting rod swings smoothly.**

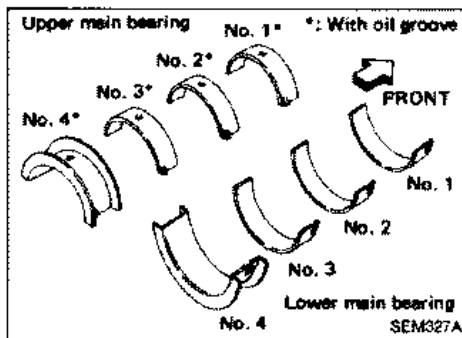
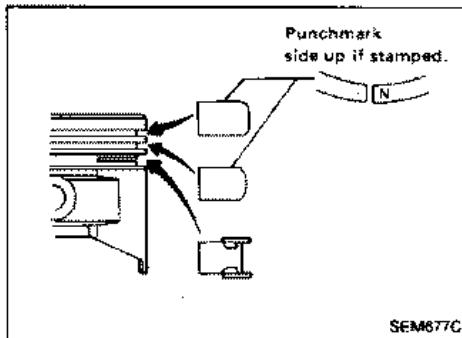


CYLINDER BLOCK

Assembly (Cont'd)



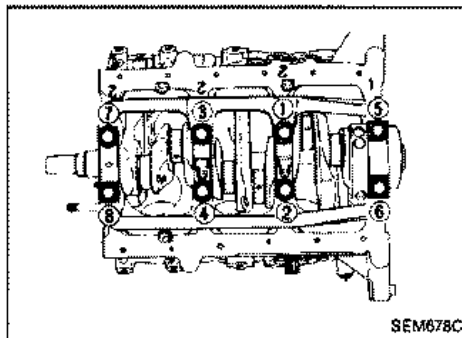
3. Set piston rings as shown.



CRANKSHAFT

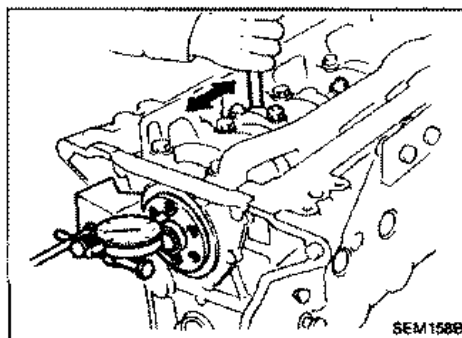
1. Set main bearings in their proper positions on cylinder block and main bearing cap.

- Confirm that correct main bearings are used. Refer to "Inspection".



2. Install crankshaft and main bearing caps and tighten bolts to the specified torque.

- Prior to tightening bearing cap bolts, place bearing cap in its proper position by shifting crankshaft in the axial direction.
- Tighten bearing cap bolts gradually in two or three stages. Start with center bearing and move outward sequentially.
- After securing bearing cap bolts, make sure crankshaft turns smoothly by hand.



3. Measure crankshaft end play.

Crankshaft end play:

Standard

0.05 - 0.18 mm (0.0020 - 0.0071 in)

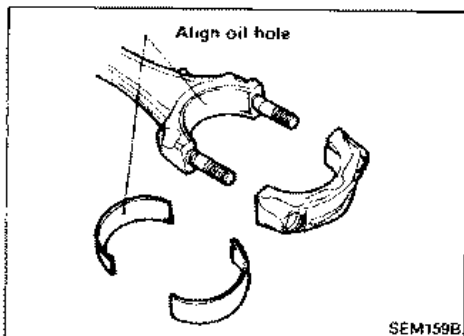
Limit

0.30 mm (0.0118 in)

If beyond the limit, replace bearing with a new one.

CYLINDER BLOCK

Assembly (Cont'd)

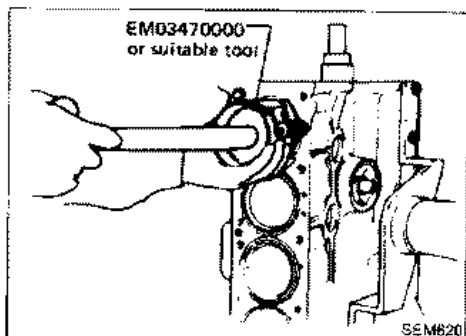


4. Install connecting rod bearings in connecting rods and connecting rod caps.

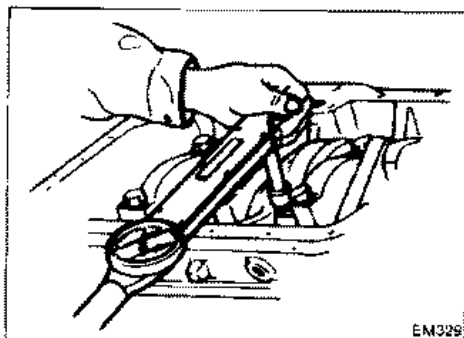
- Confirm that correct bearings are used.

Refer to "Inspection".

- Install bearings so that oil hole in connecting rod aligns with oil hole of bearing.



5. Install pistons with connecting rods.
 - a. Install them into corresponding cylinders with Tool.
 - Be careful not to scratch cylinder wall by connecting rod.
 - Arrange so that front mark on piston head faces toward front of engine.



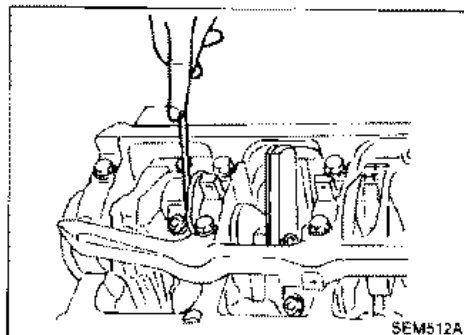
- b. Install connecting rod bearing caps. Tighten connecting rod bearingcap nuts to the specified torque.

☞: Connecting rod bearing nut

(1) Tighten to 14 to 16 N·m

(1.4 to 1.6 kg·m, 10 to 12 ft·lb).

(2) Turn nuts 60 to 65 degrees clockwise or, if an angle wrench is not available, tighten nuts to 38 to 44 N·m (3.9 to 4.5 kg·m, 28 to 33 ft·lb).



6. Measure connecting rod side clearance.

Connecting rod side clearance:

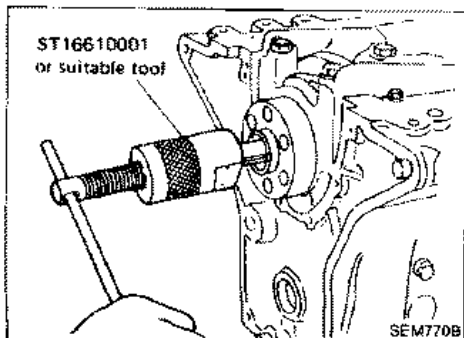
Standard

0.20 - 0.35 mm (0.0079 - 0.0138 in)

Limit

0.40 mm (0.0157 in)

If beyond the limit, replace connecting rod and/or crankshaft.



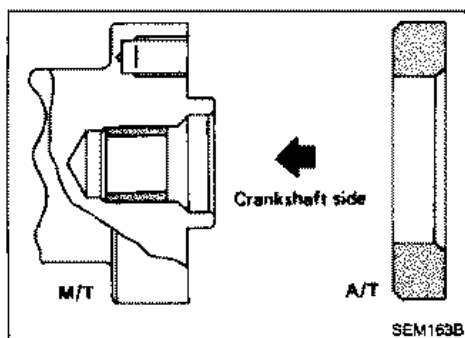
REPLACING PILOT BUSHING

1. Remove pilot bushing (M/T)/pilot converter (A/T).

CYLINDER BLOCK

Assembly (Cont'd)

2. Install pilot bushing (M/T)/pilot converter (A/T).



SERVICE DATA AND SPECIFICATIONS (S.D.S.)

General Specifications

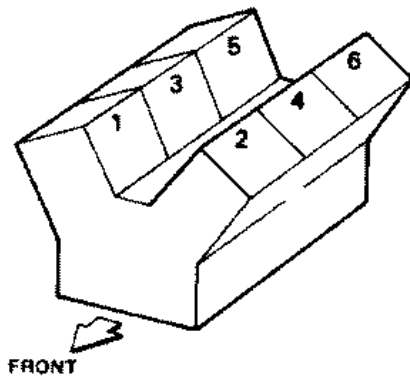
Cylinder arrangement	V-6	
Displacement	cm ³ (cu in)	2,960 (180.62)
Bore and stroke	mm (in)	87 × 83 (3.43 × 3.27)
Valve arrangement	D.O.H.C.	
Firing order	1-2-3-4-5-6	
Number of piston rings		
Compression	2	
Oil	1	
Number of main bearings	4	
Compression ratio (Non-turbo/Turbo)	10.5/8.5	

COMPRESSION PRESSURE

Unit: kPa (bar, kg/cm², psi)/300 rpm

Compression pressure		
Standard	1,285 (12.85, 13.1, 186)	
Minimum	981 (9.81, 10.0, 142)	
Differential limit between cylinders	98 (0.98, 1.0, 14)	

Cylinder number



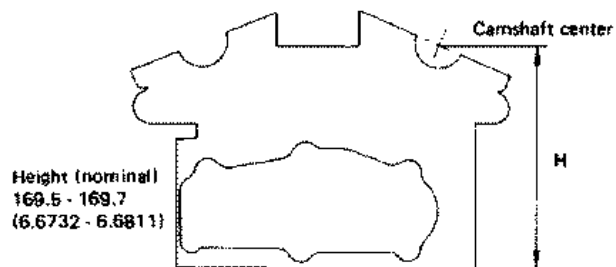
SEM713A

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Inspection and Adjustment VALVE

CYLINDER HEAD

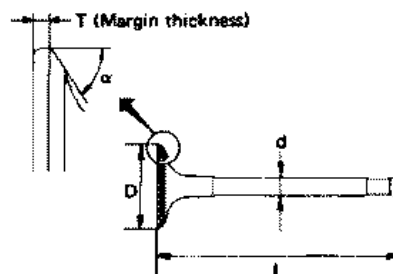
	Unit: mm (in)	
	Standard	Limit
Head surface distortion	Less than 0.05 (0.0020)	0.1 (0.004)



Height (nominal)
169.5 - 169.7
(6.6732 - 6.6811)

SEM5708

Unit: mm (in)



SEM188

Valve head diameter "D"	
Intake	34.0 - 34.2 (1.339 - 1.346)
Exhaust	29.5 - 29.7 (1.161 - 1.159)
Valve length "L"	
Intake	103.1 - 103.3 (4.059 - 4.067)
Exhaust	103.6 - 103.8 (4.079 - 4.087)
Valve stem diameter "d"	
Intake	5.965 - 5.980 (0.2348 - 0.2354)
Exhaust	5.945 - 5.960 (0.2341 - 0.2345)
Valve seat angle "α"	
Intake	45°15' - 45°45'
Exhaust	45°15' - 45°45'
Valve margin "T"	
Intake	1.15 - 1.45 (0.0453 - 0.0571)
Exhaust	1.35 - 1.65 (0.0531 - 0.0650)
Valve margin "T" limit	More than 0.5 (0.020)
Valve stem and surface grinding limit	Less than 0.2 (0.008)
Valve clearance	
Intake	0 (0)
Exhaust	0 (0)

Valve spring

Free height	mm (in)	43.1 (1.697)
Pressure	Standard	536.4 (54.7, 120.6) at 26.5 (1.043)
	Limit	452.79 (46.17, 101.80) at 28.5 (1.043)
Out-of square	mm (in)	Less than 1.8 (0.071)

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Inspection and Adjustment (Cont'd)

Hydraulic valve lifter

Unit: mm (in)

Lifter outer diameter	30.955 - 30.965 (1.2187 - 1.2191)
Lifter guide inner diameter	31.000 - 31.020 (1.2205 - 1.2213)
Clearance between lifter and lifter guide	0.035 - 0.065 (0.0014 - 0.0026)

Valve guide

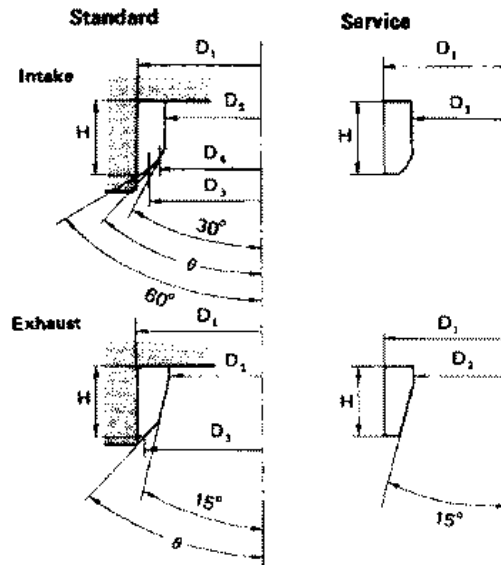
Unit: mm (in)

	Standard	Service
Valve guide		
Outer diameter	10.023 - 10.034 (0.3946 - 0.3950)	10.223 - 10.234 (0.4025 - 0.4029)
Valve guide		
Inner diameter (Finished size)	6.000 - 6.016 (0.2362 - 0.2369)	
Cylinder head valve guide hole diameter	9.975 - 9.996 (0.3927 - 0.3935)	10.175 - 10.196 (0.4006 - 0.4014)
Interference fit of valve guide	0.027 - 0.059 (0.0011 - 0.0023)	
	Standard	Max. tolerance
Stem to guide clear- ance		
Intake	0.020 - 0.053 (0.0008 - 0.0021)	0.10 (0.0039)
Exhaust	0.040 - 0.073 (0.0016 - 0.0029)	
Valve deflection limit	—	0.20 (0.0079)

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Inspection and Adjustment (Cont'd)

VALVE SEAT



SEM529C

Unit: mm (in)

		Standard	Service*
Cylinder head seal recess diameter (D ₁)	In.	36.000 - 36.016 (1.4173 - 1.4179)	36.500 - 36.516 (1.4370 - 1.4376)
	Ex.	31.500 - 31.516 (1.2402 - 1.2408)	32.000 - 32.016 (1.2596 - 1.2605)
Valve seat interference fit	In.	0.081 - 0.113 (0.0032 - 0.0044)	
	Ex.	0.054 - 0.096 (0.0025 - 0.0038)	
Valve seat outer diameter (D ₁)	In.	36.097 - 36.113 (1.4211 - 1.4218)	36.597 - 36.613 (1.4408 - 1.4415)
	Ex.	31.580 - 31.596 (1.2433 - 1.2439)	32.080 - 32.096 (1.2630 - 1.2636)
Valve seat inner diameter (D ₂)	In.	29.85 - 30.15 (1.1752 - 1.1870)	
	Ex.	24.35 - 24.65 (0.9587 - 0.9705)	
Height (H)	In.	5.9 - 6.0 (0.232 - 0.236)	5.35 - 5.45 (0.2106 - 0.2146)
	Ex.	5.9 - 6.0 (0.232 - 0.236)	5.9 - 6.0 (0.232 - 0.236)
Face angle (θ)	In.	45°	
	Ex.	45°	
Face inner diameter (D ₄)	In.	31.5 (1.240)	
Face outer diameter (D ₃)	In.	33.6 - 33.8 (1.323 - 1.331)	*: Valve seat surface must be corrected to specified value.
	Ex.	28.9 - 29.1 (1.138 - 1.146)	

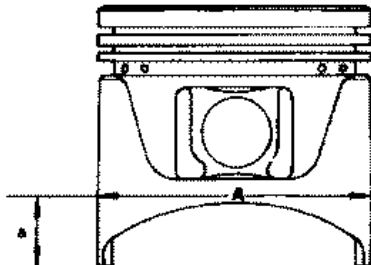
SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Inspection and Adjustment (Cont'd)

PISTON, PISTON RING AND PISTON PIN

Available piston

Unit: mm (in)



SEM891B

Piston skirt diameter "A"

Standard

Grade No. 1	86.975 - 86.985 (3.4242 - 3.4246)
Grade No. 2	86.985 - 86.995 (3.4246 - 3.4250)
Grade No. 3	86.995 - 87.005 (3.4250 - 3.4254)
0.25 (0.0098) over-size (Service)	87.225 - 87.275 (3.4340 - 3.4360)
0.50 (0.0197) over-size (Service)	87.475 - 87.525 (3.4439 - 3.4459)

"a" dimension 11.5 (0.453)

Piston pin hole diameter 21.987 - 21.999 (0.8656 - 0.8661)

Piston clearance to cylinder block

Non-turbo	0.015 - 0.036 (0.0006 - 0.0014)
Turbo	0.025 - 0.045 (0.0010 - 0.0018)

Piston ring

Unit: mm (in)

	Standard	Limit
Side clearance		
Top	0.040 - 0.073 (0.0016 - 0.0029)	0.1 (0.004)
2nd	0.030 - 0.063 (0.0012 - 0.0025)	
End gap		
Top	0.21 - 0.40 (0.0083 - 0.0157)	1.0 (0.039)
2nd	0.50 - 0.76 (0.0197 - 0.0299)	
Oil (rail ring)	0.20 - 0.76 (0.0079 - 0.0299)	

Piston pin

Unit: mm (in)

Piston pin outer diameter	21.989 - 22.001 (0.8657 - 0.8662)
Interference fit of piston pin to piston	0 - 0.004 (0 - 0.0002)
Piston pin to connecting rod bushing clearance	0.005 - 0.017 (0.0002 - 0.0007)

*Values measured at ambient temperature of 20°C (68°F)

CONNECTING ROD

Unit: mm (in)

Center distance	154.1 - 154.2 (6.067 - 6.071)
Bend [per 100 (3.94)]	
Limit	0.15 (0.0059)
Torsion [per 100 (3.94)]	
Limit	0.3 (0.012)
Piston pin bushing inner diameter*	22.000 - 22.012 (0.8661 - 0.8666)
Connecting rod big end inner diameter	53.000 - 53.013 (2.0866 - 2.0871)
Side clearance	
Standard	0.20 - 0.35 (0.0079 - 0.0138)
Limit	0.40 (0.0157)

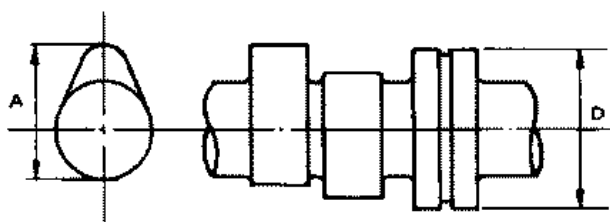
*After installing in connecting rod

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Inspection and Adjustment (Cont'd)

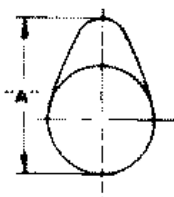
CAMSHAFT AND CAMSHAFT BEARING

Unit: mm (in)



SEM568M

	Standard	Max. tolerance
Camshaft journal to bearing clearance	0.045 - 0.086 (0.0018 - 0.0034)	0.15 (0.0059)
Inner diameter of camshaft bearing	28.000 - 28.021 (1.1024 - 1.1032)	—
Outer diameter of camshaft journal	27.935 - 27.955 (1.0998 - 1.1006)	—
Camshaft runout [T.I.R.]*	Less than 0.04 (0.0016)	0.1 (0.004)
Camshaft end play	0.03 - 0.08 (0.0012 - 0.0031)	—

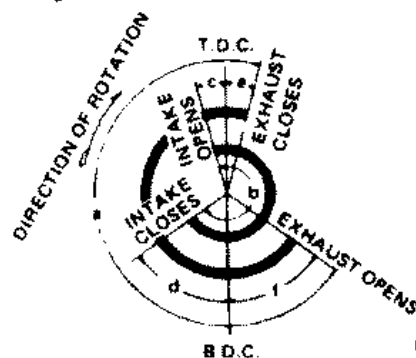


EM671

Cam height "A"	
Intake	40.405 - 40.595 (1.5907 - 1.5982)
Exhaust	
Wear limit of cam height	
	0.15 (0.0059)

*Total indicator reading

Valve timing



EM120

Unit: degree

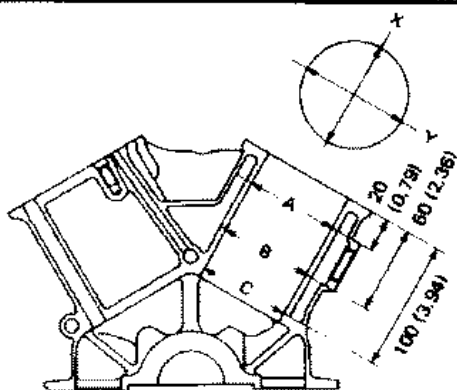
Model	a	b	c	d	e	f
VGS0DETT A/T	248	240	0	60	9	59
Others	248	248	-1	69	9	68

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Inspection and Adjustment (Cont'd)

CYLINDER BLOCK

Unit: mm (in)



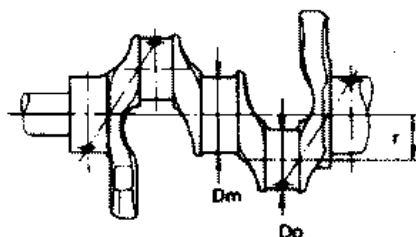
SEM321A

Surface flatness	
Standard	Less than 0.03 (0.0012)
Limit	0.10 (0.0039)
Cylinder bore	
Inner diameter	
Standard	
Grade No. 1	87.000 - 87.010 (3.4252 - 3.4256)
Grade No. 2	87.010 - 87.020 (3.4256 - 3.4260)
Grade No. 3	87.020 - 87.030 (3.4260 - 3.4264)
Wear limit	0.20 (0.0079)
Out-of-round (X - Y)	Less than 0.015 (0.0006)
Taper (A - B - C)	Less than 0.010 (0.0004)
Main journal inner diameter	
Grade No. 0	66.645 - 66.654 (2.6238 - 2.6242)
Grade No. 1	66.654 - 66.663 (2.6242 - 2.6245)
Grade No. 2	66.663 - 66.672 (2.6245 - 2.6249)
Difference in inner diameter between cylinders	
Standard	Less than 0.05 (0.0020)

CRANKSHAFT

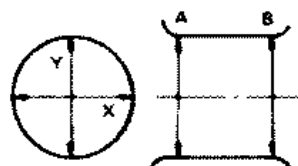
Unit: mm (in)

Main journal dia. "Dm"	
Grade No. 0	62.967 - 62.975 (2.4790 - 2.4793)
Grade No. 1	62.969 - 62.967 (2.4787 - 2.4790)
Grade No. 2	62.961 - 62.959 (2.4784 - 2.4787)
Pin journal dia. "Dp"	
Grade No. 0	49.968 - 49.974 (1.9672 - 1.9675)
Grade No. 1	49.962 - 49.968 (1.9670 - 1.9672)
Grade No. 2	49.955 - 49.962 (1.9667 - 1.9670)
Center distance "r"	41.47 - 41.53 (1.6327 - 1.6350)
Out-of-round (X - Y)	
Standard	Less than 0.005 (0.0002)
Taper (A - B)	
Standard	Less than 0.005 (0.0002)
Runout [T.I.R.]	
Standard	Less than 0.10 (0.0039)
Free end play	
Standard	0.05 - 0.16 (0.0020 - 0.0071)
Limit	0.30 (0.0118)



SEM645

Out-of-round X - Y
Taper A - B

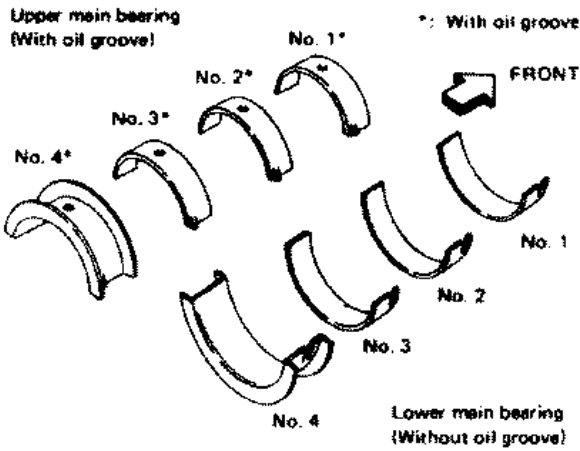


EM715

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Inspection and Adjustment (Cont'd)

AVAILABLE MAIN BEARING



SEM327A

No. 1 main bearing

Grade number	Thickness "T" mm (in)	Width "W" mm (in)	Identification color
0	1.817 - 1.821 (0.0715 - 0.0717)		Black
1	1.821 - 1.825 (0.0717 - 0.0719)		Brown
2	1.825 - 1.829 (0.0719 - 0.0720)	22.4 - 22.6 (0.882 - 0.890)	Green
3	1.829 - 1.833 (0.0720 - 0.0722)		Yellow
4	1.833 - 1.837 (0.0722 - 0.0723)		Blue

No. 2 and 3 main bearing

Grade number	Thickness "T" mm (in)	Width "W" mm (in)	Identification color
0	1.817 - 1.821 (0.0715 - 0.0717)		Black
1	1.821 - 1.825 (0.0717 - 0.0719)		Brown
2	1.825 - 1.829 (0.0719 - 0.0720)	18.9 - 19.1 (0.744 - 0.752)	Green
3	1.829 - 1.833 (0.0720 - 0.0722)		Yellow
4	1.833 - 1.837 (0.0722 - 0.0723)		Blue

No. 4 main bearing

Grade number	Thickness "T" mm (in)	Identification color
0	1.817 - 1.821 (0.0715 - 0.0717)	Black
1	1.821 - 1.825 (0.0717 - 0.0719)	Brown
2	1.825 - 1.829 (0.0719 - 0.0720)	Green
3	1.829 - 1.833 (0.0720 - 0.0722)	Yellow
4	1.833 - 1.837 (0.0722 - 0.0723)	Blue

Undersize

Unit: mm (in)

	Thickness	Main journal diameter "Dm"
0.25 (0.0098)	1.948 - 1.956 (0.0767 - 0.0770)	Grind so that bearing clearance is the specified value.

AVAILABLE CONNECTING ROD BEARING

Connecting rod bearing

Grade number	Thickness "T" mm (in)	Identification color
0	1.496 - 1.499 (0.0589 - 0.0590)	No paint
1	1.499 - 1.502 (0.0590 - 0.0591)	Brown
2	1.502 - 1.505 (0.0591 - 0.0593)	Green
3	1.505 - 1.508 (0.0593 - 0.0594)	Yellow

Undersize

Unit: mm (in)

	Thickness	Crank pin journal diameter "Dp"
0.08 (0.0031)	1.540 - 1.548 (0.0606 - 0.0609)	Grind so that bearing clearance is the specified value.
0.12 (0.0047)	1.560 - 1.568 (0.0614 - 0.0617)	
0.25 (0.0098)	1.625 - 1.633 (0.0640 - 0.0643)	

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Inspection and Adjustment (Cont'd)

TURBOCHARGER

Unit: mm (in)

Rotor shaft

Runout [T.I.R.]*	0.056 - 0.127 (0.0022 - 0.0050)
End play	0.013 - 0.096 (0.0005 - 0.0038)

*Total indicator reading

MISCELLANEOUS COMPONENTS

Unit: mm (in)

Flywheel

Runout [T.I.R.]*	Less than 0.16 (0.0059)
------------------	-------------------------

*Total indicator reading

Bearing clearance

Unit: mm (in)

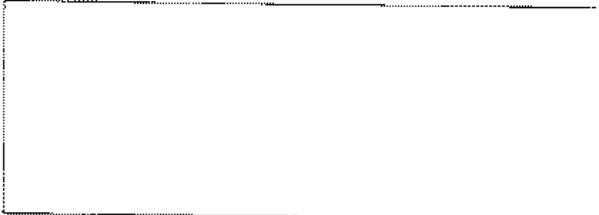
Main bearing clearance

Standard	0.028 - 0.055 (0.0011 - 0.0022)
Limit	0.090 (0.0035)

Connecting rod bearing clearance

Standard	0.028 - 0.048 (0.0011 - 0.0019)
Limit	0.090 (0.0035)

ENGINE LUBRICATION & COOLING SYSTEMS



SECTION LC



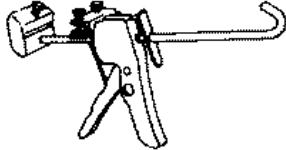
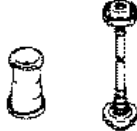
LC

CONTENTS

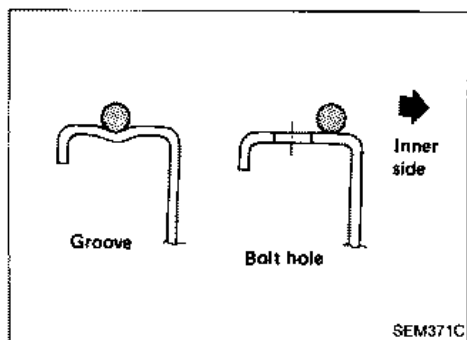
PREPARATION LC- 2
PRECAUTION LC- 3
ENGINE LUBRICATION SYSTEM LC- 4
ENGINE COOLING SYSTEM LC- 8
SERVICE DATA AND SPECIFICATIONS (S.D.S.) LC-15

PREPARATION

SPECIAL SERVICE TOOLS

Tool number Tool name	Description
ST25051001 Oil pressure gauge	 A circular oil pressure gauge with a needle, a scale, and a mounting bracket on the side.
ST25052000 Hose	Adapting oil pressure gauge to cylinder block  A circular hose with two metal fittings on opposite sides.
WS39930000 Tube presser	Pressing the tube of liquid gasket  A mechanical tool with two long handles and a central mechanism for pressing a tube.
EG17650301 Radiator cap tester adapter	Adapting radiator cap tester to radiator filler neck  Two small components: a cylindrical cap and a longer adapter with a threaded end.

PRECAUTION



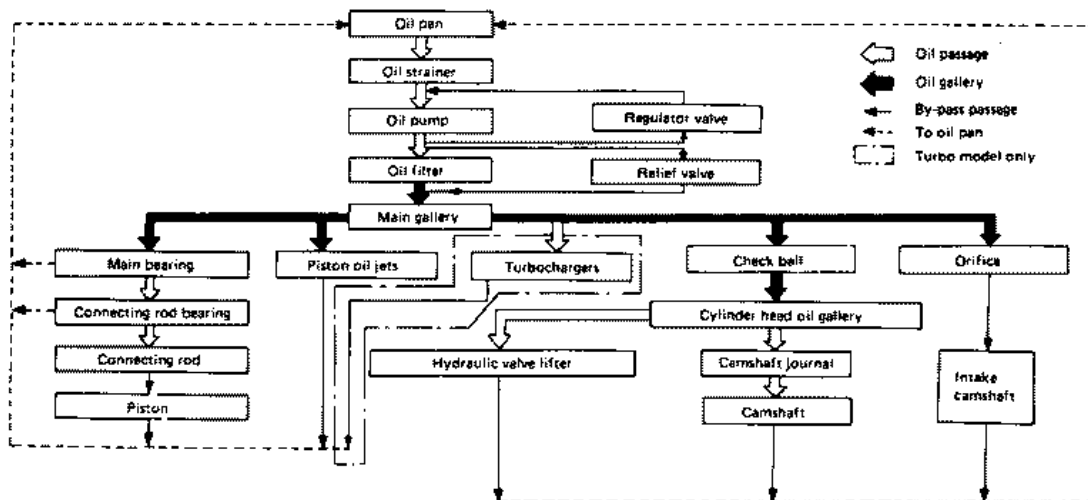
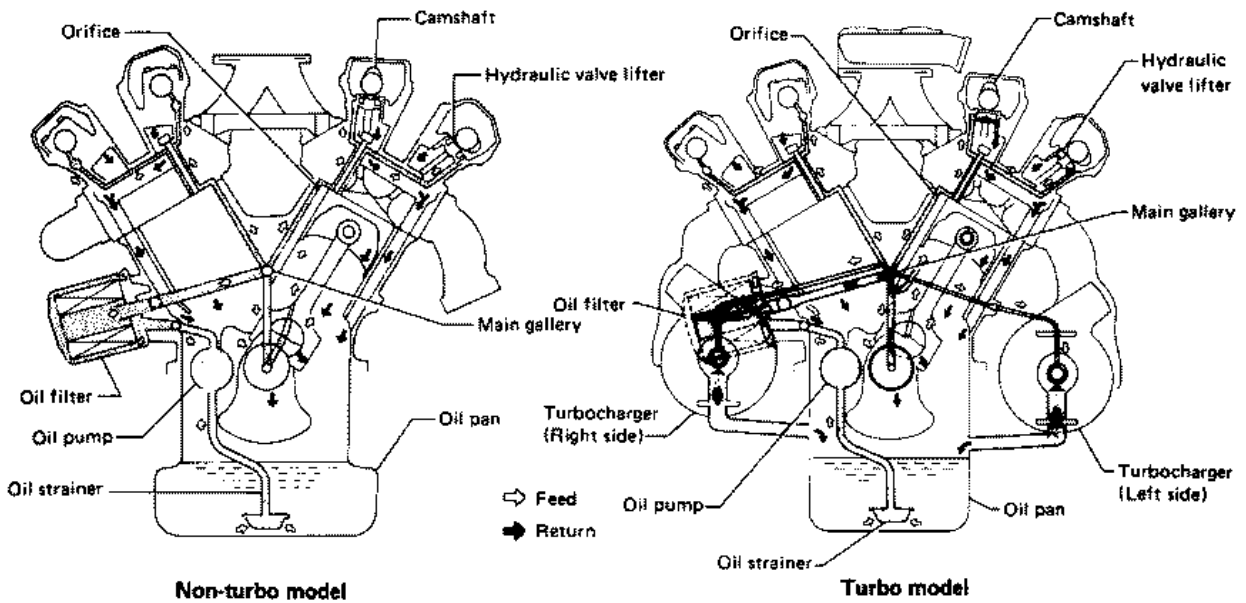
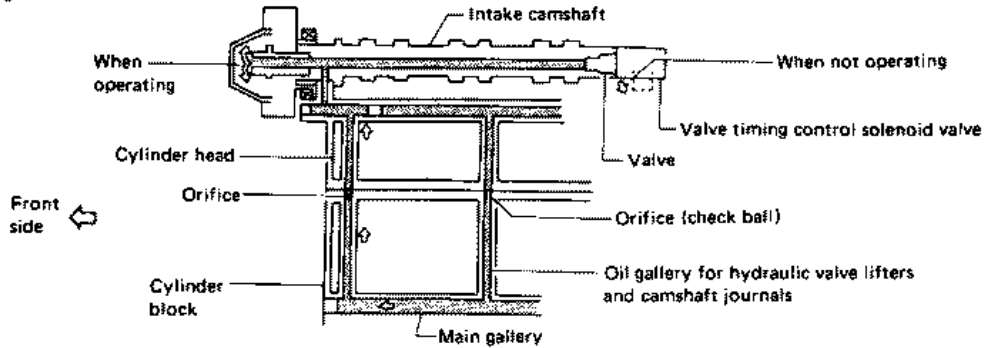
LIQUID GASKET APPLICATION PROCEDURE

- a. Before applying liquid gasket, use a scraper to remove all traces of old liquid gasket from mating surface.
- b. Apply a continuous bead of liquid gasket to mating surfaces. (Use Genuine Liquid Gasket or equivalent.)
 - Be sure liquid gasket is 3.5 to 4.5 mm (0.138 to 0.177 in) wide (for oil pan).
 - Be sure liquid gasket is 2.0 to 3.0 mm (0.079 to 0.118 in) wide (in areas except oil pan).
- c. Apply liquid gasket to inner sealing surface around hole perimeter area.
(Assembly should be done within 5 minutes after coating.)

ENGINE LUBRICATION SYSTEM

Lubrication Circuit

Valve timing control system



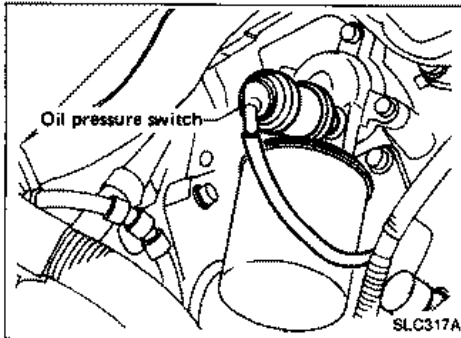
SLC342A

ENGINE LUBRICATION SYSTEM

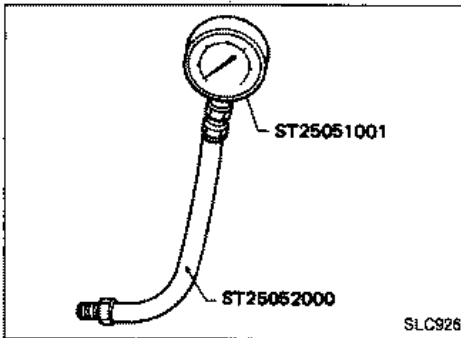
Oil Pressure Check

WARNING:

- Be careful not to burn yourself, as the engine and oil may be hot.
- Oil pressure check should be done in "Neutral" gear position.



1. Check oil level.
2. Remove oil pressure switch.

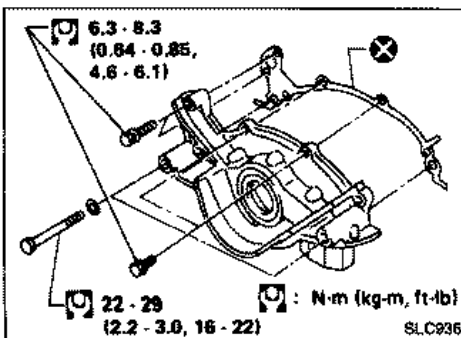


3. Install pressure gauge.
4. Start engine and warm it up to normal operating temperature.
5. Check oil pressure with engine running under no-load.

Engine rpm	Approximate discharge pressure kPa (bar, kg/cm ² , psi)
Idle speed	More than 78 (0.78, 0.8, 11)
3,000	353 - 451 (3.53 - 4.51, 3.6 - 4.6, 51 - 65)

If difference is extreme, check oil passage and oil pump for oil leaks.

6. Install oil pressure switch with sealant.



Oil Pump

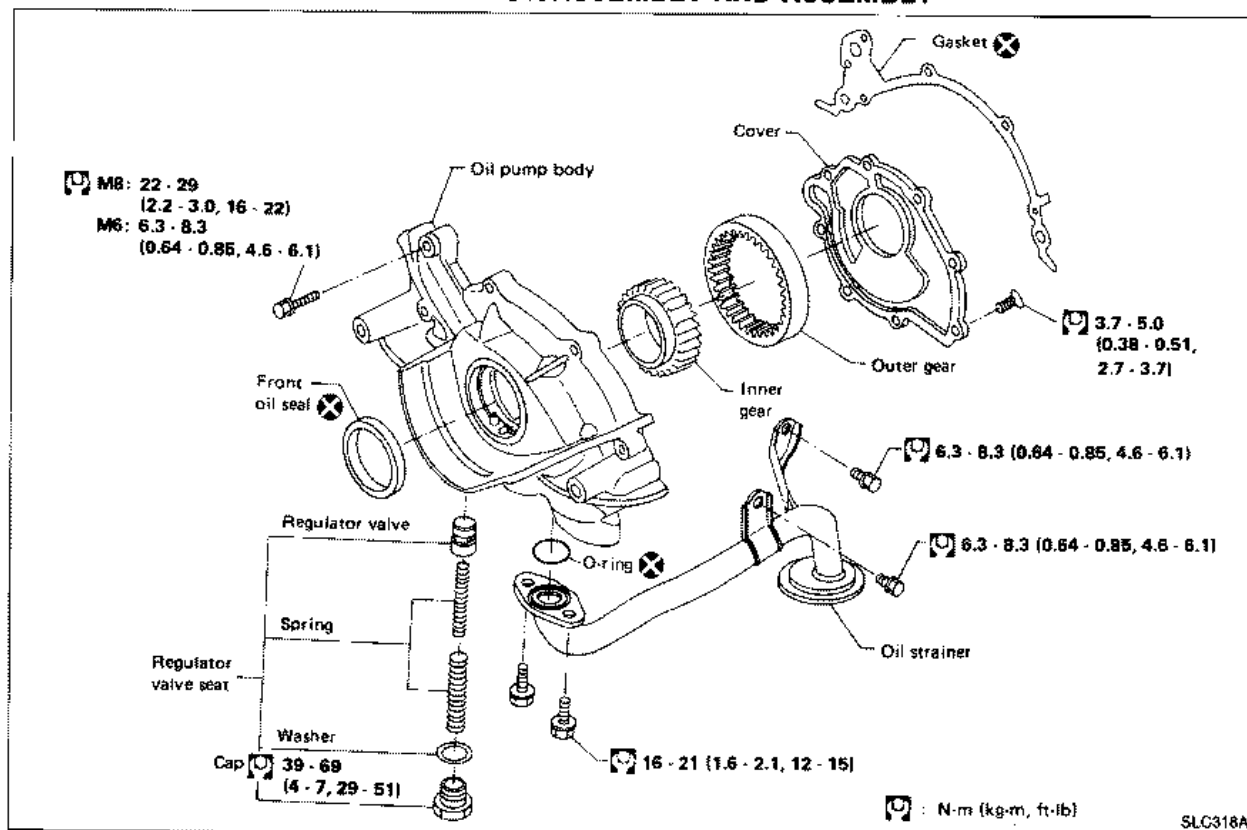
REMOVAL

1. Drain oil.
2. Remove oil pan. (Refer to "OIL PAN — Removal" in EM section.)
3. Remove oil pump assembly.

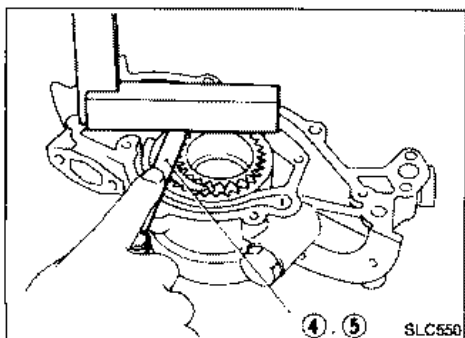
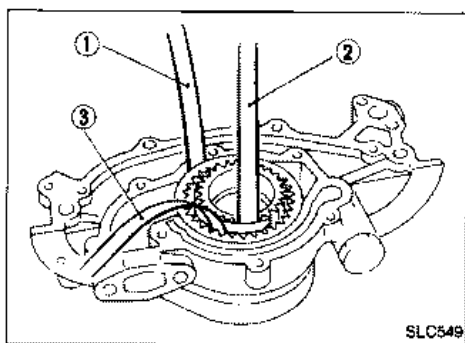
ENGINE LUBRICATION SYSTEM

Oil Pump (Cont'd)

DISASSEMBLY AND ASSEMBLY



- Always replace with new oil seal and gasket.
- When installing oil pump, apply engine oil to inner and outer gears.
- Be sure that O-ring is properly installed.



INSPECTION

Using a feeler gauge, check the following clearances:

Standard clearance:

Unit: mm (in)

Body to outer gear clearance ①	0.110 - 0.200 (0.0043 - 0.0079)
Inner gear to crescent clearance ②	0.223 - 0.333 (0.0088 - 0.0131)
Outer gear to crescent clearance ③	0.210 - 0.320 (0.0083 - 0.0126)
Housing to inner gear clearance ④	0.050 - 0.090 (0.0020 - 0.0035)
Housing to outer gear clearance ⑤	0.050 - 0.110 (0.0020 - 0.0043)

If any clearance exceeds the limit, replace gear set or entire oil pump assembly.

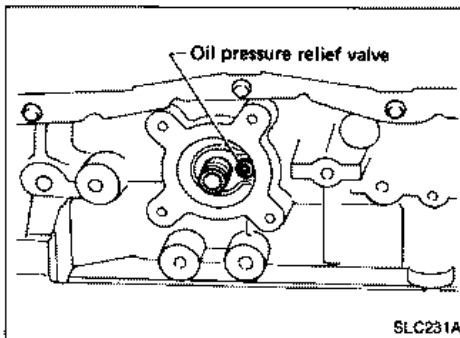
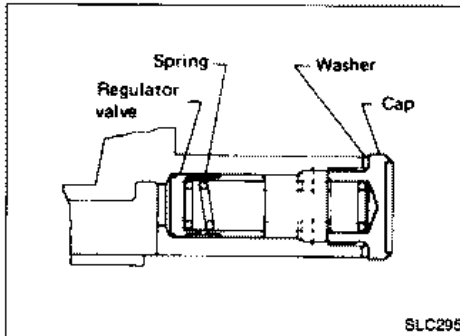
ENGINE LUBRICATION SYSTEM

Oil Pump (Cont'd)

REGULATOR VALVE INSPECTION

1. Visually inspect components for wear and damage.
2. Check oil pressure regulator valve sliding surface and valve spring.
3. Coat regulator valve with engine oil and check to make sure that it falls smoothly into the valve hole by its own weight.

If damaged, replace regulator valve set or oil pump assembly.

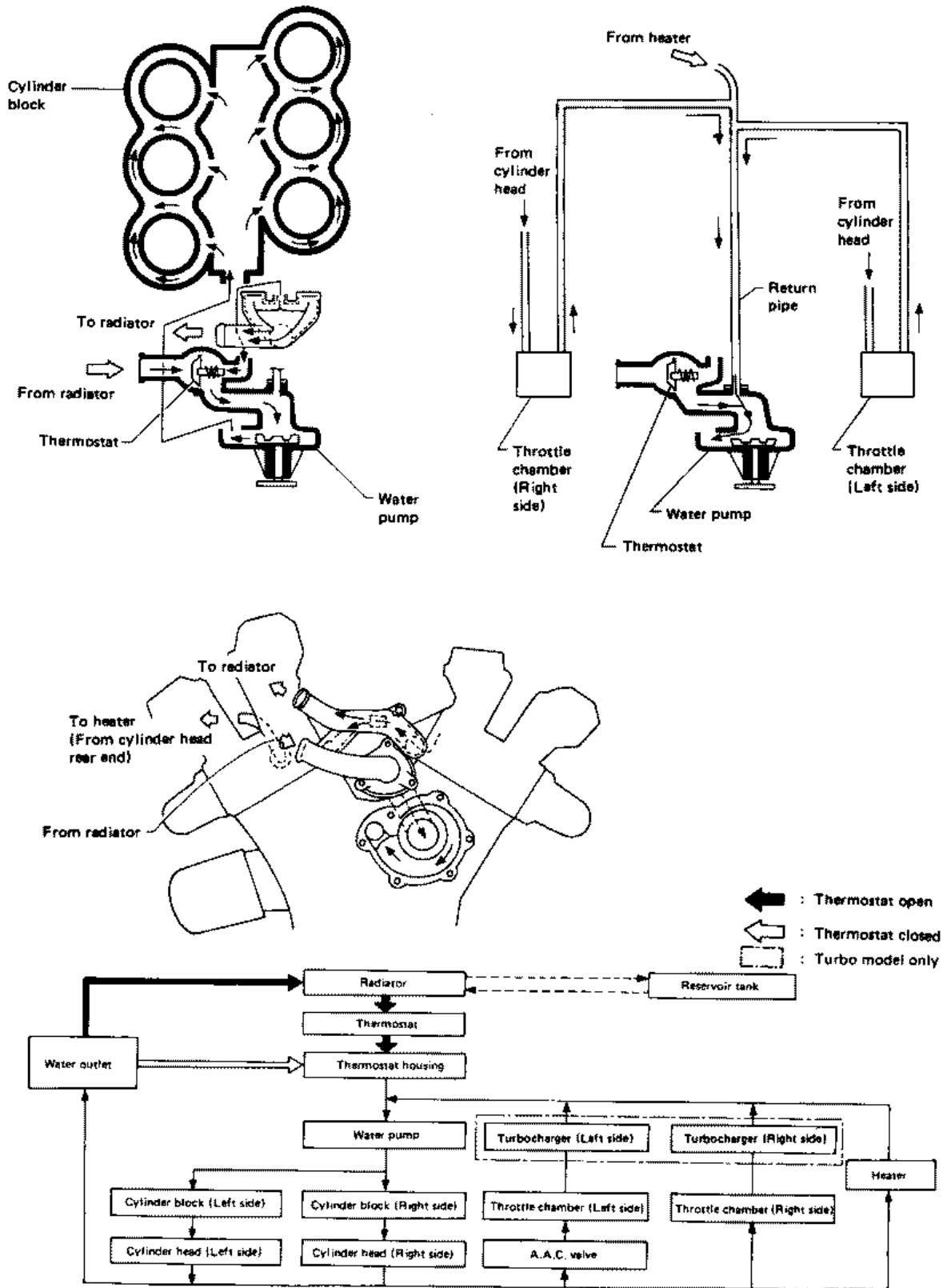


OIL PRESSURE RELIEF VALVE INSPECTION

Inspect oil pressure relief valve for movement, cracks and breaks by pushing the ball. If replacement is necessary, remove valve by prying it out with a suitable tool. Install a new valve by tapping it in place.

ENGINE COOLING SYSTEM

Cooling Circuit



SLC343A

ENGINE COOLING SYSTEM

System Check

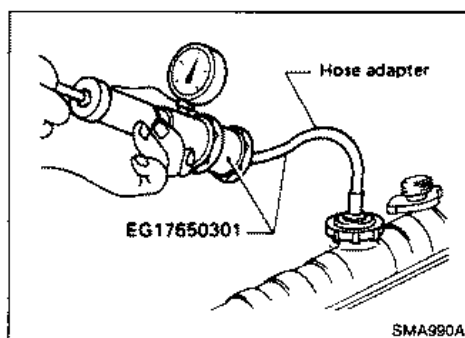
WARNING:

Never remove the radiator cap when the engine is hot; serious burns could be caused by high pressure fluid escaping from the radiator.

Wrap a thick cloth around the cap and carefully remove by turning it a quarter turn to allow built-up pressure to escape. Then continue to turn the cap until it can be removed safely.

CHECKING COOLING SYSTEM HOSES

Check hoses for improper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.



CHECKING COOLING SYSTEM FOR LEAKS

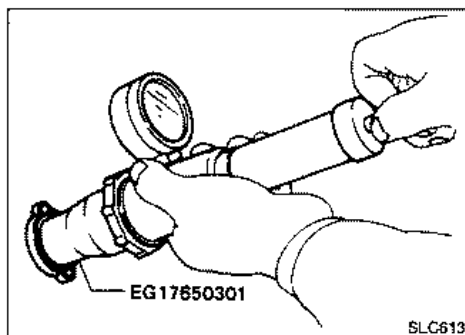
To check for leakage, apply pressure to the cooling system with a tester.

Testing pressure:

98 kPa (0.98 bar, 1.0 kg/cm², 14 psi)

CAUTION:

Higher than the specified pressure may cause radiator damage.



CHECKING RADIATOR CAP

To check radiator cap, apply pressure to cap with a tester.

Radiator cap relief pressure:

78 - 98 kPa (0.78 - 0.98 bar, 0.8 - 1.0 kg/cm²,

11 - 14 psi)

Water Pump

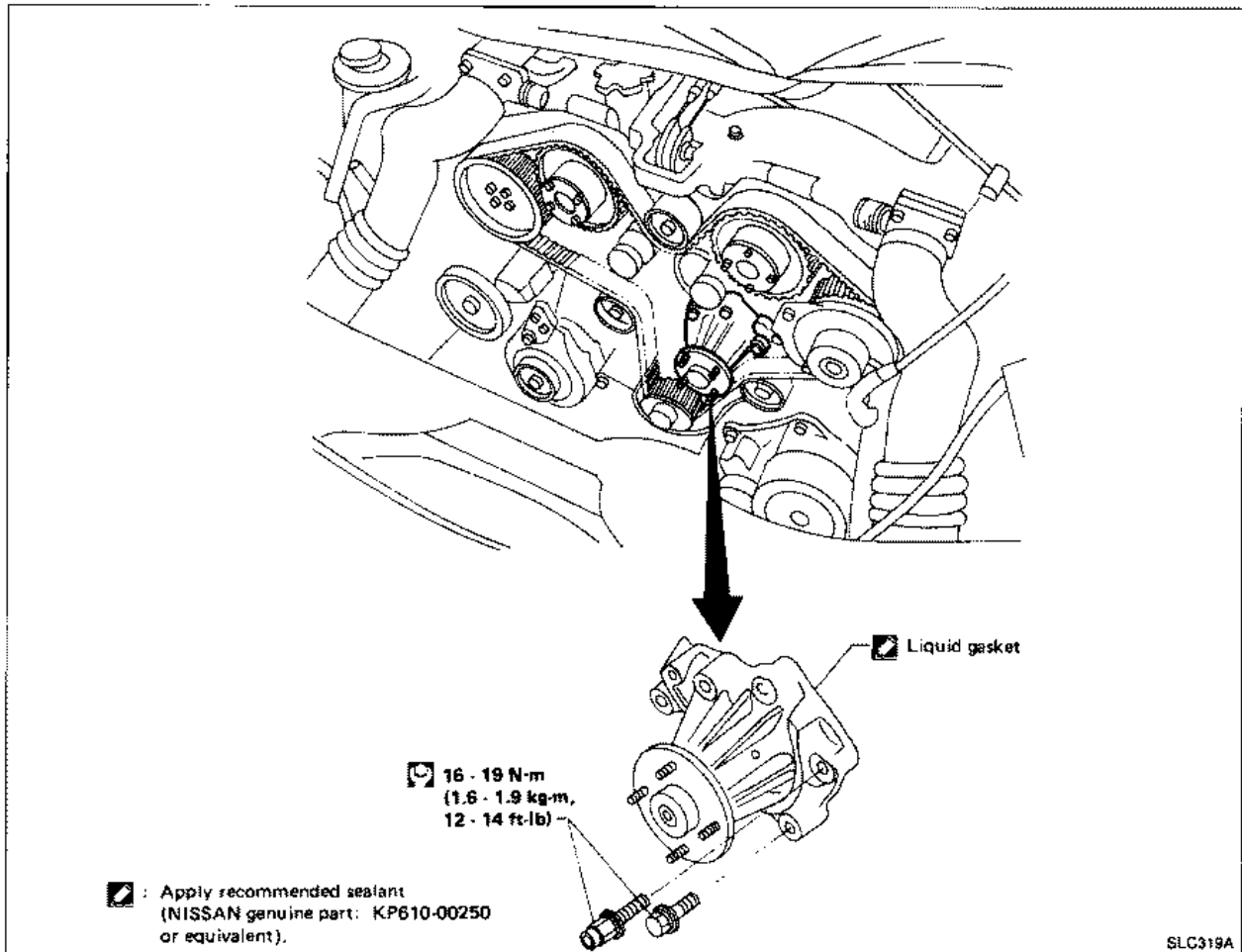
REMOVAL AND INSTALLATION

1. Drain coolant from drain cocks on both sides of cylinder block and radiator.
2. Remove the following parts:
 - Under cover
 - Radiator
 - Drive belts
 - Cooling fan and coupling
 - Water inlet and outlet

ENGINE COOLING SYSTEM

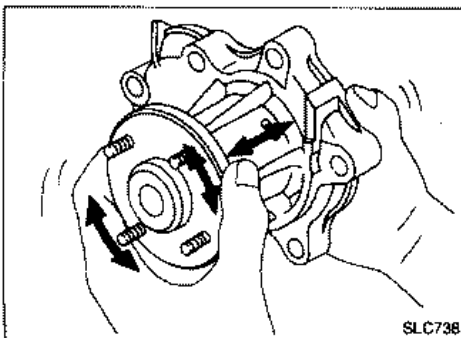
Water Pump (Cont'd)

- Crank pulley
- Timing belt cover
- 3. Remove water pump.
- 4. After repairing or replacing water pump, install any parts removed in reverse order of removal.



CAUTION:

- When removing water pump assembly, be careful not to get coolant on timing belt.
- Water pump cannot be disassembled and should be replaced as a unit.
- After installing water pump, connect hose and clamp securely, then check for leaks using radiator cap tester.



INSPECTION

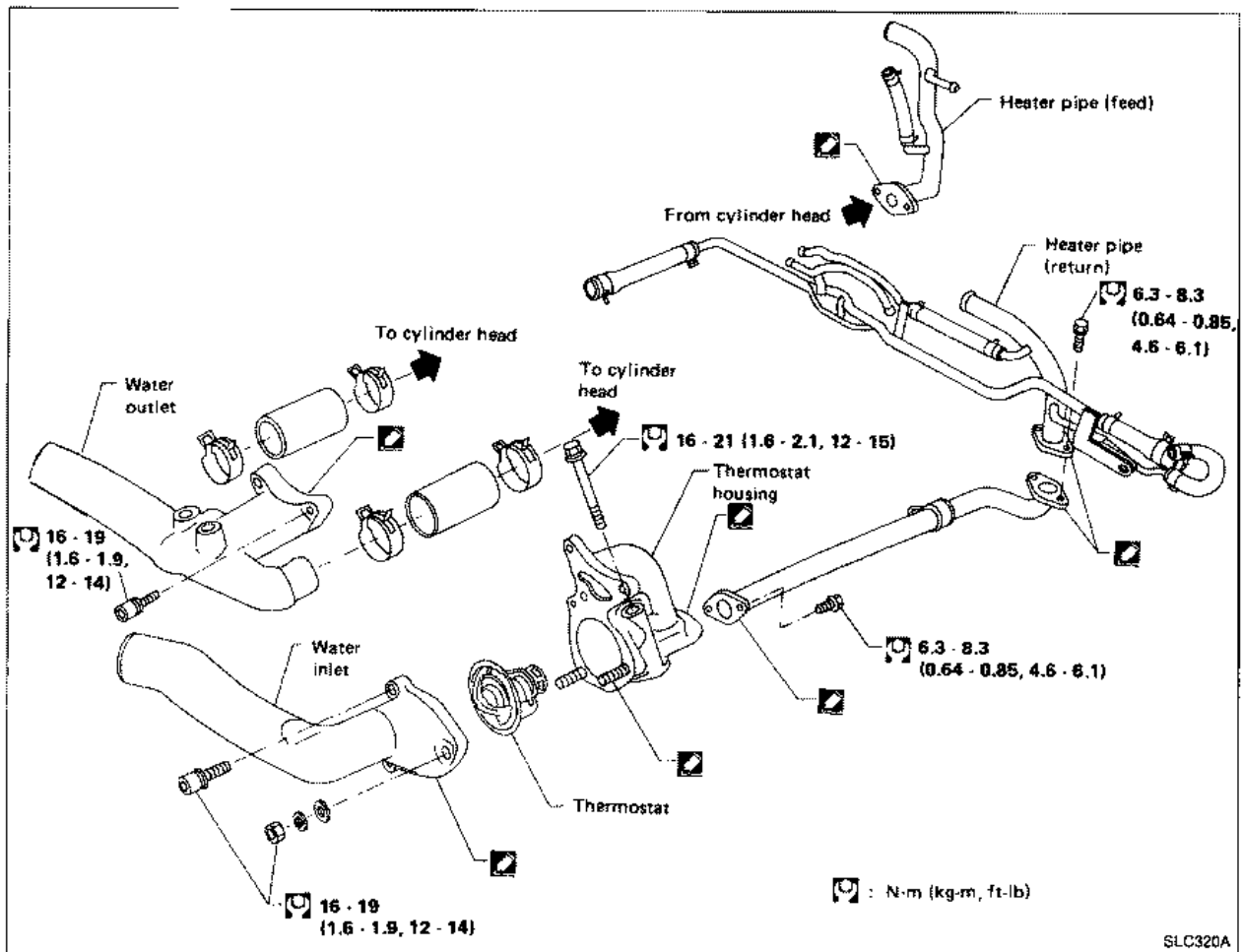
1. Check for badly rusted or corroded vanes and body assembly.
2. Check for rough operation due to excessive end play.

ENGINE COOLING SYSTEM

Thermostat

REMOVAL AND INSTALLATION

1. Drain coolant from drain cocks on both sides of cylinder block and radiator.
2. Remove the following parts:
 - Under cover
 - Radiator upper hose
 - Radiator shroud
 - Fan belt
 - Cooling fan and coupling
 - Water inlet
3. Remove thermostat.



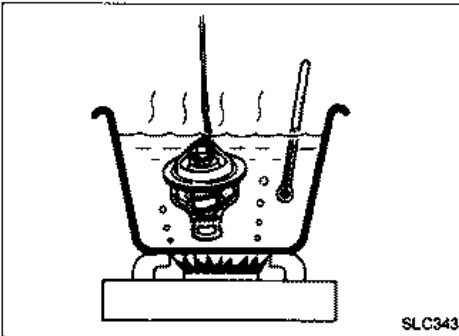
4. After repairing or replacing thermostat, install thermostat with jiggle valve facing upward.

ENGINE COOLING SYSTEM

Thermostat (Cont'd)

INSPECTION

1. Check valve seating condition at ordinary room temperatures. It should seat tightly.



2. Check valve opening temperature and maximum valve lift.

		Standard
Valve opening temperature	°C (°F)	76.5 (170)
Maximum valve lift	mm/°C (in/°F)	10/90 (0.39/194)

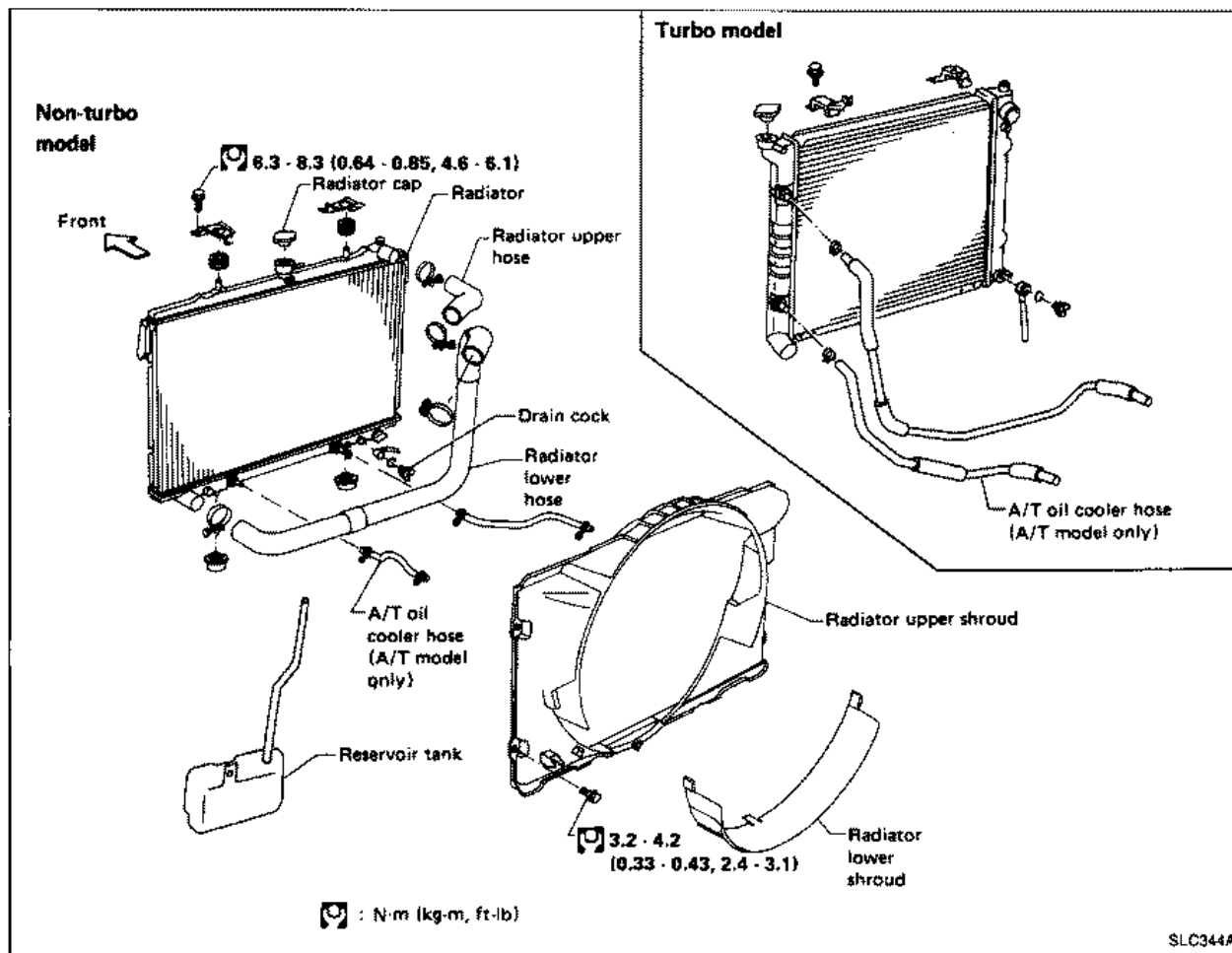
3. Then check if valve is 5°C (9°F) below valve opening temperature.
 - After installation, run engine for a few minutes, and check for leaks.
 - Be careful not to spill coolant over engine compartment. Use a rag to absorb coolant.

ENGINE COOLING SYSTEM

Radiator

REMOVAL AND INSTALLATION

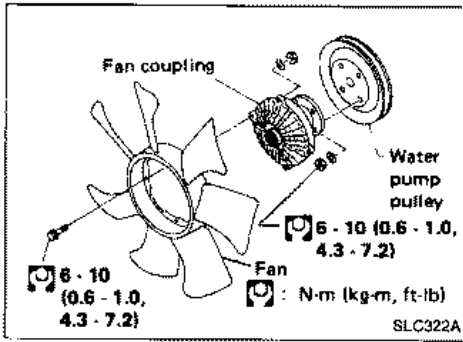
1. Drain coolant from radiator drain cock.
2. Remove under cover.
3. Disconnect radiator upper and lower hoses.
4. Remove A/T oil cooler hoses. (A/T model only)
5. Remove radiator lower shroud.
6. Remove radiator.
7. After repairing or replacing radiator, install any part removed in reverse order of removal.



Electric Cooling Fan Control System

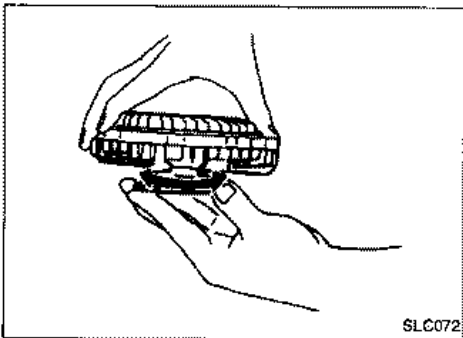
Radiator (Condenser) fan is controlled by E.C.C.S. control unit. For details, refer to EF & EC section.

ENGINE COOLING SYSTEM



Cooling Fan

DISASSEMBLY AND ASSEMBLY



INSPECTION

Check fan coupling for rough operation, oil leakage or bent bimetal.

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Engine Lubrication System

Oil pressure check

Engine rpm	Approximate discharge pressure kPa (bar, kg/cm ² , psi)
Idle speed	More than 78 (0.78, 0.8, 11)
3,000	353 - 451 (3.53 - 4.51, 3.6 - 4.6, 51 - 65)

Oil pump

	Unit: mm (in)
Body to outer gear clearance ①	0.110 - 0.200 (0.0043 - 0.0079)
Inner gear to crescent clearance ②	0.223 - 0.333 (0.0088 - 0.0131)
Outer gear to crescent clearance ③	0.210 - 0.320 (0.0083 - 0.0126)
Housing to inner gear side clearance ④	0.050 - 0.090 (0.0020 - 0.0035)
Housing to outer gear side clearance ⑤	0.050 - 0.110 (0.0020 - 0.0043)

Engine Cooling System

Thermostat

	Standard
Valve opening temperature °C (°F)	76.5 (170)
Maximum valve lift mm/°C (in/°F)	10/90 (0.39/194)

ENGINE FUEL & EMISSION CONTROL SYSTEM

SECTION **EF & EC**

CONTENTS

EF & EC

PREPARATION	EF & EC- 2
PRECAUTIONS	EF & EC- 3
ENGINE AND EMISSION CONTROL OVERALL SYSTEM	EF & EC- 4
ENGINE AND EMISSION CONTROL PARTS DESCRIPTION	EF & EC- 14
ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION	EF & EC- 21
IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION	EF & EC- 37
TROUBLE DIAGNOSES	EF & EC- 42
FUEL INJECTION CONTROL SYSTEM INSPECTION	EF & EC-185
EVAPORATIVE EMISSION CONTROL SYSTEM	EF & EC-187
CRANKCASE EMISSION CONTROL SYSTEM	EF & EC-189
SERVICE DATA AND SPECIFICATIONS (S.D.S.)	EF & EC-190

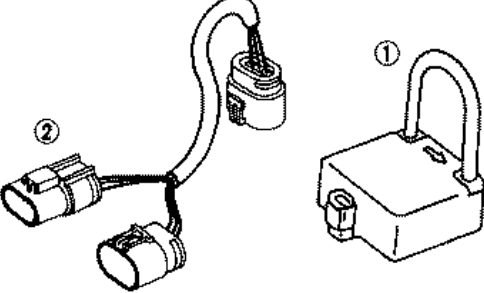
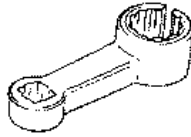
For assistance with wiring diagrams:

- Read G1 section, "HOW TO READ WIRING DIAGRAMS".
- See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.

When you perform trouble diagnoses, read G1 section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES".

PREPARATION

SPECIAL SERVICE TOOLS

Tool number Tool name	Description
① KV109D0010 Ignition timing adapter coil ② KV10114200 Adapter harness	 The diagram shows two components. On the left, labeled with a circled '2', is an adapter harness consisting of a black cable with a multi-pin connector on one end and a cylindrical coil on the other. On the right, labeled with a circled '1', is an ignition timing adapter coil, which is a rectangular metal box with a handle on top and a cylindrical protrusion on the side. <p>Measuring ignition timing</p>
KV10114400 Exhaust gas sensor wrench	 The diagram shows a specialized wrench for an exhaust gas sensor. It has a long, thin handle and a circular head with a central opening and a textured inner surface for gripping the sensor. <p>Loosening or tightening exhaust gas sensor</p>

PRECAUTIONS

BATTERY

- Always use a 12 volt battery as power source.
- Do not attempt to disconnect battery cables while engine is running.

INJECTOR

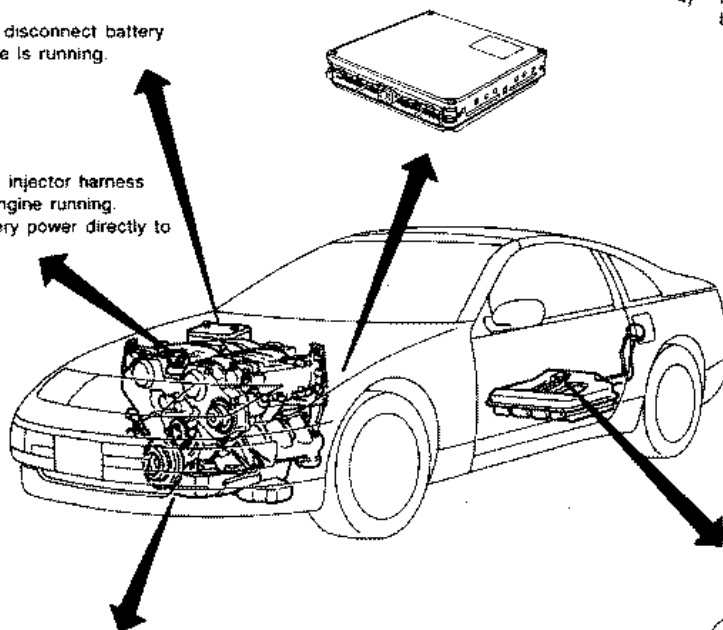
- Do not disconnect injector harness connectors with engine running.
- Do not apply battery power directly to injectors.

E.C.C.S. PARTS HANDLING

- Handle air flow meter carefully to avoid damage.
- Do not disassemble air flow meter.
- Do not clean air flow meter with any type of detergent.
- Do not disassemble auxiliary air control valve.
- Even a slight leak in the air intake system can cause serious problems.
- Do not shock or jar the crank angle sensor.

E.C.U.

- Do not disassemble E.C.C.S. control unit (E.C.U.).
- Do not turn diagnosis mode selector forcibly.
- If a battery terminal is disconnected, the memory will return to the ROM value. The E.C.C.S. will now start to self-control at its initial value. Engine operation can vary slightly when the terminal is disconnected. However, this is not an indication of a problem. Do not replace parts because of a slight variation.

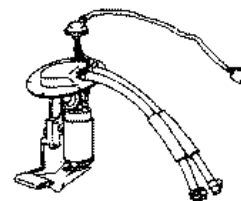
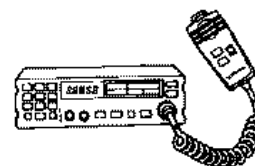


WHEN STARTING

- Do not depress accelerator pedal when starting.
- Immediately after starting, do not rev up engine unnecessarily.
- Do not rev up engine just prior to shutdown.

WIRELESS EQUIPMENT

- When installing G.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on its installation location.
 - 1) Keep the antenna as far as possible from the electronic control units.
 - 2) Keep the antenna feeder line more than 20 cm (7.9 in) away from the harness of electronic controls. Do not let them run parallel for a long distance.
 - 3) Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.
 - 4) Be sure to ground the radio to vehicle body.



FUEL PUMP

- Do not operate fuel pump when there is no fuel in lines.
- Tighten fuel hose clamps to the specified torque.

E.C.C.S. HARNESS HANDLING

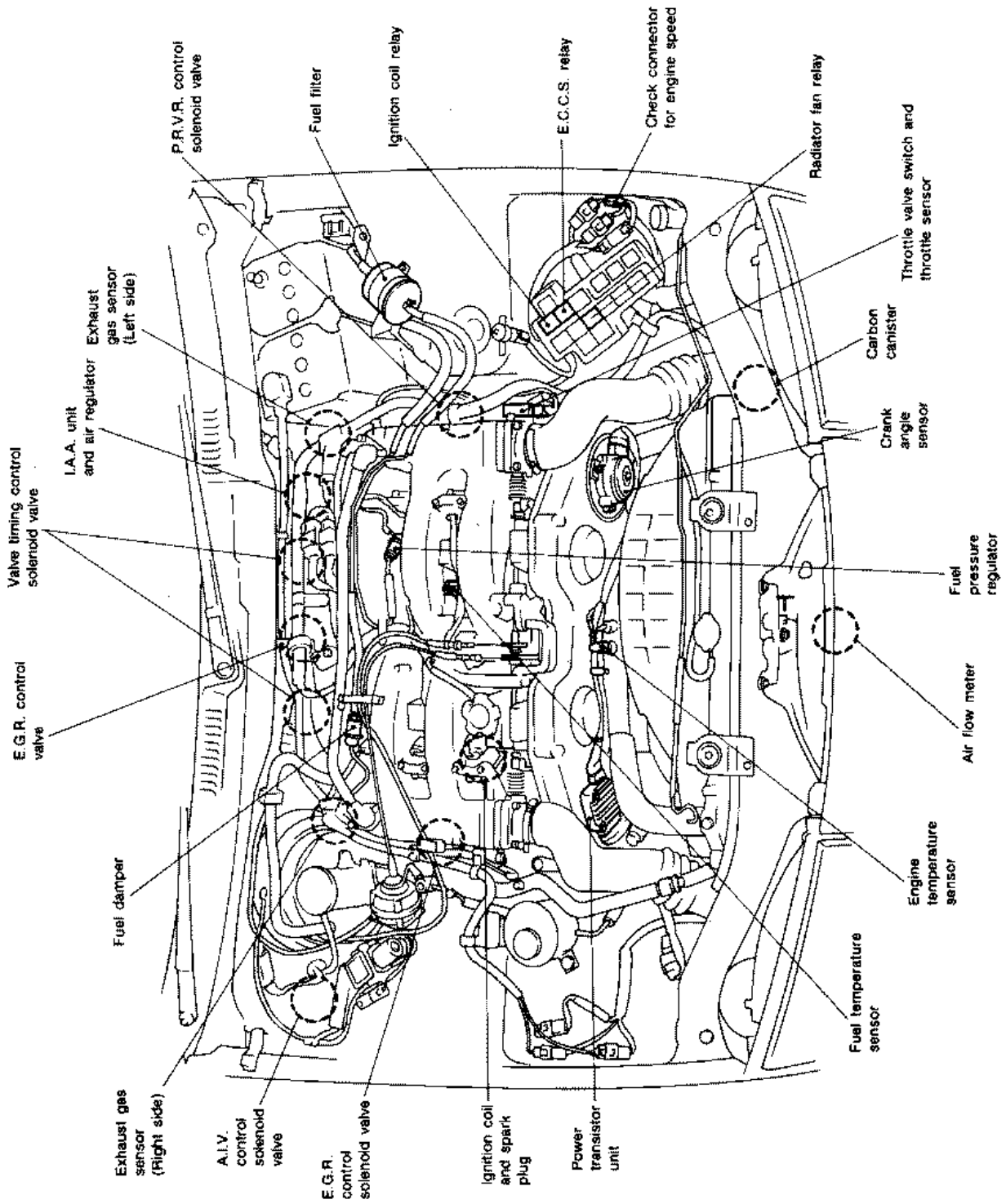
- Securely connect E.C.C.S. harness connectors.
A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- Keep E.C.C.S. harness at least 10 cm (3.9 in) away from adjacent harnesses, to prevent an E.C.C.S. system malfunction due to receiving external noise, degraded operation of ICs, etc.
- Keep E.C.C.S. parts and harnesses dry.
- Before removing parts, turn off ignition switch and then disconnect battery ground cable.

SEF3231

ENGINE AND EMISSION CONTROL OVERALL SYSTEM

E.C.C.S. Component Parts Location

NON-TURBO MODEL

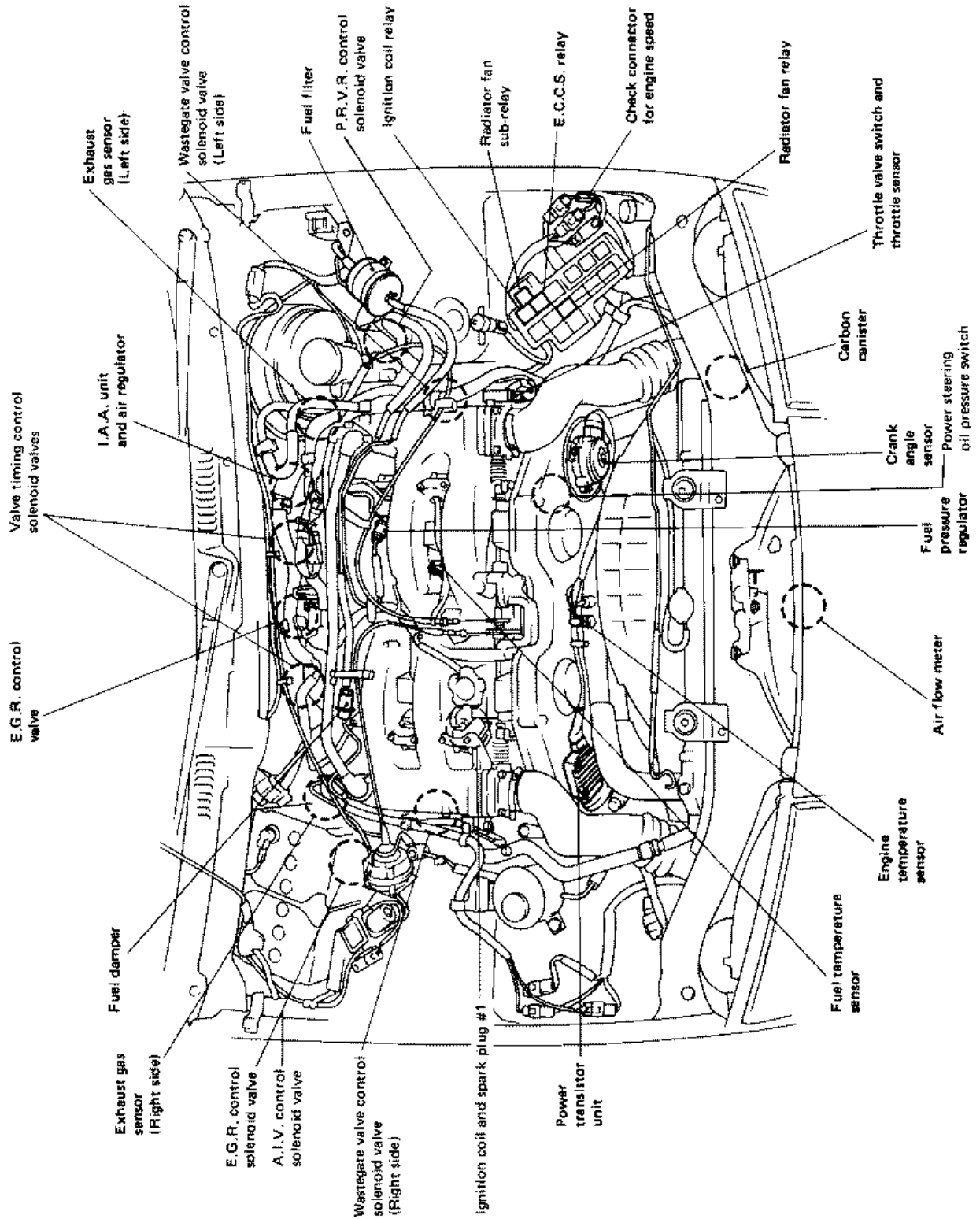


SEF986J

ENGINE AND EMISSION CONTROL OVERALL SYSTEM

E.C.C.S. Component Parts Location (Cont'd)

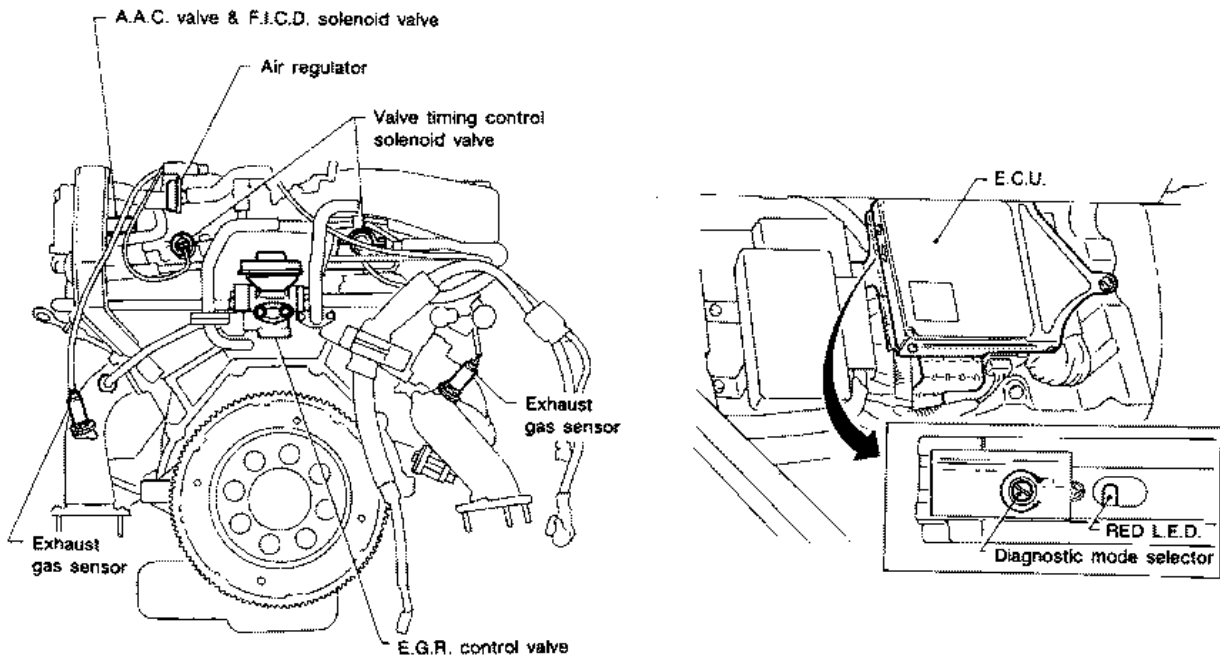
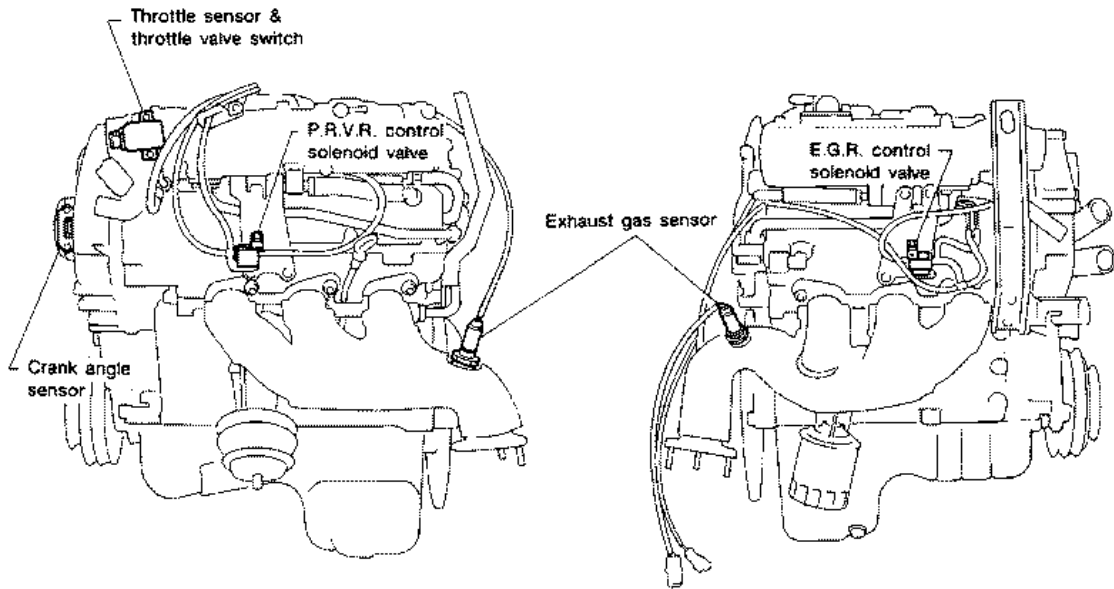
TURBO MODEL



ENGINE AND EMISSION CONTROL OVERALL SYSTEM

E.C.C.S. Component Parts Location (Cont'd)

NON-TURBO MODEL

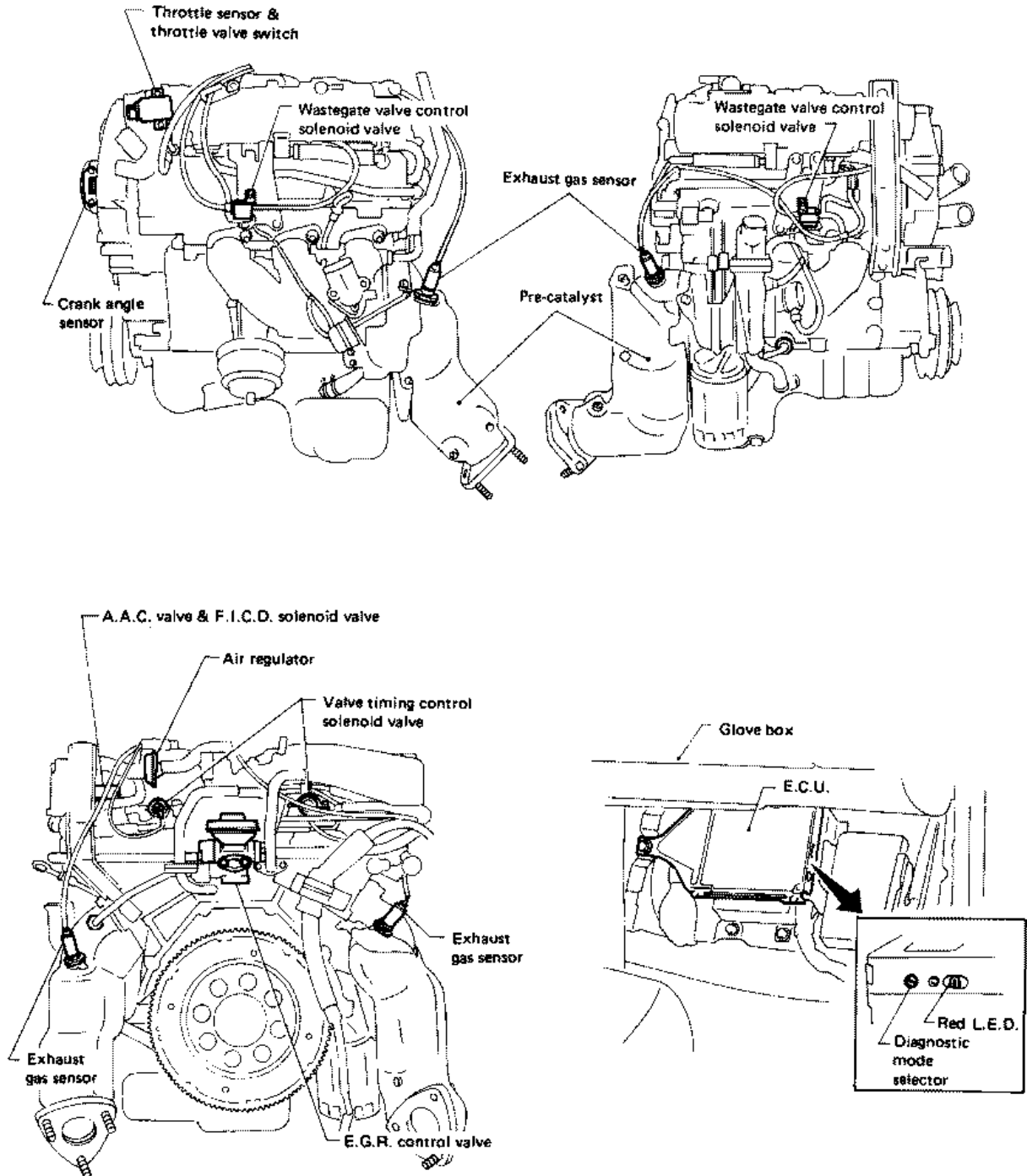


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ENGINE AND EMISSION CONTROL OVERALL SYSTEM

E.C.C.S. Component Parts Location (Cont'd)

TURBO MODEL

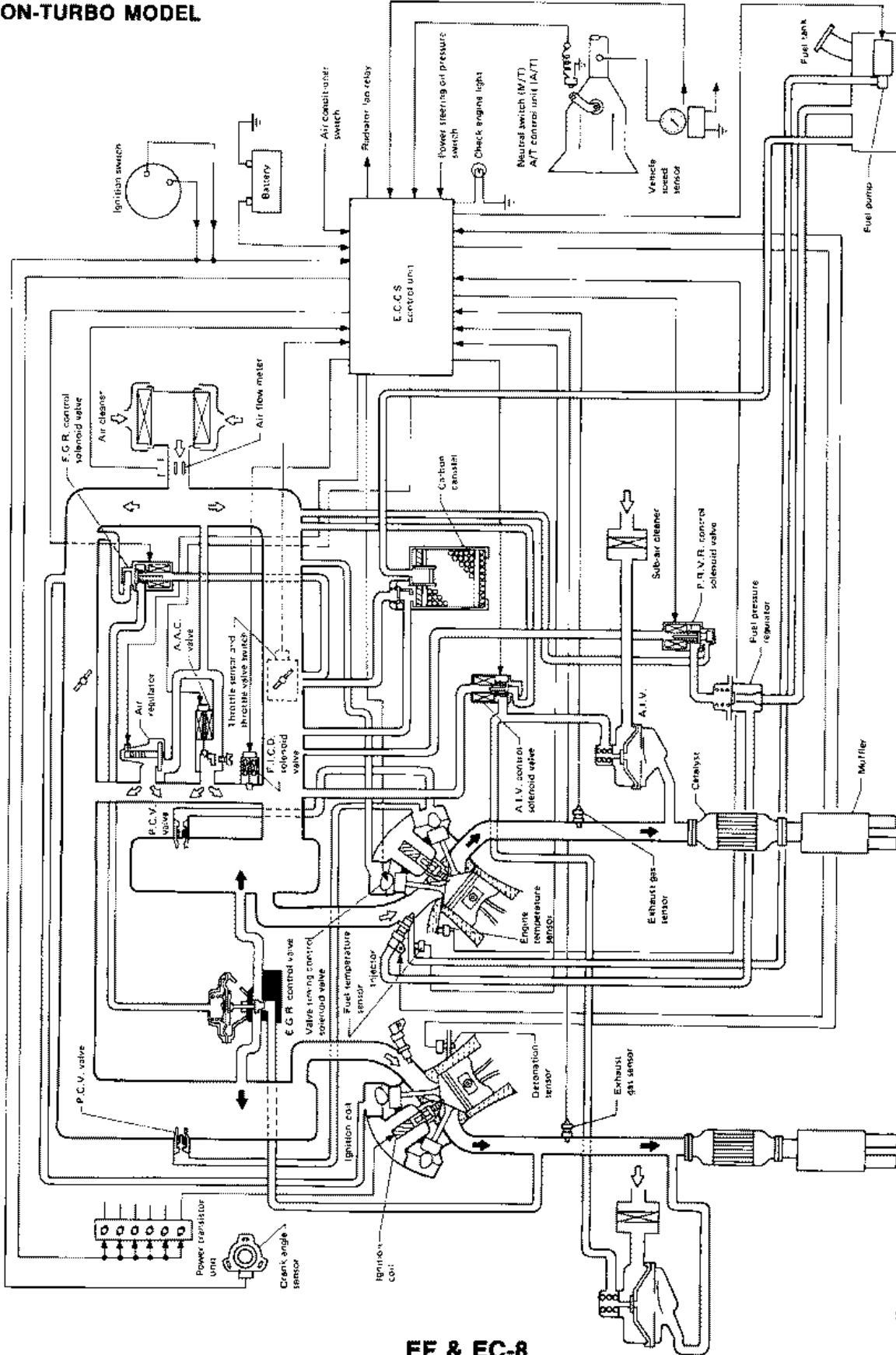


SEF447K

ENGINE AND EMISSION CONTROL OVERALL SYSTEM

System Diagram

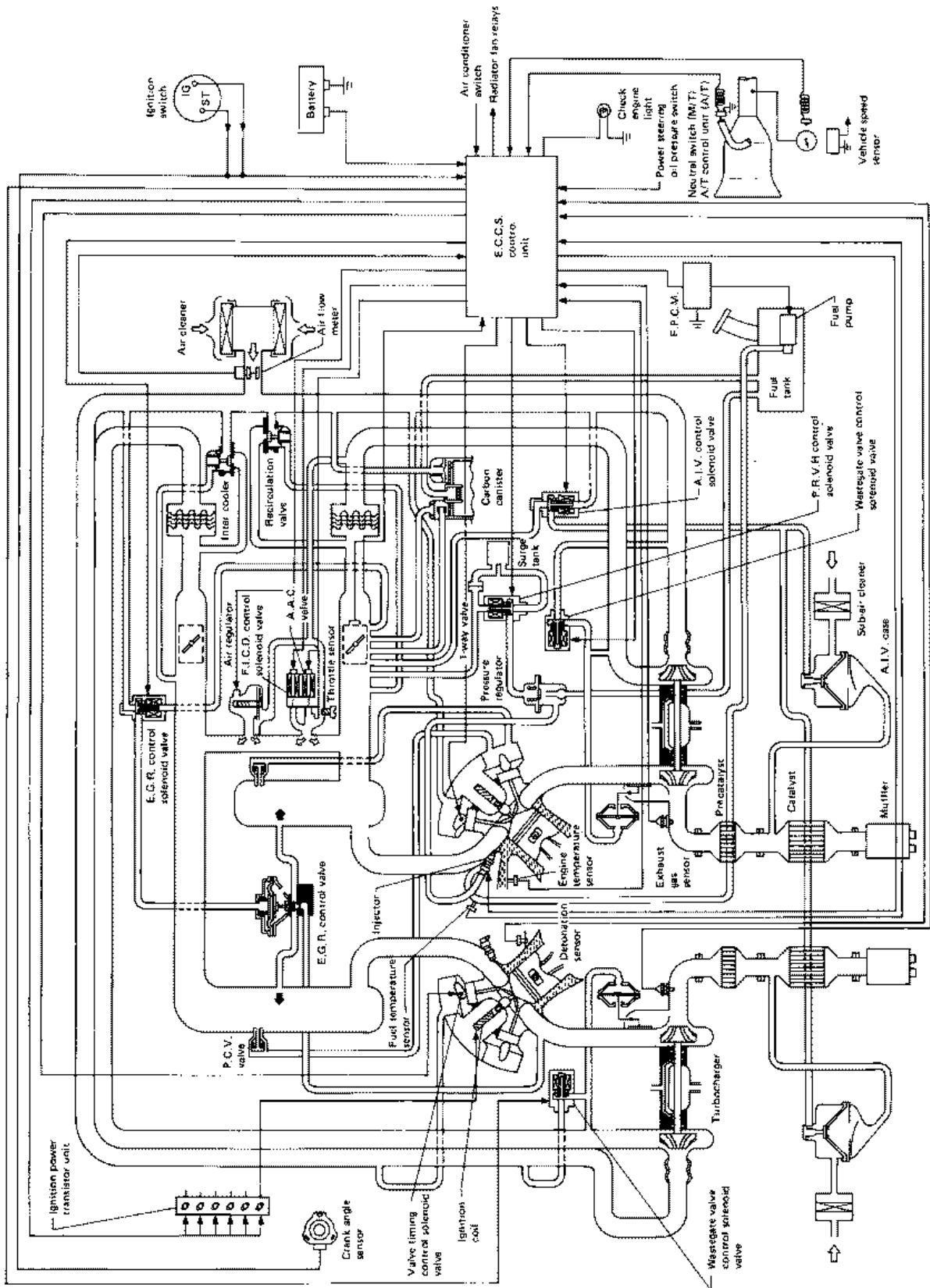
NON-TURBO MODEL



ENGINE AND EMISSION CONTROL OVERALL SYSTEM

System Diagram (Cont'd)

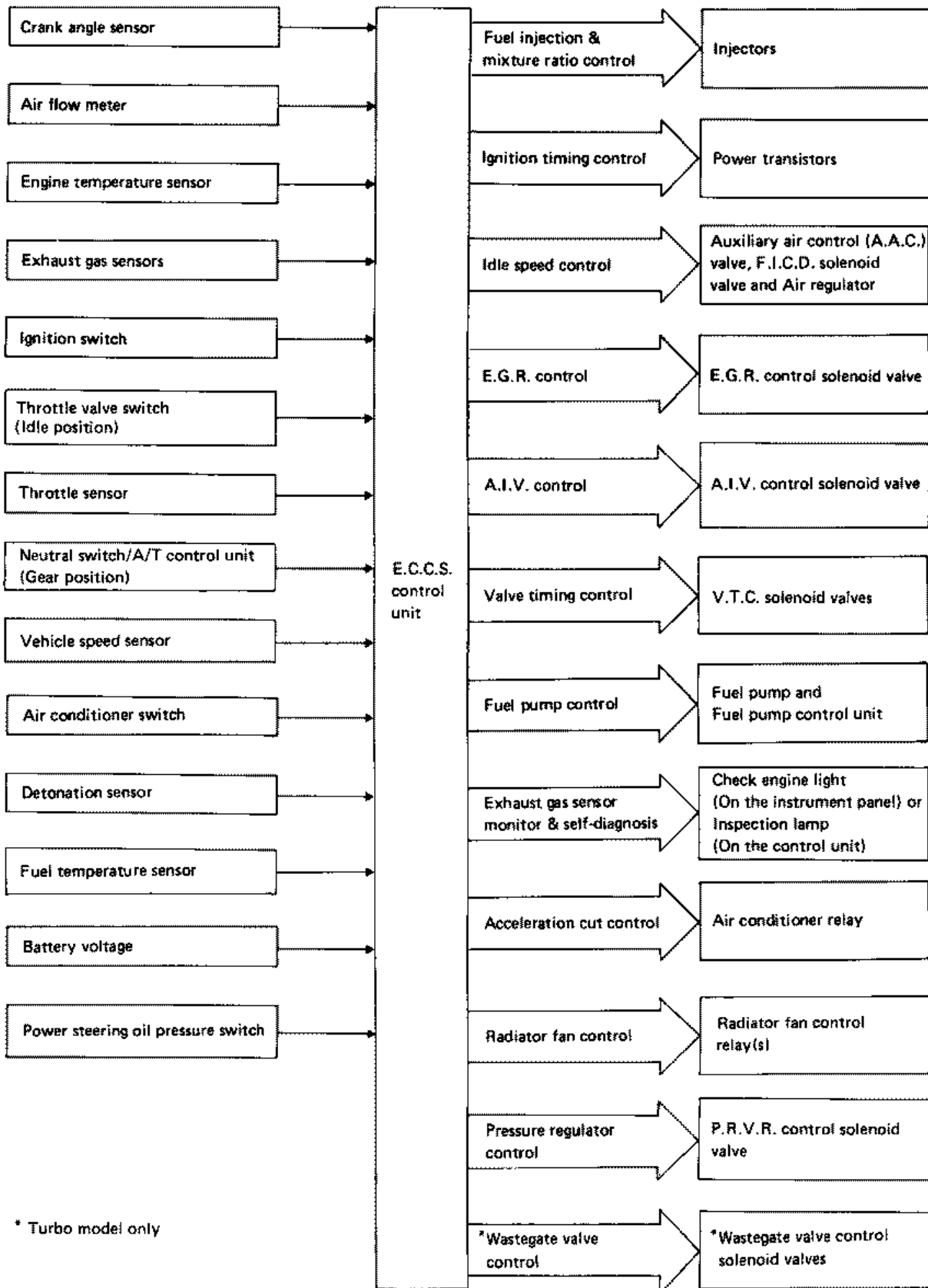
TURBO MODEL



SEF448K

ENGINE AND EMISSION CONTROL OVERALL SYSTEM

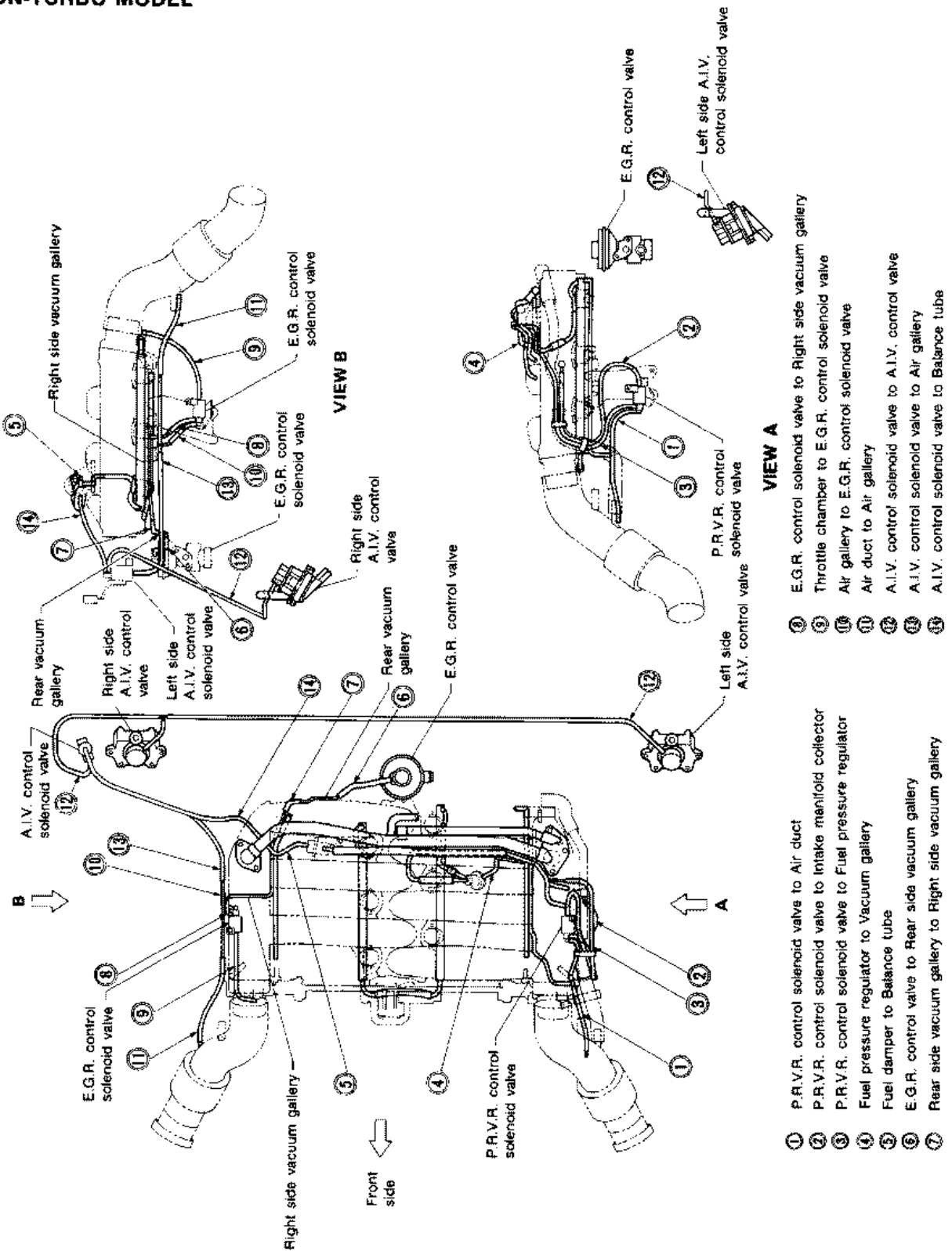
System Chart



ENGINE AND EMISSION CONTROL OVERALL SYSTEM

Vacuum Hose Drawing

NON-TURBO MODEL

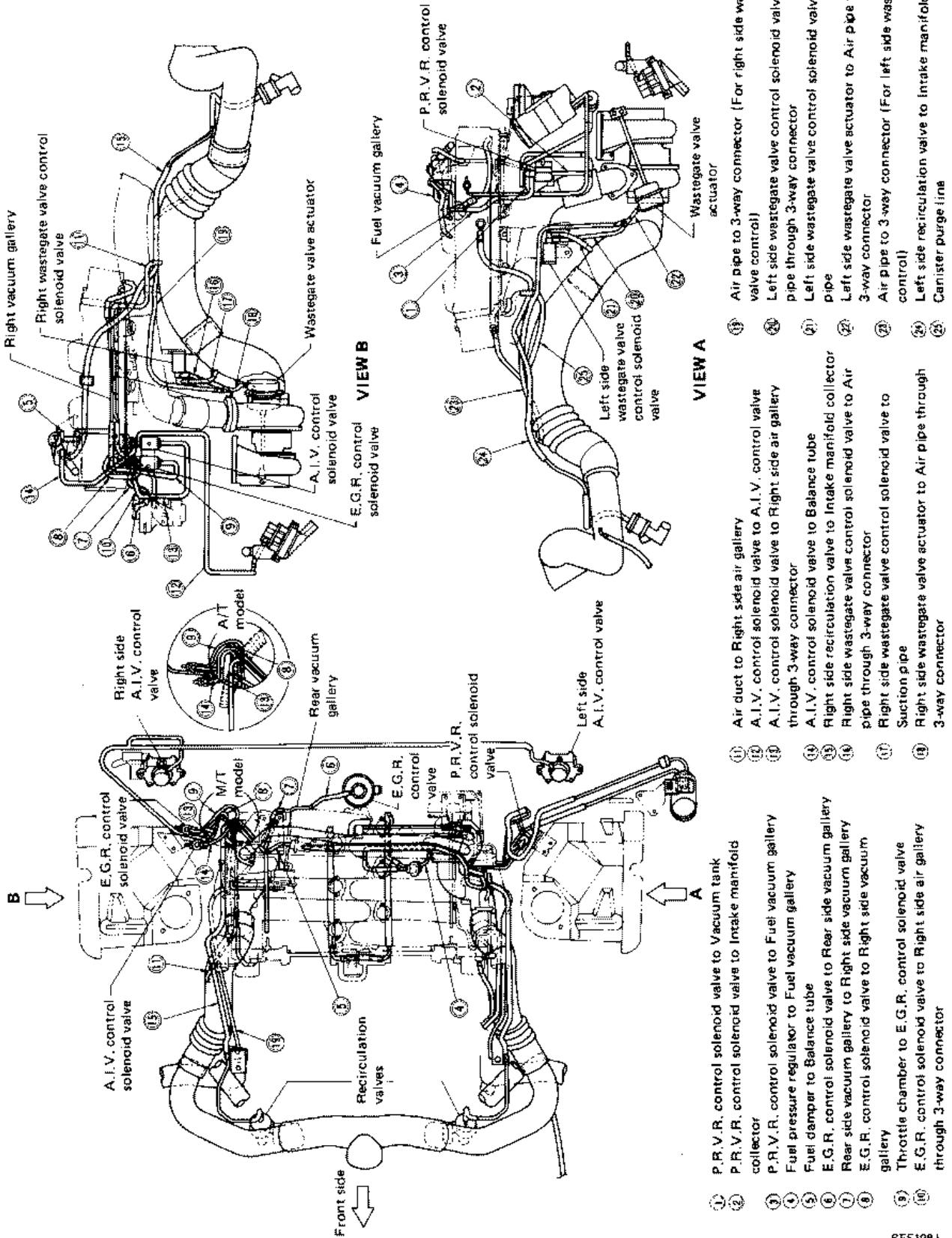


- ① P.R.V.R. control solenoid valve to Air duct
- ② P.R.V.R. control solenoid valve to Intake manifold collector
- ③ P.R.V.R. control solenoid valve to Fuel pressure regulator
- ④ Fuel pressure regulator to Vacuum gallery
- ⑤ Fuel damper to Balance tube
- ⑥ E.G.R. control valve to Rear side vacuum gallery
- ⑦ Rear side vacuum gallery to Right side vacuum gallery
- ⑧ E.G.R. control solenoid valve to Right side vacuum gallery
- ⑨ Throttle chamber to E.G.R. control solenoid valve
- ⑩ Air gallery to E.G.R. control solenoid valve
- ⑪ Air duct to Air gallery
- ⑫ A.I.V. control solenoid valve to A.I.V. control valve
- ⑬ A.I.V. control solenoid valve to Air gallery
- ⑭ A.I.V. control solenoid valve to Balance tube

ENGINE AND EMISSION CONTROL OVERALL SYSTEM

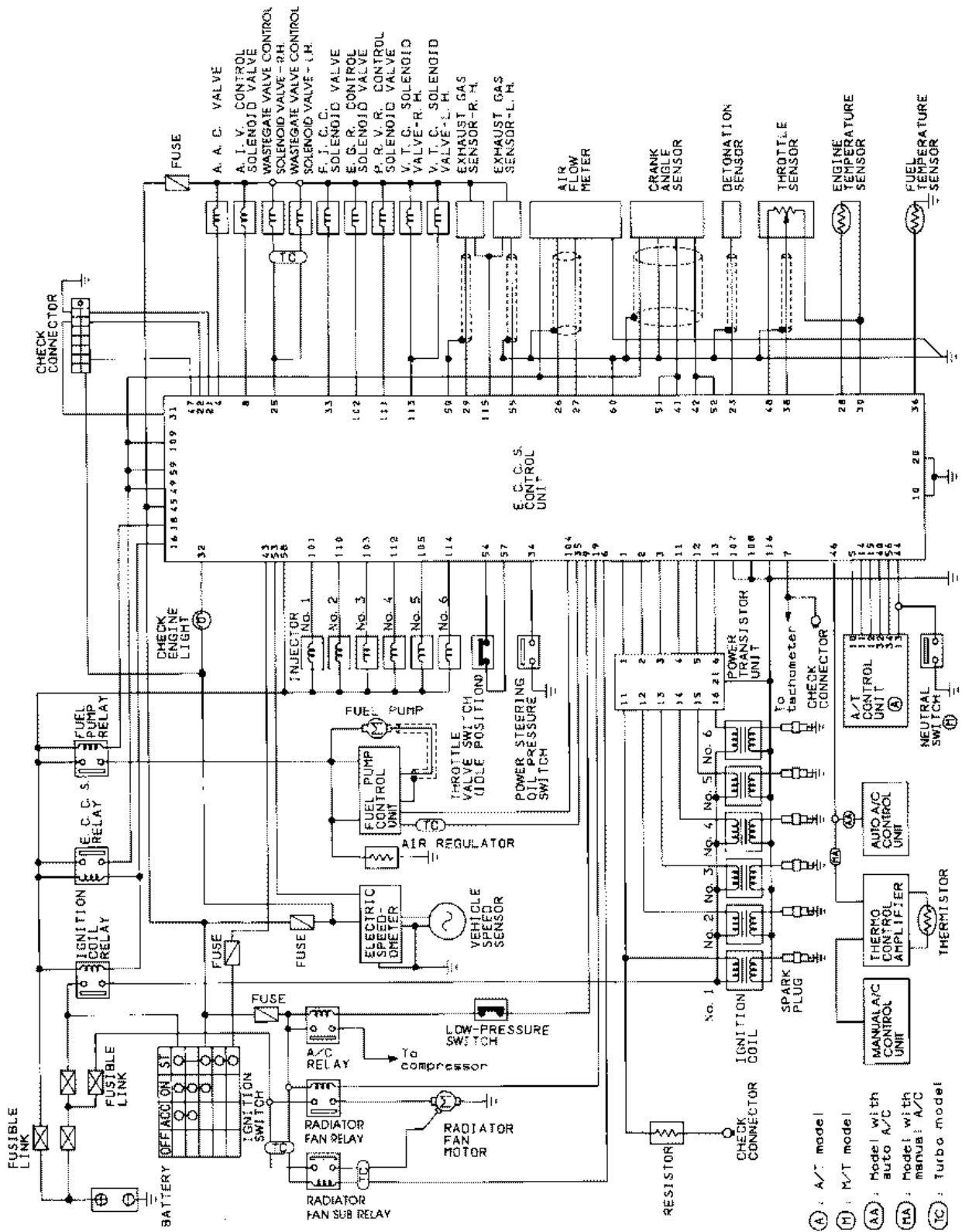
Vacuum Hose Drawing (Cont'd)

TURBO MODEL

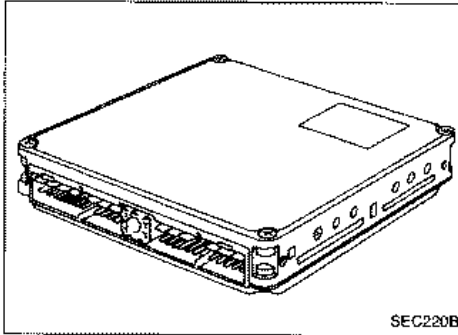


ENGINE AND EMISSION CONTROL OVERALL SYSTEM

Circuit Diagram

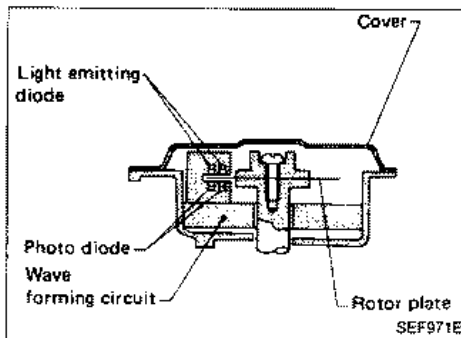


ENGINE AND EMISSION CONTROL PARTS DESCRIPTION



E.C.C.S. Control Unit (E.C.U.)

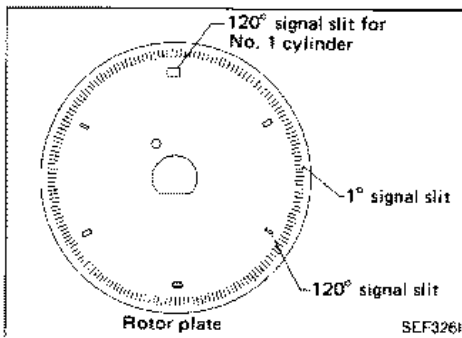
The E.C.U. consists of a microcomputer, an inspection lamp, a diagnostic mode selector, and connectors for signal input and output and for power supply. The unit controls the engine.



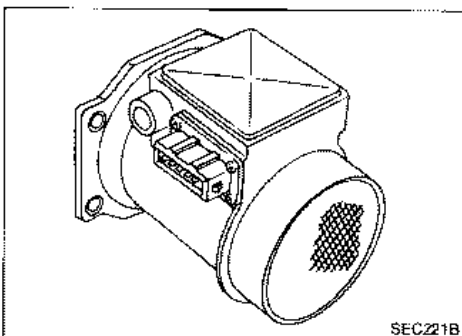
Crank Angle Sensor

The crank angle sensor is a basic component of the E.C.C.S. It monitors engine speed and piston position, and sends signals to the E.C.U. to control fuel injection, ignition timing and other functions.

The crank angle sensor has a rotor plate and a wave-forming circuit. The rotor plate has 360 slits for 1° signal and 6 slits for 120° signal. Light Emitting Diodes (L.E.D.) and photo diodes are built in the wave-forming circuit.



When the rotor plate passes between the L.E.D. and the photo diode, the slits in the rotor plate continually cut the light being transmitted to the photo diode from the L.E.D. This generates rough-shaped pulses which are converted into on-off pulses by the wave-forming circuit, which are sent to the E.C.U.



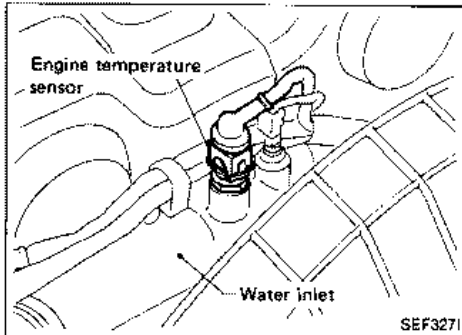
Air Flow Meter

The air flow meter measures the intake air flow rate by measuring a part of the entire flow. Measurements are made in such a way that the E.C.U. receives electrical output signals varied by the amount of heat emitting from the hot film placed in the stream of the intake air.

When intake air flows into the intake manifold through a route around the hot film, the heat generated from the hot film is taken away by the air. The amount of heat reduction depends on the air flow. The temperature of the hot film is automatically controlled to a certain number of degrees.

Therefore, it is necessary to supply the hot film with more electric current in order to maintain the temperature of the hot film. The E.C.U. detects the air flow by means of this current change.

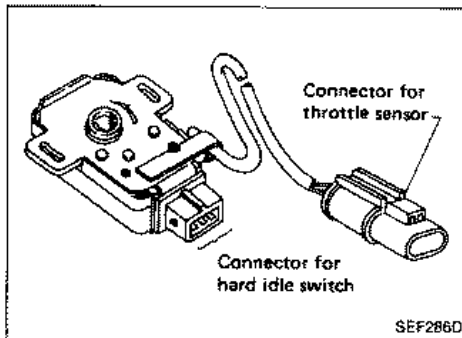
ENGINE AND EMISSION CONTROL PARTS DESCRIPTION



Engine Temperature Sensor

The engine temperature sensor, located on the top of water inlet housing, detects engine coolant temperature and transmits a signal to the E.C.U.

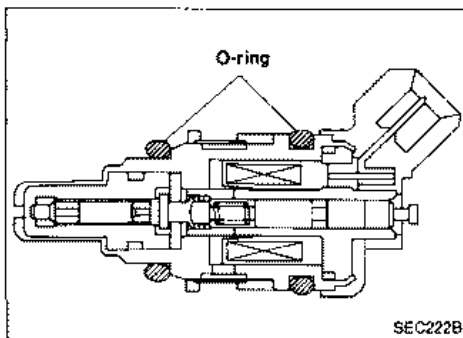
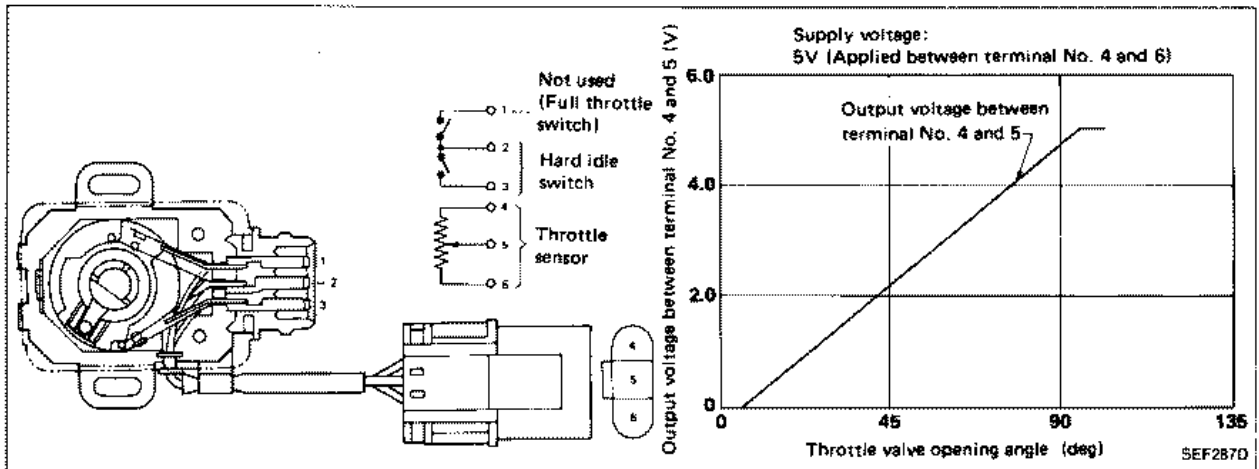
The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



Throttle Sensor & Soft/Hard Idle Switch

The throttle sensor responds to accelerator pedal movement. This sensor is a kind of potentiometer which transforms the throttle valve position into output voltage, and emits the voltage signal to the E.C.U. In addition, the sensor detects the opening and closing speed of the throttle valve and feeds the voltage signal to the E.C.U.

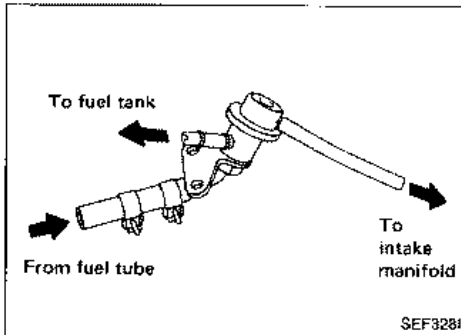
Idle position of the throttle valve is determined by the E.C.U. receiving the signal from the throttle sensor. This system is called "soft idle switch". It controls engine operation such as fuel cut. On the other hand, "hard idle switch", which is built in the throttle sensor unit, is used for engine control when soft idle switch is malfunctioning.



Fuel Injector

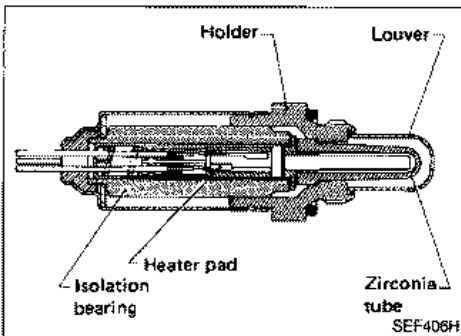
The fuel injector is a small, elaborate solenoid valve. As the E.C.U. sends injection signals to the injector, the coil in the injector pulls the needle valve back and fuel is released into the intake manifold through the nozzle. The injected fuel is controlled by the E.C.U. in terms of injection pulse duration.

ENGINE AND EMISSION CONTROL PARTS DESCRIPTION



Pressure Regulator

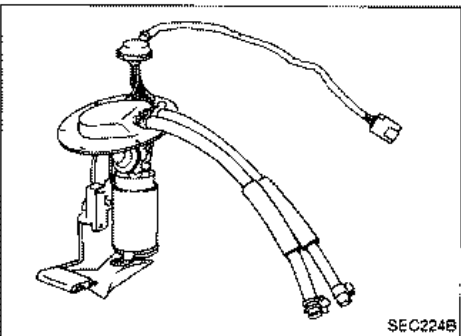
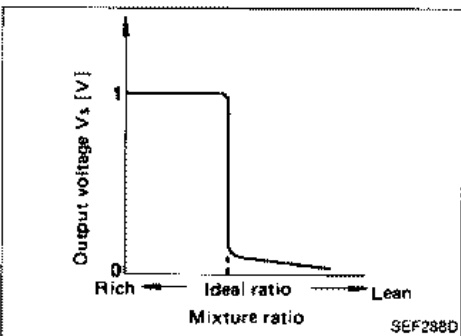
The pressure regulator maintains the fuel pressure at 299.1 kPa (2.991 bar, 3.05 kg/cm², 43.4 psi). Since the injected fuel amount depends on injection pulse duration, it is necessary to maintain the pressure at the above value.



Exhaust Gas Sensor

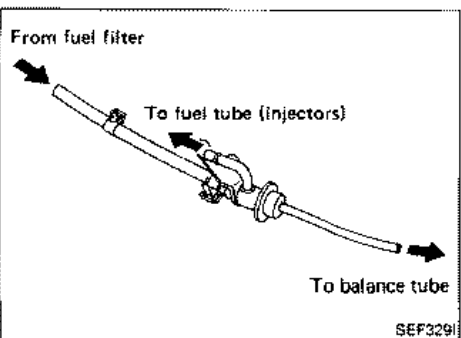
The exhaust gas sensor, which is placed into the exhaust outlet, monitors the amount of oxygen in the exhaust gas.

The sensor has a closed-end tube made of ceramic zirconia. The outer surface of the tube is exposed to exhaust gas, and the inner surface to atmosphere. The zirconia of the tube compares the oxygen density of exhaust gas with that of atmosphere, and generates electricity. In order to improve generating power of the zirconia, its tube is coated with platinum. The voltage is approximately 1V in a richer condition of the mixture ratio than the ideal air-fuel ratio, while approximately 0V in leaner conditions. The radical change from 1V to 0V occurs at around the ideal mixture ratio. In this way, the exhaust gas sensor detects the amount of oxygen in the exhaust gas and sends the signal of approximately 1V or 0V to the E.C.U. A heater is used to activate the sensor.



Fuel Pump

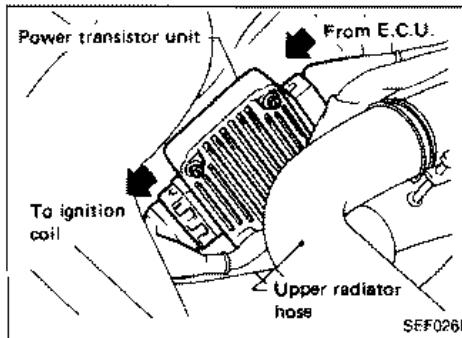
The fuel pump is an in-tank type with a fuel damper. Both the pump and damper are located in the fuel tank.



Fuel Damper

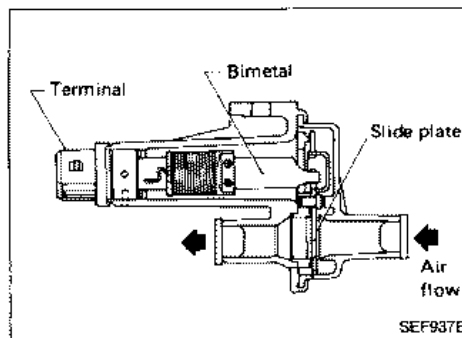
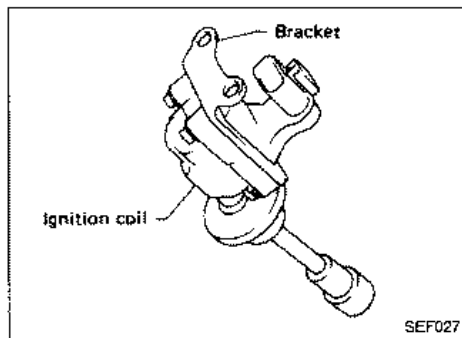
The fuel damper, which consists of a diaphragm, reduces fuel pressure pulsation in the fuel feed line between the fuel filter and injectors.

ENGINE AND EMISSION CONTROL PARTS DESCRIPTION



Power Transistor Unit & Ignition Coil

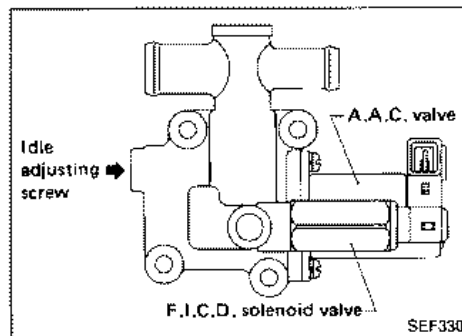
The ignition signal from the E.C.U. is amplified by the power transistor, which turns the ignition coil primary circuit on and off, inducing the proper high voltage in the secondary circuit. The ignition coil is a small, molded type.



Air Regulator

The air regulator provides an air by-pass when the engine is cold for a fast idle during warm-up.

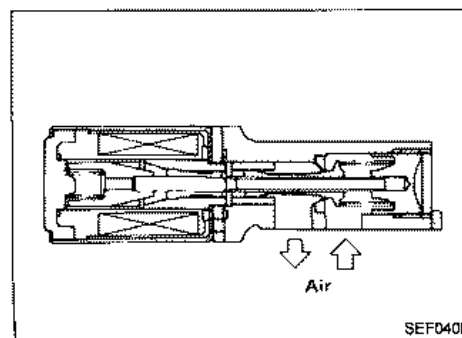
A bimetal, heater and rotary shutter are built into the air regulator. When the bimetal temperature is low, the air by-pass port opens. As the engine starts and electric current flows through a heater, the bimetal begins to turn the shutter to close the by-pass port. The air passage remains closed until the engine stops and the bimetal temperature drops.



Idle Air Adjusting (I.A.A.) Unit

The I.A.A. unit is made up of the A.A.C. valve, F.I.C.D. solenoid valve and idle adjust screw. It receives the signal from the E.C.U. and controls the idle speed at the preset value.

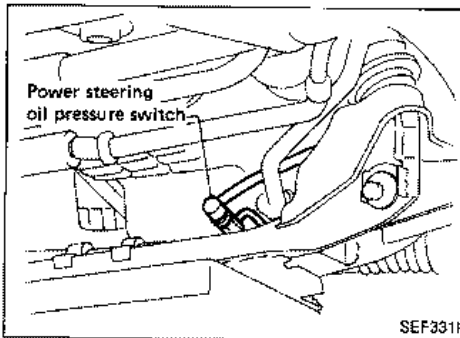
The F.I.C.D. solenoid valve compensates for changes in idle speed caused by the operation of the air compressor.



Auxiliary Air Control (A.A.C.) Valve

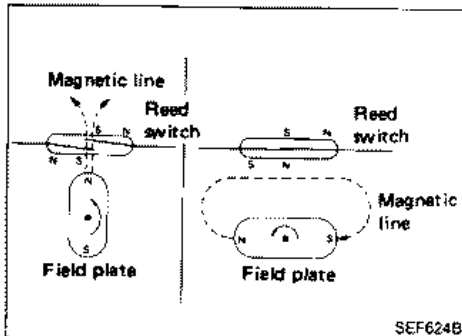
The E.C.U. actuates the A.A.C. valve by an ON/OFF pulse. The longer that ON duty is left on, the larger the amount of air that will flow through the A.A.C. valve.

ENGINE AND EMISSION CONTROL PARTS DESCRIPTION



Power Steering Oil Pressure Switch

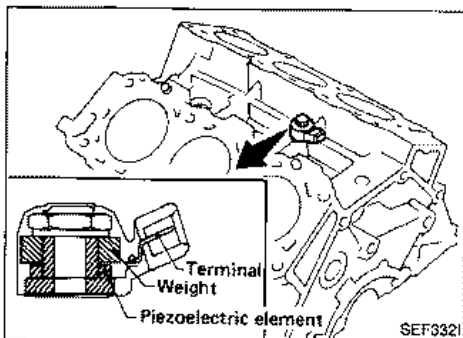
The power steering oil pressure switch is attached to the power steering high-pressure tube and detects the power steering load, sending the load signal to the E.C.U. The E.C.U. then sends the idle-up signal to the A.A.C. valve.



Vehicle Speed Sensor

The vehicle speed sensor provides a vehicle speed signal to the E.C.U.

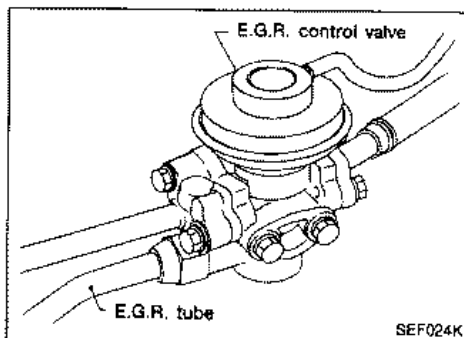
The speed sensor consists of a reed switch, which is installed in the speedometer unit and transforms vehicle speed into a pulse signal.



Detonation Sensor

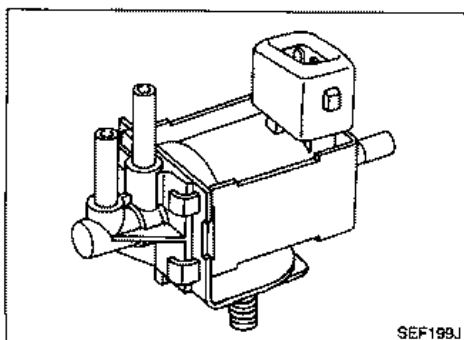
The detonation sensor is attached to the cylinder block and senses engine knocking conditions.

A knocking vibration from the cylinder block is applied as pressure to the piezoelectric element. This vibrational pressure is then converted into a voltage signal which is sent to the E.C.U.



E.G.R. Control Valve

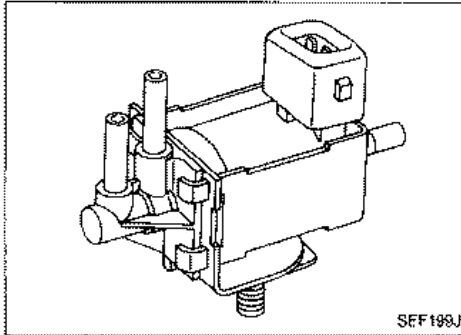
The E.G.R. control valve controls the quantity of exhaust gas to be diverted to the intake manifold through vertical movement of a taper valve connected to the diaphragm. Vacuum is applied to the diaphragm in response to the opening of the throttle valve.



E.G.R. Control Solenoid Valve

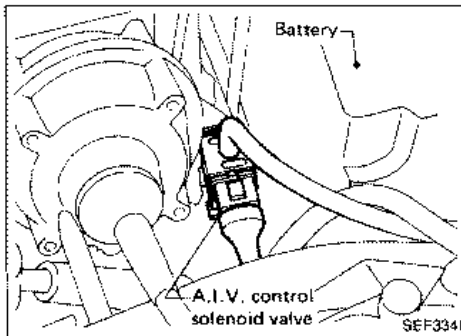
The solenoid valve responds to the ON/OFF signal from the E.C.U. When it is off, a vacuum signal from the throttle chamber is fed into the E.G.R. control valve. When the control unit sends an ON signal, the coil pulls the plunger downward and cuts the vacuum signal.

ENGINE AND EMISSION CONTROL PARTS DESCRIPTION



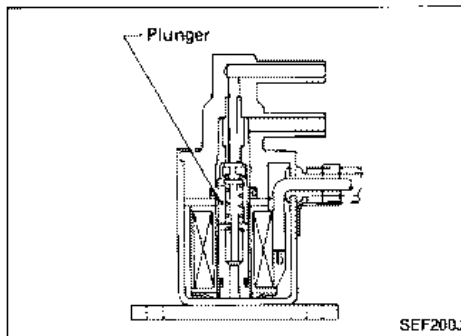
Pressure Regulator Vacuum Relief (P.R.V.R.) Control Solenoid Valve

The solenoid valve responds to the ON/OFF signal from the E.C.U. When it is off, a vacuum signal from the intake manifold is fed into the pressure regulator. When the control unit sends an ON signal, the coil pulls the plunger downward and cuts the vacuum signal.



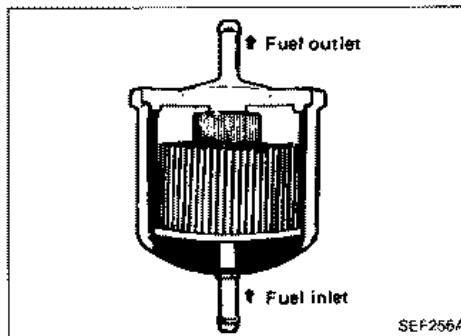
A.I.V. Control Solenoid Valve

The solenoid valve responds to the ON/OFF signal from the E.C.U. When it is ON, a vacuum signal from the intake manifold is fed into the A.I.V. control valve. When the control unit sends an OFF signal, the coil pulls the plunger downward and cuts the vacuum signal.



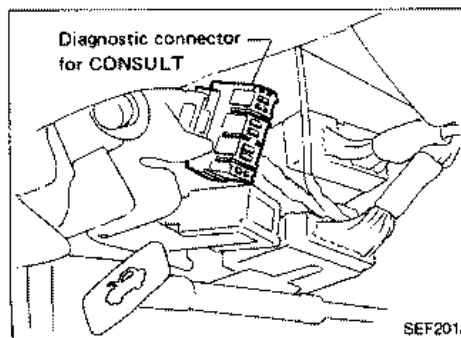
Wastegate Valve Control Solenoid Valve

The solenoid valve responds to the ON/OFF signal from the E.C.U. When it is ON, a vacuum signal from the suction pipe or compressor outlet is fed into the wastegate valve actuator. The actuator is hard to open at this time. When the control unit sends an OFF signal, the coil pulls the plunger upward and cuts the route to the suction pipe.



Fuel Filter

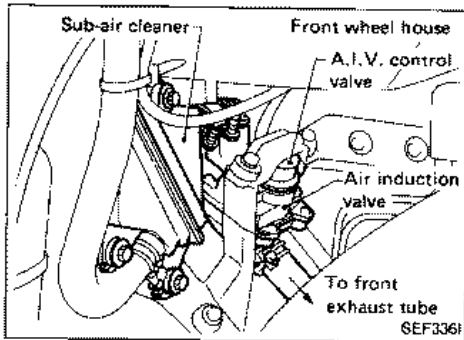
The specially designed fuel filter has a metal case in order to withstand high fuel pressure.



Diagnostic Connector for CONSULT

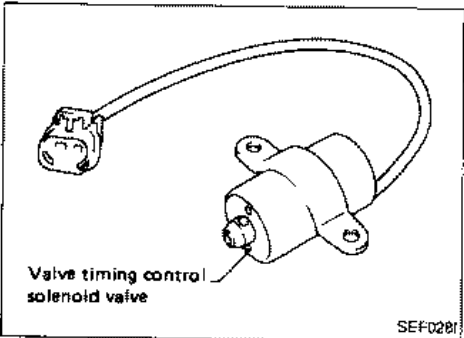
The diagnostic connector for CONSULT is located above the hood release handle.

ENGINE AND EMISSION CONTROL PARTS DESCRIPTION



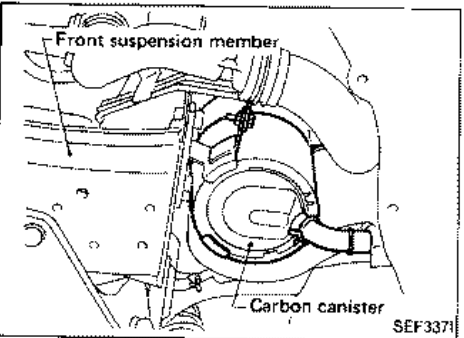
Air Induction Valve (A.I.V.)

The air induction valve sends secondary air to the exhaust manifold, using a vacuum created by exhaust pulsation in the exhaust manifold. When the exhaust pressure is below atmospheric pressure (negative pressure), secondary air is sent to the exhaust manifold. When the exhaust pressure is above atmospheric pressure, the reed valves prevent secondary air from being sent back to the sub-air cleaner.



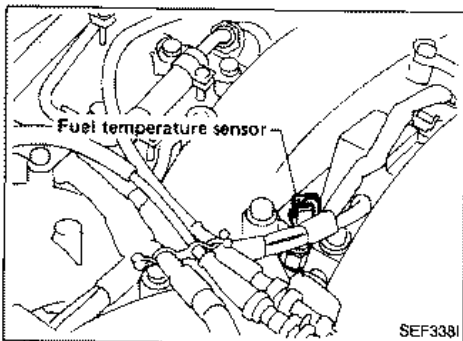
Valve Timing Control (V.T.C.) Solenoid Valve

The valve timing control solenoids are installed at the rear end of the intake camshafts, and control oil pressure which regulates the position of the intake camshafts.



Carbon Canister

The carbon canister is filled with active charcoal to absorb evaporative gases produced in the fuel tank. These absorbed gases are then delivered to the intake manifold by manifold vacuum for combustion purposes.



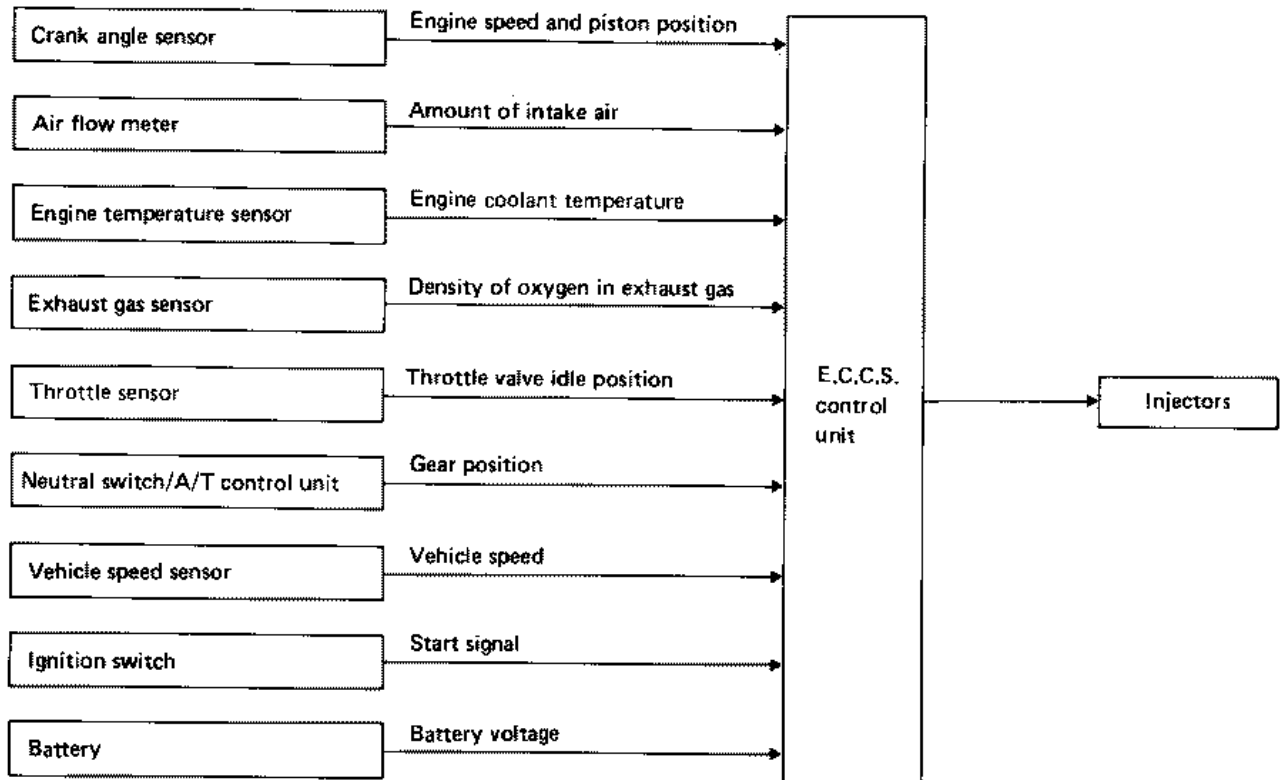
Fuel Temperature Sensor

The fuel temperature sensor, built into the fuel tube, senses fuel temperature. When the fuel temperature is higher than specified, the E.C.C.S. control unit turns the P.R.V.R. control solenoid valve ON and raises fuel pressure.

ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

Fuel Injection Control

INPUT/OUTPUT SIGNAL LINE



BASIC FUEL INJECTION CONTROL

The amount of fuel injected from the fuel injector, or the length of time the valve remains open, is determined by the E.C.U. The basic amount of fuel injected is a program value mapped in the E.C.U. ROM memory. In other words, the program value is preset by engine operating conditions determined by input signals (for engine rpm and air intake) from both the crank angle sensor and the air flow meter.

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

In addition, the amount of fuel injection is compensated for to improve engine performance under various operating conditions as listed below.

< Fuel increase >

- 1) During warm-up
- 2) When starting the engine
- 3) During acceleration
- 4) Hot-engine operation

< Fuel decrease >

- 1) During deceleration

ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

Fuel Injection Control (Cont'd)

MIXTURE RATIO FEEDBACK CONTROL

The mixture ratio feedback system is used for precise control of the mixture ratio to the stoichiometric point, so that the three-way catalyst can reduce CO, HC and NO_x emissions. This system uses an exhaust gas sensor in the exhaust manifold to check the air-fuel ratio. The control unit adjusts the injection pulse width according to the sensor voltage so the mixture ratio will be within the range of the stoichiometric air-fuel ratio.

This stage refers to the closed-loop control condition. The open-loop control condition refers to that under which the E.C.U. detects any of the following conditions and feedback control stops in order to maintain stabilized fuel combustion.

- 1) Deceleration
- 2) High-load, high-speed operation
- 3) Engine idling
- 4) Malfunction of exhaust gas sensor or its circuit
- 5) Insufficient activation of exhaust gas sensor at low engine temperature
- 6) Engine starting

MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from the exhaust gas sensor. This feedback signal is then sent to the E.C.U. to control the amount of fuel injection to provide a basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. This is due to manufacturing errors (e.g., air flow meter hot wire) and changes during operation (injector clogging, etc.) of E.C.C.S. parts which directly affect the mixture ratio.

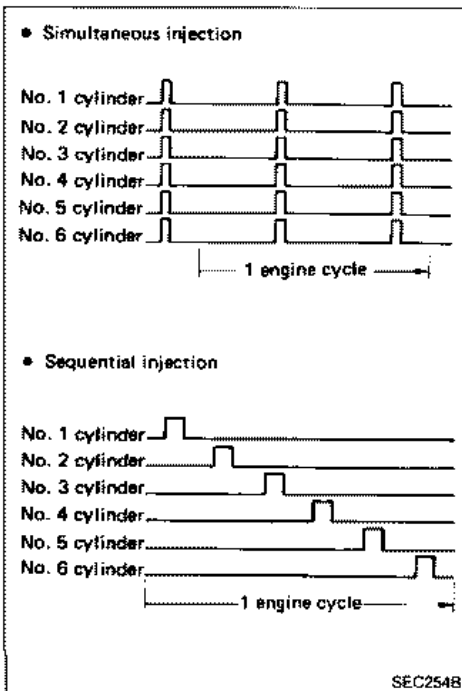
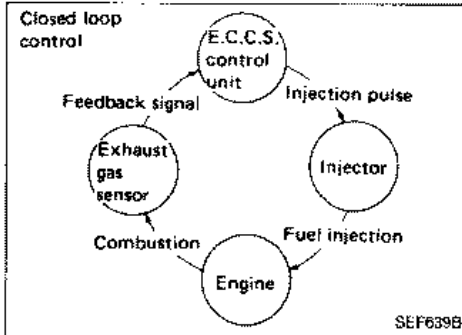
Accordingly, a difference between the basic and theoretical mixture ratios is monitored in this system. It is then computed in terms of "fuel injection duration" to automatically compensate for the difference between the two ratios.

FUEL INJECTION TIMING

Two types of fuel injection systems are used — simultaneous injection and sequential injection. In the former, fuel is injected into all six cylinders simultaneously twice each engine cycle.

In other words, pulse signals of the same width are simultaneously transmitted from the E.C.U. to the six injectors two times for each engine cycle.

In the sequential injection system, fuel is injected into each cylinder during each engine cycle according to the firing order. When engine is starting, fuel is injected into all six cylinders simultaneously twice per cycle.



ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

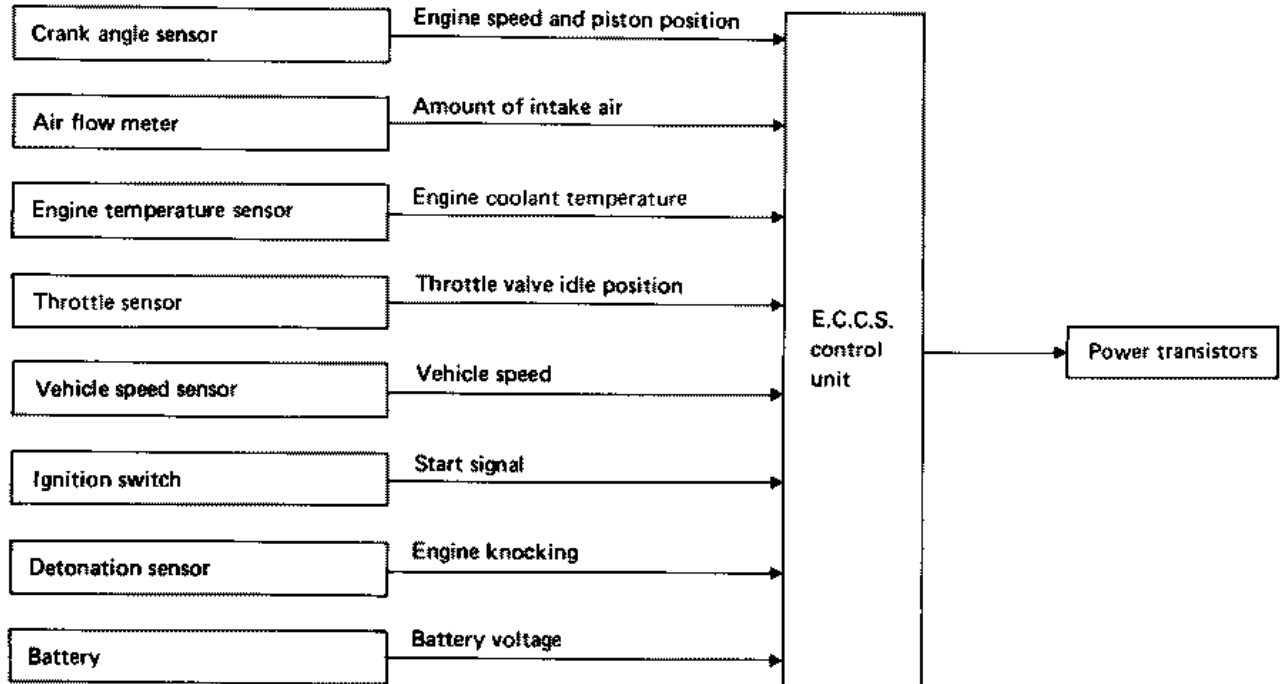
Fuel Injection Control (Cont'd)

FUEL SHUT-OFF

Fuel to each cylinder is cut off during deceleration or high-speed operation.

Ignition Timing Control

INPUT/OUTPUT SIGNAL LINE



ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

Ignition Timing Control (Cont'd)

SYSTEM DESCRIPTION

The ignition timing is controlled by the E.C.U. in order to maintain the best air-fuel ratio in response to every running condition of the engine. The ignition timing data is stored in the ROM located in the E.C.U. This data forms the map shown below.

The E.C.U. detects information such as the injection pulse width and crank angle sensor signal which varies every moment. Then responding to this information, ignition signals are transmitted

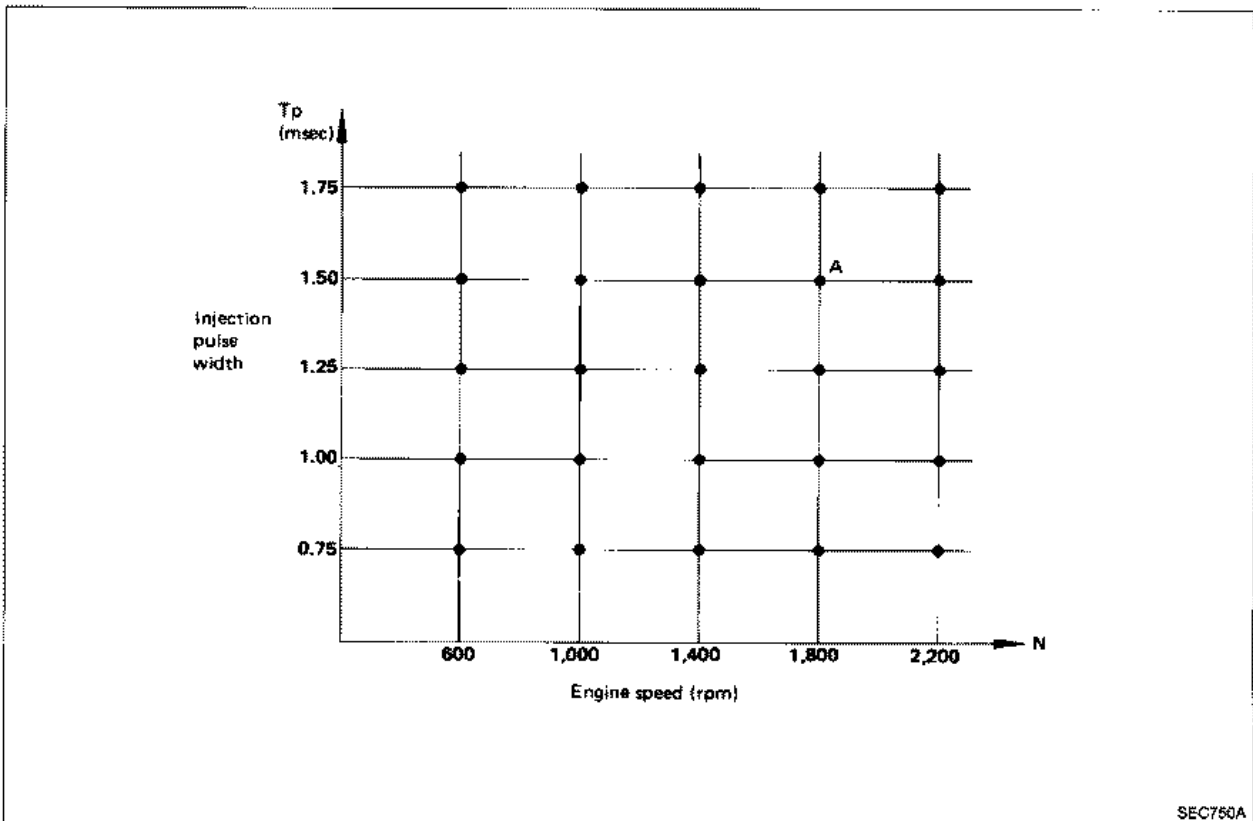
to the power transistor.

e.g. N: 1,800 rpm, T_p : 1.50 msec
A °B.T.D.C.

In addition to this,

- 1) At starting
- 2) During warm-up
- 3) At idle
- 4) At low battery voltage

the ignition timing is revised by the E.C.U. according to the other data stored in the ROM.



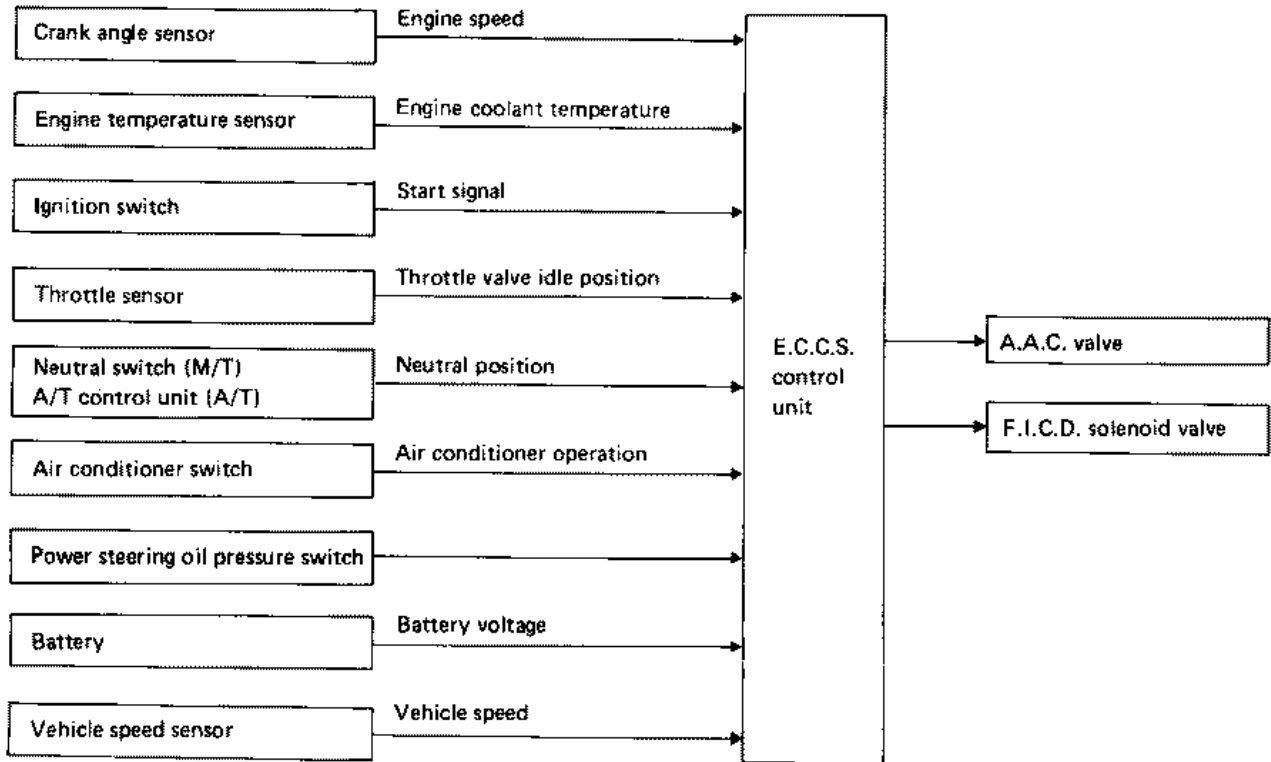
The retard system, actuated by the detonation sensor, is designed only for emergencies. The basic ignition timing is pre-programmed within the anti-knocking zone, even if recommended fuel is used under dry conditions. Consequently, the retard system does not operate under normal driving conditions.

However, if engine knocking occurs, the detonation sensor monitors the condition and the signal is transmitted to the E.C.C.S. control unit. After receiving it, the control unit retards the ignition timing to eliminate the knocking condition.

ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

Idle Speed Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

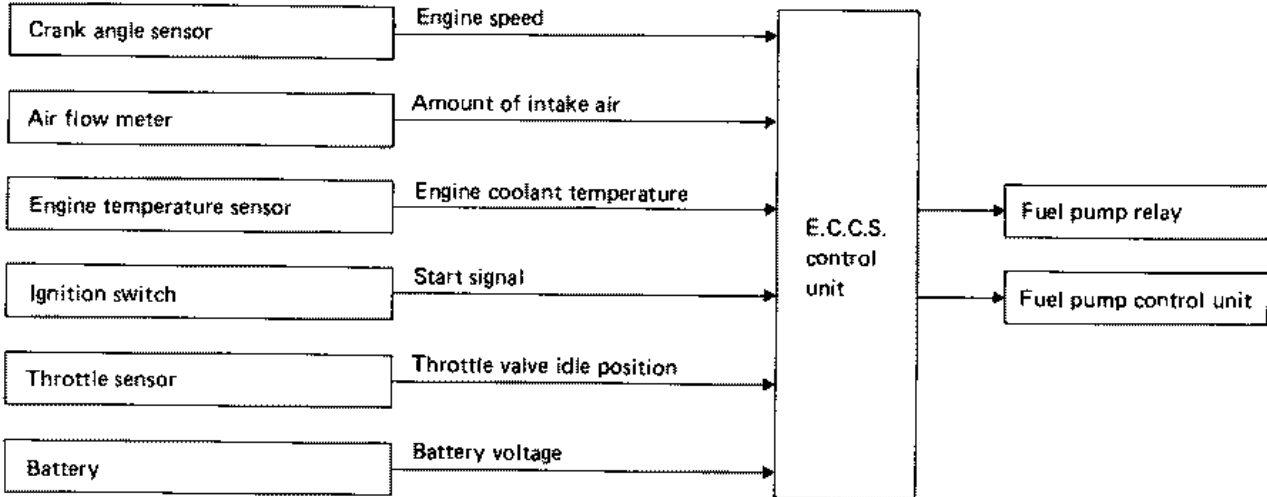
This system automatically controls engine idle speed to a specified level. Idle speed is controlled through fine adjustment of the amount of air which by-passes the throttle valve via A.A.C. valve. The A.A.C. valve repeats ON/OFF operation according to the signal sent from the E.C.U. The crank angle sensor detects the actual engine speed and sends a signal to the E.C.U. The E.C.U.

then controls the ON/OFF time of the A.A.C. valve so that engine speed coincides with the target value memorized in ROM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ROM is determined by taking into consideration various engine conditions, such as noise and vibration transmitted to the vehicle interior, fuel consumption, and engine load.

ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

Fuel Pump Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

Fuel pump and air regulator ON-OFF control

The E.C.U. activates the fuel pump for several seconds after the ignition switch is turned on to improve engine start-up. If the E.C.U. receives a 1° signal from the crank angle sensor, it knows that the engine is rotating, and causes the pump to activate. If the 1° signal is not received when the ignition switch is on, the engine stalls. The E.C.U. stops pump operation and prevents battery discharging, thereby improving safety. The E.C.U. does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

Condition	Fuel pump operation
Ignition switch is turned to ON.	Operates for 1 second
Engine running and cranking	Operates
When engine is stopped	Stops in 1.5 seconds
Except as shown above	Stops

Fuel pump voltage control

The fuel pump is controlled by the fuel pump control unit adjusting the voltage supplied to the fuel pump.

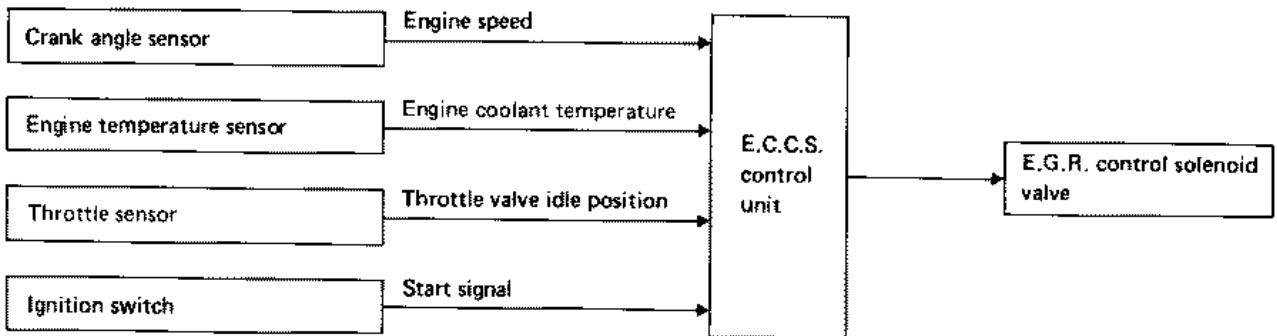
Condition	Supplied voltage	
	Turbo model	Non-turbo model
<ul style="list-style-type: none"> ● 1 second after ignition switch is turned ON ● Engine cranking ● 30 (*NA)/5 (**TC) seconds after engine start [above 50°C (122°F)] ● Engine temperature below 10°C (50°F) ● Engine is running under heavy load 	Battery voltage	Battery voltage
<ul style="list-style-type: none"> ● Engine is running under middle load 	Approx. 7V	Battery voltage
<ul style="list-style-type: none"> ● Except the above 	Approx. 6V	Approx. 8V

*NA: Non-turbo model **TC: Turbo model

ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

E.G.R. (Exhaust Gas Recirculation) Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

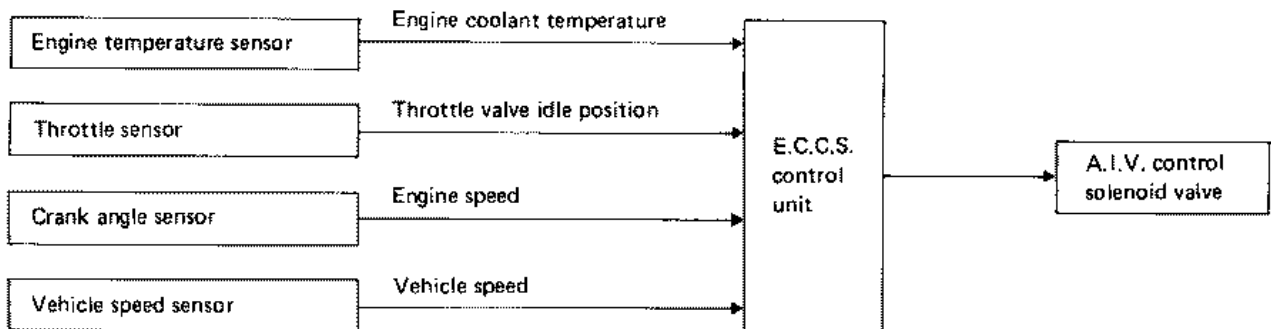
In addition, a system is provided which precisely cuts and controls port vacuum applied to the E.G.R. valve to suit engine operating conditions. This cut-and-control operation is accomplished through the E.C.U. When the E.C.U. detects any of the following conditions, current flows through the solenoid valve in the E.G.R. control vacuum line.

This causes the port vacuum to be discharged into the atmosphere so that the E.G.R. control valve remains closed.

- 1) Low engine temperature
- 2) Engine starting
- 3) High-speed engine operation
- 4) Engine idling
- 5) Excessively high engine temperature

Air Induction Valve (A.I.V.) Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

The air induction system is designed to send secondary air to the exhaust manifold, utilizing the vacuum caused by exhaust pulsation in the exhaust manifold.

The exhaust pressure in the exhaust manifold usually pulsates in response to the opening and closing of the exhaust valve and decreases below atmospheric pressure periodically.

If a secondary air intake pipe is opened to the

atmosphere under vacuum conditions, secondary air can be drawn into the exhaust manifold in proportion to the vacuum.

The air induction valve is controlled by the E.C.C.S. control unit, corresponding to the engine temperature. When the engine is cold, the A.I.V. control system operates to reduce HC and CO.

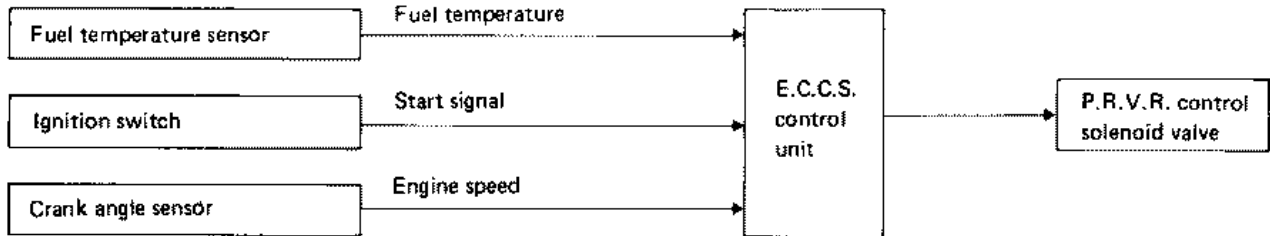
This system also operates during deceleration for the purpose of blowing off water around the air induction valve.

Engine condition	Engine coolant temperature °C (°F)	Vehicle speed km/h (MPH)	A.I.V. control solenoid valve	A.I.V. control system
Throttle valve is at idle position	Below 64 (147)	Any condition	ON	Operates
	Above 65 (149)	Below 24 (15)		

ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

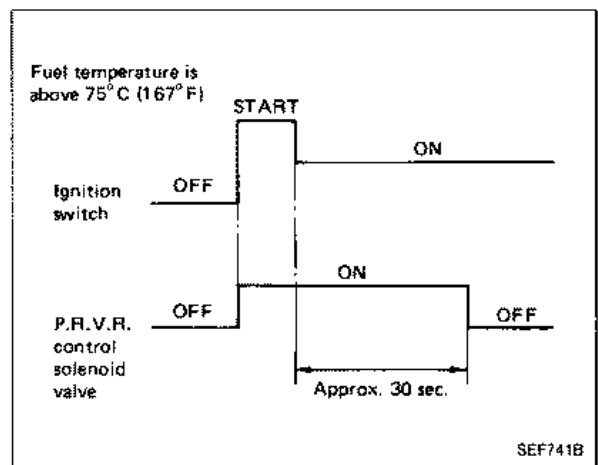
Fuel Pressure Regulator Control

INPUT/OUTPUT SIGNAL LINE



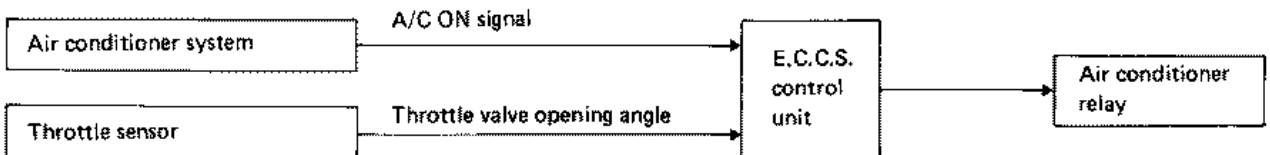
SYSTEM DESCRIPTION

The fuel "pressure-up" control system briefly increases fuel pressure for improved starting performance of a hot engine. Under normal operating conditions, manifold vacuum is applied to the fuel pressure regulator. When starting the engine, however, the E.C.U. allows current to flow through the ON/OFF solenoid valve in the control vacuum line, opening this line to the atmosphere. As a result, atmospheric pressure is applied, restricting the fuel return line so as to increase fuel pressure.



Acceleration Cut Control

INPUT/OUTPUT SIGNAL LINE



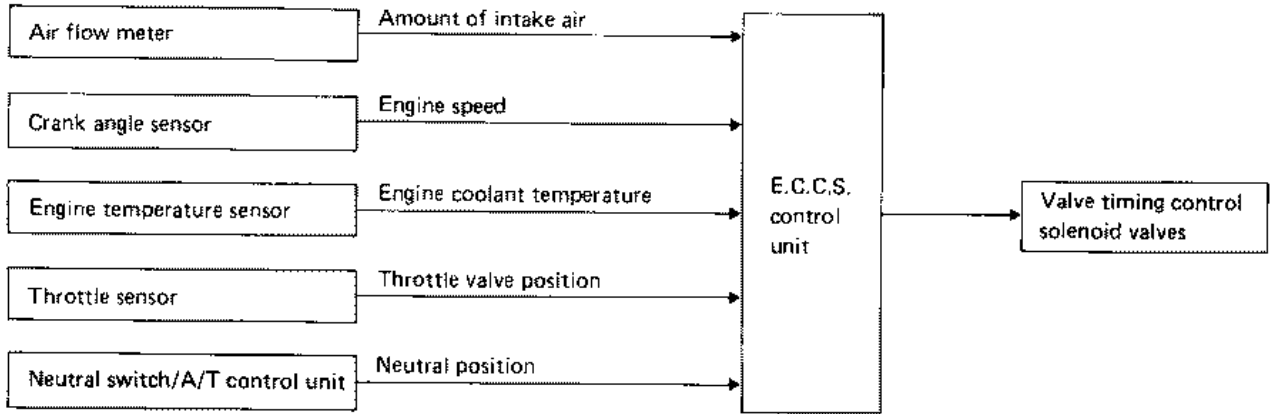
SYSTEM DESCRIPTION

When the accelerator pedal is fully depressed, the air conditioner is turned off for a few seconds. This system improves acceleration when the air conditioner is used.

ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

Valve Timing Control

INPUT/OUTPUT SIGNAL LINE

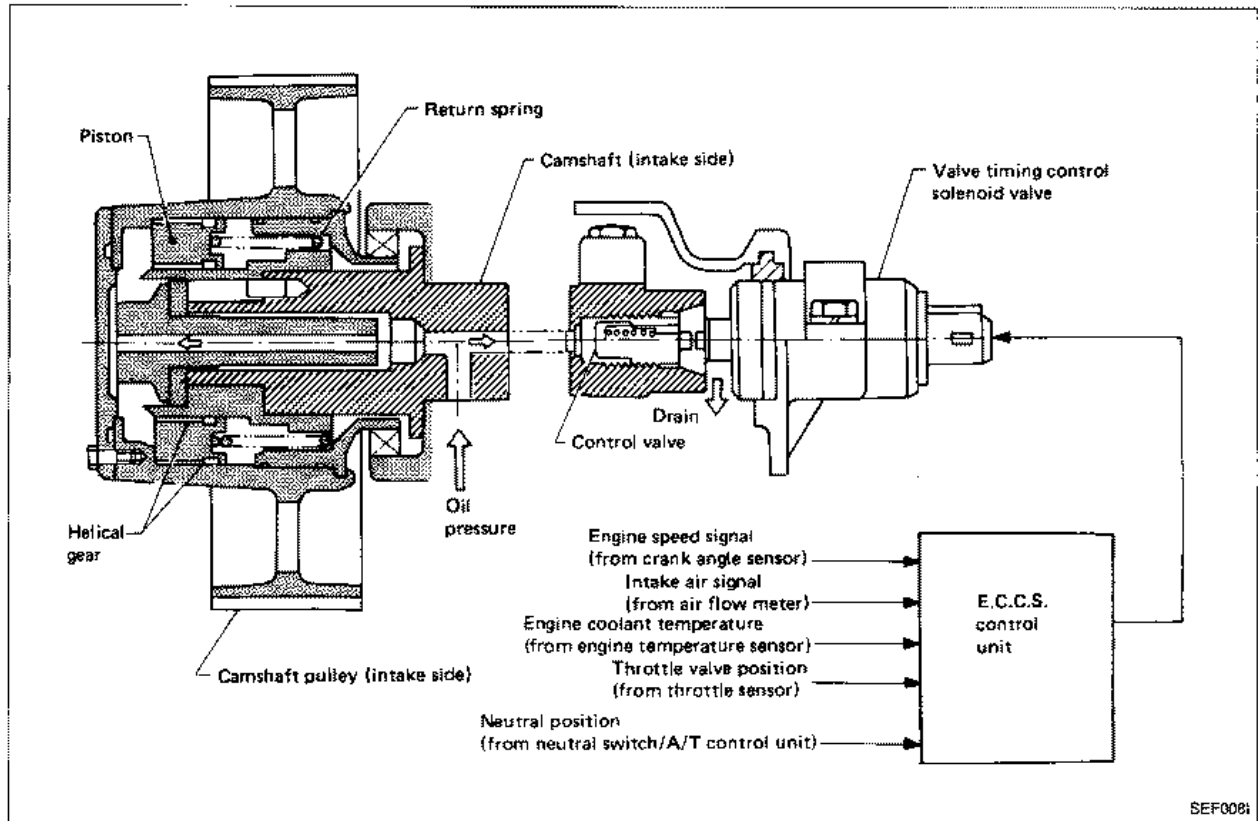


SYSTEM DESCRIPTION

The valve timing control system is utilized to increase engine performance. Intake valve opening and closing time is controlled, according to the engine operating conditions, by the E.C.U. Engine coolant temperature signals, engine

speed, amount of intake air, throttle valve position and gear position are used to determine intake valve timing.

The intake camshaft pulley position is regulated by oil pressure, which is controlled by the valve timing control solenoid valve.

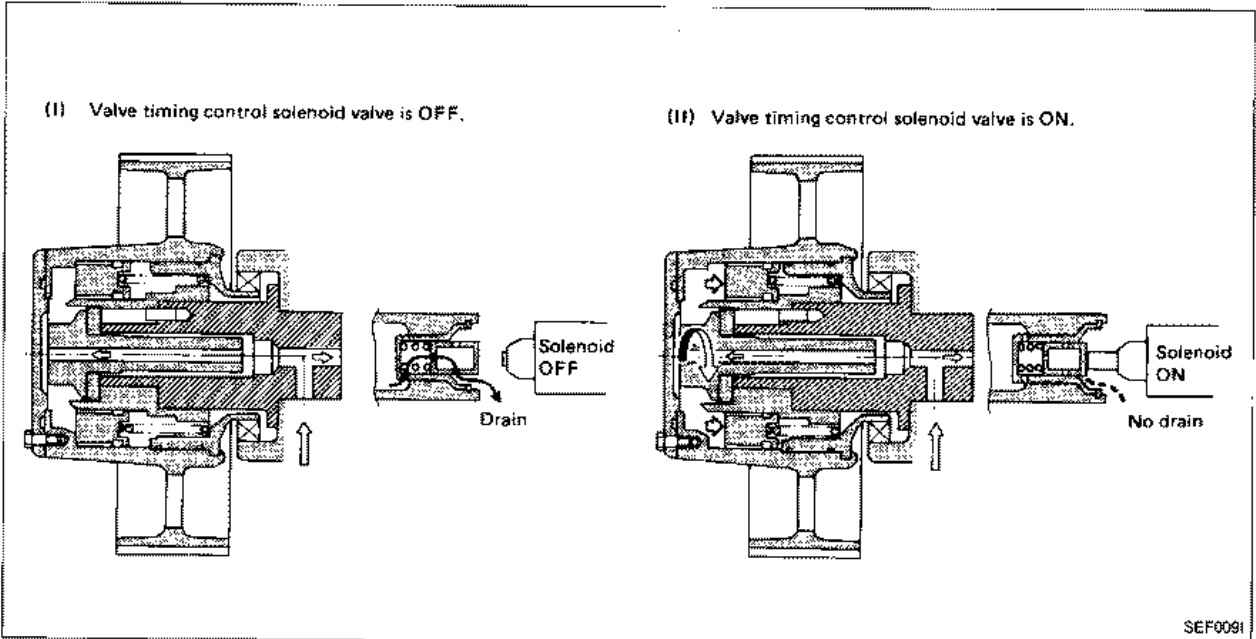


ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

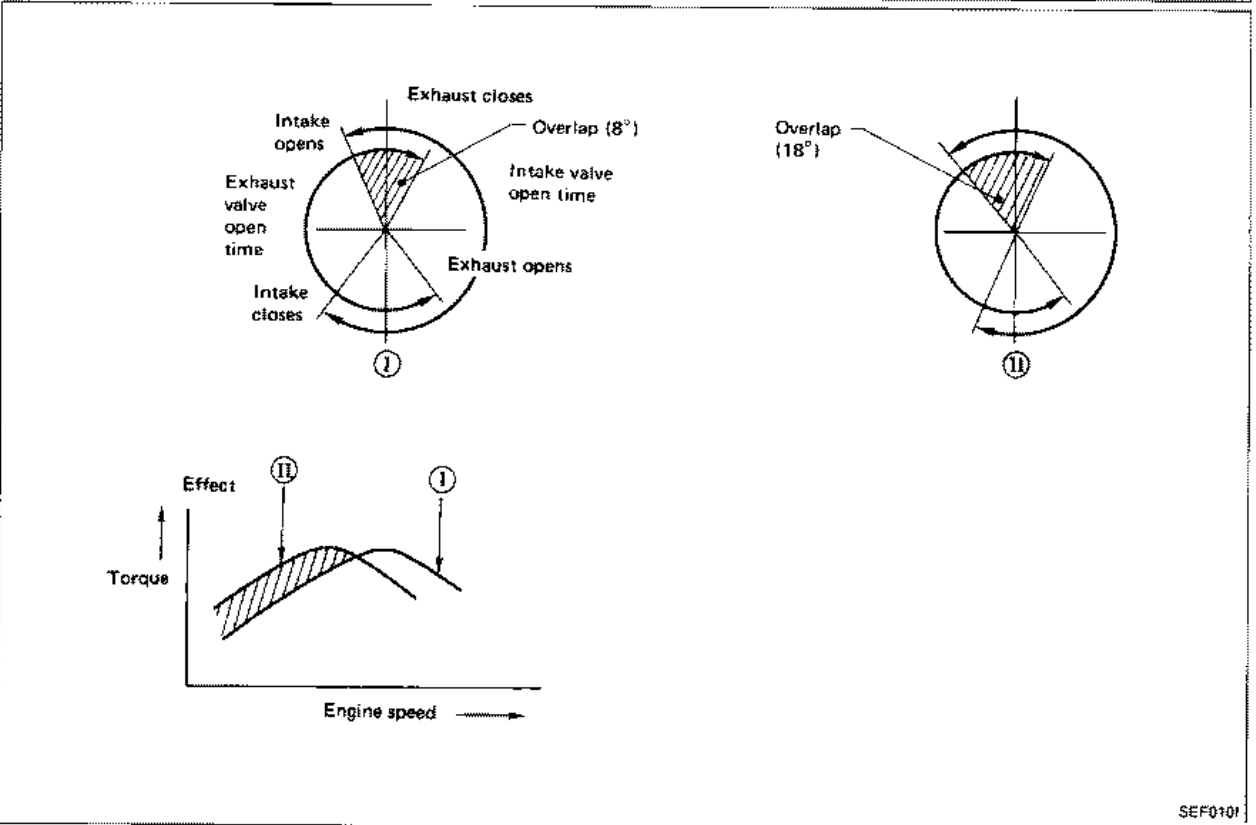
Valve Timing Control (Cont'd)

OPERATION

Engine operating condition	Valve timing control solenoid valve	Intake valve opening and closing time	Valve overlap	Engine torque curve
Idling, high speed	OFF	Retard	Decreased	Ⓘ
Low to medium speed	ON	Advance	Increased	Ⓜ



SEF0091

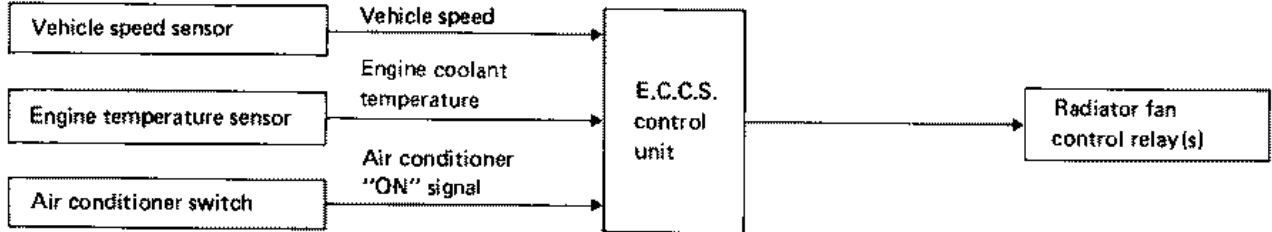


SEF0101

ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

Radiator Fan Control

INPUT/OUTPUT SIGNAL LINE



The E.C.U. controls the radiator fan corresponding to the vehicle speed, engine temperature, and air conditioner ON signal. The non-turbo model has 2-step control [ON (HIGH)/OFF], and the turbo model 3-step control [HIGH/LOW/OFF].

OPERATION

[Non-turbo model]

Air conditioner switch is "OFF"

Engine coolant temperature °C (°F)	Radiator fan
Below 104 (219)	OFF
Above 105 (221)	ON

Air conditioner switch is "ON"

Vehicle speed km/h (MPH)	Engine coolant temperature °C (°F)	Radiator fan
Below 39 (24)	Below 94 (201)	OFF
	Above 95 (203)	ON (HIGH)
Above 40 (25)	Below 104 (219)	OFF
	Above 105 (221)	ON (HIGH)

[Turbo model]

Air conditioner switch is "OFF"

Engine coolant temperature °C (°F)	Radiator fan
Below 104 (219)	OFF
Above 105 (221)	ON

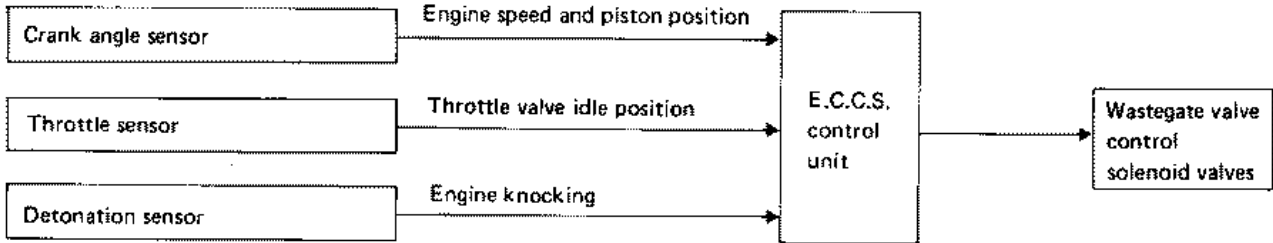
Air conditioner switch is "ON"

Vehicle speed km/h (MPH)	Engine coolant temperature °C (°F)	Radiator fan
Below 39 (24)	Below 89 (192)	OFF
	Between 90 (194) and 99 (210)	LOW
	Above 100 (212)	HIGH
Above 40 (25)	Below 104 (219)	OFF
	Above 105 (221)	HIGH

ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

Wastegate Valve Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

The wastegate valve control solenoid valve changes the source vacuum which activates the actuator. This results in a suitable turbo-pressure.

When detonation signs are detected, which means a low octane fuel is being used, the solenoid valve turns OFF, and turbocharger pressure becomes low.

OPERATION

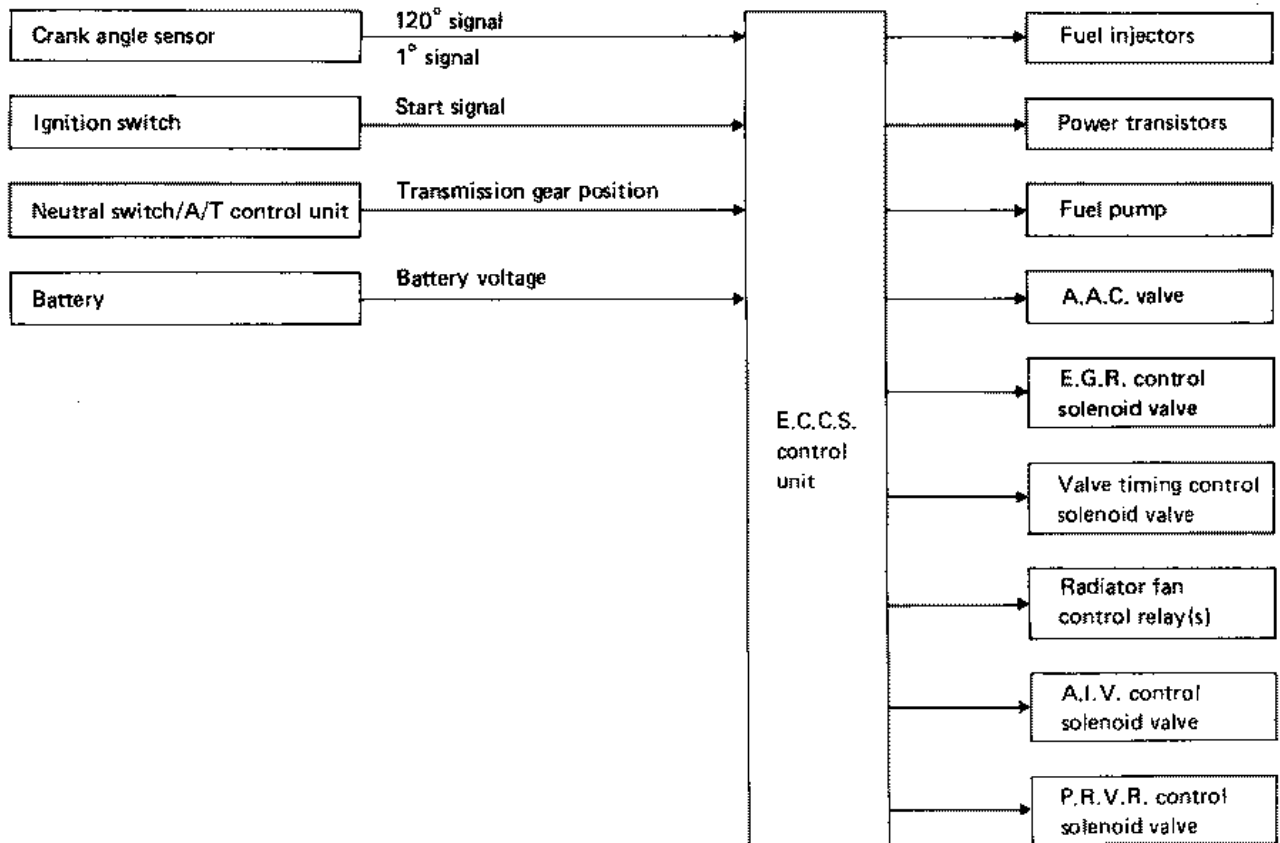
Engine condition	Wastegate valve control solenoid valves	Wastegate valve actuators	Turbocharger pressure
<ul style="list-style-type: none"> ● Engine running or cranking ● Throttle sensor output voltage: more than 0.1V ● Judged fuel quality: high octane (Detecting no sign of detonation) 	ON	Lead to suction pipe or turbocharger compressor outlet	HIGH
<ul style="list-style-type: none"> ● Except the above 	OFF	Lead to turbocharger compressor outlet	LOW

ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

Fail-safe System

C.P.U. MALFUNCTION OF E.C.U.

Input/output signal line



Outline

The fail-safe system makes engine starting possible if there is something malfunctioning in the E.C.U.'s C.P.U. circuit.

In former models, engine starting was difficult under the previously mentioned conditions. But with the provisions in this fail-safe system, it is possible to start the engine.

ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

Fail-safe System (Cont'd)

Fail-safe system activating condition when E.C.U. is malfunctioning

The fail-safe mode operation starts when the computing function of the E.C.U. is judged to be malfunctioning.

When the fail-safe system activates, i.e. if a malfunction condition is detected in the C.P.U. of the E.C.U., the CHECK ENGINE LIGHT on the instrument panel lights to warn the driver.

Engine control, with fail-safe system, operates when E.C.U. is malfunctioning

When the fail-safe system is operating, fuel injection, ignition timing, fuel pump operation, engine idle speed, E.G.R. operation, and so on are controlled under certain limitations.

Cancellation of fail-safe system when E.C.U. is malfunctioning

Activation of the fail-safe system is canceled each time the ignition switch is turned OFF. The system is reactivated if all of the activating conditions are satisfied after turning the ignition switch from OFF to ON.

AIR FLOW METER MALFUNCTION

If the air flow meter output voltage is above or below the specified value, the E.C.U. senses an air flow meter malfunction. In case of a malfunction, the throttle sensor substitutes for the air flow meter.

Although the air flow meter is malfunctioning, it is possible to start the engine and drive the vehicle. But engine speed will not rise more than 2,400 rpm in order to inform the driver of fail-safe system operation while driving.

Operation

Engine condition	Starter switch	Fail-safe system	Fail-safe functioning
Stopped	ANY	Does not operate	—
Cranking	ON	Operates	Engine will be started by a pre-determined injection pulse on E.C.U.
Running	OFF		Engine speed will not rise above 2,400 rpm

ENGINE TEMPERATURE SENSOR MALFUNCTION

When engine temperature sensor output voltage is below or above the specified value, engine coolant temperature is fixed at the preset value as follows:

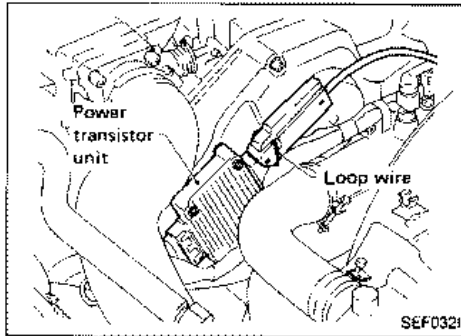
Engine condition	Engine coolant temperature preset value °C (°F)
Start	20 (68)
Running	80 (176)

FUEL TEMPERATURE SENSOR MALFUNCTION

When fuel temperature sensor output voltage is below or above the specified value, fuel temperature is fixed at the preset value as follows:

Engine condition	Fuel temperature preset value °C (°F)
Start	20 (68)
Running	80 (176)

ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION



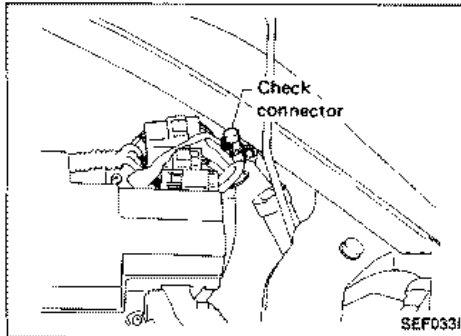
Direct Ignition System

CHECKING IDLE SPEED AND IGNITION TIMING

Idle speed

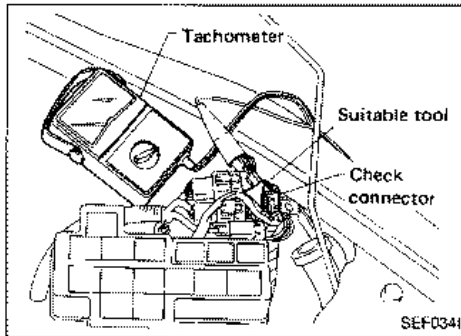
- **Method A (With pulse type tachometer)**

Clamp loop wire as shown.

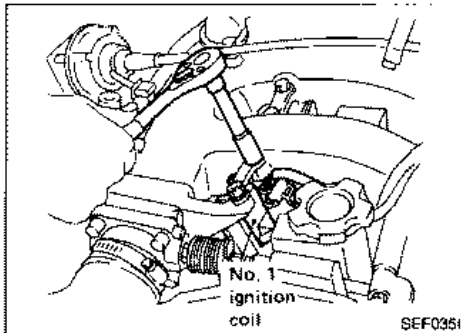


- **Method B (With voltage type tachometer)**

1. Disconnect check connector (Harness color: Y/R) for tachometer.



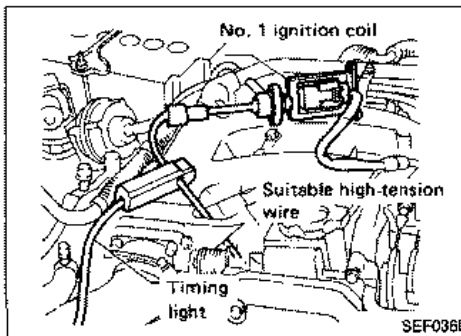
2. Connect tachometer using a suitable tool.



Ignition timing

- **Method A (Without S.S.T.)**

1. Remove No. 1 ignition coil.



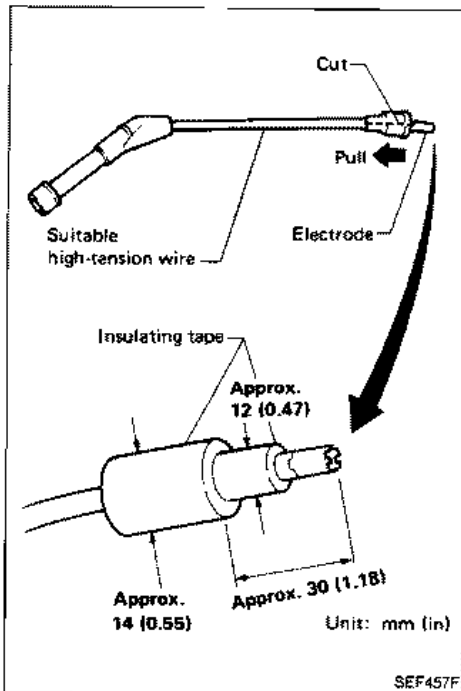
2. Connect No. 1 ignition coil and No. 1 spark plug with a suitable high-tension wire as shown, and attach timing light clamp to this wire.

3. Check ignition timing.

ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

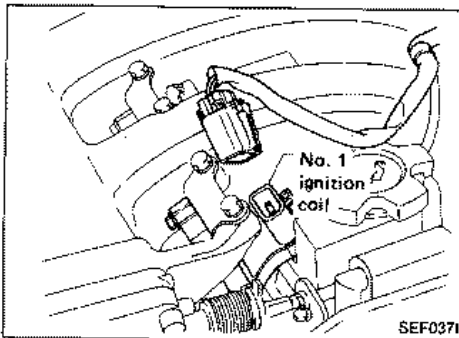
Direct Ignition System (Cont'd)

4. For above procedures, enlarge the end of a suitable high-tension wire with insulating tape as shown.

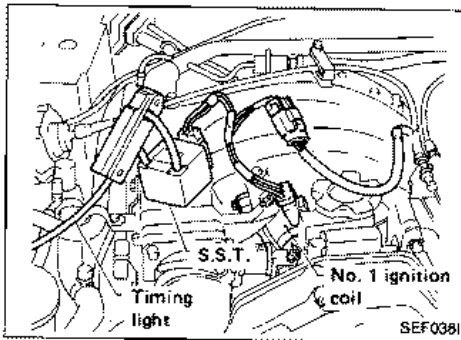


• Method B (With S.S.T.)

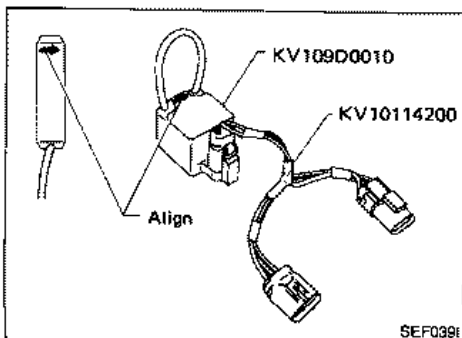
1. Disconnect connector of No. 1 ignition coil.



2. Connect S.S.T. and clamp wire with timing light as shown.
3. Check ignition timing.



Align direction marks on S.S.T. and timing light clamp if aligning mark is punched.



IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION

PREPARATION

1. Make sure that the following parts are in good order.
 - Battery
 - Ignition system
 - Engine oil and coolant levels
 - Fuses
 - E.C.U. harness connector
 - Vacuum hoses
 - Air intake system
(Oil filler cap, oil level gauge, etc.)
 - Fuel pressure
 - Engine compression
 - E.G.R. control valve operation
 - Throttle valve
2. On air conditioner equipped models, checks

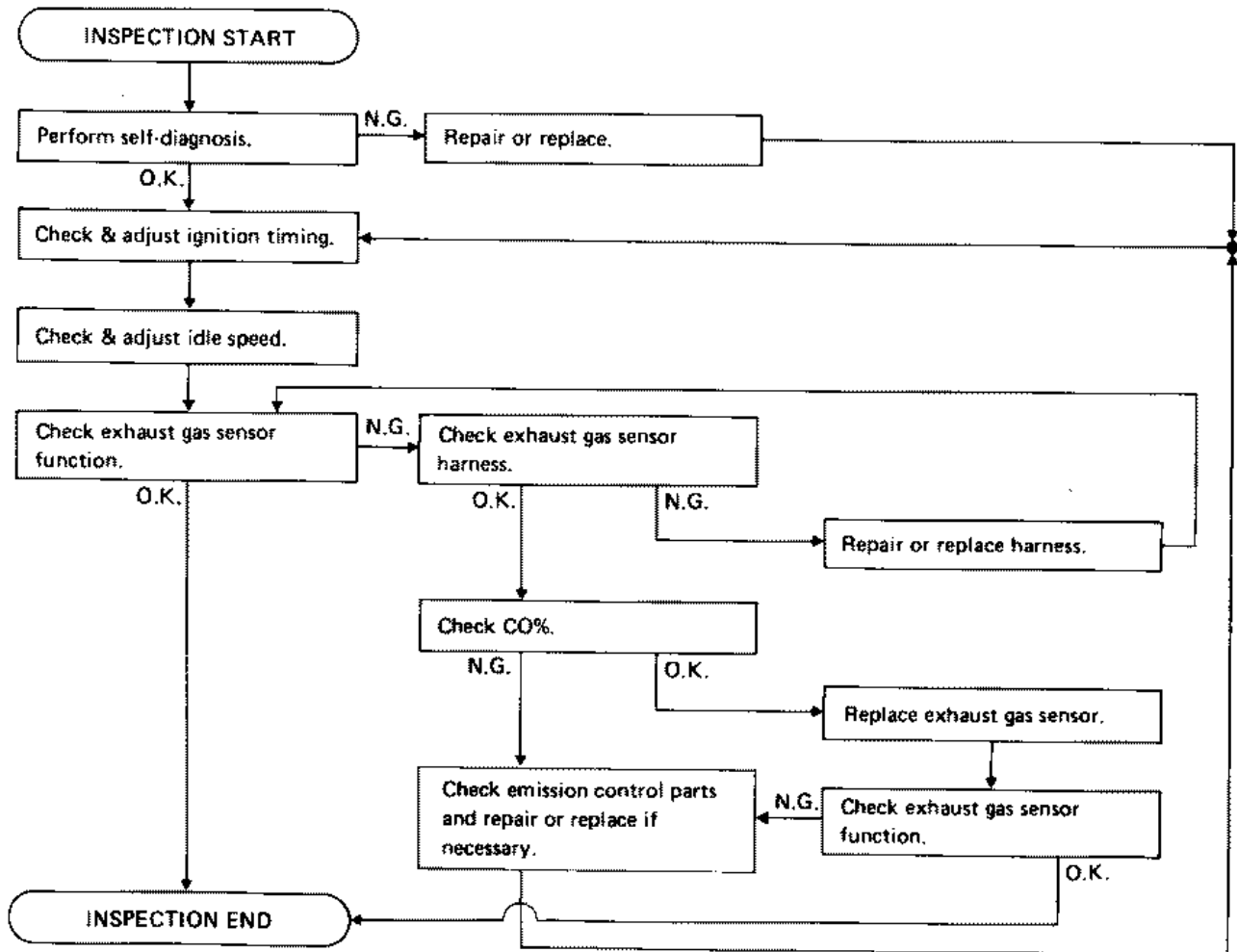
should be carried out while the air conditioner is "OFF".

3. On automatic transmission equipped models, when checking idle rpm, ignition timing and mixture ratio, checks should be carried out while shift lever is in "N" position.
4. When measuring "CO" percentage, insert probe more than 40 cm (15.7 in) into tail pipe.
5. Turn off headlamps, heater blower, rear defogger.
6. Keep front wheels pointed straight ahead.
7. Make the check after the radiator fan has stopped.

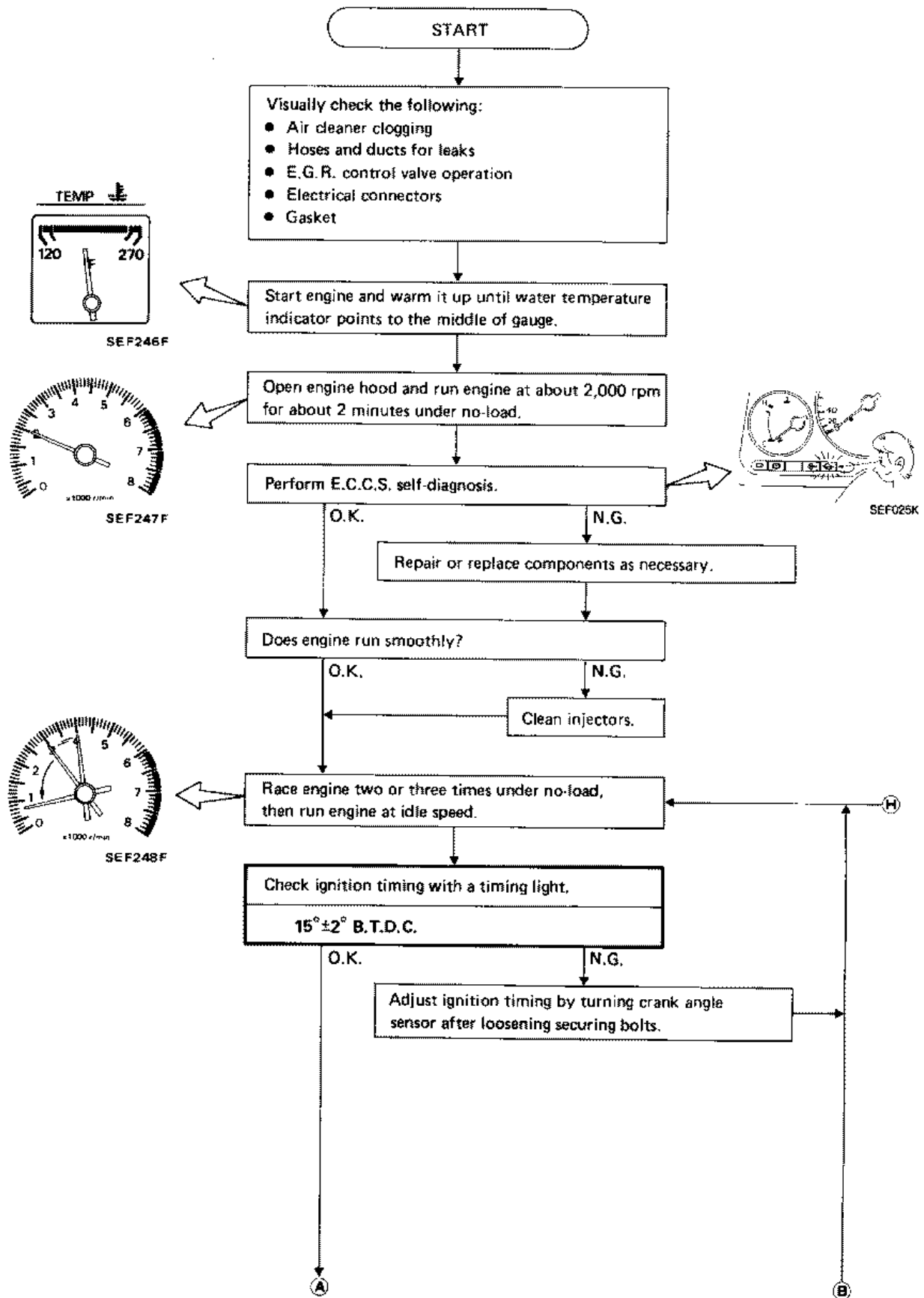
WARNING:

Apply parking brake and block both front and rear wheels with chocks.

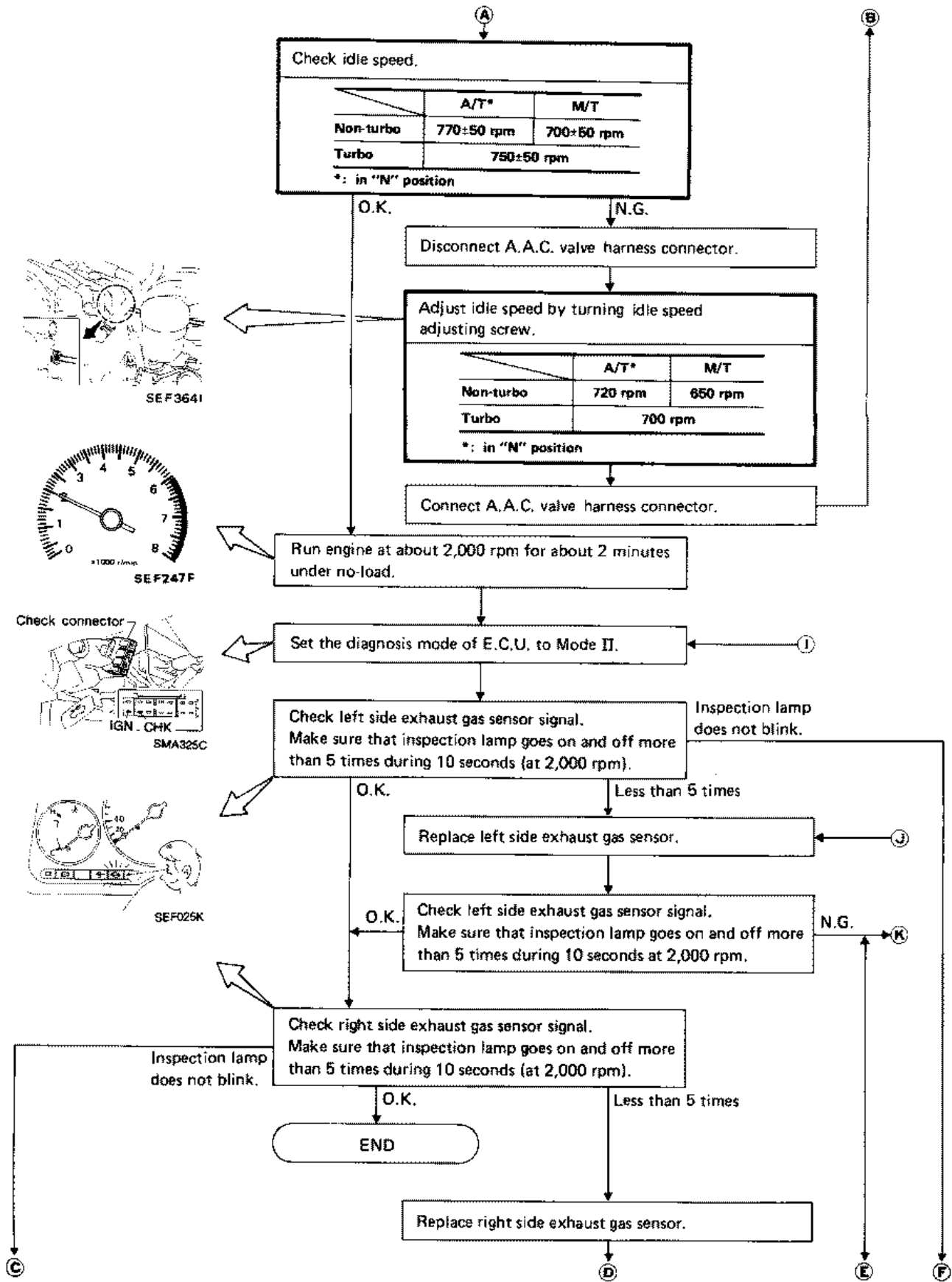
Overall inspection sequence



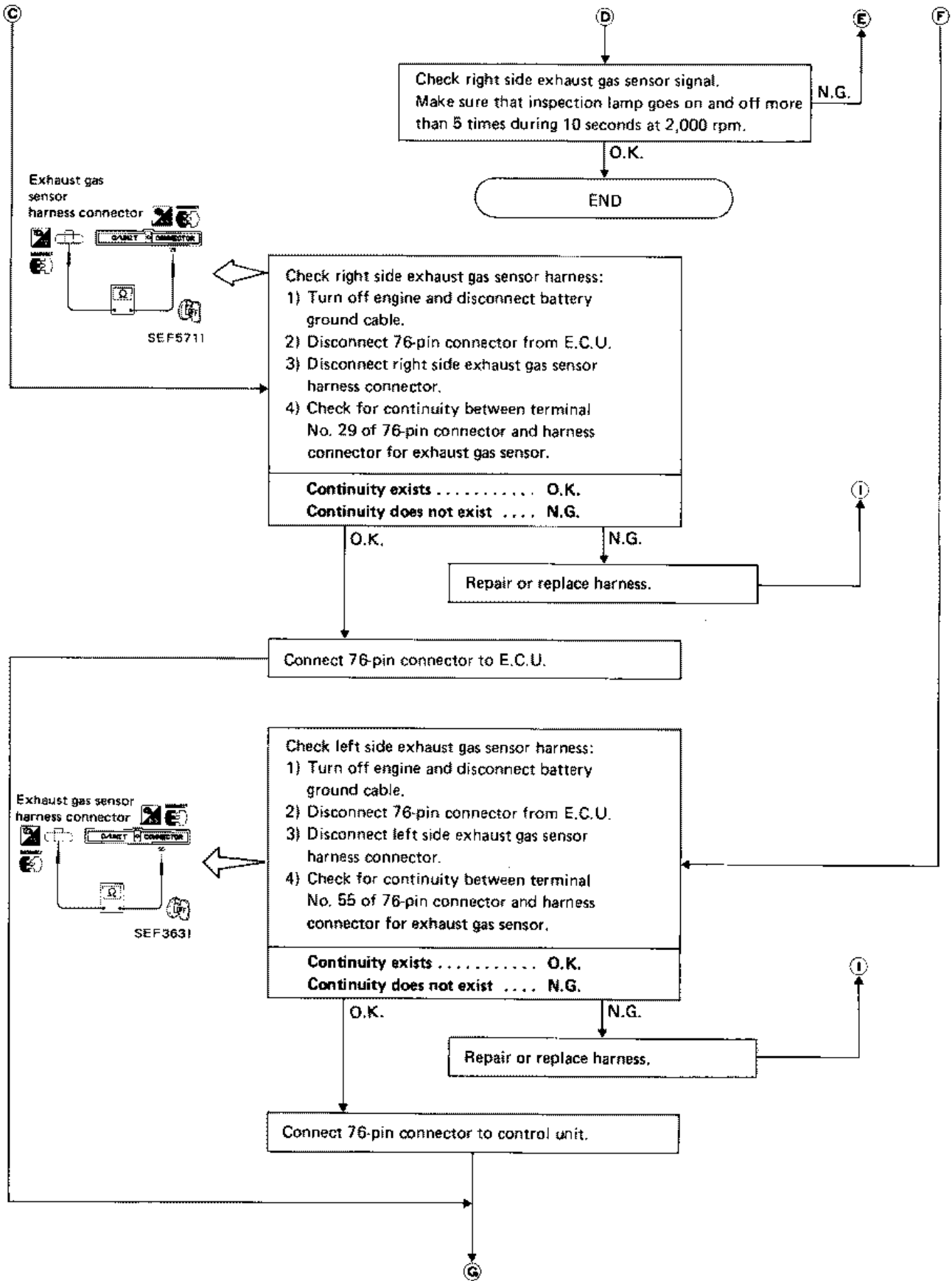
IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION



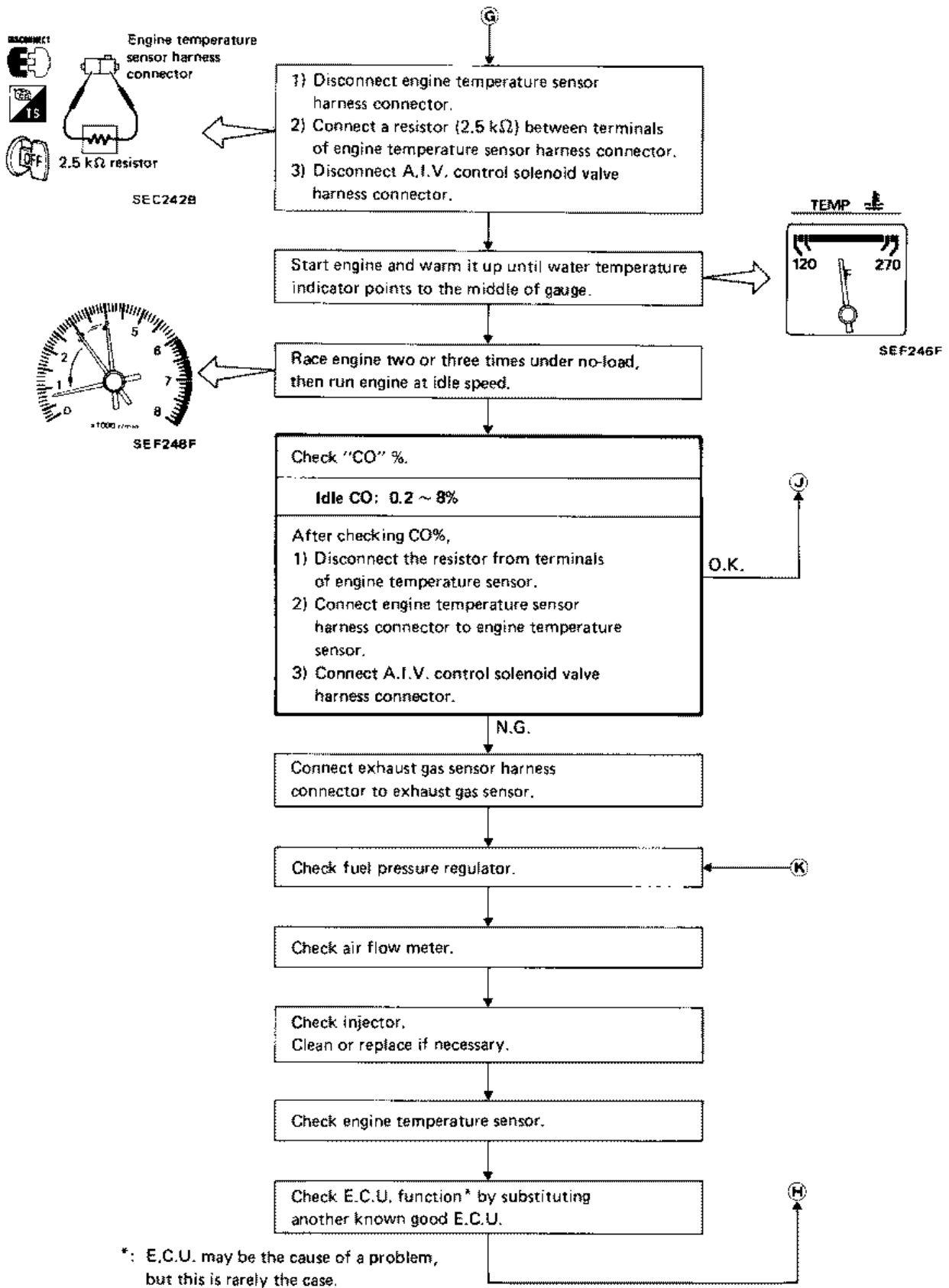
IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION



IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION



IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION



TROUBLE DIAGNOSES

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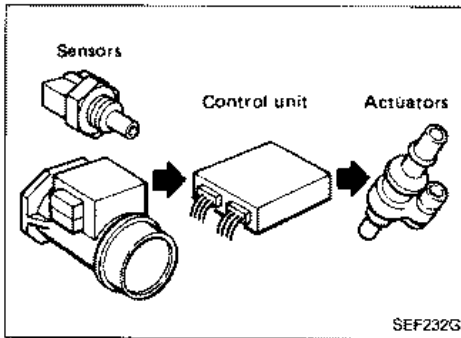
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TROUBLE DIAGNOSES

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TROUBLE DIAGNOSES



How to Perform Trouble Diagnoses for Quick and Accurate Repair

INTRODUCTION

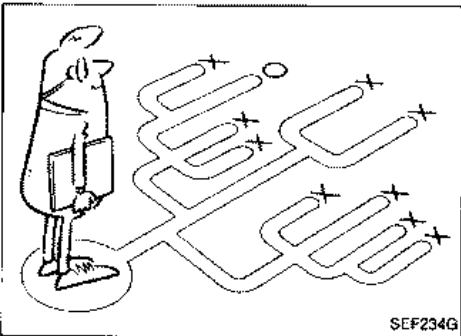
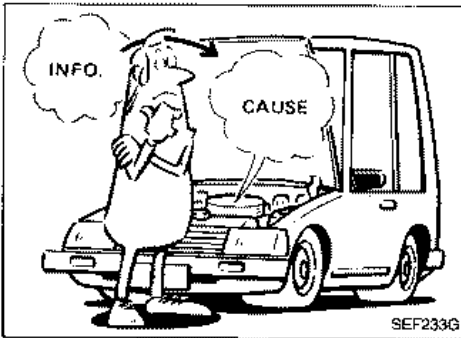
The engine has an electronic control unit to control major systems such as fuel control, ignition control, idle speed control, etc. The control unit accepts input signals from sensors and instantly drives actuators. It is essential that both kinds of signals are proper and stable. At the same time, it is important that there are no conventional problems such as vacuum leaks, fouled spark plugs, or other problems with the engine.

It is much more difficult to diagnose a problem that occurs intermittently rather than continuously. Most intermittent problems are caused by poor electric connections or improper wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts.

A visual check only may not find the cause of the problems, so a road test with a circuit tester connected to a suspected circuit should be performed.

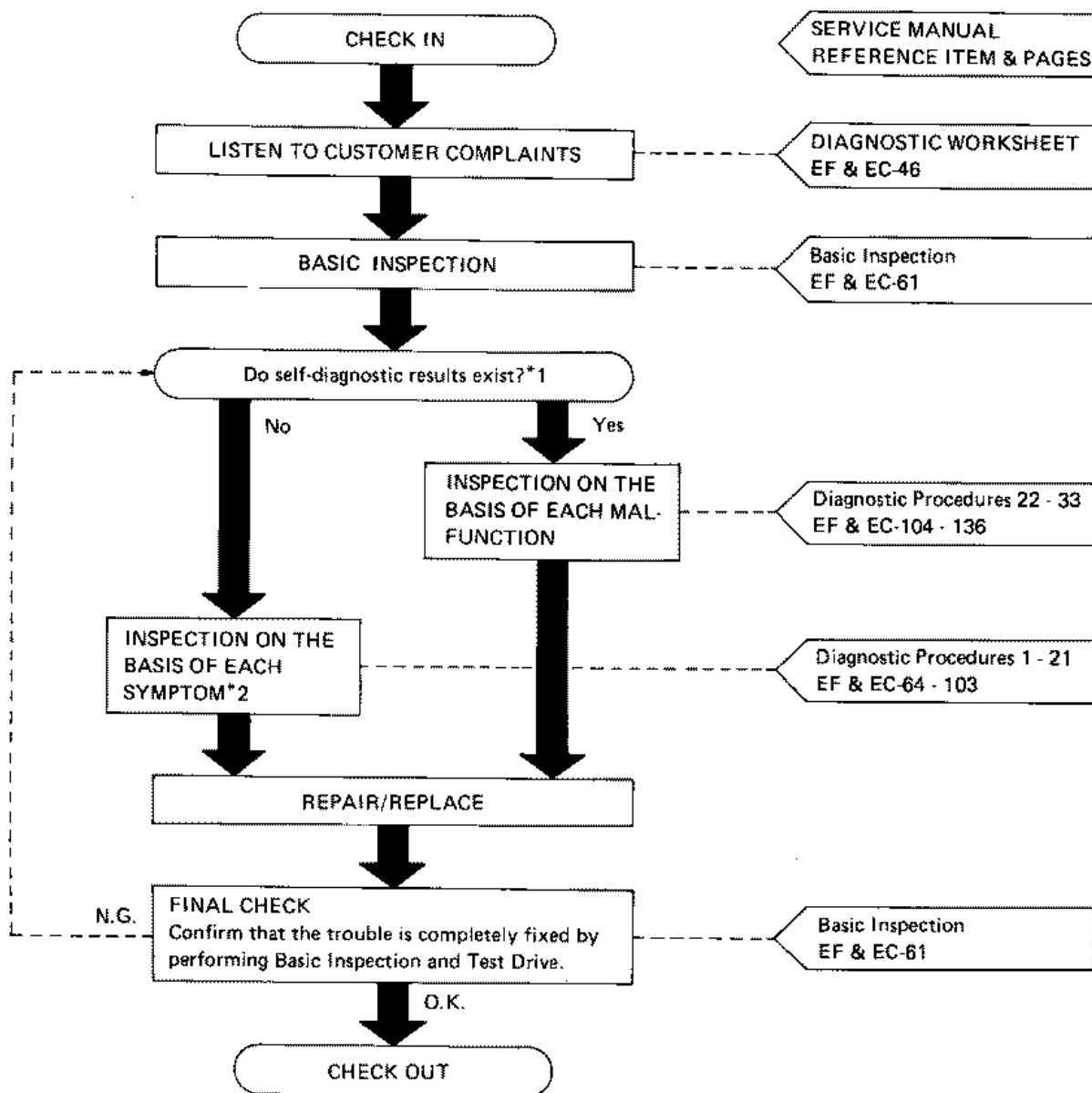
Before undertaking actual checks, take just a few minutes to talk with a customer who approaches with a driveability complaint. The customer is a very good supplier of information on such problems, especially intermittent ones. Through interaction with the customer, find out what symptoms are present and under what conditions they occur.

Start your diagnosis by looking for "conventional" problems first. This is one of the best ways to troubleshoot driveability problems on an electronically controlled engine vehicle.



TROUBLE DIAGNOSES

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd) WORK FLOW



*1: If the self-diagnosis cannot be performed, check main power supply and ground circuit. (See Diagnostic Procedure 22.)

*2: If the trouble is not duplicated, see INTERMITTENT PROBLEM SIMULATION (EF & EC-47).

TROUBLE DIAGNOSES

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

KEY POINTS	
WHAT Vehicle & engine model
WHEN Date, Frequencies
WHERE Road conditions
HOW Operating conditions, Weather conditions, Symptoms

DIAGNOSTIC WORKSHEET

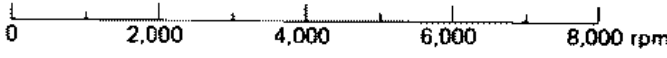
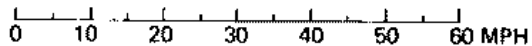
There are many kinds of operating conditions that lead to malfunctions on engine components.

A good grasp of such conditions can make trouble-shooting faster and more accurate.

In general, feelings for a problem depend on each customer. It is important to fully understand the symptoms or under what conditions a customer complains.

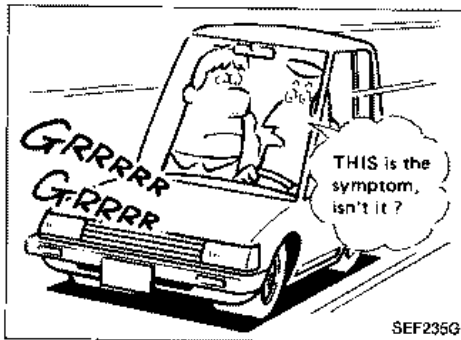
Make good use of a diagnostic worksheet such as the one shown below in order to utilize all the complaints for trouble-shooting.

Worksheet sample

Customer name MR/MS		Model & Year	VIN
Engine #		Trans.	Mileage
Incident Date		Manuf. Date	In Service Date
Symptoms	<input type="checkbox"/> Startability	<input type="checkbox"/> Impossible to start <input type="checkbox"/> No combustion <input type="checkbox"/> Partial combustion <input type="checkbox"/> Partial combustion affected by throttle position <input type="checkbox"/> Partial combustion NOT affected by throttle position <input type="checkbox"/> Possible but hard to start <input type="checkbox"/> Others []	
	<input type="checkbox"/> Idling	<input type="checkbox"/> No fast idle <input type="checkbox"/> Unstable <input type="checkbox"/> High idle <input type="checkbox"/> Low idle <input type="checkbox"/> Others []	
	<input type="checkbox"/> Driveability	<input type="checkbox"/> Stumble <input type="checkbox"/> Surge <input type="checkbox"/> Detonation <input type="checkbox"/> Lack of power <input type="checkbox"/> Intake backfire <input type="checkbox"/> Exhaust backfire <input type="checkbox"/> Others []	
	<input type="checkbox"/> Engine stall	<input type="checkbox"/> At the time of start <input type="checkbox"/> While idling <input type="checkbox"/> While accelerating <input type="checkbox"/> While decelerating <input type="checkbox"/> Just after stopping <input type="checkbox"/> While loading	
Incident occurrence		<input type="checkbox"/> Just after delivery <input type="checkbox"/> Recently <input type="checkbox"/> In the morning <input type="checkbox"/> At night <input type="checkbox"/> In the daytime	
Frequency		<input type="checkbox"/> All the time <input type="checkbox"/> Under certain conditions <input type="checkbox"/> Sometimes	
Weather conditions		<input type="checkbox"/> Not affected	
	Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Raining <input type="checkbox"/> Snowing <input type="checkbox"/> Others []	
	Temperature	<input type="checkbox"/> Hot <input type="checkbox"/> Warm <input type="checkbox"/> Cool <input type="checkbox"/> Cold <input type="checkbox"/> Humid °F	
Engine conditions		<input type="checkbox"/> Cold <input type="checkbox"/> During warm-up <input type="checkbox"/> After warm-up Engine speed 	
Road conditions		<input type="checkbox"/> In town <input type="checkbox"/> In suburbs <input type="checkbox"/> Highway <input type="checkbox"/> Off road (up/down)	
Driving conditions		<input type="checkbox"/> Not affected <input type="checkbox"/> At starting <input type="checkbox"/> While idling <input type="checkbox"/> At racing <input type="checkbox"/> While accelerating <input type="checkbox"/> While cruising <input type="checkbox"/> While decelerating <input type="checkbox"/> While turning (RH/LH) Vehicle speed 	
Check engine light		<input type="checkbox"/> Turned on <input type="checkbox"/> Not turned on	

TROUBLE DIAGNOSES

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)



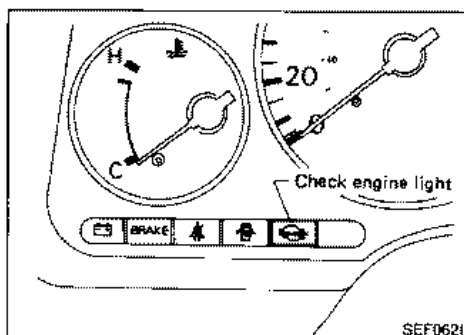
INTERMITTENT PROBLEM SIMULATION

In order to duplicate an intermittent problem, it is effective to create similar conditions for component parts, under which the problem might occur.

Perform the activity listed under Service procedure and note the result.

	Variable factor	Influential part	Target condition	Service procedure
1	Mixture ratio	Pressure regulator	Made lean	Remove vacuum hose and apply vacuum.
			Made rich	Remove vacuum hose and apply pressure.
2	Ignition timing	Crank angle sensor	Advanced	Rotate distributor counterclockwise.
			Retarded	Rotate distributor clockwise.
3	Mixture ratio feedback control	Exhaust gas sensor	Suspended	Disconnect exhaust gas sensor harness connector.
		Control unit	Operation check	Perform self-diagnosis (Mode II) at 2,000 rpm.
4	Idle speed	A.A.C. valve	Raised	Turn idle adjusting screw counterclockwise.
			Lowered	Turn idle adjusting screw clockwise.
5	Electrical connection (Electric continuity)	Harness connectors and wires	Poor electrical connection or improper wiring	Tap or wiggle. Race engine rapidly. See if the torque reaction of the engine unit causes electric breaks.
6	Temperature	Control unit	Cooled	Cool with an icing spray or similar device.
			Warmed	Heat with a hair drier. [WARNING: Do not overheat the unit.]
7	Moisture	Electric parts	Damp	Wet. [WARNING: Do not directly pour water on components. Use a mist sprayer.]
8	Electric loads	Load switches	Loaded	Turn on headlamps, air conditioner, rear defogger, etc.
9	Idle switch condition	Control unit	ON-OFF switching	Rotate throttle sensor body.
10	Ignition spark	Timing light	Spark power check	Try to flash timing light for each cylinder using ignition coil adapter (S.S.T.).

TROUBLE DIAGNOSES

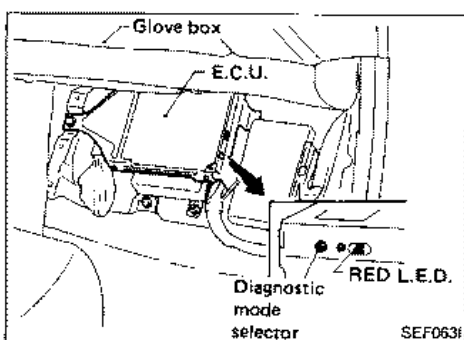


SEF062I

Self-diagnosis

CHECK ENGINE LIGHT

A check engine light has been adopted. This light blinks simultaneously with the RED L.E.D. on the E.C.U.



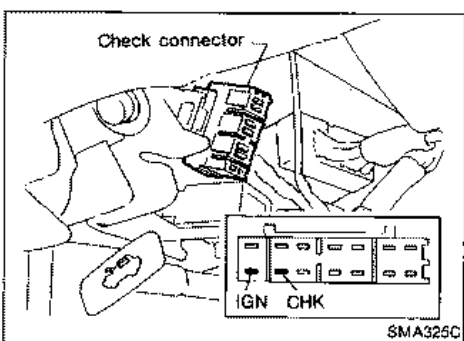
SEF063I

E.C.U. L.E.D.

In the E.C.U., the Green and Red L.E.D.'s have now been permanently changed to one RED L.E.D.

DIAGNOSTIC MODE SELECTOR

The diagnostic mode selector is on the side of the E.C.U.





SMA325C

CHECK CONNECTOR

The check connector is under the driver's side dash.

SELF-DIAGNOSTIC FUNCTION

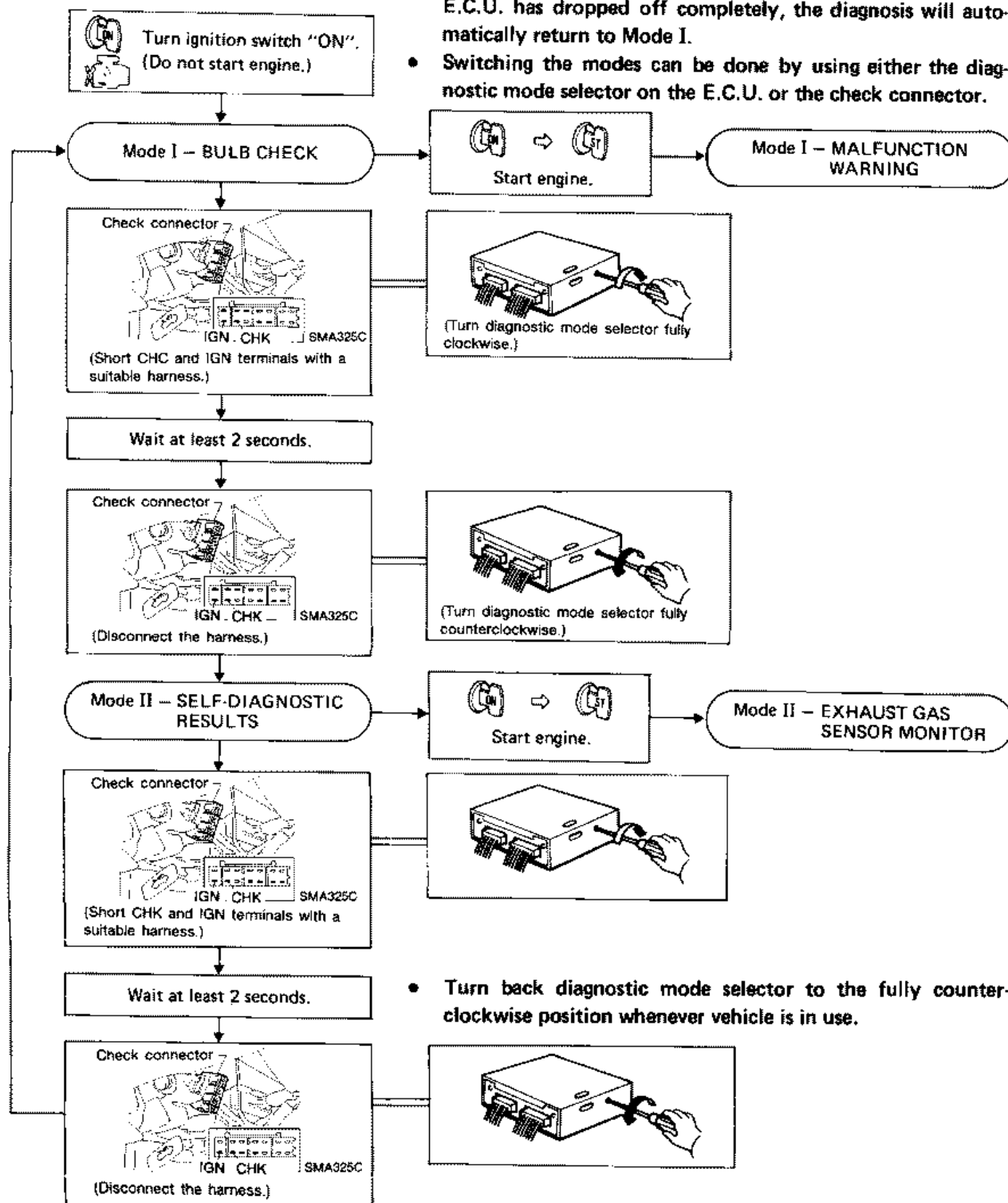
		Mode	
		Mode I	Mode II
Ignition switch in "ON" position	Engine stopped 	BULB CHECK	SELF-DIAGNOSTIC RESULTS
	Engine running 	MALFUNCTION WARNING	EXHAUST GAS SENSOR MONITOR

TROUBLE DIAGNOSES

Self-diagnosis (Cont'd)

HOW TO SWITCH MODES

- Switching the modes is not possible when the engine is running.
- When the ignition switch is turned off during diagnosis in each mode, and then turned back on again after power to the E.C.U. has dropped off completely, the diagnosis will automatically return to Mode I.
- Switching the modes can be done by using either the diagnostic mode selector on the E.C.U. or the check connector.



- Turn back diagnostic mode selector to the fully counterclockwise position whenever vehicle is in use.

TROUBLE DIAGNOSES

Self-diagnosis — Mode I

MODE I — BULB CHECK

In this mode, the RED L.E.D. in the E.C.U. and the CHECK ENGINE LIGHT in the instrument panel stay "ON".

If either remain "OFF", check the bulb in the CHECK ENGINE LIGHT or the RED L.E.D.

MODE I — MALFUNCTION WARNING

CHECK ENGINE LIGHT and RED L.E.D.	Condition
ON	When the E.C.U.'s C.P.U. is malfunctioning.
OFF	O.K.

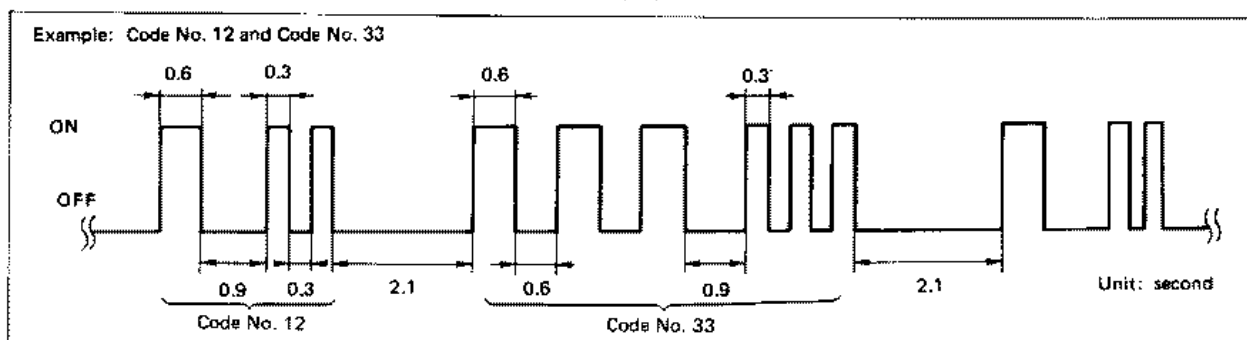
Self-diagnosis — Mode II (Self-diagnostic results)

CAUTION:

The mode selector on the E.C.U. must be returned to the fully counterclockwise position, except when switching the modes.

DESCRIPTION

In this mode, a malfunction code is indicated by the number of flashes from the RED L.E.D. or the CHECK ENGINE LIGHT as shown below:



Long (0.6 second) blinking indicates the number of ten digits and short (0.3 second) blinking indicates the number of single digits. For example, the red L.E.D. flashes once for 0.6 seconds and then it flashes twice for 0.3 seconds. This indicates the number "12" and refers to a malfunction in the air flow meter. In this way, all the problems are classified by their code numbers.

TROUBLE DIAGNOSES

Self-diagnosis — Mode II (Self-diagnostic results) (Cont'd)

Display code table

Code No.	Detected items
11	Crank angle sensor circuit
12	Air flow meter circuit
13	Engine temperature sensor circuit
21	Ignition signal circuit
34	Detonation sensor circuit
42	Fuel temperature sensor circuit
43	Throttle sensor circuit
54	Signal circuit from A/T control unit to E.C.U. (A/T only)
55	No malfunction in the above circuits

Code No.	Detected items	Malfunction is detected when ...	Check item (remedy)
*11	Crank angle sensor circuit	<ul style="list-style-type: none"> ● Either 1° or 120° signal is not entered for the first few seconds during engine cranking. ● Either 1° or 120° signal is not input often enough while the engine speed is higher than the specified rpm. 	<ul style="list-style-type: none"> ● Harness and connector (If harness and connector are normal, replace crank angle sensor.)
12	Air flow meter circuit	<ul style="list-style-type: none"> ● The air flow meter circuit is open or shorted. (An abnormally high or low voltage is entered.) 	<ul style="list-style-type: none"> ● Harness and connector (If harness and connector are normal, replace air flow meter.)
13	Engine temperature sensor circuit	<ul style="list-style-type: none"> ● The engine temperature sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.) 	<ul style="list-style-type: none"> ● Harness and connector ● Engine temperature sensor
*21	Ignition signal circuit	<ul style="list-style-type: none"> ● The ignition signal in the primary circuit is not entered during engine cranking or running. 	<ul style="list-style-type: none"> ● Harness and connector ● Power transistor unit
34	Detonation sensor circuit	<ul style="list-style-type: none"> ● The detonation circuit is open or shorted. (An abnormally high or low voltage is entered.) 	<ul style="list-style-type: none"> ● Harness and connector ● Detonation sensor
42	Fuel temperature sensor circuit	<ul style="list-style-type: none"> ● The fuel temperature sensor circuit is open or shorted. (An abnormally high or low voltage is entered.) 	<ul style="list-style-type: none"> ● Harness and connector ● Fuel temperature sensor
43	Throttle sensor circuit	<ul style="list-style-type: none"> ● The throttle sensor circuit is open or shorted. (An abnormally high or low voltage is entered.) 	<ul style="list-style-type: none"> ● Harness and connector ● Throttle sensor
54	Signal circuit from A/T control unit to E.C.U. (A/T only)	<ul style="list-style-type: none"> ● The A/T communication line is open or shorted. 	<ul style="list-style-type: none"> ● Harness and connector

*: Check items causing a malfunction of crank angle sensor circuit first, if both code No. 11 and 21 are displayed at the same time.

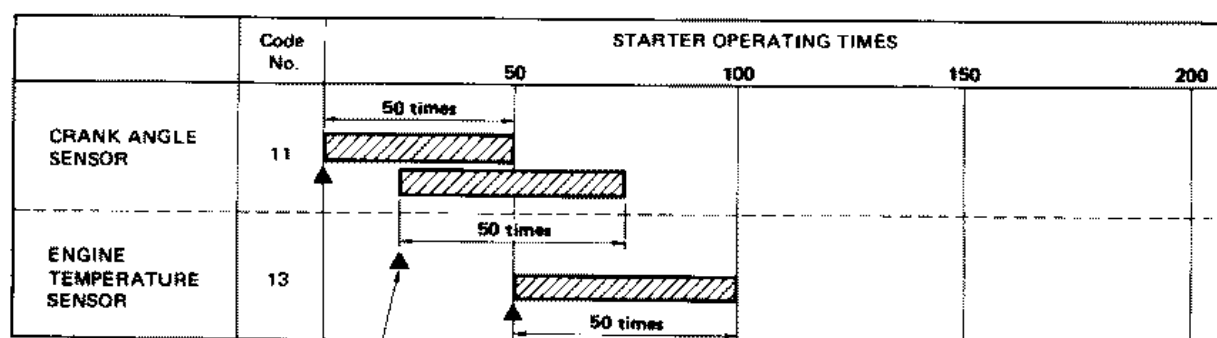
TROUBLE DIAGNOSES

Self-diagnosis — Mode II (Self-diagnostic results) (Cont'd)

RETENTION OF DIAGNOSTIC RESULTS

The diagnostic results will remain in E.C.U. memory until the starter is operated fifty times after a diagnostic item has been judged to be malfunctioning. The diagnostic result will then be cancelled automatically. If a diagnostic item which has been judged to be malfunctioning and stored in memory is again judged to be malfunctioning before the starter is operated fifty times, the second result will replace the previous one. It will be stored in E.C.U. memory until the starter is operated fifty times more.

RETENTION TERM CHART (Example)



If the same diagnostic item is judged to be malfunctioning before the starter is operated fifty times, it will be stored in E.C.U. memory until the starter is operated fifty times from this point in time.



: Retention term



: Malfunction detecting point

SEF793D

HOW TO ERASE SELF-DIAGNOSTIC RESULTS

The malfunction code is erased from the backup memory on the E.C.U. when the diagnostic mode is changed from Mode II to Mode I. (Refer to "HOW TO SWITCH MODES".)

- When the battery terminal is disconnected, the malfunction code will be lost from the backup memory within 24 hours.
- Before starting self-diagnosis, do not erase the stored memory before beginning self-diagnosis.

TROUBLE DIAGNOSES

Self-diagnosis — Mode II (Exhaust gas sensor monitor)

DESCRIPTION

In this mode, the CHECK ENGINE LIGHT and RED L.E.D. display the condition of the fuel mixture (lean or rich) which is monitored by the exhaust gas sensor.

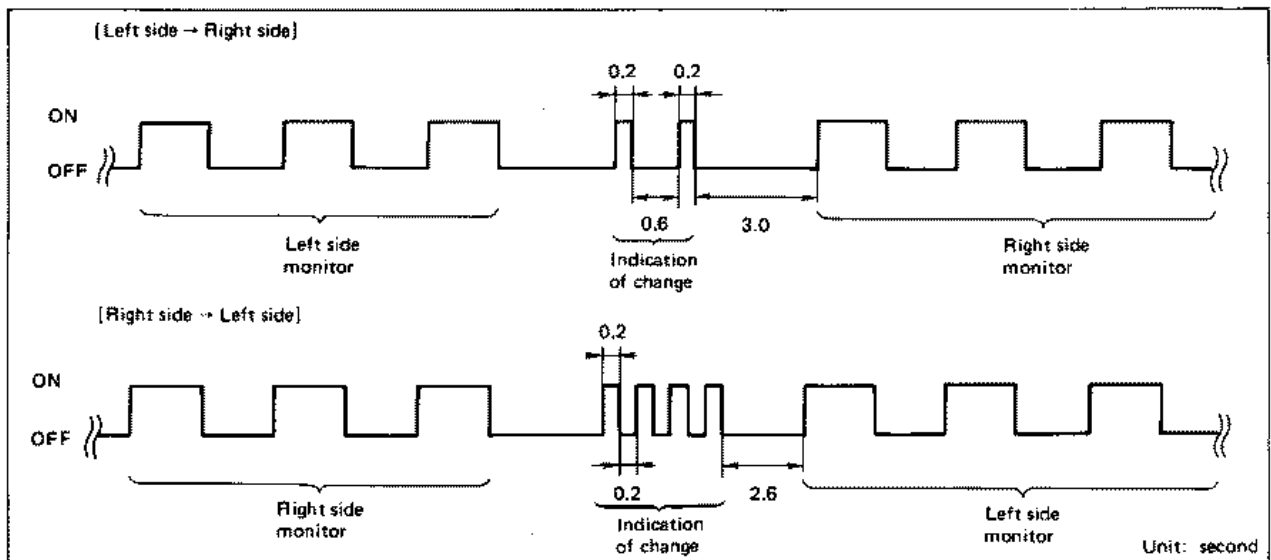
CHECK ENGINE LIGHT and RED L.E.D.	Fuel mixture condition in the exhaust gas	Air fuel ratio feedback control condition
ON	Lean	Closed loop control
OFF	Rich	
*Remains ON or OFF	Any condition	Open loop control

*: Maintains conditions just before switching to open loop.

If two exhaust gas sensors (right side and left side) are fitted on the engine, the left side exhaust gas sensor monitor operates first, when selecting this mode.

HOW TO CHANGE MONITOR FROM LEFT SIDE (Right side) TO RIGHT SIDE (Left side)

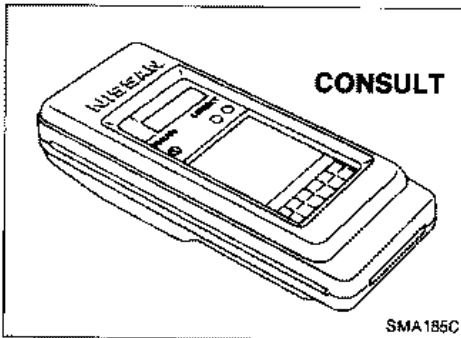
1. Turn diagnostic mode selector on E.C.U. fully clockwise.
 2. Wait at least 2 seconds.
 3. Turn diagnostic mode selector on E.C.U. fully counterclockwise.
- These procedures should be carried out when the engine is running.



HOW TO CHECK EXHAUST GAS SENSOR

1. Set Mode II. (Refer to "HOW TO SWITCH MODES".)
2. Start engine and warm it up until engine coolant temperature indicator points to the middle of the gauge.
3. Run engine at about 2,000 rpm for about 2 minutes under no-load conditions.
4. Make sure RED L.E.D. or CHECK ENGINE LIGHT goes ON and OFF more than 5 times every 10 seconds; measured at 2,000 rpm under no-load.

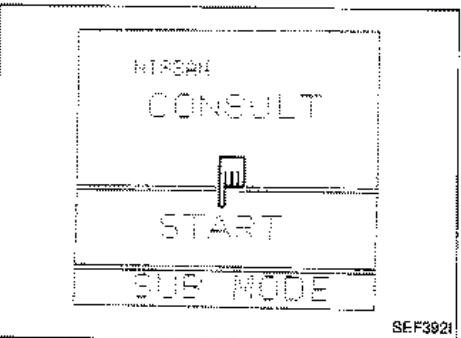
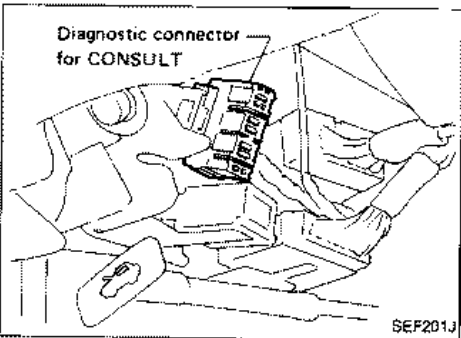
TROUBLE DIAGNOSES



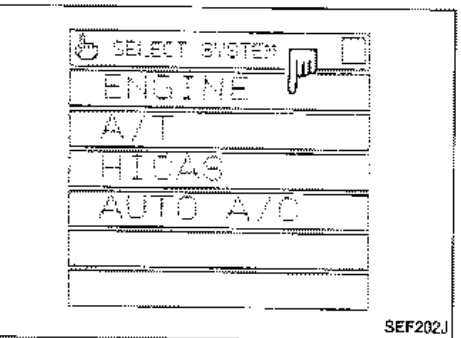
Consult

CONSULT INSPECTION PROCEDURE

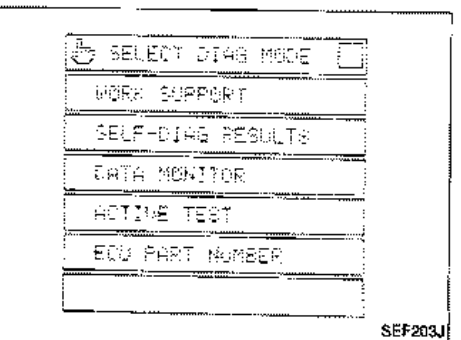
1. Turn off ignition switch.
2. Connect "CONSULT" to diagnostic connector.
(Diagnostic connector is located in left dash side panel.)



3. Turn on ignition switch.
4. Touch "START".



5. Touch "ENGINE".



6. Perform each diagnostic mode according to the inspection sheet as follows:

For further information, see the CONSULT Operation Manual.

TROUBLE DIAGNOSES

Consult (Cont'd)

E.C.C.S. COMPONENT PARTS APPLICATION

MODE		WORK SUPPORT	SELF-DIAGNOSTIC RESULTS	DATA MONITOR	ACTIVE TEST
E.C.C.S. COMPONENT PARTS					
INPUT	Control unit (E.C.U.)		X		
	Crank angle sensor		X	X	
	Air flow meter		X	X	
	Engine temperature sensor		X	X	X
	Exhaust gas sensors		X*	X	
	Vehicle speed sensor		X*	X	
	Throttle sensor	X	X	X	
	Fuel temperature sensor		X	X	
	Defonation sensor		X		
	Ignition switch (start signal)			X	
	Air conditioner switch			X	
	Neutral switch			X	
	Power steering oil pressure switch			X	
	Battery			X	
	A/T signal		X	X	
	*	Exhaust gas temperature sensor		X*	X*
OUTPUT	Injectors		X*	X	X
	Power transistors (ignition signal)	X (ignition timing)	X	X (ignition timing)	X
	A.A.C. valve	X		X	X
	F.I.C.D. solenoid valve			X	X
	Valve timing control solenoid valve			X	X
	A.I.V. control solenoid valve			X	X
	P.R.V.R. control solenoid valve		X*		X
	E.G.R. control solenoid valve			X	X
	Wastegate valve control solenoid valves			X	
	Air conditioner relay			X	
	Fuel pump relay	X		X	X
	Radiator fan			X	X

X: Applicable * : U.S.A. model

TROUBLE DIAGNOSES

Consult (Cont'd)

FUNCTION

Diagnostic mode	Function
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT unit.
Self-diagnostic results	Self-diagnostic results can be read and erased quickly.
Data monitor	Input/Output data in the control unit can be read.
Active test	Mode in which CONSULT drives some actuators apart from the control units and also shifts some parameters in a specified range.
E.C.U. part numbers	E.C.U. part number can be read.

WORK SUPPORT MODE

WORK ITEM	CONDITION	USAGE
THROTTLE SENSOR ADJUSTMENT	CHECK THE THROTTLE SENSOR SIGNAL. ADJUST IT TO THE SPECIFIED VALUE BY ROTATING THE SENSOR BODY UNDER THE FOLLOWING CONDITIONS. <ul style="list-style-type: none"> ● IGN SW "ON" ● ENG NOT RUNNING ● ACC PEDAL NOT PRESSED 	When adjusting throttle sensor initial position.
IGNITION TIMING ADJUSTMENT*	<ul style="list-style-type: none"> ● IGNITION TIMING FEEDBACK CONTROL WILL BE HELD BY TOUCHING "START". AFTER DOING SO, ADJUST IGNITION TIMING WITH A TIMING LIGHT BY TURNING THE CRANK ANGLE SENSOR. 	When adjusting initial ignition timing.
AAC VALVE ADJUSTMENT	SET ENGINE RPM AT THE SPECIFIED VALUE UNDER THE FOLLOWING CONDITIONS. <ul style="list-style-type: none"> ● ENGINE WARMED UP ● NO-LOAD 	When adjusting idle speed.
FUEL PRESSURE RELEASE	<ul style="list-style-type: none"> ● FUEL PUMP WILL STOP BY TOUCHING "START" DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS. 	When releasing fuel pressure from fuel line.

*: The ignition timing feedback control is not adopted on model 300ZX, so it is not necessary to perform IGNITION TIMING ADJUSTMENT.

TROUBLE DIAGNOSES

Consult (Cont'd)

SELF-DIAGNOSTIC RESULTS MODE

DIAGNOSTIC ITEM	DIAGNOSTIC ITEM IS DETECTED WHEN ...	CHECK ITEM (REMEDY)
CRANK ANGLE SENSOR*	<ul style="list-style-type: none"> ● Either 1° or 120° signal is not entered for the first few seconds during engine cranking. ● Either 1° or 120° signal is not input often enough while the engine speed is higher than the specified rpm. 	<ul style="list-style-type: none"> ● Harness and connector (If harness and connector are normal, replace crank angle sensor.)
AIR FLOW METER	<ul style="list-style-type: none"> ● The air flow meter circuit is open or shorted. (An abnormally high or low voltage is entered.) 	<ul style="list-style-type: none"> ● Harness and connector (If harness and connector are normal, replace air flow meter.)
ENGINE TEMP SENSOR	<ul style="list-style-type: none"> ● The engine temperature sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.) 	<ul style="list-style-type: none"> ● Harness and connector ● Engine temperature sensor
IGN SIGNAL-PRIMARY*	<ul style="list-style-type: none"> ● The ignition signal in primary circuit is not entered during engine cranking or running. 	<ul style="list-style-type: none"> ● Harness and connector ● Power transistor unit
CONTROL UNIT	<ul style="list-style-type: none"> ● E.C.U. calculation function is malfunctioning. 	(Replace E.C.C.S. control unit.)
DETONATION SENSOR	<ul style="list-style-type: none"> ● The detonation circuit is open or shorted. (An abnormally high or low voltage is entered.) 	<ul style="list-style-type: none"> ● Harness and connector ● Detonation sensor
FUEL TEMP SENSOR	<ul style="list-style-type: none"> ● The fuel temperature sensor circuit is open or shorted. (An abnormally high or low voltage is entered.) 	<ul style="list-style-type: none"> ● Harness and connector ● Fuel temperature sensor
THROTTLE SENSOR	<ul style="list-style-type: none"> ● The throttle sensor circuit is open or shorted. (An abnormally high or low voltage is entered.) 	<ul style="list-style-type: none"> ● Harness and connector ● Throttle sensor
A/T COMM LINE	<ul style="list-style-type: none"> ● The A/T communication line is open or shorted. 	<ul style="list-style-type: none"> ● Harness and connector

*: Check items causing a malfunction of crank angle sensor circuit first, if both "CRANK ANGLE SENSOR" and "IGN SIGNAL—PRIMARY" are displayed at the same time.

TROUBLE DIAGNOSES

Consult (Cont'd)

DATA MONITOR MODE

- Remarks:
- The monitor item marked "****" is applicable to vehicles for the U.S.A. only.
 - Specification data are reference values.
 - Specification data are output/input values which are detected or supplied by E.C.U. at the connector.
 - * Specification data may not be directly related to their components signals/values/operations.
 - ie. Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show the specification data in spite of the ignition timing being not adjusted to the specification data. This IGN TIMING monitors the calculated data by E.C.U. according to the input signals from crank angle sensor and other ignition timing related sensors.

MONITOR ITEM	CONDITION		SPECIFICATION		CHECK ITEM WHEN OUTSIDE SPEC.
			Non-turbo	Turbo	
CAS-RPM (POS) CAS-RPM (REF)	<ul style="list-style-type: none"> ● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT value. 		Almost the same speed as the CONSULT value.		<ul style="list-style-type: none"> ● Harness and connector ● Crank angle sensor
AIR FLOW MTR	<ul style="list-style-type: none"> ● Engine: After warming up, idle the engine ● A/C switch "OFF" ● Shift lever "N" ● No-load 	Idle	0.8 - 1.5V	0.9 - 1.4V	<ul style="list-style-type: none"> ● Harness and connector ● Air flow meter
		2,000 rpm	1.4 - 1.8V	1.4 - 1.8V	
ENG TEMP SEN	<ul style="list-style-type: none"> ● Engine: After warming up 		More than 70°C (158°F)		<ul style="list-style-type: none"> ● Harness and connector ● Engine temperature sensor
EXH GAS SEN EXH GAS SEN-R M/R F/C MNT M/R F/C MNT-R	<ul style="list-style-type: none"> ● Engine: After warming up 	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ 0.6 - 1.0V		<ul style="list-style-type: none"> ● Harness and connector ● Exhaust gas sensor ● Intake air leaks ● Injectors
LEAN ↔ RICH					
Changes more than 5 times during 10 seconds.					
CAR SPEED SEN	<ul style="list-style-type: none"> ● Turn drive wheels and compare speedometer indication with the CONSULT value 		Almost the same speed as the CONSULT value		<ul style="list-style-type: none"> ● Harness and connector ● Vehicle speed sensor
BATTERY VOLT	<ul style="list-style-type: none"> ● Ignition switch: ON (Engine stopped) 		11 - 14V		<ul style="list-style-type: none"> ● Battery ● E.C.U. power supply circuit
THROTTLE SEN	<ul style="list-style-type: none"> ● Ignition switch: ON (Engine stopped) 	Throttle valve fully closed	0.4 - 0.5V		<ul style="list-style-type: none"> ● Harness and connector ● Throttle sensor ● Throttle sensor adjustment
		Throttle valve fully opened	Approx. 4.0V		
FUEL TEMP SEN	<ul style="list-style-type: none"> ● Engine: After warming up 		20 - 60°C (68 - 140°F)		<ul style="list-style-type: none"> ● Harness and connector ● Fuel temp. sensor
START SIGNAL	<ul style="list-style-type: none"> ● Ignition switch: ON → START 		OFF → ON		<ul style="list-style-type: none"> ● Harness and connector ● Starter switch
IDLE POSITION	<ul style="list-style-type: none"> ● Ignition switch: ON (Engine stopped) 	Throttle valve: Idle position	ON		<ul style="list-style-type: none"> ● Harness and connector ● Throttle sensor ● Throttle sensor adjustment
		Throttle valve: Slightly open	OFF		

TROUBLE DIAGNOSES

Consult (Cont'd)

MONITOR ITEM	CONDITION		SPECIFICATION		CHECK ITEM WHEN OUTSIDE SPEC.
			Non-turbo	Turbo	
AIR COND SIG	● Engine: After warming up, idle the engine	A/C switch "OFF"	OFF		● Harness and connector ● Air conditioner switch
		A/C switch "ON"	ON		
NEUTRAL SW	● Ignition switch: ON	Shift lever "P" or "N"	ON		● Harness and connector ● Neutral switch
		Except above	OFF		
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel in neutral (forward direction)	OFF		● Harness and connector ● Power steering oil pressure switch
		The steering wheel is turned	ON		
INJ PULSE	● Engine: After warming up	Idle	2.0 - 3.0 msec.	1.8 - 2.5 msec.	● Harness and connector ● Injector ● Air flow meter ● Intake air system
INJ PULSE-R	● A/C switch "OFF" ● Shift lever "N" ● No-load	2,000 rpm	2.0 - 3.0 msec.	1.8 - 2.2 msec.	
IGN TIMING	ditto	Idle	15° B.T.D.C.	15° B.T.D.C.	● Harness and connector ● Crank angle sensor
		2,000 rpm	More than 25° B.T.D.C.	More than 25° B.T.D.C.	
AAC VALVE	ditto	Idle	15 - 40%	15 - 35%	● Harness and connector ● A.A.C. valve
		2,000 rpm	—	—	
EGR TEMP SEN**	● Engine: After warming up		Less than 4.5V		● Harness and connector ● Exhaust gas temperature sensor

TROUBLE DIAGNOSES

Consult (Cont'd)

ACTIVE TEST MODE

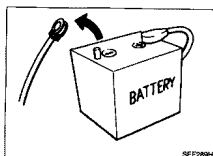
TEST ITEM	CONDITION	JUDGMENT	CHECK ITEM (REMEDY)
FUEL INJECTION TEST	<ul style="list-style-type: none"> Engine: Return to the original trouble condition Change the amount of fuel injection with the CONSULT. 	If trouble symptom disappears, see CHECK ITEM.	<ul style="list-style-type: none"> Harness and connector Fuel injectors Exhaust gas sensor
AAC/V OPENING TEST	<ul style="list-style-type: none"> Engine: After warming up, idle the engine. Change the AAC valve opening percent with the CONSULT. 	Engine speed changes according to the opening percent.	<ul style="list-style-type: none"> Harness and connector AAC valve
ENGINE TEMP TEST	<ul style="list-style-type: none"> Engine: Return to the original trouble condition Change the engine coolant temperature with the CONSULT. 	If trouble symptom disappears, see CHECK ITEM.	<ul style="list-style-type: none"> Harness and connector Engine temperature sensor Fuel injectors
IGN TIMING TEST	<ul style="list-style-type: none"> Engine: Return to the original trouble condition Timing light: Set Retard the ignition timing with the CONSULT. 	If trouble symptom disappears, see CHECK ITEM.	<ul style="list-style-type: none"> Adjust initial ignition timing
POWER BALANCE TEST	<ul style="list-style-type: none"> Engine: After warming up, idle the engine. A/C switch "OFF" Shift lever "N" Cut off each injector signal one at a time with the CONSULT. 	Engine runs rough or dies.	<ul style="list-style-type: none"> Harness and connector Compression Injectors Power transistor Spark plugs Ignition coils
RADIATOR FAN TEST	<ul style="list-style-type: none"> Ignition switch: ON Turn the radiator fan "ON" and "OFF" with the CONSULT. 	Radiator fan moves and stops.	<ul style="list-style-type: none"> Harness and connector Radiator fan motor
FICD SOLV TEST	<ul style="list-style-type: none"> Engine: After warming up, idle the engine. A/C switch "OFF" Shift lever "N" Turn the FICD solenoid valve "ON" with the CONSULT. 	Engine speed will increase momentarily by approx. 200 rpm.	<ul style="list-style-type: none"> Harness and connector FICD solenoid valve
FUEL PUMP RLY TEST	<ul style="list-style-type: none"> Ignition switch: ON (Engine stopped) Turn the fuel pump relay "ON" and "OFF" with the CONSULT and listen to operating sound. 	Fuel pump relay makes the operating sound.	<ul style="list-style-type: none"> Harness and connector Fuel pump relay
EGR CONT SOLV TEST			
PRVR CONT SOLV TEST	<ul style="list-style-type: none"> Ignition switch: ON Turn solenoid valve "ON" and "OFF" with the CONSULT and listen to operating sound. 	Each solenoid valve makes an operating sound.	<ul style="list-style-type: none"> Harness and connector Solenoid valve
VALVE TIM SOL TEST			
SELF-LEARN CONT TEST	<ul style="list-style-type: none"> In this test, the coefficient of self-learning control mixture ratio returns to the original coefficient by touching "CLEAR" on the screen. 		

TROUBLE DIAGNOSES

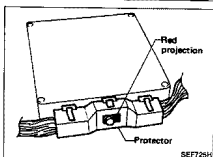
Diagnostic Procedure

CAUTION:

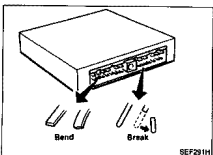
- Before connecting or disconnecting the E.C.U. harness connector to or from any E.C.U., be sure to turn the ignition switch to the "OFF" position and disconnect the negative battery terminal in order not to damage E.C.U. as battery voltage is applied to E.C.U. even if ignition switch is turned off. Failure to do so may damage the E.C.U.
- When connecting E.C.U. harness connector, tighten securing bolt until red projection is in line with connector face.
- When connecting or disconnecting pin connectors into or from E.C.U., take care not to damage pin terminals (bend or break).
- Make sure that there are not any bends or breaks on E.C.U. pin terminal, when connecting pin connectors.
- Before replacing E.C.U., perform E.C.U. input/output signal inspection and make sure whether E.C.U. functions properly or not. (See page EF & EC-174.)
- After performing this "Diagnostic Procedure", perform E.C.S. self-diagnosis and driving test.



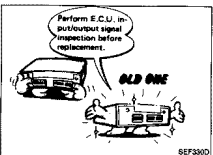
SEF289H



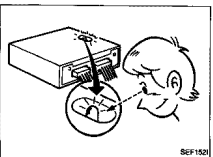
SEF725H



SEF291H



SEF330D



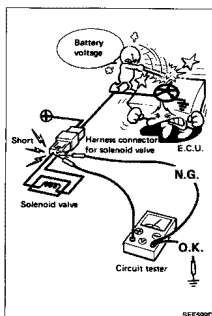
SEF152D

EF & EC-60-A

TROUBLE DIAGNOSES

Diagnostic Procedure (Cont'd)

- When measuring E.C.U. controlled components supply voltage with a circuit tester, separate one tester probe from the other. If the two tester probes accidentally make contact with each other during measurement, the circuit will be shorted, resulting in damage to the control unit power transistor.

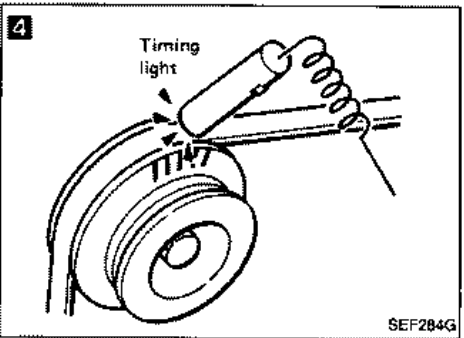
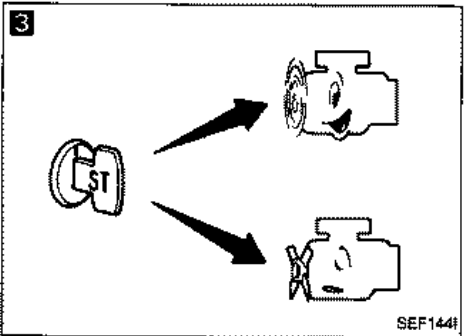
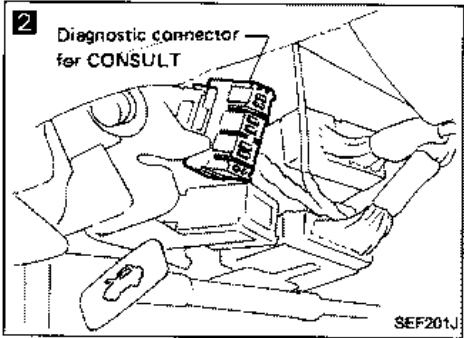
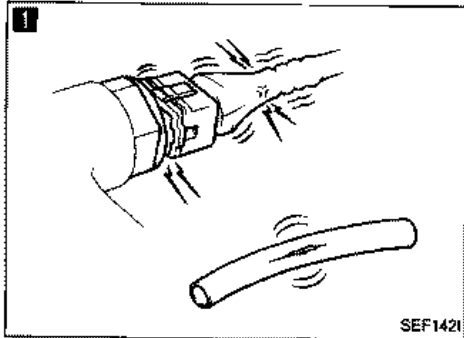


SEF398D

EF & EC-60-B

TROUBLE DIAGNOSES

Basic Inspection



1

BEFORE STARTING

1. Check service records for any recent repairs that may indicate a related problem, or the current need for scheduled maintenance.
2. Open engine hood and check the following:
 - Harness connectors for proper connections
 - Vacuum hoses for splits, kinks, and proper connections
 - Wiring for proper connections, pinches, and cuts

2

CONNECT CONSULT TO THE VEHICLE

Connect "CONSULT" to the diagnostic connector and select "ENGINE" from the menu. (Refer to page EF & EC-54.)

3

DOES ENGINE START?

No → Go to **6**.

4

CHECK IGNITION TIMING.

Warm up engine sufficiently and check ignition timing at idle using timing light. (Refer to page EF & EC-35.)

Ignition timing:
 $15^\circ \pm 2^\circ$ B.T.D.C.

N.G. → Adjust ignition timing by turning crank angle sensor.

O.K.
 (Go to **4** on next page.)

TROUBLE DIAGNOSES

Basic Inspection (Cont'd)

5

■ A.A.C. VALVE ADJ ■

SET ENGINE RPM AT THE SPECIFIED VALUE UNDER THE FOLLOWING CONDITION

- ENG WARMED UP
- NO LOAD

START

SEF372f

5

SEF146f

6

■ THROTTLE SEN ADJ ■

***** ADJ MONITOR *****

THROTTLE SEN 0.46V

***** MONITOR *****

CAS-RPM(POS) 800r/min

IDLE POSITION ON

SEF147f

6

SEF148f

5

CHECK IDLE ADJ. SCREW INITIAL SET RPM.

1. Select "A.A.C. VALVE ADJ" in "WORK SUPPORT" mode.

2. When touching "START", does engine rpm fall to;

	A/T*	M/T
Non-turbo	720±50 rpm	650±50 rpm
Turbo	700±50 rpm	

*: in "N" position

OR

When disconnecting A.A.C. valve harness connector, does engine rpm fall to;

	A/T*	M/T
Non-turbo	720±50 rpm	650±50 rpm
Turbo	700±50 rpm	

*: in "N" position

No → Adjust engine rpm by turning idle adjusting screw.

6

CHECK THROTTLE SENSOR IDLE POSITION.

1. Perform "THROTTLE SEN. ADJ." in "WORK SUPPORT" mode.

2. Check that output voltage of throttle sensor is 0.4 to 0.5V. (Throttle valve fully closes.) and "IDLE POSITION" stays "ON".

OR

Measure output voltage of throttle sensor using voltmeter, and check that it is 0.4 to 0.5V. (Throttle valve fully closed.)

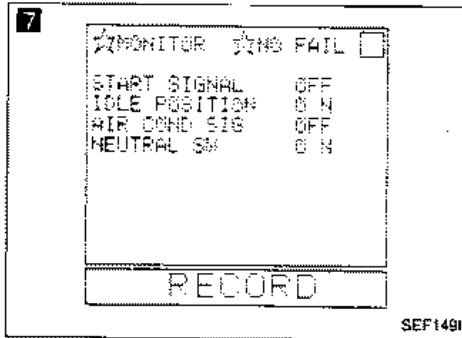
N.G. →

1. Adjust output voltage by rotating throttle sensor body.
2. Disconnect throttle sensor harness connector for a few seconds and then reconnect it.
3. Confirm that "IDLE POSITION" stays "ON".

O.K. → (Go to ⑧ on next page.)

TROUBLE DIAGNOSES

Basic Inspection (Cont'd)



7

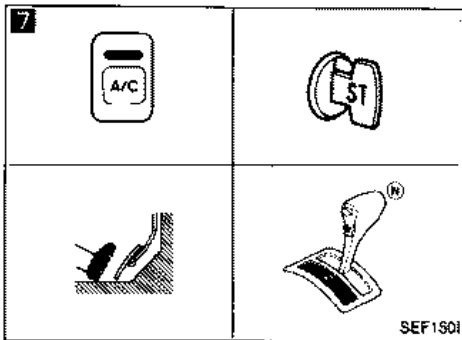
CHECK SWITCH INPUT SIGNAL.

Select the following switches in "DATA MONITOR" mode,

- Start signal,
- Idle position,
- Air conditioner signal,
- Neutral (Parking) switch,

and check the switches' ON-OFF operation.

N.G. → Repair or replace the malfunctioning switch or its circuit.

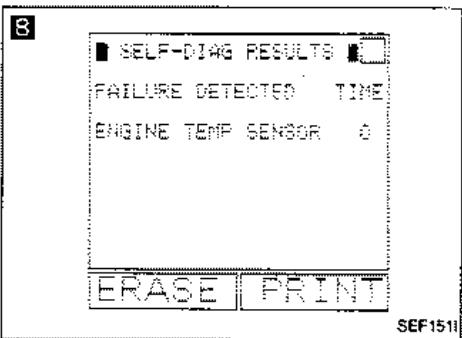


OR

Remove E.C.U. from front floor panel and check the above switches' ON-OFF operation using voltmeter at each E.C.U. terminal.

Switch	Condition	Voltage (V)
Start signal	IGN → ON → START	0 → Battery voltage
Idle position	—	—
A/C signal	A/C OFF → A/C ON (Engine running)	Battery voltage → 0.5 - 0.7
Neutral (Parking) switch	Shift lever is "N" or "P" position → Except "N" and "P"	0 → 8.0 - 9.0

O.K.



8

READ SELF-DIAGNOSTIC RESULTS.

- Perform "SELF-DIAG RESULTS" mode.
- Read out self-diagnostic results.
- Is a failure detected?

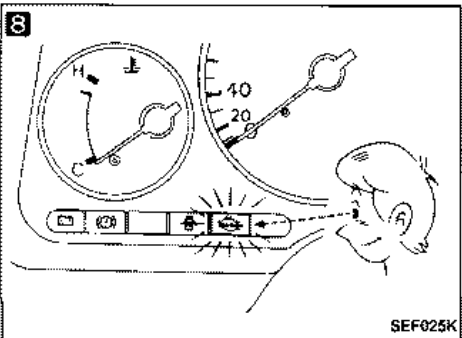
Yes → Go to the relevant inspection procedure.

OR

- Set "Self-diagnostic results mode" in Mode II. (Refer to page EF & EC-49.)
- Count the number of check engine light flashes and read out the codes.
- Are the codes being output?

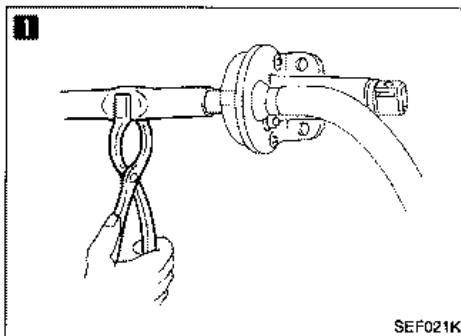
No

INSPECTION END



TROUBLE DIAGNOSES

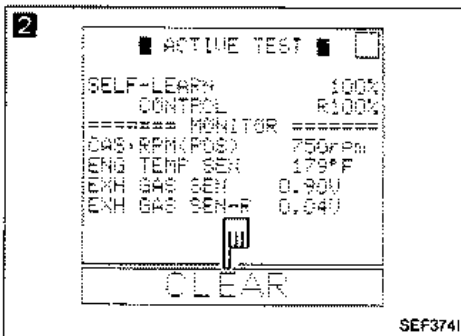
Diagnostic Procedure 1 — High Idling after Warm-up



1
CHECK AIR REGULATOR.
When pinching the air regulator hose, does the engine speed drop?

Yes → Check air regulator and circuit.

No



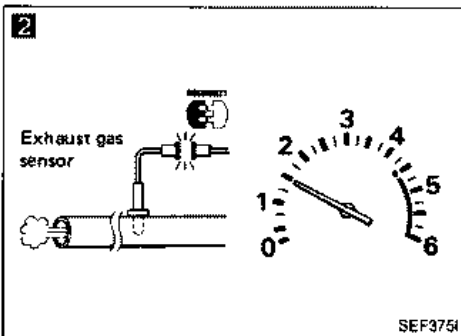
2
CHECK INTAKE AIR LEAK.
1. Select "SELF-LEARNING CONT" in "ACTIVE TEST" mode.
2. Clear the self-learning control coefficient by touching "CLEAR".
3. Does the engine speed drop?

Yes → Discover air leak location and repair.

OR

1. Disconnect exhaust gas sensor harness connectors.
2. After racing engine at 1,500 rpm under no-load for about 30 seconds, does the engine speed drop?

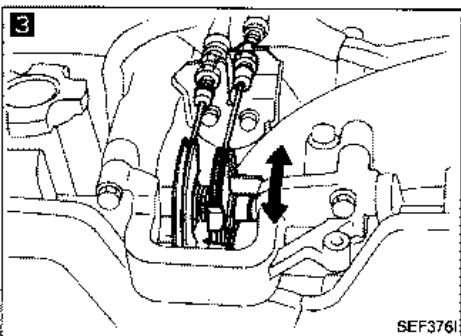
No



3
CHECK THROTTLE LINKAGE.
1. Check that throttle linkage moves smoothly.
2. Confirm that throttle valve both fully opens and fully closes.

N.G. → Repair throttle linkage or sticking of throttle valve.

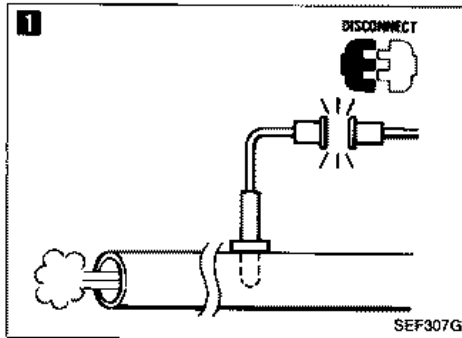
O.K.



INSPECTION END

TROUBLE DIAGNOSES

Diagnostic Procedure 2 — Hunting



1
CHECK EXHAUST GAS SENSOR.
When disconnecting exhaust gas sensor harness connector, is the hunting fixed?

Yes → Check exhaust gas sensor(s). (See page EF & EC-128.)

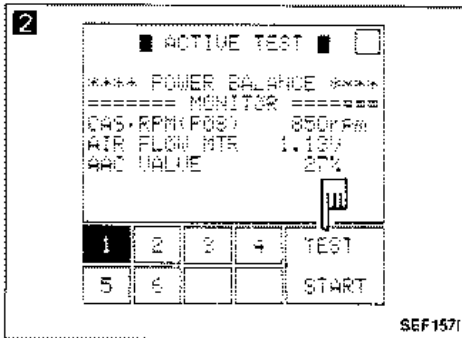
No

2
PERFORM POWER BALANCE TEST.
1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

No → Go to **4**.

OR
When disconnecting each ignition coil harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes

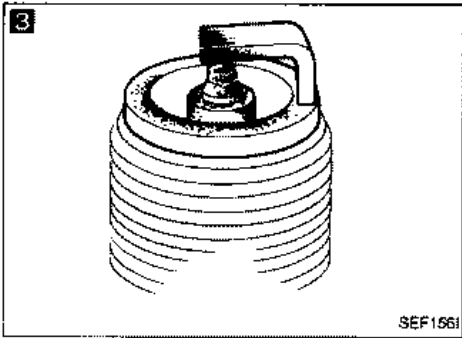
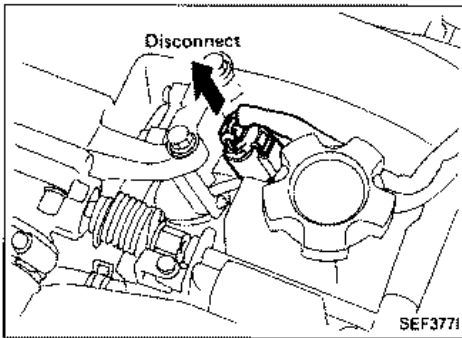


3
CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.

N.G. → Repair or replace spark plug(s).

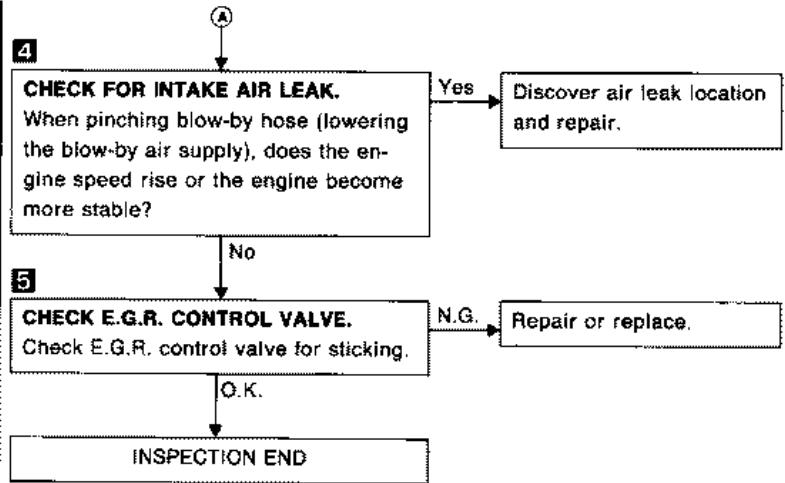
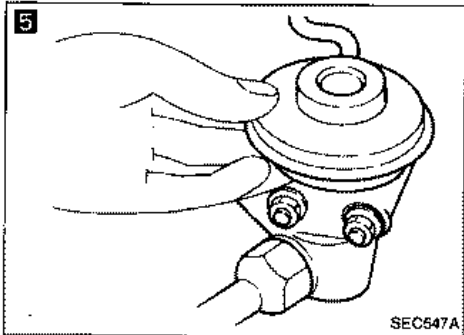
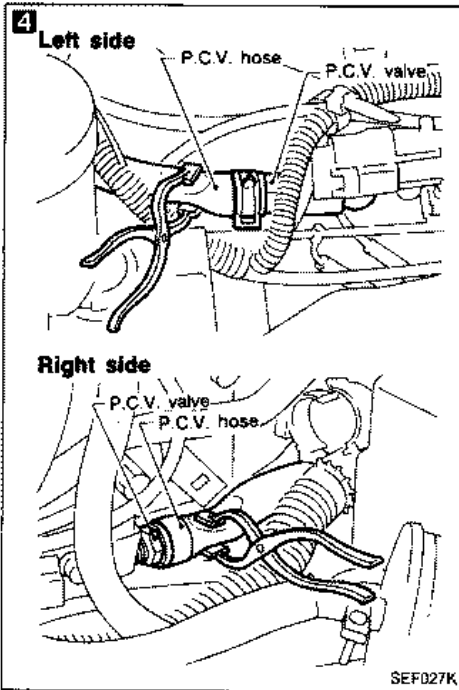
O.K.

(Go to **4** on next page.)



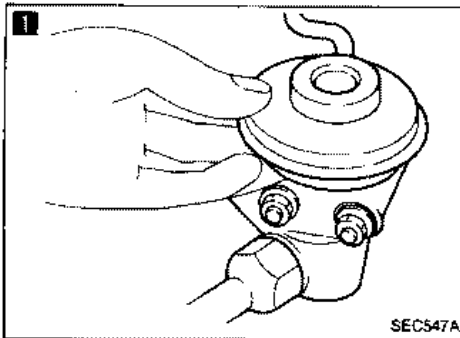
TROUBLE DIAGNOSES

Diagnostic Procedure 2 — Hunting (Cont'd)



TROUBLE DIAGNOSES

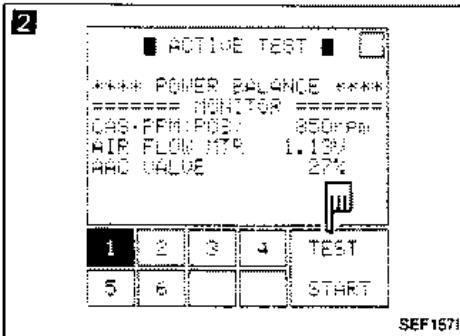
Diagnostic Procedure 3 — Unstable Idle



1
CHECK E.G.R. CONTROL VALVE.
 Check E.G.R. control valve for sticking.

N.G. → Repair or replace.

O.K.



2
PERFORM POWER BALANCE TEST.



1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

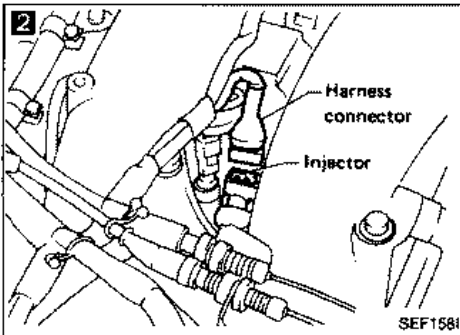
No → Go to 5.

OR



When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

Yes

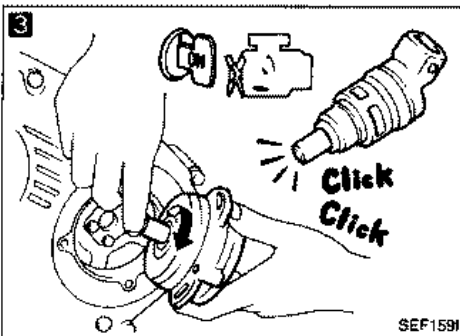


3
CHECK INJECTOR.

1. Remove crank angle sensor from engine. (Harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating crank angle sensor shaft, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes



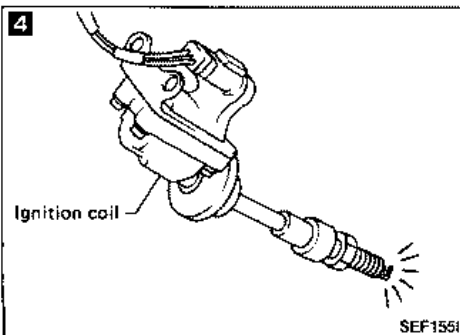
4
CHECK IGNITION SPARK.

1. Disconnect ignition coil assembly from collector.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-118.)

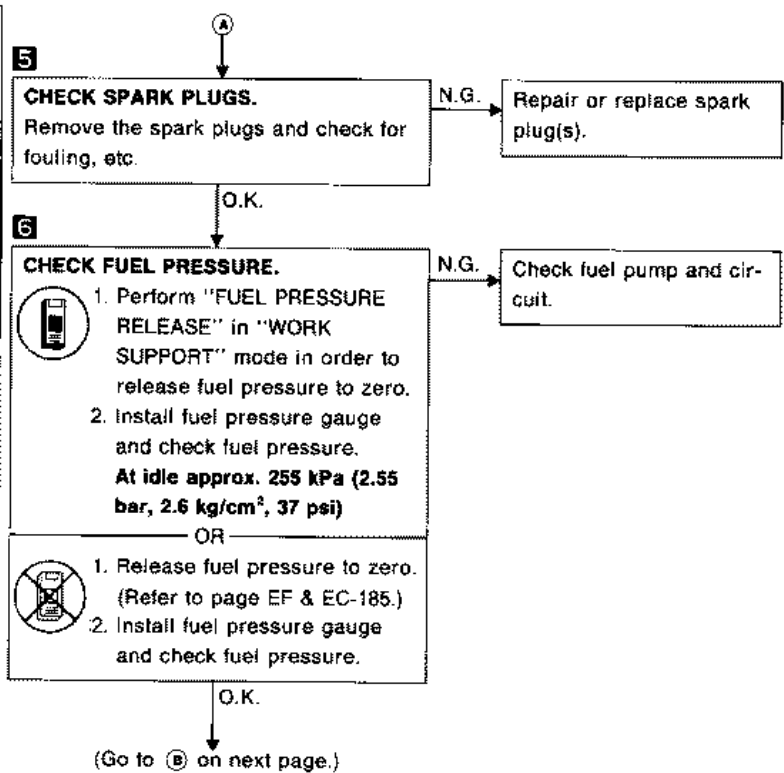
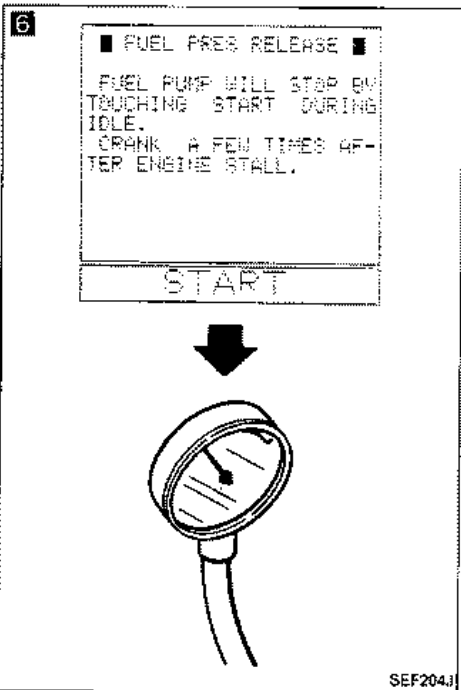
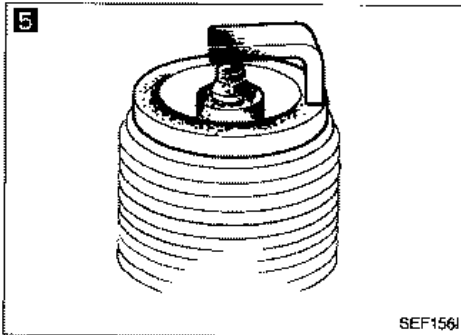
O.K.

(Go to A on next page.)



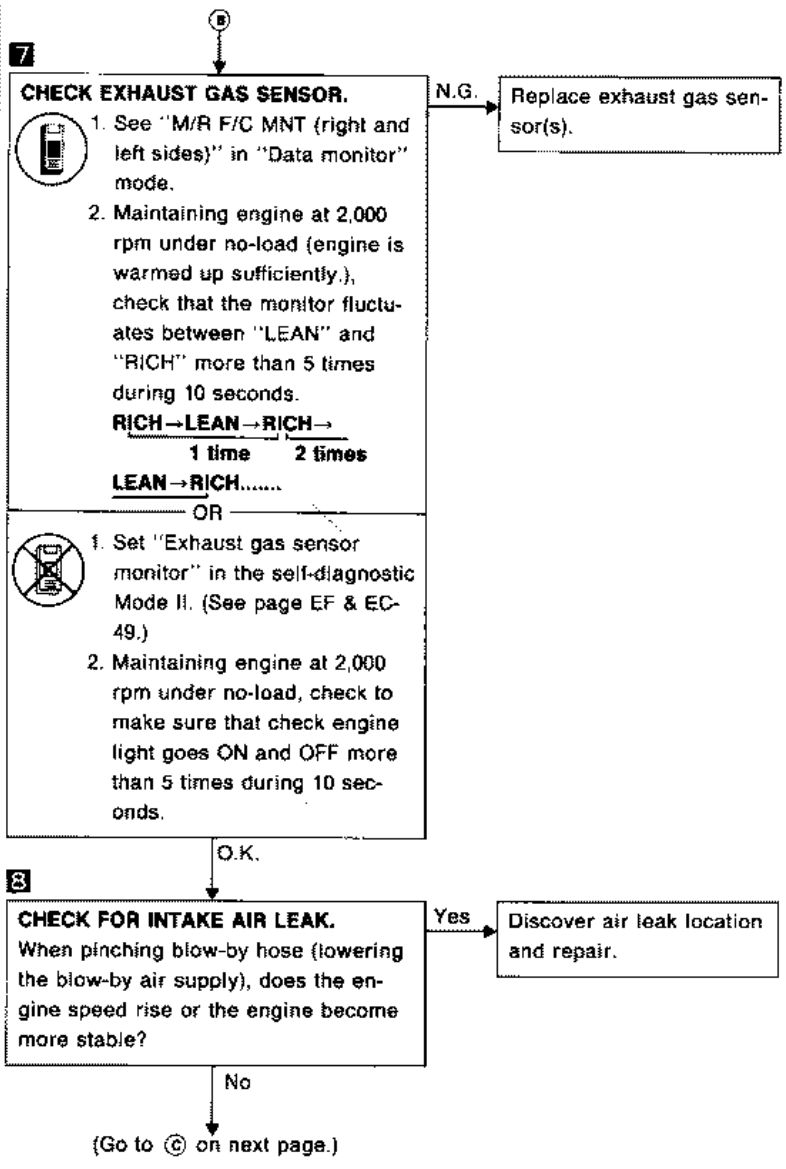
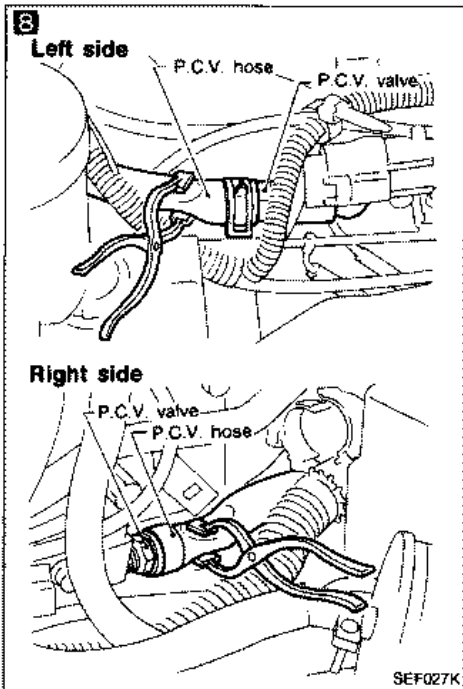
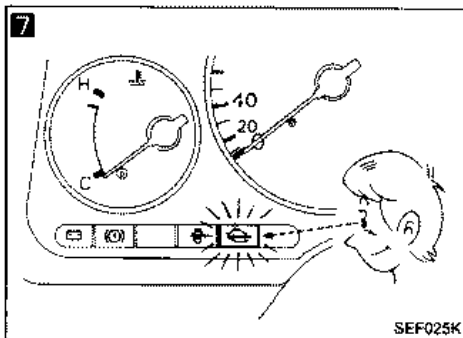
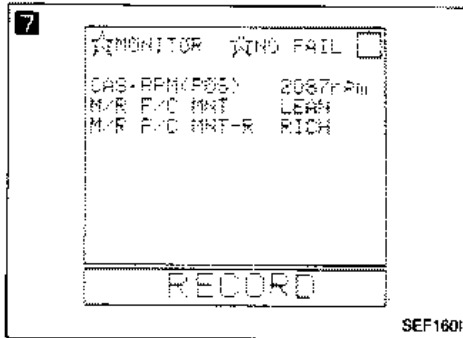
TROUBLE DIAGNOSES

Diagnostic Procedure 3 — Unstable Idle (Cont'd)



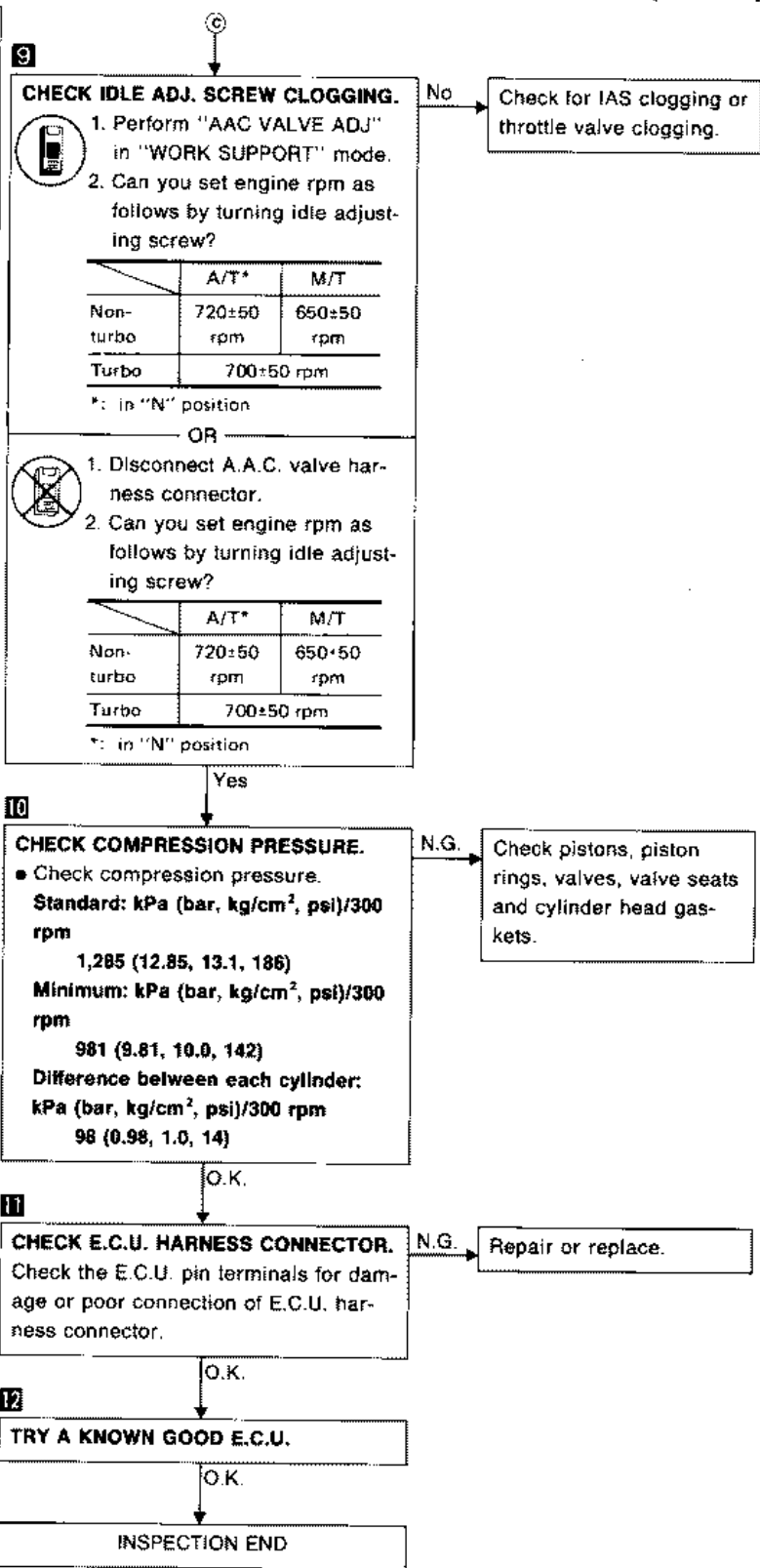
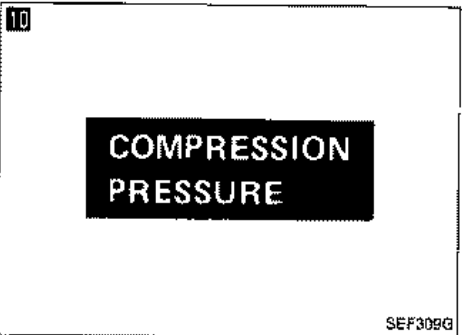
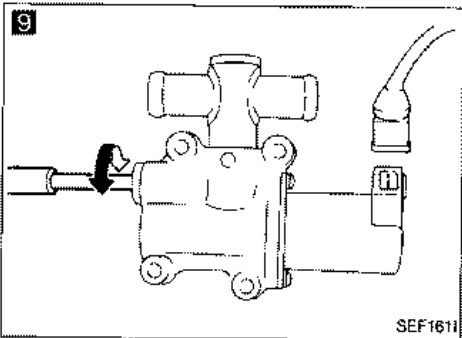
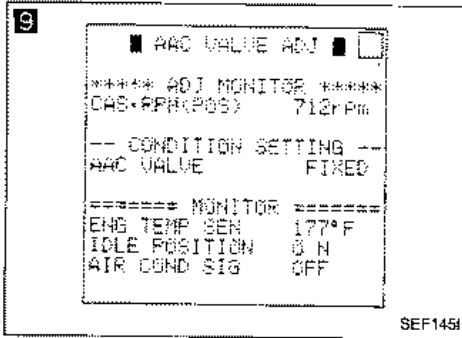
TROUBLE DIAGNOSES

Diagnostic Procedure 3 — Unstable Idle (Cont'd)

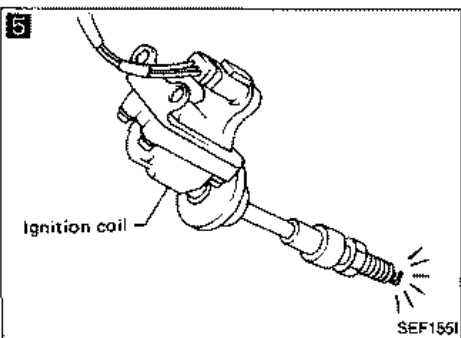
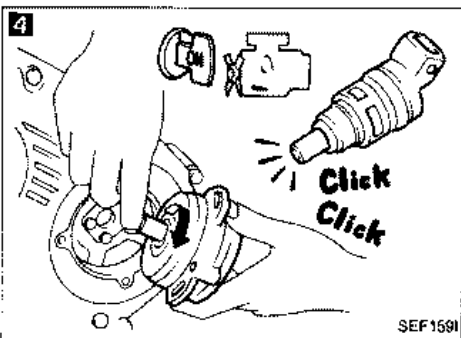
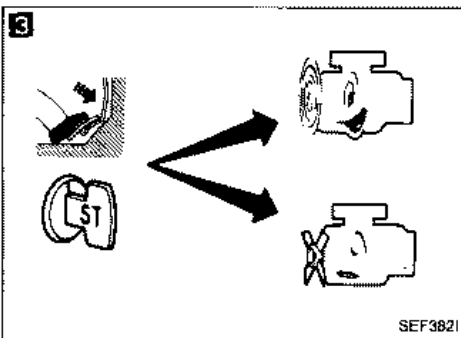
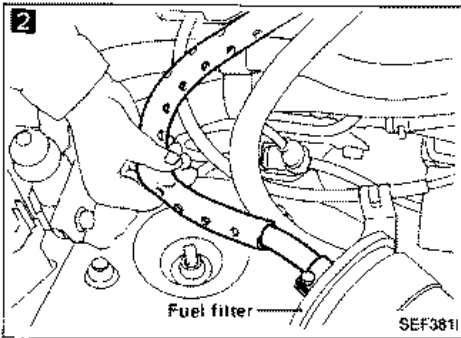
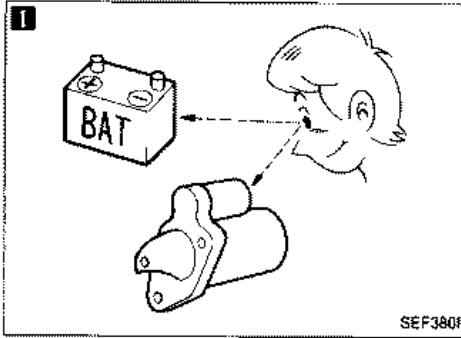


TROUBLE DIAGNOSES

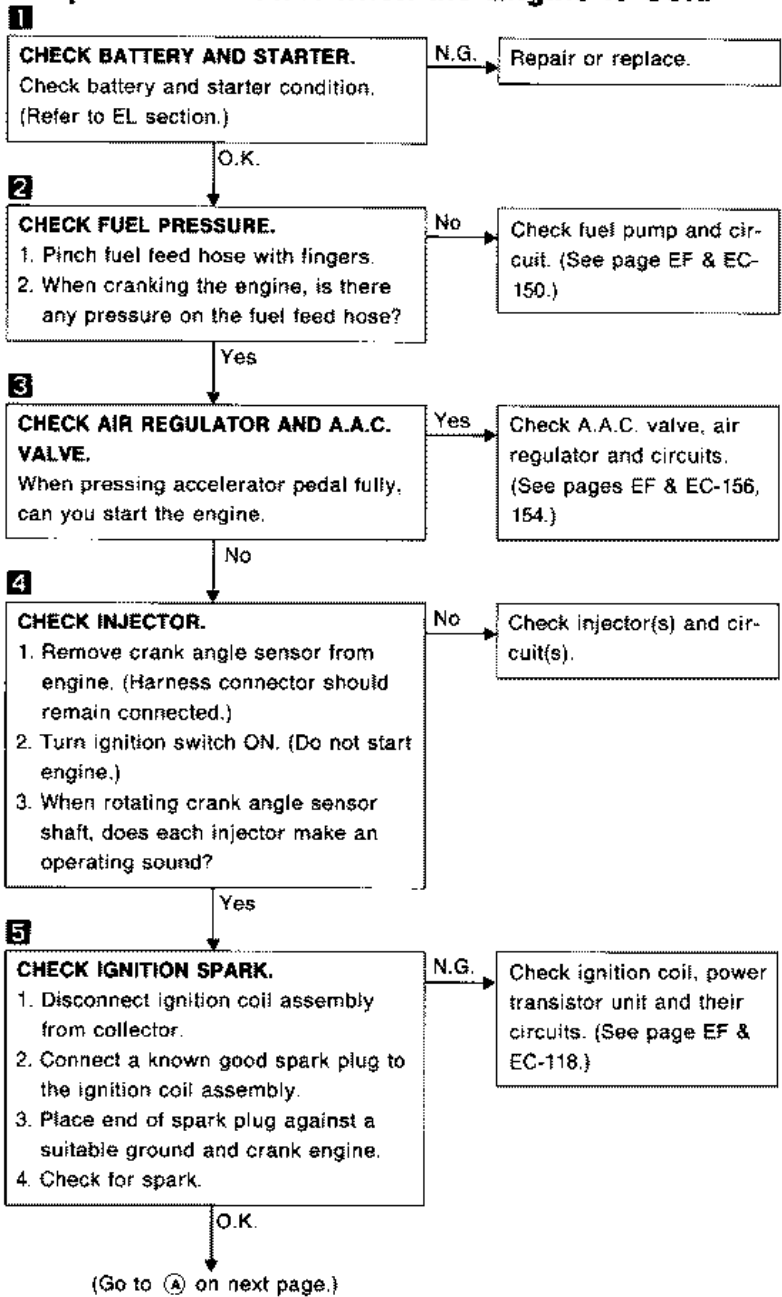
Diagnostic Procedure 3 — Unstable Idle (Cont'd)



TROUBLE DIAGNOSES

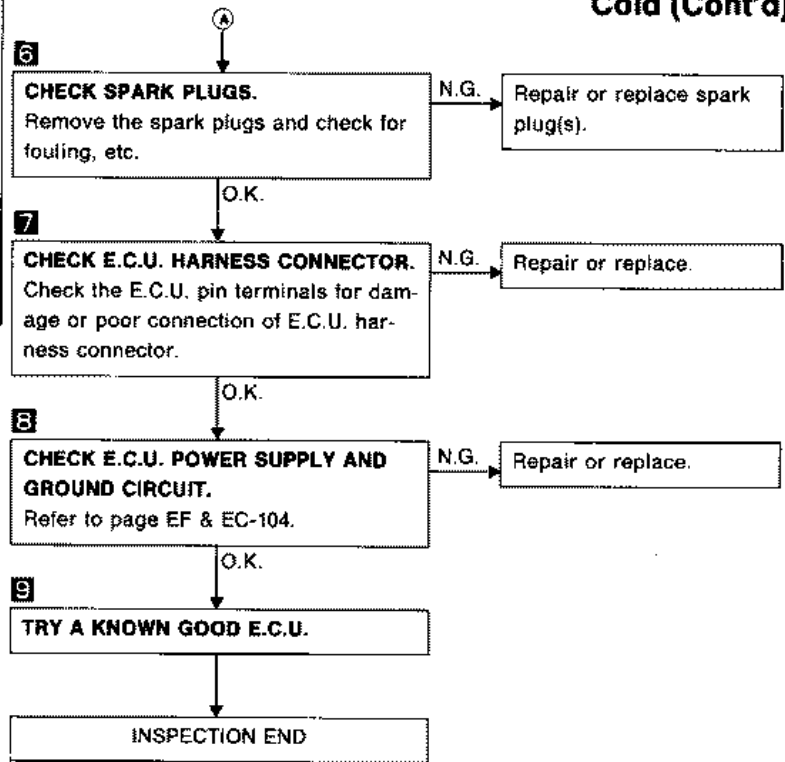
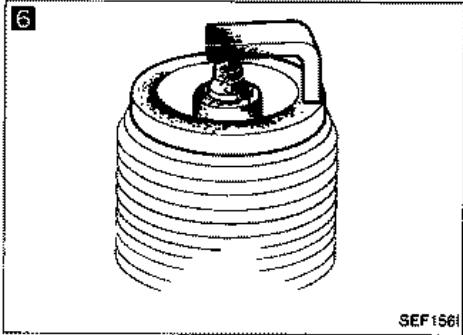


Diagnostic Procedure 4 — Hard to Start or Impossible to Start when the Engine is Cold



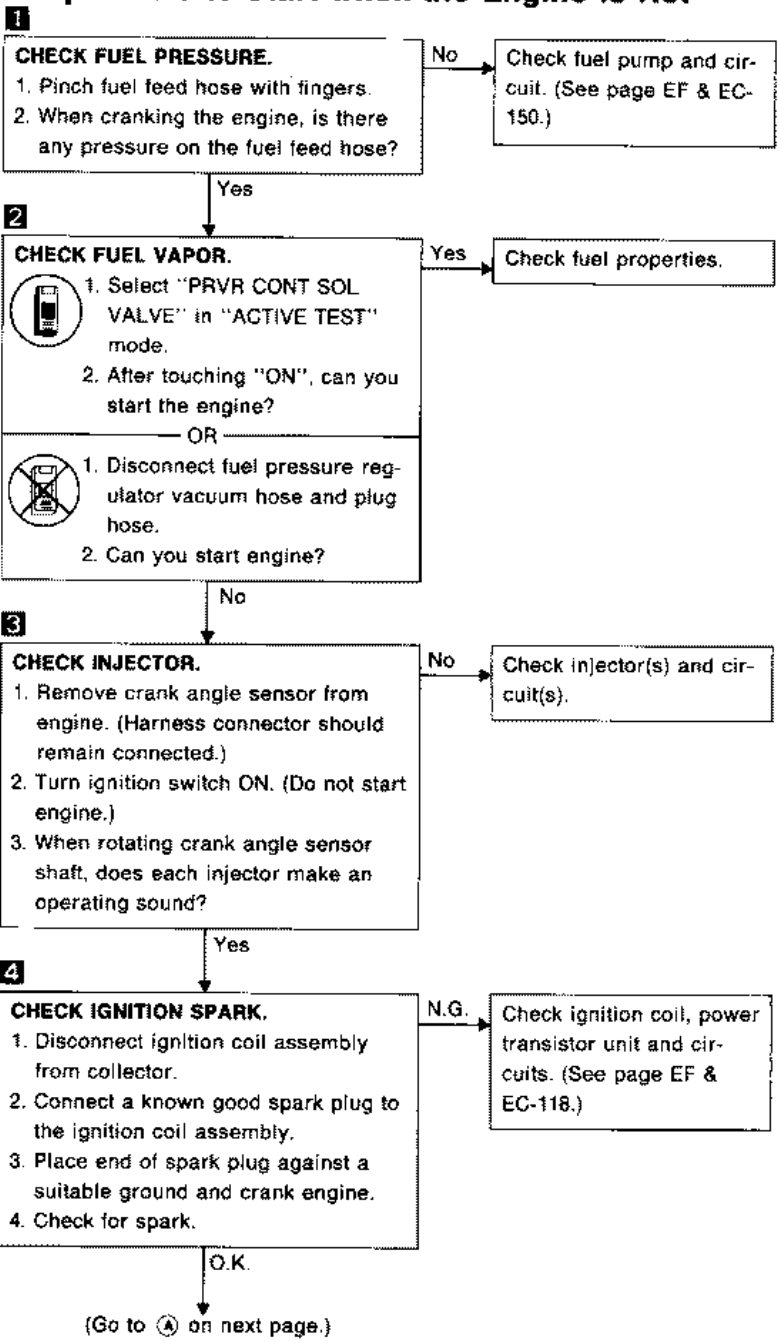
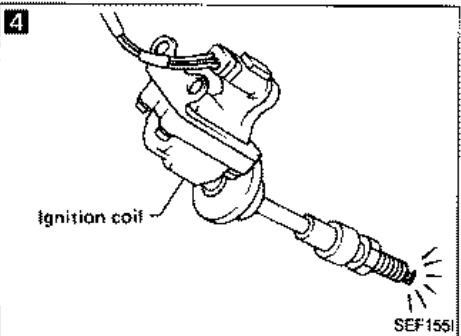
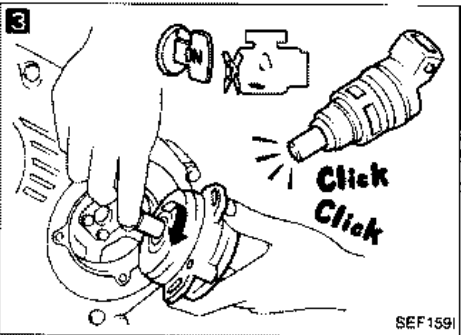
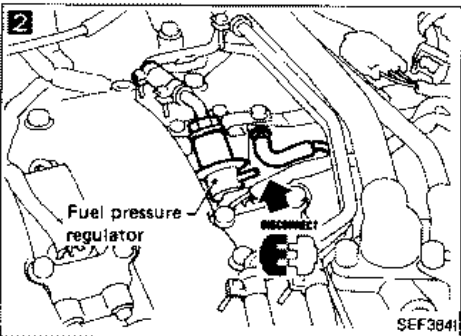
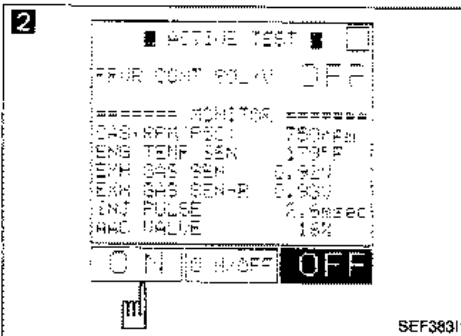
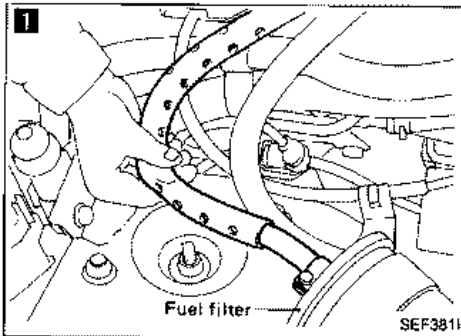
TROUBLE DIAGNOSES

Diagnostic Procedure 4 — Hard to Start or Impossible to Start when the Engine is Cold (Cont'd)



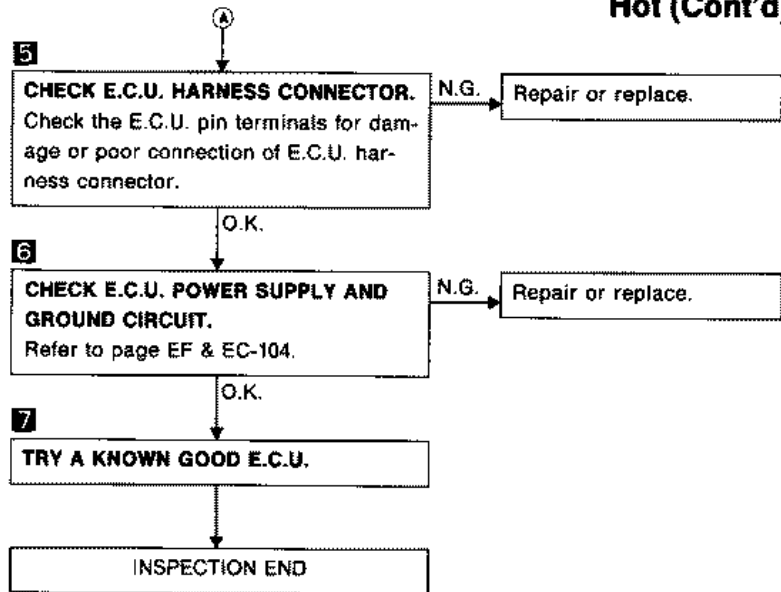
TROUBLE DIAGNOSES

Diagnostic Procedure 5 — Hard to Start or Impossible to Start when the Engine is Hot



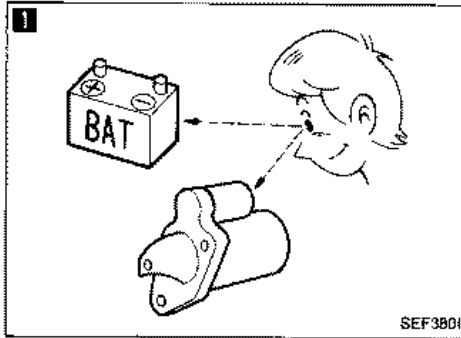
TROUBLE DIAGNOSES

Diagnostic Procedure 5 — Hard to Start or Impossible to Start when the Engine is Hot (Cont'd)



TROUBLE DIAGNOSES

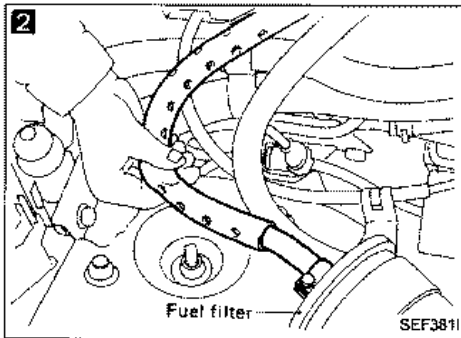
Diagnostic Procedure 6 — Hard to Start or Impossible to Start under Normal Conditions



1
CHECK BATTERY AND STARTER.
Check battery and starter operation.
(Refer to EL section.)

N.G. → Repair or replace.

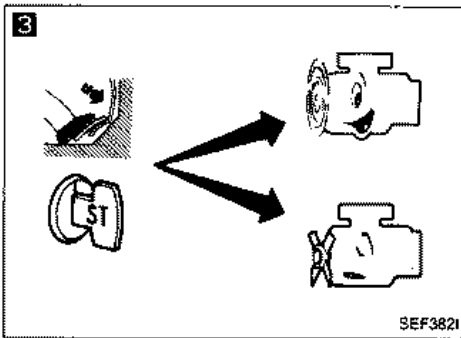
O.K. ↓



2
CHECK FUEL PRESSURE.
1. Pinch fuel feed hose with fingers.
2. When cranking the engine, is there any pressure on the fuel feed hose?

No → Check fuel pump and circuit. (See page EF & EC-150.)

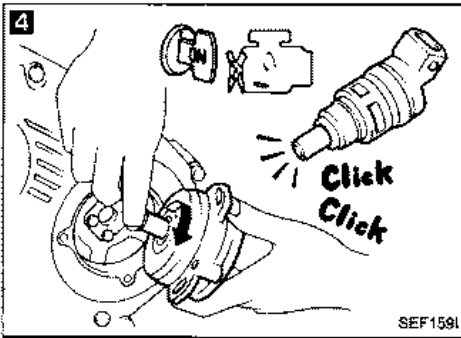
Yes ↓



3
CHECK INJECTOR FOR LEAKAGE.
When pressing accelerator pedal fully, can you start the engine.

Yes → Check injector(s) for leakage.

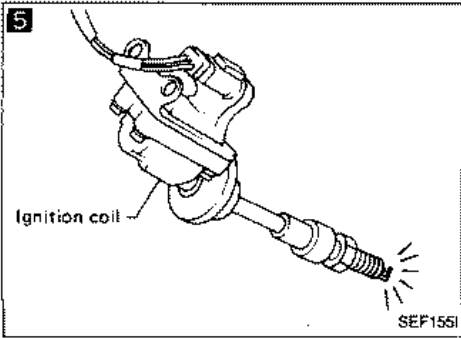
No ↓



4
CHECK INJECTOR.
1. Remove crank angle sensor from engine. (Harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating crank angle sensor shaft, does each injector make an operating sound?

No → Check injectors and circuits.

Yes ↓



5
CHECK IGNITION SPARK.
1. Disconnect ignition coil assembly from collector.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

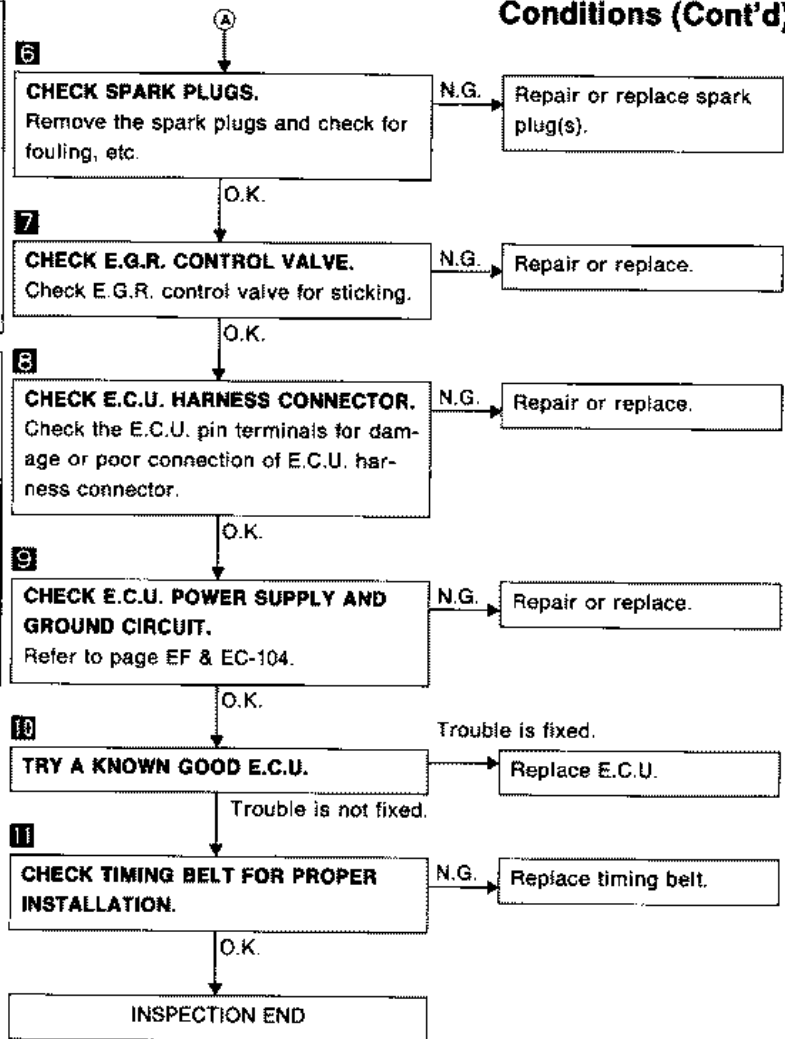
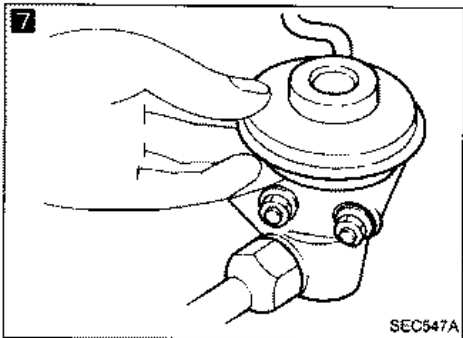
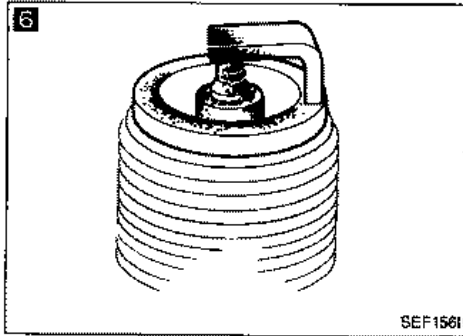
N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-118.)

O.K. ↓

(Go to Ⓐ on next page.)

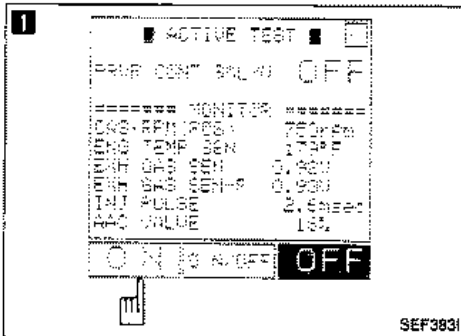
TROUBLE DIAGNOSES

Diagnostic Procedure 6 — Hard to Start or Impossible to Start under Normal Conditions (Cont'd)



TROUBLE DIAGNOSES

Diagnostic Procedure 7 — Hesitation when the Engine is Hot

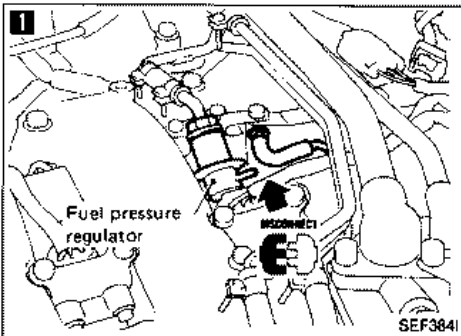


1

CHECK FUEL VAPOR.

1. Select "PRVR CONT SOL VALVE" in "ACTIVE TEST" mode.
2. After touching "ON", perform cruise test.
3. Does the hesitation disappear?

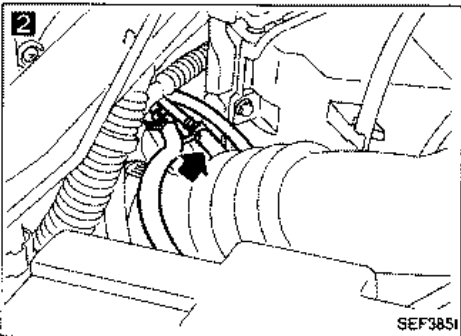
Yes → Check fuel properties.



OR

1. Disconnect fuel pressure regulator vacuum hose and plug hose.
2. Perform cruise test.
3. Does the hesitation disappear?

No



2

CHECK CANISTER PURGE.

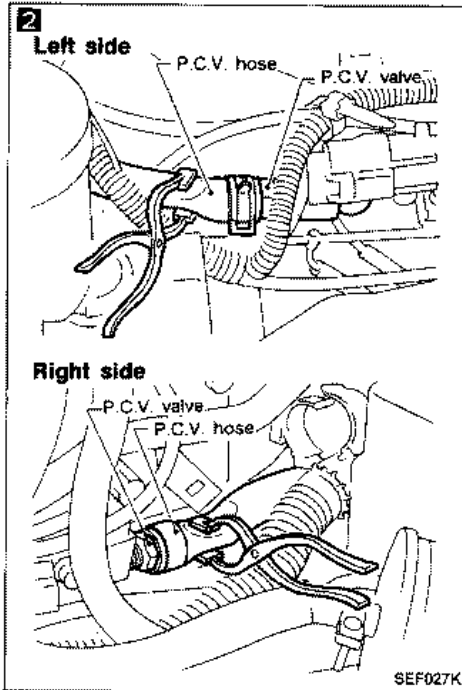
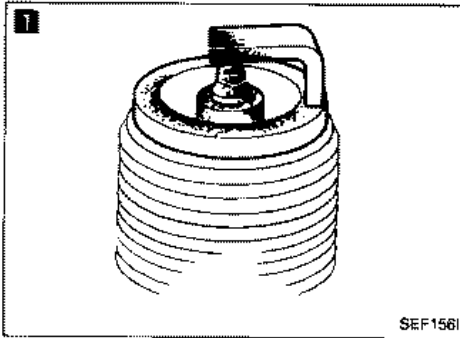
1. Disconnect canister purge line hose and plug hose.
2. Perform cruise test.
3. Does the hesitation disappear?

Yes → Check purge and vacuum lines.

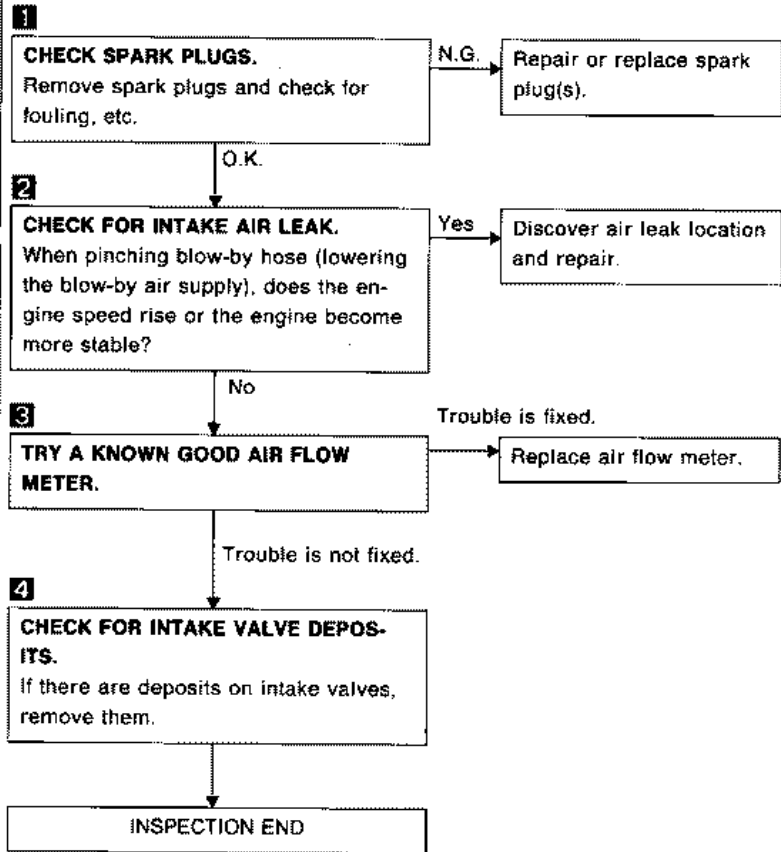
No

INSPECTION END

TROUBLE DIAGNOSES

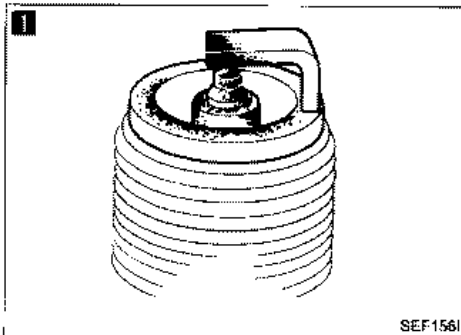


Diagnostic Procedure 8 — Hesitation when the Engine is Cold

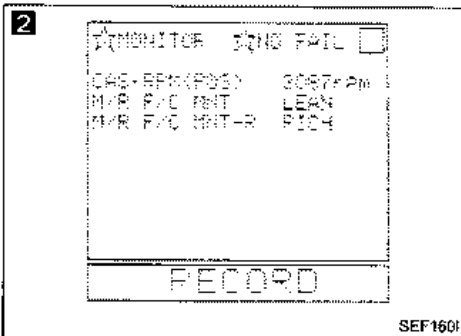


TROUBLE DIAGNOSES

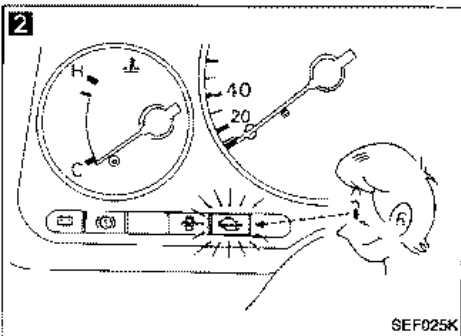
Diagnostic Procedure 9 — Hesitation under Normal Conditions



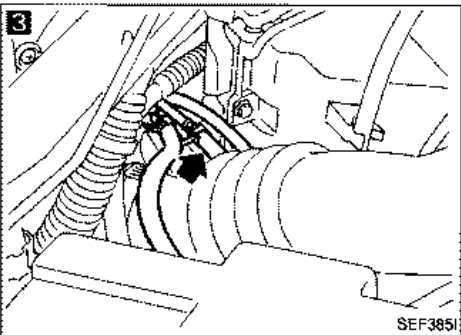
SEF156I



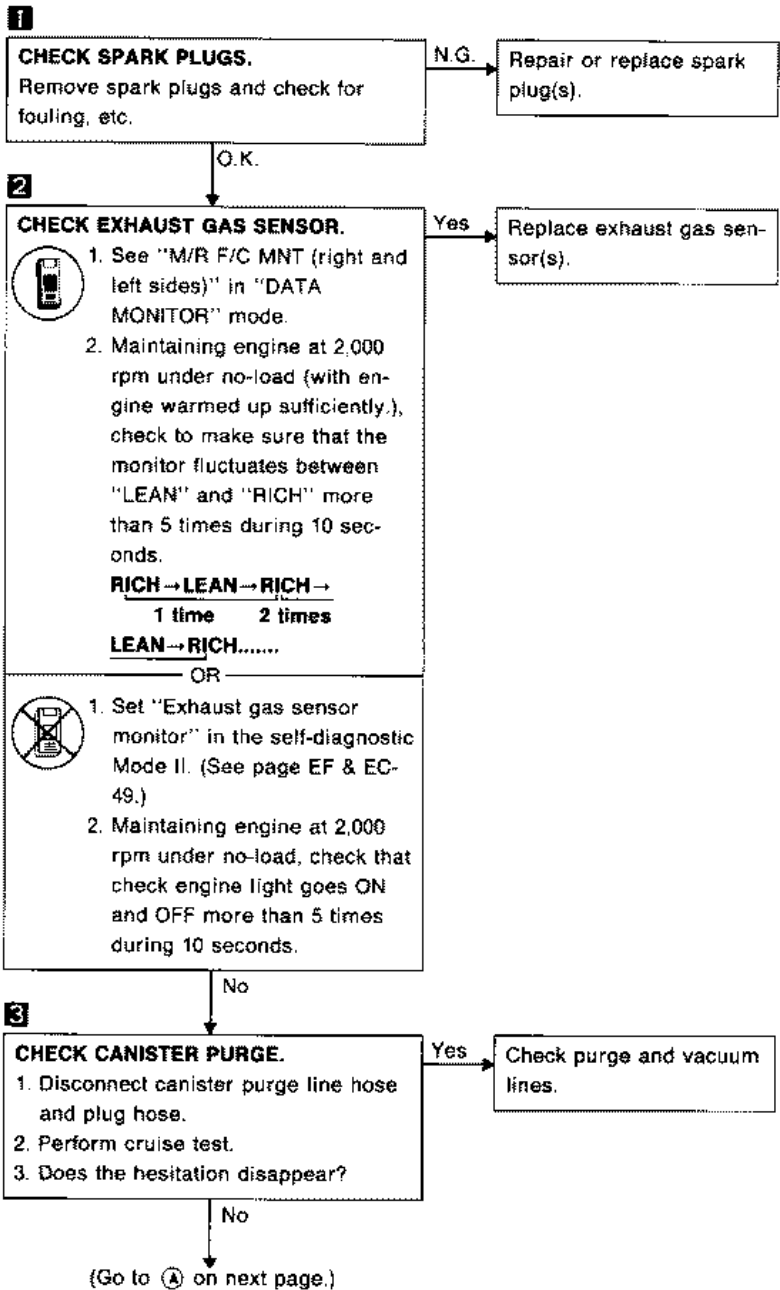
SEF160I



SEF025K

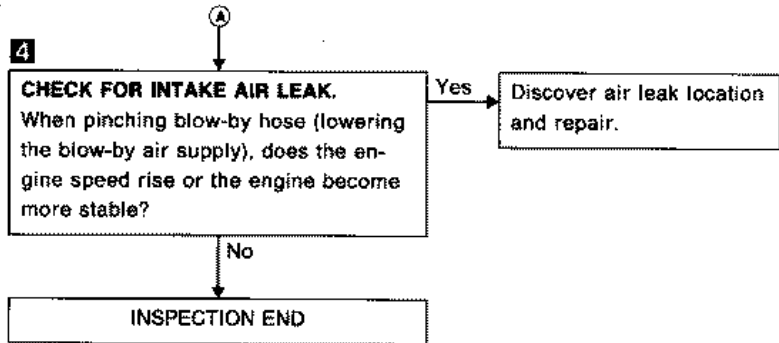
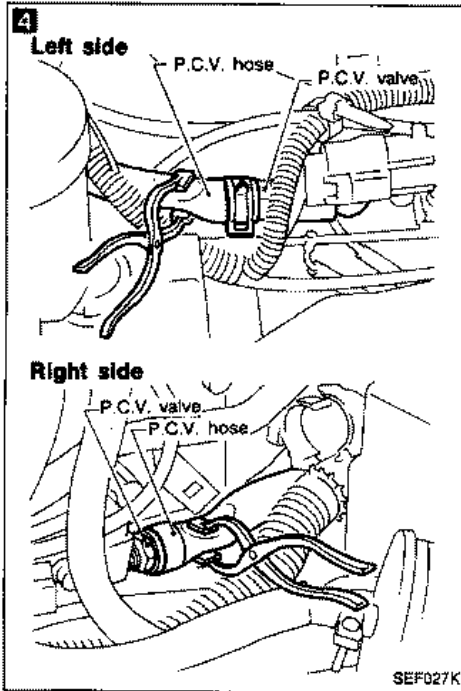


SEF385I



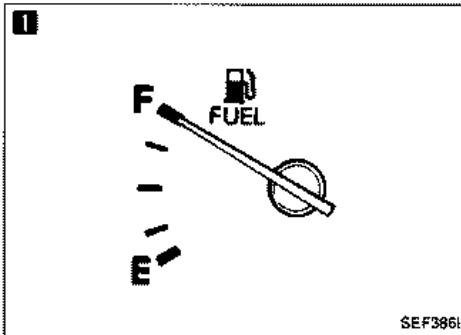
TROUBLE DIAGNOSES

Diagnostic Procedure 9 — Hesitation under Normal Conditions (Cont'd)



TROUBLE DIAGNOSES

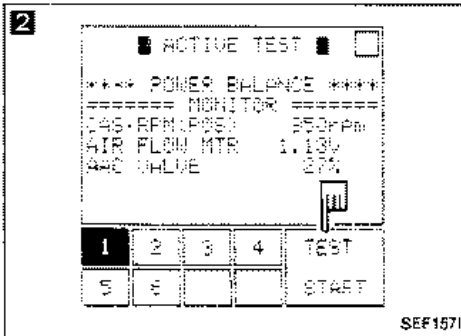
Diagnostic Procedure 10 — Engine Stalls when Turning



1
CHECK FUEL LEVEL.
Check to see that there is enough fuel in tank.

N.G. → Fill fuel tank with fuel.

O.K. ↓

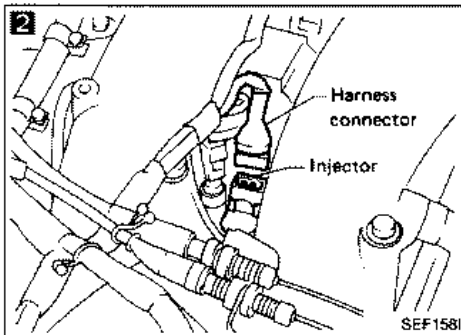


2
PERFORM POWER BALANCE TEST.
1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

No → Go to 5.

OR
When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

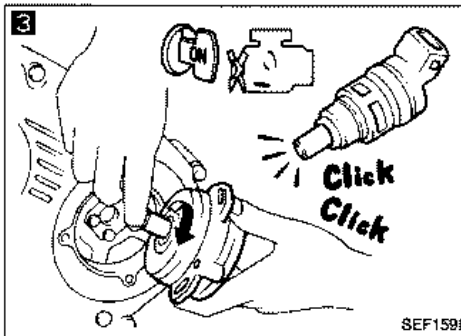
Yes ↓



3
CHECK INJECTOR.
1. Remove crank angle sensor from engine. (Harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating crank angle sensor shaft, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

Yes ↓

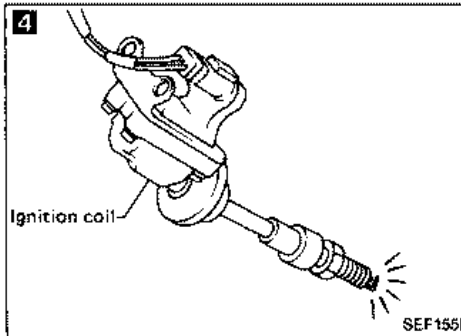


4
CHECK IGNITION SPARK.
1. Disconnect ignition coil assembly from collector.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-118.)

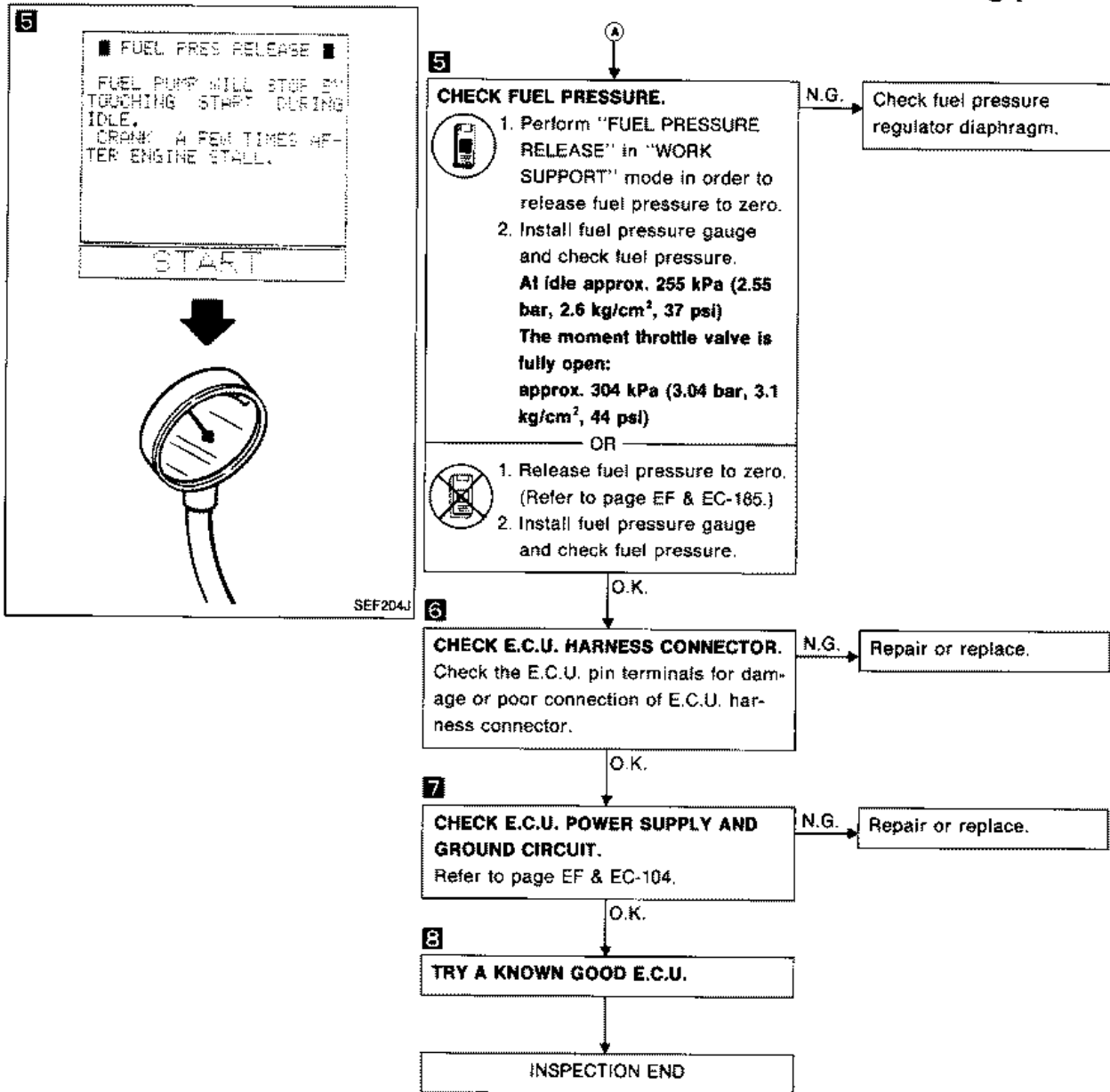
O.K. ↓

(Go to (A) on next page.)



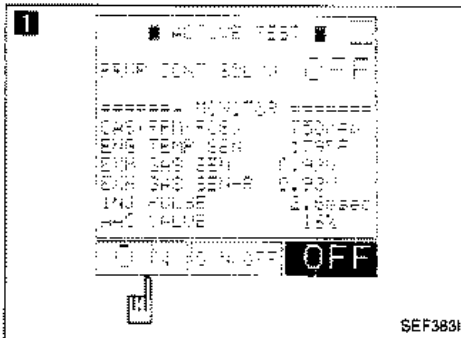
TROUBLE DIAGNOSES

Diagnostic Procedure 10 — Engine Stalls when Turning (Cont'd)



TROUBLE DIAGNOSES

Diagnostic Procedure 11 — Engine Stalls when the Engine is Hot

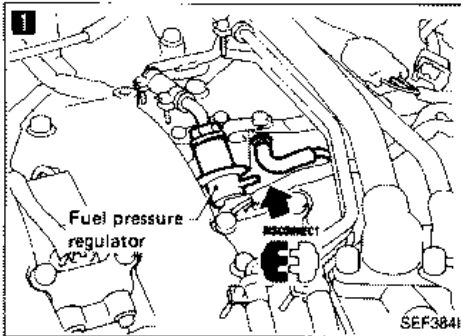


1

CHECK FUEL VAPOR.

1. Select "PRVR CONT SOL VALVE" in "ACTIVE TEST" mode.
2. After touching "ON", perform cruise test.
3. Does the engine stall disappear?

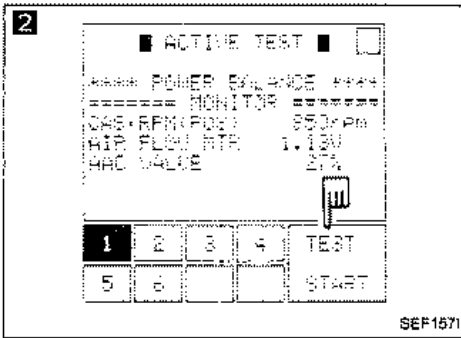
Yes → Check fuel properties.



OR

1. Disconnect fuel pressure regulator vacuum hose and plug hose.
2. Perform cruise test.
3. Does the engine stall disappear?

No



2

PERFORM POWER BALANCE TEST.

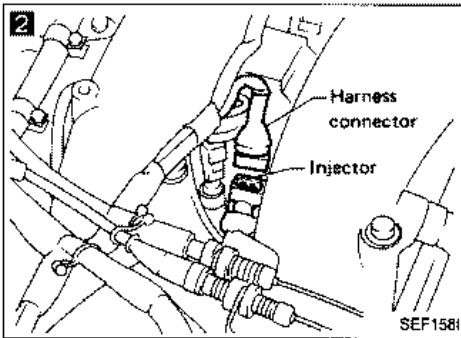
1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

OR

1. When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

No → Go to 5

Yes



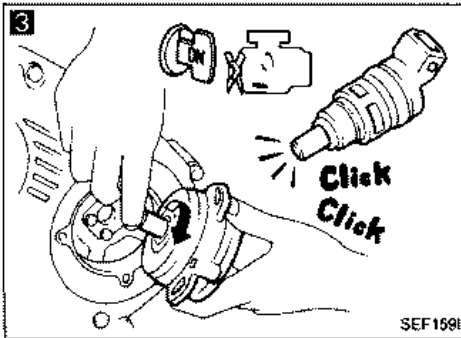
3

CHECK INJECTOR.

1. Remove crank angle sensor from engine. (Harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating crank angle sensor shaft, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

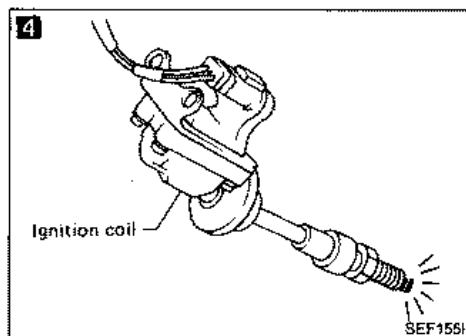
Yes



(Go to A on next page.)

TROUBLE DIAGNOSES

Diagnostic Procedure 11 — Engine Stalls when the Engine is Hot (Cont'd)

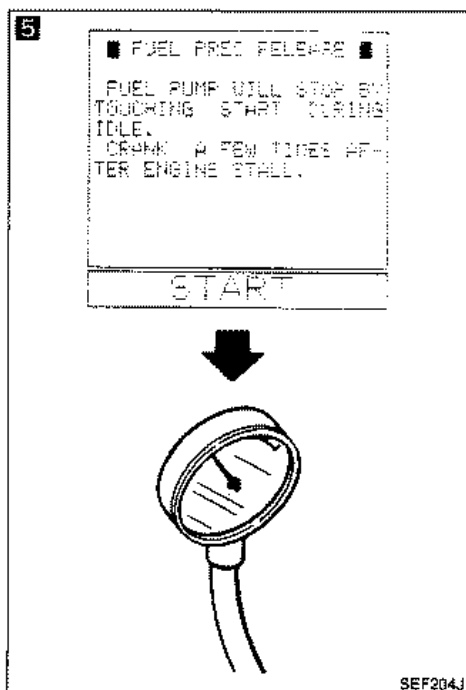


4

CHECK IGNITION SPARK.

1. Disconnect ignition coil assembly from collector.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-118.)



5

CHECK FUEL PRESSURE.

1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
At idle approx. 255 kPa (2.55 bar, 2.6 kg/cm², 37 psi)
The moment throttle valve is fully open:
approx. 304 kPa (3.04 bar, 3.1 kg/cm², 44 psi)

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-185.)
2. Install fuel pressure gauge and check fuel pressure.

N.G. → Check fuel pressure regulator diaphragm.

6

CHECK E.C.U. HARNESS CONNECTOR.

Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

7

CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.

Refer to page EF & EC-104.

N.G. → Repair or replace.

8

TRY A KNOWN GOOD E.C.U.

Trouble is fixed. → Replace E.C.U.

9

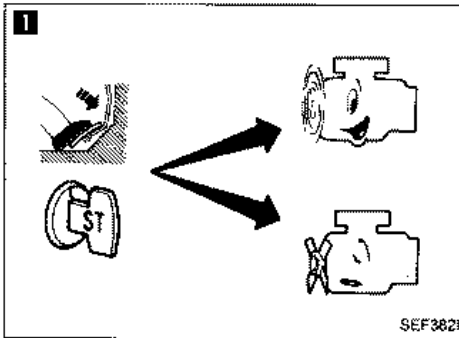
CHECK TIMING BELT FOR PROPER INSTALLATION.

N.G. → Replace timing belt.

O.K. → INSPECTION END

TROUBLE DIAGNOSES

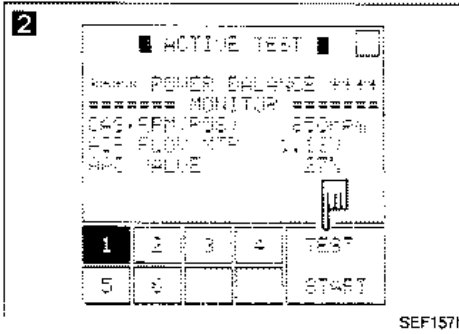
Diagnostic Procedure 12 — Engine Stalls when the Engine is Cold



1
CHECK AIR REGULATOR AND A.A.C. VALVE.
When the engine is cold, can you start the engine when pressing accelerator pedal fully?

N.G. → Check A.A.C. valve, air regulator and circuits. (See pages EF & EC-156, 154.)

O.K. ↓

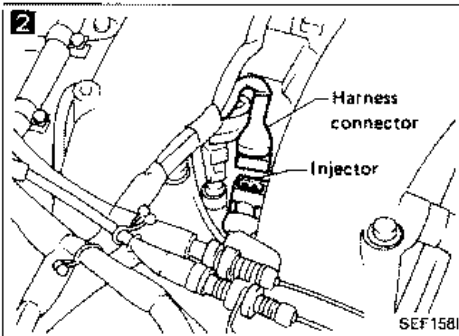


2
PERFORM POWER BALANCE TEST.
1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

N.G. → Go to 6.

OR
When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

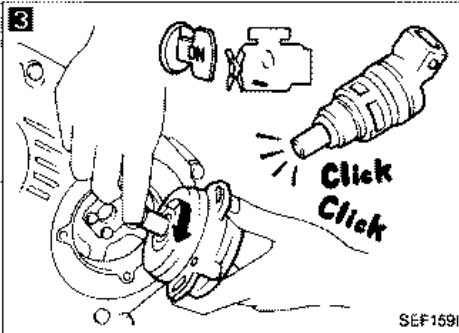
O.K. ↓



3
CHECK INJECTOR.
1. Remove crank angle sensor from engine. (Harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating crank angle sensor shaft, does each injector make an operating sound?

N.G. → Check injector(s) and circuit(s).

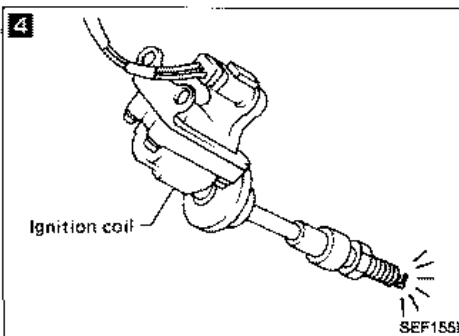
O.K. ↓



4
CHECK IGNITION SPARK.
1. Disconnect ignition coil assembly from collector.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-118.)

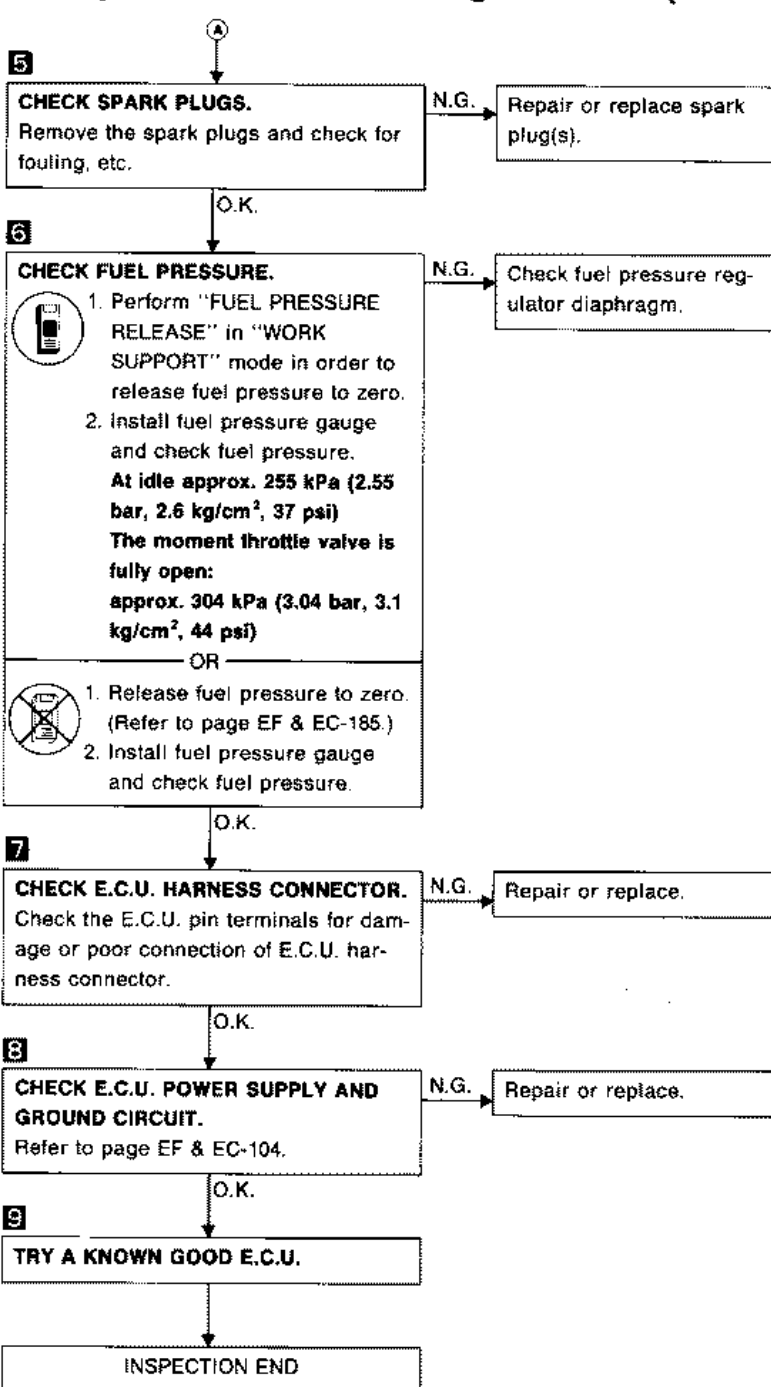
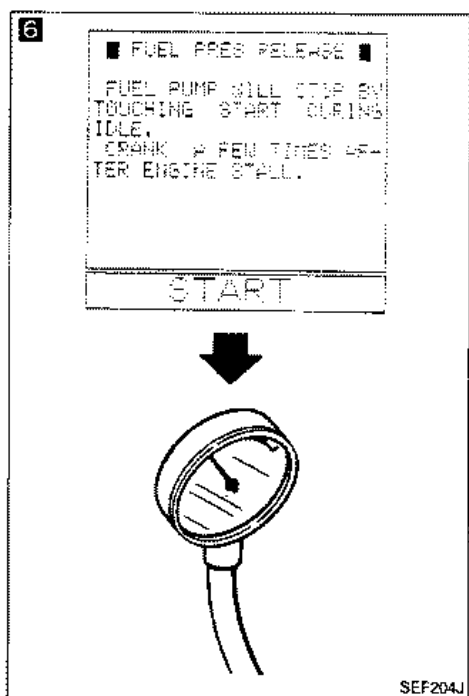
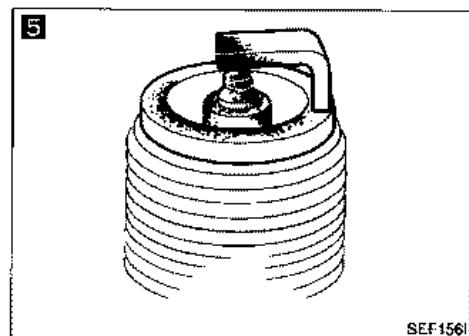
O.K. ↓



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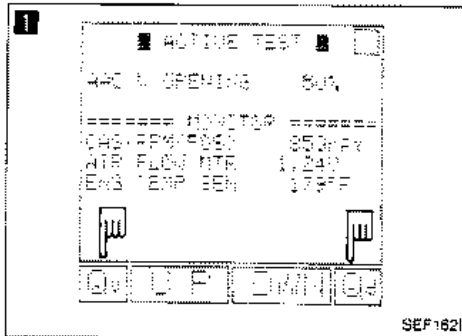
TROUBLE DIAGNOSES

Diagnostic Procedure 12 — Engine Stalls when the Engine is Cold (Cont'd)



TROUBLE DIAGNOSES

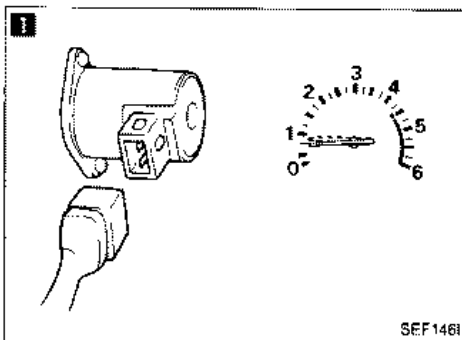
Diagnostic Procedure 13 — Engine Stalls when Stepping on the Accelerator Momentarily



1 CHECK A.A.C. VALVE.

1. Select "A.A.C. VALVE OPENING" in "ACTIVE TEST" mode.
2. When touching "Qu" and "Qd", does the engine speed change according to the percent of A.A.C. valve opening?

No → Check A.A.C. valve and circuit. (See page EF & EC-156.)



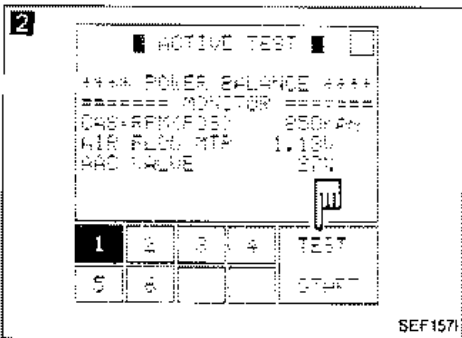
OR

When disconnecting A.A.C. valve harness connector, does the engine speed drop?

2 PERFORM POWER BALANCE TEST.

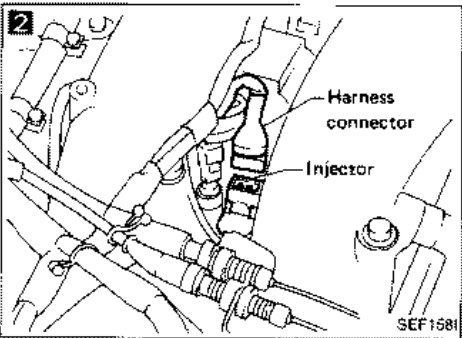
1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

No → Go to 5



OR

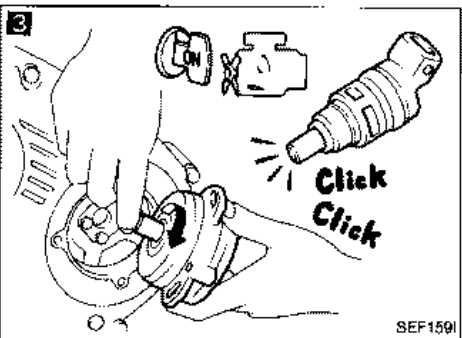
When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?



3 CHECK INJECTOR.

1. Remove crank angle sensor from engine. (Harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating crank angle sensor shaft, does each injector make an operating sound?

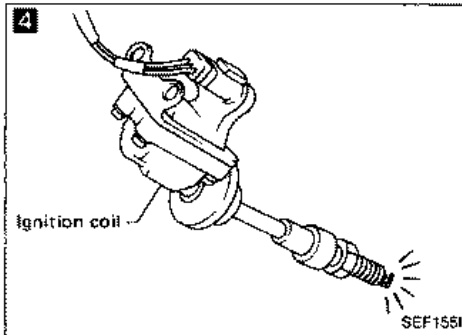
No → Check injector(s) and their circuit(s).



(Go to A on next page.)

TROUBLE DIAGNOSES

Diagnostic Procedure 13 — Engine Stalls when Stepping on the Accelerator Momentarily (Cont'd)

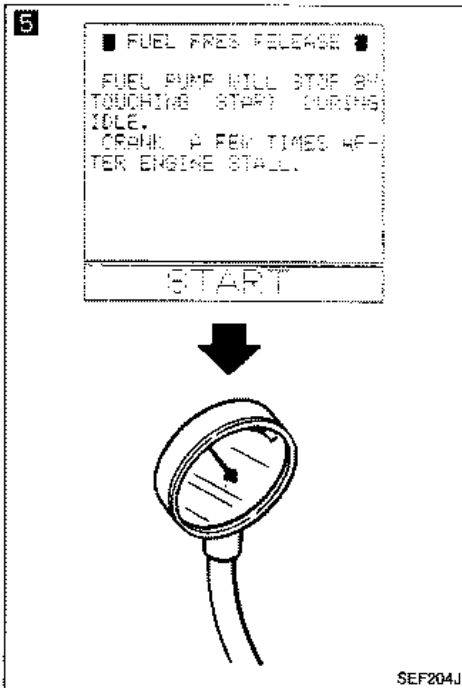


4

CHECK IGNITION SPARK.

1. Disconnect ignition coil assembly from collector.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-118.)



5

CHECK FUEL PRESSURE.

1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
At idle approx. 255 kPa (2.55 bar, 2.6 kg/cm², 37 psi)
The moment throttle valve is fully open:
approx. 304 kPa (3.04 bar, 3.1 kg/cm², 44 psi)

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-185.)
2. Install fuel pressure gauge and check fuel pressure.

N.G. → Check fuel pressure regulator diaphragm.

6

CHECK E.C.U. HARNESS CONNECTOR.

Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.

N.G. → Repair or replace.

7

CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.

Refer to page EF & EC-104.

N.G. → Repair or replace.

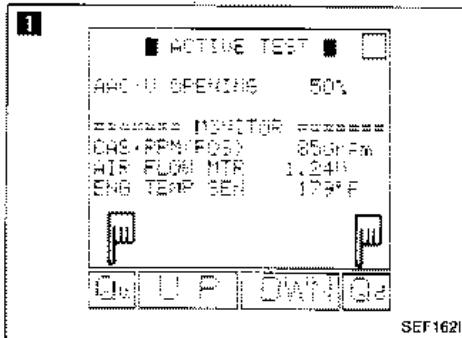
8

TRY A KNOWN GOOD E.C.U.

INSPECTION END

TROUBLE DIAGNOSES

Diagnostic Procedure 14 — Engine Stalls after Decelerating

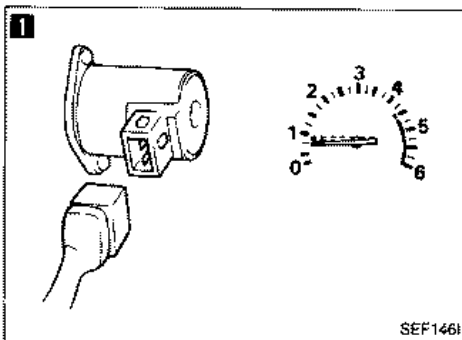


1

CHECK A.A.C. VALVE.

1. Select "A.A.C. VALVE OPENING" in "ACTIVE TEST" mode.
2. When touching "Qu" and "Qd", does the engine speed change according to the percent of A.A.C. valve opening?

No → Check A.A.C. valve and circuit. (See page EF & EC-156.)



OR

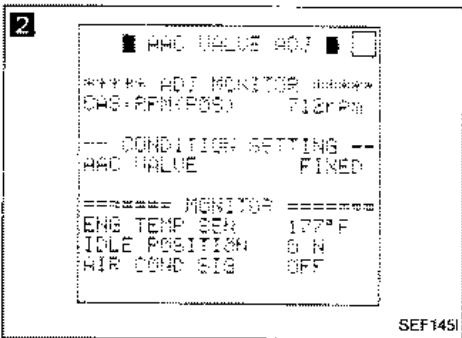
When disconnecting A.A.C. valve harness connector, does the engine speed drop?

2

CHECK IDLE ADJ. SCREW CLOGGING.

1. Perform "A.A.C. VALVE ADJ" in "WORK SUPPORT" mode.
2. Can you set engine rpm as follows by turning idle adjusting screw?

No → Check for IAS clogging or throttle chamber clogging.



	A/T*	M/T
Non-turbo	720±50 rpm	650±50 rpm
Turbo	700±50 rpm	

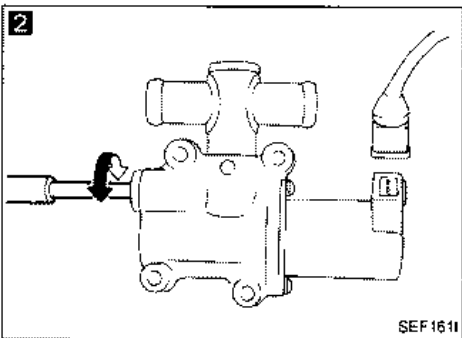
*: in "N" position

OR

1. Disconnect A.A.C. valve harness connector
2. Can you set engine rpm as follows by turning idle adjusting screw?

	A/T*	M/T
Non-turbo	720±50 rpm	650±50 rpm
Turbo	700±50 rpm	

*: in "N" position

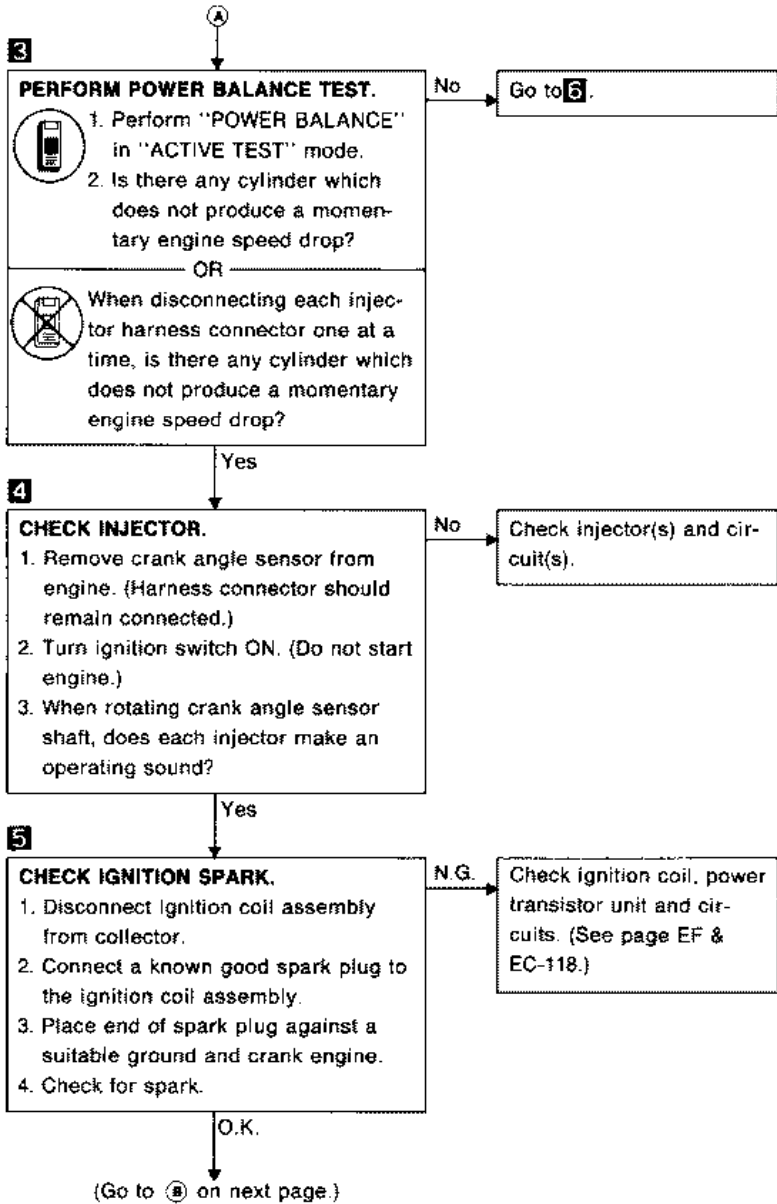
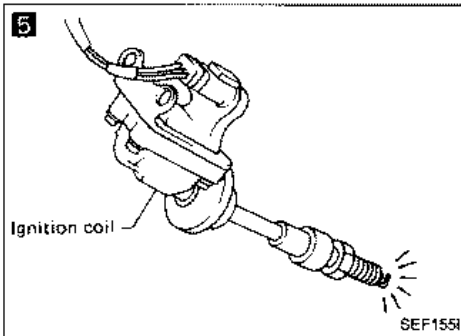
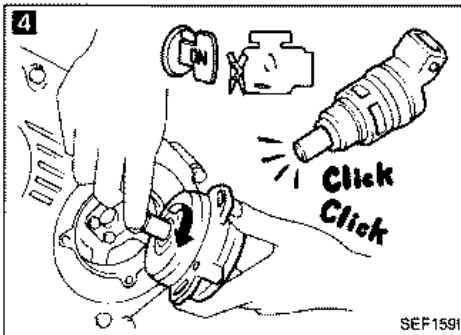
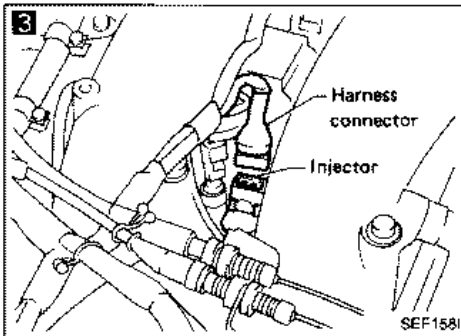
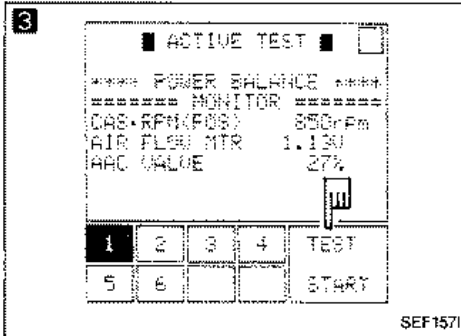


Yes

(Go to **A** on next page.)

TROUBLE DIAGNOSES

Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)



TROUBLE DIAGNOSES

Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)

6

■ FUEL PRESS RELEASE ■

FUEL PRESS. WILL STAY 01
TOUCHING START TO OPEN
IDLE.
CRANK 4 TO 7 TIMES LEAN
IF ENGINE STALLS.

START

SEF204J

6

CHECK FUEL PRESSURE.

1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
At idle approx. 255 kPa (2.55 bar, 2.6 kg/cm², 37 psi)
**The moment throttle valve is fully open:
approx. 304 kPa (3.04 bar, 3.1 kg/cm², 44 psi)**

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-185.)
2. Install fuel pressure gauge and check fuel pressure.

N.G. → Check fuel pressure regulator diaphragm.

7

CHECK EXHAUST GAS SENSOR.

1. See "M/R F/C MNT (right and left sides)" in "DATA MONITOR" mode.
2. Maintaining engine at 2,000 rpm under no-load (with engine warmed up sufficiently), check to make sure that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.
RICH → LEAN → RICH →
1 time 2 times
LEAN → RICH.....

OR

1. Set "Exhaust gas sensor monitor" in the self-diagnostic Mode II. (See page EF & EC-49.)
2. Maintaining engine at 2,000 rpm under no-load, check that check engine light goes ON and OFF more than 5 times during 10 seconds.

N.G. → Replace exhaust gas sensor(s).

7

MONITOR SENS FAIL

OAS-APK(PBS)	0067rPa
M-R F/C MNT	LEAN
M-R F/C MNT-R	RICH

RECORD

SEF160I

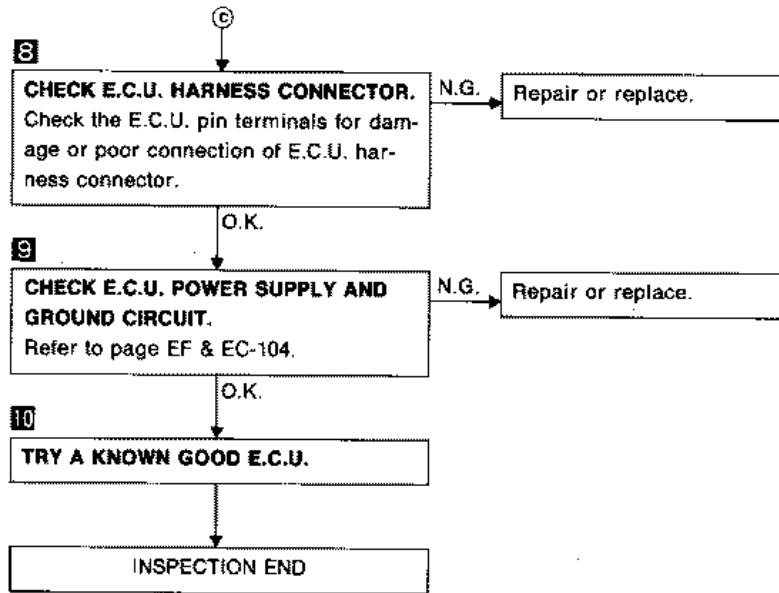
7

SEF025K

O.K.
↓
(Go to Ⓒ on next page.)

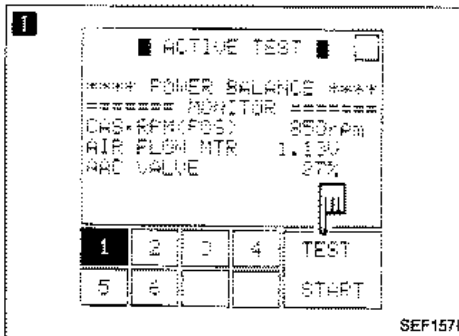
TROUBLE DIAGNOSES

Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)



TROUBLE DIAGNOSES

Diagnostic Procedure 15 — Engine Stalls when Accelerating or Cruising



1

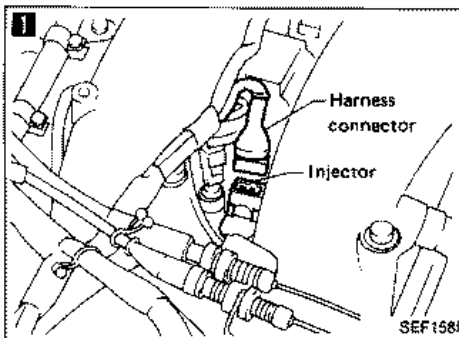
PERFORM POWER BALANCE TEST.

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

No → Go to **4**.

OR

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

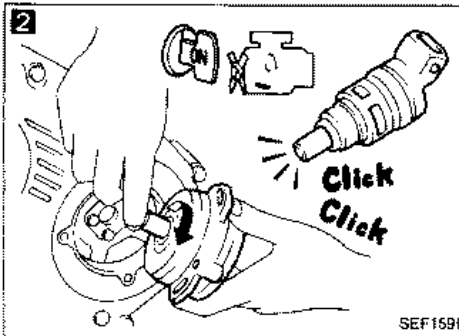


2

CHECK INJECTOR.

1. Remove crank angle sensor from engine. (Harness connector should remain connected.)
2. Turn ignition switch ON. (Do not start engine.)
3. When rotating crank angle sensor shaft, does each injector make an operating sound?

No → Check injector(s) and circuit(s).

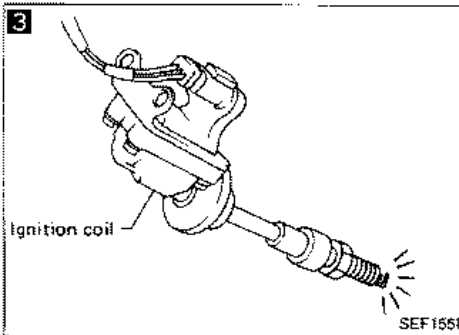


3

CHECK IGNITION SPARK.

1. Disconnect ignition coil assembly from collector.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-118.)



O.K.
→ (Go to **A** on next page.)

TROUBLE DIAGNOSES

Diagnostic Procedure 15 — Engine Stalls when Accelerating or Cruising (Cont'd)


4

■ FUEL PRESS. RELEASE ■

FUEL PUMP WILL STOP BY TOUCHING START DURING IDLE. CRANK A FEW TIMES AFTER ENGINE STALLS.

START

↓



SEF204J

A

4

CHECK FUEL PRESSURE.

1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
At idle approx. 255 kPa (2.55 bar, 2.6 kg/cm², 37 psi)
The moment throttle valve is fully open: approx. 304 kPa (3.04 bar, 3.1 kg/cm², 44 psi)

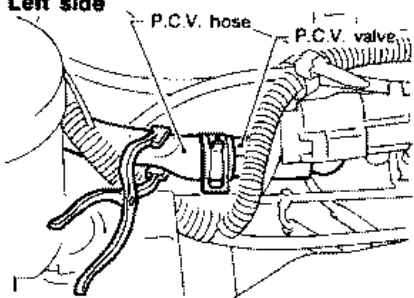
OR

1. Release fuel pressure to zero. (Refer to page EF & EC-185.)
2. Install fuel pressure gauge and check fuel pressure.

N.G. → Check fuel pump, circuit and fuel pressure regulator.

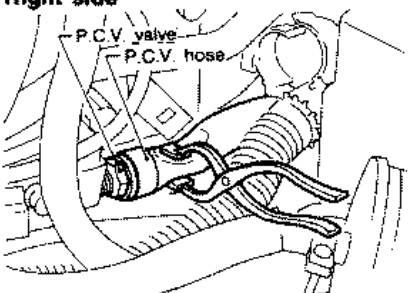
5

Left side



P.C.V. hose, P.C.V. valve

Right side



P.C.V. valve, P.C.V. hose

SEF027K

O.K.

5

CHECK FOR INTAKE AIR LEAK.

When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

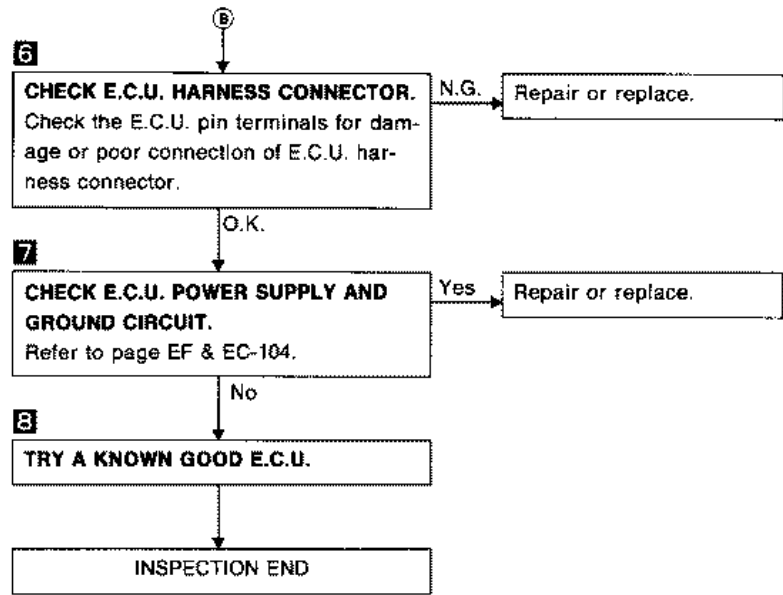
Yes → Discover air leak location and repair.

No

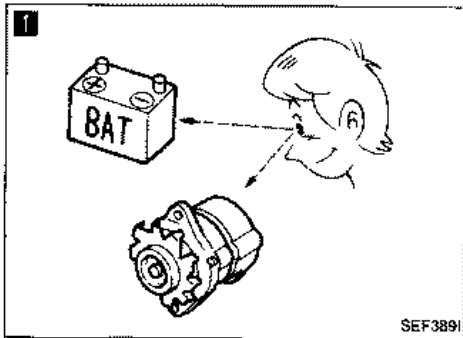
(Go to ⑥ on next page.)

TROUBLE DIAGNOSES

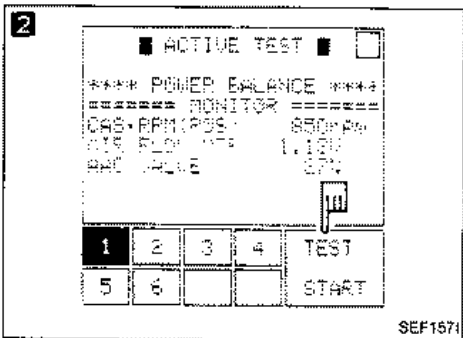
Diagnostic Procedure 15 — Engine Stalls when Accelerating or Cruising (Cont'd)



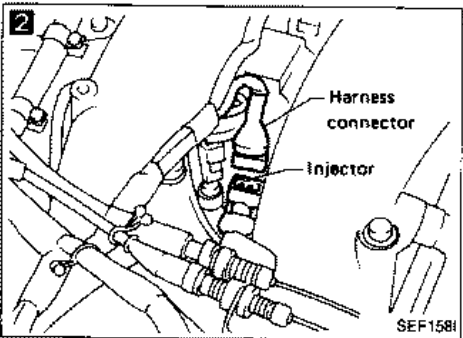
TROUBLE DIAGNOSES



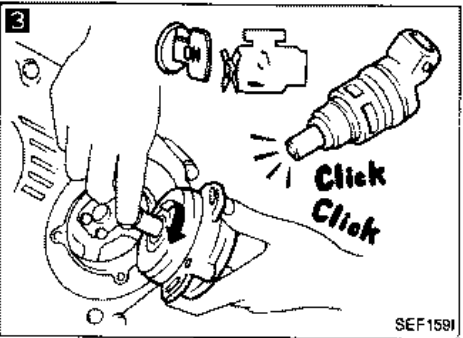
SEF389I



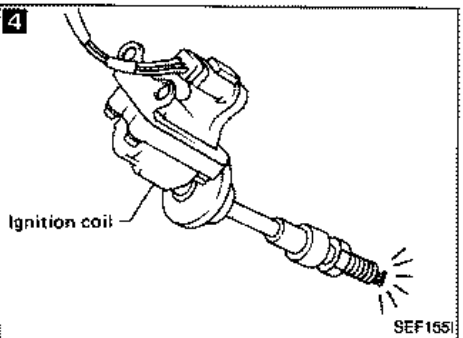
SEF157I



SEF158I

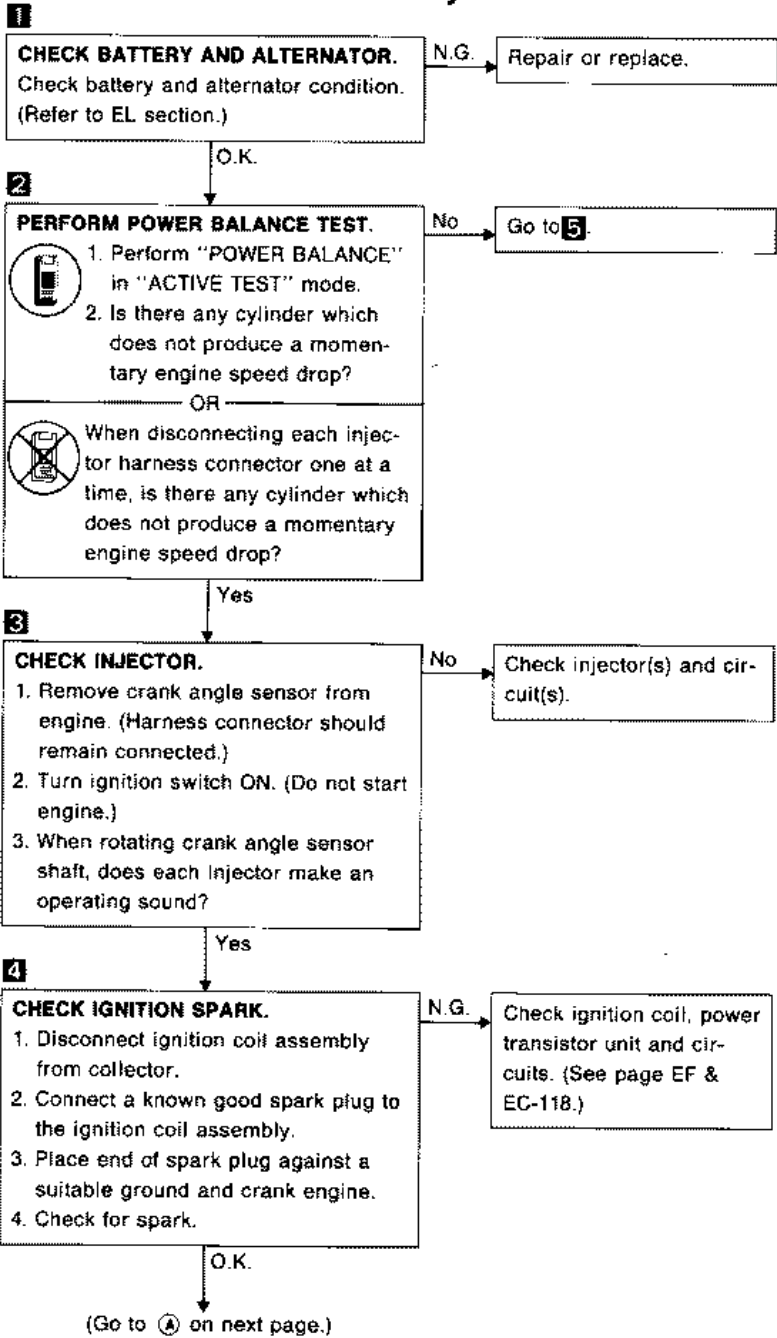


SEF159I



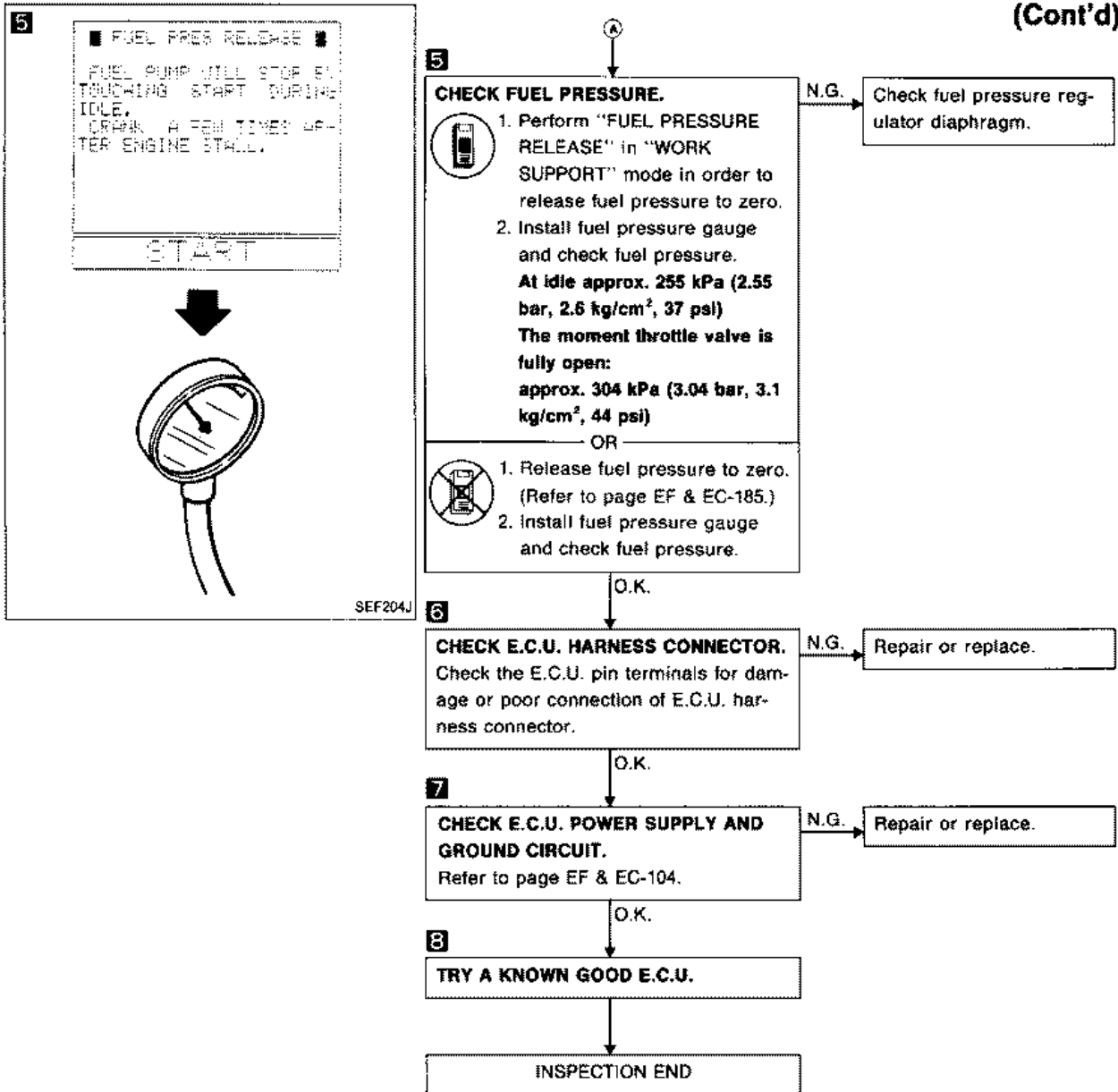
SEF155I

Diagnostic Procedure 16 — Engine Stalls when the Electrical Load is Heavy



TROUBLE DIAGNOSES

Diagnostic Procedure 16 — Engine Stalls when the Electrical Load is Heavy (Cont'd)




TROUBLE DIAGNOSES

1

FUEL PRESS RELEASE

FUEL PUMP WILL STOP BY TOUCHING START DURING IDLE. CRANK A FEW TIMES AFTER ENGINE STALL.

START



SEF204J

Diagnostic Procedure 17 — Lack of Power and Stumble

1

CHECK FUEL PRESSURE.

1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.

2. Install fuel pressure gauge and check fuel pressure.

At idle approx. 255 kPa (2.55 bar, 2.6 kg/cm², 37 psi)

The moment throttle valve is fully open: approx. 304 kPa (3.04 bar, 3.1 kg/cm², 44 psi)

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-185.)

2. Install fuel pressure gauge and check fuel pressure.

N.G. → Check fuel pressure regulator diaphragm.

O.K. →

2

CHECK FOR INTAKE AIR LEAK.

When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise or the engine become more stable?

Yes → Discover air leak location and repair.

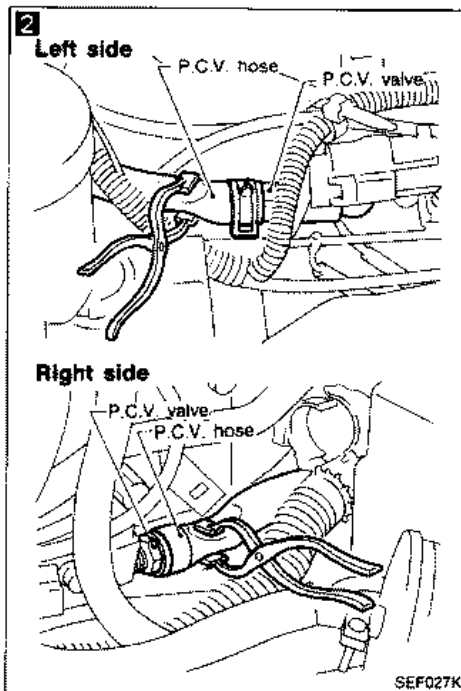
No →

CHECK TIMING BELT FOR PROPER INSTALLATION.

N.G. → Replace timing belt.

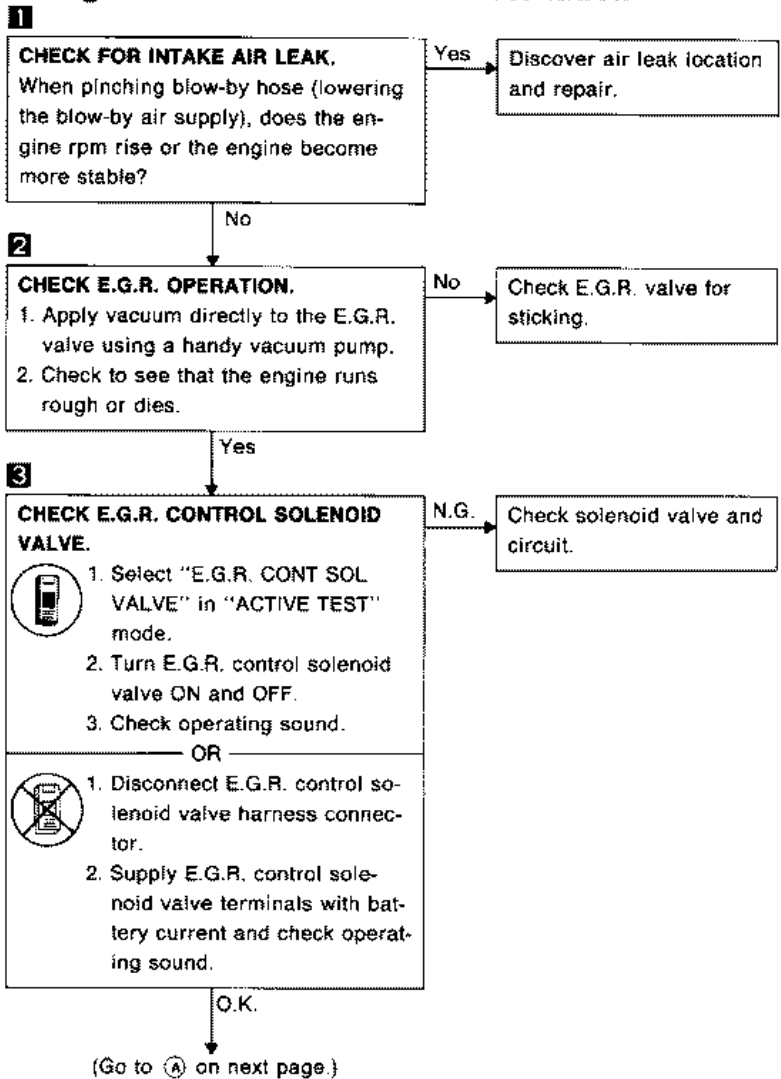
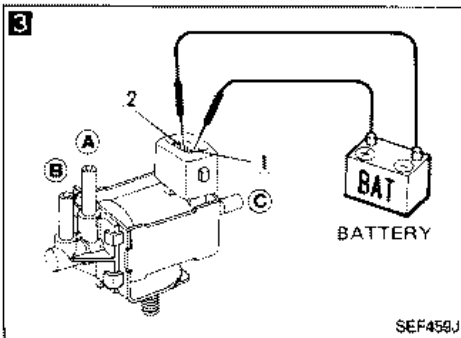
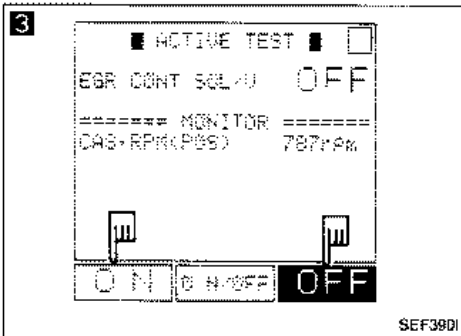
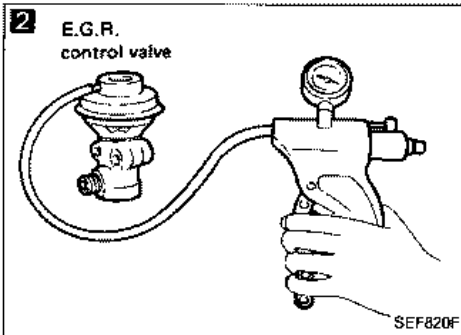
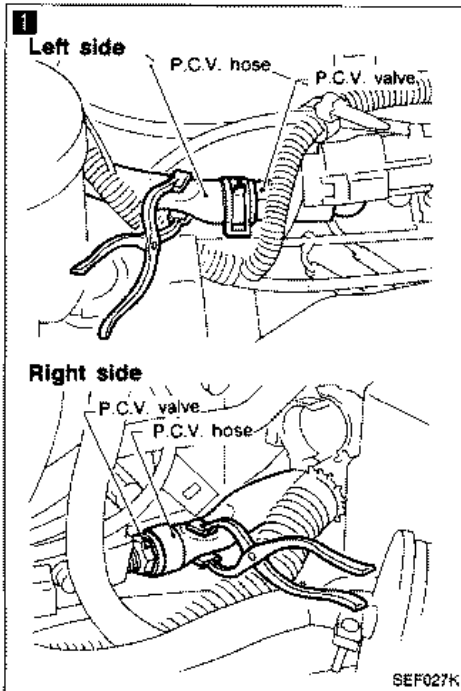
O.K. →

INSPECTION END



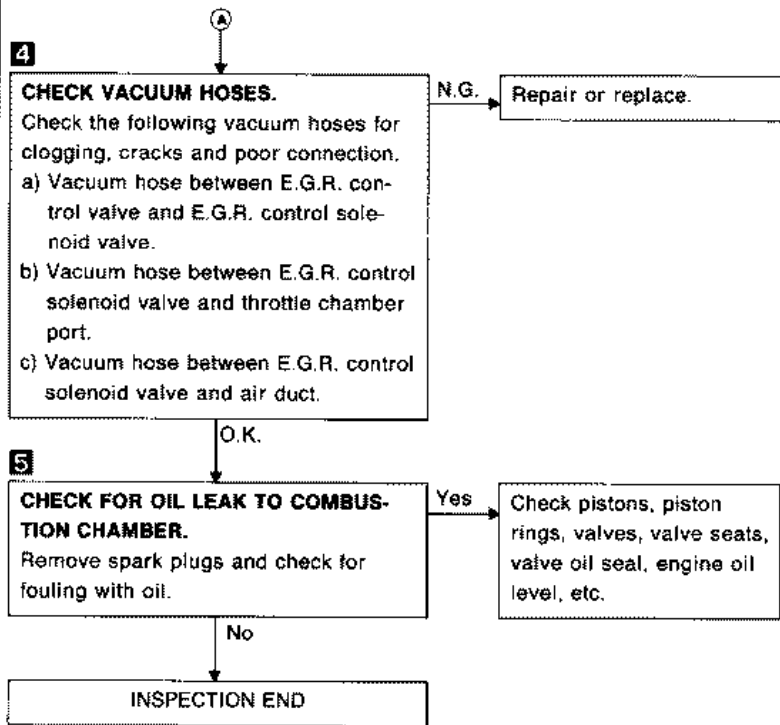
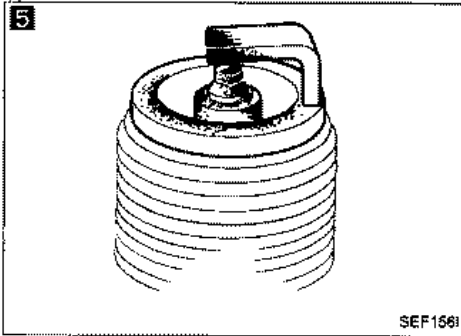
TROUBLE DIAGNOSES

Diagnostic Procedure 18 — Detonation



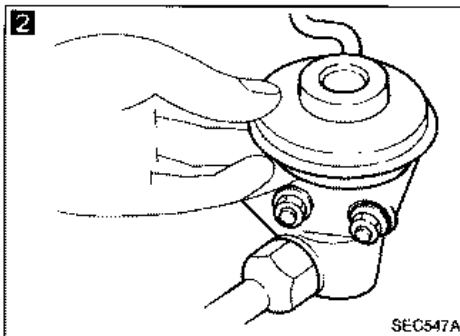
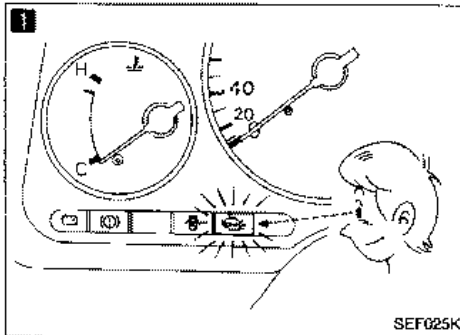
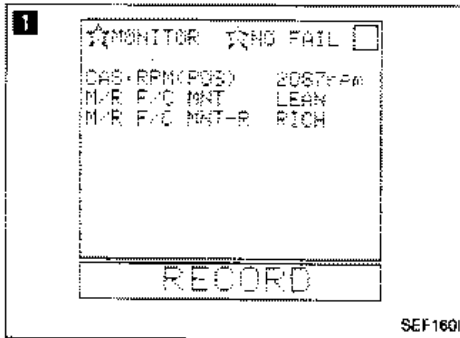
TROUBLE DIAGNOSES

Diagnostic Procedure 18 — Detonation (Cont'd)



TROUBLE DIAGNOSES

Diagnostic Procedure 19 — Surge



- 1**
- CHECK EXHAUST GAS SENSOR.**
1. See "M/R F/C MNT (right and left sides)" in "DATA MONITOR" mode.
 2. Maintaining engine at 2,000 rpm under no-load (with engine warmed up sufficiently), check to make sure that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.
- RICH → LEAN → RICH →**
1 time 2 times
LEAN → RICH.....
 — OR —
1. Set "Exhaust gas sensor monitor" in the self-diagnostic Mode II. (See page EF & EC-49.)
 2. Maintaining engine at 2,000 rpm under no-load, check that check engine light goes ON and OFF more than 5 times during 10 seconds.

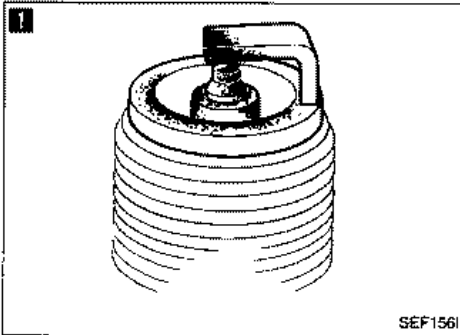
N.G. → Replace exhaust gas sensor(s).

- O.K.
- 2**
- CHECK E.G.R. CONTROL VALVE.**
Check E.G.R. control valve for sticking.

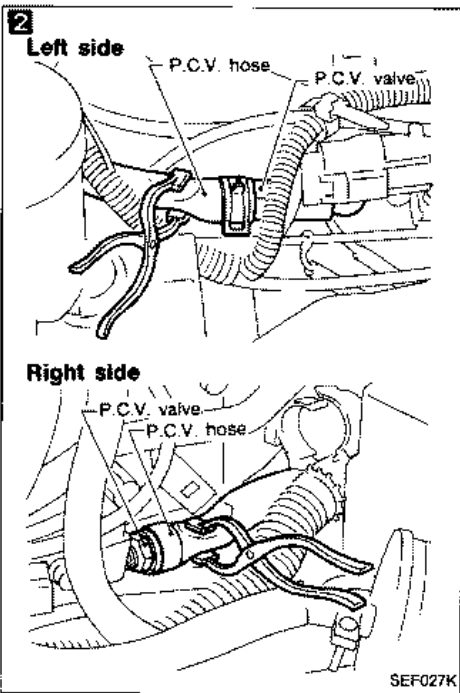
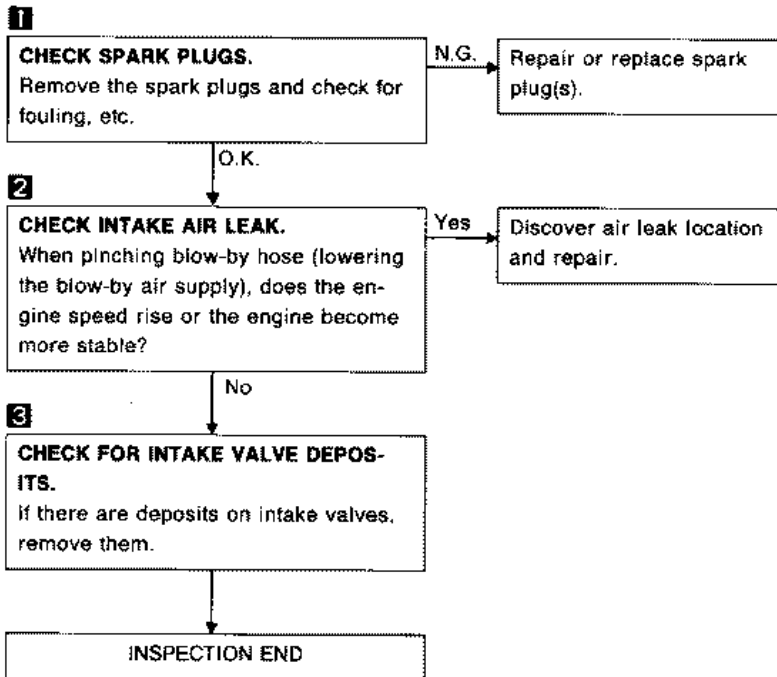
N.G. → Repair or replace.

- O.K.
- 3**
- TRY A KNOWN GOOD E.C.U.**
- O.K.
- INSPECTION END

TROUBLE DIAGNOSES



Diagnostic Procedure 20 — Backfire through the Intake



TROUBLE DIAGNOSES

Diagnostic Procedure 21 — Backfire through the Exhaust

1

CHECK ENGINE TEMPERATURE SENSOR.
Check engine temperature sensor and its circuit. (See page EF & EC-114.)

N.G.

Replace or repair.

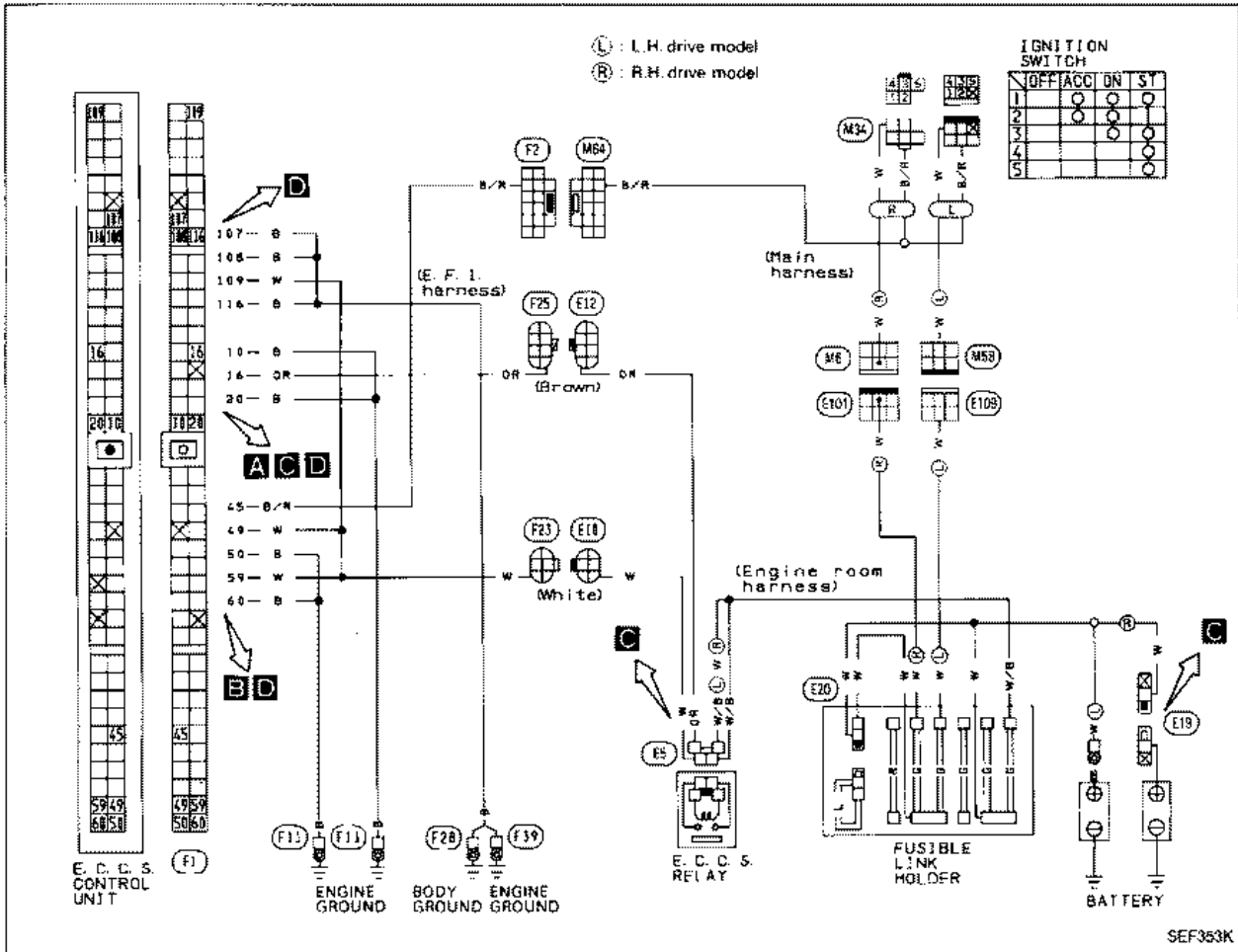
O.K.

INSPECTION END

TROUBLE DIAGNOSES

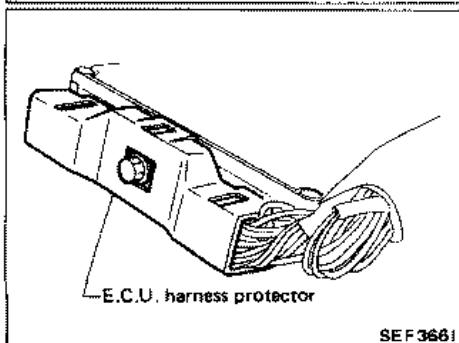
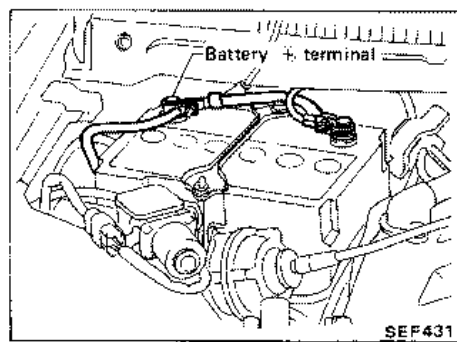
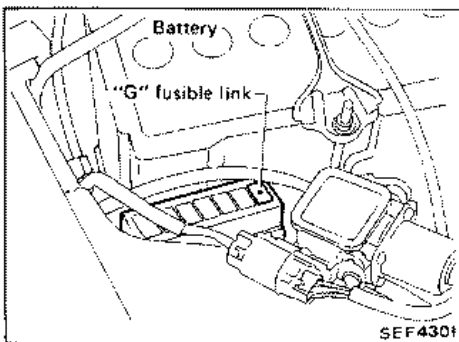
Diagnostic Procedure 22

MAIN POWER SUPPLY AND GROUND CIRCUIT



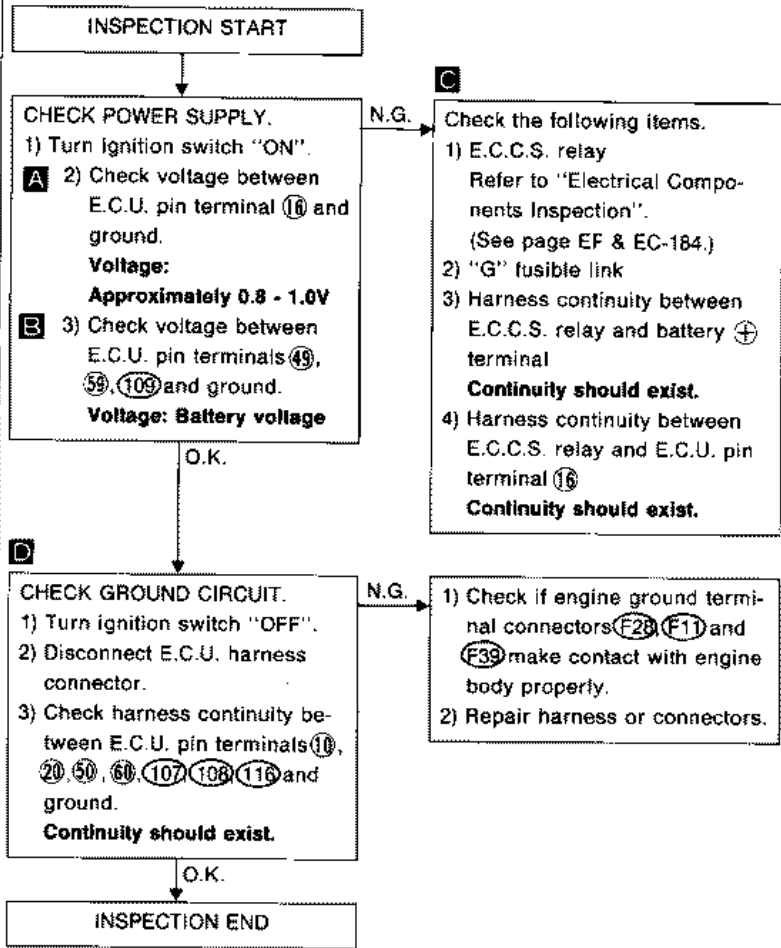
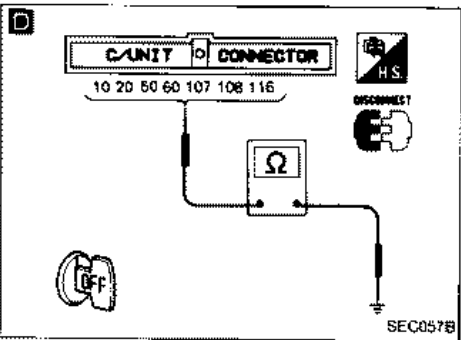
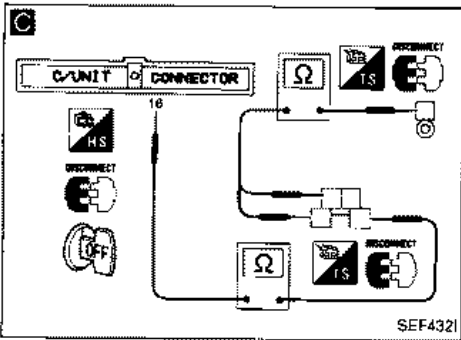
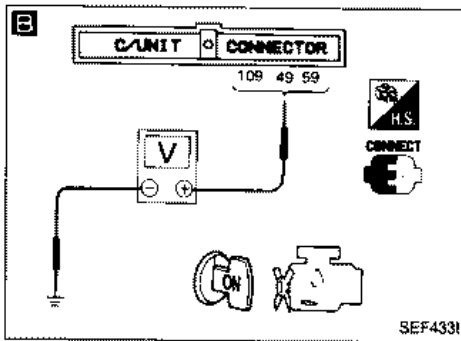
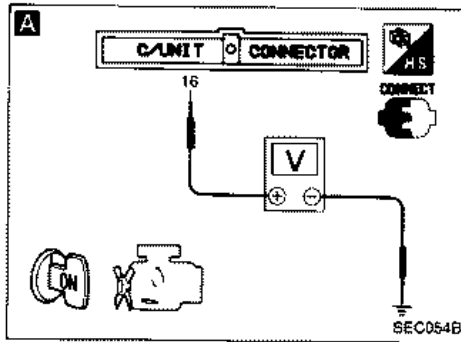
SEF353K

Harness layout



TROUBLE DIAGNOSES

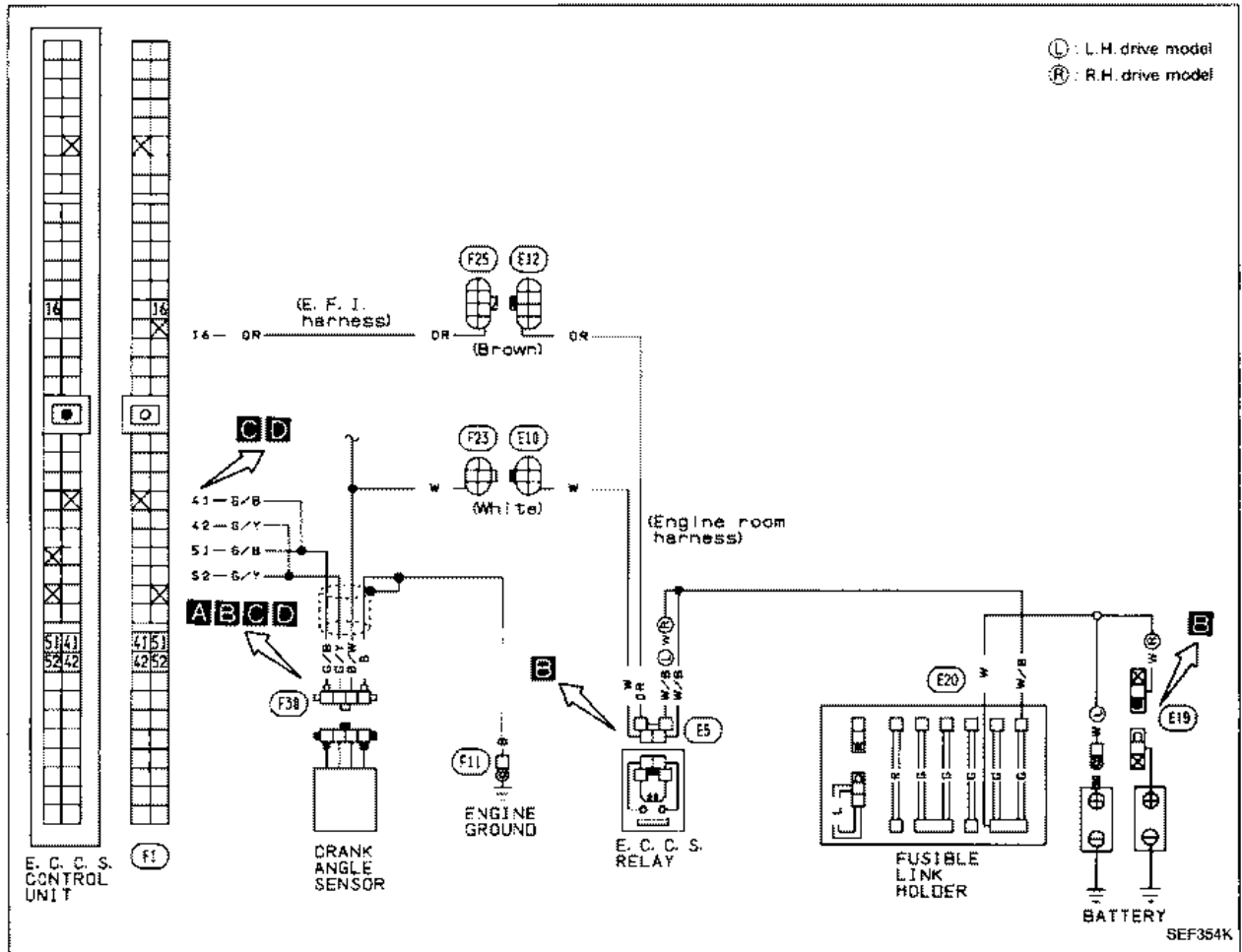
Diagnostic Procedure 22 (Cont'd)



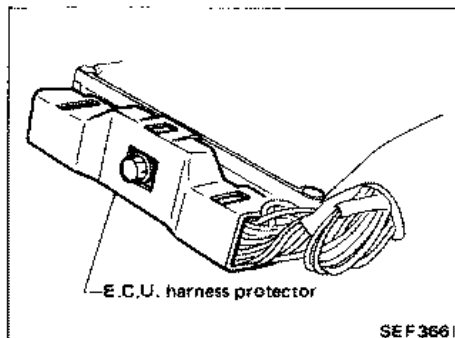
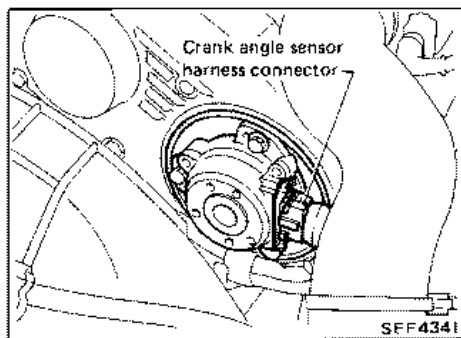
TROUBLE DIAGNOSES

Diagnostic Procedure 23

CRANK ANGLE SENSOR (Code No. 11)

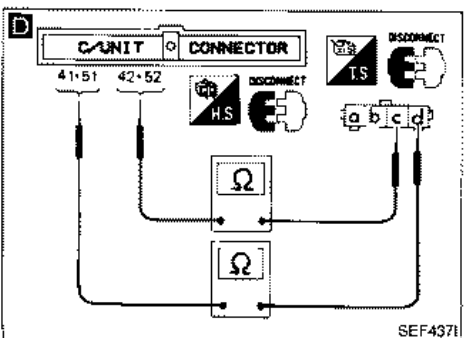
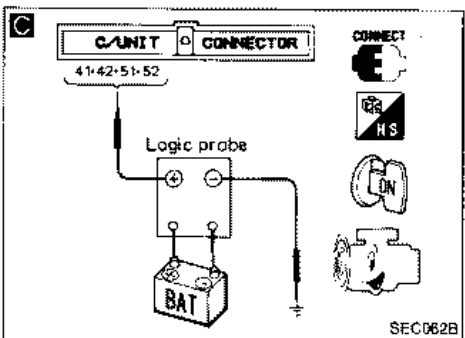
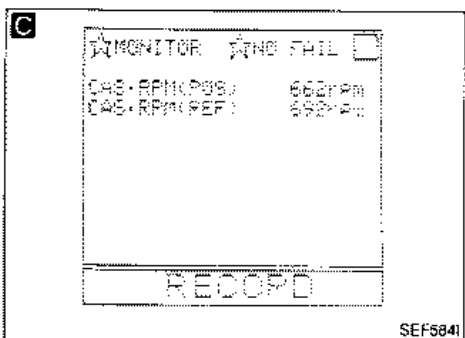
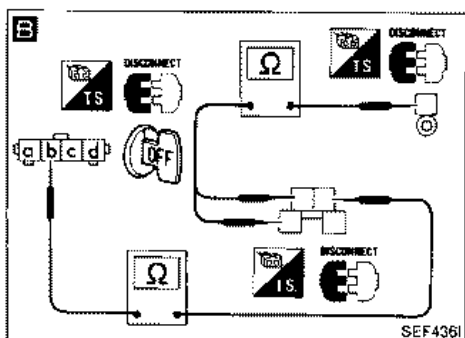
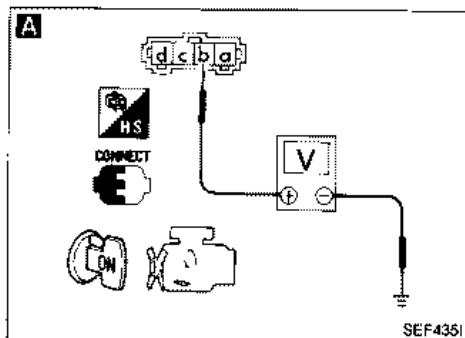


Harness layout



TROUBLE DIAGNOSES

Diagnostic Procedure 23 (Cont'd)



INSPECTION START

A
CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between terminal (b) and ground.
Voltage: Battery voltage

B
Check the following items.
1) E.C.C.S. relay
Refer to "Electrical Components Inspection".
(See page EF & EC-184.)
2) "G" fusible link
3) Harness continuity between E.C.C.S. relay and battery (+) terminal
Continuity should exist.
4) Harness continuity between E.C.C.S. relay and crank angle sensor terminal (b)
Continuity should exist.

