NISSAN STANZA

MODEL U12 SERIES

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FOREWORD

This manual contains maintenance and repair procedures for the 1992 NISSAN STANZA.

In order to assure your safety and the efficient functioning of the vehicle, this manual should be read thoroughly. It is especially important that the PRECAUTIONS in the GI section be completely understood before starting any repair task.

All information in this manual is based on the latest product information at the time of publication. The right is reserved to make changes in specifications and methods at any time without notice.

IMPORTANT SAFETY NOTICE

The proper performance of service is essential for both the safety of the technician and the efficient functioning of the vehicle.
The service methods in this Service Manual are described in such a manner that the service may be performed safely and accurately.
Service varies with the procedures used, the skills of the technician and the tools and parts available. Accordingly, anyone using service procedures, tools or parts which are not specifically recommended by NISSAN must first completely satisfy himself that neither his safety nor the vehicle's safety will be jeopardized by the service method selected.

NISSAN MOTOR CO., LTD.
Overseas Service Department
Tokyo, Japan

GENERAL INFORMATION

SECTION GI

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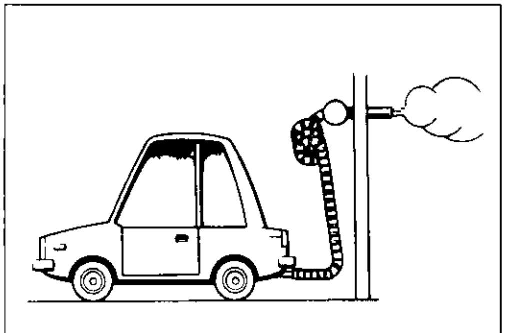
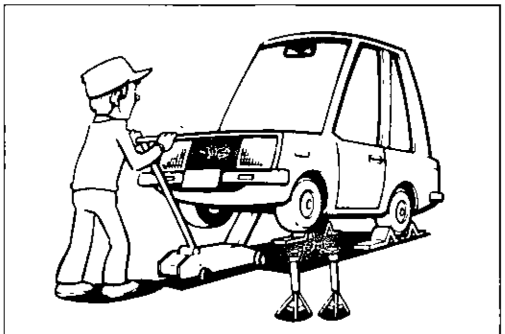
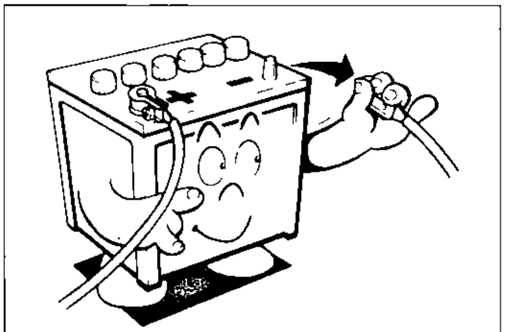


SGI285



SGI231



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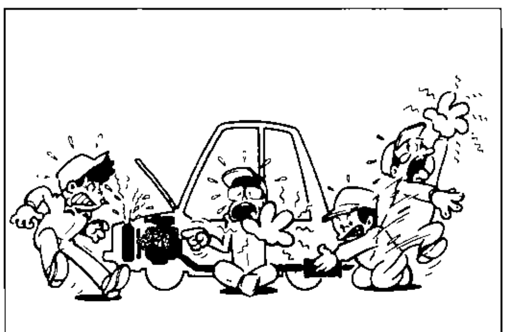

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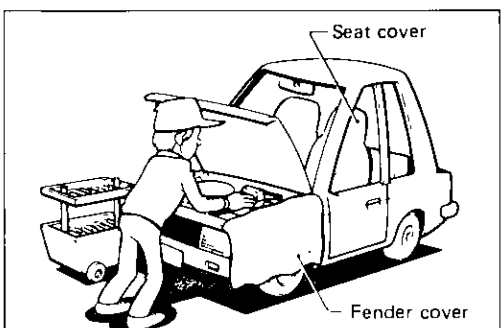
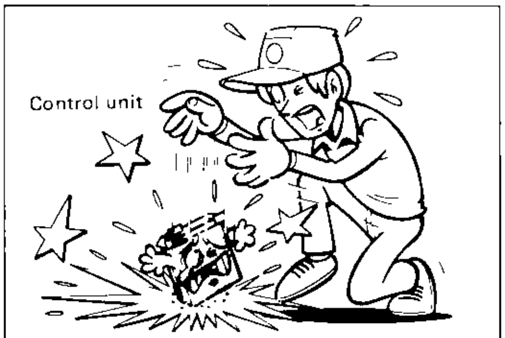


SGI234

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

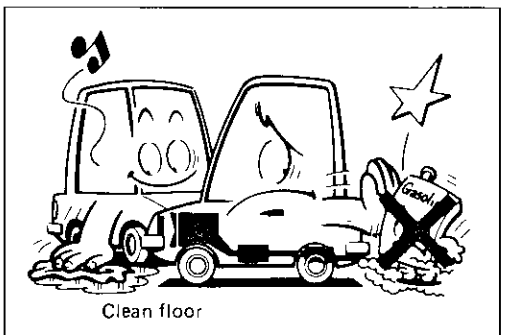
7. Clean all disassembled parts in the designated liquid or solvent prior to inspection or assembly.
8. Replace oil seals, gaskets, packings, O-rings, locking washers, cotter pins, self-locking nuts, etc. with new ones.
9. Replace inner and outer races of tapered roller bearings and needle bearings as 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.



SGI291

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.



SGI290

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.

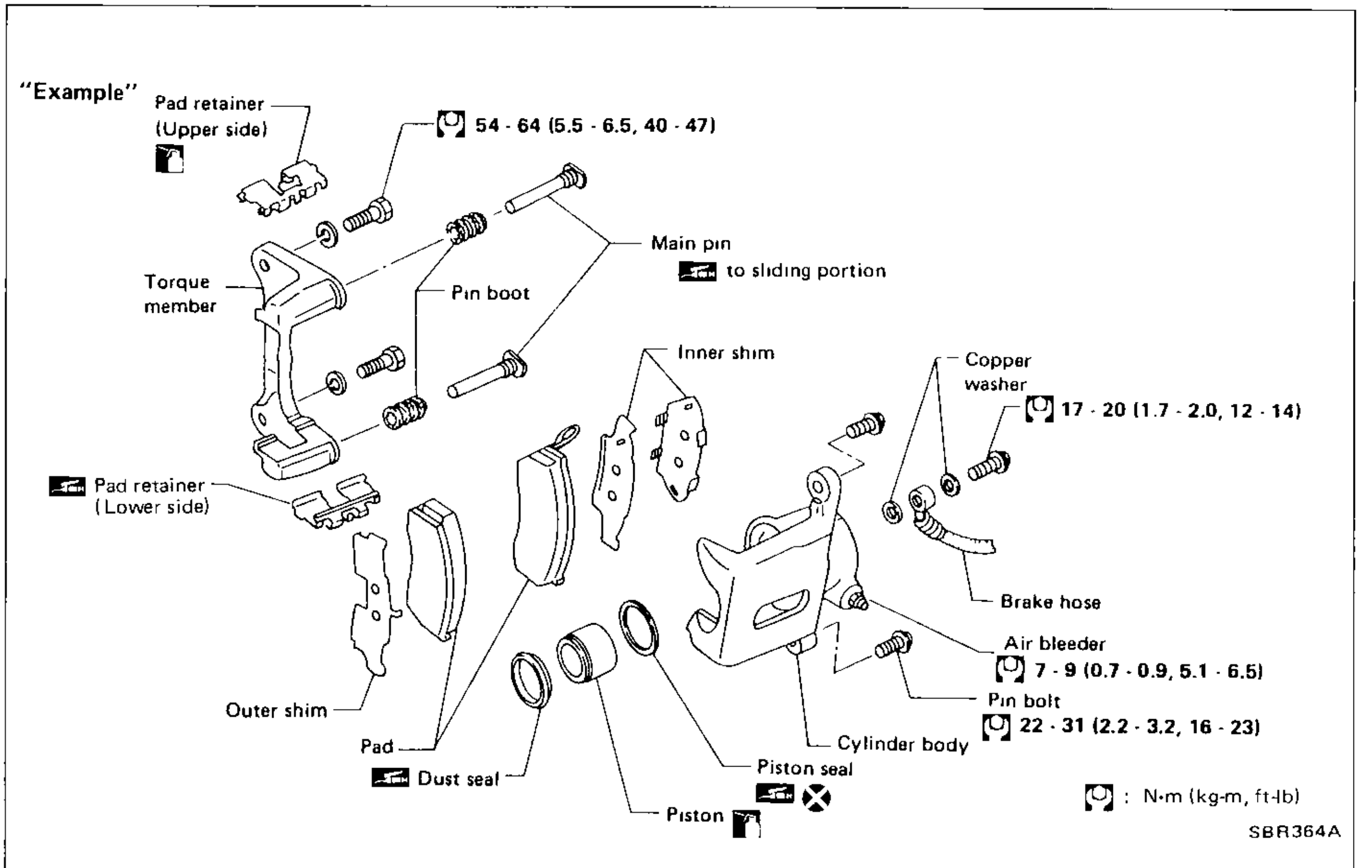
Precautions for Fuel

Use unleaded gasoline with an octane rating of at least 87 AKI (Anti-Knock Index) number (research octane number 91).

CAUTION:

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

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.

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

	: Tightening torque
	: Should be lubricated with grease. Unless otherwise indicated, use recommended multi-purpose grease.
	: Should be lubricated with oil.
	: Sealing point
	: Checking point
	: Always replace after every disassembly.
	: Apply petroleum jelly.
ATF	: Apply A.T.F.
★	: Select with proper thickness.
☆	: Adjustment is required.
S.D.S.	: Service Data and Specifications
L.H., R.H.	: Left-Hand, Right-Hand

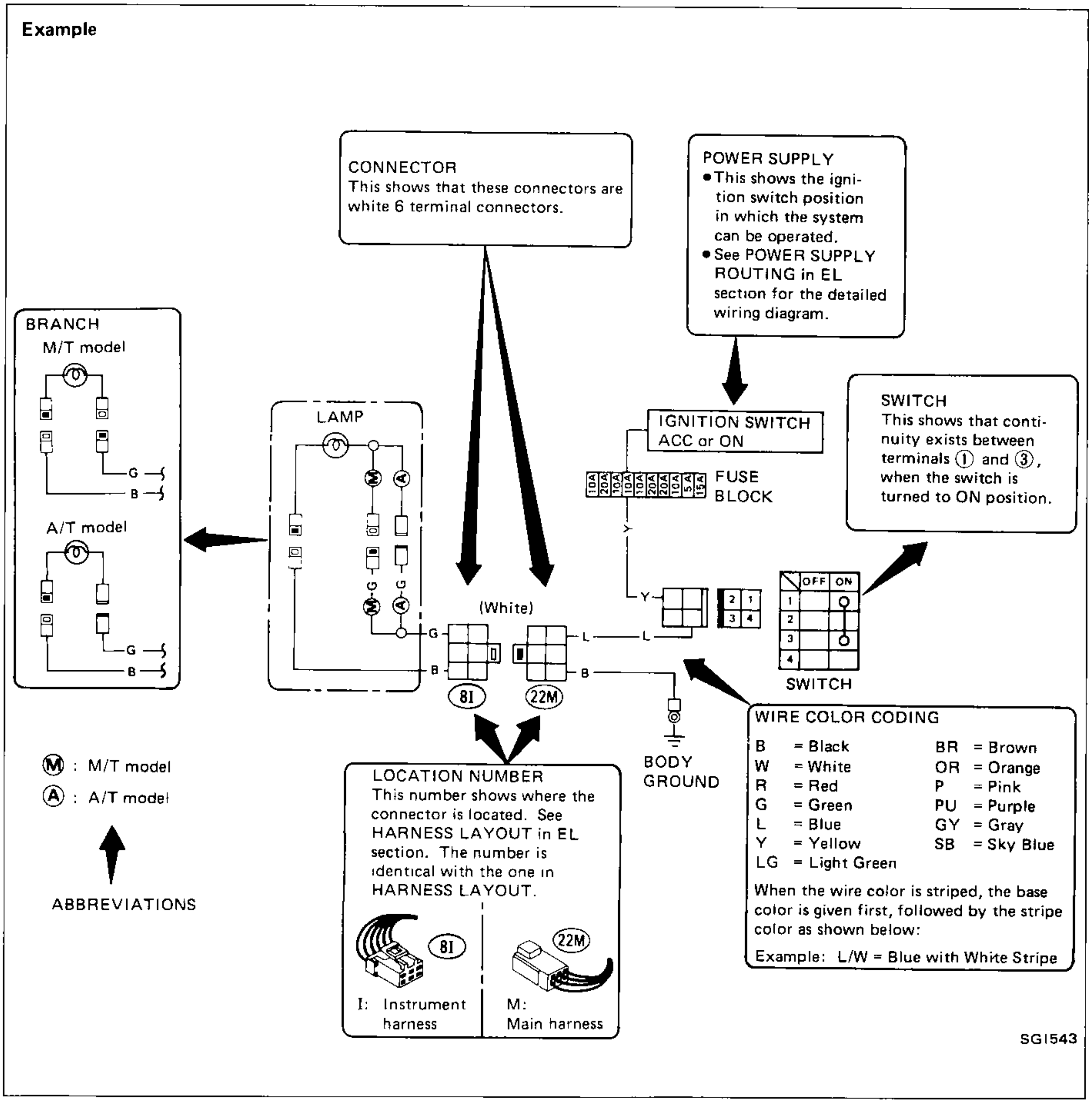
M/T	: Manual Transaxle/Transmission
A/T	: Automatic Transaxle/Transmission
Tool	: Special Service Tools
L.H.D.	: Left-Hand Drive
R.H.D.	: Right-Hand Drive
A.T.F.	: Automatic Transmission Fluid
D_1	: Drive range 1st gear
D_2	: Drive range 2nd gear
D_3	: Drive range 3rd gear
D_4	: Drive range 4th gear
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

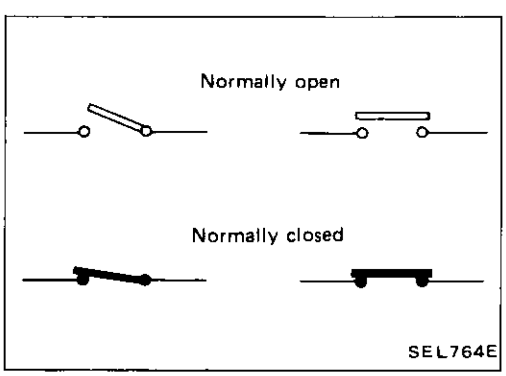
8. The **UNITS** given in this manual are primarily expressed as the SI UNIT (International System of Unit), and alternatively expressed in the metric system and in the yard/pound system.
   "Example"
   Tightening torque:
   59 - 78 N·m (6.0 - 8.0 kg-m, 43 - 58 ft-lb)
9. **TROUBLE DIAGNOSES** are included in sections dealing with complicated components.
10. **SERVICE DATA AND SPECIFICATIONS** is 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.

WIRING DIAGRAM

Symbols used in WIRING DIAGRAM are shown below:





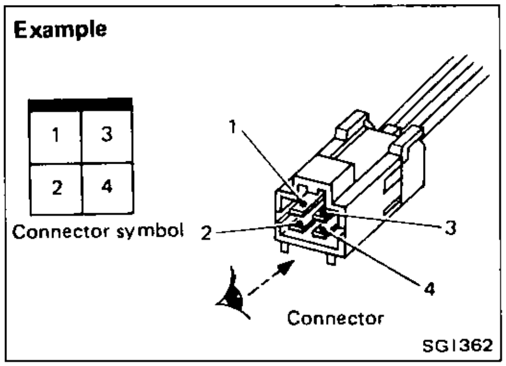
SWITCH POSITIONS

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

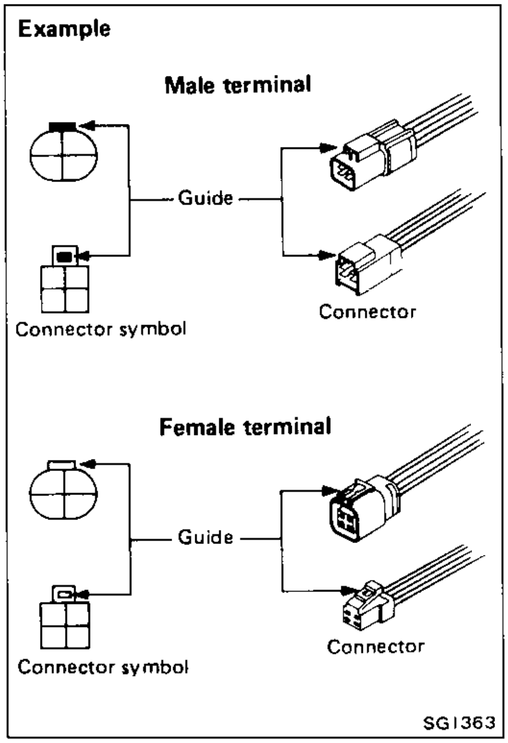
- Ignition switch "OFF".
- Doors, hood and trunk lid/back door closed.
- Pedals are not depressed and parking brake is released.

CONNECTOR SYMBOLS

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



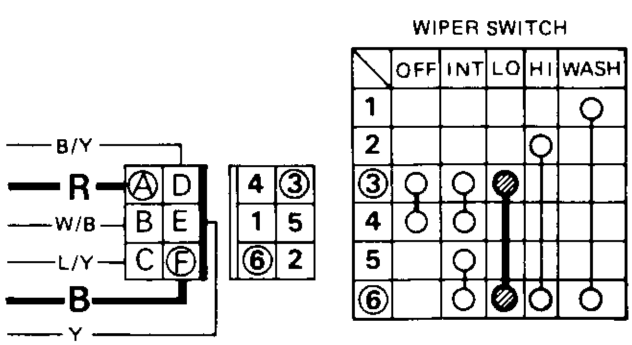
- Male and female terminals
  Connector guides for male terminals are shown in black and female terminals in white in wiring diagrams.



MULTIPLE SWITCH

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

Example



Continuity circuit of wiper switch

SWITCH POSITION	CONTINUITY CIRCUIT
OFF	3 - 4
INT	3 - 4, 5 - 6
LO	3 - 6
HI	2 - 6
WASH	1 - 6

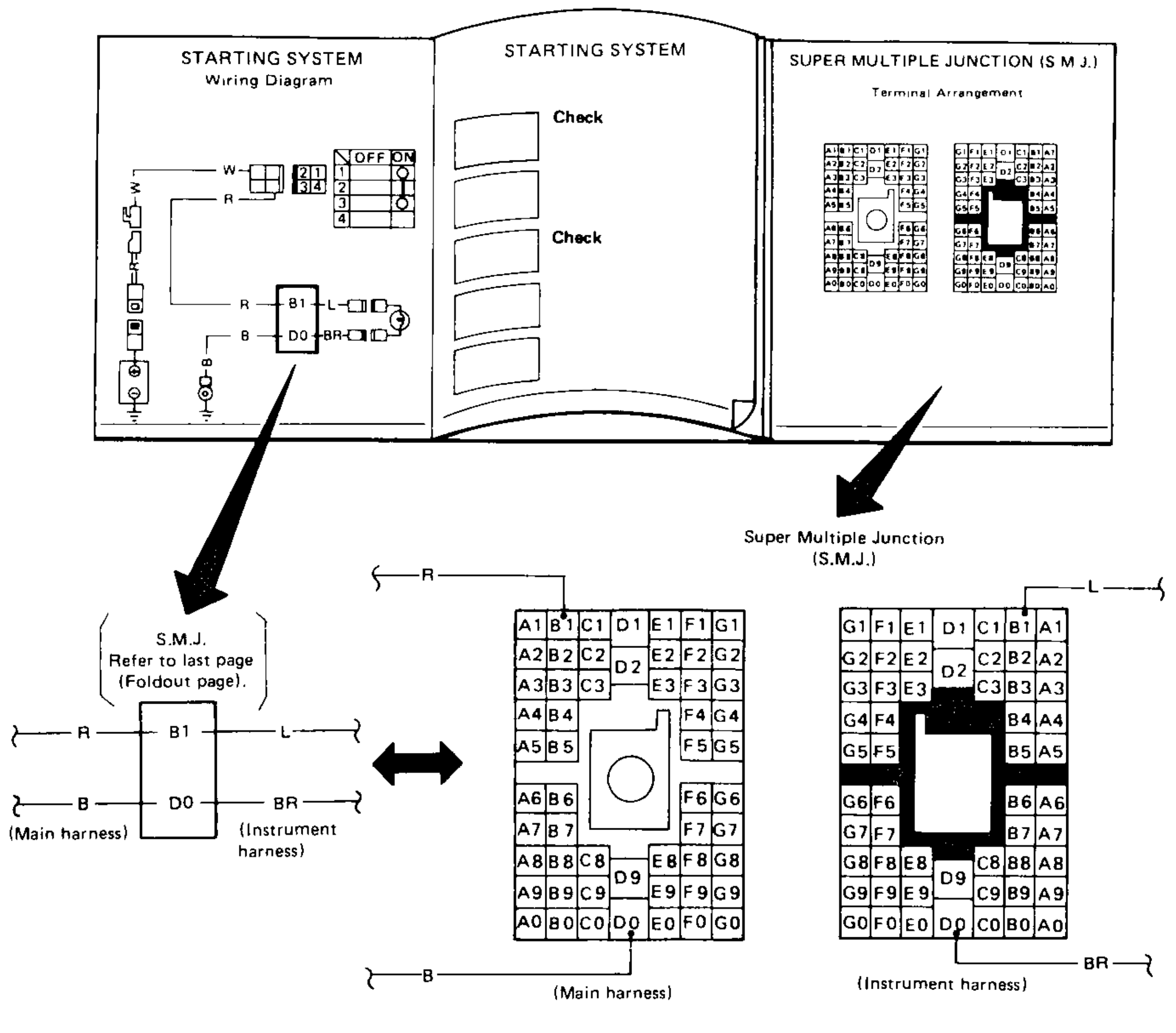
Example: Wiper switch in LO position
Continuity circuit: Red wire – Ⓐ terminal – ③ terminal – Wiper switch (– : LO) – ⑥ terminal – Ⓕ terminal – Black wire

SG1365

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.

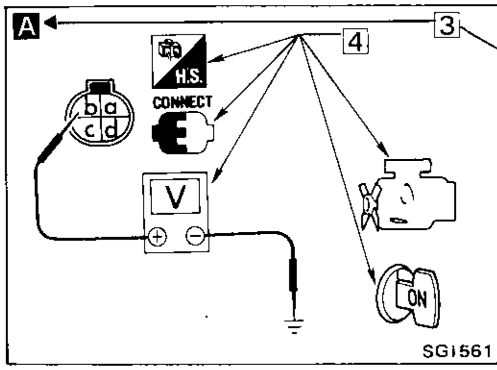
Example



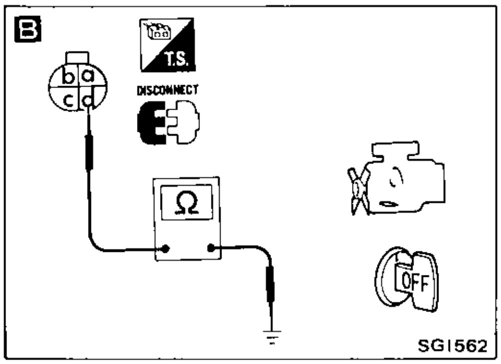
SEL653F

Example

A



B



INSPECTION START

1

2

A

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓑ and ground.
Battery voltage should exist.

N.G. → Check the following items.
1) Harness continuity between crank angle sensor and battery.
2) E.C.C.S.relay-1 (See page EF & EC-106.)
3) "BR" fusible link
4) Power souce for E.C.U. (See page EF & EC-104.)
5) Ignition switch

O.K.

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch OFF.
2) Disconnect crank angle sensor harness connector.
3) Check resistance between terminal ⓓ and ground.
Resistance:
Approximately 0 Ω

N.G. → Check the following items.
1) Harness continuity between crank angle sensor and ground
2) Ground circuit for E.C.U.
(See page EF & EC-104.)

O.K.

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 check circuit continuity between harness connectors in more detail, such as when a 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 they were.**

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.

A

CHECK POWER SUPPLY. ← Check item being performed.
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓑ and ground.
Battery voltage should exist.

Procedure, steps or measurement results

O.K.

2 Measurement results

Required results are indicated in bold type in the corresponding block, as shown below:
These have the following meanings:

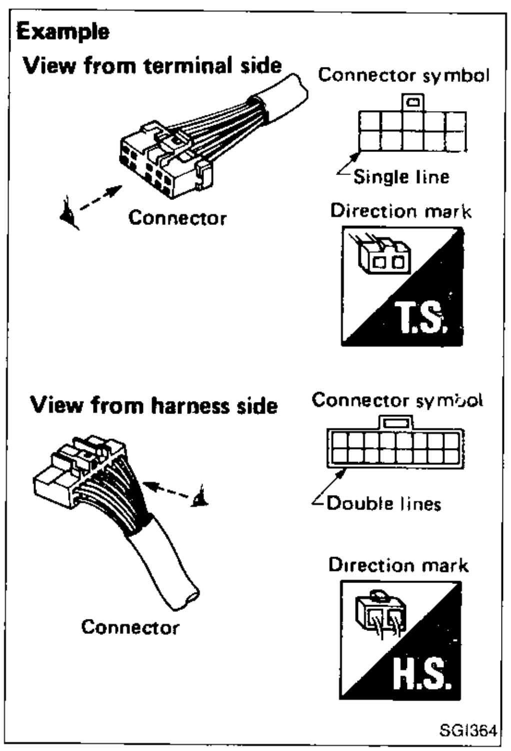
Battery voltage → 11 - 14V or approximately 12V
Voltage: Approximately 0V → Less than 1V

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 flow chart 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.



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.

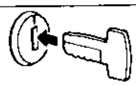
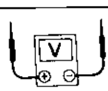
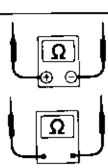
: **View from terminal side ... T.S.**

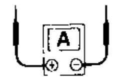
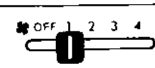
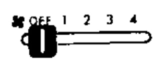
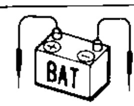
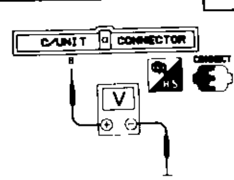
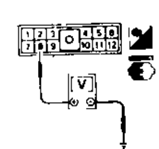
- **All connector symbols shown from the terminal side are enclosed by a single line.**

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

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

Key to symbols signifying measurements or procedures

Symbol	Symbol explanation
	Check after disconnecting the connector to be measured.
	Check after connecting the connector to be measured.
	Insert key into ignition switch.
	Turn ignition switch to "OFF" position.
	Turn ignition switch to "ON" position.
	Turn ignition switch to "START" position
	Turn ignition switch from "OFF" to "ACC" position.
	Turn ignition switch from "ACC" to "OFF" position.
	Turn ignition switch from "OFF" to "ON" position.
	Turn ignition switch from "ON" to "OFF" position.
	Do not start engine, or check with engine stopped.
	Start engine, or check with engine running.
	Apply parking brake.
	Release parking brake.
	Check after engine is warmed up sufficiently.
	Voltage should be measured with a voltmeter.
	Circuit resistance should be measured with an ohmmeter.

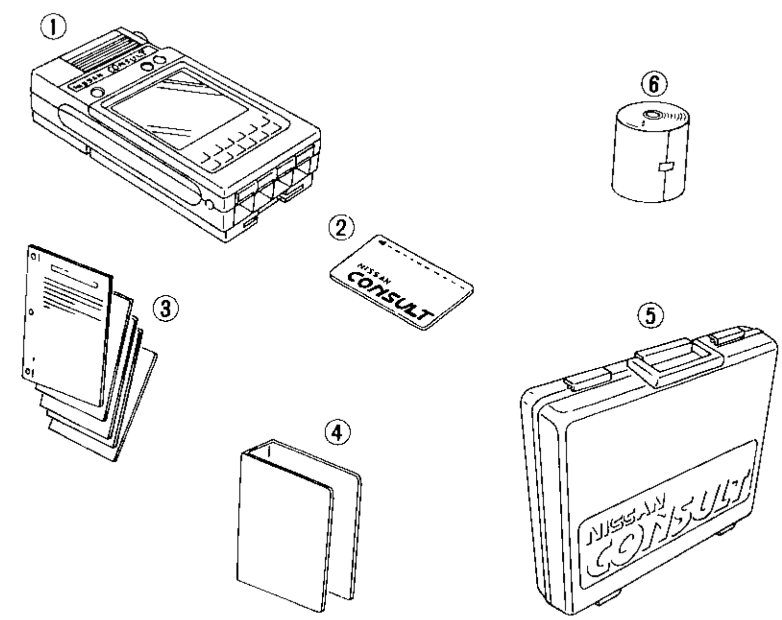
Symbol	Symbol explanation
	Current should be measured with an ammeter.
	Procedure with CONSULT
	Procedure without CONSULT
	A/C switch is "OFF".
	A/C switch is "ON".
	Fan switch is "ON". (At any position except for "OFF" position)
	Fan switch is "OFF".
	Apply battery voltage directly to components.
	Drive vehicle
	Disconnect battery negative cable.
	Depress brake pedal.
	Release brake pedal.
	Depress accelerator pedal.
	Release accelerator pedal.
	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.** 

Function and System Application

Diagnostic mode	Function	E.C.C.S.	A/T
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on CONSULT.	X	—
Self-diagnostic results	Self-diagnostic results can be read and erased quickly.	X	X
Data monitor	Input/Output data in the control unit can be read.	X	X
Active test	Mode in which CONSULT drives some actuators apart from the control units and also shifts some parameters in a specified range.	X	—
E.C.U. part number	E.C.U. part number can be read.	X	X
Function test	E.C.C.S. faults can be isolated to a general area, semi-automatically and in a short time, by following the directions on the screen.	X	—

X: Applicable

Checking Equipment

Tool name	Description
NISSAN CONSULT kit ① CONSULT unit and accessories ② Program card (UE900) ③ Operation manuals ④ Binder ⑤ Carrying case ⑥ Thermal paper (Rolls)	

When ordering the above equipment, contact your NISSAN distributor.

Model Variation

Destination	Grade	Model	Engine	Transaxle
Non-California	SE & XE	FLU12WFEU	KA24E	RS5F50A
		FLU12WAEU		RE4F02A
	GXE	FLU12YFEU		RS5F50V
		FLU12YAEU		RE4F02V
California	SE & XE	FLU12WFEV		RS5F50A
		FLU12WAEV		RE4F02A
	GXE	FLU12YFEV		RS5F50V
		FLU12YAEV		RE4F02V
Canada	SE & XE	FLU12WFEN		RS5F50A
		FLU12WAEN		RE4F02A
	GXE	FLU12YFEN		RS5F50V
		FLU12YAEN		RE4F02V

Prefix and suffix designations

F L U12 W F E U

F : KA24E engine

L : L.H. drive

U : Non-California

V : California

N : Canada

E : E.F.I.