O.K.

C
CHECK INPUT SIGNAL.
1) Start engine.
2) Read crank angle sensor signals in "DATA MONITOR" mode with CONSULT.

	A/T*	M/T
Non-turbo	770±50 rpm	700±50 rpm
Turbo	750±50 rpm	

*: in "N" position

OR
2) Check that pulse signals exist in E.C.U. terminals (41), (51) and (42), (52) with logic probe.
Pulse signal should exist.
(41), (51): 120° signal
(42), (52): 1° signal

D
CHECK HARNESS CONTINUITY BETWEEN E.C.U. AND CRANK ANGLE SENSOR.
1) Stop engine.
2) Disconnect crank angle sensor harness connector.
3) Disconnect E.C.U. harness connector.
4) Check harness continuity between E.C.U. terminals (41), (51) and terminal (d), E.C.U. terminals (42), (52) and terminal (c).
Continuity should exist.
If N.G., repair harness or connectors.

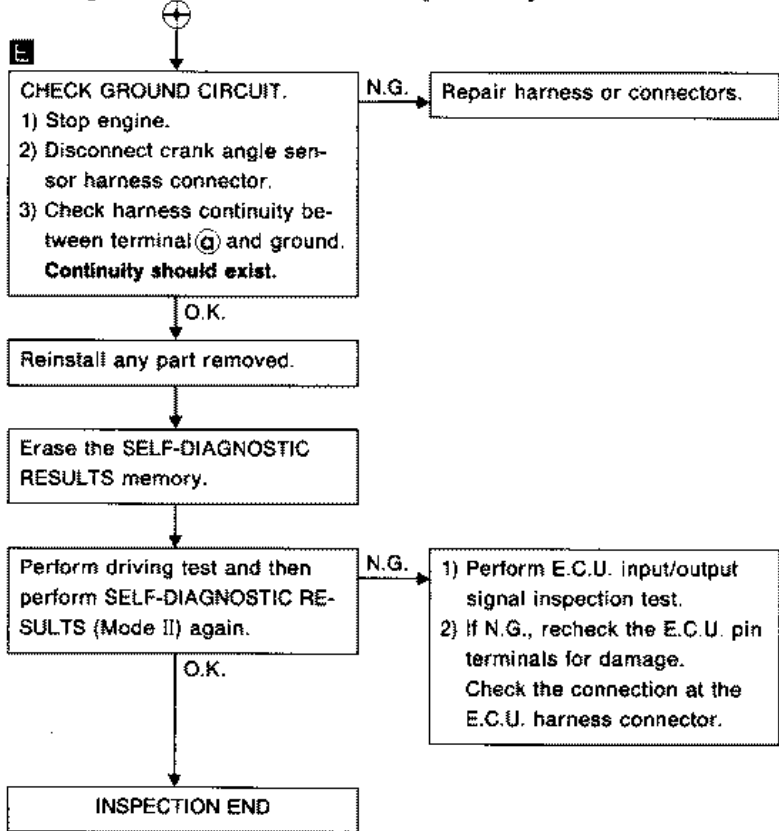
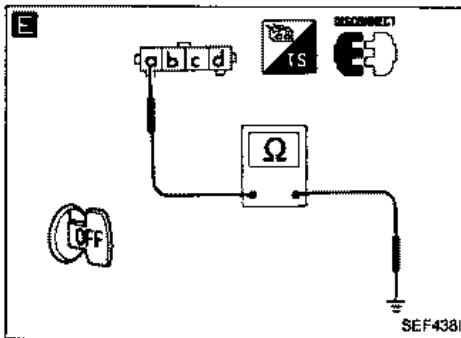
O.K.

O.K.

CHECK COMPONENT
(Crank angle sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-178.)

TROUBLE DIAGNOSES

Diagnostic Procedure 23 (Cont'd)



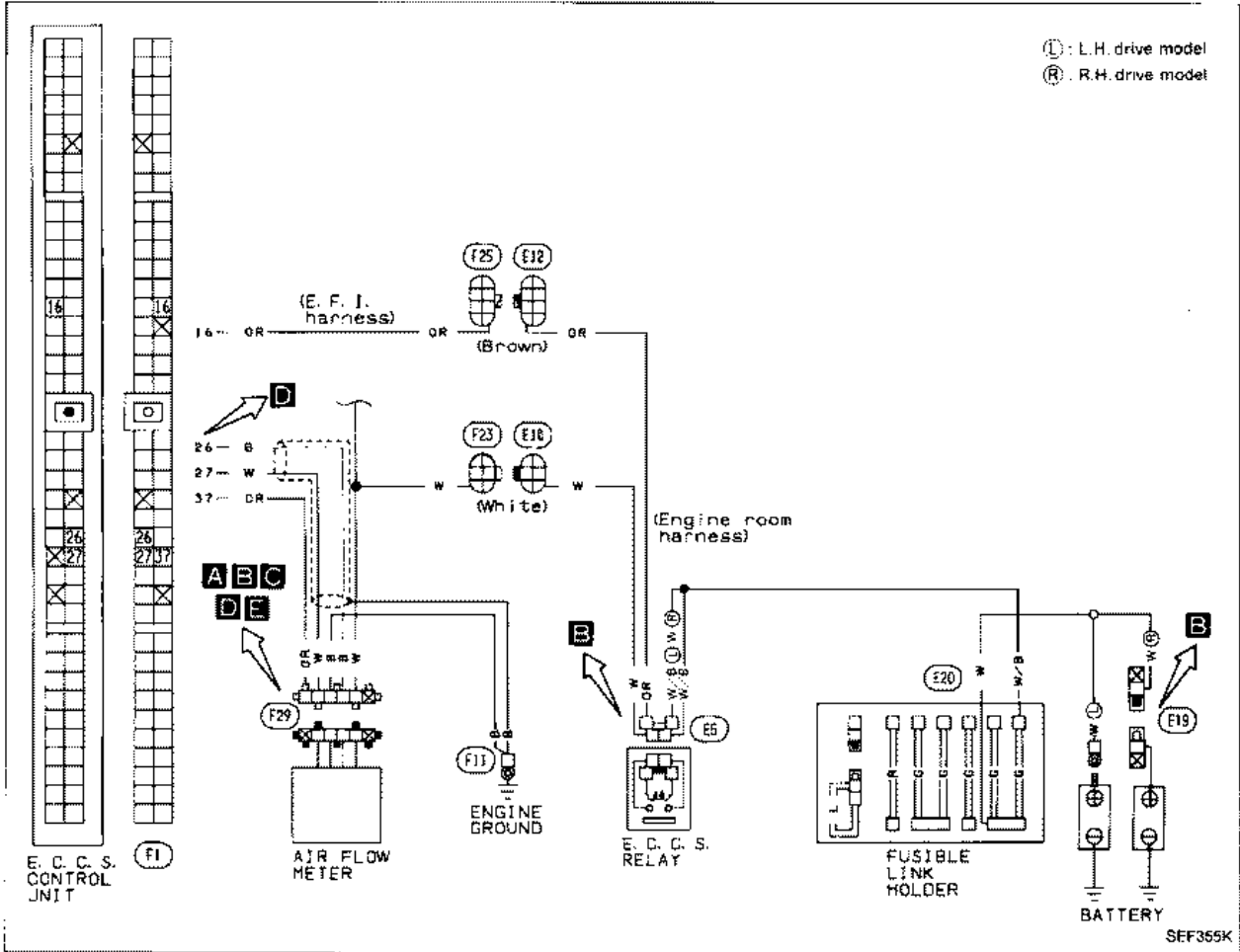
TROUBLE DIAGNOSES

NOTE

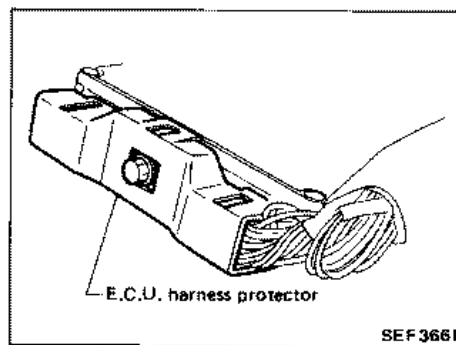
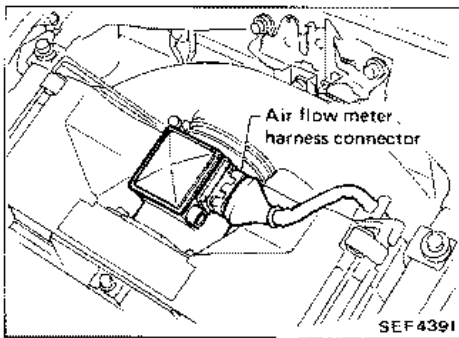
TROUBLE DIAGNOSES

Diagnostic Procedure 24

AIR FLOW METER (Code No. 12)

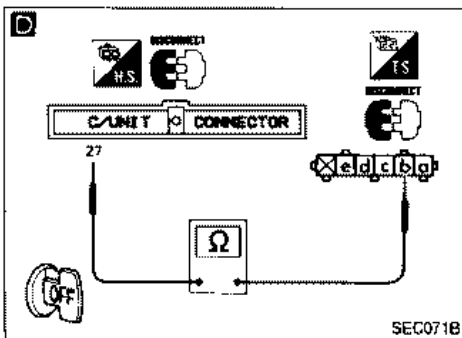
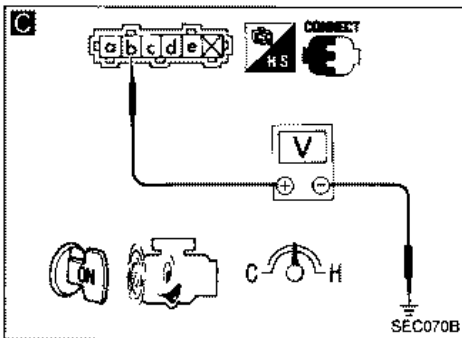
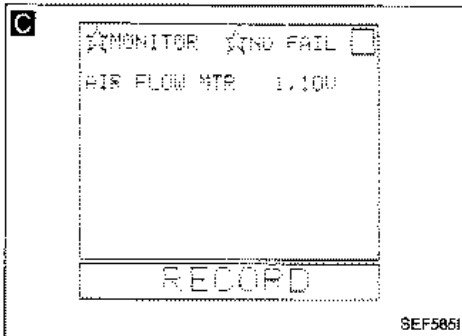
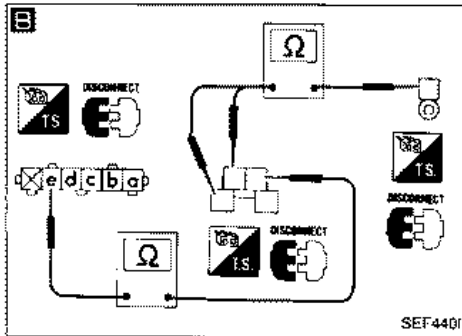
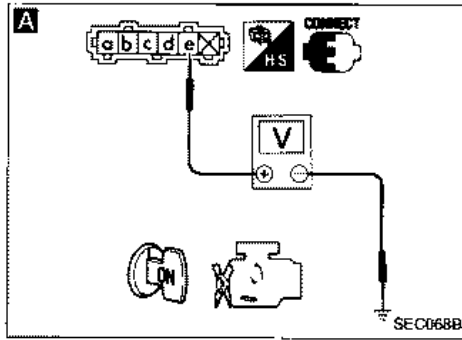


Harness layout



TROUBLE DIAGNOSES

Diagnostic Procedure 24 (Cont'd)



INSPECTION START

A
CHECK POWER SOURCE.
1) Turn ignition switch "ON".
2) Check voltage between terminal (e) and ground.
Voltage: Battery voltage

B
Check the following items.
1) E.C.C.S. relay
Refer to "Electrical Components Inspection".
(See page EF & EC-184.)
2) "G" fusible link
3) Harness continuity between E.C.C.S. relay and battery (+) terminal
Continuity should exist.
4) Harness continuity between E.C.C.S. relay and air flow meter terminal (e)
Continuity should exist.

O.K.

C
CHECK INPUT SIGNAL.
1) Start engine and warm it up sufficiently.
2) Read air flow meter signal in "DATA MONITOR" mode with CONSULT.
Voltage: 0.8 - 1.5V

D
CHECK HARNESS CONTINUITY BETWEEN AIR FLOW METER AND E.C.U.
1) Stop engine.
2) Disconnect air flow meter harness connector.
3) Disconnect E.C.U. harness connector.
4) Check harness continuity between E.C.U. terminal (27) and terminal (b).
Continuity should exist.
If N.G., repair harness or connectors.

OR

2) Check voltage between terminals (b) and ground at idle under no-load.
Voltage: 0.8 - 1.5V

O.K.

CHECK COMPONENT
(Air flow meter).
Refer to "Electrical Components Inspection".
(See page EF & EC-178.)

O.K.

E
CHECK GROUND CIRCUIT.
1) Stop engine.
2) Disconnect air flow meter harness connector.
3) Check harness continuity between terminal (c) and ground.
Continuity should exist.

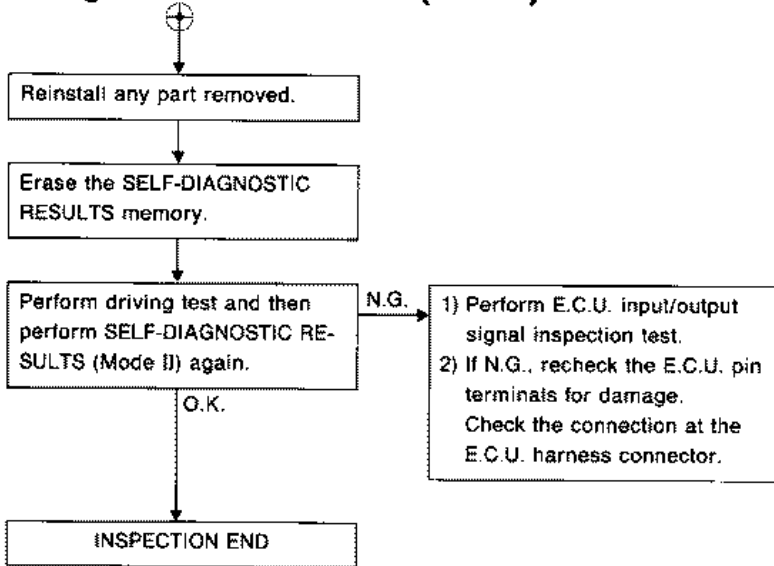
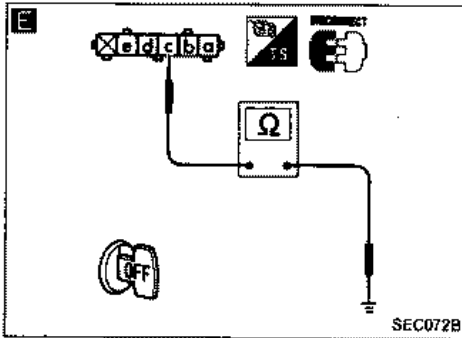
N.G. Repair harness or connectors.

O.K.

+

TROUBLE DIAGNOSES

Diagnostic Procedure 24 (Cont'd)



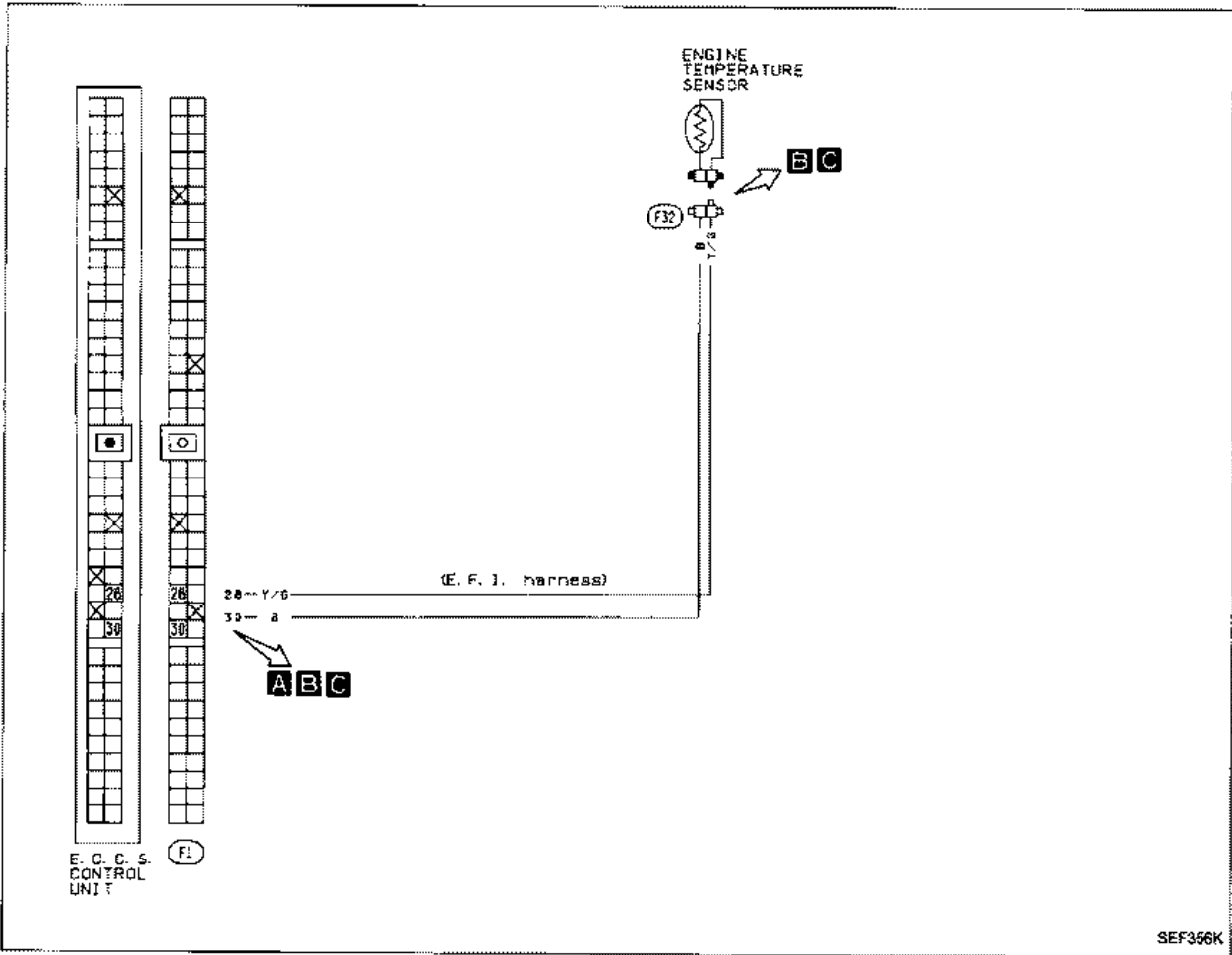
TROUBLE DIAGNOSES

NOTE

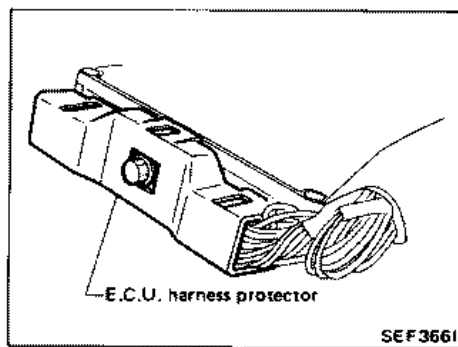
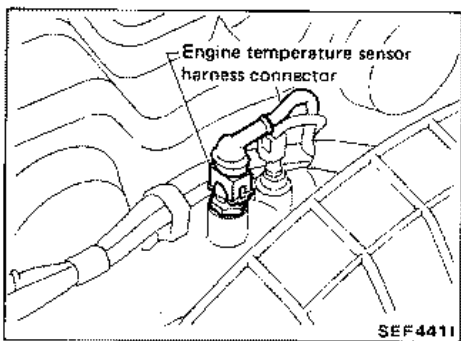
TROUBLE DIAGNOSES

Diagnostic Procedure 25

ENGINE TEMPERATURE SENSOR (Code No. 13)

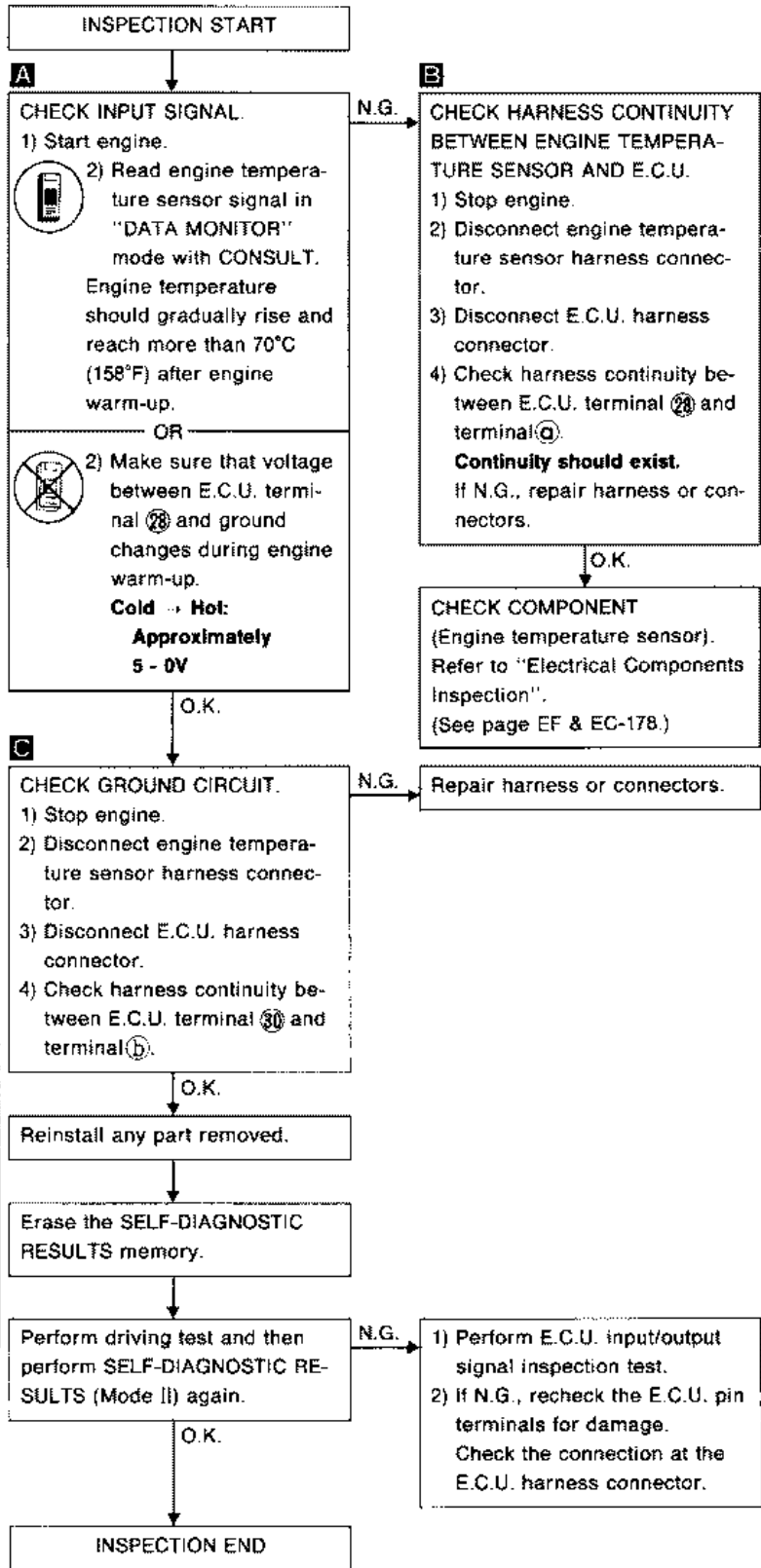
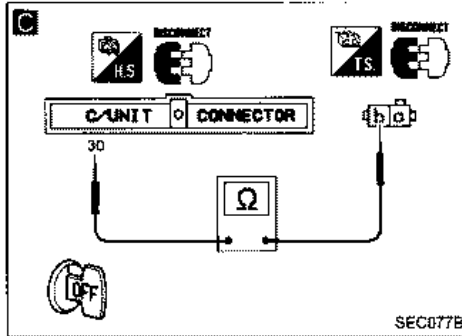
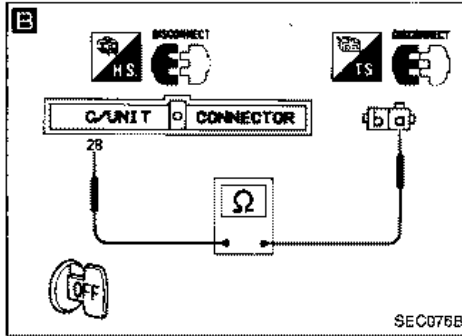
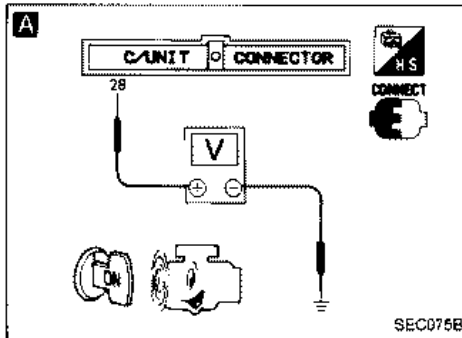
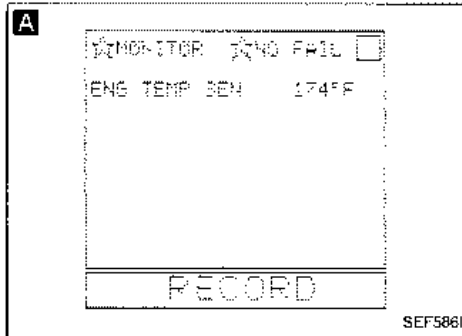


Harness layout



TROUBLE DIAGNOSES

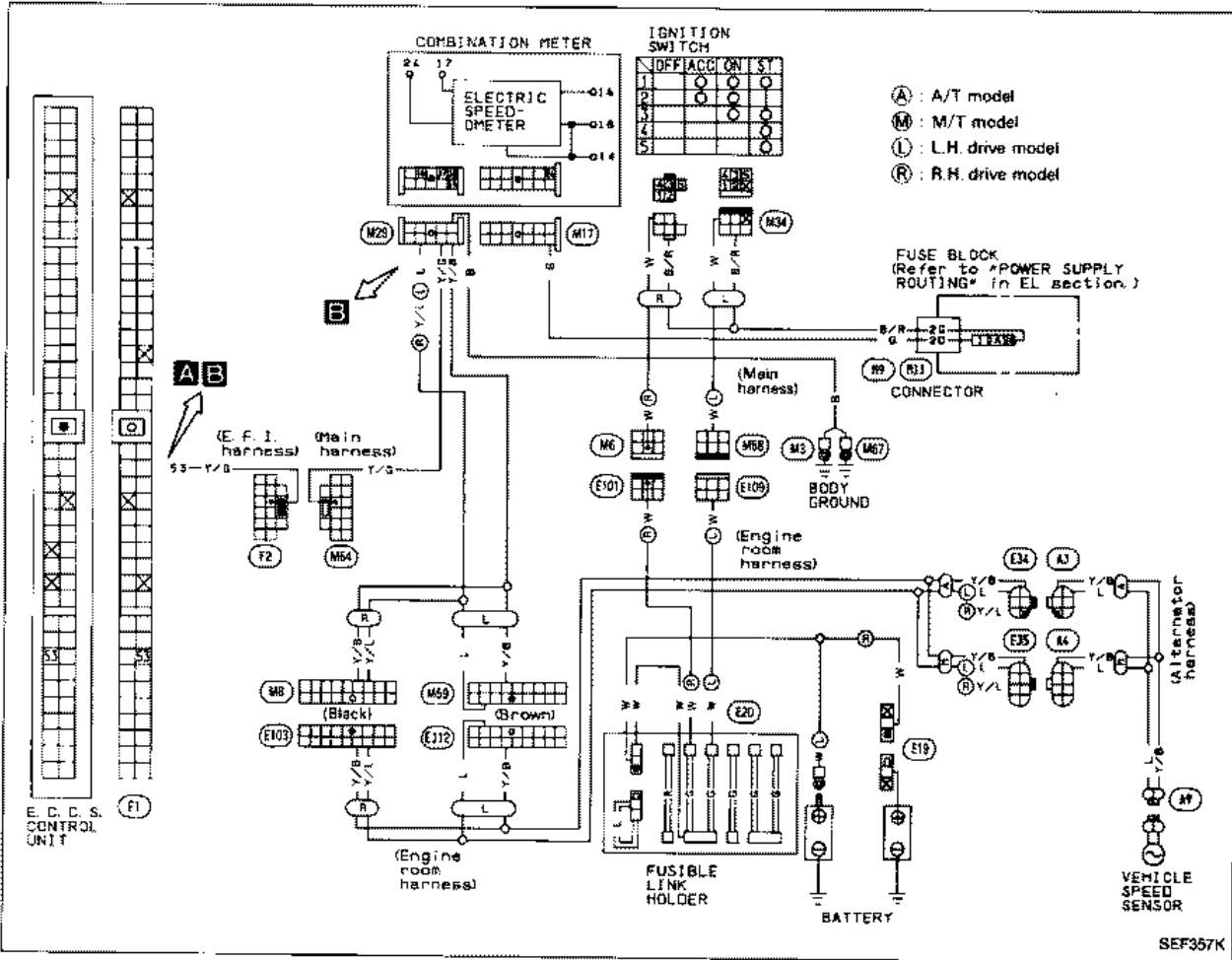
Diagnostic Procedure 25 (Cont'd)



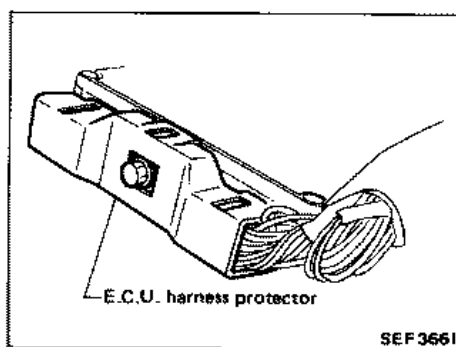
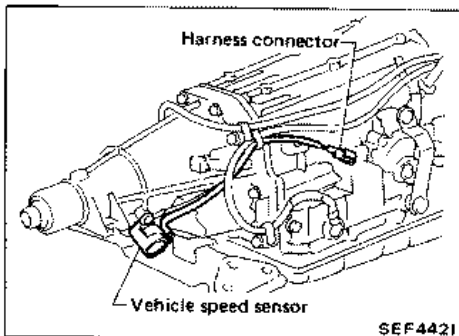
TROUBLE DIAGNOSES

Diagnostic Procedure 26

VEHICLE SPEED SENSOR

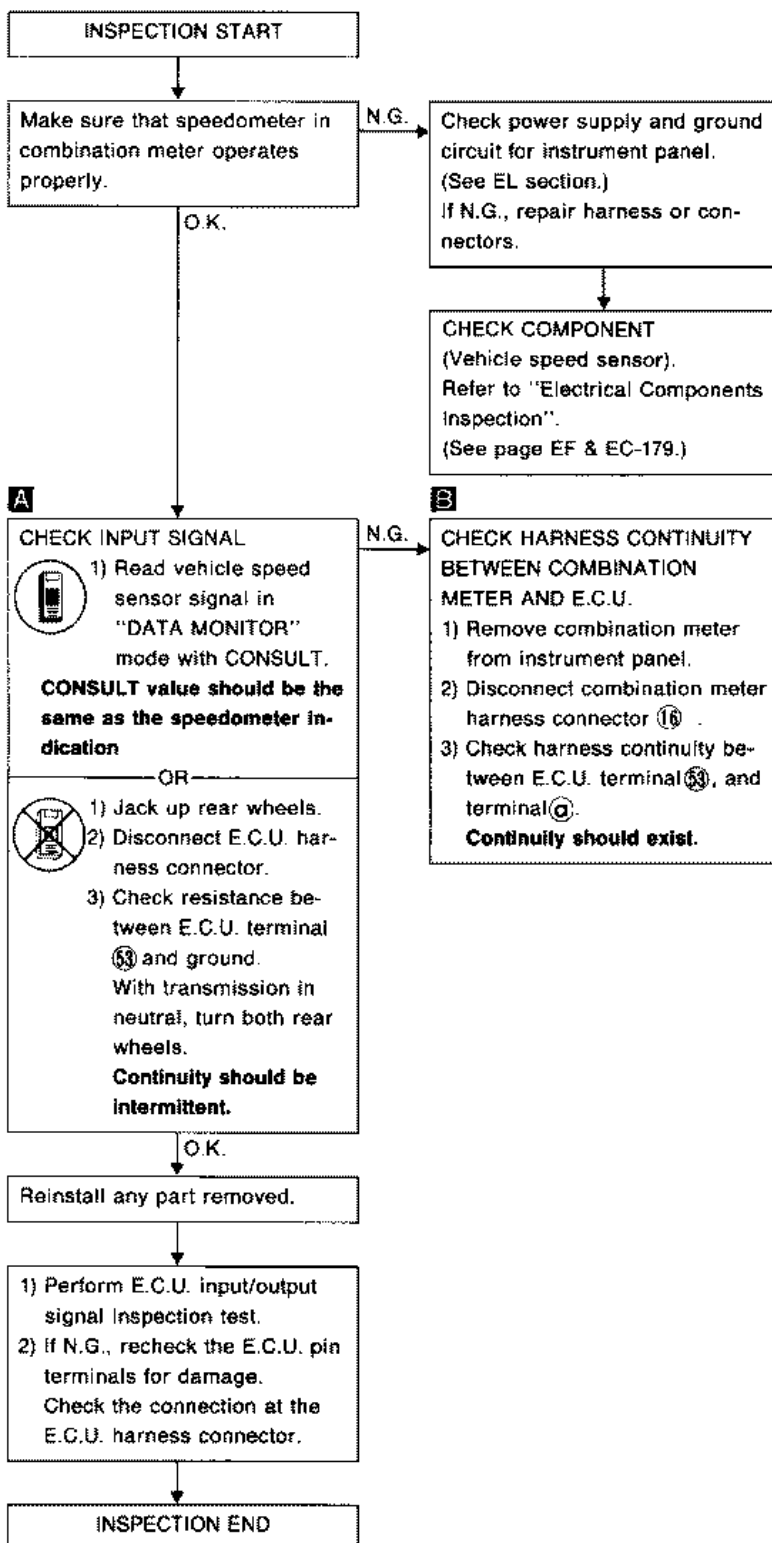
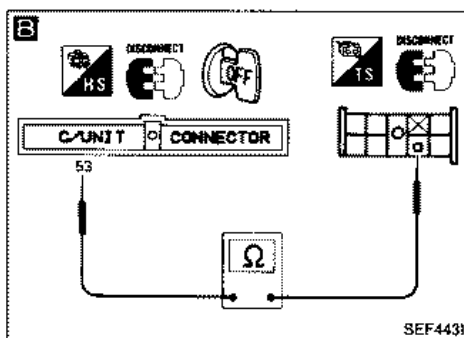
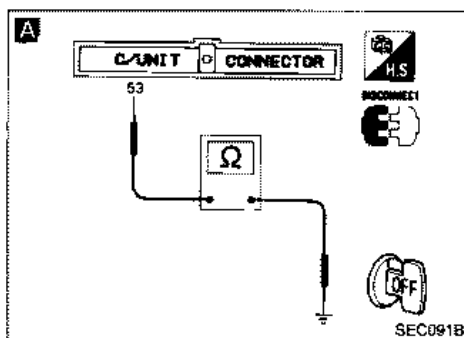
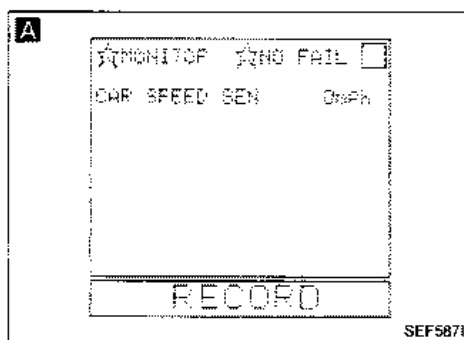


Harness layout



TROUBLE DIAGNOSES

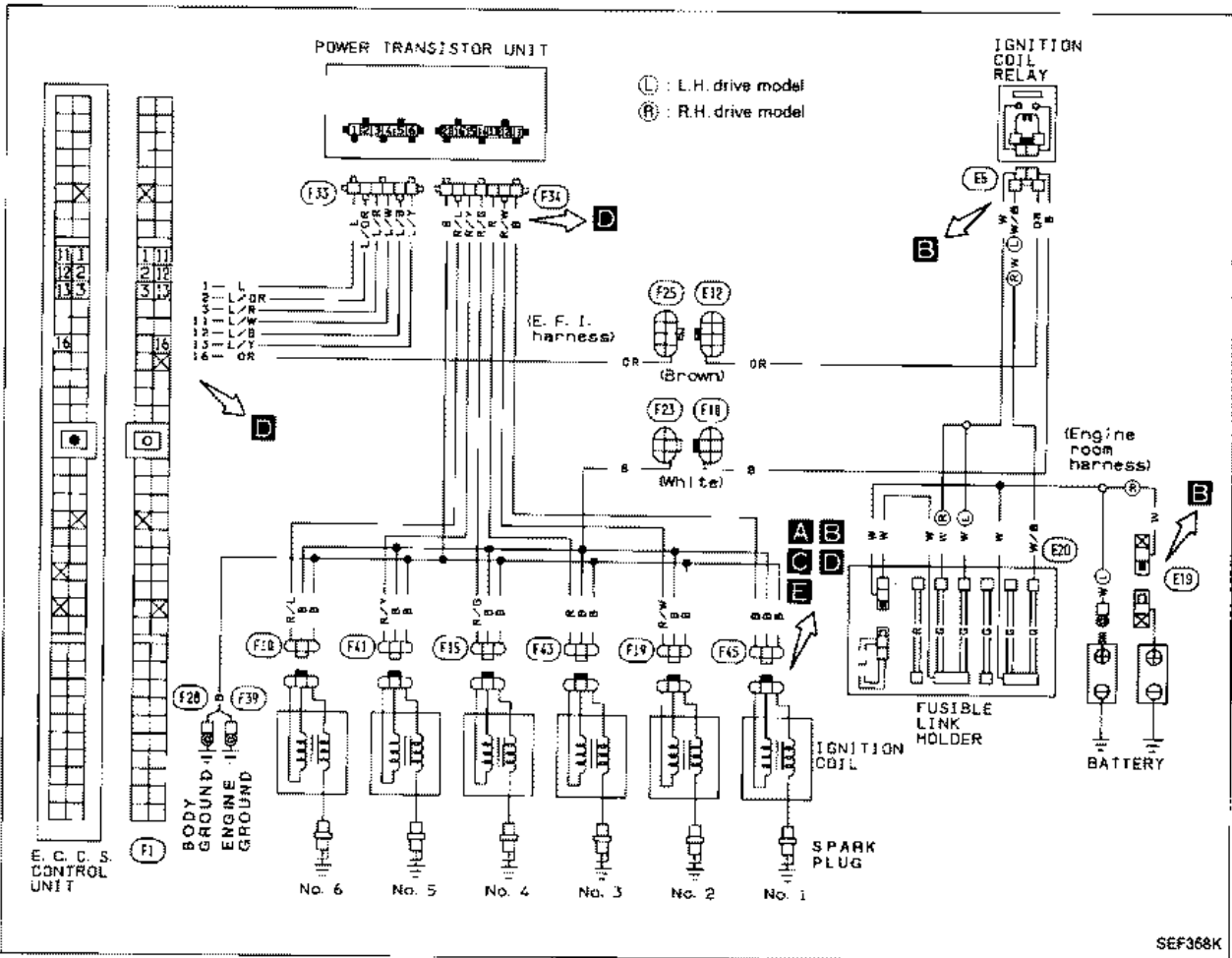
Diagnostic Procedure 26 (Cont'd)



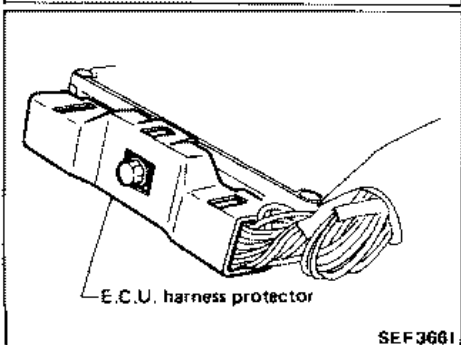
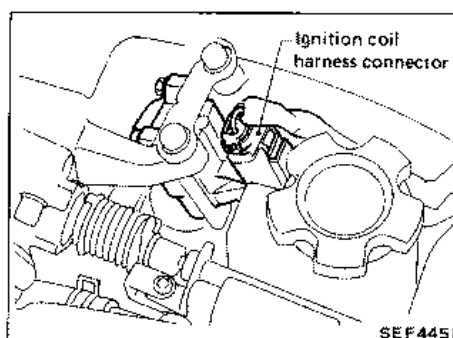
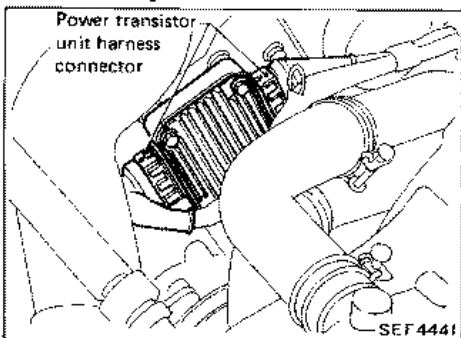
TROUBLE DIAGNOSES

Diagnostic Procedure 27

IGNITION SIGNAL (Code No. 21)

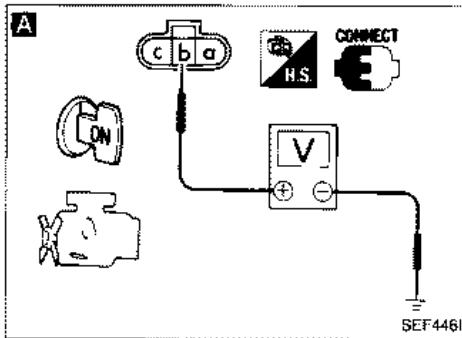


Harness layout



TROUBLE DIAGNOSES

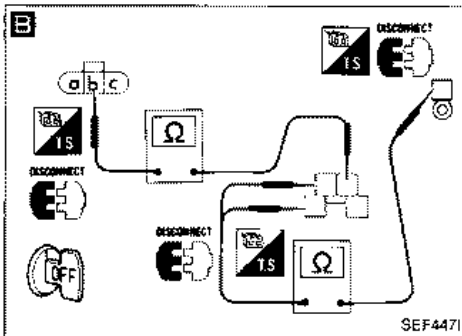
Diagnostic Procedure 27 (Cont'd)



INSPECTION START

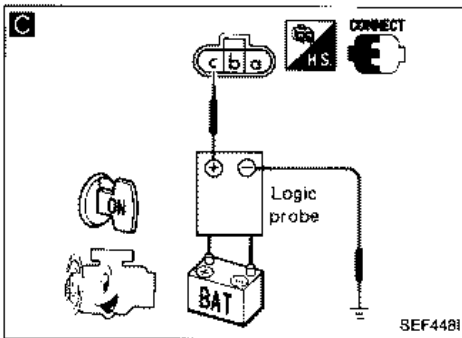
A
CHECK POWER SUPPLY.
 1) Turn ignition switch "ON".
 2) Check voltage between terminal (a) and ground.
Voltage: Approx. battery voltage

B
 Check the following items.
 1) Ignition coil relay
 Refer to "Electrical Components Inspection".
 (See page EF & EC-184.)
 2) "G" fusible link
 3) Harness continuity between ignition coil relay and ignition coils.
Continuity should exist.
 4) Harness continuity between ignition coil relay and battery (+) terminal.
Continuity should exist.



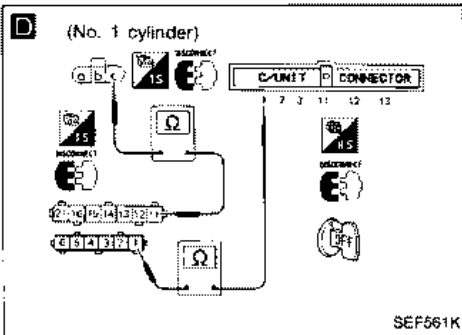
C
CHECK OUTPUT SIGNAL.
 1) Start engine.
 2) With logic probe make sure that pulse signal exists between terminal (c) and ground.
Pulse signal should exist.

D
 Check the following items.
 1) Power transistor unit
 Refer to "Electrical Components Inspection".
 (See page EF & EC-179.)
 2) Harness continuity between terminal (c) and power transistor terminals (1) (No. 1 cylinder), (2) (No. 2 cylinder), (6) (No. 6 cylinder).
Continuity should exist.
 3) Harness continuity between power transistor terminals and E.C.U. terminals.
 ① - ① ⑪ - ④
 ② - ② ⑫ - ⑤
 ③ - ③ ⑬ - ⑥
Continuity should exist.

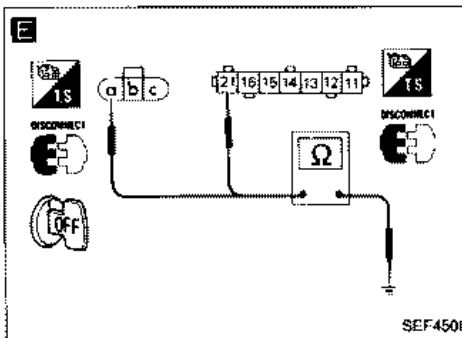


E
CHECK GROUND CIRCUIT.
 1) Stop engine.
 2) Disconnect ignition coil and power transistor harness connectors.
 3) Check harness continuity between terminal (a) (21) and ground.
Continuity should exist.

Repair or replace harness.

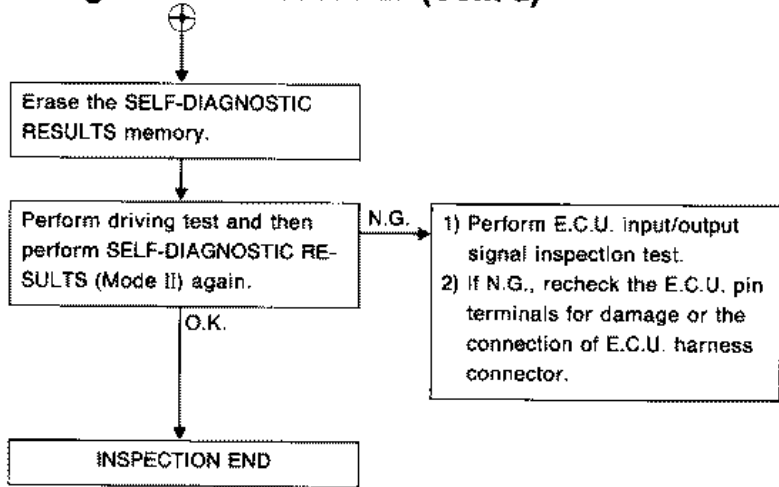


Reinstall any part removed.



TROUBLE DIAGNOSES

Diagnostic Procedure 27 (Cont'd)



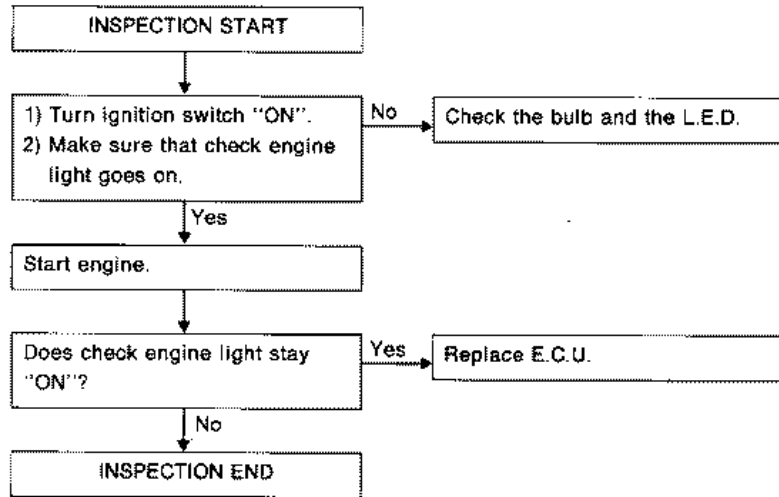
TROUBLE DIAGNOSES

NOTE

TROUBLE DIAGNOSES

Diagnostic Procedure 28

ENGINE CONTROL UNIT



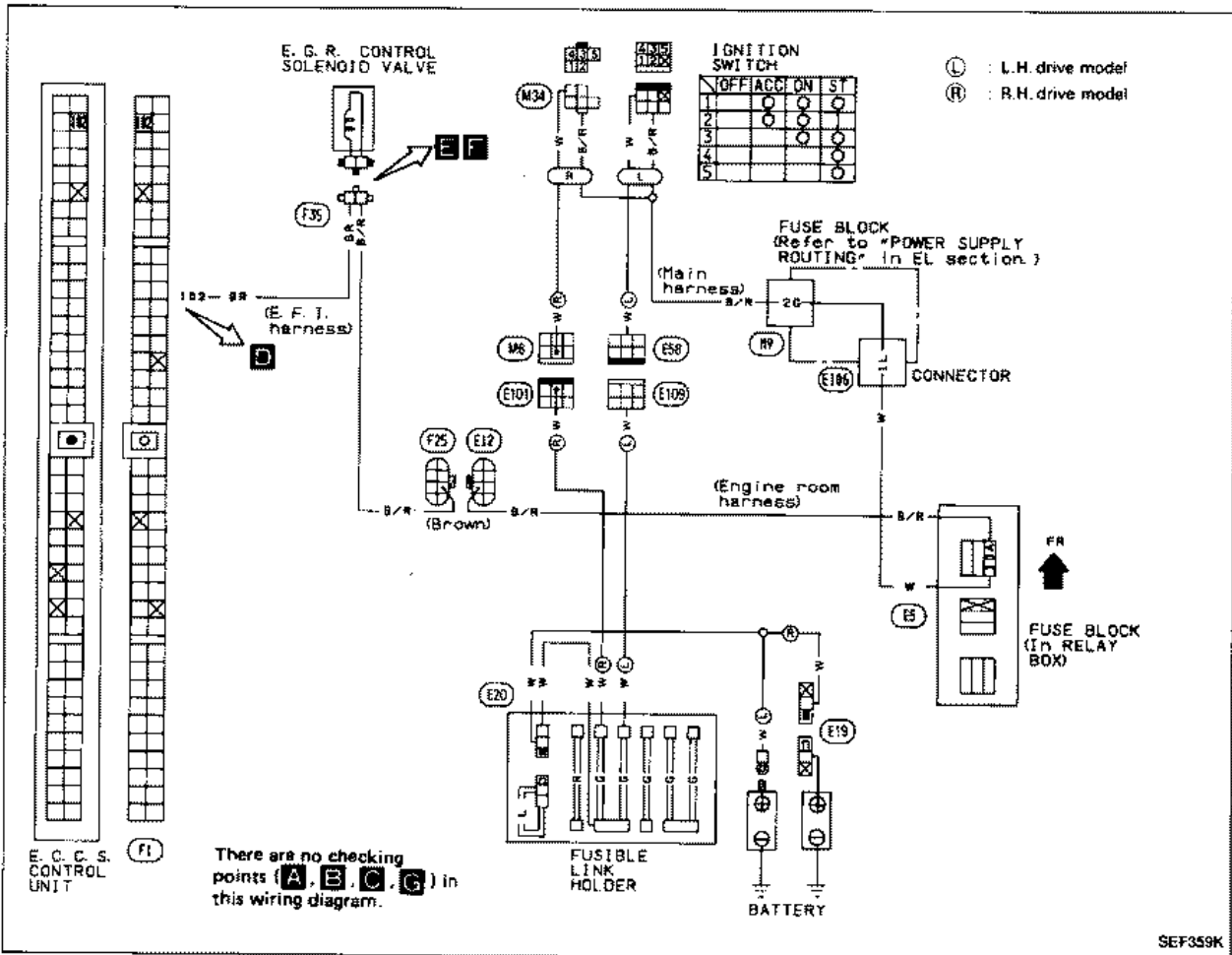
TROUBLE DIAGNOSES

NOTE

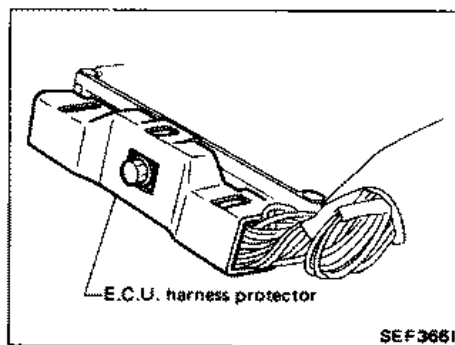
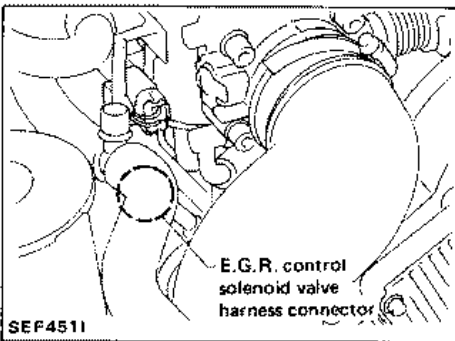
TROUBLE DIAGNOSES

Diagnostic Procedure 29

E.G.R. FUNCTION

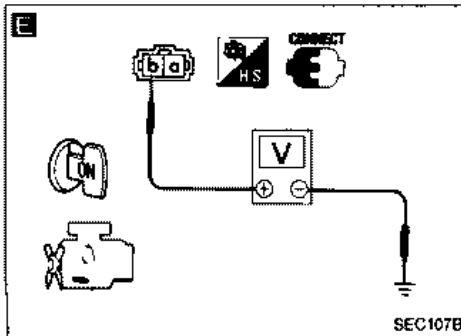
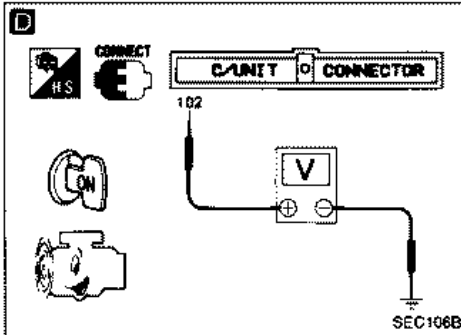
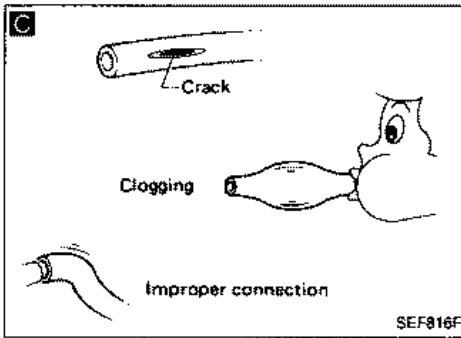
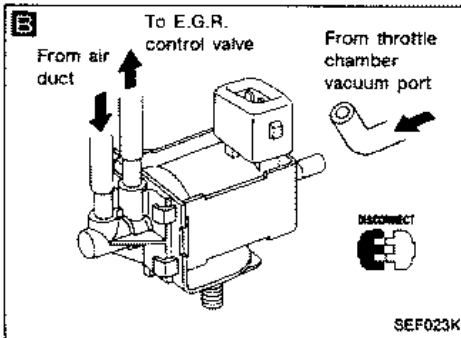
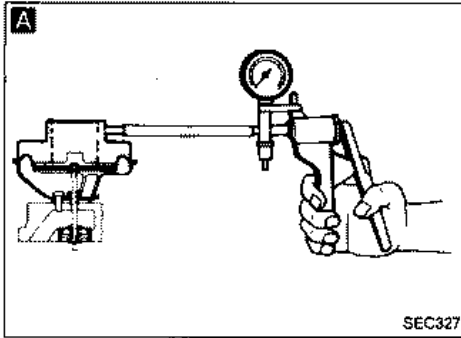


Harness layout



TROUBLE DIAGNOSES

Diagnostic Procedure 29 (Cont'd)



INSPECTION START

A CHECK E.G.R. CONTROL VALVE OPERATION.
Make sure that E.G.R. control valve lifts up when applying vacuum.

N.G. → Replace or repair E.G.R. control valve.

B CHECK VACUUM SOURCE TO E.G.R. CONTROL VALVE.
1) Disconnect vacuum hose connected to E.G.R. control solenoid valve.
2) Make sure vacuum exists when racing engine.

N.G. → CHECK THROTTLE CHAMBER VACUUM PORT FOR CLOGGING.

C CHECK VACUUM HOSE.
Check vacuum hose for clogging, cracks or improper connections.

N.G. → If necessary, replace vacuum hose or reconnect vacuum hose firmly.

D CHECK E.C.U. OUTPUT SIGNAL.
1) Check voltage between E.C.U. terminal (102) and ground under the following conditions.

Engine condition	Voltage
Idle	0.7 - 0.8V
Racing (Less than approx. 3,000 rpm)	Battery voltage

N.G. → **E** CHECK POWER SOURCE TO E.G.R. CONTROL SOLENOID VALVE.

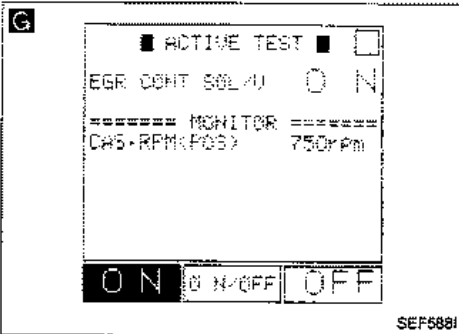
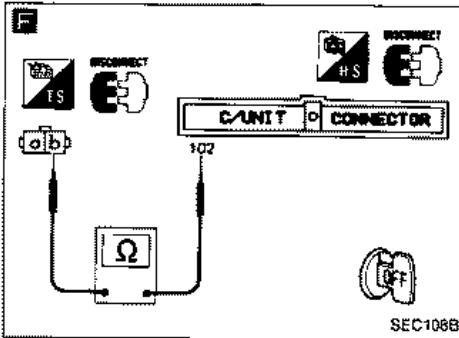
- 1) Stop engine.
- 2) Turn ignition switch "ON".
- 3) Check voltage between terminal (b) and ground.
Voltage: Battery voltage

F CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Disconnect E.G.R. control solenoid valve harness connector.
4) Check resistance between E.C.U. terminal (102) and terminal (b).
Resistance: Approximately 0Ω
If N.G. repair or replace harness.

O.K. →

TROUBLE DIAGNOSES

Diagnostic Procedure 29 (Cont'd)



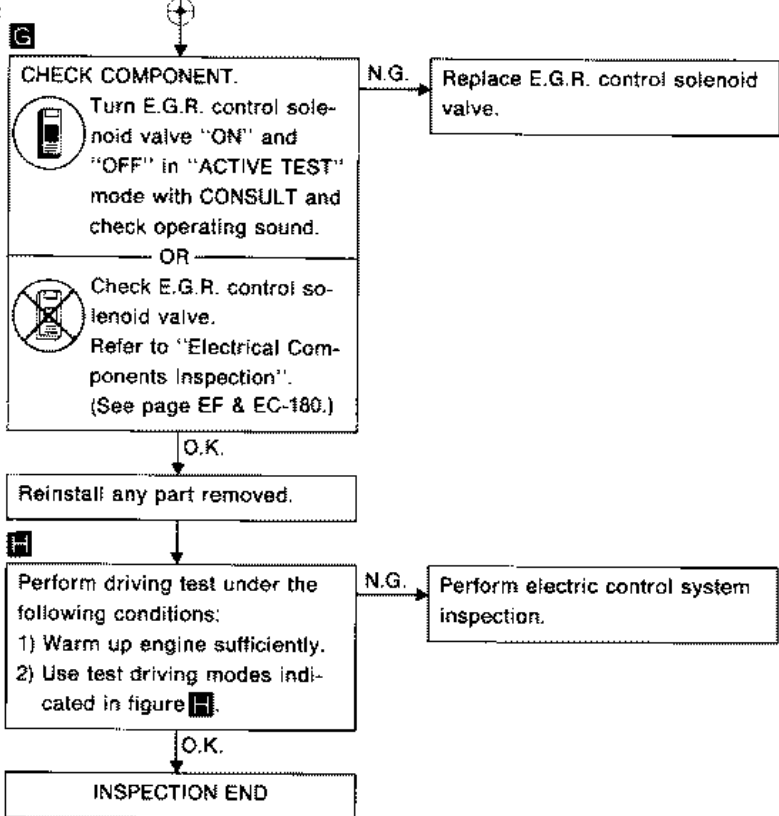
ROAD TEST

Test condition
 Drive vehicle under the following conditions with a suitable shift position.

- Engine speed:
2,200±200 rpm
- Intake manifold vacuum:
-30.0±10.0 kPa (-300±100 mbar,
-225±75 mmHg, -8.86±2.95 inHg)

Driving mode

① Start engine and warm it up sufficiently.
 ② Turn off ignition switch and keep it off until red L.E.D. goes off.
 ③ Start engine and make sure that air conditioner switch and rear defogger are turned "OFF" during driving test.
 ④ Keep engine running for at least 3 minutes.
 ⑤ Shift to suitable gear position and drive in "Test condition" for at least 21 seconds.
 ⑥ Decrease engine revolutions to less than 2,000 rpm.
 ⑦ Repeat steps ⑤ through ⑥ at least 1 more time.



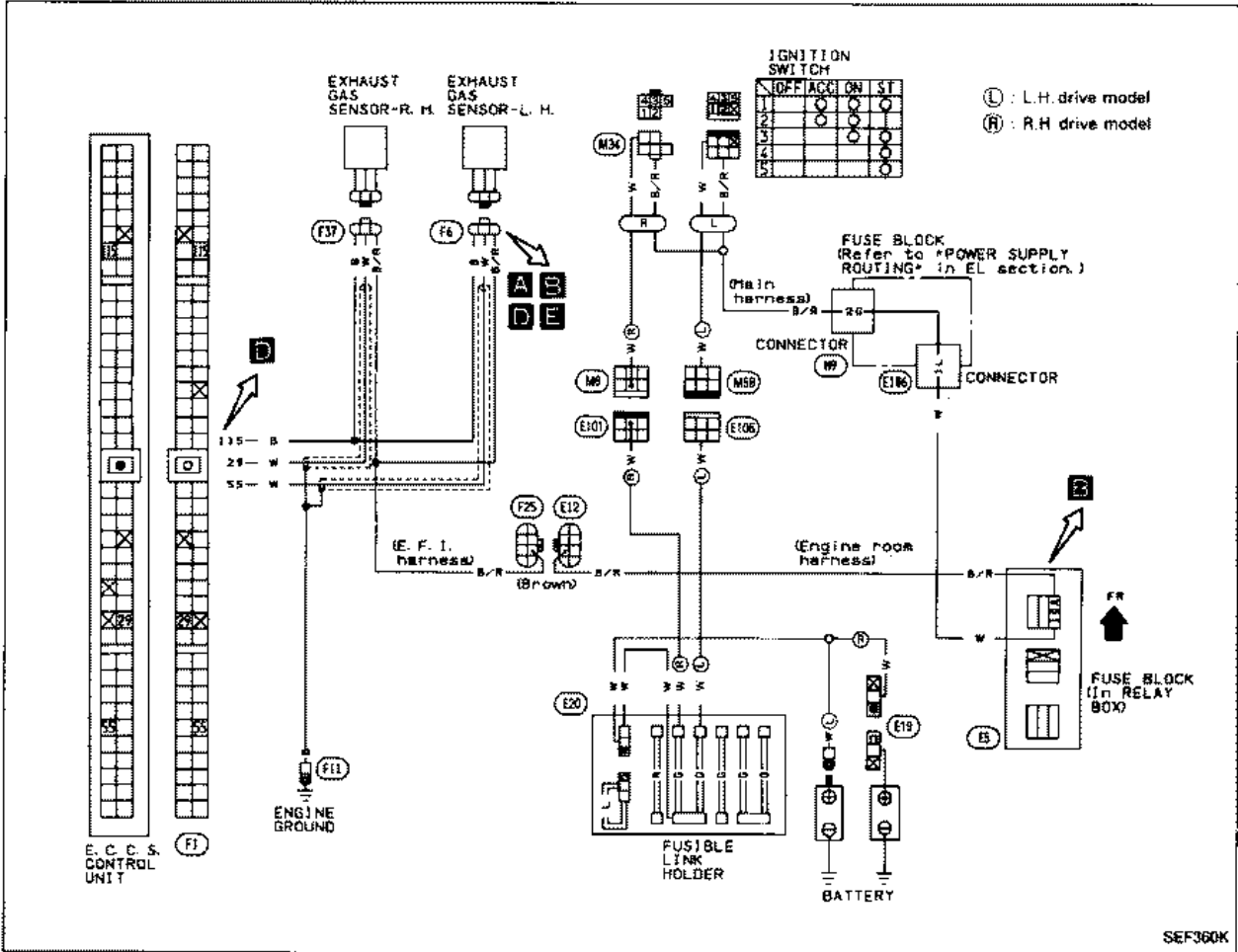
TROUBLE DIAGNOSES

NOTE

TROUBLE DIAGNOSES

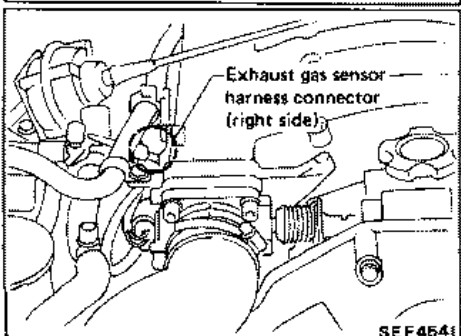
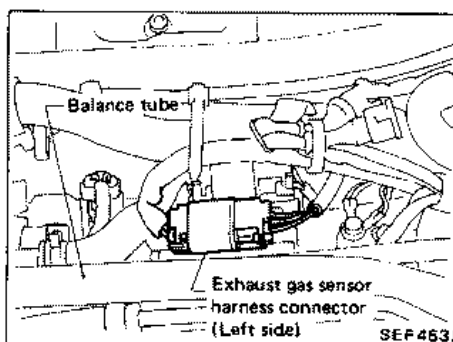
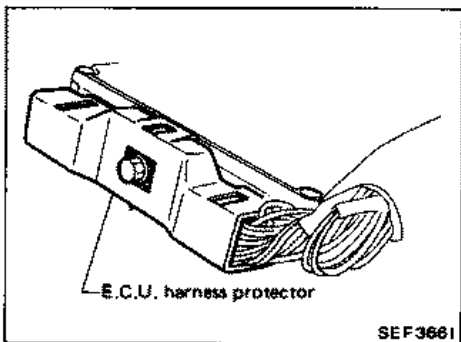
Diagnostic Procedure 30

EXHAUST GAS SENSOR



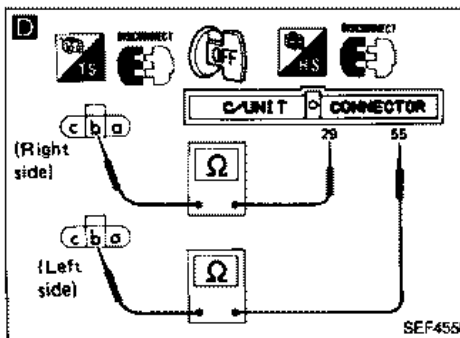
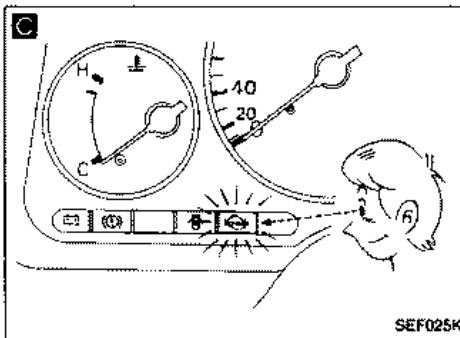
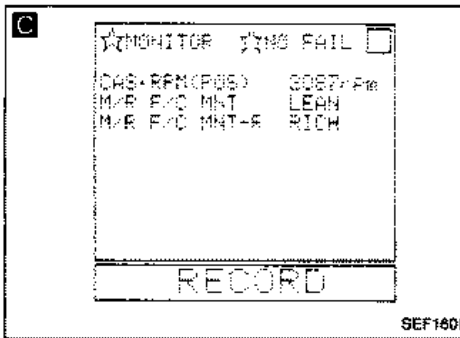
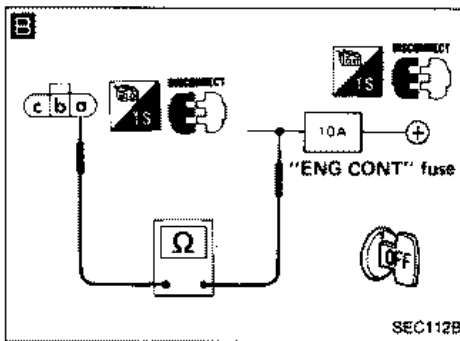
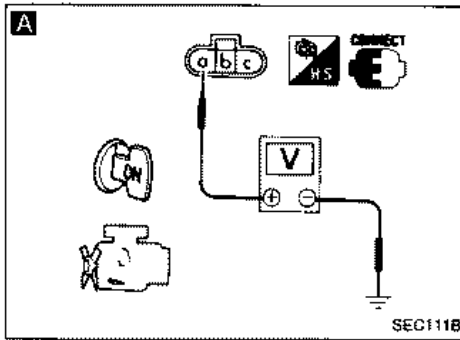
SEF360K

Harness layout



TROUBLE DIAGNOSES

Diagnostic Procedure 30 (Cont'd)



INSPECTION START

A
CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between terminal (a) and ground.
Voltage: Battery voltage

B
CHECK HARNESS CONTINUITY BETWEEN EXHAUST GAS SENSOR AND FUSE.
1) Turn ignition switch "OFF".
2) Disconnect exhaust gas sensor harness connector.
3) Disconnect "ENG CONT" fuse.
4) Check harness continuity between terminal (a) and the fuse.
Continuity should exist.
If N.G., repair harness or connectors.

O.K.

C
CHECK INPUT SIGNAL.
1) Start engine and warm it up sufficiently.
2) Make sure that "M/R F/C MNT(R)" in "DATA MONITOR" mode indicates "RICH" and "LEAN" periodically more than 5 times during 10 seconds at 2,000 rpm.

D
CHECK HARNESS CONTINUITY BETWEEN EXHAUST GAS SENSOR AND E.C.U.
1) Stop engine.
2) Disconnect exhaust gas sensor harness connector.
3) Disconnect E.C.U. harness connector.
4) Check harness continuity between E.C.U. terminals and exhaust gas sensor terminals.
Right side: (29) - (b)
Left side: (55) - (b)
Continuity should exist.
If N.G., repair harness or connectors.

OR
2) Make sure that check engine light goes on and off periodically more than 5 times during 10 seconds at 2,000 rpm in self-diagnostic results Mode II.

O.K.

O.K.

Replace exhaust gas sensor.

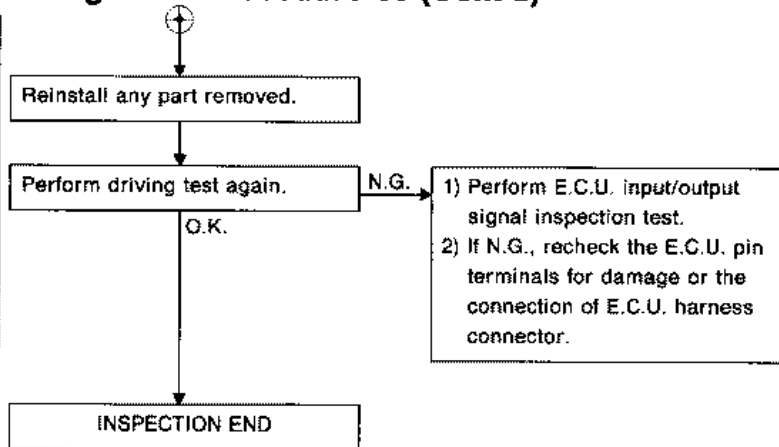
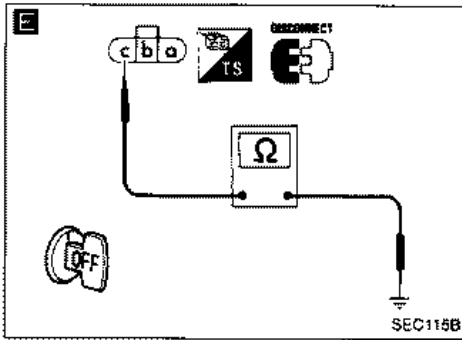
E
CHECK GROUND CIRCUIT.
1) Stop engine.
2) Disconnect exhaust gas sensor harness connector.
3) Check harness continuity between terminal (c) and ground.
Continuity should exist.

N.G. Repair harness or connectors.

O.K.

TROUBLE DIAGNOSES

Diagnostic Procedure 30 (Cont'd)



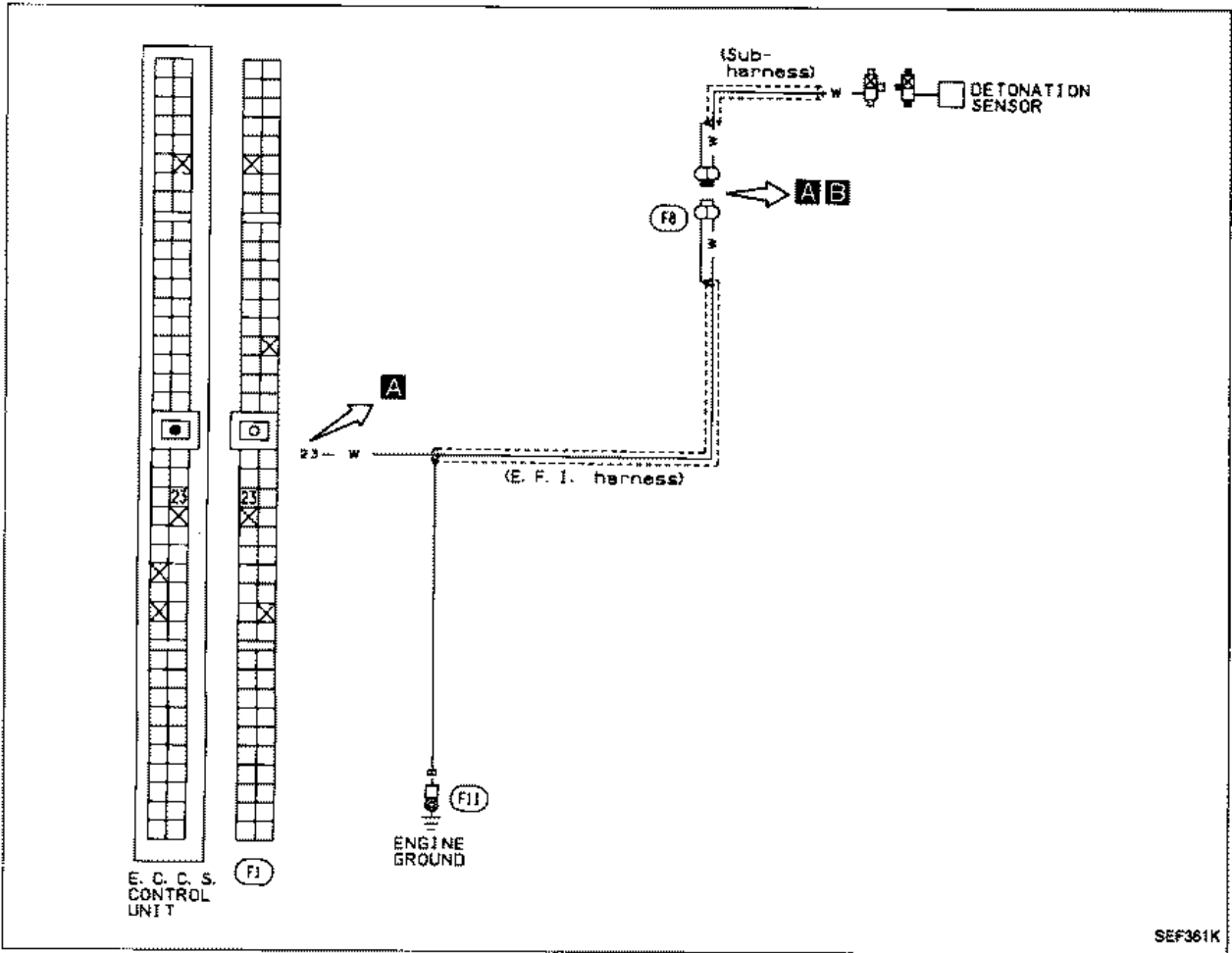
TROUBLE DIAGNOSES

NOTE

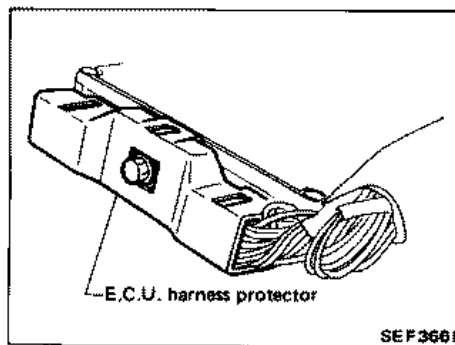
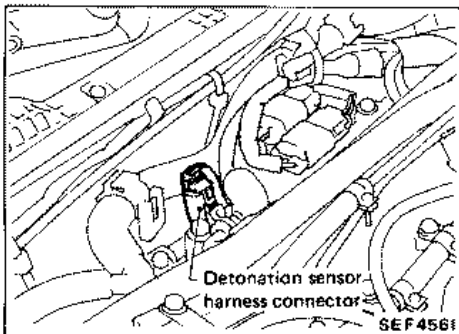
TROUBLE DIAGNOSES

Diagnostic Procedure 31

DETONATION SENSOR (Code No. 34)

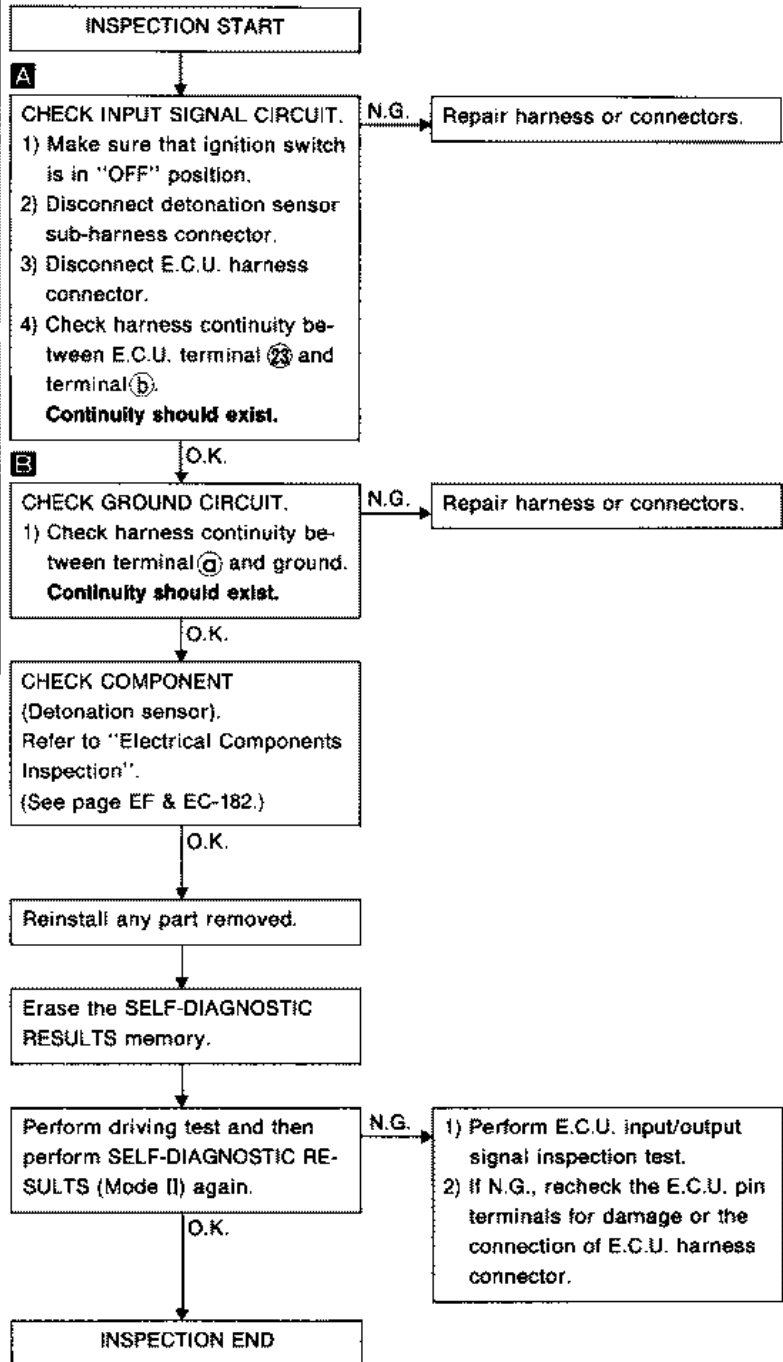
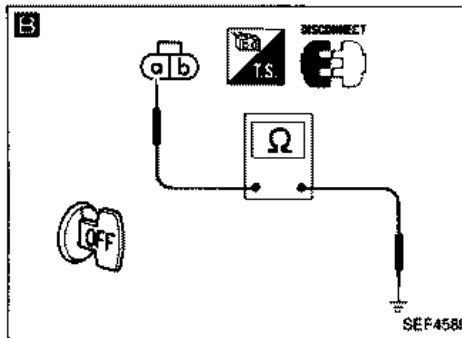
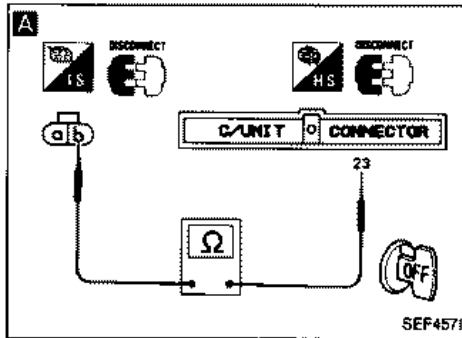


Harness layout



TROUBLE DIAGNOSES

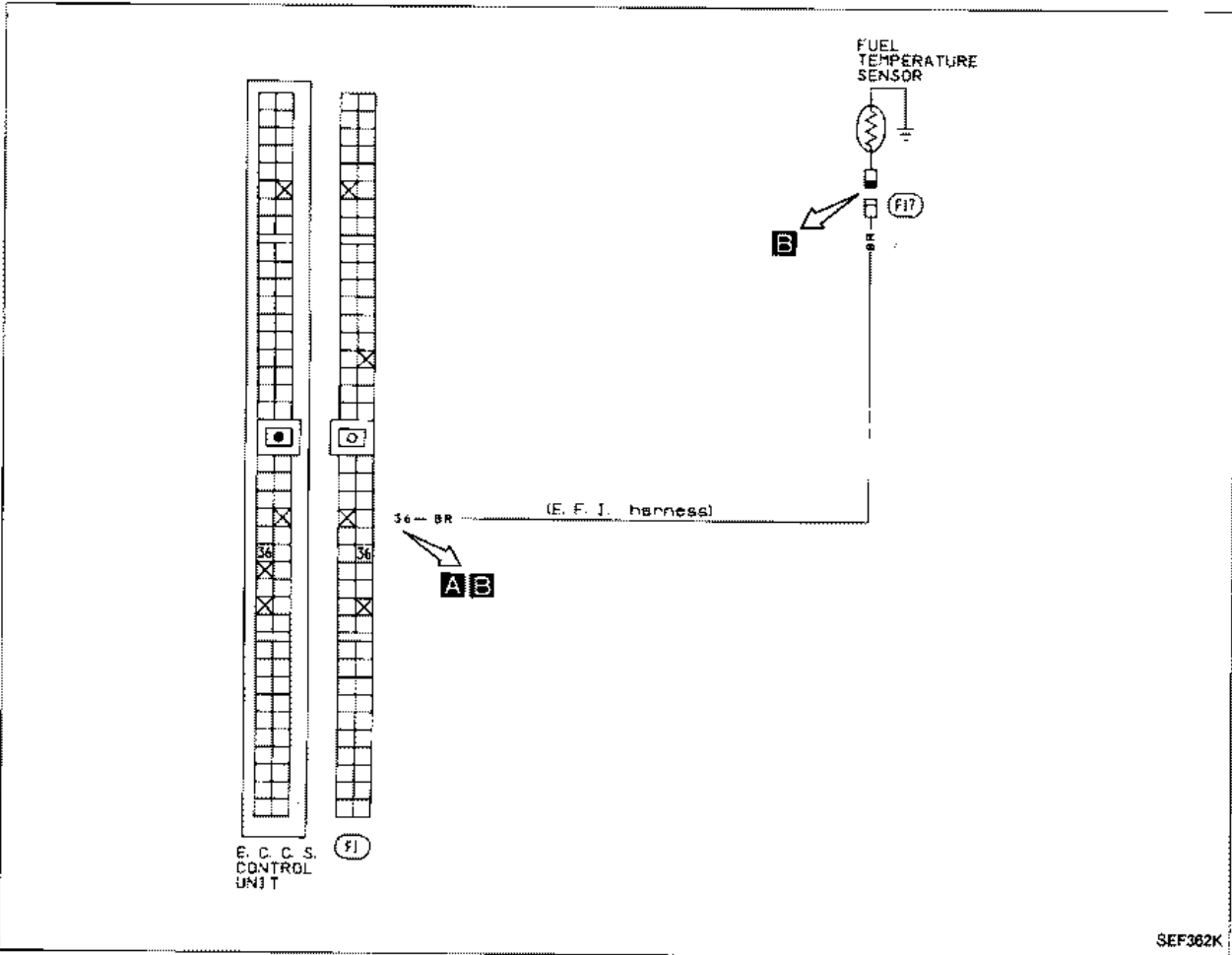
Diagnostic Procedure 31 (Cont'd)



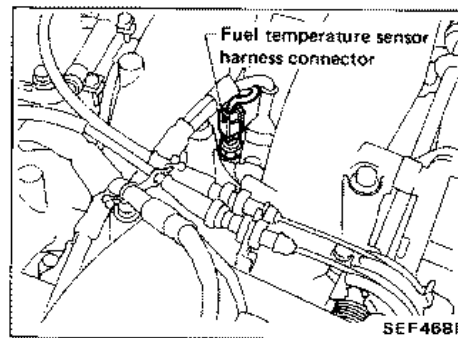
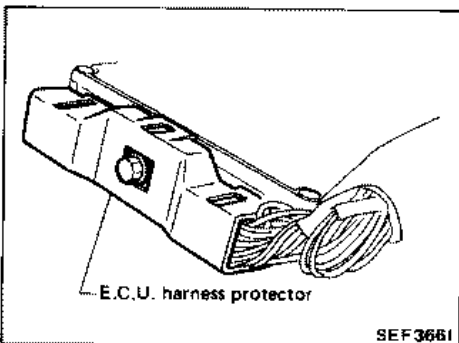
TROUBLE DIAGNOSES

Diagnostic Procedure 32

FUEL TEMPERATURE SENSOR (Code No. 42)

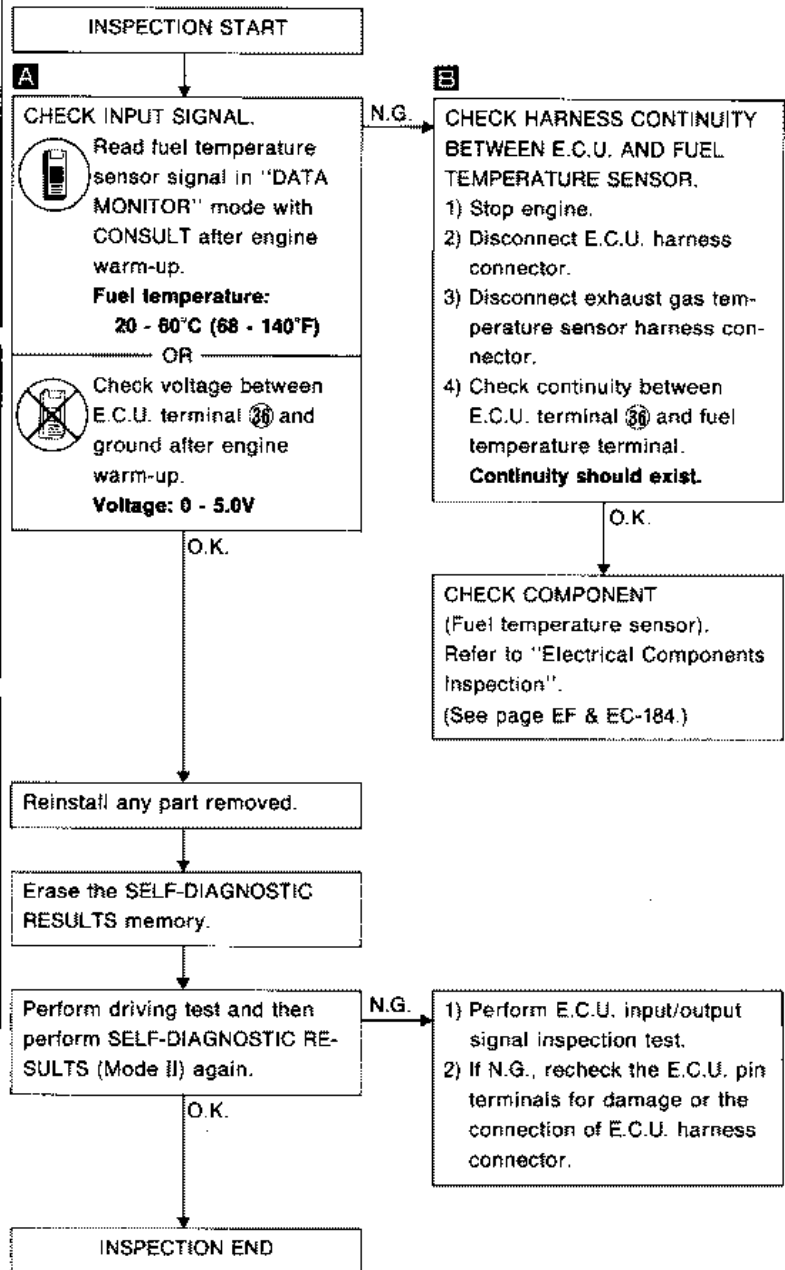
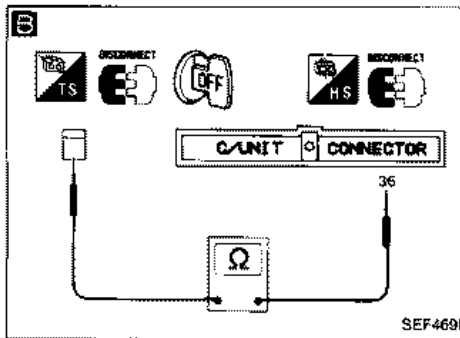
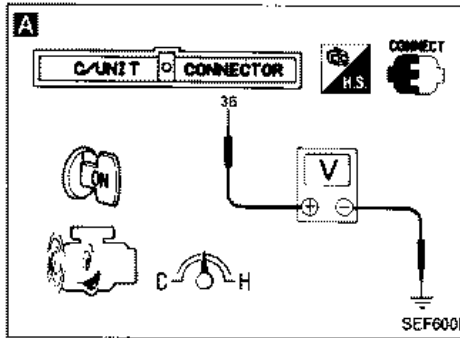
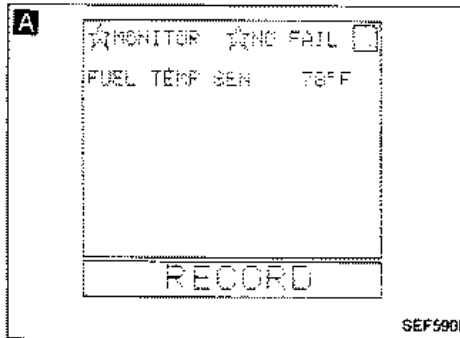


Harness layout



TROUBLE DIAGNOSES

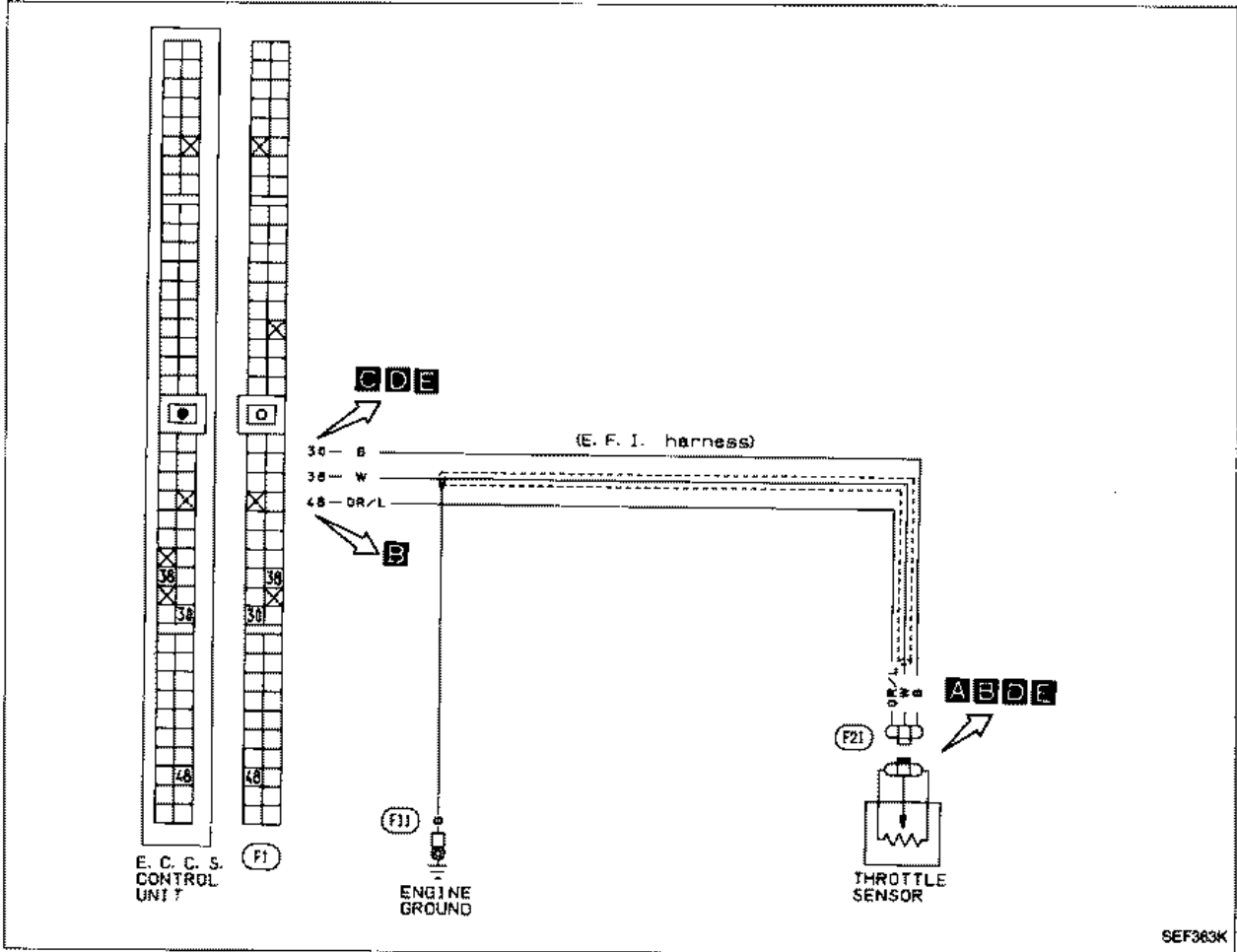
Diagnostic Procedure 32 (Cont'd)



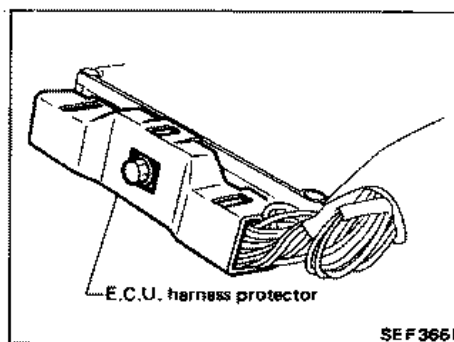
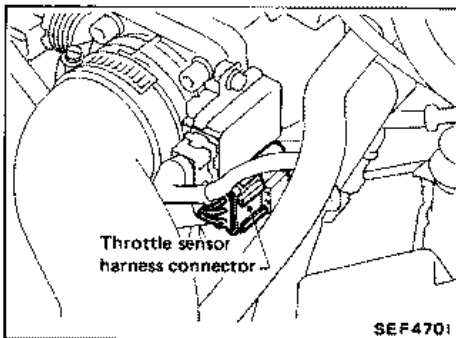
TROUBLE DIAGNOSES

Diagnostic Procedure 33

THROTTLE SENSOR (Code No. 43)

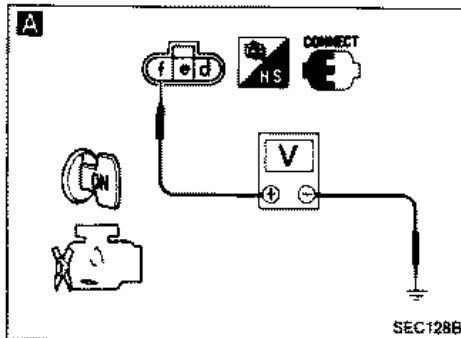


Harness layout



TROUBLE DIAGNOSES

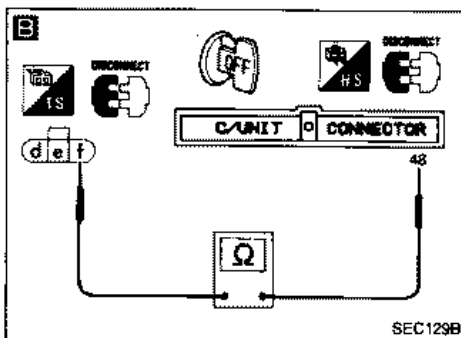
Diagnostic Procedure 33 (Cont'd)




INSPECTION START

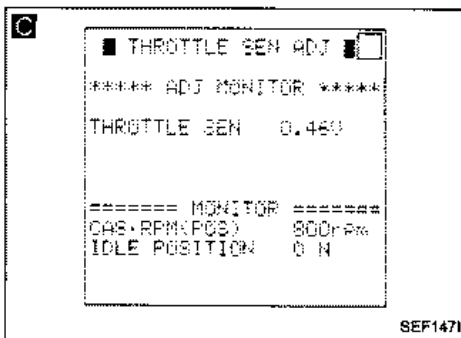
A
CHECK POWER SOURCE.
 1) Turn ignition switch "ON".
 2) Check voltage between terminal (f) and ground.
Voltage:
Approximately 5.0V

B
CHECK HARNESS CONTINUITY BETWEEN THROTTLE SENSOR AND E.C.U.
 1) Turn ignition switch "OFF".
 2) Disconnect throttle sensor harness connector.
 3) Disconnect E.C.U. harness connector.
 4) Check harness continuity between E.C.U. terminal (48) and terminal (f).
Continuity should exist.
 If N.G., repair harness or connectors.




C
CHECK INPUT SIGNAL.
 Read throttle sensor output voltage in "WORK SUPPORT" mode with CONSULT.
Throttle valve fully closed:
0.4 - 0.5V
Throttle valve fully open:
Approx. 4.0V

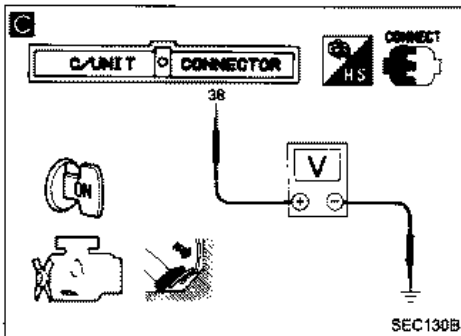
ADJUST THROTTLE SENSOR INITIAL POSITION.
 (See page EF & EC-181.)



OR

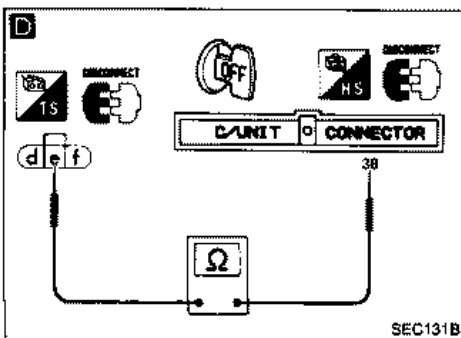
 Make sure that voltage between E.C.U. terminal (38) and ground changes when accelerator pedal is depressed.
Voltage:
Throttle valve fully closed:
0.4 - 0.5V
Throttle valve fully open:
Approx. 4.0V

D
CHECK HARNESS CONTINUITY BETWEEN THROTTLE SENSOR AND E.C.U.
 1) Turn ignition switch "OFF".
 2) Disconnect throttle sensor harness connector.
 3) Disconnect E.C.U. harness connector.
 4) Check harness continuity between E.C.U. terminal (38) and terminal (e).
Continuity should exist.
 If N.G., repair harness or connectors.



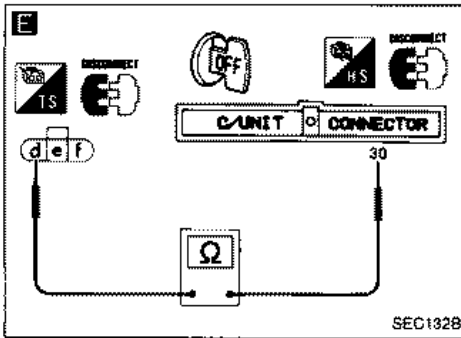
O.K.

CHECK COMPONENT (Throttle sensor).
 Refer to "Electrical Components Inspection".
 (See page EF & EC-181.)



TROUBLE DIAGNOSES

Diagnostic Procedure 33 (Cont'd)



E

CHECK GROUND CIRCUIT.

- 1) Turn ignition switch "OFF".
- 2) Disconnect E.C.U. harness connector.
- 3) Disconnect throttle sensor harness connector.
- 4) Check resistance between E.C.U. terminal ⑩ and terminal ①.

Continuity should exist.

N.G. →

- 1) Check harness continuity between throttle sensor and ground.
- 2) E.C.U. ground circuit.

O.K. ↓

Reinstall any part removed.

Erase the SELF-DIAGNOSTIC RESULTS memory.

Perform driving test and then perform SELF-DIAGNOSTIC RESULTS (Mode II) again.

N.G. →

- 1) Perform E.C.U. input/output signal inspection test.
- 2) If N.G., recheck the E.C.U. pin terminals damage or the connection of E.C.U. harness connector.

O.K. ↓

INSPECTION END

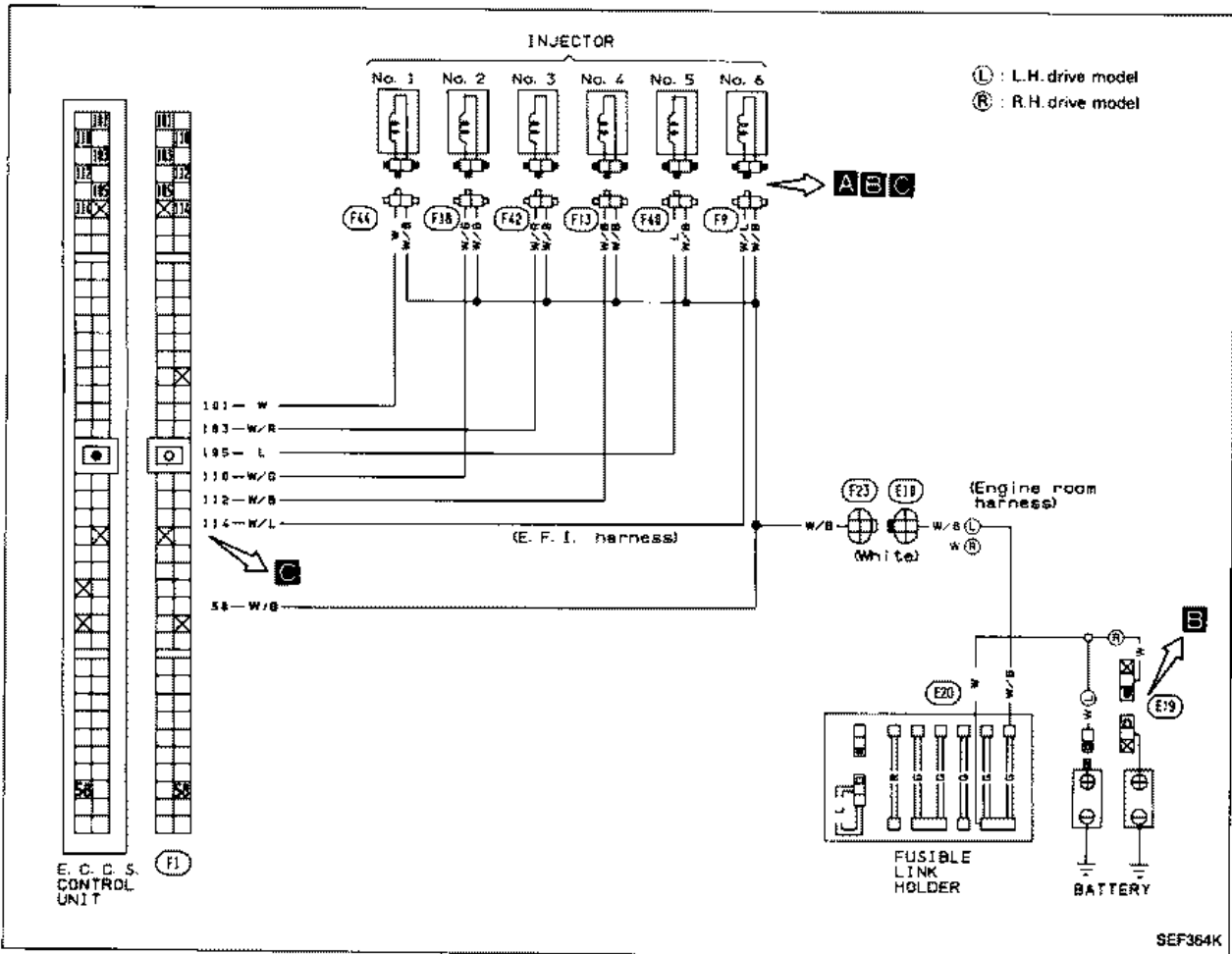
TROUBLE DIAGNOSES

NOTE

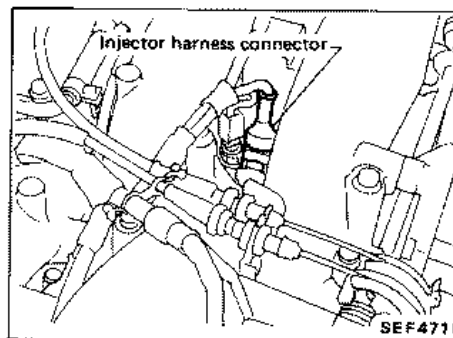
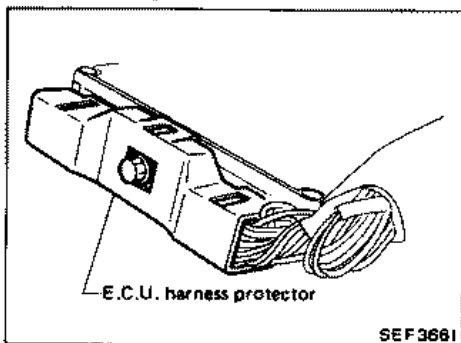
TROUBLE DIAGNOSES

Diagnostic Procedure 34

INJECTOR CIRCUIT

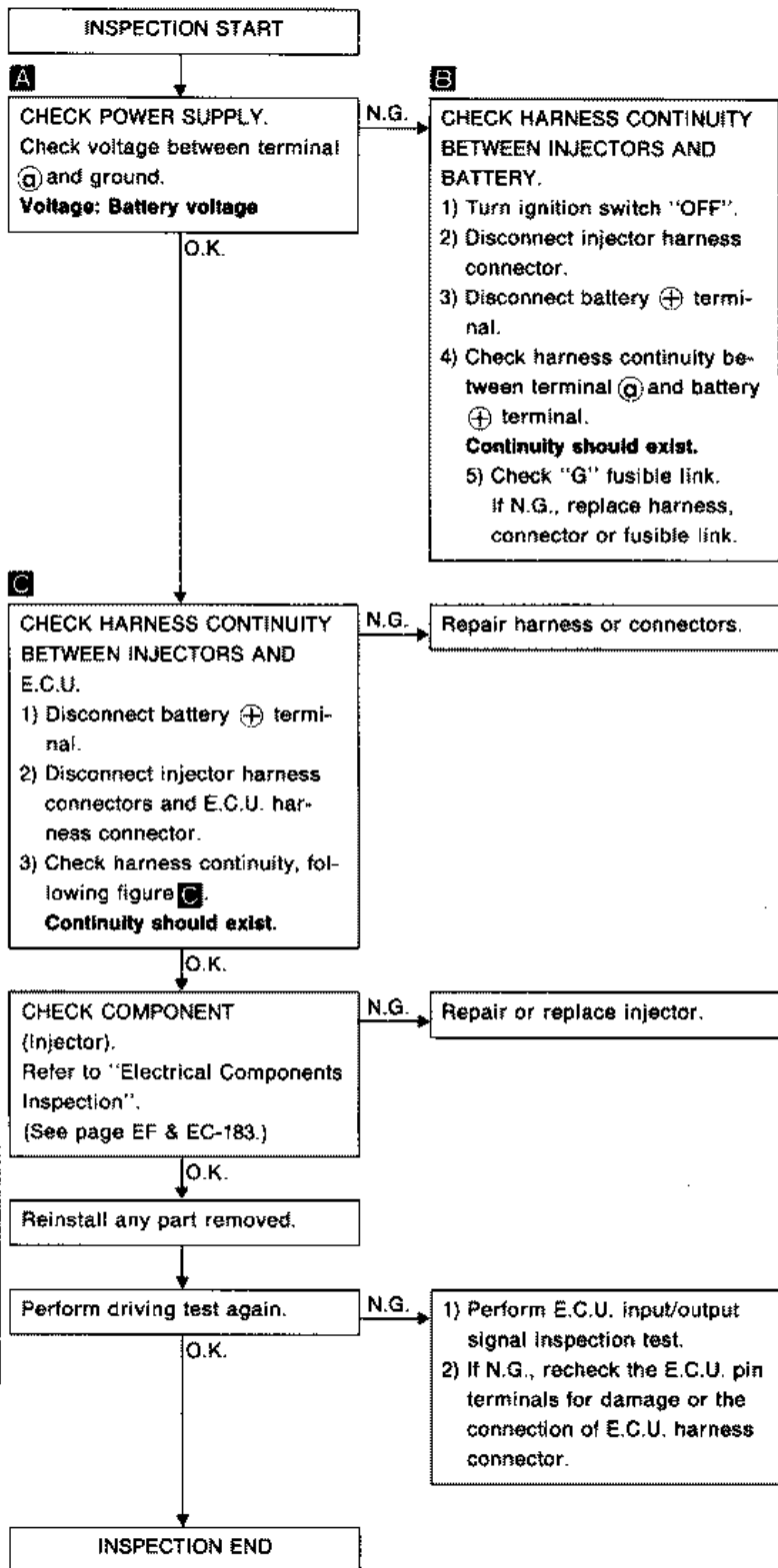
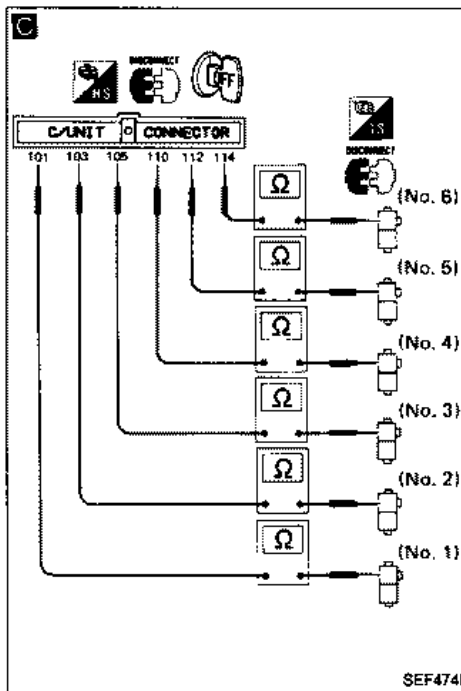
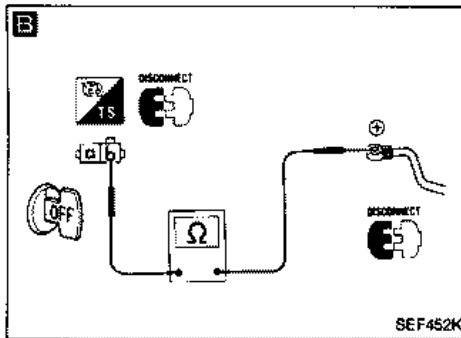
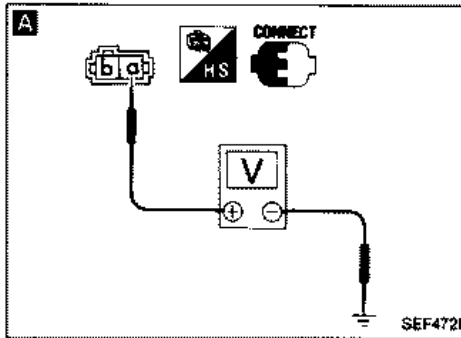


Harness layout



TROUBLE DIAGNOSES

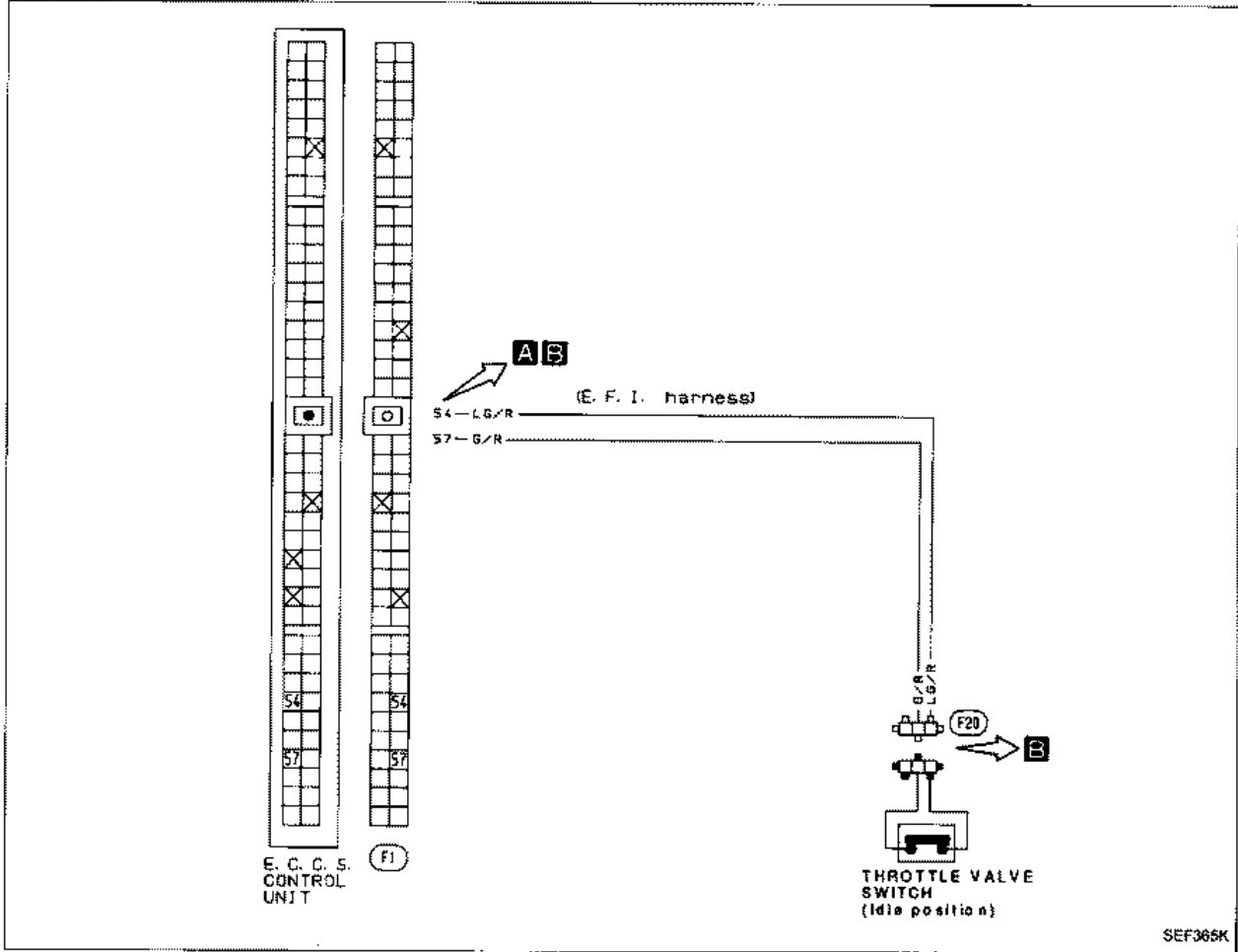
Diagnostic Procedure 34 (Cont'd)



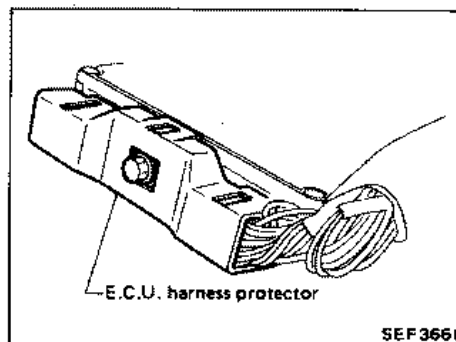
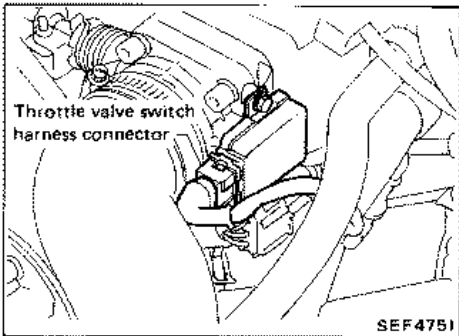
TROUBLE DIAGNOSES

Diagnostic Procedure 35

THROTTLE VALVE SWITCH (Idle position)

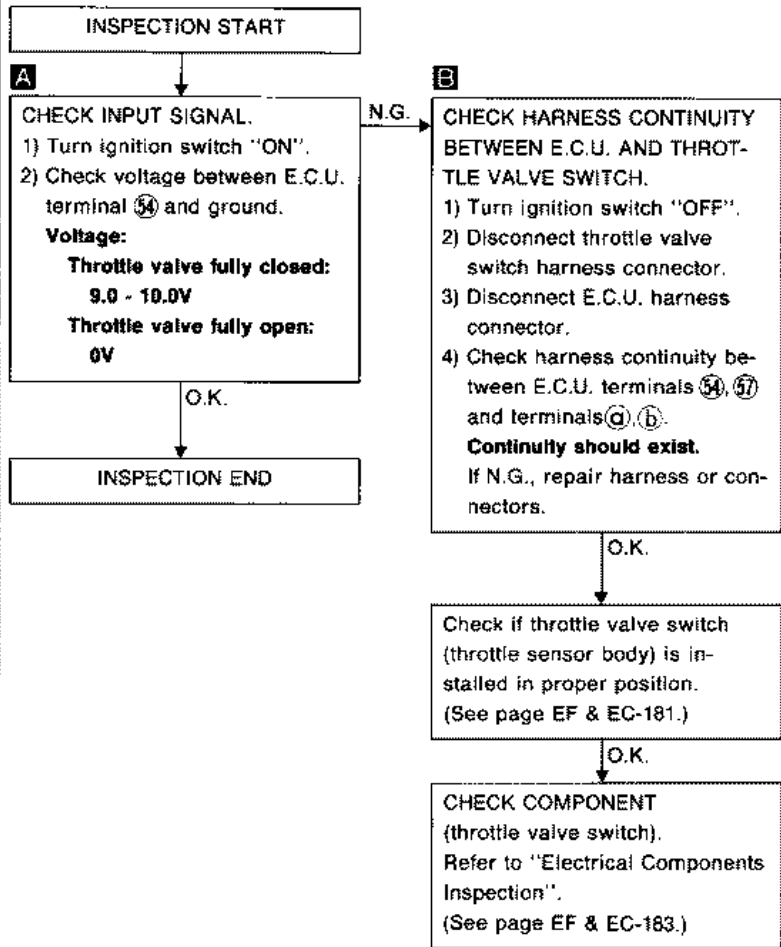
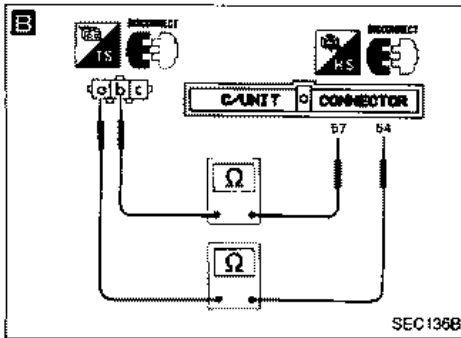
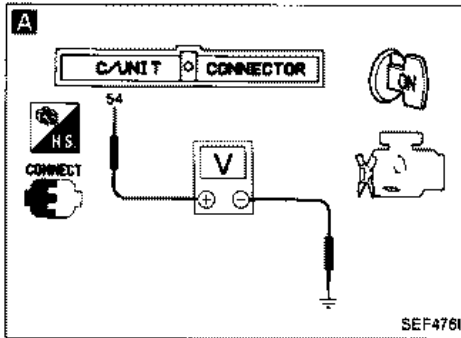


Harness layout



TROUBLE DIAGNOSES

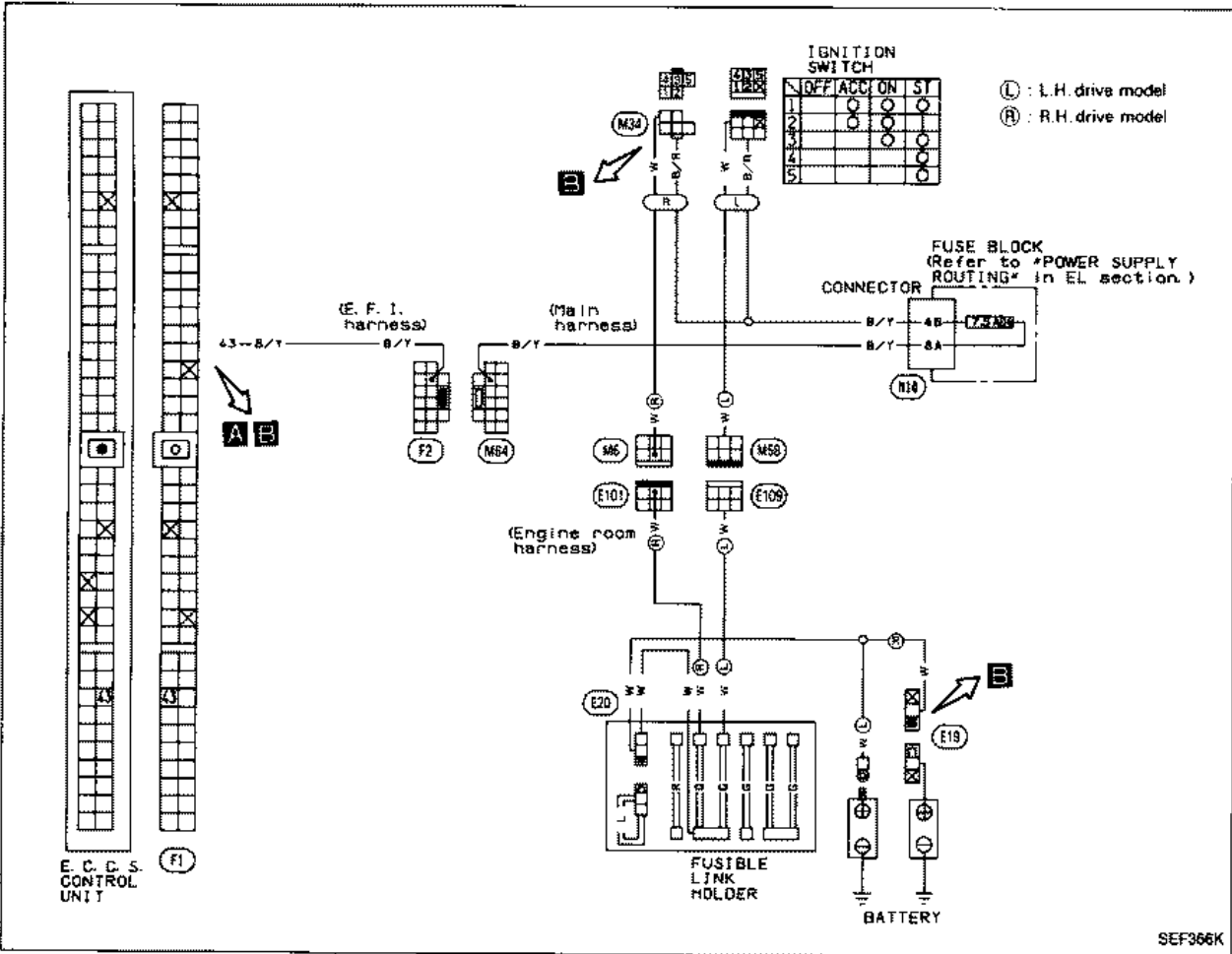
Diagnostic Procedure 35 (Cont'd)



TROUBLE DIAGNOSES

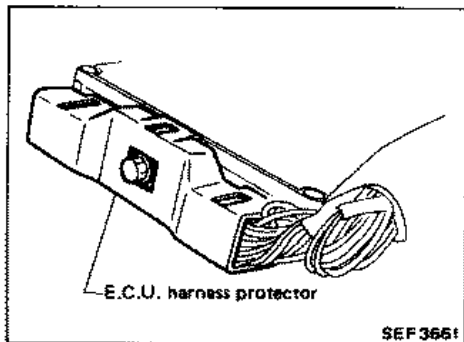
Diagnostic Procedure 36

START SIGNAL



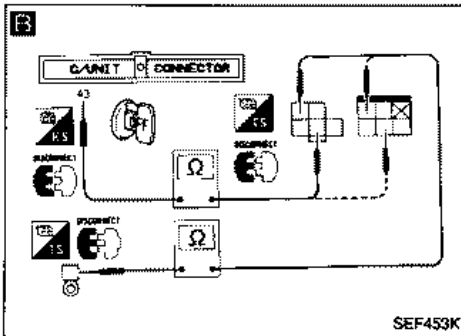
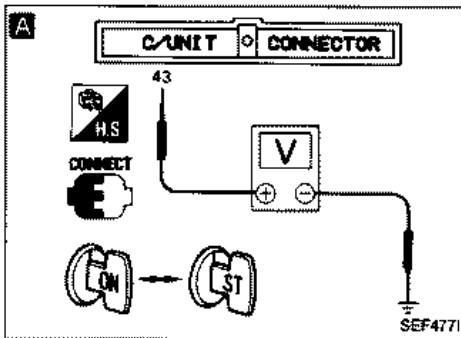
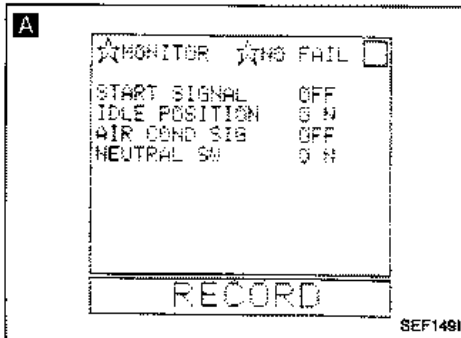
SEF366K

Harness layout



TROUBLE DIAGNOSES

Diagnostic Procedure 36 (Cont'd)



INSPECTION START

A

CHECK INPUT SIGNAL.

- 1) Turn ignition switch "ON".
- 2) Check start signal in "DATA MONITOR" mode with CONSULT.

IGN "ON"	OFF
IGN "START"	ON

OR

B

2) Check voltage between E.C.U. terminal (43) and ground.

When cranking:
Battery voltage

Except above:
0V

O.K.

INSPECTION END

B

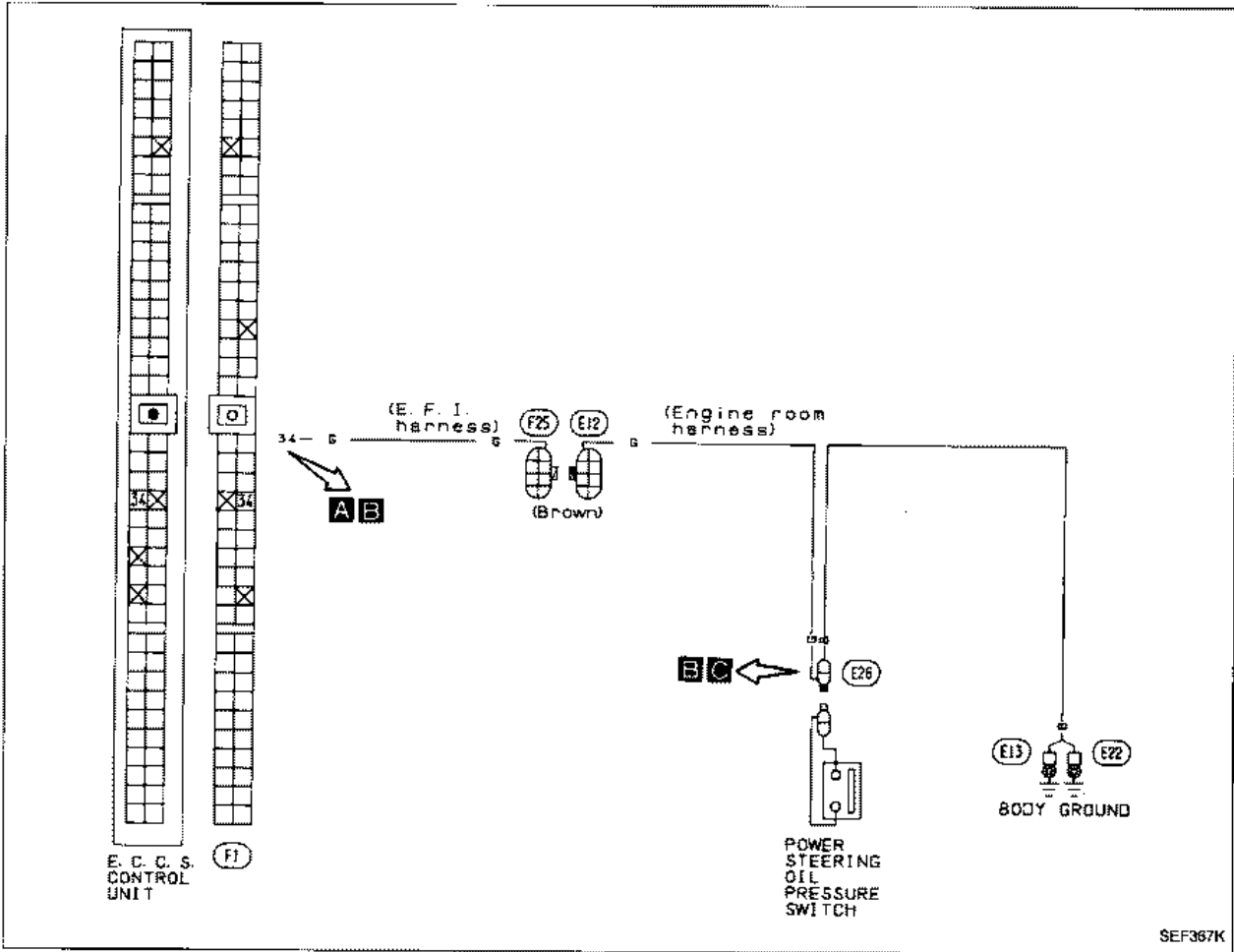
N.G. → Check the following items.

- 1) "G" fusible link
- 2) "7.5A" fuse
- 3) Ignition switch
- 4) Harness continuity between E.C.U. and ignition switch
Continuity should exist.
- 5) Harness continuity between battery (+) terminal and ignition switch
Continuity should exist.

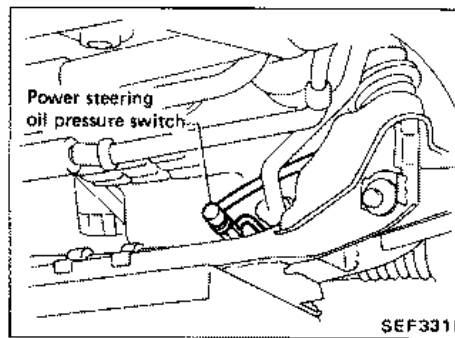
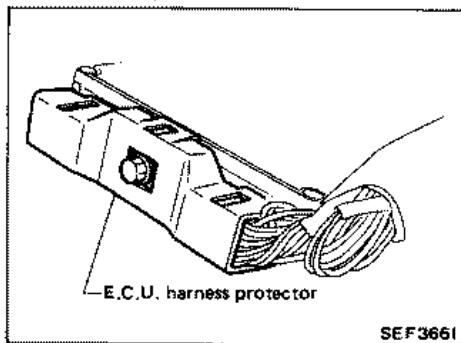
TROUBLE DIAGNOSES

Diagnostic Procedure 37

POWER STEERING OIL PRESSURE SWITCH

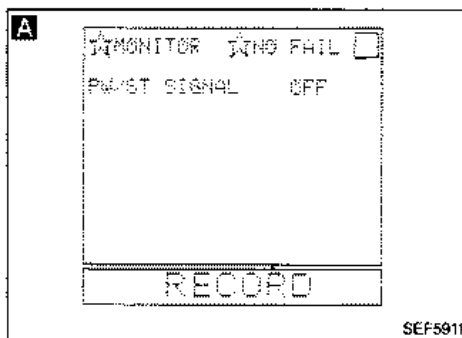


Harness layout

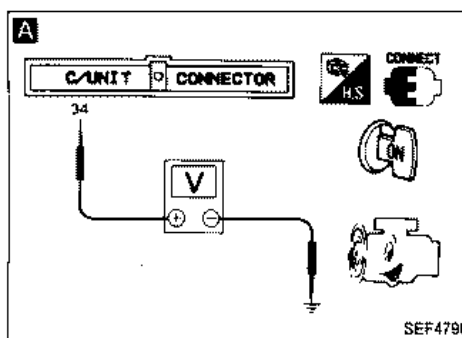


TROUBLE DIAGNOSES

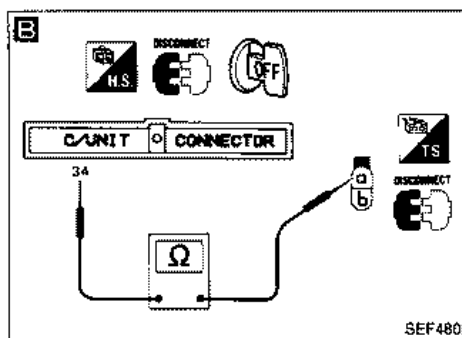
Diagnostic Procedure 37 (Cont'd)



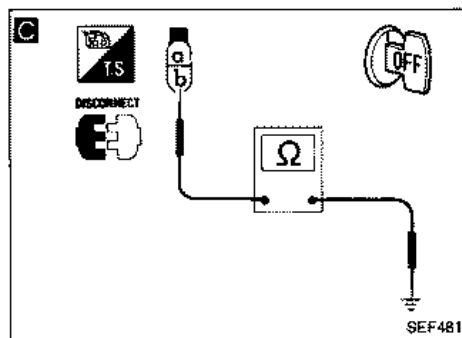
SEF591F



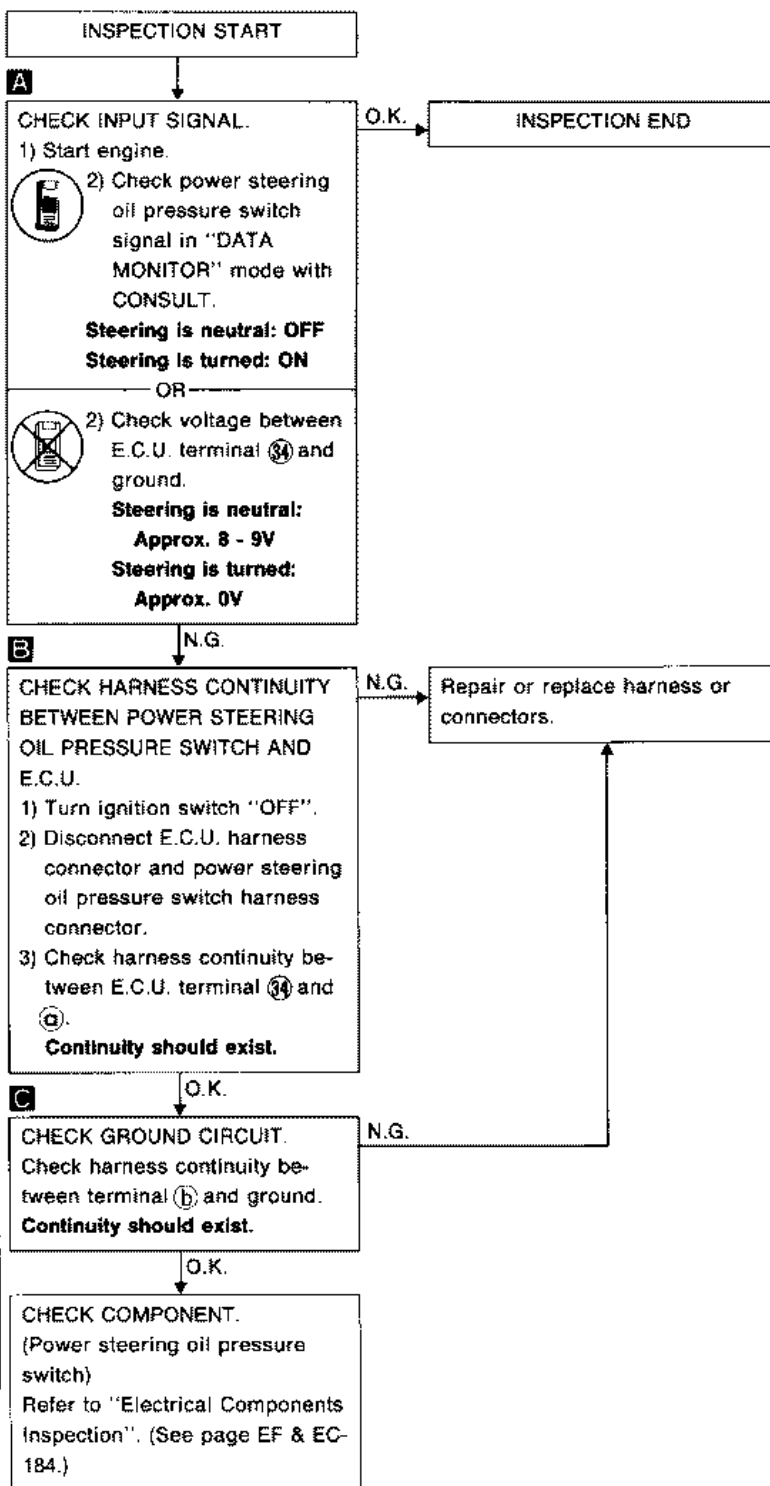
SEF479F



SEF480F



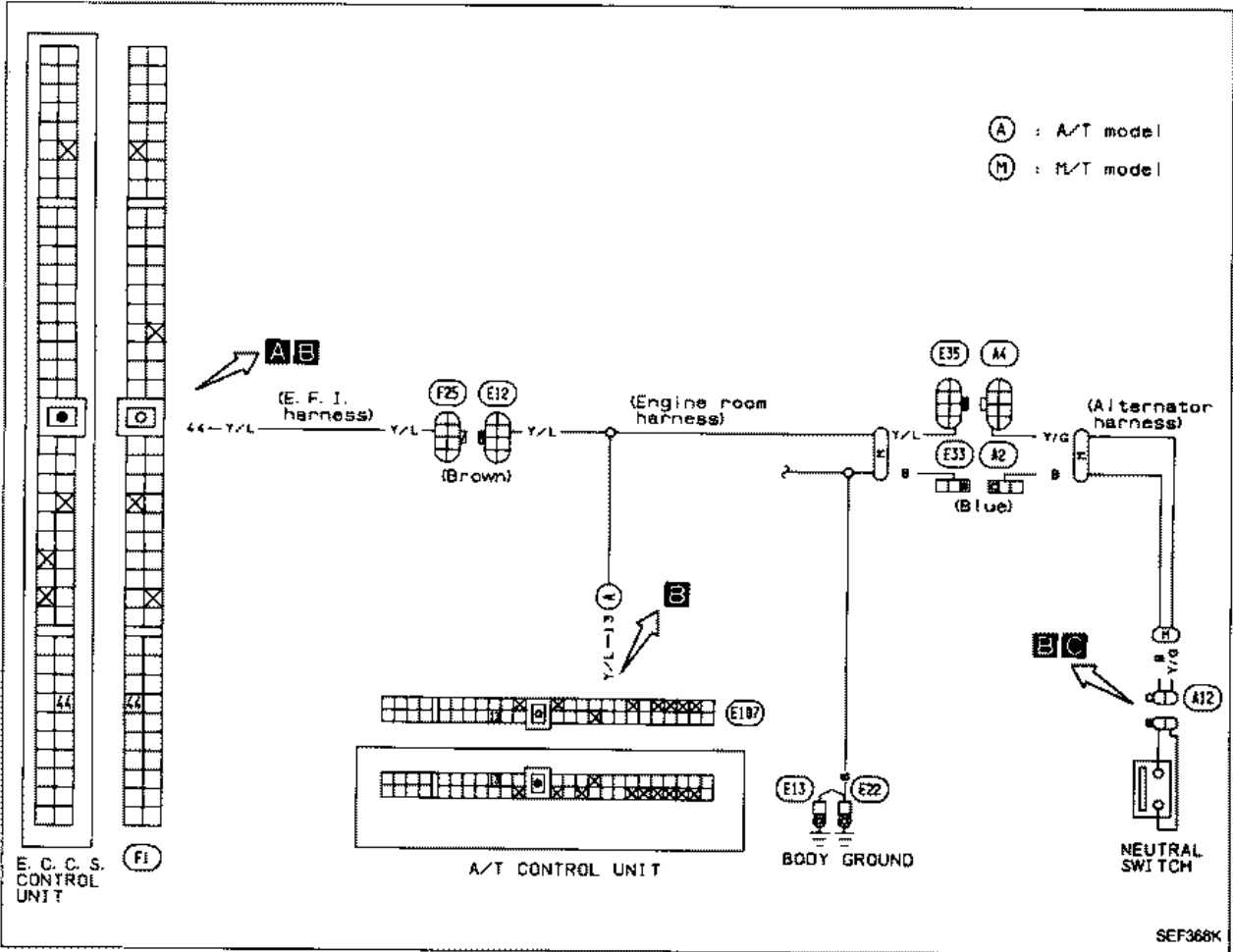
SEF481F



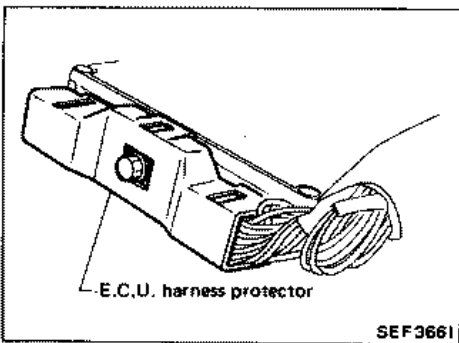
TROUBLE DIAGNOSES

Diagnostic Procedure 38

NEUTRAL SWITCH & A/T CONTROL UNIT (NEUTRAL SIGNAL) CIRCUIT

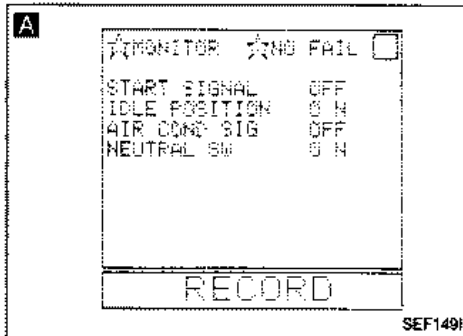


Harness layout



TROUBLE DIAGNOSES

Diagnostic Procedure 38 (Cont'd)

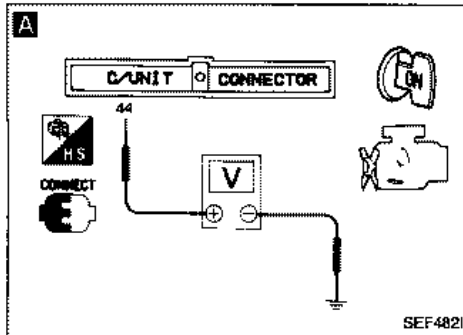


INSPECTION START

A
CHECK INPUT SIGNAL.
 1) Turn ignition switch "ON".
 2) Check neutral switch signal in "DATA MONITOR" mode with CONSULT.
 "N" or "P": ON
 Except above: OFF

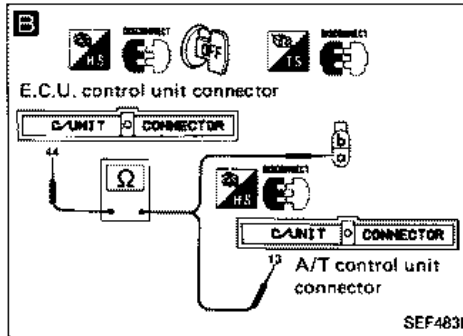
O.K. → INSPECTION END

OR
 2) Check voltage between E.C.U. terminal (44) and ground.
 "N" or "P": Approx. 0V
 Except above: 8 - 9V



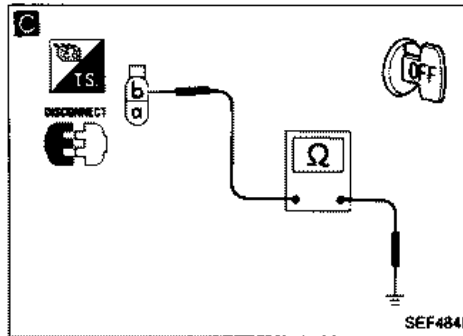
B
CHECK HARNESS CONTINUITY BETWEEN E.C.U. AND NEUTRAL SWITCH (A/T CONTROL UNIT).
 1) Turn the ignition switch "OFF".
 2) Disconnect E.C.U. harness connector and neutral switch harness connector (A/T control unit harness connector.)
 3) Check harness continuity between E.C.U. terminal (44) and (19).
 Continuity should exist.

N.G. → Repair or replace harness or connectors.



C
CHECK GROUND CIRCUIT (M/T only).
 Check harness continuity between terminal (b) and ground.
 Continuity should exist.

N.G. → Repair or replace harness or connectors.



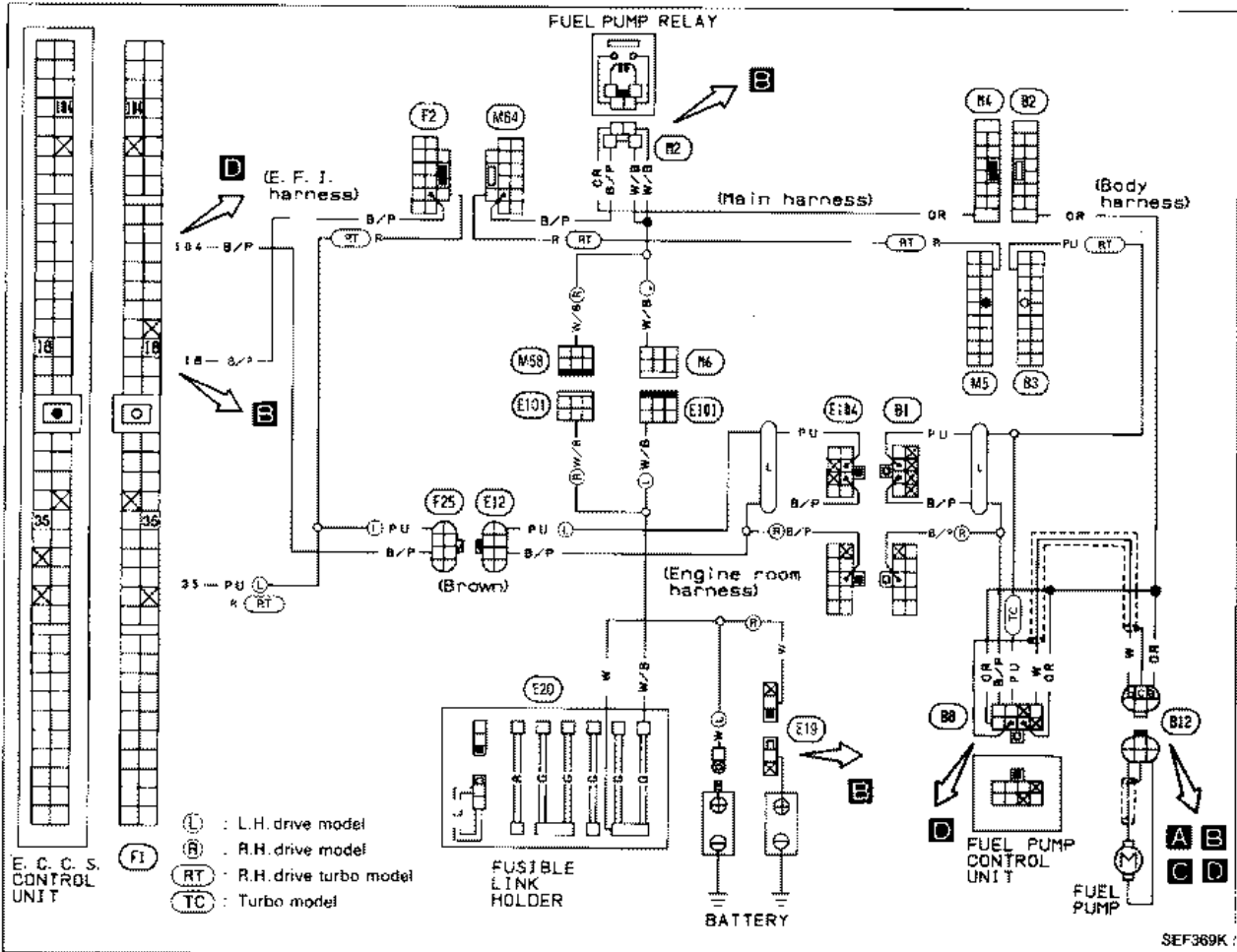
CHECK COMPONENT.

- (Neutral switch)
 Refer to "Electrical Components Inspection".
 (See page EF & EC-183.)
- (A/T control unit)
 See A/T section.
- (Inhibitor switch)
 Refer to "Electrical Components Inspection".
 (See page EF & EC-183.)

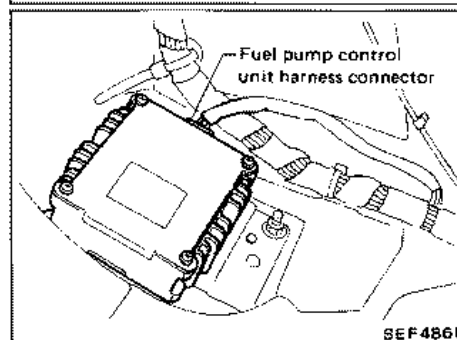
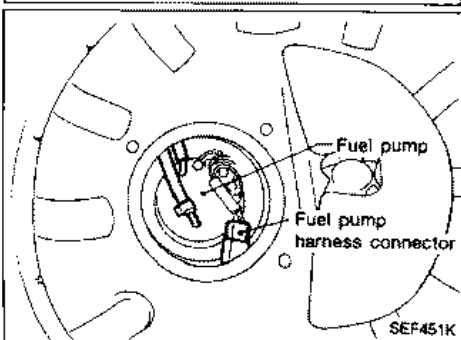
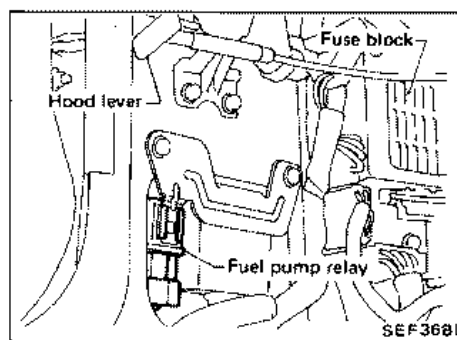
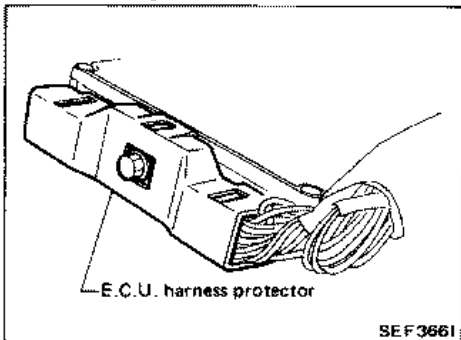
TROUBLE DIAGNOSES

Diagnostic Procedure 39

FUEL PUMP

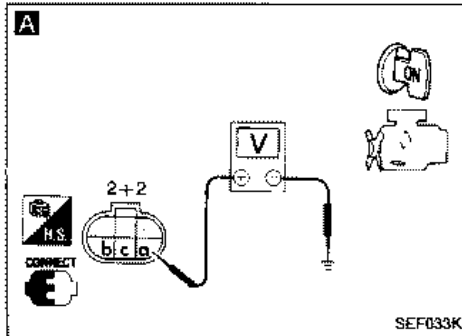


Harness layout



TROUBLE DIAGNOSES

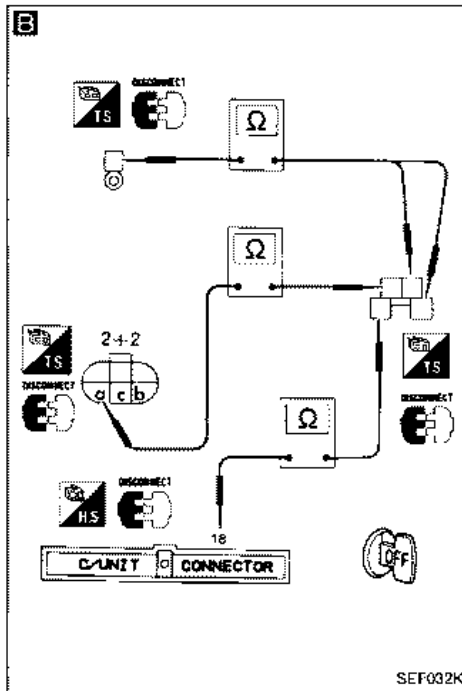
Diagnostic Procedure 39 (Cont'd)



INSPECTION START

A
CHECK POWER SUPPLY.
 1) Turn ignition switch "ON".
 2) Check voltage between fuel pump connector terminal (a) and ground.
Battery voltage indication should appear for 1 second after turning ignition switch "ON".

B
 Check the following items.
 1) "G" fusible link
 2) Harness continuity between
 • battery (+) terminal and fuel pump relay
 • fuel pump relay and fuel pump
 • fuel pump relay and E.C.U. terminal (18)
Continuity should exist.



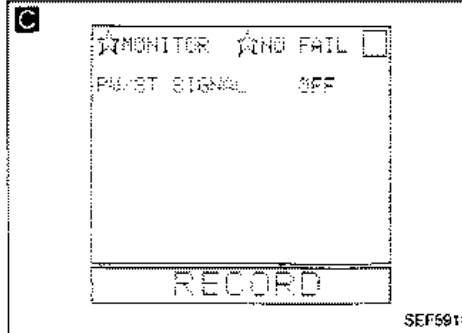
O.K.

C
CHECK COMPONENT
 (Fuel pump relay).
 Perform "FUEL PUMP RELAY TEST" in "ACTIVE TEST" mode with CONSULT.
 — OR —
 Refer to "Electrical Components Inspection".
 (See page EF & EC-184.)

D
CHECK GROUND CIRCUIT.
 Check voltage between fuel pump terminal (b) and ground under the following conditions.

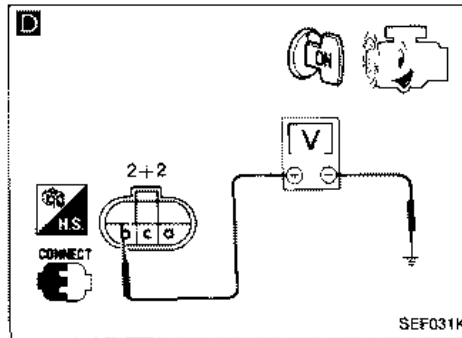
Idling	Approx. 3 - 6V
For 30 seconds after starting engine	Battery voltage

E
 Check the following items.
 Harness continuity between
 • fuel pump and fuel pump control unit
 • fuel pump control unit and E.C.U. terminal (103)
Continuity should exist.



O.K.
 INSPECTION END

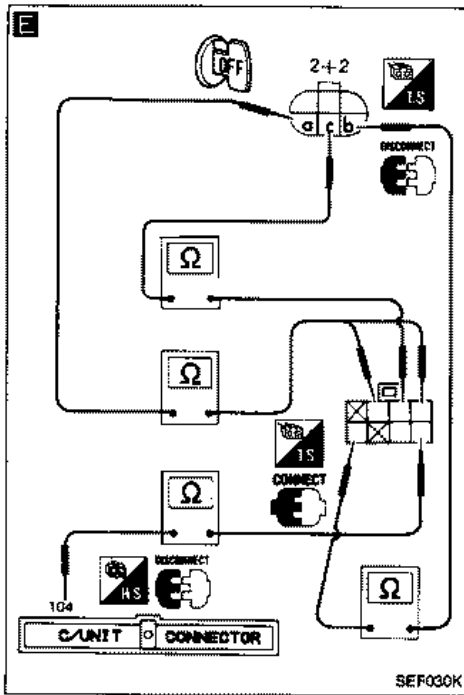
CHECK COMPONENT
 (Fuel pump).
 Refer to "Electrical Components Inspection".
 (See page EF & EC-179.)



N.G.
 Replace fuel pump control unit.

TROUBLE DIAGNOSES

Diagnostic Procedure 39 (Cont'd)



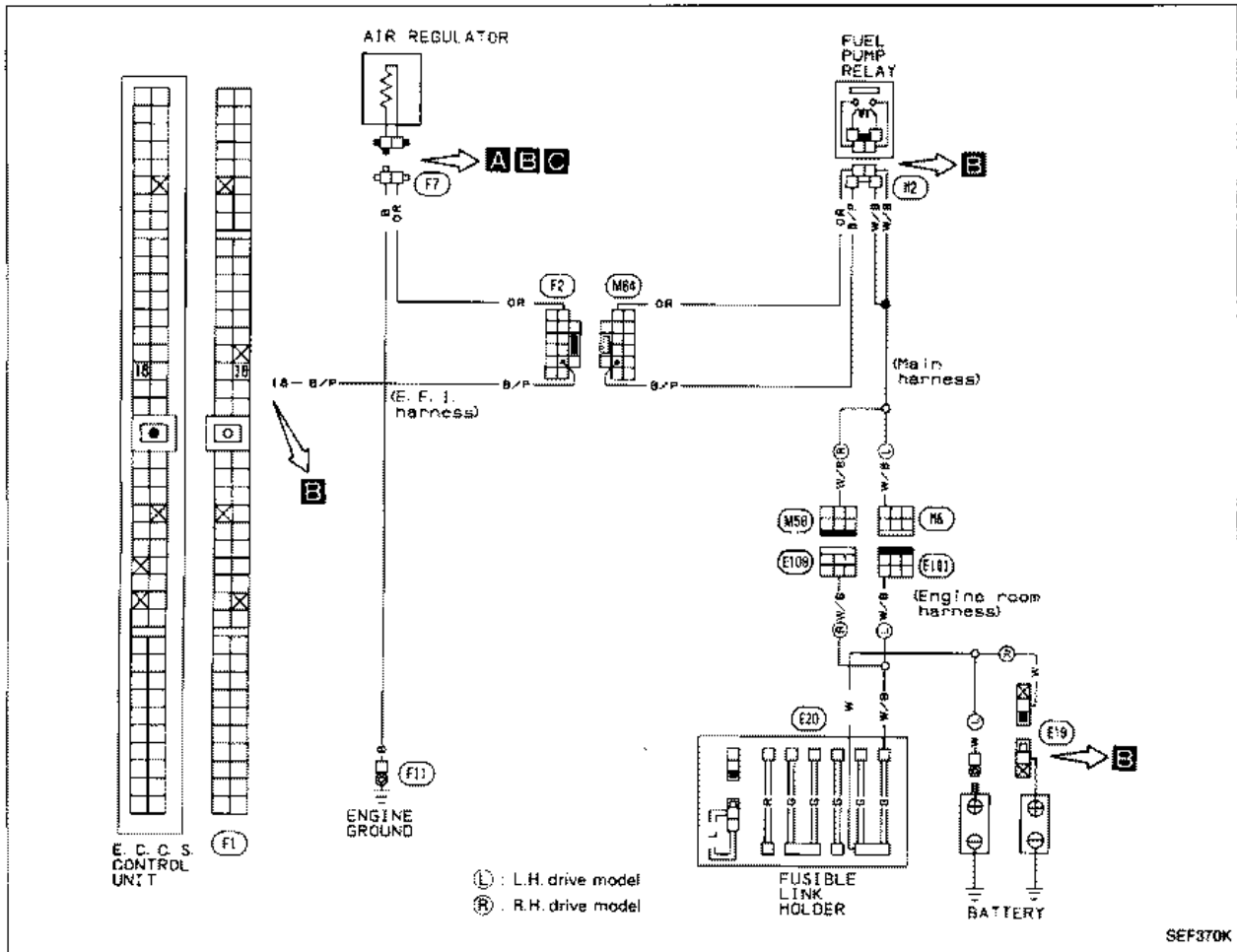
TROUBLE DIAGNOSES

NOTE

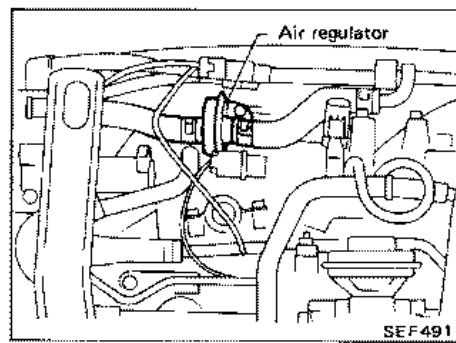
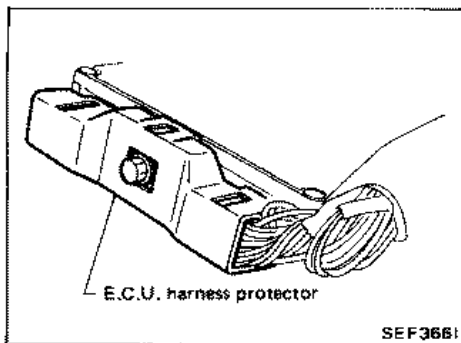
TROUBLE DIAGNOSES

Diagnostic Procedure 40

AIR REGULATOR

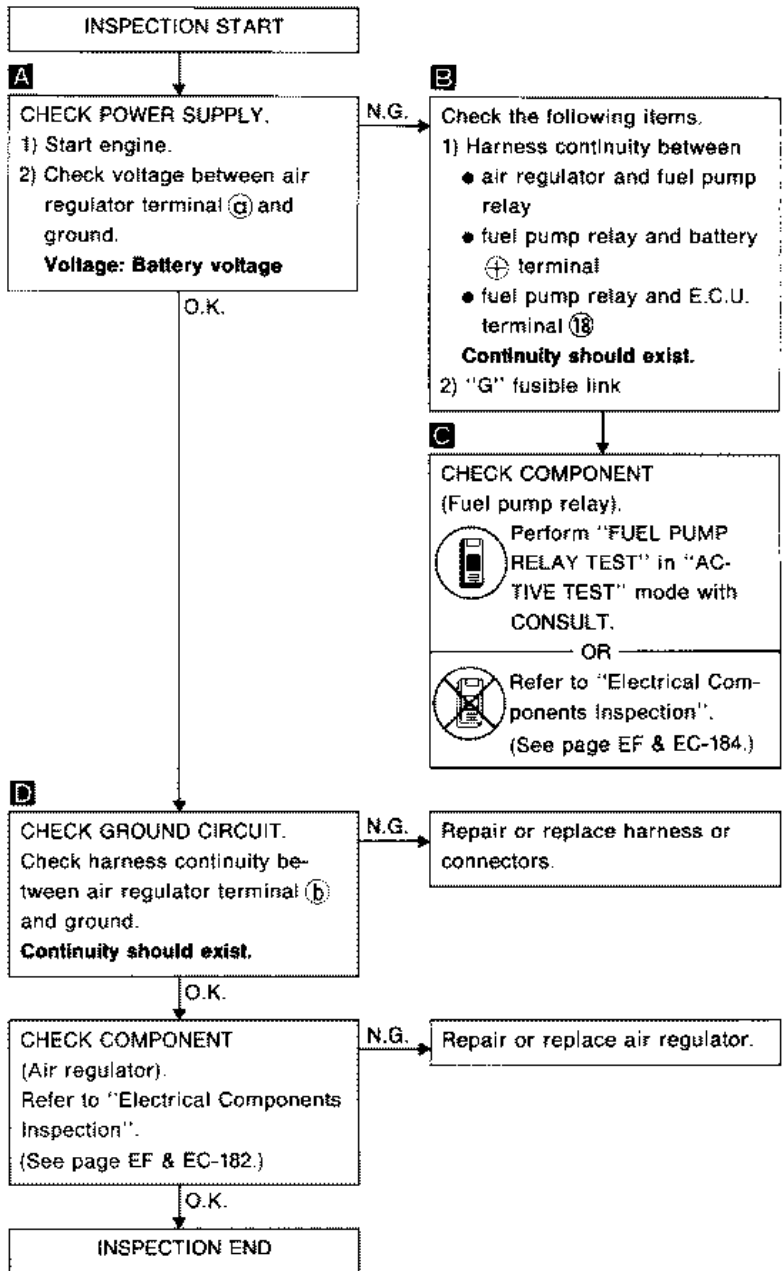
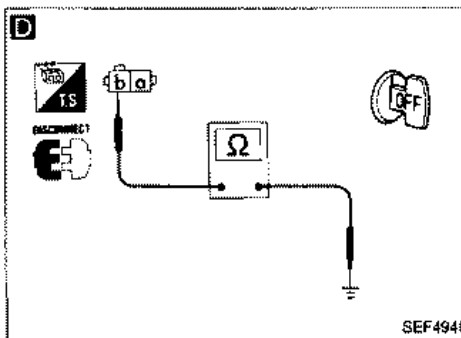
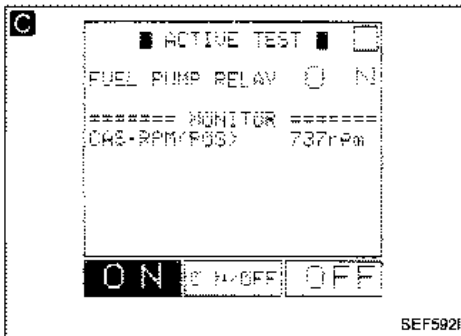
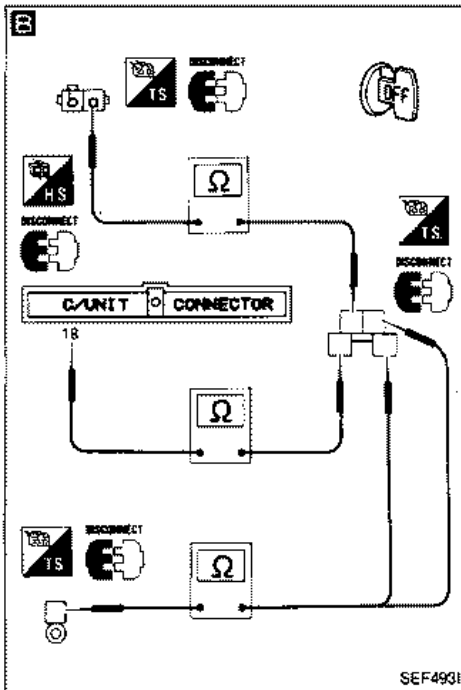
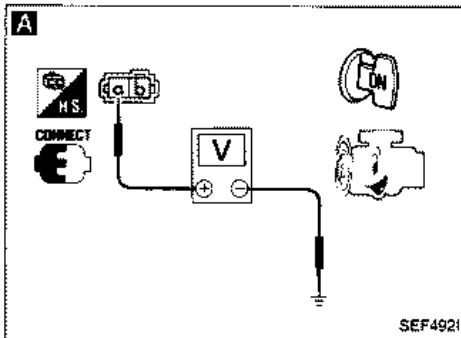


Harness layout



TROUBLE DIAGNOSES

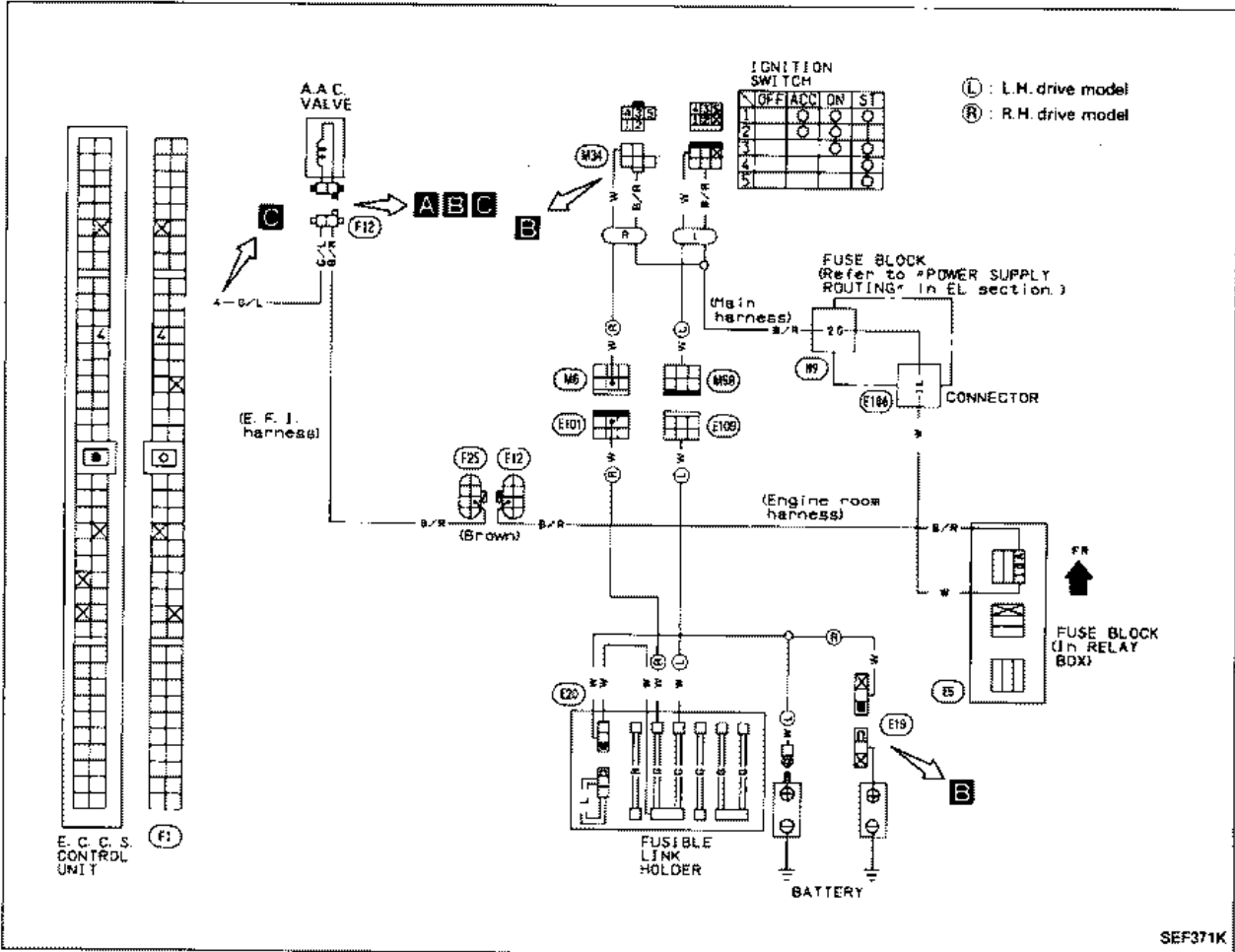
Diagnostic Procedure 40 (Cont'd)



TROUBLE DIAGNOSES

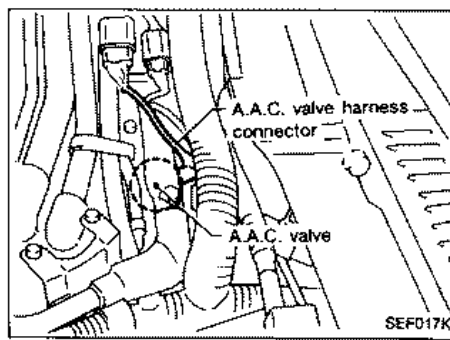
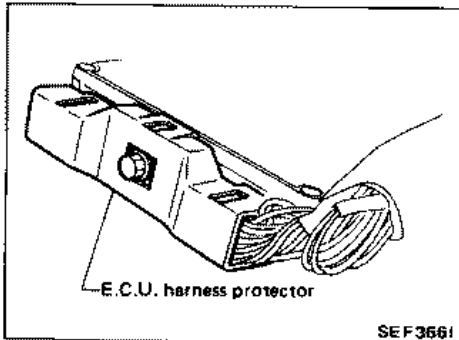
Diagnostic Procedure 41

A.A.C. VALVE



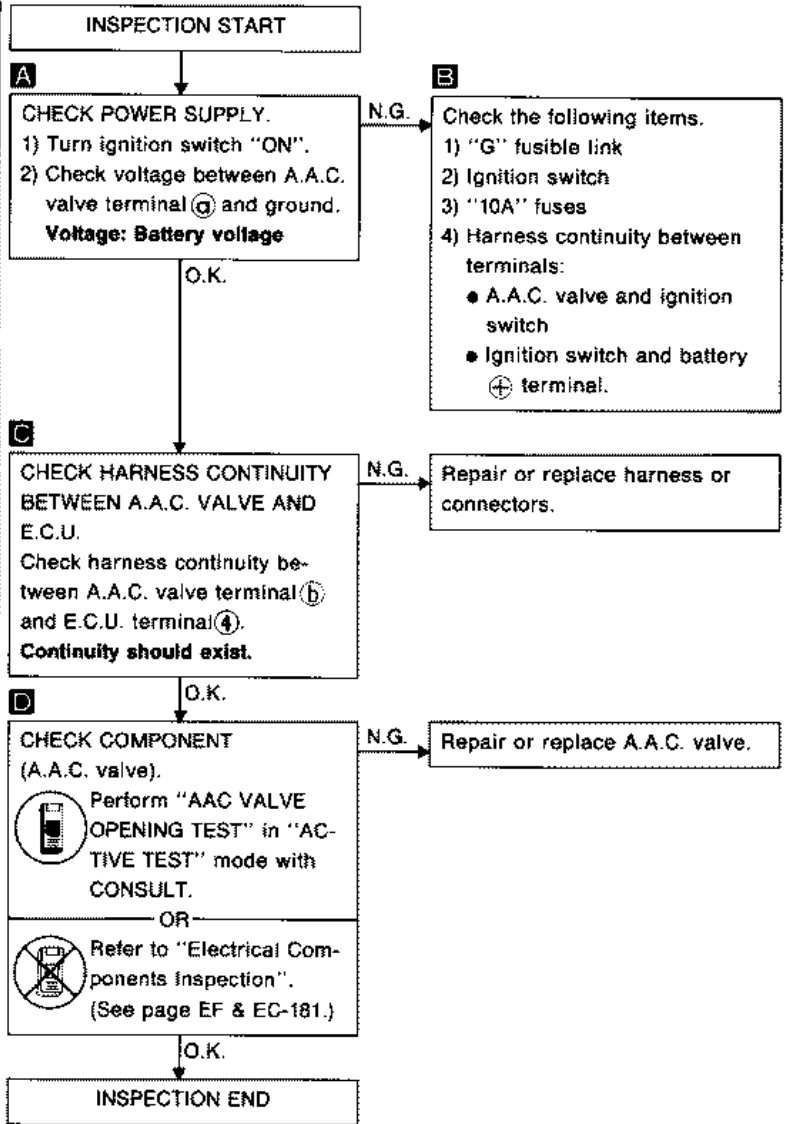
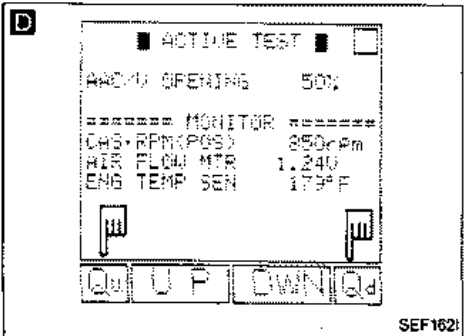
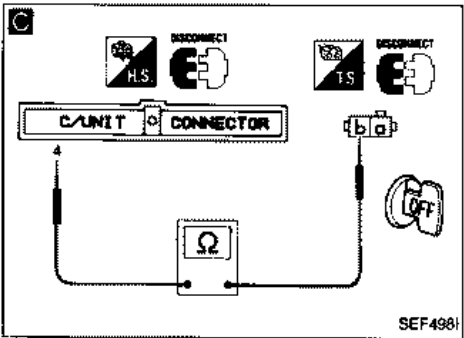
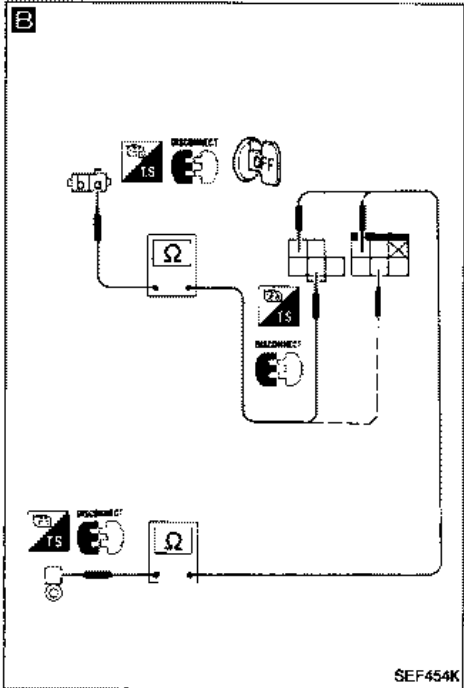
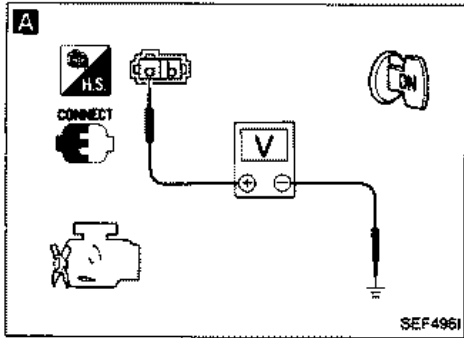
SEF371K

Harness layout



TROUBLE DIAGNOSES

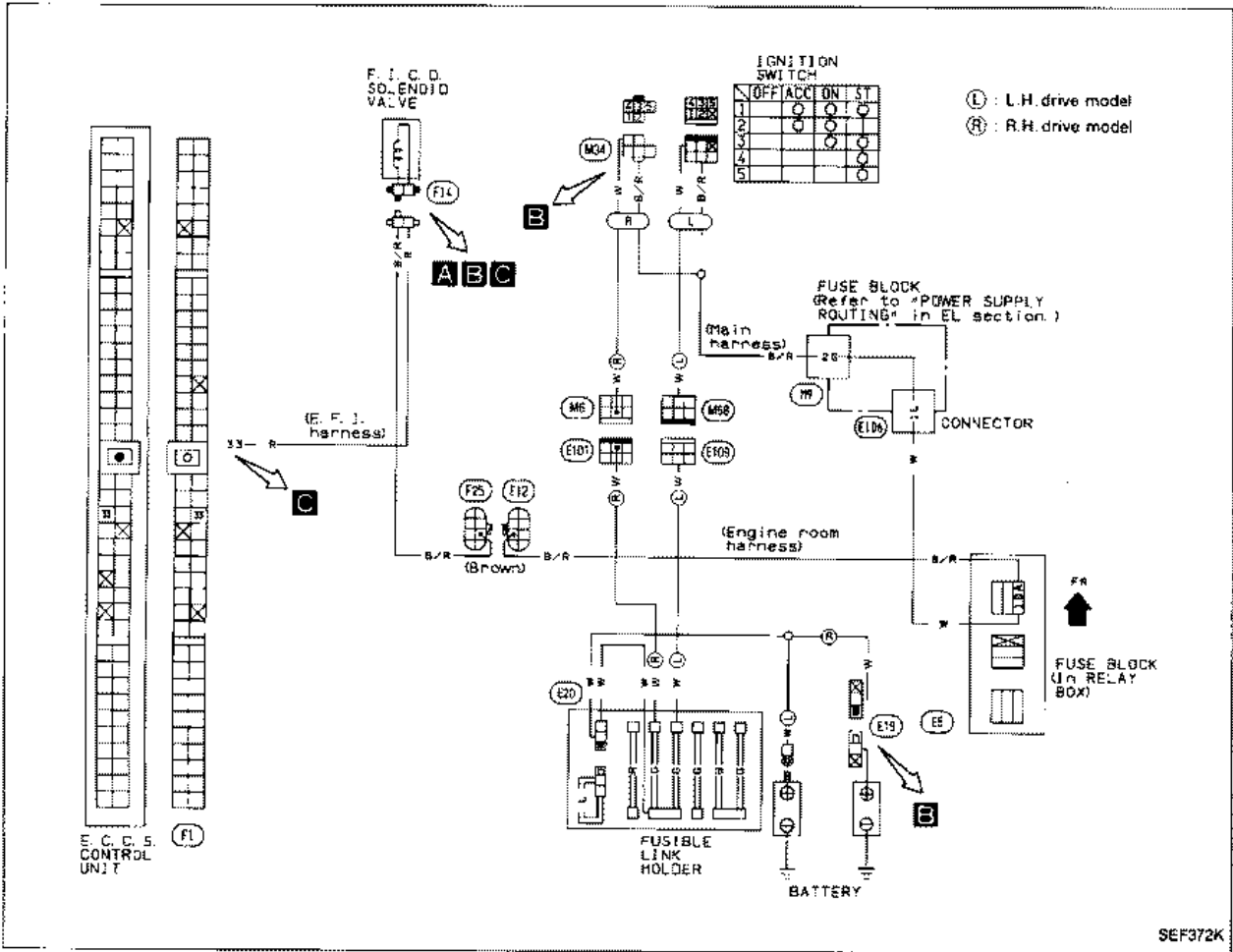
Diagnostic Procedure 41 (Cont'd)



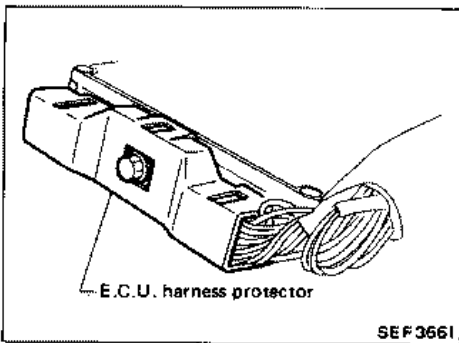
TROUBLE DIAGNOSES

Diagnostic Procedure 42

F.I.C.D. SOLENOID VALVE



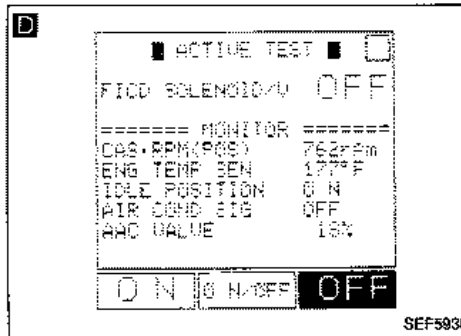
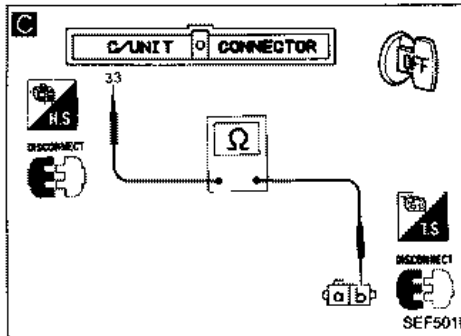
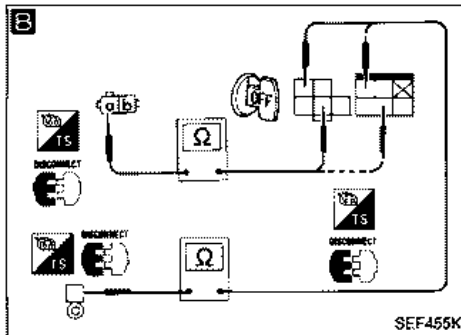
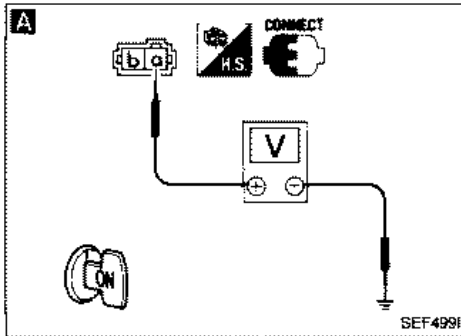
Harness layout



F.I.C.D. solenoid valve harness connector is located near A.A.C. valve harness connector.

TROUBLE DIAGNOSES

Diagnostic Procedure 42 (Cont'd)



INSPECTION START

A
CHECK POWER SUPPLY.
 1) Turn ignition switch "ON".
 2) Check voltage between F.I.C.D. solenoid valve terminal (a) and ground.
Voltage: Battery voltage

B
 Check the following items.
 1) "G" fusible link
 2) "10A" fuses
 3) Ignition switch
 4) Harness continuity between terminals:
 • F.I.C.D. solenoid valve and ignition switch
 • Ignition switch and battery (+) terminal.
Continuity should exist.

O.K.

C
CHECK HARNESS CONTINUITY BETWEEN F.I.C.D. SOLENOID VALVE AND E.C.U.
 Check harness continuity between F.I.C.D. solenoid valve terminal (b) and E.C.U. terminal (33).
Continuity should exist.

N.G. → Repair or replace harness or connectors.

O.K.

D
CHECK COMPONENT (F.I.C.D. solenoid valve).
 Perform "F.I.C.D. SOLENOID VALVE TEST" in "ACTIVE TEST" mode with CONSULT.
 OR
 Refer to "Electrical Components Inspection". (See page EF & EC-182.)

N.G. → Repair or replace F.I.C.D. solenoid valve.

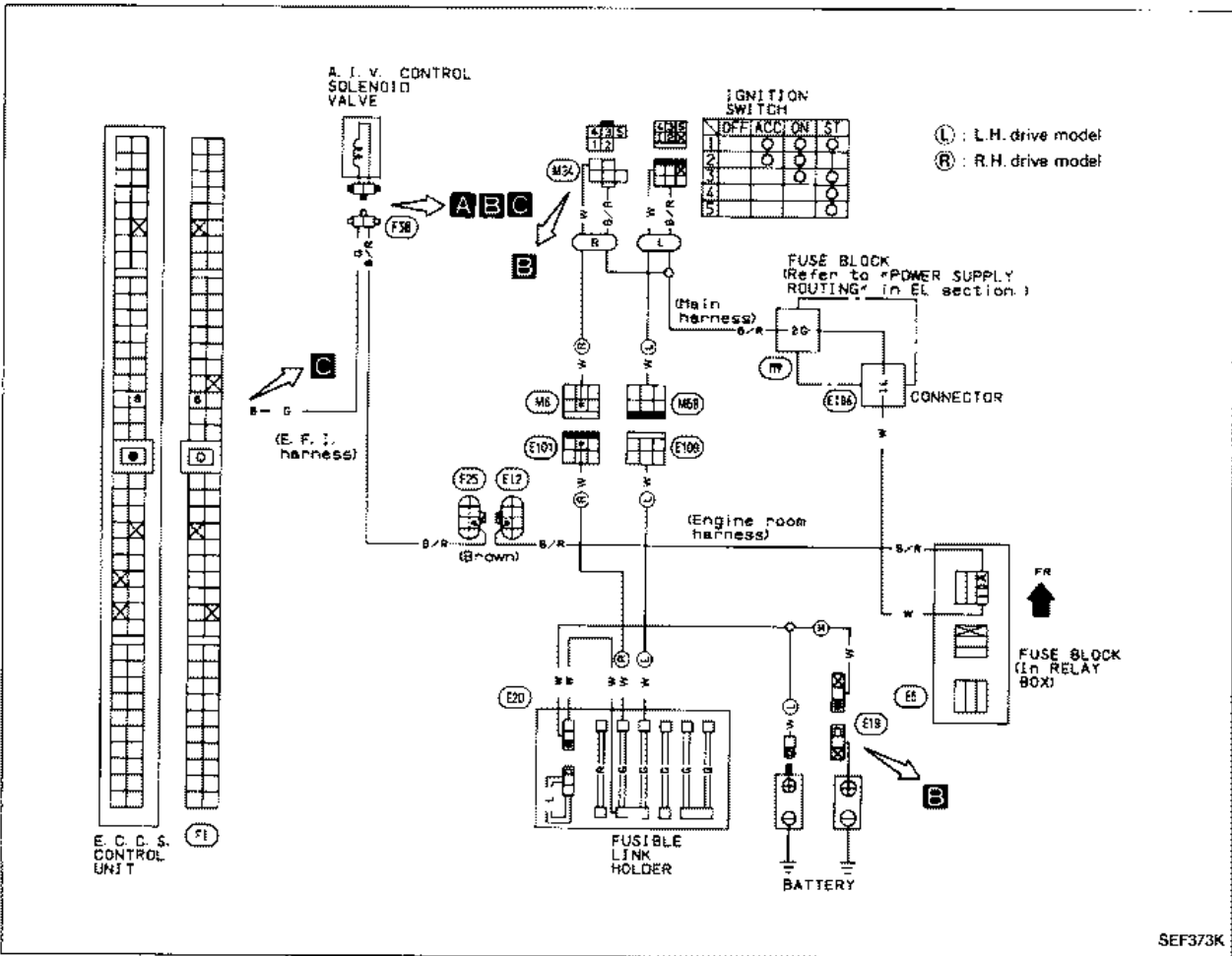
O.K.

INSPECTION END

TROUBLE DIAGNOSES

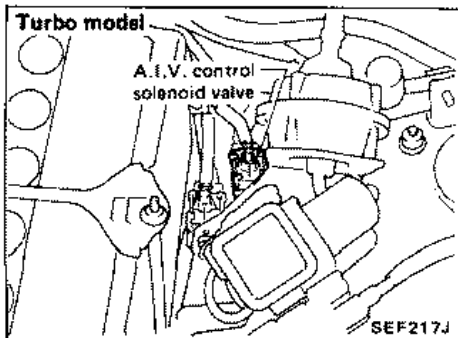
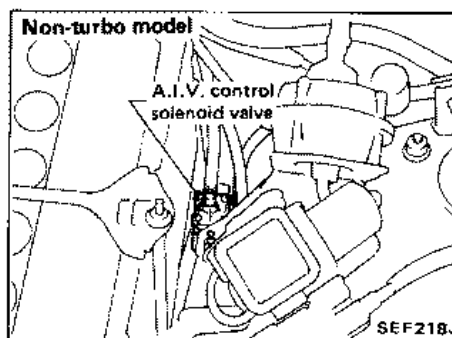
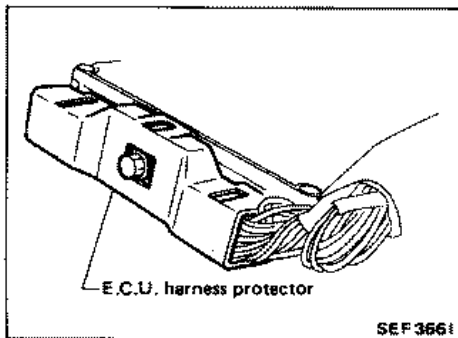
Diagnostic Procedure 43

A.I.V. CONTROL SOLENOID VALVE



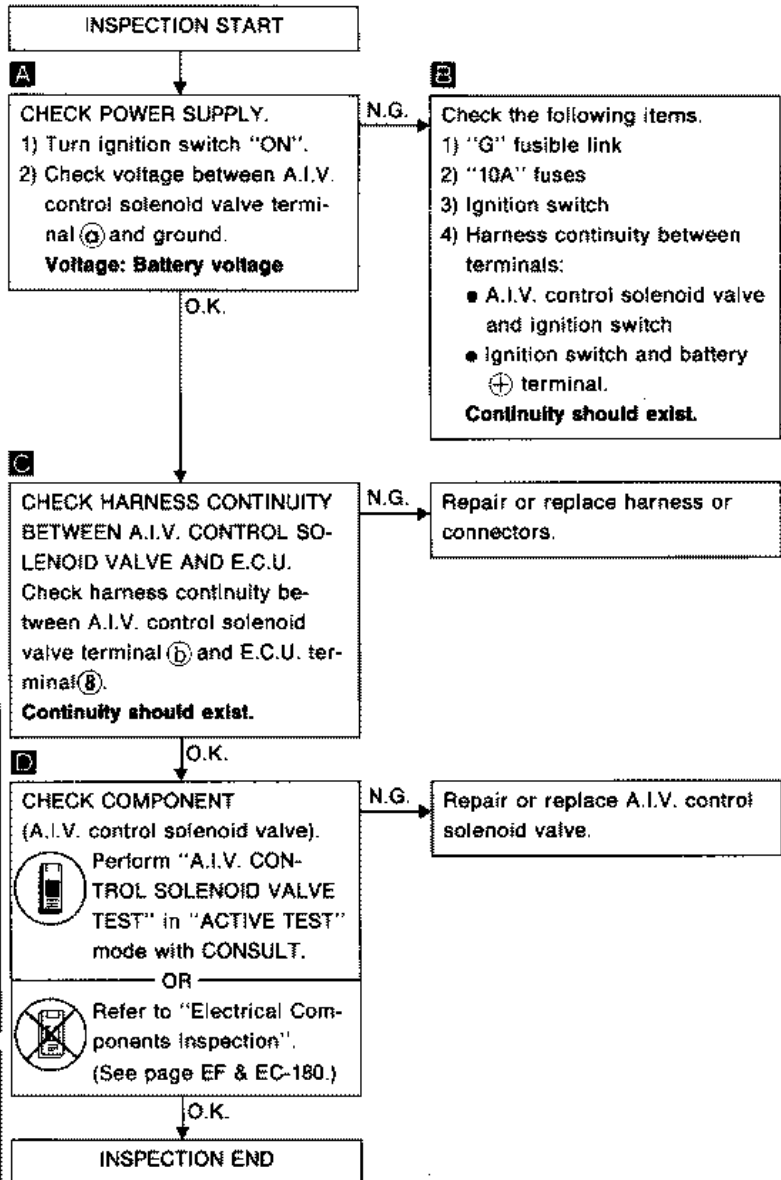
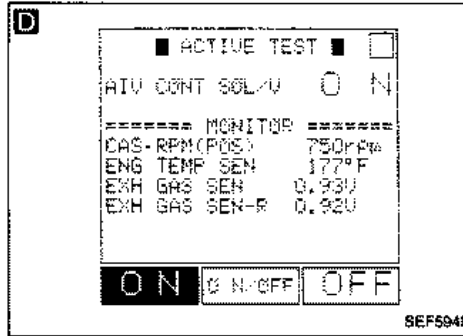
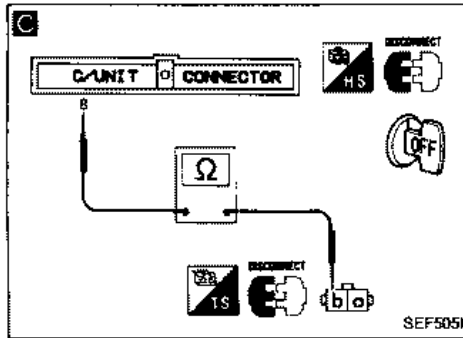
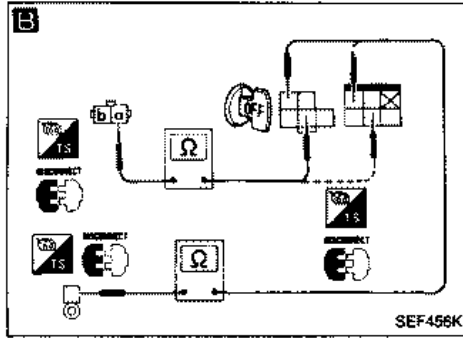
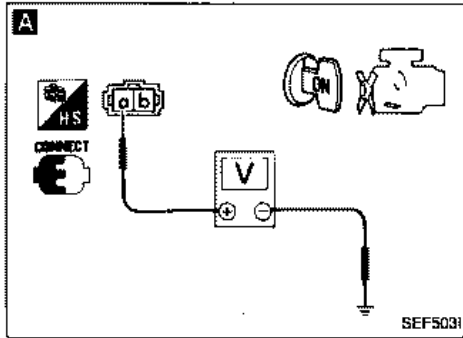
SEF373K

Harness layout



TROUBLE DIAGNOSES

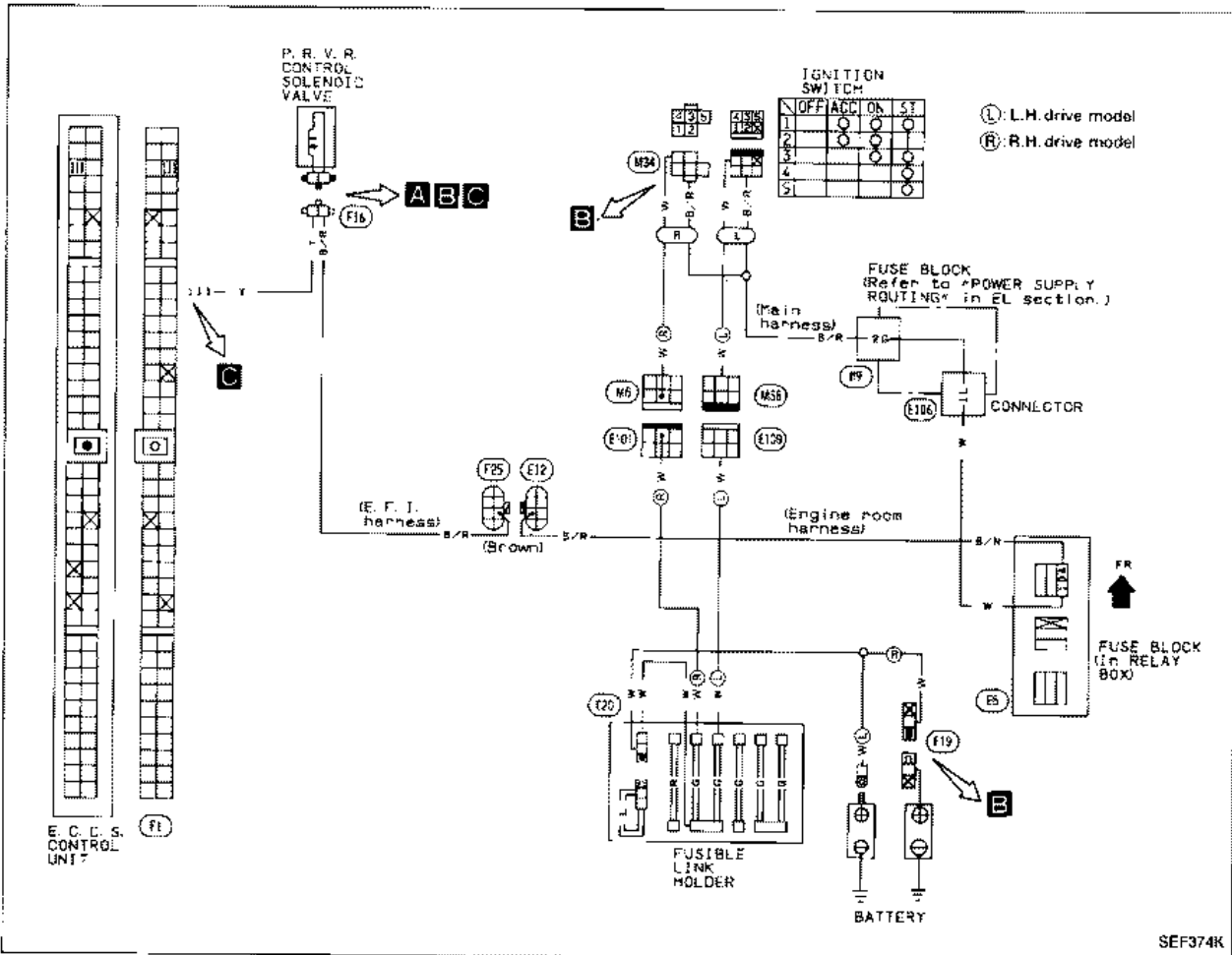
Diagnostic Procedure 43 (Cont'd)



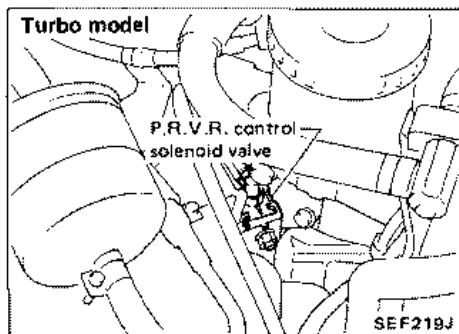
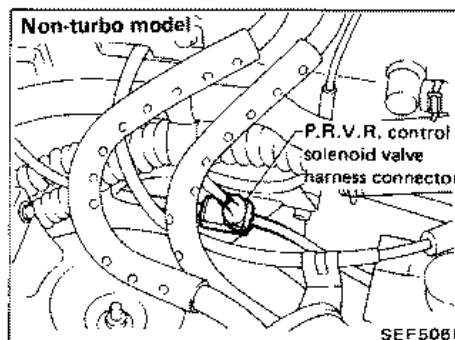
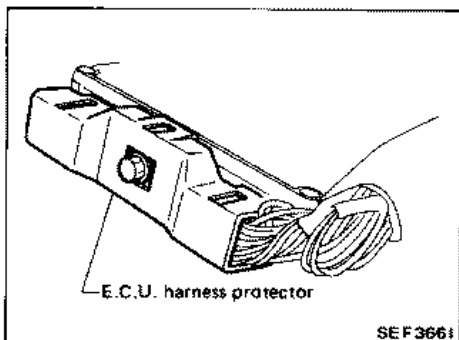
TROUBLE DIAGNOSES

Diagnostic Procedure 44

P.R.V.R. CONTROL SOLENOID VALVE

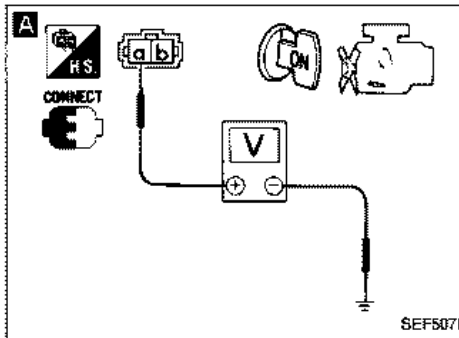


Harness layout



TROUBLE DIAGNOSES

Diagnostic Procedure 44 (Cont'd)



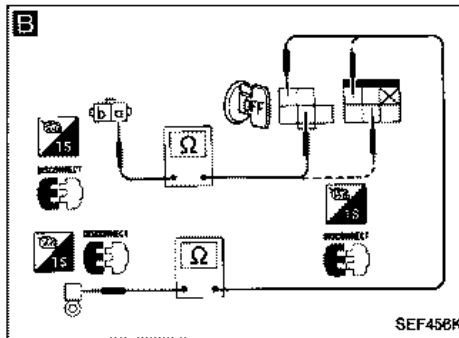
INSPECTION START

A

CHECK POWER SUPPLY.
 1) Turn ignition switch "ON".
 2) Check voltage between P.R.V.R. control solenoid valve terminal (a) and ground.
Voltage: Battery voltage

B

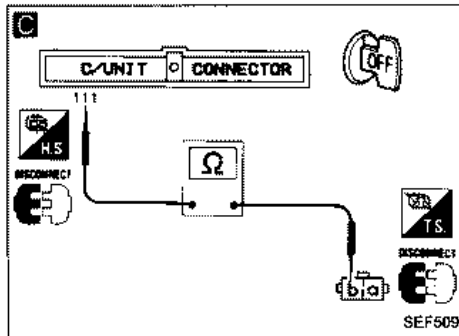
Check the following items.
 1) "G" fusible link
 2) "10A" fuses
 3) Ignition switch
 4) Harness continuity between terminals:
 • P.R.V.R. control solenoid valve and ignition switch
 • Ignition switch and battery (+) terminal.
Continuity should exist.



C

CHECK HARNESS CONTINUITY BETWEEN P.R.V.R. CONTROL SOLENOID VALVE AND E.C.U.
 Check harness continuity between P.R.V.R. control solenoid valve terminal (b) and E.C.U. terminal (111).
Continuity should exist.

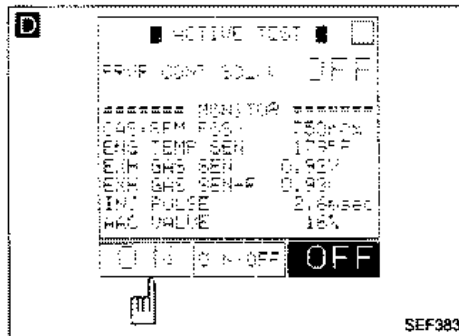
N.G. Repair or replace harness or connectors.



D

CHECK COMPONENT (P.R.V.R. control solenoid valve).
 Perform "P.R.V.R. CONTROL SOLENOID VALVE TEST" in "ACTIVE TEST" mode with CONSULT.
 — OR —
 Refer to "Electrical Components Inspection".
 (See page EF & EC-180.)

N.G. Repair or replace P.R.V.R. control solenoid valve.

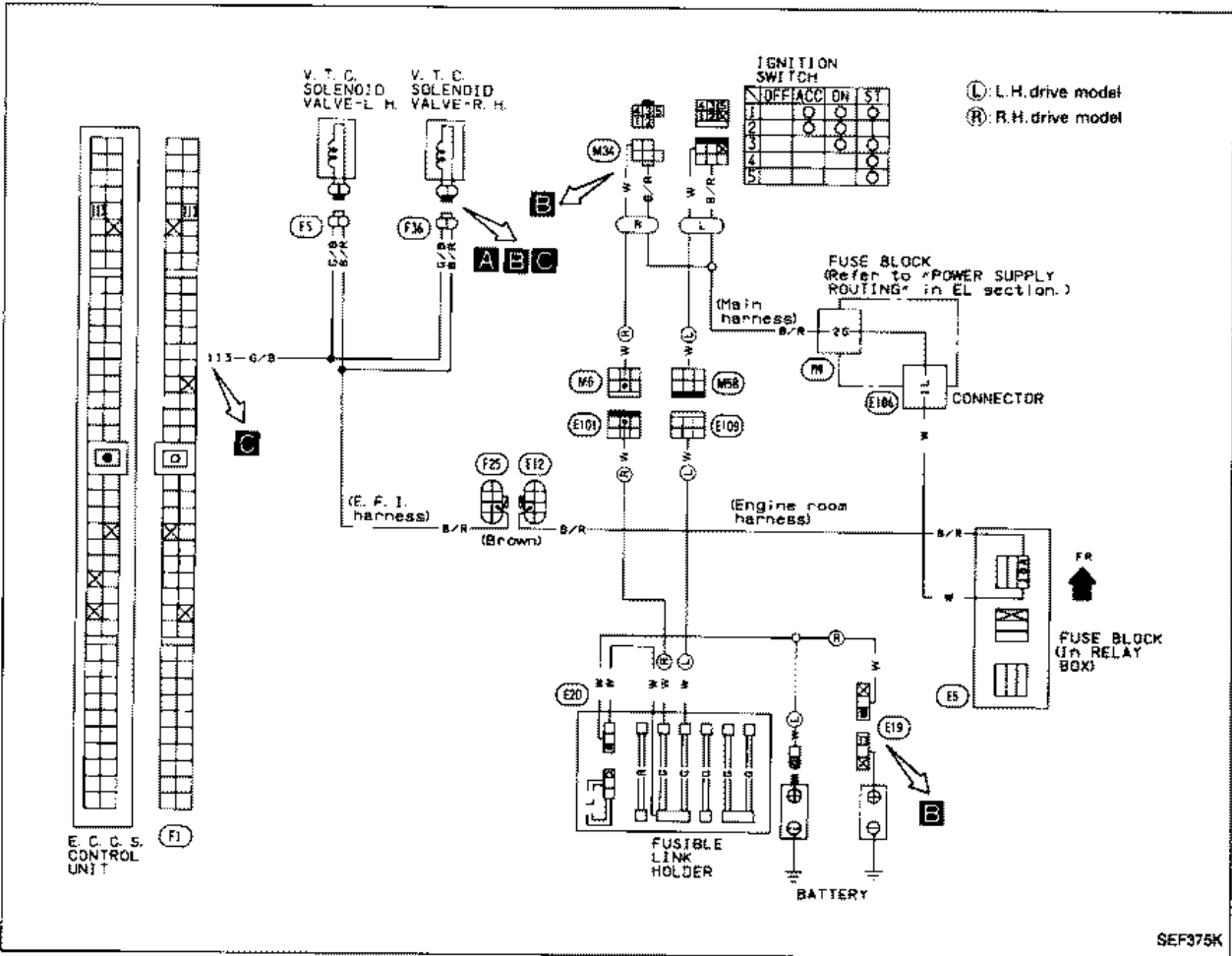


INSPECTION END

TROUBLE DIAGNOSES

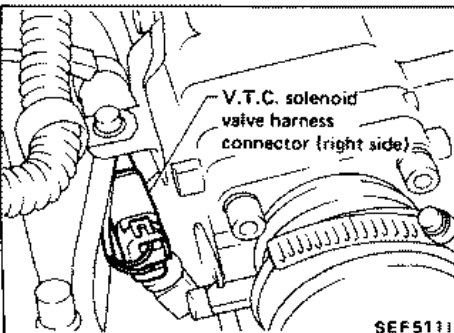
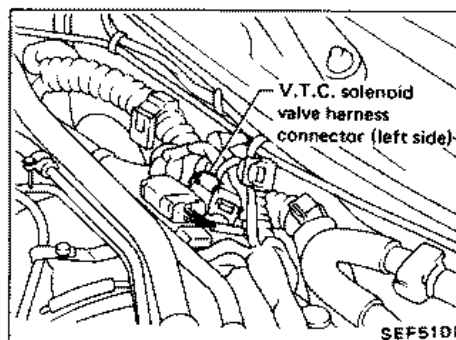
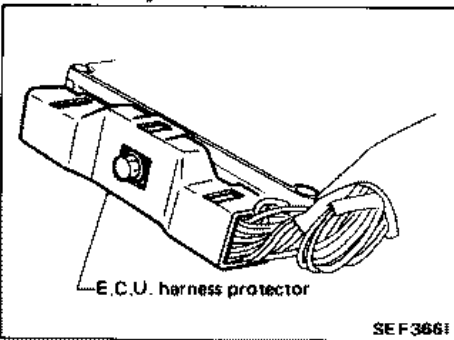
Diagnostic Procedure 45

V.T.C. SOLENOID VALVE



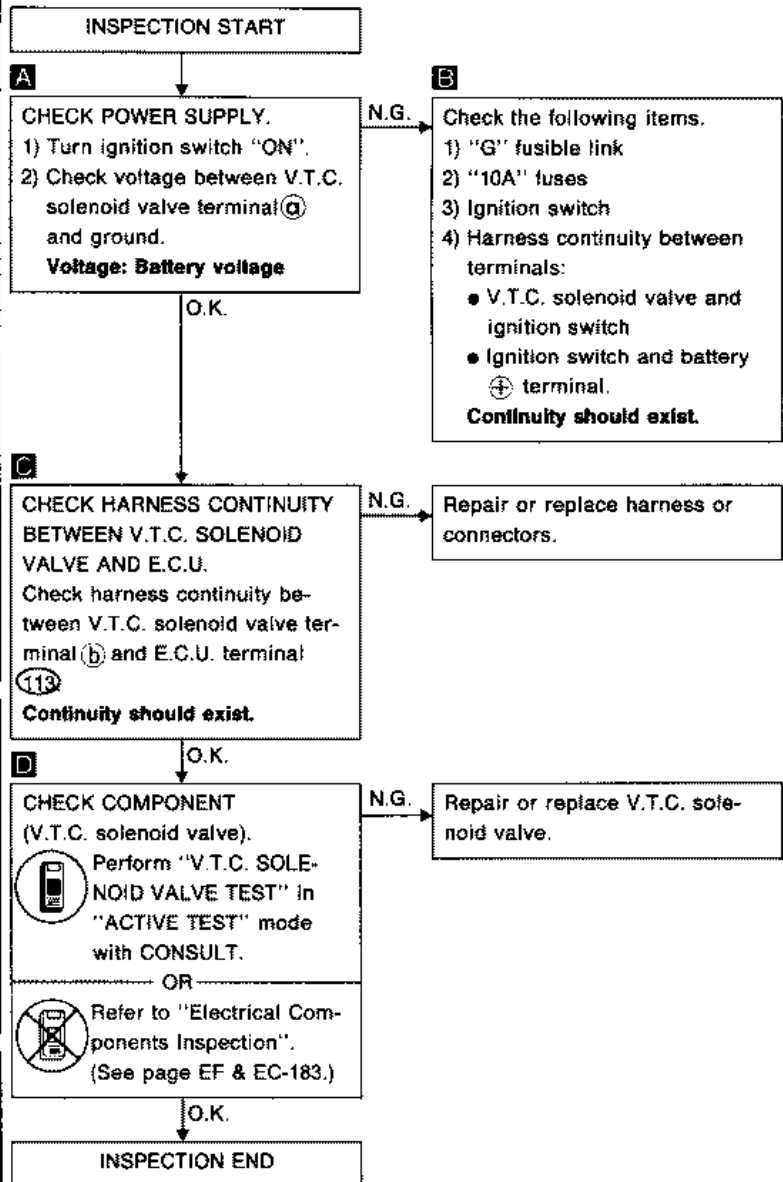
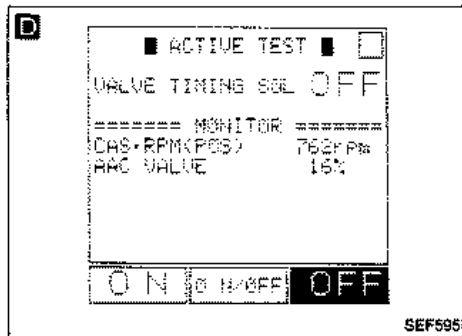
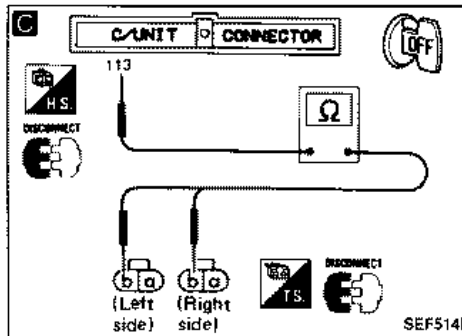
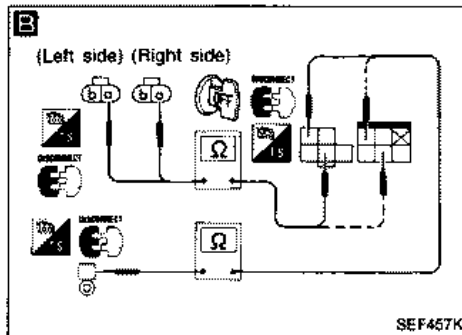
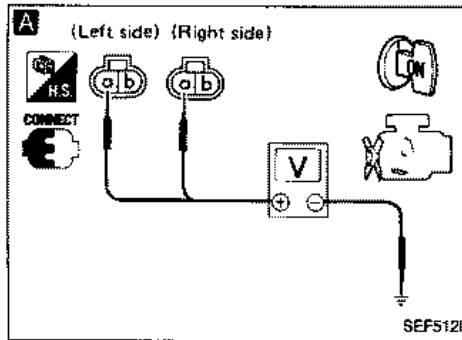
SEF375K

Harness layout



TROUBLE DIAGNOSES

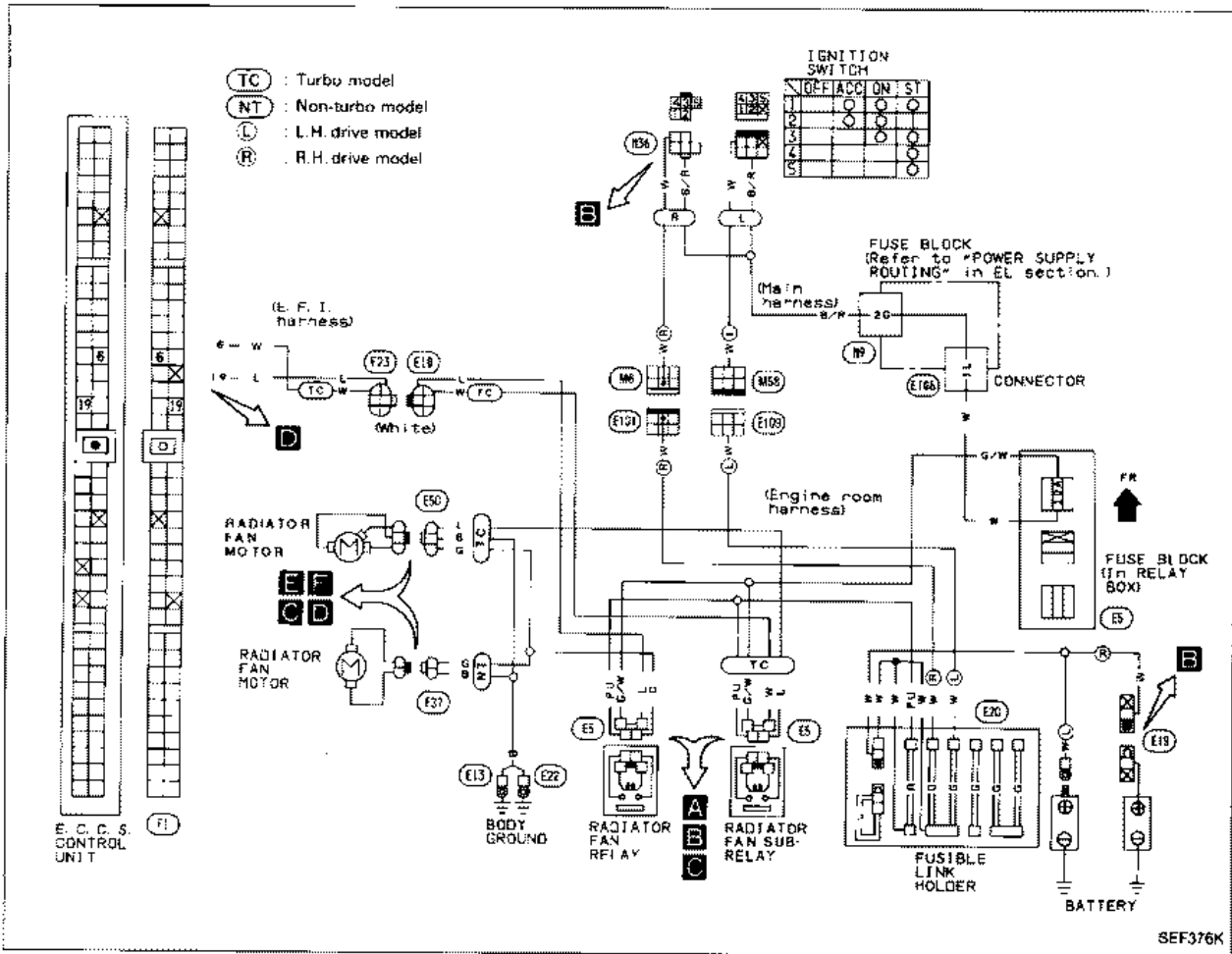
Diagnostic Procedure 45 (Cont'd)



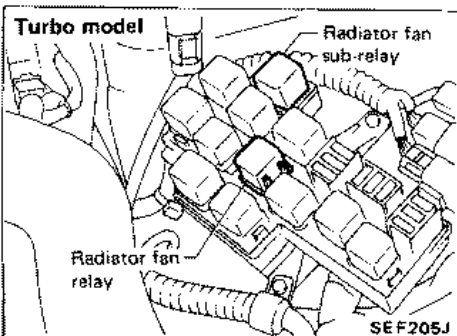
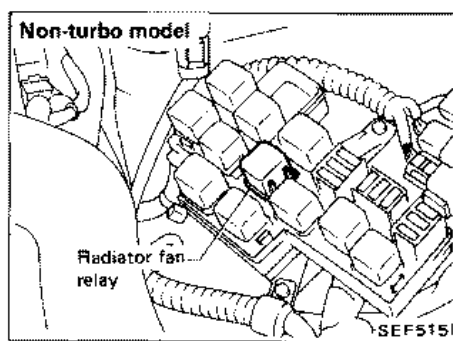
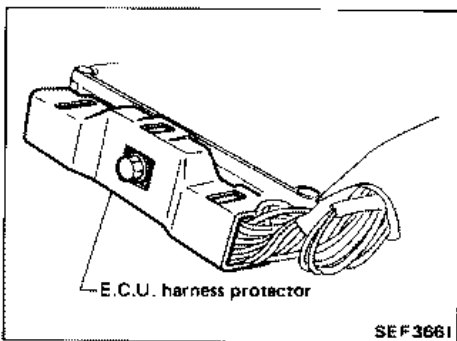
TROUBLE DIAGNOSES

Diagnostic Procedure 46

RADIATOR FAN CONTROL



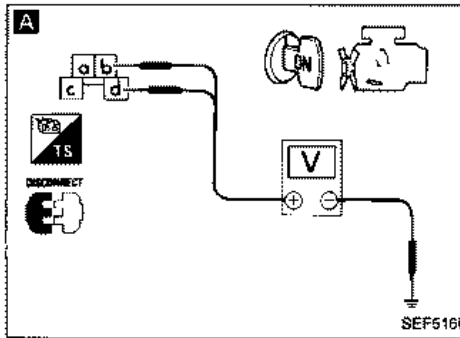
Harness layout



For radiator fan motor harness connector, see "HARNES LAYOUT" in EL section.

TROUBLE DIAGNOSES

Diagnostic Procedure 46 (Cont'd)



A

INSPECTION START

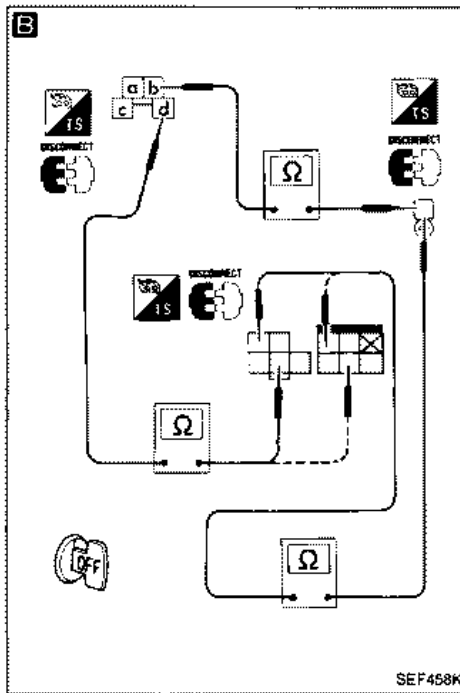
A

CHECK POWER SUPPLY (1).
 1) Turn ignition switch "ON".
 2) Check voltage between radiator fan relay terminals (b), (d) and ground.
Voltage: Battery voltage

B

N.G.

Check the following items.
 1) "G", "R" and "L" fusible links.
 2) "10A" fuses
 3) Ignition switch
 4) Harness continuity between
 • radiator fan relay terminal (b) and battery (+) terminal
 • radiator fan relay terminal (d) and ignition switch
 • ignition switch and battery (+) terminal
Continuity should exist.



C

O.K.

C

CHECK POWER SUPPLY (2).
 1) Turn radiator fan relay "ON" in "ACTIVE TEST" mode with CONSULT.
 2) Check voltage between radiator fan motor terminal (a) and ground.
Voltage: Battery voltage

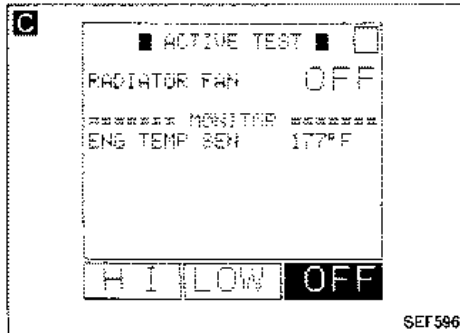
D

N.G.

Check the following items.
 Harness continuity between
 • radiator fan motor and radiator fan relay
 • radiator fan relay and E.C.U. terminal (19)

O.K.

CHECK COMPONENT
 (Radiator fan relay).
 Perform "RADIATOR FAN TEST" in "ACTIVE TEST" mode with CONSULT.
 — OR —
 Refer to "Electrical Components Inspection".
 (See page EF & EC-184.)



E

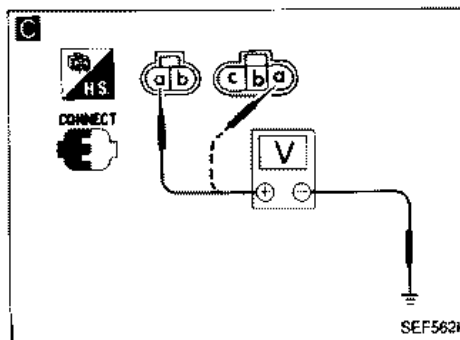
O.K.

E

CHECK GROUND CIRCUIT.
 Check harness continuity between radiator fan motor terminal (b) and ground.
Continuity should exist.

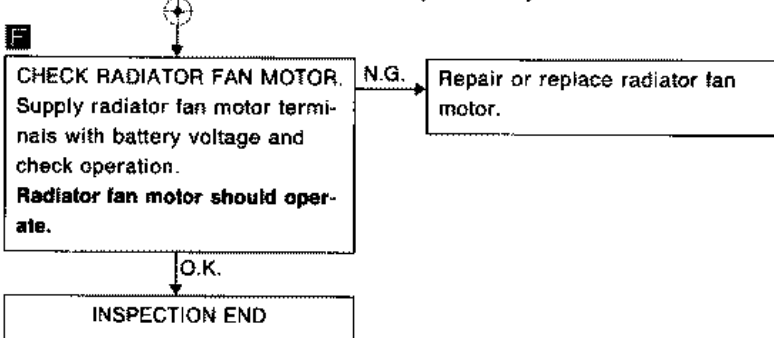
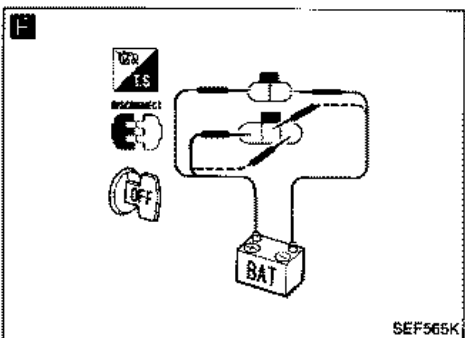
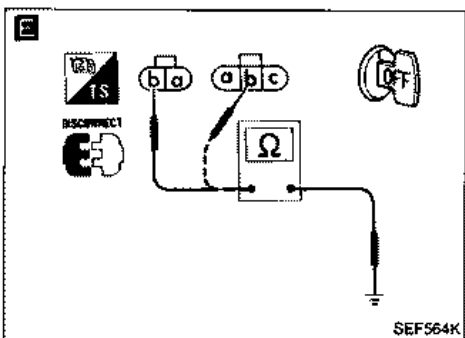
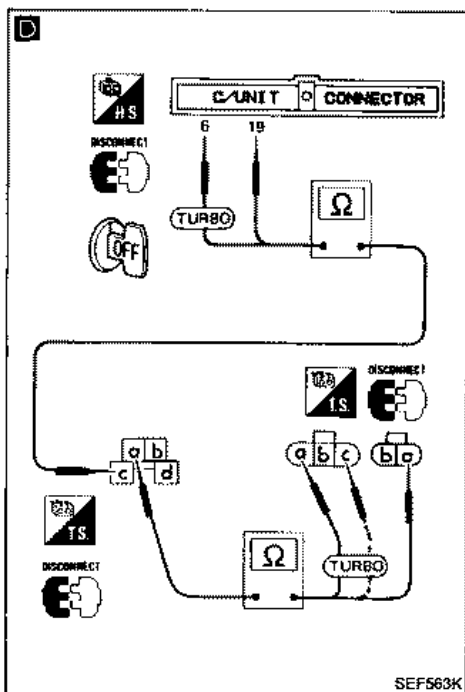
N.G.

Repair or replace harness or connectors.



TROUBLE DIAGNOSES

Diagnostic Procedure 46 (Cont'd)



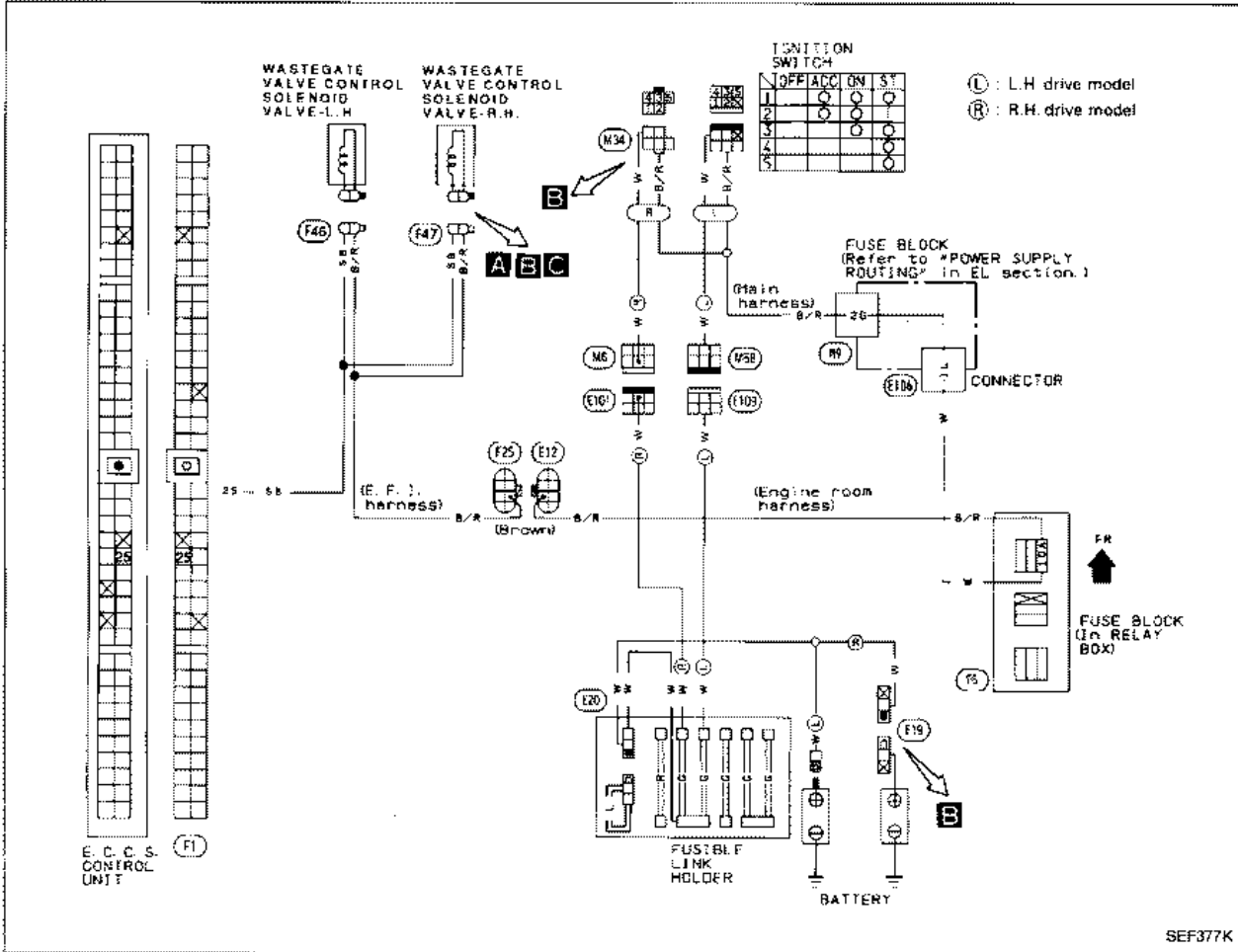
TROUBLE DIAGNOSES

NOTE

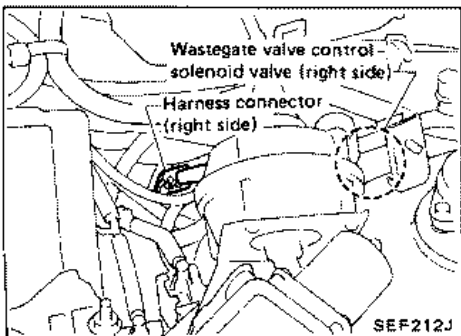
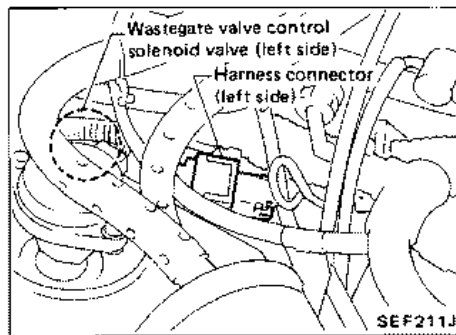
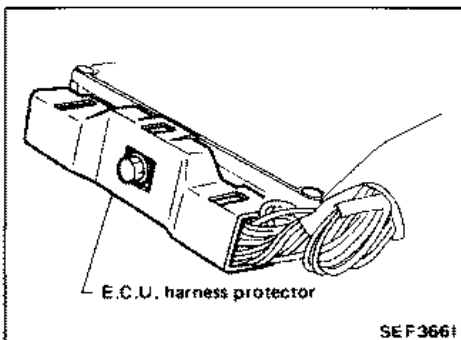
TROUBLE DIAGNOSES

Diagnostic Procedure 47

WASTEGATE VALVE CONTROL SOLENOID VALVE

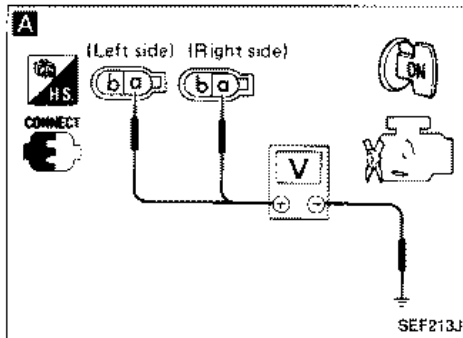


Harness layout



TROUBLE DIAGNOSES

Diagnostic Procedure 47 (Cont'd)



INSPECTION START

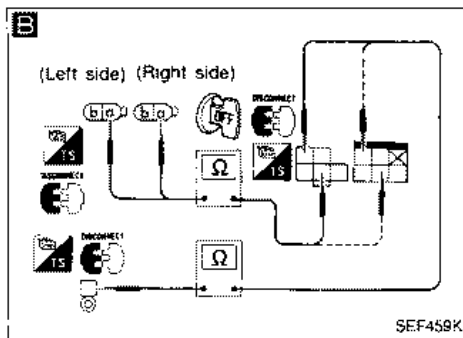
A

CHECK POWER SUPPLY.
 1) Turn ignition switch "ON".
 2) Check voltage between wastegate valve control solenoid valve terminal (b) and ground.
Voltage: Battery voltage

B

Check the following items.

- 1) "G" fusible link
- 2) "10A" fuses
- 3) Ignition switch
- 4) Harness continuity between terminals:
 - Wastegate valve control solenoid valve and ignition switch
 - Ignition switch and battery (+) terminal.**Continuity should exist.**

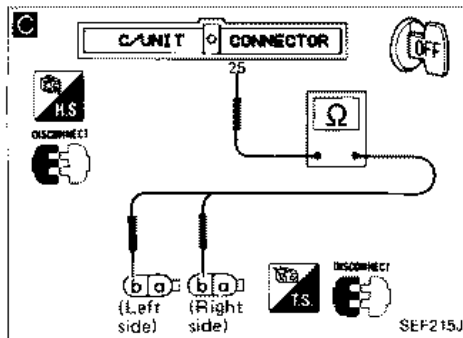


O.K.

C

CHECK HARNESS CONTINUITY BETWEEN WASTEGATE VALVE CONTROL SOLENOID VALVE AND E.C.U.
 Check harness continuity between wastegate valve control solenoid valve terminal (b) and E.C.U. terminal (25).
Continuity should exist.

N.G. → Repair or replace harness or connectors.



O.K.

CHECK COMPONENT (Wastegate valve control solenoid valve).
 Refer to "Electrical Components Inspection".
 (See page EF & EC-180.)

N.G. → Repair or replace wastegate valve control solenoid valve.

O.K.

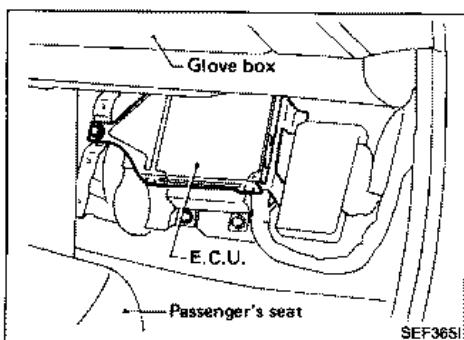
INSPECTION END

TROUBLE DIAGNOSES

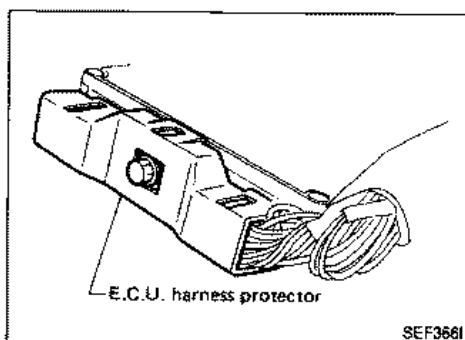
Electrical Components Inspection

E.C.U. INPUT/OUTPUT SIGNAL INSPECTION

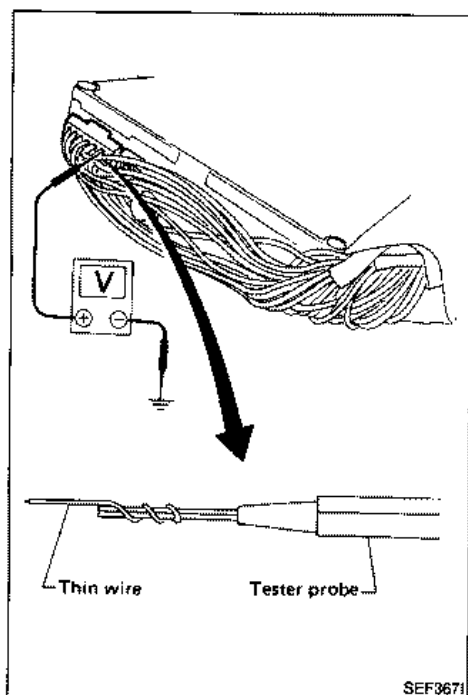
1. E.C.U. is located behind front passenger side floor board. For this inspection, remove the front passenger side floor board.



2. Remove E.C.U. harness protector.



3. Perform all voltage measurements with the connectors connected. Extend tester probe as shown to perform tests easily.



TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

E.C.U. inspection table

*Data are reference values.

TER-MINAL NO.	ITEM	CONDITION	*DATA
1 2 3 11	Ignition signal	Engine is running. └ Idle speed	Approx. 0.1V
12 13		Engine is running. └ Engine speed is 2,000 rpm.	
4	A.A.C. valve	Engine is running. └ Racing condition	Voltage briefly decreases from battery voltage (11 - 14V).
6	Radiator fan sub-relay (Turbo model)	Engine is running. └ Radiator fan is not operating.	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └ Radiator fan is operating.	0.1 - 0.3V
7	Tachometer	Engine is running. └ Idle speed	Approx. 0.7V
		Engine is running. └ Engine speed is 2,000 rpm.	Approx. 1.2V
8	A.I.V. control solenoid valve	Engine is running. └ Idle speed	Approx. 0V
		Engine is running. └ Engine speed is 2,000 rpm.	BATTERY VOLTAGE (11 - 14V)
9	Air conditioner relay	Engine is running. └ Air conditioner switch "OFF"	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └ Air conditioner switch "ON"	Approx. 0V
16	E.C.U. power source (Self-shutoff)	Engine is running. └ Idle speed	0.8 - 1.0V
		Engine is not running. └ For a few seconds after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

*Data are reference values.

TER-MINAL NO.	ITEM	CONDITION	*DATA
18	Fuel pump relay	Ignition switch "ON" └ For 5 seconds after turning ignition switch "ON" Engine is running.	0.7 - 0.9V
		Ignition switch "ON" └ In 5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
19	Radiator fan relay	Engine is running. └ Radiator fan is not operating.	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └ Radiator fan is operating.	0.1 - 0.3V
23	Detonation sensor	Engine is running. └ Idle speed	Approx. 2.5V
25	Wastegate valve control solenoid valves (Turbo model)	Ignition switch "ON" Engine is running.	BATTERY VOLTAGE (11 - 14V)
		Engine is racing. └ Engine speed is up to 2,000 rpm	Approx. 0.2V
27	Air flow meter	Engine is running. (Warm-up condition) └ Idle speed	0.8 - 1.5V
		Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm.	1.0 - 1.6V
28	Engine temperature sensor	Engine is running.	0 - 5.0V Output voltage varies with engine temperature.
29	Right side exhaust gas sensor	Engine is running.	0 ↔ Approx. 1.0V
55	Left side exhaust gas sensor	└ After warming up sufficiently and engine speed is 2,000 rpm.	
33	F.I.C.D. solenoid valve	Engine is running. └ A/C compressor is not operating.	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └ A/C compressor is operating.	0.7 - 0.8V

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

*Data are reference values.

TER-MINAL NO.	ITEM	CONDITION	*DATA
34	Power steering oil pressure switch	<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> <ul style="list-style-type: none"> └ Steering wheel is in the "straight ahead" position. 	8.0 - 9.0V
		<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> <ul style="list-style-type: none"> └ Steering wheel is turned. 	Approx. 0V
36	Fuel temperature sensor	<div style="border: 1px solid black; padding: 2px;">Engine is running.</div>	0 - 5.0V Output voltage varies with fuel temperature.
38	Throttle sensor	<div style="border: 1px solid black; padding: 2px;">Ignition switch "ON"</div>	0.4 - 4.0V Output voltage varies with throttle valve opening angle.
41 51	Crank angle sensor (Reference signal)	<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> <p style="text-align: center;">Do not run engine at high speed under no-load.</p>	1.2 - 1.4V Output voltage varies slightly with engine speed.
42 52	Crank angle sensor (Position signal)	<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> <p style="text-align: center;">Do not run engine at high speed under no-load.</p>	2.5 - 2.7V Output voltage varies slightly with engine speed.
43	Start signal	<div style="border: 1px solid black; padding: 2px;">Ignition switch "ON"</div>	Approx. 0V
		<div style="border: 1px solid black; padding: 2px;">Ignition switch "START"</div>	BATTERY VOLTAGE (11 - 14V)
44	Neutral switch (M/T model) A/T control unit (A/T model)	<div style="border: 1px solid black; padding: 2px;">Ignition switch "ON"</div> <ul style="list-style-type: none"> └ Gear position is "Neutral" (M/T model). └ Gear position is "N" or "P" (A/T model). 	Approx. 0V
		<div style="border: 1px solid black; padding: 2px;">Ignition switch "ON"</div> <ul style="list-style-type: none"> └ Except the above conditions 	8.0 - 9.0V
45	Ignition switch	<div style="border: 1px solid black; padding: 2px;">Ignition switch "ON"</div> <ul style="list-style-type: none"> └ Engine stopped 	BATTERY VOLTAGE (11 - 14V)
46	Air conditioner switch	<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> <ul style="list-style-type: none"> └ Air conditioner switch "OFF" 	BATTERY VOLTAGE (11 - 14V)
		<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> <ul style="list-style-type: none"> └ Air conditioner switch "ON" 	0.5 - 0.7V

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

*Data are reference values.

TER-MINAL NO.	ITEM	CONDITION	*DATA
48	Power source for sensors	Ignition switch "ON" └ Engine stopped	Approximately 5.0V
49	Battery source	Ignition switch "ON" └ Engine stopped	BATTERY VOLTAGE (11 - 14V)
54	Throttle valve switch (Idle position)	Ignition switch "ON" └ Accelerator pedal is fully released (engine running).	9.0 - 10.0V
		Ignition switch "ON" └ Accelerator pedal is depressed (engine running).	0V
57	Power source for throttle valve switch	Ignition switch "ON" └ Engine running	BATTERY VOLTAGE (11 - 14V)
59	Power supply	Ignition switch "ON" └ Engine running	BATTERY VOLTAGE (11 - 14V)
101 103 105 110 112 114	Injectors	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
102	E.G.R. control solenoid valve	Engine is running. (Warm-up condition) └ Idle speed	0.7 - 0.8V
		Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm.	BATTERY VOLTAGE (11 - 14V)
35 104	Fuel pump voltage control (35: Turbo model)	Ignition switch "ON" └ Engine stopped	BATTERY VOLTAGE (11 - 14V)
		Engine is running. (Warm-up condition) └ Idle speed	Approx. 0V
111	P.R.V.R. control solenoid valve	Stop and restart engine after warming it up. └ Fuel temperature is above 75°C (167°F)	0 - 1.0V (for 30 seconds after ignition switch is turned off.) BATTERY VOLTAGE (After 30 seconds)
		Stop and restart engine after warming it up. └ Fuel temperature is below 75°C (167°F)	BATTERY VOLTAGE (11 - 14V)

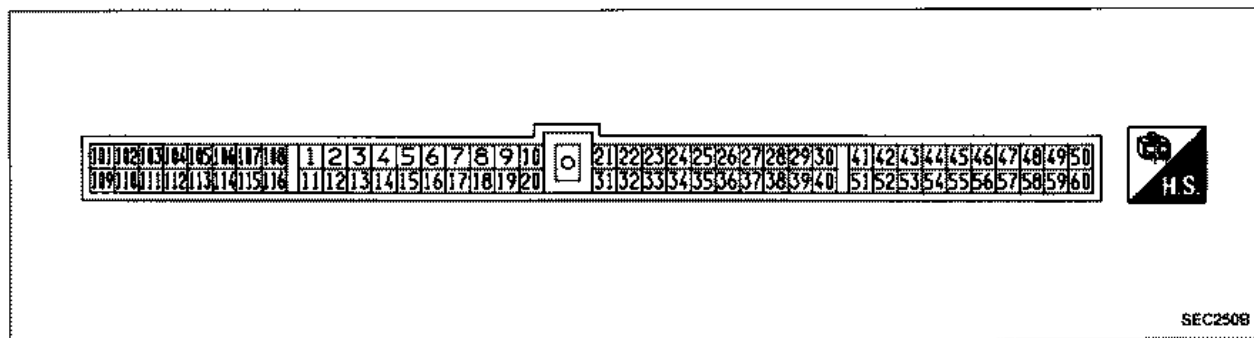
TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

*Data are reference values.

TER-MINAL NO.	ITEM	CONDITION	*DATA
113	Valve timing control solenoid valves	Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └ Engine speed is 3,000 rpm.	0.2 - 0.5V

E.C.U. HARNESS CONNECTOR TERMINAL LAYOUT

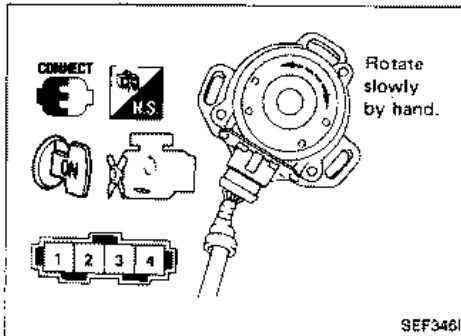


SEC2508

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

CRANK ANGLE SENSOR

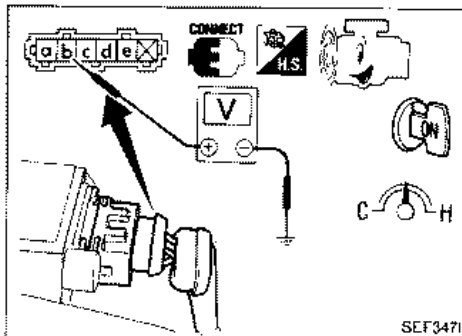


1. Remove crank angle sensor from engine. (Crank angle sensor harness connector should remain connected.)
2. Turn ignition switch "ON".
3. Rotate crank angle sensor shaft slowly by hand and check voltage between terminals ①, ② and ground.

Terminal	Voltage
② (120° signal)	Voltage fluctuates between 5V and 0V.
① (1° signal)	

If N.G., replace crank angle sensor.

After this inspection, malfunction code No. 11 might be displayed though the crank angle sensor is functioning properly. In this case erase the stored memory.

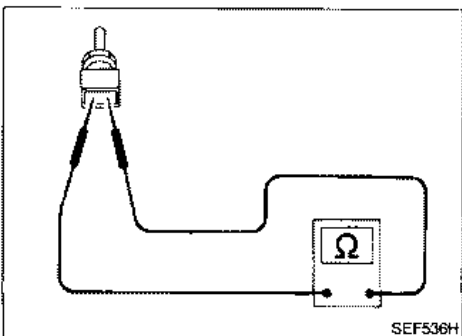
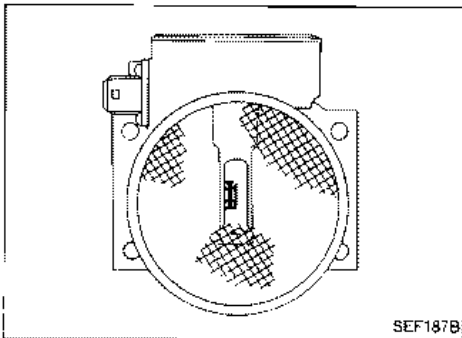


AIR FLOW METER

1. Fold back air flow meter harness connector rubber as shown in the figure if the harness connector is connected.
2. Turn ignition switch "ON".
3. Start engine and warm it up sufficiently.
4. Check voltage between terminal ⑤ and ground.

Conditions	Voltage V
Ignition switch "ON" (Engine stopped.)	Approximately 0.8
Idle (Engine is warm-up sufficiently.)	Approximately 0.8 - 1.5

5. If N.G., remove air flow meter from air duct. Check hot wire for damage or dust.



ENGINE TEMPERATURE SENSOR

1. Disconnect engine temperature sensor harness connector.
2. Check resistance as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
80 (176)	0.30 - 0.33

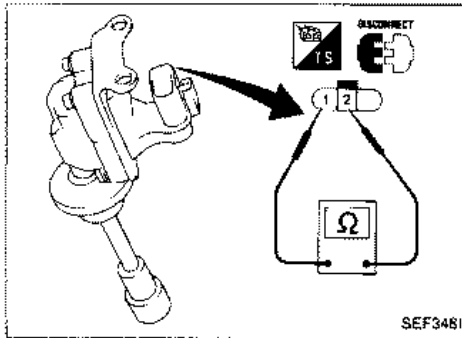
If N.G., replace engine temperature sensor.

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

IGNITION COIL

1. Disconnect ignition coil harness connector.
2. Check resistance as shown in the figure.

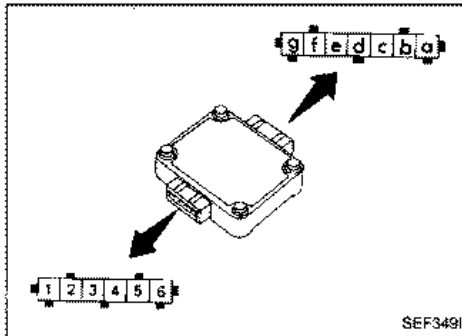


Terminal	Resistance
① - ②	Approximately 0.7Ω

If N.G., replace ignition coil.

POWER TRANSISTOR

1. Disconnect power transistor harness connector.
2. Check power transistor continuity between terminals as shown in the figure.



Terminal combination	Tester polarity	Continuity	Tester polarity	Continuity
g g g g g g a b c d e f	⊕	No	⊖	Yes
g g g g g g 1 2 3 4 5 6	⊕	Yes	⊖	Yes
g g g g g g 1 2 3 4 5 6	⊖	Yes	⊕	No

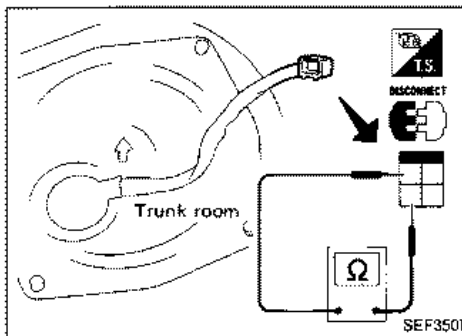
If N.G., replace power transistor.

FUEL PUMP

1. Disconnect fuel pump harness connector.
2. Check resistance between terminals ㉑ and ㉒.

Resistance: Approximately 0.5Ω

If N.G., replace fuel pump.

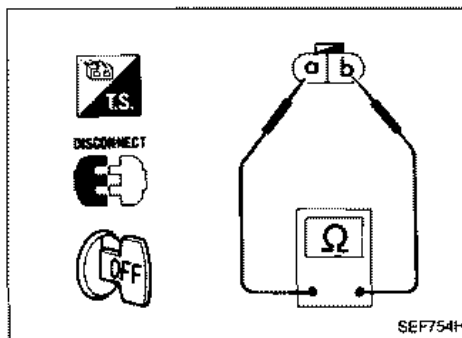


VEHICLE SPEED SENSOR

1. Jack up rear wheels. Use stands to support vehicle.
2. Disconnect vehicle speed sensor harness connector.
3. Check continuity between terminals ㉑ and ㉒ while rotating rear wheel by hand.

Continuity should come and go.

If N.G., replace vehicle speed sensor.

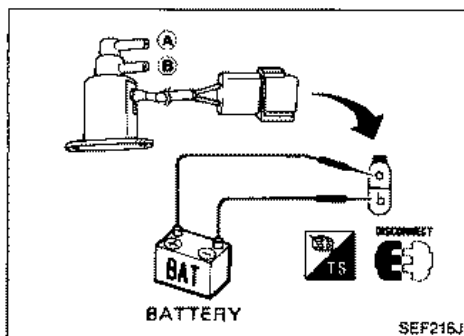


TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

WASTEGATE VALVE CONTROL SOLENOID VALVE

Check air passage continuity.



Condition	Air passage continuity between (A) and (B)
12V direct current supply between terminals (a) and (b)	Yes
No supply	No

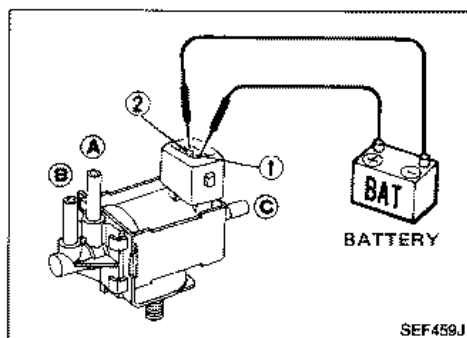
If N.G., replace solenoid valve.

E.G.R. CONTROL SOLENOID VALVE

A.I.V. CONTROL SOLENOID VALVE

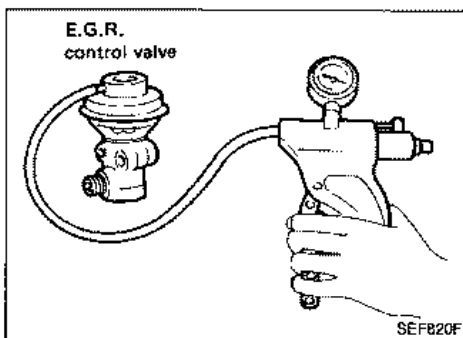
P.R.V.R. CONTROL SOLENOID VALVE

Check air passage continuity.



Condition	Air passage continuity between (A) and (B)	Air passage continuity between (A) and (C)
12V direct current supply between terminals (1) and (2)	Yes	No
No supply	No	Yes

If N.G., replace solenoid valve.

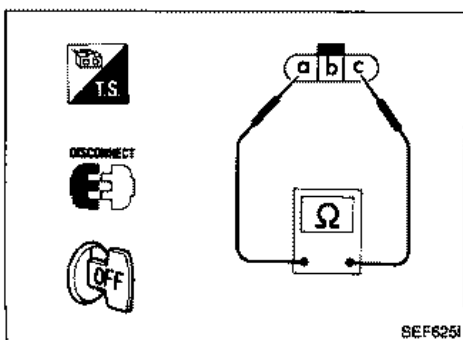


E.G.R. CONTROL VALVE

Apply vacuum to E.G.R. vacuum port with a hand vacuum pump.

E.G.R. control valve spring should lift.

If N.G., replace E.G.R. control valve.



EXHAUST GAS SENSOR

Refer to "Diagnostic Procedure 30".
(See page EF & EC-128.)

EXHAUST GAS SENSOR HEATER

Check resistance between terminals (a) and (c).

Resistance: 3 - 1,000Ω

If N.G., replace exhaust gas sensor.

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

THROTTLE SENSOR

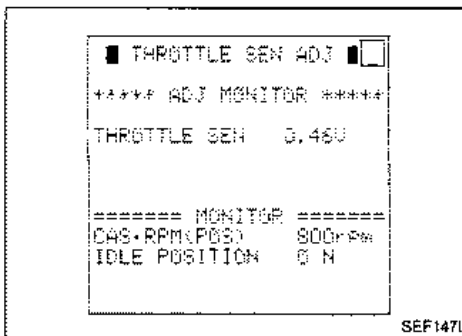
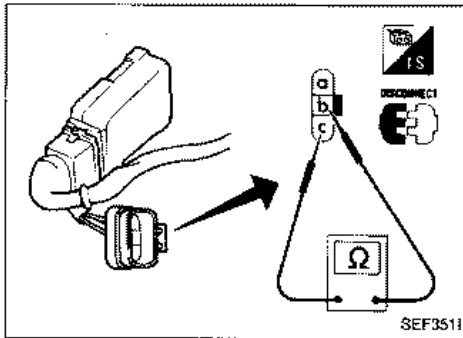
1. Disconnect throttle sensor harness connector.
2. Make sure that resistance between terminals (b) and (c) changes when opening throttle valve manually.

Accelerator pedal conditions	Resistance kΩ
Completely released	Approximately 1
Partially released	1 - 9
Completely depressed	Approximately 9

If N.G., replace throttle sensor.

Adjustment

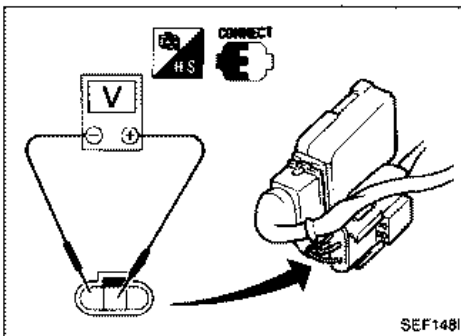
If throttle sensor is replaced or removed, it is necessary to install it in the proper position, by following the procedure as shown below:



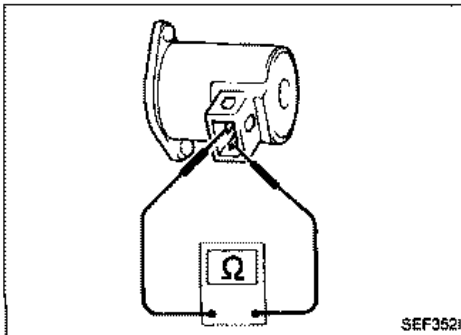
1. Install throttle sensor body in throttle chamber. Do not tighten bolts.
2. Connect throttle sensor and idle switch harness connector.
3. Start engine and warm it up sufficiently.
4. Perform "THROTTLE SEN ADJ" in "WORK SUPPORT" mode.



Measure output voltage of throttle sensor using voltmeter.



5. Adjust by rotating throttle sensor body so that output voltage is 0.4 to 0.5V.
6. Tighten mounting bolts.
7. Disconnect throttle sensor harness connector for a few seconds and then reconnect it.



A.A.C. VALVE

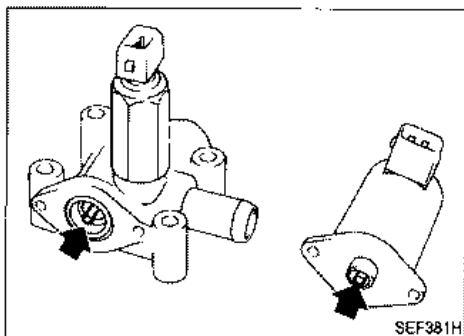
- Check A.A.C. valve resistance.

Resistance:

Approximately 10Ω

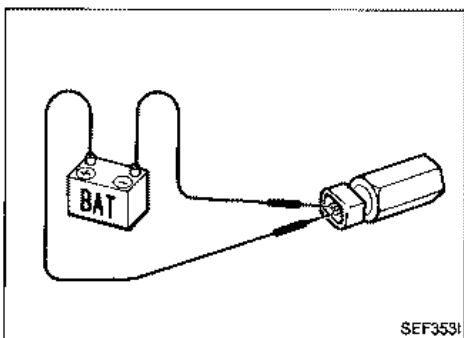
TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

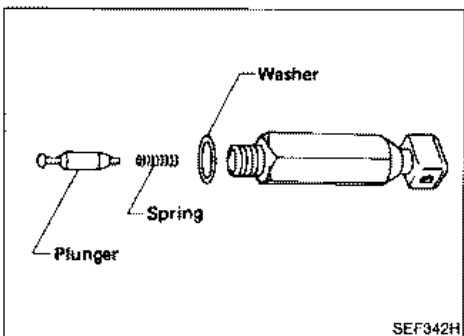


- Check plunger for seizing or sticking.
- Check for broken spring.

F.I.C.D. SOLENOID VALVE

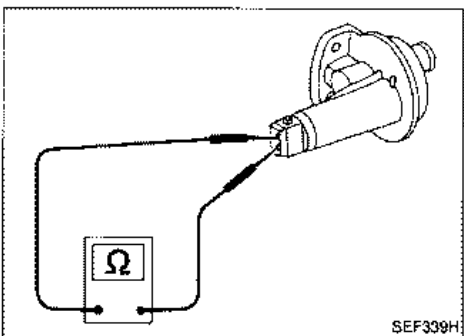


- Check for clicking sound when applying 12V direct current to terminals.



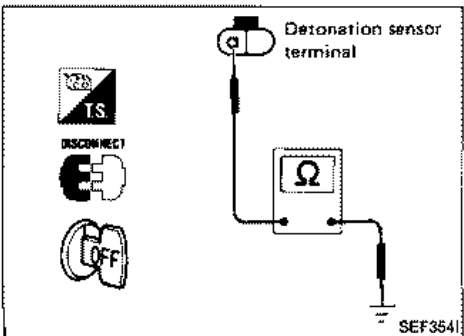
- Check plunger for seizing or sticking.
- Check for broken spring.

AIR REGULATOR



- Check air regulator resistance.
Resistance:
Approximately 70 - 80Ω
- Check air regulator for clogging.

DETONATION SENSOR

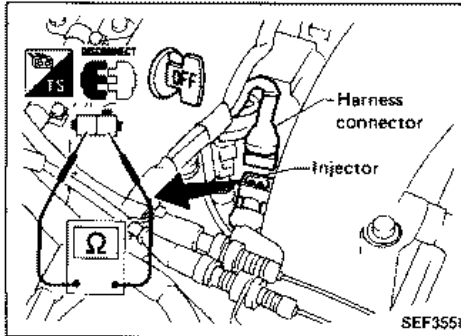


1. Disconnect detonation sensor sub-harness connector.
2. Check continuity between terminal ⓐ and ground.

Continuity should exist.

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

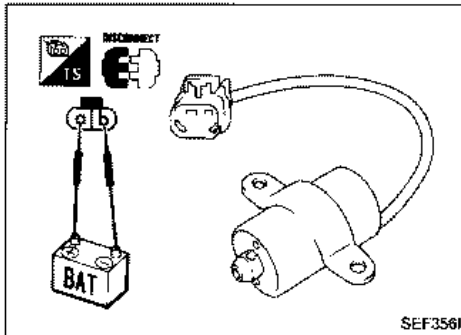


INJECTOR

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.

Resistance: 10 - 14Ω

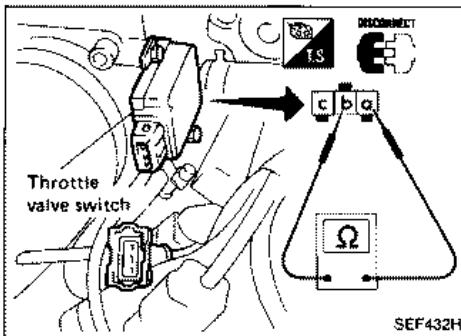
If N.G., replace injector.



VALVE TIMING CONTROL SOLENOID VALVE

Check valve timing control solenoid valve for normal operation by supplying it with battery voltage between terminals **a** and **b**.

If N.G., replace solenoid valve.

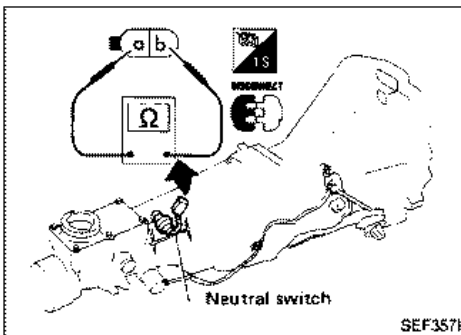


THROTTLE VALVE SWITCH (Idle position)

1. Disconnect idle switch harness connector.
2. Check continuity between terminals **a** and **b**.

Accelerator pedal condition	Continuity
Released	Yes
Depressed	No

If N.G., replace throttle valve switch.

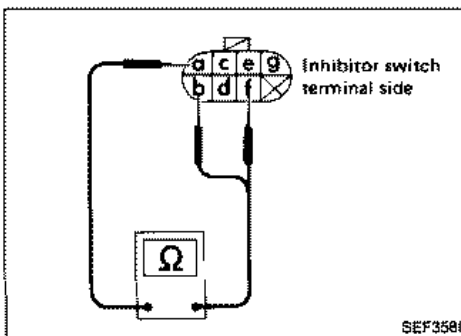


NEUTRAL SWITCH

Check continuity between terminals **a** and **b**.

Conditions	Continuity
Shift to Neutral	Yes
Shift to other position	No

If N.G., replace neutral switch.



INHIBITOR SWITCH

Check continuity between terminals **a** and **b**, **f**.

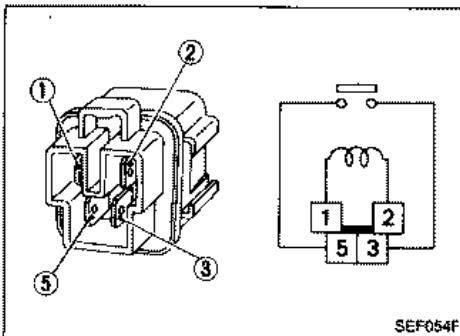
Conditions	Continuity between terminals a and b	Continuity between terminals a and f
Shift to "P" position	Yes	No
Shift to "N" position	No	Yes
Shift to positions other than "P" and "N"	No	No

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

E.C.C.S. RELAY, FUEL PUMP RELAY, RADIATOR FAN RELAY AND IGNITION COIL RELAY

Check continuity between terminals ③ and ⑤.

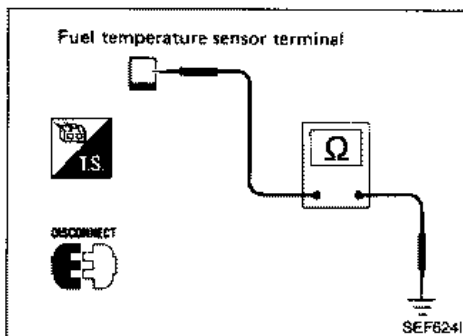


Conditions	Continuity
12V direct current supply between terminals ① and ②	Yes
No current supply	No

If N.G., replace relay.

POWER STEERING OIL PRESSURE SWITCH

1. Disconnect power steering oil pressure switch harness connector.
2. Check resistance between terminals.
Resistance: Approximately 2 - 3Ω



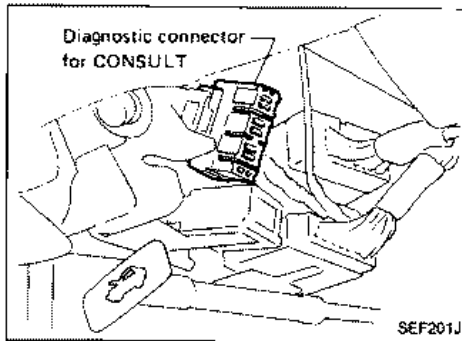
FUEL TEMPERATURE SENSOR

1. Disconnect fuel temperature sensor harness connector.
2. Check resistance between terminal and ground as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
80 (176)	0.30 - 0.33

If N.G., replace fuel inhibitor switch.

FUEL INJECTION CONTROL SYSTEM INSPECTION

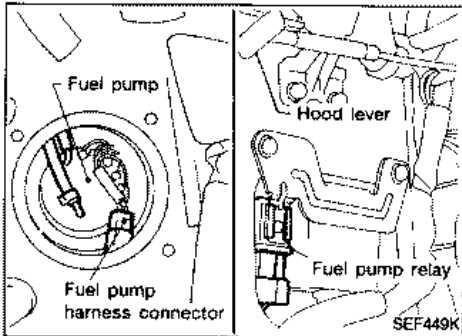


Releasing Fuel Pressure

Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.



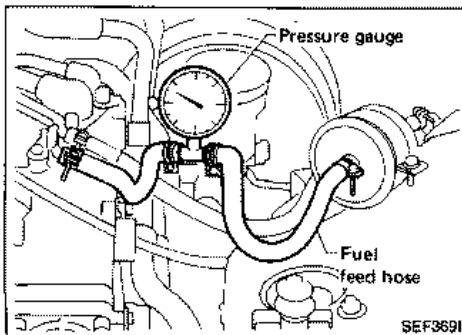
Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT.



1. Remove fuel pump relay or disconnect fuel pump connector.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch off and reconnect fuel pump relay or fuel pump connector.

Fuel Pressure Check

- a. When reconnecting fuel line, always use new clamps.
 - b. Make sure that clamp screw does not contact adjacent parts.
 - c. Use a torque driver to tighten clamps.
 - d. Use Pressure Gauge to check fuel pressure.
 - e. Do not perform fuel pressure check while fuel pressure regulator control system is operating; otherwise, fuel pressure gauge might indicate incorrect readings.
1. Release fuel pressure to zero.
 2. Disconnect fuel hose between fuel filter and fuel tube (engine side).
 3. Install pressure gauge between fuel filter and fuel tube.
 4. Start engine and check for fuel leakage.



5. Read the indication of fuel pressure gauge.

At idling:

When fuel pressure regulator valve vacuum hose is connected.

Approximately 250.1 kPa
(2.501 bar, 2.55 kg/cm², 36.3 psi)

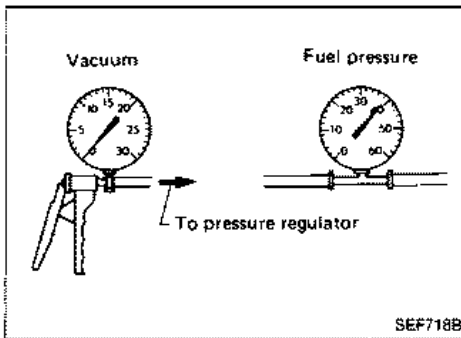
When fuel pressure regulator valve vacuum hose is disconnected.

Approximately 299.1 kPa
(2.991 bar, 3.05 kg/cm², 43.4 psi)

FUEL INJECTION CONTROL SYSTEM INSPECTION

Fuel Pressure Check (Cont'd)

6. Stop engine and disconnect fuel pressure regulator vacuum hose from intake manifold.
7. Plug intake manifold with a rubber cap.
8. Connect variable vacuum source to fuel pressure regulator.



9. Start engine and read indication of fuel pressure gauge as vacuum is changed.

Fuel pressure should decrease as vacuum increases. If results are unsatisfactory, replace fuel pressure regulator.

Injector Removal and Installation

1. Release fuel pressure to zero.
2. Drain coolant from radiator drain cock.
3. Remove or disconnect the following:
 - Related harnesses, wires and tubes
 - Intake manifold collectorFor details, refer to EM section.
4. Remove injectors with fuel tube assembly.
5. Remove injectors from fuel tube assembly.
6. Install injectors as follows:
 - 1) Clean exterior of injector tail piece.
 - 2) Use new O-rings.

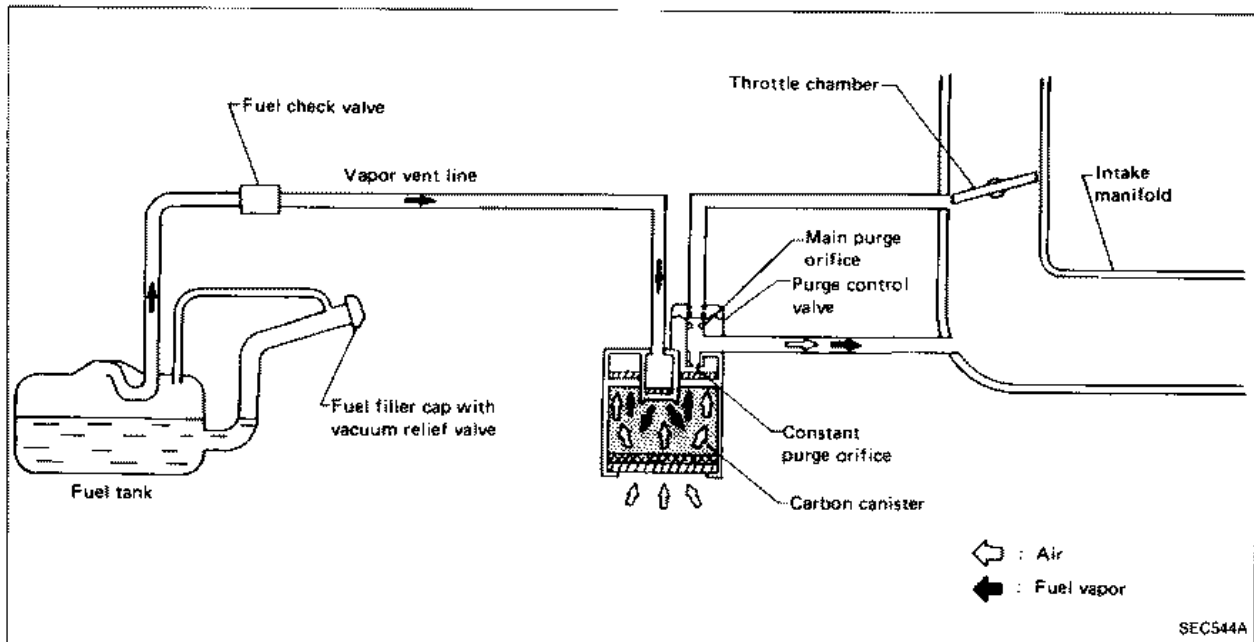
CAUTION:

After properly connecting injectors to fuel tube assembly, check connections for fuel leakage.

7. Assemble injectors with fuel tube assembly to intake manifold.

EVAPORATIVE EMISSION CONTROL SYSTEM

Description

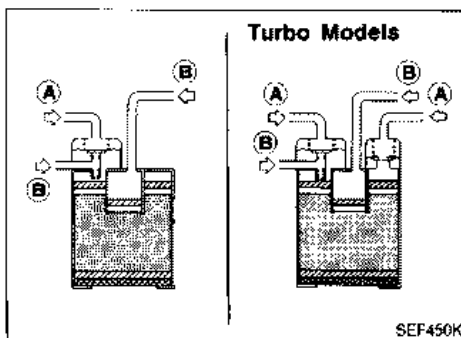


The evaporative emission control system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the carbon canister.

The fuel vapor from the sealed fuel tank is led into the canister which contains activated carbon and the vapor is stored there when the engine is not running.

The canister retains the fuel vapor until the canister is purged by the air drawn through the bottom of the canister to the intake manifold when the engine is running. When the engine runs at idle, the purge control valve is closed.

Only a small amount of stored vapor flows into the intake manifold through the constant purge orifice. As the engine speed increases, and the throttle vacuum rises higher, the purge control valve opens and the vapor is sucked into the intake manifold through both the main purge orifice and the constant purge orifice.



Inspection

CARBON CANISTER

Check carbon canister as follows:

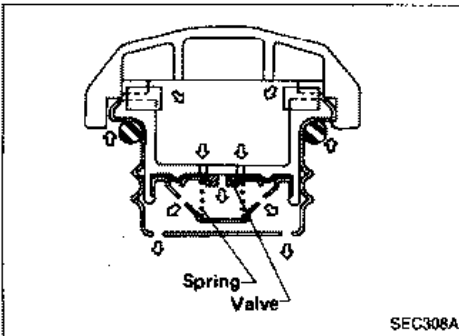
- (A) : Blow air and ensure that there is no leakage.
- (B) : Blow air and ensure that there is leakage.

EVAPORATIVE EMISSION CONTROL SYSTEM

Inspection (Cont'd)

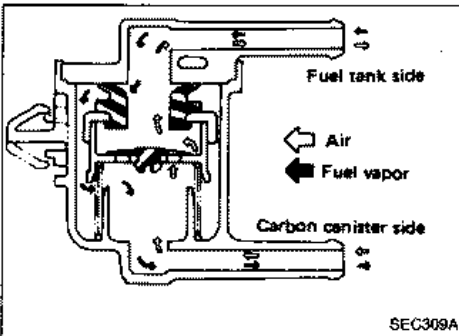
FUEL TANK VACUUM RELIEF VALVE

1. Wipe clean valve housing.
2. Suck air through the cap. A slight resistance accompanied by valve clicks indicates that valve is in good mechanical condition. Note also that, by further sucking air, the resistance should disappear with valve clicks.
3. If valve is clogged or if no resistance is felt, replace cap as an assembly.



FUEL CHECK VALVE

1. Blow air through connector on fuel tank side. A considerable resistance should be felt and a portion of air flow should be directed toward the canister.
2. Blow air through connector on canister side. Air flow should be smoothly directed toward fuel tank.
3. If fuel check valve is suspected of not properly functioning in steps 1 and 2 above, replace it.



CRANKCASE EMISSION CONTROL SYSTEM

Description

This system returns blow-by gas to both the intake manifold and air inlet tubes.

The positive crankcase ventilation (P.C.V.) valve is provided to conduct crankcase blow-by gas to the intake manifold.

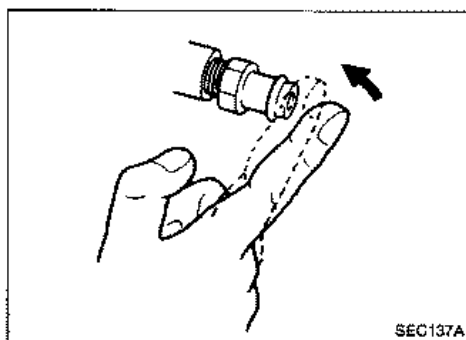
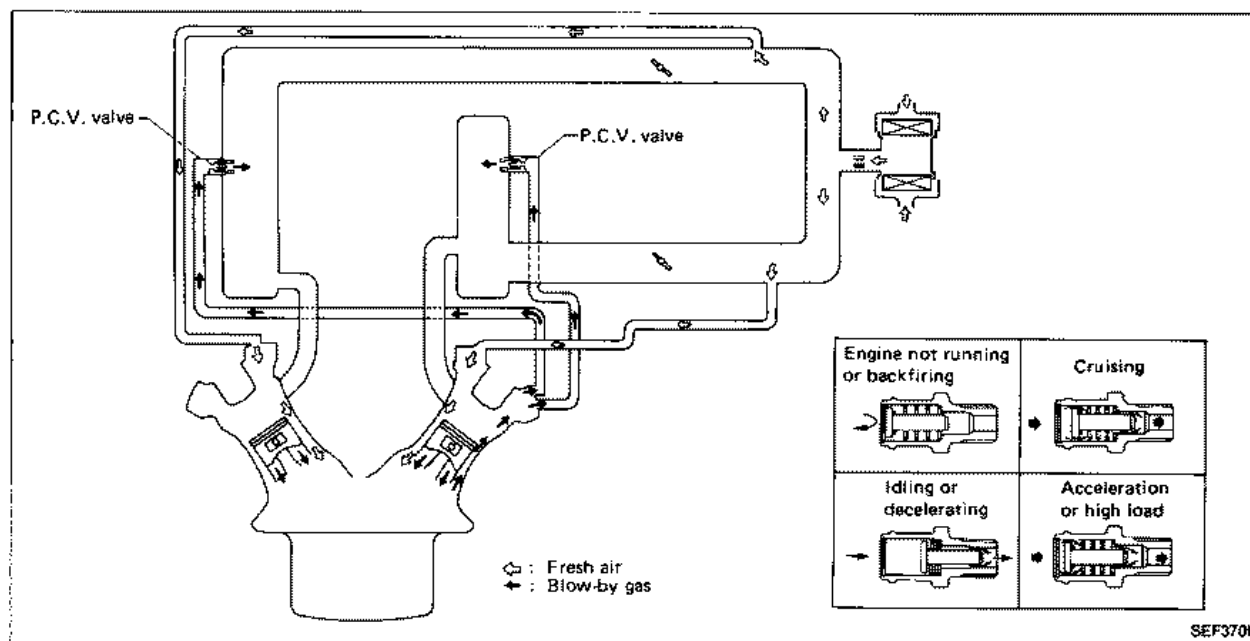
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the P.C.V. valve.

Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air.

The ventilating air is then drawn from the air inlet tubes, through the hose connecting air inlet tubes to rocker cover, into the crankcase.

Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve, and its flow goes through the hose connection in the reverse direction.

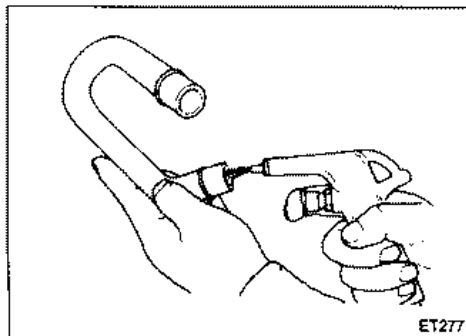
On vehicles with an excessively high blow-by some of the flow will go through the hose connection to the air inlet tubes under all conditions.



Inspection

P.C.V. (Positive Crankcase Ventilation)

With engine running at idle, remove ventilation hose from P.C.V. valve; if the valve is working properly, a hissing noise will be heard as air passes through it and a strong vacuum should be felt immediately when a finger is placed over valve inlet.



VENTILATION HOSE

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

General Specifications

PRESSURE REGULATOR Regulated pressure kPa (bar, kg/cm ² , psi)	299.1 (2.991, 3.05, 43.4)
---	---------------------------

Inspection and Adjustment

Idle speed*1	rpm	
No-load*2		
M/T		700 ± 50
A/T (in "N" position)		
Non-turbo		770 ± 50
Turbo		750 ± 50
Air conditioner: ON		
Non-turbo		800 ± 50
Turbo		850 ± 50
Ignition timing	degree	15 ± 2 B.T.D.C.
Throttle sensor idle position	V	0.4 - 0.5

*1: Feedback controlled and needs no adjustments

*2: Under the following conditions:

- Air conditioner switch: OFF
- Steering wheel: Kept straight
- Electric load: OFF (Lights, heater, fan & rear defogger)
- Radiator fan: OFF

IGNITION COIL

Primary voltage	V	12
Primary resistance [at 20°C (68°F)]	Ω	Approximately 0.7
Secondary resistance [at 20°C (68°F)]	kΩ	Approximately 8

ENGINE TEMPERATURE SENSOR AND FUEL TEMPERATURE SENSOR

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
80 (176)	0.30 - 0.33

FUEL PUMP

Resistance	Ω	Approximately 0.5
------------	---	-------------------

EXHAUST GAS TEMPERATURE SENSOR

Resistance [at 100°C (212°F)]	kΩ	85.3 ± 6.53
----------------------------------	----	-------------

EXHAUST GAS SENSOR HEATER

Resistance	Ω	3 - 1,000
------------	---	-----------

A.A.C. VALVE

Resistance	Ω	Approximately 10
------------	---	------------------

INJECTOR

Resistance	Ω	10 - 14
------------	---	---------

THROTTLE SENSOR

Accelerator pedal conditions	Resistance kΩ
Completely released	Approximately 1
Partially released	1 - 9
Completely depressed	Approximately 9

AIR REGULATOR

Resistance	Ω	70 - 80
------------	---	---------

POWER STEERING OIL PRESSURE SWITCH

Resistance	Ω	Approximately 2 - 3
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ENGINE CONTROL, FUEL & EXHAUST SYSTEMS

SECTION **FE**

CONTENTS

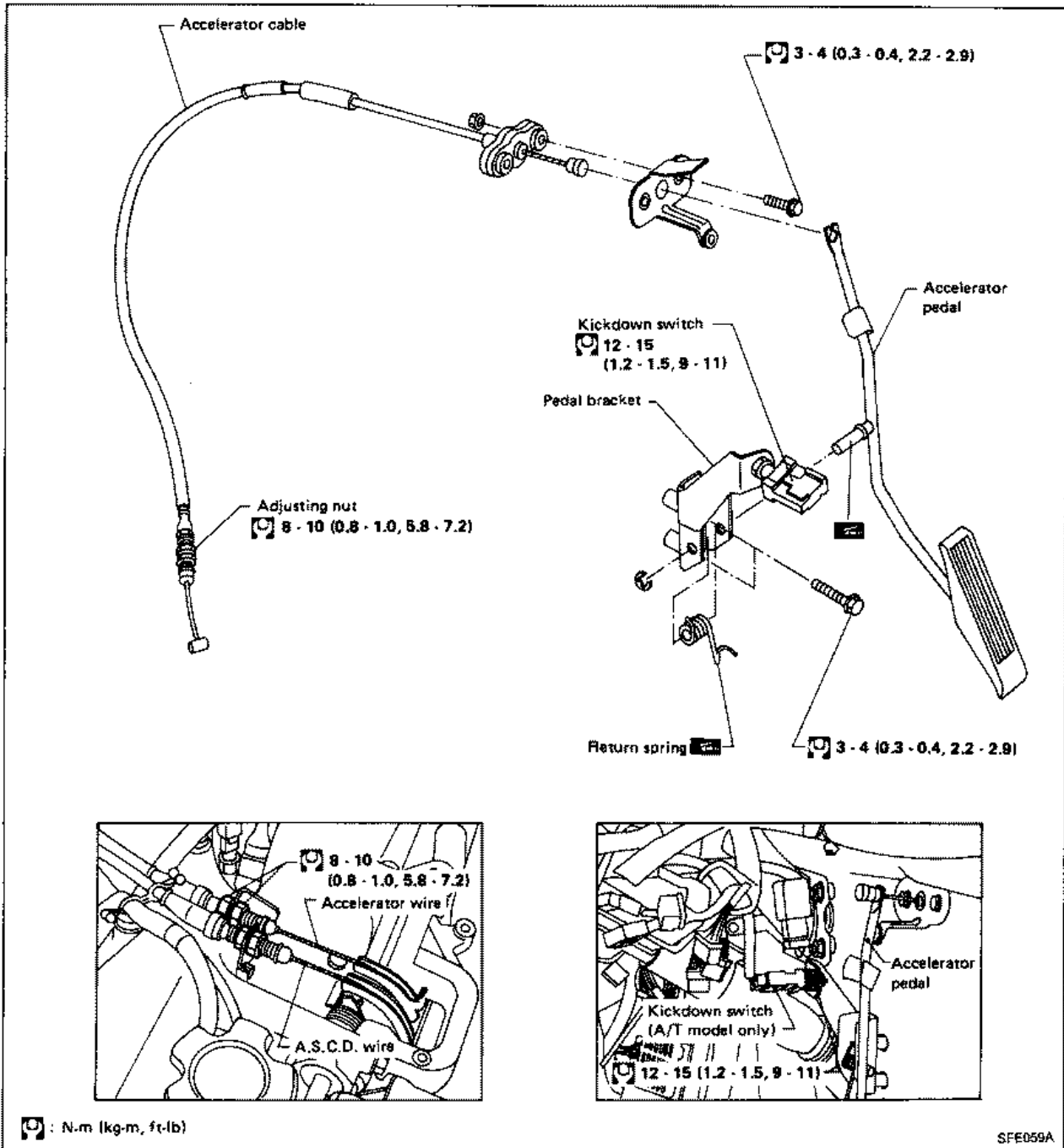
ENGINE CONTROL SYSTEM	FE-2
FUEL SYSTEM	FE-3
EXHAUST SYSTEM	FE-4

FE

ENGINE CONTROL SYSTEM

Accelerator Control System

- When removing accelerator cable, make a mark to indicate lock nut's initial position.
- Check that throttle valve opens fully when accelerator pedal is fully depressed and that it returns to idle position when pedal is released.
- Adjust accelerator cable according to the following procedure.
Tighten "adjusting nut" until "throttle drum" starts to move.
From that position turn back "adjusting nut" 1.5 to 2 turns, and fasten it with a lock nut.
- Check accelerator control parts for improper contact with any adjacent parts.
- When connecting accelerator cable, be careful not to twist or scratch its inner wire.



FUEL SYSTEM

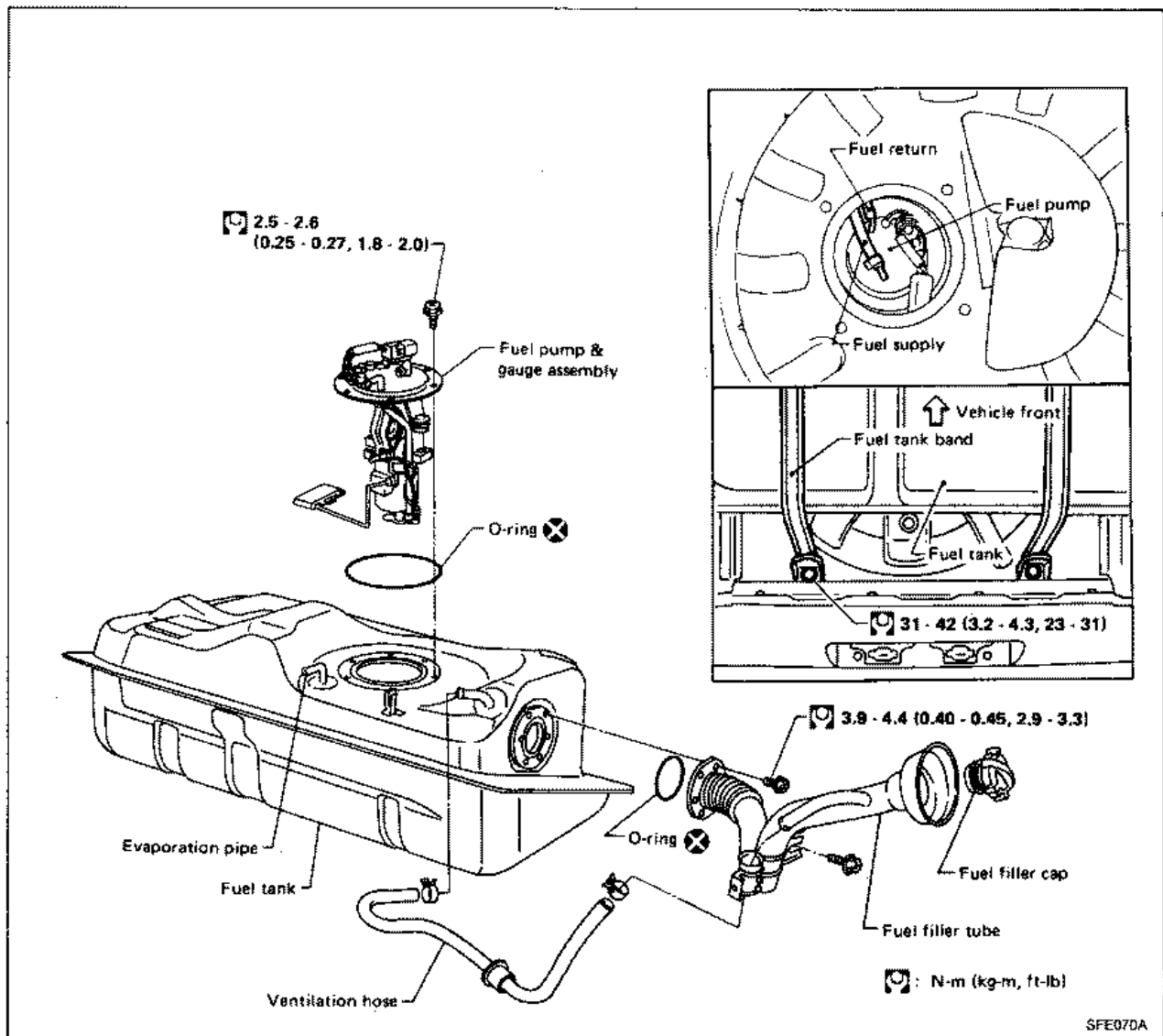
WARNING:

When replacing fuel line parts, be sure to observe the following:

- Put a "CAUTION: INFLAMMABLE" sign in workshop.
- Be sure to furnish workshop with a CO₂ fire extinguisher.
- Do not smoke while servicing fuel system. Keep open flames and sparks away from work area.
- Be sure to disconnect battery ground cable before conducting operations.
- Put drained fuel in an explosion-proof container and put lid on securely.

CAUTION:

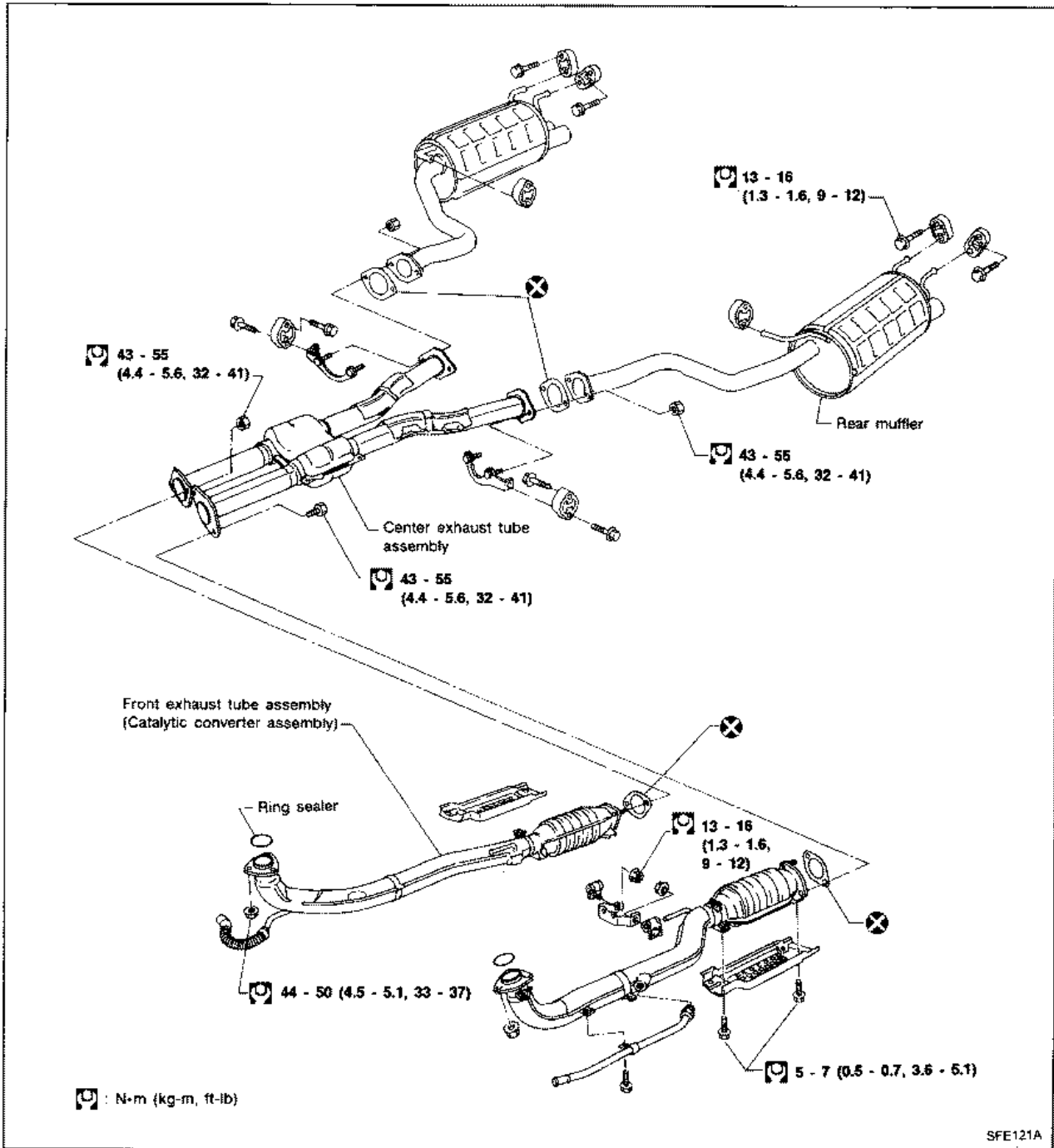
- Before disconnecting fuel hose, release fuel pressure from fuel line. Refer to "Changing Fuel Filter" in MA section.
- Do not disconnect any fuel line unless absolutely necessary.
- Plug hose and pipe openings to prevent entry of dust or dirt.
- Always replace O-ring and clamps with new ones.
- Do not kink or twist hose and tube when they are installed.
- Do not tighten hose clamps excessively.
- When installing fuel check valve, be careful of its designated direction. (Refer to section EF & EC.)
- After assembly, run engine and check for fuel leaks at connections.



EXHAUST SYSTEM

CAUTION:

- Always replace exhaust gaskets with new ones when reassembling.
- With engine running, check all tube connections for exhaust gas leaks, and entire system for unusual noises.
- After installation, check to assure that mounting brackets and mounting insulator are free from undue stress. If any of above parts are not installed properly, excessive noise or vibration may be transmitted to vehicle body.



CLUTCH

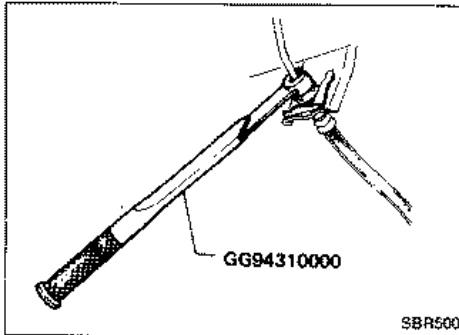
SECTION **CL**

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CL

PRECAUTIONS AND PREPARATION



Precautions



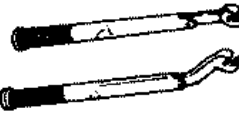

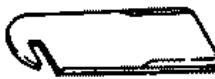
- Recommended fluid is brake fluid "DOT 3".
- Never reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas.
- When removing and installing clutch piping, use Tool.
- Use new brake fluid to clean or wash all parts of master cylinder, operating cylinder and clutch damper.
- Never use mineral oils such as gasoline or kerosene. It will ruin the rubber parts of the hydraulic system.

WARNING:

After cleaning the clutch disc, wipe it with a dust collector. Do not use compressed air.

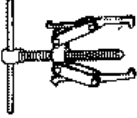
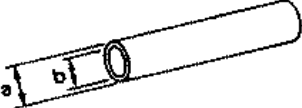
Preparation

SPECIAL SERVICE TOOLS

Tool number Tool name	Description	
ST20050010 Base plate		Inspecting diaphragm spring of clutch cover
ST20050100 Distance piece		Inspecting diaphragm spring of clutch cover
GG94310000 Flare nut torque wrench		Removing and installing each clutch piping
ST20060000 Clutch aligning bar		Installing clutch cover and clutch disc
ST20050240 Diaphragm spring adjusting wrench		Adjusting unevenness of diaphragm spring of clutch cover

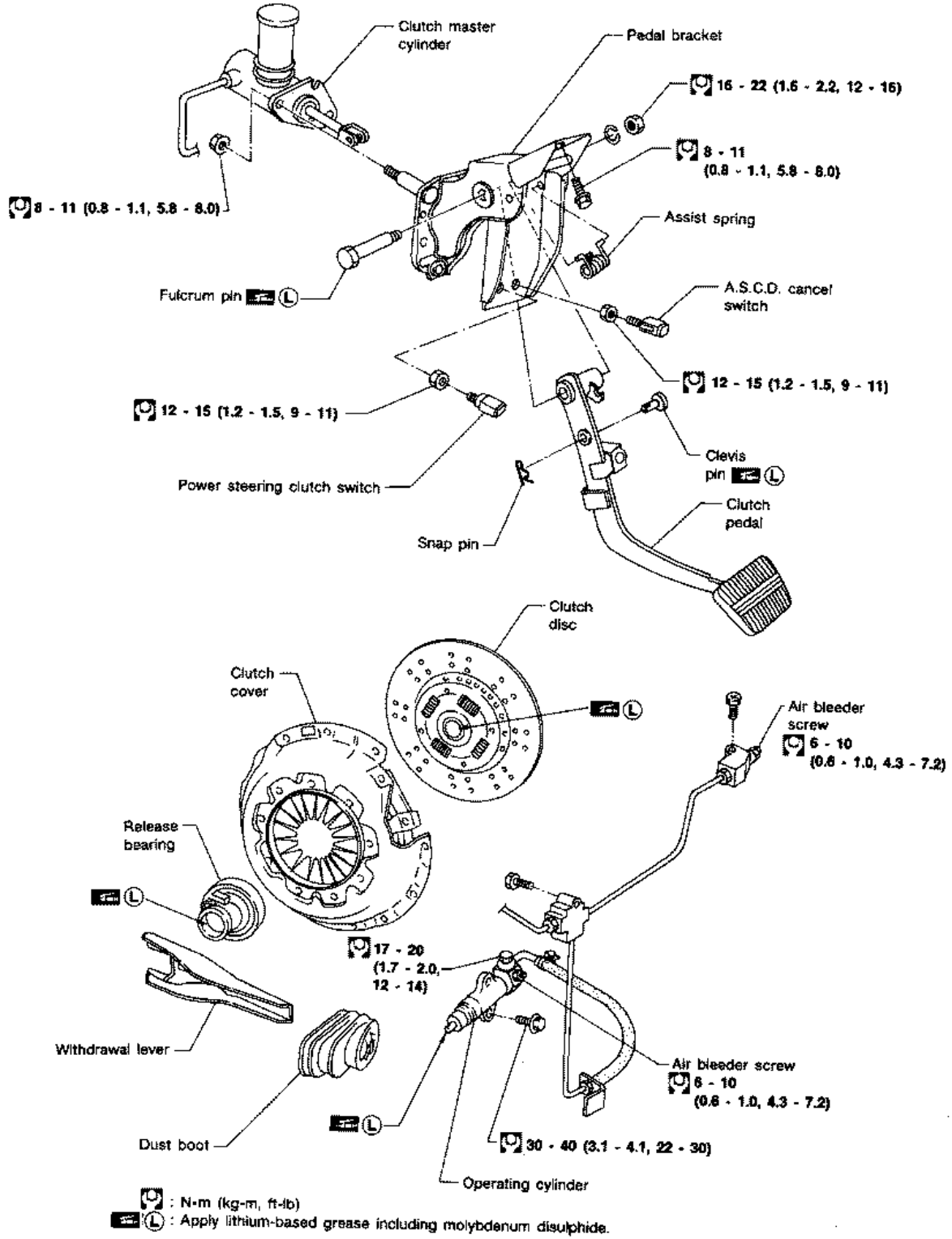
PRECAUTIONS AND PREPARATION

Preparation (Cont'd) COMMERCIAL SERVICE TOOLS

Tool name	Description
Bearing puller	 <p>Removing release bearing</p>
Bearing drift	 <p>Installing release bearing</p> <p>a: 50 mm (1.97 in) dia.</p> <p>b: 45 mm (1.77 in) dia.</p>

CLUTCH SYSTEM

VG30DE engine model

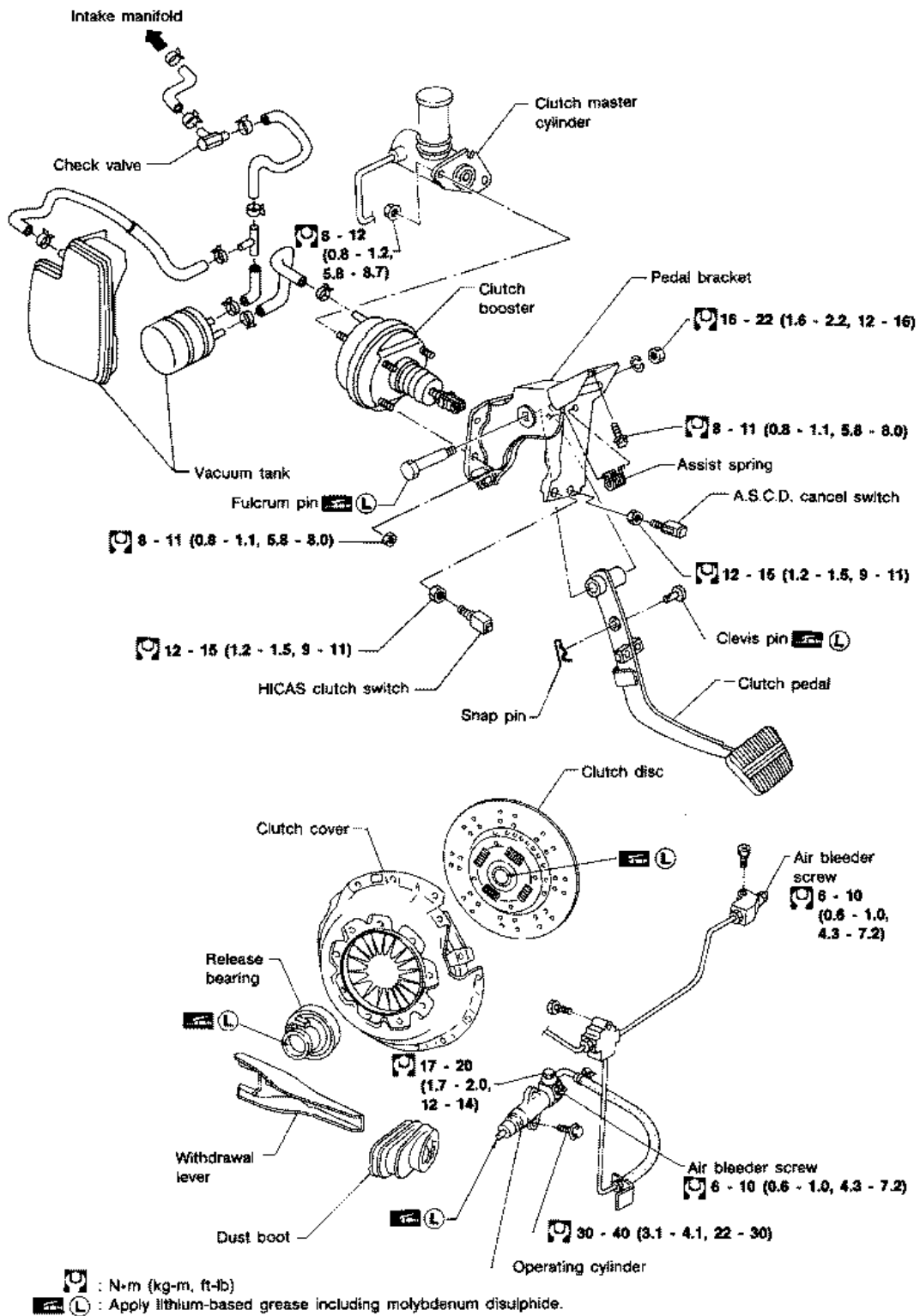


SCL416

CL-4

CLUTCH SYSTEM

VG30DETT engine model

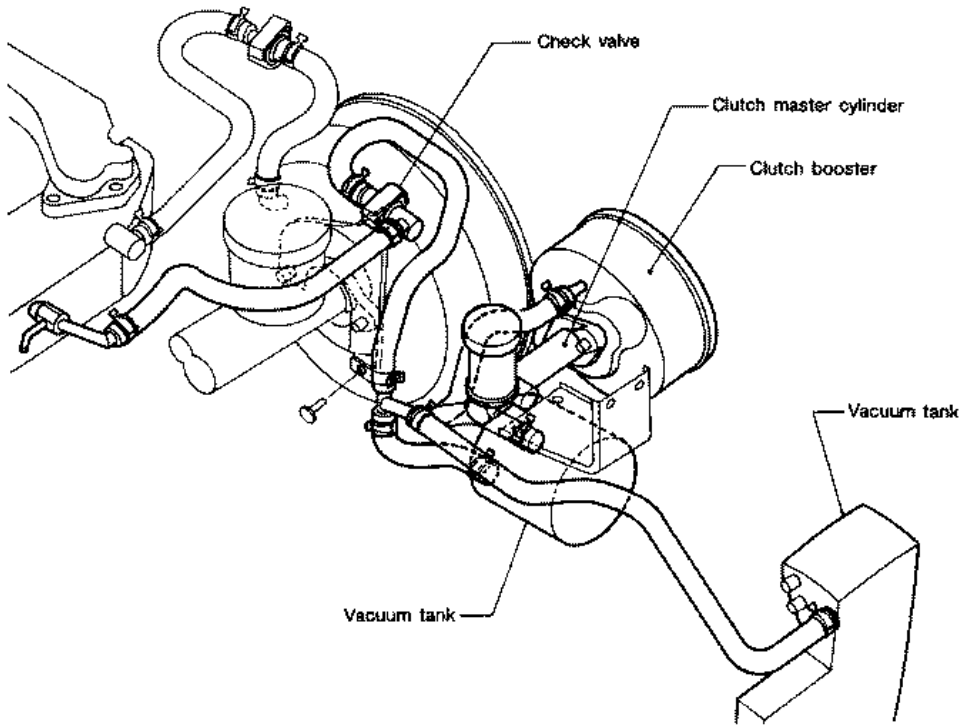


SCL411

CLUTCH SYSTEM

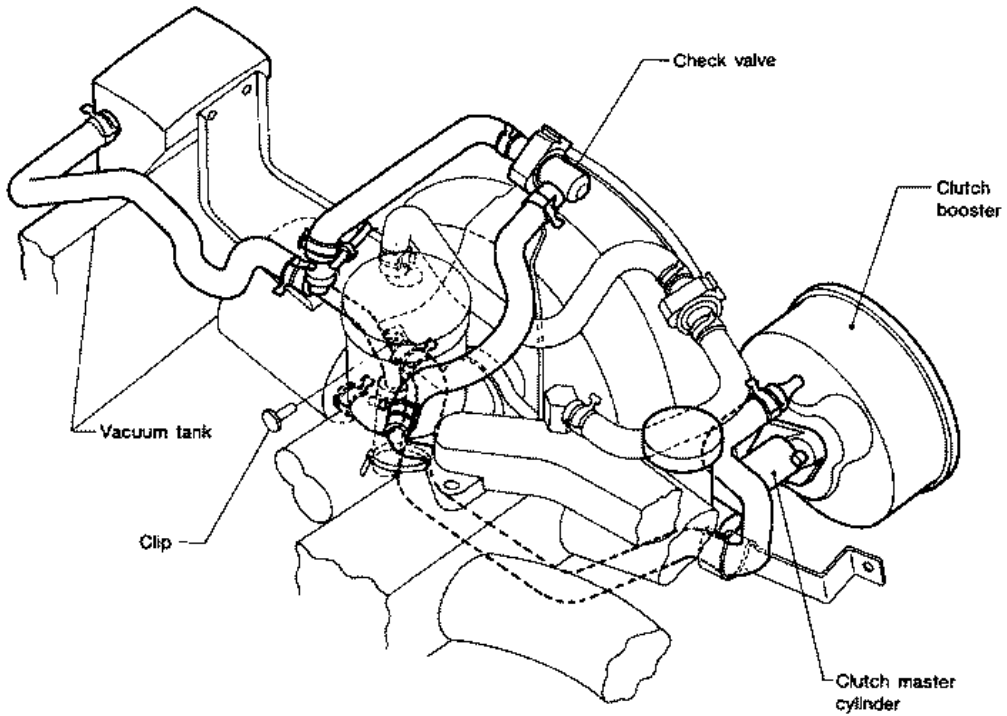
Vacuum Hose Layout — VG30DETT Engine Model —

L.H. drive model



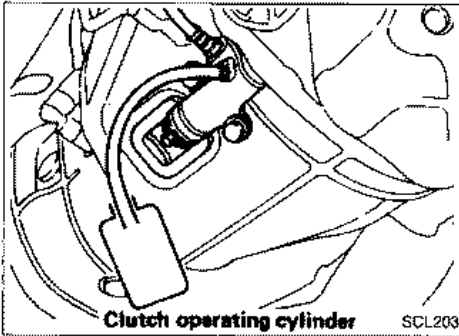
SCL412

R.H. drive model



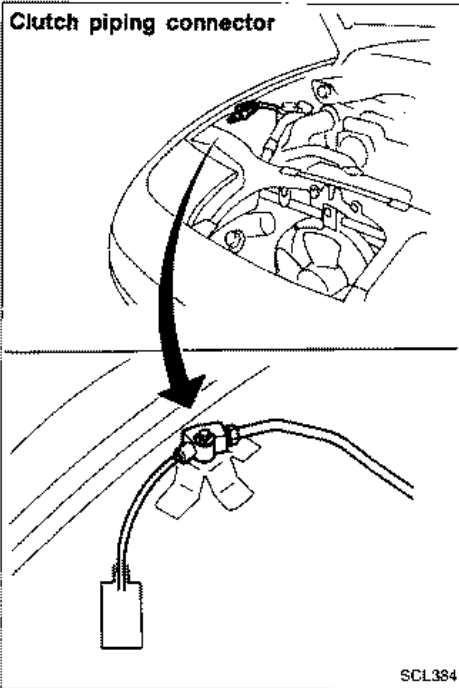
SCL413

INSPECTION AND ADJUSTMENT



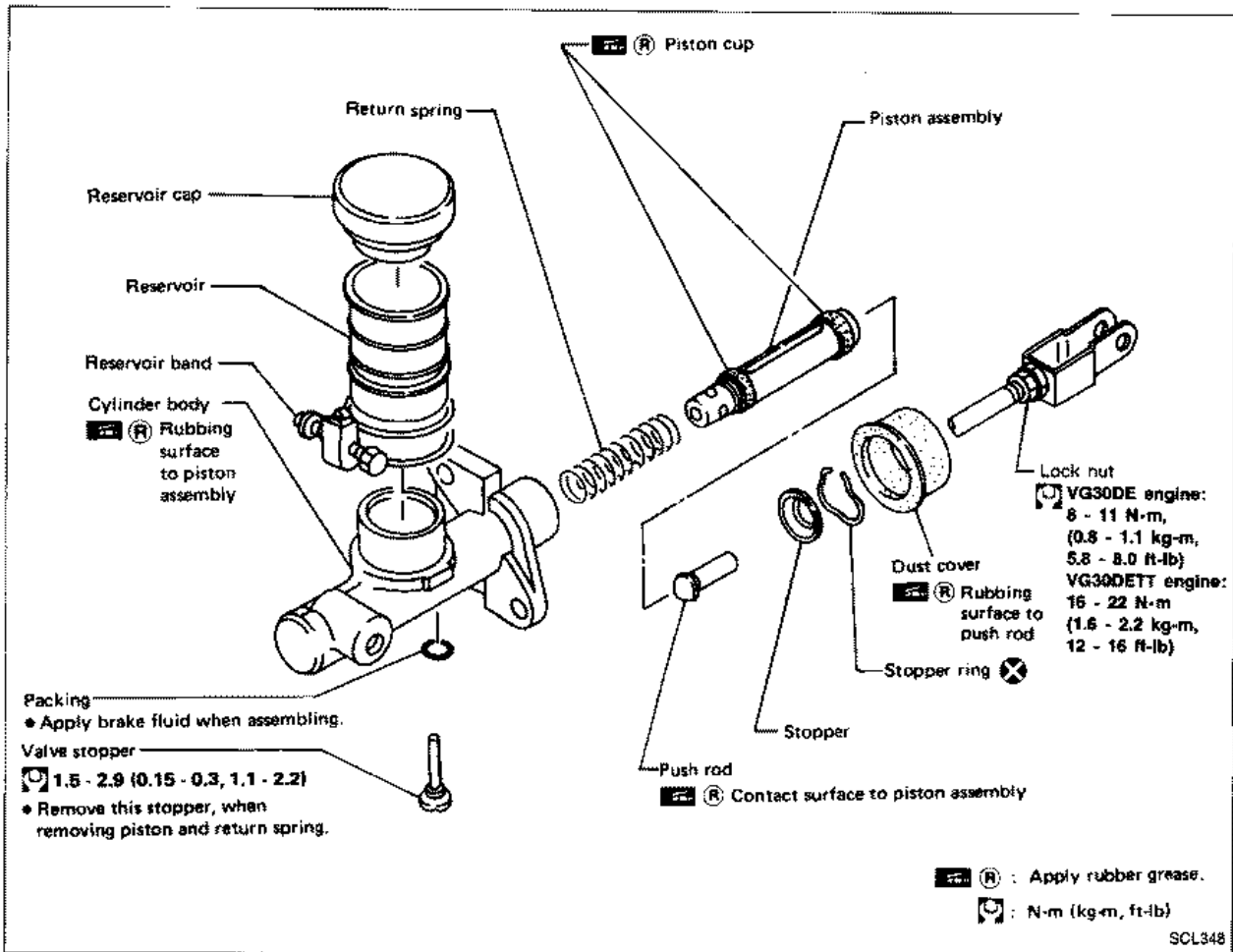
Bleeding Procedure

1. Bleed air from clutch operating cylinder according to the following procedure.
 - **Carefully monitor fluid level at master cylinder during bleeding operation.**
 - a. Top up reservoir with recommended brake fluid.
 - b. Connect a transparent vinyl tube to air bleeder valve.
 - c. Fully depress clutch pedal several times.
 - d. With clutch pedal depressed, open bleeder valve to release air.
 - e. Close bleeder valve.
 - f. Repeat steps c through e above until brake fluid flows from air bleeder valve without air bubbles.
2. Bleed air from clutch piping connector according to the above procedure.
3. Repeat the above bleeding procedure 1 and 2 several times.



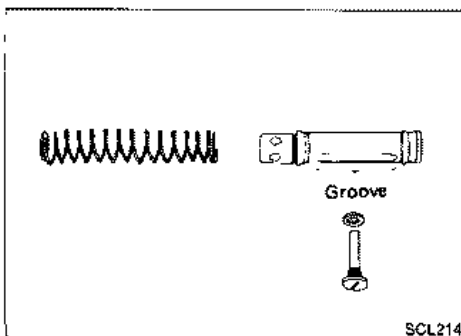
HYDRAULIC CLUTCH CONTROL

Clutch Master Cylinder



DISASSEMBLY AND ASSEMBLY

- Push piston into cylinder body with screwdriver when removing and installing valve stopper.



- Align groove of piston assembly and valve stopper when installing valve stopper.
- Check direction of piston cups.

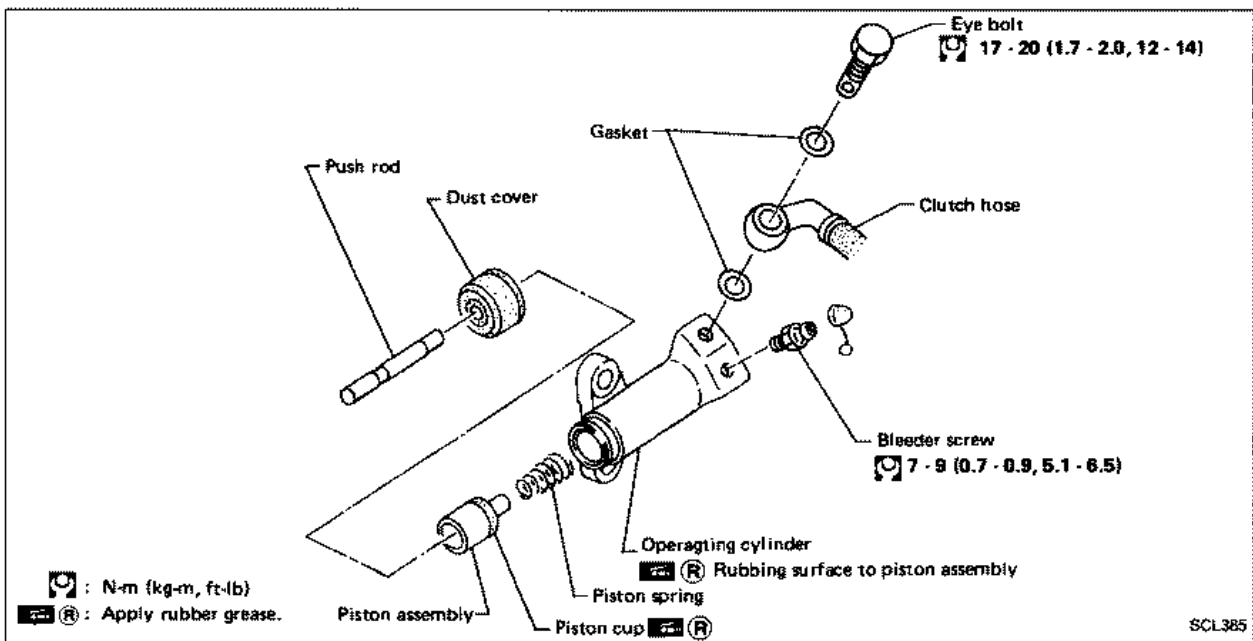
HYDRAULIC CLUTCH CONTROL

Clutch Master Cylinder (Cont'd)

INSPECTION

- Check cylinder and piston rubbing surface for uneven wear, rust or damage. Replace if necessary.
- Check piston with piston cup for wear or damage. Replace if necessary.
- Check return spring for wear or damage. Replace if necessary.
- Check reservoir for deformation or damage. Replace if necessary.
- Check dust cover for cracks, deformation or damage. Replace if necessary.

Operating Cylinder

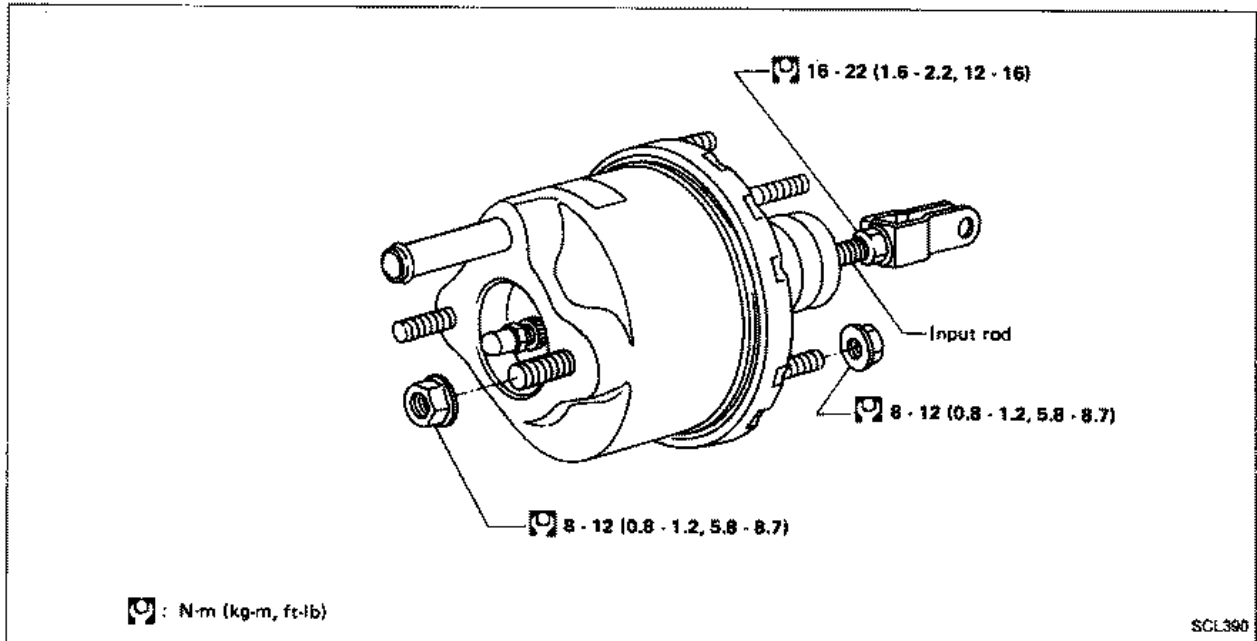


INSPECTION

- Check rubbing surface of cylinder for wear, rust or damage. Replace if necessary.
- Check piston with piston cup for wear or damage. Replace if necessary.
- Check piston spring for wear or damage. Replace if necessary.
- Check dust cover for cracks, deformation or damage. Replace if necessary.

HYDRAULIC CLUTCH CONTROL

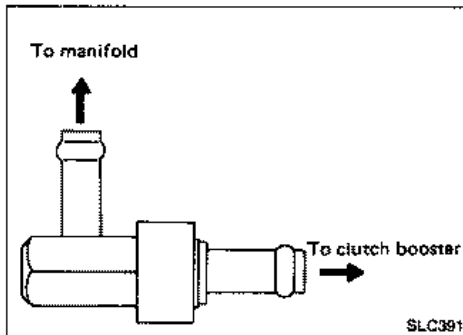
Clutch Booster — VG30DETT Engine Model —



INSPECTION

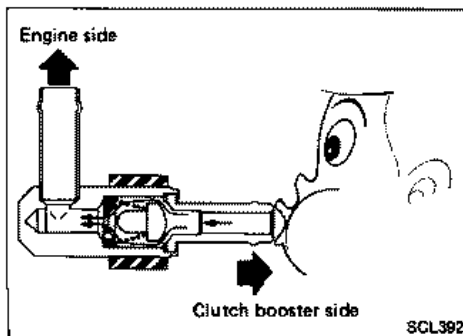
Hoses and connectors

- Check condition of vacuum hoses and connections.
- Check vacuum hoses and check valve for air tightness.



Check valve

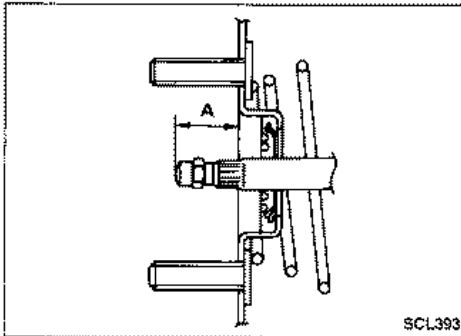
- Install check valve properly paying attention to its direction.



- When pressure is applied to the clutch booster side of check valve and valve does not open, replace check valve with a new one.

HYDRAULIC CLUTCH CONTROL

Clutch Booster — VG30DETT Engine Model — (Cont'd)

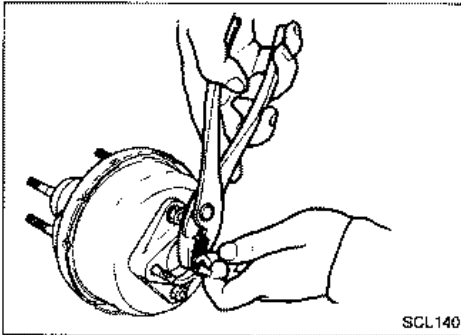


SCL393

ADJUSTMENT

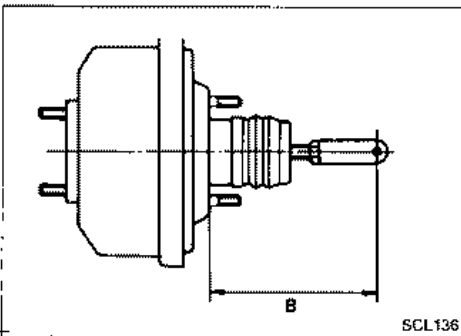
Output rod length "A":

13.35 - 13.60 mm (0.5256 - 0.5354 in)



SCL140

If amount of adjustment required exceeds 0.5 mm (0.020 in), reaction disc may have either been dislocated or fallen off. Replace clutch booster assembly.

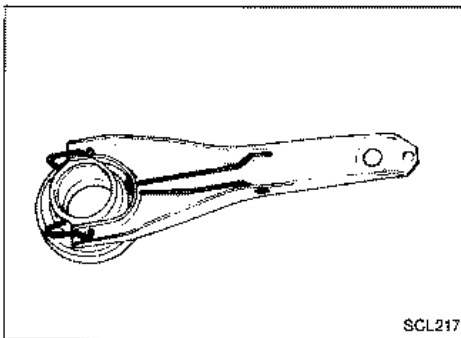
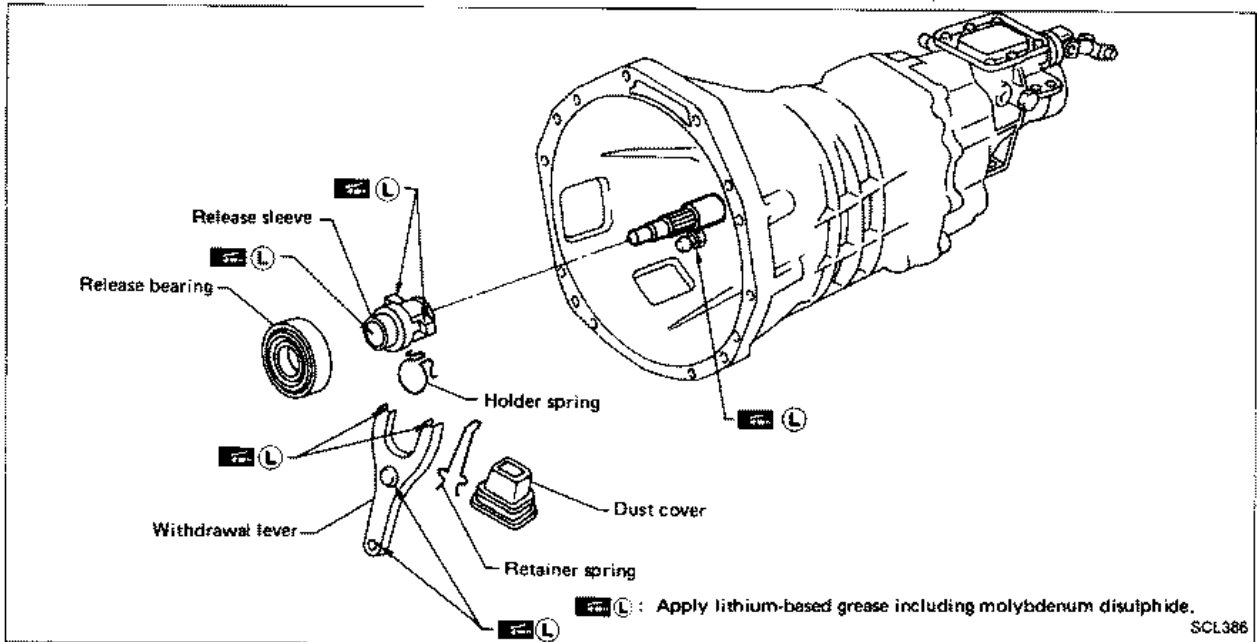


SCL136

Input rod length "B":

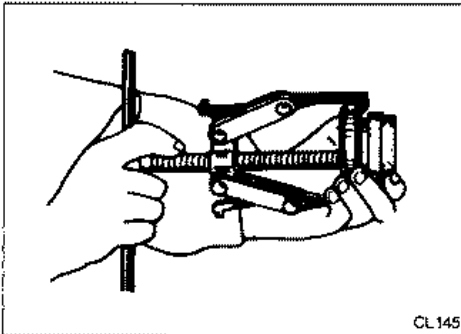
113 mm (4.45 in)

CLUTCH RELEASE MECHANISM

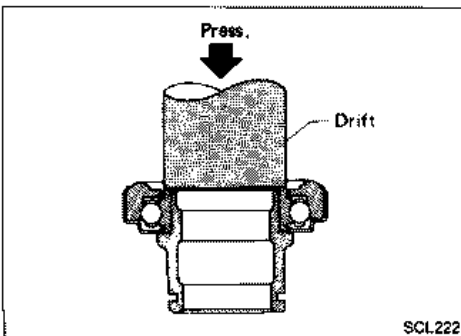


REMOVAL AND INSTALLATION

- Install retainer spring and holder spring.



- Remove release bearing.

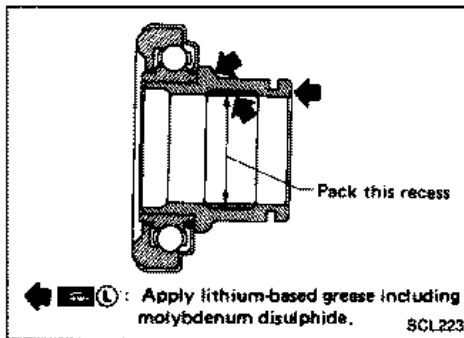


- Install release bearing with a suitable drift.

CLUTCH RELEASE MECHANISM

INSPECTION

- Check release bearing to see that it rolls freely and is free from noise, cracks, pitting or wear. Replace if necessary.
- Check release sleeve and withdrawal lever rubbing surface for wear, rust or damage. Replace if necessary.

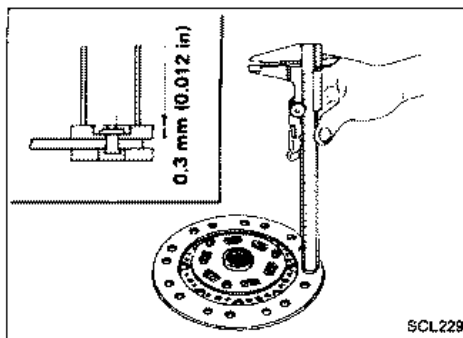
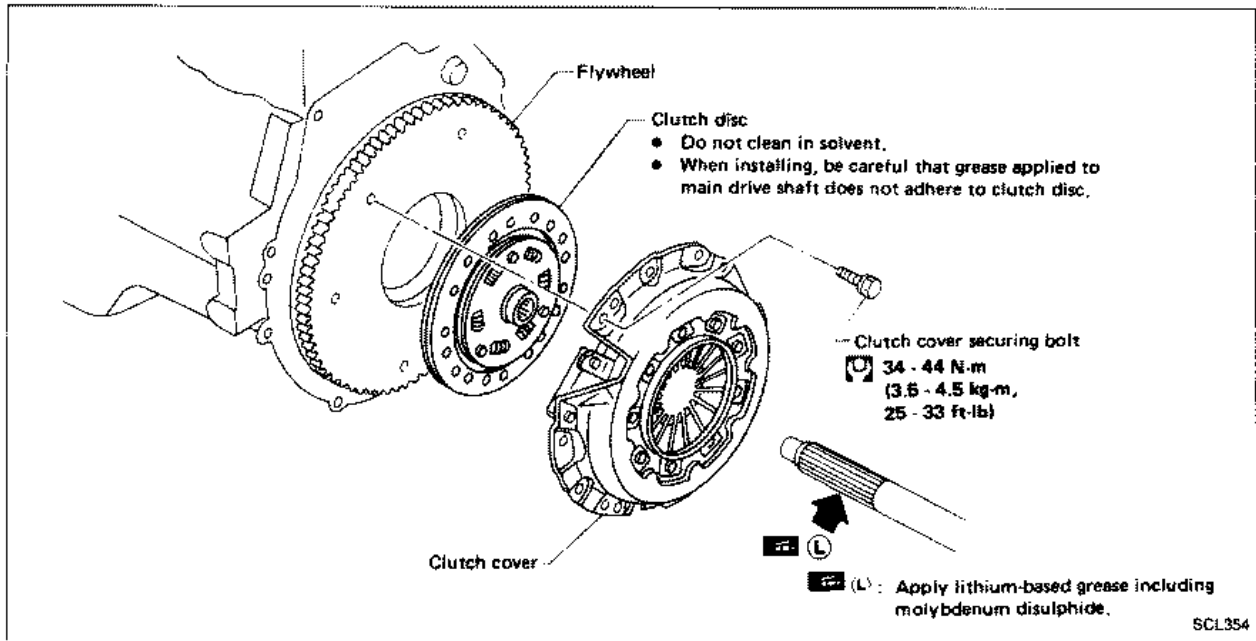


LUBRICATION

- Apply recommended grease to contact surface and rubbing surface.

Too much lubricant might damage clutch disc facing.

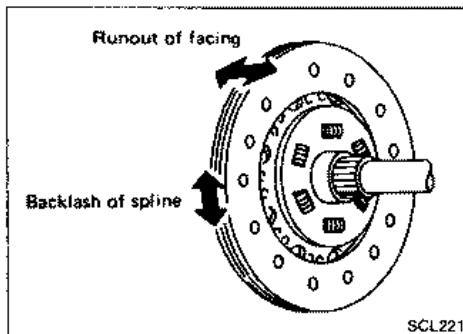
CLUTCH DISC AND CLUTCH COVER



Clutch Disc

INSPECTION

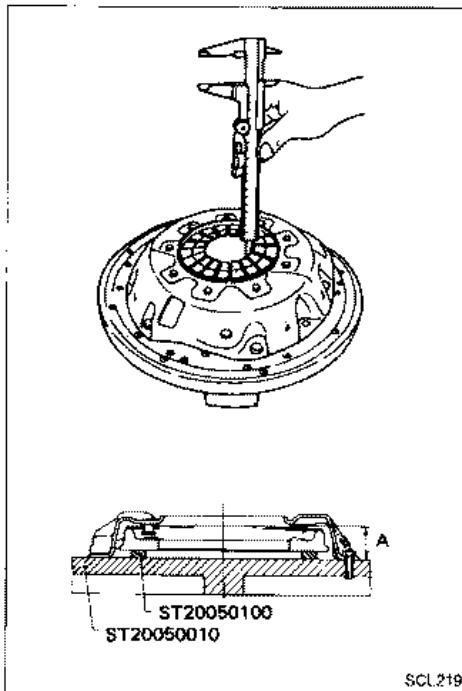
- Check clutch disc for wear of facing.
Wear limit of facing surface to rivet head:
0.3 mm (0.012 in)
- Check clutch disc for backlash of spline and runout of facing.
Maximum backlash of spline (at outer edge of disc):
1.0 mm (0.039 in)
Runout limit:
1.0 mm (0.039 in)
Distance of runout check point (from hub center):
VG30DE engine
115 mm (4.53 in)
VG30DETT engine
120 mm (4.72 in)
- Check clutch disc for burns, discoloration or oil or grease leakage. Replace if necessary.



INSTALLATION

- Apply recommended grease to contact surface of spring portion.
Too much lubricant might damage clutch disc facing.

CLUTCH DISC AND CLUTCH COVER



Clutch Cover and Flywheel

INSPECTION AND ADJUSTMENT

- Set Tool and check height and unevenness of diaphragm spring.

Diaphragm spring height "A":

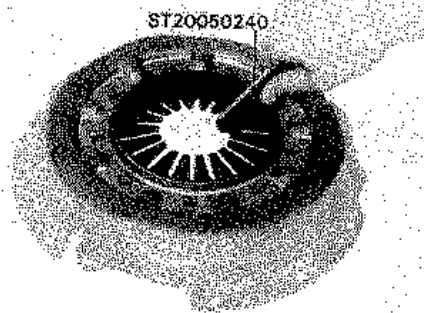
VG30DE engine

37.5 - 39.5 mm (1.476 - 1.555 in)

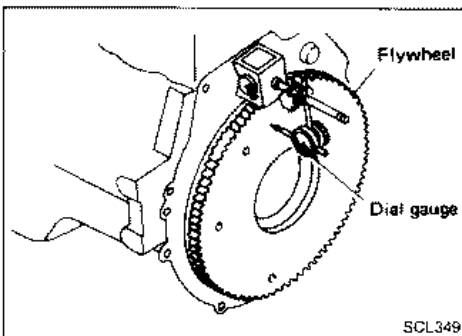
VG30DETT engine

36.5 - 38.5 mm (1.437 - 1.516 in)

- **Set 0.5 mm (0.020 in) feeler gauges on distance pieces (ST20050100) when checking diaphragm spring height.**
- Check thrust rings for wear or damage by shaking cover assembly and listening for chattering noise, or lightly hammering on rivets for a slightly cracked noise. Replace clutch cover assembly if necessary.
- Check pressure plate and clutch disc contact surface for slight burns or discoloration. Repair pressure plate with emery paper.
- Check pressure plate and clutch disc contact surface for deformation or damage. Replace if necessary.



- Adjust unevenness of diaphragm spring with Tool.
Uneven limit: 0.5 mm (0.020 in)

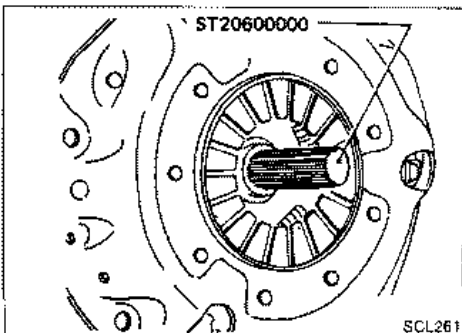


FLYWHEEL INSPECTION

- Check contact surface of flywheel for slight burns or discoloration. Repair flywheel with emery paper.
- Check flywheel runout.

Runout (Total indicator reading):

Less than 0.15 mm (0.0059 in)



INSTALLATION

- Insert Tool into clutch disc hub when installing clutch cover and disc.

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

General Specifications

CLUTCH CONTROL SYSTEM

Type of clutch control	Hydraulic
------------------------	-----------

CLUTCH MASTER CYLINDER

Inner diameter	mm (in)	15.87 (5/8)
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CLUTCH OPERATING CYLINDER

Inner diameter	mm (in)	19.05 (3/4)
----------------	---------	-------------

CLUTCH DISC

Model	240TBL	250TBL
Engine	VG30DE	VG30DETT
Facing size (Outer dia. x inner dia. x thickness) mm (in)	240 x 160 x 3.5 (9.45 x 6.30 x 0.138)	250 x 160 x 3.5 (9.84 x 6.30 x 0.138)
Thickness of disc as- sembly	8.1 - 8.5 (0.319 - 0.335)	
With load mm (in)	with 4,904 N (500 kg, 1,103 lb)	

CLUTCH COVER

Model	C240S	C250S
Engine	VG30DE	VG30DETT
Full load N (kg, lb)	5,688 (580, 1,279)	7,846 (800, 1,764)

CLUTCH BOOSTER (VG30DETT engine model)

Model	M45
Diaphragm diameter mm (in)	114.3 (4.50)

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Inspection and Adjustment CLUTCH COVER

CLUTCH PEDAL

Unit: mm (in)

Engine	VG30DE	VG30DETT
Pedal height "H"		
L.H.D.	—	183 - 193 (7.20 - 7.60)
R.H.D.	211 - 221 (8.31 - 8.70)	197 - 207 (7.76 - 8.15)
Pedal free play (Backlash at clevis)	1.0 - 3.0 (0.039 - 0.118)	

*: Measured from surface of dash lower panel to pedal pad

CLUTCH DISC

Unit: mm (in)

Model	240TBL	250TBL
Wear limit of facing surface to rivet head	0.3 (0.012)	
Runout limit of facing	1.0 (0.039)	
Distance of runout check point (from the hub center)	115 (4.53)	120 (4.72)
Maximum backlash of spline (at outer edge of disc)	1.0 (0.039)	

CLUTCH COVER

Unit: mm (in)

Model	C240S	C250S
Diaphragm spring height	37.5 - 38.5 (1.476 - 1.555)	36.5 - 38.5 (1.437 - 1.516)
Uneven limit of dia- phragm spring toe height	0.5 (0.020)	

CLUTCH BOOSTER

Unit: mm (in)

Output rod length "A"	13.35 - 13.60 (0.5256 - 0.5354)
Input rod length "B"	113 (4.45)

MANUAL TRANSMISSION

SECTION **MT**


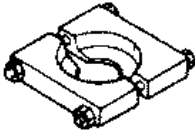

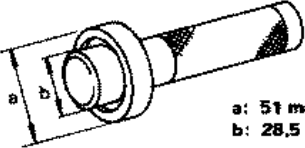
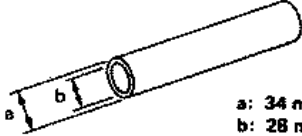
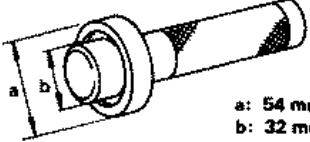
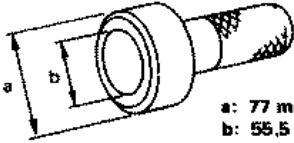
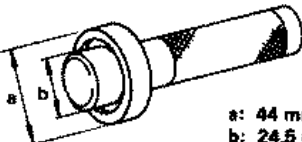
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TRANSMISSION OIL COOLER SYSTEM	MT-34
SERVICE DATA AND SPECIFICATIONS (S.D.S.)	MT-35


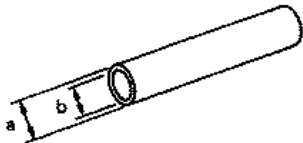
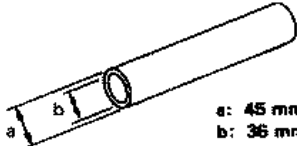
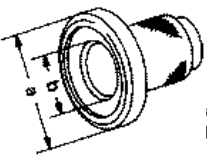
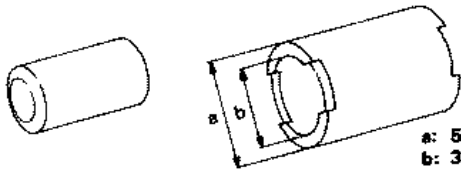
MT

PREPARATION

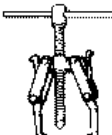
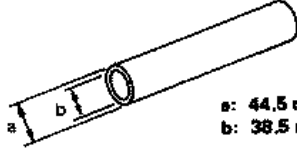
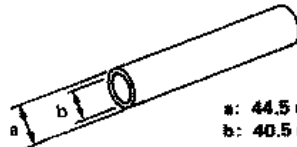
SPECIAL SERVICE TOOLS

Tool number Tool name	Description
ST23540000 Pin punch	 <p style="text-align: right;">Removing and installing retaining pin</p>
ST30031000 Puller	 <p style="text-align: right;">Removing 1st & 2nd synchronizer assembly Removing counter gear rear thrust bearing Removing main drive bearing Measuring 2nd & 3rd inner baulk ring</p>
ST33290001 Puller	 <p style="text-align: right;">Removing rear oil seal</p>
ST33230000 Drift	 <p style="text-align: right;">Removing mainshaft and counter gear</p> <p style="text-align: center;">a: 51 mm (2.01 in) dia. b: 28.5 mm (1.122 in) dia.</p>
ST22350000 Drift	 <p style="text-align: right;">Removing counter gear front bearing (Use with KV38100300)</p> <p style="text-align: center;">a: 34 mm (1.34 in) dia. b: 28 mm (1.10 in) dia.</p>
KV38100300 Drift	 <p style="text-align: right;">Removing counter gear front bearing (Use with ST22350000) Installing counter gear rear bearing</p> <p style="text-align: center;">a: 54 mm (2.13 in) dia. b: 32 mm (1.26 in) dia.</p>
ST30720000 Drift	 <p style="text-align: right;">Removing mainshaft front bearing Installing mainshaft front bearing</p> <p style="text-align: center;">a: 77 mm (3.03 in) dia. b: 55.5 mm (2.185 in) dia.</p>
ST33210000 Drift	 <p style="text-align: right;">Installing counter gear front bearing Installing front cover oil seal</p> <p style="text-align: center;">a: 44 mm (1.73 in) dia. b: 24.5 mm (0.965 in) dia.</p>

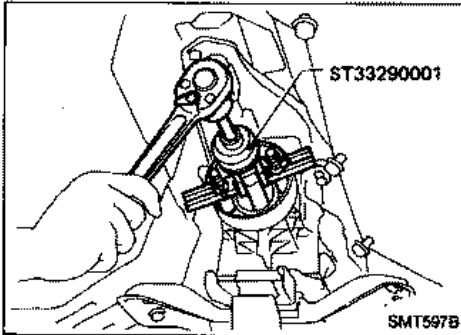
PREPARATION

Tool number Tool name	Description
ST30613000 Drift	 <p>a: 72 mm (2.83 in) dia. b: 48 mm (1.89 in) dia.</p>
ST37750000 Drift	 <p>a: 40 mm (1.57 in) dia. b: 31 mm (1.22 in) dia.</p>
ST22452000 Drift	 <p>a: 45 mm (1.77 in) dia. b: 36 mm (1.42 in) dia.</p>
ST33400001 Drift	 <p>a: 60 mm (2.36 in) dia. b: 47 mm (1.85 in) dia.</p>
ST36730000 Drift	 <p>a: 50 mm (1.97 in) dia. b: 39 mm (1.54 in) dia.</p>

COMMERCIAL SERVICE TOOLS

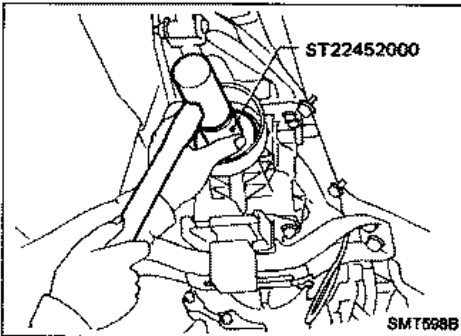
Tool name	Description
Puller	 <p>Removing counter gear rear end bearing Removing mainshaft rear bearing Removing reverse synchronizer hub Removing reverse counter gear</p>
Drift	 <p>a: 44.5 mm (1.752 in) dia. b: 38.5 mm (1.518 in) dia.</p>
Drift	 <p>a: 44.5 mm (1.752 in) dia. b: 40.5 mm (1.594 in) dia.</p>

ON-VEHICLE SERVICE

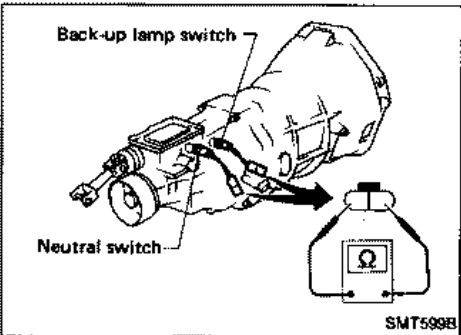


Replacing Rear Oil Seal

REMOVAL



INSTALLATION



Position Switch Check

BACK-UP LAMP SWITCH

- Check continuity.

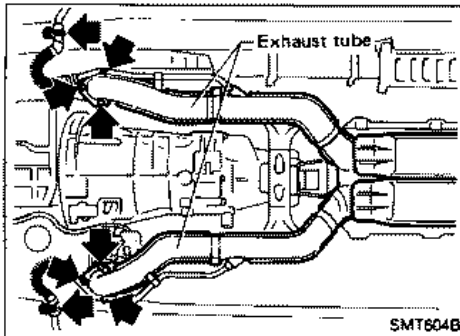
Gear position	Continuity
Reverse	Yes
Except reverse	No

NEUTRAL SWITCH

- Check continuity.

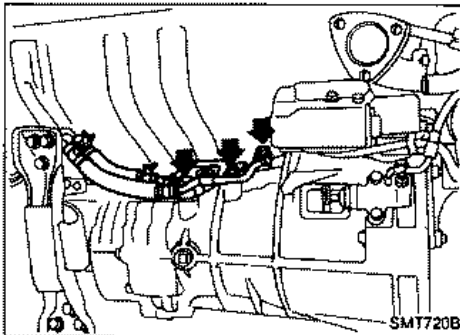
Gear position	Continuity
Neutral	Yes
Except neutral	No

REMOVAL AND INSTALLATION



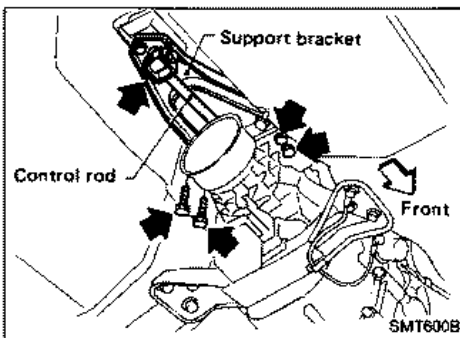
Removal

- Remove exhaust tube.

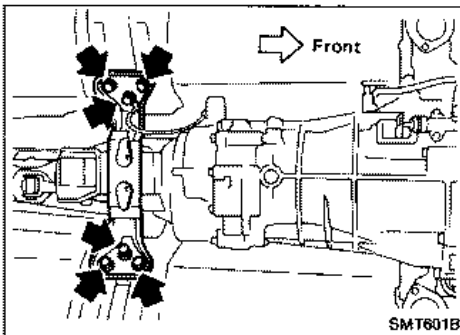


Oil cooler equipped model only

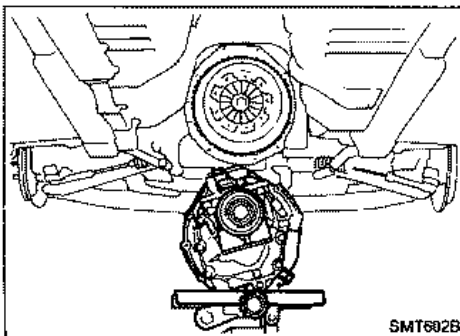
- Drain gear oil.
- Disconnect oil tubes from transmission case.



- Remove support bracket from M/T assembly.
- Remove control rod from shift lever.

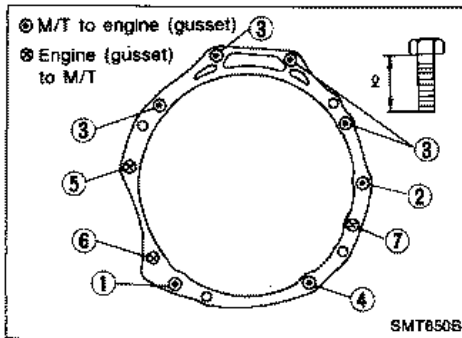


- Remove propeller shaft — Refer to section PD.
- **Insert plug into rear oil seal after removing propeller shaft.**
- **Be careful not to damage spline, sleeve yoke and rear oil seal when removing propeller shaft.**
- Disconnect back-up lamp switch and neutral switch harness connectors.
- Support manual transmission with a jack.
- Remove rear mounting.



- Lower manual transmission.

REMOVAL AND INSTALLATION



Installation

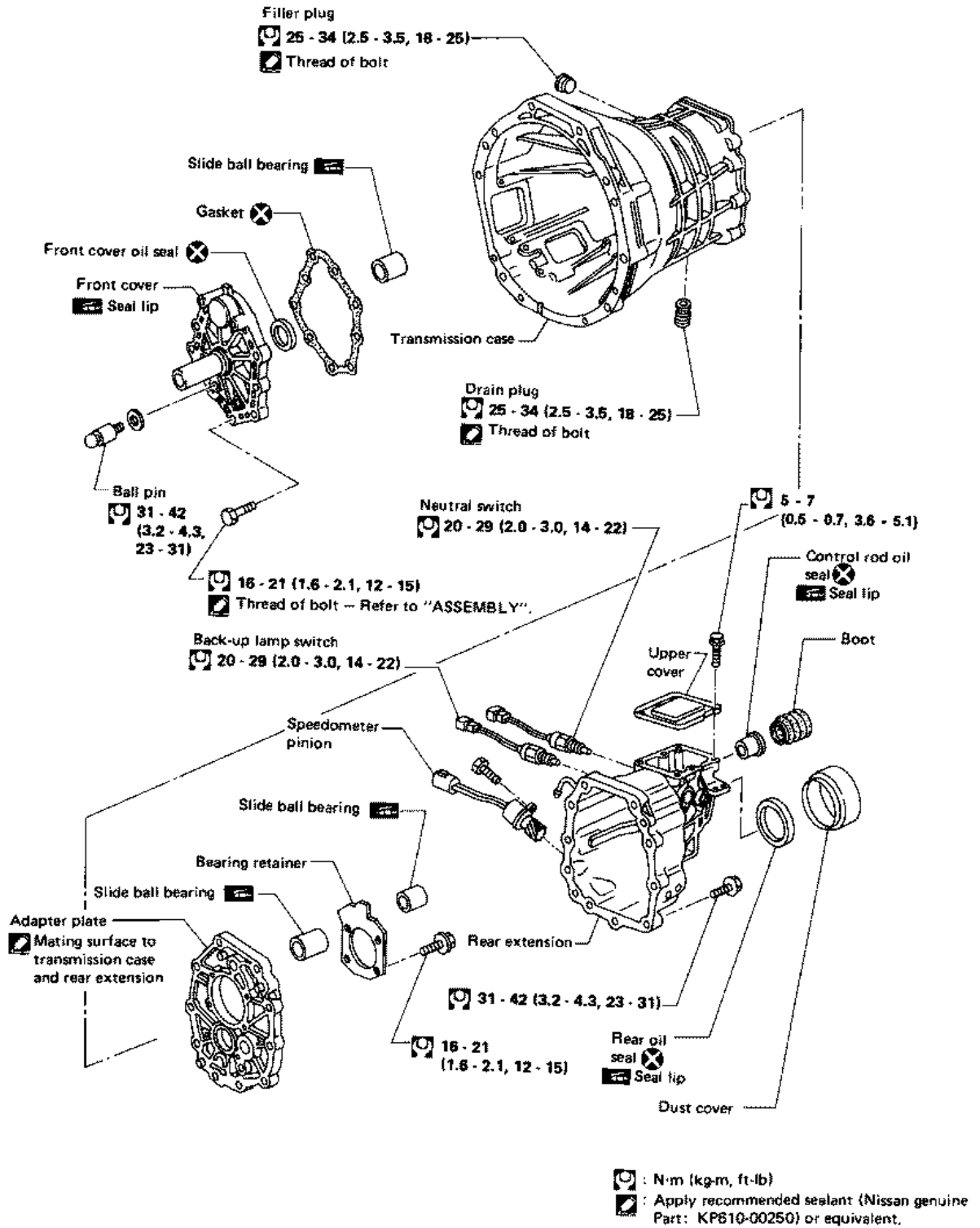
- Tighten all transmission bolts.

Bolt No.	Tightening torque N·m (kg·m, ft·lb)	ℓ mm (in)
①	39 - 49 (4.0 - 5.0, 29 - 36)	100 (3.94)
②	39 - 49 (4.0 - 5.0, 29 - 36)	65 (2.56)
③	39 - 49 (4.0 - 5.0, 29 - 36)	60 (2.36)
④	29 - 39 (3.0 - 4.0, 22 - 29)	60 (2.36)
⑤	29 - 39 (3.0 - 4.0, 22 - 29)	55 (2.17)
⑥	39 - 49 (4.0 - 5.0, 29 - 36)	25 (0.98)
⑦	29 - 39 (3.0 - 4.0, 22 - 29)	25 (0.98)

- Fill with gear oil. (Oil cooler equipped model only)
Refer to MA section.

MAJOR OVERHAUL

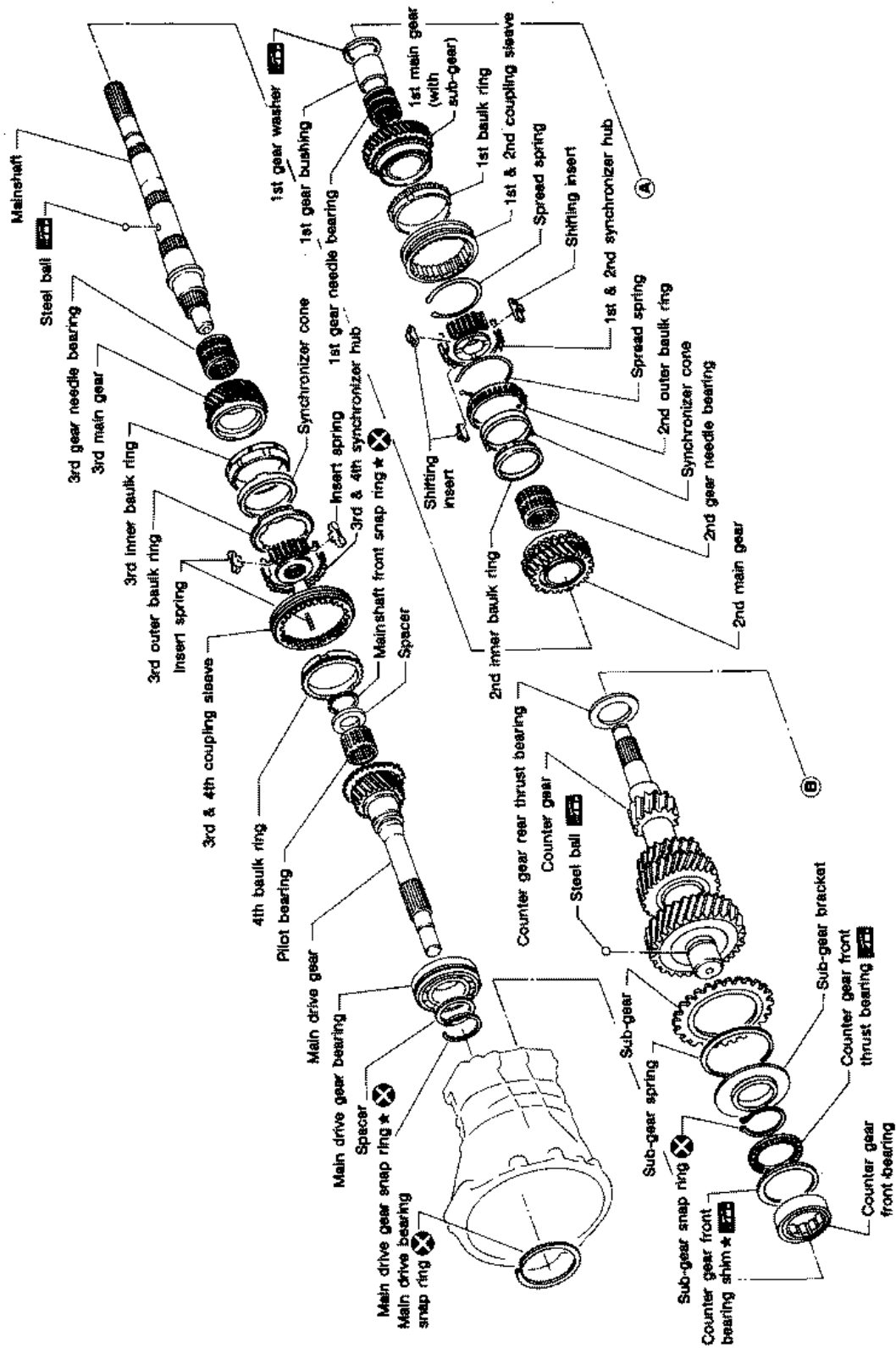
Case Components



SMT606B

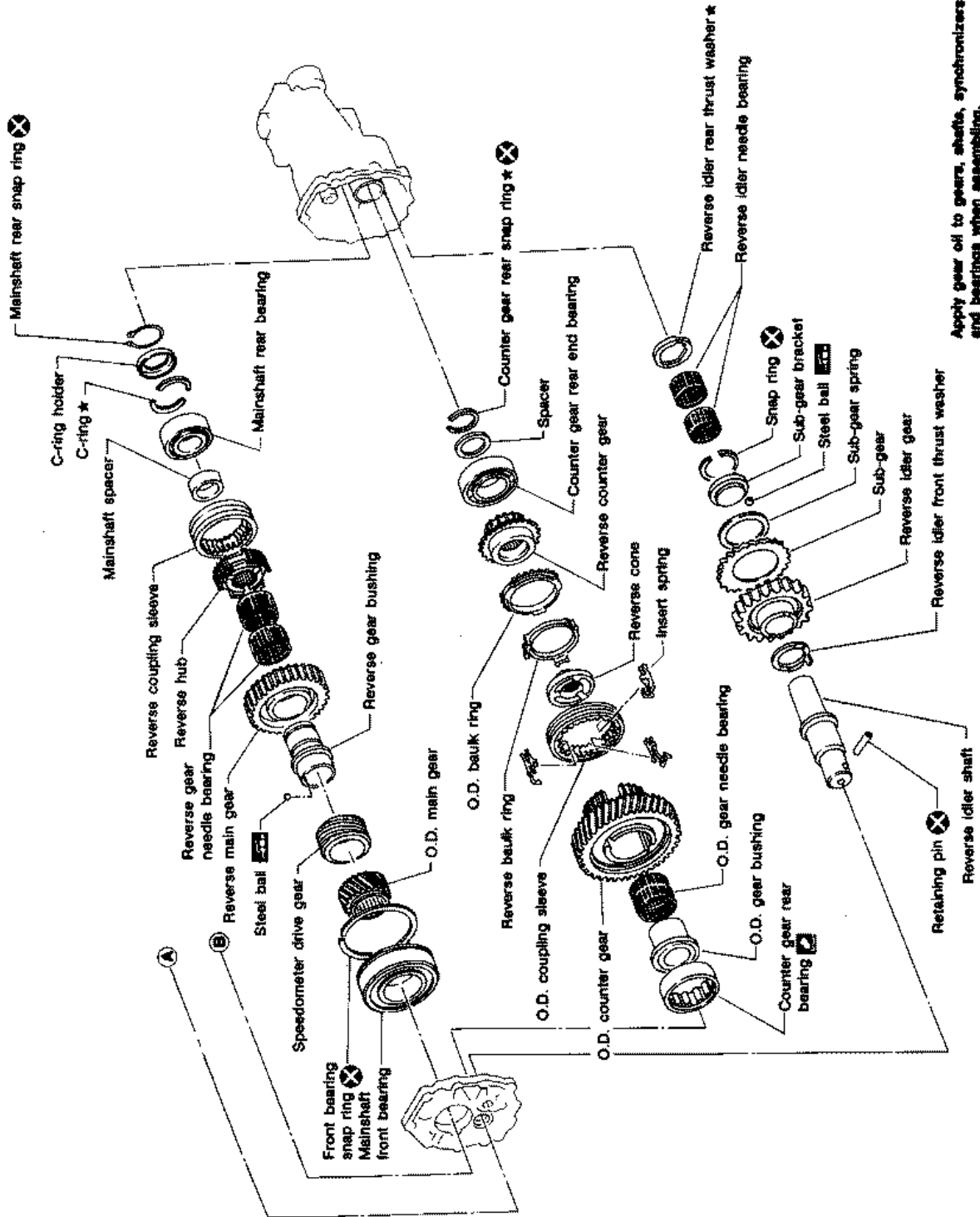
MAJOR OVERHAUL

Gear Components



MAJOR OVERHAUL

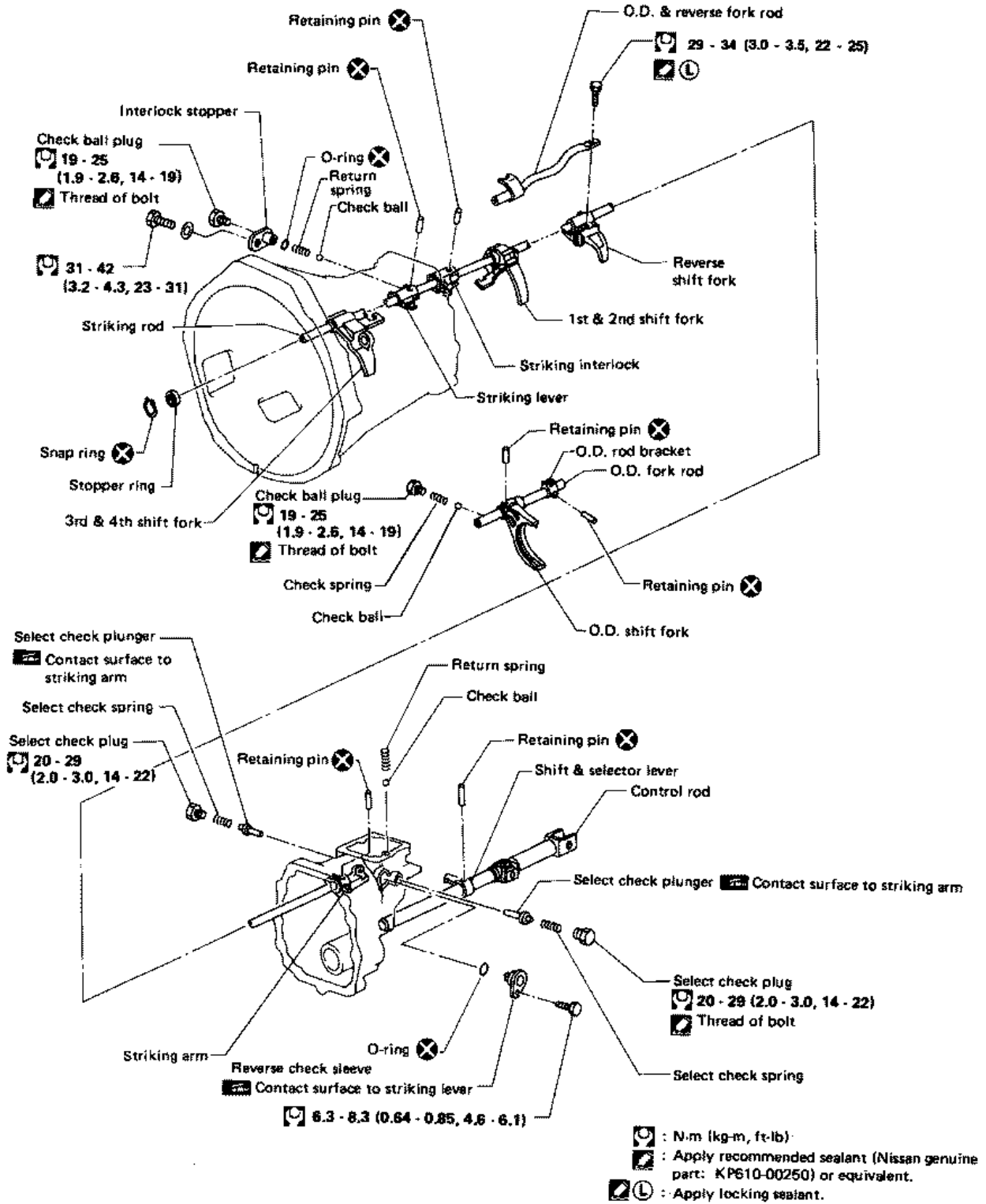
Gear Components (Cont'd)



Apply gear oil to gears, shafts, synchronizers and bearings when assembling.
 * : Select with proper thickness.

MAJOR OVERHAUL

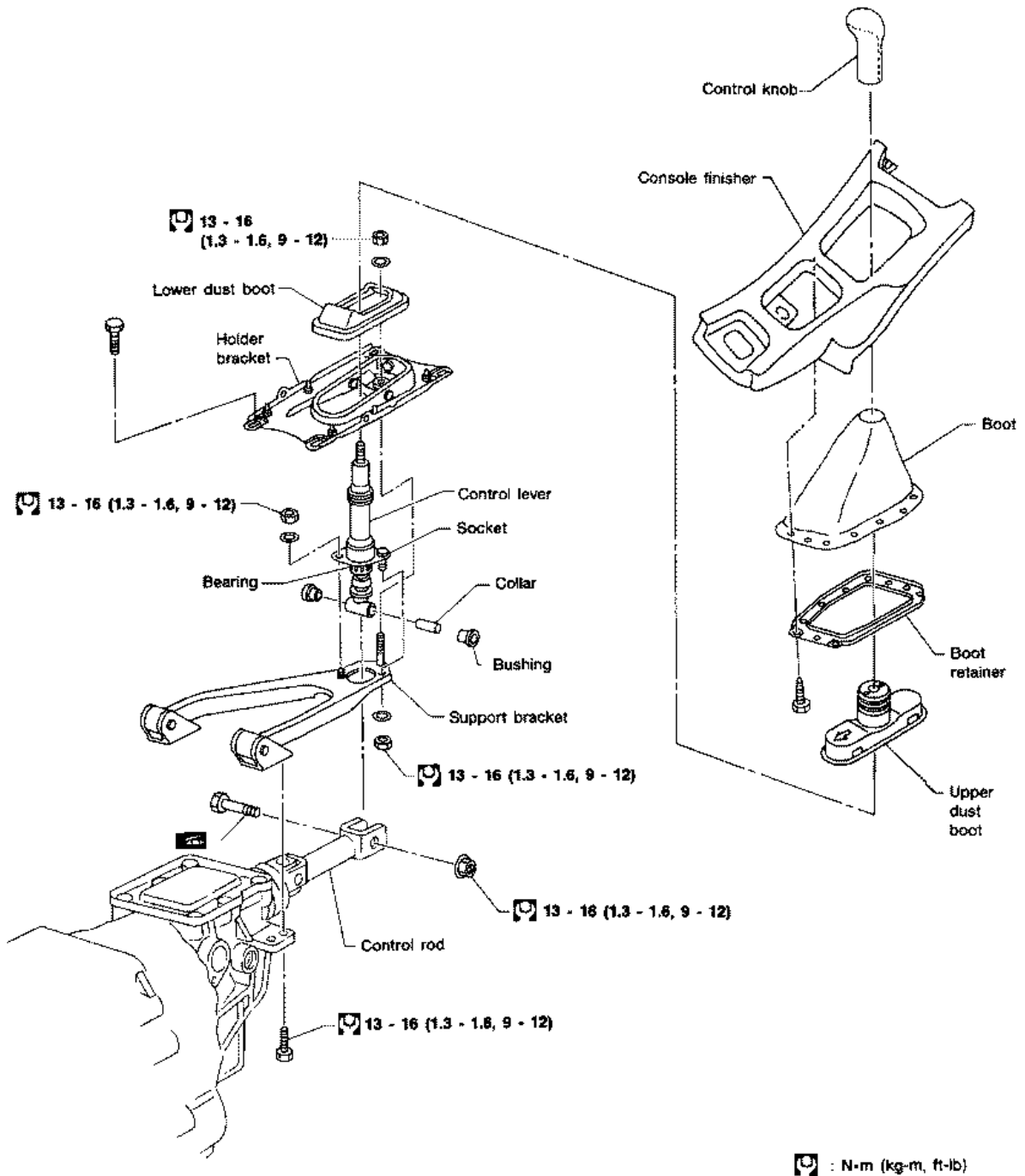
Shift Control Components



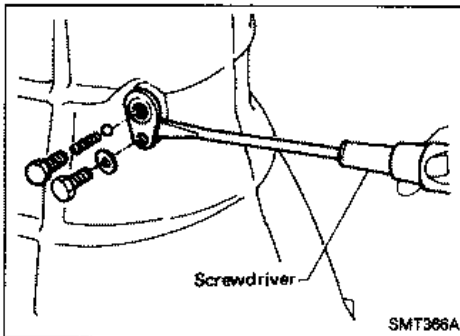
SMT607B

MAJOR OVERHAUL

Shift Control Components (Cont'd)



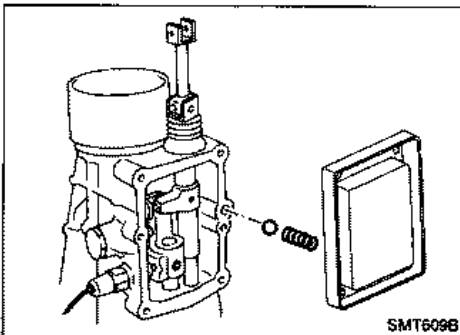
DISASSEMBLY



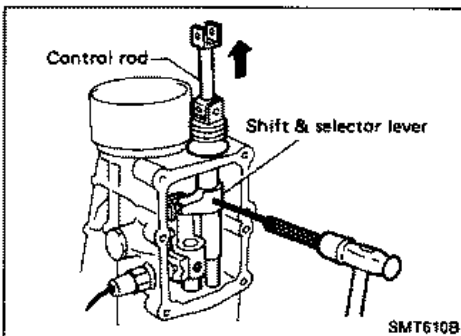
Case Components

1. Remove check ball plug, check spring and check ball. Then remove interlock stopper.

If interlock assembly is removed as a unit, the check ball can fall into transmission case.

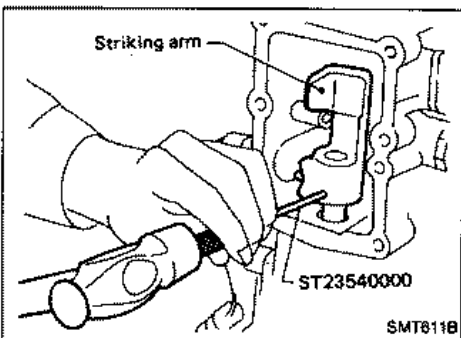


2. Remove upper cover, return spring and check ball.



3. Drive out retaining pin from shift & selector lever.
4. Remove control rod from M/T assembly.

Be careful not to damage control rod oil seal and dust cover.

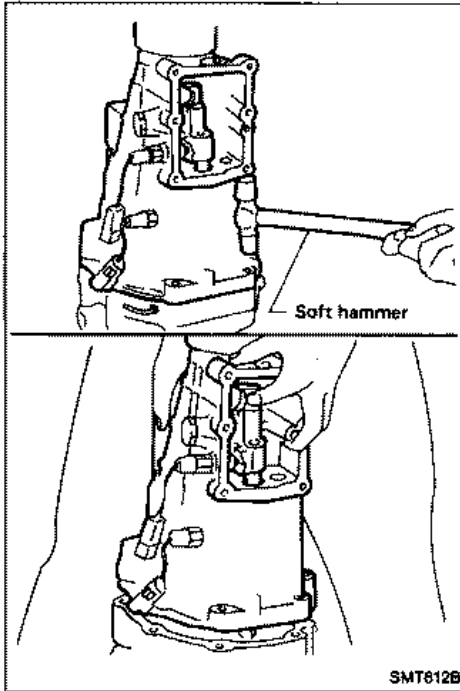


5. Drive out retaining pin from striking arm.

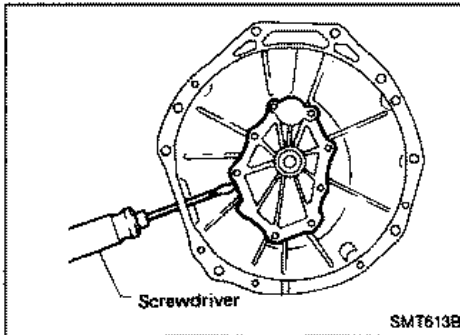
DISASSEMBLY

Case Components (Cont'd)

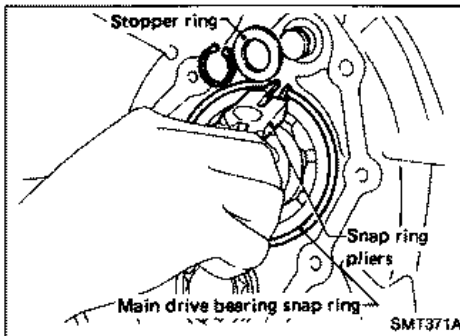
6. Remove rear extension together with striking arm by tapping lightly.



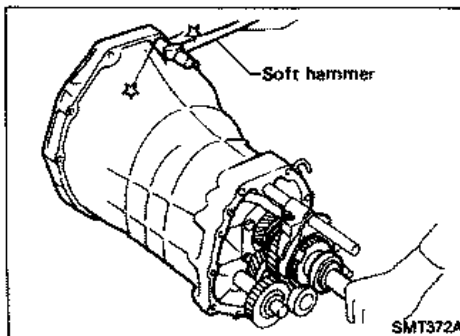
7. Remove front cover and gasket.



8. Remove stopper ring and main drive bearing snap ring.



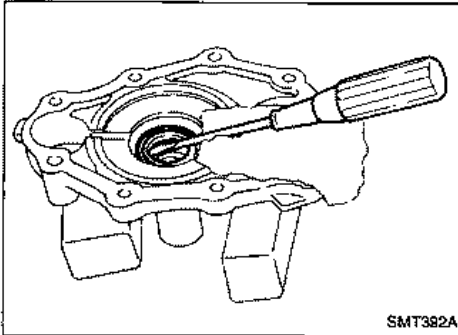
9. Remove transmission case by tapping lightly.



DISASSEMBLY

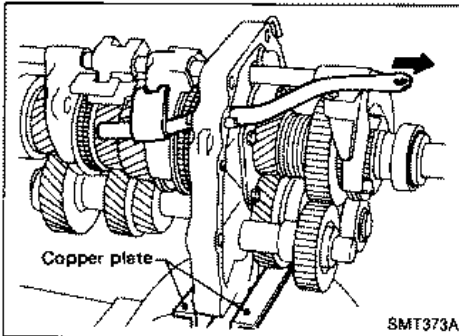
Case Components (Cont'd)

10. Remove front cover oil seal.

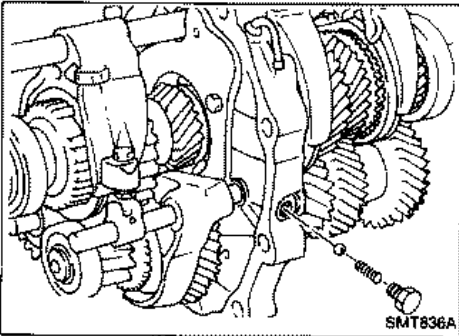


Shift Control Components

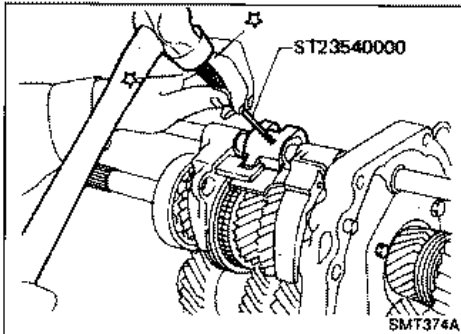
1. Mount adapter plate on vise.
2. Remove O.D. & reverse fork rod.



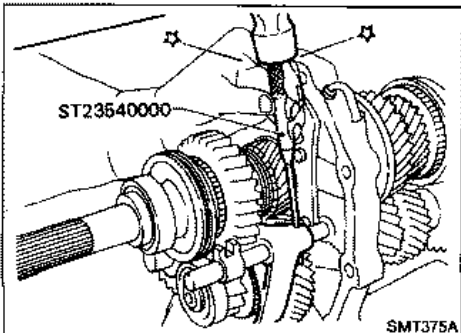
3. Remove check ball plug, check ball and return spring.



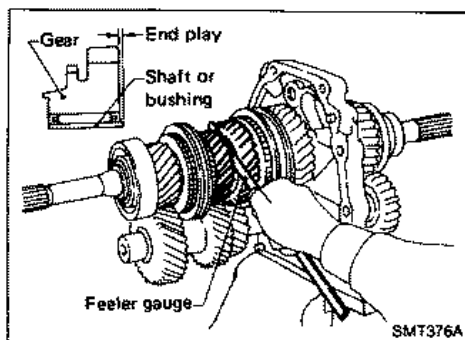
4. Drive out retaining pin from striking lever.
5. While pulling out striking rod, remove striking lever and striking interlock. Then remove 1st & 2nd, 3rd & 4th and reverse shift forks.



6. Drive out retaining pin from O.D. shift fork.
7. Pull out O.D. fork rod and then remove O.D. shift fork.



DISASSEMBLY

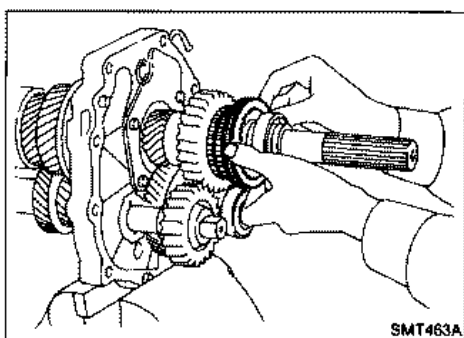


Gear Components

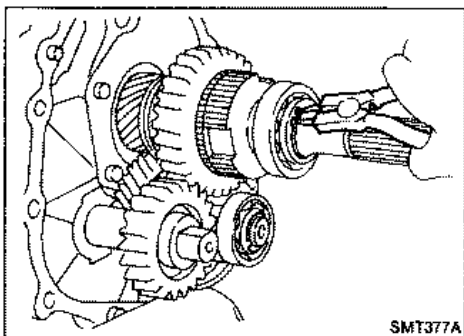
1. Before removing gears and shafts, measure each gear end play.

Gear	End play mm (in)
1st main gear	0.23 - 0.33 (0.0091 - 0.0130)
2nd main gear	0.23 - 0.33 (0.0091 - 0.0130)
3rd main gear	0.23 - 0.33 (0.0091 - 0.0130)
O.D. counter gear	0.23 - 0.33 (0.0091 - 0.0130)
Reverse main gear	0.33 - 0.43 (0.0130 - 0.0169)

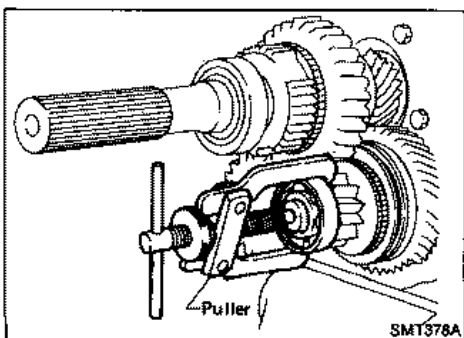
- If not within specification, disassemble and check contact surface of gear to hub, washer, bushing, needle bearing and shaft.



2. Remove rear side components on mainshaft and counter gear.
 - a. Remove snap ring, speedometer drive gear and steel ball.
 - b. Remove reverse coupling sleeve.



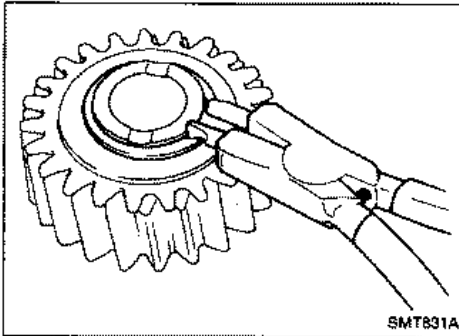
- c. Remove mainshaft rear snap ring and counter gear rear snap ring.
- d. Remove C-ring holder and mainshaft C-rings from mainshaft. Use punch and hammer to remove C-rings.



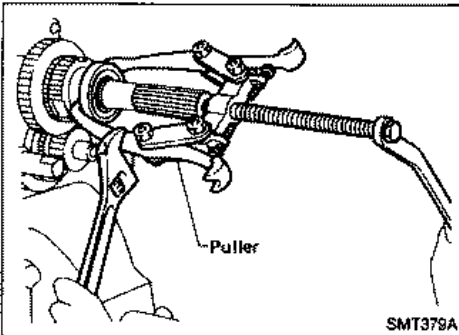
- e. Pull out counter gear rear end bearing.
- f. Remove reverse idler gear and reverse idler thrust washers.

DISASSEMBLY

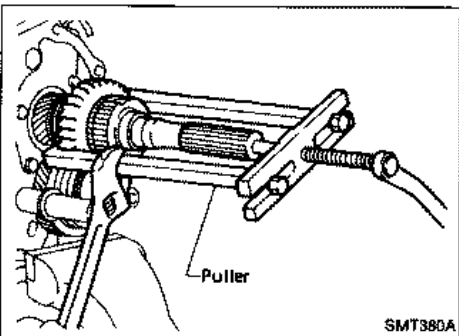
Gear Components (Cont'd)



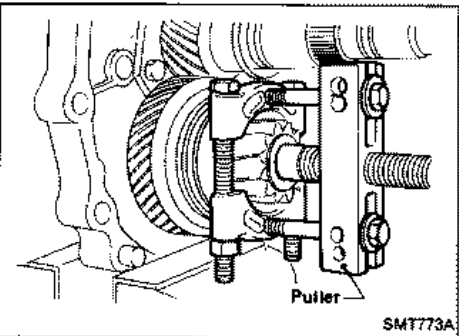
- g. Remove sub-gear from reverse idler gear.



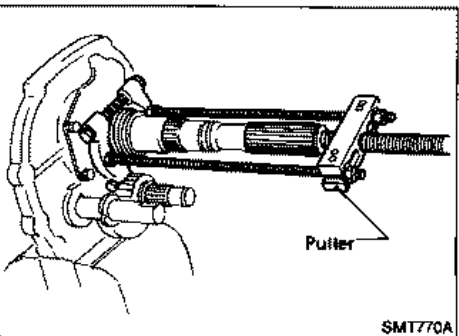
- h. Pull out mainshaft rear bearing.



- i. Pull out reverse main gear together with mainshaft spacer and reverse synchronizer hub. Then remove reverse gear needle bearings.



- j. Pull out reverse counter gear.
k. Remove O.D. coupling sleeve together with O.D. baulk ring, reverse baulk ring and spring inserts.

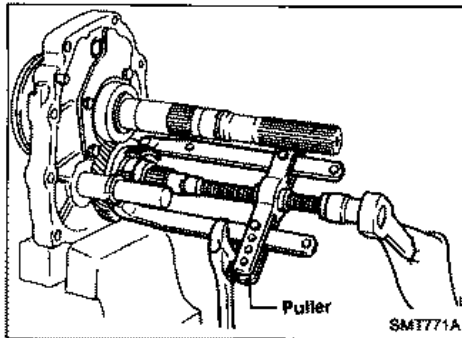


- l. Pull out reverse gear bushing.

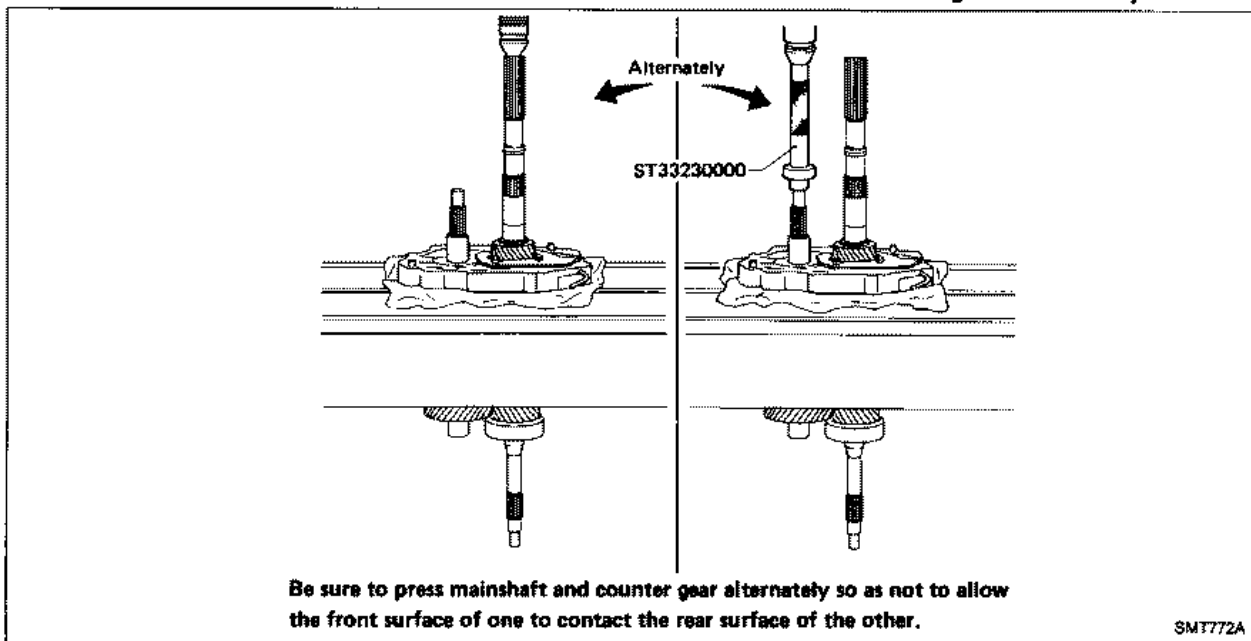
DISASSEMBLY

Gear Components (Cont'd)

- m. Pull out O.D. counter gear together with reverse cone.

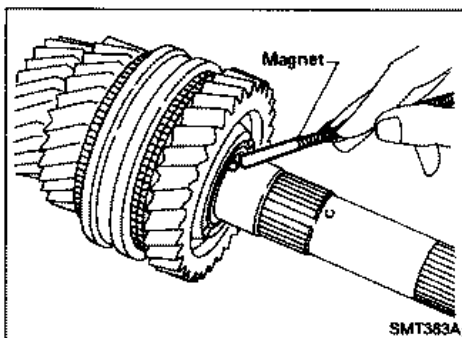


3. Press out mainshaft and counter gear alternately.

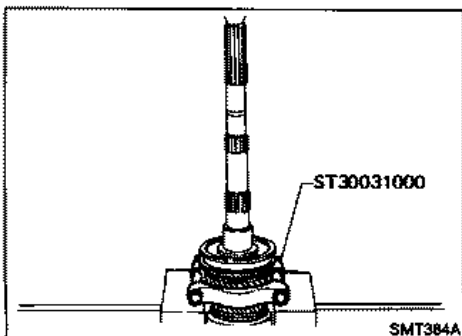


4. Remove front side components on mainshaft.

- a. Remove 1st gear washer and steel ball.
b. Remove 1st main gear and 1st gear needle bearing.

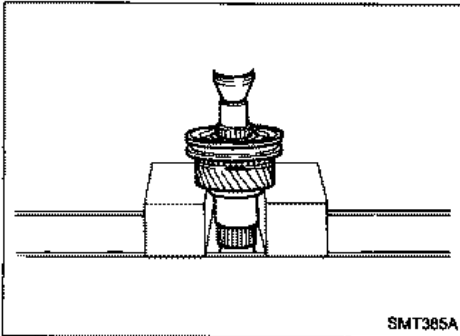


- c. Press out 2nd main gear together with 1st gear bushing and 1st & 2nd synchronizer assembly.
d. Remove mainshaft front snap ring.

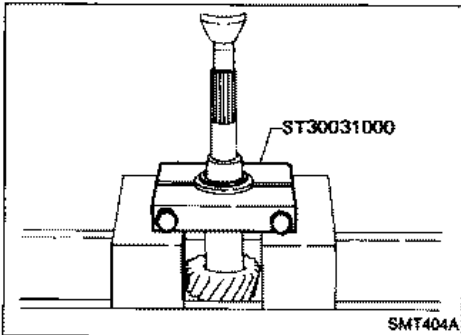


DISASSEMBLY

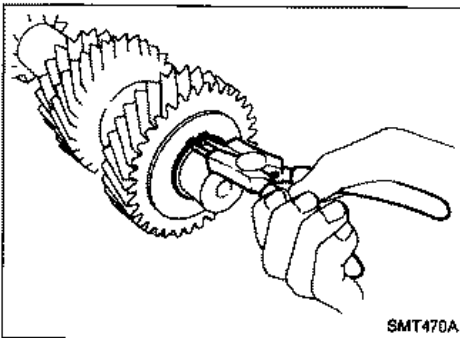
Gear Components (Cont'd)



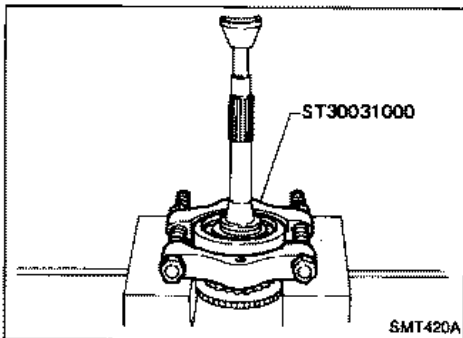
- e. Press out 3rd main gear together with 3rd & 4th synchronizer assembly and 3rd gear needle bearing.



5. Remove front side components on counter gear.
 - a. Remove counter gear rear thrust bearing.



- b. Remove sub-gear components.



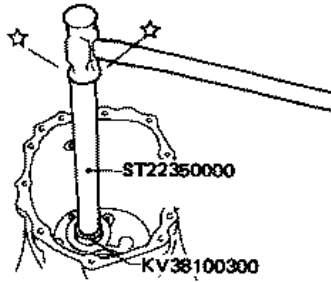
6. Remove main drive gear bearing.
 - a. Remove main drive gear snap ring and spacer.
 - b. Press out main drive gear bearing.

DISASSEMBLY

Gear Components (Cont'd)

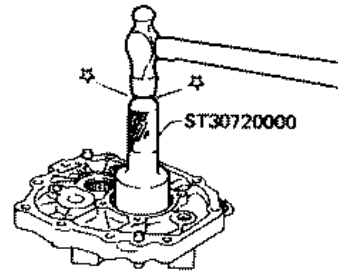
7. Remove bearings from case components.

Counter gear front bearing in transmission case



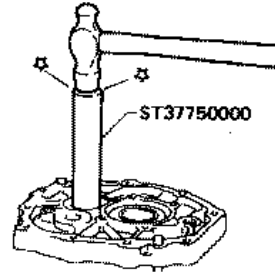
SMT388A

Mainshaft front bearing in adapter plate



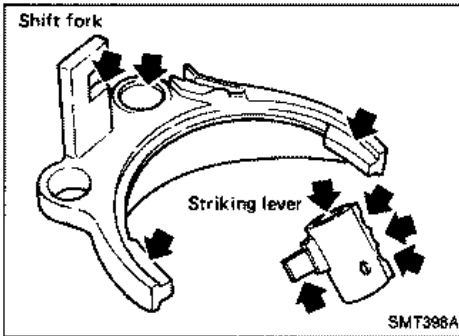
SMT396A

Counter gear rear bearing in adapter plate



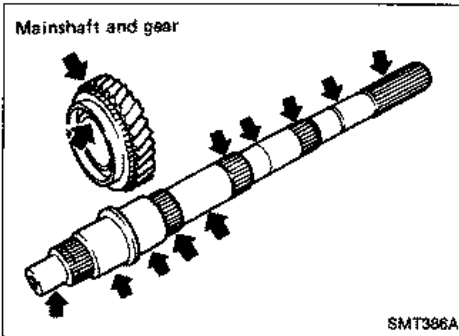
SMT394A

INSPECTION



Shift Control Components

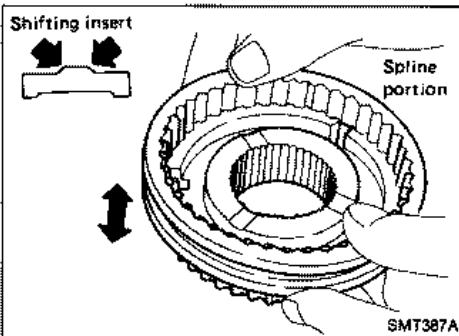
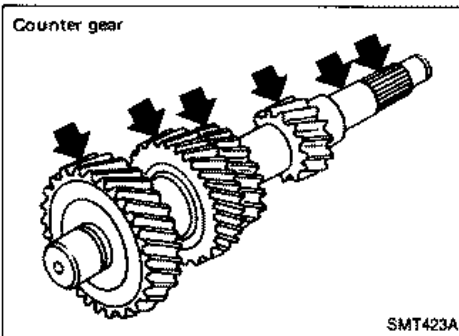
- Check contact surface and sliding surface for wear, scratches, projections or other damage.



Gear Components

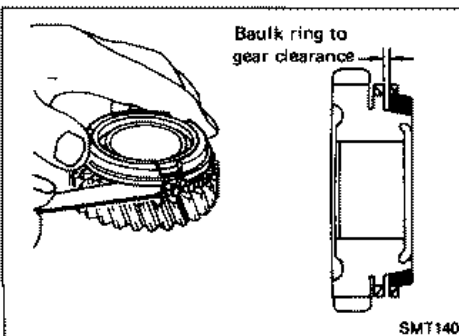
GEARS AND SHAFTS

- Check shafts for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.



SYNCHRONIZERS

- Check spline portion of coupling sleeves, hubs, and gears for wear or cracks.
- Check baulk rings for cracks or deformation.
- Check shifting inserts for wear or deformation.
- Check insert springs for deformation.



Clearance between baulk ring and gear

- Measure wear of main drive, 1st and O.D. baulk rings.

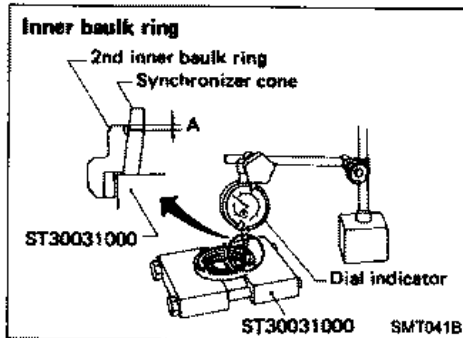
Unit: mm (in)

	Standard	Wear limit
1st	1.05 - 1.3 (0.0413 - 0.0512)	0.7 (0.028)
Main drive	1.05 - 1.3 (0.0413 - 0.0512)	0.7 (0.028)
O.D.	1.05 - 1.3 (0.0413 - 0.0512)	0.7 (0.028)

If the clearance is smaller than the wear limit, replace baulk ring.

INSPECTION

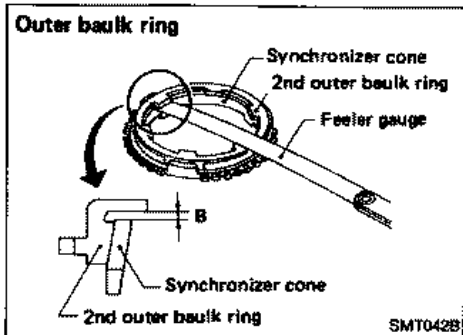
Gear Components (Cont'd)



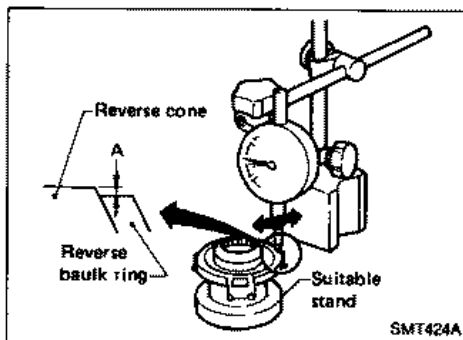
- Measure wear of 2nd and 3rd baulk rings.
- a. Place baulk rings in position on synchronizer cone.
- b. While holding baulk rings against synchronizer cone as far as it will go, measure dimensions "A" and "B".

Unit: mm (in)

Dimension	Standard	Wear limit
A	0.6 - 1.1 (0.024 - 0.043)	0.2 (0.008)
B	0.7 - 0.9 (0.028 - 0.035)	



- c. If dimension "A" or "B" is smaller than the wear limit, replace baulk ring.

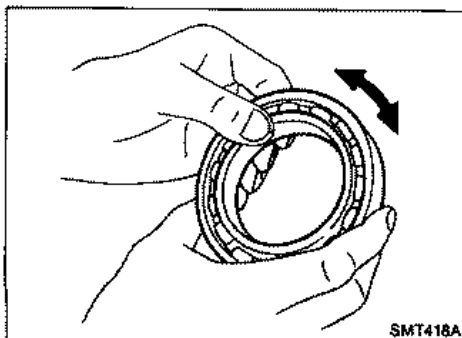


- Measure wear of reverse baulk ring.
- a. Place baulk ring in position on reverse cone.
- b. While holding baulk ring against reverse cone as far as it will go, measure dimension "A" with dial indicator.

Unit: mm (in)

	Standard	Wear limit
Dimension "A"	-0.1 to 0.35 (-0.0039 to 0.0138)	0.7 (0.028)

- c. If dimension "A" is larger than the wear limit, replace baulk ring.



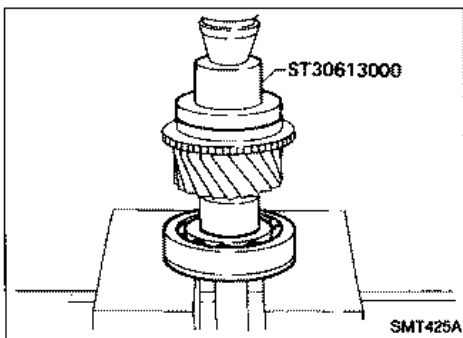
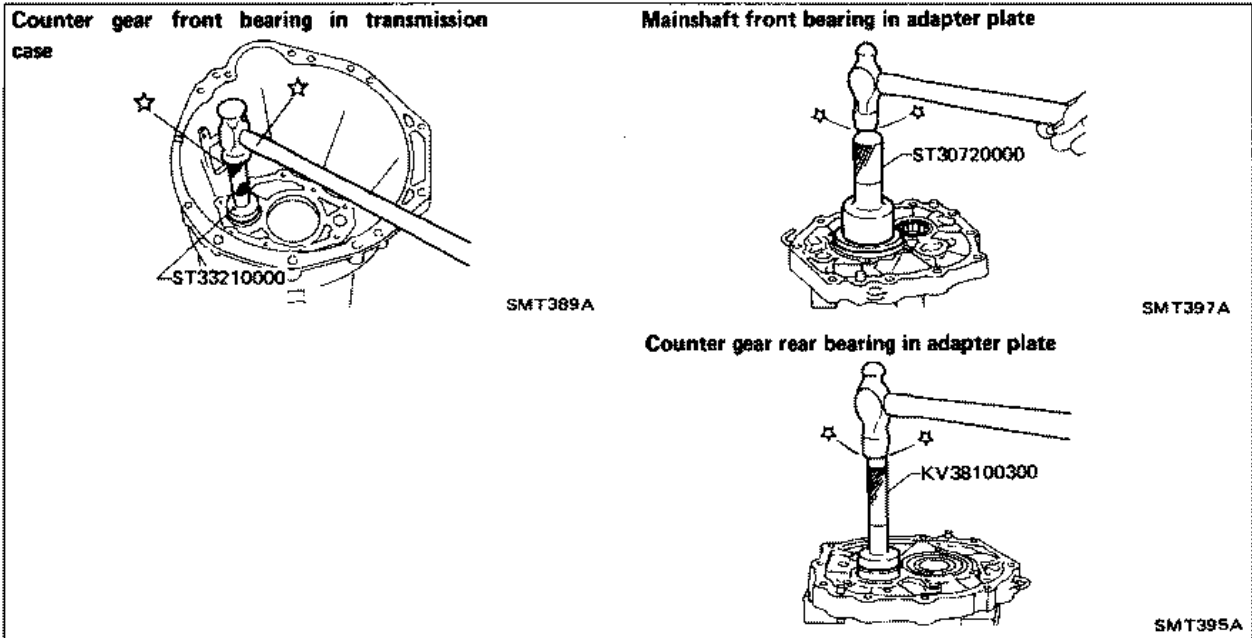
BEARINGS

- Make sure bearings roll freely and are free from noise, crack, pitting or wear.

ASSEMBLY

Gear Components

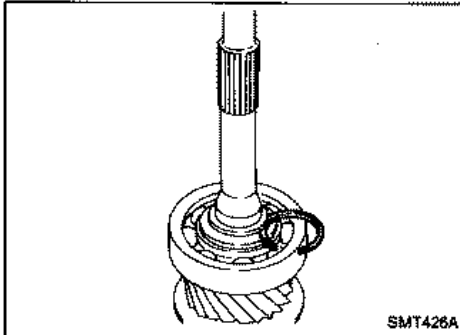
1. Install bearings into case components.



2. Install main drive gear bearing.
 - a. Press main drive gear bearing.
 - b. Install main drive gear spacer.

ASSEMBLY

Gear Components (Cont'd)



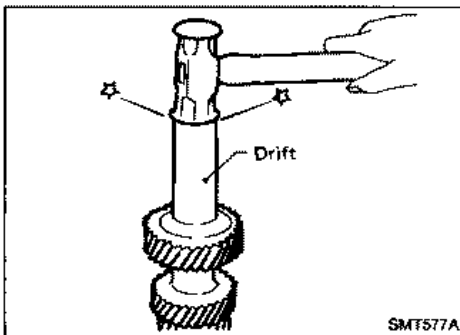
- c. Select proper main drive gear snap ring to minimize clearance of groove.

**Allowable clearance of groove:
0 - 0.1 mm (0 - 0.004 in)**

Main drive gear snap ring

Thickness mm (in)	Part number
1.89 (0.0744)	32204-01G00
1.98 (0.0780)	32204-01G01
2.05 (0.0807)	32204-01G02
2.12 (0.0835)	32204-01G03
2.19 (0.0862)	32204-01G04

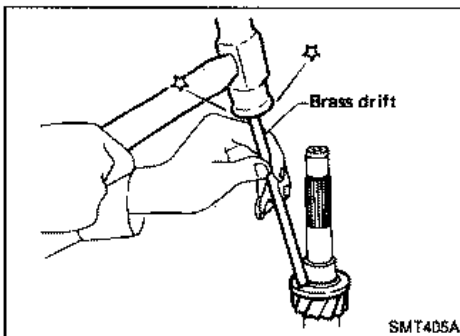
- d. Install selected snap ring on main drive gear.



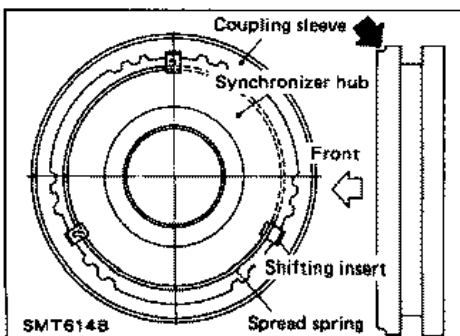
3. Install components on counter gear.

- a. Install sub-gear components.

When installing sub-gear snap ring, tap sub-gear snap ring into position on counter gear.



- b. Install counter gear rear thrust bearing.

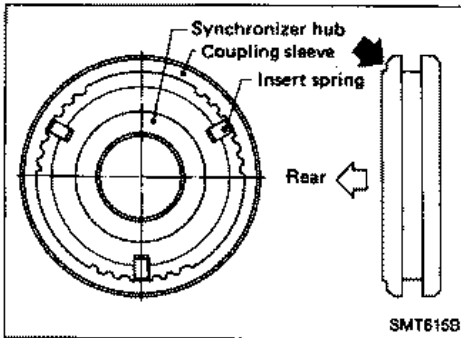


4. Install front side components on mainshaft.

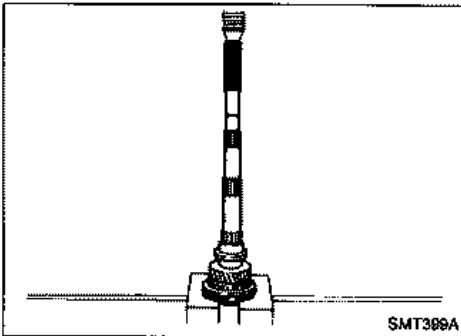
- a. Assemble 1st & 2nd synchronizer.

ASSEMBLY

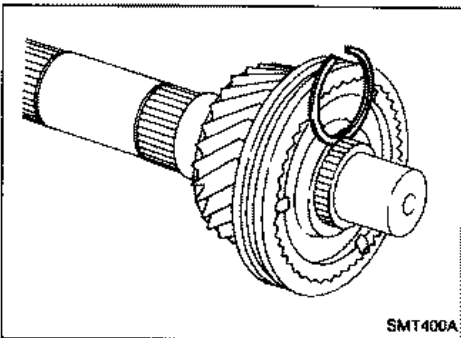
Gear Components (Cont'd)



b. Assemble 3rd & 4th synchronizer.



c. Press on 3rd & 4th synchronizer assembly together with 3rd main gear and 3rd gear needle bearing.
Pay attention to direction of synchronizer assembly.

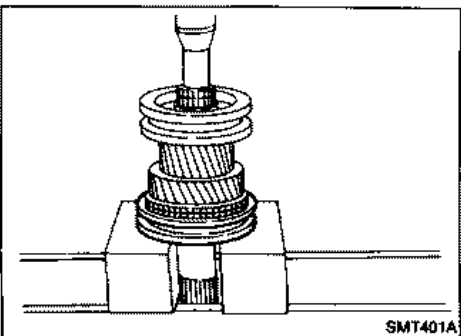


d. Select proper snap ring to minimize clearance of groove.
Allowable clearance of groove:
0 - 0.1 mm (0 - 0.004 in)

Mainshaft front snap ring

Thickness mm (in)	part number
1.89 (0.0744)	32204-01G00
1.98 (0.0780)	32204-01G01
2.05 (0.0807)	32204-01G02
2.12 (0.0835)	32204-01G03
2.19 (0.0862)	32204-01G04

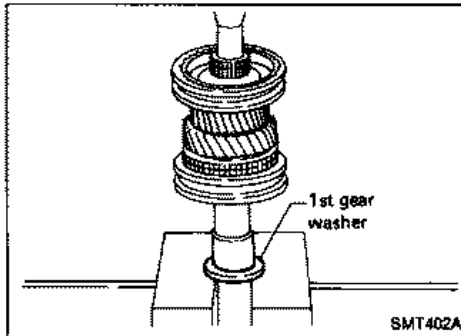
e. Install selected snap ring on mainshaft.



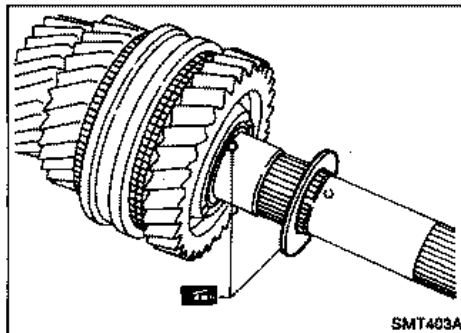
f. Press on 1st & 2nd synchronizer assembly together with 2nd main gear and 2nd gear needle bearing.

ASSEMBLY

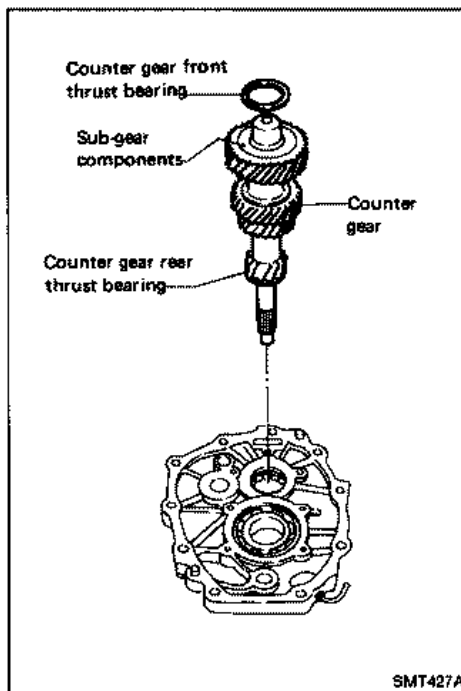
Gear Components (Cont'd)



- g. Press on 1st gear bushing using 1st gear washer.
- h. Install 1st main gear and needle bearing.



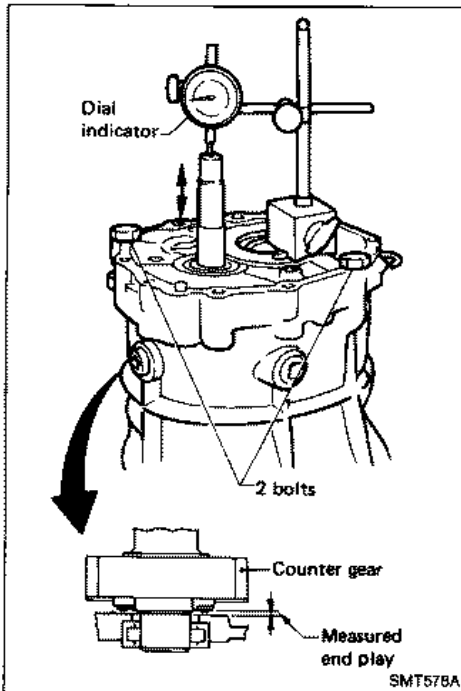
- i. Install steel ball and 1st gear washer.
Apply multi-purpose grease to steel ball and 1st gear washer before installing.



- 5. Select proper counter gear front bearing shim when replacing transmission case, counter gear, counter gear thrust bearing or sub-gear components.
 - a. Install counter gear with sub-gear components, counter gear front and rear thrust bearing on adapter plate.
 - b. Remove counter gear front bearing shim from transmission case.
 - c. Place adapter plate and counter gear assembly in transmission case (case inverted).

ASSEMBLY

Gear Components (Cont'd)



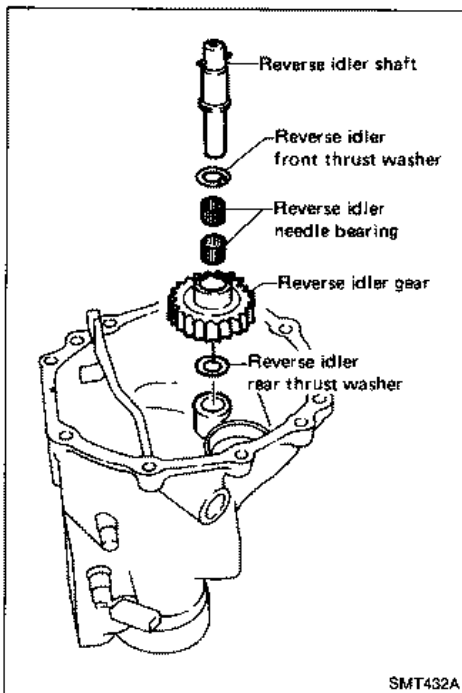
- d. Tighten adapter plate to transmission case using 2 bolts.
- e. Place dial indicator on rear end of counter gear.
- f. Move counter gear up and down and measure dial indicator deflection.
- g. Select proper shim using table below as a guide.

Counter gear end play:

0.10 - 0.25 mm (0.0039 - 0.0098 in)

Table for selecting proper counter gear front bearing shim

Dial indicator deflection mm (in)	Thickness of proper washer mm (in)	Part number
0.93 - 1.02 (0.0366 - 0.0402)	0.8 (0.031)	32218-01G00
1.03 - 1.12 (0.0406 - 0.0441)	0.9 (0.035)	32218-01G01
1.13 - 1.22 (0.0445 - 0.0480)	1.0 (0.039)	32218-01G02
1.23 - 1.32 (0.0484 - 0.0520)	1.1 (0.043)	32218-01G03
1.33 - 1.42 (0.0524 - 0.0559)	1.2 (0.047)	32218-01G04
1.43 - 1.52 (0.0563 - 0.0598)	1.3 (0.051)	32218-01G05
1.53 - 1.62 (0.0602 - 0.0638)	1.4 (0.055)	32218-01G06



6. Select proper reverse idler rear thrust washer when replacing rear extension, reverse idler gear, reverse idler shaft or reverse idler thrust washer.
- a. Install reverse idler gear, reverse idler needle bearings, reverse idler thrust washers and reverse idler shaft into rear extension.