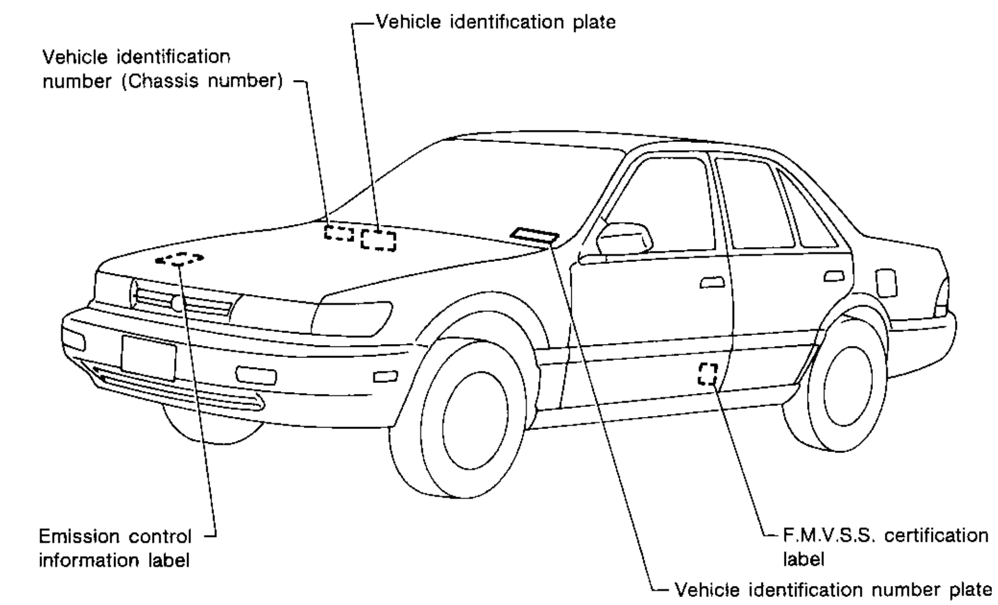
F : 5-speed manual transaxle

A : Automatic transaxle

W : SE & XE grades

Y : GXE grade

Identification Number



SGI630

VEHICLE IDENTIFICATION NUMBER ARRANGEMENT

JN1 F U 2 1 S * N T 400101

Manufacturer
JN1 : Nissan, Passenger vehicle

Engine type
F : KA24E engine

Vehicle line
U : Nissan Stanza

Model change

Body type
1 : Sedan

Vehicle serial number

Manufacturing plant
T : Oppama
X : Nissan Shatai Hiratsuka

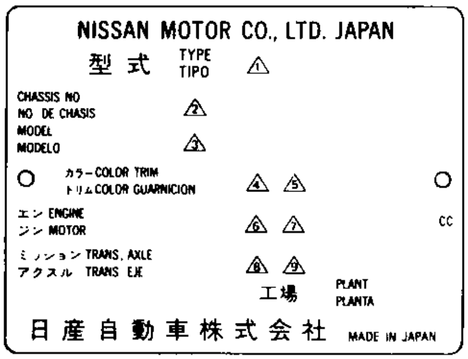
Model year
N : 1992 year model

Check digit (0 to 9 or X)

Restraint system
S : Standard
P : Automatic

Identification Number (Cont'd)

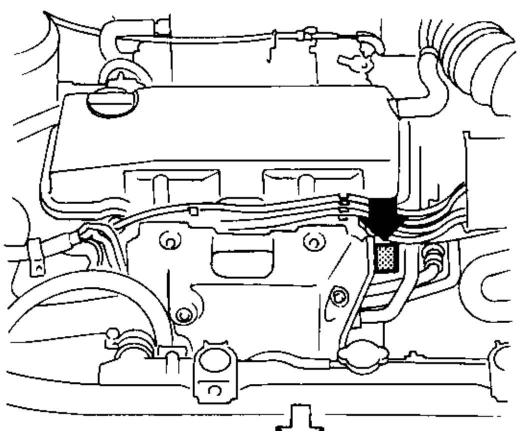
IDENTIFICATION PLATE



SGI315

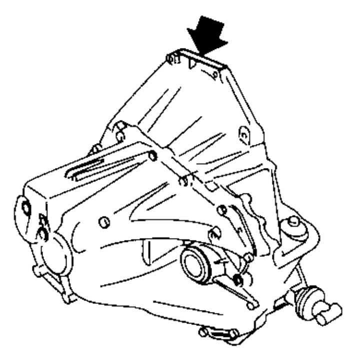
1 Type
2 Vehicle identification number (Chassis number)
3 Model
4 Body color code
5 Trim color code
6 Engine model
7 Engine displacement
8 Transaxle model
9 Axle model

ENGINE SERIAL NUMBER



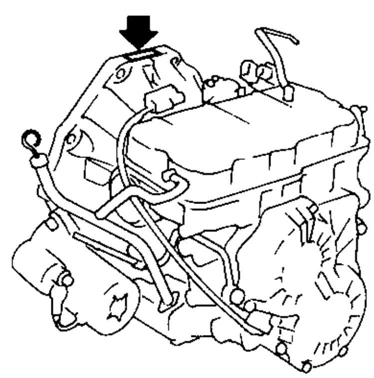
TI1053

MANUAL TRANSAXLE NUMBER



SGI298

AUTOMATIC TRANSAXLE NUMBER



SGI571

Dimensions

Unit: mm (in)

	Sedan
Overall length	4,570 (179.9)
Overall width	1,697 (66.8)
Overall height	1,375 (54.1)
Front tread	1,460 (57.5)
Rear tread	1,440 (56.7)
Wheelbase	2,525 (99.4)

Wheels and Tires

			SE & XE grades	GXE grade
Road Wheel	Conventional	Steel	14 x 5-1/2JJ	—
		Aluminum	14 x 5-1/2JJ*1 14 x 6JJ*1	— 14 x 6JJ
	Spare		15 x 4T 16 x 4T*1	16 x 4T —
	Offset	mm (in)	40 (1.57) 35 (1.38)*2	40 (1.57) 35 (1.38)*2
Tire size	Conventional	All season tire	P195/65R14 89H	P195/65R14 89H*3
		Summer tire	P195/65R14 89H*1	P195/65R14 89H
	Spare		T125/70D15 T135/70D16*1	T135/70D16 —

*1: Option
*2: For 16 x 4T
*3: Standard for Canada

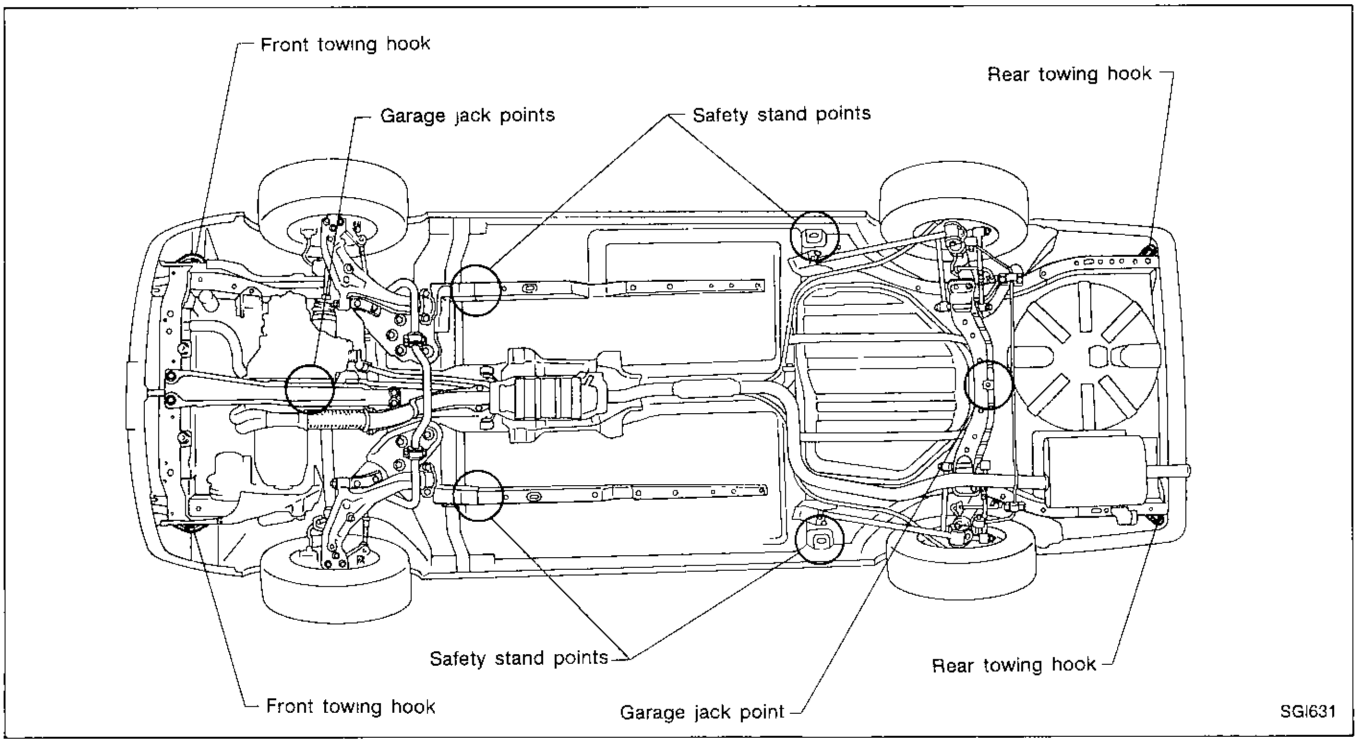
Garage Jack and Safety Stand

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 front and back 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.

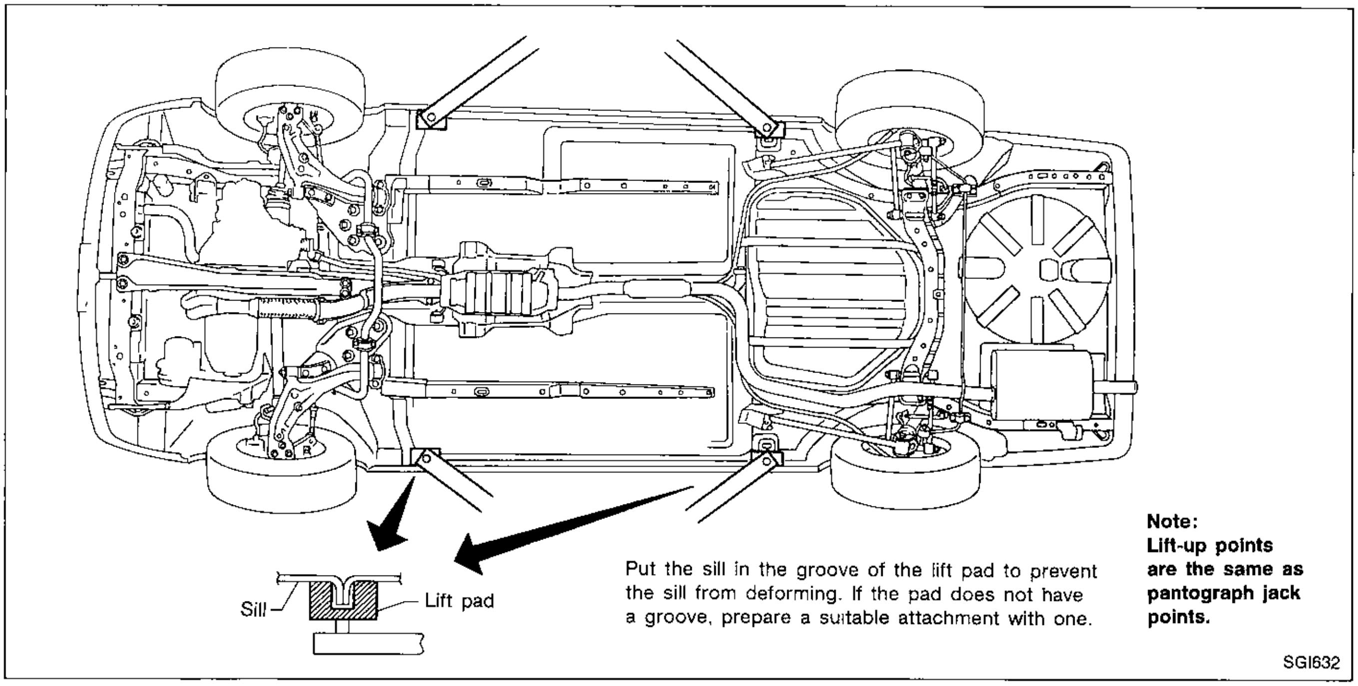


2-pole Lift

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.

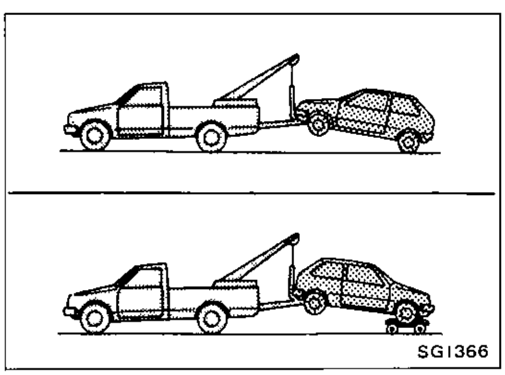
When setting the lift arm, do not allow the arm to contact the brake tubes and fuel lines.



Tow Truck Towing

CAUTION:

- **All applicable state or Provincial (in Canada) laws and 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.**



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

Tow Truck Towing (Cont'd)

TOWING AN AUTOMATIC TRANSAXLE MODEL WITH FOUR WHEELS ON GROUND

Observe the following restricted towing speeds and distances.

Speed:

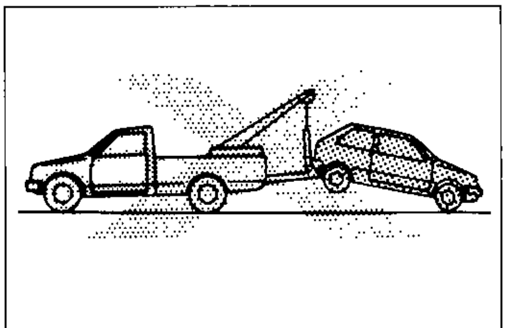
Below 50 km/h (30 MPH)

Distance:

Less than 65 km (40 miles)

CAUTION:

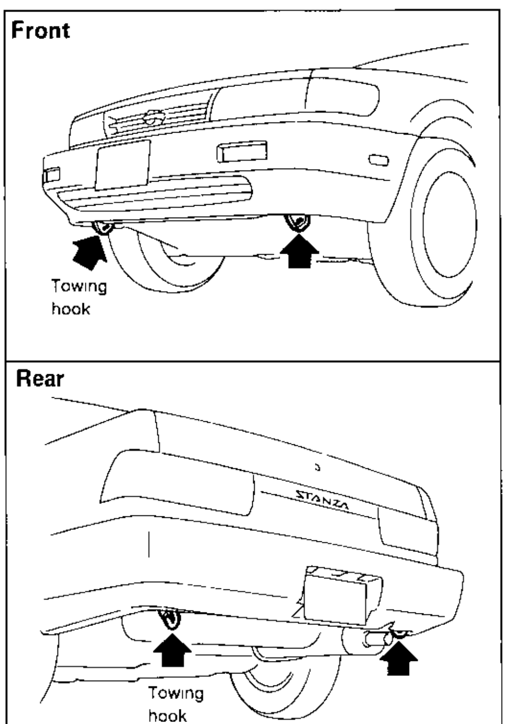
Never tow an automatic transaxle model from the rear (i.e., backward) with four wheels on the ground as this may cause serious and expensive damage to the transaxle.



SGI368

TOWING AN AUTOMATIC TRANSAXLE MODEL WITH REAR WHEELS RAISED (With front wheels on ground)

Never tow an automatic transaxle model with rear wheels raised (with front wheels on ground) as this may cause serious and expensive damage to the transaxle. If it is necessary to tow it with rear wheels raised, always use a towing dolly under the front wheels.



CE1031

TOWING POINT

Always pull the cable straight out from the vehicle. Never pull on the hook at a sideways angle.

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

M 6

6 — Nominal diameter of bolt threads (Unit: mm)

M — Metric screw threads

SECTION MA

CONTENTS

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PERIODIC MAINTENANCE .... MA- 4
RECOMMENDED FLUIDS AND LUBRICANTS .... MA- 7
ENGINE MAINTENANCE .... MA- 8
CHASSIS AND BODY MAINTENANCE MA-14
SERVICE DATA AND SPECIFICATIONS (S.D.S.) MA-20

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.

Item	Reference page
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.	—
Wheel nuts When checking the tires, make sure no nuts are missing, and check for any loose nuts. Tighten if necessary.	—
Tire rotation Tires should be rotated every 12,000 km (7,500 miles).	MA-17
Wheel alignment and balance If the vehicle should pull to either side while driving on a straight and level road, or if you detect uneven or abnormal tire wear, there may be a need for wheel alignment. If the steering wheel or seat vibrates at normal highway speeds, wheel balancing may be needed.	MA-17 FA-6
Windshield wiper blades Check for cracks or wear if they do not wipe properly.	—
Doors and engine hood Check that all doors and the engine hood operate smoothly as well as the trunk lid and back hatch. Also ensure, that all latches lock securely. Lubricate hinges, latches, rollers and links 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 lubrication frequently.	MA-19
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 buzzers/chimes Make sure that all warning lights and buzzers/chimes are operating properly.	—
Windshield wiper and washer Check that the wipers and washer operate properly and that the wipers do not streak.	—
Windshield defroster Check that the air comes out of the defroster outlets properly and in sufficient quantity when operating the heater or air conditioner.	—
Steering wheel Check that it has the specified free play. Be sure to check for changes in the steering condition, such as excessive free play, hard steering or strange noises. **Free play: Less than 35 mm (1.38 in)**	—
Seats Check seat position controls such as seat adjusters, seatback recliner, etc. to ensure they operate smoothly and that all latches lock securely in every position. Check that the head restrains move up and down smoothly and that the locks (if so equipped) hold securely in all latched positions. Check that the latches lock securely for folding-down rear seatbacks.	—
Seat belts Check that all parts of the seat belt system (e.g. buckles, anchors, adjusters and retractors) operate properly and smoothly, and are installed securely. Check the belt webbing for cuts, fraying, wear or damage.	MA-19
Clutch pedal Make sure the pedal operates smoothly and check that it has the proper free travel.	CL-4

Item	Reference page
Brakes Check that the brake does not pull the vehicle to one side when applied.	—
Brake pedal Check the pedal for smooth operation and make sure it has the proper distance under it when depressed fully. Check the brake booster function. Be certain to keep floor mats away from the pedal.	BR-7
Parking brake Check that the lever has the proper travel and confirm that your vehicle is held securely on a fairly steep hill with only the parking brake applied.	BR-23
Automatic transaxle "Park" mechanism Check that the lock release button on the selector lever operates properly and smoothly. On a fairly steep hill check that your vehicle is held securely with the selector lever in the "P" position without applying any brakes.	—
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-10
Radiator and hoses Check the front of the radiator and clean off any dirt, insects, leaves, etc., that may have accumulated. Make sure the hoses have no cracks, deformation, rot or loose connections.	—
Brake and clutch fluid levels Make sure that the brake and clutch fluid levels are between the "MAX" and "MIN" lines on the reservoir.	MA-14, 15
Battery Check the fluid level in each cell. It should be between the "MAX" and "MIN" lines.	—
Engine drive belts Make sure that no belt is frayed, worn, cracked or oily.	MA-8
Engine oil level Check the level on the dipstick after parking the vehicle on a level spot and turning off the engine.	MA-12
Power steering fluid level and lines Check the level when the fluid is cold and the engine is turned off. Check the lines for proper attachment, leaks, cracks, etc.	MA-18
Automatic transaxle fluid level Check the level on the dipstick after putting the selector lever in "P" with the engine idling.	MA-15
Exhaust system Make sure there are no loose supports, cracks or holes. If the sound of the exhaust seems unusual or there is a smell of exhaust fumes, immediately locate the trouble and correct it.	MA-18
Underbody The underbody is frequently exposed to corrosive substances such as those used on icy roads or to control dust. It is very important to remove these substances, otherwise rust will form on the floor pan, frame, fuel lines and around the exhaust system. At the end of winter, the underbody should be thoroughly flushed with plain water, being careful to clean those areas where mud and dirt can easily accumulate.	—
Fluid leaks Check under the vehicle for fuel, oil, water or other fluid leaks after the vehicle has been parked for a while. Water dripping from the air conditioner after use is normal. If you should notice any leaks or gasoline fumes are evident, check for the cause and correct it immediately.	—

Two different maintenance schedules are provided, and should be used, depending upon the conditions in which the vehicle is mainly operated. **After 60,000 miles (96,000 km) or 48 months, continue the periodic maintenance at the same mileage/time intervals.**

SCHEDULE 1

Follow Periodic Maintenance Schedule 1 if your driving habits frequently includes one or more of the following driving conditions:

- Repeated short trips of less than 5 miles (8 km).
- Repeated short trips of less than 10 miles (16 km) with outside temperatures remaining below freezing.
- Operating in hot weather in stop-and-go "rush hour" traffic.
- Extensive idling and/or low speed driving for long distances, such as police, taxi or door-to-door delivery use.
- Driving in dusty conditions.
- Driving on rough, muddy, or salt spread roads.
- Towing a trailer, using a camper or a car-top carrier.

SCHEDULE 2

Follow Periodic Maintenance Schedule 2 if none of the driving conditions shown in Schedule 1 apply to your driving habits.

Schedule 1

Abbreviations: R = Replace I = Inspect. Correct or replace if necessary.

[ ]: At the mileage intervals only

MAINTENANCE OPERATION		MAINTENANCE INTERVAL																
Perform at number of miles, kilometers or months, whichever comes first.	Miles × 1,000 (km × 1,000) Months	3.75 (6) 3	7.5 (12) 6	11.25 (18) 9	15 (24) 12	18.75 (30) 15	22.5 (36) 18	26.25 (42) 21	30 (48) 24	33.75 (54) 27	37.5 (60) 30	41.25 (66) 33	45 (72) 36	48.75 (78) 39	52.5 (84) 42	56.25 (90) 45	60 (96) 48	Reference page
Emission control system maintenance																		
Drive belts	See NOTE (1)																I*	MA-8
Air cleaner filter	See NOTE (2)								[R]								[R]	MA-11
Vapor lines									I*								I*	MA-13
Fuel lines									I*								I*	MA-10
Fuel filter	See NOTE (3)*																	MA-10
Engine coolant									R*								R*	MA-9
Engine oil		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	MA-11
Engine oil filter (Use Nissan PREMIUM type or equivalent.)		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	MA-12
Spark plugs									[R]								[R]	MA-12
Chassis and body maintenance																		
Brake lines & cables					I				I				I				I	MA-16
Brake pads, discs, drums & linings			I		I		I		I		I		I		I		I	MA-16
Manual & automatic trans-axle oil	See NOTE (4)				I				I				I				I	MA-14
Steering gear & linkage, axle & suspension parts			I		I		I		I		I		I		I		I	MA-17, FA-4
Steering linkage ball joints & front suspension ball joints			I		I		I		I		I		I		I		I	MA-17, FA-4
Exhaust system			I		I		I		I		I		I		I		I	MA-18
Drive shaft boots			I		I		I		I		I		I		I		I	FA-8

NOTE: (1) After 60,000 miles (96,000 km) or 48 months, inspect every 15,000 miles (24,000 km) or 12 months.

(2) If operating mainly in dusty conditions, more frequent maintenance may be required.

(3) If vehicle is operated under extremely adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high, the filters might become clogged. In such an event, replace them immediately.

(4) If towing a trailer, using a camper or a car-top carrier, or driving on rough or muddy roads, change (not just inspect) oil at every 30,000 miles (48,000 km) or 24 months.

(5) Maintenance items and intervals with "*" are recommended by NISSAN for reliable vehicle operation. The owner need not perform such maintenance in order to maintain the emission warranty or manufacturer recall liability. Other maintenance items and intervals are required.

Schedule 2

Abbreviations: R = Replace I = Inspect. Correct or replace if necessary.
[ ]: At the mileage intervals only

MAINTENANCE OPERATION		MAINTENANCE INTERVAL								
Perform at number of miles, kilometers or months, whichever comes first.	Miles × 1,000 (km × 1,000) Months	7.5 (12) 6	15 (24) 12	22.5 (36) 18	30 (48) 24	37.5 (60) 30	45 (72) 36	52.5 (84) 42	60 (96) 48	Reference page
Emission control system maintenance										
Drive belts	See NOTE (1)								I*	MA-8
Air cleaner filter					[R]				[R]	MA-11
Vapor lines					I*				I*	MA-13
Fuel lines					I*				I*	MA-10
Fuel filter	See NOTE (2)*									MA-10
Engine coolant					R*				R*	MA-9
Engine oil		R	R	R	R	R	R	R	R	MA-11
Engine oil filter (Use Nissan PREMIUM type or equivalent.)		R		R		R		R		MA-12
Spark plugs					[R]				[R]	MA-12
Chassis and body maintenance										
Brake lines & cables			I		I		I		I	MA-16
Brake pads, discs, drums & linings			I		I		I		I	MA-16
Manual & automatic transaxle oil			I		I		I		I	MA-14
Steering gear linkage, axle & suspension parts					I				I	MA-17, FA-4
Exhaust system			I		I		I		I	MA-18
Drive shaft boots			I		I		I		I	FA-8

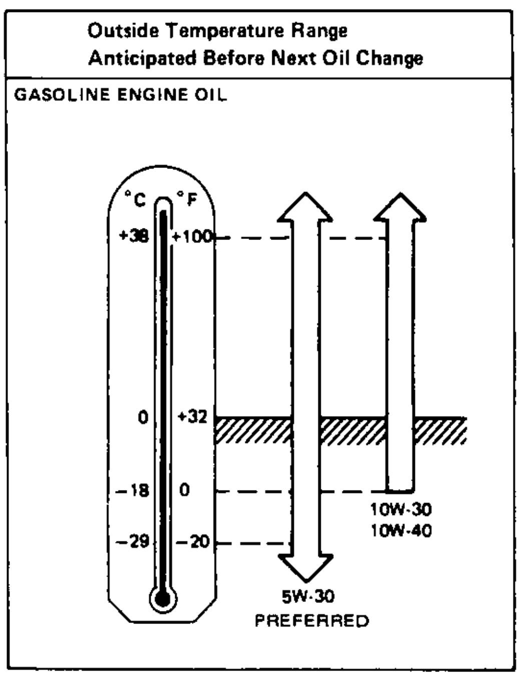
NOTE: (1) After 60,000 miles (96,000 km) or 48 months, inspect every 15,000 miles (24,000 km) or 12 months.
(2) If vehicle is operated under extremely adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high, the filters might become clogged. In such an event, replace them immediately.
(3) Maintenance items and intervals with "*" are recommended by NISSAN for reliable vehicle operation. The owner need not perform such maintenance in order to maintain the emission warranty or manufacturer recall liability. Other maintenance items and intervals are required.

Fluids and Lubricants

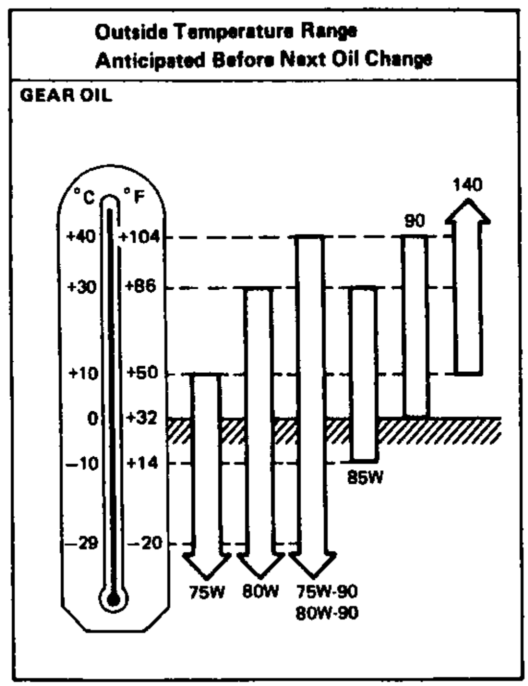
	Capacity (Approximate)			Recommended fluids and lubricants
	US measure	Imp measure	Liter	
Engine oil (Refill)				
With oil filter	3-3/4 qt	3-1/8 qt	3.5	Energy Conserving Oils of API SG *2, *3
Without oil filter	3-3/8 qt	2-7/8 qt	3.2	
Cooling system	7-7/8 qt	6-1/2 qt	7.4	Anti-freeze coolant (Ethylene glycol base)
Manual transaxle gear oil	10 pt	8-1/4 pt	4.7	API GL-4*2
Automatic transaxle fluid	7-7/8 qt	6-1/2 qt	7.4	Genuine Nissan ATF*1 or equivalent Type DEXRON™
Power steering fluid	—	—	—	Type DEXRON™
Brake fluid	—	—	—	Genuine Nissan Brake Fluid*1 or equivalent DOT 3 (US FMVSS No. 116)
Multi-purpose grease	—	—	—	NLGI No. 2 (Lithium soap base)

*1: Available in mainland U.S.A. through your Nissan dealer.
*2: For further details, see "Recommended SAE viscosity number".
*3: Energy conserving oils
These oils can be identified by such labels as EC-I, EC-II energy conserving, energy saving, improved fuel economy, etc.

SAE Viscosity Number



T10008

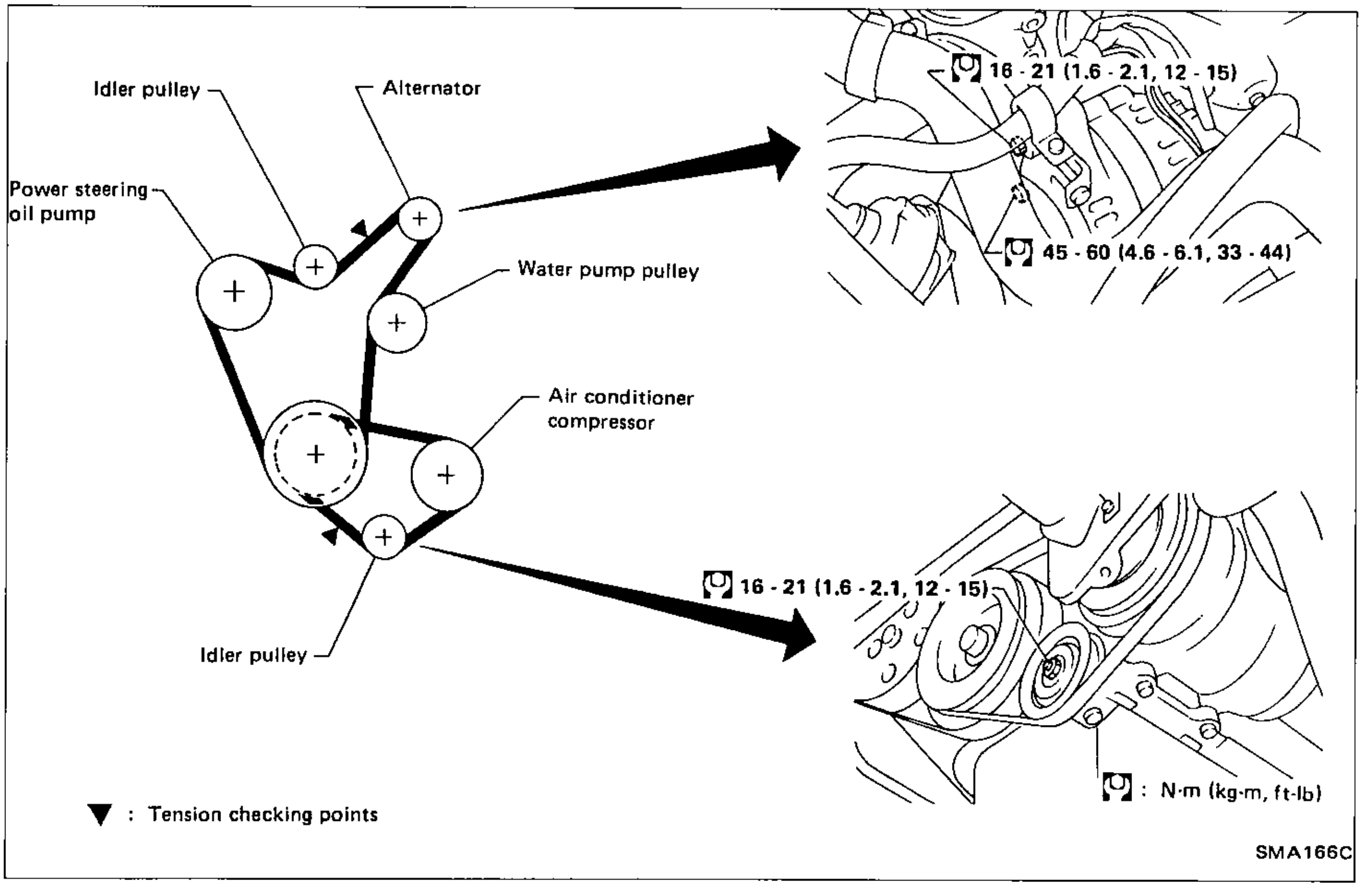


T10003

5W-30 is preferable for ambient temperatures above −18°C (0°F). 20W-40 and 20W-50 are usable for ambient temperatures above 10°C (50°F) for all seasons.

80W-90 is preferable for ambient temperatures below 40°C (104°F).

Checking Drive Belts

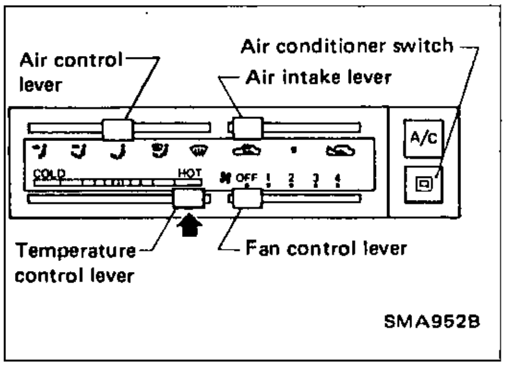


1. Inspect for cracks, fraying, wear or oil adhesion. If necessary, replace with a new one.
2. Inspect drive belt deflections by pushing on the belt midway between pulleys.

Adjust if belt deflections exceed the limit.
Belt deflection:
Inspect drive belt deflections when engine is cold.

Unit: mm (in)

	Used belt deflection		Deflection of new belt
	Limit	Deflection after adjustment	
Alternator Power steering oil pump	8 (0.31)	6 - 7 (0.24 - 0.28)	5 - 6 (0.20 - 0.24)
Air conditioner compressor	8 (0.31)	5 - 6 (0.20 - 0.24)	4 - 5 (0.16 - 0.20)
Applied pushing force	98 N (10 kg, 22 lb)		



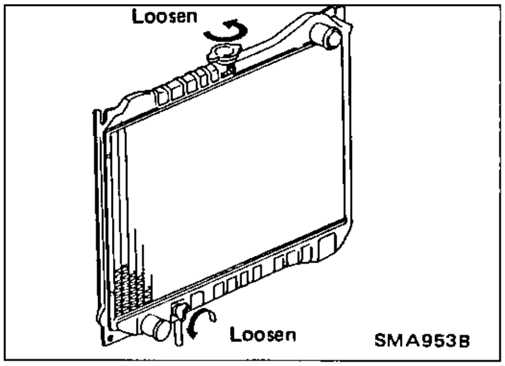
SMA952B

Changing Engine Coolant

WARNING:

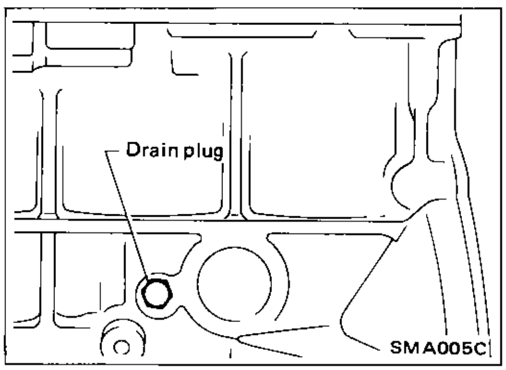
To avoid being scalded, never change the coolant when the engine is hot.

1. Move heater "TEMP" control lever all the way to "HOT" position.



SMA953B

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

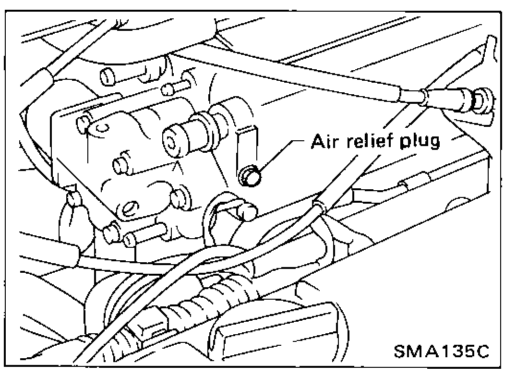


SMA005C

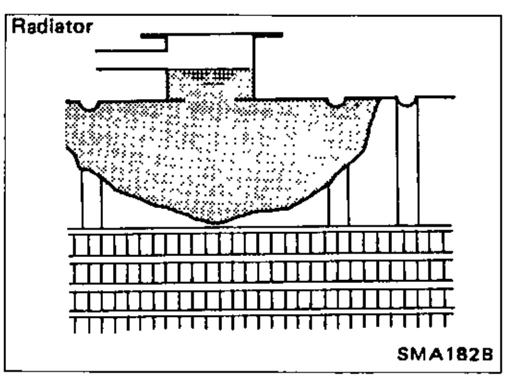
3. Remove cylinder block drain plug.
4. Close drain cock and tighten drain plug securely.