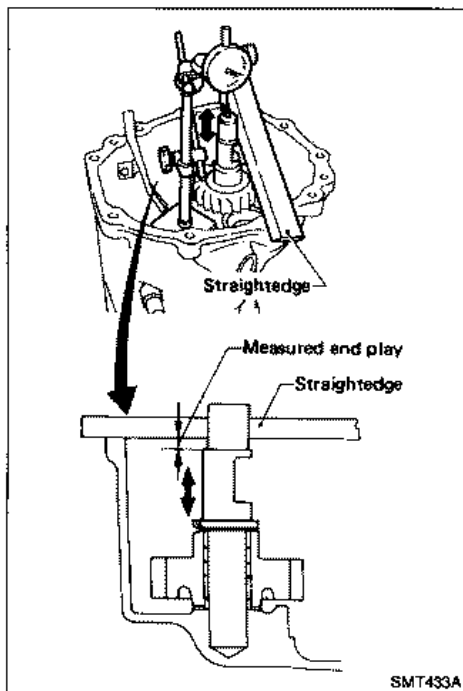
When replacing reverse idler rear washer, install either A or B.

Reverse idler rear thrust washer

	Thickness mm (in)	Part number
A	1.97 (0.0776)	32284-01G10
B	2.07 (0.0815)	32284-01G11

ASSEMBLY

Gear Components (Cont'd)

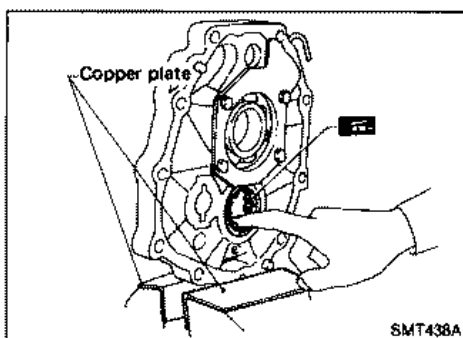


- b. Place dial indicator on front end of reverse idler shaft.
- c. Put straightedge on front surface of rear extension as a stopper of reverse idler shaft.
- d. Move reverse idler shaft up and down and measure reverse idler gear end play.

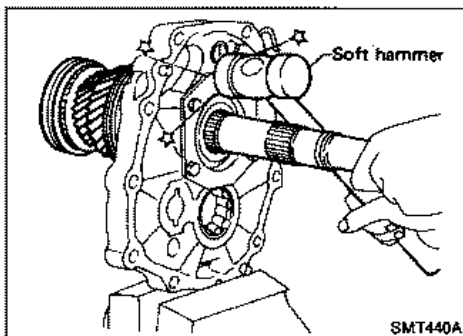
Reverse idler gear end play:

0.30 - 0.53 mm (0.0118 - 0.0209 in)

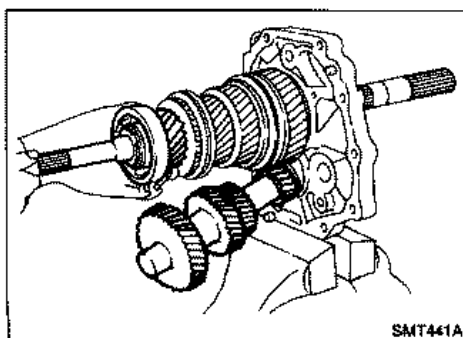
- e. If not within specification, replace reverse idler rear thrust washer with the other (A or B) and check again.



7. Install mainshaft and counter gear on adapter plate and main drive gear on mainshaft.
 - a. Mount adapter plate on vise and apply multi-purpose grease to counter gear rear bearing.



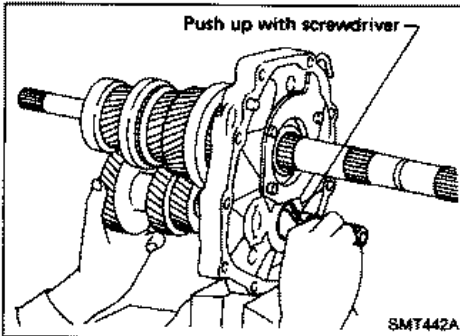
- b. Install mainshaft a little on mainshaft front bearing.
To allow for installation of counter gear, do not install mainshaft completely.



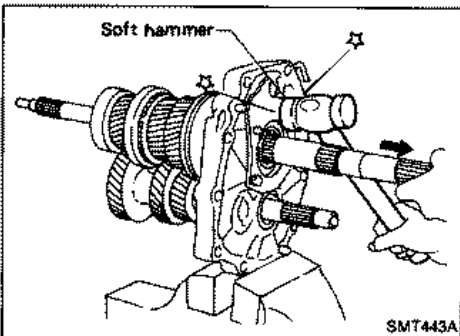
- c. Install counter gear on counter gear rear bearing and install main drive gear, pilot bearing and spacer on mainshaft.

ASSEMBLY

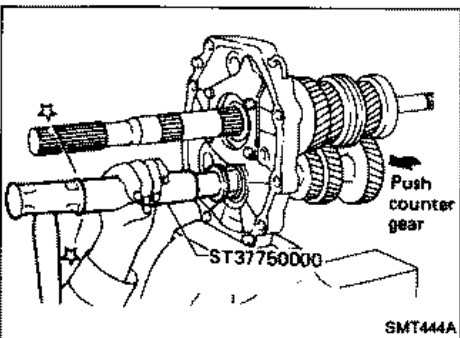
Gear Components (Cont'd)



When installing counter gear rear bearing, push up on upper roller of counter gear rear bearing with screwdriver.

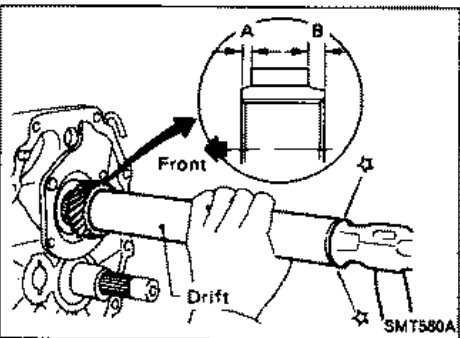


d. Install mainshaft and counter gear completely by tapping rear side of adapter plate and pulling mainshaft.



8. Install rear side components on mainshaft and counter gear.

a. Install O.D. gear bushing while pushing on the front of counter gear.

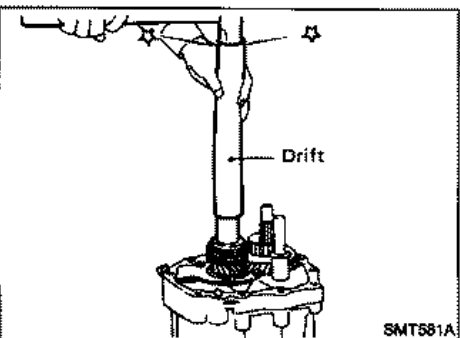


b. Install O.D. main gear.

Pay attention to direction of O.D. main gear. (B is wider than A as shown at left.)

c. Install adapter plate with gear assembly onto transmission case.

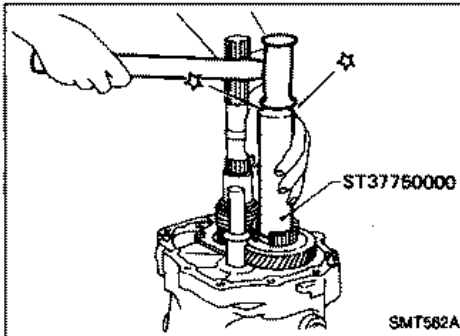
d. Install O.D. gear needle bearing and then install O.D. counter gear and reverse idler shaft.



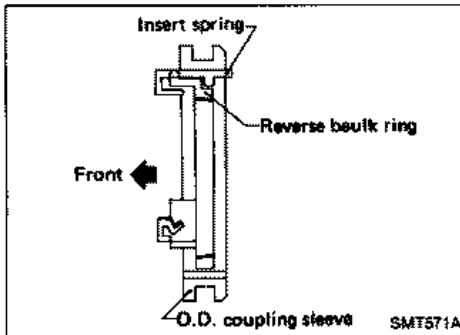
e. Install reverse gear bushing.

ASSEMBLY

Gear Components (Cont'd)

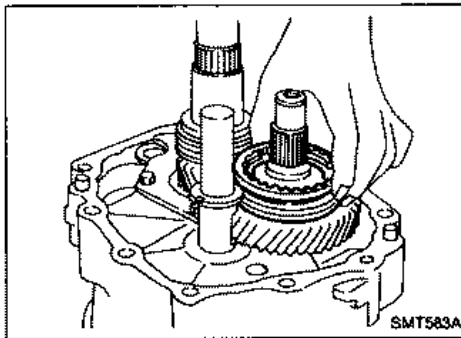


f. Install reverse cone.

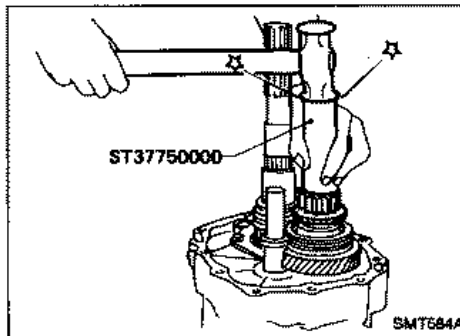


g. Install insert springs and reverse baulk ring on O.D. coupling sleeve. Then install them and O.D. baulk ring on O.D. counter gear.

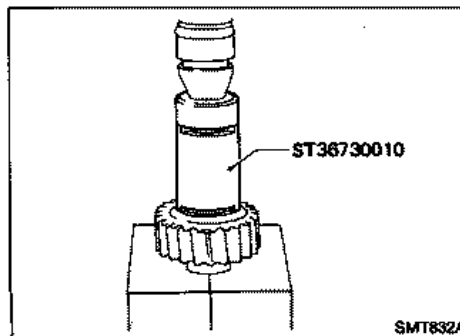
Pay attention to direction of O.D. coupling sleeve.



h. Install reverse counter gear.

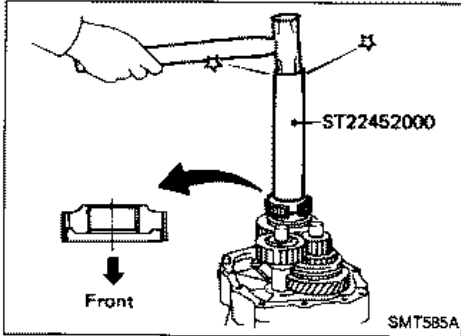


i. Install sub-gear on reverse idler gear.
j. Install reverse gear needle bearing and then install reverse main gear, reverse idler gear and reverse idler thrust washers.

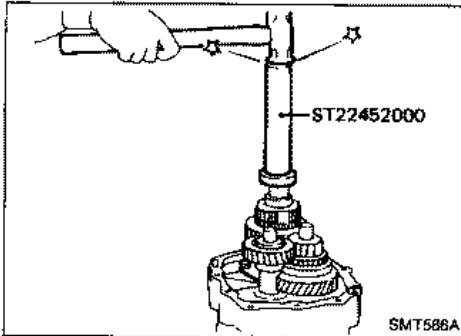


ASSEMBLY

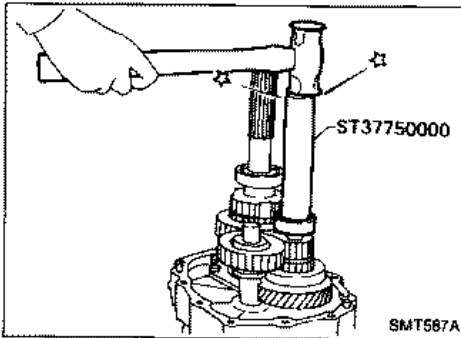
Gear Components (Cont'd)



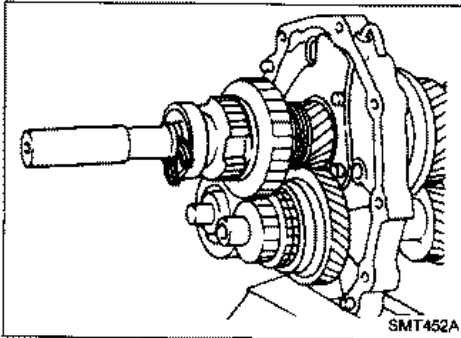
- k. Install reverse hub.
Pay attention to its direction.



- l. Install mainshaft spacer and mainshaft rear bearing.
m. Install speedometer drive gear.



- n. Install counter gear rear end bearing.
o. Separate adapter plate from transmission case and mount adapter plate on vise again.

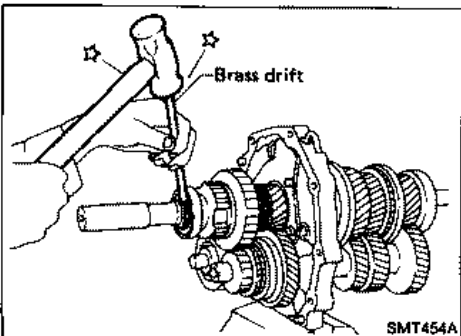


- p. Select proper mainshaft C-ring to minimize clearance of groove.

Allowable clearance of groove:
0 - 0.1 mm (0 - 0.004 in)

Mainshaft C-ring

Thickness mm (in)	Part number	Thickness mm (in)	Part number
2.63 (0.1035)	32348-01G15	3.19 (0.1256)	32348-01G07
2.70 (0.1063)	32348-01G00	3.26 (0.1283)	32348-01G08
2.77 (0.1091)	32348-01G01	3.33 (0.1311)	32348-01G09
2.84 (0.1118)	32348-01G02	3.40 (0.1339)	32348-01G10
2.91 (0.1146)	32348-01G03	3.47 (0.1366)	32348-01G11
2.98 (0.1173)	32348-01G04	3.54 (0.1394)	32348-01G12
3.05 (0.1201)	32348-01G05	3.61 (0.1421)	32348-01G13
3.12 (0.1228)	32348-01G06	3.68 (0.1449)	32348-01G14



- q. Install selected C-ring, C-ring holder and mainshaft rear snap ring.

ASSEMBLY

Gear Components (Cont'd)

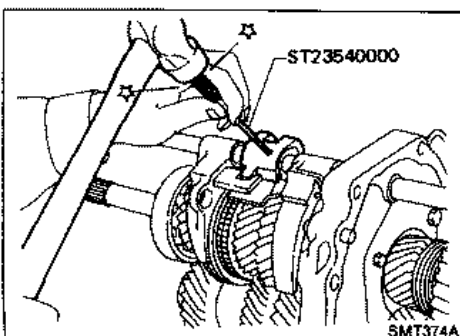
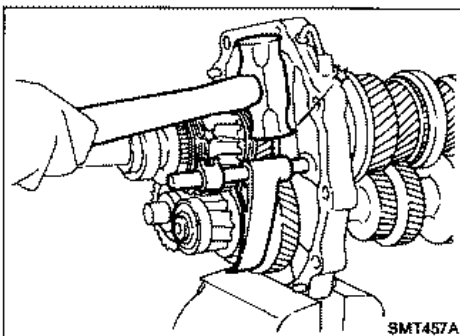
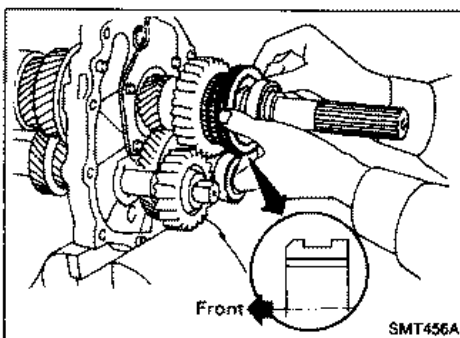
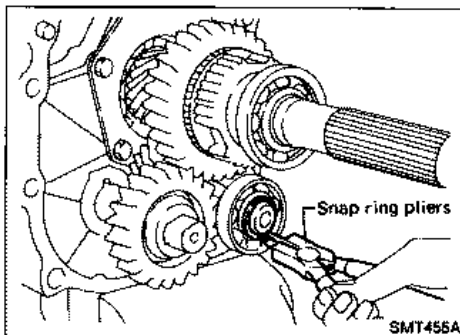
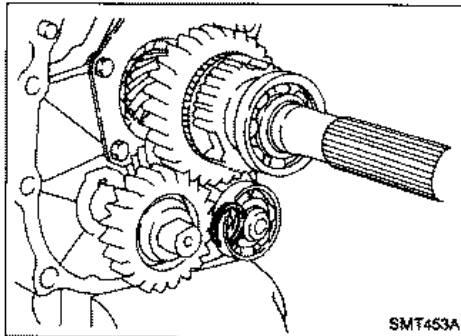
- r. Install spacer and then select proper counter gear rear snap ring to minimize clearance of groove.

Allowable clearance of groove:
0 - 0.1 mm (0 - 0.004 in)

Counter gear rear snap ring

Thickness mm (in)	Part number
1.26 (0.0496)	32236-01G08
1.32 (0.0520)	32236-01G00
1.38 (0.0543)	32236-01G01
1.44 (0.0567)	32236-01G02
1.50 (0.0591)	32236-01G03
1.56 (0.0614)	32236-01G04
1.62 (0.0638)	32236-01G05
1.68 (0.0661)	32236-01G06
1.74 (0.0685)	32236-01G07

- s. Install selected counter gear rear snap ring.
- t. Install reverse coupling sleeve.
Pay attention to its direction.
- u. Measure each gear end play as a final check — Refer to "DISASSEMBLY".

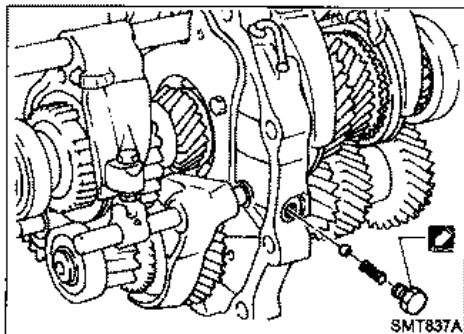


Shift Control Components

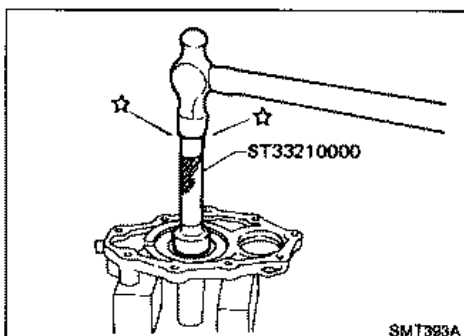
1. Install O.D. fork rod and O.D. shift fork. Then install retaining pin into O.D. shift fork.
2. Install 1st & 2nd, 3rd & 4th and reverse shift forks onto coupling sleeve.
3. Install striking rod into hole of shift forks, striking lever and interlock and then install retaining pin into striking lever.
Make sure that striking rod moves smoothly.

ASSEMBLY

Shift Control Components (Cont'd)

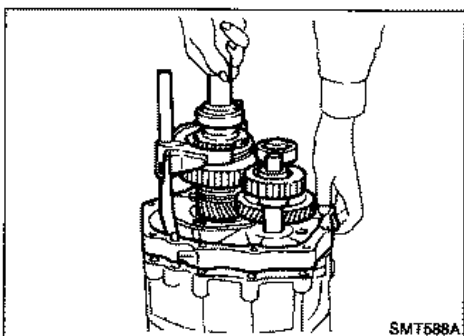


4. Install check ball, return spring and check ball plug.
Apply sealant to thread of check ball plug.

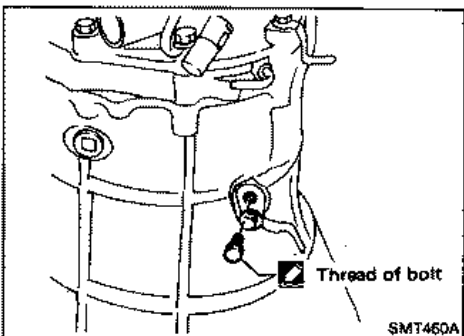


Case Components

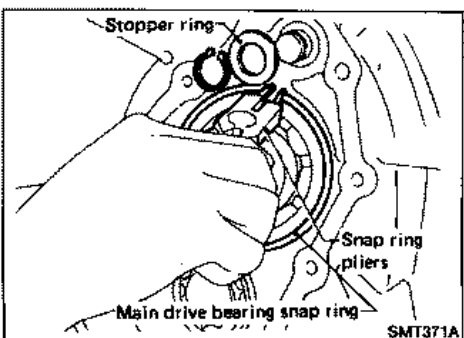
1. Install front cover oil seal.
Apply multi-purpose grease to seal lip.
2. Install selected counter gear front bearing shim onto transmission case.
Apply multi-purpose grease.
3. Apply sealant to mating surface of transmission case.



4. Install gear assembly onto transmission case.
5. Install check spring and check ball into interlock stopper.
Apply multi-purpose grease to check ball.



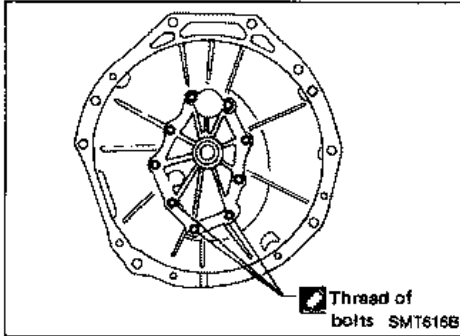
6. Install interlock stopper assembly and then tighten check ball plug.
Apply sealant to thread of check ball plug.



7. Install stopper ring and main drive bearing snap ring.

ASSEMBLY

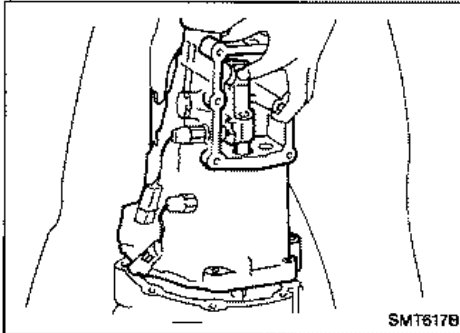
Case Components (Cont'd)



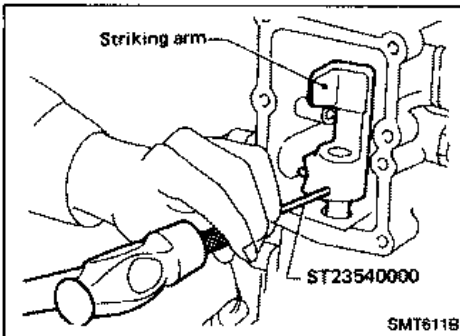
8. Install front cover and gasket.

Apply sealant to thread of 3 bolts shown left.

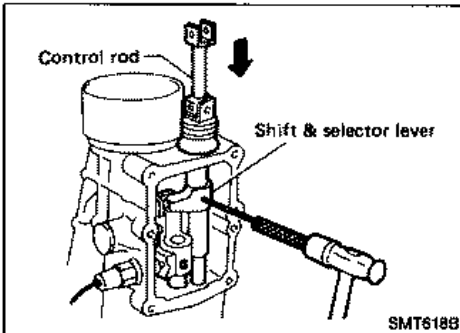
9. Apply sealant to mating surface of adapter plate.



10. Install rear extension together with striking arm.



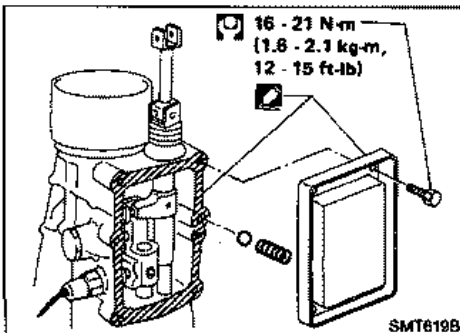
11. Install retaining pin into striking arm.



12. Install control rod.

Be careful not to damage control rod oil seal and dust cover.

13. Install retaining pin into shift & selector lever.



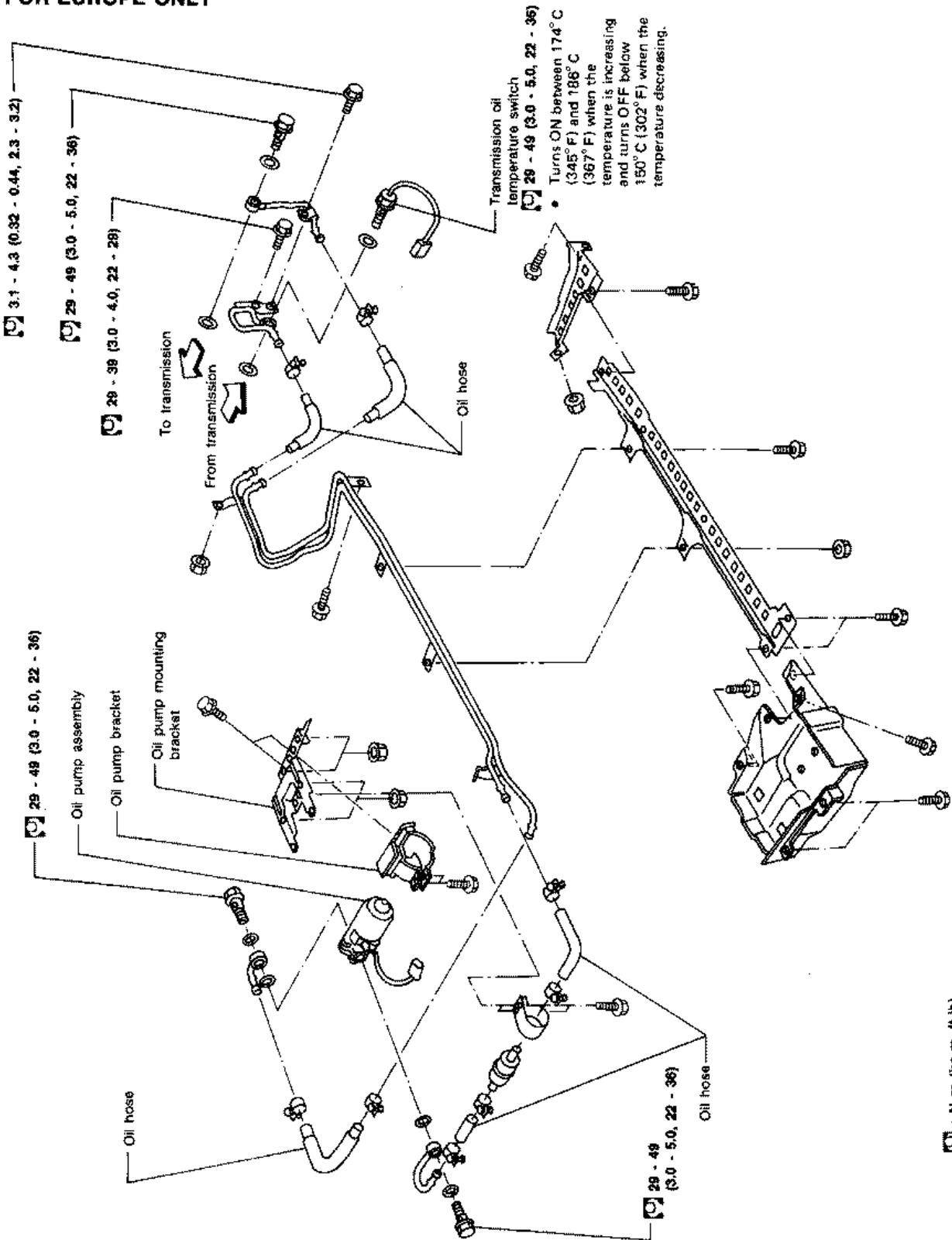
14. Install return spring and check ball and then install control housing.

Apply sealant to mating surface of rear extension.

15. Tighten control housing bolts.

TRANSMISSION OIL COOLER SYSTEM

FOR EUROPE ONLY



: N·m (kg·m, ft·lb)

SMT721B

● For Circuit Diagram, Wiring Diagram and oil pump operation, refer to "DIFFERENTIAL OIL COOLER SYSTEM" in PD section.

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

General Specifications

Engine	VG30DE	VG30DETT
Transmission model	RS5R30A	
Shift pattern		
Synchromesh type	Warner	
Gear ratio		
1st	3.214	
2nd	1.925	
3rd	1.302	
4th	1.000	
O.D.	0.752	
Reverse	3.369	
Number of teeth		
Main drive gear	23	
Main gear		
1st	31	
2nd	30	
3rd	29	
O.D.	24	
Reverse	30	
Counter drive gear	31	
Counter gear		
1st	13	
2nd	21	
3rd	30	
O.D.	43	
Reverse	12	
Reverse idler gear	22	
Oil capacity ℓ (Imp pt)	2.8 (4-7/8)	3.1 (5-1/2)

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Inspection and Adjustment

GEAR END PLAY

Gear	End play mm (in)
1st main gear	0.23 - 0.33 (0.0091 - 0.0130)
2nd main gear	0.23 - 0.33 (0.0091 - 0.0130)
3rd main gear	0.23 - 0.33 (0.0091 - 0.0130)
O.D. counter gear	0.23 - 0.33 (0.0091 - 0.0130)
Reverse main gear	0.33 - 0.43 (0.0130 - 0.0169)
Counter gear	0.10 - 0.25 (0.0039 - 0.0098)
Reverse idler gear	0.30 - 0.53 (0.0118 - 0.0209)

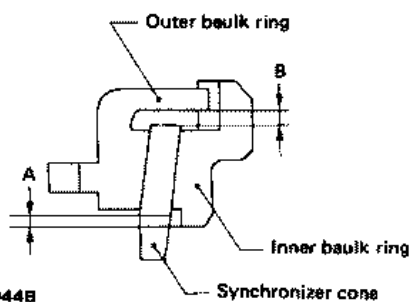
CLEARANCE BETWEEN BAULK RING AND GEAR

1st, main drive and O.D. baulk ring

Unit: mm (in)

	Standard	Wear limit
1st	1.05 - 1.3 (0.0413 - 0.0512)	0.7 (0.028)
Main drive	1.05 - 1.3 (0.0413 - 0.0512)	0.7 (0.028)
O.D.	1.05 - 1.3 (0.0413 - 0.0512)	0.7 (0.028)

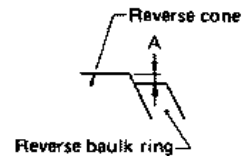
2nd and 3rd baulk ring



Unit: mm (in)

Dimension	Standard	Wear limit
A	0.6 - 1.1 (0.024 - 0.043)	0.2 (0.008)
B	0.7 - 0.9 (0.028 - 0.035)	0.2 (0.008)

DISTANCE BETWEEN REAR SURFACE OF REVERSE CONE AND REVERSE BAULK RING



Unit: mm (in)

	Standard	Wear limit
Dimension "A"	-0.1 to 0.35 (-0.0039 to 0.0138)	0.7 (0.028)

AVAILABLE SNAP RING

Main drive gear snap ring

Allowable clearance		0 - 0.1 mm (0 - 0.004 in)
Thickness mm (in)	Part number	
1.89 (0.0744)	32204-01G00	
1.98 (0.0780)	32204-01G01	
2.05 (0.0807)	32204-01G02	
2.12 (0.0835)	32204-01G03	
2.19 (0.0862)	32204-01G04	

Mainshaft front snap ring

Allowable clearance		0 - 0.1 mm (0 - 0.004 in)
Thickness mm (in)	Part number	
1.89 (0.0744)	32204-01G00	
1.98 (0.0780)	32204-01G01	
2.05 (0.0807)	32204-01G02	
2.12 (0.0835)	32204-01G03	
2.19 (0.0862)	32204-01G04	

Counter gear rear snap ring

Allowable clearance		0 - 0.1 mm (0 - 0.004 in)
Thickness mm (in)	Part number	
1.26 (0.0496)	32236-01G08	
1.32 (0.0520)	32236-01G00	
1.38 (0.0543)	32236-01G01	
1.44 (0.0567)	32236-01G02	
1.50 (0.0591)	32236-01G03	
1.56 (0.0614)	32236-01G04	
1.62 (0.0638)	32236-01G05	
1.68 (0.0661)	32236-01G06	
1.74 (0.0685)	32236-01G07	

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Inspection and Adjustment (Cont'd)

AVAILABLE C-RING

Mainshaft C-ring

Allowable clearance		0 - 0.1 mm (0 - 0.004 in)	
Thickness mm (in)	Part number	Thickness mm (in)	Part number
2.63 (0.1035)	32348-01G15	3.19 (0.1256)	32348-01G07
2.70 (0.1063)	32348-01G00	3.26 (0.1283)	32348-01G08
2.77 (0.1081)	32348-01G01	3.33 (0.1311)	32348-01G09
2.84 (0.1118)	32348-01G02	3.40 (0.1339)	32348-01G10
2.91 (0.1146)	32348-01G03	3.47 (0.1366)	32348-01G11
2.98 (0.1173)	32348-01G04	3.54 (0.1394)	32348-01G12
3.05 (0.1201)	32348-01G05	3.61 (0.1421)	32348-01G13
3.12 (0.1228)	32348-01G06	3.68 (0.1449)	32348-01G14

AVAILABLE SHIM AND WASHER

Table for selecting proper counter gear front bearing shim

Dial indicator deflection mm (in)	Thickness of proper washer mm (in)	Part number
0.93 - 1.02 (0.0366 - 0.0402)	0.8 (0.031)	32218-01G00
1.03 - 1.12 (0.0406 - 0.0441)	0.9 (0.035)	32218-01G01
1.13 - 1.22 (0.0445 - 0.0480)	1.0 (0.039)	32218-01G02
1.23 - 1.32 (0.0484 - 0.0520)	1.1 (0.043)	32218-01G03
1.33 - 1.42 (0.0524 - 0.0559)	1.2 (0.047)	32218-01G04
1.43 - 1.52 (0.0563 - 0.0598)	1.3 (0.051)	32218-01G05
1.53 - 1.62 (0.0602 - 0.0638)	1.4 (0.055)	32218-01G06

Reverse idler thrust washer

Thickness mm (in)	Part number
1.97 (0.0776)	32284-01G10
2.07 (0.0815)	32284-01G11

AUTOMATIC TRANSMISSION

SECTION **AT**

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AT

When you read wiring diagrams:

- Read GI section, "HOW TO READ WIRING DIAGRAMS".
- See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.


When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES".

PREPARATION

SPECIAL SERVICE TOOLS

Tool number Tool name	Description	
ST2505S001 Oil pressure gauge set ① ST25051001 Oil pressure gauge ② ST25052000 Hose ③ ST25053000 Joint pipe ④ ST25054000 Adapter ⑤ ST25055000 Adapter		Measuring line pressure
KV31101201 Oil pressure gauge adapter		Measuring line pressure
ST07870000 Transmission case stand		Disassembling and assembling A/T
KV31102100 Torque converter one-way clutch check tool		Checking one-way clutch in torque converter
ST25850000 Sliding hammer		Removing oil pump assembly
KV31102400 Clutch spring compressor		Removing and installing clutch return springs
ST33200000 Drift		Installing oil pump housing oil seal Installing rear oil seal (RE4R01A) a: 60 mm (2.36 in) dia. b: 44.5 mm (1.752 in) dia.

PREPARATION

Tool number Tool name	Description
ST30720000 Drift	 <p>Installing rear oil seal (RE4R03A) a: 77 mm (3.03 in) dia. b: 55.5 mm (2.185 in) dia.</p>

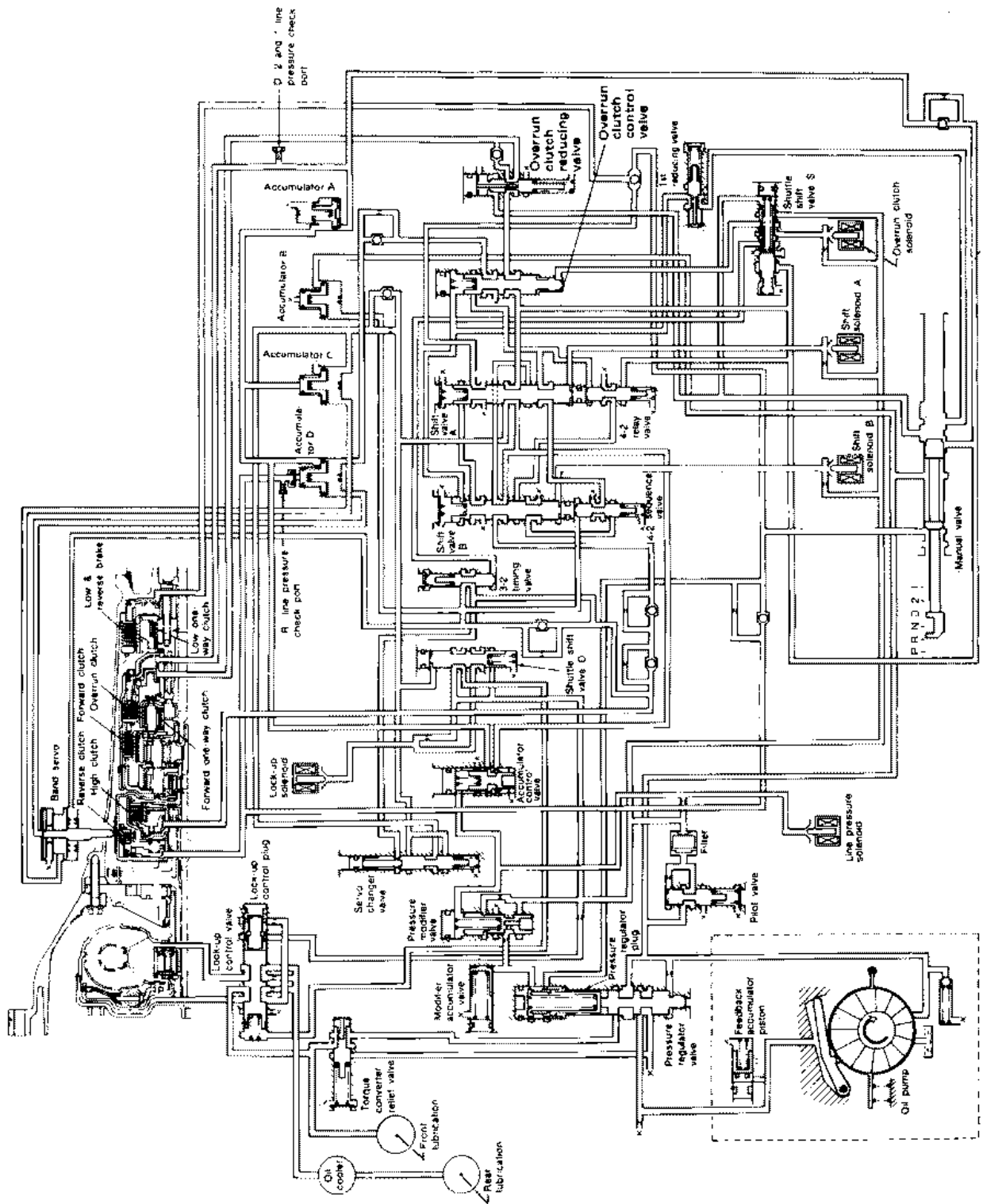
PRECAUTIONS

Service Notice

- Before proceeding with disassembly, thoroughly clean the outside of the transmission. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
- Disassembly should be done in a clean work area.
- Use lint-free cloth or towels for wiping parts clean. Common shop rags can leave fibers that could interfere with the operation of the transmission.
- When disassembling parts, place them in order in a parts rack so that they can be put back into the unit in their proper positions.
- All parts should be carefully cleaned with a general purpose, non-flammable solvent before inspection or reassembly.
- Gaskets, seals and O-rings should be replaced any time the transmission is disassembled.
- It is very important to perform functional tests whenever they are indicated.
- The valve body contains precision parts and requires extreme care when parts are removed and serviced. Place removed parts in order on a parts rack so they can be put back in the valve body in the same positions and sequences. Care will also prevent springs and small parts from becoming scattered or lost.
- Properly installed valves, sleeves, plugs, etc. will slide along their bores in the valve body under their own weight.
- Before assembly, apply a coat of recommended A.T.F. to all parts. Petroleum jelly may be applied to O-rings and seals and used to hold small bearings and washers in place during reassembly. Do not use grease.
- Extreme care should be taken to avoid damage to O-rings, seals and gaskets when assembling.
- After overhaul, refill the transmission with new A.T.F.

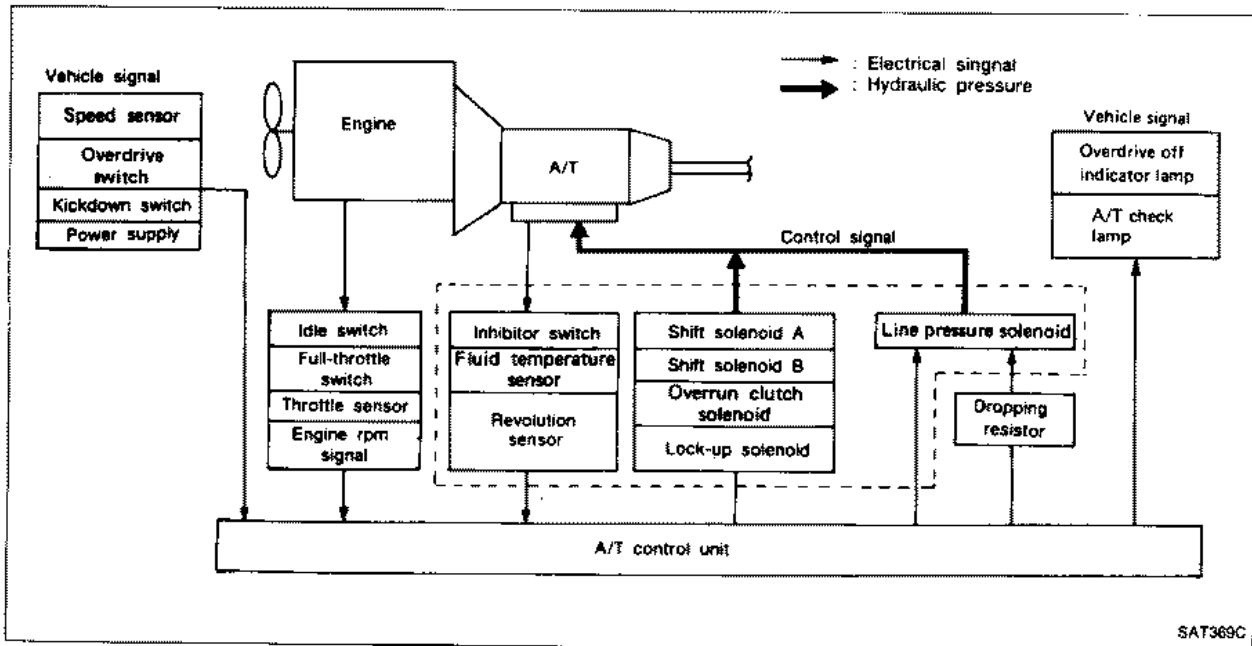
A/T CONTROL DIAGRAM

Hydraulic Control Circuits



A/T CONTROL DIAGRAM

Electrical Control Chart



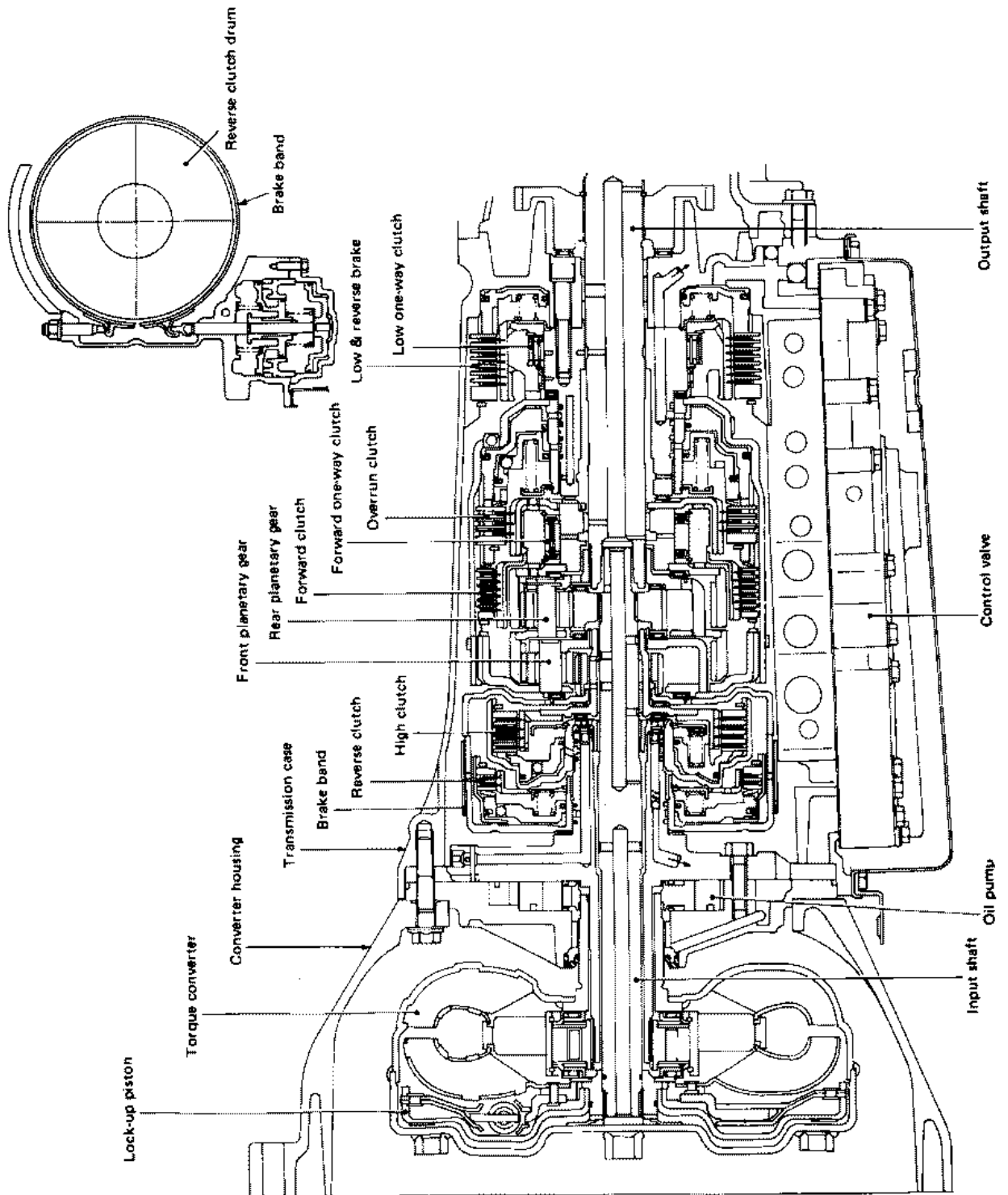
Mechanical Operation

Shift position	Re-verse clutch	High clutch	For-ward clutch	Overrun clutch	Band servo			For-ward one-way clutch	Low one-way clutch	Low & reverse brake	Lock-up	Remarks
					2nd apply	3rd release	4th apply					
P												PARK
R	○									○		REVERSE
N												NEUTRAL
D *4	1st		○	⊗				●	●			Automatic shift 1 ↔ 2 ↔ 3 ↔ 4
	2nd		○	*1 ○	○			●				
	3rd		○	○	*2 ⊗	⊗		●				
	4th		○	⊗	*3 ⊗	⊗	○				○	
2	1st		○	⊗				●	●			Automatic shift 1 ↔ 2
	2nd		○	○	○			●				
1	1st		○	○				●		○		Locks (held stationary) in 1st speed 1 ← 2
	2nd		○	○	○			●				

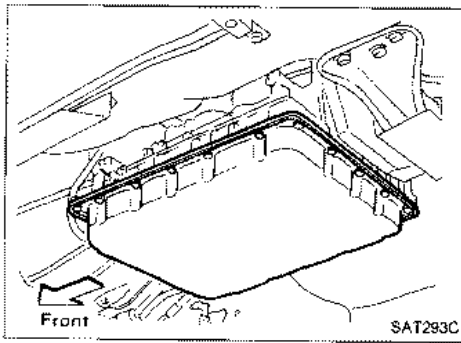
- *1. Operates when overdrive switch is set to "OFF".
 *2. Oil pressure is applied to both 2nd "apply" side and 3rd "release" side of band servo piston. However, because oil pressure area on the "release" side is greater than that on the "apply" side, brake band does not contract.
 *3. Oil pressure is applied to 4th "apply" side in condition *2 above, and brake band contracts.
 *4. A/T will not shift to 4th when overdrive switch is set to "OFF" position.
- : Operates.
 ○ : Operates when throttle opening is less than 1/16. Engine brake activates.
 ● : Operates during "progressive" acceleration.
 ⊗ : Operates but does not affect power transmission.
 ⊗ : Operates when throttle opening is less than 1/16 but does not affect engine brake.

A/T CONTROL DIAGRAM

Cross-Sectional View



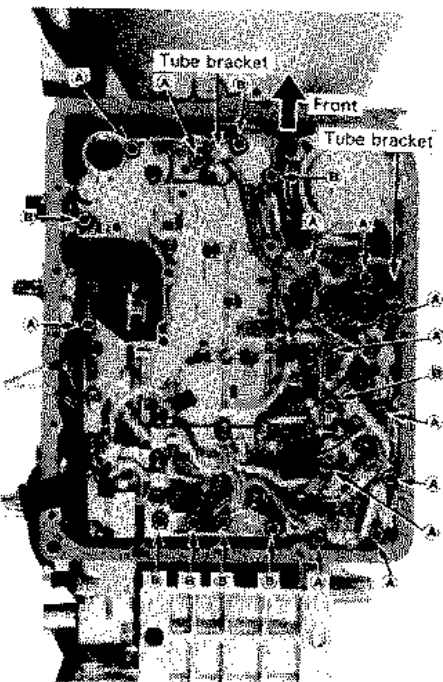
ON-VEHICLE SERVICE



Control Valve Assembly and Accumulators Inspection

1. Remove oil pan and gasket and drain A.T.F.

2. Remove oil strainer.

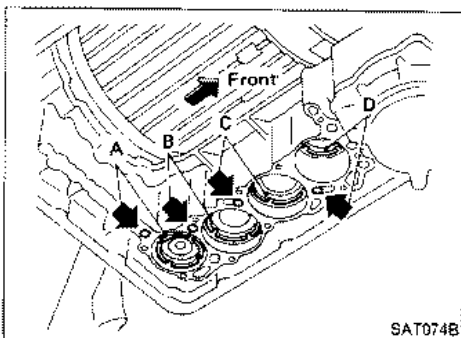


3. Remove control valve assembly by removing fixing bolts and disconnecting harness connector.

Bolt length and location

Bolt symbol	ℓ mm (in)
Ⓐ	33 (1.30)
Ⓑ	45 (1.77)

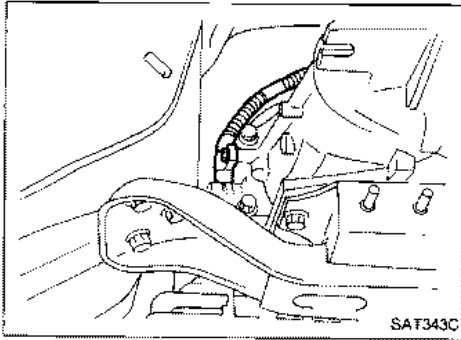
4. Remove solenoids and valves from valve body if necessary.
5. Remove terminal cord assembly if necessary.



6. Remove accumulators A, B, C and D by applying compressed air if necessary.

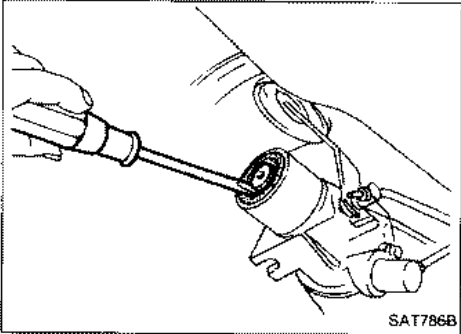
- Hold each piston with rag.
7. Reinstall any part removed.
- Always use new sealing parts.

ON-VEHICLE SERVICE



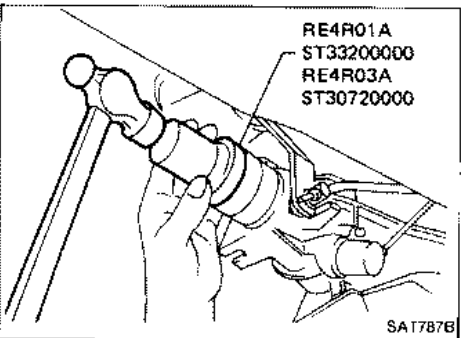
Revolution Sensor Replacement

1. Remove exhaust tube.
 2. Remove revolution sensor from A/T assembly.
 3. Reinstall any part removed.
- **Always use new sealing parts.**

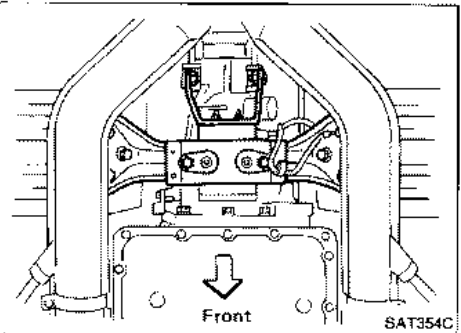


Rear Oil Seal Replacement

1. Remove propeller shaft from vehicle. — Refer to section PD.
2. Remove rear oil seal.

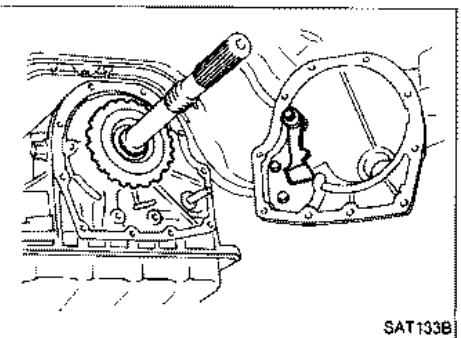


3. Install rear oil seal.
 4. Reinstall any part removed.
- **Apply A.T.F. before installing.**



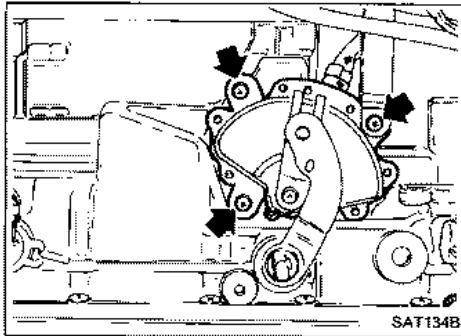
Parking Components Inspection

1. Remove exhaust tube.
2. Remove propeller shaft from vehicle. — Refer to section PD.
3. Remove rear engine mounting member from A/T assembly while supporting A/T with jack.



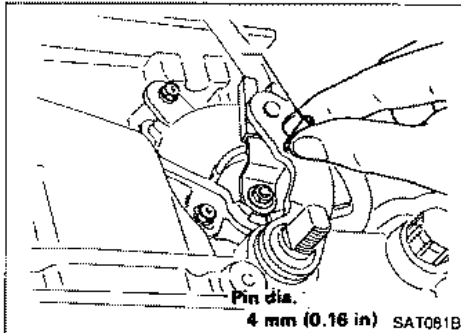
4. Remove rear extension from transmission case.
 5. Replace parking components if necessary.
 6. Reinstall any part removed.
- **Always use new sealing parts.**

ON-VEHICLE SERVICE

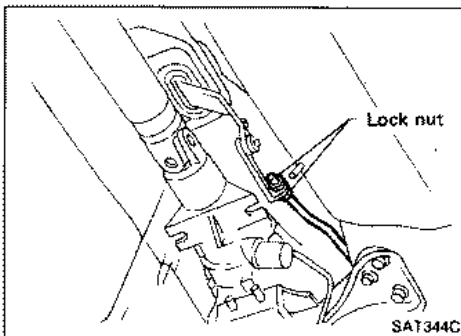


Inhibitor Switch Adjustment

1. Remove manual control linkage from manual shaft of A/T assembly.
2. Set manual shaft of A/T assembly in "N" position.
3. Loosen inhibitor switch fixing bolts.



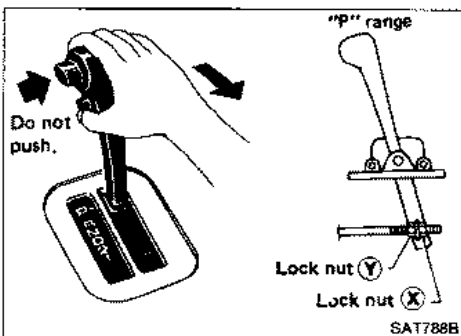
4. Insert pin into adjustment holes in both inhibitor switch and manual shaft of A/T assembly as near vertical as possible.
5. Reinstall any part removed.
6. Check continuity of inhibitor switch. — Refer to "Electrical Components Inspection".



Manual Control Linkage Adjustment

Move selector lever from "P" range to "1" range. You should be able to feel the detents in each range. If the detents cannot be felt or the pointer indicating the range is improperly aligned, the linkage needs adjustment.

1. Place selector lever in "P" range.
2. Loosen lock nuts.



3. Tighten lock nut (X) until it touches trunnion pulling selector lever toward "R" range side without pushing button.
4. Back off lock nut (X) 1 turn and tighten lock nut (Y) to the specified torque.

Lock nut:

Y : 11 - 15 N·m (1.1 - 1.5 kg·m, 8 - 11 ft·lb)

5. Move selector lever from "P" range to "1" range. Make sure that selector lever can move smoothly.

ON-VEHICLE SERVICE

NOTE

TROUBLE DIAGNOSES

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Diagnostic Procedure 12 (SYMPTOM: A/T does not perform lock-up at the specified speed.)	AT- 76

TROUBLE DIAGNOSES

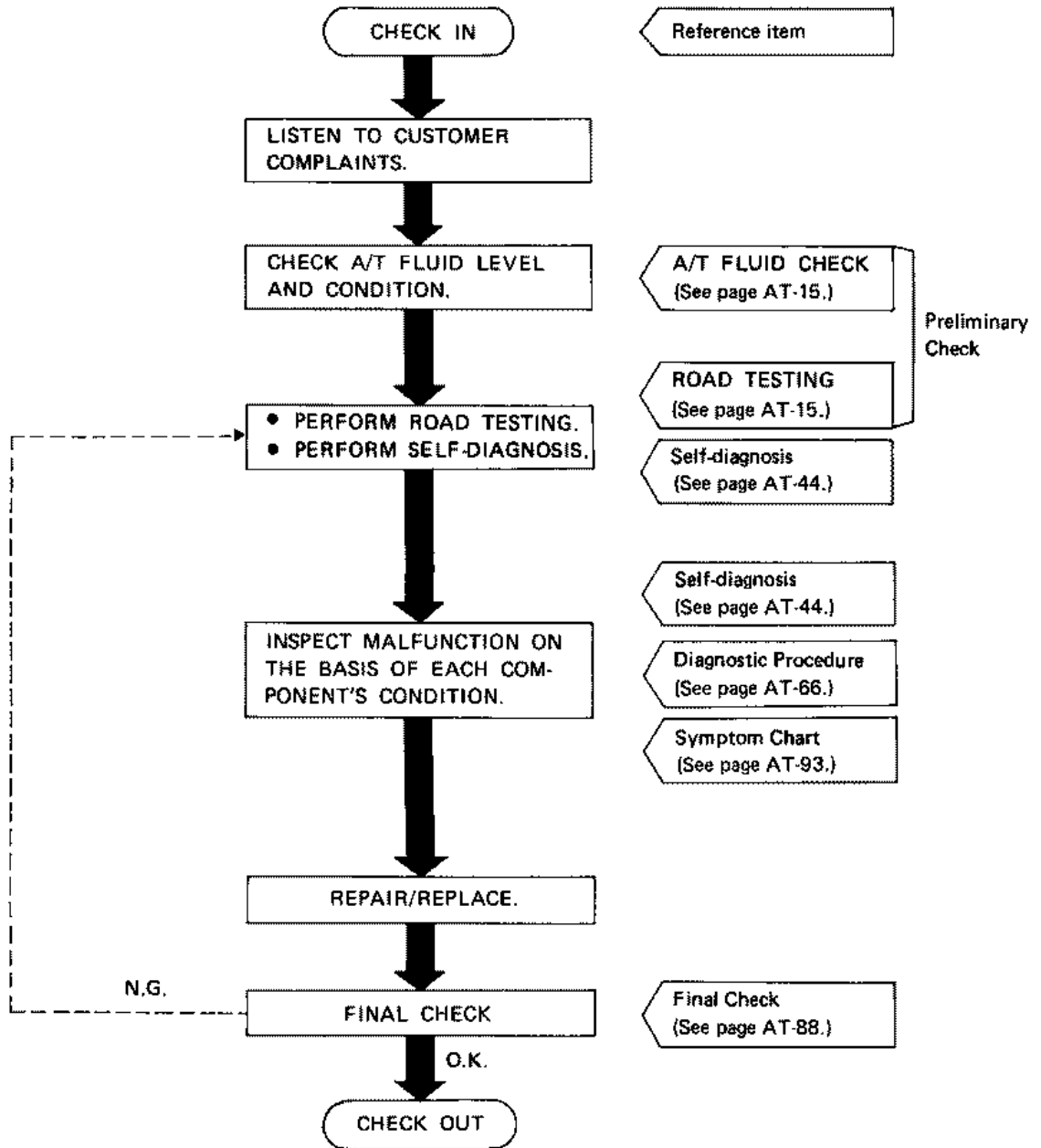
Contents (Cont'd)

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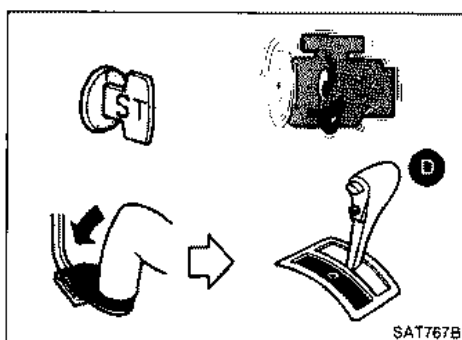
TROUBLE DIAGNOSES

How to Perform Trouble Diagnoses for Quick and Accurate Repair

WORK FLOW



TROUBLE DIAGNOSES

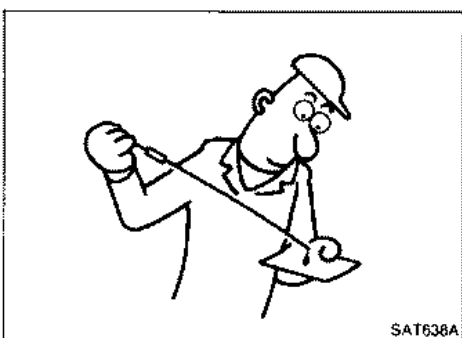
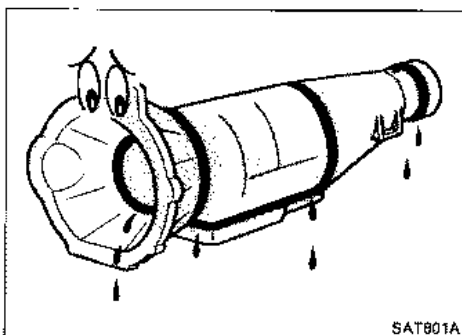


Preliminary Check

A/T FLUID CHECK

Fluid leakage check

1. Clean area suspected of leaking, — for example, mating surface of converter housing and transmission case.
2. Start engine, apply foot brake, place selector lever in "D" range and wait a few minutes.
3. Stop engine.
4. Check for fresh leakage.



Fluid condition check

Fluid color	Suspected problem
Dark or black with burned odor	Wear of frictional material
Milky pink	Water contamination — Road water entering through filler tube or breather
Varnished fluid, light to dark brown and tacky	Oxidation — Over or under filling — Overheating

Fluid level check

Refer to section MA.

ROAD TEST PROCEDURE

1. Check before engine is started.



2. Check at idle.



3. Cruise test.

SAT786A

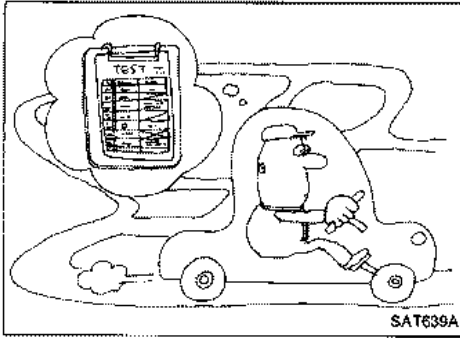
ROAD TESTING

Description

- The purpose of this road test is to determine overall performance of automatic transmission and analyze causes of problems.
- The road test consists of the following three parts:
 1. Check before engine is started
 2. Check at idle
 3. Cruise test

TROUBLE DIAGNOSES

Preliminary Check (Cont'd)

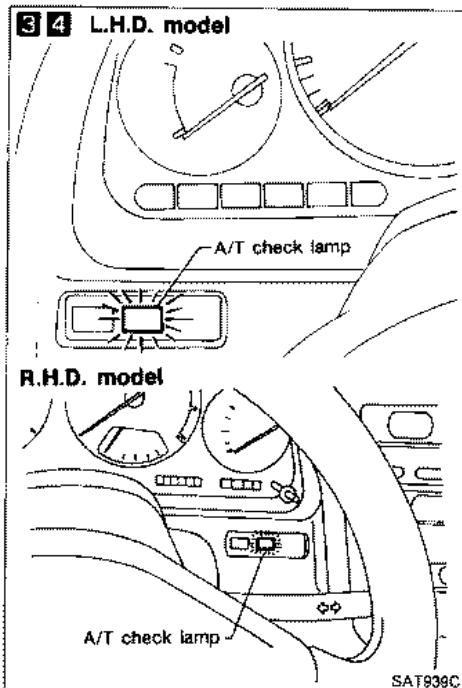
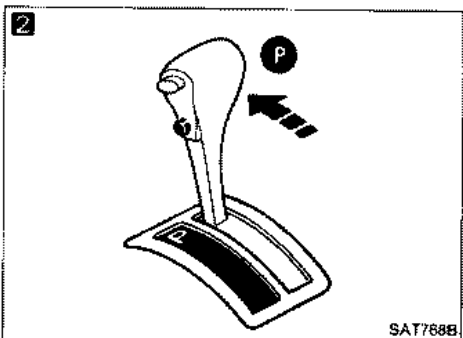
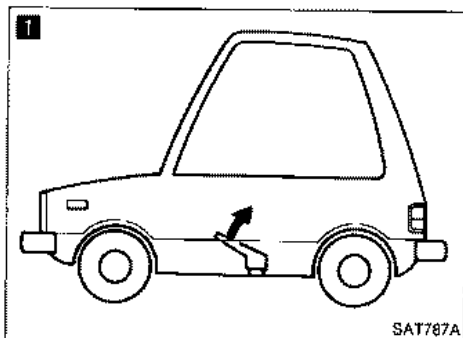


- Before road test, familiarize yourself with all test procedures and items to check.
- Conduct tests on all items. Troubleshoot items which check out No Good after road test. Refer to "Self-diagnosis" and "Diagnostic Procedure".

TROUBLE DIAGNOSES

Preliminary Check (Cont'd)

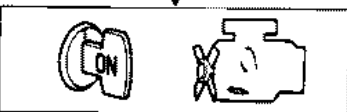
1. Check before engine is started



1
Park vehicle on flat surface.



2
Move selector lever to "P" range.

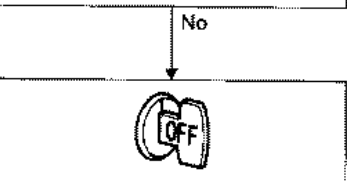


3
Does A/T check lamp come on for about 2 seconds?

No → Go to Diagnostic Procedure 1.

Yes
4
Does A/T check lamp flicker for about 8 seconds?

Yes → Perform self-diagnosis.
— Refer to SELF-DIAGNOSIS PROCEDURE.

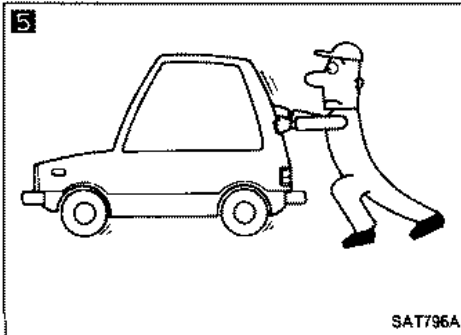
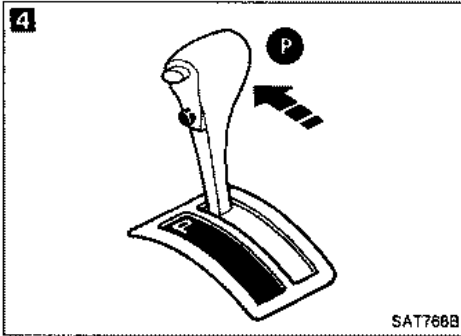
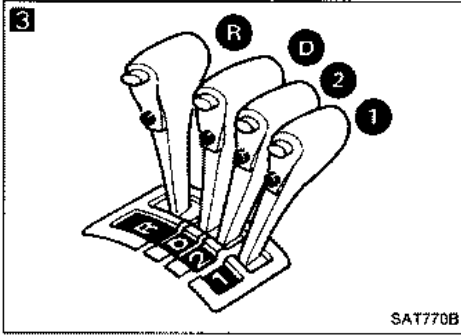
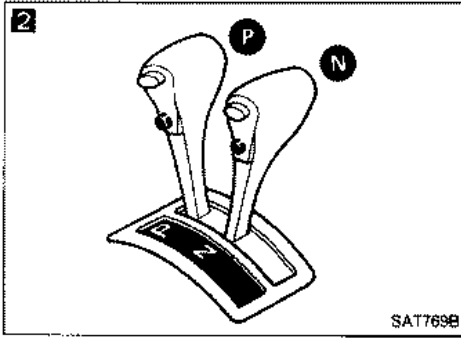
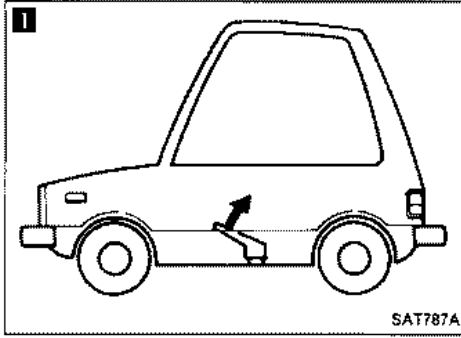


Perform self-diagnosis.
— Refer to SELF-DIAGNOSIS PROCEDURE and note N.G. items.

Go to "ROAD TESTING — 2. Check at idle".

TROUBLE DIAGNOSES

Preliminary Check (Cont'd)

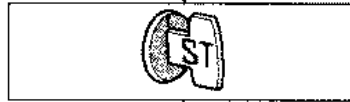


2. Check at idle

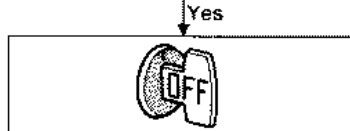
1 Park vehicle on flat surface.



2 Move selector lever to "P" or "N" range.



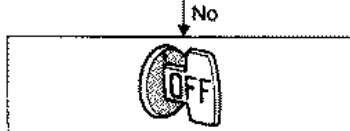
Is engine started? No → Go to Diagnostic Procedure 2.



3 Move selector lever to "D", "1", "2" or "R" range.



Is engine started? Yes → Go to Diagnostic Procedure 2.



4 Move selector lever to "P" range.



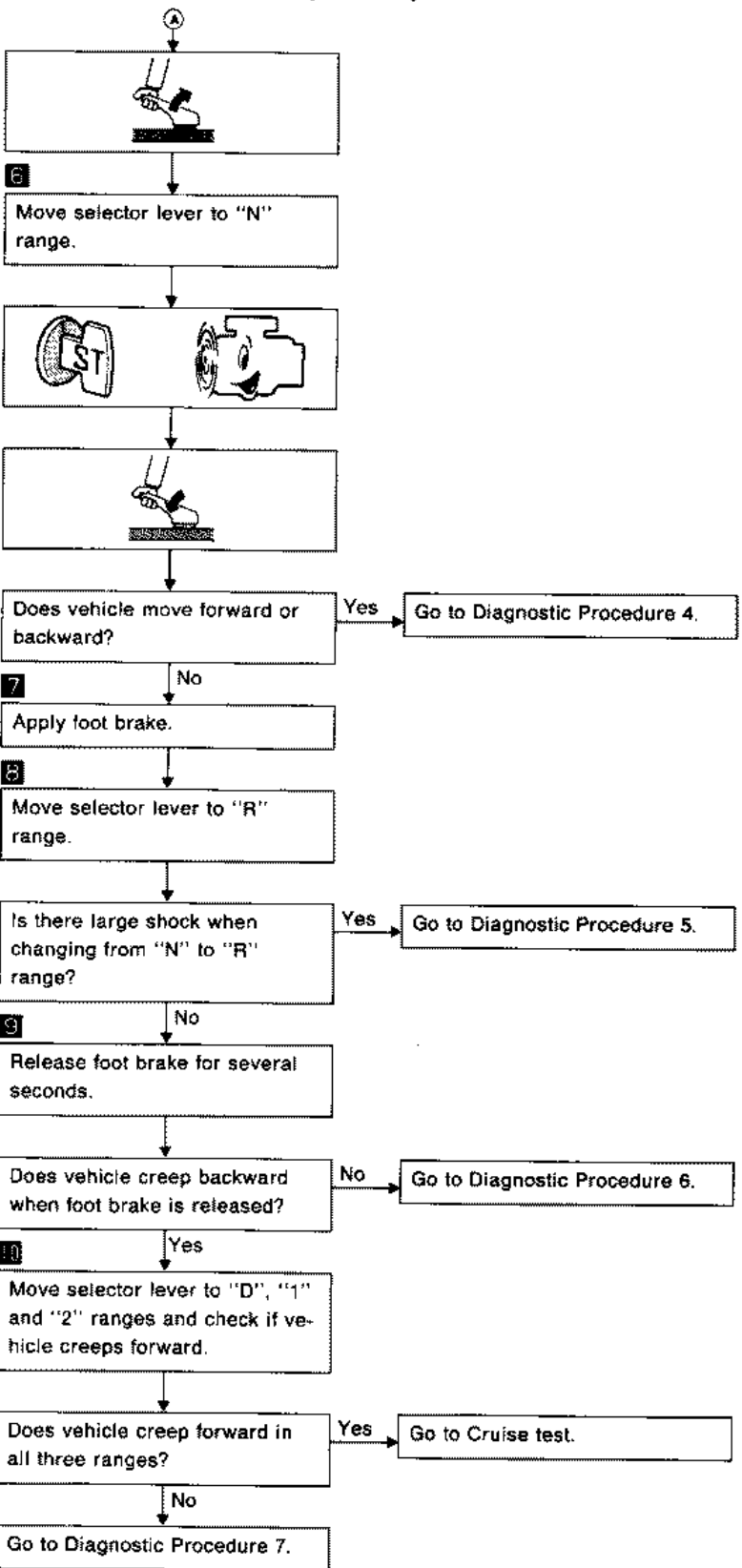
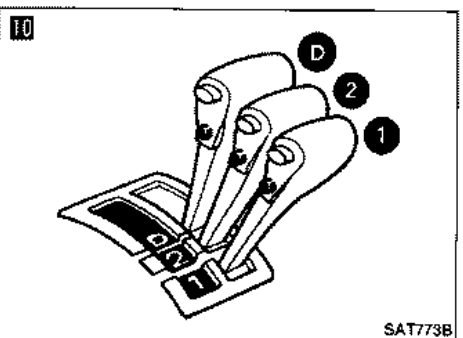
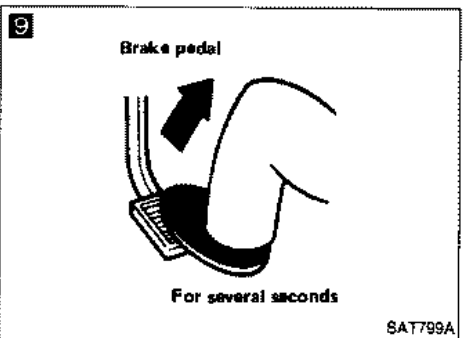
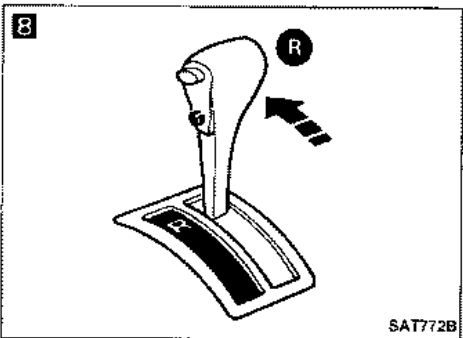
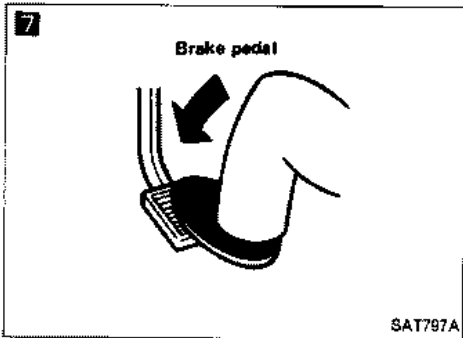
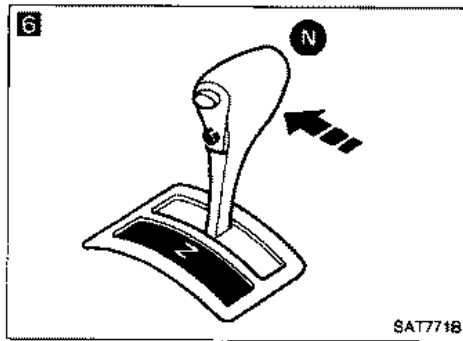
5 Push vehicle forward or backward.

Does vehicle move when it is pushed forward or backward? Yes → Go to Diagnostic Procedure 3.

No → A

TROUBLE DIAGNOSES

Preliminary Check (Cont'd)



TROUBLE DIAGNOSES

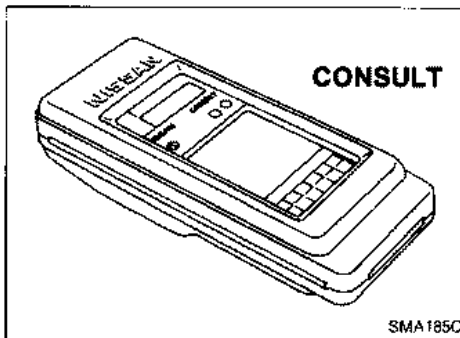
Preliminary Check (Cont'd)

3. Cruise test



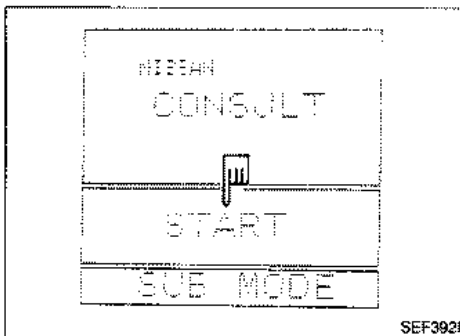
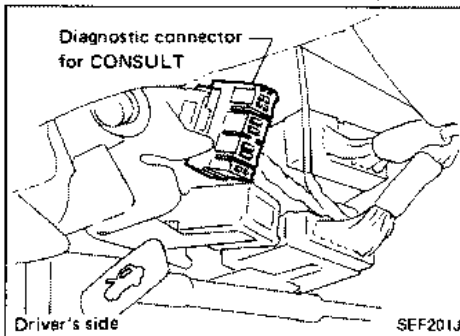
With CONSULT

- Using CONSULT, conduct a cruise test and record the result.
- Print the result and ensure that shifts and lock-ups take place as per "Shift Schedule."
- Check all items listed in Parts 1 through 3.

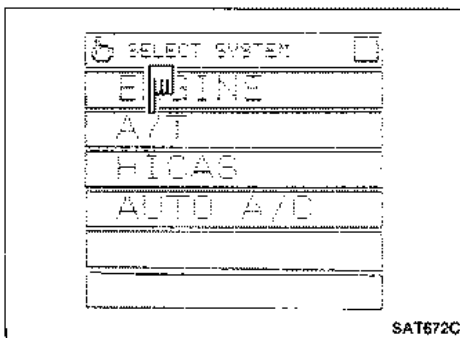


CONSULT setting procedure

1. Turn off ignition switch.
2. Connect "CONSULT" to diagnostic connector. (Diagnostic connector is located in left dash side panel.)



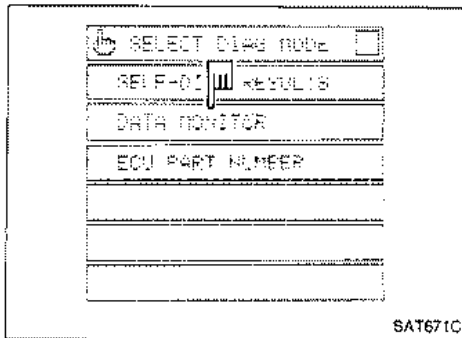
3. Turn on ignition switch.
4. Touch "START".



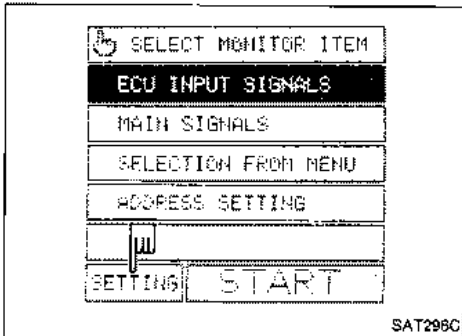
5. Touch "A/T".

TROUBLE DIAGNOSES

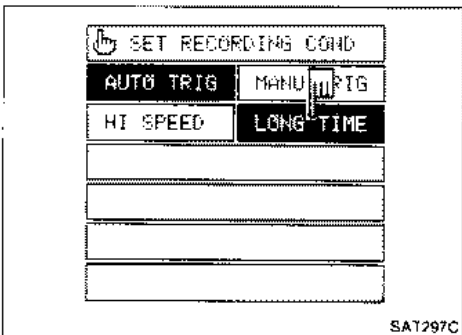
Preliminary Check (Cont'd)



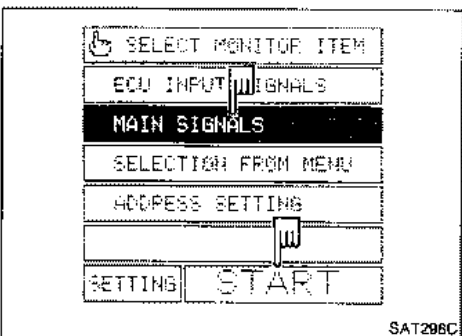
6. Touch "DATA MONITOR".



7. Touch "SETTING" to set recording condition.

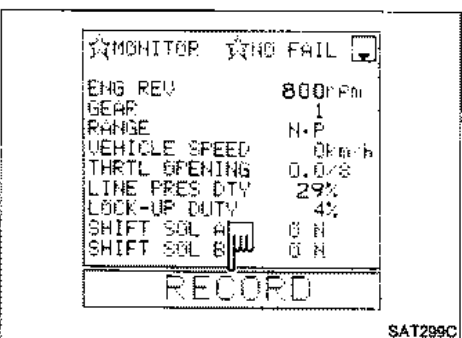


8. Touch "LONG TIME" and "ENTER" key.



9. Go back to SELECT MONITOR ITEM and touch "MAIN SIGNALS".

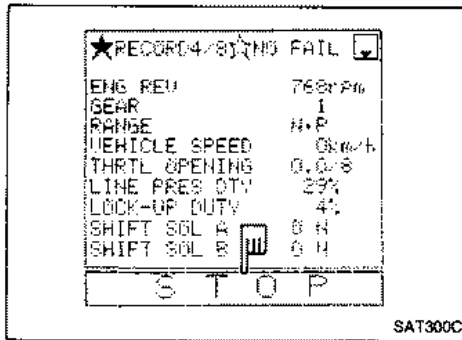
10. Touch "START".



11. When performing cruise test, touch "RECORD".

TROUBLE DIAGNOSES

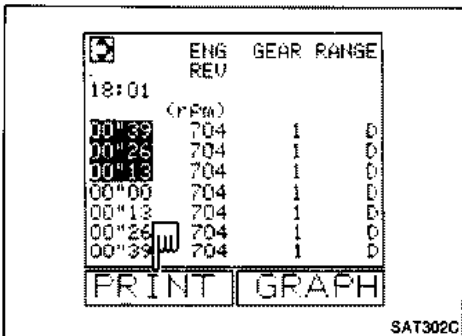
Preliminary Check (Cont'd)



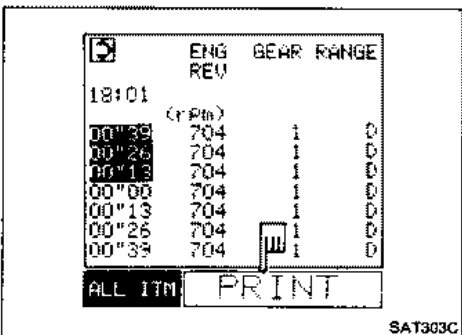
12. After finishing cruise test part 1, touch "STOP".



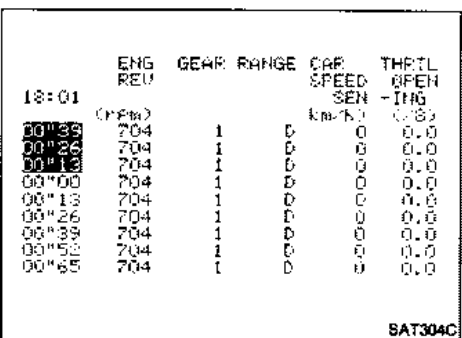
13. Touch "DISPLAY".



14. Touch "PRINT".



15. Touch "PRINT" again.

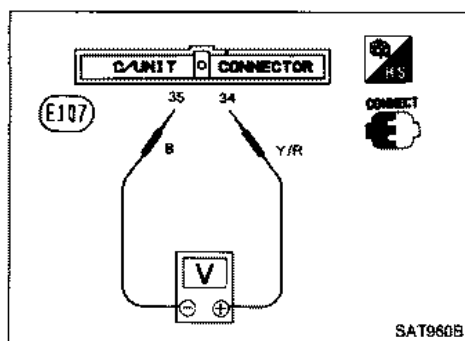


16. Check the monitor data printed out.

17. Continue cruise test part 2 and 3.

TROUBLE DIAGNOSES

Preliminary Check (Cont'd)



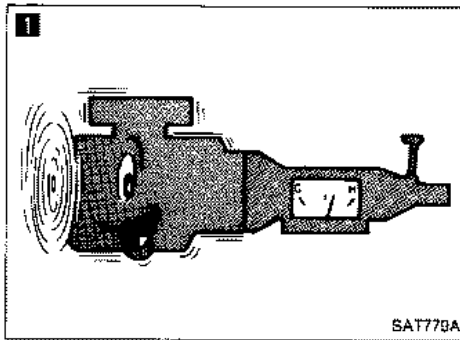
Without CONSULT

- Throttle position can be controlled by voltage across terminals 34 and 35 of A/T control unit.

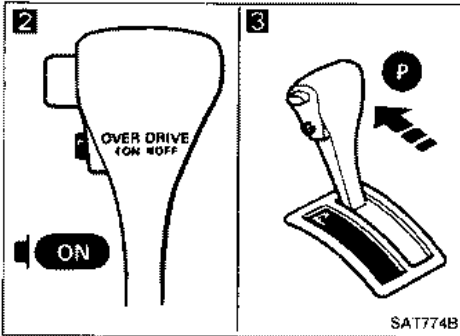
TROUBLE DIAGNOSES

Preliminary Check (Cont'd)

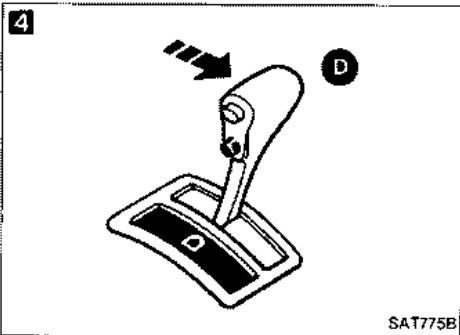
Cruise test — Part 1



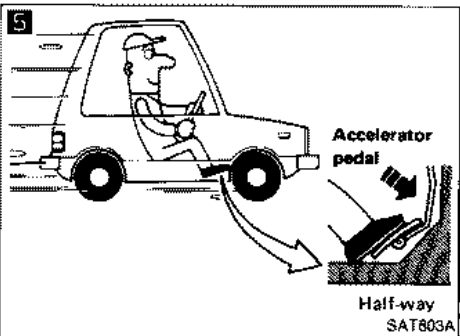
1
Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.
A.T.F. operating temperature:
50 - 80°C (122 - 176°F)



Park vehicle on flat surface.
2 Set overdrive switch in "ON" position.
3 Move selector lever to "P" range.



4 Move selector lever to "D" range.
5 Accelerate vehicle to half throttle.



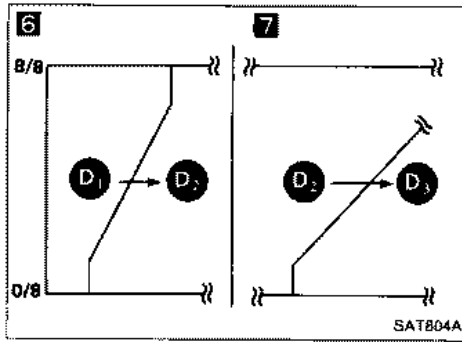
Does vehicle start from D₁?
Read gear position.

No → Go to Diagnostic Procedure 8.

Yes
↓
A

TROUBLE DIAGNOSES

Preliminary Check (Cont'd)



6

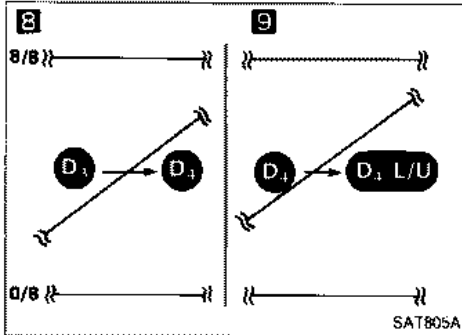
Does A/T shift from D₁ to D₂ at the specified speed?

Read gear position, throttle opening and vehicle speed.

Specified speed when shifting from D₁ to D₂:
Refer to Shift schedule.

No → Go to Diagnostic Procedure 9.

Yes →



7

Does A/T shift from D₂ to D₃ at the specified speed?

Read gear position, throttle opening and vehicle speed.

Specified speed when shifting from D₂ to D₃:
Refer to Shift schedule.

No → Go to Diagnostic Procedure 10.

Yes →

8

Does A/T shift from D₃ to D₄ at the specified speed?

Read gear position, throttle opening and vehicle speed.

Specified speed when shifting from D₃ to D₄:
Refer to Shift schedule.

No → Go to Diagnostic Procedure 11.

Yes →

9

Does A/T perform lock-up at the specified speed?

Read vehicle speed, throttle opening when lock-up duty becomes 94%.

Specified speed when lock-up occurs:
Refer to Shift schedule.

No → Go to Diagnostic Procedure 12.

Yes →

Does A/T hold lock-up condition for more than 30 seconds?

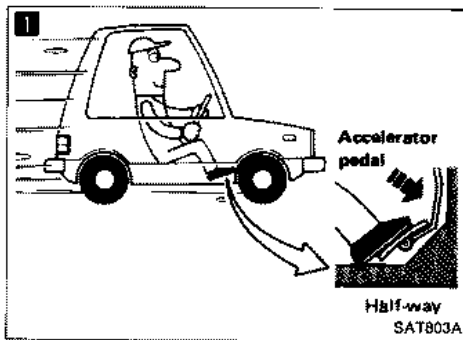
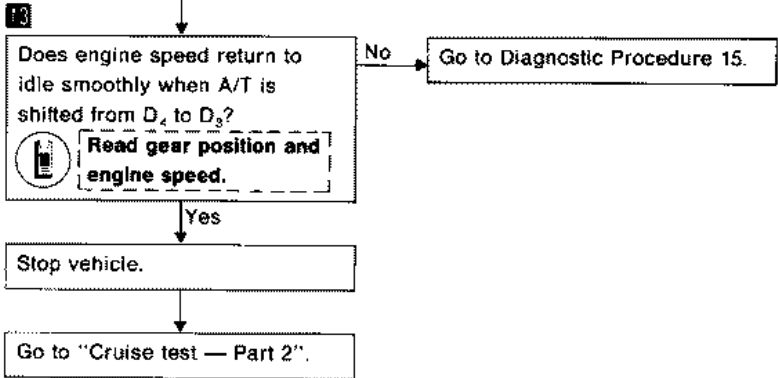
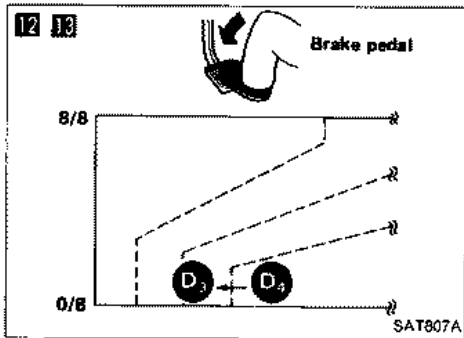
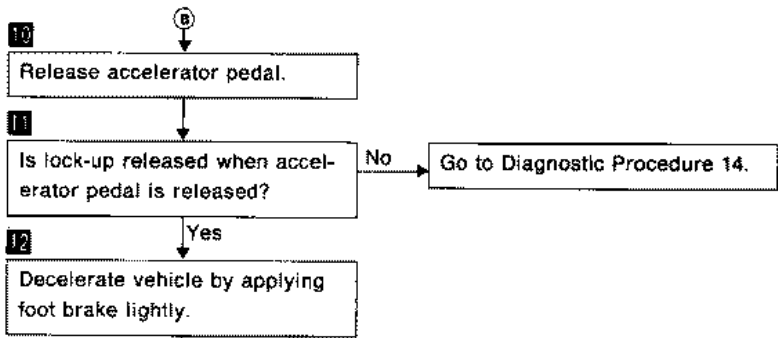
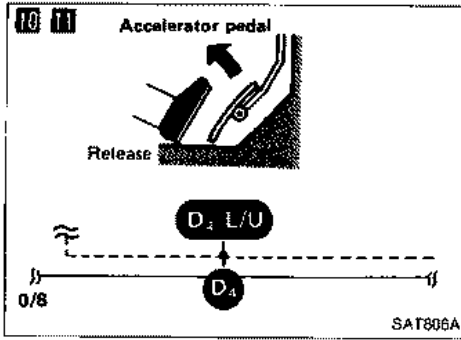
No → Go to Diagnostic Procedure 13.

Yes →

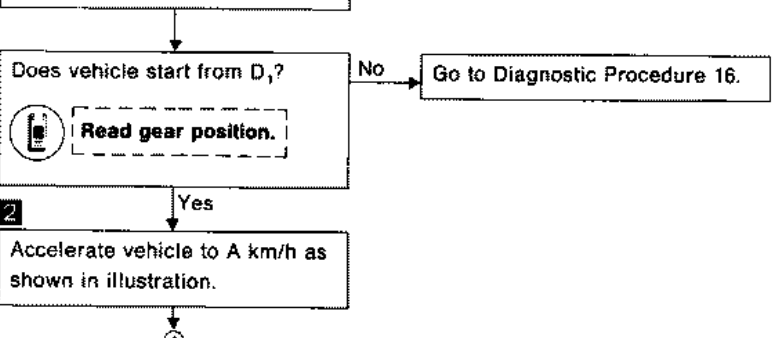
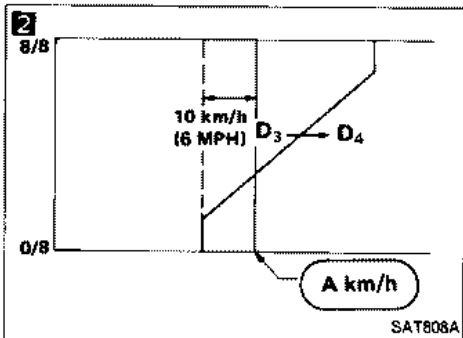
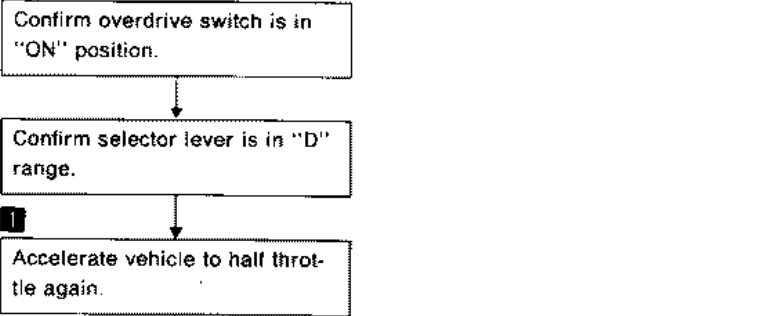
8

TROUBLE DIAGNOSES

Preliminary Check (Cont'd)

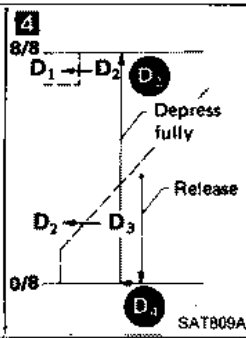
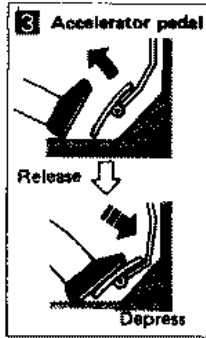


Cruise test — Part 2



TROUBLE DIAGNOSES

Preliminary Check (Cont'd)



3

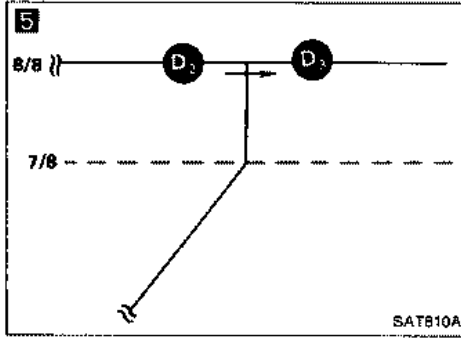
Release accelerator pedal and then quickly depress it fully.

4

Does A/T shift from D₁ to D₂ as soon as accelerator pedal is depressed fully?

Read gear position and throttle opening.

No → Go to Diagnostic Procedure 9.



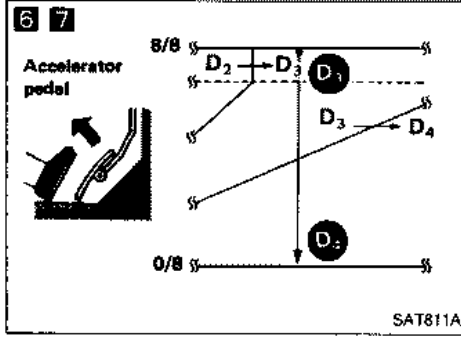
5

Does A/T shift from D₂ to D₃ at the specified speed?

Read gear position, throttle opening and vehicle speed.

Specified speed when shifting from D₂ to D₃: Refer to Shift schedule.

No → Go to Diagnostic Procedure 10.



6

Release accelerator pedal after shifting from D₂ to D₃.

7

Does A/T shift from D₃ to D₄ and does vehicle decelerate by engine brake?

Read gear position, throttle opening and vehicle speed.

No → Go to Diagnostic Procedure 11.

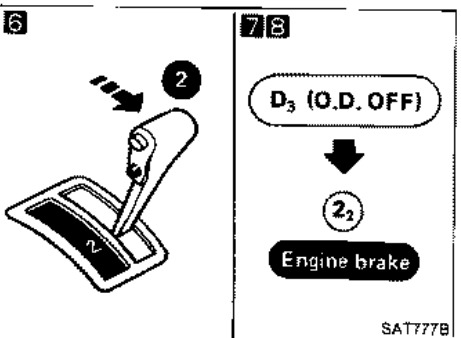
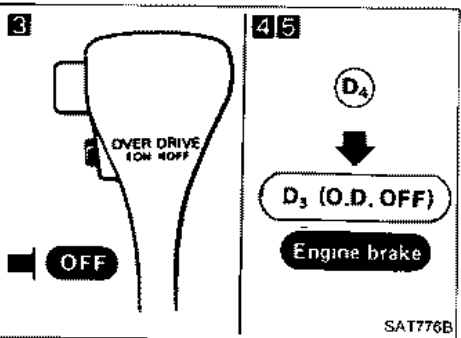
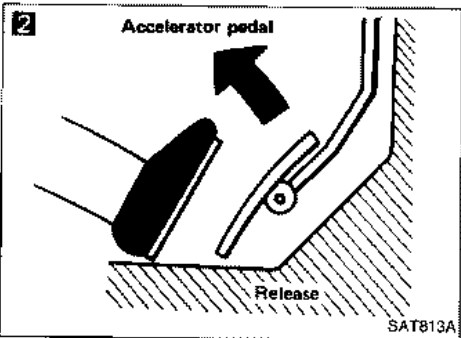
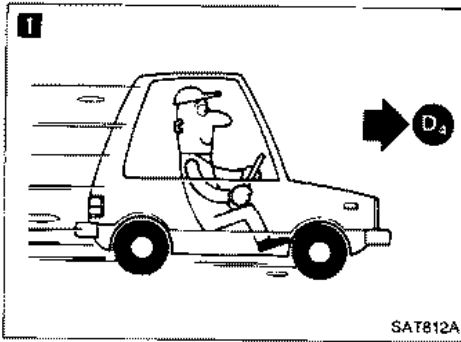
Stop vehicle.

Go to "Cruise test — Part 3".

TROUBLE DIAGNOSES

Preliminary Check (Cont'd)

Cruise test — Part 3



Confirm overdrive switch is in "ON" position.

Confirm selector lever is in "D" range.

1 Accelerate vehicle, using half-throttle, to D₄.

2 Release accelerator pedal.

3 Set overdrive switch in "OFF" position while driving in D₄ range.

4 Does A/T shift from D₄ to D₃?
 Read gear position and vehicle speed.

No → Go to Diagnostic Procedure 17.

5 Does vehicle decelerate by engine brake?

No → Go to Diagnostic Procedure 15.

6 Move selector lever from "D" to "2" range while driving in D₃.

7 Does A/T shift from D₃ to 2₂?
 Read gear position.

No → Go to Diagnostic Procedure 18.

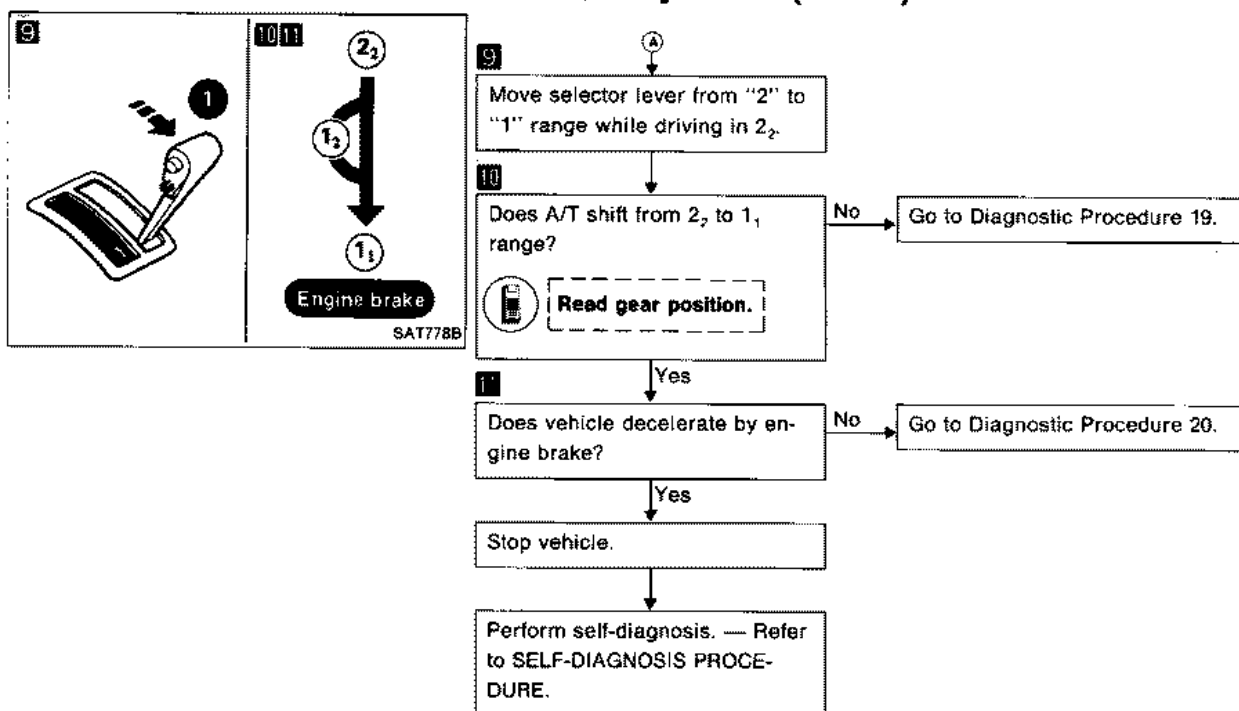
8 Does vehicle decelerate by engine brake?

No → Go to Diagnostic Procedure 15.

Yes → A

TROUBLE DIAGNOSES

Preliminary Check (Cont'd)



TROUBLE DIAGNOSES

Preliminary Check (Cont'd)

Vehicle speed when shifting gears

RE4R01A

Throttle position	Vehicle speed km/h (MPH)					
	D ₁ → D ₂	D ₂ → D ₃	D ₃ → D ₄	D ₄ → D ₅	D ₅ → D ₂	D ₂ → D ₁
Full throttle	50 - 54 (31 - 34)	107 - 115 (66 - 71)	166 - 178 (103 - 109)	161 - 169 (100 - 105)	97 - 105 (60 - 65)	44 - 48 (27 - 30)
Half throttle	45 - 49 (28 - 30)	83 - 89 (52 - 55)	119 - 127 (74 - 79)	80 - 88 (50 - 55)	33 - 39 (21 - 24)	10 - 14 (6 - 9)

RE4R03A

Throttle position	Vehicle speed km/h (MPH)					
	D ₁ → D ₂	D ₂ → D ₃	D ₃ → D ₄	D ₄ → D ₅	D ₅ → D ₂	D ₂ → D ₁
Full throttle	68 - 72 (42 - 45)	120 - 128 (75 - 80)	183 - 193 (114 - 120)	177 - 187 (110 - 116)	111 - 119 (69 - 74)	47 - 51 (29 - 32)
Half throttle	47 - 51 (29 - 32)	89 - 95 (55 - 59)	138 - 144 (85 - 89)	118 - 126 (73 - 78)	79 - 85 (49 - 53)	10 - 14 (6 - 9)

Vehicle speed when performing and releasing lock-up

RE4R01A

Throttle position	O.D. switch [Shift range]	Vehicle speed km/h (MPH)	
		Lock-up "ON"	Lock-up "OFF"
Full throttle	ON [D ₄]	167 - 175 (104 - 109)	161 - 169 (100 - 105)
	OFF [D ₃]	107 - 115 (66 - 71)	97 - 105 (60 - 65)
Half throttle	ON [D ₄]	120 - 128 (75 - 80)	84 - 92 (52 - 57)
	OFF [D ₃]	91 - 99 (57 - 62)	86 - 94 (53 - 58)

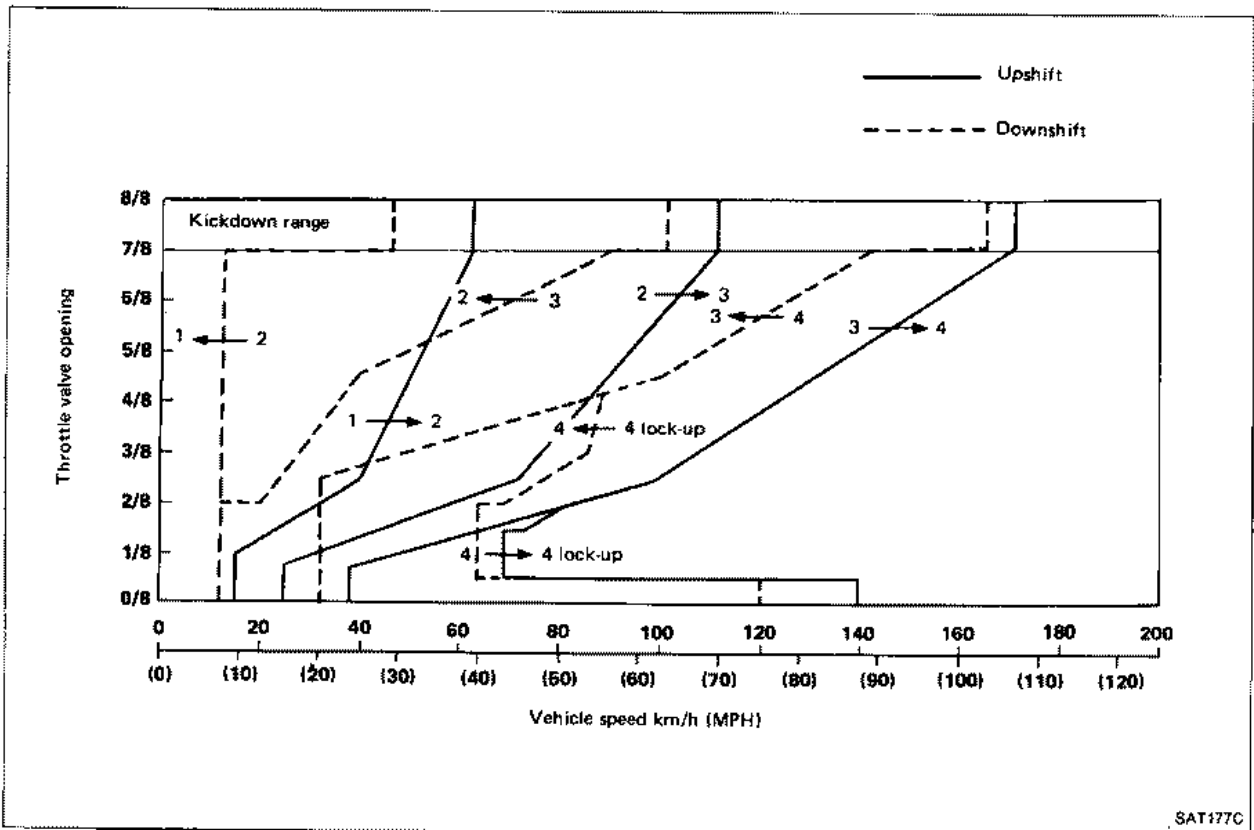
RE4R03A

Throttle position	O.D. switch [Shift range]	Vehicle speed km/h (MPH)	
		Lock-up "ON"	Lock-up "OFF"
Full throttle	ON [D ₄]	184 - 192 (114 - 119)	178 - 186 (111 - 116)
	OFF [D ₃]	120 - 128 (75 - 80)	111 - 119 (69 - 74)
Half throttle	ON [D ₄]	138 - 144 (85 - 89)	117 - 125 (73 - 78)
	OFF [D ₃]	91 - 99 (57 - 62)	86 - 94 (53 - 58)

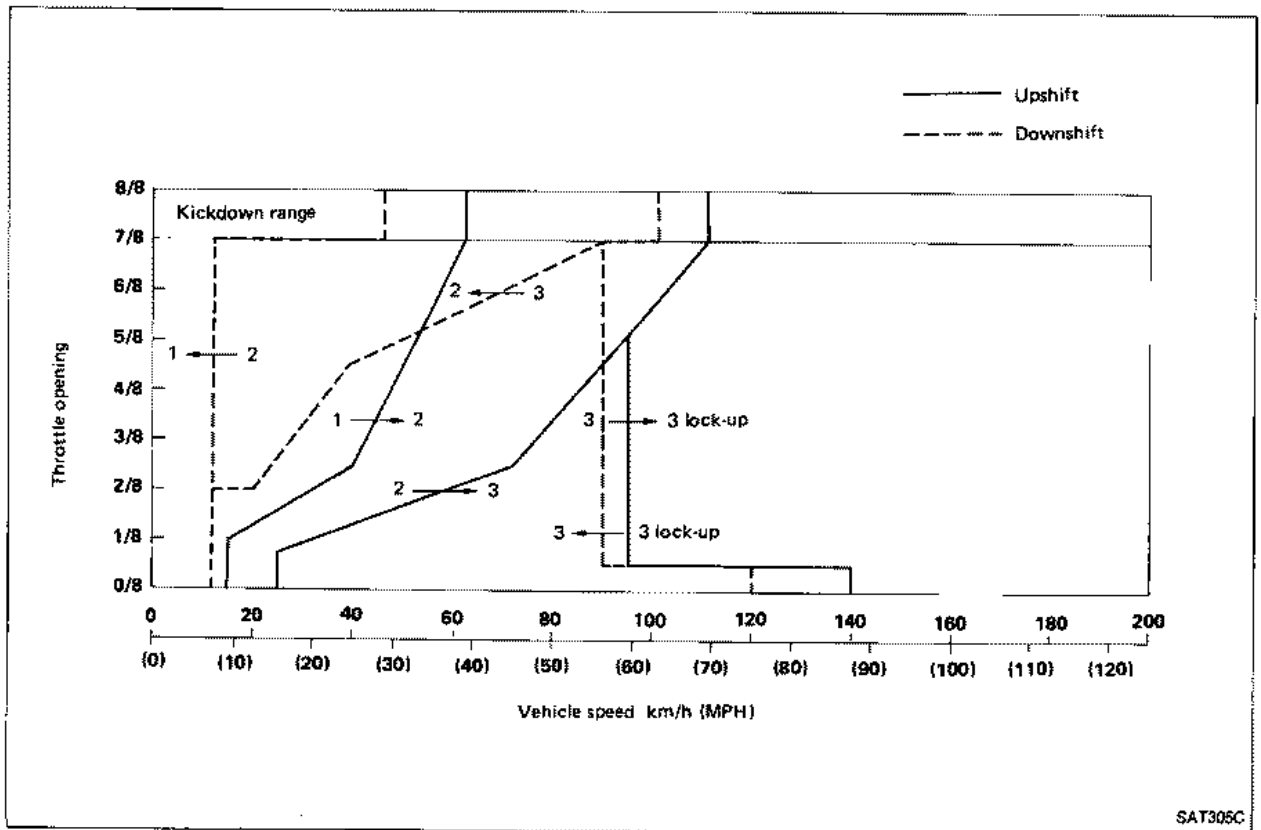
TROUBLE DIAGNOSES

Preliminary Check (Cont'd)

Shift schedule (Overdrive ON) — RE4R01A



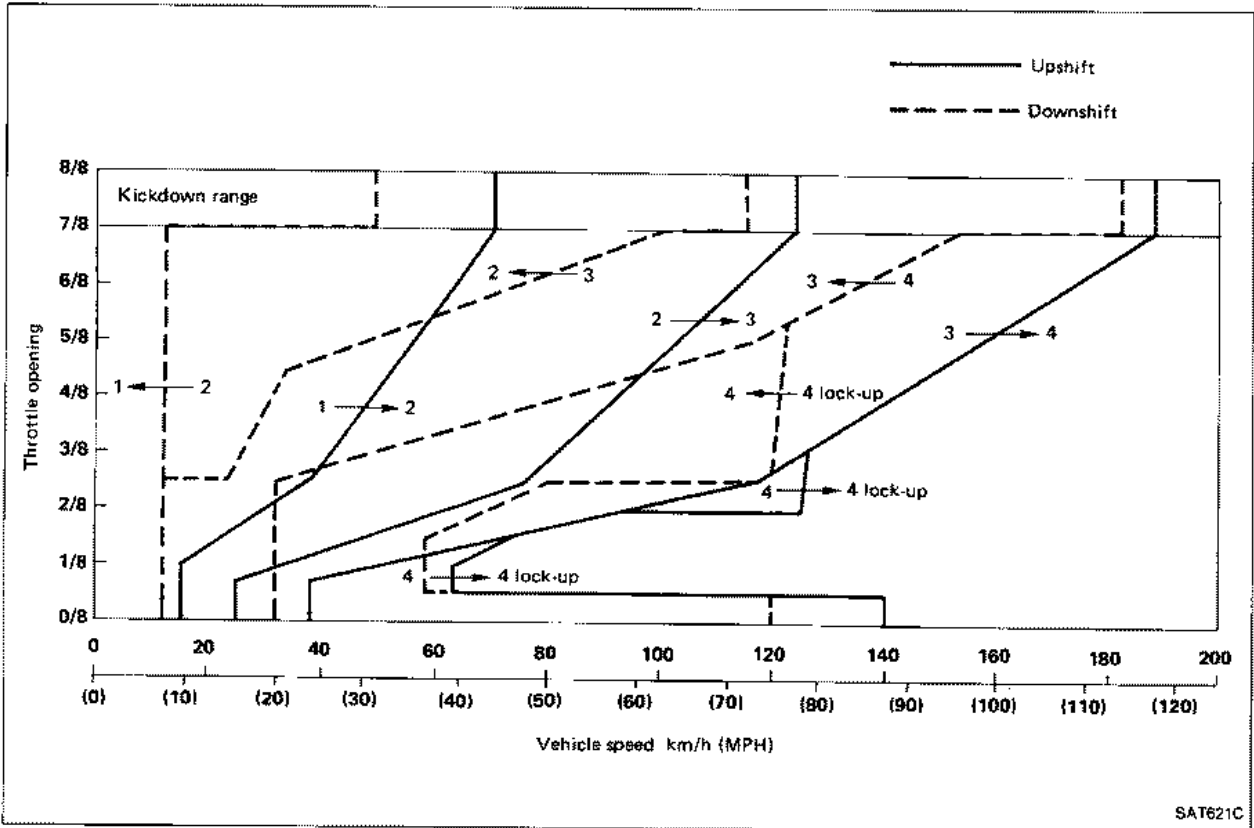
Shift schedule (Overdrive OFF) — RE4R01A



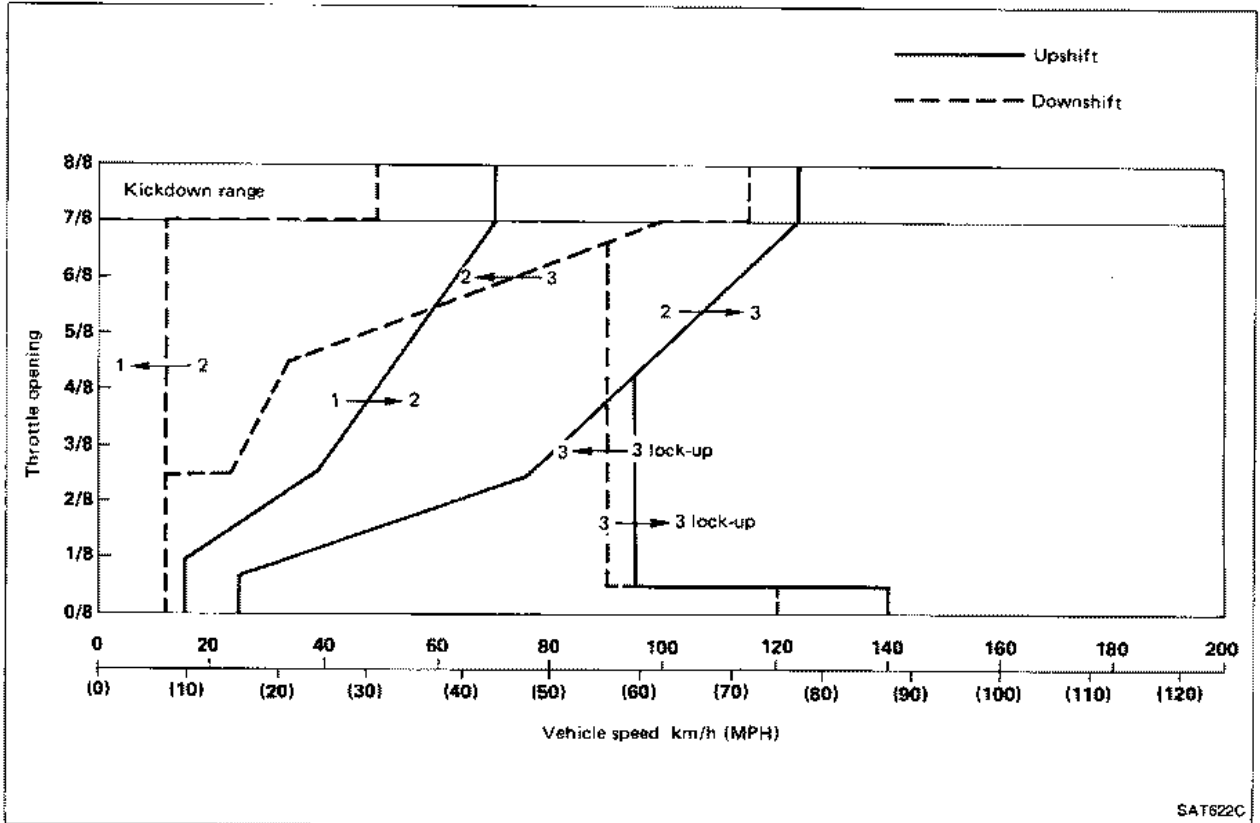
TROUBLE DIAGNOSES

Preliminary Check (Cont'd)

Shift schedule (Overdrive ON) — RE4R03A



Shift schedule (Overdrive OFF) — RE4R03A



TROUBLE DIAGNOSES

Diagnosis by CONSULT

NOTICE

1. The CONSULT electrically displays shift timing and lock-up timing (that is, operation timing of each solenoid). When a noticeable time difference occurs between shift timing which is manifested by shift shock and the CONSULT display, mechanical parts (except solenoids, sensors, etc.) are considered to be malfunctioning. Check mechanical parts using applicable diagnostic procedures.
2. Shift schedule (which implies gear position) displayed on CONSULT and that indicated in Service Manual may differ slightly. This occurs because of the following reasons:
 - Actual shift schedule has more or less tolerance or allowance,
 - Shift schedule indicated in Service Manual refers to the point where shifts starts, and
 - Gear position displayed on CONSULT indicates the point where shifts are completed.
3. Shift solenoid "A" or "B" is displayed on CONSULT at the start of shifting while gear position is displayed upon completion of shifting (which is computed by A/T control unit).

TROUBLE DIAGNOSES

Diagnosis by CONSULT (Cont'd) DATA MONITOR APPLICATION

Item	Application
Vehicle speed sensor 1 (A/T)	X
Vehicle speed sensor 2 (meter)	X
Throttle sensor	X
Fluid temperature sensor	X
Battery voltage	X
Engine rpm	X
Selector lever switch (O.D. switch)	X
A.S.C.D. — cruise signal	X
A.S.C.D. — O.D. cut signal	X
Kickdown switch	X
Power shift switch	—
Idle switch	X
Full throttle switch	X
Shift solenoid A	X
Shift solenoid B	X
Overrun clutch solenoid	X
*Shift solenoid A (feedback)	X
*Shift solenoid B (feedback)	X
*Overrun clutch solenoid (feedback)	X
Hold mode switch	—
1 range switch	X
2 range switch	X
D range switch	X
N range switch	X
R range switch	X
Gear position	X
Range position	X
Vehicle speed	X
Throttle opening	X
Line-pressure solenoid	X
Lock-up solenoid	X

X: Applicable —: Not applicable

TROUBLE DIAGNOSES

Diagnosis by CONSULT (Cont'd)

DATA ANALYSIS

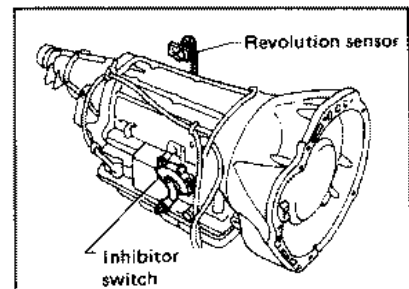
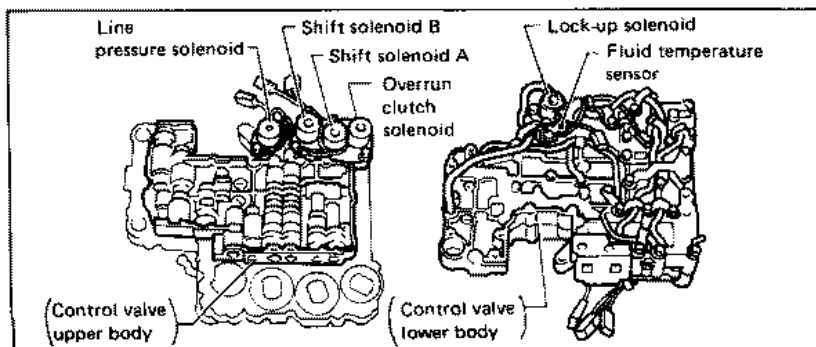
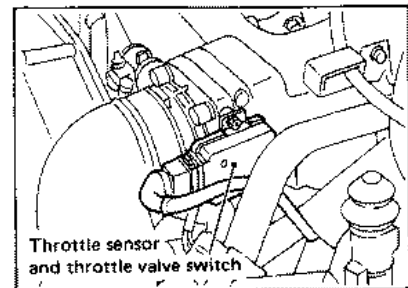
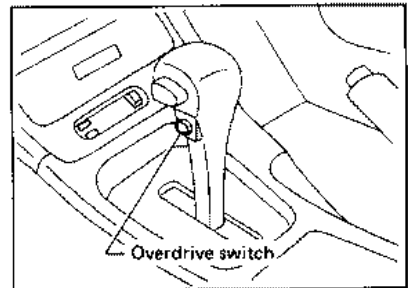
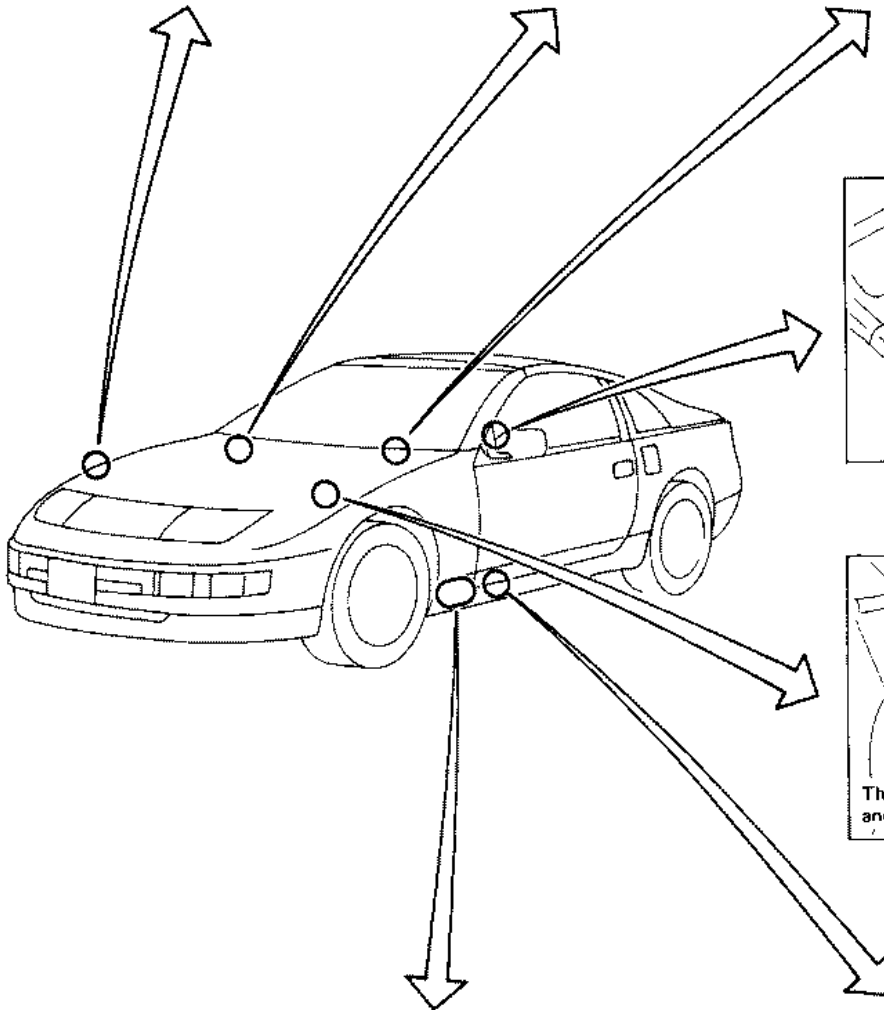
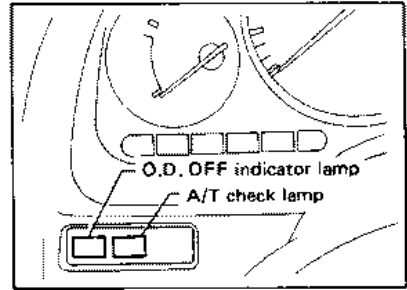
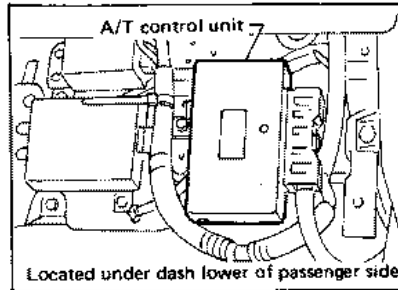
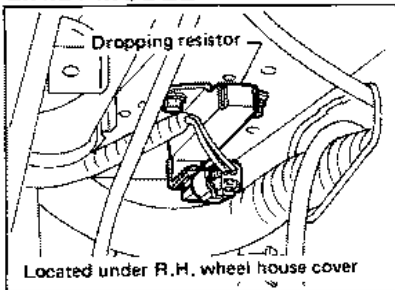
Item	Display	Condition
Lock-up duty	Approximately 4%	Lock-up "OFF"
	↓ Approximately 94%	↓ Lock-up "ON"
Line pressure duty	Approximately 29%	Low line-pressure (Small throttle opening)
	↓ Approximately 94%	↓ High line-pressure (Large throttle opening)
Throttle sensor	Approximately 0.5V	Fully-closed throttle
	Approximately 4V	Fully-open throttle
Fluid temperature sensor	Approximately 1.5V	Cold [20°C (68°F)]
	↓ Approximately 0.5V	↓ Hot [80°C (176°F)]

Gear position	1	2	3	4
Shift solenoid A	ON	OFF	OFF	ON
Shift solenoid B	ON	ON	OFF	OFF

TROUBLE DIAGNOSES

A/T Electrical Parts Location

L.H.D. MODEL

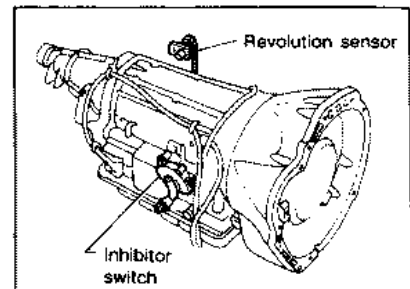
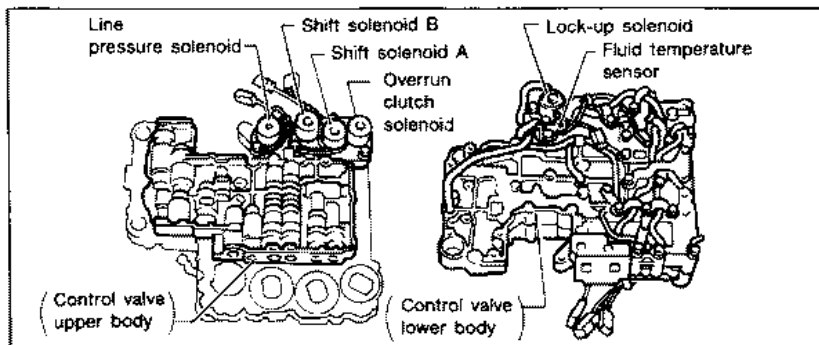
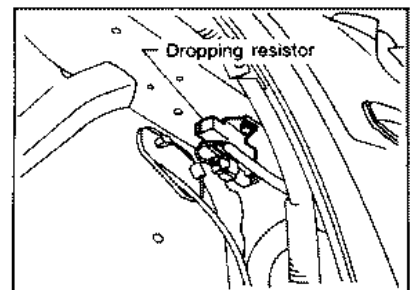
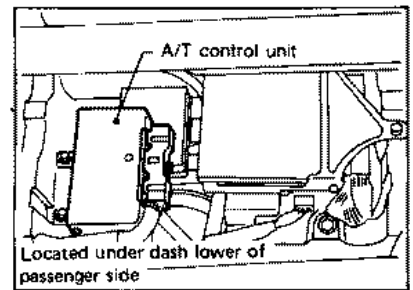
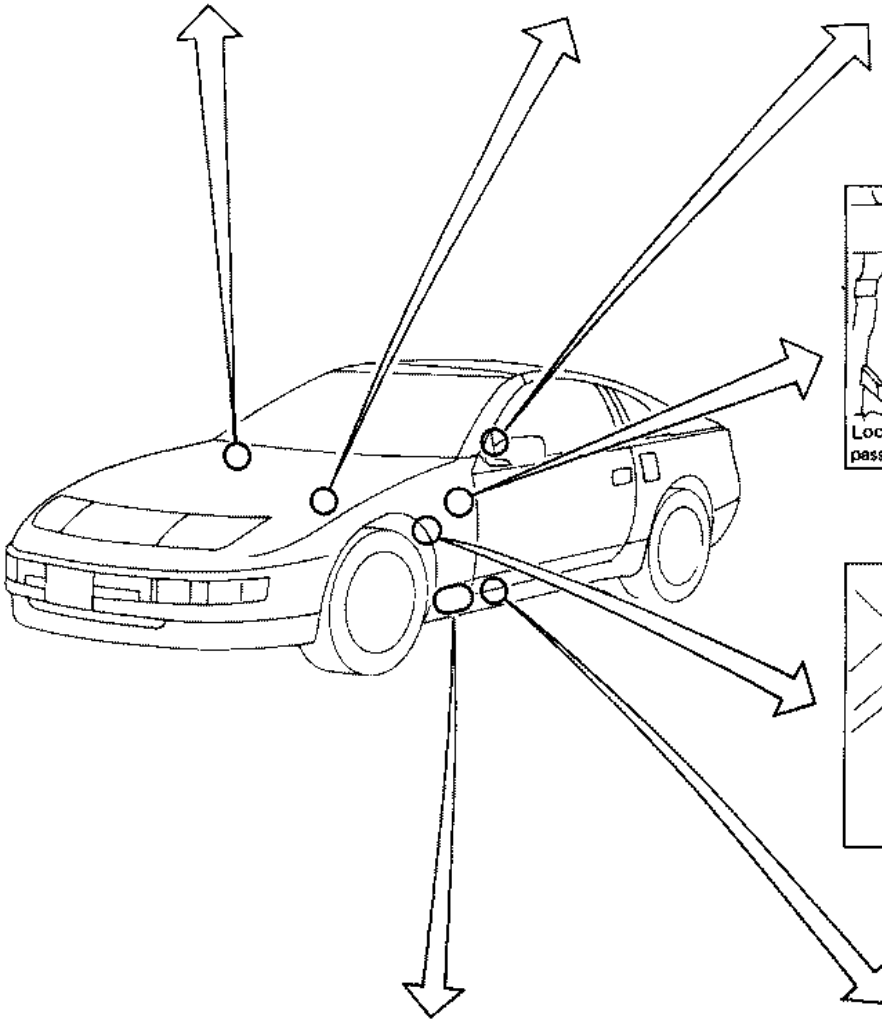
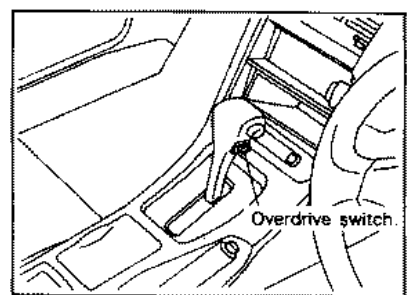
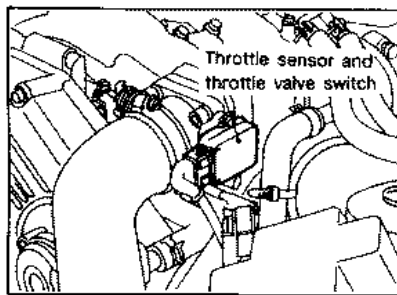
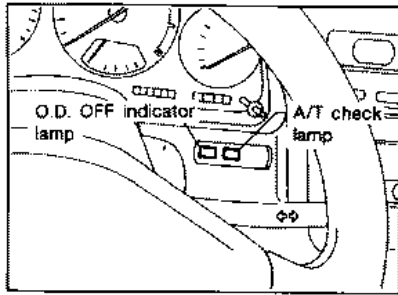


SAT356C

TROUBLE DIAGNOSES

A/T Electrical Parts Location (Cont'd)

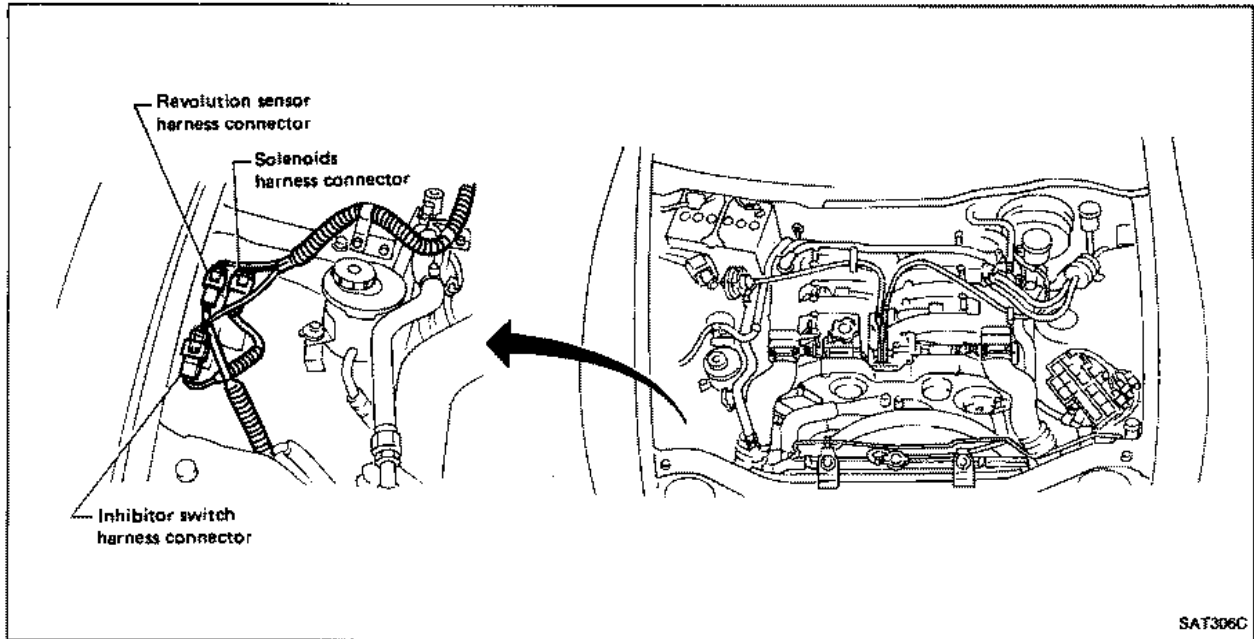
R.H.D. MODEL



SAT918C

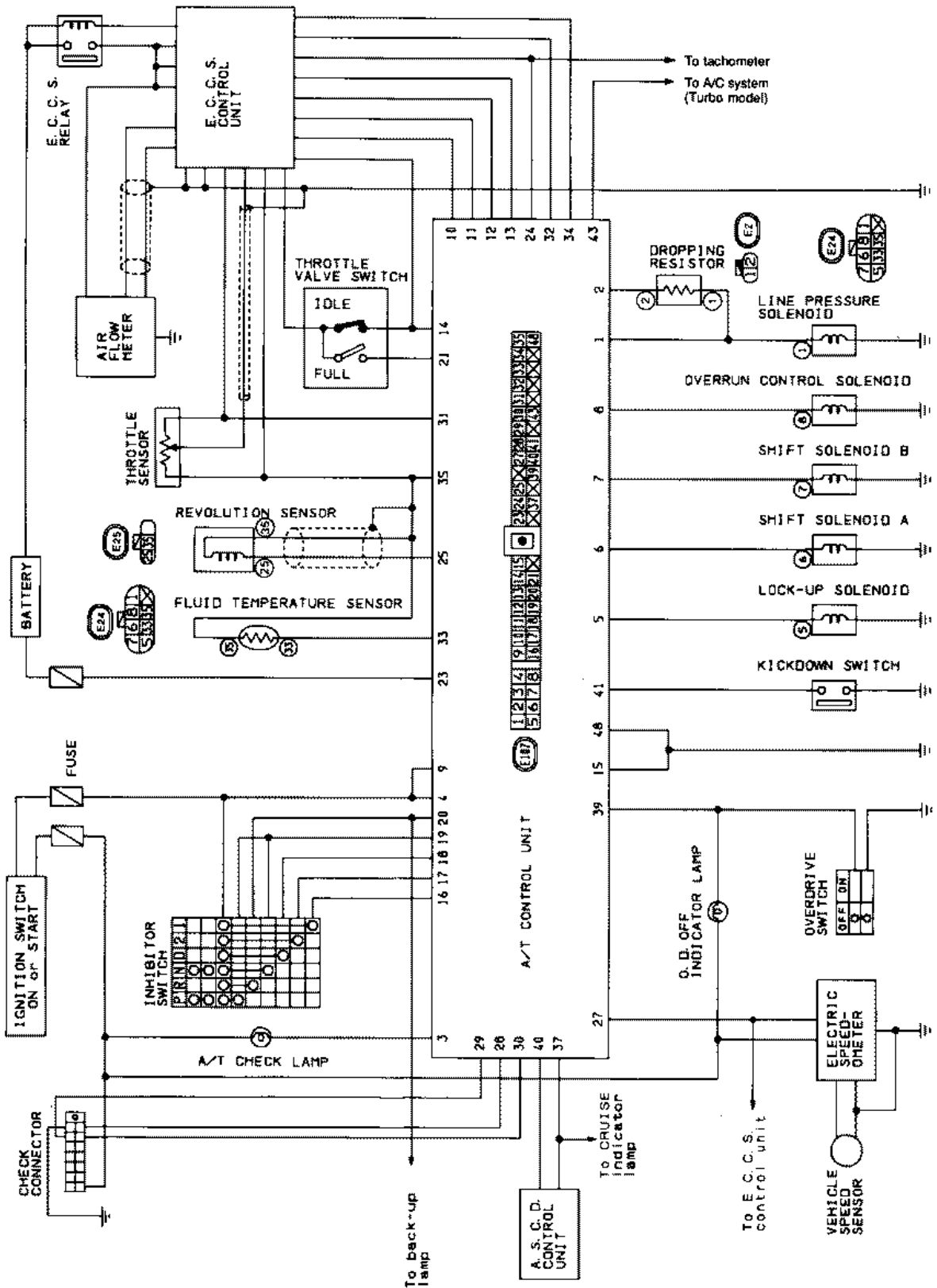
TROUBLE DIAGNOSES

A/T Electrical Parts Location (Cont'd)



TROUBLE DIAGNOSES

Circuit Diagram for Quick Pinpoint Check

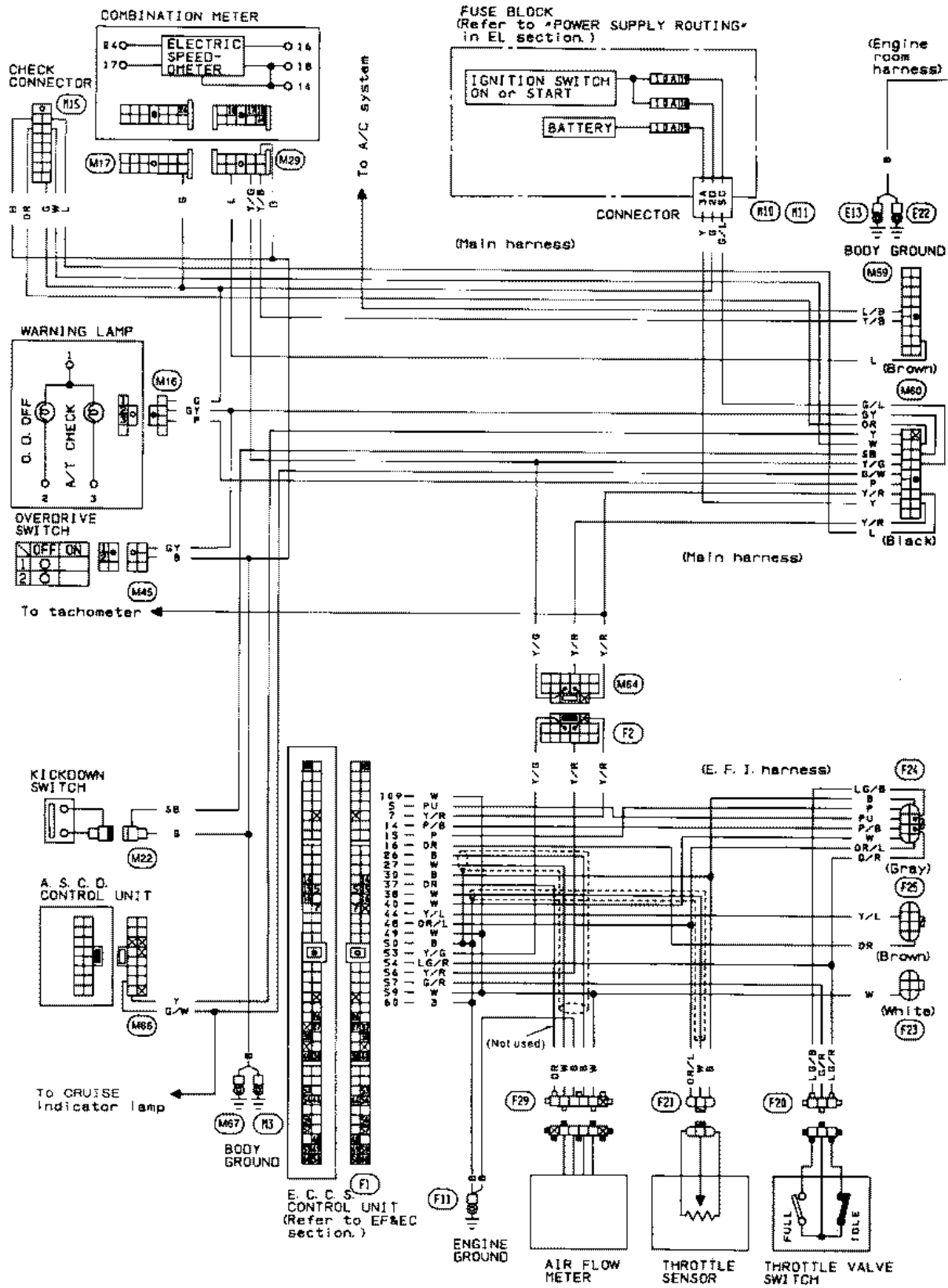


SAT501D

TROUBLE DIAGNOSES

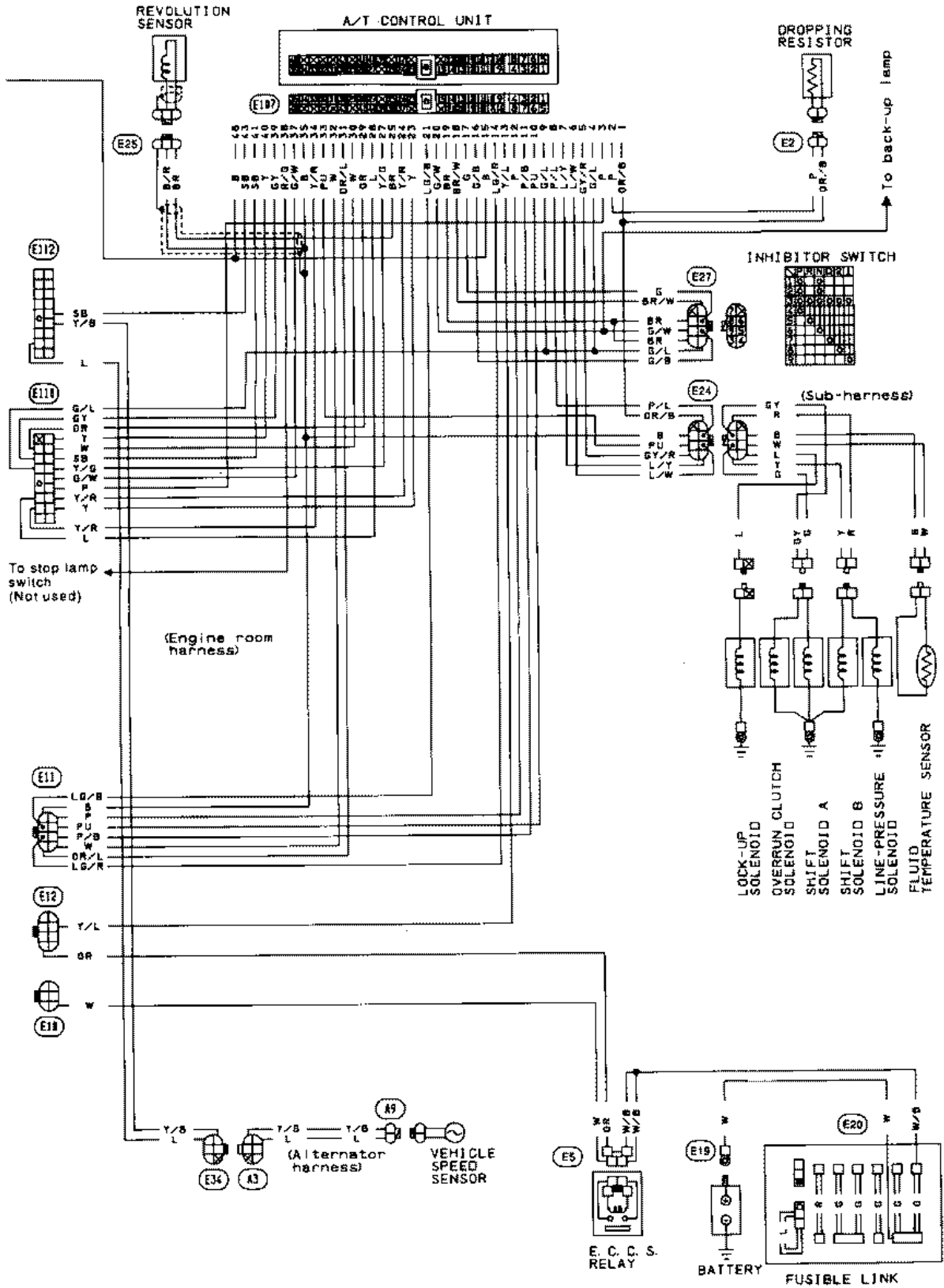
Wiring Diagram

L.H.D. model



TROUBLE DIAGNOSES

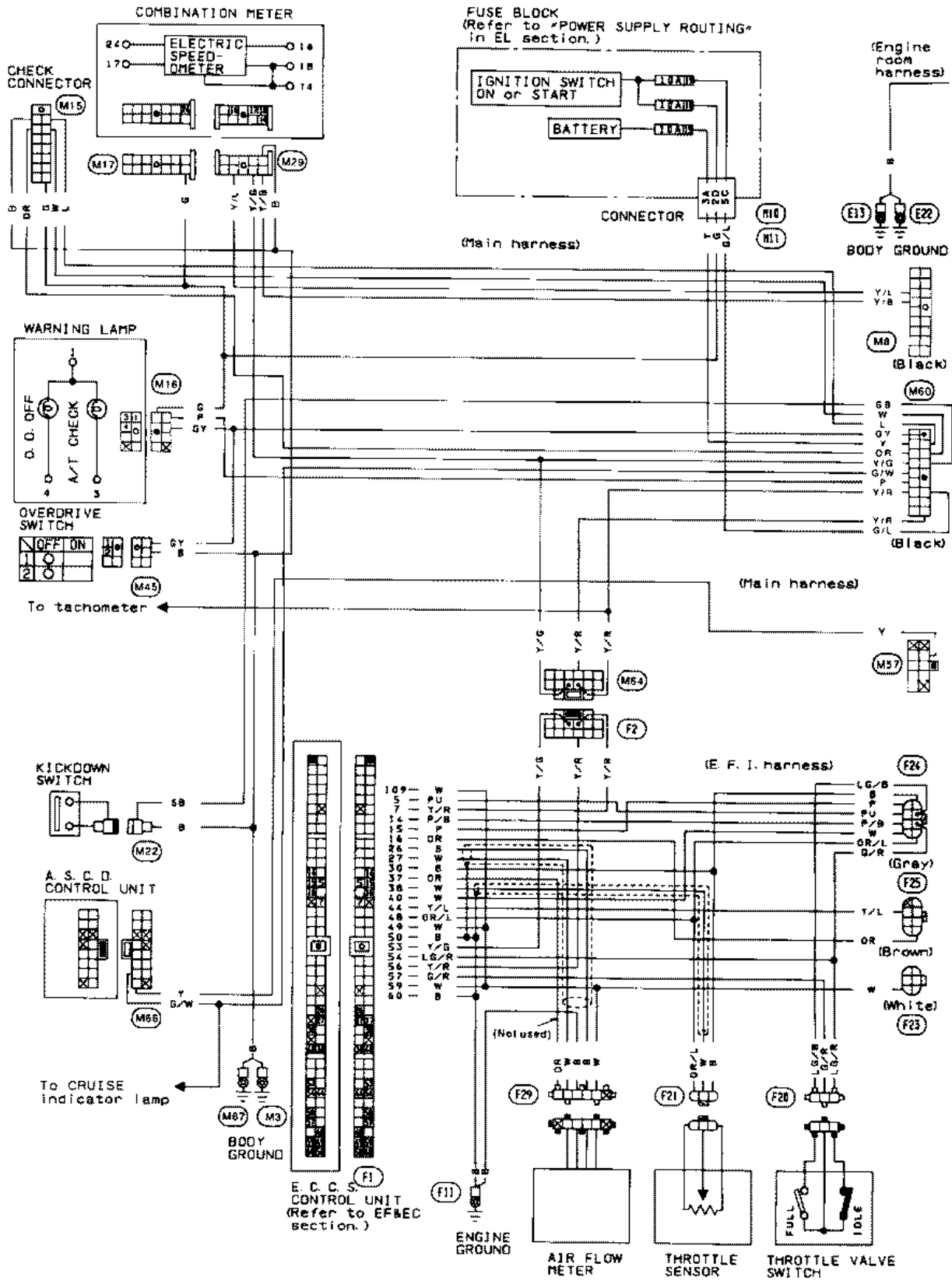
Wiring Diagram (Cont'd)



TROUBLE DIAGNOSES

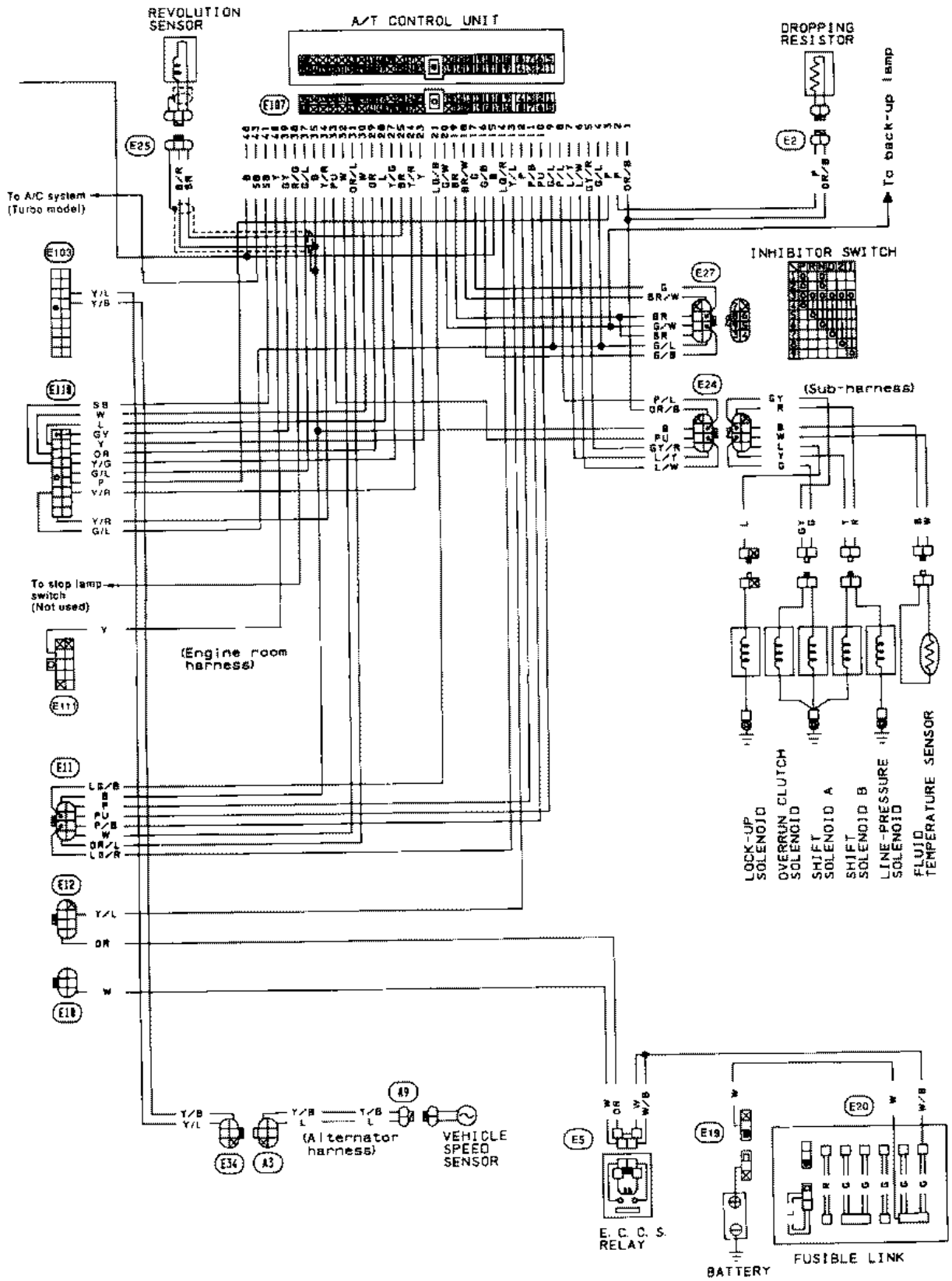
Wiring Diagram (Cont'd)

R.H.D. MODEL



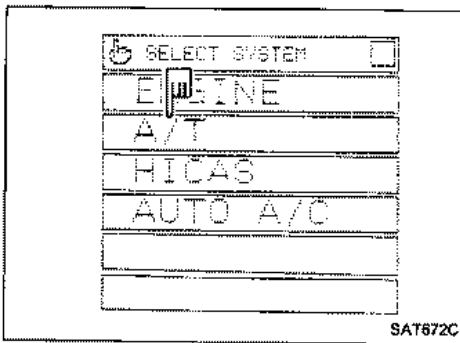
TROUBLE DIAGNOSES

Wiring Diagram (Cont'd)



SAT503D

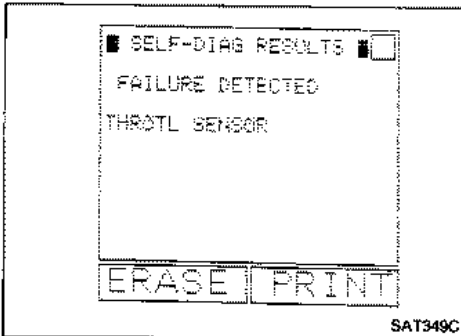
TROUBLE DIAGNOSES



Self-diagnosis

SELF-DIAGNOSTIC PROCEDURE (With CONSULT)

1. Turn on CONSULT.
2. Touch "A/T".

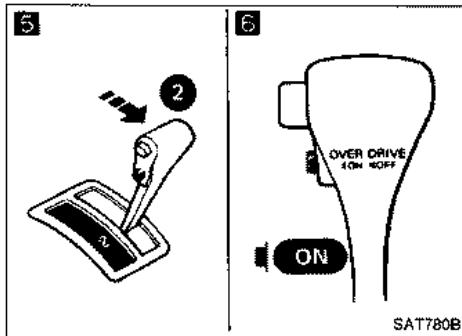
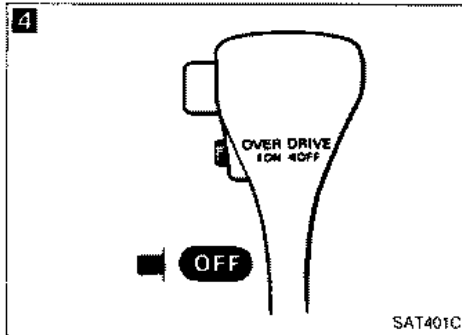
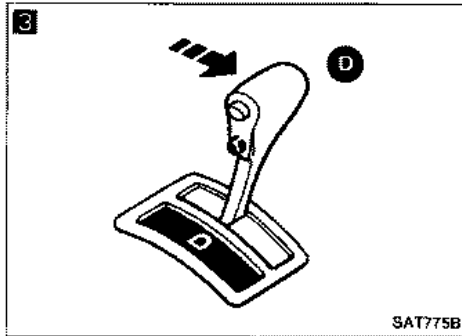
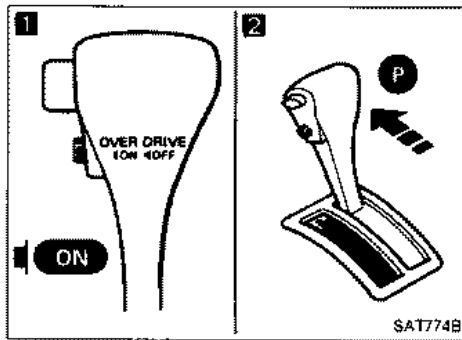


3. Touch "SELF-DIAGNOSIS".
CONSULT performs REAL-TIME SELF-DIAGNOSIS.

TROUBLE DIAGNOSES

Self-diagnosis (Cont'd)

SELF-DIAGNOSTIC PROCEDURE (⌚ Without CONSULT)



DIAGNOSIS START

Start engine and warm it up to normal engine operating temperature.



1 Set overdrive switch in "ON" position.

2 Move selector lever to "P" range.



Does A/T check lamp come on for about 2 seconds?

No → Go to Diagnostic Procedure 1.

Yes



3 Move selector lever to "D" range.

4 Set overdrive switch in "OFF" position.



Wait for more than 2 seconds after ignition switch "ON".

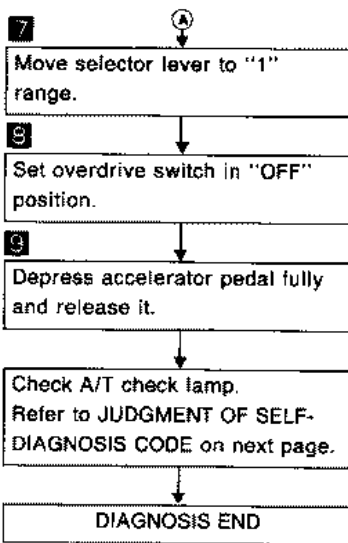
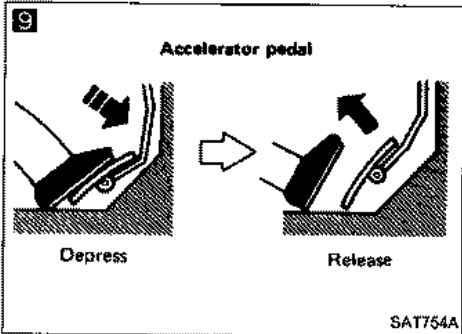
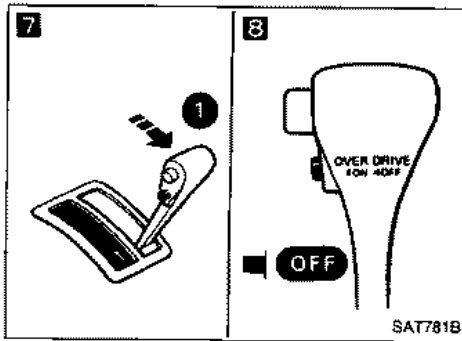
5 Move selector lever to "2" range.

6 Set overdrive switch in "ON" position.

Ⓐ

TROUBLE DIAGNOSES

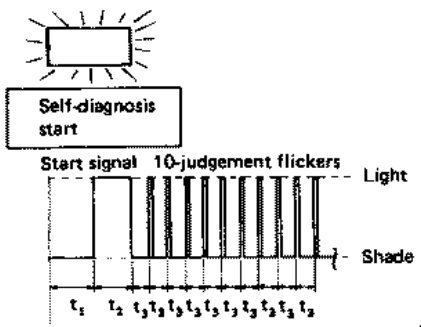
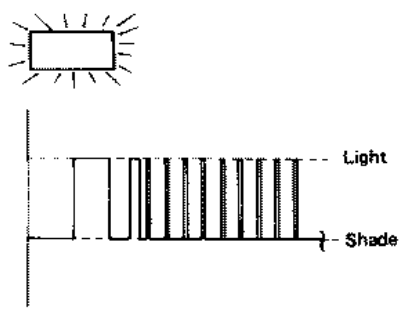
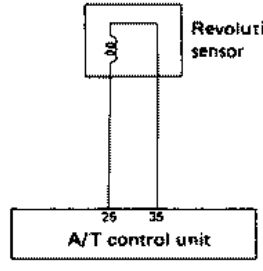
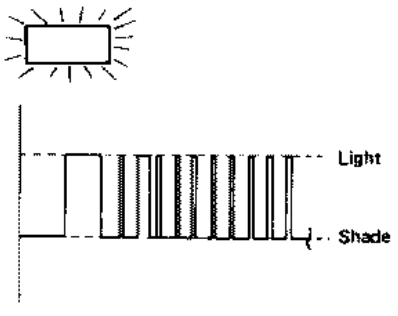
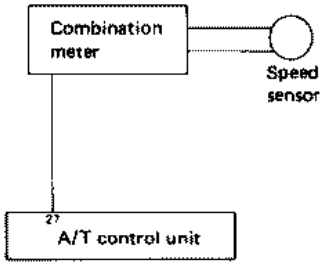
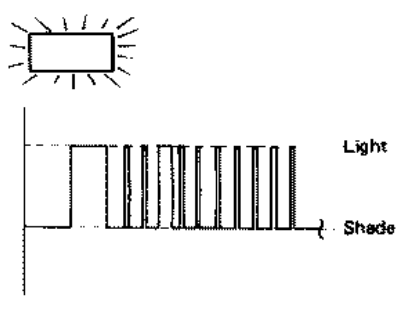
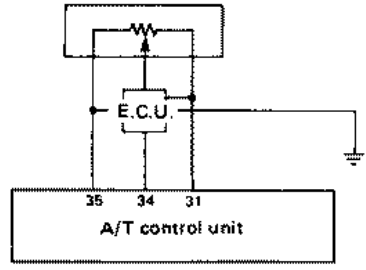
Self-diagnosis (Cont'd)



TROUBLE DIAGNOSES

Self-diagnosis (Cont'd)

JUDGMENT OF SELF-DIAGNOSIS CODE

A/T check lamp	Damaged circuit
<p>All judgment flickers are same.</p>  <p style="text-align: right;">SAT307C</p>	<p>All circuits that can be confirmed by self-diagnosis are O.K.</p>
<p>1st judgment flicker is longer than others.</p>  <p style="text-align: right;">SAT308C</p>	<p>Revolution sensor circuit is short-circuited or disconnected.</p>  <p style="text-align: center;">➡ Go to revolution sensor circuit check.</p> <p style="text-align: right;">SAT965B</p>
<p>2nd judgment flicker is longer than others.</p>  <p style="text-align: right;">SAT309C</p>	<p>Speed sensor circuit is short-circuited or disconnected.</p>  <p style="text-align: center;">➡ Go to speed sensor circuit check.</p> <p style="text-align: right;">SAT966B</p>
<p>3rd judgment flicker is longer than others.</p>  <p style="text-align: right;">SAT310C</p>	<p>Throttle sensor circuit is short-circuited or disconnected.</p>  <p style="text-align: center;">➡ Go to throttle sensor circuit check.</p> <p style="text-align: right;">SAT967B</p>

$t_1 = 2.5$ seconds $t_2 = 2.0$ seconds $t_3 = 1.0$ second

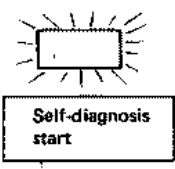

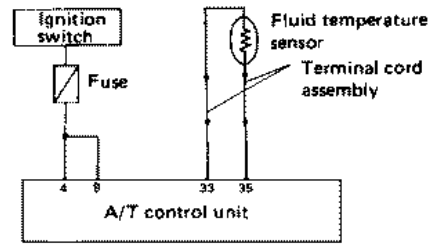
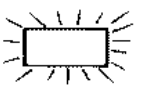
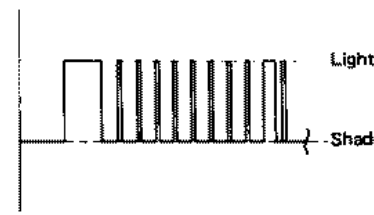
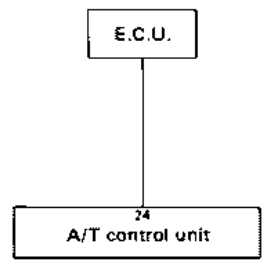
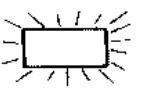
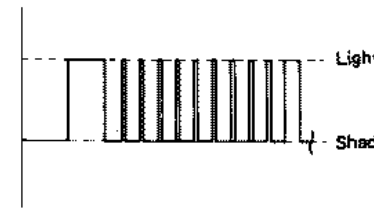
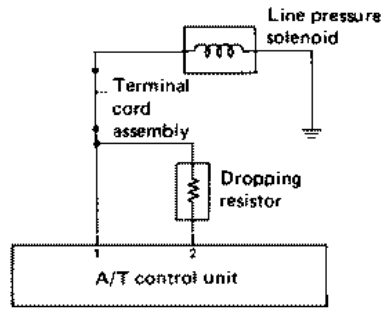
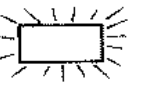
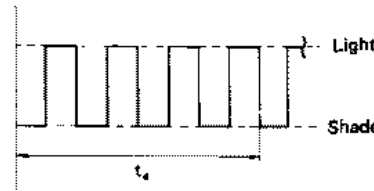
TROUBLE DIAGNOSES

Self-diagnosis (Cont'd)

A/T check lamp	Damaged circuit
<p>4th judgment flicker is longer than others.</p> <div style="text-align: center;"> </div> <p style="text-align: right;">SAT311C</p>	<p>Shift solenoid A circuit is short-circuited or disconnected.</p> <div style="text-align: center;"> </div> <p style="text-align: center;">➡ Go to shift solenoid A circuit check.</p> <p style="text-align: right;">SAT968B</p>
<p>5th judgment flicker is longer than others.</p> <div style="text-align: center;"> </div> <p style="text-align: right;">SAT312C</p>	<p>Shift solenoid B circuit is short-circuited or disconnected.</p> <div style="text-align: center;"> </div> <p style="text-align: center;">➡ Go to shift solenoid B circuit check.</p> <p style="text-align: right;">SAT969B</p>
<p>6th judgment flicker is longer than others.</p> <div style="text-align: center;"> </div> <p style="text-align: right;">SAT313C</p>	<p>Overrun clutch solenoid circuit is short-circuited or disconnected.</p> <div style="text-align: center;"> </div> <p style="text-align: center;">➡ Go to overrun clutch solenoid circuit check.</p> <p style="text-align: right;">SAT970B</p>
<p>7th judgment flicker is longer than others.</p> <div style="text-align: center;"> </div> <p style="text-align: right;">SAT314C</p>	<p>Lock-up solenoid circuit is short-circuited or disconnected.</p> <div style="text-align: center;"> </div> <p style="text-align: center;">➡ Go to lock-up solenoid circuit check.</p> <p style="text-align: right;">SAT971B</p>

TROUBLE DIAGNOSES

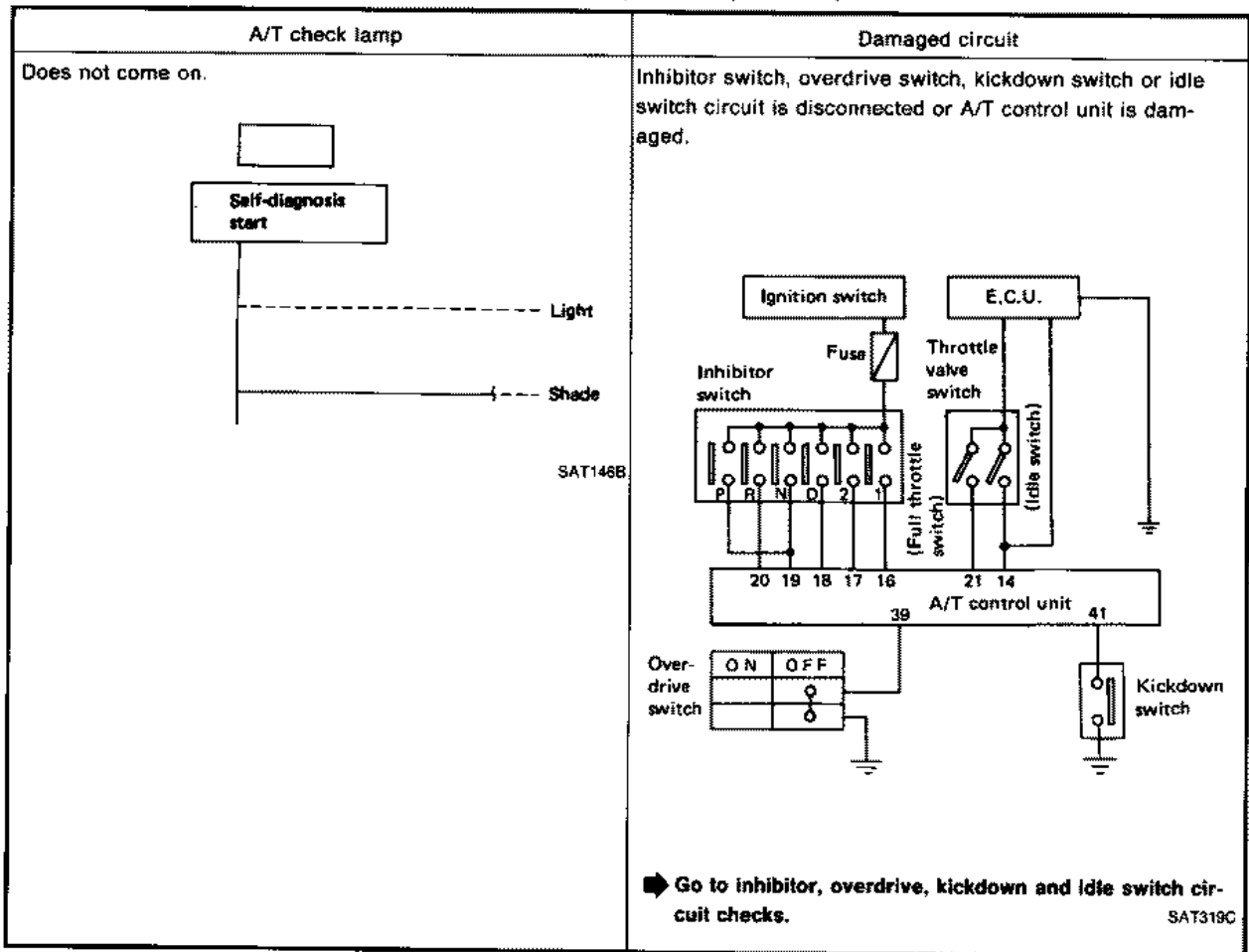
Self-diagnosis (Cont'd)

A/T check lamp	Damaged circuit
<p>8th judgment flicker is longer than others.</p> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> <p style="text-align: right;">SAT315C</p>	<p>Fluid temperature sensor is disconnected or A/T control unit power source circuit is damaged.</p> <div style="text-align: center;">  </div> <p style="text-align: center;">➡ Go to fluid temperature sensor and A/T control unit power source circuit check.</p> <p style="text-align: right;">SAT972B</p>
<p>9th judgment flicker is longer than others.</p> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> <p style="text-align: right;">SAT316C</p>	<p>Engine revolution signal circuit is short-circuited or disconnected.</p> <div style="text-align: center;">  </div> <p style="text-align: center;">➡ Go to engine revolution signal circuit check.</p> <p style="text-align: right;">SAT973B</p>
<p>10th judgment flicker is longer than others.</p> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> <p style="text-align: right;">SAT317C</p>	<p>Line pressure solenoid circuit is short-circuited or disconnected.</p> <div style="text-align: center;">  </div> <p style="text-align: center;">➡ Go to line pressure solenoid circuit check.</p> <p style="text-align: right;">SAT974B</p>
<p>Flickers as shown below.</p> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> <p style="text-align: right;">SAT318C</p>	<p>Battery power is low. Battery has been disconnected for a long time. Battery is connected conversely. (When reconnecting A/T control unit connectors. — This is not a problem.)</p>

$t_c = 1.0$ second

TROUBLE DIAGNOSES

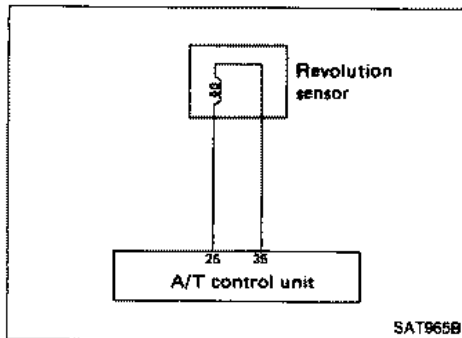
Self-diagnosis (Cont'd)



TROUBLE DIAGNOSES

Self-diagnosis (Cont'd)

REVOLUTION SENSOR CIRCUIT CHECK



CHECK REVOLUTION SENSOR.
— Refer to "Electrical Components Inspection".

N.G. → Repair or replace revolution sensor.

O.K. ↓

CHECK INPUT SIGNAL.



N.G. → Check harness continuity between A/T control unit and revolution sensor.

1.



- Select "E.C.U. INPUT SIGNALS".
- Read out the value of "CAR SPEED SENSOR 1" while driving.
- Check the value changes according to driving speed.

OR



Check voltage between A/T control unit terminal ②⑤ and ground while driving.

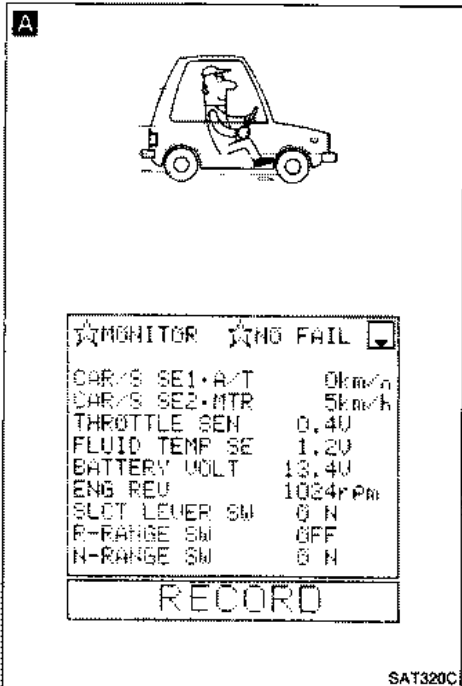
(Measure with A.C. range.)

Voltage:

At 0 km/h (0 MPH):
0V

At 30 km/h (19 MPH):
1V or more

(Voltage rises gradually in response to vehicle speed.)



O.K. ↓

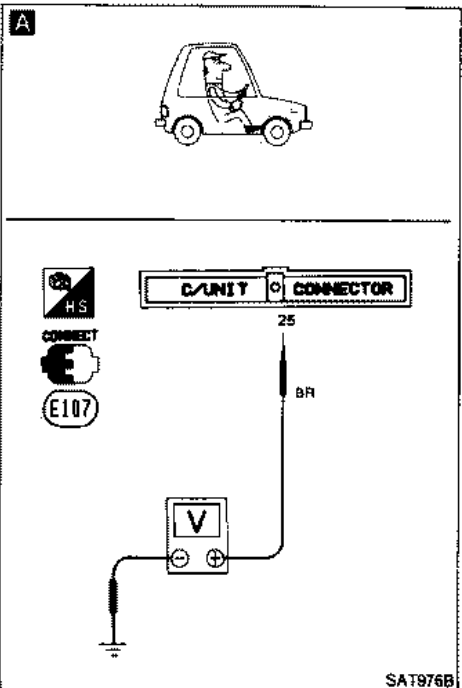
Perform self-diagnosis again after driving for a while.

N.G. →

1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

INSPECTION END




TROUBLE DIAGNOSES

Self-diagnosis (Cont'd)

SPEED SENSOR CIRCUIT CHECK

A




MONITOR	NO FAIL
CAR'S SE1-A/T	0km/h
CAR'S SE2-MTR	5km/h
THROTTLE SEN	0.40
FLUID TEMP SE	1.20
BATTERY VOLT	13.40
ENG REV	1024rPm
SLOT LEVER SW	0 N
P-RANGE SW	OFF
N-RANGE SW	0 N

RECORD


SAT1320C

A

CHECK INPUT SIGNAL.

- 
 - Select "E.C.U. INPUT SIGNALS".
 - Read out the value of "CAR SPEED SENSOR 2" while driving.
 - Check the value changes according to driving speed.

OR

- 
 - Check voltage between A/T control unit terminal 27 and ground while driving at 2 to 3 km/h (1 to 2 MPH) for 1 m (3 ft) or more.

Voltage: Varies from 0V to 5V

O.K. → Perform self-diagnosis again after driving for a while.

N.G. → Check the following items.

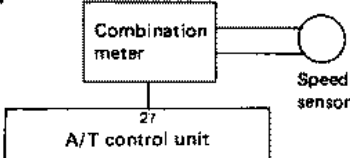
- Speed sensor and ground circuit for speed sensor — Refer to section EL.
- Harness continuity between A/T control unit and speed sensor

N.G. →


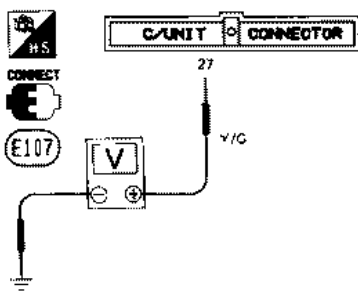
- Perform A/T control unit input/output signal inspection.
- If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. → **INSPECTION END**

A



At 2 - 3 km/h (1 - 2 MPH)

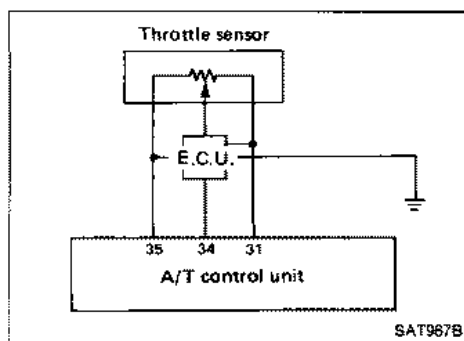



SAT977B

TROUBLE DIAGNOSES

Self-diagnosis (Cont'd)

THROTTLE SENSOR CIRCUIT CHECK



A

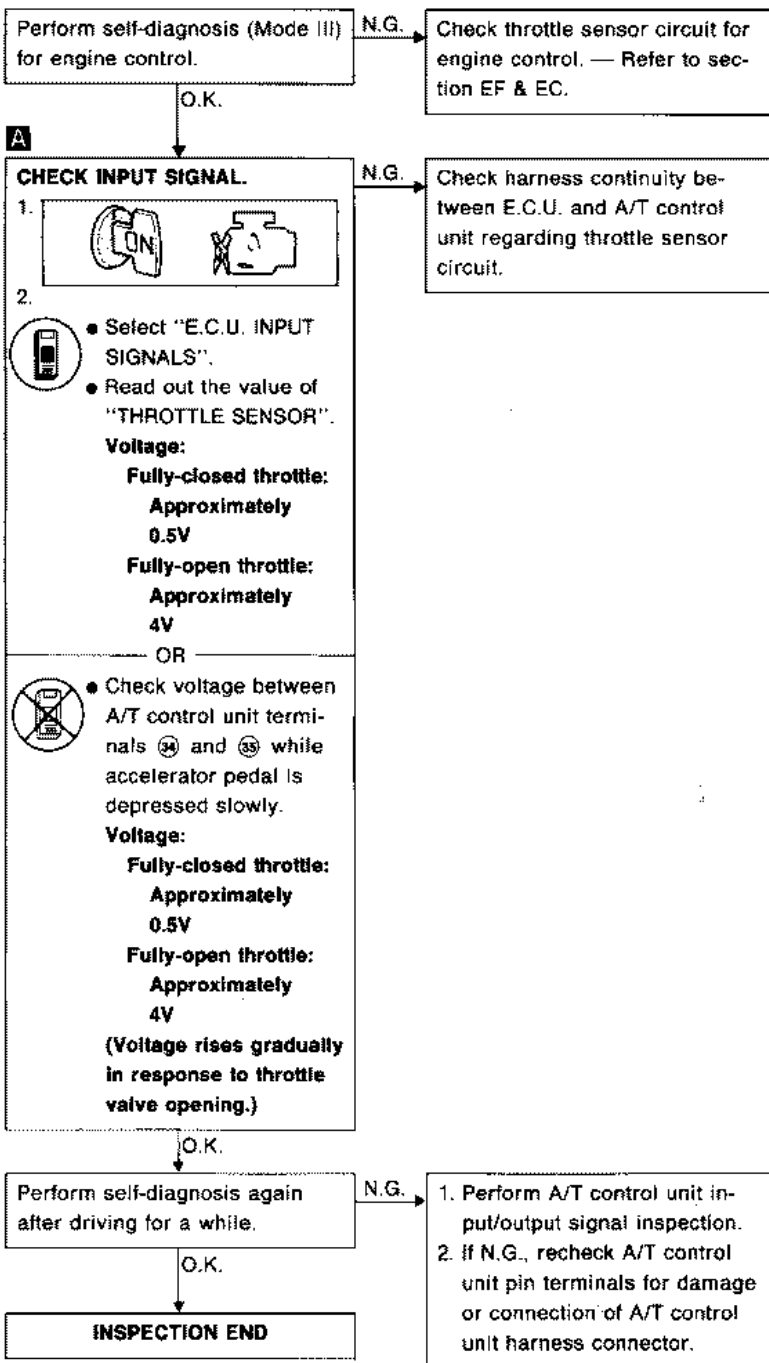
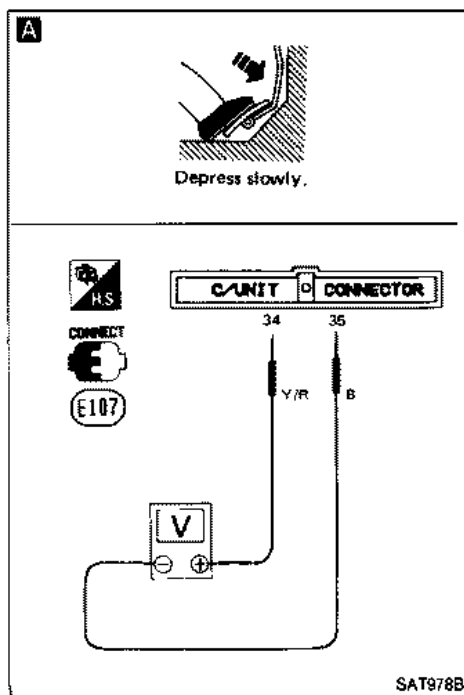
Depress slowly.

```

MONITOR  *NO FAIL
CAR/S SE1-A/T      0km/h
CAR/S SE2-MTR     0km/h
THROTTLE SEN      0.40
FLUID TEMP SE     1.20
BATTERY VOLT     13.40
ENG REV          1024rpm
SLIP LEVER SW     0 N
P-RANGE SW       OFF
N-RANGE SW       0 N
    
```

RECORD

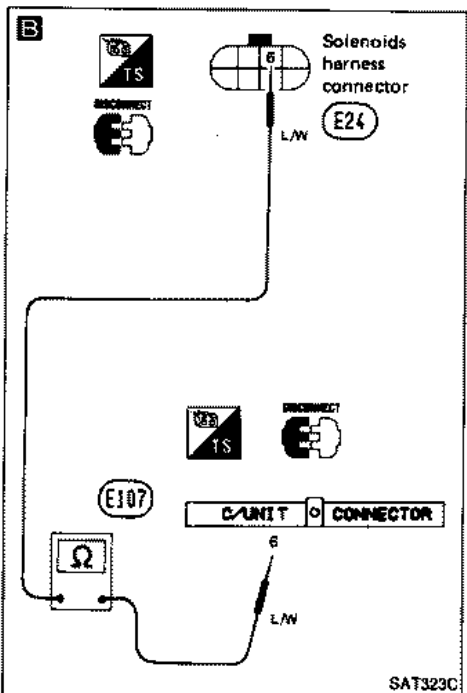
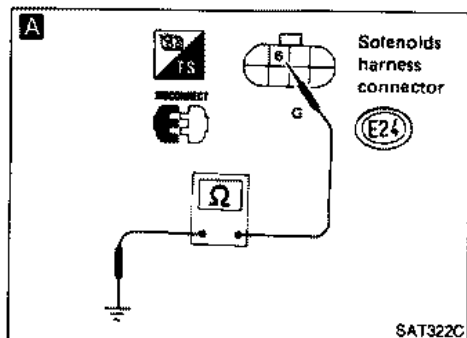
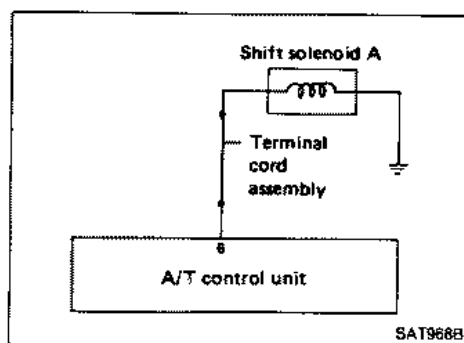
SAT321C



TROUBLE DIAGNOSES


Self-diagnosis (Cont'd)

SHIFT SOLENOID A CIRCUIT CHECK



A

CHECK GROUND CIRCUIT.


1. 
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal \oplus and ground.
Resistance: 20 - 40Ω

- N.G. →
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
 2. Check the following items.
 - Shift solenoid A — Refer to "Electrical Components Inspection".
 - Harness continuity of terminal cord assembly

O.K. ↓

B

CHECK POWER SOURCE CIRCUIT.

1. 
2. Disconnect A/T control unit connector.
3. Check resistance between terminal \oplus and A/T control unit terminal \oplus .
Resistance: Approximately 0Ω
4. Reinstall any part removed.

- N.G. →
- Repair or replace harness between A/T control unit and terminal cord assembly.

O.K. ↓

Perform self-diagnosis after driving for a while.

- N.G. →
1. Perform A/T control unit input/output signal inspection.
 2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

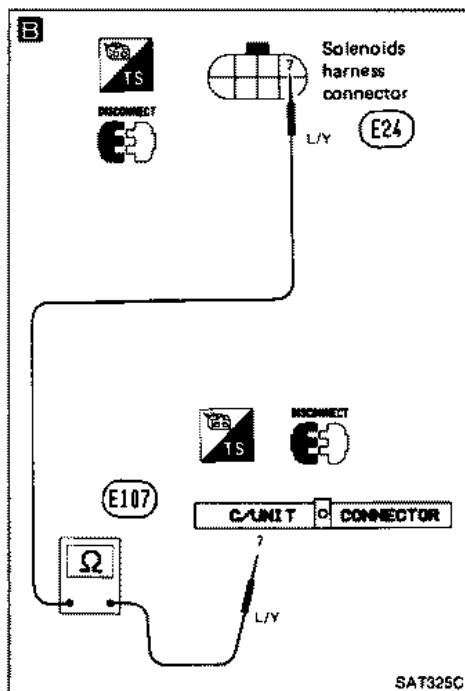
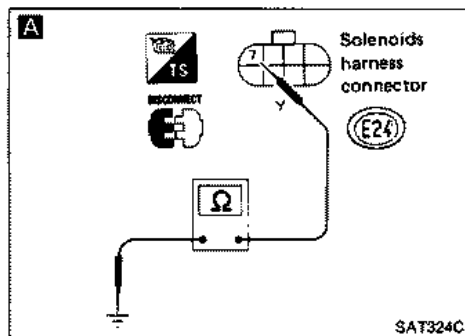
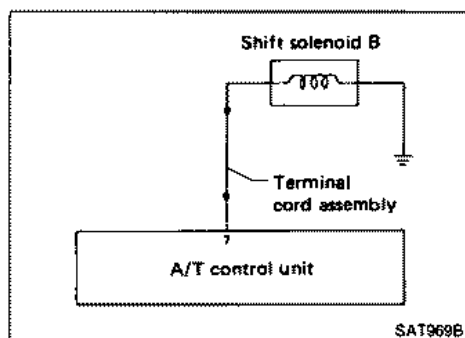
O.K. ↓

INSPECTION END

TROUBLE DIAGNOSES

Self-diagnosis (Cont'd)

SHIFT SOLENOID B CIRCUIT CHECK



A CHECK GROUND CIRCUIT.

- 1.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ⑦ and ground.
Resistance: 20 - 40Ω

N.G. →

1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
 - Shift solenoid B — Refer to "Electrical Components Inspection".
 - Harness continuity of terminal cord assembly

B CHECK POWER SOURCE CIRCUIT.

- 1.
2. Disconnect A/T control unit connector.
3. Check resistance between terminal ⑦ and A/T control unit terminal ⑦.
Resistance: Approximately 0Ω
4. Reinstall any part removed.

N.G. →

1. Repair or replace harness between A/T control unit and terminal cord assembly.

O.K. →

Perform self-diagnosis after driving for a while.

N.G. →

1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

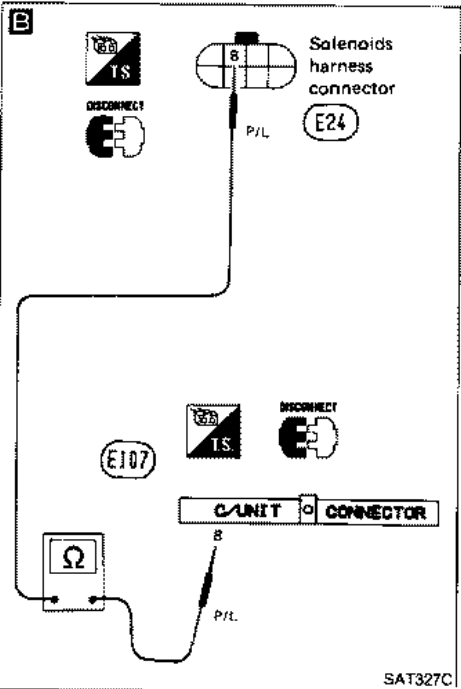
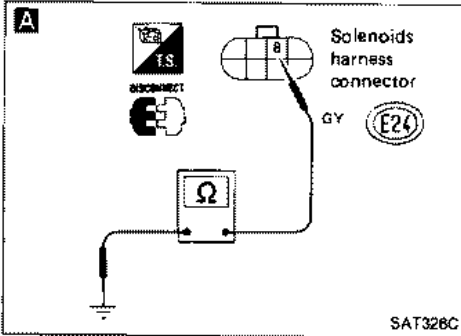
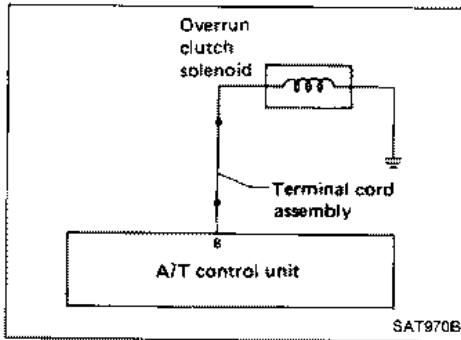
O.K. →

INSPECTION END

TROUBLE DIAGNOSES

Self-diagnosis (Cont'd)

OVERRUN CLUTCH SOLENOID CIRCUIT CHECK



A

CHECK GROUND CIRCUIT.

- 1.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal (B) and ground.
Resistance: 20 - 40Ω

N.G. →

1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
 - Overrun clutch solenoid. — Refer to "Electrical Components Inspection".
 - Harness continuity of terminal cord assembly

O.K. ↓

B

CHECK POWER SOURCE CIRCUIT.

- 1.
2. Disconnect A/T control unit connector.
3. Check resistance between terminal (B) and A/T control unit terminal (B).
Resistance: Approximately 0Ω
4. Reinstall any part removed.

N.G. →

Repair or replace harness between A/T control unit and terminal cord assembly.

O.K. ↓

Perform self-diagnosis after driving for a while.

O.K. ↓

INSPECTION END

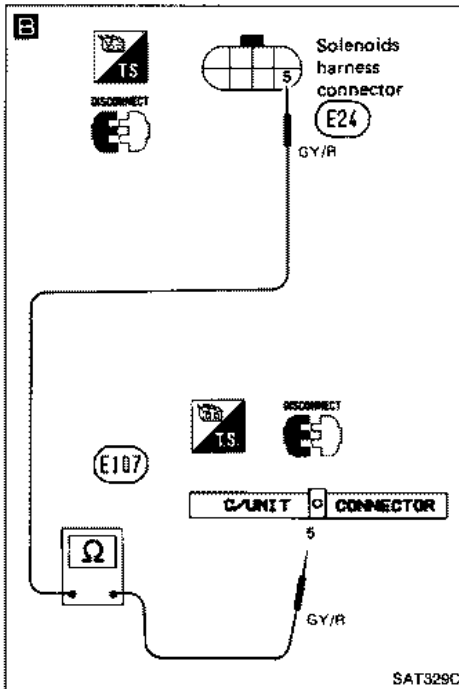
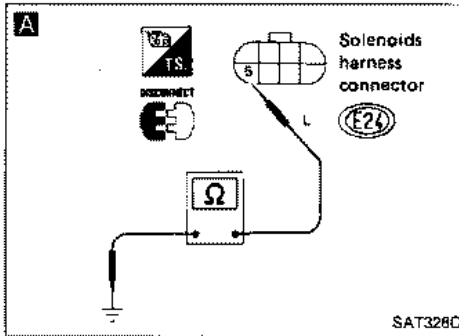
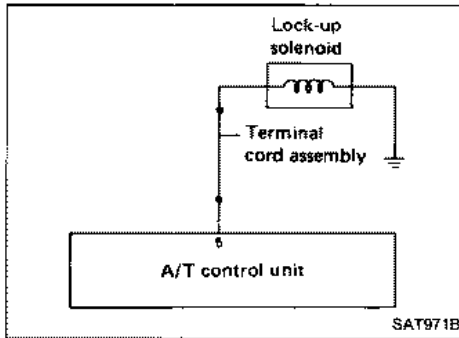
N.G. →

1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

TROUBLE DIAGNOSES


Self-diagnosis (Cont'd)

LOCK-UP SOLENOID CIRCUIT CHECK



A

CHECK GROUND CIRCUIT.

1. 
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ⑤ and ground.
Resistance: 10 - 20Ω


N.G. →

1. Remove oil pan. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
 - Lock-up solenoid — Refer to "Electrical Components Inspection".
 - Harness continuity of terminal cord assembly

O.K. ↓

B

CHECK POWER SOURCE CIRCUIT.

1. 
2. Disconnect A/T control unit connector.
3. Check resistance between terminal ⑤ and A/T control unit terminal ⑤.
Resistance: Approximately 0Ω
4. Reinstall any part removed.

N.G. →

Repair or replace harness between A/T control unit and terminal cord assembly.

O.K. ↓

Perform self-diagnosis after driving for a while.

O.K. ↓

INSPECTION END

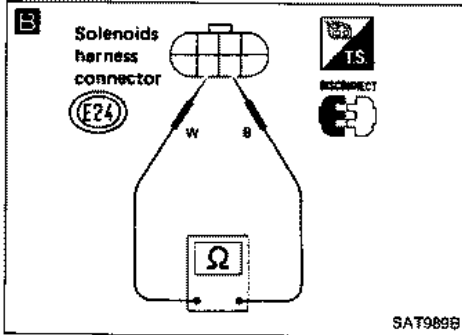
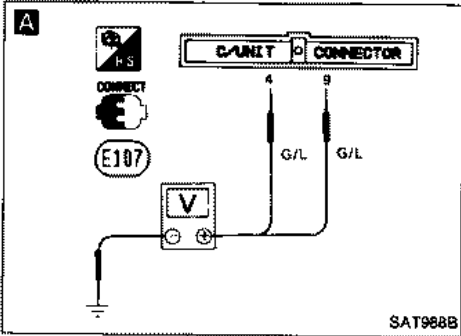
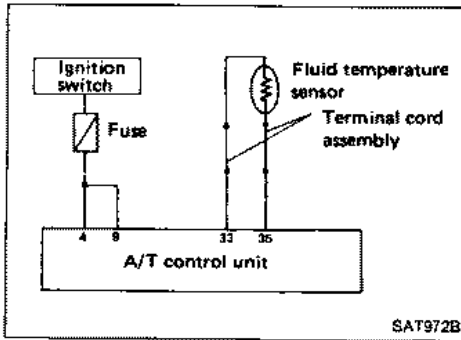
N.G. →

1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

TROUBLE DIAGNOSES

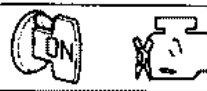
Self-diagnosis (Cont'd)

FLUID TEMPERATURE SENSOR CIRCUIT AND A/T CONTROL UNIT POWER SOURCE CIRCUIT CHECKS



A

CHECK A/T CONTROL UNIT POWER SOURCE.

1. 
2. Check voltage between A/T control unit terminals ④, ⑨ and ground.
Battery voltage should exist.

N.G.


Check the following items.

- Harness continuity between ignition switch and A/T control unit
- Ignition switch and fuse — Refer to section EL.

O.K.

B

CHECK FLUID TEMPERATURE SENSOR WITH TERMINAL CORD ASSEMBLY.

1. 
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminals ⑳ and ㉑ when A/T is cold.
Resistance:
Cold [20°C (68°F)]
Approximately 2.5 kΩ
4. Reinstall any part removed.

N.G.

1. Remove control valve cover.
2. Check the following items.
 - Fluid temperature sensor — Refer to "Electrical Components Inspection".
 - Harness continuity of terminal cord assembly

O.K.

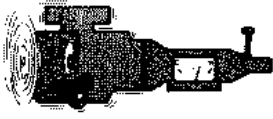
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Ⓐ

TROUBLE DIAGNOSES

Self-diagnosis (Cont'd)

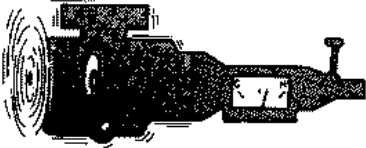
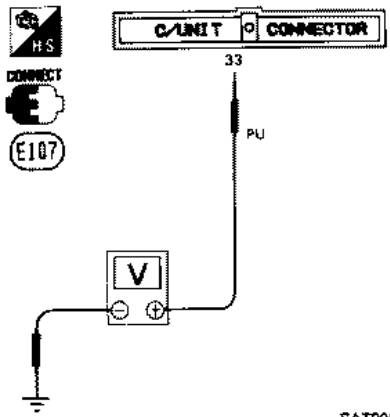
C



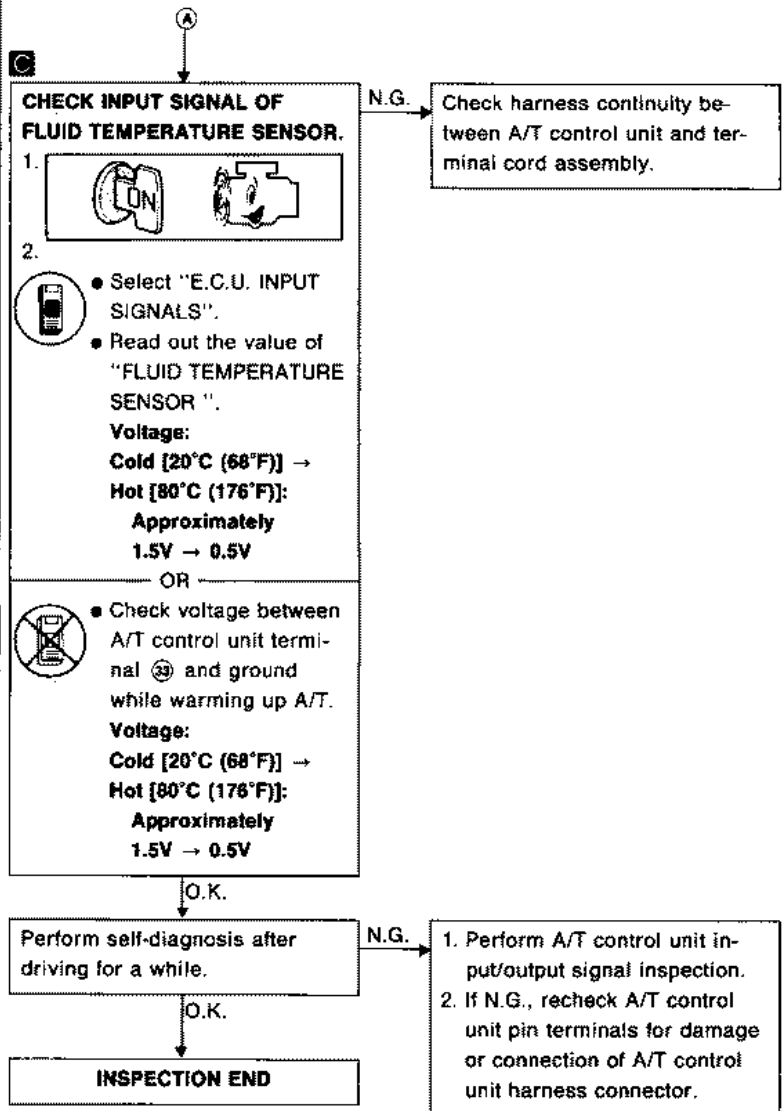
☆MONITOR	☆NG FAIL	
CAR/S SE1-A/T		0km/h
CAR/S SE2-MTR		5km/h
THROTTLE SEN		0.4U
FLUID TEMP SE		1.2U
BATTERY VOLT		13.4U
ENG REV		1024rPm
SLOT LEVER SW		0 N
R-RANGE SW		OFF
N-RANGE SW		0 N
RECORD		

SAT330C

C

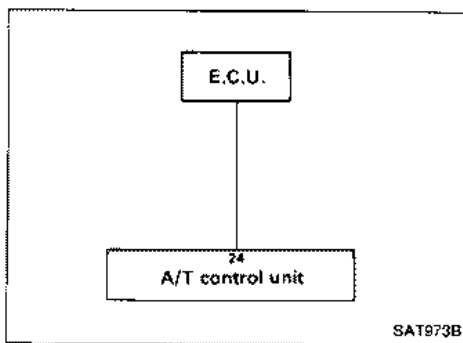
SAT990B



TROUBLE DIAGNOSES

Self-diagnosis (Cont'd)

ENGINE REVOLUTION SIGNAL CIRCUIT CHECK

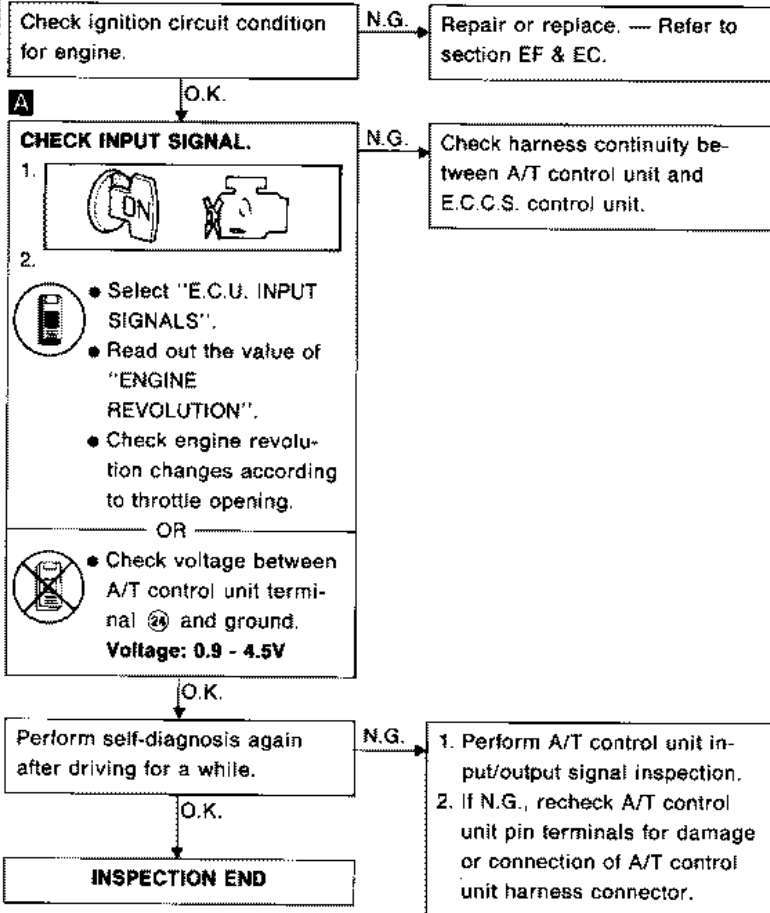
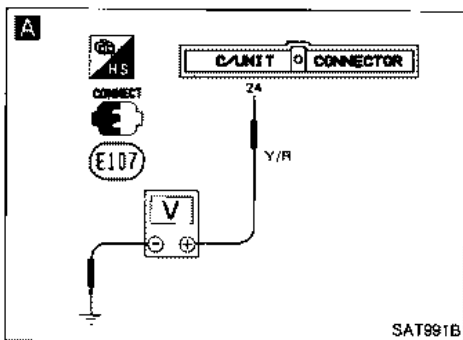


A

☆MONITOR	☆NO FAIL
CAR/S SE1-A/T	0km/h
CAR/S SE2-MTR	5km/h
THROTTLE SEN	0.4V
FLUID TEMP SE	1.2V
BATTERY VOLT	13.4V
ENG REV	1024rPm
SLOT LEVER SW	0 N
R-RANGE SW	OFF
N-RANGE SW	0 N

RECORD

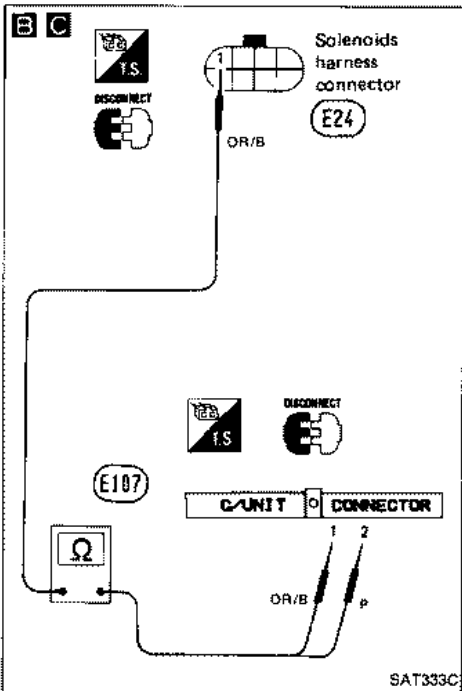
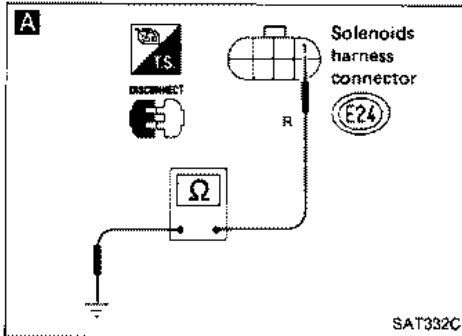
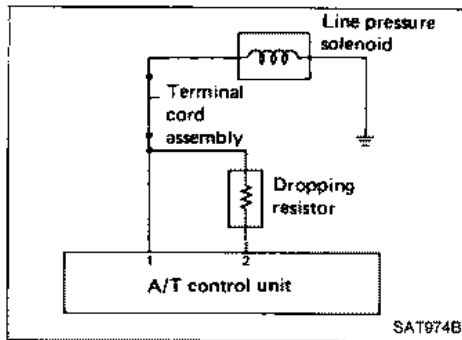
SAT331C



TROUBLE DIAGNOSES

Self-diagnosis (Cont'd)

LINE PRESSURE SOLENOID CIRCUIT CHECK



A

CHECK GROUND CIRCUIT.

- 1.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ① and ground.
Resistance: 2.5 - 5Ω

N.G. →

1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
 - Line pressure solenoid — Refer to "Electrical Components Inspection".
 - Harness continuity of terminal cord assembly

O.K. ↓

B

CHECK POWER SOURCE CIRCUIT.

- 1.
2. Disconnect A/T control unit connector.
3. Check resistance between terminal ① and A/T control unit terminal ②.
Resistance: 11.2 - 12.8Ω

N.G. →

Check the following items.

- Dropping resistor — Refer to "Electrical Components Inspection".
- Harness continuity between A/T control unit ② and terminal cord assembly

O.K. ↓

C

CHECK POWER SOURCE CIRCUIT.

- 1.
2. Check resistance between terminal ① and A/T control unit terminal ①.
Resistance: Approximately 0Ω
3. Reinstall any part removed.

N.G. →

Repair or replace harness between A/T control unit ① and terminal cord assembly.

O.K. ↓

Perform self-diagnosis after driving for a while.

O.K. ↓

INSPECTION END

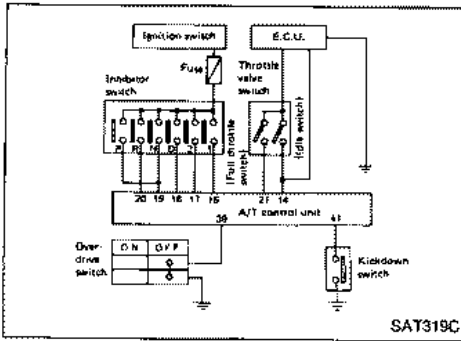
N.G. →

1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

TROUBLE DIAGNOSES

Self-diagnosis (Cont'd)

INHIBITOR, OVERDRIVE, KICKDOWN AND IDLE SWITCH CIRCUIT CHECKS



A

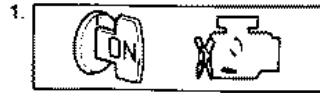
```

    *MONITOR *IND FAIL
    CAR'S SEL-A/T      0km/h
    CAR'S SEL-NTR     5km/h
    THROTTLE SEN      0.4V
    FLUID TEMP SE     1.20
    BATTERY VOLT     13.40
    ERG REU          1024rpm
    SLCT LEVER SW     0 N
    P-RANGE SW       OFF
    N-RANGE SW       0 N
    
```

RECORD

SAT334C

A
CHECK INHIBITOR SWITCH CIRCUIT.



1. Select "E.C.U. INPUT signals".
2. Read out "R, N, D, 1 and 2 range switches" moving selector lever to each range.
3. Check the selector lever position is indicated properly.

OR

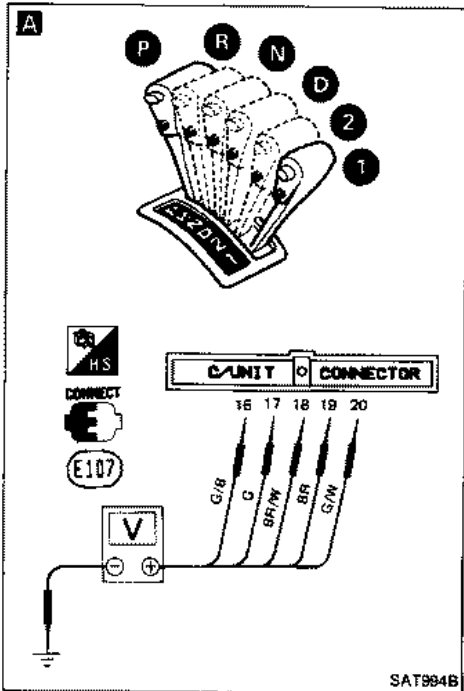
- Check voltage between A/T control unit terminals ⑱, ⑳, ㉑, ㉒, ㉓ and ground while moving selector lever through each range.

Voltage:

- B: Battery voltage**
- 0: 0V**

Terminal No.	⑱	⑳	㉑	㉒	㉓
Lever position					
P, N	B	0	0	0	0
R	0	B	0	0	0
D	0	0	B	0	0
2	0	0	0	B	0
1	0	0	0	0	B

O.K.



N.G. → Check the following items.

- Inhibitor switch — Refer to "Electrical Components Inspection".
- Harness continuity between ignition switch and inhibitor switch
- Harness continuity between inhibitor switch and A/T control unit

TROUBLE DIAGNOSES

Self-diagnosis (Cont'd)

B

OVER DRIVE (ON/OFF)

ON

OFF

```

MONITOR  NO FAIL
CAR/S SE1-A/T 0km/h
CAR/S SE2-NTR 5km/h
THROTTLE SEN 0.4V
FLUID TEMP SE 1.2V
BATTERY VOLT 13.4V
ENG REV 1024rPm
SLT LEVER SW 0 N
R-RANGE SW OFF
N-RANGE SW 0 N
    
```

RECORD

SAT335C

B

CHECK OVERDRIVE SWITCH CIRCUIT.

-
- Select "E.C.U. INPUT SIGNALS".
 - Read out "SELECTOR LEVER SWITCH (Overdrive switch)".
 - Check the selector lever switch position is indicated properly. (Selector lever switch "ON" displayed on CONSULT means overdrive "OFF".)

OR

- Check voltage between A/T control unit terminal 39 and ground when overdrive switch is in "ON" position and in "OFF" position.

Switch position	Voltage
ON	Battery voltage
OFF	1V or less

N.G.

- Check the following items.
- Overdrive switch — Refer to "Electrical Components Inspection".
 - Harness continuity between A/T control unit and overdrive switch
 - Harness continuity of ground circuit for overdrive switch

B

OVER DRIVE (ON/OFF)

ON

OFF

CONNECT

E107

V

39

GY

UNIT CONNECTOR

SAT995B


O.K.

B

TROUBLE DIAGNOSES

Self-diagnosis (Cont'd)

C


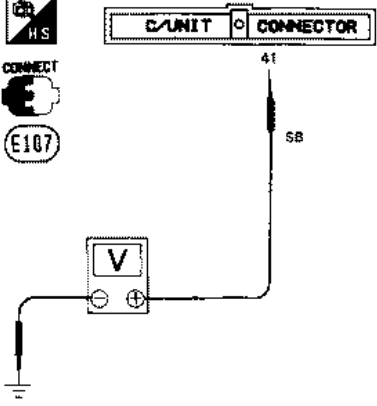


MONITOR	NO FAIL
D-RANGE SW	OFF
1-RANGE SW	OFF
2-RANGE SW	OFF
ASCD-CRUISE	OFF
ASCD-OD CUT	OFF
KICKDOWN SW	OFF
POWERSHIFT SW	OFF
IDLE SW	ON
FULL THRTL SW	OFF

RECORD

SAT336C

C

A/T UNIT CONNECTOR

41

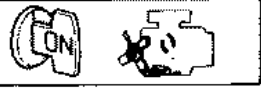

5B

V


SAT337C

C

CHECK KICKDOWN SWITCH CIRCUIT.

- 
- 
 - Select "E.C.U. INPUT SIGNALS".
 - Read out "KICKDOWN SWITCH" depressing accelerator pedal fully.
 - Check kickdown switch position is indicated properly.

OR



- Check voltage between A/T control unit terminal ④ and ground while depressing accelerator pedal slowly. (after warming up engine)

Voltage:

When releasing accelerator pedal:
3 - 8V

When depressing accelerator pedal fully:
1V or less

N.G.

Check the following items.

- Kickdown switch
- Harness continuity between A/T control unit and kickdown switch
- Harness continuity of ground circuit for kickdown switch


O.K.

C

TROUBLE DIAGNOSES

Self-diagnosis (Cont'd)

D


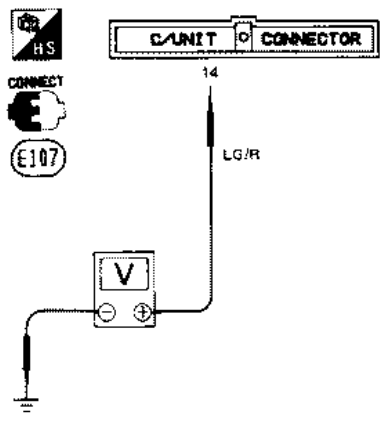


MONITOR	NO FAIL
D-RANGE SW	OFF
1-RANGE SW	OFF
2-RANGE SW	OFF
ASCD-CRUISE	OFF
ASCD-OD CUT	OFF
KICKDOWN SW	OFF
POWERSHIFT SW	OFF
IDLE SW	ON
FULL THRTL SW	OFF

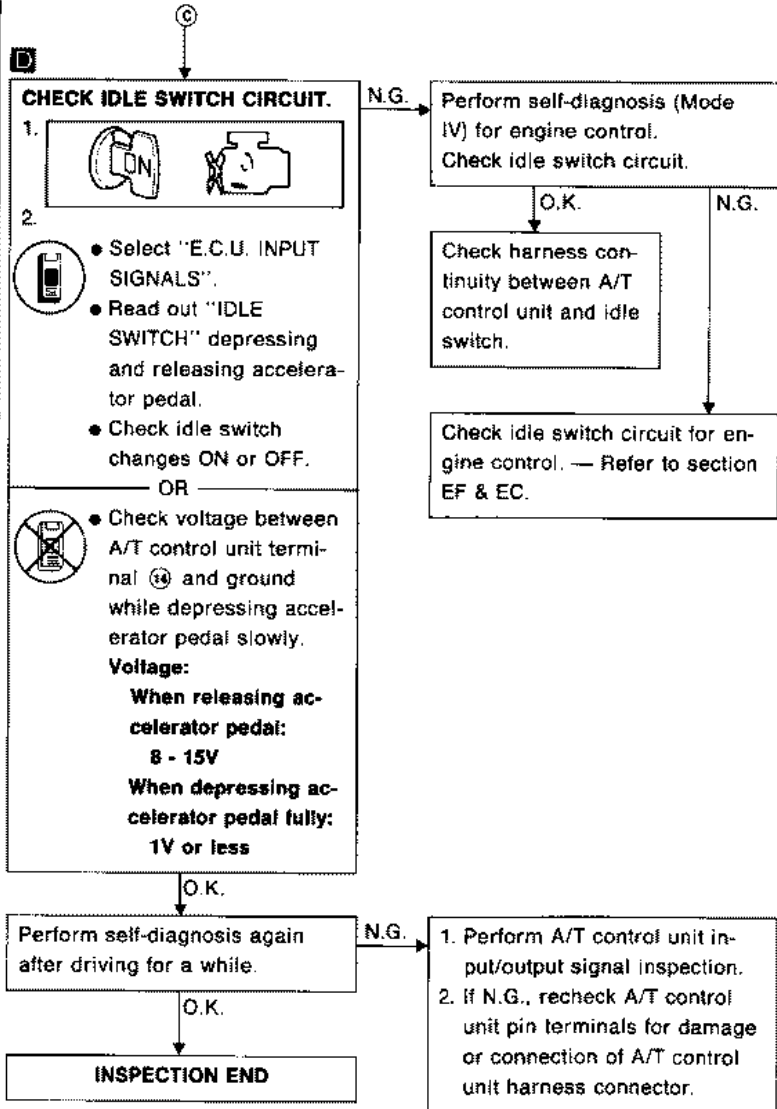
RECORD

SAT338C

D

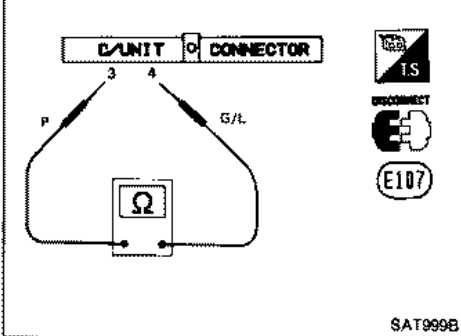
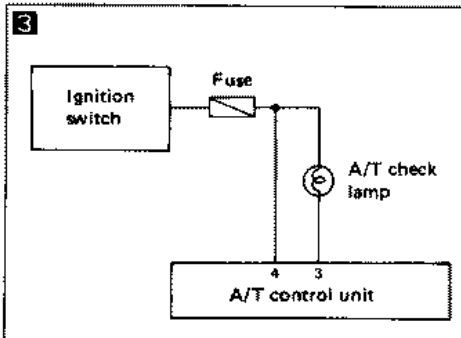
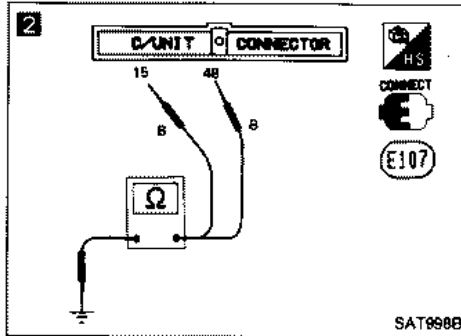
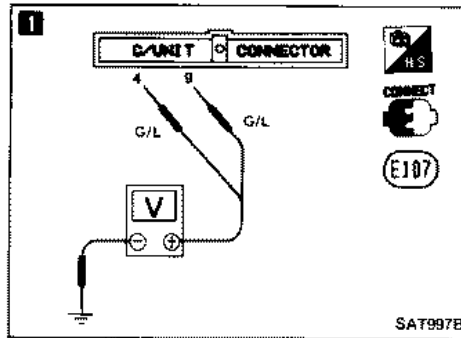
SAT339C



TROUBLE DIAGNOSES

Diagnostic Procedure 1

SYMPTOM: A/T CHECK lamp does not come on for about 2 seconds when turning ignition switch to "ON".



1

CHECK A/T CONTROL UNIT POWER SOURCE.

-
- Check voltage between A/T control unit terminals (4), (9) and ground.
Battery voltage should exist.

N.G. → Check the following items.

- Harness continuity between ignition switch and A/T control unit.
- Ignition switch and fuse — Refer to section EL.

O.K. ↓

2

CHECK A/T CONTROL UNIT GROUND CIRCUIT.

-
- Disconnect A/T control unit connector.
- Check resistance between A/T control unit terminals (15), (4B) and ground.
Resistance: Approximately 0Ω

N.G. → Check harness continuity between A/T control unit and ground.

O.K. ↓

3

CHECK LAMP CIRCUIT.

-
- Disconnect A/T control unit connector.
- Check resistance between A/T control unit terminals (3) and (4).
Resistance: 50 - 100Ω
- Reinstall any part removed.

N.G. → Check the following items.

- A/T check lamp
- Harness continuity between ignition switch and A/T check lamp
- Harness continuity between A/T check lamp and A/T control unit

O.K. ↓

Check again.

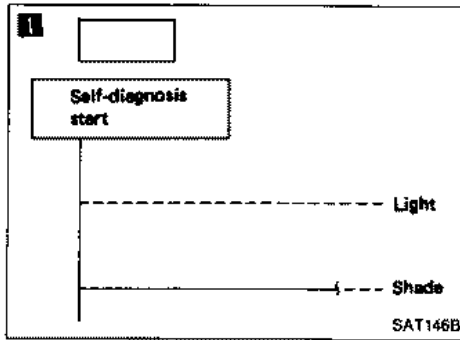
N.G. →

1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

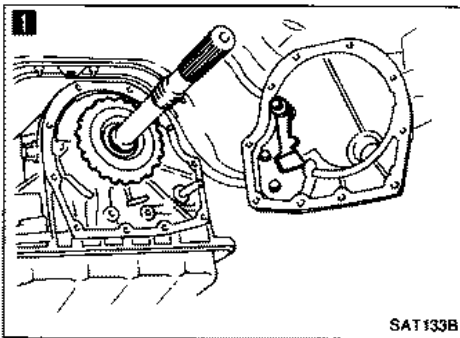
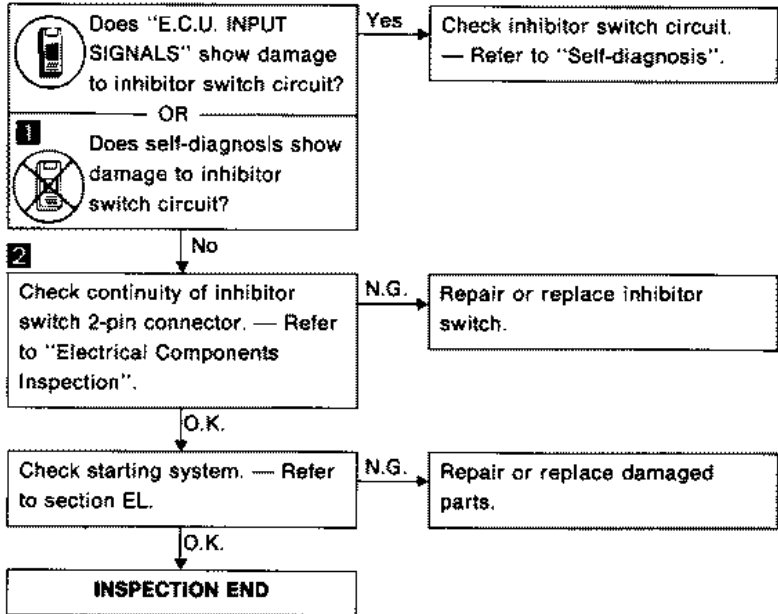
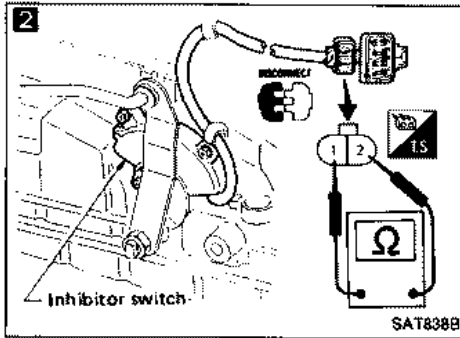
INSPECTION END

TROUBLE DIAGNOSES



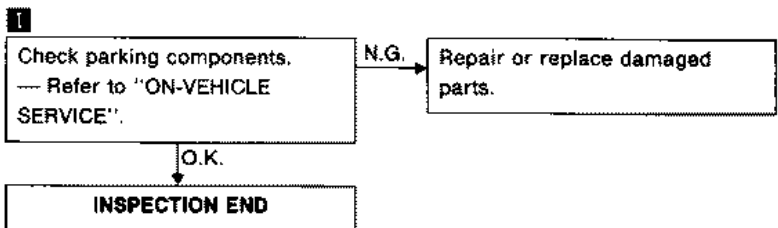
Diagnostic Procedure 2

SYMPTOM: Engine cannot be started with selector lever in "P" or "N" range or engine can be started with selector lever in "D", "2", "1" or "R" range.



Diagnostic Procedure 3

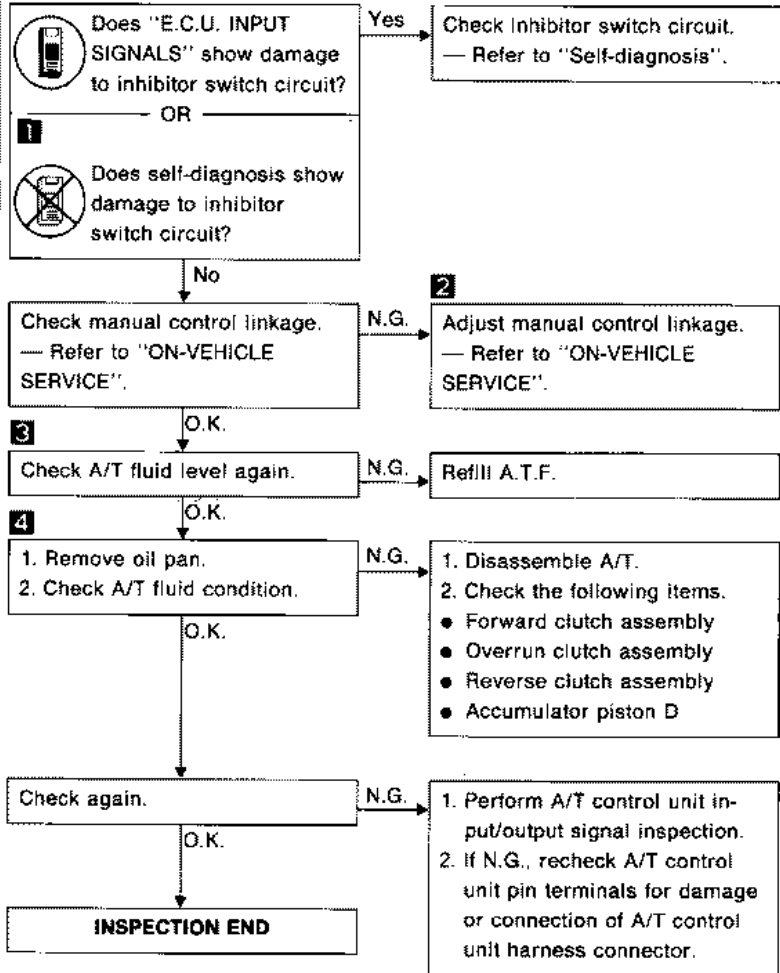
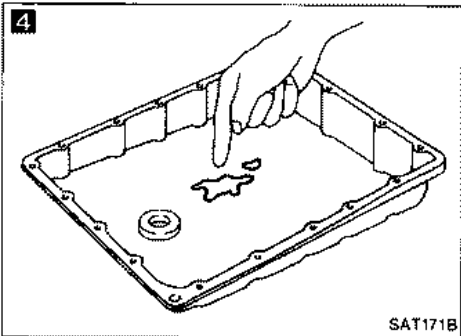
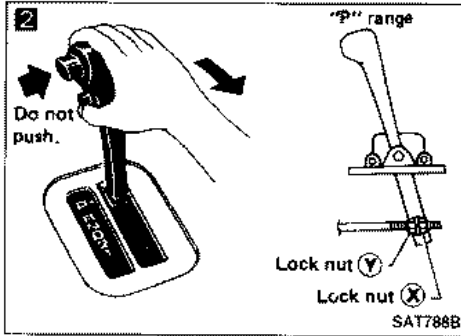
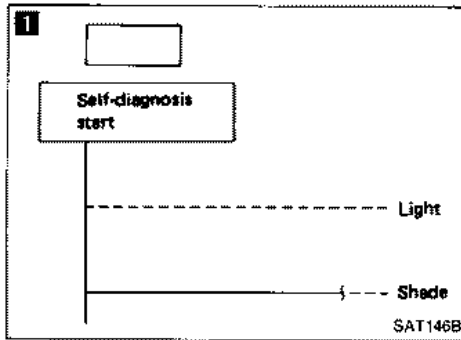
SYMPTOM: Vehicle moves when it is pushed forward or backward with selector lever in "P" range.



TROUBLE DIAGNOSES

Diagnostic Procedure 4

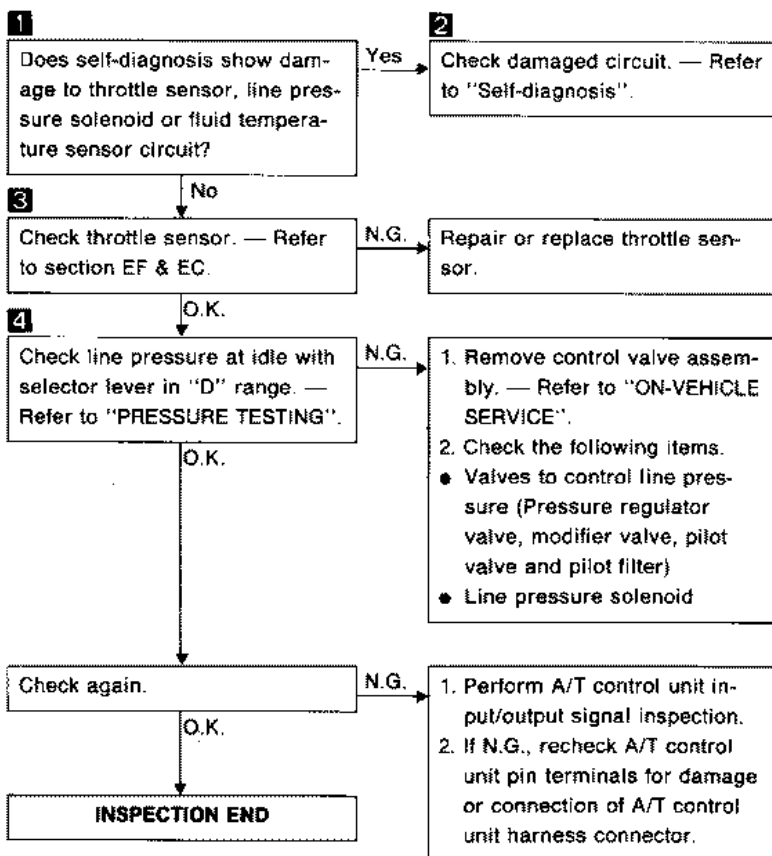
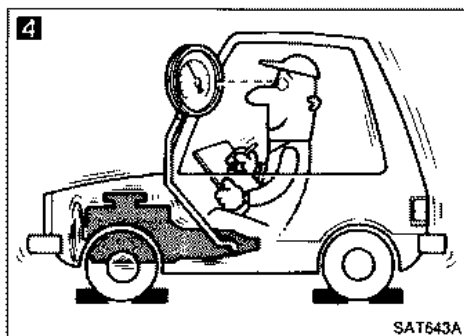
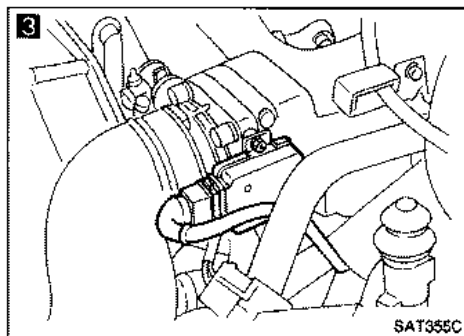
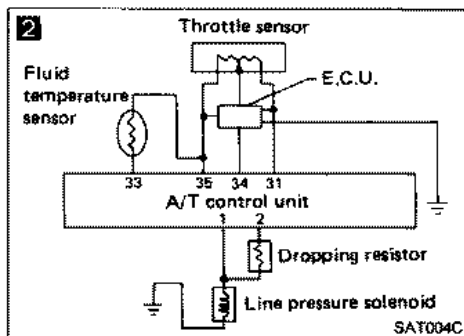
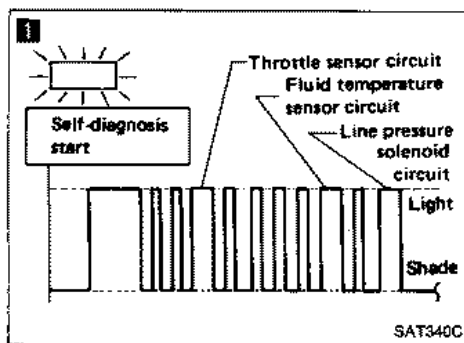
SYMPTOM: Vehicle moves forward or backward when selecting "N" range.



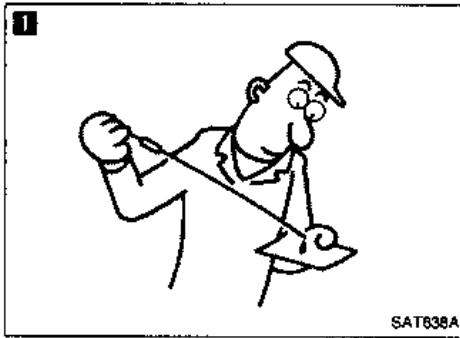
TROUBLE DIAGNOSES

Diagnostic Procedure 5

SYMPTOM: There is large shock when changing from "N" to "R" range.

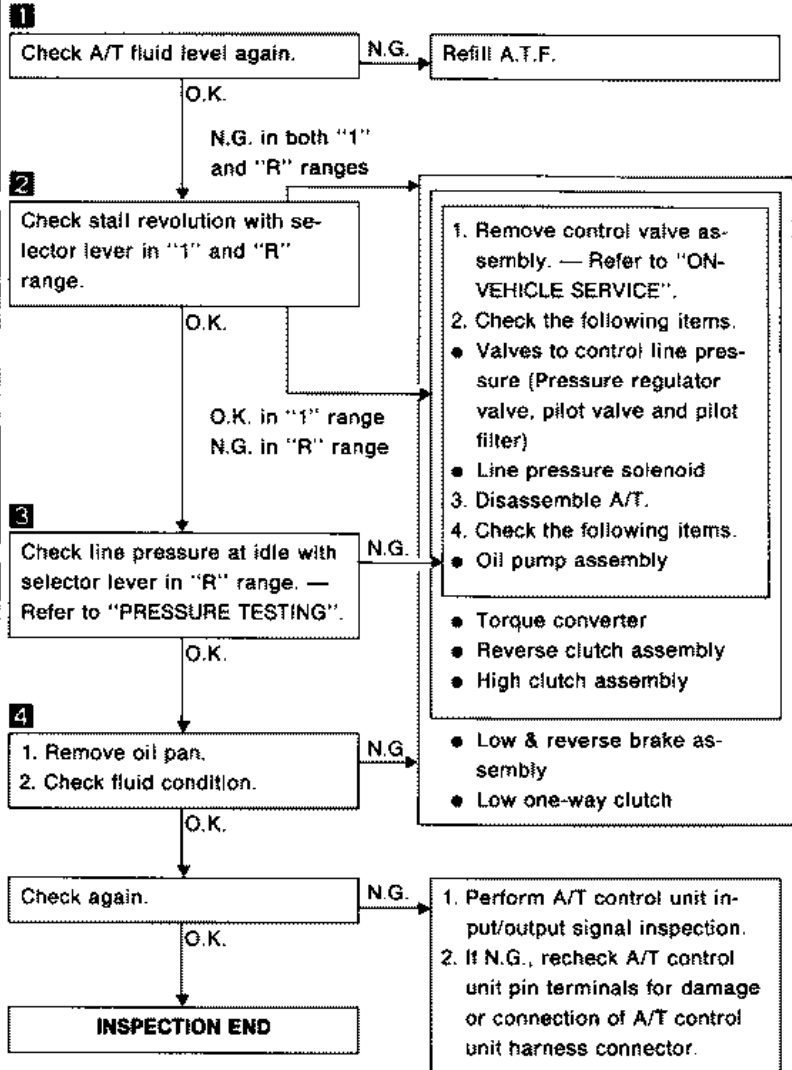
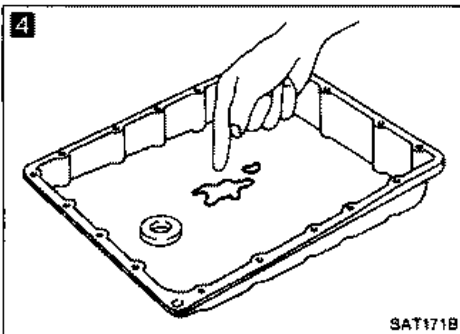
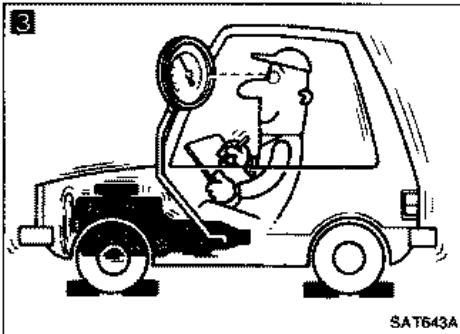
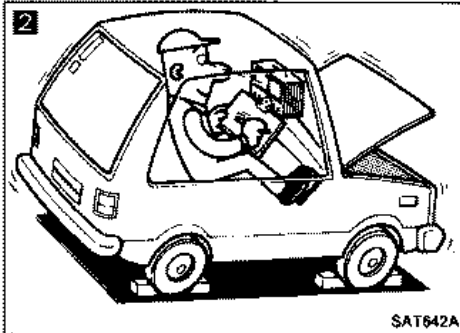


TROUBLE DIAGNOSES

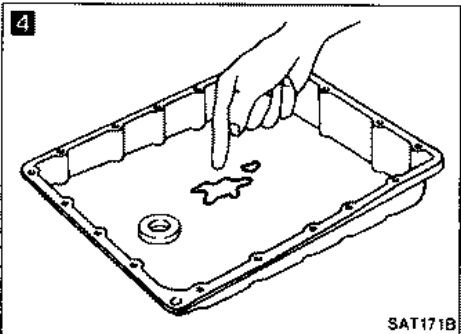
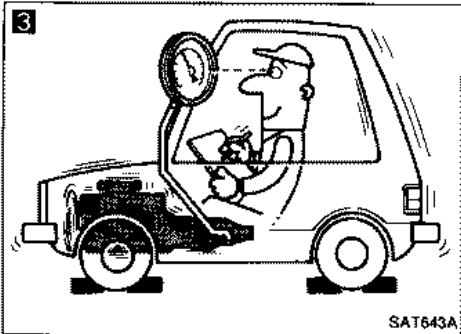
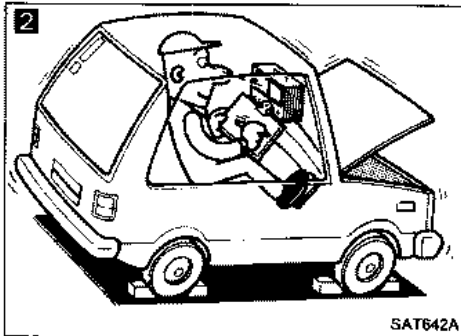
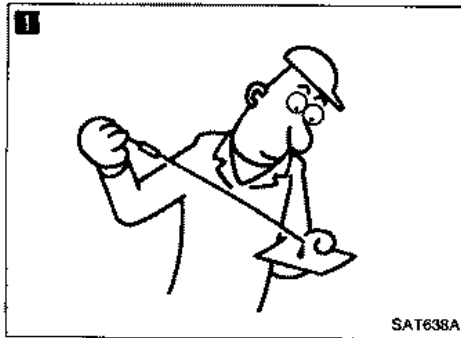


Diagnostic Procedure 6

SYMPTOM: Vehicle does not creep backward when selecting "R" range.

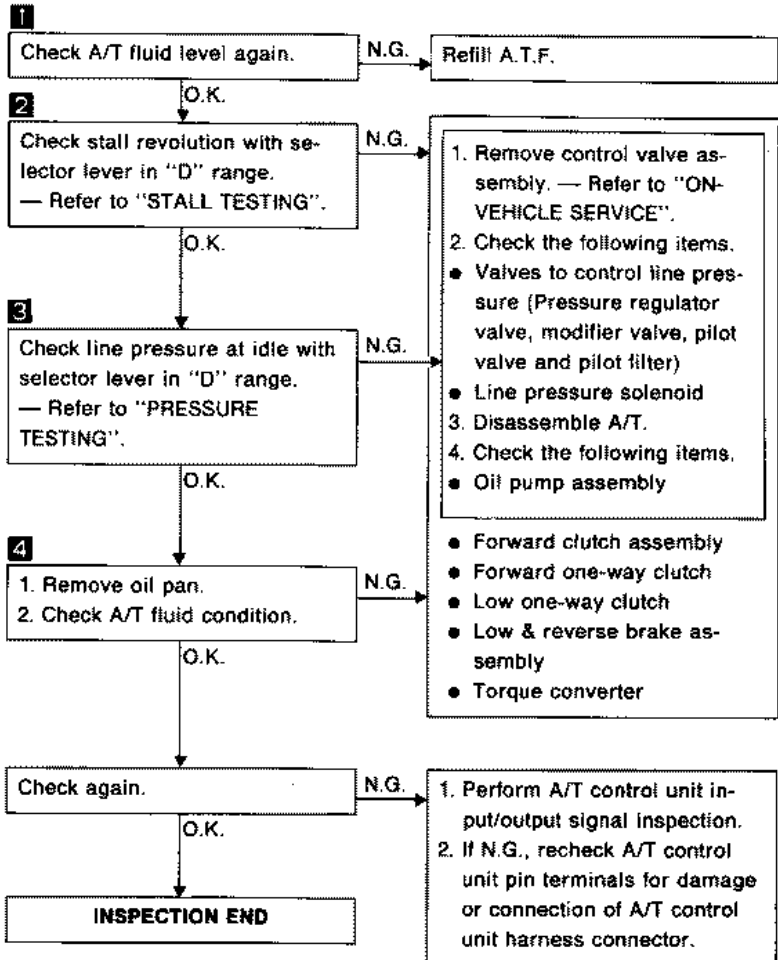


TROUBLE DIAGNOSES

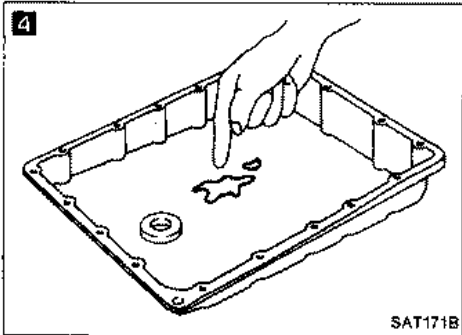
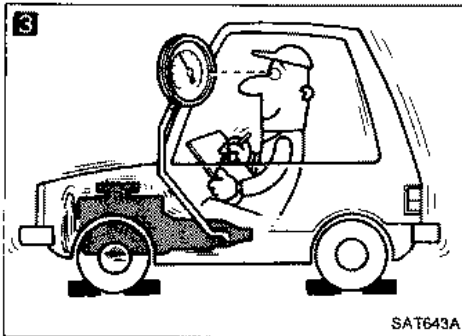
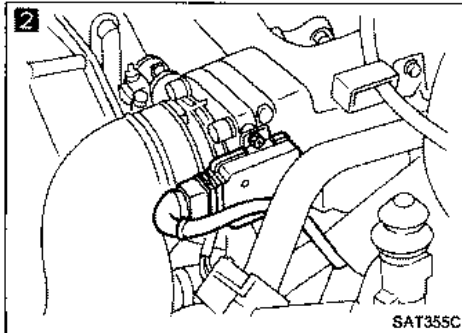
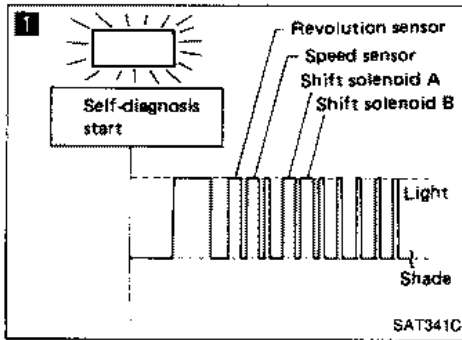


Diagnostic Procedure 7

SYMPTOM: Vehicle does not creep forward when selecting "D", "2" or "1" range.

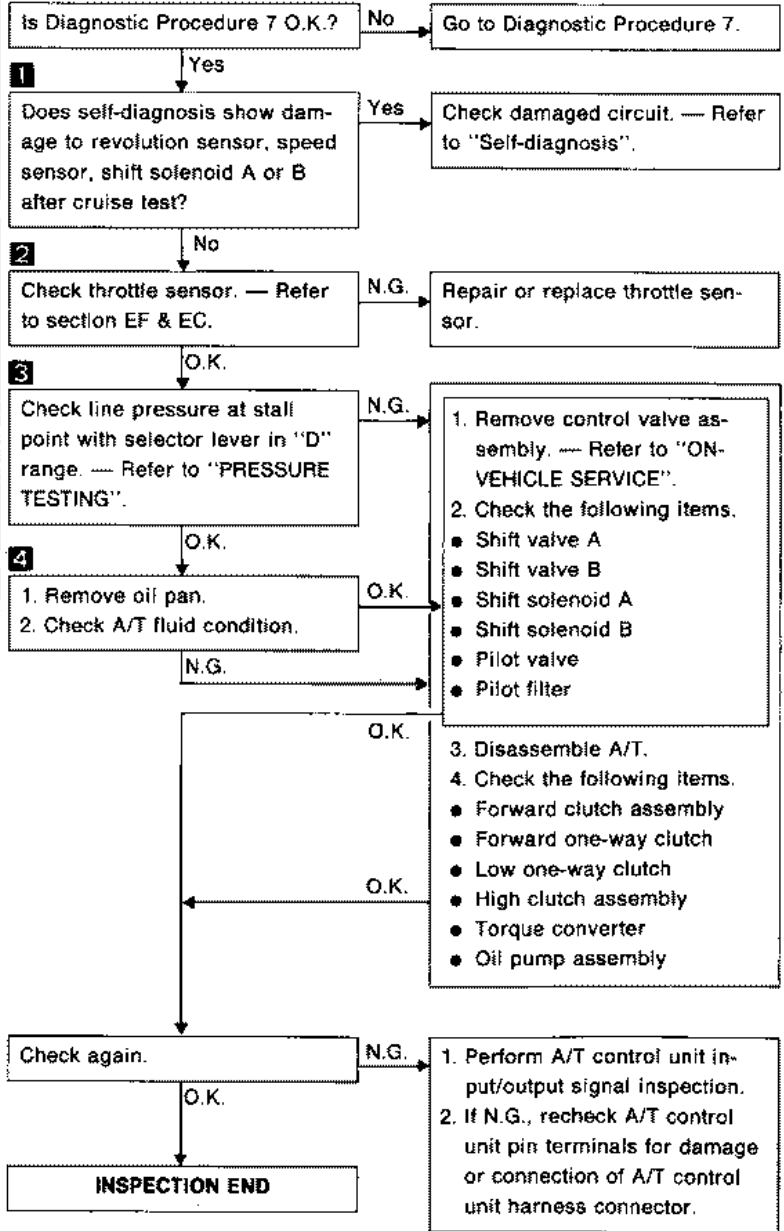


TROUBLE DIAGNOSES

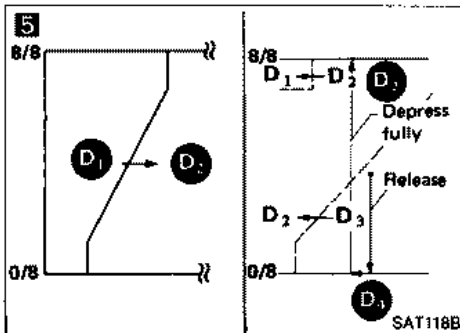
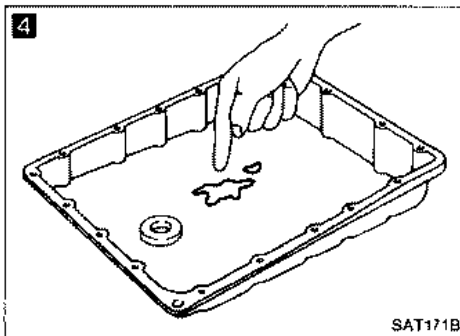
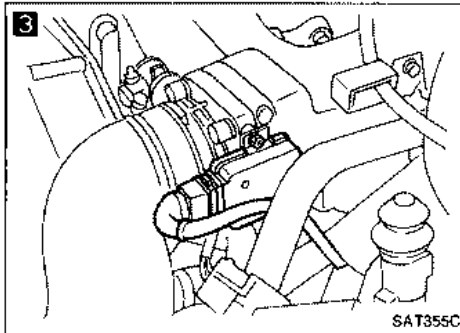
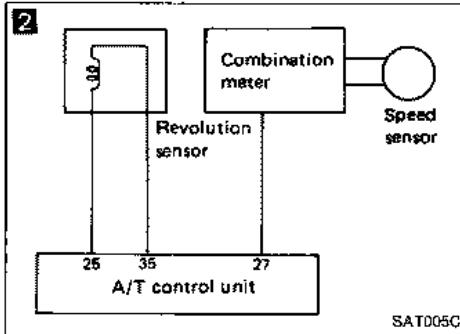
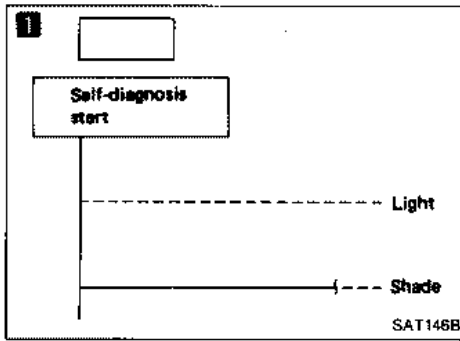


Diagnostic Procedure 8

SYMPTOM: Vehicle cannot be started from D₁ on Cruise test — Part 1.

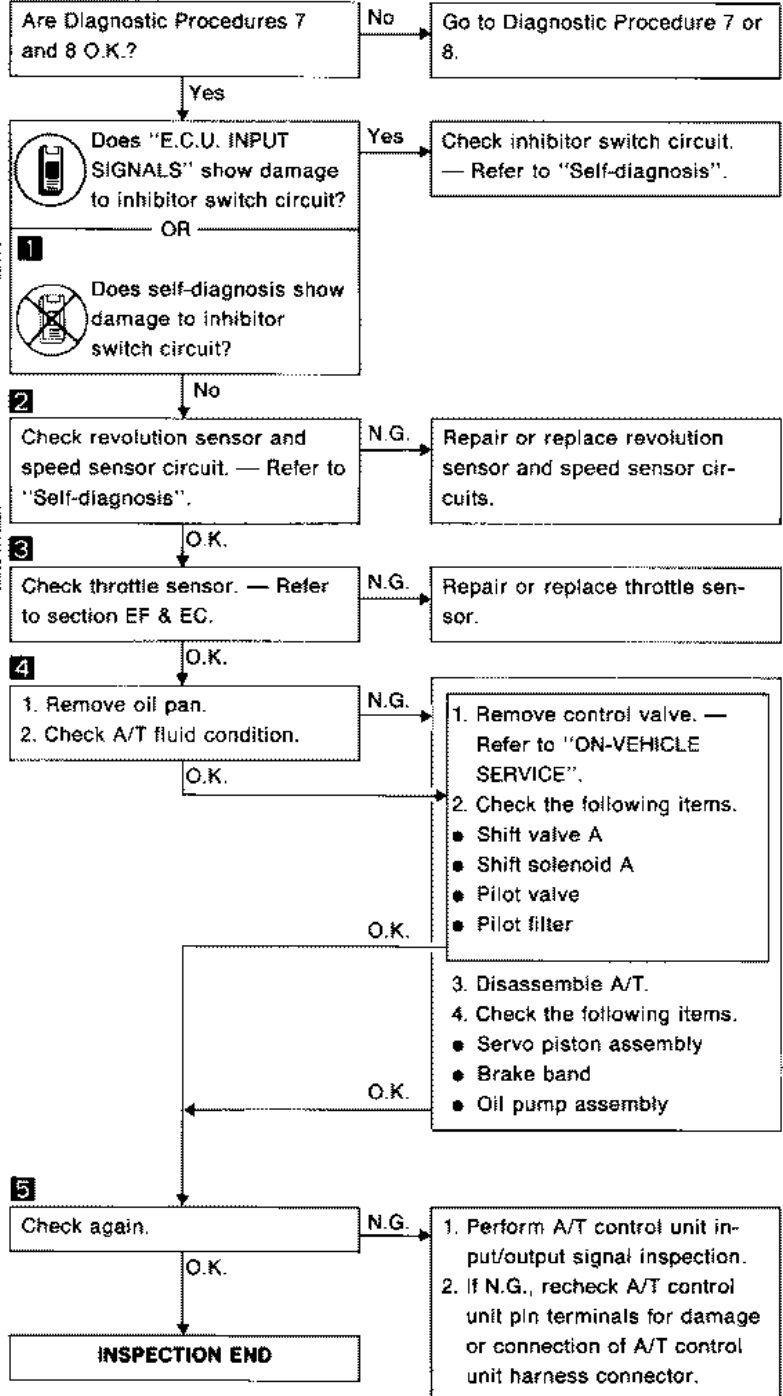


TROUBLE DIAGNOSES

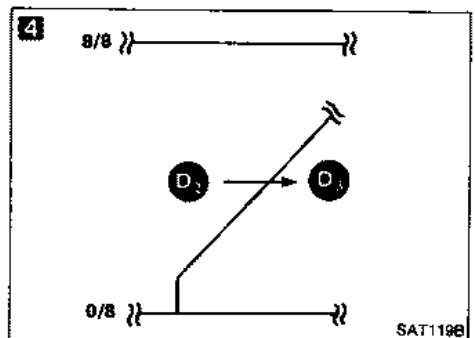
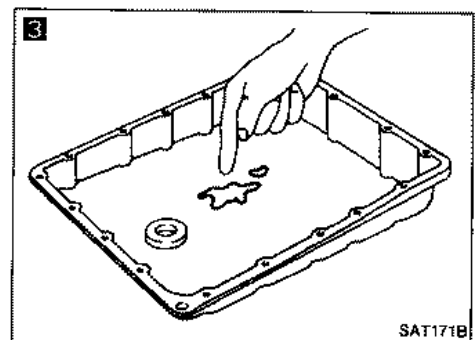
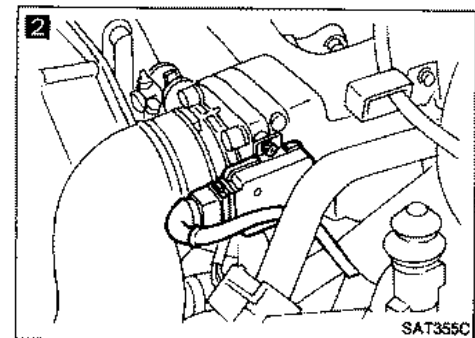
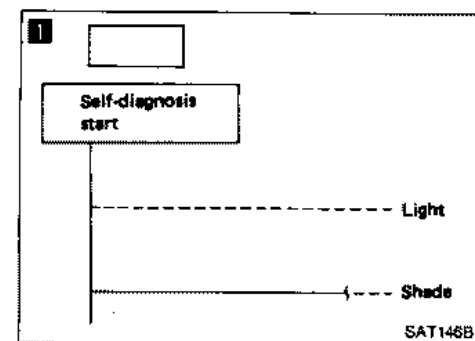


Diagnostic Procedure 9

SYMPTOM: A/T does not shift from D₁ to D₂ at the specified speed.
A/T does not shift from D₄ to D₂ when depressing accelerator pedal fully at the specified speed.

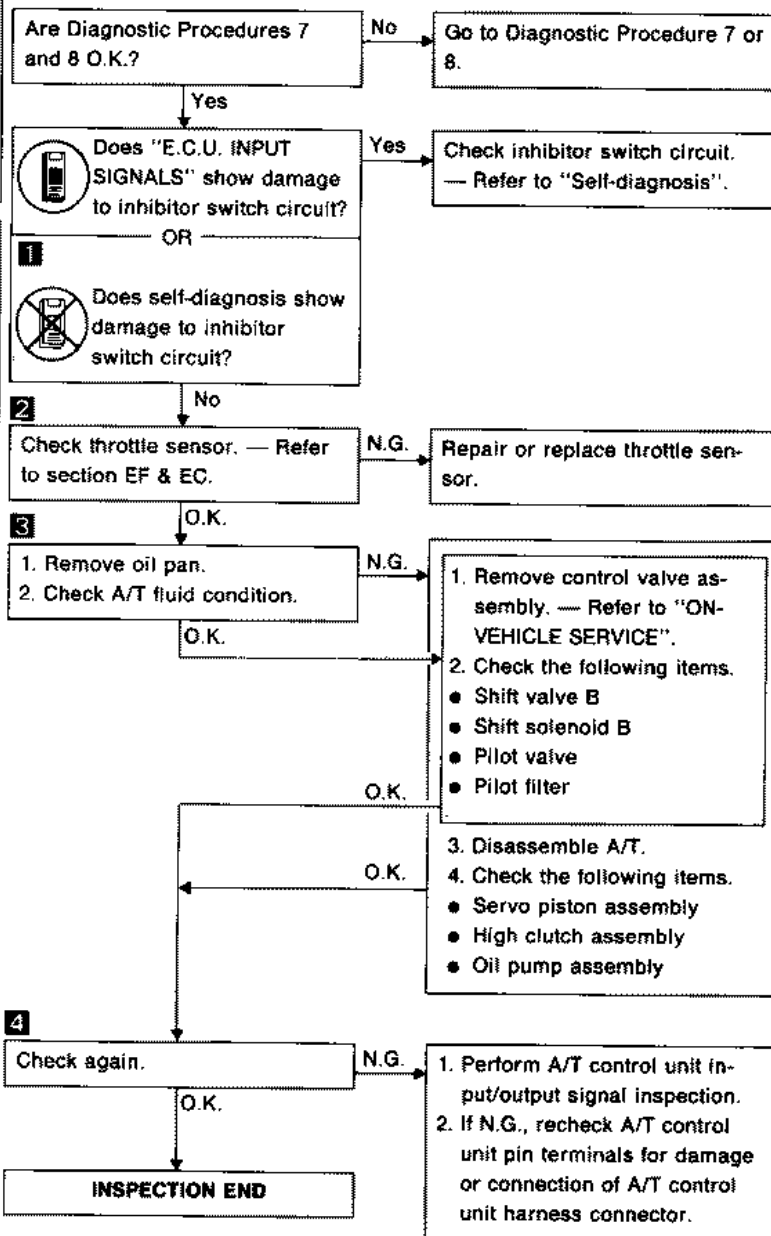


TROUBLE DIAGNOSES



Diagnostic Procedure 10

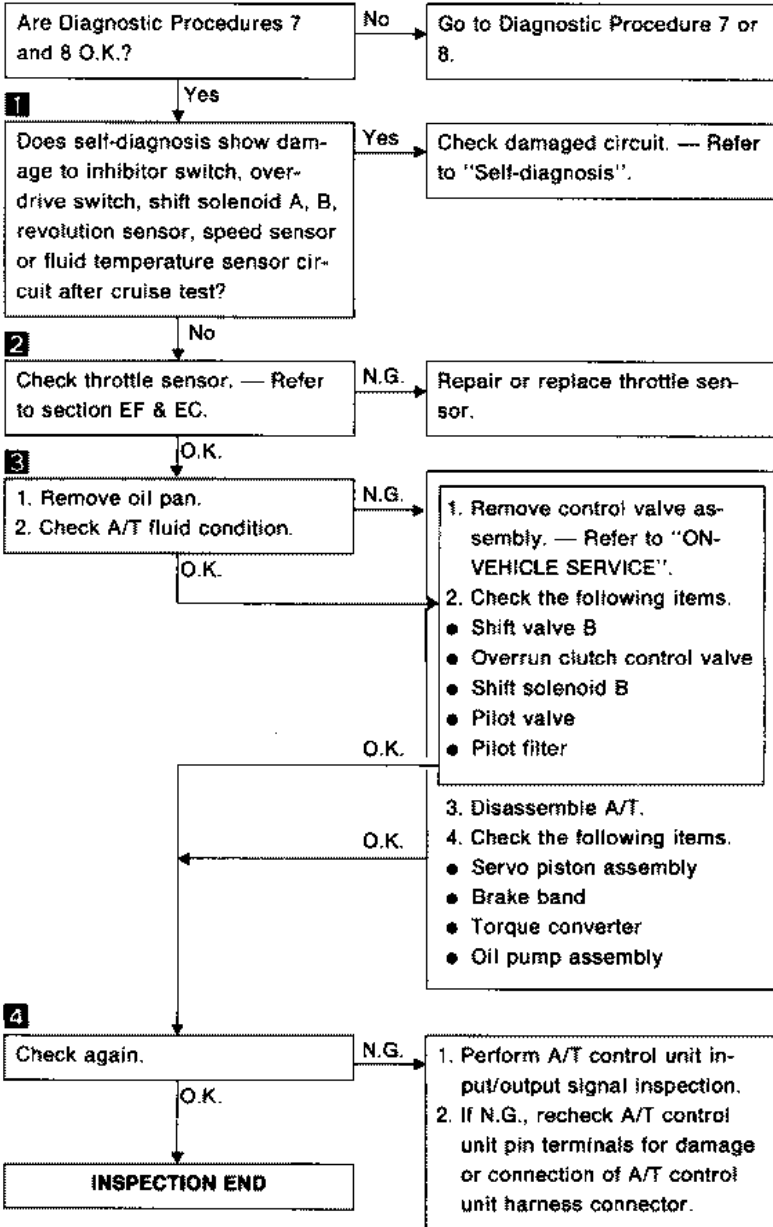
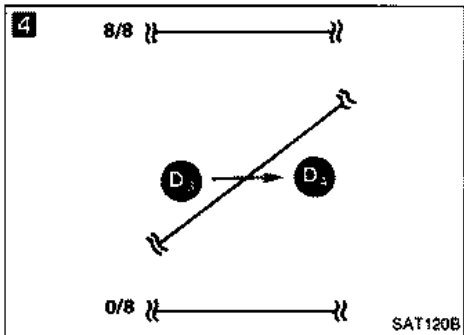
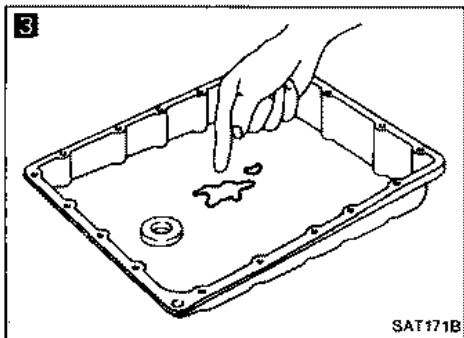
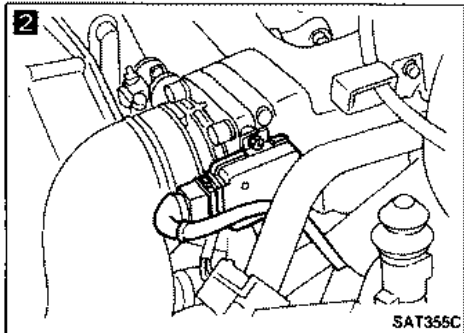
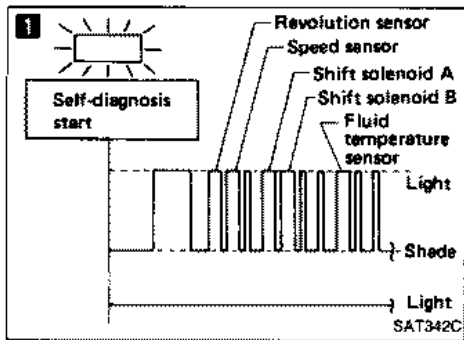
SYMPTOM: A/T does not shift from D_2 to D_3 at the specified speed.



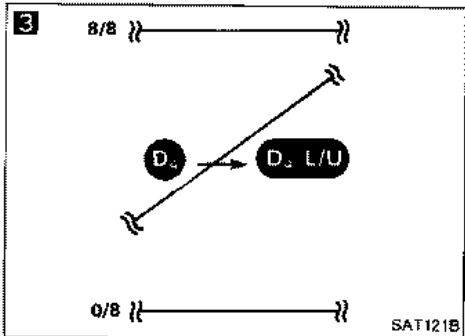
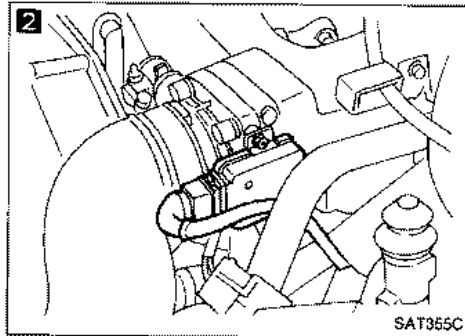
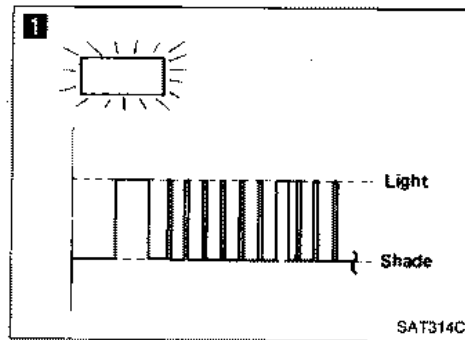
TROUBLE DIAGNOSES

Diagnostic Procedure 11

SYMPTOM: A/T does not shift from D₃ to D₄ at the specified speed.

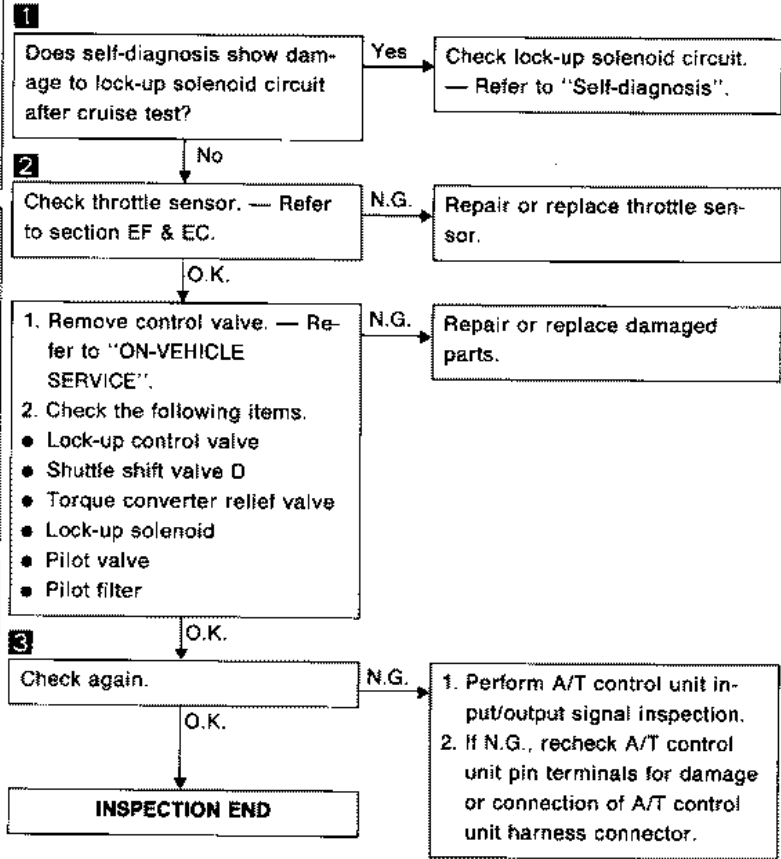


TROUBLE DIAGNOSES

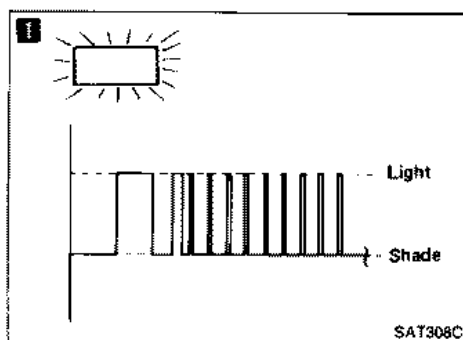


Diagnostic Procedure 12

SYMPTOM: A/T does not perform lock-up at the specified speed.

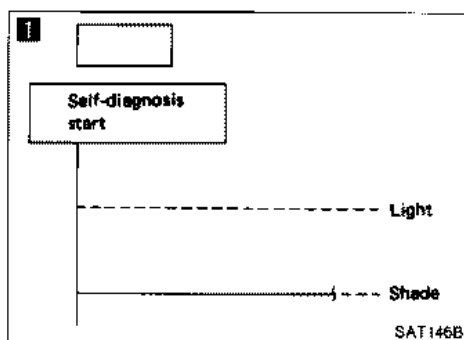
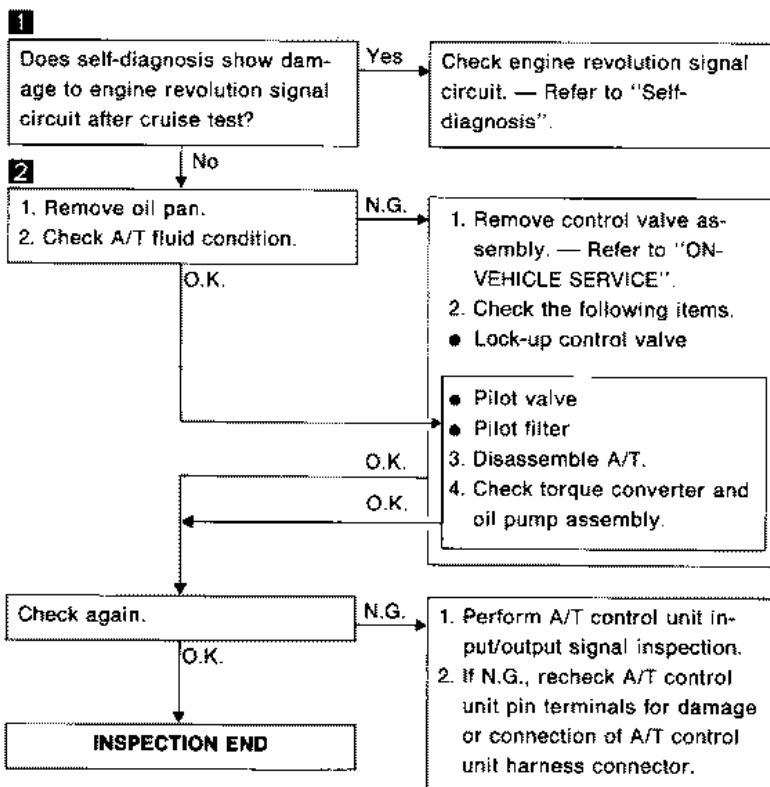
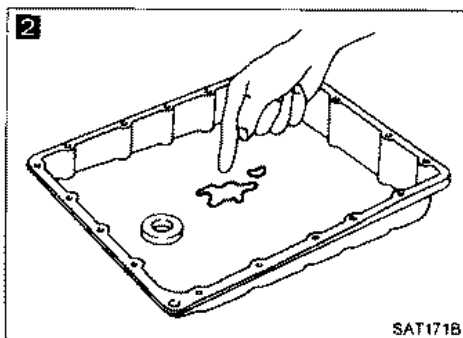


TROUBLE DIAGNOSES



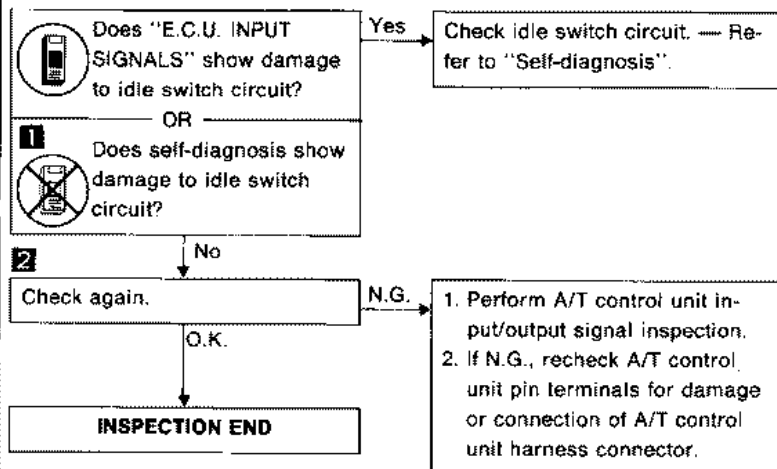
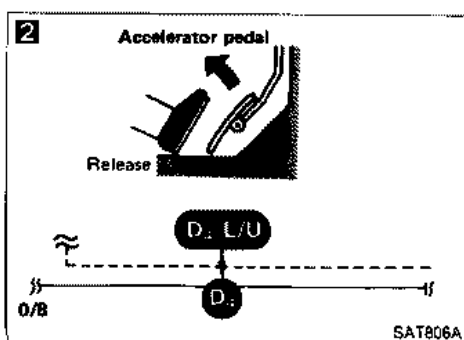
Diagnostic Procedure 13

SYMPTOM: A/T does not hold lock-up condition for more than 30 seconds.

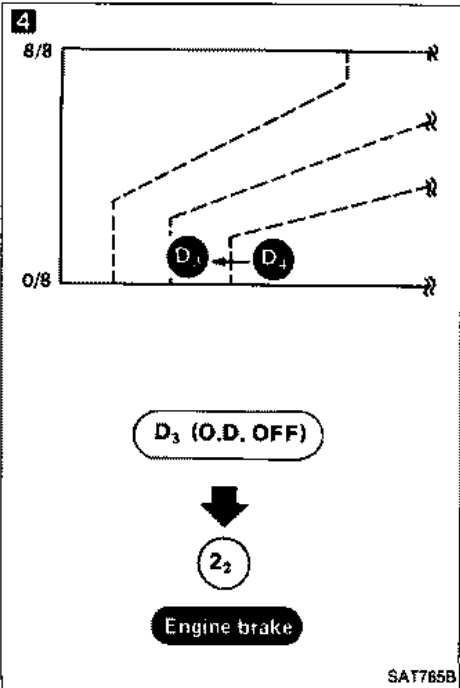
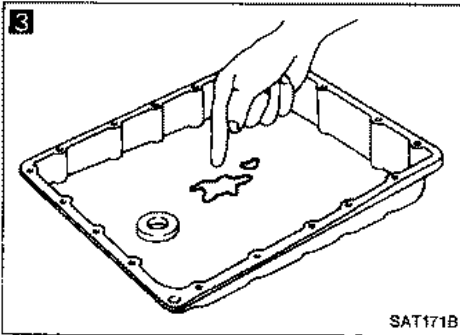
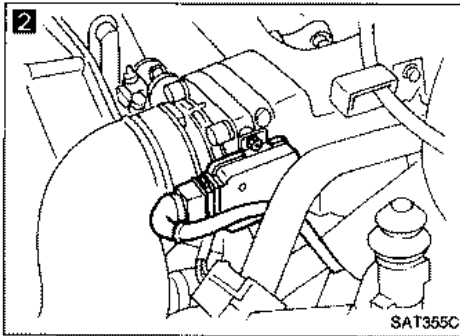
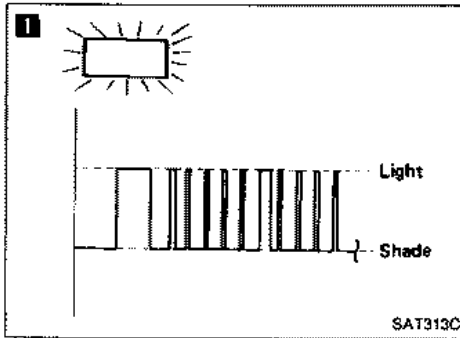


Diagnostic Procedure 14

SYMPTOM: Lock-up is not released when accelerator pedal is released.

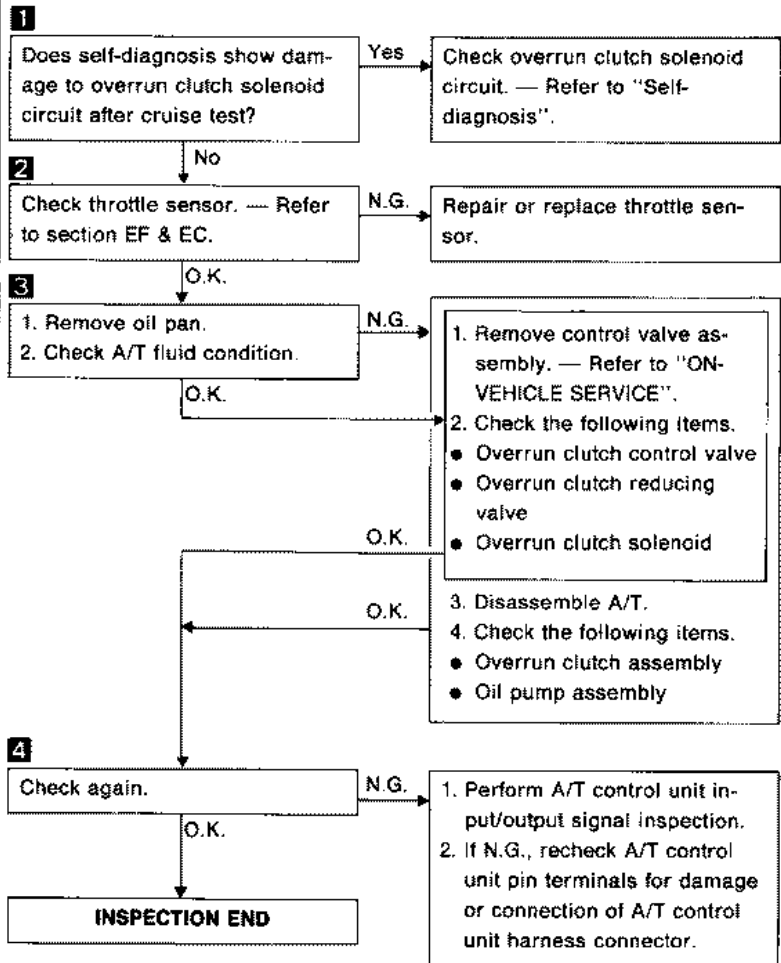


TROUBLE DIAGNOSES

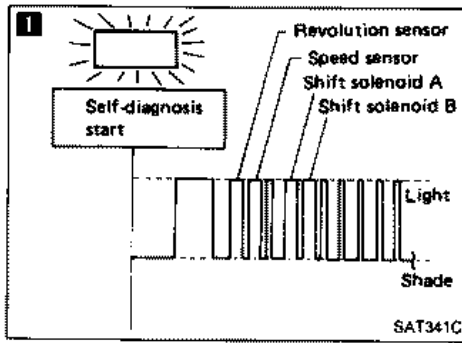


Diagnostic Procedure 15

SYMPTOM: Engine speed does not return to idle smoothly when A/T is shifted from D₄ to D₃ with accelerator pedal released. Vehicle does not decelerate by engine brake when changing overdrive switch to "OFF" position with accelerator pedal released. Vehicle does not decelerate by engine brake when changing selector lever from "D" to "2" range with accelerator pedal released.

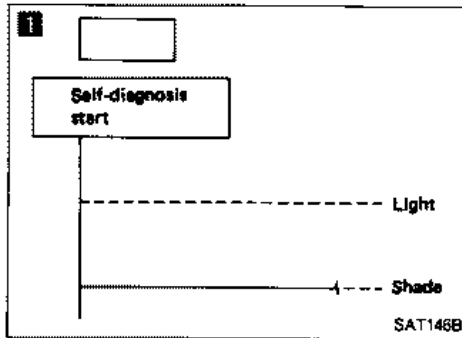
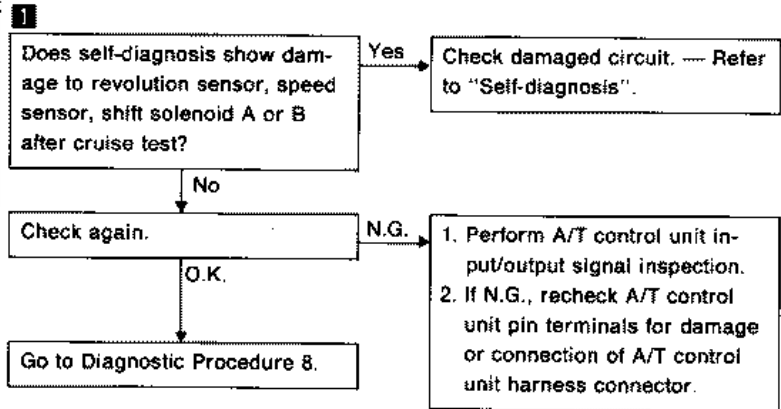


TROUBLE DIAGNOSES



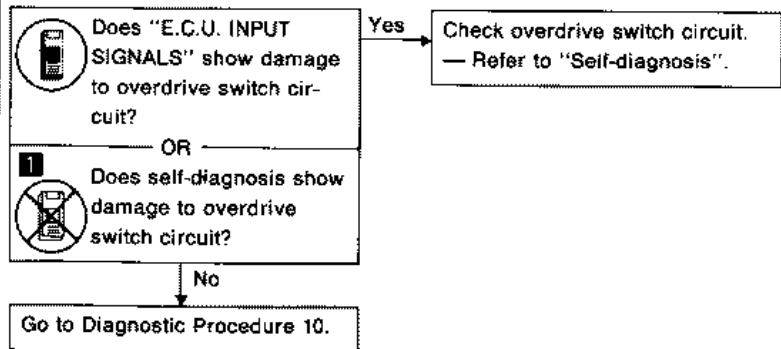
Diagnostic Procedure 16

SYMPTOM: Vehicle does not start from D₁ on Cruise test — Part 2.

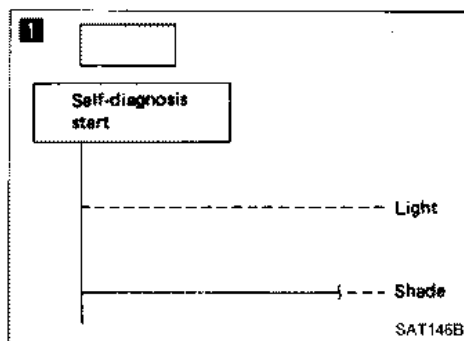


Diagnostic Procedure 17

SYMPTOM: A/T does not shift from D₄ to D₃ when changing overdrive switch to "OFF" position.

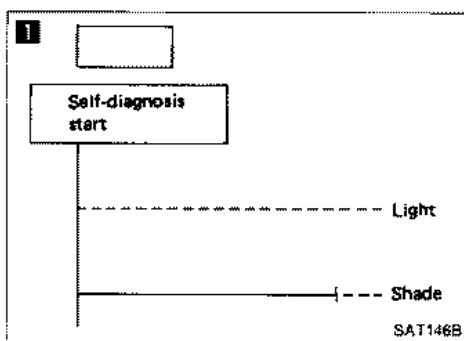
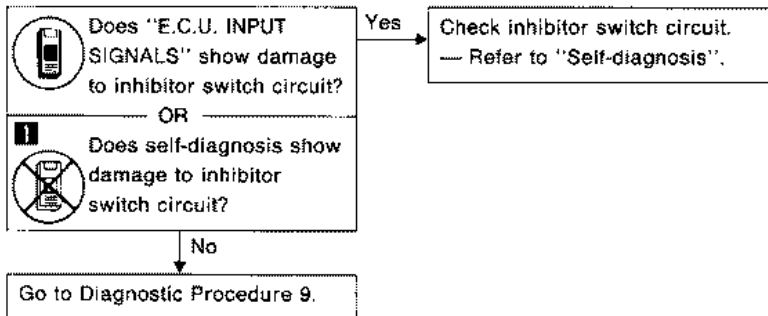


TROUBLE DIAGNOSES



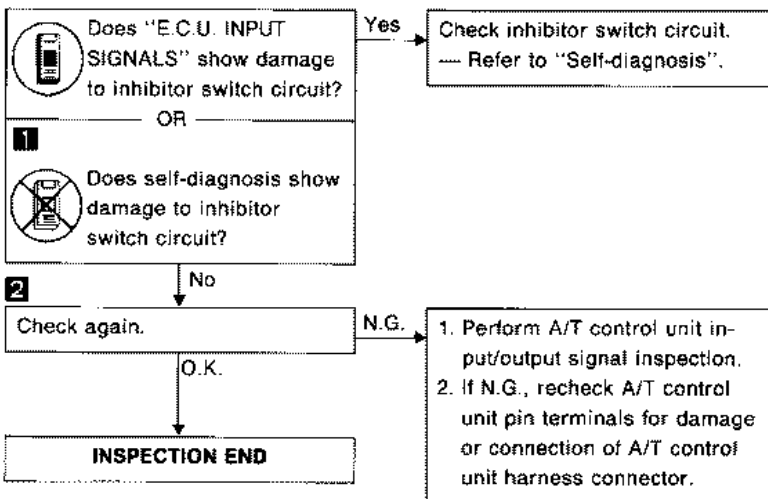
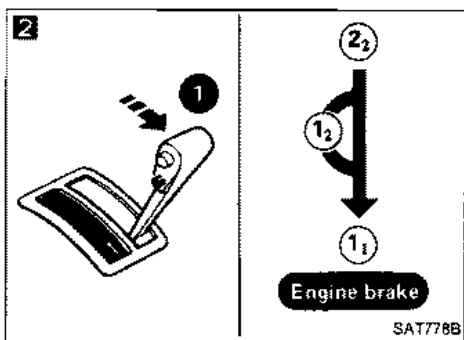
Diagnostic Procedure 18

SYMPTOM: A/T does not shift from D₃ to 2₂ when changing selector lever from "D" to "2" range.



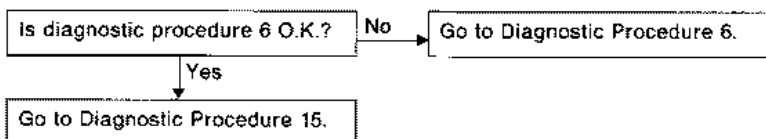
Diagnostic Procedure 19

SYMPTOM: A/T does not shift from 2₂ to 1₁ when changing selector lever from "2" to "1" range.

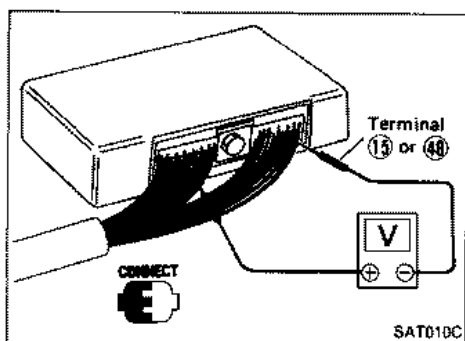


Diagnostic Procedure 20

SYMPTOM: Vehicle does not decelerate by engine brake when shifting from 2₂ (1₂) to 1₁.



TROUBLE DIAGNOSES



Electrical Components Inspection

INSPECTION OF A/T CONTROL UNIT

- Measure voltage between each terminal and terminal ⑮ or ④⑧ by following "A/T CONTROL UNIT INSPECTION TABLE".

- Pin connector terminal layout.

1	2	3	4	9	10	11	12	13	14	15	●	23	24	25	26	27	28	29	30	31	32	33	34	35
5	6	7	8	16	17	18	19	20	21	22		36	37	38	39	40	41	42	43	44	45	46	47	48








SAT011C

TROUBLE DIAGNOSES



Electrical Components Inspection (Cont'd)

A/T CONTROL UNIT INSPECTION TABLE
(Data are reference values.)

Terminal No.	Item		Condition	Judgment standard
1	Line pressure solenoid		When accelerator pedal is released after warming up engine.	1.5 - 2.5V
			When accelerator pedal is depressed fully after warming up engine.	0.5V or less
2	Line pressure solenoid (with dropping resistor)		When accelerator pedal is released after warming up engine.	5 - 14V
			When accelerator pedal is depressed fully after warming up engine.	0.5V or less
3	A/T check lamp		When A/T check lamp is on.	1V or less
			When A/T check lamp is not on.	Battery voltage
4	Power source		When ignition switch is turned to "ON".	Battery voltage
			When ignition switch is turned to "OFF".	1V or less
5	Lock-up solenoid		When A/T is performing lock-up.	8 - 15V
			When A/T is not performing lock-up.	1V or less
6	Shift solenoid A		When shift solenoid A is operating. (When driving in "D ₁ " or "D ₄ ".)	Battery voltage
			When shift solenoid A is not operating. (When driving in "D ₂ " or "D ₃ ".)	1V or less
7	Shift solenoid B		When shift solenoid B is operating. (When driving in "D ₁ " or "D ₂ ".)	Battery voltage
			When shift solenoid B is not operating. (When driving in "D ₃ " or "D ₄ ".)	1V or less
8	Overrun clutch solenoid		When timing solenoid is operating. (When driving in "D ₁ " or "D ₄ ".)	Battery voltage
			When timing solenoid is not operating. (When driving in "D ₂ " or "D ₃ ".)	1V or less

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

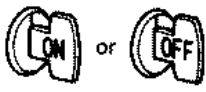






Terminal No.	Item	Condition	Judgment standard	
9	Power source	Same as No. 4		
10*	—	—	—	
11	—	—	—	
12	—	—	—	
13	—	—	—	
14	Idle switch (in throttle valve switch)	When accelerator pedal is released after warming up engine.	8 - 15V	
		When accelerator pedal is depressed after warming up engine.	1V or less	
15	Ground	—	—	
16	Inhibitor "1" range switch		When selector lever is set to "1" range.	Battery voltage
			When selector lever is set to other ranges.	1V or less
17	Inhibitor "2" range switch		When selector lever is set to "2" range.	Battery voltage
			When selector lever is set to other ranges.	1V or less
18	Inhibitor "D" range switch		When selector lever is set to "D" range.	Battery voltage
			When selector lever is set to other ranges.	1V or less
19	Inhibitor "N" or "P" range switch		When selector lever is set to "N" range.	Battery voltage
			When selector lever is set to other ranges.	1V or less
20	Inhibitor "R" range switch		When selector lever is set to "R" range.	Battery voltage
			When selector lever is set to other ranges.	1V or less
21	Full throttle switch		When accelerator pedal is depressed more than half-way after warming up engine.	8 - 15V
			When accelerator pedal is released after warming up engine.	1V or less
22	—	—	—	

*: This terminal is connected to terminal No. 36 of E.C.C.S. control unit.

When code No. 54 appears during engine self-diagnosis, check line between above terminals for proper continuity.






TROUBLE DIAGNOSES

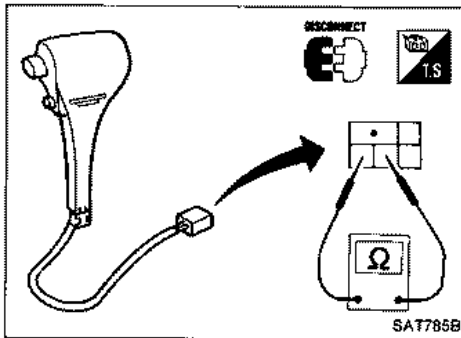
Electrical Components Inspection (Cont'd)

Terminal No.	Item		Condition	Judgment standard	
23	Power source (Back-up)		When ignition switch is turned to "OFF".	Battery voltage	
			When ignition switch is turned to "ON".	Battery voltage	
24	Engine revolution signal		When engine is running at idle speed.	0.9V	
			When engine is running at 3,000 rpm.	Approximately 3.7V	
25	Revolution sensor (Measure in AC range)		When vehicle is cruising at 30 km/h (19 MPH).	1V or more Voltage rises gradually in response to vehicle speed.	
26	—		When vehicle is parked.	0V	
27	Speed sensor		When vehicle is moving at 2 to 3 km/h (1 to 2 MPH) for 1 m (3 ft) or more.	Vary from 0 to 5V	
28	—		—	—	
29	—		—	—	
30	—		—	—	
31	Throttle sensor (Power source)		—	4.5 - 5.5V	
32	—		—	—	
33	Fluid temperature sensor			When A.T.F. temperature is 20°C (68°F).	Approximately 1.5V
				When A.T.F. temperature is 80°C (176°F).	Approximately 0.5V
34	Throttle sensor		When accelerator pedal is depressed slowly after warming up engine.	Fully-closed throttle: Approximately 0.5V Fully-open throttle: Approximately 4V	
35	Throttle sensor (Ground)		—	—	
36	—		—	—	
37	A.S.C.D. cruise signal		When A.S.C.D. cruise is being performed. ("CRUISE" light comes on.)	Battery voltage	
			When A.S.C.D. cruise is not being performed. ("CRUISE" light does not come on.)	1V or less	

TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

Terminal No.	Item	Condition	Judgment standard
38	—	—	—
39	Overdrive switch	 When overdrive switch is set in "ON" position.	Battery voltage
		 When overdrive switch is set in "OFF" position.	1V or less
40	A.S.C.D. O.D. cut signal	 When "ACCEL" set switch on A.S.C.D. cruise is released.	5 - 8V
		When "ACCEL" set switch on A.S.C.D. cruise is applied.	1V or less
41	Kickdown switch	When accelerator pedal is released after warming up engine.	3 - 8V
		When accelerator pedal is depressed fully after warming up engine.	1V or less
42	—		—
43	—	—	—
44	—	—	—
45	—	—	—
46	—		—
47	—	—	—
48	Ground	—	—



OVERDRIVE SWITCH

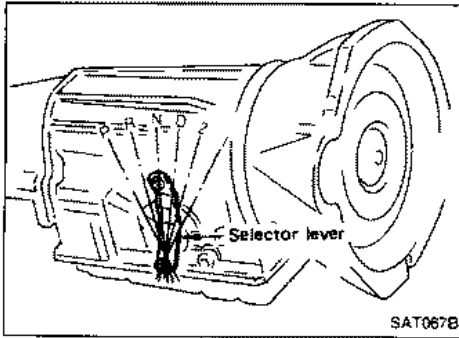
- Check continuity between two terminals.

O.D. switch position	Continuity
ON	No
OFF	Yes

TROUBLE DIAGNOSES

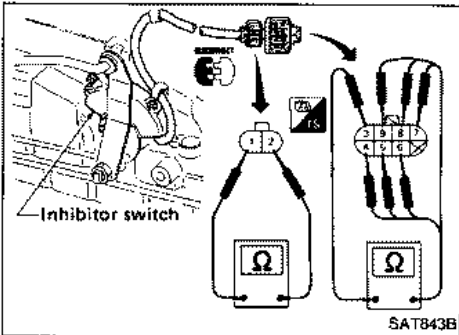
Electrical Components Inspection (Cont'd)

INHIBITOR SWITCH

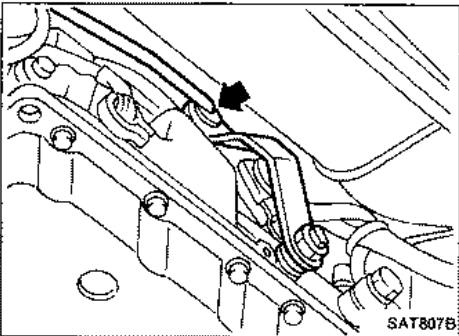


1. Check continuity between terminals ① and ② and between terminals ③ and ④, ⑤, ⑥, ⑦, ⑧, ⑨ while moving selector lever through each range.

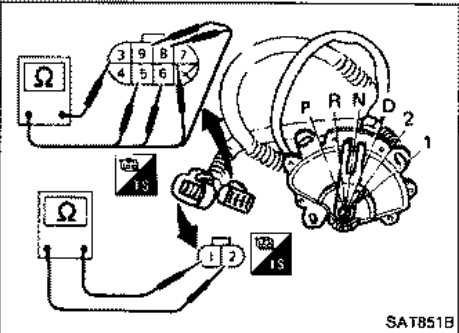
Terminal No.	①	②	③	④	⑤	⑥	⑦	⑧	⑨
Lever position									
P	○—○		○—○						
R			○—○	○—○					
N	○—○		○—○		○—○				
D			○—○			○—○			
2			○—○				○—○		
1			○—○					○—○	



2. If N.G., check again with manual control linkage disconnected from manual shaft of A/T assembly. — Refer to step 1.
3. If O.K. on step 2, adjust manual control linkage. — Refer to "ON-VEHICLE SERVICE".



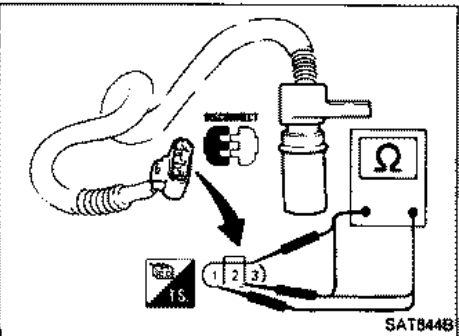
4. If N.G. on step 2, remove inhibitor switch from A/T and check continuity of inhibitor switch terminal. — Refer to step 1.
5. If O.K. on step 4, adjust inhibitor switch. — Refer to "ON-VEHICLE SERVICE".
6. If N.G. on step 4, replace inhibitor switch.



REVOLUTION SENSOR

- For removal and installation, refer to "ON-VEHICLE SERVICE".
- Check resistance between terminals ①, ② and ③.

Terminal No.		Resistance
①	②	500 - 650Ω
②	③	No continuity
①	③	No continuity

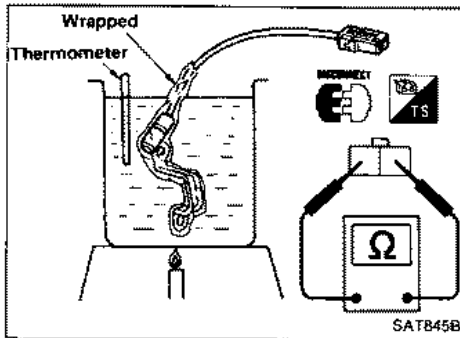


TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

FLUID TEMPERATURE SENSOR

- For removal and installation, refer to "ON-VEHICLE SERVICE".
- Check resistance between two terminals while changing temperature as shown at left.



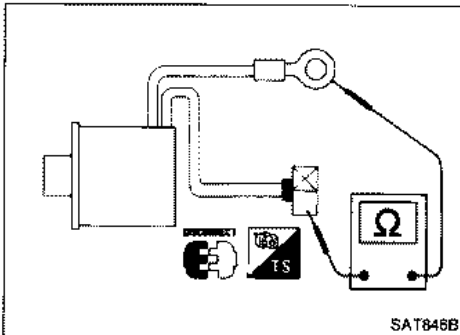
Temperature °C (°F)	Resistance
20 (68)	Approximately 2.5 kΩ
80 (176)	Approximately 0.3 kΩ

LOCK-UP SOLENOID

- For removal and installation, refer to "ON-VEHICLE SERVICE".
- Check resistance between two terminals.

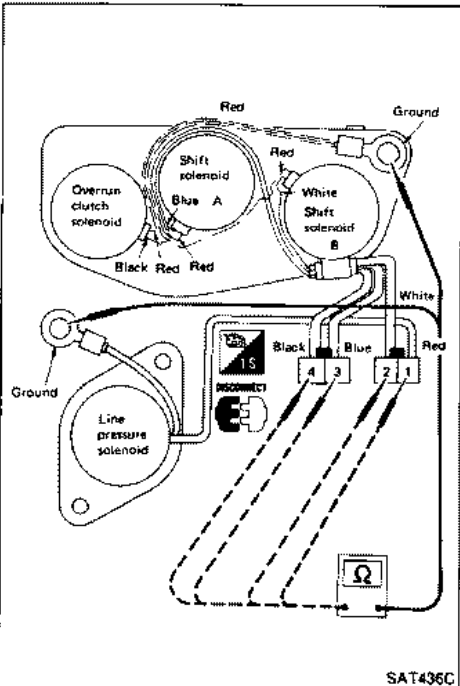
Resistance:

Lock-up solenoid 10 - 20Ω



3-UNIT SOLENOID ASSEMBLY (Shift solenoids A, B and overrun clutch solenoid) AND LINE PRESSURE SOLENOID

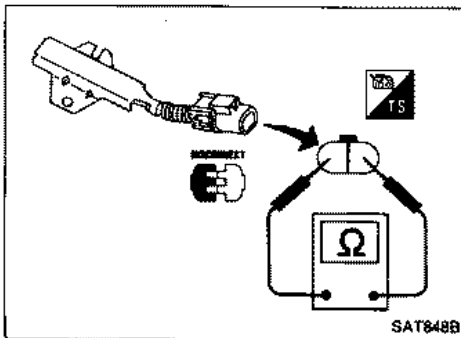
- For removal and installation, refer to "ON-VEHICLE SERVICE".
- Check resistance between terminals of each solenoid.



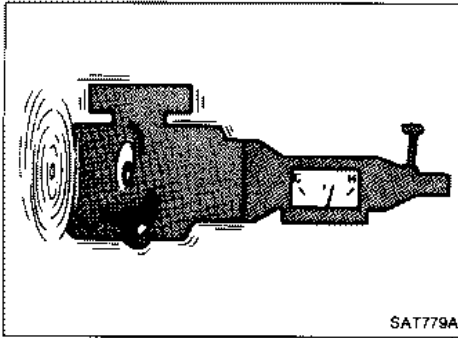
Solenoid	Terminal No.	Resistance
Shift solenoid A	③	Ground terminal
Shift solenoid B	②	
Overrun clutch solenoid	④	
Line pressure solenoid	①	2.5 - 5Ω

DROPPING RESISTOR

- Check resistance between two terminals.
- Resistance: 11.2 - 12.8Ω**



TROUBLE DIAGNOSES



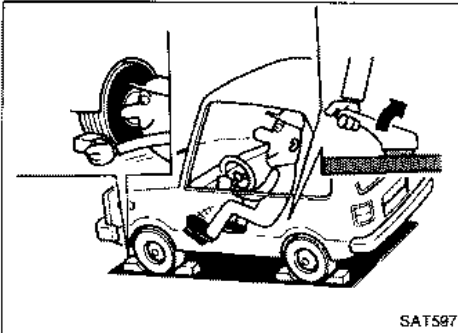
Final Check

STALL TESTING

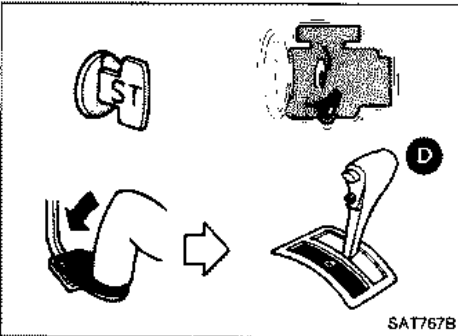
Stall test procedure

1. Check A/T and engine fluid levels. If necessary, add.
2. Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.

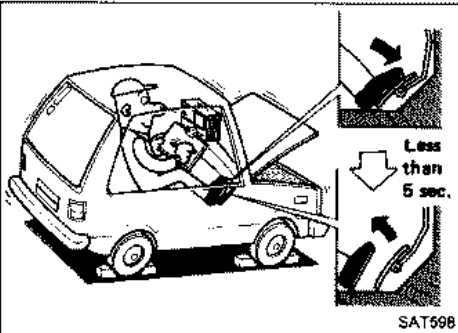
A.T.F. operating temperature:
50 - 80°C (122 - 176°F)



3. Set parking brake and block wheels.
 4. Install a tachometer where it can be seen by driver during test.
- It is good practice to put a mark on point of specified engine rpm on indicator.



5. Start engine, apply foot brake, and place selector lever in "D" range.



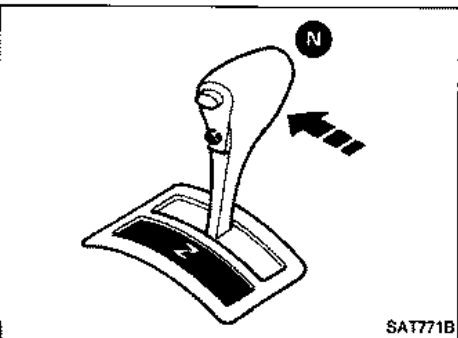
6. Accelerate to wide-open throttle gradually while applying foot brake.
7. Quickly note the engine stall revolution and immediately release throttle.

- During test, never hold throttle wide-open for more than 5 seconds.

Stall revolution:

2,450 - 2,650 rpm (RE4R01A)

2,950 - 3,200 rpm (RE4R03A)



8. Shift selector lever to "N".
 9. Cool off A.T.F.
- Run engine at idle for at least one minute.
10. Perform stall tests in the same manner as in steps 5 through 9 with selector lever in "2", "1" and "R", respectively.

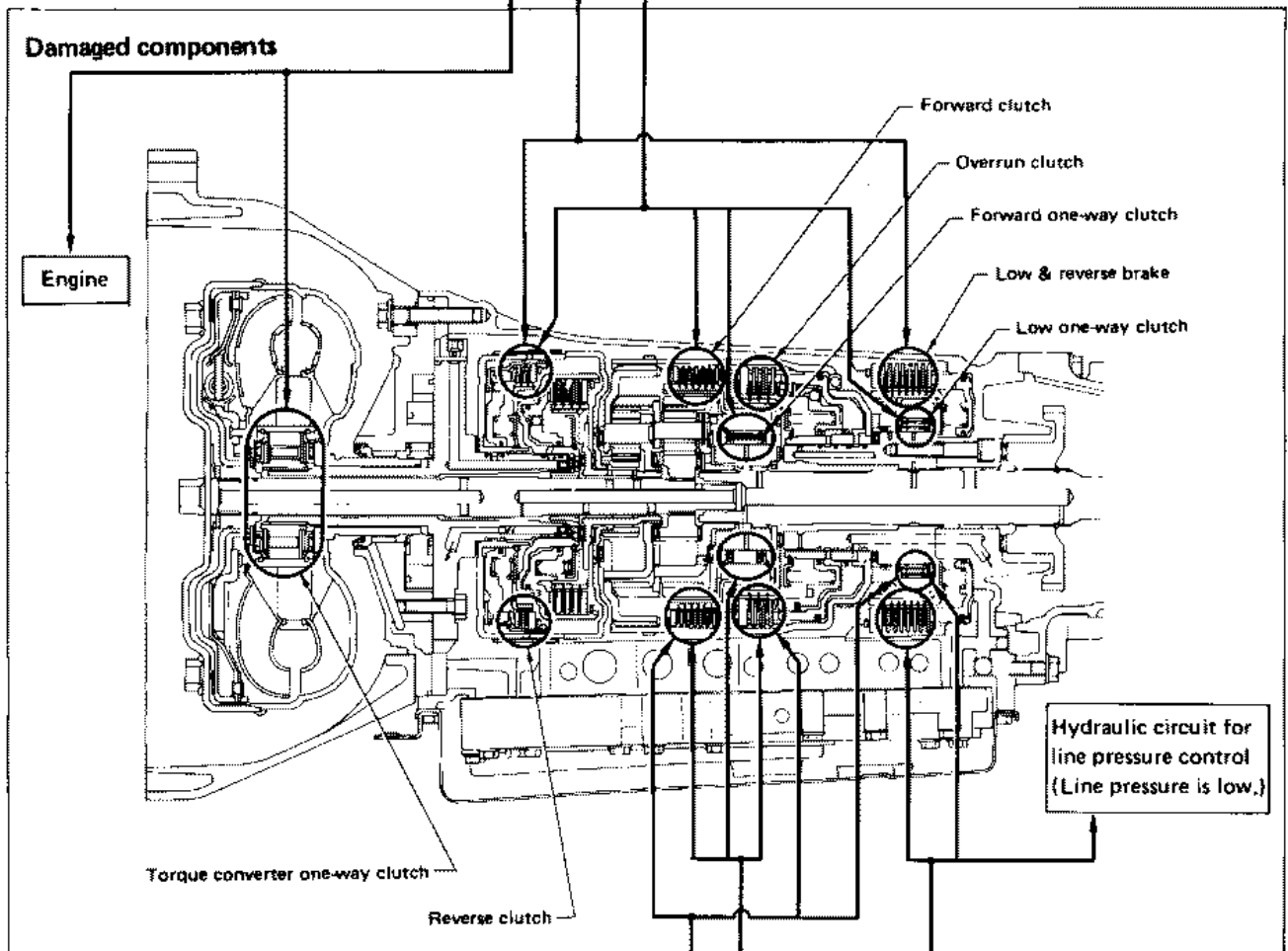
TROUBLE DIAGNOSES

Final Check (Cont'd)

Judgment of stall test

Selector lever position	Judgement		
	L	O	H
D	L	O	H
2	L	O	H
1	L	O	O
R	L	H	H

- O : Stall revolution is normal.
- H : Stall revolution is higher than specified.
- L : Stall revolution is lower than specified.



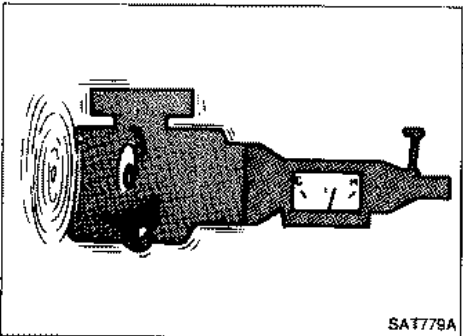
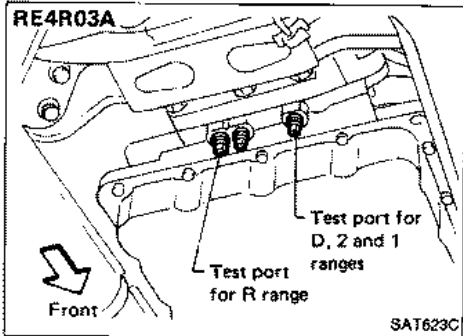
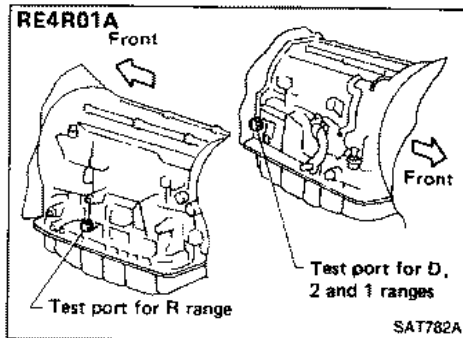
D	H	H	H	O
2	H	H	H	O
1	O	H	H	O
R	O	O	H	O
Selector lever position	Judgement			

TROUBLE DIAGNOSES

Final Check (Cont'd)

PRESSURE TESTING

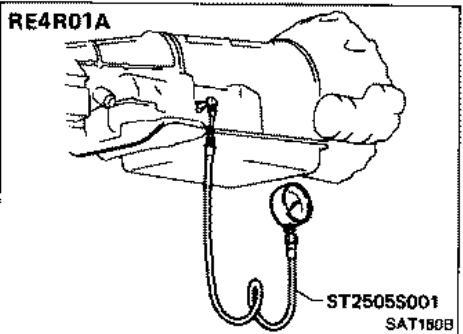
- Location of line pressure test port
- Line pressure plugs are hexagon headed bolts.
- Always replace line pressure plugs as they are self-sealing bolts.



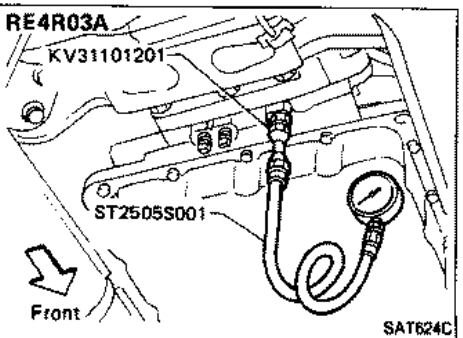
Line pressure test procedure

1. Check A/T and engine fluid levels. If necessary, add.
2. Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.

A.T.F. operating temperature:
50 - 80°C (122 - 176°F)



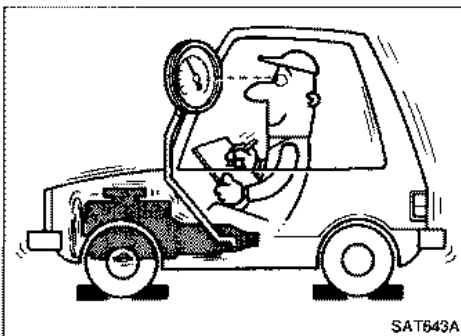
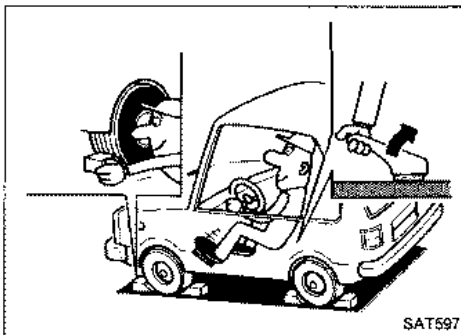
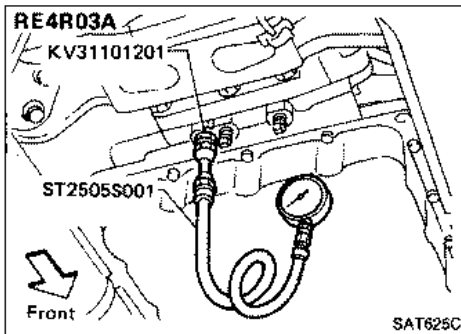
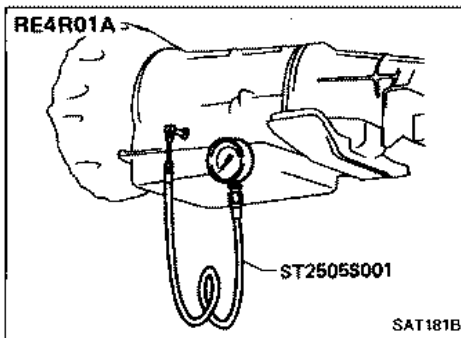
3. Install pressure gauge to line pressure port.
— D, 2 and 1 ranges —



TROUBLE DIAGNOSES

Final Check (Cont'd)

— R range —



4. Set parking brake and block wheels.
 - Continue to depress brake pedal fully while line pressure test at stall speed is performed.

5. Start engine and measure line pressure at idle and stall speed.
 - When measuring line pressure at stall speed, follow the stall test procedure.

Line pressure:

Engine speed rpm	Line pressure kPa (bar, kg/cm ² , psi)	
	D, 2 and 1 ranges	R range
Idle	412 - 490 (4.12 - 4.90, 4.2 - 5.0, 60 - 71)	608 - 647 (6.08 - 6.47, 6.2 - 6.6, 88 - 94)
Stall	1,020 - 1,098 (10.20 - 10.98, 10.4 - 11.2, 148 - 159)	1,422 - 1,500 (14.22 - 15.00, 14.5 - 15.3, 206 - 218)

TROUBLE DIAGNOSES

Final Check (Cont'd)

JUDGMENT OF LINE PRESSURE TEST

Judgment		Suspected parts
At idle	Line pressure is low in all ranges.	<ul style="list-style-type: none"> ● Oil pump wear ● Control piston damage ● Pressure regulator valve or plug sticking ● Spring for pressure regulator valve damaged ● Fluid pressure leakage between oil strainer and pressure regulator valve
	Line pressure is low in particular range.	<ul style="list-style-type: none"> ● Fluid pressure leakage between manual valve and particular clutch ● For example: If line pressure is low in "R" and "1" ranges but is normal in "D" and "2" range, fluid leakage exists at or around low & reverse brake circuit.
	Line pressure is high.	<ul style="list-style-type: none"> ● Mal-adjustment of throttle sensor ● Fluid temperature sensor damaged ● Line pressure solenoid sticking ● Short circuit of line pressure solenoid circuit ● Pressure modifier valve sticking ● Pressure regulator valve or plug sticking
At stall speed	Line pressure is low.	<ul style="list-style-type: none"> ● Mal-adjustment of throttle sensor ● Control piston damaged ● Line pressure solenoid sticking ● Short circuit of line pressure solenoid circuit ● Pressure regulator valve or plug sticking ● Pressure modifier valve sticking ● Pilot valve sticking

TROUBLE DIAGNOSES

Symptom Chart

Reference page (AT-)	Reference page (AT-)	ON vehicle										OFF vehicle																						
		9, 15	86	86	90	87, 123	87	87	8, 87	8	8	106, 118	137, 142	144, 159	144, 153	148	166																	
	Numbers are arranged in order of probability. Perform inspections starting with number one and working up. Circled numbers indicate that the transmission must be removed from the vehicle.	Fluid level	Control linkage	Inhibitor switch	Throttle sensor (Adjustment)	Revolution sensor and speed sensor	Engine revolution signal	Engine idling rpm	Line pressure	Control valve assembly	Shift solenoid A	Shift solenoid B	Line pressure solenoid	Lock-up solenoid	Overrun clutch solenoid	Fluid temperature sensor	Accumulator N-D	Accumulator 1-2	Accumulator 2-3	Accumulator 3-4 (N-R)	Ignition switch and starter	Torque converter	Oil pump	Reverse clutch	High clutch	Forward clutch	Forward one-way clutch	Overrun clutch	Low one-way clutch	Low & reverse brake	Brake band	Parking components		
67	Engine does not start in "N", "P" ranges.	2	3																	1														
67	Engine starts in range other than "N" and "P".	1	2																															
—	Transmission noise in "P" and "N" ranges.	1		3	4	5		2														7	8											
67	Vehicle moves when changing into "P" range or parking gear does not disengage when shifted out of "P" range.	1																													2			
68	Vehicle runs in "N" range.	1																		4				3		2	5							
70	Vehicle will not run in "R" range (but runs in "D", "2" and "1" ranges). Clutch slips. Very poor acceleration.	1					2	4		3													5	6	7	8	9							
—	Vehicle braked when shifting into "R" range.	1	2				3	5		4														6	8	9			7					
—	Sharp shock in shifting from "N" to "D" range.			2	5	1	3	7		6																9								
—	Vehicle will not run in "D" and "2" ranges (but runs in "1" and "R" range).	1																										2						
71	Vehicle will not run in "D", "1", "2" ranges (but runs in "R" range). Clutch slips. Very poor acceleration.	1					2	4		3														6	7	8	9	10						
—	Clutches or brakes slip somewhat in starting.	1	2	3			4	6		5																					11			
—	Excessive creep.					1																												
70, 71	No creep at all.	1					2	3															6	5		4								
—	Failure to change gear from "D ₁ " to "D ₂ ".	2	1	5			4	3																								6		
—	Failure to change gear from "D ₂ " to "D ₃ ".	2	1	5			4	3																	6							7		
—	Failure to change gear from "D ₃ " to "D ₄ ".	2	1	4				3																								6		
73, 74, 75	Too high a gear change point from "D ₁ " to "D ₂ ", from "D ₂ " to "D ₃ ", from "D ₃ " to "D ₄ ".			1	2					3	4																							
—	Gear change directly from "D ₁ " to "D ₃ " occurs.	1																		2												3		
—	Engine stops when shifting lever into "R", "D", "2" and "1".						1	3					2										4											
—	Too sharp a shock in change from "D ₁ " to "D ₂ ".			1			2	4																								6		
—	Too sharp a shock in change from "D ₂ " to "D ₃ ".			1			2	4																									6	

TROUBLE DIAGNOSES

Symptom Chart (Cont'd)

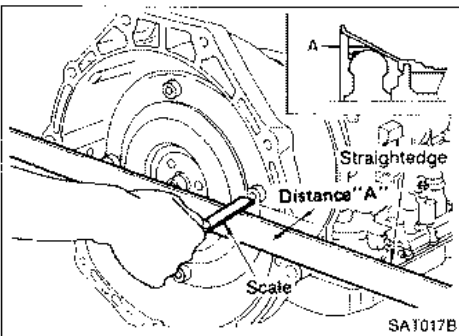
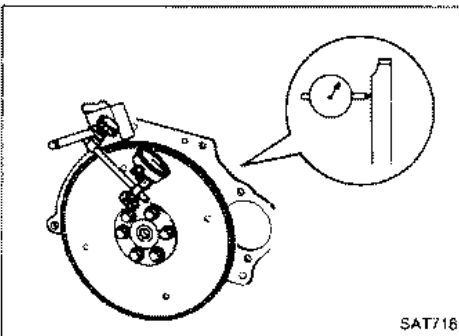
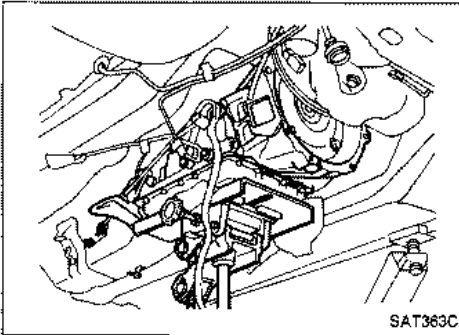
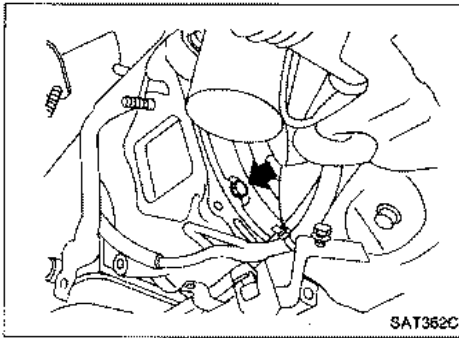
Reference page (AT-)	Reference page (AT-)	ON vehicle										OFF vehicle																				
		9 15	86	86	90	87, 123	87	87	8, 67	8	8	106, 118	137, 142	144, 159	144, 153	148	166															
		Fluid level	Control linkage inhibitor switch	Throttle sensor (Adjustment)	Revolution sensor and speed sensor	Engine revolution signal	Engine idling rpm	Line pressure	Control valve assembly	Shift solenoid A	Shift solenoid B	Line pressure solenoid	Lock-up solenoid	Overrun clutch solenoid	Fluid temperature sensor	Accumulator N-D	Accumulator 1-2	Accumulator 2-3	Accumulator 3-4 (N-R)	Ignition switch and starter	Torque converter	Oil pump	Reverse clutch	High clutch	Forward clutch	Forward one-way clutch	Overrun clutch	Low one-way clutch	Low & reverse brake	Brake band	Parking components	
—	Too sharp a shock in change from "D ₃ " to "D ₂ ".			1		2	4												3								5	5				
—	Almost no shock or clutches slipping in change from "D ₁ " to "D ₂ ".	1		2		3	5										4													6		
—	Almost no shock or slipping in change from "D ₂ " to "D ₃ ".	1		2		3	5												4					6						7		
—	Almost no shock or slipping in change from "D ₃ " to "D ₄ ".	1		2		3	5												4					6						7		
—	Vehicle braked by gear change from "D ₃ " to "D ₂ ".	1																					2	4			5	3				
—	Vehicle braked by gear change from "D ₂ " to "D ₃ ".	1																												2		
—	Vehicle braked by gear change from "D ₃ " to "D ₄ ".	1																					4		3	2						
—	Maximum speed not attained. Acceleration poor.	1	2				5	3	4													11	10	6	7				9	8		
—	Failure to change gear from "D ₂ " to "D ₃ ".	1		2			6	4	5	3																8	7					
—	Failure to change gear from "D ₃ " to "D ₂ " or from "D ₄ " to "D ₂ ".	1		2			5	3	4															6					7			
—	Failure to change gear from "D ₃ " to "D ₂ " or from "D ₃ " to "D ₁ ".	1		2			5	3	4															7		6		8				
—	Gear change shock felt during deceleration by releasing accelerator pedal.			1		2	4						3																			
—	Too high a change point from "D ₄ " to "D ₃ ", from "D ₃ " to "D ₂ ", from "D ₂ " to "D ₁ ".			1	2																											
—	Kickdown does not operate when depressing pedal in "D ₄ " within kickdown vehicle speed.			1	2				3	4																						
—	Kickdown operates or engine overruns when depressing pedal in "D ₄ " beyond kickdown vehicle speed limit.			2	1				3	4																						
—	Races extremely fast or slips in changing from "D ₄ " to "D ₃ " when depressing pedal.	1		2		3	5		4															6	7							
—	Races extremely fast or slips in changing from "D ₄ " to "D ₂ " when depressing pedal.	1		2		3	6	5	4																	8			7			
—	Races extremely fast or slips in changing from "D ₃ " to "D ₂ " when depressing pedal.	1		2		3	5		4			6		7										10	9					8		
—	Races extremely fast or slips in changing from "D ₄ " or "D ₃ " to "D ₁ " when depressing pedal.	1		2		3	5		4																	6	7	8				
—	Vehicle will not run in any range.	1	2			3			4													9	5	6				8	7	10		
—	Transmission noise in "D", "2", "1" and "R" ranges.	1																				2										

TROUBLE DIAGNOSES

Symptom Chart (Cont'd)

Reference page (AT-)	Reference page (AT-)	ON vehicle										OFF vehicle																								
		9, 15	86	86	90	87, 123	87	87	8, 87	8	8	106, 118	137, 142	144, 159	144, 153	148	166																			
	Numbers are arranged in order of probability. Perform inspections starting with number one and working up. Circled numbers indicate that the transmission must be removed from the vehicle.	Fluid level	Control linkage	Inhibitor switch	Throttle sensor (Adjustment)	Revolution sensor and speed sensor	Engine revolution signal	Engine idling rpm	Line pressure	Control valve assembly	Shift solenoid A	Shift solenoid B	Line pressure solenoid	Lock-up solenoid	Overrun clutch solenoid	Fluid temperature sensor	Accumulator N-D	Accumulator 1-2	Accumulator 2-3	Accumulator 3-4 (N-R)	Ignition switch and starter	Torque converter	Oil pump	Reverse clutch	High clutch	Forward clutch	Forward one-way clutch	Overrun clutch	Low one-way clutch	Low & reverse brake	Brake band	Parking components				
80	Failure to change from "D ₃ " to "2" when changing lever into "2" range.	7	1	2					6	5	4		3																							
—	Gear change from "2" to "2 ₃ " in "2" range.		1																																	
80	Engine brake does not operate in "1" range.	2	1	3	4				6	5			7																							
—	Gear change from "1 ₁ " to "1 ₂ " in "1" range.	2	1																																	
—	Does not change from "1 ₂ " to "1 ₁ " in "1" range.		1	2					4	3			5																							
—	Large shock changing from "1 ₂ " to "1 ₁ " in "1" range.								1																											
—	Transmission overheats.	1		3		2	4	6		5																										
—	A.T.F. shoots out during operation. White smoke emitted from exhaust pipe during operation.	1																																		
—	Offensive smell at fluid charging pipe.	1																																		
—	Torque converter is not locked up.		3	1	2	4	6	8				7	5																							
—	Lock-up piston slip	1		2			3	6		5	4																									
76	Lock-up point is extremely high or low.			1	2				4			3																								
—	A/T does not shift to "D ₂ " when driving with overdrive switch "ON".		2	1	3		8	6	4			5	7																							
—	Engine is stopped at "R", "D", "2" and "1" ranges.	1							5	4	3	2																								

REMOVAL AND INSTALLATION



Removal

- Remove exhaust tube.
- Remove fluid charging pipe from A/T assembly.
- Remove oil cooler pipe from A/T assembly.
- Remove control linkage from selector lever.
- Disconnect inhibitor switch and solenoid harness connectors.
- Remove speedometer cable from A/T assembly.
- Plug up openings such as the oil charging pipe hole, etc.
- Remove propeller shaft. — Refer to section PD.
- **Insert plug into rear oil seal after removing propeller shaft.**
- **Be careful not to damage spline, sleeve yoke and rear oil seal, when removing propeller shaft.**
- Remove starter motor.
- Remove gusset securing engine to A/T assembly.
- Remove bolts securing torque converter to drive plate.
- **Remove the bolts by turning crankshaft.**
- Support engine by placing a jack under oil pan.
- **Do not place jack under oil pan drain plug.**
- Remove transmission from engine.
- **Support automatic transmission, while removing it.**

Installation

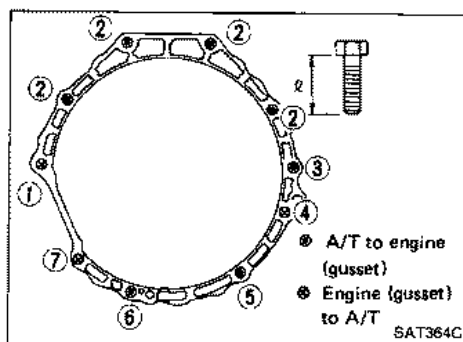
- Drive plate runout
**Maximum allowable runout:
0.5 mm (0.020 in)**
If this runout is out of allowance, replace drive plate with ring gear.
- When connecting torque converter to transmission, measure distance "A" to be certain that they are correctly assembled.
Distance "A":
**RE4R01A
26 mm (1.02 in) or more**
**RE4R03A
25 mm (0.98 in) or more**
- Install converter to drive plate.
- Reinstall any part removed.
- **After converter is installed to drive plate, rotate crankshaft several turns and check to be sure that transmission rotates freely without binding.**

REMOVAL AND INSTALLATION

Installation (Cont'd)

- Tighten bolts securing transmission.

RE4R01A

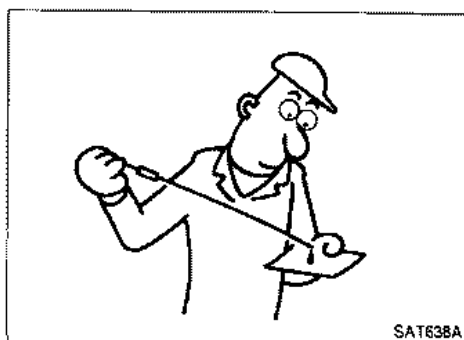


Bolt No.	Tightening torque N-m (kg-m, ft-lb)	Bolt length "l" mm (in)
1	39 - 49 (4.0 - 5.0, 29 - 36)	60 (2.36)
2	39 - 49 (4.0 - 5.0, 29 - 36)	50 (1.97)
3	39 - 49 (4.0 - 5.0, 29 - 36)	45 (1.77)
4	29 - 39 (3.0 - 4.0, 22 - 29)	25 (0.98)
5	29 - 39 (3.0 - 4.0, 22 - 29)	60 (2.36)
6	39 - 49 (4.0 - 5.0, 29 - 36)	65 (2.56)
7	39 - 49 (4.0 - 5.0, 29 - 36)	25 (0.98)
Gusset to engine	29 - 39 (3.0 - 4.0, 22 - 29)	20 (0.79)

RE4R03A

Bolt No.	Tightening torque N-m (kg-m, ft-lb)	Bolt length "l" mm (in)
1	39 - 49 (4.0 - 5.0, 29 - 36)	60 (2.36)
2	39 - 49 (4.0 - 5.0, 29 - 36)	60 (2.36)
3	39 - 49 (4.0 - 5.0, 29 - 36)	65 (2.56)
4	29 - 39 (3.0 - 4.0, 22 - 29)	25 (0.98)
5	29 - 39 (3.0 - 4.0, 22 - 29)	60 (2.36)
6	39 - 49 (4.0 - 5.0, 29 - 36)	65 (2.56)
7	39 - 49 (4.0 - 5.0, 29 - 36)	25 (0.98)
Gusset to engine	29 - 39 (3.0 - 4.0, 22 - 29)	20 (0.79)

- Reinstall any part removed.

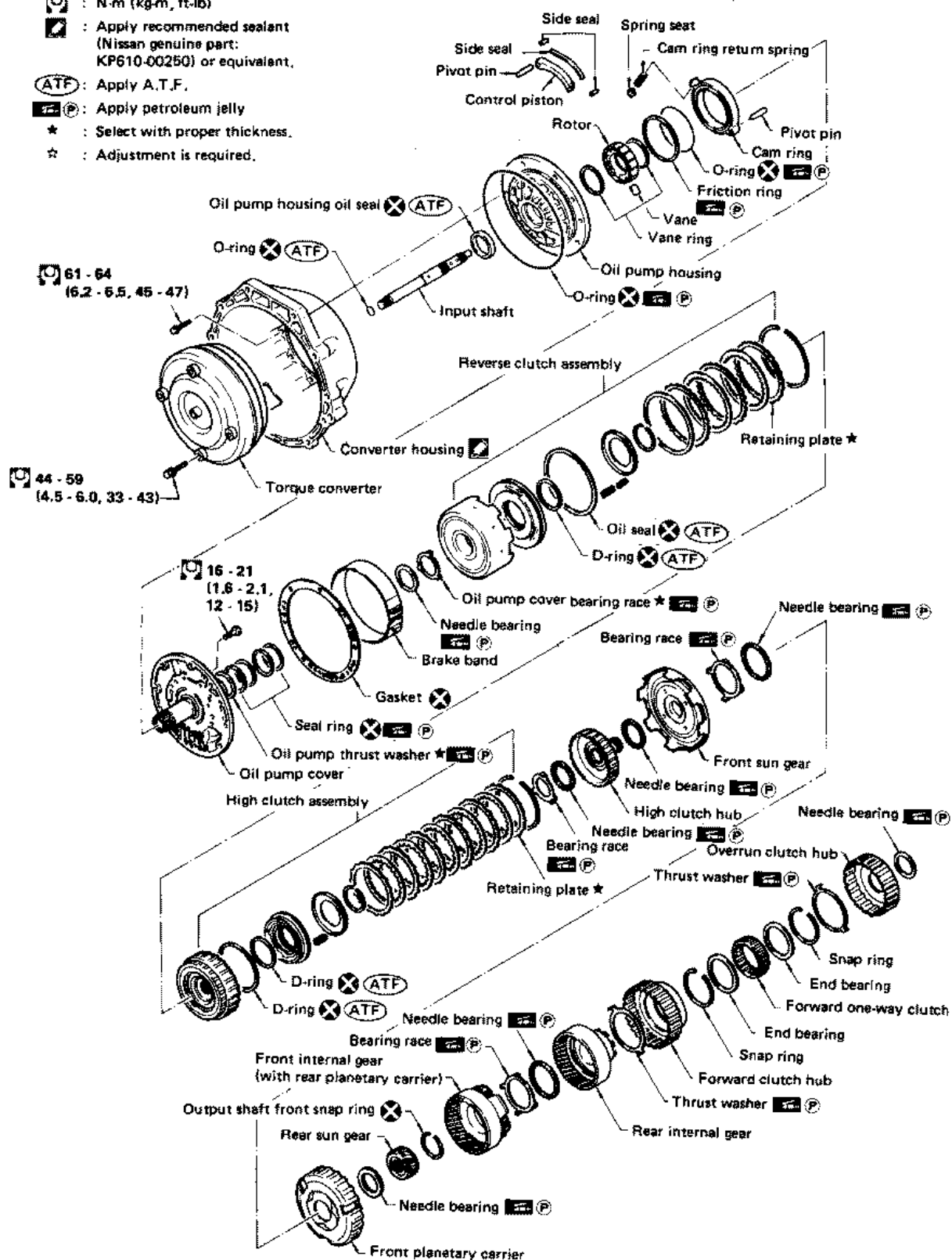


- Check fluid level in transmission.
- Move selector lever through all positions to be sure that transmission operates correctly. With parking brake applied, rotate engine at idling. Move selector lever through "N" to "D", to "2", to "1" and to "R". A slight shock should be felt by hand gripping selector each time transmission is shifted.
- Perform road test. — Refer to "ROAD TESTING".

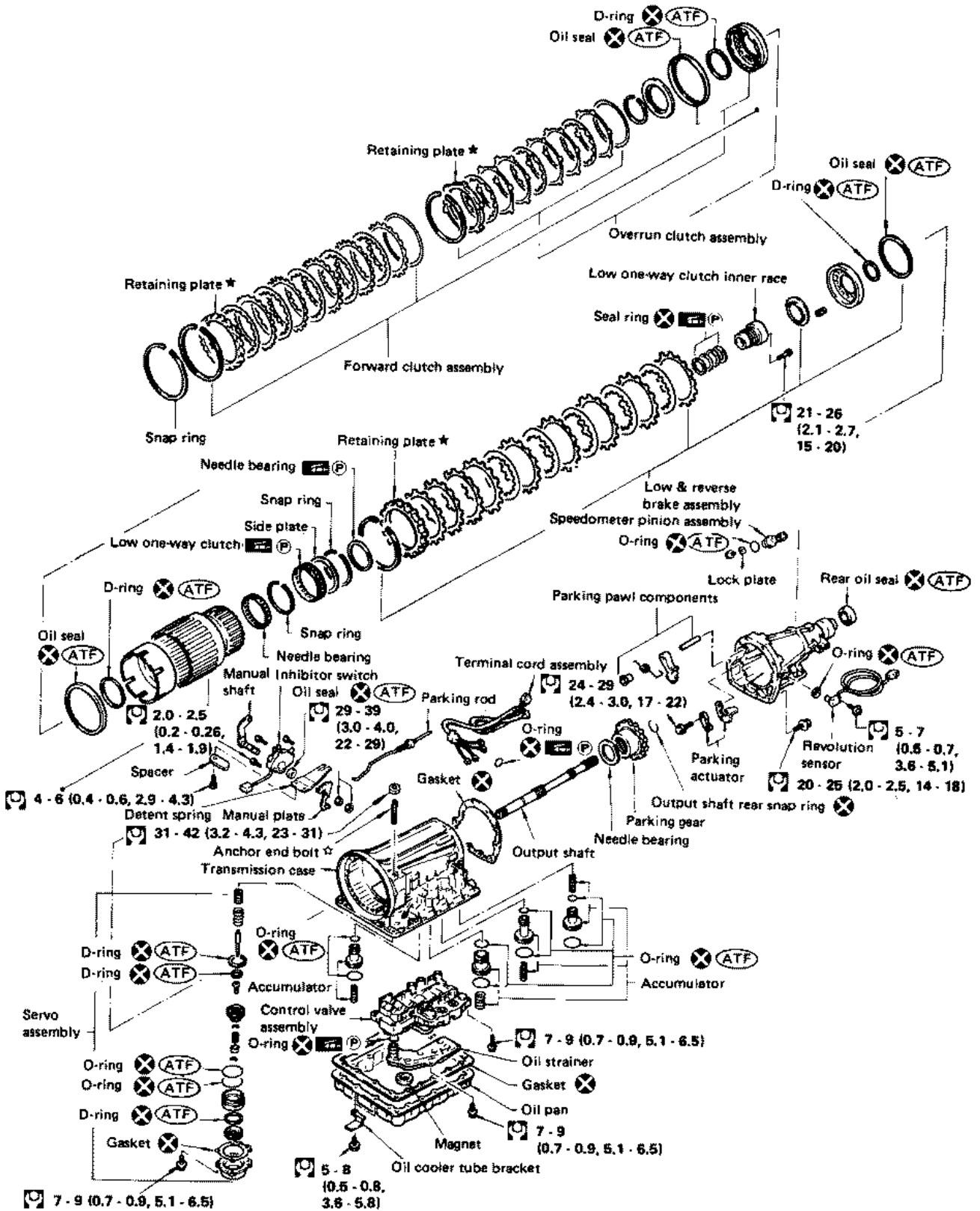
MAJOR OVERHAUL

RE4R01A

- ⊞ : N-m (kg-m, ft-lb)
- ⊞ : Apply recommended sealant
(Nissan genuine part:
KP610-00250) or equivalent.
- ATF : Apply A.T.F.
- ⊞⊞ : Apply petroleum jelly
- ★ : Select with proper thickness.
- ☆ : Adjustment is required.









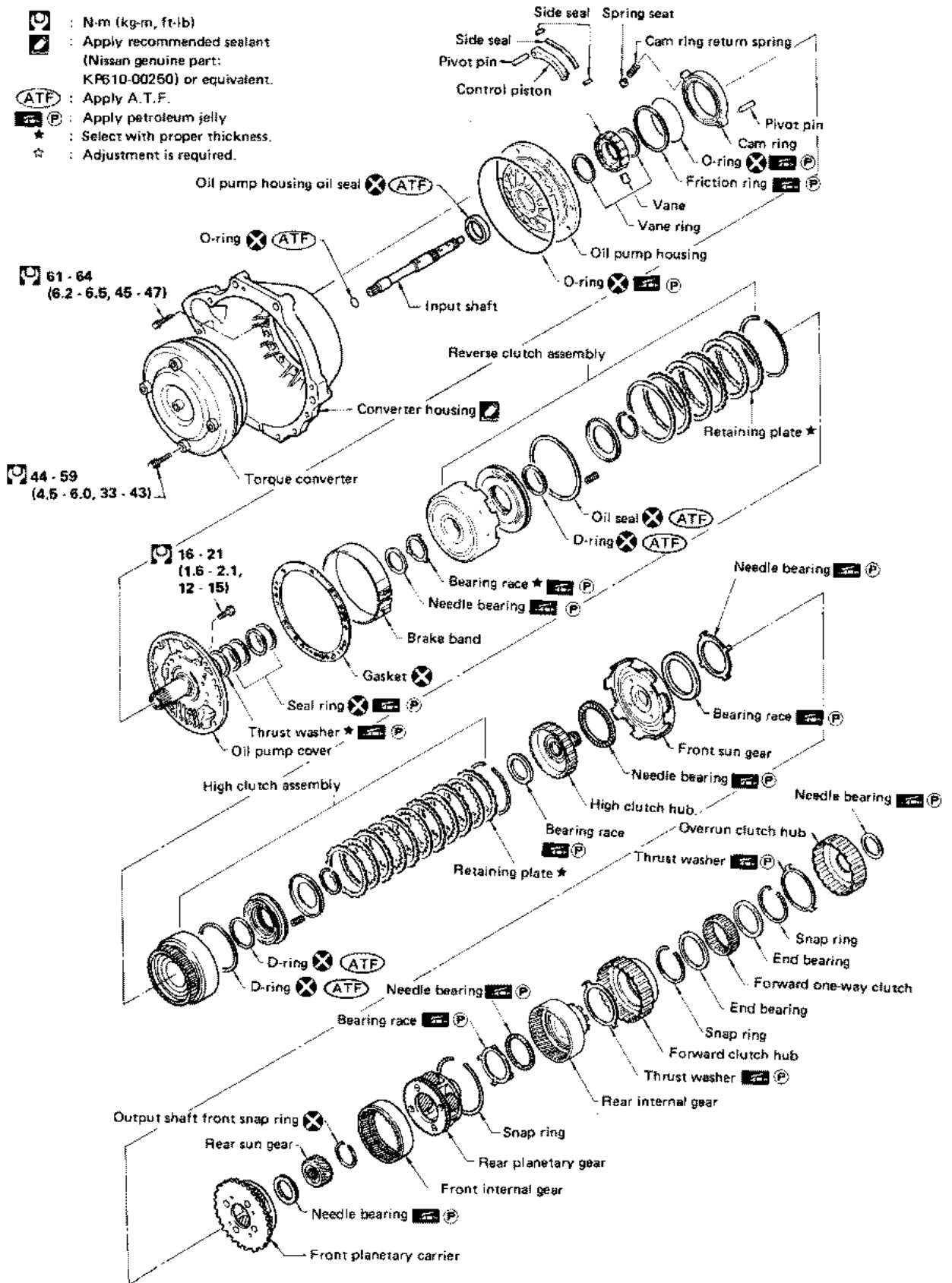
MAJOR OVERHAUL RE4R01A (Cont'd)



MAJOR OVERHAUL

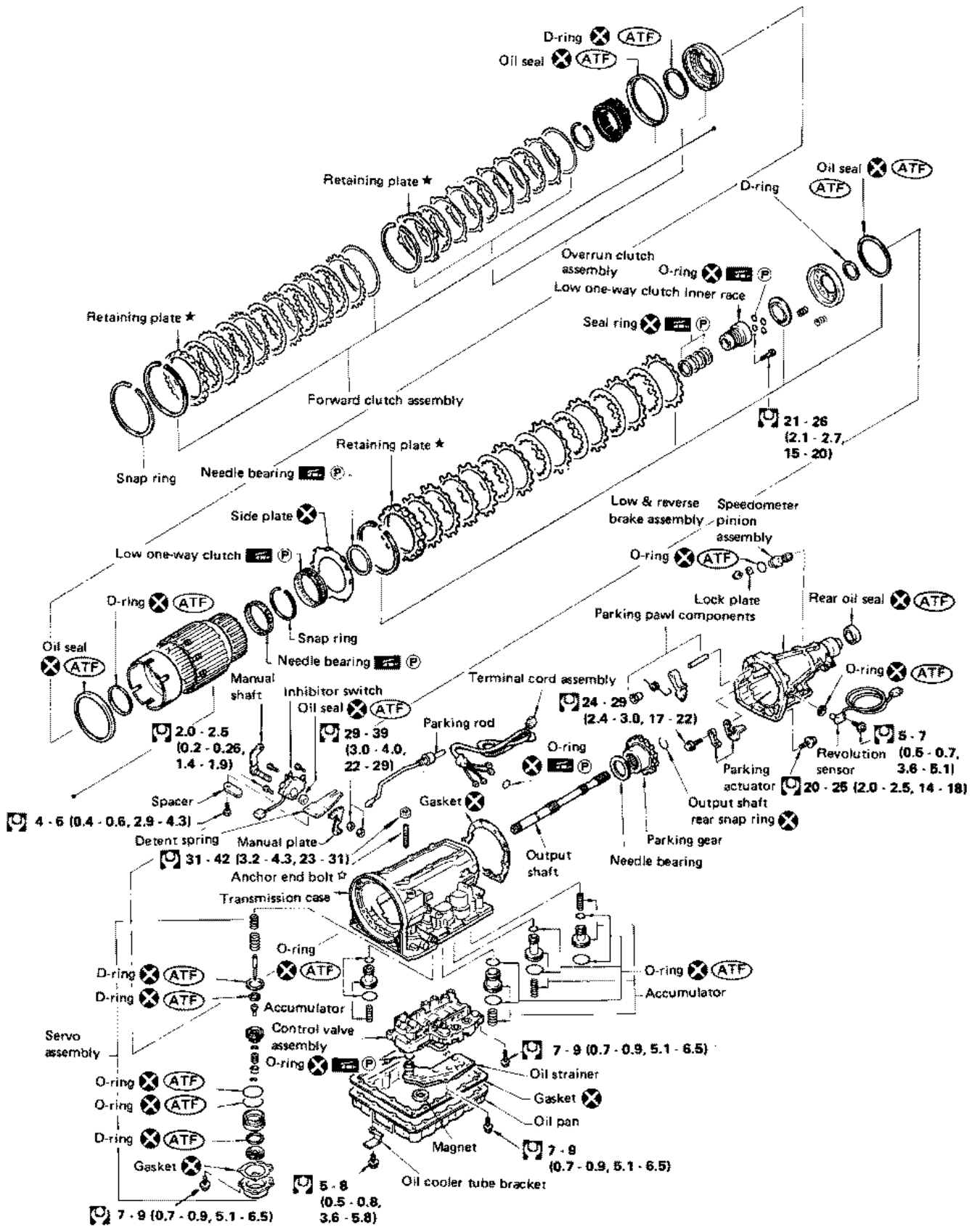
RE4R03A

-  : N·m (kg·m, ft·lb)
-  : Apply recommended sealant (Nissan genuine part: KP610-00250) or equivalent.
-  : Apply A.T.F.
-  : Apply petroleum jelly
-  : Select with proper thickness.
-  : Adjustment is required.



MAJOR OVERHAUL

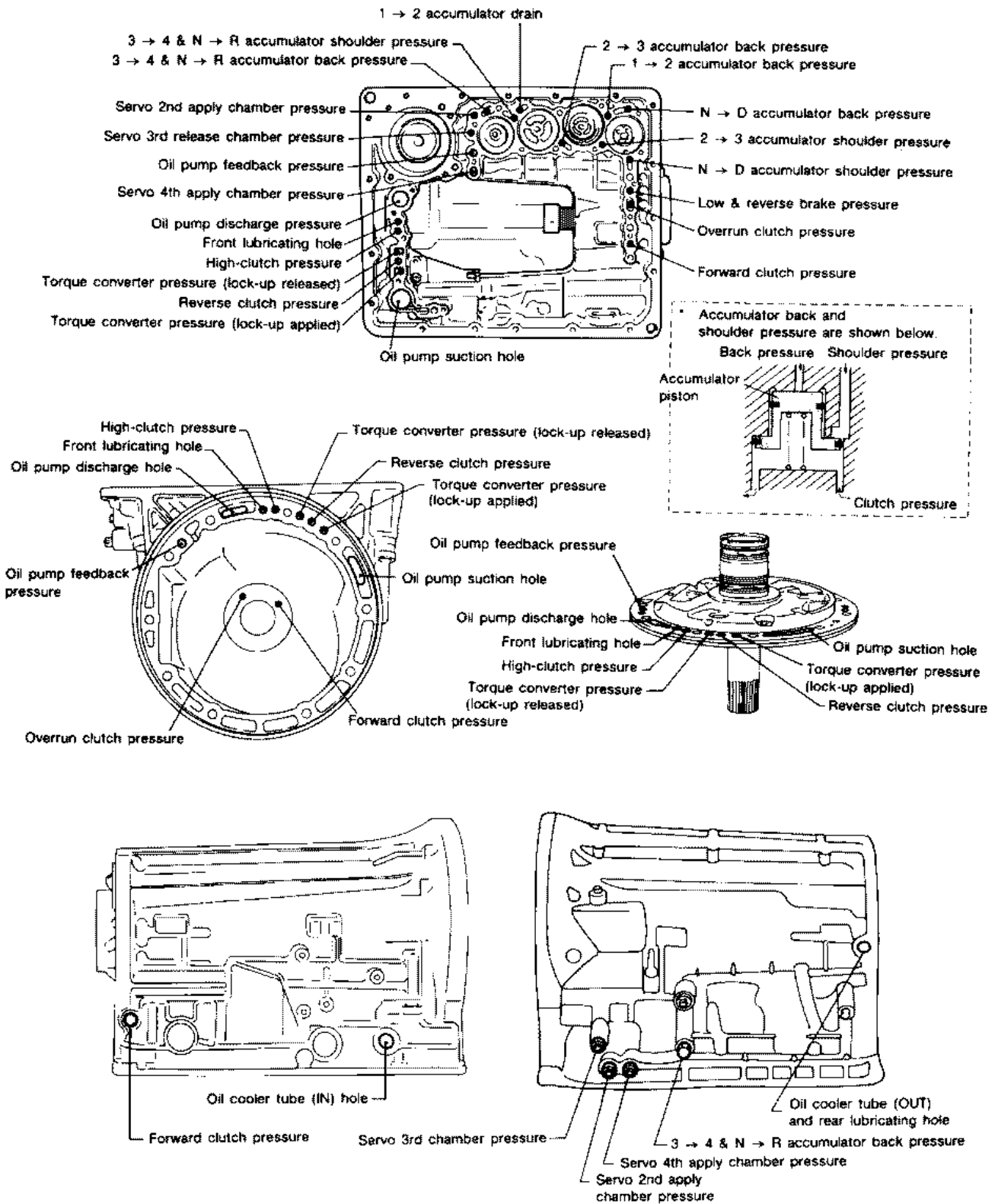
RE4R03A (Cont'd)



SAT941C

MAJOR OVERHAUL

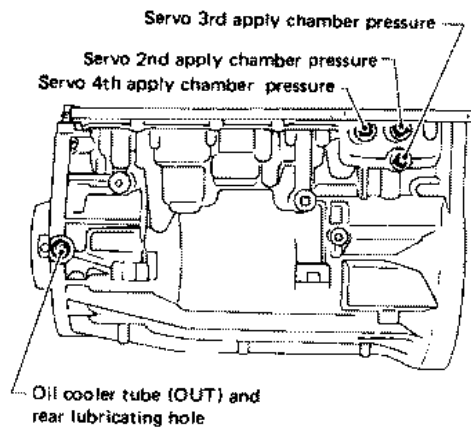
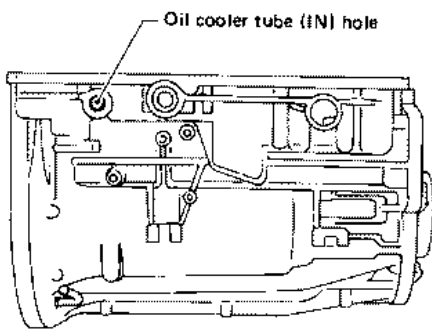
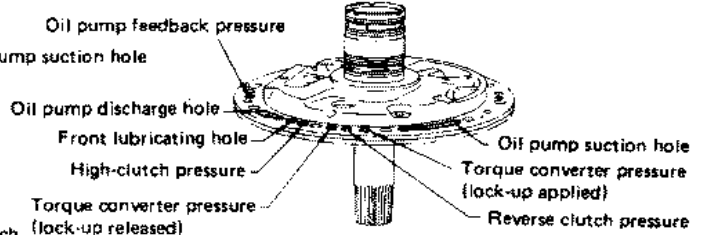
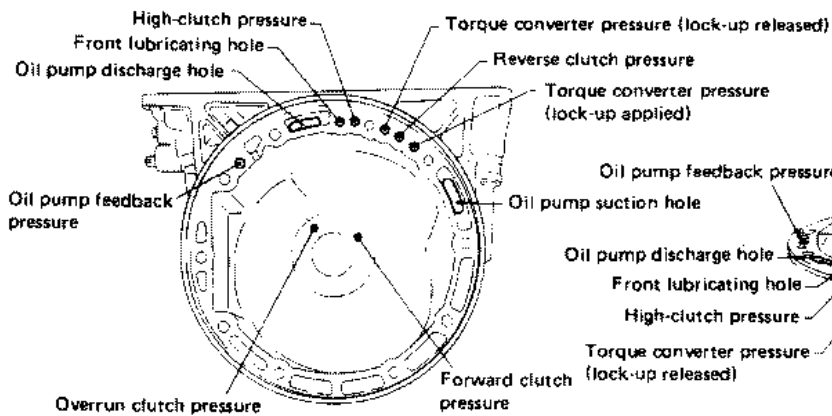
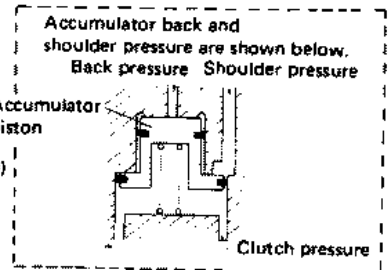
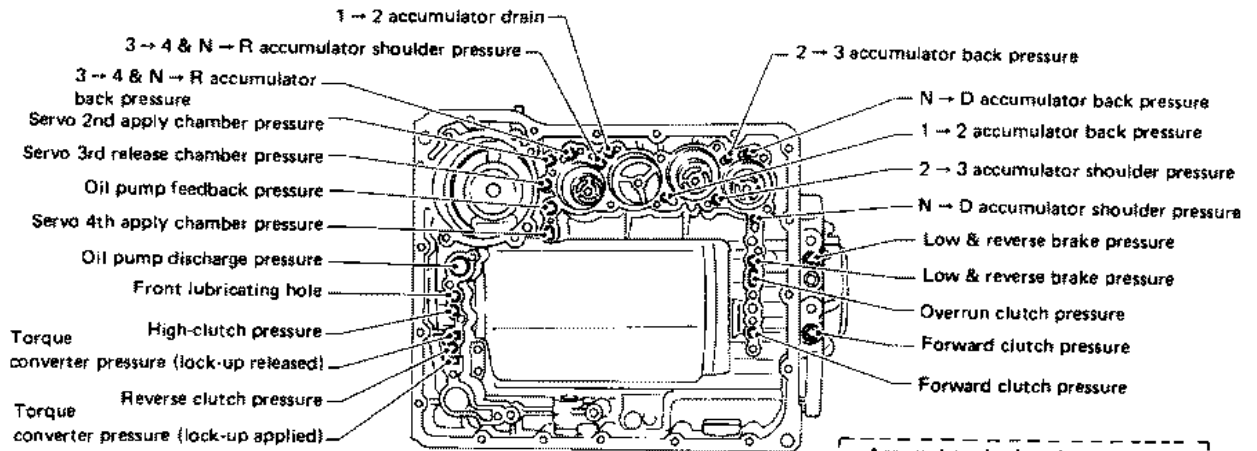
Oil Channel — RE4R01A



SAT185B

MAJOR OVERHAUL

Oil Channel — RE4R03A



MAJOR OVERHAUL

Locations of Needle Bearings, Thrust Washers and Snap Rings — RE4R01A

Outer diameter of snap rings

Item number	Outer diameter mm (in)
②	161.0 (6.34)
③	140.1 (5.52)
④	156.4 (6.16)
⑥	142.0 (5.59)
⑦	159.2 (6.27)

Thrust washers

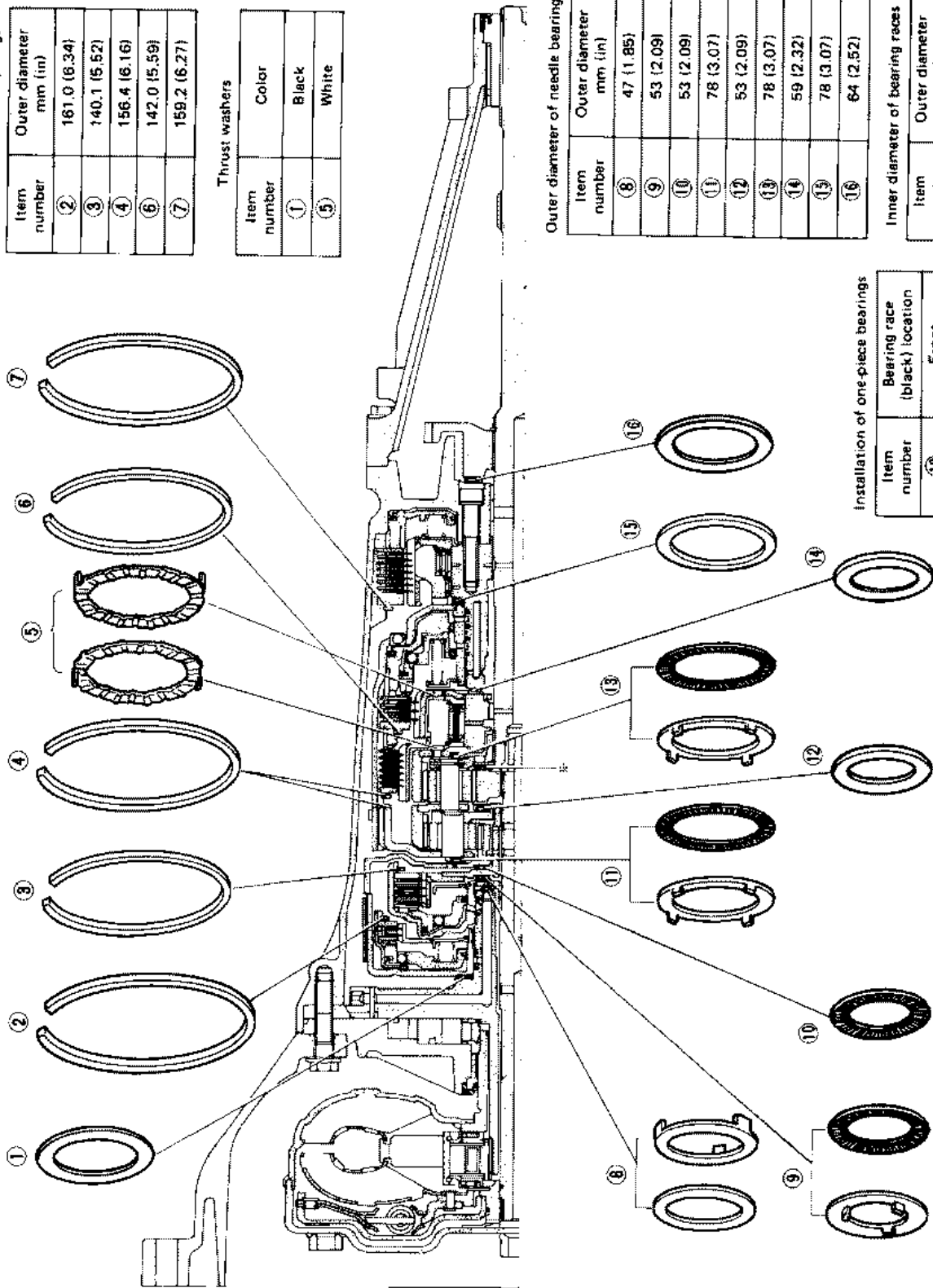
Item number	Color
①	Black
⑤	White

Outer diameter of needle bearings

Item number	Outer diameter mm (in)
⑧	47 (1.85)
⑨	53 (2.09)
⑩	53 (2.09)
⑪	78 (3.07)
⑫	53 (2.09)
⑬	78 (3.07)
⑭	59 (2.32)
⑮	78 (3.07)
⑯	64 (2.52)

Inner diameter of bearing races

Item number	Outer diameter mm (in)
⑪	58 (2.28)
⑬	58.8 (2.315)



Installation of one-piece bearings

Item number	Bearing race (black) location
⑫	Front
⑮	Rear side
⑯	Rear side

MAJOR OVERHAUL

Locations of Needle Bearings, Thrust Washers and Snap Rings — RE4R03A

Outer diameter of snap rings

Item number	Outer diameter mm (in)
②, ⑤	164.0 (6.46)
③	176.0 (6.93)
⑥	172.0 (6.77)

Thrust washers

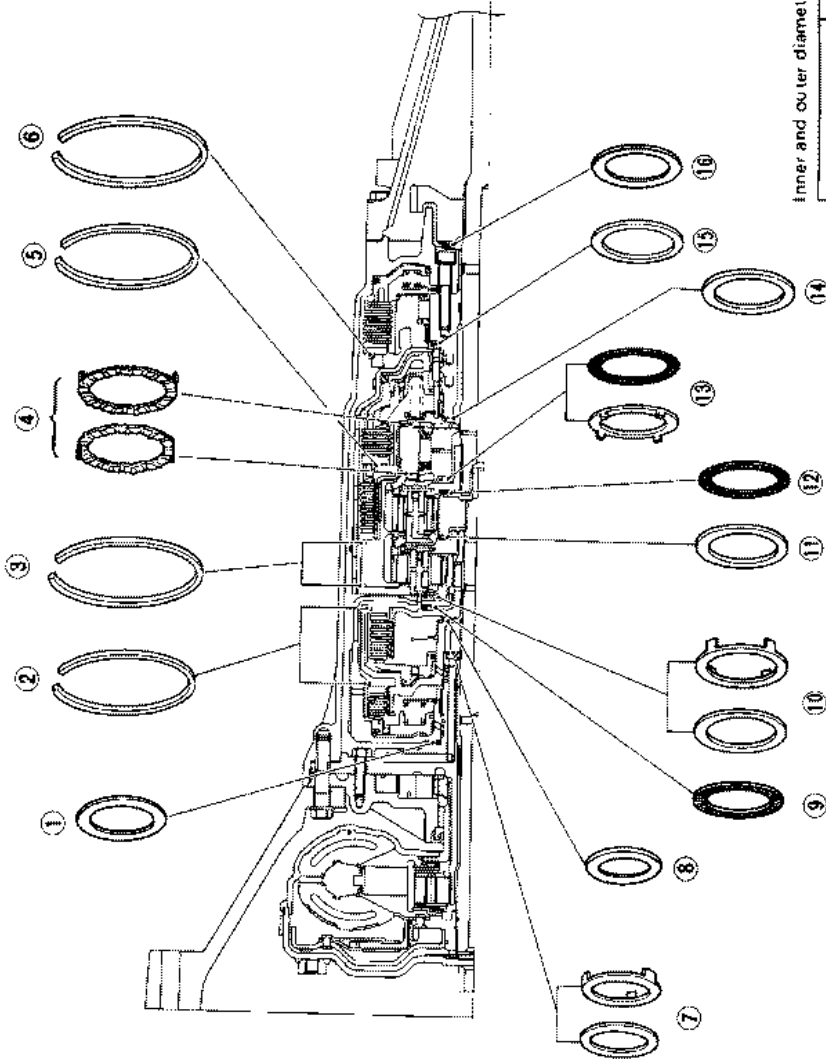
Item number	Color
①	Black
④	White

Outer diameter of bearing races

Item number	Outer diameter mm (in)
⑦	43.5 (1.713)
⑩	82.0 (3.228)
⑬	63.2 (2.488)

Installation of one-piece bearings

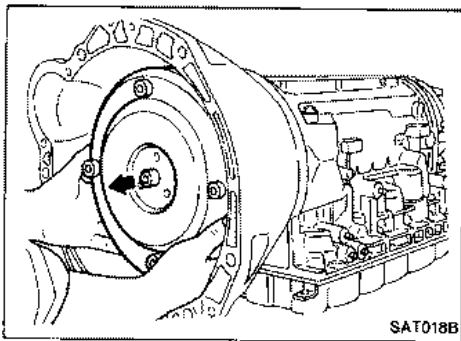
Item number	Bearing race (black) location
⑮	Rear side
⑯	Rear side



Inner and outer diameter of needle bearings

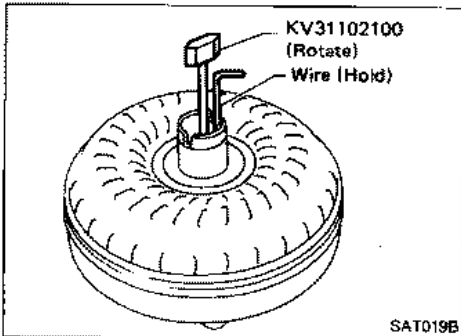
Item number	Outer diameter mm (in)	Inner diameter mm (in)	Number of needles
⑦	47.0 (1.850)	30.0 (1.181)	—
⑧	53.0 (2.087)	35.1 (1.382)	—
⑨, ⑩	85.0 (3.346)	62.7 (2.468)	—
⑪, ⑫	64.0 (2.520)	45.0 (1.772)	52
⑬	64.0 (2.520)	45.0 (1.772)	50
⑭	64.0 (2.520)	44.0 (1.732)	34
⑮	78.1 (3.075)	—	—
⑯	64.0 (2.520)	—	—

DISASSEMBLY

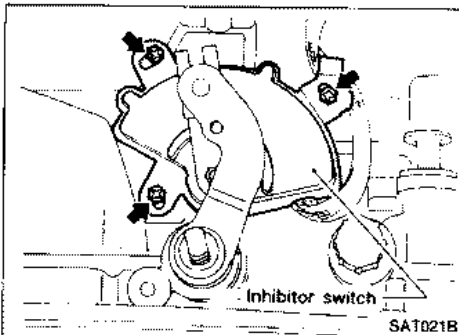


Disassembly

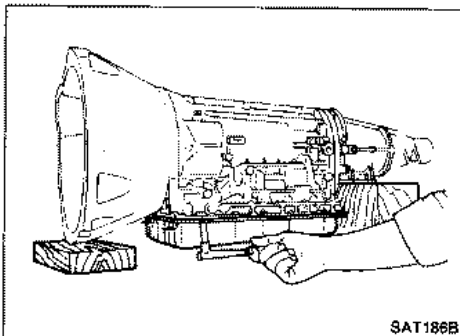
1. Remove torque converter by holding it firmly and turning while pulling straight out.



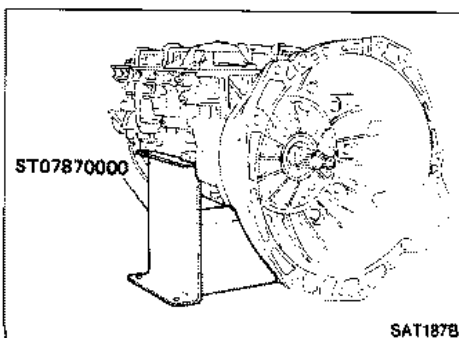
2. Check torque converter one-way clutch.
 - a. Insert Tool into spline of one-way clutch inner race.
 - b. Hook bearing support unitized with one-way clutch outer race with suitable wire.
 - c. Check that one-way clutch inner race rotates only clockwise with Tool while holding bearing support with wire.



3. Remove inhibitor switch from transmission case.



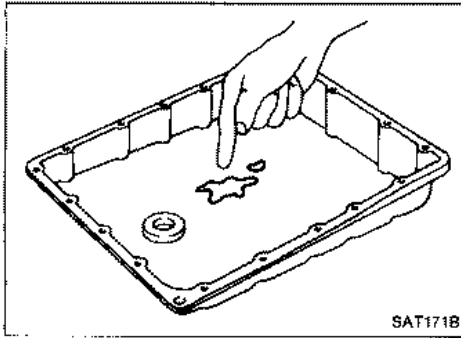
4. Remove oil pan.
 - a. Drain A.T.F. from rear extension.
 - b. Raise oil pan by placing wooden blocks under converter housing and rear extension.
 - c. Separate the oil pan and transmission case.
 - **Always place oil pan straight down so that foreign particles inside will not move.**



5. Place transmission into Tool with the control valve facing up.

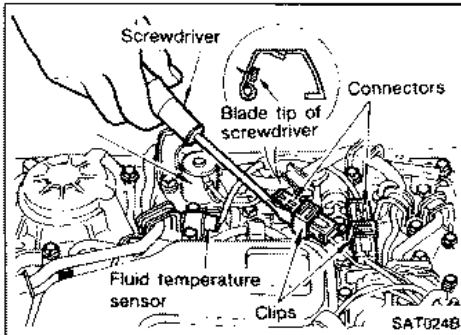
DISASSEMBLY

Disassembly (Cont'd)

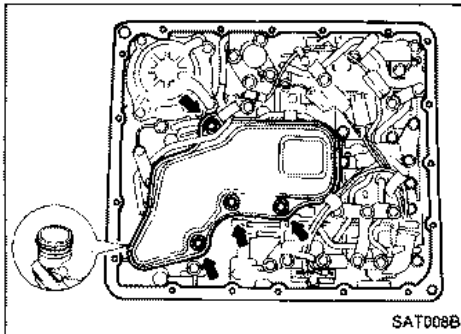


6. Check oil pan and oil strainer for accumulation of foreign particles.
 - If materials of clutch facing are found, clutch plates may be worn.
 - If metal filings are found, clutch plates, brake bands, etc. may be worn.
 - If aluminum filings are found, bushings or aluminum cast parts may be worn.

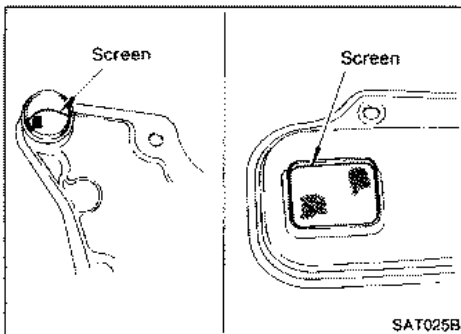
In above cases, replace torque converter and check unit for cause of particle accumulation.



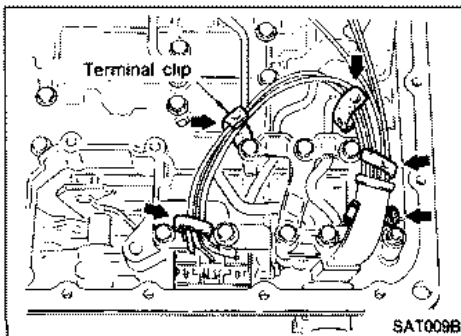
7. Remove lock-up solenoid and fluid temperature sensor connectors.
 - **Be careful not to damage connector.**



8. Remove oil strainer.
 - a. Remove oil strainer from control valve assembly. Then remove O-ring from oil strainer.



- b. Check oil strainer screen for damage.




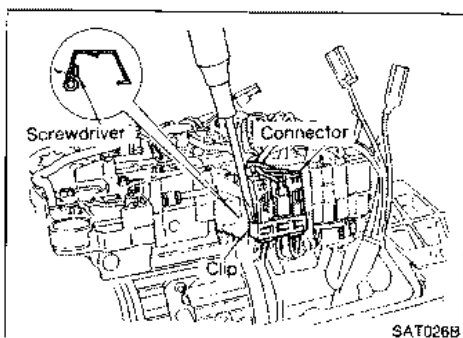
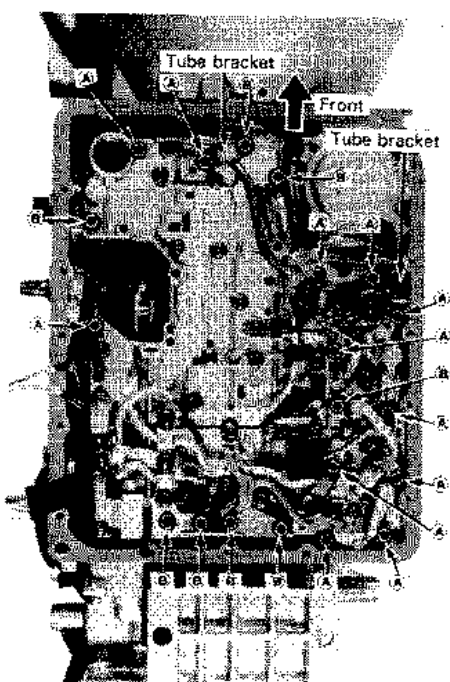
9. Remove control valve assembly.
 - a. Straighten terminal clips to free terminal cords then remove terminal clips.

DISASSEMBLY

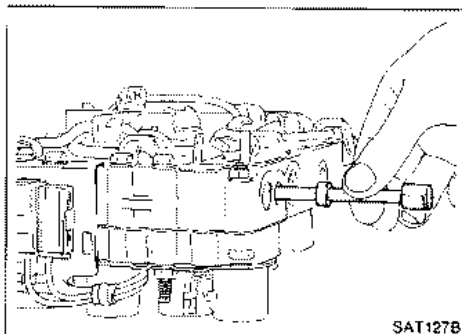
Disassembly (Cont'd)

- b. Remove bolts **(A)** and **(B)**, and remove control valve assembly from transmission.

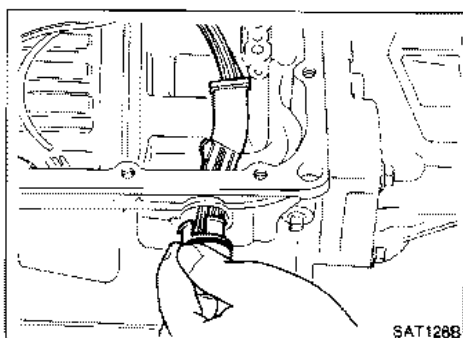
Bolt	l mm (in)	
(A)	33 (1.30)	
(B)	45 (1.77)	



- c. Remove solenoid connector.
- Be careful not to damage connector.



- d. Remove manual valve from control valve assembly.

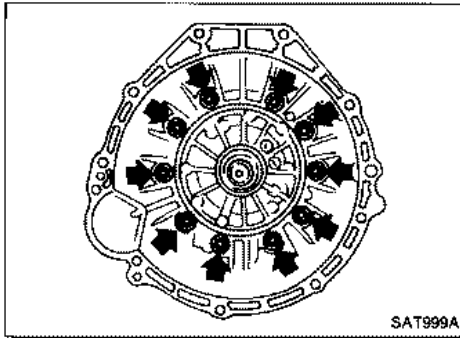


10. Remove terminal cord assembly from transmission case while pushing on stopper.
- Be careful not to damage cord.
 - Do not remove terminal cord assembly unless it is damaged.

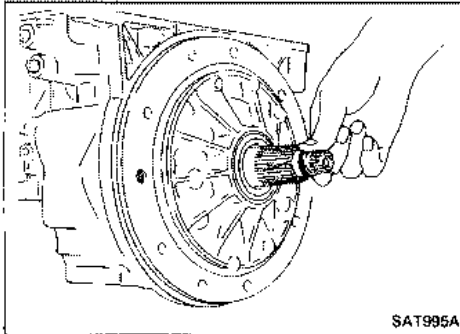
DISASSEMBLY

Disassembly (Cont'd)

11. Remove converter housing from transmission case.

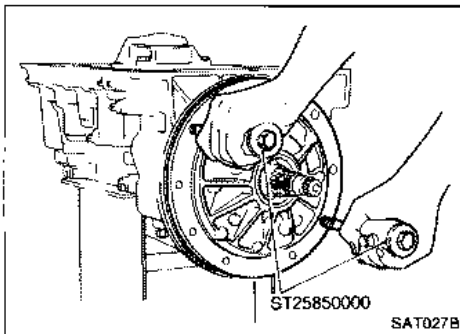


12. Remove O-ring from input shaft.



13. Remove oil pump assembly.

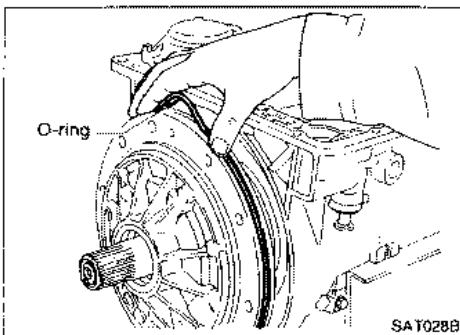
a. Attach Tool to oil pump assembly and extract it evenly from transmission case.



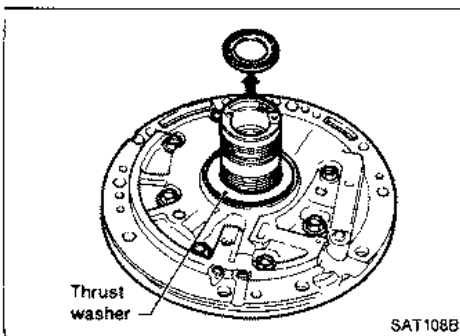
b. Remove O-ring from oil pump assembly.

c. Remove traces of sealant from oil pump housing.

● **Be careful not to scratch pump housing.**

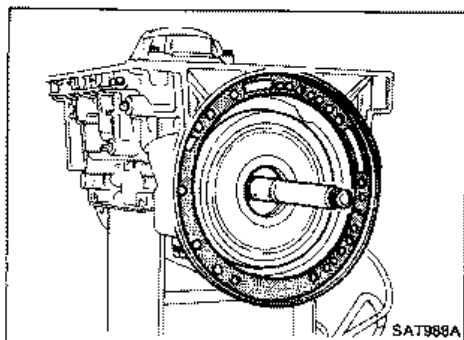


d. Remove needle bearing and thrust washer from oil pump assembly.

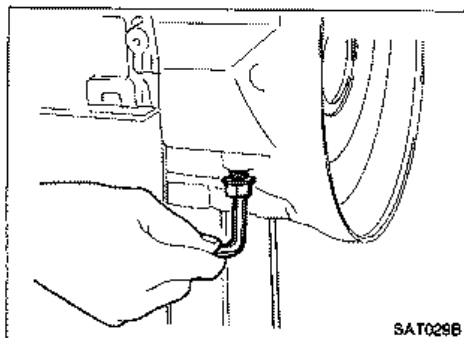


DISASSEMBLY

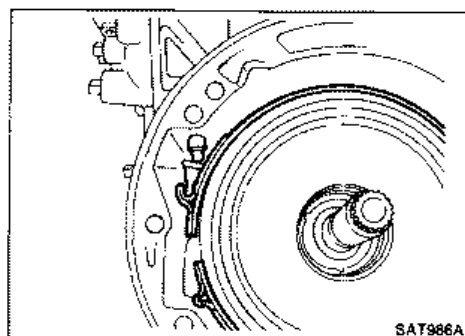
Disassembly (Cont'd)



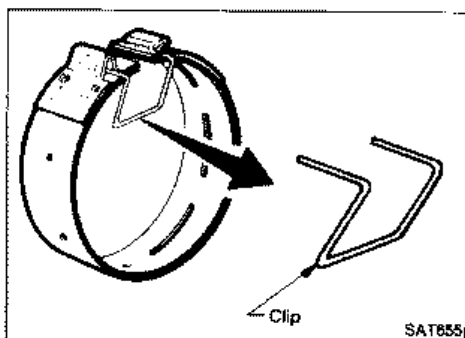
14. Remove input shaft and oil pump gasket.



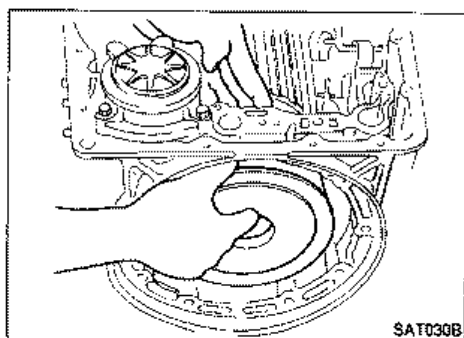
15. Remove brake band and band strut.
 - a. Loosen lock nut and remove band servo anchor end pin from transmission case.



- b. Remove brake band and band strut from transmission case.



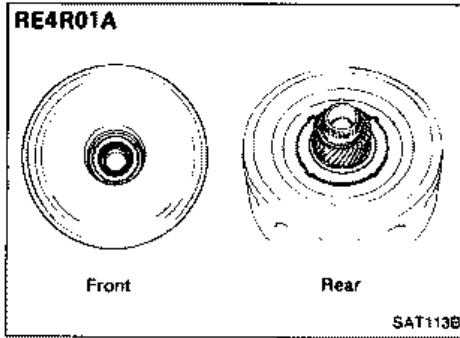
- c. Hold brake band in a circular shape with clip.



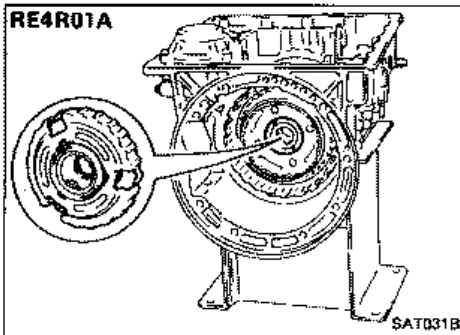
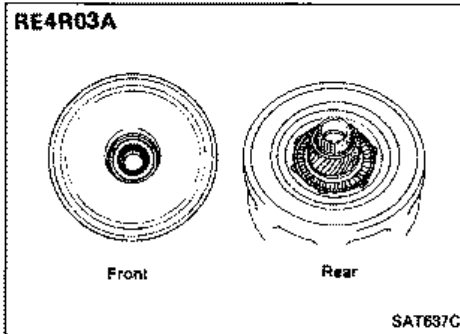
16. Remove front side clutch and gear components.
 - a. Remove clutch pack (reverse clutch, high clutch and front sun gear) from transmission case.

DISASSEMBLY

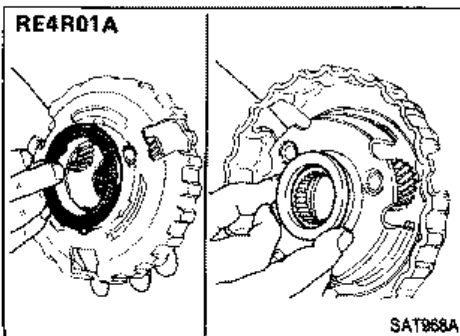
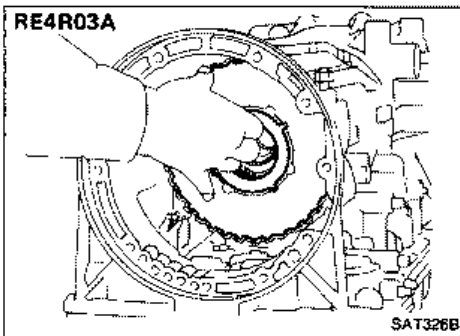
Disassembly (Cont'd)



- b. Remove front bearing race from clutch pack.
- c. Remove rear bearing race or front needle bearing from clutch pack.



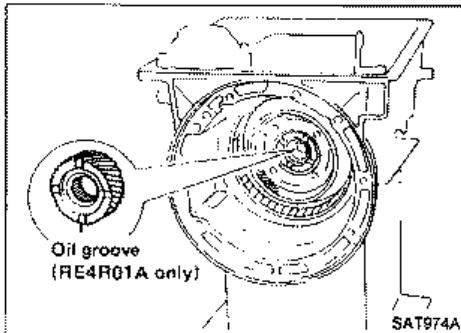
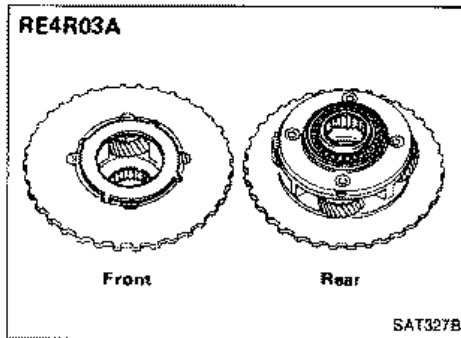
- d. Remove front planetary carrier from transmission case.



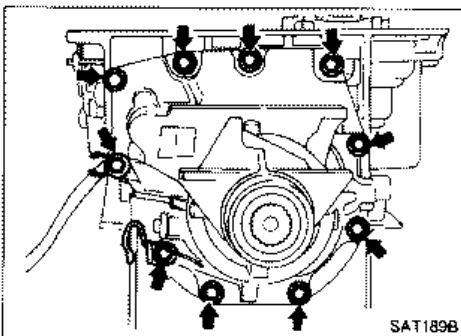
- e. Remove front needle bearing or front bearing race from front planetary carrier.
- f. Remove rear needle bearing from front planetary carrier.

DISASSEMBLY

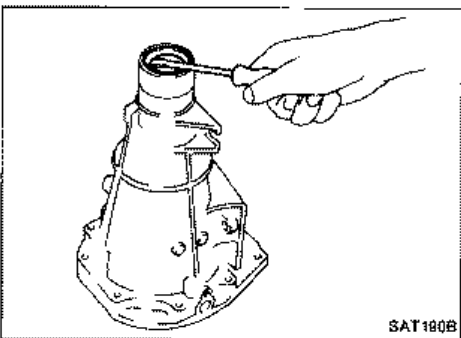
Disassembly (Cont'd)



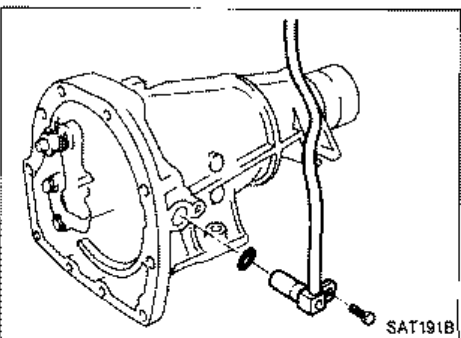
- g. Remove rear sun gear from transmission case.



17. Remove rear extension.
- a. Remove rear extension from transmission case.
 - b. Remove rear extension gasket from transmission case.



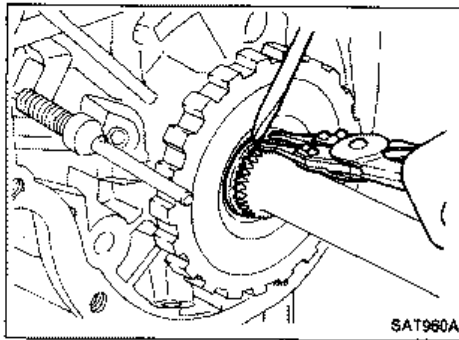
- c. Remove oil seal from rear extension.
- Do not remove oil seal unless it is to be replaced.



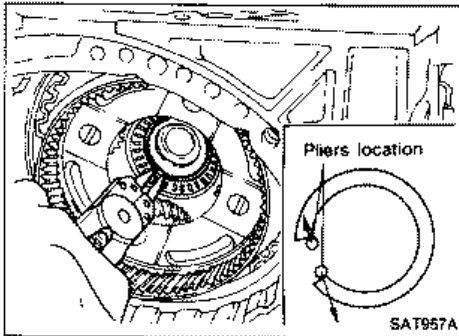
- d. Remove revolution sensor from rear extension.
- e. Remove O-ring from revolution sensor.

DISASSEMBLY

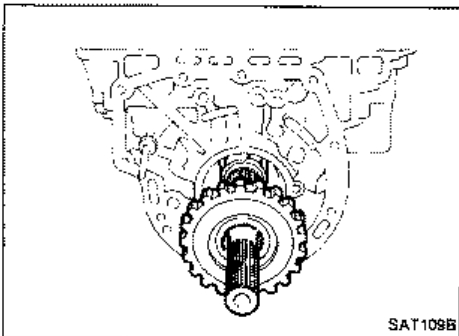
Disassembly (Cont'd)



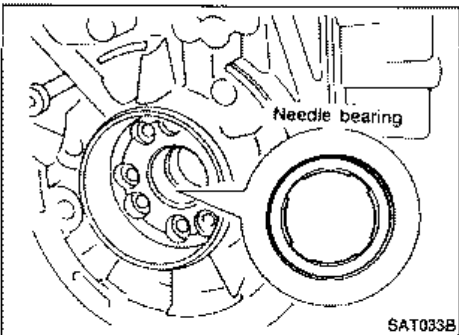
18. Remove output shaft and parking gear.
 - a. Remove rear snap ring from output shaft.



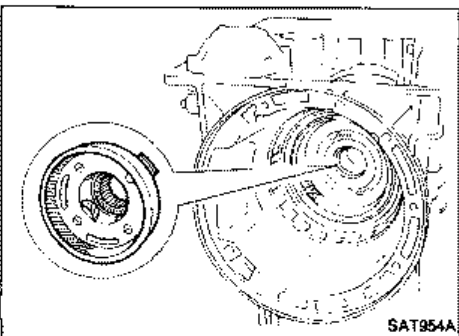
- b. Slowly push output shaft all the way forward.
 - **Do not use excessive force.**
 - c. Remove snap ring from output shaft.



- d. Remove output shaft and parking gear as a unit from transmission case.
 - e. Remove parking gear from output shaft.



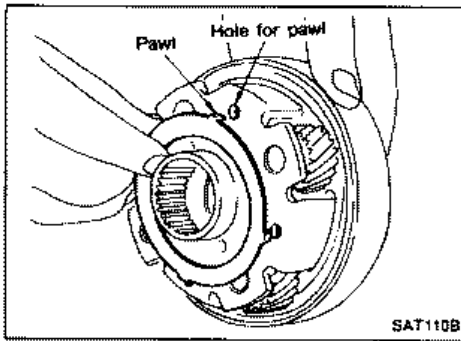
- f. Remove needle bearing from transmission case.



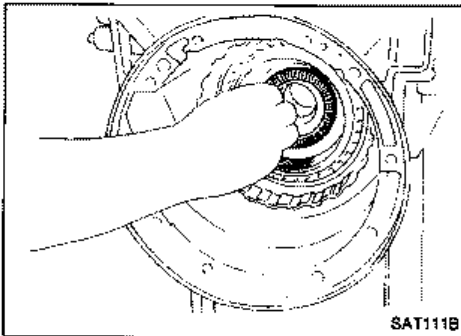
19. Remove rear side clutch and gear components.
 - a. Remove front internal gear.

DISASSEMBLY

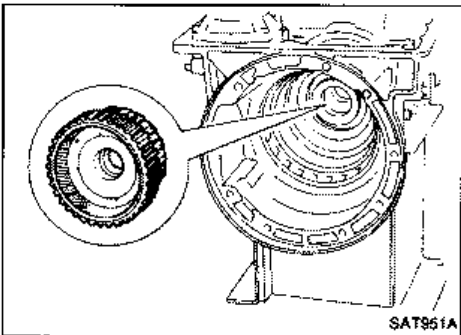
Disassembly (Cont'd)



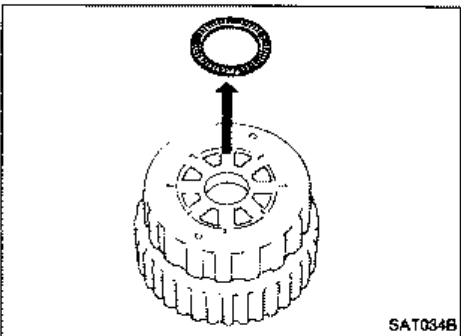
- b. Remove bearing race from front internal gear.



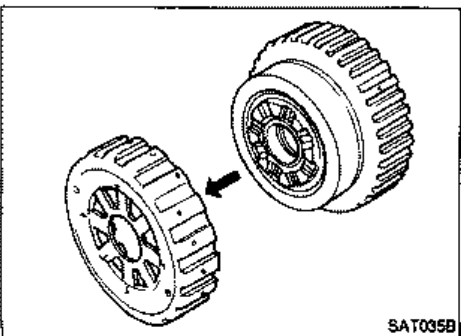
- c. Remove needle bearing from rear internal gear.



- d. Remove rear internal gear, forward clutch hub and overrun clutch hub as a set from transmission case.



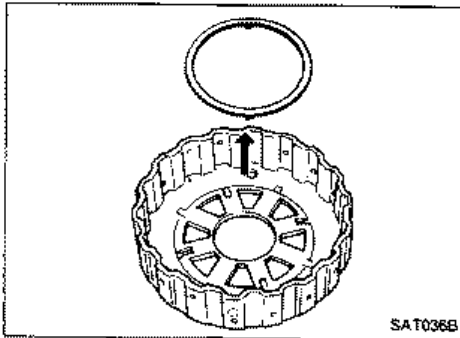
- e. Remove needle bearing from overrun clutch hub.



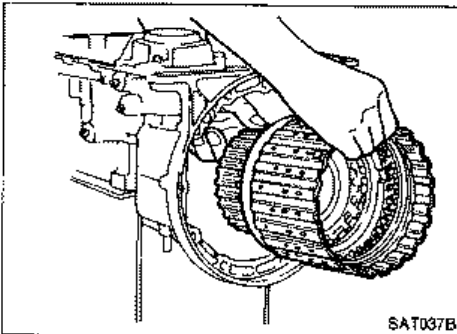
- f. Remove overrun clutch hub from rear internal gear and forward clutch hub.

DISASSEMBLY

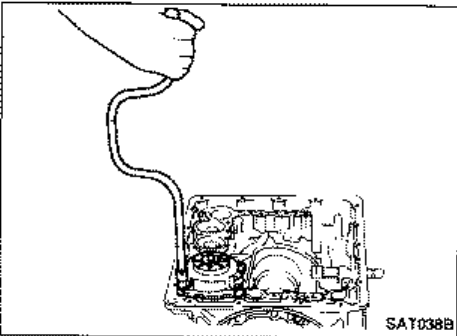
Disassembly (Cont'd)



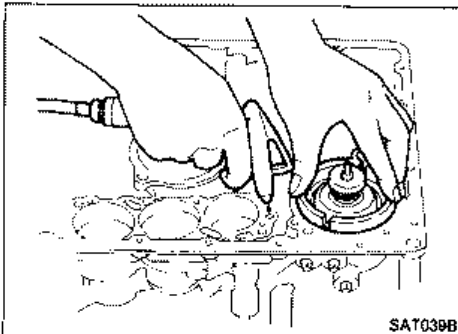
- g. Remove thrust washer from overrun clutch hub.



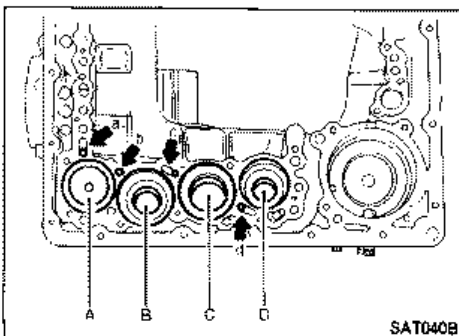
- h. Remove forward clutch assembly from transmission case.



20. Remove band servo and accumulator components.
a. Remove band servo retainer from transmission case.



- b. Apply compressed air to oil hole until band servo piston comes out of transmission case.
● **Hold piston with a rag and gradually direct air to oil hole.**
c. Remove return springs.

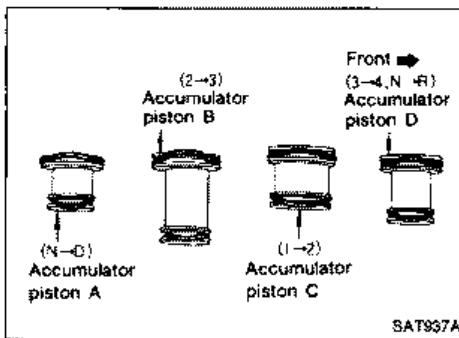


- d. Remove springs from accumulator pistons B, C and D.
e. Apply compressed air to each oil hole until piston comes out.
● **Hold piston with a rag and gradually direct air to oil hole.**

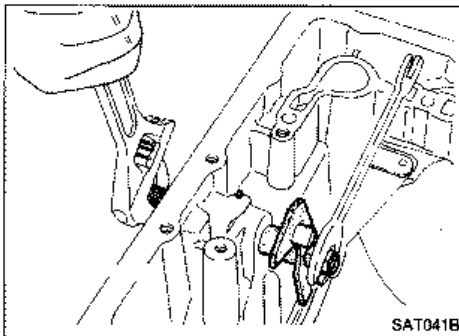
Identification of accumulator pistons	A	B	C	D
Identification of oil holes	a	b	c	d

DISASSEMBLY

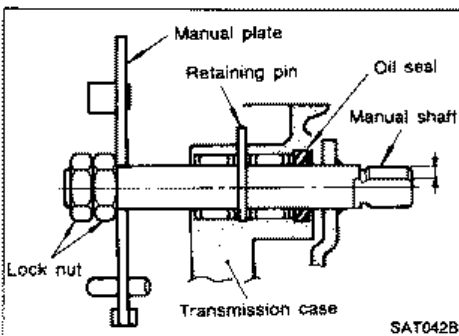
Disassembly (Cont'd)



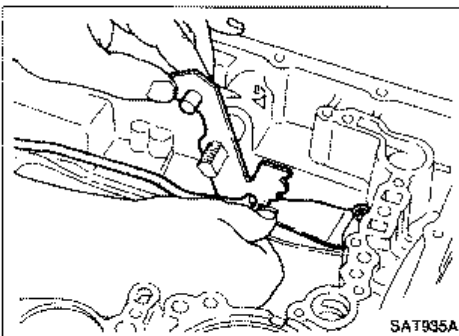
- f. Remove O-ring from each piston.



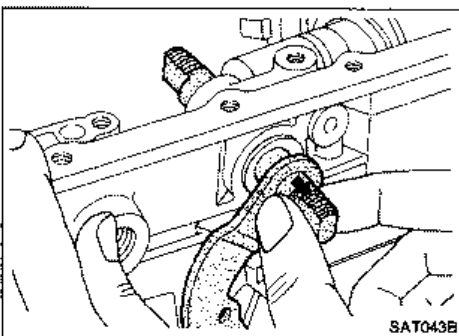
21. Remove manual shaft components, if necessary.
a. Hold width across flats of manual shaft (outside the transmission case) and remove lock nut from shaft.



- b. Remove retaining pin from transmission case.



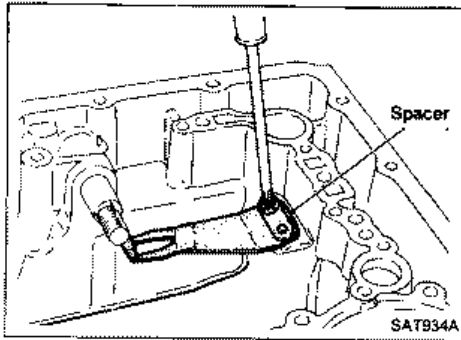
- c. While pushing detent spring down, remove manual plate and parking rod from transmission case.



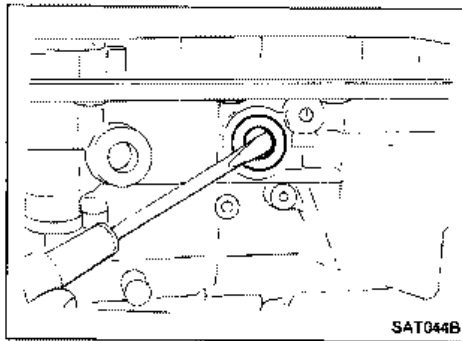
- d. Remove manual shaft from transmission case.

DISASSEMBLY

Disassembly (Cont'd)



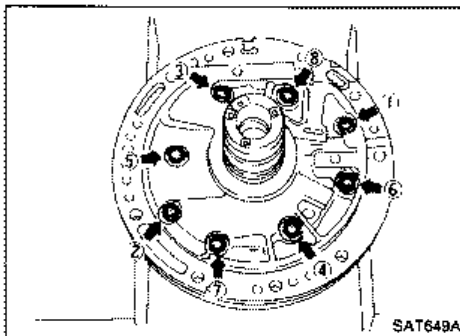
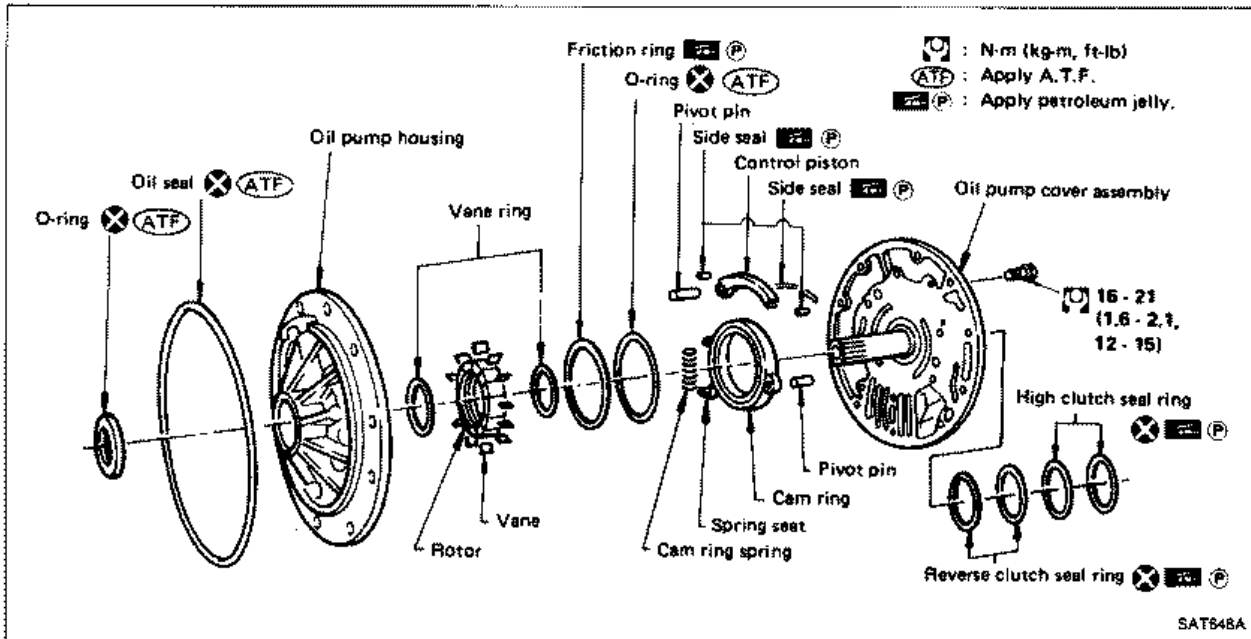
- e. Remove spacer and detent spring from transmission case.



- f. Remove oil seal from transmission case.

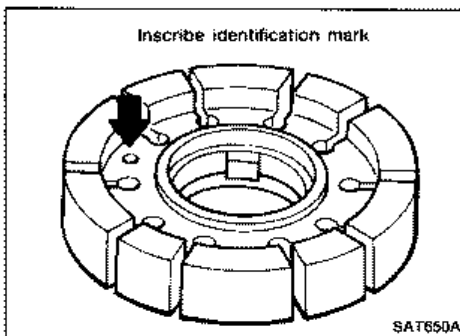
REPAIR FOR COMPONENT PARTS

Oil Pump



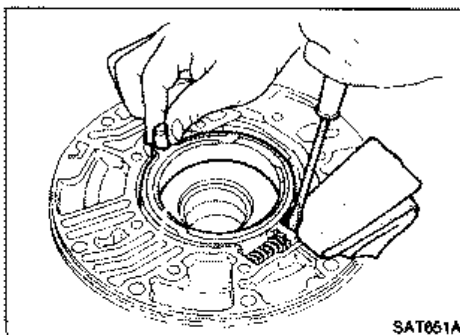
DISASSEMBLY

1. Loosen bolts in numerical order and remove oil pump cover.



2. Remove rotor, vane rings and vanes.

- Inscribe a mark on back of rotor for identification of fore-aft direction when reassembling rotor. Then remove rotor.

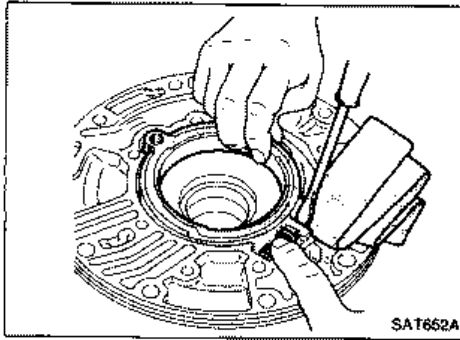


3. While pushing on cam ring remove pivot pin.

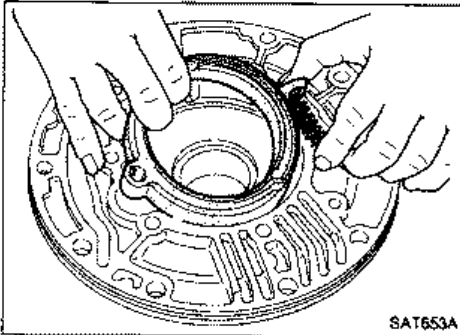
- Be careful not to scratch oil pump housing.

REPAIR FOR COMPONENT PARTS

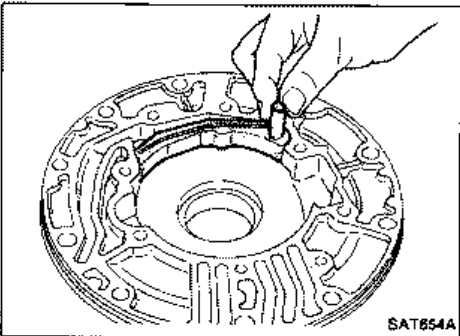
Oil Pump (Cont'd)



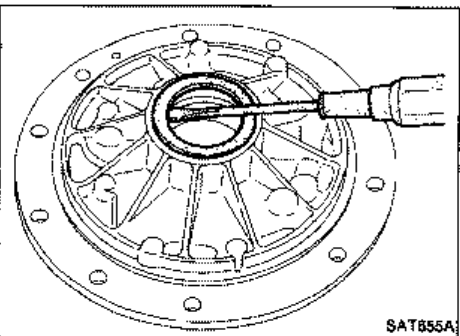
4. While holding cam ring and spring lift out cam ring spring.
 - Be careful not to damage oil pump housing.
 - Hold cam ring spring to prevent it from jumping.



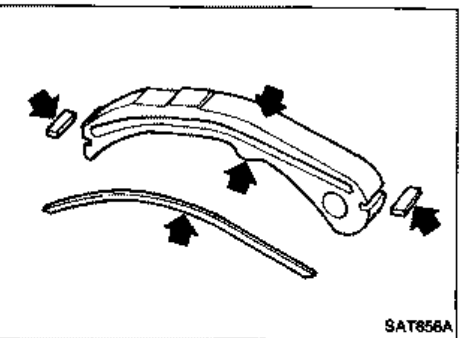
5. Remove cam ring and cam ring spring from oil pump housing.



6. Remove pivot pin from control piston and remove control piston assembly.



7. Remove oil seal from oil pump housing.
 - Be careful not to scratch oil pump housing.



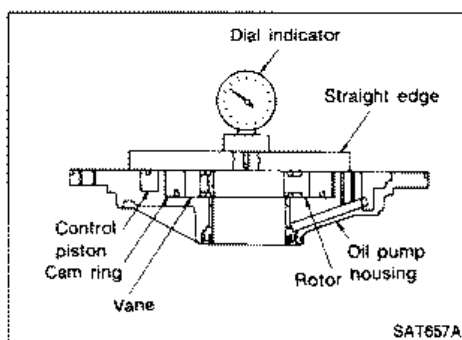
INSPECTION

Oil pump cover, rotor, vanes, control piston, side seals, cam ring and friction ring

- Check for wear or damage.

REPAIR FOR COMPONENT PARTS

Oil Pump (Cont'd)



Side clearances

- Measure side clearances between end of oil pump housing and cam ring, rotor, vanes and control piston in at least four places along their circumferences. Maximum measured values should be within specified ranges.
- Before measuring side clearance, check that friction rings, O-ring, control piston side seals and cam ring spring are removed.

Standard clearance:

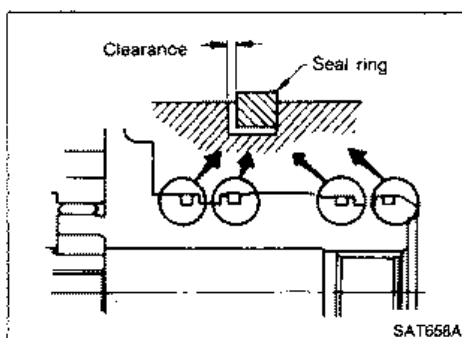
Cam ring

0.01 - 0.024 mm (0.0004 - 0.0009 in)

Rotor, vanes, control piston

0.03 - 0.044 mm (0.0012 - 0.0017 in)

- If not within standard clearance, replace oil pump assembly except oil pump cover assembly.



Seal ring clearance

- Measure clearance between seal ring and ring groove.

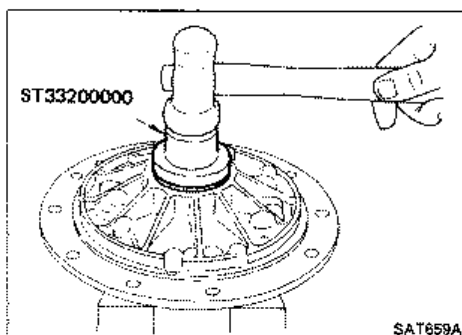
Standard clearance:

0.10 - 0.25 mm (0.0039 - 0.0098 in)

Wear limit:

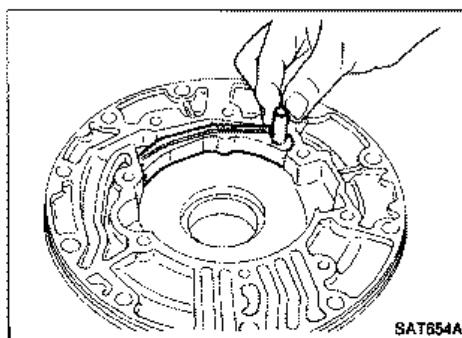
0.25 mm (0.0098 in)

- If not within wear limit, replace oil pump cover assembly.



ASSEMBLY

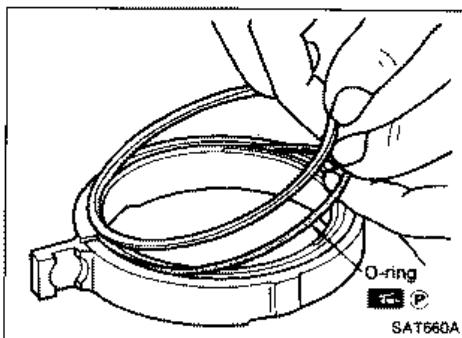
1. Drive oil seal into oil pump housing.
 - Apply A.T.F. to outer periphery and lip surface.



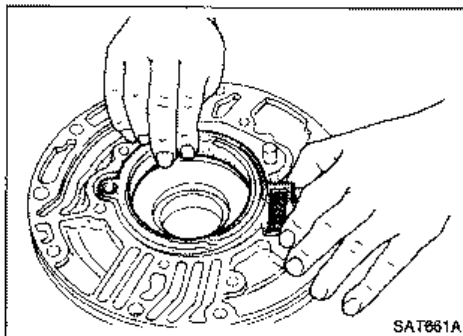
2. Install cam ring in oil pump housing by the following steps.
 - a. Install side seal on control piston.
 - Pay attention to its direction — Black surface goes toward control piston.
 - Apply petroleum jelly to side seal.
 - b. Install control piston on oil pump.

REPAIR FOR COMPONENT PARTS

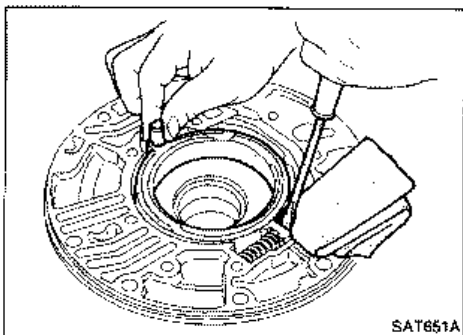
Oil Pump (Cont'd)



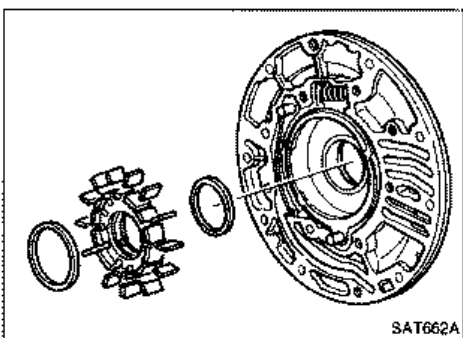
- c. Install O-ring and friction ring on cam ring.
- Apply petroleum jelly to O-ring.



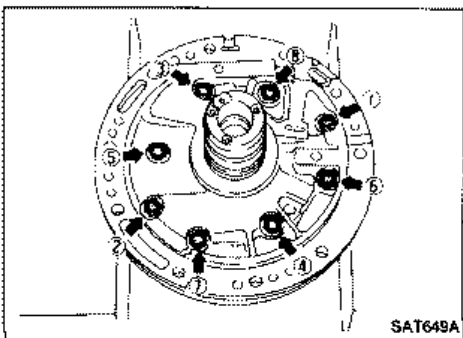
- d. Assemble cam ring, cam ring spring and spring seat. Install spring by pushing it against pump housing.



- e. While pushing on cam ring install pivot pin.



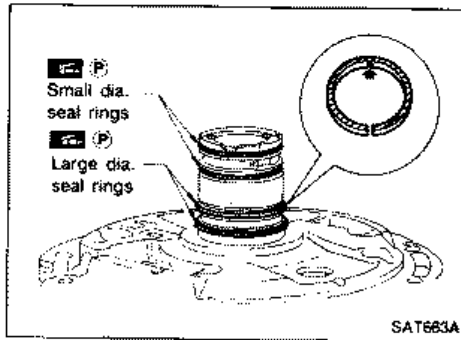
3. Install rotor, vanes and vane rings.
- Pay attention to direction of rotor.



4. Install oil pump housing and oil pump cover.
- a. Wrap masking tape around splines of oil pump cover assembly to protect seal. Position oil pump cover assembly in oil pump housing assembly, then remove masking tape.
- b. Tighten bolts in a criss-cross pattern.