- **Apply sealant to the thread of drain plug.**
  : 34 - 44 N·m
  (3.5 - 4.5 kg-m, 25 - 33 ft-lb)

5. Open air relief plug.
6. Fill radiator with water and close air relief plug and radiator cap.
7. Run engine and warm it up sufficiently.
8. Race engine 2 or 3 times under no-load.
9. Stop engine and wait until it cools down.
10. Drain water.
11. Repeat step 2 through step 10 until clear water begins to drain from radiator.



SMA135C

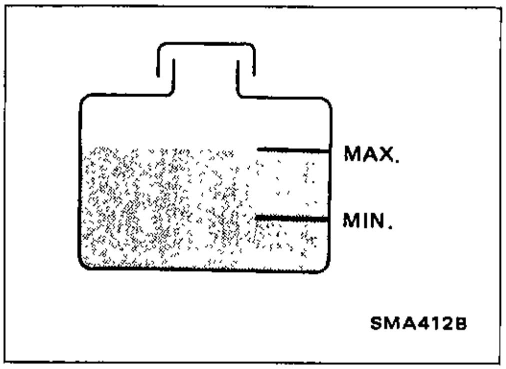


SMA182B

12. Open radiator cap and air relief plug.
13. Fill radiator with coolant up to specified level.
    Follow instructions attached to anti-freeze container for mixing ratio of anti-freeze to water.
    Coolant capacity (With reservoir tank):
    7.4 ℓ (7-7/8 US qt, 6-1/2 Imp qt)

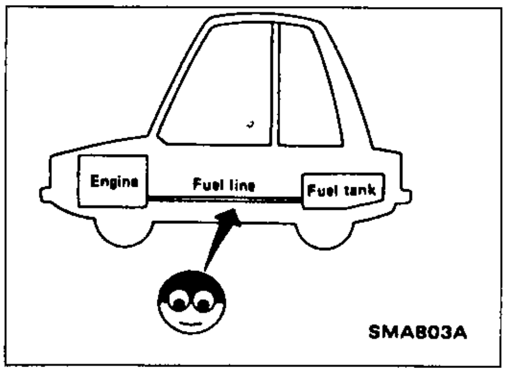
Changing Engine Coolant (Cont'd)

Pour coolant through coolant filler neck slowly to allow air in system to escape.
After radiator is filled with coolant, attach radiator cap, and shake radiator upper hose up and down. Open radiator cap, and see if coolant level has dropped. Add coolant if any drop in coolant level is found.



SMA412B

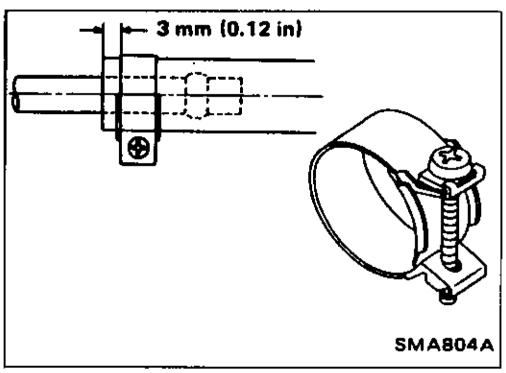
14. Close air relief plug.
15. Remove reservoir tank, drain coolant, then clean reservoir tank.
16. Install reservoir tank and fill it with coolant up to "MAX" level and then install radiator cap.
17. Run engine and warm it up sufficiently.
18. Race engine 2 or 3 times under no-load.
19. Stop engine and cool it down, then add coolant as necessary.



SMA803A

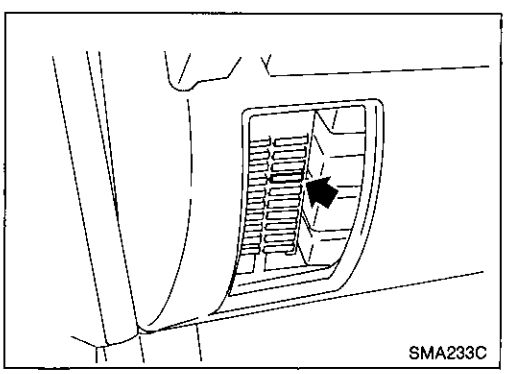
Checking Fuel Lines

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.



SMA804A

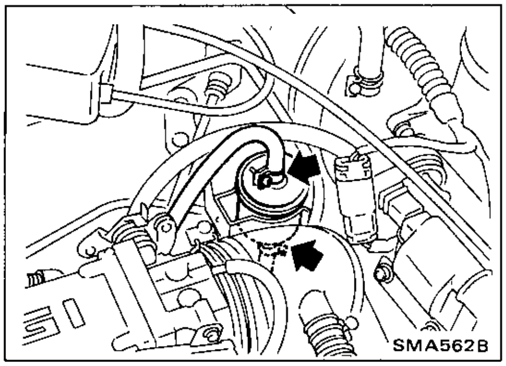
CAUTION:
Tighten high-pressure rubber hose clamp so that clamp end is 3 mm (0.12 in) from hose end.
Ensure that screw does not contact adjacent parts.


SMA233C

Changing Fuel Filter

WARNING:
Before removing fuel filter, release fuel pressure from fuel line.
1. Remove fuse for fuel pump.
2. Start engine.
3. After engine stalls, crank engine two or three times to make sure that fuel pressure is released.
4. Turn ignition switch off and install fuse for fuel pump.

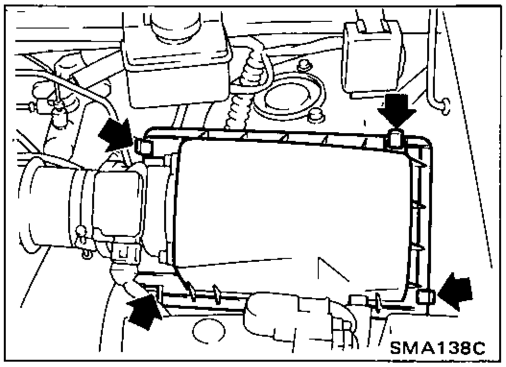
Changing Fuel Filter (Cont'd)



5. Loosen fuel hose clamps.
6. Replace fuel filter.

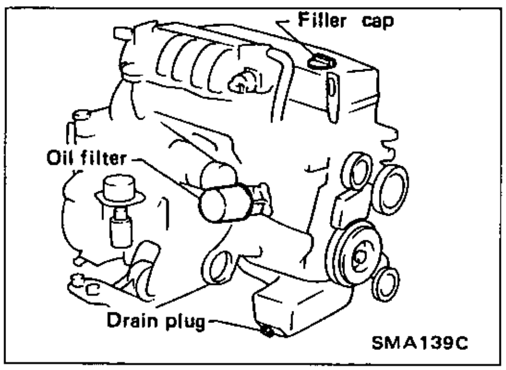
- **Use a high-pressure type fuel filter. Do not use a synthetic resinous fuel filter.**
- **When tightening fuel hose clamps, refer to "Checking Fuel Lines".**

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.
3. Drain oil and refill with new engine oil.

Oil grade: API SG
Viscosity:
See "RECOMMENDED FLUIDS AND LUBRICANTS" in MA section.
Refill oil capacity (Approximately):

Unit: liter (US qt, Imp qt)

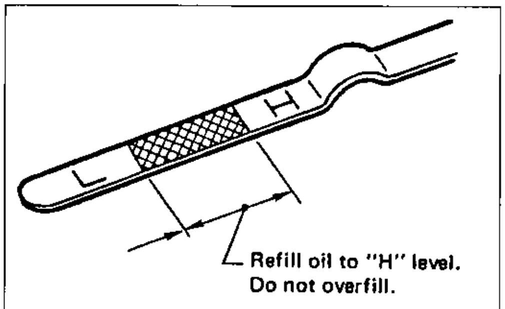
With oil filter change	3.5 (3-3/4, 3-1/8)
Without oil filter change	3.2 (3-3/8, 2-7/8)

CAUTION:

- **Be sure to clean drain plug and install with new washer.**
  Drain plug:
  : 29 - 39 N·m
  (3.0 - 4.0 kg-m, 22 - 29 ft-lb)

The refill capacity changes depending on the oil temperature and drain time, use these values as a reference and be certain to check with the dipstick when changing the oil.

Changing Engine Oil (Cont'd)



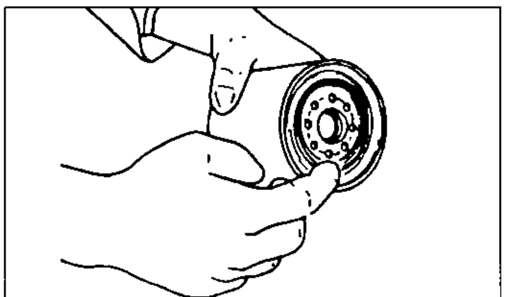
SMA042C

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, check oil level.

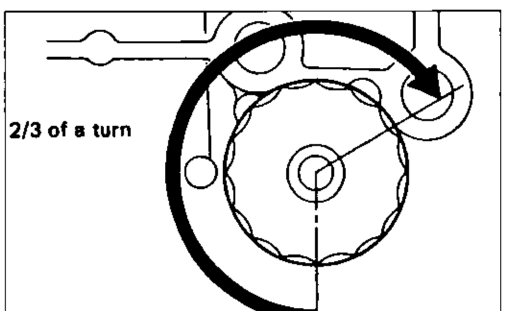
Changing Oil Filter

1. Remove oil filter with a suitable tool.

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


SMA010

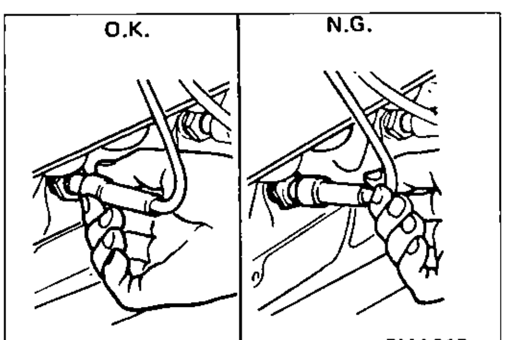
2. Before installing new oil filter, clean the oil filter mounting surface on cylinder block, and coat the rubber seal of oil filter with a little engine oil.



SMA229B

3. Screw in the oil filter until a slight resistance is felt, then tighten additionally more than 2/3 turn.
4. Add engine oil.

Refer to Changing Engine Oil.

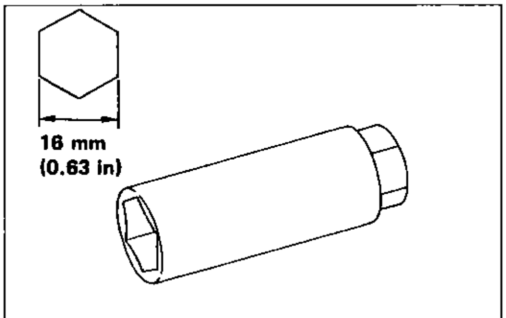


SMA017

Changing Spark Plugs

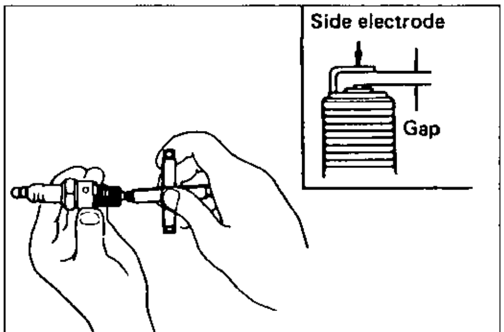
1. Disconnect ignition wires from spark plugs at boot.
   Do not pull on the wire.

Changing Spark Plugs (Cont'd)



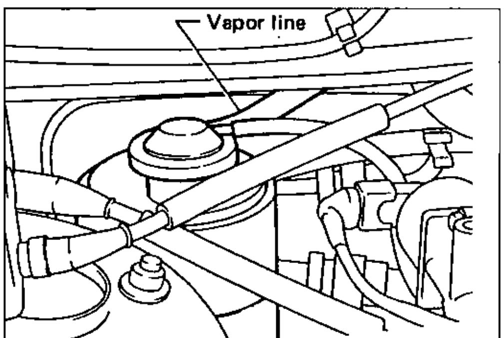
SEM294A

2. Remove spark plugs with spark plug wrench.
   Spark plug:
   Standard type
   ZFR5E-11
   Hot type
   ZFR4E-11
   Cold type
   ZFR6E-11



SMA476

3. Check plug gap of each new spark plug.
   Gap: 1.0 - 1.1 mm (0.039 - 0.043 in)
4. Install spark plugs. Reconnect ignition wires according to nos. indicated on them.
   Spark plug:
   : 20 - 29 N·m
   (2.0 - 3.0 kg-m, 14 - 22 ft-lb)

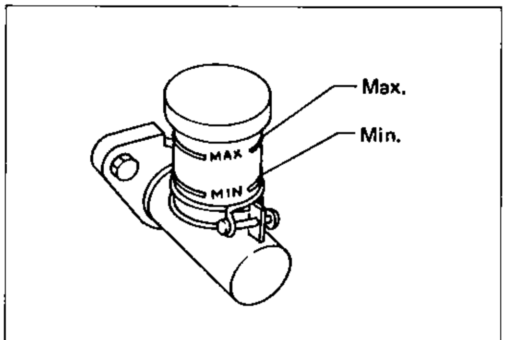


SMA140C

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.

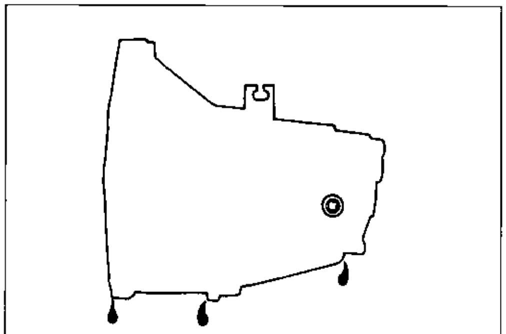
Refer to EVAPORATIVE EMISSION CONTROL SYSTEM INSPECTION in EF & EC section.



SMA941B

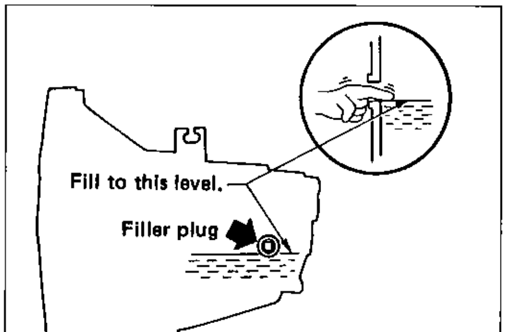
Checking Clutch Fluid Level and Leaks

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


SMA065C

Checking M/T Oil

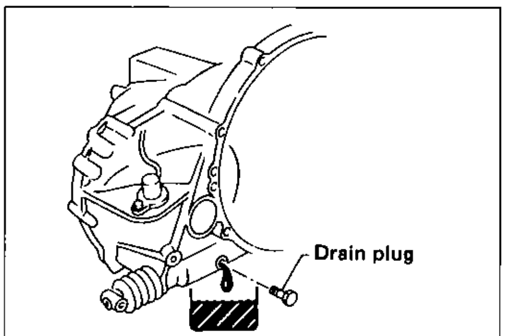
1. Check for oil leaks.



SMA066C

2. Check oil level.

Never start engine while checking oil level.

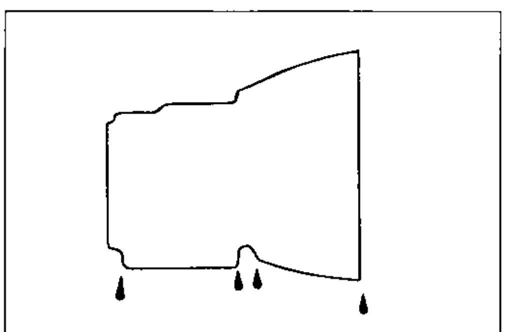


SMA067C

Changing M/T Oil

Oil capacity:

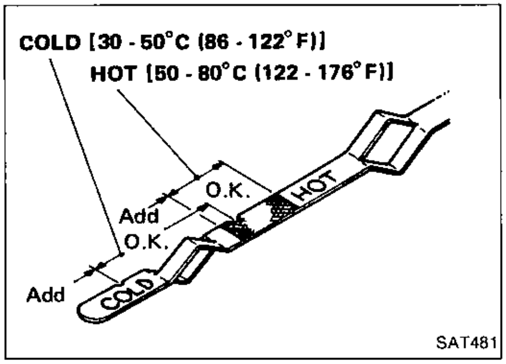
4.7 liters (10 US pt, 8-1/4 Imp pt)


SMA146B

Checking A/T Fluid Level

1. Check for fluid leakage.

Checking A/T Fluid Level (Cont'd)



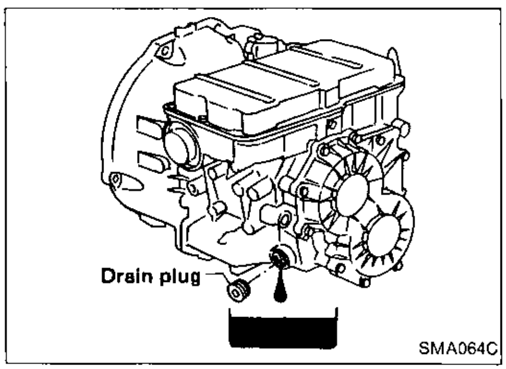
SAT481

2. 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) Re-insert 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.


Check fluid for contamination.
SMA853B

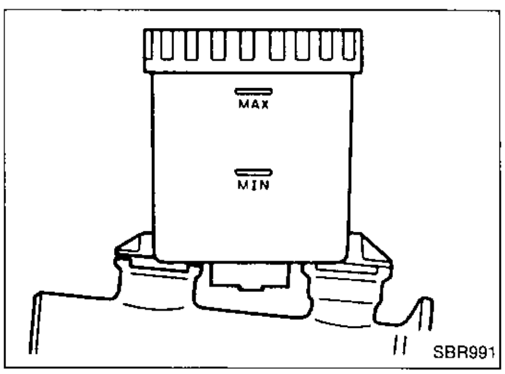
3. Check fluid condition.
   Check fluid for contamination. If fluid is very dark or smells burned, or contains frictional material (clutches, band, etc.), check operation of A/T.
   Refer to section AT for checking operation of A/T.



SMA064C

Changing A/T Fluid

Oil capacity (With torque converter):
7.4 liters (7-7/8 US qt, 6-1/2 Imp qt)



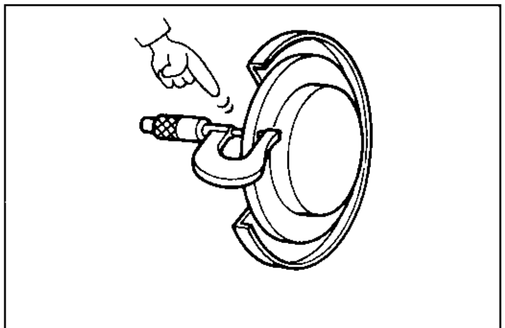
SBR991

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.



SMA260A

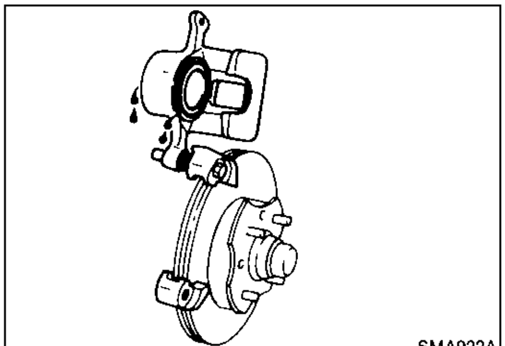
Checking Disc Brake

ROTOR

Check condition and thickness.

Unit: mm (in)

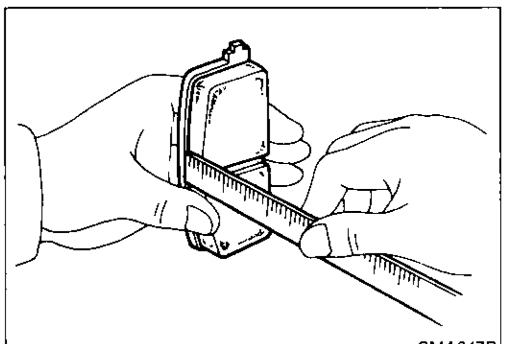
	CL25VA	CL9H
Standard	22.0 (0.866)	10.0 (0.394)
Minimum	20.0 (0.787)	9.0 (0.354)



SMA922A

CALIPER

Check operation and for leakage.



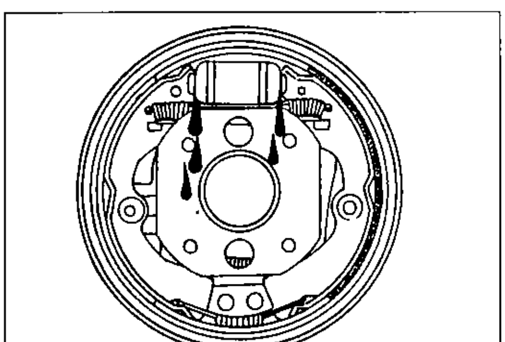
SMA847B

PAD

Check for wear or damage.

Unit: mm (in)

	CL25VA	CL9H
Standard	11.0 (0.433)	9.0 (0.354)
Minimum	2.0 (0.079)	2.0 (0.079)



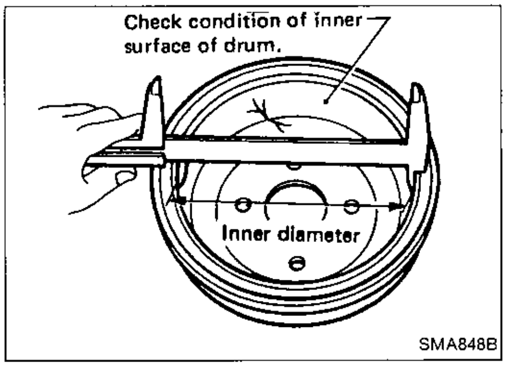
SBR205A

Checking Drum Brake

WHEEL CYLINDER

Check operation and for leakage.

Checking Drum Brake (Cont'd)

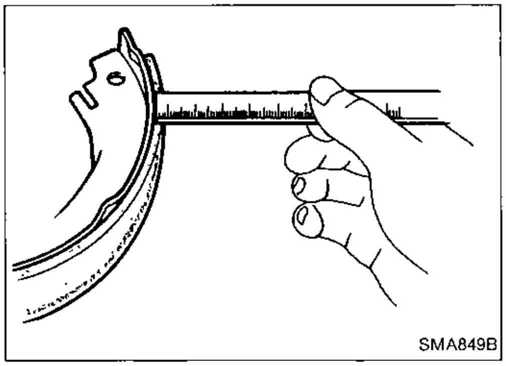


SMA848B

DRUM

Check condition of inner surface.

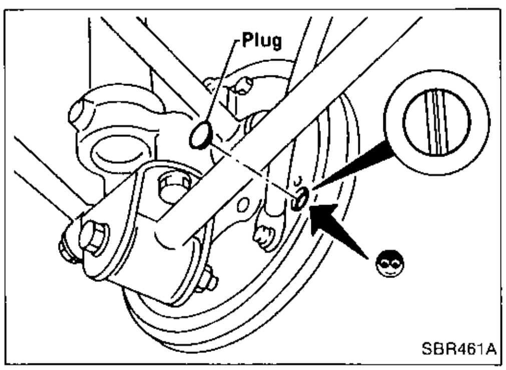
Standard inner diameter:
228.6 mm (9 in)
Maximum diameter:
230.0 mm (9.06 in)


SMA849B

LINING

Check for wear or damage.

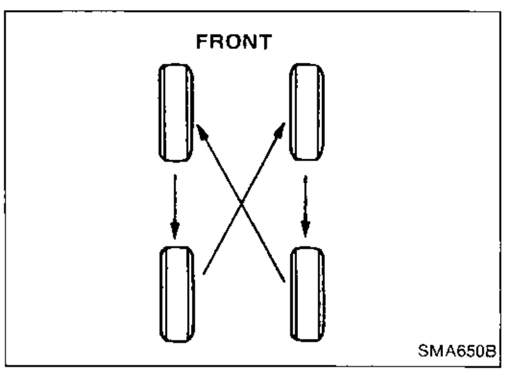
Standard thickness:
4.5 mm (0.177 in)
Minimum thickness:
1.5 mm (0.059 in)



SBR461A

TEMPORARY METHOD FOR CHECKING LINING WEAR

Remove inspection hole plug and check for lining wear.



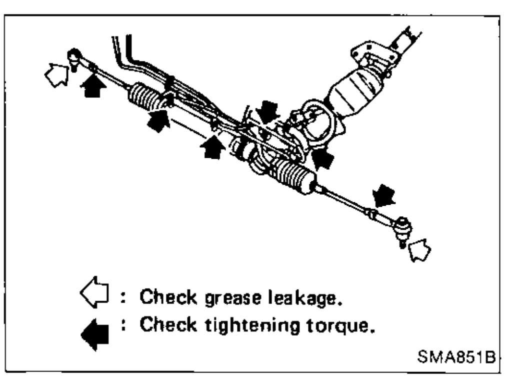
SMA650B

Balancing Wheels

- Adjust wheel balance using road wheel center.
  Wheel balance (Maximum allowable unbalance):
  Refer to S.D.S.

Tire Rotation

- **Do not include the T-type spare tire when rotating the tires.**
  Wheel nuts:
  : 98 - 118 N·m
  (10.0 - 12.0 kg-m, 72 - 87 ft-lb)



SMA851B

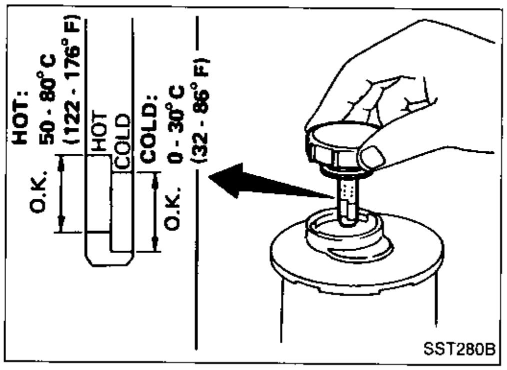
Checking Steering Gear and Linkage

STEERING GEAR

- Check gear housing and boots for looseness, damage or grease 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.



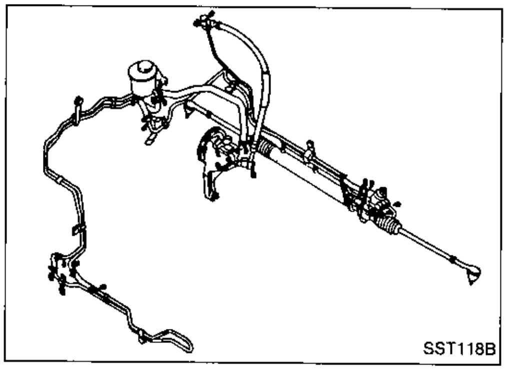
SST280B

Checking Power Steering Fluid and Lines

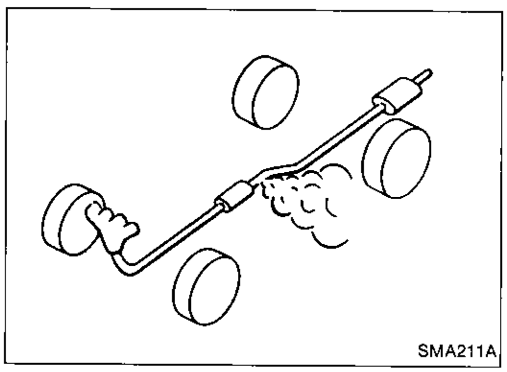
Check fluid level.
Fluid level should be checked using "HOT" range on dipstick at fluid temperatures of 50 to 80°C (122 to 176°F) or using "COLD" range on dipstick at fluid temperatures of 0 to 30°C (32 to 86°F).

CAUTION:

- **Do not overfill.**
- **Recommended fluid is Automatic Transmission Fluid "DEXRON™" type.**


SST118B

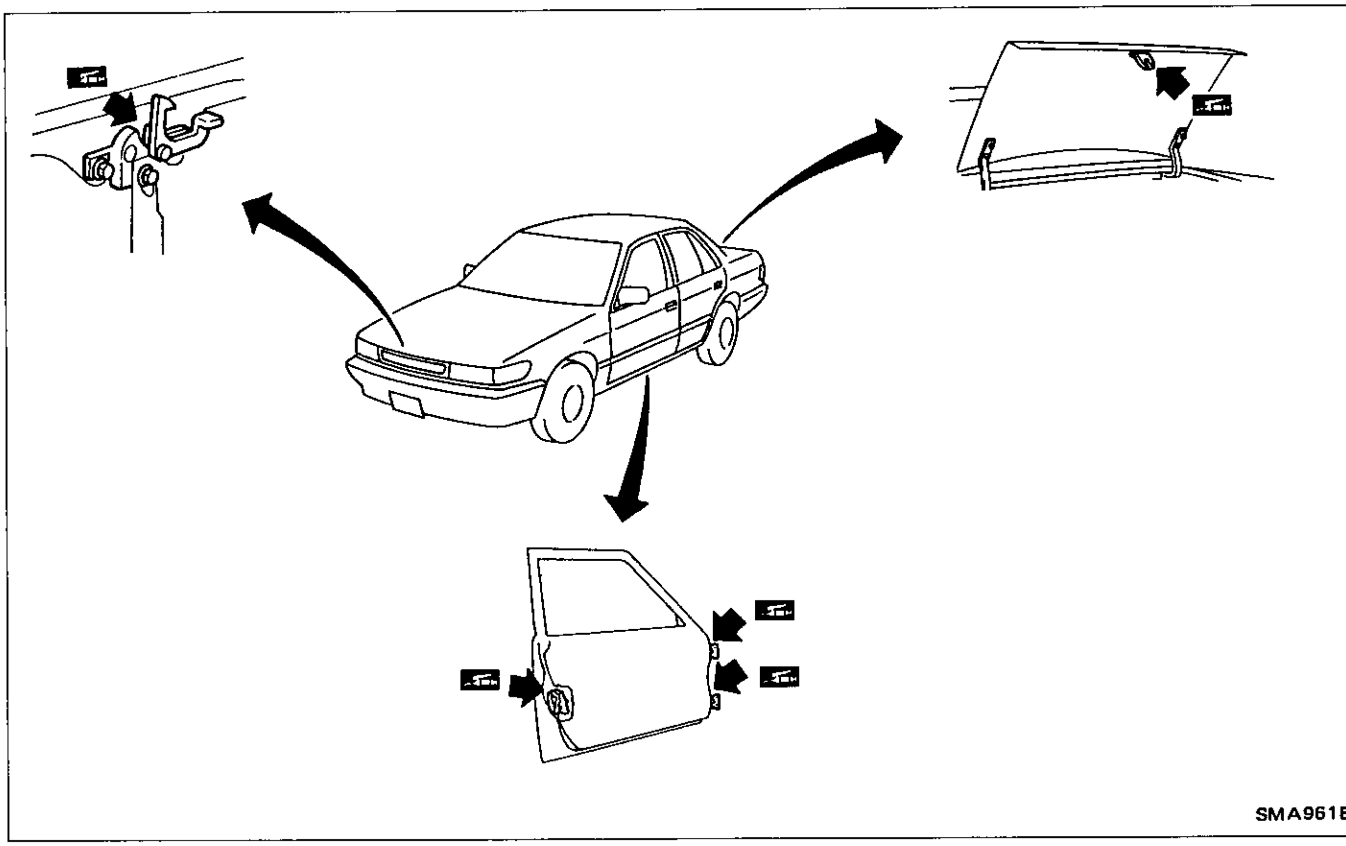
- Check lines for improper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.


SMA211A

Checking Exhaust System

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

Lubricating Locks, Hinges and Hood Latches



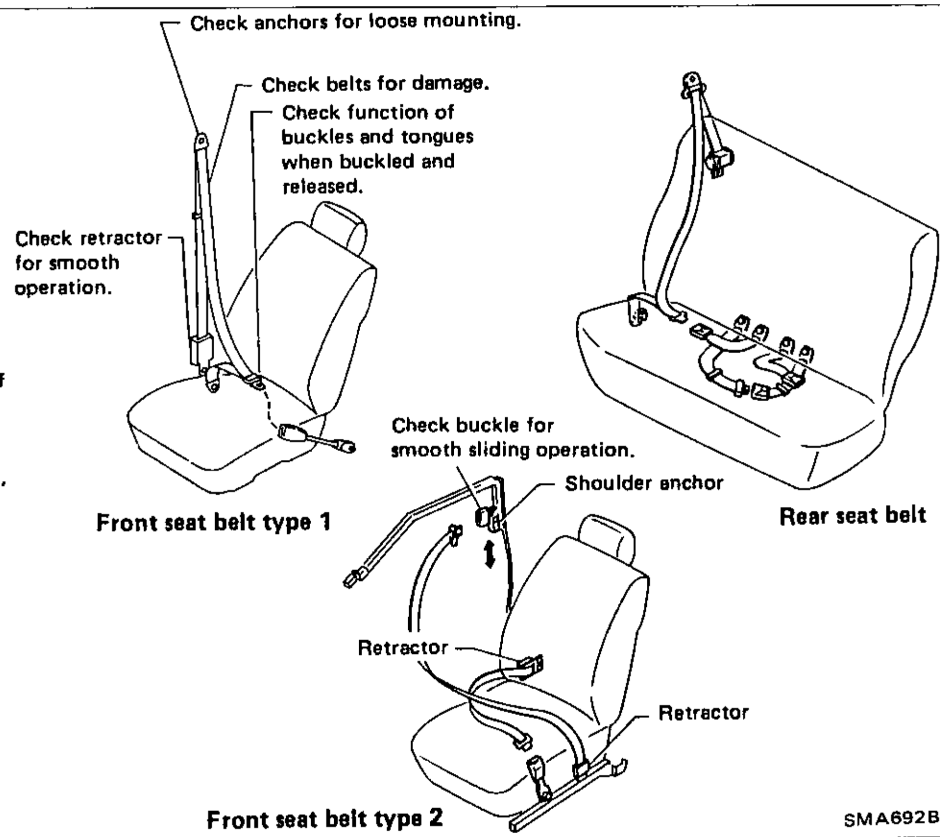
Checking Seat Belts, Buckles, Retractors, Anchors and Adjusters

CAUTION:

1. **All seat belt assemblies, including retractors and attaching hardwares 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)

For automatic seat belt details, refer to BF section.