REPAIR FOR COMPONENT PARTS

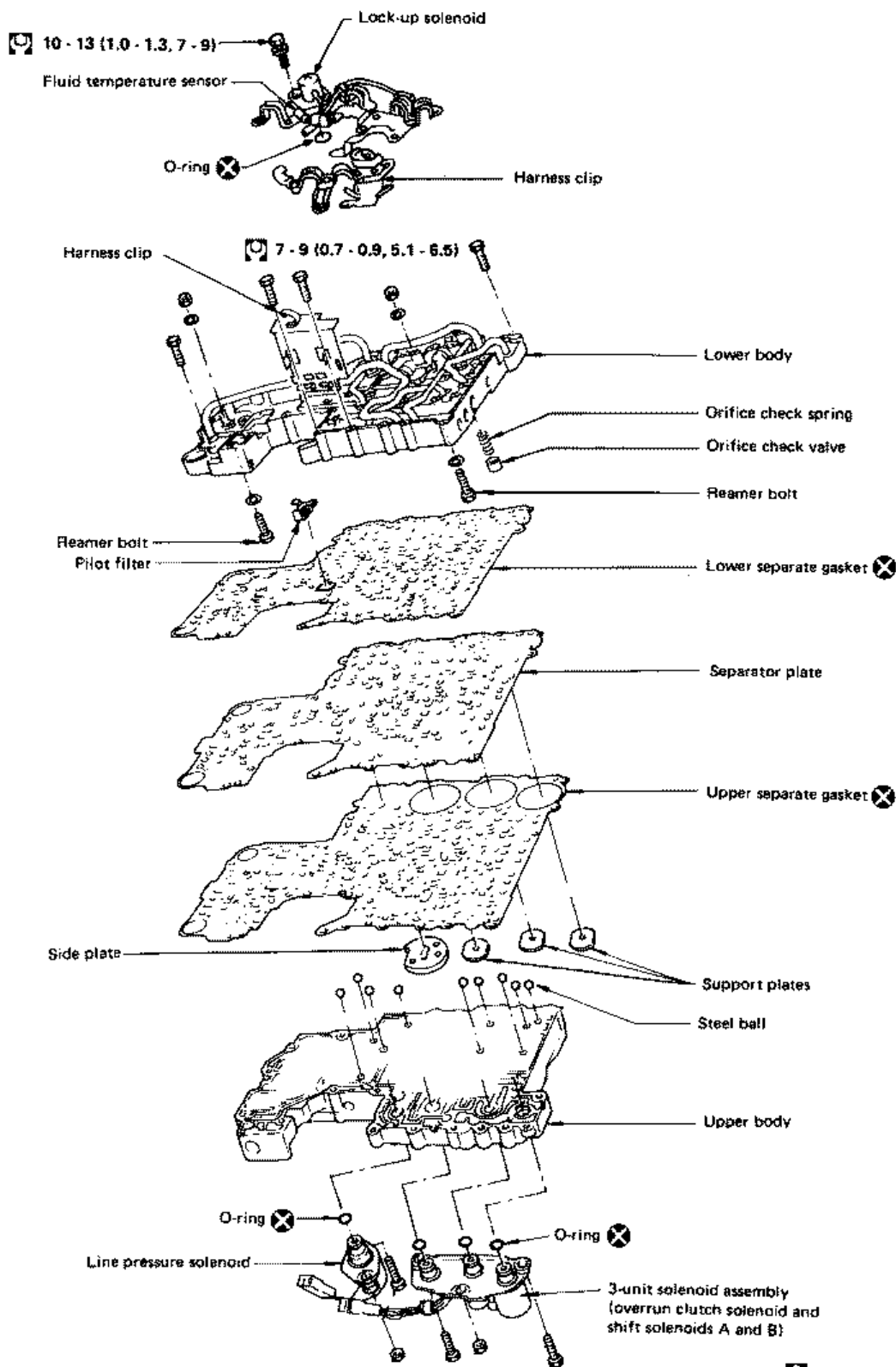
Oil Pump (Cont'd)



5. Install seal rings carefully after packing ring grooves with petroleum jelly. Press rings down into jelly to a close fit.
- Seal rings come in two different diameters. Check fit carefully in each groove.
 - Small dia. seal ring:
 - No mark
 - Large dia. seal ring:
 - Yellow mark in area shown by arrow
 - Do not spread gap of seal ring excessively while installing. It may deform ring.

REPAIR FOR COMPONENT PARTS

Control Valve Assembly



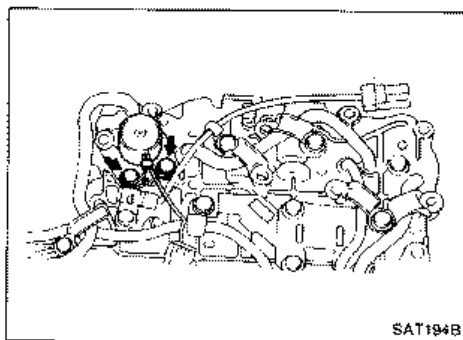
: N·m (kg·m, ft·lb)

SAT638C

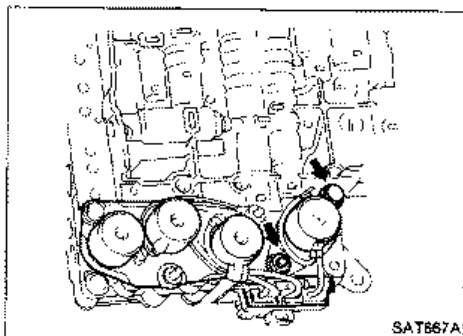
REPAIR FOR COMPONENT PARTS

Control Valve Assembly (Cont'd)

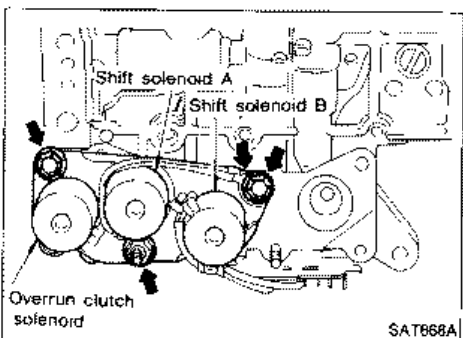
DISASSEMBLY



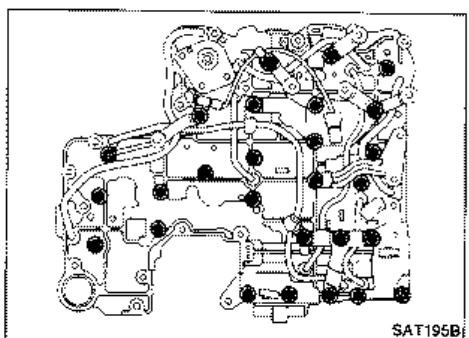
1. Remove solenoids.
 - a. Remove lock-up solenoid and side plate from lower body.
 - b. Remove O-ring from solenoid.



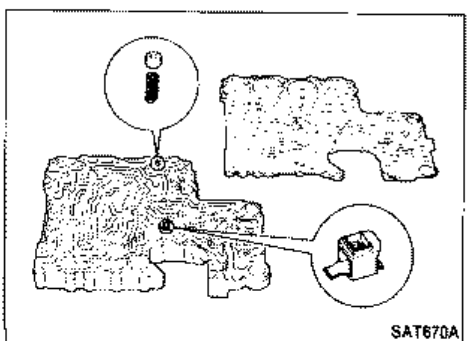
- c. Remove line pressure solenoid from upper body.
 - d. Remove O-ring from solenoid.



- e. Remove 3-unit solenoid assembly from upper body.
 - f. Remove O-rings from solenoids.



2. Disassemble upper and lower bodies.
 - a. Place upper body facedown, and remove bolts, reamer bolts and support plates.
 - b. Remove lower body, separator plate and separate gasket as a unit from upper body.
 - **Be careful not to drop pilot filter, orifice check valve, spring and steel balls.**

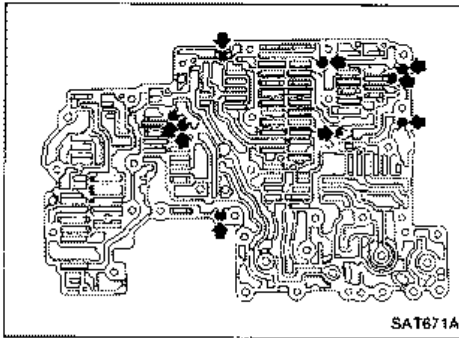


- c. Place lower body facedown, and remove separate gasket and separator plate.
 - d. Remove pilot filter, orifice check valve and orifice check spring.

REPAIR FOR COMPONENT PARTS

Control Valve Assembly (Cont'd)

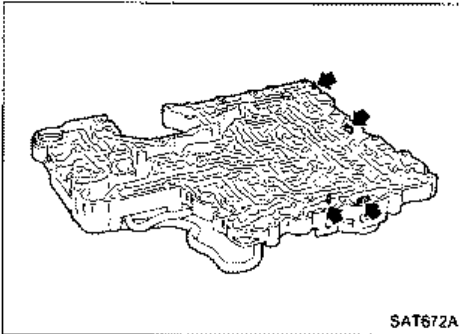
- e. Check to see that steel balls are properly positioned in upper body and then remove them from upper body.



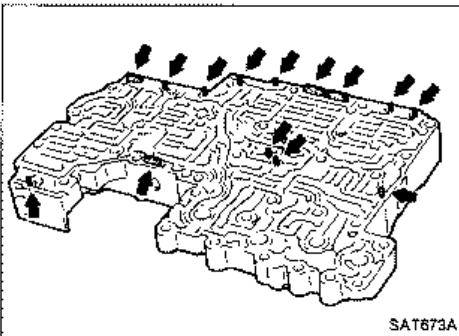
INSPECTION

Lower and upper bodies

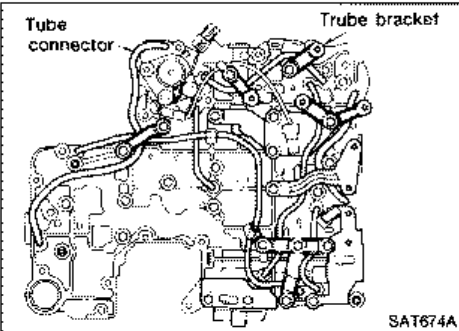
- Check to see that there are pins and retainer plates in lower body.



- Check to see that there are pins and retainer plates in upper body.
- Be careful not to lose these parts.

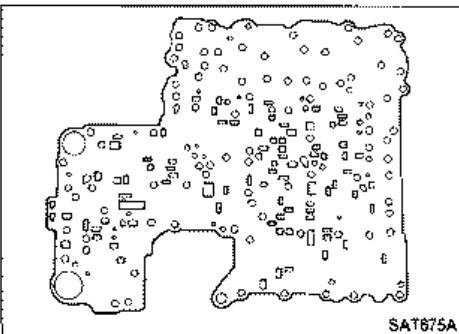


- Check to make sure that oil circuits are clean and free from damage.
- Check tube brackets and tube connectors for damage.



Separator plates

- Check to make sure that separator plate is free of damage and not deformed and oil holes are clean.

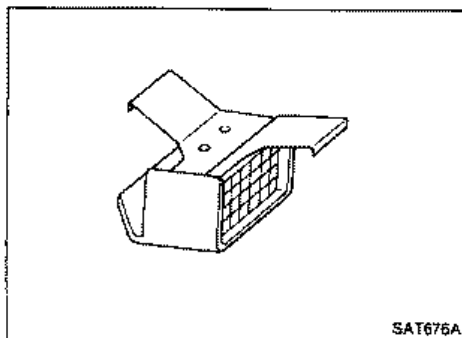


REPAIR FOR COMPONENT PARTS

Control Valve Assembly (Cont'd)

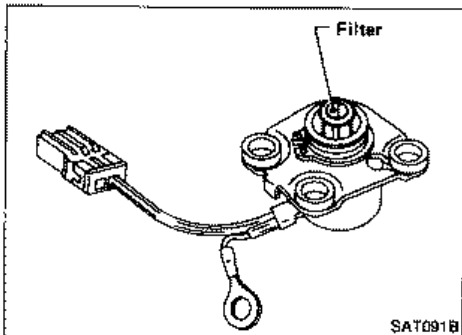
Pilot filter

- Check to make sure that filter is not clogged or damaged.



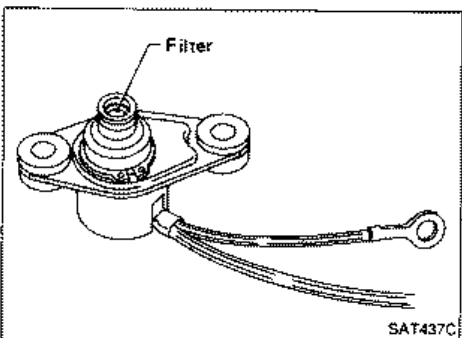
Lock-up solenoid

- Check that filter is not clogged or damaged.
- Measure resistance. — Refer to "Electrical Components Inspection".



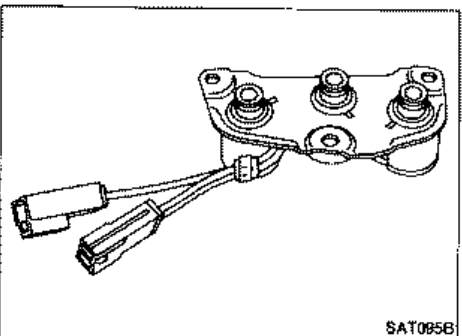
Line pressure solenoid

- Check that filter is not clogged or damaged.
- Measure resistance. — Refer to "Electrical Components Inspection".



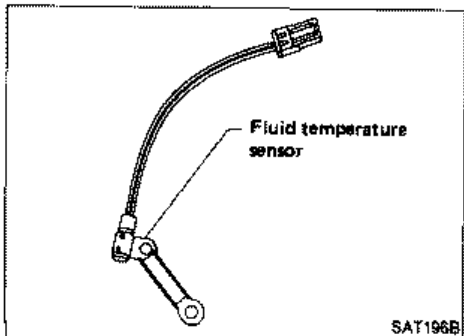
3-unit solenoid assembly (Overrun clutch solenoid and shift solenoids A and B)

- Measure resistance of each solenoid. — Refer to "Electrical Components Inspection".



Fluid temperature sensor

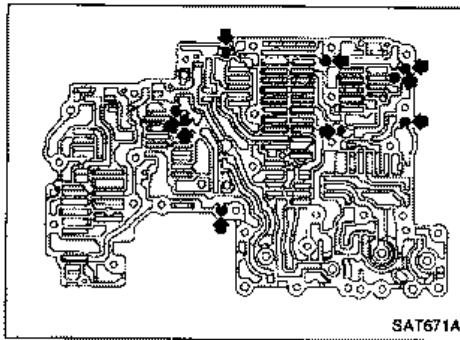
- Measure resistance. — Refer to "Electrical Components Inspection".



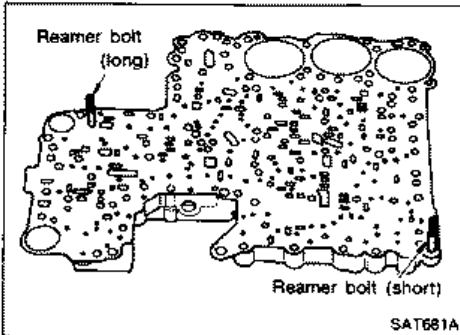
REPAIR FOR COMPONENT PARTS

Control Valve Assembly (Cont'd)

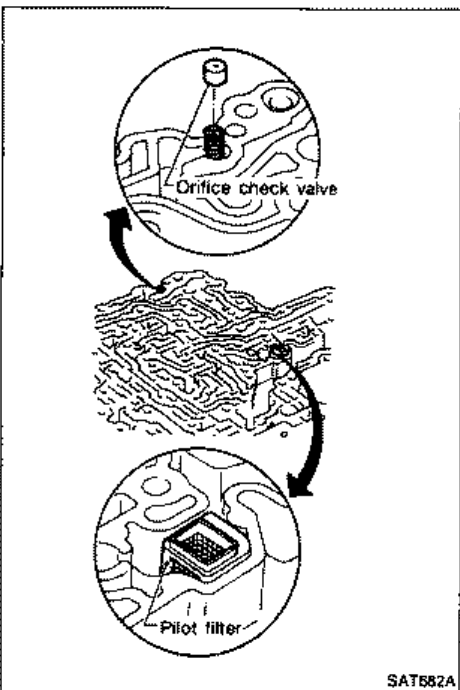
ASSEMBLY



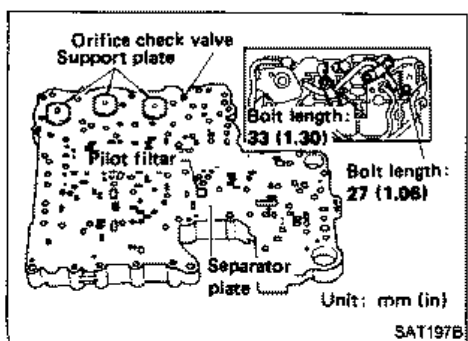
1. Install upper and lower bodies.
 - a. Place oil circuit of upper body face up. Install steel balls in their proper positions.



- b. Install reamer bolts from bottom of upper body and install separate gaskets.



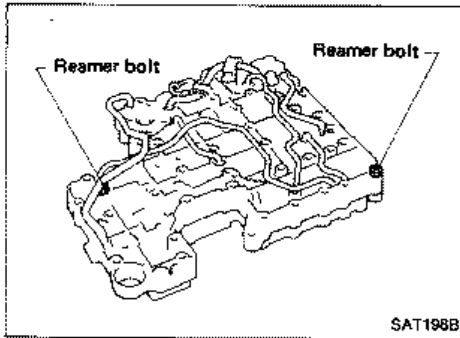
- c. Place oil circuit of lower body face up. Install orifice check spring, orifice check valve and pilot filter.



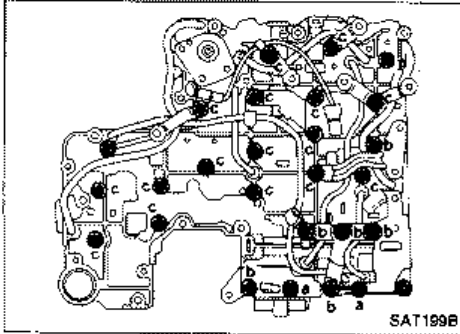
- d. Install lower separate gaskets and separator plates on lower body.
 - e. Install and temporarily tighten support plates, fluid temperature sensor and tube brackets.

REPAIR FOR COMPONENT PARTS

Control Valve Assembly (Cont'd)



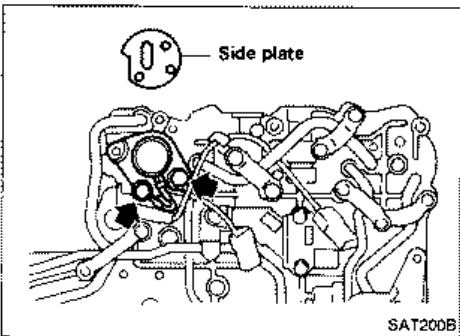
- f. Temporarily assemble lower and upper bodies, using reamer bolt as a guide.
- Be careful not to dislocate or drop steel balls, orifice check spring, orifice check valve and pilot filter.



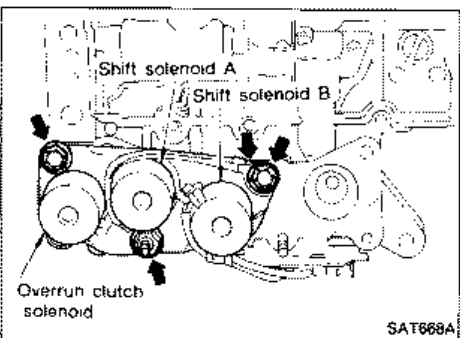
- g. Install and temporarily tighten bolts and tube brackets in their proper locations.

Bolt length and location:

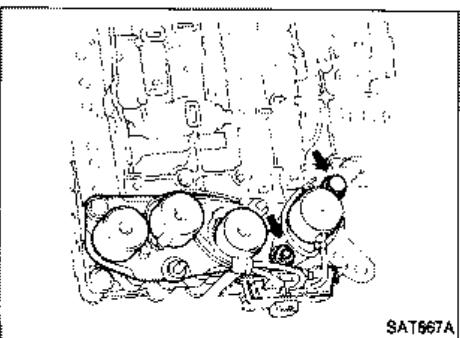
Item	Bolt symbol	a	b	c	d
		Bolt length	mm (in)	70 (2.76)	50 (1.97)



2. Install solenoids.
- a. Attach O-ring and install lock-up solenoid and side plates onto lower body.



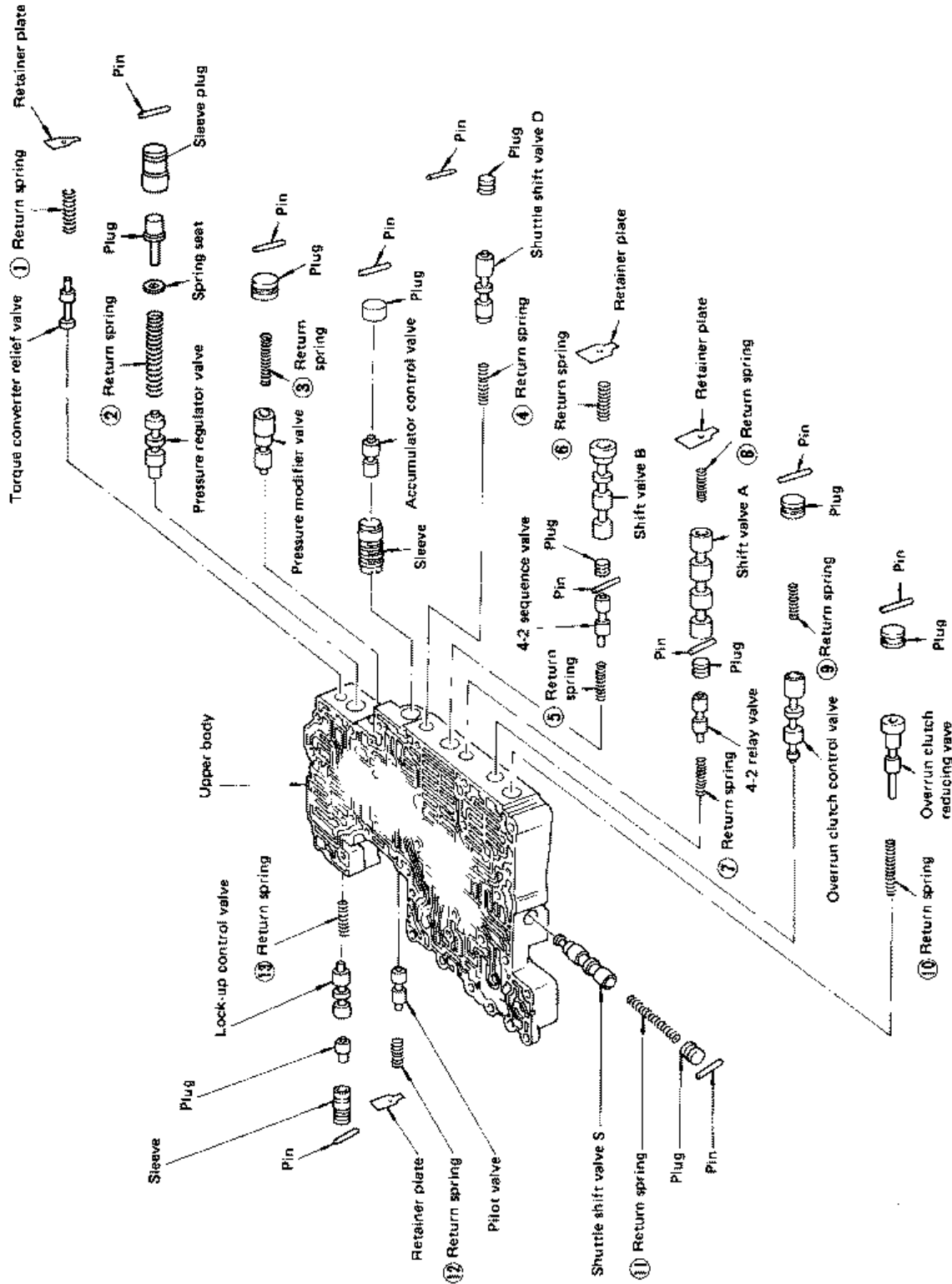
- b. Attach O-rings and install 3-unit solenoids assembly onto upper body.



- c. Attach O-ring and install line pressure solenoid onto upper body.
3. Tighten all bolts.

REPAIR FOR COMPONENT PARTS

Control Valve Upper Body



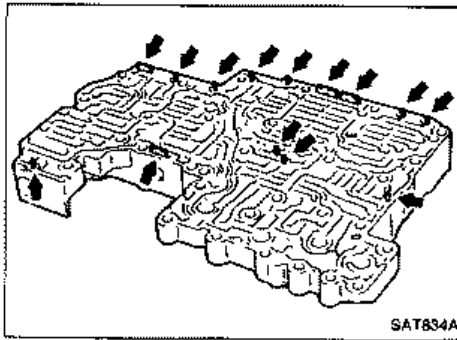
Numbers preceding valve springs correspond with those shown in Spring Chart on page AT-132.

Apply A.T.F. to all components before their installation.

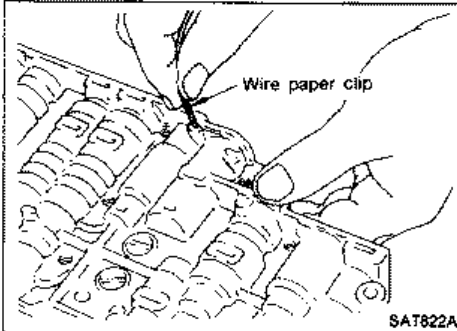
REPAIR FOR COMPONENT PARTS

Control Valve Upper Body (Cont'd)

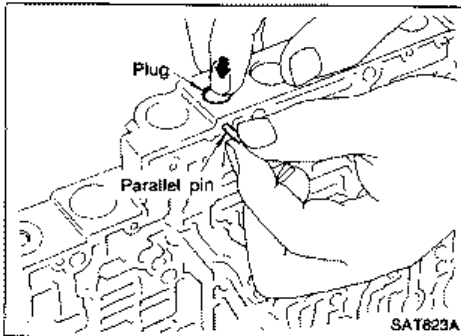
DISASSEMBLY



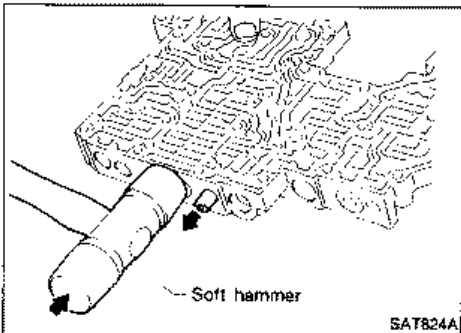
1. Remove valves at parallel pins.
 - Do not use a magnetic hand.



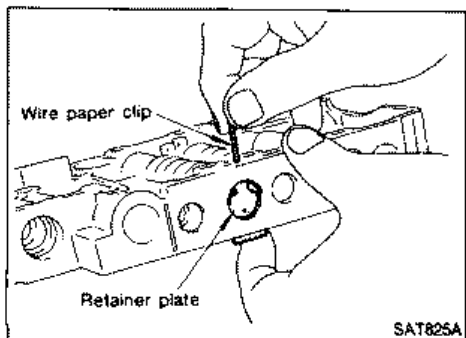
- a. Use a wire paper clip to push out parallel pins.



- b. Remove parallel pins while pressing their corresponding plugs and sleeves.
 - Remove plug slowly to prevent internal parts from jumping out.



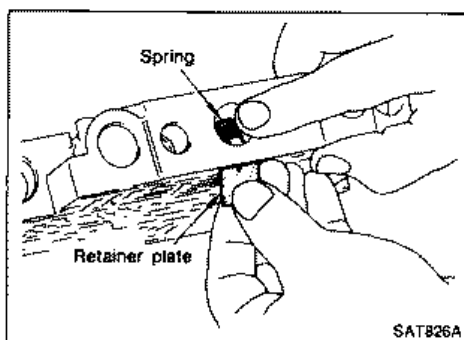
- c. Place mating surface of valve facedown, and remove internal parts.
 - If a valve is hard to remove, place valve body facedown and lightly tap it with a soft hammer.
 - Be careful not to drop or damage valves and sleeves.



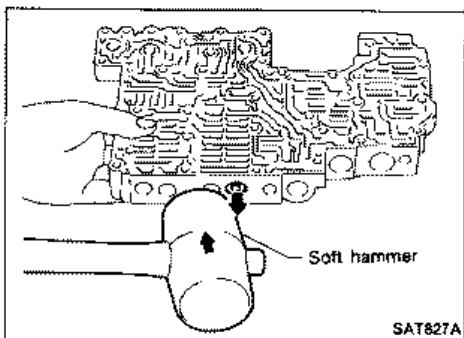
2. Remove valves at retainer plates.
 - a. Pry out retainer plate with wire paper clip.

REPAIR FOR COMPONENT PARTS

Control Valve Upper Body (Cont'd)

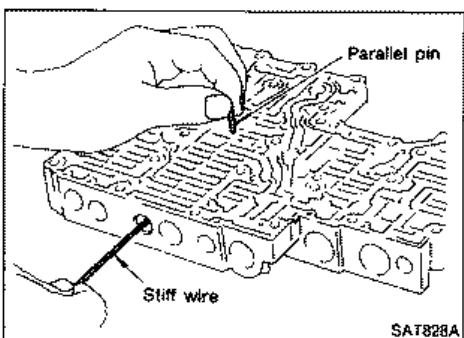


b. Remove retainer plates while holding spring.



c. Place mating surface of valve facedown, and remove internal parts.

- If a valve is hard to remove, lightly tap valve body with a soft hammer.
- Be careful not to drop or damage valves, sleeves, etc.



- 4-2 sequence valve and relay valve are located far back in upper body. If they are hard to remove, carefully push them out using stiff wire.
- Be careful not to scratch sliding surface of valve with wire.

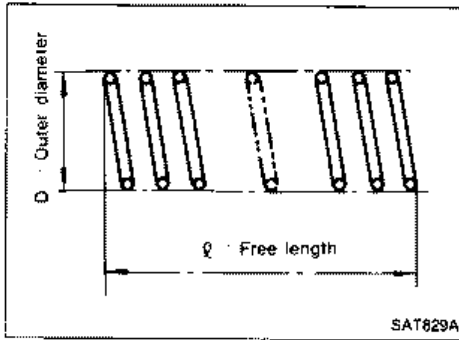
REPAIR FOR COMPONENT PARTS

Control Valve Upper Body (Cont'd)

INSPECTION

Valve springs

- Measure free length and outer diameter of each valve spring. Also check for damage or deformation.
- Numbers of each valve spring listed in table below are the same as those in the figure on AT-129.



Inspection standard

Unit: mm (in)

Parts	Item	Part No.	ℓ	D
①	Torque converter relief valve spring	31742-41X23	38.0 (1.496)	9.0 (0.354)
②	Pressure regulator valve spring	31742-41X24	44.02 (1.7331)	14.0 (0.551)
③	Pressure modifier valve spring	31742-41X19	31.95 (1.2579)	6.8 (0.268)
④	Shuttle shift valve D spring	31762-41X00	26.5 (1.043)	6.0 (0.236)
⑤	4-2 sequence valve spring	31756-41X00	29.1 (1.146)	6.95 (0.2736)
⑥	Shift valve B spring	31762-41X01	25.0 (0.984)	7.0 (0.276)
⑦	4-2 relay valve spring	31756-41X00	29.1 (1.146)	6.95 (0.2736)
⑧	Shift valve A spring	31762-41X01	25.0 (0.984)	7.0 (0.276)
⑨	Overrun clutch control valve spring	31762-41X03	23.6 (0.929)	7.0 (0.276)
⑩	Overrun clutch reducing valve spring	31742-41x20	32.5 (1.280)	7.0 (0.276)
⑪	Shuttle shift valve S spring	31762-41X04	51.0 (2.008)	5.65 (0.2224)
⑫	Pilot valve spring	31742-41X13	25.7 (1.012)	9.1 (0.358)
⑬	Lock-up control valve spring	31742-41X22	18.5 (0.728)	13.0 (0.512)

- Replace valve springs if deformed or fatigued.

Control valves

- Check sliding surfaces of valves, sleeves and plugs.

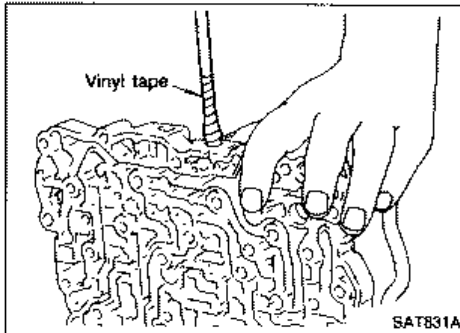
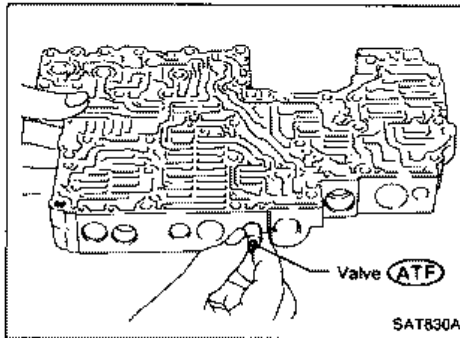
REPAIR FOR COMPONENT PARTS

Control Valve Upper Body (Cont'd)

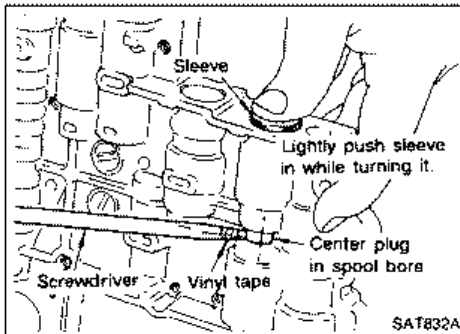
ASSEMBLY

1. Lubricate the control valve body and all valves with A.T.F. Install control valves by sliding them carefully into their bores.

- Be careful not to scratch or damage valve body.

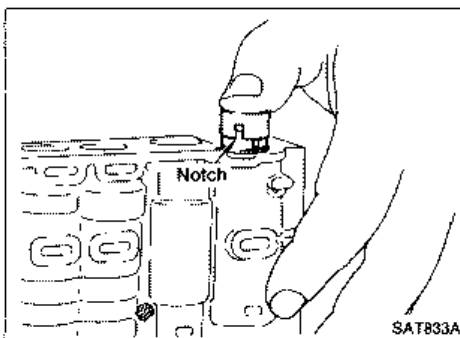


- Wrap a small screwdriver with vinyl tape and use it to insert the valves into proper position.



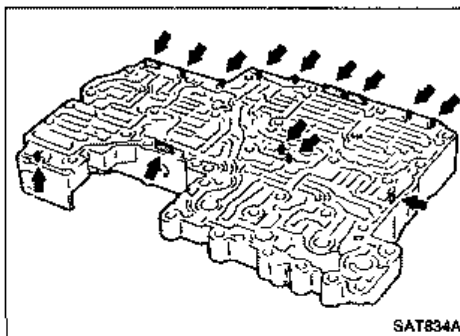
Pressure regulator valve

- If pressure regulator plug is not centered properly, sleeve cannot be inserted into bore in upper body. If this happens, use vinyl tape wrapped screwdriver to center sleeve until it can be inserted.
- Turn sleeve slightly while installing.



Accumulator control plug

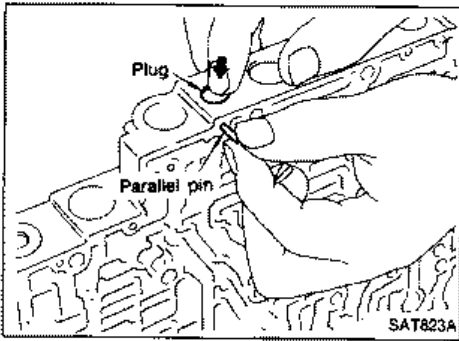
- Align protrusion of accumulator control sleeve with notch in plug.
- Align parallel pin groove in plug with parallel pin, and install accumulator control valve.



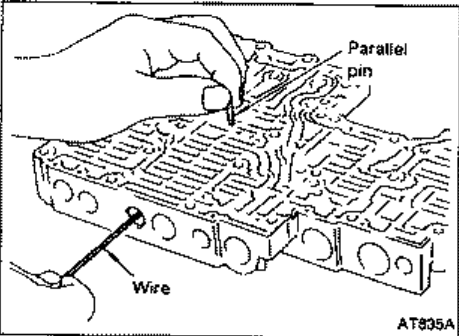
2. Install parallel pins and retainer plates.

REPAIR FOR COMPONENT PARTS

Control Valve Upper Body (Cont'd)

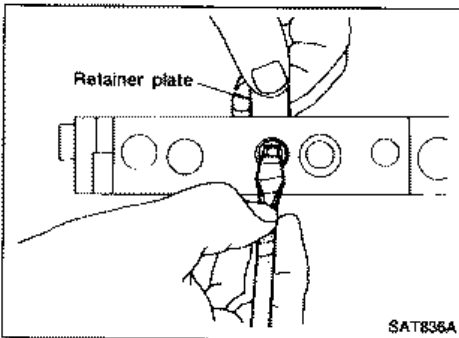


- While pushing plug, install parallel pin.



4-2 sequence valve and relay valve

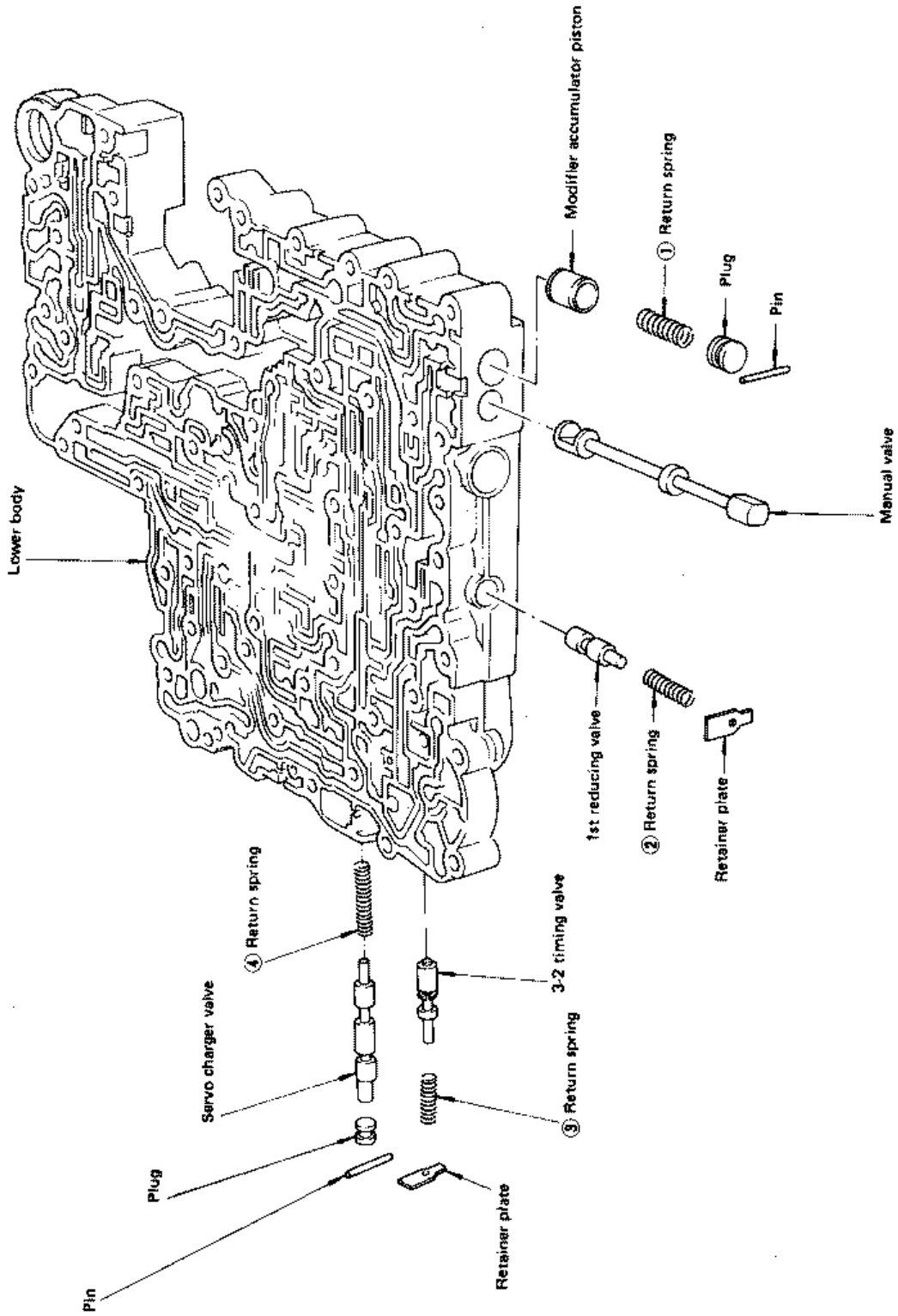
- Push 4-2 sequence valve and relay valve with wire wrapped in vinyl tape to prevent scratching valve body. Install parallel pins.



- Insert retainer plate while pushing spring.

REPAIR FOR COMPONENT PARTS

Control Valve Lower Body



Numbers preceding valve springs correspond with those shown in Spring Chart on page A.T.136.

Apply A.T.F. to all components before their installation.

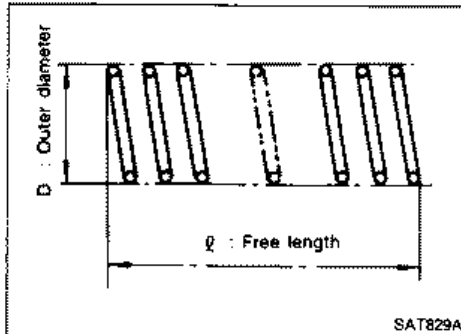
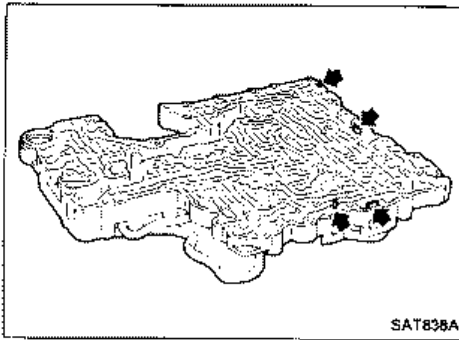
REPAIR FOR COMPONENT PARTS

Control Valve Lower Body (Cont'd)

DISASSEMBLY

1. Remove valves at parallel pins.
2. Remove valves at retainer plates.

For removal procedures, refer to "DISASSEMBLY" of Control Valve Upper Body.



INSPECTION

Valve springs

- Check each valve spring for damage or deformation. Also measure free length and outer diameter.
- Numbers of each valve spring listed in table below are the same as those in the figure on AT-135.

Inspection standard:

Unit: mm (in)

Parts	Item	Part No.	ℓ	D
①	Modifier accumulator piston spring	31742-41X15	30.5 (1.201)	9.8 (0.386)
②	1st reducing valve spring	31756-41X05	25.4 (1.000)	6.75 (0.2657)
③	3-2 timing valve spring	31742-41X08	20.55 (0.8091)	6.75 (0.2657)
④	Servo charger valve spring	31742-41X06	23.0 (0.906)	6.7 (0.264)

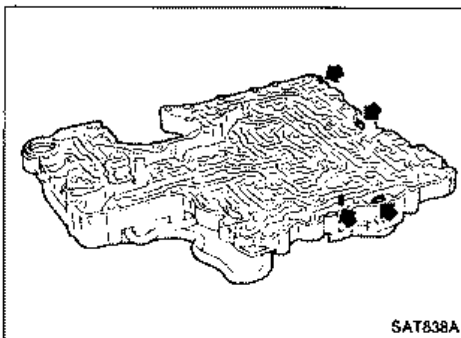
- Replace valve springs if deformed or fatigued.

Control valves

- Check sliding surfaces of control valves, sleeves and plugs for damage.

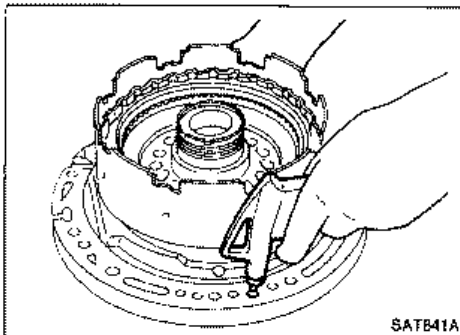
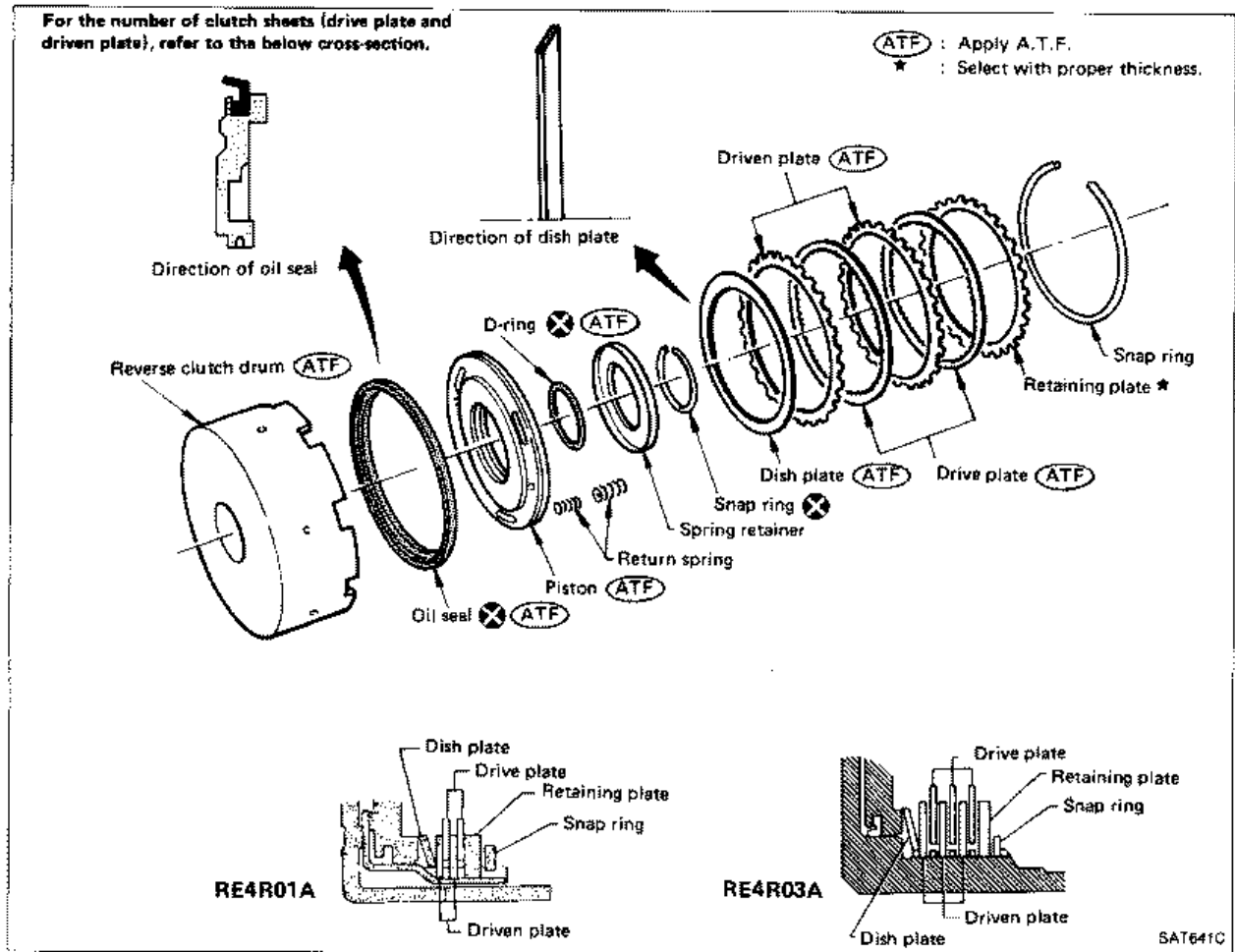
ASSEMBLY

- Install control valves.
For installation procedures, refer to "ASSEMBLY" of Control Valve Upper Body.



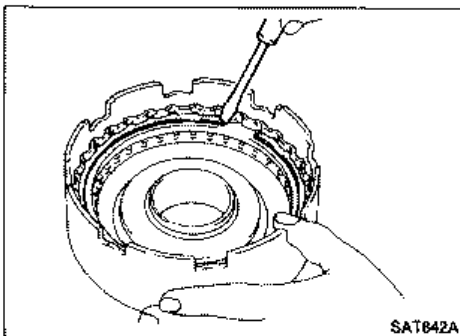
REPAIR FOR COMPONENT PARTS

Reverse Clutch



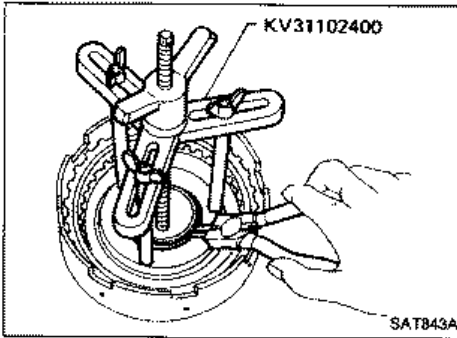
DISASSEMBLY

1. Check operation of reverse clutch.
 - a. Install seal ring onto oil pump cover and install reverse clutch. Apply compressed air to oil hole.
 - b. Check to see that retaining plate moves to snap ring.
 - c. If retaining plate does not move to snap ring, D-ring or oil seal may be damaged or fluid may be leaking at piston check ball.
2. Remove drive plates, driven plates, retaining plate, dish plate and snap ring.



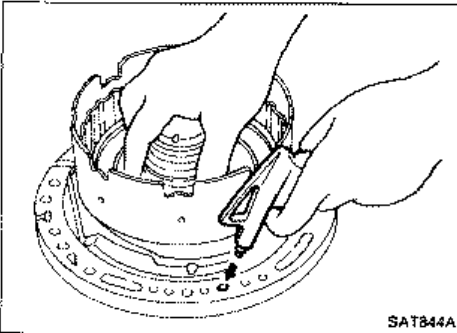
REPAIR FOR COMPONENT PARTS

Reverse Clutch (Cont'd)



3. Remove snap ring from clutch drum while compressing clutch springs.

- Do not expand snap ring excessively.
4. Remove spring retainer and return spring.



5. Install seal ring onto oil pump cover and install reverse clutch drum. While holding piston, gradually apply compressed air to oil hole until piston is removed.

- Do not apply compressed air abruptly.
6. Remove D-ring and oil seal from piston.

INSPECTION

Reverse clutch snap ring and spring retainer

- Check for deformation, fatigue or damage.

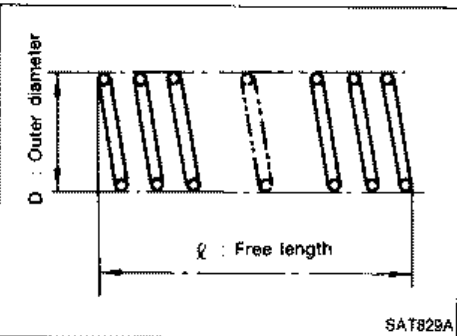
Reverse clutch return springs

- Check for deformation or damage. Also measure free length and outside diameter.

Inspection standard:

Unit: mm (in)

Model	Part No.	ℓ	D
RE4R01A	31505-41X02	19.69 (0.7752)	11.6 (0.457)
RE4R03A	31505-51X00	37.8 (1.488)	14.8 (0.583)



Reverse clutch drive plates

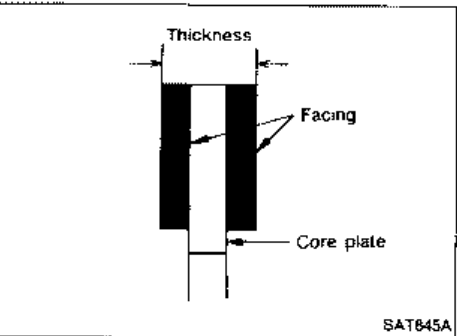
- Check facing for burns, cracks or damage.
- Measure thickness of facing.

Thickness of drive plate:

Standard value: 2.0 mm (0.079 in)

Wear limit: 1.8 mm (0.071 in)

- If not within wear limit, replace.

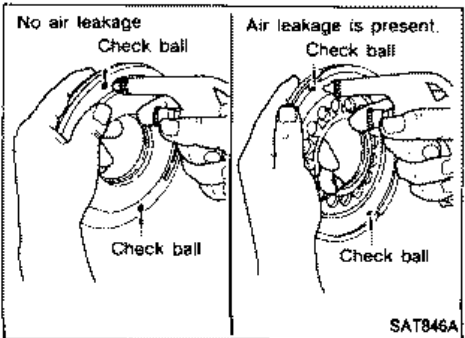


Reverse clutch dish plate

- Check for deformation or damage.

Reverse clutch piston

- Shake piston to assure that balls are not seized.
- Apply compressed air to check ball oil hole opposite the return spring to assure that there is no air leakage.
- Also apply compressed air to oil hole on return spring side to assure that air leaks past ball.

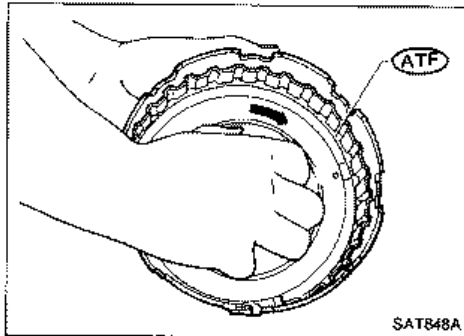
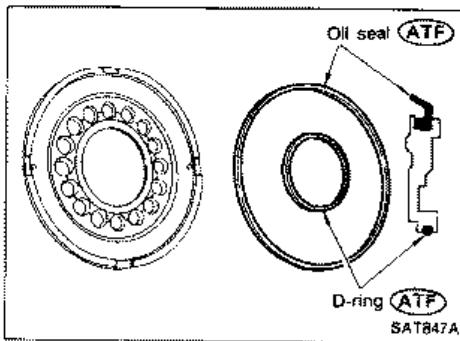


REPAIR FOR COMPONENT PARTS

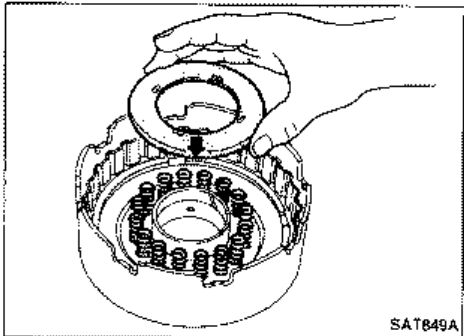
Reverse Clutch (Cont'd)

ASSEMBLY

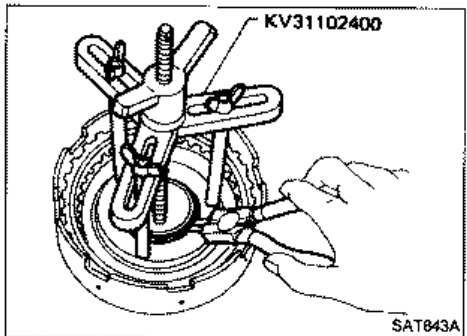
1. Install D-ring and oil seal on piston.
 - Apply A.T.F. to both parts.



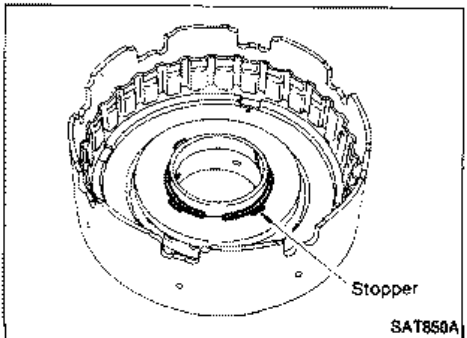
2. Install piston assembly by turning it slowly and evenly.
 - Apply A.T.F. to Inner surface of drum.



3. Install return springs and spring retainer.



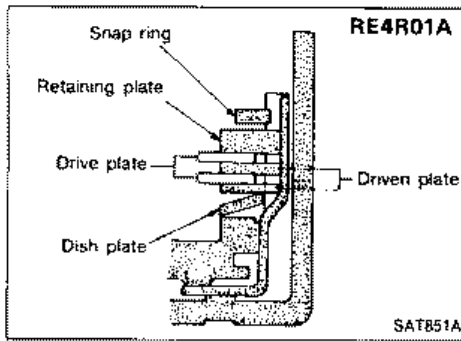
4. Install snap ring while compressing clutch springs.



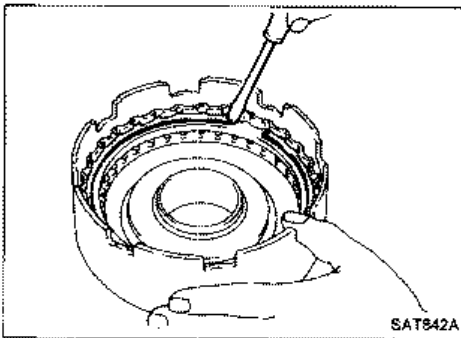
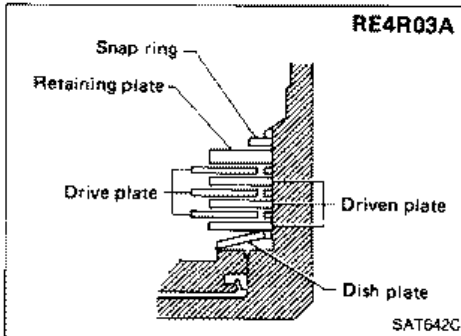
- Do not align snap ring gap with spring retainer stopper.

REPAIR FOR COMPONENT PARTS

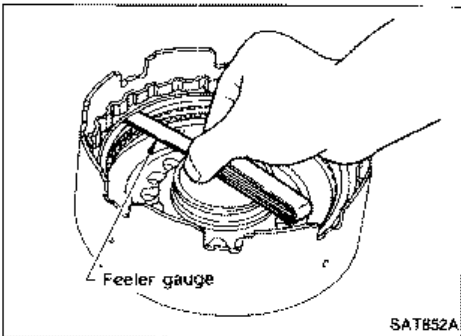
Reverse Clutch (Cont'd)



5. Install drive plates, driven plates, retaining plate and dish plate.



6. Install snap ring.



7. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.

Specified clearance:

Standard

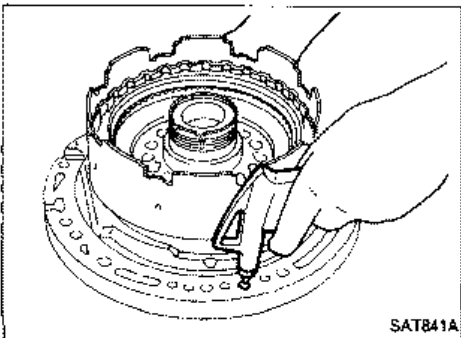
0.5 - 0.8 mm (0.020 - 0.031 in)

Allowable limit

1.2 mm (0.047 in)

Retaining plate:

Refer to S.D.S.



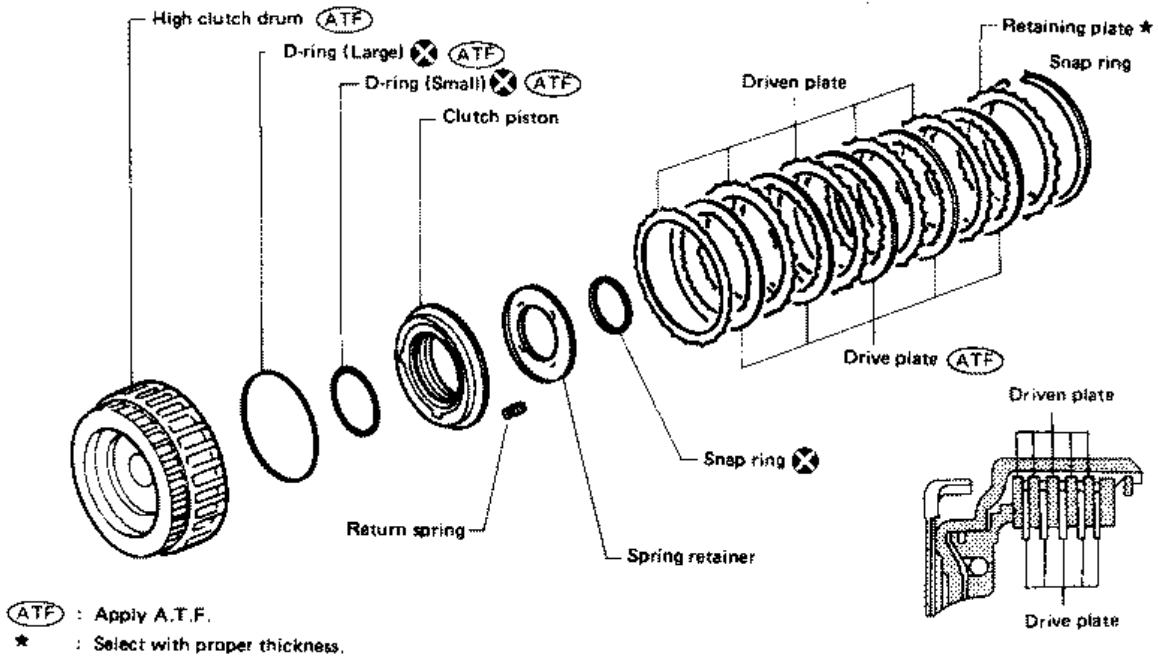
8. Check operation of reverse clutch. Refer to "DISASSEMBLY" of Reverse Clutch.

REPAIR FOR COMPONENT PARTS

High Clutch

RE4R01A

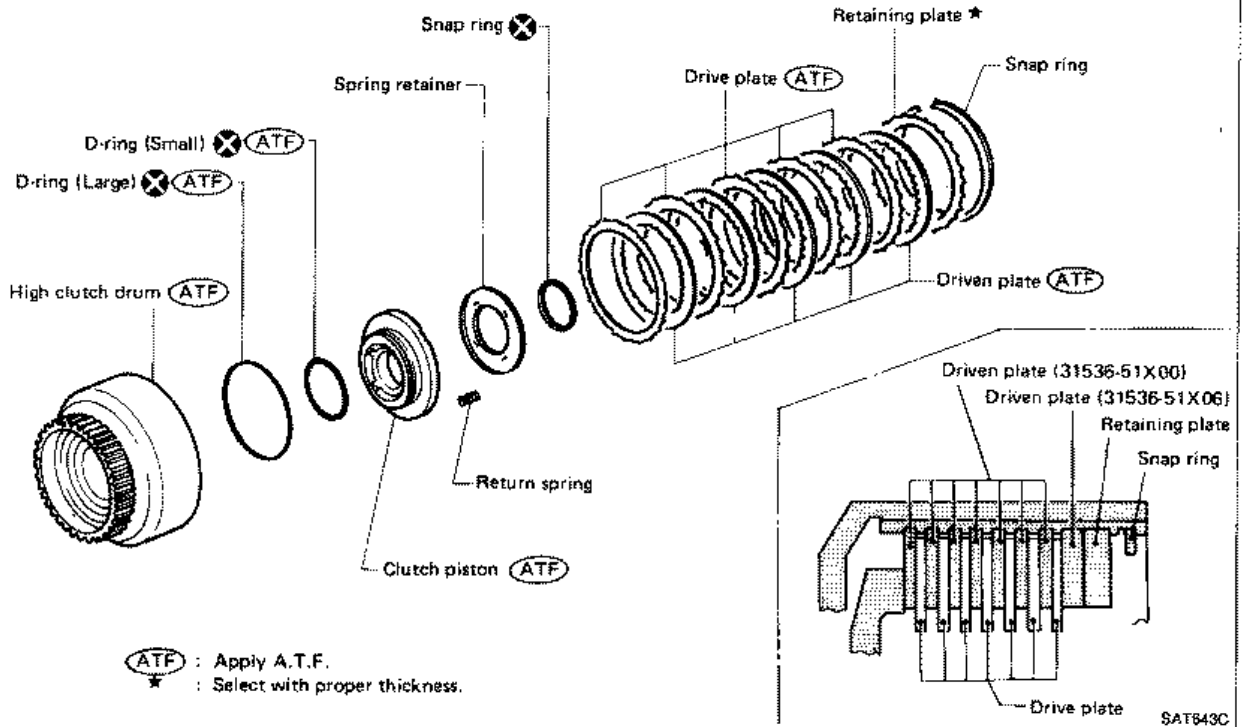
For the number of clutch sheets (drive plate and driven plate), refer to the below cross-section.



SAT365C

RE4R03A

For the number of clutch sheets (drive plate and driven plate), refer to the below cross-section.



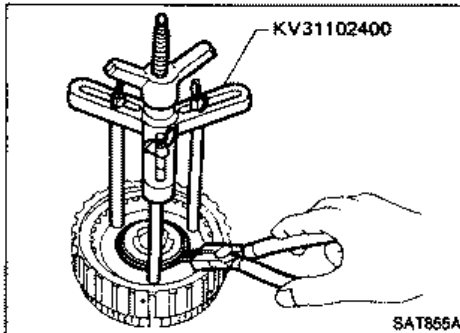
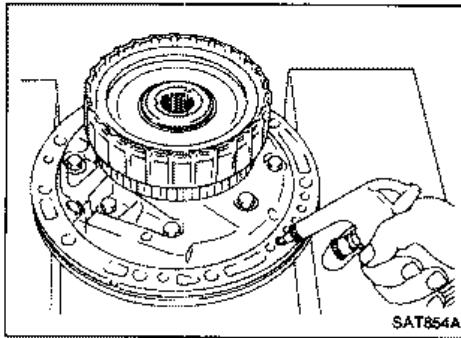
SAT843C

REPAIR FOR COMPONENT PARTS

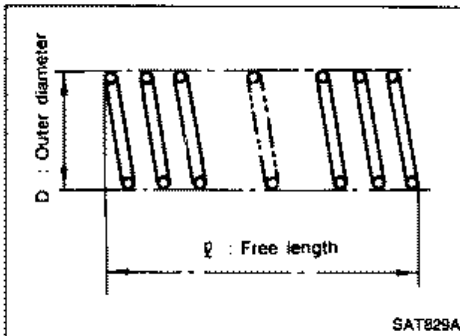
High Clutch (Cont'd)

Service procedures for high clutch are essentially the same as those for reverse clutch, with the following exception:

- Check of high clutch operation



- Removal and installation of return spring

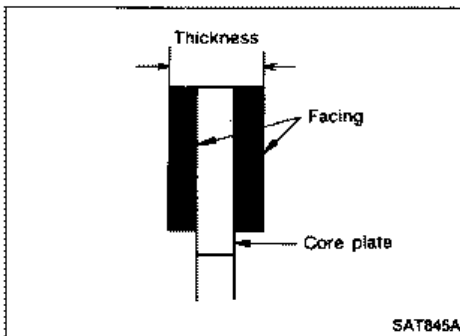


- Inspection of high clutch return springs

Inspection standard:

Unit: mm (in)

Part No.	l	D
31505-21X03	22.06 (0.8685)	11.6 (0.457)



- Inspection of high clutch drive plate

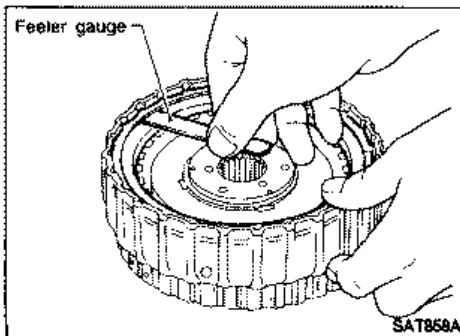
Thickness of drive plate:

Standard

1.6 mm (0.063 in)

Wear limit

1.4 mm (0.055 in)



- Measurement of clearance between retaining plate and snap ring

Specified clearance:

Standard

1.8 - 2.2 mm (0.071 - 0.087 in)

Allowable limit

3.2 mm (0.126 in)

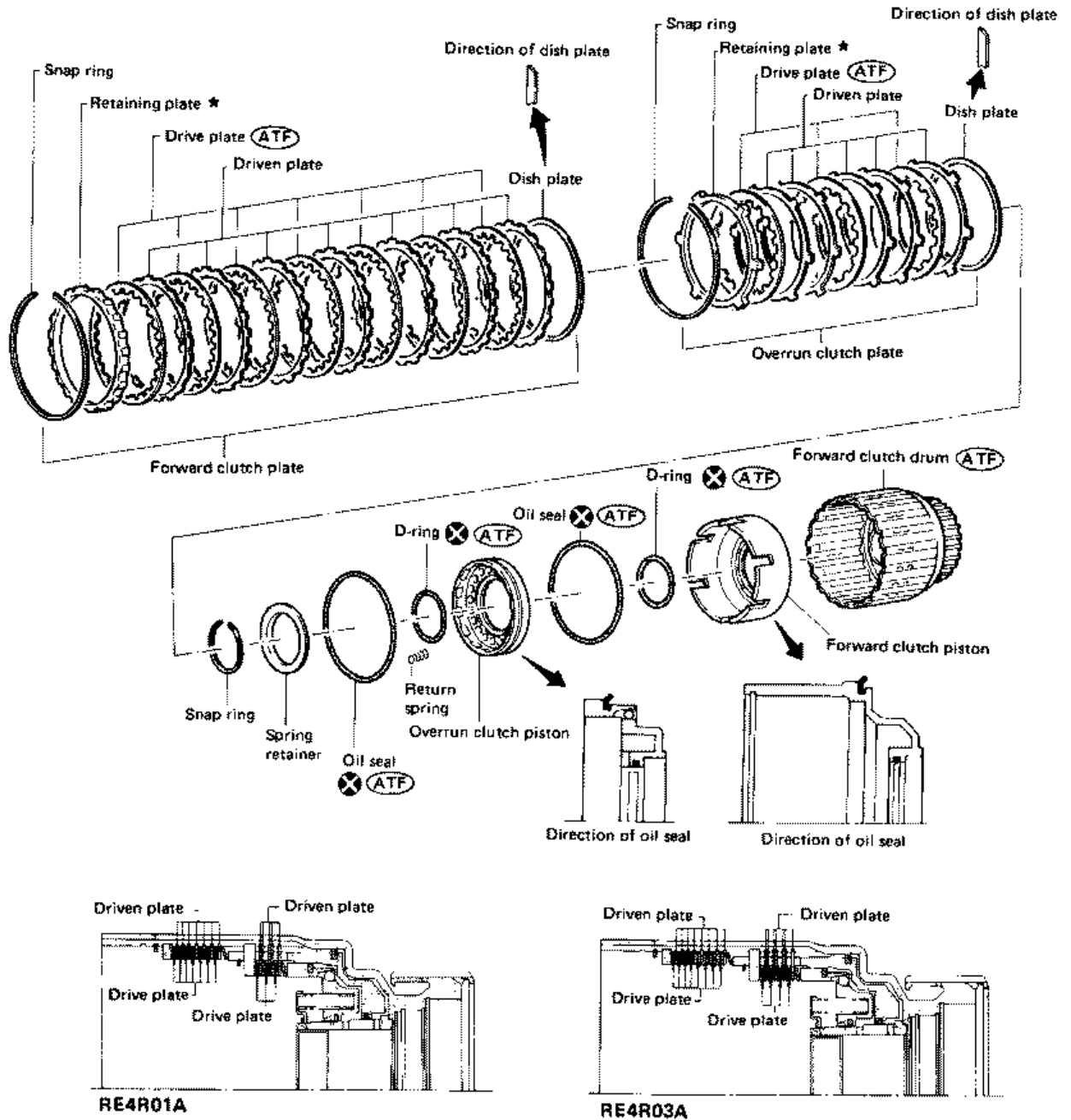
Retaining plate:

Refer to S.D.S.

REPAIR FOR COMPONENT PARTS

Forward and Overrun Clutches

For the number of clutch sheets (drive plate and driven plate), refer to the below cross-section.

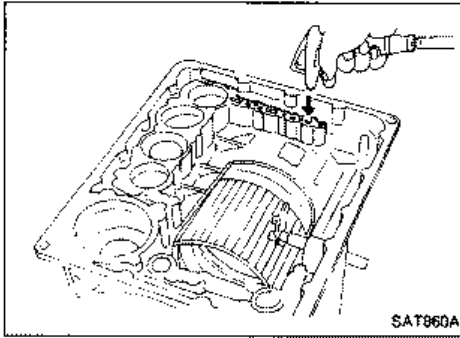


(ATF): Apply A.T.F.
 ★: Select with proper thickness.

SAT644C

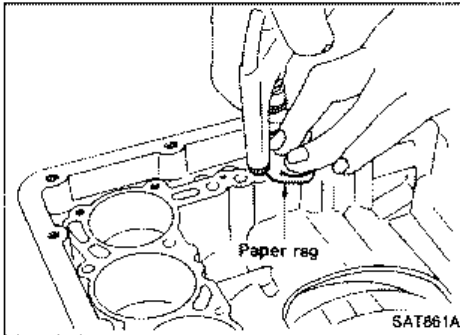
REPAIR FOR COMPONENT PARTS

Forward and Overrun Clutches (Cont'd)

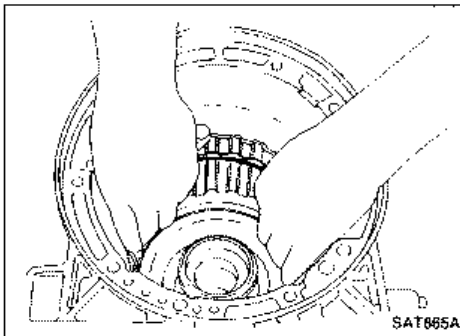


Service procedures for forward and overrun clutches are essentially the same as those for reverse clutch, with the following exception:

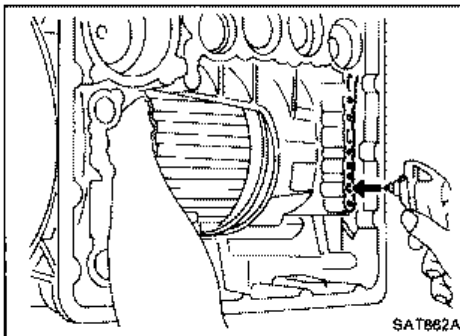
- Check of forward clutch operation.



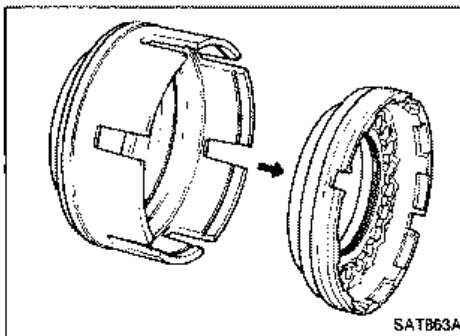
- Check of overrun clutch operation.



- Removal of forward clutch drum
Remove forward clutch drum from transmission case by holding snap ring.



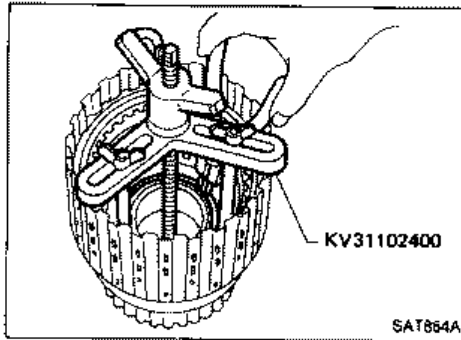
- Removal of forward clutch and overrun clutch pistons
 1. While holding overrun clutch piston, gradually apply compressed air to oil hole.



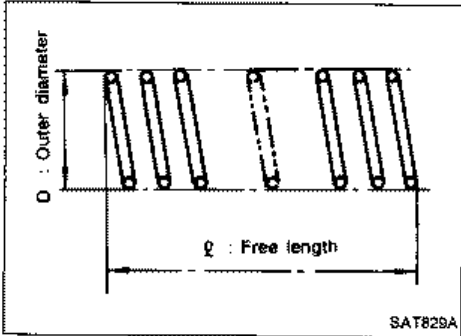
2. Remove overrun clutch from forward clutch.

REPAIR FOR COMPONENT PARTS

Forward and Overrun Clutches (Cont'd)



- Removal and installation of return springs

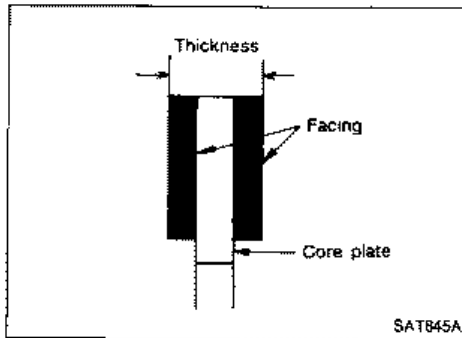


- Inspection of forward clutch and overrun clutch return springs

Inspection standard:

Unit: mm (in)

Model	Part No.	ℓ	D
RE4R01A	31505-41X01	35.77 (1.4083)	9.7 (0.382)
RE4R03A	31505-51X04	36.8 (1.449)	9.8 (0.386)



- Inspection of forward clutch drive plates
Thickness of drive plate:

Standard

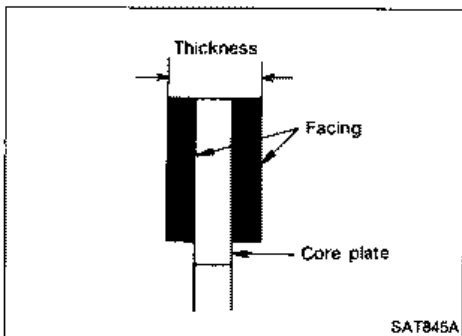
1.6 mm (0.063 in) (RE4R01A)

2.0 mm (0.079 in) (RE4R03A)

Wear limit

1.4 mm (0.055 in) (RE4R01A)

1.6 mm (0.063 in) (RE4R03A)



- Inspection of overrun clutch drive plates
Thickness of drive plate:

Standard

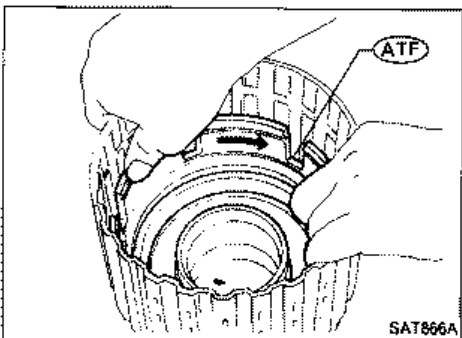
2.0 mm (0.079 in) (RE4R01A)

1.6 mm (0.063 in) (RE4R03A)

Wear limit

1.8 mm (0.071 in) (RE4R01A)

1.4 mm (0.055 in) (RE4R03A)

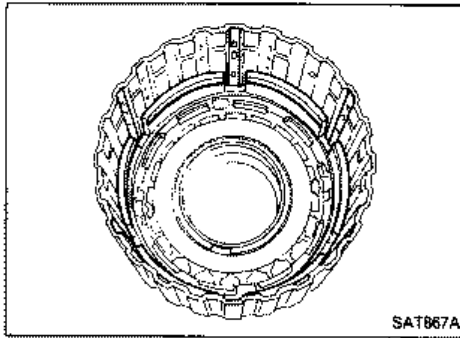


- Installation of forward clutch piston and overrun clutch piston

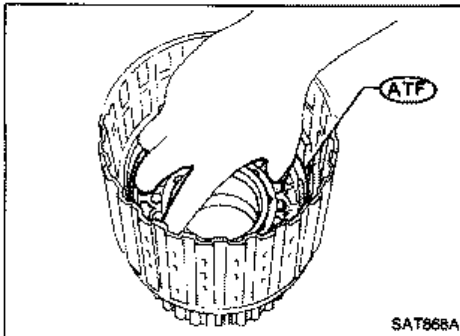
1. Install forward clutch piston by turning it slowly and evenly.
- Apply A.T.F. to inner surface of clutch drum.

REPAIR FOR COMPONENT PARTS

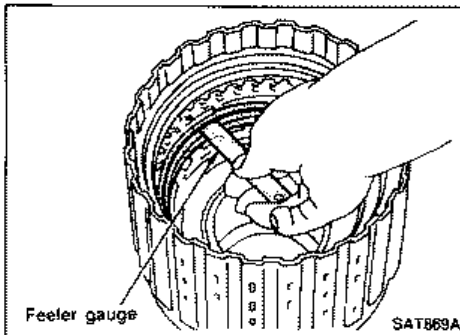
Forward and Overrun Clutches (Cont'd)



- Align notch in forward clutch piston with groove in forward clutch drum.



2. Install overrun clutch by turning it slowly and evenly.
- Apply A.T.F. to inner surface of forward clutch piston.



- Measurement of clearance between retaining plate and snap ring of overrun clutch

Specified clearance:

Standard

1.0 - 1.4 mm (0.039 - 0.055 in)

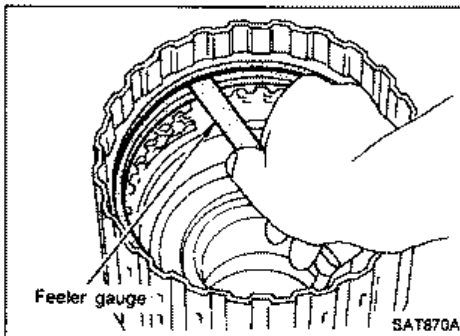
Allowable limit

2.0 mm (0.079 in) (RE4R01A)

2.2 mm (0.087 in) (RE4R03A)

Retaining plate:

Refer to S.D.S.



- Measurement of clearance between retaining plate and snap ring of forward clutch

Specified clearance:

Standard

0.45 - 0.85 mm (0.0177 - 0.0335 in)

Allowable limit

2.25 mm (0.0886 in) (RE4R01A)

2.45 mm (0.0965 in) (RE4R03A)

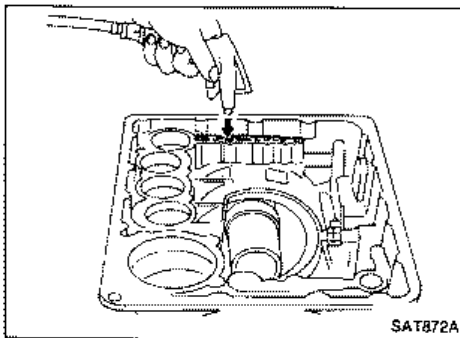
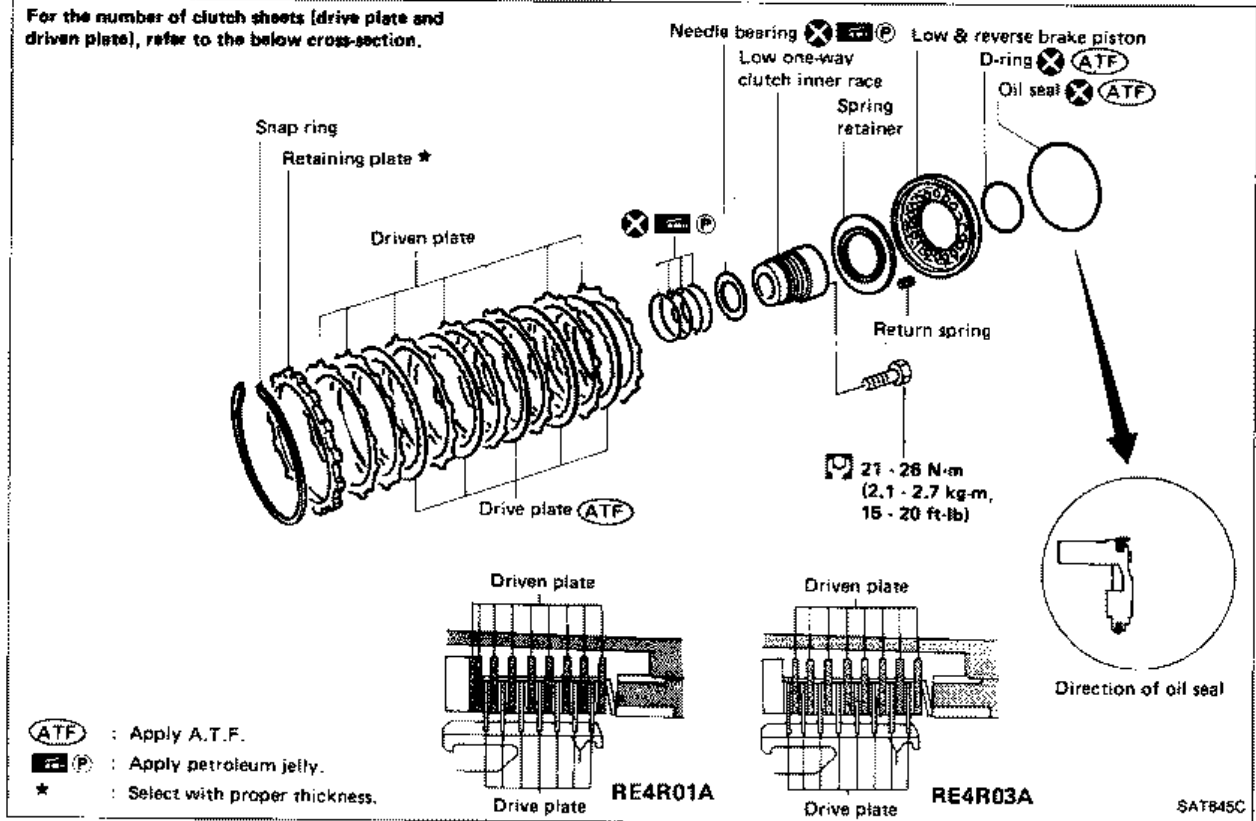
Retaining plate:

Refer to S.D.S.

REPAIR FOR COMPONENT PARTS

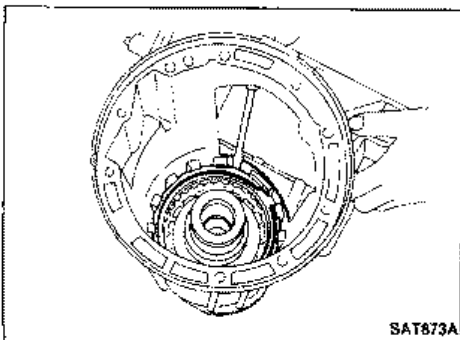
Low & Reverse Brake

For the number of clutch sheets (drive plate and driven plate), refer to the below cross-section.



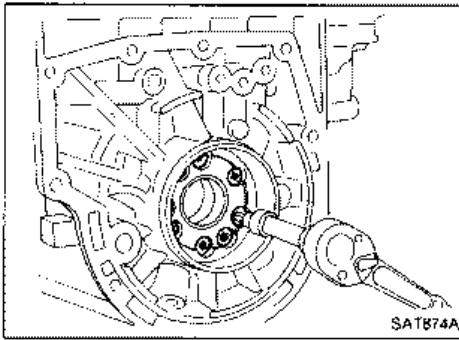
DISASSEMBLY

1. Check operation of low and reverse brake.
 - a. Install seal ring onto oil pump cover and install reverse clutch. Apply compressed air to oil hole.
 - b. Check to see that retaining plate moves to snap ring.
 - c. If retaining plate does not move to snap ring, D-ring or oil seal may be damaged or fluid may be leaking at piston check ball.
2. Remove snap ring, low and reverse brake drive plates, driven plates and dish plate.

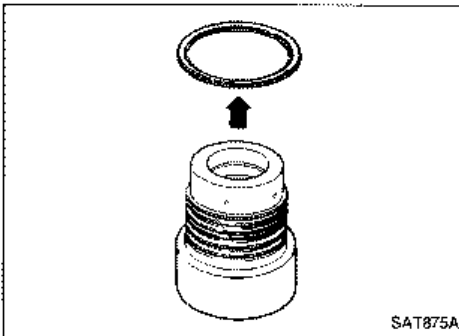


REPAIR FOR COMPONENT PARTS

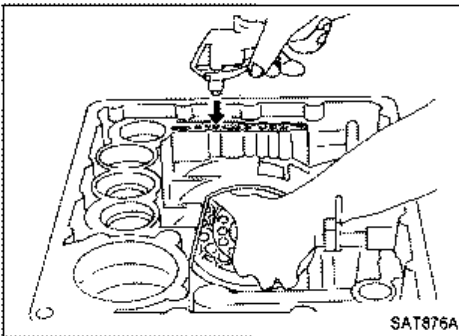
Low & Reverse Brake (Cont'd)



- Remove low one-way clutch inner race, spring retainer and return spring from transmission case.



- Remove seal rings from low one-way clutch inner race.
- Remove needle bearing from low one-way clutch inner race.

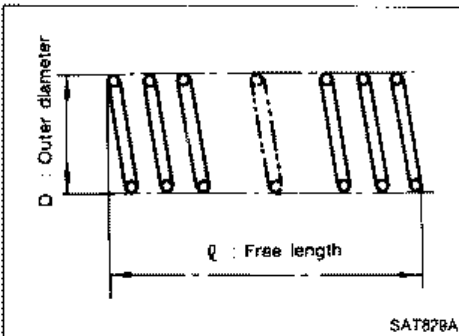


- Remove low and reverse brake piston using compressed air.
- Remove oil seal and D-ring from piston.

INSPECTION

Low and reverse brake snap ring and spring retainer

- Check for deformation, or damage.



Low and reverse brake return springs

- Check for deformation or damage. Also measure free length and outside diameter.

Inspection standard:

Unit: mm (in)

Model	Part No.	ℓ	D
RE4R01A	31521-21X00	23.7 (0.933)	11.6 (0.457)
RE4R03A	31505-51X00 (Inner)	20.43 (0.8043)	9.4 (0.370)
	31505-51X05 (Outer)	20.35 (0.8012)	11.9 (0.469)

REPAIR FOR COMPONENT PARTS

Low & Reverse Brake (Cont'd)

Low and reverse brake drive plates

- Check facing for burns, cracks or damage.
- Measure thickness of facing.

Thickness of drive plate:

Standard value

2.0 mm (0.079 in) (RE4R01A)

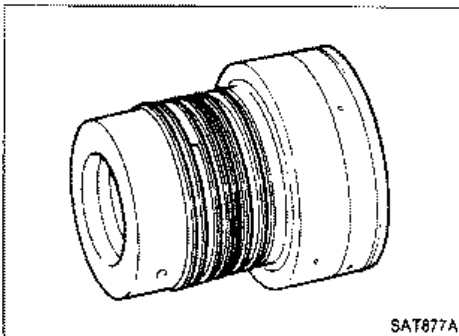
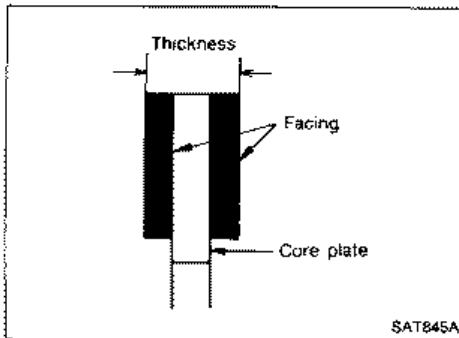
1.6 mm (0.063 in) (RE4R03A)

Wear limit

1.8 mm (0.071 in) (RE4R01A)

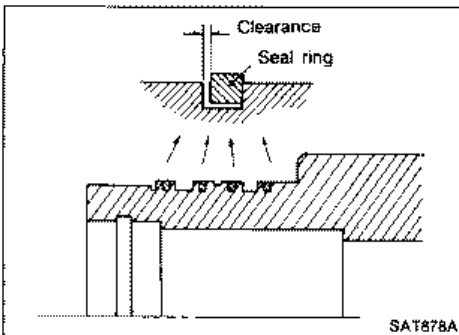
1.4 mm (0.055 in) (RE4R03A)

- If not within wear limit, replace.



Low one-way clutch inner race

- Check frictional surface of inner race for wear or damage.



- Install a new seal rings onto low one-way clutch inner race.
- **Be careful not to expand seal ring gap excessively.**

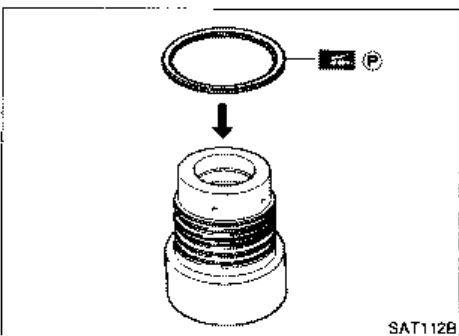
- Measure seal ring-to-groove clearance.

Inspection standard:

Standard value: 0.10 - 0.25 mm (0.0039 - 0.0098 in)

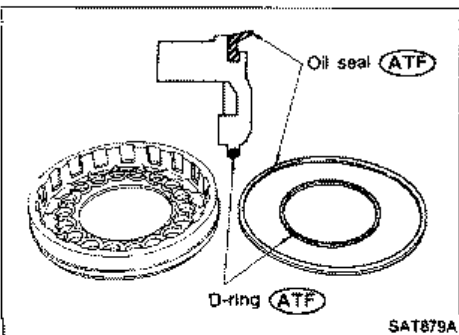
Allowable limit: 0.25 mm (0.0098 in)

- If not within allowable limit, replace low one-way clutch inner race.



ASSEMBLY

1. Install bearing onto one-way clutch inner race.
 - Pay attention to its direction — Black surface goes to rear side.
 - Apply petroleum jelly to needle bearing.

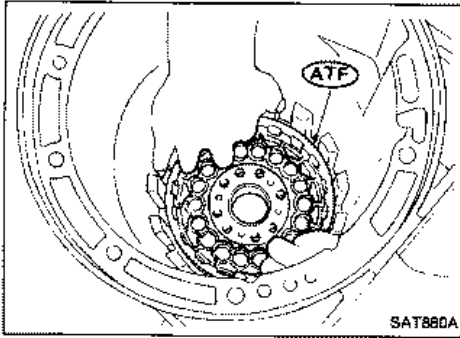


2. Install oil seal and D-ring onto piston.

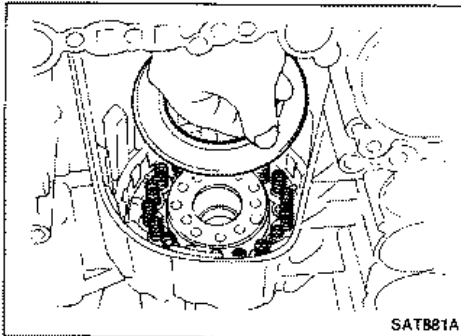
- Apply A.T.F. to oil seal and D-ring.

REPAIR FOR COMPONENT PARTS

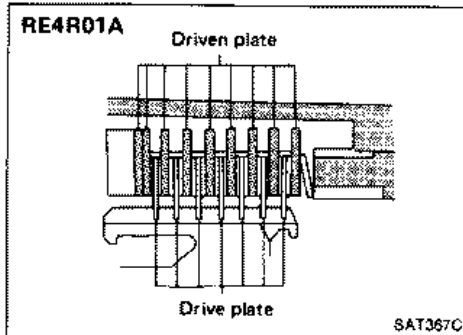
Low & Reverse Brake (Cont'd)



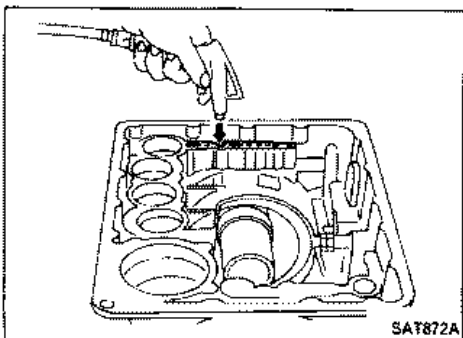
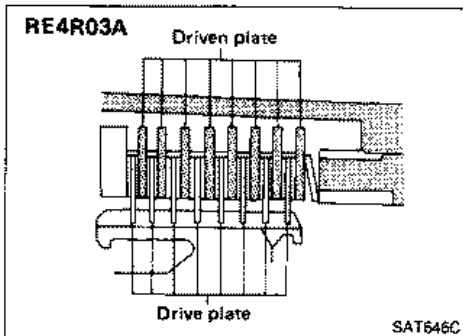
3. Install piston by rotating it slowly and evenly.
 - Apply A.T.F. to inner surface of transmission case.



4. Install return springs, spring retainer and low one-way clutch inner race onto transmission case.



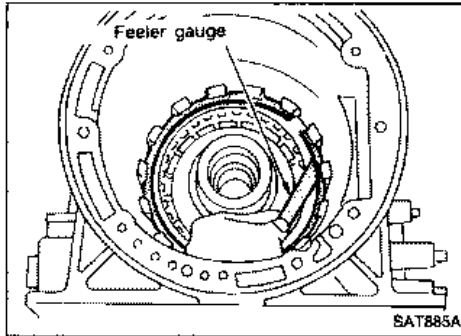
5. Install dish plate, low and reverse brake drive plates, driven plates and retaining plate.
 - Two types of drive plates are used on the RE4R03A transmission. One type uses a "waving" design and the other type uses a "flat" design. Either one can be installed first since they are interchangeable.
6. Install snap ring on transmission case.



7. Check operation of low and reverse brake clutch piston. Refer to "DISASSEMBLY".

REPAIR FOR COMPONENT PARTS

Low & Reverse Brake (Cont'd)



8. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.

Specified clearance:

Standard

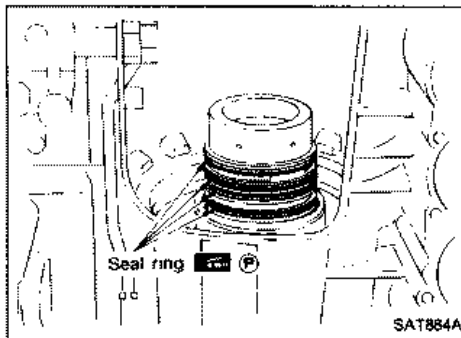
1.1 - 1.5 mm (0.043 - 0.059 in)

Allowable limit

2.9 mm (0.114 in)

Retaining plate:

Refer to S.D.S.

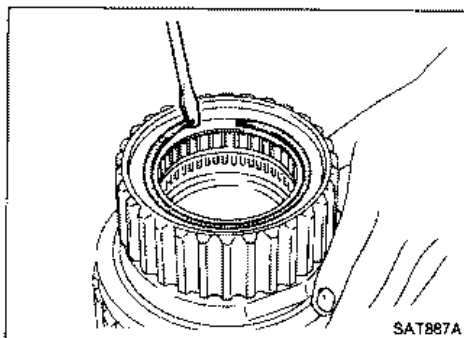
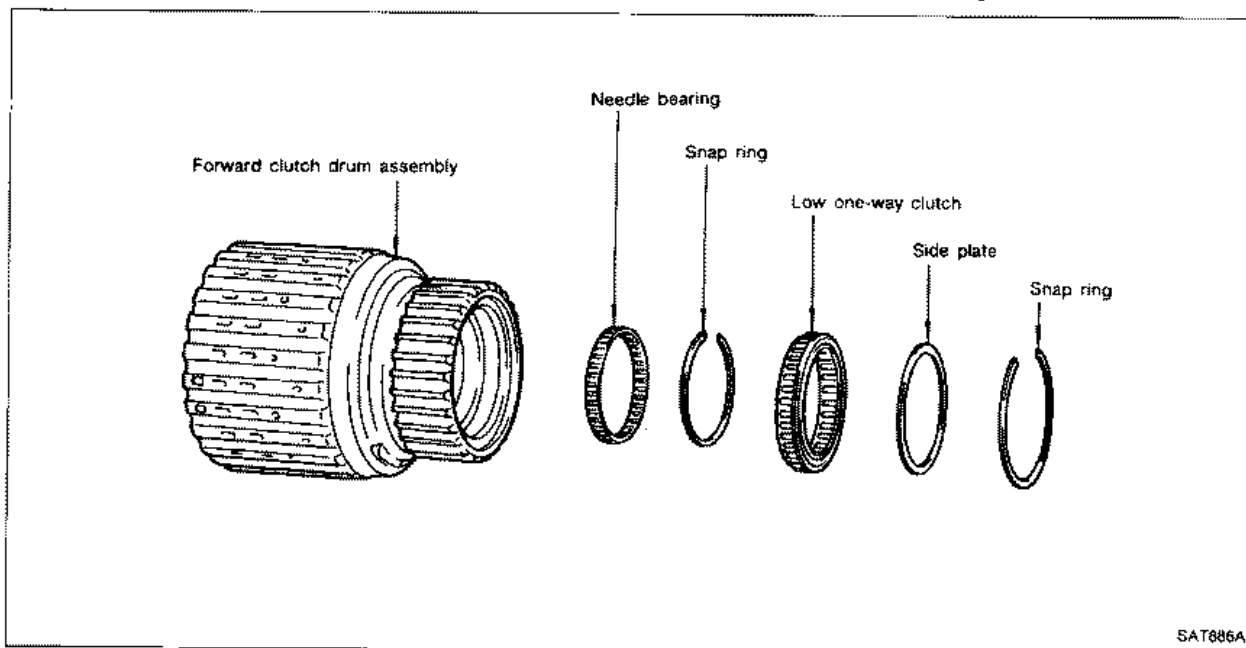


9. Install low one-way clutch inner race seal ring.

- Apply petroleum jelly to seal ring.
- Make sure seal rings are pressed firmly into place and held by petroleum jelly.

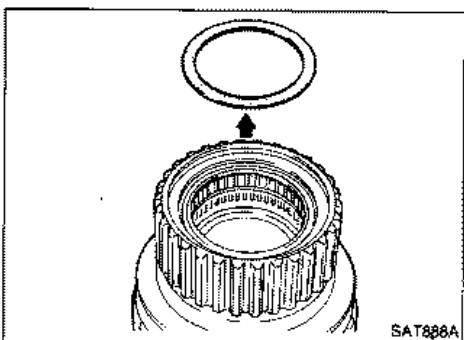
REPAIR FOR COMPONENT PARTS

Forward Clutch Drum Assembly — RE4R01A

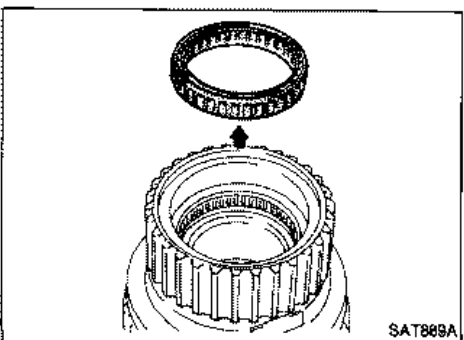


DISASSEMBLY

1. Remove snap ring from forward clutch drum.



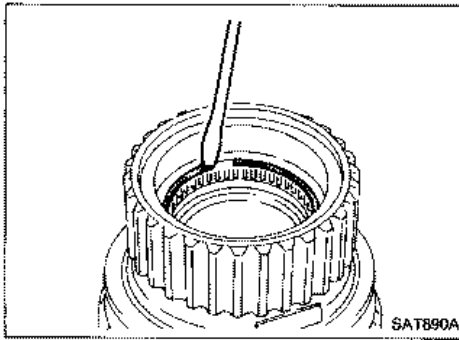
2. Remove side plate from forward clutch drum.



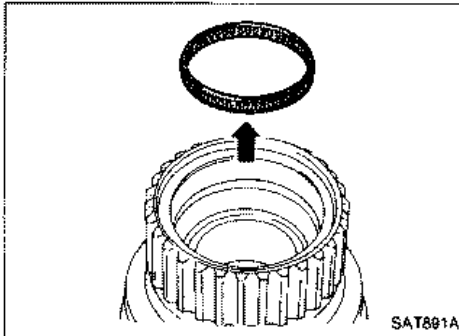
3. Remove low one-way clutch from forward clutch drum.

REPAIR FOR COMPONENT PARTS

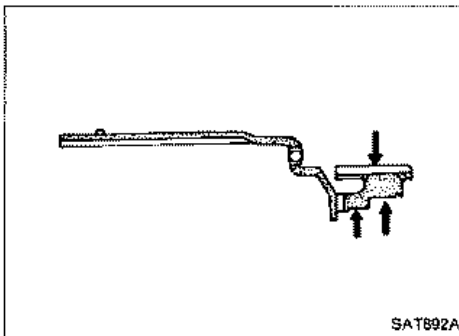
Forward Clutch Drum Assembly — RE4R01A (Cont'd)



4. Remove snap ring from forward clutch drum.



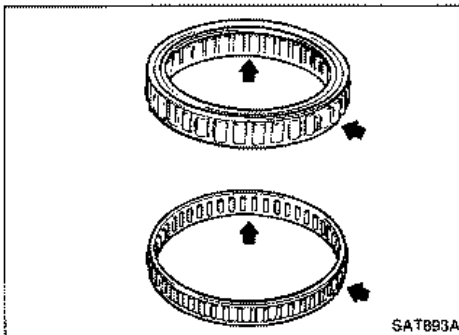
5. Remove needle bearing from forward clutch drum.



INSPECTION

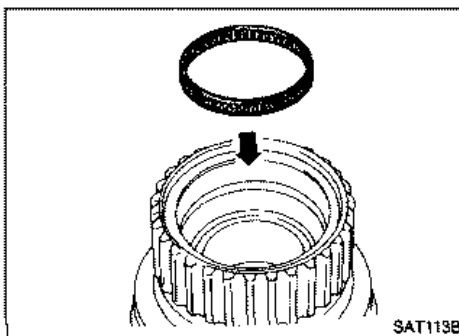
Forward clutch drum

- Check spline portion for wear or damage.
- Check frictional surfaces of low one-way clutch and needle bearing for wear or damage.



Needle bearing and low one-way clutch

- Check frictional surface for wear or damage.

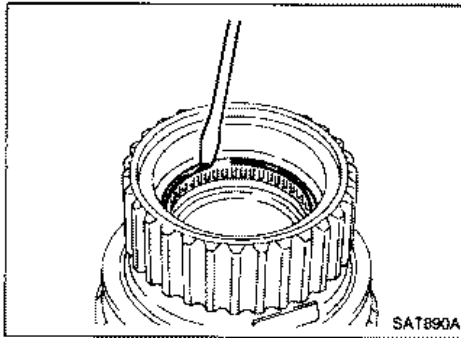


ASSEMBLY

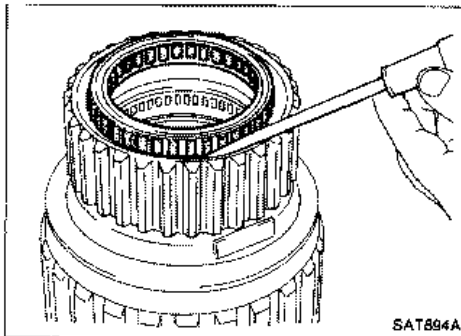
1. Install needle bearing in forward clutch drum.

REPAIR FOR COMPONENT PARTS

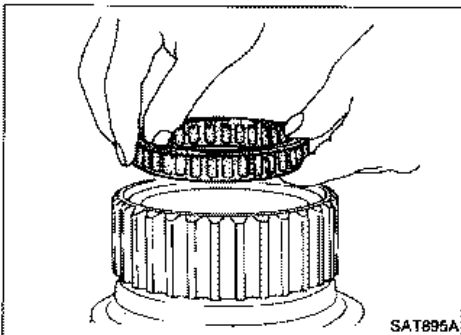
Forward Clutch Drum Assembly — RE4R01A (Cont'd)



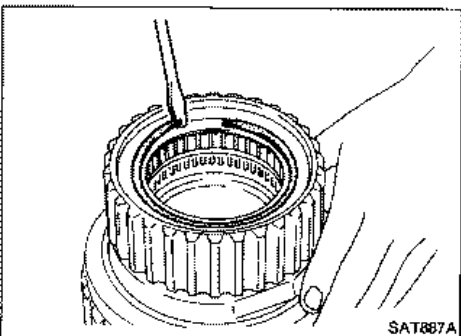
2. Install snap ring onto forward clutch drum.



3. Install low one-way clutch onto forward clutch drum by pushing the roller in evenly.



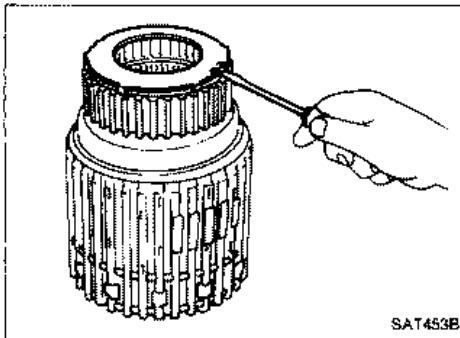
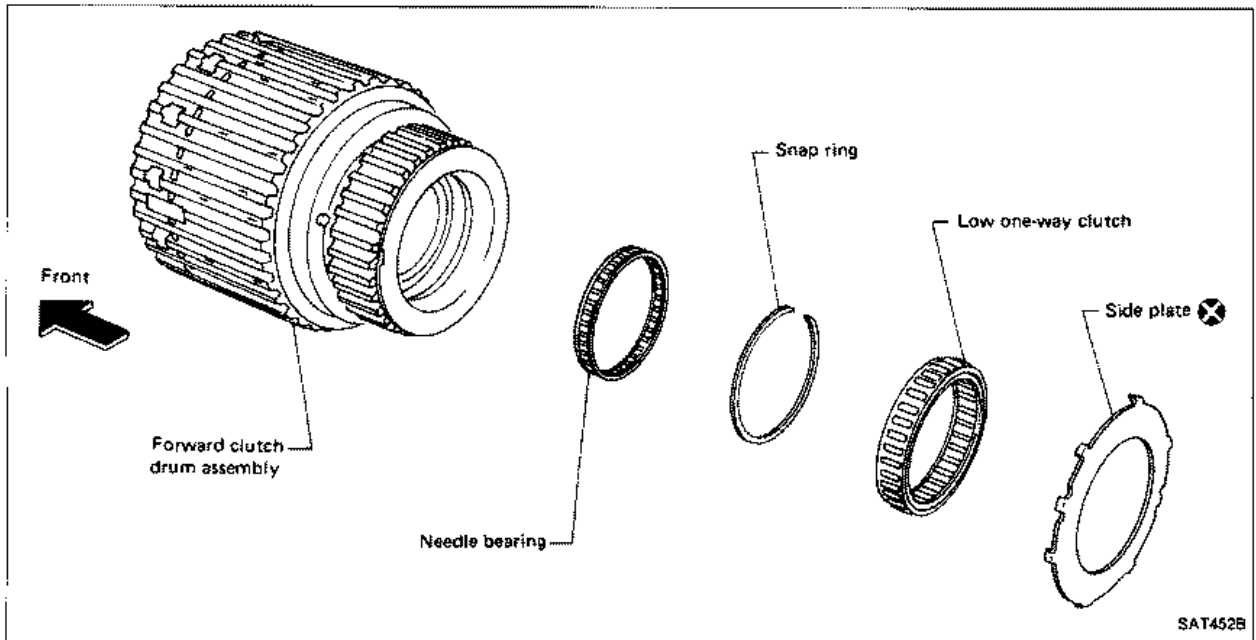
- Install low one-way clutch with flange facing rearward.



4. Install side plate onto forward clutch drum.
5. Install snap ring onto forward clutch drum.

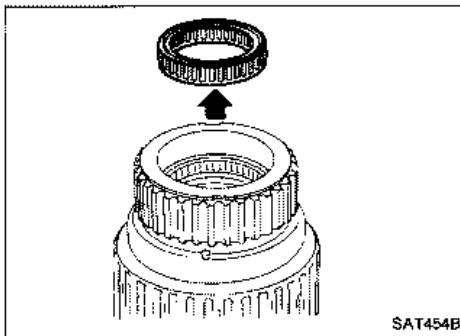
REPAIR FOR COMPONENT PARTS

Forward Clutch Drum Assembly — RE4R03A

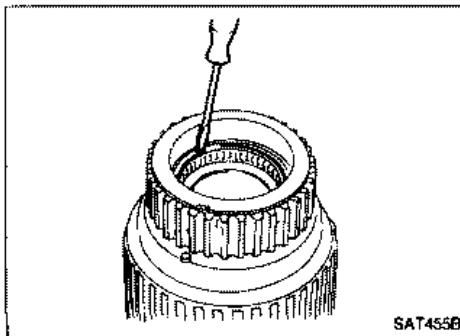


DISASSEMBLY

1. Remove side plate from forward clutch drum.



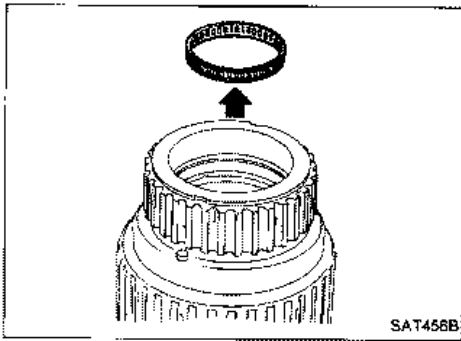
2. Remove low one-way clutch from forward clutch drum.



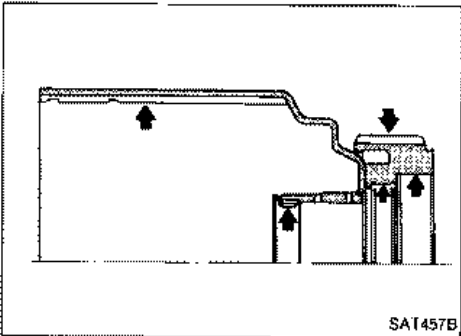
3. Remove snap ring from forward clutch drum.

REPAIR FOR COMPONENT PARTS

Forward Clutch Drum Assembly — RE4R03A (Cont'd)



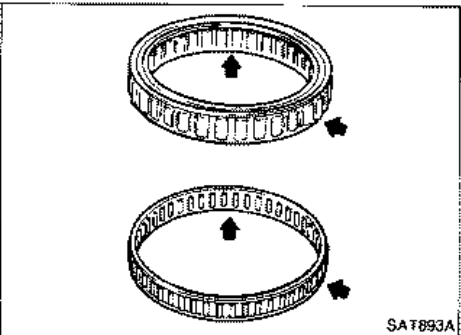
4. Remove needle bearing from forward clutch drum.



INSPECTION

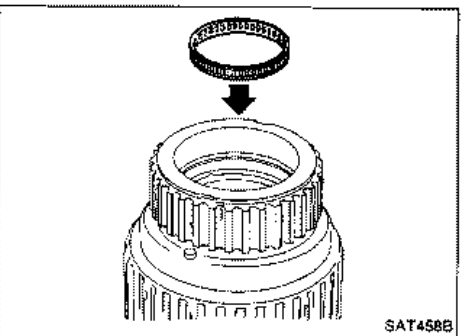
Forward clutch drum

- Check spline portion for wear or damage.
- Check frictional surfaces of low one-way clutch and needle bearing for wear or damage.



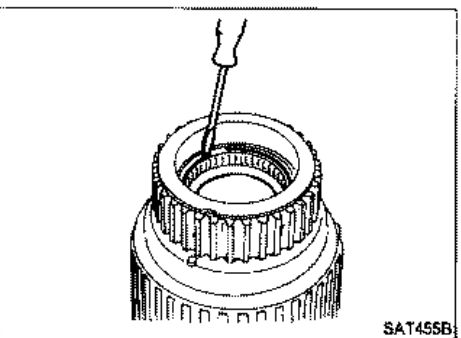
Needle bearing and low one-way clutch

- Check frictional surface for wear or damage.



ASSEMBLY

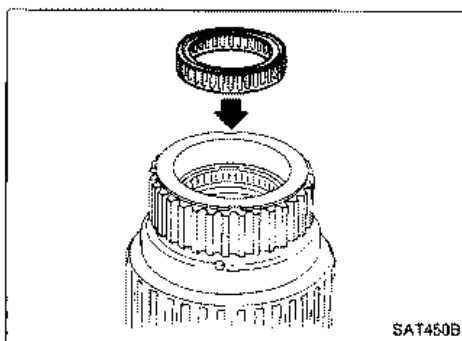
1. Install needle bearing in forward clutch drum.



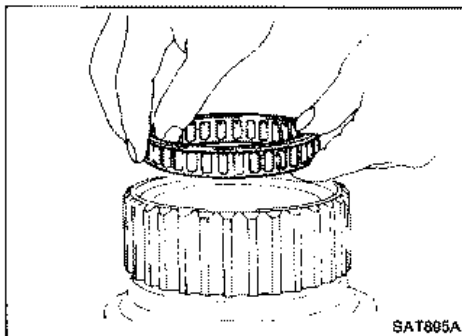
2. Install snap ring onto forward clutch drum.

REPAIR FOR COMPONENT PARTS

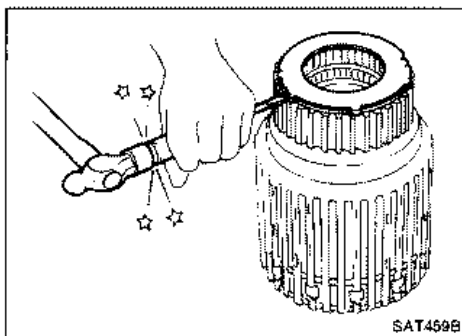
Forward Clutch Drum Assembly — RE4R03A (Cont'd)



3. Install low one-way clutch onto forward clutch drum by pushing the roller in evenly.



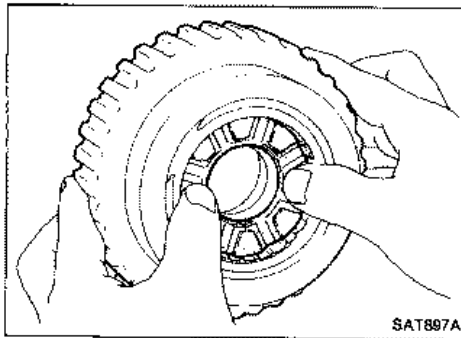
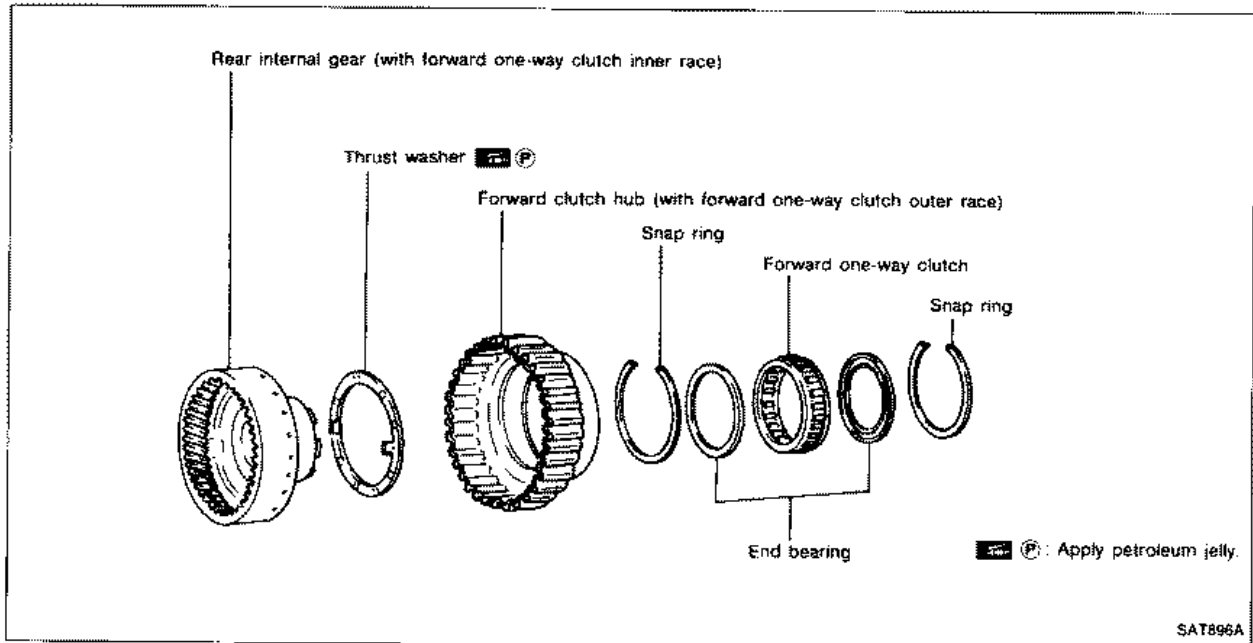
- Install low one-way clutch with flange facing rearward.



4. Install side plate onto forward clutch drum.

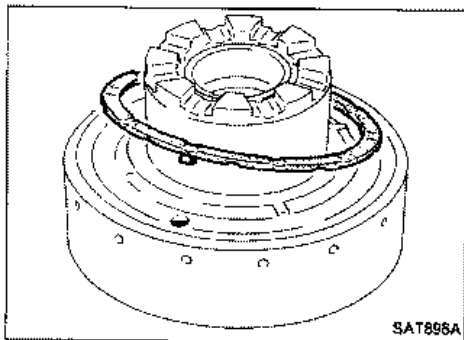
REPAIR FOR COMPONENT PARTS

Rear Internal Gear and Forward Clutch Hub

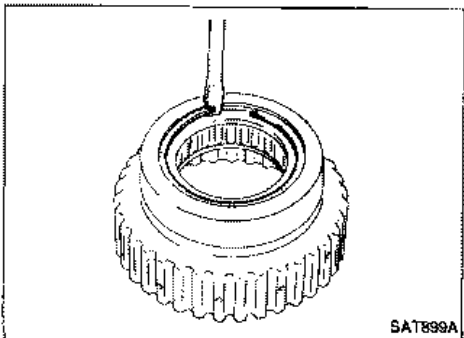


DISASSEMBLY

1. Remove rear internal gear by pushing forward clutch hub forward.



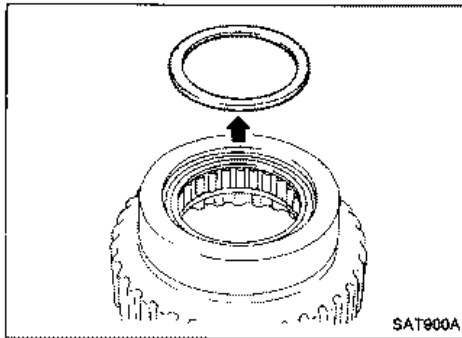
2. Remove thrust washer from rear internal gear.



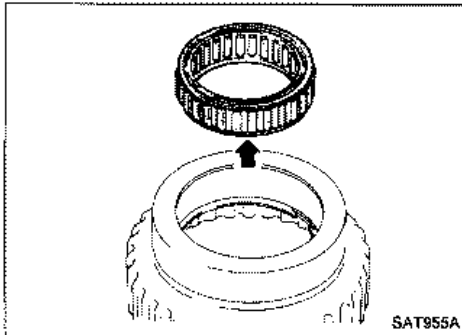
3. Remove snap ring from forward clutch hub.

REPAIR FOR COMPONENT PARTS

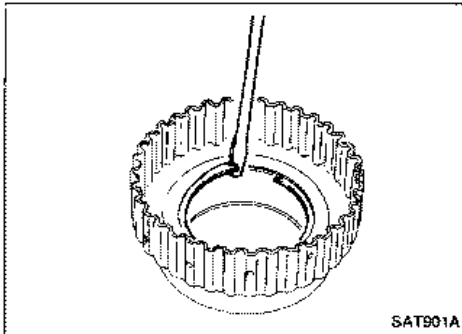
Rear Internal Gear and Forward Clutch Hub (Cont'd)



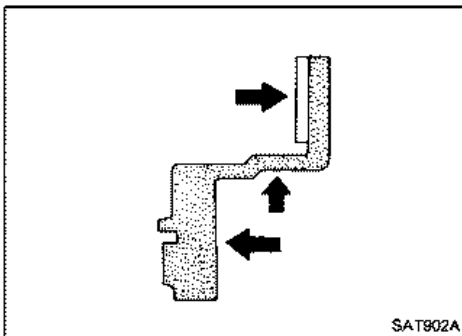
4. Remove end bearing.



5. Remove forward one-way clutch and end bearing as a unit from forward clutch hub.



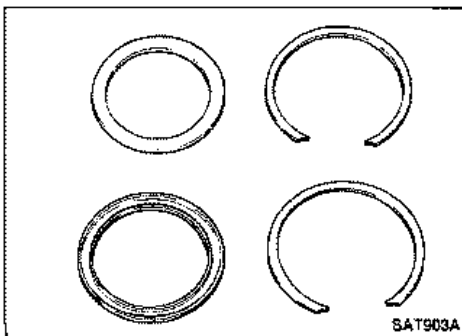
6. Remove snap ring from forward clutch hub.



INSPECTION

Rear internal gear and forward clutch hub

- Check gear for excessive wear, chips or cracks.
- Check frictional surfaces of forward one-way clutch and thrust washer for wear or damage.
- Check spline for wear or damage.



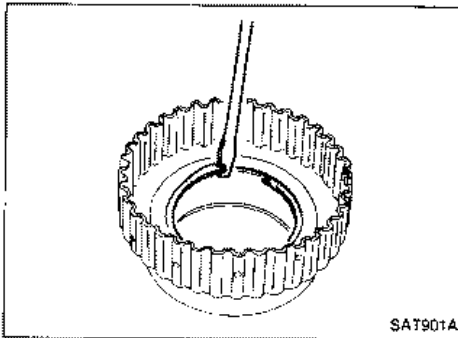
Snap ring and end bearing

- Check for deformation or damage.

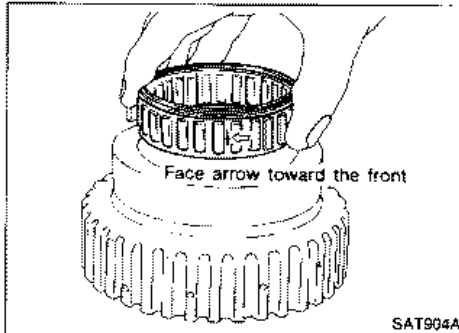
REPAIR FOR COMPONENT PARTS

Rear Internal Gear and Forward Clutch Hub (Cont'd)

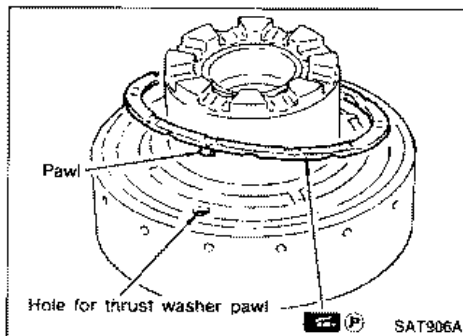
ASSEMBLY



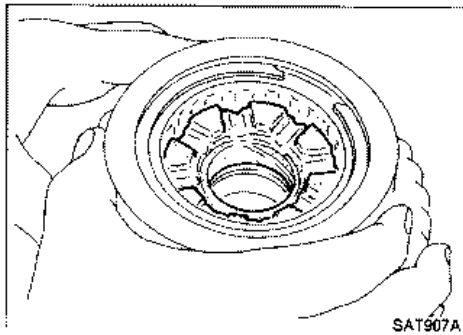
1. Install snap ring onto forward clutch hub.
2. Install end bearing.



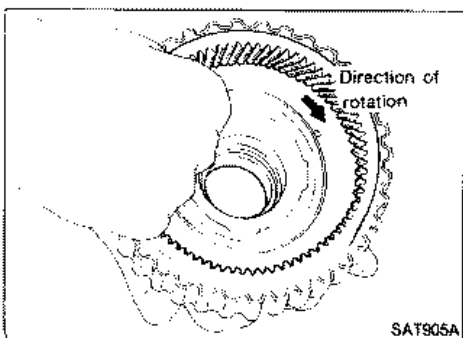
3. Install forward one-way clutch onto clutch hub.
 - **Install forward one-way clutch with flange facing rearward.**
4. Install end bearing.
5. Install snap ring onto forward clutch hub.



6. Install thrust washer onto rear internal gear.
 - **Apply petroleum jelly to thrust washer.**
 - **Securely insert pawls of thrust washer into holes in rear internal gear.**



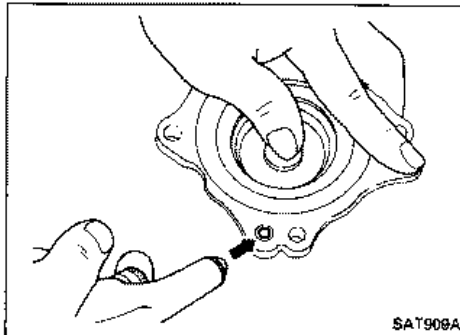
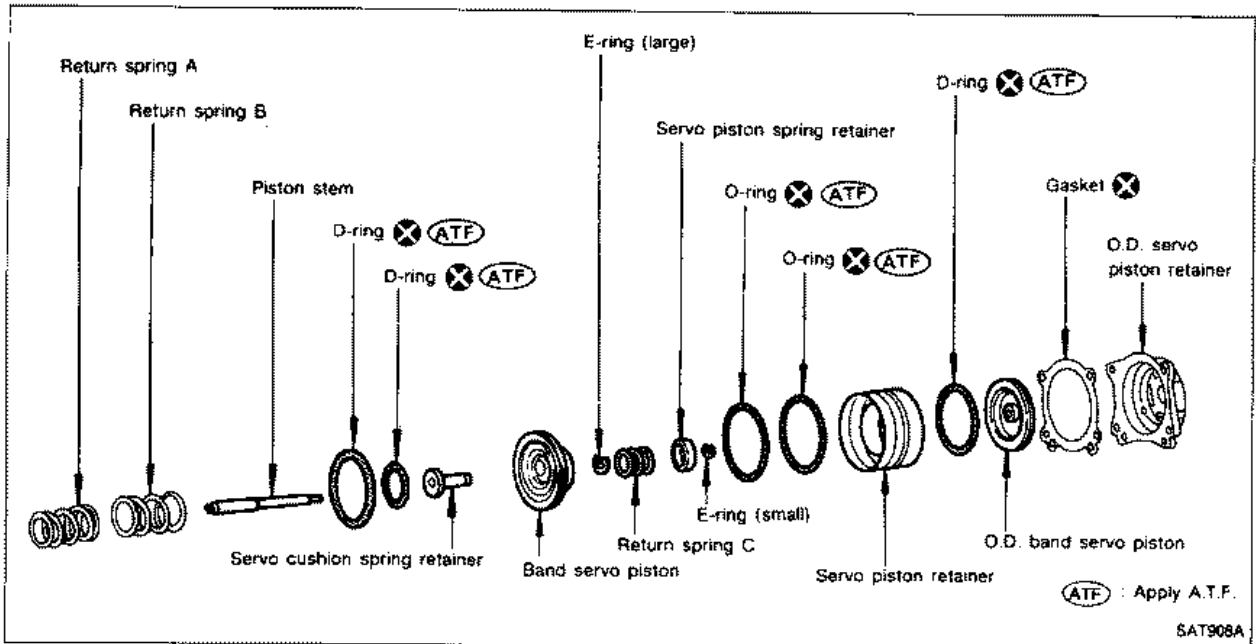
7. Position forward clutch hub in rear internal gear.



8. After installing, check to assure that forward clutch hub rotates clockwise.

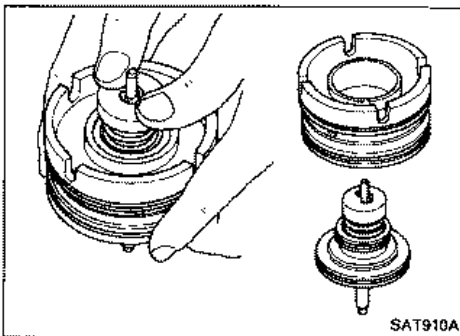
REPAIR FOR COMPONENT PARTS

Band Servo Piston Assembly

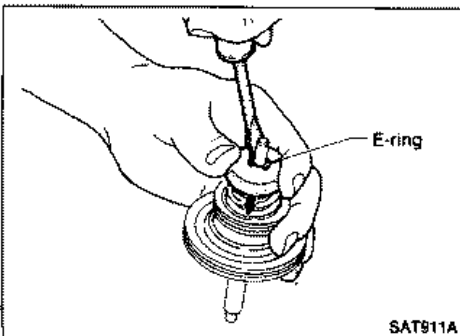


DISASSEMBLY

1. Block one oil hole in O.D. servo piston retainer and the center hole in O.D. band servo piston.
2. Apply compressed air to the other oil hole in piston retainer to remove O.D. band servo piston from retainer.
3. Remove D-ring from O.D. band servo piston.



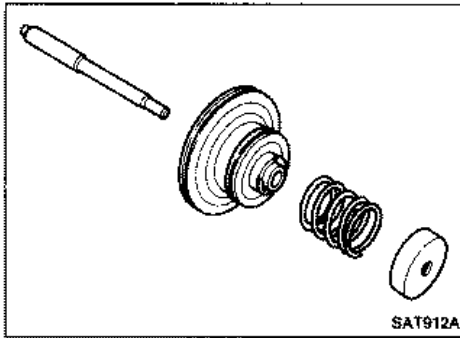
4. Remove band servo piston assembly from servo piston retainer by pushing it forward.



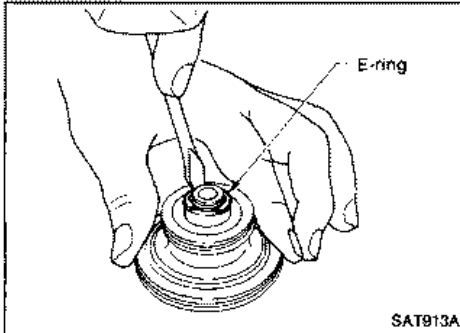
5. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, remove E-ring.

REPAIR FOR COMPONENT PARTS

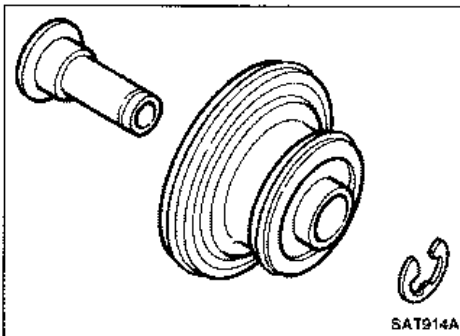
Band Servo Piston Assembly (Cont'd)



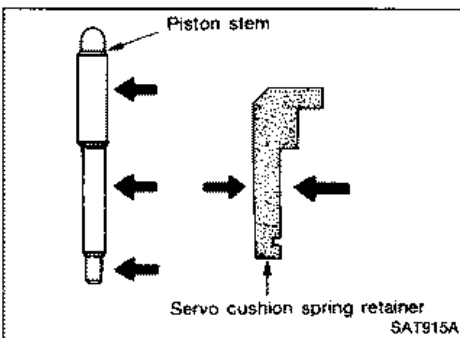
6. Remove servo piston spring retainer, return spring C and piston stem from band servo piston.



7. Remove E-ring from band servo piston.



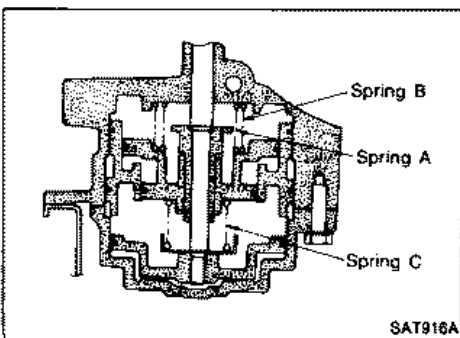
8. Remove servo cushion spring retainer from band servo piston.
9. Remove D-rings from band servo piston.
10. Remove O-rings from servo piston retainer.



INSPECTION

Pistons, retainers and piston stem

- Check frictional surfaces for abnormal wear or damage.



Return springs

- Check for deformation or damage. Measure free length and outer diameter.

Inspection standard:

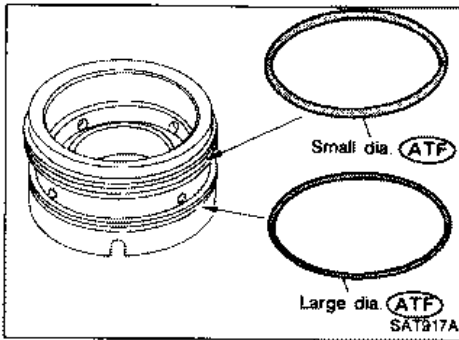
Unit: mm (in)

Parts	Free length	Outer diameter
Spring A	45.6 (1.795)	34.3 (1.350)
Spring B	53.8 (2.118)	40.3 (1.587)
Spring C	29.7 (1.169)	27.6 (1.087)

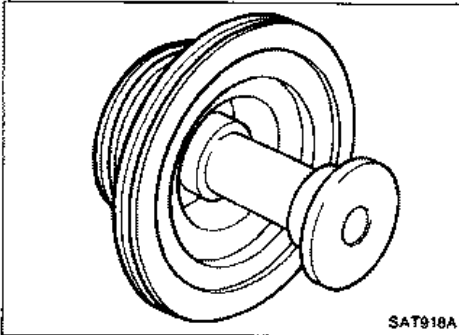
REPAIR FOR COMPONENT PARTS

Band Servo Piston Assembly (Cont'd)

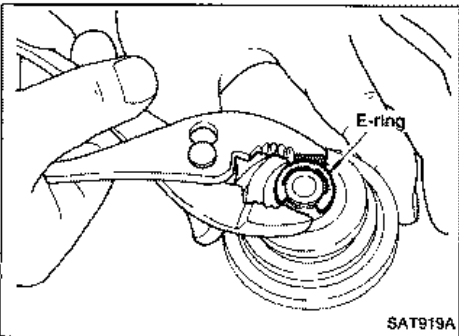
ASSEMBLY



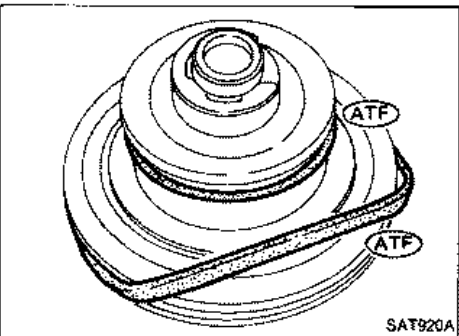
1. Install O-rings onto servo piston retainer.
 - Apply A.T.F. to O-rings.
 - Pay attention to position of each O-ring.



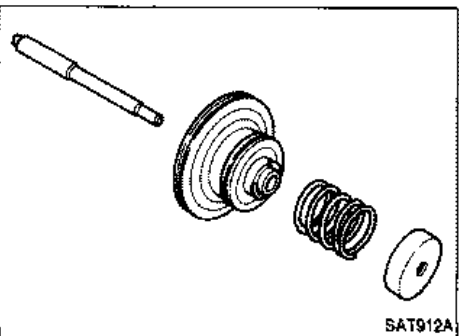
2. Install servo cushion spring retainer onto band servo piston.



3. Install E-ring onto servo cushion spring retainer.



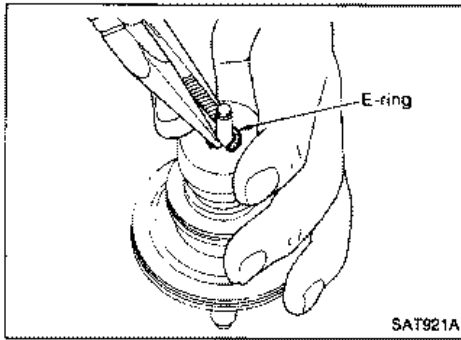
4. Install D-rings onto band servo piston.
 - Apply A.T.F. to D-rings.



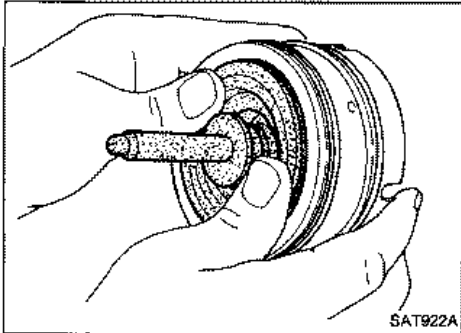
5. Install servo piston spring retainer, return spring C and piston stem onto band servo piston.

REPAIR FOR COMPONENT PARTS

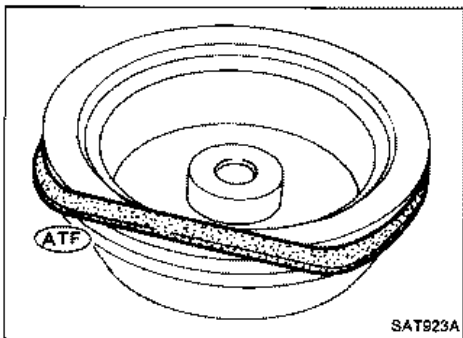
Band Servo Piston Assembly (Cont'd)



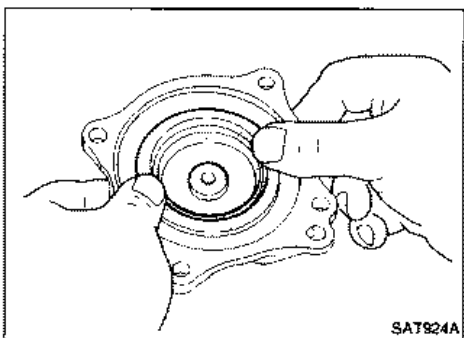
6. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, install E-ring.



7. Install band servo piston assembly onto servo piston retainer by pushing it inward.



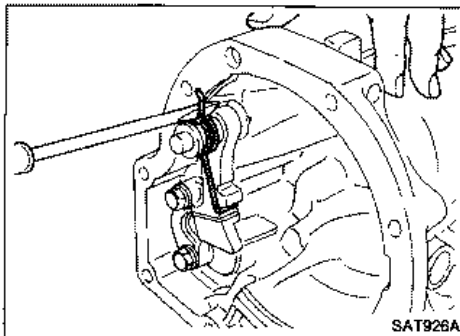
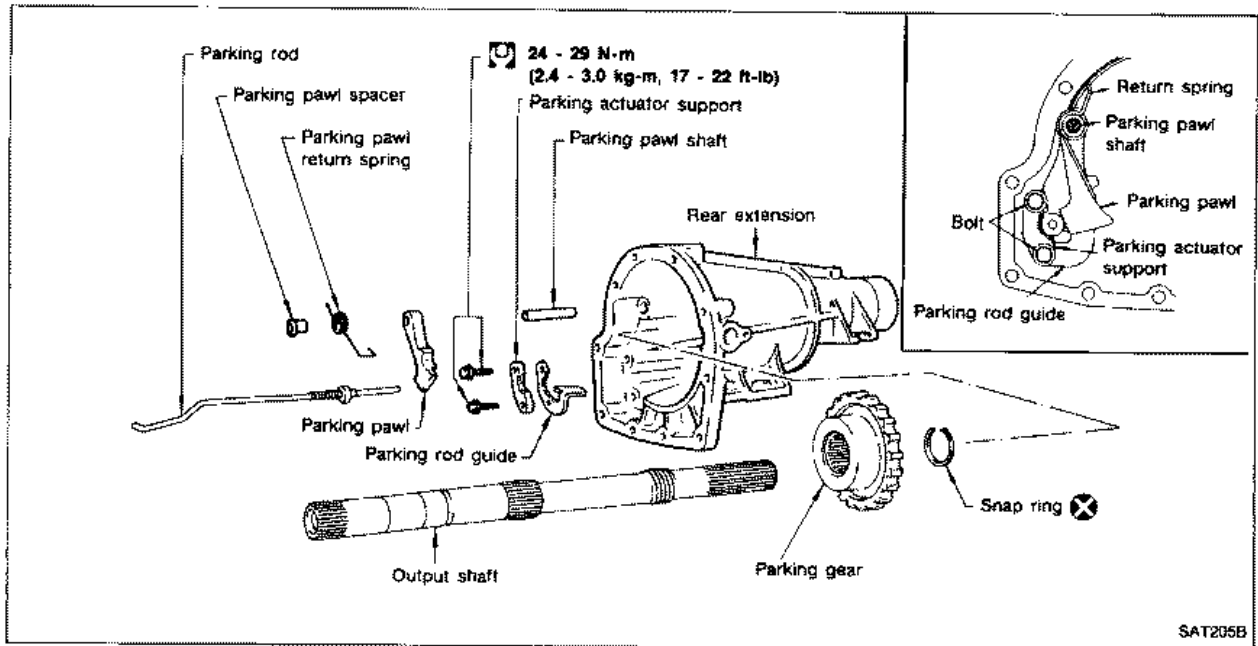
8. Install D-ring on O.D. band servo piston.
● Apply A.T.F. to D-ring.



9. Install O.D. band servo piston onto servo piston retainer by pushing it inward.

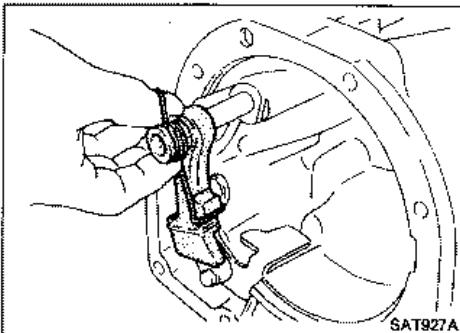
REPAIR FOR COMPONENT PARTS

Parking Pawl Components

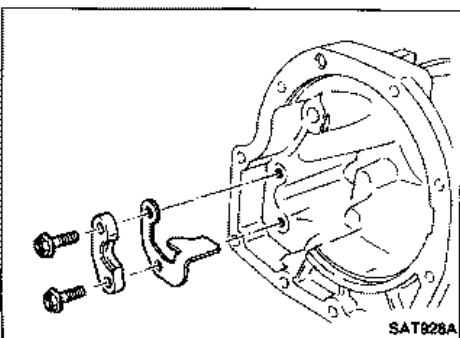


DISASSEMBLY

1. Slide return spring to the front of rear extension flange.



2. Remove return spring, pawl spacer and parking pawl from rear extension.
3. Remove parking pawl shaft from rear extension.



4. Remove parking actuator support and rod guide from rear extension.

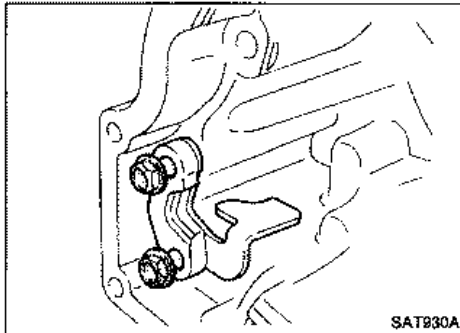
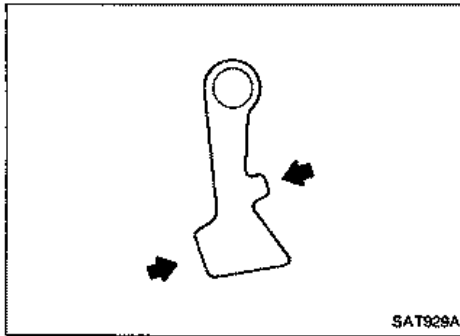
REPAIR FOR COMPONENT PARTS

Parking Pawl Components (Cont'd)

INSPECTION

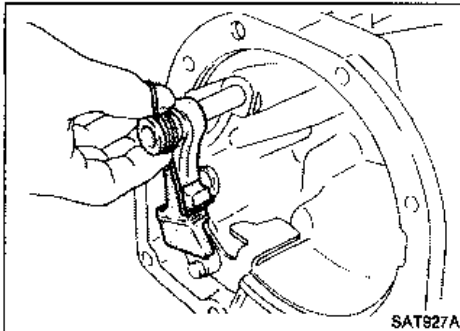
Parking pawl and parking actuator support

- Check contact surface of parking rod for wear.

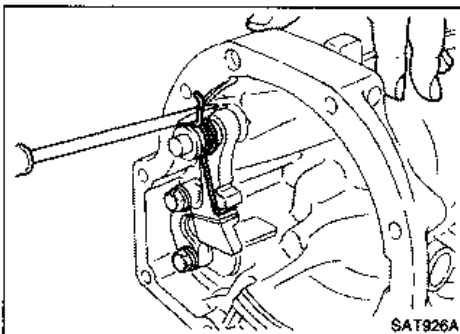


ASSEMBLY

1. Install rod guide and parking actuator support onto rear extension.
2. Insert parking pawl shaft into rear extension.

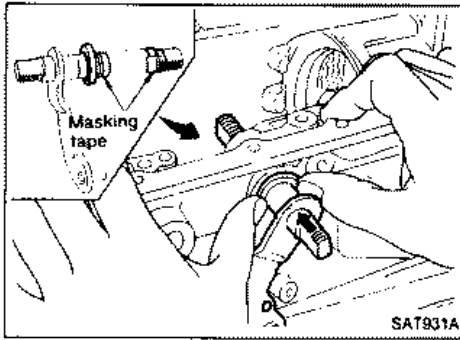


3. Install return spring, pawl spacer and parking pawl onto parking pawl shaft.



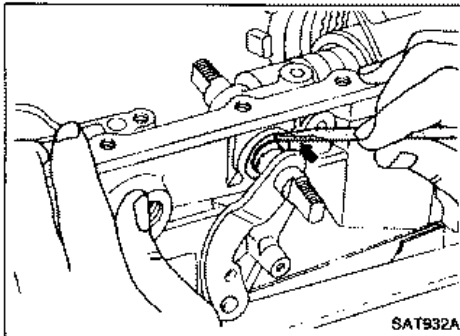
4. Bend return spring upward and install it onto rear extension.

ASSEMBLY

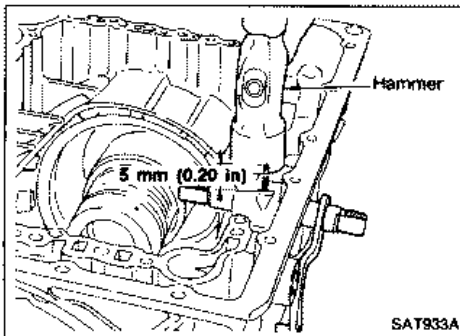


Assembly

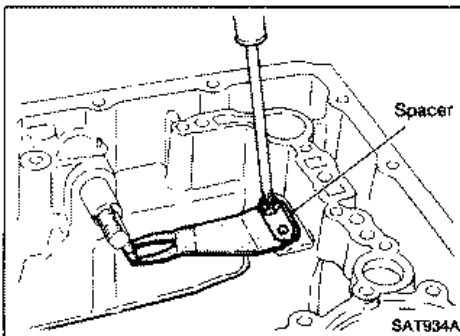
1. Install manual shaft components.
 - a. Install oil seal onto manual shaft.
 - Apply A.T.F. to oil seal.
 - **Wrap threads of manual shaft with masking tape.**
 - b. Insert manual shaft and oil seal as a unit into transmission case.
 - c. Remove masking tape.



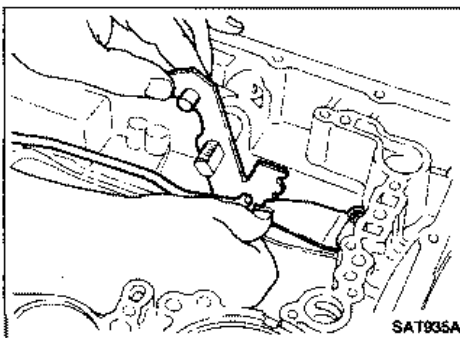
- d. Push oil seal evenly and install it onto transmission case.



- e. Align groove in shaft with drive pin hole, then drive pin into position as shown in figure at left.



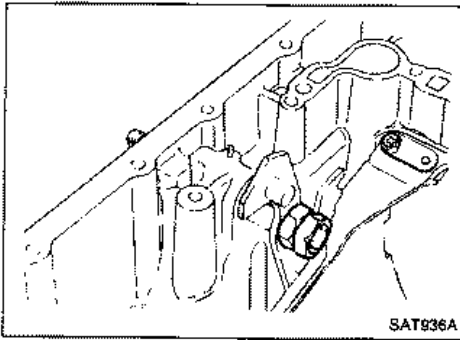
- f. Install detent spring and spacer.



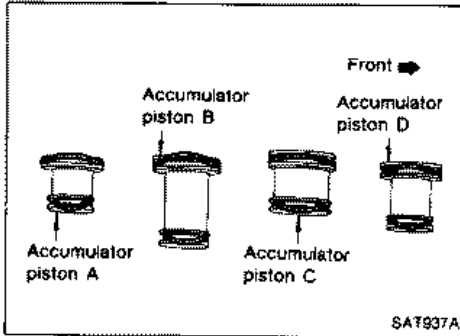
- g. While pushing detent spring down, install manual plate onto manual shaft.

ASSEMBLY

Assembly (Cont'd)



- h. Install lock nuts onto manual shaft.



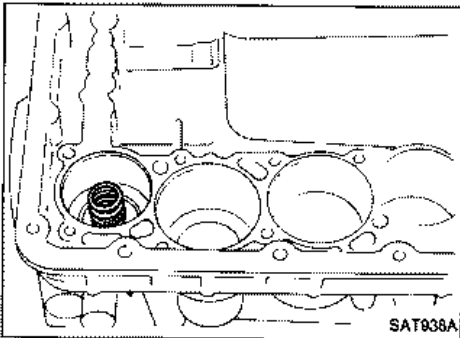
2. Install accumulator piston.
a. Install O-rings onto accumulator piston.

● **Apply A.T.F. to O-rings.**

Accumulator piston O-rings:

Unit: mm (in)

Accumulator	A	B	C	D
Small diameter end	29 (1.14)	32 (1.26)	45 (1.77)	29 (1.14)
Large diameter end	45 (1.77)	50 (1.97)	50 (1.97)	45 (1.77)

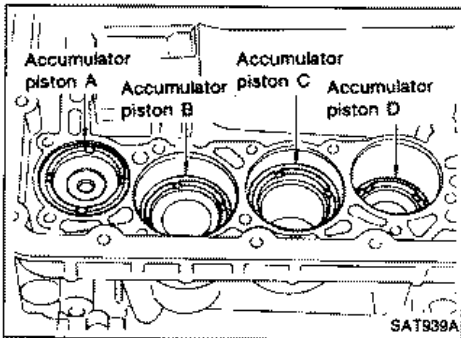


- b. Install return spring for accumulator A onto transmission case.

Free length of return spring:

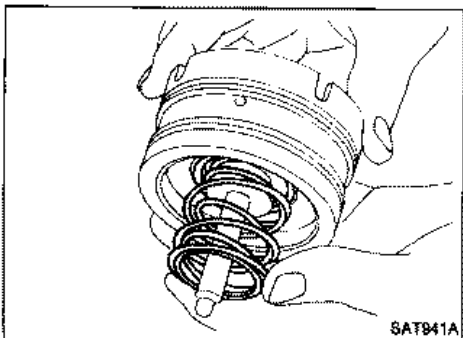
Unit: mm (in)

Accumulator	A
Free length	43 (1.69)



- c. Install accumulator pistons A, B, C and D.

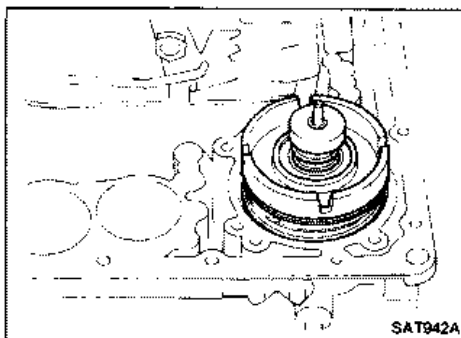
● **Apply A.T.F. to transmission case.**



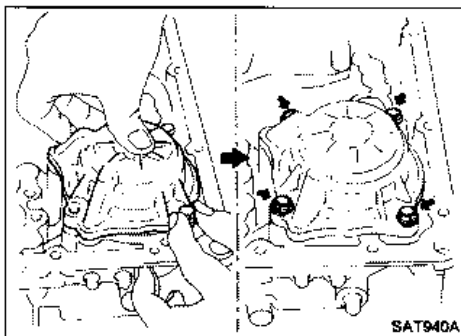
3. Install band servo piston.
a. Install return springs onto servo piston.

ASSEMBLY

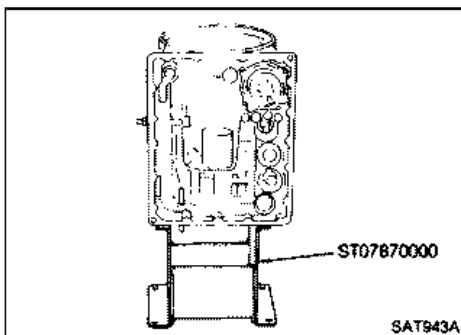
Assembly (Cont'd)



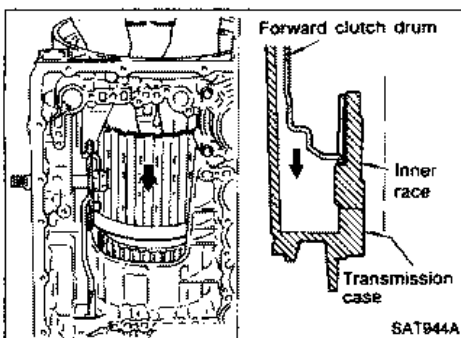
- b. Install band servo piston onto transmission case.
- Apply A.T.F. to O-ring of band servo piston and transmission case.
- c. Install gasket for band servo onto transmission case.



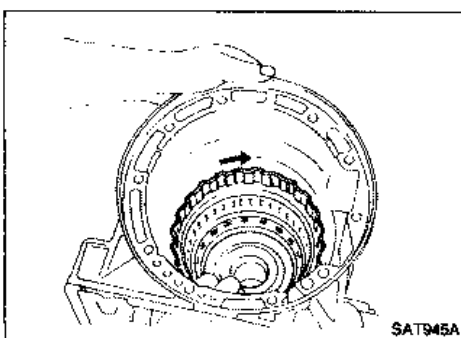
- d. Install band servo retainer onto transmission case.



4. Install rear side clutch and gear components.
 - a. Place transmission case in vertical position.



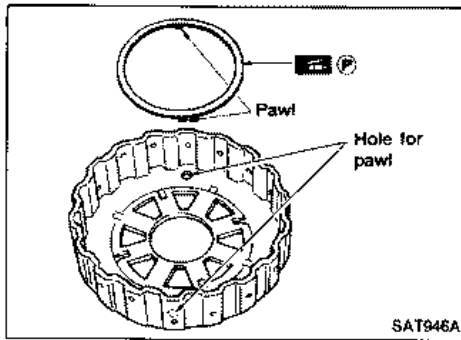
- b. Slightly lift forward clutch drum assembly and slowly rotate it clockwise until its hub passes fully over the clutch inner race inside transmission case.



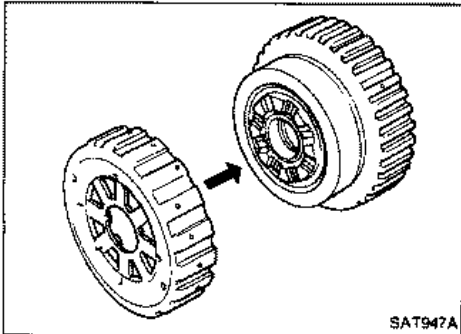
- c. Check to be sure that rotation direction of forward clutch assembly is correct.

ASSEMBLY

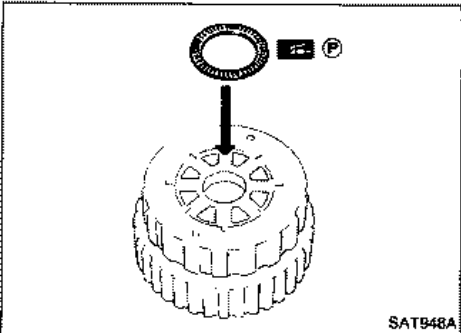
Assembly (Cont'd)



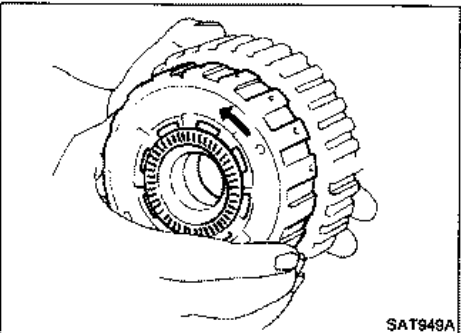
- d. Install thrust washer onto front of overrun clutch hub.
- Apply petroleum jelly to the thrust washer.
 - Insert pawls of thrust washer securely into holes in overrun clutch hub.



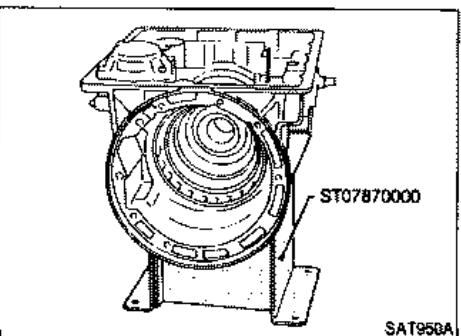
- e. Install overrun clutch hub onto rear internal gear assembly.



- f. Install needle bearing onto rear of overrun clutch hub.
- Apply petroleum jelly to needle bearing.



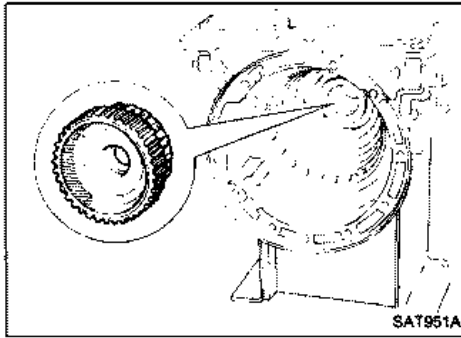
- g. Check that overrun clutch hub rotates as shown while holding forward clutch hub.



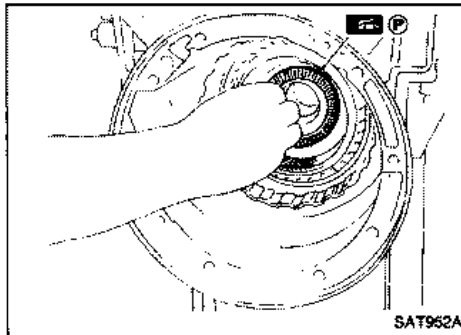
- h. Place transmission case into horizontal position.

ASSEMBLY

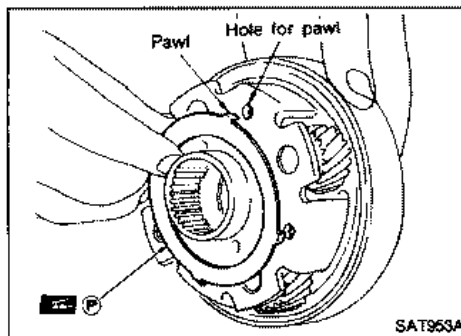
Assembly (Cont'd)



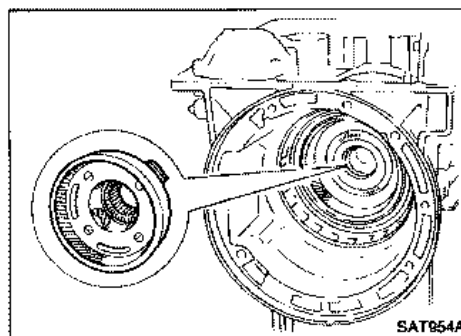
- i. Install rear internal gear, forward clutch hub and overrun clutch hub as a unit onto transmission case.



- j. Install needle bearing onto rear internal gear.
● **Apply petroleum jelly to needle bearing.**



- k. Install bearing race onto rear of front internal gear.
● **Apply petroleum jelly to bearing race.**
● **Securely engage pawls of bearing race with holes in front internal gear.**



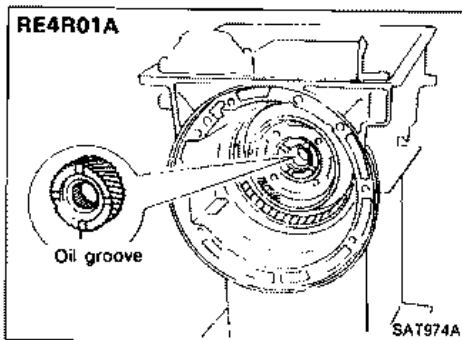
- l. Install front internal gear on transmission case.

ASSEMBLY

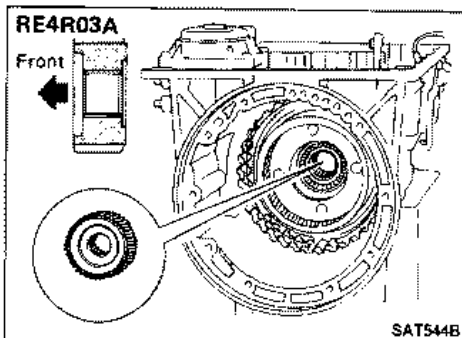
Adjustment

When any parts listed in the following table are replaced, total end play or reverse clutch end play must be adjusted.

Part name	Total end play	Reverse clutch end play
Transmission case	●	●
Low one-way clutch inner race	●	●
Overrun clutch hub	●	●
Rear internal gear	●	●
Rear planetary carrier	●	●
Rear sun gear	●	●
Front planetary carrier	●	●
Front sun gear	●	●
High clutch hub	●	●
High clutch drum	●	●
Oil pump cover	●	●
Reverse clutch drum	—	●

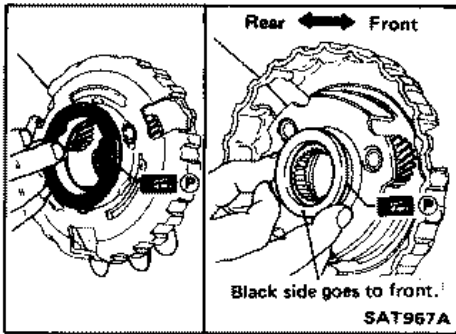


1. Install front side clutch and gear components.
 - a. Install rear sun gear on transmission case.
- **Pay attention to its direction.**

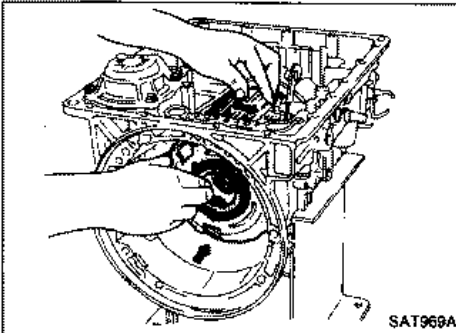


ASSEMBLY

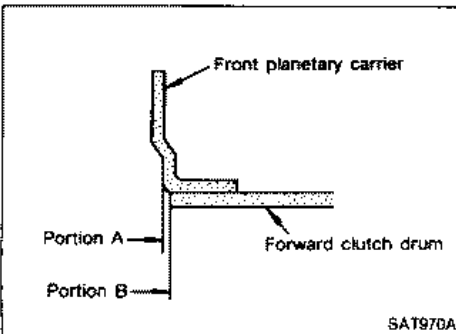
Adjustment (Cont'd)



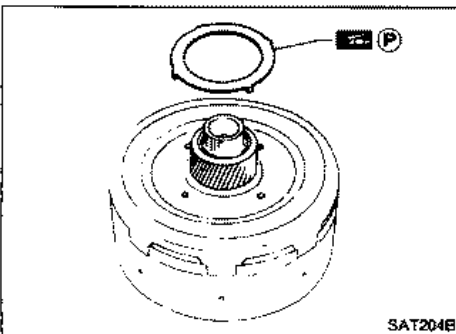
- b. Install needle bearing on front of front planetary carrier.
 - Apply petroleum jelly to needle bearing.
- c. Install needle bearing on rear of front planetary carrier.
 - Apply petroleum jelly to bearing.
 - Pay attention to its direction — Black side goes to front.



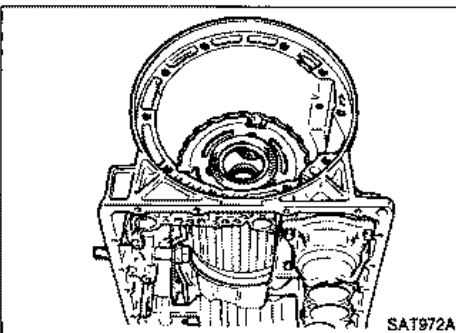
- d. While rotating forward clutch drum clockwise, install front planetary carrier on forward clutch drum.



- Check that portion A of front planetary carrier protrudes approximately 2 mm (0.08 in) beyond portion B of forward clutch assembly. (RE4R01A only)



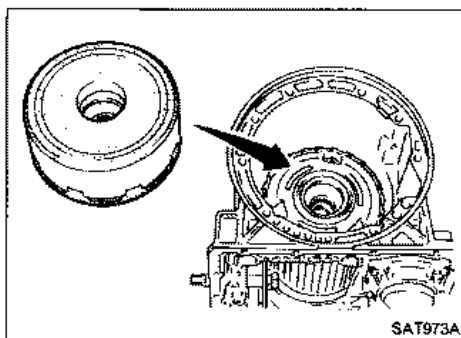
- e. Install bearing race (RE4R01A) or needle bearing (RE4R03A) on rear of clutch pack.
 - Apply petroleum jelly to bearing races.
 - Securely engage pawls of bearing race with hole in clutch pack.



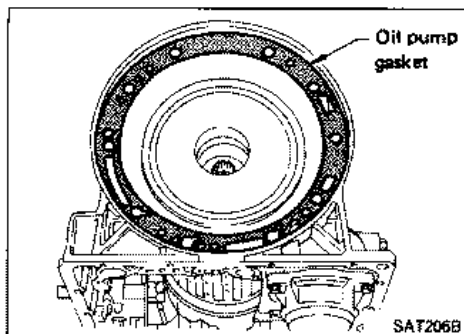
- f. Place transmission case in vertical position.

ASSEMBLY

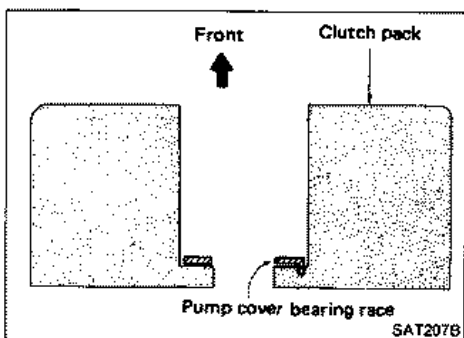
Adjustment (Cont'd)



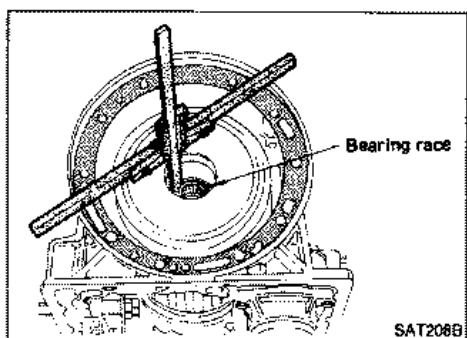
- g. Install clutch pack into transmission case.



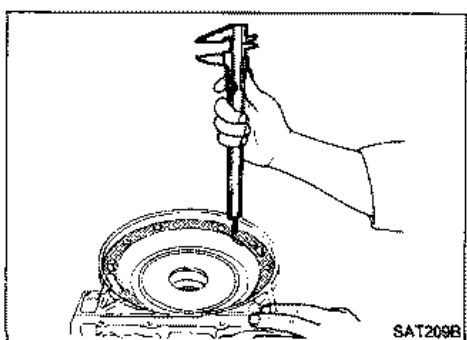
2. Adjust total end play.
a. Install new oil pump gasket on transmission case.



- b. Install pump cover bearing race on clutch pack.



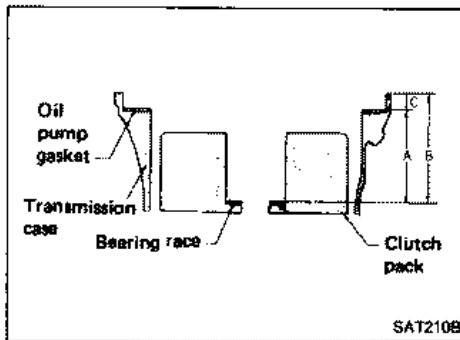
- c. Measure distance "B" between front end of transmission case and oil pump cover bearing race.



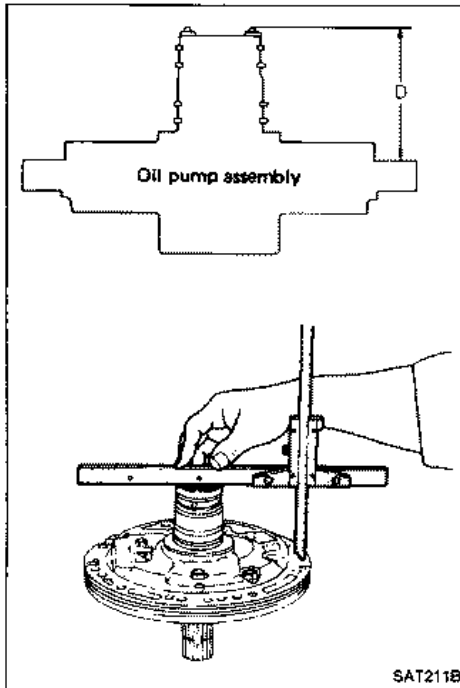
- d. Measure distance "C" between front end of transmission case and oil pump gasket.

ASSEMBLY

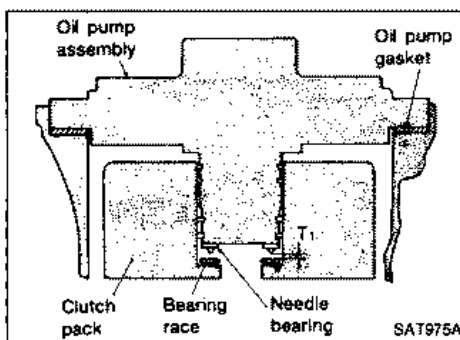
Adjustment (Cont'd)



- e. Determine dimension "A" by using the following equation.
 $A = B - C$



- f. Install needle bearing on oil pump assembly.
 g. Measure distance "D" between needle bearing and machined surface of oil pump cover assembly.



- h. Determine total end play " T_1 " by using the following equation.

$$T_1 = A - D - 0.1$$

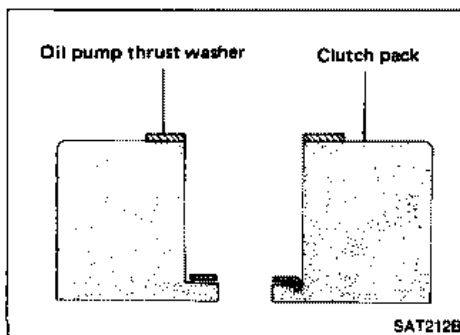
Total end play " T_1 ":

0.25 - 0.55 mm (0.0098 - 0.0217 in)

- If end play is out of specification, decrease or increase thickness of oil pump cover bearing race as necessary.

Available oil pump cover bearing race:

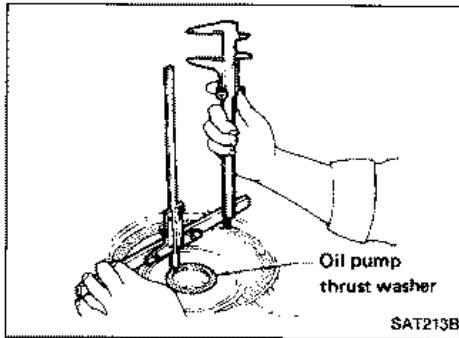
Refer to S.D.S.



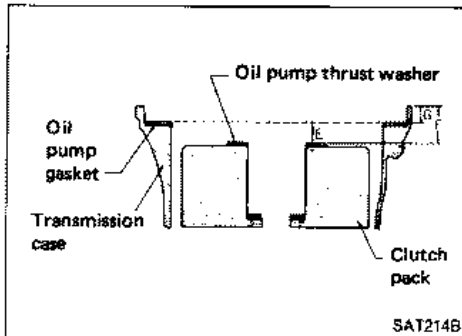
3. Adjust reverse clutch drum end play.
 a. Install oil pump thrust washer on clutch pack.

ASSEMBLY

Adjustment (Cont'd)

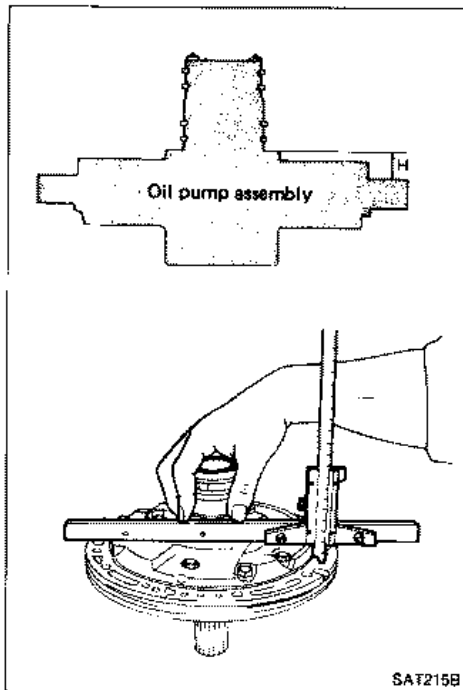


- b. Measure distance "F" between front end of transmission case and oil pump thrust washer.
- c. Measure distance "G" between front end of transmission case and gasket.

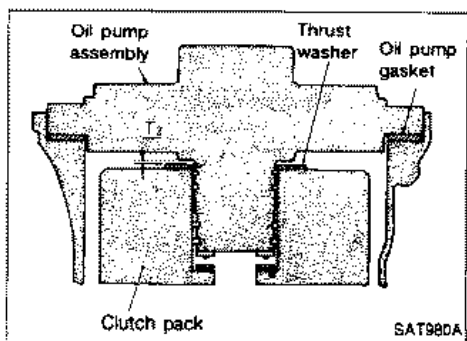


- d. Determine dimension "E" by using the following equation.

$$E = F - G$$



- e. Measure distance "H".



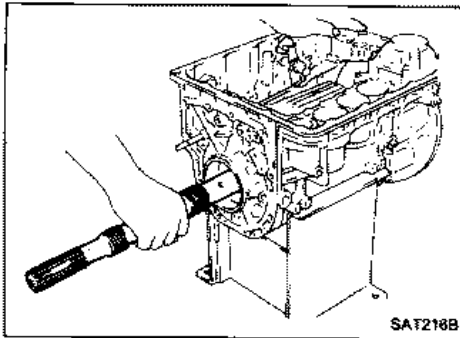
- f. Determine reverse clutch drum end play "T₂" by using the following equation.

$$T_2 = E - H - 0.1$$

Reverse clutch drum end play "T₂":
 0.55 - 0.90 mm (0.0217 - 0.0354 in)

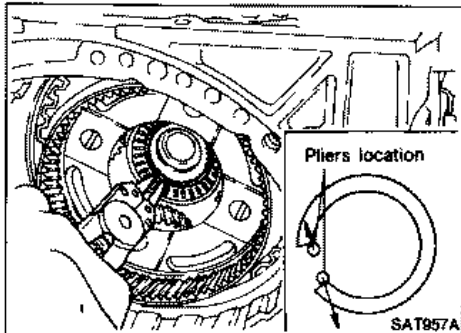
- If end play is out of specification, decrease or increase thickness of oil pump thrust washer as necessary.
Available oil pump thrust washer:
Refer to S.D.S.
4. Remove any part installed to adjust end plays.

ASSEMBLY

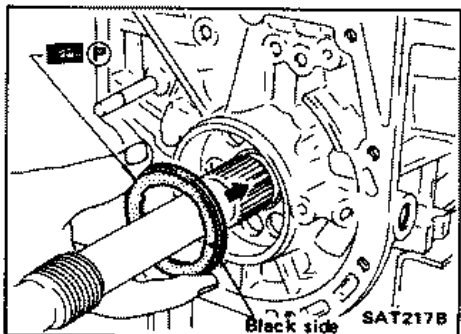


Assembly

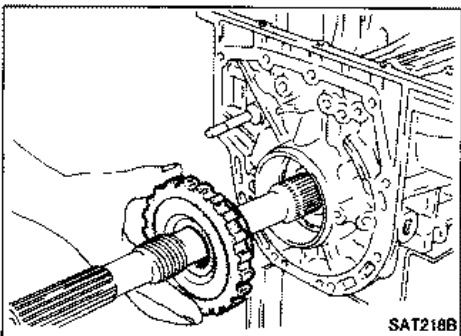
1. Install output shaft and parking gear.
 - a. Insert output shaft from rear of transmission case while slightly lifting front internal gear.
- **Do not force output shaft against front of transmission case.**



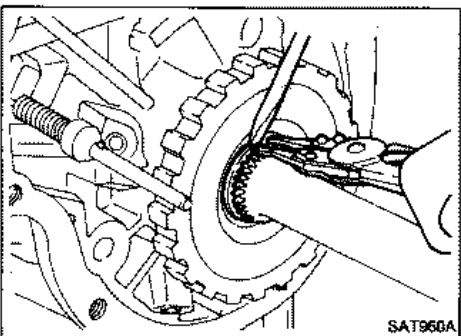
- b. Carefully push output shaft against front of transmission case. Install snap ring on front of output shaft.
- **Check to be sure output shaft cannot be removed in rear direction.**



- c. Install needle bearing on transmission case.
- **Pay attention to its direction — Black side goes to rear.**
 - **Apply petroleum jelly to needle bearing.**



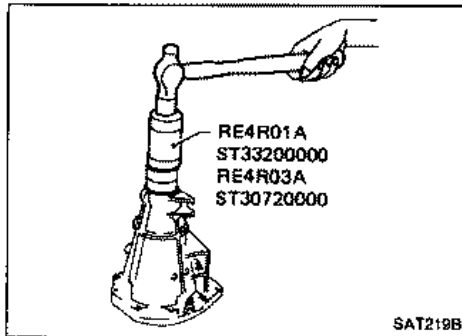
- d. Install parking gear on transmission case.



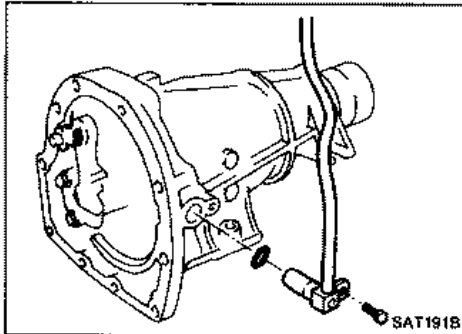
- e. Install snap ring on rear of output shaft.
- **Check to be sure output shaft cannot be removed in forward direction.**

ASSEMBLY

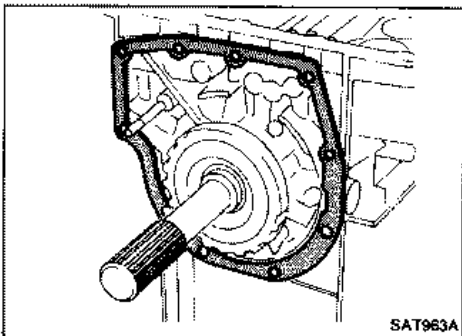
Assembly (Cont'd)



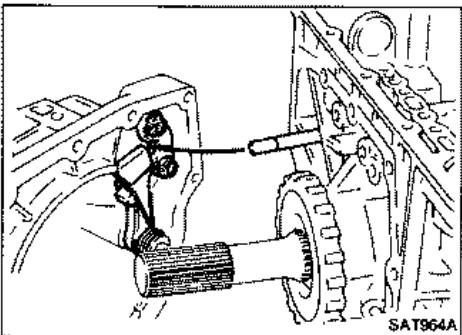
2. Install rear extension.
 - a. Install oil seal on rear extension.
 - Apply A.T.F. to oil seal.



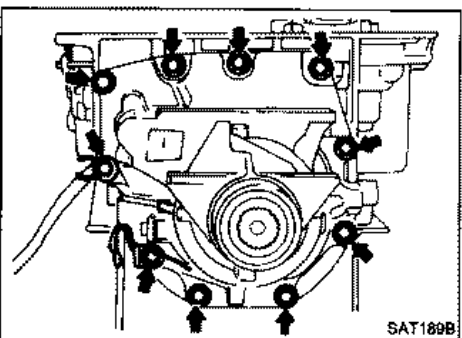
- b. Install O-ring on revolution sensor.
 - Apply A.T.F. to O-ring.
 - c. Install revolution sensor on rear extension.



- d. Install rear extension gasket on transmission case.



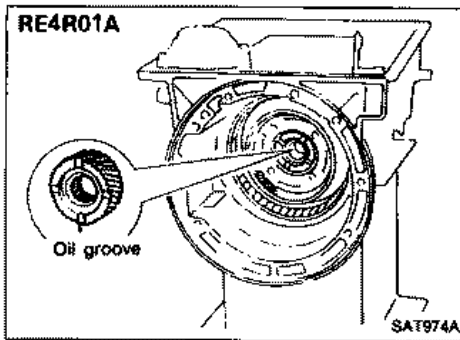
- e. Install parking rod on transmission case.



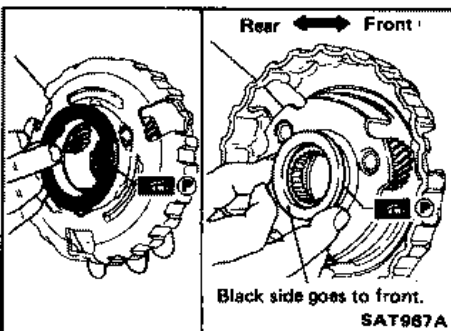
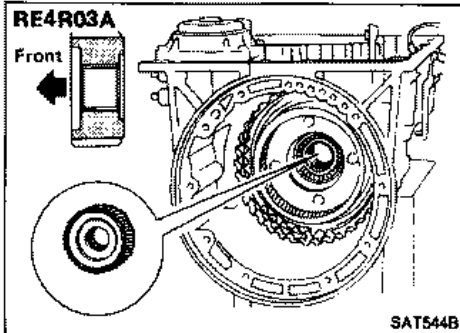
- f. Install rear extension on transmission case.

ASSEMBLY

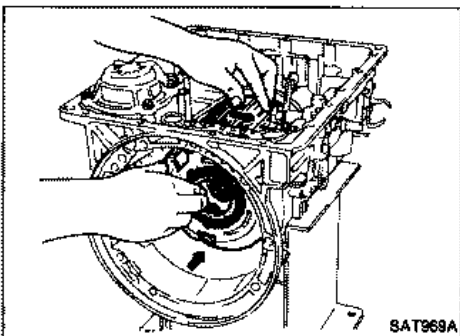
Assembly (Cont'd)



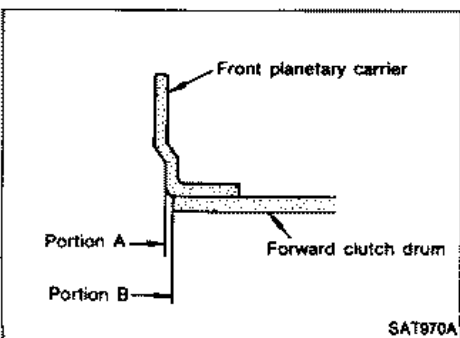
3. Install front side clutch and gear components.
 - a. Install rear sun gear on transmission case.
 - Pay attention to its direction.



- b. Make sure needle bearing is on front of front planetary carrier.
 - Apply petroleum jelly to needle bearing.
 - c. Make sure needle bearing is on rear of front planetary carrier.
 - Apply petroleum jelly to bearing.
 - Pay attention to its direction — Black side goes to front.



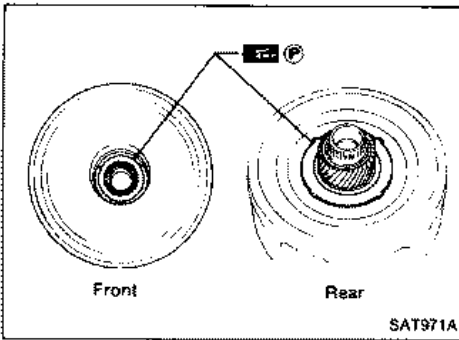
- d. While rotating forward clutch drum clockwise, install front planetary carrier on forward clutch drum.



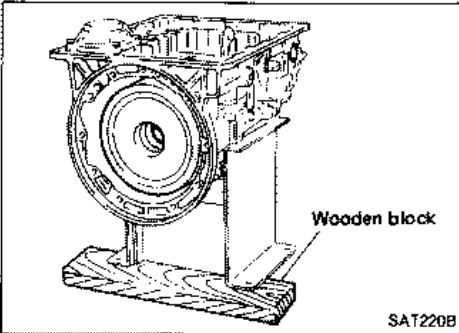
- Check that portion A of front planetary carrier protrudes approximately 2 mm (0.08 in) beyond portion B of forward clutch assembly. (RE4R01A only)

ASSEMBLY

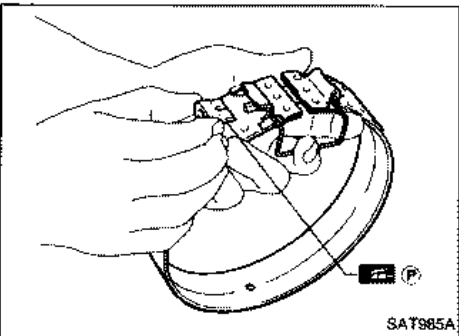
Assembly (Cont'd)



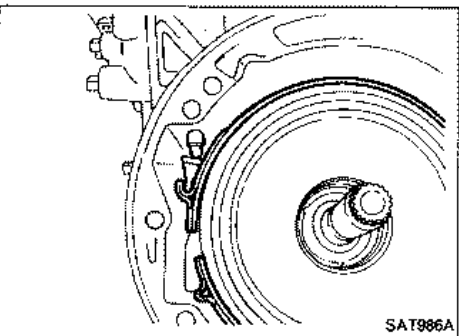
- e. Make sure bearing race (RE4R01A) or needle bearing (RE4R03A) are on front and rear of clutch pack.
- Apply petroleum jelly to bearing races.
- Securely engage pawls of bearing races with holes in clutch pack.



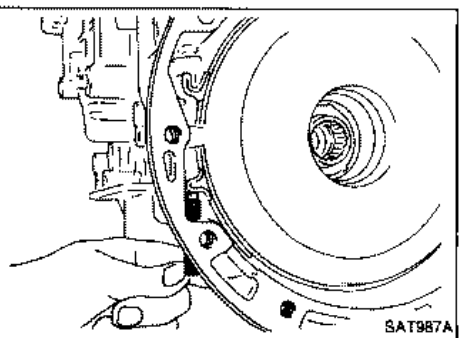
- f. Install clutch pack into transmission case.



- 4. Install brake band and band strut.
- a. Install band strut on brake band.
- Apply petroleum jelly to band strut.



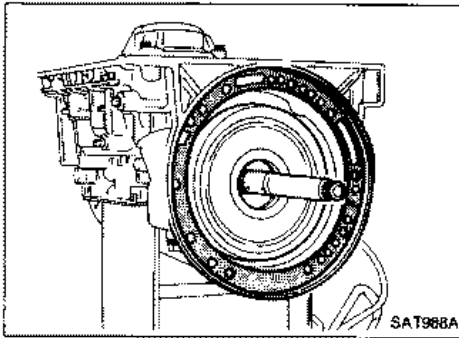
- b. Place brake band on periphery of reverse clutch drum, and insert band strut into end of band servo piston stem.



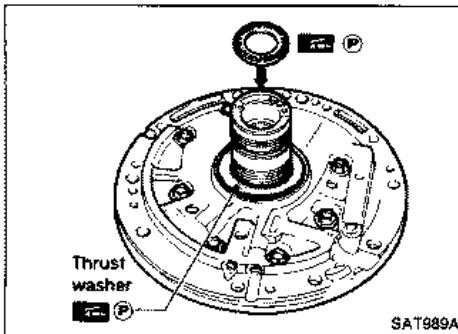
- c. Install anchor end bolt on transmission case. Then, tighten anchor end bolt just enough so that reverse clutch drum (clutch pack) will not tilt forward.

ASSEMBLY

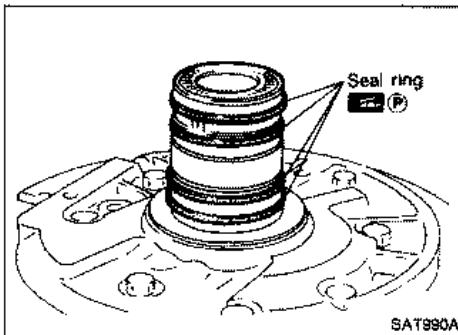
Assembly (Cont'd)



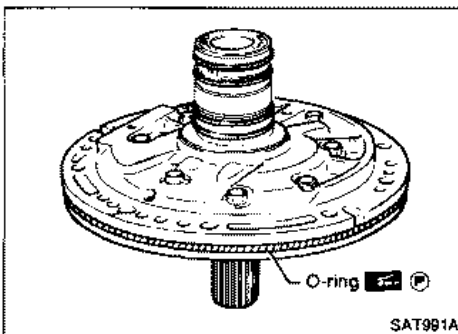
5. Install input shaft on transmission case.
 - Pay attention to its direction — O-ring groove side is front.
6. Install gasket on transmission case.



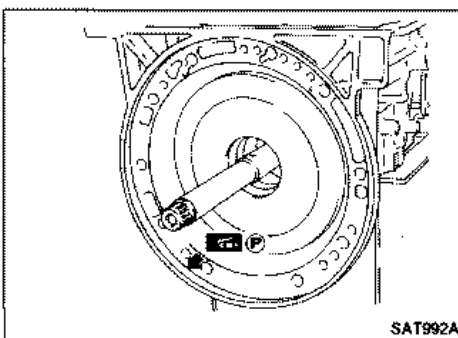
7. Install oil pump assembly.
 - a. Install needle bearing on oil pump assembly.
 - Apply petroleum jelly to the needle bearing.
 - b. Install selected thrust washer on oil pump assembly.
 - Apply petroleum jelly to thrust washer.



- c. Carefully install seal rings into grooves and press them into the petroleum jelly so that they are a tight fit.



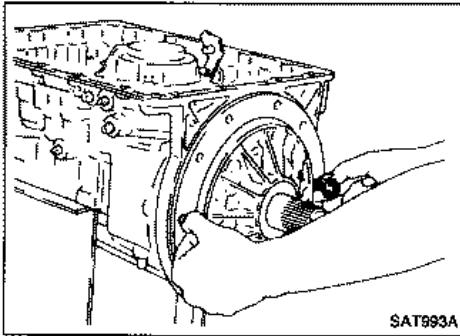
- d. Install O-ring on oil pump assembly.
 - Apply petroleum jelly to O-ring.



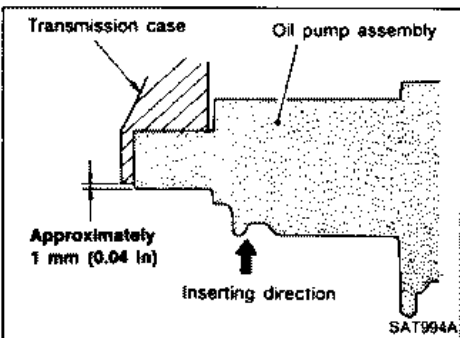
- e. Apply petroleum jelly to mating surface of transmission case and oil pump assembly.

ASSEMBLY

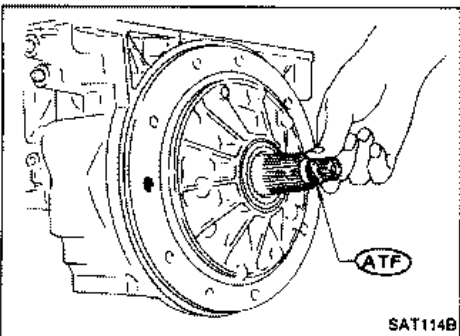
Assembly (Cont'd)



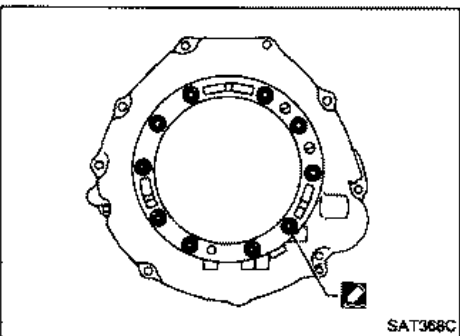
- f. Install oil pump assembly.
 - Install two converter housing securing bolts in bolt holes in oil pump assembly as guides.



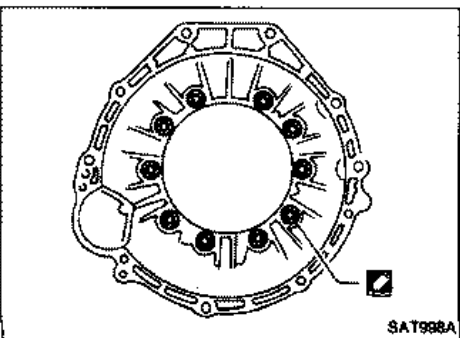
- Insert oil pump assembly to the specified position in transmission, as shown at left.



8. Install O-ring on input shaft.
 - Apply A.T.F. to O-rings.



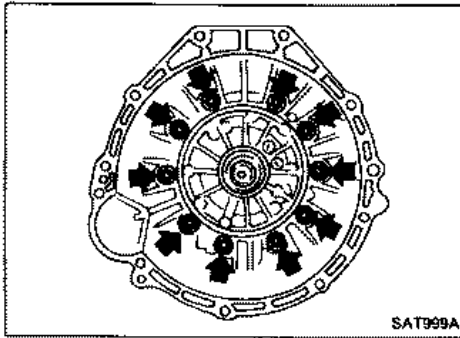
9. Install converter housing.
 - a. Apply recommended sealant (Nissan genuine part: KP610-00250 or equivalent) to outer periphery of bolt holes in converter housing.
 - Do not apply too much sealant.



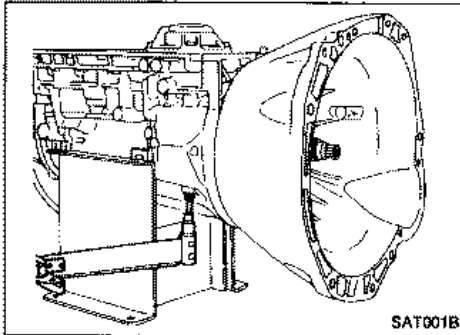
- b. Apply recommended sealant (Nissan genuine part: KP610-00250 or equivalent) to seating surfaces of bolts that secure front of converter housing.

ASSEMBLY

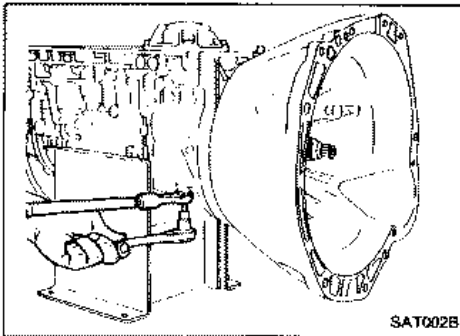
Assembly (Cont'd)



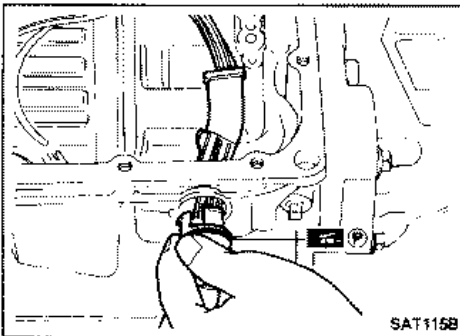
- c. Install converter housing on transmission case.



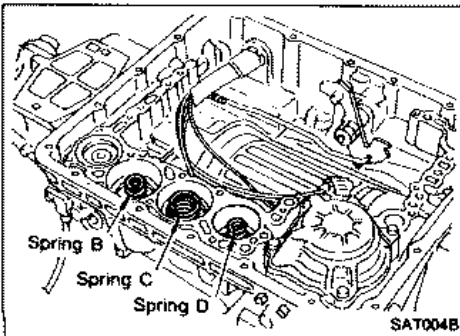
10. Adjust brake band.
 a. Tighten anchor end bolt to specified torque.
Anchor end bolt:
 \square : 4 - 6 N·m
 (0.4 - 0.6 kg-m, 2.9 - 4.3 ft-lb)
 b. Back off anchor end bolt two and a half turns.



- c. While holding anchor end pin, tighten lock nut.



11. Install terminal cord assembly.
 a. Install O-ring on terminal cord assembly.
 ● **Apply petroleum jelly to O-ring.**
 b. Compress terminal cord assembly stopper and install terminal cord assembly on transmission case.



12. Install control valve assembly.
 a. Install accumulator piston return springs B, C and D.

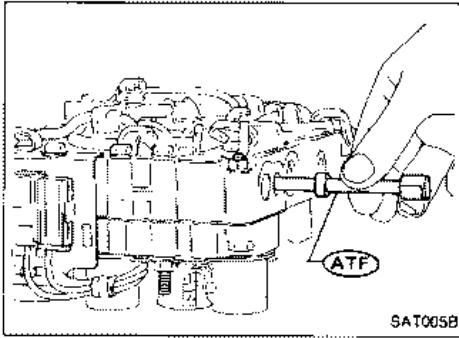
Free length of return springs:

Unit: mm (in)

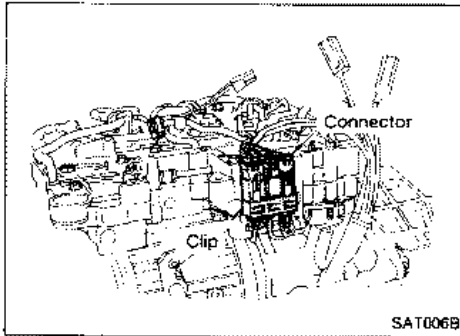
Item	Accumulator	B	C	D
Free length		66 (2.60)	45 (1.77)	58.4 (2.299)

ASSEMBLY

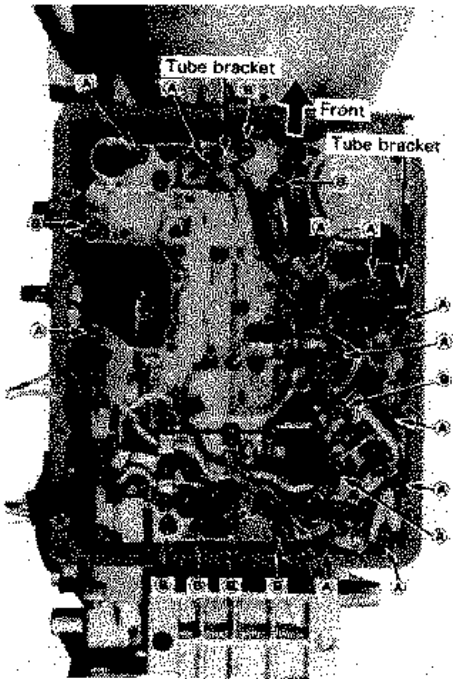
Assembly (Cont'd)




- b. Install manual valve on control valve.
 ● **Apply A.T.F. to manual valve.**

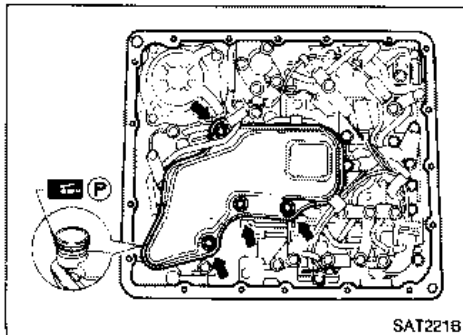


- c. Place control valve assembly on transmission case. Connect solenoid connector for upper body.
 d. Install connector clip.



- e. Install control valve assembly on transmission case.
 f. Install connector tube brackets and tighten bolts (A) and (B).
 ● **Check that terminal assembly harness does not catch.**

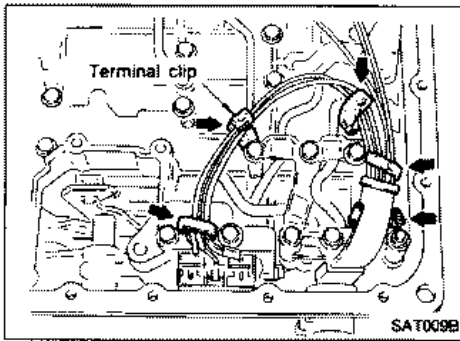
Bolt symbol	ℓ mm (in)	
(A)	33 (1.30)	
(B)	45 (1.77)	



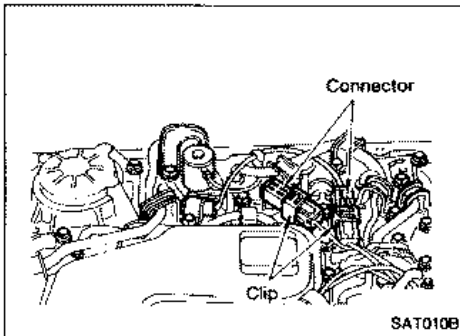
- g. Install O-ring on oil strainer.
 ● **Apply petroleum jelly to O-ring.**
 h. Install oil strainer on control valve.

ASSEMBLY

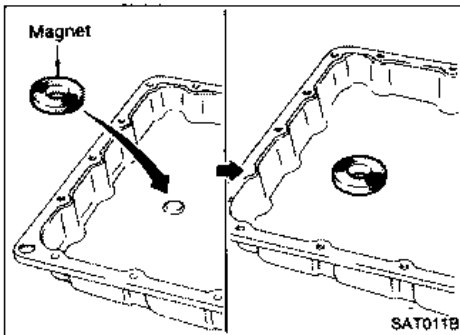
Assembly (Cont'd)



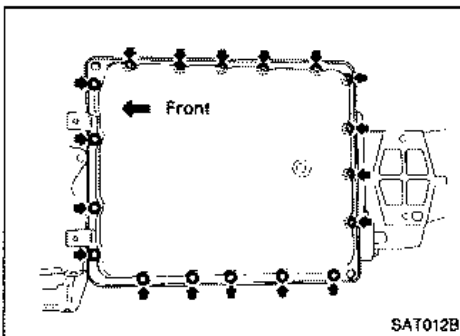
- i. Securely fasten terminal harness with clips.



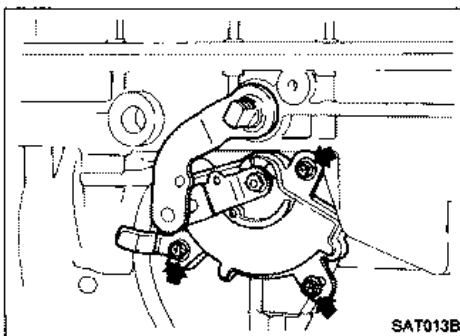
- j. Install lock-up solenoid and fluid temperature sensor connectors.



13. Install oil pan.
 - a. Attach a magnet to oil pan.



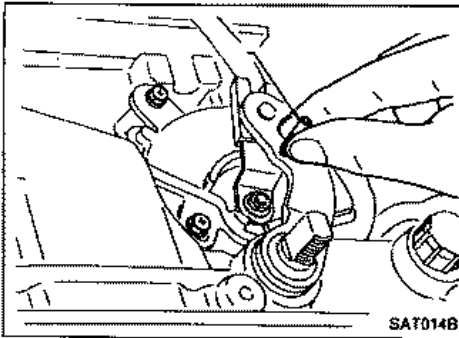
- b. Install oil pan gasket on transmission case.
 - c. Install oil pan and bracket on transmission case.
- **Tighten four bolts in a criss-cross pattern to prevent dislocation of gasket.**



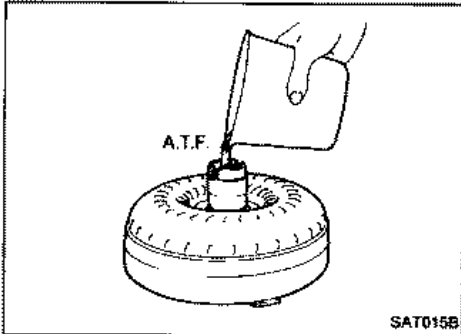
14. Install inhibitor switch.
 - a. Check that manual shaft is in "1" range.
 - b. Temporarily install inhibitor switch on manual shaft.
 - c. Move manual shaft to "N".

ASSEMBLY

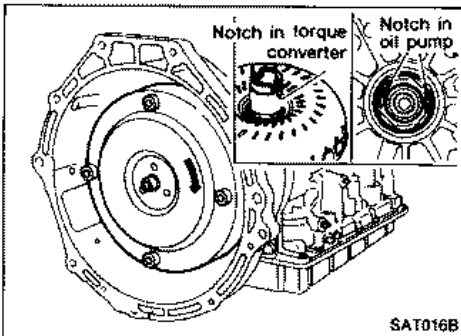
Assembly (Cont'd)



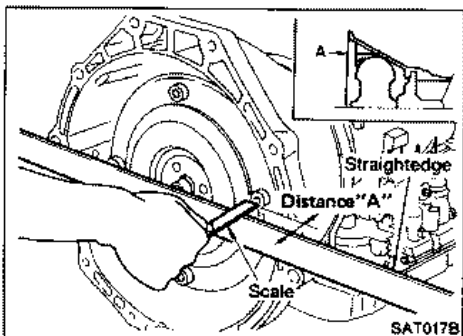
- d. Tighten bolts while inserting 4.0 mm (0.157 in) dia. pin vertically into locating holes in inhibitor switch and manual shaft.



15. Install torque converter.
- a. Pour A.T.F. into torque converter.
- Approximately 2 liters (1-3/4 imp qt) of fluid are required for a new torque converter.
 - When reusing old torque converter, add the same amount of fluid as was drained.



- b. Install torque converter while aligning notches and oil pump.



- c. Measure distance A to check that torque converter is in proper position.

Distance "A":

RE4R01A

26 mm (1.02 in) or more

RE4R03A

25 mm (0.98 in) or more

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

General Specifications

Engine	VG30DE	VG30DETT
Automatic transmission model	RE4R01A	RE4R03A
Transmission model code number	45 x 65	51 x 10
Stall torque ratio	2.0 : 1	
Transmission gear ratio		
1st	2.785	2.784
2nd	1.545	1.544
Top	1.000	1.000
O.D.	0.694	0.694
Reverse	2.272	2.275
Recommended oil	Automatic transmission fluid Type DEXRON™	
Oil capacity ℓ (Imp qt)	8.3 (7-1/4)	8.7 (7-5/8)

Specifications and Adjustment — RE4R01A

VEHICLE SPEED WHEN SHIFTING GEARS

Throttle position	Vehicle speed km/h (MPH)					
	D ₄ → D ₂	D ₂ → D ₃	D ₃ → D ₄	D ₄ → D ₃	D ₃ → D ₂	D ₂ → D ₁
Full throttle	50 - 54 (31 - 34)	107 - 115 (66 - 71)	166 - 176 (103 - 109)	161 - 169 (100 - 105)	97 - 105 (60 - 65)	44 - 48 (27 - 30)
Half throttle	45 - 49 (28 - 30)	83 - 89 (52 - 55)	119 - 127 (74 - 79)	80 - 88 (50 - 55)	33 - 39 (21 - 24)	10 - 14 (6 - 9)

VEHICLE SPEED WHEN PERFORMING AND RELEASING LOCK-UP

Throttle position	O.D. switch (Shift range)	Vehicle speed km/h (MPH)	
		Lock-up "ON"	Lock-up "OFF"
Full throttle	ON [D ₄]	167 - 175 (104 - 109)	161 - 169 (100 - 105)
	OFF [D ₃]	107 - 115 (66 - 71)	97 - 105 (60 - 65)
Half throttle	ON [D ₄]	120 - 128 (75 - 80)	84 - 92 (52 - 57)
	OFF [D ₃]	91 - 99 (57 - 62)	86 - 94 (53 - 58)

STALL REVOLUTION

Stall revolution rpm
2,450 - 2,650

LINE PRESSURE

Engine speed rpm	Line pressure kPa (bar, kg/cm ² , psi)	
	D, 2 and 1 ranges	R range
Idle	412 - 490 (4.12 - 4.90, 4.2 - 5.0, 60 - 71)	608 - 647 (6.08 - 6.47, 6.2 - 6.6, 88 - 94)
Stall	1,020 - 1,098 (10.20 - 10.98, 10.4 - 11.2, 148 - 159)	1,422 - 1,500 (14.22 - 15.00, 14.5 - 15.3, 206 - 218)

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Specifications and Adjustment — RE4R01A (Cont'd)

RETURN SPRINGS

Unit: mm (in)

Parts		Item	Part No.	Free length	Outer diameter
Control valve	Upper body	Torque converter relief valve spring	31742-41X23	38.0 (1.496)	9.0 (0.354)
		Pressure regulator valve spring	31742-41X24	44.02 (1.7331)	14.0 (0.551)
		Pressure modifier valve spring	31742-41X19	31.95 (1.2579)	6.8 (0.268)
		Shuttle shift valve D spring	31762-41X00	26.5 (1.043)	6.0 (0.236)
		4-2 sequence valve spring	31756-41X00	29.1 (1.146)	6.95 (0.2736)
		Shift valve B spring	31762-41X01	25.0 (0.984)	7.0 (0.276)
		4-2 relay valve spring	31756-41X00	29.1 (1.146)	6.95 (0.2736)
		Shift valve A spring	31762-41X01	25.0 (0.984)	7.0 (0.276)
		Overrun clutch control valve spring	31762-41X03	23.6 (0.929)	7.0 (0.276)
		Overrun clutch reducing valve spring	31742-41X20	32.5 (1.280)	7.0 (0.276)
		Shuttle shift valve S spring	31762-41X04	51.0 (2.008)	5.65 (0.2224)
		Pilot valve spring	31742-41X13	25.7 (1.012)	9.1 (0.358)
		Lock-up control valve spring	31742-41X22	18.5 (0.728)	13.0 (0.512)
	Lower body	Modifier accumulator piston spring	31742-41X15	30.5 (1.201)	9.8 (0.386)
		1st reducing valve spring	31756-41X05	25.4 (1.000)	6.75 (0.2657)
		3-2 timing valve spring	31742-41X08	20.55 (0.8091)	6.75 (0.2657)
Servo charger valve spring		31742-41X06	23.0 (0.906)	6.7 (0.264)	
Reverse clutch	16 pcs	31505-41X02	19.69 (0.7752)	11.6 (0.457)	
High clutch	16 pcs	31505-21X03	22.06 (0.8685)	11.6 (0.457)	
Forward clutch (Overrun clutch)	20 pcs	31505-41X01	35.77 (1.4083)	9.7 (0.382)	
Low & reverse brake	18 pcs	31521-21X00	23.7 (0.933)	11.6 (0.457)	
Band servo	Spring A	31605-41X05	45.6 (1.795)	34.3 (1.350)	
	Spring B	31605-41X00	53.6 (2.118)	40.3 (1.587)	
	Spring C	31605-41X01	29.7 (1.169)	27.6 (1.087)	
Accumulator	Accumulator A	31605-41X02	43.0 (1.693)		
	Accumulator B	31605-41X10	66.0 (2.598)		
	Accumulator C	31605-41X09	45.0 (1.772)		
	Accumulator D	31605-41X06	58.4 (2.299)		

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Specifications and Adjustment — RE4R01A (Cont'd)

ACCUMULATOR O-RING

Accumulator	Diameter mm (in)			
	A	B	C	D
Small diameter end	29 (1.14)	32 (1.26)	45 (1.77)	29 (1.14)
Large diameter end	45 (1.77)	50 (1.97)	50 (1.97)	45 (1.77)

CLUTCHES AND BRAKES

Reverse clutch		
Number of drive plates	2	
Number of driven plates	2	
Thickness of drive plate mm (in)		
Standard	2.0 (0.079)	
Wear limit	1.8 (0.071)	
Clearance mm (in)		
Standard	0.5 - 0.8 (0.020 - 0.031)	
Allowable limit	1.2 (0.047)	
Thickness of retaining plate	Thickness mm (in)	Part number
	4.6 (0.181)	31537-21X00
	4.8 (0.189)	31537-21X01
	5.0 (0.197)	31537-21X02
	5.2 (0.205)	31537-21X03
	5.4 (0.213)	31537-21X04
	5.6 (0.220)	31567-21X13
	5.8 (0.228)	31567-21X14
High clutch		
Number of drive plates	5	
Number of driven plates	5	
Thickness of drive plate mm (in)		
Standard	1.6 (0.063)	
Wear limit	1.4 (0.055)	
Clearance mm (in)		
Standard	1.8 - 2.2 (0.071 - 0.087)	
Allowable limit	3.2 (0.126)	
Thickness of retaining plate	Thickness mm (in)	Part number
	3.4 (0.134)	31537-41X71
	3.6 (0.142)	31537-41X61
	3.8 (0.150)	31537-41X62
	4.0 (0.157)	31537-41X63
	4.2 (0.165)	31537-41X64
	4.4 (0.173)	31537-41X65
	4.6 (0.181)	31537-41X66
4.8 (0.189)	31537-41X67	

Forward clutch		
Number of drive plates	7	
Number of driven plates	7	
Thickness of drive plate mm (in)		
Standard	1.6 (0.063)	
Wear limit	1.4 (0.055)	
Clearance mm (in)		
Standard	0.45 - 0.85 (0.0177 - 0.0335)	
Allowable limit	2.25 (0.0886)	
Thickness of retaining plate	Thickness mm (in)	Part number
	4.0 (0.157)	31537-41X07
	4.2 (0.165)	31537-41X08
	4.4 (0.173)	31537-41X09
	4.6 (0.181)	31537-41X10
	4.8 (0.189)	31537-41X11
	5.0 (0.197)	31537-41X12
	5.2 (0.205)	31537-41X13
Overrun clutch		
Number of drive plates	3	
Number of driven plates	5	
Thickness of drive plate mm (in)		
Standard	2.0 (0.079)	
Wear limit	1.8 (0.071)	
Clearance mm (in)		
Standard	1.0 - 1.4 (0.039 - 0.055)	
Allowable limit	2.0 (0.079)	
Thickness of retaining plate	Thickness mm (in)	Part number
	4.0 (0.157)	31537-41X79
	4.2 (0.165)	31537-41X80
	4.4 (0.173)	31537-41X81
	4.6 (0.181)	31537-41X82
	4.8 (0.189)	31537-41X83
	5.0 (0.197)	31537-41X84
	5.2 (0.205)	31537-41X20

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Specifications and Adjustment — RE4R01A (Cont'd)

Low & reverse brake		
Number of drive plates	7	
Number of driven plates	9	
Thickness of drive plate mm (in)		
Standard	2.0 (0.079)	
Wear limit	1.8 (0.071)	
Clearance mm (in)		
Standard	1.1 - 1.5 (0.043 - 0.059)	
Allowable limit	2.9 (0.114)	
Thickness of retaining plate	Thickness mm (in)	Part number
	7.2 (0.283)	31667-41X13
	7.4 (0.291)	31667-41X14
	7.6 (0.299)	31667-41X07
	7.8 (0.307)	31667-41X08
	8.0 (0.315)	31667-41X00
	8.2 (0.323)	31667-41X01
Brake band		
Anchor end bolt tightening torque N-m (kg-m, ft-lb)	4 - 6 (0.4 - 0.6, 2.9 - 4.3)	
Number of returning revolutions for anchor end bolt	2.5	

REVERSE CLUTCH DRUM END PLAY

Reverse clutch drum end play "T ₂ "	0.55 - 0.90 mm (0.0217 - 0.0354 in)	
Thickness of oil pump thrust washer	Thickness mm (in)	Part number
	0.7 (0.028)	31528-21X00
	0.9 (0.035)	31528-21X01
	1.1 (0.043)	31528-21X02
	1.3 (0.051)	31528-21X03
	1.5 (0.059)	31528-21X04
	1.7 (0.067)	31528-21X05
1.9 (0.075)	31528-21X06	

REMOVAL AND INSTALLATION

Manual control linkage	
Number of returning revolutions for lock nut	1
Lock nut tightening torque	11 - 15 N-m (1.1 - 1.5 kg-m, 8 - 11 ft-lb)
Distance between end of clutch housing and torque converter	26.0 mm (1.024 in) or more
Drive plate runout limit	0.5 mm (0.020 in)

OIL PUMP AND LOW ONE-WAY CLUTCH

Oil pump clearance mm (in)	
Cam ring — oil pump housing	
Standard	0.01 - 0.024 (0.0004 - 0.0009)
Rotor, vanes and control piston — oil pump housing	
Standard	0.03 - 0.044 (0.0012 - 0.0017)
Seal ring clearance mm (in)	
Standard	0.10 - 0.25 (0.0039 - 0.0098)
Allowable limit	0.25 (0.0098)

TOTAL END PLAY

Total end play "T ₁ "	0.25 - 0.55 mm (0.0098 - 0.0217 in)	
Thickness of oil pump cover bearing race	Thickness mm (in)	Part number
	0.8 (0.031)	31429-21X00
	1.0 (0.039)	31429-21X01
	1.2 (0.047)	31429-21X02
	1.4 (0.055)	31429-21X03
	1.6 (0.063)	31429-21X04
	1.8 (0.071)	31429-21X05
2.0 (0.079)	31429-21X06	

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Specifications and Adjustment — RE4R03A

VEHICLE SPEED WHEN SHIFTING GEARS

Throttle position	Vehicle speed km/h (MPH)					
	D ₁ → D ₂	D ₂ → D ₃	D ₃ → D ₄	D ₄ → D ₃	D ₃ → D ₂	D ₂ → D ₁
Full throttle	68 - 72 (42 - 45)	120 - 128 (75 - 80)	183 - 193 (114 - 120)	177 - 187 (110 - 116)	111 - 119 (69 - 74)	47 - 51 (29 - 32)
Half throttle	47 - 51 (29 - 32)	89 - 95 (55 - 59)	136 - 144 (85 - 89)	118 - 126 (73 - 78)	79 - 85 (49 - 53)	10 - 14 (6 - 9)

VEHICLE SPEED WHEN PERFORMING AND RELEASING LOCK-UP

Throttle position	O.D. switch [Shift range]	Vehicle speed km/h (MPH)	
		Lock-up "ON"	Lock-up "OFF"
Full throttle	ON [D ₄]	184 - 192 (114 - 119)	178 - 186 (111 - 116)
	OFF [D ₃]	120 - 128 (75 - 80)	111 - 119 (69 - 74)
Half throttle	ON [D ₄]	136 - 144 (85 - 89)	117 - 125 (73 - 78)
	OFF [D ₃]	91 - 99 (57 - 62)	86 - 94 (53 - 58)

STALL REVOLUTION

Stall revolution rpm
2,950 - 3,200

LINE PRESSURE

Engine speed rpm	Line pressure kPa (bar, kg/cm ² , psi)	
	D, 2 and 1 ranges	R range
idle	412 - 490 (4.12 - 4.90, 4.2 - 5.0, 60 - 71)	608 - 647 (6.08 - 6.47, 6.2 - 6.6, 88 - 94)
Stall	1,020 - 1,098 (10.20 - 10.98, 10.4 - 11.2, 148 - 159)	1,422 - 1,500 (14.22 - 15.00, 14.5 - 15.3, 206 - 218)

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Specifications and Adjustment — RE4R03A (Cont'd)

RETURN SPRINGS

Unit: mm (in)

Parts		Item	Part No.	Free length	Outer diameter	
Control valve	Upper body	Torque converter relief valve spring	31742-41X23	38.0 (1.496)	9.0 (0.354)	
		Pressure regulator valve spring	31742-41X24	44.02 (1.7331)	14.0 (0.551)	
		Pressure modifier valve spring	31742-41X19	31.96 (1.2579)	6.8 (0.268)	
		Shuttle shift valve D spring	31762-41X00	26.5 (1.043)	6.0 (0.236)	
		4-2 sequence valve spring	31756-41X00	29.1 (1.146)	6.95 (0.2736)	
		Shift valve B spring	31762-41X01	25.0 (0.984)	7.0 (0.276)	
		4-2 relay valve spring	31756-41X00	29.1 (1.146)	6.95 (0.2736)	
		Shift valve A spring	31762-41X01	25.0 (0.984)	7.0 (0.276)	
		Overrun clutch control valve spring	31762-41X03	23.6 (0.929)	7.0 (0.276)	
		Overrun clutch reducing valve spring	31742-41X20	32.5 (1.280)	7.0 (0.276)	
		Shuttle shift valve S spring	31762-41X04	51.0 (2.008)	5.65 (0.2224)	
		Pilot valve spring	31742-41X13	25.7 (1.012)	9.1 (0.358)	
	Lock-up control valve spring	31742-41X22	18.5 (0.728)	13.0 (0.512)		
		Lower body	Modifier accumulator piston spring	31742-41X15	30.5 (1.201)	9.8 (0.386)
			1st reducing valve spring	31756-41X05	25.4 (1.000)	6.75 (0.2657)
	3-2 timing valve spring		31742-41X08	20.66 (0.8091)	6.75 (0.2657)	
		Servo charger valve spring	31742-41X06	23.0 (0.906)	6.7 (0.264)	
Reverse clutch		16 pcs	31505-51X00	37.8 (1.488)	14.8 (0.583)	
High clutch		16 pcs	31505-21X03	22.06 (0.8685)	11.6 (0.457)	
Forward clutch (Overrun clutch)		20 pcs	31505-51X04	36.8 (1.449)	9.8 (0.386)	
Low & reverse brake		inner 16 pcs	31505-51X06	20.43 (0.8043)	10.3 (0.406)	
		Outer 16 pcs	31505-51X05	20.35 (0.8012)	13.0 (0.512)	
Band servo		Spring A	31605-41X05	45.6 (1.795)	34.3 (1.350)	
		Spring B	31605-41X00	53.8 (2.118)	40.3 (1.587)	
		Spring C	31605-41X01	29.7 (1.169)	27.6 (1.087)	
Accumulator		Accumulator A	31605-41X02	43.0 (1.693)		
		Accumulator B	31605-41X10	66.0 (2.598)		
		Accumulator C	31605-41X09	45.0 (1.772)		
		Accumulator D	31605-41X06	58.4 (2.299)		

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Specifications and Adjustment — RE4R03A (Cont'd)

ACCUMULATOR O-RING

Accumulator	Diameter mm (in)			
	A	B	C	D
Small diameter end	29 (1.14)	32 (1.26)	45 (1.77)	29 (1.14)
Large diameter end	45 (1.77)	50 (1.97)	50 (1.97)	45 (1.77)

CLUTCHES AND BRAKES

Reverse clutch		
Number of drive plates	3	
Number of driven plates	3	
Thickness of drive plate mm (in)		
Standard	2.0 (0.079)	
Wear limit	1.8 (0.071)	
Clearance mm (in)		
Standard	0.5 - 0.8 (0.020 - 0.031)	
Allowable limit	1.2 (0.047)	
Thickness of retaining plate	Thickness mm (in)	Part number
	4.4 (0.173)	31537-57X81
	4.6 (0.181)	31537-51X00
	4.8 (0.189)	31537-51X01
	5.0 (0.197)	31537-51X02
High clutch		
Number of drive plates	7	
Number of driven plates	7 + 1	
Thickness of drive plate mm (in)		
Standard	1.6 (0.063)	
Wear limit	1.4 (0.055)	
Clearance mm (in)		
Standard	1.8 - 2.2 (0.071 - 0.087)	
Allowable limit	3.0 (0.118)	
Thickness of retaining plate	Thickness mm (in)	Part number
	4.0 (0.157)	31537-51X19
	4.2 (0.165)	31537-51X60
	4.4 (0.173)	31537-51X61
	4.6 (0.181)	31537-51X00
	4.8 (0.189)	31537-51X01
5.0 (0.197)	31537-51X02	

Forward clutch		
Number of drive plates	8	
Number of driven plates	8	
Thickness of drive plate mm (in)		
Standard	2.0 (0.079)	
Wear limit	1.6 (0.063)	
Clearance mm (in)		
Standard	0.45 - 0.85 (0.0177 - 0.0335)	
Allowable limit	2.45 (0.0965)	
Thickness of retaining plate	Thickness mm (in)	Part number
	4.2 (0.165)	31537-51X67
	4.4 (0.173)	31537-51X05
	4.6 (0.181)	31537-51X06
	4.8 (0.189)	31537-51X07
	5.0 (0.197)	31537-51X08
5.2 (0.205)	31537-51X09	
Overrun clutch		
Number of drive plates	4	
Number of driven plates	7	
Thickness of drive plate mm (in)		
Standard	1.6 (0.063)	
Wear limit	1.4 (0.055)	
Clearance mm (in)		
Standard	1.0 - 1.4 (0.039 - 0.055)	
Allowable limit	2.2 (0.087)	
Thickness of retaining plate	Thickness mm (in)	Part number
	3.8 (0.150)	31537-51X11
	4.0 (0.157)	31537-51X12
	4.2 (0.165)	31537-51X13
	4.4 (0.173)	31537-51X14
	4.6 (0.181)	31537-51X15
4.8 (0.189)	31537-51X64	

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Specifications and Adjustment — RE4R03A (Cont'd)

Low & reverse brake		
Number of drive plates	2 + 6	
Number of driven plates	8	
Thickness of drive plate mm (in)		
Standard	1.6 (0.063)	
Wear limit	1.4 (0.055)	
Clearance mm (in)		
Standard	1.1 - 1.5 (0.043 - 0.059)	
Allowable limit	2.5 (0.098)	
Thickness of retaining plate	Thickness mm (in)	Part number
	4.2 (0.165)	31667-51X10
	4.4 (0.173)	31667-51X00
	4.6 (0.181)	31667-51X01
	4.8 (0.189)	31667-51X02
	5.0 (0.197)	31667-51X03
Brake band		
Anchor end bolt tightening torque N-m (kg-m, ft-lb)	4 - 6 (0.4 - 0.6, 2.9 - 4.3)	
Number of returning revolutions for anchor end bolt	2.5	

REVERSE CLUTCH DRUM END PLAY

Reverse clutch drum end play "T ₂ "	0.55 - 0.90 mm (0.0217 - 0.0354 in)	
Thickness of oil pump thrust washer	Thickness mm (in)	Part number
	0.7 (0.028)	31528-21X00
	0.9 (0.035)	31528-21X01
	1.1 (0.043)	31528-21X02
	1.3 (0.051)	31528-21X03
	1.5 (0.059)	31528-21X04
	1.7 (0.067)	31528-21X05
1.9 (0.075)	31528-21X06	

REMOVAL AND INSTALLATION

Manual control linkage	
Number of returning revolutions for lock nut	1
Lock nut tightening torque	11 - 15 N-m (1.1 - 1.5 kg-m, 8 - 11 ft-lb)
Distance between end of clutch housing and torque converter	25.0 mm (0.984 in) or more
Drive plate runout limit	0.5 mm (0.020 in)

OIL PUMP AND LOW ONE-WAY CLUTCH

Oil pump clearance mm (in)	
Cam ring — oil pump housing	
Standard	0.01 - 0.024 (0.0004 - 0.0009)
Rotor, vanes and control piston — oil pump housing	
Standard	0.03 - 0.044 (0.0012 - 0.0017)
Seal ring clearance mm (in)	
Standard	0.10 - 0.25 (0.0039 - 0.0098)
Allowable limit	0.25 (0.0098)

TOTAL END PLAY

Total end play "T ₁ "	0.25 - 0.55 mm (0.0098 - 0.0217 in)	
Thickness of oil pump cover bearing race	Thickness mm (in)	Part number
	0.8 (0.031)	31429-21X00
	1.0 (0.039)	31429-21X01
	1.2 (0.047)	31429-21X02
	1.4 (0.055)	31429-21X03
	1.6 (0.063)	31429-21X04
	1.8 (0.071)	31429-21X05
	2.0 (0.079)	31429-21X06

PROPELLER SHAFT & DIFFERENTIAL CARRIER

SECTION **PD**


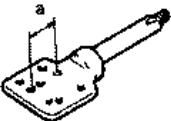
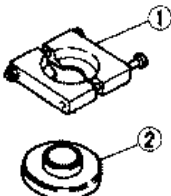
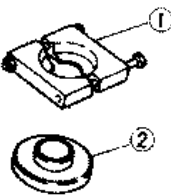
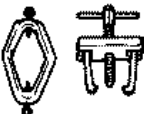

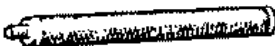

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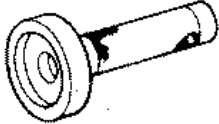

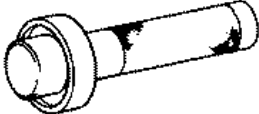

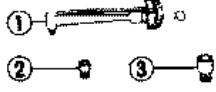

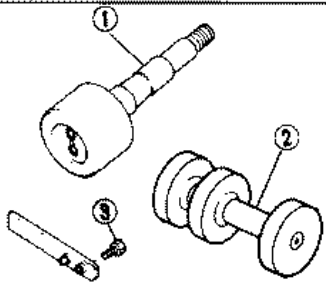
PD

PREPARATION

SPECIAL SERVICE TOOLS

Tool number Tool name	Description	Unit application		
		R200V	R230V	
ST38060002 Drive pinion flange wrench		Removing and installing propeller shaft lock nut, and drive pinion lock nut Use two holes and propeller shaft connecting bolt to hold companion flange.	X	—
KV38100800 Differential attachment		Mounting final drive (To use, make a new hole.) a: 158 mm (6.14 in) — R200V 178 mm (7.01 in) — R230V	X	X
ST3090S000 Drive pinion rear inner race puller set ① ST30031000 Puller ② ST30901000 Base		Removing and installing drive pinion rear cone	X	—
ST3002S000 Drive pinion rear inner race puller set ① ST30021000 Puller ② ST30022000 Base		Removing and installing drive pinion rear cone	—	X
ST33051001 Differential side bearing puller body		Removing and installing differential side bearing inner cone	X	X
ST33061000 Differential side bearing puller adapter		Removing and installing differential side bearing inner cone	X	—
ST30611000 Drift		Installing pinion rear bearing outer race	X	X
ST300813000 Drift		Installing pinion front bearing outer race	X	—

PREPARATION

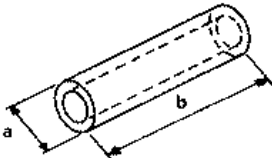
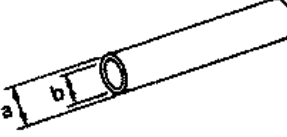
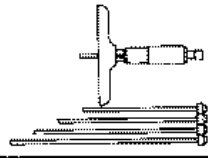

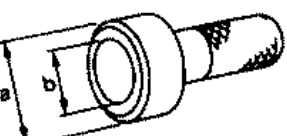
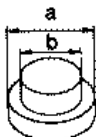
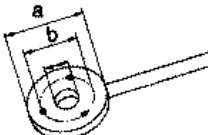
Tool number Tool name	Description	Unit application		
		R200V	R230V	
KV38100200 Oil seal drift		Installing side oil seal	X	—
KV38102510 Oil seal drift		Installing side oil seal	—	X
KV38100300 Drift		Installing side bearing inner cone	X	—
KV38100600 Side bearing spacer drift		Installing side bearing spacer	X	X
ST3127S000 Preload gauge ① GG91030000 Torque wrench ② HT62940000 Socket adapter ③ HT62900000 Socket adapter		Measuring pinion bearing preload and total preload	X	X
HT72400000 Slide hammer		Removing differential case assembly	X	X
KV381039S0 Drive pinion height setting gauge ① KV38103910 Dummy shaft ② KV38100120 Height gauge ③ KV38100140 Stopper		Selecting pinion height adjusting washer	X	—

PREPARATION

Tool number Tool name	Description	Unit application	
		R200V	R230V
KV381076S0 Drive pinion height setting gauge ① KV38107610 Dummy shaft ② KV38107650 Rear bearing spacer ③ KV38107640 Front bearing spacer ④ KV38107620 Height gauge ⑤ KV38107660 Side bearing adapter ⑥ KV38107630 Adapter shaft	Selecting pinion height adjusting washer 	—	X

PREPARATION

COMMERCIAL SERVICE TOOLS

Tool name	Description	Unit application	
		R200V	R230V
Drift	 <p>Installing pinion rear bearing outer race a: 89 mm (3.50 in) dia. — R200V 89 mm (3.90 in) dia. — R230V b: 200 mm (7.87 in)</p>	X	X
Oil seal drift	 <p>Installing front oil seal a: 85 mm (3.35 in) dia. b: 69 mm (2.72 in) dia.</p>	—	X
Depth micrometer	 <p>Measuring bearing height</p>	X	X
Drift	 <p>Installing pinion front bearing outer race a: 79 mm (3.11 in) dia.</p>	—	X
Drift	 <p>Installing side bearing inner cone a: 64 mm (2.52 in) dia. b: 55.5 mm (2.185 in) dia.</p>	—	X
Adapter	 <p>Removing and installing differential side bearing inner cone a: 54 mm (2.13 in) dia. b: 39 mm (1.54 in) dia.</p>	—	X
Drive pinion flange wrench	 <p>Removing and installing propeller shaft lock nut, and drive pinion lock nut. a: 107 mm (4.21 in) dia. b: 94 mm (3.70 in) dia. c: 50 mm (1.97 in) dia.</p>	—	X

PROPELLER SHAFT

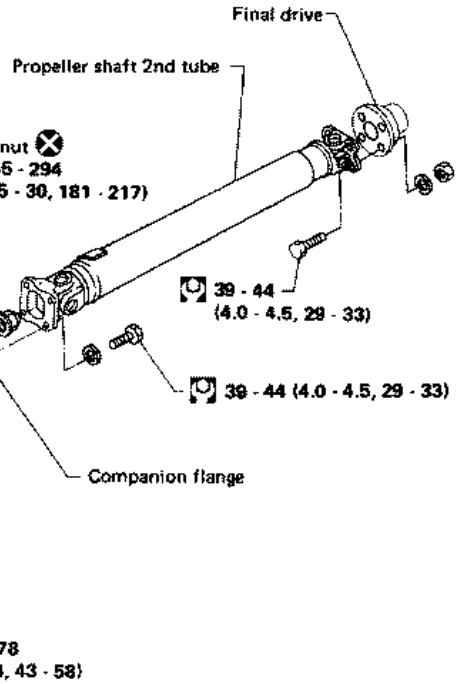
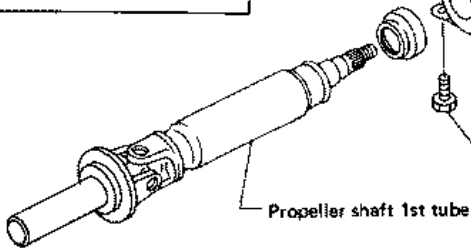
3S71A

Washer
Apply a coat of multi-purpose lithium grease containing molybdenum disulfide to the end face of the center bearing and both sides of the washer.

A/T model



M/T model



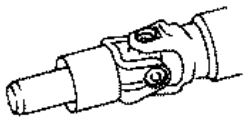
: N·m (kg·m, ft·lb)

SPD985

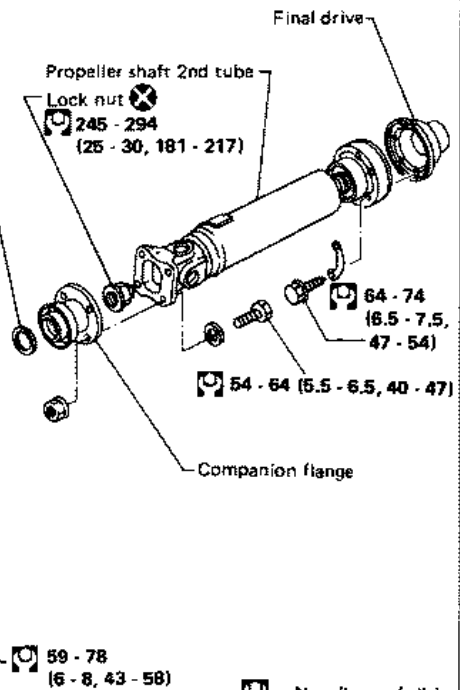
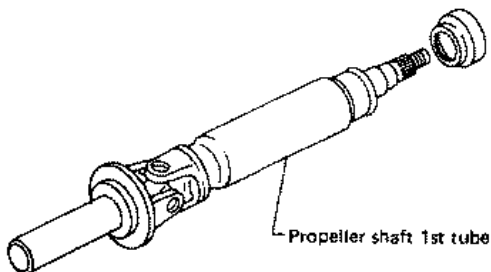
3S80A-VL107

Washer
Apply a coat of multi-purpose lithium grease containing molybdenum disulfide to the end face of the center bearing and both sides of the washer.

A/T model



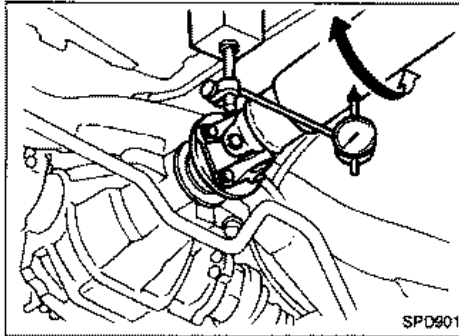
M/T model



: N·m (kg·m, ft·lb)

SPD882

PROPELLER SHAFT



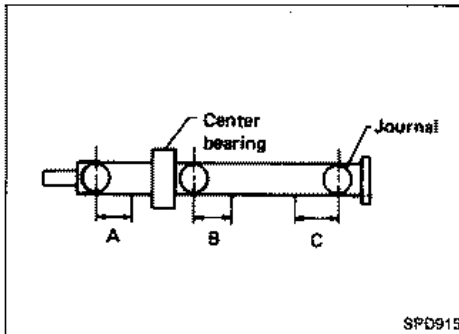
On-vehicle Service

PROPELLER SHAFT VIBRATION

If vibration is present at high speed, inspect propeller shaft runout first.

1. Raise rear wheels.
2. Measure propeller shaft runout at indicated points by rotating final drive companion flange with hands.

Runout limit: 0.6 mm (0.024 in)



Propeller shaft runout measuring points:

Distance "A":

162 mm (6.38 in)

Distance "B":

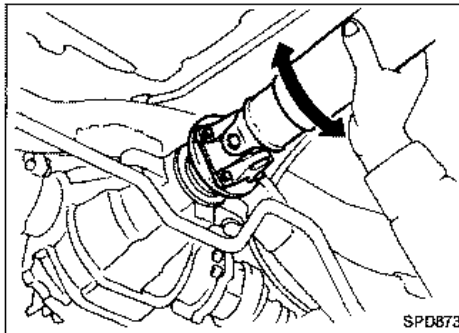
3S71A: 172 mm (6.77 in)

3S80A-VL107: 200 mm (7.87 in)

Distance "C":

3S71A: 192 mm (7.56 in)

3S80A-VL107: 200 mm (7.87 in)



3. If runout exceeds specifications, disconnect propeller shaft at final drive companion flange. Rotate companion flange 90° (3S71A) or 60° (3S80A-VL107), and reconnect propeller shaft and check runout.

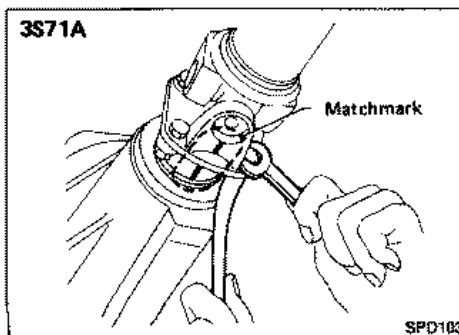
Repeat above operation when companion flange is rotated 180° (3S71A) or 120° (3S80A-VL107) and 270° (3S71A) or 180° (3S80A-VL107), respectively. Also, for 3S80A-VL107, the operation should be repeated at 240° and 300°. Securely connect propeller shaft at the point where the smallest runout of the three measurements occurs.

Runout limit: 0.6 mm (0.024 in)

4. Check runout again. If runout still exceeds specifications, replace propeller shaft assembly.
5. Perform road test.

APPEARANCE CHECKING

- Inspect propeller shaft tube surface for dents or cracks. If damaged, replace propeller shaft assembly.
- If center bearing is noisy or damaged, replace center bearing.

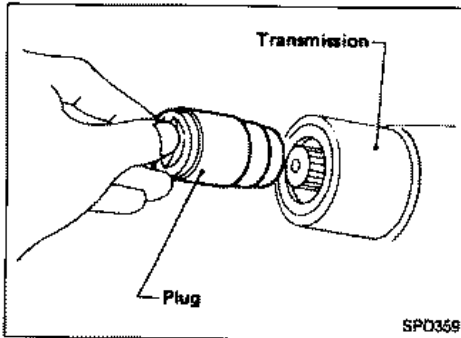
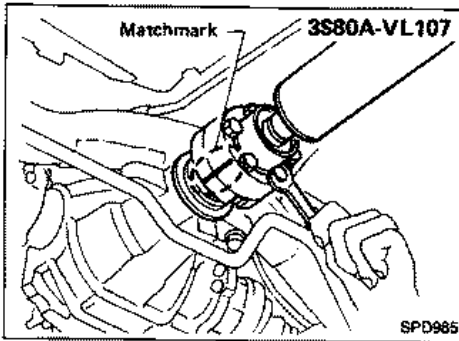


Removal

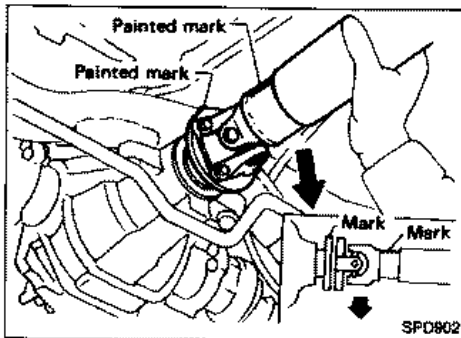
- Put matchmarks on flanges and separate propeller shaft from final drive.

PROPELLER SHAFT

Removal (Cont'd)

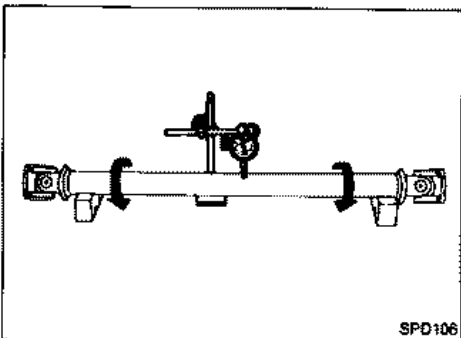


- Draw out propeller shaft from transmission and plug up rear end of transmission rear extension housing.



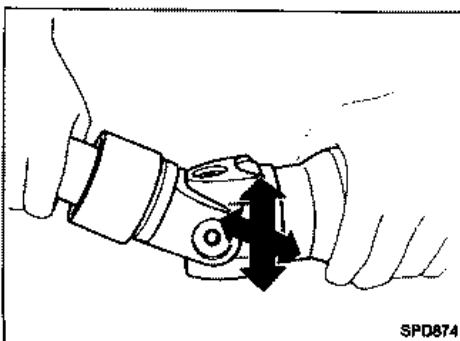
Installation

- Temporarily install differential companion flange and flange yoke so that their alignment marks (original marks) are located as close to each other as possible.
- Turn propeller shaft until alignment marks face straight upward. Securely fasten propeller shaft so that lower side wall of concave flange yoke will touch lower side wall of convex companion flange.



Inspection

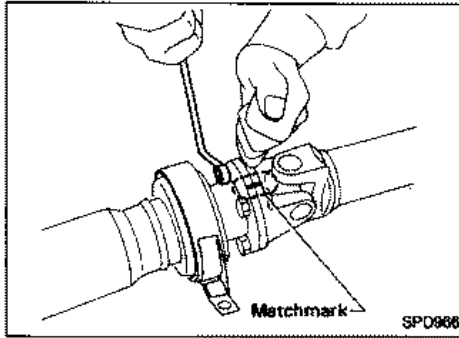
- Inspect propeller shaft runout. If runout exceeds specifications, replace propeller shaft assembly.
Runout limit: 0.6 mm (0.024 in)



- Inspect journal axial play. If the play exceeds specifications, replace propeller shaft assembly.

Journal axial play:
0 mm (0 in)

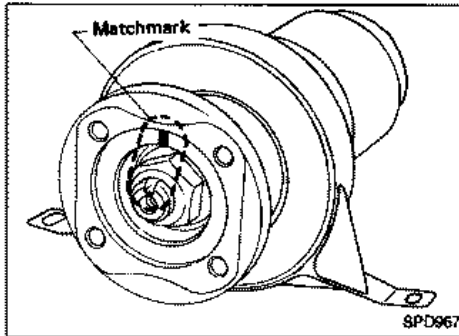
PROPELLER SHAFT



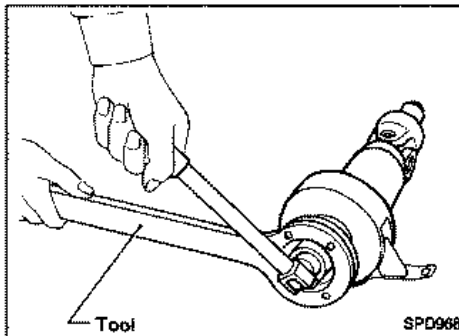
Disassembly

CENTER BEARING

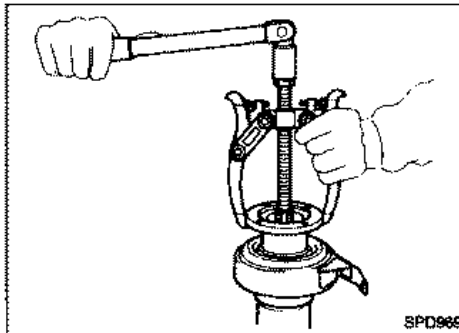
1. Put matchmarks on flanges, and separate 2nd tube from 1st tube.



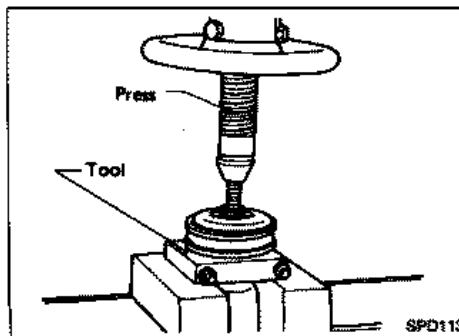
2. Put matchmarks on the flange and shaft.



3. Remove locking nut with Tool.
Tool number:
ST38060002

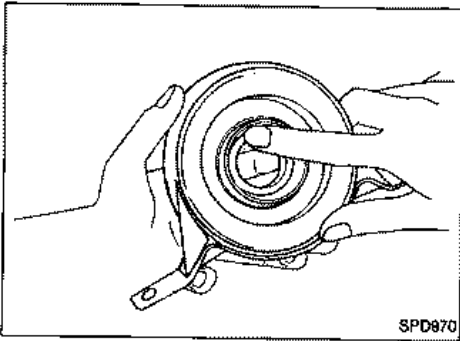


4. Remove companion flange with puller.



5. Remove center bearing with Tool and press.
Tool number: **ST30031000**

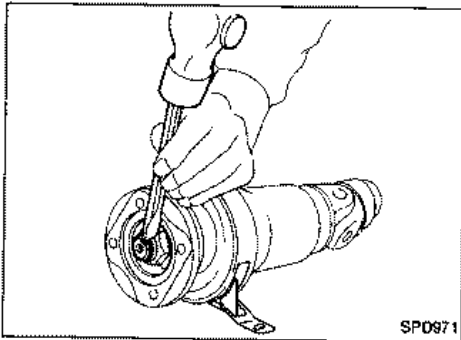
PROPELLER SHAFT



Assembly

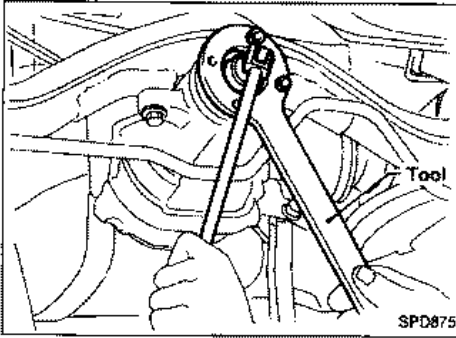
CENTER BEARING

- Install center bearing with insulator's protrusion side facing front of vehicle.
- Apply a coat of multi-purpose lithium grease containing molybdenum disulfide to the end face of the center bearing and both sides of the washer.



- Stake the nut. Always use new one.
- Align matchmarks when assembling tubes.

ON-VEHICLE SERVICE (Final drive)

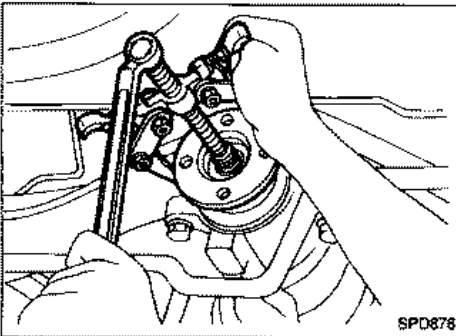


Front Oil Seal Replacement (R200V)

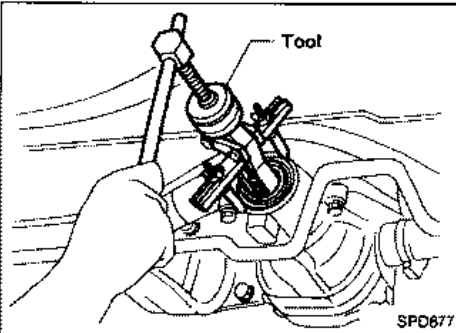
CAUTION:

For final drive models using collapsible spacer (R230V), bearing preload must be adjusted whenever companion flange is removed. In order to do this adjustment correctly, final drive overhaul is required.

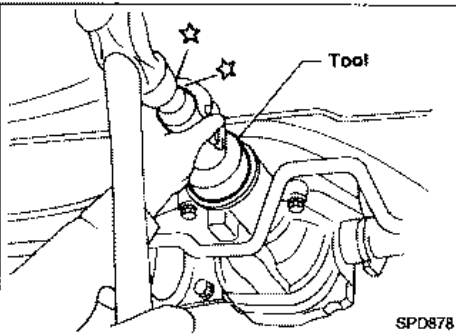
1. Remove propeller shaft.
2. Loosen drive pinion nut with Tool.
Tool number: ST38060002



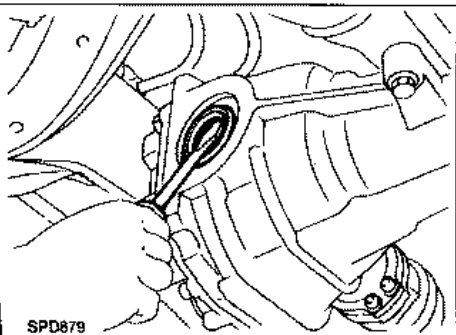
3. Remove companion flange.



4. Remove front oil seal.



5. Apply multi-purpose grease to sealing lips of oil seal. Press front oil seal into carrier.
6. Install companion flange and drive pinion nut.
7. Install propeller shaft.

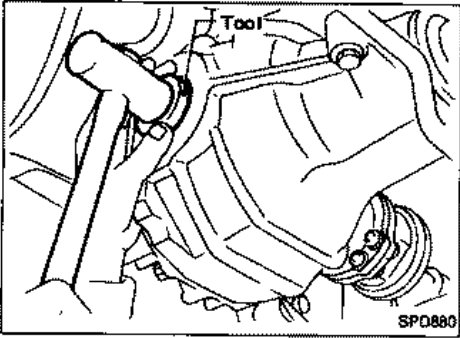


Side Oil Seal Replacement

1. Remove drive shafts.
Refer to RA section.
2. Remove final drive side flange.
3. Remove oil seal.

ON-VEHICLE SERVICE (Final drive)

Side Oil Seal Replacement (Cont'd)



4. Apply multi-purpose grease to sealing lips of oil seal. Press-fit oil seal into carrier with Tool.

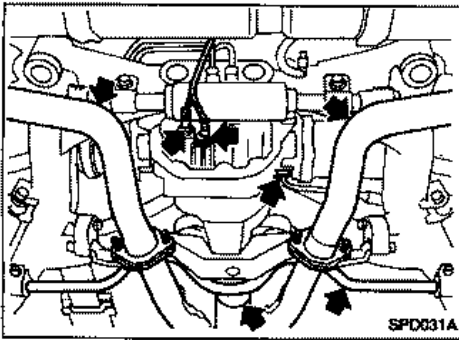
Tool number:

KV38100200 — R200V —

KV38102510 — R230V —

5. Install final drive side flange and drive shaft.

REMOVAL AND INSTALLATION



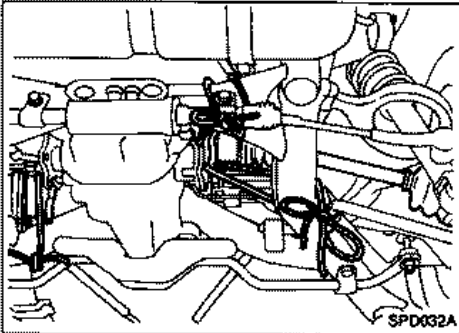
Removal

1. Remove exhaust tube.
2. Remove stabilizer bar.
3. Remove propeller shaft.

Plug rear end of transmission rear extension housing.

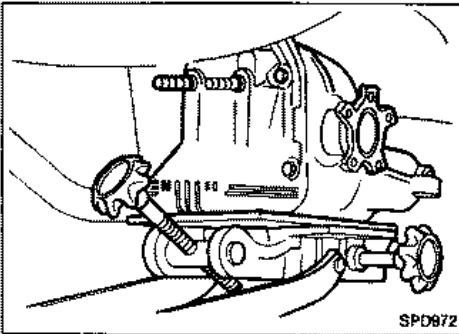
CAUTION:

- Be careful not to damage splines, sleeve yoke and transmission rear oil seal when removing propeller shaft.

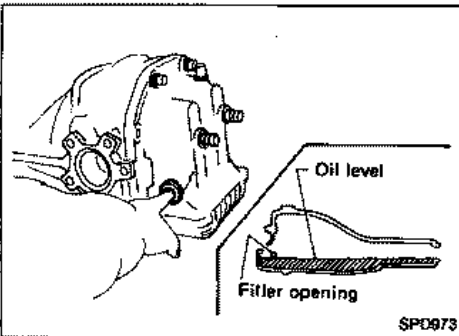


4. Disconnect drive shafts and pull them to wheel side with a wire.
5. Disconnect the following items if applicable.
 - Oil cooler warning switch connector
 - Oil cooler temperature switch connector
 - A.B.S. sensor connector
 - Hoses to oil cooler

When disconnecting oil cooler hoses, put a tray underneath.



6. Support final drive with a jack.
7. Remove securing bolts and nuts from final drive.
8. Move final drive forward and lower with jack.

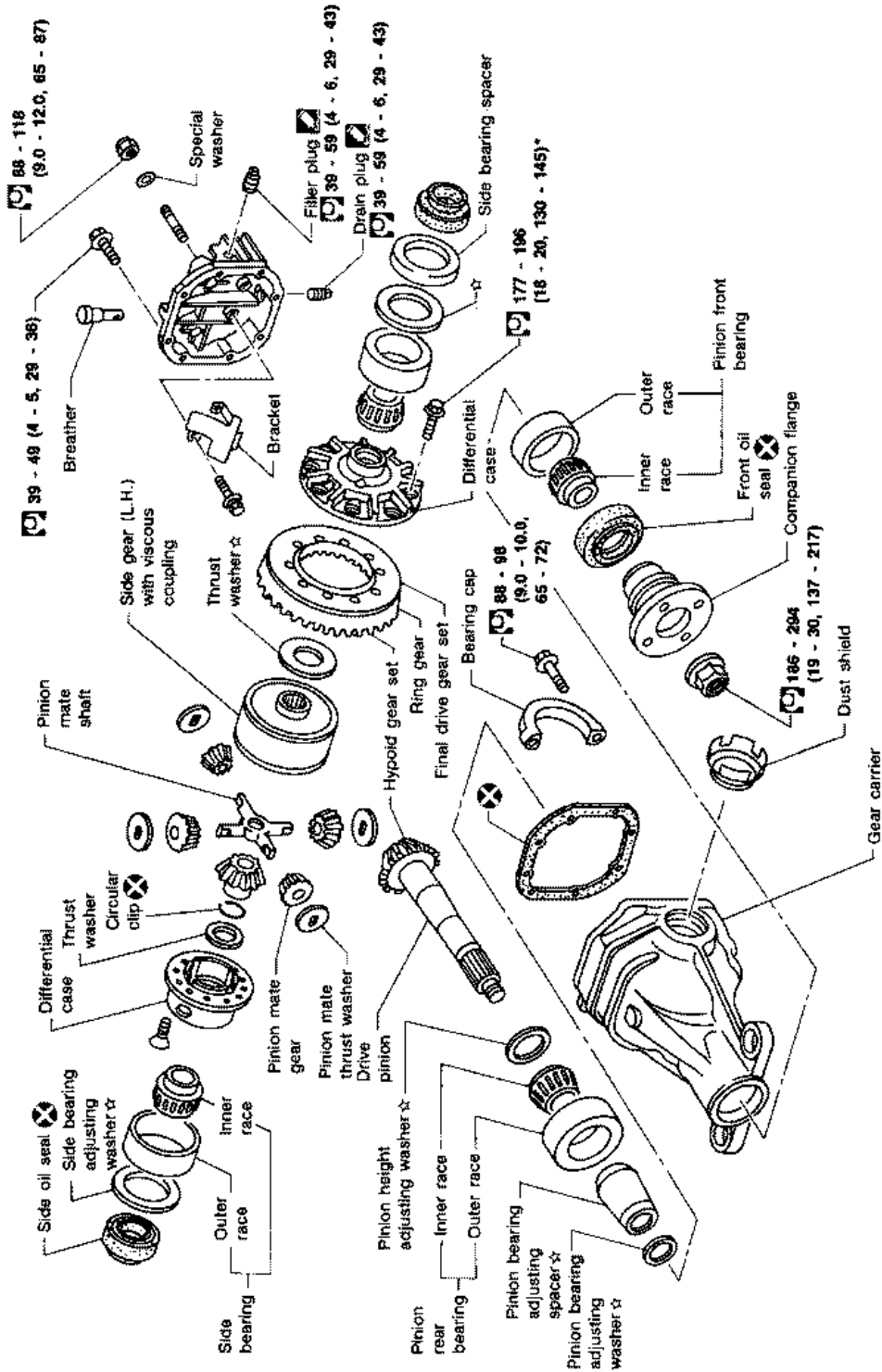


Installation

- Fill final drive with recommended gear oil.

FINAL DRIVE

Model R200V

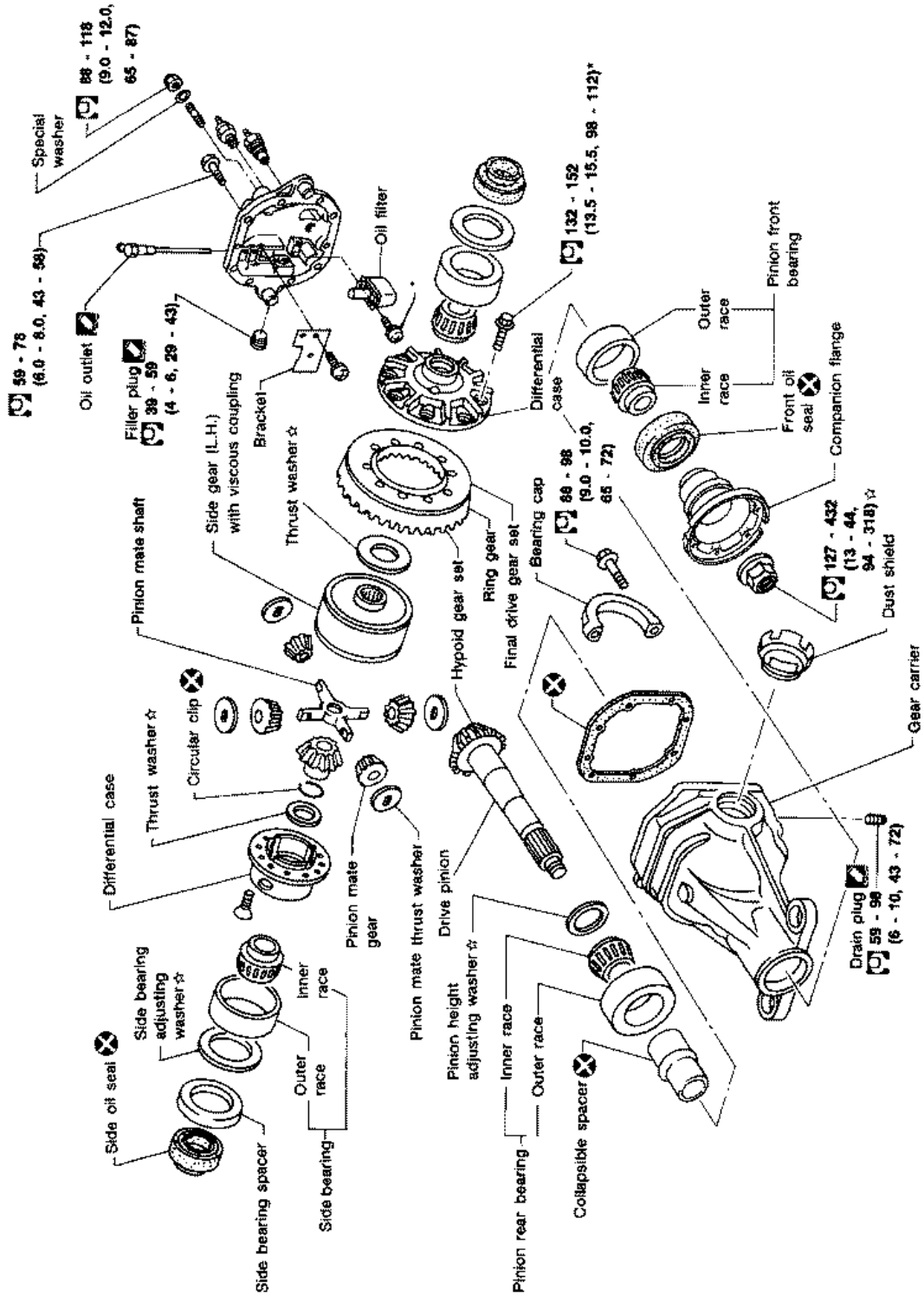


☆ : Adjustment is required.
 □ : Using locking agent [Locktite (Stud lock) or equivalent]
 ☆ : N-m (kg-m, ft-lb)

SPD016A

FINAL DRIVE

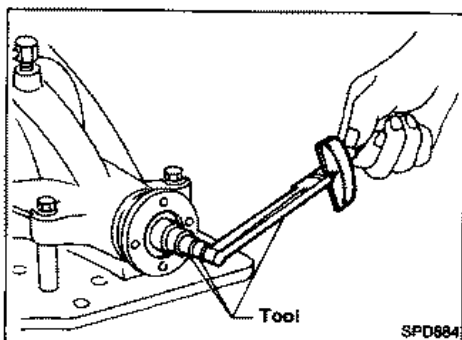
Model R230V



☆ : Adjustment is required.
 * : Using locking agent [Loctite (Stud lock) or equivalent]
 [] : N·m (kg·m, ft·lb)

SPD023A

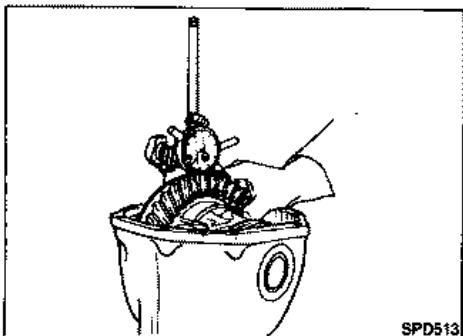
DISASSEMBLY



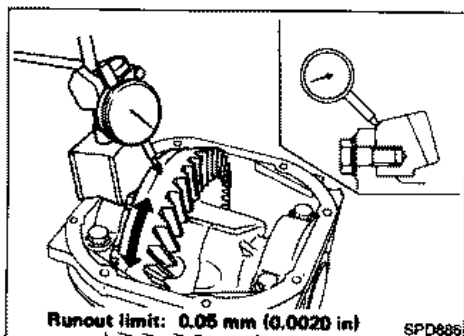
Pre-inspection

Before disassembling final drive, perform the following inspection.

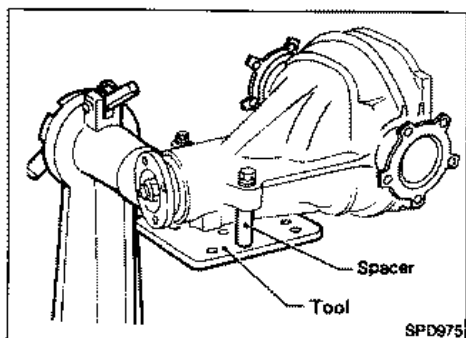
- Total preload
 - 1) Turn drive pinion in both directions several times to set bearing rollers.
 - 2) Check total preload with Tool.
Tool number: ST3127S000
Total preload:
1.4 - 1.7 N-m
(14 - 17 kg-cm, 12 - 15 in-lb)



- Ring gear to drive pinion backlash
Check ring gear-to-drive pinion backlash with a dial indicator at several points.
Ring gear-to-drive pinion backlash:
0.10 - 0.15 mm (0.0039 - 0.0059 in)

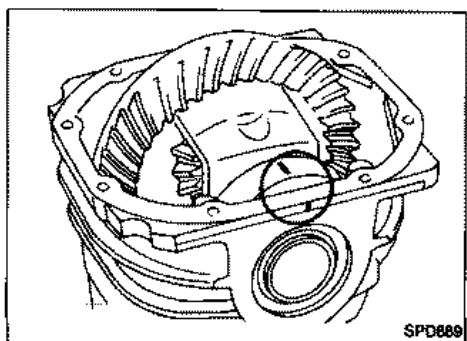


- Ring gear runout
Check runout of ring gear with a dial indicator.
Runout limit:
0.05 mm (0.0020 in)
- Tooth contact
Check tooth contact. (Refer to Adjustment.)



Differential Carrier

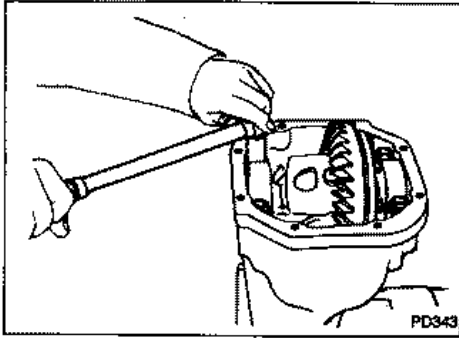
1. Using two 45 mm (1.77 in) spacers, mount carrier on Tool.
Tool number: KV38100800



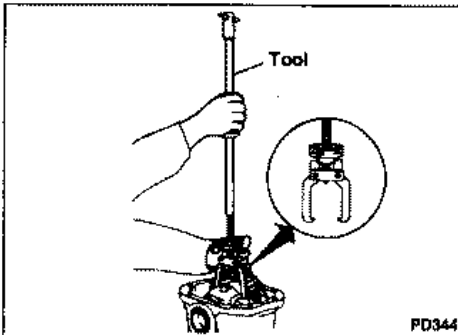
2. Paint or punch matchmarks on one side of the side bearing cap so it can be properly reinstalled.
Bearing caps are line-bored during manufacture. Replace them in their proper positions.

DISASSEMBLY

Differential Carrier (Cont'd)

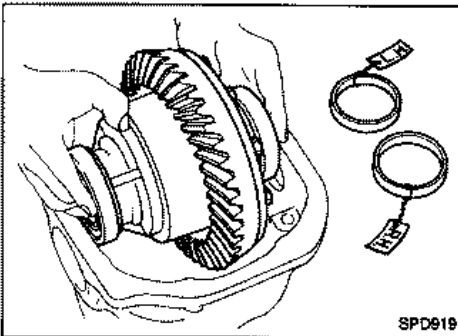


3. Remove side bearing caps.



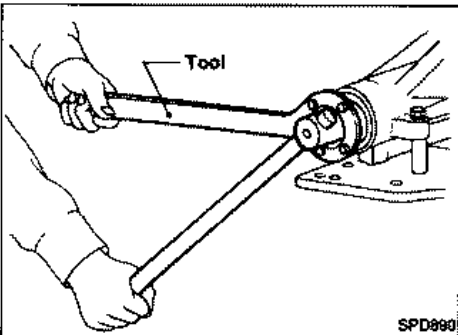
4. Lift differential case assembly out with Tool.

Tool number: HT72400000



Keep the side bearing outer races together with inner cone — do not mix them up.

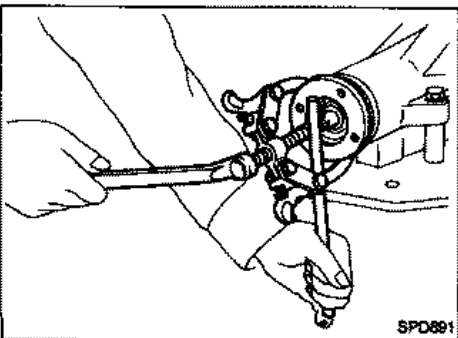
Also, keep side bearing spacer and adjusting shims together with bearings.



5. Loosen drive pinion nut and pull off companion flange.

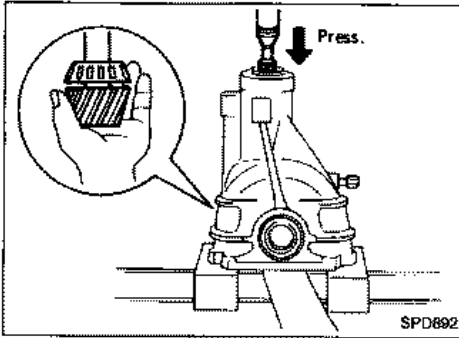
Tool number:

ST38060002 — R200V —

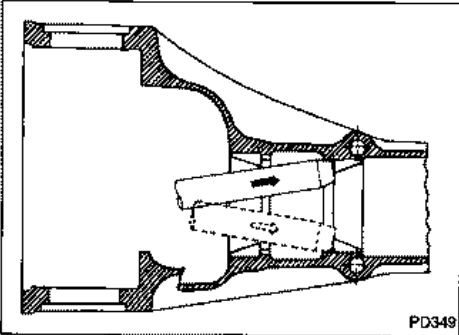


DISASSEMBLY

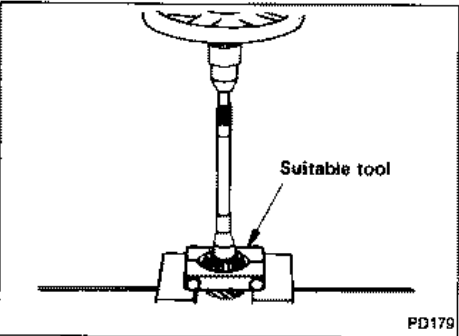
Differential Carrier (Cont'd)



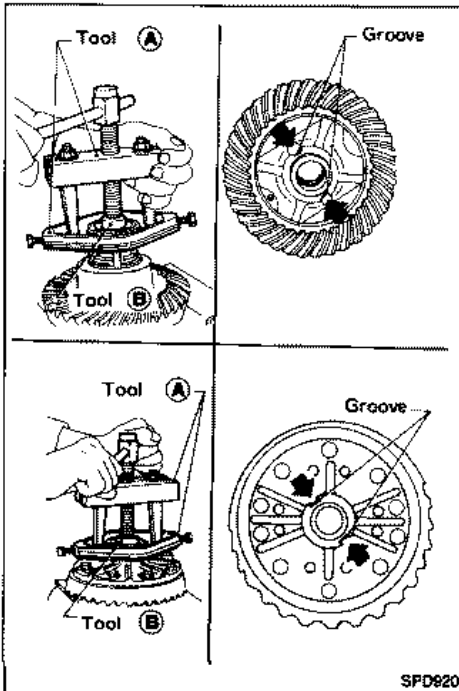
6. Take out drive pinion (together with rear bearing inner race, bearing spacer and adjusting washer).
7. Remove oil seal.
8. Remove front bearing inner race.
9. Remove side oil seal.



10. Remove pinion bearing outer races with a brass drift.



11. Remove pinion rear bearing inner race and drive pinion height adjusting washer with a suitable tool.



Differential Case

1. Remove side bearing inner cones.
To prevent damage to bearing, engage puller jaws in groove.

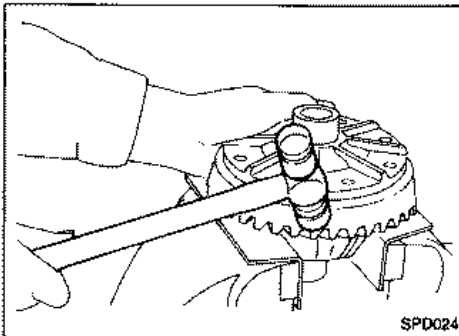
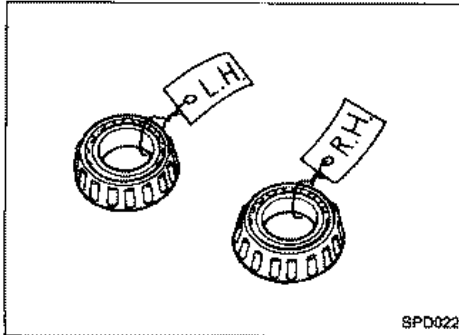
Tool number:

- Ⓐ ST33051001
- Ⓑ ST33061000 — R200V —

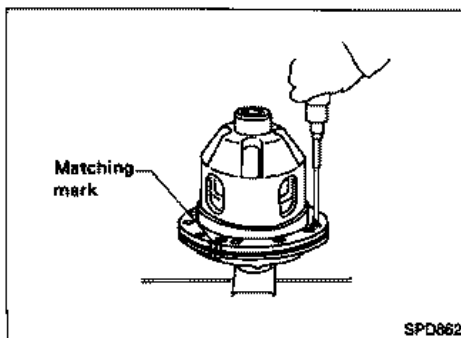
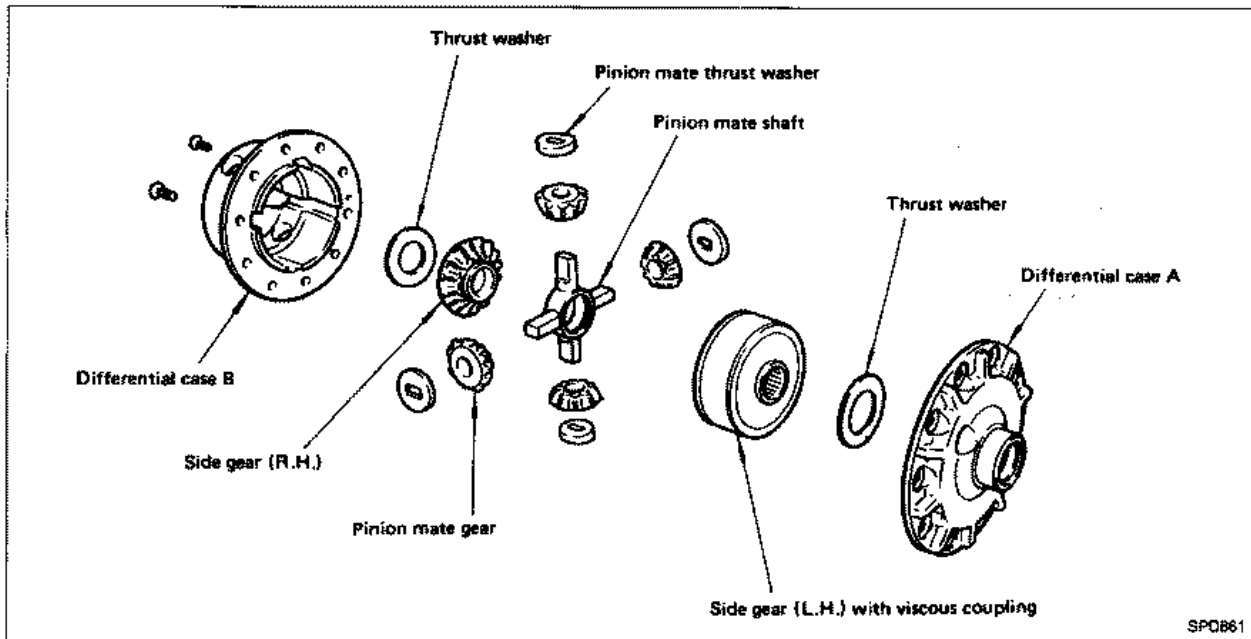
DISASSEMBLY

Differential Case (Cont'd)

Be careful not to confuse left- and right-hand parts.



2. Loosen ring gear bolts in a criss-cross fashion.
3. Tap ring gear off the differential case with a soft hammer.
Tap evenly all around to keep ring gear from binding.



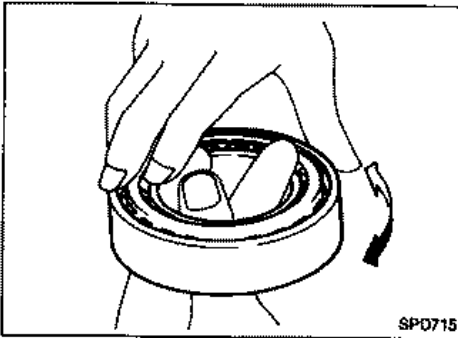
4. Loosen screws on differential cases A and B.
5. Separate differential cases A and B.

CAUTION:
Assemble differential case firmly.

INSPECTION

Contact Surfaces

1. Clean the disassembled parts in suitable solvent and blow dry with compressed air.
2. If following surfaces are found to be burred or scratched, smooth with oil stone.
 - Differential case A
 - Differential case B
 - Side gear
 - Pinion mate gear
 - Pinion mate shaft
3. Check viscous coupling for oil leakage. If necessary, replace it with a new one.

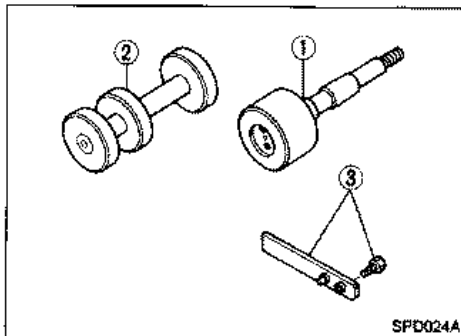


Bearing

1. Thoroughly clean bearing.
2. Check bearings for wear, scratches, pitting or flaking. Check tapered roller bearing for smooth rotation. If damaged, replace outer race and inner cone as a set.

ADJUSTMENT

To avoid confusion while calculating thickness of washers, it is absolutely necessary to stay with the metric system. If you measure anything in inches, **the results must be converted to the metric system.**

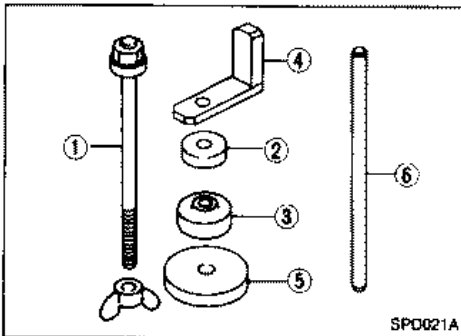


Drive Pinion Height

1. Prepare Tools for pinion height adjustment.

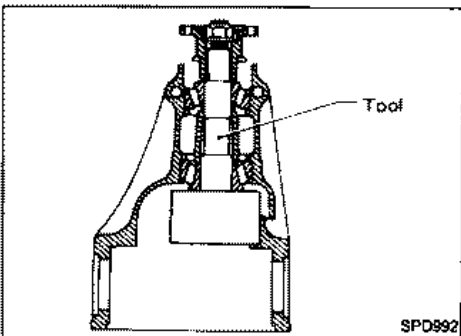
— R200V —

- ① Dummy shaft (KV38103910)
- ② Height gauge (KV38100120)
- ③ Stopper (KV38100140)



— R230V —

- ① Dummy shaft (KV38107610)
- ② Rear bearing spacer (KV38107650)
- ③ Front bearing spacer (KV38107640)
- ④ Height gauge (KV38107620)
- ⑤ Side bearing adapter (KV38107660)
- ⑥ Adapter shaft (KV38107630)



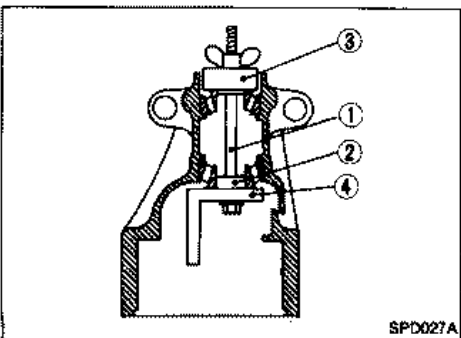
2. Lubricate bearings and set Tools as shown. Tighten nut carefully until bearings reach specified preload.

— R200V —

Tool: Dummy shaft (KV38103910)

Bearing preload:

1.0 - 1.4 N·m (10 - 14 kg-cm, 8.7 - 12.2 in-lb)



— R230V —

Tool:

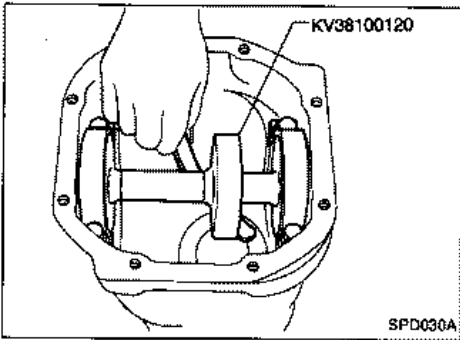
- ① Dummy shaft (KV38107610)
- ② Rear bearing spacer (KV38107650)
- ③ Front bearing spacer (KV38107640)
- ④ Height gauge (KV38107620)

Bearing preload:

1.8 - 2.6 N·m (18 - 27 kg-cm, 16 - 23 in-lb)

ADJUSTMENT

Drive Pinion Height (Cont'd)

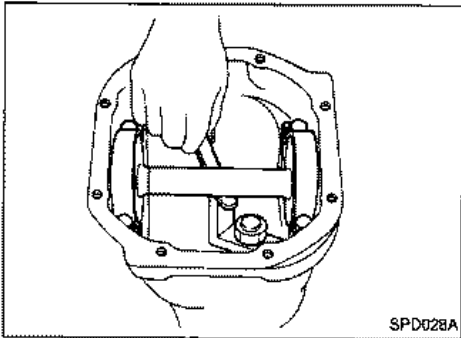


3. Attach Tools to gear carrier.

— R200V —

Measure clearance between height gauge and dummy shaft face.

Add 0.5 mm (0.020 in) to your measurement and write this figure down.

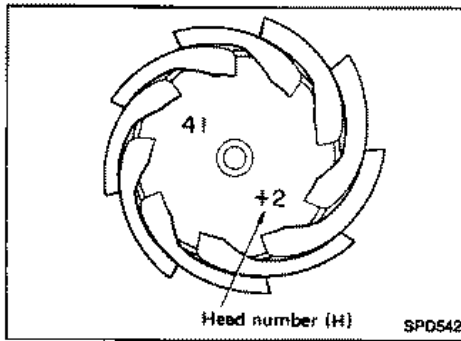


— R230V —

Measure clearance between height gauge and adapter shaft face and write this figure down.

ADJUSTMENT

Drive Pinion Height (Cont'd)



4. Correct the pinion height washer size by referring to the "pinion head number."

There are two numbers painted on the pinion gear. The first one refers to the pinion and ring gear as a matched set and should be the same as the number on the ring gear. The second number is the "pinion head height number", and it refers to the ideal pinion height from standard for quietest operation. Use the following chart to determine the correct pinion height washer.

Pinion head height number	Add or remove from the standard pinion height washer thickness measurement
-6	Add 0.06 mm (0.0024 in)
-5	Add 0.05 mm (0.0020 in)
-4	Add 0.04 mm (0.0016 in)
-3	Add 0.03 mm (0.0012 in)
-2	Add 0.02 mm (0.0008 in)
-1	Add 0.01 mm (0.0004 in)
0	Use the selected washer thickness
+1	Subtract 0.01 mm (0.0004 in)
+2	Subtract 0.02 mm (0.0008 in)
+3	Subtract 0.03 mm (0.0012 in)
+4	Subtract 0.04 mm (0.0016 in)
+5	Subtract 0.05 mm (0.0020 in)
+6	Subtract 0.06 mm (0.0024 in)

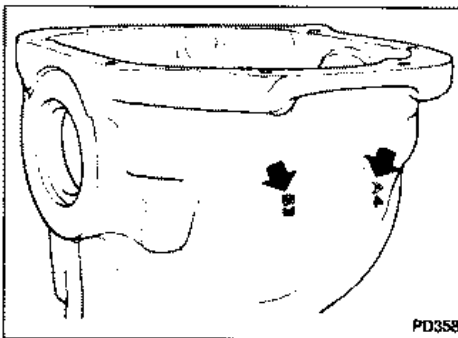
5. Select the correct pinion height washer.
Drive pinion height adjusting washer:
Refer to S.D.S.

ADJUSTMENT

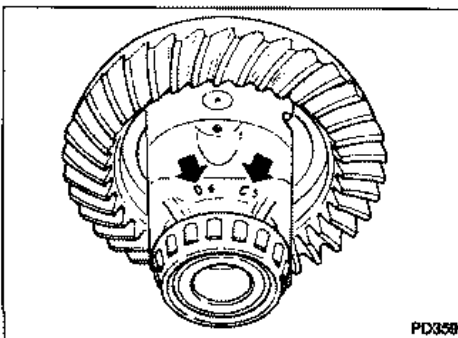
Side Bearing Preload

- To simplify the job, make a chart like the one below to organize your calculations.

LETTERS	VALUE	
	R200V	R230V
A: Left housing		
B: Right housing		
C: Differential case		
D: Differential case		
H: (+) or (-): ring gear		
E: Left side bearing		
R200V (= 21 - Measured height)		—
R230V (= 27 - Measured height)	—	
F: Right side bearing		
R200V (= 21 - Measured height)		—
R230V (= 27 - Measured height)	—	
G: Side bearing spacer (= 8.1 - measured thickness)		
X:	1.97	1.95
Y:	2.07	2.05



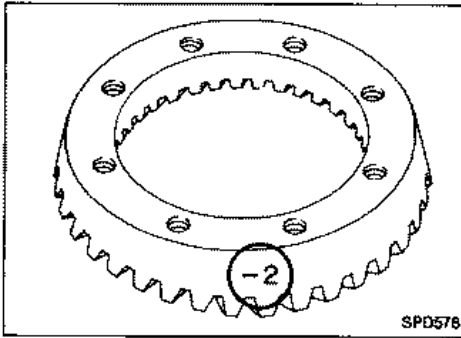
- Write the following numbers down in the chart.
If numbers for A, B, C, D and H are not given, regard them as zero.
A & B: Figures marked on gear carrier



- C & D: Figures marked on differential case

ADJUSTMENT

Side Bearing Preload (Cont'd)



H: Figure marked on ring gear
Do not confuse negative and positive values.

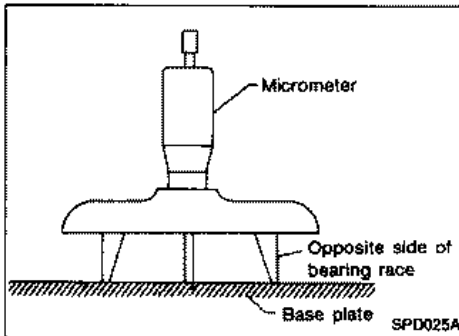
3. Calculate "E" and "F" as follows:

— R200V —

E & F = 21 mm (0.83 in) — Measured bearing height

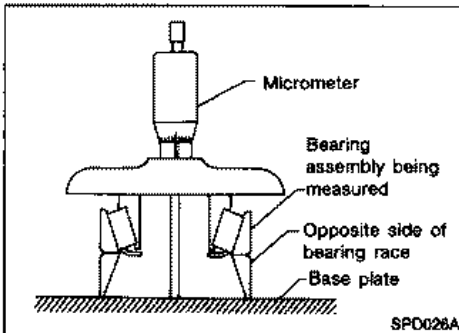
— R230V —

E & F = 27 mm (1.06 in) — Measured bearing height



Bearing height can be measured as follows:

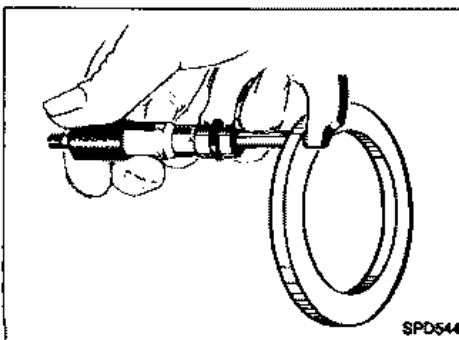
- a. Measure height of bearing race which will be used as a base for the opposite side of a side bearing assembly.



- b. Set bearing assembly to be measured on the base race and measure the total height.

Lubricate bearing assembly and turn it several times to settle it on the base for accurate measurement.

- c. Subtract base race height from total height.



4. Calculate "G".

G: This is the difference in thickness of side spacer from standard width [8.10 mm (0.3189 in)].

G = 8.10 mm (0.3189 in) — Measured thickness

ADJUSTMENT

Side Bearing Preload (Cont'd)

LETTERS	VALUE	
	R200V	R230V
A: Left housing		
B: Right housing		
C: Differential case		
D: Differential case		
H: (+) or (-): ring gear		
E: Left side bearing R200V (= 21 - Measured height)		—
R230V (= 27 - Measured height)	—	
F: Right side bearing R200V (= 21 - Measured height)		—
R230V (= 27 - Measured height)	—	
G: Side bearing spacer (= 8.1 - measured thickness)		
X:	1.97	1.95
Y:	2.07	2.05

Calculations:

Side bearing spacer is used on the right

Left side washer thickness

$$T_1 = (A - C + D - H) \times 0.01 + E + Y$$

Right side washer thickness

$$T_2 = (B - D + H) \times 0.01 + F + G + X$$

Side bearing spacer is used on the left

Left side washer thickness

$$T_1 = (A - C + D - H) \times 0.01 + E + G + X$$

Right side washer thickness

$$T_2 = (B - D + H) \times 0.01 + F + Y$$

ADJUSTMENT

Side Bearing Preload (Cont'd)

Example for R200V which has a side bearing spacer on the left:

A = 4	E = 0.18
B = 3	F = 0.15
C = 5	G = 0.08
D = 6	X = 1.97
H = -2	Y = 2.07

Left side washer thickness (with spacer)

$$T_1 = (A - C + D - H) \times 0.01 + E + G + X$$

4	A	
- 5	- C	
= -1		
+ 6	+ D	
= 5		
- (- 2)	- H	
= 7		
× 0.01	× 0.01	
= 0.07		
+ 0.18	+ E	
= 0.25		
+ 0.08	+ G	
= 0.33		
+ 1.97	+ X	
= 2.30		
T₁ = 2.30 mm		

Right side washer thickness (without spacer)

$$T_2 = (B - D + H) \times 0.01 + F + Y$$

3	B	
- 6	- D	
= - 3		
+ (- 2)	+ H	
= - 5		
× 0.01	× 0.01	
= - 0.05		
+ 0.15	+ F	
= 0.10		
+ 2.07	+ Y	
= 2.17		
T₂ = 2.17 mm		

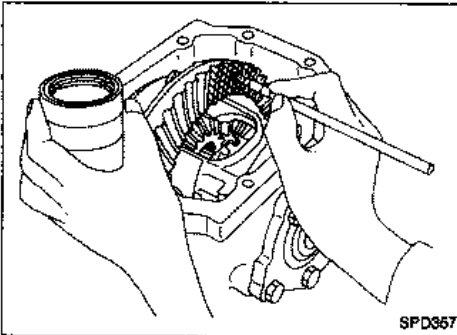
5. Select the proper shims. (Refer to S.D.S.)

If you cannot find the desired thickness of shims, use shims with the total thickness closest to the calculated value.

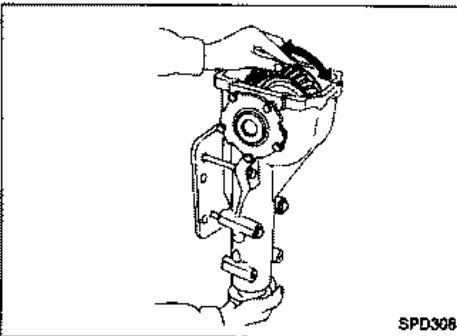
ADJUSTMENT

Tooth Contact

Checking gear tooth contact pattern is necessary to verify correct relationship between ring gear and drive pinion. Hypoid gear set which is not positioned properly in relation to one another may be noisy, or have short life or both. With the checking of gear tooth contact pattern, the most desirable contact for low noise level and long life can be assured.

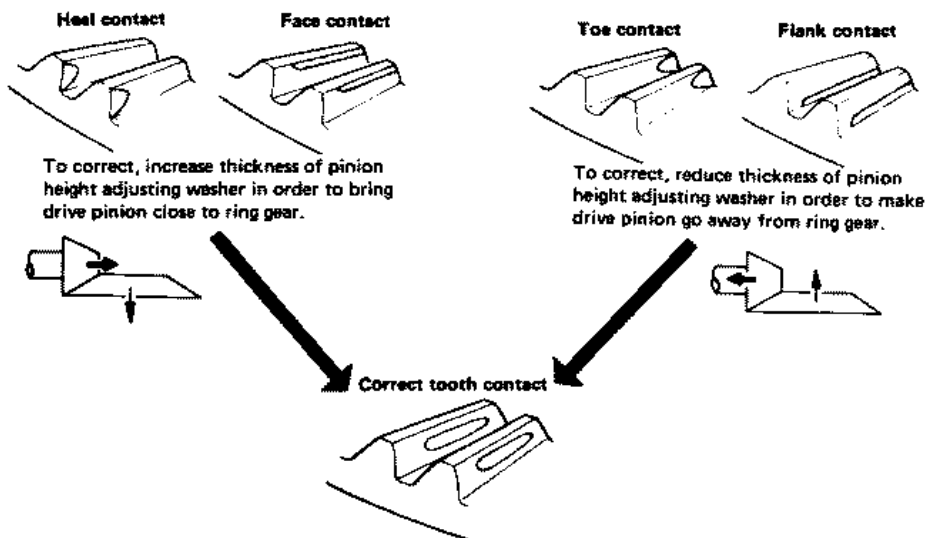


1. Thoroughly clean ring gear and drive pinion teeth.
2. Sparingly apply a mixture of powdered ferric oxide and oil or equivalent to 3 or 4 teeth of ring gear drive side.

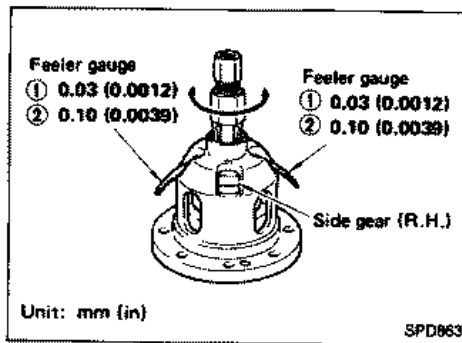


3. Hold companion flange steady by hand and rotate the ring gear in both directions.

Usually the pattern will be correct if you have calculated the shims correctly and the backlash is correct. However, in rare cases you may have to use trial-and-error processes until you get a good tooth contact pattern. The tooth pattern is the best indication of how well the final drive has been set up.



ASSEMBLY



Differential Case

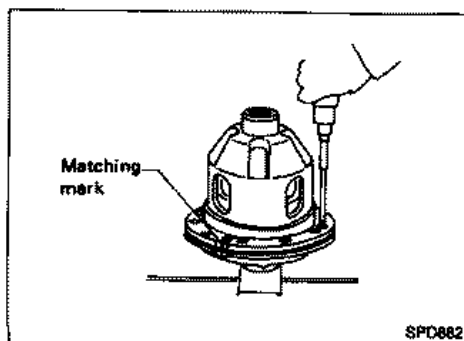
THRUST WASHER SELECTION

Whenever side gears or pinion mate gears are replaced, select suitable thrust washers as follows:

1. Clean side gears and pinion mate gears using white gasoline.
2. Before assembling gears, apply hypoid gear oil to frictional surfaces.
3. Install the previously removed thrust washer on right side gear. On left side gear, install a suitable thrust washer. Temporarily tighten differential cases using two screws.
4. Position differential assembly so that right side gear is on the upper side. Place a 0.03 mm (0.0012 in) feeler gauge (for example) between right side gear and thrust washer.

Do not insert feeler gauge in oil groove portion of differential case.

5. Also place a 0.03 mm (0.0012 in) additional feeler gauge between right side gear and thrust washer so that it is positioned diagonal to (180° apart from) the feeler gauge described previously.
6. Rotate right side gear with a suitable tool attached to splines.
If right side gear cannot be rotated, replace thrust washer used on left side gear with a thinner one.
7. Replace both 0.03 mm (0.0012 in) feeler gauges with 0.10 mm (0.0039 in) gauges. At this point, make sure right side gear does not rotate. If it does, replace thrust washer on left side gear with a thicker one so that right side gear does not rotate.
8. As explained in above example, select suitable thrust washers to ensure that:
 - a) Both side gears rotate. [0.03 mm (0.0012 in) feeler gauges are used in this case.]
 - b) Side gear is held stationary. [0.10 mm (0.0039 in) feeler gauges are used in this case.](Refer to S.D.S.)

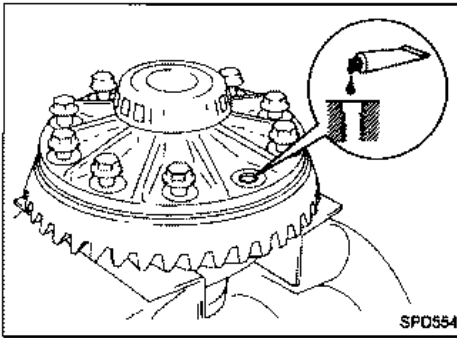


ASSEMBLY

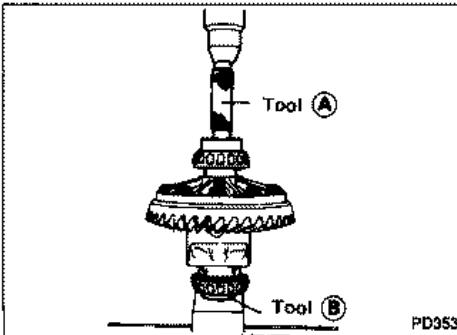
1. Install differential cases A and B.

ASSEMBLY

Differential Case (Cont'd)



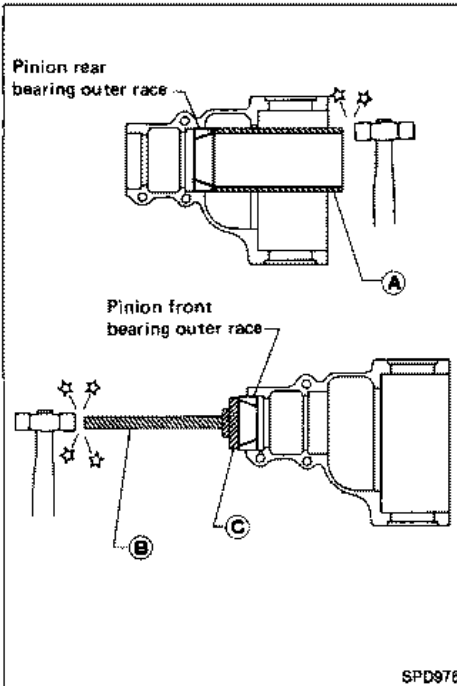
2. Place differential case on ring gear.
3. Apply locking sealant to ring gear bolts, and install them.
Tighten bolts in a criss-cross fashion, lightly tapping bolt head with a hammer.



4. Press-fit side bearing inner cones on differential case with Tool.

Tool number:

- (A) KV38100300 — R200V —
- (B) ST33061000 — R200V —



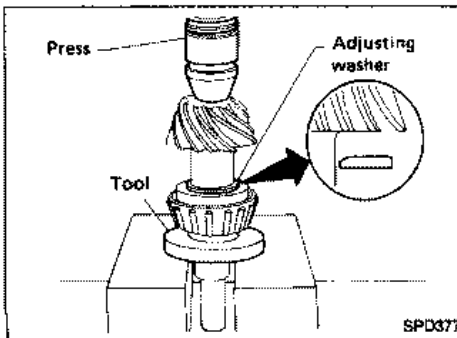
Differential Carrier

1. Press-fit front and rear bearing outer races with Tools.

Tool number:

- (A) suitable tool
- (B) ST30611000
- (C) ST30613000 — R200V —

2. Select pinion bearing adjusting washer and drive pinion bearing spacer, referring to ADJUSTMENT.



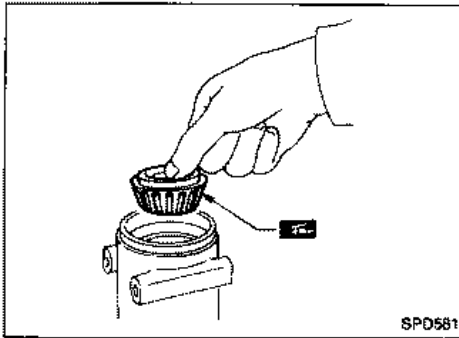
3. Install selected drive pinion height adjusting washer in drive pinion, and press-fit pinion rear bearing inner cone in it, using press and Tool.

Tool number:

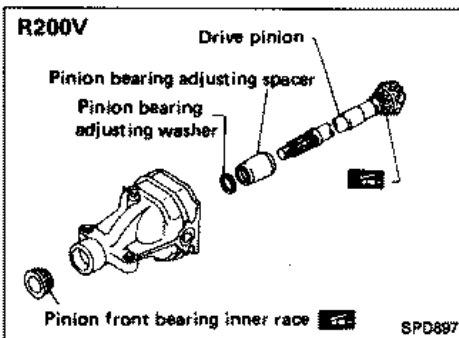
- ST30901000 — R200V —

ASSEMBLY

Differential Carrier (Cont'd)



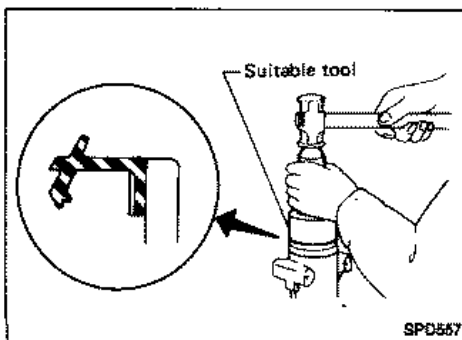
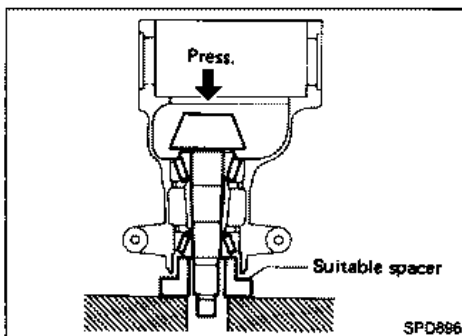
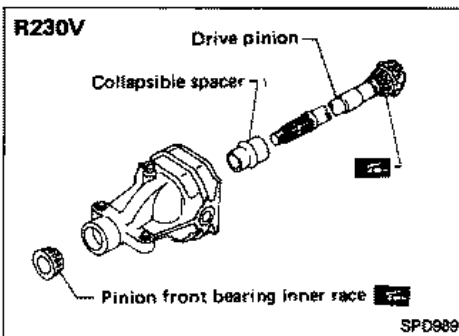
4. Place pinion front bearing inner cone in final drive housing.



5. Set drive pinion assembly (as shown in figures at left) in differential carrier and install drive pinion, with press and a suitable tool.

Stop when drive pinion touches bearing.

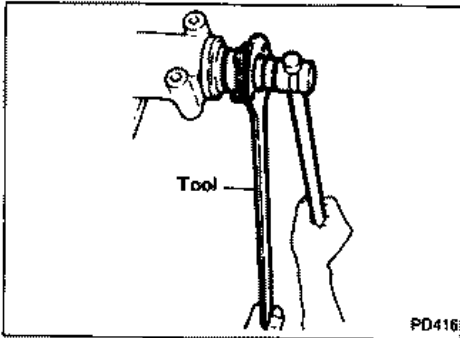
Apply multi-purpose grease to pinion rear bearing inner race, pinion front bearing inner race and front pilot bearing.



6. Apply multi-purpose grease to cavity at sealing lips of oil seal. Install front oil seal with a suitable tool.

ASSEMBLY

Differential Carrier (Cont'd)



7. Install companion flange.

— R200V —

Tighten pinion nut to specified torque with Tool.

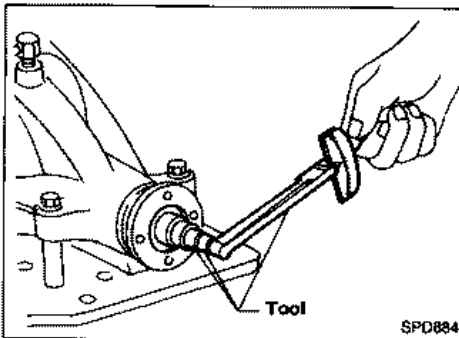
— R230V —

Tighten pinion nut to 127 N·m (13 kg·m, 94 ft-lb).

Make sure that threaded portion of drive pinion and pinion nut are free from oil or grease.

Tool number:

ST38060002 — R200V —



8.

— R200V —

Turn drive pinion in both directions several times, and measure pinion bearing preload.

Pinion bearing preload:

1.1 - 1.4 N·m

(11 - 14 kg·cm, 9.5 - 12.2 in-lb)

When pinion bearing preload is outside the specifications, replace pinion bearing adjusting washer and spacer with a different thickness.

— R230V —

Tighten the pinion nut by very small degrees until the specified preload is achieved. When checking the preload, turn the drive pinion in both directions several times to set the bearing rollers.

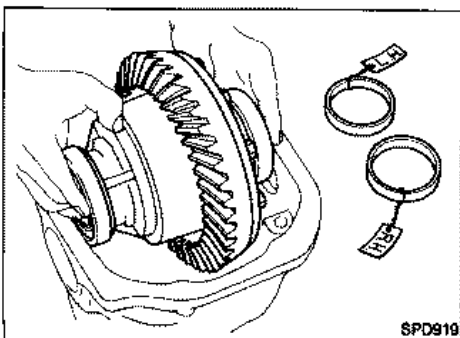
Pinion bearing preload:

1.8 - 2.6 N·m

(18 - 27 kg·cm, 16 - 23 in-lb)

This procedure will have to be repeated if:

- Maximum preload is achieved before the minimum pinion nut torque is reached.
- Minimum preload is not achieved before the maximum pinion nut torque is reached.



9. Install differential case assembly with side bearing outer races into gear carrier.

FRONT AXLE & FRONT SUSPENSION

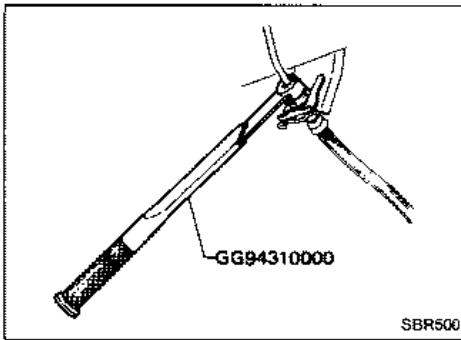
SECTION **FA**

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FA

PRECAUTIONS AND PREPARATION

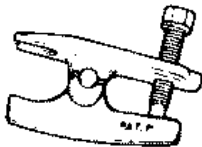
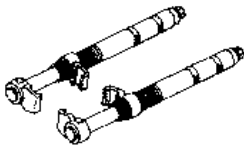
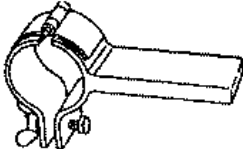




Precautions

- When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.
- * Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.
- When removing each suspension part, check wheel alignment and adjust if necessary.
- Use Tool when removing or installing brake lines.

Preparation

SPECIAL SERVICE TOOLS

Tool number Tool name	Description	
HT72750000 Ball joint remover		Removing tie-rod outer end and lower ball joint
HT71780000 Spring compressor		Removing and installing coil spring
ST35652000 Shock absorber attachment		Fixing shock absorber
GG94310000 Flare nut torque wrench		Removing and installing brake piping
ST30031000 Bearing inner race puller		Removing bearing inner race

PRECAUTIONS AND PREPARATION


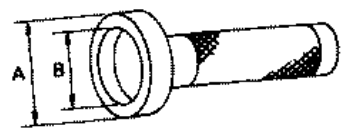
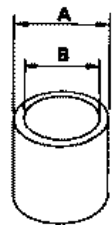
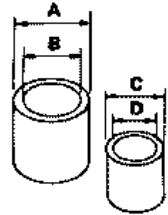
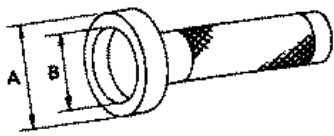
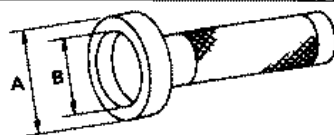
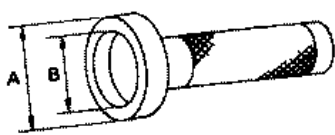
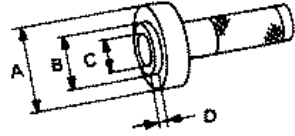
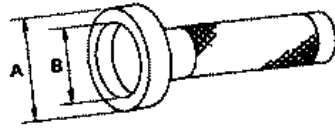
Preparation (Cont'd)

Tool number Tool name	Description	
KV991040S0 C.C.K. holder KV99104010 Attachment set ① Plate ② Guide bolts ③ Nuts ④ Springs ⑤ Center plate ⑥ KV99104020 Adapter A ⑦ KV99104030 Adapter B ⑧ KV99104040 Adapter C ⑨ KV99104050 Adapter D		Attaching wheel alignment gauge a: 72 mm (2.83 in) dia. b: 65 mm (2.56 in) dia. c: 57 mm (2.24 in) dia. d: 53.4 mm (2.102 in) dia.

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PRECAUTIONS AND PREPARATION

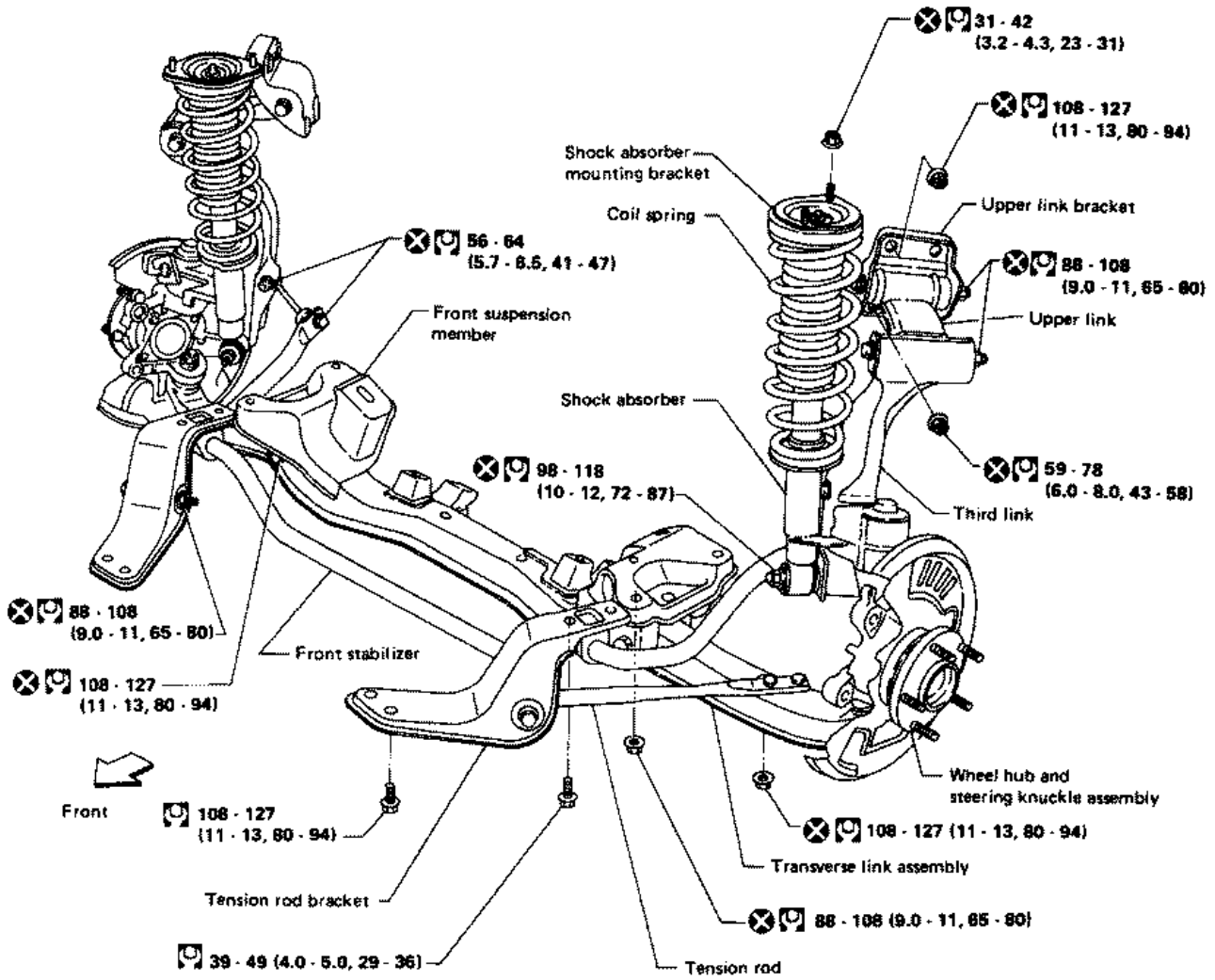
Preparation (Cont'd) COMMERCIAL SERVICE TOOLS

Tool name	Description
Wheel bearing drift	 <p>Removing wheel bearing</p> <p>A: 60 mm (2.36 in) dia. B: 37 mm (1.46 in) dia.</p>
Wheel bearing drift	 <p>Installing wheel bearing</p> <p>A: 75 mm (2.95 in) dia. B: 65 mm (2.56 in) dia.</p>
Baffle plate drift	 <p>Installing baffle plate</p> <p>A: 125 mm (4.92 in) dia. B: 106 mm (4.17 in) dia.</p>
Tension rod bushing drift	 <p>Removing and installing tension rod bushing</p> <p>A: 78 mm (3.07 in) dia. B: 66 mm (2.60 in) dia. C: 62 mm (2.44 in) dia. D: 25 - 55 mm (0.98 - 2.17 in) dia.</p>
Grease seal drift	 <p>Installing wheel hub grease seal</p> <p>A: 86 mm (3.39 in) dia. B: 76 mm (2.99 in) dia.</p>
Cap drift	 <p>Installing king pin cap</p> <p>A: 60 mm (2.36 in) dia. B: 52 mm (2.05 in) dia.</p>
Bearing drift	 <p>Installing king pin lower bearing</p> <p>A: 57 mm (2.24 in) dia. B: 50 mm (1.97 in) dia.</p>
Bearing drift	 <p>Installing king pin upper bearing</p> <p>A: 57 mm (2.24 in) dia. B: 46 mm (1.81 in) dia. C: 40 mm (1.57 in) dia. D: 2.5 mm (0.098 in)</p>
Grease seal drift	 <p>Installing king pin grease seal</p> <p>A: 68 mm (2.68 in) dia. B: 58 mm (2.28 in) dia.</p>

FRONT AXLE AND FRONT SUSPENSION

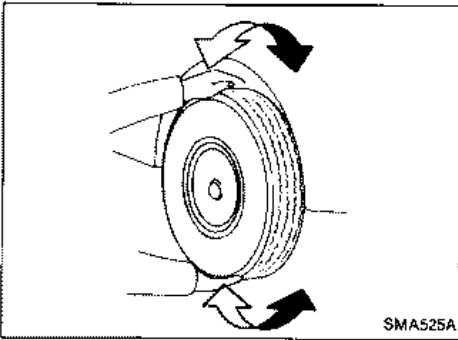
Final tightening for rubber parts must be done under unladen condition*, with tires on ground.

- * Fuel, radiator coolant and engine oil full.
- Spare tire, jack, hand tools and mats in designated positions.



⊙: N·m (kg-m, ft-lb)

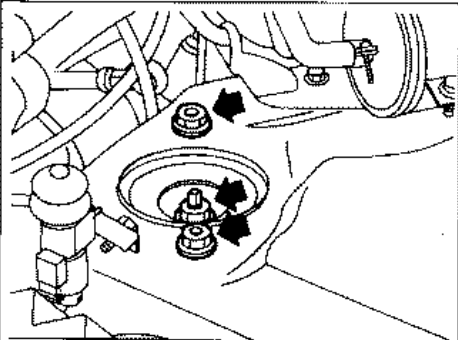
CHECK AND ADJUSTMENT — On-vehicle



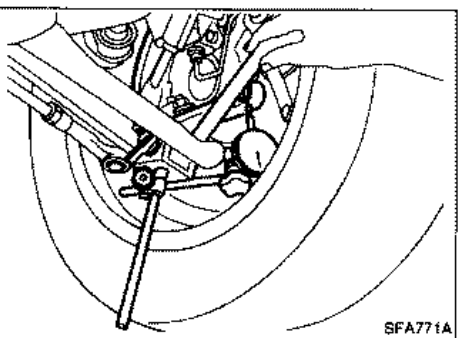
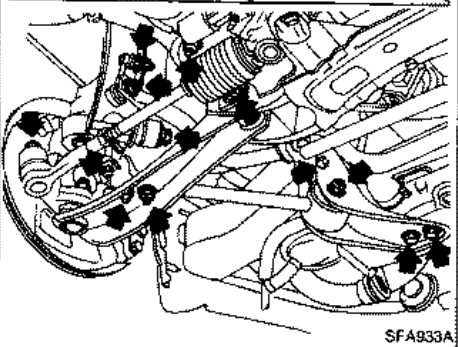
Front Axle and Front Suspension Parts

Check front axle and front suspension parts for looseness, cracks, wear or other damage.

- Shake each front wheel to check for excessive play.



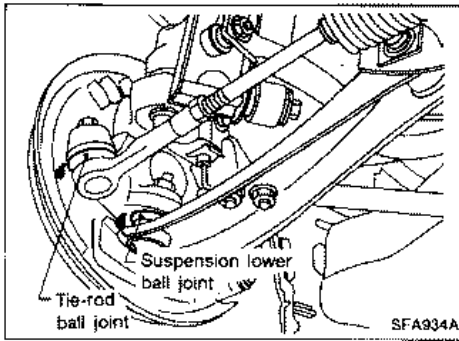
- Retighten all nuts and bolts to the specified torque.
Tightening torque: Refer to FRONT SUSPENSION.
- Make sure that cotter pin is inserted.



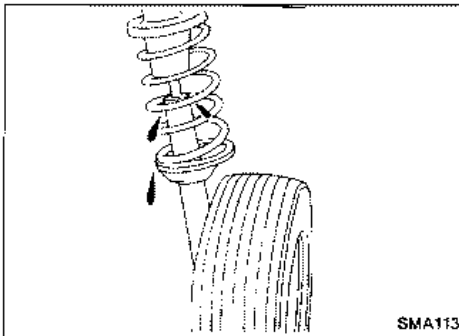
- Check suspension ball joint end play.
 - (1) Jack up front of vehicle and set the stands.
 - (2) Clamp dial indicator onto transverse link and place indicator tip on lower edge of brake caliper.
 - (3) Make sure front wheels are straight and brake pedal is depressed.
 - (4) Place a pry bar between transverse link and inner rim of road wheel.
 - (5) While pushing and releasing pry bar, observe maximum dial indicator value.
Vertical end play: 0 mm (0 in)
 - (6) If not to above specification, remove and recheck ball joint.

CHECK AND ADJUSTMENT — On-vehicle

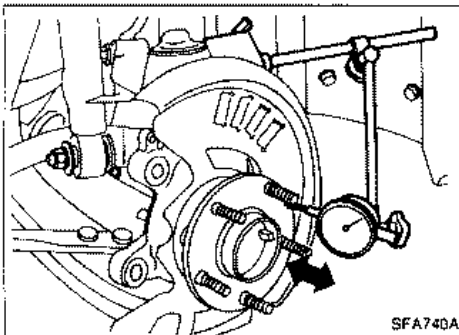
Front Axle and Front Suspension Parts (Cont'd)



- Check suspension lower ball joint and tie-rod ball joint for grease leakage, and dust cover for cracks or other damage.

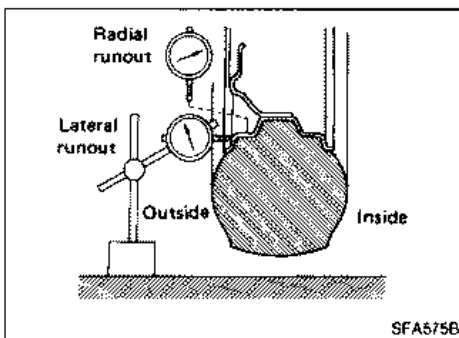


- Check shock absorber for oil leakage or other damage.



Front Wheel Bearing

- Check wheel bearings for smooth operation.
- Check axial end play.
Axial end play: 0.05 mm (0.0020 in) or less
- If axial end play is not within specification or wheel bearing does not turn smoothly, replace wheel bearing assembly. Refer to FRONT AXLE — Wheel Hub and Knuckle.



Front Wheel Alignment

Before checking front wheel alignment, be sure to make a preliminary inspection.

PRELIMINARY INSPECTION

Make the following checks. Adjust, repair or replace if necessary.

- Check tires for wear and improper inflation.
- Check front wheel bearings for looseness.
- Check wheel runout.
Wheel runout: Refer to S.D.S.
- Check front suspension for looseness.
- Check steering linkage for looseness.
- Check that front shock absorbers work properly.
- Check vehicle posture (Unladen).
("Unladen": Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.)

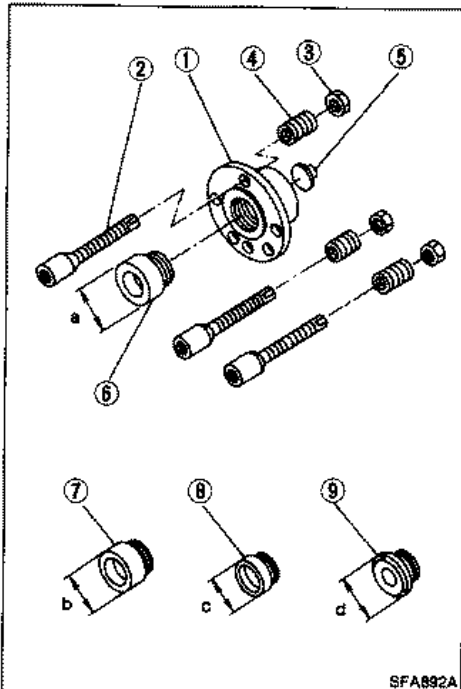
CHECK AND ADJUSTMENT — On-vehicle

Front Wheel Alignment (Cont'd)

CAMBER, CASTER AND KINGPIN INCLINATION

Camber, caster and kingpin inclination are preset at factory and cannot be adjusted.

1. Set vehicle on turning radius gauge.



2. Mount Tool as follows.

Tool number:

KV991040S0

KV99104010 ① to ⑤

KV99104020 ⑥

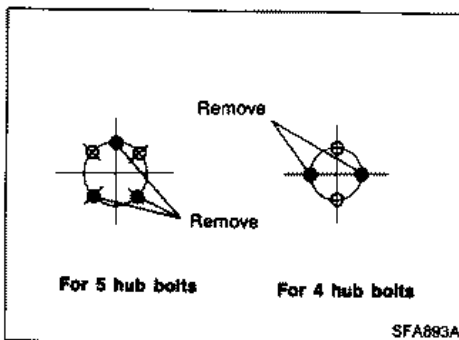
KV99104030 ⑦

KV99104040 ⑧

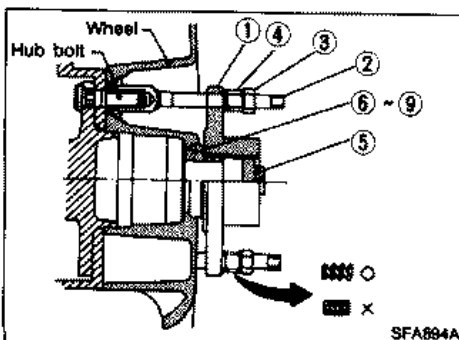
KV99104050 ⑨

- a. Select adapter which corresponds with wheel or hub shape from four types ⑥ to ⑨.
- b. Screw selected adapter in until it contacts plate ①.

- c. Remove wheel nuts.

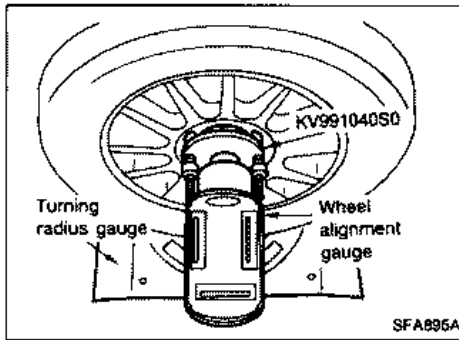


- d. Install guide bolts ② to where wheel nuts were removed and tighten them by hand.
- e. Install plate and adapter assembly to guide bolts ②.
- f. Install springs ④ onto guide bolts ②. Then tighten nuts ③ evenly until a little before springs ④ are completely compressed.
- g. Install center plate ⑤.
- h. Mount wheel alignment gauge on attachment plate.



CHECK AND ADJUSTMENT — On-vehicle

Front Wheel Alignment (Cont'd)



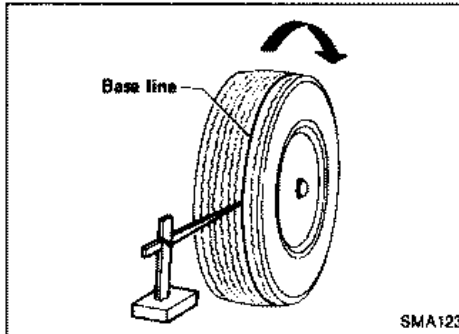
3. Measure camber, caster and kingpin inclination of both right and left wheels with a suitable alignment gauge.

Camber: $-1^{\circ}35'$ to $-0^{\circ}05'$

Caster: $9^{\circ}00'$ - $10^{\circ}30'$

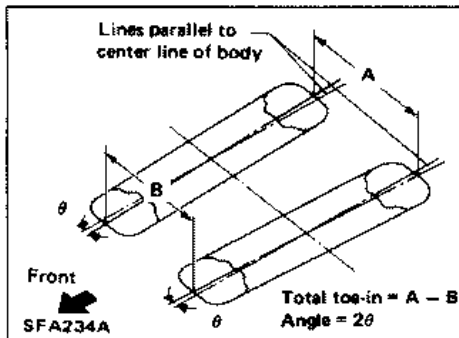
Kingpin inclination: $12^{\circ}10'$ - $13^{\circ}40'$

4. If camber, caster and kingpin inclination are not within specification, inspect and replace any damaged or worn front suspension parts.



TOE-IN

1. Draw a base line on tread surface of tires.
 - After lowering front of vehicle, move it up and down to eliminate friction, and set wheels in straight-ahead position.



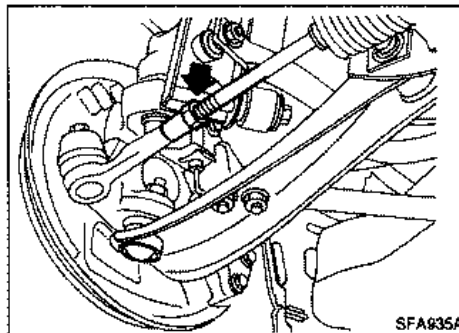
2. Measure toe-in.

- Measure distance "A" and "B" at same height as hub center.

Total toe-in:

A - B: 0 - 2 mm (0 - 0.08 in)

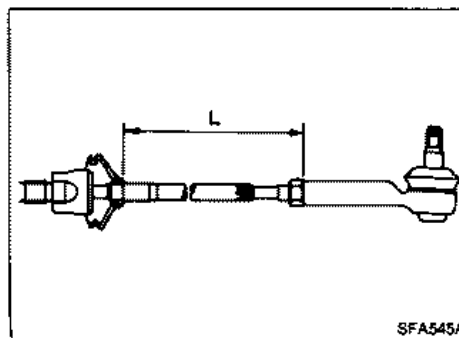
2θ: 0' - 11'



3. Adjust toe-in by varying length of steering tie-rods.

- (1) Loosen lock nuts.

- (2) Adjust toe-in by turning tie-rod forward or backward.



Make sure both tie-rods are the same length.

Standard length "L":

155 mm (6.10 in)

- (3) Tighten lock nuts to the specified torque.

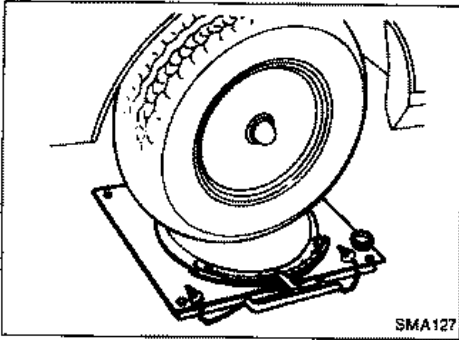
⊛: 78 - 98 N·m

(8.0 - 10.0 kg-m, 58 - 72 ft-lb)

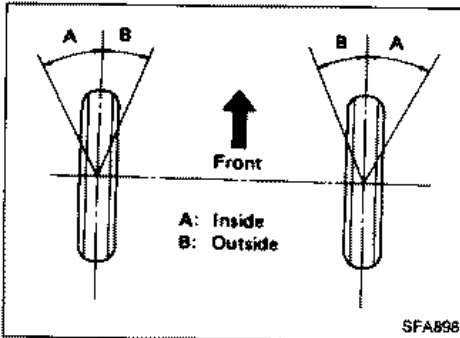
CHECK AND ADJUSTMENT — On-vehicle

Front Wheel Alignment (Cont'd)

FRONT WHEEL TURNING ANGLE



SMA127



SFA896

1. Set wheels in straight-ahead position and then move vehicle forward until front wheels rest on turning radius gauge properly.

2. Rotate steering wheel fully to the right or left with a force of 98 to 147 N (10 to 15 kg, 22 to 33 lb) while engine is running at idle and measure turning angle.

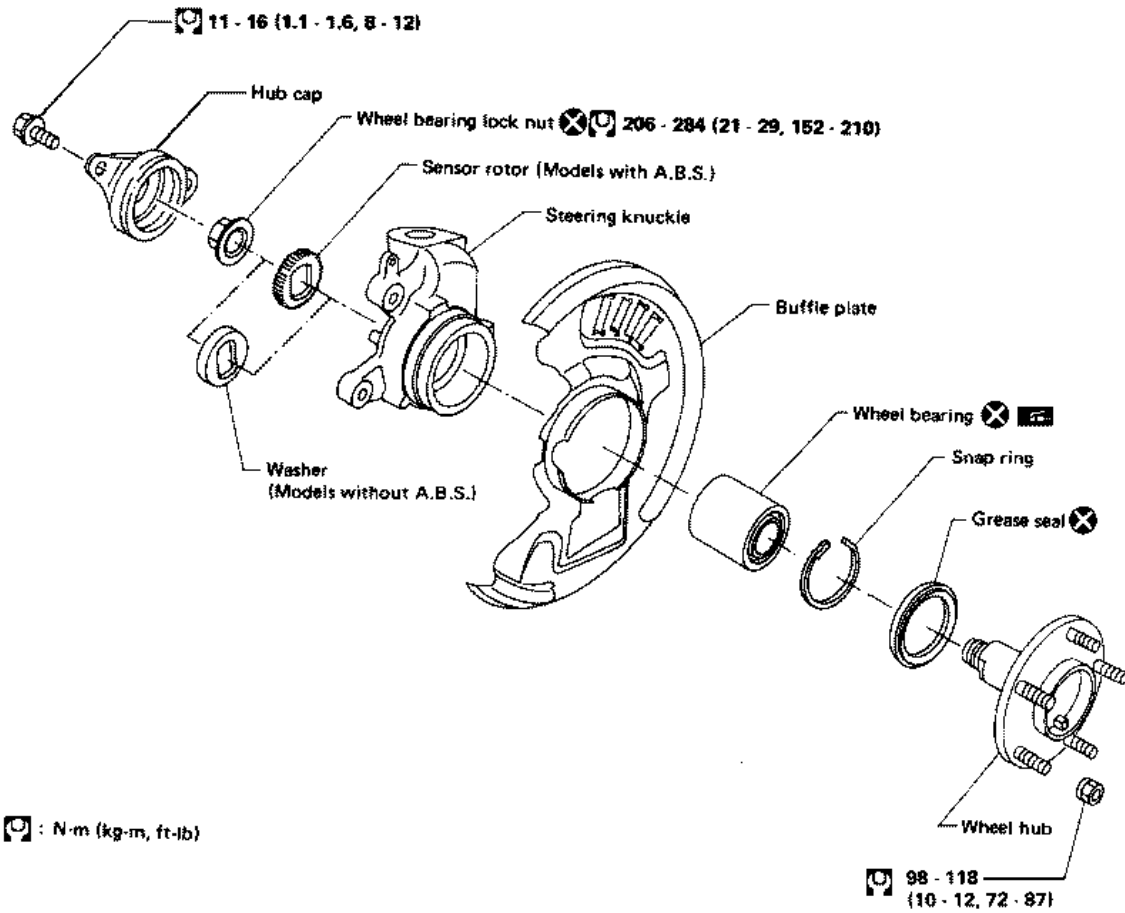
Do not hold the steering wheel at full lock for more than 15 seconds.

Wheel turning angle (Full turn):

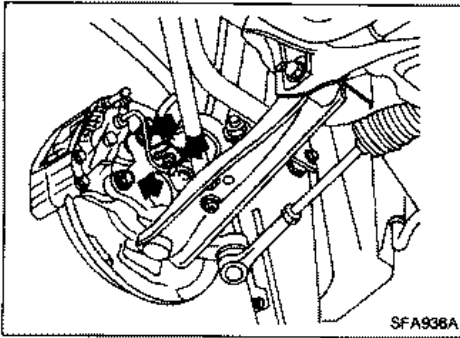
Inside wheel (A): 32° - 36°

Outside wheel (B): 27° - 31°

FRONT AXLE



FRONT AXLE — Wheel Hub and Steering Knuckle



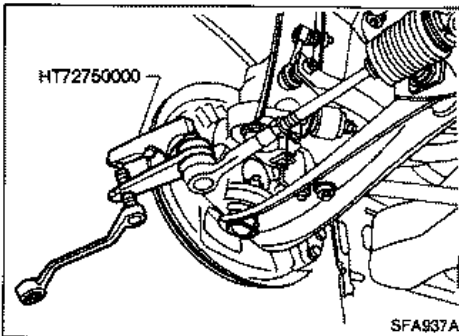
Removal

CAUTION:

Wheel bearing usually does not require maintenance. If any of the following symptoms are noted, replace wheel bearing assembly.

- Growling noise is emitted from wheel bearing during operation.
- Wheel bearing drags or turns roughly when hub is turned by hand.
- Remove brake caliper assembly and rotor.

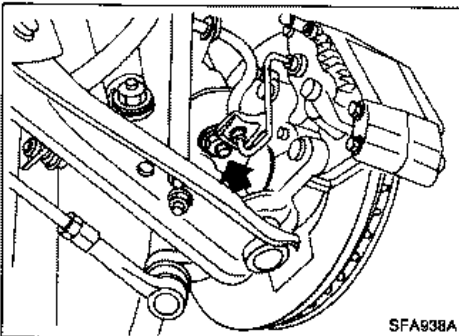
Brake hose need not be disconnected from brake caliper. Be careful not to depress brake pedal, or piston will pop out. Do not pull or twist brake hose.



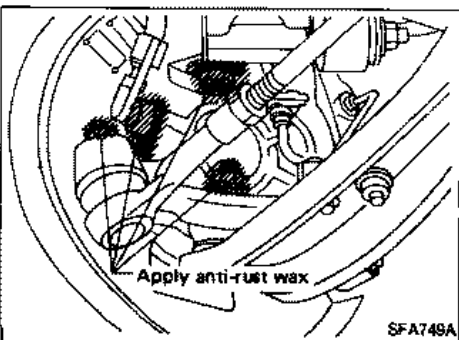
- Remove tie-rod ball joint and lower ball joint with Tool.

CAUTION:

Steering knuckle is made from aluminum alloy. Be careful not to hit steering knuckle.



- Remove kingpin lower nut then remove steering knuckle assembly.



Installation

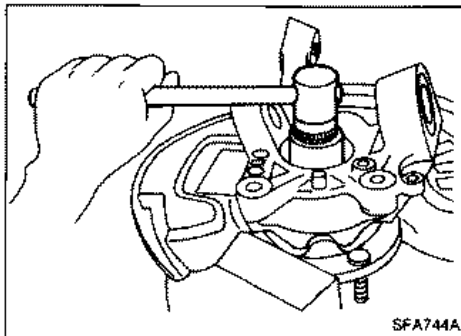
- Install steering knuckle assembly.
- Apply anti-rust wax as follows:
 - Portions around lower ball joint connections
 - Portions around tie-rod ball joint connections
 - Portions around kingpin lower nut location
 - Portions around A.B.S. sensor connection

FRONT AXLE — Wheel Hub and Steering Knuckle

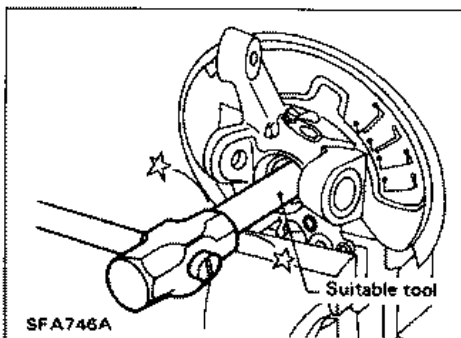
Disassembly

CAUTION:

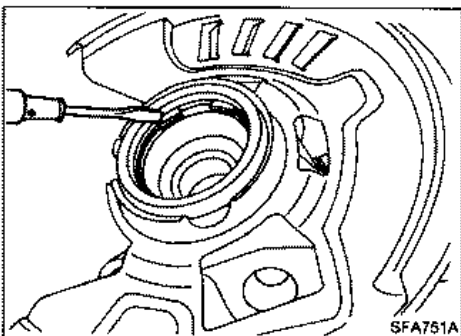
When removing wheel bearing from steering knuckle, replace wheel bearing assembly (outer race, inner races and grease seal) with a new one.



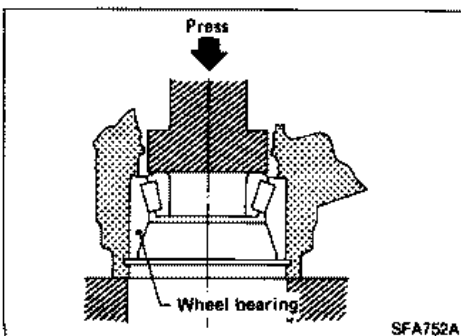
- Remove hub cap and wheel bearing lock nut.



- Remove wheel hub with a suitable tool.



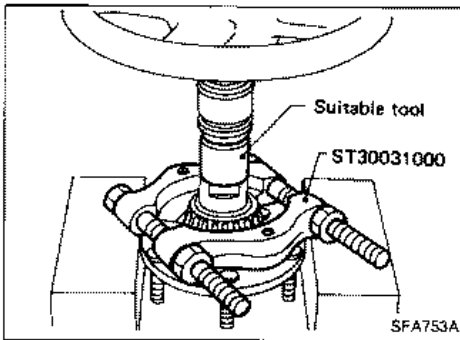
- Remove circular clip with a suitable tool.



- Press out wheel bearing assembly from steering knuckle.

FRONT AXLE — Wheel Hub and Steering Knuckle

Disassembly (Cont'd)



- Drive out wheel bearing inner race (to outside) from wheel hub, then remove grease seal.

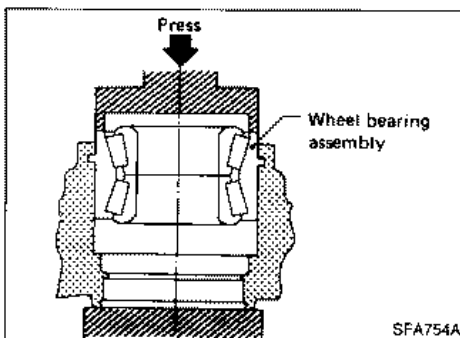
Inspection

WHEEL HUB AND STEERING KNUCKLE

Check wheel hub and steering knuckle for any cracks.

CIRCULAR CLIP

Check circular clip for wear or cracks.
Replace if necessary.



Assembly

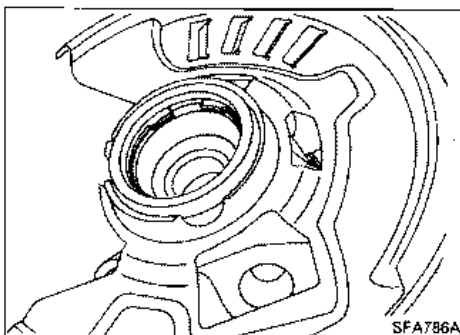
1. Press new wheel bearing assembly into steering knuckle from outside of steering knuckle.

Maximum load P:

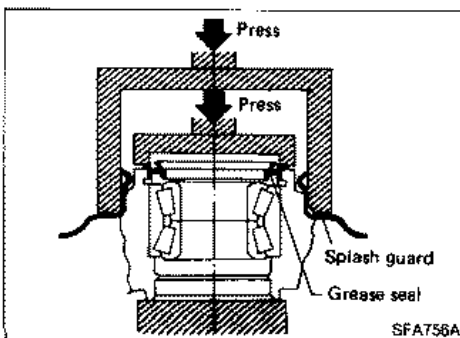
34.3 kN (3.5 t, 3.9 US ton, 3.44 Imp ton)

CAUTION:

- Do not press inner race of wheel bearing assembly.
- Do not apply oil or grease to mating surfaces of wheel bearing outer race and wheel hub.



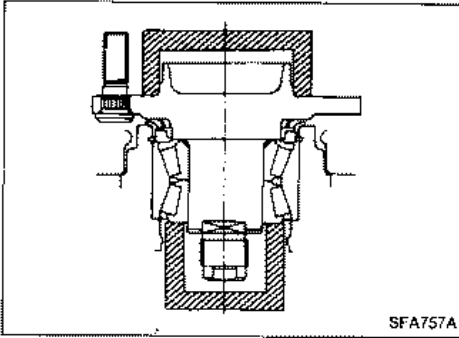
2. Install circular clip into groove of steering knuckle.



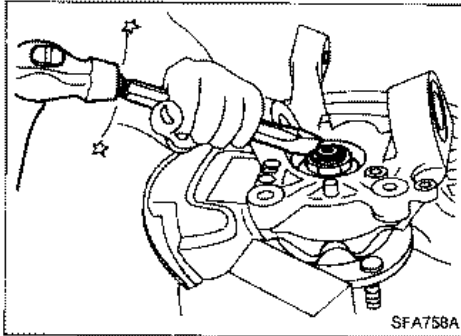
3. Apply multi-purpose grease to sealing lip.
4. Install grease seal.
Maximum load P:
10 kN (1 t, 1.1 US ton, 1.0 Imp ton)
5. Install splash guard.

FRONT AXLE — Wheel Hub and Steering Knuckle

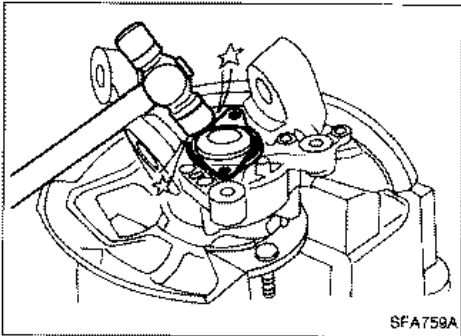
Assembly (Cont'd)



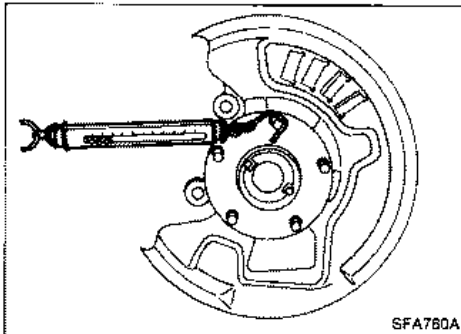
6. Press wheel hub into steering knuckle.
Maximum load P:
29 kN (3 t, 3.3 US ton, 3.0 Imp ton)
7. Tighten wheel bearing lock nut to the specified torque.
⌚: 206 - 284 N·m (21 - 29 kg·m, 152 - 210 ft·lb)



8. Stake wheel bearing lock nut.



9. Install hub cap.
Drive hub cap onto steering knuckle by lightly tapping with a plastic hammer. After hub cap is in close contact with steering knuckle, tighten bolts.



10. Check wheel bearing preload and axial end play.
Before checking, spin wheel hub at least 10 revolutions in both directions.

Turning torque:

0.34 - 2.16 N·m (3.5 - 22.0 kg·cm, 3.0 - 19.1 in·lb)
(NSK bearing)

0.44 - 3.33 N·m (4.5 - 34.0 kg·cm, 3.9 - 29.5 in·lb)
(NTN bearing)

As measured at wheel hub bolt:

5.9 - 37.3 N (0.6 - 3.8 kg, 1.3 - 8.4 lb)
(NSK bearing)

7.8 - 57.9 N (0.8 - 5.9 kg, 1.8 - 13.0 lb)
(NTN bearing)

Axial end play:

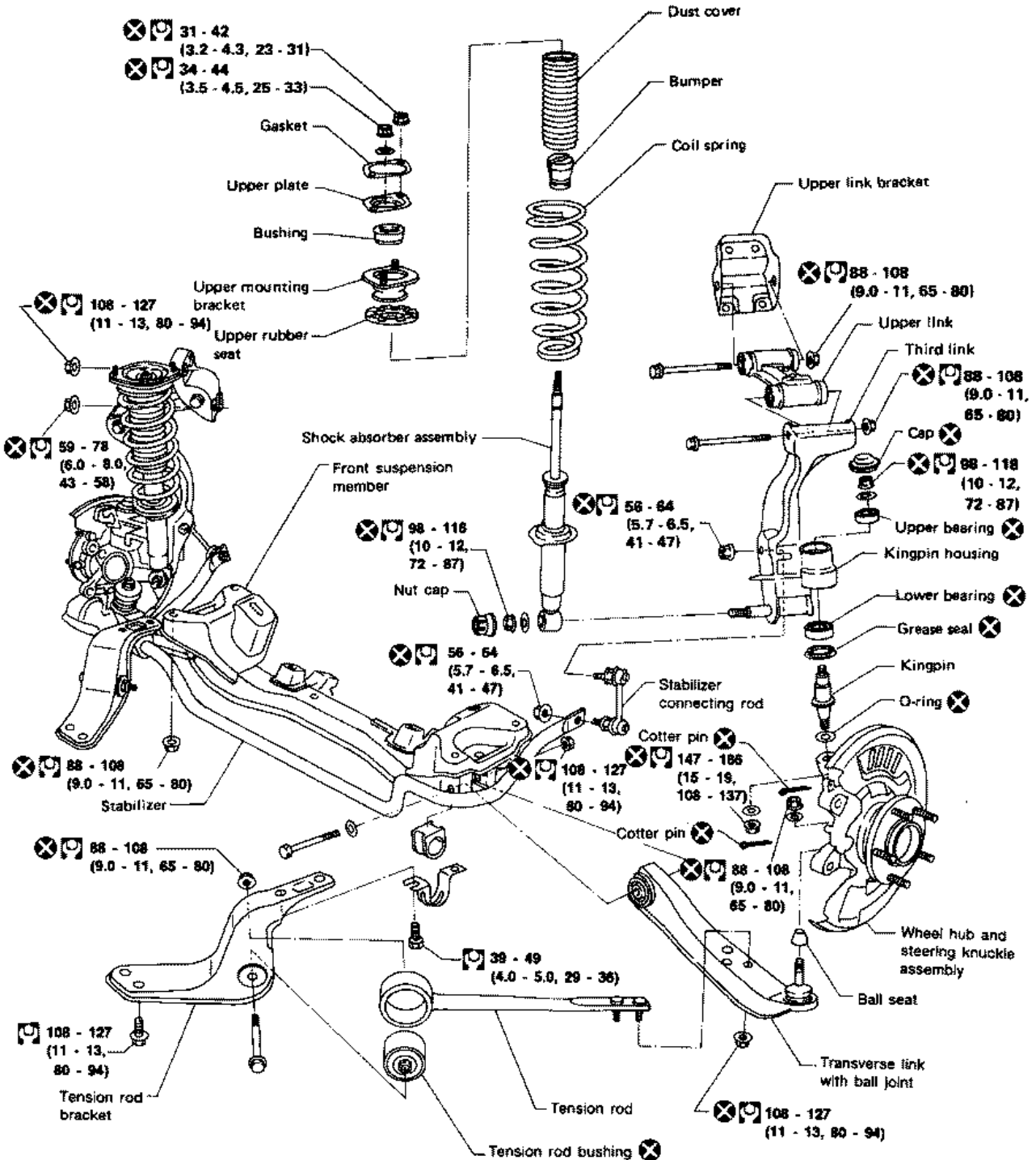
0.05 mm (0.0020 in) or less

FRONT SUSPENSION

Final tightening for rubber parts must be done under unladen condition*, with tires on ground.

* Fuel, radiator coolant and engine oil full.

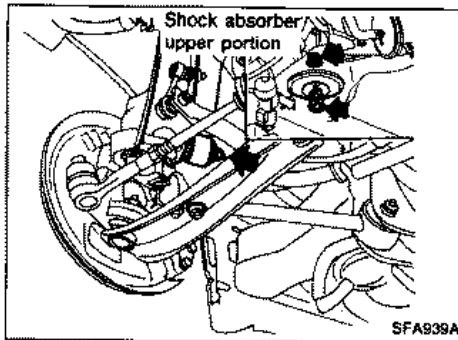
Spare tire, jack, hand tools and mats in designated positions.



⊗ : N·m (kg·m, ft·lb)

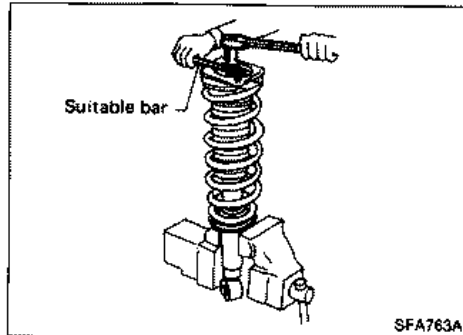
SFA890A

FRONT SUSPENSION — Coil Spring and Shock Absorber



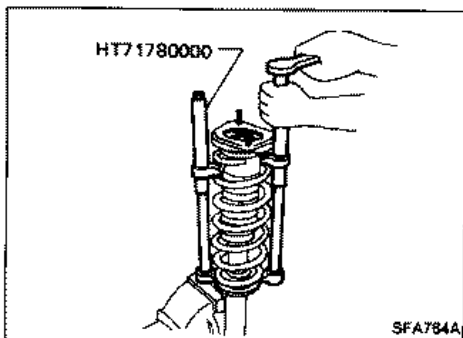
Removal

- Remove shock absorber fixing bolt and nut (to hoodledge).
Do not remove piston rod lock nut.

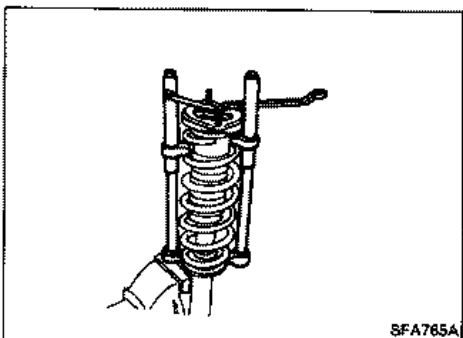


Disassembly

1. Set shock absorber on vise with Tool, then loosen piston rod lock nut.
Do not remove piston rod lock nut.



2. Compress spring with Tool so that shock absorber mounting insulator can be turned by hand.



3. Remove piston rod lock nut.

Inspection

SHOCK ABSORBER ASSEMBLY

- Check for smooth operation through a full stroke, both compression and extension.
- Check for oil leakage occurring on welded or gland packing portions.
- Check piston rod for cracks, deformation or other damage. Replace if necessary.

FRONT SUSPENSION — Coil Spring and Shock Absorber

Inspection (Cont'd)

MOUNTING INSULATOR AND RUBBER PARTS

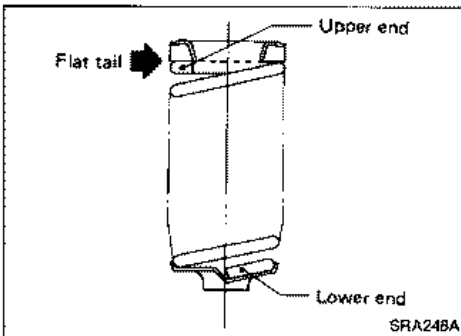
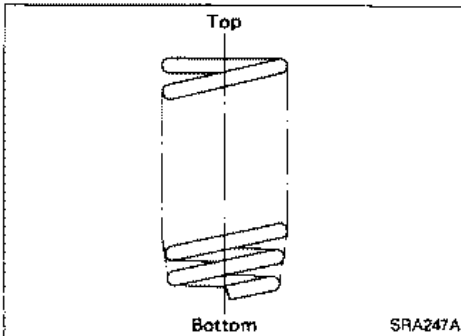
Check cemented rubber-to-metal portion for separation or cracks. Check rubber parts for deterioration. Replace if necessary.

COIL SPRING

Check for cracks, deformation or other damage. Replace if necessary.

Assembly

- When installing coil spring, be careful not to reverse top and bottom direction. (Top end is flat.)



- When installing coil spring on shock absorber, it must be positioned as shown in figure at left.

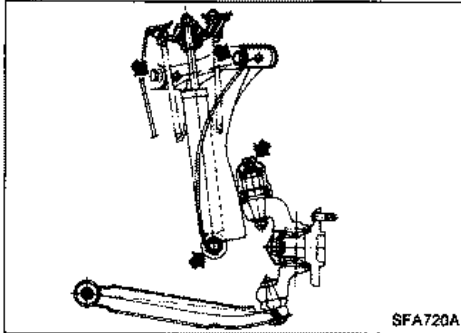
FRONT SUSPENSION — Third Link and Upper Link

Removal

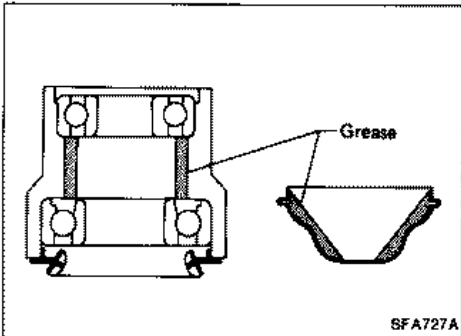
CAUTION:

Kingpin bearing usually does not require maintenance. If any of the following symptoms are noted, replace kingpin bearing assembly.

- Growling noise is emitted from kingpin bearing during operation.
- Kingpin bearing drags or turns roughly when steering knuckle is turned by hand.



1. Remove cap and kingpin upper nut.
Do not remove kingpin lower nut.
2. Remove shock absorber fixing nut and upper link fixing bolts.
3. Remove third link and upper link.



Installation

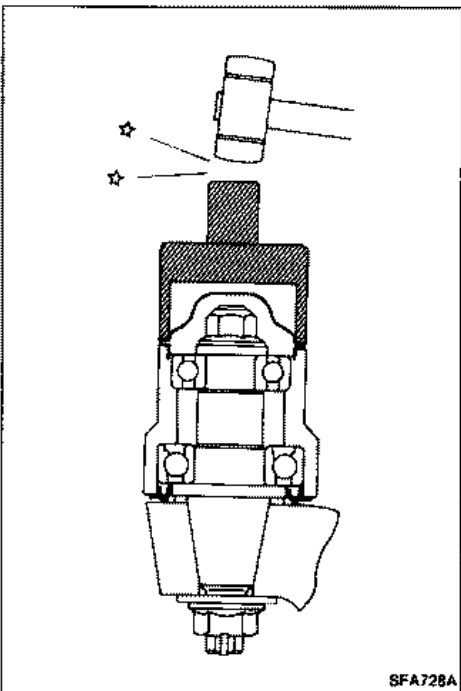
THIRD LINK

- Pack kingpin housing and cap with multi-purpose grease.

Grease capacity:

Kingpin housing 10 g (0.35 oz)

Cap 5 g (0.18 oz)



- Install third link and cap.

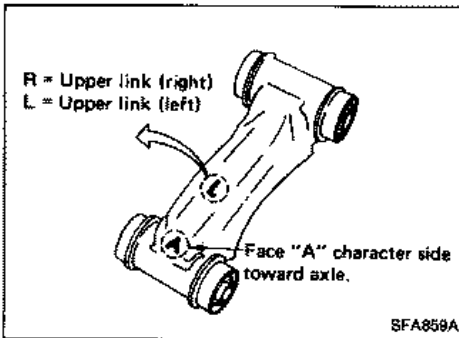
FRONT SUSPENSION — Third Link and Upper Link

Installation (Cont'd)

UPPER LINK

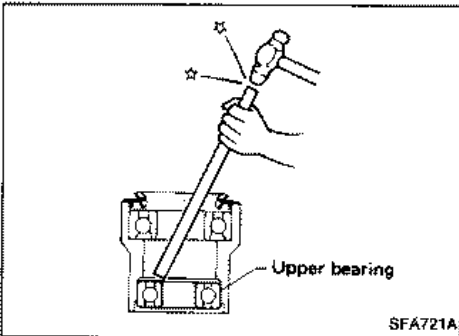
- Upper link has characters "A" and "L" (or "R") on it as shown. Always install upper link with "A" side facing axle and side without a character facing vehicle body.

Upper link bushings cannot be disassembled.

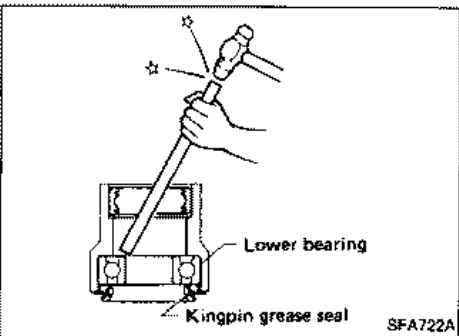


Disassembly

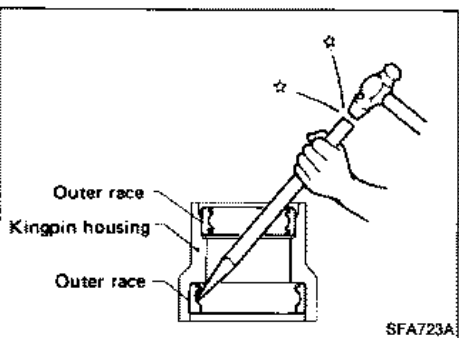
- Remove upper bearing (inner race and ball).



- Remove kingpin grease seal.
- Remove lower bearing (inner race and ball).

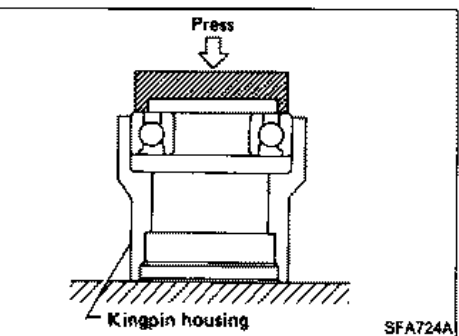


- Remove upper and lower outer race.
- Be careful not to damage kingpin housing.**



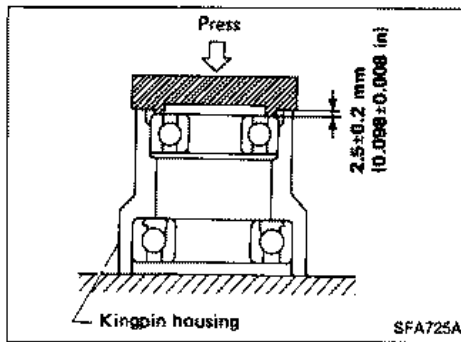
Assembly

- Install lower bearing.

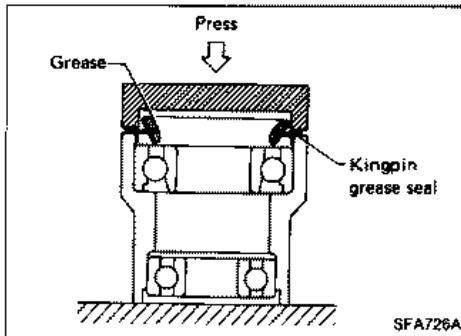


FRONT SUSPENSION — Third Link and Upper Link

Assembly (Cont'd)

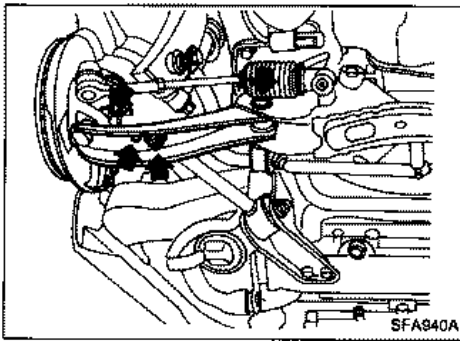


- Install upper bearing.



- Install lower oil seal.
- Apply multi-purpose grease to oil seal lip.

FRONT SUSPENSION — Transverse Link and Lower Ball Joint



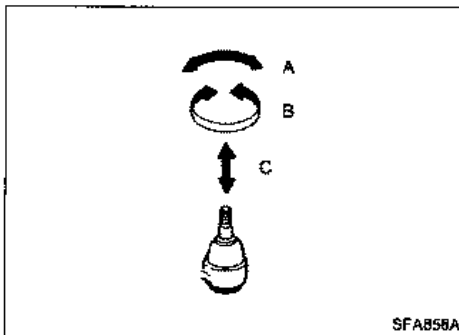
Removal and Installation

- Remove tension rod, ball joint and transverse link assembly.
- During installation, final tightening must be done at curb weight with tires on ground.
- After installation, check wheel alignment. Refer to "Front Wheel Alignment" in CHECK AND ADJUSTMENT — On-vehicle.

Inspection

TRANSVERSE LINK

- Check transverse link for damage, cracks or deformation. Replace it if necessary.
- Check rubber bushing for damage, cracks and deformation. Replace transverse link if necessary.



LOWER BALL JOINT

Check ball joint for play. If ball stud is worn, play in axial direction is excessive or joint is hard to swing, replace transverse link assembly.

Swing force and turning torque

Before checking, turn ball joint at least 10 revolutions so that ball joint is properly broken in.

Swing force "A":

(measuring point: cotter pin hole of ball stud)

7.8 - 53.0 N (0.8 - 5.4 kg, 1.8 - 11.9 lb)

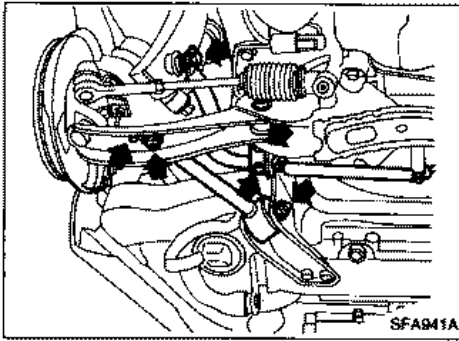
Turning torque "B":

0.49 - 3.43 N·m (5.0 - 35 kg-cm, 4.3 - 30.4 in-lb)

Vertical end play "C":

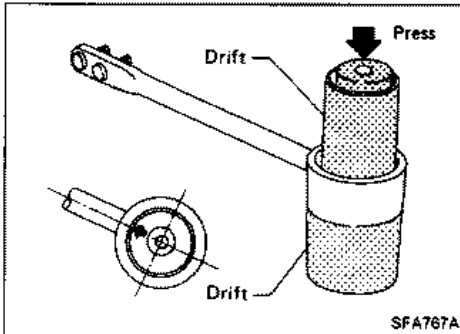
0 mm (0 in)

FRONT SUSPENSION — Tension Rod and Stabilizer Bar

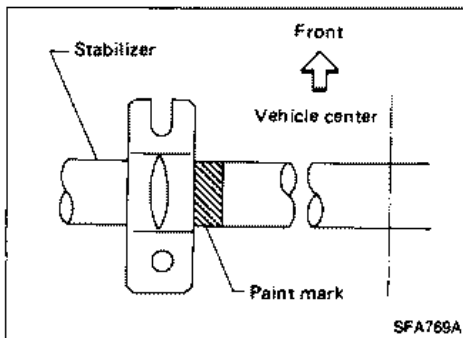


Removal and Installation

- Remove tension rod and stabilizer bar.



- When removing tension rod bushing, place one drift on lower side of bushing and the other on upper side, and press bushing out.
- Place arrow mark on bushing facing tension rod before installing bushing.



- When installing stabilizer, make sure that paint mark and clamp face in the correct direction.

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

General Specifications

COIL SPRING

Applied model		Australia	Europe
		VG30DE	VG30DETT
Wire diameter	mm (in)	12.0 (0.472)	
Coil diameter	mm (in)	100 (3.94)	
Free length	mm (in)	370 (14.57)	390 (15.35)
Spring constant	N/mm (kg/mm, lb/in)	27.5 (2.8, 157)	25.5 (2.6, 146)
Identification color		Blue x 2	L.H.: Orange x 1, Purple x 1 R.H.: White x 1, Purple x 1

SHOCK ABSORBER

Applied model		Australia	Europe
		VG30DE	VG30DETT
Damping force [at 0.3 m (1.0 ft)/sec.]	N (kg, lb)		
Expansion		1,177 - 1,569 (120 - 180, 265 - 353)	1,177 - 1,530 (120 - 158, 265 - 344)
Compression		559 - 814 (57 - 83, 128 - 183)	539 - 755 (55 - 77, 121 - 170)
Piston rod diameter	mm (in)	12.5 (0.492)	

FRONT STABILIZER BAR

Applied model		Australia	Europe
		VG30DE	VG30DETT
Stabilizer diameter	mm (in)	28.6 (1.126)	27.2 (1.071)
Identification color		Purple	White

TENSION ROD

Applied model		All
Rod diameter	mm (in)	20.0 (0.787)

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Inspection and Adjustment

WHEEL ALIGNMENT (Unladen*1)

Camber	degree	-1°35' to -0°05'
Caster	degree	9°00' - 10°30'
Toe-in (Total)	mm (in)	0 - 2 (0 - 0.08)
	degree	0° - 11'
Kingpin inclination	degree	12°10' - 13°40'
Front wheel turning angle		
Full turn*2	degree	
Inside		32° - 36°
Outside		27° - 31°

*1: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

*2: On power steering models, wheel turning force (at circumference of steering wheel) of 98 to 147 N (10 to 15 kg, 22 to 33 lb) with engine idle.

LOWER BALL JOINT

Swing force (Measuring point: cotter pin hole of ball stud)	N (kg, lb)	7.8 - 53.0 (0.8 - 5.4, 1.8 - 11.9)
Turning torque	N·m (kg·cm, in·lb)	0.49 - 3.43 (5.0 - 35, 4.3 - 30.4)
Vertical end play	mm (in)	0 (0)

WHEEL RUNOUT (Radial and lateral)

Unit: mm (in)

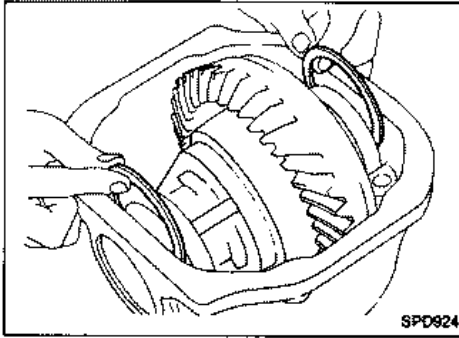
Wheel type	Aluminum wheel
Radial runout limit	0.3 (0.012)
Lateral runout limit	

WHEEL BEARING

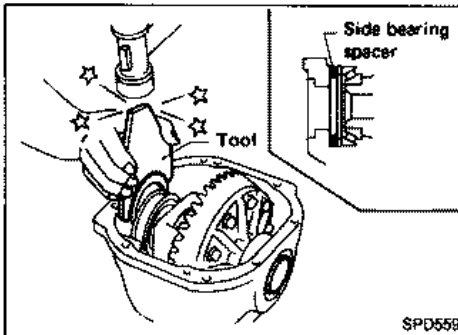
Wheel bearing axial end play	mm (in)	0.05 (0.0020) or less
Wheel bearing lock nut		
Tightening torque	N·m (kg·m, ft·lb)	206 - 284 (21 - 29, 152 - 210)
Wheel bearing turning resistance	N·m (kg·cm, in·lb)	
NSK bearing		0.34 - 2.16 (3.5 - 22.0, 3.0 - 19.1)
NTN bearing		0.44 - 3.33 (4.5 - 34.0, 3.9 - 29.5)
At wheel hub bolt	N (kg, lb)	
NSK bearing		5.9 - 37.3 (0.6 - 3.8, 1.3 - 8.4)
NTN bearing		7.8 - 57.9 (0.8 - 5.9, 1.8 - 13.0)

ASSEMBLY

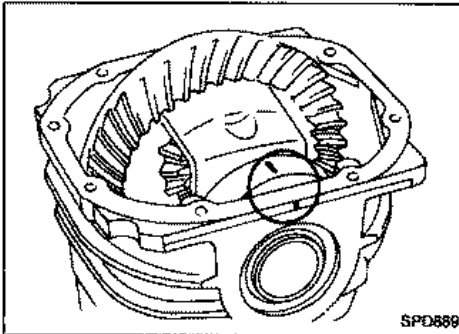
Differential Carrier (Cont'd)



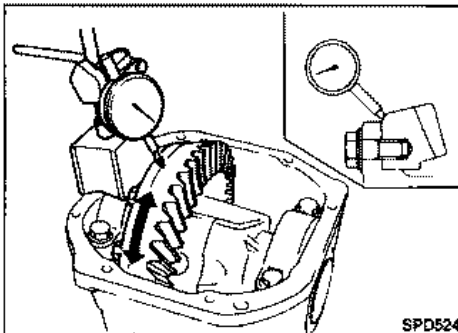
10. Insert left and right side bearing adjusting washers in place between side bearings and carrier.



11. Drive in side bearing spacer with Tool.
Tool number:
KV38100600



12. Align mark on bearing cap with that on gear carrier and install bearing cap on gear carrier.

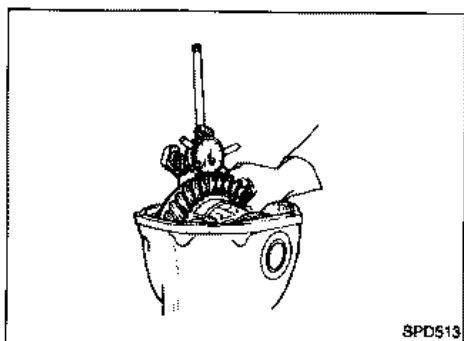


13. Check runout of ring gear with a dial indicator.
Runout limit:
0.05 mm (0.0020 in)

- If backlash varies excessively in different places, foreign matter may be caught between the ring gear and the differential case.

ASSEMBLY

Differential Carrier (Cont'd)



14. Measure ring gear-to-drive pinion backlash with a dial indicator.

Ring gear-to-drive pinion backlash:

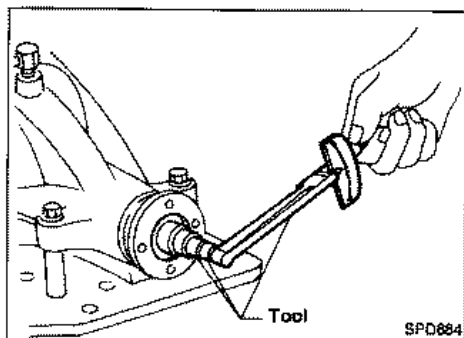
0.10 - 0.15 mm (0.0039 - 0.0059 in)

- If backlash is too small, decrease thickness of left washer and increase thickness of right washer by the same amount.

If backlash is too great, reverse the above procedure.

Never change the total amount of washer thickness as this will change the bearing preload.

- If the backlash varies greatly when the ring gear runout is within the specified range, replace the hypoid gear set or differential case.



15. Check total preload with Tool.

When checking preload, turn drive pinion in both directions several times to seat bearing rollers correctly.

Total preload:

Value more than 0.29 N-m (3.0 kg-cm, 2.6 in-lb) added on measured value of drive pinion preload

- If preload is too great, decrease the same amount of washer thickness from each side.
- If preload is too small, increase the same amount of washer thickness to each side.

Never increase or decrease different amounts of washer thickness for each side as this will change ring gear-to-drive pinion backlash.

16. Recheck ring gear-to-drive pinion backlash because increase or decrease in thickness of washer will cause change of ring gear-to-pinion backlash.
17. Check tooth contact.
Refer to ADJUSTMENT.
18. Install rear cover.

DIFFERENTIAL OIL COOLER SYSTEM

Description

M/T MODEL

- The differential and transmission oil pumps automatically repeat ON-OFF operation according to the differential gear oil temperature.

OFF → ON 130°C (266°F)

ON → OFF 120°C (248°F)

However, the pumps will not operate when the vehicle speed is less than 120 km/h (75 MPH).

- When the oil temperature becomes excessively high, the warning lamp in the combination meter will illuminate and both oil pumps will activate regardless of vehicle speed.

Differential gear oil:

OFF → ON 180°C (356°F)

ON → OFF 150°C (302°F)

Transmission gear oil:

OFF → ON 180°C (356°F)

ON → OFF 150°C (302°F)

A/T MODEL

- The differential oil pump automatically repeats ON-OFF operation according to the temperature of the differential gear oil.

OFF → ON 130°C (266°F)

ON → OFF 120°C (248°F)

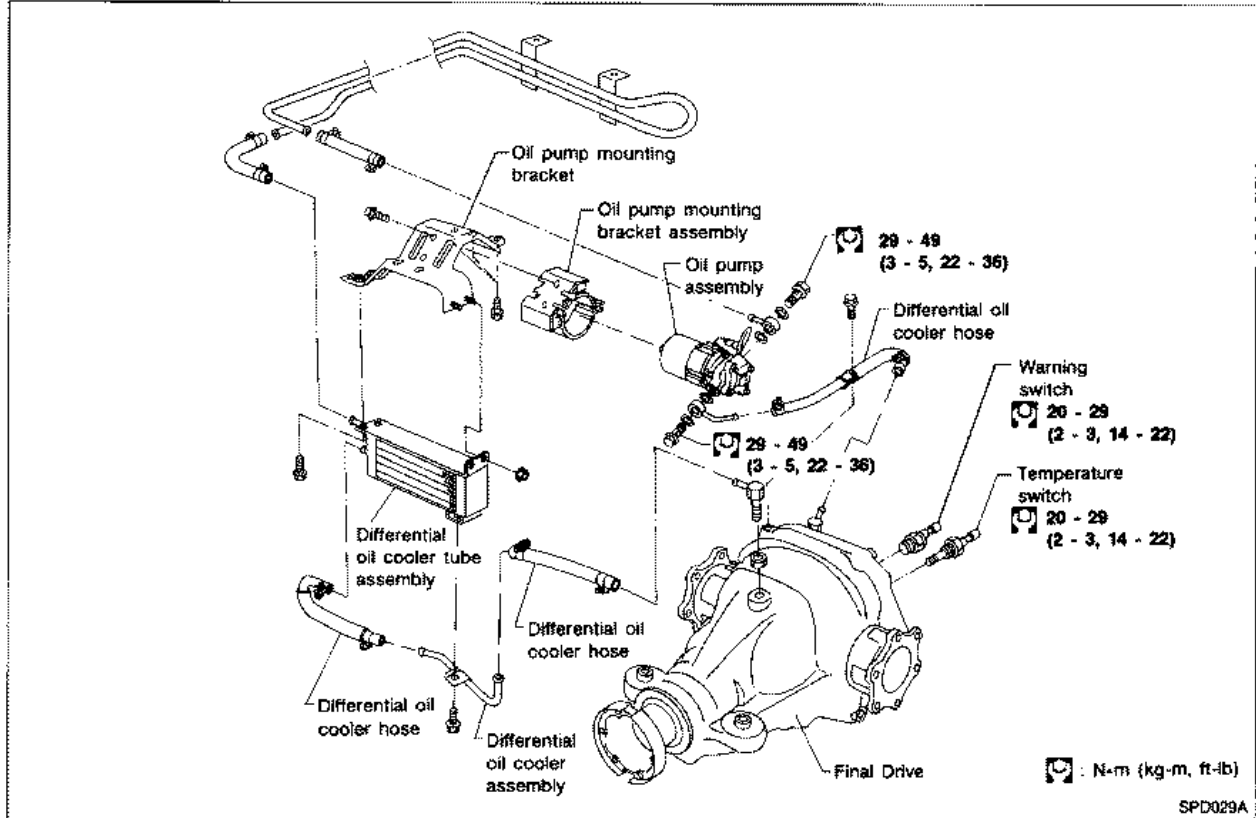
However, the pump will not operate when the vehicle speed is less than 10 km/h (6 MPH).

- When the oil temperature becomes excessively high, the warning lamp in the combination meter will illuminate and the oil pump will activate regardless of vehicle speed.

OFF → ON 180°C (356°F)

ON → OFF 150°C (302°F)

Removal and Installation



DIFFERENTIAL OIL COOLER SYSTEM

Removal and Installation (Cont'd)

REMOVAL

The oil cooler assembly and the oil pump can be removed together or separately without removing the final drive.

1. Remove right side rear exhaust tube.
2. Disconnect right side drive shaft from final drive.

Be careful not to damage drive shaft boot.

3. Disconnect oil cooler hoses which connect to final drive.

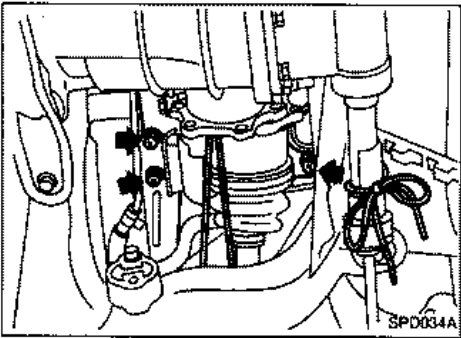
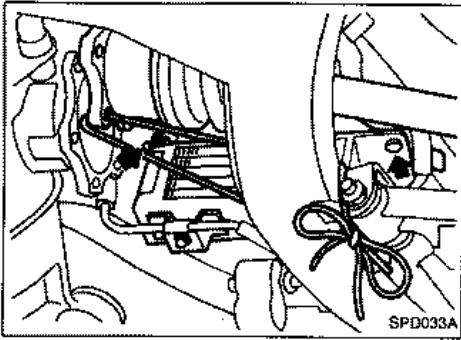
When disconnecting hoses, put a tray underneath to catch oil.

4. Remove securing nuts and bolts from oil cooler assembly.

5. Remove mounting bracket securing bolts.

6. Disconnect electric connector from oil pump.

7. Remove oil cooler assembly with oil pump.

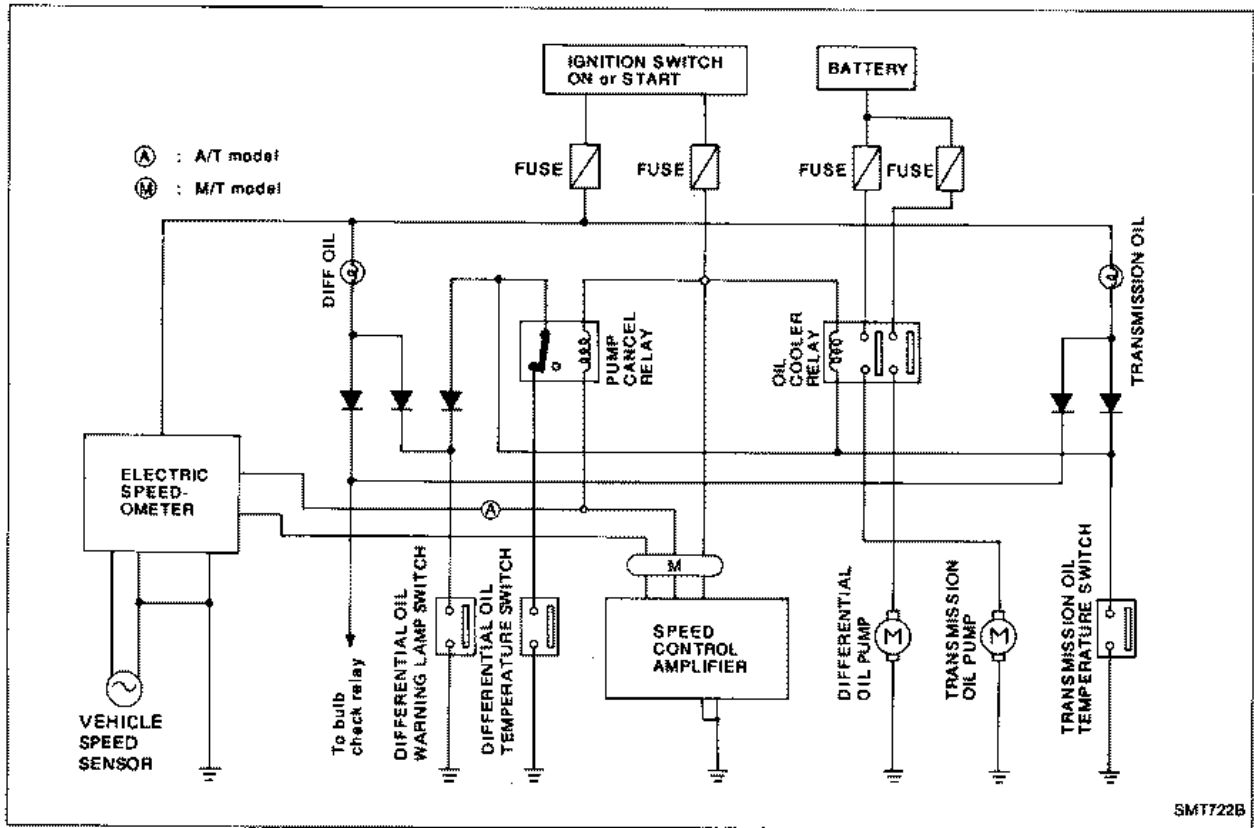


INSTALLATION

Oil level and oil leak from hoses must be checked after the oil cooler has been operated.

DIFFERENTIAL OIL COOLER SYSTEM

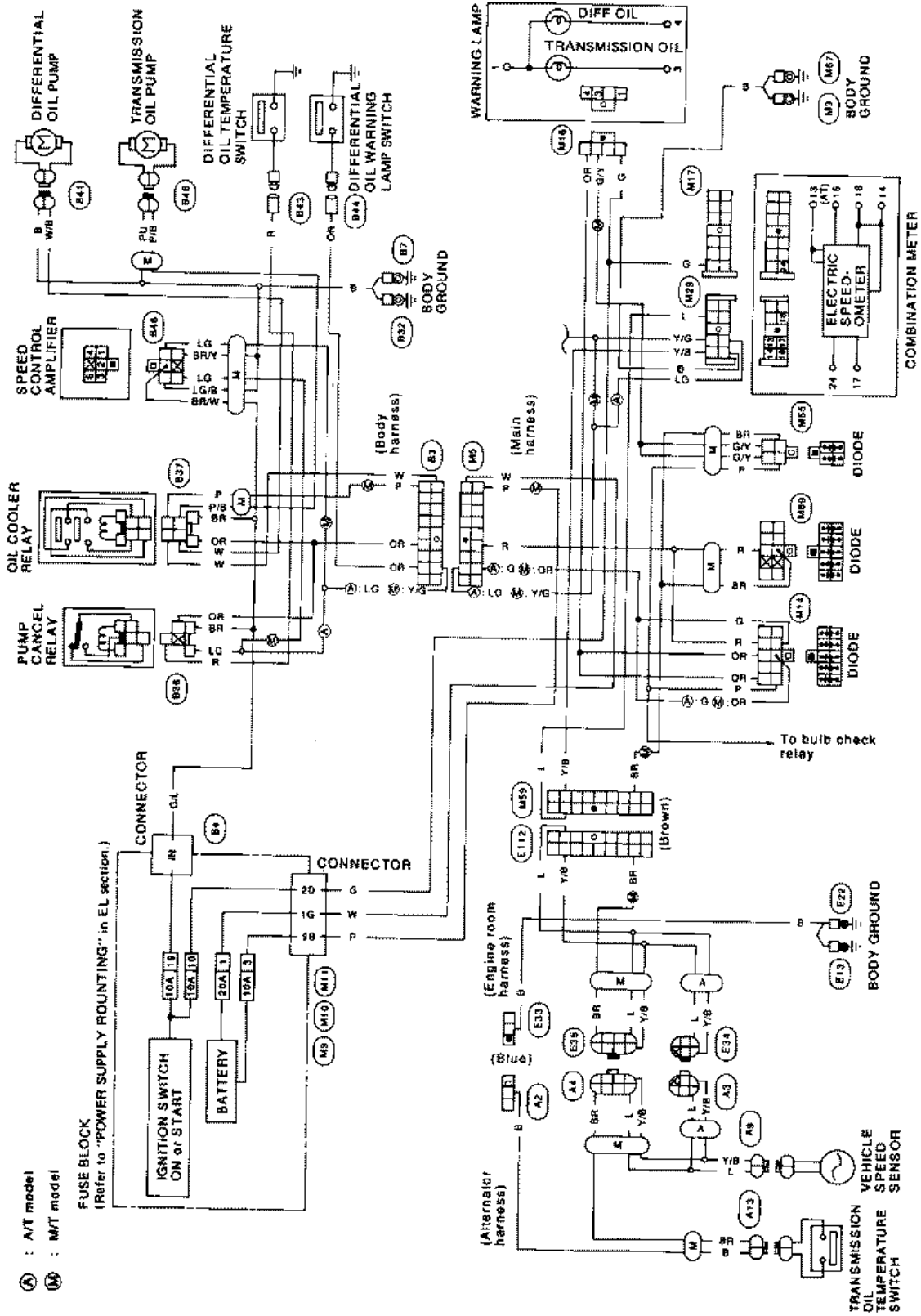
Circuit Diagram



DIFFERENTIAL OIL COOLER SYSTEM

Wiring Diagram

L.H.D. MODEL

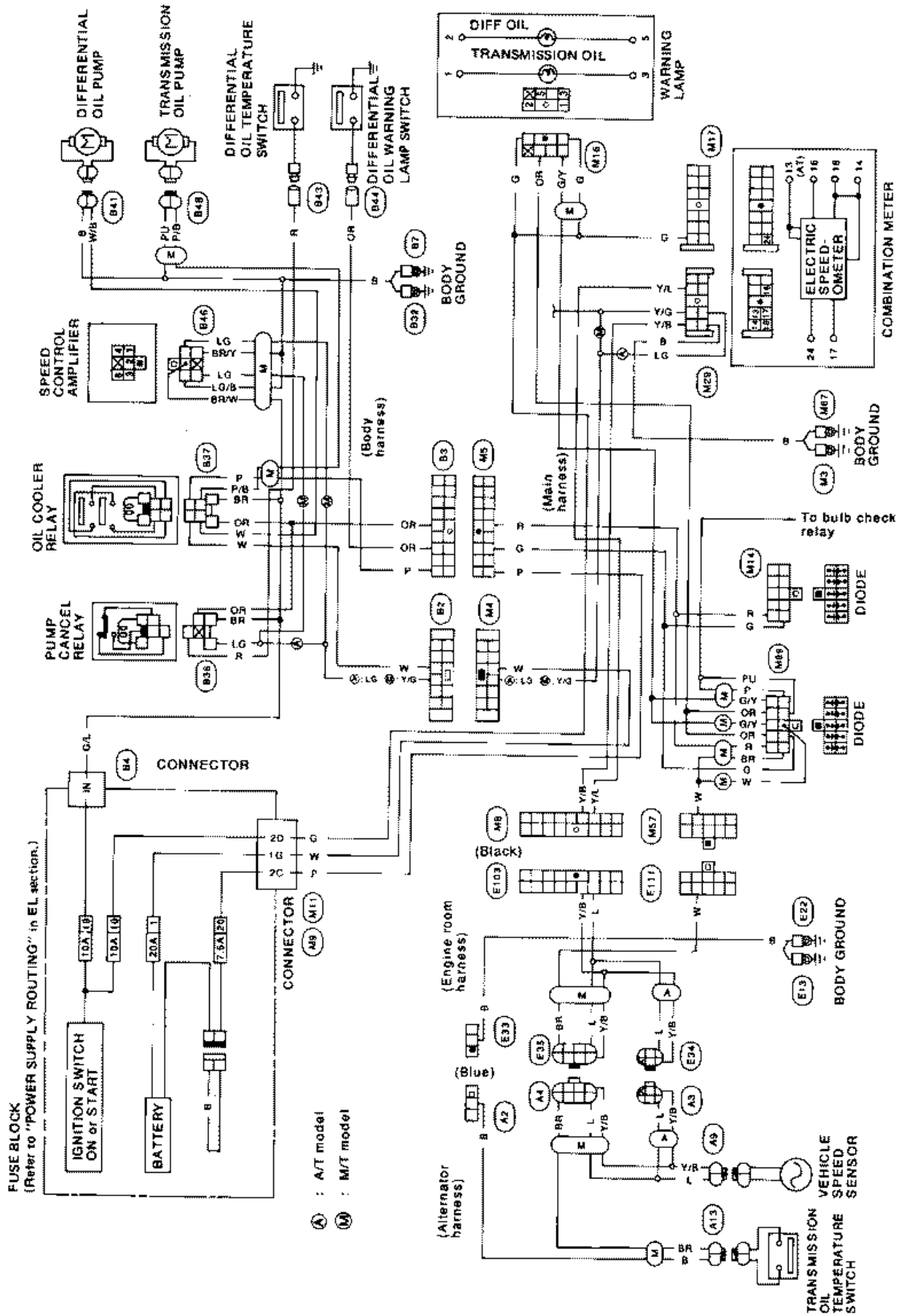


SMT723B

DIFFERENTIAL OIL COOLER SYSTEM

Wiring Diagram (Cont'd)

R.H.D. MODEL



SMT724B

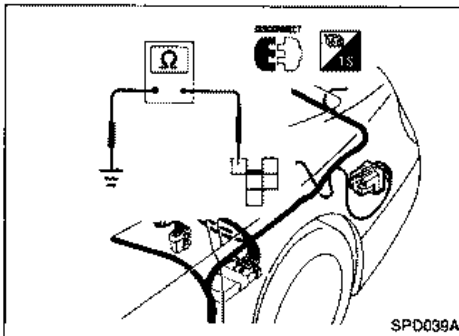
DIFFERENTIAL OIL COOLER SYSTEM

Inspection

Thoroughly clean all parts in cleaning solvent and blow dry with compressed air, if available.

OIL PUMP ASSEMBLY

Replace oil pump assembly when motor does not rotate because of motor seizure or other damage.



SPEEDOMETER AMPLIFIER

Check speedometer amplifier operation as follows:

1. Disconnect differential oil pump cancel relay from connector and connect circuit tester to connector for the relay as shown.
2. Raise rear wheels.
3. Drive vehicle slowly and check the voltage.

M/T model:

Less than 120 km/h (75 MPH) ... Continuity exists.

More than 120 km/h (75 MPH) ... Continuity does not exist.

A/T model:

Less than 10 km/h (6 MPH) ... Continuity exists

More than 10 km/h (6 MPH) ... Continuity does not exist.

OIL COOLER ASSEMBLY, OIL TUBE ASSEMBLY, OIL HOSE

If oil leakage is detected during removal, replace oil cooler assembly or oil tube.

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Propeller Shaft

GENERAL SPECIFICATIONS

Engine	VG30DE		VG30DETT	
Transmission	M/T	A/T	M/T	A/T
Propeller shaft model	3S71A		3S80A-VL107	
Number of joints	3			
Coupling method with transmission	Sleeve type			
Types of journal bearings	Shell type (non-disassembly type)		Shell type (non-disassembly type) x 2, CVJ* x 1	
Distance between yokes	mm (in)	71.0 (2.795)		80.0 (3.150)
Shaft length (Spider to spider)	mm (in)			
1st		606 (23.86)	510 (20.08)	606 (23.86) 489 (19.25)
2nd		539 (21.22)		508 (20.00)
Shaft outer diameter	mm (in)			
1st		75 (2.95)		82.6 (3.252)
2nd		75 (2.95)		82.6 (3.252)

*: Constant velocity joint

INSPECTION AND ADJUSTMENT

Unit: mm (in)

Propeller shaft model	3S71A	3S80A-VL107
Journal axial play	0 (0)	
Propeller shaft runout limit	0.6 (0.024)	

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Final Drive

GENERAL SPECIFICATIONS

Final drive model	R200V	R230V
Ring gear pitch diameter mm (in)	205 (8.07)	230 (9.06)
Gear ratio	4.083	3.692
Number of teeth (Ring gear/Drive pinion)	49/12	48/13
Oil capacity (approx.) ℓ (Imp pt)	1.5 (2-5/8)	2.1 (3-3/4)
Side bearing spacer location	Left	Right

INSPECTION AND ADJUSTMENT (R200V)

Ring gear runout

Ring gear runout limit mm (in)	0.05 (0.0020)
-----------------------------------	---------------

Side gear adjustment

Side gear backlash (Clearance between side gear and differential case) mm (in)	0.03 - 0.09 (0.0012 - 0.0035)
---	-------------------------------

Available side gear thrust washers

Thickness mm (in)	Part number
0.80 (0.0315)	38424-40F60
0.83 (0.0327)	38424-40F61
0.86 (0.0339)	38424-40F62
0.89 (0.0350)	38424-40F63
0.92 (0.0362)	38424-40F64
0.95 (0.0374)	38424-40F65
0.98 (0.0386)	38424-40F66
1.01 (0.0398)	38424-40F67
1.04 (0.0409)	38424-40F68
1.07 (0.0421)	38424-40F69
1.10 (0.0433)	38424-40F70
1.13 (0.0445)	38424-40F71
1.16 (0.0457)	38424-40F72
1.19 (0.0469)	38424-40F73
1.22 (0.0480)	38424-40F74
1.25 (0.0492)	38424-40F75
1.28 (0.0504)	38424-40F76
1.31 (0.0516)	38424-40F77
1.34 (0.0528)	38424-40F78
1.37 (0.0539)	38424-40F79
1.40 (0.0551)	38424-40F80
1.43 (0.0563)	38424-40F81
1.46 (0.0575)	38424-40F82
1.49 (0.0587)	38424-40F83

Drive pinion height adjustment

Available pinion height adjusting washers

Thickness mm (in)	Part number
3.09 (0.1217)	38154-P6017
3.12 (0.1228)	38154-P6018
3.15 (0.1240)	38154-P6019
3.18 (0.1252)	38154-P6020
3.21 (0.1264)	38154-P6021
3.24 (0.1276)	38154-P6022
3.27 (0.1287)	38154-P6023
3.30 (0.1299)	38154-P6024
3.33 (0.1311)	38154-P6025
3.36 (0.1323)	38154-P6026
3.39 (0.1335)	38154-P6027
3.42 (0.1346)	38154-P6028
3.45 (0.1358)	38154-P6029
3.48 (0.1370)	38154-P6030
3.51 (0.1382)	38154-P6031
3.54 (0.1394)	38154-P6032
3.57 (0.1406)	38154-P6033
3.60 (0.1417)	38154-P6034
3.63 (0.1429)	38154-P6035
3.66 (0.1441)	38154-P6036

Drive pinion preload adjustment

Drive pinion preload with front oil seal N·m (kg·cm, in·lb)	1.1 - 1.4 (11 - 14, 9.5 - 12.2)
---	---------------------------------

Available drive pinion bearing preload adjusting washers

Thickness mm (in)	Part number
3.80 - 3.82 (0.1496 - 0.1504)	38125-61001
3.82 - 3.84 (0.1504 - 0.1512)	38126-61001
3.84 - 3.86 (0.1512 - 0.1520)	38127-61001
3.86 - 3.88 (0.1520 - 0.1528)	38128-61001
3.88 - 3.90 (0.1528 - 0.1535)	38129-61001
3.90 - 3.92 (0.1535 - 0.1543)	38130-61001
3.92 - 3.94 (0.1543 - 0.1551)	38131-61001
3.94 - 3.96 (0.1551 - 0.1559)	38132-61001
3.96 - 3.98 (0.1559 - 0.1567)	38133-61001
3.98 - 4.00 (0.1567 - 0.1575)	38134-61001
4.00 - 4.02 (0.1575 - 0.1583)	38135-61001
4.02 - 4.04 (0.1583 - 0.1591)	38136-61001
4.04 - 4.06 (0.1591 - 0.1598)	38137-61001
4.06 - 4.08 (0.1598 - 0.1606)	38138-61001
4.08 - 4.10 (0.1606 - 0.1614)	38139-61001

Available drive pinion bearing preload adjusting spacers

Length mm (in)	Part number
45.60 (1.7953)	38165-10V05
45.90 (1.8071)	38165-10V06
46.20 (1.8189)	38165-10V07
46.50 (1.8307)	38165-10V00
46.80 (1.8425)	38165-10V01

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Final Drive (Cont'd)

Side bearing adjustment

Available side bearing adjusting washers

Thickness mm (in)	Part number
2.00 (0.0787)	38453-N3100
2.05 (0.0807)	38453-N3101
2.10 (0.0827)	38453-N3102
2.15 (0.0846)	38453-N3103
2.20 (0.0866)	38453-N3104
2.25 (0.0886)	38453-N3105
2.30 (0.0906)	38453-N3106
2.35 (0.0925)	38453-N3107
2.40 (0.0945)	38453-N3108
2.45 (0.0965)	38453-N3109
2.50 (0.0984)	38453-N3110
2.55 (0.1004)	38453-N3111
2.60 (0.1024)	38453-N3112

Total preload

Total preload	Value of more than 0.29 N·m (3.0 kg-cm, 2.6 in-lb) added on to measured value of drive pinion preload
Ring gear backlash mm (in)	0.10 - 0.15 (0.0039 - 0.0059)

INSPECTION AND ADJUSTMENT (R230V)

Ring gear runout

Ring gear runout limit mm (in)	0.05 (0.0020)
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Side gear adjustment

Side gear backlash (Clearance between side gear and differential case) mm (in)	0.03 - 0.09 (0.0012 - 0.0035)
---	----------------------------------

Available side gear thrust washers

Thickness mm (in)	Part number
1.10 (0.0433)	38424-40P71
1.15 (0.0453)	38424-40P72
1.20 (0.0472)	38424-40P73
1.25 (0.0492)	38424-40P74
1.30 (0.0512)	38424-40P75
1.35 (0.0531)	38424-40P76
1.40 (0.0551)	38424-40P77
1.45 (0.0571)	38424-40P78
1.50 (0.0591)	38424-40P79

Drive pinion height adjustment

Available pinion height adjusting washers

Thickness mm (in)	Part number
2.59 (0.1020)	38154-40P00
2.61 (0.1028)	38154-40P01
2.63 (0.1035)	38154-40P02
2.65 (0.1043)	38154-40P03
2.67 (0.1051)	38154-40P04
2.69 (0.1059)	38154-40P05
2.71 (0.1067)	38154-40P06
2.73 (0.1075)	38154-40P07
2.75 (0.1083)	38154-40P08
2.77 (0.1091)	38154-40P09
2.79 (0.1099)	38154-40P10
2.81 (0.1106)	38154-40P11
2.83 (0.1114)	38154-40P12
2.85 (0.1122)	38154-40P13
2.87 (0.1130)	38154-40P14
2.89 (0.1138)	38154-40P15
2.91 (0.1146)	38154-40P16
2.93 (0.1154)	38154-40P17
2.95 (0.1161)	38154-40P18
2.97 (0.1169)	38154-40P19

Drive pinion preload adjustment

Drive pinion preload with front oil seal N·m (kg-cm, in-lb)	1.8 - 2.6 (18 - 27, 16 - 23)
--	---------------------------------

Side bearing adjustment

Available side bearing adjusting washers

Thickness mm (in)	Part number
2.00 (0.0787)	38453-40P00
2.05 (0.0807)	38453-40P01
2.10 (0.0827)	38453-40P02
2.15 (0.0846)	38453-40P03
2.20 (0.0866)	38453-40P04
2.25 (0.0886)	38453-40P05
2.30 (0.0906)	38453-40P06
2.35 (0.0925)	38453-40P07
2.40 (0.0945)	38453-40P08
2.45 (0.0965)	38453-40P09
2.50 (0.0984)	38453-40P10
2.55 (0.1004)	38453-40P11
2.60 (0.1024)	38453-40P12

Total preload

Total preload	Value of more than 0.29 N·m (3.0 kg-cm, 2.6 in-lb) added on to measured value of drive pinion preload
Ring gear backlash mm (in)	0.13 - 0.18 (0.0051 - 0.0071)

REAR AXLE & REAR SUSPENSION

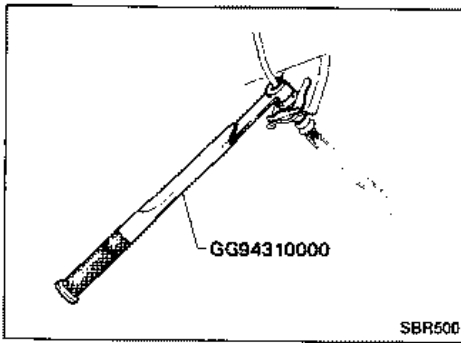
SECTION **RA**

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RA

PRECAUTIONS AND PREPARATION

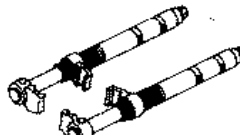
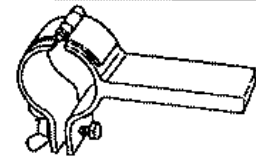

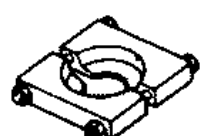
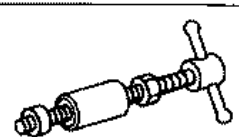
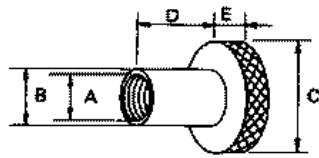


Precautions

- When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.
- * Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.
- Use Tool when removing or installing brake lines.
- When removing each suspension part, check wheel alignment and adjust if necessary.
- Do not jack up at the lower arm.

Preparation

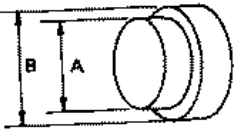
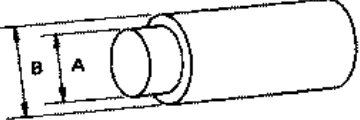

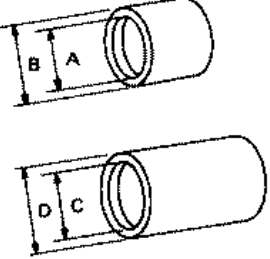
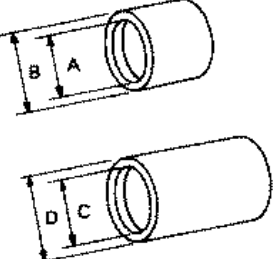
SPECIAL SERVICE TOOLS

Tool number Tool name	Description
HT71780000 Spring compressor	 <p style="text-align: right;">Removing and installing coil spring</p>
ST35652000 Shock absorber attachment	 <p style="text-align: right;">Fixing strut assembly</p>
GG94310000 Flare nut torque wrench	 <p style="text-align: right;">Removing and installing brake piping</p>
ST30031000 Bearing puller	 <p style="text-align: right;">Removing inner race of wheel bearing</p>
ST38280000 Arm bushing remover	 <p style="text-align: right;">Removing and installing bushing of rear axle housing</p>
IM23600800 Attachment Wheel alignment	 <p style="text-align: right;">Measure rear wheel alignment</p> <p style="text-align: right;"> A: Screw M24 x 1.5 B: 35 (1.38) dia. C: 65 (2.56) dia. D: 56 (2.20) E: 12 (0.47) Unit: mm (in) </p>

PRECAUTIONS AND PREPARATION

Preparation (Cont'd)

COMMERCIAL SERVICE TOOLS

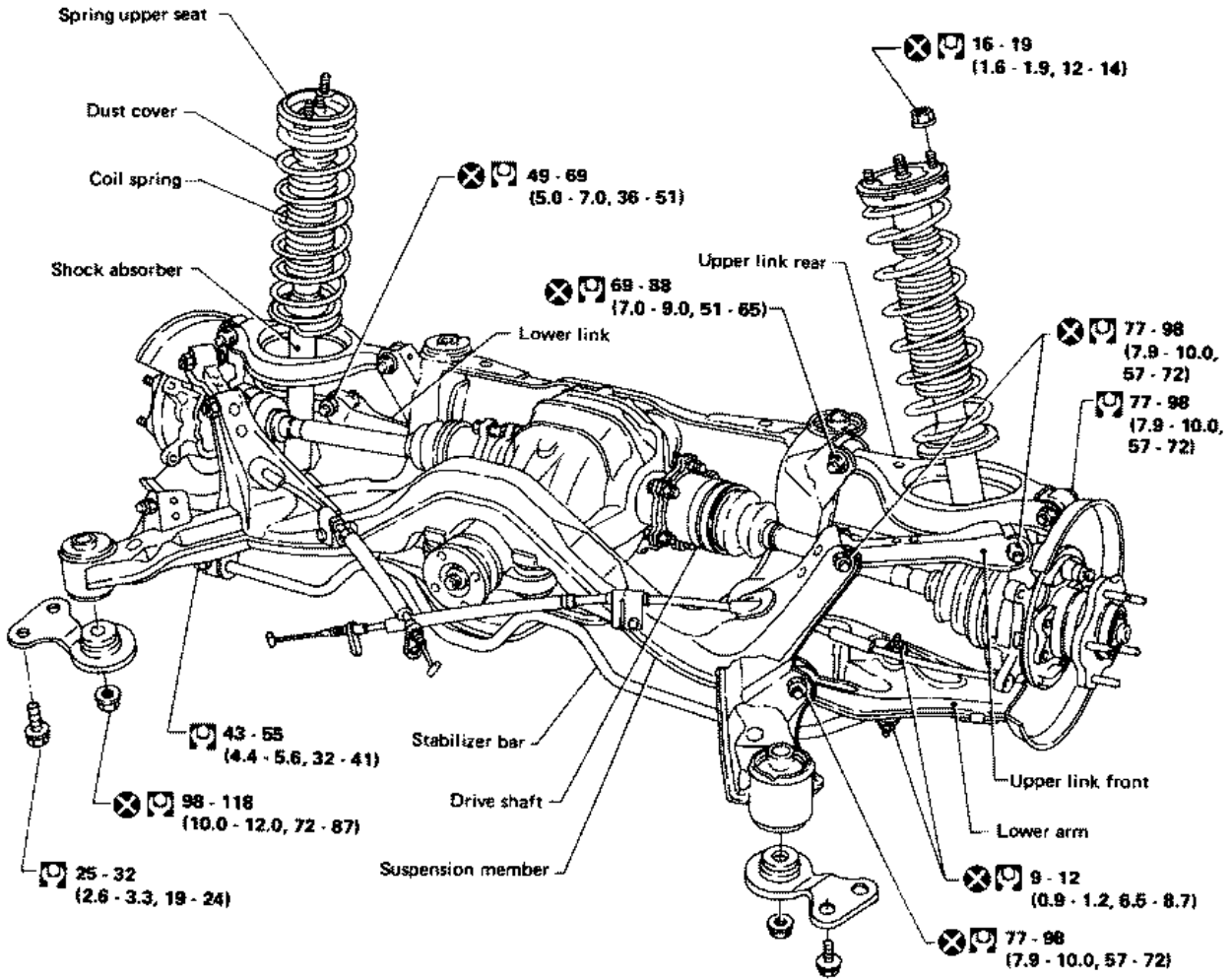
Tool name	Description
Rear wheel hub drift	 <p>Installing wheel bearing A: 41 mm (1.61 in) dia. B: 49 mm (1.93 in) dia.</p>
Wheel bearing drift	 <p>Removing rear wheel hub A: 26 mm (1.02 in) dia. B: 40 mm (1.57 in) dia.</p>
Rear drive shaft plug seal drift	 <p>Installing rear drive shaft plug seal A: 67 mm (2.64 in) dia. B: 85 mm (3.35 in) dia.</p>
Rear axle housing ball joint drift	 <p>Removing ball joint A: 20 (0.79) dia. B: 28 (1.10) dia. C: 40 (1.57) dia. D: 43 (1.69) dia. Unit: mm (in)</p>
Rear axle housing ball joint drift	 <p>Installing ball joint A: 33 (1.30) dia. B: 43 (1.69) dia. C: 30 (1.18) dia. D: 40 (1.57) dia. Unit: mm (in)</p>

REAR AXLE AND REAR SUSPENSION

Final tightening for rubber parts must be done under unladen condition*, with tires on ground.

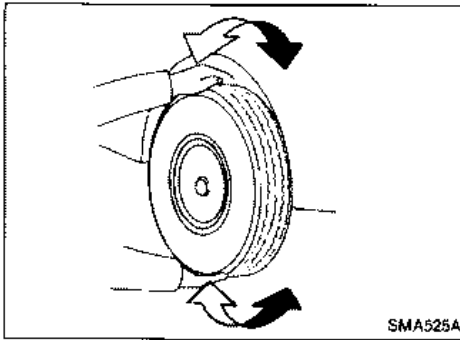
* Fuel, radiator coolant and engine oil full.

Spare tire, jack, hand tools and mats in designated positions.



: N.m (kg-m, ft-lb)

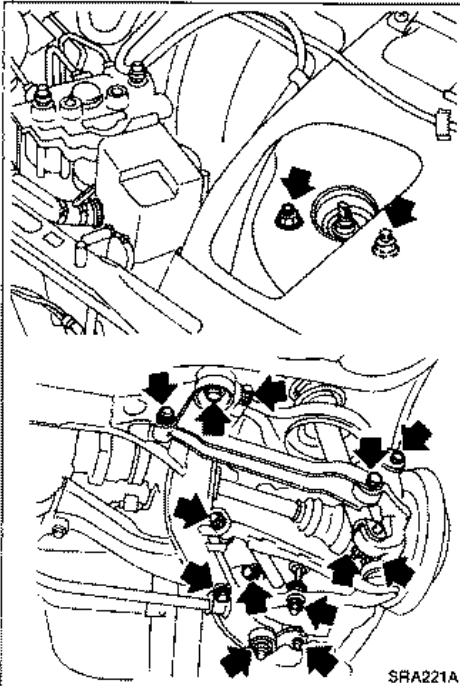
CHECK AND ADJUSTMENT — On-vehicle



Rear Axle and Rear Suspension Parts

Check axle and suspension parts for looseness, wear or damage.

- Shake each rear wheel to check for excessive play.

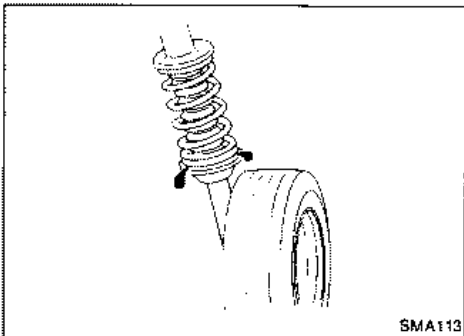


- Retighten all nuts and bolts to the specified torque.

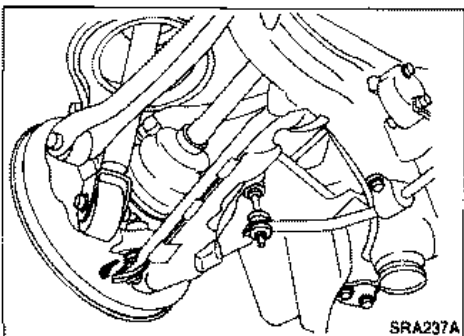
Tightening torque:

Refer to REAR SUSPENSION.

- Make sure that cotter pin is inserted.

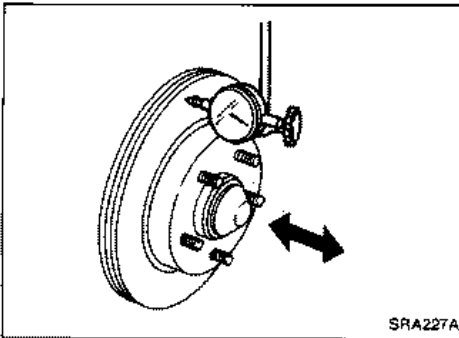


- Check shock absorber for oil leakage or other damage.



- Check suspension ball joint for grease leakage and ball joint dust cover for cracks or other damage.

CHECK AND ADJUSTMENT — On-vehicle



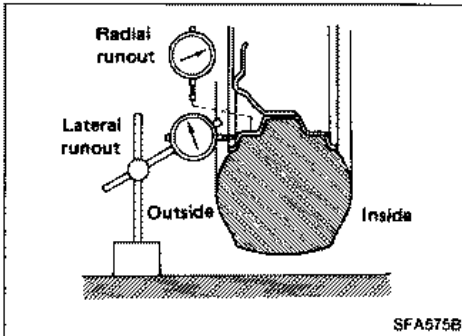
Rear Wheel Bearing

- Check wheel bearings for smooth operation.
- Check axial end play.

Axial end play:

0.05 mm (0.0020 in) or less

If axial end play is not within specification or wheel bearing does not turn smoothly, replace wheel bearing assembly. Refer to REAR AXLE — Wheel Hub and Axle Housing.



Rear Wheel Alignment

Before checking rear wheel alignment, be sure to make a preliminary inspection.

PRELIMINARY INSPECTION

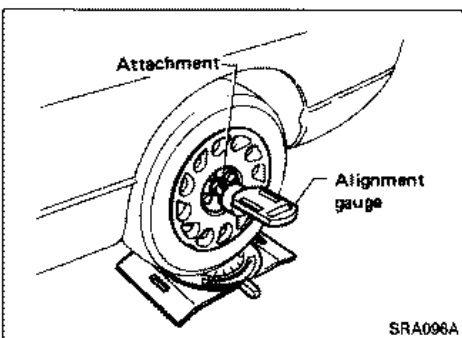
Make the following checks. Adjust, repair or replace if necessary.

- Check tires for wear and for improper inflation.
- Check rear wheel bearings for looseness.
- Check wheel runout.

Wheel runout:

Refer to S.D.S. in section FA.

- Check that rear shock absorber works properly.
- Check rear axle and rear suspension parts for looseness.
- Check vehicle posture (Unladen). ("Unladen": Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.)

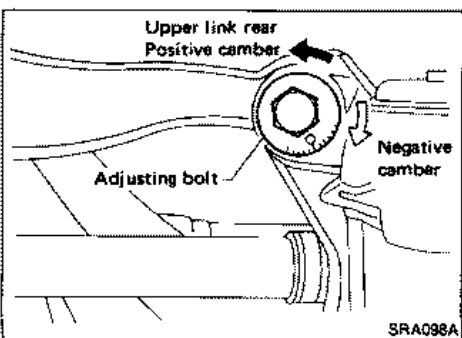


CAMBER

- Measure camber of both right and left wheels with a suitable alignment gauge and adjust in accordance with the following procedures.

Camber:

-1°35' to -0°35'



If camber is not within specification, adjust by turning the adjusting pin.

- (1) Turn the adjusting pin to adjust.

Camber changes about 5' with each graduation of the adjusting pin.

- (2) Tighten to the specified torque.

⊞: 69 - 88 N·m

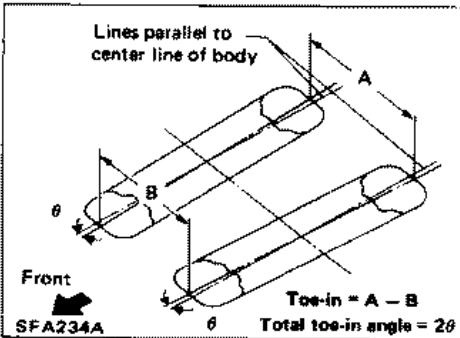
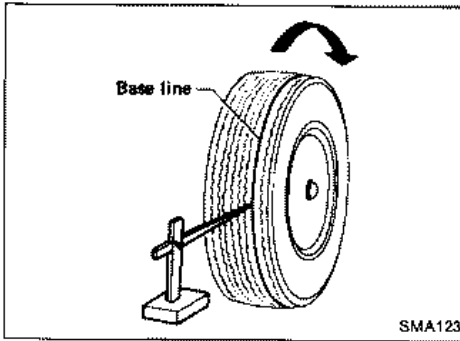
(7.0 - 9.0 kg-m, 51 - 65 ft-lb)

CHECK AND ADJUSTMENT — On-vehicle

Rear Wheel Alignment (Cont'd)

TOE-IN

1. Draw a base line across the tread.
 - After lowering rear of vehicle, move it up and down to eliminate friction.



2. Measure toe-in.
 - Measure distance "A" and "B" at the same height as hub center.

Total toe-in:

A - B: 0 - 4 mm (0 - 0.16 in)

2θ: 0' - 22'

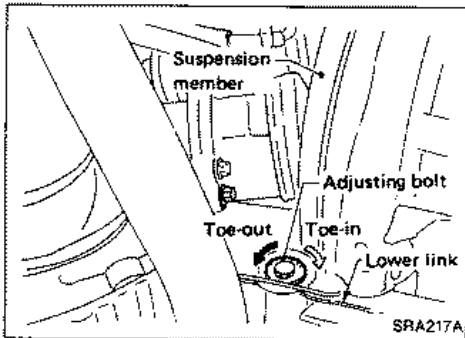
3. Adjust toe-in by turning adjusting pins.

Toe changes about 1.5 mm (0.059 in) [One side] with each graduation of the adjusting pin.

4. Tighten to the specified torque.

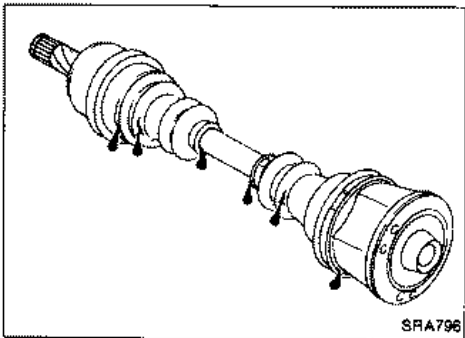
⌚: 69 - 88 N·m

(7.0 - 9.0 kg·m, 51 - 65 ft·lb)

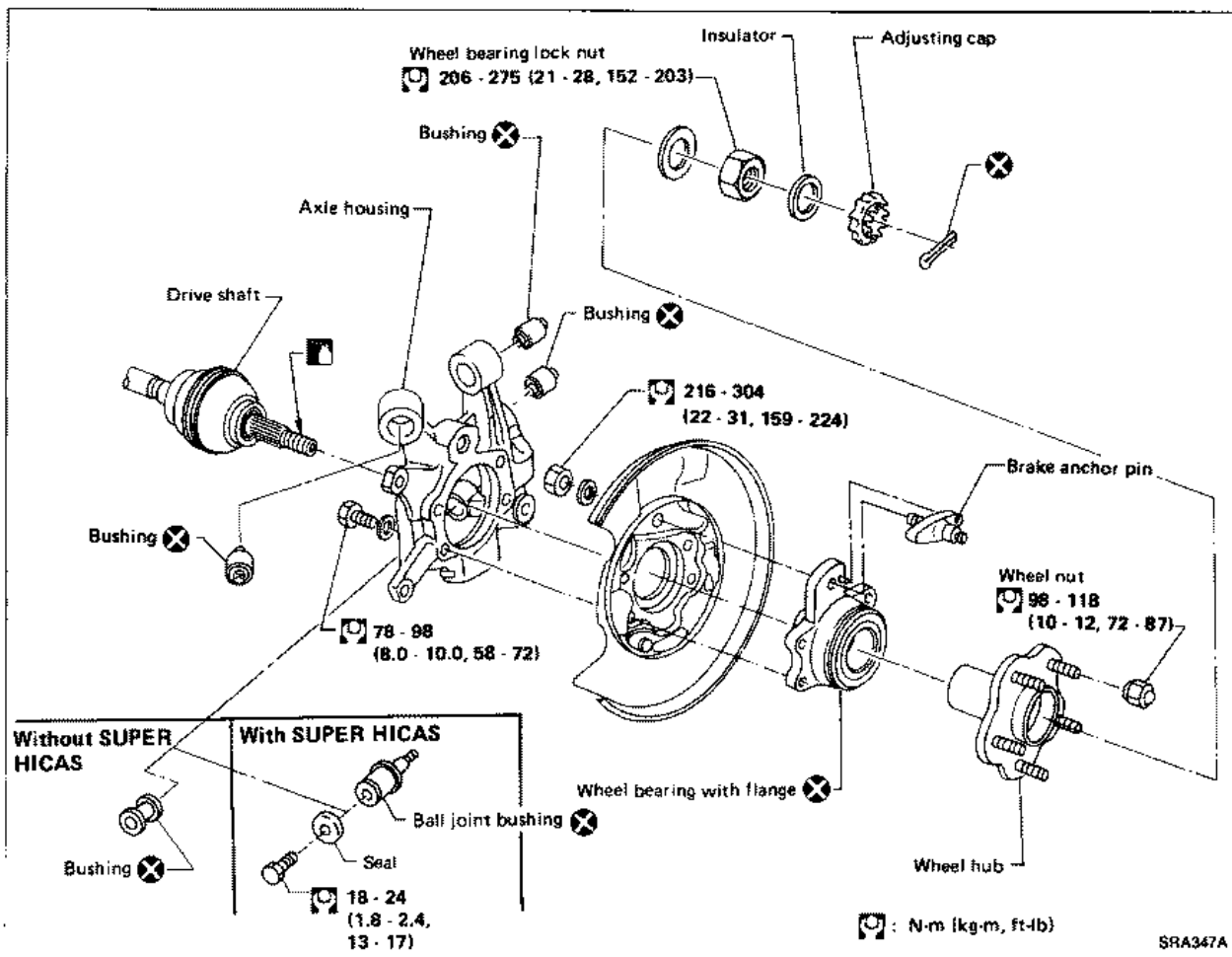


Drive Shaft

Check boot and drive shaft for cracks, wear, damage or grease leakage.

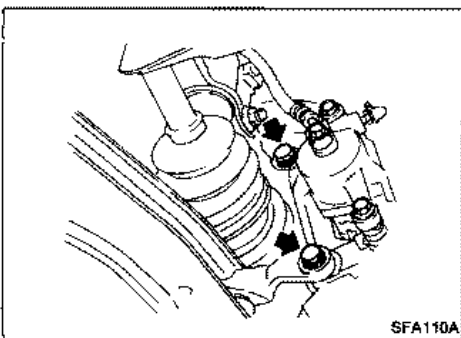


REAR AXLE — Wheel Hub and Axle Housing



Removal

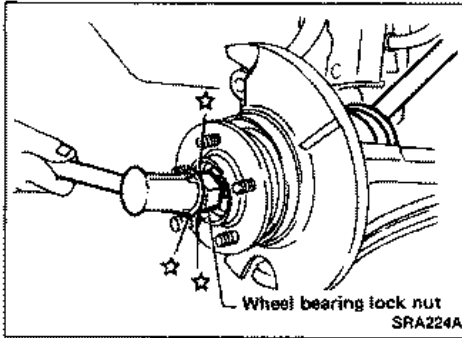
- Remove wheel bearing lock nut.



- Remove brake caliper assembly and rotor. **Brake line need not be disconnected from brake caliper. Be careful not to depress brake pedal, or piston will pop out. Do not pull or twist brake hose.**

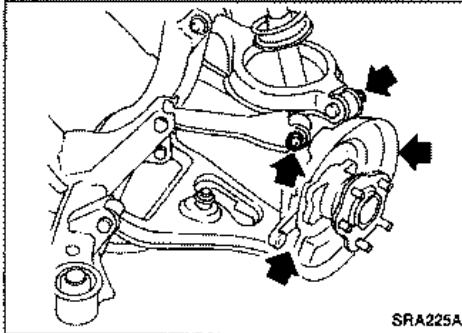
REAR AXLE — Wheel Hub and Axle Housing

Removal (Cont'd)

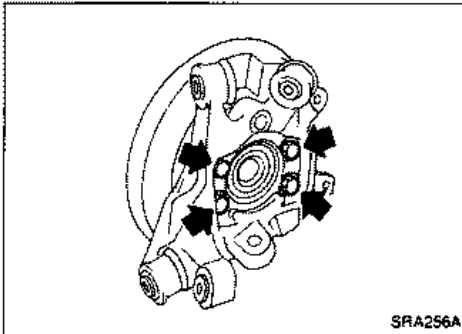


- Separate drive shaft from axle housing by slightly tapping it. If it is hard to separate, then, use a puller.

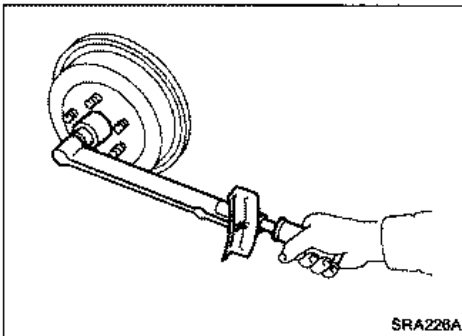
When removing drive shaft, cover boots with waste cloth to prevent them from being damaged.



- Remove axle housing.

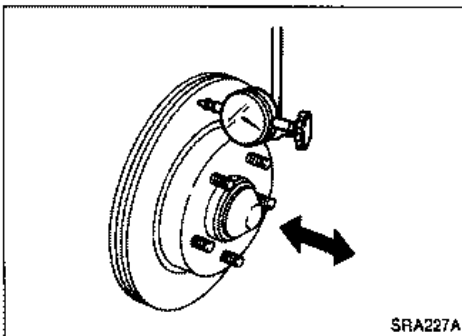


- Remove wheel bearing with flange, and wheel hub from axle housing.



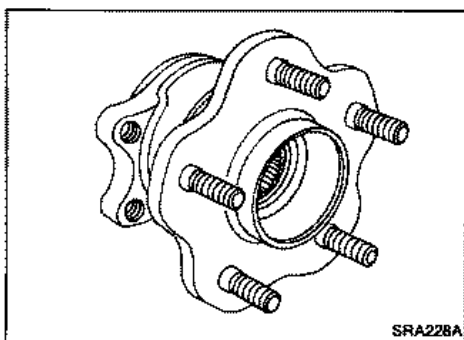
Installation

- Install axle housing with wheel hub.
- Tighten wheel bearing lock nut.
⌚: 206 - 275 N·m
(21 - 28 kg·m, 152 - 203 ft·lb)



- Check wheel bearing axial end play.
Axial end play: 0.05 mm (0.0020 in) or less

REAR AXLE — Wheel Hub and Axle Housing



Disassembly

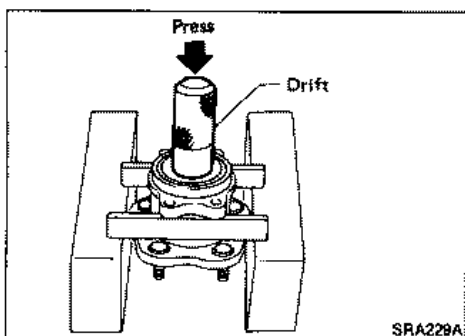
CAUTION:

Wheel bearing with flange usually does not require maintenance. If any of the following symptoms are noted, replace wheel bearing assembly (including flange, and inner and outer seals).

- Growling noise is emitted from wheel bearing during operation.
- Wheel bearing drags or turns roughly when hub is turned with your hand after bearing lock nut is tightened to specified torque.
- After wheel bearing is removed from hub.

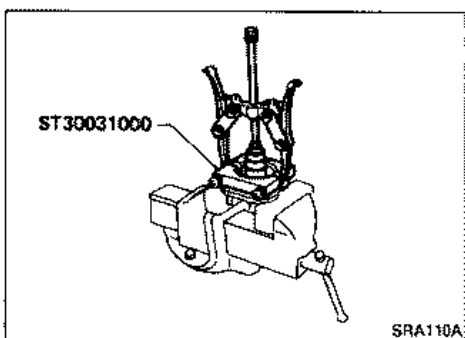
WHEEL HUB

Remove wheel bearing (with flange) and wheel hub as one unit from axle housing before disassembling.



WHEEL BEARING

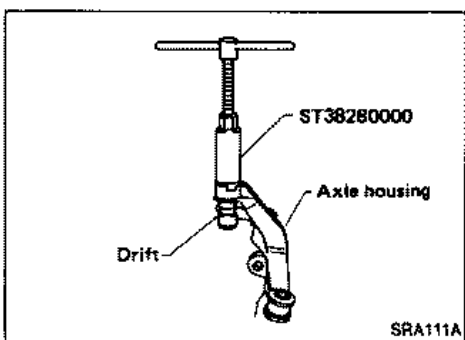
- Using a press and drift as shown in figure at left, press wheel bearing out.
- Discard old wheel bearing assembly. Replace with a new wheel assembly.



- Remove inner race from hub using a bearing replacer /puller.

CAUTION:

- Do not reuse old inner race although it is of the same brand as the bearing assembly.
- Do not replace grease seals as single parts.



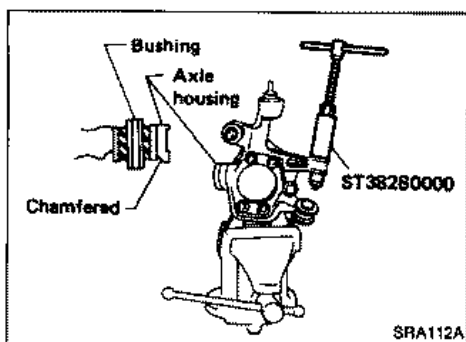
AXLE HOUSING

- Attach a drift on outer shell of bushing as shown in figure at left, remove bushing using arm bushing remover.

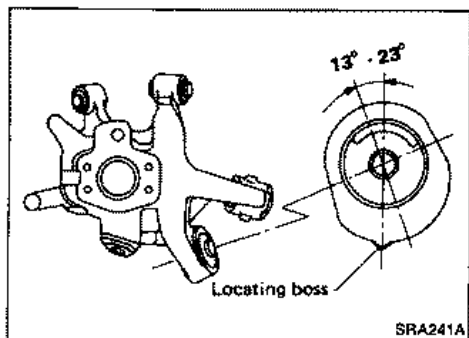
When placing axle housing in a vise, use wooden blocks or copper plates as pads.

REAR AXLE — Wheel Hub and Axle Housing

Disassembly (Cont'd)



- Ensure axle housing bore is free from scratches or deformities before pressing bushing into it.
- Attach bushing to chamfered bore end of axle housing and press it until it is flush with end face of axle housing.



- When installing shock absorber bushing, make sure that it is positioned as shown.

Inspection

WHEEL HUB AND AXLE HOUSING

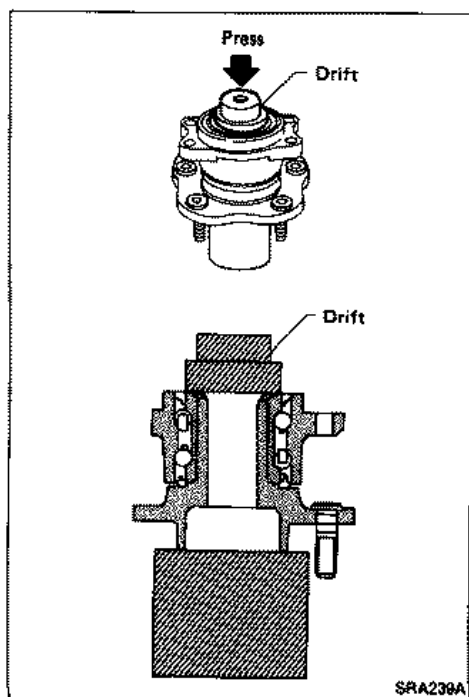
- Check wheel hub and axle housing for cracks by using a magnetic exploration or dyeing test.
- Check wheel bearing for damage, seizure, rust or rough operation.
- Check rubber bushing for wear or other damage.

Replace if necessary.

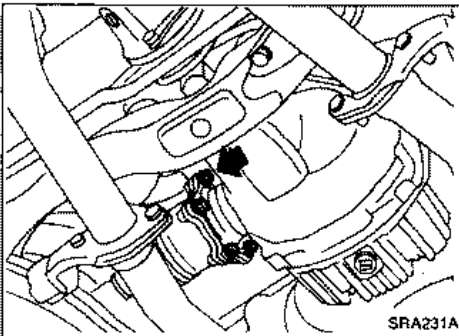
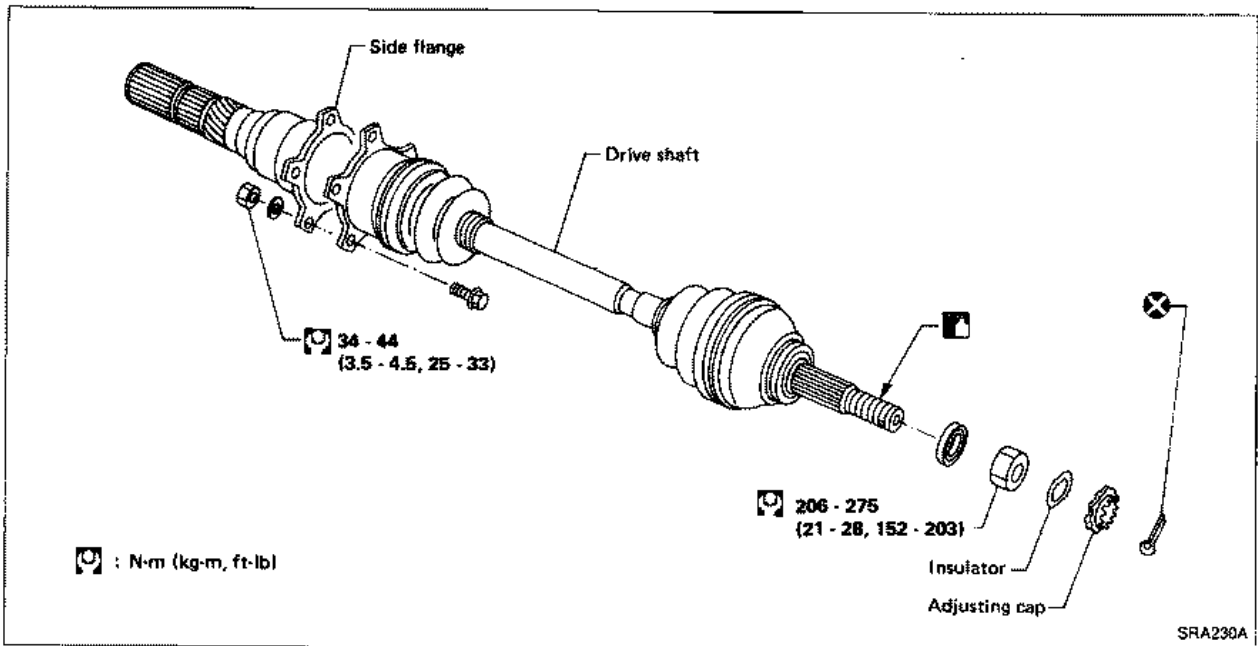
Assembly

Place hub on a block. Attach a drift to inner race of wheel bearing and press it into hub as shown in figure at left.

Be careful not to damage grease seal.



REAR AXLE — Drive Shaft

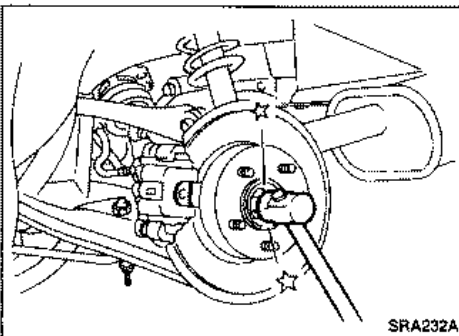


Removal

When removing drive shaft, cover boots with waste cloth to prevent damage to them.

FINAL DRIVE SIDE

Remove side flange mounting bolt and separate shaft.



WHEEL SIDE

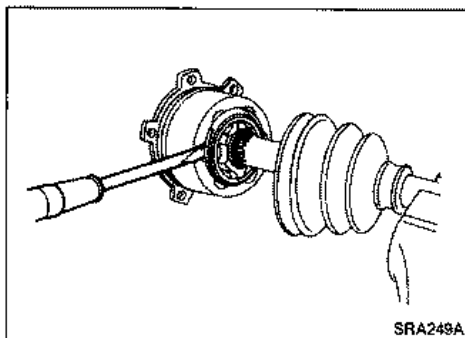
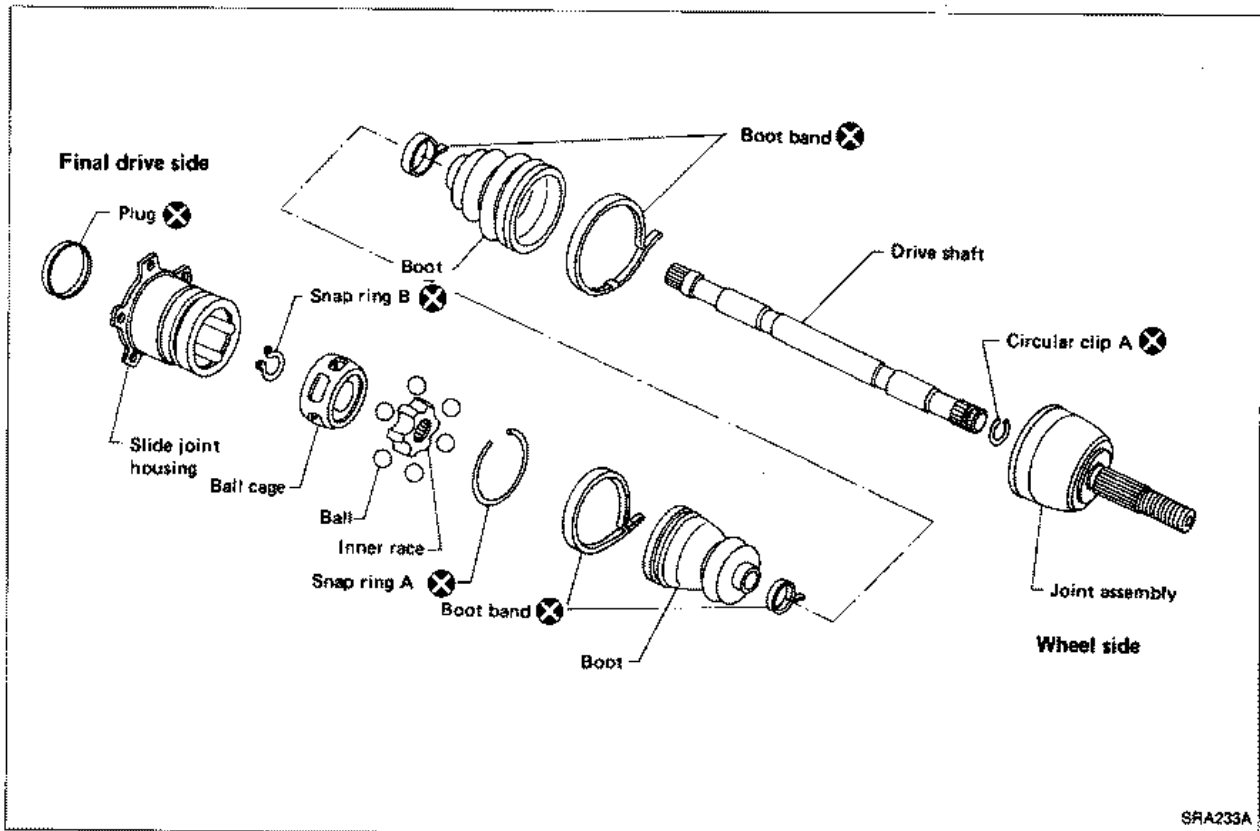
Remove drive shaft by lightly tapping it with a copper hammer. To avoid damaging threads of drive shaft, install a nut while removing drive shaft.

Installation

- Insert drive shaft from wheel hub and temporarily tighten wheel bearing lock nut.
- Tighten side flange mounting bolts to specified torque.
- Tighten wheel bearing lock nut to specified torque.

REAR AXLE — Drive Shaft

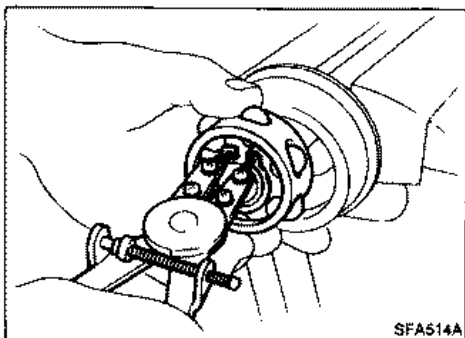
Components



Disassembly

FINAL DRIVE SIDE (DS90, DS100)

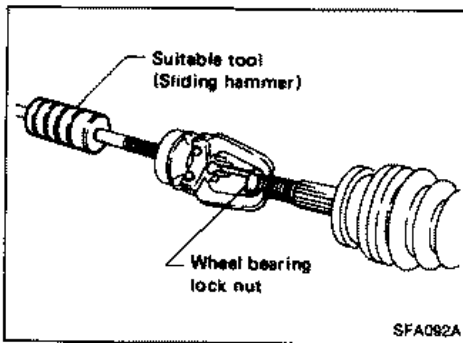
1. Remove boot bands.
2. Put matching marks on slide joint housing and inner race, before separating joint assembly.
3. Pry off snap ring "A" with a screwdriver, and pull out slide joint housing.



4. Put matching marks on inner race and drive shaft.
5. Pry off snap ring "B", then remove ball cage, inner race and balls as a unit.
6. Draw out boot.

Cover drive shaft serration with tape so as not to damage the boot.

REAR AXLE — Drive Shaft



Disassembly (Cont'd)

WHEEL SIDE (ZF100, BF100)

CAUTION:

The joint on the wheel side cannot be disassembled.

- Before separating joint assembly, put matching marks on drive shaft and joint assembly.
 - Separate joint assembly with a suitable tool.
- Be careful not to damage threads on drive shaft.
- Remove boot bands.

Inspection

Thoroughly clean all parts in cleaning solvent, and dry with compressed air. Check parts for evidence of deformation or other damage.

DRIVE SHAFT

Replace drive shaft if it is twisted or cracked.

BOOT

Check boot for fatigue, cracks, or wear. Replace boot with new boot bands.

JOINT ASSEMBLY (Final drive side)

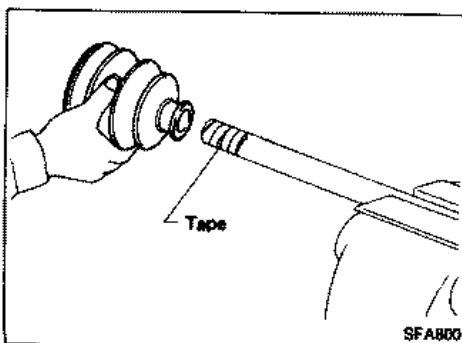
- Replace any parts of double offset joint which show signs of scorching, rust, wear or excessive play.
- Check serration for deformation. Replace if necessary.
- Check slide joint housing for any damage. Replace if necessary.

JOINT ASSEMBLY (Wheel side)

Replace joint assembly if it is deformed or damaged.

Assembly

- After drive shaft has been assembled, ensure that it moves smoothly over its entire range without binding.
- Use NISSAN GENUINE GREASE or equivalent after every overhaul.

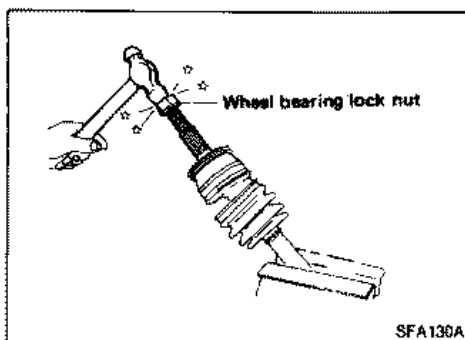


WHEEL SIDE (ZF100, BF100)

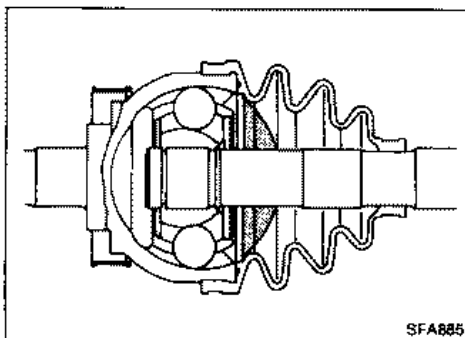
1. Install boot and new small boot band on drive shaft. Cover drive shaft serration with tape so as not to damage boot during installation.

REAR AXLE — Drive Shaft

Assembly (Cont'd)



2. Set joint assembly onto drive shaft by lightly tapping it. Install joint assembly securely, ensuring marks which were made during disassembly are properly aligned.



3. Pack drive shaft with specified amount of grease.

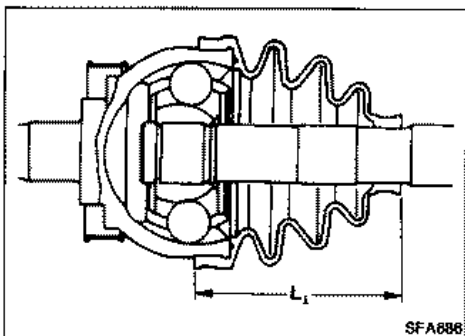
Specified amount of grease:

VG30DE

165 - 175 g (5.82 - 6.17 oz)

VG30DETT

170 - 190 g (6.00 - 6.70 oz)



4. Set boot so that it does not swell and deform when its length is "L₁".

Make sure that boot is properly installed on the drive shaft groove.

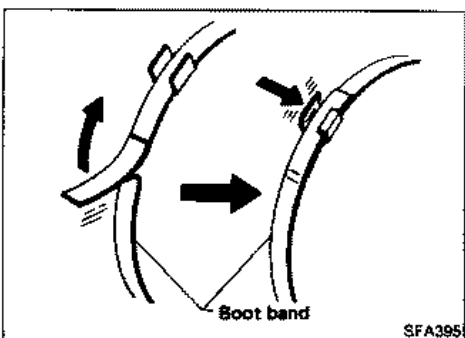
Length "L₁":

VG30DE

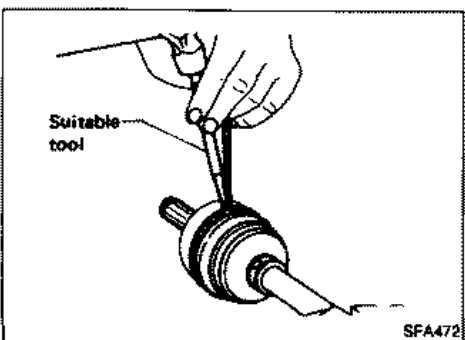
96 - 98 mm (3.78 - 3.86 in)

VG30DETT

101 - 103 mm (3.98 - 4.06 in)



5. Lock new larger and smaller boot bands securely with a suitable tool.

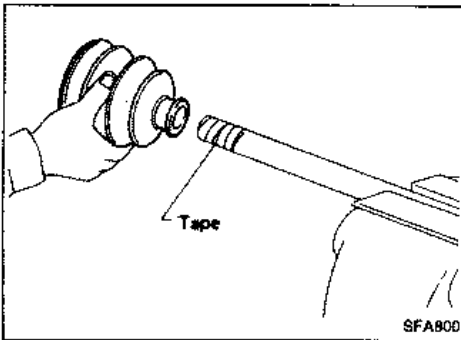


REAR AXLE — Drive Shaft

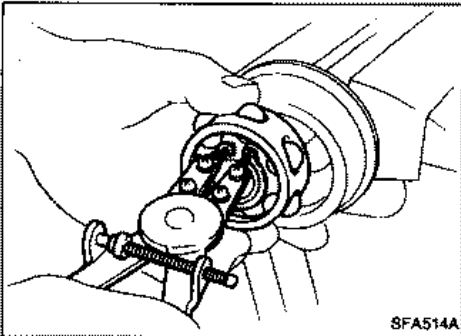
Assembly (Cont'd)

FINAL DRIVE SIDE (DS90, DS100)

1. Install boot and new small boot band on drive shaft.
Cover drive shaft serration with tape so as not to damage boot during installation.



2. Securely install ball cage, inner race and balls as a unit, making sure the marks which were made during disassembly are properly aligned.
3. Install new snap ring "B".



4. Pack drive shaft with specified amount of grease.
Specified amount of grease:

VG30DE

165 - 175 g (5.82 - 6.17 oz)

VG30DETT

180 - 200 g (6.35 - 7.05 oz)

5. Install slide joint housing, then install new snap ring "A".
6. Set boot so that it does not swell and deform when its length is "L₂".

Make sure that boot is properly installed on the drive shaft groove.

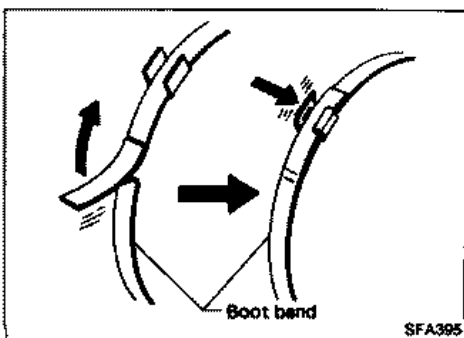
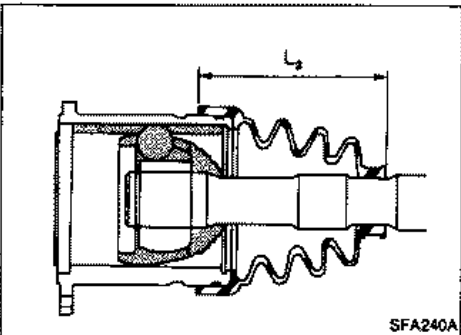
Length "L₂":

VG30DE

93 - 95 mm (3.66 - 3.74 in)

VG30DETT

102.5 - 104.5 mm (4.04 - 4.11 in)



7. Lock new larger and smaller boot bands securely with a suitable tool.

REAR SUSPENSION

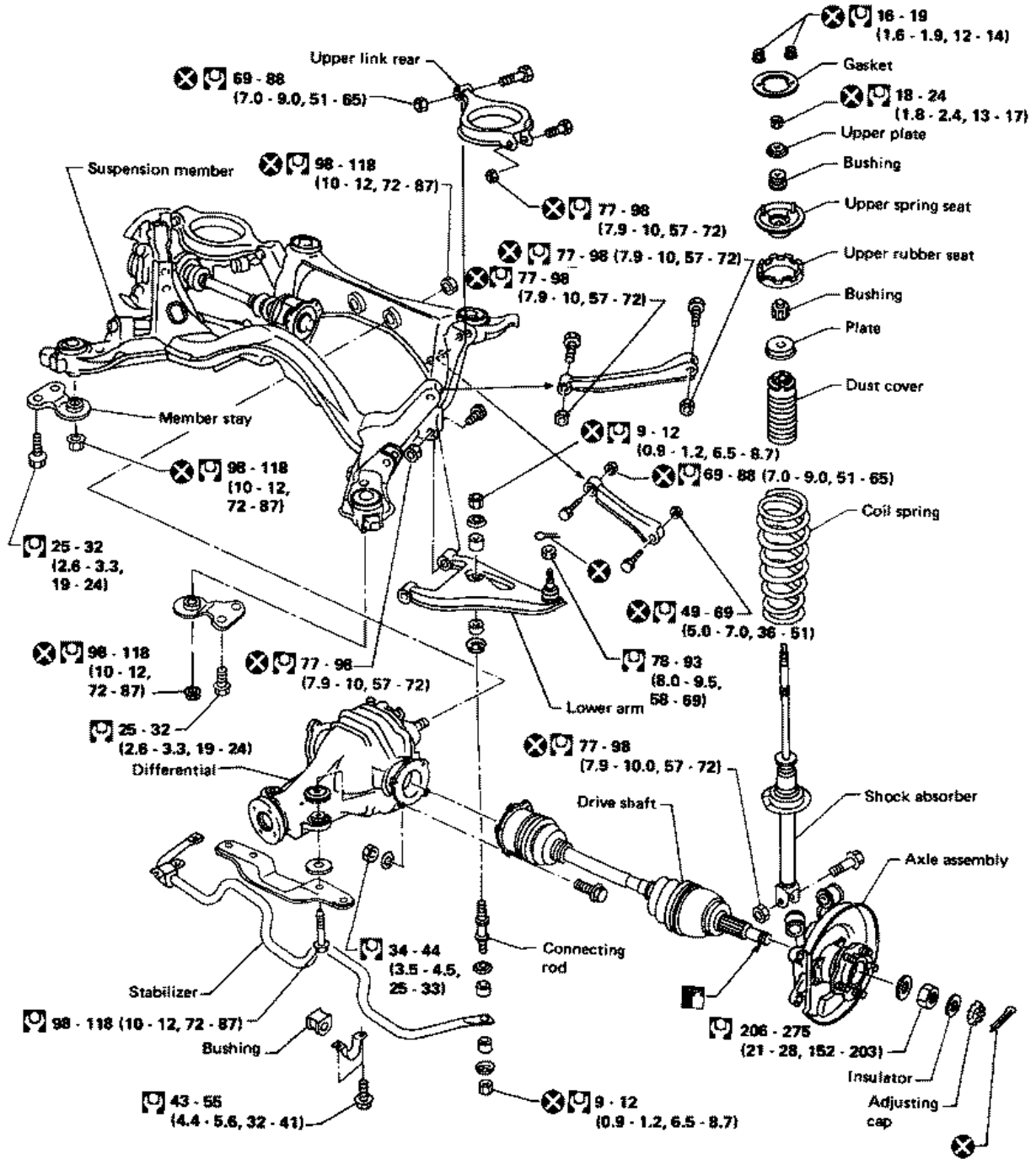
CAUTION:

Do not jack up at lower arm.

Final tightening for rubber parts must be done under unladen condition*, with tires on ground.

* Fuel, radiator coolant and engine oil full.

Spare tire, jack, hand tools and mats in designated positions.

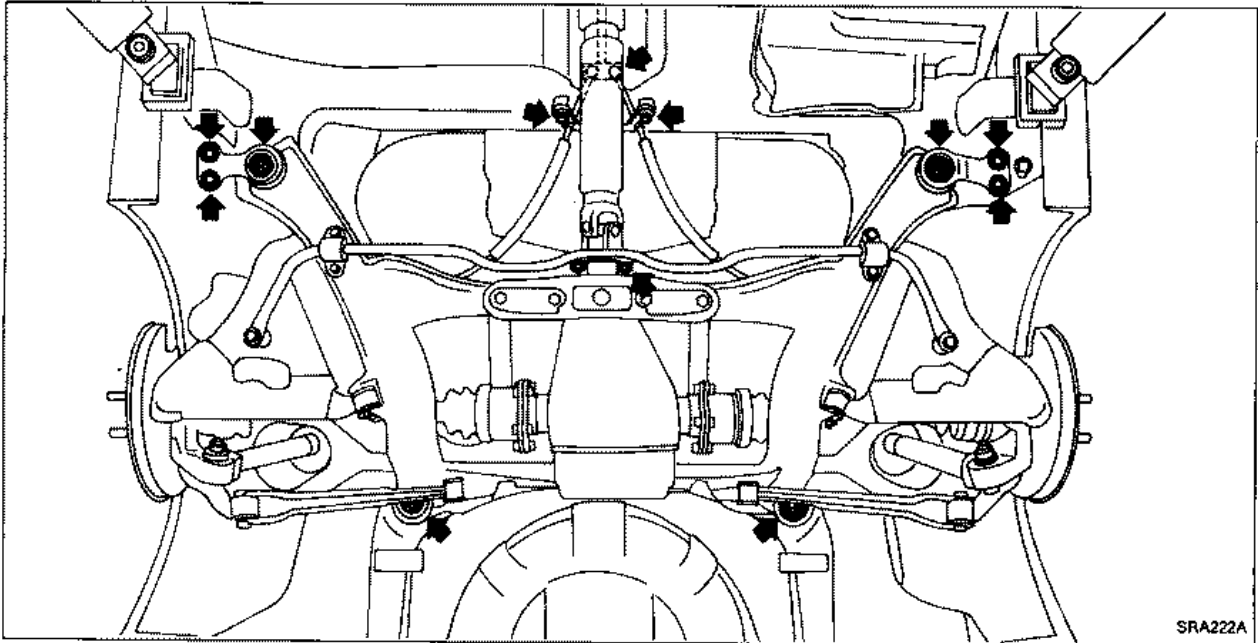


: N-m (kg-m, ft-lb)

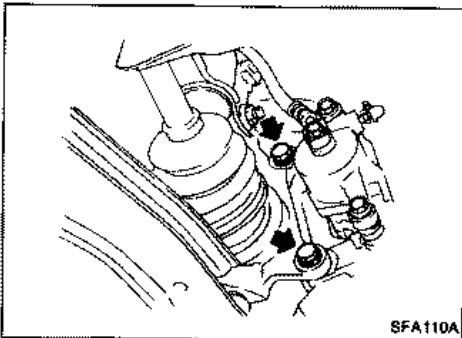
SRA234A

REAR SUSPENSION

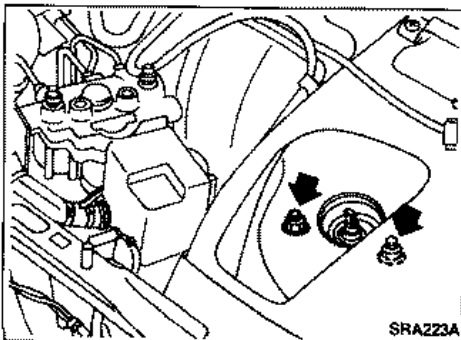
Removal and Installation



- Remove exhaust tube.
- Disconnect propeller shaft rear end.
- Disconnect hand brake wire front end.



- Remove brake caliper assembly.
Brake line need not be disconnected from brake caliper.
Be careful not to depress brake pedal, or piston will pop out.
Do not pull or twist brake hose.

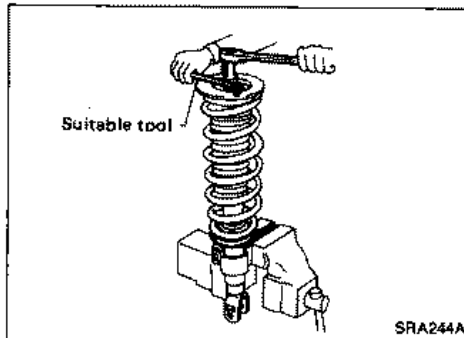


- Remove upper end nuts of shock absorber.
Do not remove piston rod lock nut.
- Remove suspension member fixing nuts. Then draw out rear axle and rear suspension assembly.

REAR SUSPENSION — Coil Spring and Shock Absorber

Removal

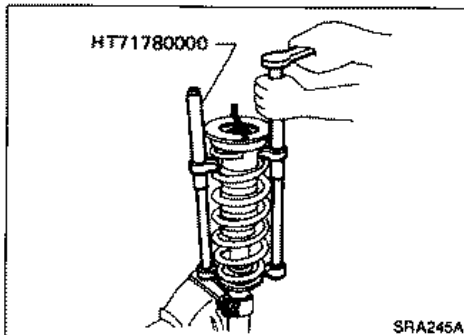
Remove shock absorber upper and lower fixing nuts.
Do not remove piston rod lock nut on vehicle.



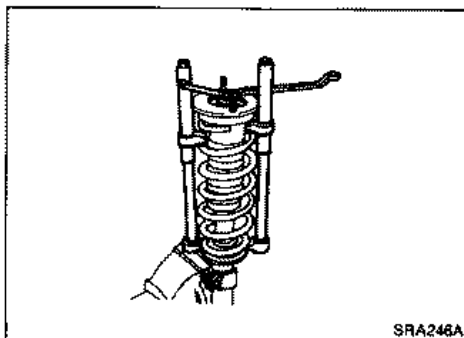
Disassembly

1. Set shock absorber on vise with attachment, then loosen piston rod lock nut.

Do not remove piston rod lock nut.



2. Compress spring with Tool so that the strut upper spring seat can be turned by hand.



3. Remove piston rod lock nut.

Inspection

SHOCK ABSORBER ASSEMBLY

- Check for smooth operation through a full stroke, both compression and extension.
- Check for oil leakage occurring on welded or gland packing portions.
- Check piston rod for cracks, deformation or other damage. Replace if necessary.

REAR SUSPENSION — Coil Spring and Shock Absorber

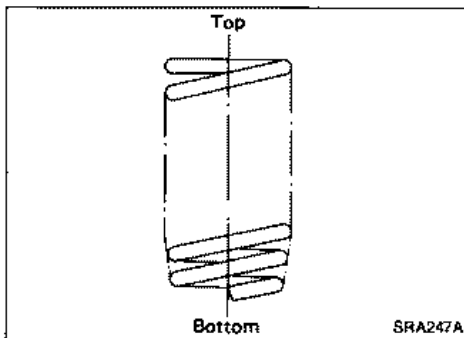
Inspection (Cont'd)

UPPER RUBBER SEAT AND BUSHING

Check rubber parts for deterioration or cracks.
Replace if necessary.

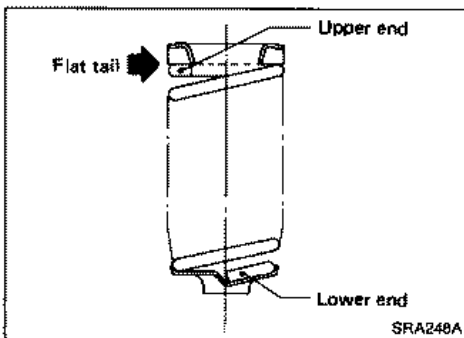
COIL SPRING

Check for cracks, deformation or other damage.
Replace if necessary.



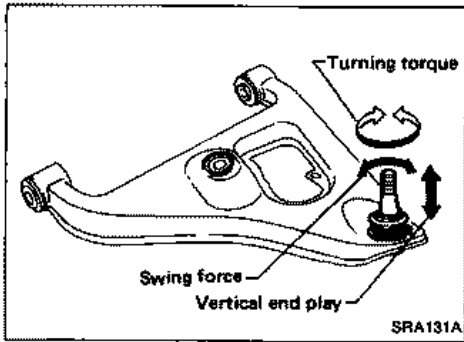
Assembly

- When installing coil spring, be careful not to reverse top and bottom direction. (Top end is flat.)



- When installing coil spring on strut, it must be positioned as shown in figure at left.

REAR SUSPENSION — Multi-link and Lower Ball Joint



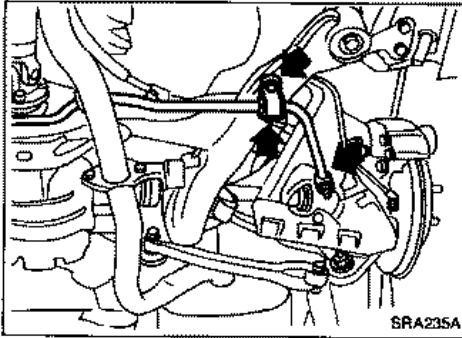
Inspection (Cont'd)

SUSPENSION LOWER BALL JOINT

- Measure swing force, turning torque and vertical end play in axial direction. (Use same measurement procedures as that of section FA.)
- If ball stud is worn, play in axial direction is excessive, or joint is hard to swing, replace lower arm.

Ball joint specifications	Swing force	7.8 - 54.9 N (0.8 - 5.6 kg, 1.8 - 12.3 lb)
	Turning torque	0.5 - 3.4 N·m (5 - 35 kg-cm, 4.3 - 30.4 in-lb)
	Vertical end play	0 mm (0 in)

REAR SUSPENSION — Stabilizer Bar

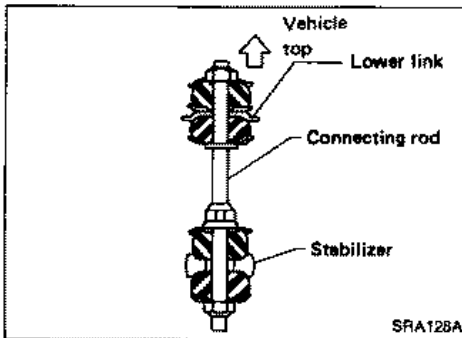


Removal

Remove connecting rod and clamp.

Inspection

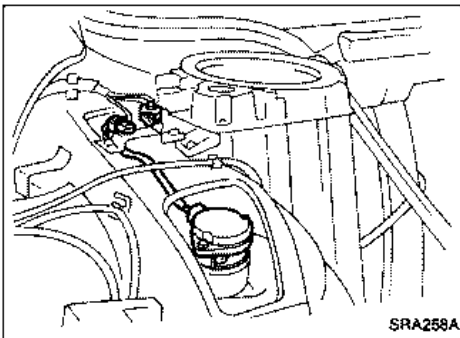
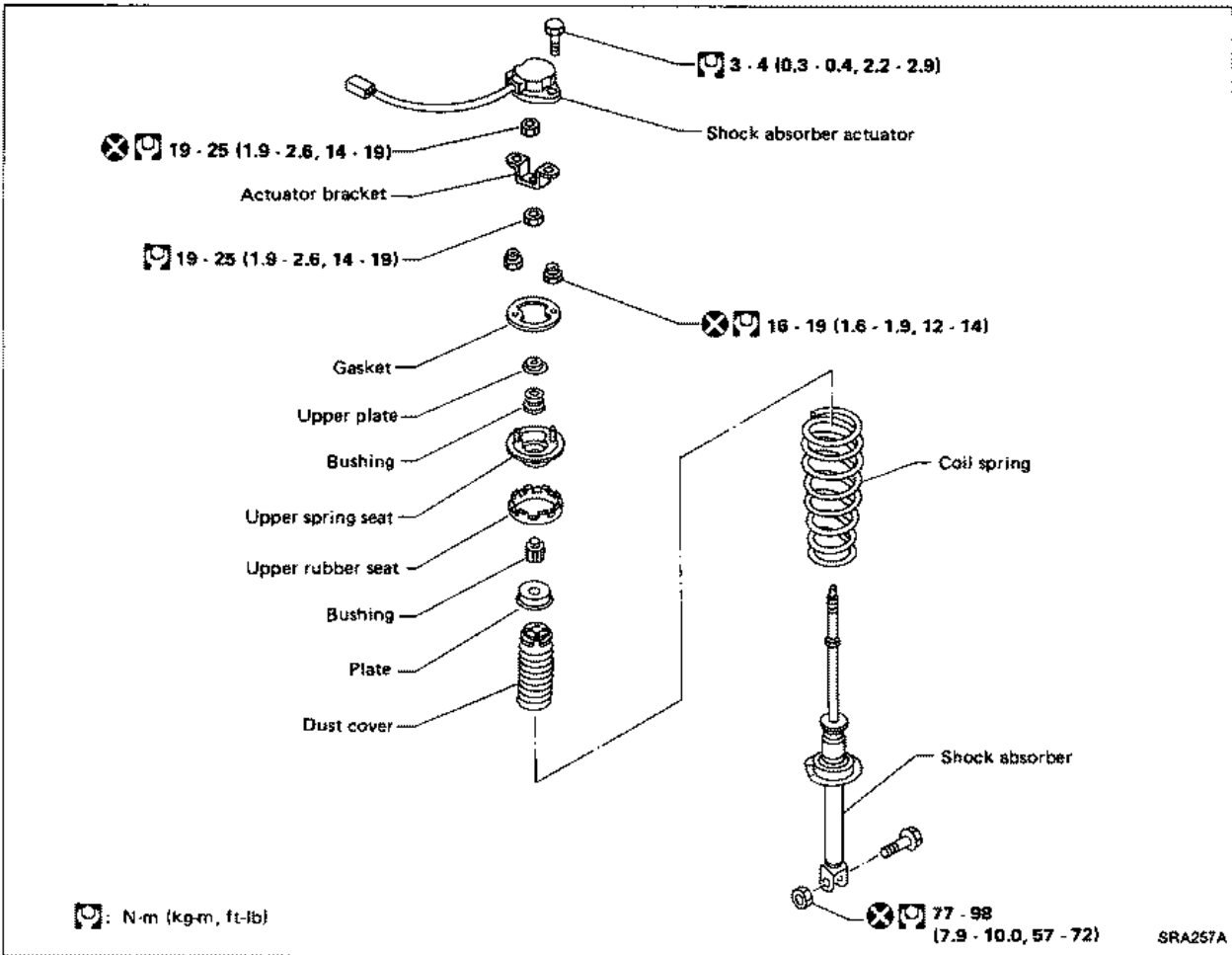
- Check stabilizer bar for deformation or cracks. Replace if necessary.
- Check rubber bushings for deterioration or cracks. Replace if necessary.



Installation

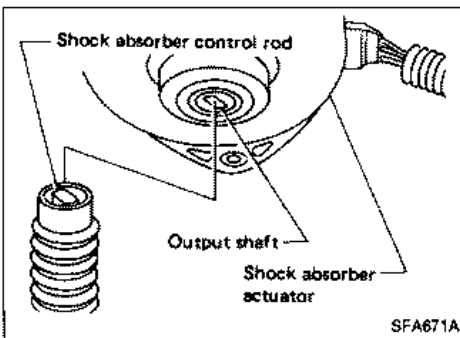
When installing connecting rod, make sure direction is correct (as shown at left).

ADJUSTABLE SHOCK ABSORBER



Removal and Installation

- Remove room trim. Refer to section BF.
- Disconnect sub-harness connector.
- Remove shock absorber actuator fixing bolts.



- Before installing actuator, ensure angle of shock absorber control rod is aligned with that of actuator output shaft. Otherwise, actuator may be damaged.
- Refer to REAR SUSPENSION for other procedures.

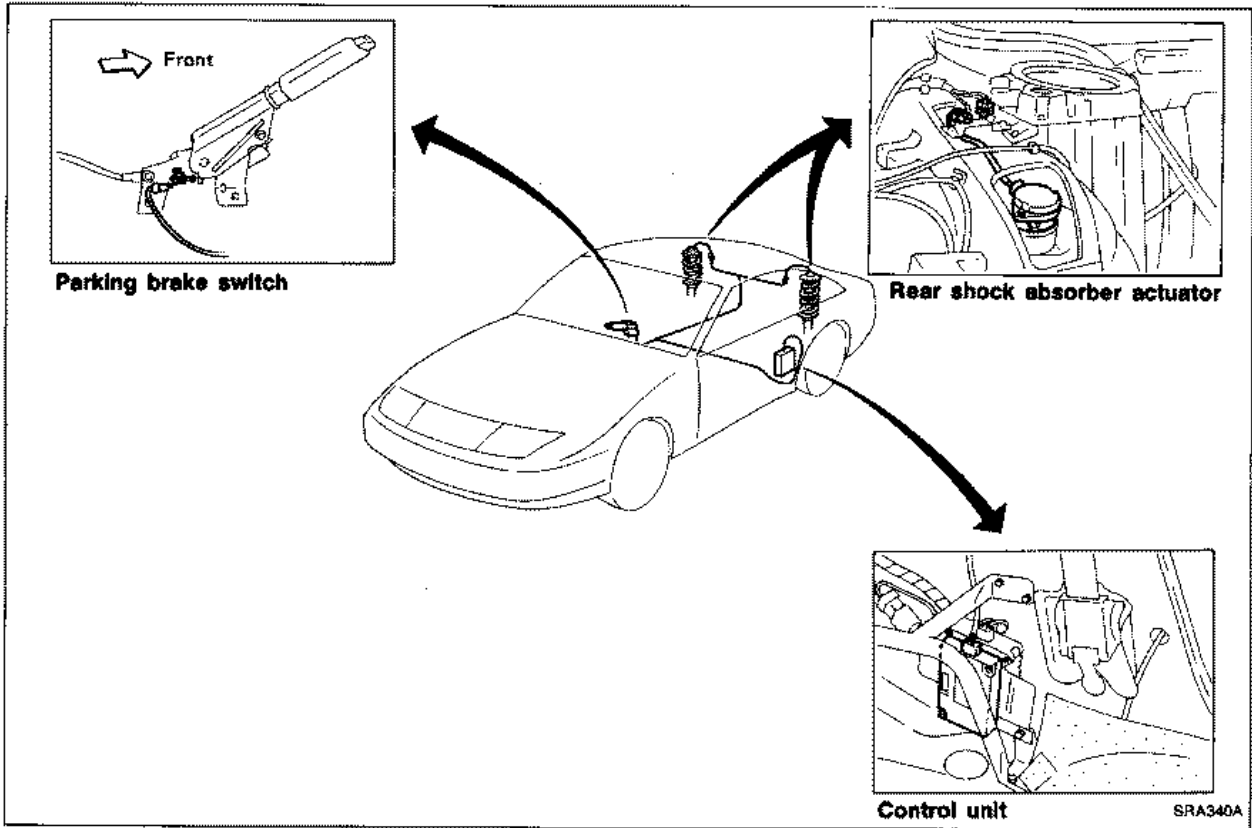
ADJUSTABLE SHOCK ABSORBER

Inspection

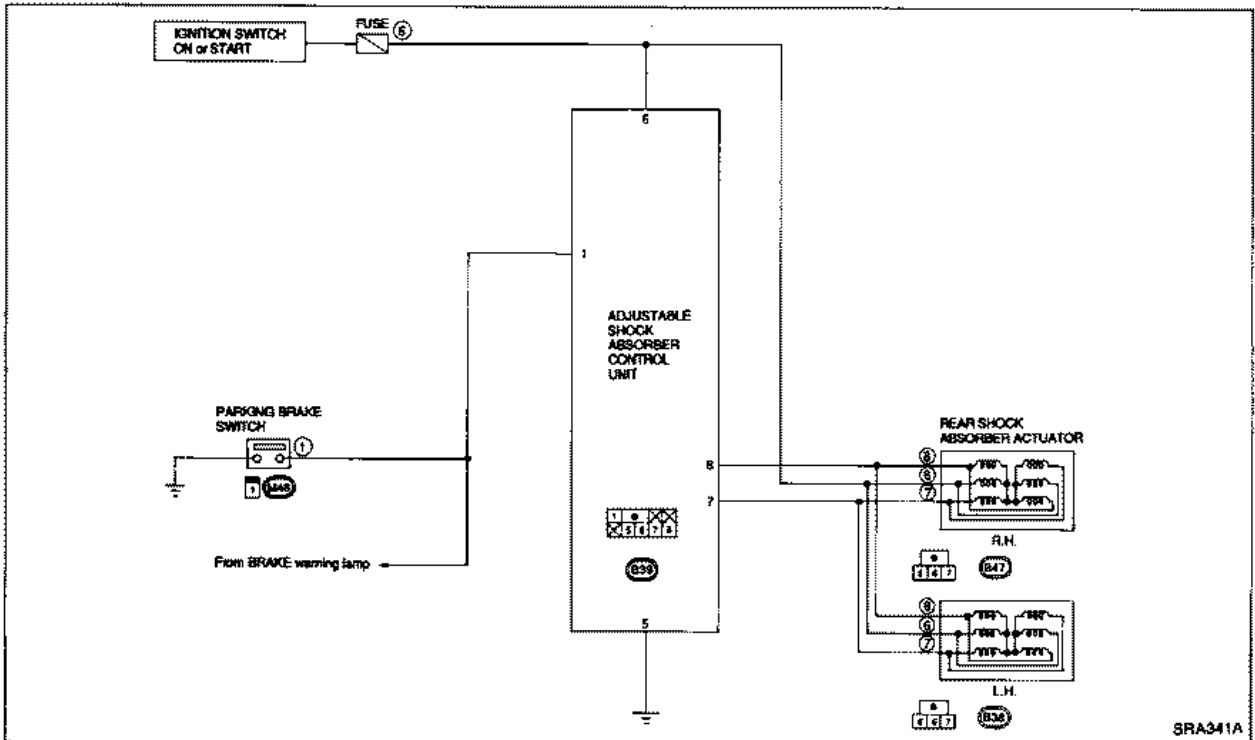
- Replace shock absorber assembly if it is damaged.
Refer to REAR SUSPENSION — Coil Spring and Shock Absorber.

ADJUSTABLE SHOCK ABSORBER — Trouble Diagnoses

Component Parts and Harness Connector Location

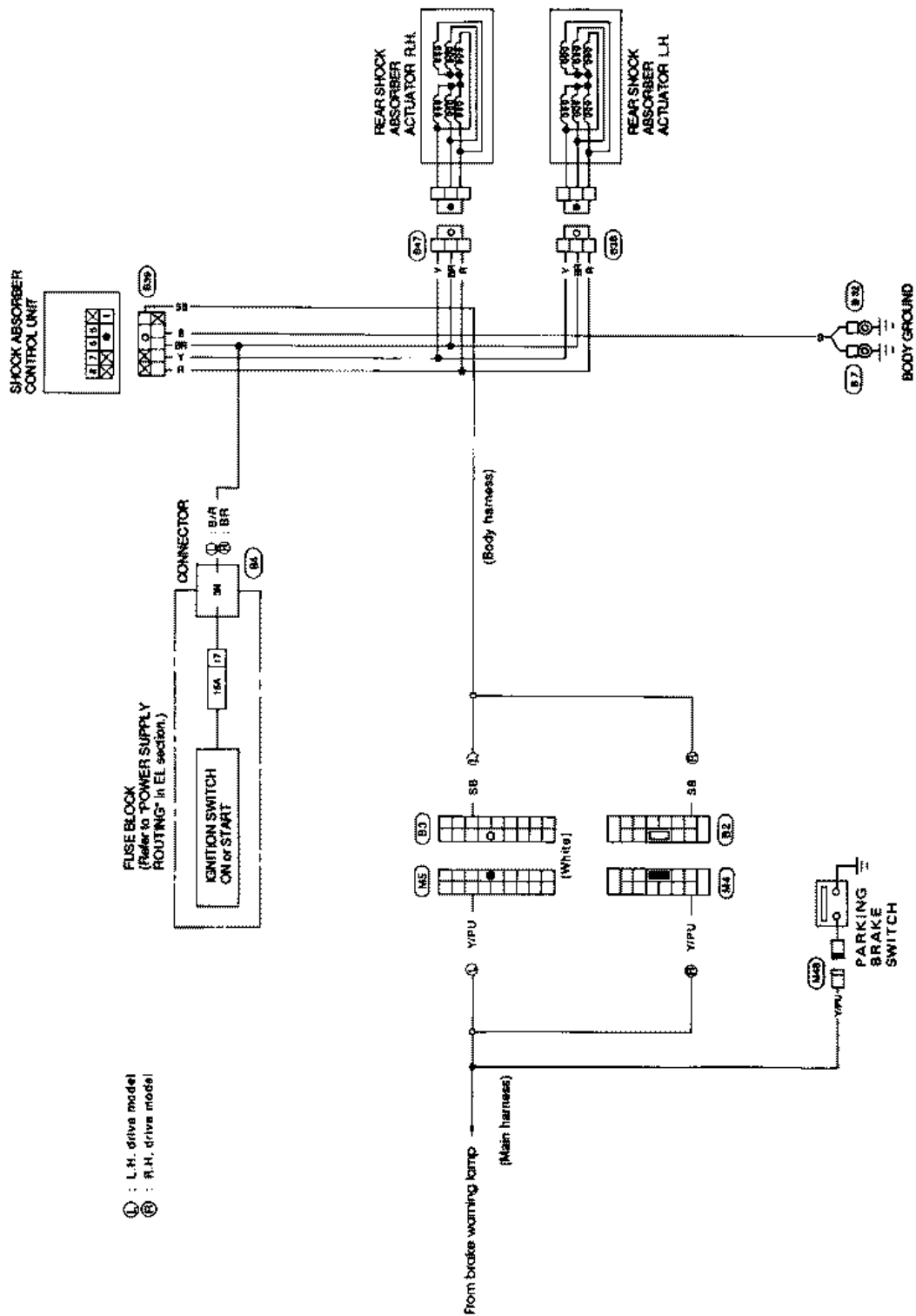


Circuit Diagram for Quick Pinpoint Check



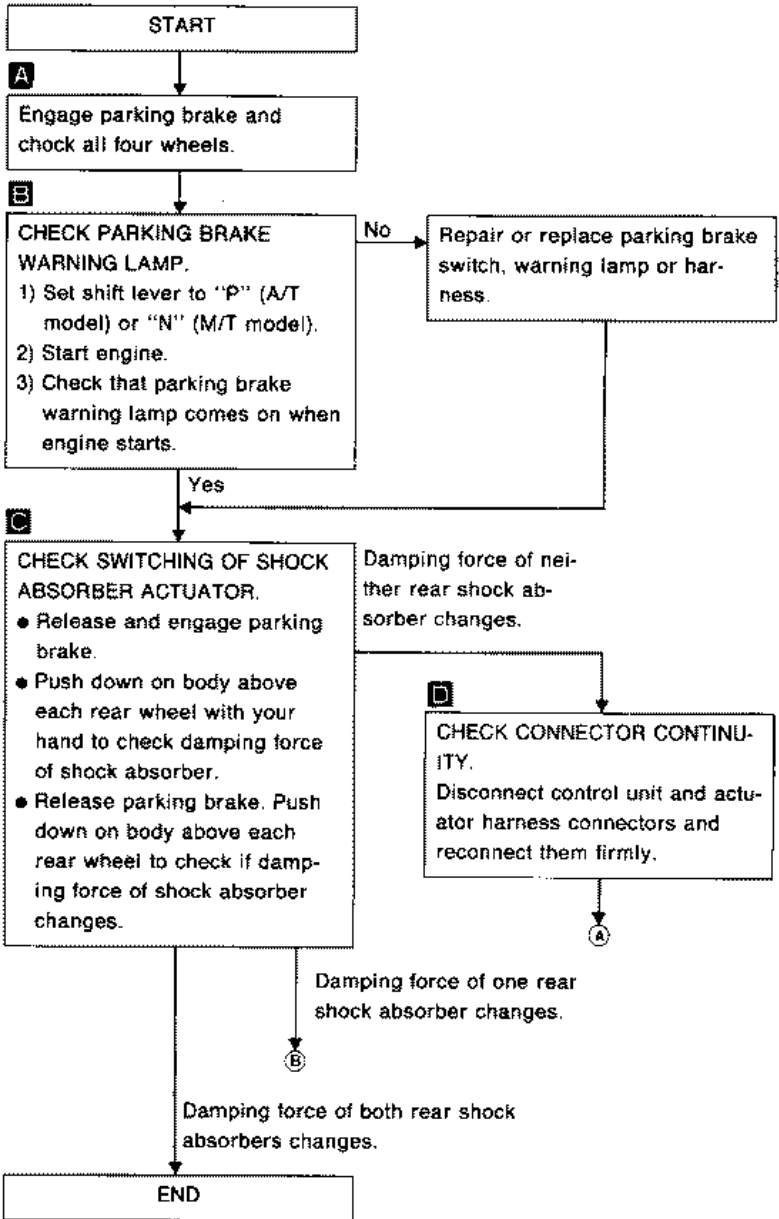
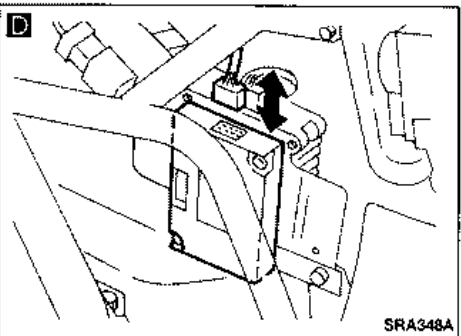
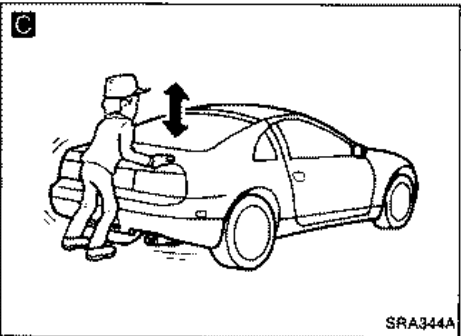
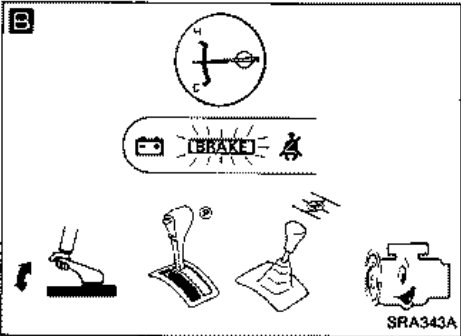
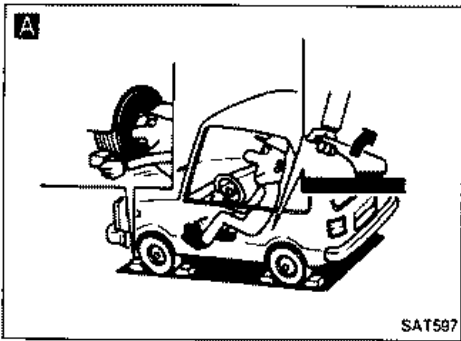
ADJUSTABLE SHOCK ABSORBER — Trouble Diagnoses

Wiring Diagram



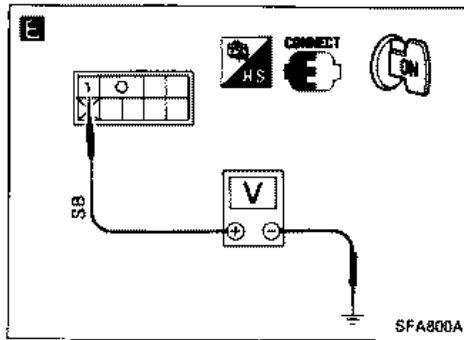
ADJUSTABLE SHOCK ABSORBER — Trouble Diagnoses

Diagnostic Procedure



ADJUSTABLE SHOCK ABSORBER — Trouble Diagnoses

Diagnostic Procedure (Cont'd)



E

CHECK CONTROL UNIT INPUT SIGNAL.
 Check control unit input signal at terminal ①.

- Turn ignition switch "ON".
- Parking brake lever:
 - Released ...
 - Approx. 12V
 - Engaged ... 0V

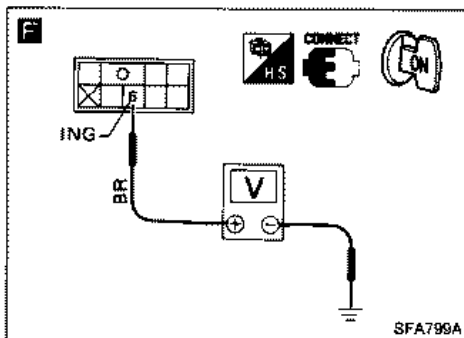
O.K.

12V are indicated regardless of parking brake lever position.

Repair or replace harness between control unit and parking brake switch.

0V are indicated regardless of parking lever position.

Repair or replace harness between control unit and parking brake switch.



F

CHECK CONTROL UNIT POWER SUPPLY.
 1) Turn ignition switch "ON".
 2) Measure voltage across control unit terminal ② and ground.

Voltage:
Approximately 12V ... O.K.

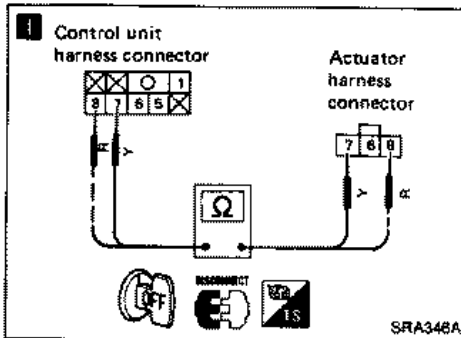
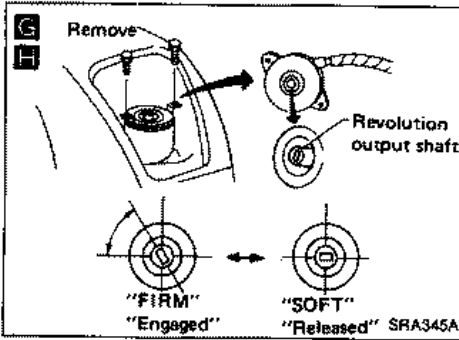
O.K.

Replace control unit.

N.G.
 Check and repair fuse and power supply harness.

ADJUSTABLE SHOCK ABSORBER — Trouble Diagnoses

Diagnostic Procedure (Cont'd)



G CHECK ACTUATOR.
Remove actuator from shock absorber (for those shock absorbers in which damping force does not change). Release and engage parking brake lever to check if actuator output shaft rotates.

→ Rubbing noise is emitted from actuator. → Replace actuator.

→ Output shaft rotates. → **C**

H Interchange left and right actuators and check that output shafts rotate.

→ Yes → Old actuator malfunctions. Replace.

→ No → **I**

I CHECK HARNESS CONTINUITY BETWEEN CONTROL UNIT AND ACTUATOR.

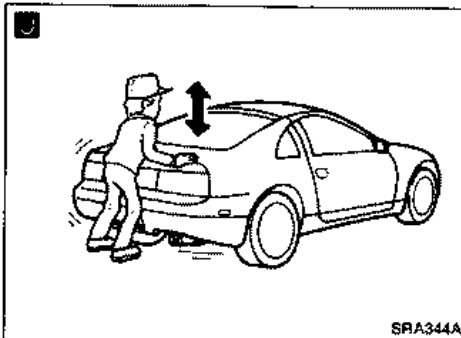
1) Disconnect control unit connector and actuator connector.

2) Check continuity between control unit harness connector terminals and corresponding terminals of actuator harness connector.

Continuity should exist.

→ N.G. → Repair or replace harness between control unit and actuator.

→ O.K. → Replace control unit.



C Visually check bracket for deformities.

→ N.G. → Replace bracket.

→ O.K. → **J**

J CHECK SWITCHING OF SHOCK ABSORBER ACTUATOR.
After checking that output shafts rotate with left and right actuators interchanged, install actuator on shock absorber for which damping force does not change, and check that damping force changes properly.

→ N.G. → Replace shock absorber.

→ O.K. → Old actuator malfunctions. Replace.

ADJUSTABLE SHOCK ABSORBER — Trouble Diagnoses

Diagnostic Procedure (Cont'd)

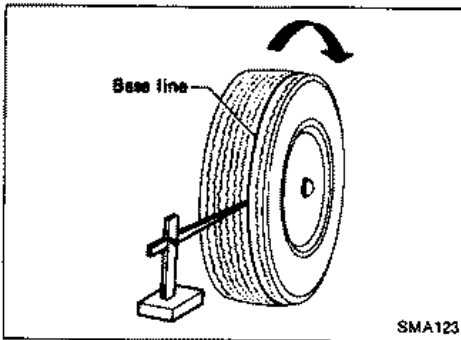
CONTROL AND OPERATION OF SHOCK ABSORBER DAMPING FORCE

Parking brake lever	Damping force
Released	Soft
Engaged	Firm

CONTROL UNIT INSPECTION TABLE

Terminal No.	Connected to	Standard value
①	Parking brake switch	Approx. 12V (parking brake lever released); 0V (parking brake lever engaged)
②	GND	0V
③	IGN	Approx. 12V
⑦	Rear actuator "Firm"	When select signal is emitted, 12V (approx.) instantaneously drops to 2 - 3V.
⑧	Rear actuator "Soft"	When select signal is emitted, 12V (approx.) instantaneously drops to 2 - 3V.

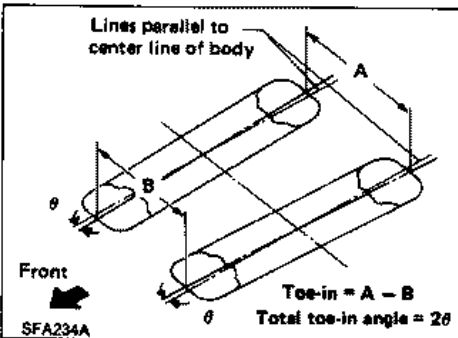
SUPER HICAS



Rear Wheel Alignment

TOE-IN

1. Draw a base line across the tread.
After lowering rear of vehicle, move it up and down to eliminate friction.



2. Measure toe-in.
Measure distance "A" and "B" at the same height as hub center.

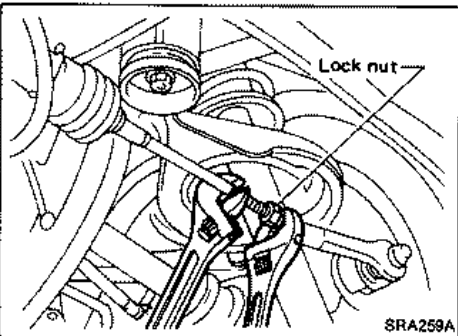
Toe-in:

$$A - B$$

$$0 - 4 \text{ mm (0 - 0.16 in)}$$

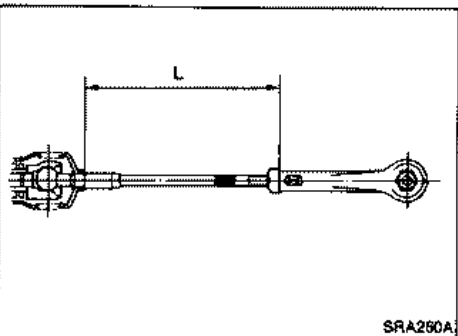
$$2\theta \text{ (Total toe-in angle)}$$

$$0' - 22'$$



3. Adjust toe-in by varying length of power cylinder lower links.

- (1) Loosen lock nuts.
- (2) Adjust toe-in by turning lower links forward or backward.



Make sure both lower links are the same length.

Standard length "L":

$$185.5 \text{ mm (7.30 in)}$$

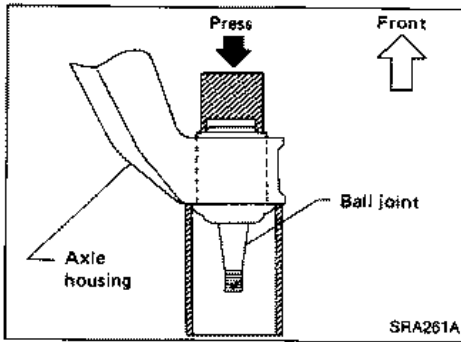
- (3) Tighten lock nuts to the specified torque.

$$\square: 37 - 46 \text{ N}\cdot\text{m}$$

$$(3.8 - 4.7 \text{ kg}\cdot\text{m, } 27 - 34 \text{ ft}\cdot\text{lb})$$

- Refer to CHECK AND ADJUSTMENT — On-vehicle for other procedures.

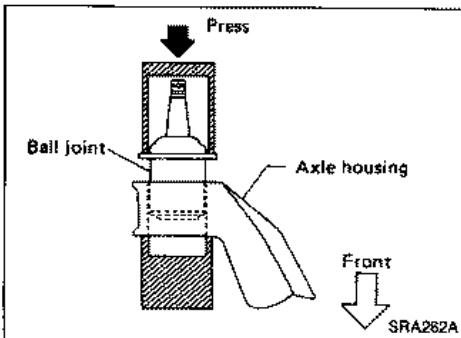
SUPER HICAS



Rear Axle Housing Ball Joint

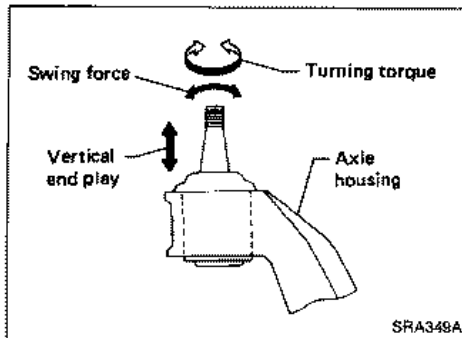
REMOVAL

- Remove ball joint snap ring.
- Press out ball joint from axle housing.



ASSEMBLY

- Press new ball joint assembly into axle housing.
- Install snap ring into groove of ball joint.
- Refer to REAR AXLE — Wheel Hub and Axle Housing for other procedures.
- Refer to ST section for power cylinder and SUPER HICAS — Trouble Diagnoses.



INSPECTION

- Measure swing force, turning torque and vertical end play in axial direction.
- If ball joint is worn, play in axial direction is excessive, or joint is hard to swing, replace ball joint.

Ball joint specifications	Swing force	6.9 - 68.6 N (0.7 - 7.0 kg, 1.5 - 15.4 lb)
	Turning torque	0.3 - 2.9 N-m (3 - 30 kg-cm, 2.6 - 26.0 in-lb)
	Vertical end play	0 mm (0 in)

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

General Specifications

COIL SPRING

Applied model		Australia	Europe
		VG30DE	VG30DETT
Wire diameter	mm (in)	11.5 (0.453)	
Coil diameter	mm (in)	100 (3.94)	
Free length	mm (in)	380 (14.96)	370 (14.57)
Spring constant	N/mm (kg/mm, lb/in)	21.6 (2.2, 123)	25.5 (2.6, 146)
Identification color		Purple x 1, Pink x 1	Yellow x 2, Pink x 1

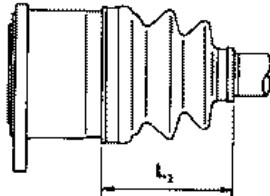
SHOCK ABSORBER

Applied model		Australia	Europe			
		VG30DE	VG30DETT			
Damping force [at 0.3 m (1.0 ft)/sec.]	N (kg, lb)		Firm	Soft		
			Expansion	873 - 1,187 (89 - 121, 196 - 267)	1,451 - 1,833 (148 - 192, 326 - 423)	991 - 1,226 (101 - 125, 223 - 276)
			Compression	520 - 755 (53 - 77, 117 - 170)	745 - 1,020 (76 - 104, 168 - 229)	481 - 657 (49 - 67, 108 - 148)
Piston rod diameter	mm (in)	12.5 (0.492)	14.0 (0.551)			

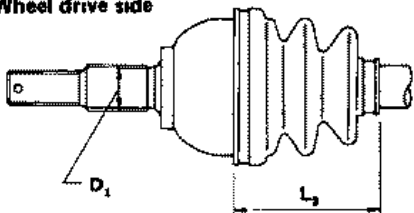
DRIVE SHAFT

Applied model		Australia	Europe
		VG30DE	VG30DETT
Joint type			
Final drive side		DS90	DS100
Wheel side		ZF100	BF100
Diameter	mm (in)		
Wheel side D ₁		30 (1.18)	33 (1.30)
Grease Nissan genuine grease or equivalent			
Specified amount of grease g (oz)			
Final drive side		165 - 175 (5.82 - 6.17)	180 - 200 (6.35 - 7.05)
Wheel side		165 - 175 (5.82 - 6.17)	170 - 190 (6.00 - 6.70)
Boot length	mm (in)		
Final drive side (L ₁)		93 - 95 (3.66 - 3.74)	102.5 - 104.5 (4.04 - 4.11)
Wheel side (L ₂)		96 - 98 (3.78 - 3.86)	101 - 103 (3.98 - 4.06)

Final drive side



Wheel drive side



SRA322A

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

General Specifications (Cont'd)

REAR STABILIZER BAR

Applied model	Australia	Europe
		VG30DE
Stabilizer diameter mm (in)		
Outer	21.0 (0.827)	25.0 (0.984)
Inner	15.8 (0.622)	—

Inspection and Adjustment

WHEEL ALIGNMENT (Unladen*)

Camber	degree	-1°35' to -0°35'
Toe-in (Total)	mm (in)	0 - 4 (0 - 0.16)
	degree	0° - 22'

* Fuel, radiator coolant and engine oil full.
Spare tire, jack, hand tools and mats in designated positions.

WHEEL BEARING

Wheel bearing axial end play mm (in)	0.05 (0.0020) or less
Wheel bearing lock nut Tightening torque N·m (kg-m, ft-lb)	206 - 275 (21 - 28, 152 - 203)

WHEEL RUNOUT (Radial and lateral)

Wheel type	Radial runout	Lateral runout
Aluminum wheel	mm (in)	0.3 (0.012) or less

LOWER BALL JOINT

Swing force (Measuring point: cotter pin hole of ball stud)	N (kg, lb)	7.8 - 54.9 (0.8 - 5.6, 1.8 - 12.3)
Turning torque N·m (kg-cm, in-lb)		0.5 - 3.4 (5 - 35, 4.3 - 30.4)
Vertical end play	mm (in)	0 (0)

LOWER LINK BALL JOINT (SUPER HICAS)

Swing force (at cotter pin hole)	N (kg, lb)	6.9 - 66.6 (0.7 - 7.0, 1.5 - 15.4)
Turning torque N·m (kg-cm, in-lb)		0.3 - 2.9 (3 - 30, 2.6 - 25.0)
Vertical end play	mm (in)	0 (0)

BRAKE SYSTEM

SECTION **BR**

CONTENTS

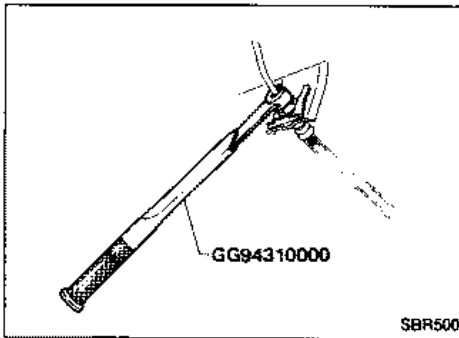
PRECAUTIONS AND PREPARATION	BR- 2
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BRAKE PEDAL AND BRACKET	BR- 6
BRAKE BOOSTER	BR- 8
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MASTER CYLINDER	BR-11
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FRONT DISC BRAKE (OPZ25V and OPF25V) — Rotor	BR-15
REAR DISC BRAKE — Caliper	BR-16
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BR

PRECAUTIONS AND PREPARATION

Precautions

- Recommended fluid is brake fluid "DOT 3".
- Never reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas.
- To clean or wash all parts of master cylinder, disc brake caliper and wheel cylinder, use clean brake fluid.
- Never use mineral oils such as gasoline or kerosene. They will ruin rubber parts of hydraulic system.




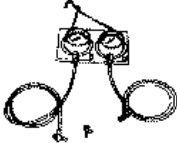

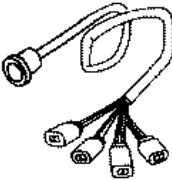
- Use Tool when removing and installing brake tube.

WARNING:

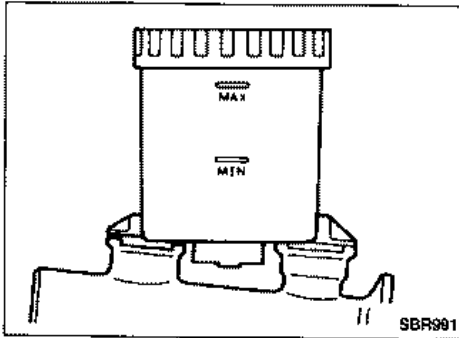
- Clean brake pads and shoes with a waste cloth, then collect dust with a dust collector.

Preparation

SPECIAL SERVICE TOOLS

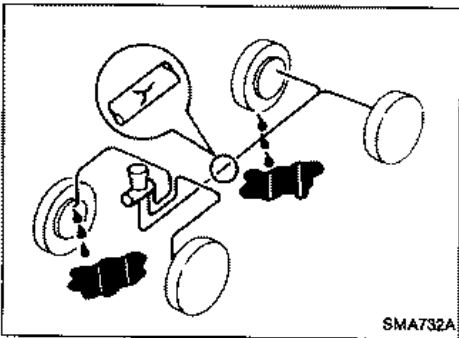
Tool number Tool name	Description
GG94310000 Flare nut torque wrench	 <p>Removing and installing each brake piping</p>
KV991V0010 Brake fluid pressure gauge	 <p>Measuring brake fluid pressure</p>
KV999P1000 A.B.S. checker	 <p>Checking brake fluid pressure of A.B.S. actuator</p>
KV999P1020 A.B.S. checker adapter harness	 <p>Checking brake fluid pressure of A.B.S. actuator</p>

CHECK AND ADJUSTMENT



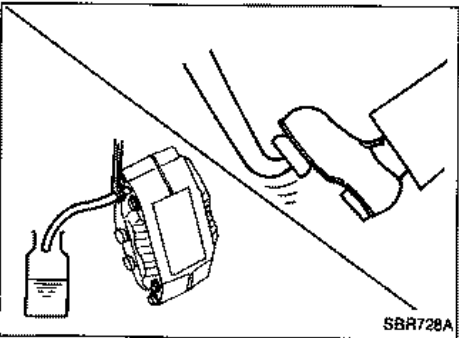
Checking Brake Fluid Level

- Check fluid level in reservoir tank. It should be between Max. and Min. lines on reservoir tank.
- If fluid level is extremely low, check brake system for leaks.



Checking Brake System

- Check brake lines (lines and flexible hoses) for cracks, deterioration or other damage. Replace any damaged parts.
If leakage occurs around joints, retighten or, if necessary, replace damaged parts.
- Check for oil leakage by fully depressing brake pedal.

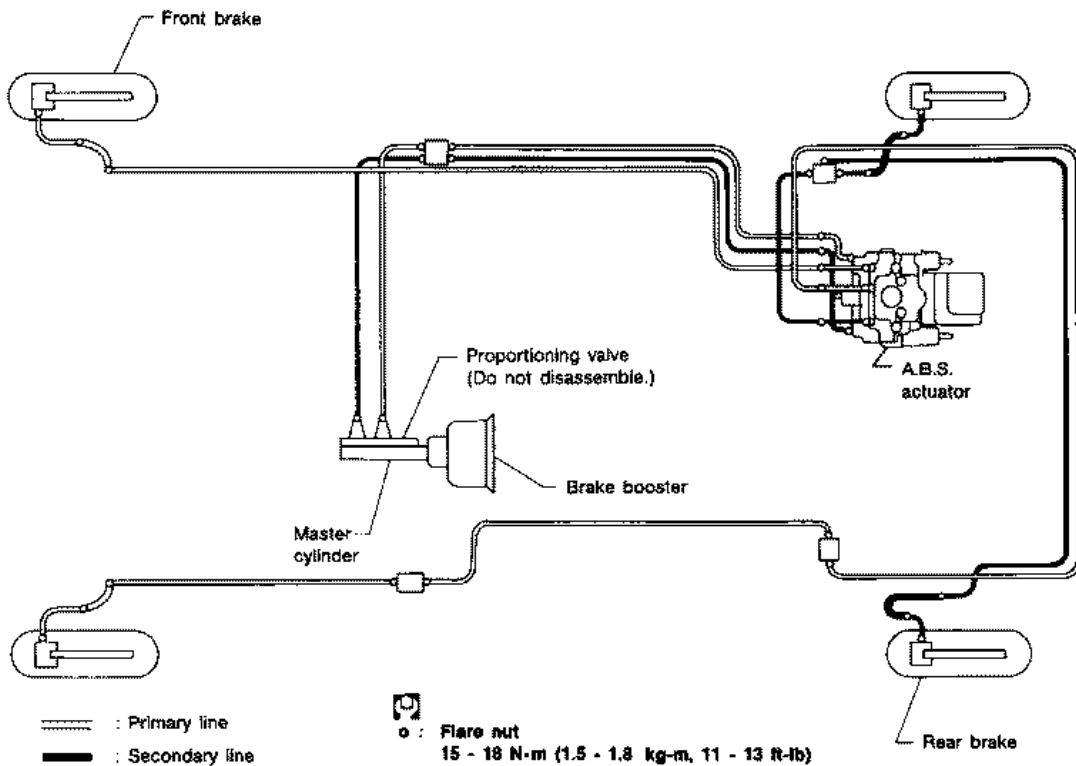


Changing Brake Fluid

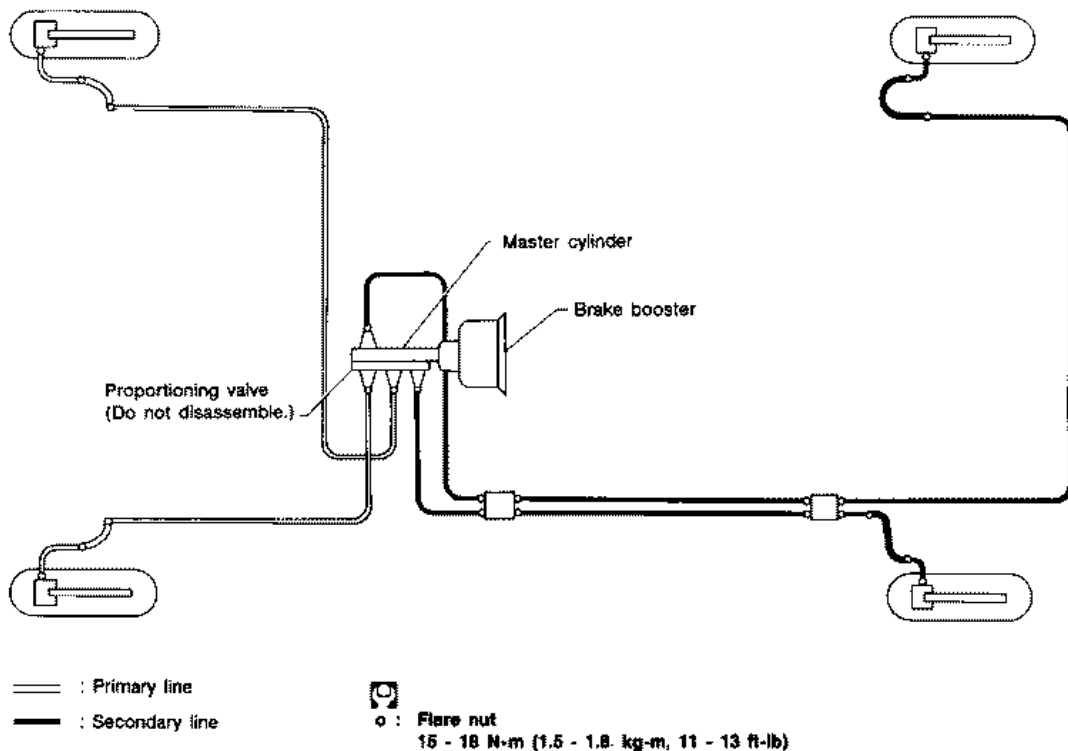
1. Drain brake fluid in each air bleeder valve.
 2. Refill until new brake fluid comes out of each air bleeder valve.
Use same procedure as in bleeding hydraulic system to refill brake fluid.
Refer to Bleeding Procedure.
- Refill with recommended brake fluid "DOT 3".
 - Never reuse drained brake fluid.
 - Be careful not to splash brake fluid on painted areas.

BRAKE HYDRAULIC LINE

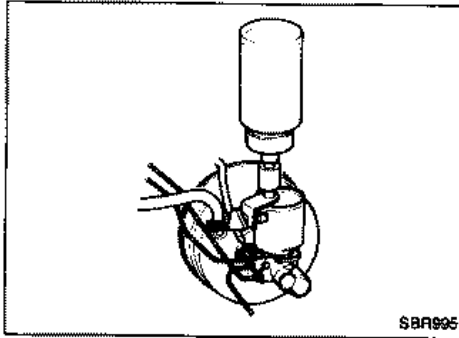
Models with A.B.S.



Models without A.B.S.



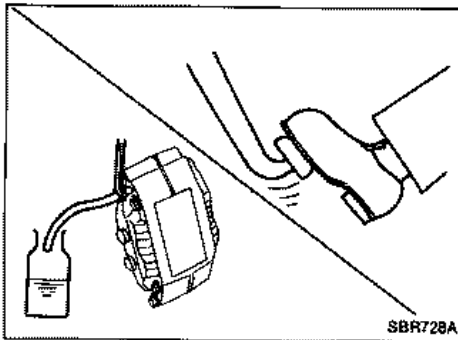
BRAKE HYDRAULIC LINE



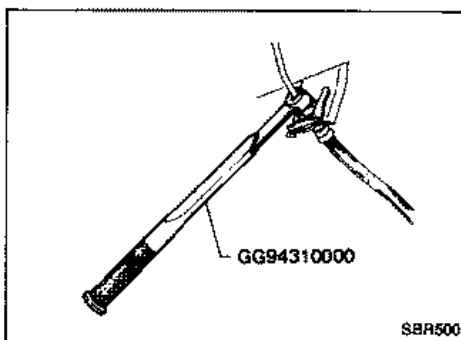
Bleeding Procedure

CAUTION:

- Carefully monitor brake fluid level at master cylinder during bleeding operation.
- Fill reservoir with recommended brake fluid. Make sure it is full at all times while bleeding air out of system.
- Place a container beneath master cylinder to avoid spillage of brake fluid.



- Bleed air according to the following procedure.
Left rear caliper
↓
Right rear caliper
↓
Left front caliper
↓
Right front caliper
↓
Front side air bleeder on A.B.S. actuator (Models with A.B.S.)
↓
Rear side air bleeder on A.B.S. actuator (Models with A.B.S.)
- To bleed air out of lines, wheel cylinders and calipers, use the following procedure.
 - 1) Connect a transparent vinyl tube to air bleeder valve.
 - 2) Fully depress brake pedal several times.
 - 3) With brake pedal depressed, open air bleeder valve to release air.
 - 4) Close air bleeder valve.
 - 5) Release brake pedal slowly.
 - 6) Repeat steps 2) through 5) until clear brake fluid comes out of air bleeder valve.



Removal and Installation

1. To remove brake flexible hose, first remove flare nut securing brake line to hose, then withdraw lock spring.
2. Cover openings to prevent entrance of dirt whenever disconnecting hydraulic line.
3. All hoses must be free from excessive bending, twisting and pulling.
4. After installing brake lines, check for oil leakage by fully depressing brake pedal.

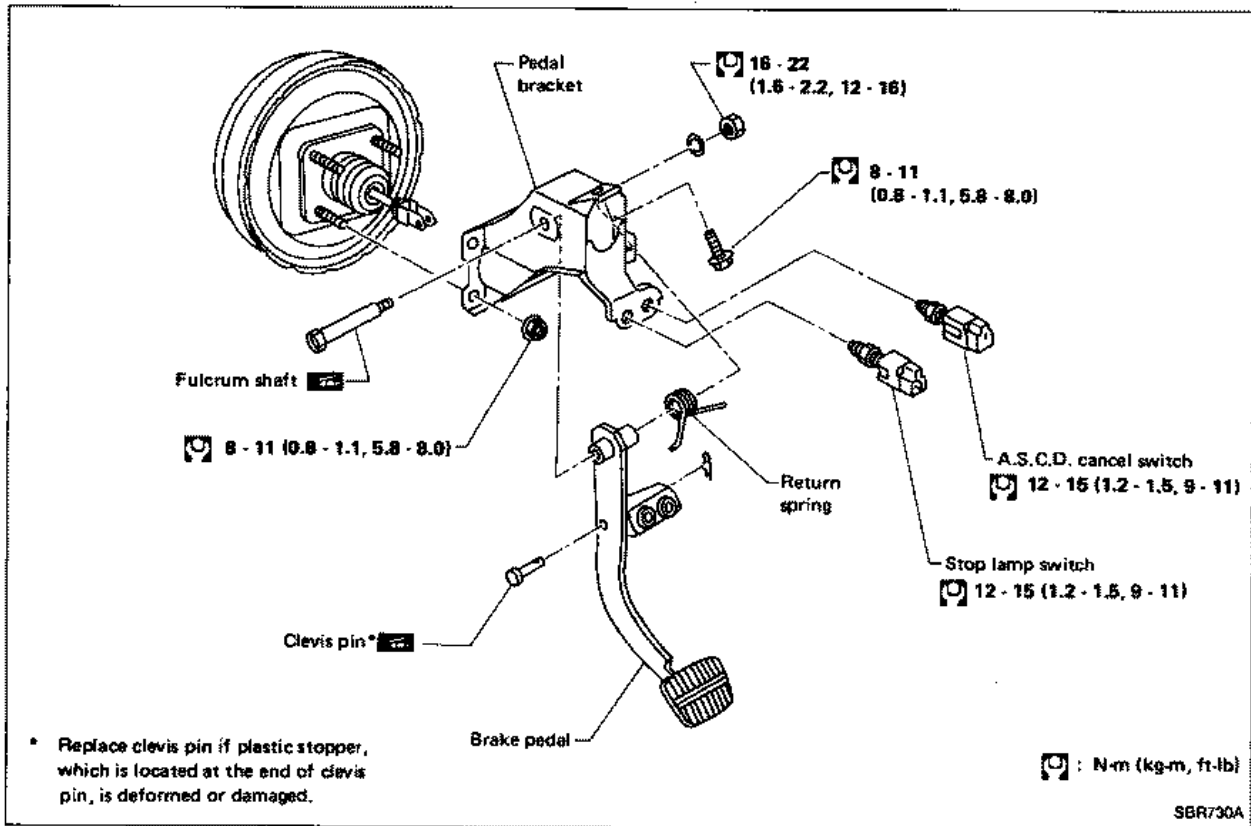
Inspection

Check brake lines (lines and flexible hoses) for cracks, deterioration or other damage. Replace any damaged parts.

If leakage occurs around joints, retighten or, if necessary, replace damaged parts.

BRAKE PEDAL AND BRACKET

Removal and Installation

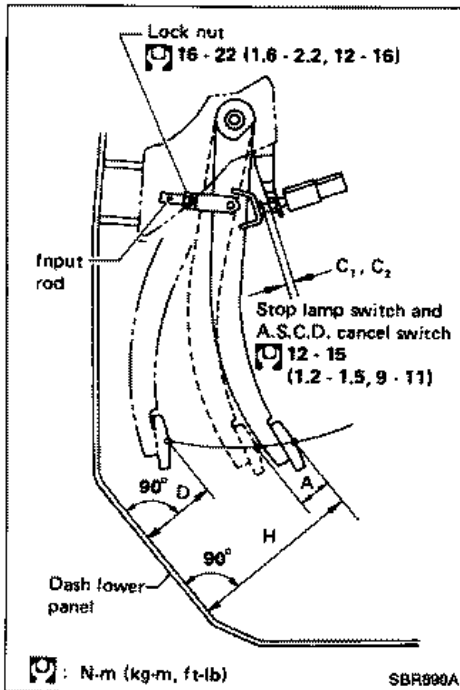


Inspection

Check brake pedal for following items.

- Brake pedal bend
- Clevis pin deformation
- Crack of any welded portion

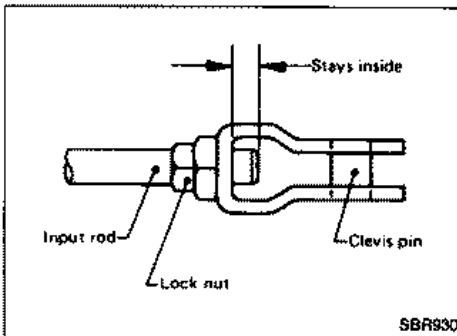
BRAKE PEDAL AND BRACKET



Adjustment

Check brake pedal free height from dash reinforcement panel. Adjust if necessary.

- H: Free height
Refer to S.D.S.
- D: Depressed height
Refer to S.D.S.
Under force of 490 N (50 kg, 110 lb) with engine running
- C₁: Clearance between pedal stopper and threaded end of stop lamp switch
0.3 - 1.0 mm (0.012 - 0.039 in)
- C₂: Clearance between pedal stopper and threaded end of A.S.C.D. switch
0.3 - 1.0 mm (0.012 - 0.039 in)
- A: Pedal free play
1 - 3 mm (0.04 - 0.12 in)



1. Adjust pedal free height with brake booster input rod. Then tighten lock nut.

Make sure that tip of input rod stays inside.

2. Adjust clearance "C₁" and "C₂" with stop lamp switch and A.S.C.D. switch respectively. Then tighten lock nuts.
3. Check pedal free play.

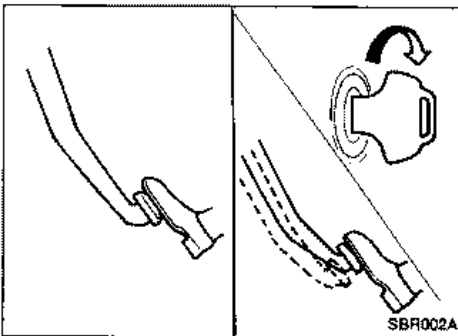
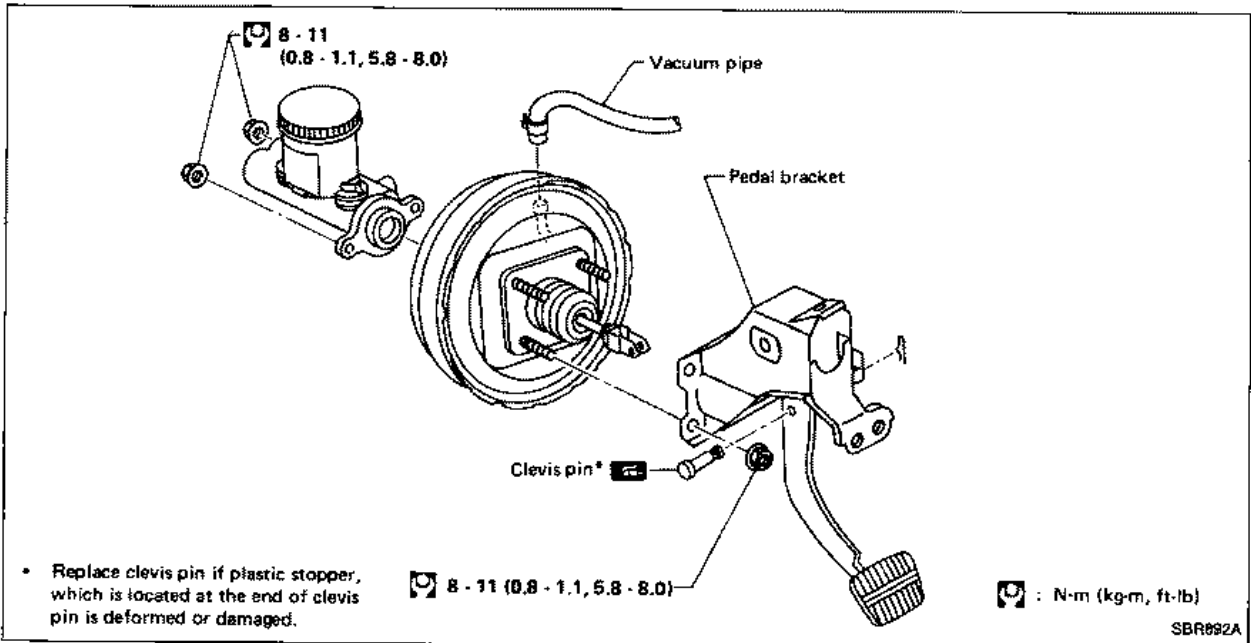
Make sure that stop lamp is off when pedal is released.

4. Check brake pedal's depressed height while engine is running.

If depressed height is below specified value, check brake system for leaks, accumulation of air or any damage to components (master cylinder, wheel cylinder, etc.); then make necessary repairs.

BRAKE BOOSTER

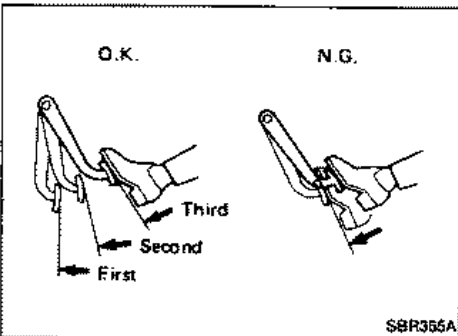
Removal and Installation



Inspection

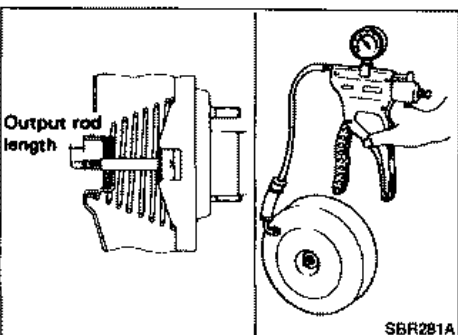
OPERATING CHECK

- Depress brake pedal several times with engine off, and check that there is no change in pedal stroke.
- Depress brake pedal, then start engine. If pedal goes down slightly, operation is normal.



AIRTIGHT CHECK

- Start engine, and stop it after one or two minutes. Depress brake pedal several times slowly. If pedal goes further down the first time and gradually rises after second or third time, booster is airtight.
- Depress brake pedal while engine is running, and stop engine with pedal depressed. If there is no change in pedal stroke after holding pedal down 30 seconds, brake booster is airtight.

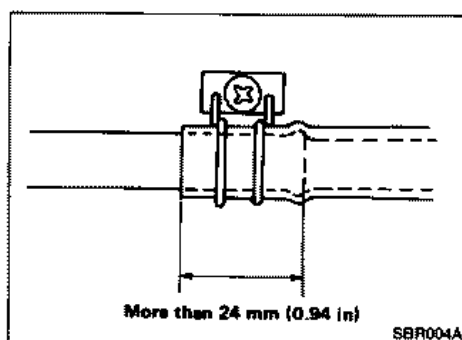
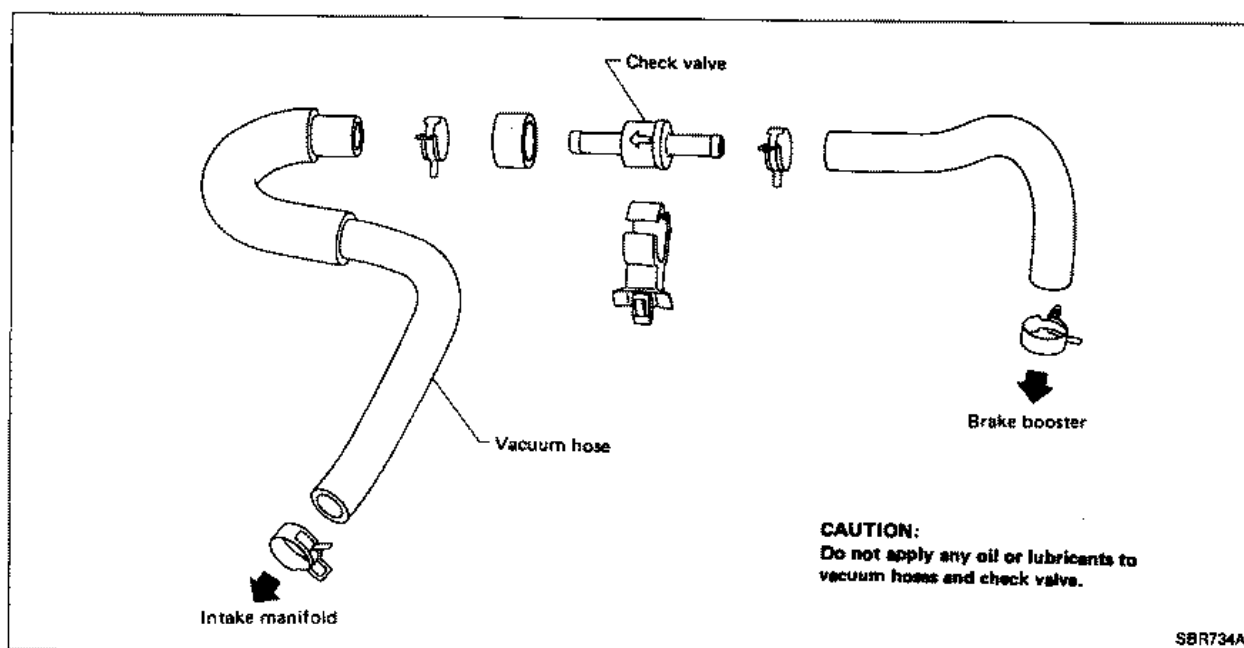


OUTPUT ROD LENGTH CHECK

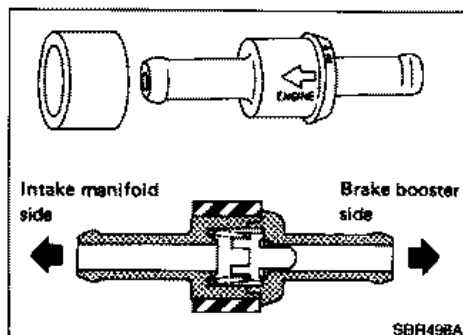
1. Supply brake booster with vacuum of -66.7 kPa (-667 mbar, -500 mmHg, -19.69 inHg) using a handy vacuum pump.
2. Check output rod length.
Specified length:
10.275 - 10.525 mm (0.4045 - 0.4144 in)

VACUUM PIPING

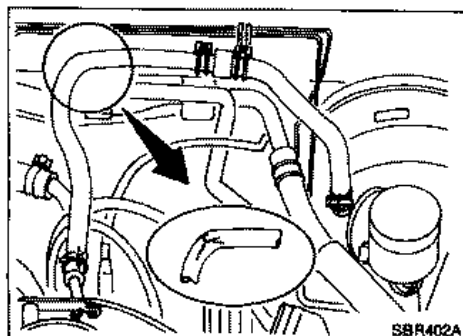
Removal and Installation



- Insert vacuum tube into vacuum hose more than 24 mm (0.94 in).



- Install check valve, paying attention to its direction.



Inspection

HOSES AND CONNECTORS

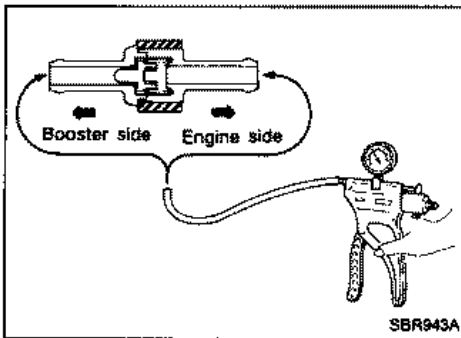
- Check vacuum lines, connections and check valve for airtightness, improper attachment chafing and deterioration.

VACUUM PIPING

Inspection (Cont'd)

CHECK VALVE

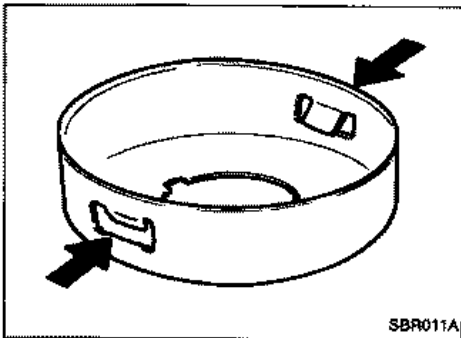
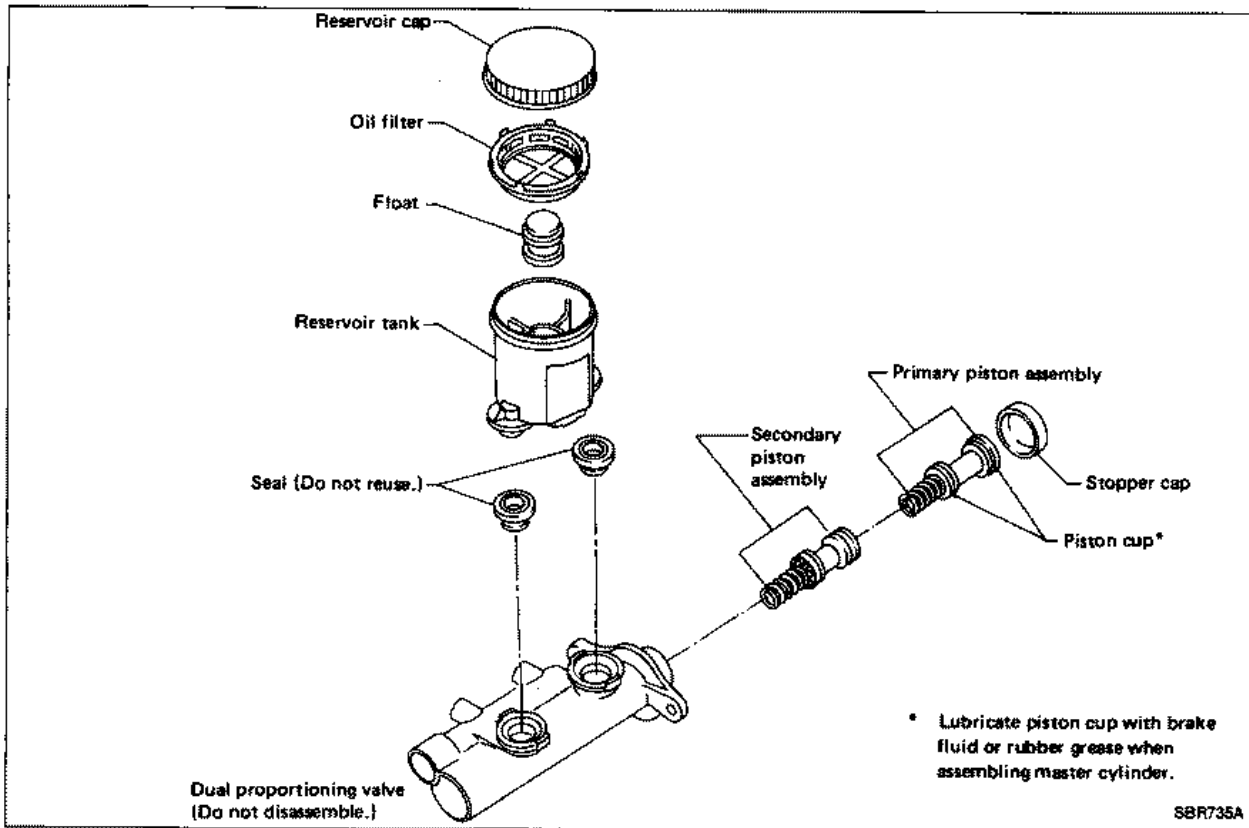
Check vacuum with a vacuum pump.



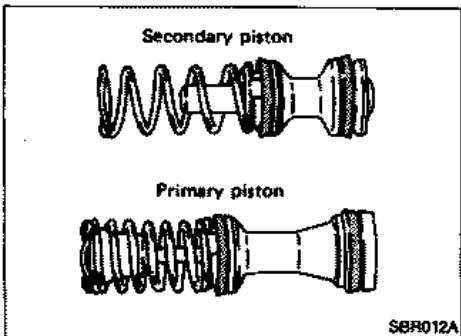
Connect to booster side	Vacuum should exist.
Connect to engine side	Vacuum should not exist.

MASTER CYLINDER

Removal and Installation

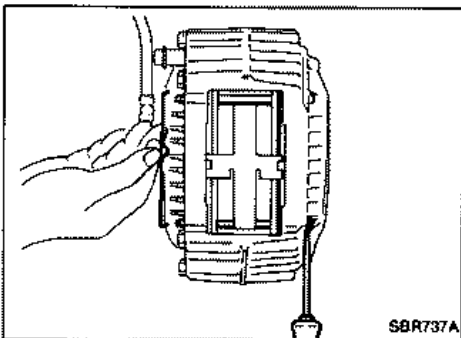
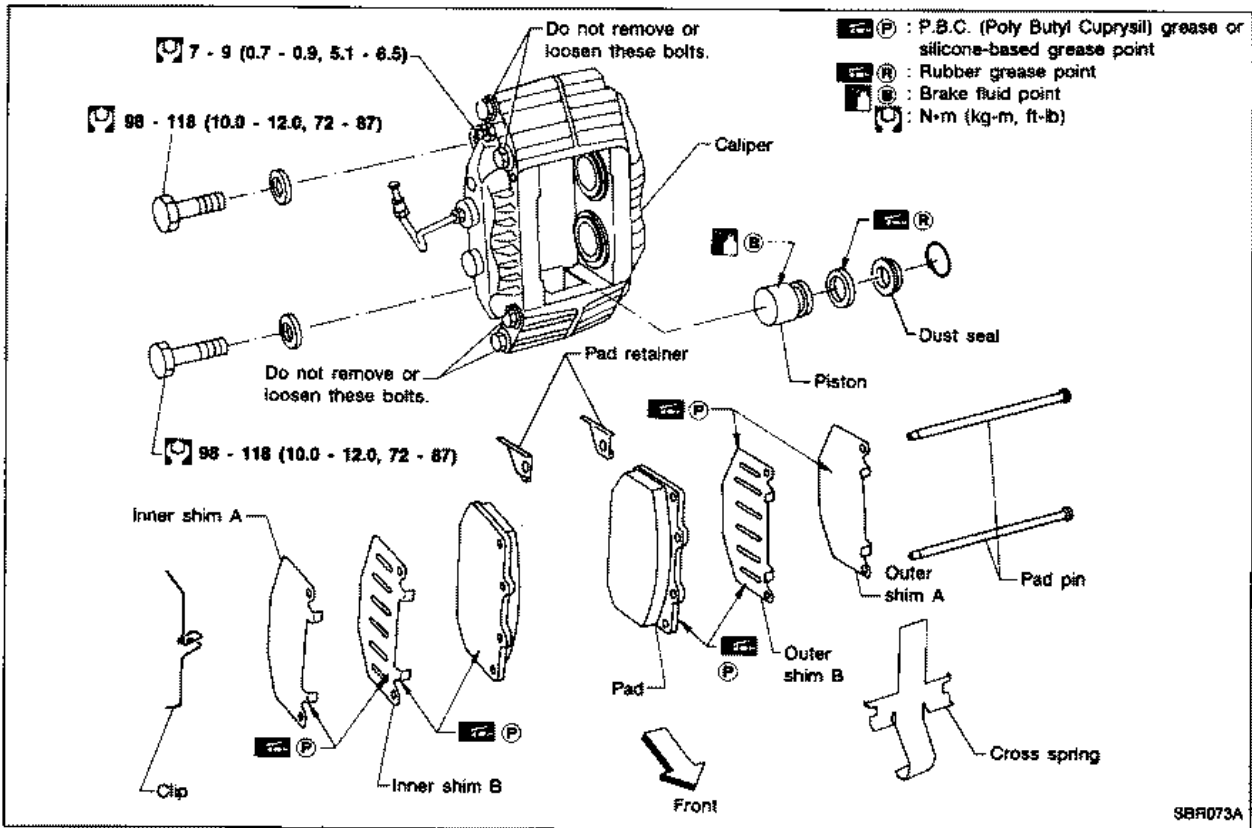


- Replace stopper cap if claw is damaged or deformed.
- Bend claws inward when installing stopper cap.



- Pay attention to direction of piston cups in figure at left.
- Check parts for wear or damage. Replace if necessary.

FRONT DISC BRAKE (OPZ25V and OPF25V) — Caliper

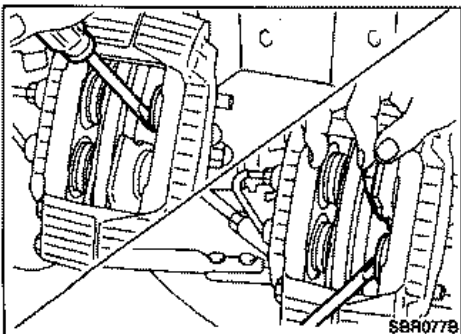


Pad Replacement

CAUTION:

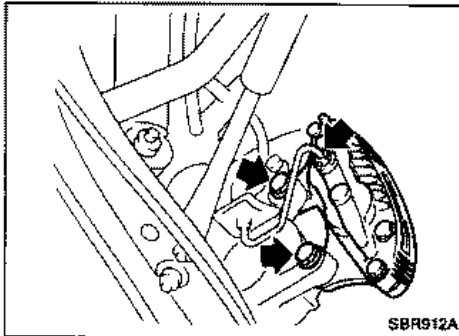
- When pads are removed, do not depress brake pedal because piston will pop out.
- Be careful not to damage dust seal or get oil on rotor. Always replace shims when replacing pads.

1. Remove clip from pad pin and then remove pad pin.
2. Remove cross spring.



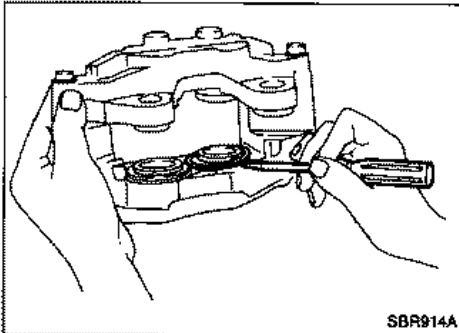
3. Pull out outer pad and insert it temporarily between lower piston and rotor as shown.
4. Push back upper piston with a suitable tool and insert new pad so it contacts upper piston as shown.
5. Pull out old pad.
6. Push back lower piston with a suitable tool.
7. Pull out new pad and reinstall it in the proper position.
8. Repeat step 3 to 7 for inner pad.
9. Install cross spring, pad pin and clip.

FRONT DISC BRAKE (OPZ25V and OPF25V) — Caliper



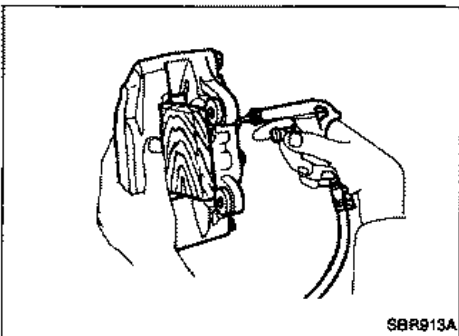
Removal and Installation

1. Disconnect brake tube.
2. Remove brake pad.
3. Remove brake caliper mounting bolts.

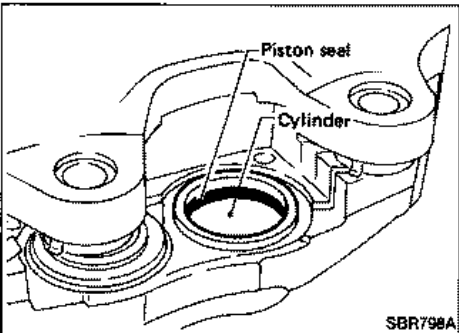


Disassembly

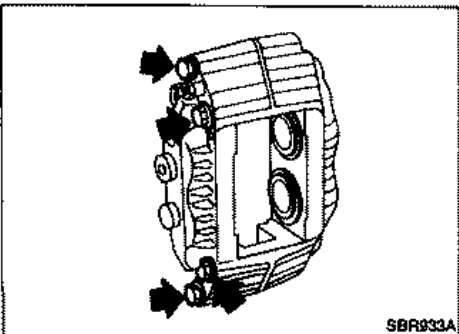
1. Remove retaining ring.



2. Push out piston with dust seal using compressed air.



3. Remove piston seal.



CAUTION:

Be careful not to loosen or remove bolts joining both sides of caliper.

If there is any fluid leakage, replace caliper assembly.

FRONT DISC BRAKE (OPZ25V and OPF25V) — Caliper

Inspection

CALIPER

- Check dust seals for damage.
- Check calipers for damage, rust or foreign materials.
- Check inside surface of cylinder for scoring, rust, wear, damage or foreign materials. Replace if any such condition exists.
- Eliminate minor damage from rust or foreign materials by polishing surface with fine emery paper.

CAUTION:

Use brake fluid to clean.

PISTON

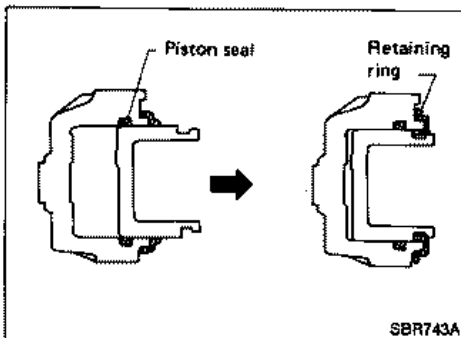
Check piston for scoring, rust, wear, damage or foreign materials. Replace if any condition exists.

CAUTION:

Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign materials are stuck to sliding surface.

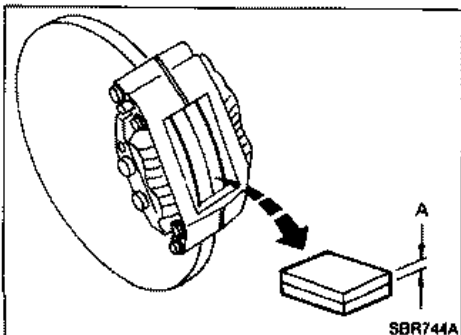
PAD PIN AND CLIPS

Check for wear, cracks deformation, deterioration, rust or other damage. Replace if any such condition exists.



Assembly

1. Insert piston seal into groove on cylinder body.
2. With dust seal fitted to piston, install piston into cylinder body.
3. Secure dust seal properly.
4. Install retaining ring.



Inspection (On-vehicle)

DISC PAD

- Check pad shims for deformation or damage.
- Check disc pad for wear or damage.

Pad standard thickness (A):

10.0 mm (0.394 in)

Pad wear limit (A):

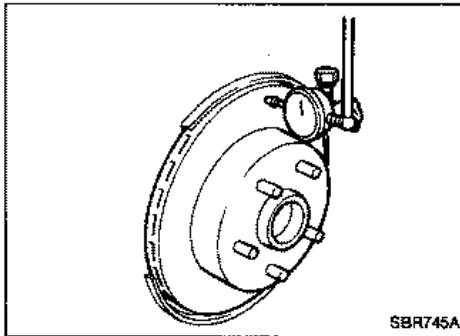
2.0 mm (0.079 in)

FRONT DISC BRAKE (OPZ25V and OPF25V) — Rotor

Inspection

RUBBING SURFACE

Check rotor for roughness, cracks or chips.



RUNOUT

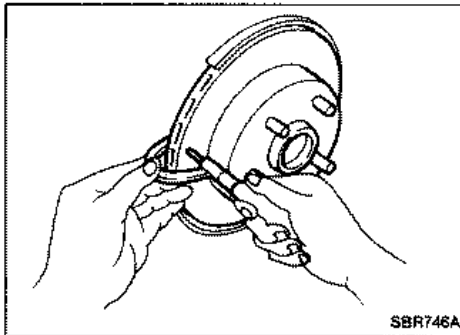
Check runout using a dial indicator. Make sure that axial end play is within the specifications before measuring. Refer to section FA.

Rotor repair limit:

Maximum runout

(Total indicator reading at center of rotor pad contact surface)

0.07 mm (0.0028 in)



THICKNESS

Standard thickness:

OPZ25V

26.0 mm (1.024 in)

OPF25V

30.0 mm (1.181 in)

Minimum thickness:

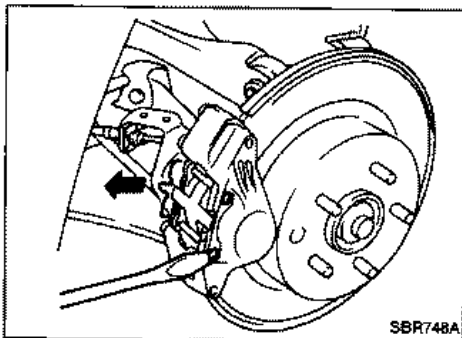
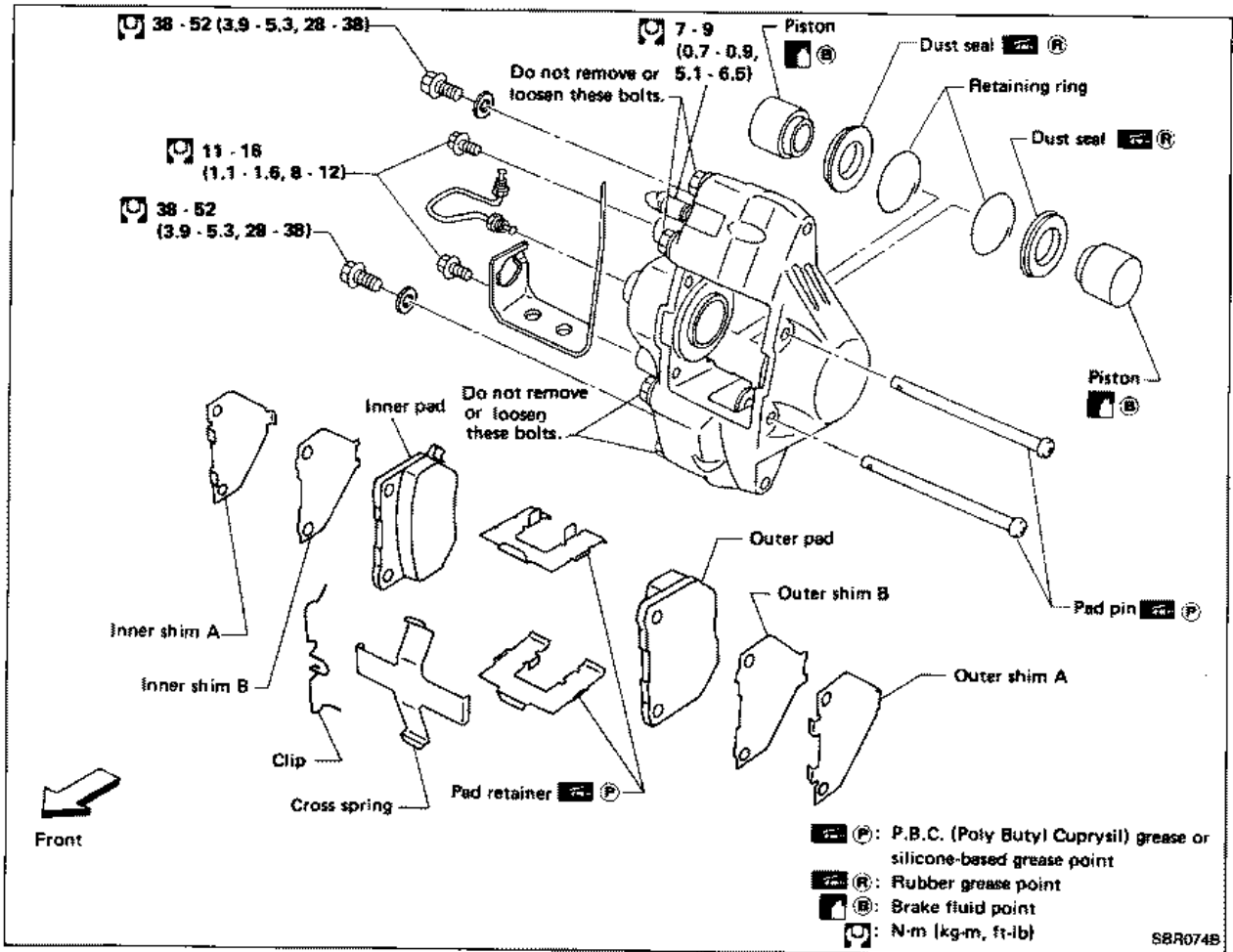
OPZ25V

24.0 mm (0.945 in)

OPF25V

28.0 mm (1.102 in)

REAR DISC BRAKE — Caliper

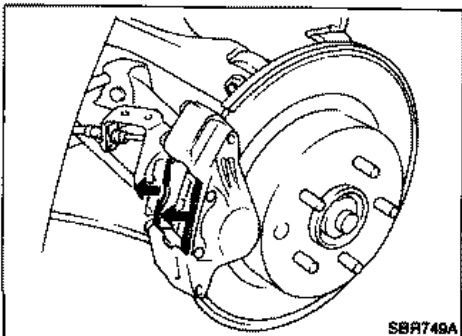


Pad Replacement

CAUTION:

When pads are removed, do not depress brake pedal because piston will pop out.

1. Remove clip from pad pin and then remove pad pin.
2. Remove cross spring.

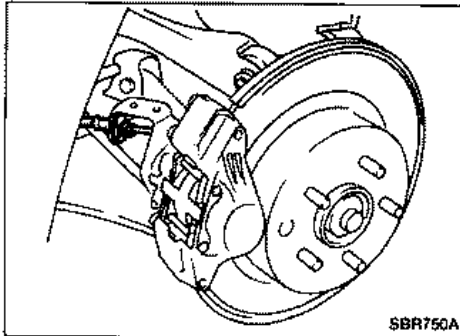


3. Pull out inner and outer pads.

CAUTION:

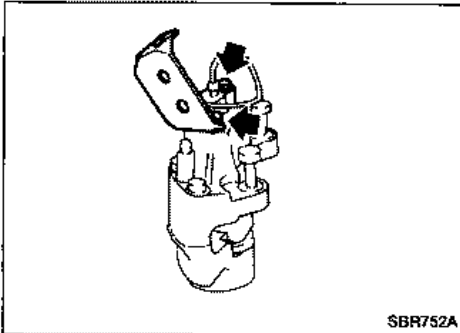
Be careful not to damage dust seal or get oil on rotor. Always replace shims when replacing pads.

REAR DISC BRAKE — Caliper

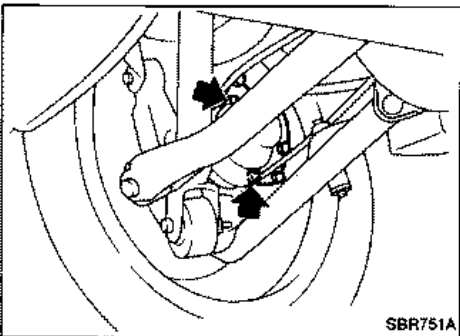


Removal and Installation

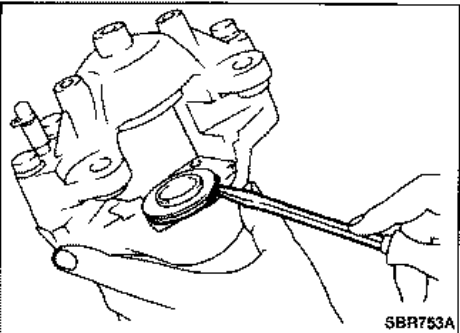
1. Disconnect brake tube.
2. Remove brake pad.



3. Remove brake cable and bracket.

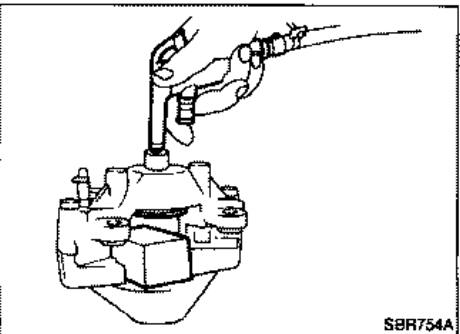


4. Remove axle housing fixing bolts.



Disassembly

1. Remove retaining ring.

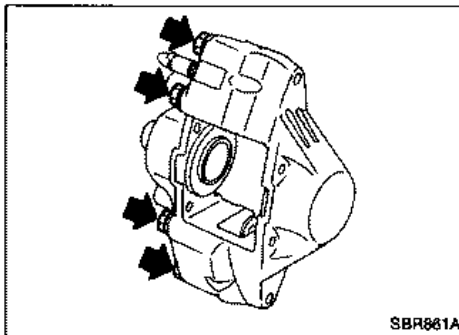
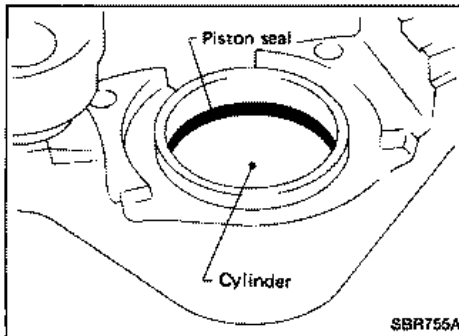


2. Push out piston with dust seal using compressed air.

REAR DISC BRAKE — Caliper

Disassembly (Cont'd)

3. Remove piston seal.



CAUTION:

Be careful not to loosen or remove bolts joining both sides of caliper.

If there is any fluid leakage, replace caliper assembly.

Inspection

CALIPER

- Check dust seals for damage.
- Check calipers for damage, rust or foreign materials.
- Check inside surface of cylinder for score, rust, wear or other damage.
- Minor damage from rust or foreign materials may be eliminated by polishing surface with a fine emery paper. Replace if necessary.

CAUTION:

Use brake fluid to clean.

PISTON

Check piston for score, rust, wear or other damage. Replace if necessary.

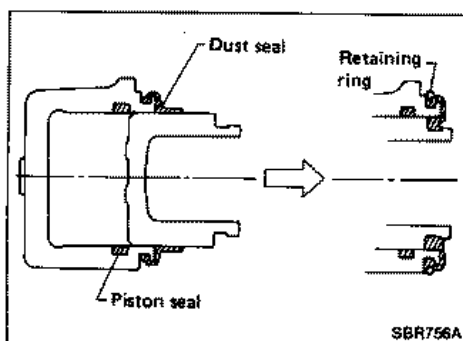
CAUTION:

Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign matter is stuck to sliding surface.

PAD PIN AND CLIP

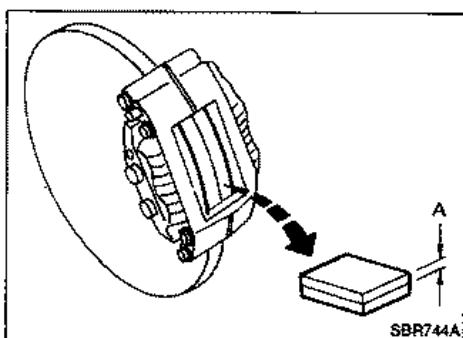
Check for wear, cracks deformation, deterioration, rust or other damage. Replace if necessary.

REAR DISC BRAKE — Calliper



Assembly

1. Insert piston seal into groove on cylinder body.
2. With dust seal fitted to piston, install piston into cylinder body.
3. Secure dust seal properly.
4. Install retaining ring.



Inspection (On-vehicle)

DISC PAD

- Check pad shims for deformation or damage.
- Check disc pad for wear or damage.

Standard thickness (A):

11.5 mm (0.453 in)

Pad wear limit (A):

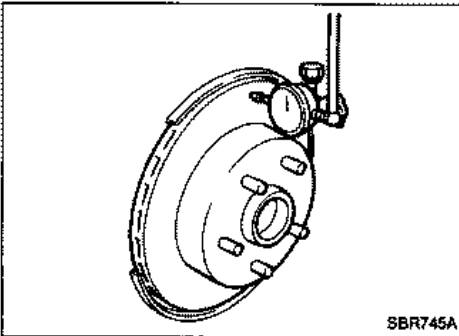
2.0 mm (0.079 in)

REAR DISC BRAKE — Rotor

Inspection

RUBBING SURFACE

Check rotor for roughness, cracks or chips.



RUNOUT

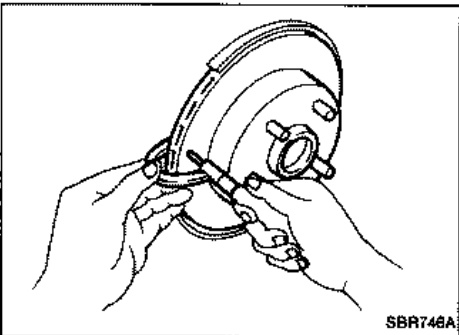
- Check runout using a dial indicator.
- Make sure that axial end play is within the specifications before measuring. Refer to section RA.

Rotor repair limit:

Maximum runout

(Total indicator reading at center of rotor pad contact surface)

0.07 mm (0.0028 in)



THICKNESS

Standard thickness:

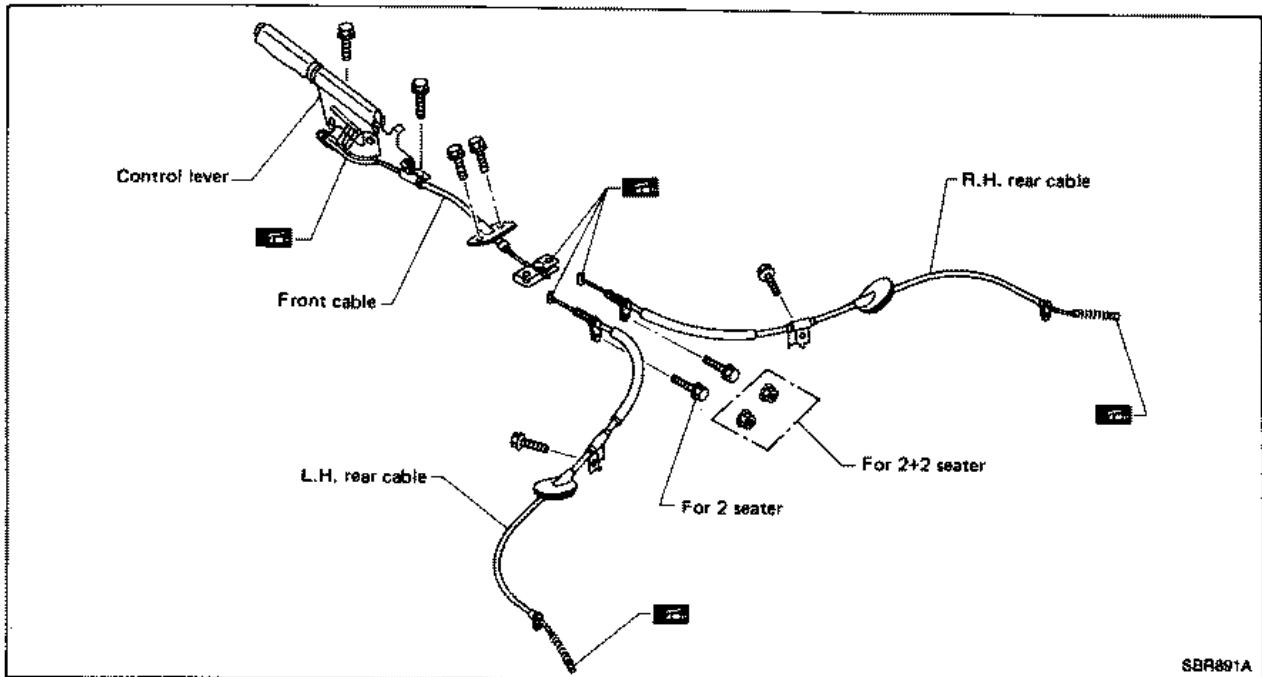
18.0 mm (0.709 in)

Minimum thickness:

16.0 mm (0.630 in)

PARKING BRAKE CONTROL

Removal and Installation



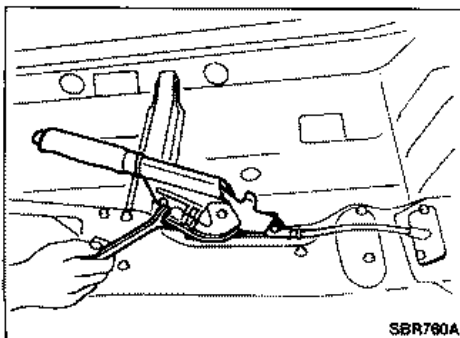
- Before removing parking brake control, remove console box.
- Loosen cable using control lever adjuster, and separate front and rear cables.

Apply multi-purpose grease to areas between control lever drum and cables.

Be careful not to damage boot and inner cable.

Inspection

1. Check control lever for wear or other damage. Replace if necessary.
2. Check parking brake cables, lamp and switch. Replace if necessary.
3. Check parts at each connecting portion for deformation or damage. If found, replace.



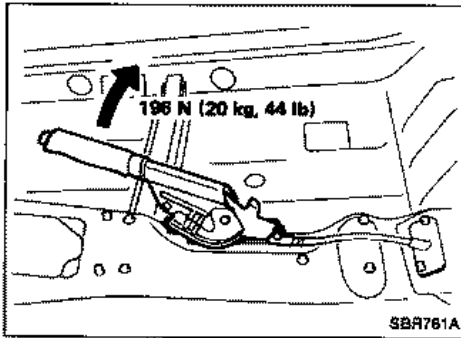
Adjustment

Perform shoe clearance adjustment before adjusting control lever stroke.

1. Turn adjusting nut.

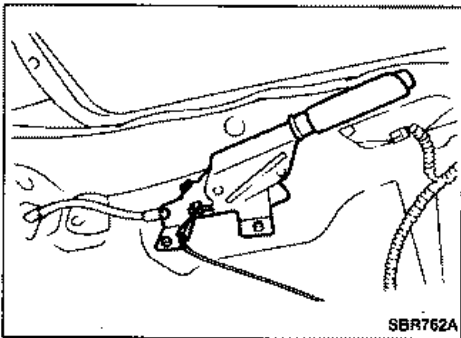
PARKING BRAKE CONTROL

Adjustment (Cont'd)



2. Pull control lever with specified amount of force. Check lever stroke and ensure smooth operation.

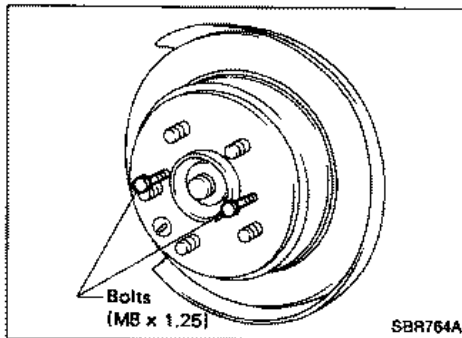
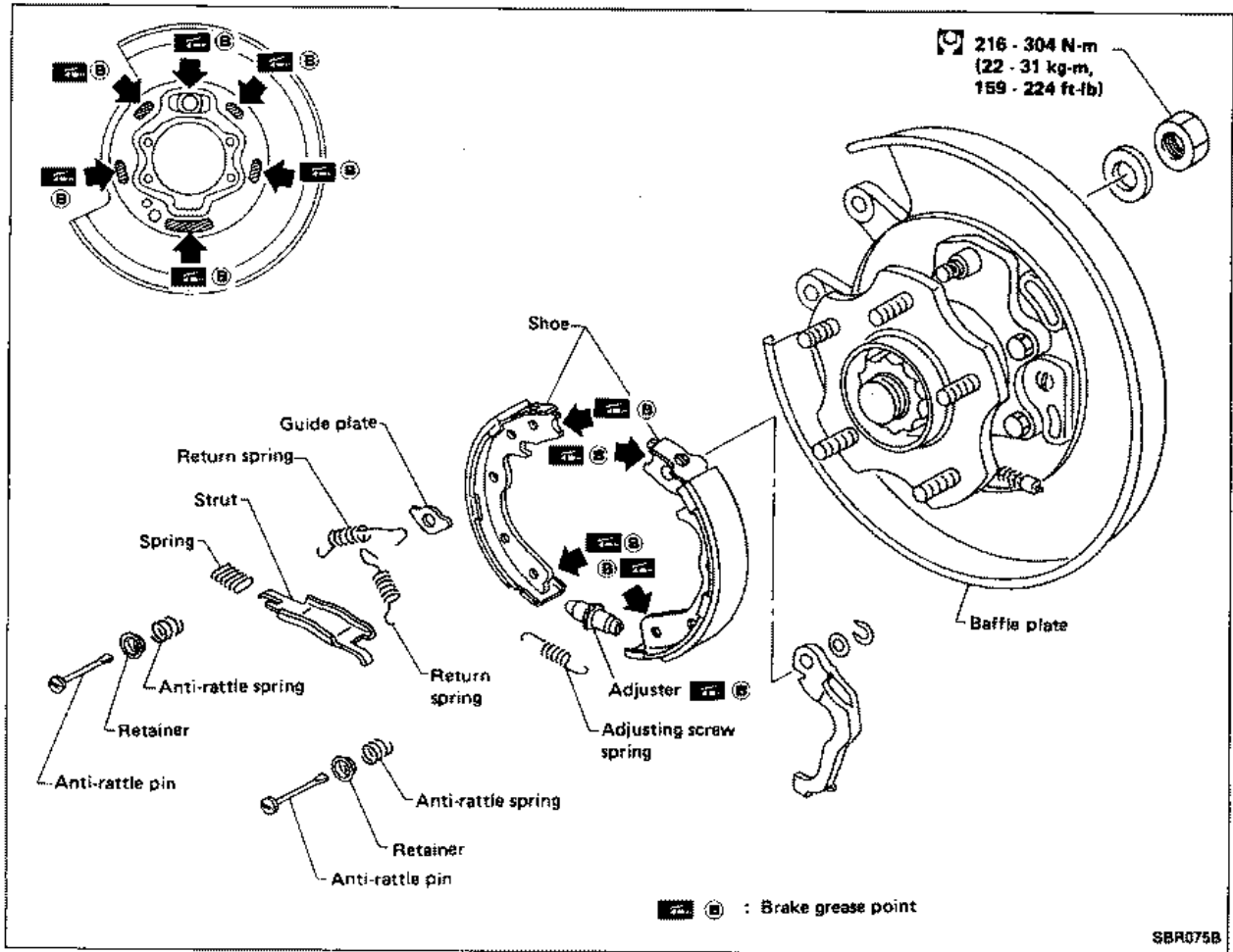
Number of notches: 6 - 7



3. Bend parking brake warning lamp switch plate so that brake warning light comes on when ratchet at parking brake lever is pulled "A" notches and goes out when fully released.

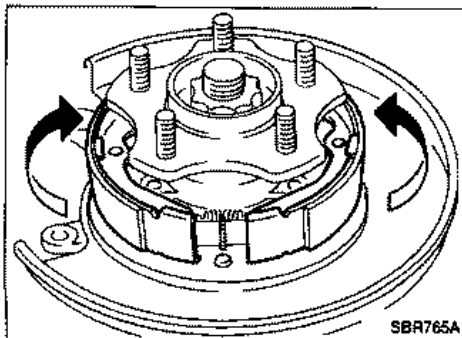
Number of notches "A": 1

PARKING DRUM BRAKE



Shoe Replacement

1. Remove disc rotor (With parking drum brake).
Tighten two bolts gradually if disc rotor is hard to remove.



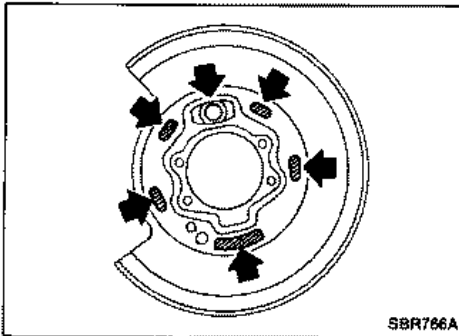
2. After removing anti-rattle pin, remove spring by rotating shoes.

Be careful not to damage parking brake cable when separating it.

PARKING DRUM BRAKE

Shoe Replacement (Cont'd)

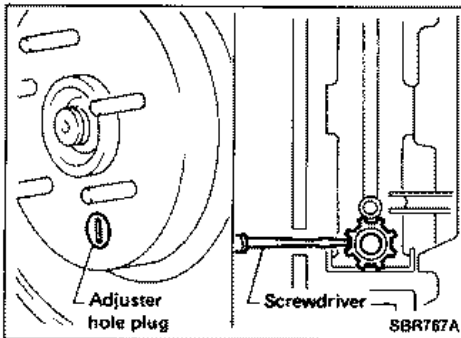
3. Apply brake grease to the contact areas shown at left.



Shoe Clearance Adjustment

1. Remove adjuster hole plug, and turn adjuster wheel with a screwdriver until shoe touches brake drum.

Make sure that parking control lever is released completely.



2. Return adjuster wheel 5 to 6 latches.
3. Install adjuster hole plug; and make sure that there is no drag between shoes and brake drum when rotating disc rotor.

Breaking In Drum and Lining

1. Using either low or 2nd transmission speed, drive the unloaded vehicle on a safe, level and dry road.
2. Depress the release button of parking brake lever, then pull the lever with a force of 98 N (10 kg, 22 lb).
3. While holding the lever, continue to drive the vehicle forward 100 m (328 ft) at approximately 35 km/h (22 MPH).
4. While holding the lever, drive the vehicle in reverse 10 m (33 ft) at approximately 10 km/h (6 MPH).
5. Repeat steps 1 through three times and then repeat only step 4 one more time.

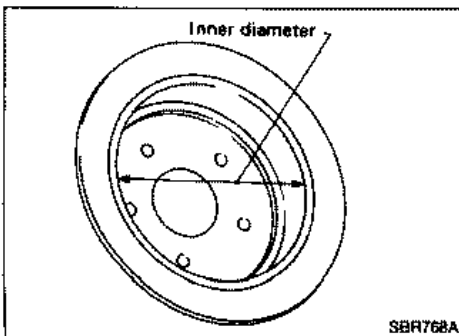
Drum Inspection

Standard inner diameter:

172.0 mm (6.77 in)

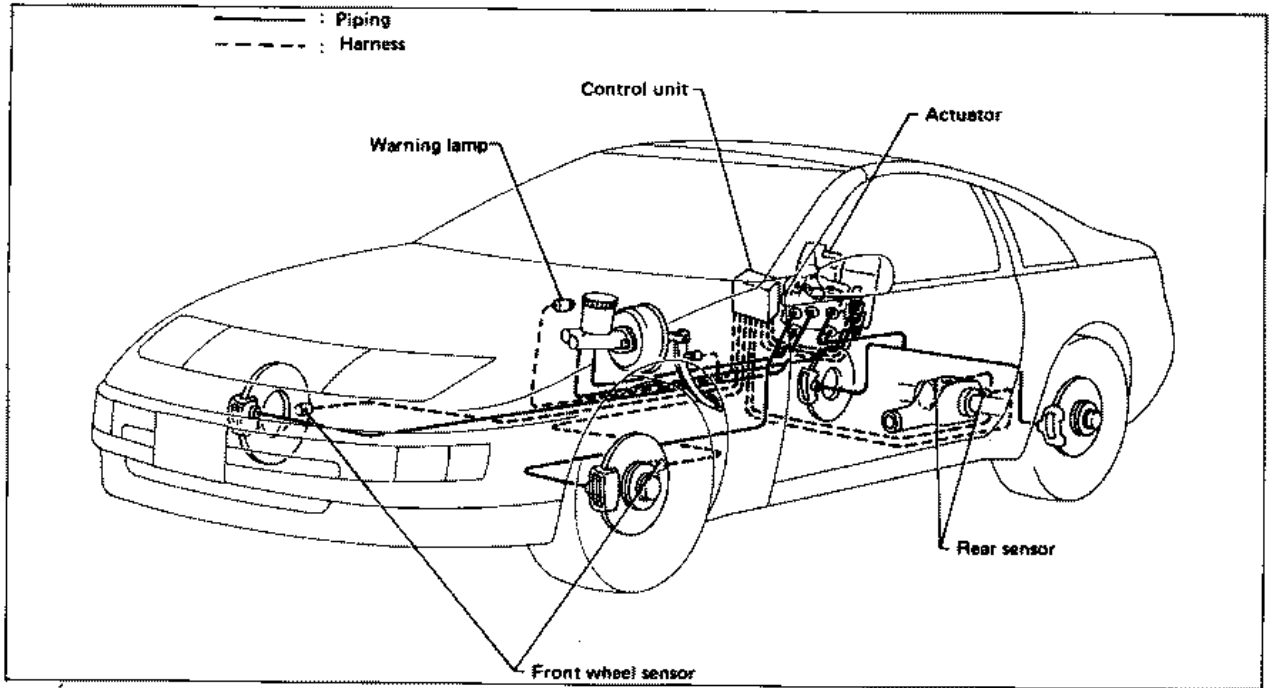
Maximum inner diameter:

173.0 mm (6.81 in)

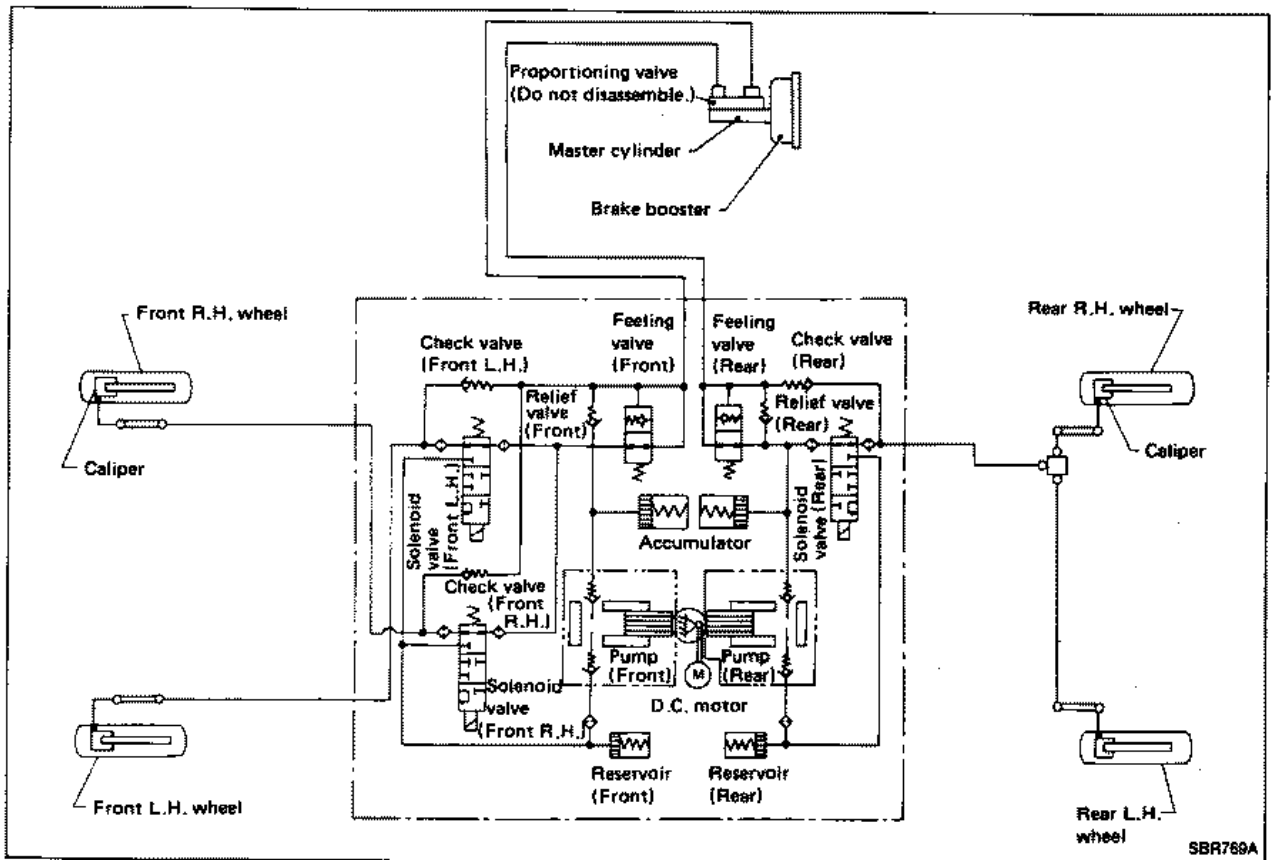


ANTI-LOCK BRAKING SYSTEM

System Components



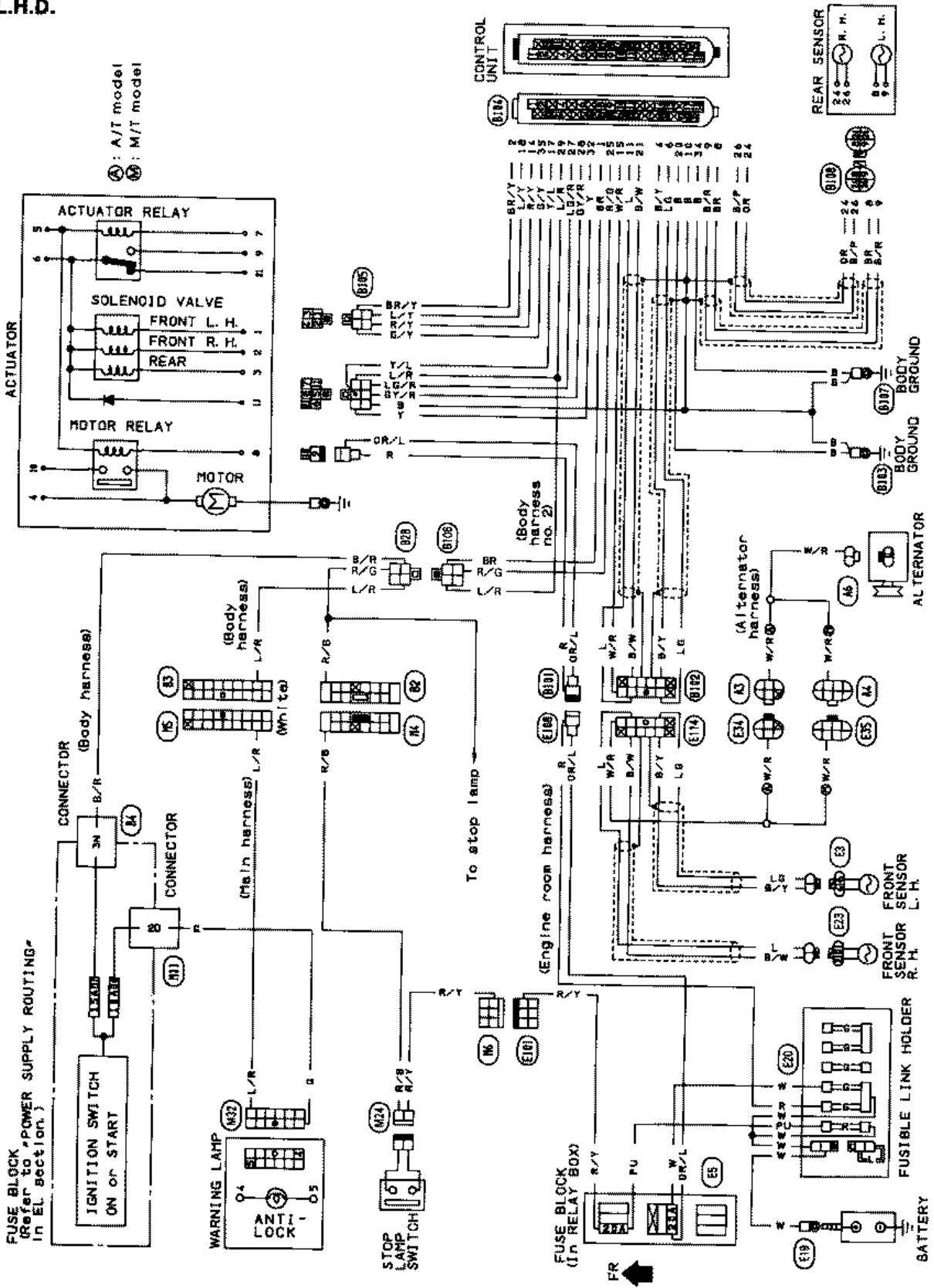
Hydraulic Circuit



ANTI-LOCK BRAKING SYSTEM

Wiring Diagram

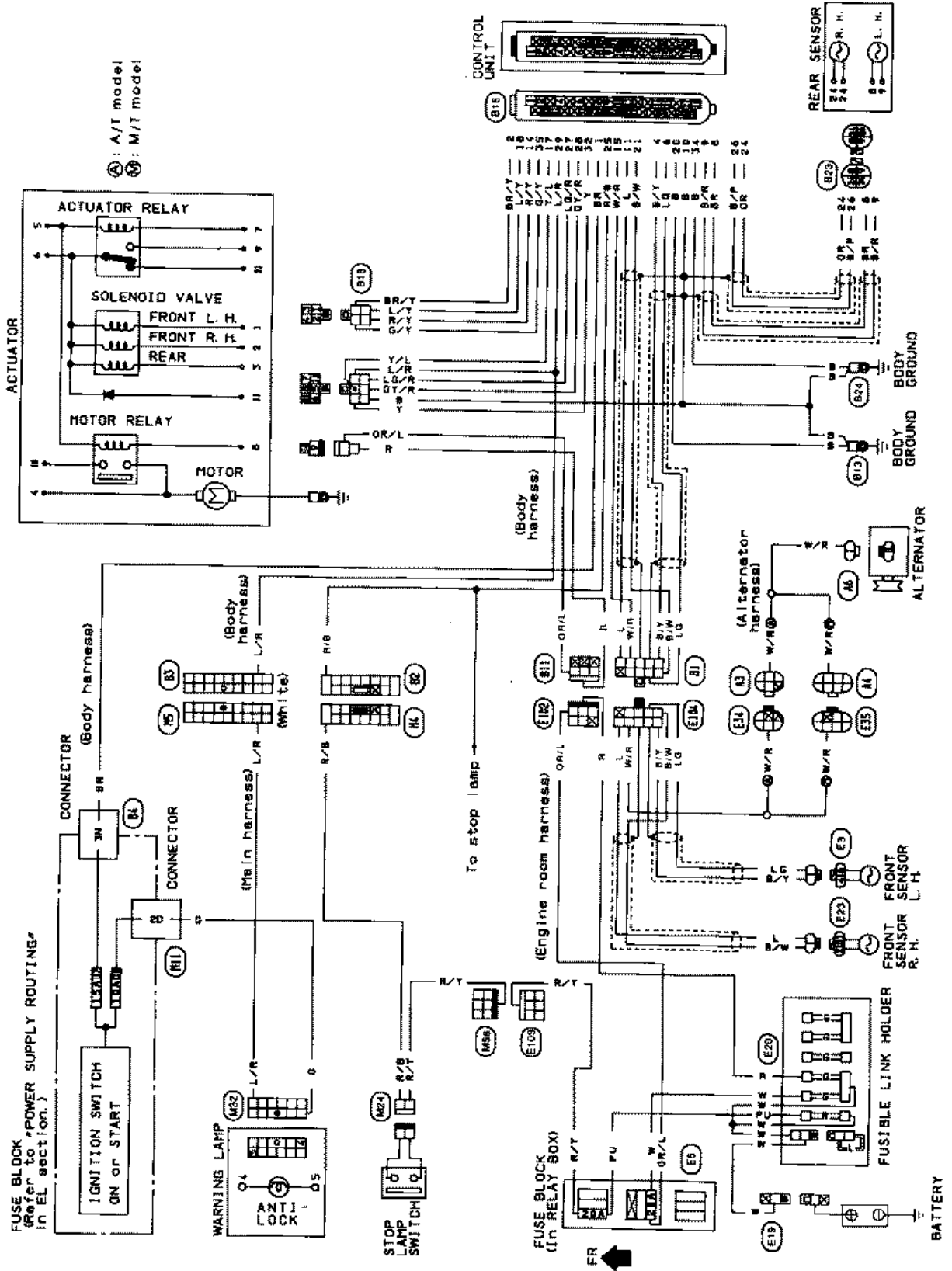
L.H.D.



ANTI-LOCK BRAKING SYSTEM

Wiring Diagram (Cont'd)

R.H.D.



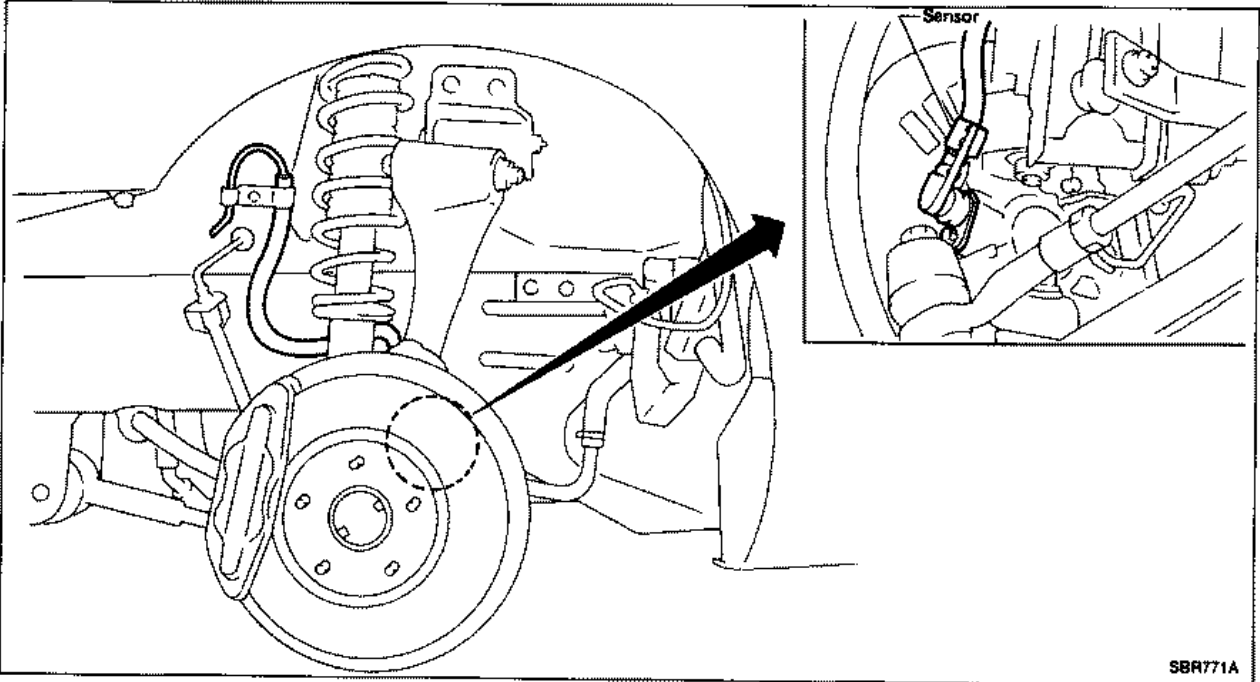
ANTI-LOCK BRAKING SYSTEM

Removal and Installation

CAUTION:

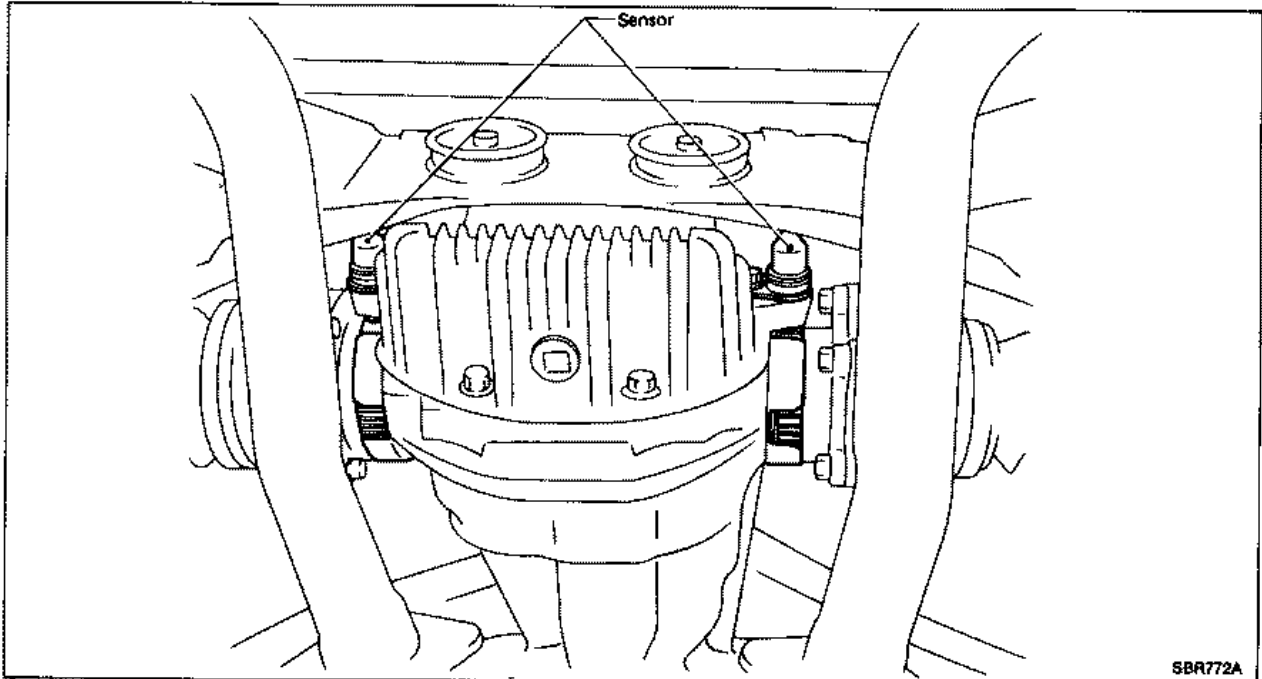
Be careful not to damage sensor edge and sensor rotor teeth.

FRONT WHEEL SENSOR



SBR771A

REAR SENSOR

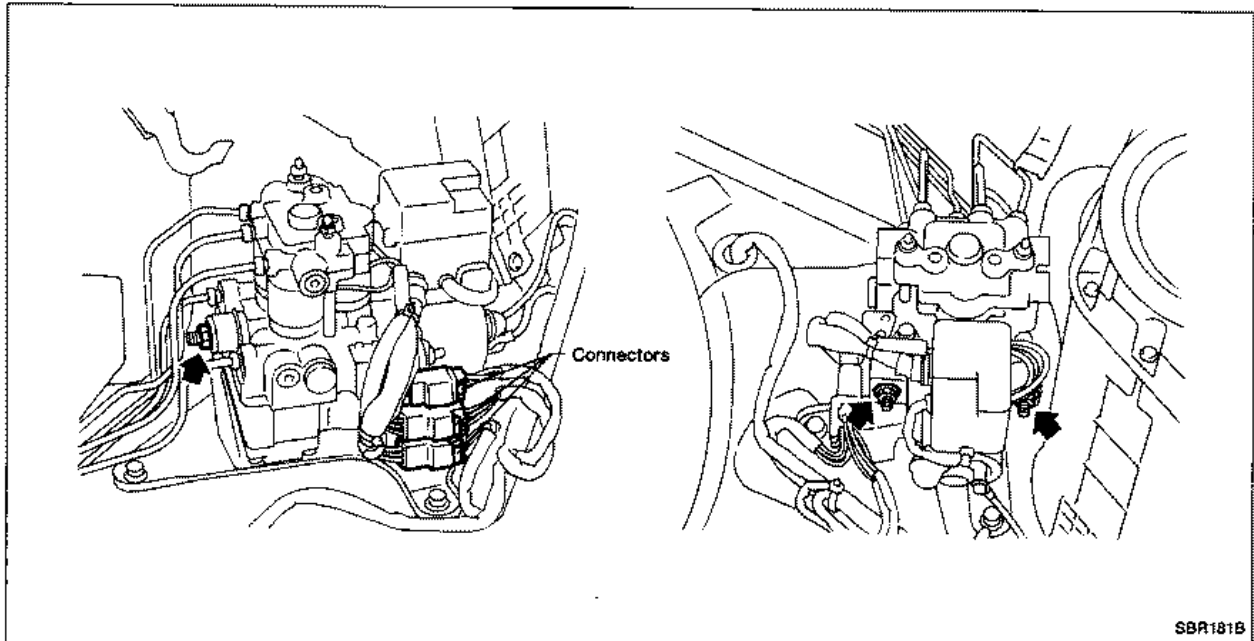


SBR772A

- Remove rear sensor rotor with differential side flange after drive shaft removal. Refer to RA section.

ANTI-LOCK BRAKING SYSTEM

Removal and Installation (Cont'd) ACTUATOR



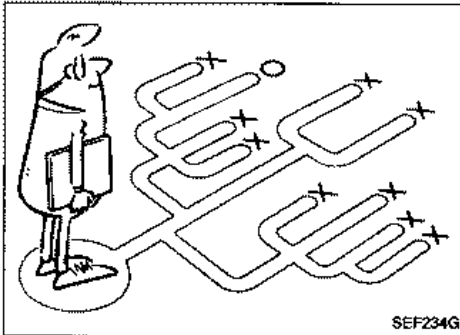
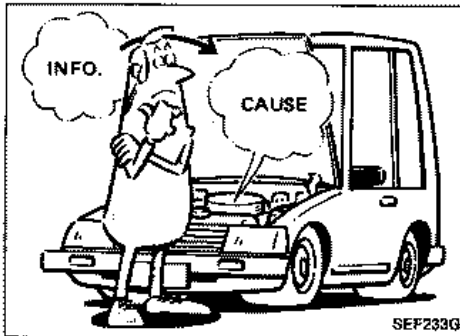
- Disconnect 3 connectors and brake tubes.
- Remove 3 nuts fixing actuator to bracket.

TROUBLE DIAGNOSES

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Preliminary Check 2	BR-36
Preliminary Check 3, 4	BR-37
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Ground Circuit Check	BR-41
Circuit Diagram for Quick Pinpoint Check	BR-42
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Diagnostic Procedure 9	BR-50
Diagnostic Procedure 10	BR-51
Diagnostic Procedure 11	BR-52
Electrical Components Inspection	BR-53

TROUBLE DIAGNOSES



How to Perform Trouble Diagnoses for Quick and Accurate Repair

INTRODUCTION

The A.B.S. system has an electronic control unit to control major functions. The control unit accepts input signals from sensors and instantly drives actuators. It is essential that both kinds of signals are proper and stable. At the same time, it is important that there are no conventional problems such as air leaks in the booster or lines, lack of brake fluid, or other problems with brake system.

It is much more difficult to diagnose a problem that occurs intermittently rather than continuously. Most intermittent problems are caused by poor electric connections or faulty wiring. In this case, careful checking of suspicious circuits may help prevent the replacement of good parts.

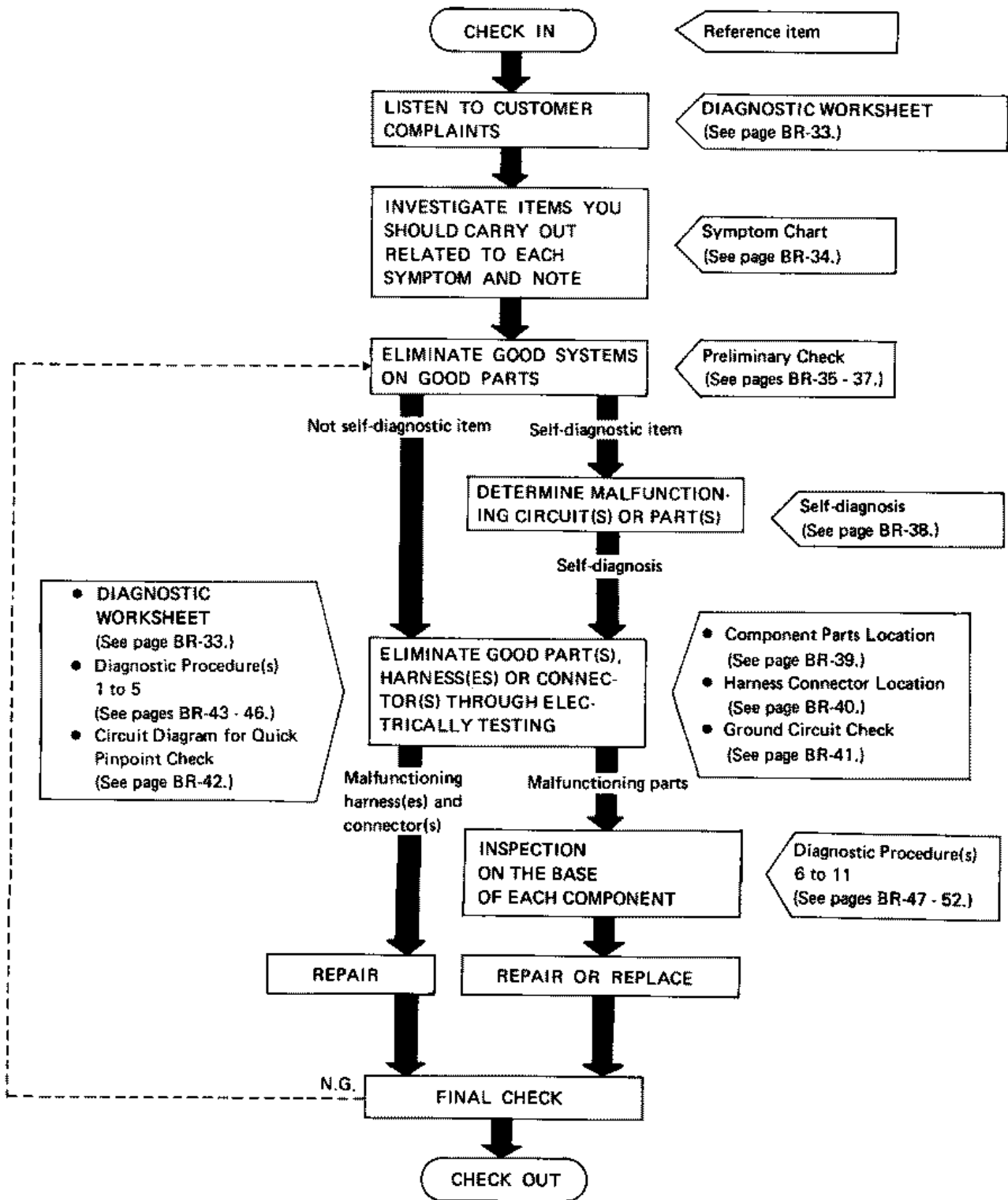
A visual check only may not find the cause of the problems, so a road test should be performed.

Before undertaking actual checks, take just a few minutes to talk with a customer who approaches with a A.B.S. complaint. The customer is a very good source of information on such problems; especially intermittent ones. Through the talks with the customer, find out what symptoms are present and under what conditions they occur.

Start your diagnosis by looking for "conventional" problems first. This is one of the best ways to troubleshoot brake problems on an A.B.S. controlled vehicle.

TROUBLE DIAGNOSES

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd) WORK FLOW



TROUBLE DIAGNOSES

How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

KEY POINTS	
WHAT Vehicle model
WHEN Date, Frequencies
WHERE Road conditions
HOW Operating conditions, Weather conditions, Symptoms

DIAGNOSTIC WORKSHEET

There are many kinds of operating conditions that lead to customer complaints, even if the system is normal.

A good grasp of such conditions can make trouble-shooting faster and more accurate.

In general, feelings for a problem depend on each customer's information. It is therefore important to fully understand the symptoms or under what conditions a customer complains.

Make good use of a diagnostic worksheet such as the one shown below in order to utilize all the complaints for trouble-shooting.

Worksheet sample

Customer name MR/MS		Model & Year			VIN		
Engine #		Trans.			Mileage		
Incident Date		Manuf. Date			In Service Date		
Symptoms	<input type="checkbox"/> Pedal vibration and noise	<input type="checkbox"/> Warning activates	<input type="checkbox"/> Long stopping distance	<input type="checkbox"/> Abnormal pedal action	<input type="checkbox"/> A.B.S. doesn't work	<input type="checkbox"/> A.B.S. works but warning activates	<input type="checkbox"/> A.B.S. works frequently
Engine conditions		<input type="checkbox"/> When starting <input type="checkbox"/> After starting <input type="checkbox"/> Engine speed: 5,000 rpm or more					
Road conditions		<input type="checkbox"/> Low friction road (<input type="checkbox"/> Snow <input type="checkbox"/> Gravel <input type="checkbox"/> Other) <input type="checkbox"/> Protrusion					
Driving conditions		<input type="checkbox"/> High speed cornering <input type="checkbox"/> Vehicle speed: Greater than 10 km/h (6 MPH) <input type="checkbox"/> Vehicle speed: 10 km/h (6 MPH) or less <input type="checkbox"/> Vehicle is stopped					
Applying brake conditions		<input type="checkbox"/> Suddenly <input type="checkbox"/> Gradually					
Other conditions		<input type="checkbox"/> Operation of electrical equipment <input type="checkbox"/> Large pedal stroke <input type="checkbox"/> Operation of clutch					

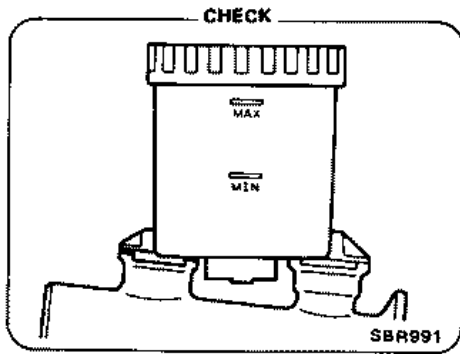
TROUBLE DIAGNOSES

Symptom Chart

PROCEDURE	REFERENCE PAGE	SYMPTOM						
Electrical Components Inspection	BR-53	Actuator inspection						○
	BR-41	Motor ground						○
Ground Circuit Check	BR-41	Control unit ground						○
	BR-52	Diagnostic Procedure 11	○	○	○	○	○	○
Diagnostic Procedure (Select inspection with L.E.D. flashing No.)	BR-51	Diagnostic Procedure 10	○	○	○	○	○	○
	BR-50	Diagnostic Procedure 9	○	○	○	○	○	○
	BR-49	Diagnostic Procedure 8	○	○	○	○	○	○
	BR-48	Diagnostic Procedure 7	○	○	○	○	○	○
	BR-47	Diagnostic Procedure 6	○	○	○	○	○	○
	Diagnostic Procedure	BR-46	Diagnostic Procedure 5					
BR-46		Diagnostic Procedure 4					○	
BR-45		Diagnostic Procedure 3				○		
BR-45		Diagnostic Procedure 2			○			
BR-43		Diagnostic Procedure 1	○					
Preliminary Check	BR-37	Preliminary Check 4	○	○	○	○	○	○
	BR-37	Preliminary Check 3	○	○				
	BR-36	Preliminary Check 2		○			○	
	BR-35	Preliminary Check 1			○	○		
		Pedal vibration & noise						
		Warning activates						
		Long stopping distance						
		Abnormal pedal action						
		A.B.S. doesn't work						
		A.B.S. works but warning activates						

TROUBLE DIAGNOSES

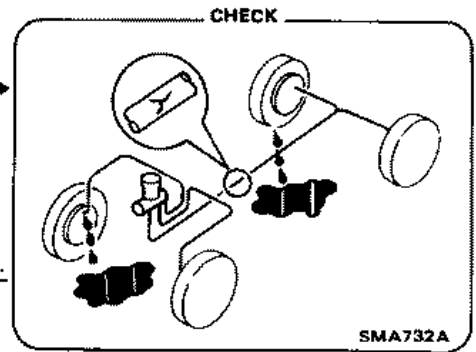
Preliminary Check 1



Check brake fluid level in reservoir tank.

N.G. → Fill up brake fluid.

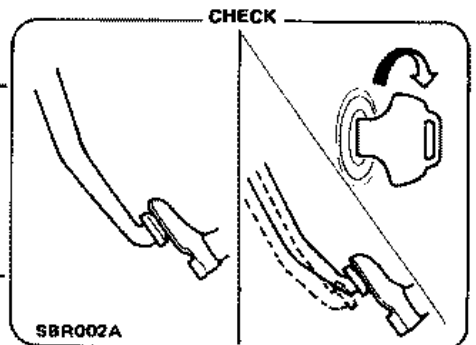
O.K. →



Check brake system.
Refer to CHECK AND ADJUSTMENT.

Repair brake system. ← N.G.

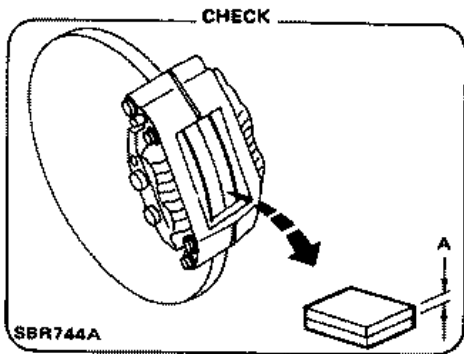
O.K. ↓



Check brake booster operation and airtightness.
Refer to "Inspection" of BRAKE BOOSTER.

Repair or replace booster system. ← N.G.

O.K. →

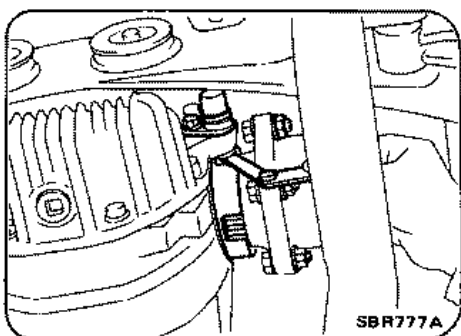
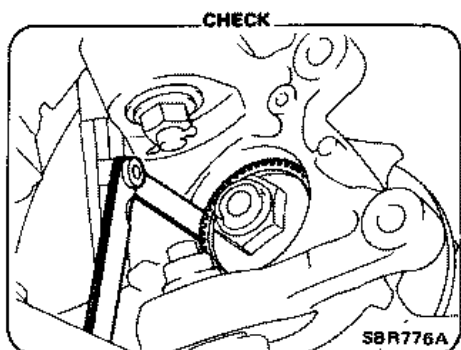


Check brake pads and rotor.
Refer to "Inspection" of FRONT and REAR DISC BRAKE.

Replace malfunctioning parts. ← N.G.

TROUBLE DIAGNOSES

Preliminary Check 2



Check sensor clearance.

	Clearance mm (in)
Front wheel sensor	0.06 - 0.93 (0.0024 - 0.0366)
Rear sensor	0.18 - 1.15 (0.0071 - 0.0453)

N.G.

Check sensor for the following items:

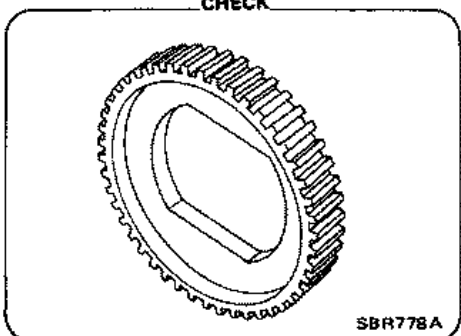
- Dust, foreign materials, etc., at fastening portion
- Improper installation
- Breakage

O.K.

N.G.

O.K.

CHECK



N.G.

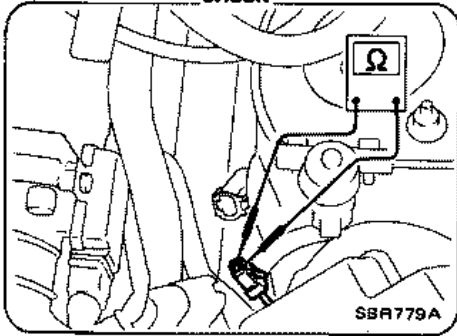
Replace sensor rotor.

Repair or replace malfunctioning sensor.

Check sensor rotor for teeth damage.

TROUBLE DIAGNOSES

Preliminary Check 3 CHECK



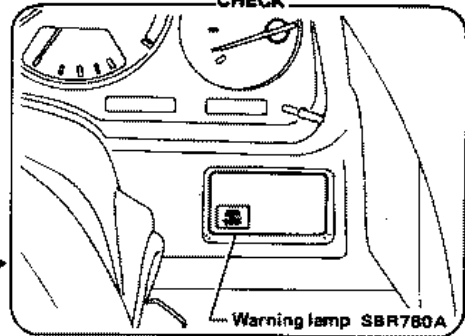
Measure each sensor resistance.
0.8 - 1.2 kΩ

N.G. → Replace.

O.K. →

Preliminary Check 3, 4

Preliminary Check 4 CHECK

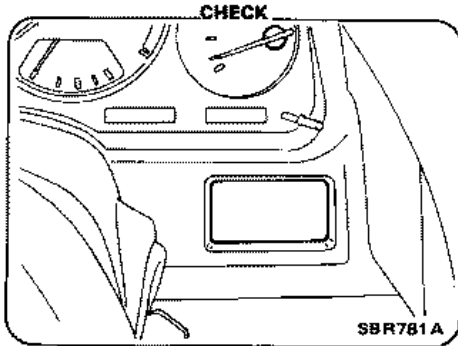


Check warning lamp activation.
When ignition switch is turned on, warning lamp turns on.

O.K. →

N.G. ↓

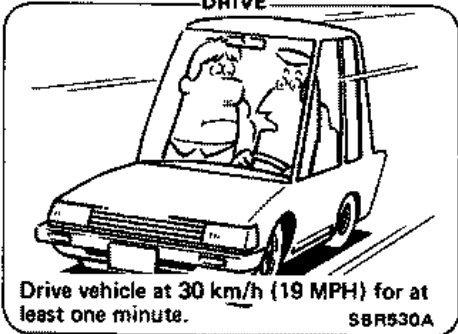
Check fuse.
Check bulb condition and remedy.



Check warning lamp for deactivation.
When engine starts, warning lamp deactivates.

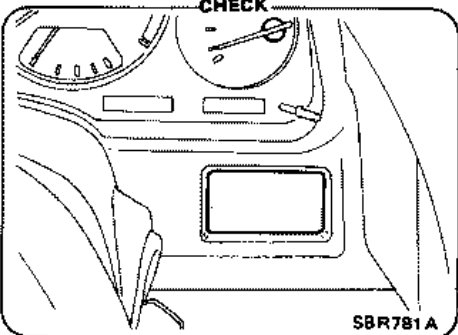
O.K. ↓

DRIVE



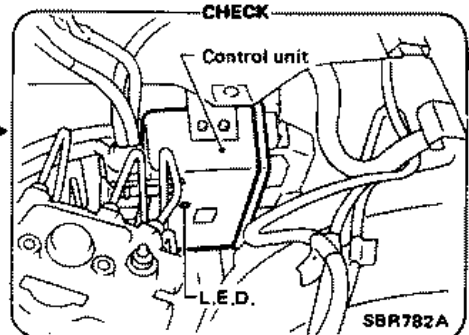
Drive vehicle at 30 km/h (19 MPH) for at least one minute.

CHECK



Ensure warning lamp remains off while driving.

N.G. →



- Keep engine on and running.
- Count the number of L.E.D. flashes during 5 to 10 second "OFF" period.

Go to Self-diagnosis.
(See page BR-38.)

N.G. →

O.K. → If Preliminary Check 2 is not performed and there is abnormal A.B.S. operation, perform Preliminary Check 2.

TROUBLE DIAGNOSES

Self-diagnosis

CHECKING THE NUMBER OF L.E.D. FLASHES

When a problem occurs in the A.B.S., the warning light on the instrument panel comes on. As shown in the Table, the control unit performs self-diagnosis.

To obtain satisfactory self-diagnosing results, the vehicle must be driven above 30 km/h (19 MPH) for at least one minute before the self-diagnosis is performed. After the vehicle is stopped, the number of L.E.D. flashes is counted while the engine is running.

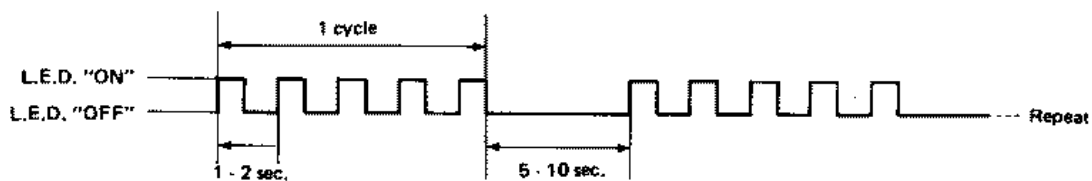
The L.E.D. is located on the control unit, identifying a malfunctioning part or unit by the number of flashes. Both the warning light and the L.E.D. persistently activate, even after a malfunctioning part or unit has been repaired, unless the ignition switch is turned "OFF". After repairs, turn the ignition switch "OFF". Then start the engine and drive the vehicle over 30 km/h (19 MPH) for at least one minute to ensure that the malfunctioning part or unit has been repaired properly.

If more than two circuits malfunction at the same time, the L.E.D. will flash to indicate one of the malfunctioning circuits. After the circuit has been repaired, the L.E.D. will then flash to indicate that the other circuit is malfunctioning.

No. of L.E.D. flashes	Malfunctioning part or unit	Diagnostic Procedure
1	Left front actuator solenoid circuit	Diagnostic Procedure 6
2	Right front actuator solenoid circuit	
3 or 4	Rear actuator solenoid circuit	
5	Left front wheel sensor circuit	Diagnostic Procedure 7
6	Right front wheel sensor circuit	
7 or 8	Rear wheel sensor circuit	
9	Motor and motor relay	Diagnostic Procedure 8
10	Solenoid valve relay	Diagnostic Procedure 9
16 or continuous	Control unit	Diagnostic Procedure 10
Warning activates and L.E.D. "OFF"	Power supply or ground circuit for control unit	Diagnostic Procedure 11

Example

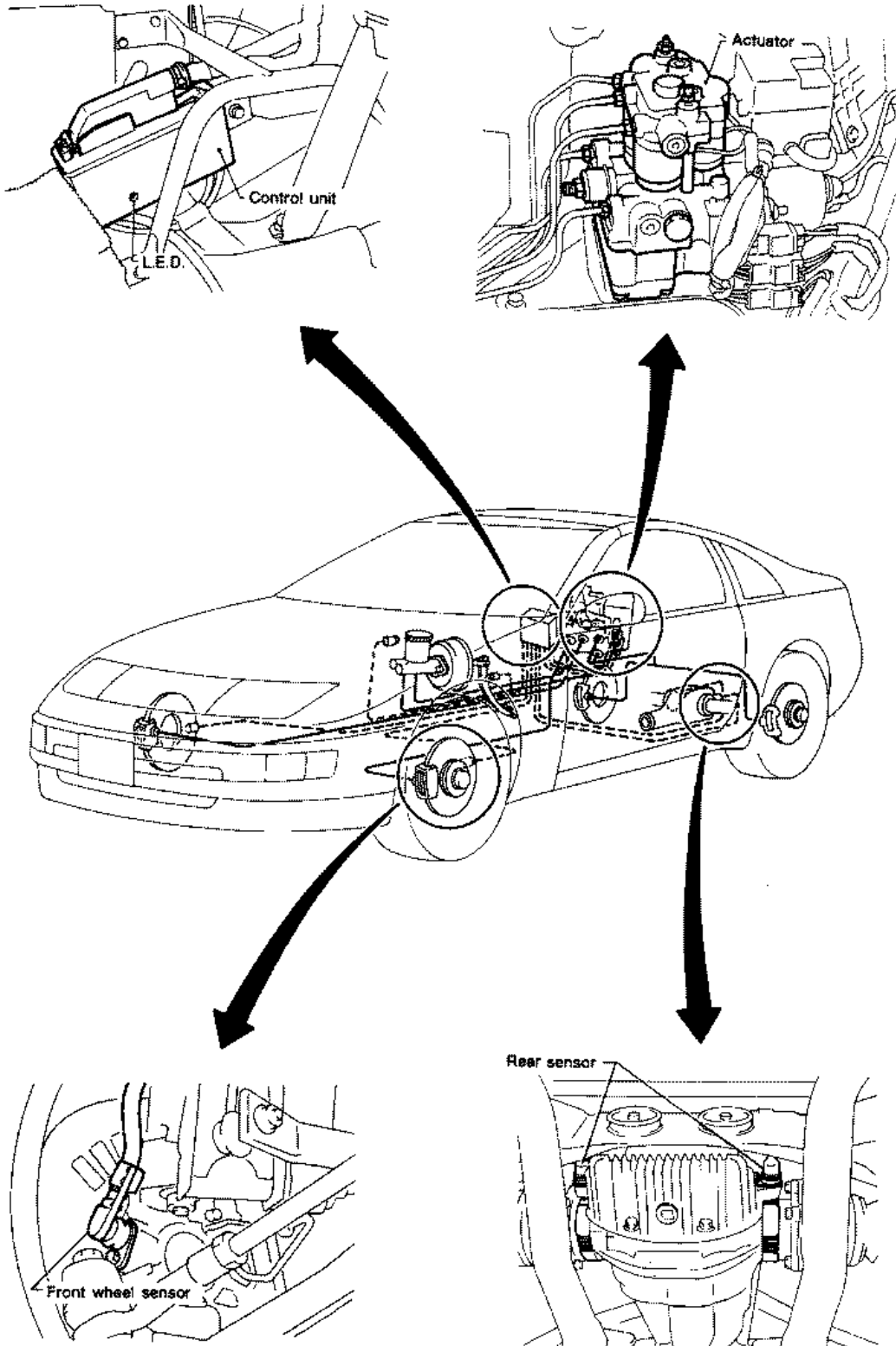
Improper operation of left front rotor sensor circuit



SBR531A

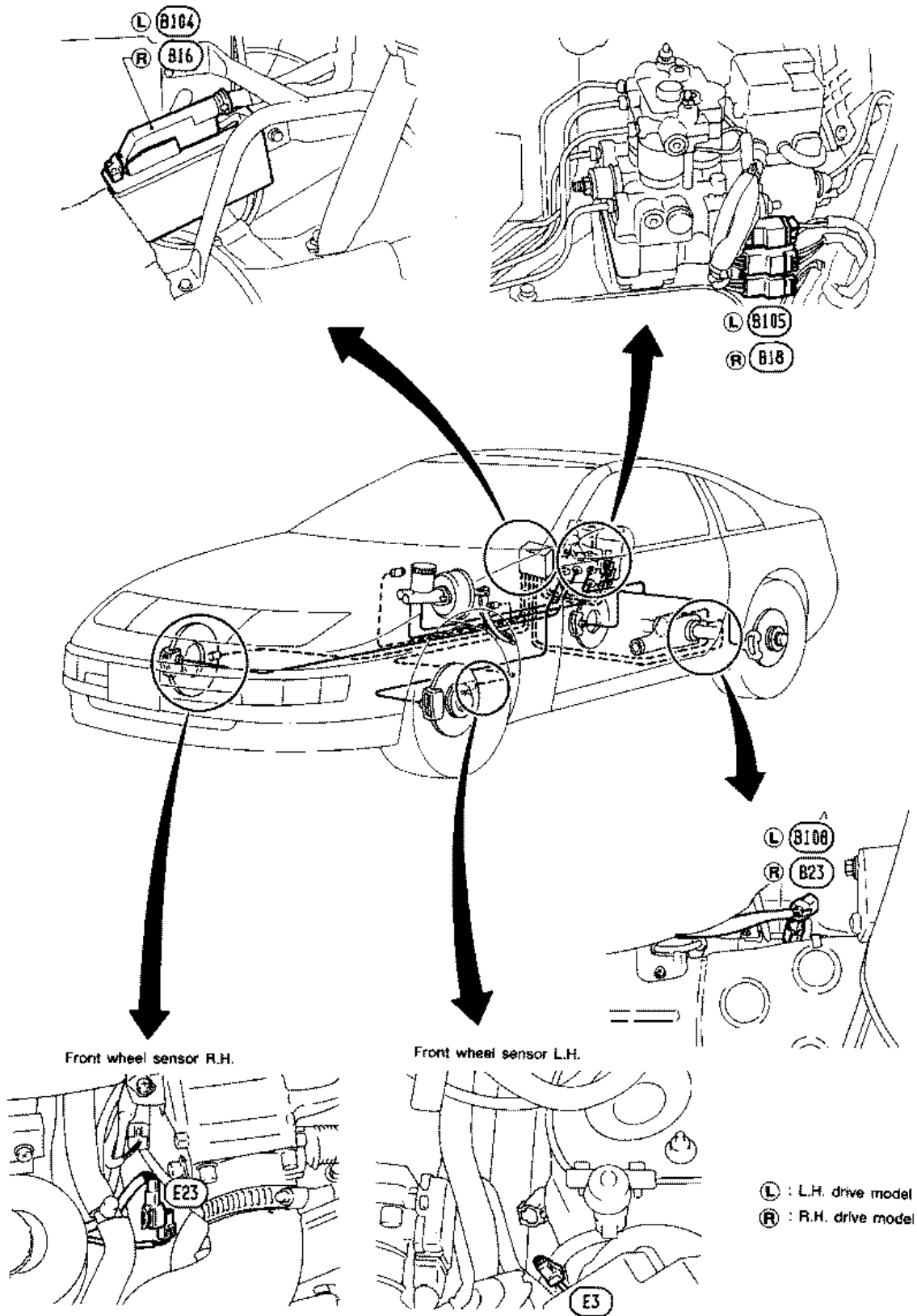
TROUBLE DIAGNOSES

Component Parts Location



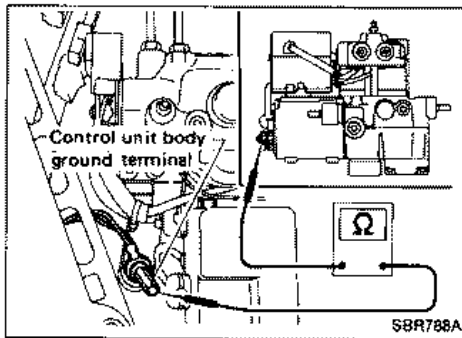
TROUBLE DIAGNOSES

Harness Connector Location



SBR183B

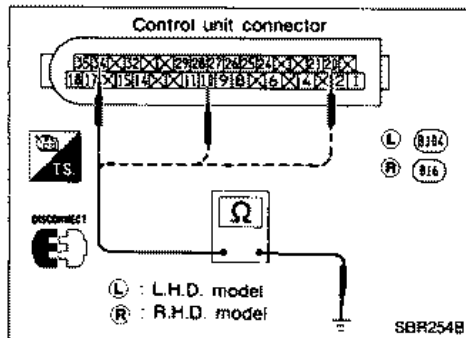
TROUBLE DIAGNOSES



Ground Circuit Check

ACTUATOR MOTOR GROUND

- Check resistance between both terminals.
Resistance: approx. 0Ω

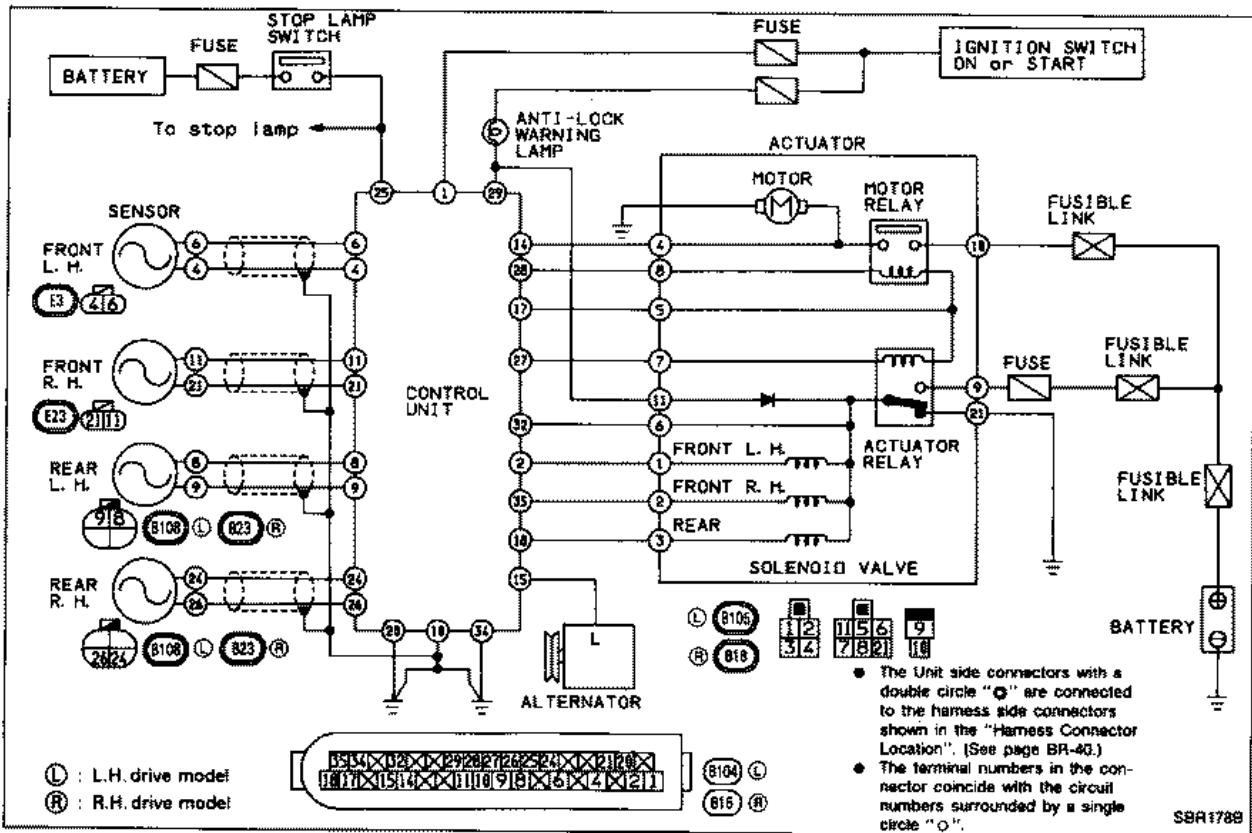


CONTROL UNIT GROUND

- Check resistance between both terminals.
Resistance: 0Ω

TROUBLE DIAGNOSES

Circuit Diagram for Quick Pinpoint Check

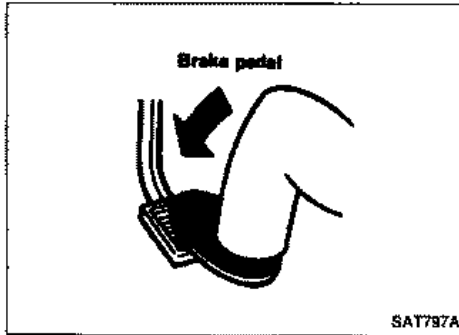


TROUBLE DIAGNOSES

Diagnostic Procedure 1

SYMPTOM: Pedal vibration and noise

Refer to worksheet result.



Check whether the symptom appears only when brake is applied suddenly.

Yes

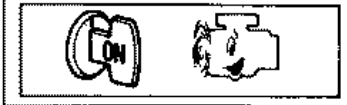
When brake is normally applied, A.B.S. works and produces pedal vibration or noise.

No

Check whether the symptom appears only when engine is started.

Yes

Refer to Preliminary Check 4 result.



No

Check whether the symptom appears only when the vehicle speed is within 10 km/h (6 MPH) after starting engine.

Yes

Check whether the symptom disappears within 5 seconds.

No

(A)

Yes

A.B.S. may sometimes operate when load is high and voltage is low due to insufficient alternator output.

No

Check whether the symptom appears while the vehicle is being driven.

No

(A)

Yes

Check whether the symptom appears when brake is applied gradually.

No

(Appears when brake is not applied.)

Check if there are any conditions, among those listed below, when symptom appears.

- Shifting
- Operating clutch
- Passing over bumps/potholes

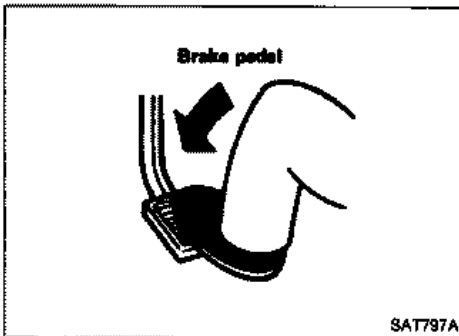
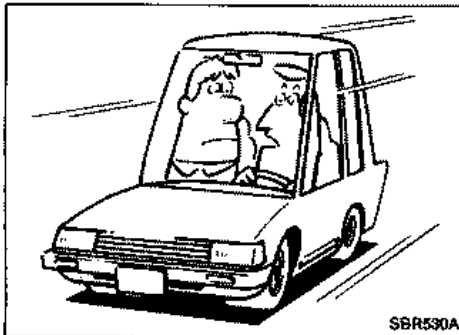
No

(A)

Yes

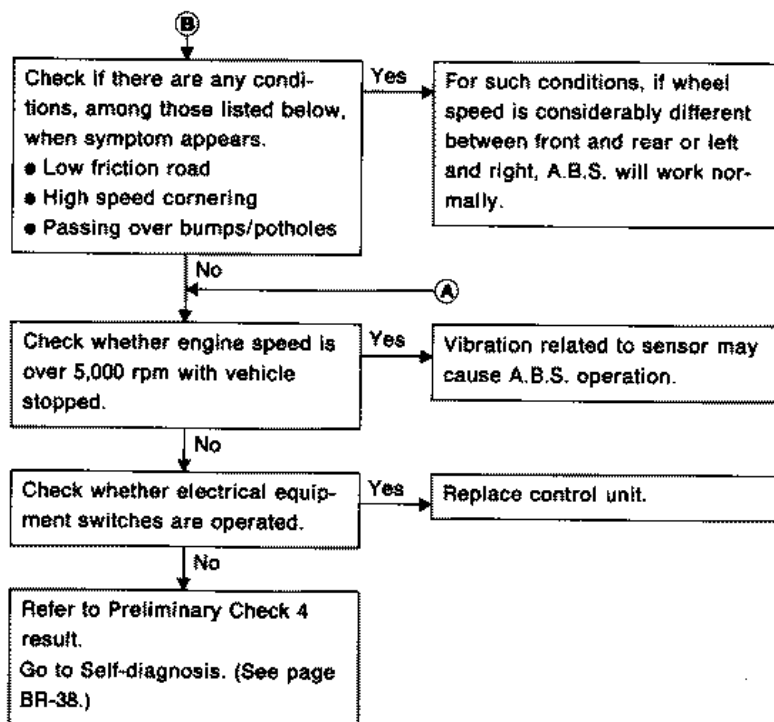
Under these conditions individual wheel speed can change suddenly. This may sometimes cause the A.B.S. to operate.

(B)

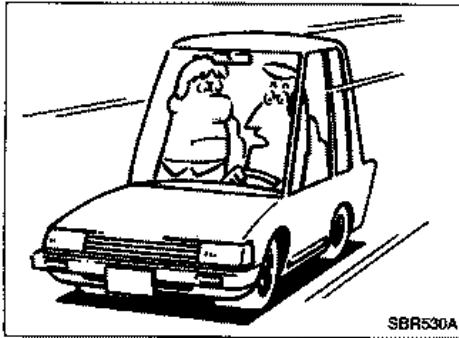


TROUBLE DIAGNOSES

Diagnostic Procedure 1 (Cont'd)



TROUBLE DIAGNOSES

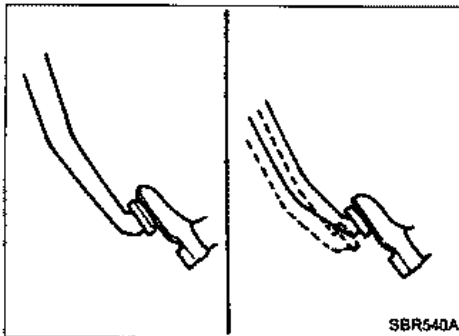
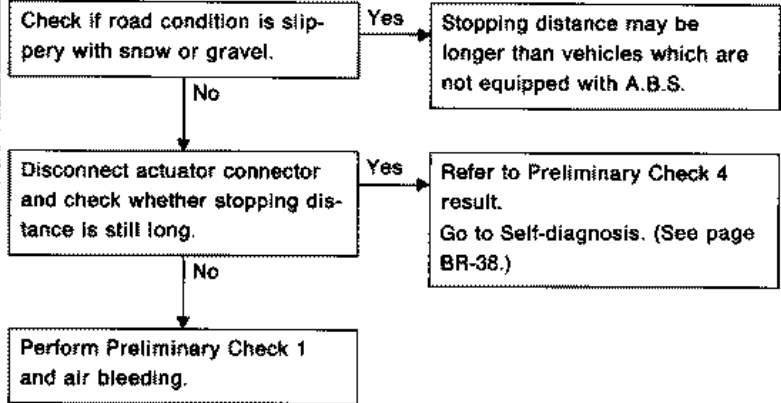


SBR530A

Diagnostic Procedure 2

SYMPTOM: Long stopping distance

Refer to worksheet results.

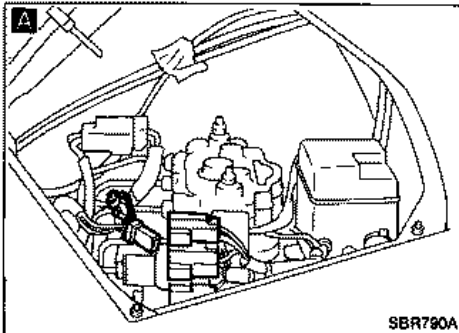


SBR540A

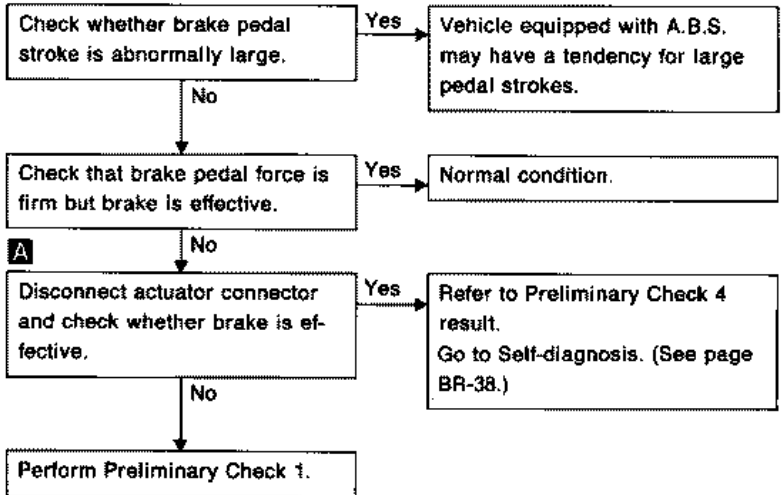
Diagnostic Procedure 3

SYMPTOM: Abnormal pedal action

Refer to worksheet results.



SBR790A

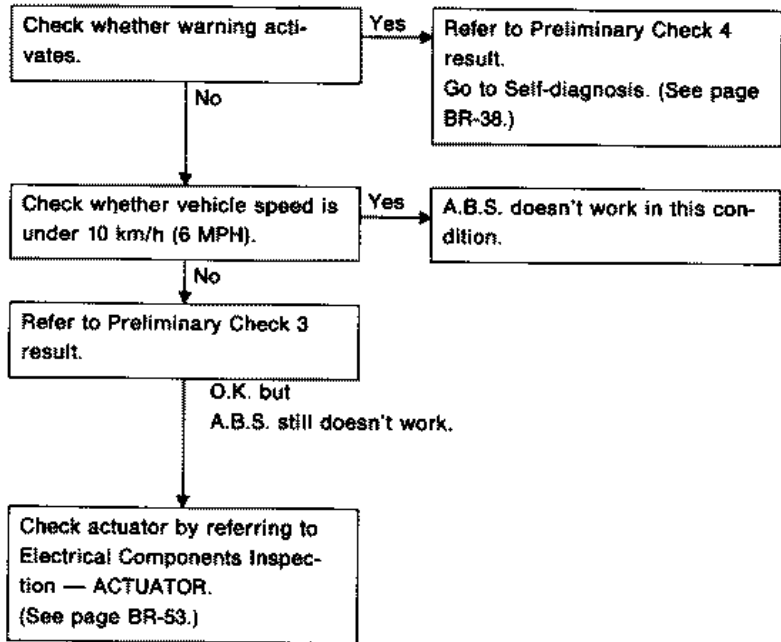


TROUBLE DIAGNOSES

Diagnostic Procedure 4

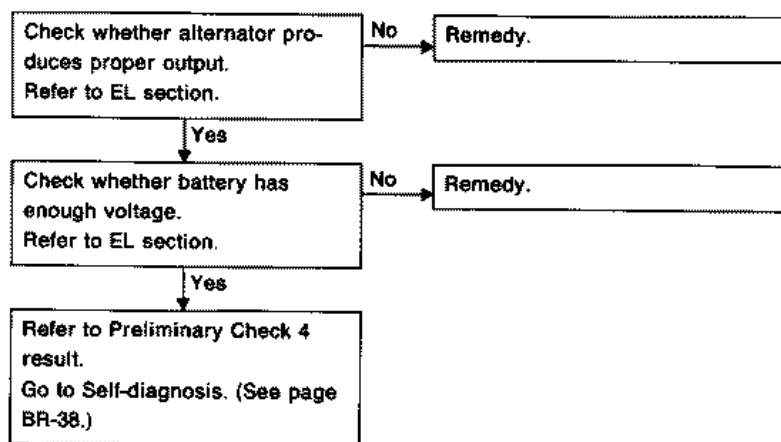
SYMPTOM: A.B.S. doesn't work.

Refer to worksheet results.

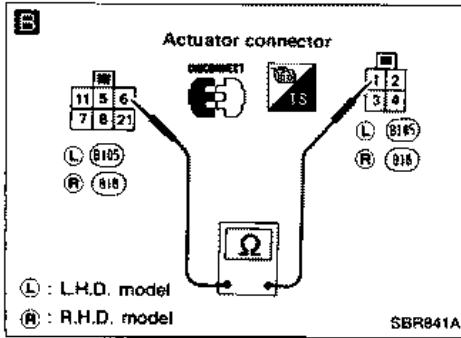
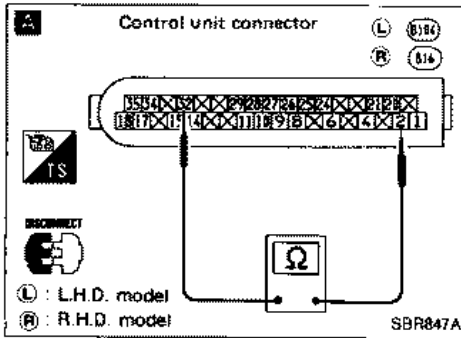


Diagnostic Procedure 5

SYMPTOM: A.B.S. works but warning activates.



TROUBLE DIAGNOSES



Diagnostic Procedure 6

ACTUATOR SOLENOID (L.E.D. flashing number 1 - 4)

INSPECTION START
Remove battery negative terminal connector.

A
CHECK SOLENOID VALVE RESISTANCE.
Disconnect control unit connector.
Check resistance between control unit connector (vehicle side) terminals.
Flashing number 1:
Terminals ⑫ and ②
Flashing number 2:
Terminals ⑫ and ⑮
Flashing number 3 or 4:
Terminals ⑫ and ⑱
Resistance: 0.7 - 1.6Ω

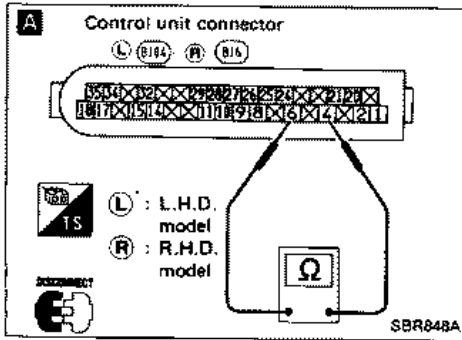
O.K. → Replace control unit.

B
Disconnect actuator connector.
Check resistance between actuator connector (actuator side) terminals.
Flashing number 1:
Terminals ⑥ and ①
Flashing number 2:
Terminals ⑥ and ②
Flashing number 3 or 4:
Terminals ⑥ and ③
Resistance: 0.7 - 1.6Ω

O.K. → Repair harness between actuator connector and control unit connector.

N.G. →
N.G. →
Replace actuator.

TROUBLE DIAGNOSES



Diagnostic Procedure 7

WHEEL SPEED SENSOR (L.E.D. flashing number 5 - 8)

INSPECTION START

Remove battery negative terminal connector.

A

CHECK SPEED SENSOR RESISTANCE.

Disconnect control unit connector.

Check resistance between control unit connector (vehicle side) terminals.

Flashing number 5:

Terminals ④ and ⑥

Flashing number 6:

Terminals ① and ②

Flashing number 7 or 8:

Terminals ⑦ and ⑨

Resistance: 0.8 - 1.2 kΩ

O.K. → Replace control unit.

N.G.

Refer to Preliminary Check 3 result.

Check whether sensor has 0.8 - 1.2 kΩ resistance.

N.G. → Replace sensor.

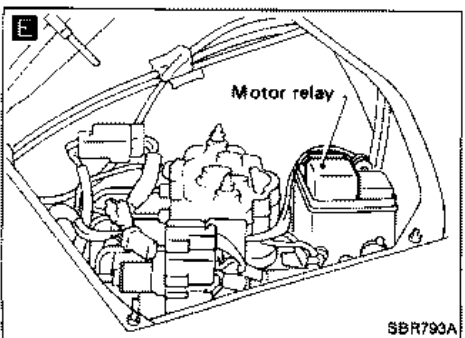
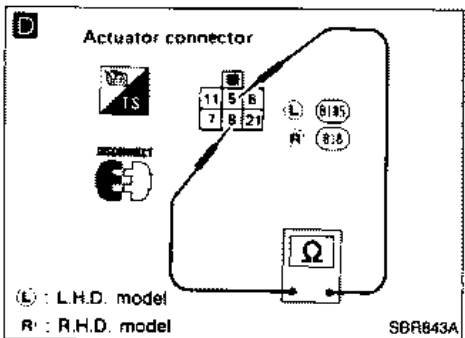
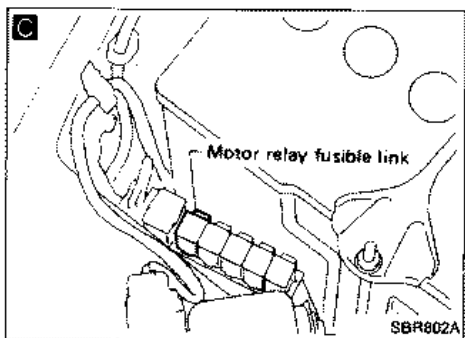
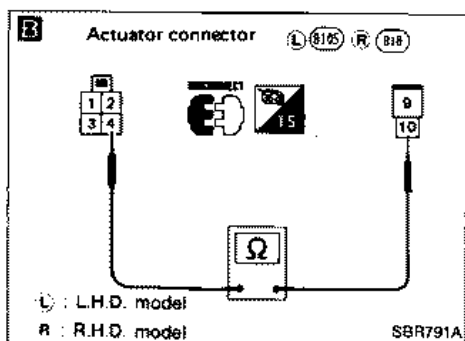
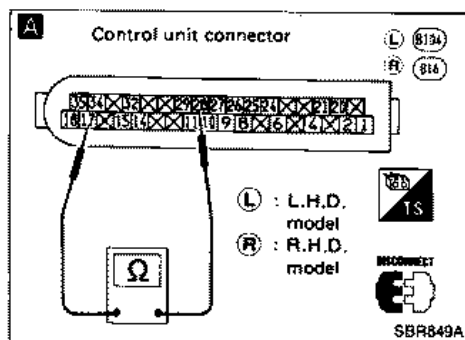
O.K.

Repair harness between sensor connector and control unit connector.

TROUBLE DIAGNOSES

Diagnostic Procedure 8

ACTUATOR MOTOR RELAY (L.E.D. flashing number 9)



INSPECTION START
Remove battery negative terminal connector.

A CHECK MOTOR RELAY SOLENOID RESISTANCE.
Disconnect control unit connector.
Check resistance between control unit connector (vehicle side) terminals ①⑦ and ②⑧.
Resistance: 45 - 55Ω

O.K. → **B**

B CHECK MOTOR RELAY DEACTIVATION.
Disconnect actuator connector.
Check continuity between actuator connector (actuator side) terminals ④ and ⑩.

No → **C**
Yes → **E**

C Check if motor's fusible link is blown.
No → Perform Electrical Components Inspection — ACTUATOR. (See page BR-53.)
Yes → Replace fusible link.

N.G. → **D** Disconnect actuator connector.
Check resistance between actuator connector (actuator side) terminals ⑧ and ⑤.
Resistance: 45 - 55Ω

O.K. → **E** Replace motor relay.
N.G. → Repair harness between actuator and control unit.

Repair harness between actuator and control unit.

E Replace motor relay.

Perform Electrical Components Inspection — ACTUATOR. (See page BR-53.)

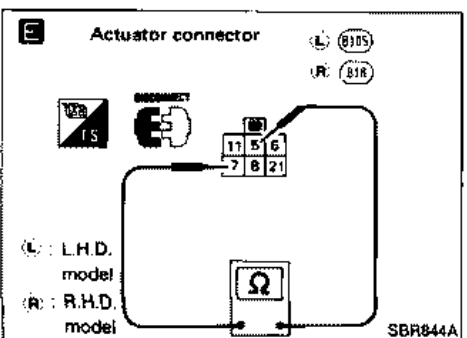
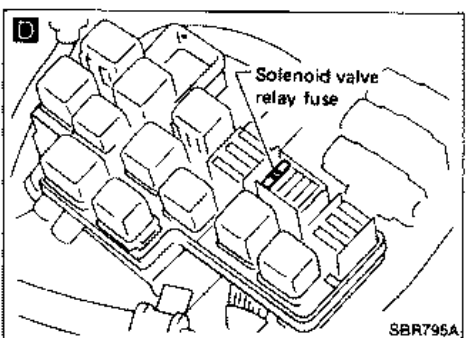
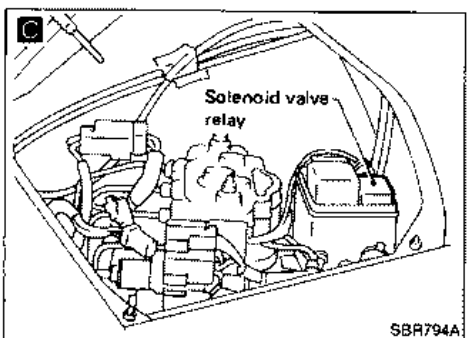
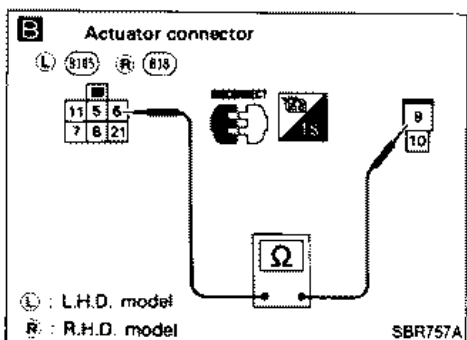
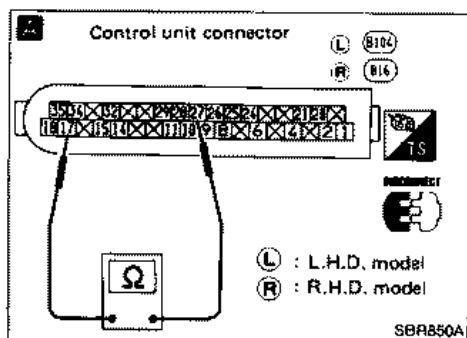
O.K. → Replace control unit.
N.G. → Replace actuator.

Replace control unit.

TROUBLE DIAGNOSES

Diagnostic Procedure 9

ACTUATOR SOLENOID VALVE RELAY (L.E.D. flashing number 10)



INSPECTION START

Remove battery negative terminal connector.

CHECK SOLENOID VALVE RELAY RESISTANCE.
Disconnect control unit connector.
Check resistance between control unit connector (vehicle side) terminals ⑦ and ⑤.
Resistance: 80 - 90Ω

N.G. → Check resistance between actuator connector (actuator side) terminals ⑦ and ⑨.
Resistance: 80 - 90Ω

O.K. →
N.G. → Replace solenoid valve relay.

Repair harness between actuator and control unit.

CHECK SOLENOID VALVE RELAY MOVEMENT.
Disconnect actuator connector.
Check continuity between actuator connector (actuator side) terminals ⑥ and ⑨.

Yes → Replace solenoid valve relay.

No → Check if solenoid valve relay fuse is blown.

No → Perform Electrical Components Inspection — ACTUATOR. (See page BR-53.)

Yes → Replace fuse.

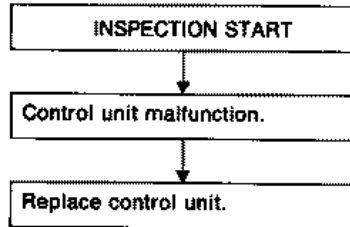
N.G. →
O.K. → Replace control unit.

Replace actuator.

TROUBLE DIAGNOSES

Diagnostic Procedure 10

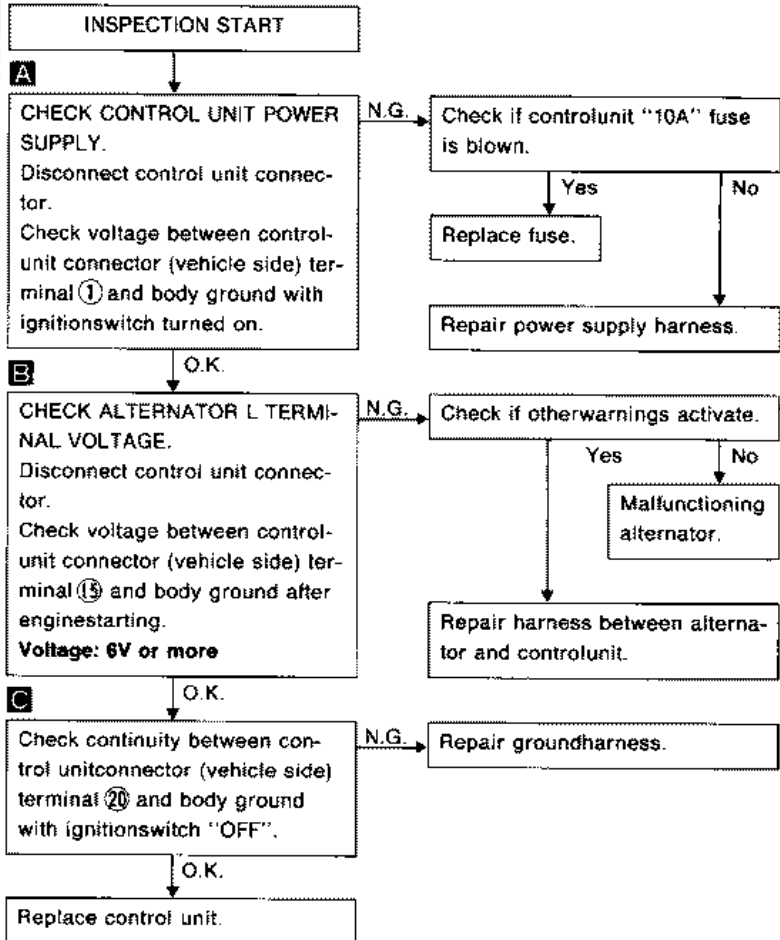
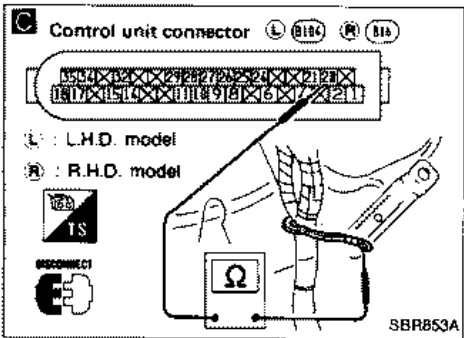
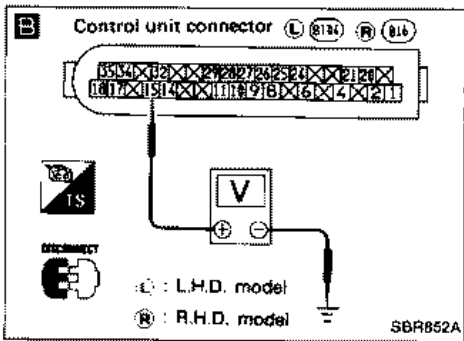
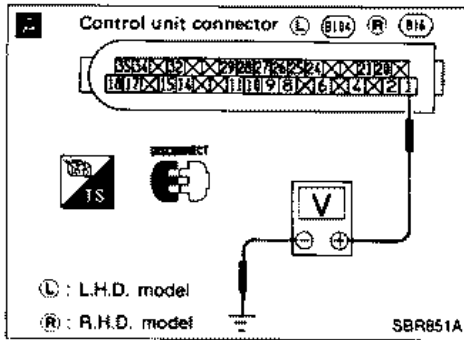
CONTROL UNIT (L.E.D. flashing number 16)



TROUBLE DIAGNOSES

Diagnostic Procedure 11

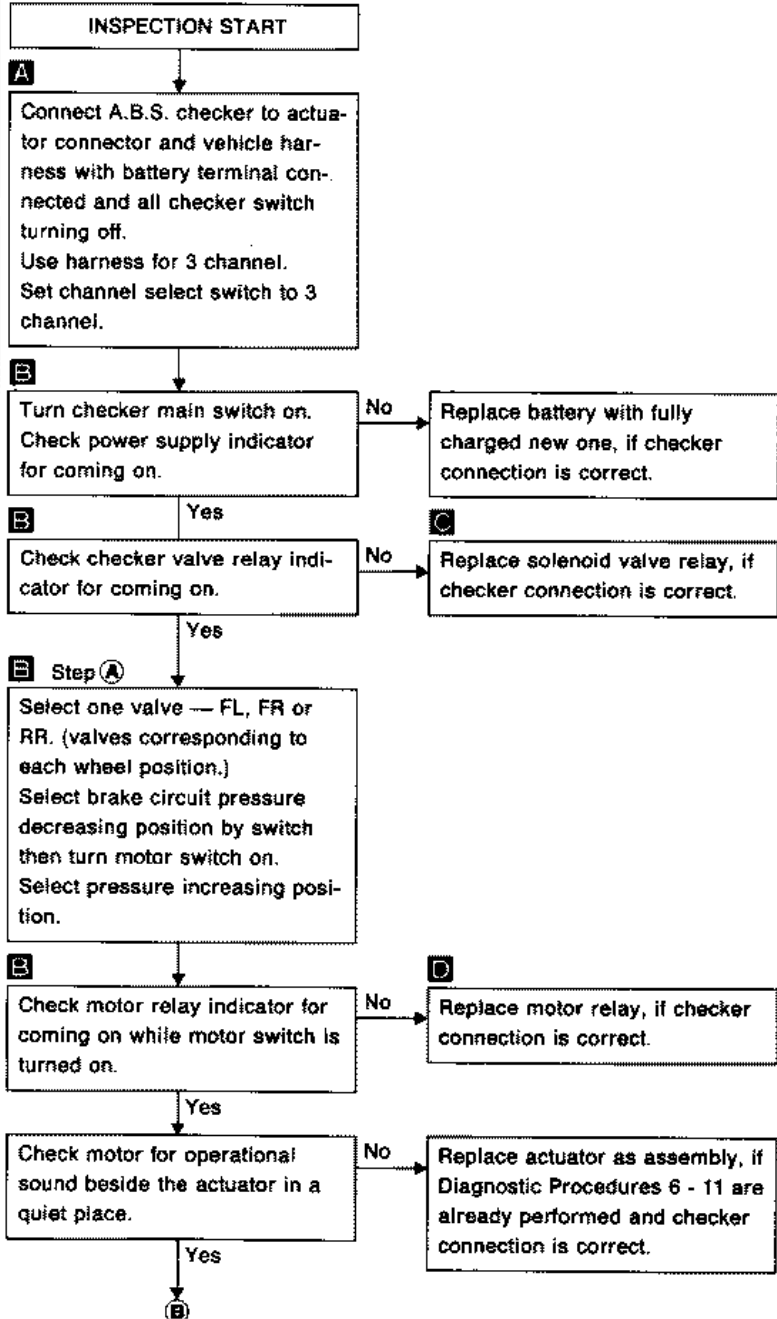
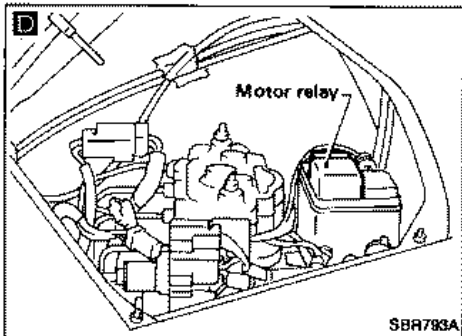
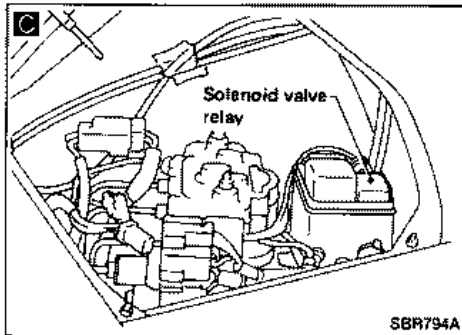
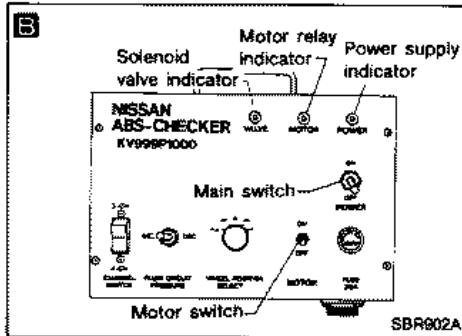
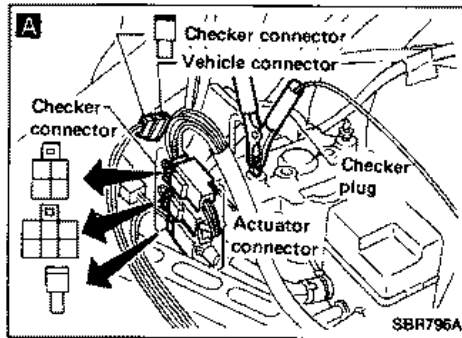
CONTROL UNIT OR POWER SUPPLY AND GROUND CIRCUIT (Warning activates but L.E.D. comes off.)



TROUBLE DIAGNOSES

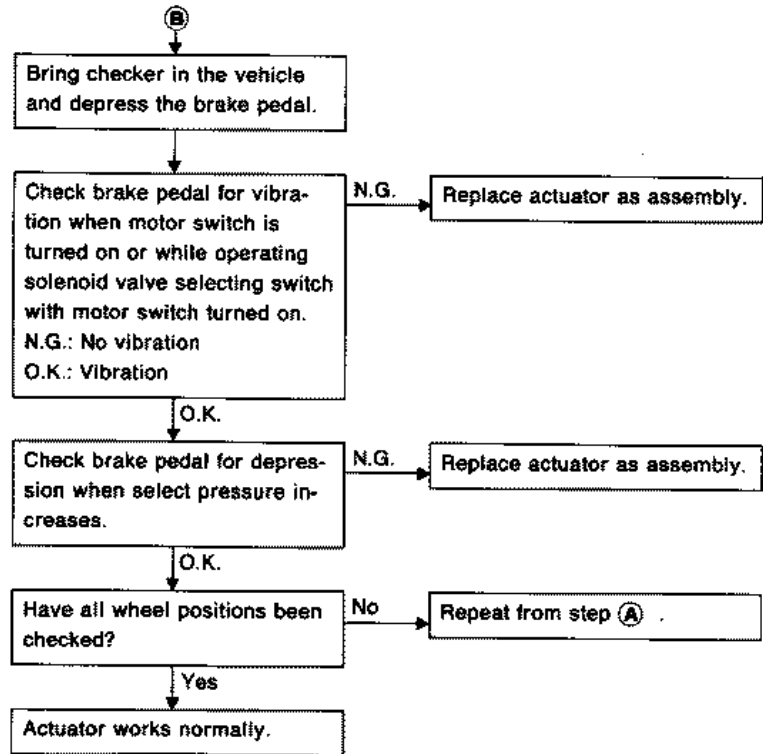
Electrical Components Inspection

ACTUATOR (Not self-diagnostic item)



TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)



CAUTION:

Do not set checker at pressure decrease position for more than 5 seconds at a time. Actuator solenoid valve may be damaged.

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

General Specifications

Applied model	Australia		Europe
	Without A.B.S.	With A.B.S.	-
Front brake	OPZ25V		OPF25V
Brake model	OPZ25V		OPF25V
Cylinder bore diameter mm (in)	40.45 (1.5925) x 4		
Pad length x width x thickness mm (in)	116 x 50 x 10 (4.57 x 1.97 x 0.39)		
Rotor outer diameter x thickness mm (in)	280 x 26 (11.02 x 1.02)	280 x 30 (11.02 x 1.18)	
Rear brake	OPZ11VB		
Brake model	OPZ11VB		
Cylinder bore diameter mm (in)	38.1 (1.500) x 2		
Pad length x width x thickness mm (in)	71.8 x 36.5 x 11.5 (2.827 x 1.437 x 0.453)		
Rotor outer diameter x thickness mm (in)	297 x 18 (11.69 x 0.71)		
Master cylinder	23.81 (15/16)		26.99 (17/16)
Cylinder bore diameter mm (in)	23.81 (15/16)		26.99 (17/16)
Control valve	Proportioning valve (within master cylinder)		
Valve model	Proportioning valve (within master cylinder)		
Split point x reducing ratio kPa (bar, kg/cm ² , psi)	3,432 (34.3, 35, 498) x 0.4		
Brake booster	M215T		
Booster model	M215T		
Diaphragm diameter mm (in)	Primary: 230 (9.06) Secondary: 205 (8.07)		
Brake fluid	DOT 3		
Recommended brake fluid	DOT 3		
Parking drum brake	DS17HD		
Brake model	DS17HD		
Lining	154.1 x 25.0 x 3.0 (6.07 x 0.984 x 0.118)		
Width x thickness x length mm (in)	154.1 x 25.0 x 3.0 (6.07 x 0.984 x 0.118)		
Drum inner diameter mm (in)	172.0 (6.77)		

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Inspection and Adjustment

FRONT DISC BRAKE

Unit: mm (in)

Brake model	OPZ25V	OPF25V
Pad wear limit		
Minimum thickness	2.0 (0.079)	
Rotor repair limit		
Minimum thickness	24.0 (0.945)	28.0 (1.102)
Maximum runout	0.07 (0.0028)	

REAR DISC BRAKE

Unit: mm (in)

Brake model	OPZ11VB
Pad wear limit	
Minimum thickness	2.0 (0.079)
Rotor repair limit	
Minimum thickness	16.0 (0.630)
Maximum runout	0.07 (0.0028)

PARKING DRUM BRAKE

Unit: mm (in)

Brake model	DS17HD
Lining replacement limit	
Minimum thickness	1.5 (0.059)
Drum repair limit	
Maximum inner diameter	173.0 (6.81)

BRAKE PEDAL

Unit: mm (in)

Applied model	M/T	A/T
Free height	186 - 196 (7.32 - 7.72)	195 - 205 (7.68 - 8.07)
Depressed height		
[under force of 490 N (50 kg, 110 lb) with engine running]		
With A.B.S.	105 (4.13)	110 (4.33)
Without A.B.S.	95 (3.74)	105 (4.13)
Clearance between pedal stopper and threaded end of switches	0.3 - 1.0 (0.012 - 0.039)	
Pedal free play at clevis	1 - 3 (0.04 - 0.12)	

PARKING BRAKE

Number of notches [under force of 196 N (20 kg, 44 lb)]	6 - 7
Number of notches (when warning lamp switch comes on)	1

STEERING SYSTEM

SECTION **ST**

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When you read wiring diagrams:

- Read GI section, "HOW TO READ WIRING DIAGRAMS".
- See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.

When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES".


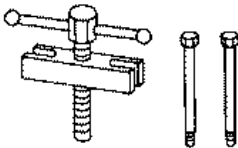
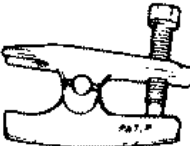
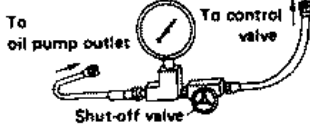
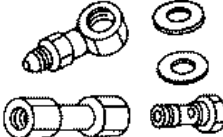
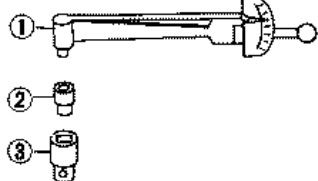
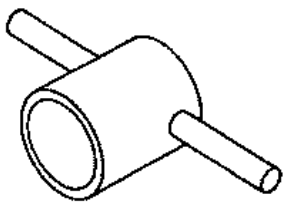

ST

PRECAUTIONS

- **Before disassembly, thoroughly clean the outside of the unit.**
 - **Disassembly should be done in a clean work area. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.**
 - **When disassembling parts, be sure to place them in order in a parts rack so they can be reinstalled in their proper positions.**
 - **Use nylon cloths or paper towels to clean the parts; common shop rags can leave lint that might interfere with their operation.**
 - **Before inspection or reassembly, carefully clean all parts with a general purpose, non-flammable solvent.**
 - **Before assembly, apply a coat of recommended A.T.F.* to hydraulic parts. Vaseline may be applied to O-rings and seals. Do not use any grease.**
 - **Replace all gaskets, seals and O-rings. Avoid damaging O-rings, seals and gaskets during installation. Perform functional tests whenever designated.**
- *: Automatic transmission fluid

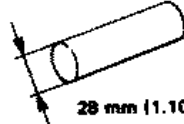
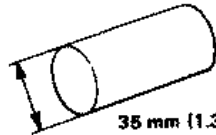
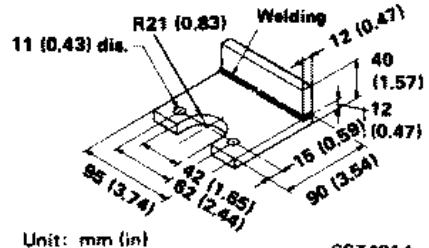
PREPARATION

SPECIAL SERVICE TOOLS

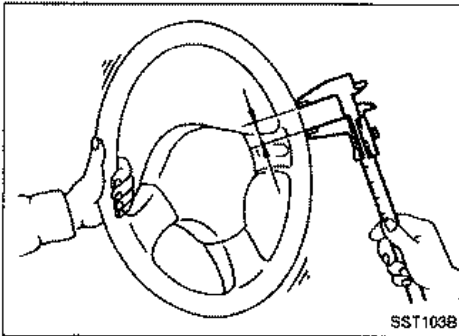
Tool number Tool name	Description	
KV48100700 Torque adapter		Measuring pinion rotating torque
ST27180001 Steering wheel puller		Removing steering wheel
HT72750000 Ball joint remover		Removing ball joint
ST27091000 Pressure gauge		Measuring oil pressure
KV48102500 Pressure gauge adapter		Measuring oil pressure
ST3127S000 ①GG91030000 Torque wrench ②HT6294000 Socket adapter ③HT62900000 Socket adapter		Measuring turning torque
KV48104400 Rack seal ring reformer		Reforming teflon ring
KV32101100 Pin punch		Removing and installing tube seat

PREPARATION

COMMERCIAL SERVICE TOOLS

Tool name	Description
Rear oil seal drift	<div style="display: flex; justify-content: space-between;"> <div>  <p>28 mm (1.10 in) dia.</p> </div> <div>Installing rear oil seal</div> </div>
Pinion oil seal drift	<div style="display: flex; justify-content: space-between;"> <div>  <p>35 mm (1.38 in) dia.</p> </div> <div>Installing pinion oil seal</div> </div>
Oil pump attachment	<div style="display: flex; justify-content: space-between;"> <div>  <p>Unit: mm (in) SST481A</p> </div> <div>Disassembling and assembling oil pump</div> </div>

ON-VEHICLE INSPECTION



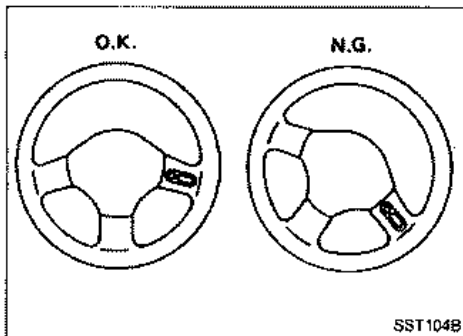
Checking Steering Wheel Play

- With wheels in a straight-ahead position, check steering wheel play.

Steering wheel play:

35 mm (1.38 in) or less

- If it is not within specification, check steering gear assembly when front suspension and axle, steering gear assembly and steering column are mounted correctly.



Checking Neutral Position on Steering Wheel

Pre-checking

- Make sure that wheel alignment is correct.

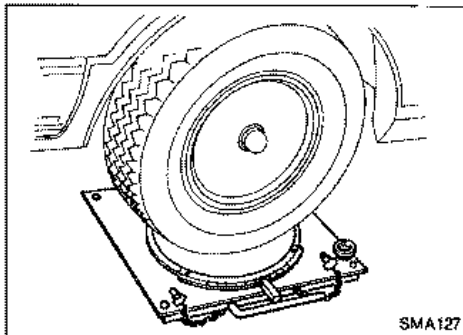
Wheel alignment:

Refer to section FA for S.D.S.

- Verify that the steering gear is centered before removing the steering wheel.

Checking

1. Check that the steering wheel is in the neutral position when driving straight ahead.
2. If it is not in the neutral position, remove the steering wheel and reinstall it correctly.
3. If the neutral position is between two serrated teeth, loosen tie-rod lock nut and move tie-rod in the opposite direction by the same amount on both left and right sides to compensate for error in the neutral position.

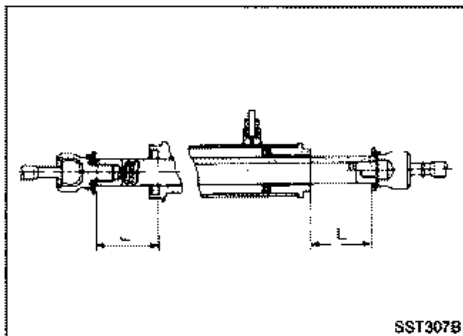


Front Wheel Turning Angle

1. Rotate steering wheel all the way right and left; measure turning angle.

Turning angle of full turns:

Refer to section FA for S.D.S.

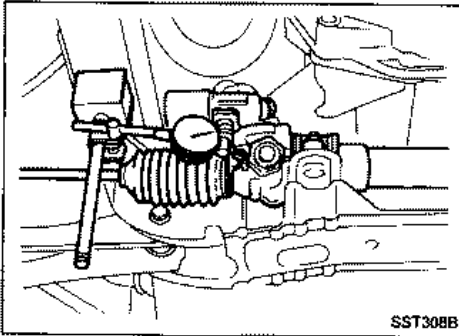


2. If it is not within specification, check rack stroke.

Rack stroke "L":

Refer to S.D.S.

ON-VEHICLE INSPECTION



Checking Gear Housing Movement

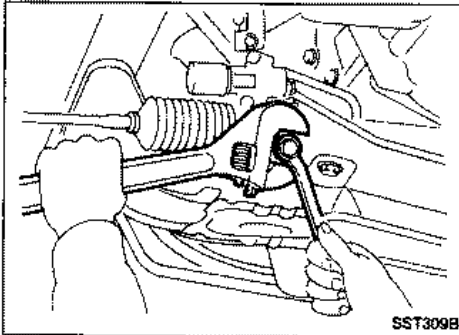
1. Check the movement of steering gear housing during stationary steering on a dry paved surface.
 - Apply a force of 49 N (5 kg, 11 lb) to steering wheel to check the gear housing movement.

Turn off ignition key while checking.

Movement of gear housing:

$\pm 2 \text{ mm } (\pm 0.08 \text{ in})$ or less

2. If movement exceeds the limit, replace mount insulator after confirming proper installation of gear housing clamps.

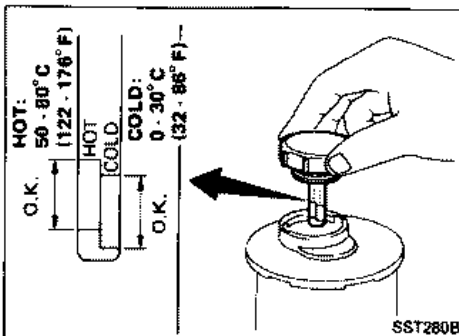


Adjusting Rack Retainer

- Perform this driving test on a flat road.
1. Check whether vehicle moves in a straight line when steering wheel is released.
 2. Check whether steering wheel returns to neutral position when steering wheel is released from a slightly turned (approx. 20°) position.
- If any abnormality is found, correct it by resetting adjusting screw.

Checking and Adjusting Drive Belts

Refer to section MA for Drive Belt Inspection.



Checking Fluid Level

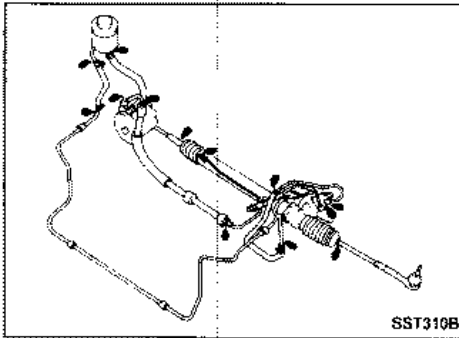
Check fluid level.

Fluid level should be checked using "HOT" range on dipstick at fluid temperatures of 50 to 80°C (122 to 176°F) or using "COLD" range on dipstick at fluid temperatures of 0 to 30°C (32 to 86°F).

CAUTION:

- Do not overfill.
- Recommended fluid is Automatic Transmission Fluid "DEXRON™" type.

ON-VEHICLE INSPECTION



Checking Fluid Leakage

Check the lines for improper attachment and for leaks, cracks, damage, loose connections, chafing or deterioration.

1. Run engine at idle speed or 1,000 rpm.

Make sure temperature of fluid in oil tank rises to 60 to 80°C (140 to 176°F).

2. Turn steering wheel right-to-left several times.
3. Hold steering wheel at each "lock" position for five seconds and carefully check for fluid leakage.

CAUTION:

Do not hold the steering wheel in a locked position for more than 15 seconds.

4. If fluid leakage at connectors is noticed, loosen flare nut and then retighten.

Do not overtighten connector as this can damage O-ring, washer and connector.

Bleeding Hydraulic System

1. Raise front end of vehicle until wheels clear ground.
2. Add fluid into oil tank to specified level. Meanwhile, quickly turn steering wheel fully to right and left and lightly touch steering stoppers.

Repeat steering wheel operation until fluid level no longer decreases.

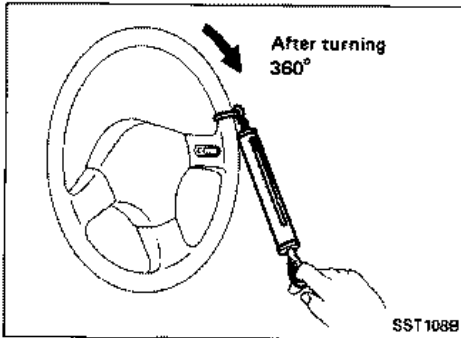
3. Start engine.

Repeat step 2 above.

- Incomplete air bleeding will cause the following to occur. When this happens, bleed air again.
 - a. Generation of air bubbles in reservoir tank
 - b. Generation of clicking noise in oil pump
 - c. Excessive buzzing in oil pump

While the vehicle is stationary or while turning the steering wheel slowly, fluid noise may occur in the valve or oil pump. This noise is inherent in this steering system, and it will not affect performance or durability of the system.

ON-VEHICLE INSPECTION



Checking Steering Wheel Turning Force

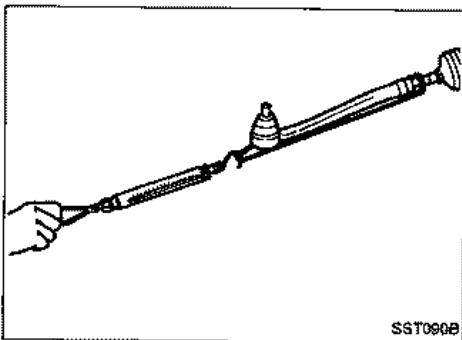
1. Park vehicle on a level, dry surface and set parking brake.
2. Start engine.
3. Bring power steering fluid up to adequate operating temperature. [Make sure temperature of fluid is approximately 60 to 80°C (140 to 176°F).]

Tires need to be inflated to normal pressure.

4. Check steering wheel turning force when steering wheel has been turned 360° from the neutral position.

Steering wheel turning force:

39 N (4 kg, 9 lb) or less



5. If steering wheel turning force is out of specifications, check rack sliding force to detect condition of steering gear assembly.
 - a. Disconnect steering column lower joint and knuckle arms from the gear.
 - b. Start and run engine at idle to make sure steering fluid has reached normal operating temperature.
 - c. While pulling tie-rod slowly in the ± 11.5 mm (± 0.453 in) range from the neutral position, make sure rack sliding force is within specification.

Average rack sliding force:

Without HICAS

206 - 265 N (21 - 27 kg, 46 - 60 lb)

With HICAS

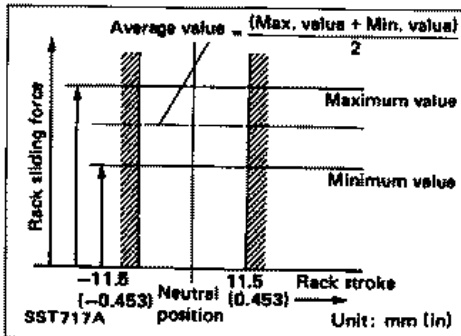
201.0 - 250.1 N (20.5 - 25.5 kg, 45.2 - 56.2 lb)

- d. Check sliding force outside above range.

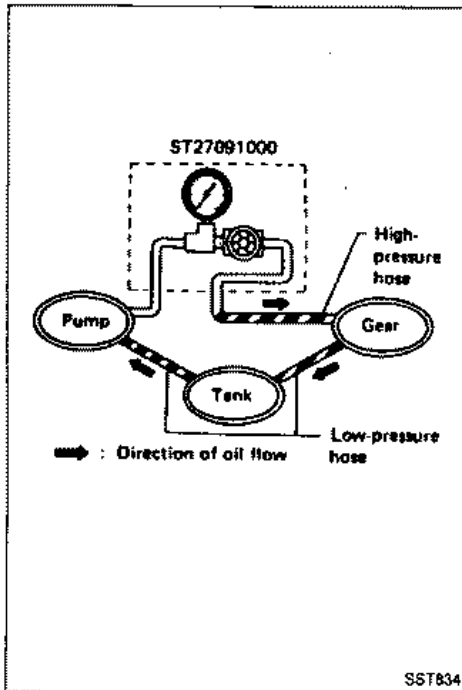
Maximum rack sliding force:

Not more than 39 N (4 kg, 9 lb) beyond above value

6. If rack sliding force is not within specification, overhaul steering gear assembly.



ON-VEHICLE INSPECTION



Checking Hydraulic System

Before starting, check belt tension, driving pulley and tire pressure.

1. Set Tool. Open shut-off valve. Then bleed air. (See "Bleeding Hydraulic System".)
2. Run engine.

Make sure temperature of fluid in tank rises to 60 to 80°C (140 to 176°F).

WARNING:

Warm up engine with shut-off valve fully opened. If engine is started with shut-off valve closed, oil pressure in oil pump will increase to relief pressure, resulting in an abnormal rise in oil temperature.

3. Check pressure with steering wheel fully turned to left and right positions with engine idling at 1,000 rpm.

CAUTION:

Do not hold the steering wheel in a locked position for more than 15 seconds.

Oil pump maximum standard pressure:

7,453 - 8,042 kPa (74.5 - 80.4 bar, 76 - 82 kg/cm²,
1,081 - 1,166 psi)

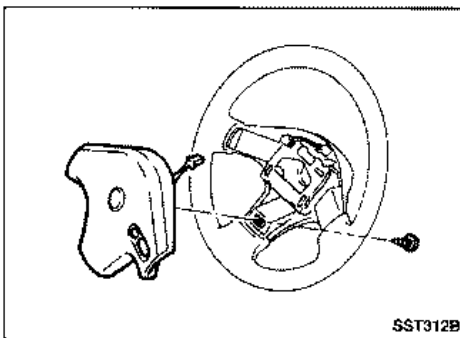
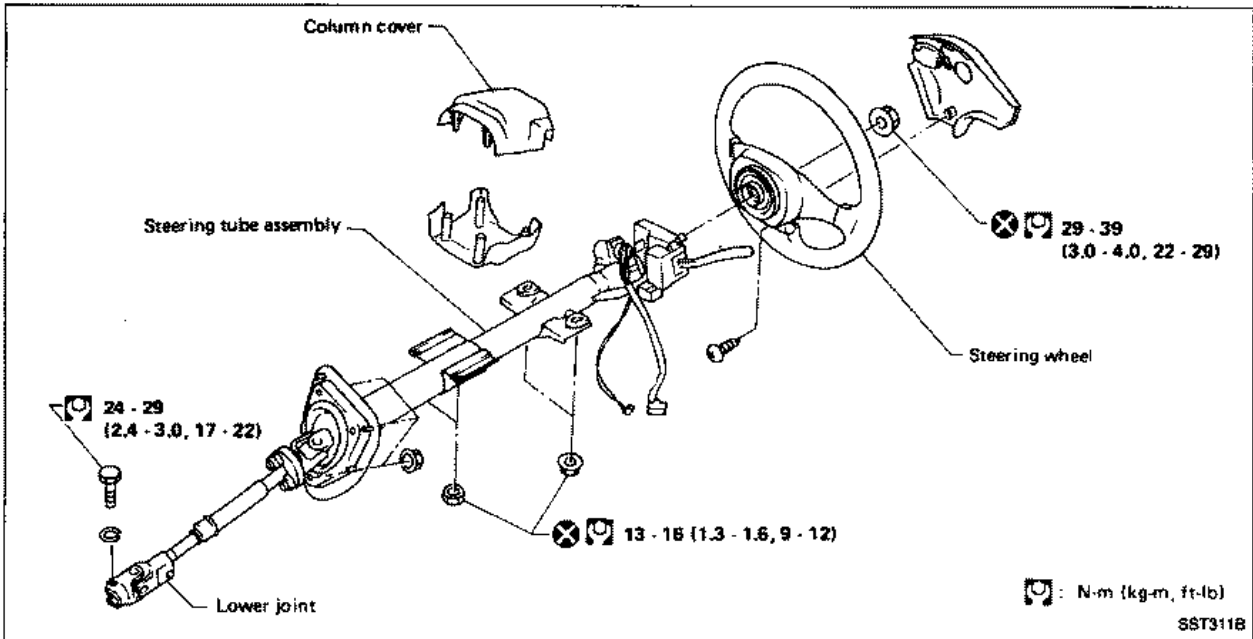
4. If oil pressure is below the standard pressure, slowly close shut-off valve and check pressure.
 - When pressure reaches standard pressure, gear is damaged.
 - When pressure remains below standard pressure, pump is damaged.

CAUTION:

Do not close shut-off valve for more than 15 seconds.

5. If oil pressure is higher than standard pressure, check oil pump flow control valve.
6. After checking hydraulic system, remove Tool and add fluid as necessary, then completely bleed air out of system.

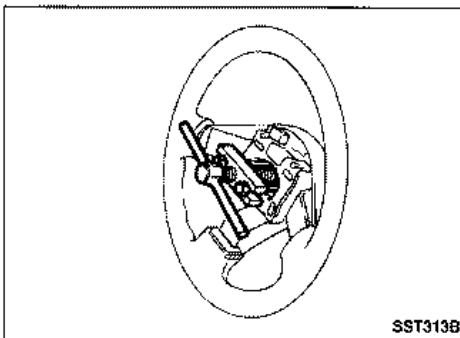
STEERING WHEEL AND STEERING COLUMN



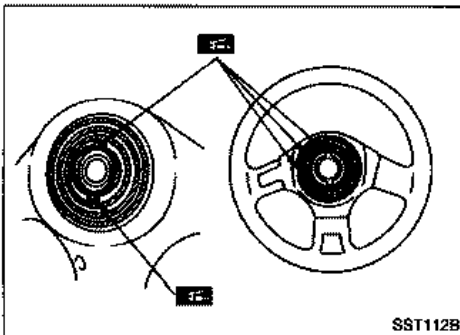
Removal

STEERING WHEEL

- Remove screw from rear of steering wheel and pull out horn pad.



- Remove steering wheel with Tool.



Installation

STEERING WHEEL

When installing steering wheel, apply multi-purpose grease to entire surface of turn signal cancel pin (both portions) and also to horn contact slip ring.

STEERING WHEEL AND STEERING COLUMN

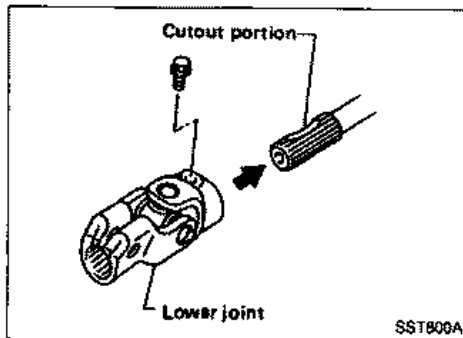
Installation (Cont'd)

STEERING COLUMN

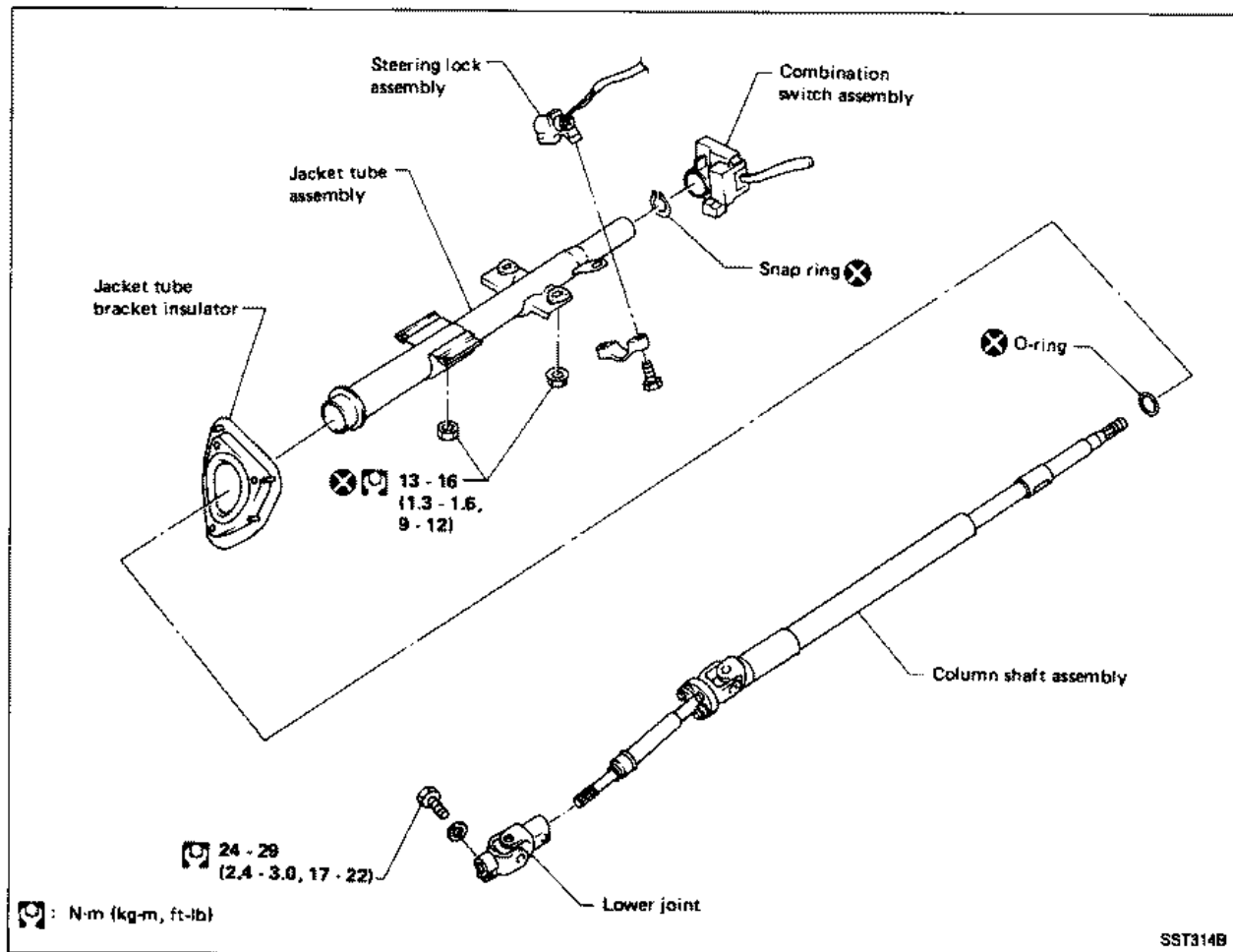
- When installing steering column, fingertighten all lower bracket and clamp retaining bolts; then tighten them securely. Do not apply undue stress to steering column.
- When attaching coupling joint, be sure tightening bolt faces cutout portion.

CAUTION:

After installing steering column, turn steering wheel to make sure it moves smoothly and that the number of turns from the straight forward position to left and right locks are equal. Be sure that the steering wheel is in a neutral position when driving straight ahead.

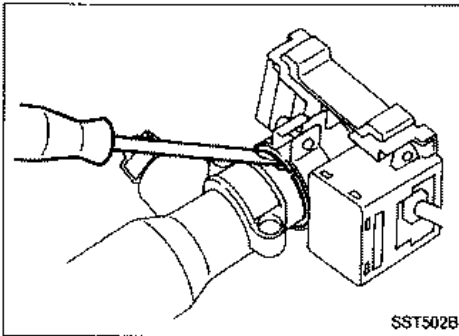


Disassembly and Assembly

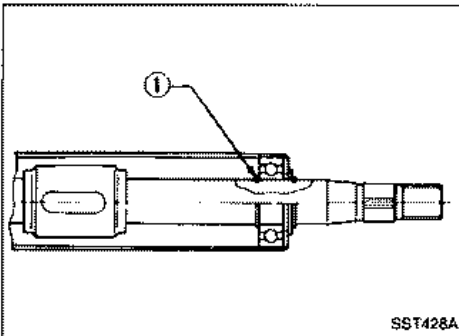


STEERING WHEEL AND STEERING COLUMN

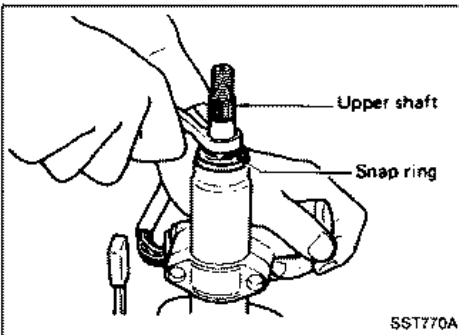
Disassembly and Assembly (Cont'd)



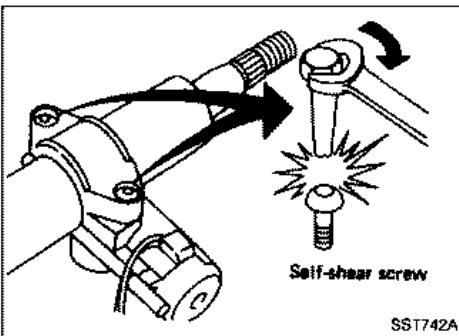
- To remove combination switch, insert a suitable tool between mating portion. Lift switch bracket and pull it out.



- When disassembling and assembling, unlock steering lock with key.
- Install O-ring ① before inserting shaft into jacket tube. Ensure that rounded surface of snap ring faces toward bearing when snap ring is installed.

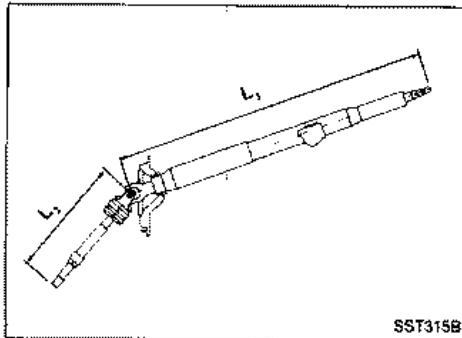


- Install snap ring on upper shaft with box wrench.



- Steering lock
 - a) Break self-shear type screws with a drill or other appropriate tool.
 - b) Install self-shear type screws and then cut off self-shear type screw heads.

STEERING WHEEL AND STEERING COLUMN



Inspection

- When steering wheel can not be rotated smoothly, check the steering column for the following matters and replace damaged parts.
 - a. Check column bearings for damage or unevenness. Lubricate with recommended multi-purpose grease or replace steering column as an assembly, if necessary.
 - b. Check steering column lower shaft for deformation or breakage. Replace if necessary.
- When the vehicle is involved in a light collision, check steering column length " L_1 " and steering column lower shaft length " L_2 ". If it is not within specifications, replace steering column as an assembly.

Steering column length " L_1 ":

745.9 - 747.5 mm (29.37 - 29.43 in)

Steering column lower shaft length " L_2 ":

L.H.D.

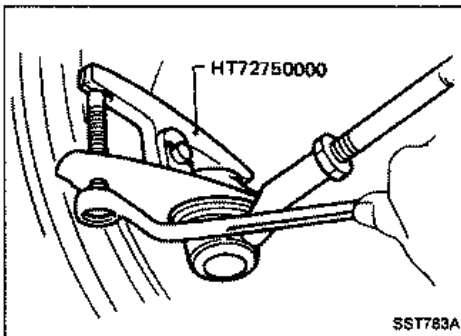
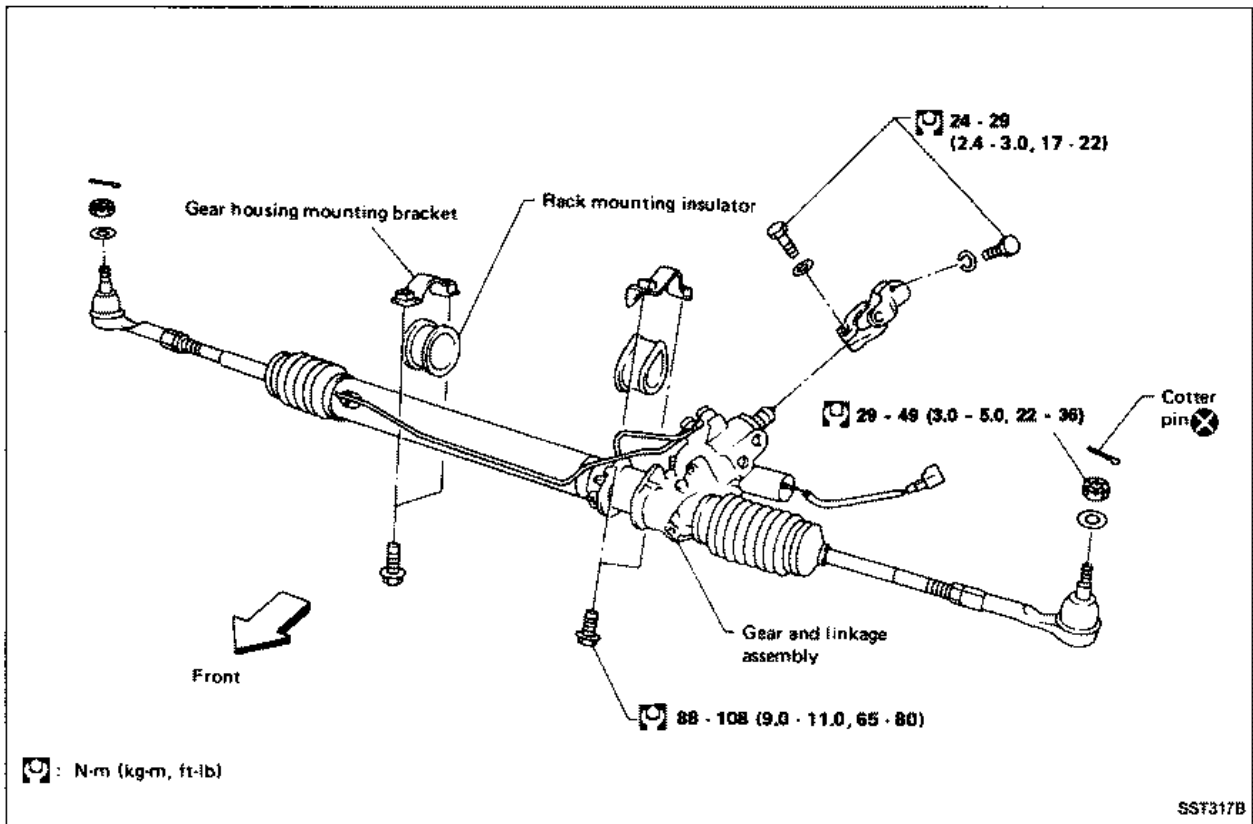
280.6 - 282.2 mm (11.05 - 11.11 in)

R.H.D.

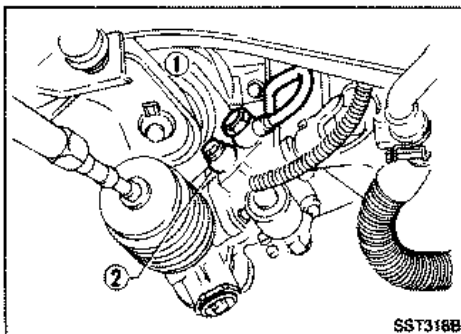
314.6 - 316.2 mm (12.39 - 12.45 in)

POWER STEERING GEAR AND LINKAGE (Model PR26SE)

Removal and Installation



- Detach tie-rod outer sockets from knuckle arms with Tool.

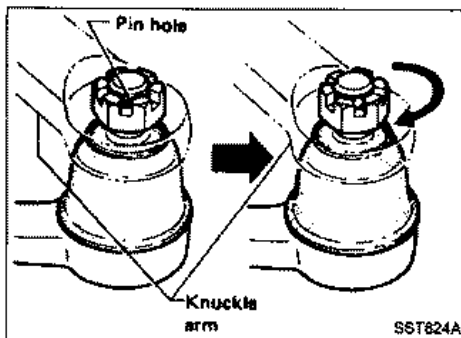


- Install pipe connector.
 - ① Low-pressure side
⌘: 36 - 40 N·m (3.7 - 4.1 kg·m, 27 - 30 ft·lb)
 - ② High-pressure side
⌘: 30 - 35 N·m (3.1 - 3.6 kg·m, 22 - 26 ft·lb)

POWER STEERING GEAR AND LINKAGE (Model PR26SE)

Removal and Installation (Cont'd)

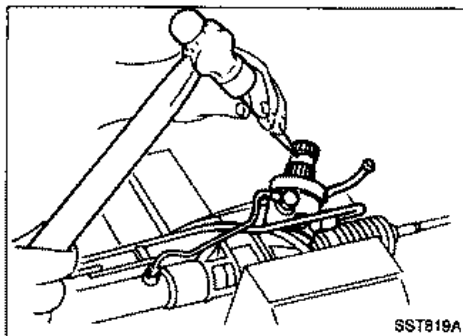
- Observe specified tightening torque when tightening high-pressure and low-pressure pipe connectors. Excessive tightening can damage threads or damaged connector O-ring.
- The O-ring in low-pressure pipe connector is larger than that in high-pressure connector. Take care to install the proper O-ring.



- Initially, tighten nut on tie-rod outer socket and knuckle arm to 29 to 49 N·m (3 to 5 kg-m, 22 to 36 ft-lb). Then tighten further to align nut groove with first pin hole so that cotter pin can be installed.

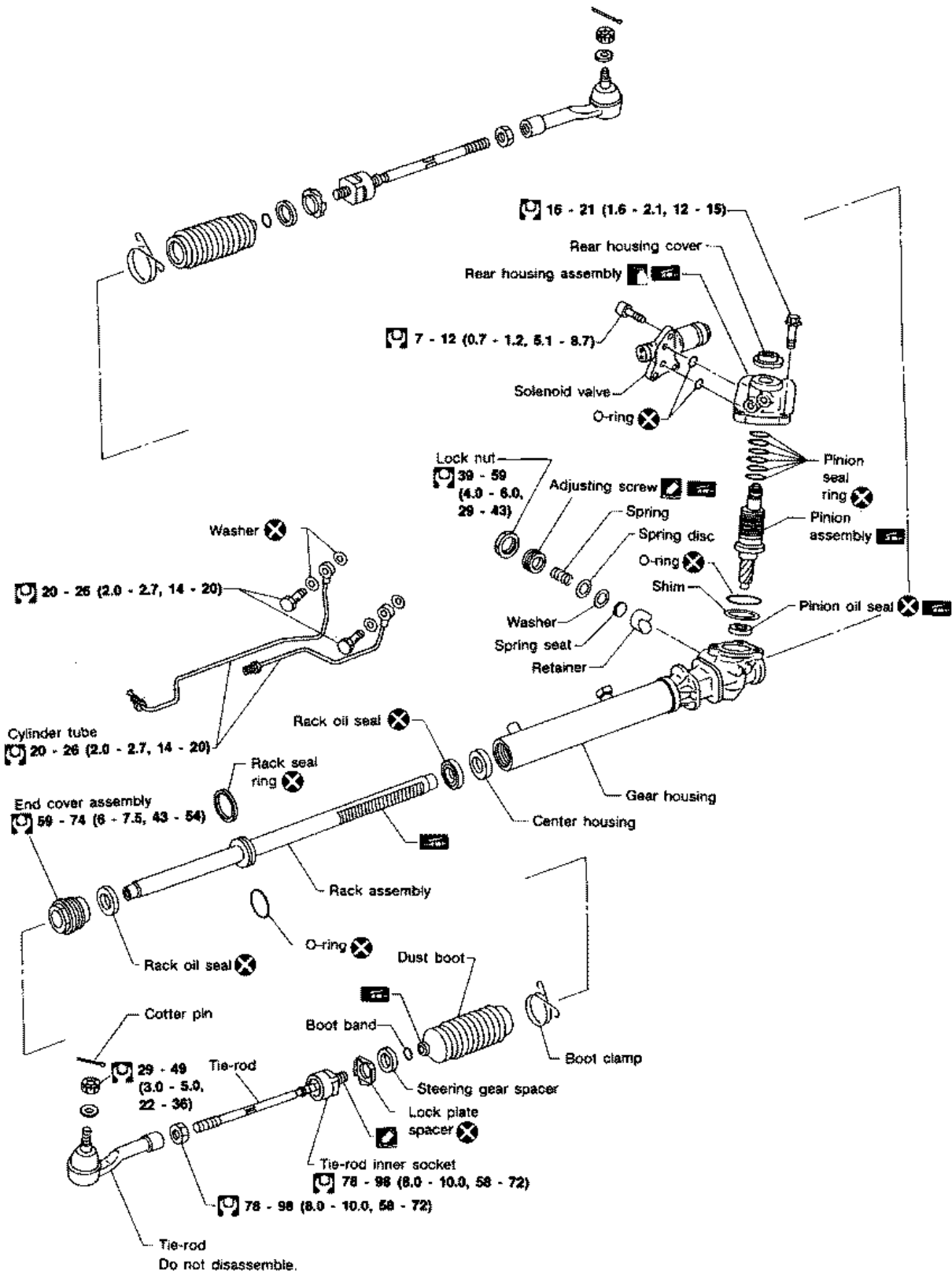
CAUTION:

Tightening torque must not exceed 49 N·m (5 kg-m, 36 ft-lb).



- Before removing lower joint from gear, set gear in neutral (wheels in straight-ahead position). After removing lower joint, put matching mark on pinion shaft and pinion housing to record neutral position of gear.
- To install, set left and right dust boots to equal deflection, and attach lower joint by aligning matching marks of pinion shaft and pinion housing.

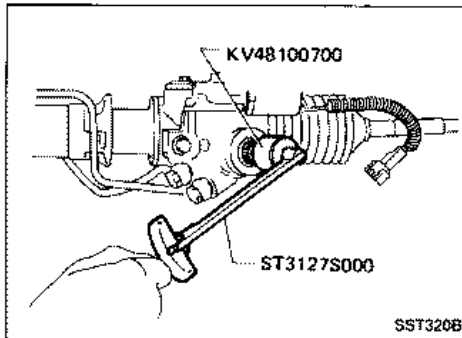
POWER STEERING GEAR AND LINKAGE (Model PR26SE)



: N·m (kg-m, ft-lb)

S87552B

POWER STEERING GEAR AND LINKAGE (Model PR26SE)



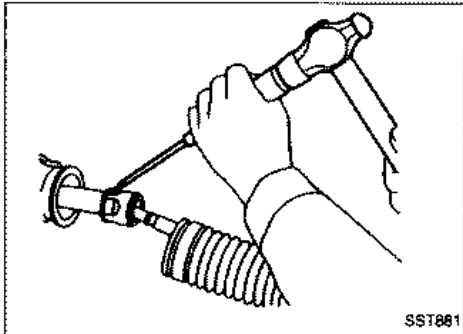
Disassembly

1. Prior to disassembling, measure pinion rotating torque. Record the pinion rotating torque as a reference.

- Before measuring, disconnect cylinder tube and drain fluid.
- Use soft jaws when holding steering gear housing. Handle gear housing carefully, as it is made of aluminum. Do not grip cylinder in a vise.

2. Remove pinion gear.

Be careful not to damage pinion gear when removing pinion seal ring.

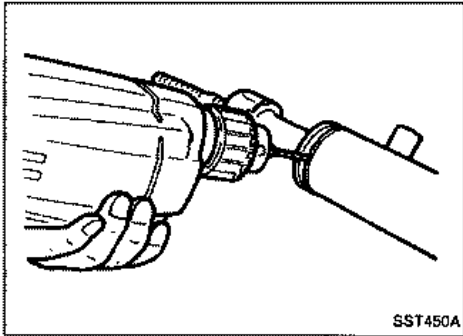


3. Remove tie-rod outer sockets and boots.

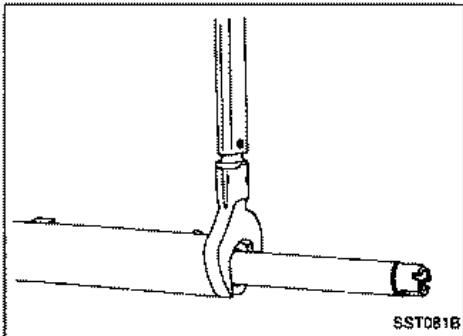
4. Loosen tie-rod inner socket by prying up staked portion, and remove socket.

5. Remove retainer.

6. Remove pinion assembly.

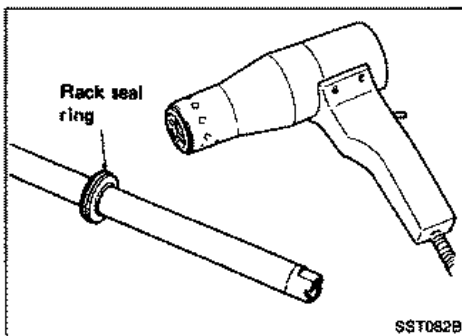


7. Drill staked portion of cylinder end cover with drill of 2 to 2.5 mm (0.079 to 0.098 in) diameter, until the staking is eliminated.



8. Remove gear housing end cover assembly with Tool.

9. Draw out rack assembly.



10. Remove rack seal ring.

- Using a heat gun, heat rack seal to approximately 40°C (104°F).

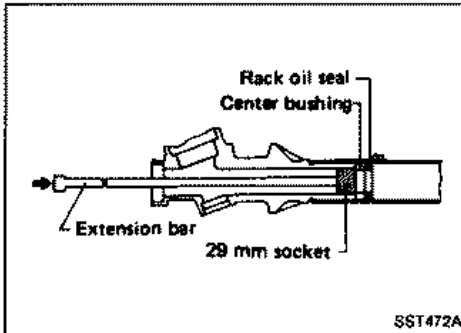
- Remove rack seal ring.

- Replace rack seal ring and O-ring with new ones.

Be careful not to damage rack.

POWER STEERING GEAR AND LINKAGE (Model PR26SE)

Disassembly (Cont'd)



11. Remove center bushing and rack oil seal using tape wrapped socket and extension bar.

Do not scratch inner surfaces of pinion housing.

Inspection

Thoroughly clean all parts in cleaning solvent or automatic transmission fluid "DEXRON™" type, and blow dry with compressed air, if available.

BOOT

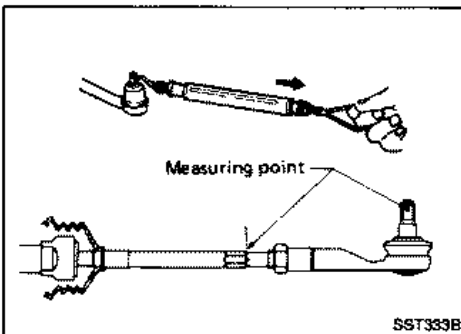
Check condition of boot. If cracked excessively, replace it.

RACK

Thoroughly examine rack gear. If damaged, cracked or worn, replace it.

PINION ASSEMBLY

- Thoroughly examine pinion gear. If pinion gear is damaged, cracked or worn, replace it.
- Inspect bearings to see that they roll freely and are free from cracked, pitted, or worn balls, rollers and races. Replace if necessary.



TIE-ROD OUTER AND INNER SOCKET

- Check ball joint for swinging force.

Tie-rod outer ball joint:

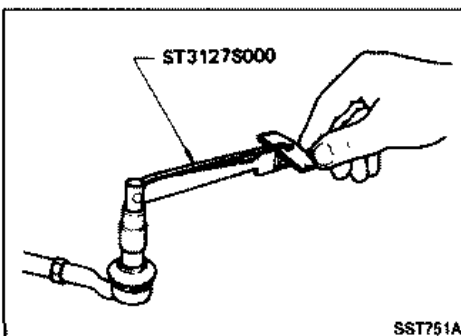
4.61 - 46.09 N

(0.47 - 4.7 kg, 1.04 - 10.36 lb)

Tie-rod inner ball joint:

8.8 - 78.5 N

(0.9 - 8.0 kg, 2.0 - 17.6 lb)



- Check ball joint for rotating torque.

Tie-rod outer ball joint:

0.29 - 2.94 N·m

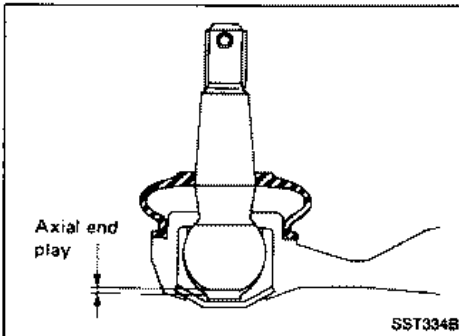
(3.0 - 30.0 kg·cm, 2.6 - 26.0 in·lb)

Tie-rod inner ball joint:

1.0 - 8.8 N·m (10 - 90 kg·cm, 8.7 - 78.1 in·lb)

POWER STEERING GEAR AND LINKAGE (Model PR26SE)

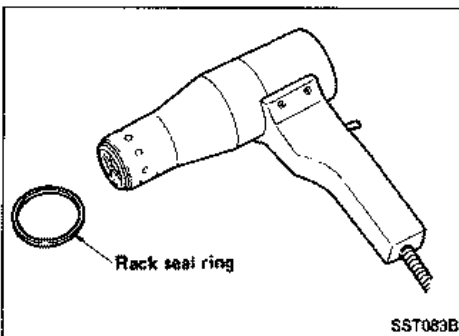
Inspection (Cont'd)



- Check ball joint for axial end play.
 - Tie-rod outer ball joint:**
0 mm (0 in)
 - Tie-rod inner ball joint:**
0 mm (0 in)
- Check condition of dust cover. If cracked excessively, replace it.

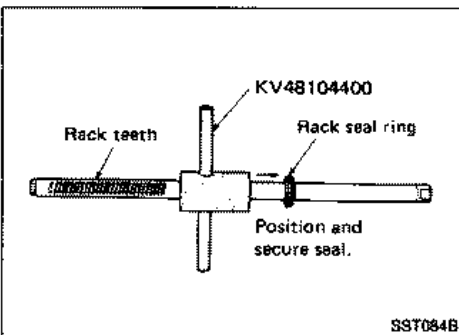
CYLINDER TUBES

Check cylinder tubes for scratches or other damage. Replace if necessary.



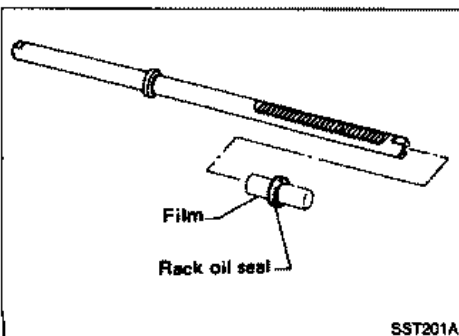
Assembly

1. Using a heat gun, heat rack seal ring (made of Teflon) to approximately 40°C (104°F) and install it onto rack with your hand.



- Using Tool, compress periphery of rack seal ring (made of Teflon) to position and secure it on rack.

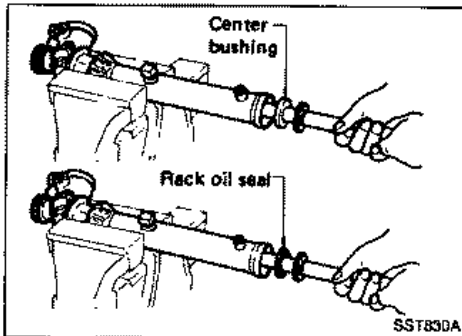
Always insert the tool from the rack gear side.



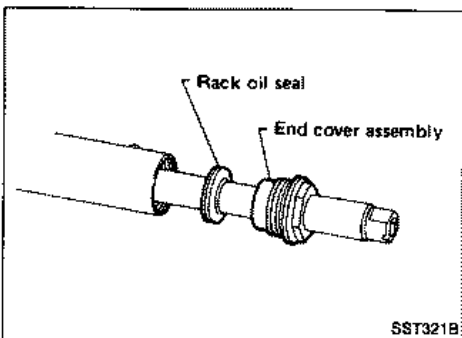
2. Insert rack oil seal.
 - Place plastic film into rack oil seal to prevent damage by rack teeth.
 - Always remove plastic film after rack oil seal is positioned properly.
 - Make sure lips of rack oil seal face each other.

POWER STEERING GEAR AND LINKAGE (Model PR26SE)

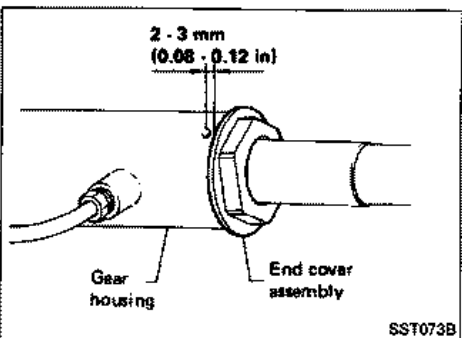
Assembly (Cont'd)



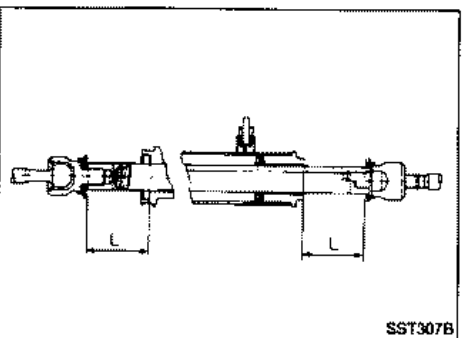
3. Install center bushing and rack oil seal with rack assembly.



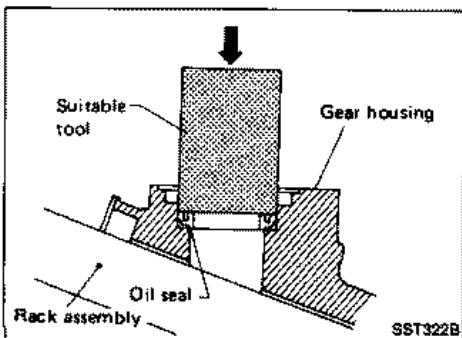
4. Insert rack oil seal and end cover assembly to rack then tighten end cover assembly.



5. Fasten cylinder end cover assembly to gear housing by staking.



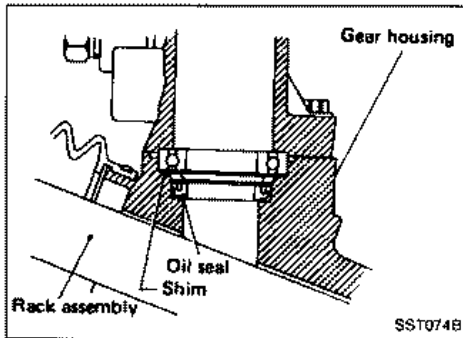
6. Set rack gear in neutral position.
Rack stroke "L":
Refer to S.D.S.



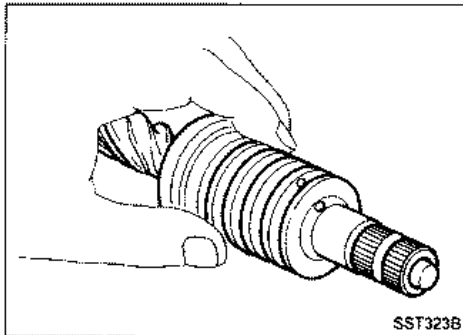
7. Coat seal lip of oil seal with multi-purpose grease and install new pinion oil seal to pinion housing with a suitable tool.
 - Make sure lip of oil seal faces up when installed.

POWER STEERING GEAR AND LINKAGE (Model PR26SE)

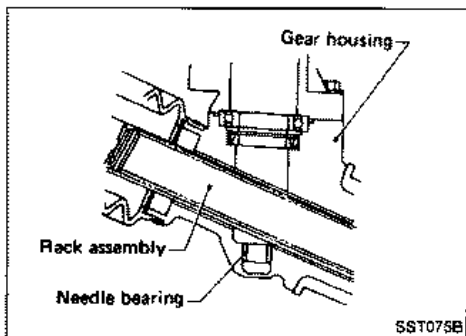
Assembly (Cont'd)



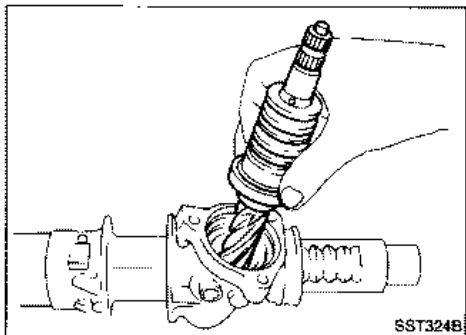
8. Install pinion bearing adjusting shim(s).
 - Whenever pinion assembly, gear housing and rear housing are disassembled, replace shim(s) with new ones. Always use the same number of shim(s) when replacing.



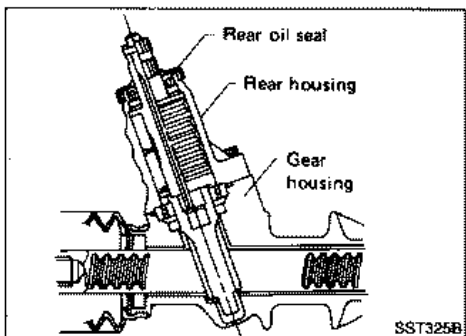
9. Install pinion seal ring on pinion gear assembly.
 - Using a heat gun, heat pinion seal ring to approximately 40°C (104°F) before installing it onto pinion gear assembly.
 - Make sure pinion seal ring is properly settled in valve groove.



10. Apply a coat of multi-purpose grease to needle bearing roller and oil seal lip before installing pinion assembly in gear housing.



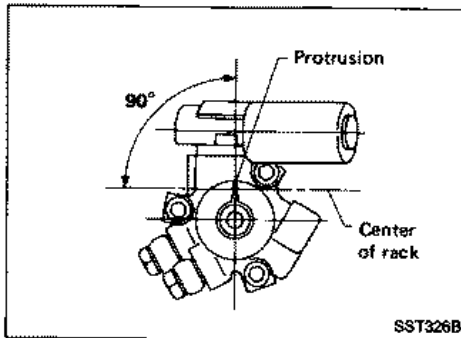
11. Install pinion assembly to pinion housing.
Be careful not to damage pinion oil seal.



12. Apply a coat of multi-purpose grease to rear oil seal lip before installing rear housing.

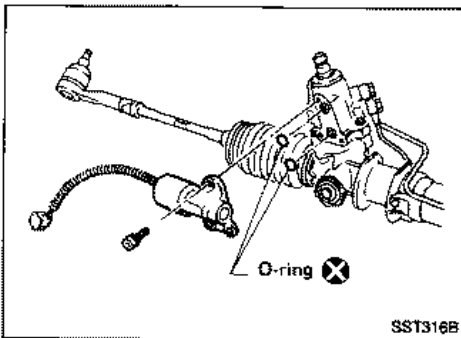
POWER STEERING GEAR AND LINKAGE (Model PR26SE)

Assembly (Cont'd)

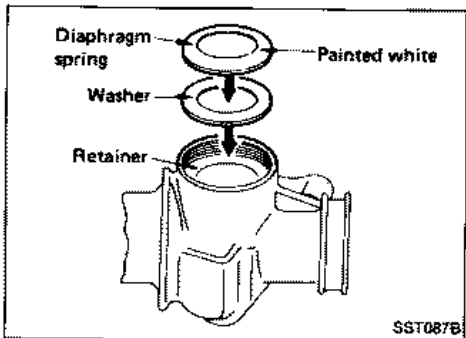


13. Install rear cover cap so that protrusion of rear housing cover is positioned as shown in figure at left.

Be careful not to damage worm ring and oil seal.



14. Install solenoid valve.

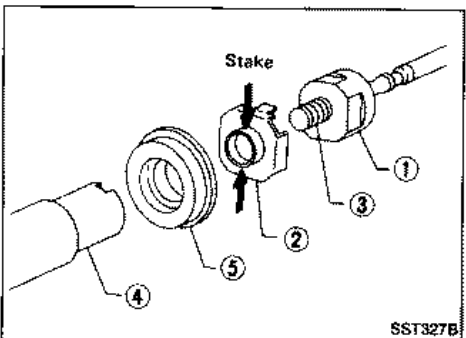


15. Install diaphragm spring at retainer.

- Always install retainer, spring washer and diaphragm spring in that order.

- Make sure convex end (painted white) of diaphragm spring faces outward when installing.

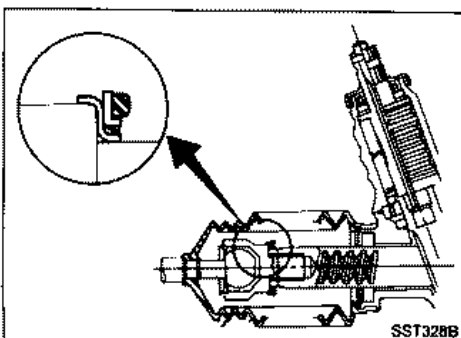
16. Install retainer spring and adjusting screw temporarily.



CAUTION:

Ensure steering gear spacer is installed with rubber side facing rack.

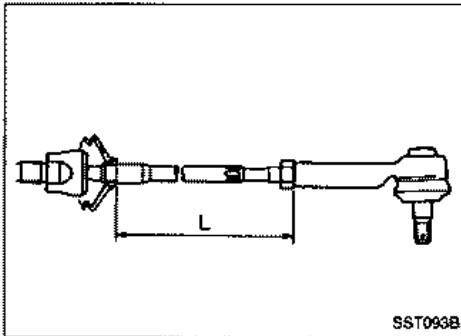
- Attach lock plate ② to side rod inner socket ①.
- Insert steering gear spacer ⑤ to rack ④.
- Apply locking sealant to inner socket threads ③. Screw inner socket into rack ④ and tighten to specified torque.
- Stake lock plate at two places.



17. Install steering gear spacer ⑤ to lock plate ②.

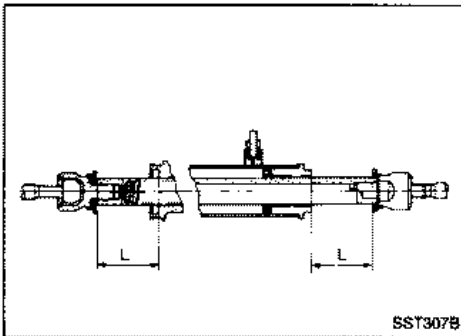
POWER STEERING GEAR AND LINKAGE (Model PR26SE)

Assembly (Cont'd)



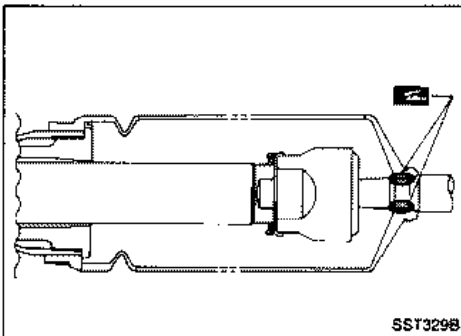
18. Tighten outer socket lock nut.

Tie-rod length "L":
Refer to S.D.S.

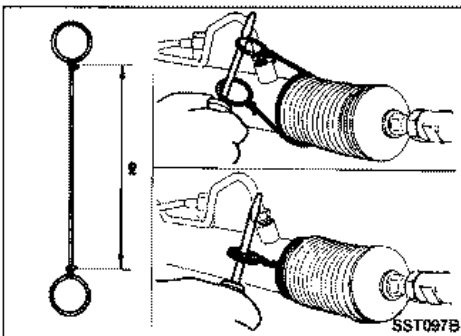


19. Measure rack stroke.

Rack stroke "L":
Refer to S.D.S.

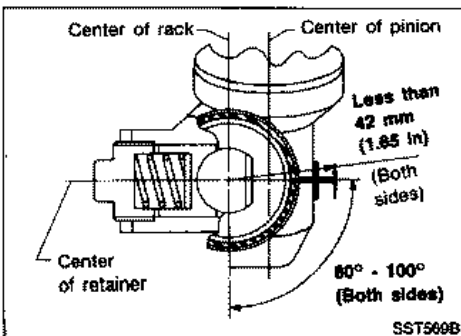


20. Before installing boot, coat the contact surfaces between boot and tie-rod with grease.



21. Install boot clamps.

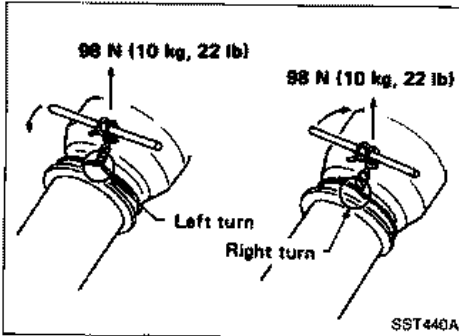
- To install, wrap boot clamp around boot groove twice. Tighten clamp by twisting rings at both ends 4 to 4-1/2 turns with screwdriver while pulling with a force of approx. 98 N (10 kg, 22 lb).



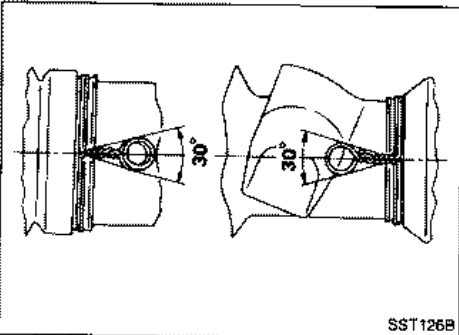
- Install boot clamps so that they are behind the steering gear housing when steering gear is attached to the vehicle. (This will prevent interference with other parts.)

POWER STEERING GEAR AND LINKAGE (Model PR26SE)

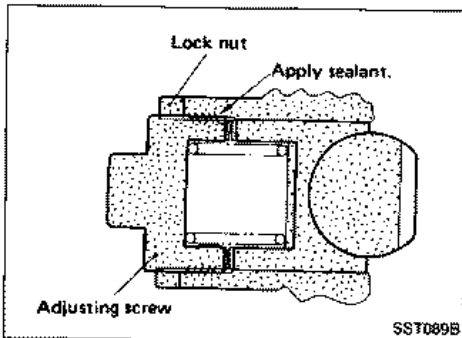
Assembly (Cont'd)



- Twist boot clamp in the direction shown in figure at left.



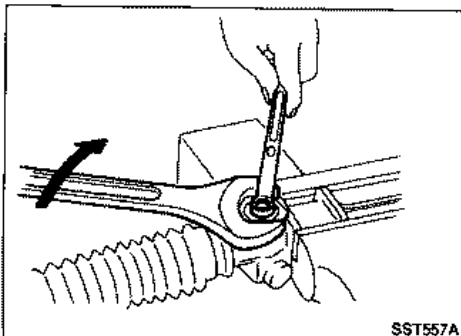
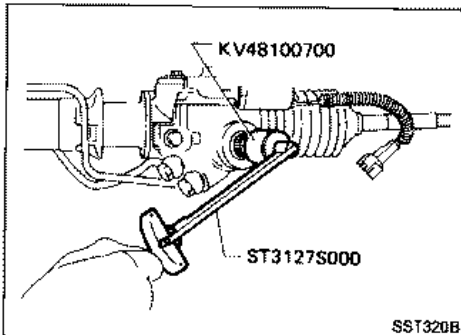
- After twisting boot clamp, bend twisted and diagonally so it does not contact boot.



Adjustment

Adjust pinion rotating torque as follows:

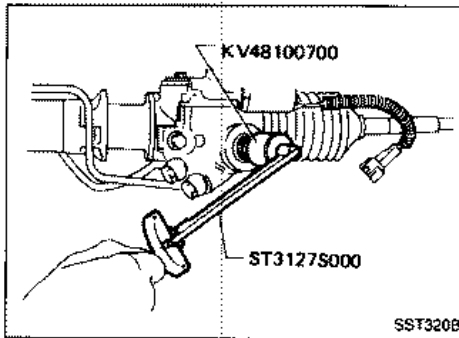
1. Set gears to Neutral without fluid in the gear.
2. Coat the adjusting screw with locking sealant and screw it in.
3. Lightly tighten lock nut.
4. Tighten adjusting screw to a torque of 4.9 to 5.9 N-m (50 to 60 kg-cm, 43 to 52 in-lb).
5. Loosen adjusting screw, then retighten it to 0.05 to 0.20 N-m (0.5 to 2 kg-cm, 0.43 to 1.74 in-lb).
6. Move rack over its entire stroke several times.
7. Measure pinion rotating torque within the range of 180° from neutral position.
Stop the gear at the point of maximum torque.
8. Loosen adjusting screw, then retighten it to 4.9 N-m (50 kg-cm, 43 in-lb).
9. Loosen adjusting screw by 60° to 100°.



10. Prevent adjusting screw from turning, and tighten lock nut to specified torque.

POWER STEERING GEAR AND LINKAGE (Model PR26SE)

Adjustment (Cont'd)



11. Measure pinion rotating torque.

Within 100° from the neutral position:

Average rotating torque

0.8 - 1.3 N·m (8 - 13 kg-cm, 6.9 - 11.3 in-lb)

Maximum torque deviation

0.4 N·m (4 kg-cm, 3.5 in-lb)

Except for above measuring range:

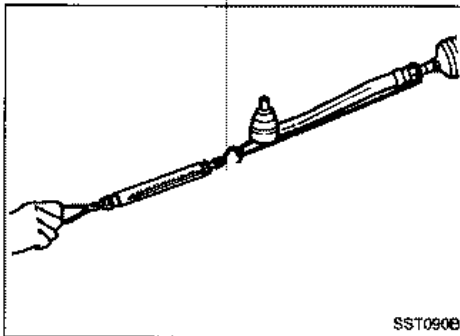
Maximum rotating torque

1.9 N·m (19 kg-cm, 16 in-lb)

Maximum force deviation

0.6 N·m (6 kg-cm, 5.2 in-lb)

- If pinion rotating torque is not within specifications, readjust it by starting from procedure 4. If pinion rotating torque is still out of specifications after readjustment, replace steering gear assembly.



12. Check rack sliding force on vehicle as follows:

- Install steering gear onto vehicle, but do not connect tie-rod to knuckle arm.
- Connect all piping and fill with steering fluid.
- Start engine and bleed air completely.
- Disconnect steering column lower joint from the gear.
- Keep engine at idle and make sure steering fluid has reached normal operating temperature.
- While pulling tie-rod slowly in the ± 11.5 mm (± 0.453 in) range from the neutral position, make sure rack sliding force is within specification.

Average rack sliding force:

Without HICAS

206 - 265 N (21 - 27 kg, 46 - 60 lb)

With HICAS

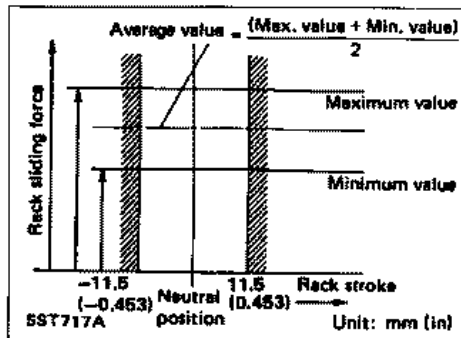
201.0 - 250.1 N (20.5 - 25.5 kg, 45.2 - 56.2 lb)

- Check sliding force outside above range.

Maximum rack sliding force:

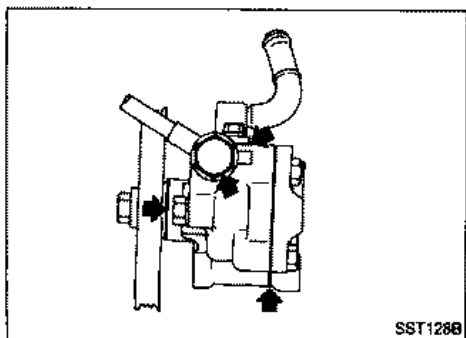
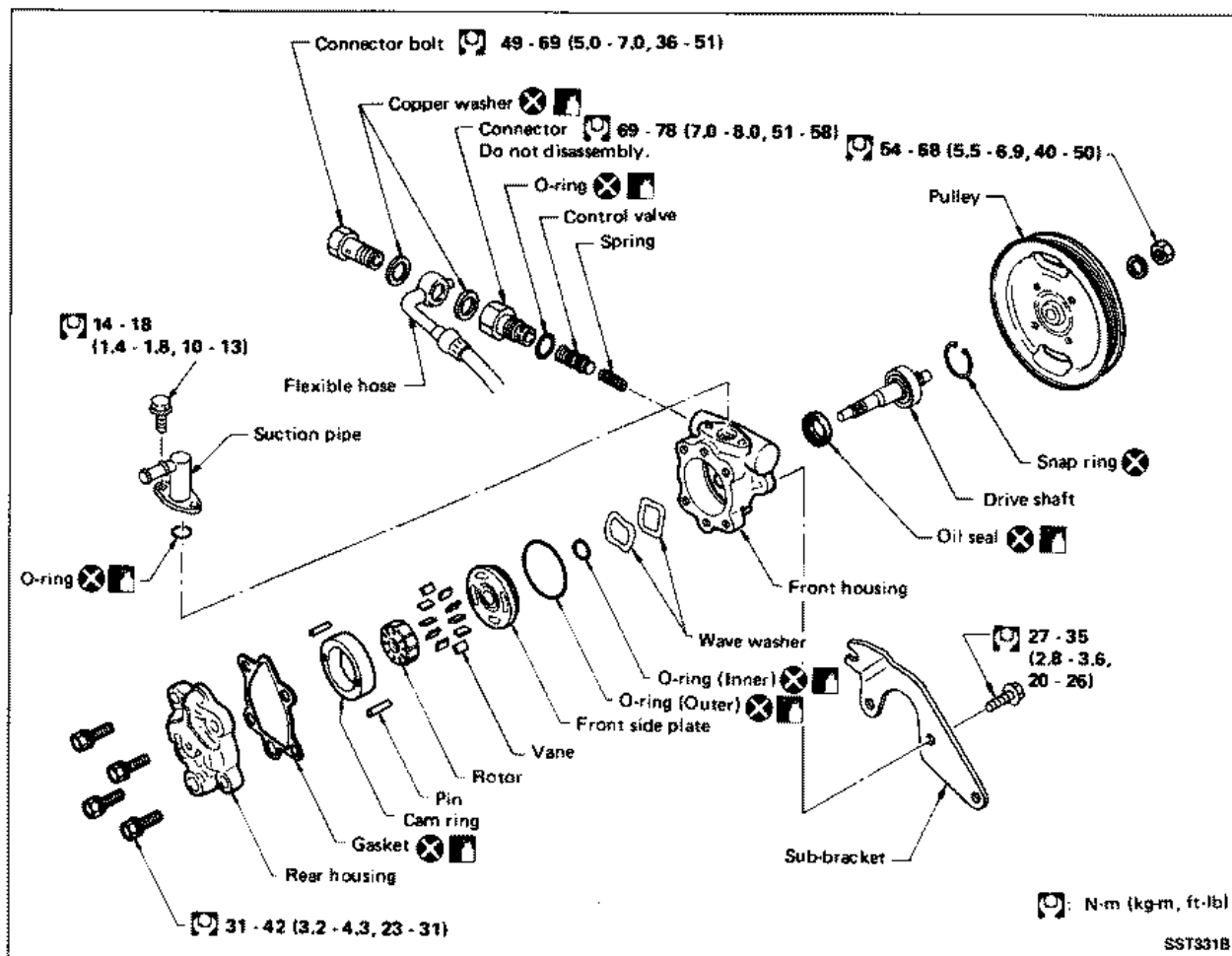
Not more than 39 N (4 kg, 9 lb) beyond above value

- If rack sliding force is not within specification, readjust by repeating adjustment procedure from the beginning.
- If rack sliding force is still out of specification after readjustment, gear assembly needs to be replaced.



POWER STEERING OIL PUMP

Disassembly and Assembly



Pre-disassembly Inspection

Disassemble the power steering oil pump only if the following items are found.

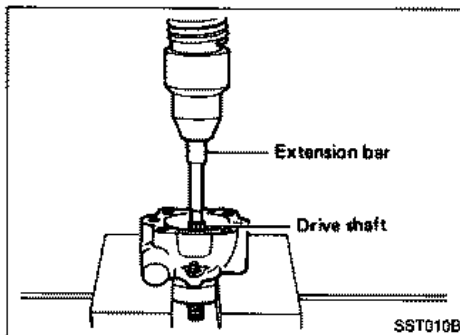
- Oil leak from any point shown in the figure.
- Deformed or damaged pulley.
- Poor performance

POWER STEERING OIL PUMP

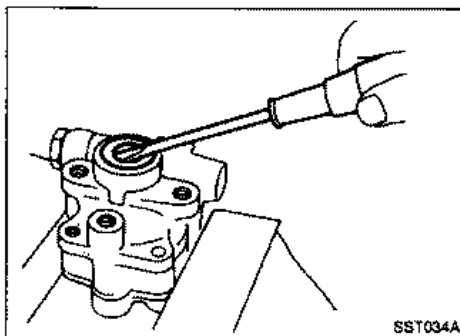
Disassembly

CAUTION:

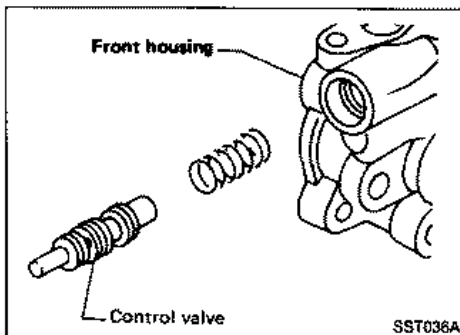
- Parts which can be disassembled are strictly limited. Never disassemble parts other than those specified.
- Disassemble in as clean a place as possible.
- Clean your hands before disassembly.
- Do not use rags; use nylon cloths or paper towels.
- Follow the procedures and cautions in the Service Manual.
- When disassembling and reassembling, do not let foreign matter enter or contact the parts.



- Remove snap ring, then draw drive shaft out.
Be careful not to drop drive shaft.



- Remove oil seal.
Be careful not to damage front housing.

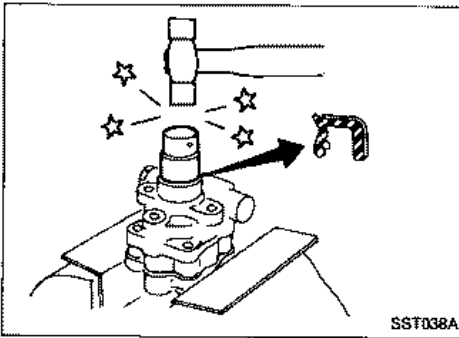


- Remove connector.
Be careful not to drop control valve.

Inspection

Inspect each component part for wear, deformation, scratches, and cracks. If damage is found, replace the part.

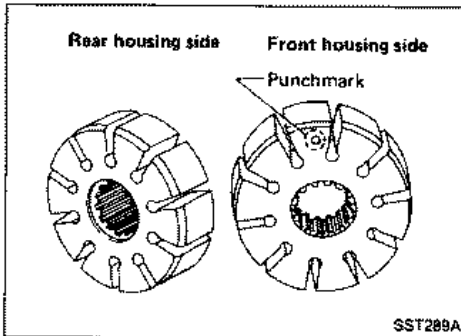
POWER STEERING OIL PUMP



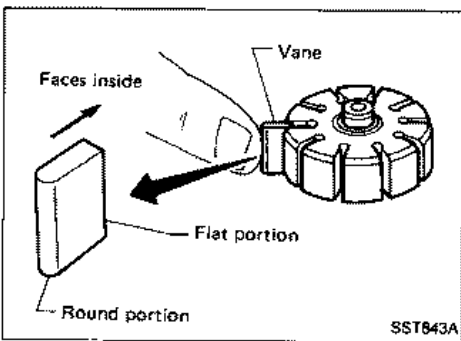
Assembly

Assemble oil pump, noting the following instructions.

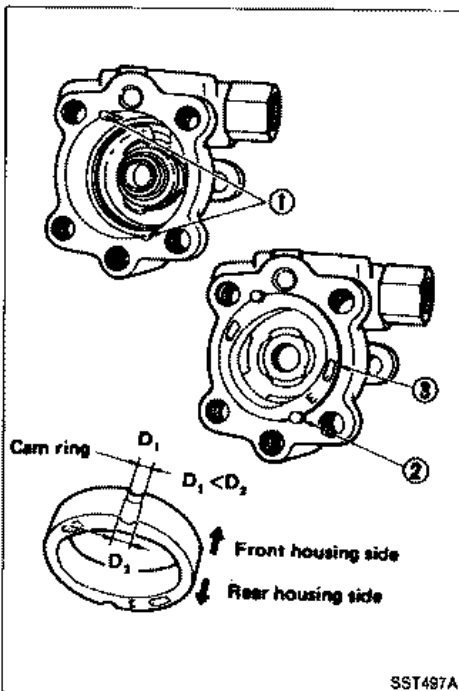
- Make sure O-rings and oil seal are properly installed.
- Always install new O-rings and oil seal.
- Be careful of oil seal direction.
- Cam ring, rotor and vanes must be replaced as a set if necessary.
- Coat each part with A.T.F. when assembling.



- Pay attention to rotor direction.



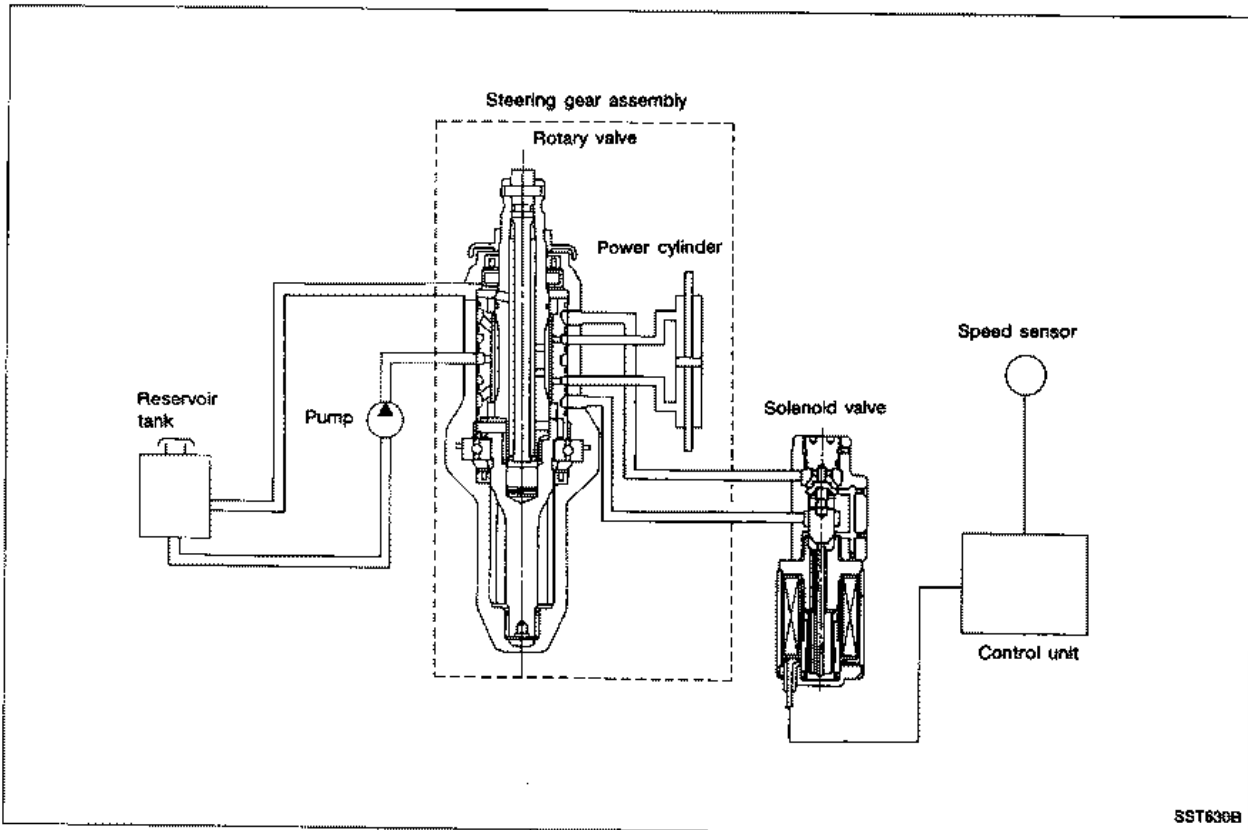
- When assembling vanes to rotor, rounded surfaces of vanes must face cam ring side.



- Insert pin ② into pin groove ① of front housing and front side plate. Then install cam ring ③ as shown at left.

TWIN ORIFICE POWER STEERING SYSTEM

Hydraulic Circuit

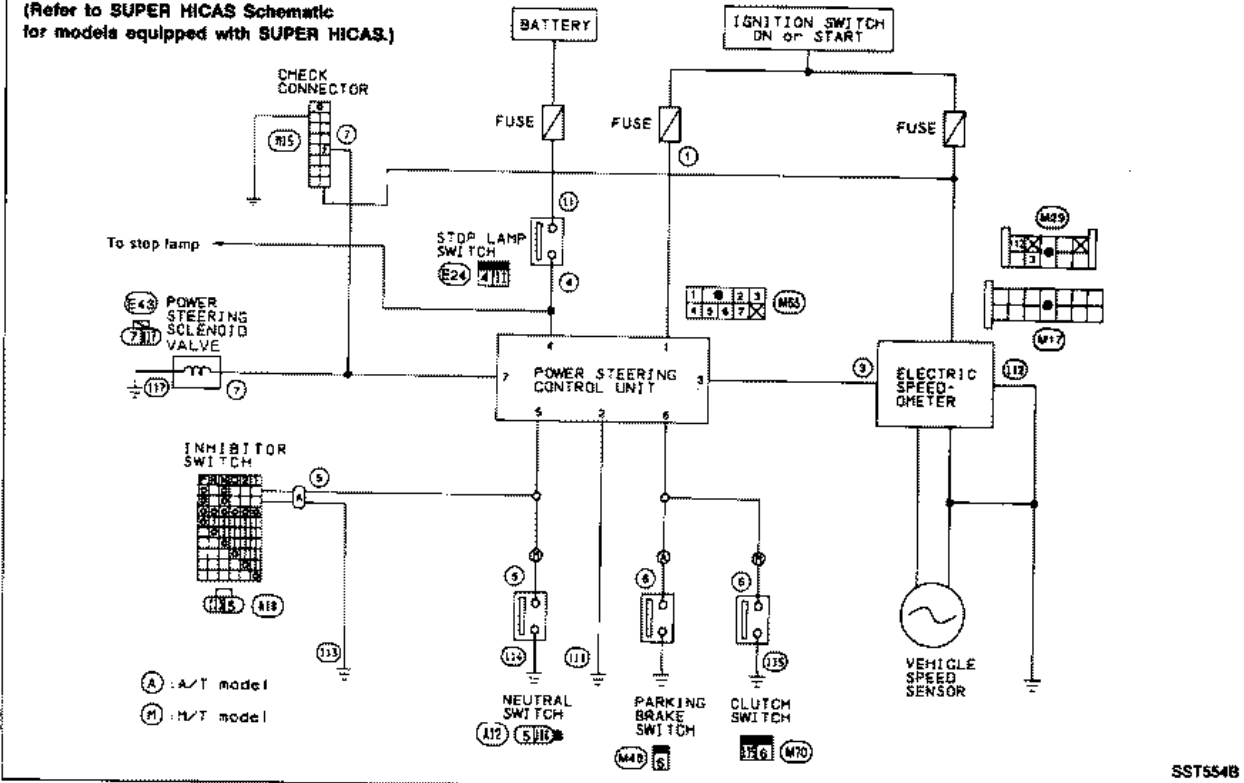


SST636B

Schematic

Without SUPER HICAS

(Refer to SUPER HICAS Schematic for models equipped with SUPER HICAS.)



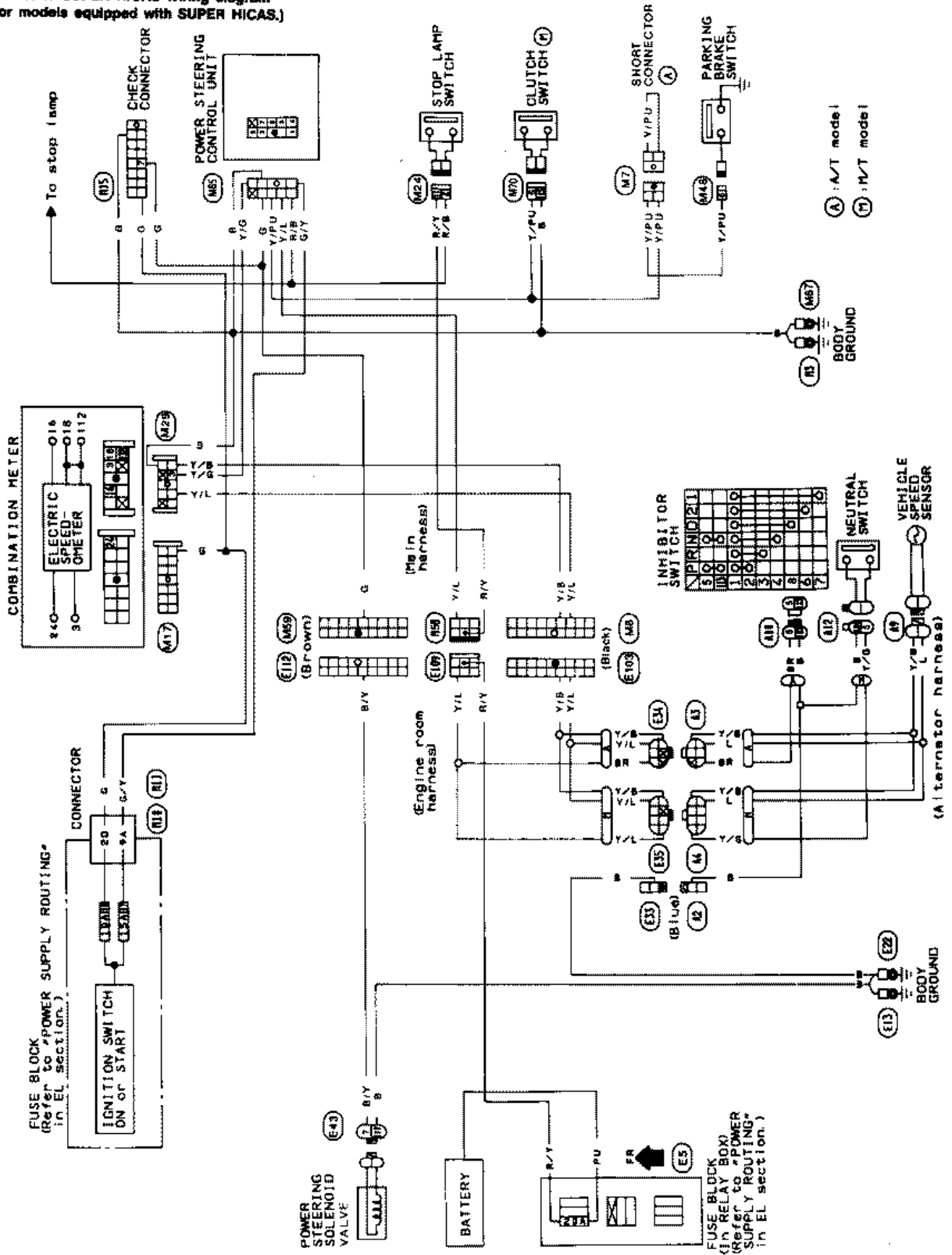
SST554B

TWIN ORIFICE POWER STEERING SYSTEM

Wiring Diagram

Without SUPER HICAS

(Refer to SUPER HICAS Wiring diagram for models equipped with SUPER HICAS.)



SST625B

TWIN ORIFICE POWER STEERING SYSTEM — Trouble Diagnoses

Precautions

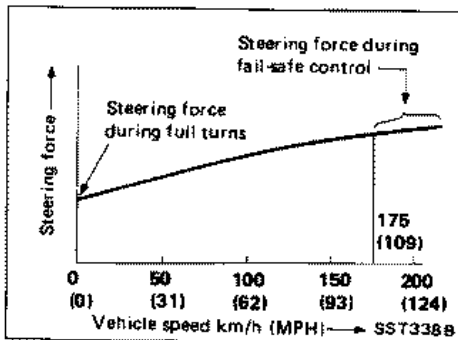
BEFORE DIAGNOSING THE POWER STEERING SYSTEM, ENSURE THAT:

Vehicle stopped

- Power steering components (gears, oil pump, pipes, etc.) are free from leakage, and that oil level is correct.
- Tires are inflated to specified pressure and are of specified size, and that steering wheel is a genuine Nissan part.
- Wheel alignment is adjusted properly.
- Suspension utilizes the original design, and is free of modifications which increase vehicle weight.

Vehicle in operation

- Understand the trouble symptoms.
- Engine is operating properly.



PRELIMINARY KNOWLEDGE HELPFUL IN CONDUCTING DIAGNOSES

The power steering system is a twin orifice type, which uses a vehicle-speed sensing, electronic control design. Valve sensitivity is controlled in response to vehicle speed to achieve optimum steering effort. When a vehicle-speed signal is not entered into the power steering control unit for approximately 10 seconds during normal operation (see NOTE below), a fail-safe system activates to maintain the steering effort at a level similar to that experienced during high-speed operation. More precisely, if a foot-brake signal, parking-brake signal and/or transmission position signal (N or P-range signal on automatic transmission models and a neutral or clutch signal on manual transmission models) are not entered, the power steering system is held in a "fail-safe" control state. When this happens, a symptom referred to as "heavy steering during stationary turns" sometimes occurs.

NOTE:

Normal operation refers to a driving condition in which the foot brake pedal and parking brake lever are released, the shift lever is in any position other than "P" or "N" (automatic transmission models), the shift lever set in any position except "N" (manual transmission models) and the clutch pedal is not depressed.

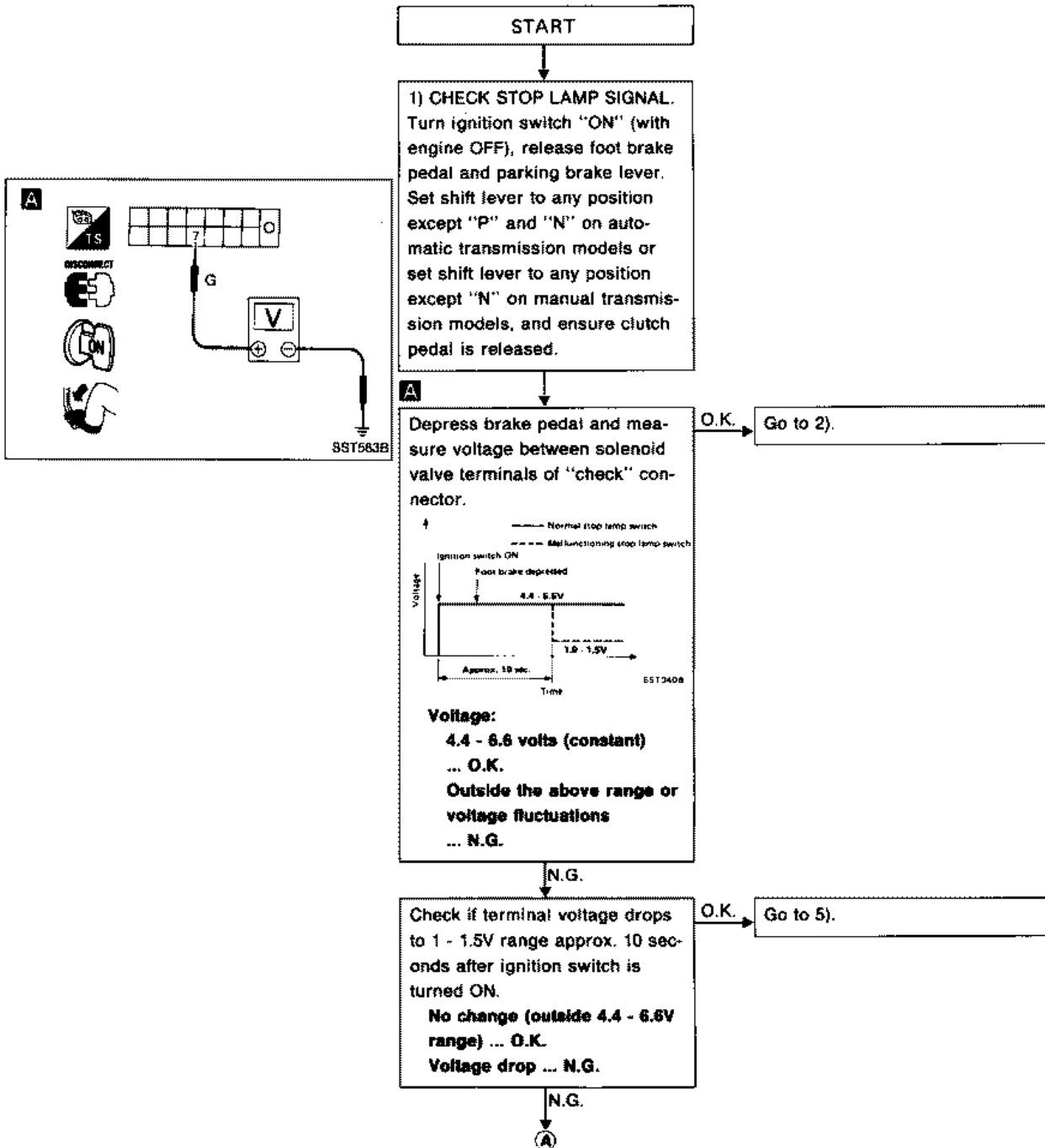
TWIN ORIFICE POWER STEERING SYSTEM

— Trouble Diagnoses (Without SUPER HICAS system)

Diagnostic Procedure 1

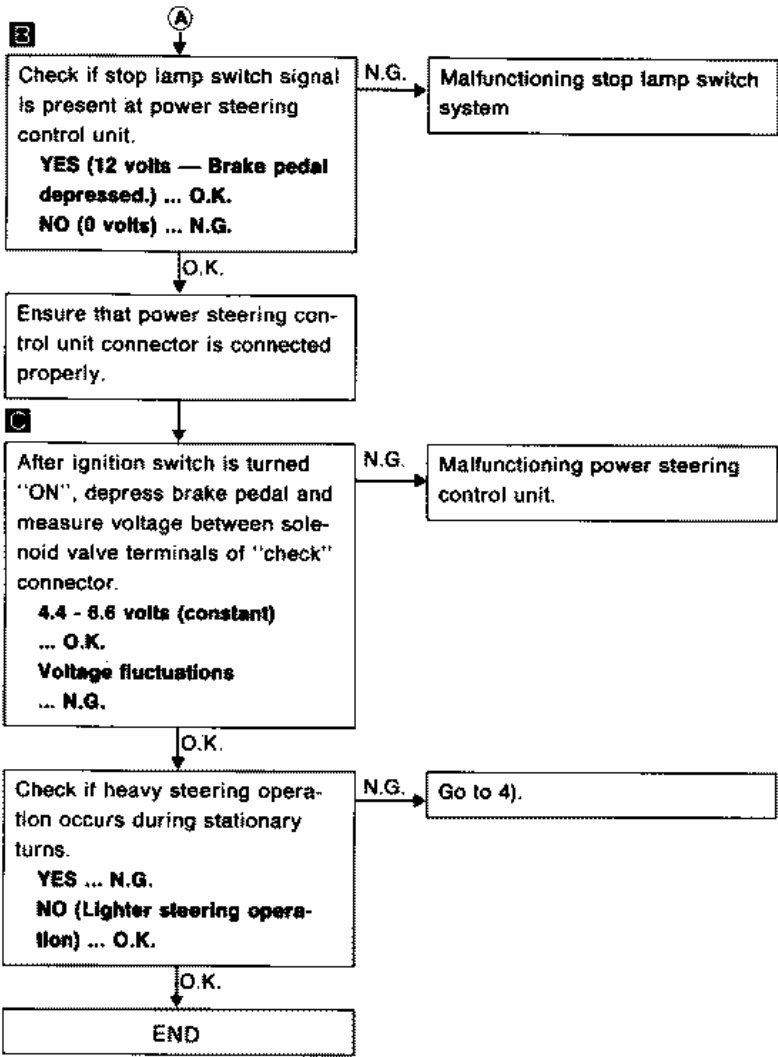
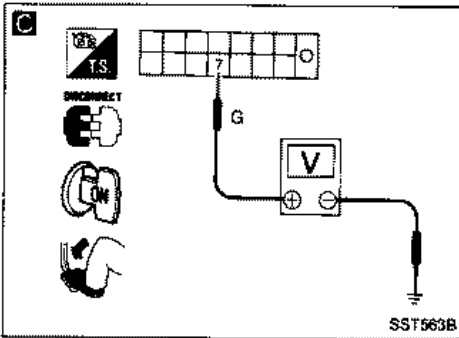
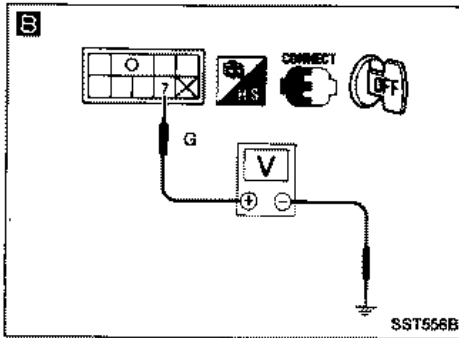
SYMPTOM:

Heavy steering operation during stationary turns



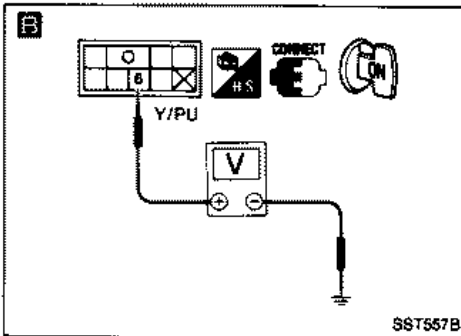
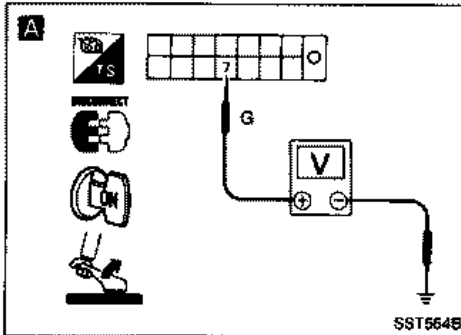
**TWIN ORIFICE POWER STEERING SYSTEM
— Trouble Diagnoses (Without SUPER HICAS system)**

Diagnostic Procedure 1 (Cont'd)



TWIN ORIFICE POWER STEERING SYSTEM — Trouble Diagnoses (Without SUPER HICAS system)

Diagnostic Procedure 1 (Cont'd)



A

2) CHECK PARKING BRAKE SIGNAL.
Release foot brake pedal and apply parking brake lever. Measure voltage between solenoid valve terminals of "check" connector.

Voltage:
4.4 - 6.6V (constant)
... O.K.
Outside the above range or voltage fluctuations
... N.G.

O.K. → Go to 3).

N.G.

Check if terminal voltage drops to 1.0 - 1.5V range approx. 10 seconds after ignition switch is turned ON.
No change (outside 4.4 - 6.6V range) ... O.K.
Voltage drop ... N.G.

O.K. → Go to 5).

N.G.

B

Check if parking brake switch signal is present at power steering control unit.
YES (0 volts — Parking brake applied.)
NO (12 volts) ... N.G.

N.G. → Malfunctioning parking brake system

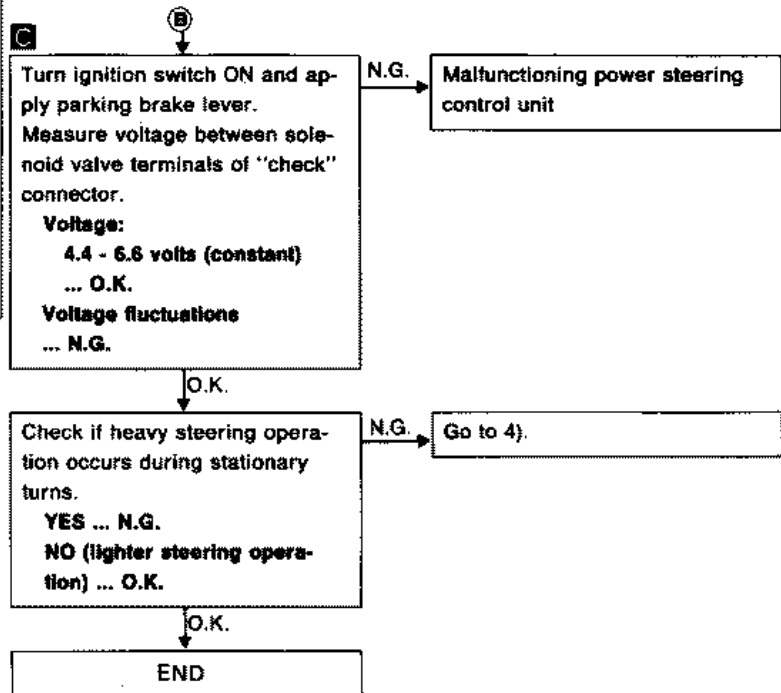
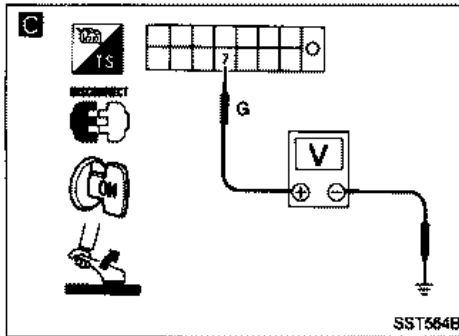
O.K.

Ensure that power steering control unit connector is connected properly.

B

TWIN ORIFICE POWER STEERING SYSTEM — Trouble Diagnoses (Without SUPER HICAS system)

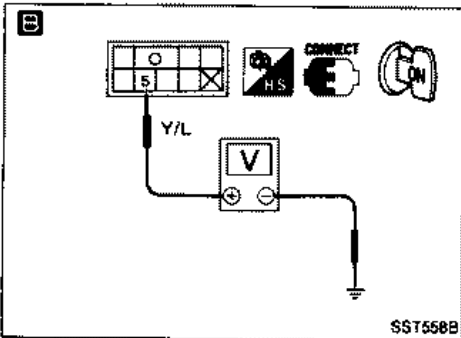
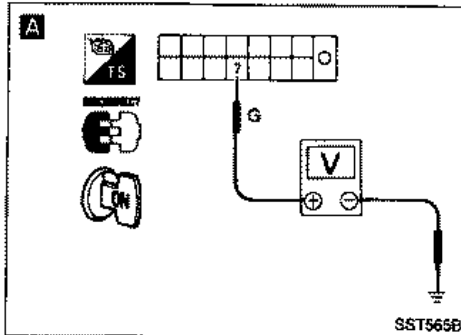
Diagnostic Procedure 1 (Cont'd)



TWIN ORIFICE POWER STEERING SYSTEM

— Trouble Diagnoses (Without SUPER HICAS system)

Diagnostic Procedure 1 (Cont'd)



A

3) CHECK NEUTRAL POSITION SIGNAL.
 Release parking brake lever.
 Move shift lever to Neutral (A/T and M/T models). Measure voltage between solenoid valve terminals of "check" connector.

Voltage:
 4.4 - 6.6V (constant) ... O.K.
 Outside the 4.4 - 6.6V range or Voltage fluctuations ... N.G.

O.K. → Depress clutch pedal (M/T model) and move shift lever to "P" (A/T model). Measure voltage between solenoid valve terminals at "check" connector.
Voltage:
 4.4 - 6.6V (constant) ... O.K.
 Outside the above range or voltage fluctuations ... N.G.

N.G. →

O.K. → Go to 4).

N.G. → Check if terminal voltage drops to 1.0 - 1.5V range approx. 10 seconds after ignition switch is turned ON.
No change (outside 4.4 - 6.6V range) ... O.K.
Voltage drop ... N.G.

O.K. → Go to 5).

N.G. → **B** Check if position switch signal is present at power steering control unit.
YES (0 volts, when position switch is ON) ... O.K.
NO (4 - 5 volts) ... N.G.

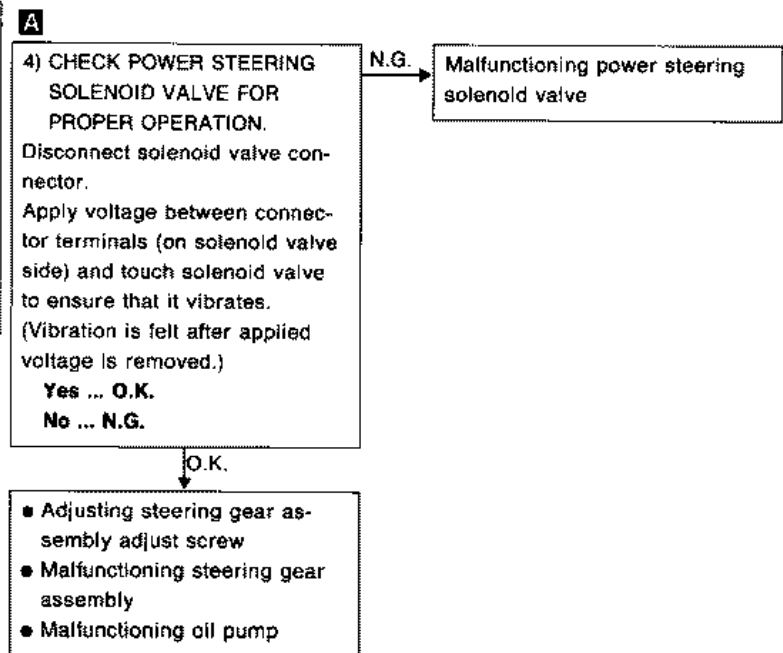
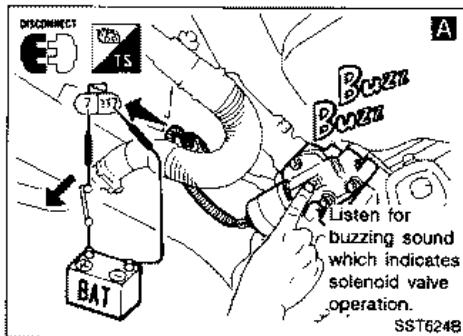
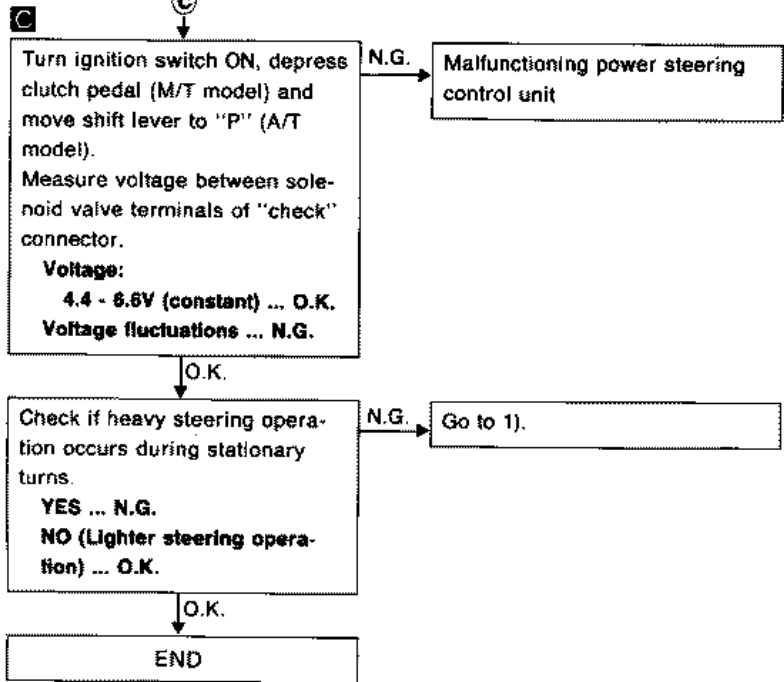
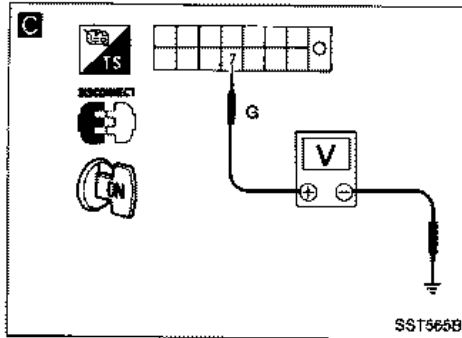
N.G. → Malfunctioning position switch system

O.K. → Ensure that power steering control unit connector is connected properly.

©

TWIN ORIFICE POWER STEERING SYSTEM — Trouble Diagnoses (Without SUPER HICAS system)

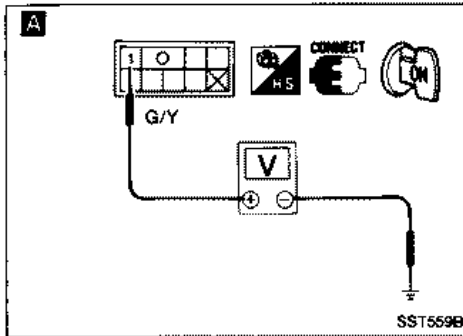
Diagnostic Procedure 1 (Cont'd)



TWIN ORIFICE POWER STEERING SYSTEM

— Trouble Diagnoses (Without SUPER HICAS system)

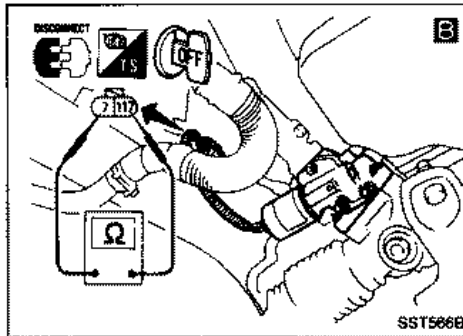
Diagnostic Procedure 1 (Cont'd)



A

5) CHECK POWER STEERING CONTROL UNIT FOR PROPER OPERATION.
 Check if power voltage is present at power steering control unit.
YES (12V) ... O.K.
NO (0V) ... N.G.

N.G. → Malfunctioning ignition power circuit



B

Measure solenoid valve resistance.
 Disconnect solenoid valve connector, and measure resistance between connector terminals (on solenoid valve side.)
Resistance:
4 - 6 ohms ... O.K.
0 ohms or infinite ... N.G.

N.G. → Malfunctioning solenoid valve system

O.K. → Ensure that power steering control unit connector is connected properly.

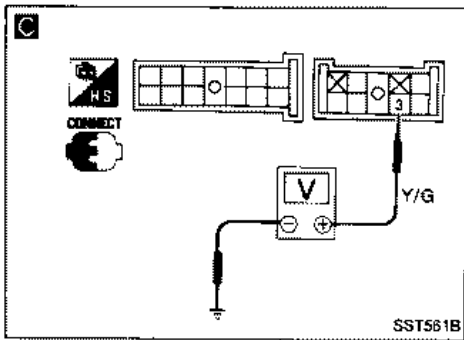
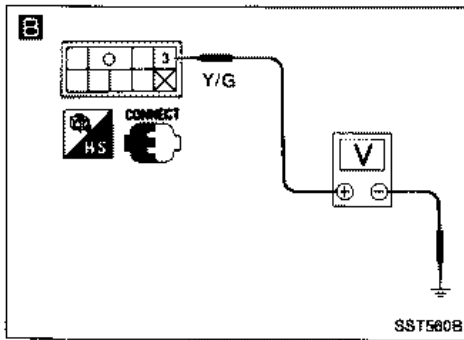
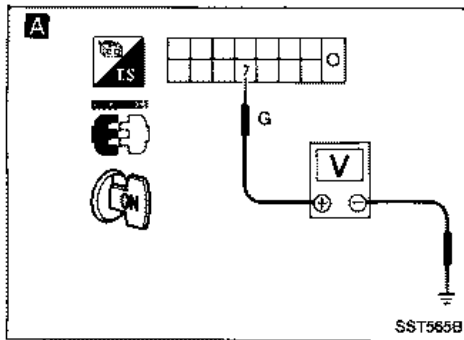
Check if heavy steering operation occurs during stationary turns.
YES ... N.G.
NO (Lighter steering operation) ... O.K.

N.G. → Malfunctioning power steering control unit

O.K. → **END**

TWIN ORIFICE POWER STEERING SYSTEM

— Trouble Diagnoses (Without SUPER HICAS system)



Diagnostic Procedure 2

SYMPTOM:
Light steering operation during high-speed driving

Raise rear wheels off ground and start engine.

A Measure voltage between solenoid valve terminals of "check" connector while driving vehicle from 0 to 100 km/h (0 to 62 MPH).

Voltage:
 0 km/h (0 MPH):
 4.4 - 6.6V ... O.K.
 100 km/h (62 MPH):
 1.8 - 2.8V ... O.K.
 Constant voltage ... N.G.

N.G. Check speedometer for proper operation.
YES ... O.K.
NO ... N.G.

O.K. → **C**

N.G. → Malfunctioning vehicle speed sensor or speedometer

O.K. Check A.S.C.D. and vehicle speed-sensing door lock for proper operation.
YES ... O.K.
NO ... N.G.

N.G. **C** Check if vehicle speed signal is present at speedometer. Disconnect speedometer from vehicle to facilitate work. Reconnect wiring. Measure voltage between speedometer terminals while driving vehicle at very slow speeds.
1 volt (Min.) and 5 volts (Max.) are alternately repeated ... O.K.
No voltage is present ... N.G.

O.K. **B** Check if vehicle speed signal is present at power steering control unit. While driving at very slow speeds, connect power steering unit connector. Measure terminal voltage.
1 volt (Min.) and 5 volts (Max.) are alternately repeated ... O.K.
No voltage is present ... N.G.

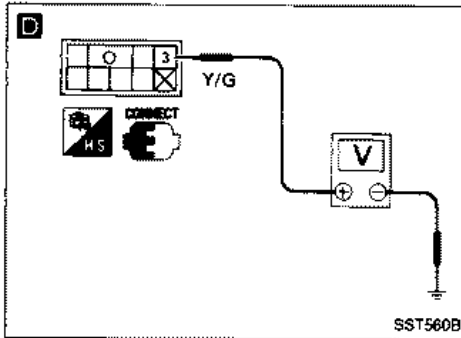
N.G. → Malfunctioning speedometer

O.K. Ensure that power steering control unit connector is connected properly.

O.K. → Improper connection between speedometer and power steering control unit

TWIN ORIFICE POWER STEERING SYSTEM — Trouble Diagnoses (Without SUPER HICAS system)

Diagnostic Procedure 2 (Cont'd)



D

Measure voltage between solenoid valve connector terminals of "check" connector while driving vehicle from 0 to 100 km/h (0 to 62 MPH).

Voltage:

0 km/h (0 MPH):
4.4 - 6.6V ... O.K.

100 km/h (62 MPH):
1.8 - 2.8V ... O.K.

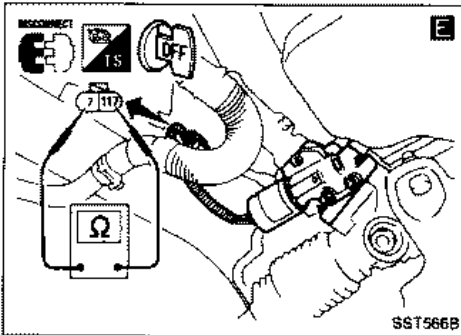
No voltage variations ... N.G.

O.K. → Check if steering operation is heavy during high-speed driving.
YES ... O.K.
NO ... N.G.

N.G. →

O.K. →

END



E

Measure solenoid valve resistance. Disconnect solenoid valve connector, and measure resistance between connector terminals (on solenoid valve side).

Resistance:

4 - 6 ohms ... O.K.

0 ohms or infinite ... N.G.

N.G. →

O.K. → Malfunctioning power steering control unit

F

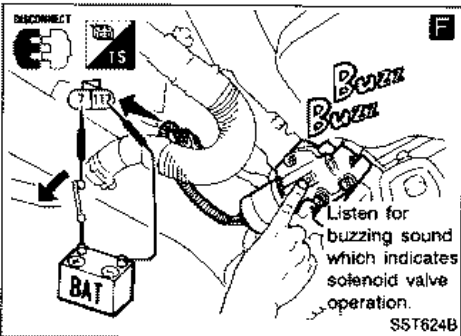
Disconnect solenoid valve connector. Apply voltage between connector terminals (on solenoid valve side) and touch solenoid valve to ensure that it vibrates. (Vibration is felt after applied voltage is removed.)
Yes ... O.K.
No ... N.G.

N.G. →

Malfunctioning solenoid valve

O.K. →

- Adjusting steering gear assembly adjust screw
- Malfunctioning steering gear assembly
- Malfunctioning oil pump



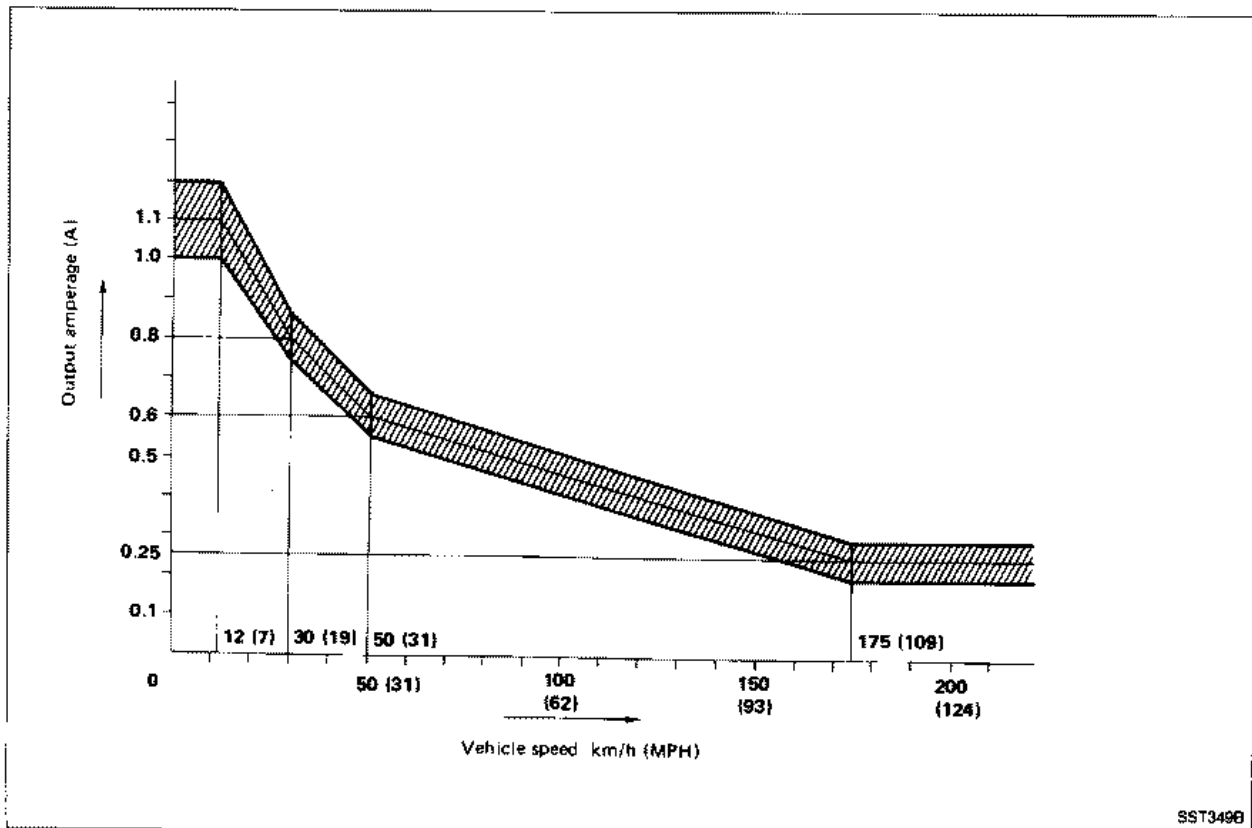
TWIN ORIFICE POWER STEERING SYSTEM — Trouble Diagnoses (Without SUPER HICAS system)

Control Unit Inspection Table

The standard values (voltage), measured with an analog tester in contact with the control unit terminal, are shown below:

Terminal No.	Application	Standard value
1	Power	Approx. 12V
2	Ground	0V
3	Vehicle speed sensor input	1 volt (min.) and 5 volts (max.) are alternately repeated when vehicle is driven at very slow speeds.
4	Stop lamp switch input	Pressed: Approx. 12V Released: 0V
5	Neutral switch input	0V (clutch engaged and shift lever in "N") ... M/T models 0V (selector lever in "N" or "P") ... A/T models 4 - 5V (except for the above)
6	Parking brake switch input	Applied: 0V Released: Approx. 12V
7	Power steering solenoid valve output	0 km/h 4.4 - 6.6V 100 km/h 1.8 - 2.8V Fail-safe 1.0 - 1.5V

Performance of Controller



SST349B

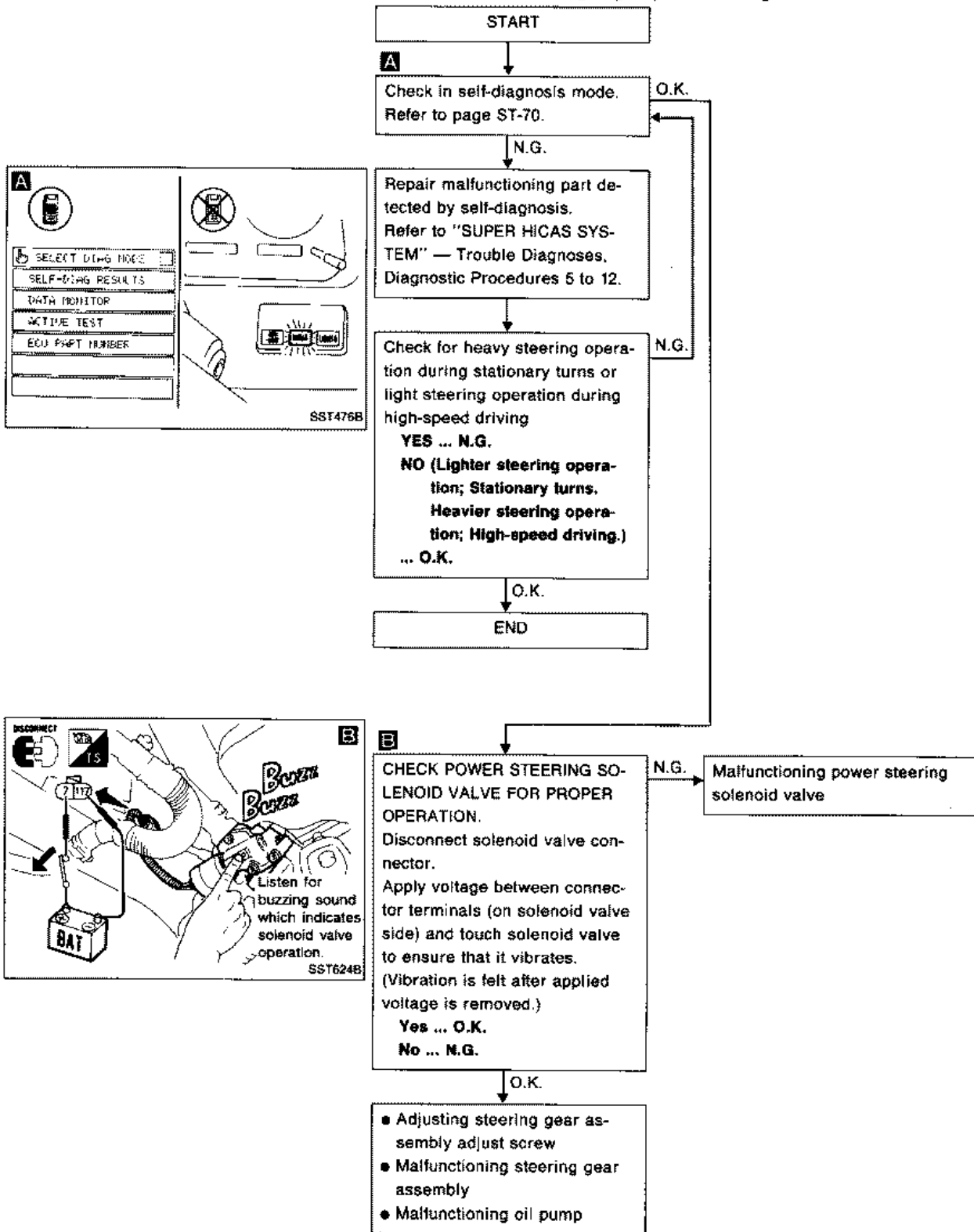
TWIN ORIFICE POWER STEERING SYSTEM

— Trouble Diagnoses (With SUPER HICAS system)

Diagnostic Procedure 1

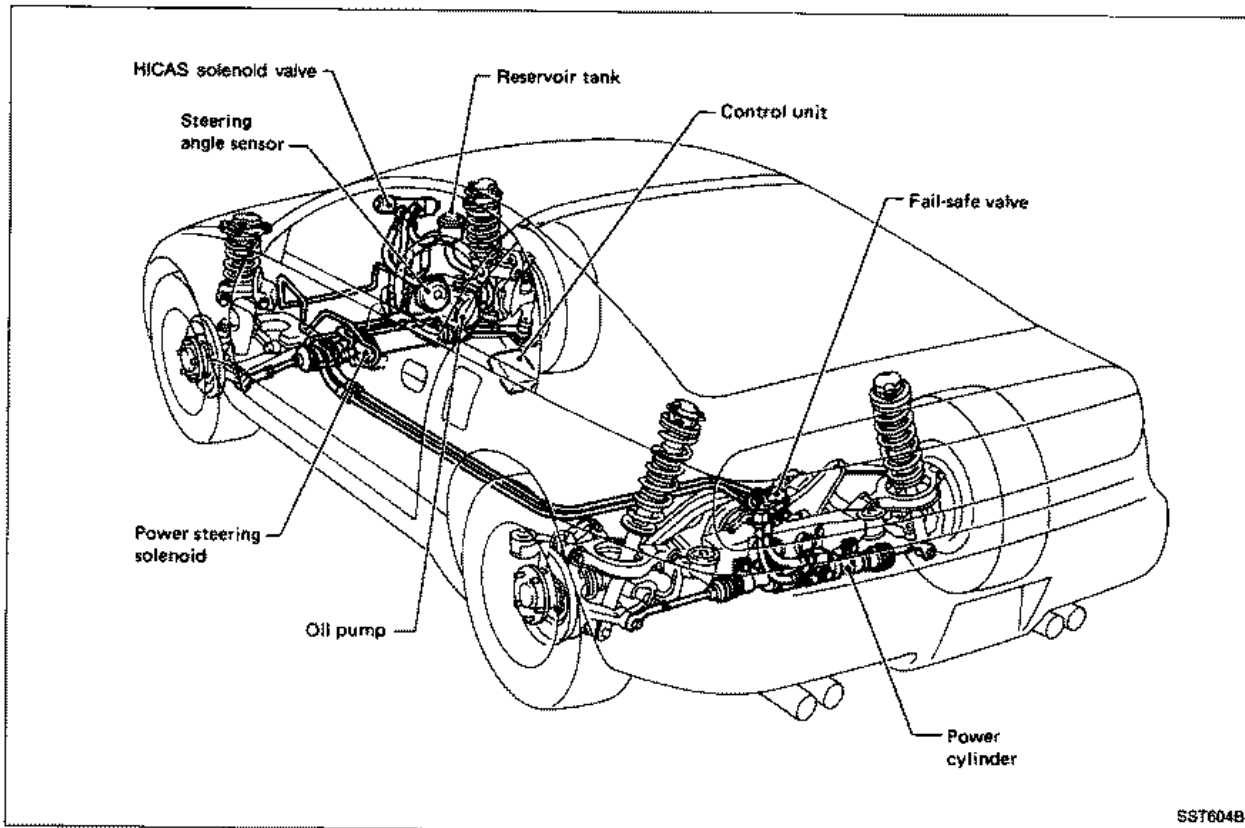
SYMPTOM:

Heavy steering operation during stationary turns or light steering operation during high-speed driving.

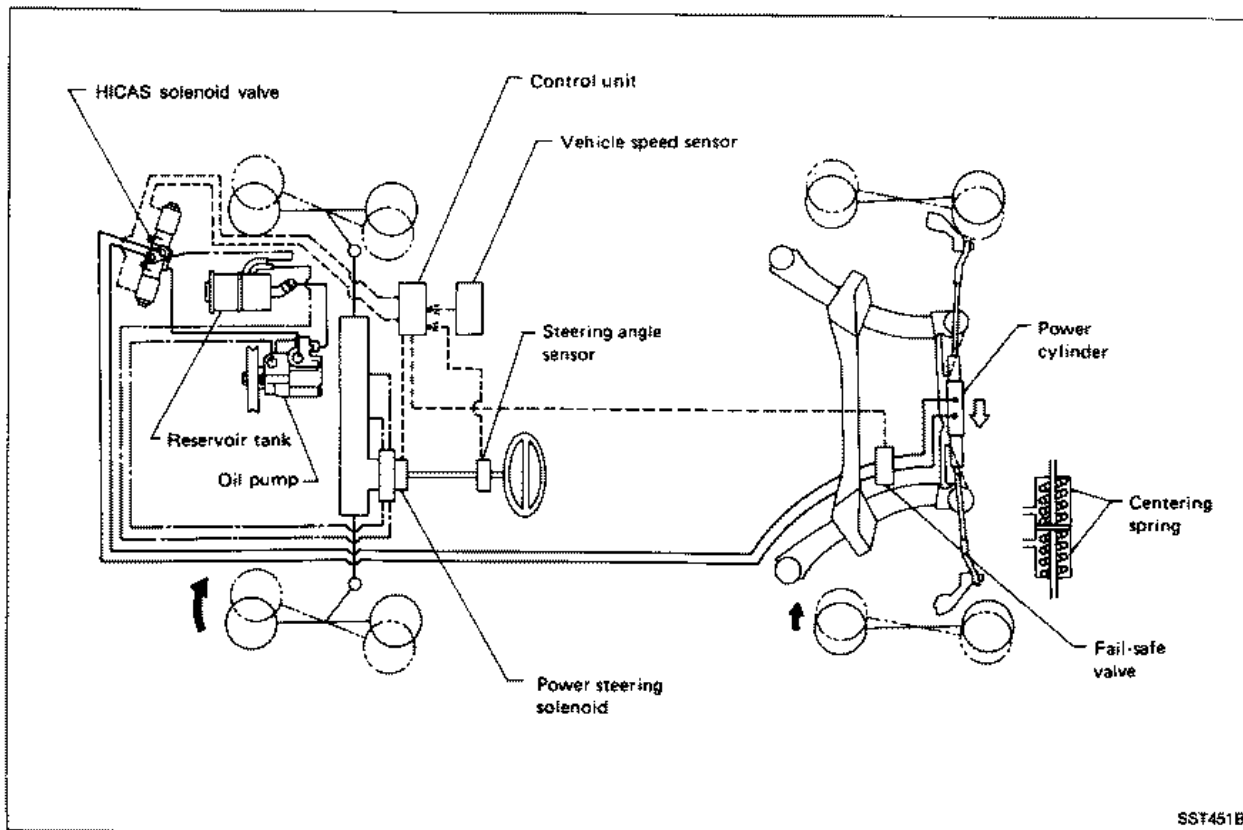


SUPER HICAS SYSTEM

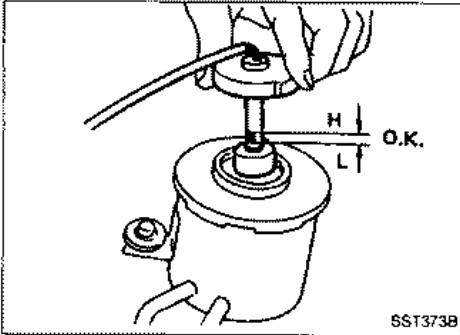
HICAS Component Parts Location



System Diagram



SUPER HICAS SYSTEM — On-vehicle Inspection



Checking Fluid Level

Maintain the fluid level so that the lower surface of the float is maintained between the "L" and "H" marks on the gauge rod. The fluid level should be checked when the engine is stopped and the fluid temperature is normal.

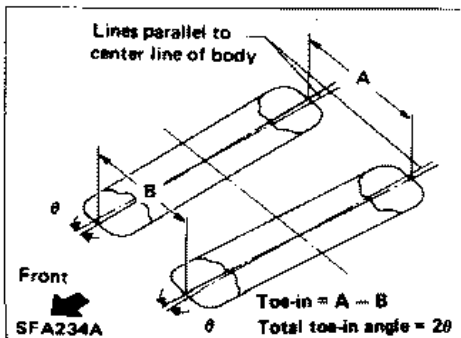
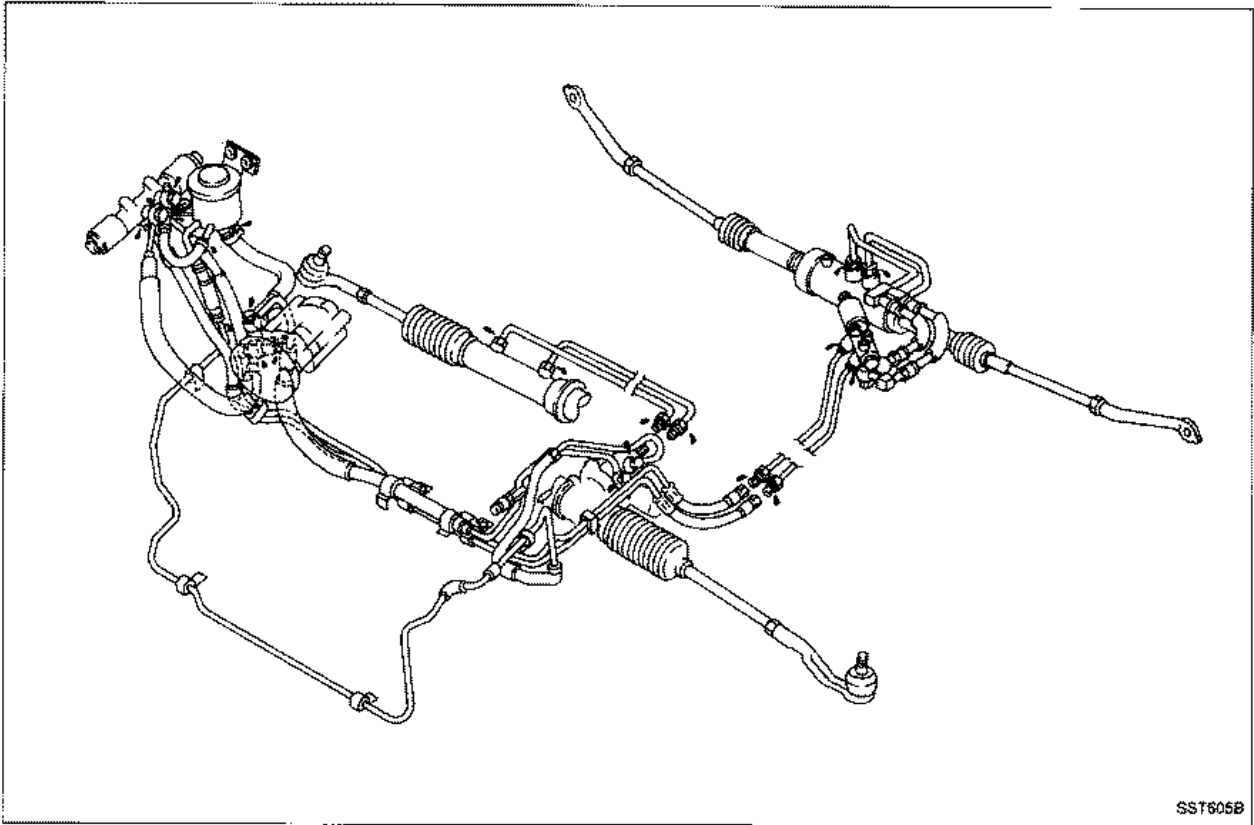
CAUTION:

- Do not overfill.
- Recommended fluid is Automatic Transmission Fluid "Dexron™" type.

Checking Fluid Leakage

Check lines for proper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.

Fluid leakage should be checked for when the oil temperature is normal with the engine idling.



Measuring Rear Toe-in

Measure distance "A" and "B" at the same height as hub center.

Total toe-in:

A - B: 0 - 4 mm (0 - 0.16 in)

2θ: 0' - 22'

Refer to "SUPER HICAS" in section RA.

SUPER HICAS SYSTEM — On-vehicle Inspection

Inspection of HICAS System Operation

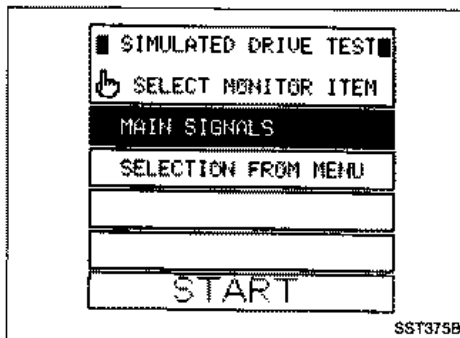
CAUTION:

Ensure that shift lever is set to "P" (A/T model) or "Neutral" (M/T model) before checking HICAS system operation.

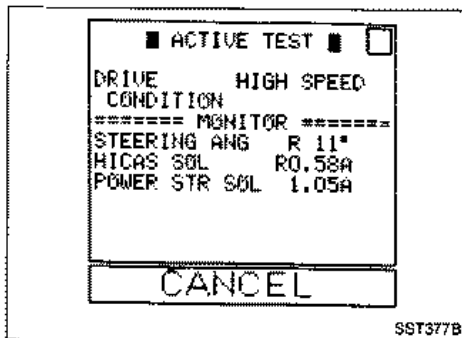
When CONSULT is used:



1. Have a helper sit in the driver's compartment and raise vehicle.
(Use a two-pole lift or a center pole lift so that the four wheels are free to rotate.)
2. Connect CONSULT unit to diagnosis connector and start engine.
3. Touch "START" on CONSULT display.
4. Touch "HICAS", "ACTIVE TEST" and "SIMULATED DRIVE" in that order.



5. Touch "START" when MAIN SIGNALS display is reversed.

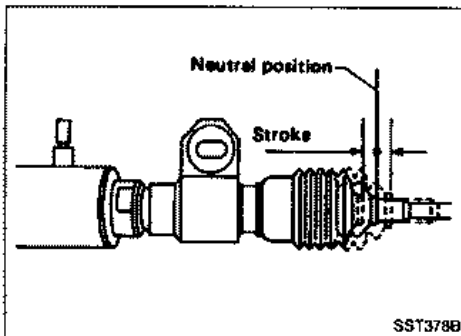


6. Touch "START."

After simulated drive condition has continued for 5 minutes, it will automatically cancel and CONSULT unit will then show "TEST IS INTERRUPTED TO AVOID OIL TEMP. RISE" display. To cancel this mode during self-diagnosis, simply touch "CANCEL".

SUPER HICAS SYSTEM — On-vehicle Inspection

Inspection of HICAS System Operation (Cont'd)



- Operate engine at speeds greater than 2,000 rpm, and turn steering wheel 180° in one direction from the neutral position. Measure extension value of one power cylinder rod and retraction value of the other. Then, turn steering wheel 180° in the other direction from the neutral position, and measure extension value of one cylinder rod and retraction value of the other. Determine strokes of respective power cylinders by adding (measured) extension and retraction values.

Measure rod strokes in as short a period of time as possible.

Standard stroke:

When turned to the right

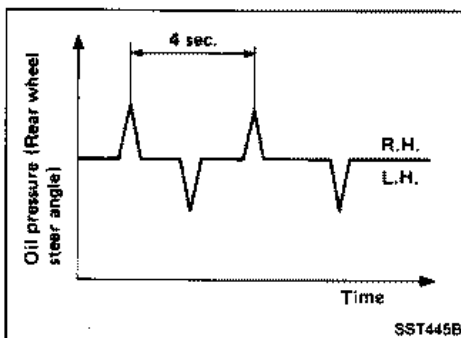
2.6 mm (0.102 in)

When turned to the left

2.6 mm (0.102 in)

Total stroke

5.2 mm (0.205 in)



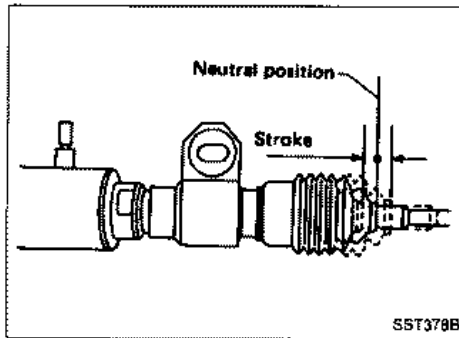
When CONSULT is not used:



- Have a helper sit in the driver's compartment and raise vehicle.
(Use a 2-pole lift or a center pole lift so that the four wheels are free to rotate.)
- Set HICAS system in self-diagnosis mode.
 - Turn ignition switch "OFF".
 - Set shift lever to "P" or "N" position (A/T model), or "Neutral" position (M/T model).
 - Turn ignition switch "ON".
 - Immediately start engine.
 - Turn steering wheel from left to right (at least 20° from the neutral position) 5 times or more, then depress foot brake pedal at least 5 times all within 10 seconds after ignition switch has been turned "ON".
- Set steering wheel to a point approximately 10° from the neutral position and check to ensure that rear wheels turn to the left and right alternately.

SUPER HICAS SYSTEM — On-vehicle Inspection

Inspection of HICAS System Operation (Cont'd)



4. Operate engine at speeds greater than 2,000 rpm, and turn steering wheel 180° in one direction from the neutral position. Measure extension value of one power cylinder rod and retraction value of the other. Then, turn steering wheel 180° in the other direction from the neutral position, and measure extension value of one cylinder rod and retraction value of the other. Determine strokes of respective power cylinder rods by adding (measured) extension and retraction values.

Measure rod strokes in as short a period of time as possible.

Standard stroke:

When turned to the right

2.6 mm (0.102 in)

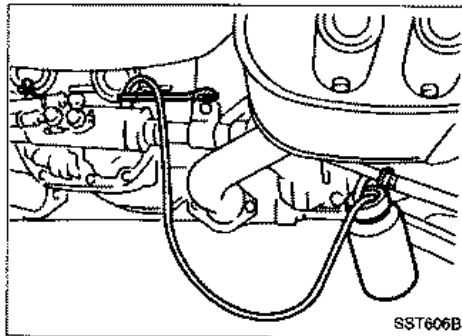
When turned to the left

2.6 mm (0.102 in)

Total stroke

5.2 mm (0.205 in)

Do not depress foot brake pedal during operation check, otherwise the operation will be stopped.



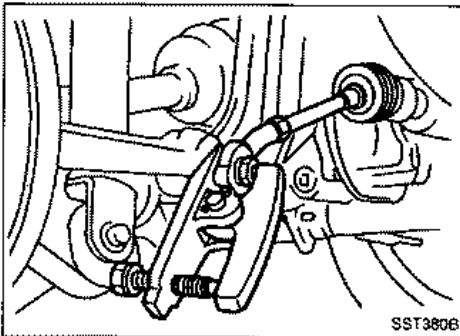
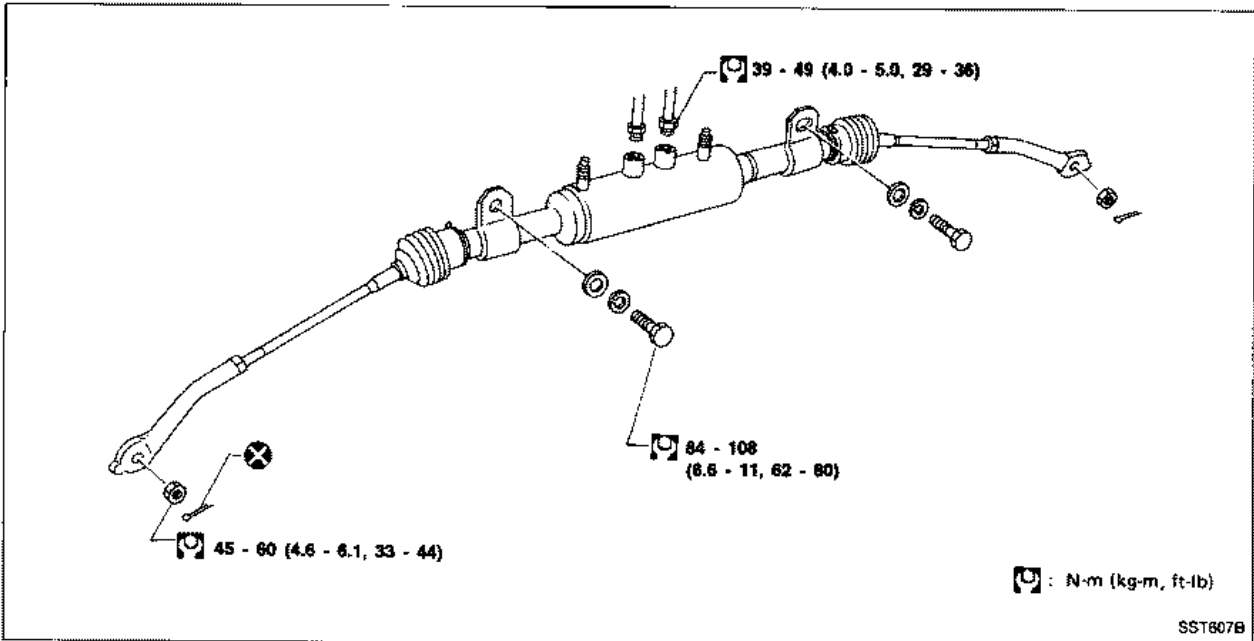
Bleeding Hydraulic System

Before bleeding air from the HICAS system, be sure to bleed air from the power steering system.

Refer to "SUPER HICAS SYSTEM — Repair of Component Parts".

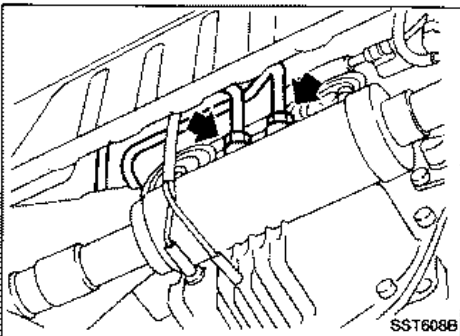
SUPER HICAS SYSTEM — Repair of Component Parts

Power Cylinder



REMOVAL

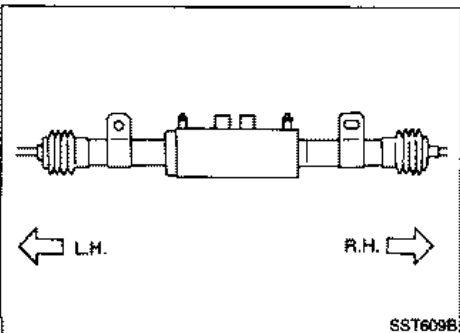
- Detach power cylinder lower links from axle housing sockets with Tool.



- Disconnect oil pipes from power cylinders and remove power cylinders.

CAUTION:

Plug openings of oil pipes and power cylinders to prevent entry of foreign particles after removal.



INSTALLATION

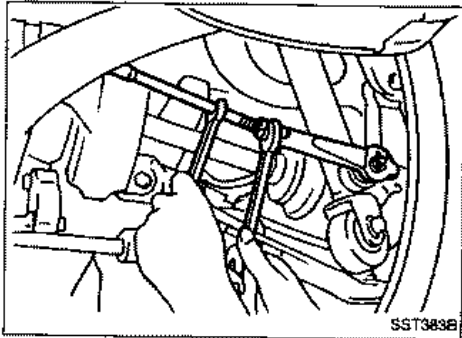
1. Before installing power cylinder on suspension member, wipe power cylinder bracket and mating surface of suspension member. Using the left side of the bracket as a reference point, locate the right side (oblong hole side) and install power cylinder.

CAUTION:

- a. To prevent entry of foreign particles, clean oil pipes and connectors using dry compressed air.
- b. Ensure that your hands are clean and free from foreign particles when connecting oil pipes.

SUPER HICAS SYSTEM — Repair of Component Parts

Power Cylinder (Cont'd)



2. Install power cylinders and oil pipes.
3. After installing lower link assemblies, check toe-in to ensure that it is within specifications. If it is not within specifications, perform proper adjustments. Refer to "SUPER HICAS" in section RA.

BLEEDING HYDRAULIC SYSTEM

Before bleeding air from the HICAS system, be sure to bleed air from the power steering system.

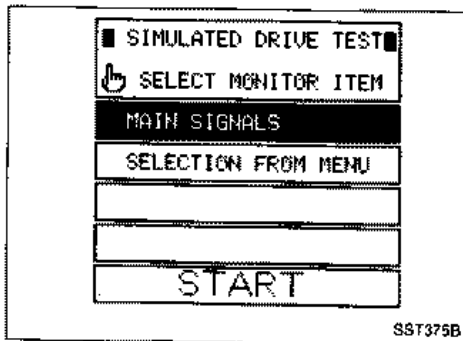
CAUTION:

Ensure that shift lever is set to "P" (A/T model) or "Neutral" (M/T model).

When CONSULT is used: 

1. Connect CONSULT unit to diagnosis connector on body side.
2. Have a helper sit in the driver's compartment and raise vehicle.

Use a two-pole lift or a center pole lift so that the four wheels are free to rotate.



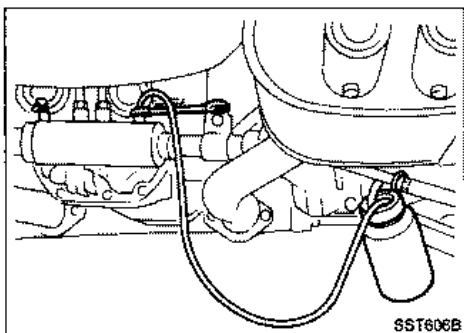
3. Start engine.
4. Touch "START" on CONSULT display. (Display will then change.)
5. Touch "HICAS", "ACTIVE TEST", "SIMULATED DRIVE" and "START" in that order.

Before touching "START", ensure that MAIN SIGNALS display is reversed.

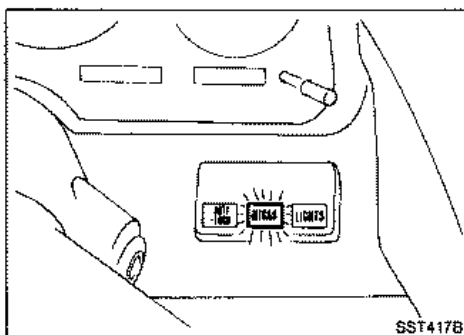
6. Touch "START".

SUPER HICAS SYSTEM — Repair of Component Parts

Power Cylinder (Cont'd)



7. Operate engine at speeds greater than 2,000 rpm, and turn steering wheel 180° to the right from the neutral position. Loosen right power cylinder bleeder valve to bleed air, then retighten. Return steering wheel to the neutral position.
8. Operate engine at speeds greater than 2,000 rpm, and turn steering wheel 180° to the left from the neutral position. Loosen left power cylinder bleeder valve to bleed air, then retighten. Return steering wheel to the neutral position.
9. Repeat steps 7. and 8. until there are no air bubbles in fluid. While bleeding air from power cylinders, never allow fluid level to drop below inlet port of reservoir tank (by adding fluid as required).
10. Touch "CANCEL" on CONSULT display and turn ignition switch OFF.

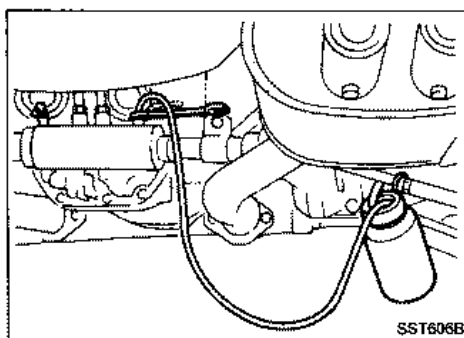


When CONSULT is not used:

1. Have a helper sit in the driver's compartment, and raise vehicle.

Use a two-pole lift or center pole lift so that the four wheels are free to rotate.

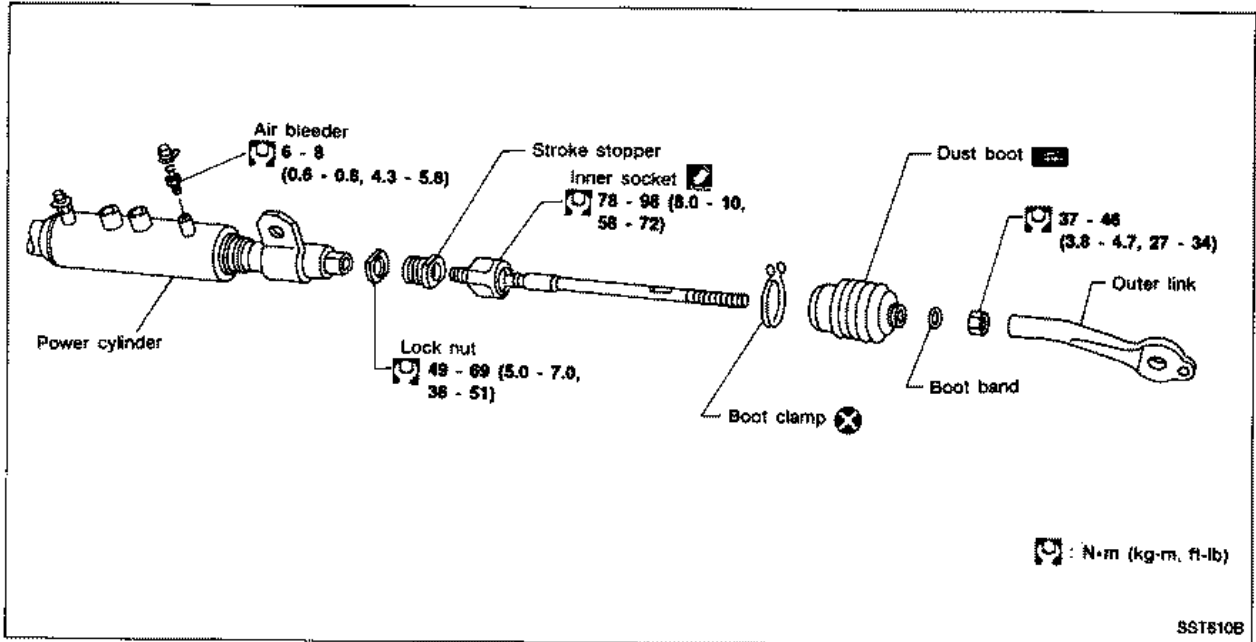
2. Set HICAS system in self-diagnosis mode.
 - (1) Turn ignition switch "OFF".
 - (2) Set shift lever to "P" or "N" position (A/T model), or "Neutral" position (M/T model).
 - (3) Turn ignition switch "ON".
 - (4) Immediately start engine.
 - (5) Turn steering wheel from left to right (at least 20° from the neutral position) 5 times or more, then depress foot brake pedal at least 5 times all within 10 seconds after ignition switch has been turned "ON".
3. Set steering wheel within 10° from the neutral position. Ensure that rear wheels turn to the left and right alternately.
4. Operate engine at idling speed, and turn steering wheel 180° to the right from the neutral position. Loosen right power cylinder bleeder valve to bleed air, then retighten. Return steering wheel to the neutral position.
5. Operate engine at idling speed, and turn steering wheel 180° to the left from the neutral position. Loosen left power cylinder bleeder valve to bleed air, then retighten. Return steering wheel to the neutral position.
6. Repeat steps 4. and 5. above until there are no air bubbles in fluid. While bleeding air from power cylinders, never allow fluid level to drop below inlet port of reservoir tank (by adding fluid as required).
7. Turn ignition switch OFF to complete self-diagnosis operation.



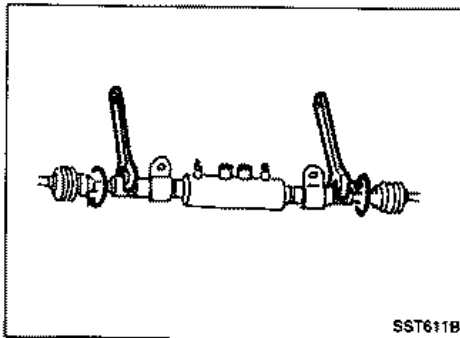
SUPER HICAS SYSTEM — Repair of Component Parts

Power Cylinder (Cont'd)

DISASSEMBLY AND ASSEMBLY

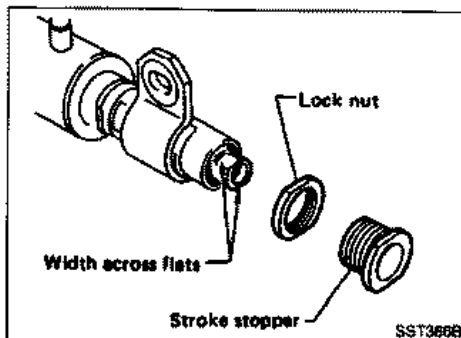


Power cylinder assembly cannot be disassembled. When it is malfunctioning, replace power cylinder as an assembly.



DISASSEMBLY

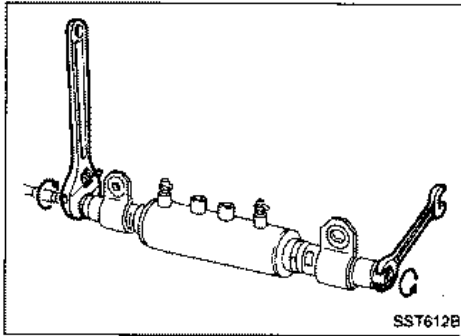
1. Remove clamps from left and right dust boots, and move dust boots toward outer links.
2. Attach wrenches to left and right ball joint sockets, and turn in directions that loosen lower links. Remove one of loosened lower link assemblies.



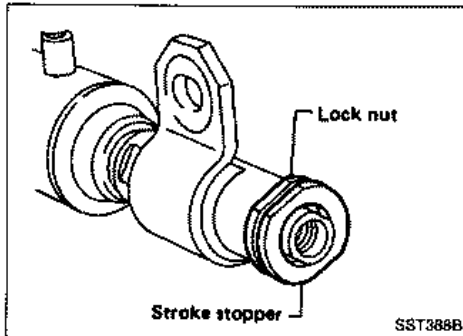
3. Loosen stroke stopper lock nut from which lower link assembly was removed, and remove stroke stopper.

SUPER HICAS SYSTEM — Repair of Component Parts

Power Cylinder (Cont'd)

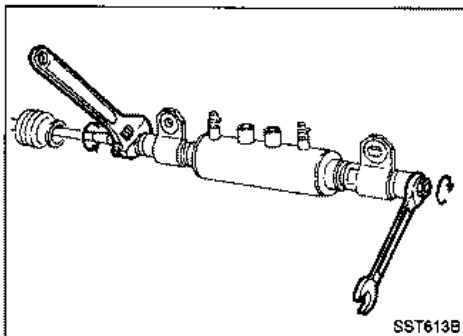


- While attaching a wrench to "width across flats" section of rod end from which stroke stopper was removed, remove the other lower link assembly.

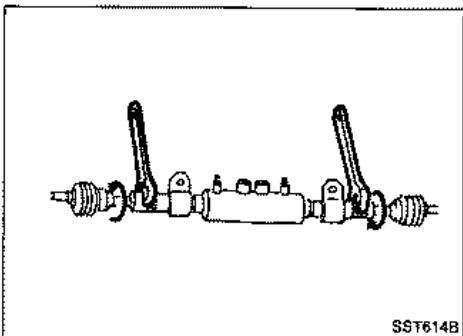


ASSEMBLY

1. Install stroke stopper and lock nut on the lower link assembly to be assembled.



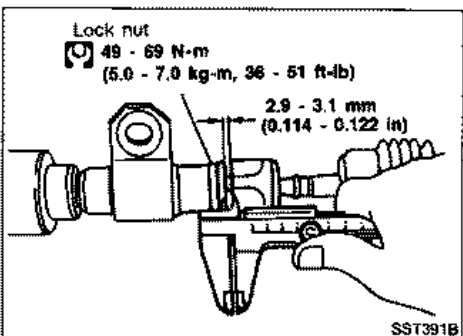
2. Apply Locktite to inner ball joint thread. Attach a wrench to "width across flats" section of piston rod (located on the other side) to prevent rod from turning. Install lower link assembly.



3. After installing stroke stopper and lock nut on the other lower link assembly, install lower link assembly. Attach a wrench to inner ball joint (to prevent it from turning), tighten inner socket to specified torque.

Inner socket:

\square : 78 - 98 N·m (8 - 10 kg·m, 58 - 72 ft·lb)



4. If stroke stopper was moved during removal of lower link, adjust it after installation, as described below:

- (1) Loosen lock nut which secures stroke stopper.
- (2) Turn stroke stopper until clearance between inner ball joint and stroke stopper is 2.9 to 3.1 mm (0.114 to 1.122 in) on each side.
- (3) Tighten lock nut securely.

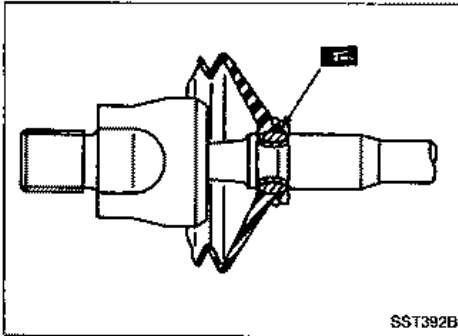
Lock nut:

\square : 49 - 69 N·m (5.0 - 7.0 kg·m, 36 - 51 ft·lb)

- (4) Recheck clearance between inner ball joint and stroke stopper on each side.

SUPER HICAS SYSTEM — Repair of Component Parts

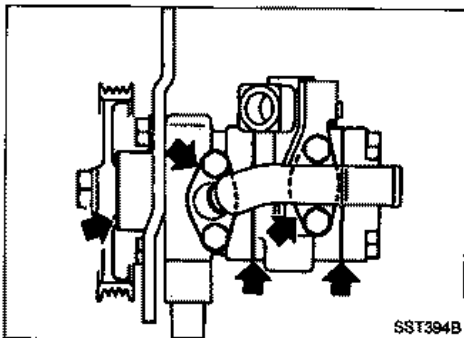
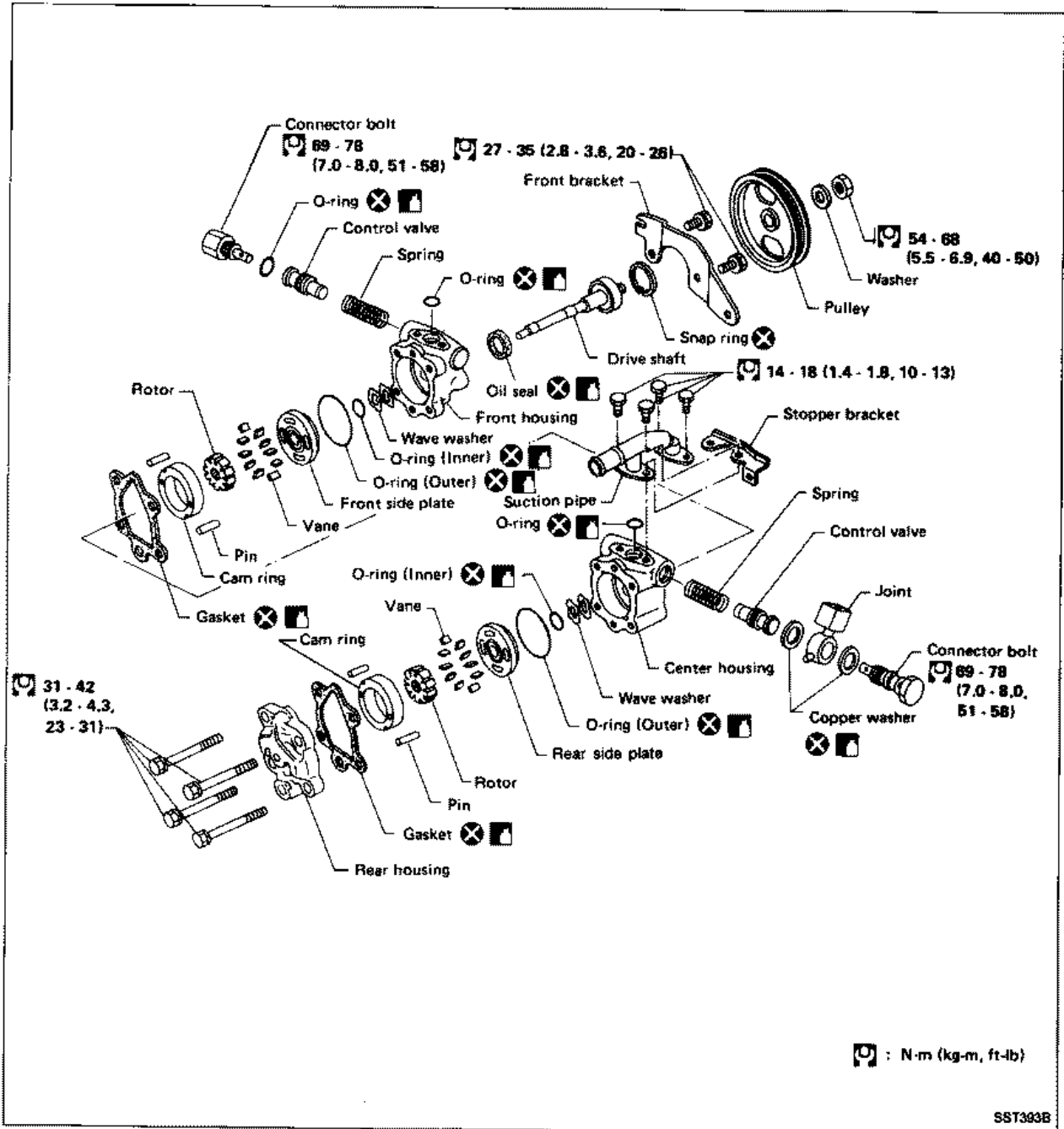
Power Cylinder (Cont'd)



5. Install dust boot using new boot band and clamp.
 - Apply a coat of grease to grooves at boot location.

SUPER HICAS SYSTEM — Repair of Component Parts

Oil Pump



PRE-DISASSEMBLY INSPECTION

Disassemble the power steering oil pump only if the following items are found.

- Oil leak from any point shown in the figure.
- Deformed or damaged pulley.

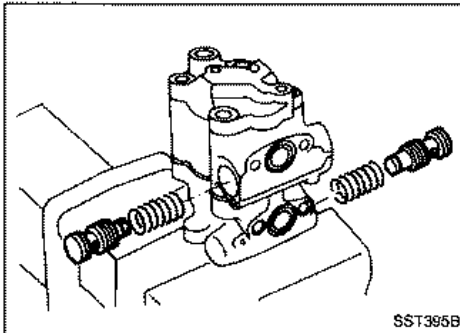
Procedures for disassembly and assembly are the same as those for the power steering oil pump.

SUPER HICAS SYSTEM — Repair of Component Parts

Disassembly

CAUTION:

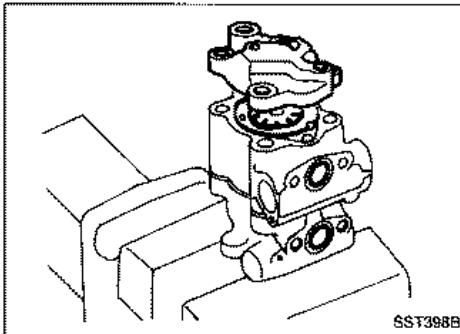
- Parts which can be disassembled are strictly limited. Never disassemble parts other than those specified.
- Disassemble in as clean a place as possible.
- Clean your hands before disassembly.
- Do not use rags; use nylon cloths or paper towels.
- Follow the procedures and cautions in the Service Manual.
- When disassembling and reassembling, do not let foreign matter enter or contact the parts.



1. Remove connector.

Be careful not to drop control valve.

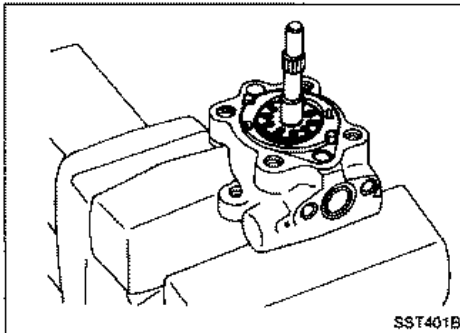
Be careful not to confuse main side with sub side.



2. Remove rear housing.

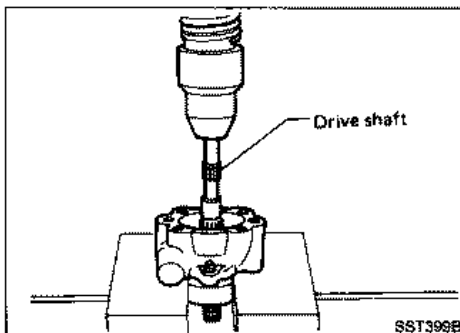
3. Remove center housing.

4. Remove cam ring, rotor and other parts from center housing (sub side).



5. Remove cam ring, rotor and other parts from front housing (main side).

Be careful not to confuse main side with sub side.



6. Remove snap ring, then draw drive shaft out.

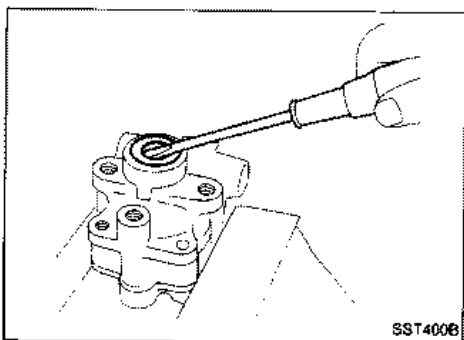
Be careful not to drop drive shaft.

SUPER HICAS SYSTEM — Repair of Component Parts

Disassembly (Cont'd)

7. Remove oil seal.

Be careful not to damage front housing.



SST400B

Inspection

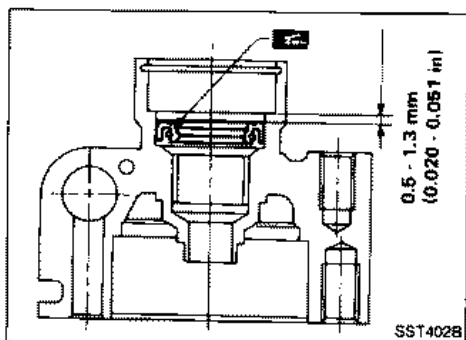
If any of the following parts are scratched or damaged, replace oil pump assembly.

- Mating surfaces of front housing and cam center housing
- Mating surfaces of rear housing and cam center housing
- Front housing bushing (at drive shaft support location)
- Flow control valve
- Drive shaft
- Rotor

Assembly

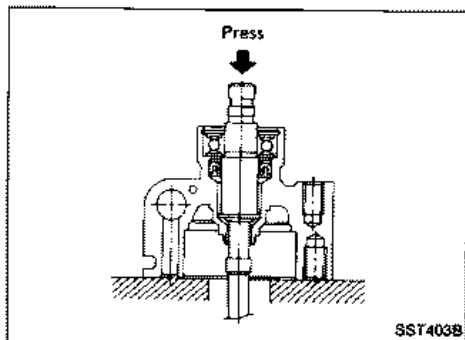
Assemble oil pump in the reverse order of disassembly, noting the following instructions.

- Before installation, coat the O-rings and oil seal with A.T.F.
- Make sure O-rings and oil seal are properly installed.
- When assembling vanes to rotor, rounded surfaces of vanes must face cam case side.
- Always install new O-rings and oil seal.
- Be careful of oil seal direction.



SST402B

1. Press oil seal into front housing and apply grease to sealing lips.

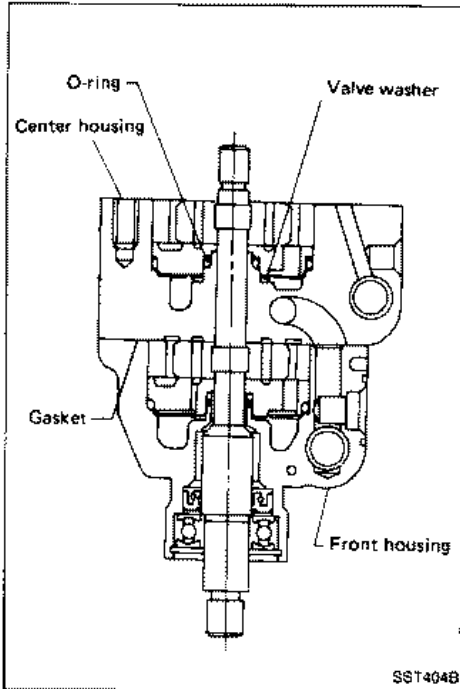


SST403B

2. Press shaft assembly into front housing and install snap ring.

SUPER HICAS SYSTEM — Repair of Component Parts

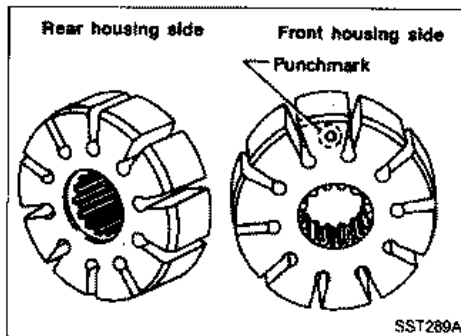
Assembly (Cont'd)



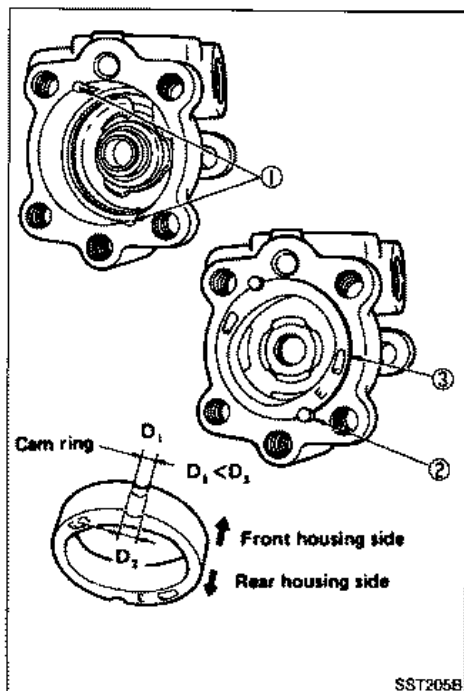
3. Install component parts on front housing in the order indicated below:
 - 1) O-ring x 2
 - 2) Wave washer
 - 3) Side plate
 - 4) Rotor [thickness: 16.25 mm (0.6398 in) (main side); 13 mm (0.51 in) (sub side)]
 - 5) Vane
 - 6) Pin
 - 7) Cam ring [thickness: 16.25 mm (0.6398 in) (main side); 13 mm (0.51 in) (sub side)]
4. Place packing on front housing and position center housing on the packing. In the manner similar to step 3. above, install component parts on front housing (sub side).

CAUTION:

- Ensure that O-rings are positioned properly.
- Ensure that vane is installed with curved side facing cam ring.
- Use cam, rotor vane as original single unit.
- Ensure that control valve moves smoothly.

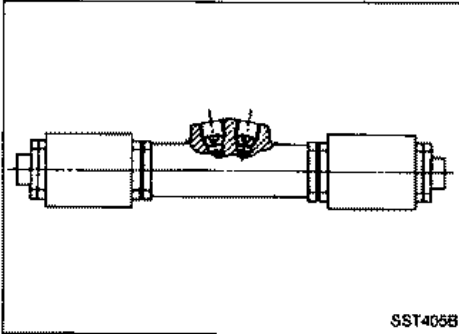


- Pay attention to rotor direction.