Engine Maintenance

INSPECTION AND ADJUSTMENT

Drive belt deflection

Unit: mm (in)

	Used belt deflection		Deflection of new belt
	Limit	Deflection after adjustment	
Alternator Power steering oil pump	8 (0.31)	6 - 7 (0.24 - 0.28)	5 - 6 (0.20 - 0.24)
Air conditioner compressor	8 (0.31)	5 - 6 (0.20 - 0.24)	4 - 5 (0.16 - 0.20)
Applied pushing force	98 N (10 kg, 22 lb)		

Oil capacity (Refill)

Unit: ℓ (US qt, Imp qt)

With oil filter	3.5 (3-3/4, 3-1/8)
Without oil filter	3.2 (3-3/8, 2-7/8)

Oil capacity

Unit: ℓ (US qt, Imp qt)

With reservoir tank	7.4 (7-7/8, 6-1/2)

Spark plug

Standard type	ZFR5E-11
Hot type	ZFR4E-11
Cold type	ZFR6E-11
Plug gap	1.0 - 1.1 mm (0.039 - 0.043 in)

Ignition wire

Resistance	kΩ/m (kΩ/ft)	Less than 30 (9.1)

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Spark plug	20 - 29	2.0 - 3.0	14 - 22
Drain plug			
Engine block	34 - 44	3.5 - 4.5	25 - 33
Oil pan	29 - 39	3.0 - 4.0	22 - 29

Chassis and Body Maintenance

INSPECTION AND ADJUSTMENT

Clutch

Unit: mm (in)

Pedal free height	163 - 173 (6.42 - 6.81)
Pedal free play	1 - 3 (0.04 - 0.12)

Front axle and front suspension (Unladen)*

Chamber	degree	–30′ to 1°00′
Caster	degree	35′ - 2°05′
Kingpin inclination	degree	13°45′ - 15°15′
Toe-in		
A — B	mm (in)	1 - 3 (0.04 - 0.12)
Total angle 2θ	degree	6′ - 18′
Front wheel turning angle		
Full turn Inside/outside	degree	34° - 38°/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°20′ to 10′
Toe-in		
A – B	mm (in)	–4 to 0 (–0.16 to 0)
Total angle 2θ	degree	–23′ to 0′

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

Brake

Disc brake mm (in)	
Pad	
Standard thickness	
CL25VA	11.0 (0.433)
CL9H	9.0 (0.354)
Minimum thickness	
CL25VA	2.0 (0.079)
CL9H	2.0 (0.079)
Rotor	
Standard thickness	
CL25VA	22.0 (0.866)
CL9H	10.0 (0.394)
Minimum thickness	
CL25VA	20.0 (0.787)
CL9H	9.0 (0.354)

Drum brake mm (in)	
Lining	
Standard thickness	4.5 (0.177)
Minimum thickness	1.5 (0.059)
Drum	
Standard diameter	228.6 (9)
Maximum diameter	230.0 (9.06)

Wheel balance

Maximum allowable unbalance	Dynamic (at rim flange) g (oz)	10 (0.35) (One side)
	Static g (oz)	20 (0.71)

Wheel bearing

	Front	Rear
Wheel bearing axle end play mm (in)	0.05 (0.0020) or less	
Wheel bearing lock nut Tightening torque N·m (kg-m, ft-lb)	235 - 314 (24 - 32, 174 - 231)	186 - 255 (19 - 26, 137 - 188)

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Clutch			
Pedal stopper lock nut	16 - 22	1.6 - 2.2	12 - 16
Clutch switch lock nut	12 - 15	1.2 - 1.5	9 - 11
Manual transaxle			
Filler plug	25 - 34	2.5 - 3.5	18 - 25
Drain plug	20 - 29	2.0 - 3.0	14 - 22
Automatic transaxle			
Drain plug	25 - 34	2.5 - 3.5	18 - 25
Front axle and front suspension			
Tie-rod lock nut	37 - 46	3.8 - 4.7	27 - 34
Rear axle and rear suspension			
Toe adjusting lock nut	78 - 98	8.0 - 10.0	58 - 72
Brake system			
Air bleed valve	7 - 9	0.7 - 0.9	5.1 - 6.5
Wheel and tire			
Wheel nut	98 - 118	10 - 12	72 - 87

ENGINE MECHANICAL

SECTION EM

EM

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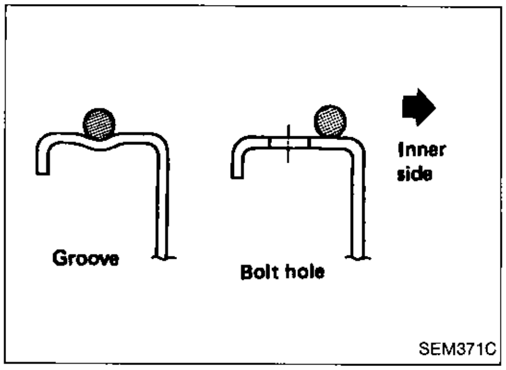
OIL SEAL REPLACEMENT EM-14
CYLINDER HEAD EM-16
ENGINE REMOVAL EM-29
CYLINDER BLOCK EM-31
SERVICE DATA AND SPECIFICATIONS (S.D.S.) EM-43



Liquid Gasket Application Procedure

a. Before applying liquid gasket, use a scraper to remove all traces of old liquid gasket from mating surfaces and grooves, and then completely clean any oil stains from these portions.

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).**

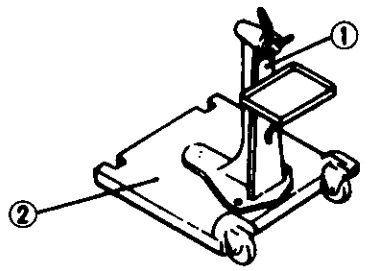
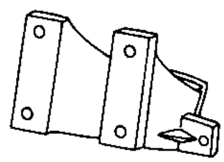
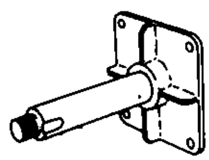
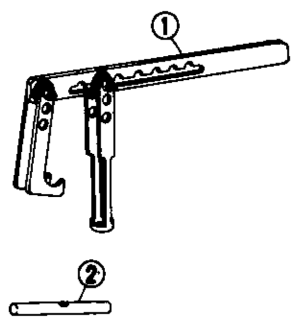
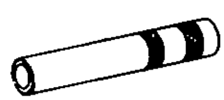
c. Apply liquid gasket to inner surface around hole perimeter area.
(Assembly should be done within 5 minutes after coating.)

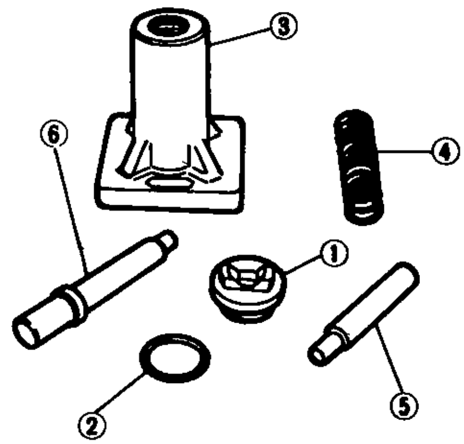
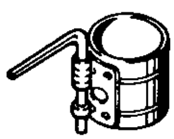
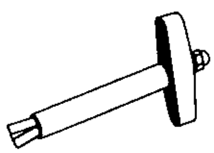
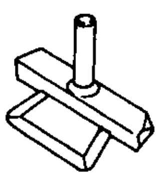
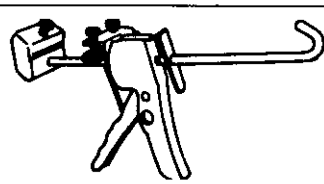
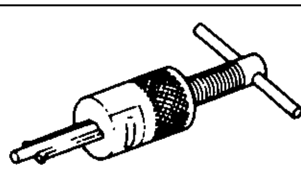
d. Wait at least 30 minutes before refilling engine oil and engine coolant.

Parts Requiring Angular Tightening

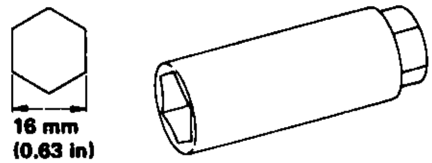
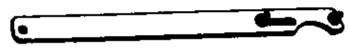
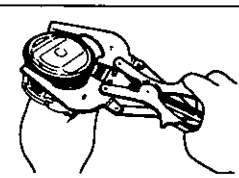
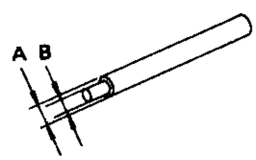
- Some important engine parts are tightened using an angular-tightening method rather than a torque setting method.
- If these parts are tightened using a torque setting method, dispersal of the tightening force (axial bolt force) will be two or three times that of the dispersal produced by using the 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 bearing cap nuts

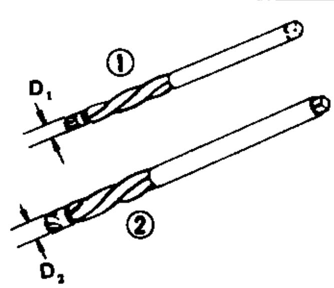
SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.) Tool name	Description	
ST0501S000 (—) Engine stand assembly ① ST05011000 (—) Engine stand ② ST05012000 (—) Base		Disassembling and assembling
KV10114300 (—) Engine sub-attachment		
KV101065001 (—) Engine stand shaft		
KV101092S0 (—) Valve spring compressor ① KV10109210 (—) Compressor ② KV10109220 (—) Adapter		Disassembling and assembling valve components
KV109B0010 (—) Valve oil seal drift		Installing valve oil seal

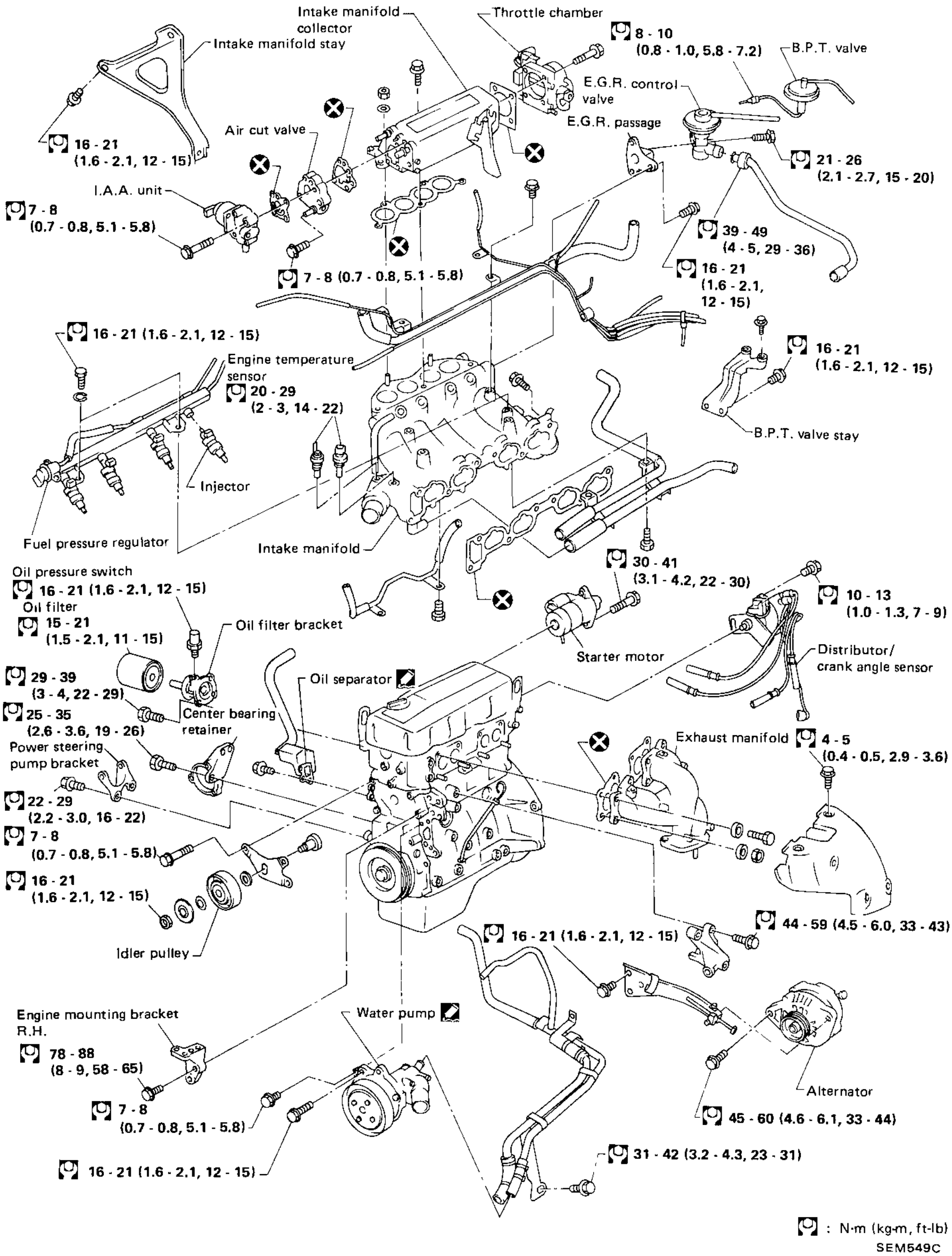
Tool number (Kent-Moore No.) Tool name	Description
KV10110300 (—) Piston pin press stand assembly ① KV10110310 (—) Cap ② KV10110330 (—) Spacer ③ ST13030020 (—) Press stand ④ ST13030030 (—) Spring ⑤ KV10110340 (—) Drift ⑥ KV10110320 (—) Center shaft	 Disassembling and assembling piston with connecting rod
EM03470000 (J8037) Piston ring compressor	 Installing piston assembly into cylinder bore
(J36467) Valve oil seal remover	 Displacement valve oil seal
KV10111100 (—) Seal cutter	 Removing oil pan
WS39930000 (—) Tube presser	 Pressing the tube of liquid gasket
ST16610001 (J23907) Pilot bushing puller	

COMMERCIAL SERVICE TOOLS

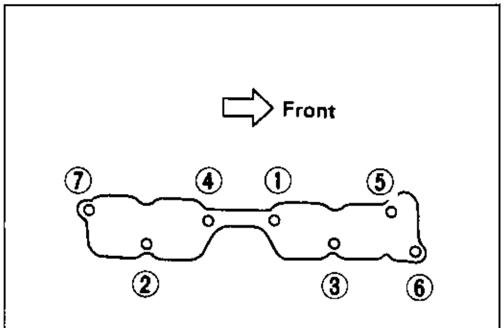
<table>
<tr><th>Tool name</th><th>Description</th><th></th></tr>
<tr><td>Spark plug wrench</td><td>
</td><td>Removing and installing spark plug</td></tr>
<tr><td>Pulley holder</td><td></td><td>Holding camshaft pulley while tightening or loosening camshaft bolt</td></tr>
<tr><td>Valve seat cutter set</td><td></td><td>Finishing valve seat dimensions</td></tr>
<tr><td>Piston ring expander</td><td></td><td>Removing and installing piston ring</td></tr>
<tr><td>Valve guide drift</td><td>
</td><td>Removing and installing valve guide

Diameter: mm (in)
<table>
<tr><th></th><th>Intake</th><th>Exhaust</th></tr>
<tr><td>A</td><td>10.5 (0.413)</td><td>11.5 (0.453)</td></tr>
<tr><td>B</td><td>6.6 (0.260)</td><td>7.6 (0.299)</td></tr>
</table></td></tr>
<tr><td>Valve guide reamer</td><td>
</td><td>Reaming valve guide (①) or hole for oversize valve guide (②)

Diameter: mm (in)
<table>
<tr><th></th><th>Intake</th><th>Exhaust</th></tr>
<tr><td>D_1</td><td>7 (0.28)</td><td>8 (0.31)</td></tr>
<tr><td>D_2</td><td>11.2 (0.441)</td><td>12.2 (0.480)</td></tr>
</table></td></tr>
</table>


Intake manifold collector
Throttle chamber
Intake manifold stay
8 - 10 (0.8 - 1.0, 5.8 - 7.2)
B.P.T. valve
E.G.R. control valve
E.G.R. passage
Air cut valve
16 - 21 (1.6 - 2.1, 12 - 15)
21 - 26 (2.1 - 2.7, 15 - 20)
I.A.A. unit
7 - 8 (0.7 - 0.8, 5.1 - 5.8)
39 - 49 (4 - 5, 29 - 36)
16 - 21 (1.6 - 2.1, 12 - 15)
7 - 8 (0.7 - 0.8, 5.1 - 5.8)
16 - 21 (1.6 - 2.1, 12 - 15)
Engine temperature sensor
20 - 29 (2 - 3, 14 - 22)
16 - 21 (1.6 - 2.1, 12 - 15)
B.P.T. valve stay
Injector
Fuel pressure regulator
Intake manifold
30 - 41 (3.1 - 4.2, 22 - 30)
Oil pressure switch
16 - 21 (1.6 - 2.1, 12 - 15)
Oil filter
15 - 21 (1.5 - 2.1, 11 - 15)
Oil filter bracket
10 - 13 (1.0 - 1.3, 7 - 9)
Starter motor
Distributor/ crank angle sensor
29 - 39 (3 - 4, 22 - 29)
Oil separator
25 - 35 (2.6 - 3.6, 19 - 26)
Center bearing retainer
Power steering pump bracket
Exhaust manifold
4 - 5 (0.4 - 0.5, 2.9 - 3.6)
22 - 29 (2.2 - 3.0, 16 - 22)
7 - 8 (0.7 - 0.8, 5.1 - 5.8)
16 - 21 (1.6 - 2.1, 12 - 15)
44 - 59 (4.5 - 6.0, 33 - 43)
16 - 21 (1.6 - 2.1, 12 - 15)
Idler pulley
Engine mounting bracket R.H.
Water pump
78 - 88 (8 - 9, 58 - 65)
Alternator
7 - 8 (0.7 - 0.8, 5.1 - 5.8)
45 - 60 (4.6 - 6.1, 33 - 44)
31 - 42 (3.2 - 4.3, 23 - 31)
16 - 21 (1.6 - 2.1, 12 - 15)
: N·m (kg-m, ft-lb)
SEM549C

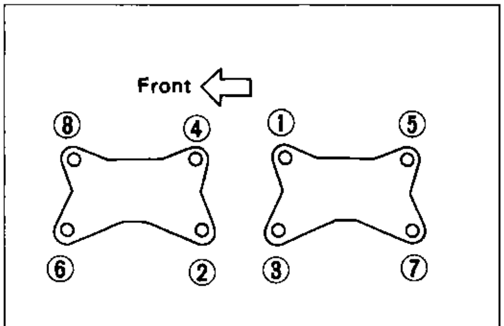
Tightening Procedure of each Part



SEM593C

INTAKE MANIFOLD

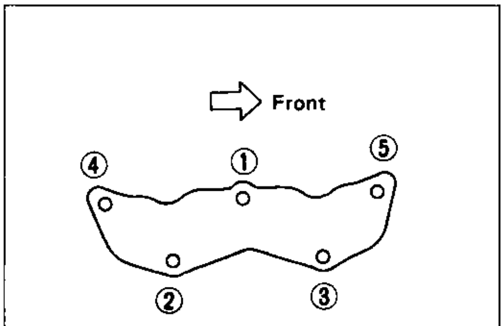
: 16 - 21 N·m (1.6 - 2.1 kg-m, 12 - 15 ft-lb)



SEM594C

EXHAUST MANIFOLD

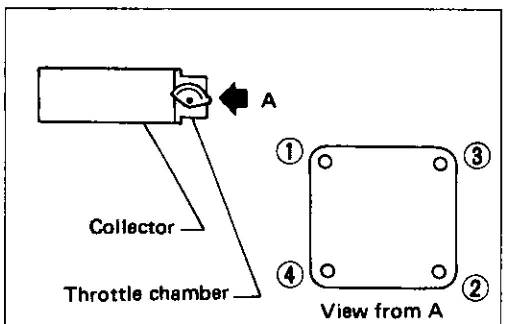
: 16 - 21 N·m (1.6 - 2.1 kg-m, 12 - 15 ft-lb)



SEM595C

INTAKE MANIFOLD COLLECTOR

: 16 - 21 N·m (1.6 - 2.1 kg-m, 12 - 15 ft-lb)



SEM596C

THROTTLE CHAMBER

: Bolts should be tightened twice.

1st:

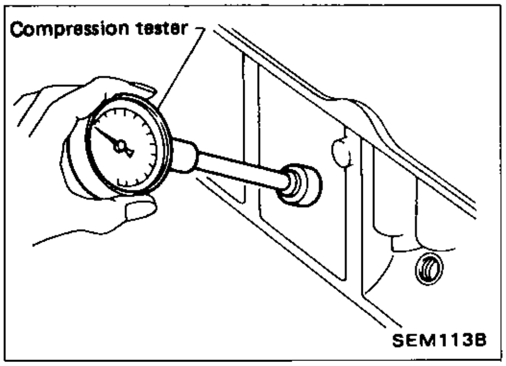
9 - 11 N·m (0.9 - 1.1 kg-m, 6.5 - 8.0 ft-lb)

2nd:

18 - 22 N·m (1.8 - 2.2 kg-m, 13 - 16 ft-lb)

Measurement of Compression Pressure

1. Warm up engine.
2. Turn ignition switch off.
3. Disconnect fusible link for injectors.
4. Remove all spark plugs.
5. Disconnect distributor center cable.



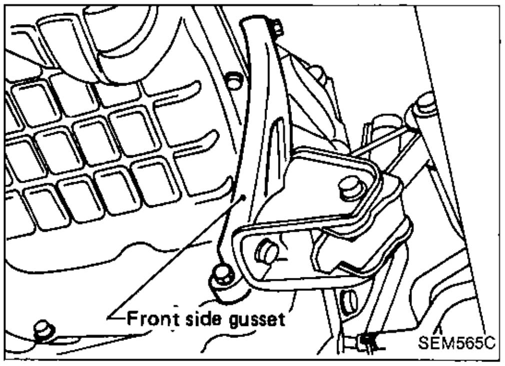
6. Attach a compression tester to No. 1 cylinder.
7. Depress accelerator pedal fully to keep throttle valve wide open.
8. Crank engine and record highest gauge indication.
9. Repeat the measurement on each cylinder as shown above.

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

  Compression pressure:
  kPa (kg/cm^2, psi)/rpm
  Standard
  1,206 (12.3, 175)/250
  Minimum
  1,010 (10.3, 146)/250
  Difference limit between cylinders
  98 (1.0, 14)/250

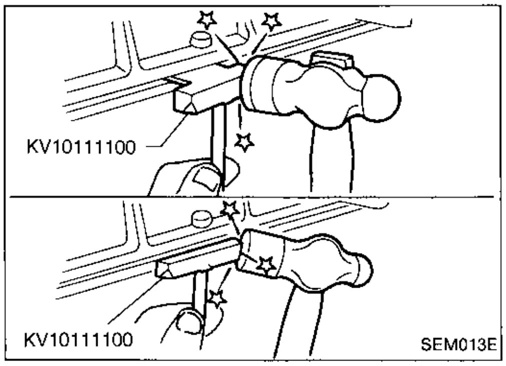
10. If cylinder compression in one or more cylinders is low, pour a small amount of engine oil into cylinders through spark plug holes and retest compression.

- **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 valve and valve seat. (Refer to S.D.S.) If valve or valve seat is damaged excessively, replace them.**
- **If compression in any two adjacent cylinders is low and if adding oil does not help compression, there is leakage past the gasket surface. If so, replace cylinder head gasket.**



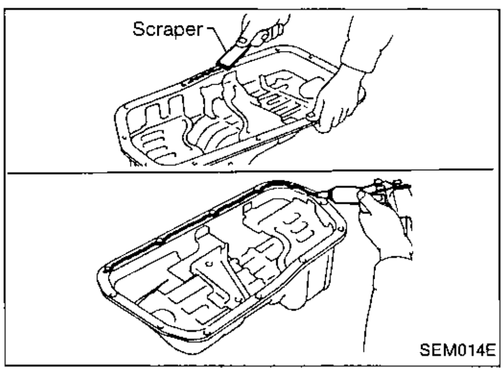
Removal

1. Remove the following parts:
- Front exhaust tube
- Front side gusset
- Center member (2WD model)
2. Remove oil pan bolts.



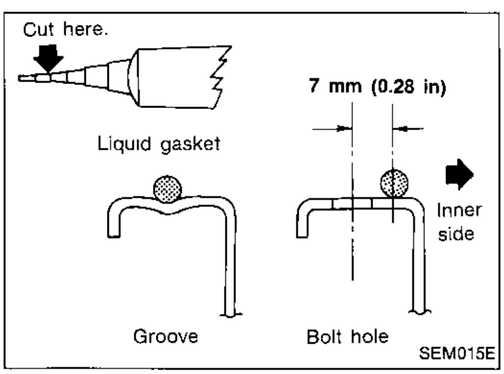
3. Remove oil pan.
(1) Insert Tool between cylinder block and oil pan.
- **Do not drive seal cutter into oil pump or rear oil seal retainer portion, or aluminum mating face will be damaged.**
- **Do not insert screwdriver, or oil pan flange will be deformed.**

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

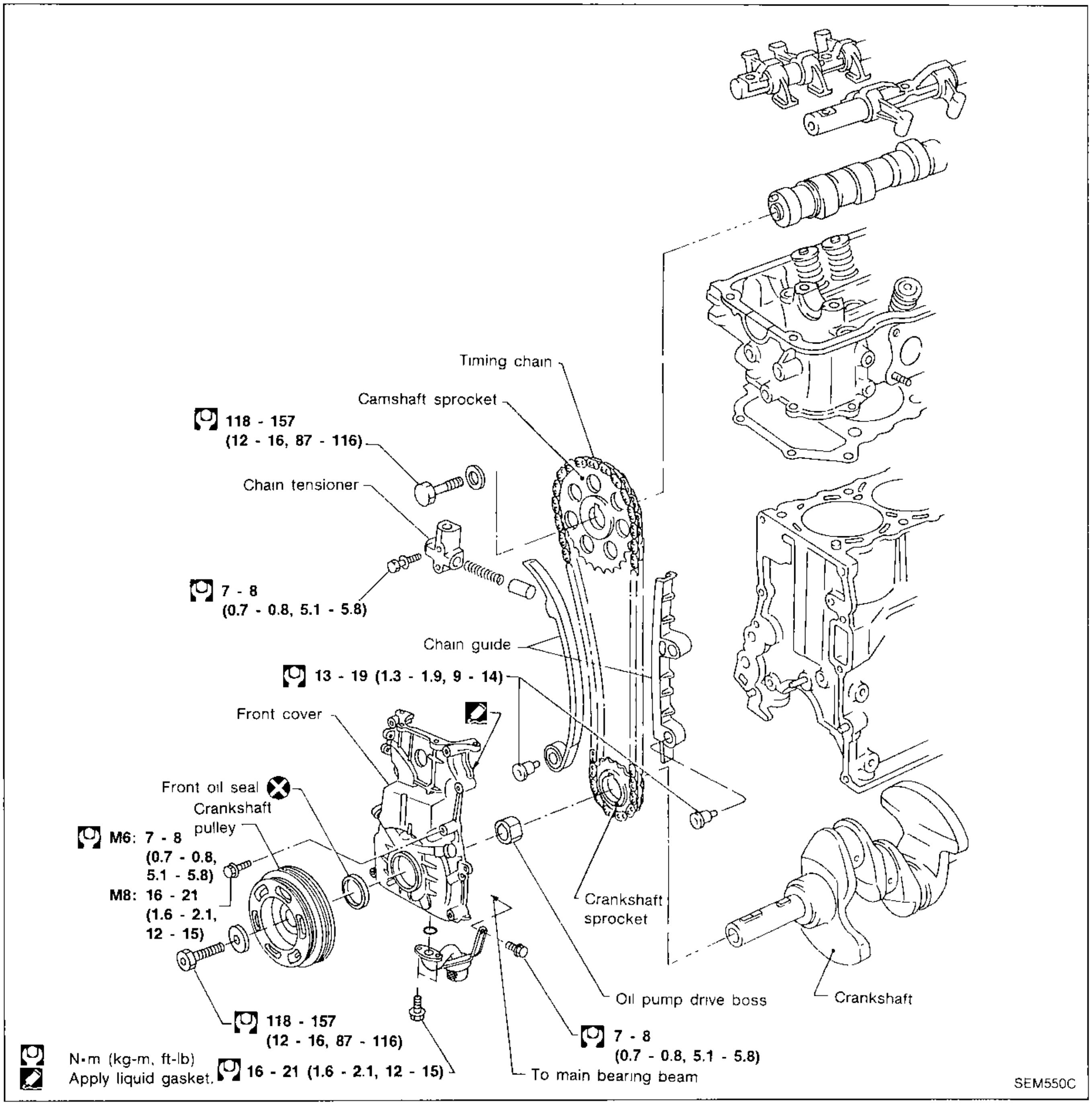


Installation

1. Before installing oil pan, remove all traces of liquid gasket from mating surface using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder block.
2. Apply a continuous bead of liquid gasket to mating surface of oil pan.
- **Use Genuine Liquid Gasket or equivalent.**



- Be sure liquid gasket is 3.5 to 4.5 mm (0.138 to 0.177 in) wide.
3. Apply liquid gasket to inner sealing surface as shown in figure.
- Attaching should be done within 5 minutes after coating.
4. Install oil pan.
- **Wait at least 30 minutes before refilling engine oil.**



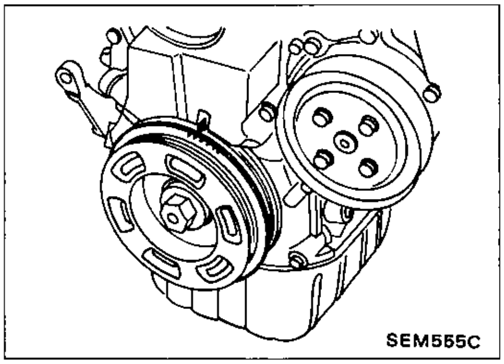
CAUTION:

- **After removing timing chain, do not turn crankshaft and camshaft separately, or valves will strike piston heads.**

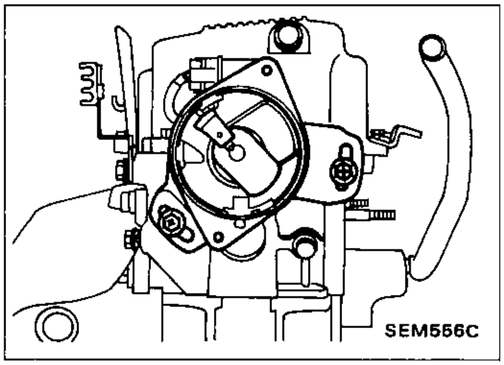
Removal

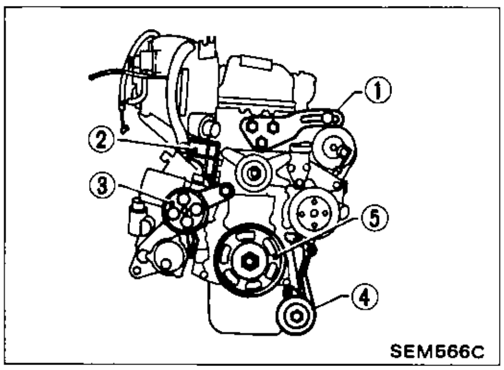
1. Place wheel chocks at both front and back of rear wheels.
2. Place safety stands under designated front supporting points. Remove front right side wheel.
3. Remove dust cover and under cover.
4. Drain engine oil.

Removal (Cont'd)



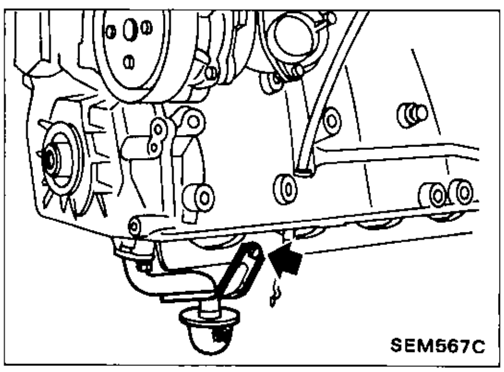
5. Set No. 1 piston at T.D.C. on its compression stroke.



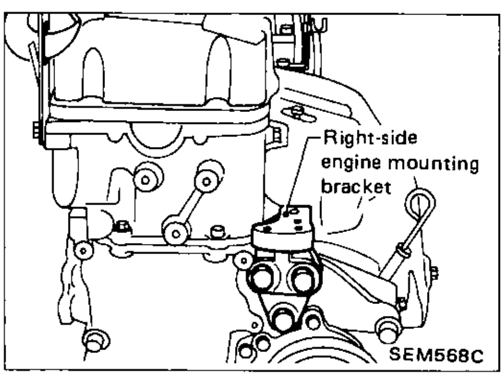


6. Remove the alternator and compressor drive belts.
7. Remove the following parts.

① Alternator and adjusting bar
② Oil separator
③ Power steering pump pulley, pump stay and bracket.
④ Compressor and bracket.
⑤ Crankshaft pulley and oil pump drive boss.

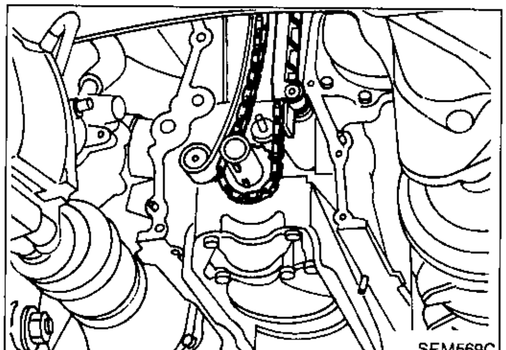


8. Remove oil pan. (Refer to OIL PAN.)
9. Remove oil strainer securing bolt.
10. Remove front cover securing bolts (cover to block and head to cover).