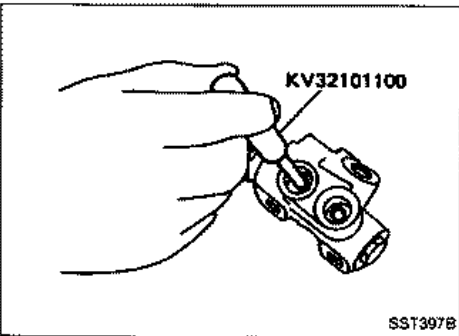
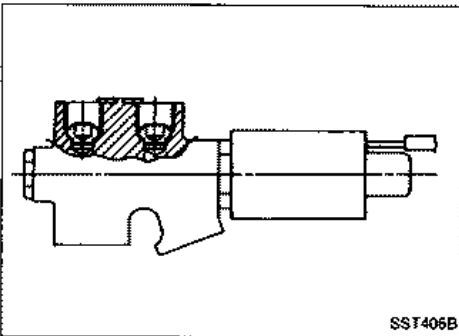
- Pay attention to cam ring direction.

SUPER HICAS SYSTEM — Repair of Component Parts

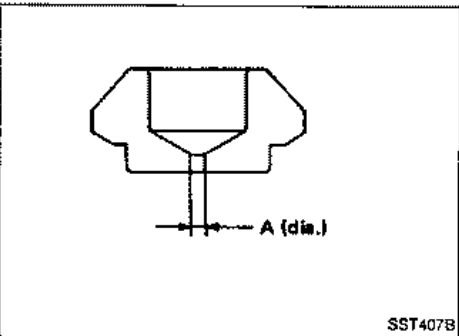


HICAS Solenoid Valve and Fail-safe Valve

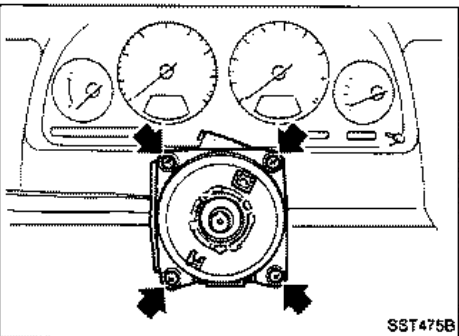
- Do not loosen lock nut which secures solenoid since HICAS solenoid fail-safe valves are of types that should not be disassembled.
- If any part is found to be malfunctioning, always replace as a valve assembly.



- Whenever tubes are disconnected, check tube seat for scratches or damage. A scratched or cracked tube seat may cause oil leakage. Replace it using pin punch.



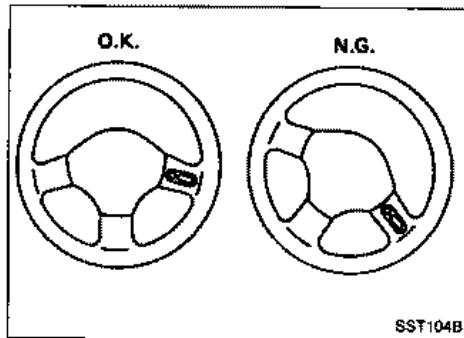
	HICAS solenoid valve	Fail-safe valve
Part No.	49528-31P10	49528-52L10
A (dia.)	mm (In)	6.5 (0.256)



Steering Angle Sensor

- Ensure that steering angle sensor bolts are secure and tight.
- If any part of steering angle sensor is malfunctioning, replace steering angle sensor assembly.

SUPER HICAS SYSTEM — Repair of Component Parts



Steering Wheel

CHECKING NEUTRAL POSITION

- Check that the steering wheel is in the neutral position when driving straight ahead at a speed of at least 70 km/h (43 MPH).
- If it is not in the neutral position, remove the steering wheel and reinstall it correctly.
- If the neutral position is between two serrated teeth, loosen tie-rod lock nut and move tie-rod in the opposite direction by the same amount on both left and right sides to compensate for error in the neutral position.

SUPER HICAS SYSTEM — Trouble Diagnoses

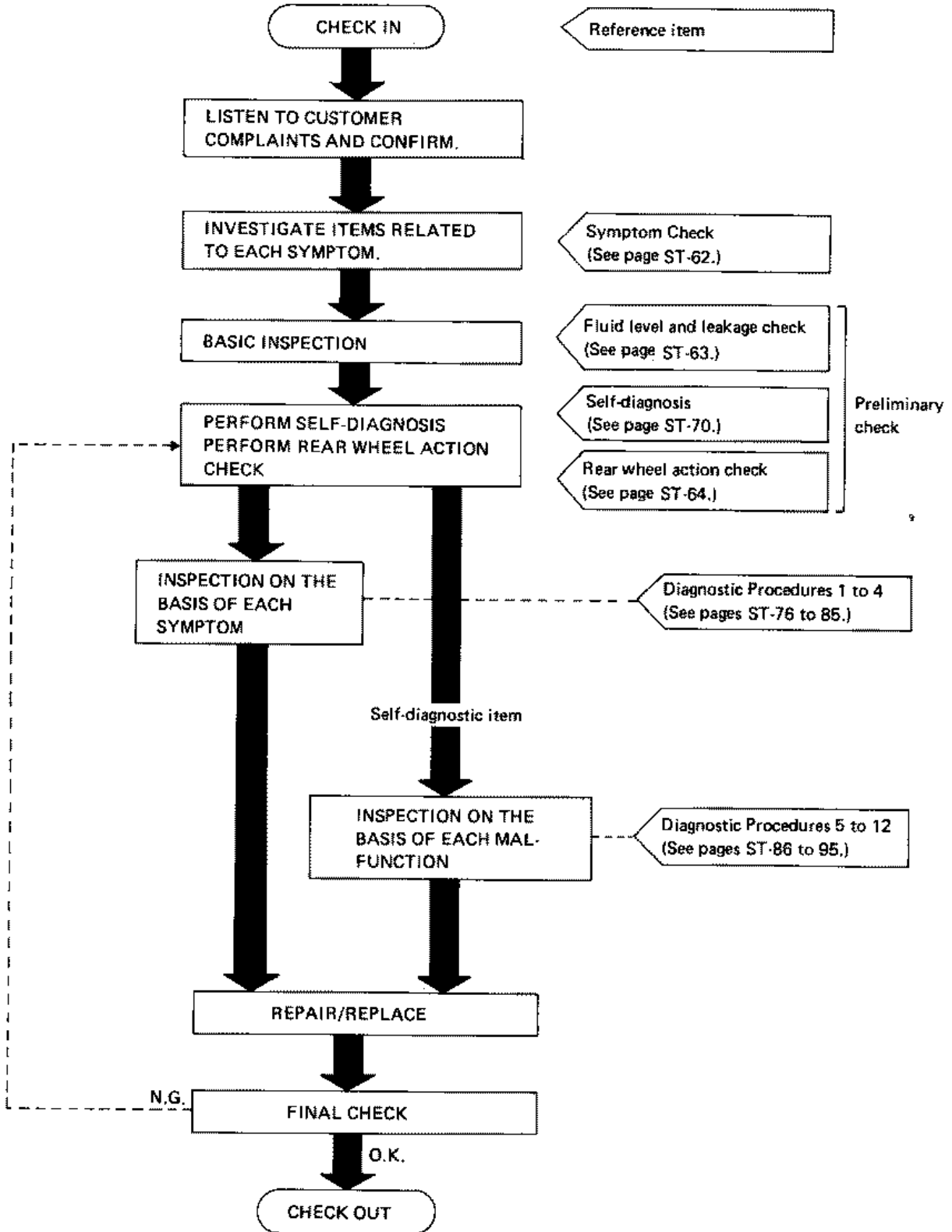
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SUPER HICAS SYSTEM — Trouble Diagnoses

How to Perform Trouble Diagnoses for Quick and Accurate Repair

WORK FLOW



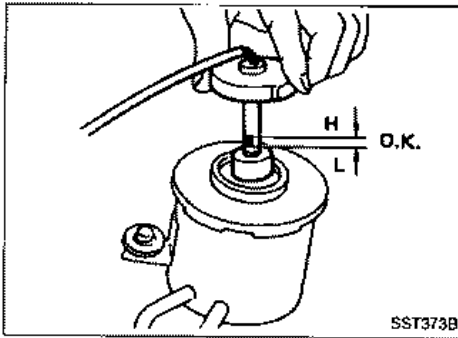
SUPER HICAS SYSTEM — Trouble Diagnoses

Symptom Chart

DIAGNOSTIC TABLE

PROCEDURE			Preliminary Check			Diagnostic Procedure											
REFERENCE PAGE (ST-)			63	63	64	76	77	79	80	85	88	89	90	91	92	94	95
SYMPTOM			Preliminary check 1	Preliminary check 2	Preliminary check 3	Diagnostic procedure 1	Diagnostic procedure 2	Diagnostic procedure 3	Diagnostic procedure 4	Diagnostic procedure 5	Diagnostic procedure 6	Diagnostic procedure 7	Diagnostic procedure 8	Diagnostic procedure 9	Diagnostic procedure 10	Diagnostic procedure 11	Diagnostic procedure 12
No warning lamp comes on when ignition switch is turned "ON"			○			○											
Warning lamp comes on when engine is running			○	○	○		○		○	○	○	○	○	○	○	○	○
Abnormal noise is emitted.			○	○	○			○									
Vehicle behavior is unusual (due to malfunctioning HICAS system.)			○	○	○				○	○	○	○	○	○	○	○	○
System is not set in self-diagnosis mode.										○							
Self-diagnostic results	Self-diagnosis code No.	Diagnosed part	CONSULT indication														
	1	HICAS solenoid valve (RH) output is not present.	HICAS SOLENOID-R [ABNORMAL SIGNAL]								○						
	2	HICAS solenoid valve (LH) output is not present.	HICAS SOLENOID-L [ABNORMAL SIGNAL]								○						
	3	Fail-safe valve output is not present.	FAIL-SAFE VALVE [ABNORMAL SIGNAL]									○					
	4	Power steering solenoid output is not present.	POWER STEERING SOL [ABNORMAL SIGNAL]										○				
	5	Vehicle speed signal is not present.	VEHICLE SPEED SENSOR [NO SIGNAL] (-a) CAR SPEED SENSOR [SIG-SUDDEN TURN] (-b)											○			
	6	Steering angle sensor input is not present.	STEERING ANGLE SEN [NO ANG SIGNAL] (-a) STEERING ANGLE SEN [NO NEUT SIGNAL] (-b)													○	
	7		STEERING ANGLE SEN [NEUT SIG-360° OFF] (-c) STEERING ANGLE SEN [NEUT SIG-30° ON] (-d)														○
	8	Parking brake (AT) or clutch switch (MT) input is not present.	—														○
9	Inhibitor switch (AT) or neutral switch (MT) input is not present.	—															○

SUPER HICAS SYSTEM — Trouble Diagnoses

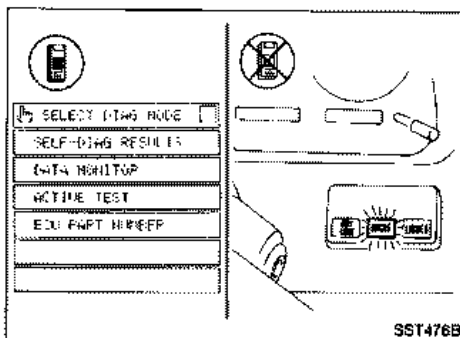
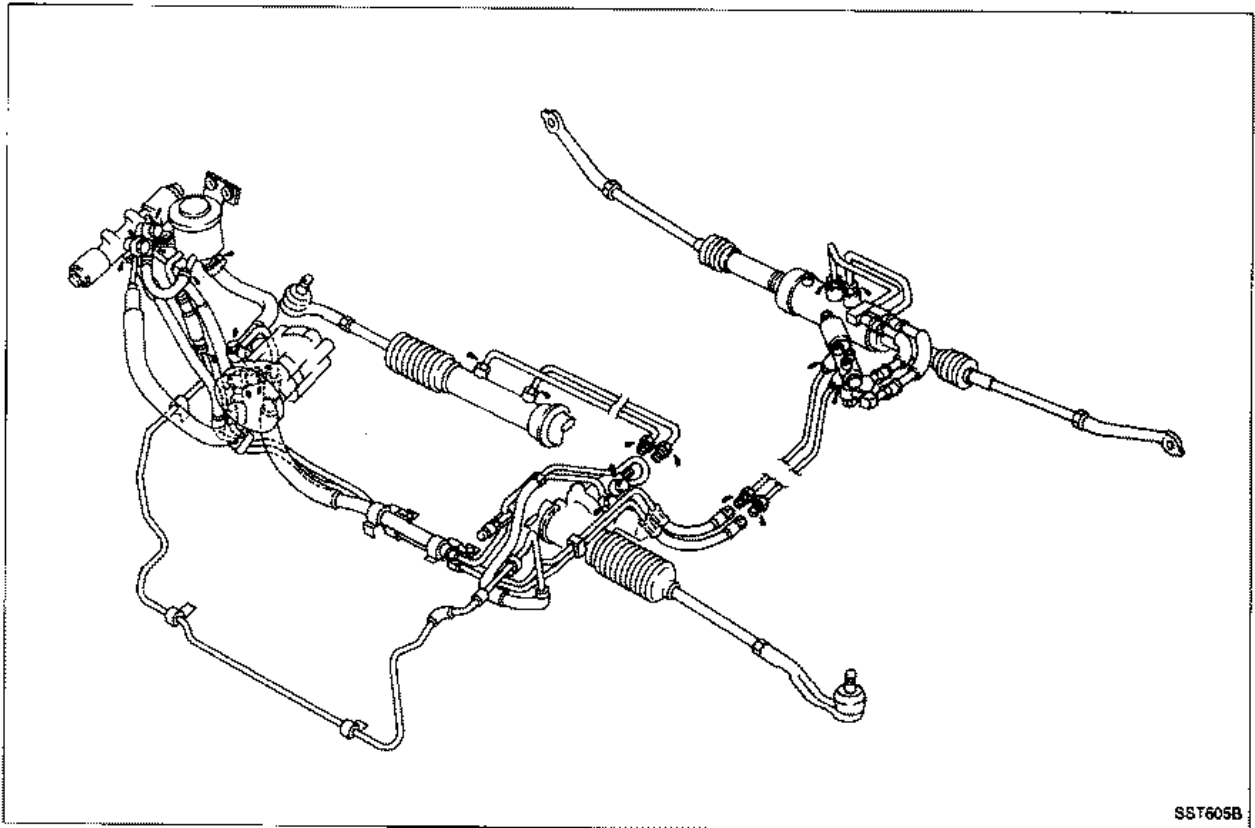


Preliminary Check

CHECK 1

Checking fluid level and fluid leakage

Refer to "SUPER HICAS SYSTEM — On-vehicle Inspection" on page ST-44.



CHECK 2

Perform self-diagnosis.

Refer to "Self-diagnosis" on page ST-70.

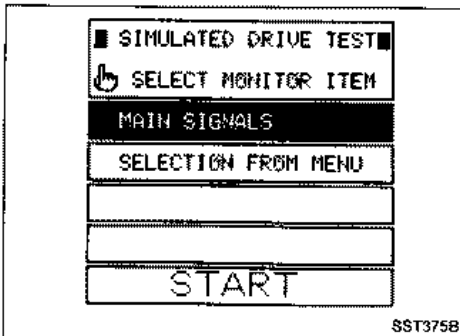
SUPER HICAS SYSTEM — Trouble Diagnoses

Preliminary Check (Cont'd)

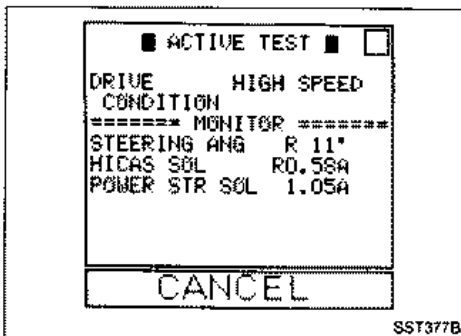
CHECK 3

Perform rear wheel action check.

When CONSULT is used: 

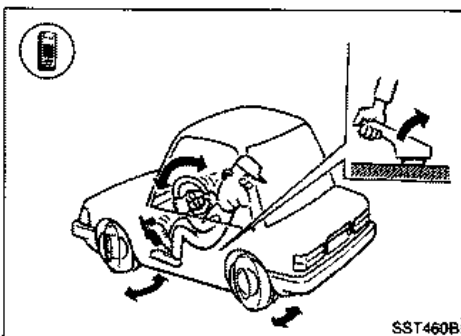


1. Have a helper sit in the driver's compartment, and raise vehicle.
(Use a two-pole lift or a center pole lift so that the four wheels are free to rotate.)
2. Connect CONSULT unit to diagnosis connector and start engine.
3. Touch "START" on CONSULT display.
4. Touch "HICAS", "ACTIVE TEST" and "SIMULATED DRIVE" in that order.
5. Touch "START" when "MAIN SIGNALS" display is reversed.



6. Touch "START".

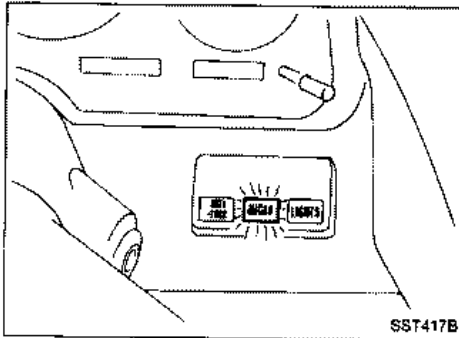
After simulated drive condition has continued for 5 minutes, it will automatically cancel and CONSULT unit will then show "TEST IS INTERRUPTED TO AVOID OIL TEMP RISE" display. To cancel this mode during self-diagnosis, simply touch "CANCEL".



7. While running engine at speeds greater than 2,000 rpm, turn steering wheel 180° to the left and right from the neutral position. Ensure that rear wheels steer in response to rotation of steering wheel.

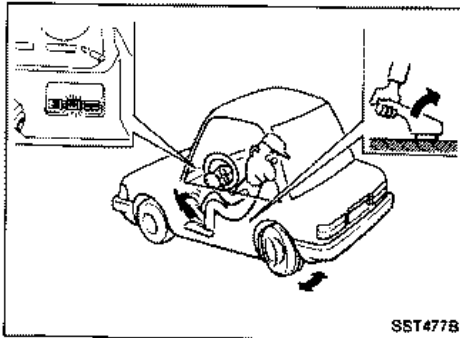
SUPER HICAS SYSTEM — Trouble Diagnoses

Preliminary Check (Cont'd)



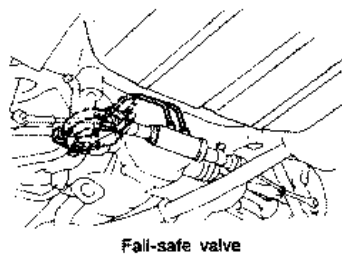
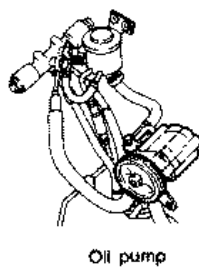
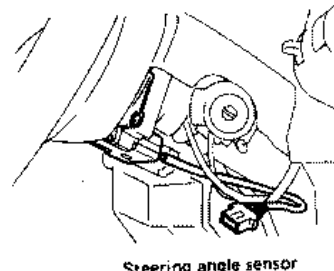
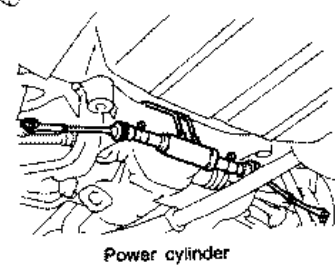
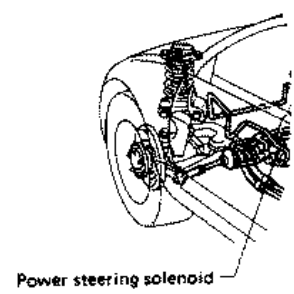
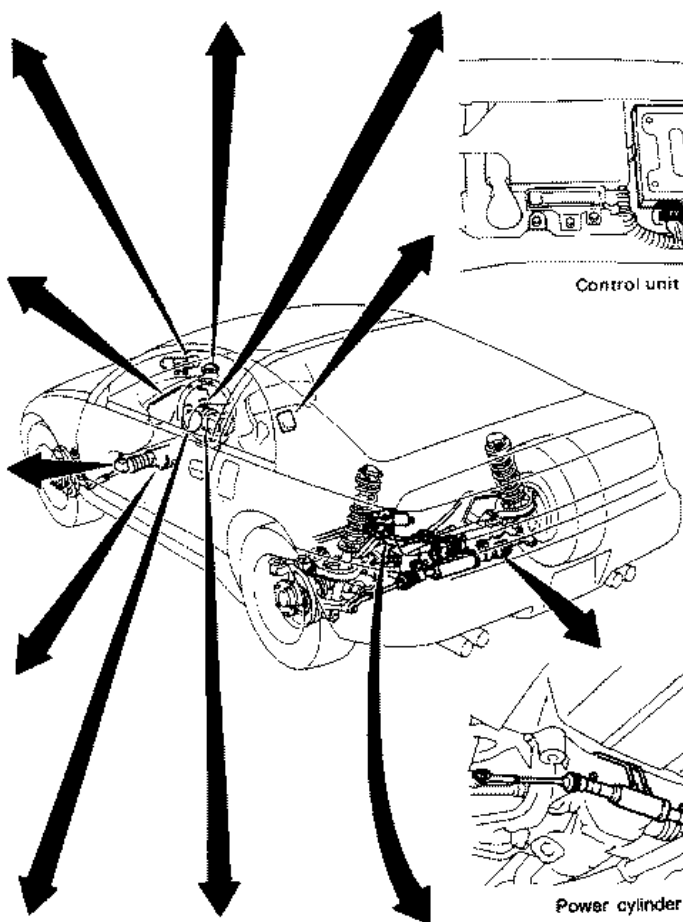
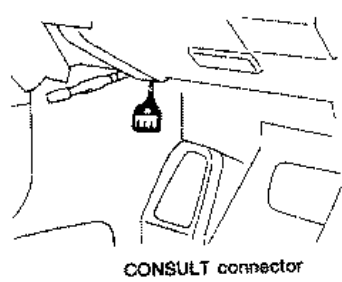
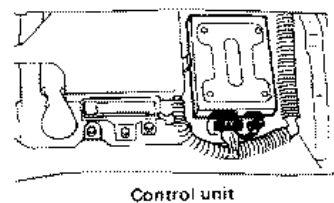
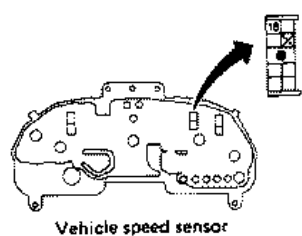
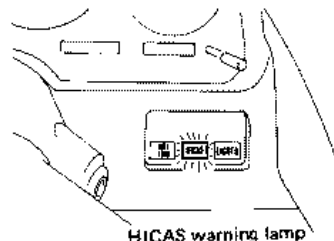
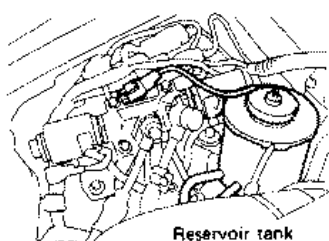
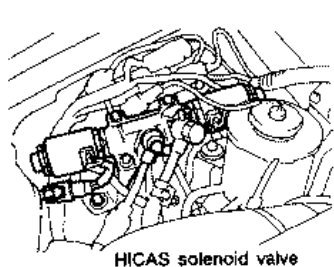
When CONSULT is not used: 

1. Have a helper sit in the driver's compartment and raise vehicle.
(Use a 2-pole lift or a center pole lift so that the four wheels are free to rotate.)
2. Set HICAS system in self-diagnosis mode.
 - (1) Turn ignition switch "OFF".
 - (2) Set shift lever to "P" or "N" position (A/T model), or "Neutral" position (M/T model).
 - (3) Turn ignition switch "ON".
 - (4) Immediately start engine.
 - (5) Turn steering wheel from left to right (at least 20° from the neutral position) 5 times or more, then depress foot brake pedal at least 5 times all within 10 seconds after ignition switch has been turned "ON".
3. Set steering wheel to a point approximately 10° from the neutral position and check to ensure that rear wheels turn to the left and right alternately.



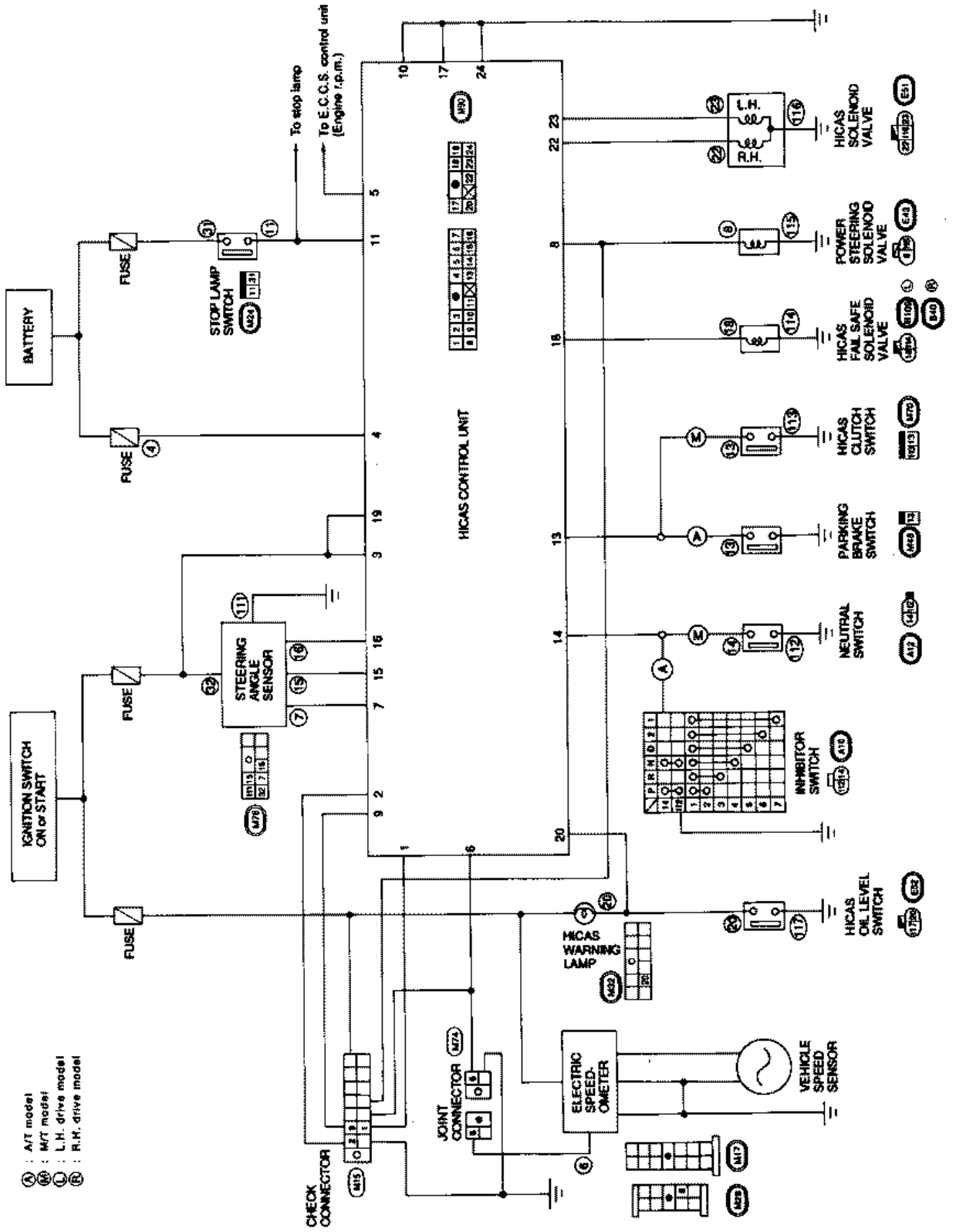
SUPER HICAS SYSTEM — Trouble Diagnoses

Component Parts and Harness Connector Location



SUPER HICAS SYSTEM — Trouble Diagnoses

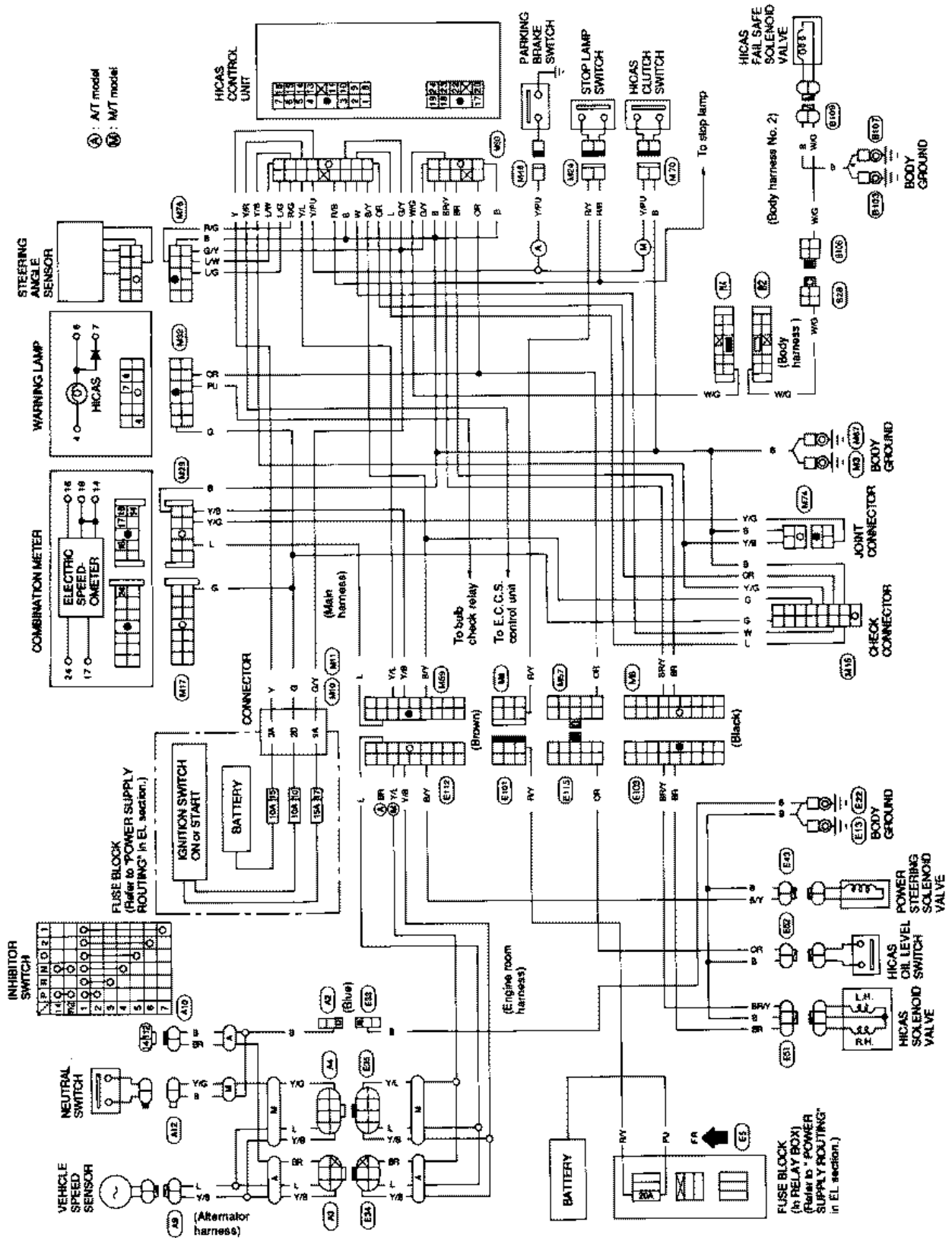
Circuit Diagram for Quick Pinpoint Check



SUPER HICAS SYSTEM — Trouble Diagnoses

Wiring Diagram

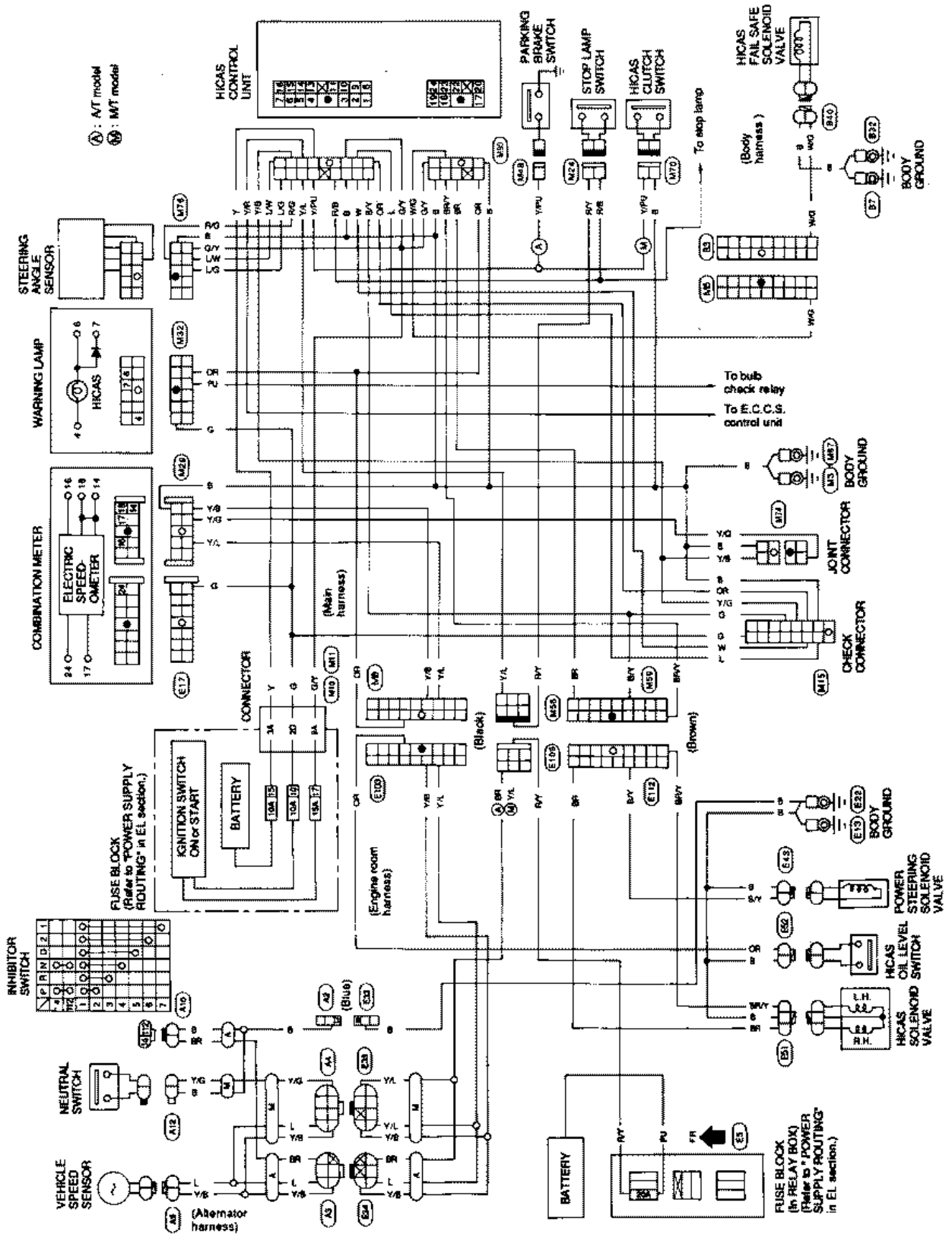
L.H.D. MODELS



SUPER HICAS SYSTEM — Trouble Diagnoses

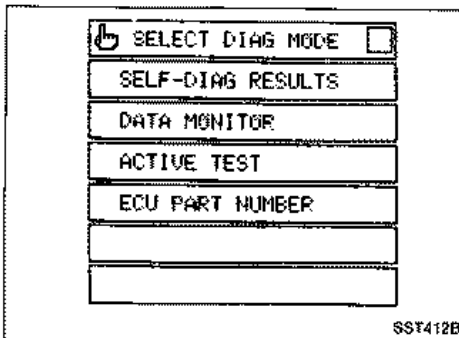
Wiring Diagram (Cont'd)

R.H.D. MODELS



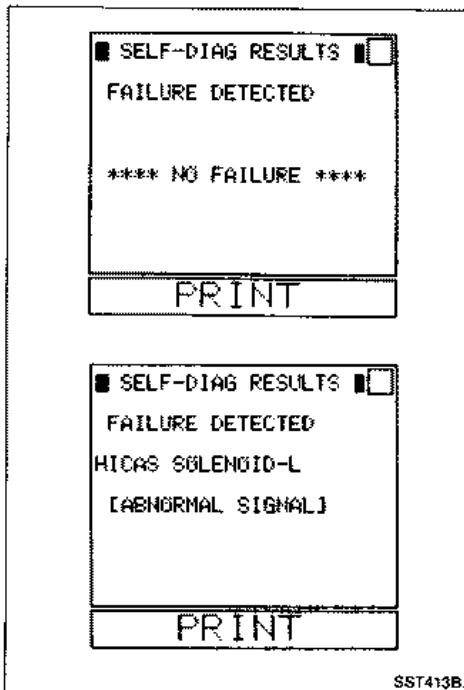
SST823B

SUPER HICAS SYSTEM — Trouble Diagnoses

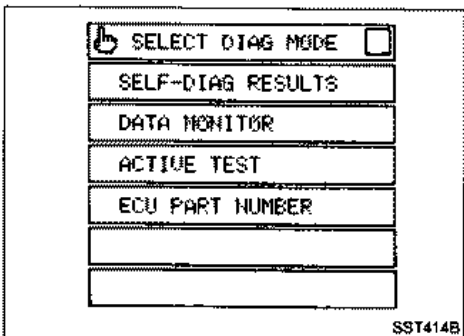


Self-diagnosis (When CONSULT is used)

- Start engine.
- Touch START (on CONSULT display).
- Touch HICAS.
- Touch SELF-DIAG RESULTS.



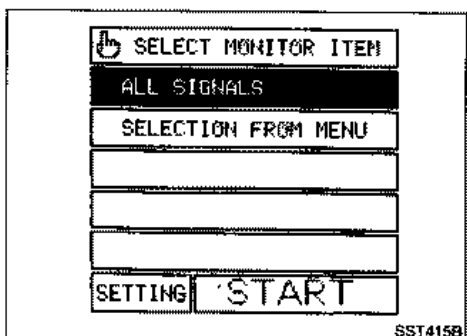
- Self-diagnostic results are shown on display. Refer to Table on page ST-71.



For reference:

Recording input/output signals using data monitor function

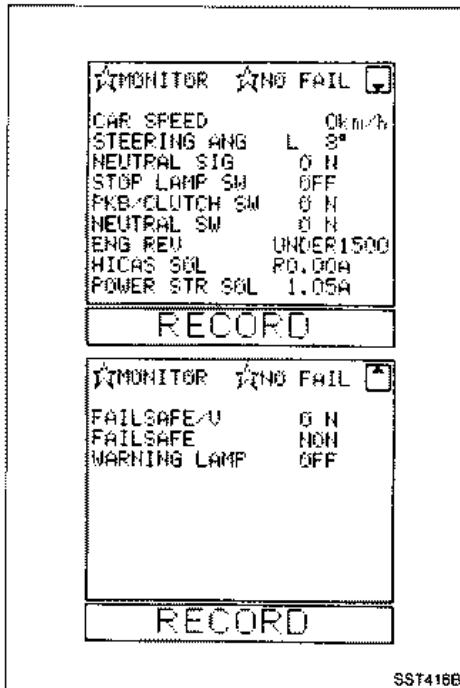
- Start engine.
- Touch START (on CONSULT display).
- Touch HICAS.
- Touch DATA MONITOR.



- Check to ensure that the ALL SIGNALS display is reversed. Touch START. Refer to Table on page ST-72.

SUPER HICAS SYSTEM — Trouble Diagnoses

Self-diagnosis (When CONSULT is used) (Cont'd)



- Touch RECORD to record data.
- Ensure that ON-OFF signal is produced when signal is entered from each sensor while monitoring.

To cancel data recording during operation, touch CANCEL.

Self-diagnosis items

Diagnostic item	Description	Remarks
****NO FAILURE****	● No failure has been detected.	
VEHICLE SPEED SENSOR [NO SIGNAL] (-a)	● No vehicle speed signal is entered after vehicle has been operated.	
VEHICLE SPEED SENSOR [SIG-SUDDEN TURN] (-b)	● Vehicle speed signal abruptly changes during operation.	
STEERING ANGLE SEN [NO ANG SIGNAL] (-a)	● Steering angle has not been changed while driving at a speed of at least 60 km/h (37 MPH).	
STEERING ANGLE SEN [NO NEUT SIGNAL] (-b)	● Neutral (ON) signal is not entered after vehicle has been driven.	
STEERING ANGLE SEN [NEUT SIG-360° OFF] (-c)	● Neutral (ON) signal is not entered even after steering wheel has been turned at least 360°.	
STEERING ANGLE SEN [NEUT SIG-30° ON] (-d)	● Neutral (ON) signal is continually shown at steering angle of at least 30°.	
FAILSAFE VALVE [ABNORMAL SIGNAL]	● Output terminal voltage is abnormal due to broken or shorted HICAS fail-safe valve circuit.	
HICAS SOLENOID-R [ABNORMAL SIGNAL]	● Output terminal voltage is abnormal due to broken or shorted HICAS solenoid valve (RH) circuit.	
HICAS SOLENOID-L [ABNORMAL SIGNAL]	● Output terminal voltage is abnormal due to broken or shorted HICAS solenoid valve (LH) circuit.	
POWER STEERING SOL [ABNORMAL SIGNAL]	● Output terminal voltage is abnormal due to broken or shorted power steering solenoid valve circuit.	

SUPER HICAS SYSTEM — Trouble Diagnoses

Self-diagnosis (When CONSULT is used) (Cont'd)

Data monitoring items

○: Standard
△: Optional selection

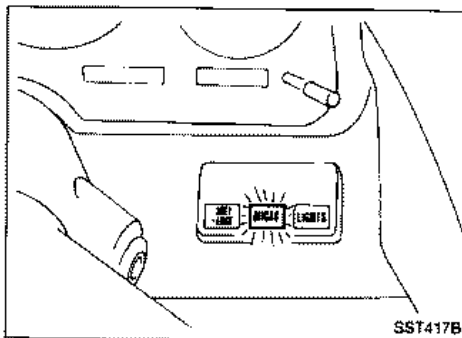
Item	Monitor item selection		Remarks
	All items	Item menu	
Vehicle speed sensor (km/h)	○	△	—
Steering angle sensor (deg)	○	△	Abnormal value is shown before straight-ahead position ("0") is set and after battery is disconnected and reconnected.
Neutral signal (ON-OFF display)	○	△	—
Stop lamp switch signal (ON-OFF display)	○	△	—
Parking brake/Clutch switch (ON-OFF display)	○	△	Clutch switch signal for M/T model and parking brake switch signal for A/T model.
Neutral switch (ON-OFF display)	○	△	Neutral switch signal for M/T model and inhibitor relay (N or P) signal for A/T model.
Engine rpm ("OVER 1,500" or "UNDER 1,500" is shown.)	○	△	Engine speed greater than/less than 1,500 rpm is shown.
HICAS solenoid valve (R/L) (A)	○	△	Controlled current flow from control unit to HICAS solenoid valve and direction of current control are shown.
Power steering solenoid valve (A)	○	△	Controlled current flow from control unit to power steering solenoid valve is shown.
Fail-safe valve (ON-OFF display)	○	△	ON (when connected) or OFF (when disconnected) is shown.
Fail-safe system (CUT-NON display)	○	△	NON (fail-safe valve ON) referring to "normal" conditioner CUT (fail-safe valve OFF) when in "fail-safe" condition are shown.
Warning lamp (ON-OFF display)	○	△	Illumination control of control unit's HICAS warning lamp is shown.
■ Voltage (V)	—	△	Voltage measured with voltage probes is shown.
■ Pulse (ms, Hz or)	—	△	Value measured with pulse probes is shown. If pulse cannot be measured, "#" is down. "#" is also shown at left of final data until measurement results are determined.

SUPER HICAS SYSTEM — Trouble Diagnoses

Self-diagnosis (When CONSULT is not used)

SELF-DIAGNOSIS PROCEDURES

1. Input starting conditions for self-diagnosis.
 - (1) Turn ignition switch "OFF".
 - (2) Set shift lever to "P" or "N" position (A/T model), or "Neutral" position (M/T model).
 - (3) Turn ignition switch "ON".
 - (4) Immediately start engine.
 - (5) Turn steering wheel from left to right (at least 20° from the neutral position) 5 times or more, then depress foot brake pedal at least 5 times all within 10 seconds after ignition switch has been turned "ON".
2. Input self-diagnosis item.
 - (1) Depress and release foot brake pedal.
 - (2) Turn steering wheel from left to right (at least 20°) from the neutral position.
 - (3) (M/T model)
Depress clutch pedal and move gear shift lever to any position other than Neutral and return to Neutral. Release clutch pedal.
(A/T model)
Disengage and engage parking brake lever. Move shift lever to any position other than Neutral or Parking and return to Parking.
 - (4) Move car at least 3 meters (10 ft) forward and proceed at an indicated speed of at least 2 km/h (1 MPH) in self-diagnosis mode.



3. The self-diagnosis mode will then appear in the "HICAS" warning lamp.

When all systems are normal:

HICAS warning lamp flashes at 0.25-second intervals.

SUPER HICAS SYSTEM — Trouble Diagnoses

Self-diagnosis (When CONSULT is not used) (Cont'd)

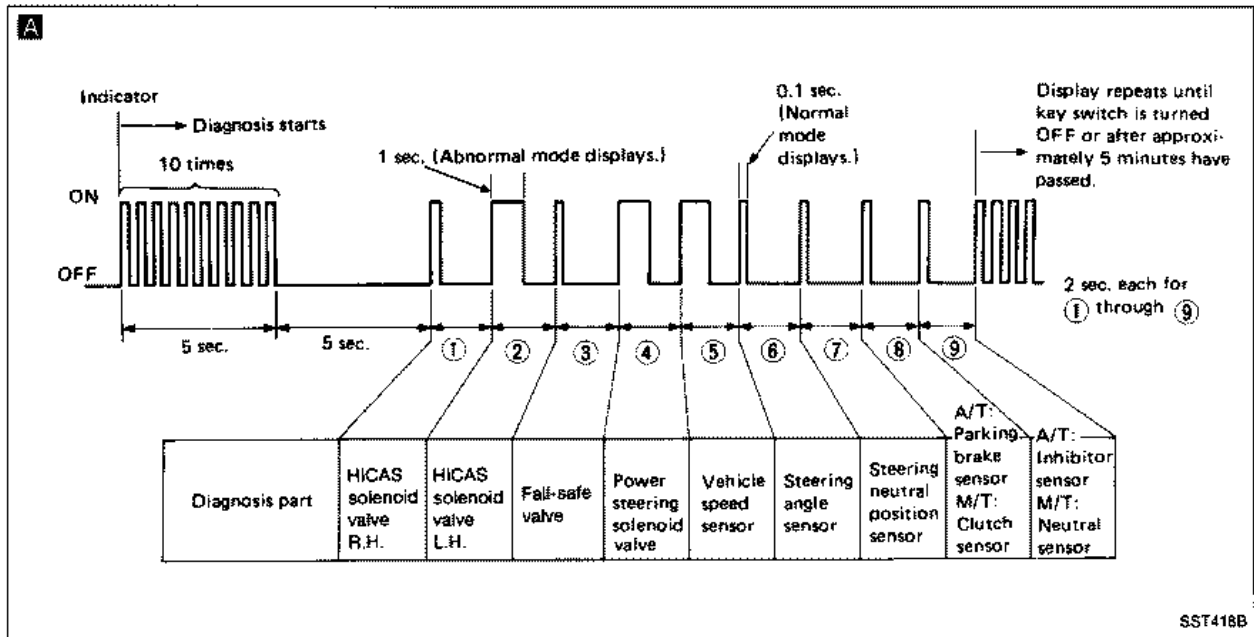
When there is a system malfunction:

Example: When ② HICAS solenoid valve LH, ④ power steering solenoid valve and ⑤ vehicle speed sensor have experienced a malfunction.

The warning lamp displays abnormal mode (1 sec. ON).

A If fail-safe system was operated (fail-safe valve is operating) when ignition switch was turned OFF for the last time, fail-safe items will be displayed in numerical order in modes indicated. After all items are displayed, display is repeated again.

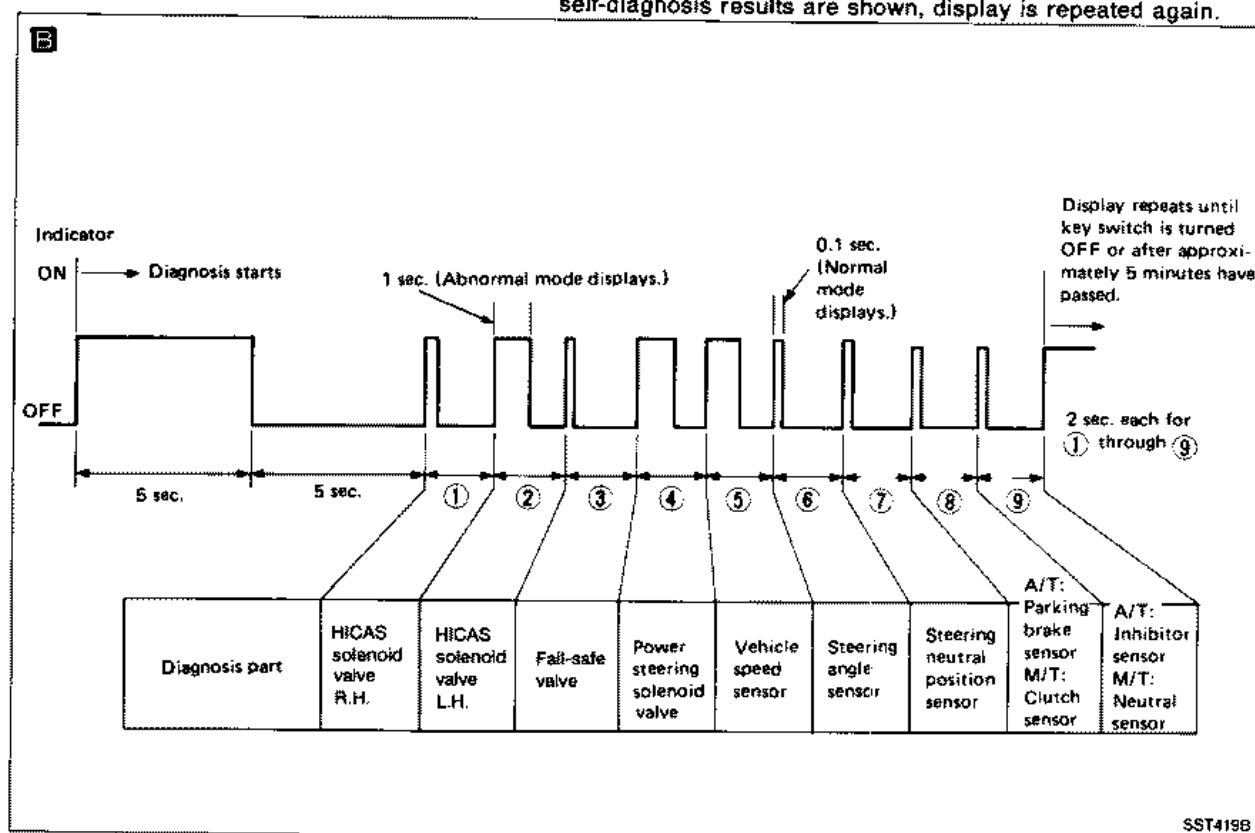
- To change the display mode to **A**, turn OFF ignition switch after mode **B** is displayed.
- When battery charge is insufficient, mode **B** is displayed.



SUPER HICAS SYSTEM — Trouble Diagnoses

Self-diagnosis (When CONSULT is not used) (Cont'd)

- If fail-safe system was not operated when ignition switch was turned OFF for the last time, display will show self-diagnosis results in numerical sequence in modes indicated below. After all self-diagnosis results are shown, display is repeated again.

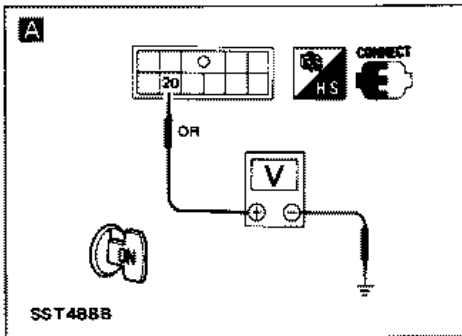
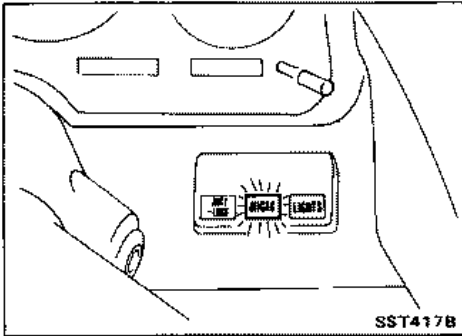


CANCELING THE SELF-DIAGNOSIS FUNCTION

There are three methods for canceling the self-diagnosis function, as described below:

- The self-diagnosis system is canceled by the turning ignition switch "OFF".
- After self-diagnosing has been operated for approximately 5 minutes, the self-diagnosis system will be automatically canceled.
- The self-diagnosis system is canceled by a vehicle speed of 30 km/h (19 MPH) or over.

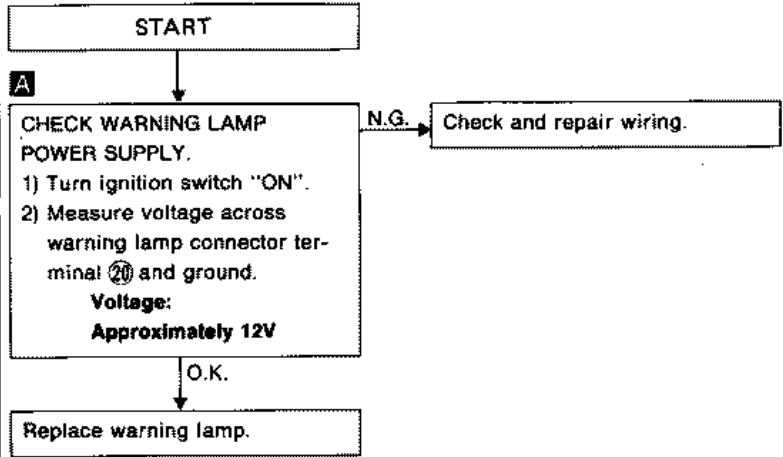
SUPER HICAS SYSTEM — Trouble Diagnoses



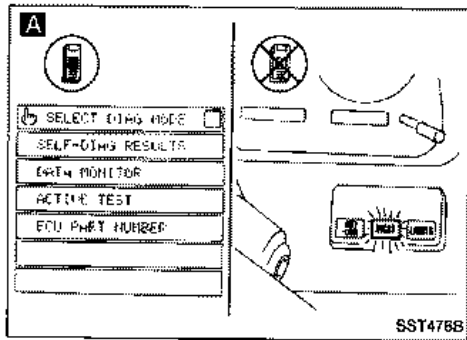
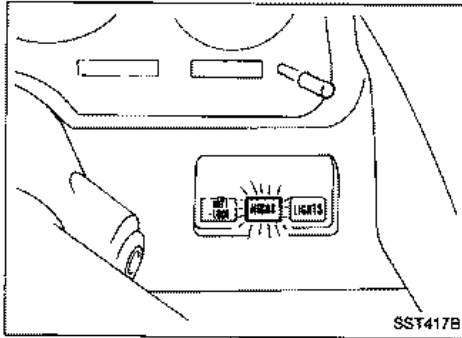
Diagnostic Procedure 1

SYMPTOM:

No warning lamp comes on when ignition switch is turned "ON".



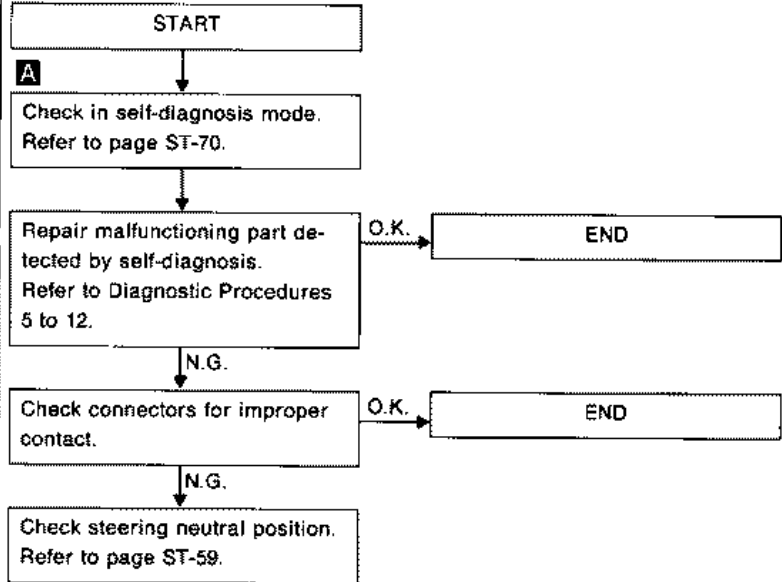
SUPER HICAS SYSTEM — Trouble Diagnoses



Diagnostic Procedure 2

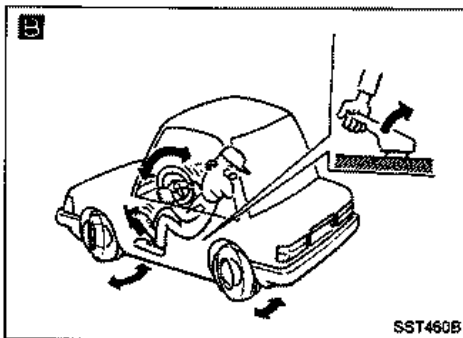
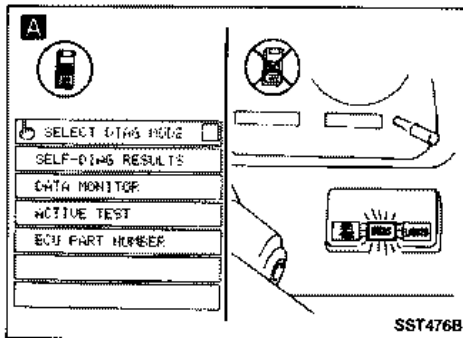
SYMPTOM (A):

Warning lamp comes on during operation.



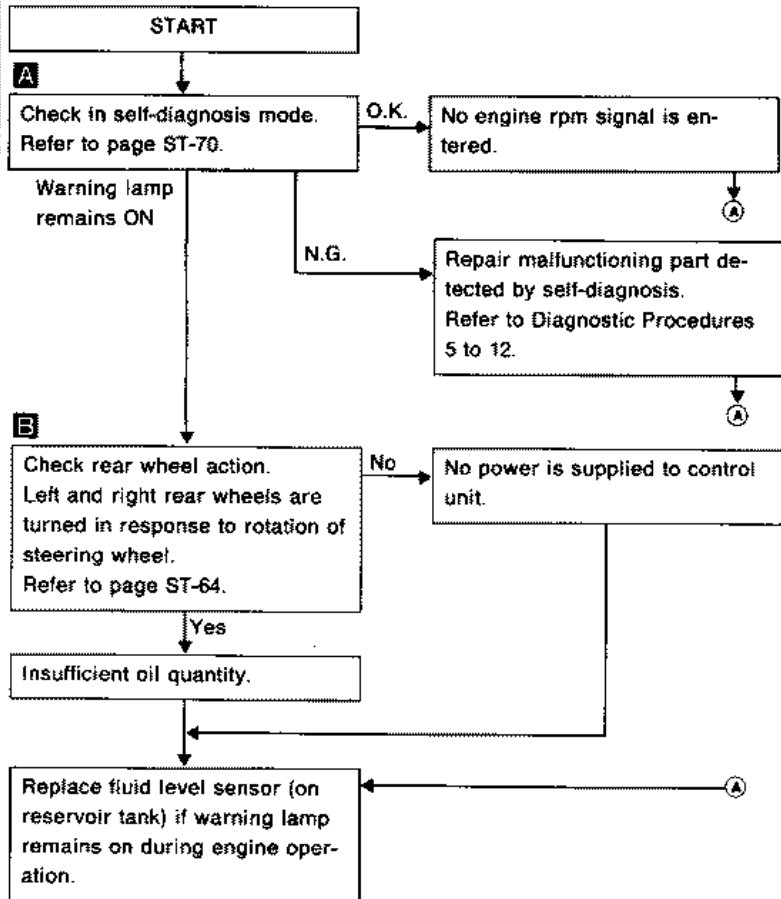
SUPER HICAS SYSTEM — Trouble Diagnoses

Diagnostic Procedure 2 (Cont'd)

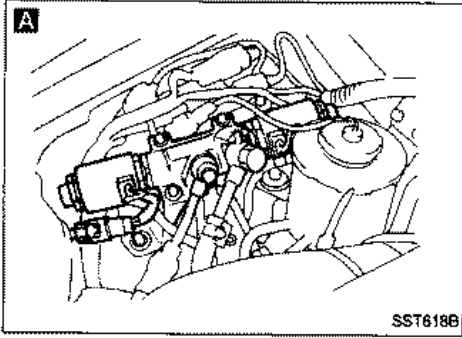


SYMPTOM (B):

Warning lamp comes on when ignition switch is turned ON; however, it does not go out after engine start.

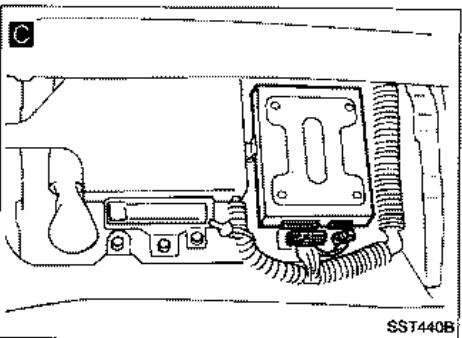
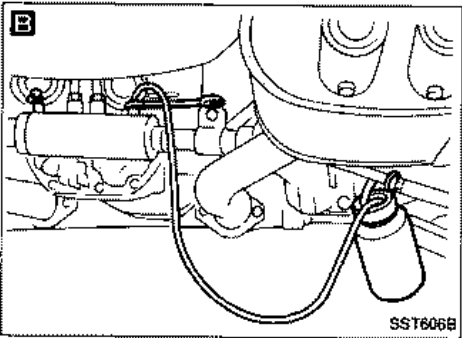
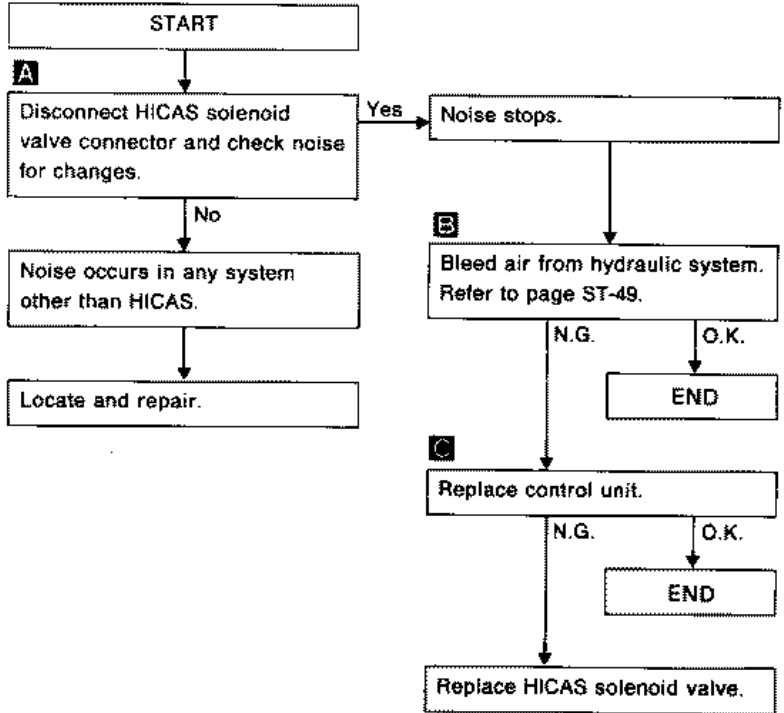


SUPER HICAS SYSTEM — Trouble Diagnoses

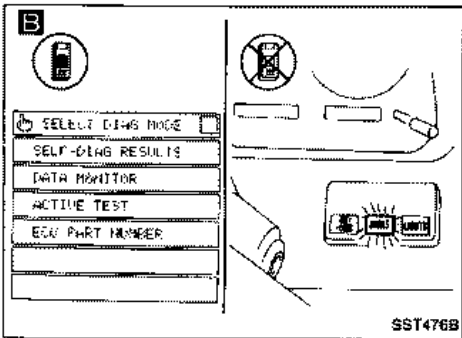
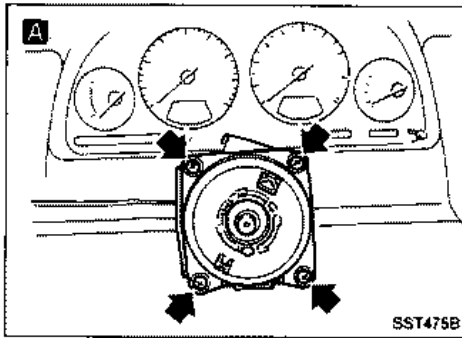


Diagnostic Procedure 3

SYMPTOM:
Abnormal noise occurs.



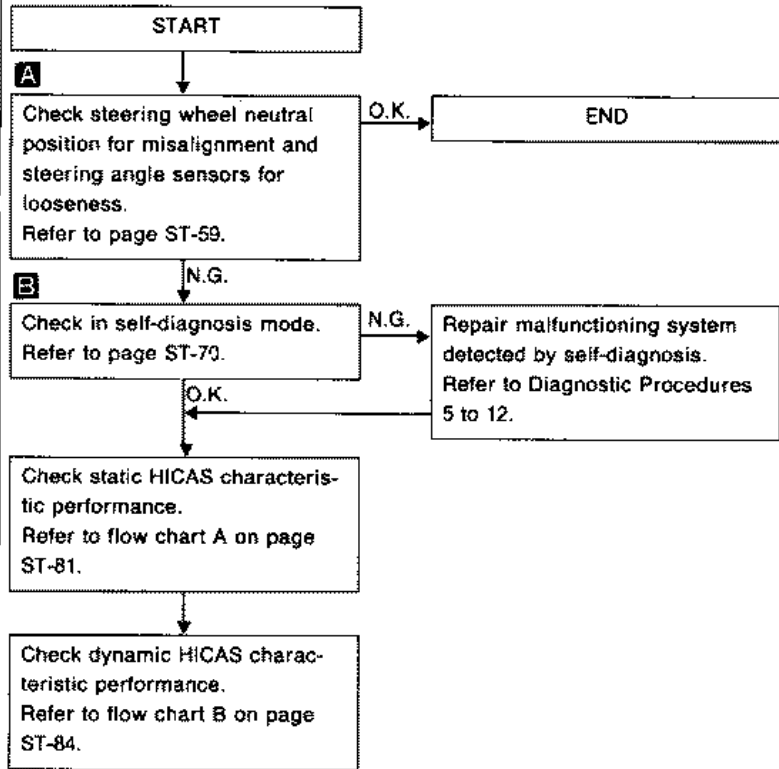
SUPER HICAS SYSTEM — Trouble Diagnoses



Diagnostic Procedure 4

SYMPTOM:

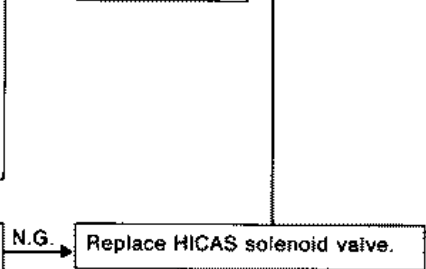
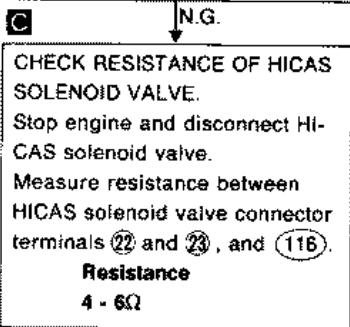
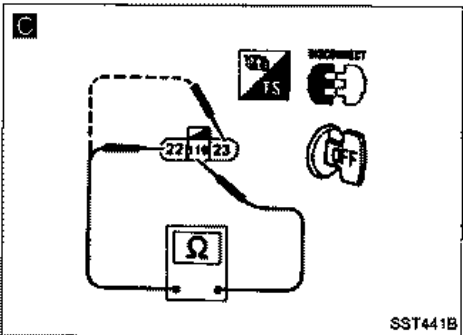
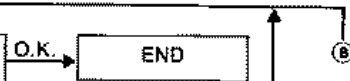
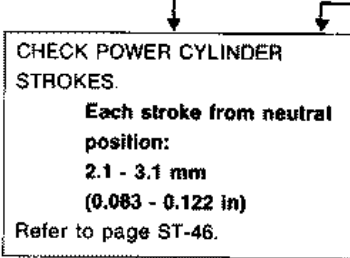
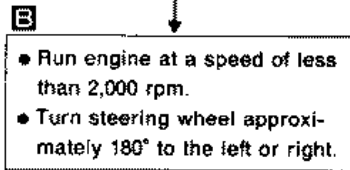
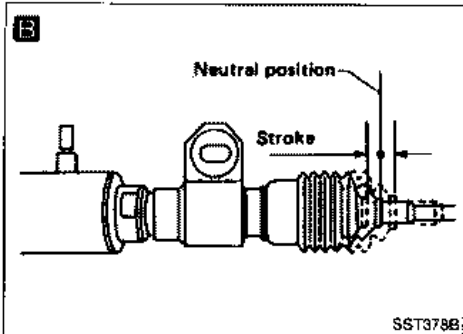
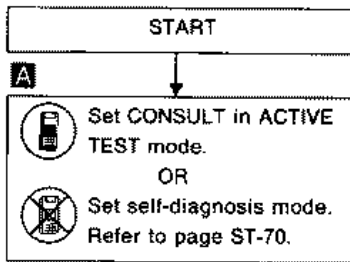
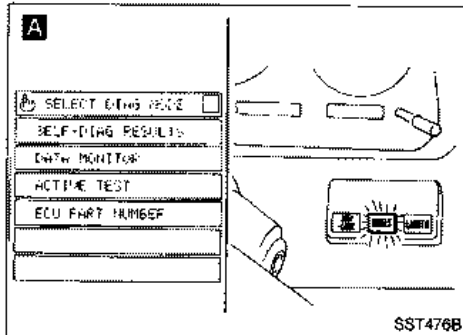
Vehicle behavior is abnormal. (Vehicle sways or jerks.)



SUPER HICAS SYSTEM — Trouble Diagnoses

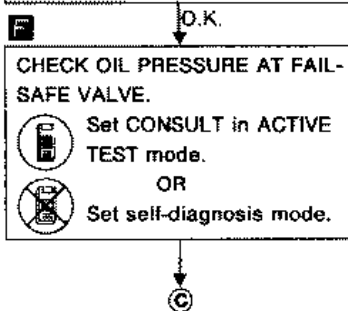
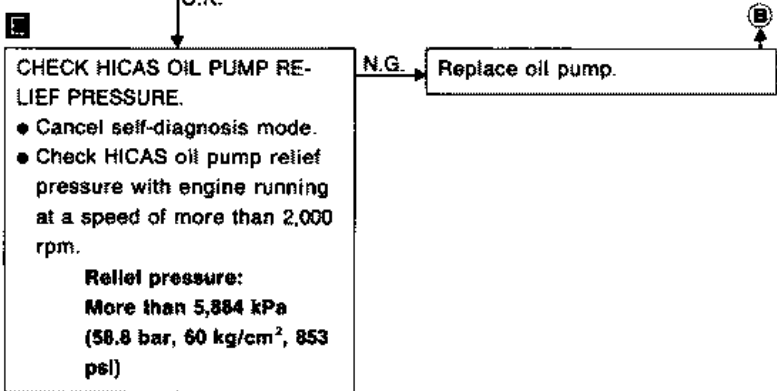
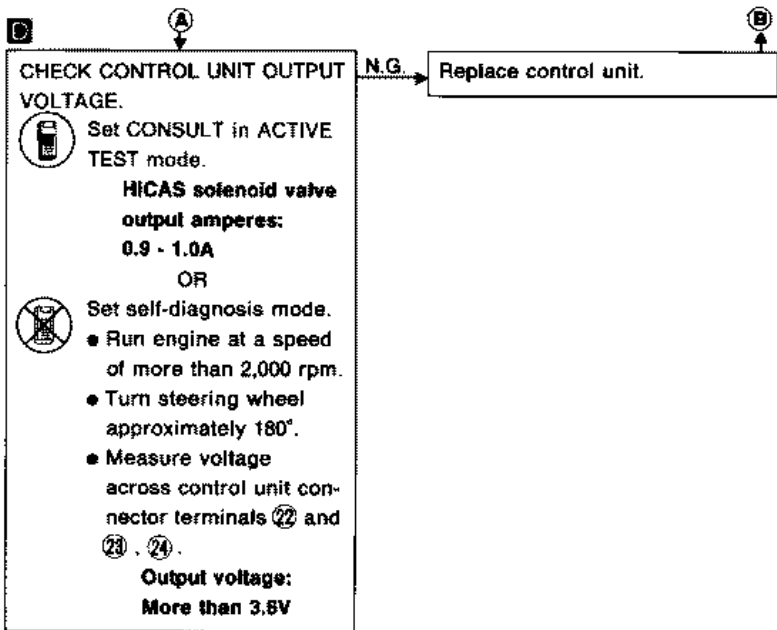
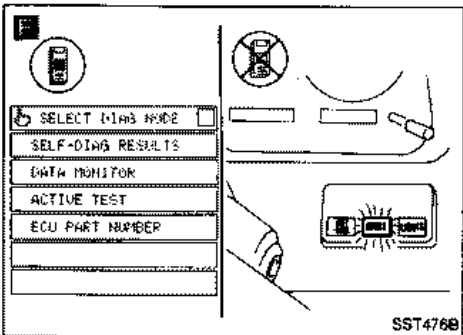
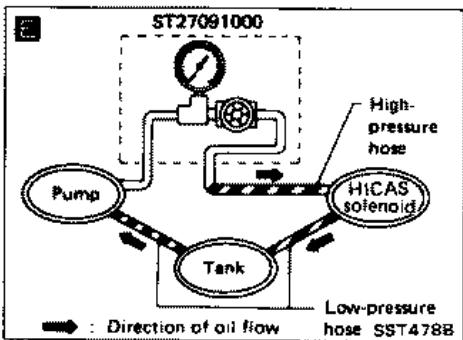
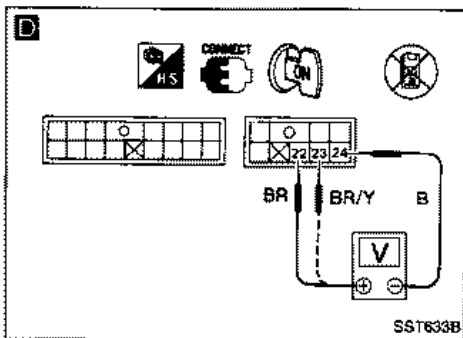
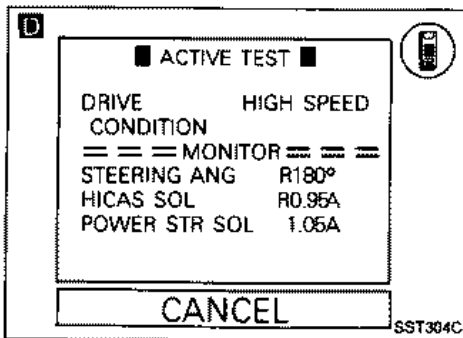
Diagnostic Procedure 4 (Cont'd)

A. Static HICAS characteristic performance check



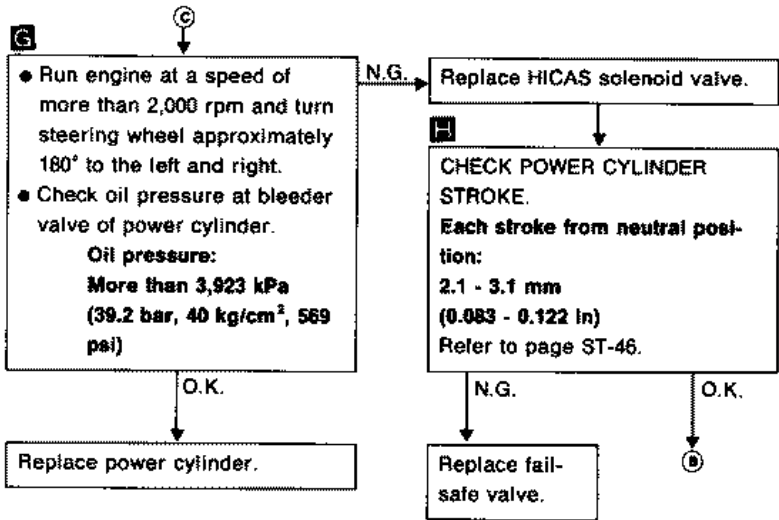
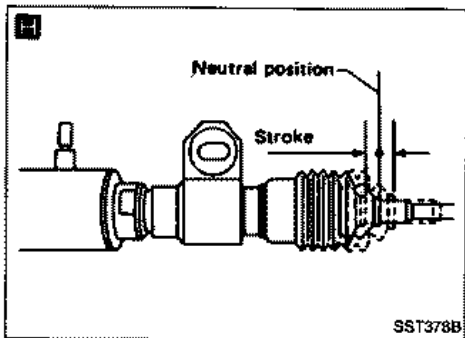
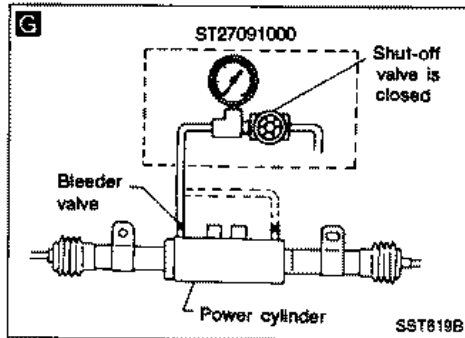
SUPER HICAS SYSTEM — Trouble Diagnoses

Diagnostic Procedure 4 (Cont'd)



SUPER HICAS SYSTEM — Trouble Diagnoses

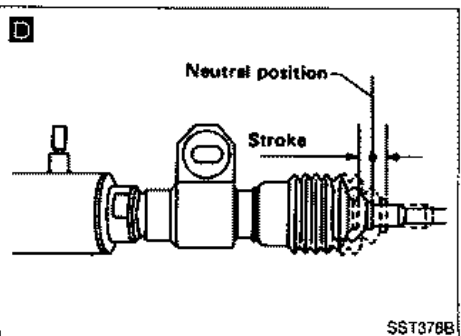
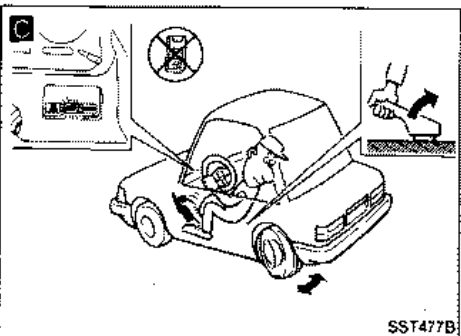
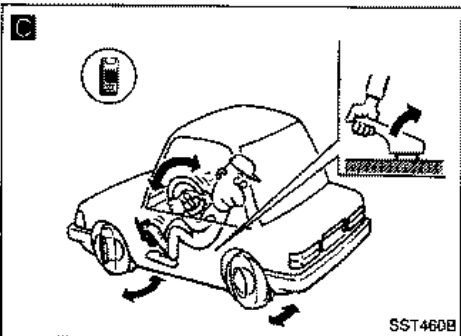
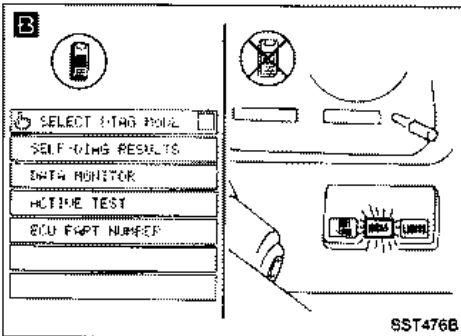
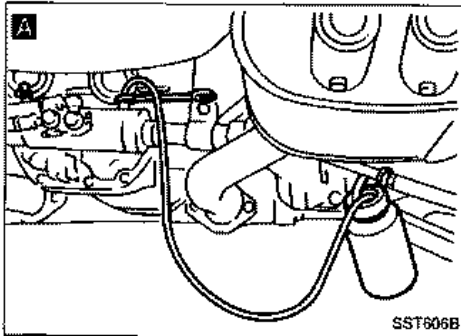
Diagnostic Procedure 4 (Cont'd)



SUPER HICAS SYSTEM — Trouble Diagnoses

Diagnostic Procedure 4 (Cont'd)

B. Dynamic HICAS characteristic performance check



START

A CHECK PIPING AND CONNECTIONS. ALSO BLEED AIR FROM HYDRAULIC SYSTEM.

- Replace piping or connectors which are found to be damaged.
- Bleed air from hydraulic system.

Refer to page ST-49.

B Set CONSULT in ACTIVE TEST mode.
OR
Set in self-diagnosis mode.
Refer to page ST-70.

Run engine at a speed of more than 2,000 rpm.

C CHECK REAR WHEELS FOR PROPER MOVEMENT.

- Ensure that rear wheel turns to the left or right when steering wheel is turned to the left or right.
- OR
- Ensure that rear wheels intermittently turn to the left and right when steering wheel is set to the neutral position.

D CHECK POWER CYLINDER STROKES.

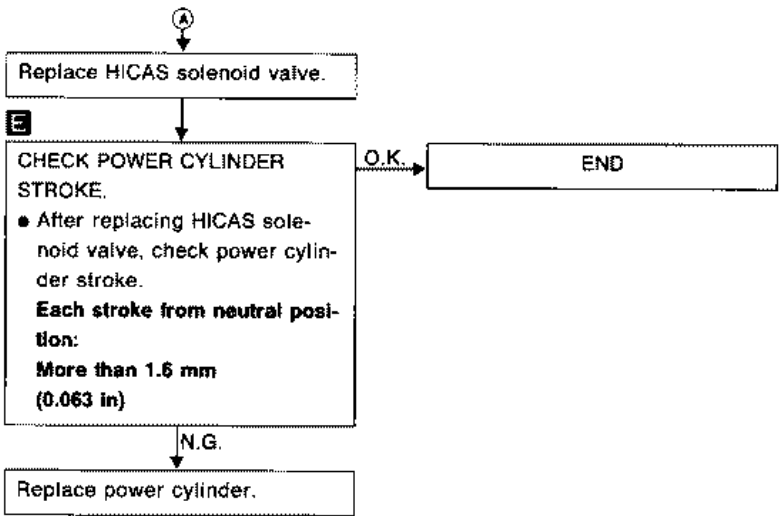
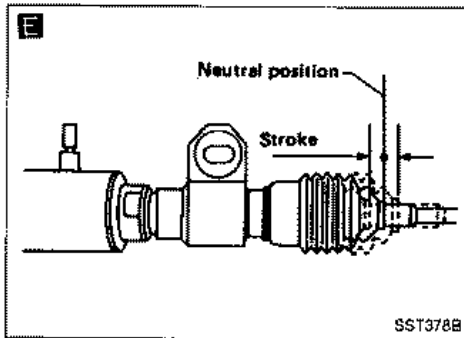
Each stroke from neutral position:
More than 1.5 mm (0.063 in)

O.K. → END

N.G. → A

SUPER HICAS SYSTEM — Trouble Diagnoses

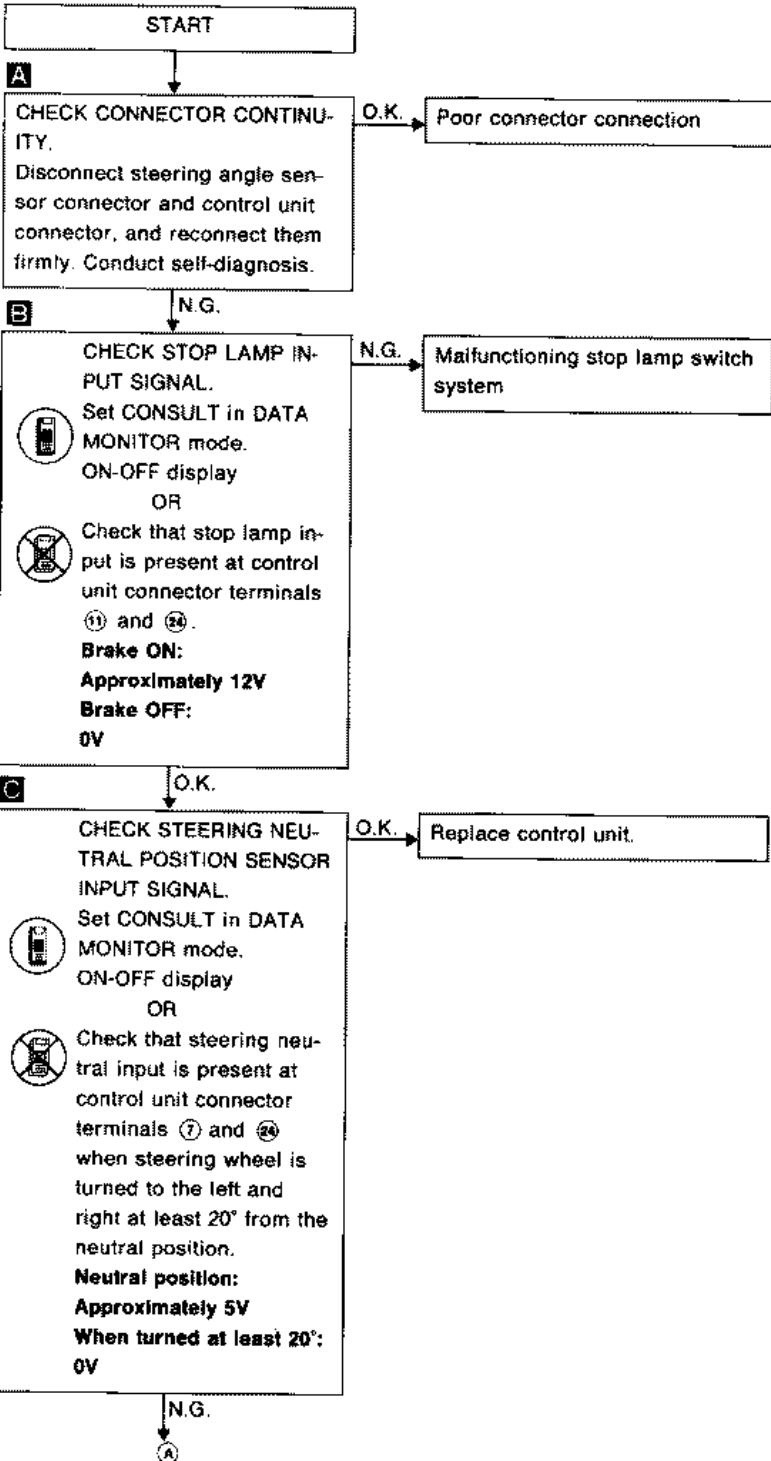
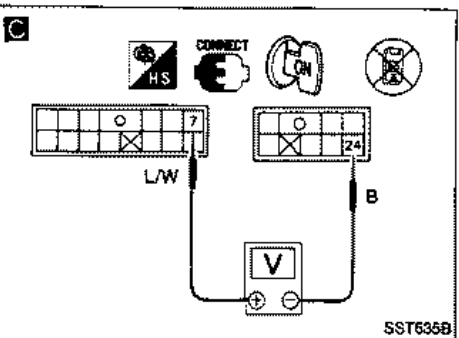
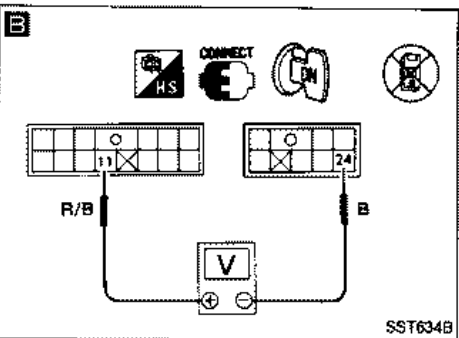
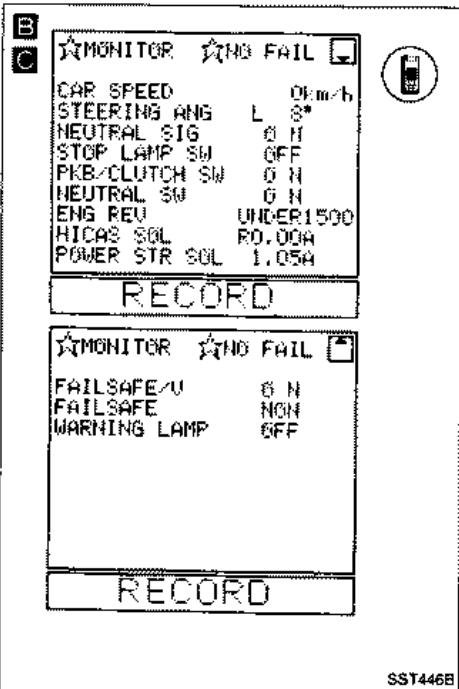
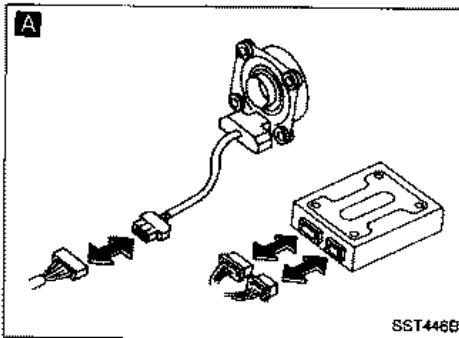
Diagnostic Procedure 4 (Cont'd)



SUPER HICAS SYSTEM — Trouble Diagnoses

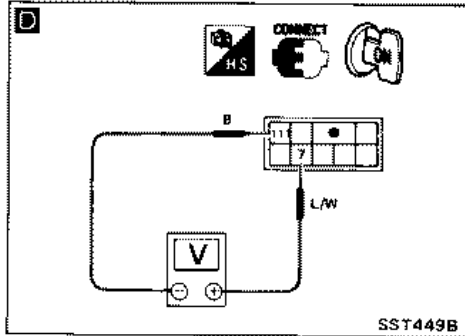
Diagnostic Procedure 5

SYMPTOM:
System is not set in self-diagnosis mode.



SUPER HICAS SYSTEM — Trouble Diagnoses

Diagnostic Procedure 5 (Cont'd)



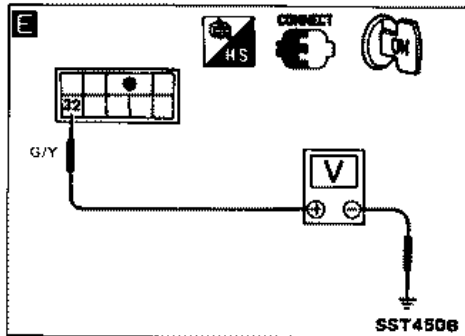
D CHECK STEERING NEUTRAL POSITION SENSOR OUTPUT SIGNAL.

Check that steering neutral output is present at steering angle sensor connector terminals (7) and (11) when steering wheel is turned to the left and right at least 20° from the neutral position.

Neutral position:
Approximately 5V
When turned at least 20°:
0V

O.K. → Repair or replace harness between control unit and steering angle sensor.

N.G.



E CHECK STEERING ANGLE SENSOR POWER SUPPLY.

- 1) Turn ignition switch "ON".
- 2) Measure voltage across steering angle sensor connector terminal (22) and ground.

Voltage:
Approximately 12V

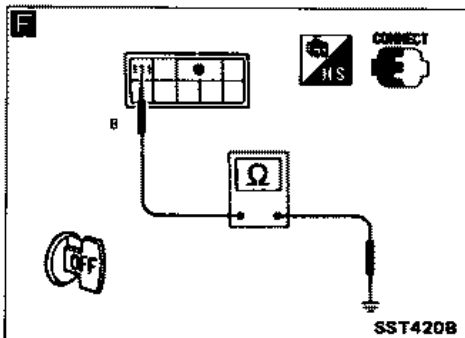
F CHECK STEERING ANGLE SENSOR GROUND CIRCUIT.

Check continuity between steering angle sensor connector terminal (11) and ground.

Continuity should exist.

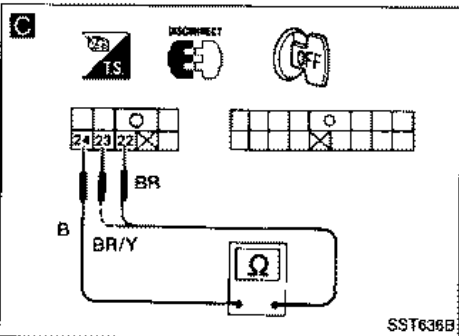
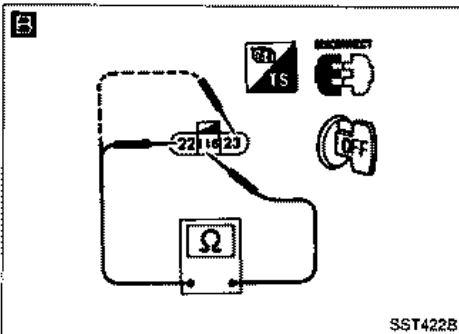
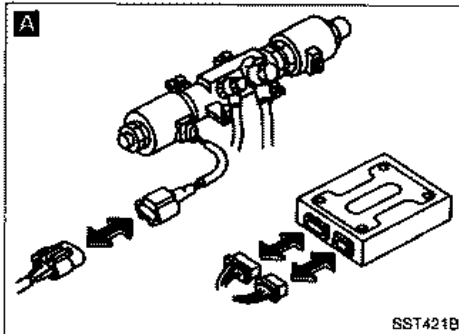
O.K. → Replace steering angle sensor.

N.G.



Check and repair power supply harness or ground harness.

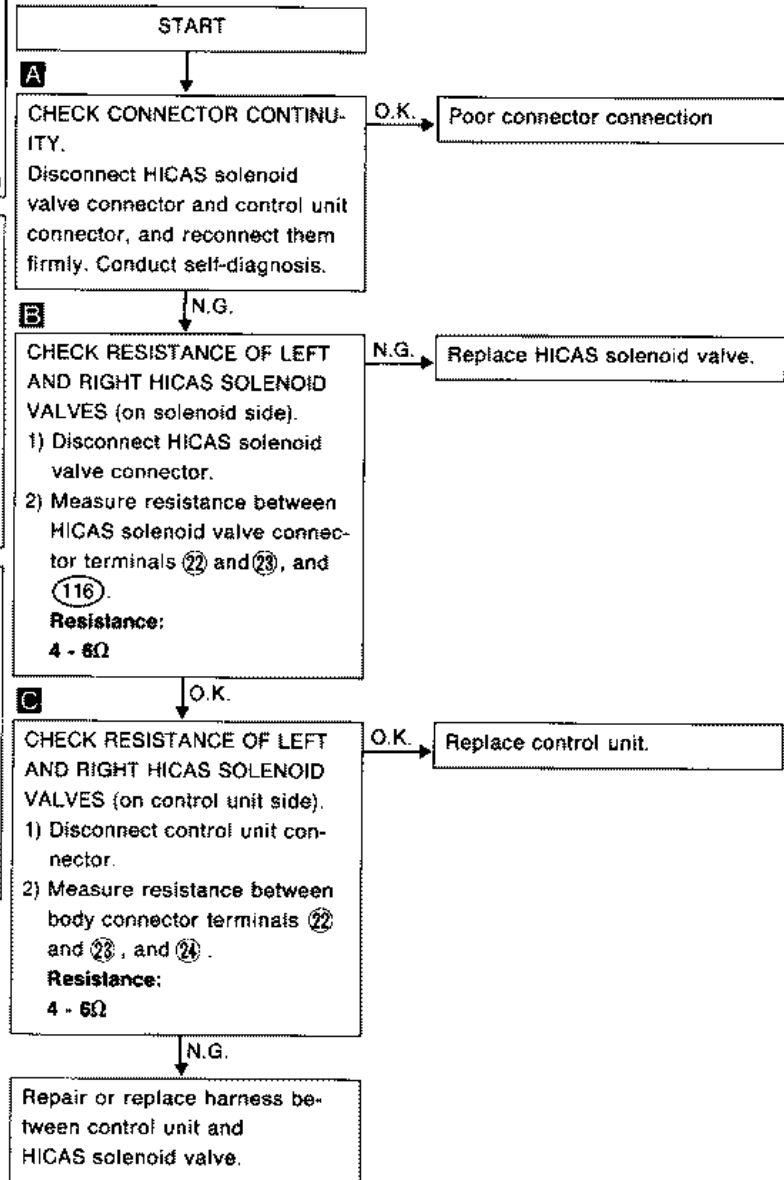
SUPER HICAS SYSTEM — Trouble Diagnoses



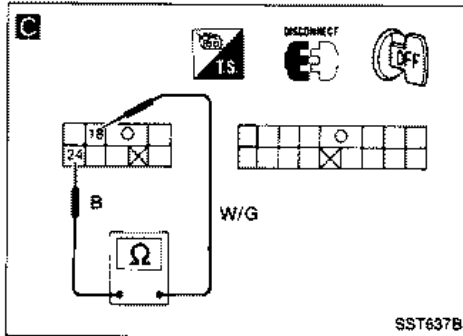
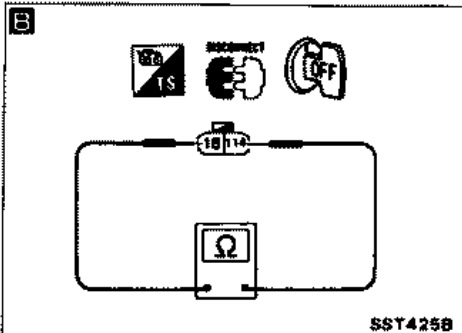
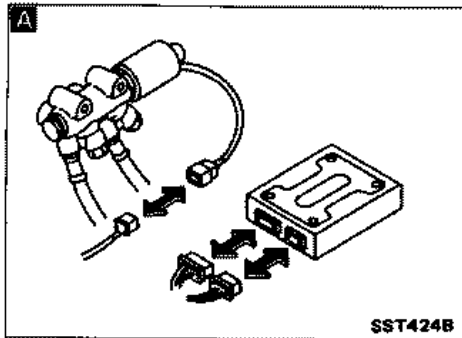
Diagnostic Procedure 6

SYMPTOM:

HICAS solenoid valve (left and right) output is not present.



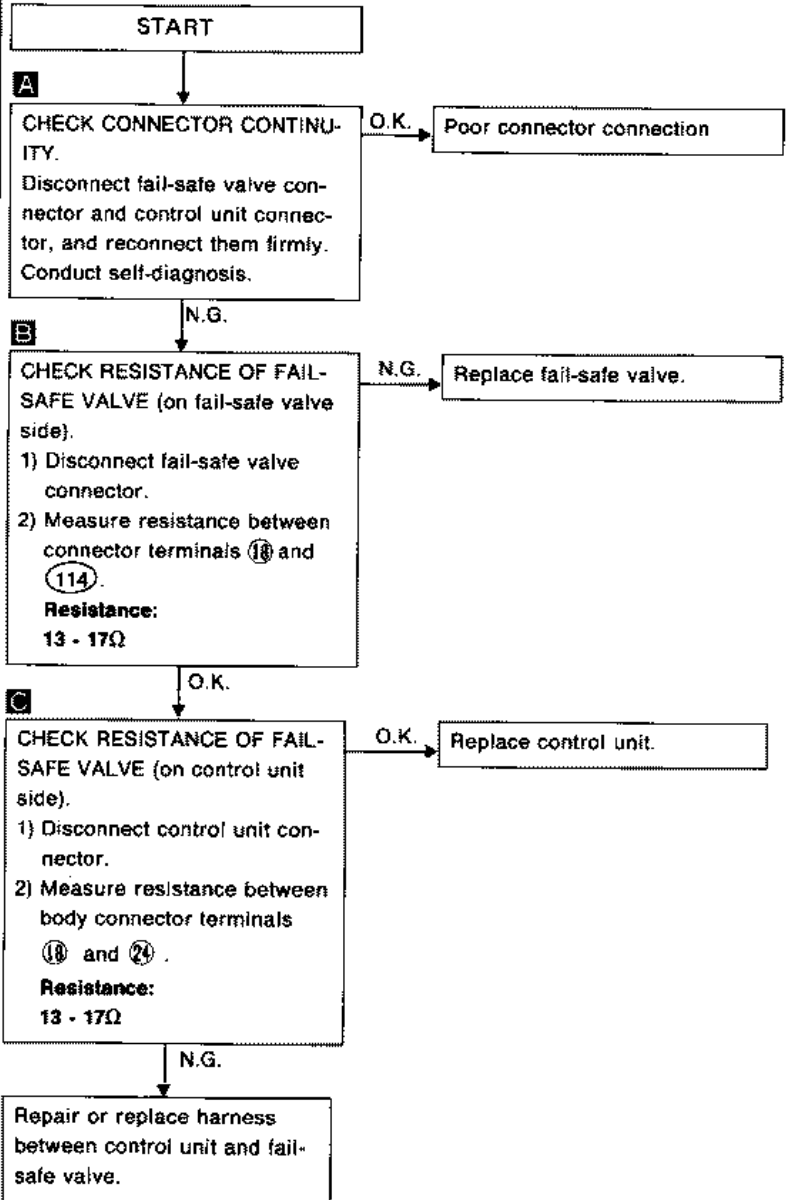
SUPER HICAS SYSTEM — Trouble Diagnoses



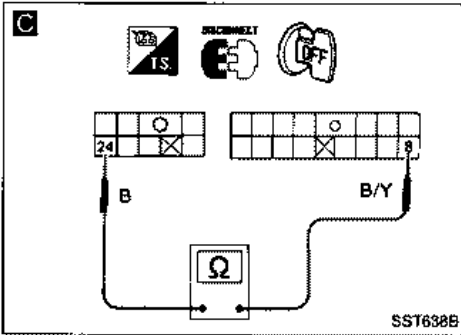
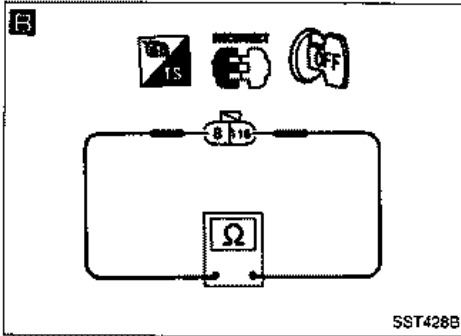
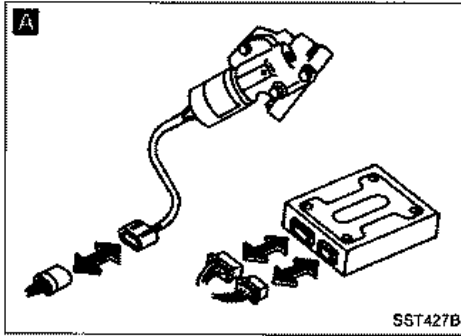
Diagnostic Procedure 7

SYMPTOM:

Fail-safe valve output is not present.



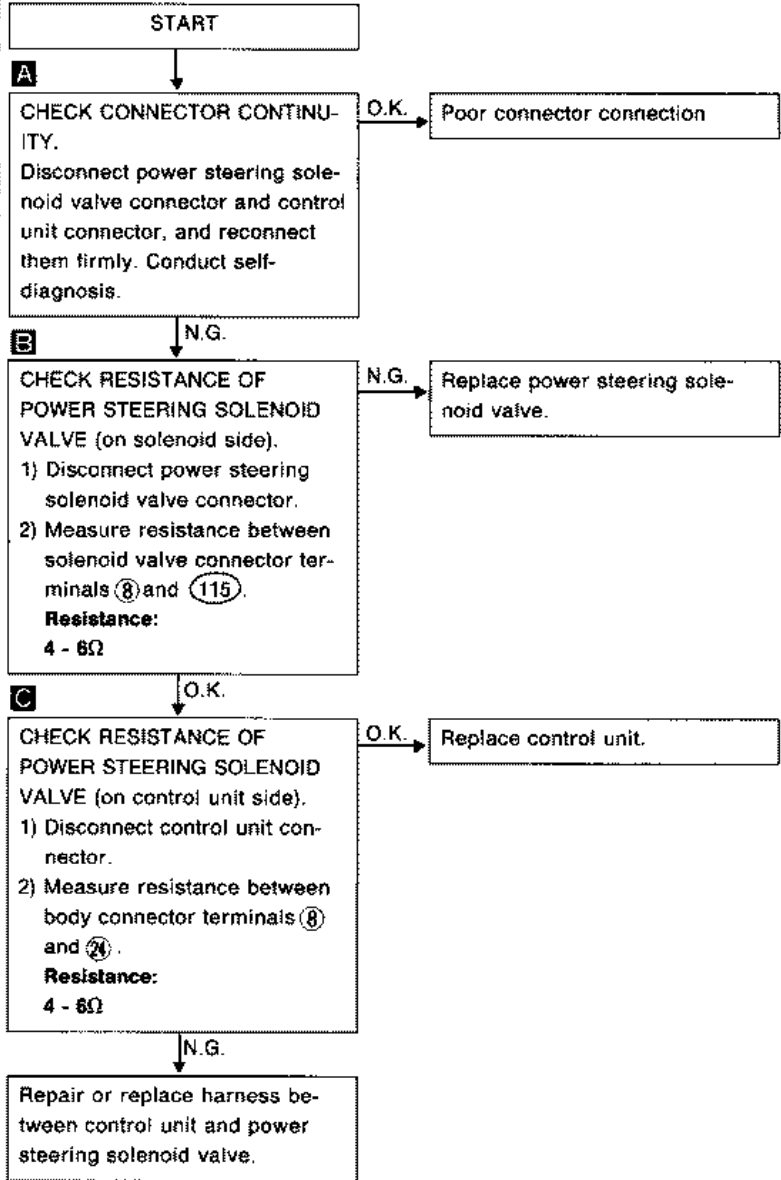
SUPER HICAS SYSTEM — Trouble Diagnoses



Diagnostic Procedure 8

SYMPTOM:

Power steering solenoid valve output is not present.

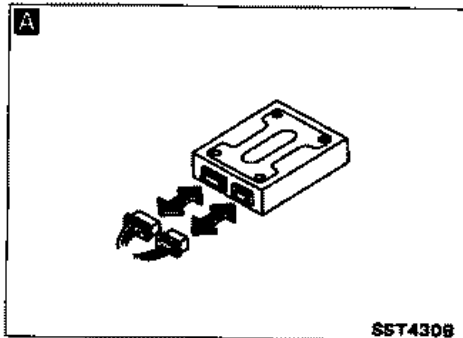


SUPER HICAS SYSTEM — Trouble Diagnoses

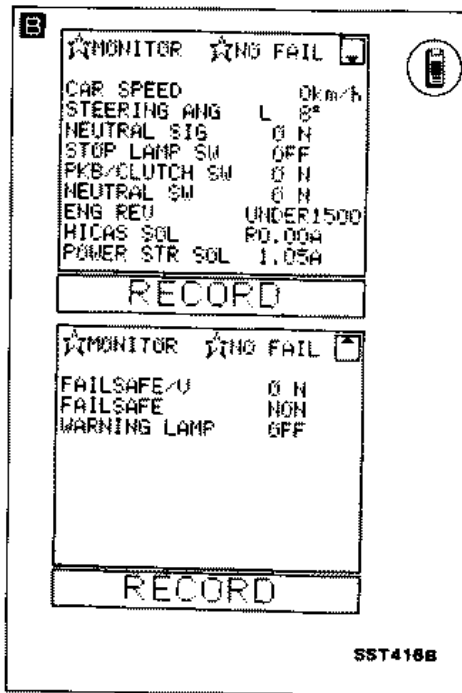
Diagnostic Procedure 9

SYMPTOM:

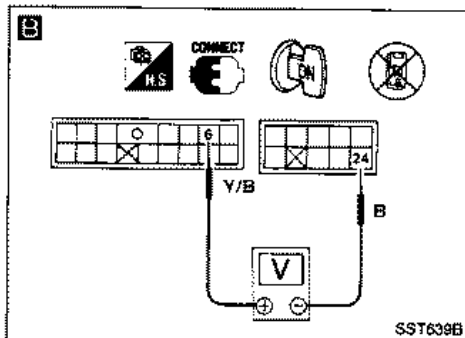
Vehicle speed signal is not present.



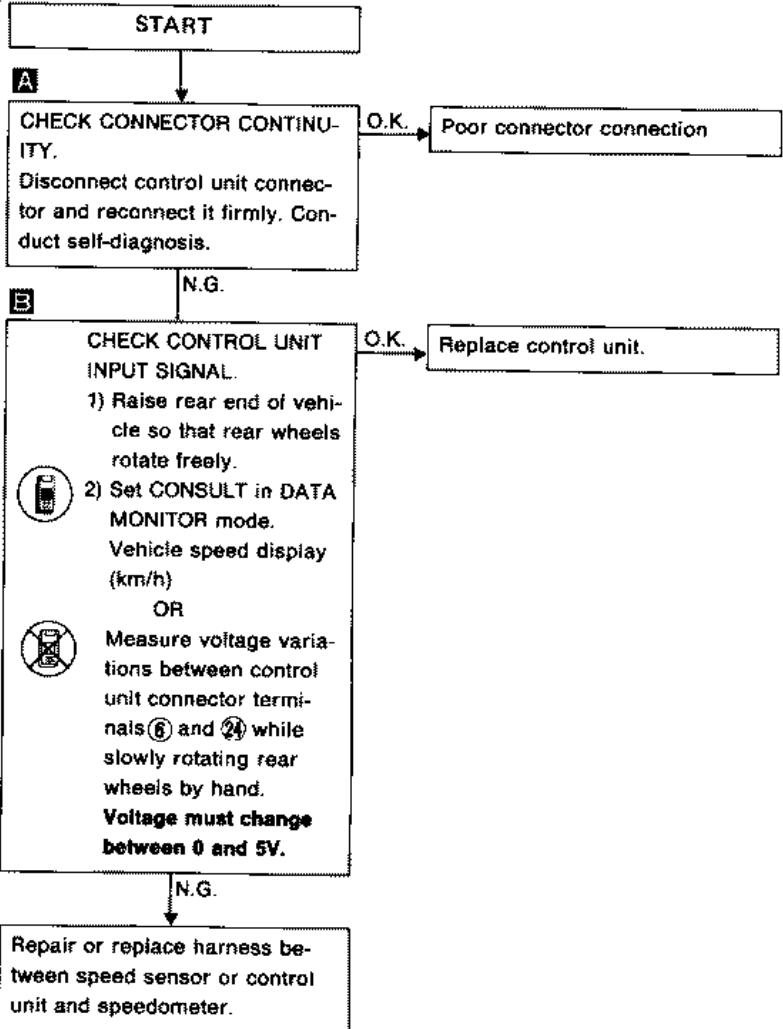
SST430B



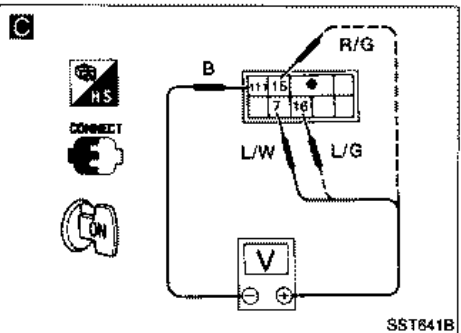
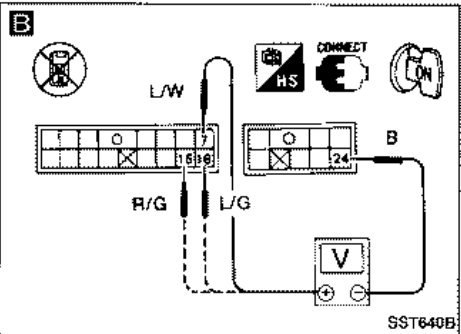
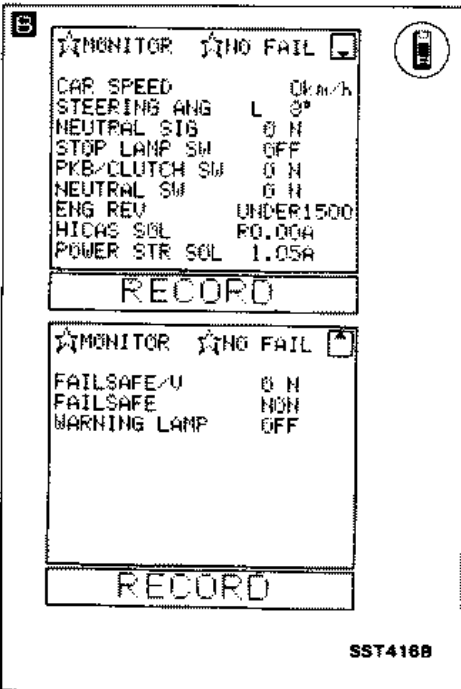
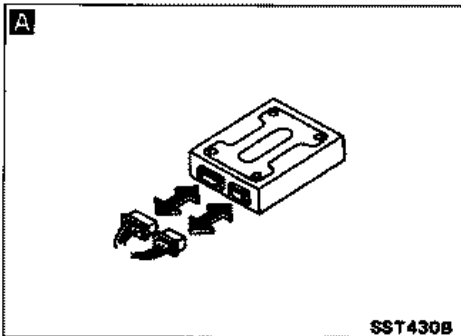
SST416B



SST639B

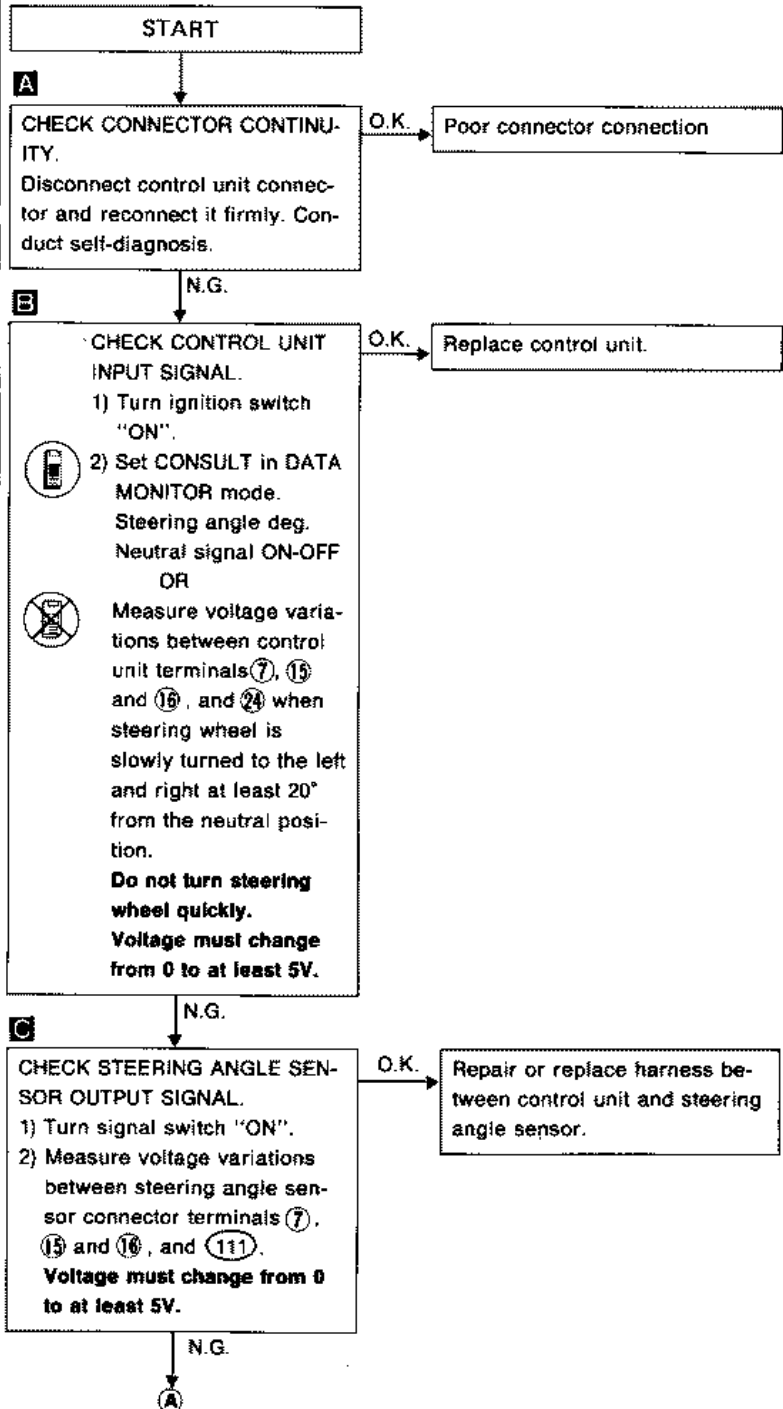


SUPER HICAS SYSTEM — Trouble Diagnoses



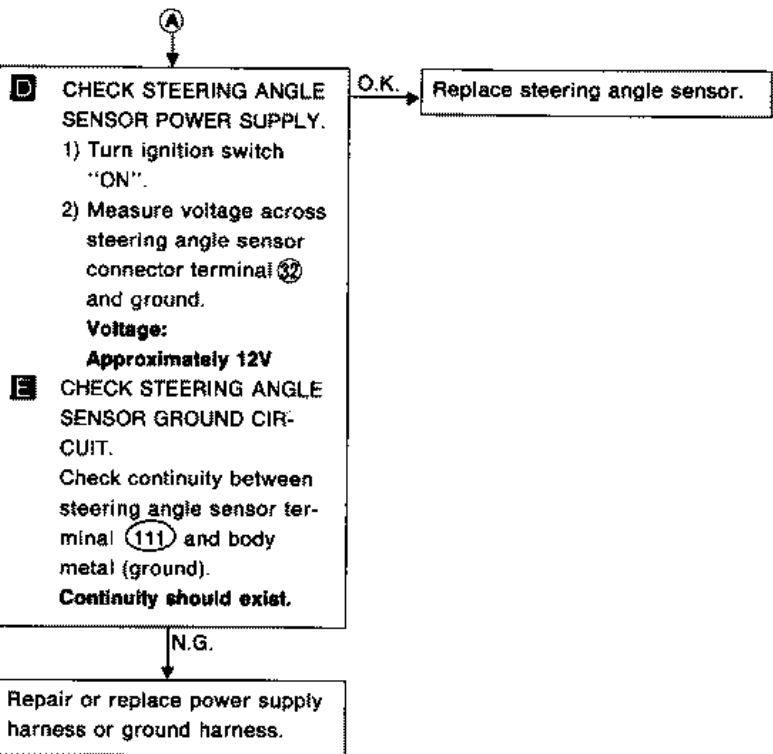
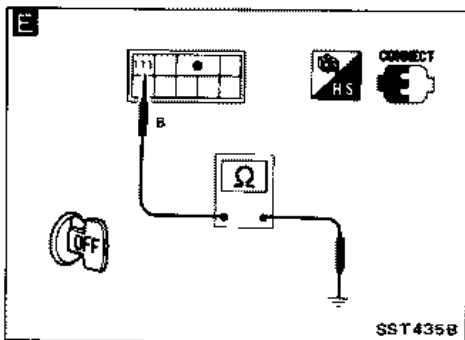
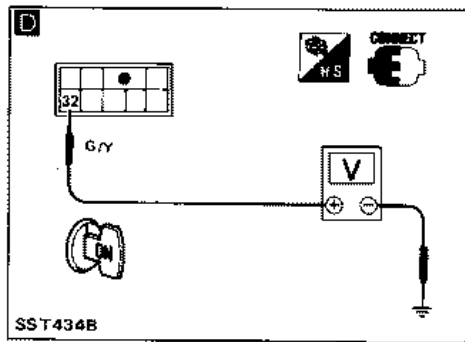
Diagnostic Procedure 10

SYMPTOM:
Steering angle sensor input is not present.

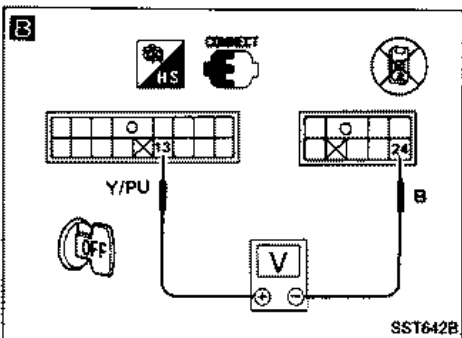
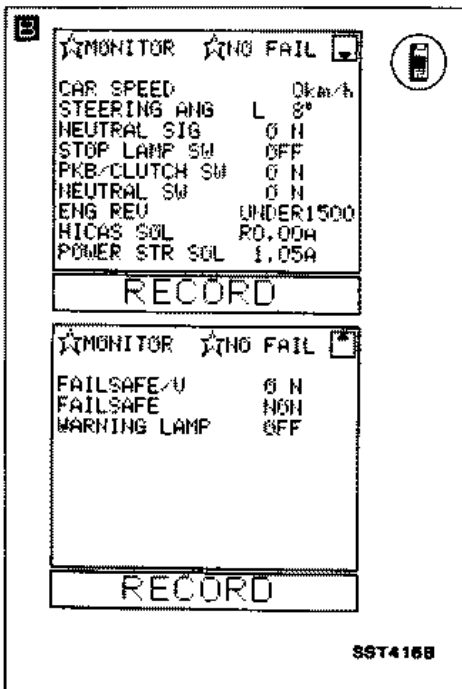
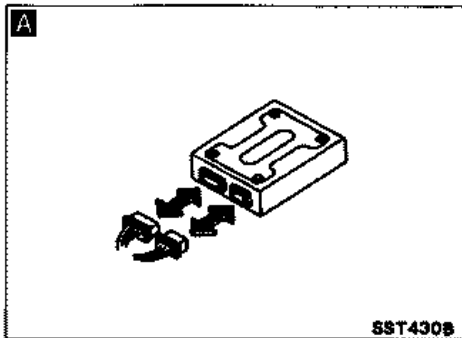


SUPER HICAS SYSTEM — Trouble Diagnoses

Diagnostic Procedure 10 (Cont'd)

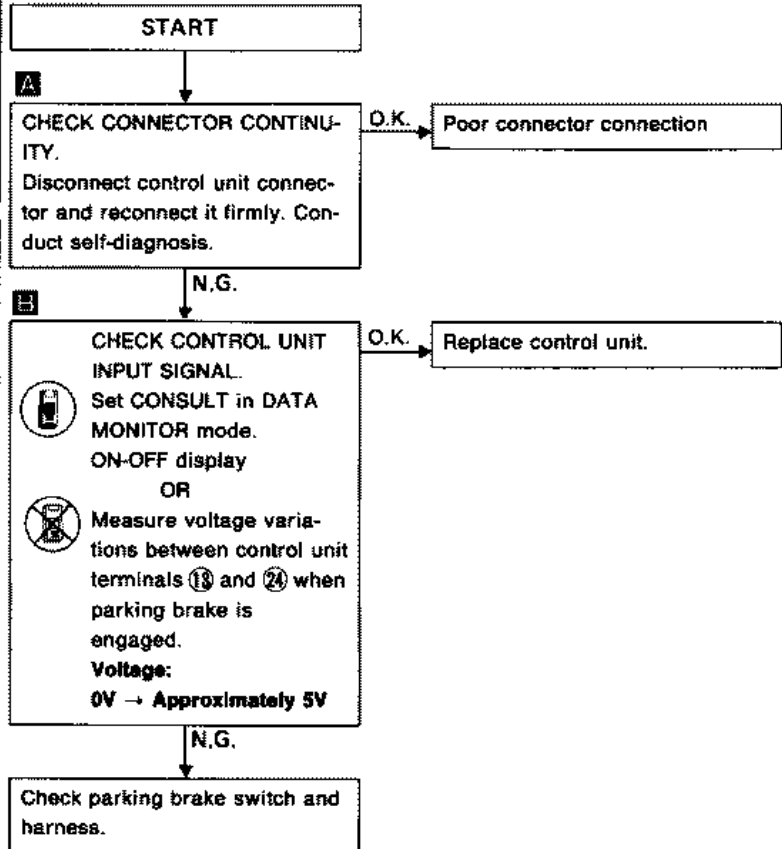


SUPER HICAS SYSTEM — Trouble Diagnoses

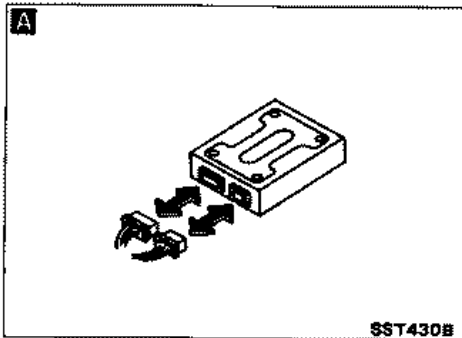


Diagnostic Procedure 11

SYMPTOM:
Parking brake input is not present.



SUPER HICAS SYSTEM — Trouble Diagnoses



Diagnostic Procedure 12

SYMPTOM:

Inhibitor switch input is not present.

START

A

CHECK CONNECTOR CONTINUITY. Disconnect control unit connector and reconnect it firmly. Conduct self-diagnosis.

O.K. → Poor connector connection

N.G. ↓

B

MONITOR	FAIL
CAR SPEED	0 km/h
STEERING ANG	L 8°
NEUTRAL SIG	0 N
STOP LAMP SW	OFF
PKB/CLUTCH SW	0 N
NEUTRAL SW	0 N
ENG REV	UNDER1500
HICAS SOL	00.00A
POWER STR SOL	1.05A

RECORD

MONITOR	FAIL
FAILSAFE/U	0 N
FAILSAFE	NON
WARNING LAMP	OFF

RECORD

SST416B

B

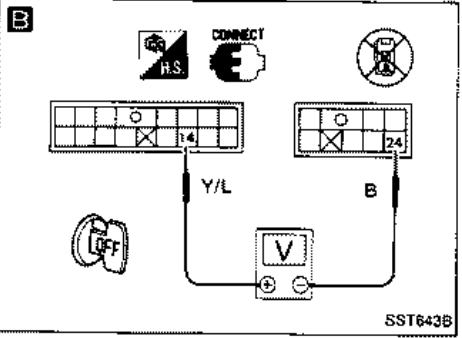
CHECK CONTROL UNIT INPUT SIGNAL. Set CONSULT in DATA MONITOR mode. ON-OFF display OR Measure voltage variations between control unit terminals (14) and (24) when shift lever is moved from P to any other position.

Voltage:
0V → Approximately 5V

O.K. → Replace control unit.

N.G. ↓

Check inhibitor switch and harness.

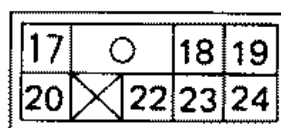
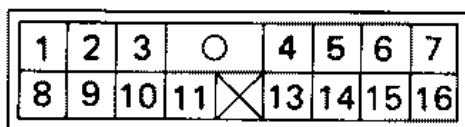


SUPER HICAS SYSTEM — Trouble Diagnoses

Control Unit Inspection Table

The standard values (voltage) measured with an analog tester, in contact with the control unit terminal, are shown below:

Terminal No.	Application	Standard value
1	Service support CLK input	—
2	Service support RX output	—
3	IGN power supply	Key switch ON: Approximately 12V Key switch in other position: 0V
4	Battery	Approximately 12V
5	E.C.C.S. revolution signal	—
6	Vehicle speed signal	Rear wheel rotating 0V ↔ greater than 5V (approx.), intermittent
7	Steering neutral position sensor	Approximately 5V (Neutral position)
8	Resistance of power steering solenoid valve	4 - 6Ω
9	Service support TX output	—
10	Ground	0V
11	Stop lamp switch signal	Brake ON: Approximately 12V Brake OFF: 0V
13	Parking brake signal	Parking brake engaged (A/T)/ clutch disengaged (M/T): Approximately 12V
14	Inhibitor signal	Shift lever in any position other than Parking: Approximately 5V
15	Steering angle sensor-1 signal	Steering wheel turned 0 ↔ Approximately 5V, intermittent
16	Steering angle sensor-2 signal	—
17	Ground	0V
18	Resistance of fail-safe valve	13 - 17Ω
19	IGN power supply	Ignition switch ON: Approximately 12V Ignition switch in other position: 0V
20	HICAS warning lamp	—
22	Resistance of HICAS solenoid valve (R.H.)	4 - 6Ω
23	Resistance of HICAS solenoid valve (L.H.)	4 - 6Ω
24	Ground	0V



SST632B

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

General Specifications

Applied model	Australia	Europe
	Without SUPER HICAS	With SUPER HICAS
Steering model	Power steering	
Steering gear type	PR26SE	
Steering overall gear ratio	16.9	16.7
Turn of steering wheel (Lock to lock)	2.7	2.7
Steering column type	Collapsible	

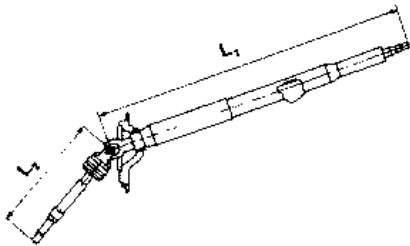
Inspection and Adjustment

GENERAL

Steering wheel axial play mm (in)	0 (0)
Steering wheel play mm (in)	35 (1.38) or less
Movement of gear housing mm (in)	±2 (±0.08) or less

STEERING COLUMN

Steering position	R.H.D.	L.H.D.
Steering column length "L ₁ " mm (in)	745.9 - 747.5 (29.37 - 29.43)	
Steering column lower shaft length "L ₂ " mm (in)	314.6 - 316.2 (12.39 - 12.45)	280.6 - 282.2 (11.05 - 11.11)

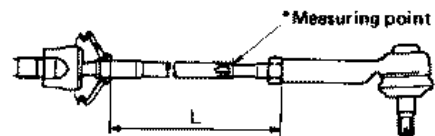


SST315B

STEERING GEAR AND LINKAGE

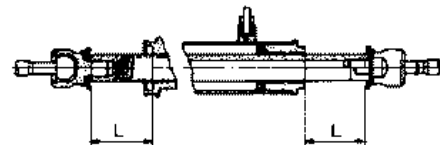
Steering gear type	PR26SE	
Tie-rod outer ball joint		
Swinging force (at cotter pin hole) N (kg, lb)	4.61 - 46.1 (0.47 - 4.7, 1.04 - 10.4)	
Rotating torque N·m (kg·cm, in·lb)	0.29 - 2.94 (3.0 - 30.0, 2.6 - 26.0)	
Axial end play mm (in)	0 (0)	
Tie-rod inner ball joint		
Swinging force* N (kg, lb)	8.8 - 78.5 (0.9 - 8.0, 2.0 - 17.6)	
Rotating torque N·m (kg·cm, in·lb)	1.0 - 8.8 (10 - 90, 8.7 - 78.1)	
Axial end play mm (in)	0 (0)	
Tie-rod standard length "L" mm (in)	155 (6.10)	

*: Measuring point



SST304B

Rack stroke "L"	mm (in)	59.5 (2.343)
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SST307B

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Inspection and Adjustment (Cont'd)

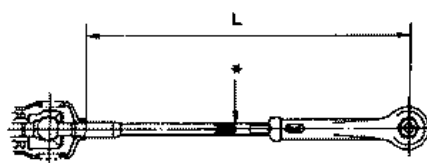
POWER STEERING

Applied model	Without SUPER HICAS	With SUPER HICAS
Retainer adjustment		
Adjusting screw		
Initial tightening torque N·m (kg-cm, in-lb)	4.9 - 5.9 (50 - 60, 43 - 52)	
Retightening torque after loosening	0.2 (2, 1.7)	
Tightening torque after gear has settled	4.9 (50, 43)	
Returning angle degree	60° - 100°	
Pinion gear preload without gear oil N·m (kg-cm, in-lb)		
Within 100° from the neutral position		
Average rotating torque	0.78 - 1.27 (8.0 - 13.0, 6.9 - 11.3)	
Maximum torque deviation	0.4 (4, 3.5)	
Except above range		
Maximum rotating torque	1.9 (19, 16)	
Maximum torque deviation	0.6 (6, 5.2)	
Rack sliding force N (kg, lb)		
Under normal operating oil pressure		
Range within ± 11.5 mm (± 0.453 in) from the neutral position	206 - 265 (21 - 27, 46 - 60)	201.0 - 250.1 (20.5 - 25.5, 45.2 - 56.2)
Except above range		
Not more than 39 (4, 9) beyond above value		
Steering wheel turning force (Measured at one full turn from the neutral position) N (kg, lb)		
39 (4, 9) or less		
Fluid capacity (Approximate) ℓ (imp qt)		
1.3 (1-1/8)	2.0 (1-3/4)	
Oil pump maximum pressure kPa (bar, kg/cm ² , psi)		
7,649 - 8,238 (76.5 - 82.4, 78 - 84, 1,109 - 1,194)	Main: 7,649 - 8,238 (76.5 - 82.4, 78 - 84, 1,109 - 1,194) Sub: 6,375 - 6,865 (63.7 - 68.6, 65 - 70, 924 - 995)	

POWER CYLINDER LOWER LINK (SUPER HICAS)

Power cylinder lower link ball joint		
Swinging force*	N (kg, lb)	2.9 - 41.2 (0.3 - 4.2, 0.7 - 9.3)
Axial end play	mm (in)	0 (0)
Power cylinder lower link standard length "L"		
	mm (in)	309.5 (12.19)
Stroke		
	mm (in)	3.0 (0.118)

*: Measuring point



SST486B

SECTION BF**CONTENTS**

GENERAL SERVICING	
(Including all clips & fasteners)	BF- 2
BODY END	BF- 6
DOOR	
(Including "Power Window" and "Power Door Lock")	BF-10
INSTRUMENT PANEL	BF-16
INTERIOR AND EXTERIOR	
(In EXTERIOR, including "Weatherstrips")	BF-18
T-BAR ROOF	BF-28
REAR AIR SPOILER	BF-30
SEAT	BF-32
WINDSHIELD AND WINDOWS	BF-35
MIRROR	BF-40
BODY ALIGNMENT	BF-42

When you read wiring diagrams:

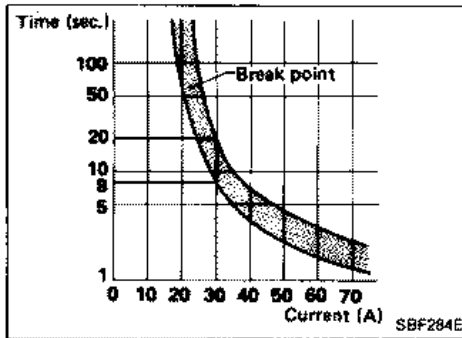
- Read GI section, "HOW TO READ WIRING DIAGRAMS".
- See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.

★ For seat belt, refer to MA section.

GENERAL SERVICING

Precautions

- When removing or installing various parts, place a cloth or padding onto the vehicle body to prevent scratches.
- Handle trim, molding, instruments, grille, etc. carefully during removal or installation. Be careful not to soil or damage them.
- Apply sealing compound where necessary when installing parts.
- When applying sealing compound, be careful that the sealing compound does not protrude from parts.
- When replacing any metal parts (for example body outer panel, members, etc.), be sure to take rust prevention measures.



Circuit Breaker Inspection



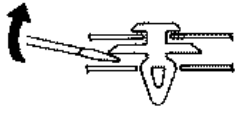

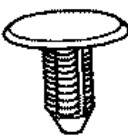
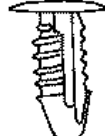
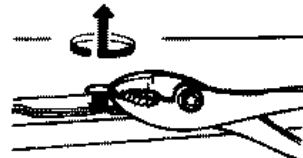
For example, when current is 30A, the circuit is broken within 8 to 20 seconds.

Circuit breakers are used in the following systems.

- Power window & power door lock
- Power seat



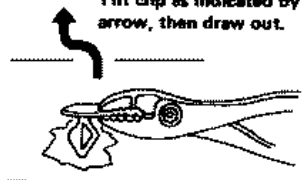
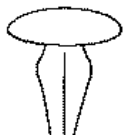

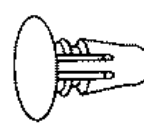
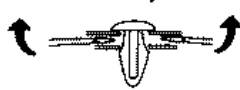

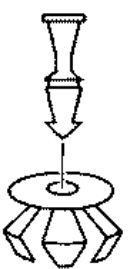

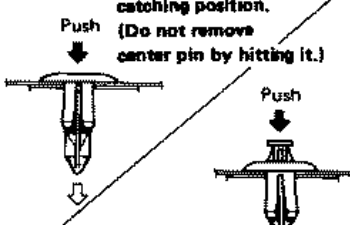

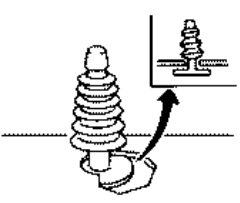
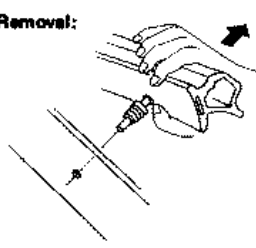
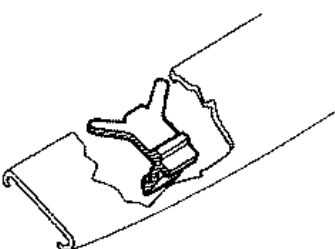
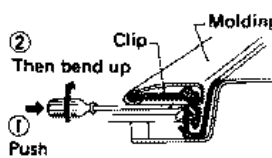
Clip and Fastener

- Clips and fasteners in BF section correspond to the following numbers and symbols.
- Replace any clips and/or fasteners which are damaged during removal or installation.

No.	Symbol	Shape	Removal & installation
C101	 SBF092B	 SBF109B	<p>Removal: Remove by bending up with a flat-bladed screwdriver.</p>  <p style="text-align: right;">SBF094B</p>
C102	 SBF113B	 SBF114B  SBF137B	 <p>Removal: Pull up while rotating.</p> <p style="text-align: right;">SBF115B</p>

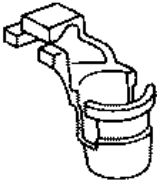
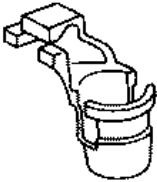
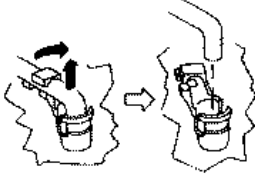


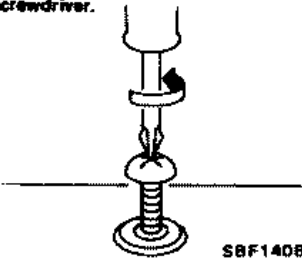
GENERAL SERVICING

Clip and Fastener (Cont'd)

No.	Symbol	Shape	Removal & Installation
C105	 <p style="text-align: center;">SBF141B</p>	 <p style="text-align: center;">SBF142B</p>	<p>Removal: Tilt clip as indicated by arrow, then draw out.</p>  <p style="text-align: right;">SBF143B</p>
C106	 <p style="text-align: center;">SBF089B</p>	  <p style="text-align: center;">SBF090B</p>	<p>Removal: Remove with flat-bladed screwdriver or pliers.</p>   <p style="text-align: right;">SBF091B</p>
C203	 <p style="text-align: center;">SBF318C</p>	 <p style="text-align: center;">SBF319C</p>	<p>Push center pin to catching position. (Do not remove center pin by hitting it.)</p>  <p>Installation:</p> <p style="text-align: right;">SBF706E</p>
C103	 <p style="text-align: center;">SBF103B</p>	 <p style="text-align: center;">SBF104B</p>	<p>Removal:</p>  <p style="text-align: right;">SBF147B</p>
CE106	 <p style="text-align: center;">SBF653B</p>	<p>Removal:</p>  <p style="text-align: right;">SBF654B</p>	

GENERAL SERVICING

Clip and Fastener (Cont'd)

No.	Symbol	Shape	Removal & Installation
CR103		 <p style="text-align: center;">SBF768B</p>	<p>Removal: Holder portion of clip must be spread out to remove rod.</p>  <p style="text-align: right;">SBF770B</p>
CS102	 <p style="text-align: center;">SBF138B</p>	 <p style="text-align: center;">SBF139B</p>	<p>Removal: Screw out with a Phillips screwdriver.</p>  <p style="text-align: right;">SBF140B</p>

GENERAL SERVICING

NOTE

BODY END

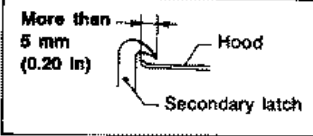
Body Front End

- Hood adjustment: Adjust at hinge portion.
- Hood lock adjustment: After adjusting, check hood lock control operation. Apply a coat of grease to hood lock engaging mechanism.
- Hood opener: Do not attempt to bend cable forcibly.

Hood lock adjustment

- Adjust lock so that hood primary lock meshes at a position where hood is 1 to 1.5 mm (0.039 to 0.059 in) lower than fender.
- After hood lock adjustment, adjust bumper rubber.
- When securing hood lock, ensure it does not tilt. Striker must be positioned at the center of hood primary lock.
- After adjustment, ensure that hood primary and secondary lock operate properly.

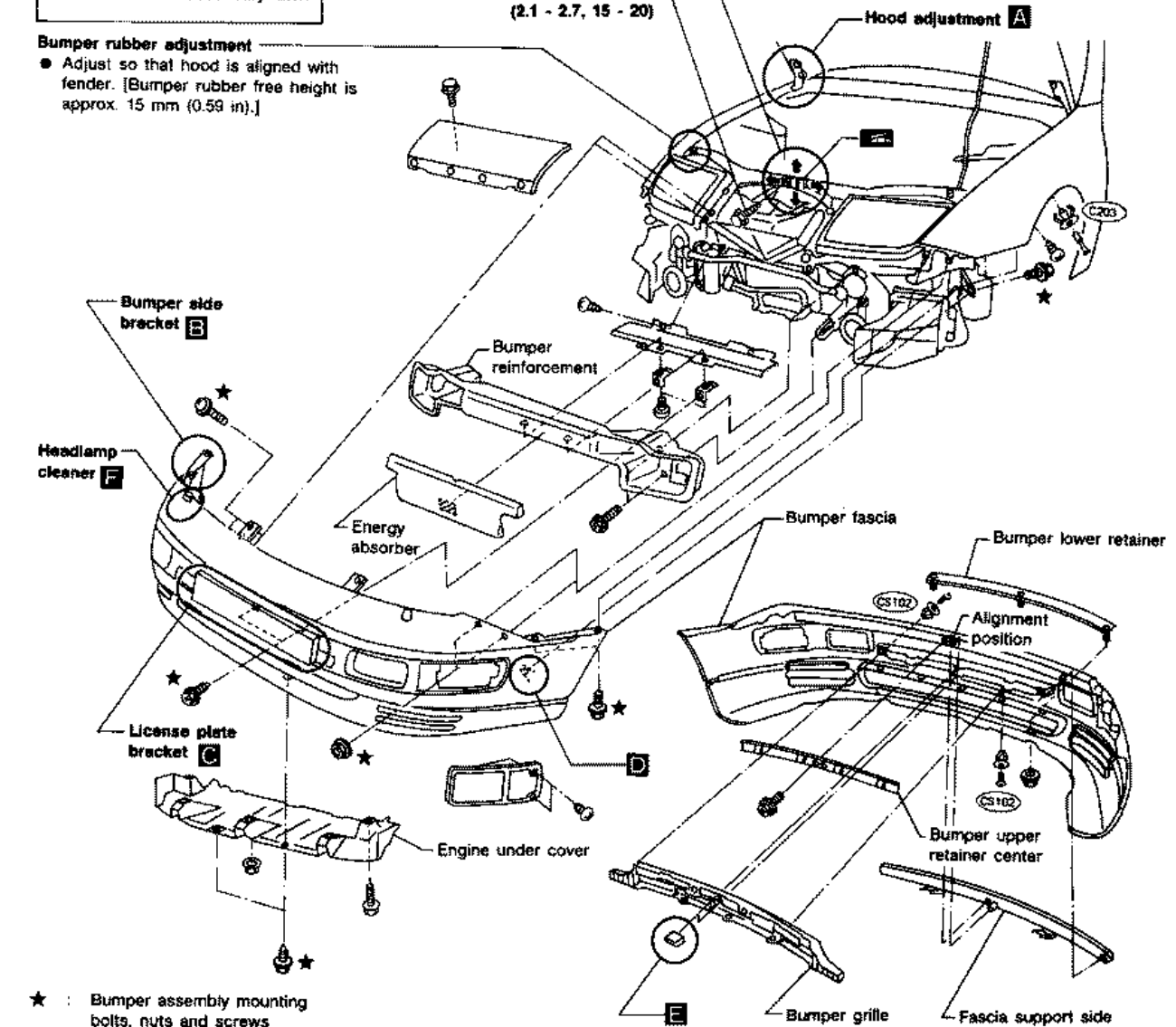
Hood lock secondary latch hooking length



21 - 26
(2.1 - 2.7, 15 - 20)

Bumper rubber adjustment

- Adjust so that hood is aligned with fender. [Bumper rubber free height is approx. 15 mm (0.59 in).]



- ★ : Bumper assembly mounting bolts, nuts and screws
- : N-m (kg-m, ft-lb)

▨ : Double-faced adhesive tape

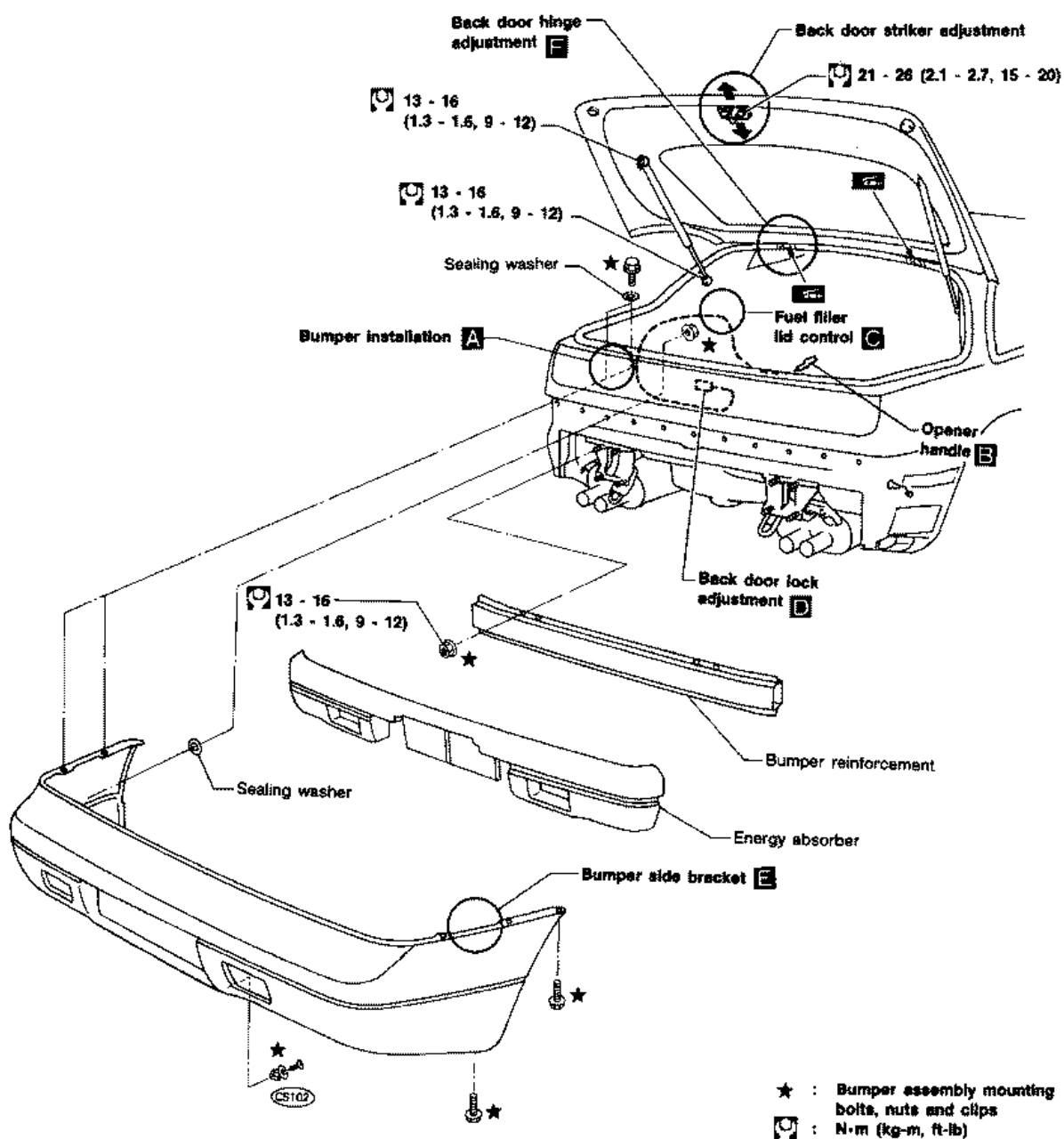
BODY END

Body Rear End and Opener

- Back door adjustment: Adjust at hinge-body portion for proper back door fit.
- Back door lock system adjustment: Adjust lock & striker so that they are in the center. After adjustment, check back door lock operation.

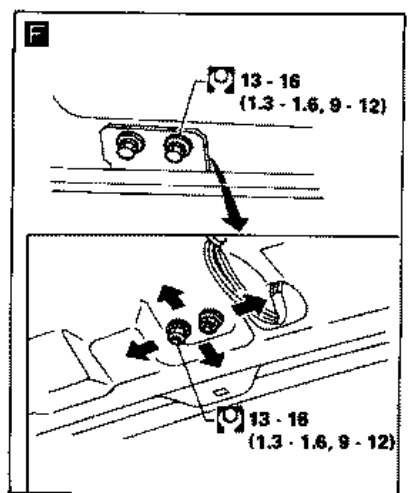
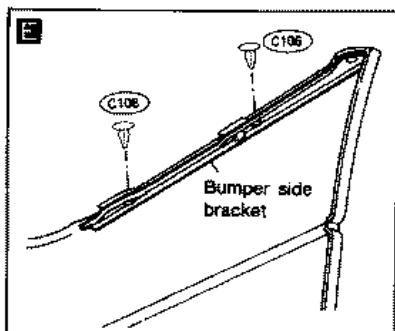
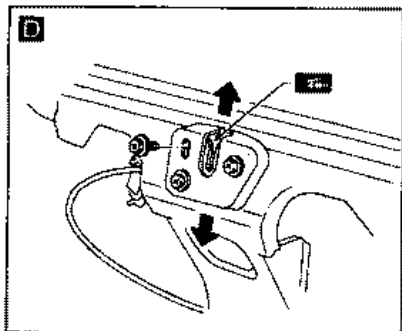
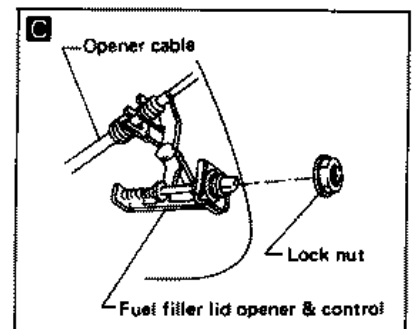
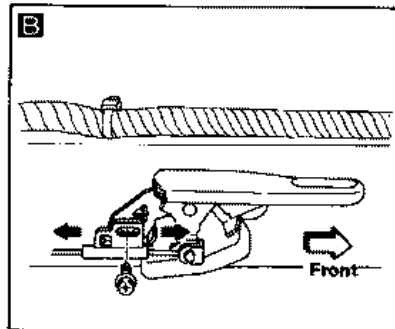
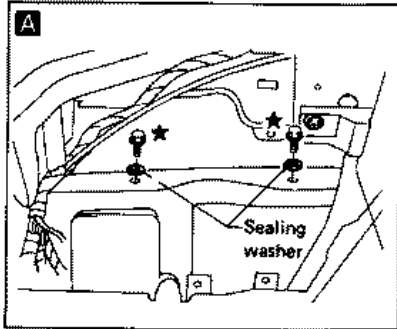
WARNING:

- a. Be careful not to scratch back door stay when installing back door. A scratched stay may cause gas leakage.
 - b. The contents of the back door stay are under pressure. Do not take apart, puncture, apply heat or allow fire near it.
- Opener cable: do not attempt to bend cable using excessive force.
 - After installation, make sure that trunk lid/back door and fuel filler lid open smoothly.



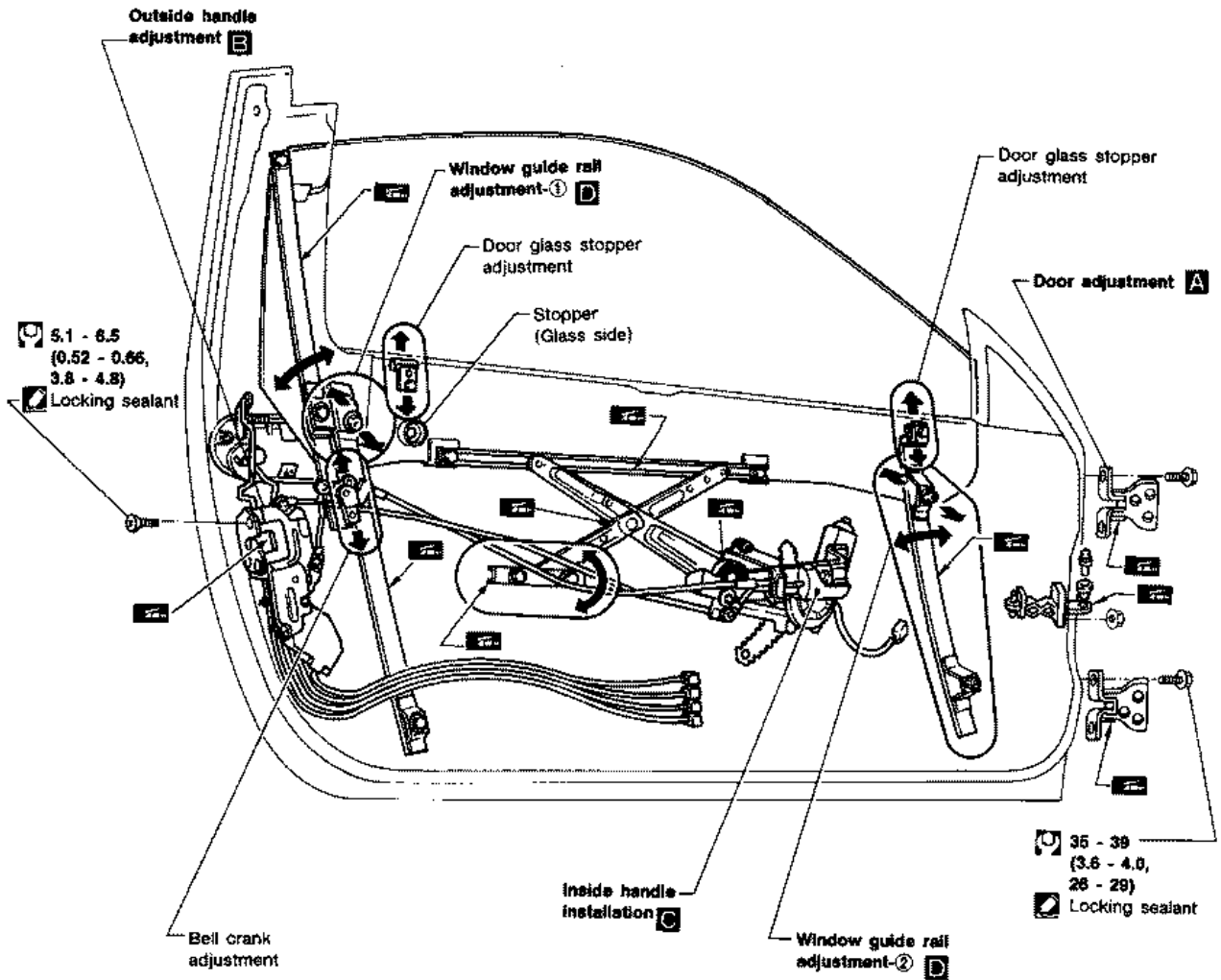
BODY END

Body Rear End and Opener (Cont'd)



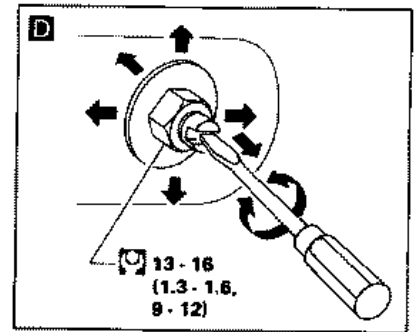
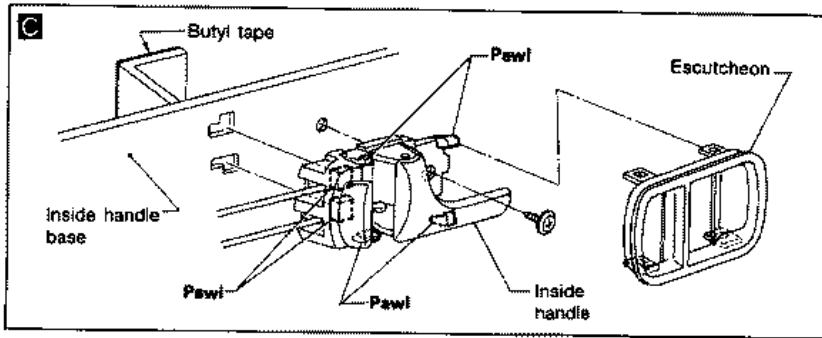
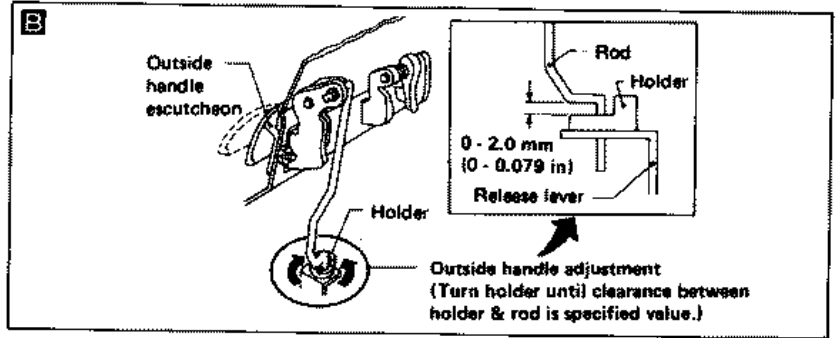
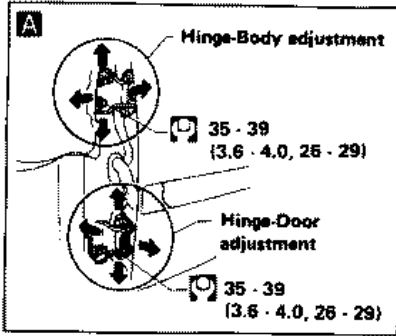
DOOR

- After adjusting door or door lock, check door lock operation.

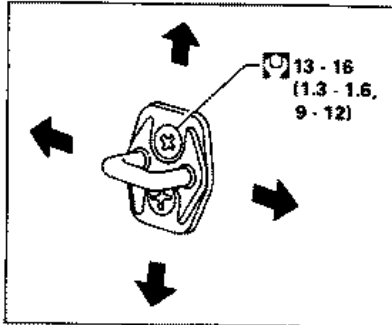


: N·m (kg-m, ft-lb)

DOOR



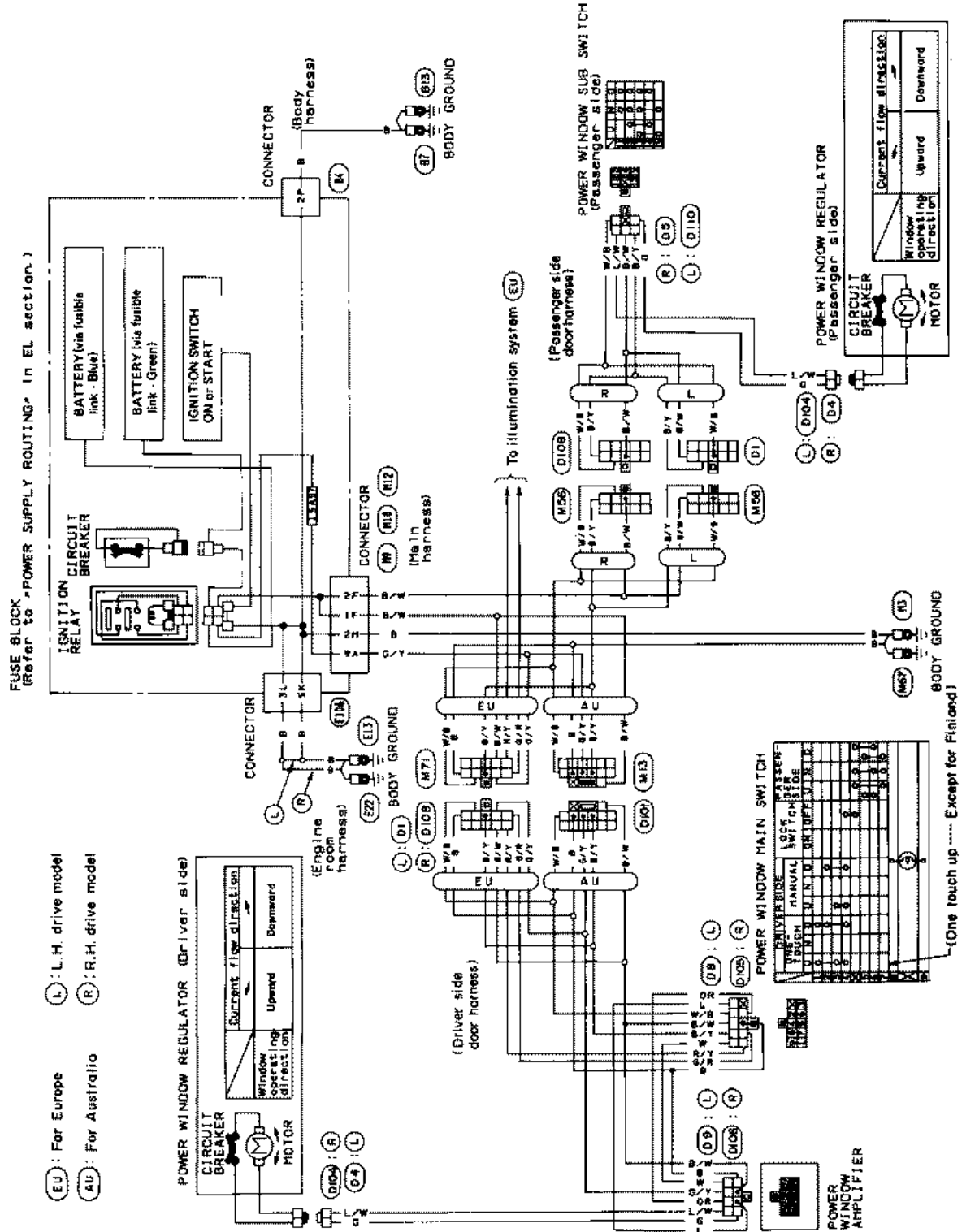
Striker adjustment



DOOR

Power Window

WIRING DIAGRAM



DOOR

Power Window (Cont'd)

POWER WINDOW AMP. INSPECTION

FRONT DRIVER SIDE POWER WINDOW SWITCH

FR Drive side		Connections	
One-touch (Auto)	Manual	U	D
1	1	○	○
2	2	○	○
3	3	○	○
4	4	○	○

AMP. OPERATION

Connections	Operations							
	Manual operation				One-touch (Auto) Operation			
	12V	12V	12V	12V	12V	12V	12V	12V
24 Power source (IGN)	12V	12V	12V	12V	12V	12V	12V	12V
27 Ground	Ground	Ground	Ground	Ground	Ground	Ground	Ground	Ground
23 From ignition SW (ON or ST)	ON or ST	ON or ST	ON or ST	ON or ST	ON or ST	ON or ST	ON or ST	ON or ST
Input terminals	28 To FR driver side power window SW (AUTO) (1)	OFF	OFF	OFF	OFF	ON	OFF	ON
	21 To FR driver side power window SW (UP) (2)	OFF	ON	OFF	OFF	ON	OFF	OFF
	22 To FR driver side power window SW (DOWN) (2)	OFF	OFF	ON	OFF	OFF	OFF	ON
Output terminals	25 FR driver side regulator ("Up" power source)	Approx. 0V	Approx. over 9V	Approx. 0V	Approx. 0V	Approx. over 9V	Approx. 0V	Approx. 0V
	26 FR driver side regulator ("Down" power source)	Approx. 0V	Approx. 0V	Approx. over 9V	Approx. 0V	Approx. 0V	Approx. over 9V	Approx. over 9V

Regulator Operating Condition	Stop	Upward operation	Downward operation	Stop	Starting	Keeps operating until fully closed, then stops automatically.	Starting	Keeps operating until fully open, then stops automatically.
					Upward operation (U)		Downward operation (D)	

Carry out this operation check in this chart from left to right.

POWER WINDOW AMP. — Front driver side door (Behind door trim)

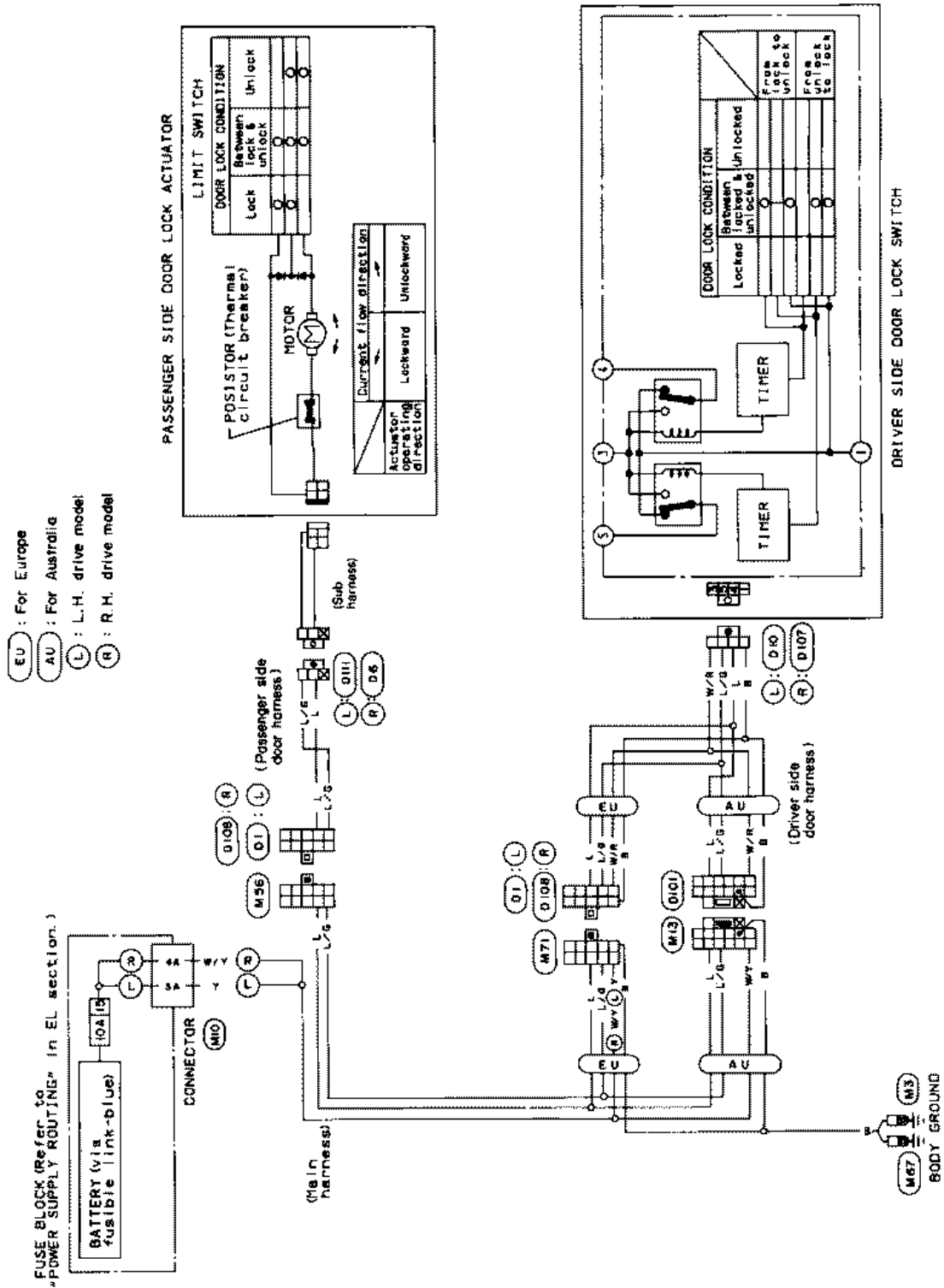
(X) Except for Finland

SBF831F

DOOR

Power Door Lock

WIRING DIAGRAM

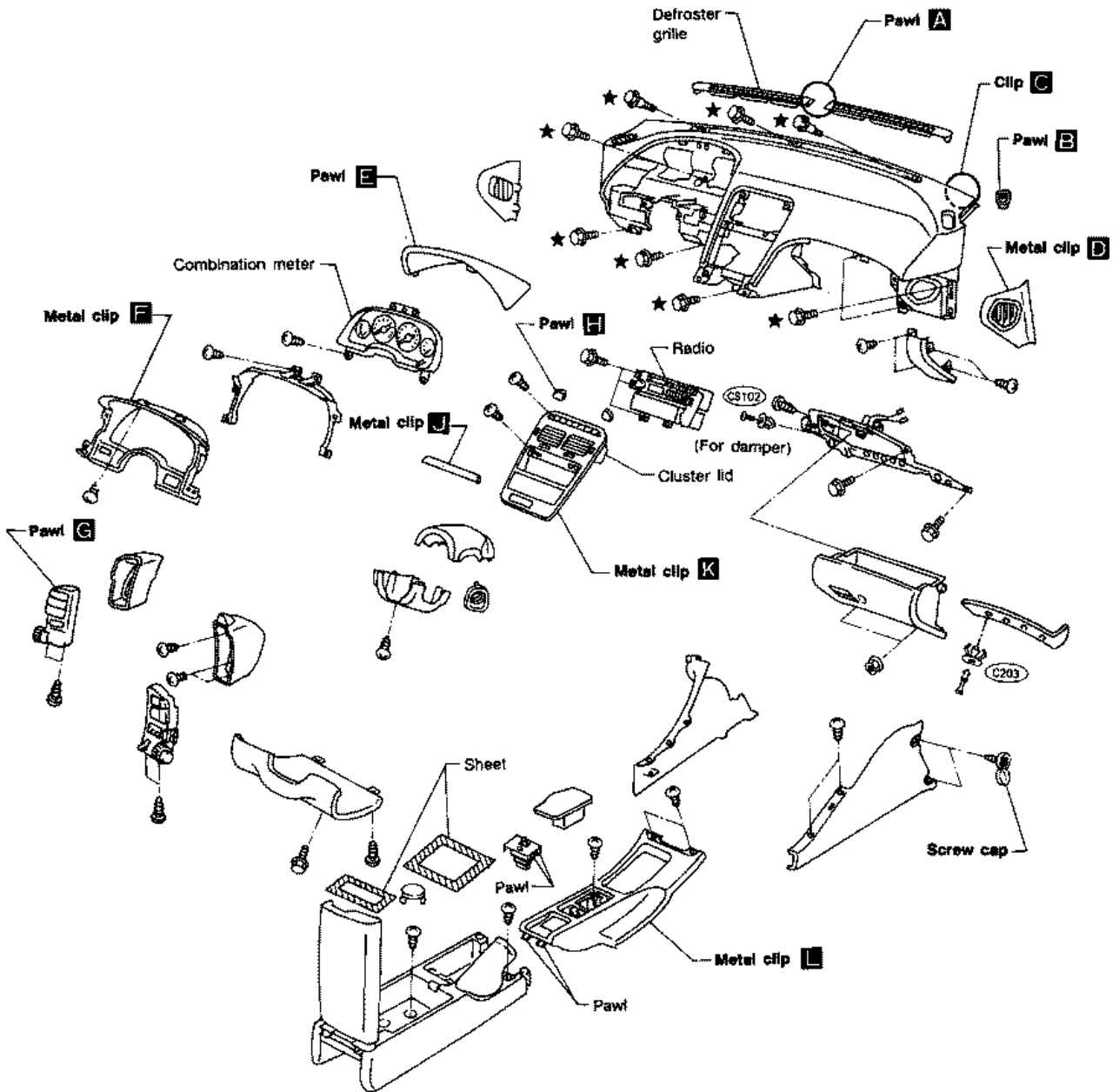


DOOR

NOTE

INSTRUMENT PANEL

- When removing instrument panel assembly, remove defroster grille, combination meter, cluster lid and radio first.

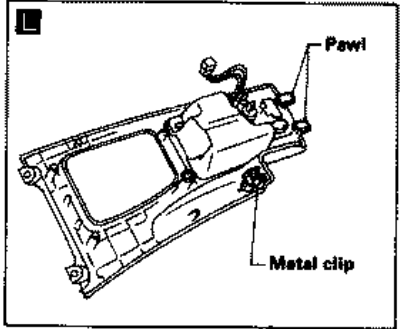
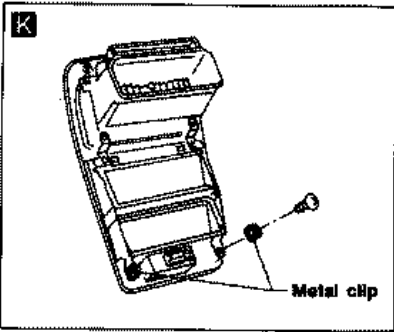
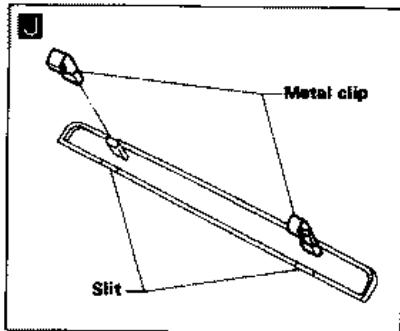
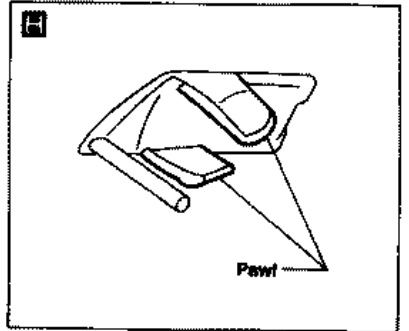
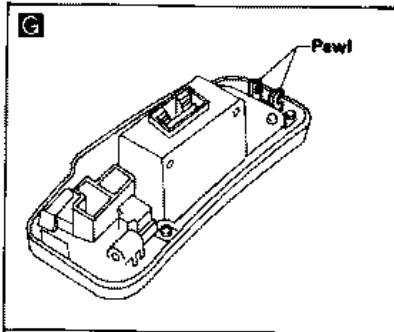
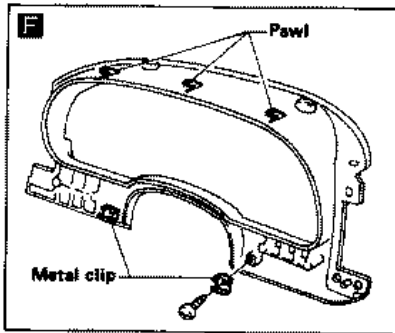
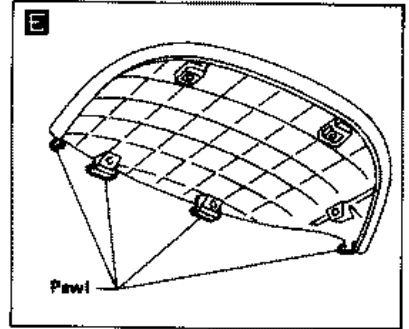
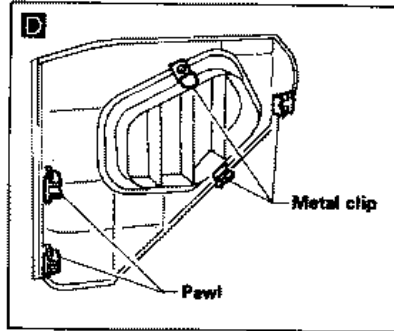
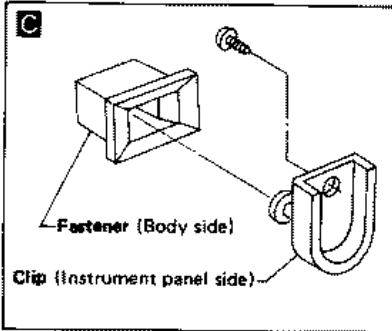
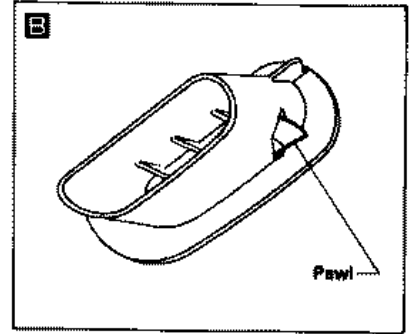
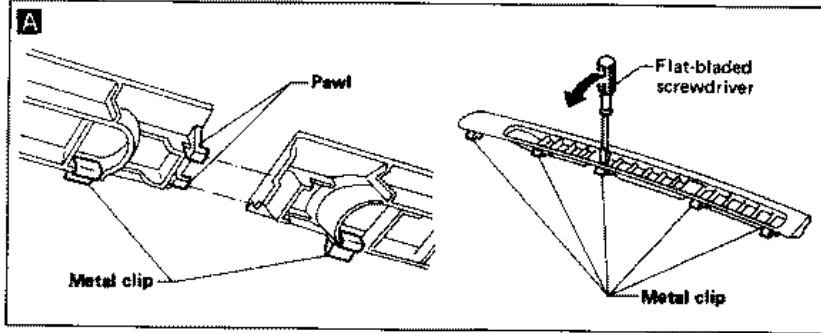


: Double-faced adhesive tape



: Instrument panel assembly mounting bolts

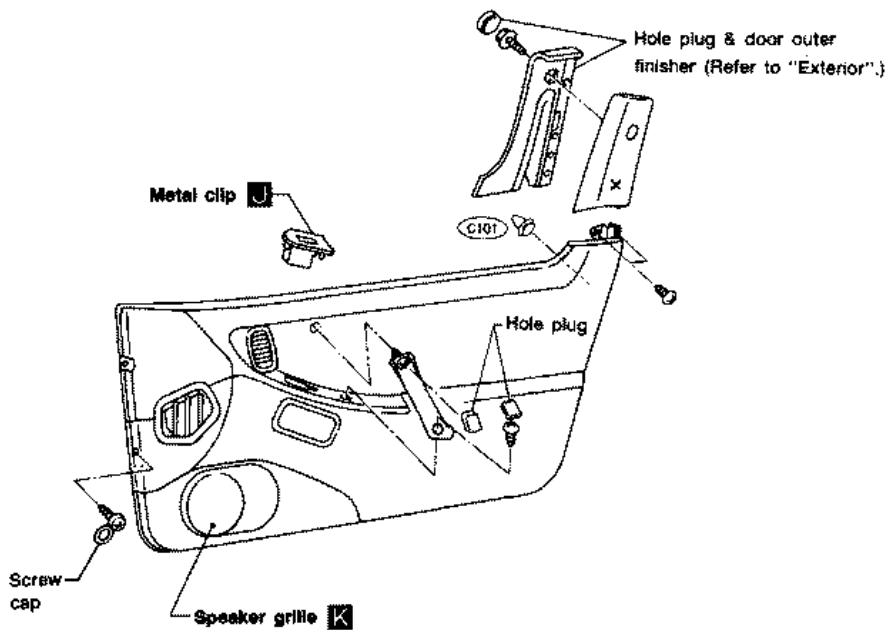
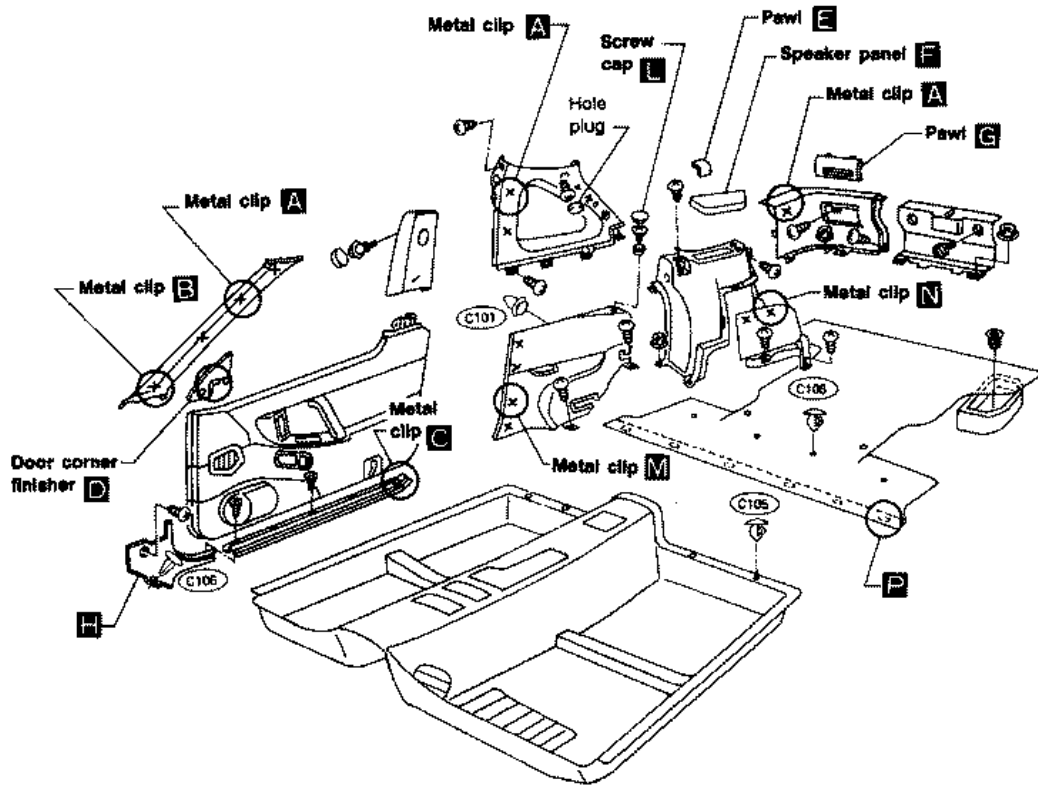
INSTRUMENT PANEL



INTERIOR AND EXTERIOR

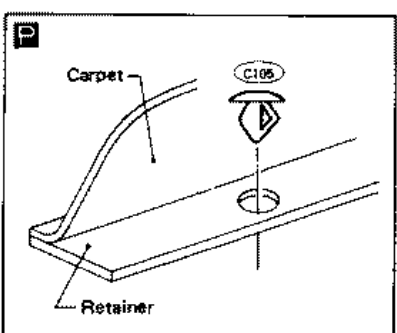
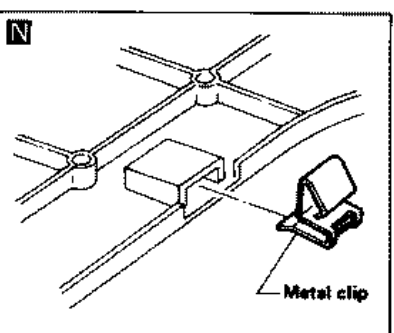
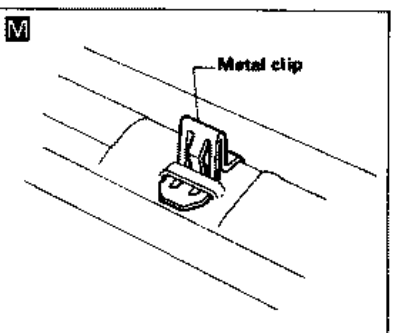
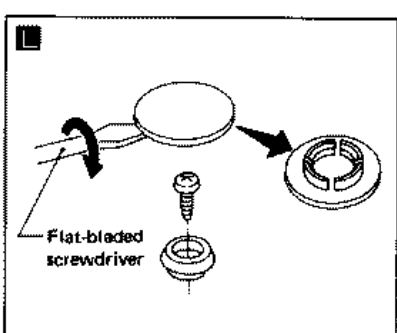
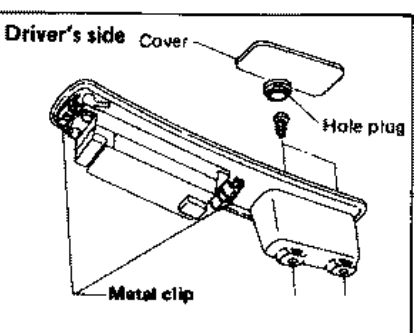
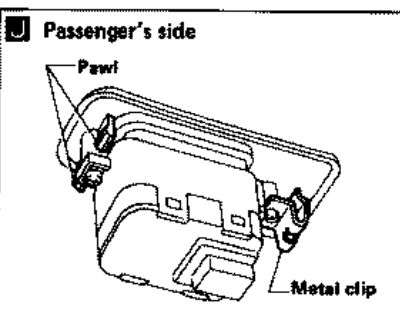
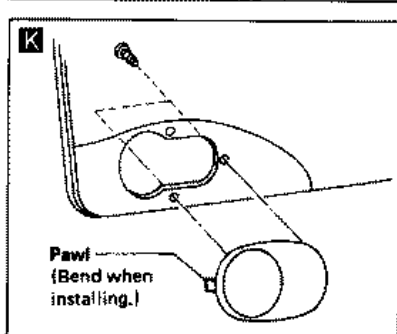
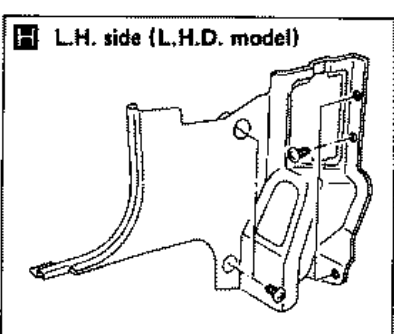
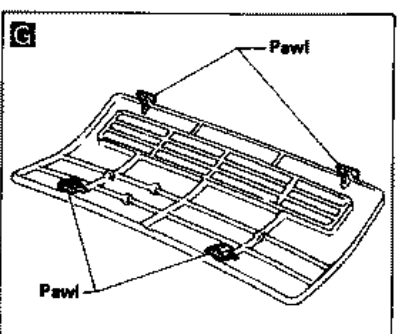
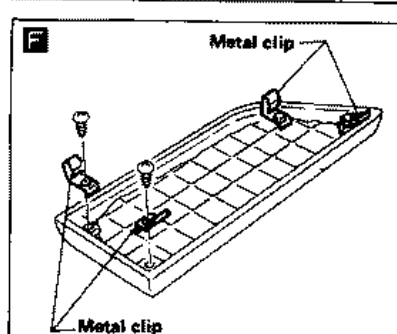
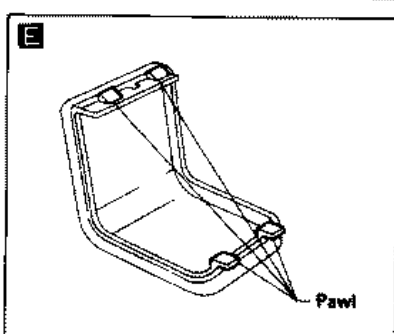
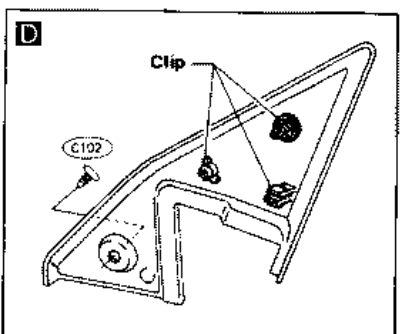
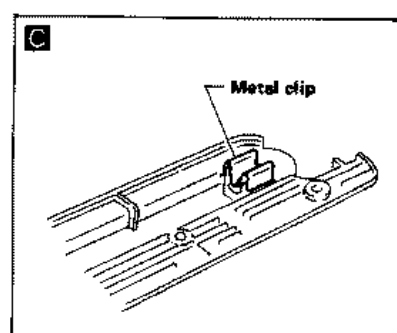
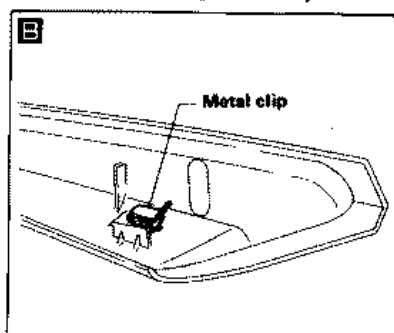
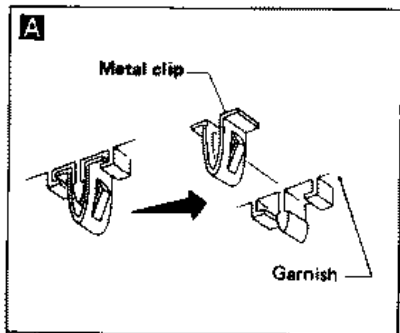
Interior

SIDE, LUGGAGE AND FLOOR TRIM



INTERIOR AND EXTERIOR

Interior (Cont'd)

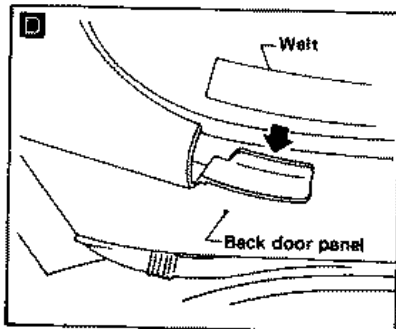
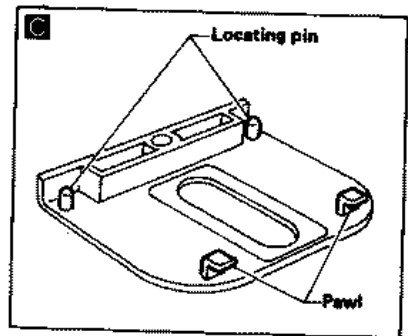
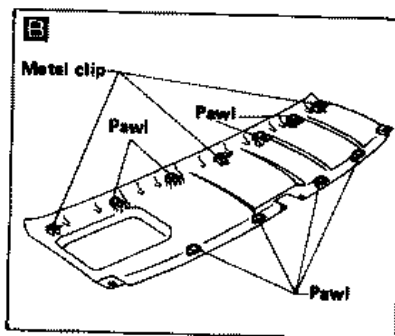
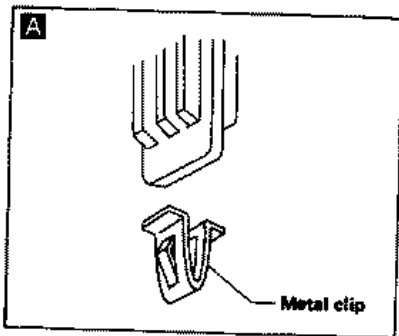
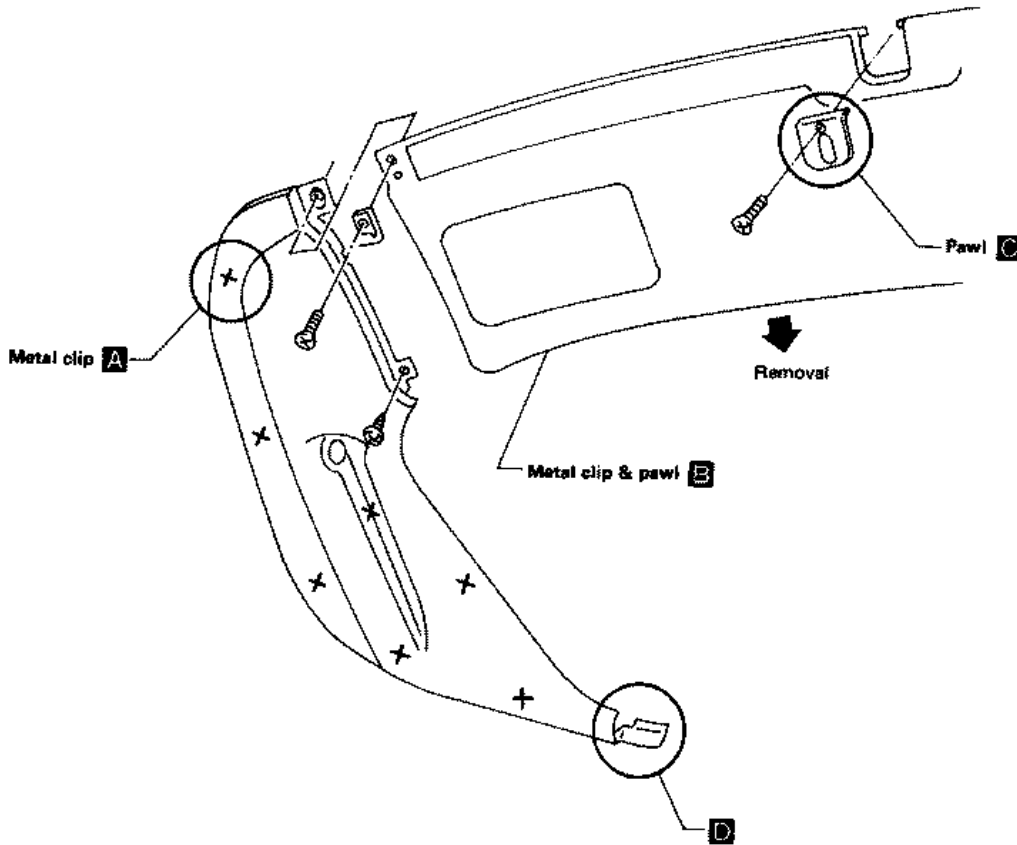


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INTERIOR AND EXTERIOR

Interior (Cont'd)

BACK DOOR TRIM

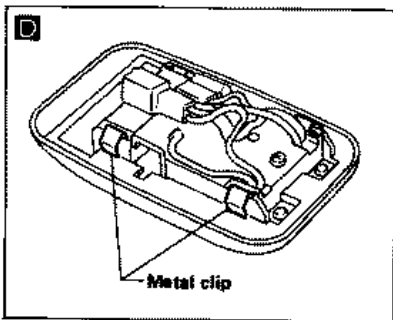
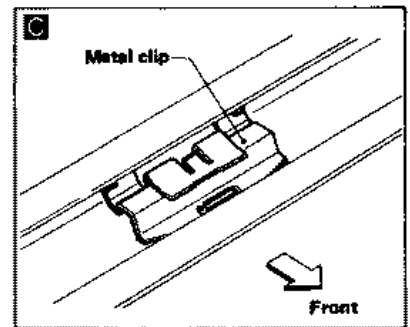
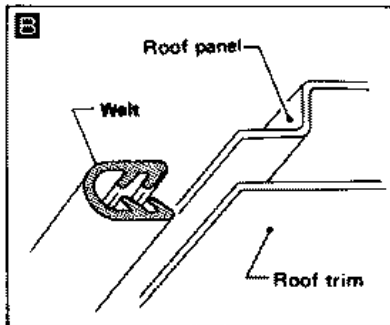
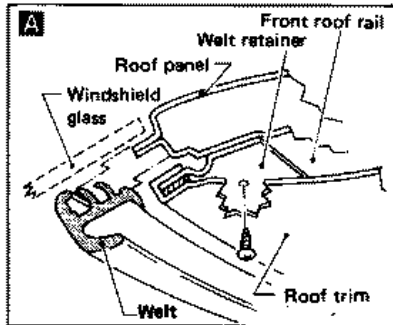
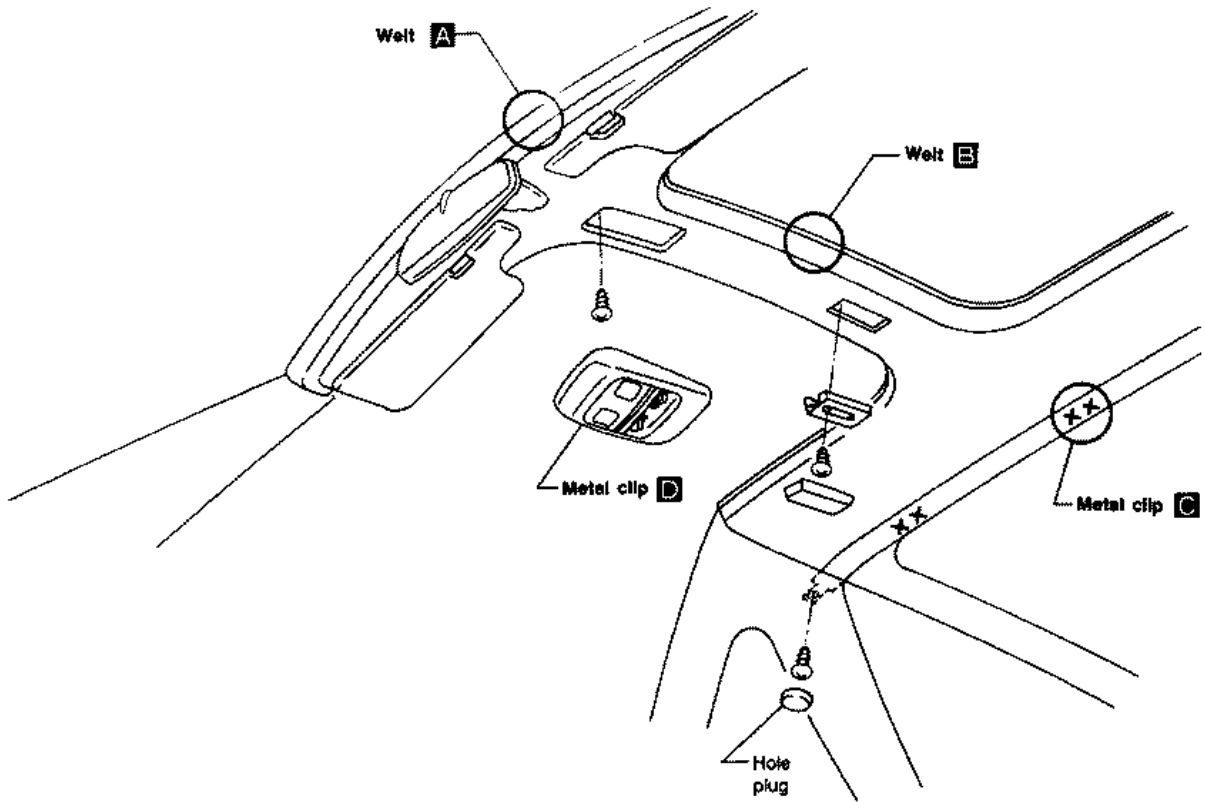


SBF861E

INTERIOR AND EXTERIOR

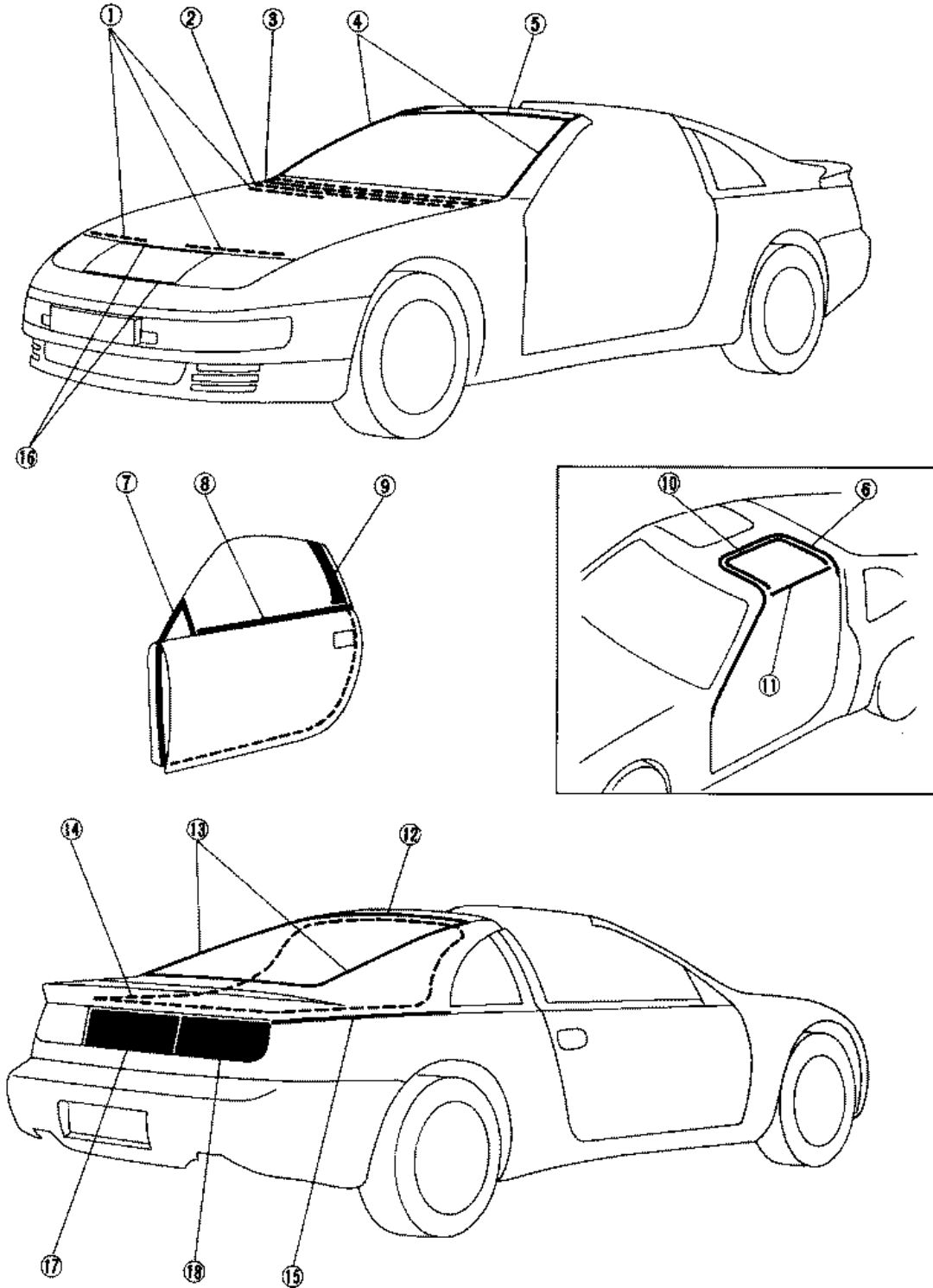
Interior (Cont'd)

ROOF TRIM



INTERIOR AND EXTERIOR

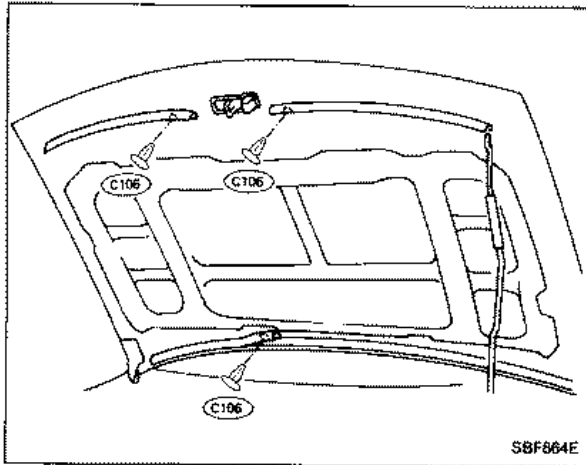
Exterior



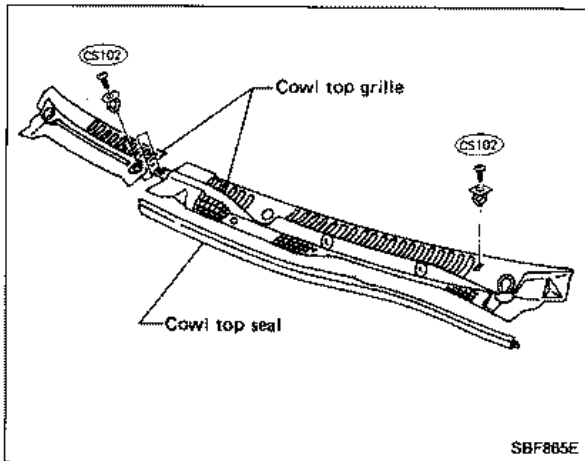
INTERIOR AND EXTERIOR

Exterior (Cont'd)

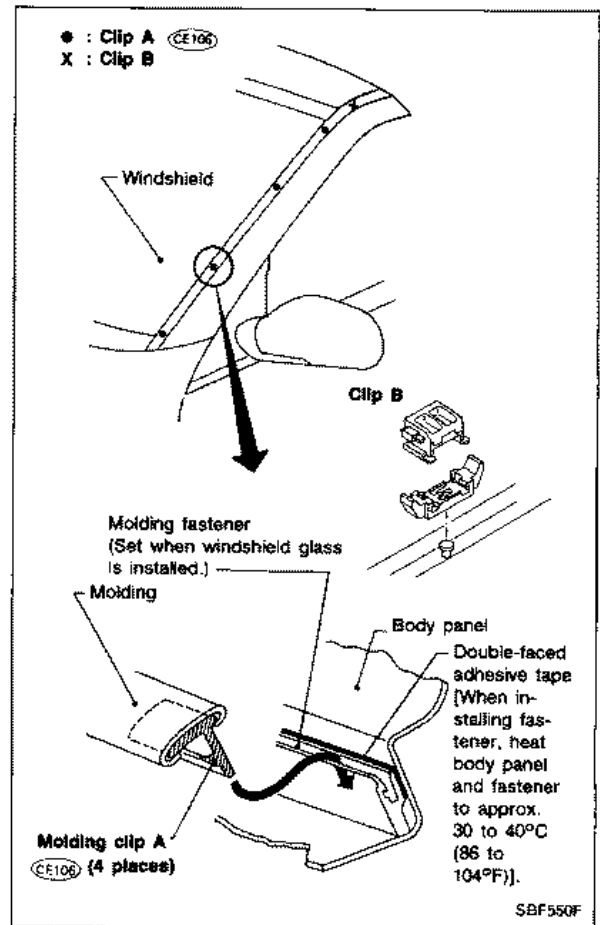
① Hood front and rear seal



② ③ Cowl top seal and cowl top grille



④ Windshield side molding



⑤ Windshield upper molding

Method 1

Cut off top portion of molding and clean glass and panel surfaces.

Apply sealant to top portion of molding.

Cut off lower portion of new molding

Finish well to give it a good appearance.

Method 2

1. Cut off sealant at glass end.
2. Clean the side on which panel was mounted.
3. Set molding fastener and apply sealant & primer to body panel, and apply primer to molding.

4. Install molding by aligning the molding mark located on center with vehicle center. Be sure to install tightly so that there is no gap around the corner.

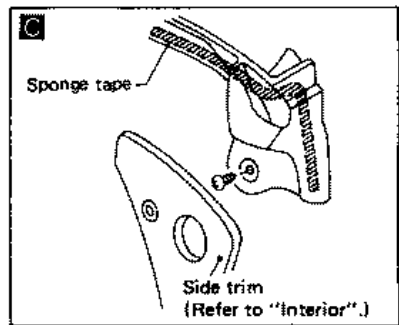
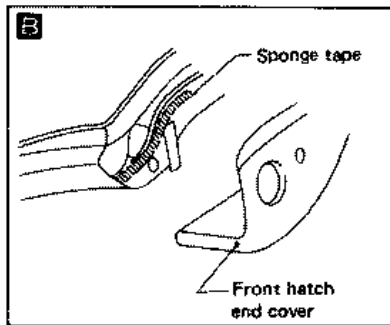
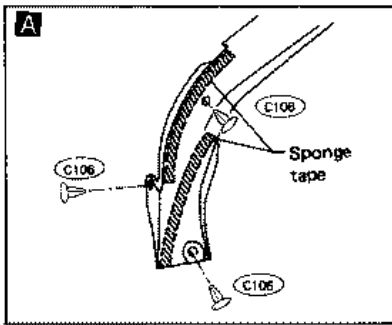
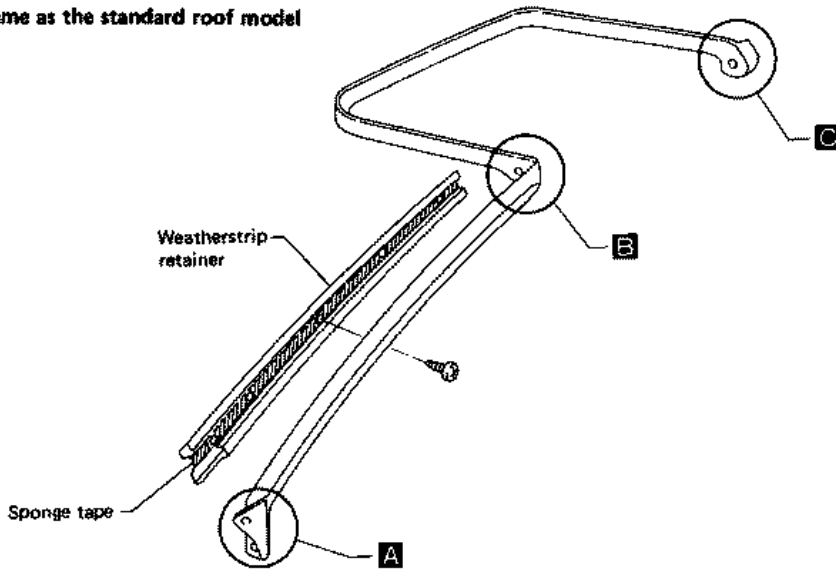
INTERIOR AND EXTERIOR

Exterior (Cont'd)

⑥ Body side weatherstrip

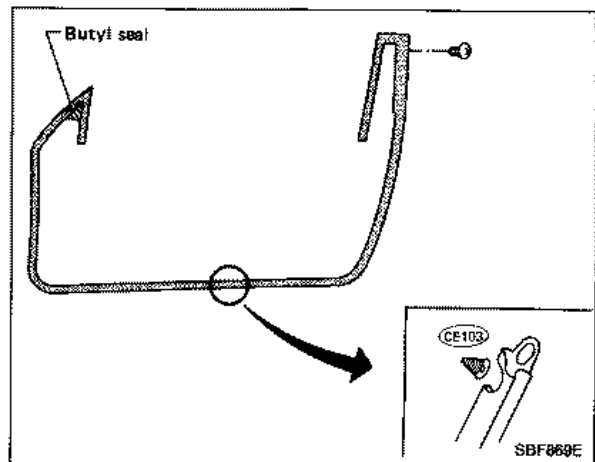
T-bar roof model

Basically the same as the standard roof model



SBF868E

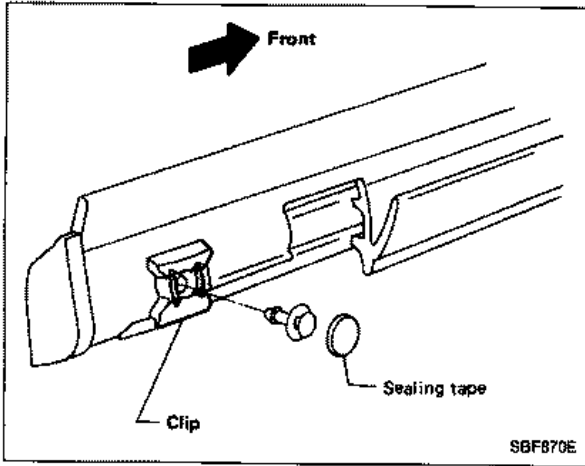
⑦ Door weatherstrip



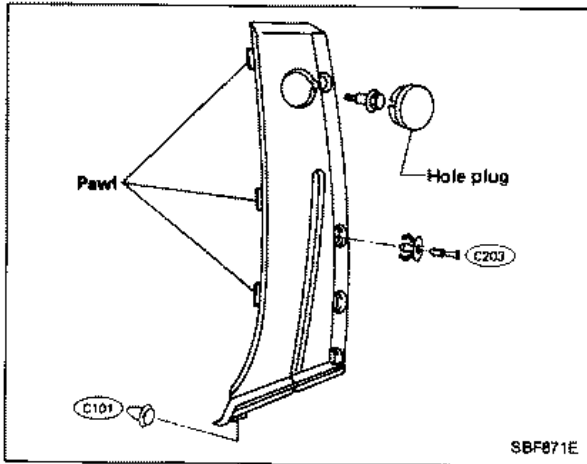
INTERIOR AND EXTERIOR

Exterior (Cont'd)

⑧ Door outside molding



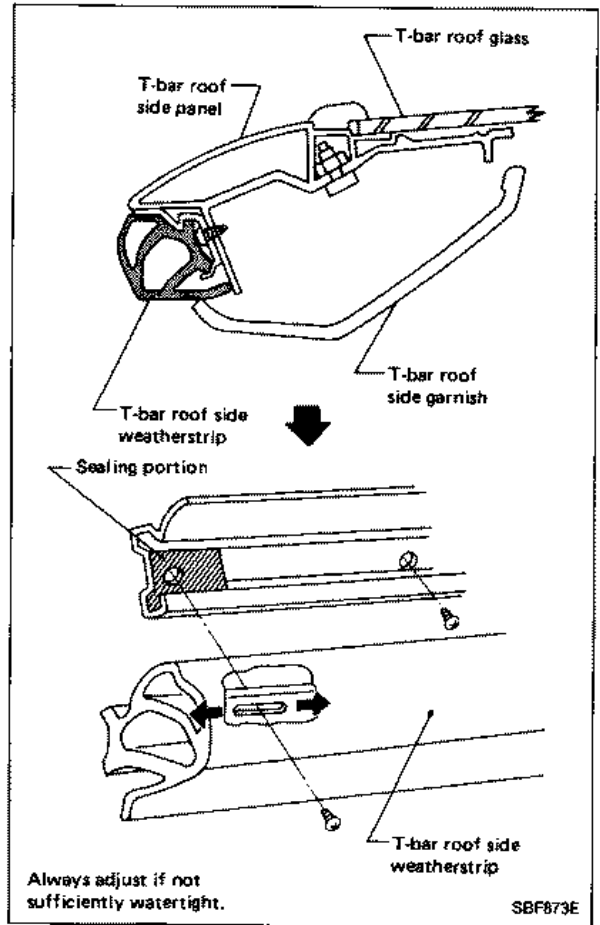
⑨ Door outer finisher



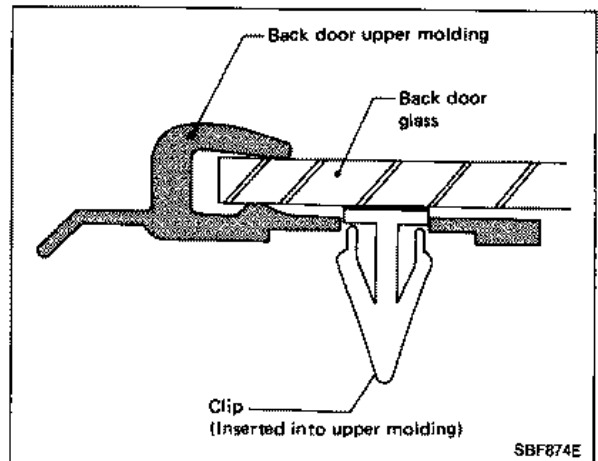
⑩ T-bar roof sash and T-bar roof weatherstrip

These are part of the T-bar roof glass and cannot be removed. (Refer to T-BAR ROOF.) If they are damaged, replace entire T-bar roof glass assembly.

⑪ T-bar roof side weatherstrip



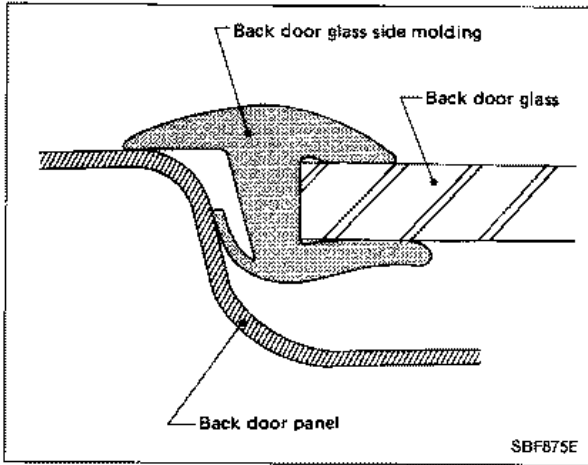
⑫ Back door glass upper molding



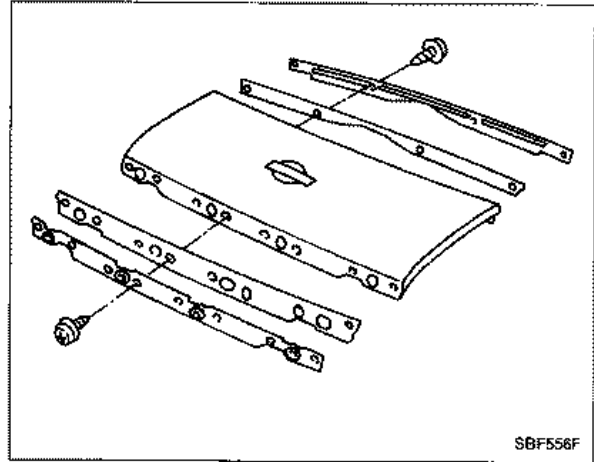
INTERIOR AND EXTERIOR

Exterior (Cont'd)

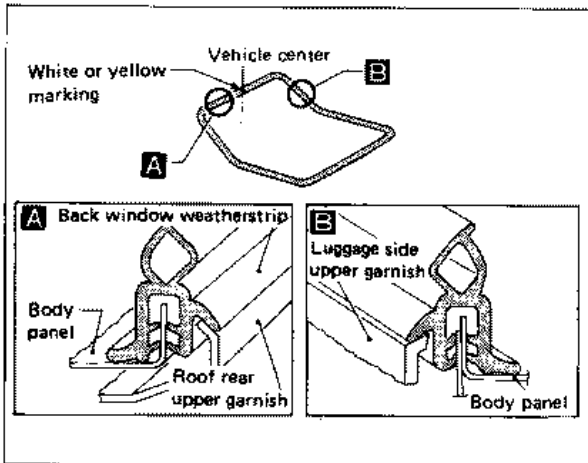
13 Back door glass side molding



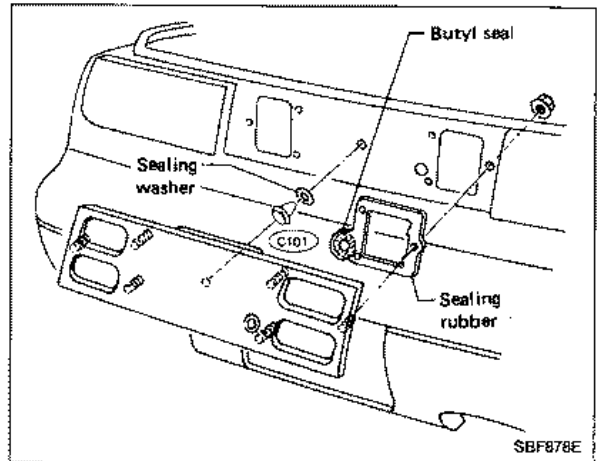
16 Front panel finisher



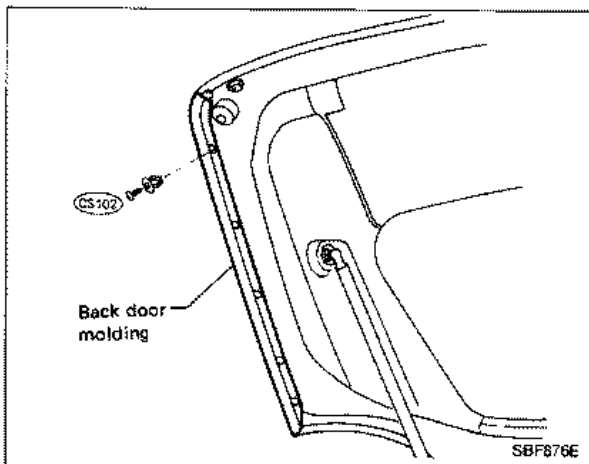
14 Back door weatherstrip



17 Rear panel finisher



15 Back door molding

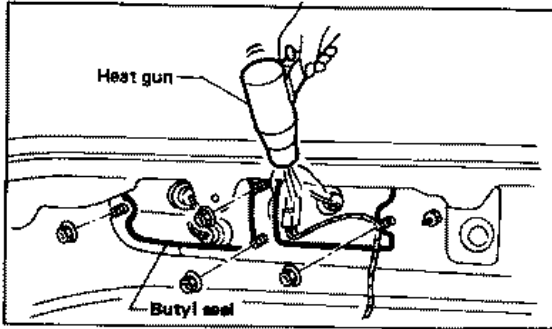


INTERIOR AND EXTERIOR

Exterior (Cont'd)

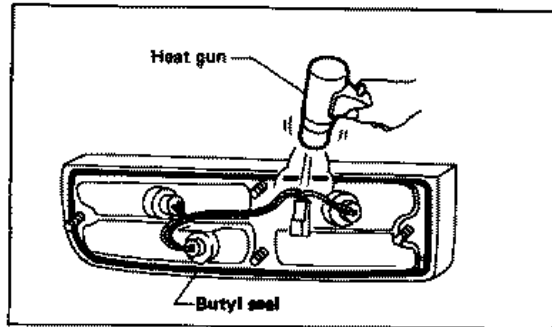
⑱ Rear combination lamp

Removal



- Warm up lamp assembly area to a temperature a little below 60° C (140° F).

Installation

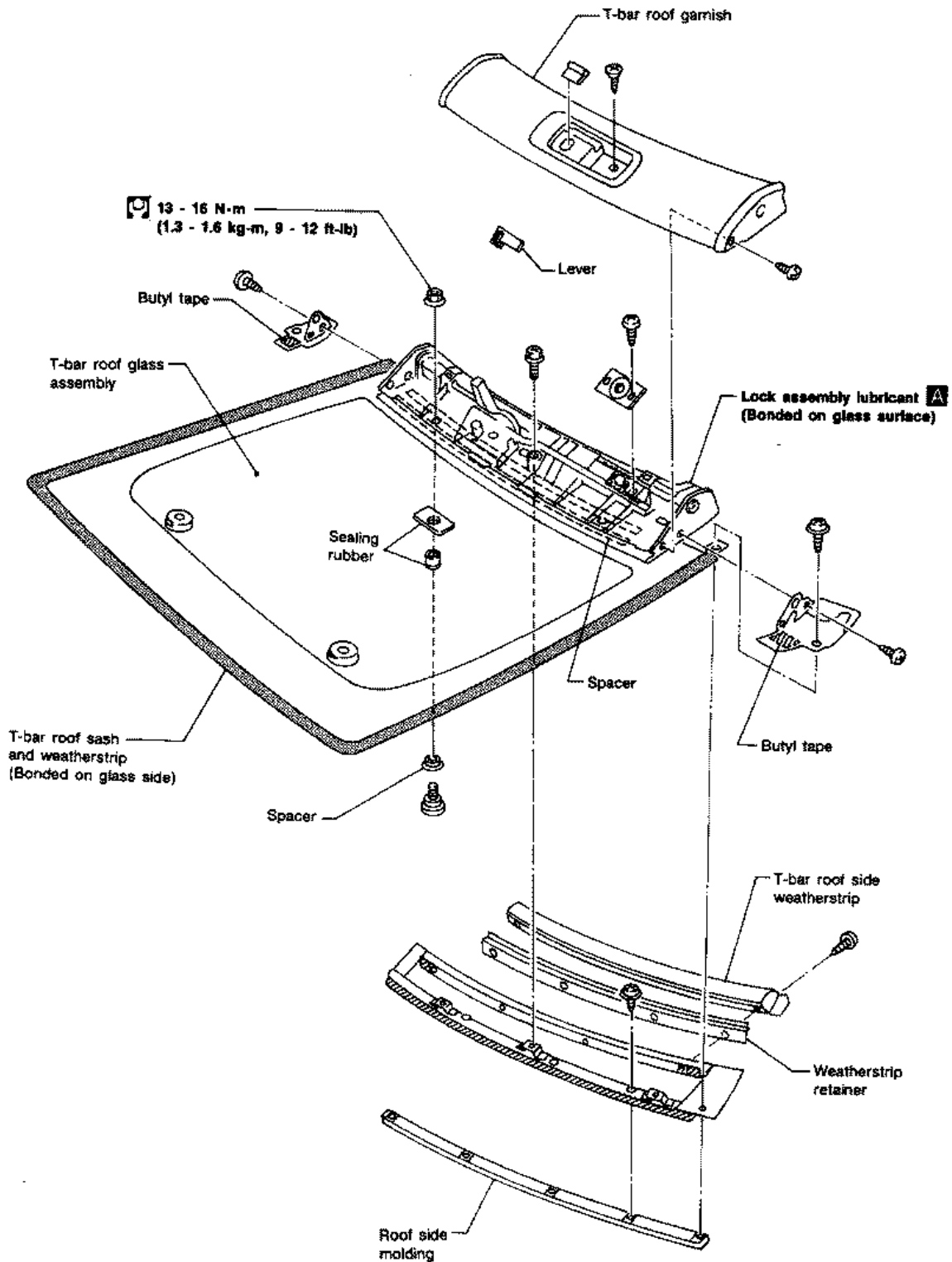


- Apply butyl seal evenly as it tends to become thin in the corners.
- Warm up lamp assembly area to a temperature a little below 60° C (140° F).

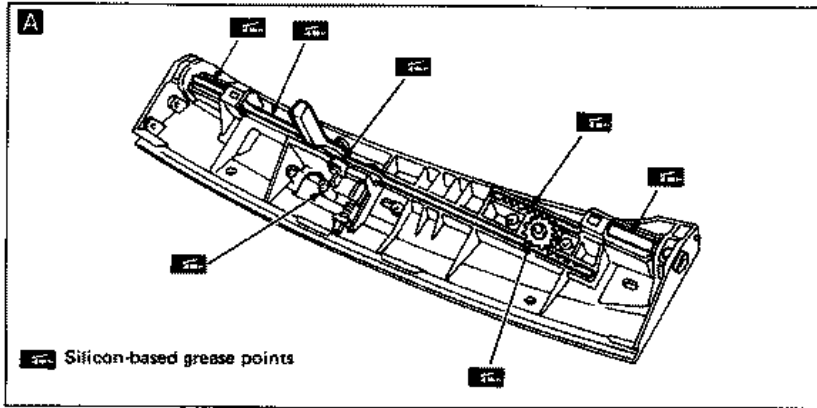
SBF866F

T-BAR ROOF

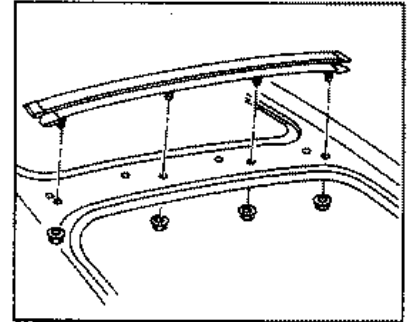
- Handle T-bar roof glass with care so not to damage it.
- Apply sealant to portions susceptible to water leakage if necessary.
- Side molding, sash, lock basement and glass of T-bar roof constitute one unit and cannot be disassembled.



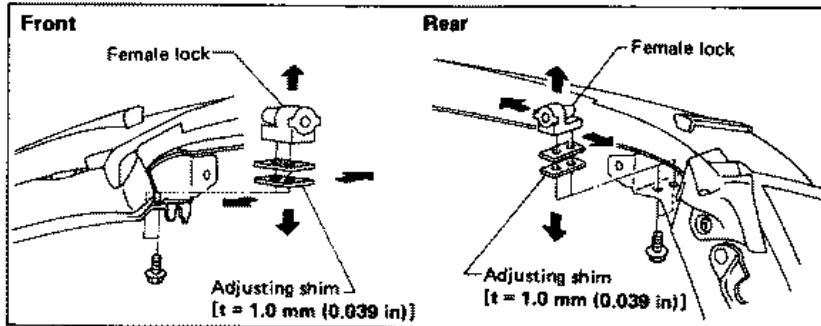
T-BAR ROOF



T-bar roof hook



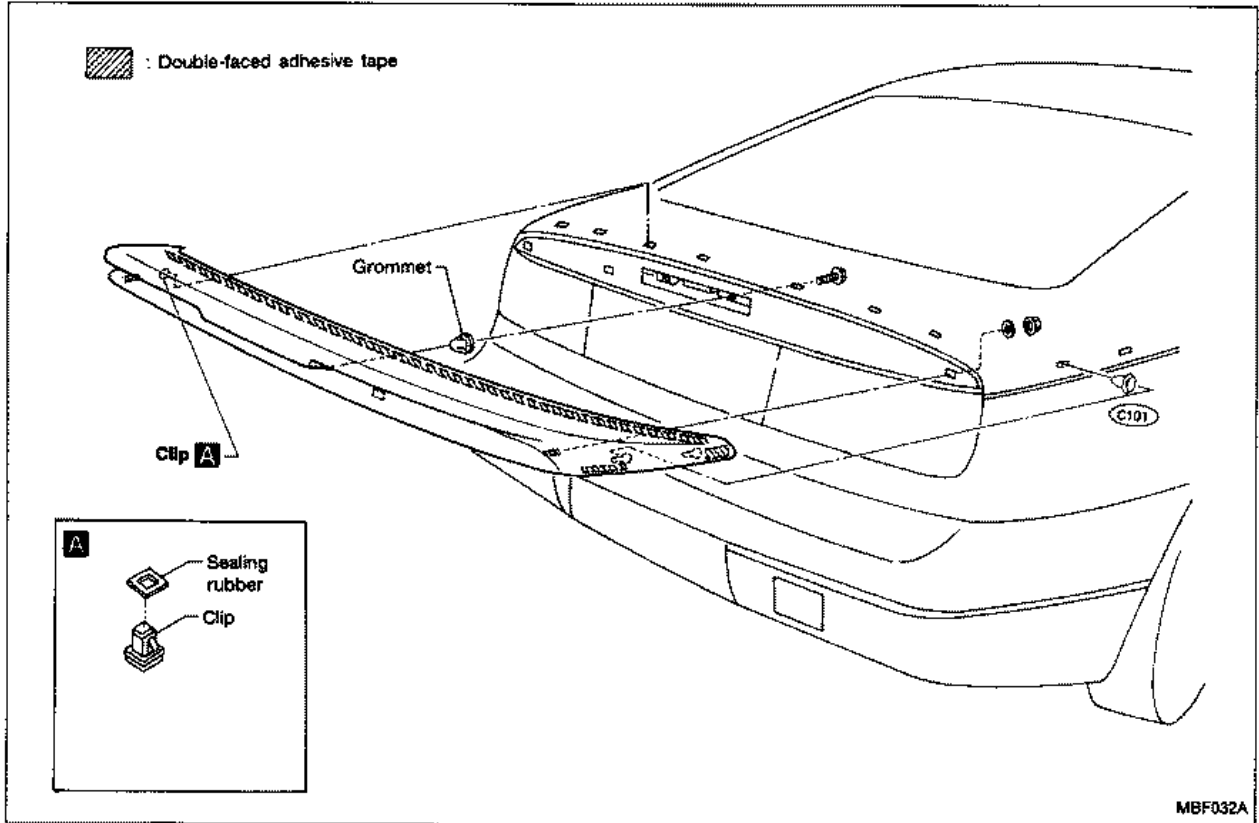
T-bar roof female lock adjustment



REAR AIR SPOILER

- When installing, make sure that there are not gaps or waves at ends of air spoiler.
- Before installing spoiler, clean and remove oil from surface where spoiler will be mounted.

REAR AIR SPOILER



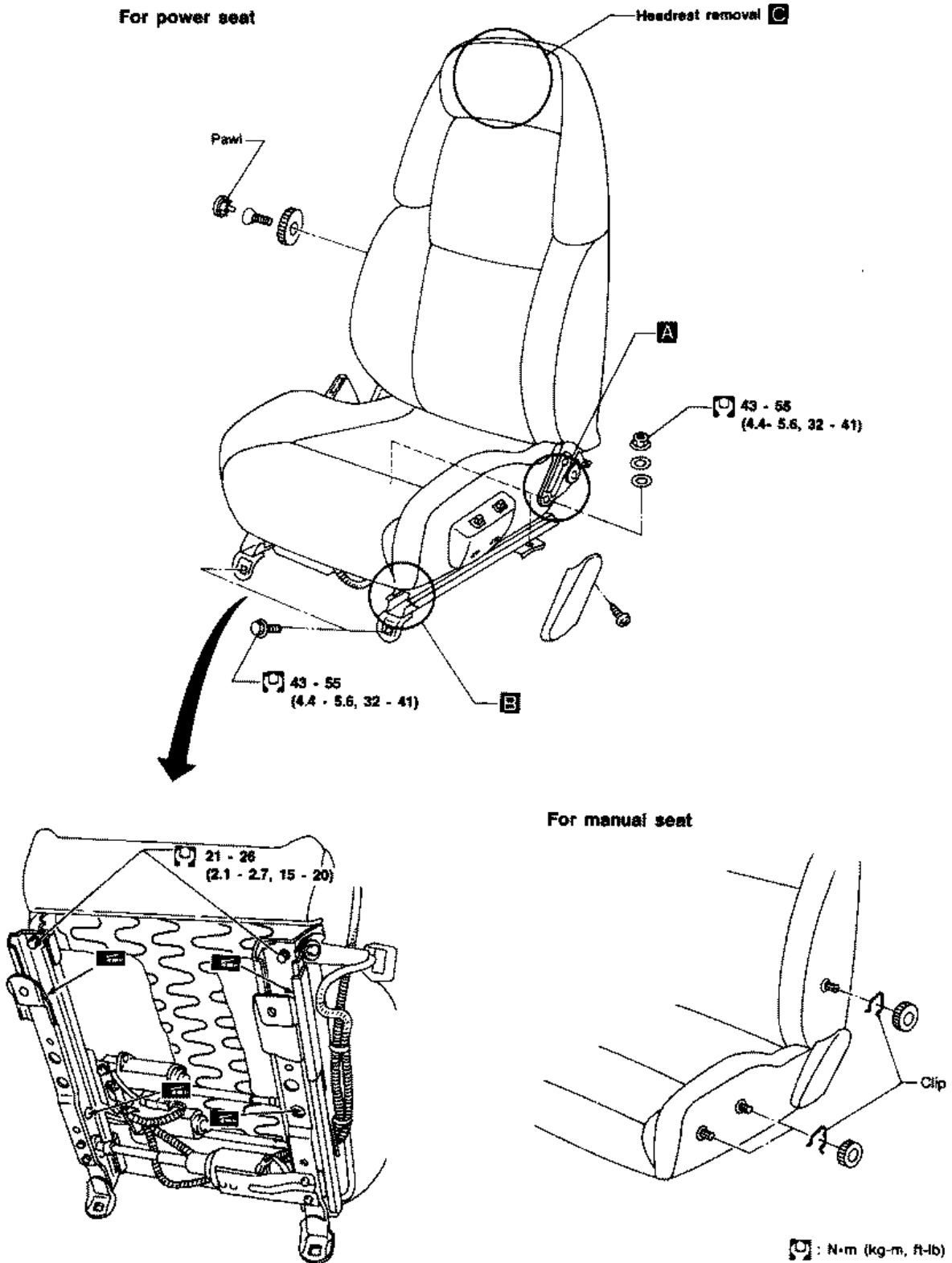
REAR AIR SPOILER

NOTE

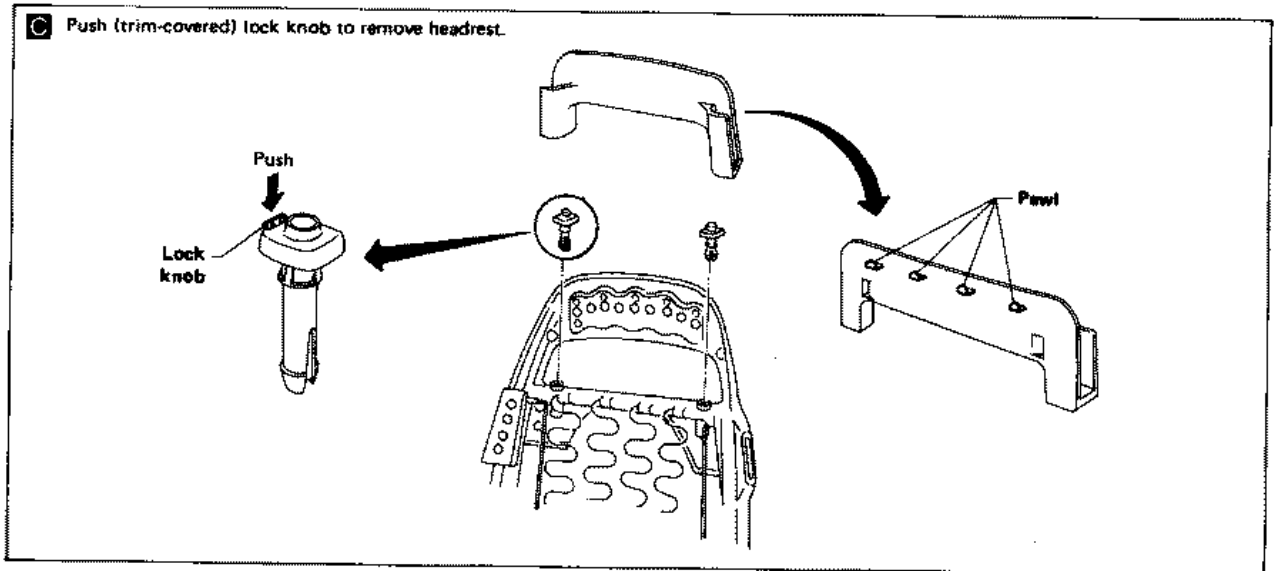
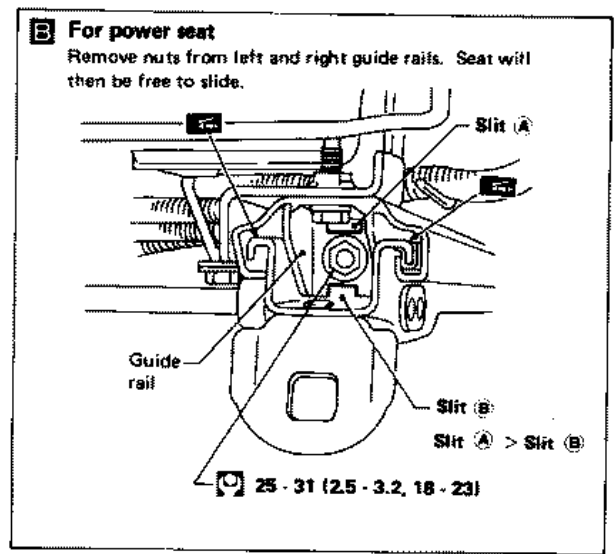
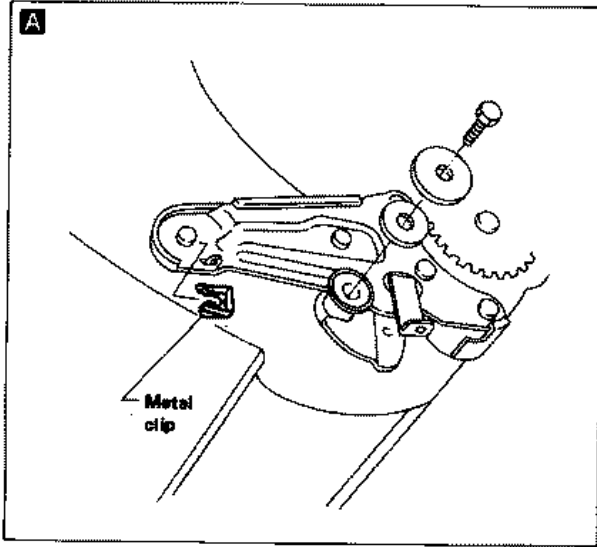
SEAT

- When removing or installing the seat trim, handle it carefully to keep it from becoming dirty and to avoid damage.

FRONT SEAT

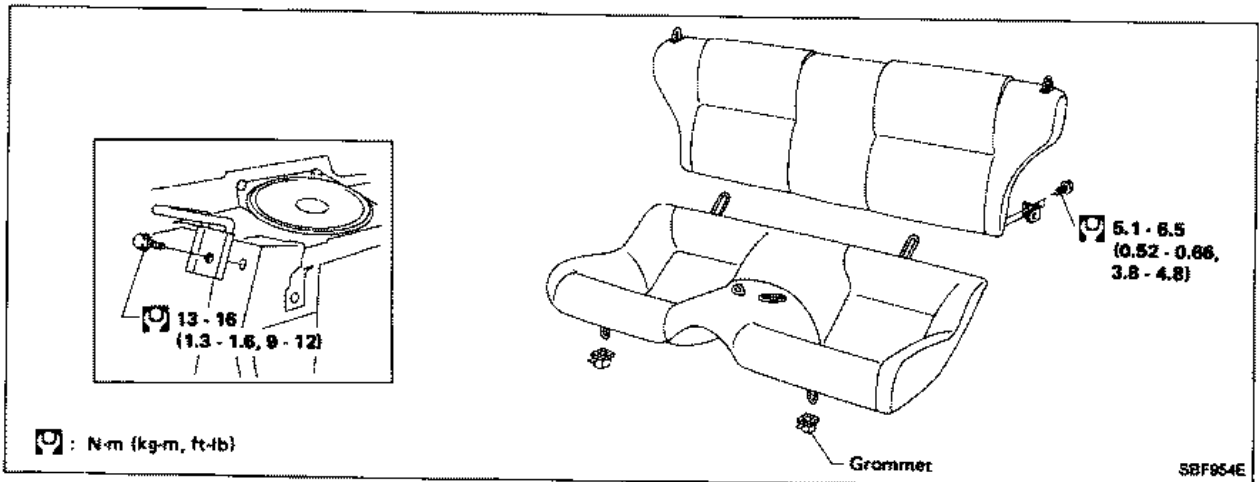


SEAT



REAR SEAT

MBF057A

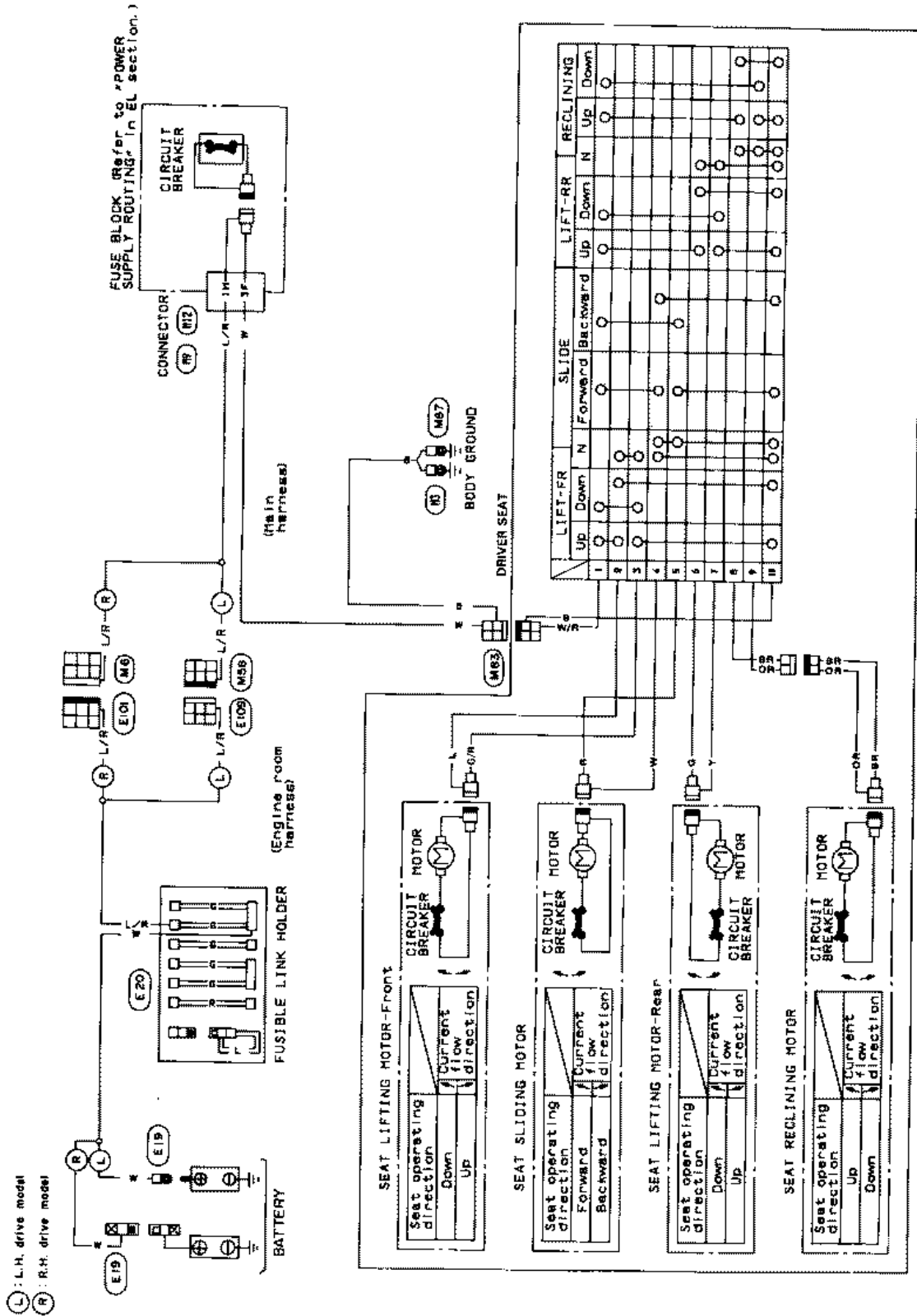


: N·m (kg·m, ft·lb)

SBF954E

SEAT

POWER SEAT/WIRING DIAGRAM

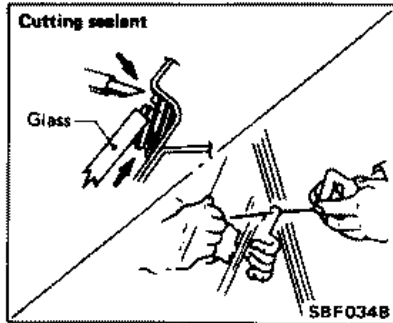


WINDSHIELD AND WINDOWS

Windshield

REMOVAL

After removing moldings, remove glass.

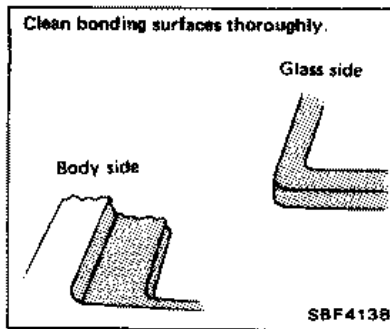


CAUTION:

Be careful not to scratch glass when removing.

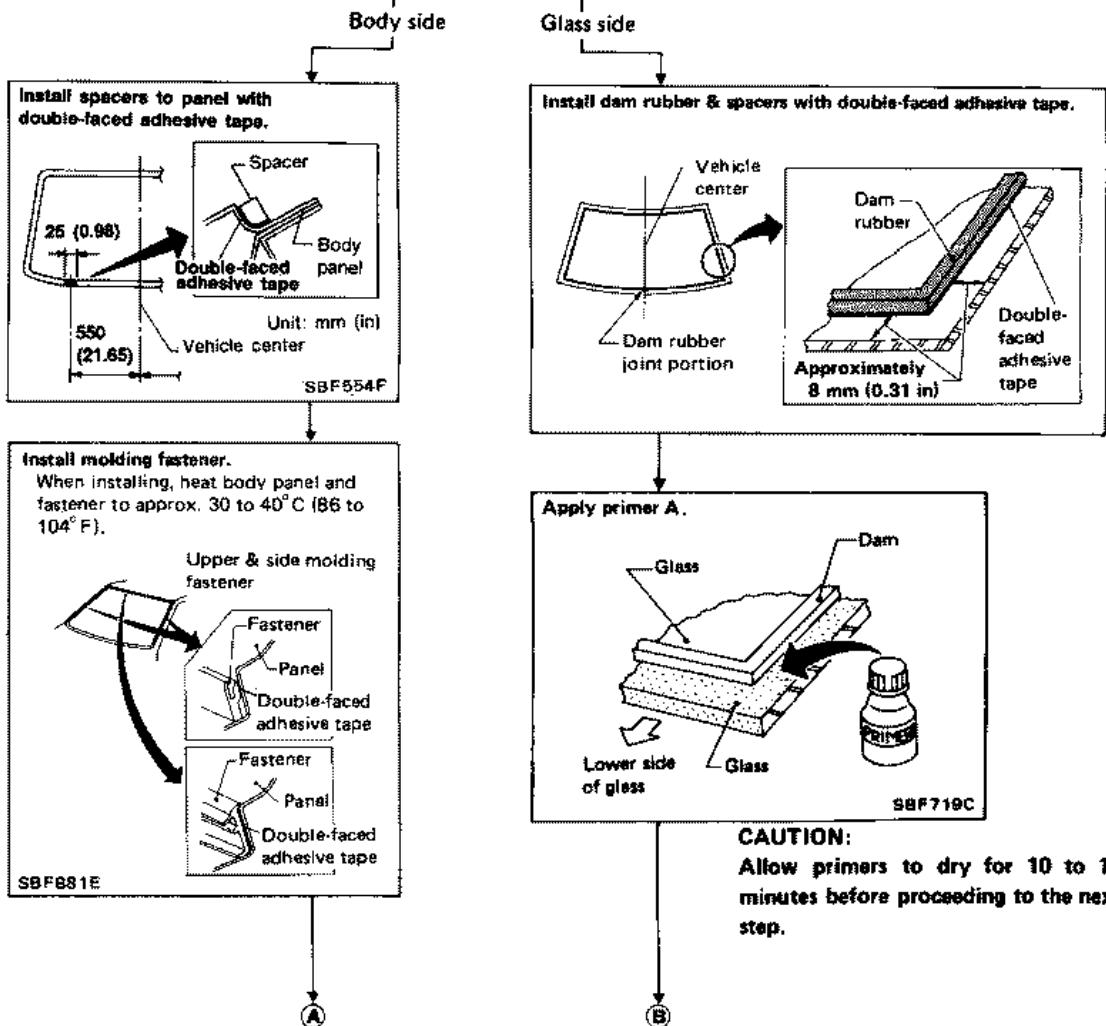
INSTALLATION

- Use genuine Nissan Sealant kit or equivalent. Follow instructions provided with each kit.
- After installation, the vehicle should remain stationary for about 24 hours.
- Do not use sealant which is more than 12 months past its production date.
- Do not leave cartridge unattended with its cap open.
- Keep primers and sealant in a cool, dry place. Nissan recommends that they are stored in a refrigerator.
- Be sure to install moldings.



WARNING:

Keep heat or open flames away as primers are flammable.

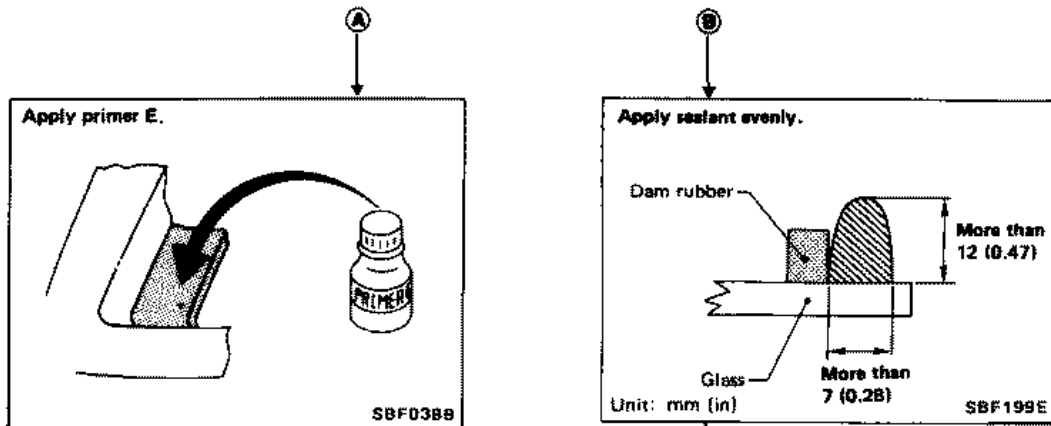


CAUTION:

Allow primers to dry for 10 to 15 minutes before proceeding to the next step.

WINDSHIELD AND WINDOWS

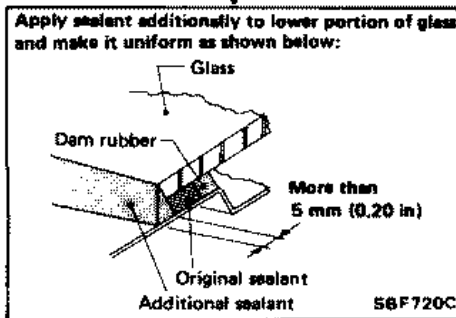
Windshield (Cont'd)



CAUTION:
Allow primers to dry for 10 to 15 minutes before proceeding to the next step.

CAUTION:
Windshield glass should be installed within 15 minutes of applying sealant: sealant starts to harden 15 minutes after it is applied.

Set glass in position and press glass lightly and evenly.



Check for water leakage.

CAUTION:
For sealant drying period, refer to "Drying Time for Sealant".

Apply sealant to upper & side molding fixing portion.

Set upper and side moldings.

CAUTION:
Molding must be installed securely so that it is in position and leaves no gap.

Install lower molding.

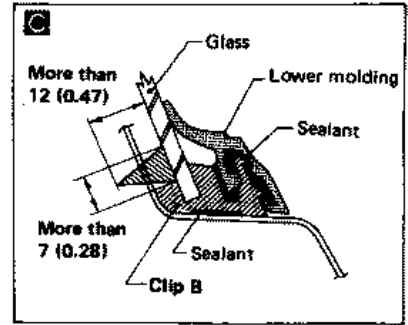
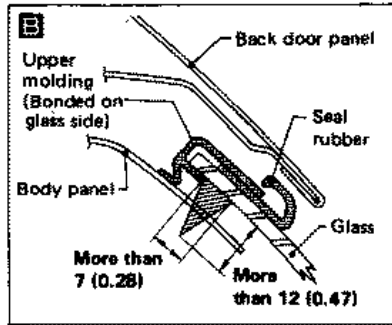
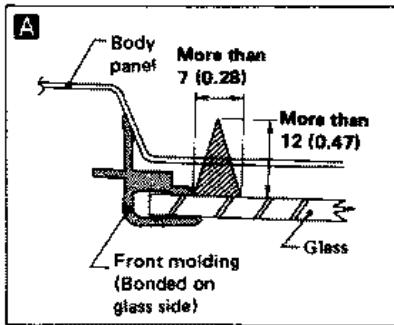
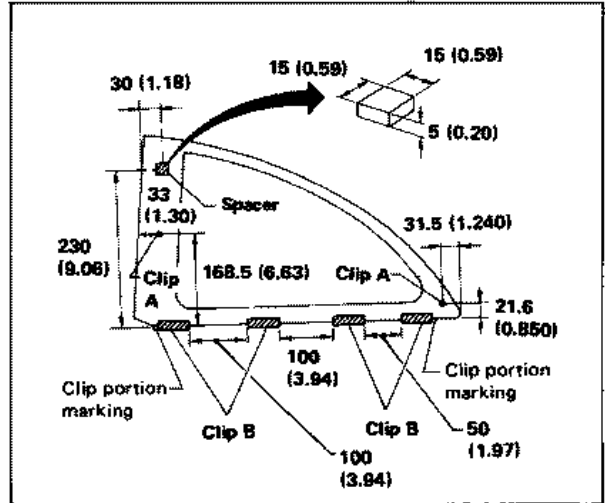
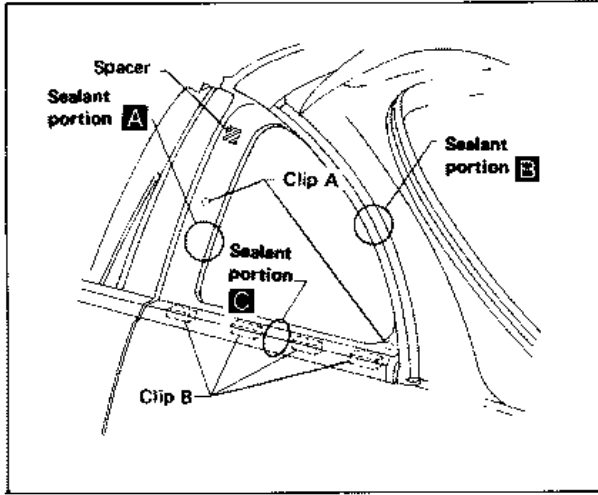
For details of moldings, refer to "Exterior".

WINDSHIELD AND WINDOWS

Side Window

Spacer and clip portion

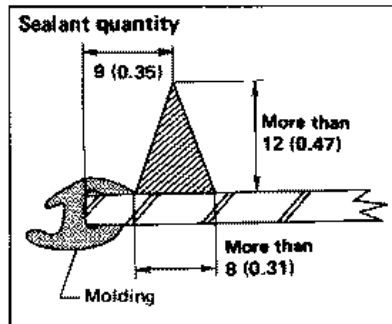
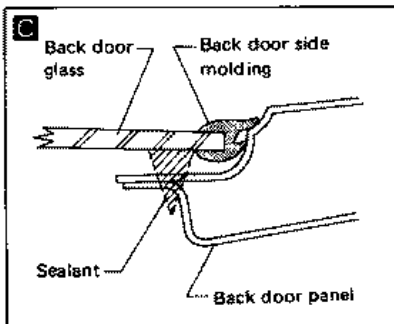
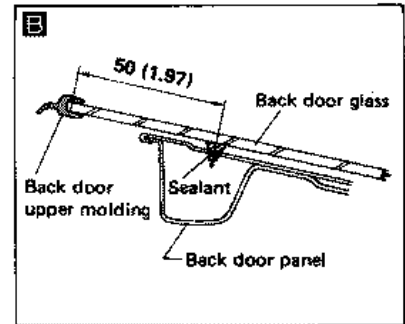
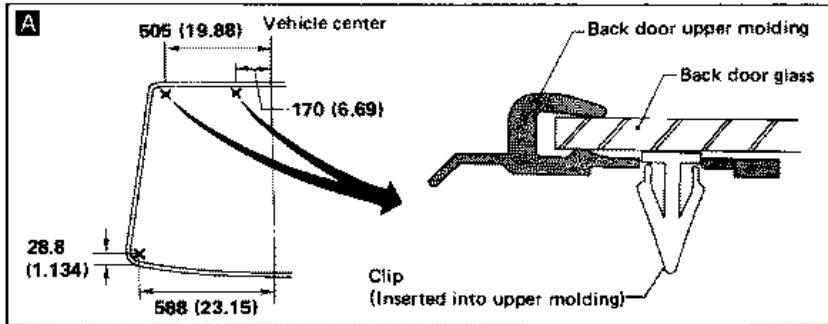
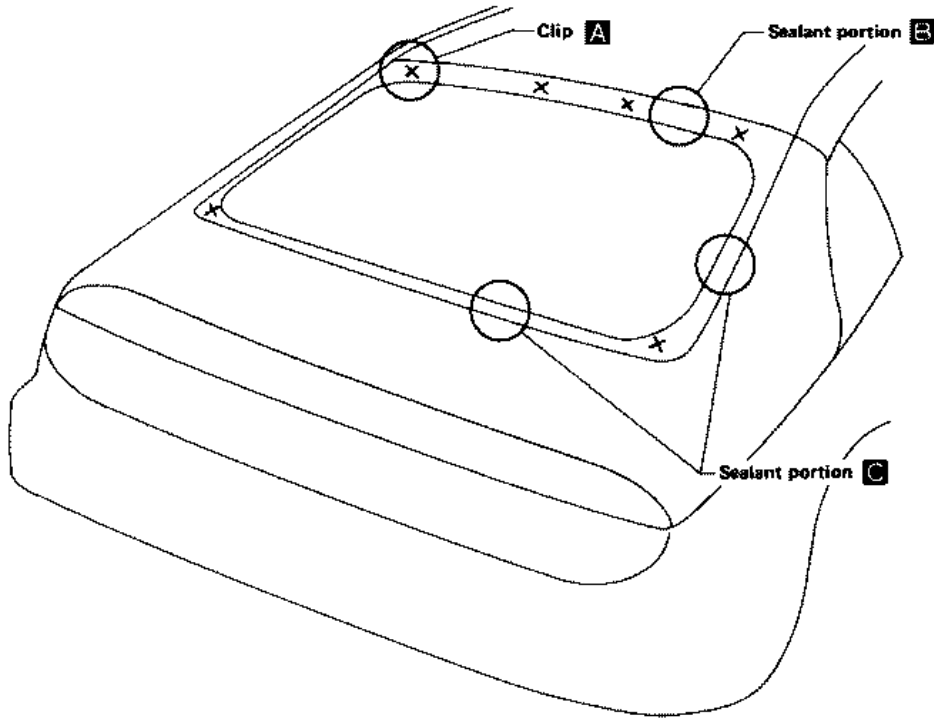
Unit: mm (in)



WINDSHIELD AND WINDOWS

Back Door Window

- Construction and removal/reinstallation method of back door window are basically the same as those of windshield.
- For sealant drying time, refer to "Drying Time for Sealant".
- For details of moldings, refer to "Exterior".



Unit: mm (in)

SBF884E

WINDSHIELD AND WINDOWS

Drying Time for Sealant

Reference: Time required for sealant to dry to desired hardness.

Unit: days

Relative humidity %	90	50	25
Temperature °C (°F)			
40 (104)	1.0	1.5	3.0
25 (77)	1.5	2.5	5.0
5 (41)	3.0	8.0	13.0

CAUTION:

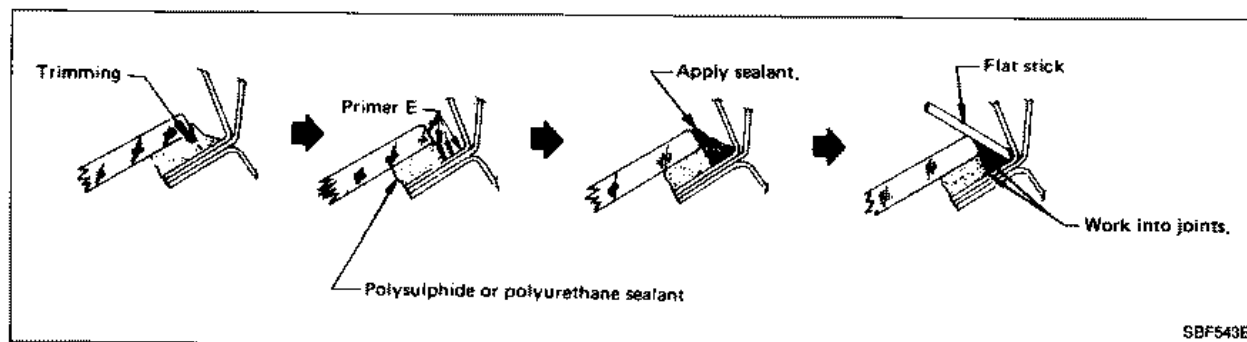
Advise the user of the fact that vehicle should not be driven on rough roads or surfaces until sealant has properly vulcanized.

Repairing Water Leaks for Windshield, Side Window and Back Door Window

Leaks can be repaired without removing and reinstalling glass.

If water is leaking between caulking material and body or between glass and caulking material, determine the extent of the leak by applying water while pushing glass outward.

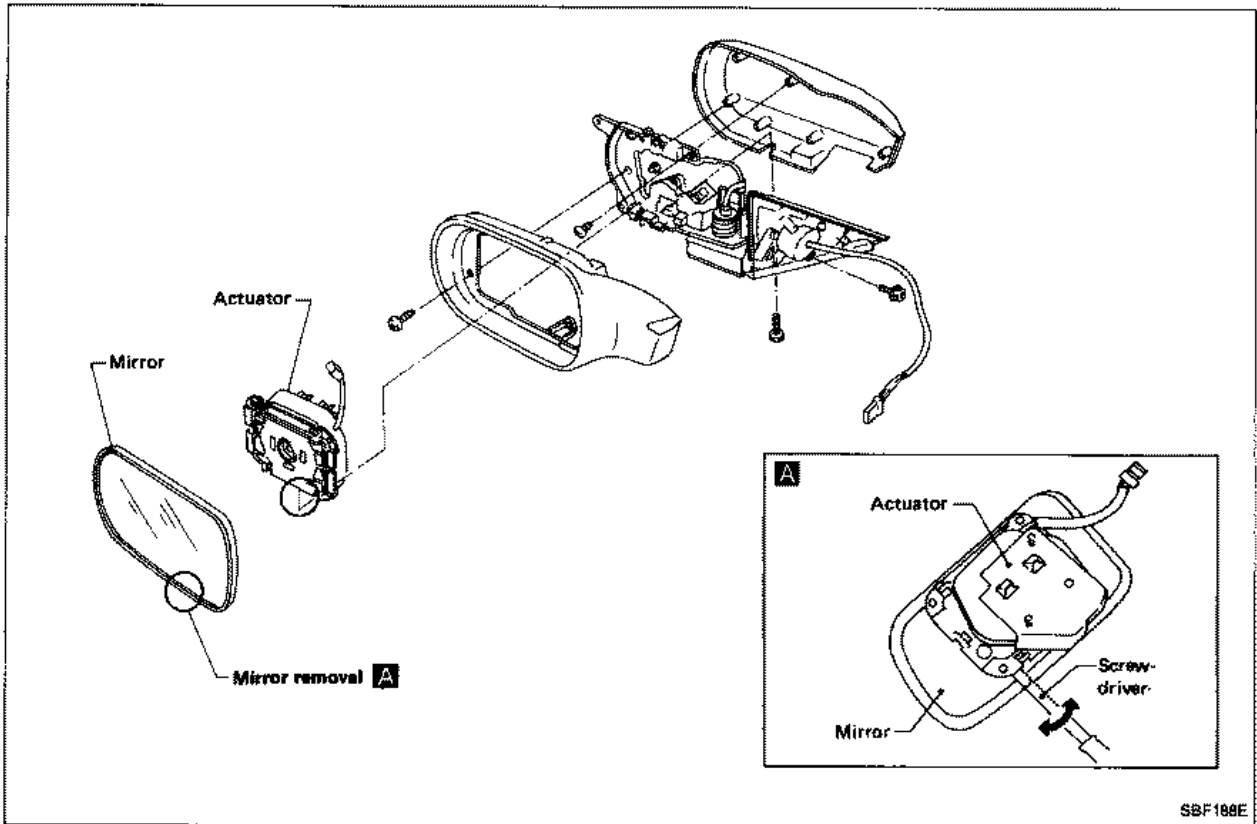
To stop the leak, apply primer and then sealant to the leak point.



Afterwards, install molding securely.

MIRROR

Door Mirror



SBF188E

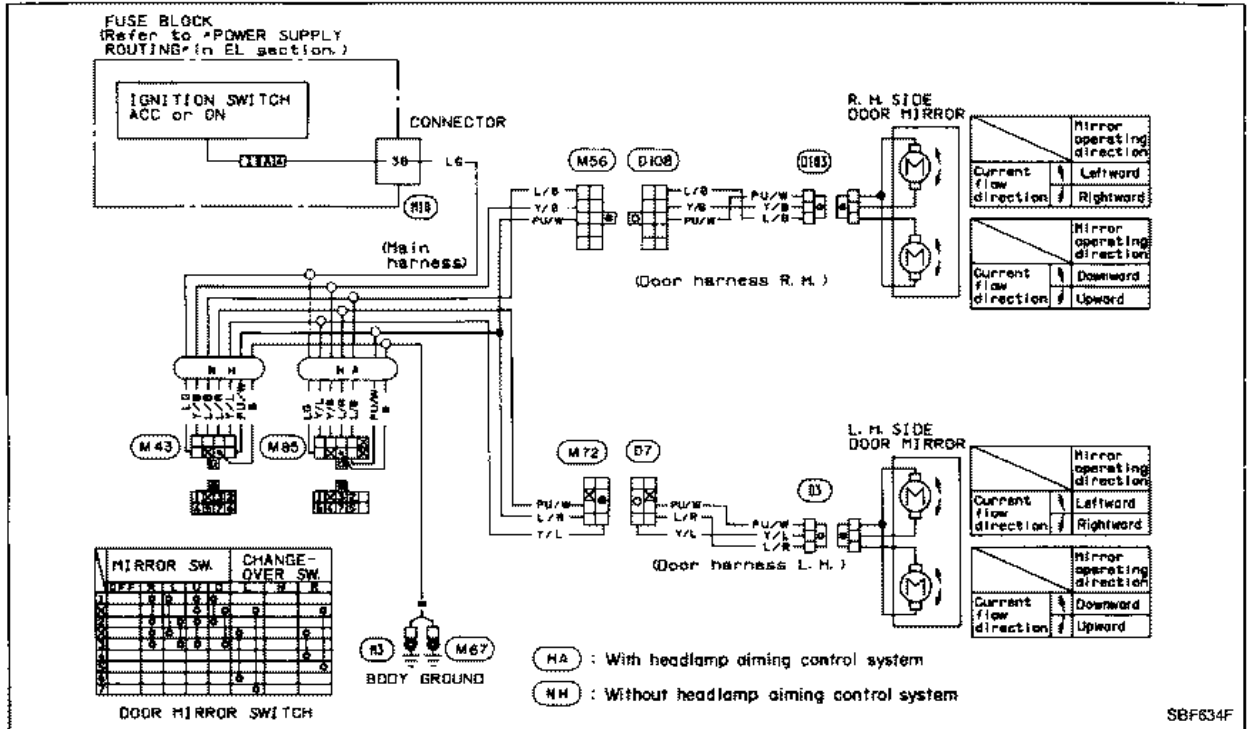
MIRROR

Door Mirror (Cont'd)

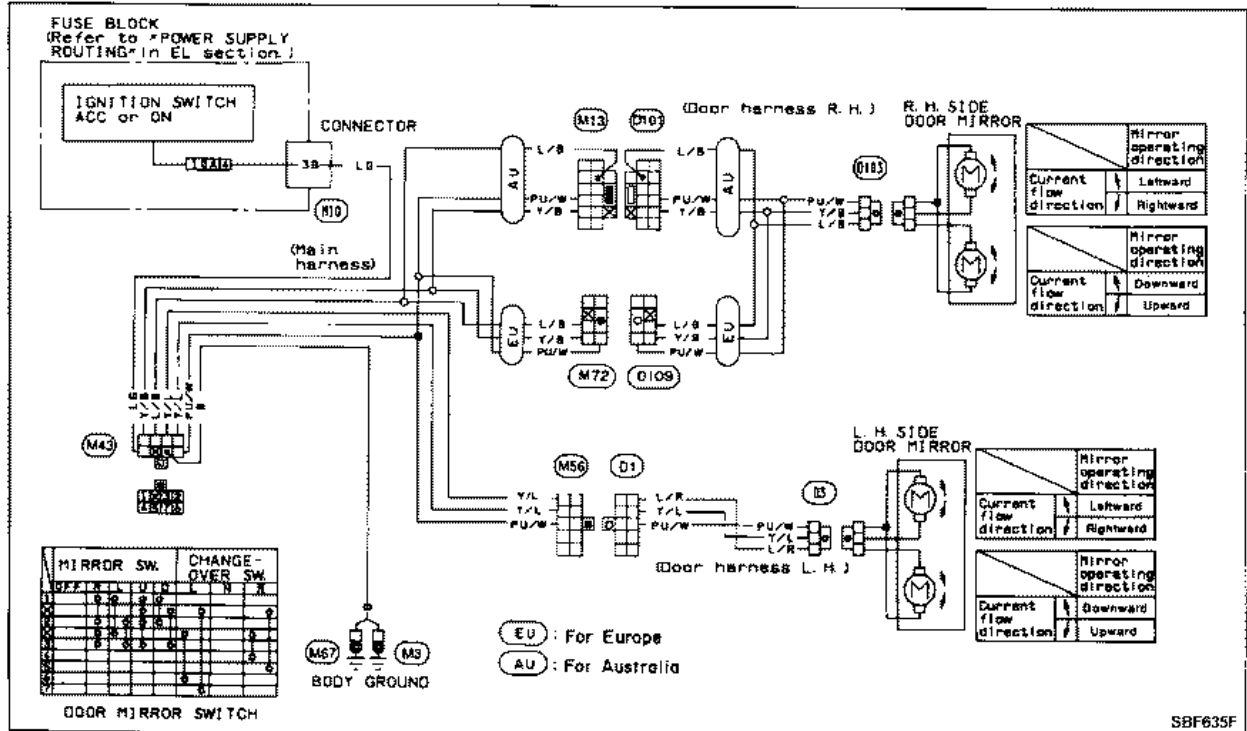
WIRING DIAGRAM

Without door mirror defogger

L.H. drive model

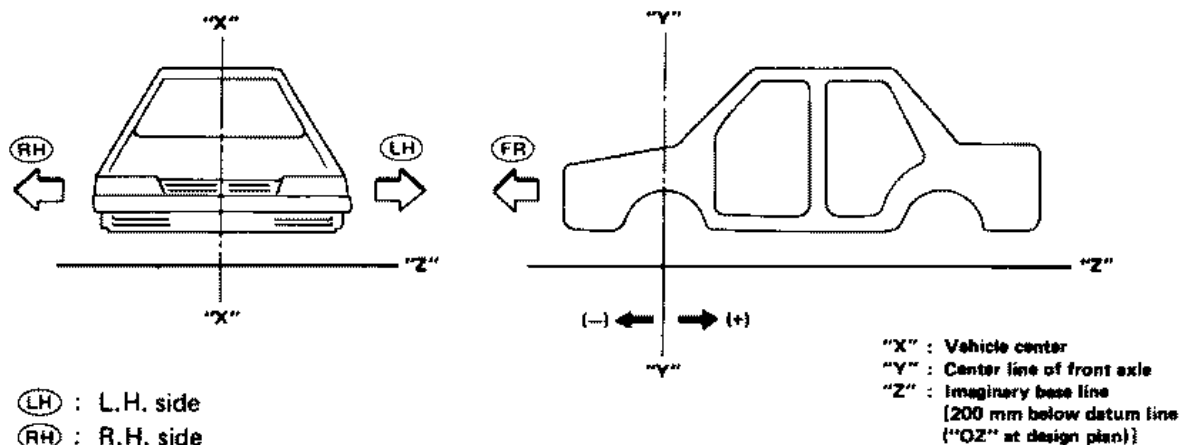


R.H. drive model



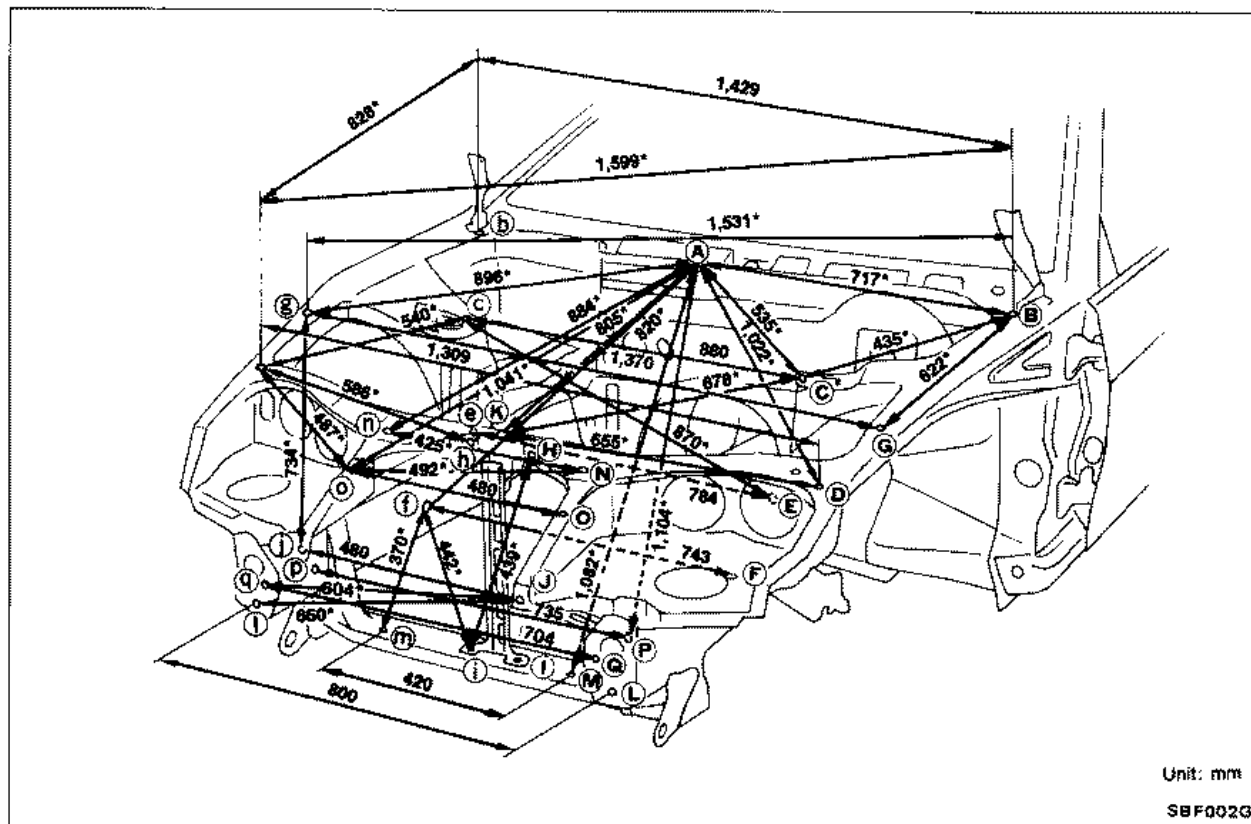
BODY ALIGNMENT

- All dimensions indicated in figures are actual ones.
- When a tram tracking gauge is used, adjust both pointers to equal length and check the pointers and gauge itself to make sure there is no free play.
- When a measuring tape is used, check to be sure there is no elongation, twisting or bending.
- Measurements should be taken at the center of the mounting holes.
- An asterisk (*) following the value at the measuring point indicates that the measuring point on the other side is symmetrically the same value.
- The coordinates of the measurement points are the distances measured from the standard line of "X", "Y" and "Z".



Engine Compartment

MEASUREMENT

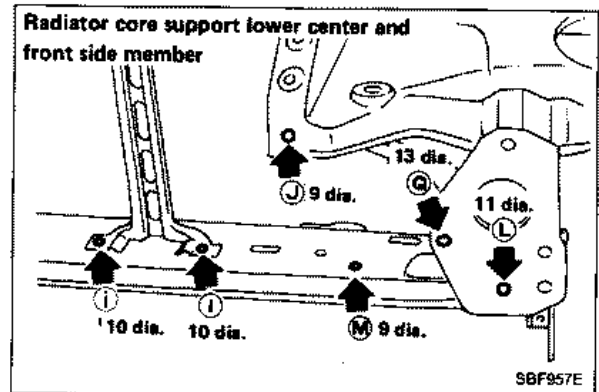
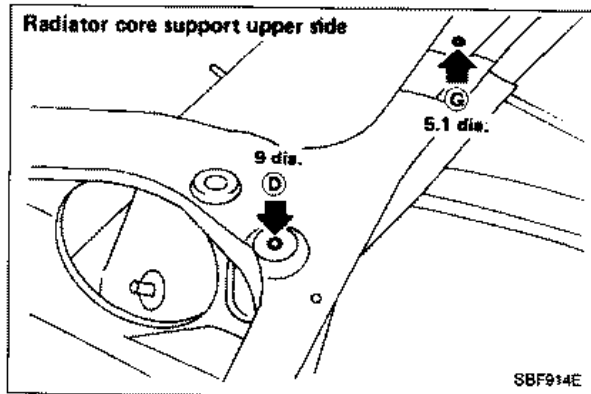
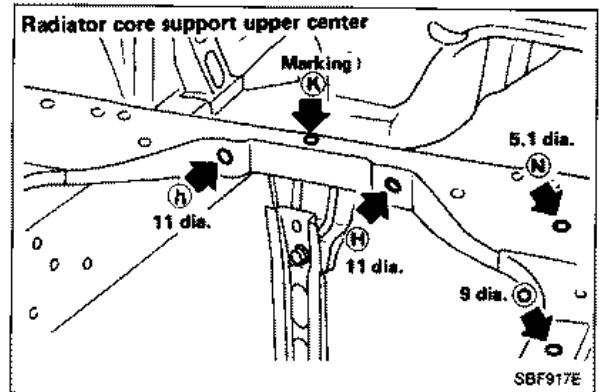
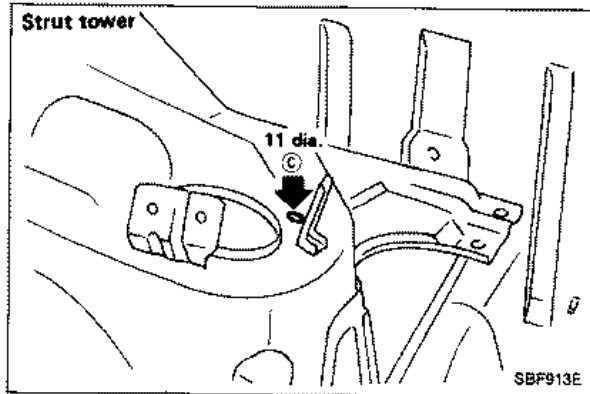
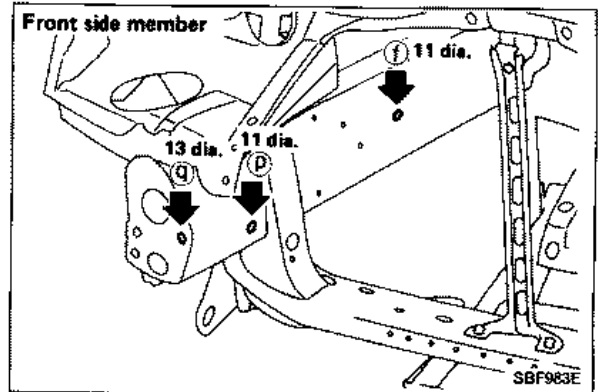
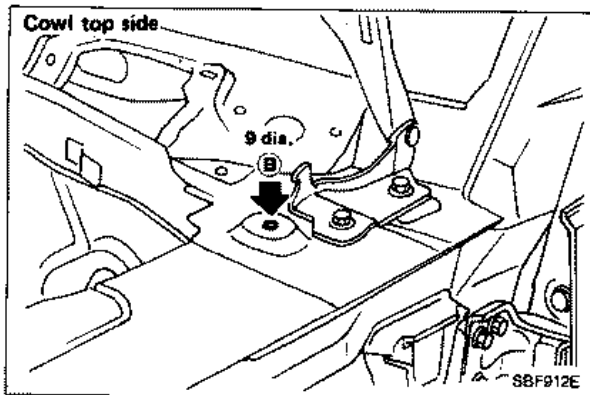
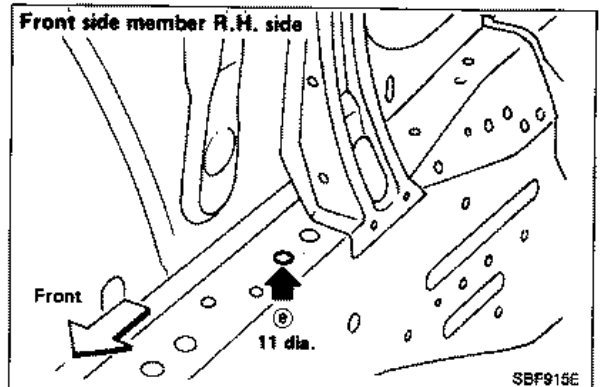
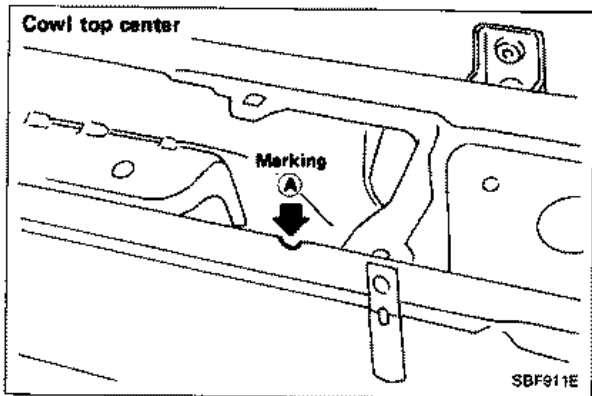


BODY ALIGNMENT

Engine Compartment (Cont'd)

MEASUREMENT POINTS

Unit: mm

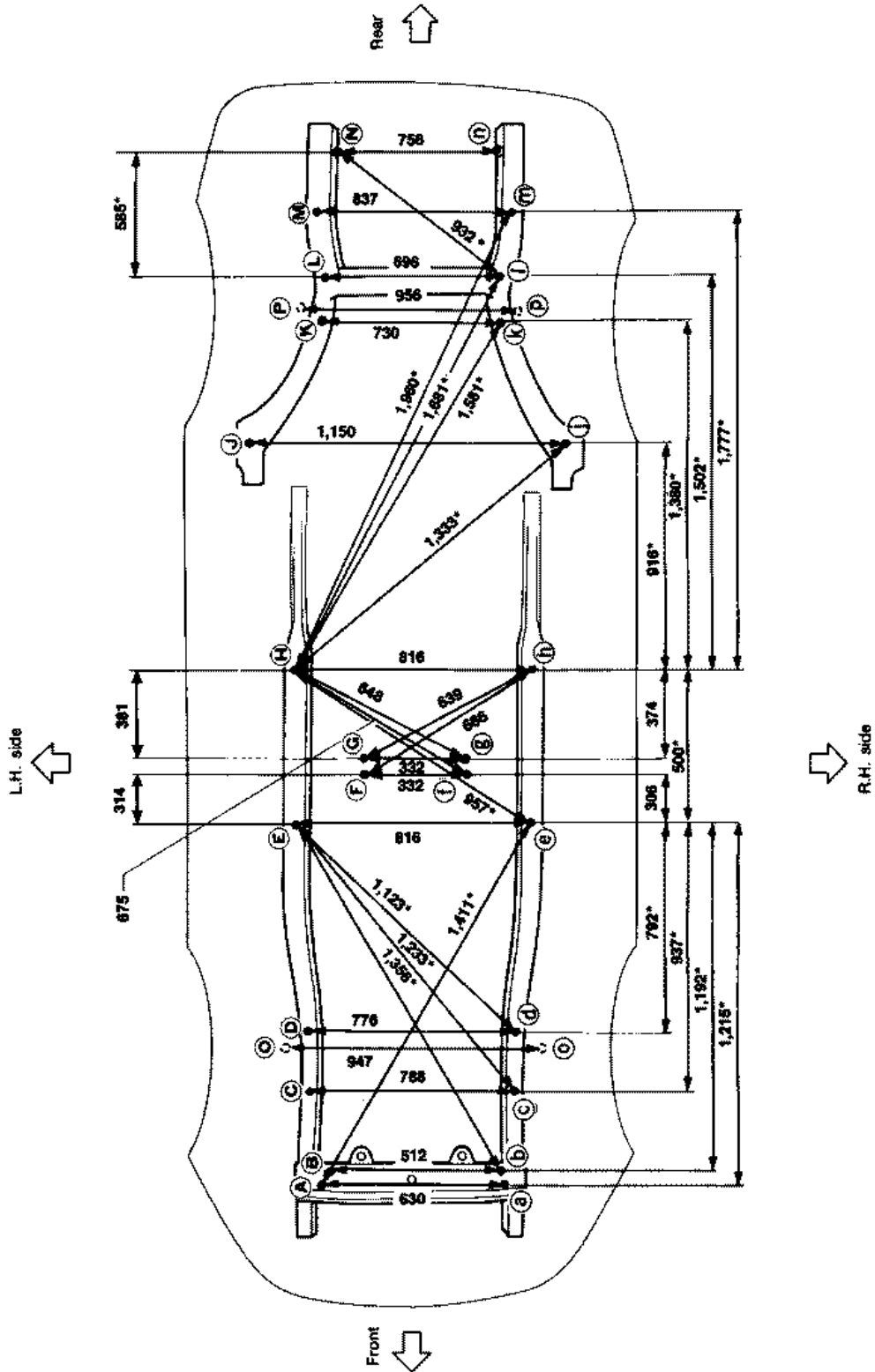


BODY ALIGNMENT

Underbody

MEASUREMENT

Unit: mm

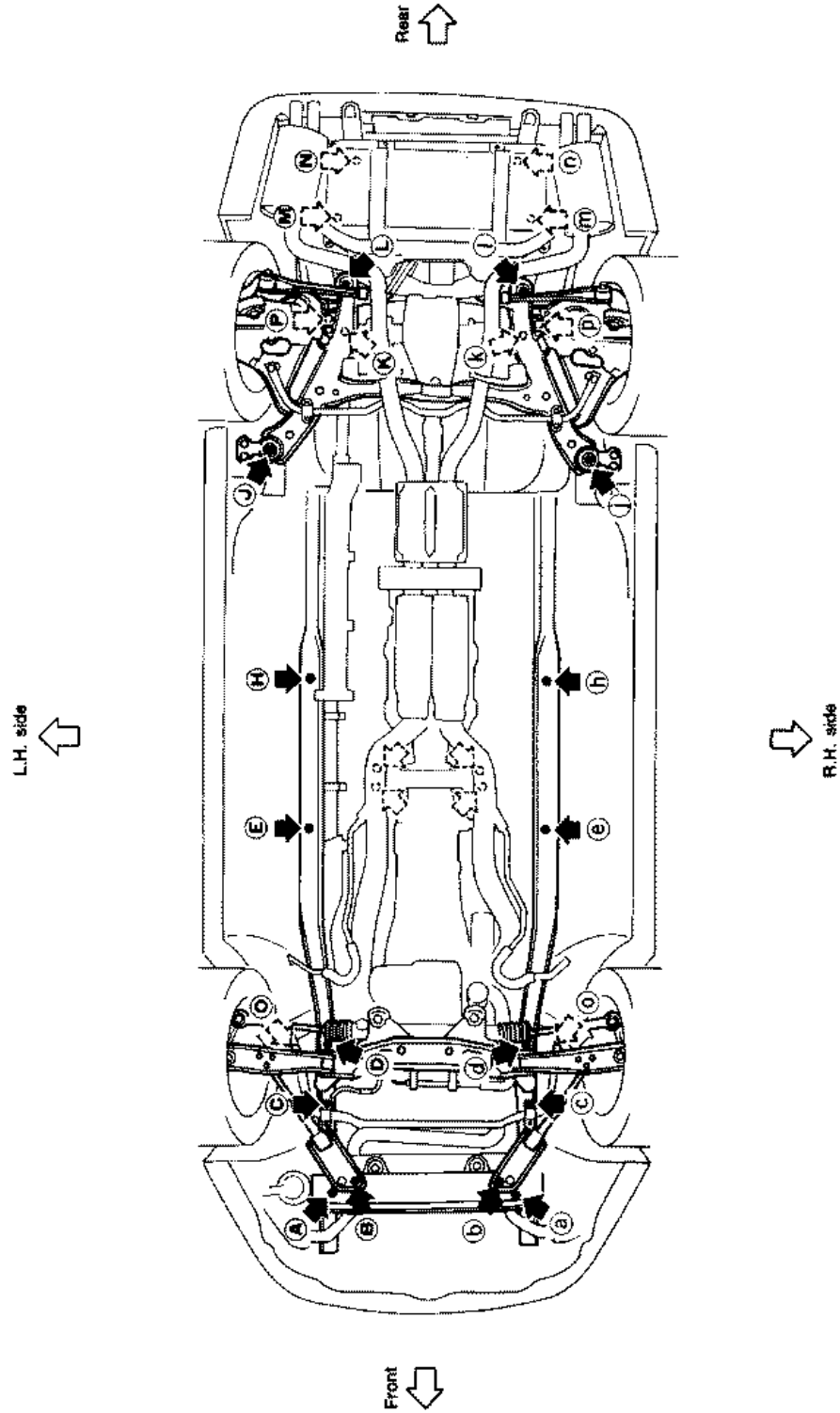


All dimensions indicated in this figure are actual ones. (There are no projected dimensions.)

BODY ALIGNMENT

Underbody (Cont'd)

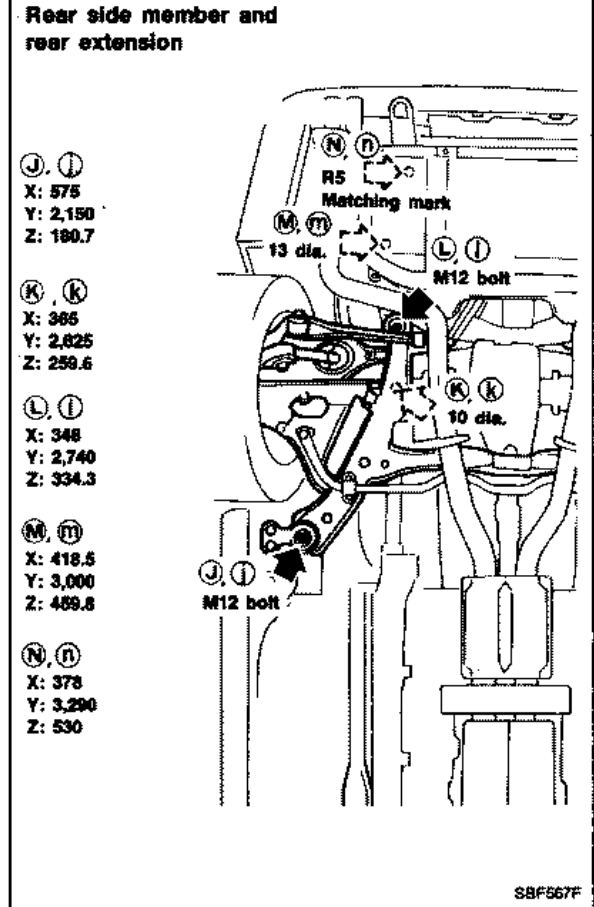
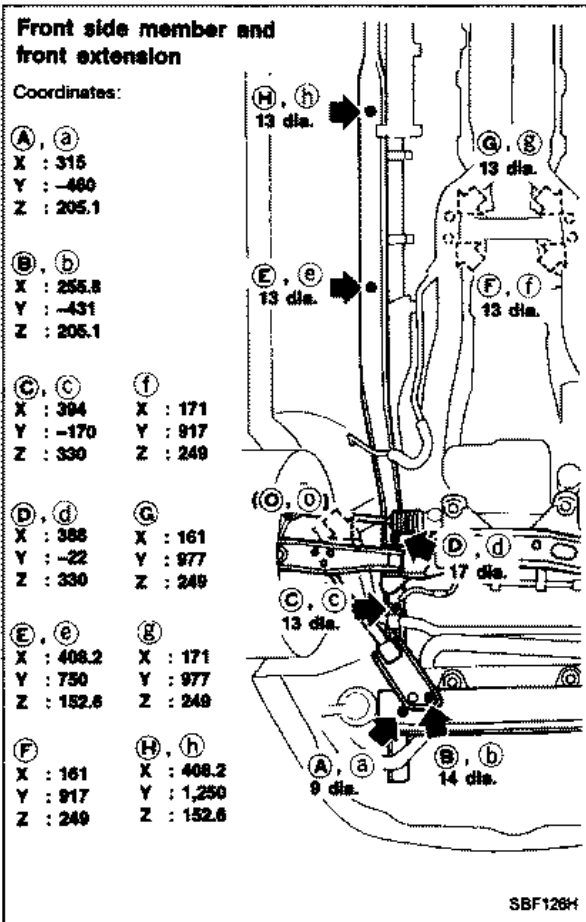
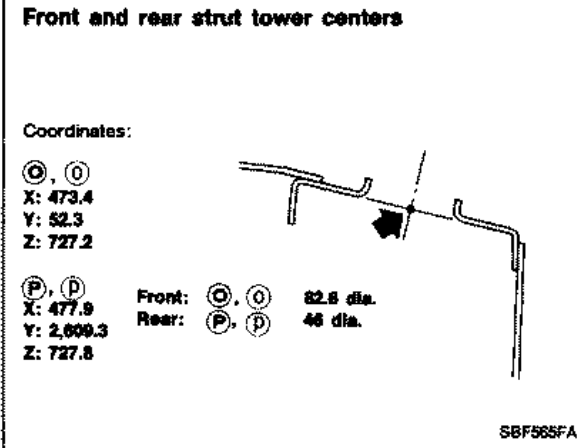
MEASUREMENT POINTS



BODY ALIGNMENT

Underbody (Cont'd)

Unit: mm



HEATER & AIR CONDITIONER

SECTION **HA**

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SERVICE DATA AND SPECIFICATIONS (S.D.S.)	HA-168

When you read wiring diagrams:

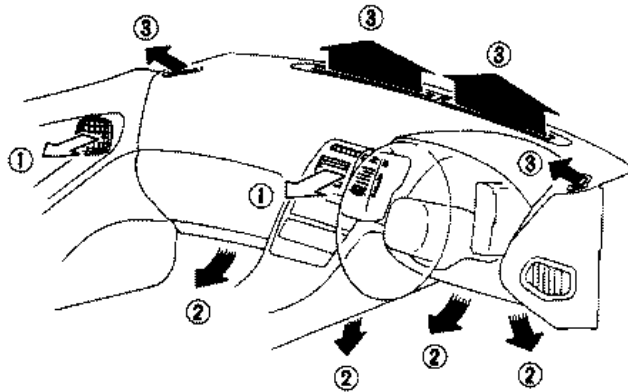
- Read GI section, "HOW TO READ WIRING DIAGRAMS".
- See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.

When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES".

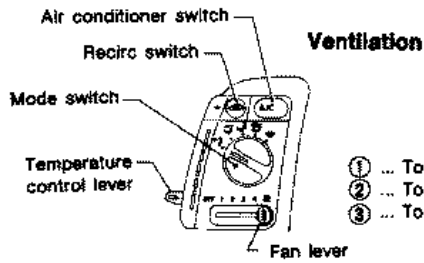
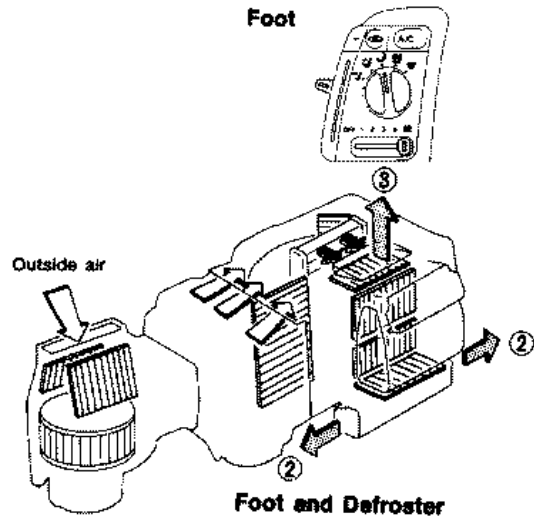
HA

AIR FLOW AND COMPONENT LAYOUT — Manual Air Conditioner

Air Flow

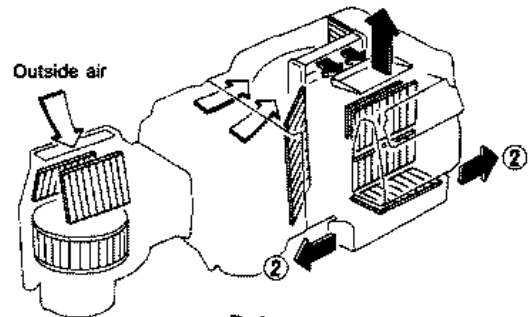
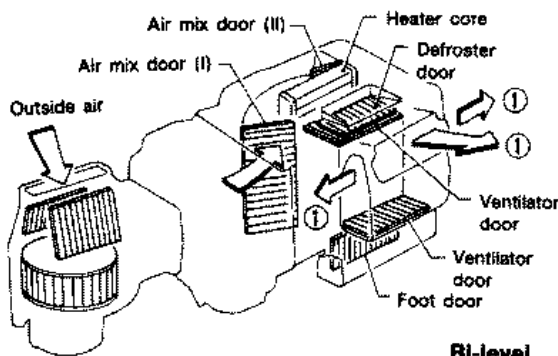
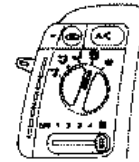


Foot

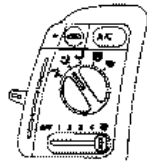


- ① ... To ventilator
- ② ... To floor
- ③ ... To defroster

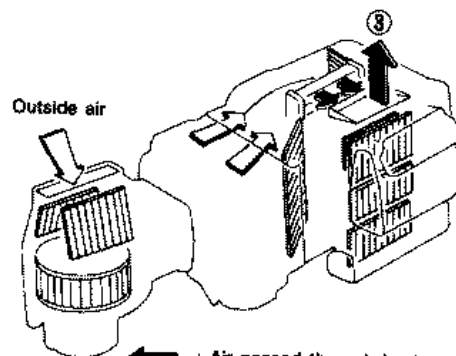
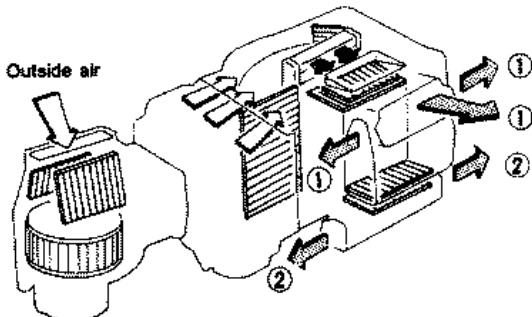
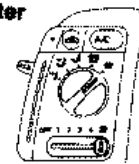
Foot and Defroster



BI-level



Defroster

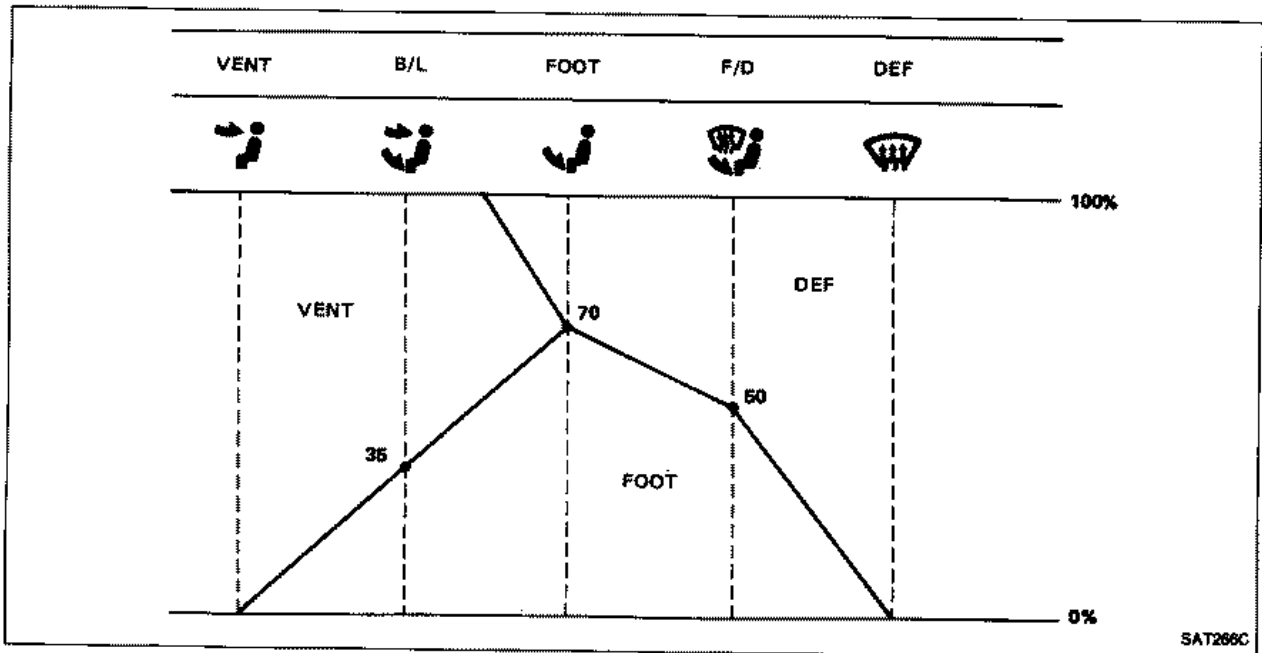


- ← : Air passed through heater core
- ←+← : Mixed air (←+←)
- ← : Air not passed through heater core

AIR FLOW AND COMPONENT LAYOUT — Manual Air Conditioner

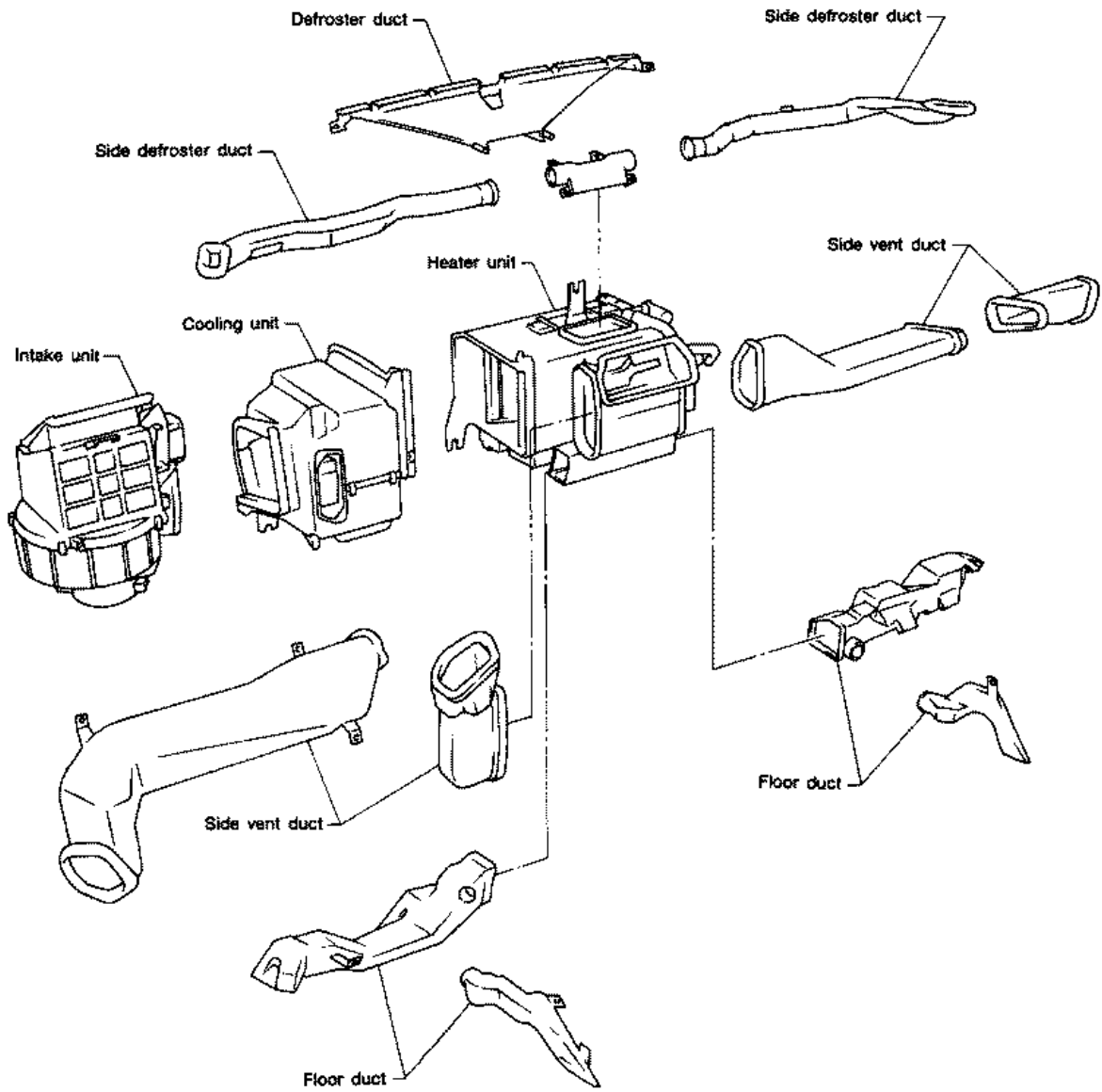
Air Flow (Cont'd)

AIR DISTRIBUTION RATIOS

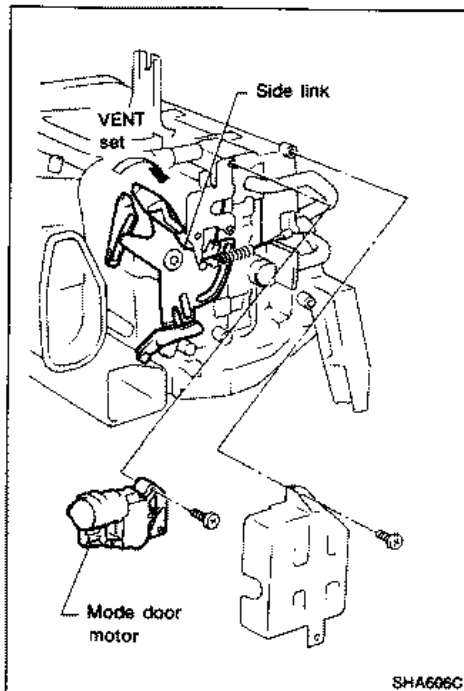


AIR FLOW AND COMPONENT LAYOUT — Manual Air Conditioner

Component Layout



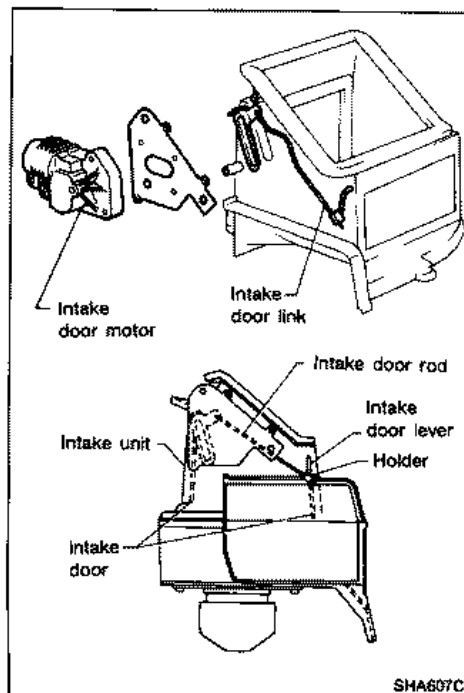
DOOR CONTROL — Manual Air Conditioner



Control Rod Adjustment

MODE DOOR

1. Move side link by hand and hold mode door in VENT mode.
2. Install mode door motor on heater unit and connect it to harness.
3. Turn ignition switch to ACC.
4. Turn VENT switch ON.
5. Attach mode door rod to side link rod holder.
6. Check that when DEF position is selected, only DEF door is at full-open position, and when VENT position is selected, only VENT door is at full-open position.



INTAKE DOOR

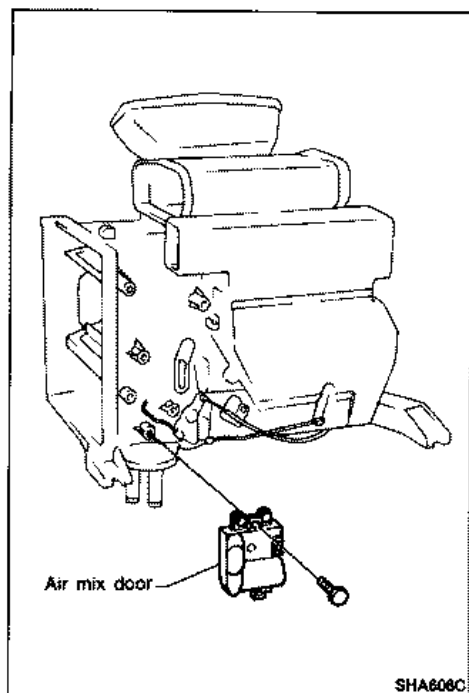
1. Install intake door motor on intake unit.
2. Connect intake door motor harness connector.
3. Turn ignition switch to ACC.
4. Turn REC switch ON.
5. Install intake door lever.
6. Set intake door rod in REC position and fasten intake door rod to holder on intake door lever.
7. Check that intake door operates properly when REC switch is turned ON and OFF.

DOOR CONTROL — Manual Air Conditioner

Control Rod Adjustment (Cont'd)

AIR MIX DOOR

1. Connect harness to air mix door motor and set temperature control lever at full-cold position.
2. Set air mix doors I and II at full-cold position and fasten door rod.
3. Check that when temperature control lever is at full-cold, both doors are at full-cold position, and when temperature control lever is at full-hot, both doors are at full-hot position.



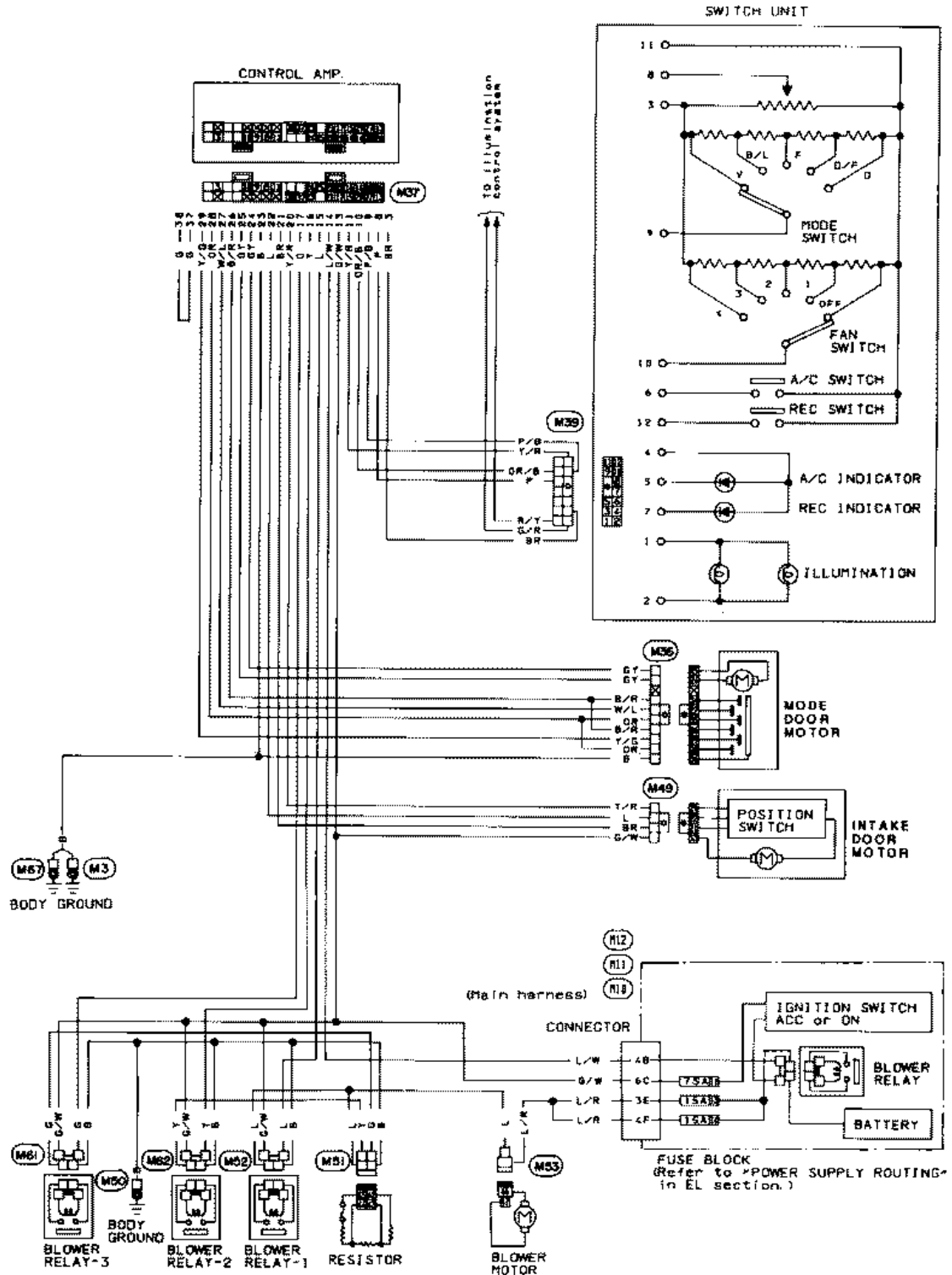
WATER COCK CONTROL CABLE

Clamp cable at full-close position when air mix doors I and II are at full-cold position, and full-open position when air mix doors I and II are at full-hot position.

HEATER ELECTRICAL CIRCUIT — Manual Air Conditioner

Wiring Diagram

R.H. DRIVE MODEL



PRECAUTIONS

Goggles



RHA260B

Gloves



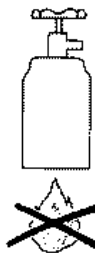
RHA261B

Avoid Open Flame



RHA262B

No Direct Heat
on Container



RHA263B

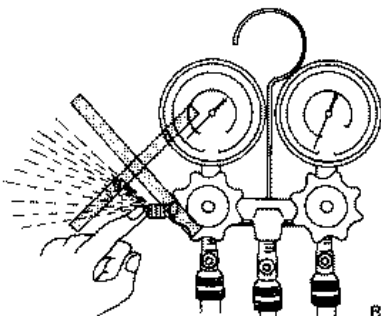
PRECAUTIONS FOR THE HANDLING OF REFRIGERANT

- Always wear eye protection when working around the system.
- Always be careful that refrigerant does not come in contact with your skin.
- Keep refrigerant containers stored below 40°C (104°F) and never drop from high places.
- Work in well-ventilated area because refrigerant gas evaporates quickly and breathing may become difficult due to the lack of oxygen.
- Keep refrigerant away from open flames because poisonous gas will be produced if it burns.
- Do not increase can temperature beyond 40°C (104°F) in charging.
- Do not heat refrigerant container with an open flame. There is a danger that container will explode.

CAUTION:

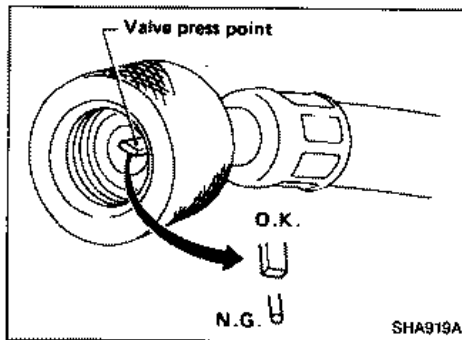
- Do not use steam to clean surface of condenser or evaporator. Be sure to use cold water or compressed air.
- Compressed air must never be used to clean a dirty line.

- Do not release refrigerant into the atmosphere.



RHA676B

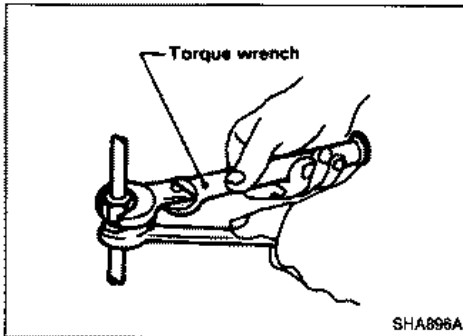
PRECAUTIONS



- Do not use manifold gauge whose press point shape is different from that shown. Otherwise, insufficient evacuating may occur.

- Do not over-tighten service valve cap.
- Do not allow refrigerant to rush out. Otherwise, compressor oil will be discharged along with refrigerant.

PRECAUTIONS FOR REFRIGERANT CONNECTION



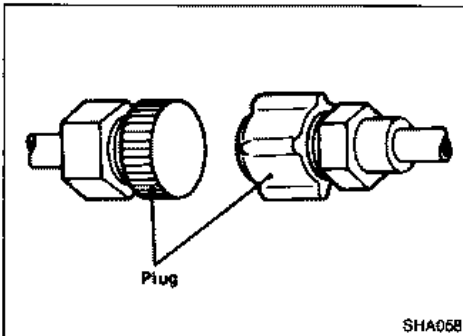
WARNING:

Gradually loosen discharge side hose fitting, and remove it after remaining pressure has been released.

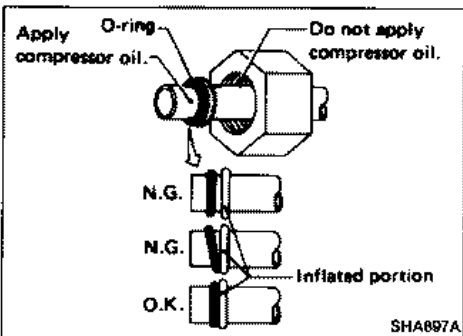
CAUTION:

When replacing or cleaning refrigerant cycle components, observe the following.

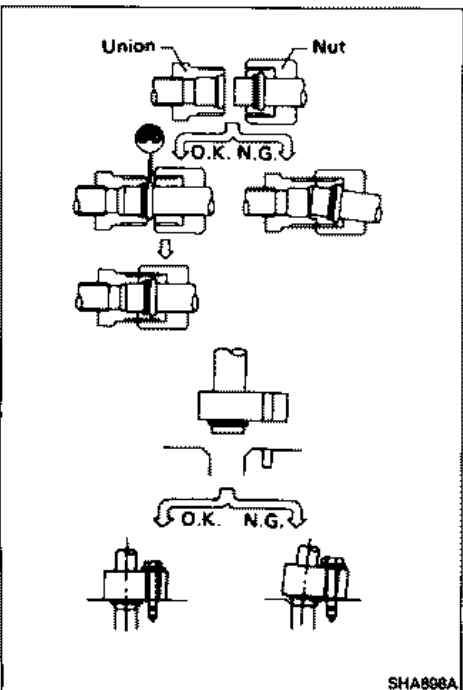
- Do not leave compressor on its side or upside down for more than 10 minutes, as compressor oil will enter low pressure chamber.
- When connecting tubes, always use a torque wrench.



- After disconnecting tubes, plug all openings immediately to prevent entrance of dirt and moisture.



- Always replace used O-rings.
- When connecting tube, apply compressor oil to portion shown in illustration. Be careful not to apply oil to threaded portion.
- O-ring must be closely attached to inflated portion of tube.



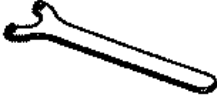

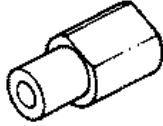
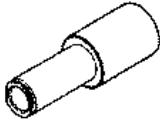
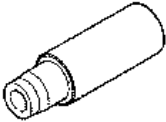



- After inserting tube into union until O-ring is no longer visible, tighten nut to specified torque.
- After connecting line, conduct leak test and make sure that there is no leakage from connections. If a gas leaking point is found, disconnect that line and replace the O-ring. Then tighten connections of seal seat to the specified torque.

PREPARATION

SPECIAL SERVICE TOOLS

MJS170 model

*: Special tool or commercial equivalent

Tool name Tool number	Description
Clutch disc wrench KV99412302*	 <p style="text-align: right;">Removing shaft nut and clutch disc</p>
Clutch disc puller KV994C5780	 <p style="text-align: right;">Removing clutch disc</p>
Shaft handle socket KV99412329*	 <p style="text-align: right;">Rotating compressor shaft</p>
Shaft seal remover KV99403043	 <p style="text-align: right;">Removing and installing shaft seal</p>
Shaft seal installer KV99403042	
Shaft seal pilot KV99403041*	 <p style="text-align: right;">Installing shaft seal</p>
Allen socket KV99412330*	 <p style="text-align: right;">Removing rear cover</p>
Cylinder head remover KV994C5785*	 <p style="text-align: right;">Removing rear cylinder head</p>

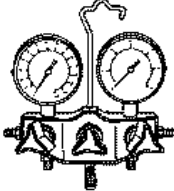
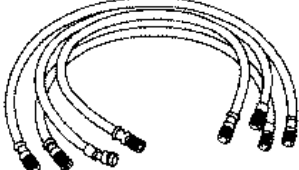
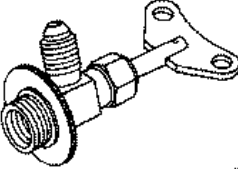
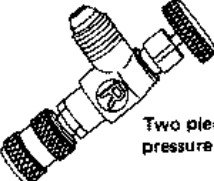
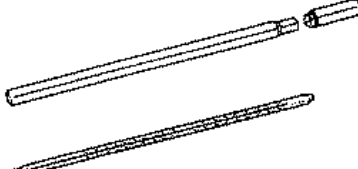
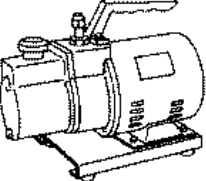
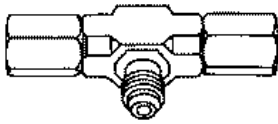
PREPARATION

Tool name Tool number	Description
Oil separator kit KV994A9690	<div style="display: flex; justify-content: space-between;"> <div> </div> <div style="text-align: right;"> Separating oil from refrigerant </div> </div>
KV992C5079 Adapter connector A ① KV992C5081 Adapter connector B ② KV992C5082	<div style="display: flex; justify-content: space-between;"> <div> </div> <div style="text-align: right;"> Using separate oil </div> </div>
Charge nozzle KV994C1552	<div style="display: flex; justify-content: space-between;"> <div> </div> <div style="text-align: right;"> Charging refrigerant into compressor </div> </div>
Blind cover set KV994C4548 Blind cover ① KV994C4531 Gasket ② KV994C4532 Gasket (Useless) ③ KV994C4533 Gasket (Useless) ④ KV994C4534 Bolt ⑤ KV994C4559	<div style="display: flex; justify-content: space-between;"> <div> </div> <div style="text-align: right;"> Blind cover </div> </div> <p style="text-align: center; margin-top: 10px;">Unit: mm (in)</p>

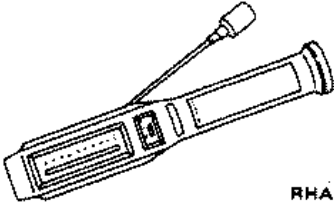

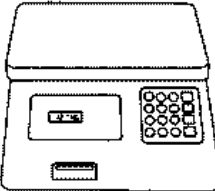
PREPARATION

Service Tools

RECOMMENDED TOOLS

Tool name	Description
Manifold gauge (3-valve type)	 <p style="text-align: center;">RHA570B</p> Discharging, evacuating and charging refrigerant
Charging hose (Four)	 <p style="text-align: center;">RHA571B</p> Discharging, evacuating and checking refrigerant
Charge valve	 <p style="text-align: center;">RHA572B</p> Discharging and charging refrigerant
Adapter valve	 <p style="text-align: center;">Two pieces on each high pressure and low pressure line RHA573B</p> Evacuating and charging
Thermometer	 <p style="text-align: center;">RHA574B</p> Checking temperature
Vacuum pump	 <p style="text-align: center;">RHA575B</p> Evacuating refrigerant
Joint adapter (T-type)	 <p style="text-align: center;">RHA576B</p> Charging refrigerant

PREPARATION
Service Tools (Cont'd)

Tool name	Description
Gas leak detector	<div style="text-align: right;">Charging refrigerant leaks</div> <div style="text-align: center;">  <p>RHA577B</p> </div>
Charging cylinder	<div style="text-align: right;">Checking amount of refrigerant and charging refrigerant</div> <div style="text-align: center;">  <p>RHA578B</p> </div>
Weight scale	<div style="text-align: right;">Checking amount of refrigerant</div> <div style="text-align: center;">  <p>RHA579B</p> </div>

For details of such handling methods, refer to the Instruction Manual attached to each of the service tools.

PREPARATION

Service Tools (Cont'd)

HANDLING METHOD AND STRUCTURE

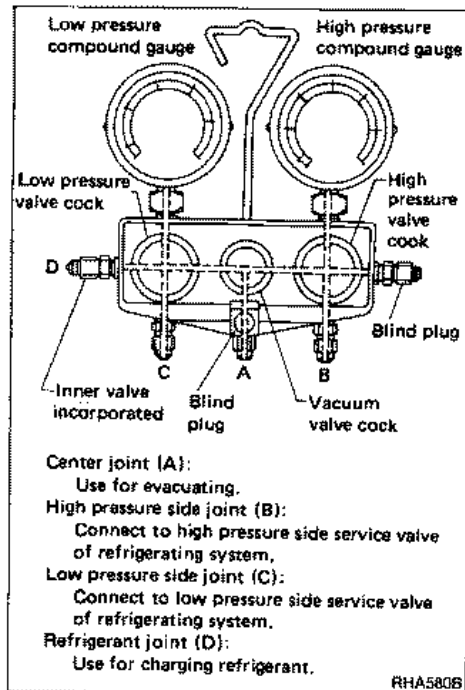
Manifold gauge

The manifold gauge is used to measure the operating pressure accurately in the high pressure and low pressure lines of the refrigerating system.

The high pressure gauge measures from -101.3 kPa ($-1,013 \text{ mbar}$, -760 mmHg , -29.92 inHg) to $2,942 \text{ kPa}$ (29.4 bar , 30 kg/cm^2 , 427 psi), and the low pressure gauge measures generally from -101.3 kPa ($-1,013 \text{ mbar}$, -760 mmHg , -29.92 inHg) to $1,471 \text{ kPa}$ (14.7 bar , 15 kg/cm^2 , 213 psi).

CAUTION:

- When installing the gauge to the refrigerating system, use utmost care not to mistake high pressure and low pressure line connections. (Wrong connections will lead to a damaged gauge.)
- Before evacuating, confirm that the gauge has a negative pressure scale. (If not, the gauge will be damaged.)

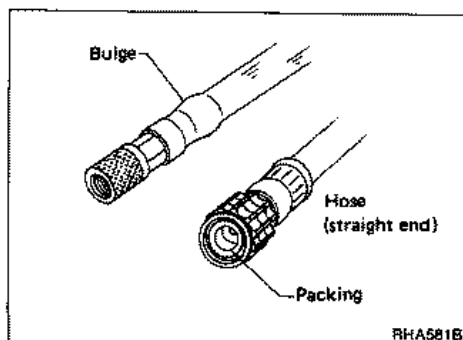


Charging hose

1. Completely tighten the high pressure valve, low pressure valve and vacuum pump valve cocks of the gauge manifold.
2. Connect the charging hoses to the high and low pressure lines.
3. Connect the charging hose fitted with a valve core to the refrigerant canister.
4. Connect the charging hose to the vacuum pump.

The high and low pressure hoses are color coded to prevent wrong connection.

High pressure line hose	Red
Low pressure line hose	Yellow
Refrigerant canister hose	Blue or green (with valve core)
Vacuum pump hose	Blue or green



CAUTION:

- Check each hose for cracks. If found, discard the hose.
- Do not use any hose if bulges are found.
- Check the rubber packing. If any deterioration or cracks are found, replace it with a new one.

PREPARATION

Service Tools (Cont'd)

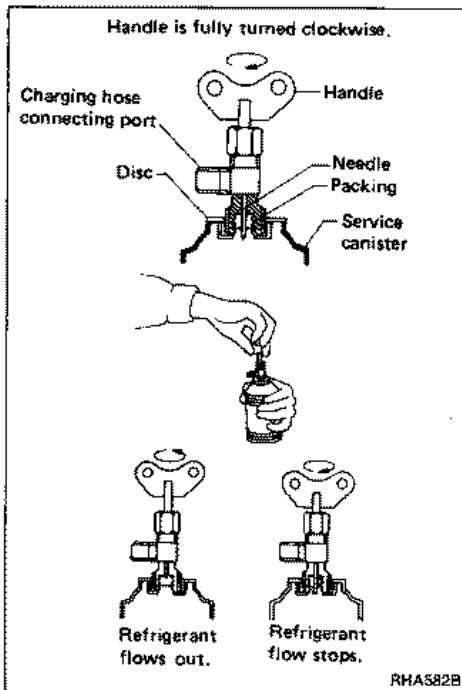
Charge valve

The charge valve is used to charge the refrigerant into the system from the service canister through the gauge manifold. Attach this valve to the head of a service canister by screwing it on. Then turn the handle clockwise to pierce the canister to allow the refrigerant to flow into the refrigerating system.

CAUTION:

Check the packing for any sign of deterioration or cracks. If any abnormalities are found, replace it with a new one.

1. Turn the charge valve handle counterclockwise to fully retract the needle, and then attach the charge valve to the service canister. Note that leakage will occur if the charge valve is attached to the canister without retracting the needle.
2. Securely fit the charge valve to the head of the service canister by turning it. Then turn the handle slowly clockwise to make a hole in the canister with the needle.
3. Turn the handle counterclockwise to retract the needle, and the refrigerant will flow into the gauge manifold through the hole. To stop the flow of the refrigerant, turn the handle clockwise to close the hole with the needle.

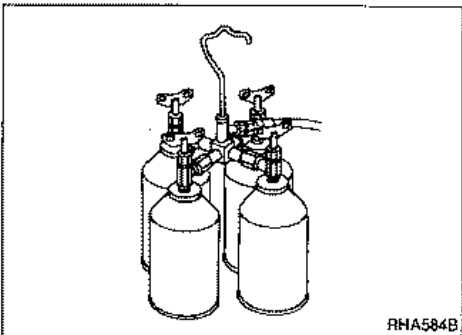
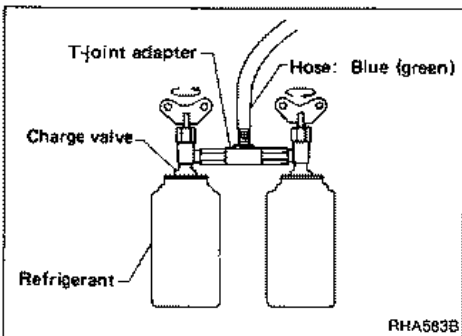


Connecting T-joint adapter

The T-joint adapter is used to connect two refrigerant canisters so that air purging and the accompanying discharge of refrigerant into the atmosphere can be eliminated when recharging the refrigerant. If only one service canister is sufficient to charge the refrigeration system, do not use this T-joint adapter.

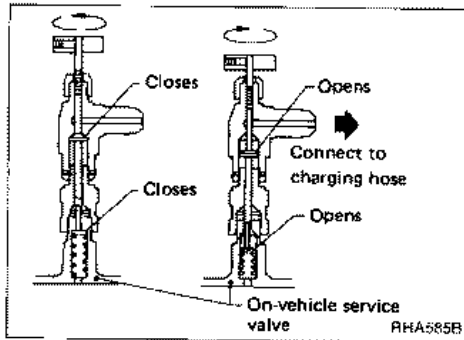
1. Turn the handle of each charge valve fully counterclockwise, and attach the valve to a refrigerant canister.
2. Connect the T-joint adapter to both charge valves so that two refrigerant canisters are connected as shown.
3. Connect the charging hose with valve core to the T-joint adapter. Connect the valve core end of the charging hose to the manifold gauge.

If more than three service canisters are needed for charging, use a cross joint adapter to connect four service canisters.



PREPARATION

Service Tools (Cont'd)



Installing the adapter valve

Install the adapter valve to each of the high pressure and low pressure service valves so that air purging from the charging hose can be omitted. This also ensures that refrigerant leakage upon disconnection of the hose can be prevented.

1. Before connecting the adapter valve to the on-vehicle service valve, turn the adapter valve handle fully counterclockwise to retract the pin.

CAUTION:

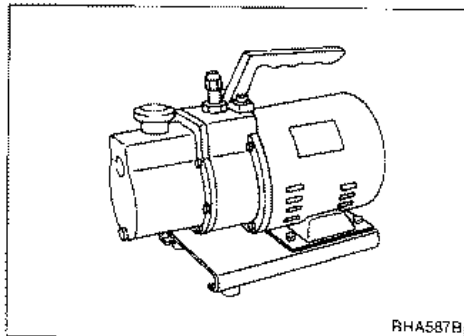
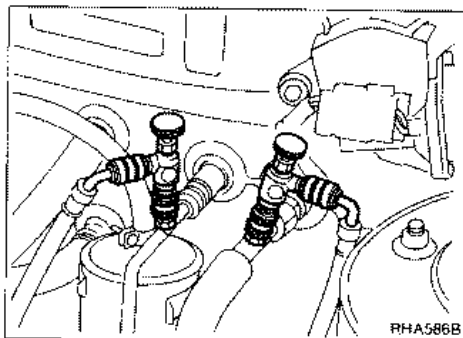
Check the packing for any sign of deterioration or cracks. If any abnormality is found, replace the packing with new.

2. Connect the charging hose to the adapter valve.

Turning the handle clockwise will cause the on-vehicle service valve pin to be pushed open by the adapter valve pin, thus opening the refrigerant passage.

Turning the handle counterclockwise will close the passage.

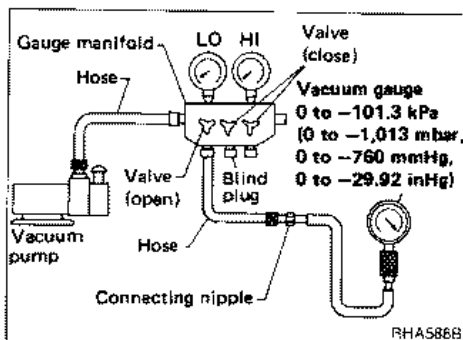
Before removing the adapter valve from the on-vehicle service valve, be sure to fully turn the handle counterclockwise to shut off the refrigerant passage.



Vacuum pump

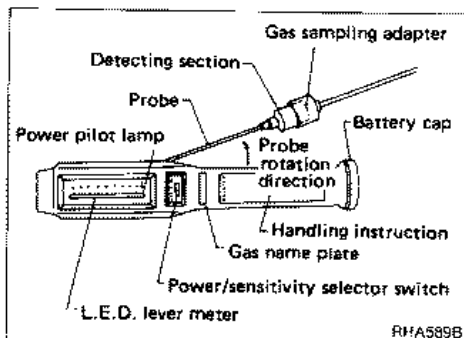
The vacuum pump is used to purge air and moisture from the inside of the refrigeration system by evacuation, thereby ensuring proper functioning of the air conditioner system.

Check the vacuum pump to see that the vacuum pump capacity is greater than -100.0 kPa ($-1,000$ mbar, -750 mmHg, -29.53 inHg).



Vacuum pump performance check procedure

1. Connect the vacuum gauge to the system.
2. Run the vacuum pump, and check to see that the needle pointers of the gauge manifold and vacuum gauge move smoothly, indicating a similar value.
3. After running the vacuum pump for two or three minutes, read the vacuum gauge. The measured value indicates the vacuum pump capacity.



Gas leak detector

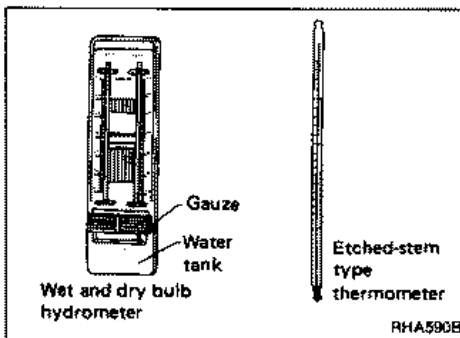
The gas leak detector is used to check whether the refrigeration system is leaking. The detector is available in two types; halide torch or electrical. The features of these gas leak detectors are listed on the next page.

PREPARATION

Service Tools (Cont'd)

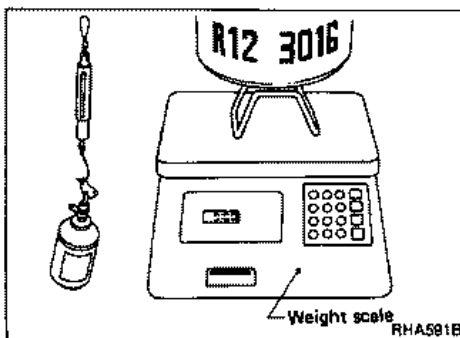
Type	Detection ability	Features
Halide torch	200 g (7.05 oz)/year (thin green)	<ul style="list-style-type: none"> ● Low price ● Low sensitivity ● Less safe because of the use of flame for detection
Electrical	Discharge type (Suction type)	<ul style="list-style-type: none"> ● Easy handling ● Medium sensitivity ● Each point needs two or more seconds for detection.
	Positive ion emission type (Suction type)	<ul style="list-style-type: none"> ● High sensitivity ● High price ● Warm-up time is needed because a heater is incorporated.
Other simple checking method: Change in vacuum when evacuating	1 kg (2 lb)/month; if 13.3 kPa (133 mbar, 100 mmHg, 3.94 inHg) change in vacuum is detected in 10 minutes.	<ul style="list-style-type: none"> ● Can be used easily in refrigerant charging operation. ● Detection ability is very low with vacuum gauge in gauge manifold.

- Leakage inspection of a refrigeration system needs a sensitivity greater than 20 g (0.71 oz)/year.
- The actual amount of leak is estimated at 5 to 10 times the detected amount.
- Insufficient cooling may be felt if leakage exceeds 150 to 200 g (5.29 to 7.05 oz).



Temperature gauge

Use to check the air conditioner performance. An etched stem type thermometer may be used. A hygrometer must also be used because the air conditioner performance depends on the humidity.



Scale

Measure the weight of the refrigerant to determine how much the refrigerant is charged.

PREPARATION

Service Tools (Cont'd)

Charging cylinder

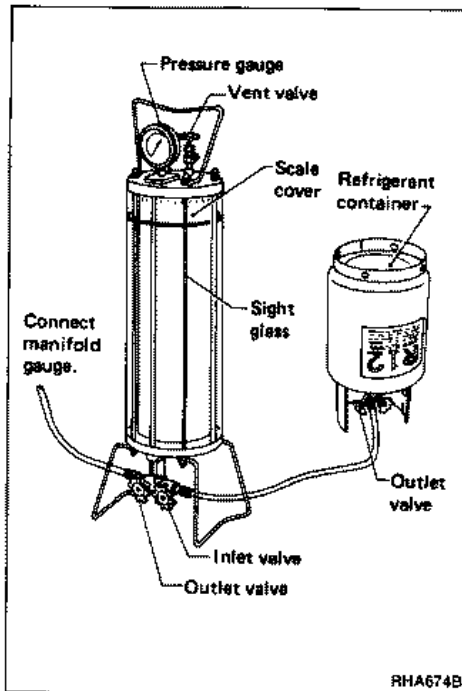
The charging cylinder is used to correctly measure the amount of refrigerant to be charged.

Features

- With the charging cylinder, the operator can measure correctly the amount of refrigerant to be charged into the system.
- Change in the refrigerant volume due to a change in temperature and pressure can be supplemented, and this ensures correct charging of refrigerant.

CAUTIONS:

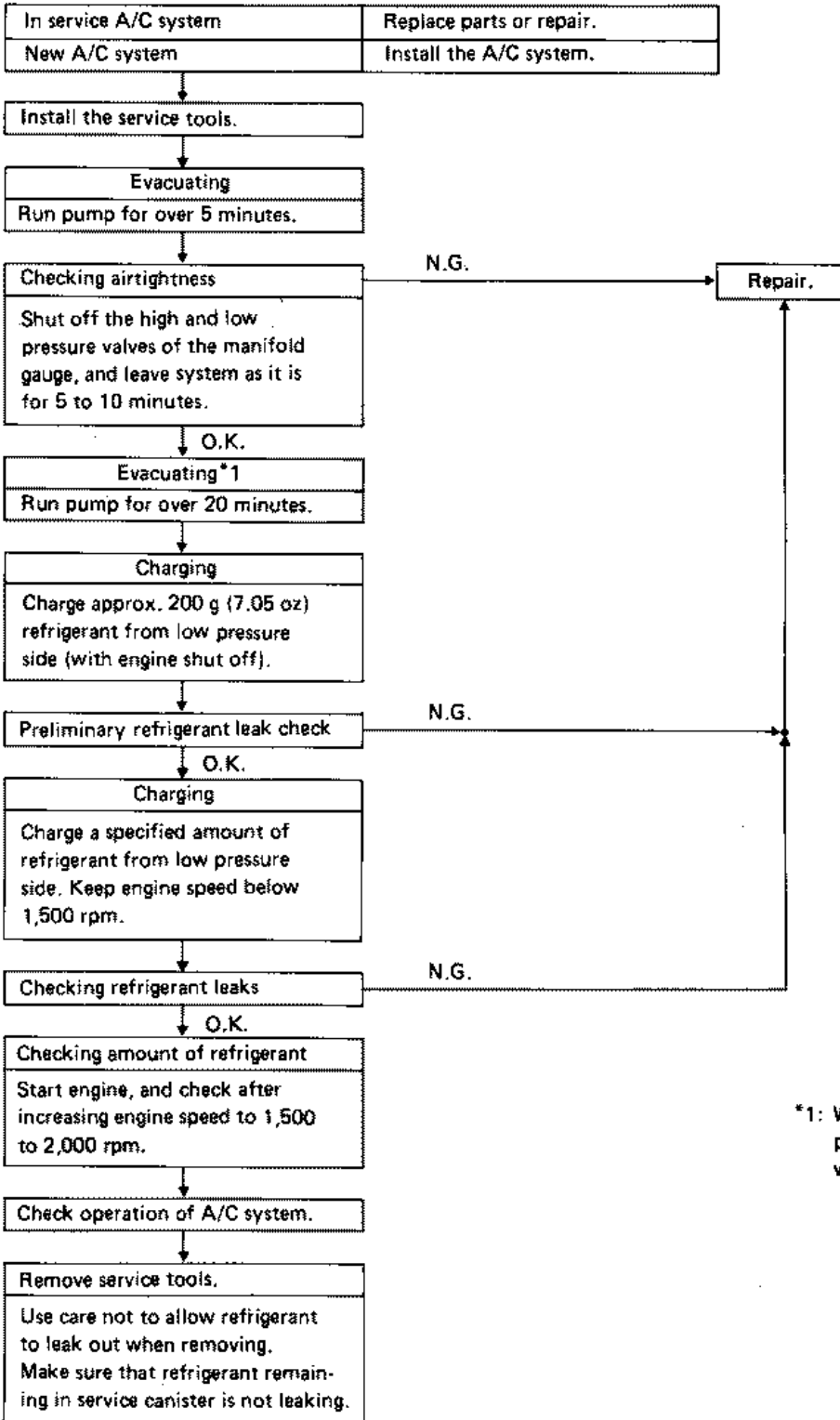
- **Never attempt to carry the charging cylinder containing refrigerant.**
- **Do not put the charging cylinder in a hot place. If the temperature and pressure of the refrigerant in the cylinder increase, the safety valve will be pushed open and the refrigerant will be released into the atmosphere.**
- **Do not expose the cylinder to the direct sunlight.**
- **Do not over-charge the refrigerant so that it exceeds the maximum limit of the cylinder.**
- **Do not charge the cylinder with more refrigerant than is needed.**



EVACUATING, CHARGING AND CHECKING

Refrigerant Charging Procedure

WORK PROCEDURE

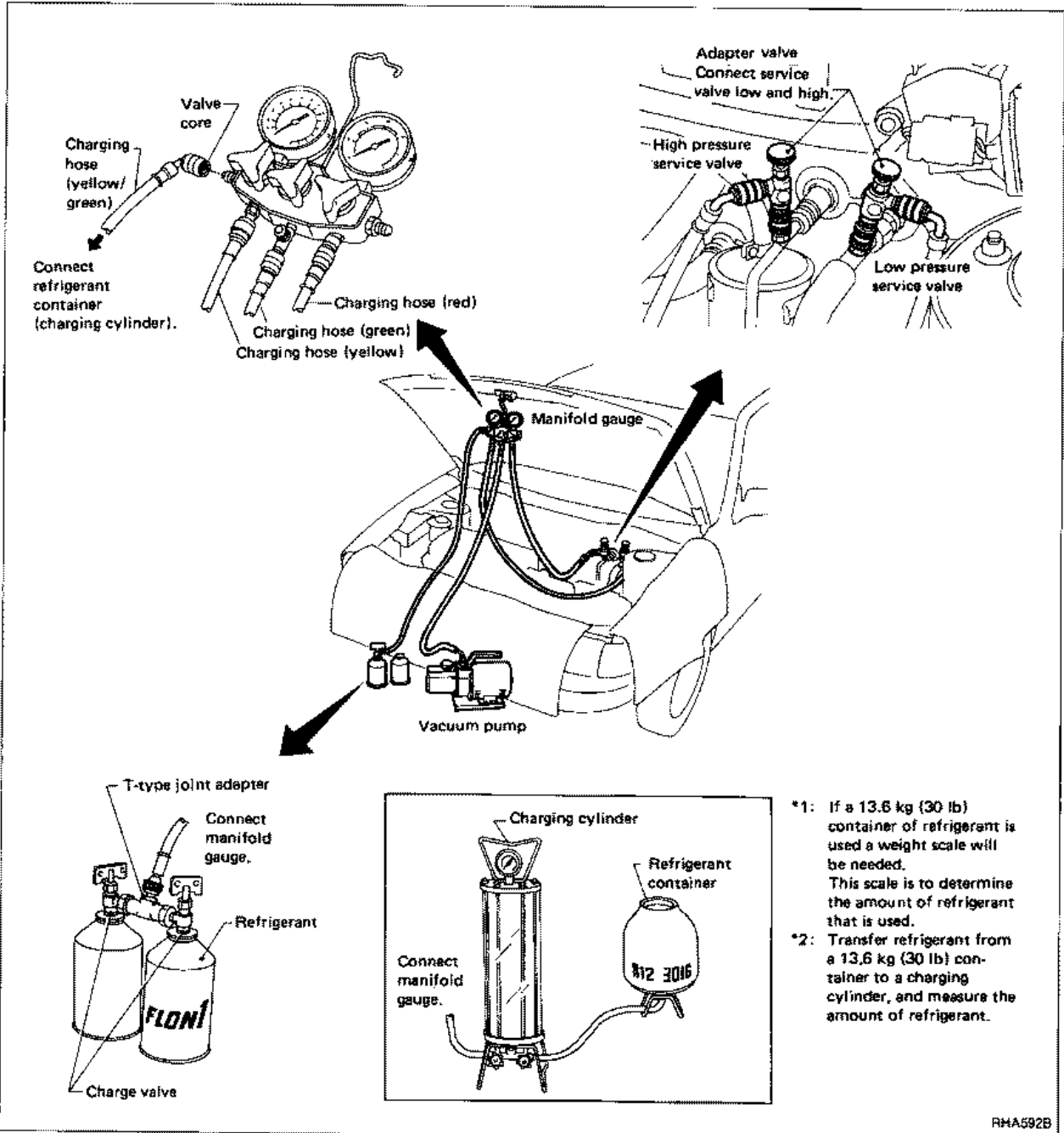


*1: Working operation depends upon the performance of the pump and the weather.

EVACUATING, CHARGING AND CHECKING

Refrigerant Charging Procedure (Cont'd) SETTING OF SERVICE TOOLS

Make sure that the service tools are set as indicated below and that no refrigerant is leaking.



RMA592B

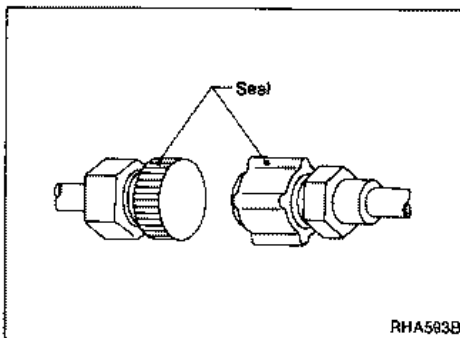
EVACUATING, CHARGING AND CHECKING

Evacuation

Why evacuation is needed

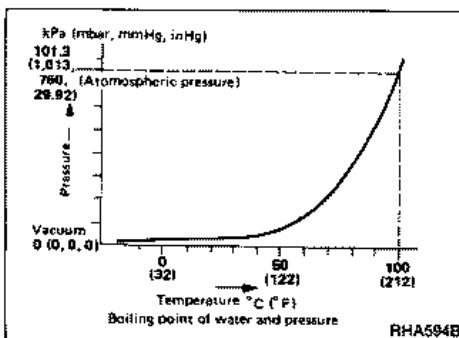
When installing a car air conditioner, it is essential to completely remove air and water from the inside of the refrigeration system beforehand. This process is called evacuation. If the air conditioner is operated without completely removing these substances, the following abnormalities may result.

- Poor cooling due to reduction in the thermal exchange rate in condenser
- Moisture recirculating together with the refrigerant through the refrigeration system freezes at the port of the cold expansion valve. This impedes the normal refrigerant flow, thus lowering the cooling efficiency.
- The refrigerant reacts with water chemically, generating corrosive hydrochloric acid thus causing corrosion to the refrigeration system components.



CAUTION:

- When installing an air conditioner in the vehicle, the pipes must be connected as the final stage of the operation. The seal caps of the pipes and other components must not be removed until their removal is required for connection.
- Before installing any air conditioner component that has been stored in a cool location to a vehicle that has been exposed to the hot sun, leave the component as it is for some time in a hot location with its seal cap unremoved. This step is necessary to prevent condensation of moisture inside the cold component.
- Thoroughly remove moisture from the refrigeration system before charging the refrigerant.



Relation between boiling point of water and atmospheric pressure

Water boils at 100°C (212°F) under normal atmospheric pressure. The boiling point lowers with the atmospheric pressure. This characteristic of water is utilized to purge it from the system. The pressure inside the refrigeration system is lowered by a vacuum pump so that water can evaporate at a normal temperature. The water vapor is then discharged to the outside together with the air.

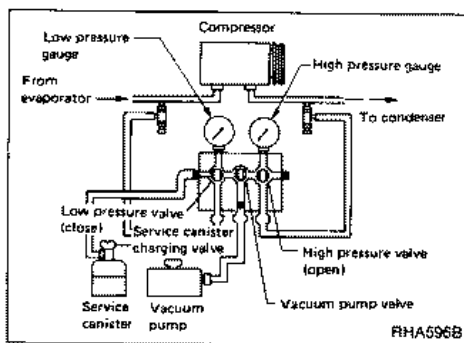
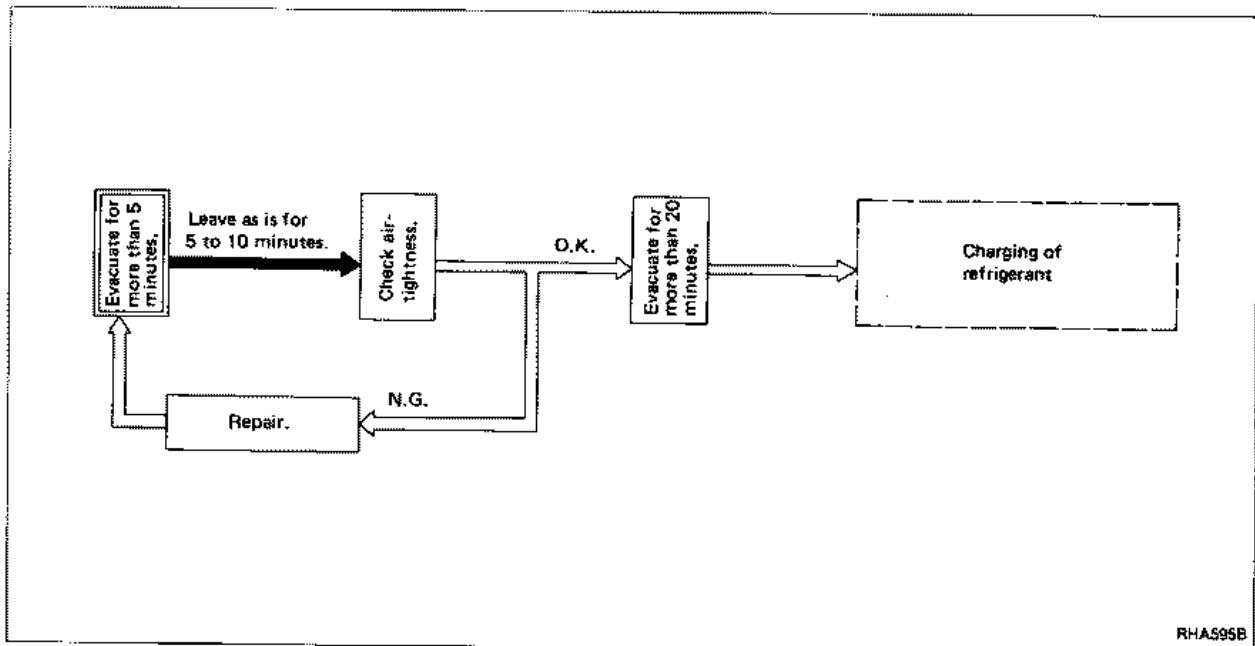
EVACUATING, CHARGING AND CHECKING

Evacuation (Cont'd)

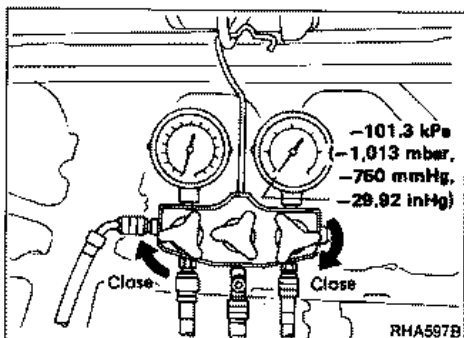
Vacuum pump

The degree of evacuation greatly affects the cooling capacity of the air conditioner and the service life of the refrigeration system components. However, use of a vacuum pump having insufficient capacity results in prolonged evacuation. It is necessary to use a vacuum pump with a sufficiently large capacity and also to maintain the pump to ensure its original pumping capacity.

EVACUATION PROCEDURE



1. Completely tighten the low pressure and high pressure adapter valves. Tightening of the valves opens the service canister valve.
2. Open the high and low pressure valves and vacuum pump valve of the gauge manifold.
3. Run the vacuum pump.



4. Perform evacuation for more than five minutes to stabilize the vacuum inside the system. Check to ensure that the low pressure gauge indicates -98.6 to -101.3 kPa (-986 to $-1,013$ mbar, -740 to -760 mmHg, -29.13 to -29.92 inHg).
5. Shut off the high and low pressure valves and vacuum pump valve of the gauge manifold.

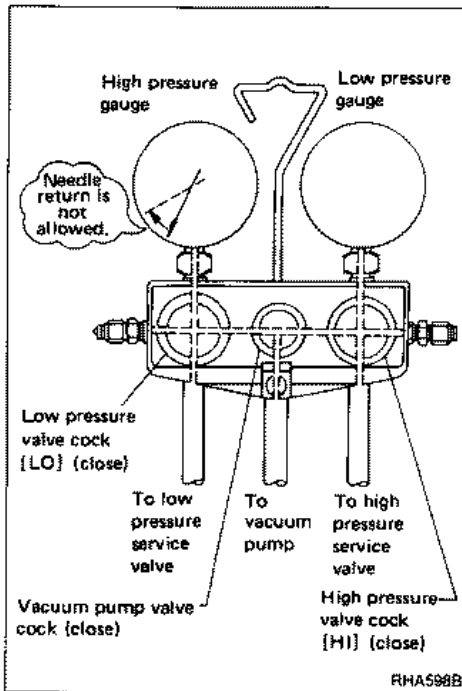
EVACUATING, CHARGING AND CHECKING

Evacuation (Cont'd)

CHECKING AIRTIGHTNESS

1. Shut off the high and low pressure valves and vacuum pump valve of the gauge manifold, and leave the system as it is for 5 to 10 minutes.
2. Make sure that the needle of the low pressure gauge will not move back toward the atmospheric pressure side (gauge pressure 0).

If any reverse movement is noted, it indicates poor system airtightness. Service the system until airtightness is complete. If pressure changes approx. 13.3 kPa (133 mbar, 100 mmHg, 3.94 inHg) in 10 minutes, the refrigerant in the system will be exhausted in about one month.



MAINTENANCE

If inadequate airtightness is detected, check and service the following portions:

Leak from pipe joints	Leak from gauge manifold
<ul style="list-style-type: none"> ● Contaminated, damaged, or deformed O-ring ● No oil applied when connecting pipe ● Excessive or insufficient tightening of pipe joint 	<ul style="list-style-type: none"> ● Malfunctioning hose ● Improper installation of gauge ● Malfunctioning valve ● Malfunctioning packing

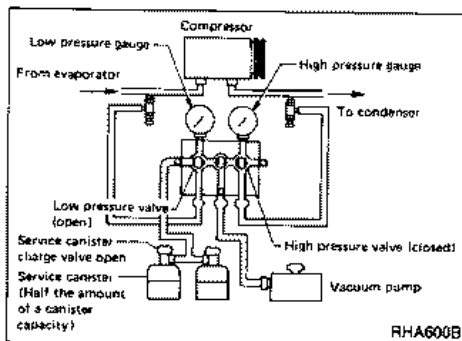
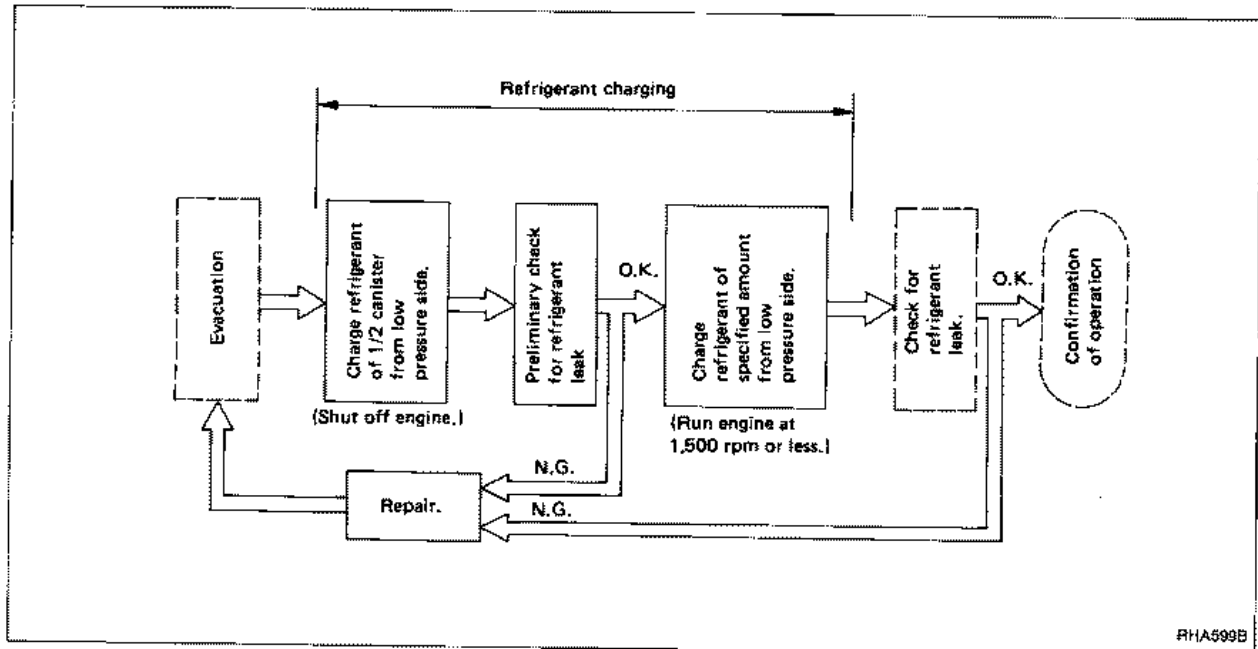
EVACUATION

If no abnormality is found during the airtightness check, perform evacuation again for more than 20 minutes.

1. Run the vacuum pump.
2. Open the high and low pressure valve and vacuum pump valve of the gauge manifold.
3. Evacuate for more than 20 minutes.
4. Close the high and low pressure valves and vacuum pump valve of the gauge manifold.

EVACUATING, CHARGING AND CHECKING

Charging Refrigerant Procedure



PRELIMINARY CHARGING PROCEDURE

This operation is performed to check the refrigerant leakage and to protect the compressor.

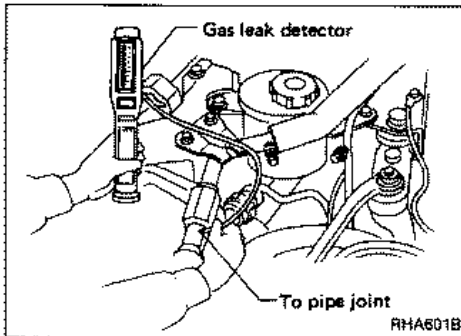
1. Turn the charge valve handle to open a hole in the service canister to allow the refrigerant to flow through the gauge manifold.
2. Open the low pressure valve of the gauge manifold, and charge the refrigerant into the system from the low pressure side.
3. After charging approx. 200 g (7.05 oz) of refrigerant, shut off the low pressure valve.

CAUTION:

- The refrigerant charging operation must be performed after shutting off the engine. If the compressor is operated with an insufficient amount of refrigerant, the compressor may seize up due to a lack of return of the compressor oil.
- Do not shake nor hold the refrigerant canister upside down.

EVACUATING, CHARGING AND CHECKING

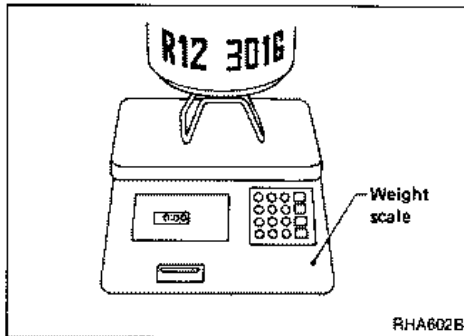
Charging Refrigerant (Cont'd)



PRELIMINARY CHECK FOR REFRIGERANT LEAKS

1. Make sure that the gauge manifold valve is closed.
2. Check for refrigerant leak from each connector in the system using the leak detector.

At this point, the pressure in the system is not high. Only large amounts of refrigerant leak due to loose pipe joints, etc. can be detected.



CHARGING REFRIGERANT

1. Make sure that the valves of the gauge manifold are closed.
2. Start the engine, and run the compressor.
3. Slowly open the low pressure valve of the gauge manifold.
4. Charge the specified amount of refrigerant.

The charged amount of refrigerant can be determined by subtracting the weight of the canister measured after charging from its weight measured before charging.

WARNING:

Never attempt to open the high pressure valve while the engine is running. If opened, the pressure in the refrigerant canister will increase, thus causing an explosion.

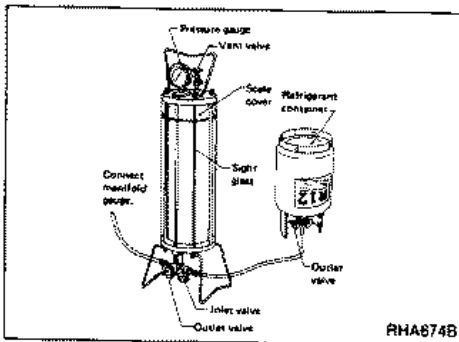
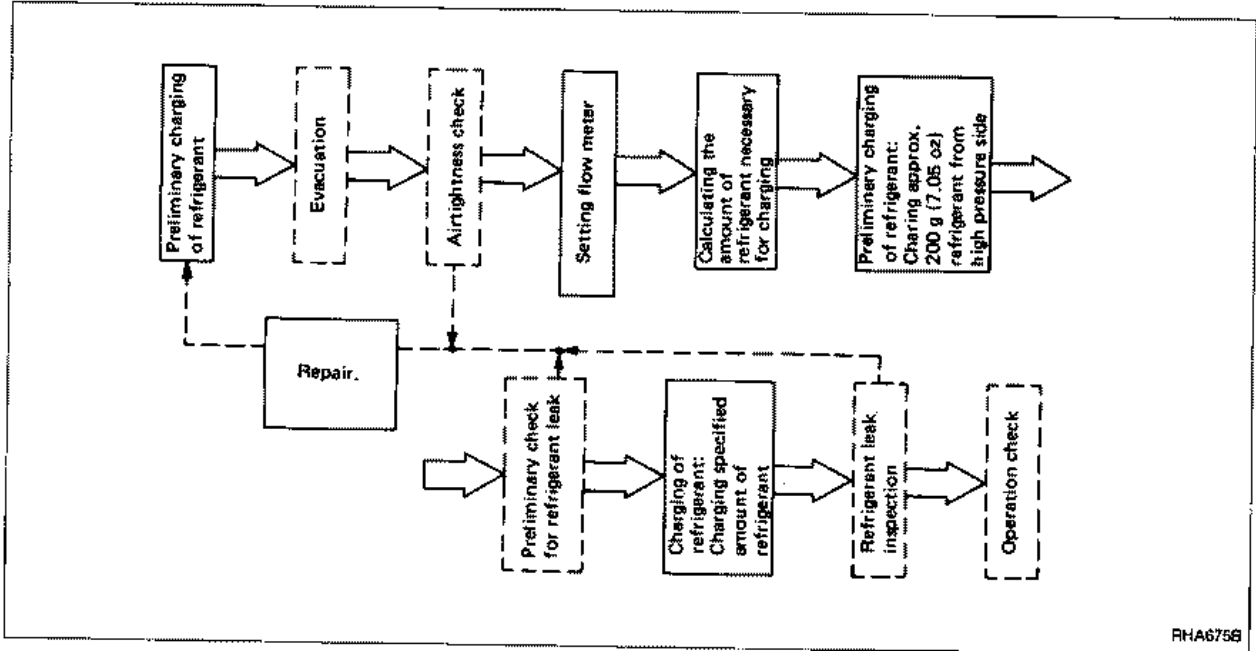
CHARGING REFRIGERANT WITHOUT USING T-JOINT ADAPTER

If the service canister used for charging is empty, replace the canister with a new one, and proceed as follows:

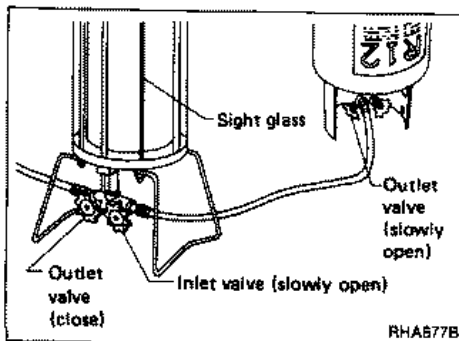
1. Make sure by shaking the canister that no refrigerant is left inside.
2. Shut off all the valves of the gauge manifold.
3. Disconnect the charge valve from the emptied canister, and attach it to a new service canister.
4. Run the vacuum pump, and open the vacuum valve (center) of the gauge manifold to purge air from the inside of the hose.
5. Run the vacuum pump for approx. 30 seconds.
6. Shut off the vacuum valve (center) and stop the vacuum pump.
7. Unseal the new canister, and open the charge valve.
8. Open the low pressure valve to charge the refrigerant into the system.

EVACUATING, CHARGING AND CHECKING

Charging Refrigerant — Charging cylinder WORK PROCEDURE



Install the charging cylinder correctly to the vehicle. Refer to "SETTING OF SERVICE TOOLS" in "Refrigerant Charging Procedure".



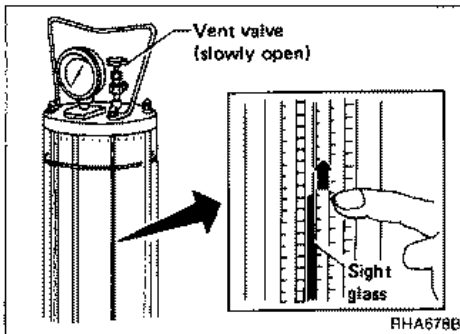
PRELIMINARY CHARGING OF REFRIGERANT-1

1. Make sure that the inlet and outlet valves of the charging cylinder are closed.
2. Slowly open the outlet valve of a refrigerant container [13.6 kg (30 lb)].
3. Slowly open the inlet valve of the charging cylinder.

The refrigerant will flow into the sight glass of the charging cylinder as the valve is opened.

EVACUATING, CHARGING AND CHECKING

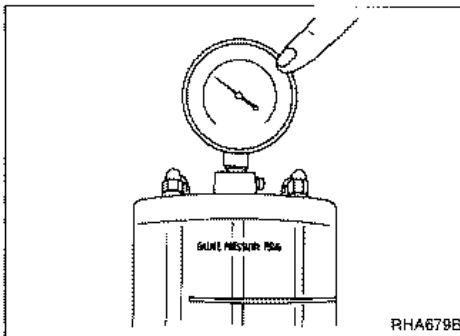
Charging Refrigerant — Charging cylinder (Cont'd)



4. Slowly open the upper vent valve to release pressure from the charging cylinder. While doing so, continue charging until the required amount of refrigerant is reached.

The refrigerant volume changes with the temperature and pressure. It is necessary to charge refrigerant with a little more than the required amount (indicated on the sight glass). Refer to the CAUTION label attached on the vehicle, or to the Service Manual.

5. Close the inlet valve and upper vent valve of the charging cylinder.



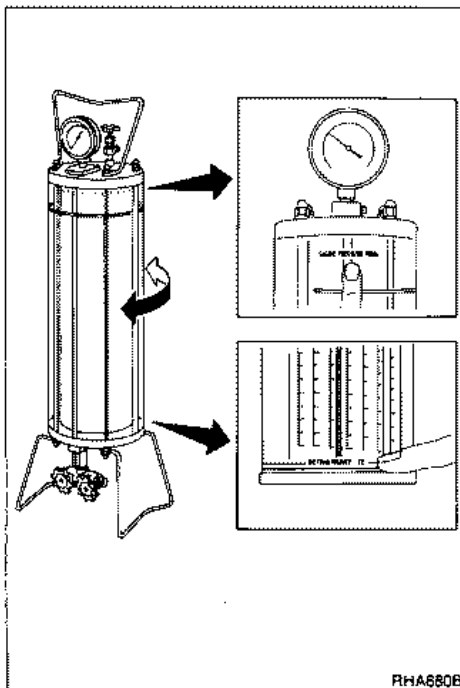
6. Turn on the heater switch (the charging cylinder is provided with a heater.)

The refrigerant charging time can be reduced by heating the refrigerant to increase its pressure. In this case, do not allow the pressure in the cylinder to rise higher than 1,030 kPa (10.30 bar, 10.5 kg/cm², 150 psi). (If pressure rises above this level, turn off the heater.)

The pressure in the charging cylinder can be measured by the upper pressure gauge.

EVACUATION AND AIRTIGHTNESS CHECK

Refer to "EVACUATION" and "CHECKING AIRTIGHTNESS" in "Evacuation".

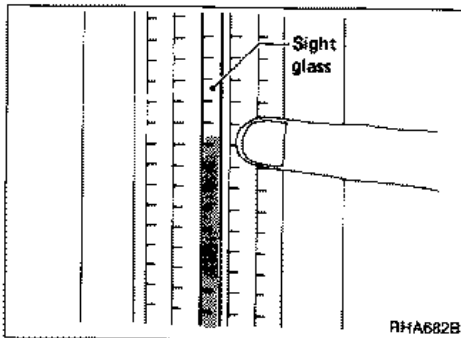
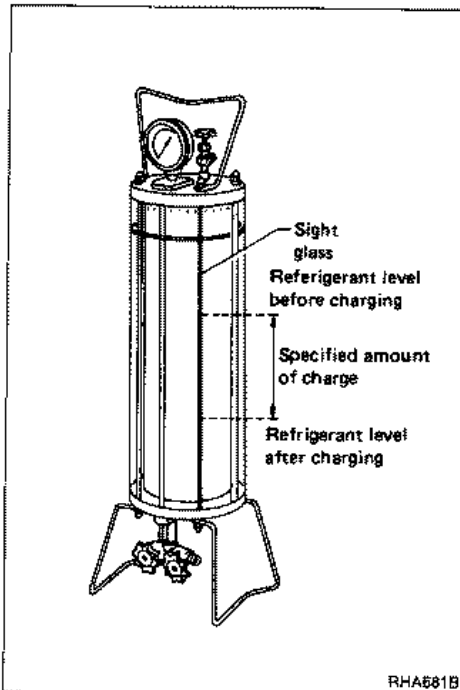


SETTING OF FLOW METER

1. Rotate the charging cylinder main body until the scale for R12 is at the correct position on the sight glass.
2. Read the charging cylinder pressure gauge.
3. Rotate the charging cylinder so that the scale of the charging cylinder agrees with the pressure value indicated on the pressure gauge.
4. Open the outlet valve of the charging cylinder.

EVACUATING, CHARGING AND CHECKING

Charging Refrigerant — Charging cylinder (Cont'd)



CALCULATING CHARGING AMOUNT OF REFRIGERANT

1. Record the amount of refrigerant in the sight glass before charging.
2. Subtract the required amount of refrigerant (charge quantity specified for the vehicle) from the amount of refrigerant recorded in step 1. Charge refrigerant into the system until the remaining value equals to the value indicated on the sight glass.

Example:

Level in sight glass: 3 lb 8 oz

Charge specification (from Service Manual) 2.0 - 2.4 lb.

Calculate charge quantity into lb and oz as follows: 1 lb = 16 oz, and 0.1 lb = 1.6 oz, so that 2.0 lb = 32 oz, 2.4 lb = 32 + (4 x 1.6) = 32 + 6.4 = 38.4, round off to 38. Therefore our charge quantity will be between 32 and 38 oz, or 2 lb 0 oz to 2 lb 6 oz. Subtract 2 lb 6 oz from the level in the sight glass (3 lb 8 oz) = 1 lb 2 oz.

This will be our ending point.

PRELIMINARY CHARGING OF REFRIGERANT-2

1. Slowly open the high pressure side valve of the manifold gauge to charge refrigerant from the high pressure side.
2. Close the high pressure valve after charging approx. 200 g (7.05 oz) refrigerant.

CAUTION:

The refrigerant in the charging cylinder is kept in the liquid state, so the refrigerant should be charged from high pressure side. Do not start the engine with the high pressure valve kept open.

PRELIMINARY CHECK FOR REFRIGERANT LEAKS

Refer to "PRELIMINARY CHECK FOR REFRIGERANT LEAKS" in "Charging Refrigerant".

CHARGING REFRIGERANT

1. Slowly open the high pressure valve of the manifold gauge, and charge the calculated amount of refrigerant in "CALCULATING CHARGING AMOUNT OF REFRIGERANT".

CAUTION:

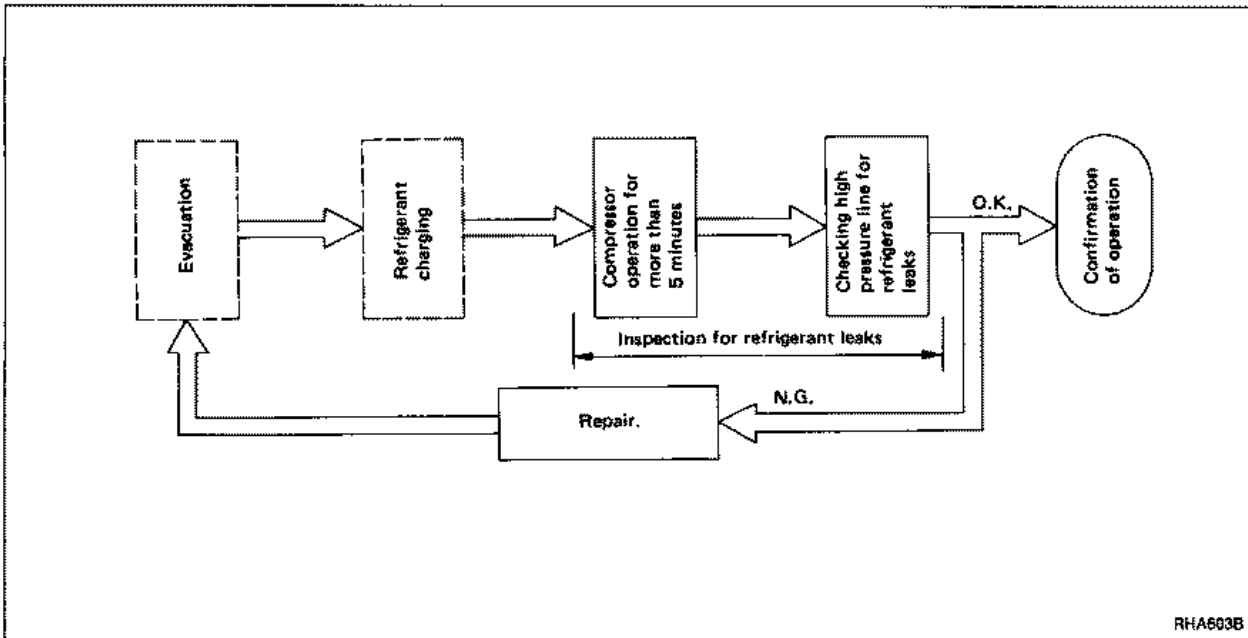
The refrigerant in the charging cylinder is kept in the liquid state, so the refrigerant should be charged from high pressure side. Do not start the engine with the high pressure valve kept open.

2. Close the high pressure valve of the manifold gauge.
3. Make sure that the calculated amount of refrigerant is in the sight glass.
4. Close the charging cylinder outlet valve.
5. Turn off the heater if it is on (when using heater equipped type).

EVACUATING, CHARGING AND CHECKING

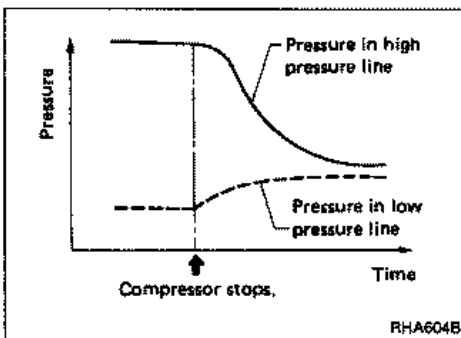
Inspection for Refrigerant Leaks

WORK PROCEDURE



To facilitate inspection for refrigerant leaks, establish the following conditions:

- Start the engine.
- Run the air conditioner.
- Set the blower fan control to MAX.
- Set the temperature control to FULL COLD.
- Run the refrigerant system for more than 5 minutes after setting the above-mentioned conditions (to circulate the refrigerant through the system).



Refrigerant leaks should be checked immediately after stopping the engine, beginning with the high pressure line, using a gas leak tester. This is because the pressure in the high pressure line drops gradually after the refrigerant circulation stops while the pressure in the low pressure line rises gradually as shown in the graph. Leaks can be detected easily when pressure is high.

EVACUATING, CHARGING AND CHECKING

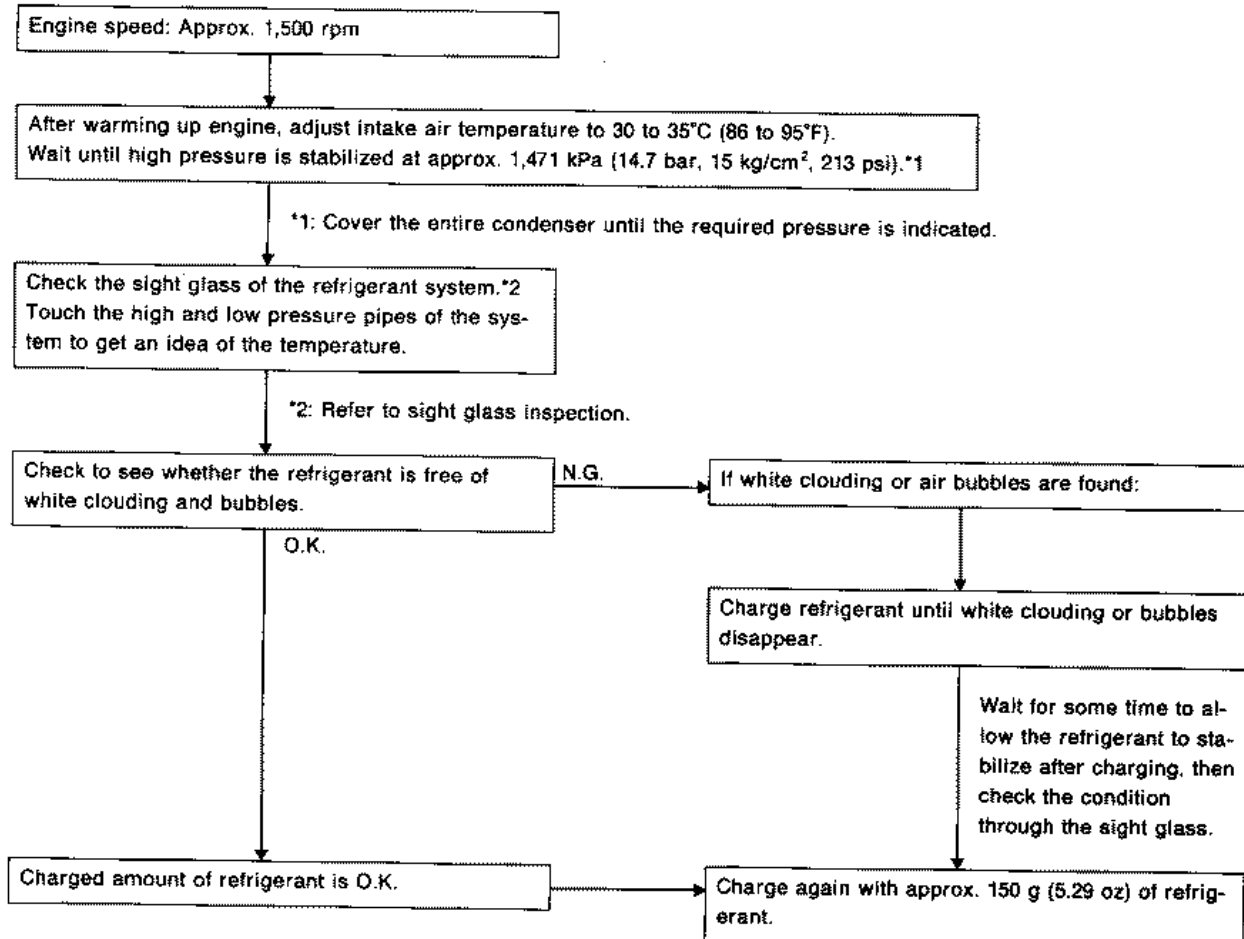
Confirmation of Amount of Charged Refrigerant

The amount of refrigerant charged into the system can be observed through the sight glass by watching the flow of the refrigerant and by reading the high pressure and low pressure manifold gauges under the following conditions:

CONDITIONS

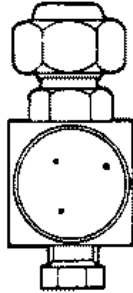
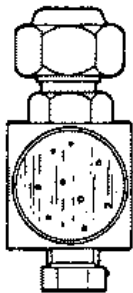

- Door window: Open
- A/C switch: ON (Manual Air Conditioner)
- Auto switch: ON (Auto Air Conditioner)
- TEMP. setting: Max. COLD
(Manual Air Conditioner)
I (Auto Air Conditioner)
- FAN speed: 4 (Manual Air Conditioner)
HI (Auto Air Conditioner)
- Check sight glass after a lapse of about five minutes.

WORK PROCEDURE



EVACUATING, CHARGING AND CHECKING

Confirmation of Amount of Charged Refrigerant (Cont'd)

Amount of charge	Appropriate	Refrigerant is insufficient	Almost no refrigerant	Overcharged, or air in system
Check item				
Temperature of high and low pressure pipes	High pressure side is hot while low pressure side is cold.	High pressure side is warm and low pressure side is somewhat cold.	No difference is felt between high and low pressure sides.	High pressure side is very hot.
Flow of refrigerant viewed through sight glass	Mostly transparent. Occasionally some bubbles are seen when engine rpm is increased or decreased.	Bubbles are always flowing. Refrigerant is cloudy.	Nothing is visible.	If overcharged, no bubbles are seen. If there is air in the system, large bubbles are seen.
				
Pressure	Normal high pressure: 1,373 - 1,765 kPa (13.7 - 17.7 bar, 14 - 18 kg/cm ² , 199 - 256 psi) Normal low pressure: 147 - 294 kPa (1.47 - 2.94 bar, 1.5 - 3 kg/cm ² , 21 - 43 psi)	Both high and low pressure values are insufficient.	High pressure value is very small.	Both high and low pressure values are excessive.
Action to take	Air bubbles may be generated when the receiver drier strainer is clogged, or when the expansion valve is opened excessively.	Add refrigerant after checking for leaks.	Check the refrigerant system.	Stop the compressor and extract excessive refrigerant. If air is found, perform evacuation, then charge the specified amount of refrigerant.

a. The bubbles seen through the sight glass are influenced by the ambient temperature. Since the bubbles are hard to see in comparatively low temperatures below 20°C (68°F), it is possible that a slightly larger amount of refrigerant would be filled if supplied according to the sight glass.

When the STV (for the auto air conditioning system) activates at an ambient temperature of less than 20°C (68°F), bubbles can sometimes be seen through the sight glass. However, the amount of refrigerant is correct if the following conditions are met:

- (1) The air vent temperature is less than 7°C (45°F) as per the performance chart (HA-28).

(2) Bubbles disappear under the following conditions:

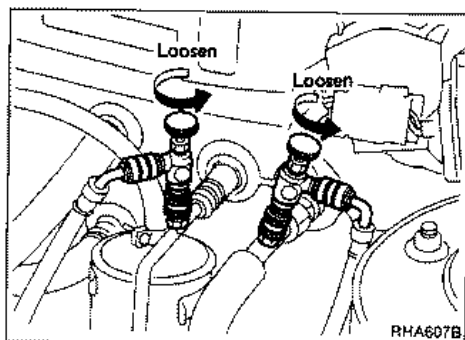
- Door windows: Closed
- Auto switch: ON
- TEMP. setting: 40
- FAN speed: HI
- REC. switch: ON

Check sight glass after a lapse of about five minutes.

Recheck the amount when it exceeds 20°C (68°F). At higher temperatures the bubbles are easy to see.

b. When the screen in the receiver drier is clogged, the bubbles will appear even if the amount of refrigerant is normal. In this case, the outlet side pipe of the receiver drier becomes considerably cold.

EVACUATING, CHARGING AND CHECKING



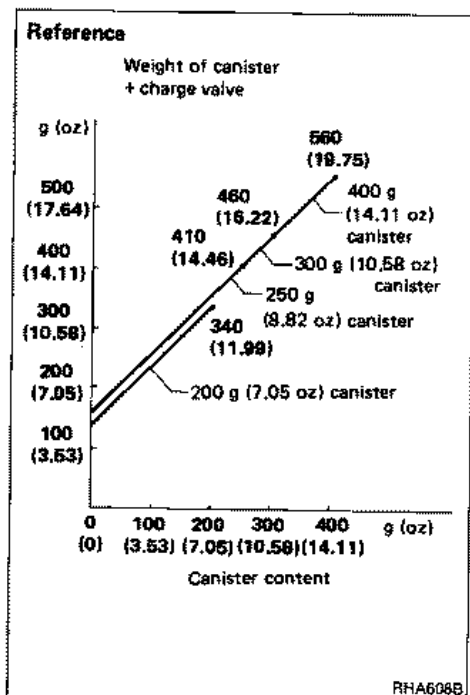
Recovery Procedure

REMOVAL OF REFRIGERANT CHARGING DEVICE

1. Completely loosen the adapter valves of the low pressure and high pressure lines.
The inner valve of the adapter valve will prevent the refrigerant from leaking out.
2. Remove both the high-pressure and low-pressure side adapter valves from the on-vehicle service valve.

If adapter valve is not used for charging, proceed as follows to minimize the refrigerant discharge into the atmosphere.

3. Loosen the nut of the low pressure charging hose while pressing it against the service valve to prevent refrigerant leakage.
4. After loosening the nut, quickly remove the charge valve from the service valve.
5. Wait until the high pressure gauge indication drops to below 981 kPa (9.8 bar, 10 kg/cm², 142 psi), then similarly disconnect the high pressure charging hose.



DISPOSAL OF RESIDUAL REFRIGERANT








Securely shut off each of the charge valves, adapter valves and manifold gauge valves to prevent the residual refrigerant from leaking out. Keep these valves in a safe location for the next charging.

The amount of refrigerant remaining in a service canister can be estimated from the Table shown here. It is recommended that a label be attached indicating the remaining amount in the canister.

DESCRIPTION — Manual Air Conditioner

Control Switches

SWITCHES AND THEIR CONTROL FUNCTIONS

Switch		Indicator illuminates		Air outlet	Intake air	Compressor
		A/C				
A/C		○		/	/	ON*1
Mode				VENT	*3	*1*4
				B/L	*5	*1*4
				FOOT	*5	*1*4
				F/D	*5	ON*1
				DEF	FRE	*1*4
			○	/	REC*2	ON*1

*1: Compressor is operated by thermo control amp. and E.C.C.S. control unit.

*2: Depending on mode switch position.

*3: When vent mode is selected, REC switch function is as in the following chart:

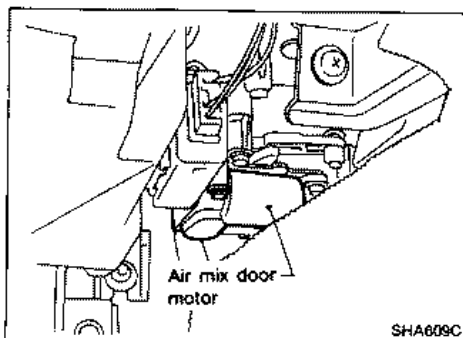
*4: Depending on A/C switch position.

*5: Depending on REC switch position.

		REC	
		ON	OFF
A/C SW	ON	REC	REC/FRE
	OFF	REC	FRE

SHA267C

DESCRIPTION — Manual Air Conditioner



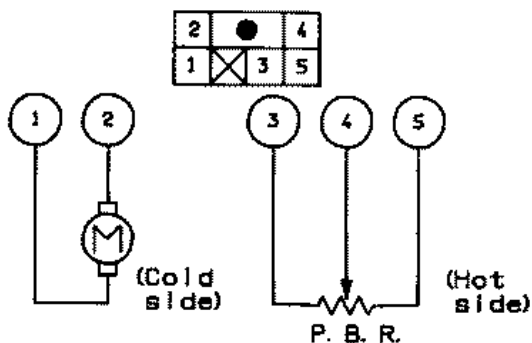
Specifications

AIR MIX DOOR MOTOR

The air mix door motor is attached to the heater unit. It rotates, opening the air mix door to the position set by the temperature control lever.

Motor rotation is conveyed through shafts and linkages. The air mix door position is fed back to the control amplifier by the Potentio Balance Resistor (P.B.R.) built into the air mix door motor.

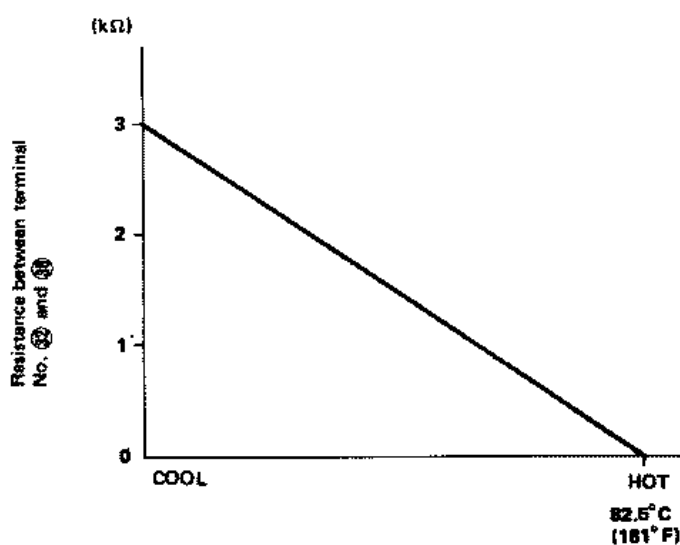
Air mix door motor operation



1	2	Air mix door operation	Direction of lever movement
⊕	⊖	COLD → HOT	Clockwise (Toward passenger compartment)
⊖	⊖	STOP	STOP
⊖	⊕	HOT → COLD	Counterclockwise (Toward engine compartment)

SHA637C

Characteristics of P.B.R.



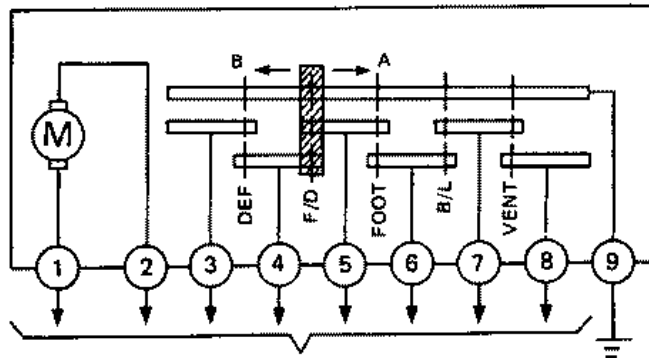
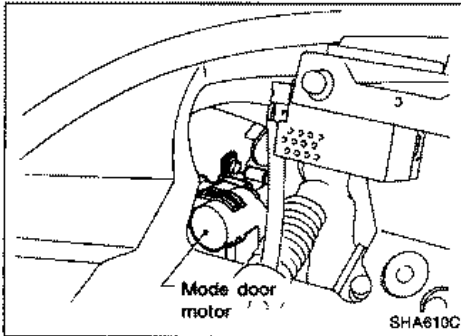
SHA270C

DESCRIPTION — Manual Air Conditioner

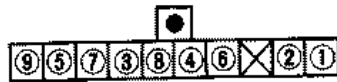
Specifications (Cont'd)

MODE DOOR MOTOR

When a mode switch is selected, the position switch built into it reads the corresponding mode to determine the direction of motor rotation. As soon as the desired mode is set, the position switch stops the motor.



To control amp.



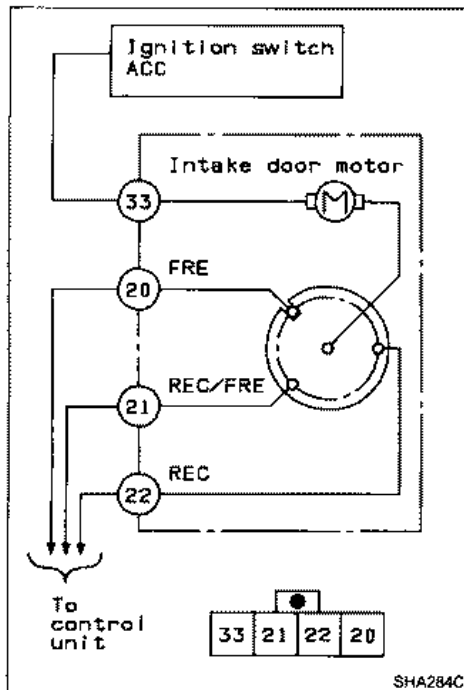
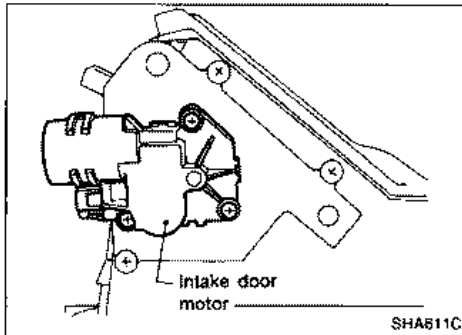
SHA638C

DESCRIPTION — Manual Air Conditioner

Specifications (Cont'd)

INTAKE DOOR MOTOR

The intake door motor is installed on the side portion of the intake unit. Using a rod and link it opens and closes the intake door. When the REC switch is ON (OFF), the ground line of the intake door motor is switched from terminal 20 to 22 (22 to 20). This causes the motor to start because the position switch contacts built into it are now set to the current flow position. The contacts turn along with the motor. When they reach the non-current flow position, the motor will stop. The motor always turns in the same direction. (FRE → REC → REC/FRE)



SERVICE PROCEDURES

Acceleration Cut System

This system is controlled by the E.C.C.S. control unit. When the engine is heavily overloaded, the compressor is turned off for several seconds to reduce overloading.

Water Cock Control System

The water cock is connected to the air mix doors with a cable. When the air mix doors are at the full-cold position, the water cock is fully closed, and when the air mix doors are at the full-hot position, the water cock is fully opened.

SERVICE PROCEDURES

Refrigeration Cycle

REFRIGERANT FLOW

The refrigerant flows in the standard pattern, that is, through the compressor, the condenser, the receiver drier, through the evaporator, and back to the compressor.

Refrigerant evaporation through the evaporator coil is controlled by an externally equalized expansion valve, located inside the evaporator case.

FREEZE PROTECTION (For manual air conditioner)

The compressor cycles on and off to maintain the evaporator temperature within a specified range. When the evaporator coil temperature falls below a specified point, the thermo control amplifier interrupts the compressor operation. When the evaporator coil temperature rises above the specified point, the thermo control amplifier allows compressor operation.

FREEZE PROTECTION (For auto air conditioner)

When the A/C is switched on, the compressor runs continuously, and the evaporator pressure is controlled by a suction throttle valve (S.T.V.) to prevent freeze up.

REFRIGERANT SYSTEM PROTECTION

Low-pressure switch

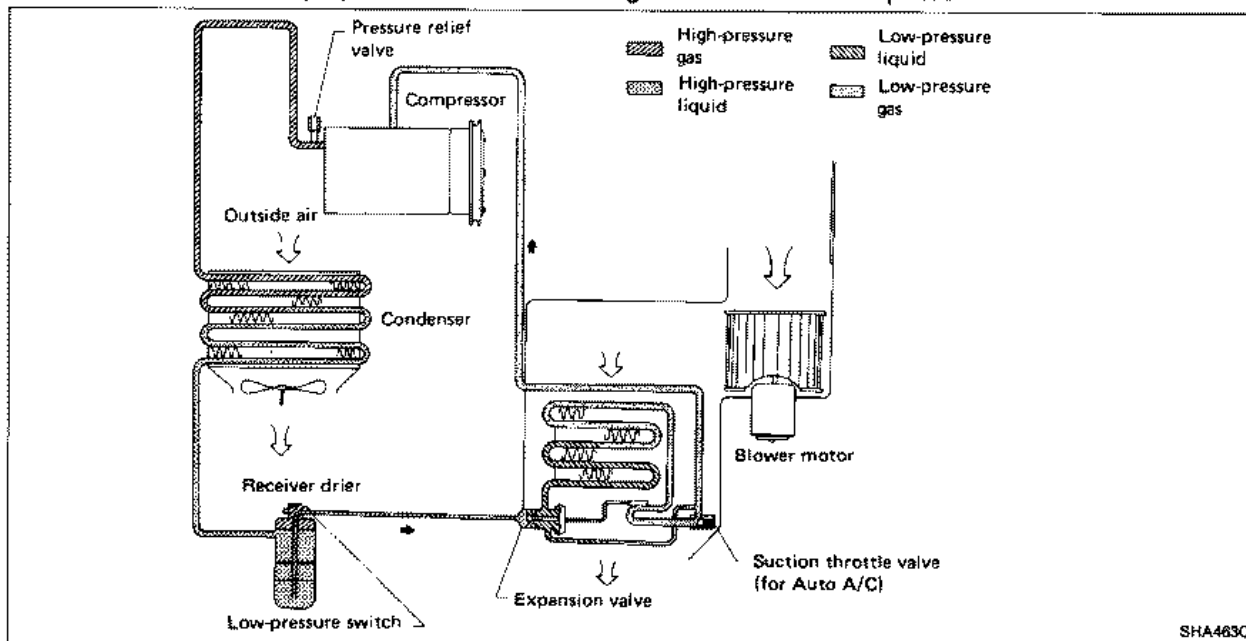
The refrigerant system is protected against excessively low pressures by the low-pressure switch, located on the receiver drier. If the system pressure falls below the specifications, the low-pressure switch opens to interrupt compressor operation.

Fusible plug

Opens at temperature above 105°C (221°F), thereby discharging refrigerant to the atmosphere. If this plug is melted and opened, check the refrigerant line and replace the receiver drier.

Pressure relief valve

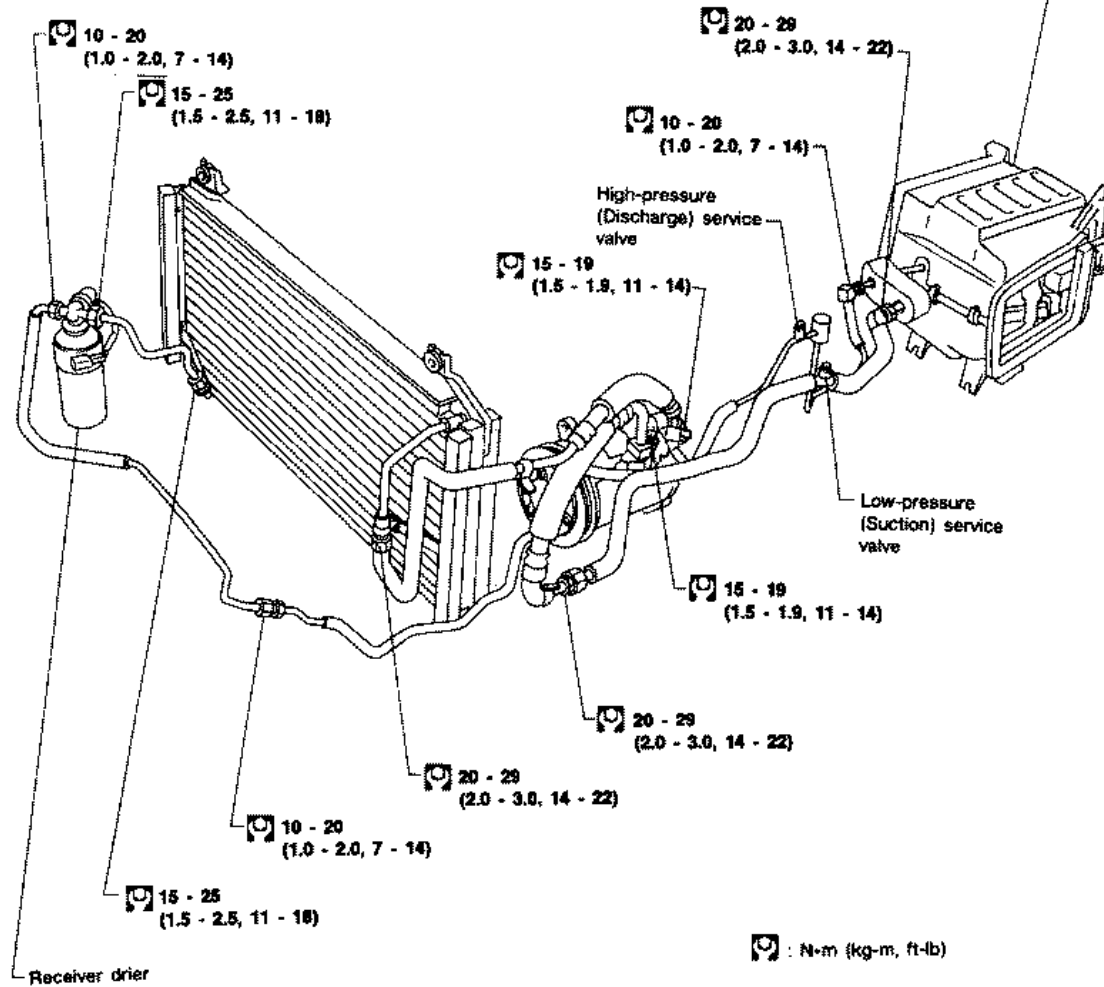
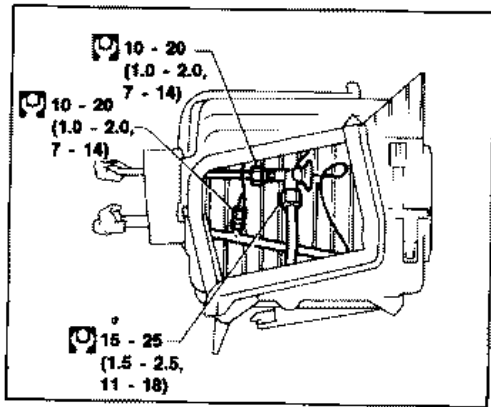
The refrigerant system is also protected by a pressure relief valve, located on the end of the high pressure flexible hose near the compressor. When the pressure of refrigerant in the system increases to an abnormal level [more than 3,727 kPa (37.3 bar, 38 kg/cm², 540 psi)], the release port on the pressure relief valve automatically opens and releases refrigerant into the atmosphere.



SERVICE PROCEDURES

Refrigerant Lines

FOR AUSTRALIA



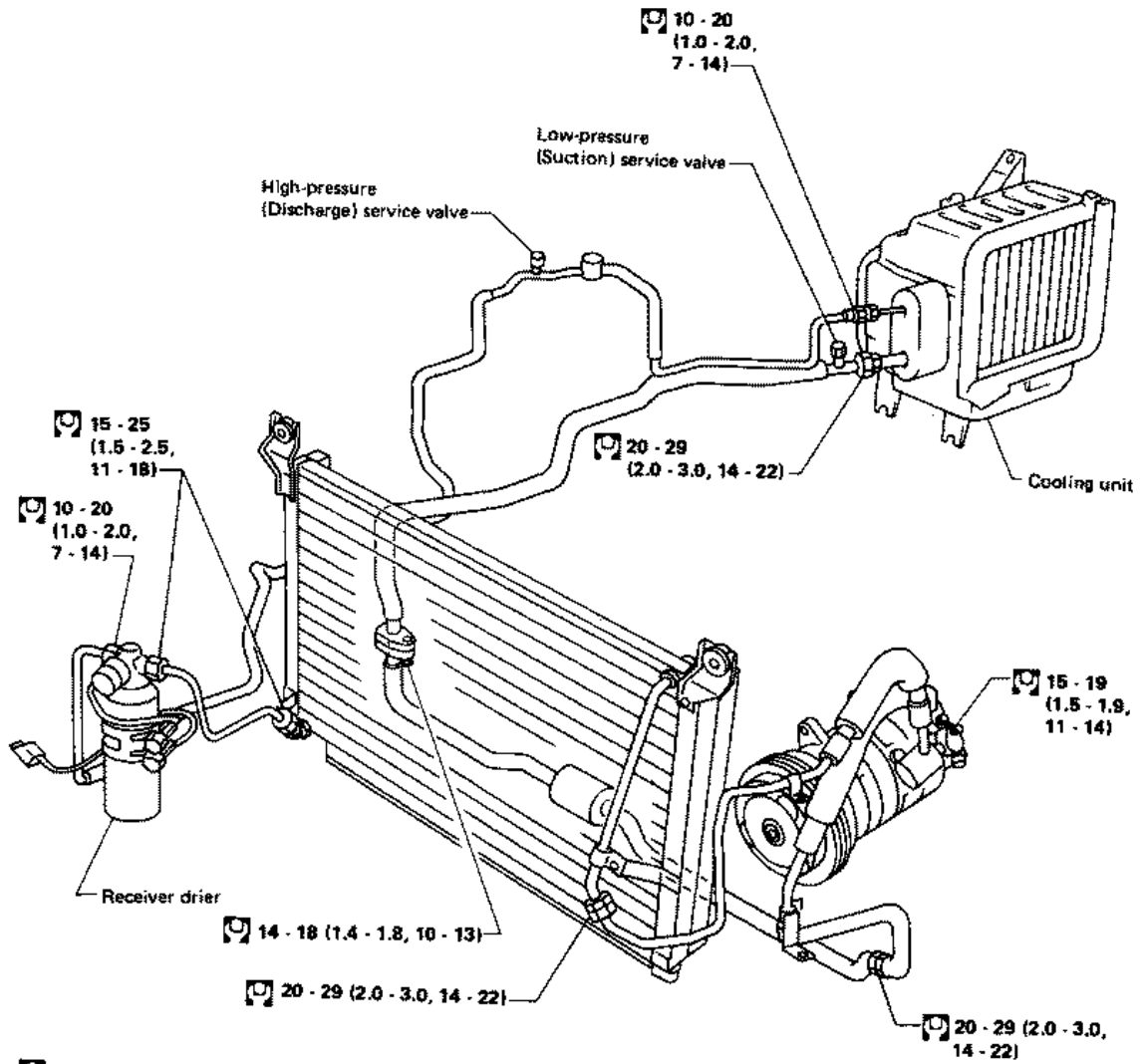
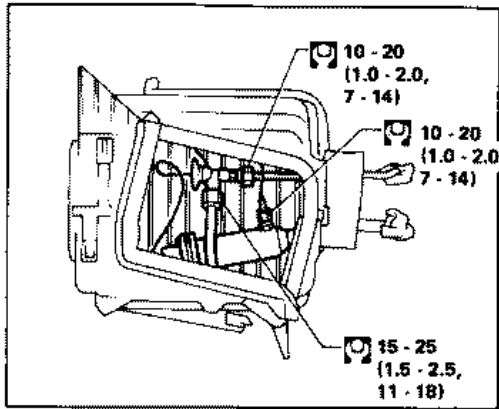
SHA613C

HA-40

SERVICE PROCEDURES

Refrigerant Lines (Cont'd)

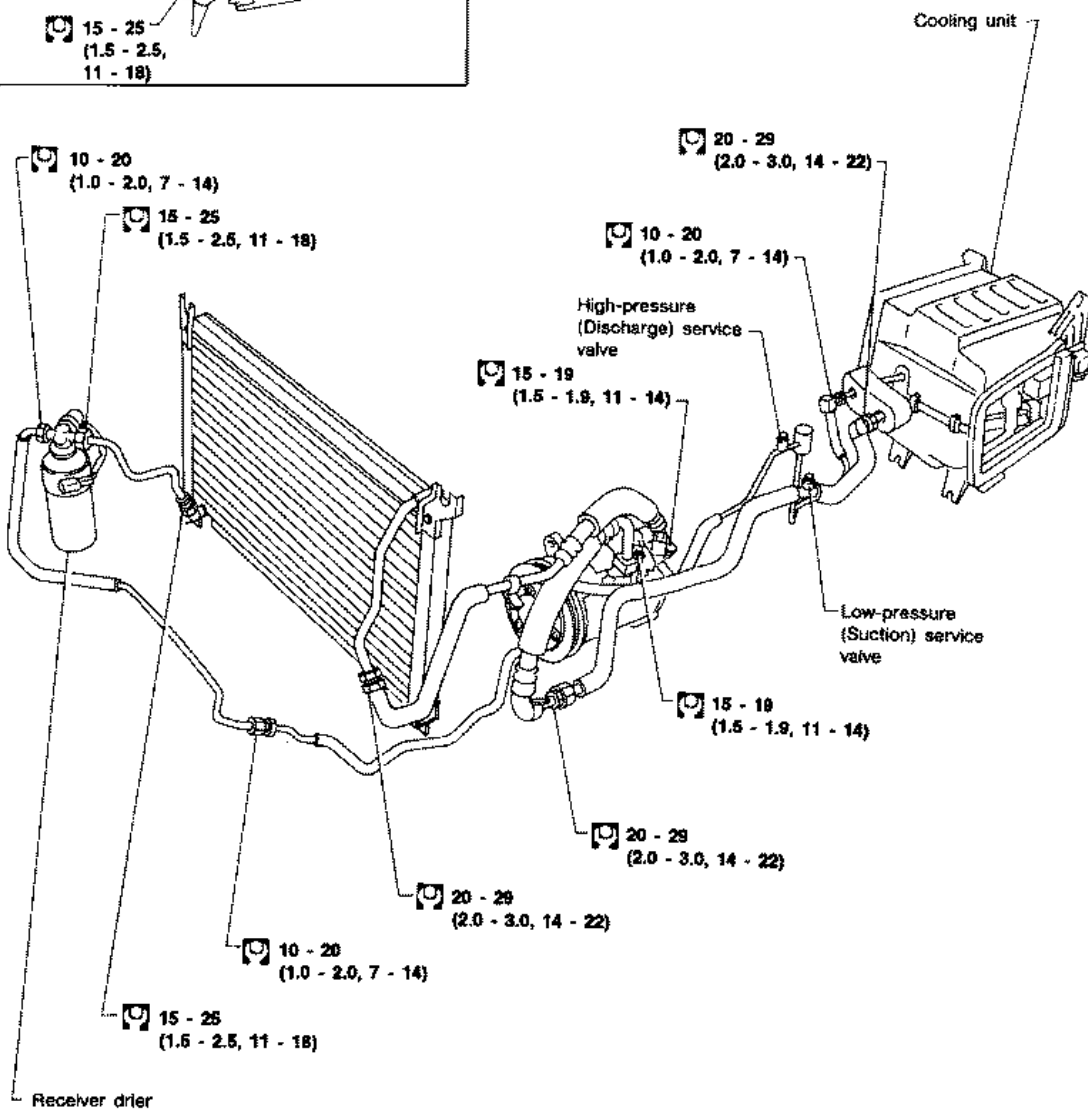
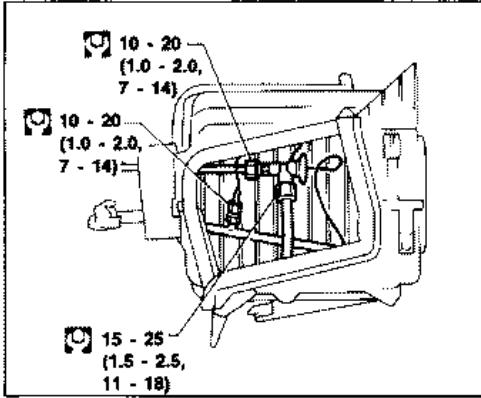
L.H.D. MODEL FOR EUROPE



SERVICE PROCEDURES

Refrigerant Lines (Cont'd)

R.H.D. MODEL FOR EUROPE

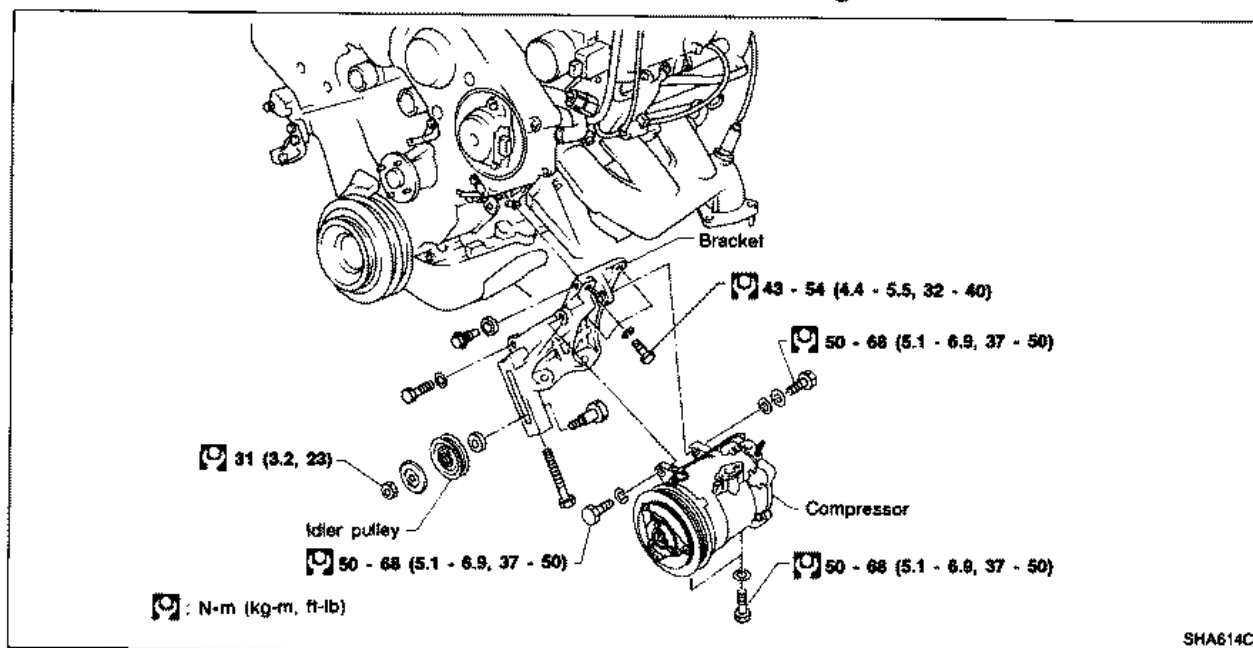


: N·m (kg·m, ft·lb)

SHA718C

SERVICE PROCEDURES

Compressor Mounting



Belt Tension

- Refer to section MA.

Fast Idle Control Device (F.I.C.D.)

- Refer to section EF & EC.

A/C PERFORMANCE TEST

Performance Chart

TEST CONDITION — For Manual Air Conditioner

Testing must be performed as follows:

Vehicle location: Indoors or in the shade (in a well ventilated place)


Doors: Closed

Door windows: Open

Hood: Open

TEMP. lever position: Max. COLD

Mode switch:  (Ventilation) set

REC switch:  (Recirculation) set

FAN lever position: Max. position

Engine speed: 1,500 rpm

Time required before starting testing after air conditioner starts operating: More than 10 minutes

TEST READING

For Australia

Recirculating-to-discharge air temperature table

Inside air (Recirculating air) at blower assembly inlet		Discharge air temperature at center ventilator °C (°F)
Relative humidity %	Air temperature °C (°F)	
50 - 60	20 (68)	6.5 - 7.2 (44 - 45)
	25 (77)	11.0 - 12.0 (52 - 54)
	30 (86)	15.6 - 16.8 (60 - 62)
	35 (95)	20.3 - 21.6 (69 - 71)
60 - 70	20 (68)	7.2 - 7.9 (45 - 46)
	25 (77)	12.0 - 12.9 (54 - 55)
	30 (86)	16.8 - 17.9 (62 - 64)
	35 (95)	21.6 - 22.9 (71 - 73)

Ambient air temperature-to-compressor pressure table

Ambient air		High-pressure (Discharge side) kPa (bar, kg/cm ² , psi)	Low-pressure (Suction side) kPa (bar, kg/cm ² , psi)
Relative humidity %	Air temperature °C (°F)		
50 - 70	20 (68)	1,079 - 1,324 (10.79 - 13.24, 11.0 - 13.5, 156 - 192)	105.9 - 129.5 (1.059 - 1.295, 1.08 - 1.32, 15.4 - 18.8)
	25 (77)	1,196 - 1,461 (11.96 - 14.61, 12.2 - 14.9, 173 - 212)	146.1 - 178.5 (1.461 - 1.785, 1.49 - 1.82, 21.2 - 25.9)
	30 (86)	1,373 - 1,687 (13.73 - 16.87, 14.0 - 17.2, 199 - 245)	187.3 - 228.5 (1.873 - 2.285, 1.91 - 2.33, 27.2 - 33.1)
	35 (95)	1,589 - 1,942 (15.89 - 19.02, 16.2 - 19.8, 230 - 282)	229.5 - 280.5 (2.295 - 2.805, 2.34 - 2.86, 33.3 - 40.7)
	40 (104)	1,804 - 2,197 (18.04 - 21.97, 18.4 - 22.4, 262 - 319)	269.7 - 329.5 (2.697 - 3.295, 2.75 - 3.36, 39.1 - 47.8)
	45 (113)	1,991 - 2,442 (19.91 - 24.42, 20.3 - 24.9, 289 - 354)	308.9 - 377.6 (3.089 - 3.776, 3.15 - 3.85, 44.8 - 54.7)

A/C PERFORMANCE TEST

Performance Chart (Cont'd)

TEST CONDITION — For Auto Air Conditioner


Testing must be performed as follows:

Vehicle location: Indoors or in the shade (in a well ventilated place)

Doors: Closed

Door windows: Open

Hood: Open

 Set up ACTIVE-TEST with CONSULT and set each component as follows:


Mode door: VENT

Intake door: REC

Air mix door: Full-cold

Compressor: ON

Blower motor: 12V

 Set up self-diagnosis STEP 2 and set code No. "66".

A/C PERFORMANCE TEST

Performance Chart (Cont'd)

VG30DETT engine L.H.D. model

Recirculating-to-discharge air temperature table

Inside air (Recirculating air) at blower assembly inlet		Discharge air temperature at center ventilator °C (°F)
Relative humidity %	Air temperature °C (°F)	
50 - 60	20 (68)	7.0 - 7.8 (45 - 46)
	25 (77)	11.6 - 12.7 (53 - 55)
	30 (86)	16.5 - 17.7 (62 - 64)
	35 (95)	21.3 - 22.7 (70 - 73)
	40 (104)	26.2 - 27.8 (79 - 82)
60 - 70	20 (68)	7.8 - 8.7 (46 - 48)
	25 (77)	12.7 - 13.8 (55 - 57)
	30 (86)	17.7 - 18.9 (64 - 66)
	35 (95)	22.7 - 24.1 (73 - 75)
	40 (104)	27.8 - 29.6 (82 - 85)

Ambient air temperature-to-compressor pressure table

Ambient air		High-pressure (Discharge side) kPa (bar, kg/cm ² , psi)	Low-pressure (Suction side) kPa (bar, kg/cm ² , psi)
Relative humidity %	Air temperature °C (°F)		
50 - 70	20 (68)	785 - 961 (7.85 - 9.61, 8.0 - 9.8, 114 - 139)	68.6 - 103.0 (0.686 - 1.030, 0.70 - 1.05, 10.0 - 14.9)
	25 (77)	912 - 1,108 (9.12 - 11.08, 9.3 - 11.3, 132 - 161)	118.7 - 150.0 (1.187 - 1.500, 1.21 - 1.53, 17.2 - 21.8)
	30 (86)	1,128 - 1,383 (11.28 - 13.83, 11.5 - 14.1, 164 - 201)	167.7 - 205.0 (1.677 - 2.050, 1.71 - 2.09, 24.3 - 29.7)
	35 (95)	1,353 - 1,657 (13.53 - 16.57, 13.8 - 16.9, 196 - 240)	213.8 - 260.9 (2.138 - 2.609, 2.18 - 2.66, 31.0 - 37.8)
	40 (104)	1,579 - 1,922 (15.79 - 19.22, 16.1 - 19.6, 229 - 279)	258.9 - 315.8 (2.589 - 3.158, 2.64 - 3.22, 37.5 - 45.8)
	45 (113)	1,795 - 2,207 (17.95 - 22.07, 18.3 - 22.5, 260 - 320)	304.0 - 372.7 (3.040 - 3.727, 3.10 - 3.80, 44.1 - 54.0)

A/C PERFORMANCE TEST

Performance Chart (Cont'd)

VG30DETT ENGINE R.H.D. MODEL

Recirculating-to-discharge air temperature table

Inside air (Recirculating air) at blower assembly inlet		Discharge air temperature at center ventilator °C (°F)
Relative humidity %	Air temperature °C (°F)	
50 - 60	20 (68)	7.0 - 7.8 (45 - 46)
	25 (77)	10.2 - 11.4 (50 - 53)
	30 (86)	15.2 - 16.5 (59 - 62)
	35 (95)	20.4 - 21.5 (69 - 71)
	40 (104)	25.4 - 26.7 (78 - 80)
60 - 70	20 (68)	7.8 - 8.6 (46 - 47)
	25 (77)	11.4 - 12.4 (53 - 54)
	30 (86)	16.5 - 17.6 (62 - 64)
	35 (95)	21.5 - 22.8 (71 - 73)
	40 (104)	26.7 - 28.0 (80 - 82)

Ambient air temperature-to-compressor pressure table

Ambient air		High-pressure (Discharge side) kPa (bar, kg/cm ² , psi)	Low-pressure (Suction side) kPa (bar, kg/cm ² , psi)
Relative humidity %	Air temperature °C (°F)		
50 - 70	20 (68)	1,098 - 1,353 (10.98 - 13.53, 11.2 - 13.8, 159 - 196)	122.6 - 152.0 (1.226 - 1.520, 1.25 - 1.55, 17.8 - 22.0)
	25 (77)	1,265 - 1,559 (12.65 - 15.59, 12.9 - 15.9, 183 - 226)	156.9 - 194.2 (1.569 - 1.942, 1.60 - 1.98, 22.8 - 28.2)
	30 (86)	1,451 - 1,785 (14.51 - 17.85, 14.8 - 18.2, 210 - 259)	185.4 - 226.5 (1.854 - 2.265, 1.89 - 2.31, 26.9 - 32.8)
	35 (95)	1,608 - 1,981 (16.08 - 19.81, 16.4 - 20.2, 233 - 287)	220.7 - 269.7 (2.207 - 2.697, 2.25 - 2.75, 32.0 - 39.1)
	40 (104)	1,765 - 2,158 (17.65 - 21.58, 18.0 - 22.0, 256 - 313)	247.1 - 313.8 (2.471 - 3.138, 2.52 - 3.20, 35.8 - 45.5)
	45 (113)	1,942 - 2,373 (19.42 - 23.73, 19.8 - 24.2, 282 - 344)	274.6 - 362.9 (2.746 - 3.629, 2.80 - 3.70, 39.8 - 52.6)

A/C PERFORMANCE TEST

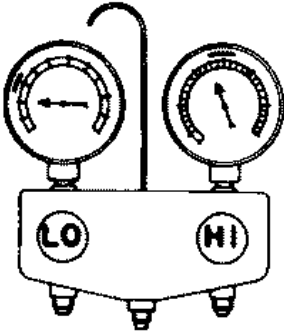
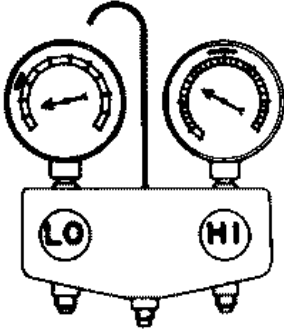
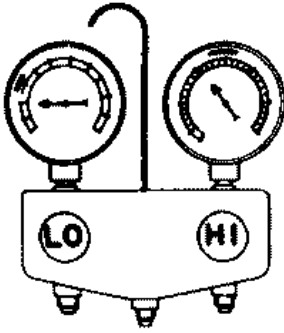
Performance Test Diagnoses

Characteristics revealed by the manifold gauge readings for the air conditioning system are shown in the following table.

For how to do the performance test, refer to the item "Performance Chart".

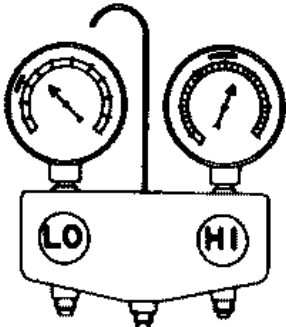
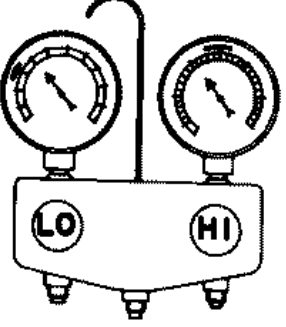
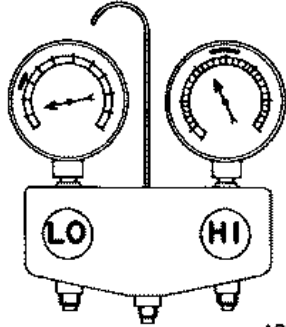
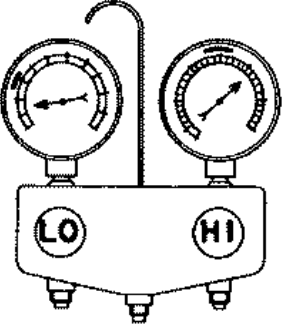
In the following table, the portion marked on each gauge scale indicates the range which shows that the air conditioning system is in good order.

This range is described in Performance Chart.

Condition	Probable cause	Corrective action
<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">INSUFFICIENT REFRIGERANT CHARGE</div>  <p style="text-align: right; margin-right: 10px;">AC352A</p>	<p>Insufficient cooling. Bubbles appear in sight glass.</p> <p>Refrigerant is low, or leaking slightly.</p>	<ol style="list-style-type: none"> 1. Leak test. 2. Repair leak. 3. Charge system. <p>Evacuate, as necessary, and recharge system.</p>
<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">ALMOST NO REFRIGERANT</div>  <p style="text-align: right; margin-right: 10px;">AC353A</p>	<p>No cooling action. A lot of bubbles or something like mist appears in sight glass.</p> <p>Serious refrigerant leak.</p>	<p>Stop compressor immediately.</p> <ol style="list-style-type: none"> 1. Leak test. 2. Discharge system. 3. Repair leak(s). 4. Replace receiver drier if necessary. 5. Check oil level. 6. Evacuate and recharge system.
<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;">MALFUNCTIONING EXPANSION VALVE</div>  <p style="text-align: right; margin-right: 10px;">AC354A</p>	<p>Slight cooling. Sweat or frosting on expansion valve inlet.</p> <p>Expansion valve restricts refrigerant flow.</p> <ul style="list-style-type: none"> ● Expansion valve is clogged. ● Expansion valve is inoperative. <p style="margin-left: 20px;">Valve stuck closed. Thermal bulb has lost charge.</p>	<p>If valve inlet reveals sweat or frost:</p> <ol style="list-style-type: none"> 1. Discharge system. 2. Remove valve and clean it. Replace it if necessary. 3. Evacuate system. 4. Charge system. <p>If valve does not operate:</p> <ol style="list-style-type: none"> 1. Discharge system. 2. Replace valve. 3. Evacuate and charge system.

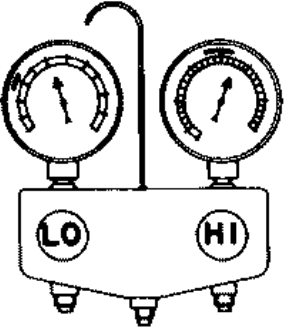
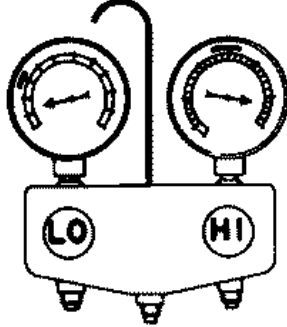
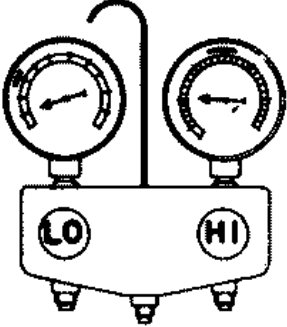
A/C PERFORMANCE TEST

Performance Test Diagnoses (Cont'd)

Condition	Probable cause	Corrective action
 <p style="text-align: right; margin-right: 50px;">AC355A</p>	<p>Insufficient cooling. Sweat on suction line.</p>	<p>Expansion valve allows too much refrigerant through evaporator.</p>
 <p style="text-align: right; margin-right: 50px;">AC356A</p>	<p>No cooling. Sweat or frosting on suction line.</p>	<p>Malfunctioning expansion valve.</p> <ol style="list-style-type: none"> 1. Discharge system. 2. Replace valve. 3. Evacuate and charge system.
MALFUNCTIONING SUCTION THROTTLE VALVE		
 <p style="text-align: right; margin-right: 50px;">AC357A</p>	<p>Insufficient cooling. Frosted evaporator.</p>	<p>Suction throttle valve is inoperative.</p> <ol style="list-style-type: none"> 1. Discharge system. 2. Replace valve. 3. Evacuate and charge system.
 <p style="text-align: right; margin-right: 50px;">AC358A</p>	<p>Insufficient cooling.</p>	<p>Suction throttle valve restricts refrigerant flow.</p> <ol style="list-style-type: none"> 1. Discharge system. 2. Replace valve. 3. Evacuate and charge system.

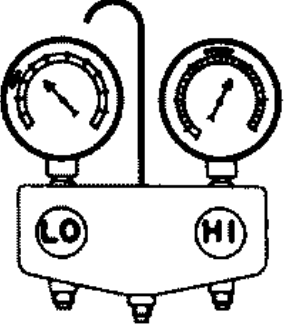
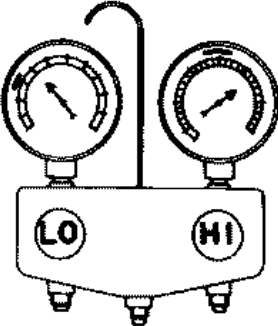
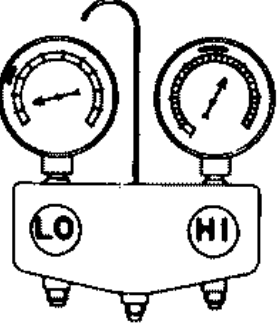
A/C PERFORMANCE TEST

Performance Test Diagnoses (Cont'd)

Condition	Probable cause	Corrective action
<div style="border: 1px solid black; padding: 2px; margin-bottom: 10px;">MALFUNCTIONING CONDENSER</div>  <p style="text-align: right; margin-right: 10px;">AC361A</p> <p>No cooling action; engine may overheat. Bubbles appear in sight glass of drier. Suction line is very hot.</p>	Usually a malfunctioning condenser.	<ul style="list-style-type: none"> ● Check fan belt and fluid coupling ● Check radiator fan motor. ● Check condenser for dirt accumulation. ● Check engine cooling system for overheating. ● Check for refrigerant overcharging. <p>If pressure remains high in spite of all above actions taken, remove and inspect the condenser for possible oil clogging.</p>
<div style="border: 1px solid black; padding: 2px; margin-bottom: 10px;">HIGH-PRESSURE LINE BLOCKED</div>  <p style="text-align: right; margin-right: 10px;">AC362A</p> <p>Insufficient cooling. Frosted high-pressure liquid line.</p>	Drier clogged, or restriction in high-pressure line.	<ol style="list-style-type: none"> 1. Discharge system. 2. Remove receiver drier or strainer and replace it. 3. Evacuate and charge system.
<div style="border: 1px solid black; padding: 2px; margin-bottom: 10px;">MALFUNCTIONING COMPRESSOR</div>  <p style="text-align: right; margin-right: 10px;">AC363A</p> <p>Insufficient cooling.</p>	Internal problem in compressor, or damaged gasket and valve.	<ol style="list-style-type: none"> 1. Discharge system. 2. Remove and check compressor. 3. Repair or replace compressor. 4. Check oil level. 5. Replace receiver drier. 6. Evacuate and charge system.

A/C PERFORMANCE TEST

Performance Test Diagnoses (Cont'd)

Condition	Probable cause	Corrective action
<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> TOO MUCH OIL IN SYSTEM (Excessive) </div> <div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>Insufficient cooling.</p> </div> </div> <p style="text-align: right; margin-top: 10px;">AC364A</p>	<p>Too much oil circulates with refrigerant, causing the cooling capacity of the system to be reduced.</p>	<p>Refer to COMPRESSOR OIL for correcting oil level.</p>
<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> AIR IN SYSTEM </div> <div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>Insufficient cooling. Sight glass shows occasional bubbles.</p> </div> </div> <p style="text-align: right; margin-top: 10px;">AC359A</p>	<p>Air mixed with refrigerant in system.</p>	<ol style="list-style-type: none"> 1. Discharge system. 2. Replace receiver drier. 3. Evacuate and charge system.
<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> MOISTURE IN SYSTEM </div> <div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>After short operation, suction side may show vacuum pressure reading. During this condition, discharge air will be warm. As a warning of this, reading vibrates around 39 kPa (0.39 bar, 0.4 kg/cm², 6 psi).</p> </div> </div> <p style="text-align: right; margin-top: 10px;">AC360A</p>	<p>Drier is saturated with moisture. Moisture has frozen in expansion valve. Refrigerant flow is restricted.</p>	<ol style="list-style-type: none"> 1. Discharge system. 2. Replace receiver drier (twice if necessary). 3. Evacuate system completely. (Repeat 30-minutes evacuating three times.) 4. Recharge system.

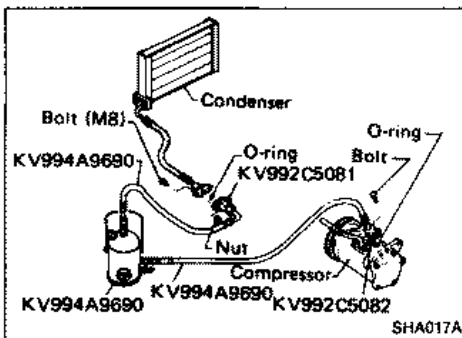
COMPRESSOR OIL — For MJS170 (HITACHI make)

Checking and Adjusting

The oil used to lubricate the compressor is circulating with the refrigerant.

Whenever replacing any component of the system or a large amount of gas leakage occurs, add oil to maintain the original amount of oil.

Total amount of oil in the system:
150 ml (5.3 imp fl oz)



1. Connect oil separator KV994A9690 between compressor discharge side and condenser.
2. Evacuate and charge the system.
3. Operate compressor at engine idling with air conditioner set for maximum cooling and high fan speed.
4. Stop compressor operation after 10 minutes.

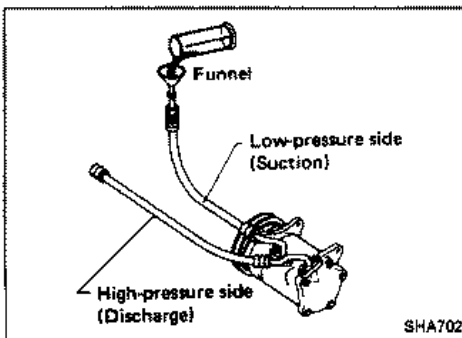
CAUTION:

Never allow engine speed to exceed idling speed.

Do not continue compressor operation for more than 10 minutes.

5. Disconnect oil separator and connect refrigerant line to original positions.
6. Disconnect low flexible hose from compressor suction valve.
7. Add new oil from compressor suction port.

Amount of oil to be added:
120 ml (4.2 imp fl oz)



- About 30 ml (1.1 imp fl oz) of oil remains unremoved in the system.

8. After adding oil, rotate compressor clutch by hand 5 to 10 turns.
9. Connect refrigerant line and evacuate and charge system.
10. Conduct leak test and performance test.
11. Gradually loosen drain cap of oil separator to release residual pressure. Remove cap and drain oil.
12. To prevent formation of rust and intrusion of moisture or dust, perform the following before placing oil separator kit into storage.

- 1) Cap each opening of flexible hose and double union securely.
- 2) Cap oil separator, evacuate it from service valve, and charge refrigerant.

When oil contains chips or other foreign material. After air conditioner system has been flushed with refrigerant replace receiver drier. Then pour in 150 ml (5.3 imp fl oz) of oil into air conditioner system.

COMPRESSOR OIL — For MJS170 (HITACHI make)

IF OIL SEPARATOR IS NOT AVAILABLE

Add oil accordance with the table below.

Condition		Amount of oil to be added mℓ(imp fl oz)
Replacement of compressor		1. Remove all oil from new and old compressors.* 2. Charge new compressor with the same amount of oil as was in the old compressor.
Replacement of front cooling unit		70 (2.5)
Replacement of rear cooling unit		15 (0.5)
Replacement of cool box		10 (0.4)
Replacement of receiver drier (liquid tank)		10 (0.4)
Replacement of condenser	There is no sign of oil leakage from condenser.	10 (0.4)
	There are evidences of a large amount of oil leakage from condenser.	60 (2.1)
Replacement of flexible hose or pipe	There is no sign of oil leakage.	Oil need not be added.
	There are evidences of a large amount of oil leakage.	60 (2.1)
Gas leakage	There is no sign of oil leakage.	Oil need not be added.
	There are evidences of a large amount of oil leakage.	60 (2.1)

*: Remove compressor oil as follows.

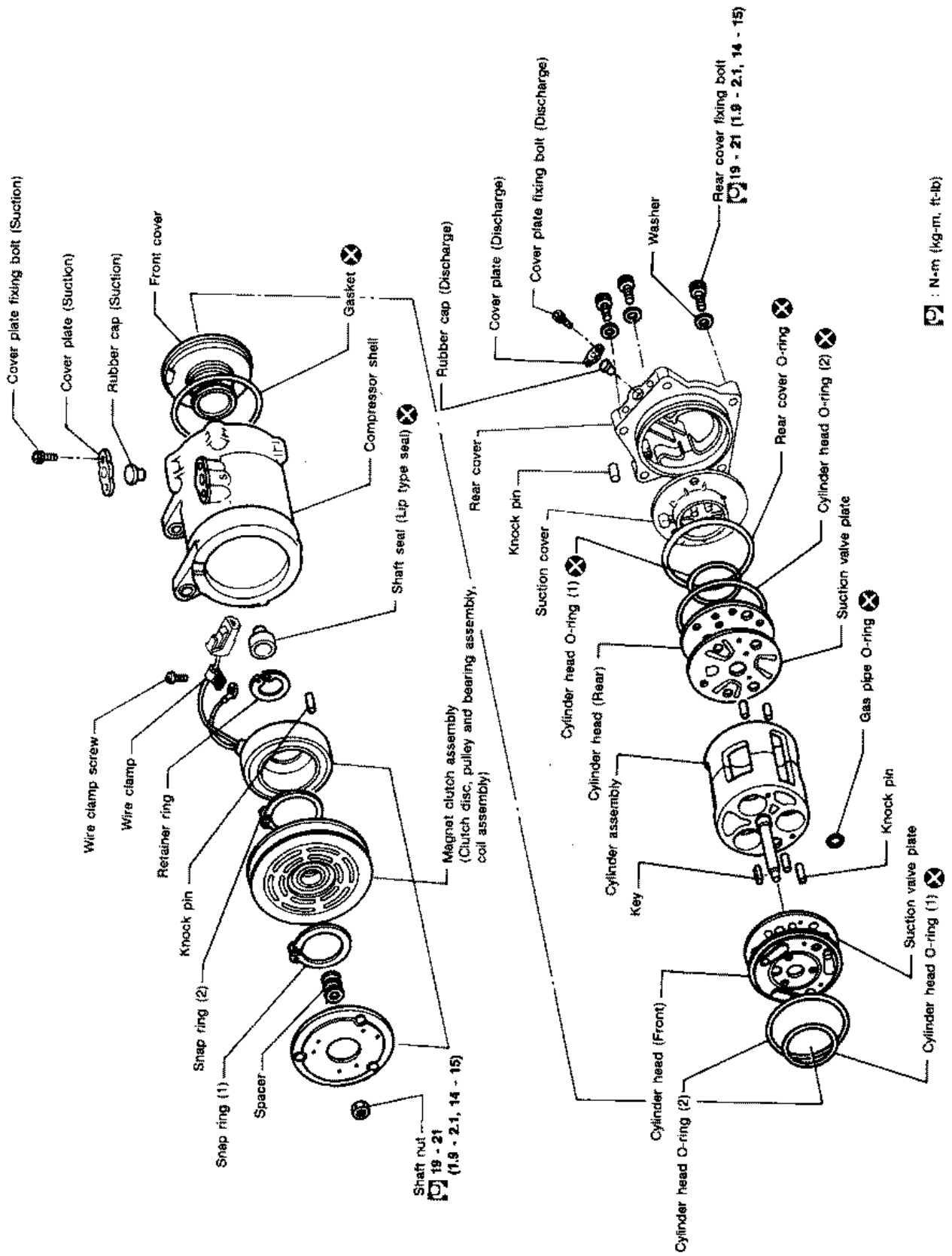
1. With the compressor upside down, completely drain the oil through the suction port (from the embossed letter "s" mark side).
2. When the oil stops flowing out, rotate the clutch hub two or three times to completely drain the oil.

COMPRESSOR — Model MJS170 (HITACHI make)

Precautions

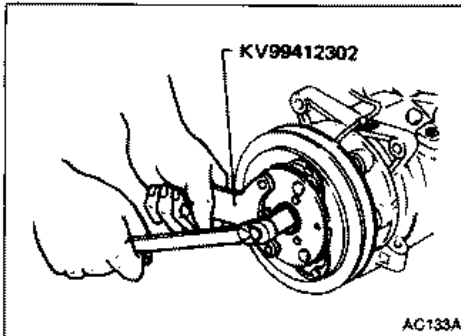
- Plug all openings to prevent moisture and foreign matter from entering.
- Do not leave compressor on its side or upside down for more than 10 minutes.
- When replacing or repairing compressor, check compressor oil level in system.
- When replacing with a new compressor, drain specified oil from new compressor. Refer to COMPRESSOR OIL.
- Be sure there is no oil or dirt on frictional surface of clutch disc and pulley.
- When replacing compressor clutch, be careful not to scratch shaft or bend pulley.
- When replacing compressor clutch assembly, do not forget **BREAK-IN OPERATION**.
- When storing a compressor, be sure to fill it with refrigerant to prevent rust formation. Add refrigerant at the low-pressure side and purge air at the high-pressure side, while rotating shaft by hand.
- When installing shaft seal, O-ring and gaskets, apply compressor oil sparingly to the contact surface. Do not reuse them.
- After replacement or repairs, conduct a Leak Test.

COMPRESSOR — Model MJS170 (HITACHI make)



⊗ : N·m (kg·m, ft·lb)

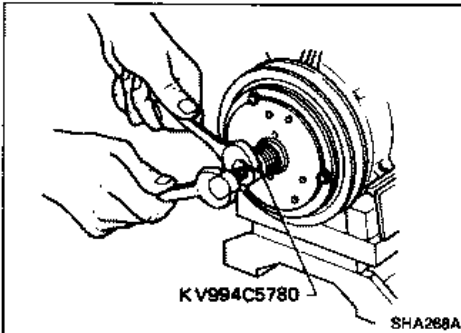
COMPRESSOR — Model MJS170 (HITACHI make)



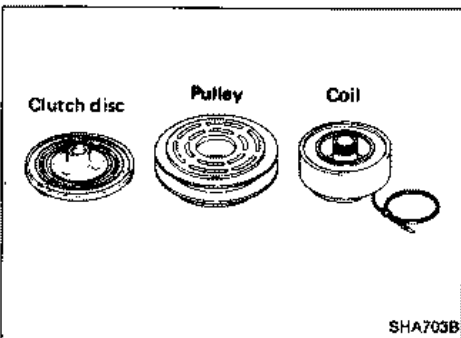
Compressor Clutch

REMOVAL

- When removing shaft nut, hold clutch disc with clutch disc wrench.



- Using clutch disc puller, clutch disc can be removed easily



INSPECTION

Clutch disc

If the contact surface shows signs of damage due to excessive heat, the drive plate and pulley should be replaced.

Pulley

Check the appearance of the pulley assembly. If the contact surface of the pulley shows signs of excessive grooving due to slippage, both the pulley and drive plate should be replaced. The contact surfaces of the pulley assembly should be cleaned with a suitable solvent before reinstallation.

Coil

Check coil for loose connection or cracked insulation.

COMPRESSOR — Model MJS170 (HITACHI make)

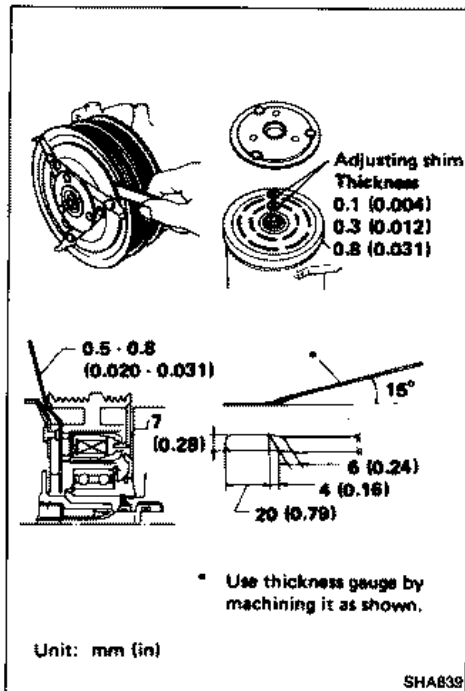
Compressor Clutch (Cont'd)

ADJUSTMENT

- When assembling clutch disc, adjust disc-to-pulley clearance with shims.

BREAK-IN OPERATION

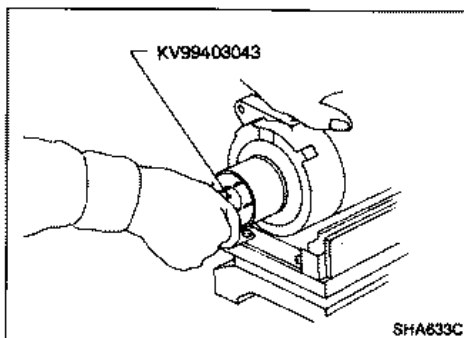
When replacing compressor clutch assembly, do not forget break-in operation, accomplished by engaging and disengaging the clutch about thirty times. Break-in operation raises the level of transmitted torque.



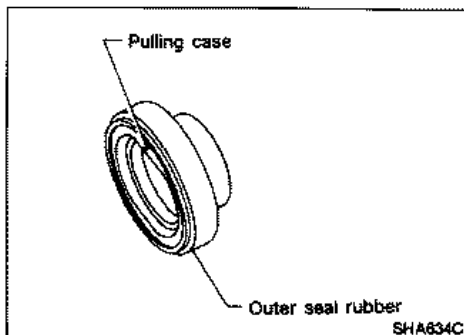
Shaft Seal

REMOVAL

- Before disassembling, be sure to measure the amount of oil. After assembling, charge with the same amount of new oil.



- With Tool KV99403043, remove shaft seal by hooking the pulling case.



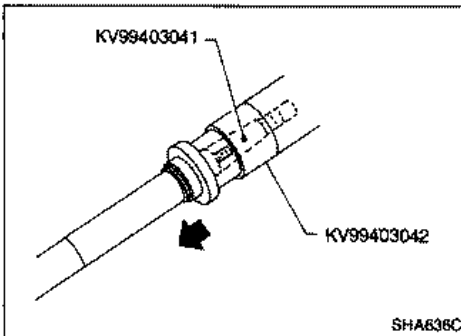
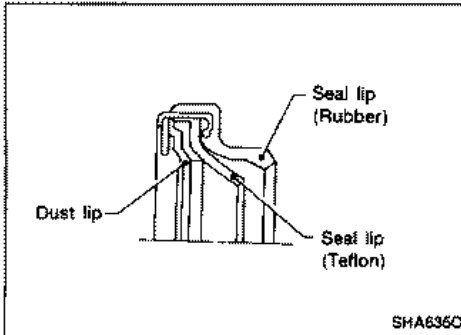
INSPECTION

- Check the outer seal rubber for scars and hardening.

COMPRESSOR — Model MJS170 (HITACHI make)

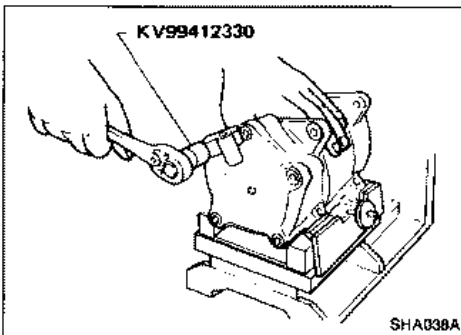
Shaft Seal (Cont'd)

- Check the seal lips for scars and wear.



INSTALLATION

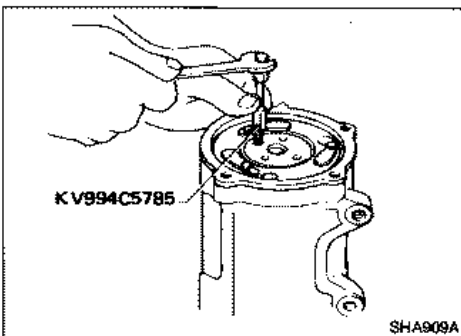
- When installing shaft seal;
 - 1) Cap shaft seal pilot to the top end of compressor shaft.
 - 2) Using shaft seal installer, insert shaft seal.



Cylinder Head, Valve and Cylinder

REMOVAL (Rear)

- Using Allen socket, remove rear cover.



- Using cylinder head remover, remove rear cylinder head.

INSPECTION

- Check suction valve plate and cylinder head for signs of damage.

COMPRESSOR — Model MJS170 (HITACHI make)

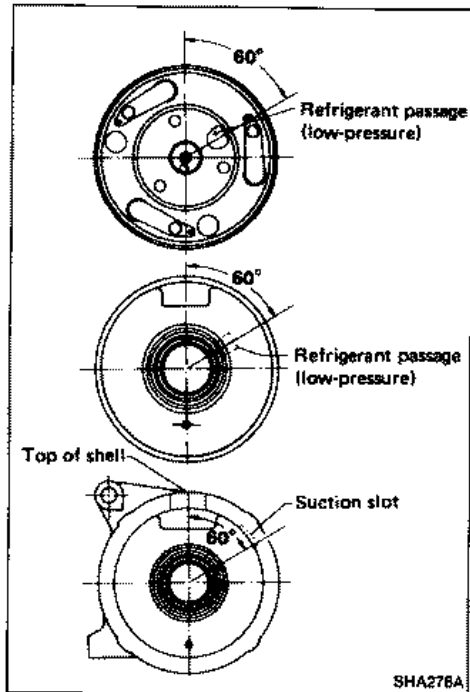
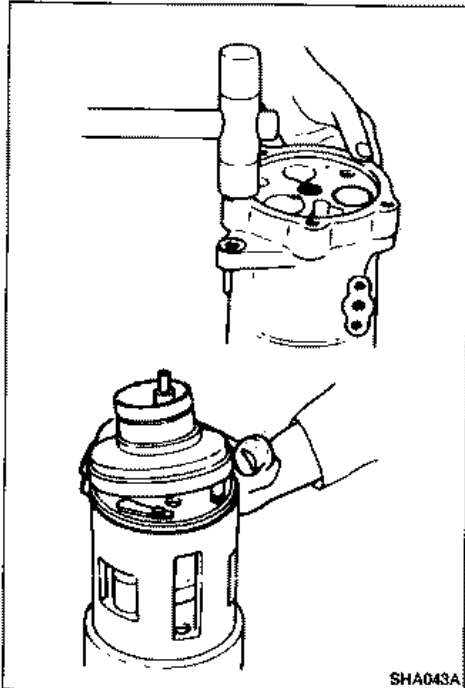
Cylinder Head, Valve and Cylinder (Cont'd)

REMOVAL (Front)

- With the front facing downward, support compressor shell. Using a plastic mallet, tap at the rear end of the shell flange, driving shell straight downward.
- Detach front cover from cylinder assembly.

INSPECTION

- Check suction valve plate and cylinder head for signs of damage.
- Check to make sure contact surfaces of cylinders, compressor shaft and compressor shell are free from any sign of scratches.

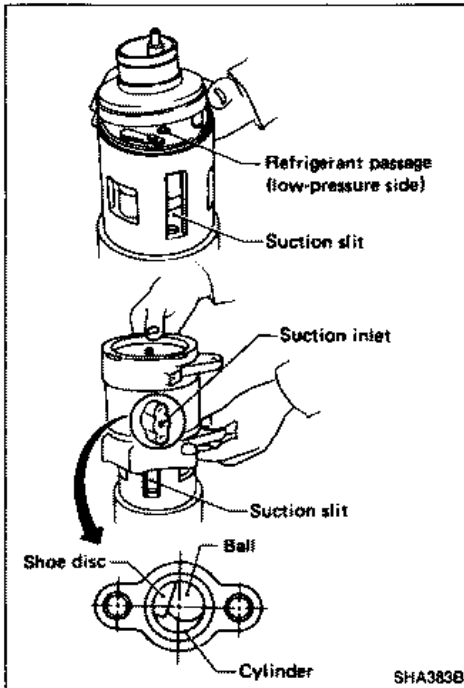


INSTALLATION

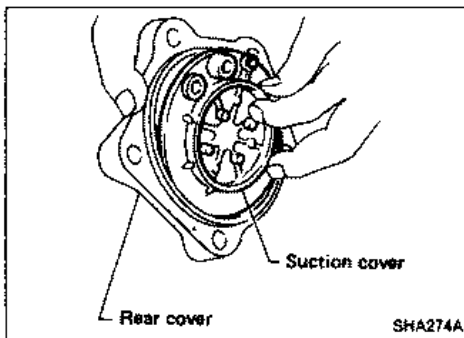
1. Front cover must be installed so that the cutout portions of front cover and shell are aligned. For this purpose, install front cover on cylinder head so that angle between threaded hole in front cover and low-pressure side refrigerant passage in cylinder head is about 60°.

COMPRESSOR — Model MJS170 (HITACHI make)

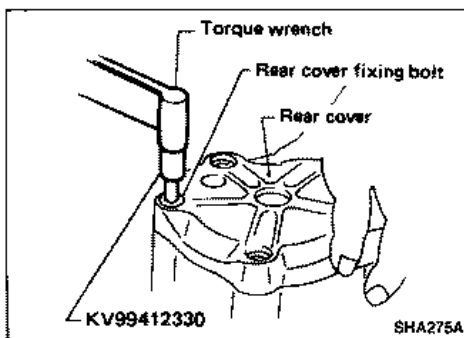
Cylinder Head, Valve and Cylinder (Cont'd)



2. When installing shell on cylinder, adjust position of shell so that suction inlet of shell opens in the same direction as suction slit of cylinder visible in suction inlet by removing suction valve.

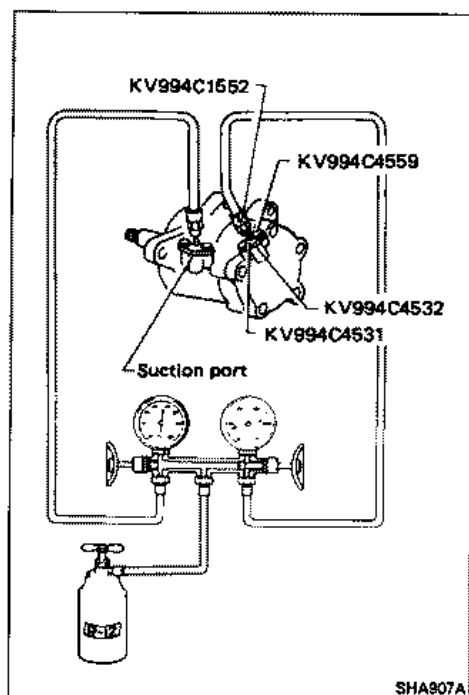


- When installing suction cover to rear cover, align knock pin.



- Using Allen socket, install rear cover.

COMPRESSOR — Model MJS170 (HITACHI make)

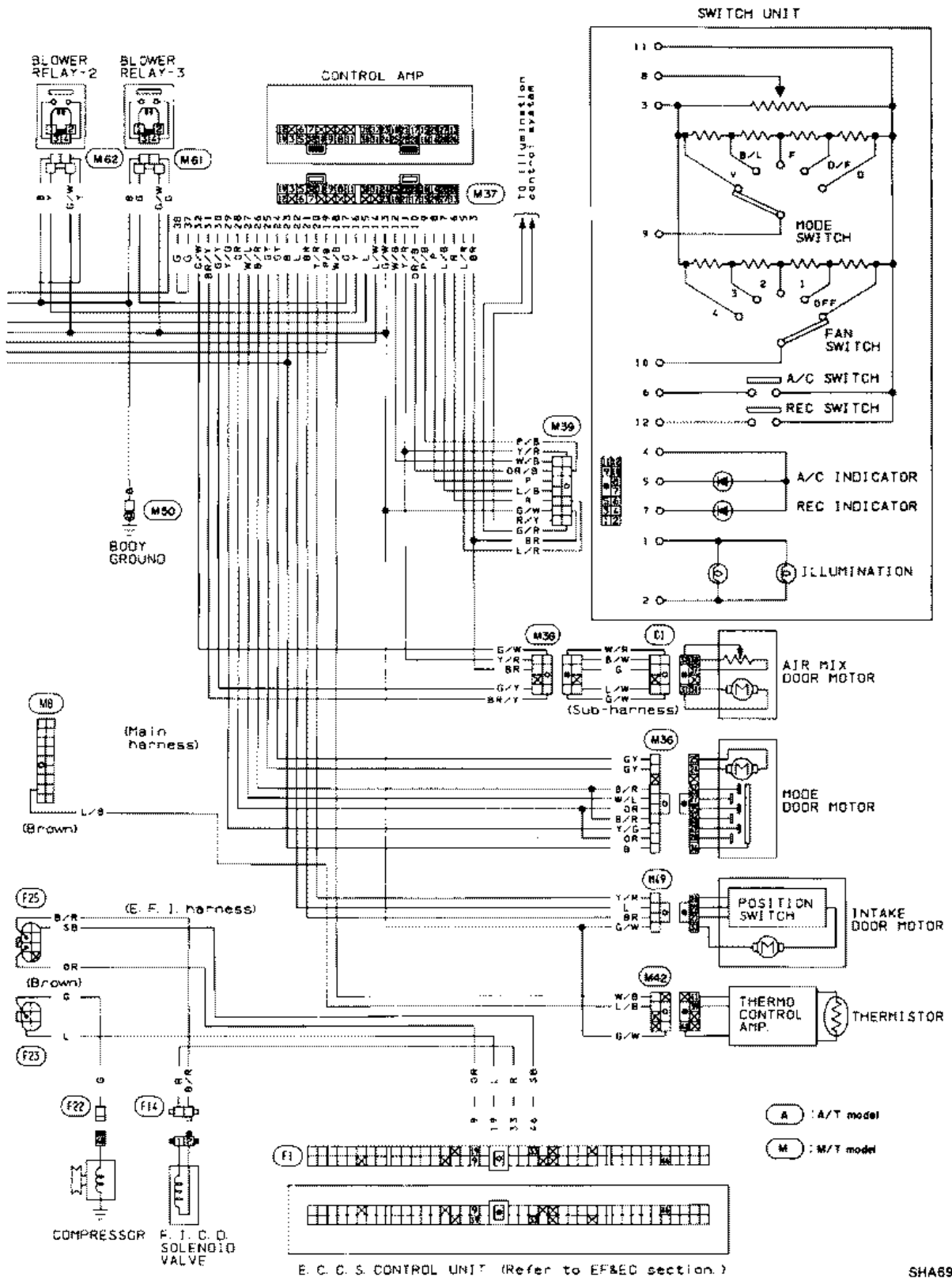


Leak Test

- Charge refrigerant from suction side and evacuate air from discharge side. Then conduct leak test.

A/C ELECTRICAL CIRCUIT — Manual Air Conditioner

Wiring Diagram (Cont'd)



SHA692C

TROUBLE DIAGNOSES — Manual Air Conditioner

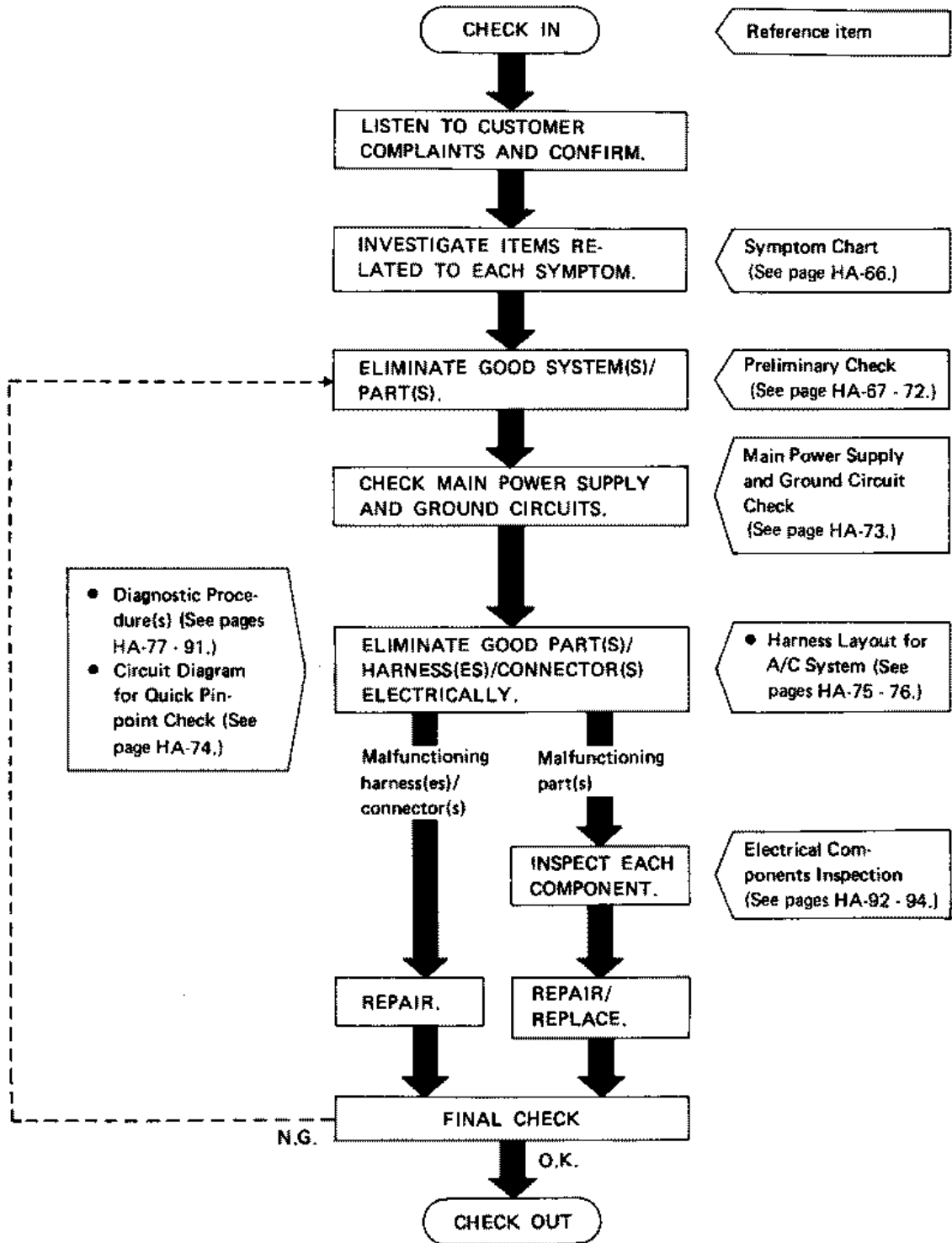
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TROUBLE DIAGNOSES — Manual Air Conditioner

How to Perform Trouble Diagnoses for Quick and Accurate Repair

WORK FLOW



TROUBLE DIAGNOSES — Manual Air Conditioner

Symptom Chart

DIAGNOSTIC TABLE

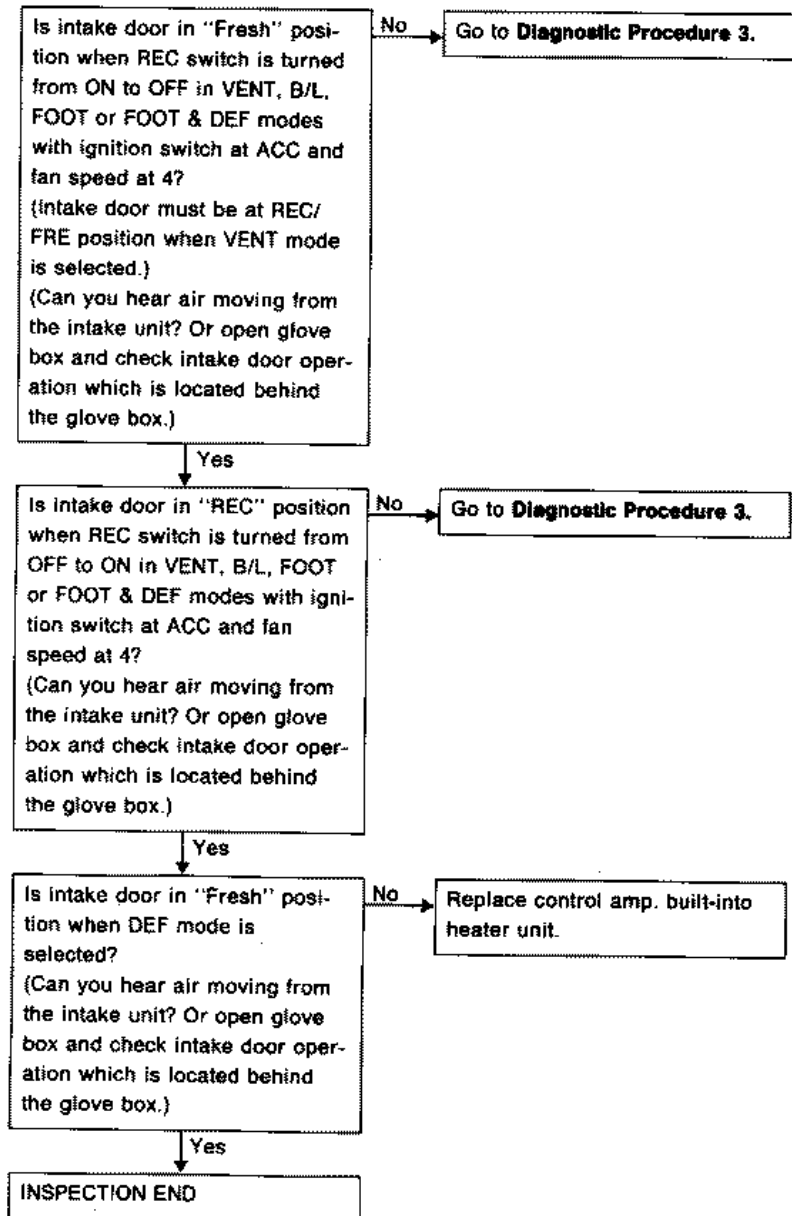
PROCEDURE	Preliminary check						Diagnostic Procedure						Main power supply and Ground circuit check		Electrical components inspection																														
	HA-67	HA-68	HA-69	HA-70	HA-71	HA-72	HA-77	HA-79	HA-81	HA-82	HA-88	HA-90	HA-73	—	HA-82	HA-92	HA-92	HA-93	HA-93	HA-90	HA-94	HA-94	—	—	—	—	—	—																	
REFERENCE PAGE	Preliminary check 1						Preliminary check 2						Control amp.		Fuses		Fan switch		Blower motor		Blower resistor		A/C switch		Low pressure switch		RELAYS		MODE switch		THERMO CONTROL AMP.		Air mix door motor		Mode door motor		Intake door motor		Compressor		Harness				
SYMPTOM	Preliminary check 1						Preliminary check 2						Control amp.		Fuses		Fan switch		Blower motor		Blower resistor		A/C switch		Low pressure switch		RELAYS		MODE switch		THERMO CONTROL AMP.		Air mix door motor		Mode door motor		Intake door motor		Compressor		Harness				
A/C does not blow cold air.	①																																												
Insufficient heating						③																																							
Blower motor does not rotate.	①						②																																						
Air outlet does not change.				①				②																																					
Intake door does not change in VENT, B/L or FOOT modes.									①																																				
Intake door is not set at "FRESH" in DEF mode.	①																																												
Magnet clutch does not engage when A/C switch and fan switch are ON.		①								②																																			
Magnet clutch does not engage in FOOT & DEF or DEF mode.		①	②																																										
Illumination or indicators on switch panel do not come on.												①																																	
Noise					③																																								

TROUBLE DIAGNOSES — Manual Air Conditioner

Preliminary Check

PRELIMINARY CHECK 1

Intake door is not set at "FRESH" in DEF mode.

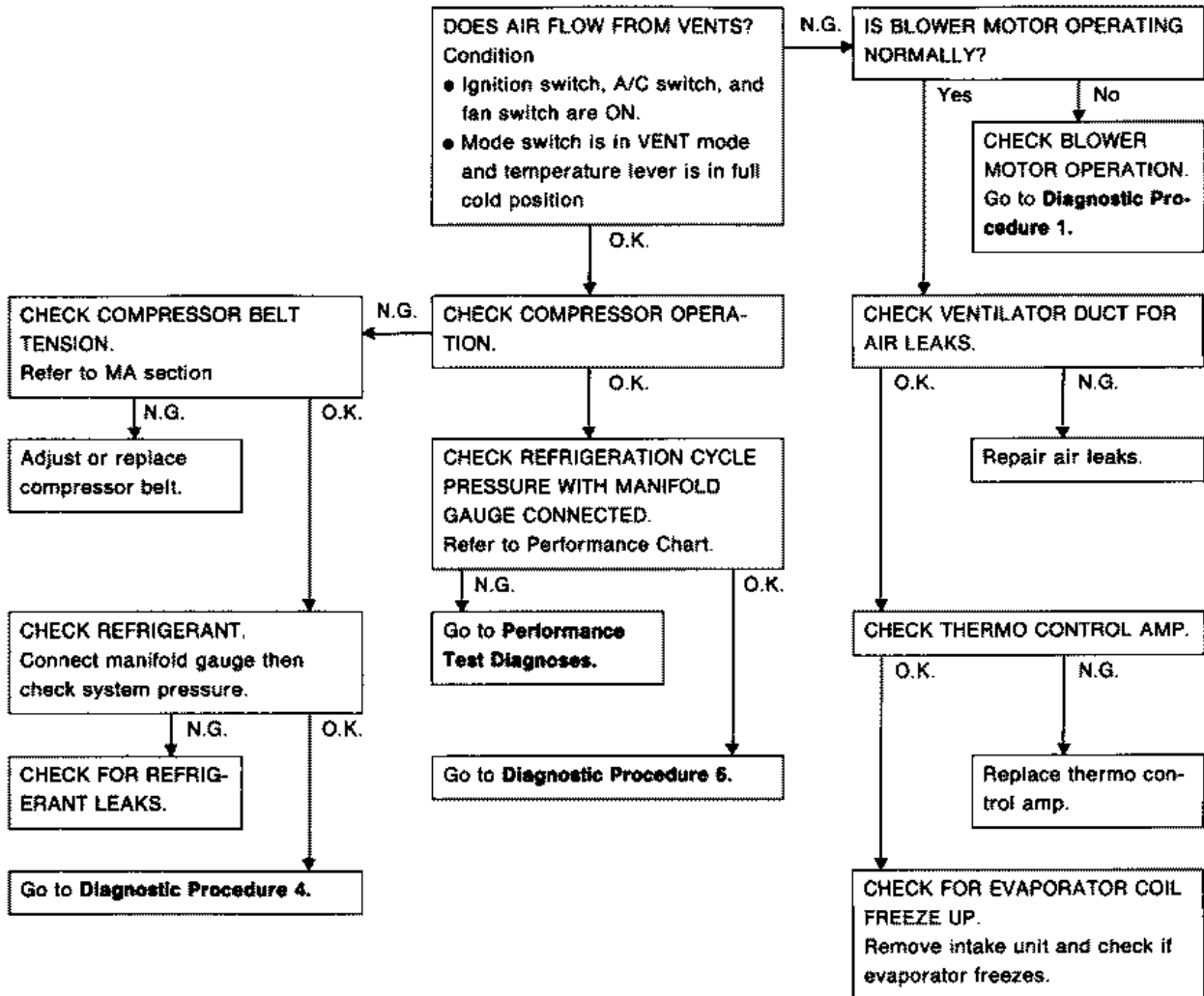


TROUBLE DIAGNOSES — Manual Air Conditioner

Preliminary Check (Cont'd)

PRELIMINARY CHECK 2

A/C does not blow cold air.



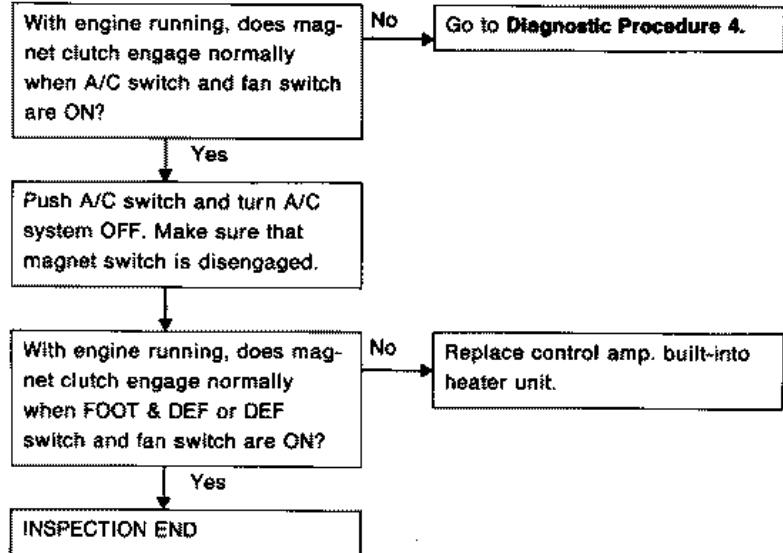
TROUBLE DIAGNOSES — Manual Air Conditioner

Preliminary Check (Cont'd)

PRELIMINARY CHECK 3

Magnet clutch does not engage in FOOT & DEF or DEF modes.

- Perform PRELIMINARY CHECK 2 and 4 before referring to the following flow chart.

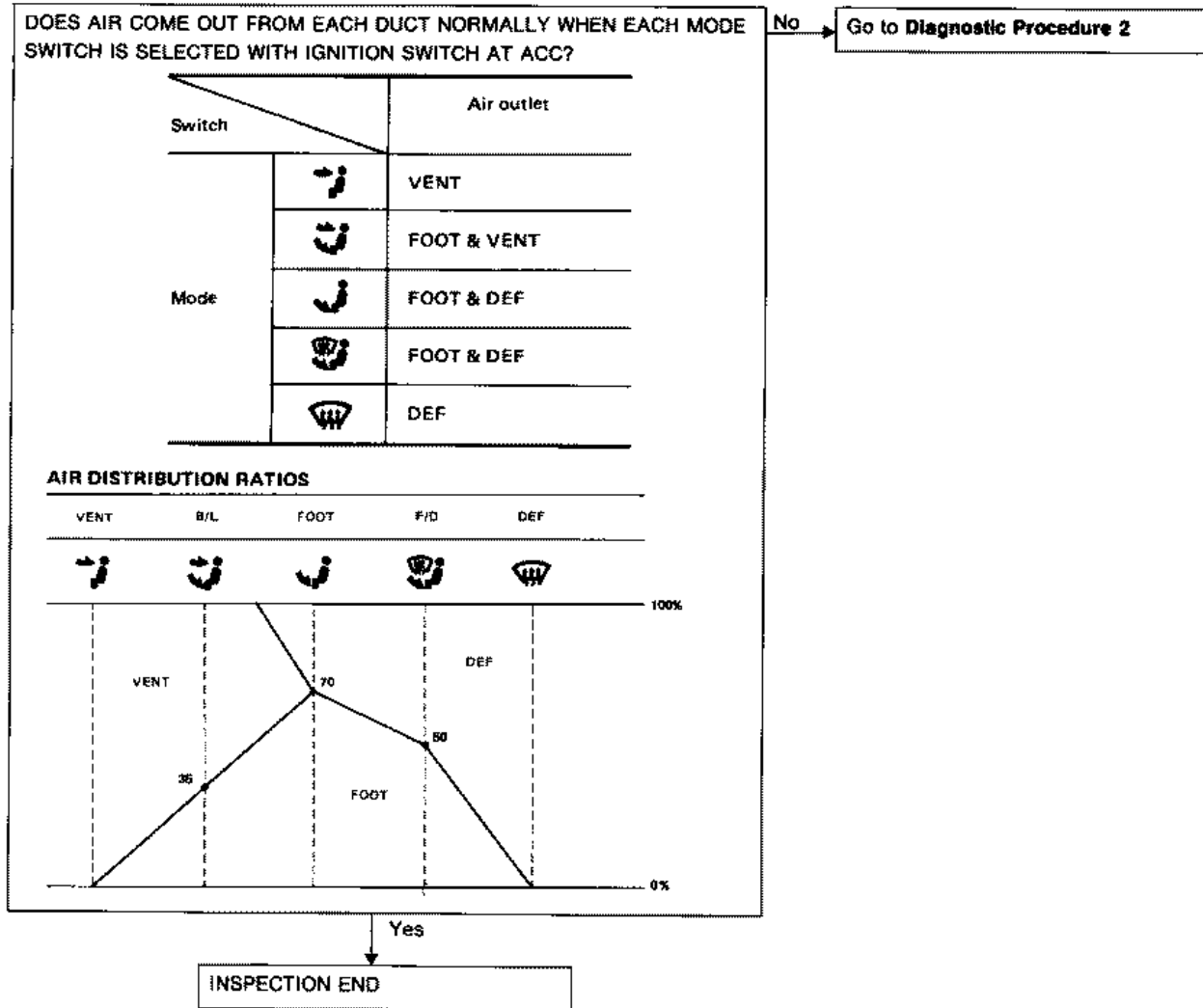


TROUBLE DIAGNOSES — Manual Air Conditioner

Preliminary Check (Cont'd)

PRELIMINARY CHECK 4

Air outlet does not change.

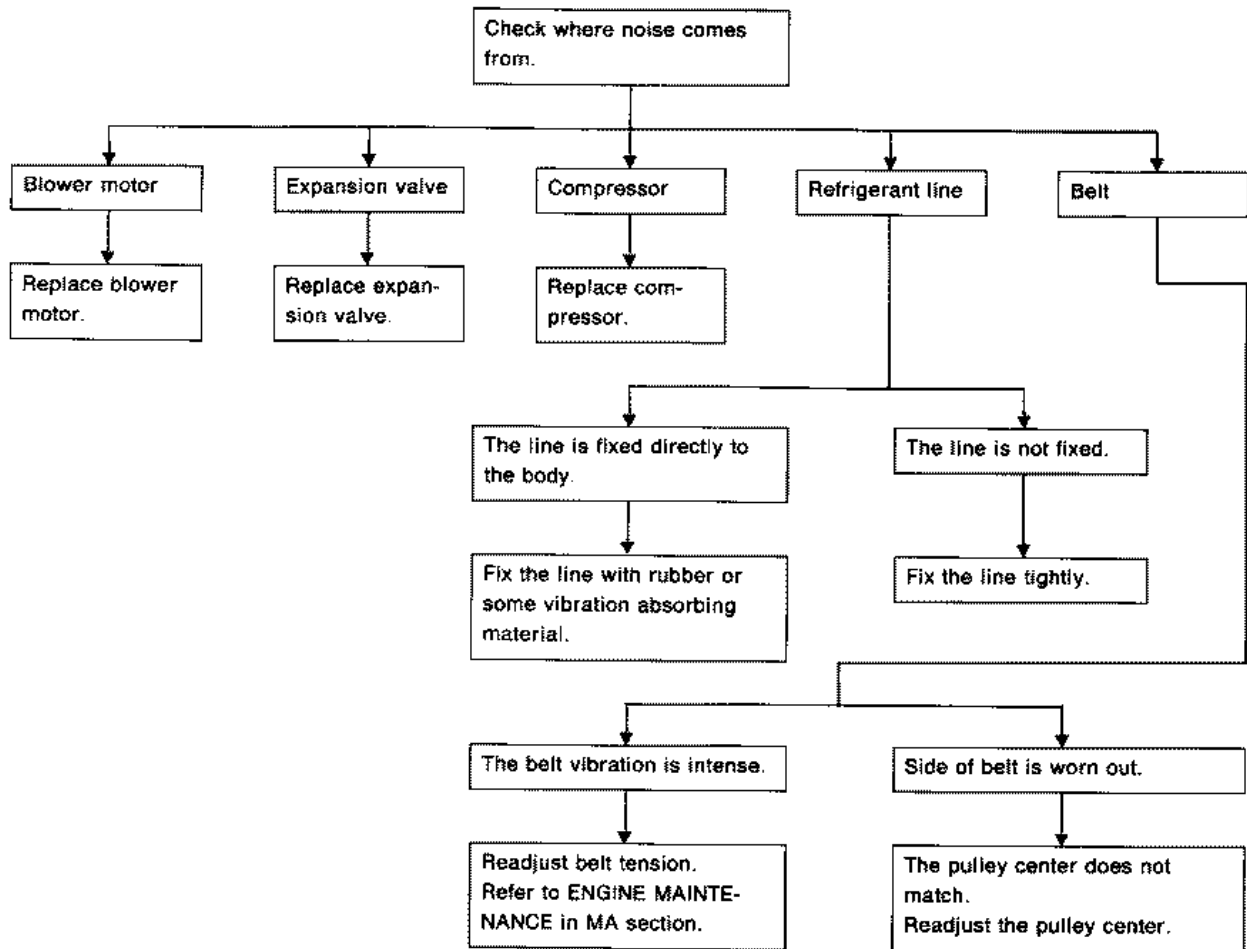


TROUBLE DIAGNOSES — Manual Air Conditioner

Preliminary Check (Cont'd)

PRELIMINARY CHECK 5

Noise

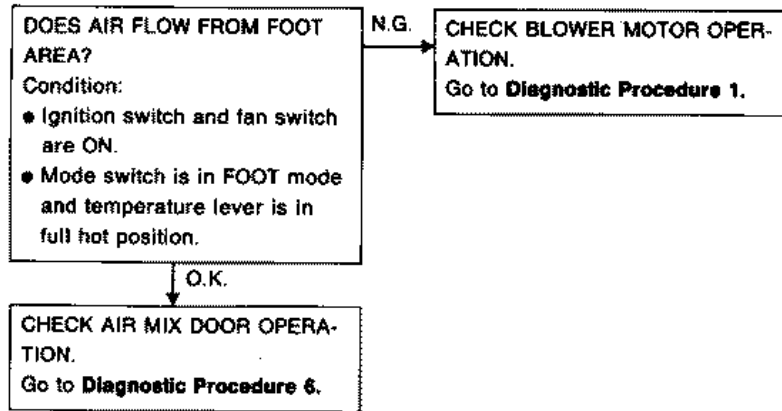


TROUBLE DIAGNOSES — Manual Air Conditioner

Preliminary Check (Cont'd)

PRELIMINARY CHECK 6

Insufficient heating



TROUBLE DIAGNOSES — Manual Air Conditioner

Main Power Supply and Ground Circuit Check

POWER SUPPLY CIRCUIT CHECK FOR A/C SYSTEM

Check power supply circuit for air conditioning system.

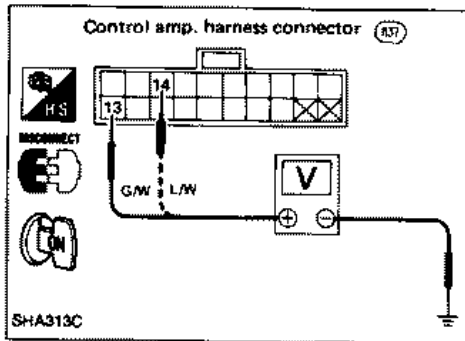
Refer to "POWER SUPPLY ROUTING" in section EL and A/C ELECTRICAL CIRCUIT.

CONTROL AMP. REMOVAL

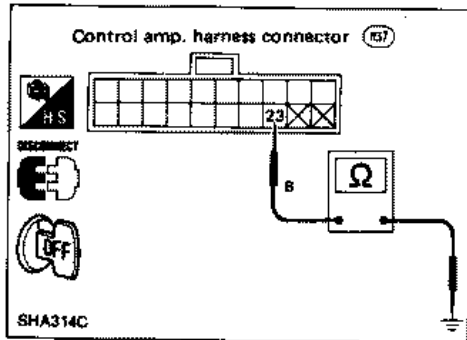
1. Remove driver side instrument lower lid.
2. Remove vent duct.
3. Remove control amp. with harness connected.

CONTROL AMP. CHECK

1. Disconnect control amp. harness connector.
2. Connect voltmeter from harness side.
3. Measure voltage across terminal No. ⑬ or No. ⑭ and body ground.



Voltmeter terminal		Voltage
⊕	⊖	
⑬	Body ground	Approximately 12V
⑭		

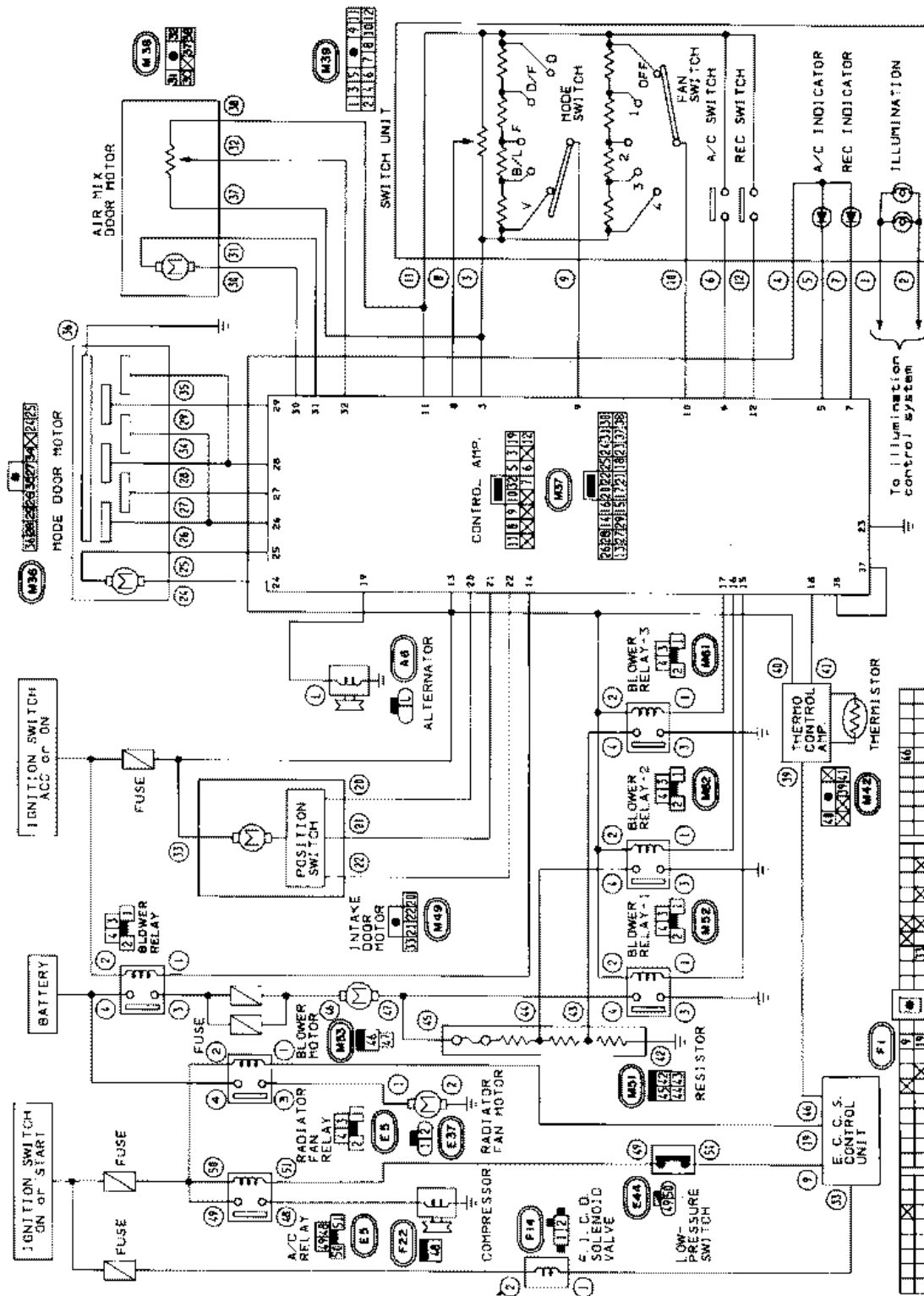


Check body ground circuit for control amp. with ignition switch OFF.

1. Disconnect control amp. harness connector.
2. Connect ohmmeter from harness side.
3. Check continuity between terminal No. ⑳ and body ground.

TROUBLE DIAGNOSES — Manual Air Conditioner

Circuit Diagram for Quick Pinpoint Check



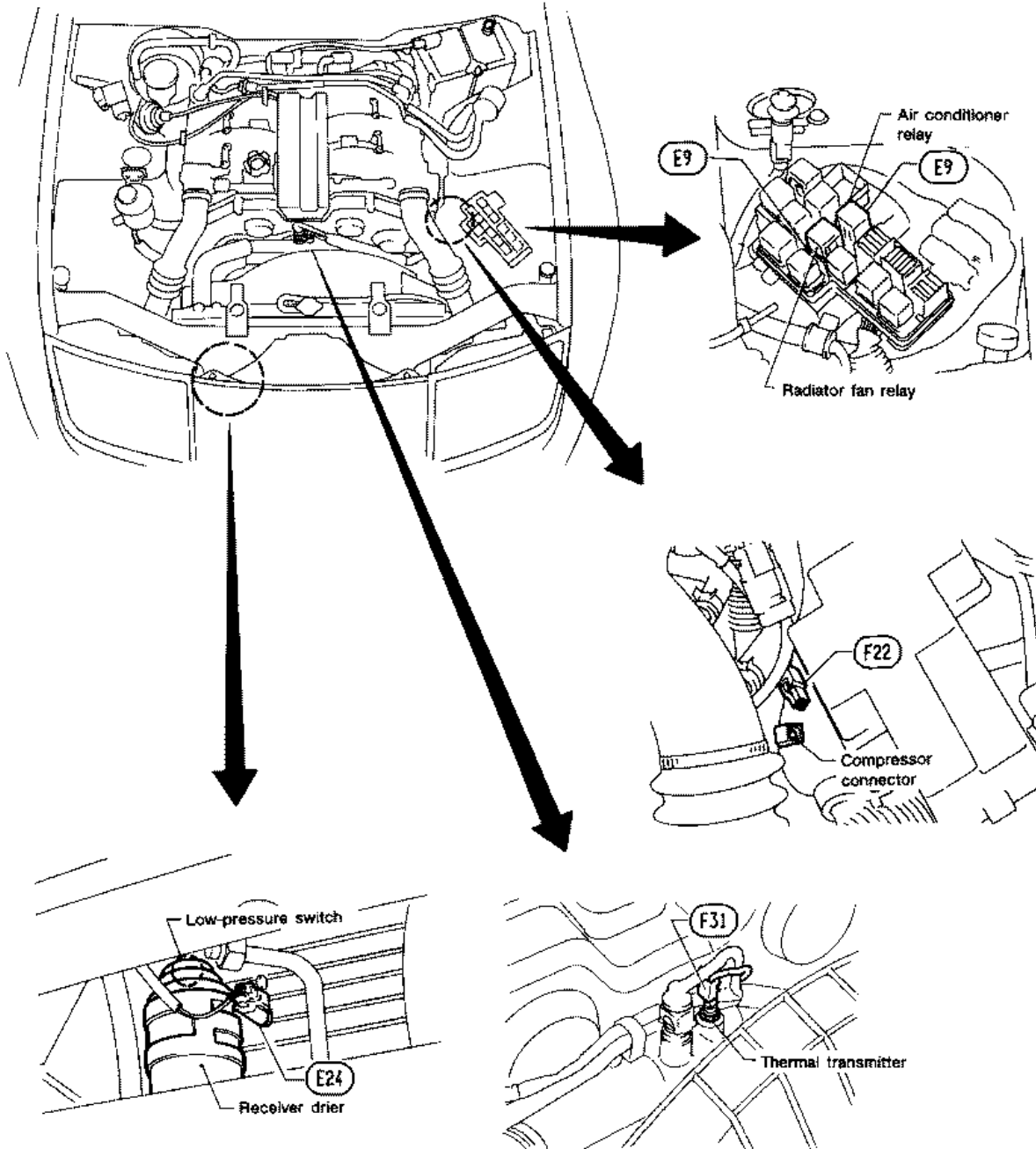
- All connectors shown in this illustration are unit side connectors.
- The unit side connectors with a double circle "⊖" are connected to the harness side connectors shown in the "Harness Layout for A/C System". (See pages HA-75 - 76.)
- The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle "⊙".

SHA693C

TROUBLE DIAGNOSES — Manual Air Conditioner

Harness Layout for A/C System

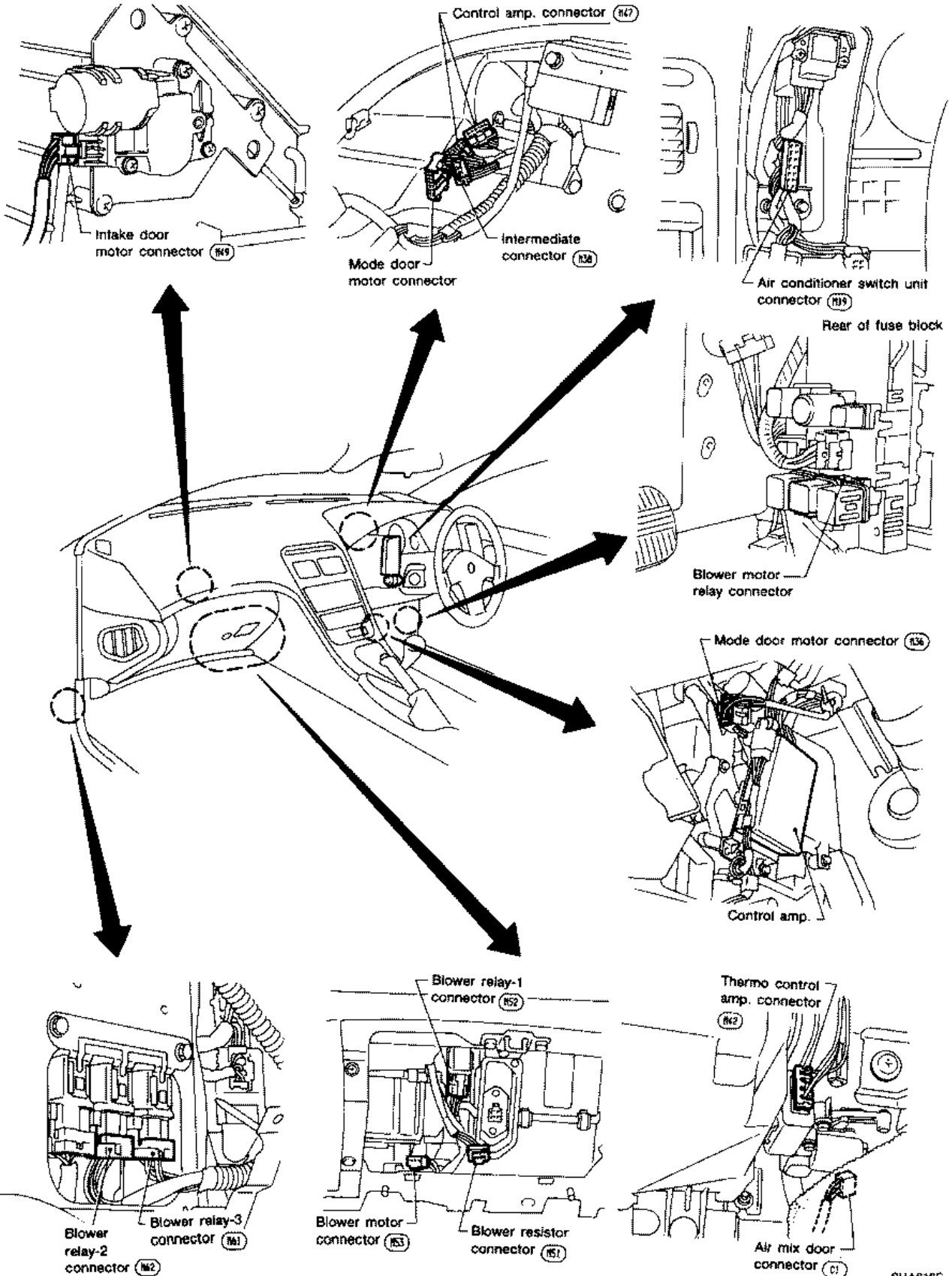
ENGINE COMPARTMENT



TROUBLE DIAGNOSES — Manual Air Conditioner

Harness Layout for A/C System (Cont'd)

PASSENGER COMPARTMENT



SHA616C

TROUBLE DIAGNOSES — Manual Air Conditioner

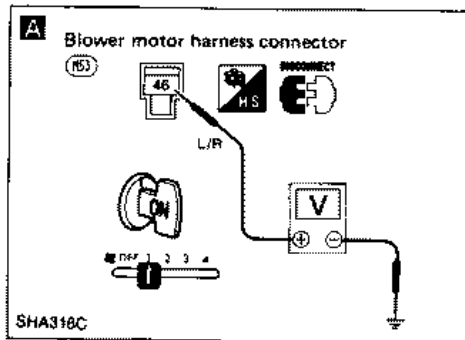
INCIDENT	Flow chart No.
1 Fan fails to rotate	1
2 Fan does not rotate at speed 1.	2
3 Fan does not rotate at speed 2.	3
4 Fan does not rotate at speed 3.	4
5 Fan does not rotate at speed 4.	5

Diagnostic Procedure 1

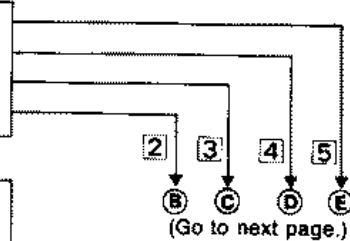
SYMPTOM: Blower motor does not rotate.

- Perform **PRELIMINARY CHECK 2** before referring to the following flow chart.

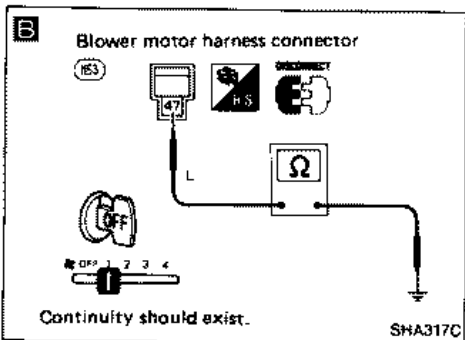
Check if blower motor rotates properly at each fan speed. Conduct checks as per flow chart.



A **CHECK POWER SUPPLY FOR BLOWER MOTOR.**
Disconnect blower motor harness connector. Do approximately 12 volts exist between blower motor harness terminal No. 46 and body ground?



N.G. Check fuses at fuse block. (Refer to "POWER SUPPLY ROUTING" in EL section and A/C ELECTRICAL CIRCUIT.)

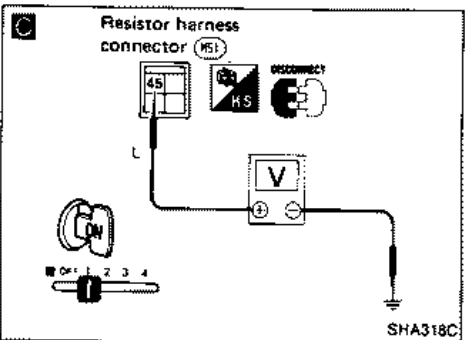


O.K. **B** Check circuit continuity between blower motor harness terminal No. 47 and body ground.

N.G. Reconnect blower motor harness connector.

O.K. **CHECK BLOWER MOTOR.** (Refer to Electrical Components Inspection.)

N.G. Replace blower motor.

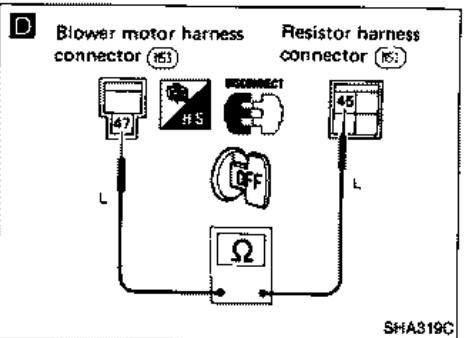


C **CHECK BLOWER MOTOR CIRCUIT BETWEEN BLOWER MOTOR AND RESISTOR.** Do approximately 12 volts exist between resistor harness terminal No. 45 and body ground?

N.G. Disconnect blower motor and resistor harness connectors.

D Note Check circuit continuity between blower motor harness terminal No. 47 and resistor terminal No. 45.

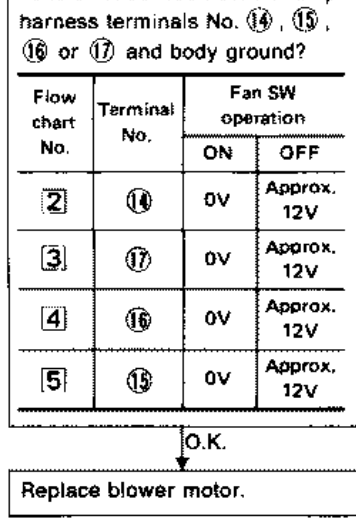
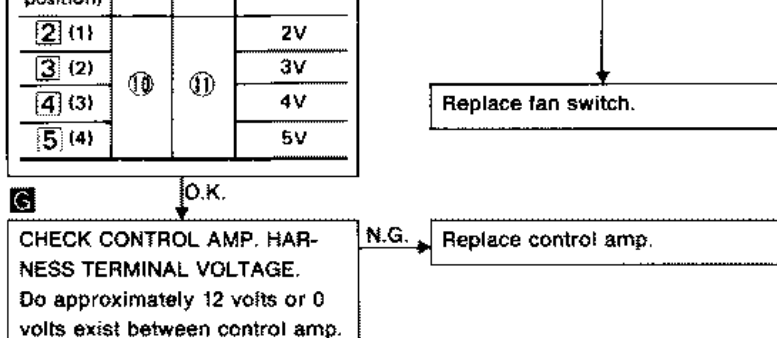
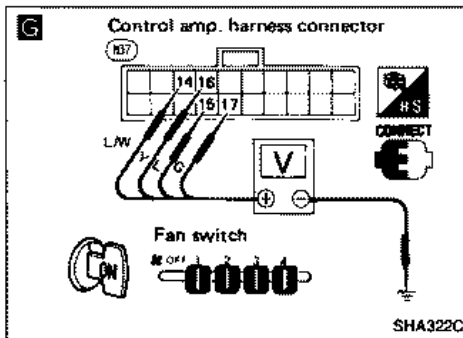
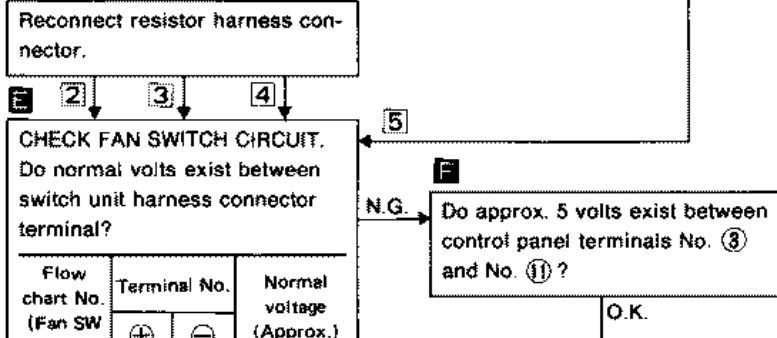
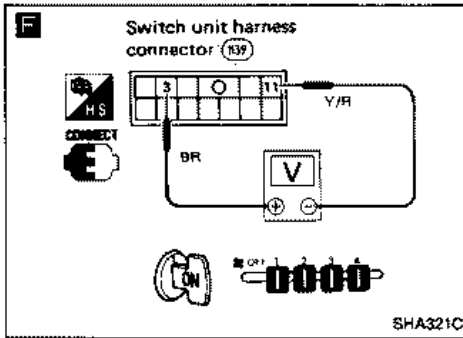
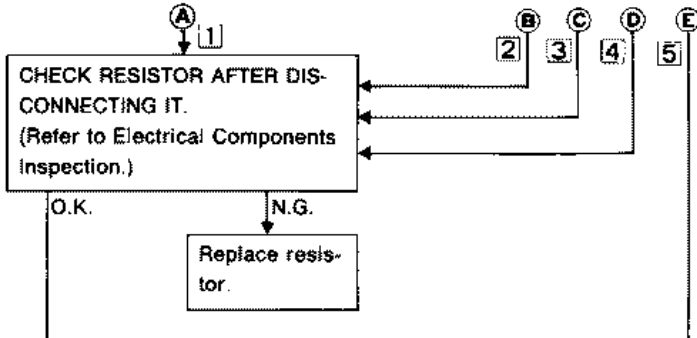
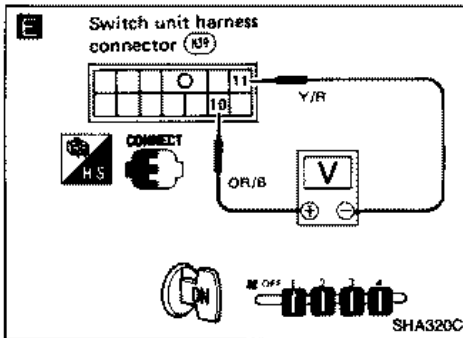
O.K. **A** (Go to next page.)



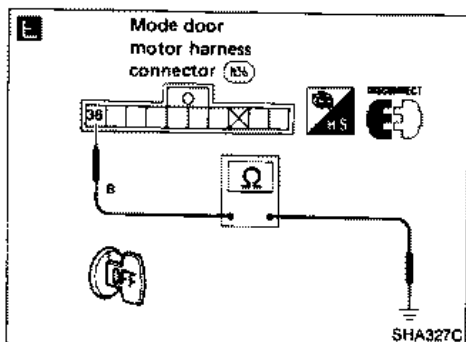
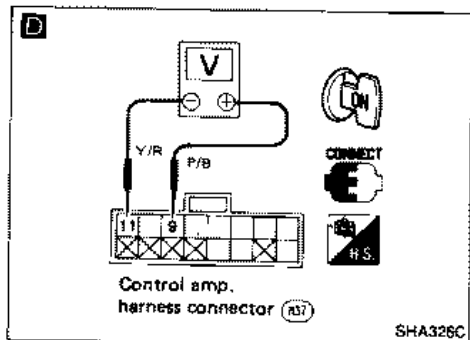
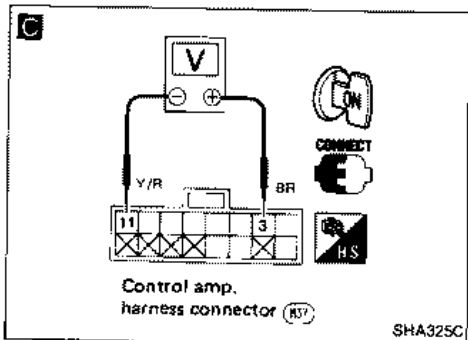
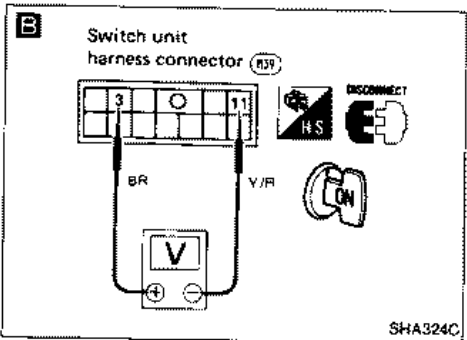
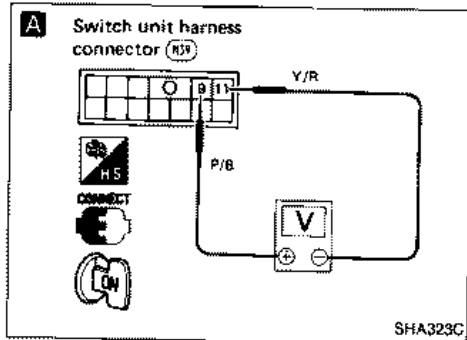
Note: If the result is N.G. after checking circuit continuity, repair harness or connector.

TROUBLE DIAGNOSES — Manual Air Conditioner

Diagnostic Procedure 1 (Cont'd)



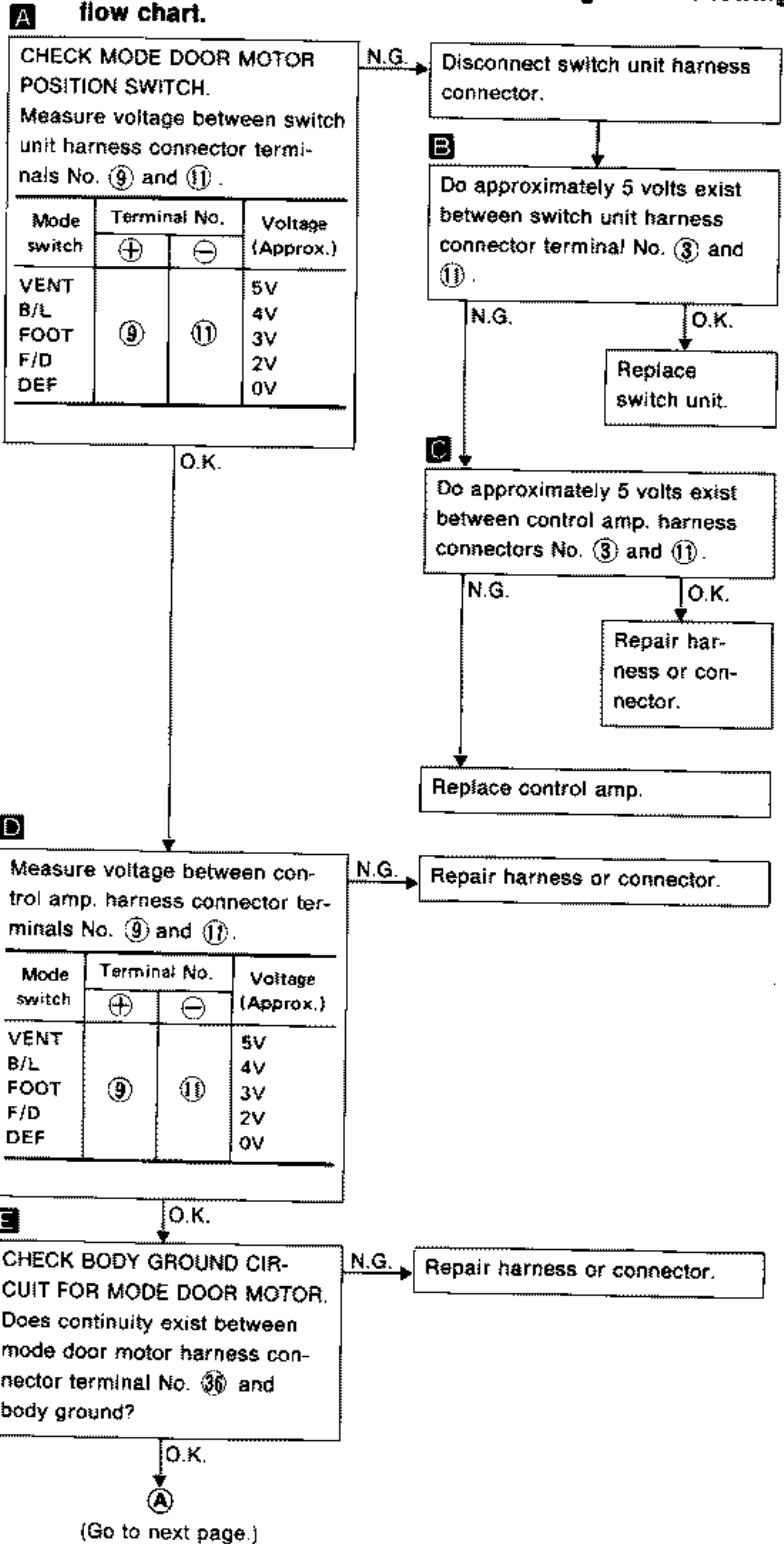
TROUBLE DIAGNOSES — Manual Air Conditioner



Diagnostic Procedure 2

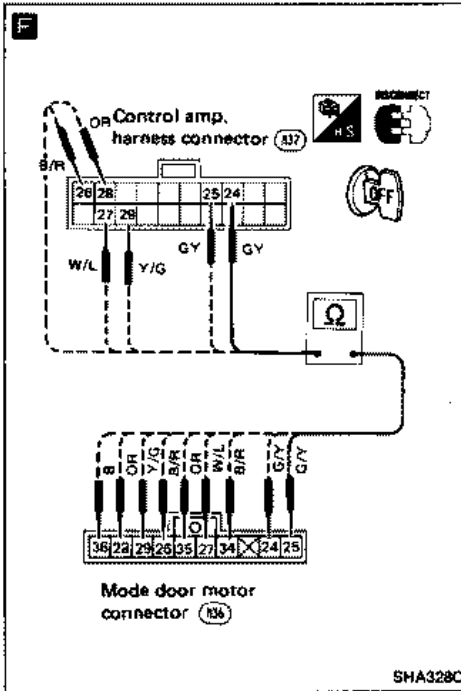
SYMPTOM: Air outlet does not change.

- Perform **PRELIMINARY CHECK 4** and **Main Power Supply and Ground Circuit Check** before referring to the following flow chart.



TROUBLE DIAGNOSES — Manual Air Conditioner

Diagnostic Procedure 2 (Cont'd)



F

Check circuit continuity between each terminal on control amp. and mode door motor.

Terminal No.		Continuity
Control amp.	Mode door motor	
24	24	Yes
25	25	
26	26 and 34	
27	27	
28	28 and 35	
29	29	

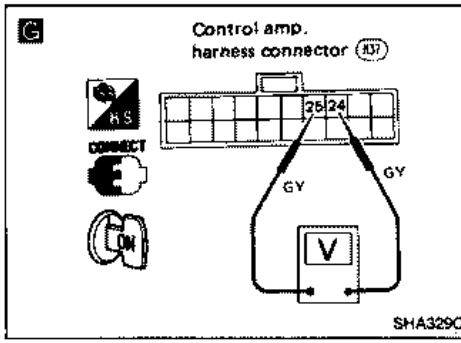
N.G. → Repair harness or connector.

G

Check for output of control amp. Do approximately 12 volts exist between control amp. harness terminals No. 24 and 25 when mode is switched from "VENT" to "DEF" or when mode is switched from "DEF" to "VENT"?

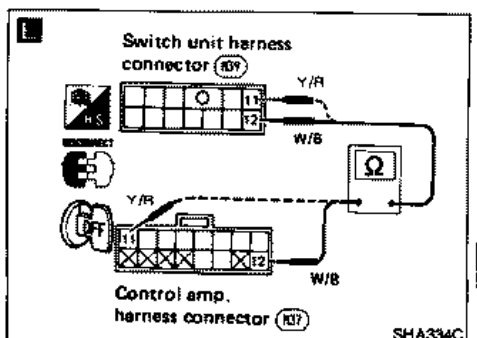
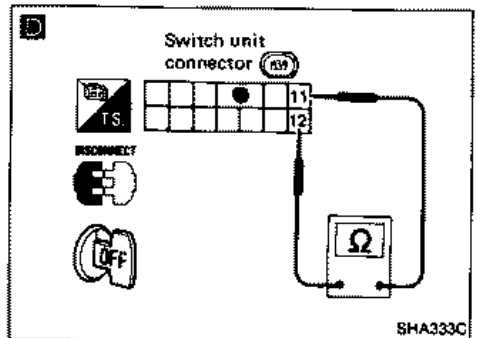
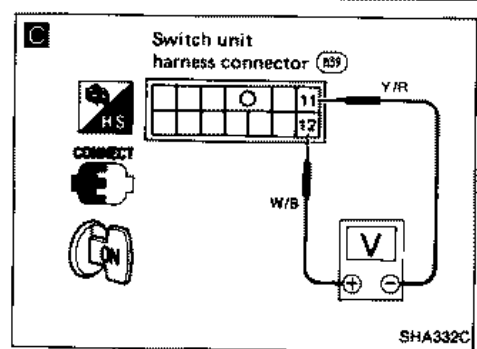
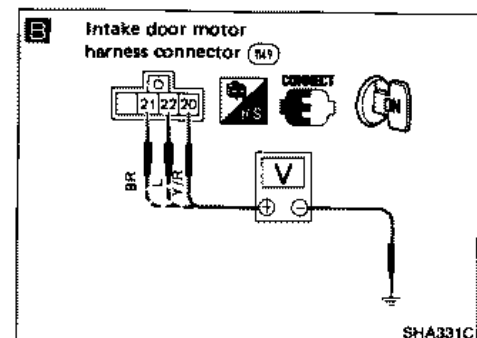
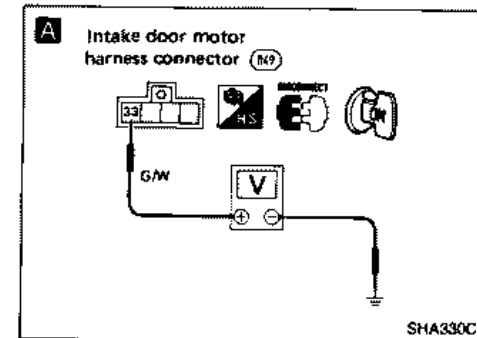
Terminal No.		Mode door motor	
24	25	Mode door operation	Direction of linkage rotation
⊖	⊖	Stop	Stop
⊖	⊕	VENT → DEF	Counter-clockwise
⊕	⊖	DEF → VENT	Clockwise

N.G. → Replace control amp.



O.K. → Replace mode door motor.

TROUBLE DIAGNOSES — Manual Air Conditioner



Diagnostic Procedure 3

SYMPTOM: Intake door does not change in VENT, B/L, or FOOT modes.

- Perform PRELIMINARY CHECK 1, and Main Power Supply and Ground Circuit Check before referring to the following flow chart.

A CHECK POWER SUPPLY FOR INTAKE DOOR MOTOR.
Disconnect intake door motor harness connector.
Do approximately 12 volts exist between intake door motor harness terminal No. 33 and body ground?

N.G. → Check intake door motor power supply circuit continuity.

O.K. → **B**

B Select VENT mode and check the voltage between intake door motor harness terminals No. 20, 21, 22 and body ground.

A/C switch	REC switch	Mode	Terminal voltage (Approx.)		
			20	21	22
ON	ON	REC	12V	12V	0V
ON	OFF	REC/FRE	12V	0V	12V
OFF	OFF	FRE	0V	12V	12V

N.G. → **C**

C Check the voltage between control panel harness connector terminals No. 12 and 11.

A/C switch	Terminal No.		Voltage (Approx.)
	12	11	
Switch pressed	+	-	0V
Switch free	+	-	5V

N.G. → Disconnect control panel connector.
O.K. → Replace control amp.

O.K. → Replace intake door motor.

D Check circuit continuity between control panel terminals No. 12 and 11.

REC switch	Continuity between terminal No. 12 and 11
Switch pressed	Yes
Switch free	No

N.G. → Replace control panel.

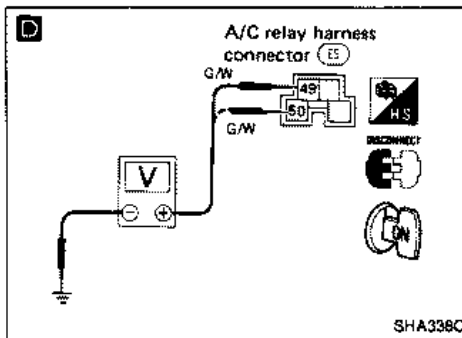
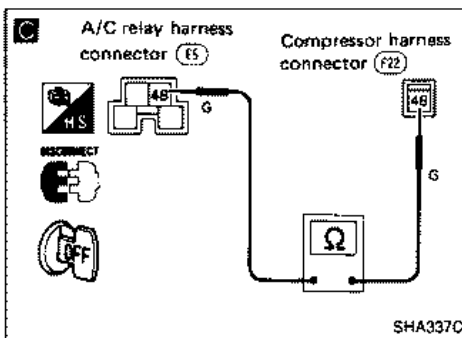
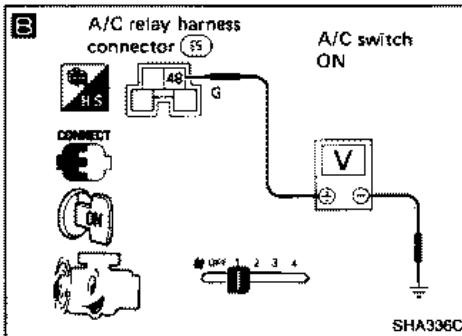
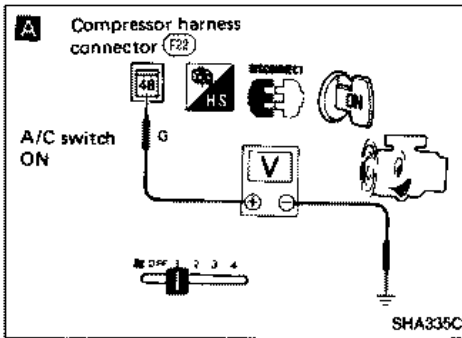
O.K. → **E**

E Check circuit continuity between control panel harness terminal No. 12 (11) and control amp. harness terminal No. 12 (11).

N.G. → Repair harness or connector.

O.K. → Replace control amp.

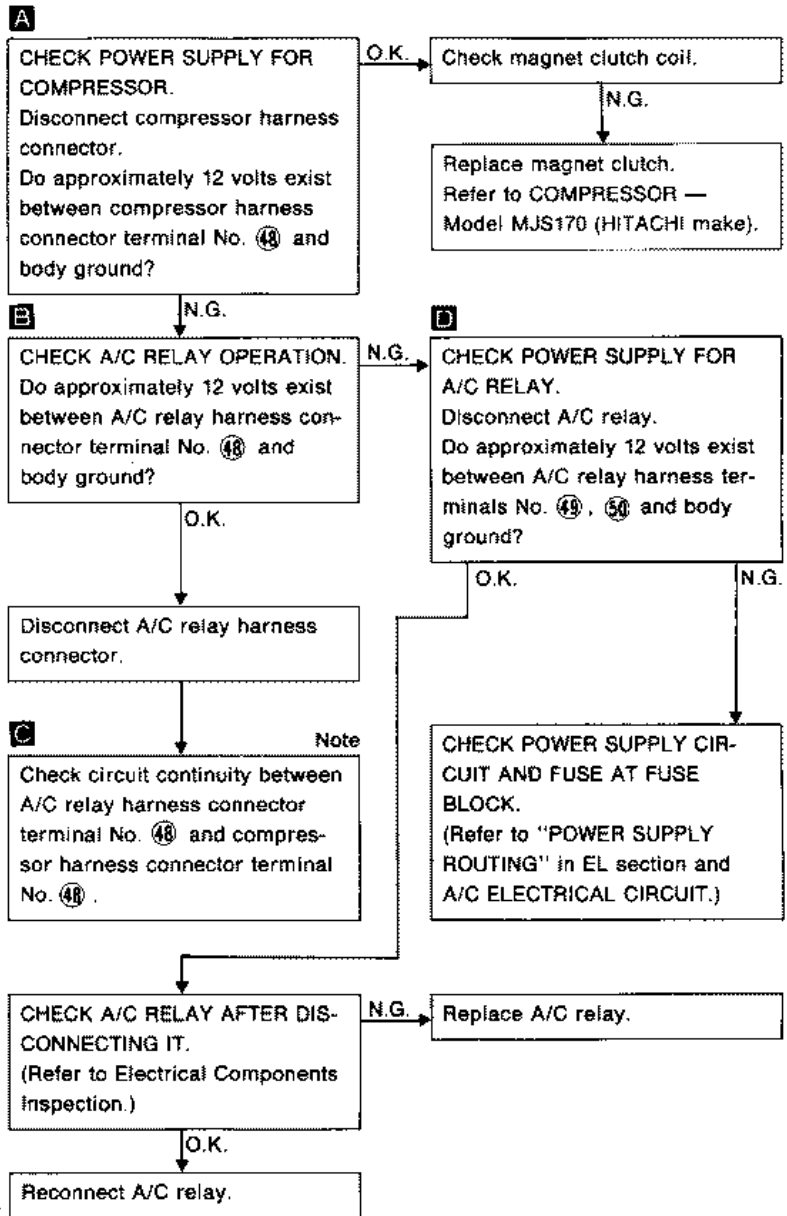
TROUBLE DIAGNOSES — Manual Air Conditioner



Diagnostic Procedure 4

SYMPTOM: Magnet clutch does not engage with A/C switch and fan switch are ON.

- Perform PRELIMINARY CHECK 2 before referring to the following flow chart.

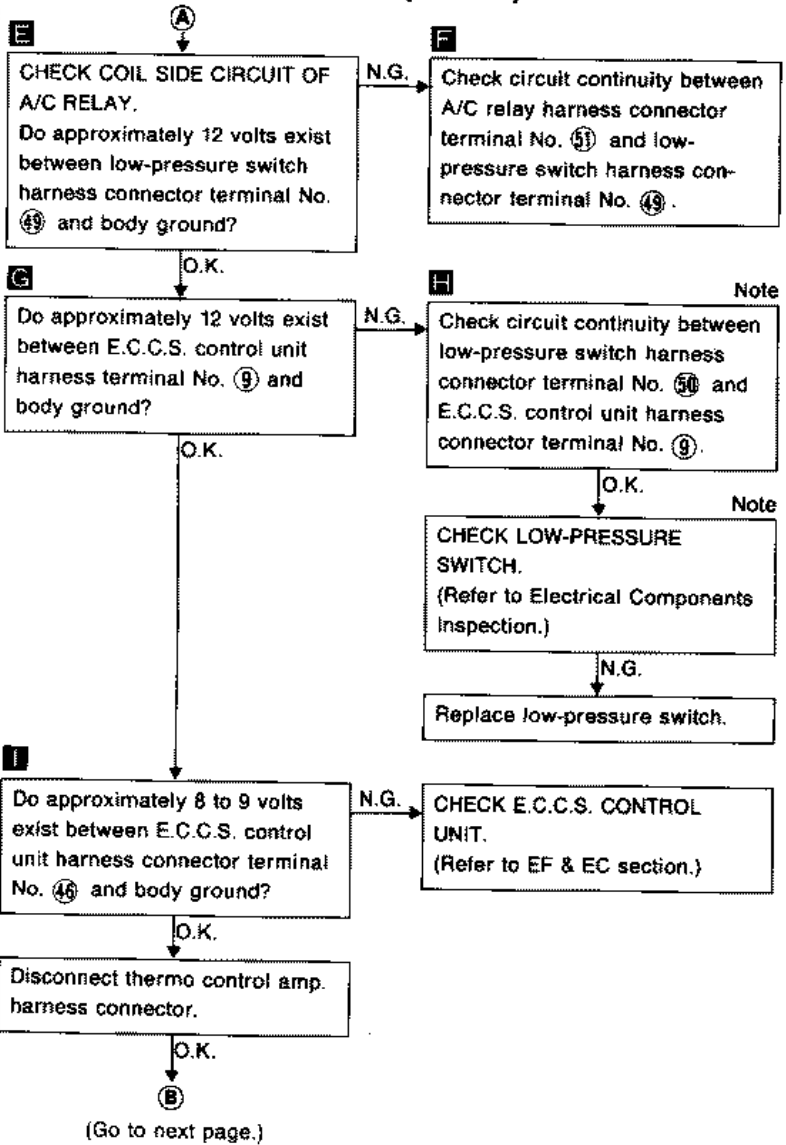
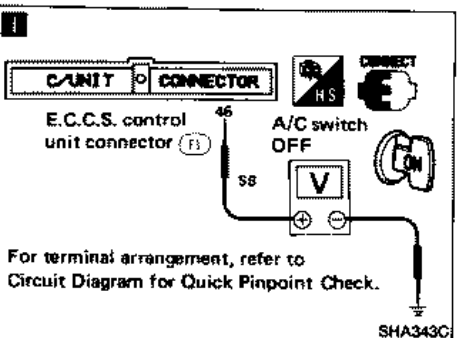
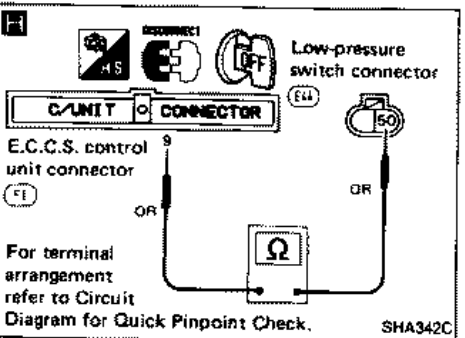
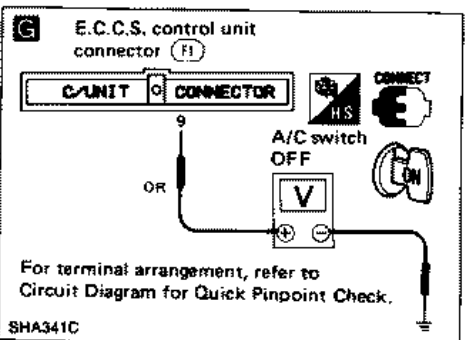
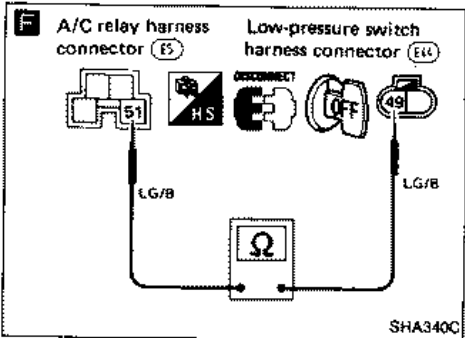
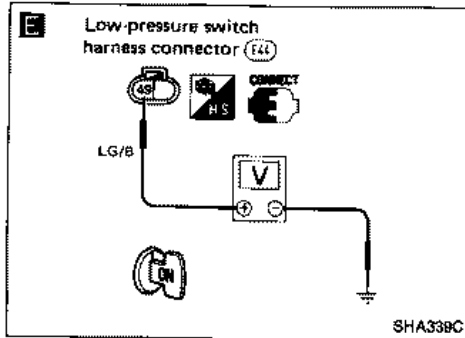


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Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

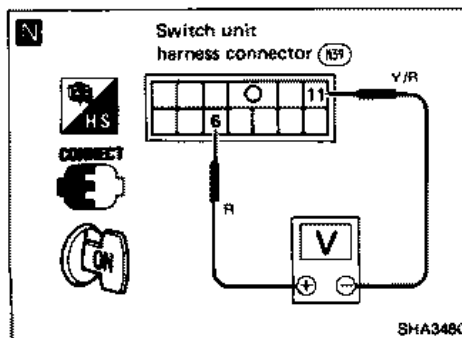
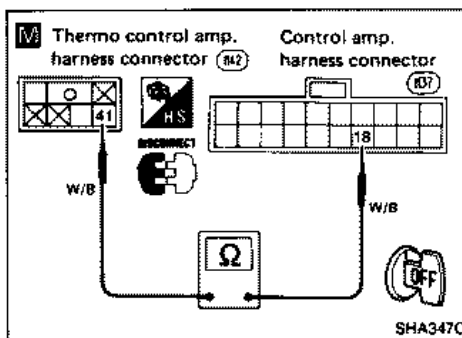
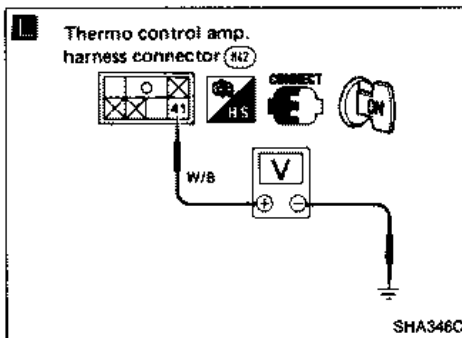
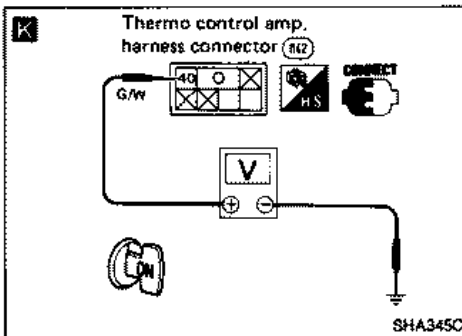
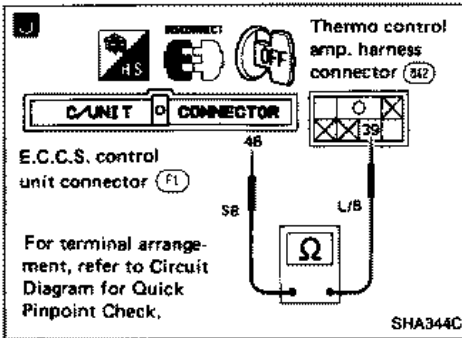
TROUBLE DIAGNOSES — Manual Air Conditioner

Diagnostic Procedure 4 (Cont'd)



TROUBLE DIAGNOSES — Manual Air Conditioner

Diagnostic Procedure 4 (Cont'd)



Note
Check circuit continuity between thermo control amp. harness connector terminal No. (39) and E.C.C.S. control unit harness connector terminal No. (44).

K O.K.
CHECK POWER SUPPLY FOR THERMO CONTROL AMP.
Do approximately 12 volts exist between thermo control amp. harness connector terminal No. (40) and body ground?

N.G. → CHECK POWER SUPPLY CIRCUIT AND FUSE AT FUSE BLOCK.
(Refer to "POWER SUPPLY ROUTING" in EL section and A/C ELECTRICAL CIRCUIT.)

L O.K.
Is the voltage between thermo control amp. harness connector terminal No. (41) and body ground approximately 0V?

N.G. → Replace thermo control amp.

M O.K. **Note**
Check continuity between thermo control amp. harness connector terminal No. (41) and control amp. harness connector terminal No. (18).

N O.K.
CHECK A/C SWITCH OF SWITCH UNIT.
Check the voltage between switch unit harness connector terminals No. (6) and (11)

N.G. → Disconnect switch unit connector.

REC switch	Terminal No.	Terminal No.	Voltage (Approx.)
	(12)	(11)	
Switch pressed	+	-	0V
Switch free			5V

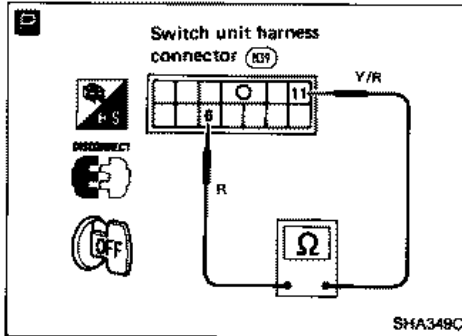
O.K. → Replace control amp.

Ⓢ (Go to next page.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

TROUBLE DIAGNOSES — Manual Air Conditioner

Diagnostic Procedure 4 (Cont'd)

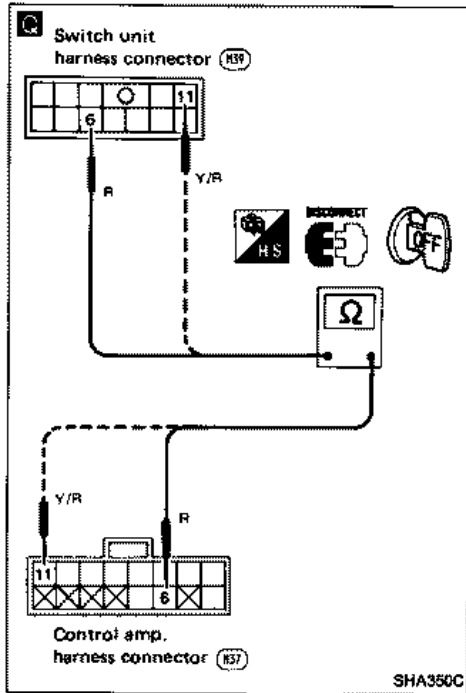


C

P Check circuit continuity between switch unit harness connector terminal No. ⑥ and ⑪.

N.G. → Replace switch unit.

A/C switch	Continuity between terminal No. ⑥ and ⑪
Switch pressed	Yes
Switch free	No



Q O.K. Note

Check circuit continuity between switch unit harness connector terminal No. ⑥ (⑪) and control amp. harness connector terminal No. ⑥ (⑪).

O.K. → Replace control amp.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

TROUBLE DIAGNOSES — Manual Air Conditioner

Diagnostic Procedure 5

SYMPTOM: Illumination or control panel indicators do not come on.

- Perform Main Power Supply and Ground Circuit Check before referring to the following flow chart.

Turn ignition switch and lighting switch ON.

↓

CHECK ILLUMINATION AND INDICATORS.

- Turn A/C, REC and fan ON.
- Rotary VENT, B/L, FOOT, F/D and DEF switches in order.
- Check for incidents and follow the repairing methods as shown.

INCIDENT			How to repair
ILL	A/C	REC	
Control panel			
X	○	○	Go to DIAGNOSTIC PROCEDURE 5-1.
○	X	○	Go to DIAGNOSTIC PROCEDURE 5-2.
○	○	X	Go to DIAGNOSTIC PROCEDURE 5-3.
○	X	X	Go to DIAGNOSTIC PROCEDURE 5-4.

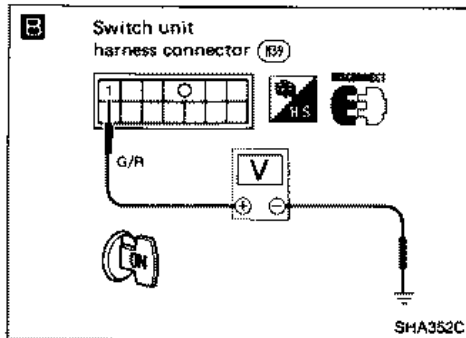
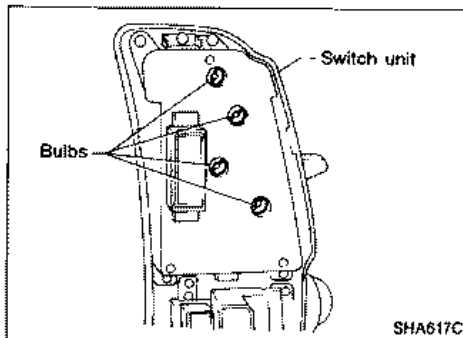
○: Illumination or indicator comes on.

X: Illumination or indicator does not come on.

TROUBLE DIAGNOSES — Manual Air Conditioner

Diagnostic Procedure 5 (Cont'd)

DIAGNOSTIC PROCEDURE 5-1



CHECK THE OTHER ILLUMINATION SYSTEMS EXCEPT FOR A/C SYSTEM.
Do the other illuminations come on with Ignition switch and lighting switch ON?

N.G.

CHECK ILLUMINATION SYSTEM.
Refer to Illumination/Wiring Diagram in EL section.

O.K.

Turn ignition switch and lighting switch OFF.

A
CHECK ILLUMINATION BULB.
Remove switch unit and disconnect harness connectors. Remove illumination bulb(s) and check them.

N.G.

Replace illumination bulb(s).

O.K.

B
CHECK POWER SUPPLY FOR ILLUMINATION WITH LIGHTING SWITCH ON.
Do approximately 12 volts exist between switch unit connector harness terminal No. ① and body ground?

N.G.

CHECK POWER SUPPLY FOR ILLUMINATION SYSTEM.
Refer to Illumination/Wiring Diagram in EL section.

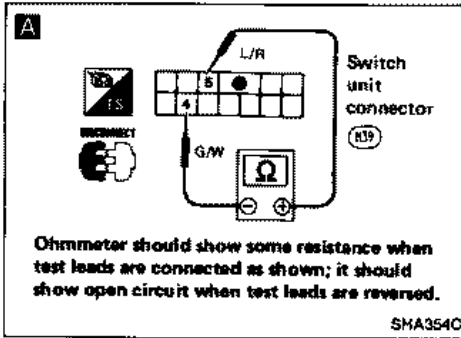
O.K.

CHECK TIME CONTROL SYSTEM.
Refer to TIME CONTROL SYSTEM in EL section.

TROUBLE DIAGNOSES — Manual Air Conditioner

Diagnostic Procedure 5 (Cont'd)

DIAGNOSTIC PROCEDURE 5-2

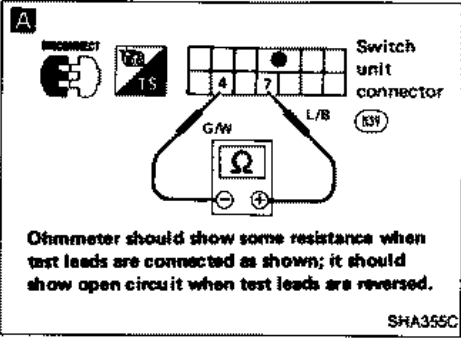


CHECK MAGNET CLUTCH OPERATION.
Does magnet clutch operate normally when engine is ON and A/C switch, fan switch are ON?

N.G. → Go to Diagnostic Procedure 4.

A ↓ O.K.
Check circuit continuity of L.E.D.

↓ N.G.
Replace switch unit.



DIAGNOSTIC PROCEDURE 5-3

CHECK INTAKE DOOR OPERATION.
Does intake door operate normally when engine is ON and A/C switch, fan switch are ON?

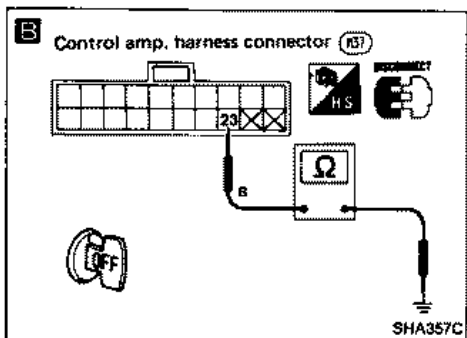
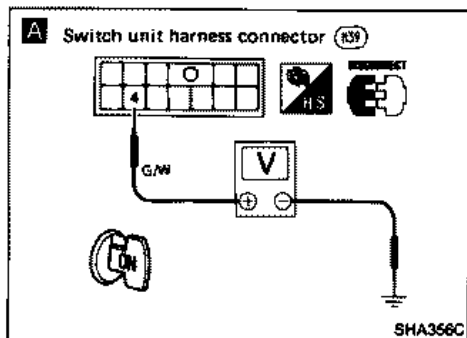
N.G. → Go to Diagnostic Procedure 3.

A ↓ O.K.
Check circuit continuity of L.E.D.

↓ N.G.
Replace control panel.

TROUBLE DIAGNOSES — Manual Air Conditioner

Diagnostic Procedure 5 (Cont'd) DIAGNOSTIC PROCEDURE 5-4



Turn ignition switch and lighting switch OFF.

Disconnect switch unit harness connector.

A
CHECK POWER SUPPLY FOR SWITCH UNIT
Do approximately 12 volts exist between switch unit harness connector terminal No. ④ and body ground?

N.G.

Check harness of switch unit power supply circuit.
(Refer to "POWER SUPPLY ROUTING" in EL section and A/C ELECTRICAL CIRCUIT.)

O.K.
B
CHECK BODY GROUND CIRCUIT FOR CONTROL AMP.
Does continuity exist between control amp. harness connector terminal No. ⑳ and body ground?

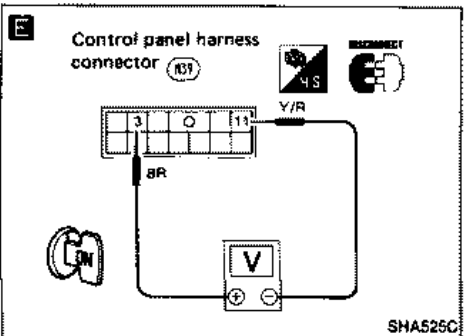
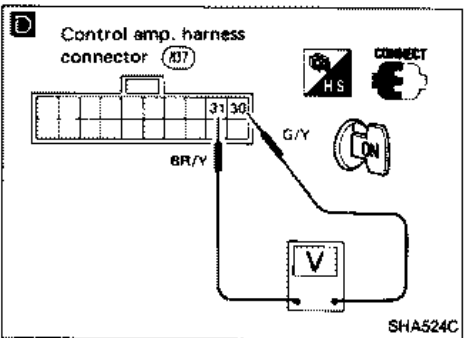
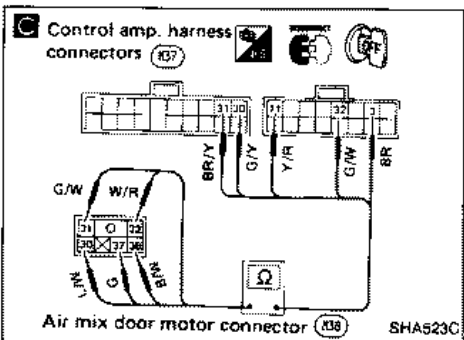
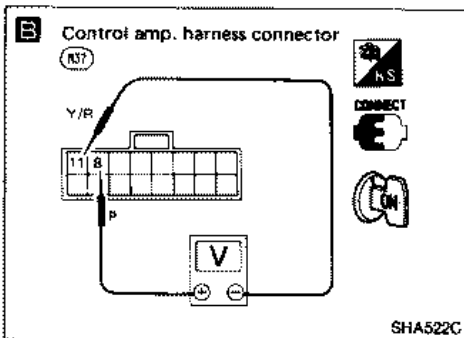
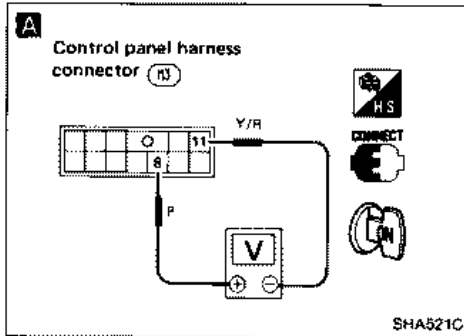
O.K.

Replace control amp.

TROUBLE DIAGNOSES — Manual Air Conditioner

Diagnostic Procedure 6

SYMPTOM: Temperature of air outlet does not change.



A CHECK TEMPERATURE CONTROL LEVER.
Measure voltage between control panel harness connector terminals No. ⑧ and ⑪.

Temp. control lever	Terminal No.		Voltage (approx.)
	+	-	
Full hot	⑧	⑪	5V
Full cold	⑧	⑪	0V

B Measure voltage between control amp. harness connector terminals No. ⑧ and ⑪.

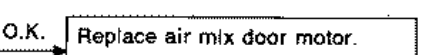
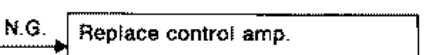
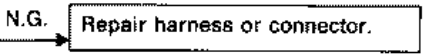
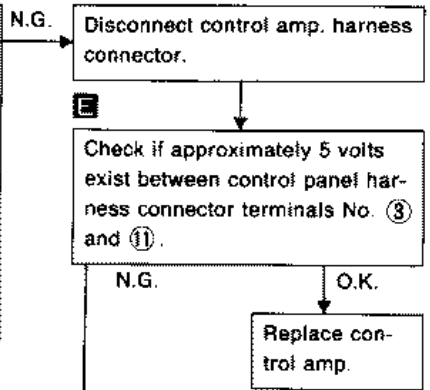
Temp. control lever	Terminal No.		Voltage (approx.)
	+	-	
Full hot	⑧	⑪	5V
Full cold	⑧	⑪	0V

C Check continuity between each terminal of control amp. and air mix door motor.

Terminal No.		Continuity
Control amp.	Air mix door motor	
⑩	⑩	Yes
⑪	⑪	
⑬	⑬	
⑭	⑭	
⑮	⑮	

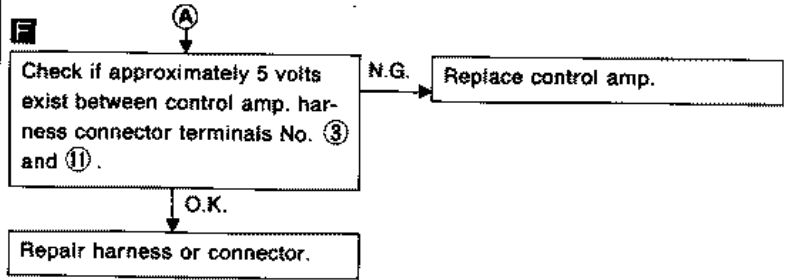
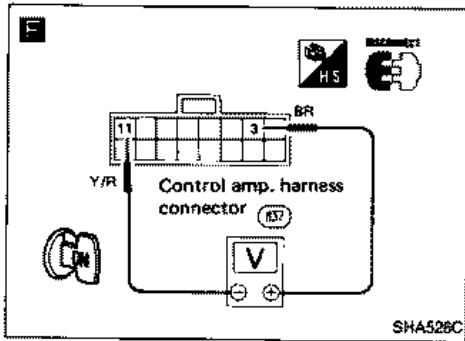
D CHECK FOR CONTROL AMP. OUTPUT.
Check if 12 volts exist between control amp. harness connector terminals No. ⑩ and ⑪ when temp. control lever is moved.

Terminal No.	Air mix door motor	Direction of linkage rotation
⑩	⑩	
⊖	⊖	Stop
⊖	⊕	Cold → Hot
⊕	⊖	Hot → Cold

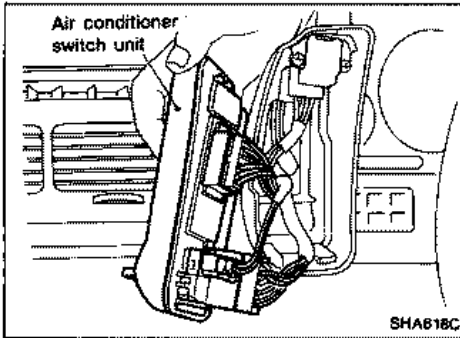


TROUBLE DIAGNOSES — Manual Air Conditioner

Diagnostic Procedure 6 (Cont'd)



TROUBLE DIAGNOSES — Manual Air Conditioner

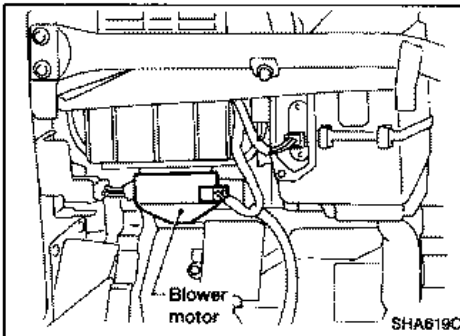
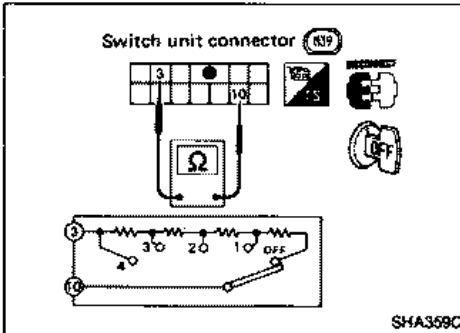


Electrical Components Inspection

FAN SWITCH

Check resistance between terminals at each switch position.

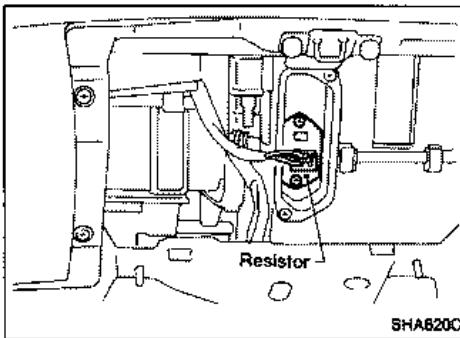
Switch position	Resistance between terminals No. ③ and ⑩ (Approx. Ω)
OFF	710
1	1,140
2	460
3	270
4	0



BLOWER MOTOR

Confirm smooth rotation of the blower motor.

- Ensure that there are no foreign particles inside the intake unit.



BLOWER RESISTOR

Check continuity between terminals.

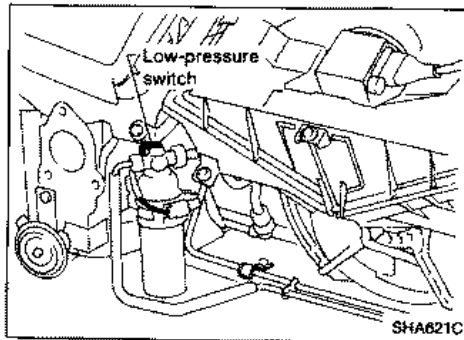
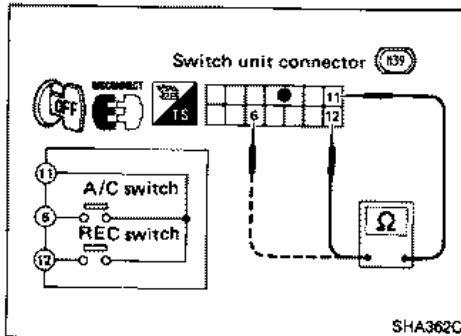
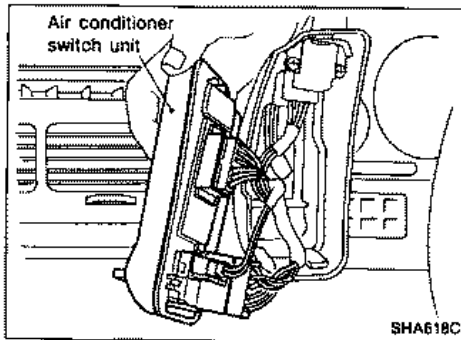
TROUBLE DIAGNOSES — Manual Air Conditioner

Electrical Components Inspection (Cont'd)

A/C SWITCH

Check continuity between terminals at each switch position.

Switch condition	Terminal No.		Continuity
While A/C switch is pushed	⑤	⑪	Yes
While REC switch is pushed	⑫	⑪	Yes

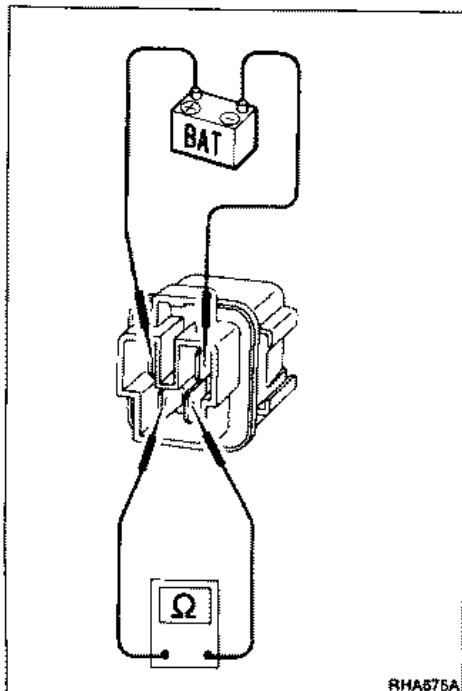


LOW-PRESSURE SWITCH

High-pressure side line pressure kPa (bar, kg/cm ² , psi)	Operation	Continuity
196 (1.96, 2.0, 28)	Turn OFF	Does not exist
206 (2.06, 2.1, 30)	Turn ON	Exist

RELAY

Check circuit continuity between terminals by supplying 12 volts to coil side terminal of relay.

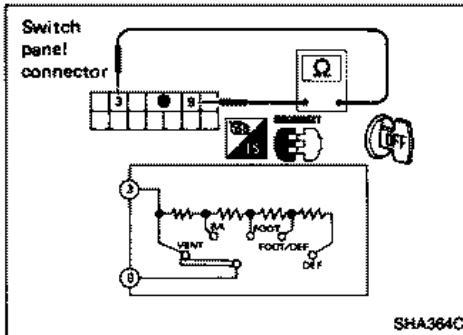
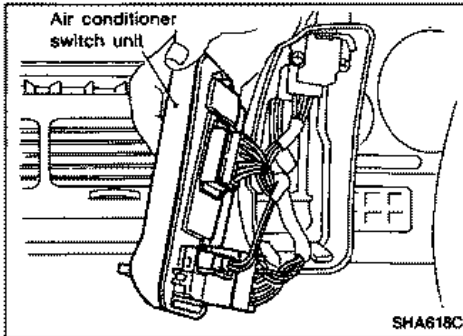


TROUBLE DIAGNOSES — Manual Air Conditioner

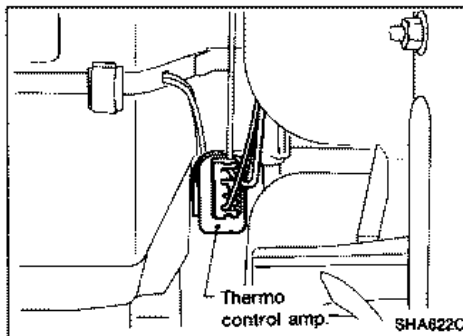
Electrical Components Inspection (Cont'd)

MODE SWITCH

Check resistance between terminals at each switch position.



Switch position	Resistance between terminals No. ② and No. ③ (Ω)
VENT	0
B/L	270
FOOT	460
FOOT/DEF	1,140
DEF	710



THERMO CONTROL AMP.

1. Run engine and operate A/C system.
2. Connect the voltmeter from harness side.
3. Check thermo control amp. operation shown in the table.

Evaporator outlet air temperature °C (°F)	Thermo control amp. operation	Voltage (Approx.)
Decreasing to 3.0 (37)	Turn OFF	12V
Increasing to 4.5 (40)	Turn ON	0V

DESCRIPTION — Auto Air Conditioner

Features

OUTLET AIR TEMPERATURE CONTROL (Air mix door control)

When the desired temperature is set on the control panel, the automatic temperature control system determines both the head and foot target temperatures, as well as target upper (VENT and DEF) and lower (FOOT) outlet air temperatures. This computation is accomplished in relation to the desired temperature, and outside conditions (ambient temperature and sunload). The automatic temperature control system then controls the air mix door position so that the outlet air temperatures meet target* outlet air temperatures.

A summary of the automatic temperature control system is as follows:

1. The upper and lower air temperatures are independently controlled to provide a comfortable ride.
2. Optimum outlet air temperatures can be set to the passenger's preference.
3. Outlet air temperature feedback control through duct sensors permits a "potentiometerless" air mix door design. It requires no adjustment, increases service life and improves performance reliability.

FAN SPEED CONTROL

The A.T.C. system continuously regulates fan speed according to the difference between the target temperature and the temperatures detected at the upper and lower in-vehicle sensors. The greater the difference between the temperatures the higher the blower speed. If the cabin sunload or ambient temperature is high, fan speed will be increased.

INTAKE DOOR CONTROL

The A.T.C. system adjusts the intake door position once every sixty seconds. The system is programmed to take in outside air as much as possible.

OUTLET DOOR CONTROL

The A.T.C. system controls distribution of air through the VENT, DEF and FOOT outlets based on the cabin sunload, ambient temperature and the set temperature.

COMPRESSOR MAGNET CLUTCH CONTROL

The A.T.C. system automatically shuts off the compressor at temperatures lower than 0°C (32°F).

SELF-DIAGNOSTIC SYSTEM

The A.T.C. system contains an on-board diagnostic system which can be used to check the A.T.C. system sensors and motors and any trouble data stored in the memory.

Pushing the "AUTO" and "OFF" switches at the same time for more than 5 seconds will give the self-diagnostic mode. There are 4 kinds of self-diagnostic systems (STEP 1 to STEP 4). Each step can be accessed by pushing the "AUTO" switch. The functions of each step are as follows:

- STEP 1 — Monitor diagnosis
- STEP 2 — Actuator test
- STEP 3 — Change of difference between upper and lower target temperature
- STEP 4 — Readout of trouble data memory

*: Target temperature

When a temperature for the cabin is set using the TEMP. SET switch, the A.T.C. system calculates an initial target temperature based on information from the various A.T.C. system sensors. This target temperature is continuously updated to bring the cabin temperature to the set temperature in the most comfortable way possible for the occupants. (The program for this was made after careful study of comfort levels related to car interiors).

DESCRIPTION — Auto Air Conditioner

Switch Functions on Control Unit

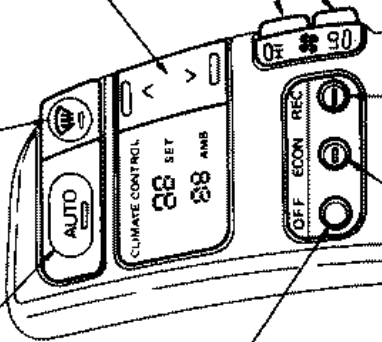
DEF SWITCH	
INTAKE DOOR POSITION	OUTSIDE AIR
OUTLET DOOR POSITION	DEFROSTER
AIR MIX DOOR POSITION	AUTOMATIC CONTROL
FAN SPEED	AUTOMATIC CONTROL
COMPRESSOR	ON [outside air temperature above 0° C (32° F)] Fan speed can be set at "HI" or "LO".
REMARKS	

TEMP. SET SWITCH

Each time corresponding switch is pressed, set temperature is increased or decreased by 1° F. When it is pressed for more than 0.5 seconds, set temperature can be continuously changed.

FAN SPEED FIXING SWITCH	
INDICATOR	HI LO
FAN SPEED	HI SPEED LO SPEED
Each function is cancelled when corresponding switch is pressed again.	

RECIRC SWITCH	
INDICATOR	ON OFF
INTAKE DOOR POSITION	RECIRCULATED AIR AUTOMATIC CONTROL
REMARKS	Recirculation mode changes to automatic control mode ten minutes after "RECIRC" switch is turned "ON". "RECIRC" switch does not function when compressor is "OFF" or when it is in "ECON" or "DEF" mode. Recirculation function is cancelled when "RECIRC" switch is pressed again.



AUTO SWITCH	
INTAKE DOOR POSITION	AUTOMATIC CONTROL
OUTLET DOOR POSITION	AUTOMATIC CONTROL
AIR MIX DOOR POSITION	AUTOMATIC CONTROL
FAN SPEED	AUTOMATIC CONTROL
COMPRESSOR	ON [outside air temperature above 0° C (32° F)] Fan speed can be set at "HI" or "LO".
REMARKS	

OFF SWITCH	
INTAKE DOOR POSITION	OUTSIDE AIR
OUTLET DOOR POSITION	AUTOMATIC CONTROL
AIR MIX DOOR POSITION	AUTOMATIC CONTROL
FAN SPEED	OFF
COMPRESSOR	OFF
REMARKS	REC switch can be set.

ECON SWITCH	
INDICATOR	ON OFF
INTAKE DOOR POSITION	OUTSIDE AIR AUTOMATIC CONTROL
COMPRESSOR	OFF ON [outside air temperature above 0° C (32° F)]
REMARKS	"ECON" switch does not function when compressor is "OFF" and DEF switch is "ON". "ECON" switch function is also cancelled when pressed again.

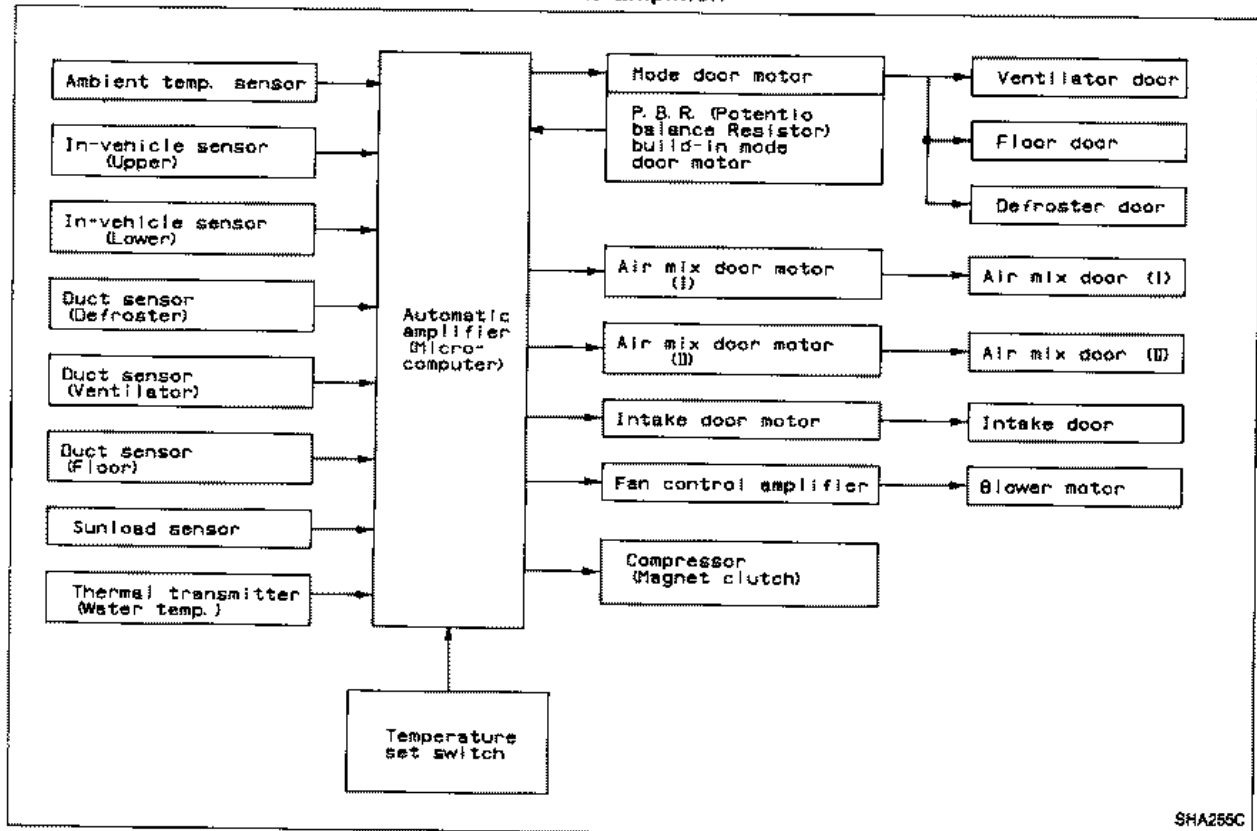
DESCRIPTION — Auto Air Conditioner

Specifications

AUTO AMPLIFIER

The auto amplifier has a built-in microcomputer which processes information from the A.T.C. system sensors. Signals are sent from the auto amplifier to activate the A.T.C. system depending upon the information sent by these sensors and the set temperature selected on the switch panel.

The A.T.C. system's self-diagnostic capabilities are built into the auto amplifier.



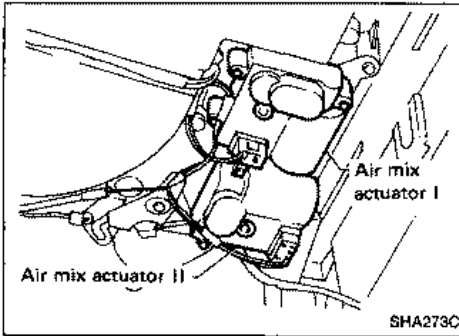
DESCRIPTION — Auto Air Conditioner

Specifications (Cont'd)

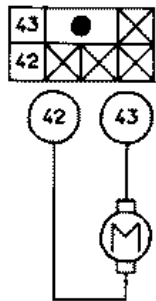
AIR MIX DOOR I and II MOTORS

Component and related parts

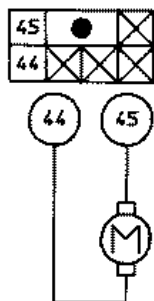
- Auto amplifier
- Air mix door motors
- In-vehicle sensors (upper and lower)
- Duct sensors (vent, floor, defroster)
- Ambient sensor
- sunload sensor



Operation of air mix door I and II motors

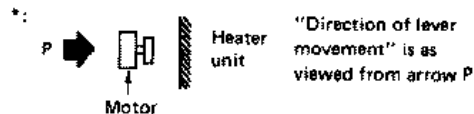


Air mix door I



Air mix door II

④② ④④	④③ ④⑤	Air mix door I and II operation	Direction of lever movement
⊖	⊕	COLD → HOT	*Clockwise
⊖	⊖	STOP	STOP
⊕	⊖	HOT → COLD	*Counterclockwise



SHA274C

System operation

The air mix door motors are attached to the bottom of the heater unit. The motors rotate, moving a lever system which varies the air mix door position to heat or cool the inlet air. Outlet air temperature is measured by the duct sensors, signals from which are sent to the auto amplifier which uses them to modify the air mix door position to achieve the current target temperature.

- It takes about 1 minute to stabilize duct air temperature.
- When ambient temperature is below 5°C (41°F) or above 60°C (140°F), air mix door position is fixed.

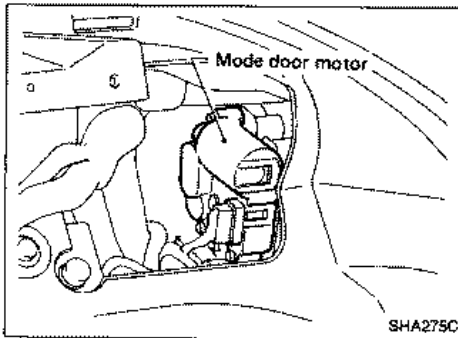
DESCRIPTION — Auto Air Conditioner

Specifications (Cont'd)

MODE DOOR MOTOR

Component and related parts

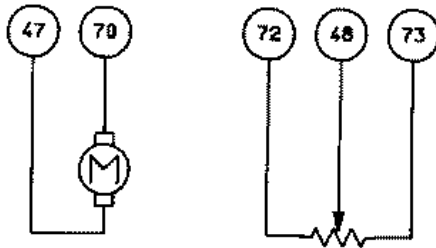
- Auto amplifier
- Mode door motor with potential ballast resistor (P.B.R.)
- Lower in-vehicle sensor
- Ambient sensor
- Sunload sensor



Mode door motor operation

Mode door motor operation

76	●	48
47	⊗	73 72



47	70	Mode door operation	Direction of side link rotation
⊖	⊕	VENT → DEF	Clockwise
⊖	⊖	STOP	STOP
⊕	⊖	DEF → VENT	Counterclockwise

SHA276C

System operation

The mode door motor is attached to the heater unit. The motor operates a cam assembly which moves the air outlet doors. The auto amplifier controls air distribution to the VENT, DEF and FOOT outlets. Outlet door position is conveyed to the auto amplifier by the P.B.R. built into the mode door motor.

The auto amplifier computes air outlet conditions according to ambient temperature, set temperature and sunload. When thermal loads are great, the air outlet computation is additionally influenced by the foot area temperature. The air outlet positions are smoothly adjusted in response to changes in ambient temperatures.

When the set temperature is decreased or when the sunload is increased, the air flow volume from the vent outlets is increased.

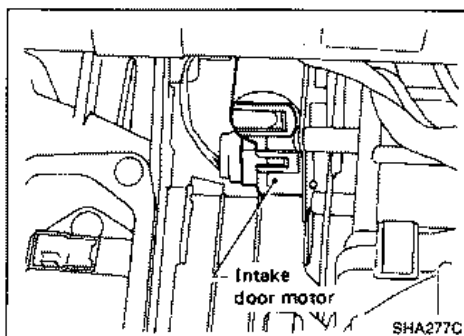
DESCRIPTION — Auto Air Conditioner

Specifications (Cont'd)

INTAKE DOOR MOTOR

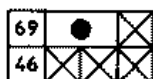
Component and related parts

- Auto amplifier
- Intake door motor
- Upper in-vehicle sensor
- Vent duct sensor
- Ambient sensor
- Sunload sensor



Intake door operation

Intake door operation



46	69	Intake door operation	Direction of lever rotation
⊖	⊕	REC → FRE	Counterclockwise
⊖	⊖	STOP	STOP
⊕	⊖	FRE → REC	Clockwise

SHA278C

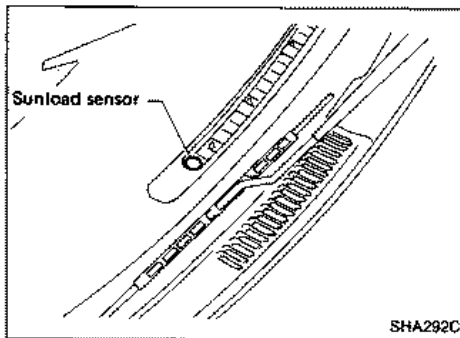
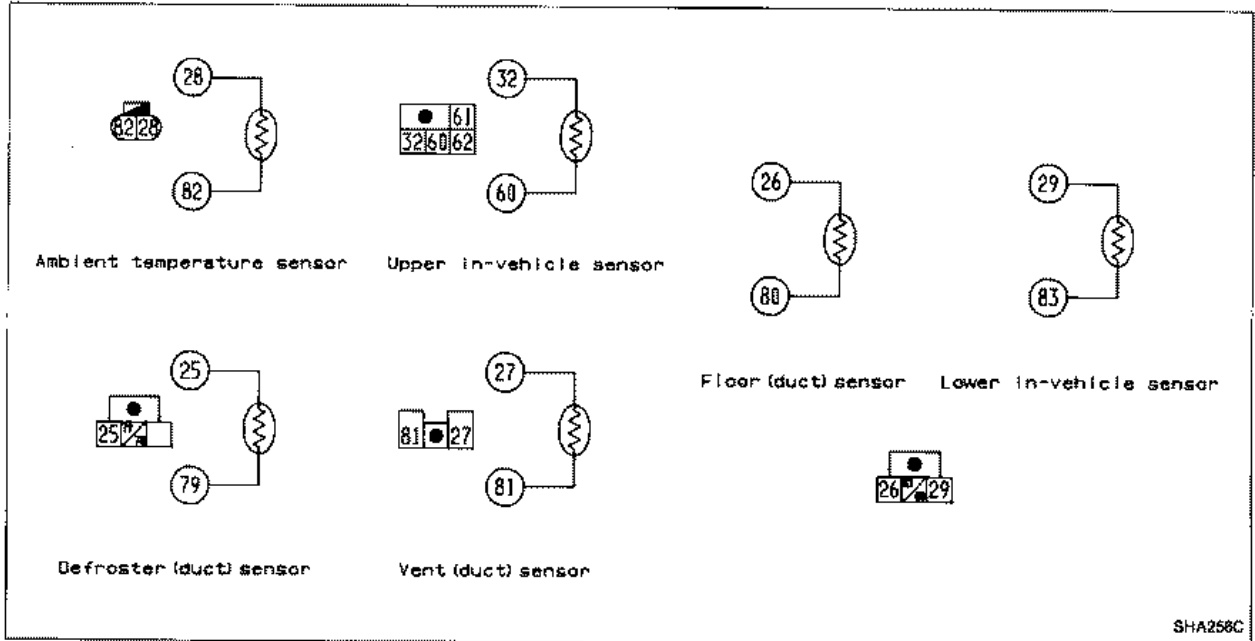
System operation

The intake door motor is attached to the air intake unit. Intake door position is controlled approximately once every minute, according to the difference between target and actual vent air temperatures. When the actual outlet air temperature is higher than the target vent air temperature, the intake door will gradually shift toward the recirculation-air side. When the outlet air temperature reaches the target outlet air temperature, the intake door will gradually shift toward the fresh air side. However, when the ambient temperature is lower than 20°C (68°F), 100% fresh air is taken is regardless of outlet air temperatures.

When the compressor is "OFF" the auto amplifier sets the intake door at the "FRESH" position except when the "RECIRC" switch is "ON".

DESCRIPTION — Auto Air Conditioner

Specifications (Cont'd) TEMPERATURE SENSORS



SUNLOAD SENSOR

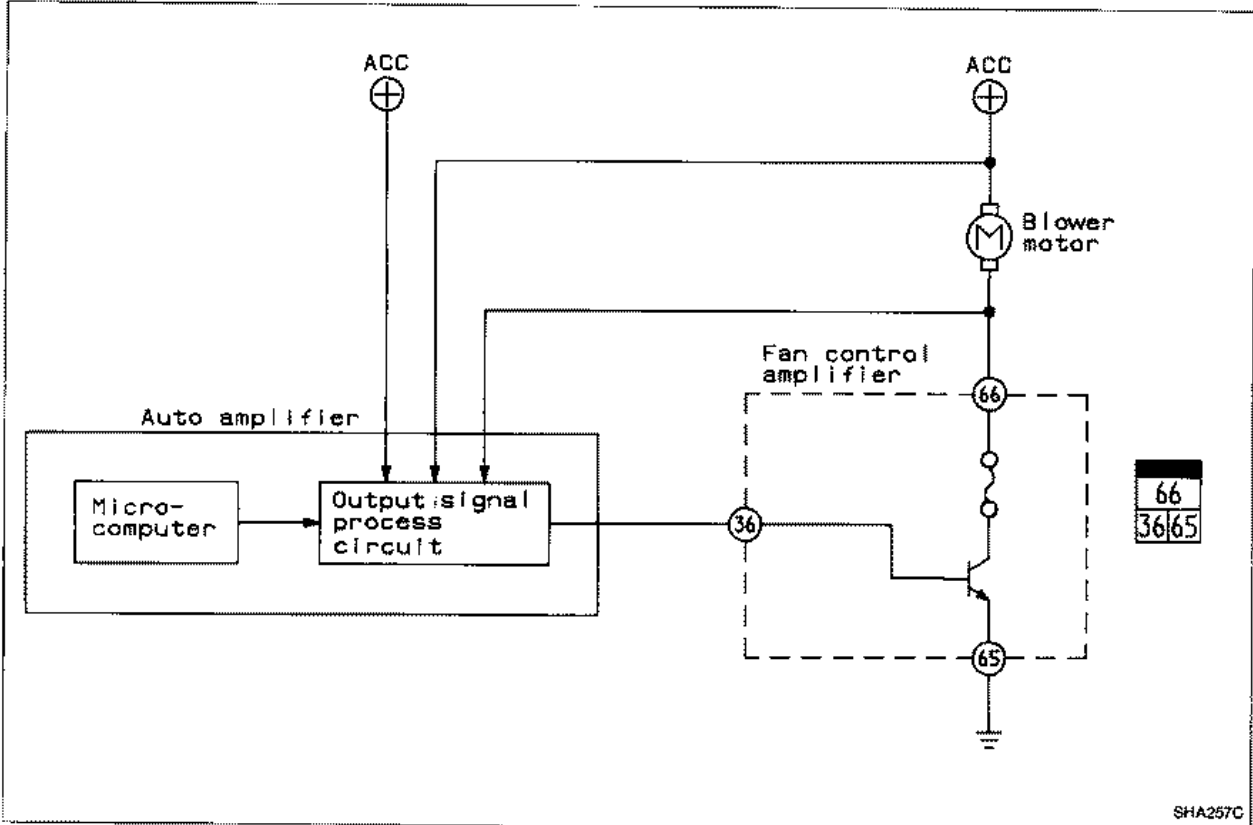
The sunload sensor is located on the right defroster grille. It detects sunload entering through the windshield by means of a photo diode and converts it into a current value which is then input into the auto amplifier.

DESCRIPTION — Auto Air Conditioner

Specifications (Cont'd)

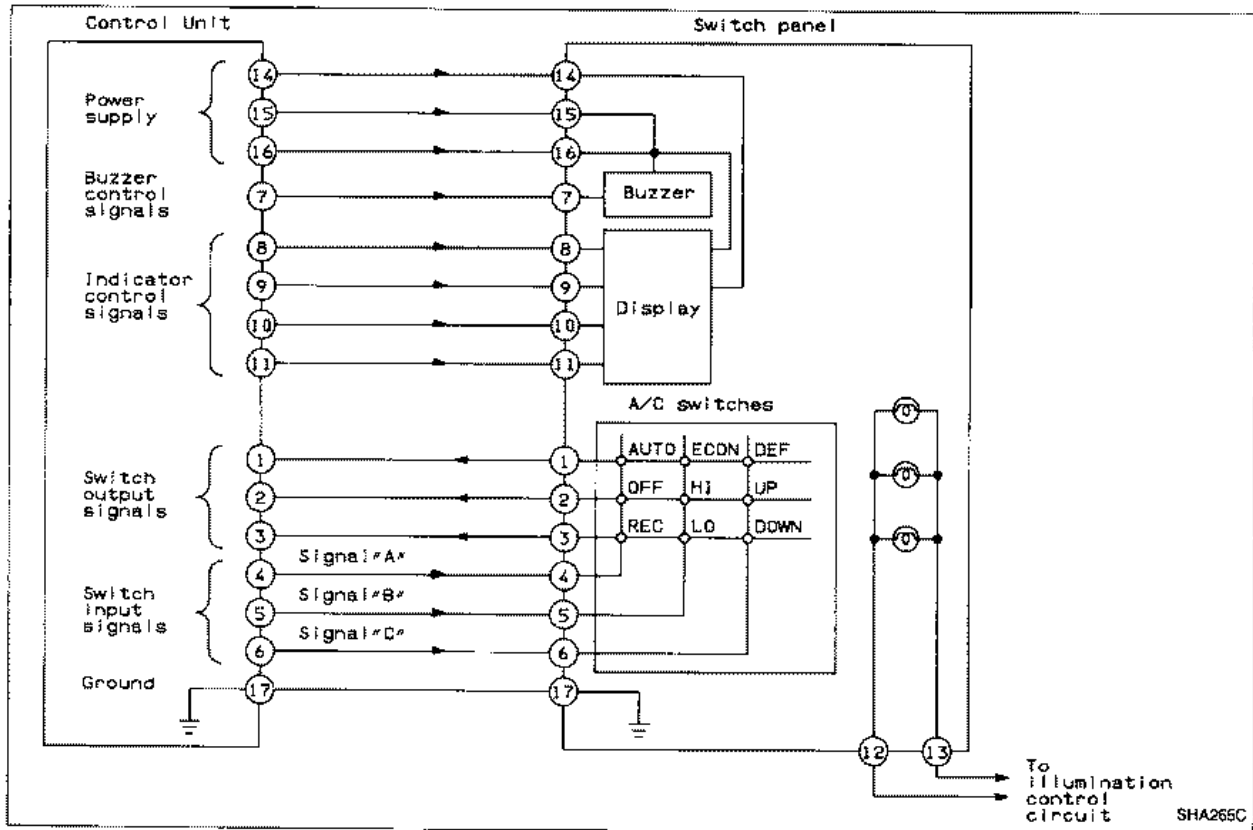
FAN CONTROL AMPLIFIER

The fan control amplifier is located on the cooling unit. It amplifies the base current flowing from the auto amplifier to change the blower speed.



DESCRIPTION — Auto Air Conditioner

System Operation SWITCH PANEL



System operation

Except for illumination lamp terminals ⑫ and ⑬, the switch panel is operated by signals emitted from the control unit. There are three categories of signals.

- 1) Power and ground signals
- 2) Indicators (VFD and LED) and buzzer control signals
- 3) Switch input and output signals

The control unit always sends three different signals to the switch panel on three lines ④, ⑤, and ⑥. For example, when the "Auto" switch is pushed, signal "A" returns to the control unit on line No. ①. And when the "Econ" switch is pushed, signal "B" returns to the control unit on line No. ②. Similarly for the other switches; the control unit recognizes which signal returns on which line, and then identifies which switch is pushed.

DESCRIPTION — Auto Air Conditioner

System Operation (Cont'd)

AMBIENT TEMPERATURE INPUT PROCESS

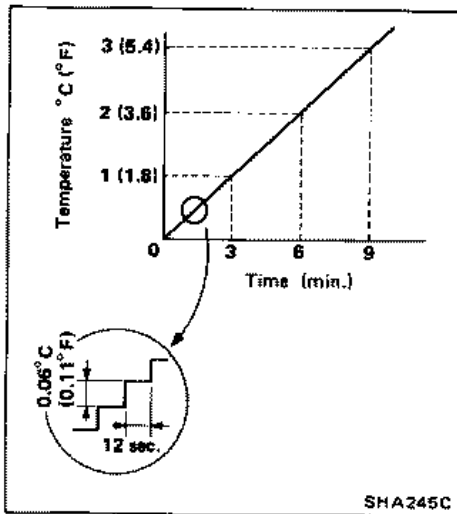
For A.T.C. system operation an accurate ambient sensor signal is necessary. The auto amplifier contains a circuit to ensure accurate measurement of increases in ambient temperature. Sudden increase in temperature of 16°C (61°F) or more, which may be detected after encountering heavy traffic after a period of high speed cruising, are processed through a delay circuit. The delay circuit processes any temperature increase in increments of 0.06°C (0.11°F) every 12 seconds and, in this way, the A.T.C. system is protected from any sudden changes in ambient sensor signal due to low air flow around the sensor.

Temperature decreases are not processed through the time delay circuit.

Example:

In the case of a signal stop after high-speed cruising, the ambient temperature will rise suddenly.

The ambient temperature input process functions at this time to prevent unpleasant air conditioning system changes.

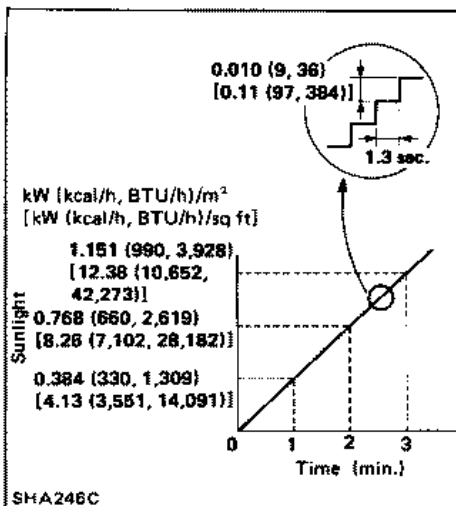


SUNLOAD INPUT PROCESS

The sunload input circuit in the auto amplifier also features a time delay to prevent abrupt A.T.C. system changes. This feature operates under rapid increases and decreases in sunload.

Example:

When entering a tunnel the sunload will change suddenly. The sunload input process system functions at this time to prevent unpleasant air conditioning system changes.



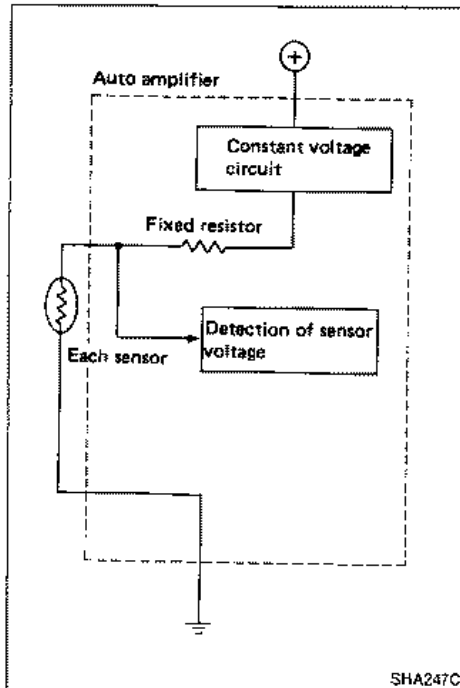
DESCRIPTION — Auto Air Conditioner

System Operation (Cont'd)

SENSOR INPUT PROCESS

A fixed resistor is built into the auto amplifier. 12V DC is converted to 5V DC by the constant voltage circuit where it is then applied to the ground line of the auto amplifier by the fixed resistor and sensors. The auto amplifier monitors the voltage between each sensor and the fixed resistor. The resistance of each sensor varies according to temperature.

Accordingly, the voltage at each sensor varies according to the temperature. The voltage signal is processed by the auto amplifier for A.T.C. system operation.



STARTING FAN SPEED AND OUTLET DOOR CONTROL

Component parts

Starting fan speed and outlet door control components are:

- Auto amplifier
- Fan control amplifier
- In-vehicle sensors (Upper and Lower)
- Duct sensor (Defroster, Ventilator and Floor)
- Ambient sensor
- sunload sensor
- Thermal transmitter (Engine coolant temperature sensor)

System operation

- Fan speed control

At a set temperature of 25°C (77°F), when the upper compartment temperature is below 21°C (70°F) and the outlet duct temperature is lower than 35°C (95°F), the fan starts at minimum flow rate. As the discharge air temperature increases, the air flow rate increases to bring the compartment temperature to the target level as quickly as possible.

When the ambient temperature is above 40°C (104°F), fan air flow rate is at full volume.

As interior temperature begins to reach the target temperature, fan speed decreases.

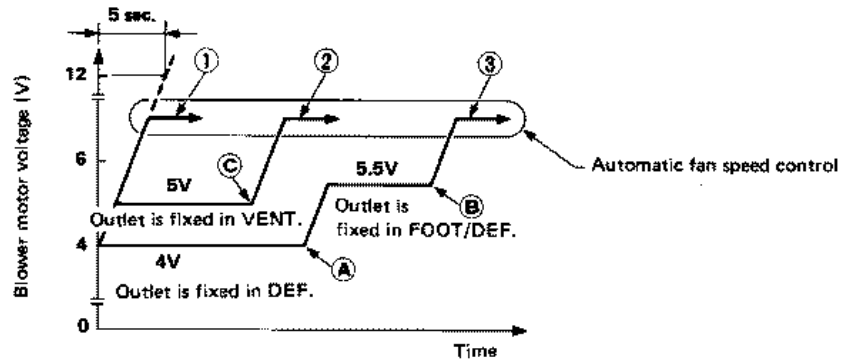
Under heavy sunload conditions, fan speed is increased to maintain uniform interior temperature. Fan speed also increases if the set temperature is decreased.
- Outlet door control

At a set temperature of 25°C (77°F), when the upper in-vehicle temperature is lower than 21°C (70°F) and all of the outlet air temperatures are lower than 35°C (95°F), the system starts with the minimum airflow rate in the defroster mode. When defroster duct temperature rises above 35°C (95°F), the air outlet mode changes from the defroster mode to the DEF/FOOT mode. When floor duct temperature exceeds 40°C (104°F), the starting fan speed control and outlet door control mode is replaced by the normal automatic control mode. When the upper in-vehicle temperature is far greater than the lower in-vehicle temperature because of a large sunload, the system starts with the ventilator mode, which is replaced by the automatic control mode as the coolant temperature and outlet air temperature increases.

DESCRIPTION — Auto Air Conditioner

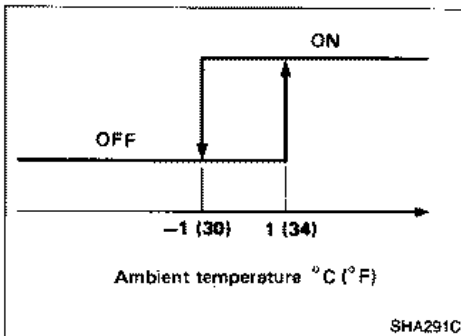
System Operation (Cont'd)

Starting fan speed and outlet door control specifications



- ① : When both upper and lower in-vehicle temperatures are much higher than set temperature.
- ② : When upper in-vehicle temperature is higher than set temperature.
- ③ : When upper in-vehicle temperature is lower than set temperature.
- Ⓐ : VG30DE engine model
When DEF duct temperature rises above 35°C (95°F)
VG30DE engine model
When DEF duct temperature rises above approximately 20°C (68°F)
(Exact temperature depends on ambient temperature.)
- Ⓑ : VG30DE engine model
When FLOOR duct temperature rises above 40°C (104°F)
VG30DETT engine model
When FLOOR duct temperature rises above approximately 36°C (97°F)
(Exact temperature depends on ambient temperature.)
- Ⓒ : When water temperature rises above 40°C (104°F) and difference between outlet air temperature and target temperature is lower than 5°C (9°F).

SHA290C



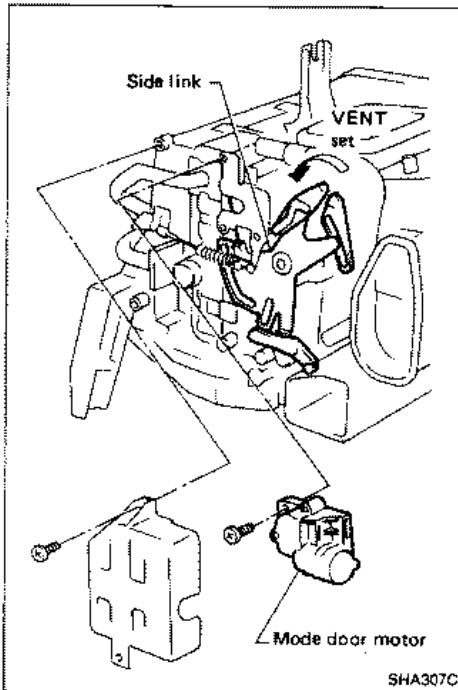
SHA291C

MAGNET CLUTCH CONTROL

The auto amplifier controls compressor operation by the ambient temperature and signals from the E.C.C.S. unit.

The auto amplifier will turn the compressor 'ON' or 'OFF' as determined by a signal detected by the ambient temperature sensor.



DOOR CONTROL — Auto Air Conditioner




Control Rod Adjustment

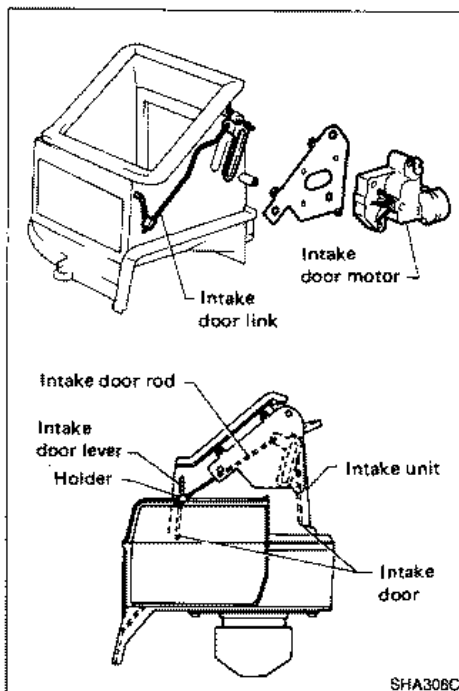
MODE DOOR

1. Move side link by hand and hold mode door in VENT mode.
2. Install mode door motor on heater unit and connect it to harness.
3. Turn ignition switch to ACC.
4. Set up "ACTIVE TEST" mode with CONSULT or set up self-diagnosis STEP 2.
5. Set MODE DOOR position as in the following table.

	
MODE DOOR POSITION	Code No.
VENT	6X



6. Attach mode door rod to side link rod holder.
7. Check mode door operates when position is changed with CONSULT or when code No. 6X is changed to others.

	3X	4X	5X	6X
Code No.				
Mode door position	DEF	HEAT	B/L	VENT




INTAKE DOOR

1. Install intake door motor on intake unit.
2. Connect intake door motor to harness.
3. Turn ignition switch to ACC.
4. Set up "ACTIVE TEST" mode with CONSULT or set up self-diagnosis STEP 2.
5. Set INTAKE DOOR position as in the following table.

	
INTAKE DOOR POSITION	Code No.
REC	6X

6. Install intake door lever.
7. Set intake door rod in REC position and fasten intake door rod to holder intake door lever.
8. Check intake door operates properly when position is changed with CONSULT or when code No. 6X is changed to others.

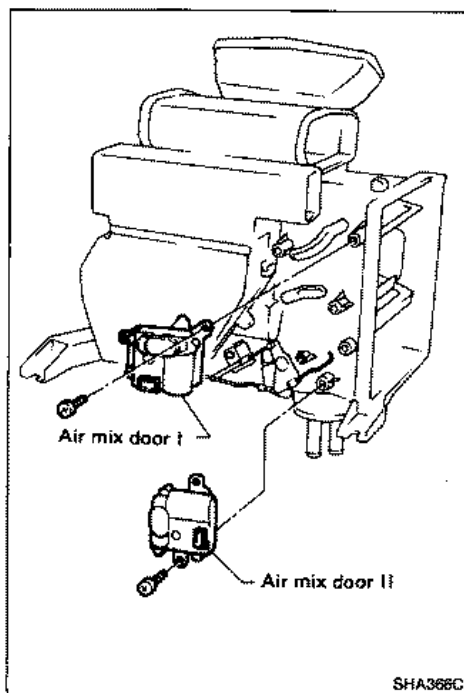
	3X	4X	5X	6X
Code No.				
Intake door position	Outside air		Partial outside air	Recirculation

DOOR CONTROL — Auto Air Conditioner

Control Rod Adjustment (Cont'd)

AIR MIX DOOR

1. Connect harness to air mix door motors I and II and set temperature control lever at full-cold position.
2. Set air mix doors I and II at full-cold position and fasten door rod.
3. Check that when temperature control lever is at full-cold, both doors are at full-cold position, and when temperature control lever is at full-hot, both doors are at full-hot position.



WATER COCK CONTROL CABLE

Clamp cable at full-close position when air mix door II is at full-cold position, and full-open position when air mix door II is at full-hot position.

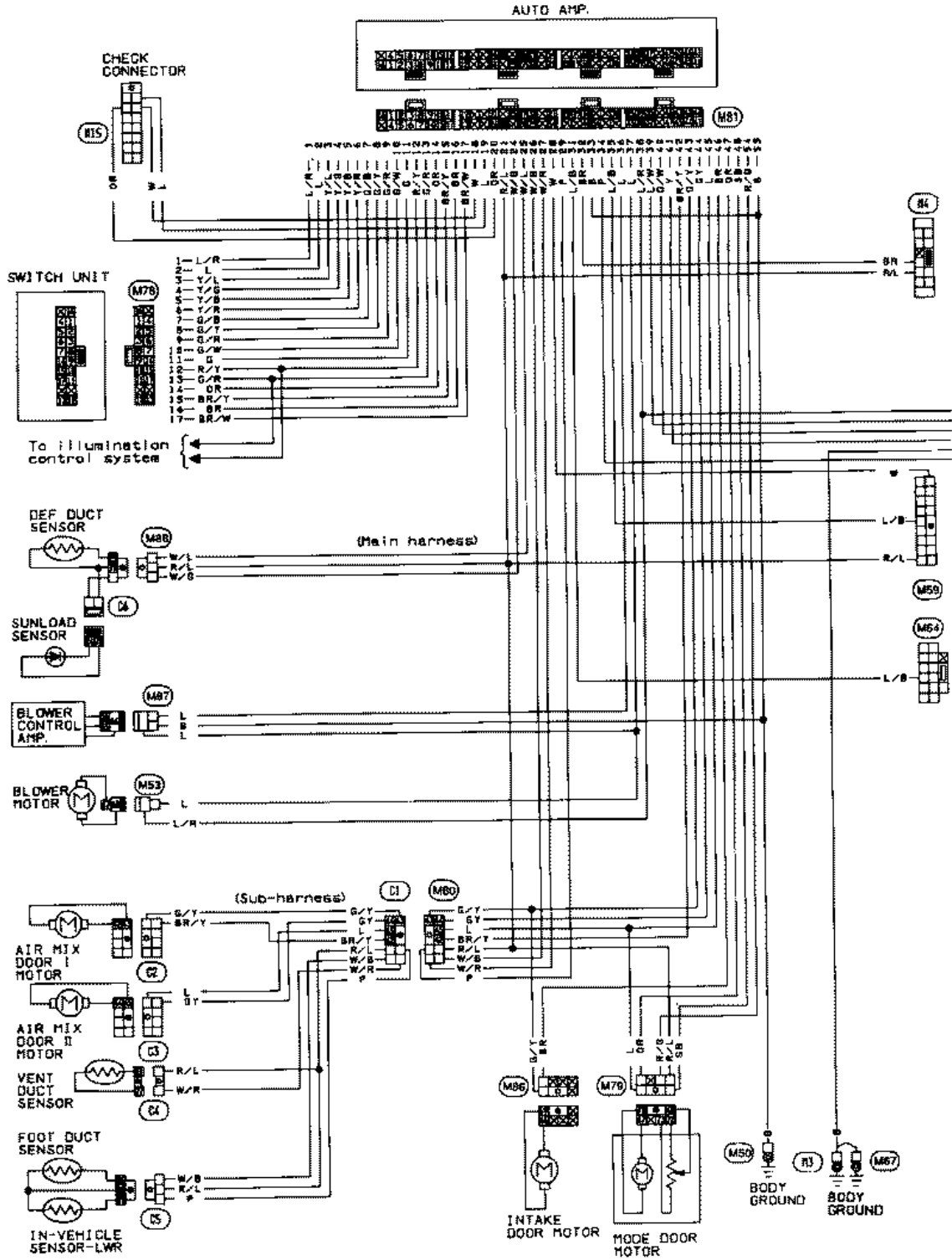
DOOR CONTROL — Auto Air Conditioner

NOTE

A/C ELECTRICAL CIRCUIT — Auto Air Conditioner

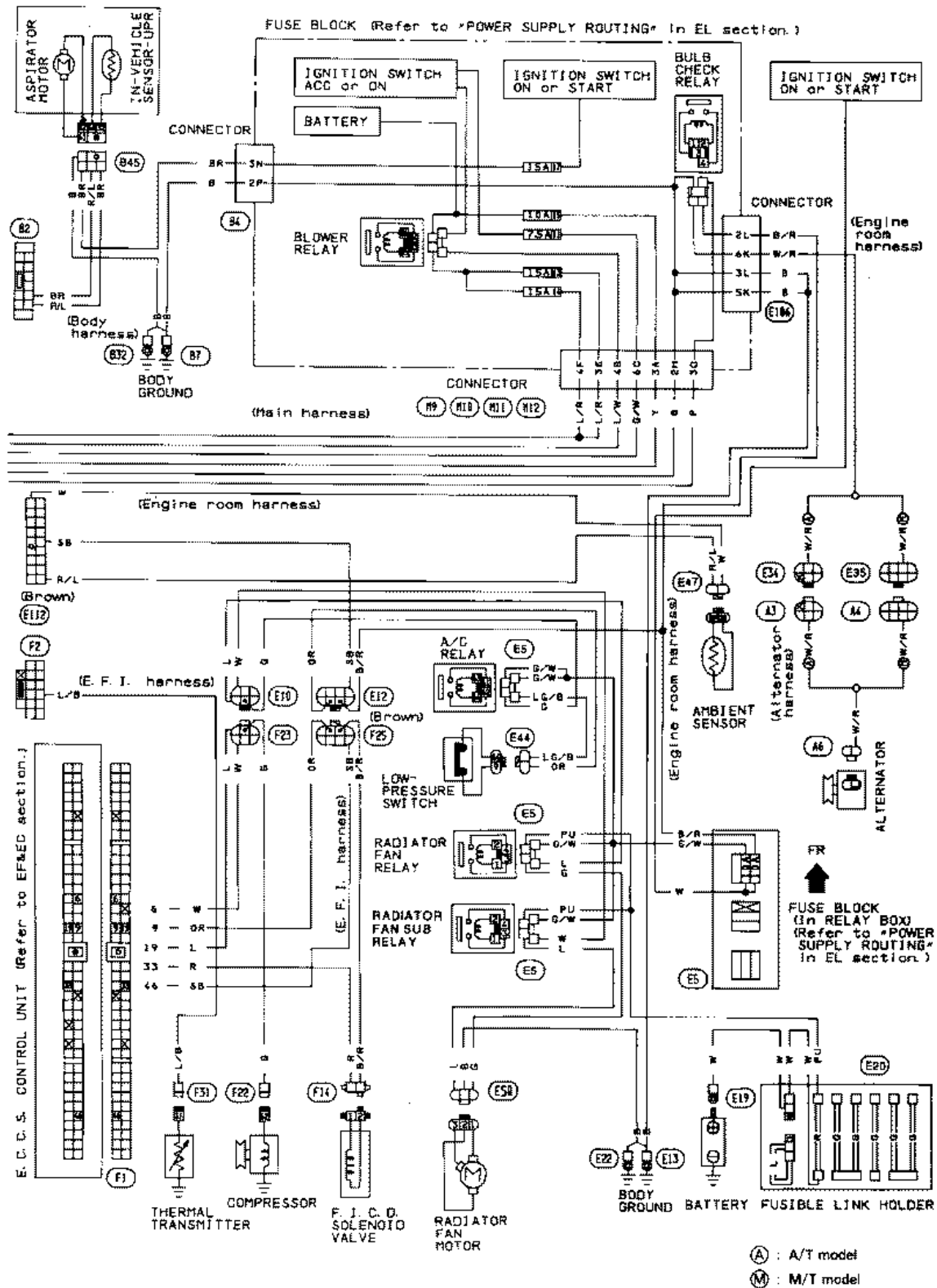
Wiring Diagram

L.H. DRIVE MODEL



A/C ELECTRICAL CIRCUIT — Auto Air Conditioner

Wiring Diagram (Cont'd)



SHA694C

TROUBLE DIAGNOSES — Auto Air Conditioner

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TROUBLE DIAGNOSES — Auto Air Conditioner

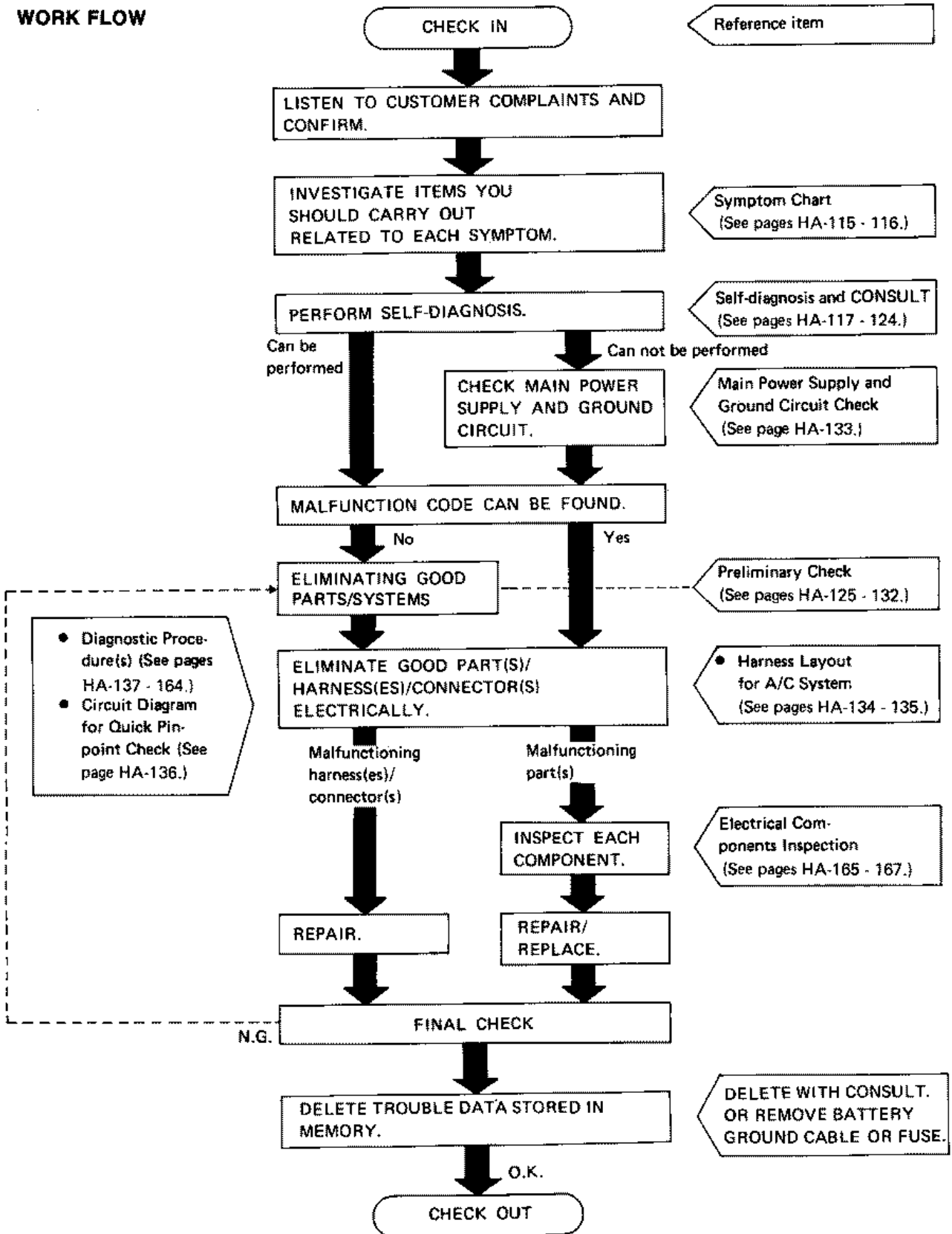
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TROUBLE DIAGNOSES — Auto Air Conditioner

How to Perform Trouble Diagnoses for Quick and Accurate Repair

WORK FLOW



TROUBLE DIAGNOSES — Auto Air Conditioner

Symptom Chart

DIAGNOSTIC TABLE

Symptom	Possible cause	Diagnostic procedure
Air outlet does not change	<ul style="list-style-type: none"> ● Mode door motor not operating correctly ● Inaccurate sensor input ● No output to mode door motor from auto amplifier 	Proceed to Preliminary check 1, then to Diagnostic procedures 17 and 18 if air mix door is malfunctioning.
Intake door does not change	<ul style="list-style-type: none"> ● Intake door motor or mechanism malfunctioning ● Inaccurate sensor input ● No output to intake door motor from auto amplifier 	Proceed to Preliminary check 2, if intake door is malfunctioning, go to Diagnostic Procedure 16.
Insufficient cooling	<ul style="list-style-type: none"> ● Compressor clutch not engaged ● Air mix door motors not working properly ● Condenser fan inoperative ● Low freon level 	Proceed to Preliminary check 3. If air mix doors do not operate properly, go to Diagnostic procedure 15. Check compressor clutch operation and freon level of system.
Discharged air temperature does not change	<ul style="list-style-type: none"> ● Air mix doors do not operate correctly ● Incorrect sensor input 	Proceed to Preliminary check 7.
Noise	<ul style="list-style-type: none"> ● Compressor belt tension ● Compressor component malfunction ● Blower motor interference ● Radiator cooling fan interference 	Proceed to Preliminary check 8.
Air conditioner control switch panel illumination does not come on	<ul style="list-style-type: none"> ● Blown fuse ● Loose or open in harness ● Blown bulb 	Proceed to Diagnostic procedure 20.
Insufficient heating	<ul style="list-style-type: none"> ● Coolant temperature is low ● Air mix doors not in correct position ● Incorrect sensor input 	Proceed to Preliminary check 4. If air mix doors do not operate correctly, go to Diagnostic procedure 15.
Blower motor operation is malfunctioning	<ul style="list-style-type: none"> ● Blower motor is not receiving power ● Vents may be obstructed ● Motor does not spin freely ● Air intake obstructed ● Blown fuse ● Malfunctioning blower relay 	Proceed to Preliminary check 5. If blower motor is malfunctioning, go to Diagnostic procedure 25.
Magnet clutch does not engage	<ul style="list-style-type: none"> ● Blown fuse ● A/C relay inoperative ● Open in wiring ● Open ambient sensor circuit ● Low freon level ● Malfunctioning clutch assembly 	Proceed to Preliminary check 6, then Diagnostic procedure 19 if clutch is malfunctioning.

TROUBLE DIAGNOSES — Auto Air Conditioner

Symptom Chart (Cont'd)

Symptom	Possible cause	Diagnostic procedure
No display on A/C switch panel	<ul style="list-style-type: none">● Blown fuse● Malfunctioning bulb	Proceed to Diagnostic procedure 20.
Set temperature and ambient temperature do not appear on display window	<ul style="list-style-type: none">● Malfunctioning switch unit● Open in circuit● Malfunctioning auto amplifier	Proceed to Diagnostic procedure 21.
When air conditioner switch is operated, it does not beep	<ul style="list-style-type: none">● Malfunctioning A/C switch● Open in harness or connector● Malfunctioning auto amplifier	Proceed to Diagnostic procedure 22.
Set and ambient temperature do not appear in display and indicator lamp (L.E.D.) does not come on	<ul style="list-style-type: none">● Open in harness● Malfunctioning switch panel● Malfunctioning auto amplifier	Proceed to Diagnostic procedure 23.
Switches do not work	<ul style="list-style-type: none">● Malfunctioning switch panel● Open in harness● Malfunctioning auto amplifier	Proceed to Diagnostic procedure 24.

TROUBLE DIAGNOSES — Auto Air Conditioner

Self-diagnosis

CONSULT AND ONBOARD SELF-DIAGNOSTIC SYSTEM

Function of CONSULT and ONBOARD SELF-DIAGNOSTIC SYSTEM are as follows:

ITEM	MONITOR		CHANGE PARAMETER		READOUT OF TROUBLE DATA STORED IN MEMORY	
	CONSULT	ONBOARD	CONSULT	ONBOARD	CONSULT	ONBOARD
Ambient temp.	○	○			○	○
In-vehicle temp. (Upper)	○	○			○	○
In-vehicle temp. (Lower)	○	○			○	○
Duct temp. (Defroster)	○	○			○	○
Duct temp. (Ventilator)	○	○			○	○
Duct temp. (Floor)	○	○			○	○
Sunload	○	○			○	○
Water temp.	○	○				
Mode door P.B.R.	○	○				
In-vehicle target temp. (Upper)	○					
In-vehicle target temp. (Lower)	○					
Outlet air target temp. (Upper)	○		○	*○		
Outlet air target temp. (Lower)	○		○	*○		
Mode door target position	○		○	*○		
Intake door target position	○		○	*○		
Blower motor target voltage	○		○	*○		
Difference between upper and lower target temp.	○		○	*○		
Output signal to compressor	○		○	*○		
Set temp.	○					
Selected mode	○					
Operated switches status	○					

*: These can be set by self-diagnosis step II; their combinations are as follows:

SET		30			
AMB		code			
Press HS SW.					
Actuator test					
Code	Intake	Outlet	A/M door	Comp	
3x	Outside air	Def	F/H	On	
4x	Outside air	Heat	F/H	Off	
5x	Partial outside air	B/L	30° C (86° F)	On	
6x	Recirculation air	Vent	F/C	On	
Press LO SW.					
Blower voltage (fixed)					
Code	Voltage				
x3	4V				
x4	6V				
x5	9V				
x6	12V				

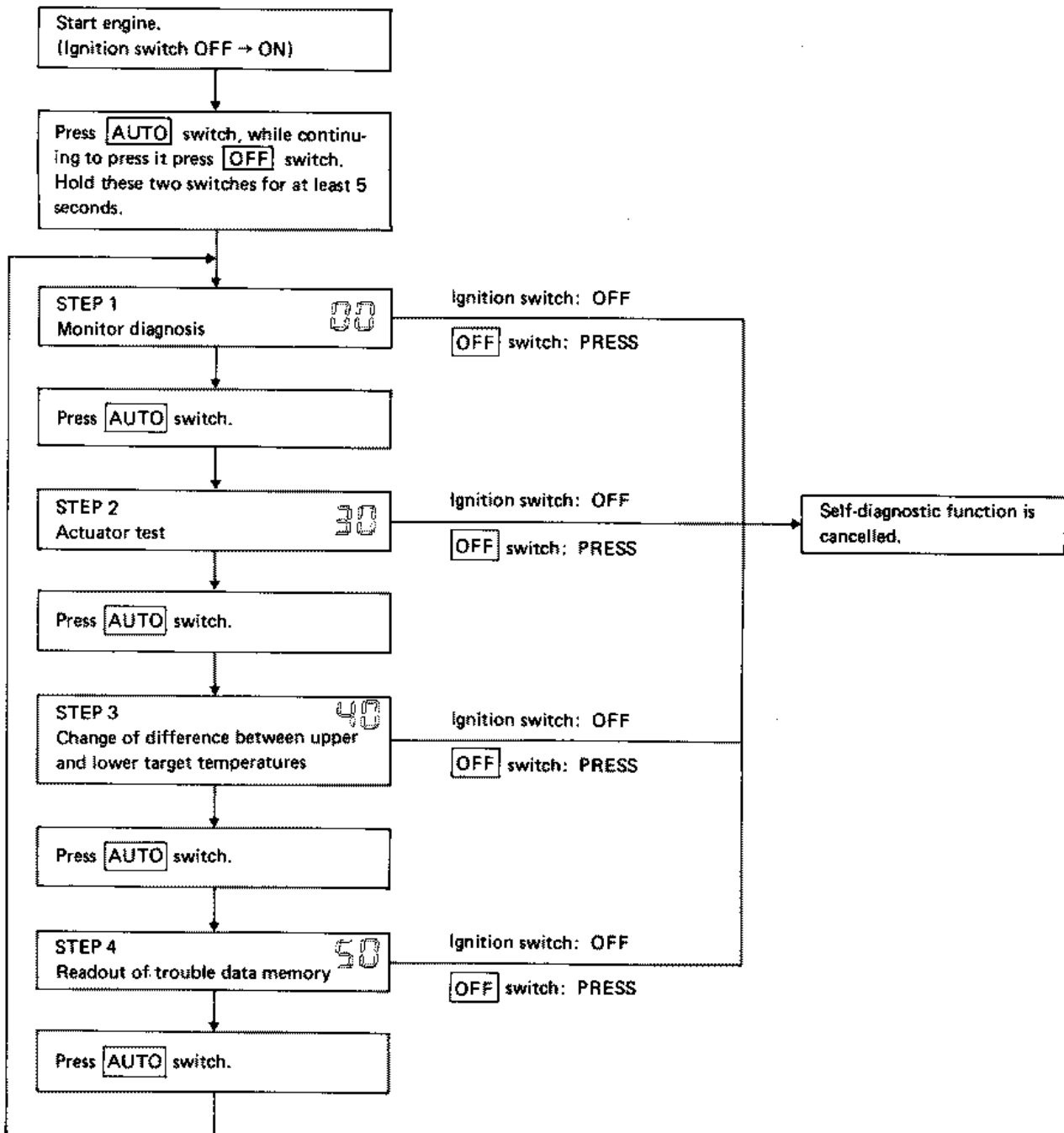
*: "x" refers to any value of 3, 4, 5 and 6.

TROUBLE DIAGNOSES — Auto Air Conditioner

Self-diagnosis (Cont'd)

The self-diagnostic system diagnoses the sensors, door motors, blower motor, etc. by system line. Refer to applicable sections (items) for details. Shifting from normal control to the self-diagnostic system is accomplished by starting the engine (turning ignition switch from "OFF" to "ON"), and pressing both the (AUTO) and (OFF) switch for at least 5 seconds.

This system will be cancelled by either pressing the (OFF) switch or turning the ignition switch "OFF". Shifting from one step to another is accomplished by means of pushing the (AUTO) switch, as required.

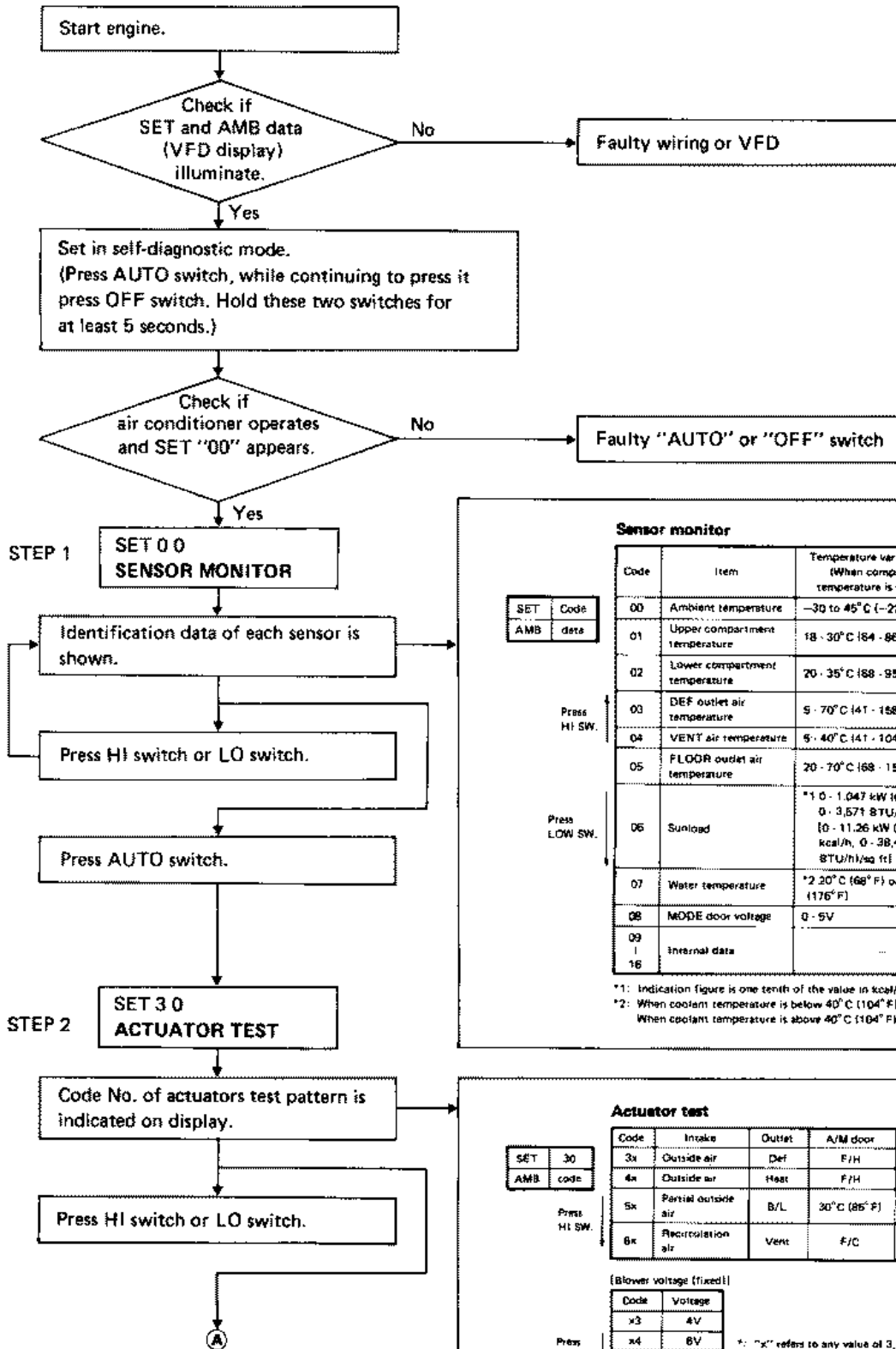


TROUBLE DIAGNOSES — Auto Air Conditioner

Self-diagnosis (Cont'd)

CHECKING PROCEDURE

Note



STEP 1
SET 00
SENSOR MONITOR

Identification data of each sensor is shown.

Press HI switch or LO switch.

Press AUTO switch.

STEP 2
SET 30
ACTUATOR TEST

Code No. of actuators test pattern is indicated on display.

Press HI switch or LO switch.

Sensor monitor

Code	Item	Temperature variation range (When compartment temperature is stabilized)
00	Ambient temperature	-30 to 45°C (-22 to 113°F)
01	Upper compartment temperature	18 - 30°C (64 - 86°F)
02	Lower compartment temperature	20 - 35°C (68 - 95°F)
03	DEF outlet air temperature	5 - 70°C (41 - 158°F)
04	VENT air temperature	5 - 40°C (41 - 104°F)
05	FLOOR outlet air temperature	20 - 70°C (68 - 158°F)
06	Sunload	*1 0 - 1,047 kW (0 - 900 kcal/h, 0 - 3,671 BTU/h)/m ² [0 - 11.26 kW (0 - 9,684 kcal/h, 0 - 38,430 BTU/h)/sq ft]
07	Water temperature	*2 20°C (68°F) or 80°C (176°F)
08	MODE door voltage	0 - 5V
09	Internal data	...

*1: Indication figure is one tenth of the value in kcal/h unit.
*2: When coolant temperature is below 40°C (104°F) indicates 20°C (68°F).
When coolant temperature is above 40°C (104°F) indicates 80°C (176°F).

Actuator test

Code	Intake	Outlet	A/M door	Comp
3x	Outside air	Def	F/H	OH
4x	Outside air	Heat	F/H	OH
5x	Partial outside air	B/L	30°C (86°F)	On
6x	Recirculation air	Vent	F/C	On

(Blower voltage (fixed))

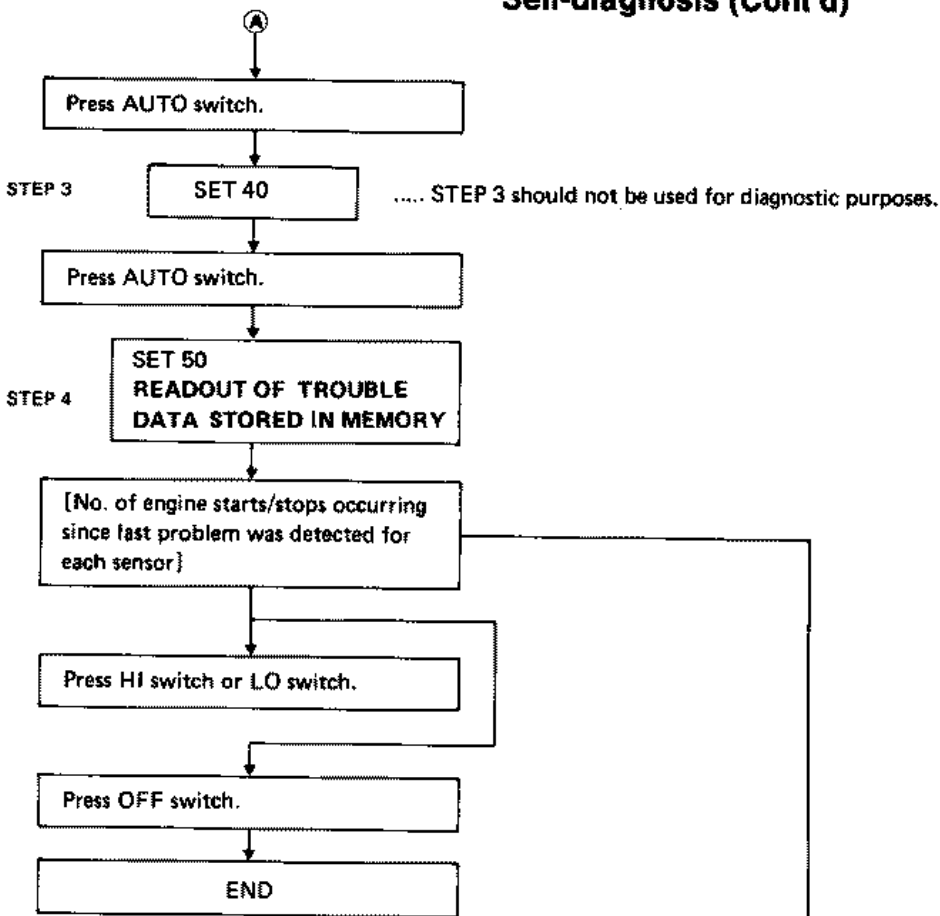
Code	Voltage
x3	4V
x4	8V
x5	9V
x6	12V

*: "x" refers to any value of 3, 4, 5 and 6.

- Note:
- Without engine running, STEP 1 and 2 are not useful for some case because compressor not operate.
 - While in the self-diagnosis mode, set temperature switch functions remain as usual.

TROUBLE DIAGNOSES — Auto Air Conditioner

Self-diagnosis (Cont'd)



Readout of trouble data stored in memory

	SET	code	Data contents	Trouble diagnosis criteria	Remarks
	SET	code			
	AMB	data			
Press LO SW.	S0		Ambient sensor trouble data	Less than -70°C (-94°F), greater than 141°C (286°F)	
	S1		Upper in-vehicle sensor trouble data		
	S2		Lower in-vehicle sensor trouble data		
	S3		Defroster (duct) sensor trouble data	Less than -38°C (-36°F) greater than 141°C (286°F)	
	S4		Vent (duct) sensor trouble data		
Press HI SW.	S5		Floor (duct) sensor trouble data		
	S6		Sunload sensor trouble data	Greater than 1.784 kW (1,534 kcal/h, 6,087 BTU/h)/m ² [19.19 kW (16,506 kcal/h, 65,502 BTU/h)/sq ft]	Detects shorted side only

Identification of trouble data

Shorted sensor trouble

Open circuit in sensor

No. of engine starts/stops occurring since last problem was detected

Trouble data = 50 : No problems
49 ~ 01 : Problem existed
0 : Problem exists

TROUBLE DIAGNOSES — Auto Air Conditioner

Self-diagnosis (Cont'd)

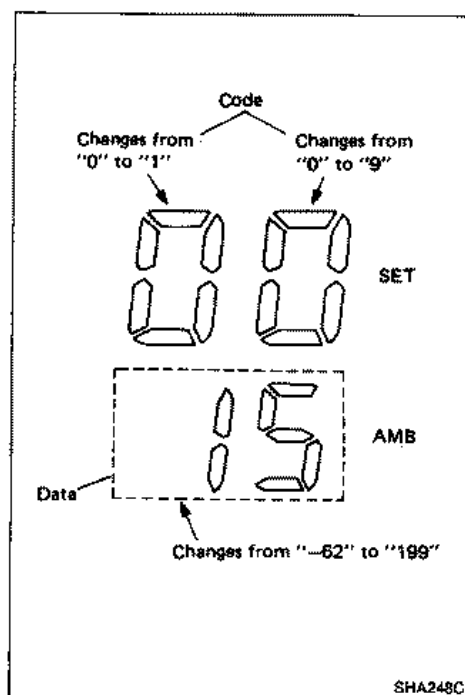
STEP 1: MONITOR DIAGNOSIS

In STEP 1 mode, "00" and "data", respectively appear in SET and AMB section of display.

Each time the "HI" switch is pressed, the code number in the SET section advances one number, and data corresponding with the code number appears in the AMB section. Each time the "LO" switch is pressed, the code number reduces by one number, and data corresponding with the code number appears in the AMB section.

If the temperature shown on the display greatly differs from the actual temperature, check the sensor circuit first, then inspect the sensor itself according to the procedures described in Electrical Components Inspection.

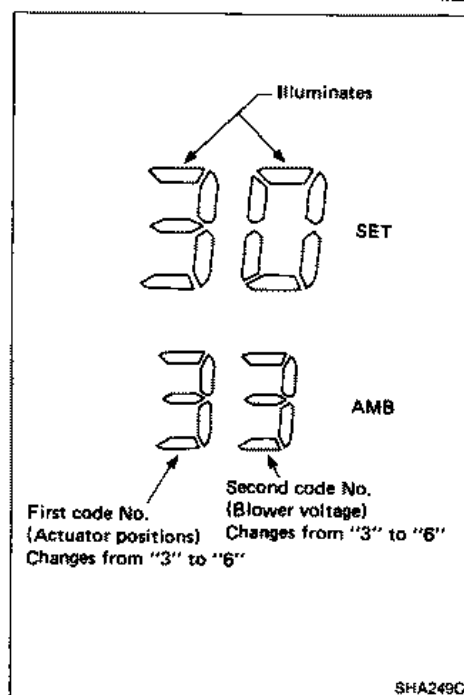
* For cross-reference of code number and corresponding data, refer to "Monitor Diagnosis" in STEP 1.



STEP 2: ACTUATOR TEST

In STEP 2 mode, "30" and "33" respectively appear in the SET and AMB sections of the display.

When the "HI" switch is pressed one time, the first code advances. This code returns to "3" after it reaches "6". Similarly, when the "LO" switch is pressed one time, the second code advances one number. After the code number "6" appears, it returns to "3".



TROUBLE DIAGNOSES — Auto Air Conditioner

Self-diagnosis (Cont'd)

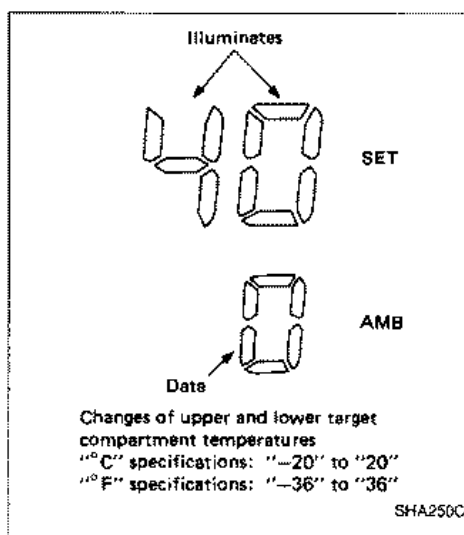
During inspection in STEP 2 mode, the auto amplifier will forcefully transmit an output to the affected actuators in response to the code No. shown on the display, as indicated in the table below. Checks must be made for improper operation visually, by listening to any noise, or by touching air outlets with your hand, etc.

First code No.	3	4	5	6
Actuator				
Mode door	DEF	HEAT	B/L	VENT
Intake door	FRE	FRE	50% FRE	REC
Air mix door	Full Hot	Full Hot	30°C (86°F)	Full Cold
Compressor	OFF	OFF	ON	ON

Second code No.	3	4	5	6
Blower motor				
Voltage	4V	6V	9V	12V

Operating condition of each actuator cannot be checked by indicators.

- * 1) First and second codes can be set independently.
- 2) When first code "5" appears, air mix door activates.
A stabilized outlet temperature 30°C (86°F) is reached after air mix door has been operating for approximately one minute.



STEP 3:AUXILIARY MECHANISM

Changes of difference between upper and lower target temperatures.

* Figures in parentheses "()" refer to values for "°F" specifications.

In STEP 3 mode, "40" and "0" (if this number is changed, the corresponding number appears) respectively appear in the SET and AMB sections of the display.

Each time the "HI" switch is pressed, the number in the AMB section advances. This number will increase up to 20 for °C specifications and 36 for °F specifications. Each time the "LO" switch is pressed, the number decreases. This number decreases to -20 for °C specifications and -36 for °F specifications. For °C specifications, pressing the "HI" or "LO" switch each time increases or decreases the data number by "1" degree (and by "1" through "3" degrees for °F specifications).

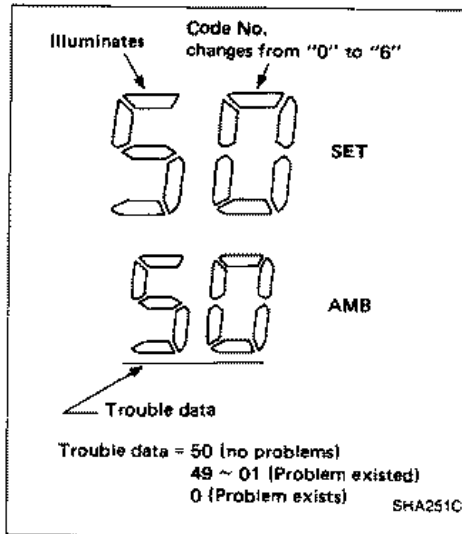
°C specifications	Data	-20	---	-1	0	1	---	20
	Difference between upper and lower target temperatures	-2.0°C	---	-1°C	0°C	0.1°C	---	2.0°C
°F specifications	Data	-36	---	-2	0	2°C	---	36
	Difference between upper and lower target temperatures	-3.6°F	---	-0.2°F	0°F	0.2°F	---	3.6°F

Difference between upper and lower target temperatures changed in the preceding procedure is kept until the next change is done or the battery cable is removed.

TROUBLE DIAGNOSES — Auto Air Conditioner

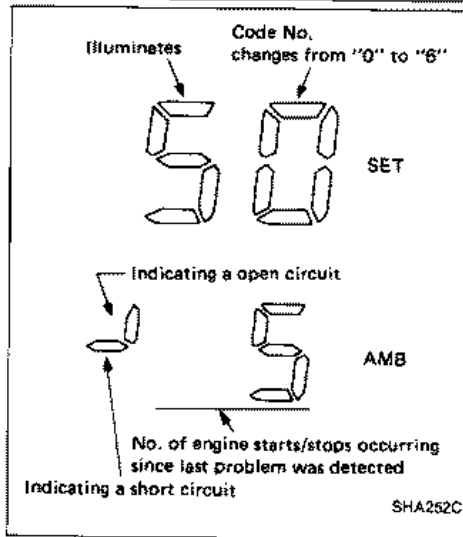
Self-diagnosis (Cont'd)

STEP 4: READOUT OF TROUBLE DATA STORED IN MEMORY



In STEP 4 mode, "50" and "trouble data" respectively appear in the SET and AMB sections.

Each time the "HI" switch is pressed, the code number advances by one number. After it reaches "6", it will return to "0". Each time the "LO" switch is pressed, the code number reduces by one number. After it reaches "0", it will return to "6".

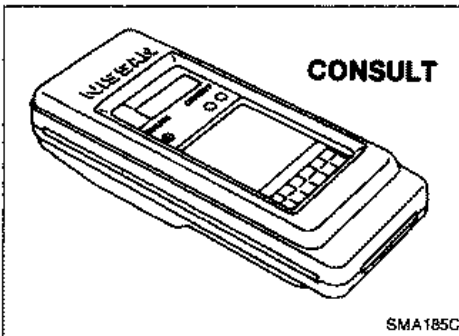


When the sensor becomes inoperative, number of engine starts/stops occurring since last problem was detected, appears in the AMB section of the display.

Open circuit or short circuit is indicated by "0" or "=".

Code No.	Sensor	Open circuit	Short circuit
50	Ambient sensor	Less than -70°C (-94°F)	Greater than 141°C (286°F)
51	Room upper sensor	Less than -38°C (-36°F)	Greater than 141°C (286°F)
52	Room lower sensor	Less than -38°C (-36°F)	Greater than 141°C (286°F)
53	DEF duct sensor	Less than -38°C (-36°F)	Greater than 141°C (286°F)
54	VENT duct sensor	Less than -38°C (-36°F)	Greater than 141°C (286°F)
55	Floor duct sensor	Less than -38°C (-36°F)	Greater than 141°C (286°F)
56	Sunload sensor	Open circuit can not be detected by self-diagnosis.	Greater than 1.784 kW ($1,534\text{ kcal/h}$, $6,087\text{ BTU/h}/\text{m}^2$ [19.19 kW ($16,506\text{ kcal/h}$, $65,502\text{ BTU/h}/\text{sq ft}$))

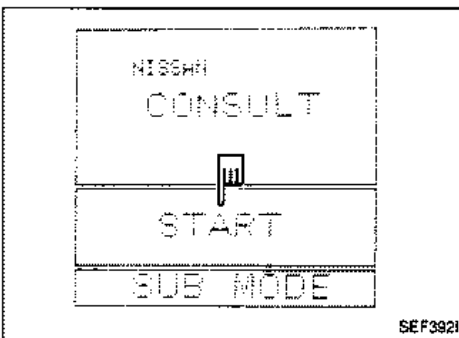
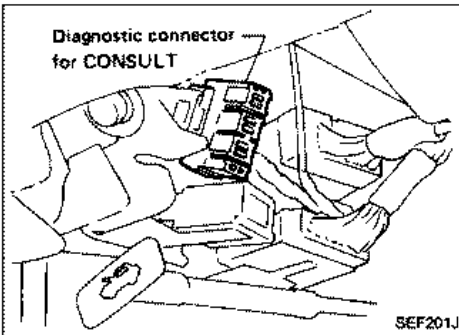
TROUBLE DIAGNOSES — Auto Air Conditioner



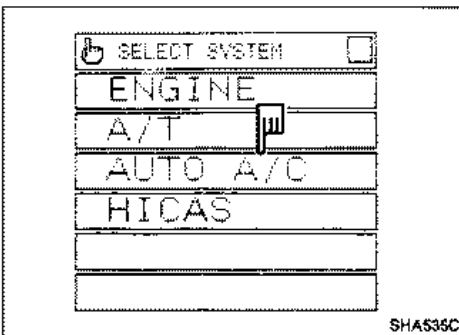
Consult

CONSULT INSPECTION PROCEDURE

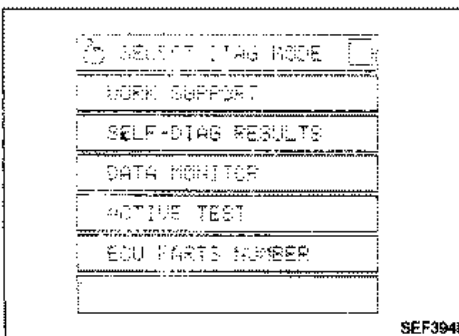
1. Turn off ignition switch.
2. Connect "CONSULT" to diagnostic connector.
(Diagnostic connector is located in left dash side panel.)



3. Turn on ignition switch.
4. Touch "START".



5. Touch "AUTO A/C".



6. Perform each diagnostic mode according to the inspection sheet as follows:

For further information, read the CONSULT Operation Manual.

TROUBLE DIAGNOSES — Auto Air Conditioner

Preliminary Check

PRELIMINARY CHECK 1

Air outlet does not change.

CHECK SENSOR CIRCUIT.

- Read out trouble data with CONSULT.
- or
- Set up self-diagnosis STEP 4. Is each sensor circuit normal?

N.G.

CHECK SENSOR CIRCUIT IN DETAIL ACCORDING TO THE DIAGNOSTIC PROCEDURE BELOW CORRESPONDING TO EACH CODE NO.

CONSULT indication	Self-diagnosis code No.	Data	How to repair	Reference page
Ambient sensor circuit is open	50	0	Go to Diagnostic procedure 2.	HA-138
Ambient sensor circuit is shorted.	50	-	Go to Diagnostic procedure 3.	HA-139
Upper in-vehicle sensor circuit is open.	51	0	Go to Diagnostic procedure 4.	HA-140
Upper in-vehicle sensor circuit is shorted.	51	-	Go to Diagnostic procedure 5.	HA-141
Lower in-vehicle sensor circuit is open.	52	0	Go to Diagnostic procedure 6.	HA-142
Lower in-vehicle sensor circuit is shorted.	52	-	Go to Diagnostic procedure 7.	HA-143
Defroster (duct) sensor circuit is open.	53	0	Go to Diagnostic procedure 8.	HA-144
Defroster (duct) sensor circuit is shorted.	53	-	Go to Diagnostic procedure 9.	HA-145
Vent (duct) sensor circuit is open.	54	1	Go to Diagnostic procedure 10.	HA-146
Vent (duct) sensor circuit is shorted.	54	-	Go to Diagnostic procedure 11.	HA-147
Floor (duct) sensor circuit is open.	55	0	Go to Diagnostic procedure 12.	HA-148
Floor (duct) sensor circuit is shorted.	55	-	Go to Diagnostic procedure 13.	HA-149
Sunload sensor circuit is shorted.	56	-	Go to Diagnostic procedure 14.	HA-150

When malfunctioning sensor circuit, ambient sensor, in-vehicle sensor, and duct sensors are suspected, it is useful to check temperature detected by each sensor with self-diagnosis STEP 1 to confirm the temperature is within normal range before performing Diagnostic Procedures.

CHECK MODE DOOR OPERATION.

- Set up "ACTIVE TEST" mode with CONSULT.
- or
- Set up self-diagnosis STEP 2.

Does air outlet change according to each mode?

Set mode	DEF	HEAT	B/L	VENT
Code No.	3X	4X	5X	6X
Air outlet	DEF	FOOT/DEF	FOOT/VENT	VENT

Refer to **AIR DISTRIBUTION**.

O.K.

N.G.

CHECK SIDE LINK MECHANISM.
Refer to **DOOR CONTROL — Auto Air Conditioner**.

N.G.

Repair or adjust.

O.K.

Go to **Diagnostic Procedure 17 or 18**.

Air outlet control system is normal.
Refer to **Outlet door control specification**.

TROUBLE DIAGNOSES — Auto Air Conditioner

Preliminary Check (Cont'd)

PRELIMINARY CHECK 2

Intake door does not change.

CHECK SENSOR CIRCUIT.

Read out trouble data with CONSULT.
or
 Set up self-diagnosis STEP 4. Is each sensor circuit normal?

N.G.

CHECK SENSOR CIRCUIT IN DETAIL ACCORDING TO THE DIAGNOSTIC PROCEDURE BELOW CORRESPONDING TO EACH CODE NO.

CONSULT indication	Self-diagnosis code No./data		How to repair	Reference page
	Code No.	Data		
Ambient sensor circuit is open.	51	0	Go to Diagnostic procedure 2.	HA-138
Ambient sensor circuit is shorted.	51	-	Go to Diagnostic procedure 3.	HA-139
Upper in-vehicle sensor circuit is open.	51	0	Go to Diagnostic procedure 4.	HA-140
Upper in-vehicle sensor circuit is shorted.	51	-	Go to Diagnostic procedure 5.	HA-141
Lower in-vehicle sensor circuit is open.	52	0	Go to Diagnostic procedure 6.	HA-142
Lower in-vehicle sensor circuit is shorted.	52	-	Go to Diagnostic procedure 7.	HA-143
Defroster (duct) sensor circuit is open.	53	0	Go to Diagnostic procedure 8.	HA-144
Defroster (duct) sensor circuit is shorted.	53	-	Go to Diagnostic procedure 9.	HA-145
Vent (duct) sensor circuit is open.	54	0	Go to Diagnostic procedure 10.	HA-146
Vent (duct) sensor circuit is shorted.	54	-	Go to Diagnostic procedure 11.	HA-147
Floor (duct) sensor circuit is open.	55	0	Go to Diagnostic procedure 12.	HA-148
Floor (duct) sensor circuit is shorted.	55	-	Go to Diagnostic procedure 13.	HA-149
Sunload sensor circuit is shorted.	56	-	Go to Diagnostic procedure 14.	HA-150

When malfunctioning sensor circuit, ambient sensor, in-vehicle sensor, and duct sensors are suspected, it is useful to check temperature detected by each sensor with self-diagnosis STEP 1 to confirm the temperature is within normal range before performing Diagnostic Procedures.

O.K.

CHECK INTAKE DOOR MOTOR.

Set up "ACTIVE TEST" mode with CONSULT.
or
 Set up self-diagnosis STEP 2.

Does intake air change according to each ordered position?

Set position	FRE		FRE/REC	REC
	Code No.	3X	4X	5X
Code No.	3X	4X	5X	6X
Air intake	FRE	FRE/REC	REC	

O.K.

N.G.

Intake door control system is normal.
Refer to Intake door control specification.

CHECK INTAKE DOOR ROD or LEVER MECHANISM.
Refer to **DOOR CONTROL — Auto Air Conditioner.**

N.G.

Repair or adjust.

O.K.

Go to Diagnostic Procedure 16.

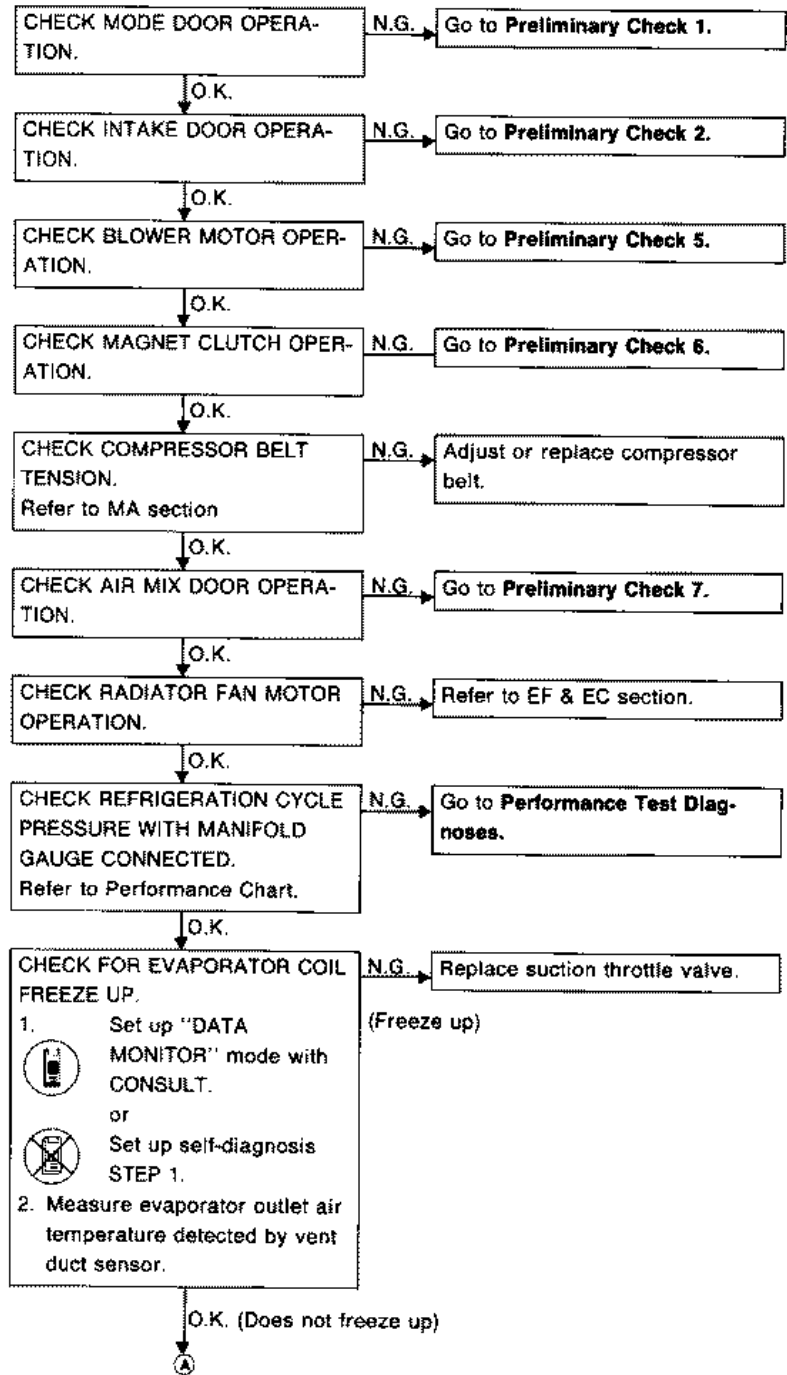
TROUBLE DIAGNOSES — Auto Air Conditioner

Preliminary Check (Cont'd)

PRELIMINARY CHECK 3

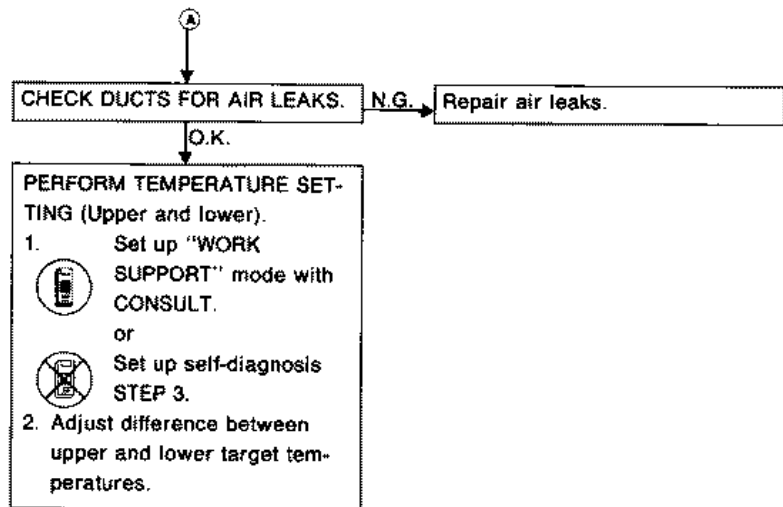
Insufficient cooling

- Read out self-diagnosis result with CONSULT or perform self-diagnosis STEP 4 before referring to the following flow chart.



TROUBLE DIAGNOSES — Auto Air Conditioner

Preliminary Check (Cont'd)



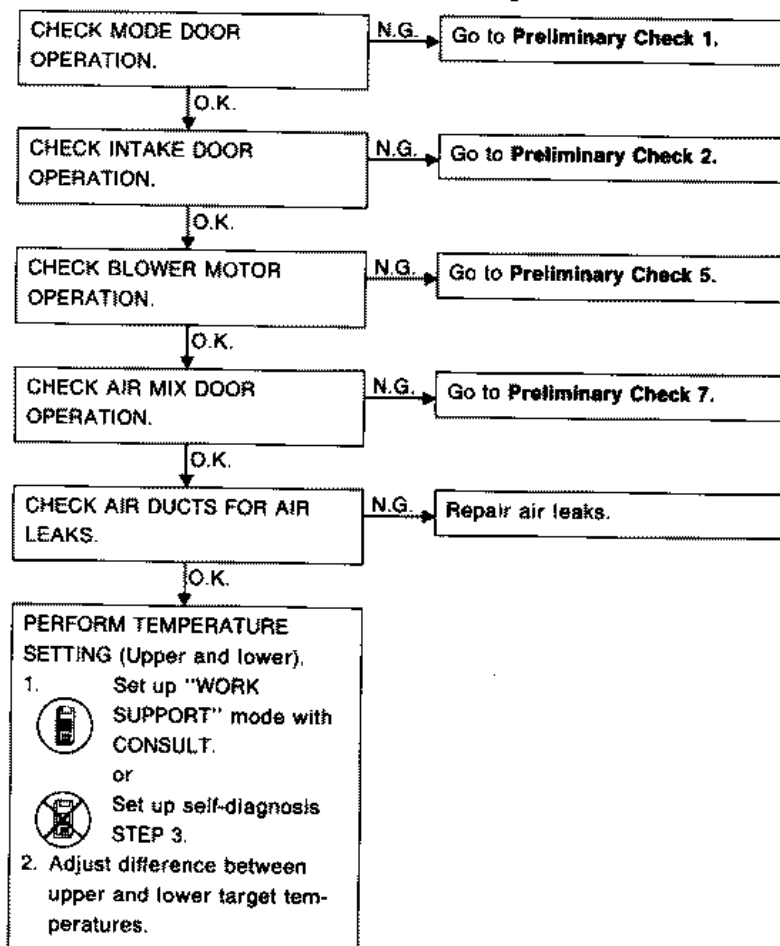
TROUBLE DIAGNOSES — Auto Air Conditioner

Preliminary Check (Cont'd)

PRELIMINARY CHECK 4

Insufficient heating

- Check coolant level, engine temperature and heater hoses and read out self-diagnosis result with CONSULT or perform self-diagnosis STEP 4 before referring to the following flow chart.

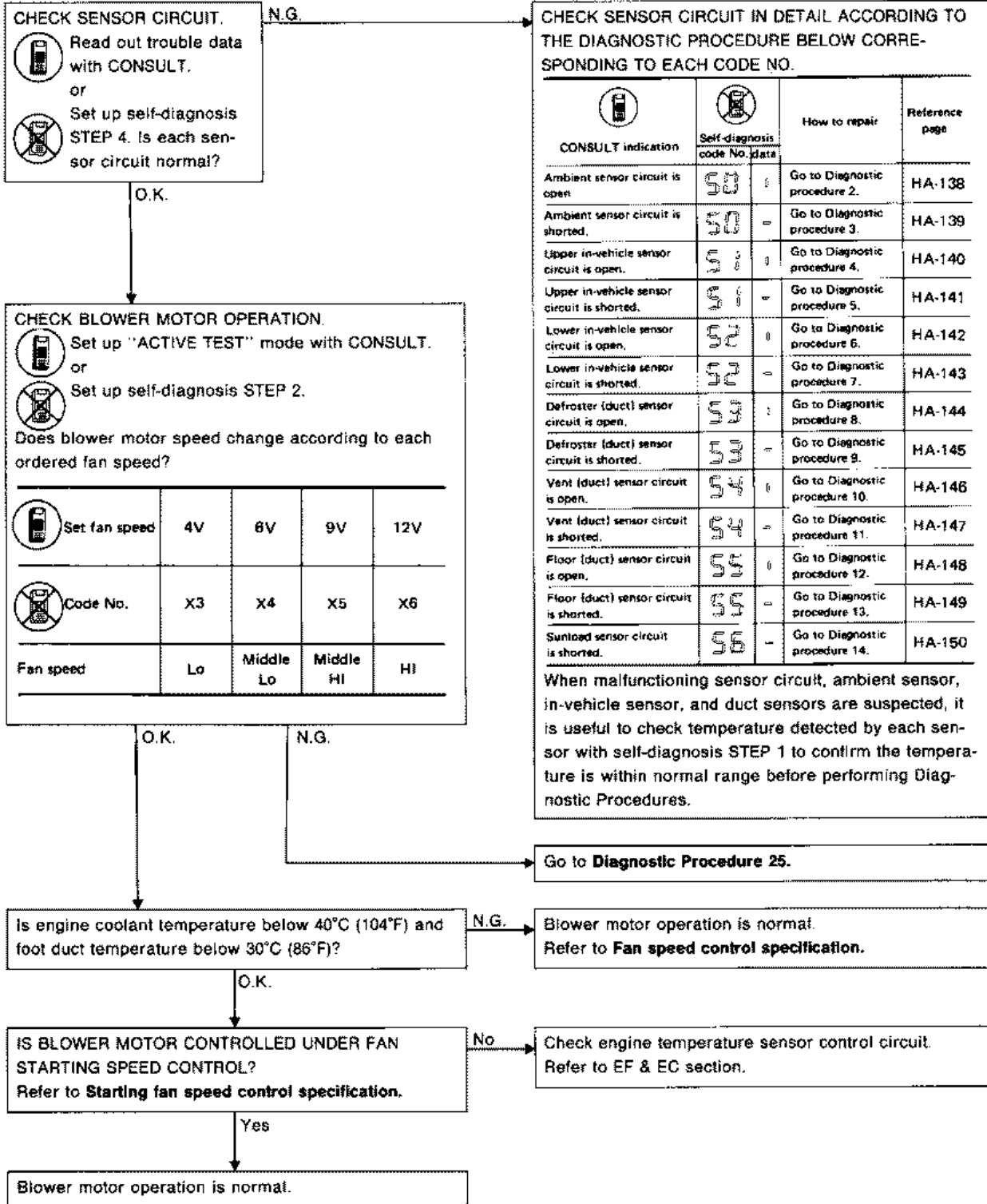


TROUBLE DIAGNOSES — Auto Air Conditioner

Preliminary Check (Cont'd)

PRELIMINARY CHECK 5

Blower motor operation is malfunctioning.

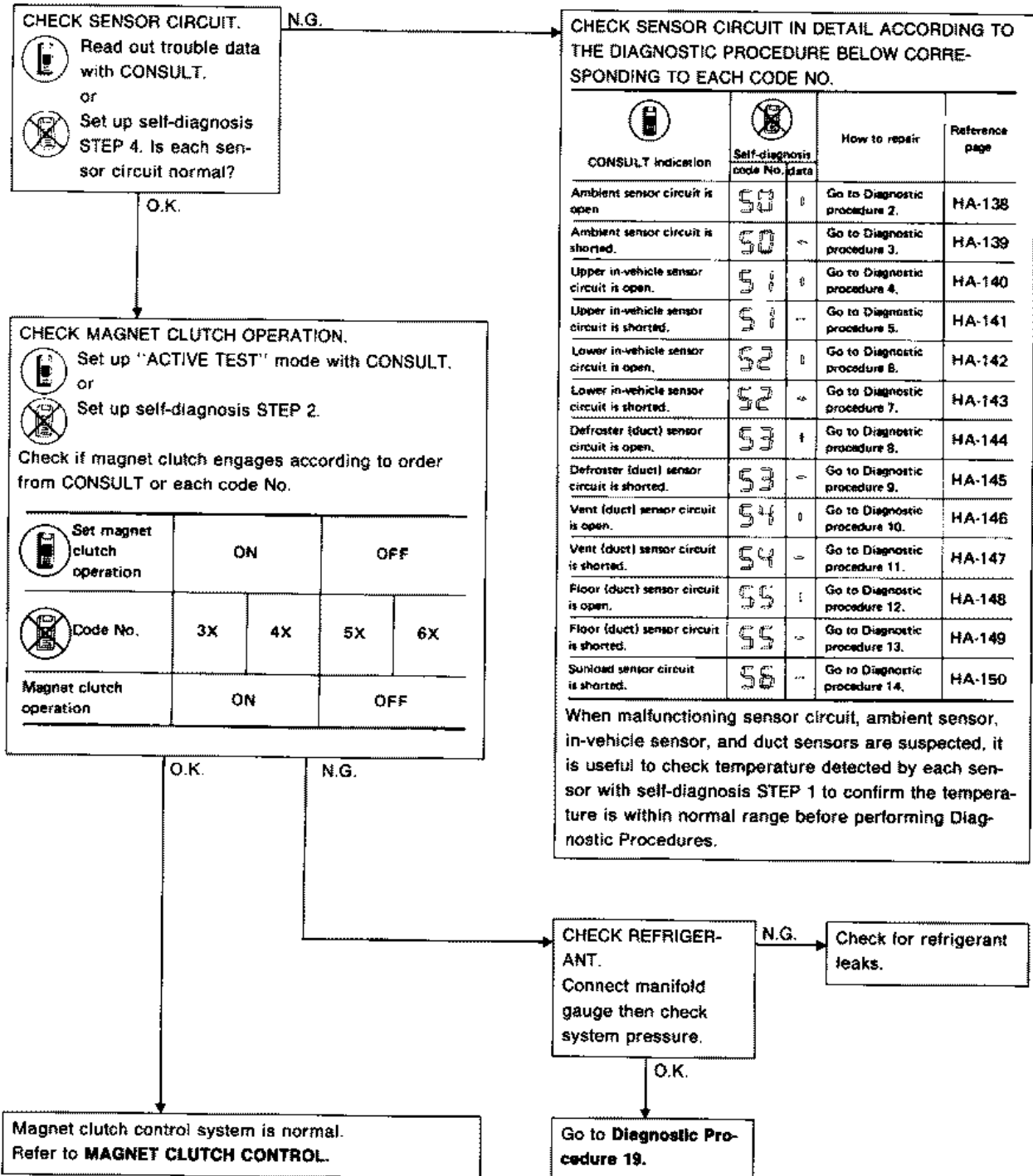


TROUBLE DIAGNOSES — Auto Air Conditioner

Preliminary Check (Cont'd)

PRELIMINARY CHECK 6

Magnet clutch does not engage.

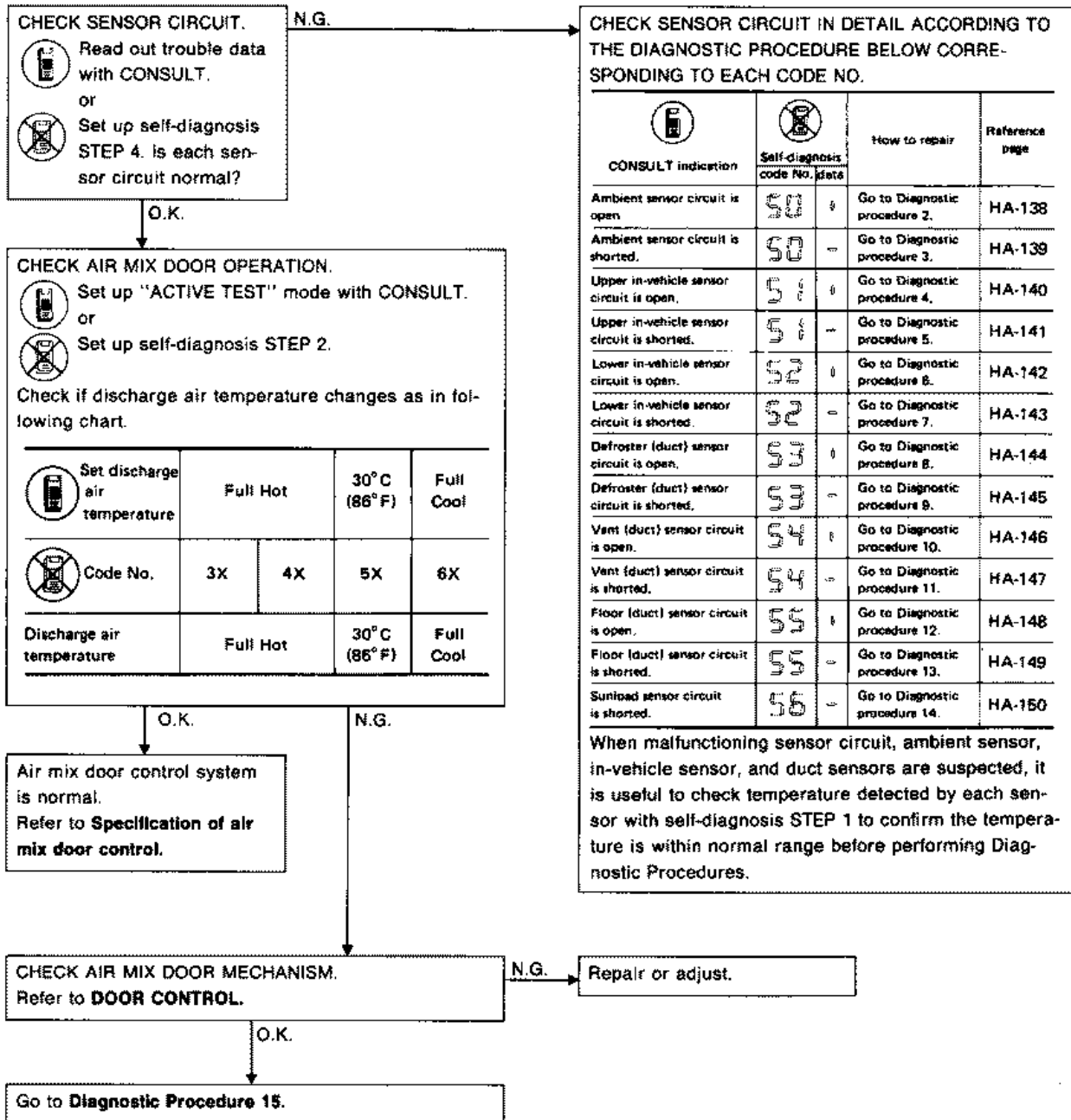


TROUBLE DIAGNOSES — Auto Air Conditioner

Preliminary Check (Cont'd)

PRELIMINARY CHECK 7

Discharged air temperature does not change.



PRELIMINARY CHECK 8

Noise

Refer to page HA-71.

TROUBLE DIAGNOSES — Auto Air Conditioner

Main Power Supply and Ground Circuit Check

POWER SUPPLY CIRCUIT CHECK FOR A/C SYSTEM

Check power supply circuit for air conditioning system.

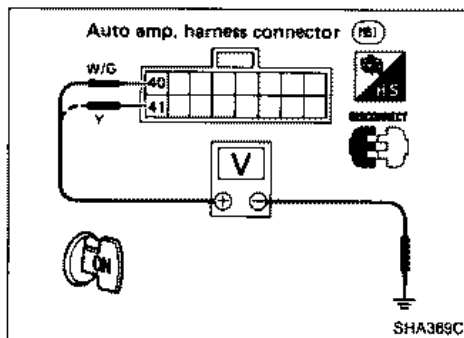
Refer to "POWER SUPPLY ROUTING" in section EL and A/C ELECTRICAL CIRCUIT — Auto Air Conditioner.

AUTO AMP. REMOVAL

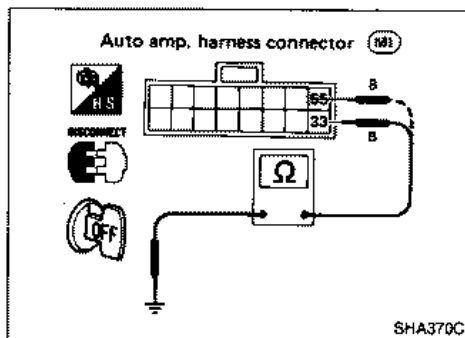
1. Remove driver side instrument lower lid.
2. Remove vent duct.
3. Remove auto amp. with harness connected.

AUTO AMP. CHECK

1. Disconnect auto amp. harness connectors.
2. Connect voltmeter from harness side.
3. Measure voltage across terminal No. 40 or No. 41 and body ground.



Voltmeter terminal		Voltage (Approx.)
⊕	⊖	
40	Body ground	12V
41		



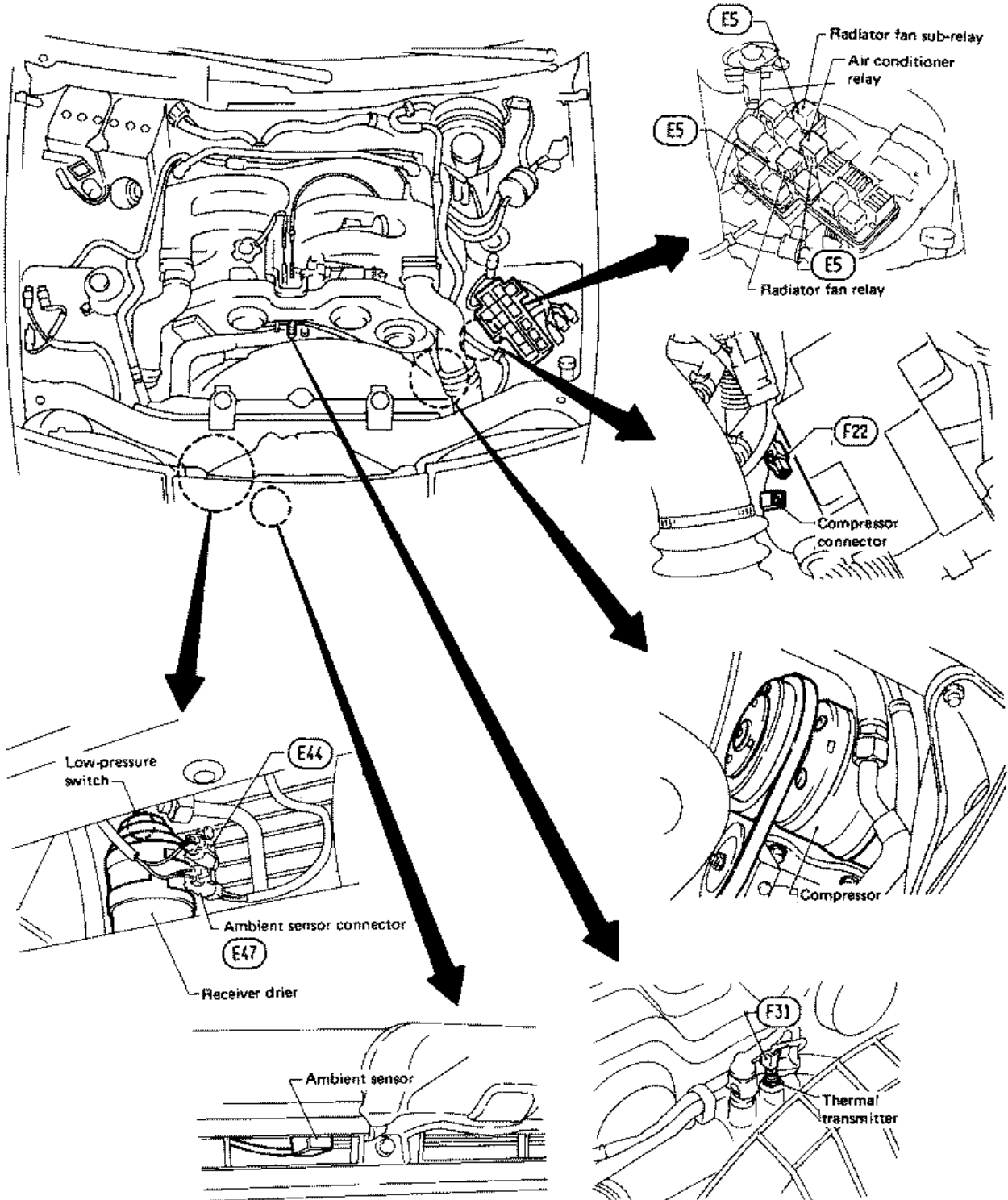
Check body ground circuit for control unit with ignition switch OFF

1. Disconnect auto amp. harness connector.
2. Connect ohmmeter from harness side.
3. Check continuity between terminal No. 33 or 55 and body ground.

TROUBLE DIAGNOSES — Auto Air Conditioner

Harness Layout for A/C System

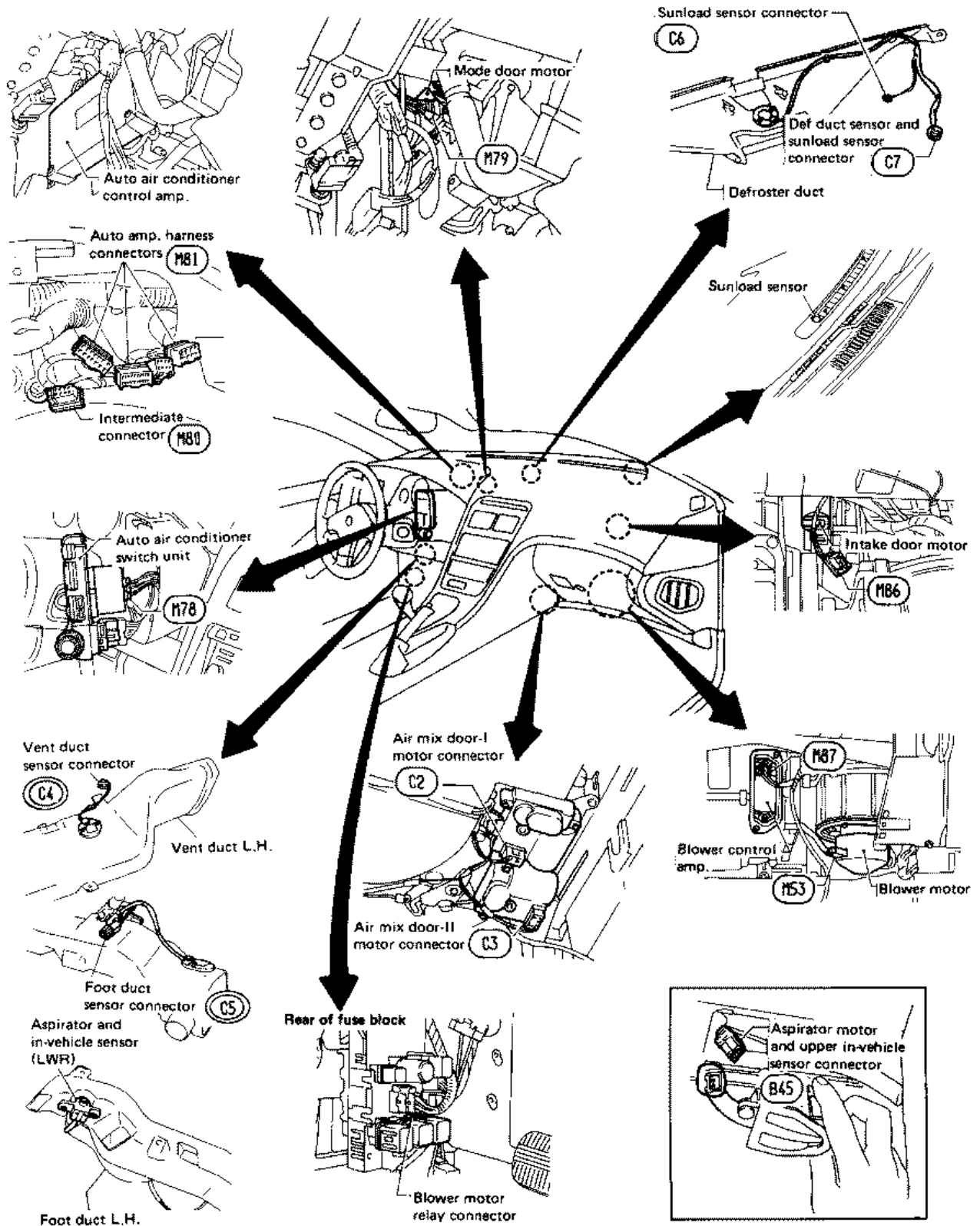
Engine compartment



TROUBLE DIAGNOSES — Auto Air Conditioner

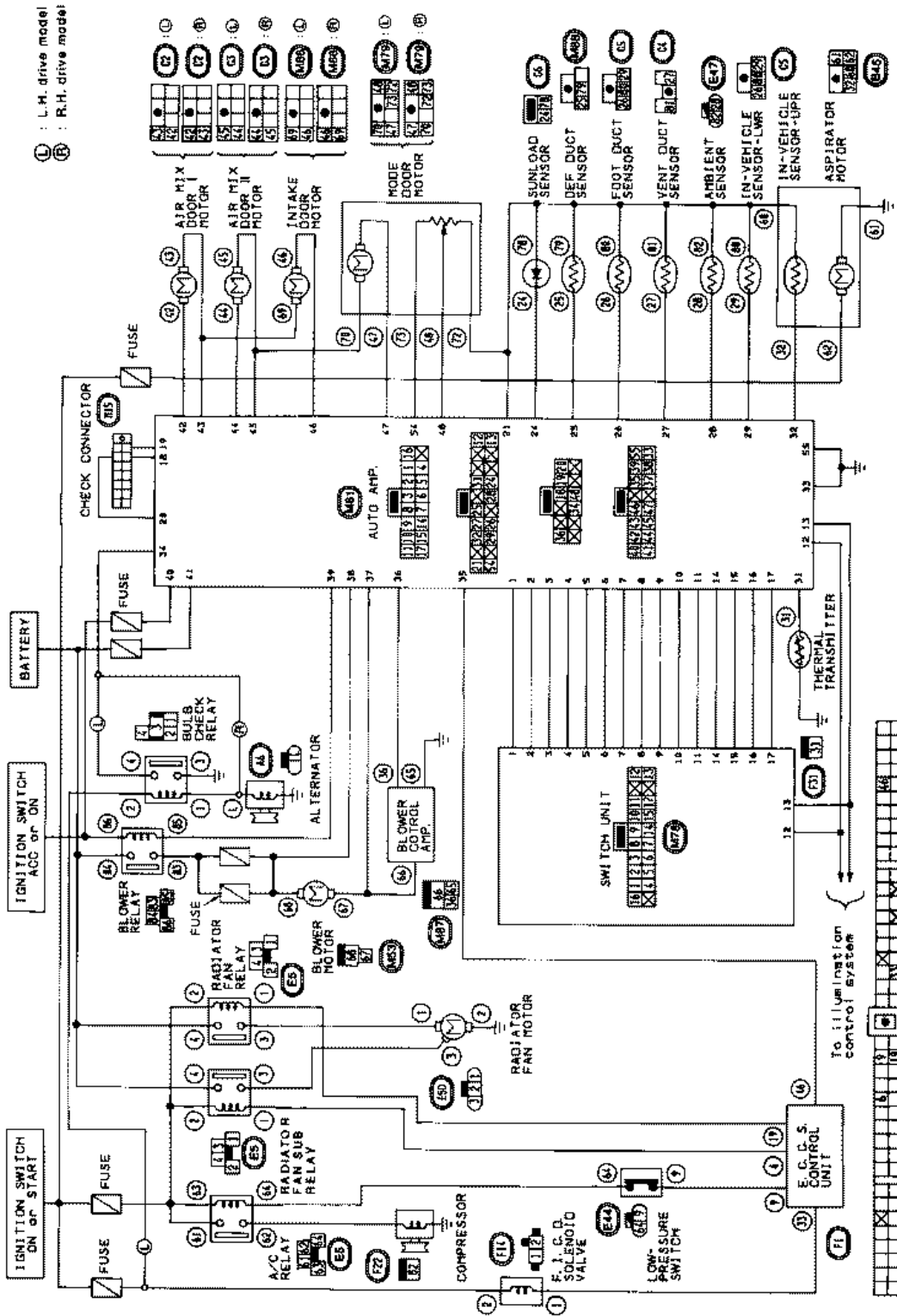
Harness Layout for A/C System (Cont'd)

Passenger compartment



TROUBLE DIAGNOSES — Auto Air Conditioner

Circuit Diagram for Quick Pinpoint Check



- All connectors shown in this illustration are unit side connectors.
- The unit side connectors with a double circle "⊖" are connected to the harness side connectors shown in the "Harness Layout for A/C System". (See pages HA-134 - HA-135.)
- The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle "⊙".

SHA696C

TROUBLE DIAGNOSES — Auto Air Conditioner

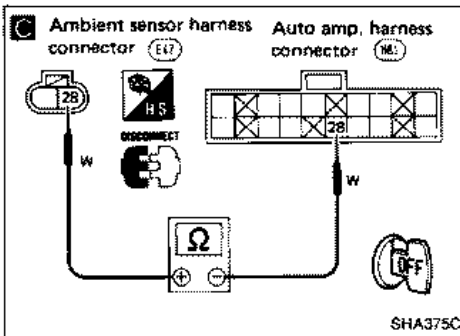
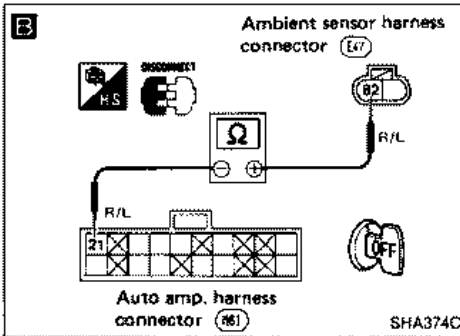
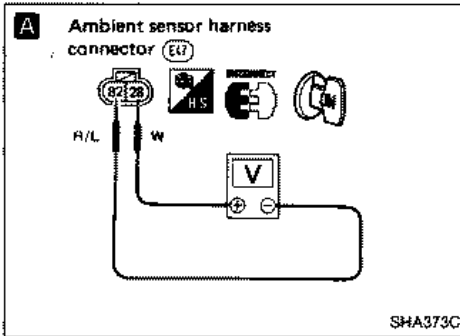
Diagnostic Procedure 1

SYMPTOM: Self-diagnosis detects intermittent short or open circuit in each sensor circuit.

Check each connector connection as shown in the following table, and check the condition of each wire.

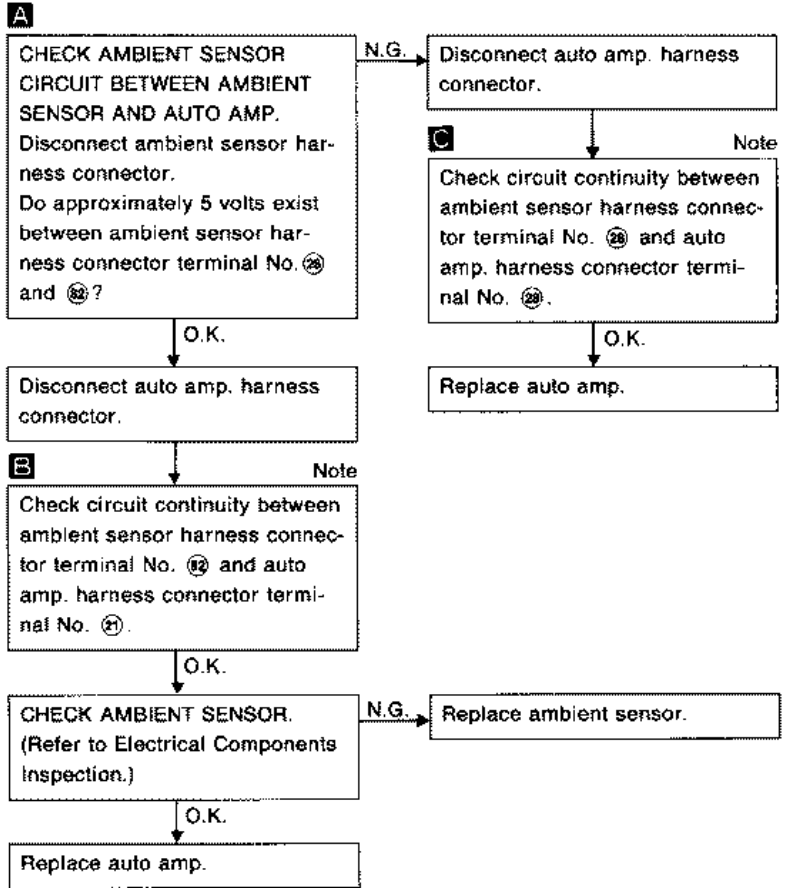
Malfunctioning circuit	Connector No. to be checked			
	Main harness	Engine room harness	Body harness	A/C sub-harness
Ambient sensor				
(L.H.D. model)	(M59) (M81)	(E47) (E112)		
(R.H.D. model)	(M8) (M81)	(E47) (E103)		
Upper in-vehicle sensor				
(L.H.D. model)	(M4) (M81)		(B2) (B45)	
(R.H.D. model)	(M5) (M81)		(B3)	
Lower in-vehicle sensor				
DEF duct sensor		(M81) (M89)		(C1) (C5)
VENT duct sensor		(M80) (M81)		(C1) (C4)
Floor duct sensor		(M80) (M81)		(C1) (C5)
Sunload sensor		(M81) (M86)		(C6) (C7)

TROUBLE DIAGNOSES — Auto Air Conditioner



Diagnostic Procedure 2

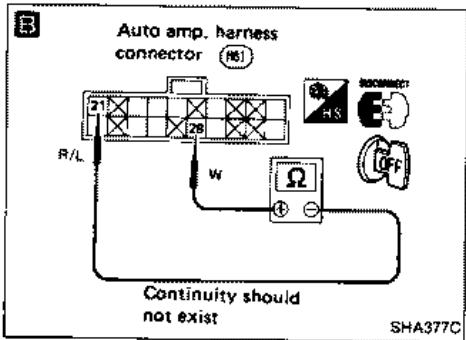
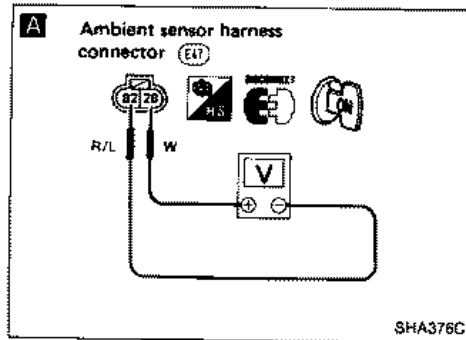
SYMPTOM: Ambient sensor circuit is open. (CONSULT or self-diagnosis STEP 4 indicates this.)



Note:

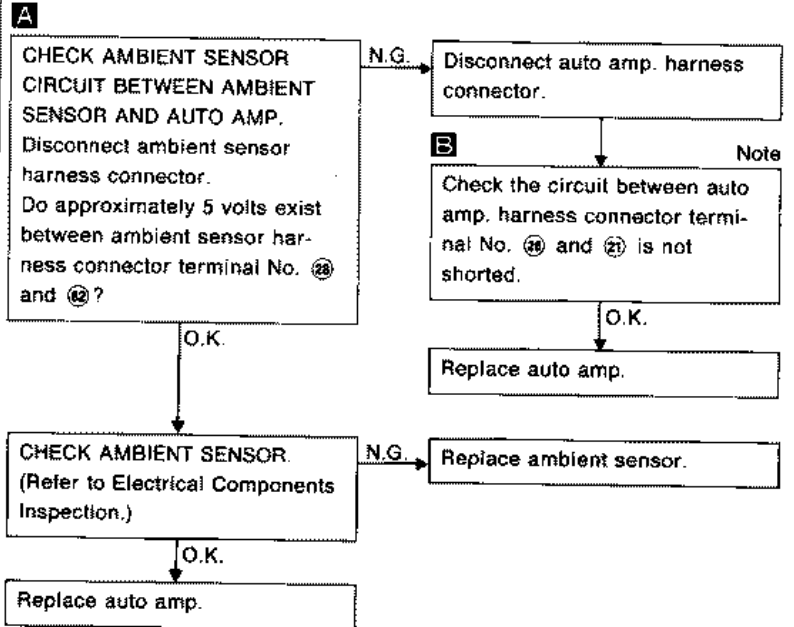
If the result is N.G. after checking circuit continuity, repair harness or connector.

TROUBLE DIAGNOSES — Auto Air Conditioner

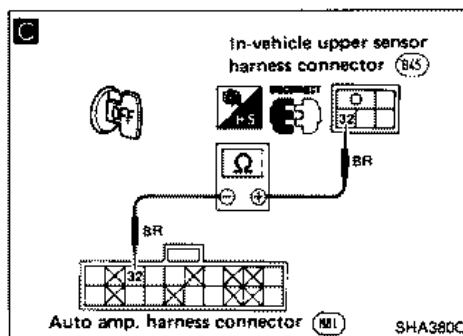
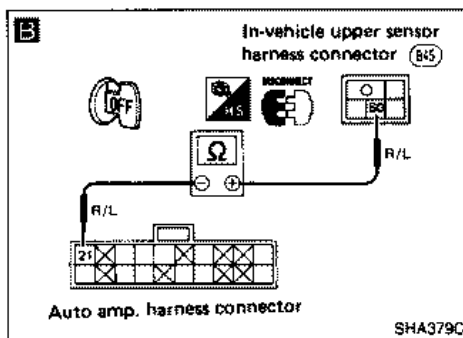
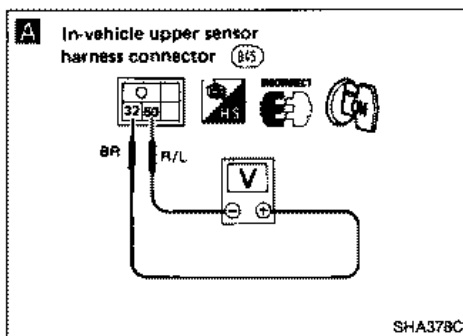


Diagnostic Procedure 3

SYMPTOM: Ambient sensor circuit is shorted. (CONSULT or self-diagnosis STEP 4 indicates this.)

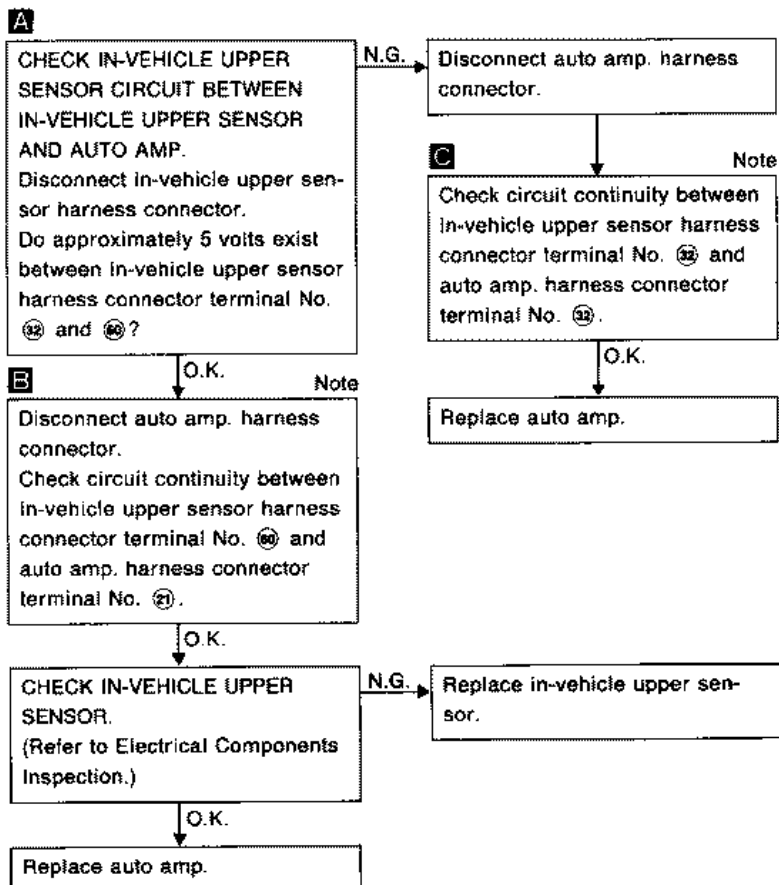


TROUBLE DIAGNOSES — Auto Air Conditioner



Diagnostic Procedure 4

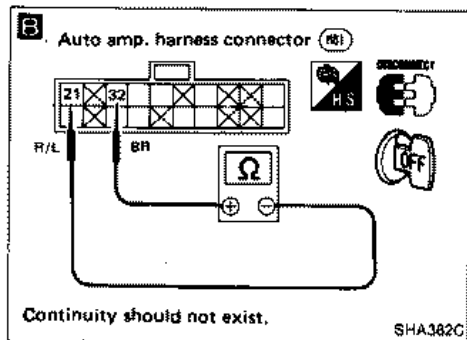
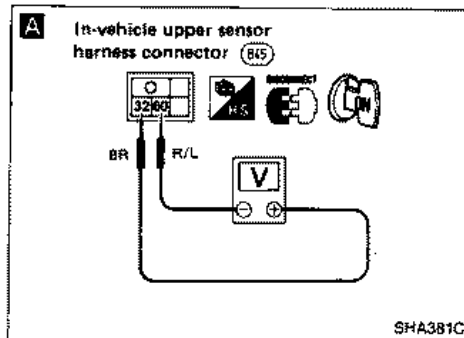
SYMPTOM: Upper in-vehicle sensor circuit is open. (CONSULT or self-diagnosis STEP 4 indicates this.)



Note:

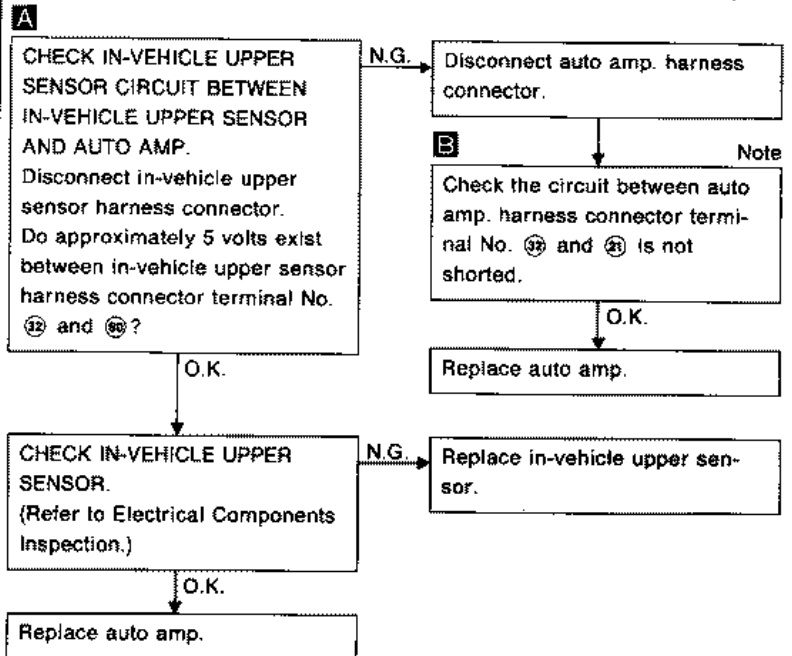
If the result is N.G. after checking circuit continuity, repair harness or connector.

TROUBLE DIAGNOSES — Auto Air Conditioner



Diagnostic Procedure 5

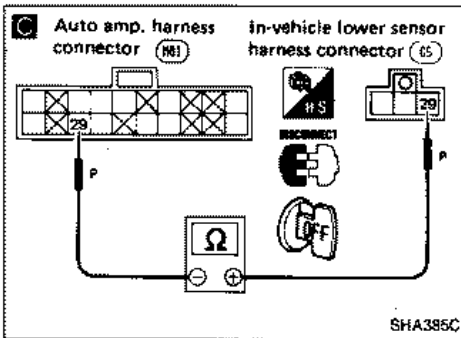
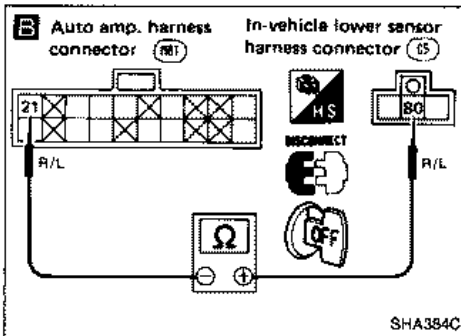
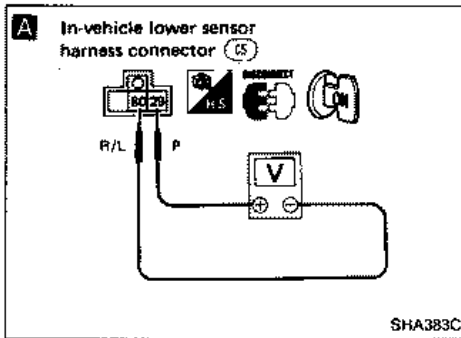
SYMPTOM: Upper in-vehicle sensor circuit is shorted. (CONSULT or self-diagnosis STEP 4 indicates this.)



Note:

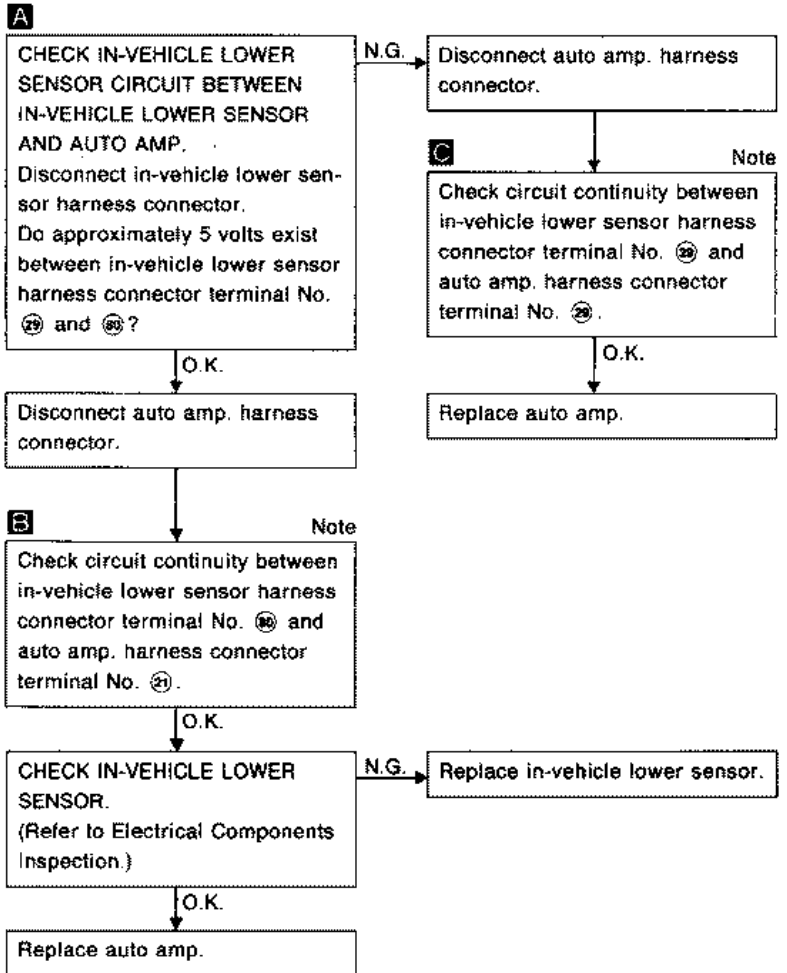
If the result is N.G. after checking circuit continuity, repair harness or connector.

TROUBLE DIAGNOSES — Auto Air Conditioner



Diagnostic Procedure 6

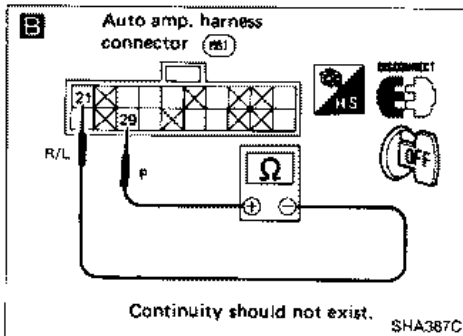
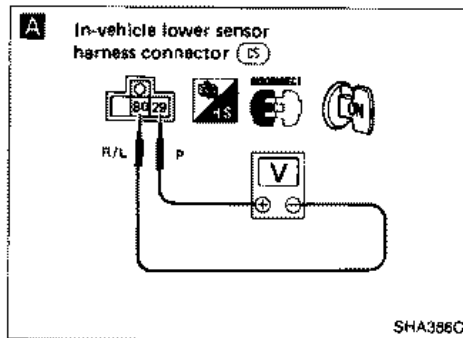
SYMPTOM: Lower in-vehicle sensor circuit is open. (CONSULT or self-diagnosis STEP 4 indicates this.)



Note:

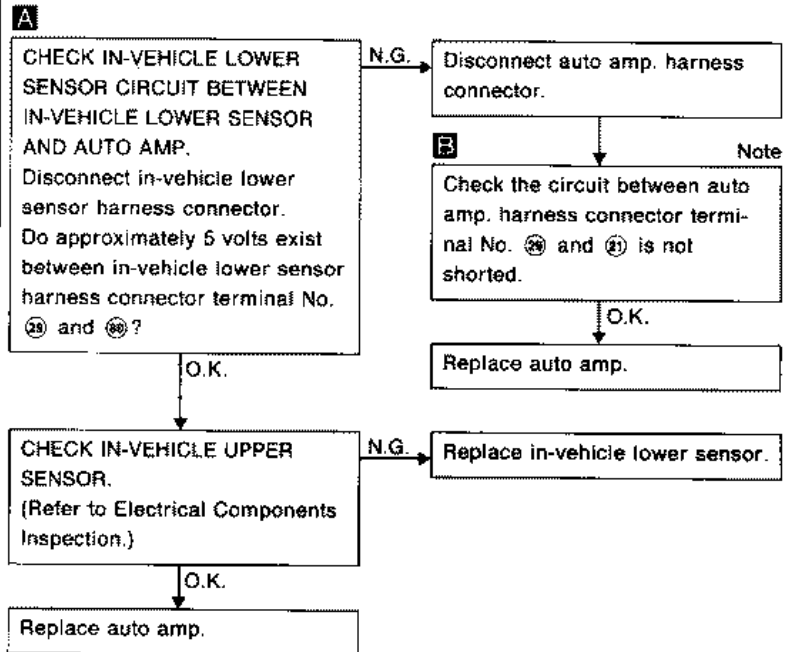
If the result is N.G. after checking circuit continuity, repair harness or connector.

TROUBLE DIAGNOSES — Auto Air Conditioner

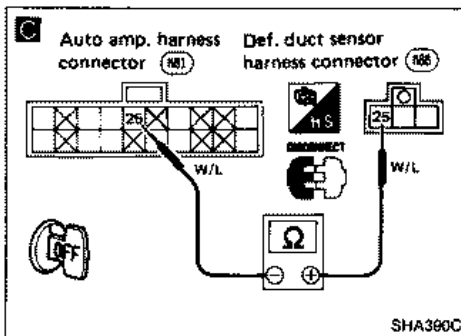
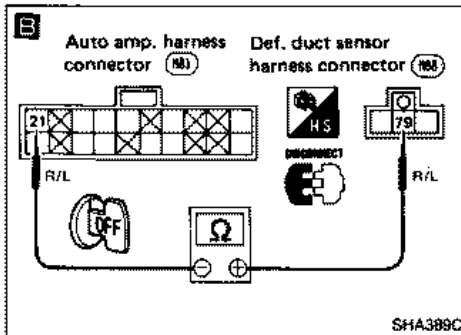
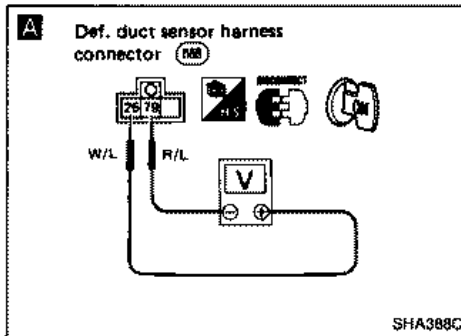


Diagnostic Procedure 7

SYMPTOM: Lower in-vehicle sensor circuit is shorted. (CONSULT or self-diagnosis STEP 4 indicates this.)

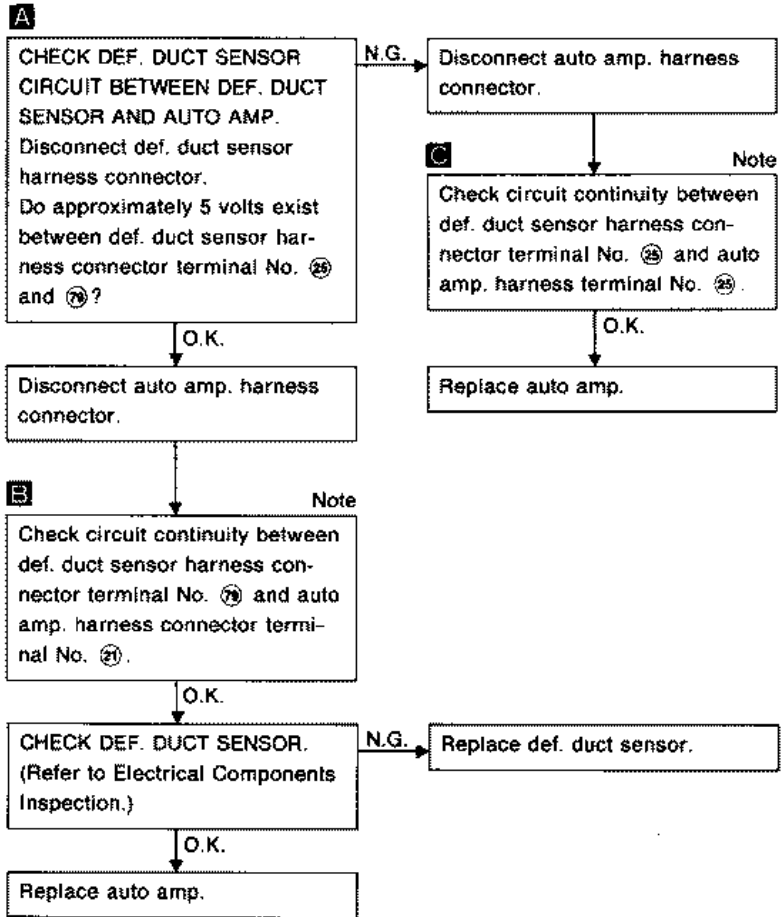


TROUBLE DIAGNOSES — Auto Air Conditioner



Diagnostic Procedure 8

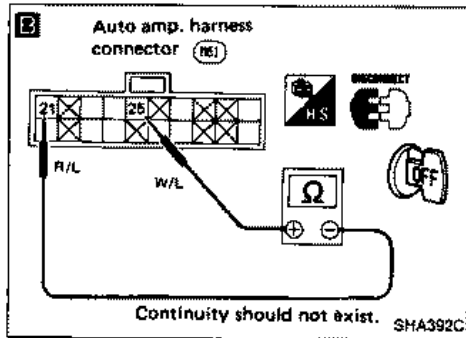
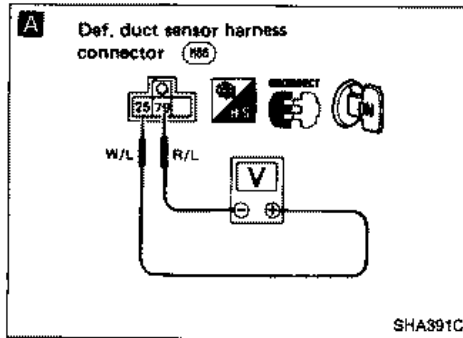
SYMPTOM: Def. duct sensor circuit is open. (CONSULT or self-diagnosis STEP 4 indicates this.)



Note:

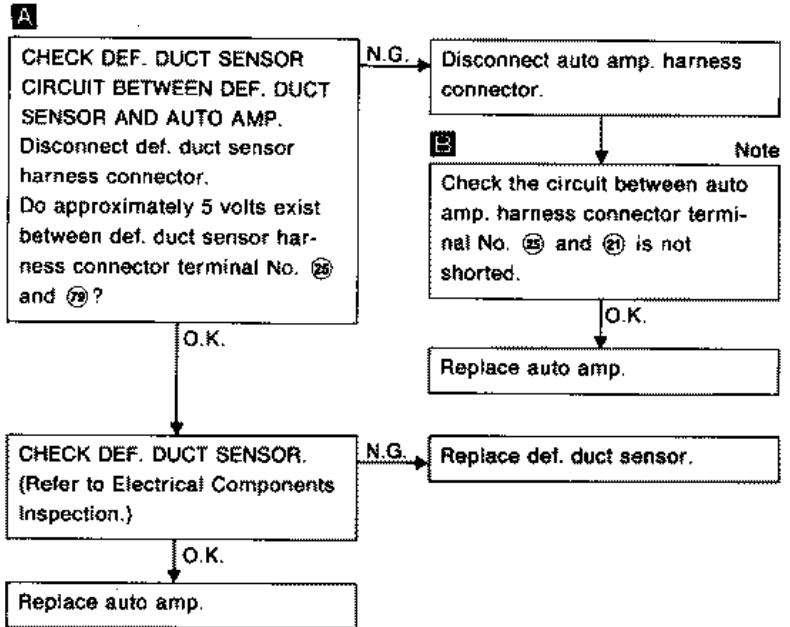
If the result is N.G. after checking circuit continuity, repair harness or connector.

TROUBLE DIAGNOSES — Auto Air Conditioner



Diagnostic Procedure 9

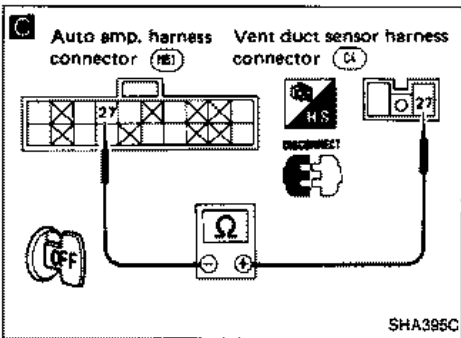
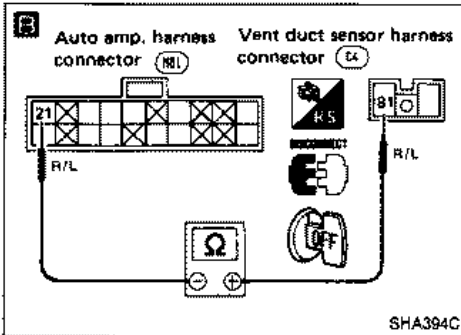
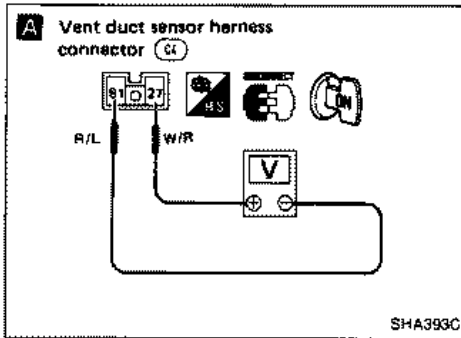
SYMPTOM: Def. duct sensor circuit is shorted. (CONSULT or self-diagnosis STEP 4 indicates this.)



Note:

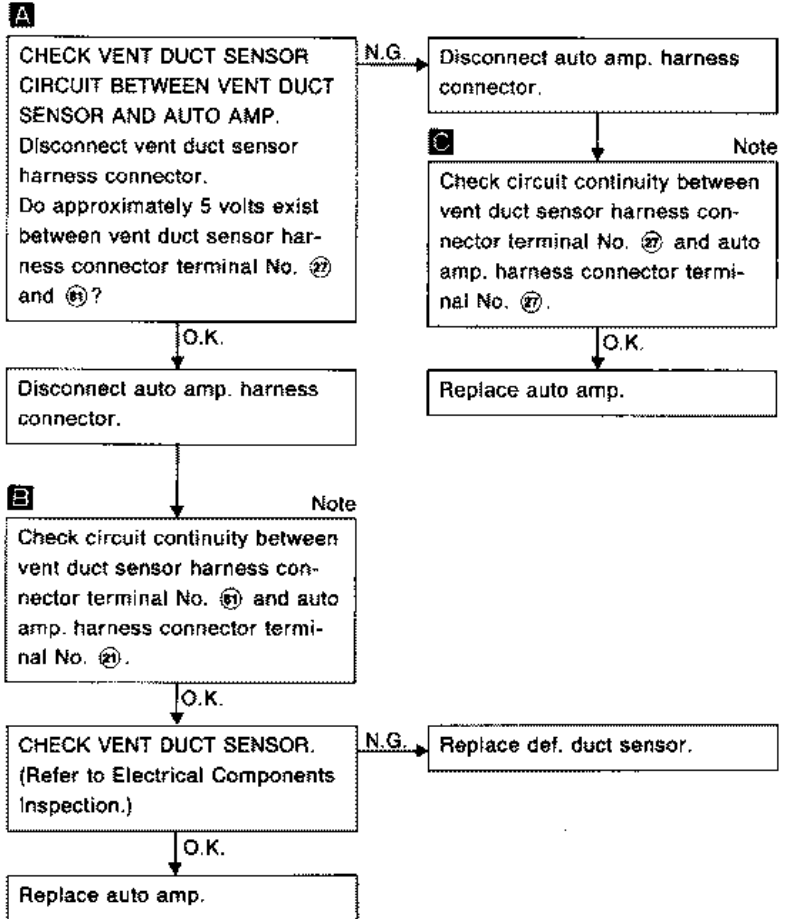
If the result is N.G. after checking circuit continuity, repair harness or connector.

TROUBLE DIAGNOSES — Auto Air Conditioner



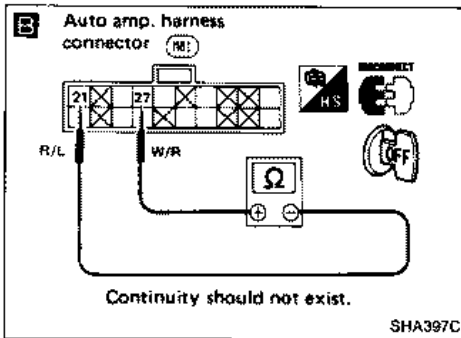
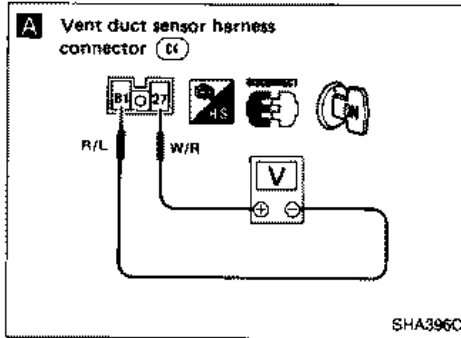
Diagnostic Procedure 10

SYMPTOM: Vent duct sensor circuit is open. (CONSULT or self-diagnosis STEP 4 indicates this.)



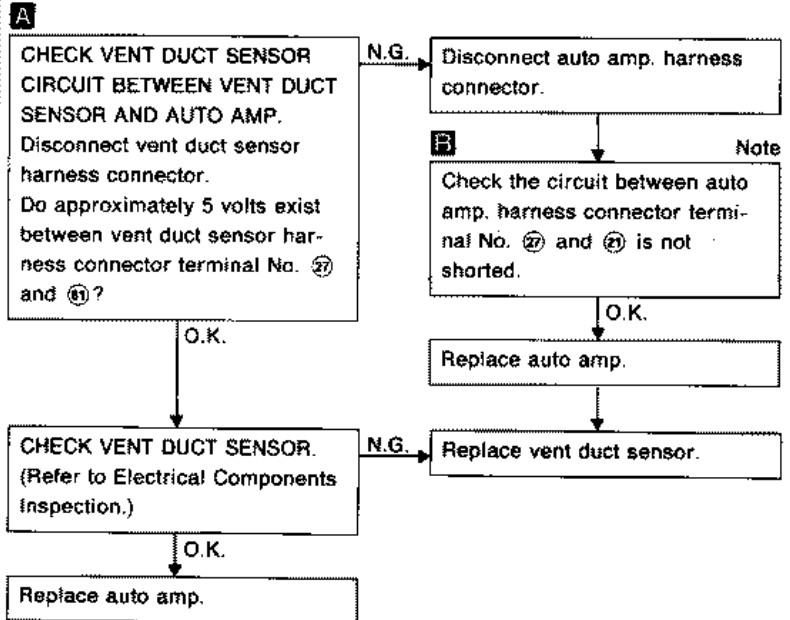
Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

TROUBLE DIAGNOSES — Auto Air Conditioner



Diagnostic Procedure 11

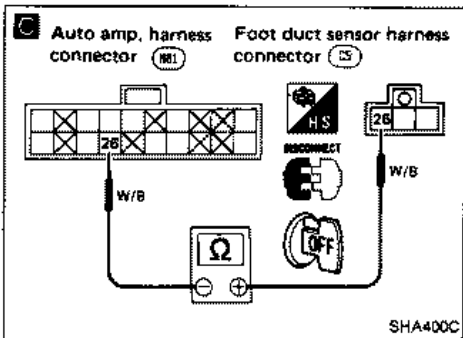
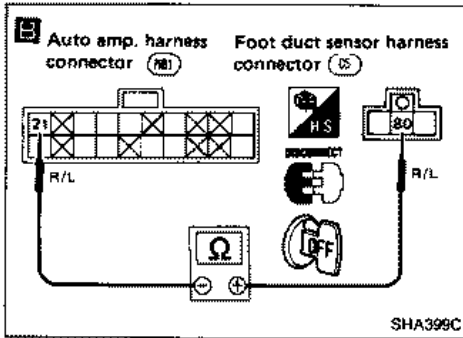
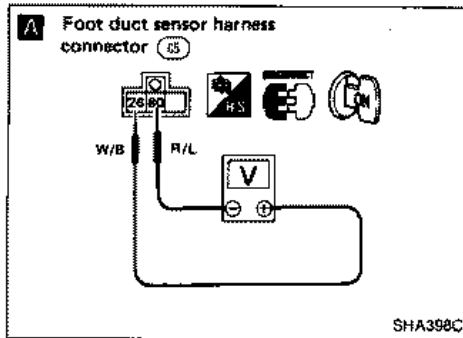
SYMPTOM: Vent duct sensor circuit is shorted. (CONSULT or self-diagnosis STEP 4 indicates this.)



Note:

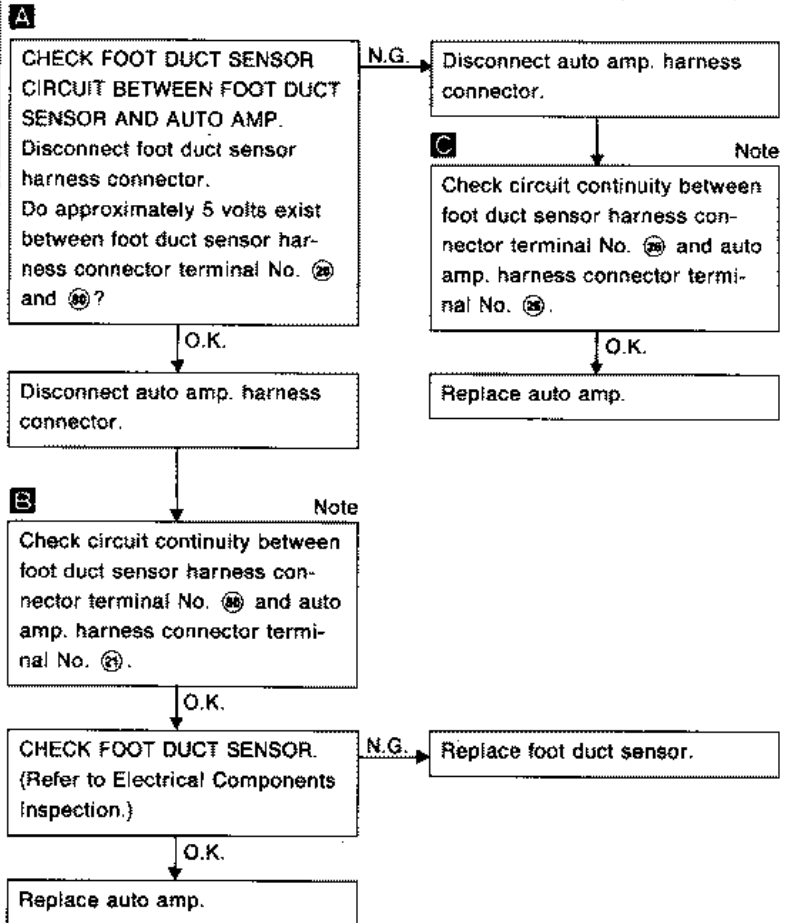
If the result is N.G. after checking circuit continuity, repair harness or connector.

TROUBLE DIAGNOSES — Auto Air Conditioner



Diagnostic Procedure 12

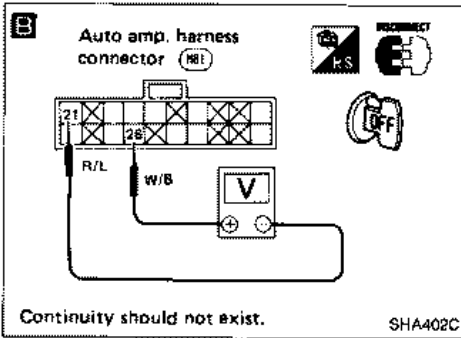
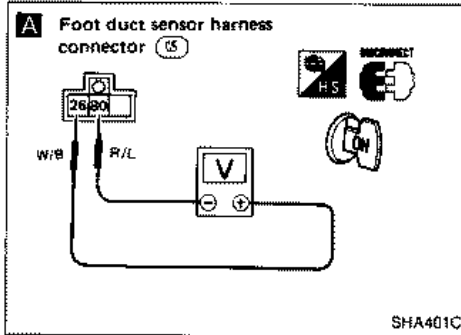
SYMPTOM: Floor duct sensor circuit is open. (CONSULT or self-diagnosis STEP 4 indicates this.)



Note:

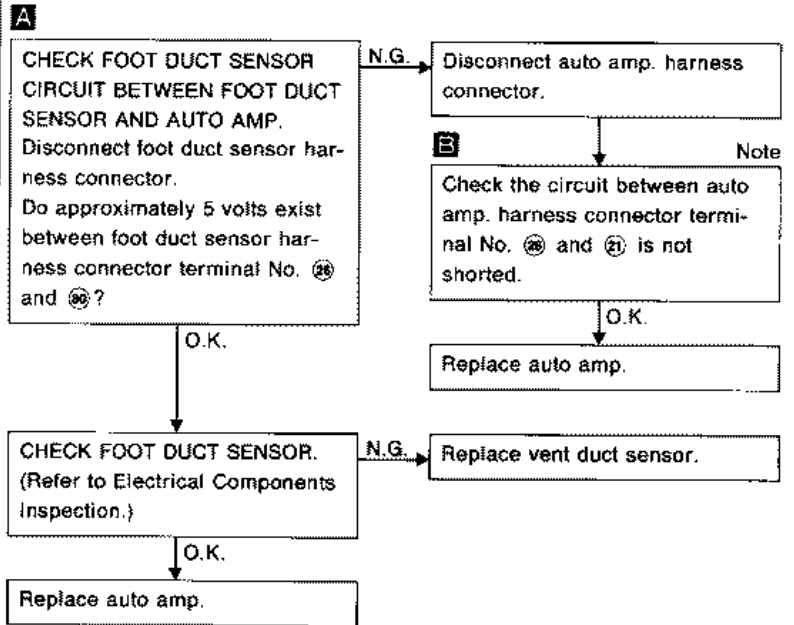
If the result is N.G. after checking circuit continuity, repair harness or connector.

TROUBLE DIAGNOSES — Auto Air Conditioner



Diagnostic Procedure 13

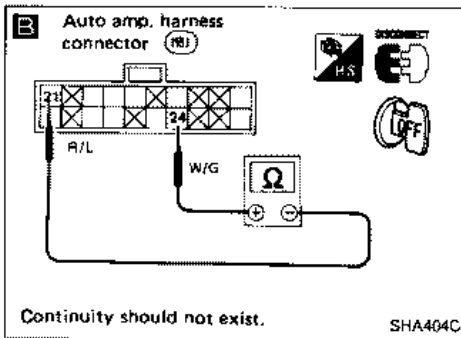
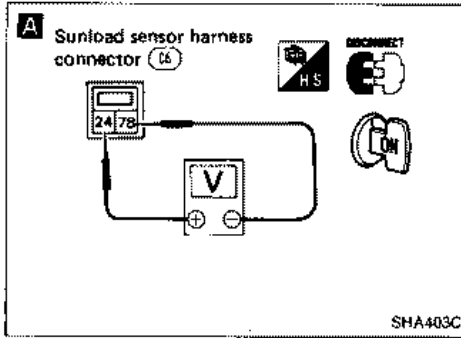
SYMPTOM: Floor duct sensor circuit is shorted. (CONSULT or self-diagnosis STEP 4 indicates this.)



Note:

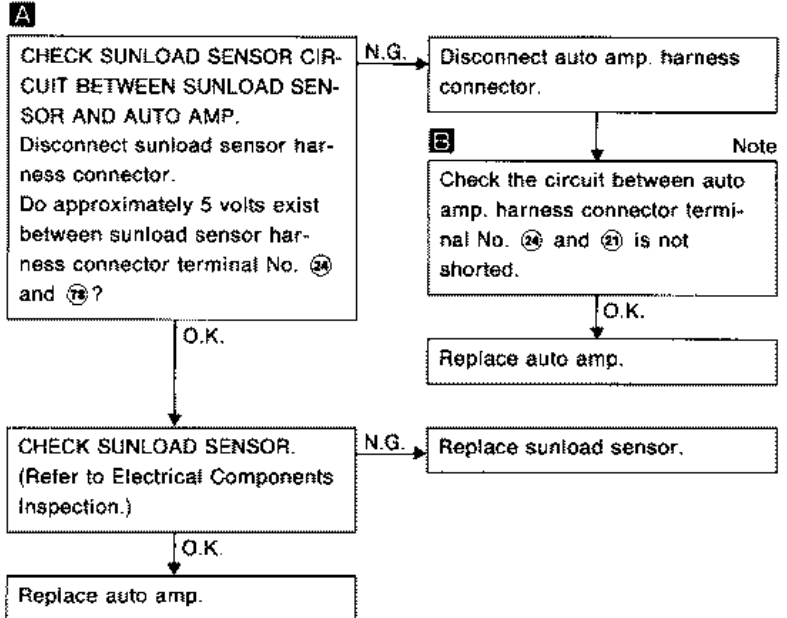
If the result is N.G. after checking circuit continuity, repair harness or connector.

TROUBLE DIAGNOSES — Auto Air Conditioner



Diagnostic Procedure 14

SYMPTOM: Sunload sensor circuit is shorted. (CONSULT or self-diagnosis STEP 4 indicates this.)



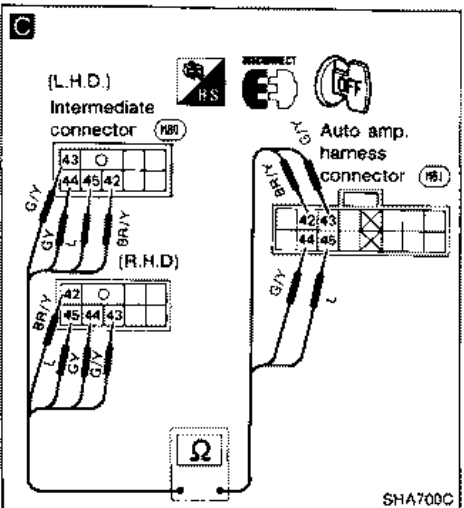
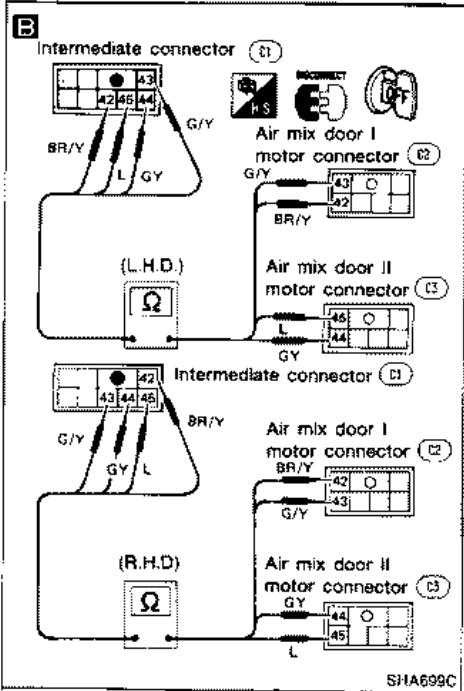
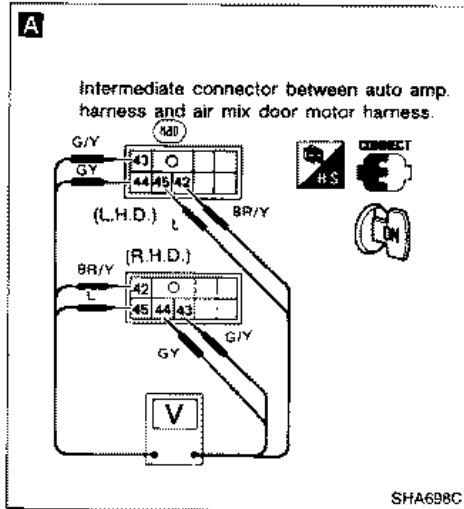
Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

TROUBLE DIAGNOSES — Auto Air Conditioner

Diagnostic Procedure 15

SYMPTOM: Air mix door does not operate normally.

- Read out self-diagnosis result with CONSULT or perform self-diagnosis STEP 4 before referring to the following flow chart.
- Remove combination meter assembly to make working space and reconnect air conditioner switch connector.



A

CHECK FOR SIGNALS TO AIR MIX DOOR MOTOR.

- ① Set up "ACTIVE TEST" mode with CONSULT.
- ② Set up self-diagnosis STEP 2.

Set air mix door position as shown in the following chart. Check if approximately 10V exists for 3 seconds every 10 seconds between each terminal.*

Air mix door position	Code No.	Terminal No.			
		Air mix door I		Air mix door II	
Full-Hot	3X	⊕	⊖	⊕	⊖
Full-Cool	6X	⊕	⊖	⊕	⊖

O.K.
*: After two minutes power supply is automatically cut off.

Remove heater unit assembly.

B

Check continuity between intermediate connector terminal and each air mix door motor harness connector terminal.

Intermediate connector	Air mix door I motor connector	Continuity
②	②	Yes
③	③	Yes

Intermediate connector	Air mix door II motor connector	Continuity
④	④	Yes
⑤	⑤	Yes

O.K.
Replace air mix door motor.

C

Check circuit continuity between auto amp. harness connector terminals and intermediate connector terminals.

Intermediate connector	Auto amp. connector	Continuity
②	②	Yes
③	③	Yes
④	④	Yes
⑤	⑤	Yes

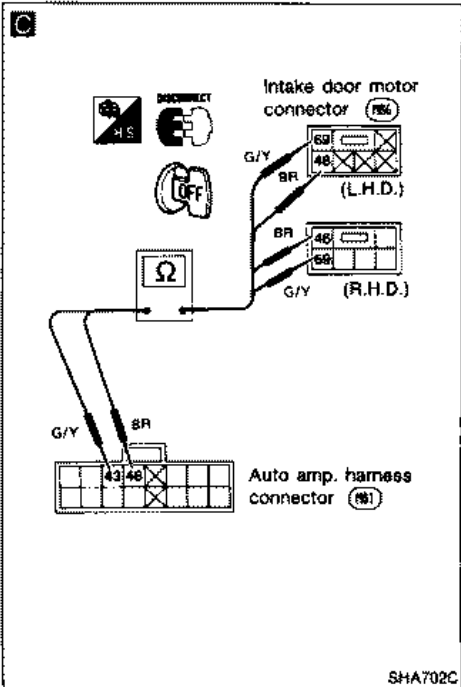
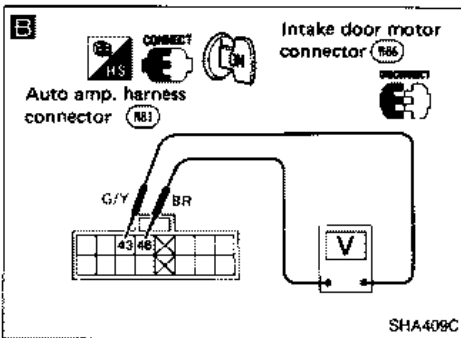
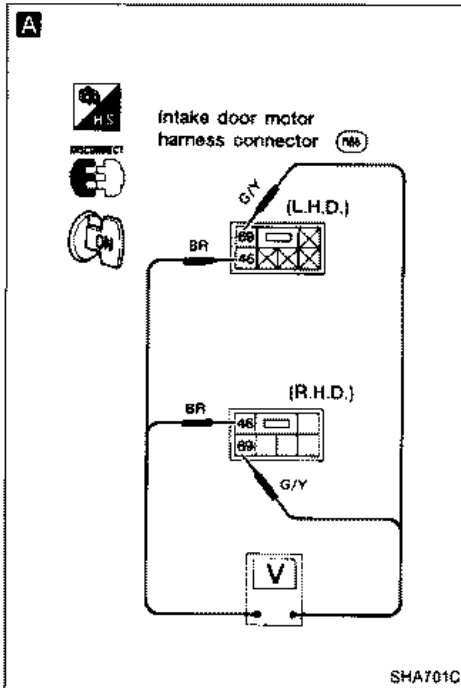
O.K. → Replace auto amp.
N.G. → Repair harness or connector.

TROUBLE DIAGNOSES — Auto Air Conditioner

Diagnostic Procedure 16

SYMPTOM: Intake door does not operate normally.

- Read out self-diagnosis result with CONSULT or perform self-diagnosis STEP 4 before referring to the following flow chart.



A

CHECK FOR SIGNALS TO INTAKE DOOR MOTOR.
Disconnect intake door motor harness connector.

- Set up "ACTIVE TEST" mode with CONSULT.
- Set up self-diagnosis STEP 2.

Set intake door position as shown in the following chart.
Check if approximately 10V exists for 2.5 seconds between each terminal.

Intake door position	Code No.	Terminal No.	
		+	-
5X → 6X	FRE/REC → REC	46	69
6X → 3X	REC → FRE	69	46

O.K. → Replace intake door motor.

B

CHECK OUTPUT OF AUTO AMP.

- Set up "ACTIVE TEST" mode with CONSULT.
- Set up self-diagnosis STEP 2.

Set intake door position as shown in the following chart.
Check if approximately 10V exists for 2.5 seconds between each terminal.

Intake door position	Code No.	Terminal No.	
		+	-
5X → 6X	FRE/REC → REC	46	69
6X → 3X	REC → FRE	69	46

O.K. → [Flow to Step C]

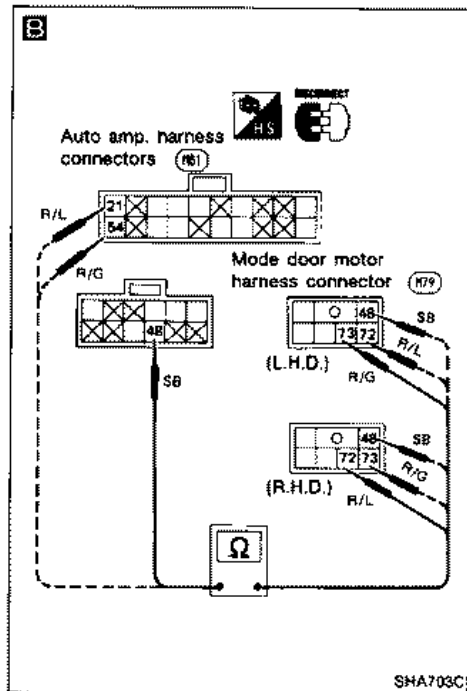
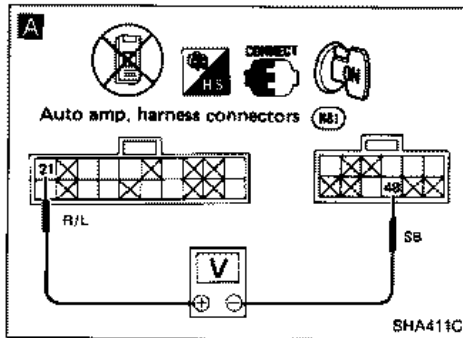
N.G. → Replace auto amp.

C

Check continuity between auto amp. harness connector terminal No. 46 and intake door motor harness connector terminal No. 69.
Check auto amp. harness connector terminal No. 69 and intake door motor harness connector terminal No. 46.

N.G. → Repair harness or connector.

TROUBLE DIAGNOSES — Auto Air Conditioner



Diagnostic Procedure 17

SYMPTOM: Mode door does not operate normally.

- Read out self-diagnosis result with CONSULT or perform self-diagnosis STEP 4 before referring to the following flow chart.

A

CHECK P.B.R. CIRCUIT

- ① Set up "ACTIVE TEST" mode with CONSULT.
- ② Set up self-diagnosis STEP 2.

Set mode door motor as shown in the following chart.

- ③ Check P.B.R. voltage with data monitor function in "ACTIVE TEST" mode.

Mode door position	P.B.R. voltage (approx.)
DEF	4.8V
FOOT/DEF	2.5V
B/L	1.1V
VENT	0V

- ④ Check if voltage between auto amp. harness connector terminals ④ and ⑤ varies from approximately 5V to approximately 0V according to mode door position varies.

Code No.	Voltage	
	④	⑤
3X	4.8V	
4X	2.5V	
5X	1.1V	
6X	0V	

N.G.

CHECK MODE DOOR MOTOR.
Refer to Electrical Components Inspection.

O.K.

N.G.

Replace mode door motor.

B

CHECK HARNESS BETWEEN AUTO AMP. AND MODE DOOR MOTOR.

Auto amp. harness connector terminal	Mode door motor harness connector terminal	Continuity
②	④	No
	⑦	Yes
	⑧	No
④	④	Yes
	⑦	No
	⑧	No
⑤	④	No
	⑦	No
	⑧	Yes

O.K.

N.G.

Repair harness or connector.

O.K.

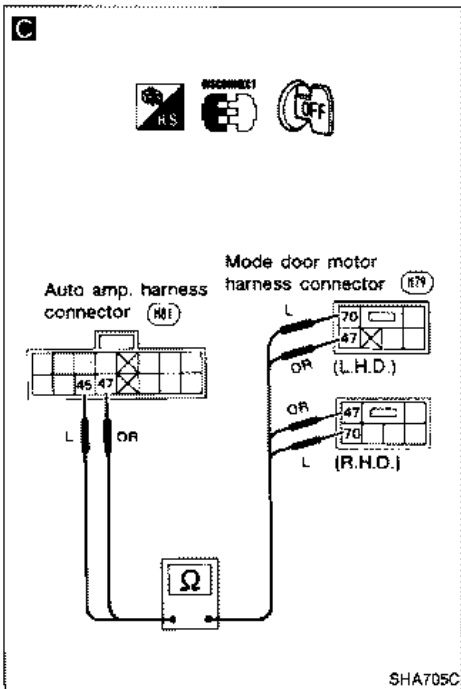
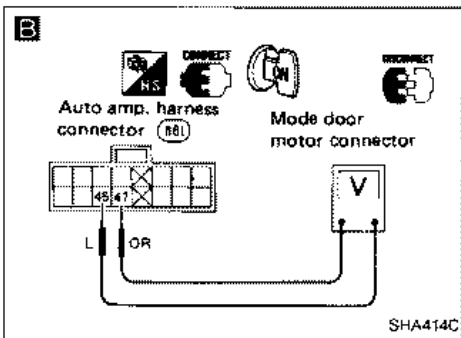
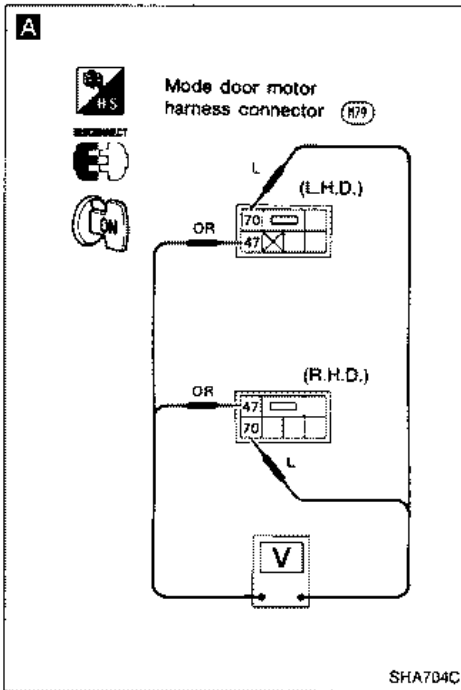
Go to diagnostic procedure 18.

TROUBLE DIAGNOSES — Auto Air Conditioner

Diagnostic Procedure 18

SYMPTOM: Mode door does not move at all.

- Read out self-diagnosis result with CONSULT or perform self-diagnosis STEP 4 before referring to the following flow chart.



A

CHECK FOR SIGNALS TO MODE DOOR MOTOR.

- Ⓜ Set up "ACTIVE TEST" mode with CONSULT.
 - ⌚ Set up self-diagnosis STEP 2.
- Set mode door position as shown in the following chart. Check if approximately 10V exists between mode door motor harness connector terminals ④⑦ and ⑤⑧ for approximately 1.3 seconds every 10 seconds.

Mode door position	Code No.	Terminal No.	
		+	-
DEF	3X	⑦⑩	④⑦
VENT	6X	④⑦	⑦⑩

O.K.

Replace mode door motor.

B

CHECK OUTPUT OF AUTO AMP.

- Ⓜ Set up "ACTIVE TEST" mode with CONSULT.
 - ⌚ Set up self-diagnosis STEP 2.
- Set mode door position as shown in the following chart. Check if approximately 10V exists between mode door motor harness connector terminals ④⑦ and ⑤⑧ for approximately 1.3 seconds every 10 seconds.

Mode door position	Code No.	Terminal No.	
		+	-
DEF	3X	④⑤	④⑦
VENT	6X	④⑦	④⑤

O.K.

N.G.

Replace auto amp.

C

Check continuity between auto amp. harness connector terminal No. ④⑦, ⑤⑧ and mode door motor harness connector terminal No. ④⑦, ⑤⑧ respectively.

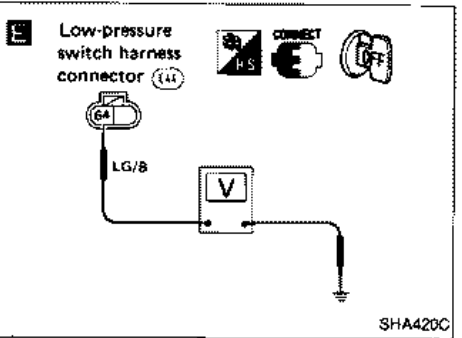
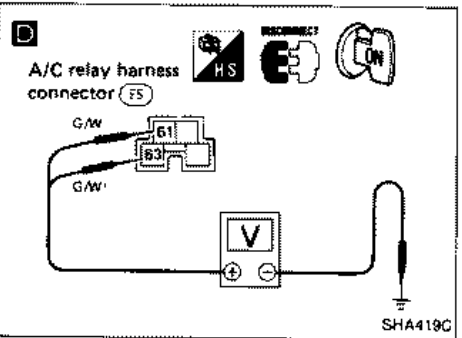
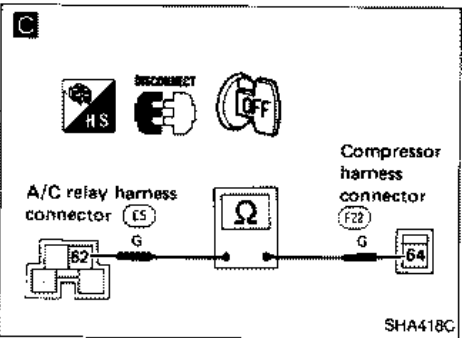
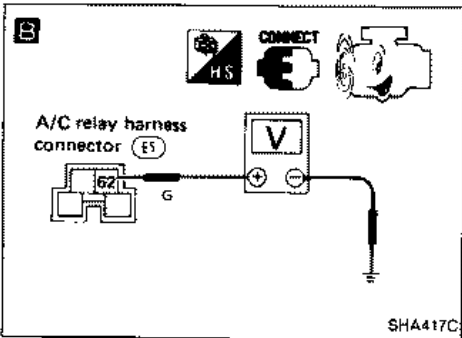
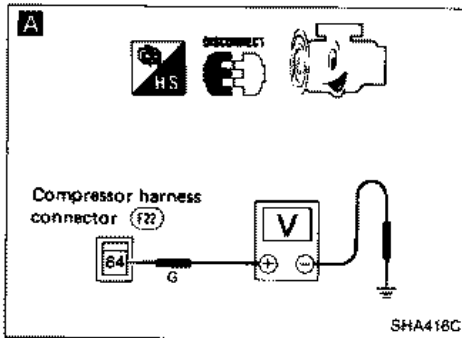
O.K.

N.G.

Repair harness or connector.

INSPECTION END

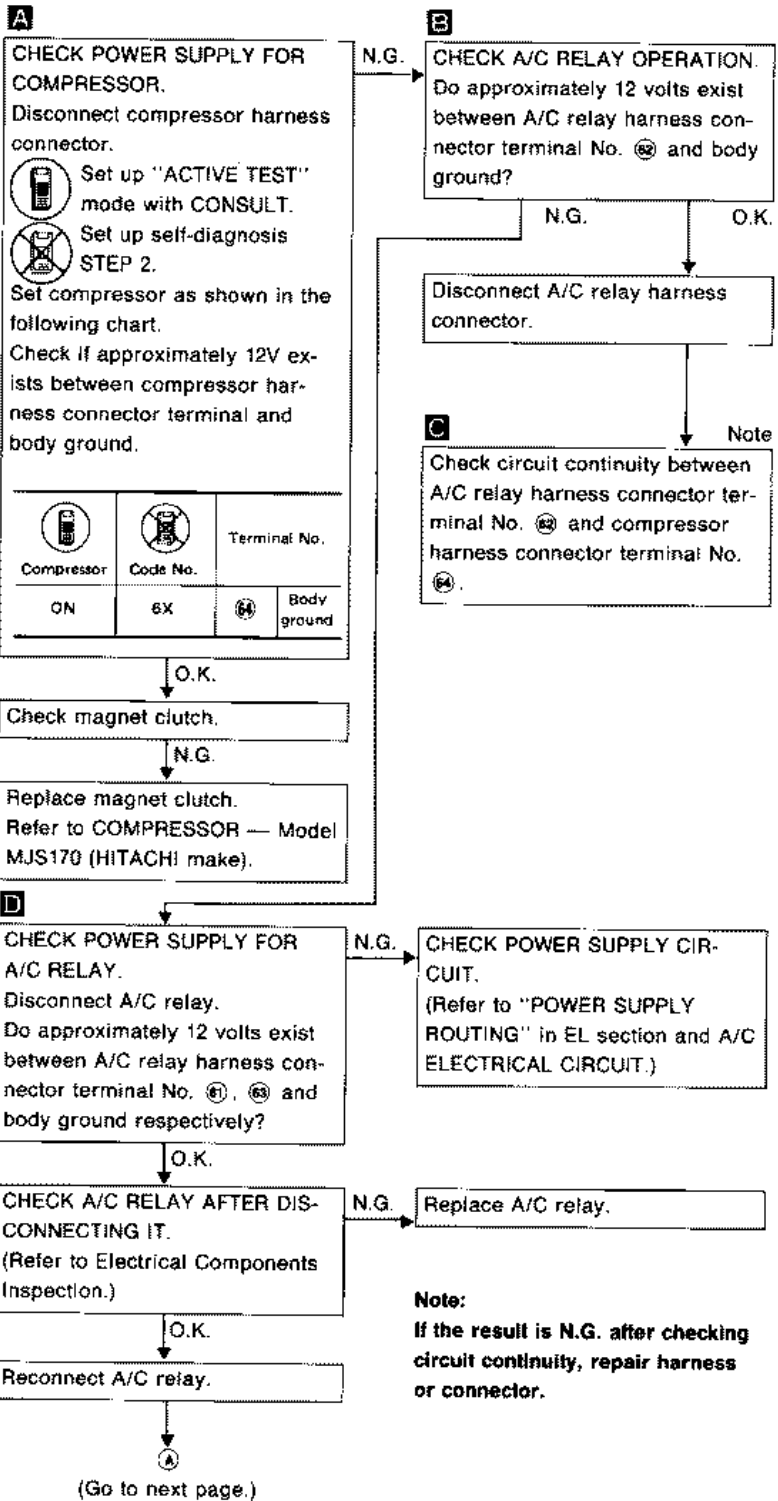
TROUBLE DIAGNOSES — Auto Air Conditioner



Diagnostic Procedure 19

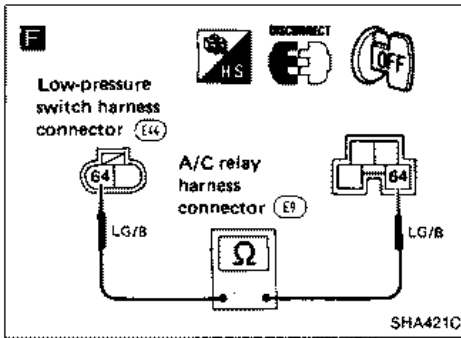
SYMPTOM: Magnet clutch does not engage.

- Perform Preliminary check 6 before referring to the following flow chart.



TROUBLE DIAGNOSES — Auto Air Conditioner

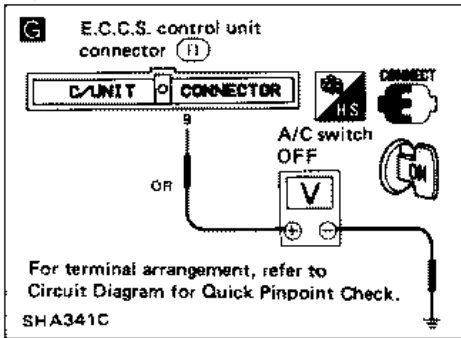
Diagnostic Procedure 19 (Cont'd)



Turn ignition switch ON and press OFF switch.

E CHECK COIL SIDE CIRCUIT OF A/C RELAY.
Do approximately 12 volts exist between low-pressure switch harness connector terminal No. ④ and body ground?

N.G. **F** Note
Check circuit continuity between A/C relay harness connector terminal No. ④ and low-pressure harness connector terminal No. ④.

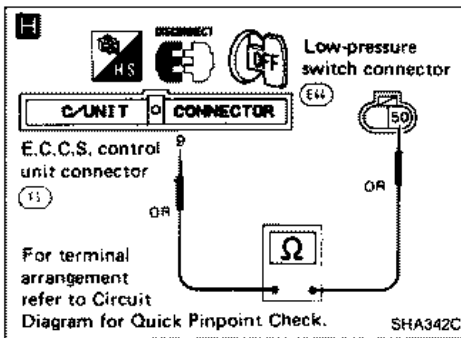


G Do approximately 12 volts exist between E.C.C.S. control unit harness connector terminal No. ① and body ground?

N.G. **H** Note
Check circuit continuity between low-pressure switch harness connector terminal No. ③ and E.C.C.S. control unit harness connector terminal No. ③.

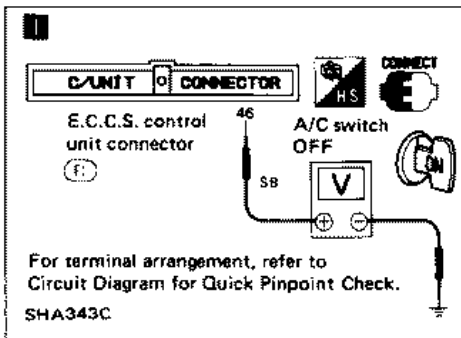
O.K.
CHECK LOW-PRESSURE SWITCH.
(Refer to Electrical Components Inspection.)

N.G.
Replace low-pressure switch.



I Do approximately 8 to 9 volts exist between E.C.C.S. control unit harness connector terminal No. ④ and body ground?

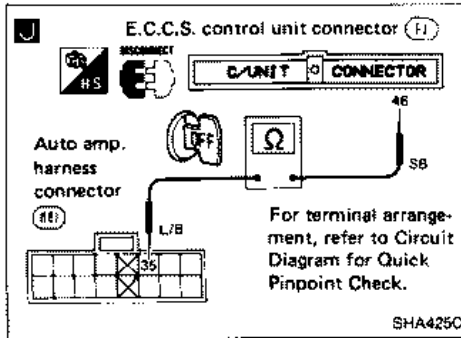
N.G. CHECK E.C.C.S. CONTROL UNIT.
(Refer to EF & EC section.)



Disconnect auto amp. harness connector.

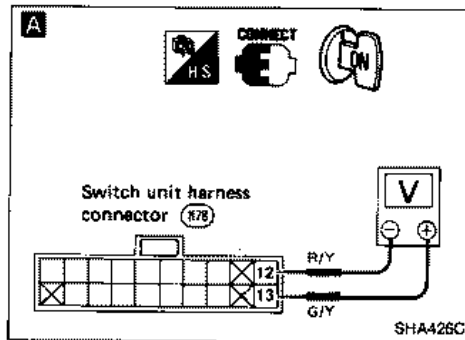
J Check circuit continuity between auto amp. harness connector terminal No. ③ and E.C.C.S. control unit harness connector terminal No. ④.

O.K.
Replace auto amp.



Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

TROUBLE DIAGNOSES — Auto Air Conditioner



Diagnostic Procedure 20

SYMPTOM: Air conditioner control switch panel illumination does not come on.

A

Turn on light switch.
Set illumination control switch at the brightest position.
Check if approximately 12V exists between switch panel harness connector terminal No. ⑫ and ⑬.

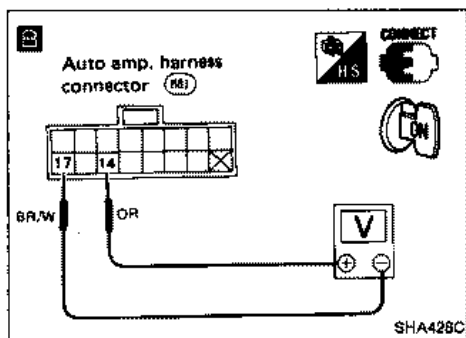
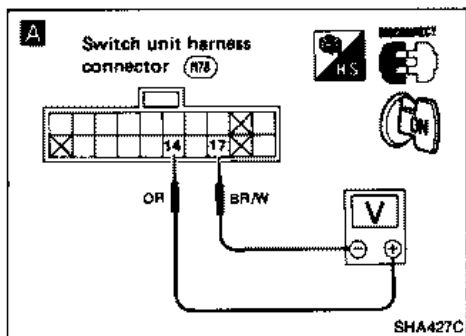
N.G.

Check illumination control system. Refer to section EL.

O.K.

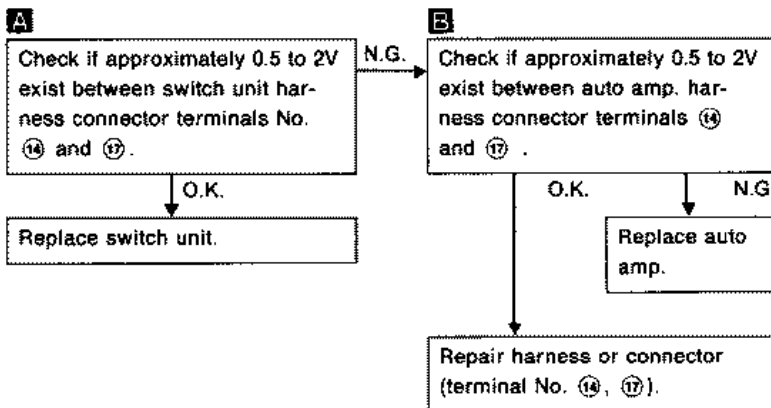
Replace bulb.

TROUBLE DIAGNOSES — Auto Air Conditioner

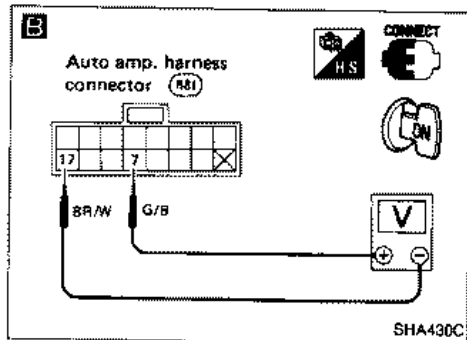
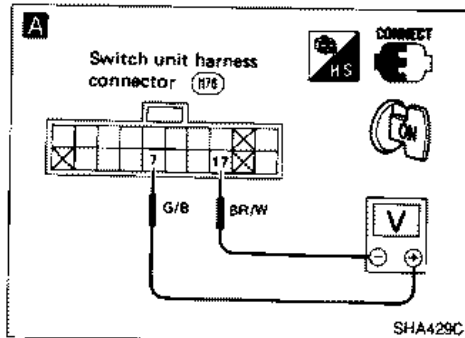


Diagnostic Procedure 21

SYMPTOM: Set temperature and ambient temperature do not appear on display window.

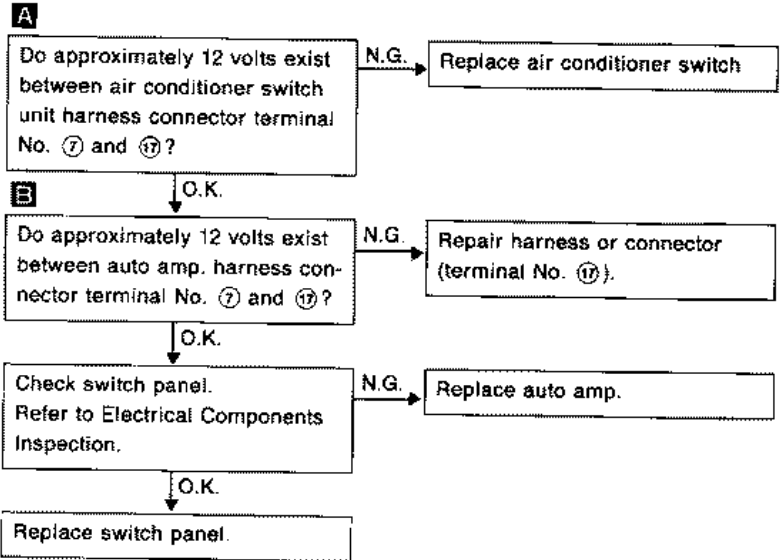


TROUBLE DIAGNOSES — Auto Air Conditioner



Diagnostic Procedure 22

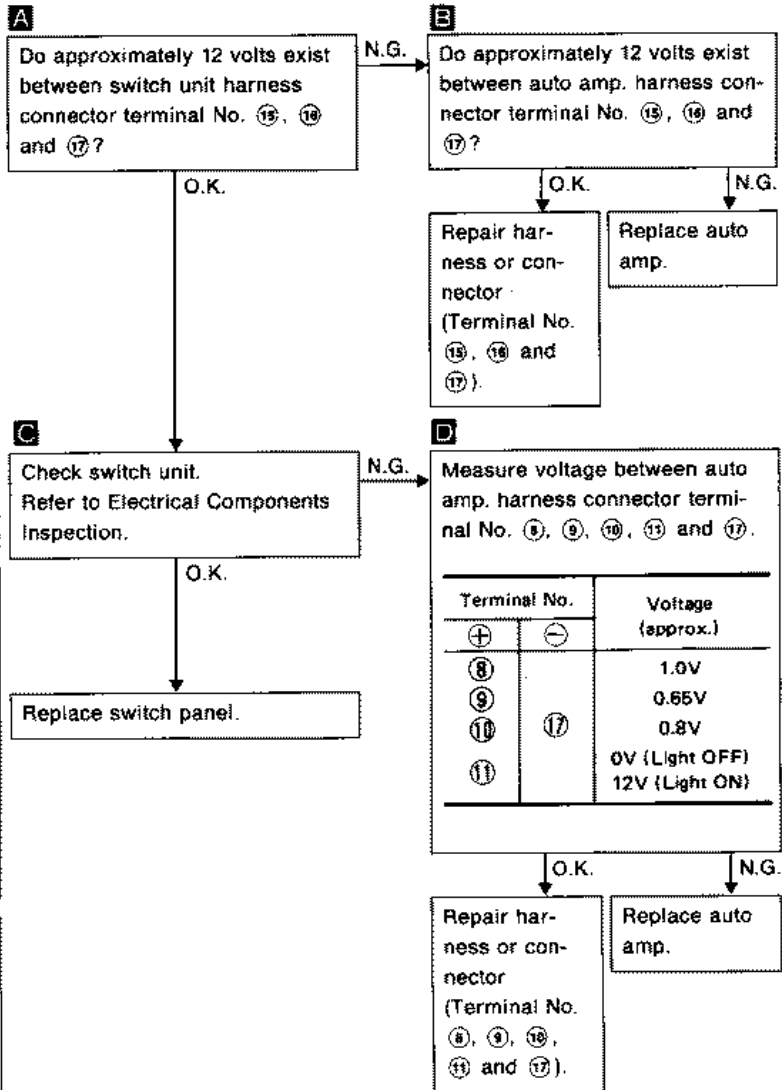
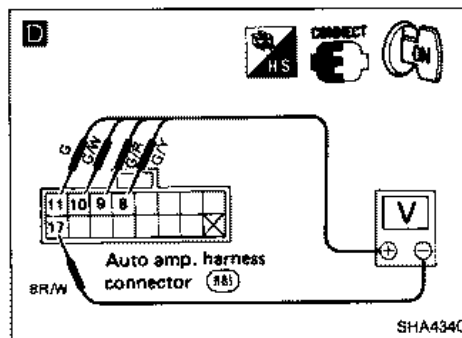
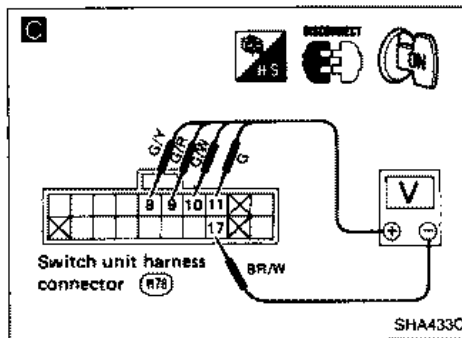
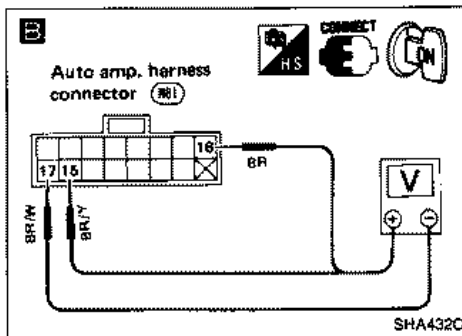
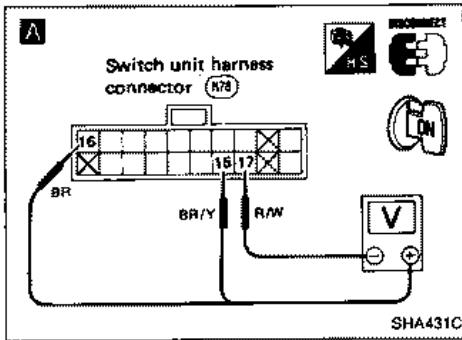
SYMPTOM: When air conditioner switch is operated it does not beep.



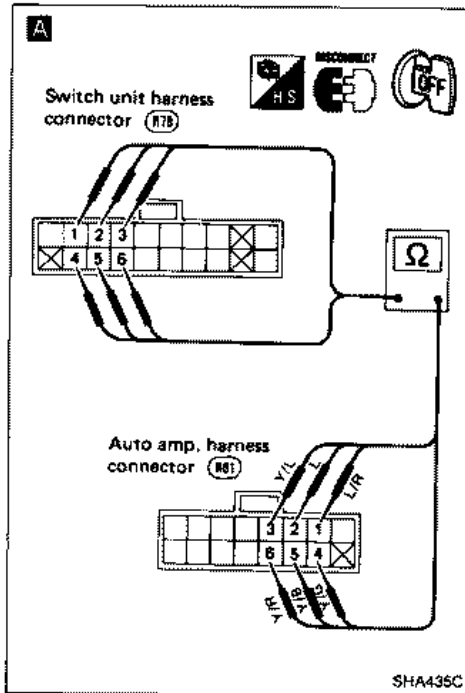
TROUBLE DIAGNOSES — Auto Air Conditioner

Diagnostic Procedure 23

SYMPTOM: Figures of set temperature and ambient temperature do not appear on the display window and Indicator lamp (L.E.D.) does not come on.

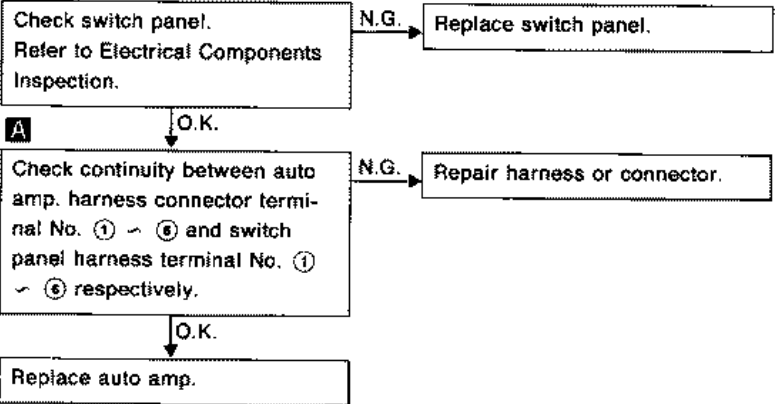


TROUBLE DIAGNOSES — Auto Air Conditioner



Diagnostic Procedure 24

SYMPTOM: Switches do not work.

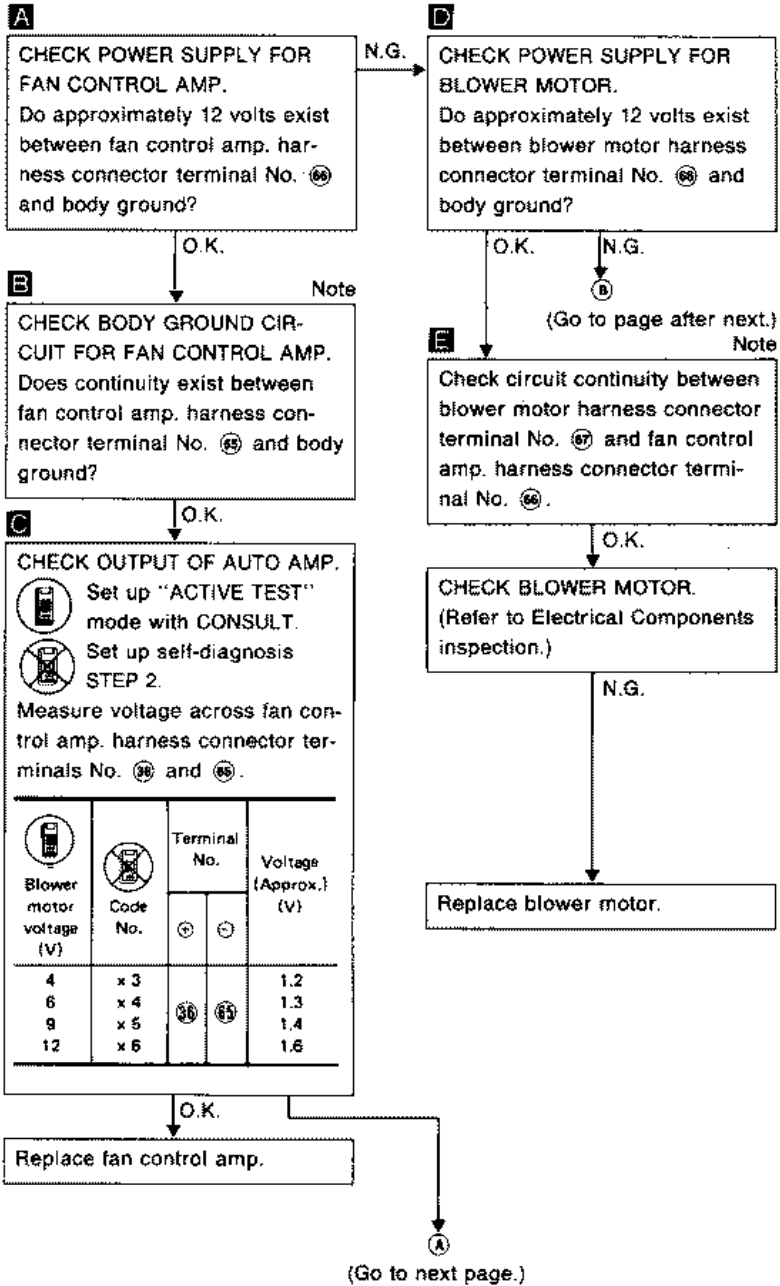
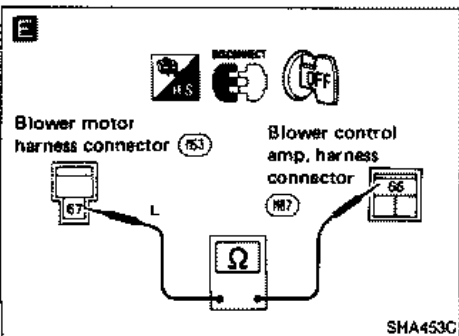
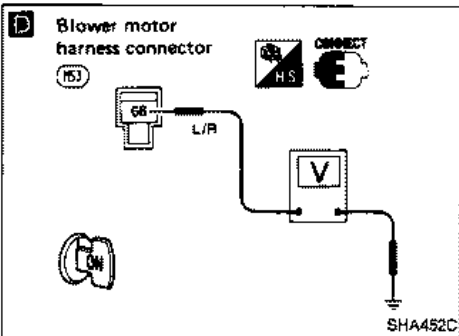
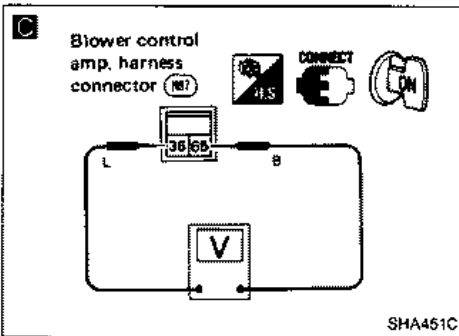
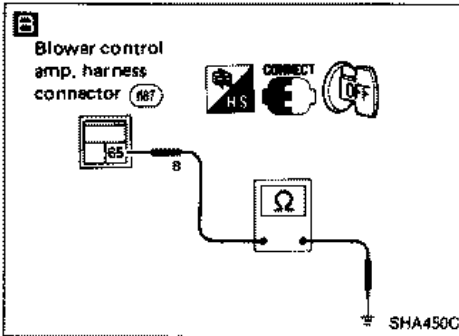
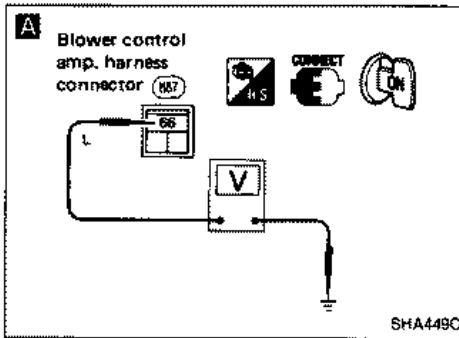


TROUBLE DIAGNOSES — Auto Air Conditioner

Diagnostic Procedure 25

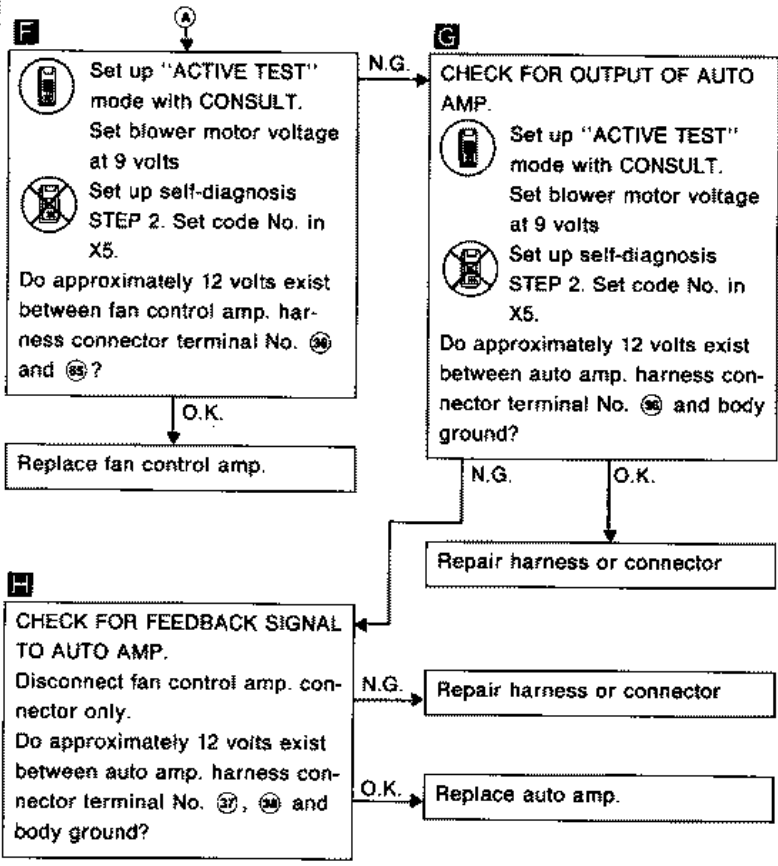
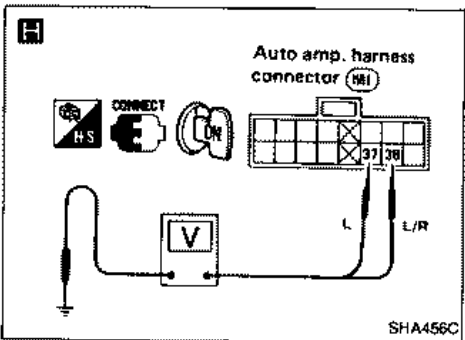
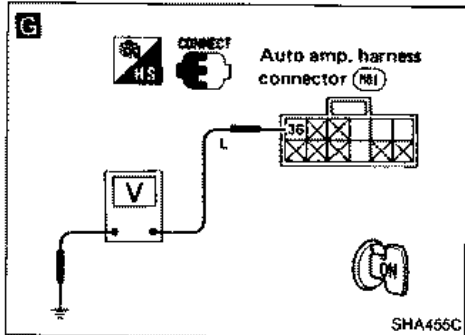
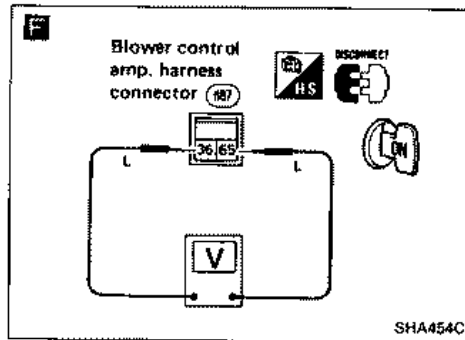
SYMPTOM: Blower motor operation is malfunctioning.

- Perform Preliminary check 5 before referring to the of flowing flow chart.



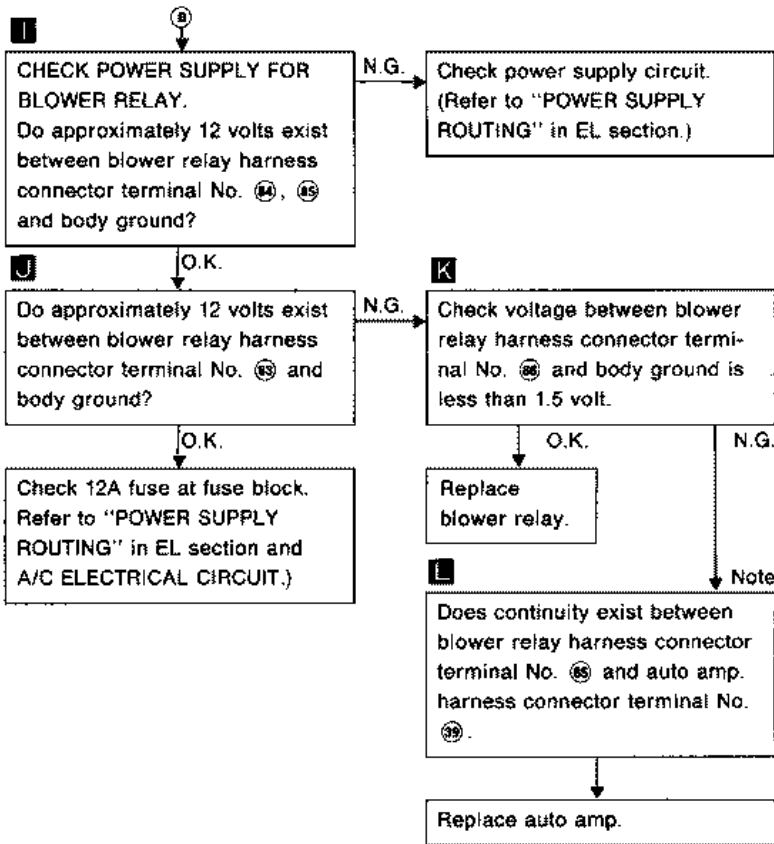
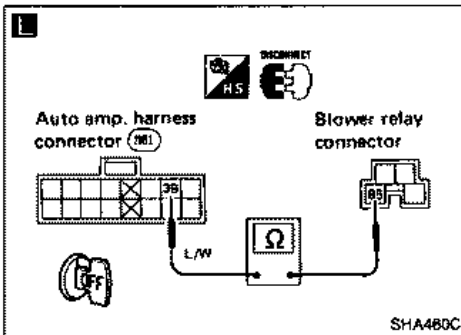
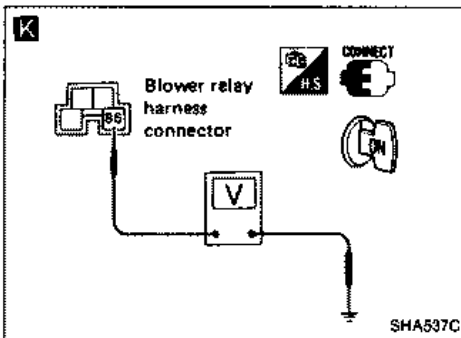
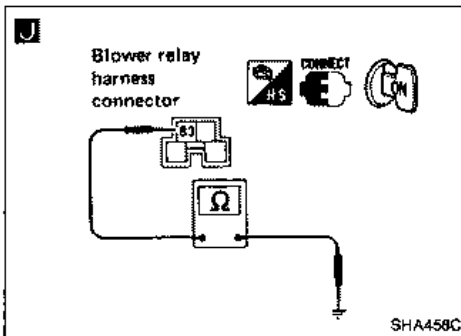
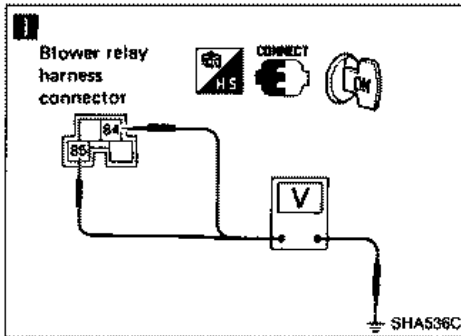
TROUBLE DIAGNOSES — Auto Air Conditioner

Diagnostic Procedure 25 (Cont'd)



TROUBLE DIAGNOSES — Auto Air Conditioner

Diagnostic Procedure 25 (Cont'd)



Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

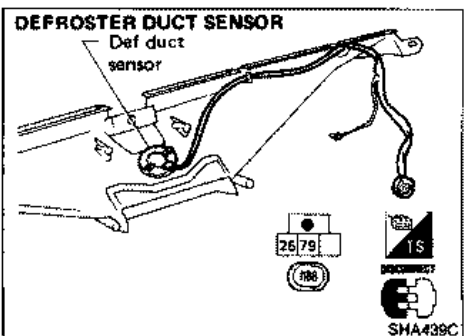
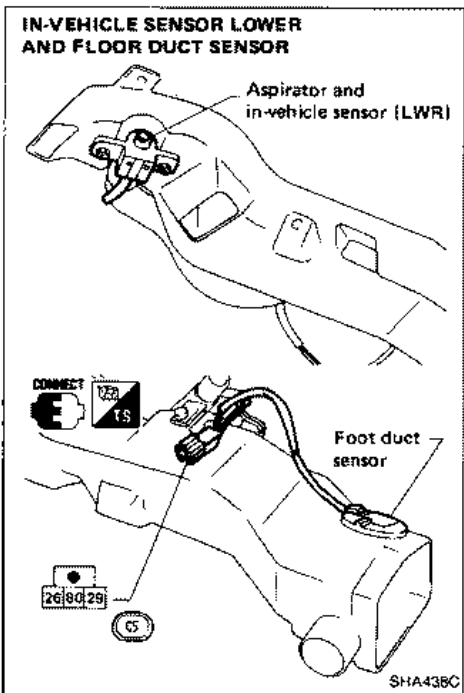
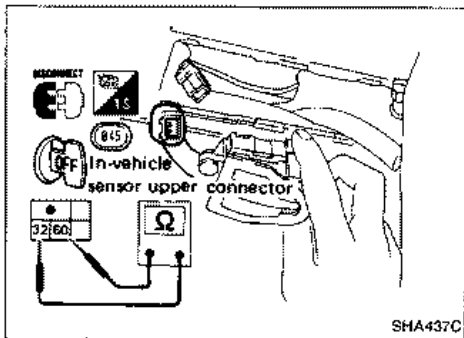
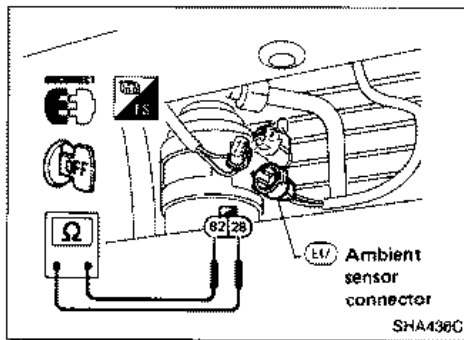
TROUBLE DIAGNOSES — Auto Air Conditioner

Electrical Components Inspection

TEMPERATURE SENSORS

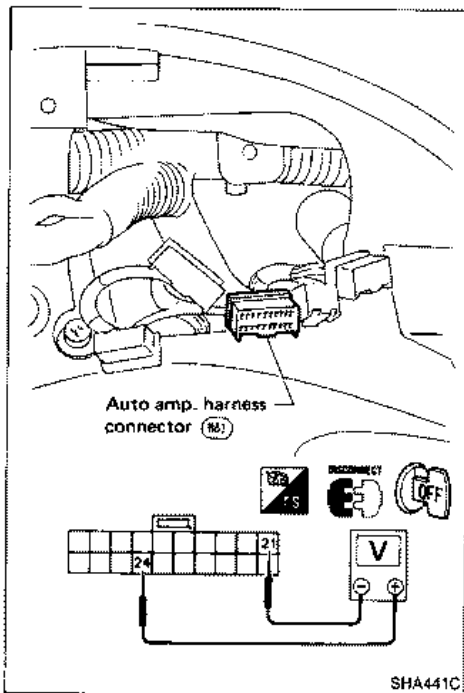
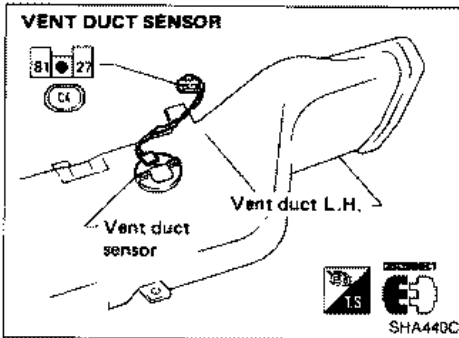
After disconnecting temperature sensors harness connector measure resistance between terminals of each sensor, using the table below.

Temperature °C (°F)	Resistance kΩ
-40 (-40)	210.55
-35 (-31)	146.86
-30 (-22)	103.97
-25 (-13)	74.63
-20 (-4)	54.28
-15 (5)	39.97
-10 (14)	29.77
-5 (23)	22.43
0 (32)	17.07
5 (41)	13.11
10 (50)	10.18
15 (59)	7.96
20 (68)	6.29
25 (77)	5.00
30 (86)	4.01
35 (95)	3.24
40 (104)	2.63
45 (113)	2.15
50 (122)	1.77
55 (131)	1.47
60 (140)	1.22
65 (149)	1.02
70 (158)	0.86
75 (167)	0.73
80 (176)	0.62



TROUBLE DIAGNOSES — Auto Air Conditioner

Electrical Components Inspection (Cont'd)



SUNLOAD SENSOR

Measure voltage between terminals ②① and ②④ at vehicle harness side using the table below.

Input current mA	Output voltage (V)
0	5
0.1	4
0.2	3
0.3	2
0.4	1
0.5	0

- When checking sunload sensor, select a place where sun shines on it directly.

MODE DOOR MOTOR

Check to see if motor rotates when 12V is applied across mode door motor connector terminals No. ④⑦ and No. ⑦⑩.

Terminal No.		Mode door operation
④⑦	⑦⑩	
⊖	⊕	VENT → DEF
⊖	⊖	STOP
⊕	⊖	DEF → VENT

Check to see if mode door P.B.R. resistance is varied according to mode door position, as shown in the following table.

Mode door position	Resistance between terminal No. ④⑥ and ⑦⑫
DEF	3 kΩ
FOOT/DEF	1.6 kΩ
B/L	0.7 kΩ
VENT	0Ω

TROUBLE DIAGNOSES — Auto Air Conditioner

Electrical Components Inspection (Cont'd)

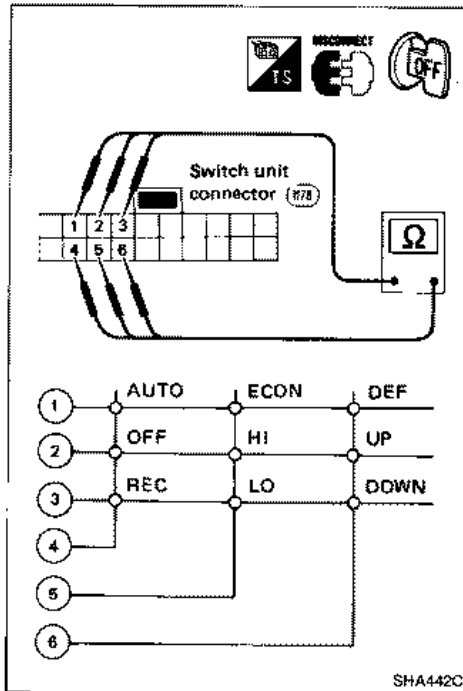
AIR CONDITIONER SWITCH UNIT

Check the resistance between switch unit connector terminals as follows:

Switch condition	Resistance
Press	Less than 500Ω
Free	∞

Example:

When Auto switch is pressed, the resistance between terminal No. ① and ④ is less than 500Ω.



BLOWER MOTOR

- Refer to page HA-92.

RELAY

- Refer to page HA-93.

LOW-PRESSURE SWITCH

- Refer to page HA-93.

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

General Specifications

COMPRESSOR

Model	HITACHI make MJS170
Type	Swash plate
Displacement cm ³ (cu in)/Rev.	170 (10.37)
Cylinder bore x stroke mm (in)	40.0 x 22.6 (1.575 x 0.890)
Direction of rotation	Clockwise (Viewed from drive end)
Drive belt	Poly V

LUBRICATION OIL

Model	HITACHI make MJS170
Type	SUNISO 5GS
Capacity ml (Imp fl oz)	
Total in system	150 (5.3)
Amount of oil which can be drained	Approx. 120 (4.2)
Compressor (Service parts) charging amount	150 (5.3)

REFRIGERANT

Type	R-12
Capacity kg (lb)	
VG30DE engine model	0.85 - 0.95 (1.87 - 2.09)
VG30DETT engine model	0.75 - 0.85 (1.65 - 1.87)

Inspection and Adjustment

ENGINE IDLING SPEED (When A/C is ON.)

- Refer to EF & EC section.

BELT TENSION

- Refer to Checking Drive Belts (MA section).

COMPRESSOR

Model	MJS170
Clutch disc-pulley clearance mm (in)	0.5 - 0.8 (0.020 - 0.031)

ELECTRICAL SYSTEM

SECTION **EL**

When you read wiring diagrams:

- Read GI section, "HOW TO READ WIRING DIAGRAMS".

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WIRING DIAGRAM REFERENCE CHART

E.C.C.S.	EF & EC SECTION
AT CONTROL	AT SECTION
TRANSMISSION OIL COOLER	MT SECTION
DIFFERENTIAL OIL COOLER	PD SECTION
ADJUSTABLE SHOCK ABSORBER	RA SECTION
ANTI-LOCK BRAKING SYSTEM	BR SECTION
POWER STEERING, SUPER HICAS	ST SECTION
POWER WINDOW, POWER DOOR LOCK, POWER SEAT, DOOR MIRROR	BF SECTION
HEATER AND AIR CONDITIONER	HA SECTION

EL

HARNESS CONNECTOR

Description

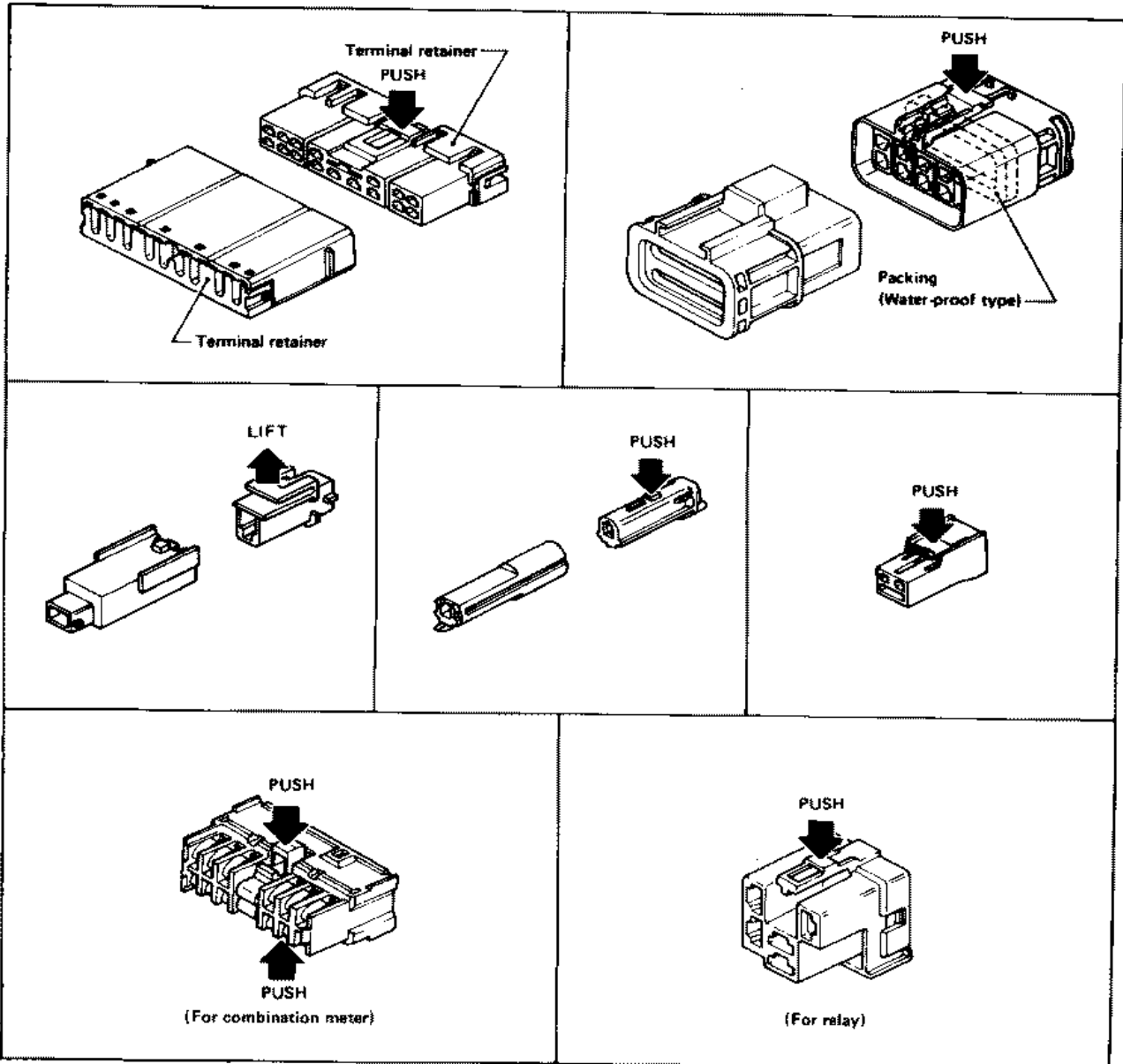
HARNESS CONNECTOR

- All harness connectors have been modified to prevent accidental loosening or disconnection.
- The connector can be disconnected by pushing or lifting the locking section.

CAUTION:

Do not pull the harness when disconnecting the connector.

[Example]



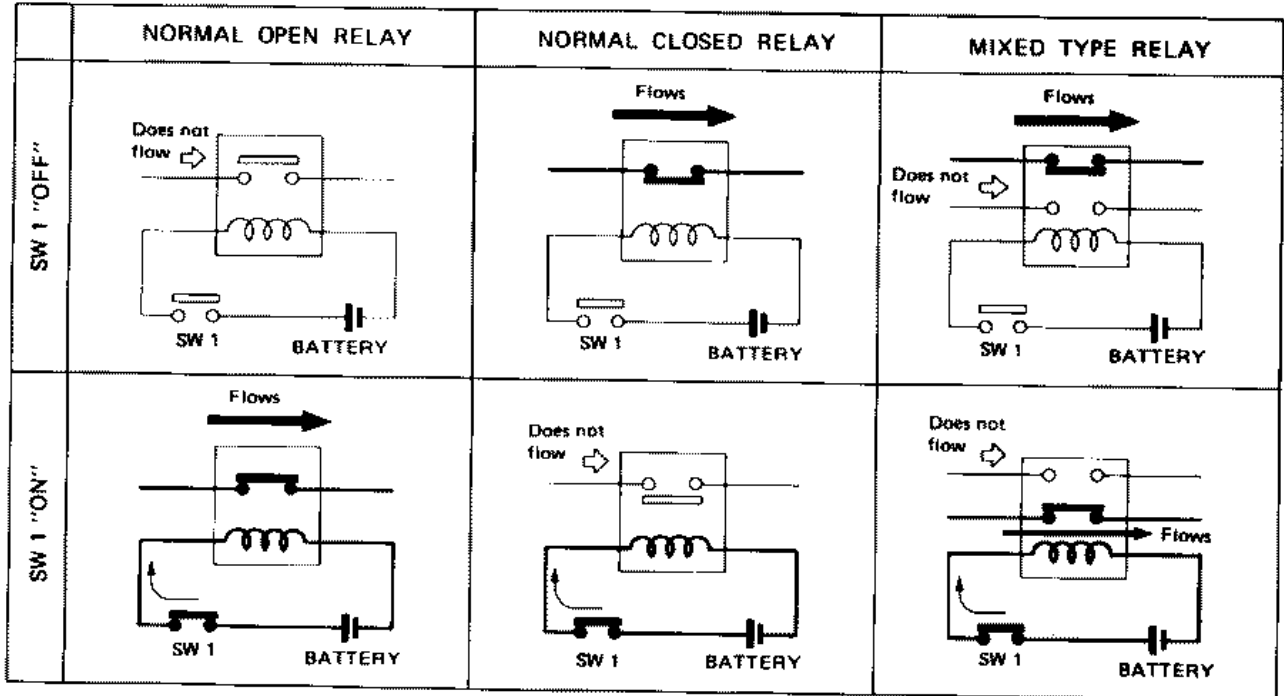
SEL769D

STANDARDIZED RELAY

Description

NORMAL OPEN, NORMAL CLOSED AND MIXED TYPE RELAYS

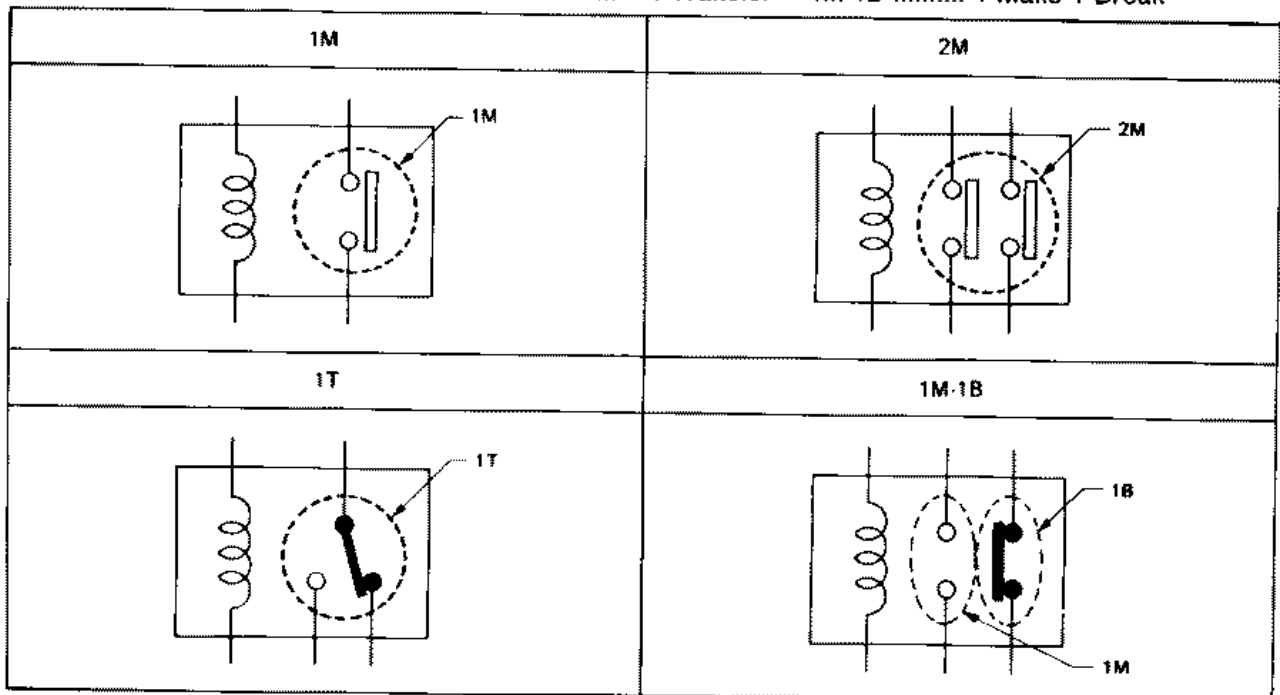
Relays can mainly be divided into three types: normal open, normal closed and mixed type relays.



SEL881H

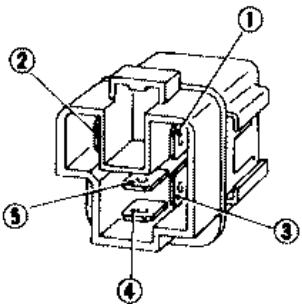
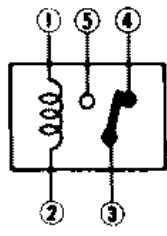
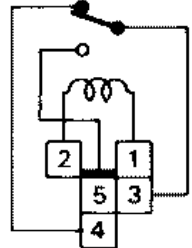
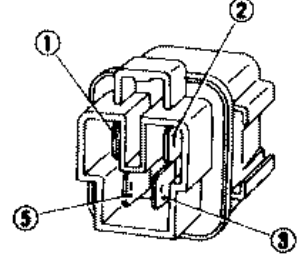
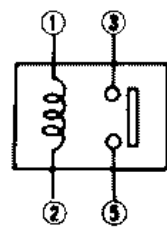
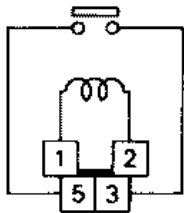
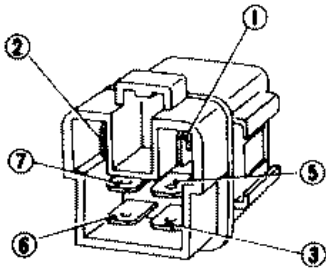
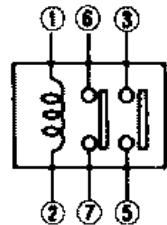
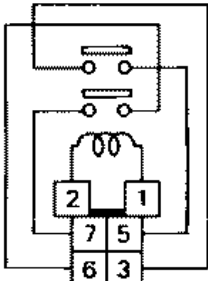
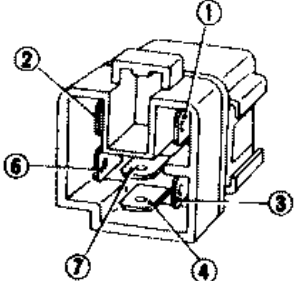
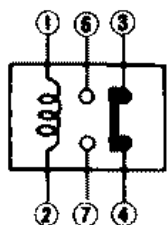
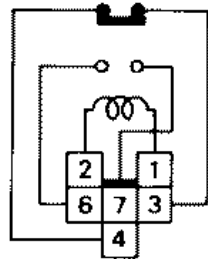
TYPE OF STANDARDIZED RELAYS

1M 1 Make 2M 2 Make
 1T 1 Transfer 1M·1B 1 Make 1 Break



SEL882H

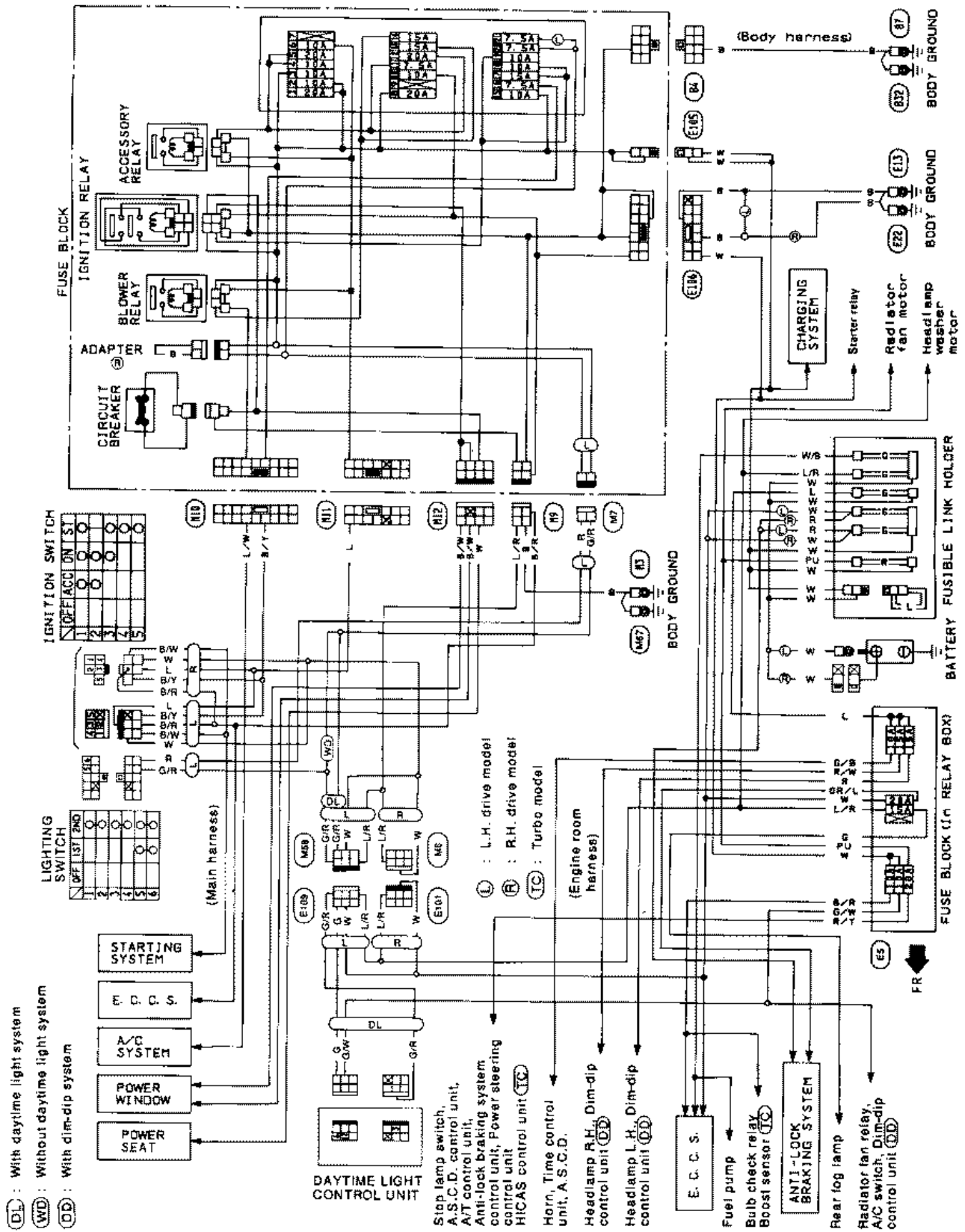
STANDARDIZED RELAY

Type	Outer view	Circuit	Connector symbol and connection	Case color
1T				BLACK
1M				BLUE or GREEN
2M				BROWN
1M-1B				GRAY

SE L883H

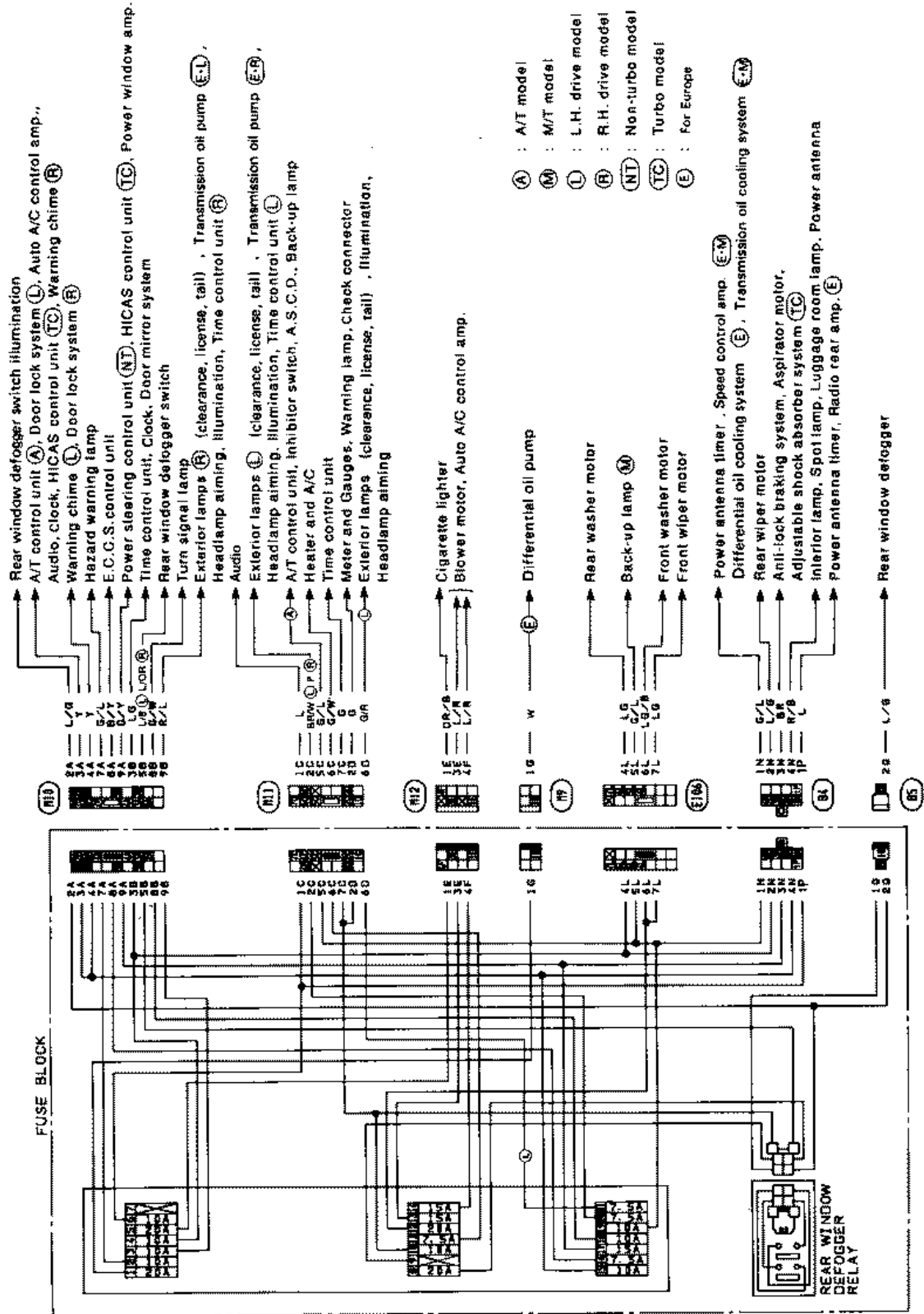
POWER SUPPLY ROUTING

Wiring Diagram



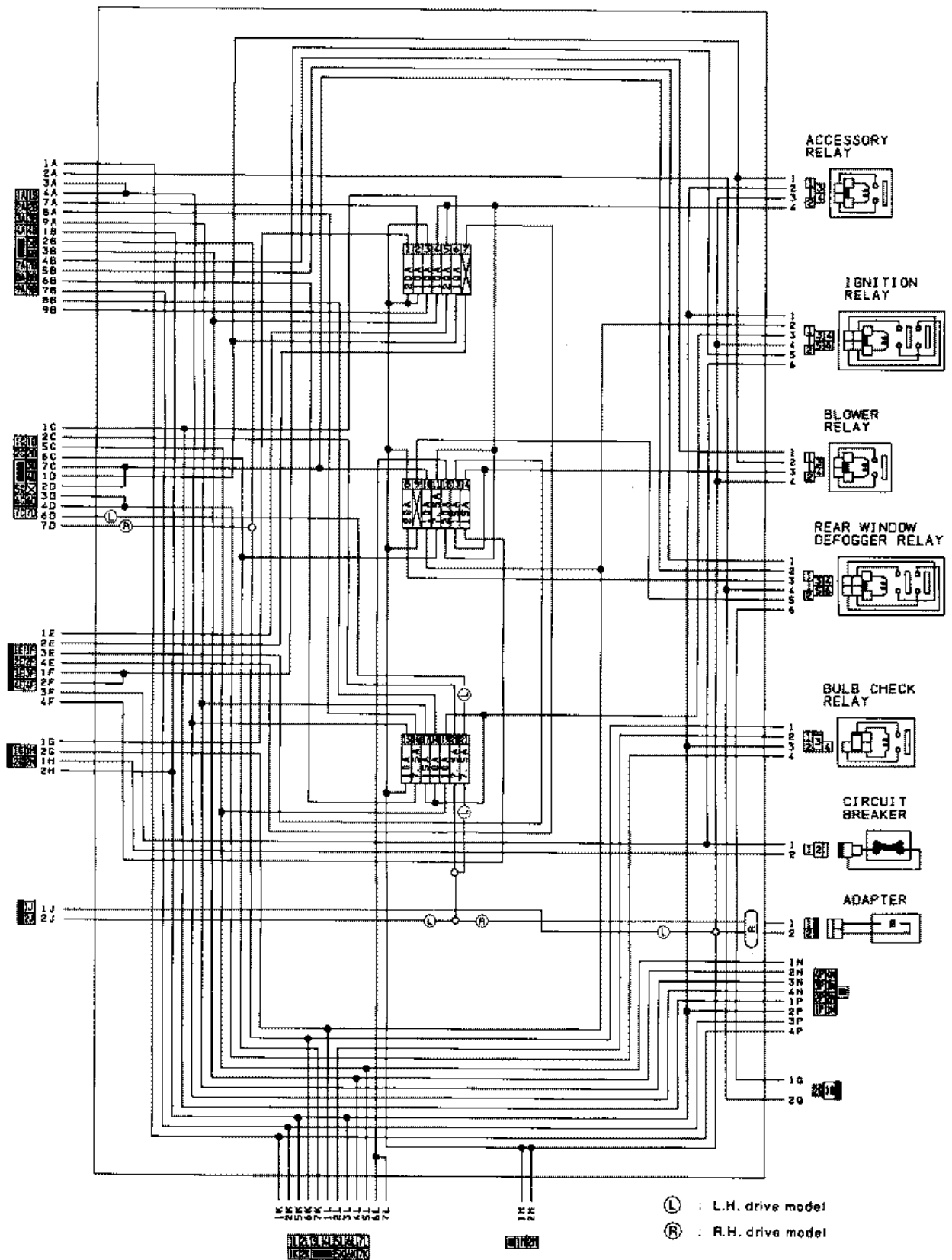
POWER SUPPLY ROUTING

Wiring Diagram (Cont'd)



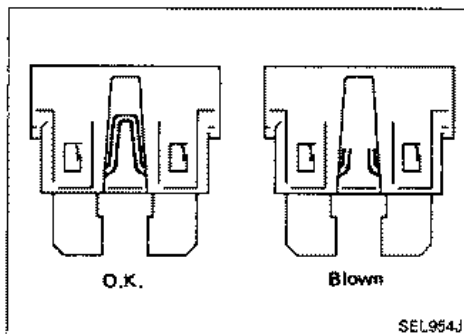
POWER SUPPLY ROUTING

Fuse Block Internal Circuit



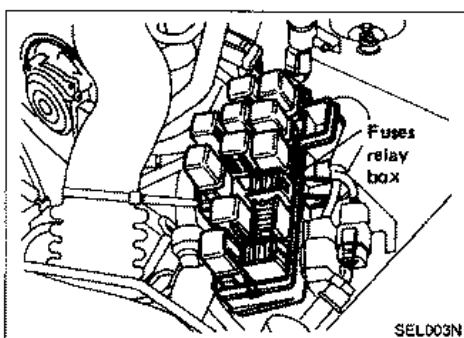
SEL309P

POWER SUPPLY ROUTING



Fuse

- If fuse is blown, be sure to eliminate cause of problem before installing new fuse.
- Use fuse of specified rating. Never use fuse of more than specified rating.
- Do not install fuse in oblique direction; always insert it into fuse holder properly.
- Remove fuse for clock if vehicle is not used for a long period of time.

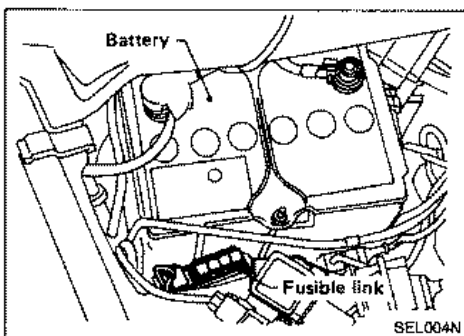


Fusible Link

A melted fusible link can be detected either by visual inspection or by feeling with finger tip. If its condition is questionable, use circuit tester or test lamp.

CAUTION:

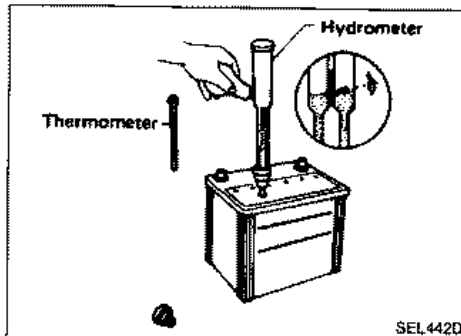
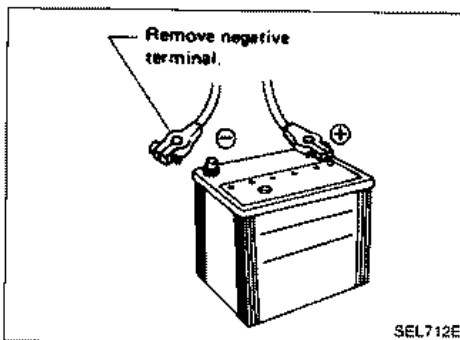
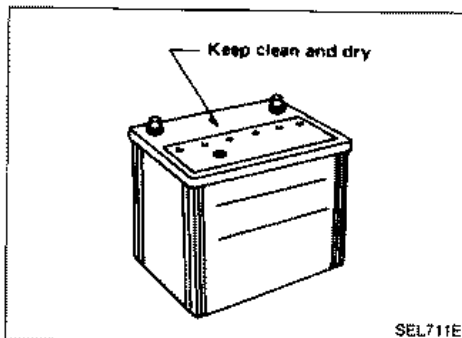
- If fusible link should melt, it is possible that a critical circuit (power supply or large current carrying circuit) is shorted. In such a case, carefully check these circuits and eliminate cause of problem.
- Never wrap periphery of fusible link with vinyl tape. Extreme care should be taken with this link to ensure that it does not come into contact with any other wiring harness, or vinyl or rubber parts.



BATTERY

CAUTION:

- If it becomes necessary to start the engine with a booster battery and jumper cables, use a 12-volt booster battery.
- After connecting battery cables, ensure that they are tightly clamped to battery terminals for good contact.
- Never add distilled water through the hole used to check specific gravity.



How to Handle Battery

METHODS OF PREVENTING OVER-DISCHARGE

The following precautions must be taken to prevent over-discharging a battery.

- The battery surface (particularly its top) should always be kept clean and dry. If the top surface of a battery is wet with electrolyte or water, leakage current will cause the battery to discharge. Always keep the battery clean and dry.
- When the vehicle is not going to be used over a long period of time, disconnect the negative battery terminal. (If the vehicle has an extended storage switch, turn it off.)
- Check the charge condition of the battery. Periodically check the specific gravity of the electrolyte. Keep a close check on charge condition to prevent over-discharge.

CHECKING ELECTROLYTE LEVEL

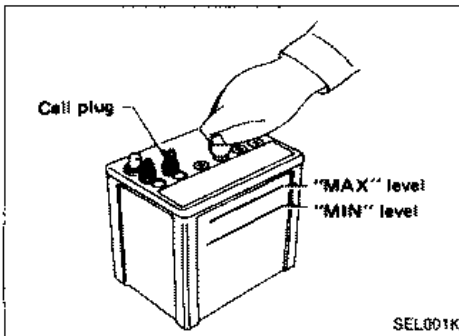
WARNING:

Do not allow battery fluid to come in contact with skin, eyes, fabrics, or painted surfaces. After touching a battery, do not touch or rub your eyes until you have thoroughly washed your hands. If the acid contacts the eyes, skin or clothing, immediately flush with water for 15 minutes and seek medical attention.

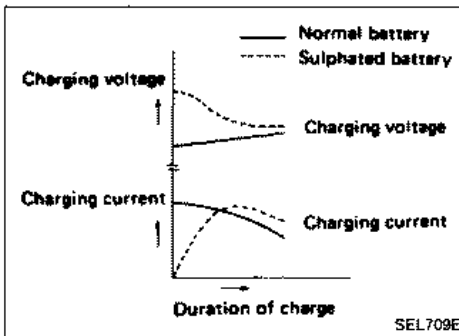
Normally the battery does not require additional water. However, when the battery is used under severe conditions, adding distilled water may be necessary during the battery life.

BATTERY

How to Handle Battery (Cont'd)



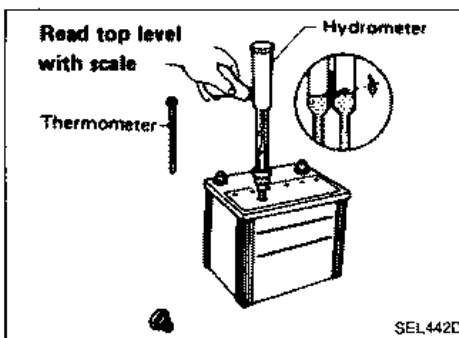
- Remove the cell plug using a suitable tool.
- Add distilled water up to the MAX level.



SULPHATION

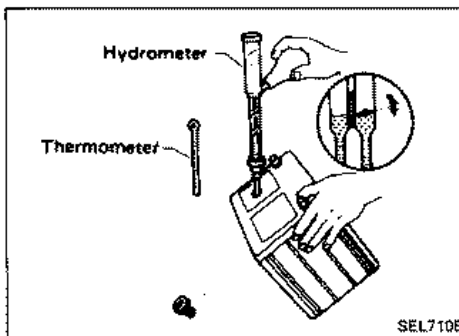
When a battery has been left unattended for a long period of time and has a specific gravity of less than 1.100, it will be completely discharged, resulting in sulphation on the cell plates.

Compared with a battery discharged under normal conditions, the current flow in a "sulphated" battery is not as smooth although its voltage is high during the initial stage of charging, as shown in the figure at the left.



SPECIFIC GRAVITY CHECK

1. Read hydrometer and thermometer indications at eye level.



- When electrolyte level is too low, tilt battery case to raise it for easy measurement.

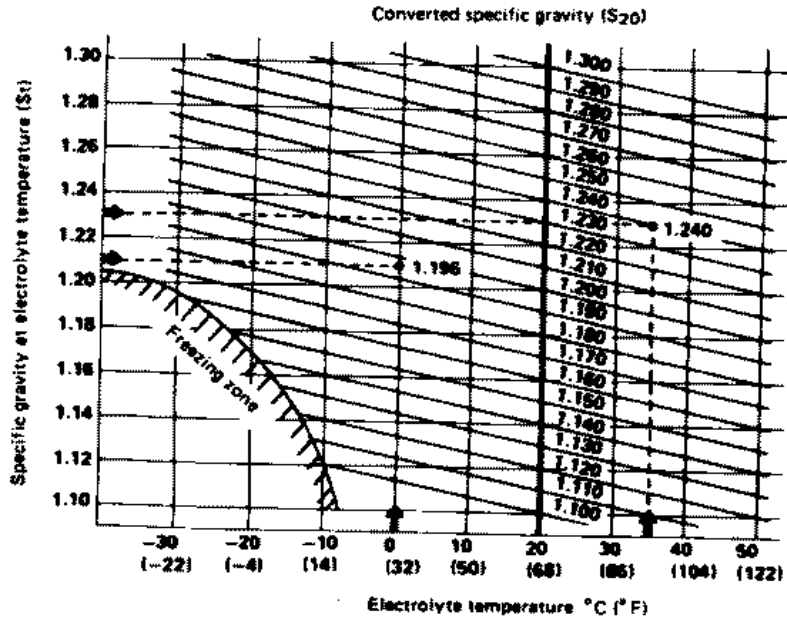
2. Convert into specific gravity at 20°C (68°F).

Example:

- When electrolyte temperature is 35°C (95°F) and specific gravity of electrolyte is 1.230, converted specific gravity at 20°C (68°F) is 1.240.
- When electrolyte temperature is 0°C (32°F) and specific gravity of electrolyte is 1.210, converted specific gravity at 20°C (68°F) is 1.196.

BATTERY

How to Handle Battery (Cont'd)

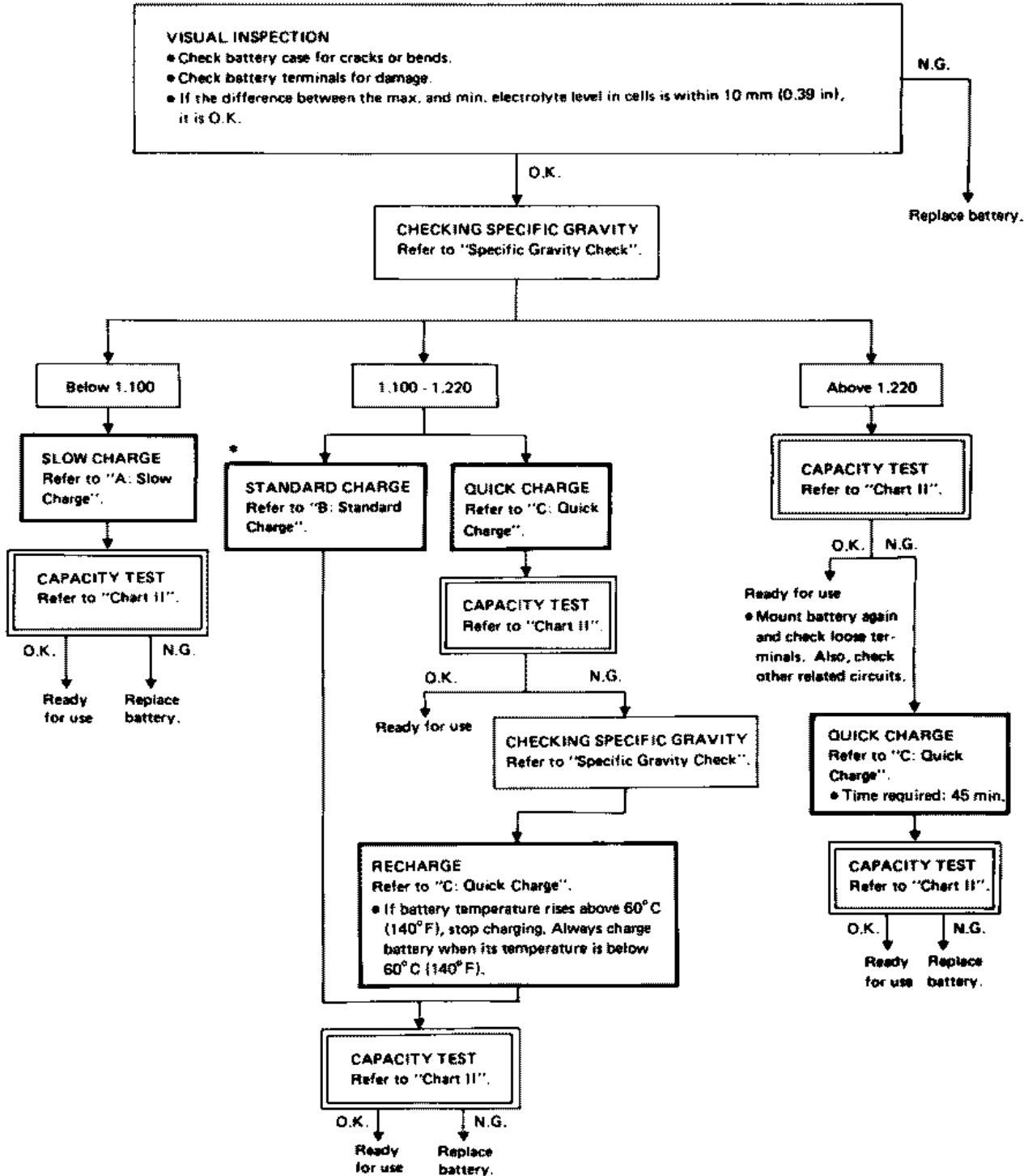


SEL042D

BATTERY

Battery Test and Charging Chart

Chart I

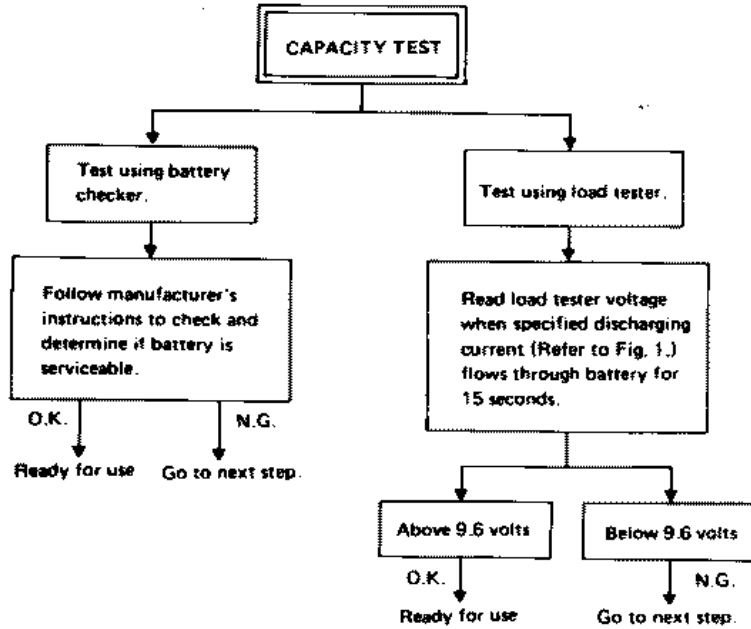


* "STANDARD CHARGE" is recommended in case that the vehicle is in storage after charging.

BATTERY

Battery Test and Charging Chart (Cont'd)

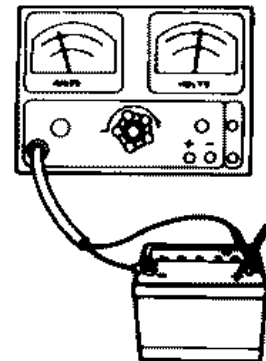
Chart II



- Check battery type and determine the specified current using the following table.

Fig. 1 DISCHARGING CURRENT (Load tester)

Type	Current (A)
28B19R(L)	90
34B19R(L)	99
46B24R(L)	135
55B24R(L)	135
50D23R(L)	150
55D23R(L)	180
65D26R(L)	195
80D26R(L)	195
75D31R(L)	210
95D31R(L)	240
95E41R(L)	300
130E41R(L)	330



SEL6978

BATTERY

Battery Test and Charging Chart (Cont'd)

A: SLOW CHARGE

Fig. 2 INITIAL CHARGING CURRENT SETTING (Slow charge)

BATTERY TYPE CON- VERTED SPECIFIC GRAVITY	28B19R(L) 34B19R(L)	48B24R(L) 55B24R(L)	50D23R(L) 55D23R(L)	65D26R(L) 80D26R(L)	75D31R(L)	95D31R(L) 95E41R(L)	130E41R(L)
Below 1.100	4.0 (A)	5.0 (A)	7.0 (A)	8.0 (A)	9.0 (A)	10.0 (A)	14.0 (A)

- Check battery type and determine the specified current using the table shown above.
- After starting charging, adjustment of charging current is not necessary.

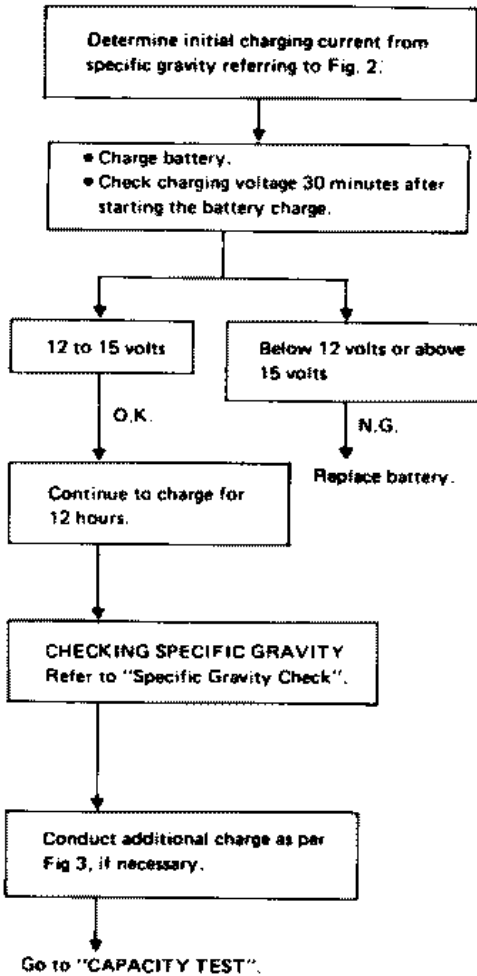
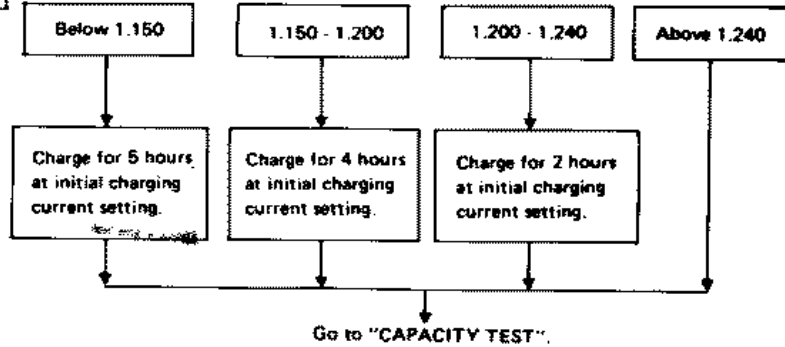


Fig. 3 ADDITIONAL CHARGE (Slow charge)



CAUTION:

- Set charging current to value specified in Fig. 2. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.
- Keep battery away from open flame while it is being charged.
- When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.
- If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).

BATTERY

Battery Test and Charging Chart (Cont'd)

B: STANDARD CHARGE

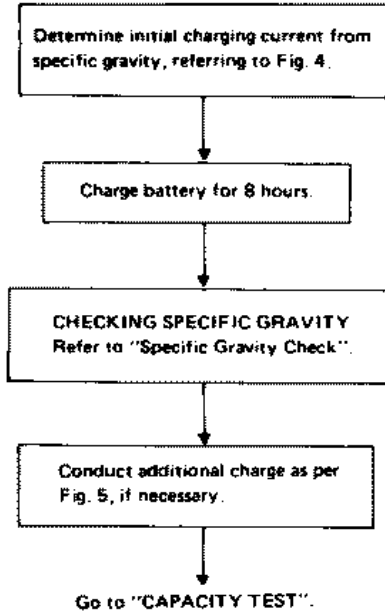
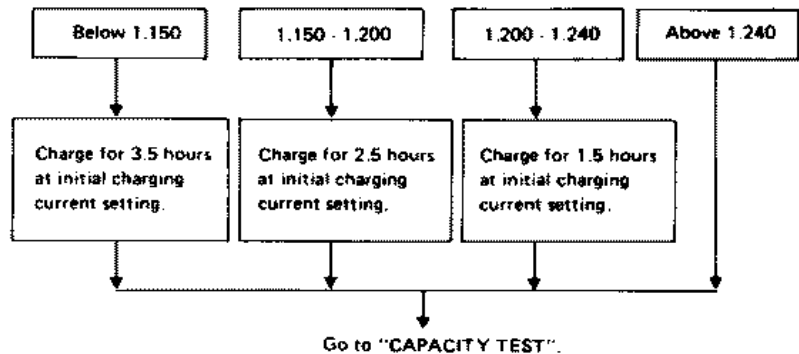


Fig. 4 INITIAL CHARGING CURRENT SETTING
(Standard charge)

BATTERY TYPE CON- VERTED SPECIFIC GRAVITY	28B19R(L) 34B19R(L)		46B24R(L) 55B24R(L)		50D23R(L) 55D23R(L)		65D26R(L) 80D26R(L)		75D31R(L)	95D31R(L) 95E41R(L)		130E41R(L)
	1.100 - 1.130	4.0 (A)	5.0 (A)	5.0 (A)	6.0 (A)	7.0 (A)	8.0 (A)	9.0 (A)	13.0 (A)			
1.130 - 1.160	3.0 (A)	4.0 (A)	5.0 (A)	6.0 (A)	7.0 (A)	8.0 (A)	11.0 (A)					
1.160 - 1.190	2.0 (A)	3.0 (A)	4.0 (A)	5.0 (A)	6.0 (A)	7.0 (A)	9.0 (A)					
1.190 - 1.220	2.0 (A)	2.0 (A)	3.0 (A)	4.0 (A)	5.0 (A)	5.0 (A)	7.0 (A)					

- Check battery type and determine the specified current using the table shown above.
- After starting charging, adjustment of charging current is not necessary.

Fig. 5 ADDITIONAL CHARGE (Standard charge)



CAUTION:

- Do not use standard charge method on a battery whose specific gravity is less than 1.100.
- Set charging current to value specified in Fig. 4. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.
- Keep battery away from open flame while it is being charged.
- When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.
- If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).

BATTERY

Battery Test and Charging Chart (Cont'd)

C: QUICK CHARGE

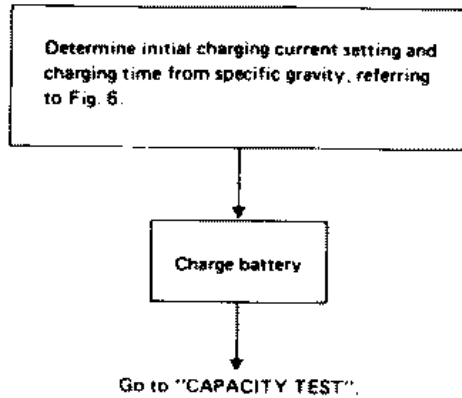


Fig. 6 INITIAL CHARGING CURRENT SETTING AND CHARGING TIME (Quick charge)

CON- VERTED SPECIFIC GRAVITY	BATTERY TYPE		CUR- RENT (A)		130E41R(L)
	28B19R(L) 34B19R(L)	46B24R(L) 55B24R(L) 50D23R(L)	55D23R(L) 65D26R(L) 80D26R(L)	75D31R(L) 95D31R(L) 95E41R(L)	
	10 (A)	15 (A)	20 (A)	30 (A)	40 (A)
1.100 - 1.130	2.5 hours				
1.130 - 1.160	2.0 hours				
1.160 - 1.190	1.5 hours				
1.190 - 1.220	1.0 hours				
Above 1.220	0.75 hours (45 min.)				

- Check battery type and determine the specified current using the table shown above.
- After starting charging, adjustment of charging current is not necessary.