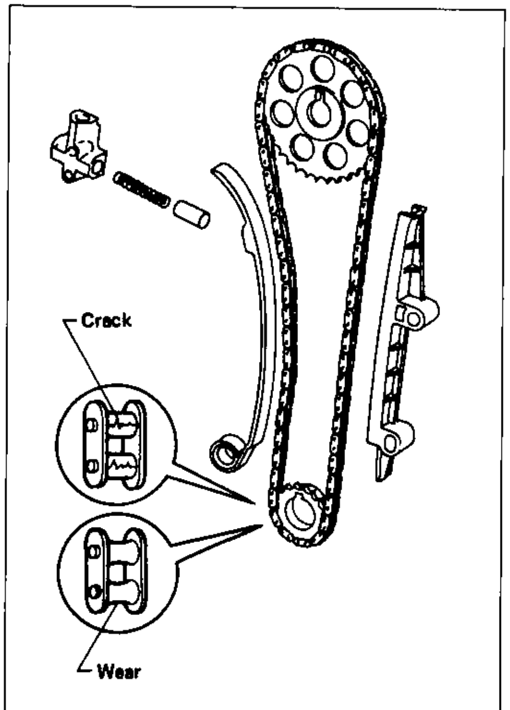
11. Remove rocker cover.
12. Support engine with hoist or chain block.
13. Remove right-side engine mounting bracket and lower the engine.

Removal (Cont'd)



SEM569C

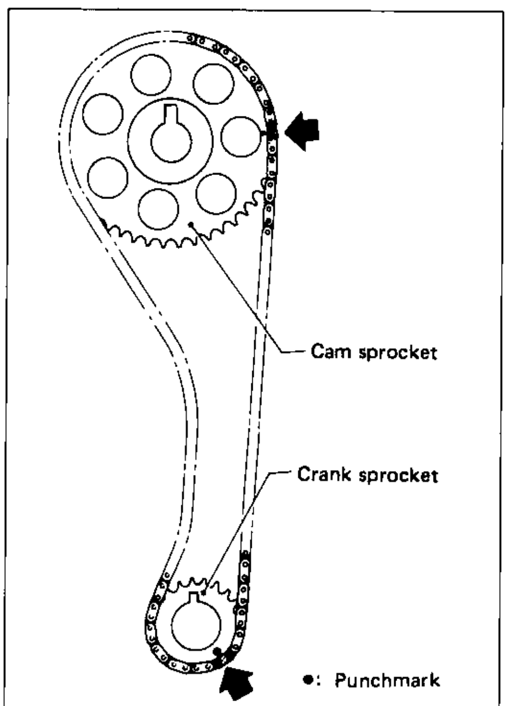
14. Remove front cover.
15. Remove the following parts:
- Chain tensioner
- Chain guides
- Timing chain and sprocket



SEM204C

Inspection

Check for cracks and excessive wear at roller links. Replace if necessary.

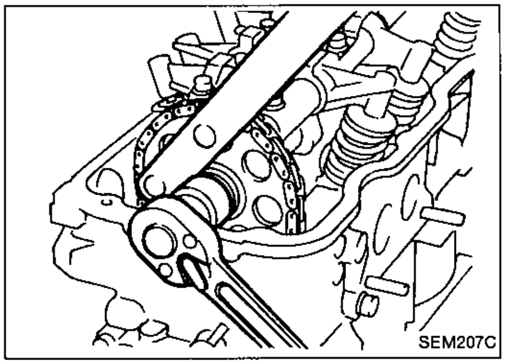


SEM206C

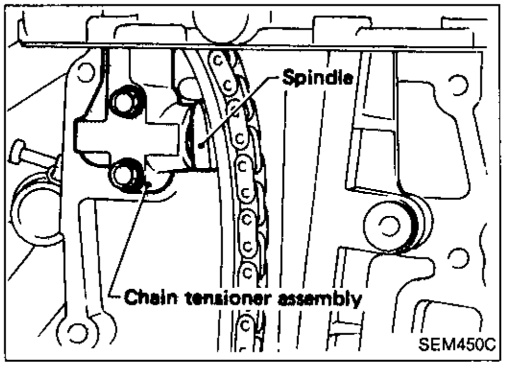
Installation

1. Install crankshaft sprocket.
- **Make sure that mating marks of crankshaft sprocket face engine front.**
2. Install camshaft sprocket.
3. Confirm that No. 1 piston is set at T.D.C. on its compression stroke.
4. Install timing chain.
- **Set timing chain by aligning its mating marks with those of crankshaft sprocket and camshaft sprocket.**

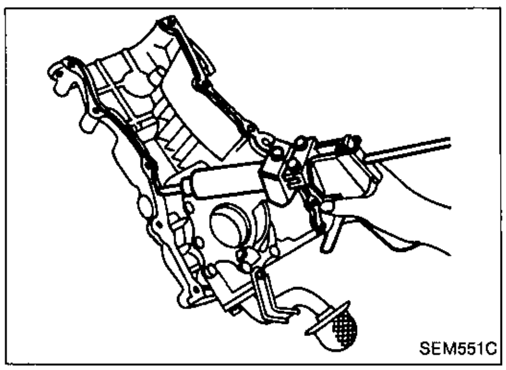
Installation (Cont'd)



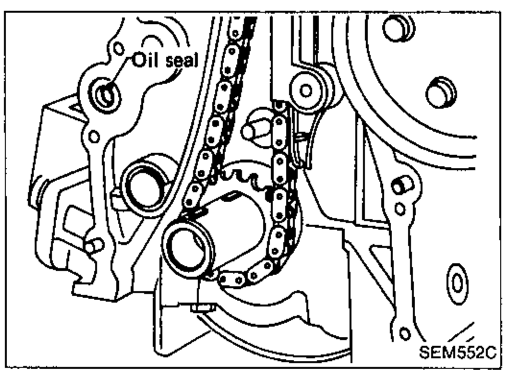
5. Tighten camshaft sprocket bolt.



6. Install chain guide and chain tensioner.



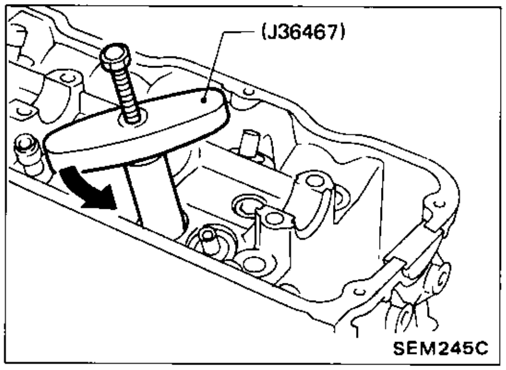
7. Apply liquid gasket to front cover.



8. Install front cover.

- **Be careful not to damage cylinder head gasket.**
- **Do not forget oil seal.**

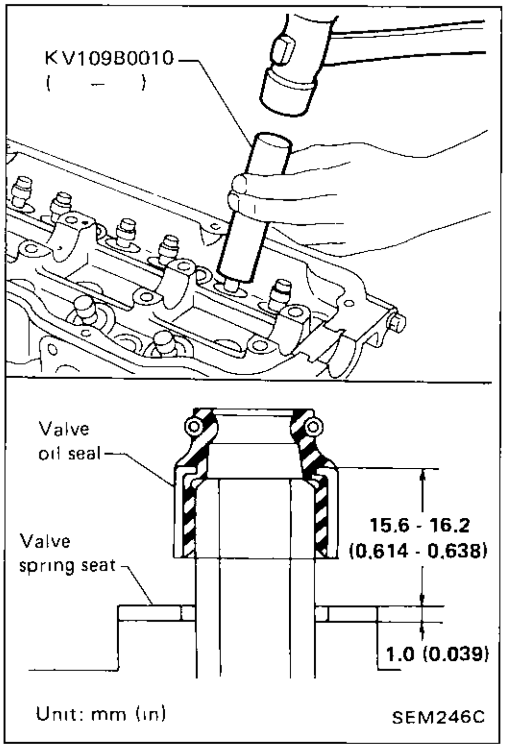
9. Install rubber plug onto cylinder head. (Refer to "Installation" of CYLINDER HEAD.)
10. Install oil pan. (Refer to OIL PAN.)
11. Install engine mounting.
12. Install any parts removed.



VALVE OIL SEAL

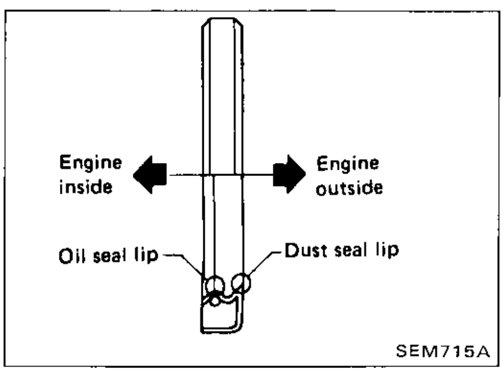
1. Remove rocker cover.
2. Remove rocker shaft assembly.
3. Remove valve spring and valve oil seal with Tool or a suitable tool.

Piston concerned should be set at T.D.C. to prevent valve from falling.

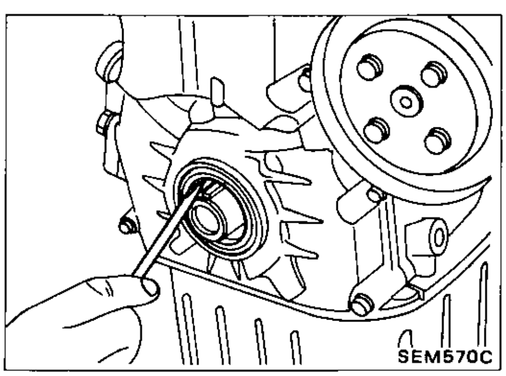


4. Apply engine oil to new valve oil seal and install it with Tool.

Before installing valve oil seal, install valve spring seat.



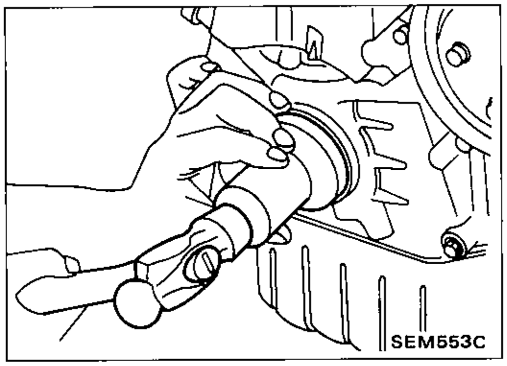
OIL SEAL INSTALLING DIRECTION



FRONT OIL SEAL

1. Remove crankshaft pulley.
2. Remove front oil seal.

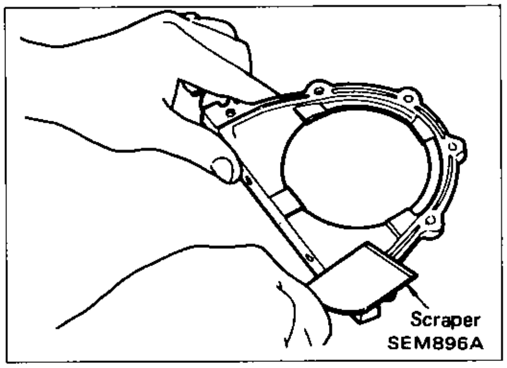
Be careful not to damage crankshaft.



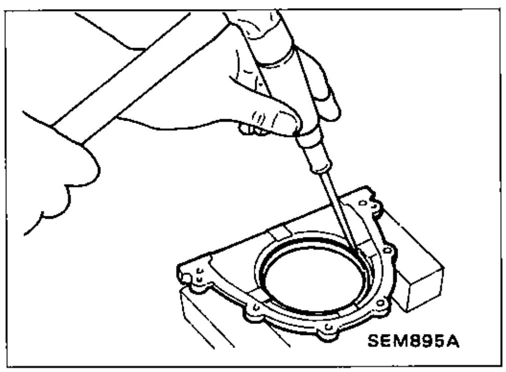
3. Apply engine oil to new oil seal and install it using a suitable tool.

REAR OIL SEAL

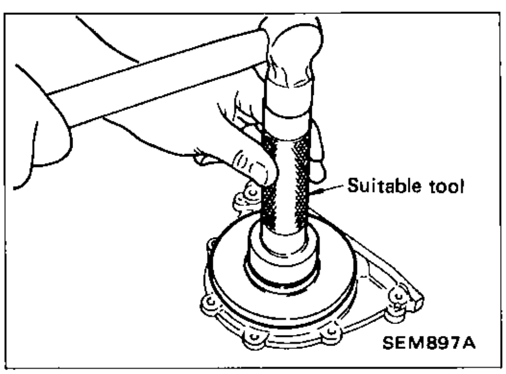
1. Remove transaxle.
2. Remove flywheel or drive plate.
3. Remove rear oil seal retainer.
4. Remove traces of liquid gasket using scraper.



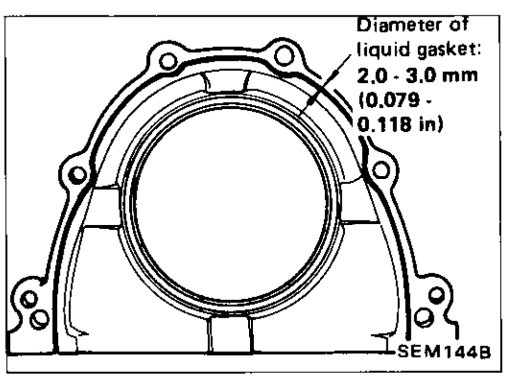
5. Remove rear oil seal from retainer.

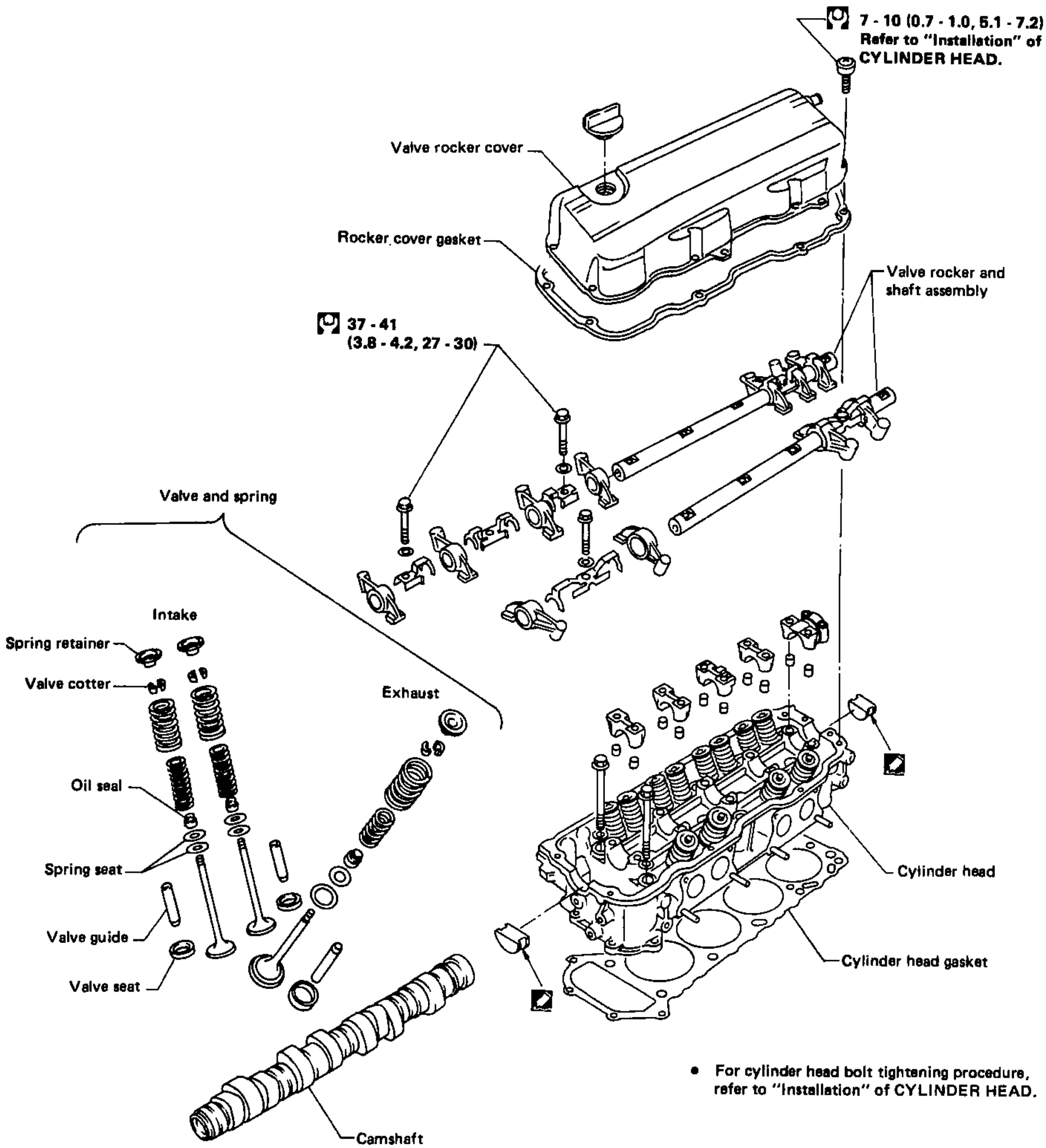


6. Apply engine oil to new oil seal and install it using a suitable tool.



7. Apply liquid gasket to rear oil seal retainer.



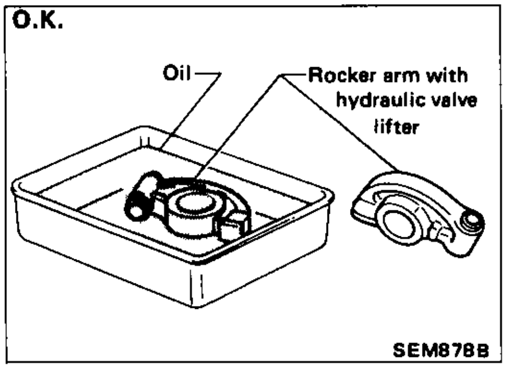


- For cylinder head bolt tightening procedure, refer to "Installation" of CYLINDER HEAD.

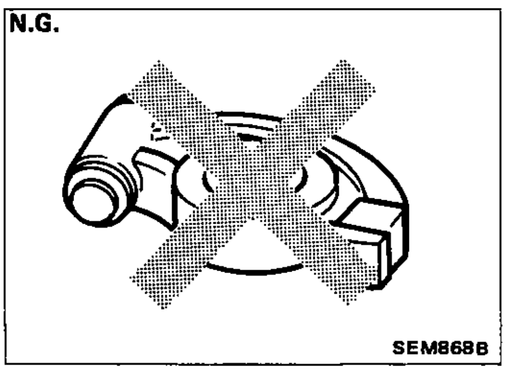
: N·m (kg-m, ft-lb)

SEM564C

CAUTION:
- **When installing sliding parts such as rocker arms, camshaft and oil seal, be sure to apply new engine oil on their sliding surfaces.**
- **When tightening cylinder head bolts and rocker shaft bolts, apply new engine oil to thread portions and seat surfaces of bolts.**



- **Hydraulic valve lifters are installed in each rocker arm. If hydraulic valve lifter is kept on its side, even when installed in rocker arm, there is a possibility of air entering it. After removal, always set rocker arm straight up, or when laying it on its side, have it soak in new engine oil.**



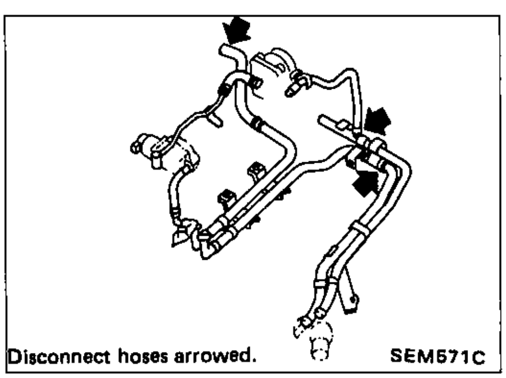
- **Do not disassemble hydraulic valve lifter.**
- **Attach tags to valve lifters so as not to mix them up.**

Removal

1. Drain coolant from radiator.
2. Relieve fuel pressure to zero.

Refer to EF & EC section "FUEL INJECTION CONTROL SYSTEM INSPECTION".

3. Remove the following parts:
- Exhaust manifold
- Air duct
- Intake manifold collector
- Intake manifold stay



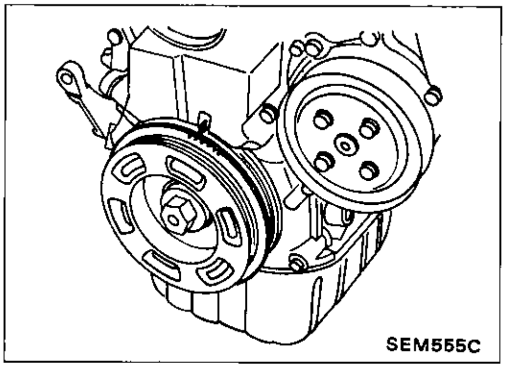
Disconnect hoses arrowed.

4. Disconnect hoses.
- Vacuum gallery hoses, which are installed on intake manifold.
- Fuel tube hoses
5. Disconnect water hoses as shown in figure.

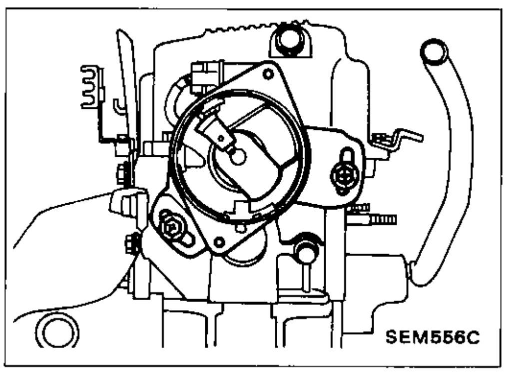
Removal (Cont'd)

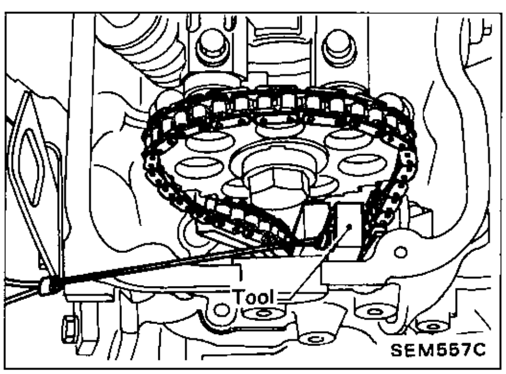
6. Remove intake manifold.
7. Remove rocker cover.

When removing rocker cover, do not knock rocker cover against rocker arms.

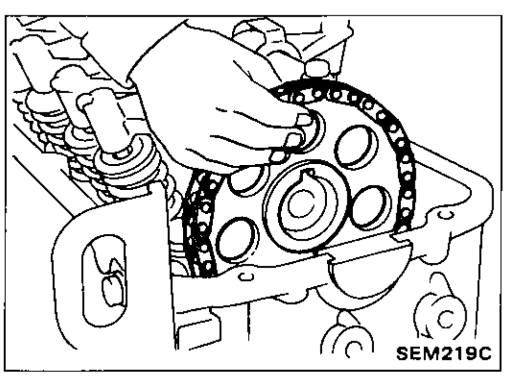


8. Set No. 1 piston at T.D.C. on its compression stroke.



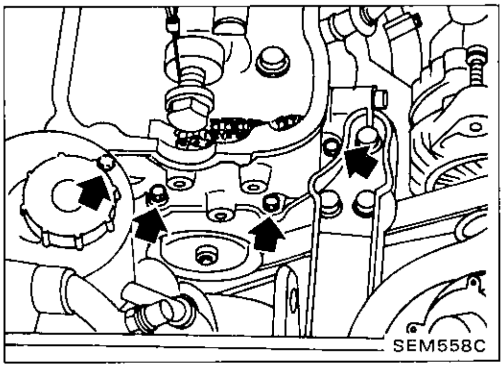


9. Loosen camshaft sprocket bolt.
- Support timing chain by using Tool as shown in figure.

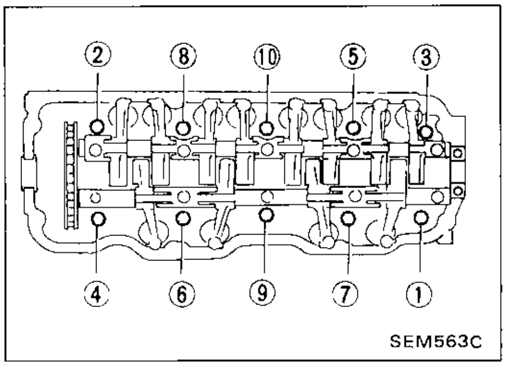


10. Remove camshaft sprocket.

Removal (Cont'd)



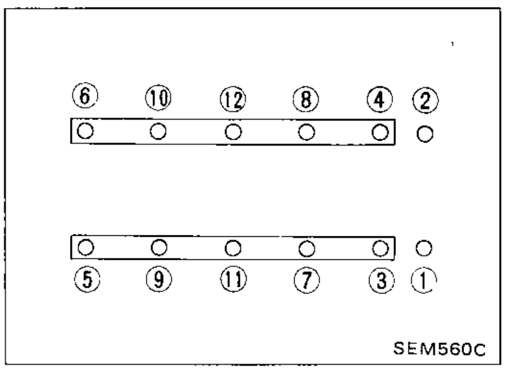
11. Remove front cover tightening bolts to cylinder head.



12. Remove cylinder head.

- **Head warpage or cracking could result from removing in incorrect order.**
- **Cylinder head bolts should be loosened in two or three steps.**

Disassembly



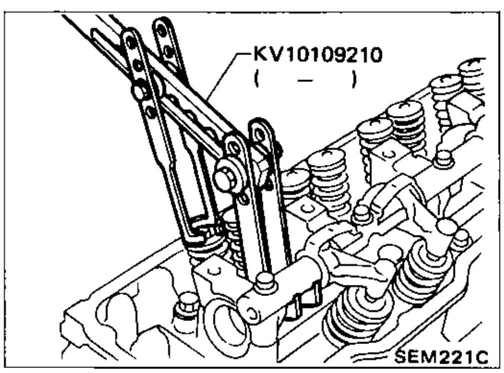
1. Remove rocker shaft assembly.

a. When loosening bolts, evenly loosen from outside in sequence.

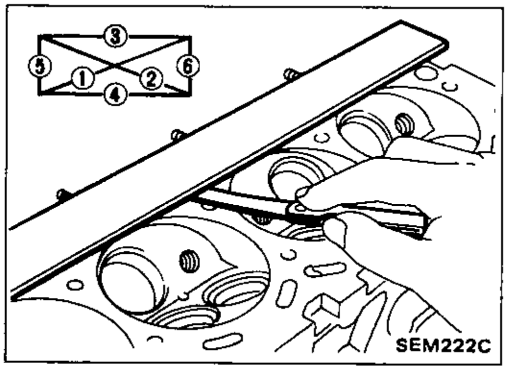
b. Bolts should be loosened in two or three steps.

2. Remove camshaft.

- **Before removing camshaft, measure camshaft end play. (Refer to "Inspection".)**



3. Remove valve components with Tool.
4. Remove valve oil seals. (Refer to OIL SEAL REPLACEMENT.)



SEM222C

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".

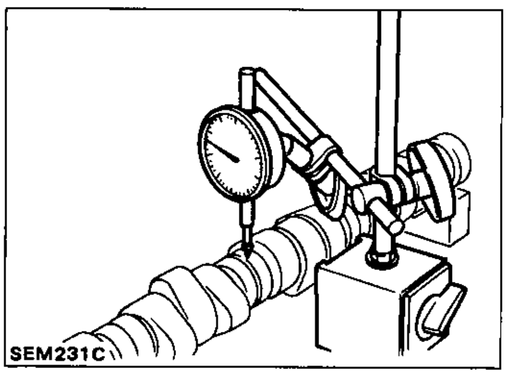
The maximum limit is as follows:
A + B = 0.2 mm (0.008 in)

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

Nominal cylinder head height:
98.8 - 99.0 mm (3.890 - 3.898 in)

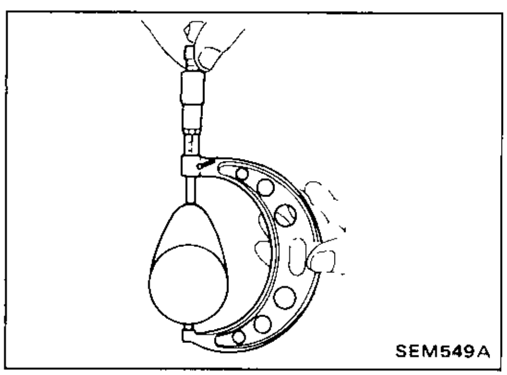
CAMSHAFT VISUAL CHECK

Check camshaft for scratches, seizure and wear.


SEM231C

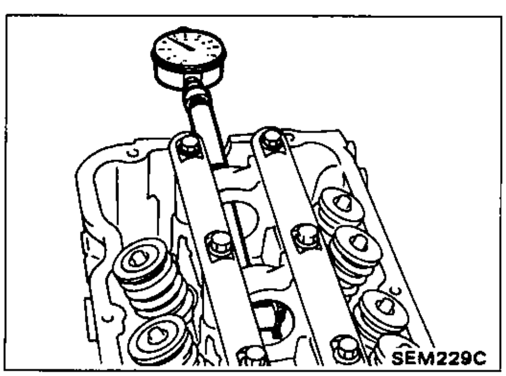
CAMSHAFT RUNOUT

1. Measure camshaft runout at the center journal.
   Runout (Total indicator reading):
   0 - 0.02 mm (0 - 0.0008 in)
2. If it exceeds the limit, replace camshaft.


SEM549A

CAMSHAFT CAM HEIGHT

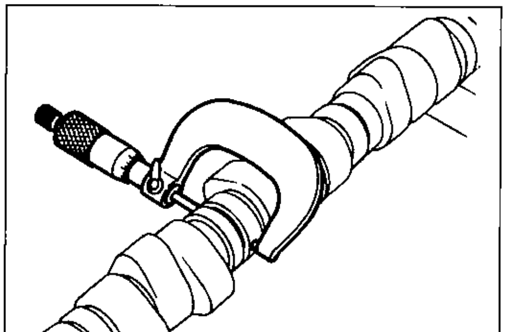
1. Measure camshaft cam height.
   Standard cam height:
   44.839 - 45.029 mm (1.7653 - 1.7728 in)
   Cam wear limit:
   0.2 mm (0.008 in)
2. If wear is beyond the limit, replace camshaft.


SEM229C

CAMSHAFT JOURNAL CLEARANCE

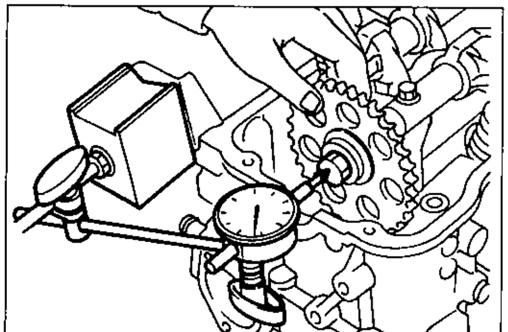
1. Install camshaft bracket and rocker shaft and tighten bolts to the specified torque.
2. Measure inner diameter of camshaft bearing.
   Standard inner diameter:
   33.000 - 33.025 mm (1.2992 - 1.3002 in)

Inspection (Cont'd)



SEM230C

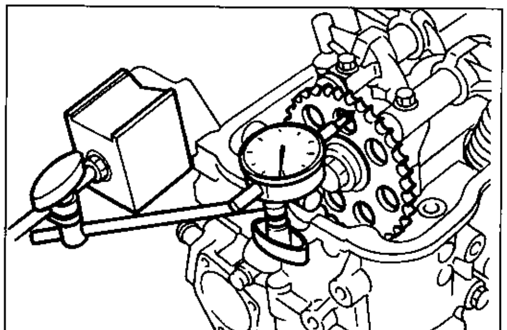
3. Measure outer diameter of camshaft journal.
   Standard outer diameter:
   32.935 - 32.955 mm (1.2967 - 1.2974 in)
4. If clearance exceeds the limit, replace camshaft and/or cylinder head.
   Camshaft journal clearance:
   Standard
   0.045 - 0.090 mm (0.0018 - 0.0035 in)
   Limit
   0.12 mm (0.0047 in)



SEM228C

CAMSHAFT END PLAY

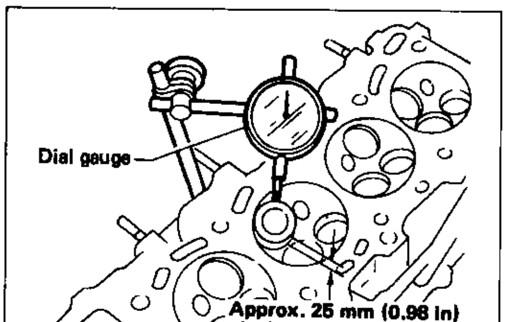
1. Install camshaft in cylinder head.
2. Measure camshaft end play.
   Camshaft end play:
   Standard
   0.07 - 0.15 mm (0.0028 - 0.0059 in)
   Limit
   0.2 mm (0.008 in)



SEM232C

CAMSHAFT SPROCKET RUNOUT

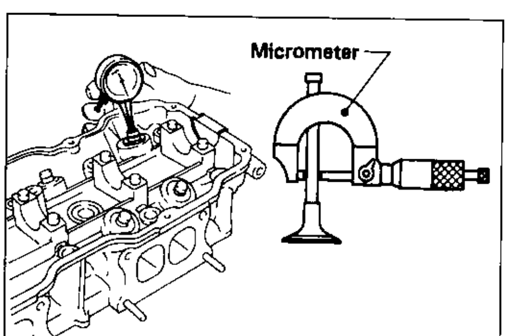
1. Install sprocket on camshaft.
2. Measure camshaft sprocket runout.
   Runout (Total indicator reading):
   Limit 0.12 mm (0.0047 in)
3. If it exceeds the limit, replace camshaft sprocket.