CAUTION:

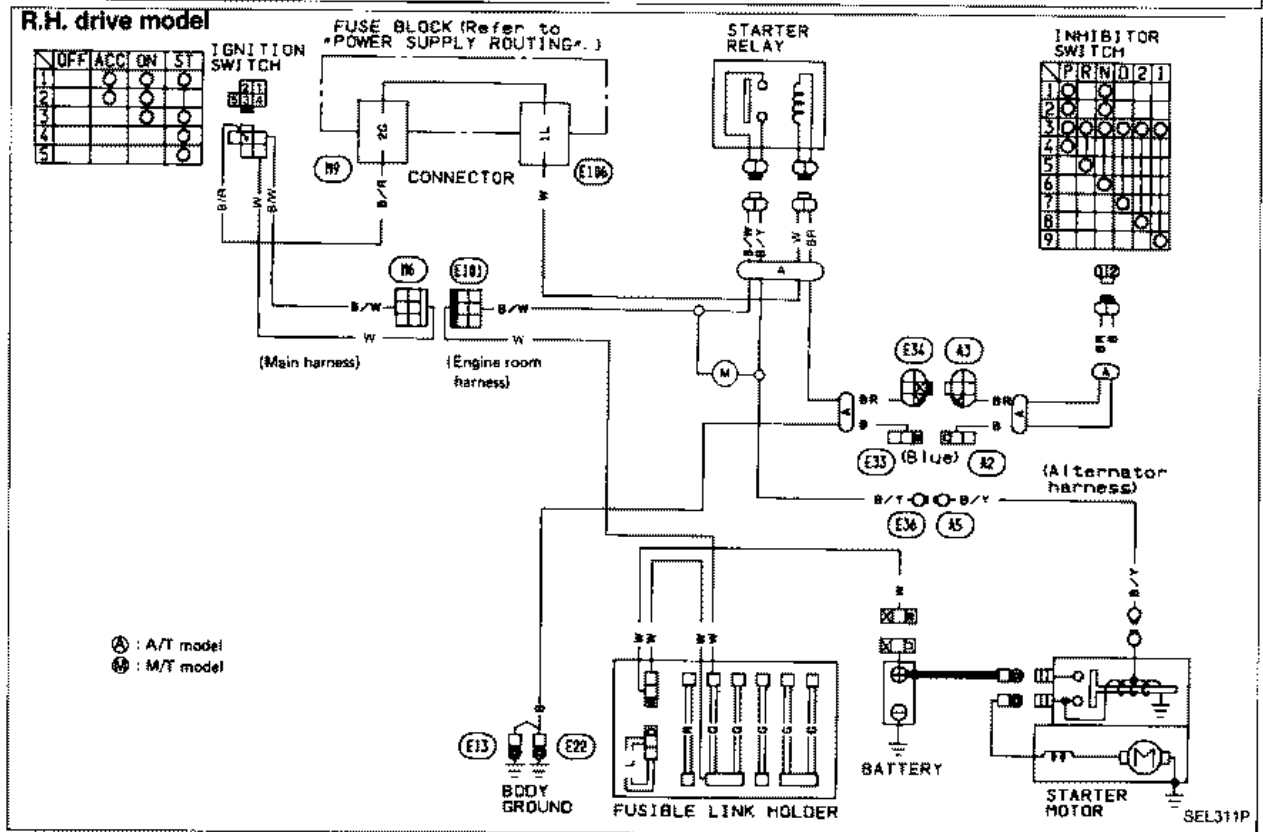
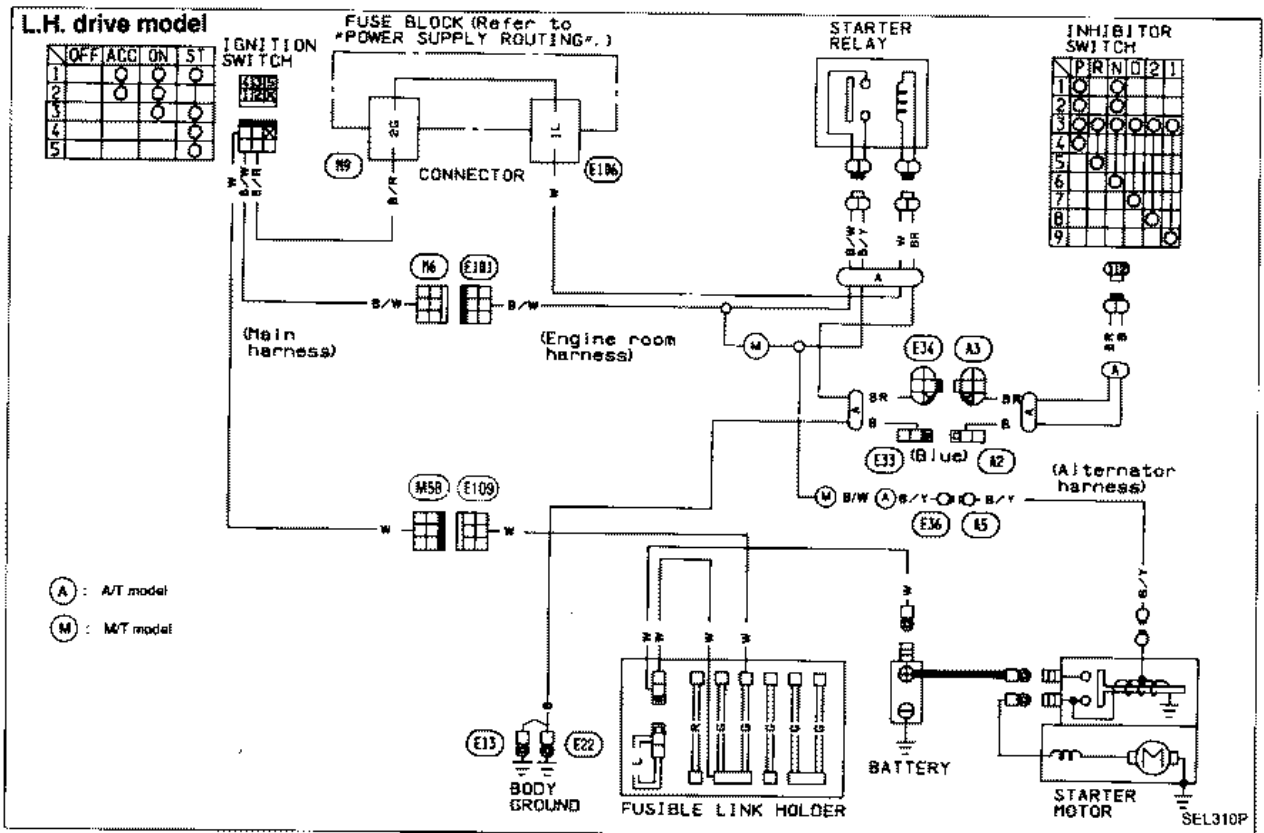
- a. Do not use quick charge method on a battery whose specific gravity is less than 1.100.
- b. Set initial charging current to value specified in Fig. 6. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.
- c. Keep battery away from open flame while it is being charged.
- d. When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.
- e. Be careful of a rise in battery temperature because a large current flow is required during quick-charge operation.
If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).
- f. Do not exceed the charging time specified in Fig. 6, because charging battery over the charging time can cause deterioration of the battery.

Service Data and Specifications (S.D.S.)

		Australia	Europe	
Applied model		All	M/T	A/T
Type		55D23L	65D26L	80D26L
Capacity	V-AH	12-60	12-65	

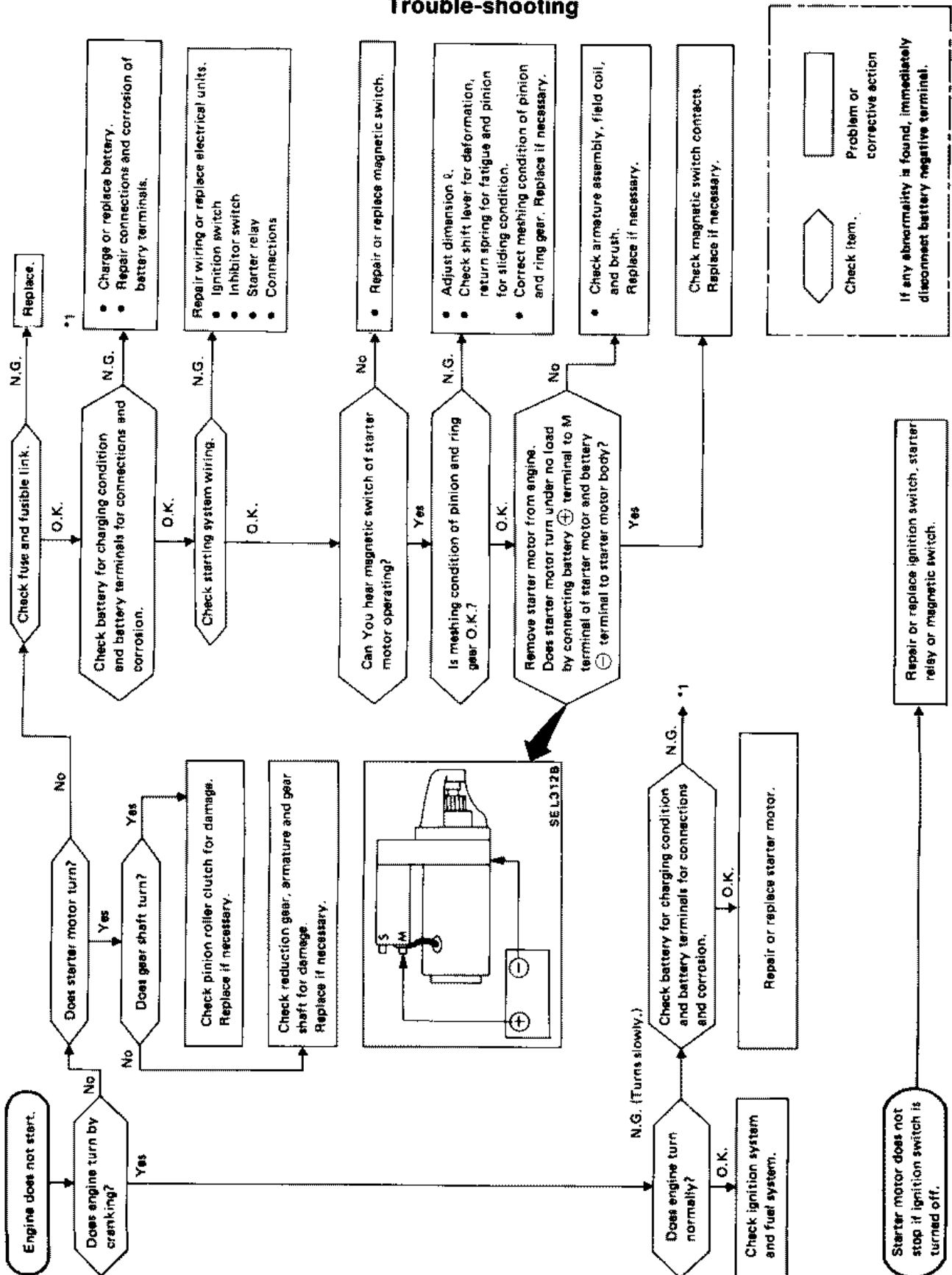
STARTING SYSTEM

Wiring Diagram



STARTING SYSTEM

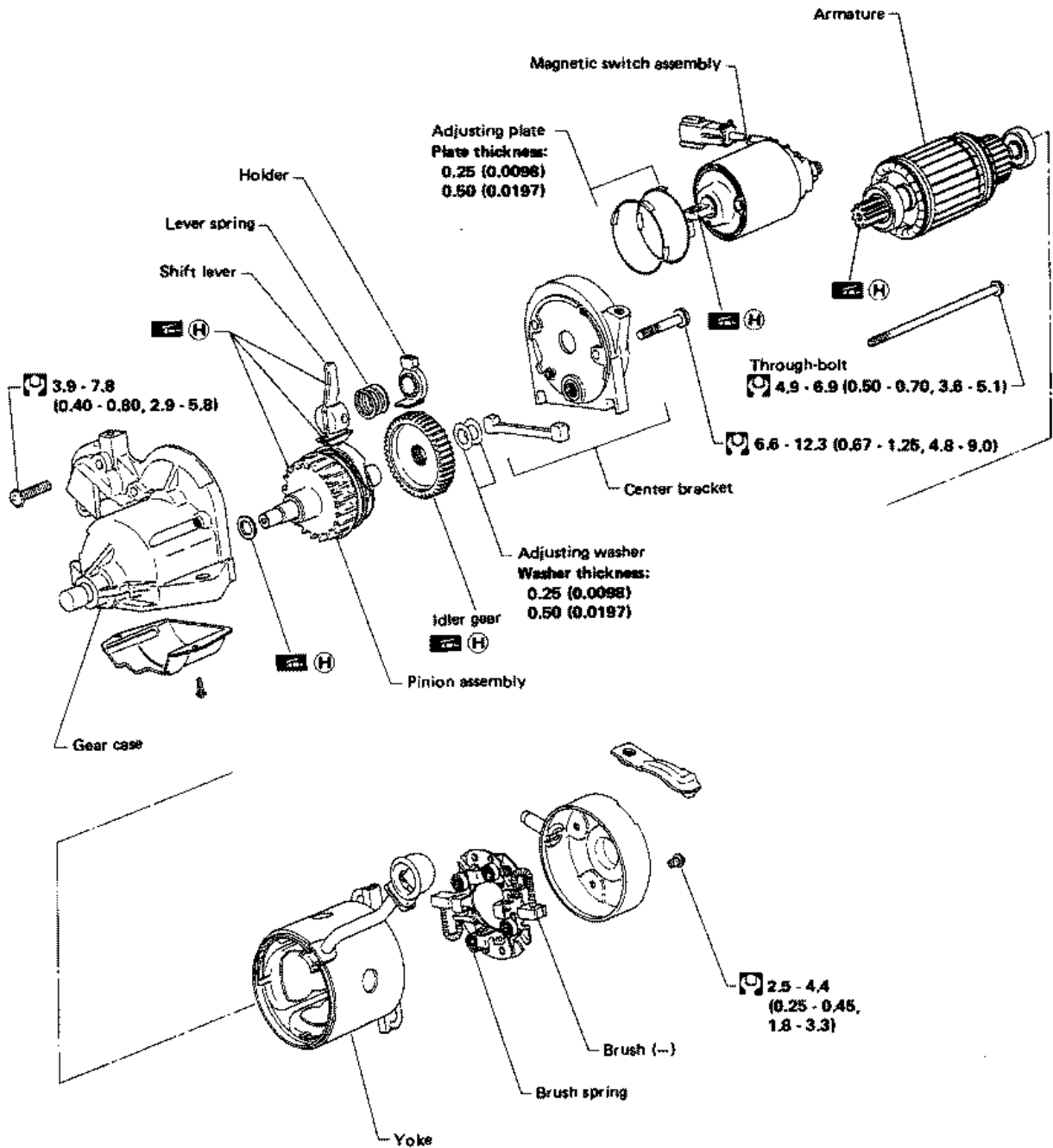
Trouble-shooting



STARTING SYSTEM — Starter —

Construction

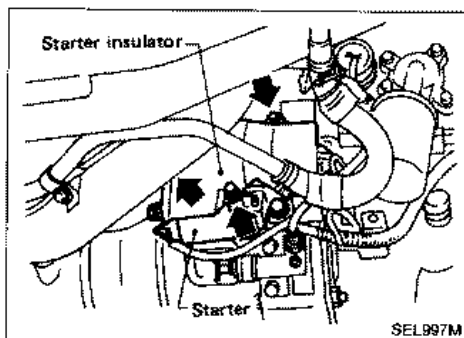
M2T25281



Unit: mm (in)
 [Wrench/Screwdriver Icon] : N·m (kg·m, ft·lb)
 [Grease Gun Icon] (H) : High-temperature grease point

SEL038N

STARTING SYSTEM — Starter —



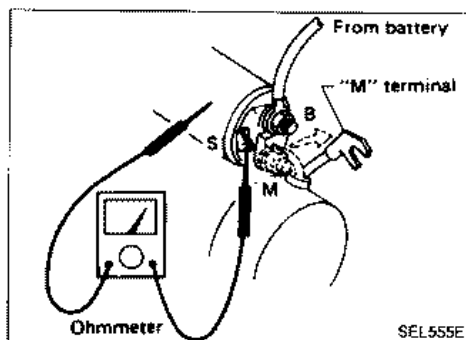
Removal and Installation

REMOVAL

1. Remove starter insulator.
2. Remove starter harness connector and cable.
3. Remove starter fixing bolt and nut and remove starter.

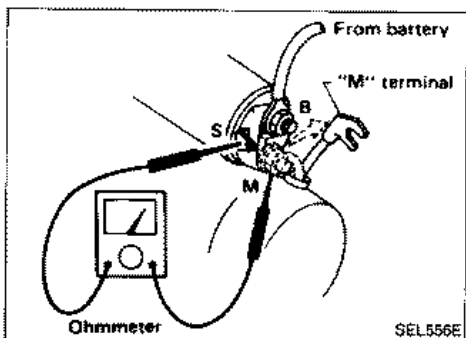
INSTALLATION

- Installation procedure is in reverse order of removal.

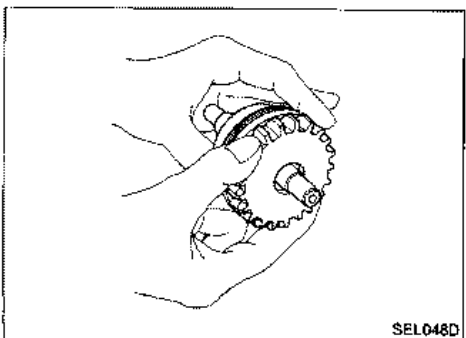


Magnetic Switch Check

- Before starting to check, disconnect battery ground cable.
- Disconnect "M" terminal of starter motor.
- 1. Continuity test (between "S" terminal and switch body).
- No continuity ... Replace.



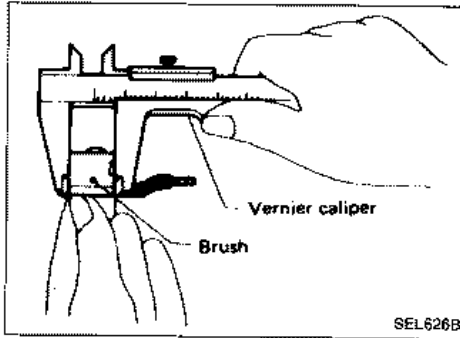
2. Continuity test (between "S" terminal and "M" terminal).
- No continuity ... Replace.



Pinion/Clutch Check

1. Inspect pinion teeth.
 - Replace pinion if teeth are worn or damaged. (Also check condition of ring gear teeth.)
2. Check to see if pinion locks in one direction and rotates smoothly in the opposite direction.
 - If it does not lock (or locks) in either direction or unusual resistance is evident ... Replace.
3. Inspect reduction gear teeth.
 - Replace reduction gear if teeth are worn or damaged. (Also check condition of armature shaft gear teeth.)

STARTING SYSTEM — Starter —



Brush Check

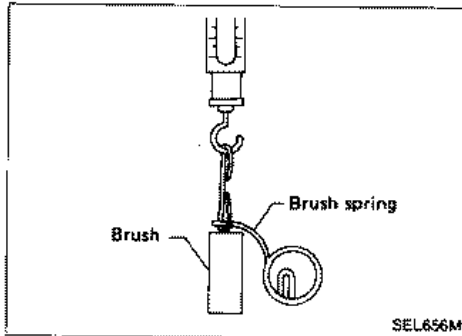
BRUSH

Check brush for wear.

Wear limit length:

Refer to S.D.S.

- Excessive wear ... Replace.



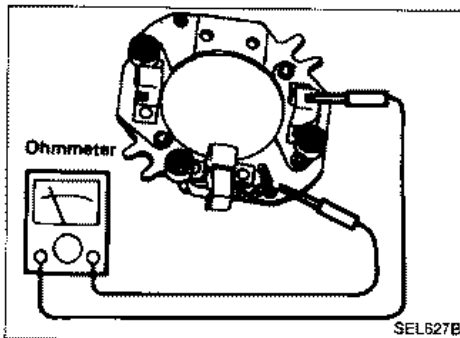
BRUSH SPRING PRESSURE

Check brush spring pressure with brush spring detached from brush.

Spring pressure (with new brush):

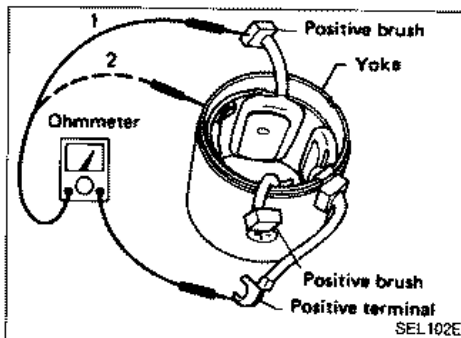
Refer to S.D.S.

- Not within the specified values ... Replace.



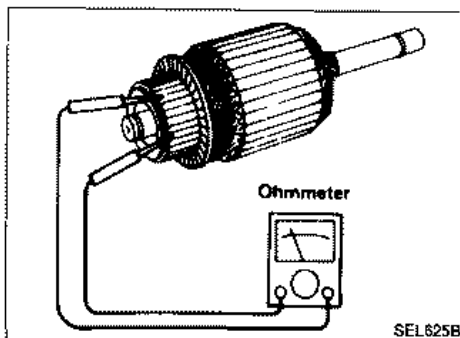
BRUSH HOLDER

1. Perform insulation test between brush holder (positive side) and its base (negative side).
- Continuity exists Replace.
2. Check brushes to see if they move smoothly.
- If brush holder is bent, replace it; if surfaces of brush holder and base are dirty, clean them.



Field Coil Check

1. Continuity test (between field coil positive terminal and positive brushes).
- No continuity ... Replace yoke.
2. Insulation test (between field coil positive terminal and yoke).
- Continuity exists Replace yoke.

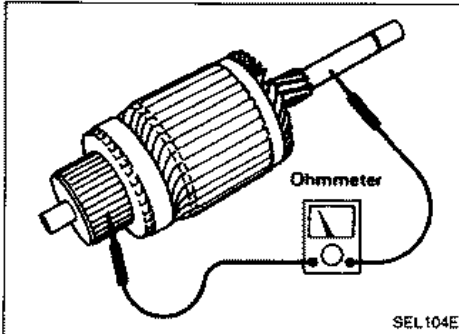


Armature Check

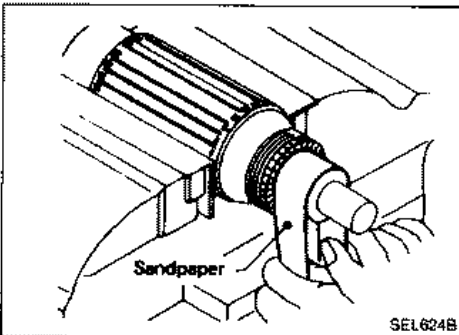
1. Continuity test (between two segments side by side).
- No continuity ... Replace.

STARTING SYSTEM — Starter —

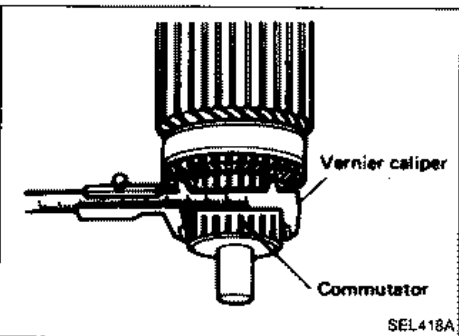
Armature Check (Cont'd)



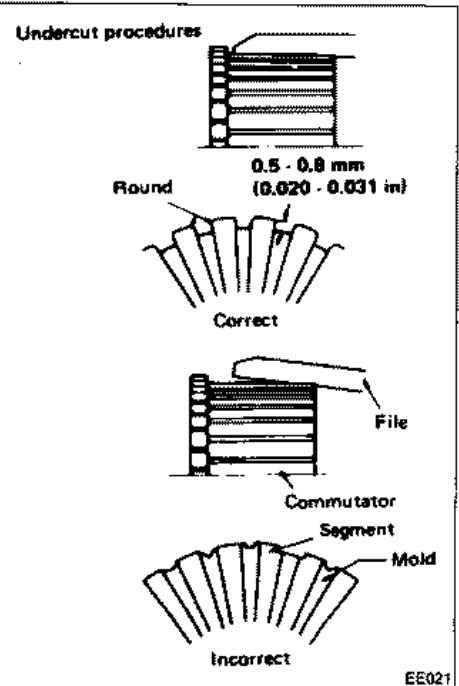
2. Insulation test (between each commutator bar and shaft).
- Continuity exists ... Replace.



3. Check commutator surface.
- Rough ... Sand lightly with No. 500 - 600 sandpaper.

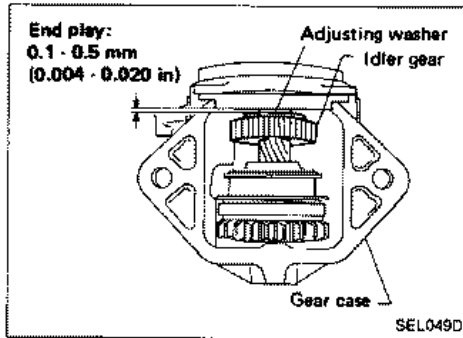


4. Check diameter of commutator.
- Commutator minimum diameter:
Refer to S.D.S.**
- Less than specified value ... Replace.



5. Check depth of insulating mold from commutator surface.
- Less than 0.2 mm (0.008 in) ... Undercut to 0.5 to 0.8 mm (0.020 to 0.031 in)

STARTING SYSTEM — Starter —



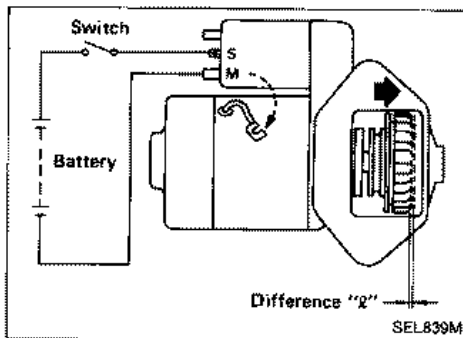
Reassembly

Carefully observe the following instructions.

a. Apply grease to:

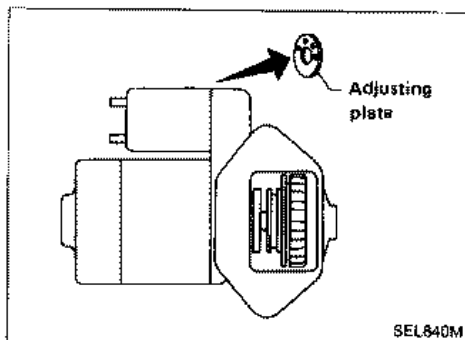
- Rear cover metal
- Gear case metal
- Frictional surface of pinion
- Moving portion of shift lever
- Plunger of magnetic switch

- b. After assembling gear case, pinion assembly, idler gear, adjusting washers and center bracket, turn idler gear with your hand in axial direction and adjust end play to the 0.1 to 0.5 mm (0.004 to 0.020 in) range using adjusting washer(s).
- c. Check pinion to see if its engagement length is correct.



Measure difference in height "ℓ" of pinion assembly front edge when pinion assembly is forced out by the magnetic switch and then when it is pulled out by hand.

Difference "ℓ": 0.3 - 2.0 mm (0.012 - 0.079 in)



- Not in the specified value ... Adjust by adjusting plate.

STARTING SYSTEM — Starter —

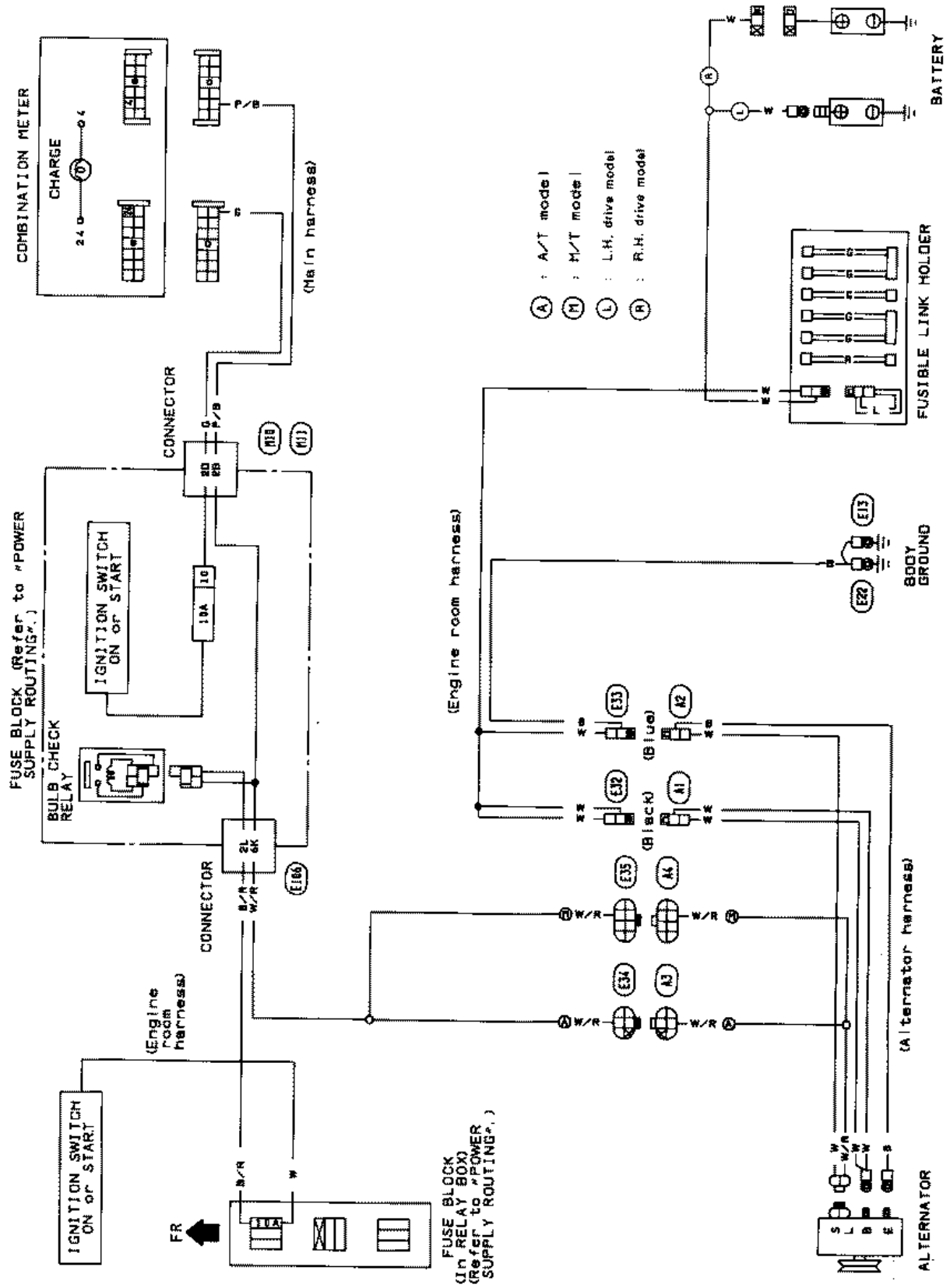
Service Data and Specifications (S.D.S.)

STARTER

Type		M2T25281	
		Reduction gear	
System voltage	V	12	
No-load	Terminal voltage	V	11.0
	Current	A	70
	Revolution	rpm	More than 2,000
Minimum length of brush	mm (in)	11.5 (0.453)	
Brush spring tension (With new brush)	N (kg, lb)	13.7 - 25.5 (1.4 - 2.6, 3.1 - 5.7)	
Minimum diameter of commutator	mm (in)	31.4 (1.236)	
Difference "ε" in height of pinion assembly	mm (in)	0.3 - 2.0 (0.012 - 0.079)	

CHARGING SYSTEM

Wiring Diagram



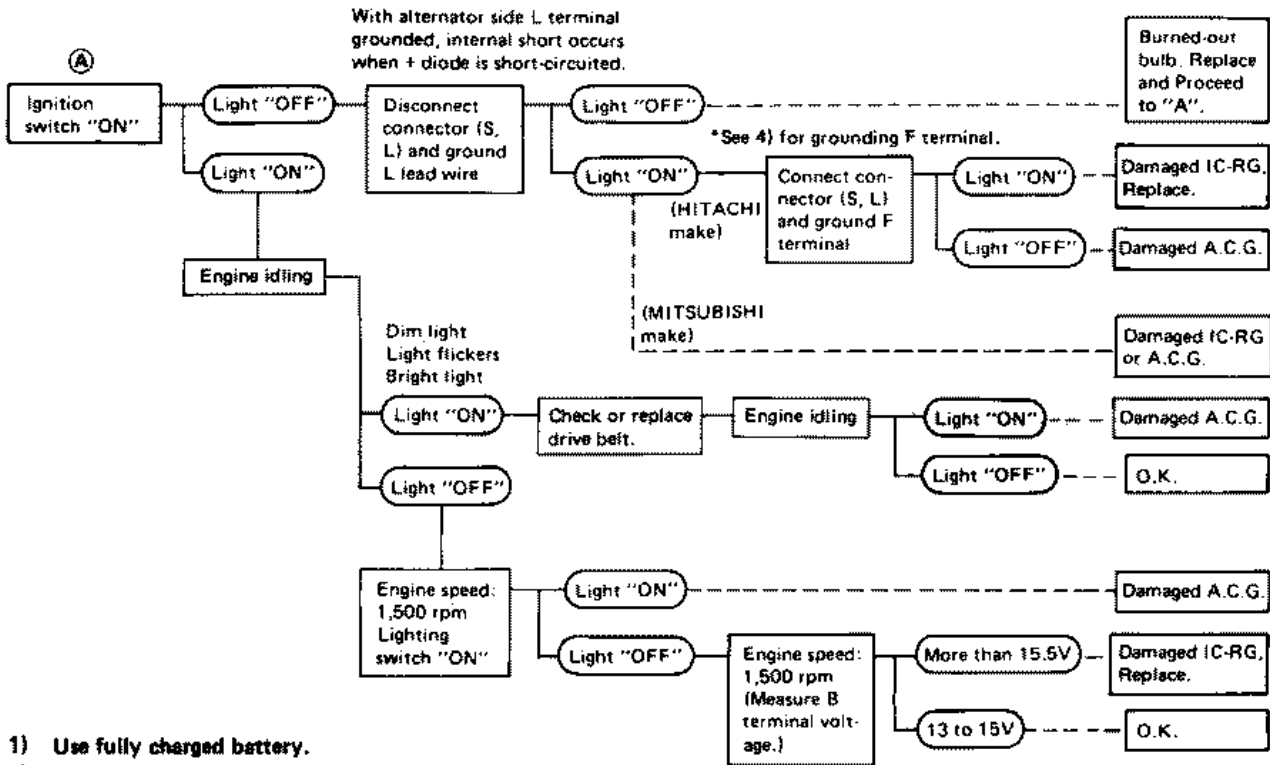
CHARGING SYSTEM

Trouble-shooting

Before conducting an alternator test, make sure that the battery is fully charged. A 30-volt voltmeter and suitable test probes are necessary for the test. The alternator can be checked easily by referring to the Inspection Table.

Before starting trouble-shooting, inspect the fusible link.

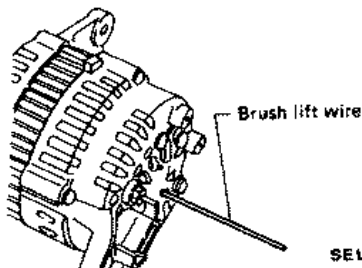
WITH IC REGULATOR



- 1) Use fully charged battery.
- 2) Light : Charge warning light
A.C.G. : Alternator parts except IC regulator
IC-RG : IC regulator
O.K. : IC alternator is in good condition.
- 3) When reaching "Damaged A.C.G.", remove alternator from vehicle and disassemble, inspect and correct or replace faulty parts.
- 4) *Method of grounding F terminal (HITACHI make only)

Gasoline engine model

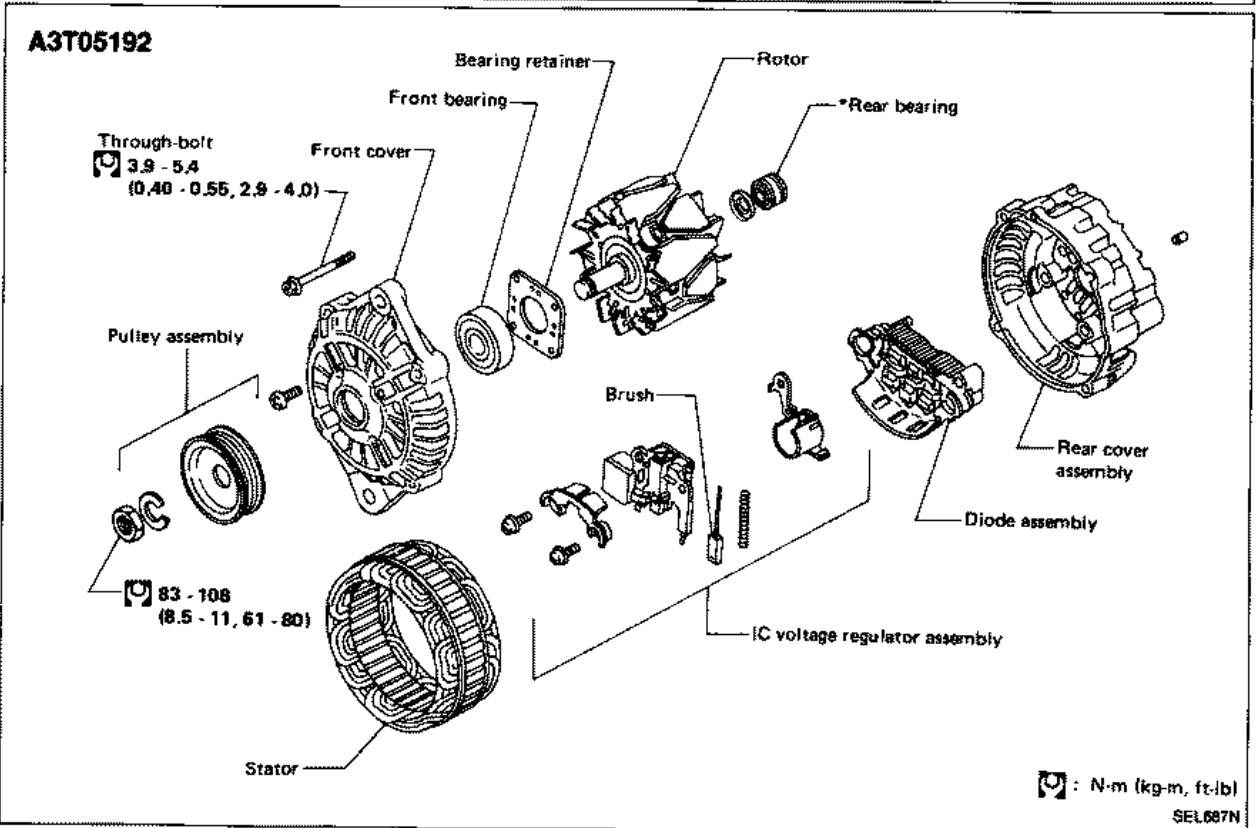
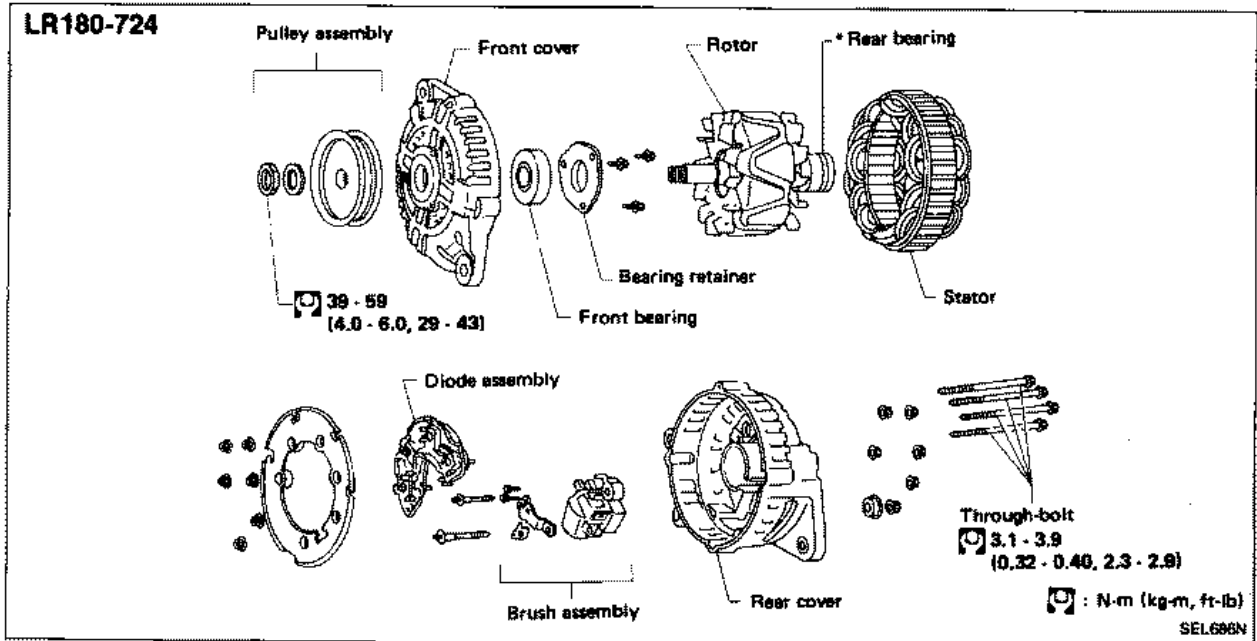
Contact tip of wire with brush and attach wire to alternator body.



- 5) Terminals "S", "L", "B" and "E" are marked on rear cover of alternator.

CHARGING SYSTEM — Alternator —

Construction



*Rear bearing

CAUTION:

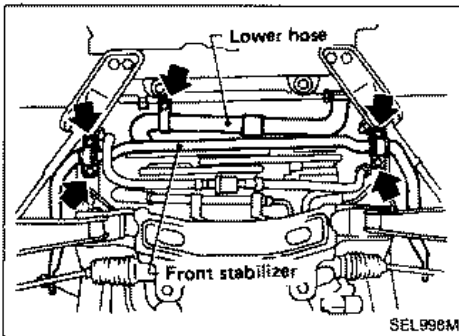
Rear cover may be hard to remove because a ring is used to lock outer race of rear bearing. Be careful not to lose this ring during removal.

CHARGING SYSTEM — Alternator —

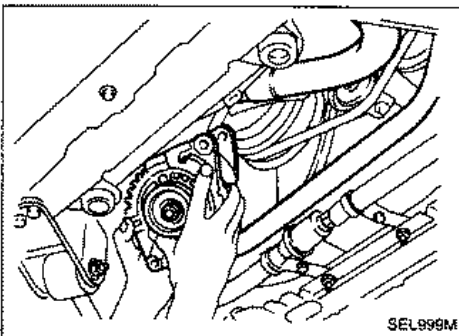
Removal and Installation

REMOVAL

1. Loosen alternator belt.
2. Remove alternator adjusting bar.
3. Remove harness connector and cable from alternator.



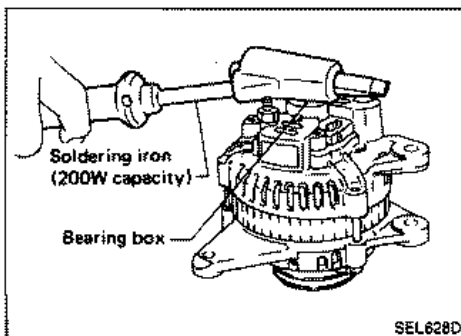
4. Remove stabilizer bracket fixing bolts.
5. Remove radiator lower hose bracket and push lower hose upward to make room.



6. Remove alternator fixing bolt and take out alternator as shown in the figure.

INSTALLATION

- Installation procedure is in reverse order of removal.

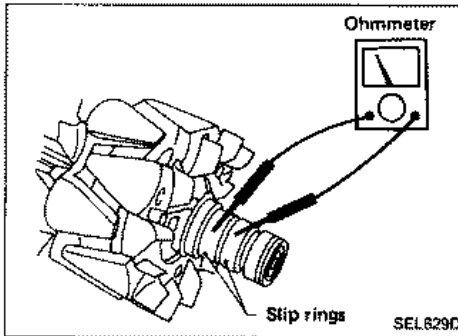


Disassembly

CAUTION:

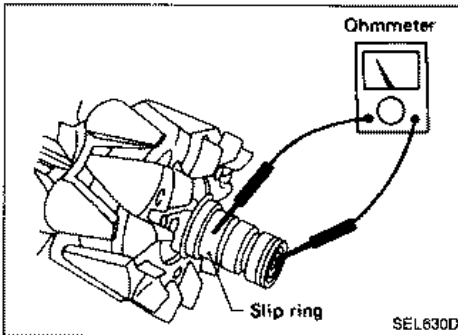
Rear cover may be hard to remove because a ring is used to lock outer race of rear bearing. To facilitate removal of rear cover, heat just bearing box section with a 200W soldering iron. Do not use a heat gun, as it can damage diode assembly.

CHARGING SYSTEM — Alternator —

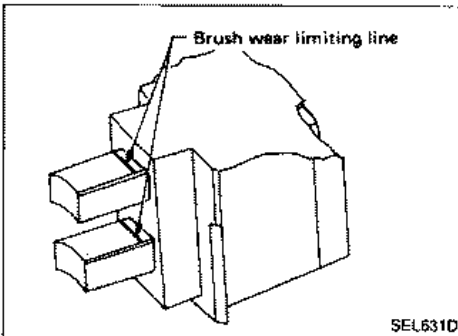


Rotor Slip Ring Check

1. Continuity test
 - No continuity ... Replace rotor.

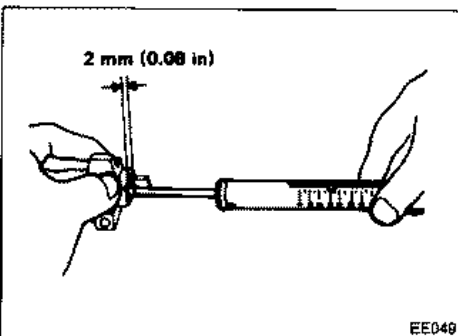


2. Insulator test
 - Continuity exists ... Replace rotor.
3. Check slip ring for wear.
 - Slip ring minimum outer diameter:
Refer to S.D.S.



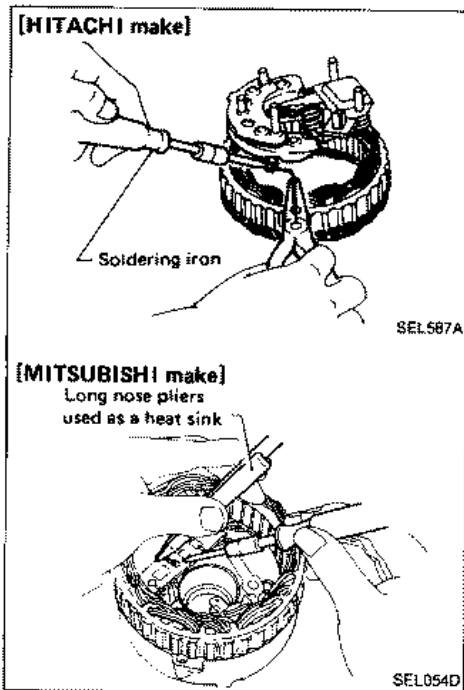
Brush Check

1. Check smooth movement of brush.
 - Not smooth ... Check brush holder and clean.
2. Check brush for wear.
 - Replace brush if it is worn down to the limit line.



3. Check brush lead wire for damage.
 - Damaged ... Replace.
4. Check brush spring pressure with brush projected approximately 2 mm(0.08 in) from brush holder.
 - Spring pressure:
Refer to S.D.S.
 - Not within the specified values ... Replace.

CHARGING SYSTEM — Alternator —

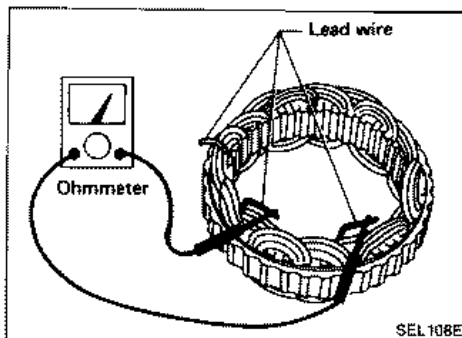


Stator Check

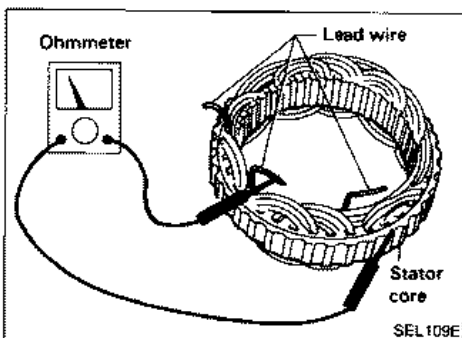
To test the stator or diode, you must separate them by unsoldering the connecting wires.

CAUTION:

Use only as much heat as required to melt solder. Otherwise, diodes will be damaged by excessive heat.



1. Continuity test
 - No continuity ... Replace stator.



2. Ground test
 - Continuity exists ... Replace stator.

CHARGING SYSTEM — Alternator —

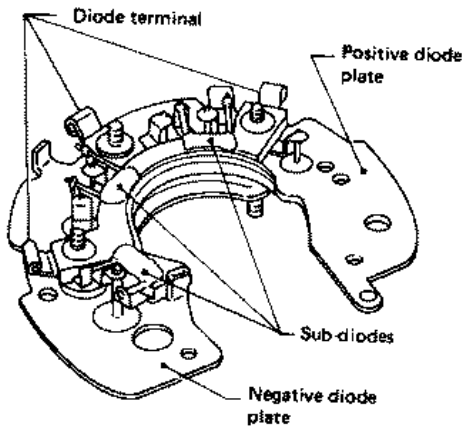
Diode Check

MAIN DIODES

- Use an ohmmeter to check condition of diodes as indicated in chart below.
- If any of the test results is not satisfactory, replace diode assembly.

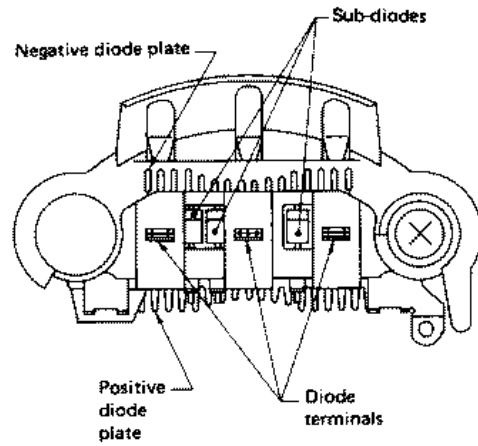
	Ohmmeter probes		Continuity
	Positive ⊕	Negative ⊖	
Diodes check (Positive side)	Positive diode plate	Diode terminals	Yes
	Diode terminals	Positive diode plate	No
Diodes check (Negative side)	Negative diode plate	Diode terminals	No
	Diode terminals	Negative diode plate	Yes

[HITACHI make]

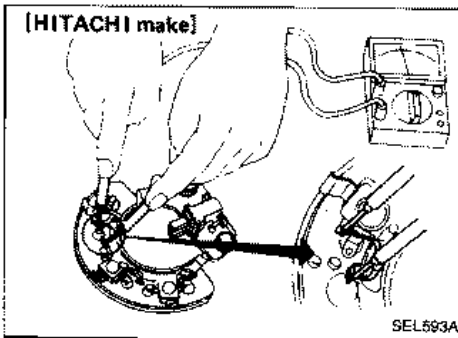


SEL768D

[MITSUBISHI make]

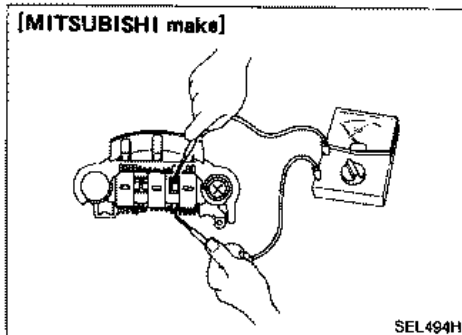


SEL493H



SUB-DIODES

- Attach ohmmeter's probe to each end of diode to check for continuity.
- Continuity is N.G Replace diode assembly.

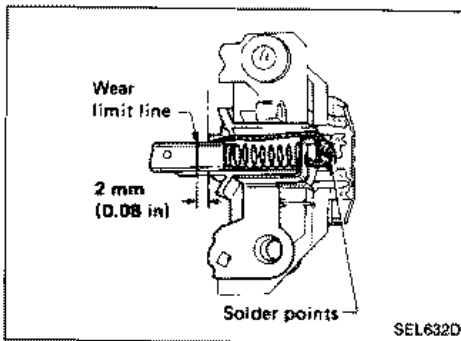


CHARGING SYSTEM — Alternator —

Assembly

Carefully observe the following instructions.

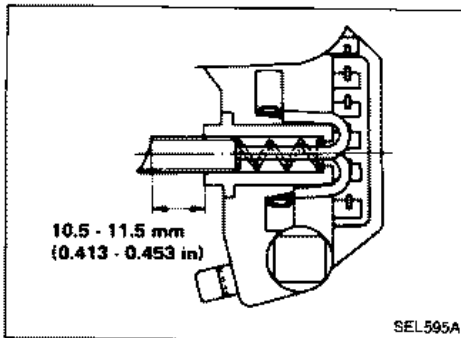
- When soldering each stator coil lead wire to diode assembly terminal, carry out the operation as fast as possible.



WHEN SOLDERING BRUSH LEAD WIRE

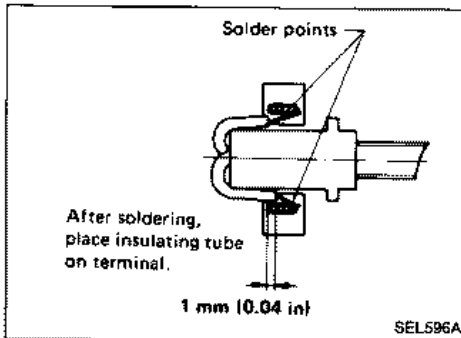
[MITSUBISHI make]

- Position brush so that its wear limit line protrudes 2 mm (0.08 in) beyond end face of brush holder.



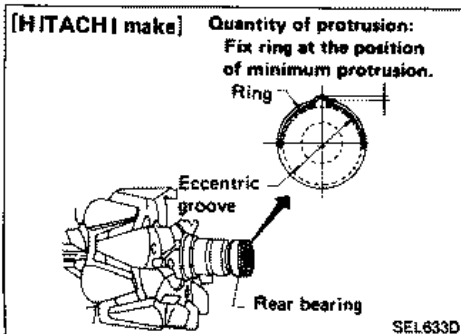
[HITACHI make]

- (1) Position brush so that it extends 10.5 to 11.5 mm (0.413 to 0.453 in) from brush holder.



- (2) Coil lead wire 1.5 times around terminal groove. Solder outside of terminal.

When soldering, be careful not to let solder adhere to insulating tube as it will weaken the tube and cause it to break.



RING FITTING IN REAR BEARING

[HITACHI make]

- Fix ring into groove in rear bearing so that it is as close to the adjacent area as possible.

[MITSUBISHI make]

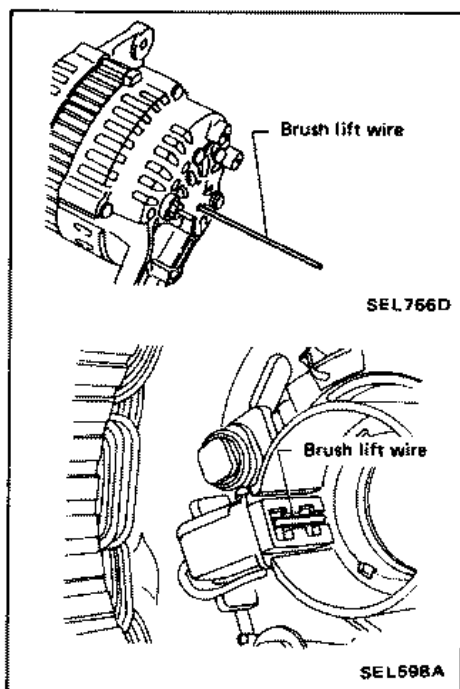
- Always press new bearing into place with ring groove toward slip ring.

CHARGING SYSTEM — Alternator —

Assembly (Cont'd)

REAR COVER INSTALLATION

- (1) Before installing front cover with pulley and rotor with rear cover, push brush up with fingers and retain brush by inserting brush lift wire into brush lift hole from outside.
- (2) After installing front and rear sides of alternator, pull out brush lift wire.



CHARGING SYSTEM — Alternator —

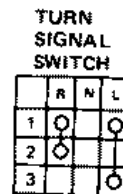
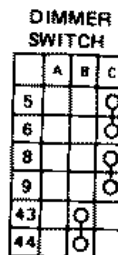
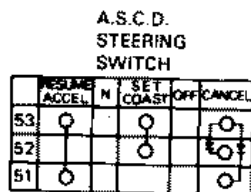
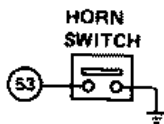
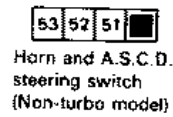
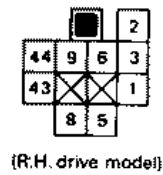
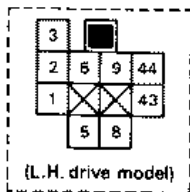
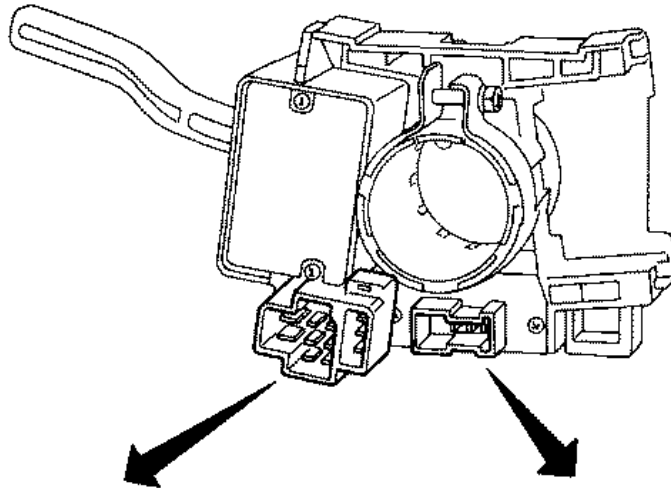
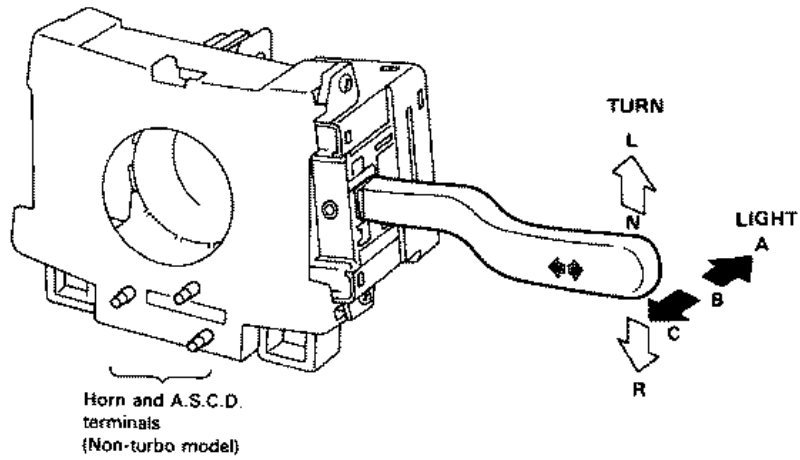
Service Data and Specifications (S.D.S.)

ALTERNATOR

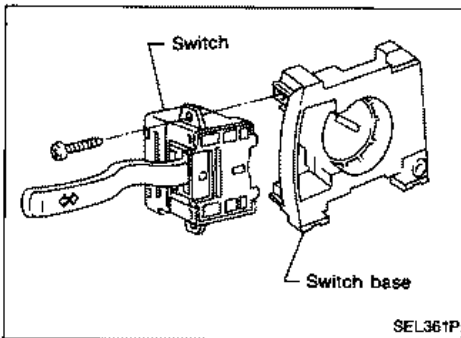
Type		LR180-724	A3T05192
		HITACHI make	MITSUBISHI make
Applied model		Australia	Europe
Nominal rating	V-A	12-80	12-90
Ground polarity		Negative	
Minimum revolution under no-load (when 13.5 volts is applied)	rpm	Less than 950	Less than 1,300
Hot output current	A/rpm	More than 65/2,500 More than 80/5,000	More than 65/2,500 More than 90/5,000
Regulated output voltage	V	14.1 - 14.7	
Minimum length of brush	mm (in)	More than 7.0(0.276)	More than 8.0 (0.315)
Brush spring pressure	N(g, oz)	1.863 - 3.040 (190 - 310, 6.70 - 10.93)	3.040 -4.217 (310 - 430, 10.93 - 15.17)
Slip ring minimum outer diameter	mm (in)	More than 30.6 (1.205)	More than 22.1 (0.870)

COMBINATION SWITCH

Combination Switch/Check

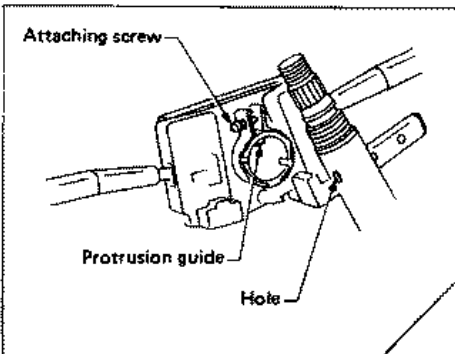


COMBINATION SWITCH

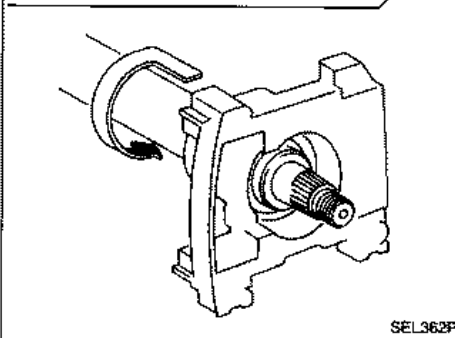


Combination Switch/Replacement

- Each switch can be replaced without removing combination switch base.



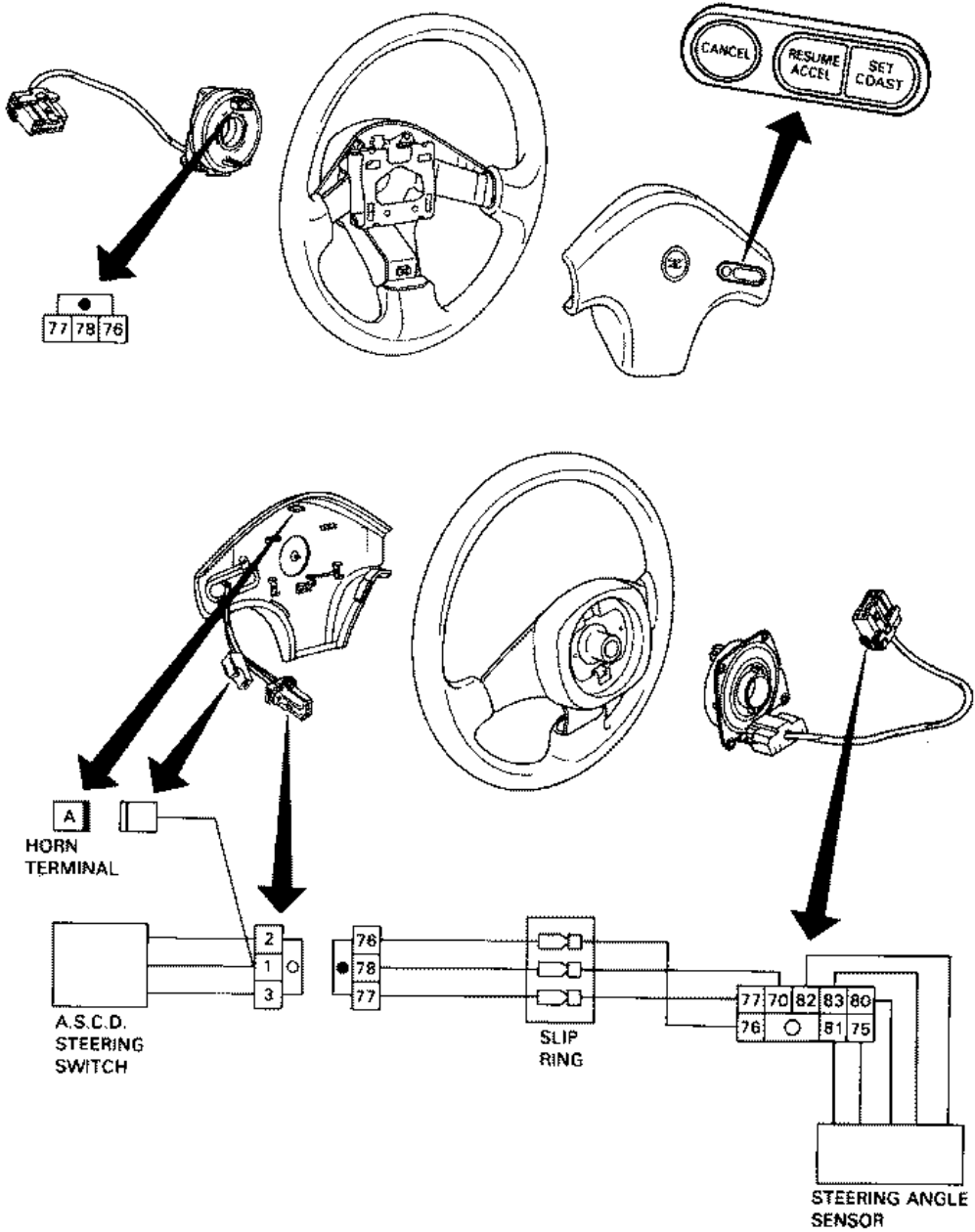
- To remove combination switch base, remove base attaching screw and turn after pushing on it.



COMBINATION SWITCH

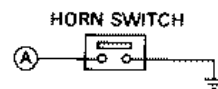
Steering Switch/Check

Turbo model



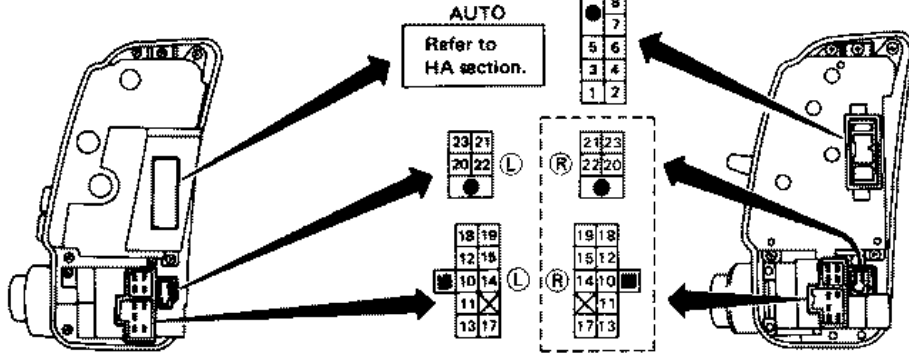
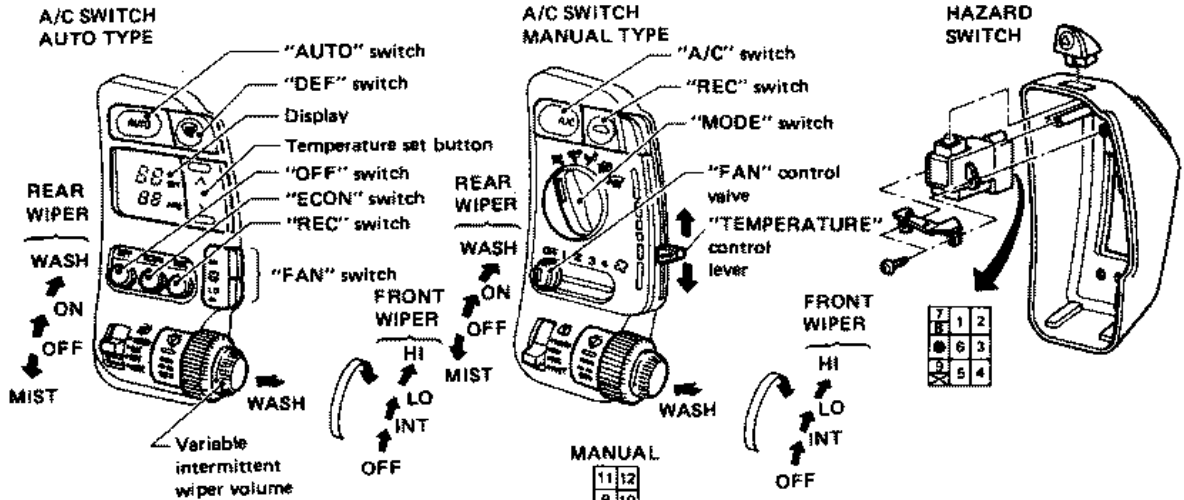
A.S.C.D. STEERING SWITCH

	RESUME ACCEL	N	SET COAST	OFF	CANCEL
1					
2					
3					

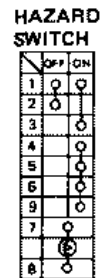
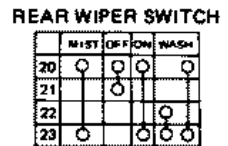
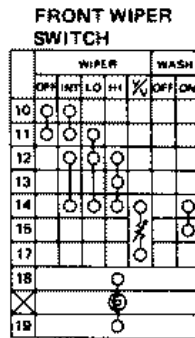
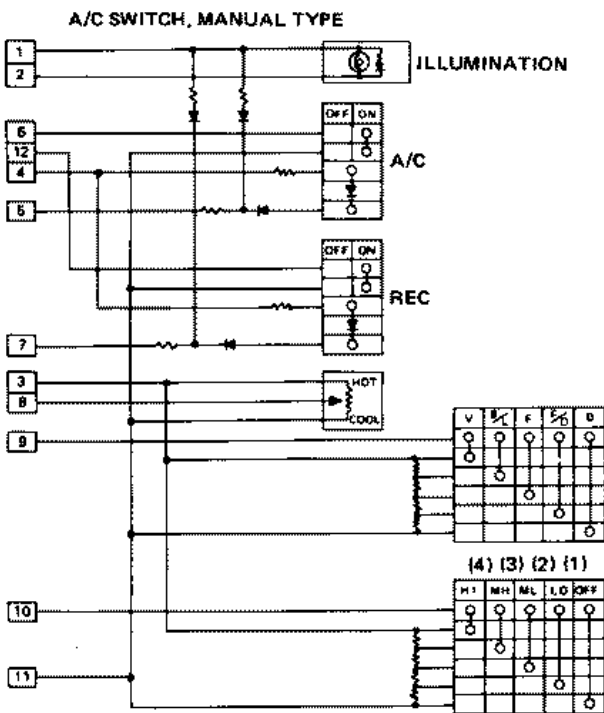


INSTRUMENT SWITCH

Check

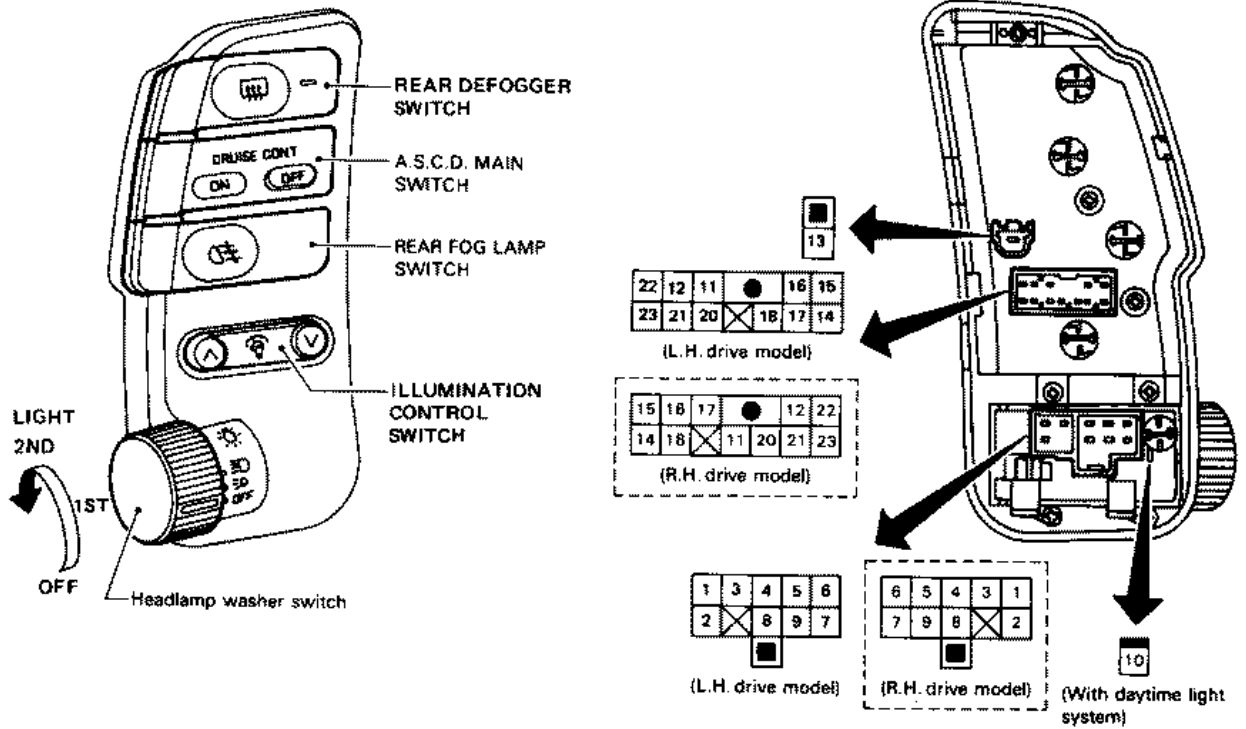


Ⓐ : L.H. drive model
Ⓑ : R.H. drive model

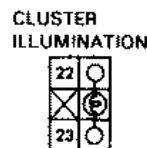
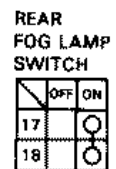
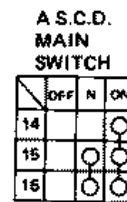
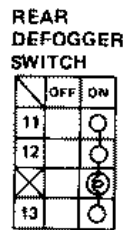
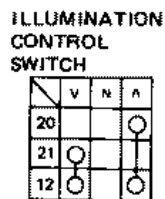
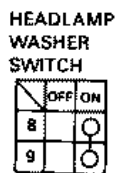
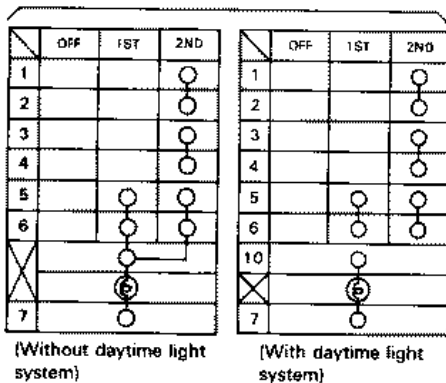


INSTRUMENT SWITCH

Check (Cont'd)

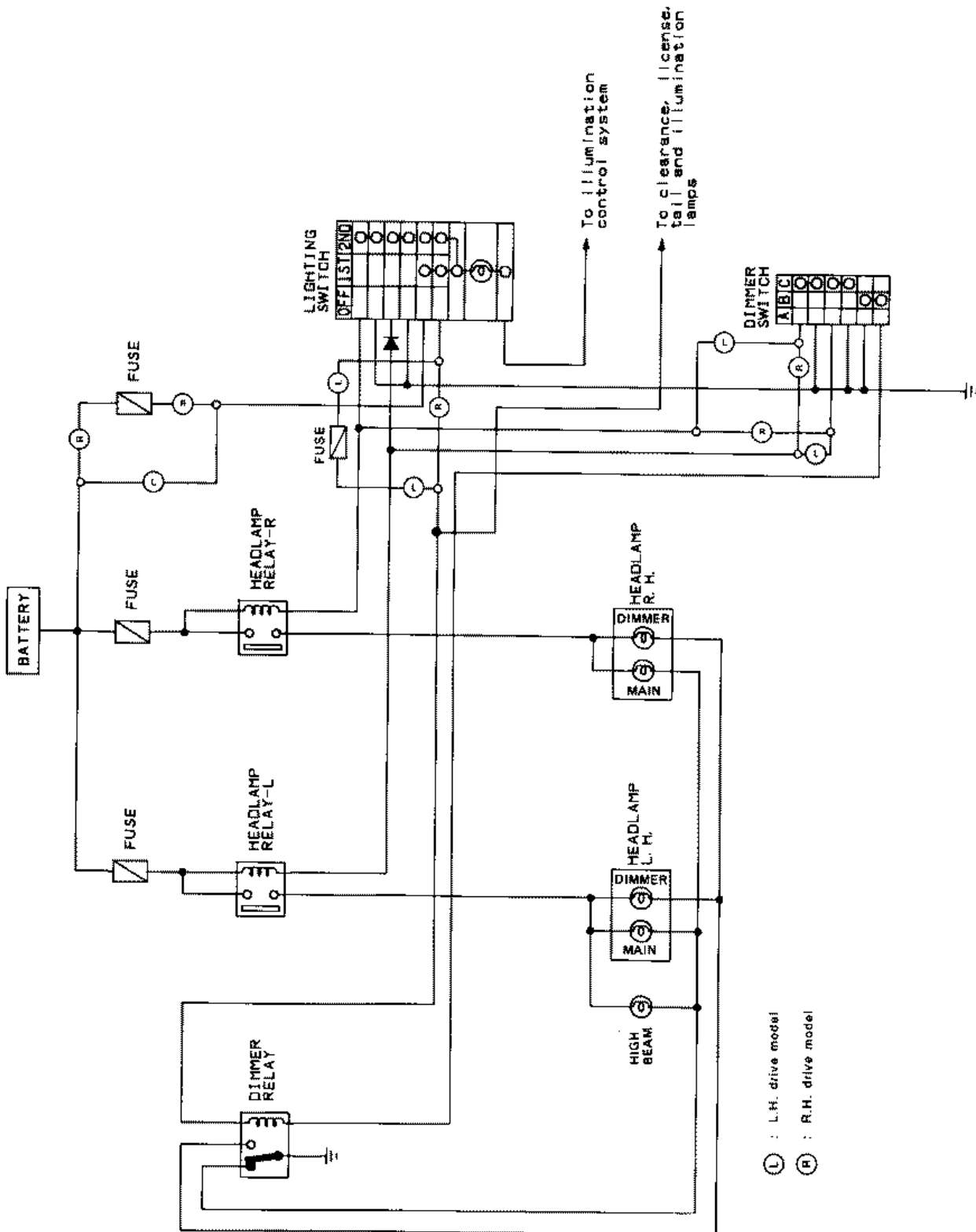


LIGHTING SWITCH



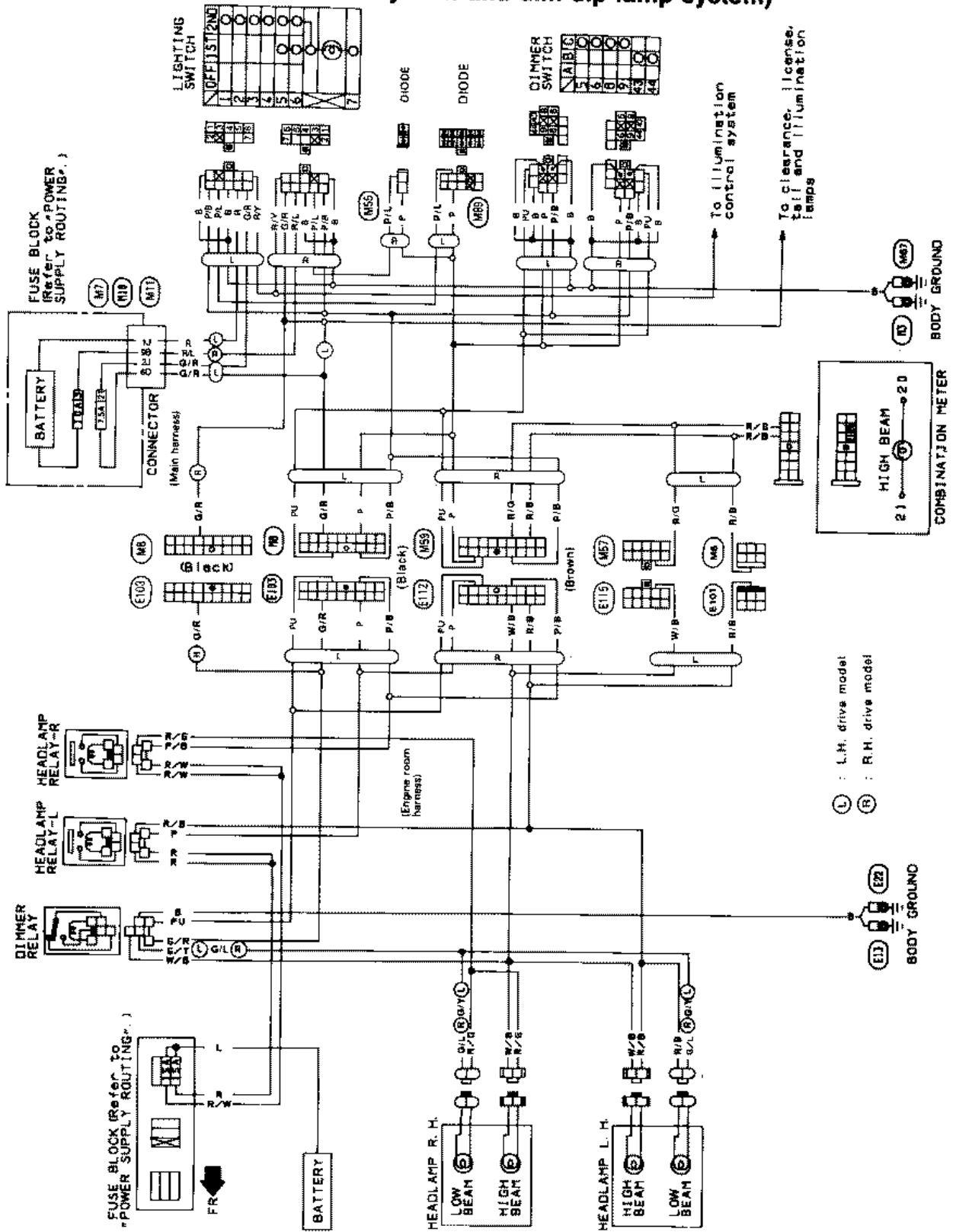
HEADLAMP

Schematic (Models without daytime light system and dim-dip lamp system)



HEADLAMP

Wiring Diagram (Models without daytime light system and dim-dip lamp system)



HEADLAMP

Operation (Models equipped with daytime light system)

After starting the engine with the lighting switch in the "OFF" position, the headlamp low beam and clearance, tail, license and instrument illumination lamps automatically turn on. Lighting switch operations other than the above are the same as conventional light systems.

Engine		With engine stopped									With engine running								
		OFF			1ST			2ND			OFF			1ST			2ND		
Lighting switch		A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Headlamp	High beam	X	X	O	X	X	O	O	X	O	X	X	O	X	X	O	O	X	O
	Low beam	X	X	X	X	X	X	X	O	X	O	O	O	X	X	X	X	O	X
Clearance and tail lamp		X	X	X	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
License and instrument illumination lamp		X	X	X	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

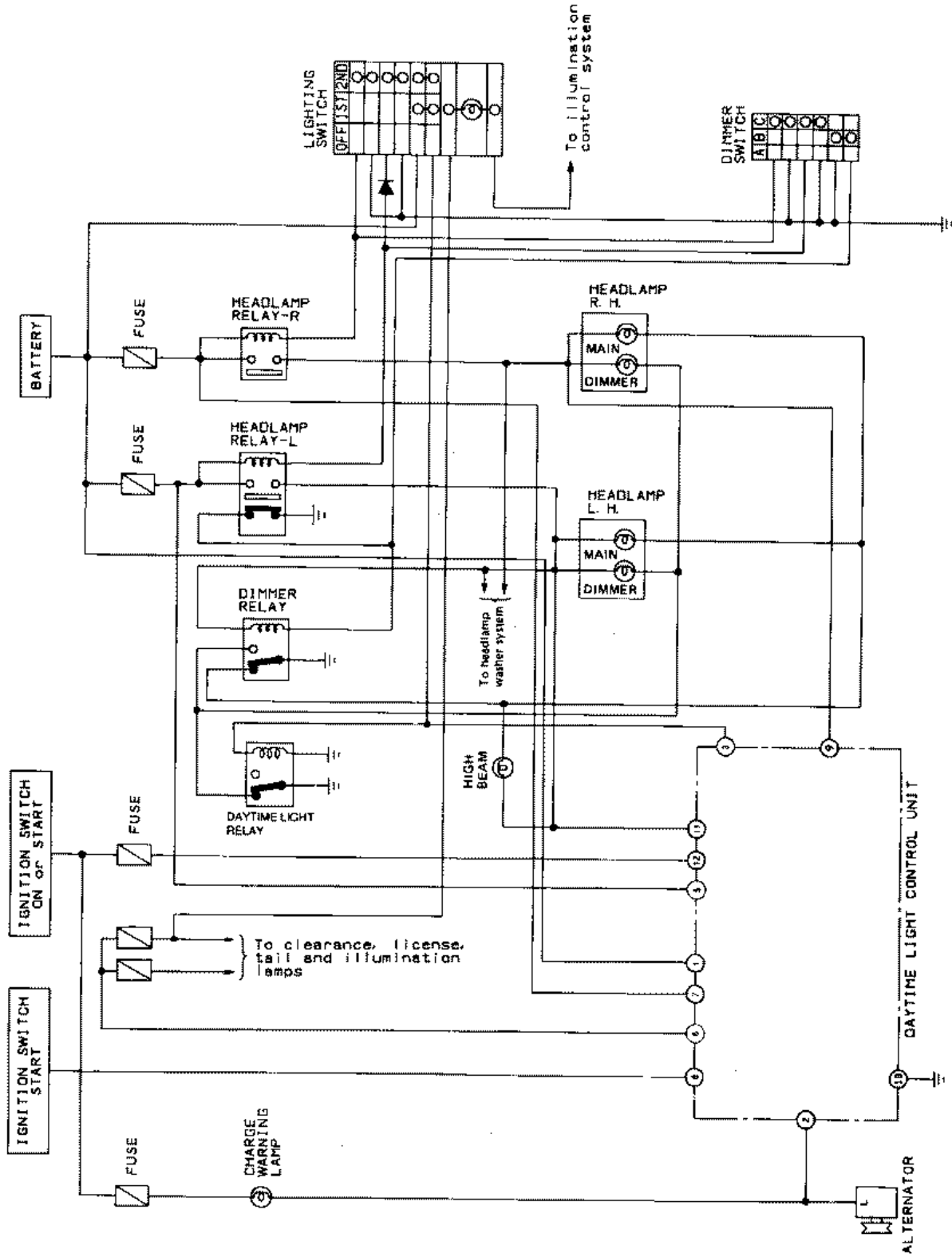
O : Lamp "ON"

X : Lamp "OFF"

■ : Added functions

HEADLAMP

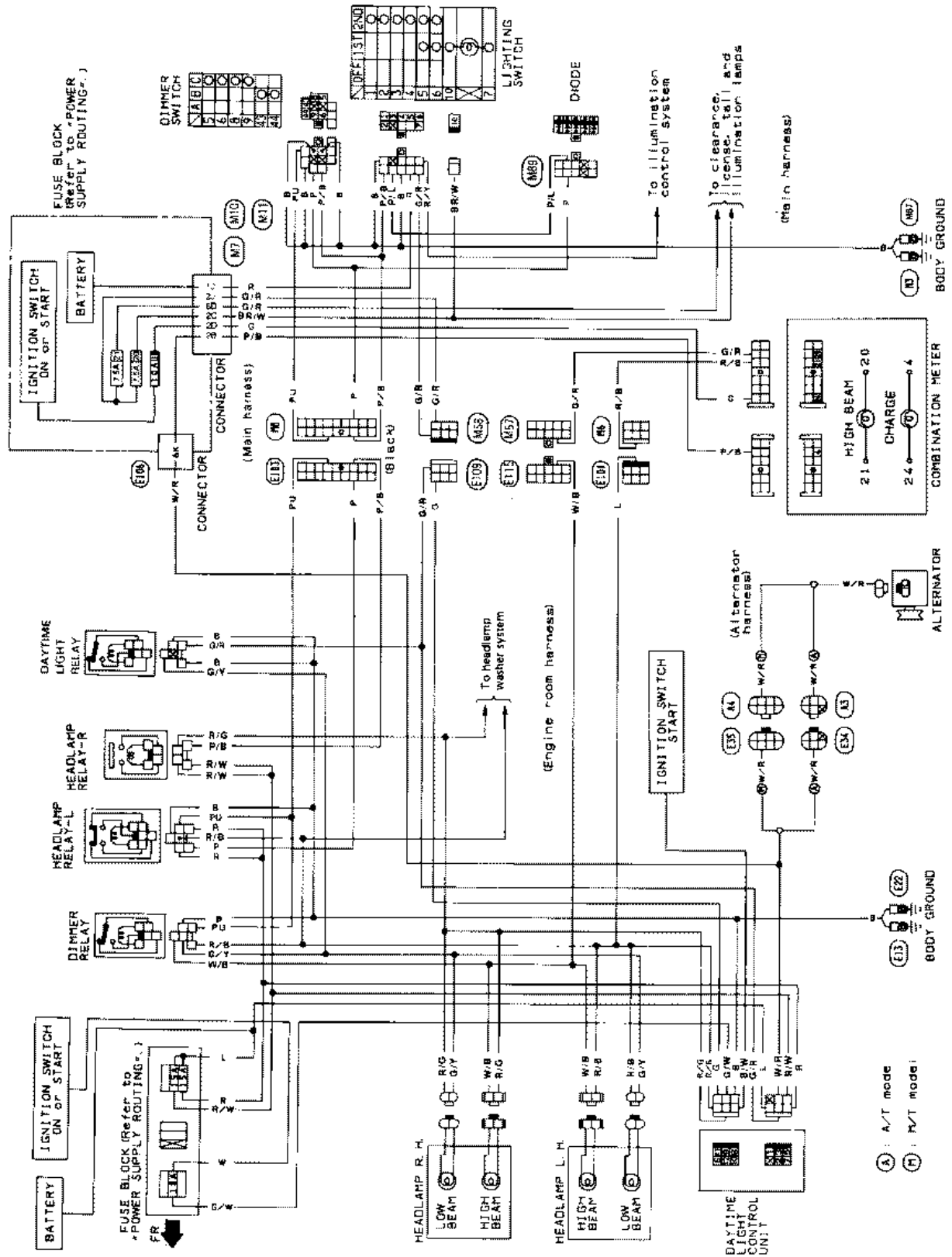
Schematic (Models equipped with daytime light system)



SEL318P

HEADLAMP

Wiring Diagram (Models equipped with daytime light system)



SF1319P

HEADLAMP

Operation (Models equipped with dim-dip lamp)

When ignition switch is in the "ON" position with the lighting switch in the "1ST" position, the headlamp low beam comes on dimly to function as a clearance lamp. Lighting switch operations other than the above are the same as conventional light systems.

Ignition switch		OFF or ACC									ON								
		OFF			1ST			2ND			OFF			1ST			2ND		
Lighting switch		A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Headlamp	High beam	X	X	O	X	X	O	O	X	O	X	X	O	X	X	O	O	X	O
	Low beam	X	X	X	X	X	X	X	O	X	X	X	X	X	X	X	X	O	X
	Dim-dip (Low beam)	X	X	X	X	X	X	X	X	X	X	X	X	O	O	X	X	X	X
Clearance, tail, license and illumination lamps		X	X	X	O	O	O	O	O	O	X	X	X	O	O	O	O	O	O

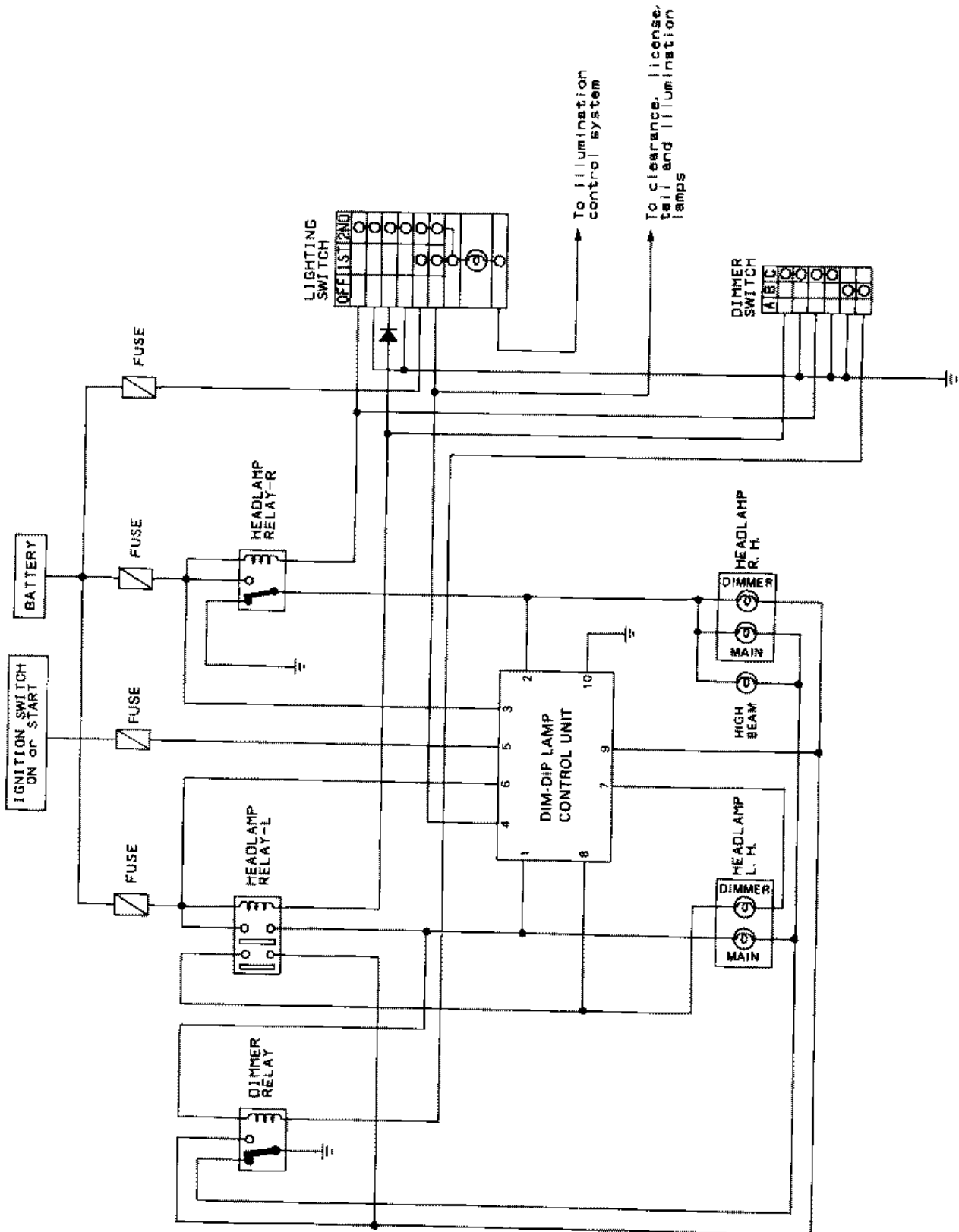
O : Lamp "ON"

X : Lamp "OFF"

■ : Added functions

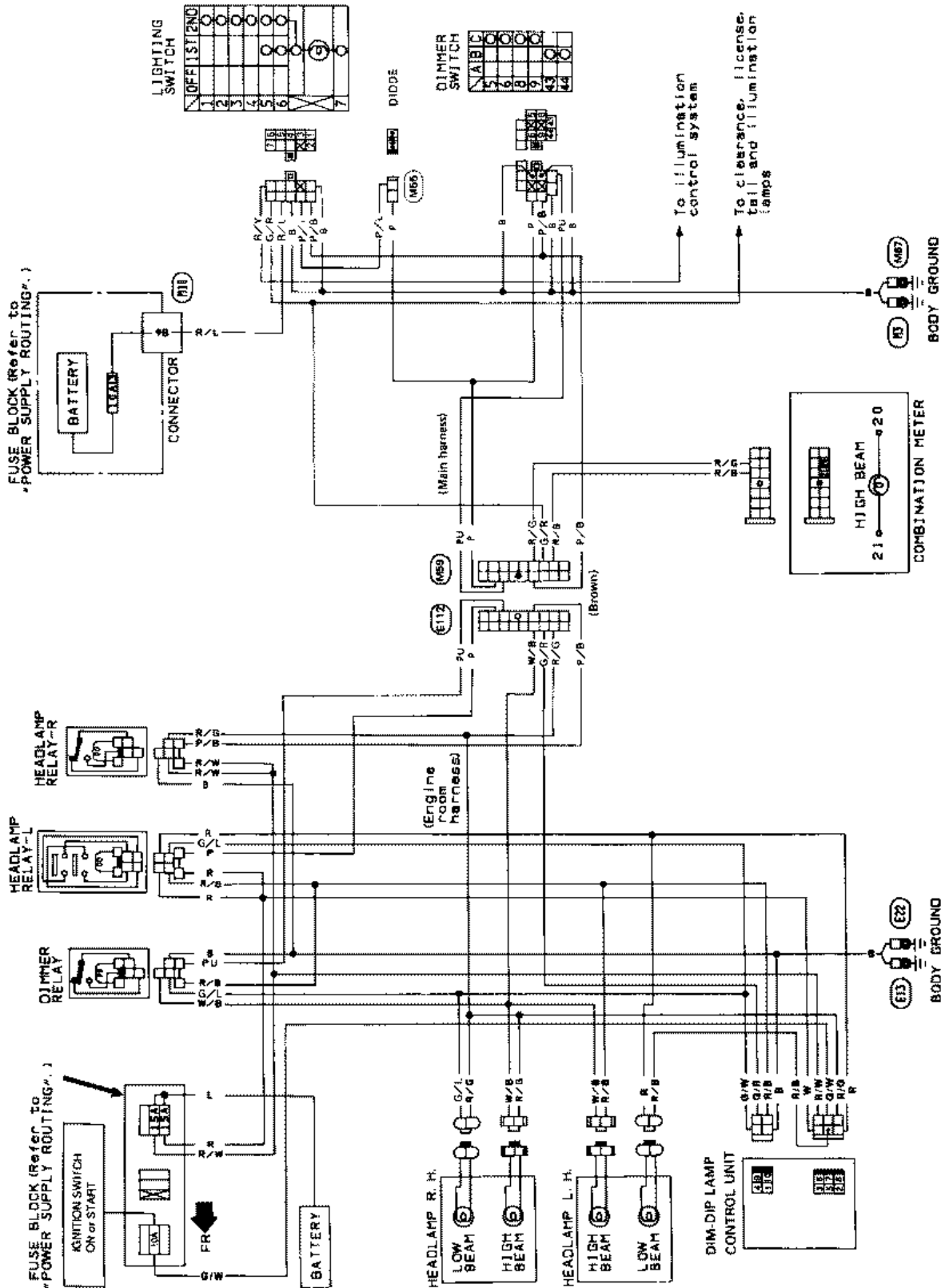
HEADLAMP

Schematic (Models equipped with dim-dip lamp)



HEADLAMP

Wiring Diagram (Models equipped with dim-dip lamp)

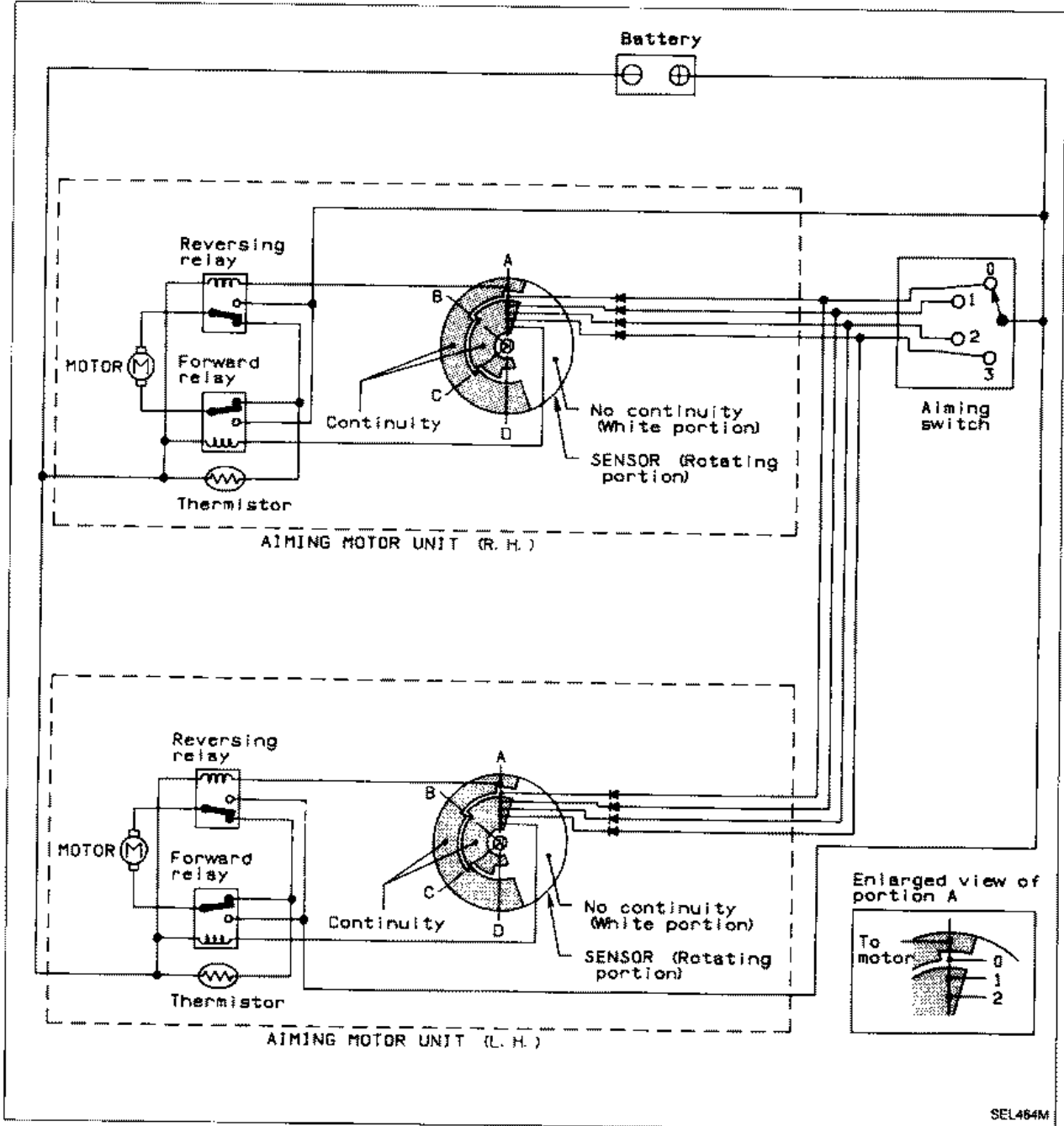


SEL321P

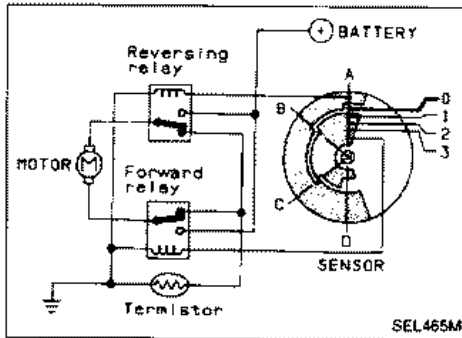
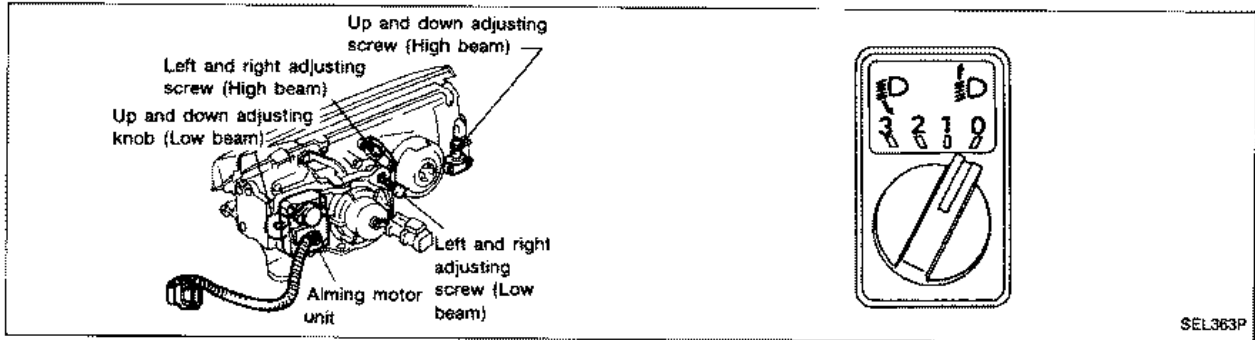
HEADLAMP — Headlamp Aiming Control —

Description

- The vertical direction of the headlamp projection can be adjusted from inside the vehicle to prevent the headlight beam axis from facing upward due to a change in the number of occupants and load conditions in the vehicle.



HEADLAMP — Headlamp Aiming Control — Description (Cont'd)

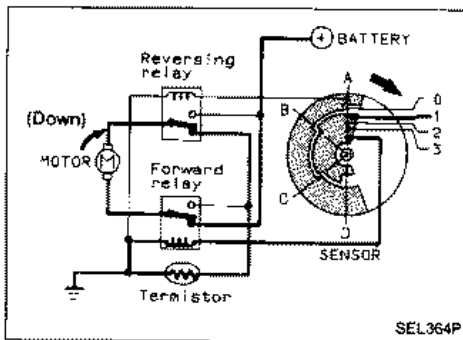


CIRCUIT OPERATION

[Example]

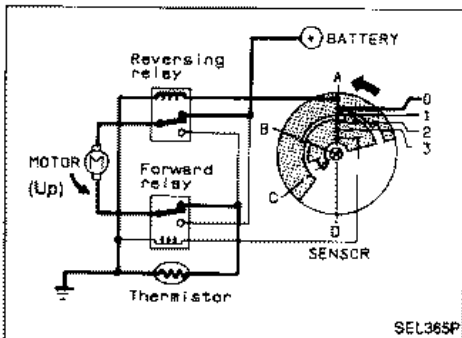
Aiming switch "0"

- When the aiming switch is set to "0", the motor will not start because the power terminals are positioned at the nonconductive section of the sensor's rotary unit.



Aiming switch "0" → "1"

- When the aiming switch is moved from "0" to "1", power is applied to the motor through the relay operated by the sensor's conductive section. The headlamps will then move in the "DOWN" direction.
- The motor continues to rotate while the rotary unit of the sensor moves from point A to point B.
- The power terminals will then be positioned at the nonconductive section, disconnecting the power to the motor. Then motor then stops.

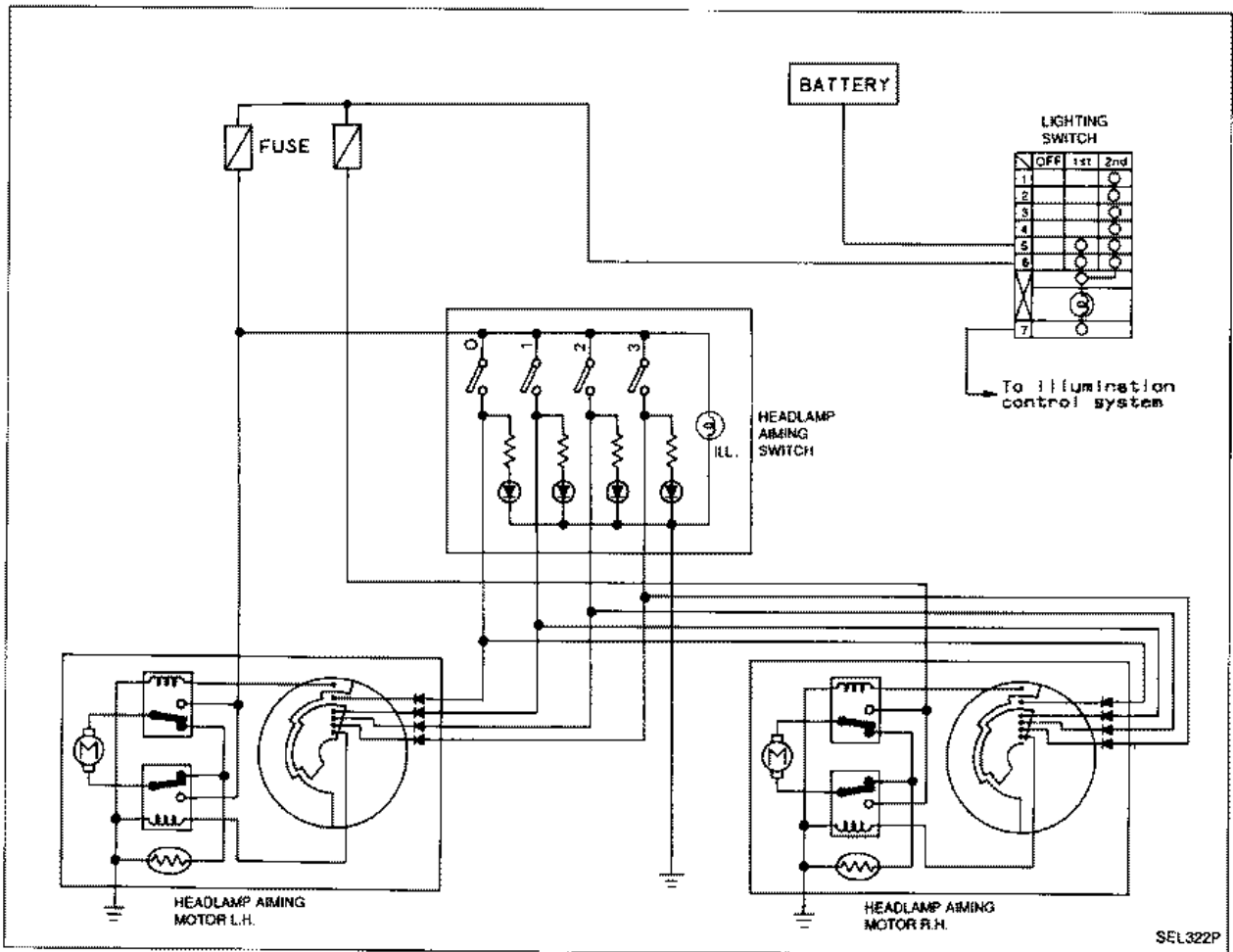


Aiming switch "1" → "0"

- When the aiming switch is moved from "1" to "0", power is applied to the motor through the relay operated by the conductive section of the sensor. The motor will rotate to move the headlamps in the "UP" direction.
- When the rotary unit of the sensor moves from point B to point A, the motor will stop.

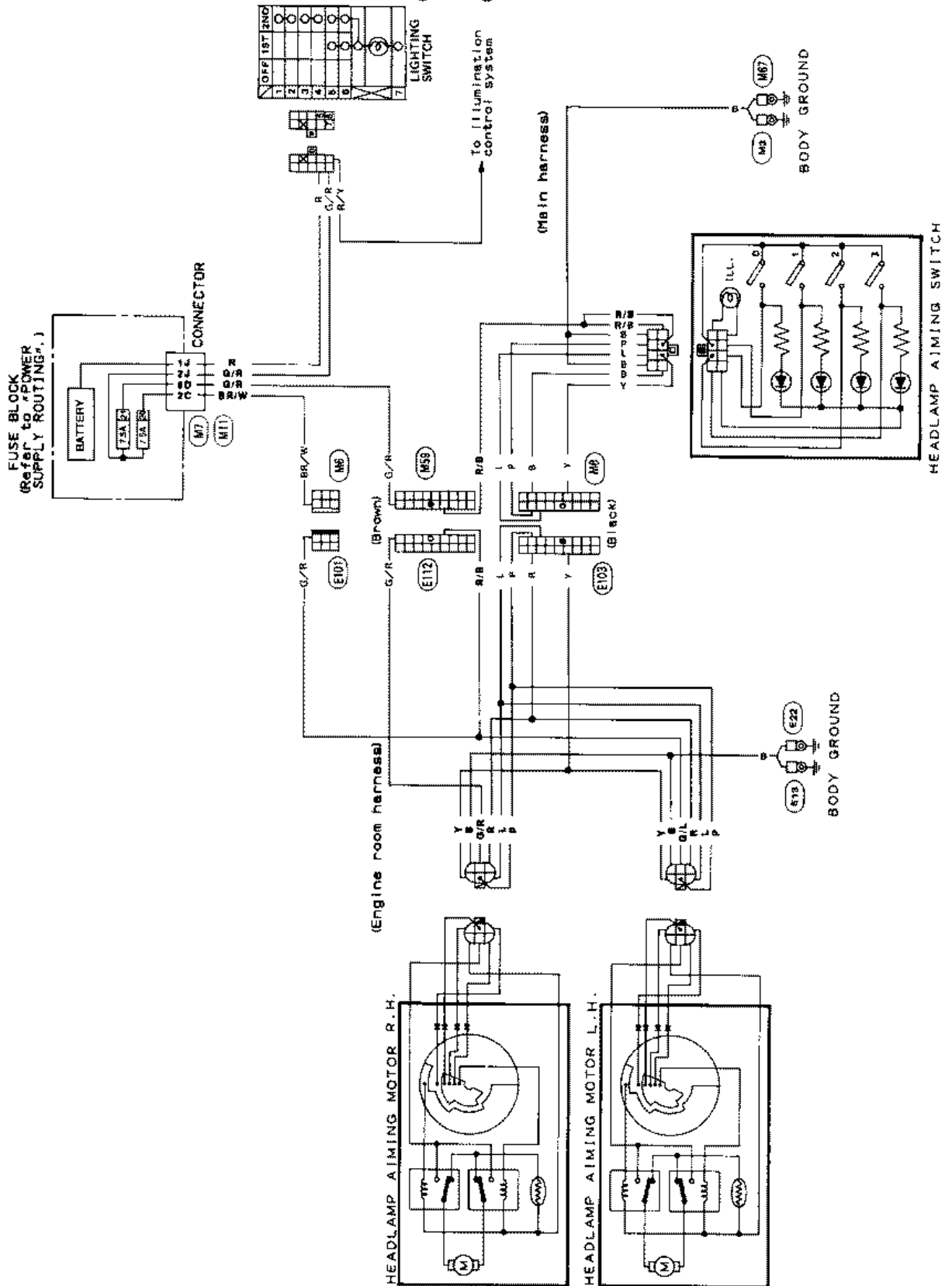
HEADLAMP — Headlamp Aiming Control —

Schematic

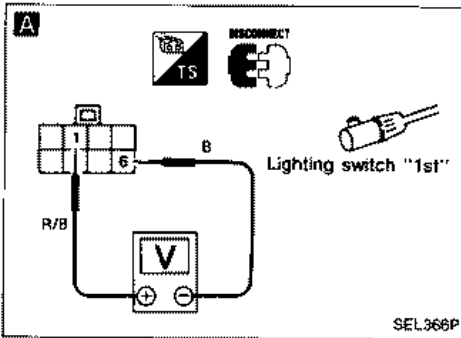


HEADLAMP — Headlamp Aiming Control —

Wiring Diagram



HEADLAMP — Headlamp Aiming Control —



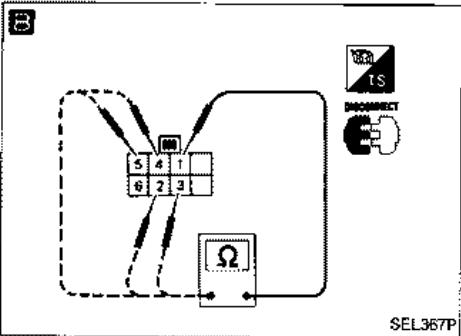
Trouble-diagnosis

SYMPTOM: Headlamp aiming does not operate.

A
POWER SUPPLY CIRCUIT CHECK (For aiming switch)
 Check if 12 volts exist between terminals ① and ⑥.

Voltmeter terminals		Voltage [V]
(+)	(-)	
①	⑥	Approx. 12

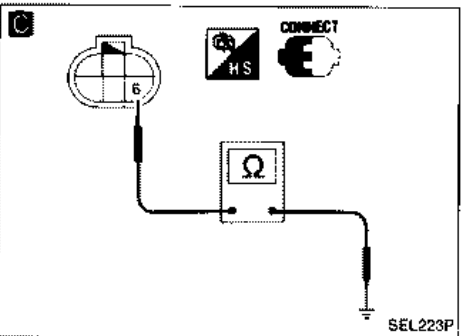
N.G. → Check 7.5A fuse at fuse block. (Refer to "POWER SUPPLY ROUTING".)



B
AIMING SWITCH CHECK
 Check continuity between terminals at each switch position

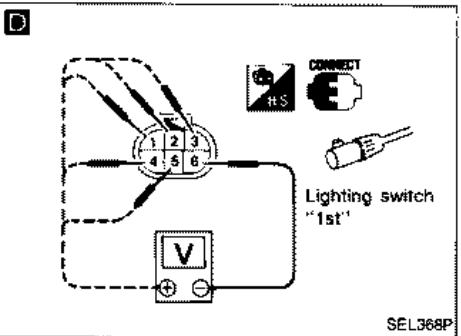
Terminal \ Switch position	①	②	③	④	⑤
0	○—○				
1	○—○	○—○			
2	○—○		○—○		
3	○—○			○—○	

N.G. → Replace aiming switch.



C
GROUND CIRCUIT CHECK FOR AIMING MOTOR
 Check continuity between terminals ⑥ and body ground. Continuity exists ... O.K.

N.G. → Repair harness between aiming motor and body ground.



D
POWER SUPPLY CIRCUIT CHECK (For aiming motor unit)
 Check if 12 volts exist between terminals ①, ②, ③, ④, ⑤ and ⑥.

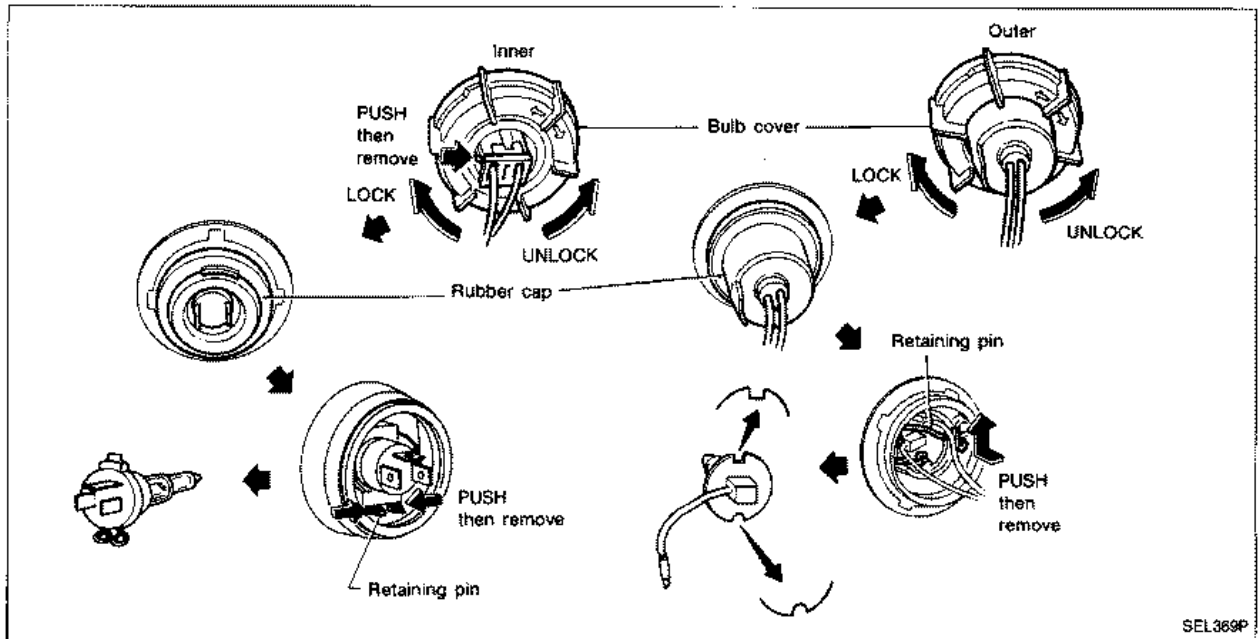
Voltmeter terminals	Voltage [V]		Aiming switch position
	(+)	(-)	
①	⑥	Approx. 12	"0"
		0	Except "0"
②	⑥	Approx. 12	"1"
		0	Except "1"
③	⑥	Approx. 12	"2"
		0	Except "2"
④	⑥	Approx. 12	"3"
		0	Except "3"
⑤	⑥	Approx. 12	—

N.G. → Check harness between aiming switch and aiming motor unit

O.K. → Replace aiming motor unit.

HEADLAMP — Headlamp Aiming Control —

Bulb Replacement



The headlamp is a semi-sealed beam type which uses a replaceable halogen bulb. The bulb can be replaced from the engine compartment side without removing the headlamp body.

- **Grasp only the plastic base when handling the bulb. Never touch the glass envelope.**

1. Disconnect the battery cable.
2. Disconnect harness connector from rear end of bulb. (Inner)
3. Turn bulb cover counterclockwise, then remove it.
4. Pull off rubber cap.
5. Push and turn retaining pin to loosen it.
6. Remove headlamp bulb. Do not shake or rotate bulb when removing it.
7. Disconnect harness connector. (Outer)
8. Install in the reverse order of removal.

CAUTION:

- **Do not leave the bulb out of the headlamp reflector for a long period of time as dust, moisture, smoke, etc. may enter the headlamp body and affect the performance of the headlamp. Thus, the headlamp bulb should not be removed from the headlamp reflector until just before a replacement bulb is to be installed.**

- **Use the same wattage as originally installed:**

	Inside (High beam)	Outside (Low beam)
Wattage (W)	55	55

HEADLAMP — Headlamp Aiming Control —

Aiming Adjustment

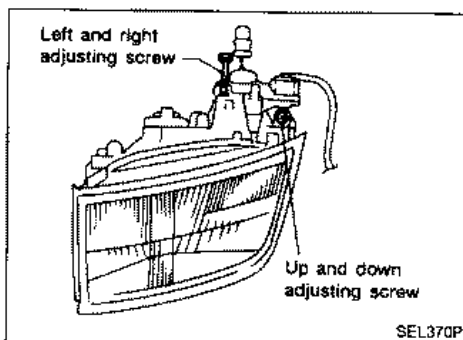
When performing headlamp aiming adjustment, use an aiming machine, aiming wall screen or headlamp tester. For operating instructions of any aimer, it should be in good repair, calibrated and used according to respective operation manuals supplied with the unit.

If any aimer is not available, aiming adjustment can be done as follows:

For details, refer to the regulations in your own country.

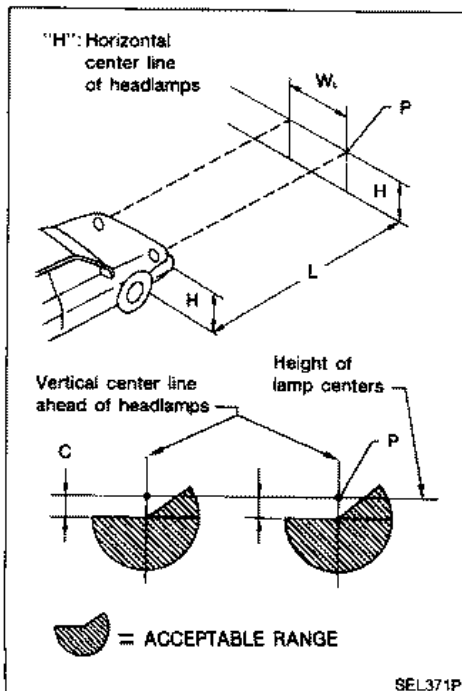
CAUTION:

- Keep all tires inflated to correct pressures.
- Place vehicle and tester on one and same flat surface.
- See that there is no-load in vehicle (coolant, engine oil filled up to correct level and full fuel tank) other than the driver (or equivalent weight placed in driver's position).



LOW BEAM

- Turn headlamp low beam on.
 - Use adjusting screws to perform aiming adjustment.
- First tighten the adjusting screw all the way and then make adjustment by loosening the screw.



- Adjust headlamps so that main axis of light is parallel to center line of body and is aligned with point P shown in illustration.

- Figure to the left shows headlamp aiming pattern for driving on right side of road; for driving on left side of road, aiming pattern is reversed.

- Dotted lines in illustration show center of headlamp.

"H": Horizontal center line of headlamps

"W_L": Distance between each headlamp center

"L": 5,000 mm (196.85 in)

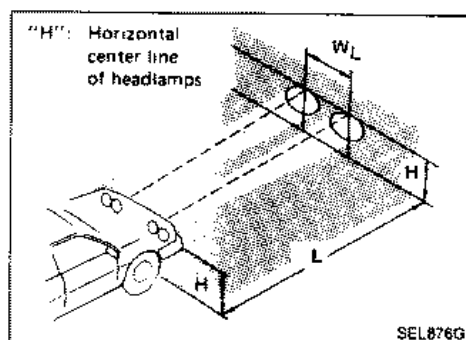
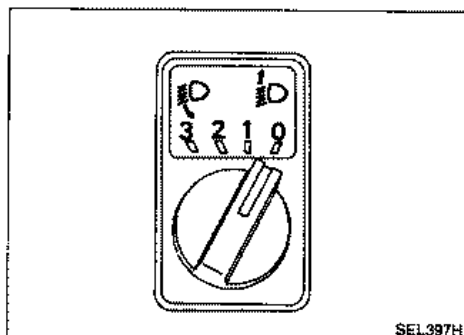
"C": 50 mm (1.97 in)

HEADLAMP — Headlamp Aiming Control —

Aiming Adjustment (Cont'd)

CAUTION:

Be sure aiming switch is set to "0" when performing aiming adjustment on vehicles equipped with headlamp aiming control.



HIGH BEAM

Turn headlamp high beam on.

a. Adjust high beams so that main axis of light is parallel to center line of body.

b. Dotted lines in illustration show center of headlamp.

"H": Horizontal center line of headlamps

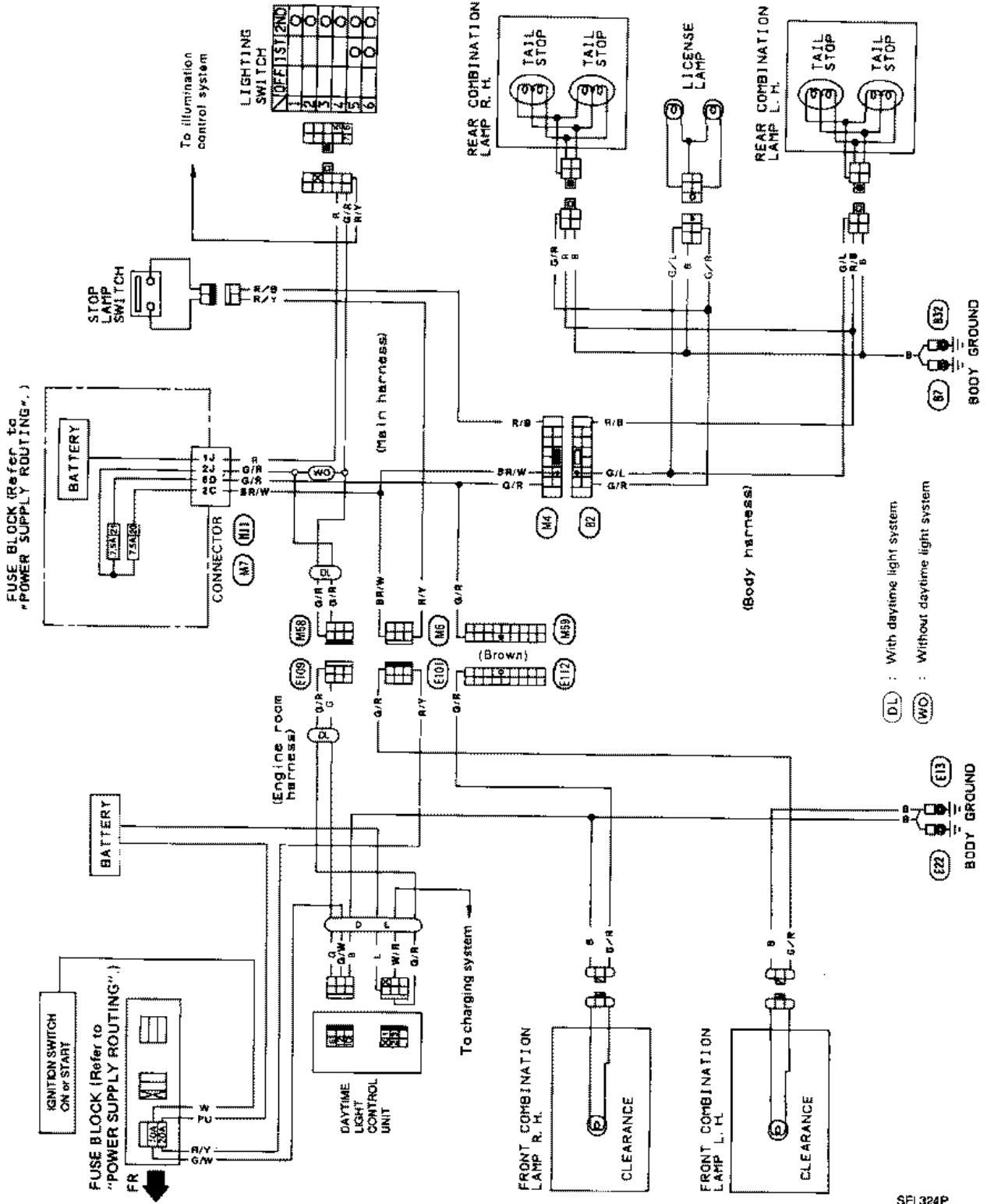
"W_L": Distance between each headlamp center

"L": 5,000 mm (196.85 in)

EXTERIOR LAMP

Clearance, License, Tail and Stop Lamps/Wiring Diagram

L.H. DRIVE MODELS

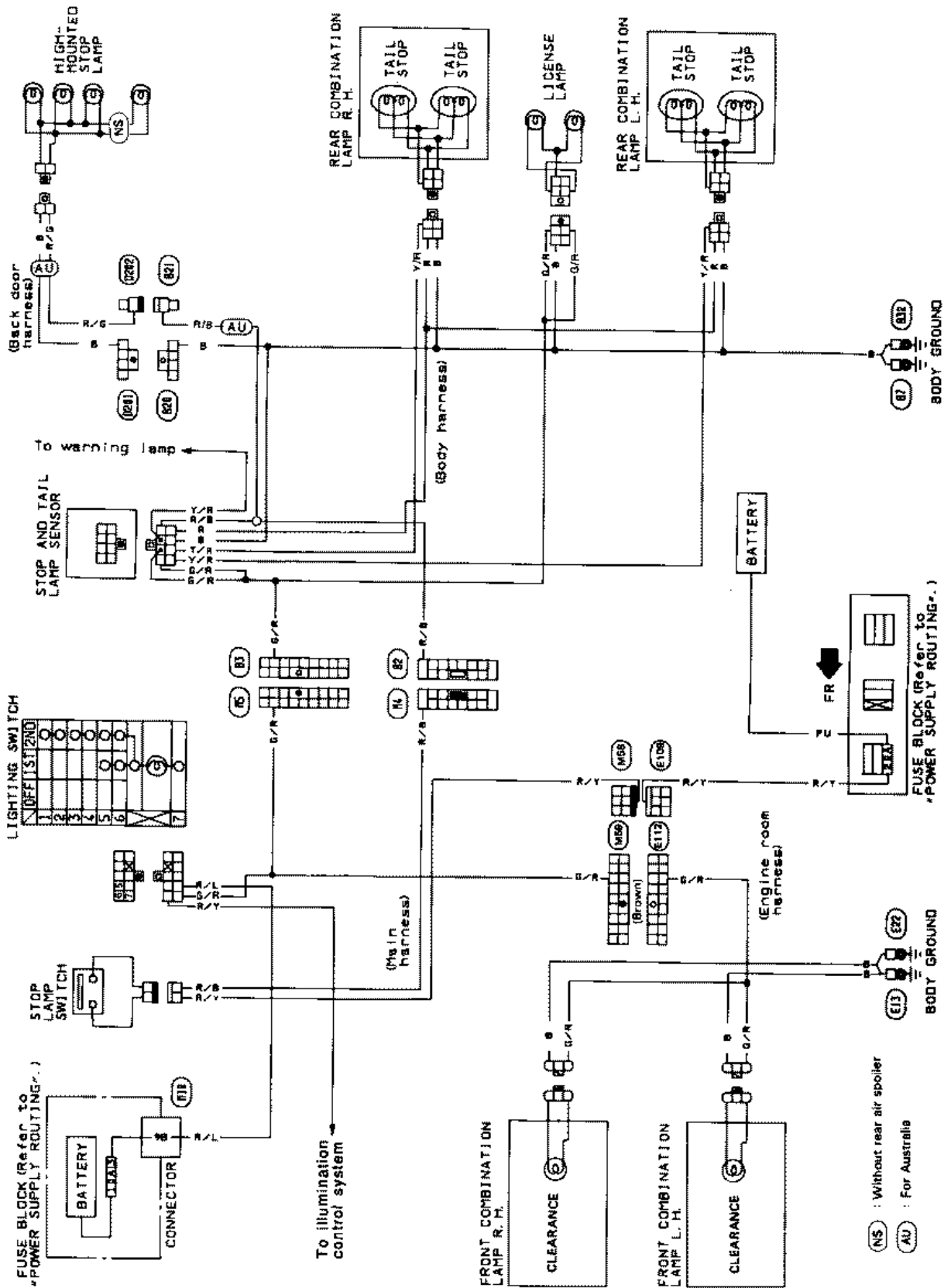


SEL324P

EXTERIOR LAMP

Clearance, License, Tail and Stop Lamps/Wiring Diagram (Cont'd)

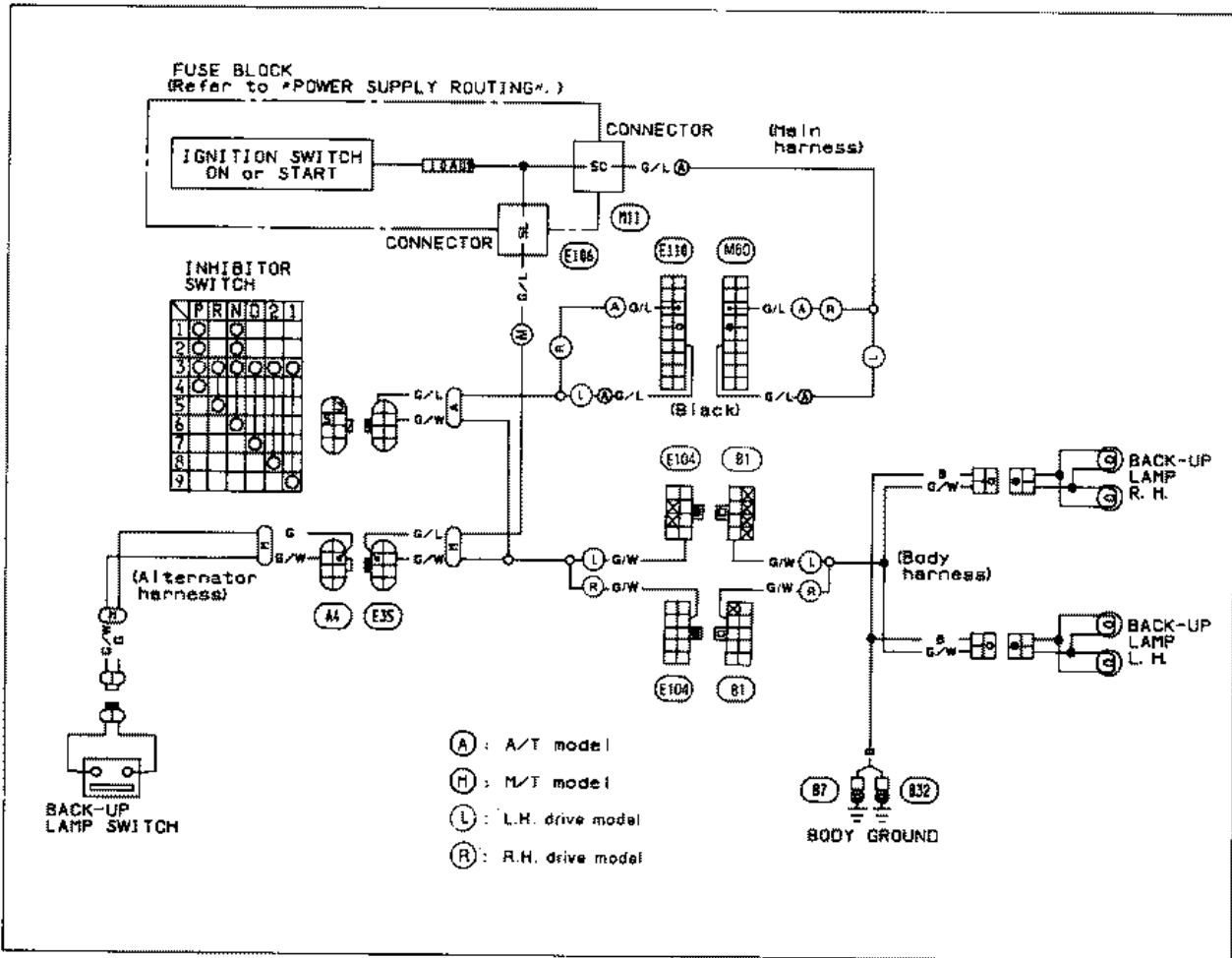
R.H. DRIVE MODELS



(NS) : Without rear air spoiler
 (AU) : For Australia

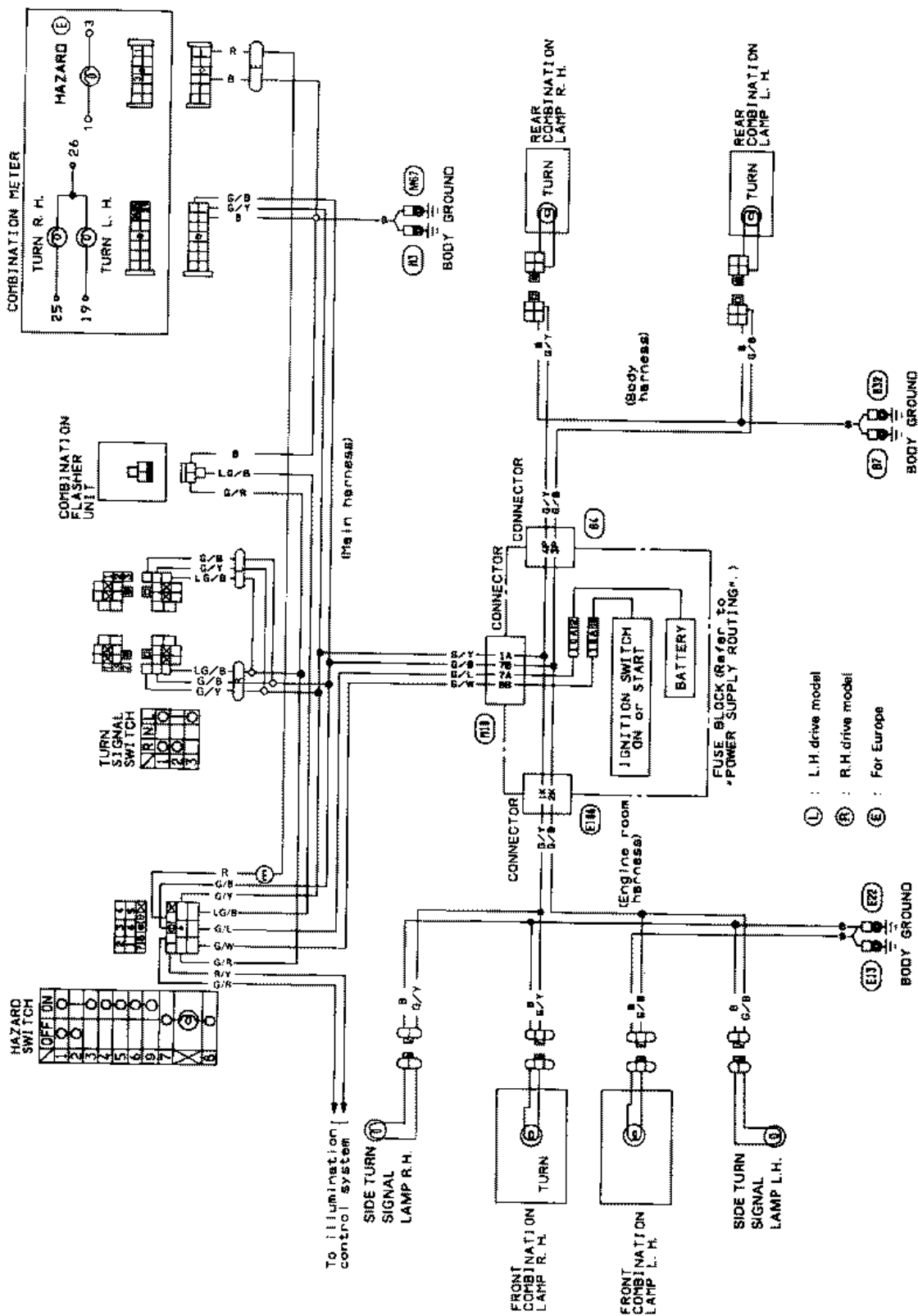
EXTERIOR LAMP

Back-up Lamp/Wiring Diagram



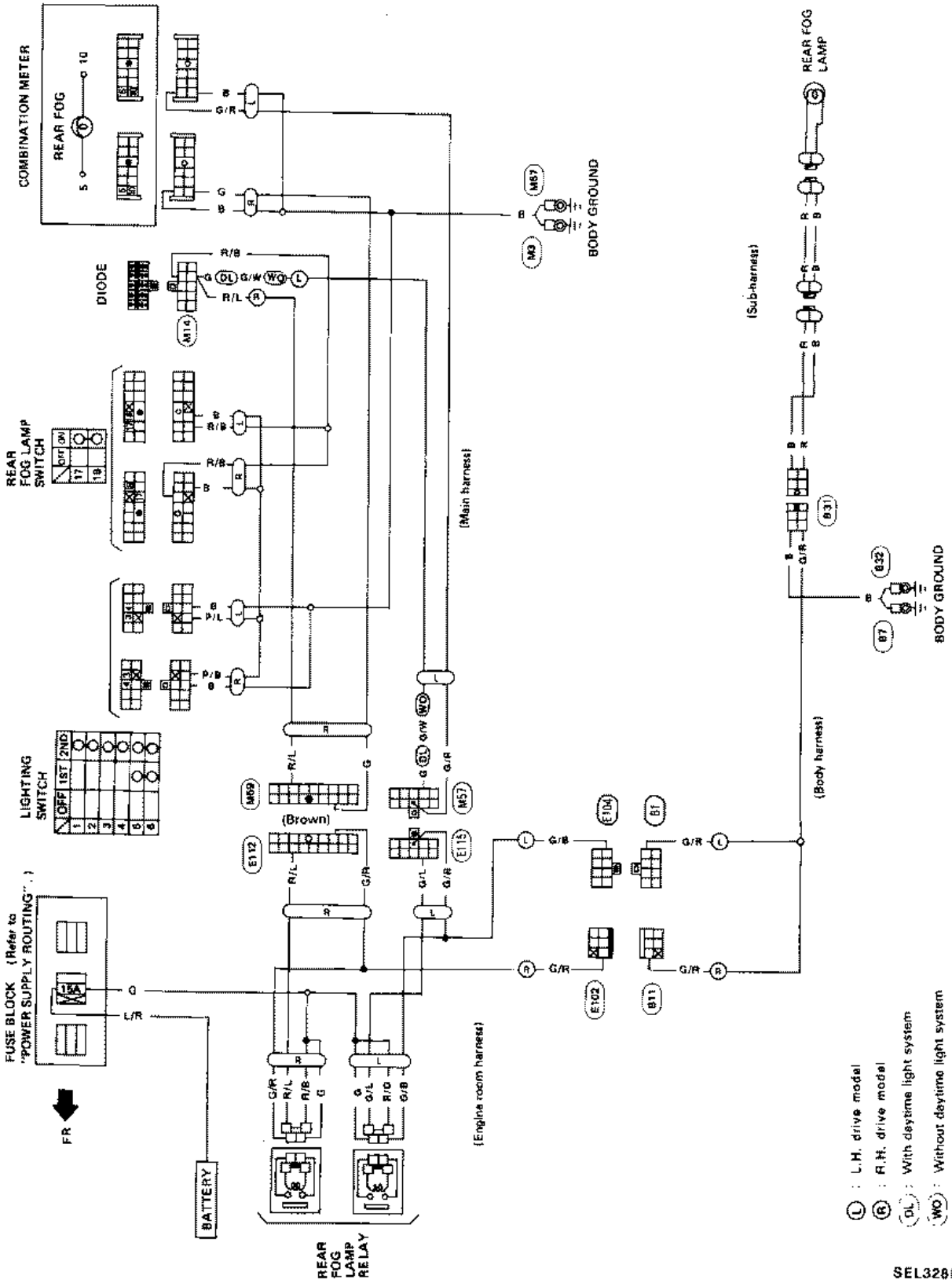
EXTERIOR LAMP

Turn Signal and Hazard Warning Lamps/Wiring Diagram



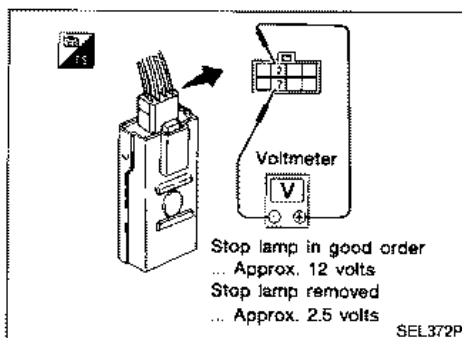
EXTERIOR LAMP

Rear Fog Lamp/Wiring Diagram



SEL328P

EXTERIOR LAMP

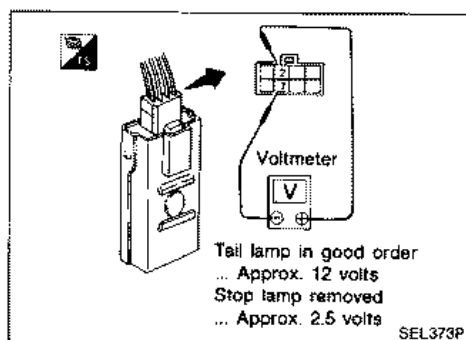


Stop and Tail Lamp Sensor Check

- Before checking, ensure that bulbs meet specifications.

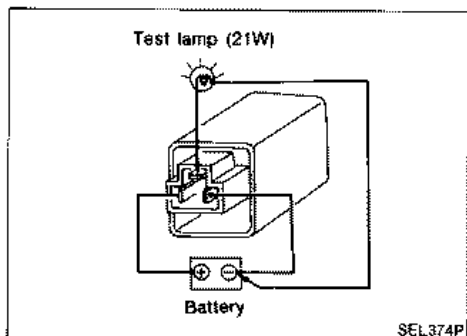
STOP LAMP

1. Start engine.
2. Stop lamp switch on.



Tail Lamp

1. Start engine.
2. Lighting switch on.



Combination Flasher Unit Check

- Before checking, ensure that bulbs meet specifications.
- Connect a battery and test lamp to the combination flasher unit, as shown. Combination flasher unit is properly functioning if it blinks when power is supplied to the circuit.

Bulb Specifications

	Wattage (W)
Front combination lamp	
Turn signal	21
Clearance	5
Side turn signal lamp	5
Rear combination lamp	
Turn signal	21
Stop/Tail	21/5
Back-up lamp	21
License plate lamp	5
Rear fog lamp	21
High-mounted stop lamp	13
Interior lamp	10
Spot lamp	3.8
Luggage room lamp	3.4

INTERIOR LAMP

Illumination/Wiring Diagram

L.H. DRIVE MODELS

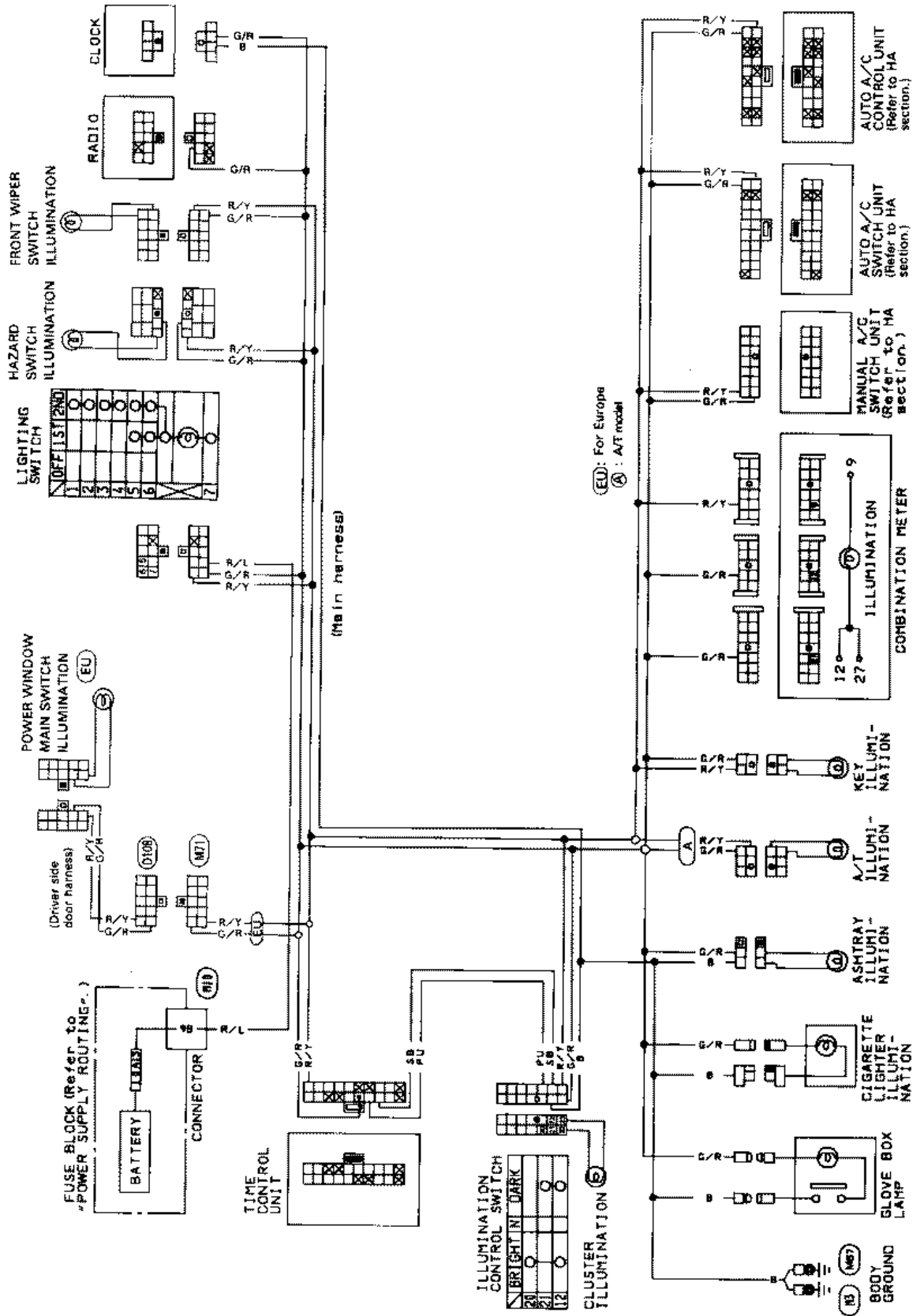


SEL329P

INTERIOR LAMP

Illumination/Wiring Diagram (Cont'd)

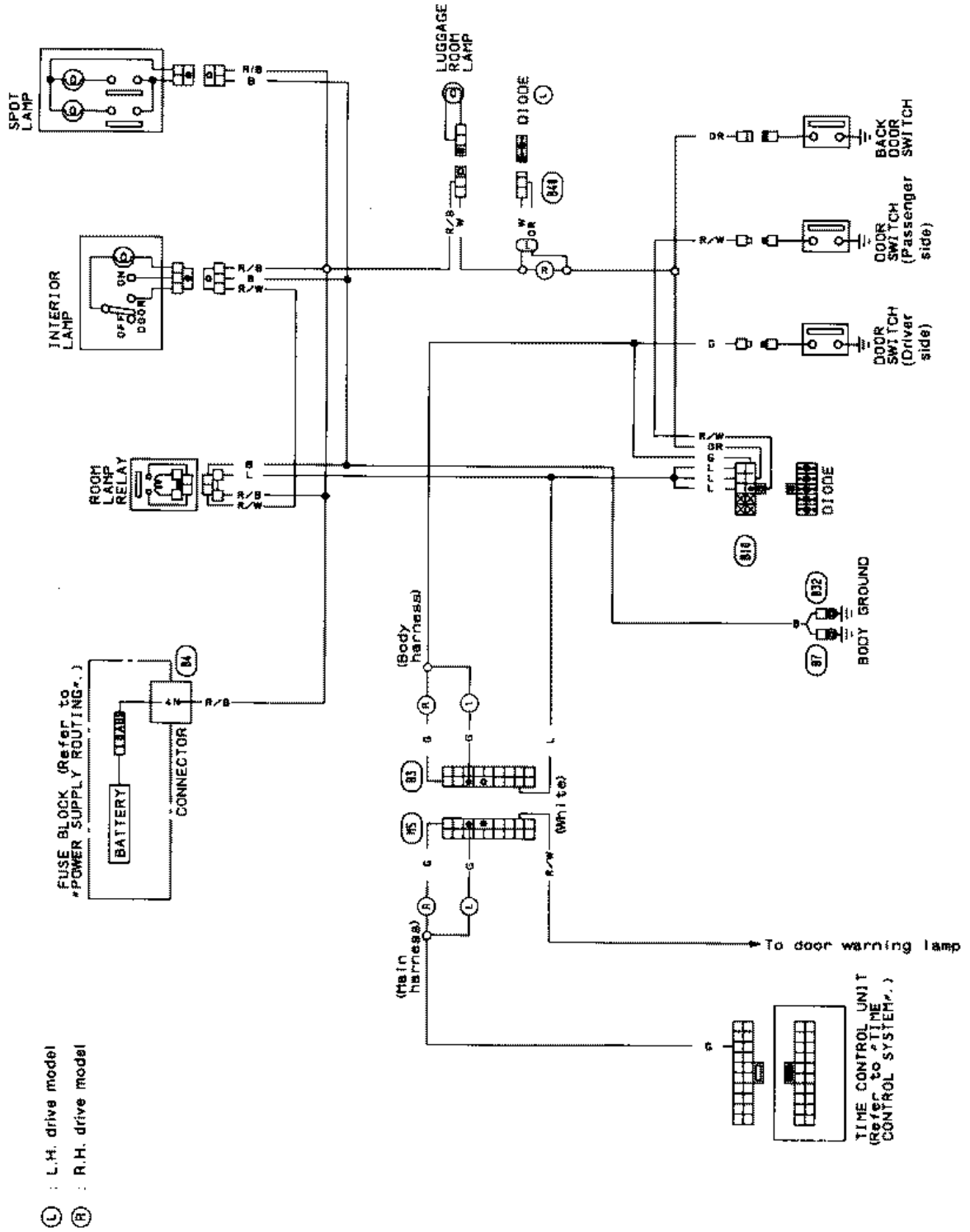
R.H. DRIVE MODELS



SEL412P

INTERIOR LAMP

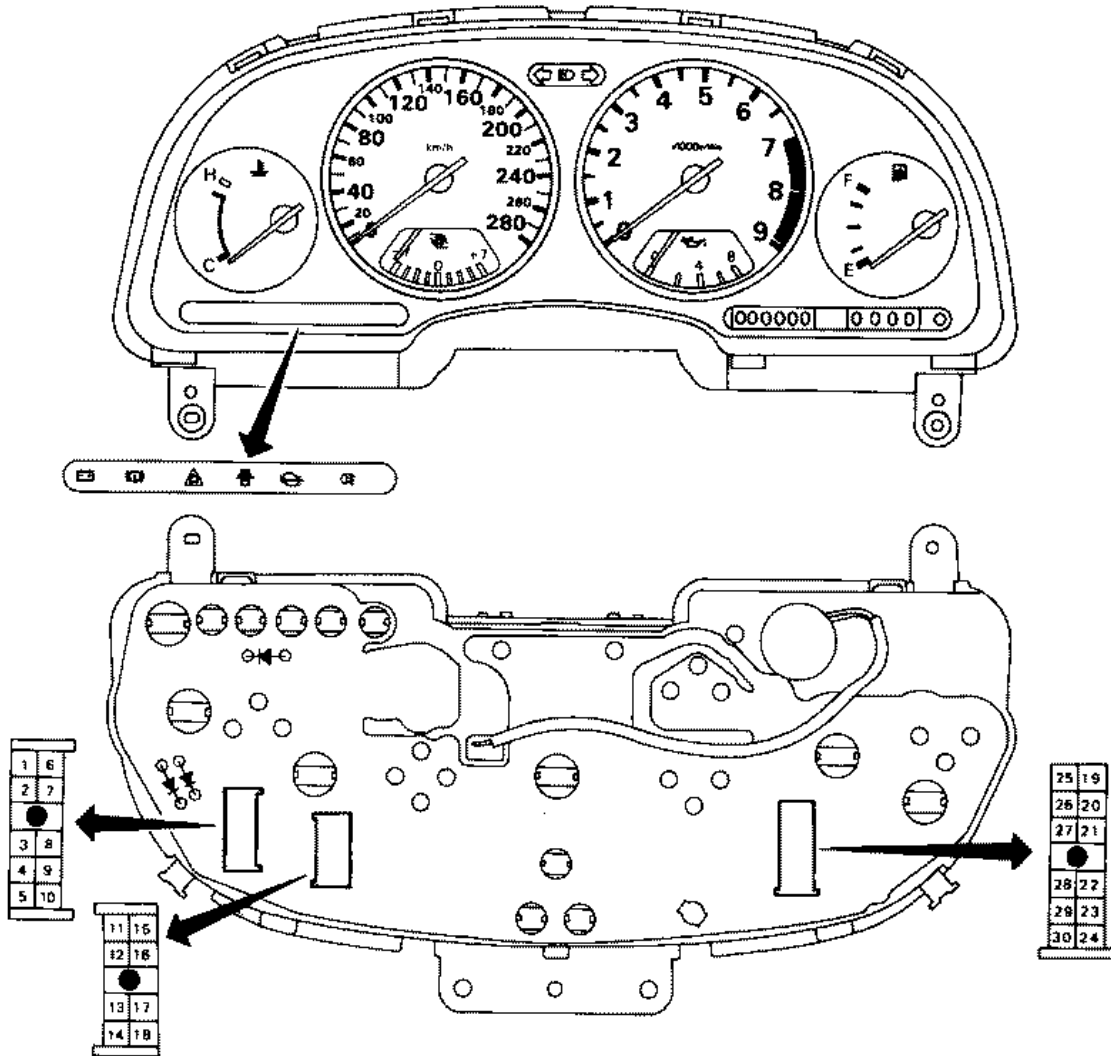
Interior Lamp/Wiring Diagram



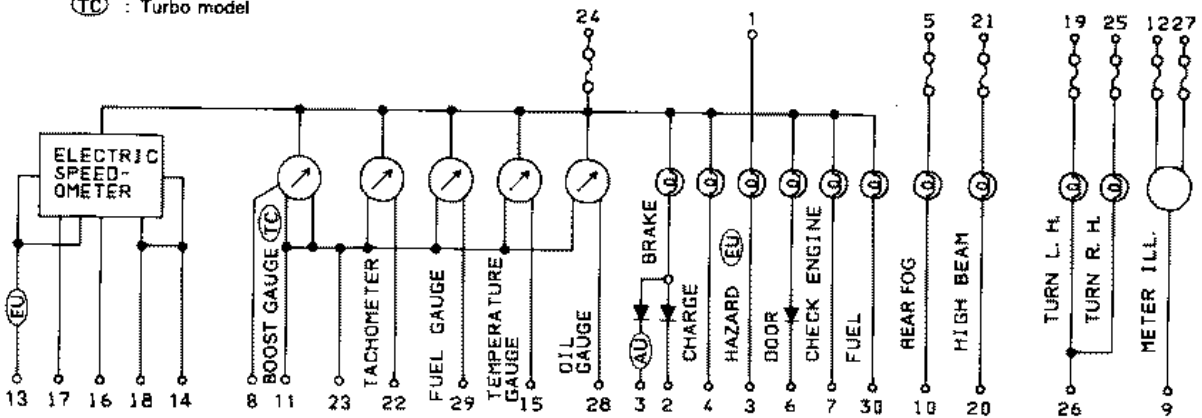
(L) : L.H. drive model
 (R) : R.H. drive model

METER AND GAUGES

Combination Meter

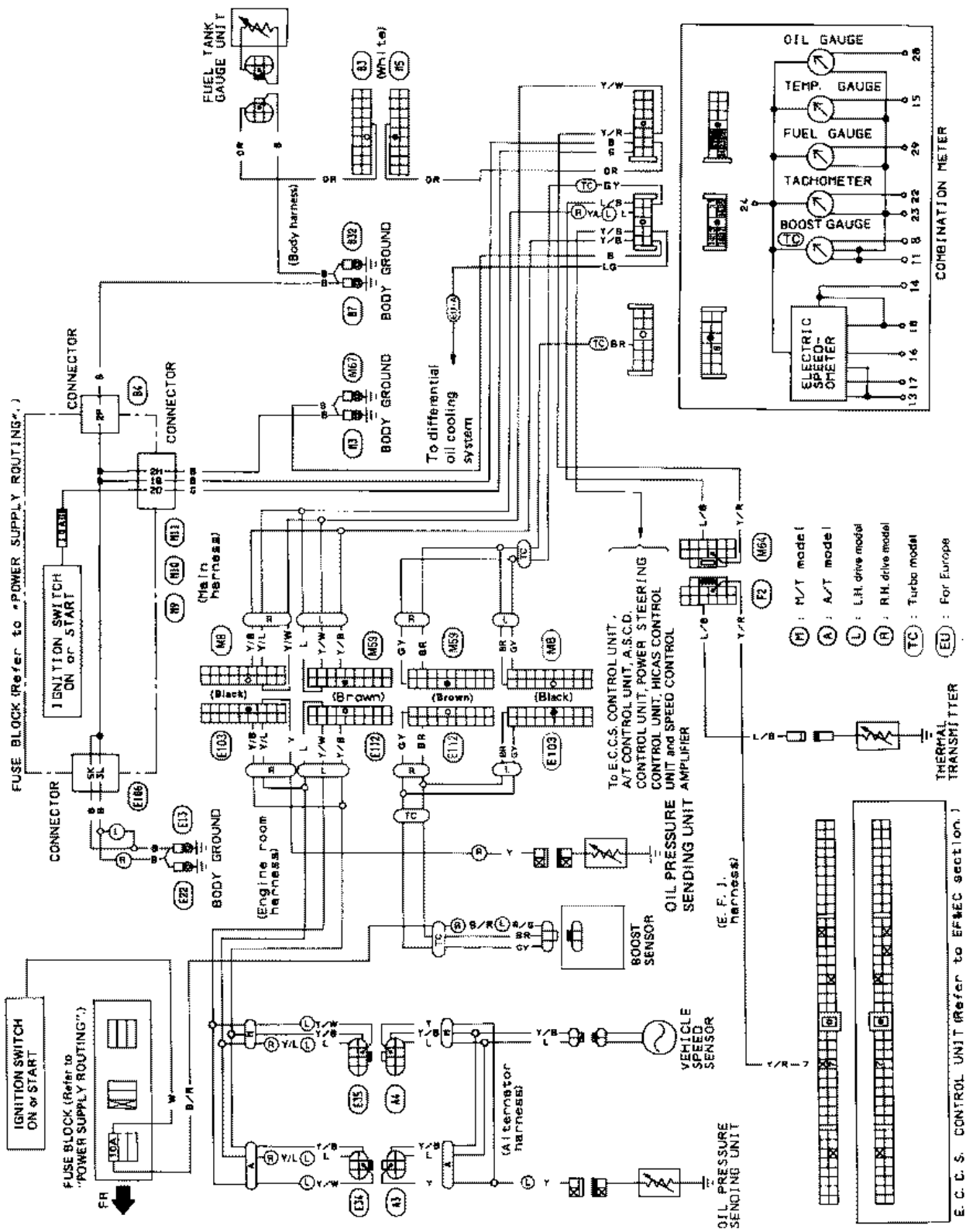


- ⓔⓤ : For Europe
- ⓐⓤ : For Australia
- ⓉⓄ : Turbo model



METER AND GAUGES

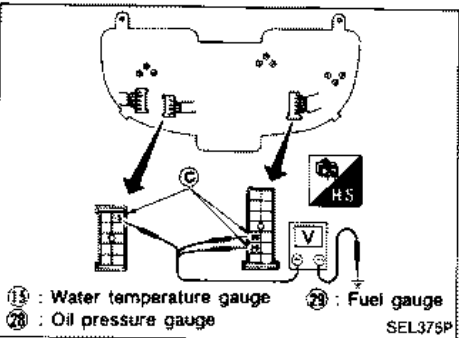
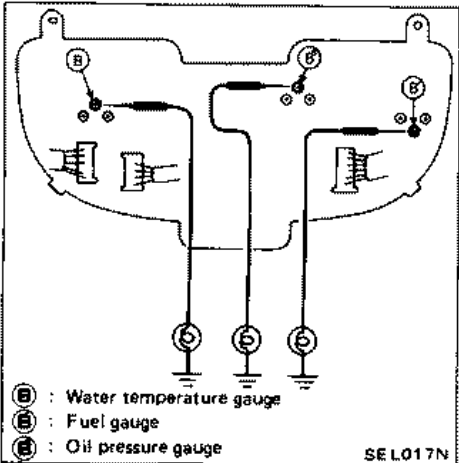
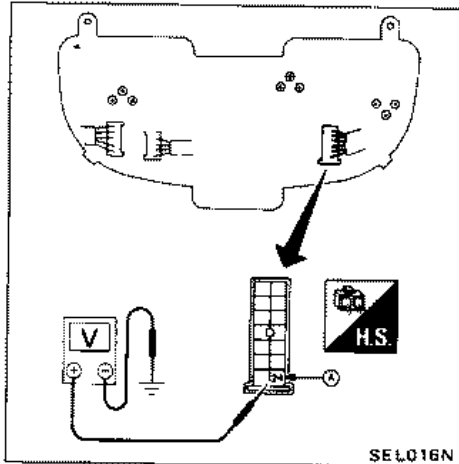
Tachometer, Temp., Oil, Fuel and Boost Gauges/Wiring Diagram



SEL332P

METER AND GAUGES

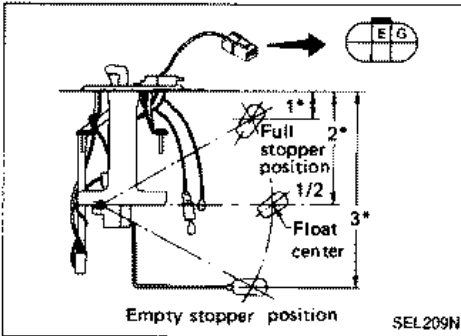
Inspection/Fuel, Oil Pressure and Water Temperature Gauges



```

    graph TD
      Start[INSPECTION START] -- O.K. --> Power[CHECK POWER SOURCE  
1) Turn ignition switch "ON".  
2) Check voltage between terminal (A) and ground.  
Battery voltage should exist.]
      Power -- N.G. --> PowerN[Check the following items.  
1) Harness continuity between battery terminal and combination meter  
2) Ignition relay  
3) Fusible link and fuse  
4) Ignition switch]
      Power -- O.K. --> Gauge[CHECK GAUGE OPERATION  
1) Turn ignition switch "ON".  
2) Connect terminal (B) and ground with wire through 3.4 W test bulb.  
3) Check operation of gauge.  
Gauge should move smoothly to full scale.]
      Gauge -- N.G. --> GaugeN[Repair or replace gauge.]
      Gauge -- O.K. --> Continuity[Check harness continuity between component and combination meter (C).]
      Continuity -- N.G. --> ContinuityN[Repair or replace.]
      Continuity -- O.K. --> Component[CHECK COMPONENT  
Check gauge units and harness.  
Refer to "Fuel Tank Gauge Unit Check", "Thermal Transmitter Check".]
      Component -- N.G. --> ComponentN[Repair or replace.  
Refer to FE section. (Fuel tank gauge unit)]
      Component -- O.K. --> Reinstall[Reinstall any part removed.]
      Reinstall --> End[INSPECTION END]
  
```

METER AND GAUGES



Fuel Tank Gauge Unit Check

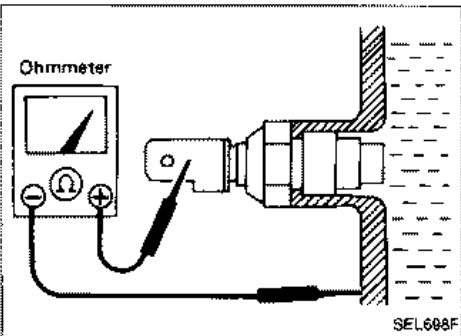
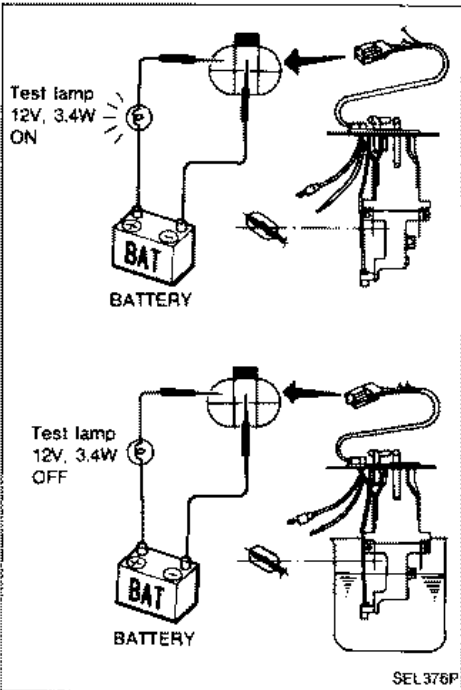
- For removal, refer to FE section.
- Check the resistance between terminals **G** and **E**.

Ohmmeter		Float position			Resistance value (Ω)
(+)	(-)	mm (in)			
G	E	1*	Full	21.0 (0.827)	4.3 - 5.8
		2*	1/2	115.0 (4.53)	27.7 - 34.3
		3*	Empty	207.0 (8.15)	78.3 - 84.8

1* and 3*: When float rod is in contact with stopper.

Fuel Warning Lamp Sensor Check

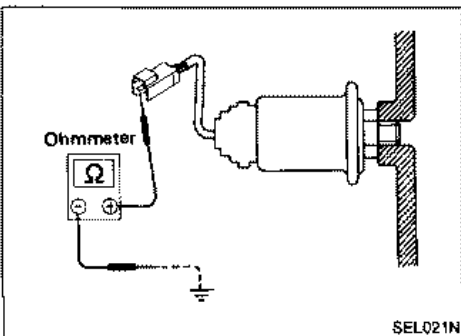
- It will take a short time for the bulb to light.



Thermal Transmitter Check

Check the resistance between the terminals of thermal transmitter and body ground.

Water temperature	Resistance
60°C (140°F)	Approx. 70 - 90 Ω
100°C (212°F)	Approx. 21 - 24 Ω

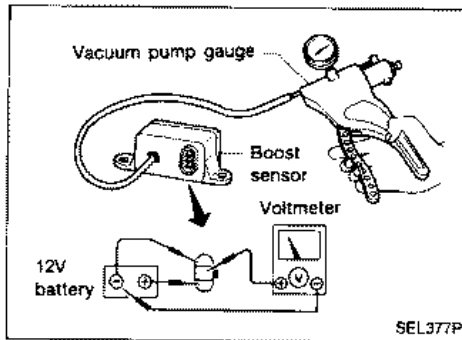


Oil Pressure Sending Unit Check

Check the resistance between the terminals of oil pressure sending unit and body ground.

Oil pressure kPa (bar, kg/cm ² , psi)	Resistance value (Ω)
0 (0, 0, 0) (Engine is stopped)	More than 54
392 (3.9, 4, 57)	Approx. 26 - 37
588 (5.9, 6, 85)	Approx. 18 - 26

METER AND GAUGES



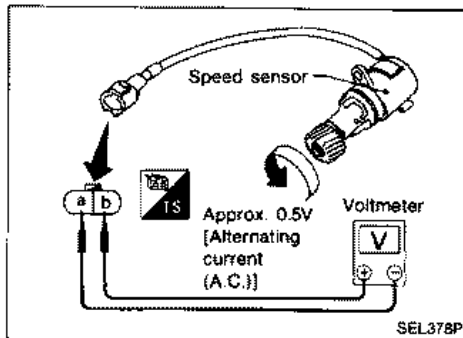
Boost Sensor Check

1. Connect vacuum pump gauge to boost sensor vacuum hose.
2. Disconnect harness connector from boost sensor and connect battery and voltmeter as shown.
3. Apply vacuum pressure to boost sensor by vacuum pump gauge and measure voltages.

Voltage:

Approx. 2.2V at 0 kPa (0 mbar, 0 mmHg, 0 inHg)
(Atmospheric pressure)

Approx. 1.3V at -53.3 kPa (-533 mbar, -400 mmHg, -15.75 inHg)

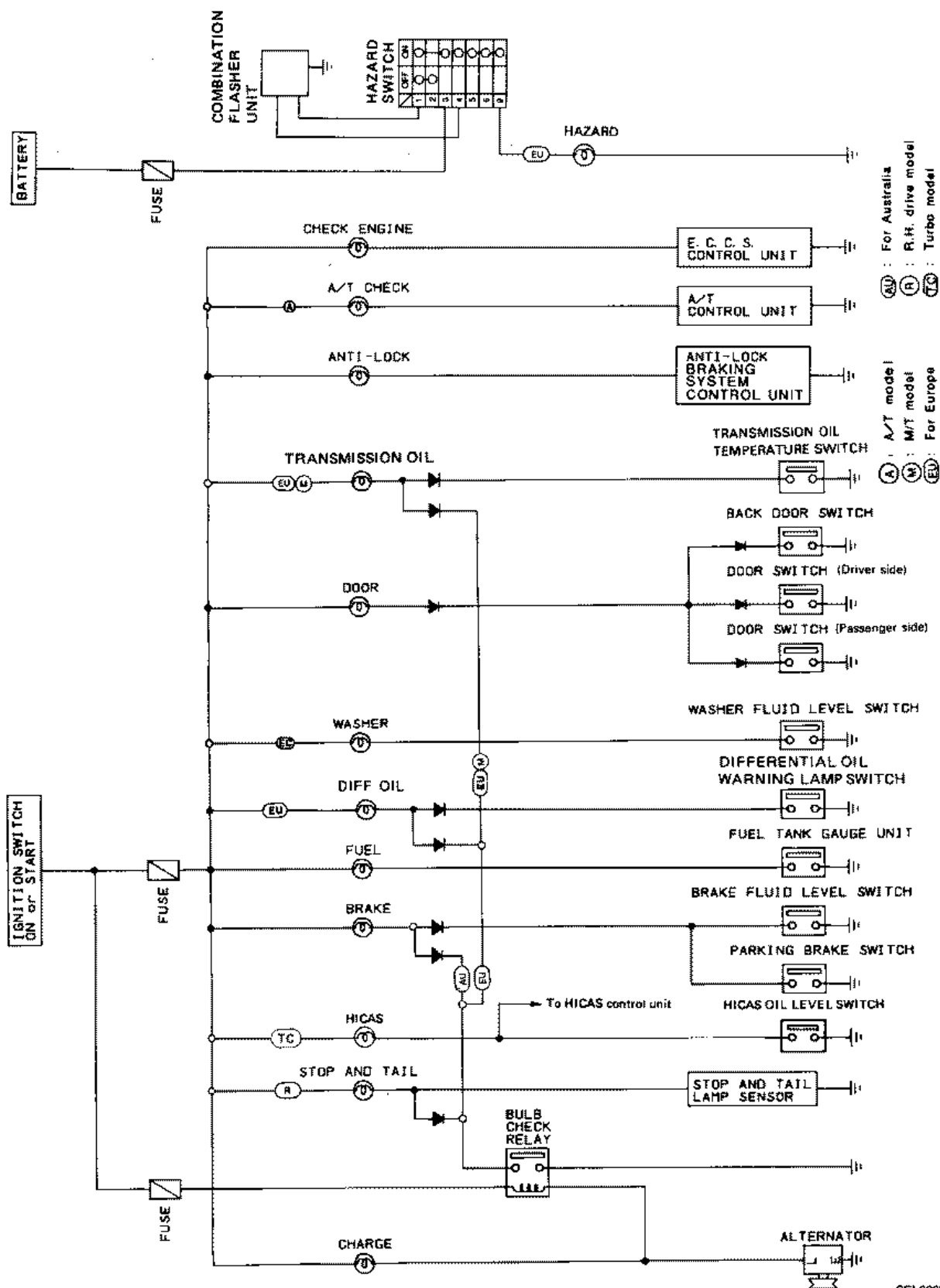


Speed Sensor Signal Check

1. Remove speed sensor from transmission.
2. Turn speedometer pinion quickly and measure voltage across Ⓐ and Ⓑ.

WARNING LAMPS AND CHIME

Warning Lamps/Schematic

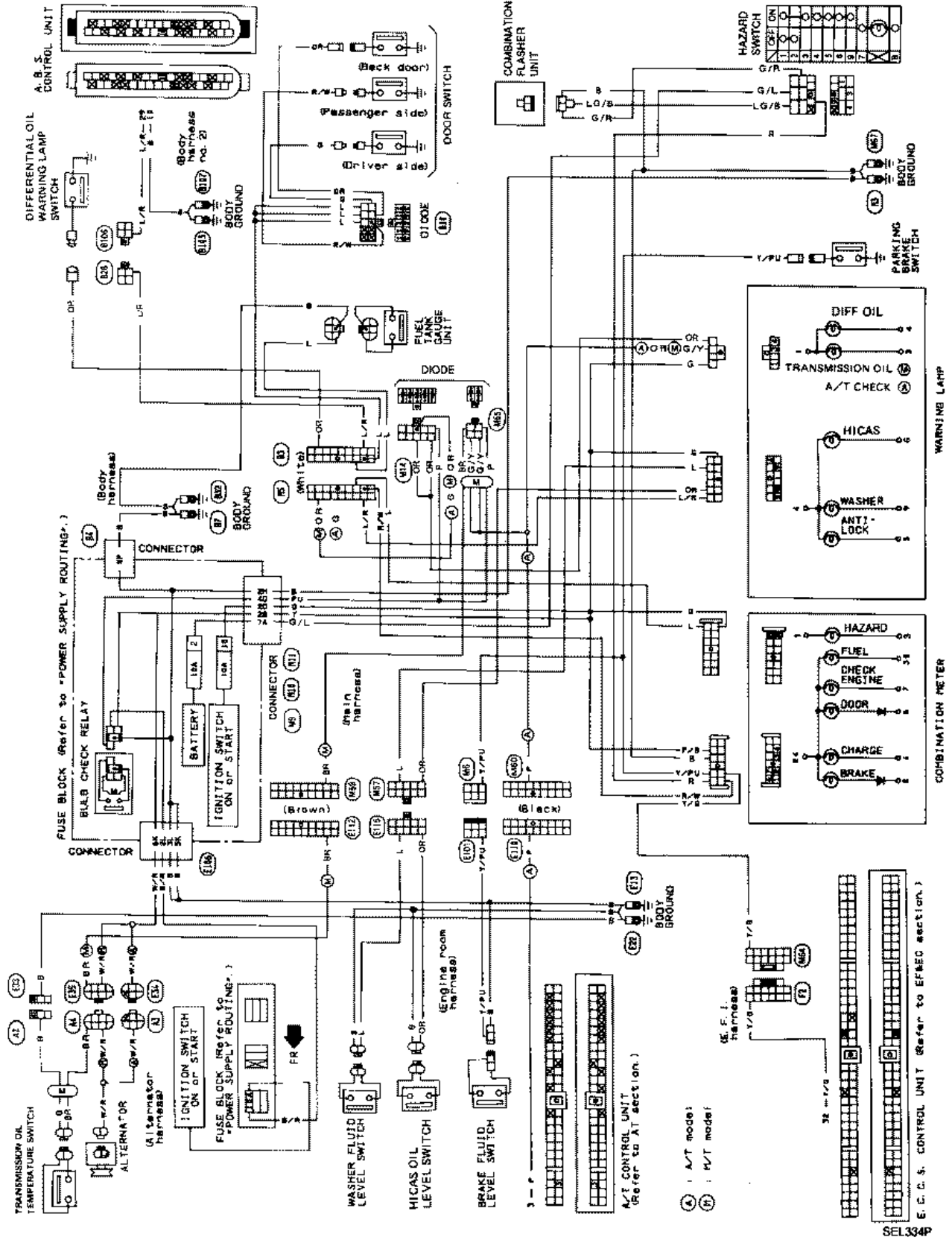


SEL333P

WARNING LAMPS AND CHIME

Warning Lamps/Wiring Diagram

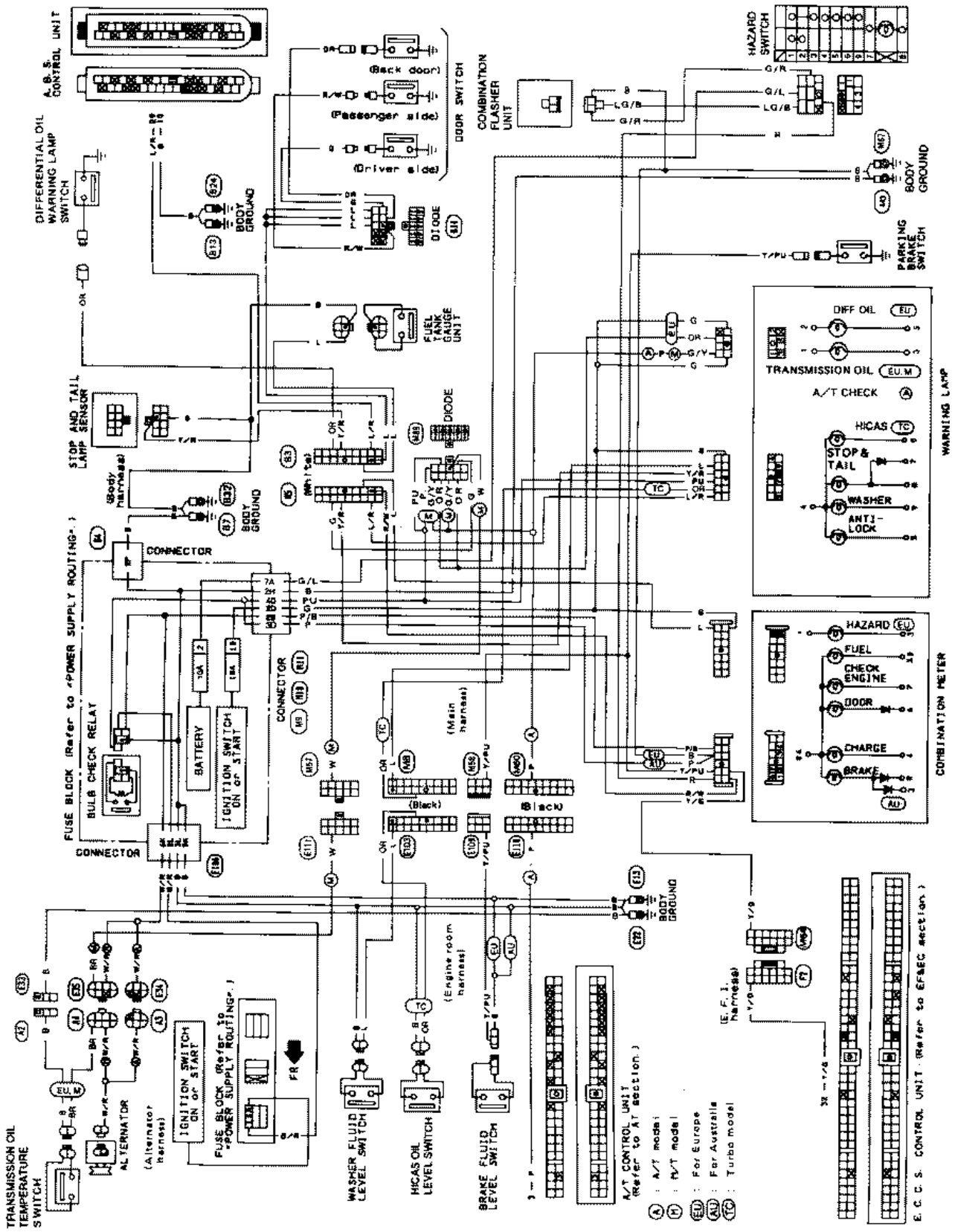
L.H. DRIVE MODELS



WARNING LAMPS AND CHIME

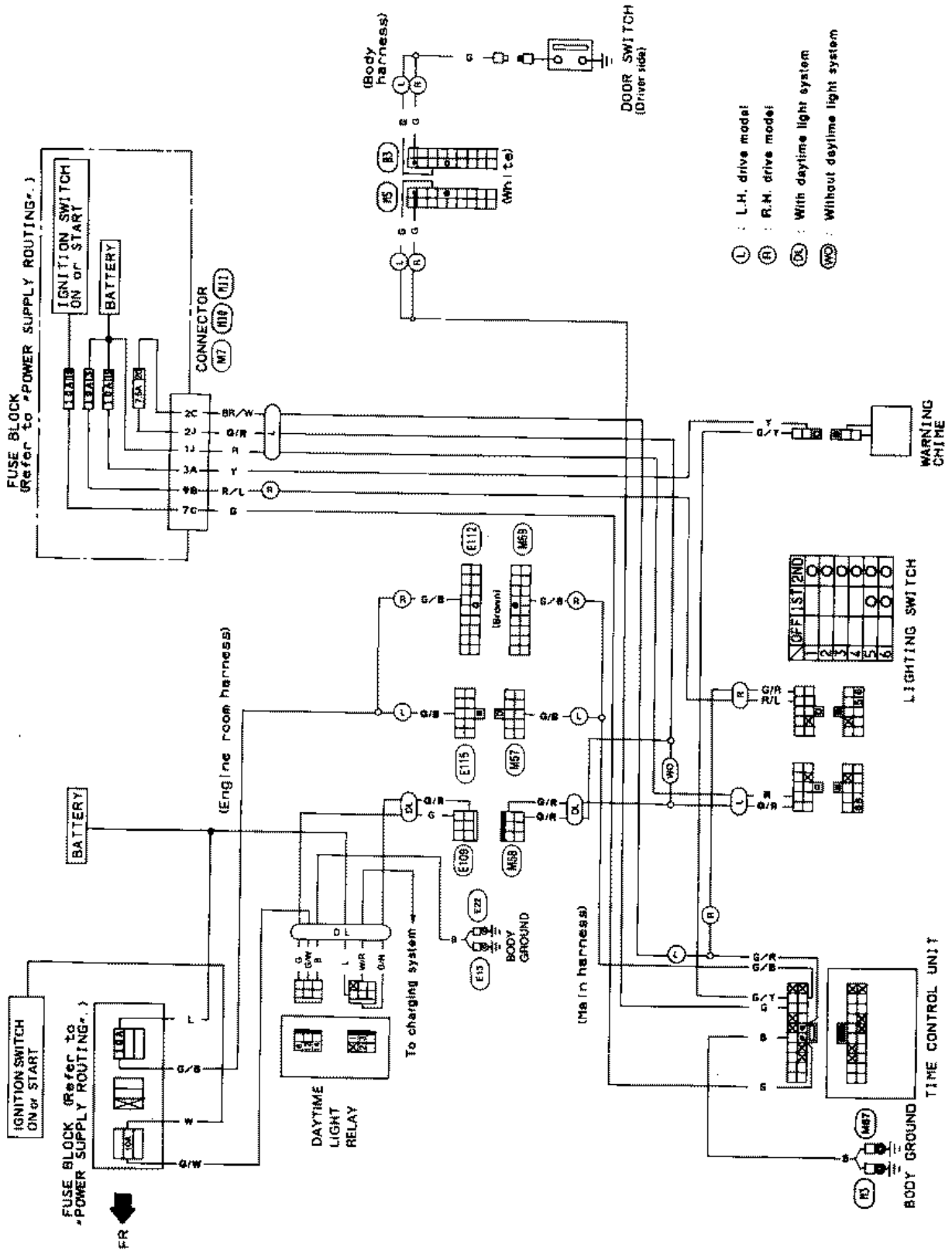
Warning Lamps/Wiring Diagram (Cont'd)

R.H. DRIVE MODELS

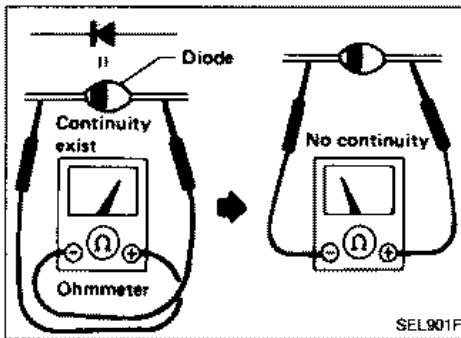


WARNING LAMPS AND CHIME

Warning Chime/Wiring Diagram

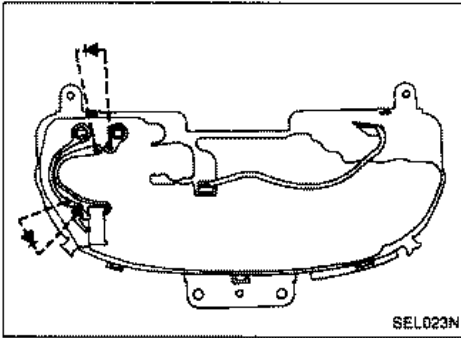


WARNING LAMPS AND CHIME

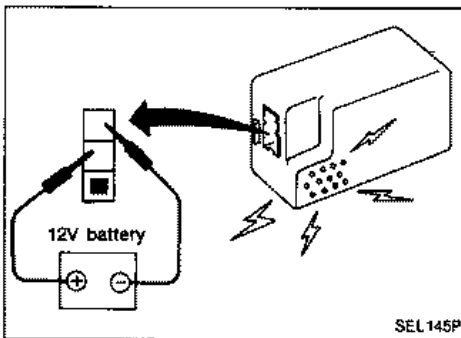


Diode Check

- Check continuity using an ohmmeter.
- Diode is functioning properly if test results are as shown in the figure at left.



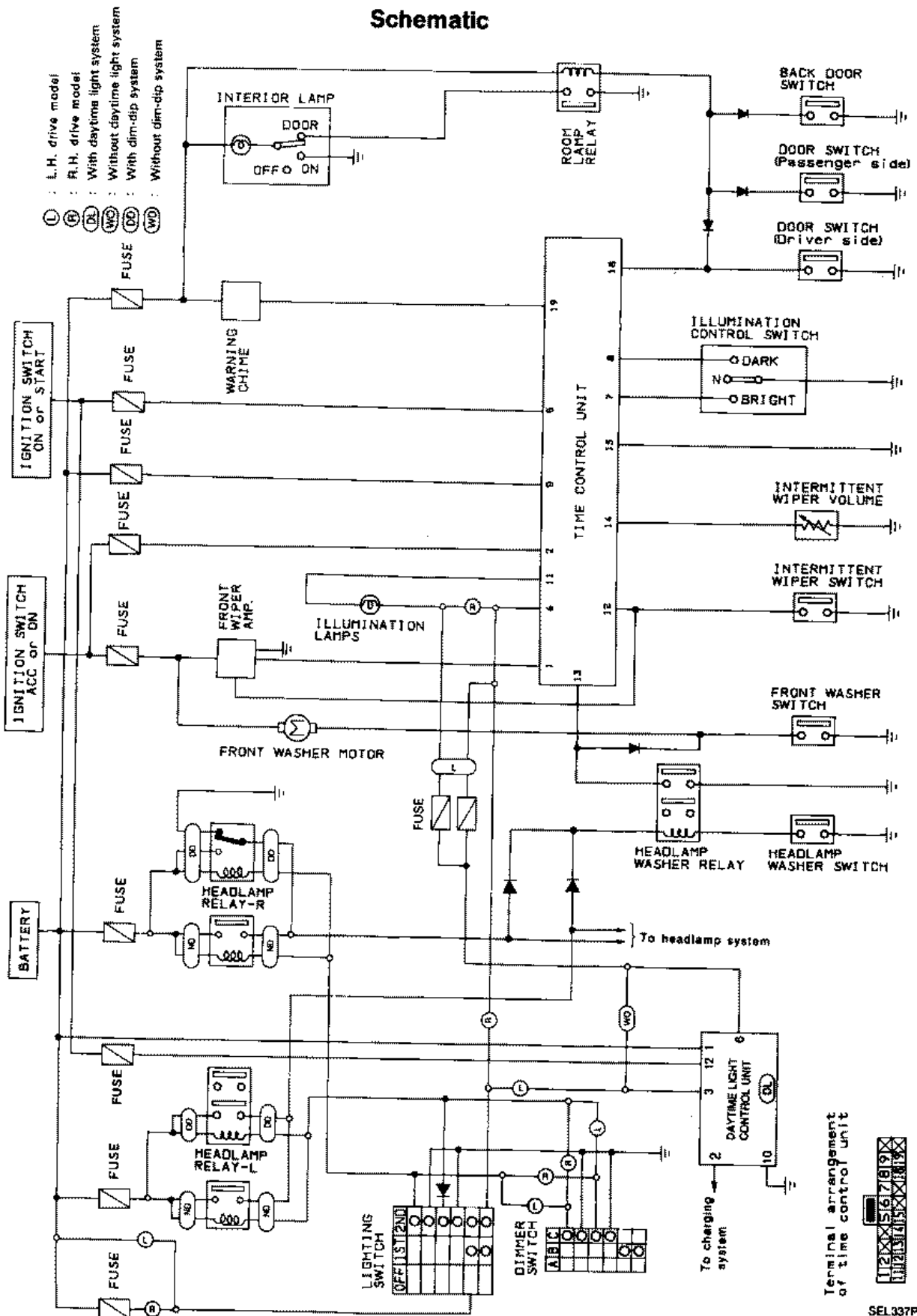
- Diodes for warning lamps are built into the combination meter printed circuit.



Warning Chime Check

TIME CONTROL SYSTEM

Schematic



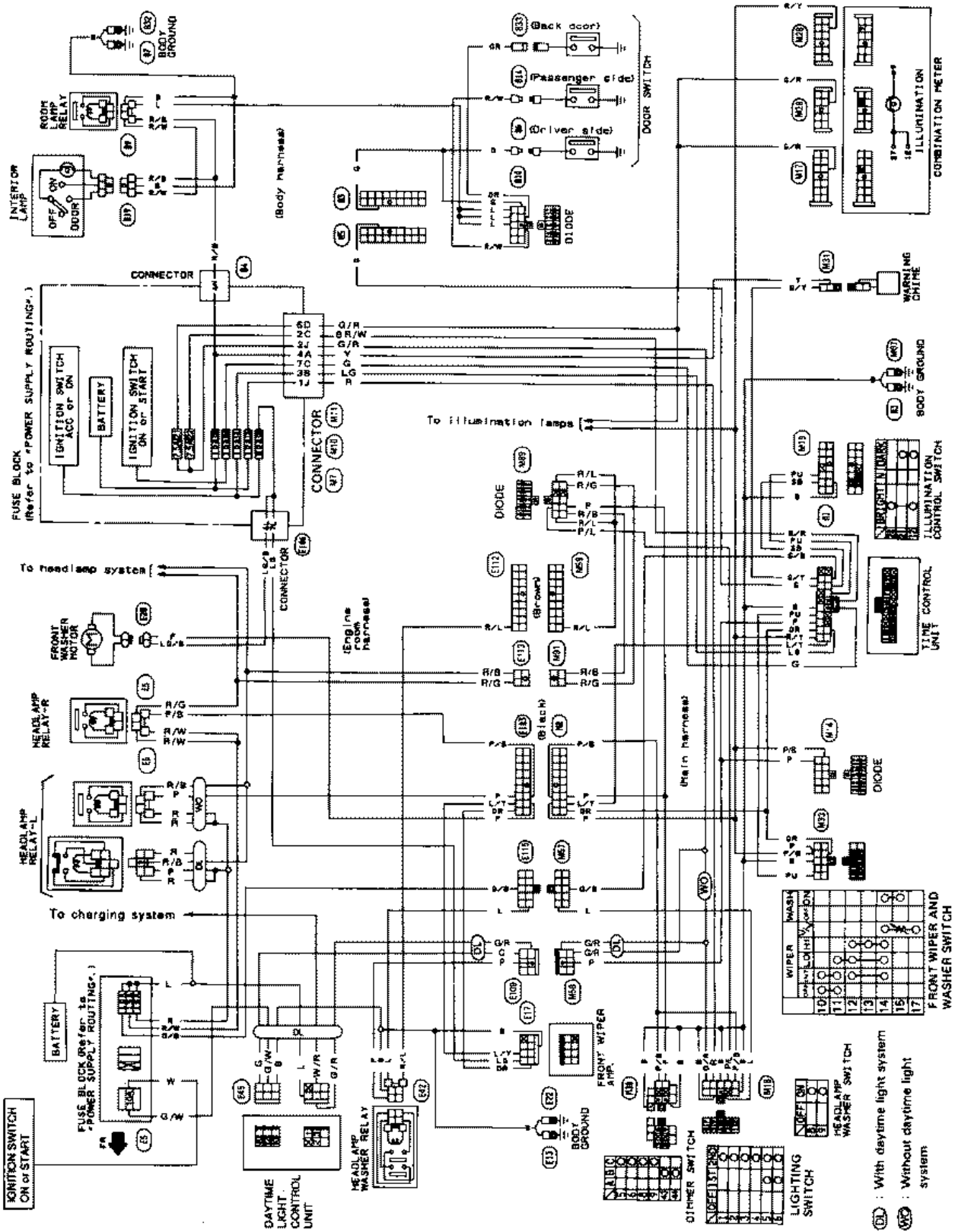
EL-75

SEL337P

TIME CONTROL SYSTEM

Wiring Diagram

L.H. DRIVE MODELS

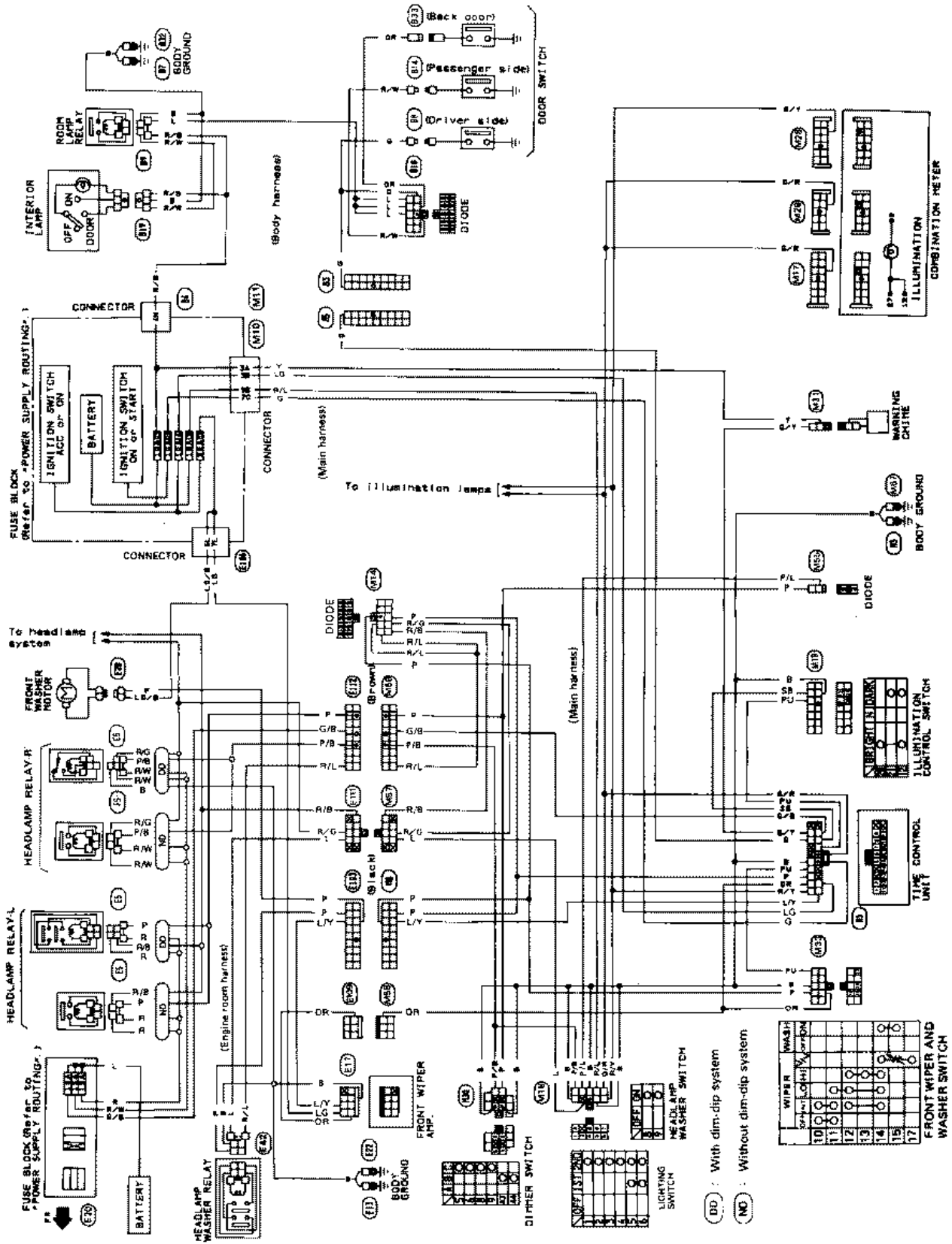


SEL338P

TIME CONTROL SYSTEM

Wiring Diagram (Cont'd)

R.H. DRIVE MODELS



TIME CONTROL SYSTEM

Description

FUNCTION

- Time control unit has the following functions.

Item		Details of control
1	Intermittent wiper control	Regulates intermittent time from approximately 3 to 23 seconds depending on the intermittent wiper volume setting.
2	Washer and wiper combination control Headlamp washer control	Wiper is operated in conjunction with washer switch. Headlamp washer is operated for about 7 seconds when headlamp washer switch is turned "ON".
3	Illumination control	Regulates brightness of illumination in 16 stages depending on the illumination control switch setting.
4	Light warning chime timer	When driver's door is opened with light switch "ON" and ignition switch "OFF", warning chime sounds.

OPERATING CONDITIONS

Item	Input signal	Power source from battery	Ignition switch	Light switch	Wiper switch "INT"	Washer switch	Driver's side door switch *1	Illumination control switch
	Input terminal Output terminal	9	2 or 5	8	12	13	18	7 or 8
Intermittent wiper control	1	ON	ACC or ON		ON			
Washer and wiper combination control Headlamp washer control	12	ON	ACC or ON			ON		
Illumination control	11	ON		ON				ON
Light warning chime timer	13	ON	OFF or ACC	ON			ON	

*1: Door switch is turned "ON" when door is opened.

Trouble-diagnosis

Symptom		DIAGNOSTIC PROCEDURE
Wiper & washer	Intermittent wiper does not operate.	1
	Intermittent time of wiper cannot be adjusted.	2
	Wiper and washer activate individually but not in combination.	3
Illumination	Illumination control system does not actuate.	4
Warning	Light warning chime does not activate.	5

TIME CONTROL SYSTEM

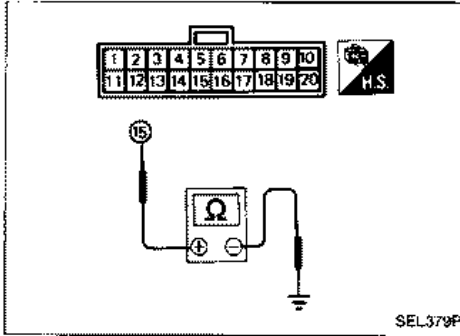
Trouble-diagnosis (Cont'd)

PREPARATION FOR TROUBLE-DIAGNOSIS

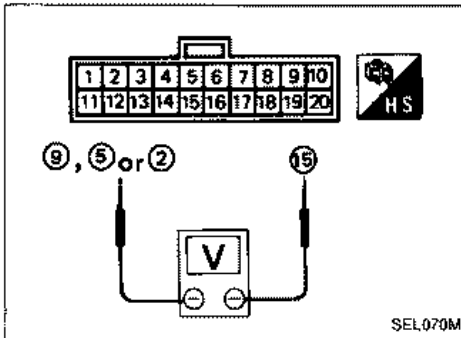
1. Remove lower trim.
2. Remove time control unit with harness connected.

POWER SUPPLY CIRCUIT CHECK

1. Connect ohmmeter from harness side.
2. Check continuity between terminal ⑮ and body ground.



Ohmmeter terminals		Continuity
(+)	(-)	
⑮	Body ground	Yes



3. Connect voltmeter from harness side.
4. Measure voltage across terminal ⑮ and terminals ②, ⑤ or ⑨.

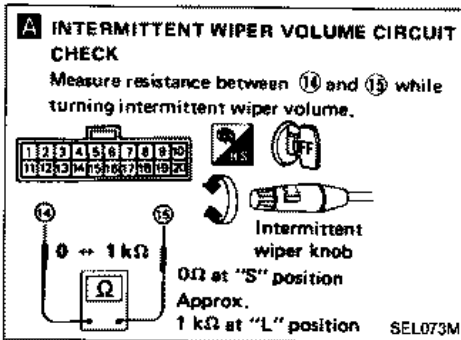
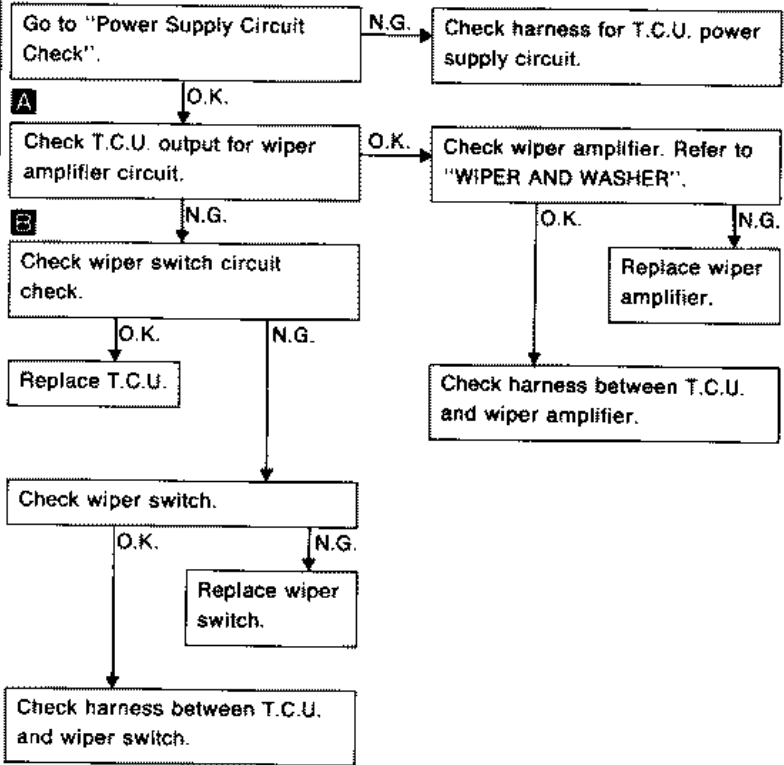
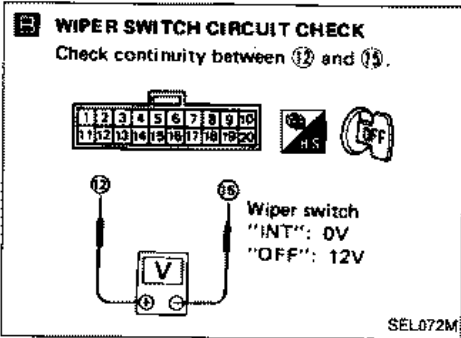
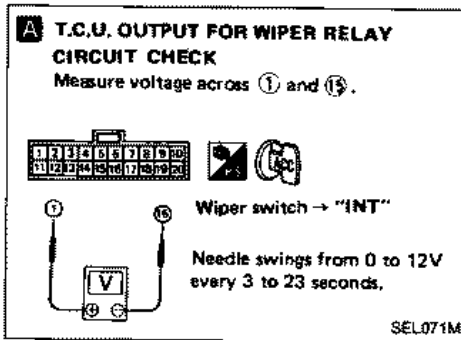
Voltmeter terminals		Ignition switch position		
(+)	(-)	OFF	ACC	ON
⑨	⑮	Approx. 12V	Approx. 12V	Approx. 12V
⑤	⑮	0V	0V	Approx. 12V
②	⑮	0V	Approx. 12V	Approx. 12V

TIME CONTROL SYSTEM

Trouble-diagnosis (Cont'd)

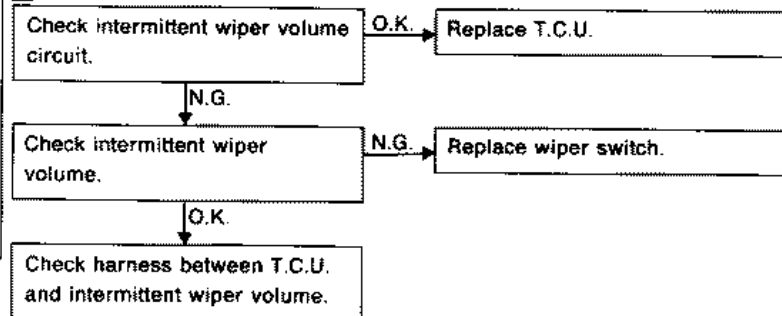
DIAGNOSTIC PROCEDURE-1

Intermittent wiper does not operate.



DIAGNOSTIC PROCEDURE-2

Intermittent time of wiper cannot be adjusted.

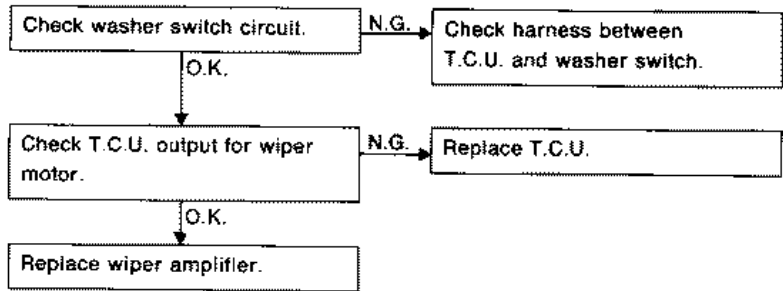


TIME CONTROL SYSTEM

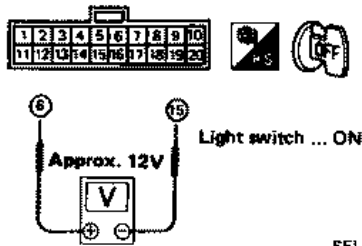
Trouble-diagnosis (Cont'd)

DIAGNOSTIC PROCEDURE-3

Wiper and washer activate individually but not in combination.

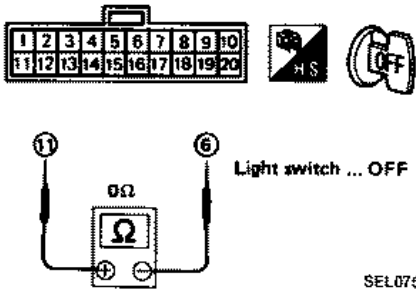


A T.C.U. OUTPUT FOR LIGHT SWITCH CIRCUIT CHECK



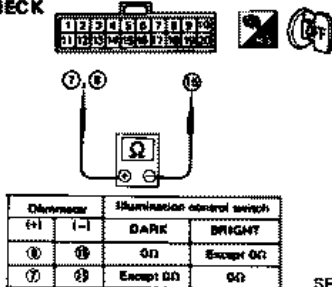
SEL074M

B ILLUMINATION CIRCUIT CHECK



SEL075M

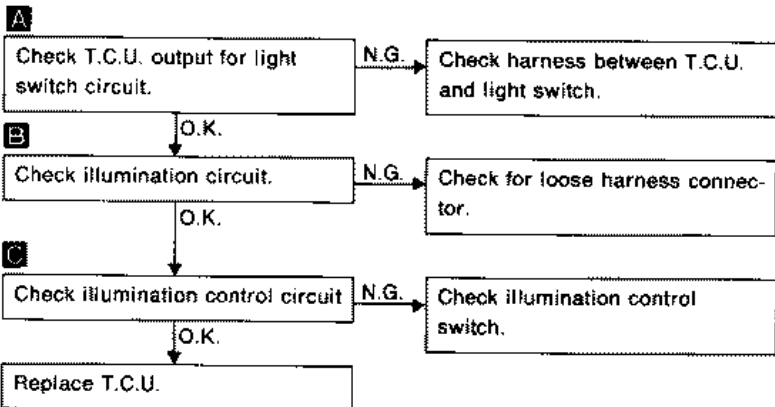
C ILLUMINATION CONTROL CIRCUIT CHECK



SEL076M

DIAGNOSTIC PROCEDURE-4

Illumination control system does not actuate.

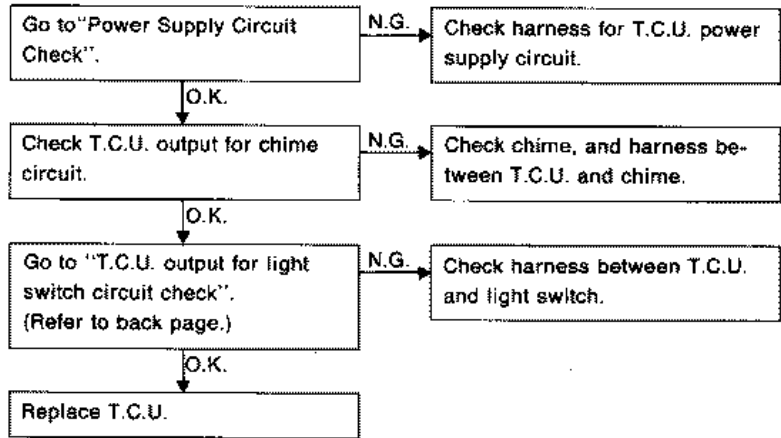


TIME CONTROL SYSTEM

Trouble-diagnosis (Cont'd)

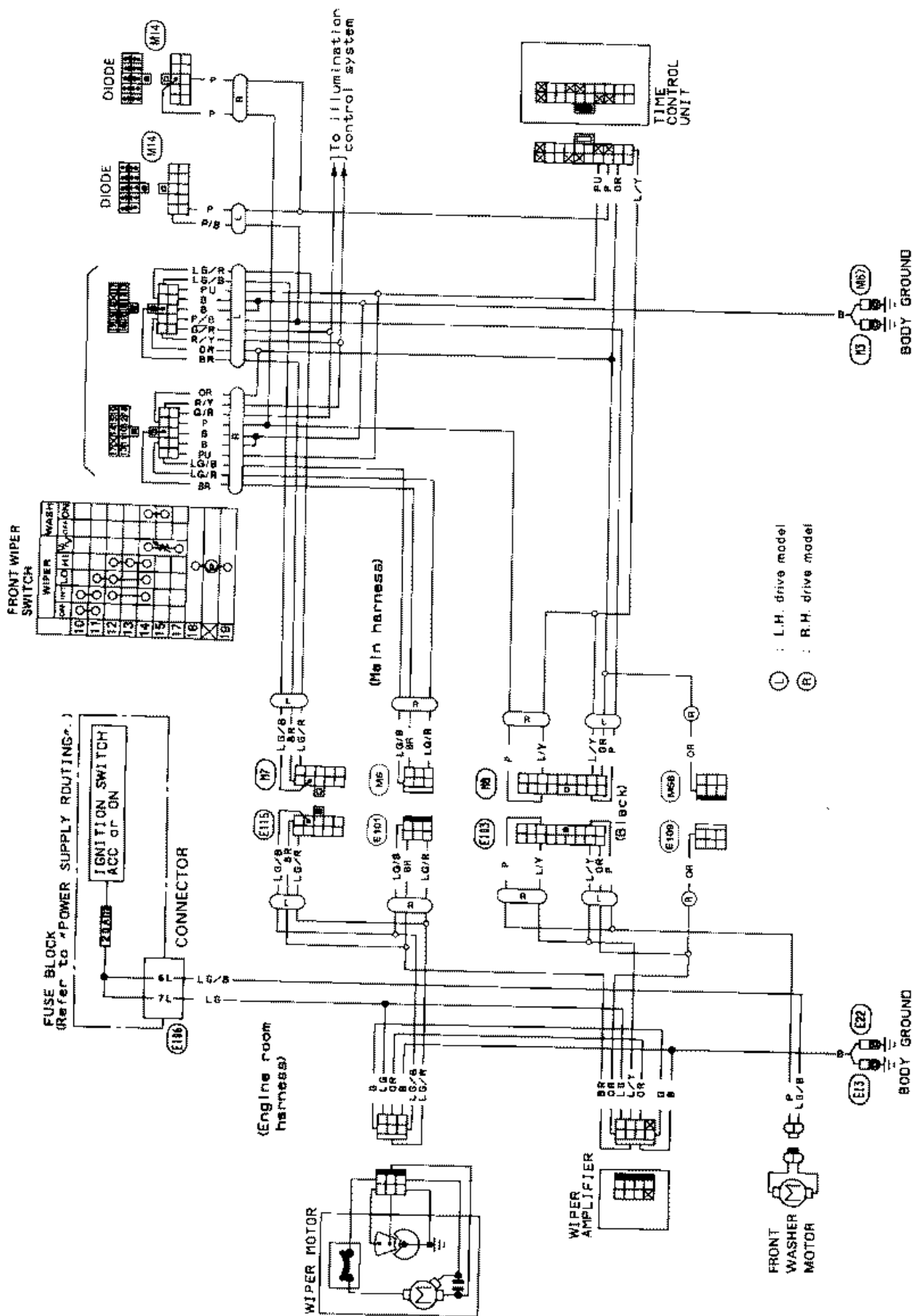
DIAGNOSTIC PROCEDURE-5

Light warning chime does not activate.



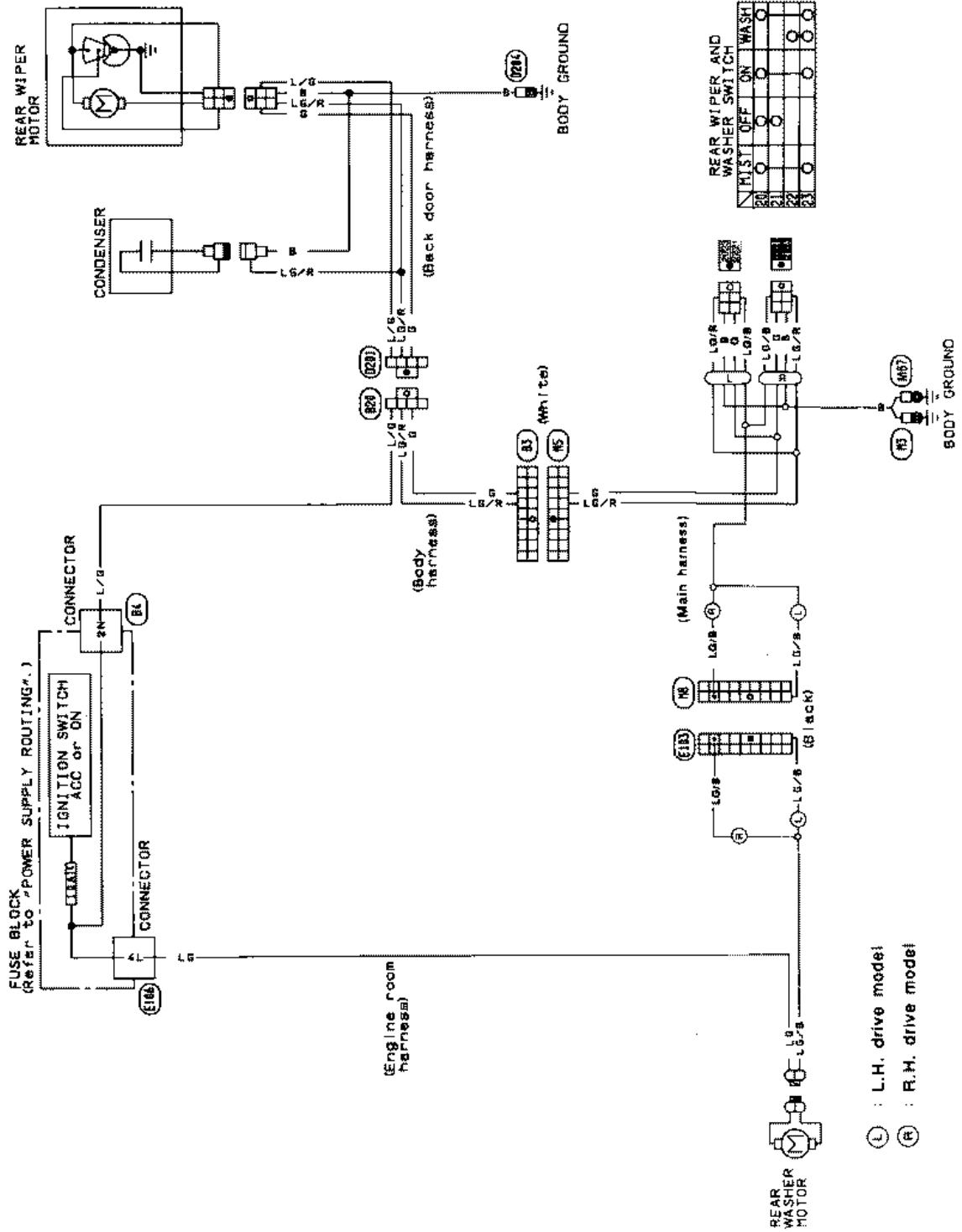
WIPER AND WASHER

Front Wiper and Washer/Wiring Diagram



WIPER AND WASHER

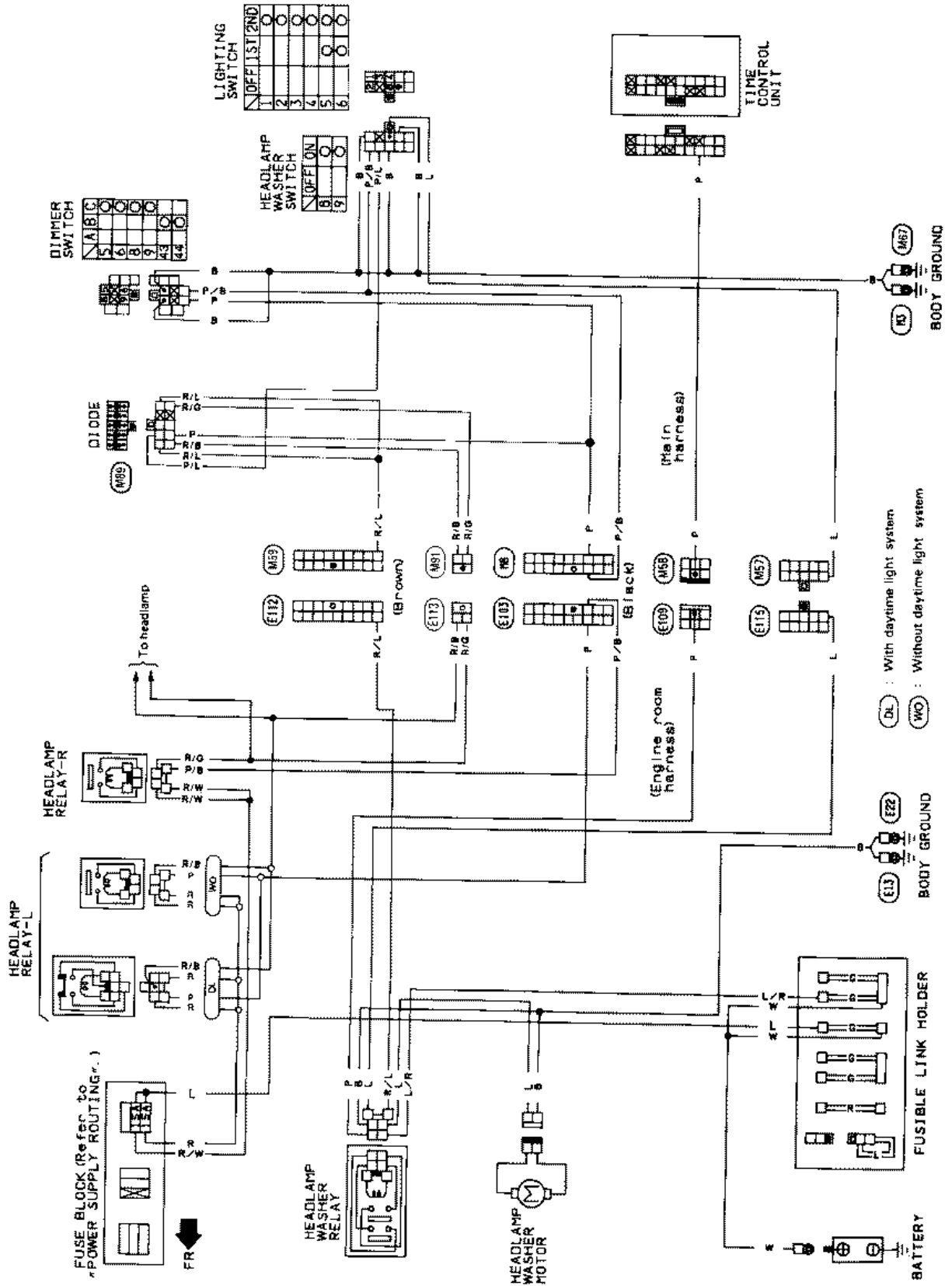
Rear Wiper and Washer/Wiring Diagram



WIPER AND WASHER

Headlamp Washer/Wiring Diagram

L.H. DRIVE MODELS

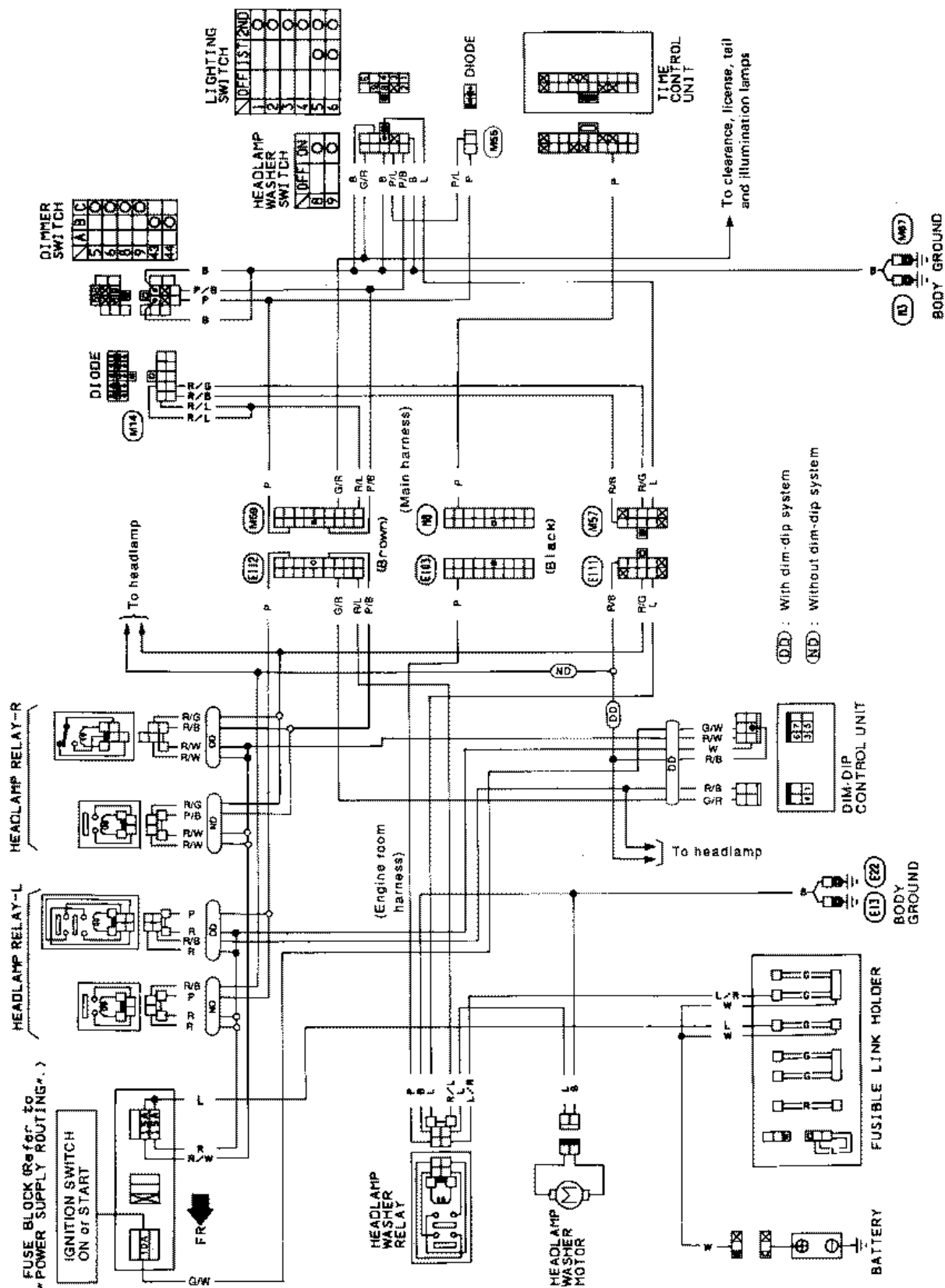


SEL342P

WIPER AND WASHER

Headlamp Washer/Wiring Diagram (Cont'd)

R.H. DRIVE MODELS



WIPER AND WASHER

Installation

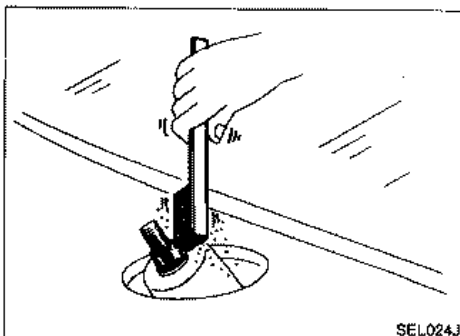
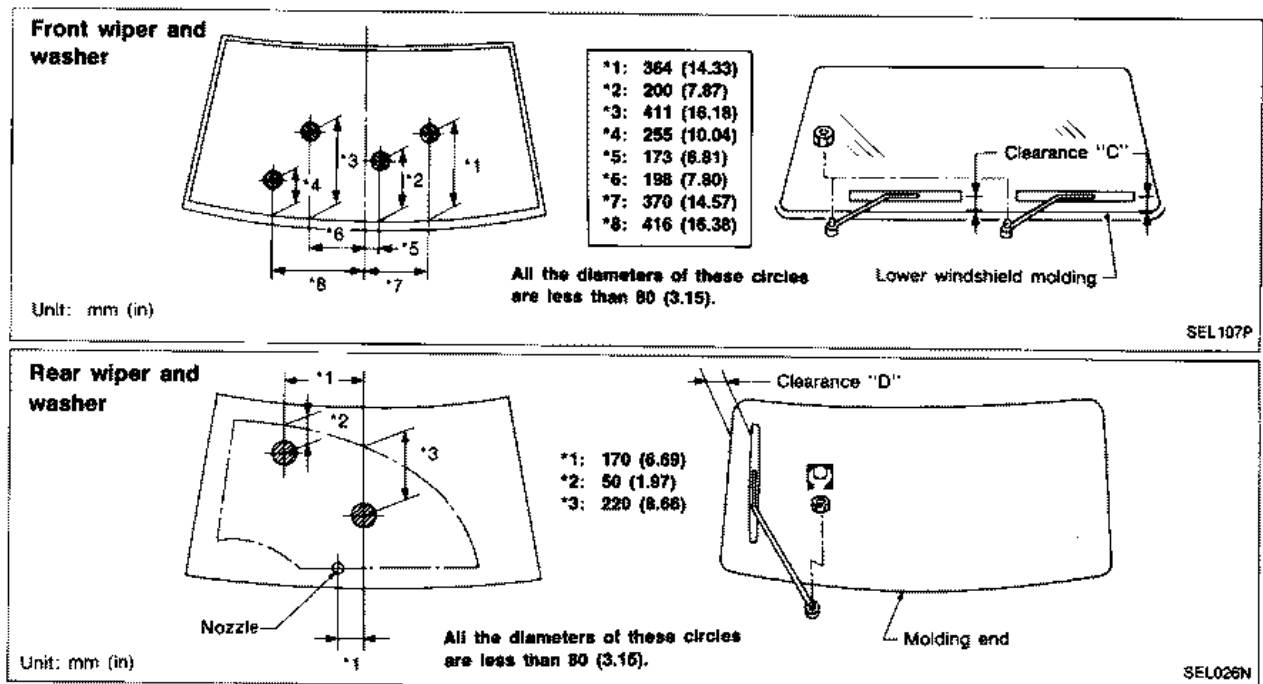
1. Prior to wiper arm installation, turn "ON" wiper switch to operate wiper motor and then turn it "OFF" (Auto Stop).
 2. Lift the blade up and then set it down onto glass surface to set the blade center to clearance "C" or "D" immediately before tightening nut.
 3. Eject washer fluid. Turn "ON" wiper switch to operate wiper motor and then turn it "OFF".
 4. Ensure that wiper blades stop within clearance "C" or "D". Clearance "C": 0 - 10 mm (0 - 0.39 in)
Clearance "D": 73 - 88 mm (2.87 - 3.46 in)
- Tighten windshield wiper arm nuts to specified torque.

Front wiper:

: 26 - 32 N·m (2.7 - 3.3 kg·m, 20 - 24 ft·lb)

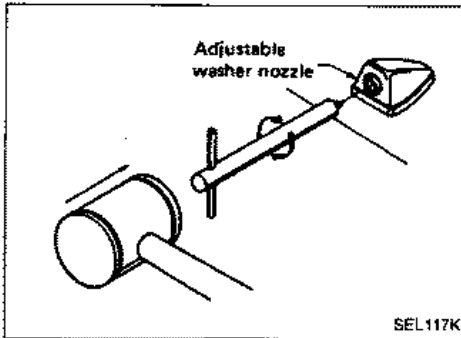
Rear wiper:

: 13 - 18 N·m (1.3 - 1.8 kg·m, 9 - 13 ft·lb)



- Before reinstalling wiper arm, clean up the pivot area as illustrated. This will reduce possibility of wiper arm looseness.

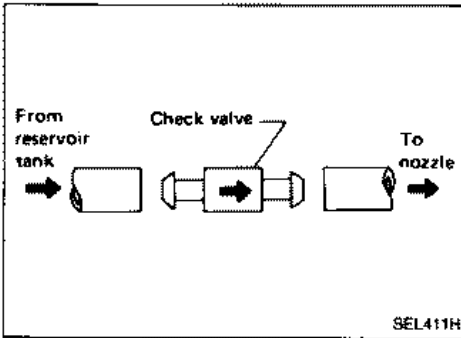
WIPER AND WASHER



Washer Nozzle Adjustment

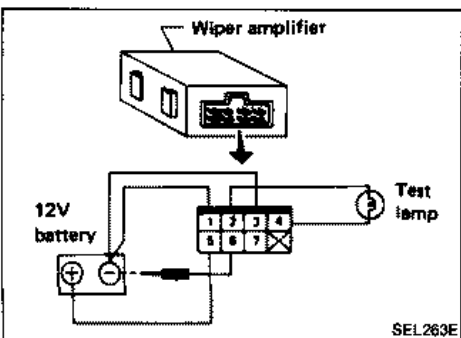
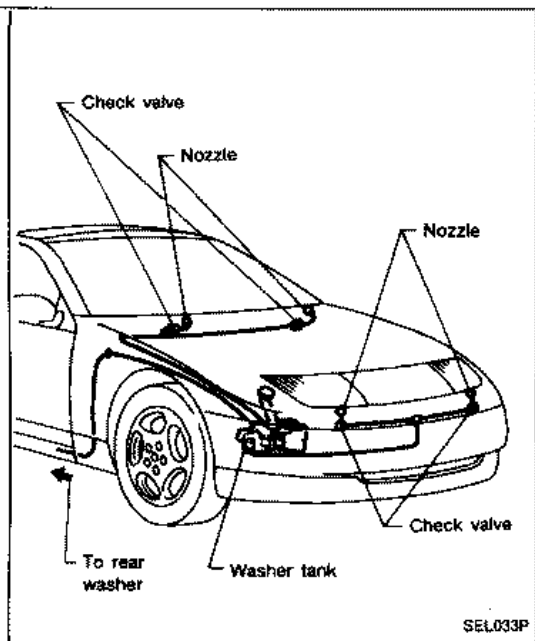
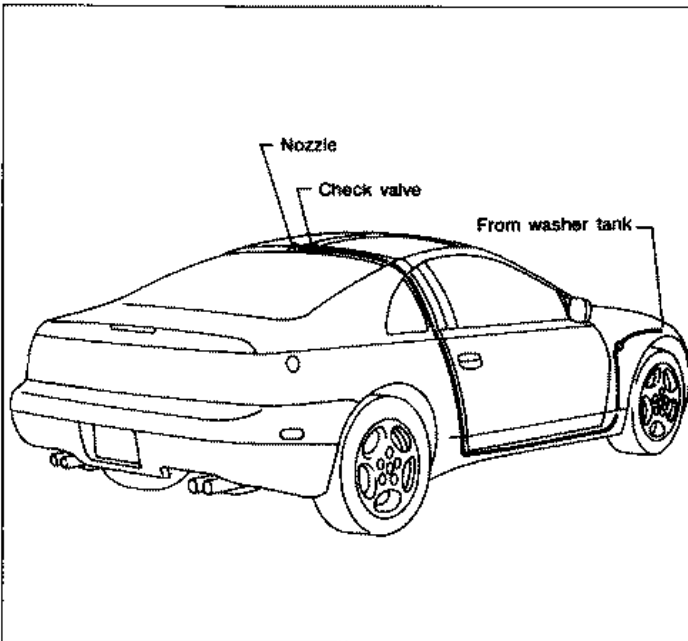
- Adjust washer nozzle with a suitable tool as shown in the figure at left.

Before attempting to turn the nozzle, gently tap the end of the tool to free the nozzle. This will prevent "rounding out" the small female square in the center of the nozzle.



Check Valve

- A check valve is provided in the washer fluid line. Be careful not to connect check valve to washer tube in the wrong direction.

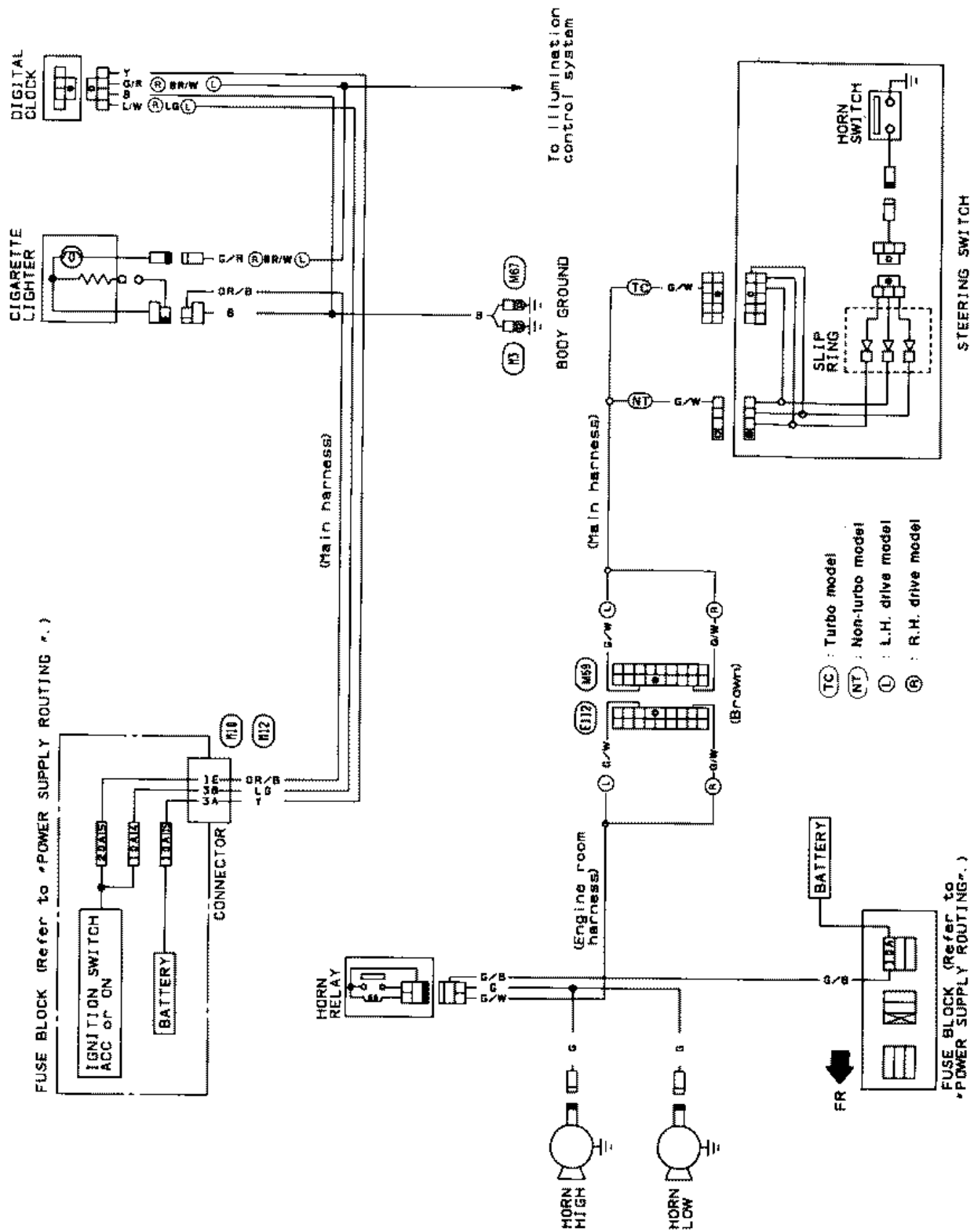


Wiper Amplifier Check

1. Connect as shown in the figure at left.
2. If test lamp comes on when connected to terminal ⑥ and battery ground, wiper relay is normal.

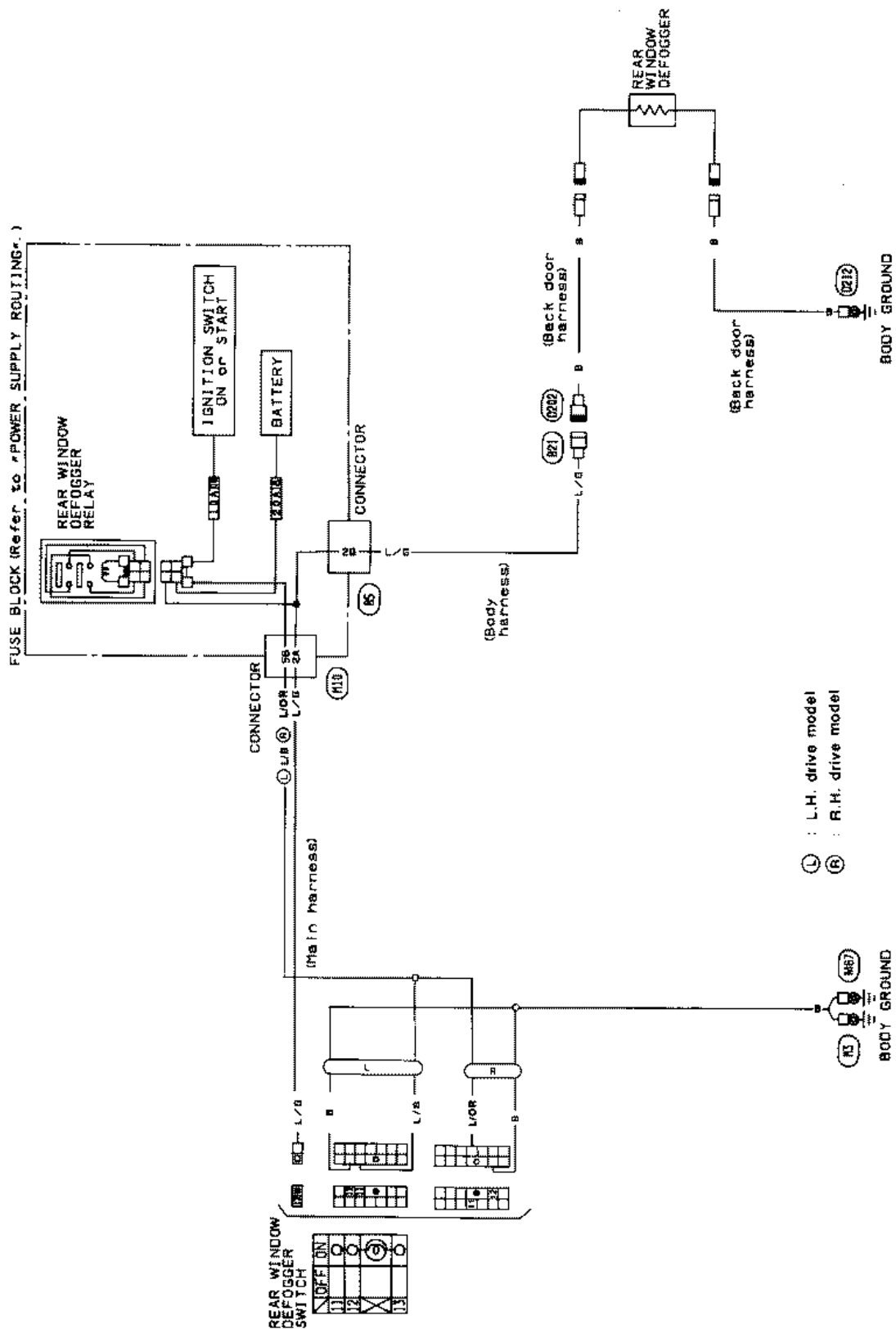
HORN, CIGARETTE LIGHTER, CLOCK

Wiring Diagram



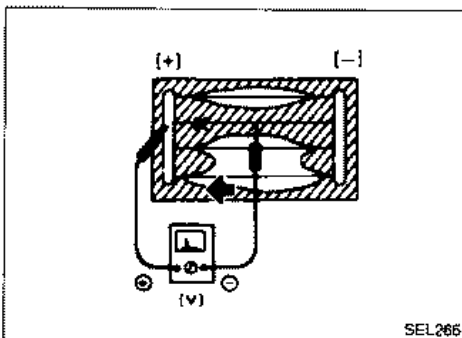
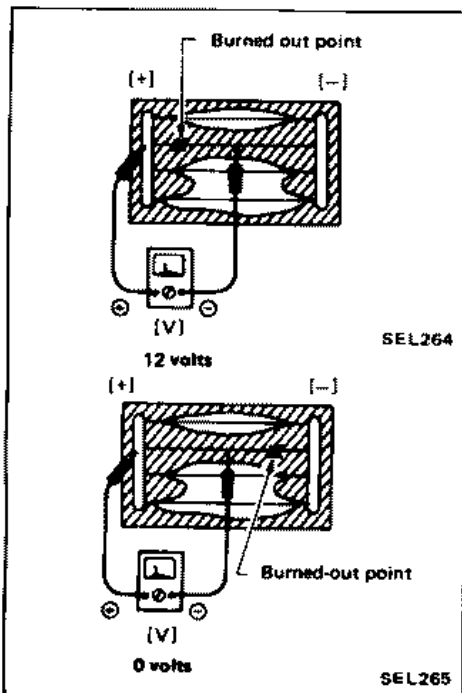
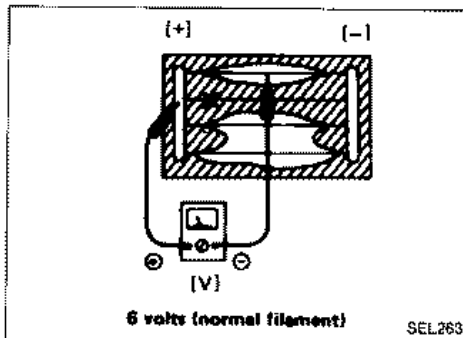
REAR WINDOW DEFOGGER

Wiring Diagram



SEL345P

REAR WINDOW DEFOGGER



Filament Check

1. Attach probe circuit tester (in volt range) to middle portion of each filament.
2. If a filament is burned out, circuit tester registers 0 or 12 volts.
3. To locate burned out point, move probe to left and right along filament to determine point where tester needle swings abruptly.

Filament Repair

REPAIR EQUIPMENT

1. Conductive silver composition (Dupont No. 4817 or equivalent)
2. Ruler 30 cm (11.8 in) long
3. Drawing pen
4. Heat gun
5. Alcohol
6. Cloth

REAR WINDOW DEFOGGER

Filament Repair (Cont'd)

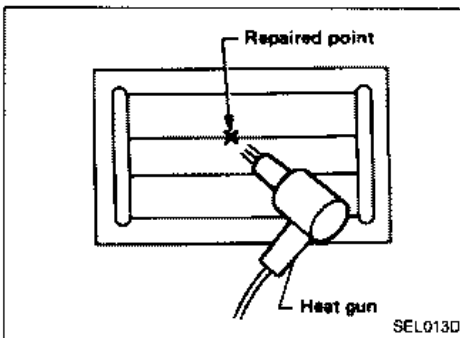
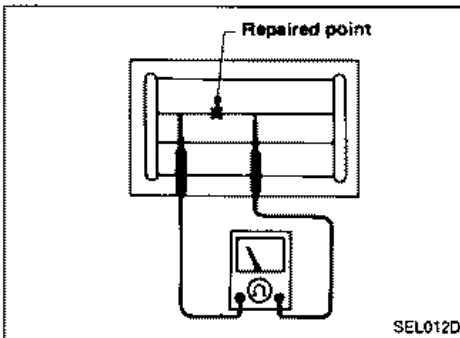
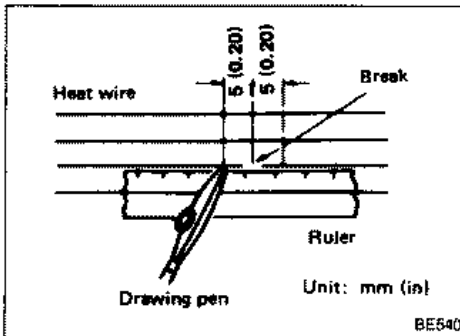
REPAIRING PROCEDURE

1. Wipe broken heat wire and its surrounding area clean with a cloth dampened in alcohol.
2. Apply a small amount of conductive silver composition to tip of drawing pen.

Shake silver composition container before use.

3. Place ruler on glass along broken line. Deposit conductive silver composition on break with drawing pen. Slightly overlap existing heat wire on both sides [preferably 5 mm (0.20 in)] of the break.
4. After repair has been completed, check repaired wire for continuity. This check should be conducted 10 minutes after silver composition is deposited.

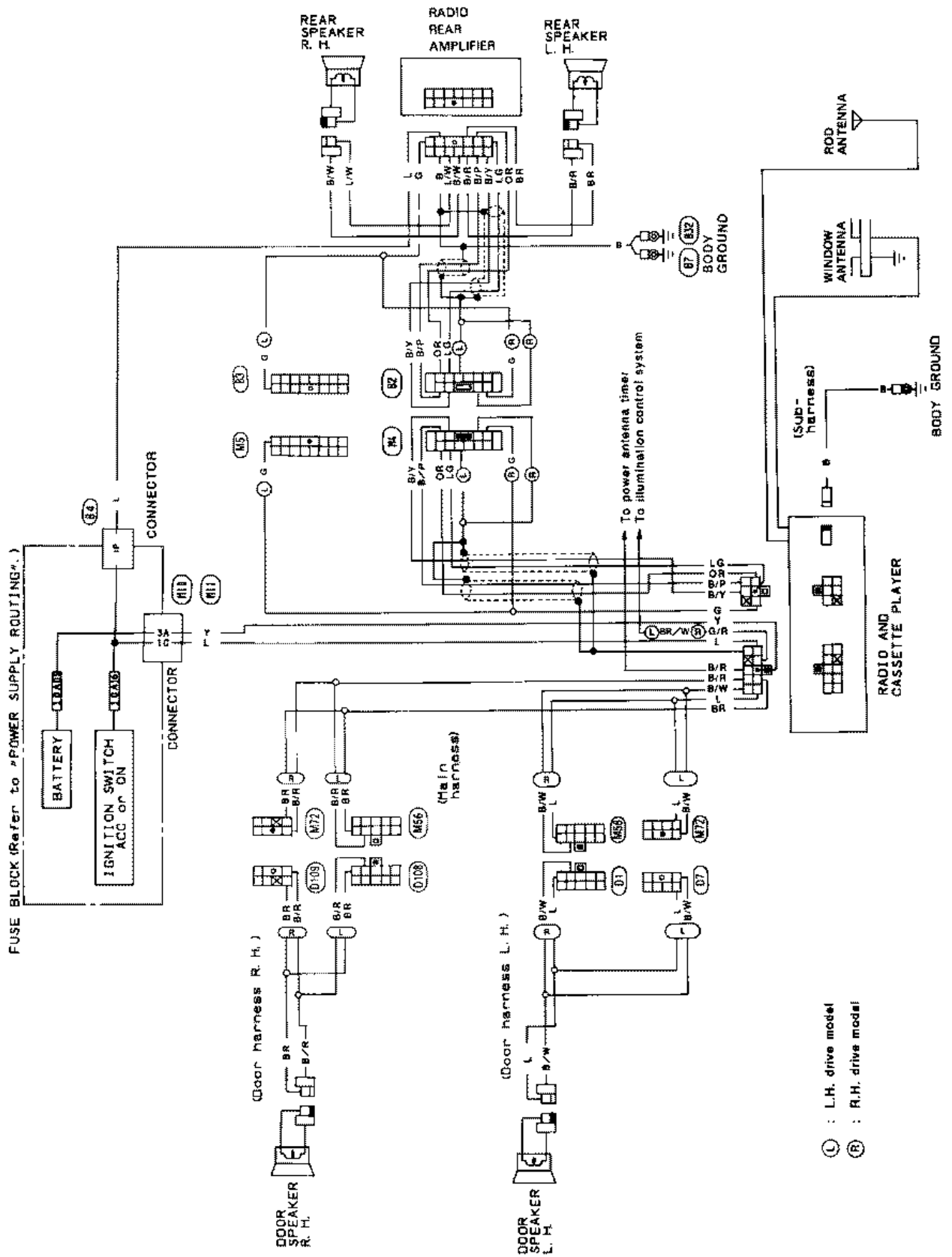
Do not touch repaired area while test is being conducted.



5. Apply a constant stream of hot air directly to the repaired area for approximately 20 minutes with a heat gun. A minimum distance of 3 cm (1.2 in) should be kept between repaired area and hot air outlet. If a heat gun is not available, let the repaired area dry for 24 hours.

AUDIO AND POWER ANTENNA

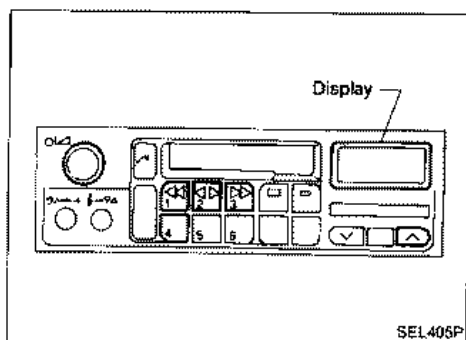
Audio/Wiring Diagram



(L) : L.H. drive model
 (R) : R.H. drive model

SEL346P

AUDIO AND POWER ANTENNA

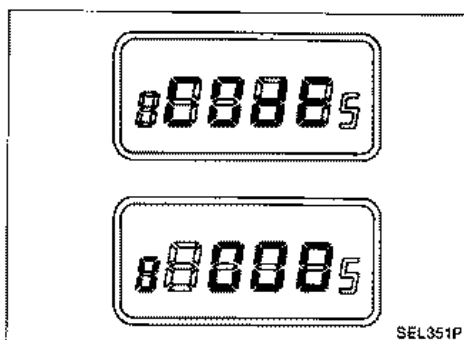


Radio

ANTI-THEFT SYSTEM


By using a personal 4-digit code known only to the vehicle owner, the possibility of the audio unit being stolen is effectively reduced, because without the code the unit can not be activated. When in normal use, the unit is unlocked and accessible in the usual way.

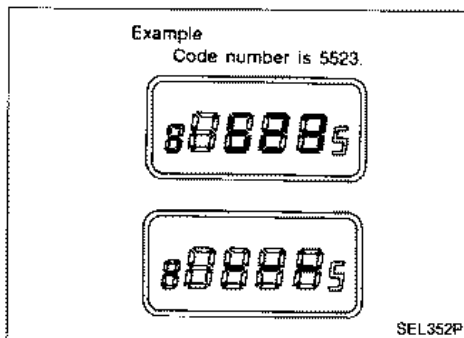
If however, someone attempts to remove the unit or the ground cable is disconnected from the battery, the Anti-theft system activates and the unit "locks". The only way it can be unlocked is by entering a personal code number known only by the owner.



UNLOCKING THE UNIT (How to enter a personal code number)

Use the following procedures to enter a personal code number into the radio.

1. Turn ignition switch to "ACC" or "ON".
2. Turn SW. VOL knob to "ON" and "LOCK" will appear on the display.
3. Press any button (except "eject") and "8888" will appear on the display.
4. Enter a personal code number by pressing station select buttons 1, 2, 3,4 the required number of times to display the code.
5. Press  to enter the code.
Unit is unlocked and the radio/cassette will operate.
If the wrong code number is entered, the display shows "----". Wait ten seconds then enter the correct code.



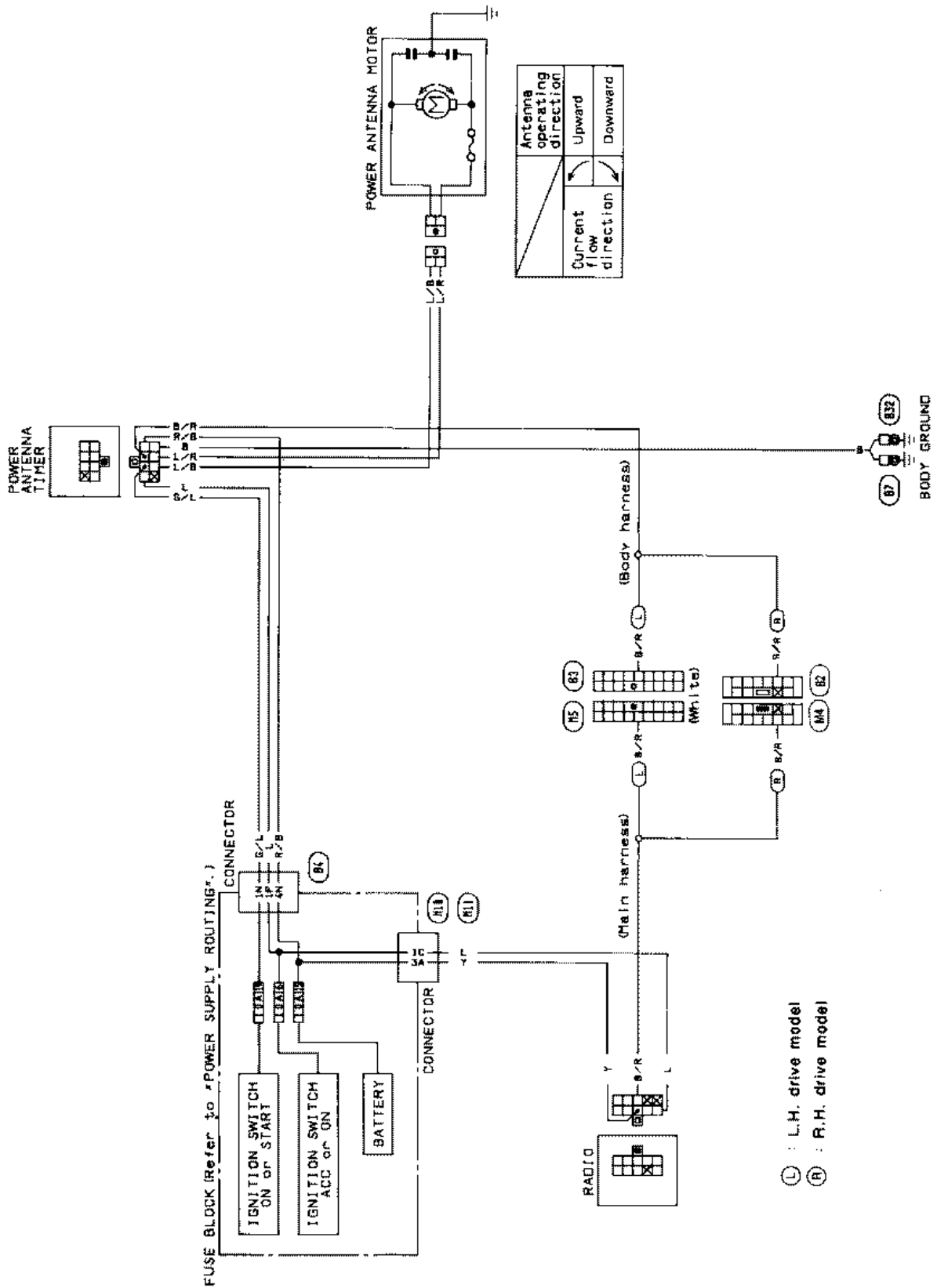
CAUTION:

There are two ten second waiting periods after a wrong code number has been entered. There then follows twenty waiting periods of fifteen minutes duration.

After that, if wrong code is entered, the unit will lock permanently.

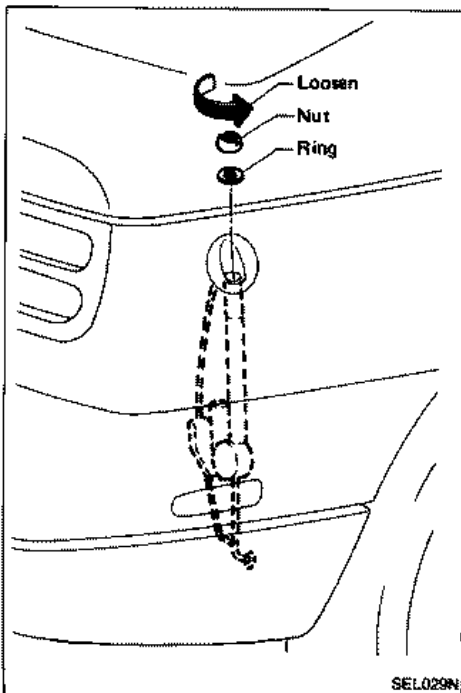
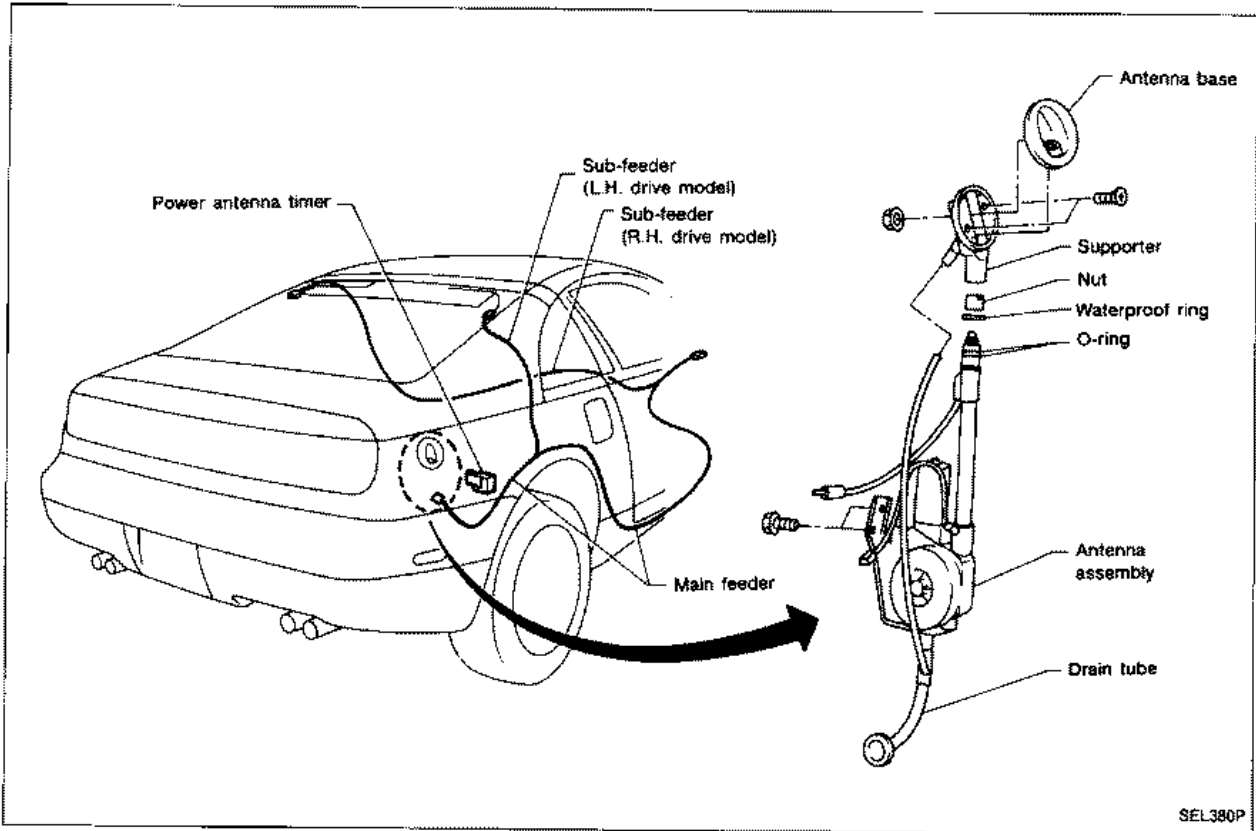
AUDIO AND POWER ANTENNA

Power Antenna/Wiring Diagram



AUDIO AND POWER ANTENNA

Location of Antenna



Antenna Rod Replacement

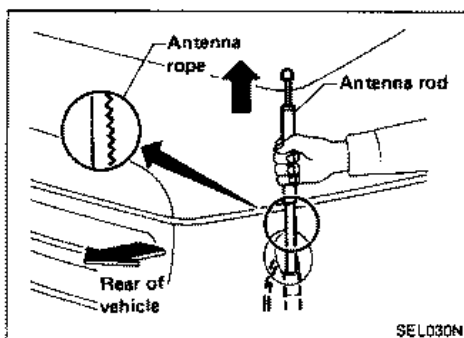
REMOVAL

1. Remove antenna nut and antenna base.

AUDIO AND POWER ANTENNA

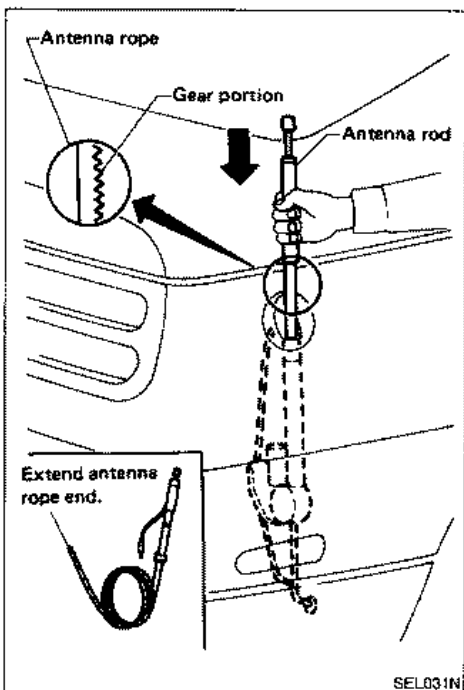
Antenna Rod Replacement (Cont'd)

2. Withdraw antenna rod while raising it by operating antenna motor.

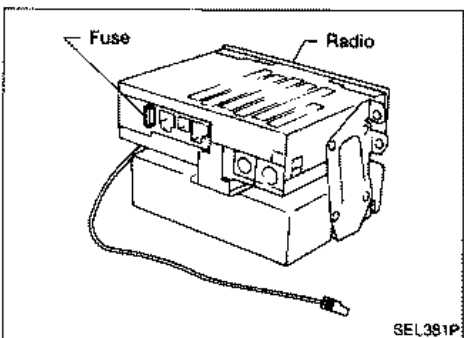


INSTALLATION

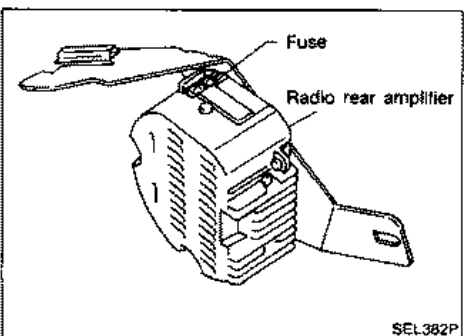
1. Lower antenna rod by operating antenna motor.
2. Insert gear section of antenna rope into place with it facing toward antenna motor.
3. As soon as antenna rope is wound on antenna motor, stop antenna motor. Insert antenna rod lower end into antenna motor pipe.
4. Retract antenna rod completely by operating antenna motor.
5. Install antenna nut and base.



Radio Fuse Check



Radio Rear Amplifier Check

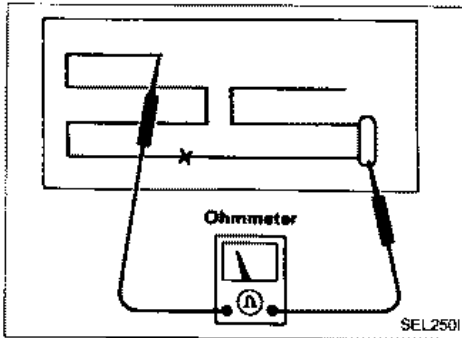


AUDIO AND POWER ANTENNA

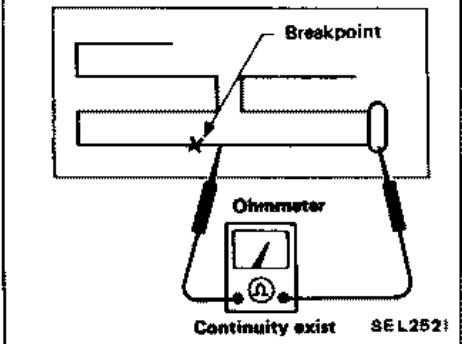
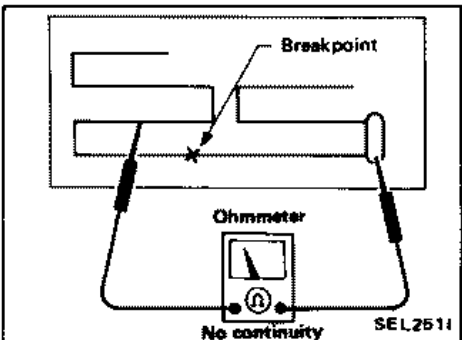
Window Antenna Repair

ELEMENT CHECK

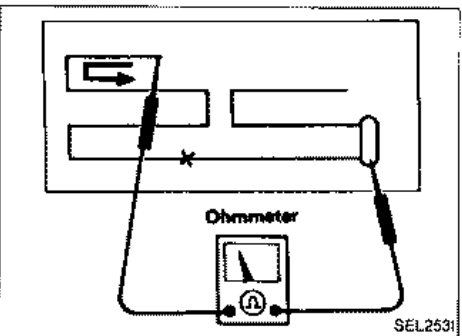
1. Attach probe circuit tester (in ohm range) to antenna terminal on each side.



2. If an element is broken, no continuity will exist.



3. To locate broken point, move probe to left and right along element to determine point where tester needle swings abruptly.



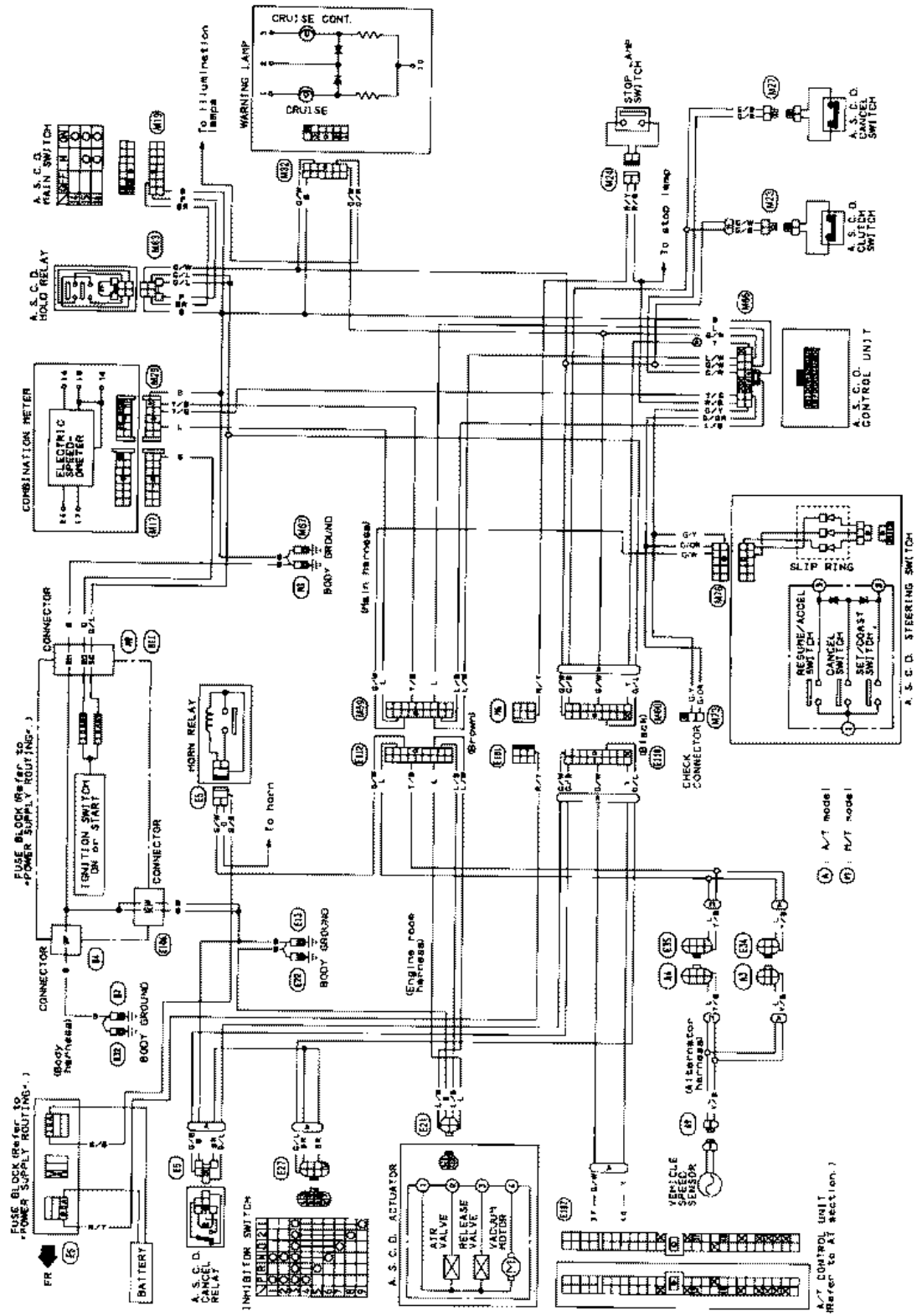
ELEMENT REPAIR

Refer to REAR WINDOW DEFOGGER "Filament Repair".

AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

Wiring Diagram

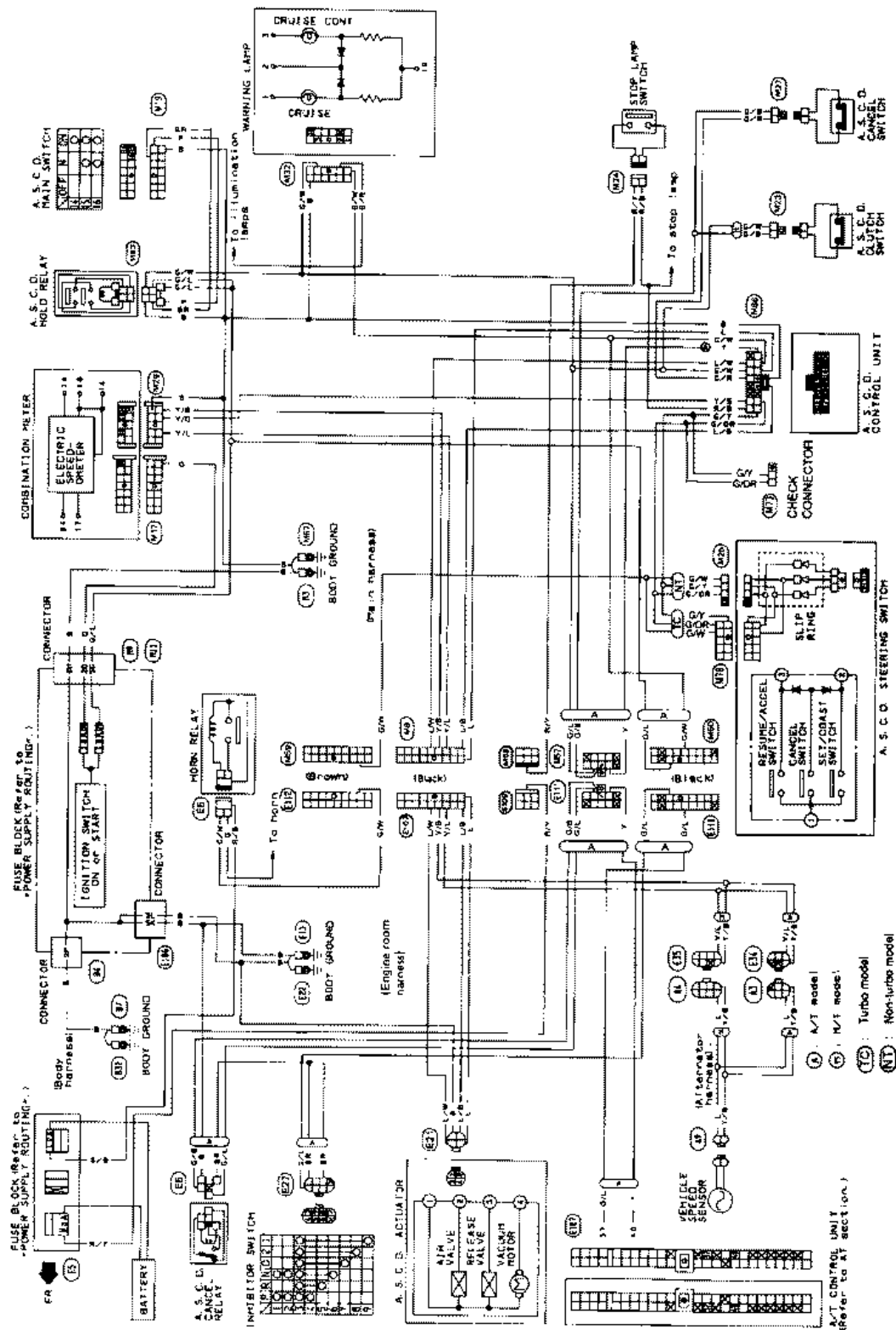
L.H. DRIVE MODELS



AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

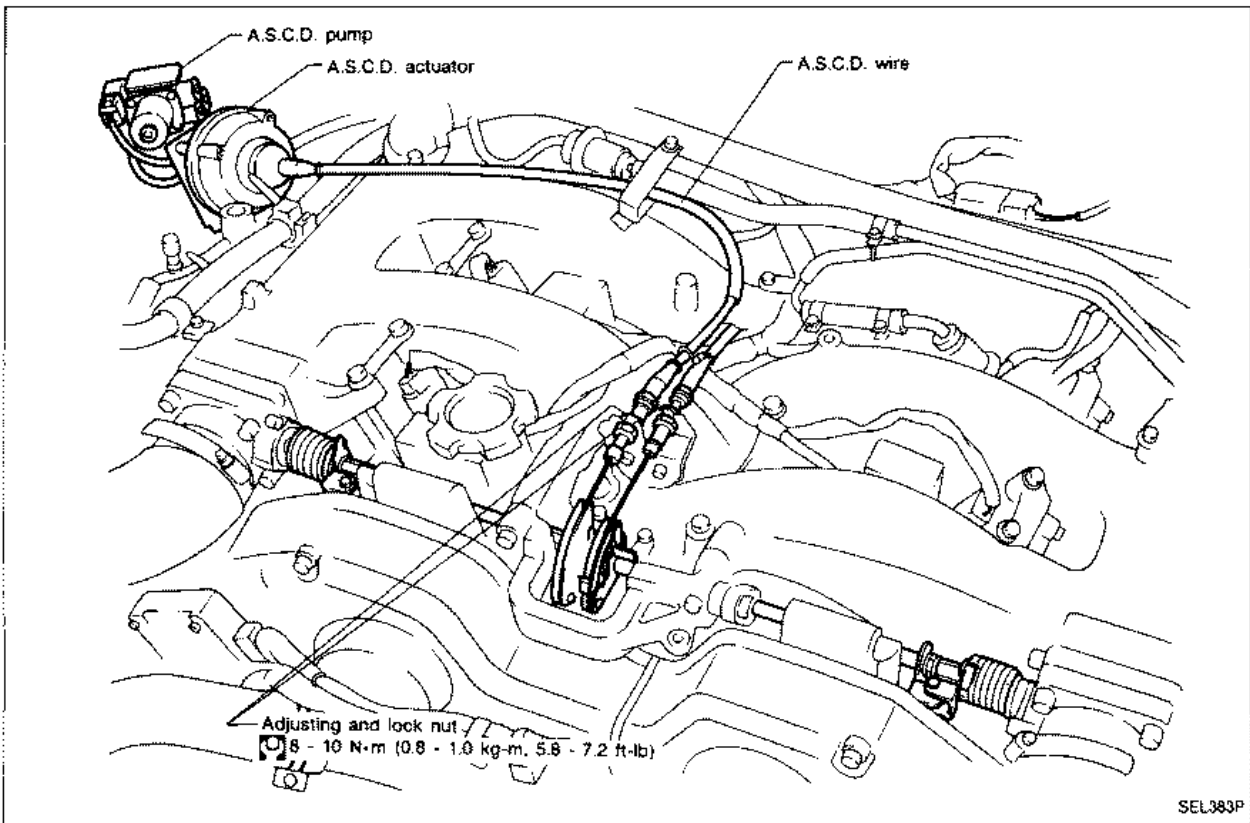
Wiring Diagram (Cont'd)

R.H. DRIVE MODELS



AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

A.S.C.D. Wire Adjustment



CAUTION:

- Be careful not to twist A.S.C.D. wire when removing it.
 - Do not tense A.S.C.D. wire excessively during adjustment.
- After confirming that accelerator wire is properly adjusted, adjust the tension of A.S.C.D. wire in the following manner.
- (1) After adjusting the length of the accelerator wire, turn a securing nut by 1/2 to 1 turn from throttle open starting position to the wire loosening direction to fix. (Must be securing carried out to prevent response delay of operation of the A.S.C.D.)
 - (2) Securely tighten lock nut to hold adjusting nut in place.
- For A.S.C.D. stop switch and clutch switch adjustment, refer to BR and CL sections.

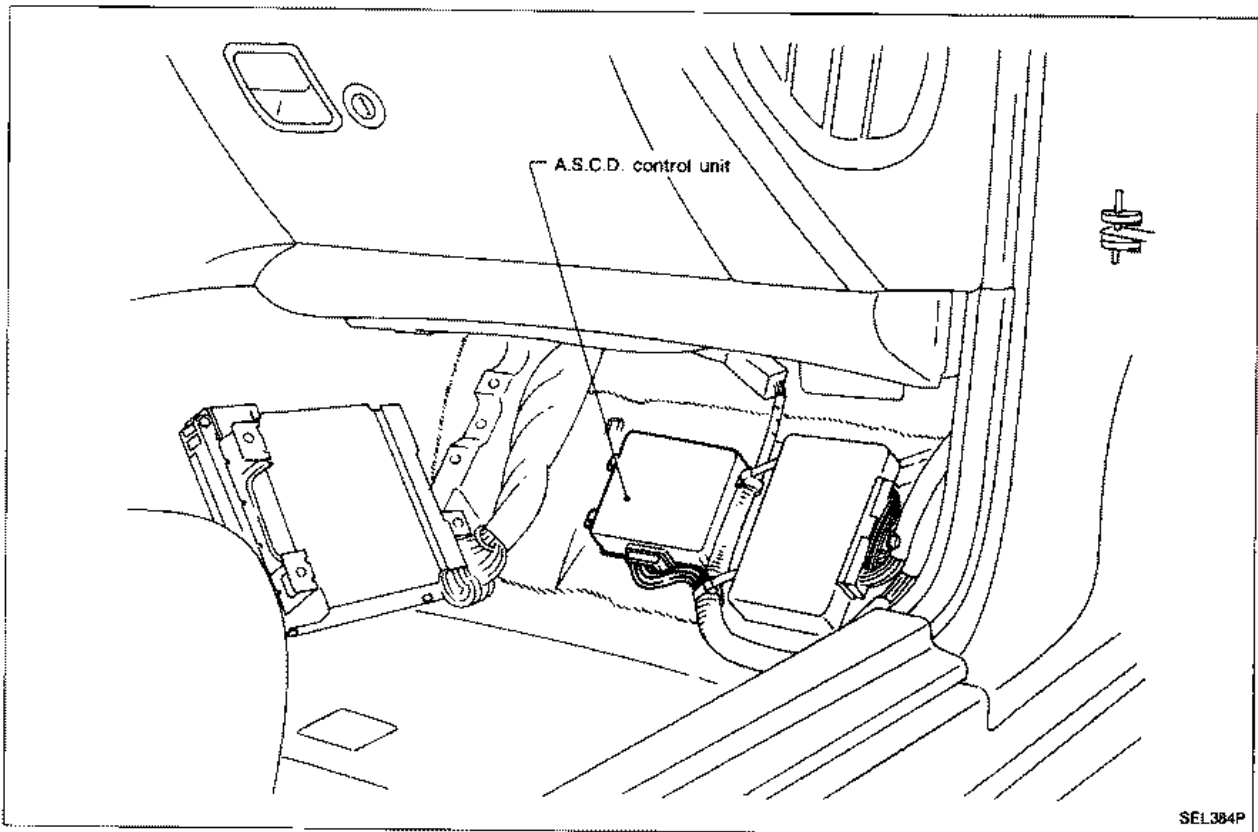
AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

Trouble Diagnoses

Symptom	DIAGNOSTIC PROCEDURE
A.S.C.D. control unit cannot be set properly.	1
Resume switch will not operate.	2
Cancel switch will not operate.	3
Engine hunts.	4
Large difference between set vehicle speed and actual speed.	5
Set speed cannot be canceled.	6

PREPARATION FOR TROUBLE-DIAGNOSIS

1. Remove lower trim.
2. Remove A.S.C.D. control unit with harness connected.
3. Perform check from harness side using circuit tester, with harness connector connected.



GROUND CIRCUIT CHECK

- Check continuity between ③ and body ground.

AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)


Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE-1

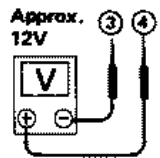
A.S.C.D. control unit cannot be set properly.

POWER SUPPLY CIRCUIT CHECK

1. Turn A.S.C.D. main switch to "ON".
2. Check voltage between ④ and ③.




Approx. 12V



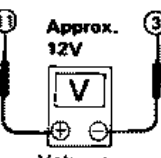
Voltmeter

CUT-OFF CIRCUIT CHECK

1. Step on brake pedal.
2. Turn A.S.C.D. main switch to "ON".
3. Check voltage between ① and ③.



Approx. 12V




Voltmeter

Brake pedal → Step on.

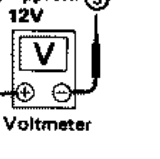
SEL629L

SET SWITCH CIRCUIT CHECK

1. Push A.S.C.D. set switch.
2. Check voltage between ② and ③.



Approx. 12V




Voltmeter

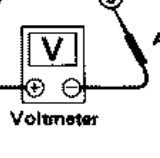
SPEED SENSOR CIRCUIT CHECK

1. Disconnect speed sensor from transmission.
2. Connect a voltmeter between ⑦ and ③.
3. Slowly turn speed sensor by hand to make sure voltmeter pointer deflects.

- Voltmeter pointer deflects twice per rotation of pinion.

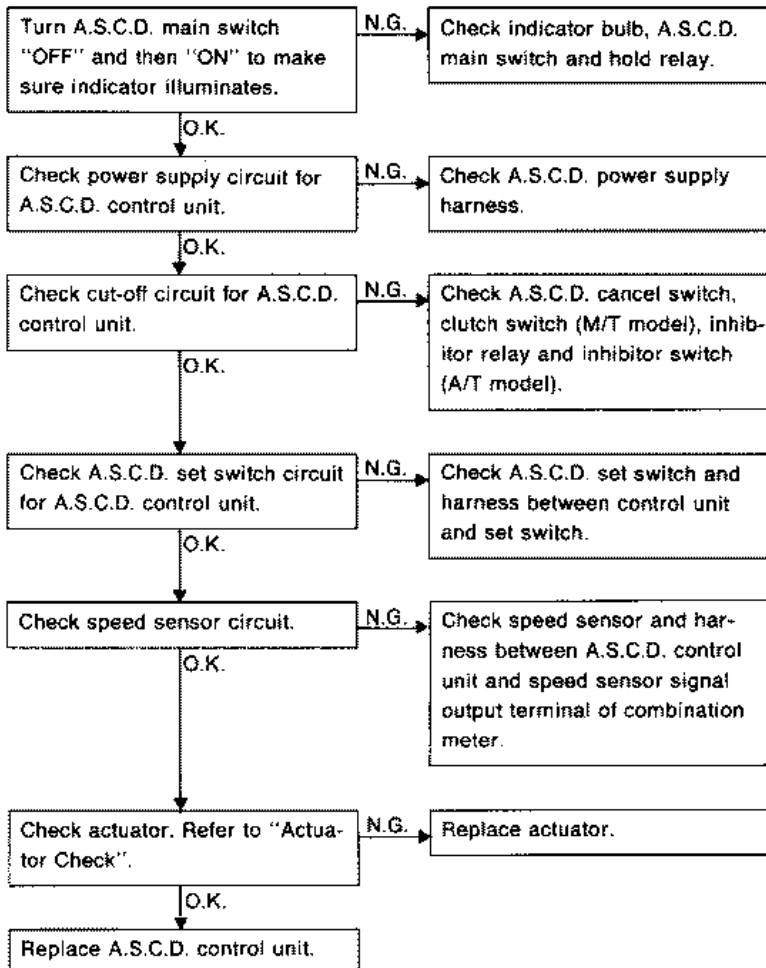


Approx. 0.5V



Voltmeter

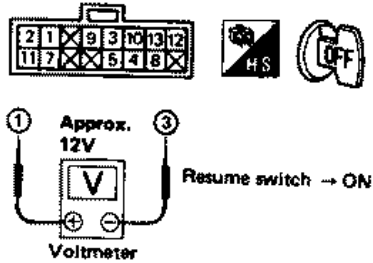
SEL630L



AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

PRESUME SWITCH CIRCUIT CHECK

1. Turn resume switch to "ON".
2. Check voltage between ① and ③.

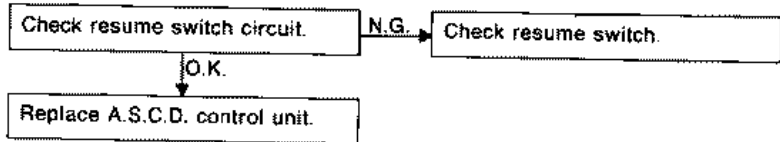


SEL636L

Trouble Diagnoses (Cont'd)

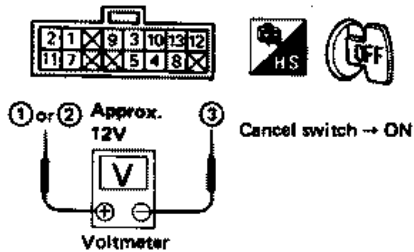
DIAGNOSTIC PROCEDURE-2

Resume switch will not operate.



CANCEL SWITCH CIRCUIT CHECK

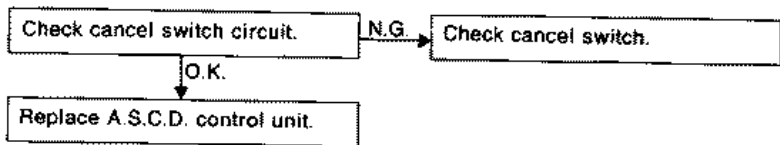
1. Turn cancel switch to "ON".
2. Check voltage between ② and ③ or ① and ③.



SEL637L

DIAGNOSTIC PROCEDURE-3

Cancel switch will not operate.

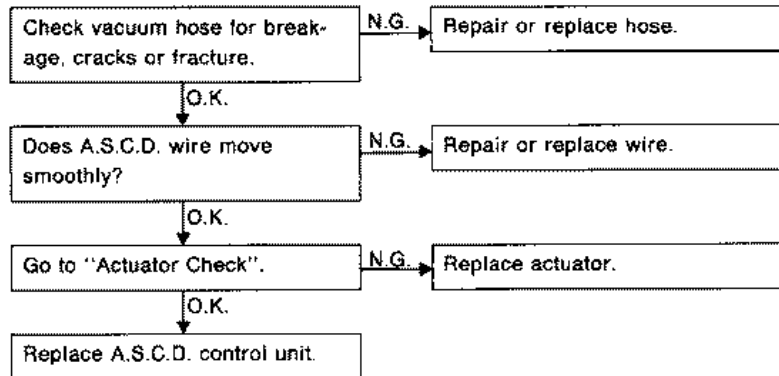


AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

Trouble Diagnoses (Cont'd)

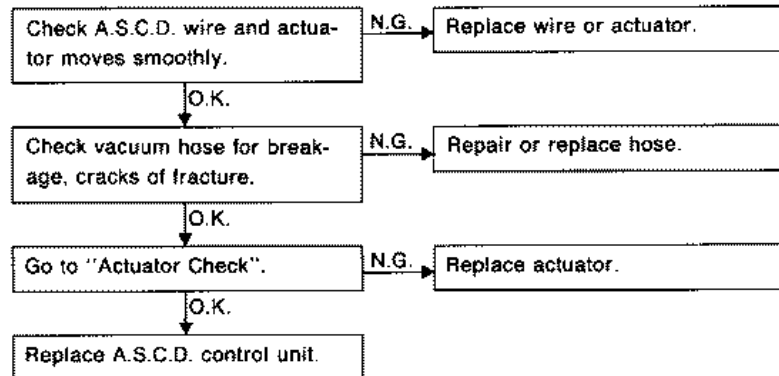
DIAGNOSTIC PROCEDURE-4

Engine hunts.



DIAGNOSTIC PROCEDURE-5

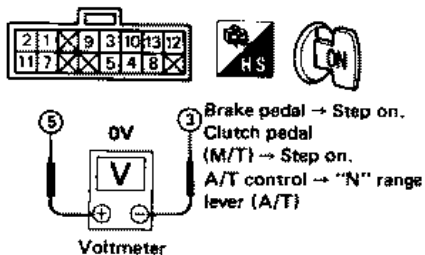
Large difference between set vehicle speed and actual speed.



AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)

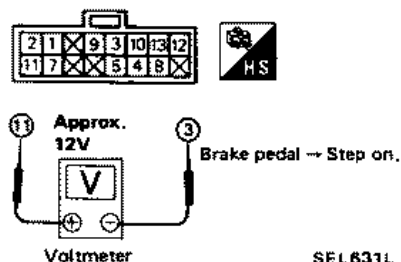
CUT-OFF CIRCUIT CHECK

1. Turn A.S.C.D. main switch to "ON".
2. Turn A.S.C.D. main switch to "ON" again.
3. Step on brake pedal.
4. Step on clutch pedal (M/T) or shift in "N" range (A/T).
5. Check voltage between ⑤ and ③.



STOP LAMP CIRCUIT CHECK

1. Step on brake pedal.
2. Check voltage between ⑪ and ③.

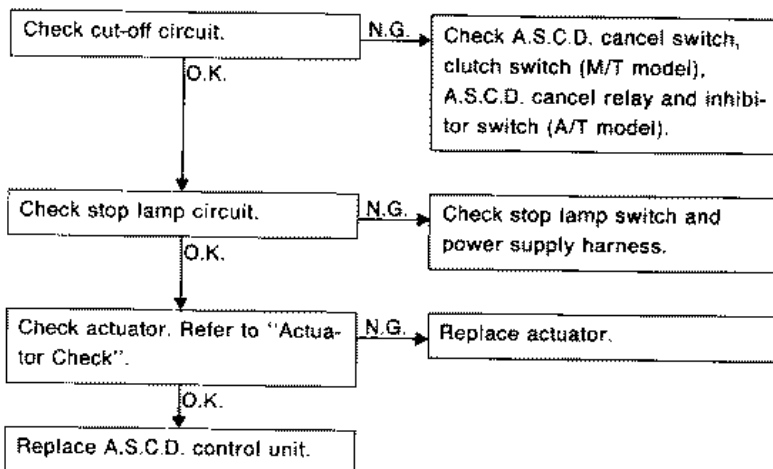


SEL631L

Trouble Diagnoses (Cont'd)

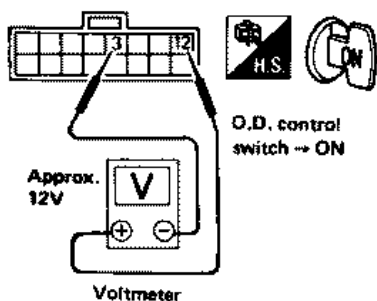
DIAGNOSTIC PROCEDURE-6

Set speed cannot be canceled.



O.D. CANCEL CIRCUIT CHECK FOR A.S.C.D. CONTROL UNIT

1. Turn O.D. control switch to "ON"
2. Measure voltage across ⑫ and ③.

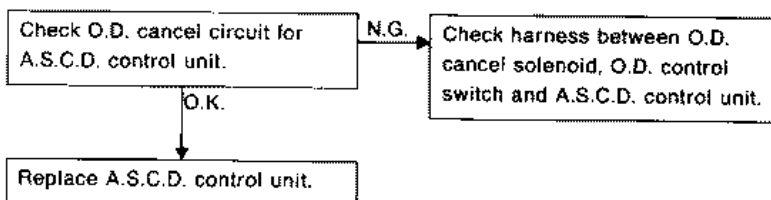


SEL640M

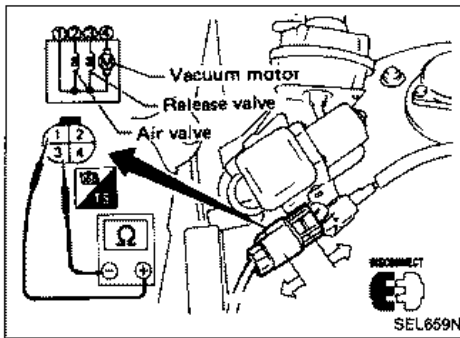
DIAGNOSTIC PROCEDURE-7

A/T model only:

- When A.S.C.D. is set while vehicle is operating in "O.D." range, O.D. will be canceled and shifting to O.D. cannot be made thereafter.
- O.D. will not be canceled even if actual vehicle speed is 6 km/h (4 MPH) lower than set speed. (Set speed cannot be maintained.)
- O.D. will not be canceled even if accelerator switch is turned "ON".

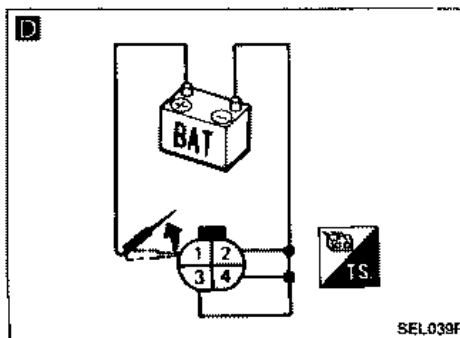
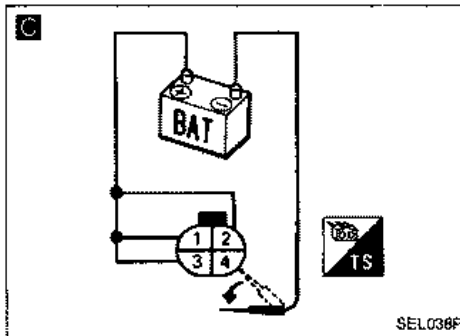
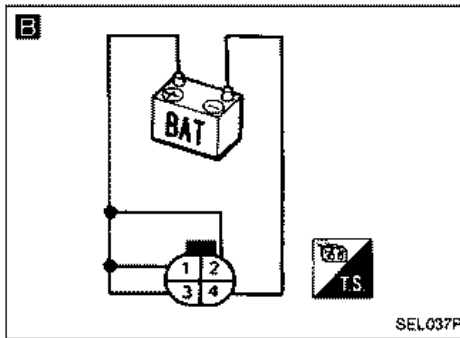
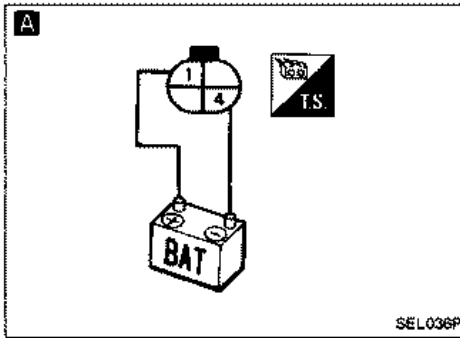
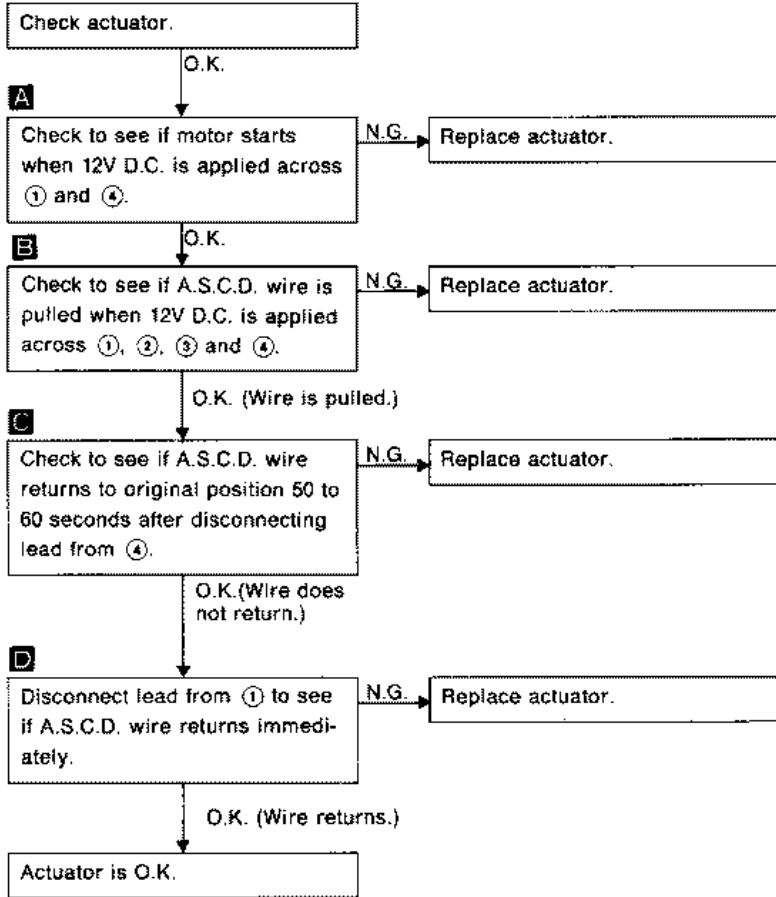


AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.)



Actuator Check

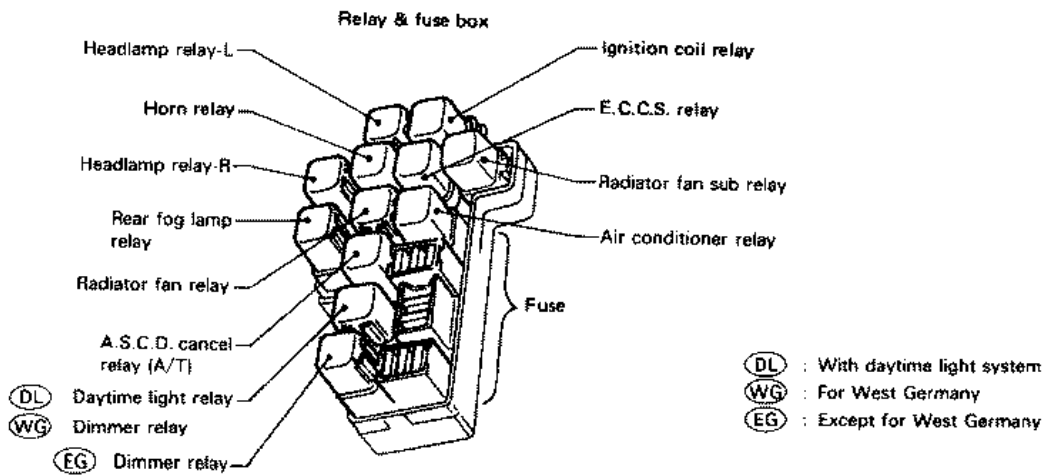
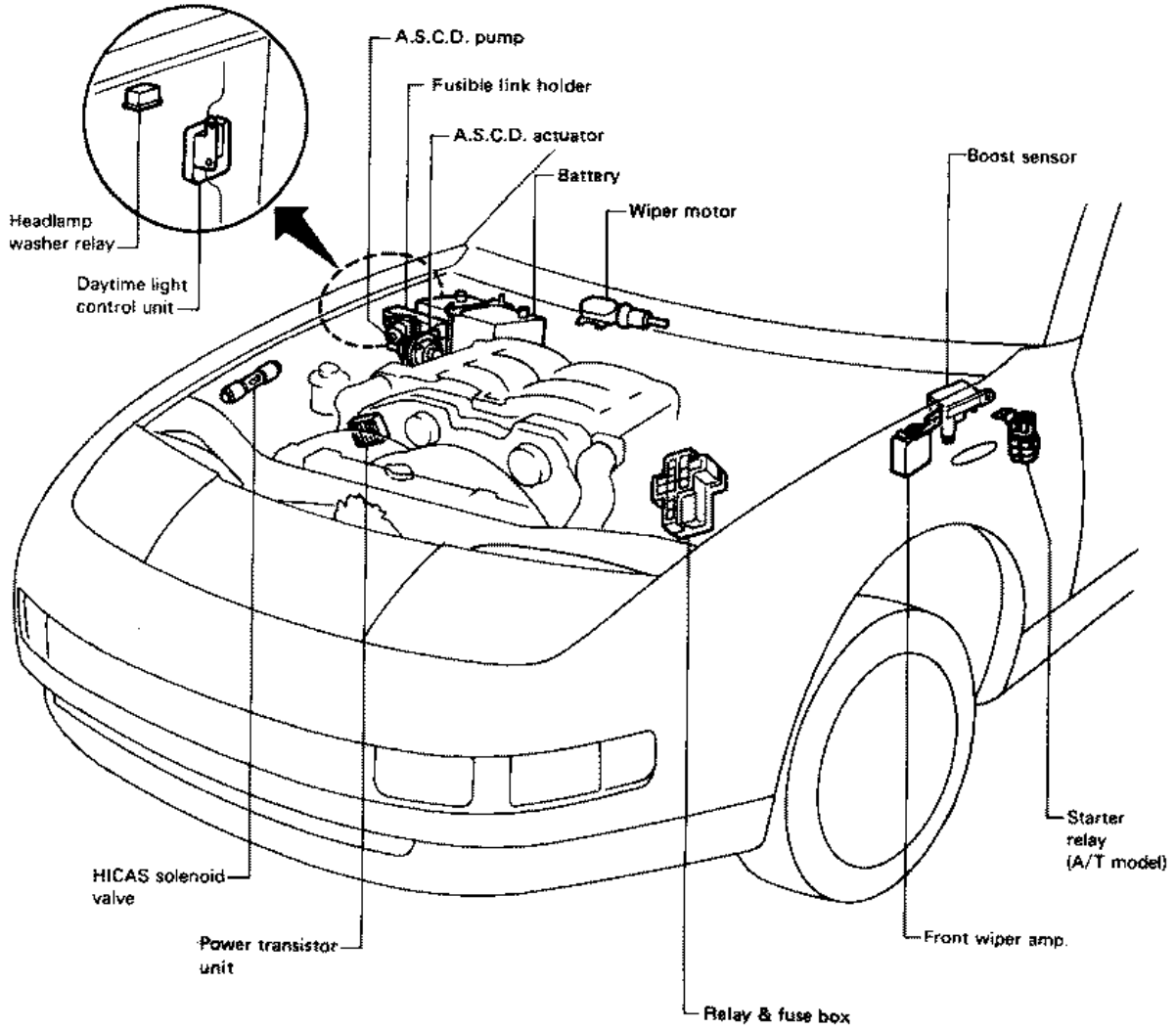
1. Disconnect connector of actuator from main harness.
2. Check actuator operations as shown.



LOCATION OF ELECTRICAL UNITS

Engine Compartment

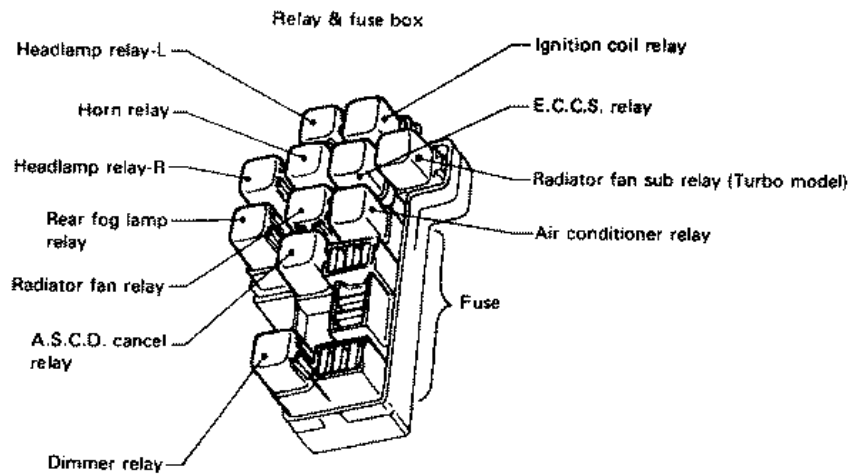
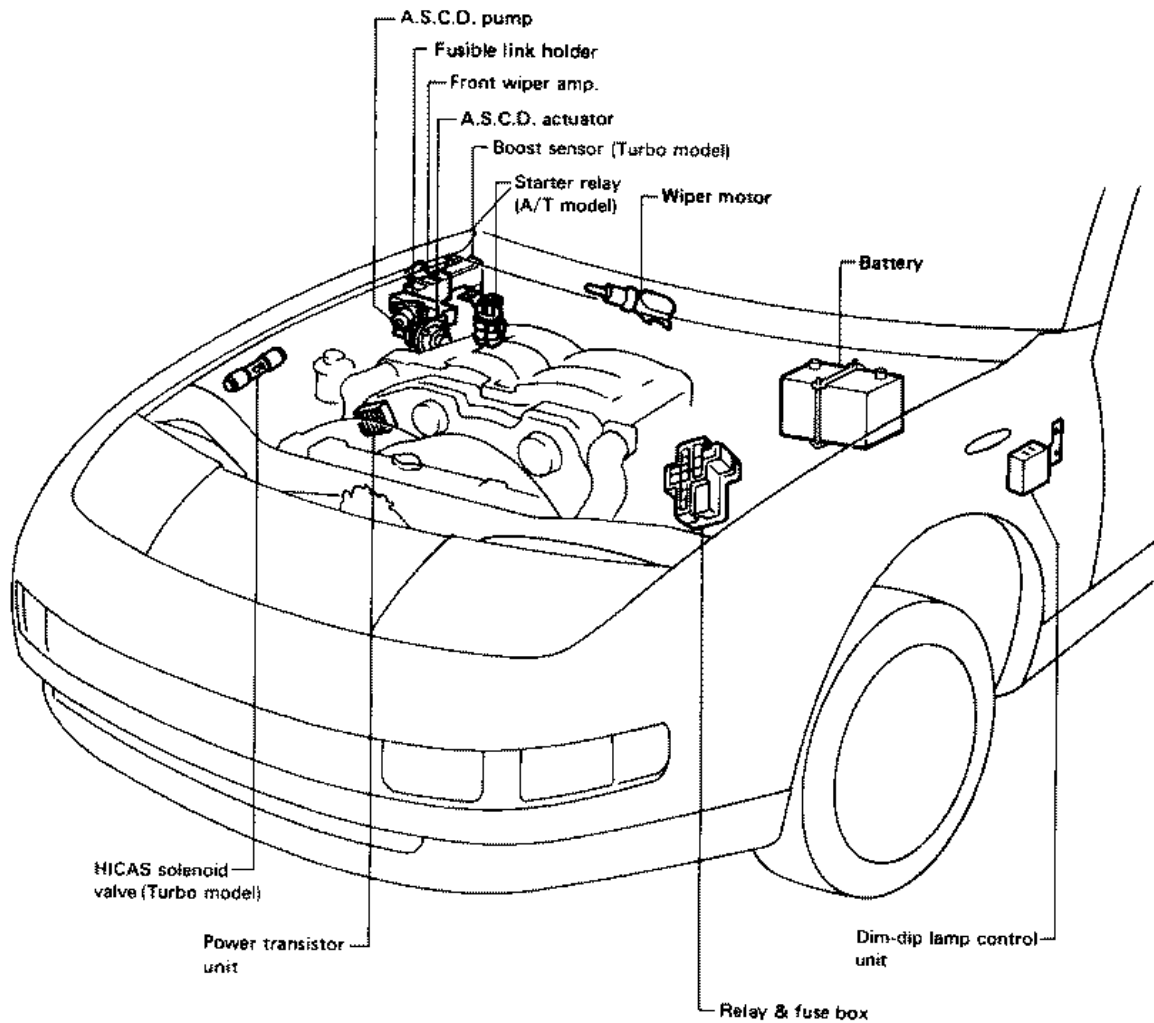
L.H. DRIVE MODELS



LOCATION OF ELECTRICAL UNITS

Engine Compartment (Cont'd)

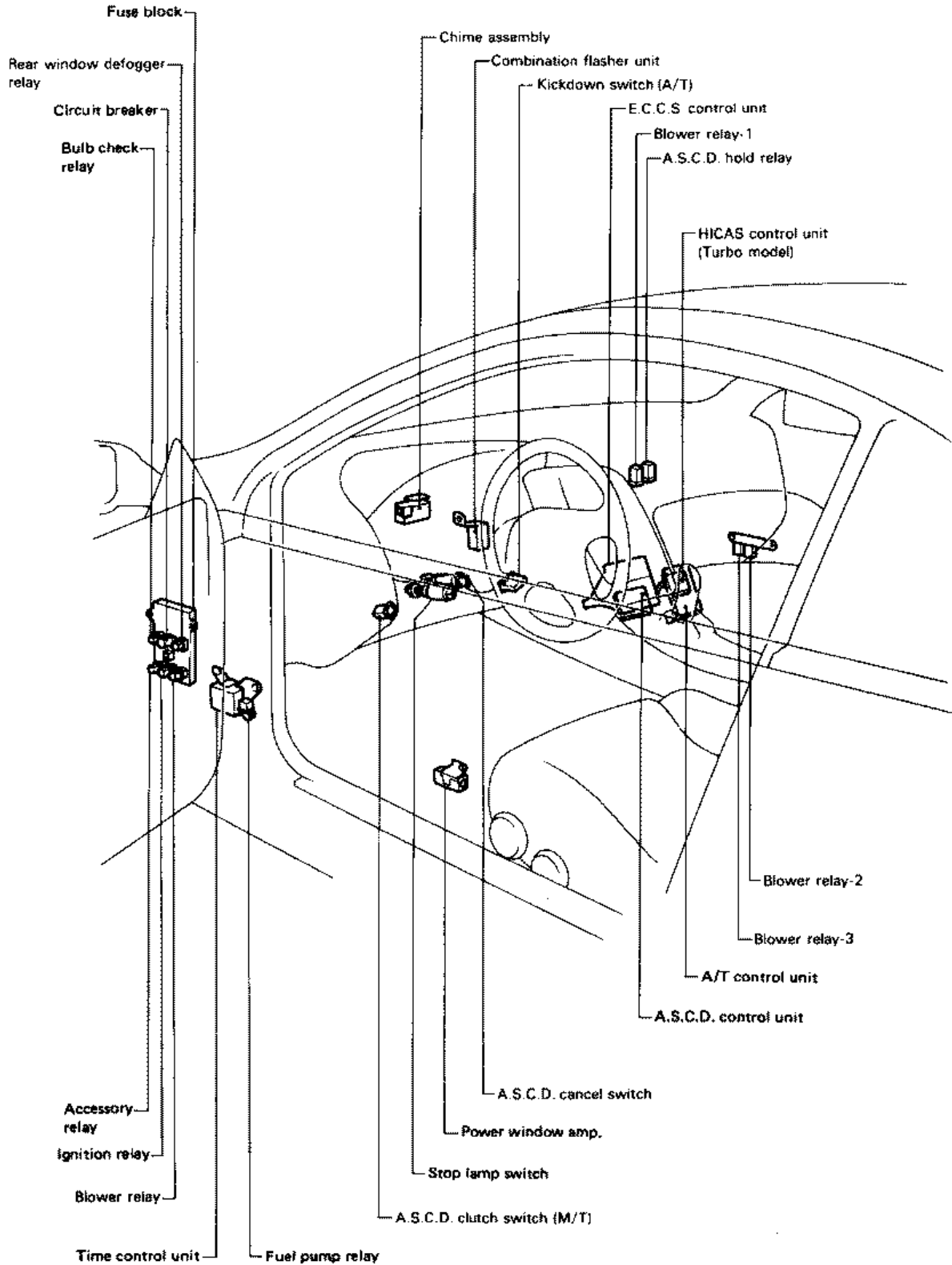
R.H. DRIVE MODELS



LOCATION OF ELECTRICAL UNITS

Passenger Compartment

L.H. DRIVE MODELS

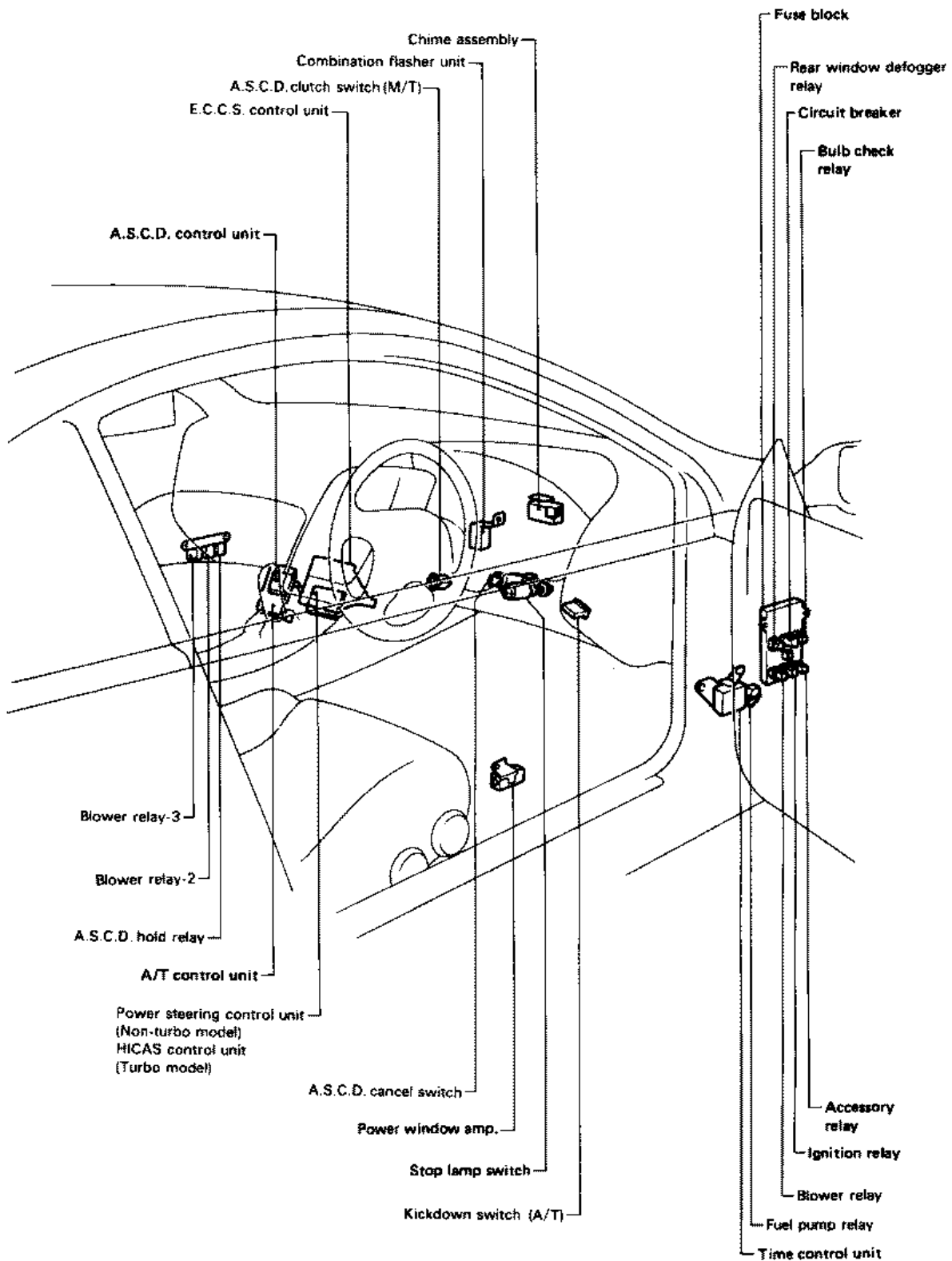


SEL387P

LOCATION OF ELECTRICAL UNITS

Passenger Compartment (Cont'd)

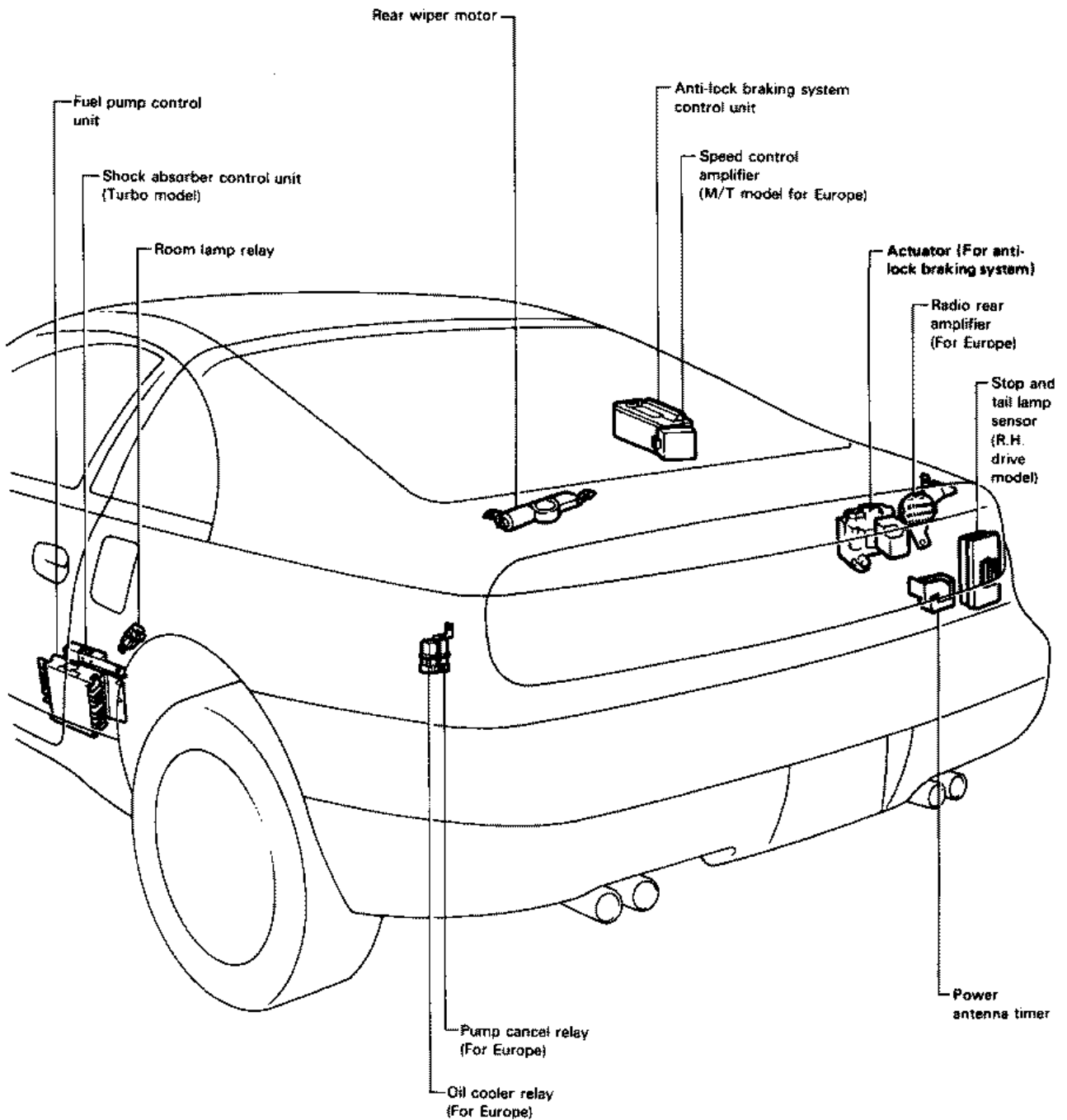
R.H. DRIVE MODELS



SEL388P

LOCATION OF ELECTRICAL UNITS

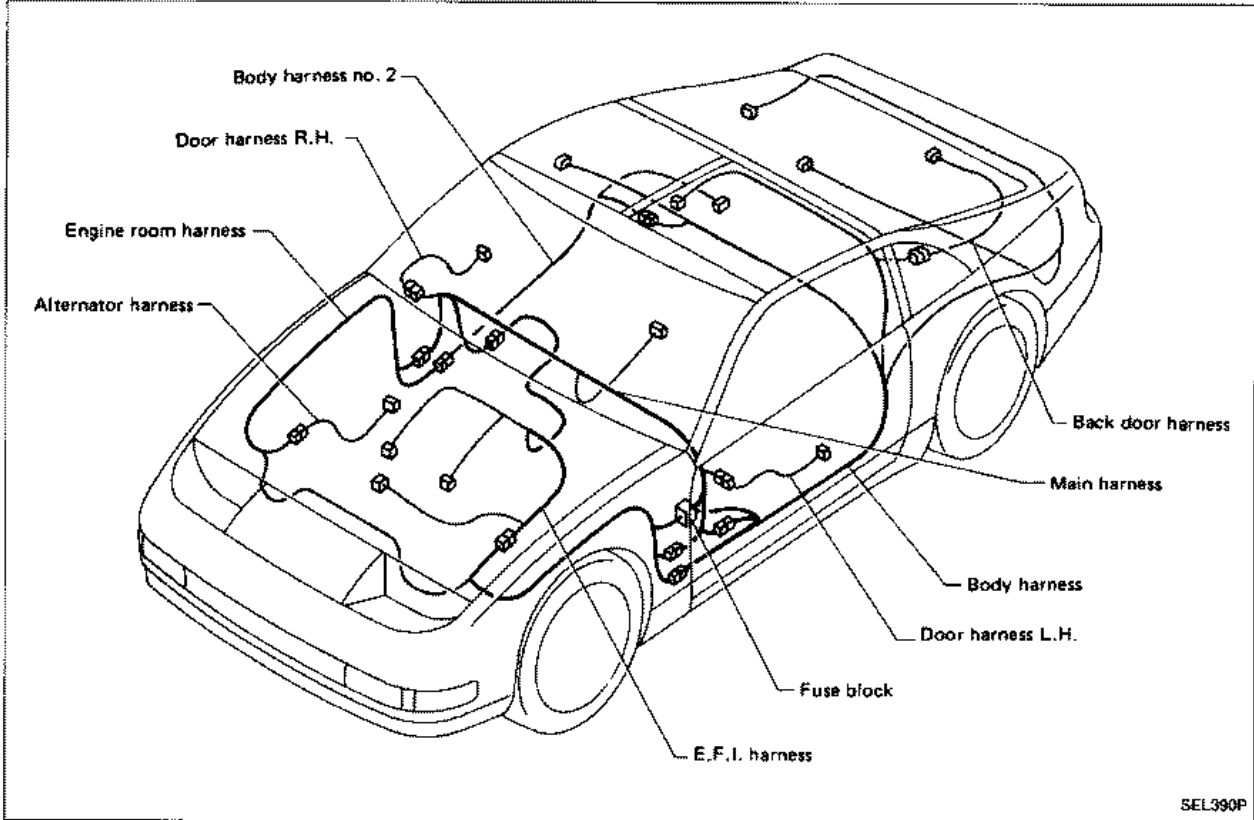
Luggage Compartment



HARNESS LAYOUT

Outline

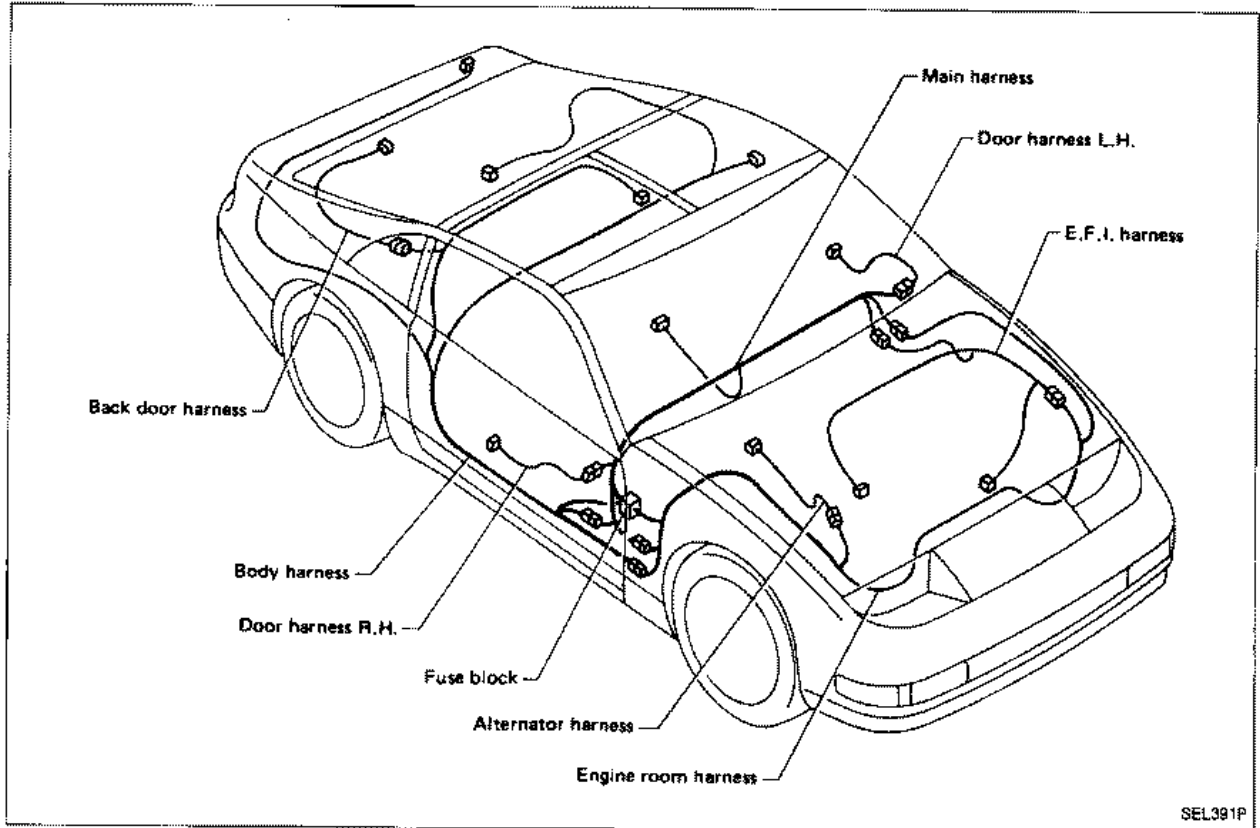
L.H. DRIVE MODELS



HARNES LAYOUT

Outline (Cont'd)

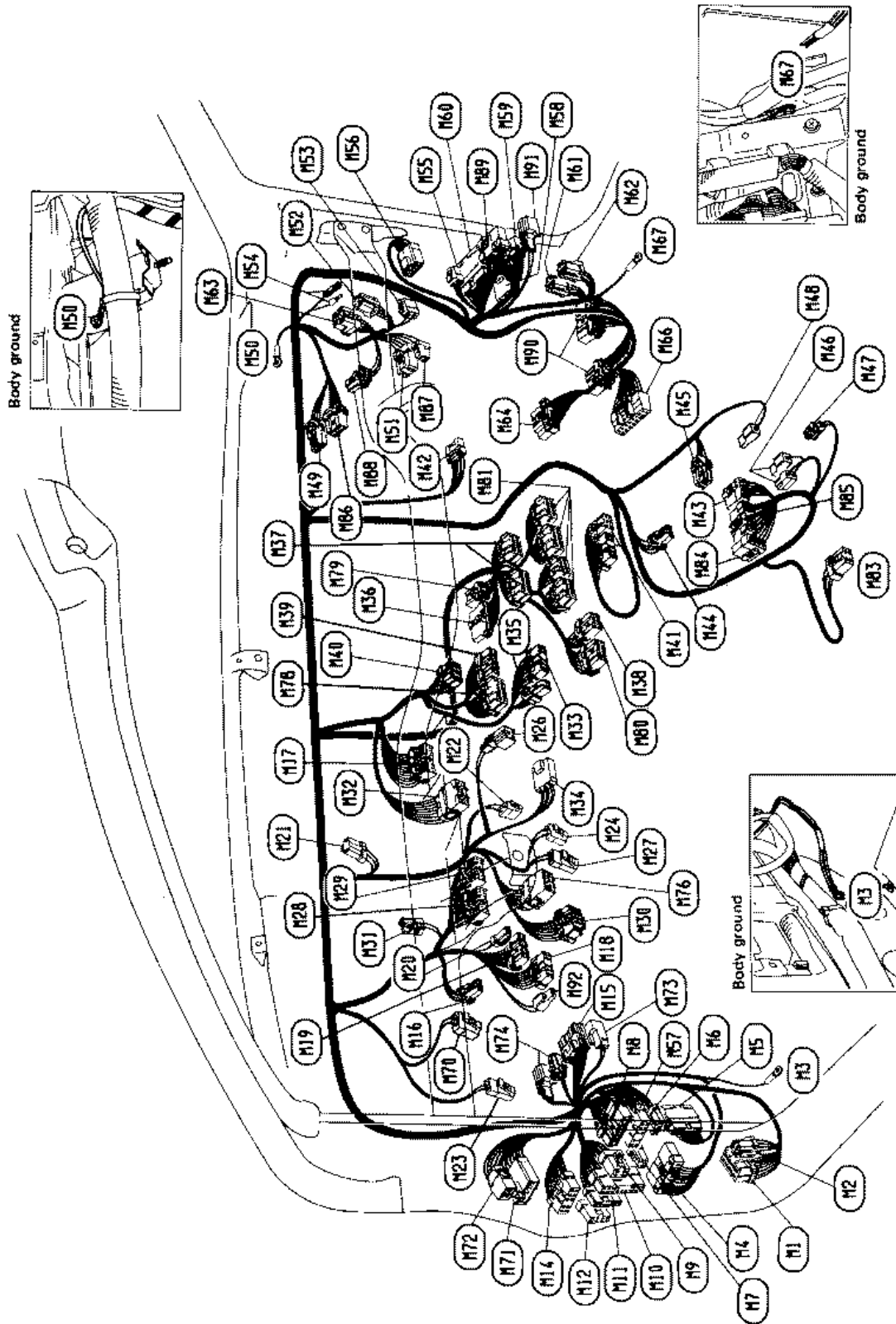
R.H. DRIVE MODELS



HARNESS LAYOUT

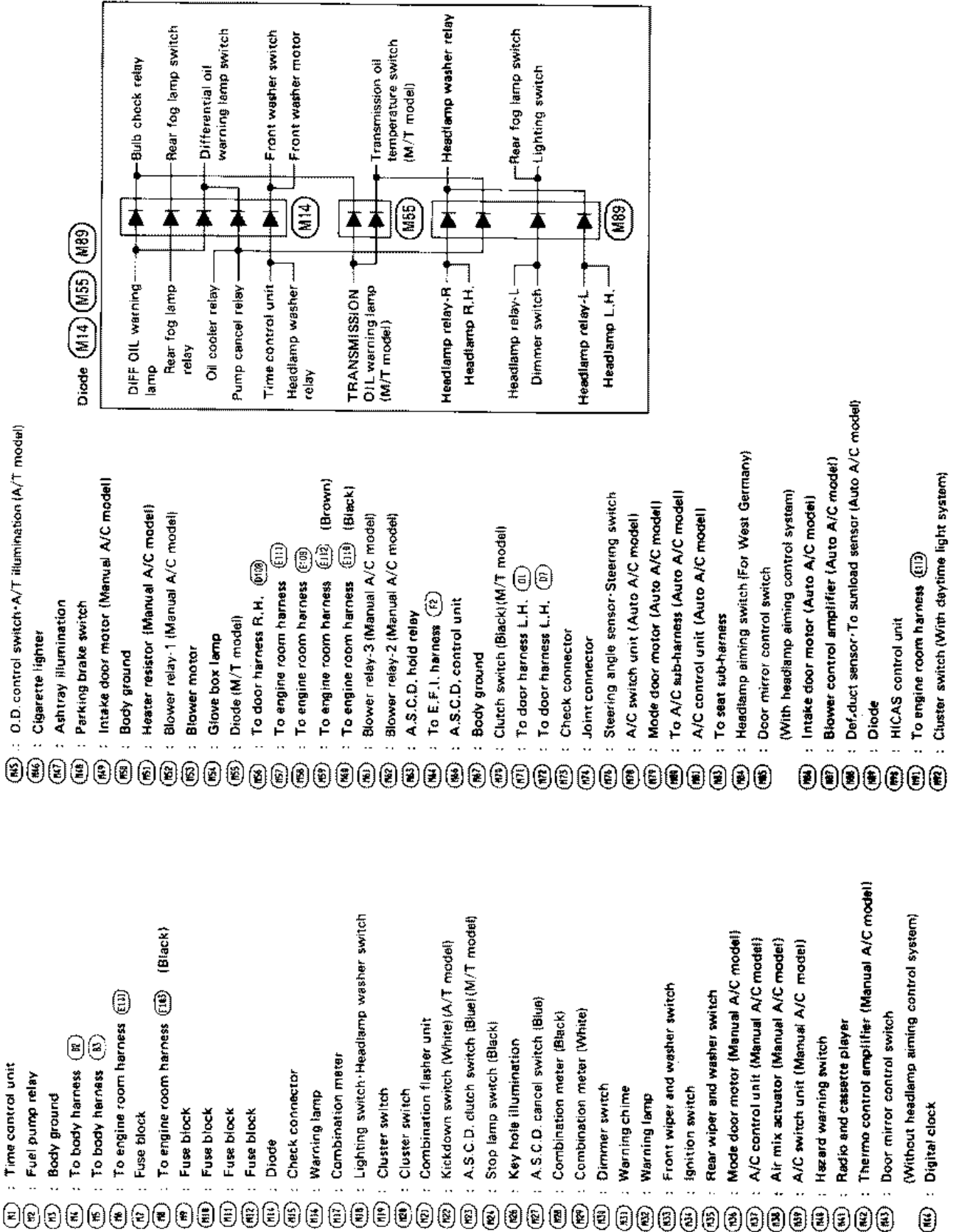
Main Harness

L.H. DRIVE MODELS



HARNES LAYOUT

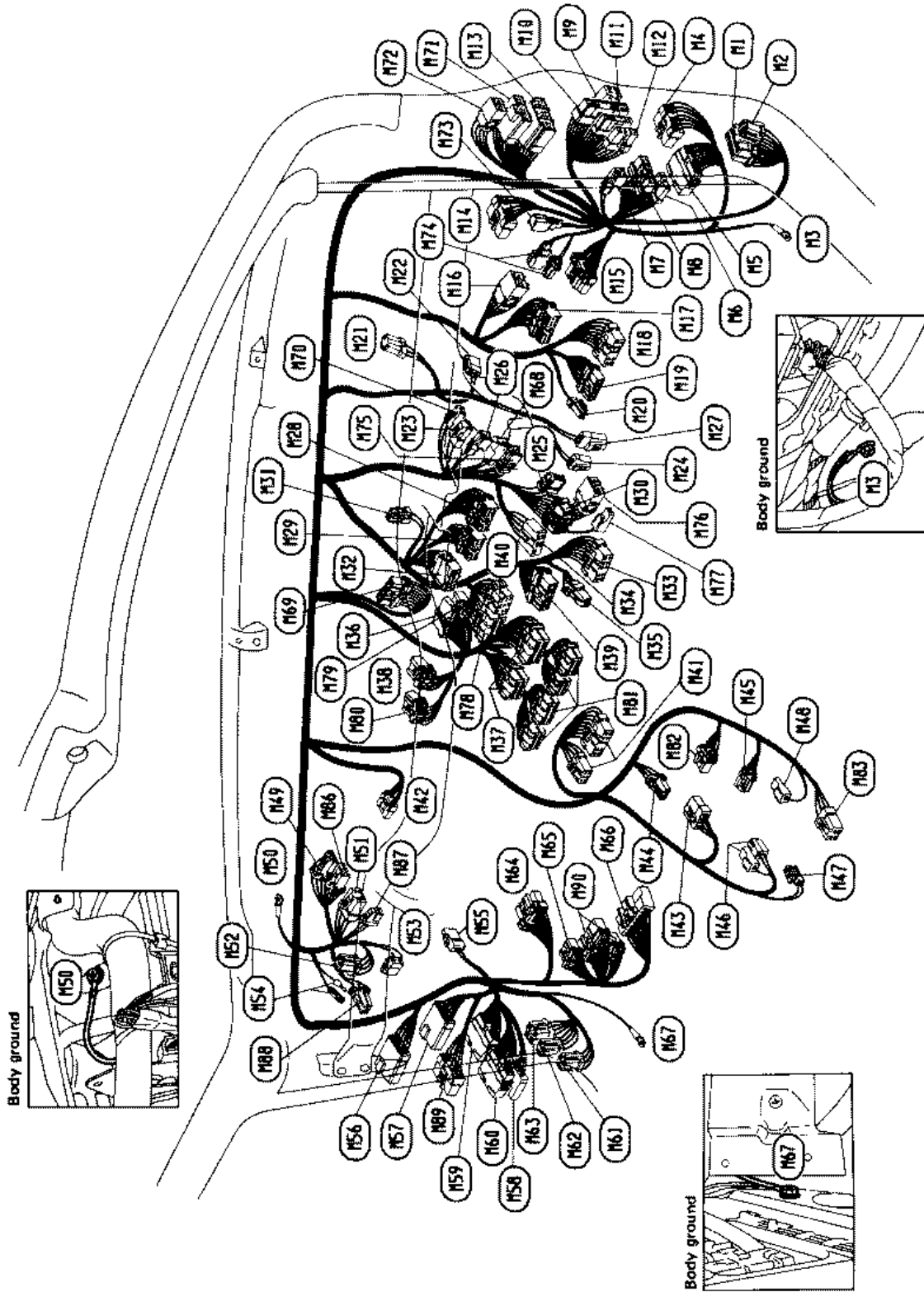
Main Harness (Cont'd)



HARNESS LAYOUT

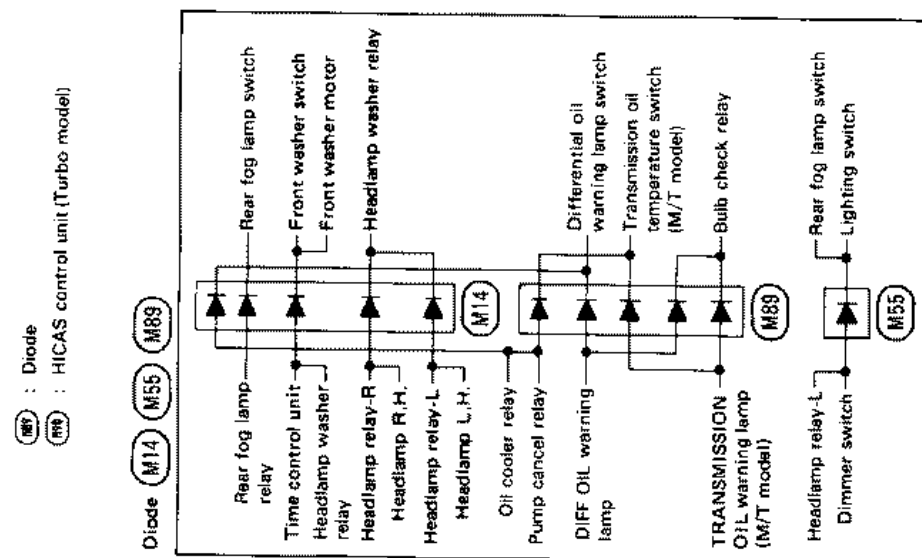
Main Harness (Cont'd)

R.H. DRIVE MODELS



HARNESS LAYOUT

Main Harness (Cont'd)



(M14) : Diode
 (M89) : HICAS control unit (Turbo model)

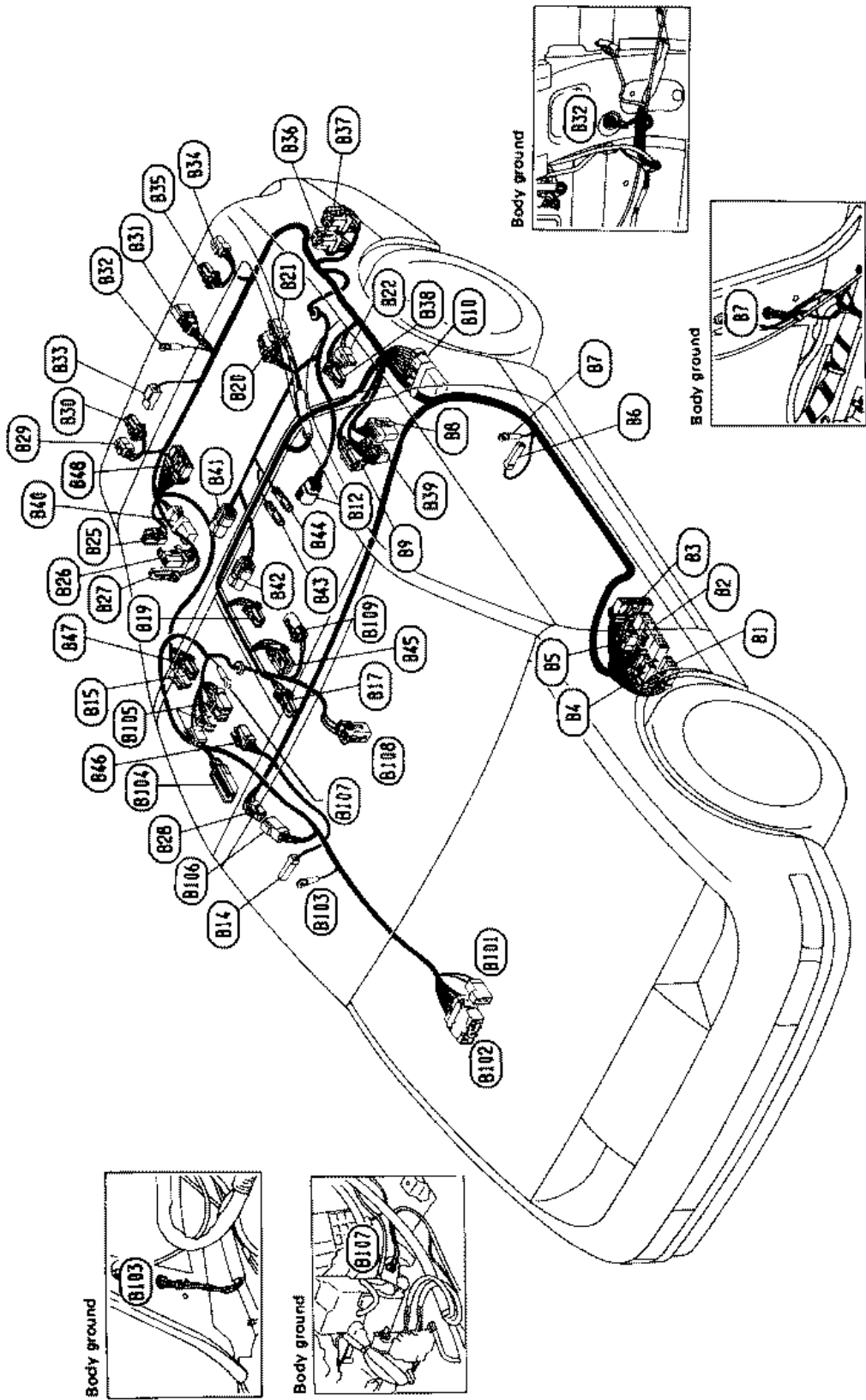
- (R4) : Digital clock
- (R5) : O.D. control switch-A/T illumination (A/T model)
- (R6) : Cigarette lighter
- (R7) : Ashtray illumination
- (R8) : Parking brake switch
- (R9) : Intake door motor (Manual A/C model)
- (R10) : Body ground
- (R11) : Heater resistor (Manual A/C model)
- (R12) : Blower relay-1 (Manual A/C model)
- (R13) : Blower motor
- (R14) : Glove box lamp
- (R15) : Diode
- (R16) : To door harness L.H. (R1)
- (R17) : To engine room harness (R11)
- (R18) : To engine room harness (R19)
- (R19) : To engine room harness (R15) (Brown)
- (R20) : To engine room harness (R15) (Black)
- (R21) : Blower relay-2 (Manual A/C model)
- (R22) : Blower relay-3 (Manual A/C model)
- (R23) : A.S.C.D. hold relay
- (R24) : To E.F.I. harness (R2)
- (R25) : Power steering control unit (Non-turbo model)
- (R26) : A.S.C.D. control unit
- (R27) : Body ground
- (R28) : Not used
- (R29) : Not used
- (R30) : Clutch switch (Black) (M/T model)
- (R31) : To door harness L.H. (R08) (For Europe)
- (R32) : To door harness L.H. (R10) (For Europe)
- (R33) : Check connector
- (R34) : Joint connector (Turbo model)
- (R35) : Not used
- (R36) : Steering angle sensor-Steering switch (Turbo model)
- (R37) : Not used
- (R38) : A/C switch unit (Auto A/C model)
- (R39) : Mode door motor (Auto A/C model)
- (R40) : To A/C sub-harness (Auto A/C model)
- (R41) : A/C control unit (Auto A/C model)
- (R42) : Not used
- (R43) : To seat sub-harness (For Europe)
- (R44) : Intake door motor (Auto A/C model)
- (R45) : Blower control amplifier (Auto A/C model)
- (R46) : Def. duct sensor-To sunload sensor (Auto A/C model)

- (R1) : Time control unit
- (R2) : Fuel pump relay
- (R3) : Body ground
- (R4) : To body harness (R2)
- (R5) : To body harness (R1)
- (R6) : To engine room harness (R13)
- (R7) : Joint connector (Non-turbo model)
- (R8) : To engine room harness (R13) (Black)
- (R9) : Fuse block
- (R10) : Fuse block
- (R11) : Fuse block
- (R12) : Fuse block
- (R13) : To door harness R.H. (R10) (For Australia)
- (R14) : Diode
- (R15) : Check connector
- (R16) : Warning lamp
- (R17) : Combination meter
- (R18) : Lighting switch-Headlamp washer switch
- (R19) : Cluster switch
- (R20) : Cluster switch
- (R21) : Combination flasher unit
- (R22) : Kickdown switch (White) (A/T model)
- (R23) : A.S.C.D. clutch switch (Blue) (M/T model)
- (R24) : Stop lamp switch (Black)
- (R25) : Steering switch (Non-turbo model)
- (R26) : Key hole illumination
- (R27) : A.S.C.D. cancel switch (Blue)
- (R28) : Combination meter (Black)
- (R29) : Combination meter (White)
- (R30) : Dimmer switch
- (R31) : Warning chime
- (R32) : Warning lamp
- (R33) : Front wiper and washer switch
- (R34) : Ignition switch
- (R35) : Rear wiper and washer switch
- (R36) : Mode door motor (Manual A/C model)
- (R37) : A/C control unit (Manual A/C model)
- (R38) : Air mix actuator (Manual A/C model)
- (R39) : A/C switch unit (Manual A/C model)
- (R40) : Hazard warning switch
- (R41) : Radio and cassette player
- (R42) : Thermo control amplifier (Manual A/C model)
- (R43) : Door mirror control switch

HARNES LAYOUT

Body Harness

L.H. DRIVE MODELS



HARNES LAYOUT

Body Harness (Cont'd)

Body harness

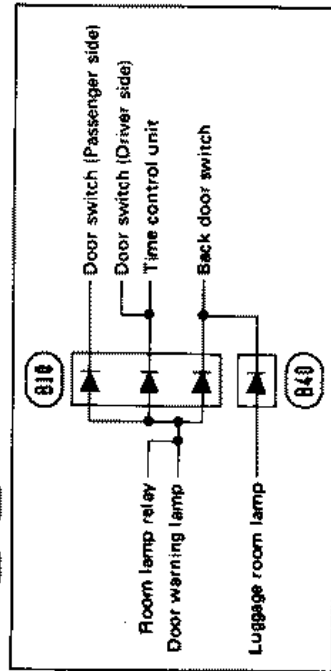
- ⑧1 : To engine room harness (E11)
- ⑧2 : To main harness (M)
- ⑧3 : To main harness (M)
- ⑧4 : Fuse block
- ⑧5 : Fuse block
- ⑧6 : Door switch (Driver side)
- ⑧7 : Body ground
- ⑧8 : Fuel pump control unit
- ⑧9 : Room lamp relay
- ⑧10 : Diode
- ⑧11 : Fuel tank gauge unit
- ⑧12 : Door switch (Passenger side)
- ⑧13 : Rear speaker R.H.
- ⑧14 : Spot lamp
- ⑧15 : Interior lamp
- ⑧16 : To back door harness (B21)
- ⑧17 : To back door harness (B22)
- ⑧18 : Rear speaker L.H.
- ⑧19 : Luggage room lamp
- ⑧20 : Power antenna timer
- ⑧21 : Power antenna motor
- ⑧22 : To body harness no. 2 (B12)

Body harness no. 2

- ⑧10 : To engine room harness (E10)
- ⑧11 : To engine room harness (E11)
- ⑧12 : Body ground
- ⑧13 : Anti-lock braking system control unit
- ⑧14 : Actuator (For anti-lock braking system)
- ⑧15 : To body harness (B2)
- ⑧16 : Body ground
- ⑧17 : Rear sensor (For anti-lock braking system)
- ⑧18 : HICAS fail-safe solenoid valve

- ⑧23 : Rear combination lamp R.H.
- ⑧24 : Back-up lamp R.H.
- ⑧25 : License lamp-To rear fog lamp sub-harness
- ⑧26 : Body ground
- ⑧27 : Back door switch
- ⑧28 : Rear combination lamp L.H.
- ⑧29 : Back-up lamp L.H.
- ⑧30 : Pump cancel relay (Black)
- ⑧31 : Oil cooler relay (Brown)
- ⑧32 : Shock absorber actuator L.H.
- ⑧33 : Shock absorber control unit
- ⑧34 : Diode
- ⑧35 : Differential oil pump
- ⑧36 : Transmission oil pump (M/T model)
- ⑧37 : Differential oil temperature switch
- ⑧38 : Differential oil warning lamp switch
- ⑧39 : In-vehicle sensor upper-Aspirator motor (Auto A/C model)
- ⑧40 : Speed control amplifier (M/T model)
- ⑧41 : Shock absorber actuator R.H.
- ⑧42 : Radio rear amplifier

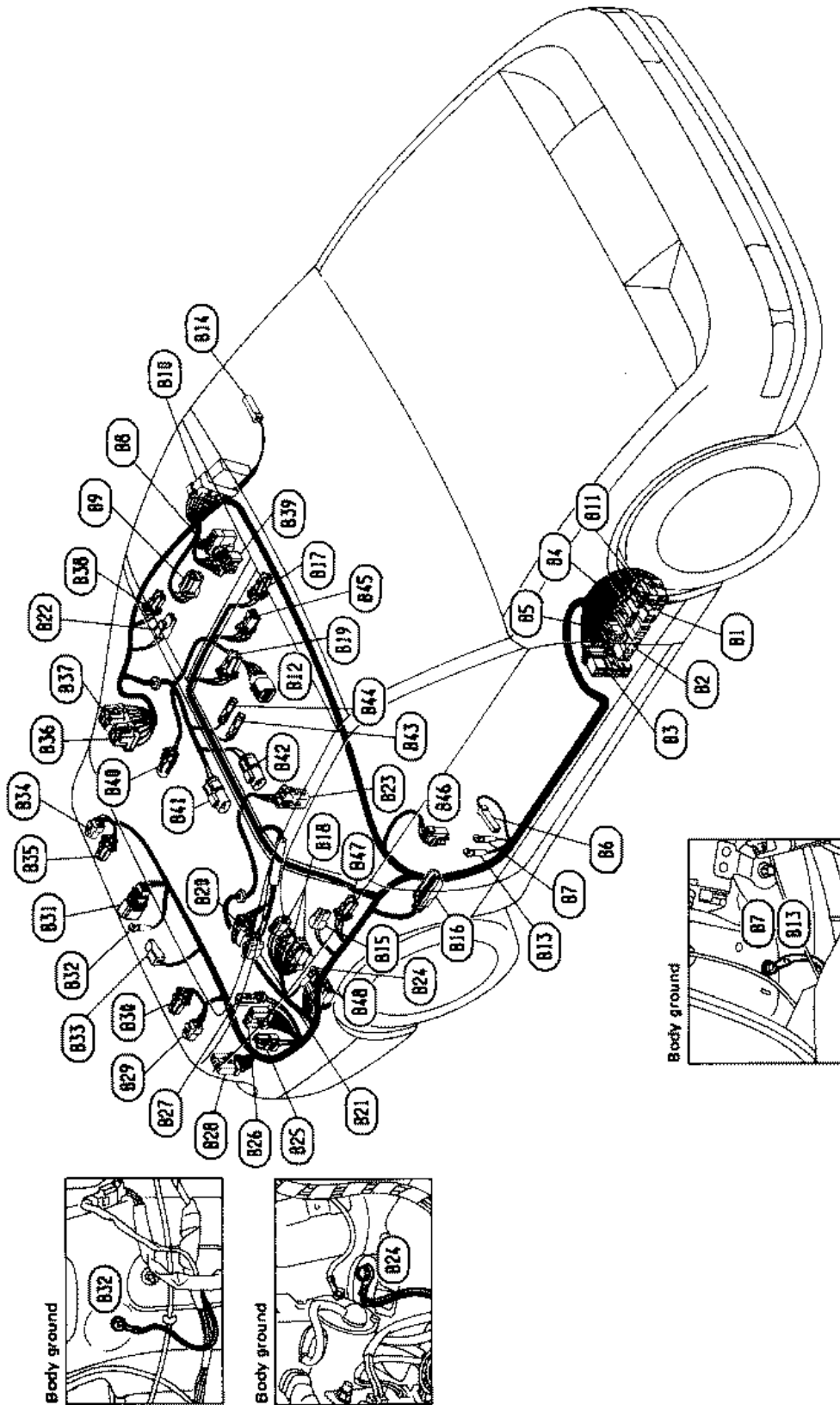
Diode ⑧10 ⑧40



HARNES LAYOUT

Body Harness (Cont'd)

R.H. DRIVE MODELS

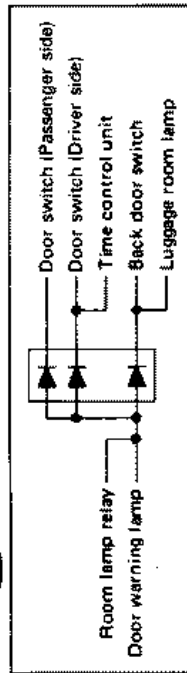


HARNES LAYOUT

Body Harness (Cont'd)

- | | | |
|---|---|--|
| <ul style="list-style-type: none"> 81 : To engine room harness (114) 82 : To main harness (16) 83 : To main harness (16) 84 : Fuse block 85 : Fuse block 86 : Door switch (Driver side) 87 : Body ground 88 : Fuel pump control unit 89 : Room lamp relay 90 : Diode 91 : To engine room harness (112) 92 : Fuel tank gauge unit 93 : Body ground 94 : Door switch (Passenger side) 95 : Rear speaker R.H. 96 : Anti-lock braking system control unit 97 : Spot lamp 98 : Actuator (For anti-lock braking system) | <ul style="list-style-type: none"> 819 : Interior lamp 820 : To back door harness (241) 821 : To back door harness (242) 822 : Rear speaker L.H. 823 : Rear sensor (For anti-lock braking system) 824 : Body ground 825 : Luggage room lamp 826 : Power antenna timer 827 : Power antenna motor 828 : Stop and tail lamp sensor 829 : Rear combination lamp R.H. 830 : Back-up lamp R.H. 831 : License lamp - To rear fog lamp sub-harness 832 : Body ground 833 : Back door switch 834 : Rear combination lamp L.H. 835 : Back-up lamp L.H. | <ul style="list-style-type: none"> 836 : Pump cancel relay (Black) (For Europe) 837 : Oil cooler relay (Brown) (For Europe) 838 : Shock absorber actuator L.H. (Turbo model) 839 : Shock absorber control unit (Turbo model) 840 : HICAS fail-safe solenoid valve (Turbo model) 841 : Differential oil pump (For Europe) 842 : Transmission oil pump (M/T model for Europe) 843 : Differential oil temperature switch (For Europe) 844 : Differential oil warning lamp switch (For Europe) 845 : In-vehicle sensor upper - Aspirator motor (Auto A/C model) 846 : Speed control amplifier (M/T model for Europe) 847 : Shock absorber actuator R.H. (Turbo model) 848 : Radio rear amplifier (For Europe) |
|---|---|--|

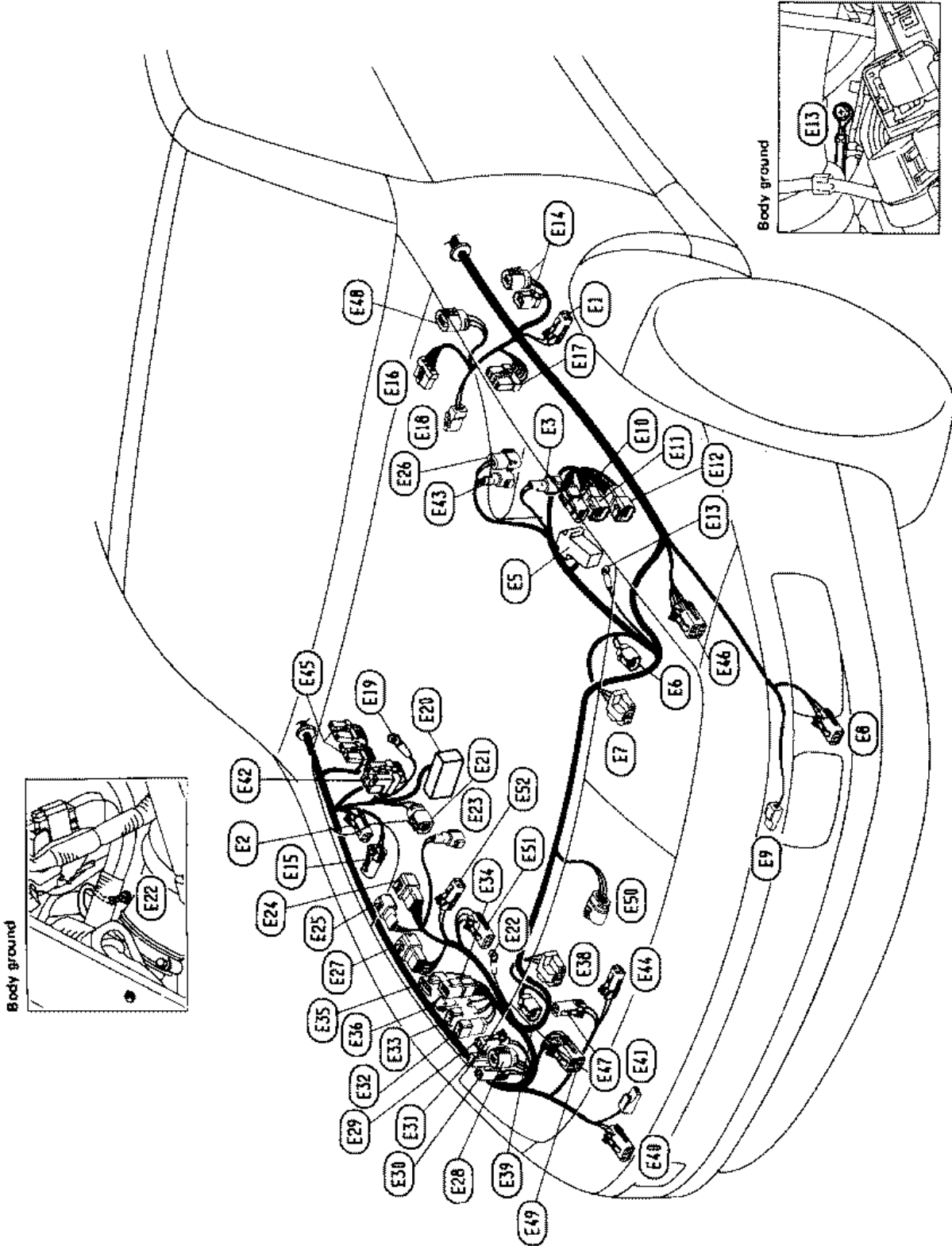
Diode (810)



HARNES LAYOUT

Engine Room Harness

L.H. DRIVE MODELS (Engine compartment)



HARNES LAYOUT

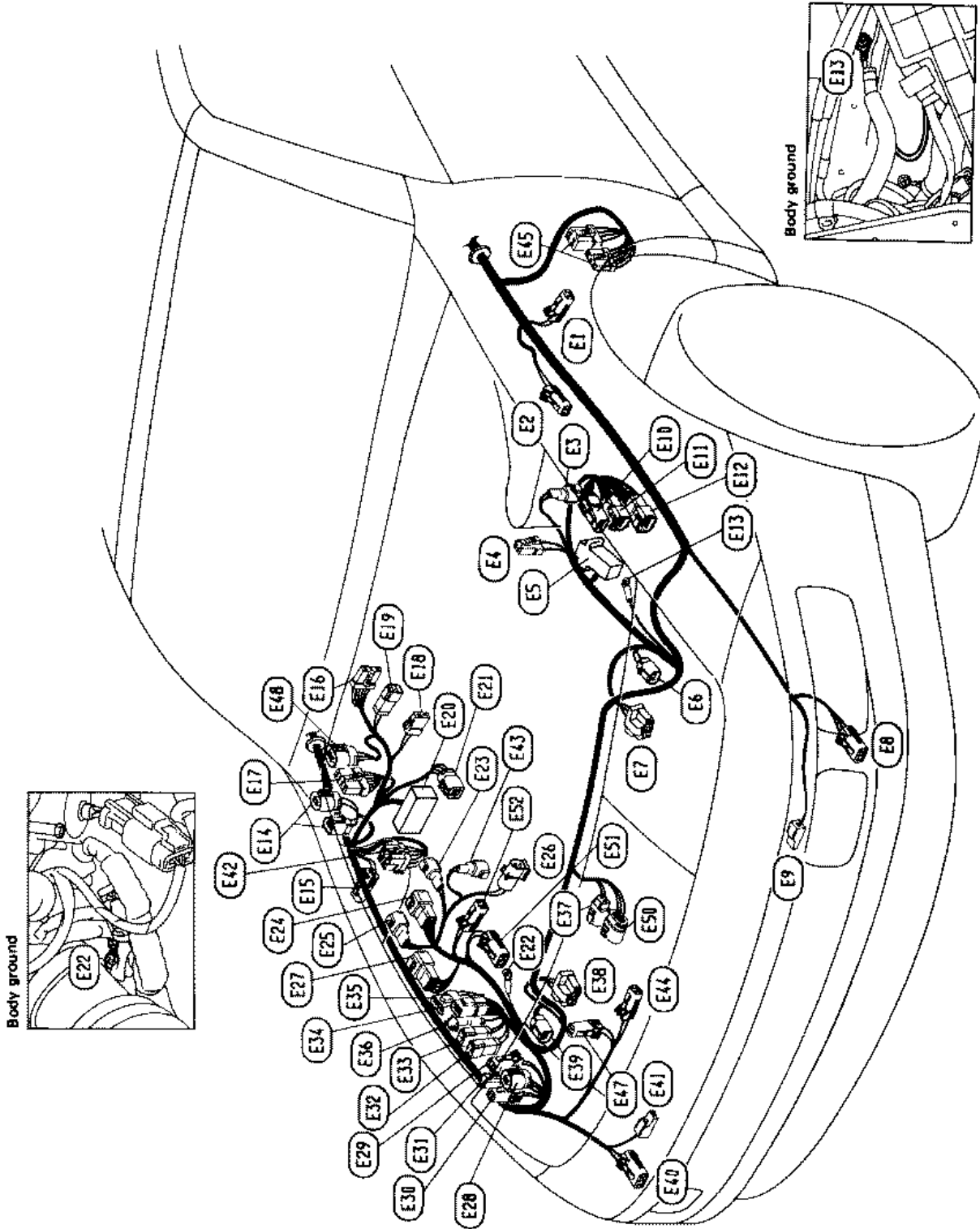
Engine Room Harness (Cont'd)

- (E1) : Side turn signal lamp L.H.
- (E2) : Dropping resistor (A/T model)
- (E3) : Front sensor L.H. (For anti-lock braking system)
- (E5) : Relay box (Refer to LOCATION OF ELECTRICAL UNITS.)
- (E6) : Headlamp L.H. (Low beam)
- (E7) : Headlamp L.H. (High beam)
- (E8) : Front combination lamp L.H.
- (E9) : Horn-low
- (E10) : To E.F.I. harness (E3) (White)
- (E11) : To E.F.I. harness (E7A) (Gray)
- (E12) : To E.F.I. harness (E5) (Brown)
- (E13) : Body ground
- (E14) : Starter relay (A/T model)
- (E15) : Side turn signal lamp R.H.
- (E16) : Front wiper motor
- (E17) : Front wiper amplifier
- (E18) : Brake fluid level switch
- (E19) : Battery
- (E20) : Fusible link holder
- (E21) : A.S.C.D. actuator
- (E22) : Body ground
- (E23) : Front sensor R.H. (For anti-lock braking system)
- (E24) : To A/T solenoid harness (A/T model)
- (E25) : Revolution sensor (A/T model)
- (E26) : Power steering oil pressure switch (Black)
- (E27) : Inhibitor switch (A/T model)
- (E28) : Front washer motor (White)
- (E29) : Rear washer motor (Gray)
- (E30) : Washer fluid level switch (Brown)
- (E31) : Headlamp washer motor (Black)
- (E32) : To alternator harness (E1) (Black)
- (E33) : To alternator harness (E2) (Blue)
- (E34) : To alternator harness (E3) (A/T model)
- (E35) : To alternator harness (E4) (M/T model)
- (E36) : To alternator harness (E5)
- (E37) : Headlamp R.H. (High beam)
- (E38) : Headlamp R.H. (Low beam)
- (E39) : Front combination lamp R.H.
- (E41) : Horn-high
- (E42) : Headlamp washer relay
- (E43) : Power steering solenoid valve (Gray)
- (E44) : Low-pressure switch
- (E45) : Daytime light control unit
- (E46) : Aiming motor unit L.H. (For West Germany)
- (E47) : Ambient sensor (Auto A/C model)
- (E48) : Boost sensor
- (E49) : Aiming motor unit R.H. (For West Germany)
- (E50) : Radiator fan motor
- (E51) : HICAS solenoid valve
- (E52) : HICAS oil level switch

HARNESS LAYOUT

Engine Room Harness (Cont'd)

R.H. DRIVE MODELS (Engine compartment)



HARNES LAYOUT

Engine Room Harness (Cont'd)

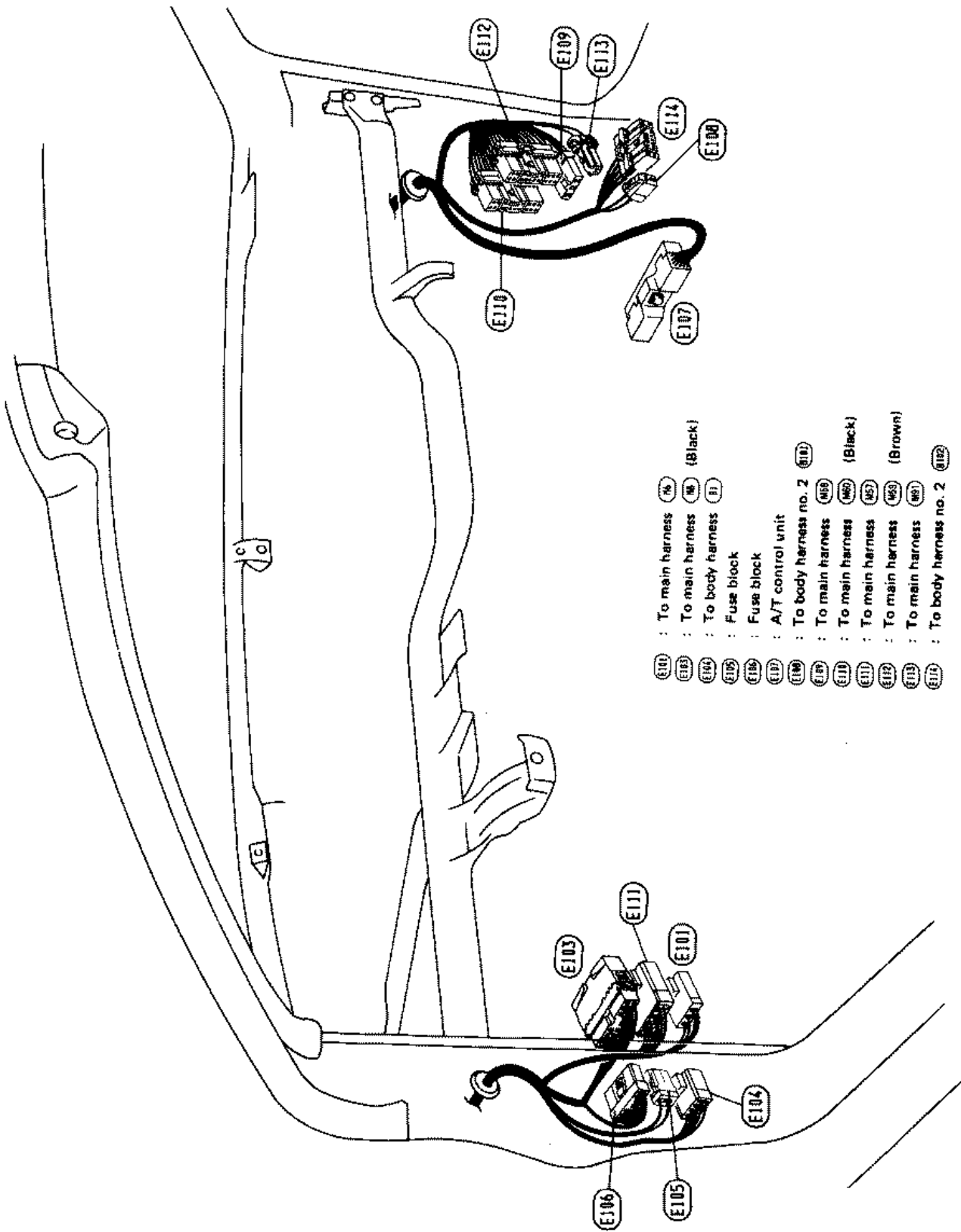
- (24) : Power steering oil pressure switch (Black)
- (27) : Inhibitor switch (A/T model)
- (28) : Front washer motor (White)
- (29) : Rear washer motor (Gray)
- (30) : Washer fluid level switch (Brown)
- (31) : Headlamp washer motor (Black)
- (32) : To alternator harness (1) (Black)
- (33) : To alternator harness (2) (Blue)
- (34) : To alternator harness (3) (A/T model)
- (35) : To alternator harness (4) (M/T model)
- (36) : To alternator harness (5)
- (37) : Radiator fan motor (Non-turbo model)
- (38) : Headlamp R.H. (High beam)
- (39) : Headlamp R.H. (Low beam)
- (40) : Front combination lamp R.H.
- (41) : Horn-high
- (42) : Headlamp washer relay
- (43) : Power steering solenoid valve (Gray)
- (44) : Low-pressure switch
- (45) : Dim-dip lamp unit
- (46) : Ambient sensor (Auto A/C model)
- (48) : Boost sensor (Turbo model)
- (50) : Radiator fan motor (Turbo model)
- (51) : HICAS solenoid valve (Turbo model)
- (52) : HICAS oil level switch (Turbo model)

- (1) : Side turn signal lamp L.H.
- (2) : Dropping resistor (A/T model)
- (3) : Front sensor L.H. (For anti-lock braking system)
- (4) : Oil sending unit
- (5) : Relay box (Refer to LOCATION OF ELECTRICAL UNITS.)
- (6) : Headlamp L.H. (Low beam)
- (7) : Headlamp L.H. (High beam)
- (8) : Front combination lamp L.H.
- (9) : Horn-low
- (10) : To E.F.I. harness (23) (White)
- (11) : To E.F.I. harness (24) (Gray)
- (12) : To E.F.I. harness (25) (Brown)
- (13) : Body ground
- (14) : Starter relay (A/T model)
- (15) : Side turn signal lamp R.H.
- (16) : Front wiper motor
- (17) : Front wiper amplifier
- (18) : Brake fluid level switch
- (19) : Battery
- (20) : Fusible link holder
- (21) : A.S.C.D. actuator
- (22) : Body ground
- (23) : Front sensor R.H. (For anti-lock braking system)
- (24) : To A/T solenoid harness (A/T model)
- (25) : Revolution sensor (A/T model)

HARNES LAYOUT

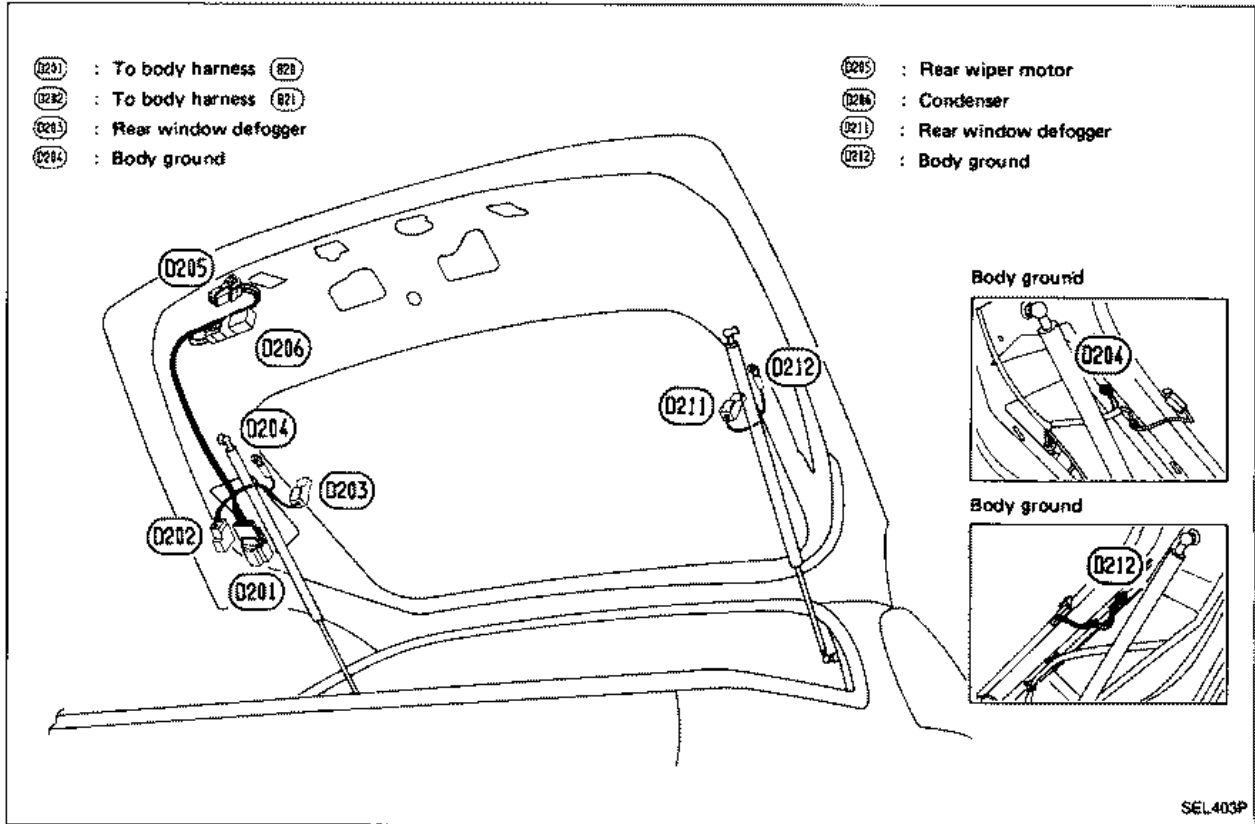
Engine Room Harness (Cont'd)

L.H. DRIVE MODELS (Passenger compartment)

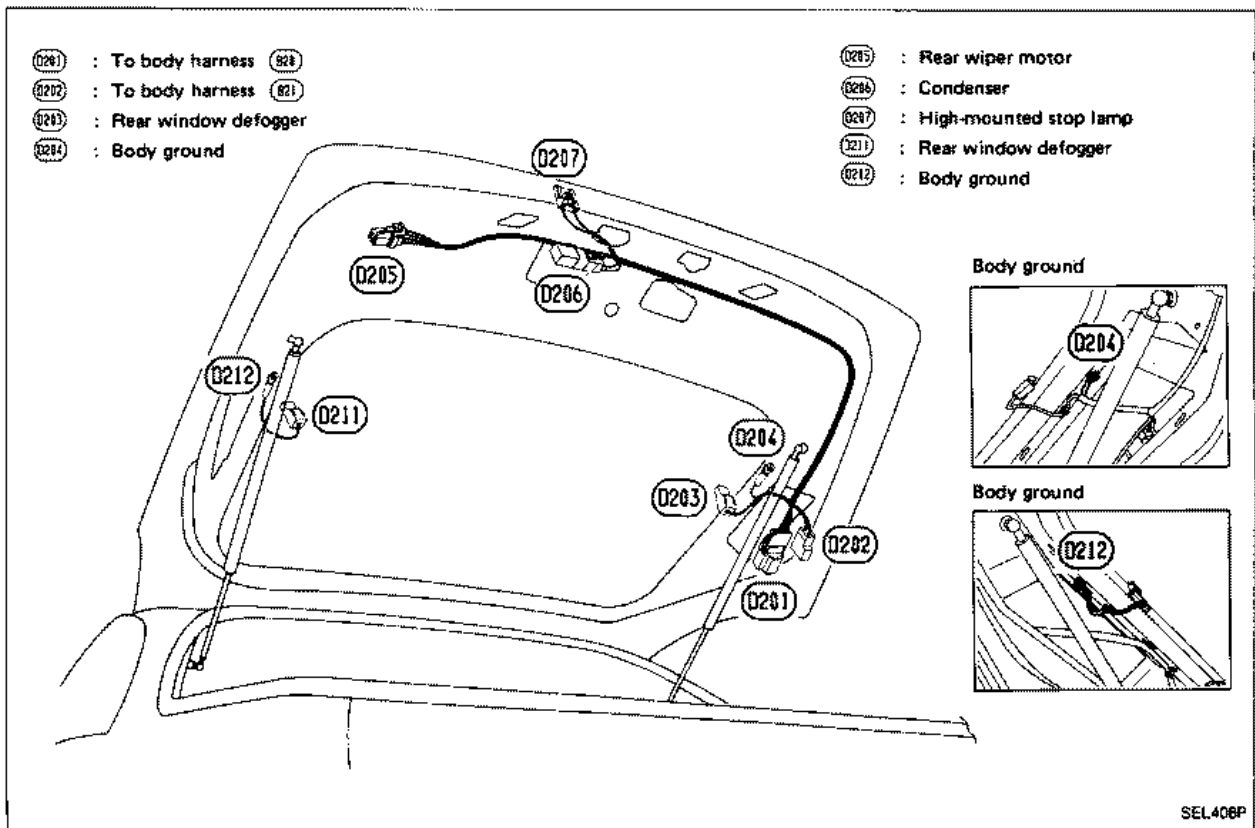


HARNES LAYOUT

Back Door Harness L.H.

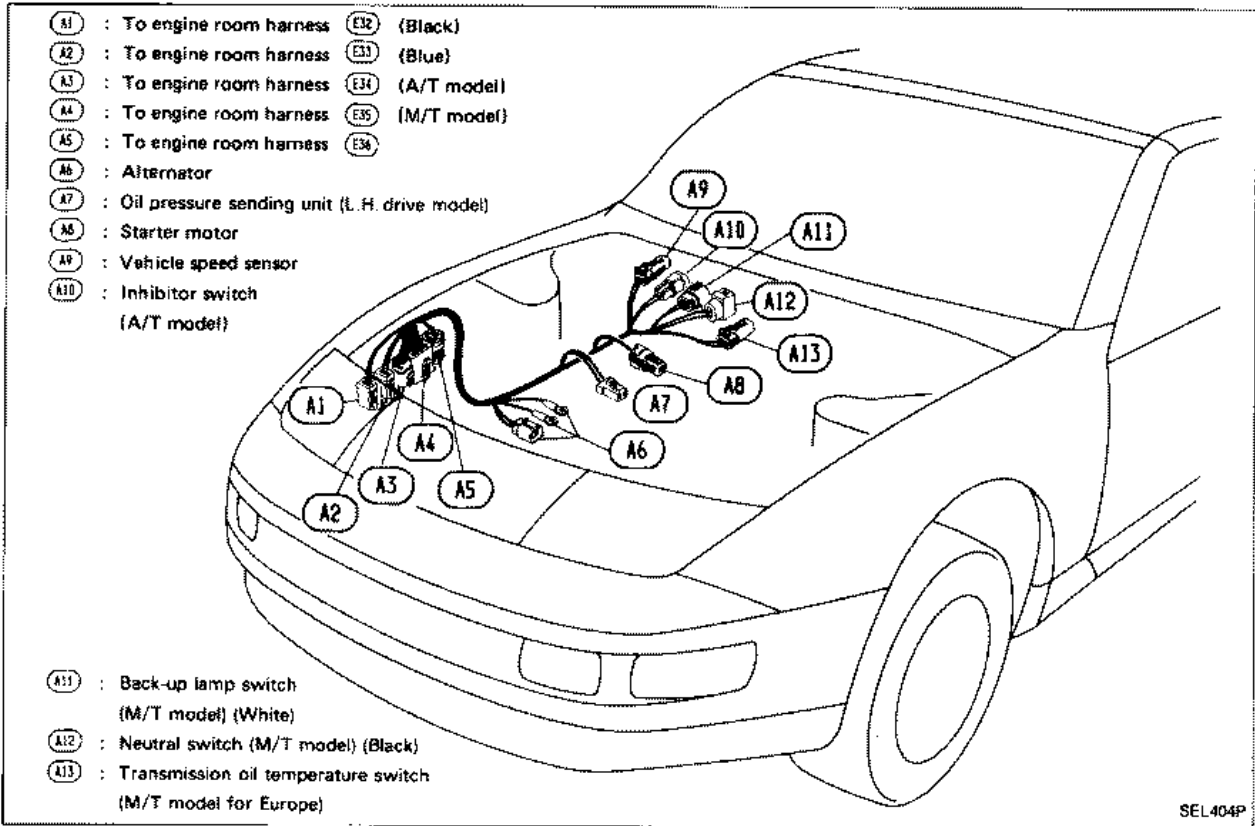


Back Door Harness R.H.



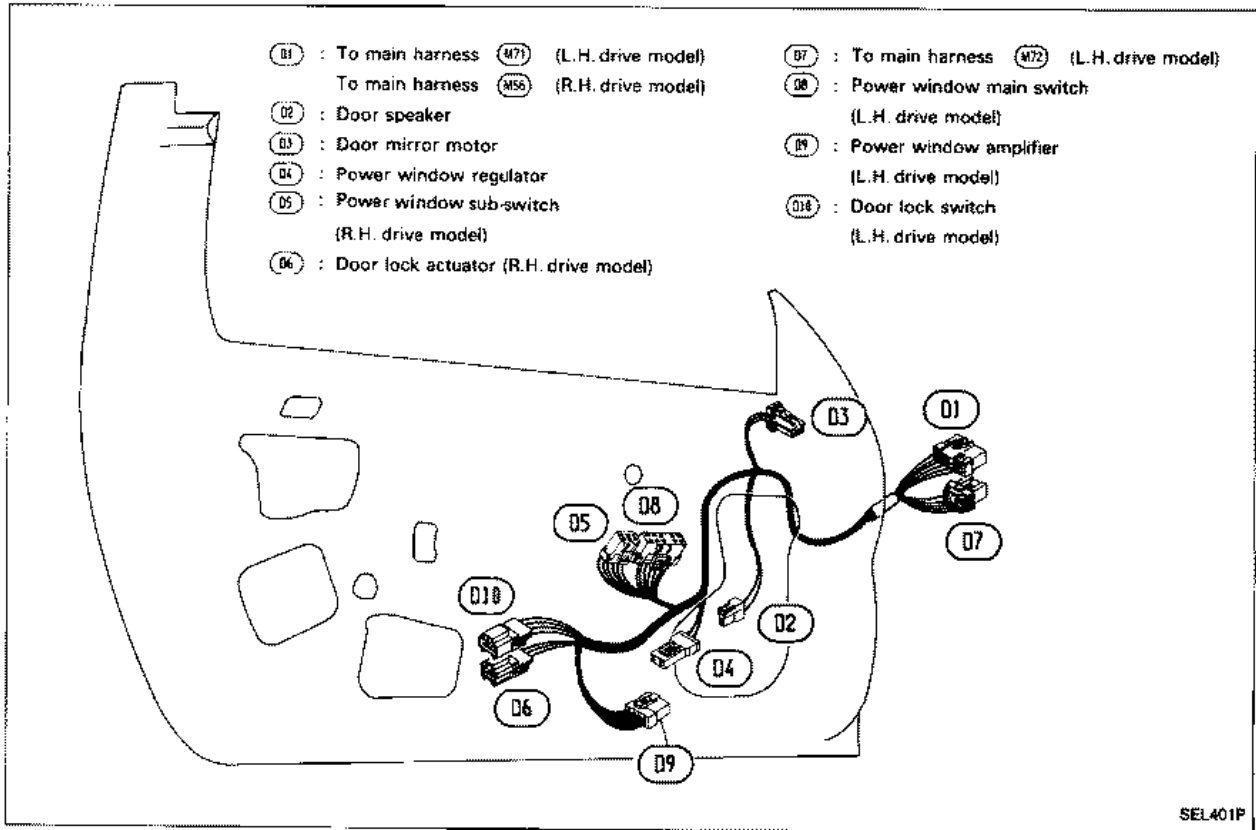
HARNESS LAYOUT

Alternator Harness

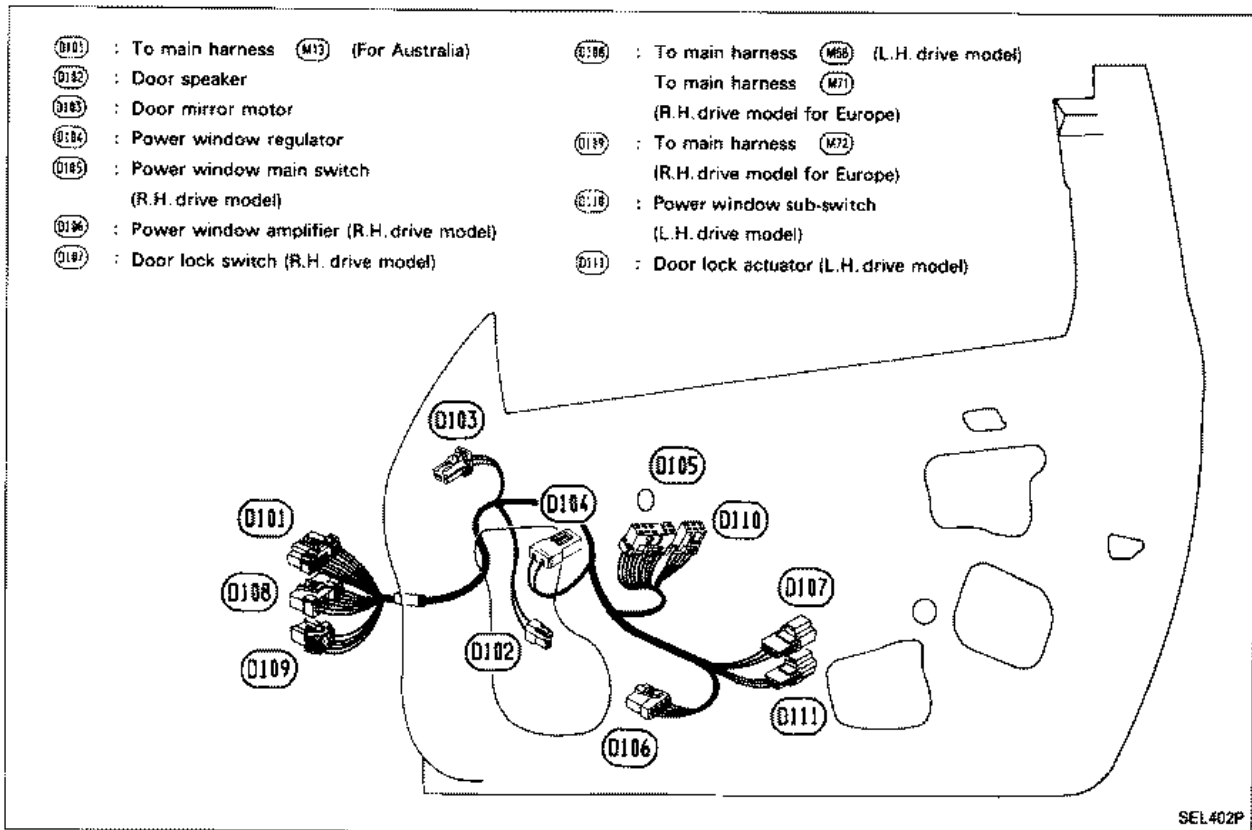


HARNES LAYOUT

Door Harness L.H.

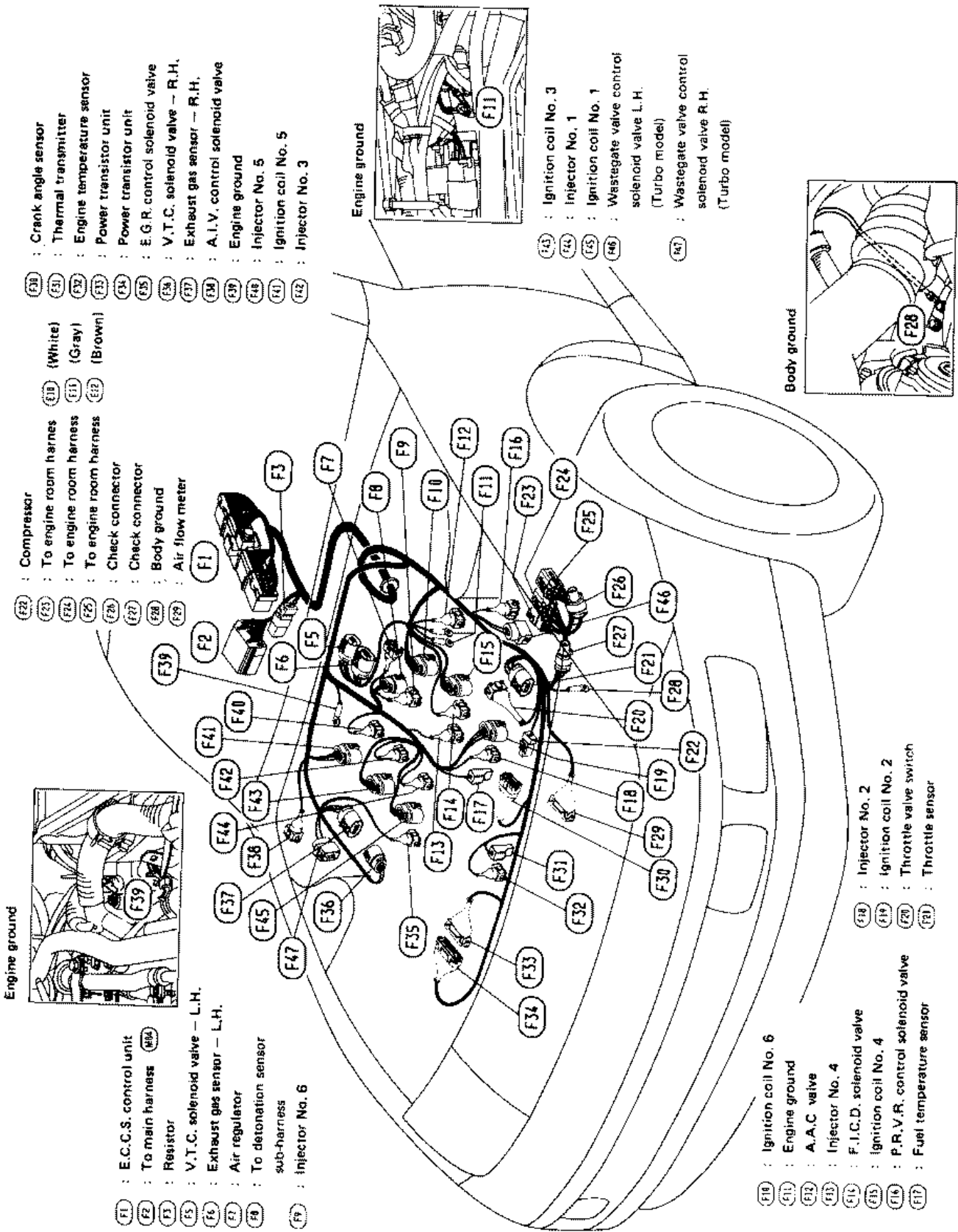


Door Harness R.H.



HARNES LAYOUT

E.F.I. Harness



Engine ground

Body ground

- (F38) : Crank angle sensor
- (F39) : Thermal transmitter
- (F40) : Engine temperature sensor
- (F41) : Power transistor unit
- (F42) : Power transistor unit
- (F43) : E.G.R. control solenoid valve
- (F44) : V.T.C. solenoid valve - R.H.
- (F45) : Exhaust gas sensor - R.H.
- (F46) : A.I.V. control solenoid valve
- (F47) : Engine ground
- (F48) : Injector No. 5
- (F49) : Ignition coil No. 5
- (F50) : Injector No. 3

- (F2) : Compressor
- (F3) : To engine room harness (White)
- (F4) : To engine room harness (Gray)
- (F5) : To engine room harness (Brown)
- (F6) : Check connector
- (F7) : Check connector
- (F8) : Body ground
- (F9) : Air flow meter

- (F1) : E.C.S. control unit
- (F2) : To main harness (W/B)
- (F3) : Resistor
- (F4) : V.T.C. solenoid valve - L.H.
- (F5) : Exhaust gas sensor - L.H.
- (F6) : Air regulator
- (F7) : To detonation sensor sub-harness
- (F8) : Injector No. 6

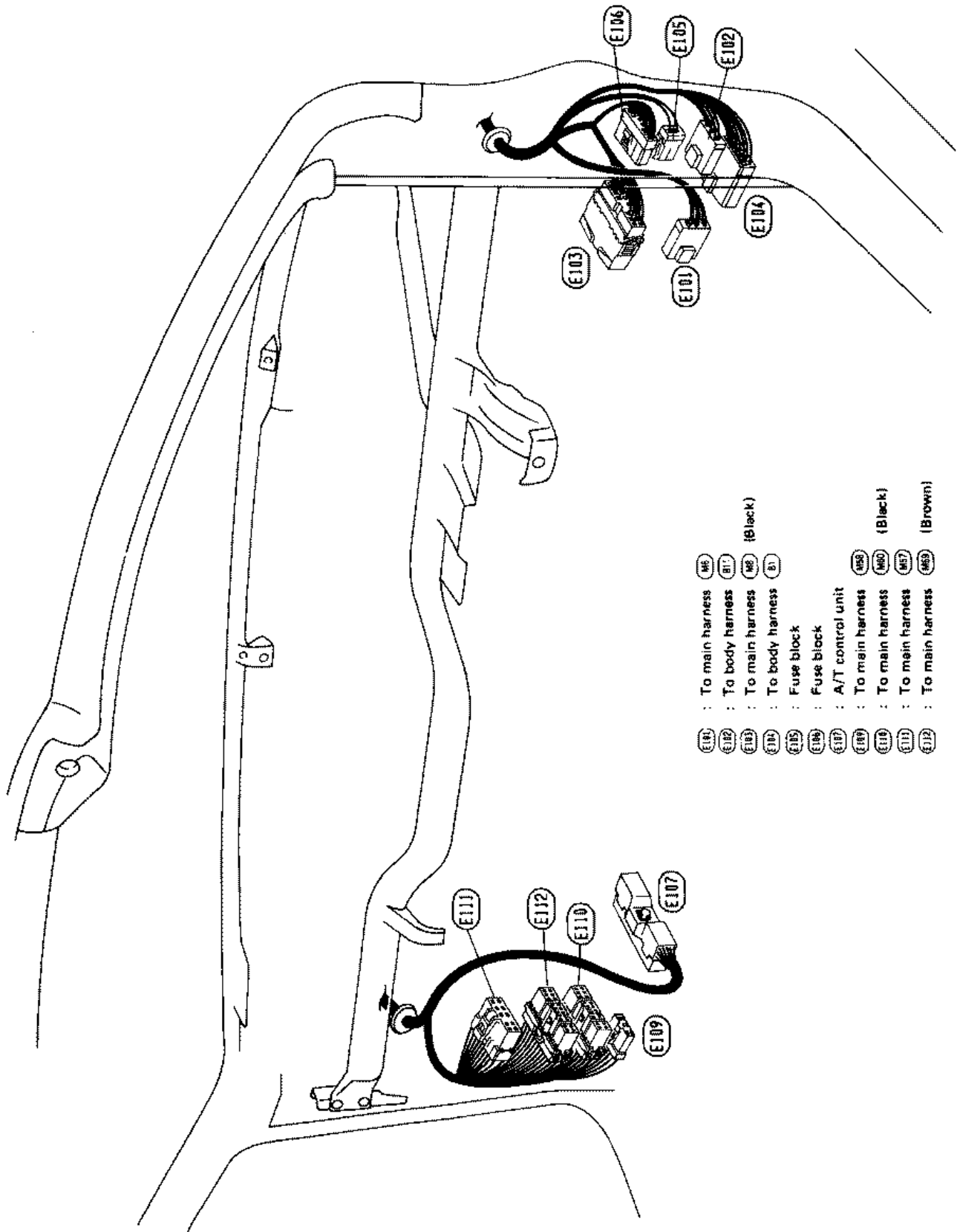
- (F43) : Ignition coil No. 3
- (F44) : Injector No. 1
- (F45) : Ignition coil No. 1
- (F46) : Wastegate valve control solenoid valve L.H. (Turbo model)
- (F47) : Wastegate valve control solenoid valve R.H. (Turbo model)

- (F10) : Ignition coil No. 6
- (F11) : Engine ground
- (F12) : A.A.C valve
- (F13) : Injector No. 4
- (F14) : F.I.C.D. solenoid valve
- (F15) : Ignition coil No. 4
- (F16) : P.R.V.R. control solenoid valve
- (F17) : Fuel temperature sensor
- (F18) : Injector No. 2
- (F19) : Ignition coil No. 2
- (F20) : Throttle valve switch
- (F21) : Throttle sensor

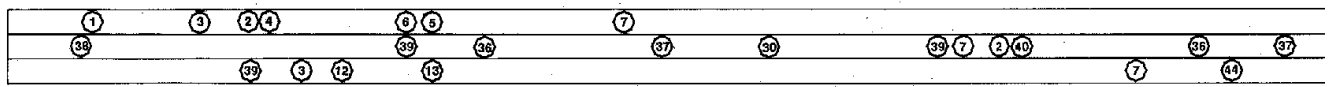
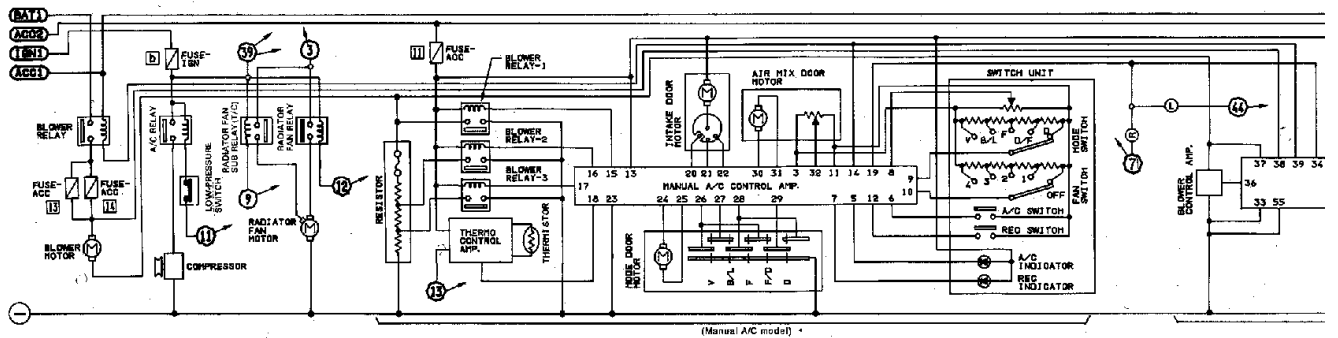
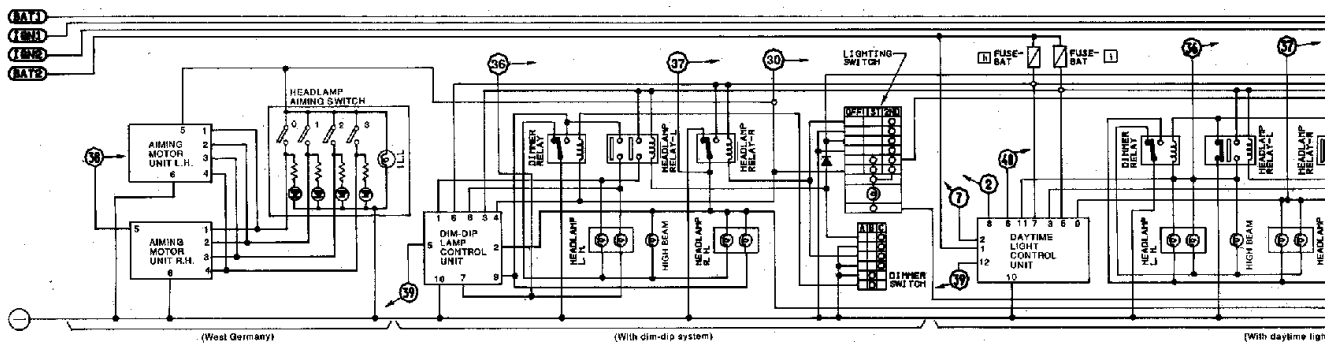
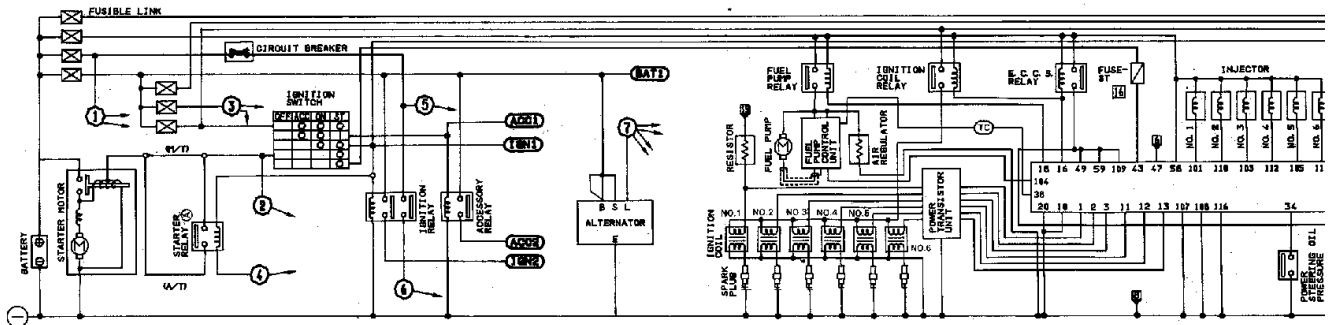
HARNESS LAYOUT

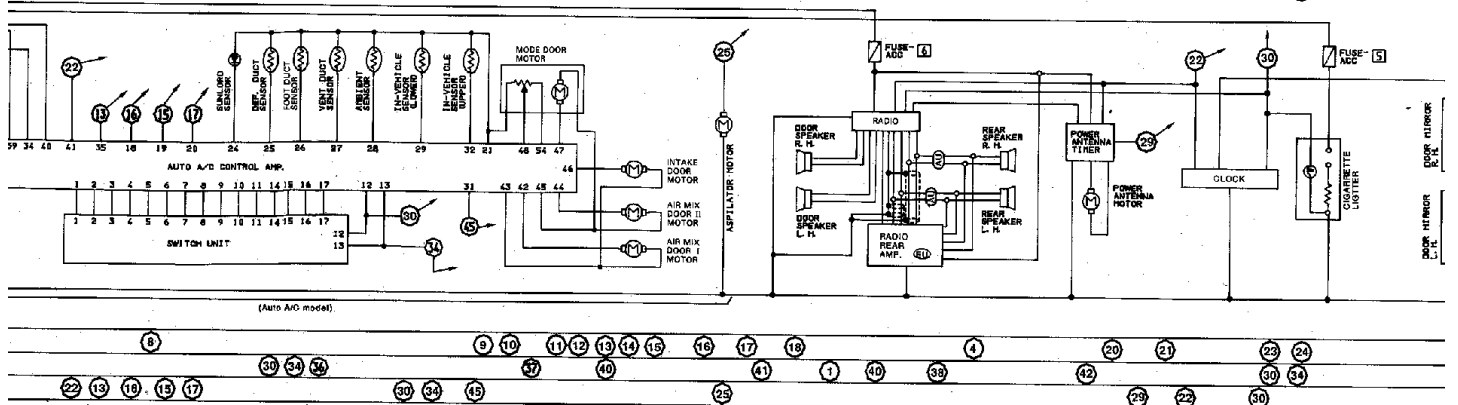
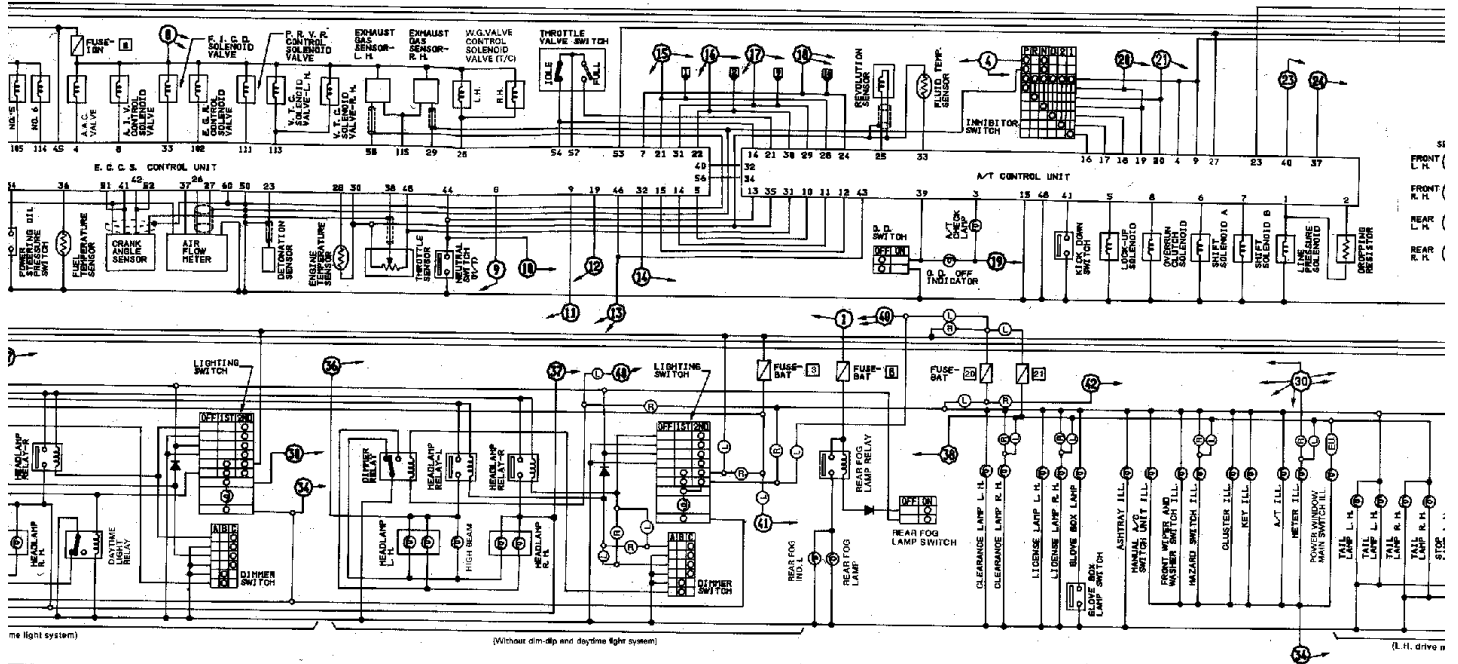
E.F.I. Harness (Cont'd)

R.H. DRIVE MODELS (Passenger compartment)

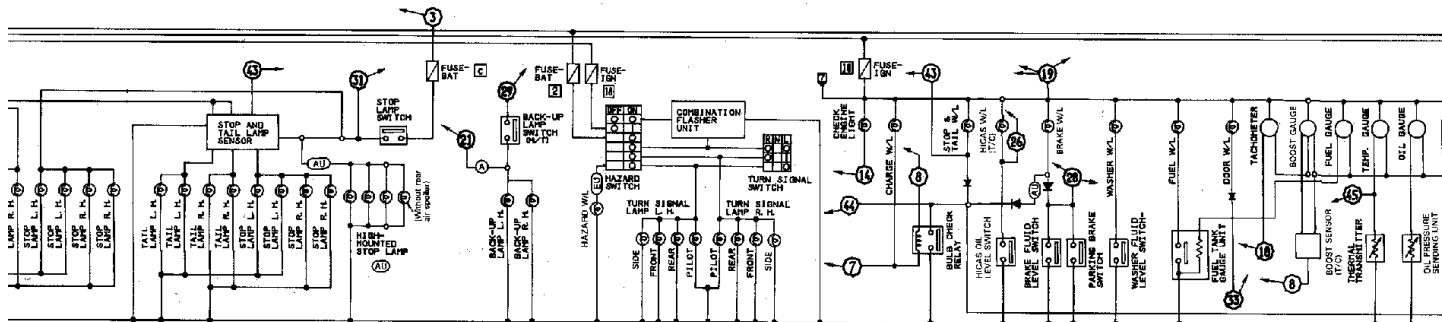
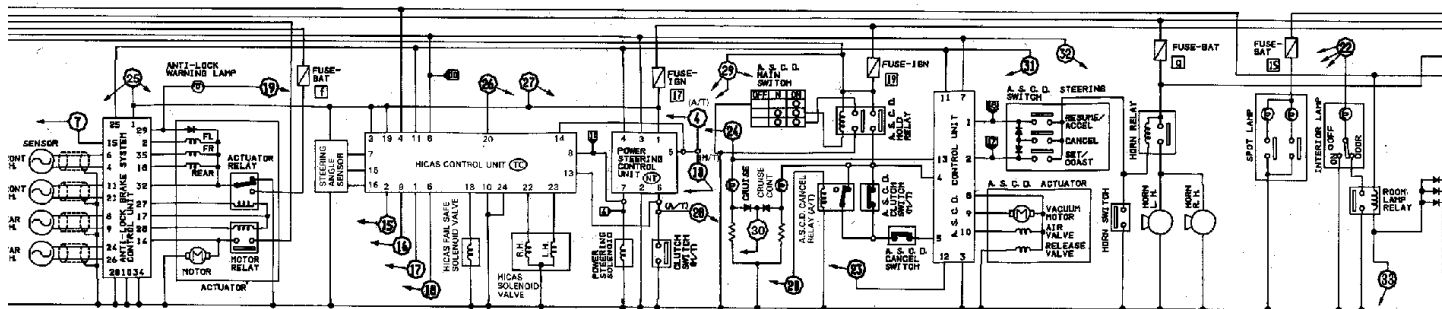


NISSAN 300ZX(Z32 Series) CIRCUIT DIAGRAM

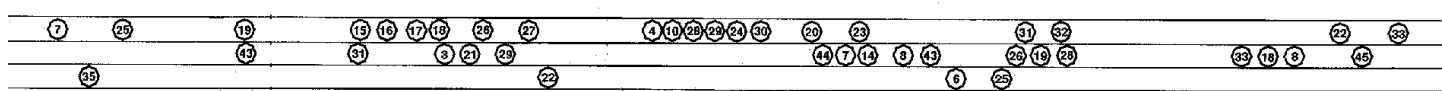
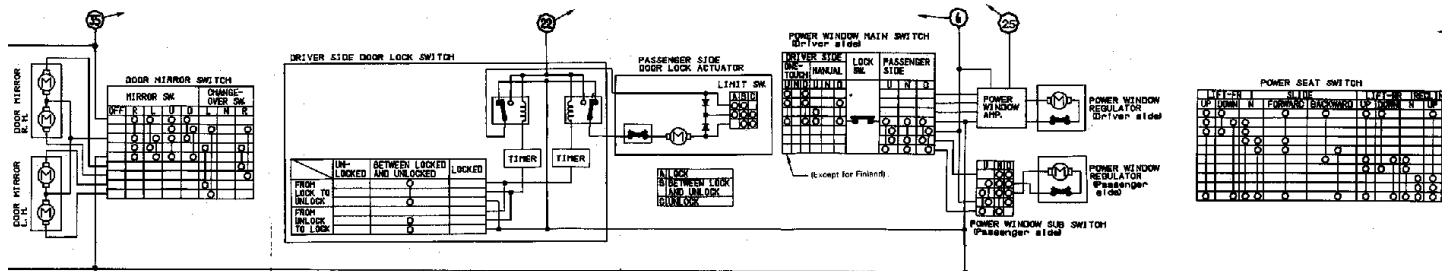


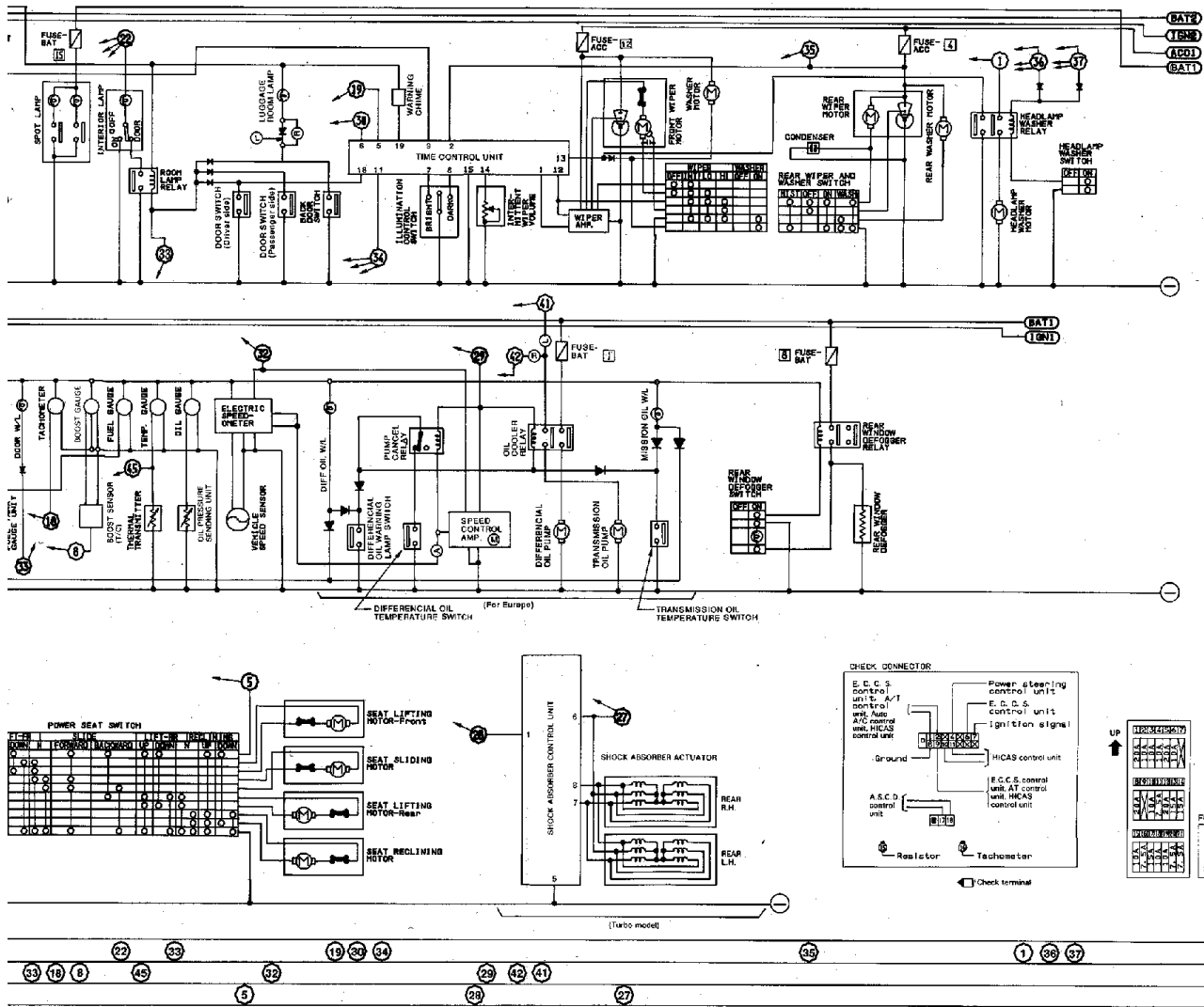


(Auto A/D model)



(Live mode) (R.H. drive mode)





- ① : L.H. drive model
- ② : R.H. drive model
- ③ : A/T model
- ④ : M/T model
- ⑤ : For Europe
- ⑥ : For Australia
- ⑦ : Turbo model
- ⑧ : Non-turbo model



NISSAN 300ZX (Z32 Series) E. C. C. S. WIRING DIAGRAM

101	11
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