SEM451C

VALVE GUIDE CLEARANCE

1. Measure valve deflection in a right-angled direction with camshaft. (Valve and valve guide mostly wear in this direction.)
   Valve deflection limit (Dial gauge reading):
   0.15 mm (0.0059 in)



SEM449C

2. If it exceeds the limit, check valve to valve guide clearance.

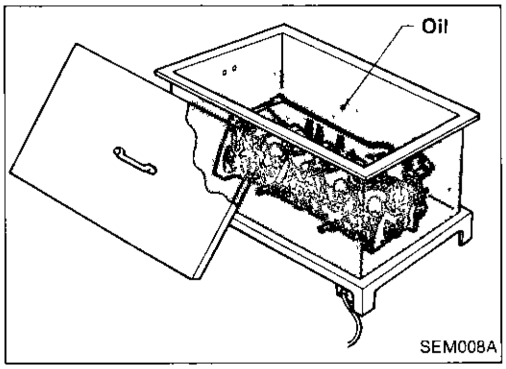
a. Measure valve stem diameter and valve guide inner diameter.

b. Check that clearance is within specification.
   Valve to valve guide clearance:
   Standard 0.020 - 0.053 mm
   (0.0008 - 0.0021 in) (Intake)
   0.040 - 0.070 mm
   (0.0016 - 0.0028 in) (Exhaust)
   Limit 0.1 mm (0.004 in)

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

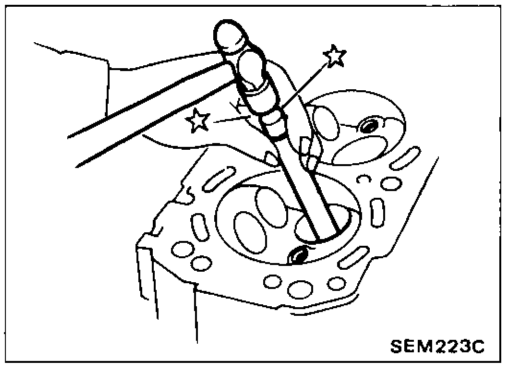
Inspection (Cont'd)

VALVE GUIDE REPLACEMENT

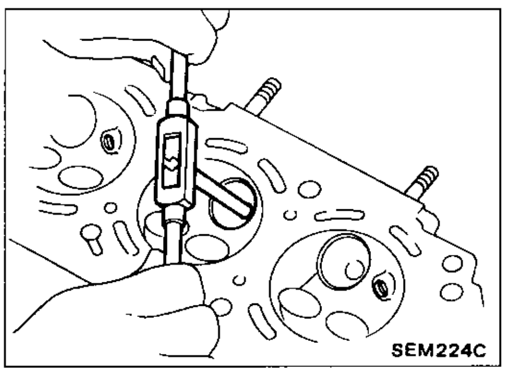


SEM008A

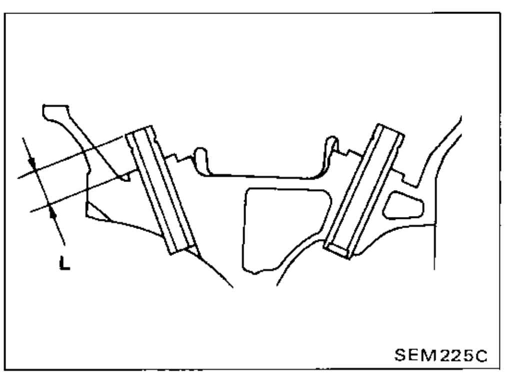
1. To remove valve guide, heat cylinder head to 150 to 160°C (302 to 320°F).


SEM223C

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 a suitable tool.

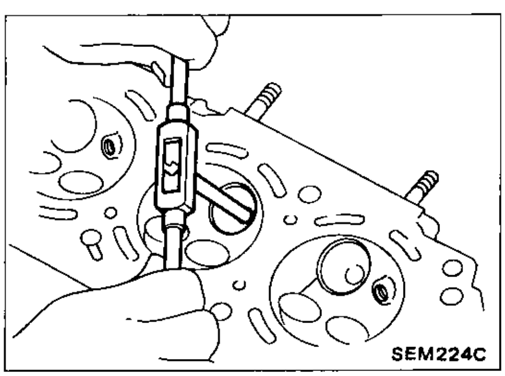

SEM224C

3. Ream cylinder head valve guide hole.
   Valve guide hole diameter (for service parts):
   Intake
   11.175 - 11.196 mm (0.4400 - 0.4408 in)
   Exhaust
   12.175 - 12.196 mm (0.4793 - 0.4802 in)



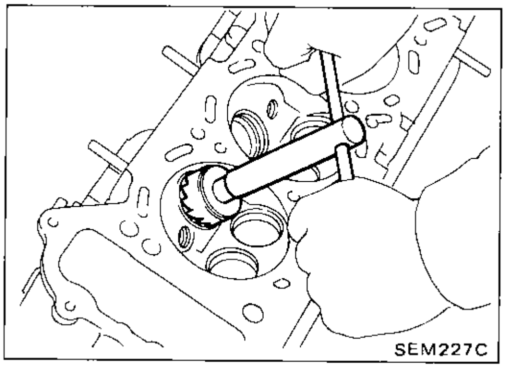
SEM225C

4. Heat cylinder head to 150 to 160°C (302 to 320°F) and press service valve guide onto cylinder head.
   Projection "L":
   14.9 - 15.1 mm (0.587 - 0.594 in)


SEM224C

5. Ream valve guide.
   Finished size:
   Intake
   7.000 - 7.018 mm (0.2756 - 0.2763 in)
   Exhaust
   8.000 - 8.018 mm (0.3150 - 0.3157 in)

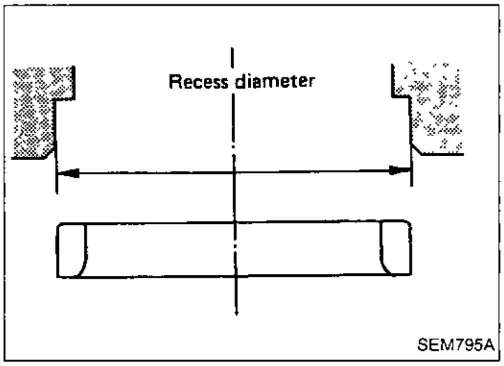
Inspection (Cont'd)



VALVE SEATS

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

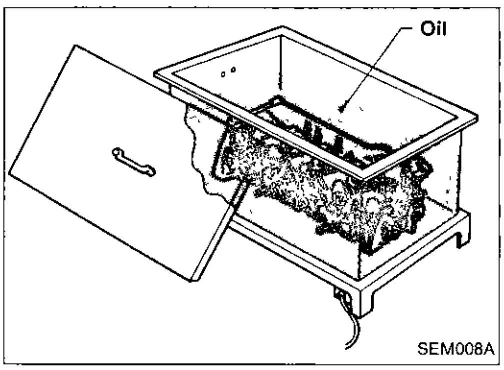
- **Before repairing valve seats, check valve and valve guide for wear. If they have worn, replace them. Then correct valve seat.**
- **Cut with both hands to uniform the cutting surface.**



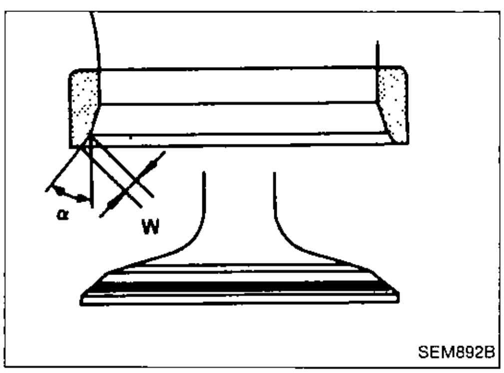
REPLACING VALVE SEAT FOR SERVICE PARTS

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
   Oversize [0.5 mm (0.020 in)]:
   Intake 36.500 - 36.516 mm (1.4370 - 1.4376 in)
   Exhaust 42.500 - 42.516 mm (1.6732 - 1.6739 in)

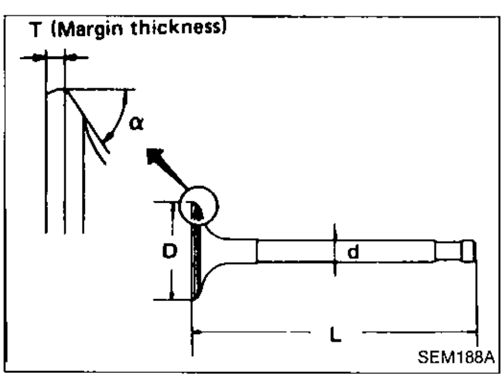
Reaming should be done to the concentric circles to valve guide center so that valve seat will have the correct fit.



3. Heat cylinder head to 150 to 160°C (302 to 320°F).



4. Cut or grind valve seat using a suitable tool to the specified dimensions as shown in S.D.S.
5. After cutting, lap valve seat with abrasive compound.
6. Check valve seating condition.
   Seat face angle "α":
   45 deg.
   Contacting width "W":
   Intake
   1.6 - 1.7 mm (0.063 - 0.067 in)
   Exhaust
   1.7 - 2.1 mm (0.067 - 0.083 in)



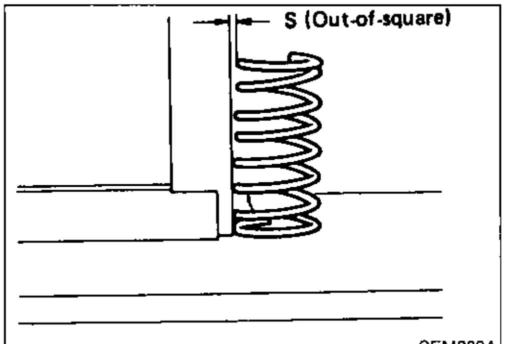
VALVE DIMENSIONS

Check dimensions in each valve. For dimensions, refer to S.D.S.

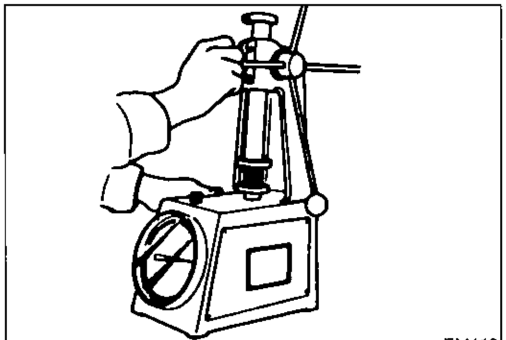
When valve head has been worn down to 0.5 mm (0.020 in) in margin thickness, replace valve.

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

Inspection (Cont'd)



SEM288A


EM113

VALVE SPRING

Squareness

1. Measure "S" dimension.
   Out-of-square:
   Outer
   Intake
   Less than 2.5 mm (0.098 in)
   Exhaust
   Less than 2.3 mm (0.091 in)
   Inner
   Intake
   Less than 2.3 mm (0.091 in)
   Exhaust
   Less than 2.1 mm (0.083 in)
2. If it exceeds the limit, replace spring.

Pressure

Check valve spring pressure.

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

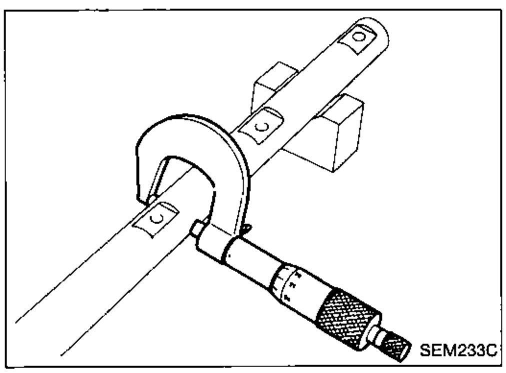
Standard

Outer	**Intake**	**604.1 (61.6, 135.8) at 37.6 (1.480)**
	Exhaust	**640.4 (65.3, 144.0) at 34.1 (1.343)**
Inner	**Intake**	**284.4 (29.0, 63.9) at 32.6 (1.283)**
	Exhaust	**328.5 (33.5, 73.9) at 29.1 (1.146)**

Limit

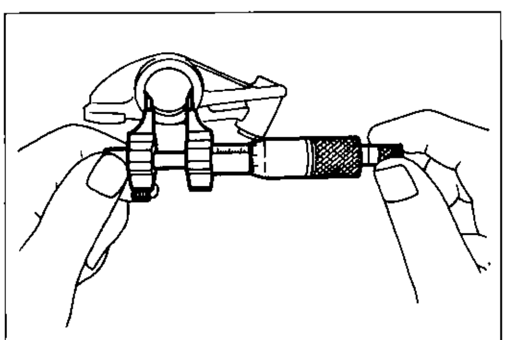
Outer	**Intake**	**567.8 (57.9, 127.7) at 37.6 (1.480)**
	Exhaust	**620.8 (63.3, 139.6) at 34.1 (1.343)**
Inner	**Intake**	**266.8 (27.2, 60.0) at 32.6 (1.283)**
	Exhaust	**318.7 (32.5, 71.7) at 29.1 (1.146)**

If it exceeds the limit, replace spring.


SEM233C

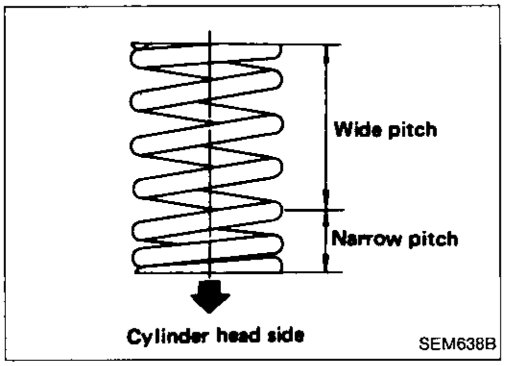
ROCKER SHAFT AND ROCKER ARM

1. Check rocker shafts for scratches, seizure and wear.
2. Check outer diameter of rocker shaft.
   Diameter:
   21.979 - 22.000 mm (0.8653 - 0.8661 in)


SEM234C

3. Check inner diameter of rocker arm.
   Diameter:
   22.012 - 22.029 mm (0.8666 - 0.8673 in)
   Rocker arm to shaft clearance:
   0.012 - 0.050 mm (0.0005 - 0.0020 in)

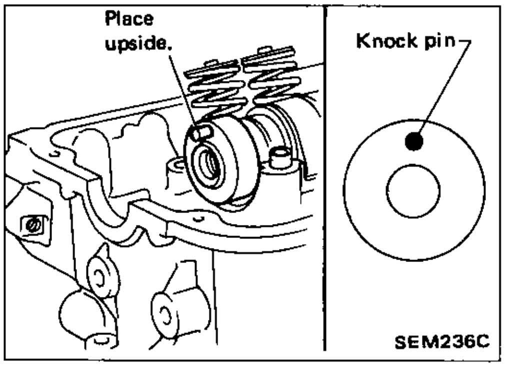
- **Keep rocker arm with hydraulic valve lifter standing to prevent air from entering hydraulic valve lifter when checking.**



Assembly

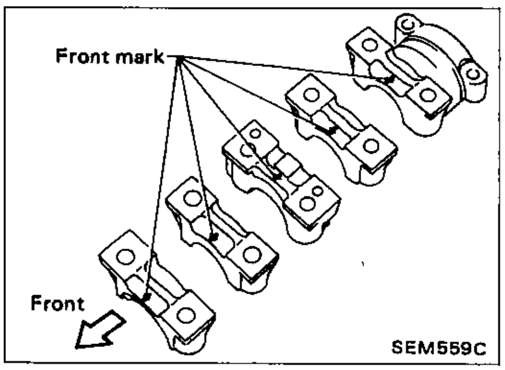
1. Install valve component parts.

- **Always use new valve oil seal. Refer to OIL SEAL REPLACEMENT.**
- **Before installing valve oil seal, install inner valve spring seat.**
- **Install outer valve spring (uneven pitch type) with its narrow pitch side toward cylinder head side.**
- **After installing valve component parts, use plastic hammer to lightly tap valve stem tip to assure a proper fit.**



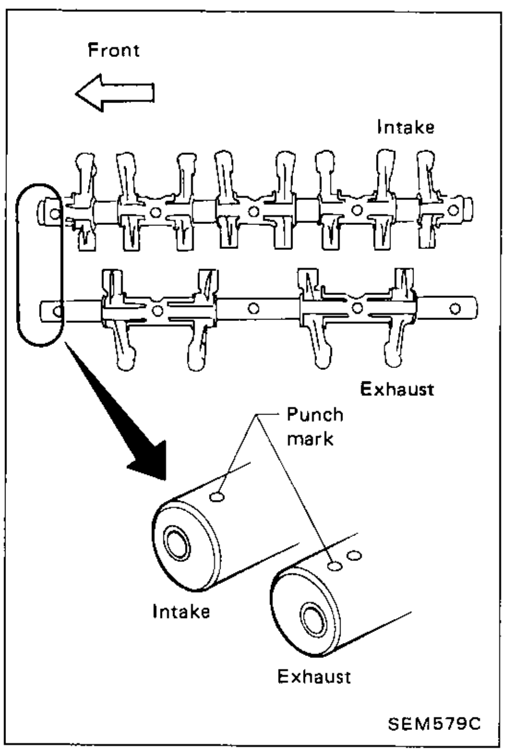
2. Mount camshaft onto cylinder head, placing knock pin at front end to top position.

Apply engine oil to camshaft when mounting onto cylinder head.



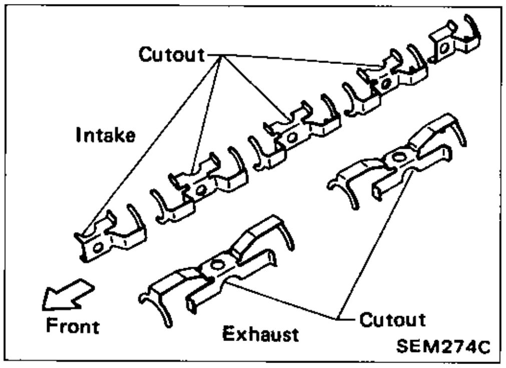
3. Install camshaft brackets.

Front mark is punched on the camshaft bracket.



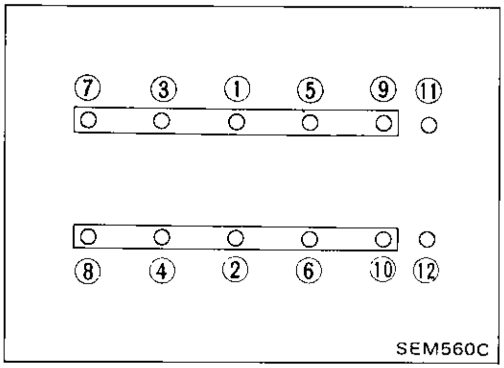
4. Install rocker shaft with rocker arms.

Assembly (Cont'd)



SEM274C

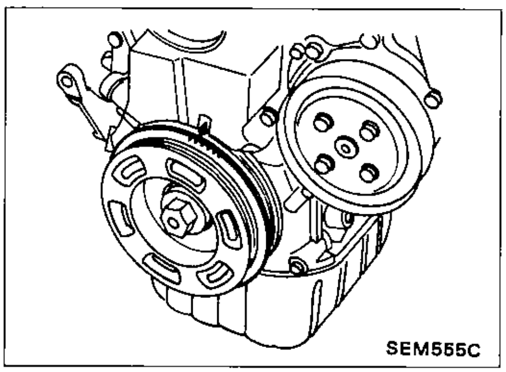
- Install retainer with cutout facing direction shown in figure at left.



SEM560C

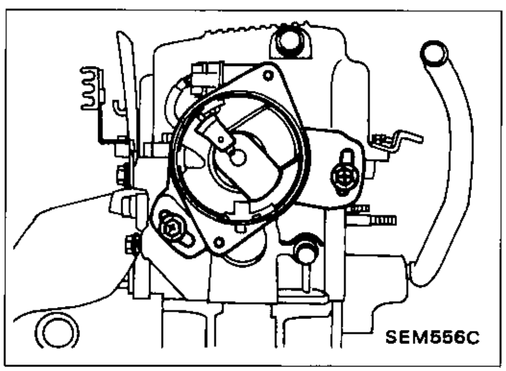
5. Tighten bolts as shown in figure at left.

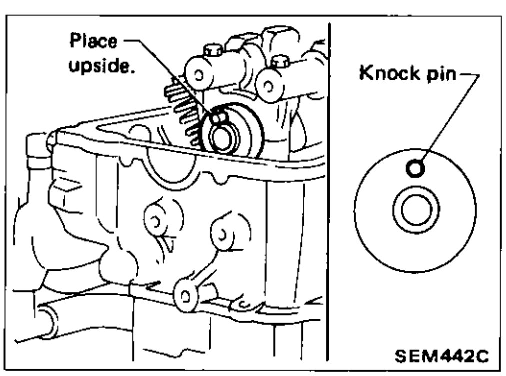
Installation


SEM555C

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

(1) Align mark on crankshaft pulley with "0°" position and confirm that distributor rotor head is set as shown in figure.

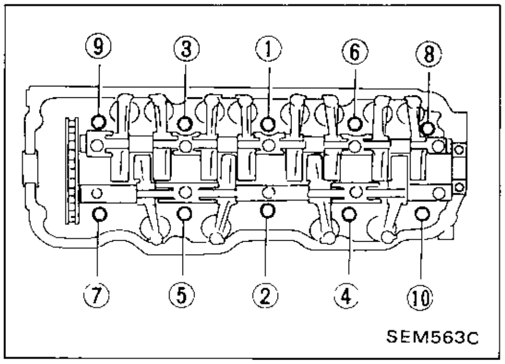

SEM556C



SEM442C

(2) Confirm that knock pin on camshaft is set at the top.

Installation (Cont'd)

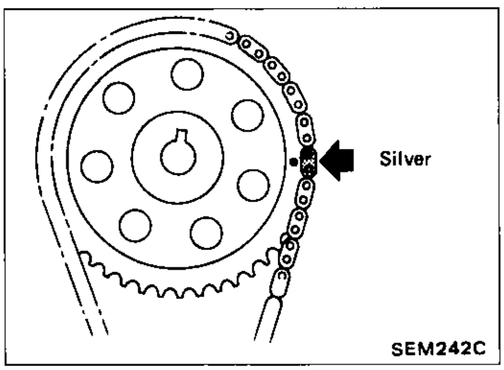


SEM563C

2. Install cylinder head with new gasket and tighten cylinder head bolts in numerical order.

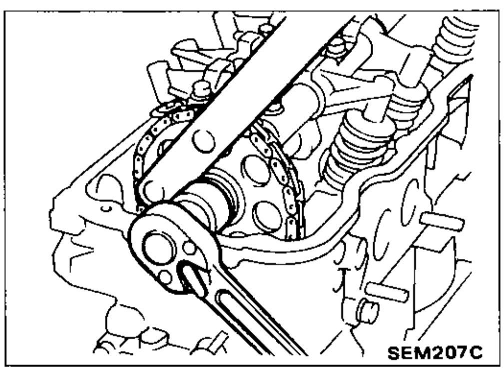
- **Do not rotate crankshaft and camshaft separately, or valves will hit piston heads.**
- **Tightening procedure**

(1) Tighten all bolts to 29 N·m (3.0 kg-m, 22 ft-lb).
(2) Tighten all bolts to 78 N·m (8.0 kg-m, 58 ft-lb).
(3) Loosen all bolts completely.
(4) Tighten all bolts to 29 N·m (3.0 kg-m, 22 ft-lb).
(5) Turn all bolts 80 to 85 degrees clockwise with an angle wrench, or if an angle wrench is not available, tighten all bolts to 74 to 83 N·m (7.5 to 8.5 kg-m, 54 to 61 ft-lb).

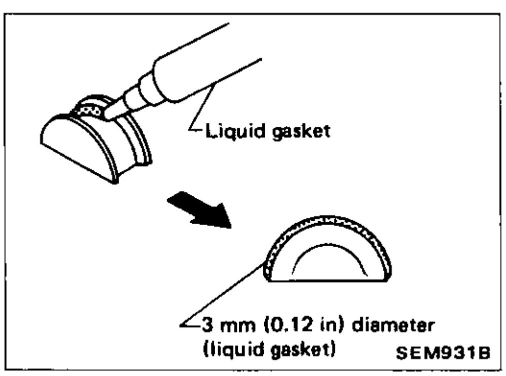


SEM242C

3. Set chain on camshaft sprocket by aligning each mating mark. Then install camshaft sprocket to camshaft.


SEM207C

4. Tighten camshaft sprocket bolt.



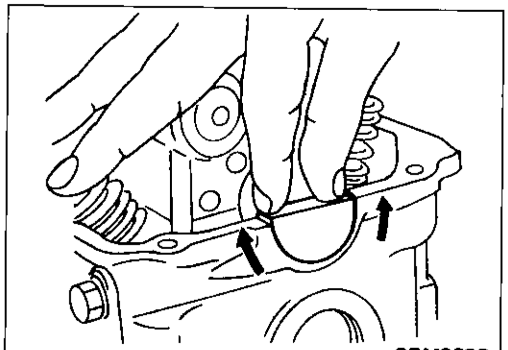
SEM931B

5. Install rubber plugs as follows:

(1) Apply liquid gasket to rubber plugs.

- **Rubber plugs should be replaced with new ones.**
- **Rubber plugs should be installed within 5 minutes of applying liquid gasket.**

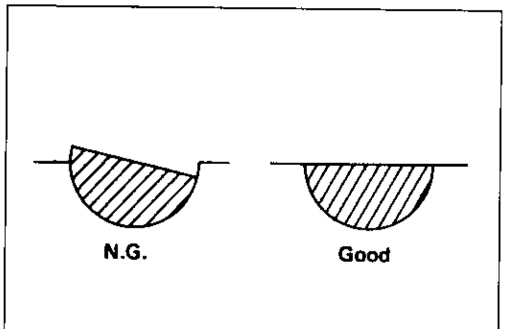
Installation (Cont'd)



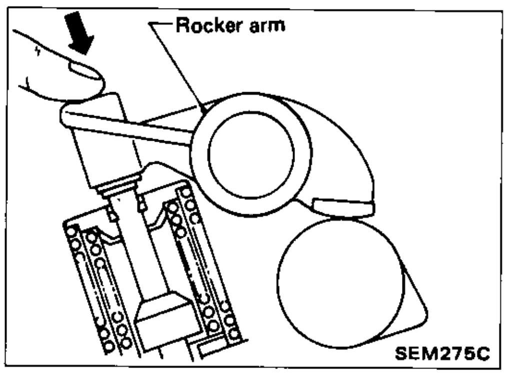
SEM932B

(2) Install rubber plugs, then move them with your fingers to uniformly spread the gasket on cylinder head surface.

- **Rubber plugs should be installed flush with the surface.**
- **Do not start the engine for 30 minutes after installing rocker cover.**
- **Wipe clean excessive liquid gasket from cylinder head top surface.**



SEM933B



SEM275C

6. Check hydraulic valve lifter.

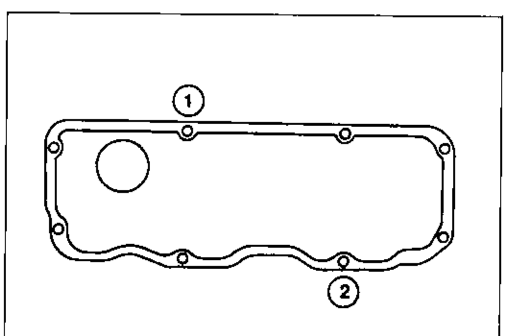
(1) Push hydraulic valve lifter forcefully with your finger.

- **Be sure to check it with rocker arm in its free position.**

(2) If valve lifter moves more than 1 mm (0.04 in), air may be inside of it.

(3) Bleed air off by running engine at 1,000 rpm under no-load for about 20 minutes.

(4) If hydraulic valve lifters are still noisy, replace them and bleed air off again in the same manner as in step (3).



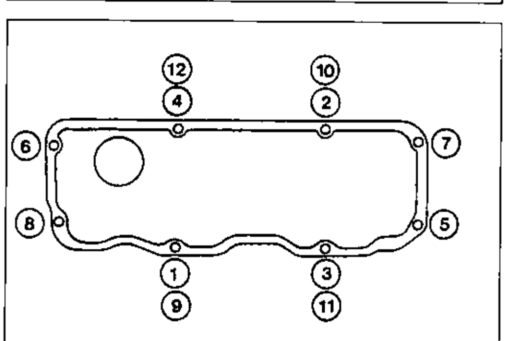
SEM546C

7. Install rocker cover.

- **Be sure to avoid interference between rocker cover and rocker arm.**

8. Tighten bolts as follows:

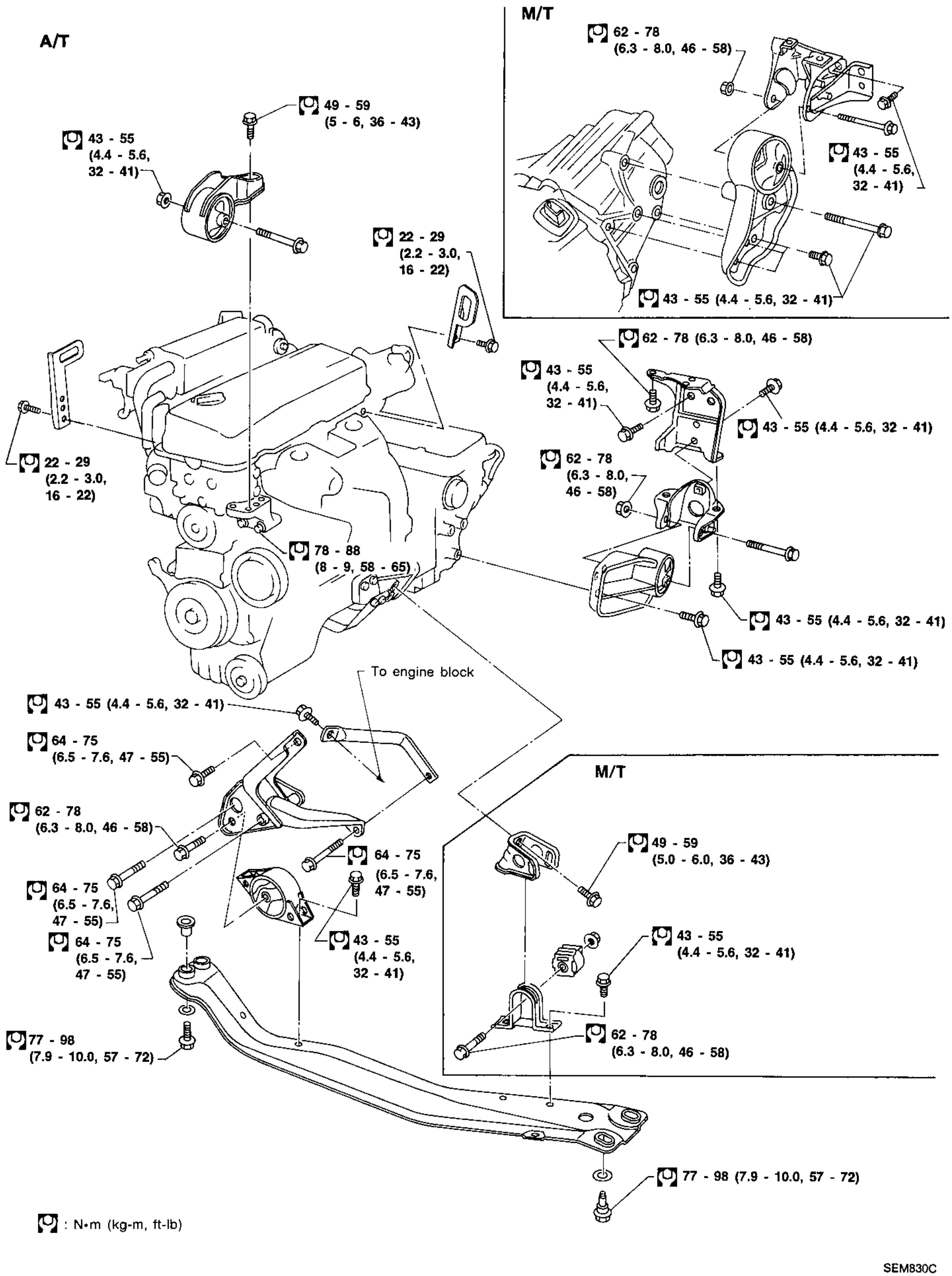
(1) Tighten 2 bolts to 3 N·m (0.3 kg-m, 2.2 ft-lb) temporarily in order shown in figure.



SEM547C

(2) Then tighten all bolts to 7 to 10 N·m (0.7 to 1.0 kg-m, 5.1 to 7.2 ft-lb) in order shown in figure.

9. Install any parts removed.



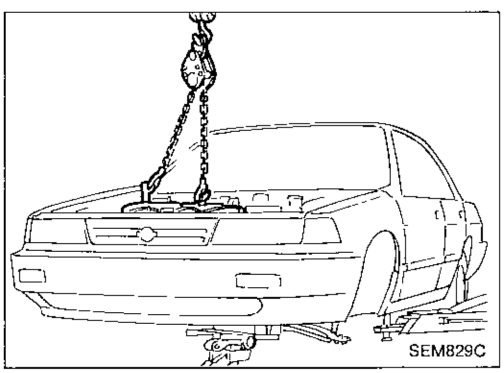
A/T
M/T
62 - 78
(6.3 - 8.0, 46 - 58)
49 - 59
(5 - 6, 36 - 43)
43 - 55
(4.4 - 5.6,
32 - 41)
43 - 55
(4.4 - 5.6,
32 - 41)
22 - 29
(2.2 - 3.0,
16 - 22)
43 - 55 (4.4 - 5.6, 32 - 41)
62 - 78 (6.3 - 8.0, 46 - 58)
43 - 55
(4.4 - 5.6,
32 - 41)
43 - 55 (4.4 - 5.6, 32 - 41)
22 - 29
(2.2 - 3.0,
16 - 22)
62 - 78
(6.3 - 8.0,
46 - 58)
78 - 88
(8 - 9, 58 - 65)
43 - 55 (4.4 - 5.6, 32 - 41)
43 - 55 (4.4 - 5.6, 32 - 41)
To engine block
43 - 55 (4.4 - 5.6, 32 - 41)
64 - 75
(6.5 - 7.6, 47 - 55)
M/T
62 - 78
(6.3 - 8.0, 46 - 58)
49 - 59
(5.0 - 6.0, 36 - 43)
64 - 75
(6.5 - 7.6,
47 - 55)
64 - 75
(6.5 - 7.6,
47 - 55)
64 - 75
(6.5 - 7.6,
47 - 55)
43 - 55
(4.4 - 5.6,
32 - 41)
43 - 55
(4.4 - 5.6, 32 - 41)
62 - 78
(6.3 - 8.0, 46 - 58)
77 - 98
(7.9 - 10.0, 57 - 72)
77 - 98 (7.9 - 10.0, 57 - 72)
: N•m (kg-m, ft-lb)
SEM830C

WARNING:

a. **Situate vehicle on a flat and solid surface.**
b. **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.
c. **For safety during subsequent steps, the tension of wires should be slackened against the engine.**
d. **Before disconnecting fuel hose, release fuel pressure from fuel line.**
   Refer to "Releasing Fuel Pressure" in section EF & EC.
e. **Before removing front axle from transaxle, place safety stands under designated front supporting points. Refer to GI section for lifting points and towing.**
f. **Be sure to hoist engine and transaxle in a safe manner.**
g. **For engines not equipped with engine slingers, attach proper slingers and bolts described in PARTS CATALOG.**

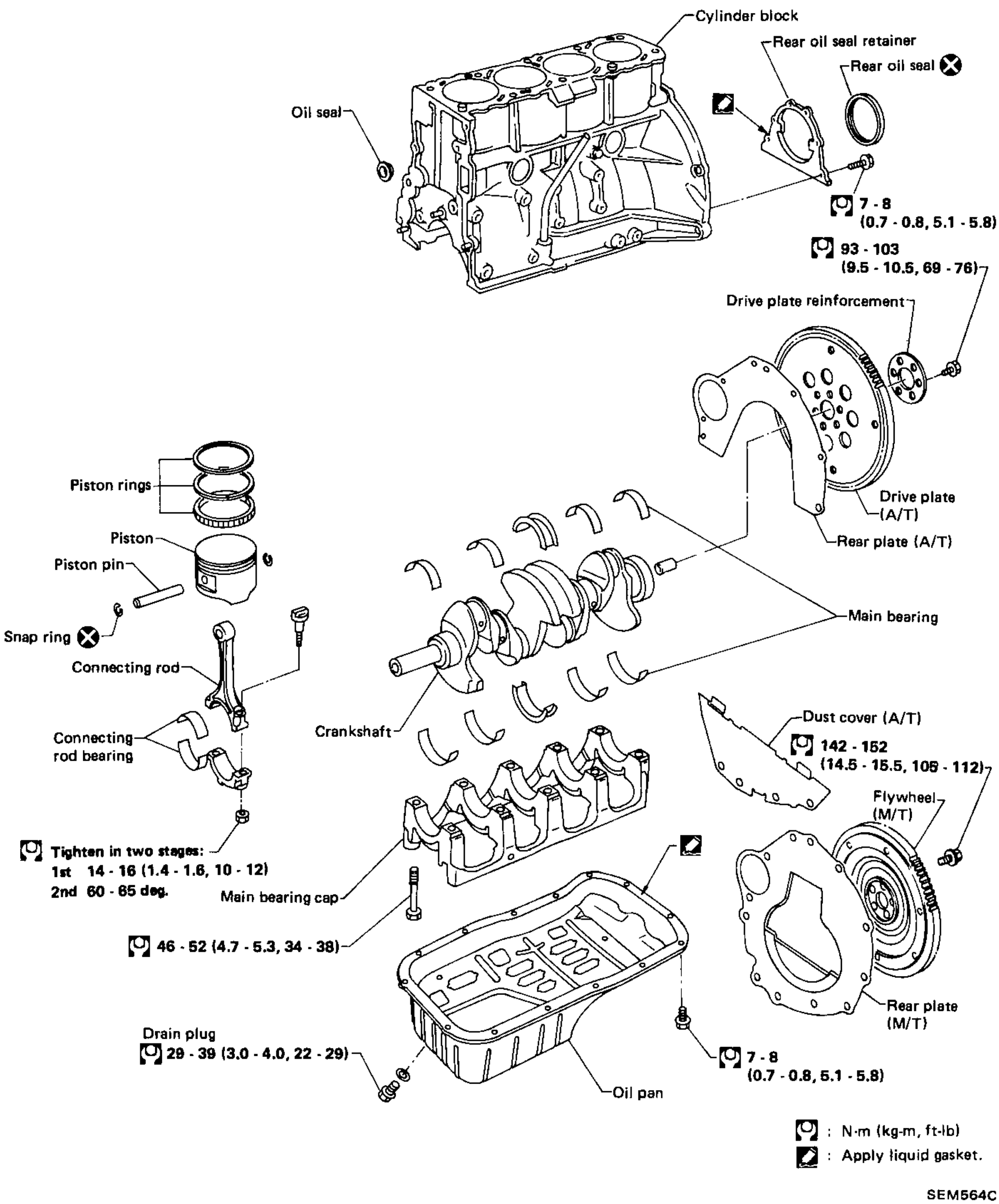
CAUTION:

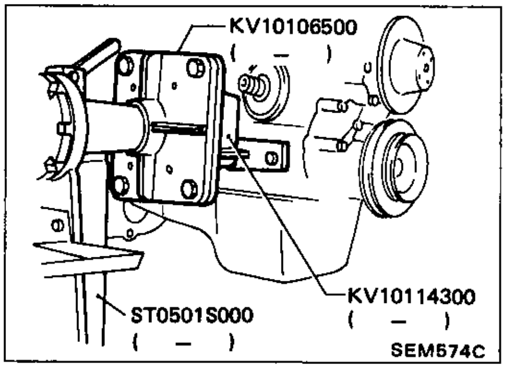
- **When lifting engine, be careful not to strike adjacent parts, especially accelerator wire casing, brake lines, and brake master cylinder.**
- **In hoisting the engine, always use engine slingers in a safe manner.**
- **In removing drive shaft, be careful not to damage grease seal of transaxle.**


SEM829C

Removal

1. Drain coolant.
2. Disconnect adjacent wires, harness, pipes and hoses.
3. Remove the following parts:
- Drive belts
- Power steering pump
- A/C compressor
- Alternator and adjusting bar
- Drive shafts
- Front exhaust tube
4. Lift up engine slightly with engine slingers and disconnect or remove all engine mountings.
5. Support engine and transaxle assembly by placing suitable jacks under oil pan and transaxle.
6. Lower engine and transaxle assembly.
7. Remove engine from transaxle.

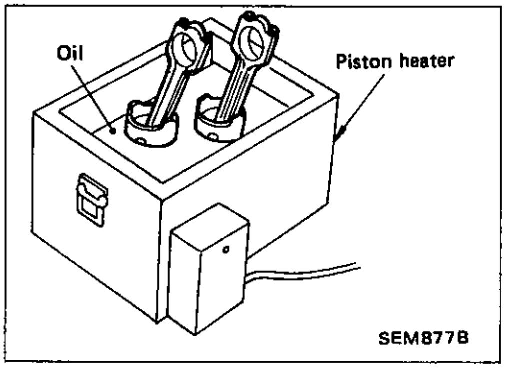

Cylinder block
Rear oil seal retainer
Rear oil seal
Oil seal
7 - 8
(0.7 - 0.8, 5.1 - 5.8)
93 - 103
(9.5 - 10.5, 69 - 76)
Drive plate reinforcement
Piston rings
Piston
Piston pin
Snap ring
Connecting rod
Connecting rod bearing
Crankshaft
Drive plate (A/T)
Rear plate (A/T)
Main bearing
Dust cover (A/T)
142 - 152
(14.5 - 15.5, 105 - 112)
Flywheel (M/T)
Tighten in two stages:
1st 14 - 16 (1.4 - 1.6, 10 - 12)
2nd 60 - 65 deg.
Main bearing cap
46 - 52 (4.7 - 5.3, 34 - 38)
Drain plug
29 - 39 (3.0 - 4.0, 22 - 29)
Oil pan
7 - 8
(0.7 - 0.8, 5.1 - 5.8)
Rear plate (M/T)
: N·m (kg-m, ft-lb)
: Apply liquid gasket.
SEM564C



Disassembly

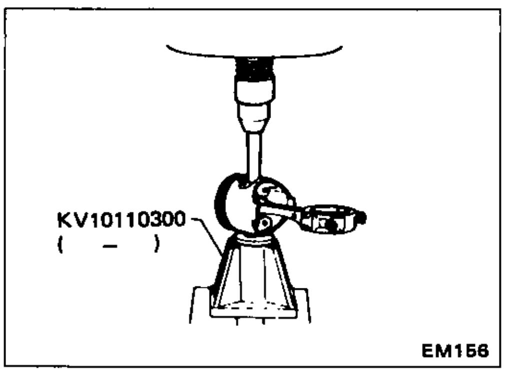
PISTON AND CRANKSHAFT

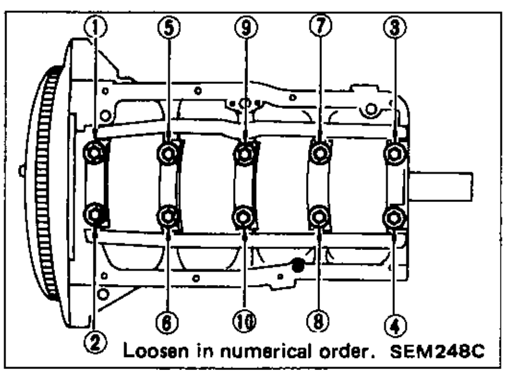
1. Place engine on a work stand.
2. Drain oil.
3. Remove oil pan.
4. Remove water pump.
5. Remove cylinder head.
6. Remove timing chain.



7. Remove pistons.

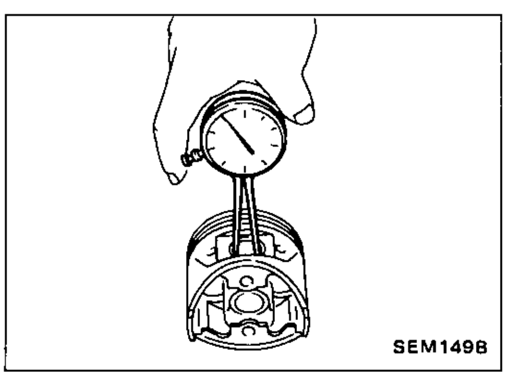
- When disassembling piston and connecting rod, remove snap rings, then heat piston to 60 to 70°C (140 to 158°F) or use piston pin press stand at room temperature.





8. Remove main bearing beam and crankshaft.

- **Before removing main bearing beam, measure crankshaft end play.**
- **Bolts should be loosened in two or three steps.**

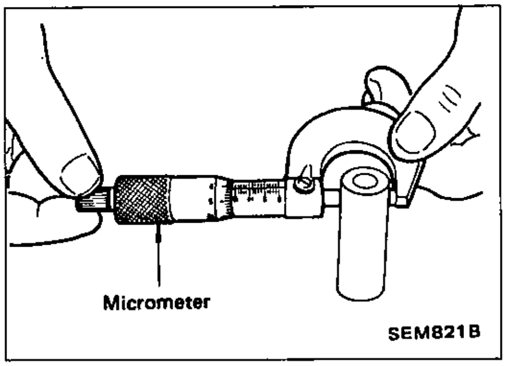


Inspection

PISTON AND PISTON PIN CLEARANCE

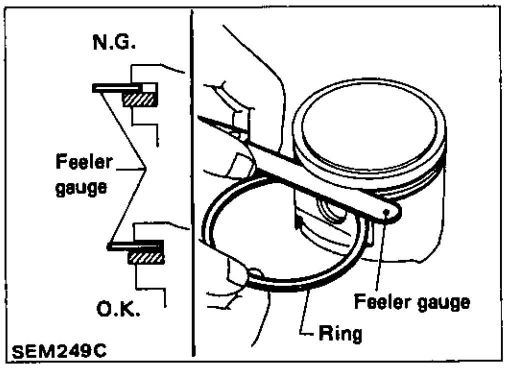
1. Measure inner diameter of piston pin hole "dp".
   Standard diameter "dp":
   20.987 - 20.999 mm (0.8263 - 0.8267 in)

Inspection (Cont'd)



2. Measure outer diameter of piston pin "Dp".
   Standard diameter "Dp":
   20.989 - 21.001 mm (0.8263 - 0.8268 in)
3. Calculate interference fit of piston pin to piston.
   dp − Dp = 0 - 0.004 mm (0 - 0.0002 in)

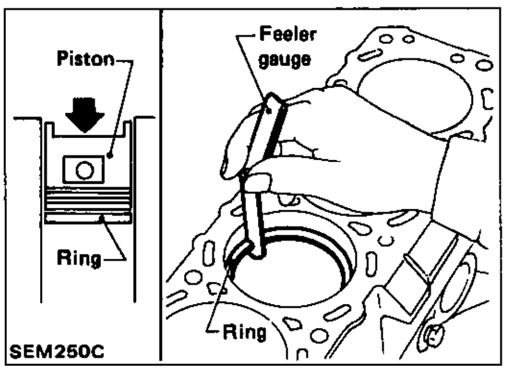
If it exceeds the above value, replace piston assembly with pin.



PISTON RING SIDE CLEARANCE

Side clearance:
Top ring
0.04 - 0.08 mm (0.0016 - 0.0031 in)
2nd ring
0.03 - 0.07 mm (0.0012 - 0.0028 in)
Max. limit of side clearance:
0.1 mm (0.004 in)

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

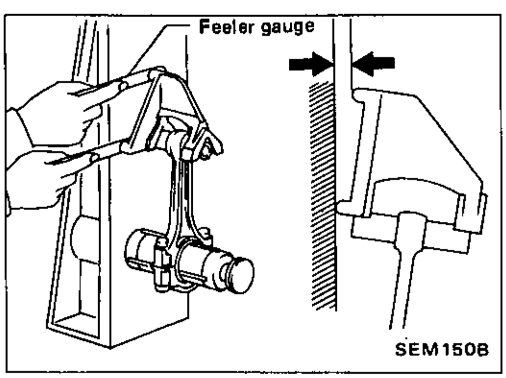


PISTON RING END GAP

End gap:
Top ring
0.28 - 0.52 mm (0.0110 - 0.0205 in)
2nd ring
0.45 - 0.69 mm (0.0177 - 0.0272 in)
(For rings punched with R or T.)
0.55 - 0.70 mm (0.0217 - 0.0276 in)
(For rings punched with N.)
Oil ring
0.20 - 0.69 mm (0.0079 - 0.0272 in)
Max. limit of ring gap:
0.5 mm (0.020 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.

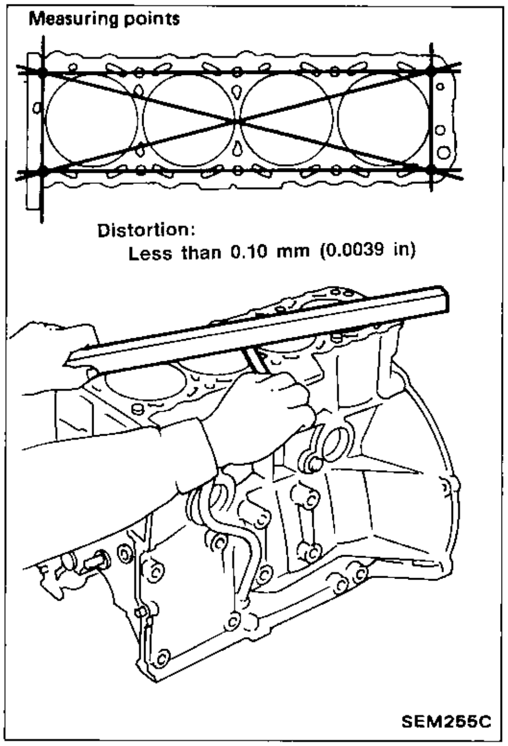


CONNECTING ROD BEND AND TORSION

Bend:
Limit 0.15 mm (0.0059 in)
per 100 mm (3.94 in) length
Torsion:
Limit 0.30 mm (0.0118 in)
per 100 mm (3.94 in) length

If it exceeds the limit, replace connecting rod assembly.

Inspection (Cont'd)

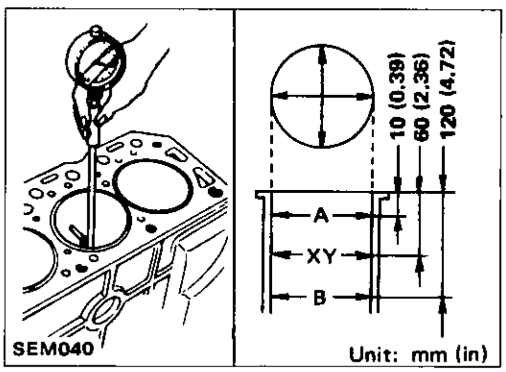


CYLINDER BLOCK DISTORTION AND WEAR

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 mm (0.008 in)
Nominal cylinder block height from crankshaft center:
246.95 - 247.05 mm (9.7224 - 9.7264 in)

3. If necessary, replace cylinder block.

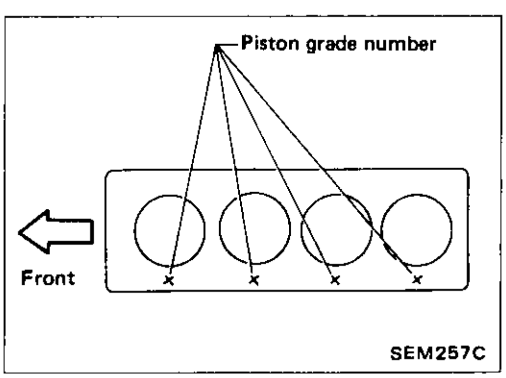


PISTON-TO-BORE CLEARANCE

1. Using a bore gauge, measure cylinder bore for wear, out-of-round and taper.
   Standard inner diameter:
   89.000 - 89.030 mm (3.5039 - 3.5051 in)
   Wear limit:
   0.2 mm (0.008 in)
   Out-of-round (X - Y) limit:
   0.015 mm (0.0006 in)
   Taper (A - B) limit:
   0.015 mm (0.0006 in)

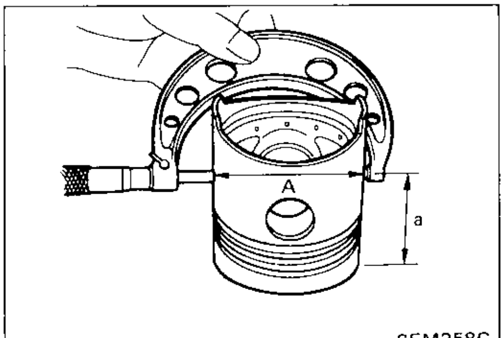
If it exceeds the limit, rebore all cylinders. Replace cylinder block if necessary.

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.**

Inspection (Cont'd)

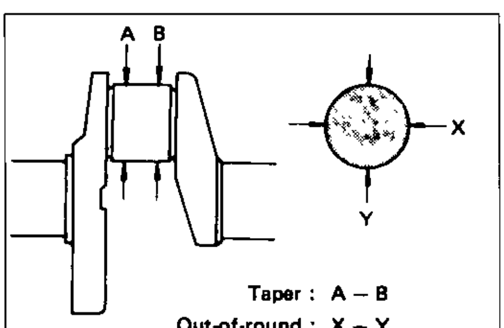


SEM258C

3. Measure piston skirt diameter.
   Piston diameter "A":
   Refer to S.D.S.
   Measuring point "a" (Distance from the top):
   Approximately 52 mm (2.05 in)
4. Check that piston-to-bore clearance is within specification.
   Piston-to-bore clearance "B":
   0.020 - 0.040 mm (0.0008 - 0.0016 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. Cut only 0.05 mm (0.0020 in) or so 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.**

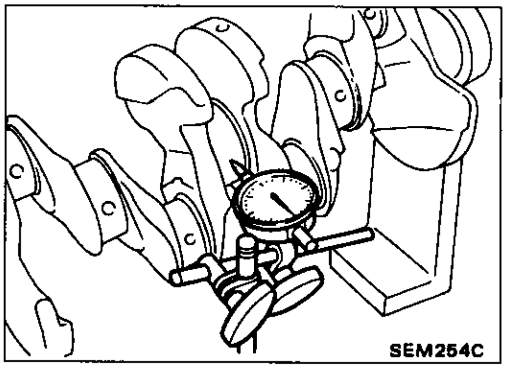


SEM316A

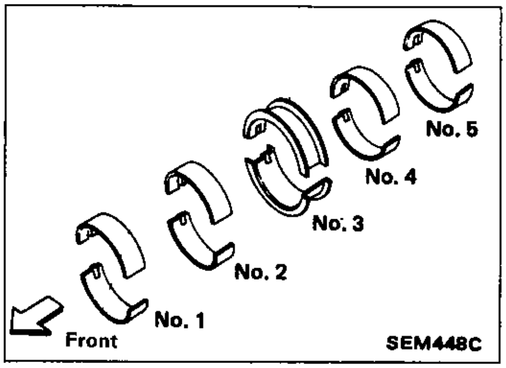
CRANKSHAFT

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):
   Main journal Less than 0.01 mm (0.0004 in)
   Crank pin Less than 0.005 mm (0.0002 in)
   Taper (A − B):
   Main journal Less than 0.01 mm (0.0004 in)
   Crank pin Less than 0.005 mm (0.0002 in)

Inspection (Cont'd)



3. Measure crankshaft runout.
   Runout (Total indicator reading):
   Less than 0.10 mm (0.0039 in)



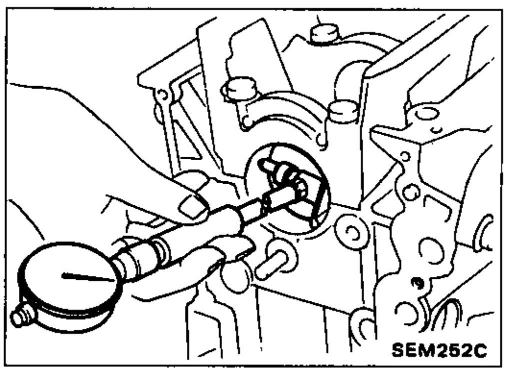
BEARING CLEARANCE

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

Method A (Using bore gauge and micrometer)

Main bearing

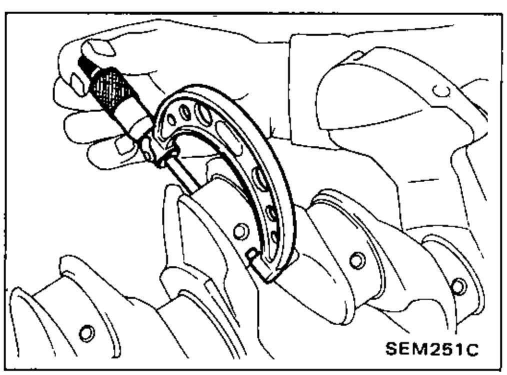
1. Set main bearings in their proper positions on cylinder block and main bearing cap.



2. Install main bearing cap to cylinder block.

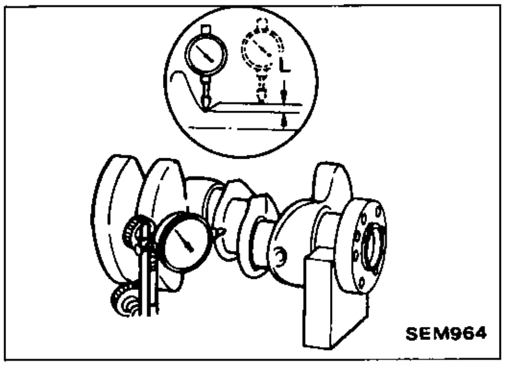
Tighten all bolts in correct order in two or three stages. Refer to "Assembly".

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:
   0.020 - 0.047 mm (0.0008 - 0.0019 in)
   Limit:
   0.1 mm (0.004 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.

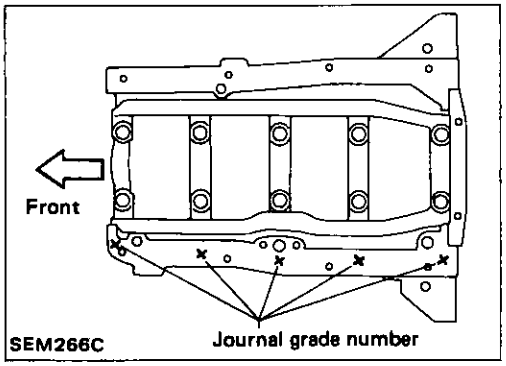
Inspection (Cont'd)



SEM964

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)

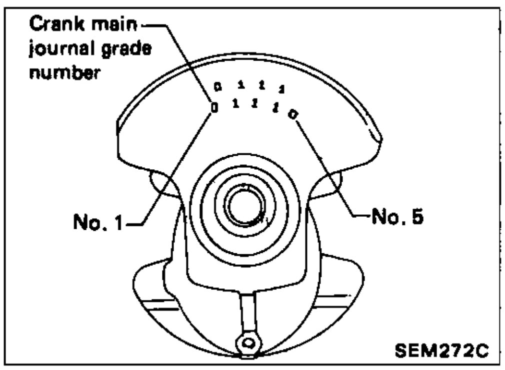
b. Refer to S.D.S. for grinding crankshaft and available service parts.



SEM266C

8. If crankshaft, is reused, measure main bearing clearance and thickness of main bearing.
   If crankshaft is replaced with a new one, 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.



SEM272C

b. Grade number of each crankshaft main journal is punched on crankshaft.

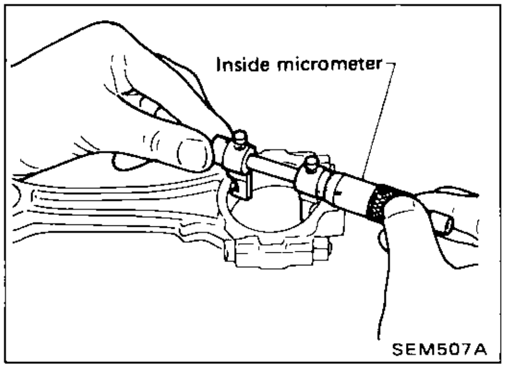
c. Select main bearing with suitable thickness according to the following table.

Main bearing grade number:

Crankshaft journal grade number \ Main journal grade number	0	1	2
0	0	1	2
1	1	2	3
2	2	3	4

For example:
Main journal grade number: 1
Crankshaft journal grade number: 2
Main bearing grade number = 1 + 2 = 3

Inspection (Cont'd)



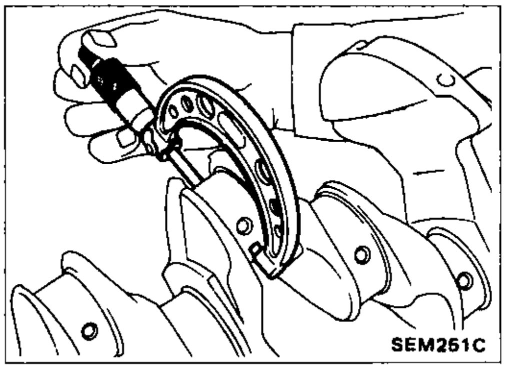
SEM507A

Connecting rod bearing (Big end)

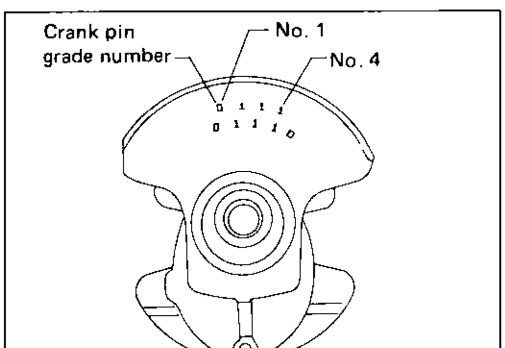
1. Install connecting rod bearing to connecting rod and cap.
2. Install connecting rod cap to connecting rod.

Tighten bolts to the specified torque.

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


SEM251C

4. Measure outer diameter "Dp" of each crankshaft pin journal.
5. Calculate connecting rod bearing clearance.
   Connecting rod bearing clearance = C – Dp
   Standard:
   0.010 - 0.035 mm (0.0004 - 0.0014 in)
   Limit:
   0.09 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".

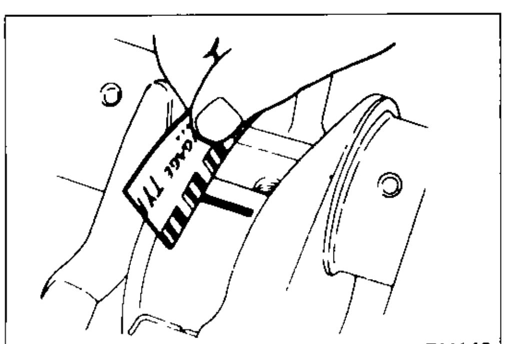


SEM567B

8. If crankshaft is replaced with a new one, select connecting rod bearing according to the following table.

Connecting rod bearing grade number:

Crank pin grade number	Connecting rod bearing grade number
0	0
1	1
2	2


EM142

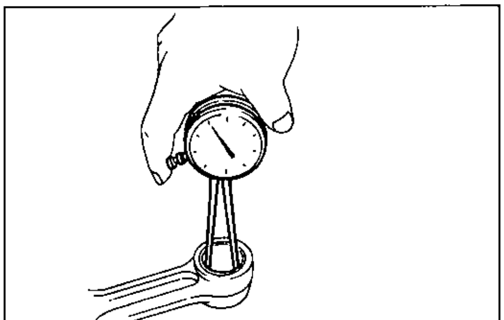
Method B (Using plastigage)

CAUTION:

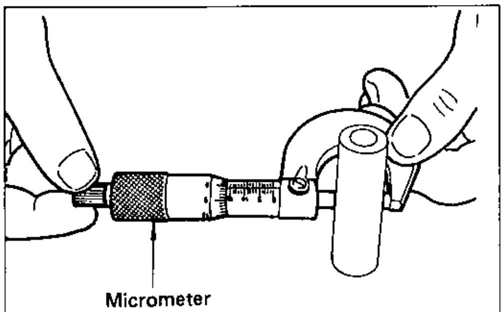
- **Do not turn crankshaft or connecting rod while plastigage is being inserted.**
- **When bearing clearance exceeds the specified limit, ensure that the proper bearing has been installed. Then if excessive bearing clearance exists, use a thicker main bearing or undersized bearing so that the specified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

Inspection (Cont'd)

CONNECTING ROD BUSHING CLEARANCE (Small end)


SEM151B

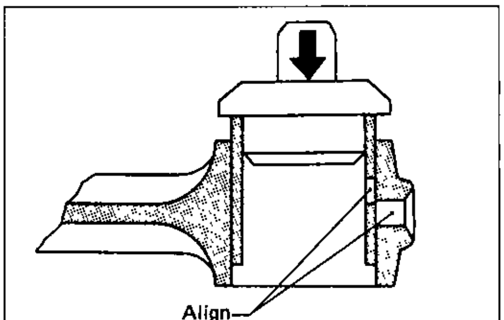
1. Measure inner diameter "C" of bushing.



SEM903A

2. Measure outer diameter "Dp" of piston pin.
3. Calculate connecting rod bearing clearance.
   C − Dp =
   0.005 - 0.017 mm (0.0002 - 0.0007 in) (Standard)
   0.023 mm (0.0009 in) (Limit)
   If it exceeds the limit, replace connecting rod assembly and/or piston set with pin.

REPLACEMENT OF CONNECTING ROD BUSHING (Small end)



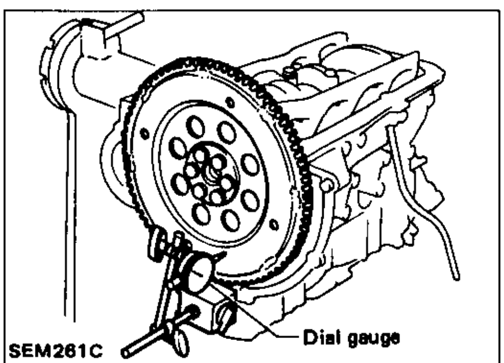
SEM062A

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 so that clearance between small end bushing and piston pin is specified value.
   Clearance between small end bushing and piston pin:
   0.005 - 0.017 mm (0.0002 - 0.0007 in)

FLYWHEEL/DRIVE PLATE RUNOUT

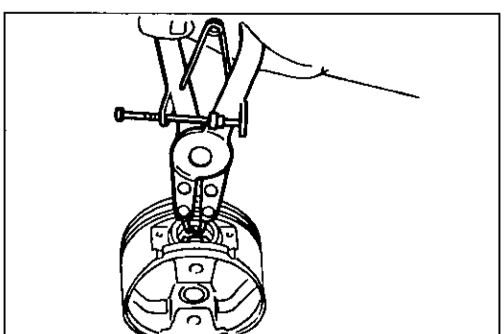


SEM261C

Runout (Total indicator reading):
Flywheel (M/T model)
Less than 0.1 mm (0.004 in)
Drive plate (A/T model)
Less than 0.1 mm (0.004 in)

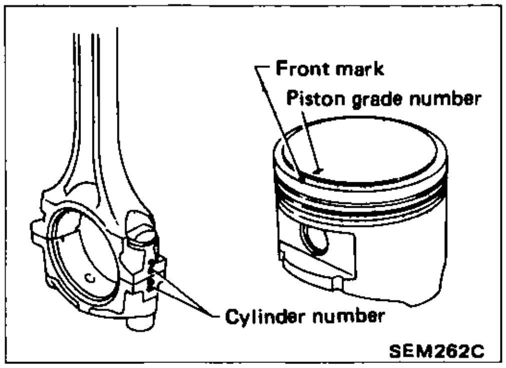
Assembly

PISTON


SEM166B

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

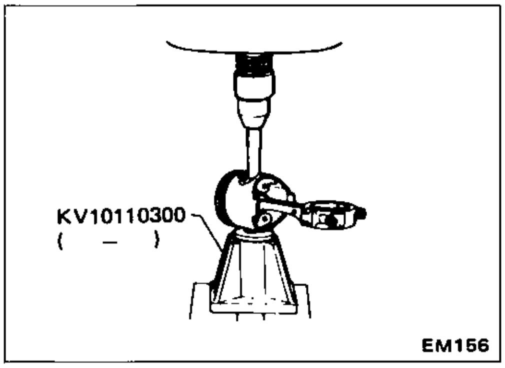
Assembly (Cont'd)



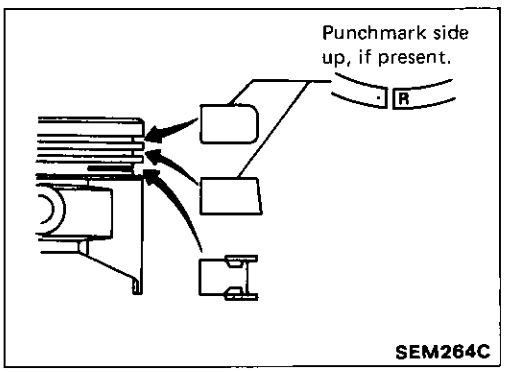
SEM262C

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.**



EM156

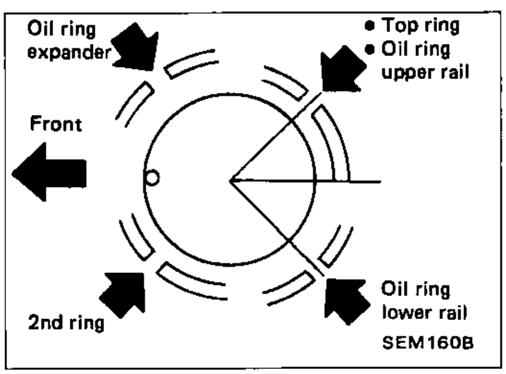


SEM264C

3. Set piston rings as shown.

CAUTION:

- **When piston rings are not replaced, make sure that piston rings are mounted in their original positions.**
- **When piston rings are being replaced and no punchmark is present, piston rings can be mounted with either side up.**

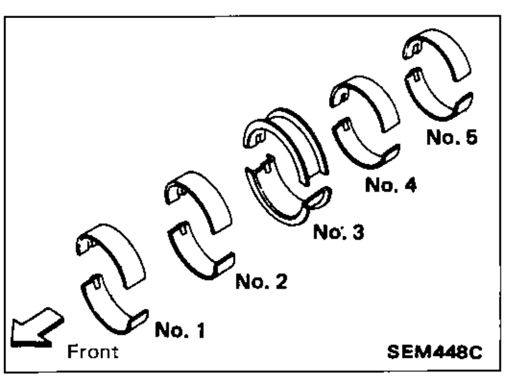


SEM160B

CRANKSHAFT

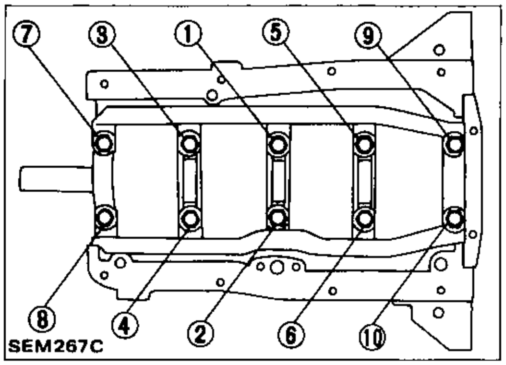
1. Set main bearings in their proper positions on cylinder block and main bearing beam.

- **Confirm that correct main bearings are used. Refer to "Inspection" of this section.**



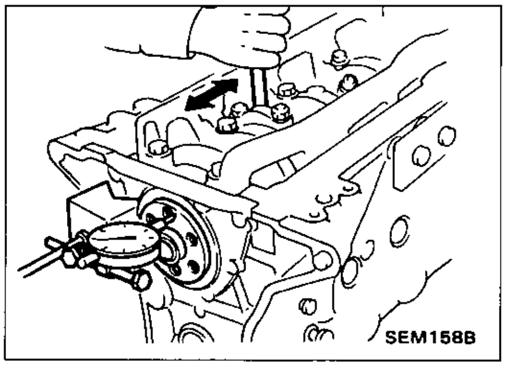
SEM448C

Assembly (Cont'd)



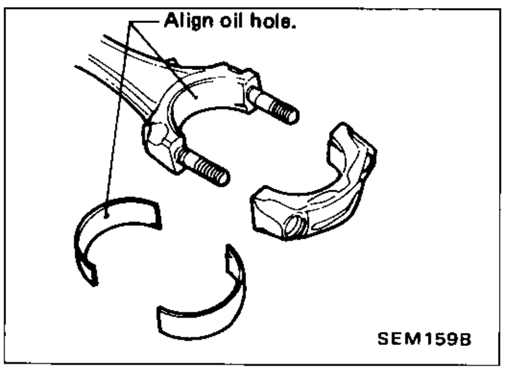
SEM267C

2. Install crankshaft and main bearing beam 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.**


SEM158B

3. Measure crankshaft end play.
   Crankshaft end play:
   Standard
   0.05 - 0.18 mm (0.0020 - 0.0071 in)
   Limit
   0.3 mm (0.012 in)

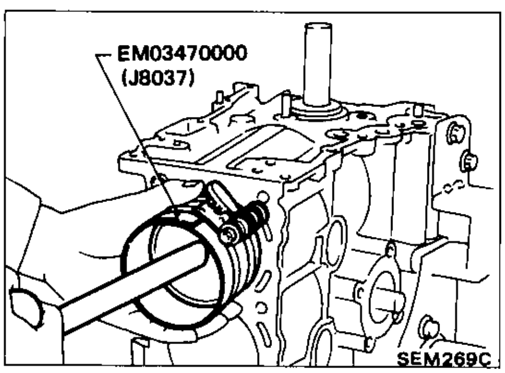
If beyond the limit, replace bearing with a new one.



SEM159B

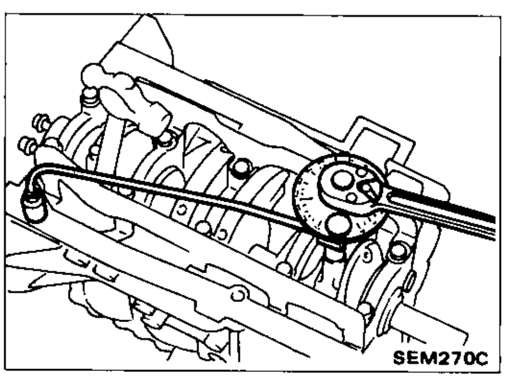
4. Install connecting rod bearings in connecting rods and connecting rod caps.
- Confirm that correct bearings are used.

Refer to "Inspection".
- Install bearings so that oil hole in connecting rod aligns with oil hole of bearing.



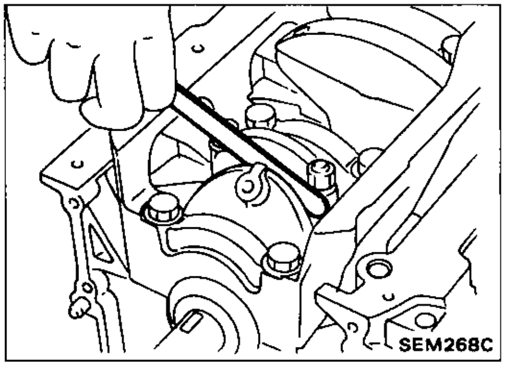
SEM269C

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.**

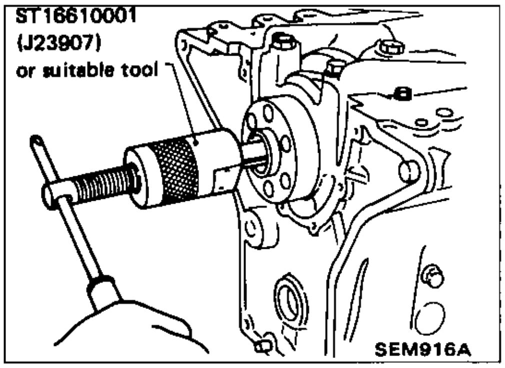

SEM270C

b. Install connecting rod bearing caps.
Tighten connecting rod bearing cap 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) Tighten bolts 60 to 65 degrees clockwise with an angle wrench, or if an angle wrench is not available, tighten them to 38 to 44 N·m (3.9 to 4.5 kg-m, 28 to 33 ft-lb).

Assembly (Cont'd)

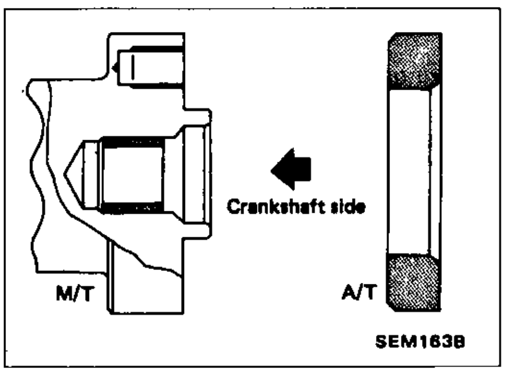


6. Measure connecting rod side clearance.
   Connecting rod side clearance:
   Standard
   0.2 - 0.4 mm (0.008 - 0.016 in)
   Limit
   0.6 mm (0.024 in)
   If beyond the limit, replace connecting rod and/or crankshaft.



REPLACING PILOT BUSHING

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



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

General Specifications

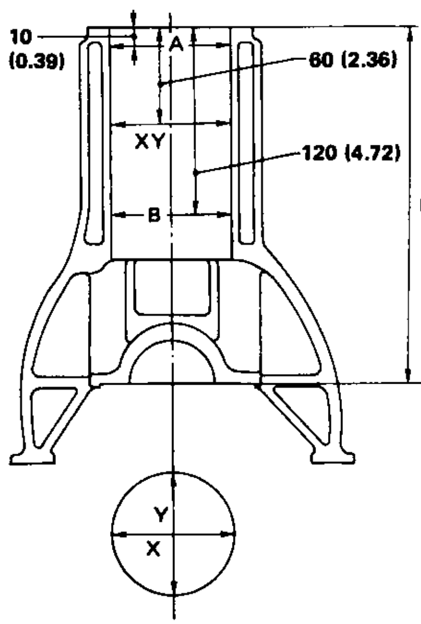
Engine model	KA24E
Cylinder arrangement	4, in-line
Displacement cm³ (cu in)	2,389 (145.78)
Bore x stroke mm (in)	89 x 96 (3.50 x 3.78)
Valve arrangement	O.H.C.
Firing order	1-3-4-2
Number of piston rings	
Compression	2
Oil	1
Number of main bearings	5
Compression ratio	8.6

Unit: kPa (kg/cm², psi)/rpm

Compression pressure	
Standard	1,206 (12.3, 175)/250
Minimum	1,010 (10.3, 146)/250
Differential limit between cylinders	98 (1.0, 14)/250

Inspection and Adjustment

CYLINDER BLOCK



SEM447C

Unit: mm (in)

			Standard	Limit
Distortion			—	0.1 (0.004)
Cylinder bore	Inner diameter	Grade 1	89.000 - 89.010 (3.5039 - 3.5043)	0.2 (0.008)*
		Grade 2	89.010 - 89.020 (3.5043 - 3.5047)	
		Grade 3	89.020 - 89.030 (3.5047 - 3.5051)	
	Out-of-round (X – Y)		Less than 0.015 (0.0006)	—
	Taper (A – B)		Less than 0.010 (0.0004)	—
Difference in inner diameter between cylinders			Less than 0.05 (0 0020)	0.2 (0.008)
Piston-to-cylinder clearance			0.020 - 0.040 (0.0008 - 0.0016)	—
Cylinder block height (From crankshaft center)			246.95 - 247.05 (9.7224 - 9.7264)	0.2 (0.008)**

* Wear limit
** Total amount of cylinder head resurfacing and cylinder block resurfacing

Inspection and Adjustment (Cont'd)

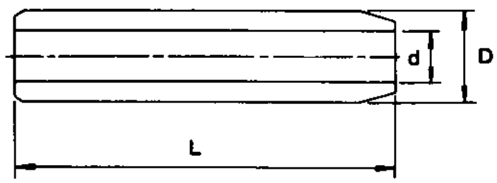
CYLINDER HEAD

Unit: mm (in)

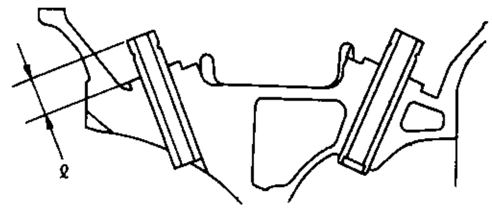
	Standard	Limit
Height (H)	98.8 - 99.0 (3.890 - 3.898)	0.2 (0.008)*
Surface distortion	0.03 (0.0012)	0.1 (0.004)

* Total amount of cylinder head resurfacing and cylinder block resurfacing

VALVE GUIDE



SEM571B

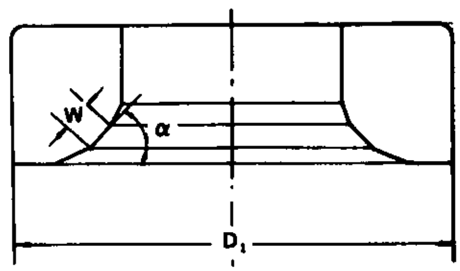


SEM225C

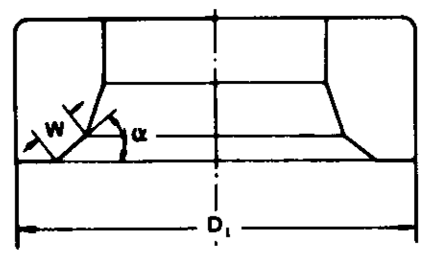
Unit: mm (in)

	Standard		Service		Limit
	Intake	Exhaust	Intake	Exhaust	—
Length (L)	52.6 (2.071)	56.0 (2.205)	52.6 (2.071)	56.0 (2.205)	—
Outer diameter (D)	11.023 - 11.034 (0.4340 - 0.4344)	12.023 - 12.034 (0.4733 - 0.4738)	11.223 - 11.234 (0.4418 - 0.4423)	12.223 - 12.234 (0.4812 - 0.4817)	—
Inner diameter (d) (Finished size)	7.000 - 7.018 (0.2756 - 0.2763)	8.000 - 8.018 (0.3150 - 0.3157)	7.000 - 7.018 (0.2756 - 0.2763)	8.000 - 8.018 (0.3150 - 0.3157)	—
Cylinder head hole diameter	10.975 - 10.996 (0.4321 - 0.4329)	11.975 - 11.996 (0.4715 - 0.4723)	11.175 - 11.196 (0.4400 - 0.4408)	12.175 - 12.196 (0.4793 - 0.4802)	—
Interference fit	0.027 - 0.059 (0.0011 - 0.0023)				—
Stem to guide clearance	0.020 - 0.053 (0.0008 - 0.0021)	0.040 - 0.070 (0.0016 - 0.0028)	0.020 - 0.053 (0.0008 - 0.0021)	0.040 - 0.070 (0.0016 - 0.0028)	0.1 (0.004)
Tapping length (ℓ)	14.9 - 15.1 (0.587 - 0.594)				—

Inspection and Adjustment (Cont'd)



SEM177



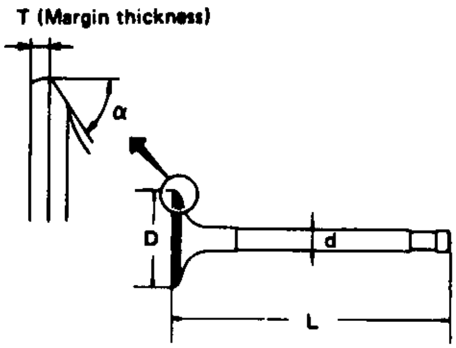
SEM178

Unit: mm (in)

	Standard		Service	
	Intake	Exhaust	Intake	Exhaust
Cylinder head seat recess diameter	36.000 - 36.016 (1.4173 - 1.4179)	42.000 - 42.016 (1.6535 - 1.6542)	36.500 - 36.516 (1.4370 - 1.4376)	42.500 - 42.516 (1.6732 - 1.6739)
Valve seat outer diameter (D_1)	36.080 - 36.096 (1.4205 - 1.4211)	42.080 - 42.096 (1.6567 - 1.6573)	36.580 - 36.596 (1.4402 - 1.4408)	42.580 - 42.596 (1.6764 - 1.6770)
Face angle (α)	45°	45°	45°	45°
Contacting width (W)	1.6 - 1.7 (0.063 - 0.067)	1.7 - 2.1 (0.067 - 0.083)	1.6 - 1.7 (0.063 - 0.067)	1.7 - 2.1 (0.067 - 0.083)

Inspection and Adjustment (Cont'd)

VALVE



SEM188A

Unit: mm (in)

		Standard	Limit
Valve head diameter (D)	In.	34.0 - 34.2 (1.339 - 1.346)	—
	Ex.	40.0 - 40.2 (1.575 - 1.583)	—
Valve length (L)	In.	119.9 - 120.2 (4.720 - 4.732)	—
	Ex.	120.67 - 120.97 (4.7508 - 4.7626)	—
Valve stem diameter (d)	In.	6.965 - 6.980 (0.2742 - 0.2748)	—
	Ex.	7.948 - 7.960 (0.3129 - 0.3134)	—
Valve face angle (α)	In.	45°30'	—
	Ex.	45°30'	—
Valve head margin (T)	In.	1.15 - 1.45 (0.0453 - 0.0571)	0.5 (0.020)
	Ex.	1.35 - 1.65 (0.0531 - 0.0650)	

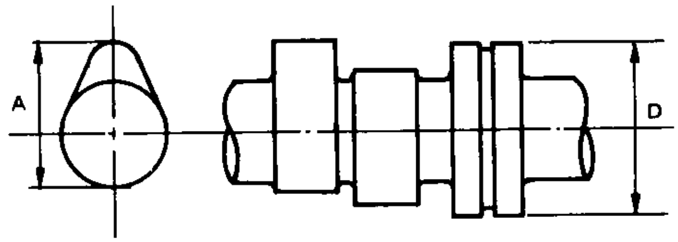
VALVE SPRING

Unit: mm (in)

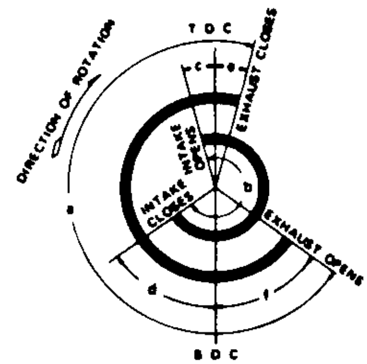
		Standard		Limit	
		Intake	Exhaust	Intake	Exhaust
Free height (H)	Outer	57.44 (2.2614)	53.21 (2.0949)	—	—
	Inner	53.34 (2.1000)	47.95 (1.8878)	—	—
Pressure N (kg, lb)at height	Outer	604.1 (61.6, 135.8) at 37.6 (1.480)	640.4 (65.3, 144.0) at 34.1 (1.343)	567.8 (57.9, 127.7) at 37.6 (1.480)	620.8 (63.3, 139.6) at 34.1 (1.343)
	Inner	284.4 (29.0, 63.9) at 32.6 (1.283)	328.5 (33.5, 73.9) at 29.1 (1.146)	266.8 (27.2, 60.0) at 32.6 (1.283)	318.7 (32.5, 71.7) at 29.1 (1.146)
Out-of-square	Outer	—	—	2.5 (0.098)	2.3 (0.091)
	Inner	—	—	2.3 (0.091)	2.1 (0.083)

Inspection and Adjustment (Cont'd)

CAMSHAFT AND CAMSHAFT BEARING



SEM568A



EM120

Unit: mm (in)

		Standard	Limit
Cam height (A)		44.839 - 45.029 (1.7653 - 1.7728)	—
Valve lift (h)		10.4 (0.409)	—
Wear limit of cam height		—	0.2 (0.008)
Camshaft journal to bearing clearance		0.045 - 0.090 (0.0018 - 0.0035)	0.12 (0.0047)
Inner diameter of camshaft bearing		33.000 - 33.025 (1.2992 - 1.3002)	—
Outer diameter of camshaft journal (D)		32.935 - 32.955 (1.2967 - 1.2974)	—
Camshaft runout		0 - 0.02 (0 - 0.0008)	—
Camshaft end play		0.07 - 0.15 (0.0028 - 0.0059)	0.2 (0.008)
Valve timing (Degree on crankshaft)	a	248	—
	b	240	—
	c	3	—
	d	57	—
	e	12	—
	f	56	—

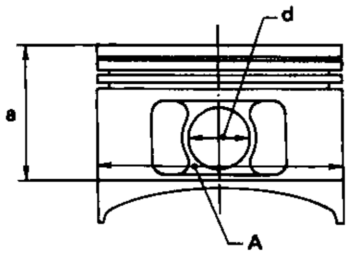
ROCKER ARM AND ROCKER SHAFT

Unit: mm (in)

Rocker arm to shaft clearance	0.012 - 0.050 (0.0005 - 0.0020)
Rocker shaft diameter	21.979 - 22.000 (0.8653 - 0.8661)
Rocker arm rocker shaft hole diameter	22.012 - 22.029 (0.8666 - 0.8673)

PISTON, PISTON RING AND PISTON PIN

Piston



SEM444C

Unit: mm (in)

Piston skirt diameter (A)	Standard	Grade No. 1	88.970 - 88.980 (3.5027 - 3.5031)
		Grade No. 2	88.980 - 88.990 (3.5031 - 3.5035)
		Grade No. 3	88.990 - 89.000 (3.5035 - 3.5039)
	Service (Oversize)	0.5 (0.020)	89.470 - 89.500 (3.5224 - 3.5236)
		1.0 (0.039)	89.970 - 90.000 (3.5421 - 3.5433)
Dimensions (a)			Approximately 52 (2.05)
Piston pin hole diameter (d)			20.987 - 20.999 (0.8263 - 0.8267)
Piston-to-cylinder bore clearance			0.020 - 0.040 (0.0008 - 0.0016)

Piston pin

Unit: mm (in)

	Standard	Limit
Piston pin outer diameter	20.989 - 21.001 (0.8263 - 0.8268)	—
Interference fit of piston pin to piston pin hole	0 - 0.004 (0 - 0.0002)	—
Piston pin to connecting rod bearing clearance	0.005 - 0.017 (0.0002 - 0.0007)	0.023 (0.0009)

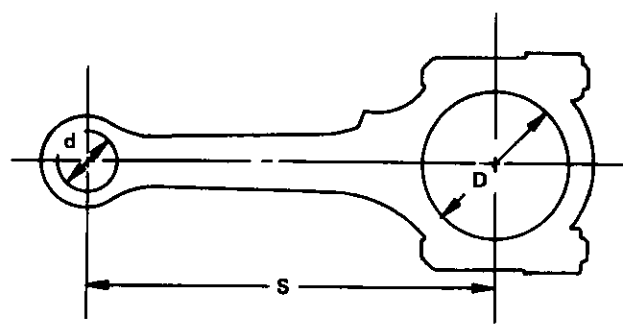
Piston ring

Unit: mm (in)

		Standard	Limit
Side clearance	Top	0.040 - 0.080 (0.0016 - 0.0031)	0.1 (0.004)
	2nd	0.030 - 0.070 (0.0012 - 0.0028)	0.1 (0.004)
Ring gap	Top	0.28 - 0.52 (0.0110 - 0.0205)	0.5 (0.020)
	2nd	0.45 - 0.69 (0.0177 - 0.0272)*1	0.5 (0.020)
		0.55 - 0.70 (0.0217 - 0.0276)*2	
	Oil (rail ring)	0.20 - 0.69 (0.0079 - 0.0272)	0.5 (0.020)

*1: For rings punched with R or T.
*2: For rings punched with N.

CONNECTING ROD



SEM570A

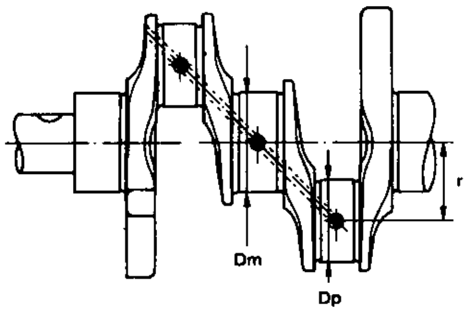
Unit: mm (in)

	Standard	Limit
Center distance (S)	164.95 - 165.05 (6.4941 - 6.4980)	—
Bend [per 100 mm (3.94 in)]	—	0.15 (0.0059)
Torsion [per 100 mm (3.94 in)]	—	0.3 (0.012)
Piston pin bushing inner diameter (d)*	21.000 - 21.012 (0.8268 - 0.8272)	—
Connecting rod big end inner diameter (D)*	53.000 - 53.013 (2.0866 - 2.0871)	—
Side clearance	0.2 - 0.4 (0.008 - 0.016)	0.6 (0.024)

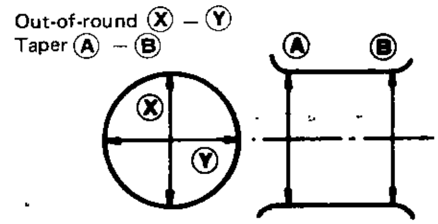
* Without bearing

Inspection and Adjustment (Cont'd)

CRANKSHAFT



SEM394



EM715

Unit: mm (in)

Main journal diameter (Dm)	Grade	No. 0	59.967 - 59.975 (2.3609 - 2.3612)	
		No. 1	59.959 - 59.967 (2.3606 - 2.3609)	
		No. 2	59.951 - 59.959 (2.3603 - 2.3606)	
Pin journal diameter (Dp)	Grade	No. 0	46.968 - 49.974 (1.8491 - 1.9675)	
		No. 1	49.962 - 49.968 (1.9670 - 1.9672)	
		No. 2	49.956 - 49.962 (1.9668 - 1.9670)	
Center distance (r)			47.97 - 48.03 (1.8886 - 1.8909)	
			Standard	Limit
Taper of journal and pin [A - B]	Journal		—	0.01 (0.0004)
	Pin		—	0.005 (0.0002)
Out-of-round of journal and pin [X - Y]	Journal		—	0.01 (0.0004)
	Pin		—	0.005 (0.0002)
Runout [T.I.R.]*			—	0.10 (0.0039)
Free end play			0.05 - 0.18 (0.0020 - 0.0071)	0.3 (0.012)
Fillet roll			More than 0.1 (0.004)	

* Total indicator reading

BEARING CLEARANCE

Unit: mm (in)

	Standard	Limit
Main bearing clearance	0.020 - 0.047 (0.0008 - 0.0019)	0.1 (0.004)
Connecting rod bearing clearance	0.010 - 0.035 (0.0004 - 0.0014)	0.09 (0.0035)

Inspection and Adjustment (Cont'd)

AVAILABLE MAIN BEARING

Standard

Grade number	Thickness mm (in)	Identification color
0	1.821 - 1.825 (0.0717 - 0.0719)	Black
1	1.825 - 1.829 (0.0719 - 0.0720)	Brown
2	1.829 - 1.833 (0.0720 - 0.0722)	Green
3	1.833 - 1.837 (0.0722 - 0.0723)	Yellow
4	1.837 - 1.841 (0.0723 - 0.0725)	Blue

Undersize (service)

Unit: mm (in)

	Thickness	Main journal diameter "Dm"
0.25 (0.0098)	1.952 - 1.960 (0.0769 - 0.0772)	Grind so that bearing clearance is the specified value.

AVAILABLE CONNECTING ROD BEARING

Standard

Grade number	Thickness mm (in)	Identification color
0	1.505 - 1.508 (0.0593 - 0.0594)	—
1	1.508 - 1.511 (0.0594 - 0.0595)	Brown
2	1.511 - 1.514 (0.0595 - 0.0596)	Green

Undersize (service)

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)	

MISCELLANEOUS COMPONENTS

Unit: mm (in)

Camshaft sprocket runout [T.I.R.]*	Less than 0.12 (0.0047)
Flywheel runout [T.I.R.]*	Less than 0.1 (0.004)
Drive plate runout [T.I.R.]*	Less than 0.1 (0.004)

* Total indicator reading

ENGINE LUBRICATION & COOLING SYSTEMS

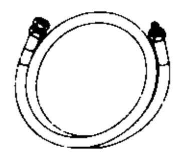
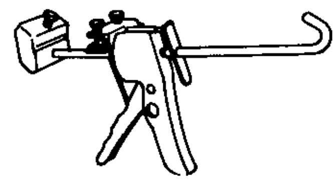
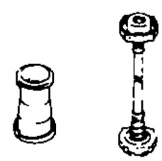
SECTION LC

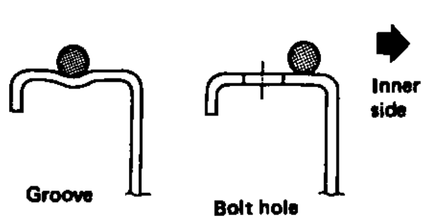
CONTENTS

PREPARATION AND PRECAUTIONS .... LC- 2
ENGINE LUBRICATION SYSTEM .... LC- 3
ENGINE COOLING SYSTEM .... LC- 6
SERVICE DATA AND SPECIFICATIONS (S.D.S.) LC-10

Preparation

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.) Tool name	Description
ST25051001 (J25695-1) Oil pressure gauge	
ST25052000 (J25695-2) Hose	Adapting oil pressure gauge to cylinder block 
WS39930000 (—) Tube presser	Pressing the tube of liquid gasket 
EG17650301 (—) Radiator cap tester adapter	Adapting radiator cap tester to radiator filler neck 



SEM371C

Precautions

LIQUID GASKET APPLICATION PROCEDURE

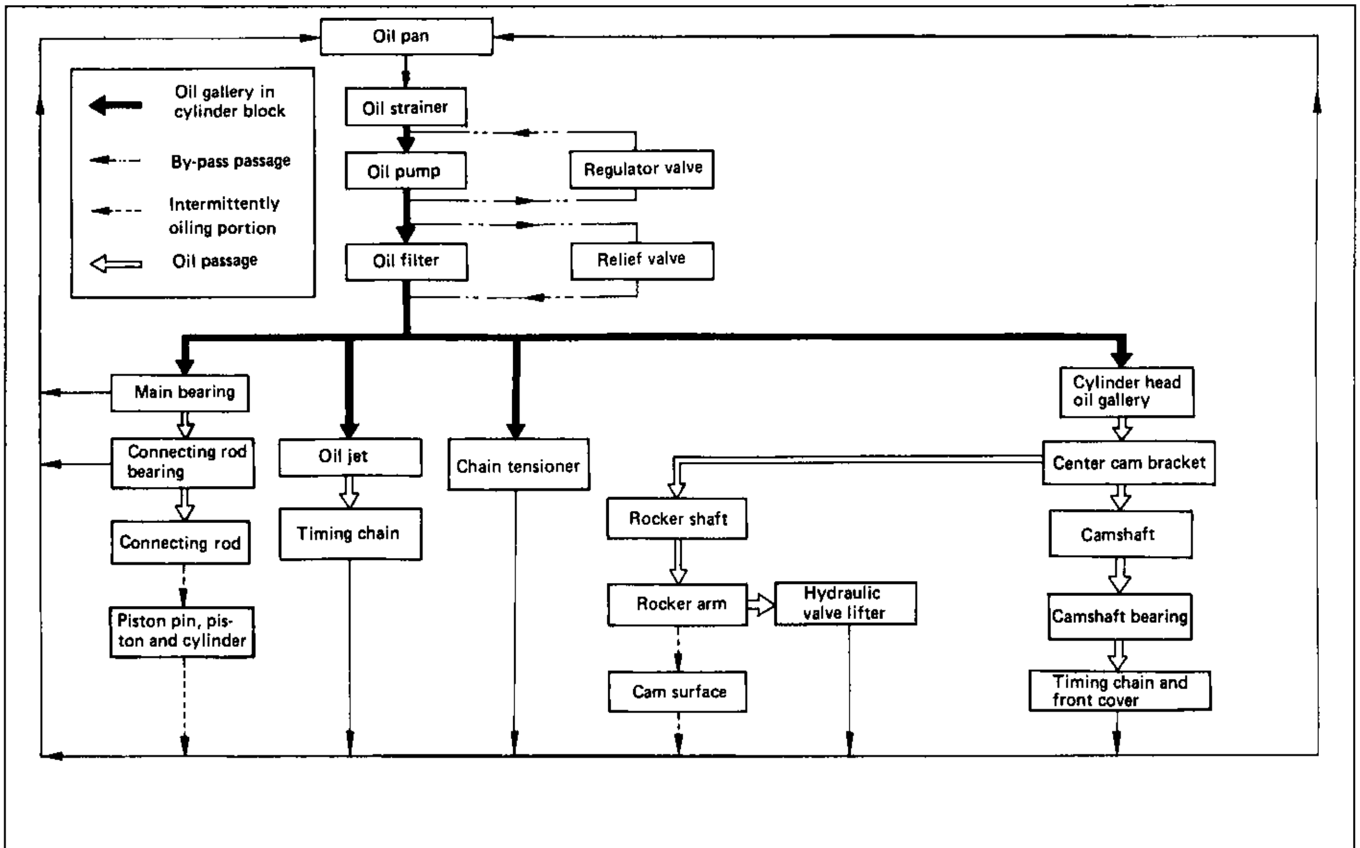
a. **Before applying liquid gasket, use a scraper to remove all traces of old liquid gasket from mating surfaces and grooves, and then completely clean any oil stains from these portions.**

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 surface around hole perimeter area.**
   (Assembly should be done within 5 minutes after coating.)

d. **Wait at least 30 minutes before refilling engine oil and engine coolant.**

Lubrication Circuit

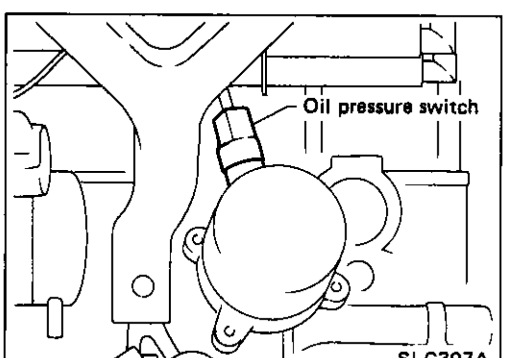


SEF115I

Oil Pressure Check

WARNING:

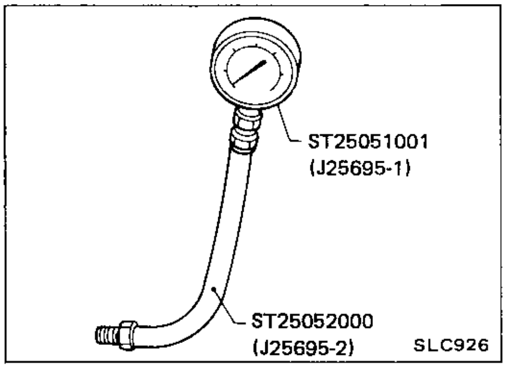
- **Be careful not to burn yourself, as the engine and oil may be hot.**
- **Oil pressure check should be done in "Neutral" gear position.**



SLC307A

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

Oil Pressure Check (Cont'd)



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 (kg/cm^2, psi)
Idle speed	More than 78 (0.8, 11)
3,000	412 - 481 (4.2 - 4.9, 60 - 70)

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

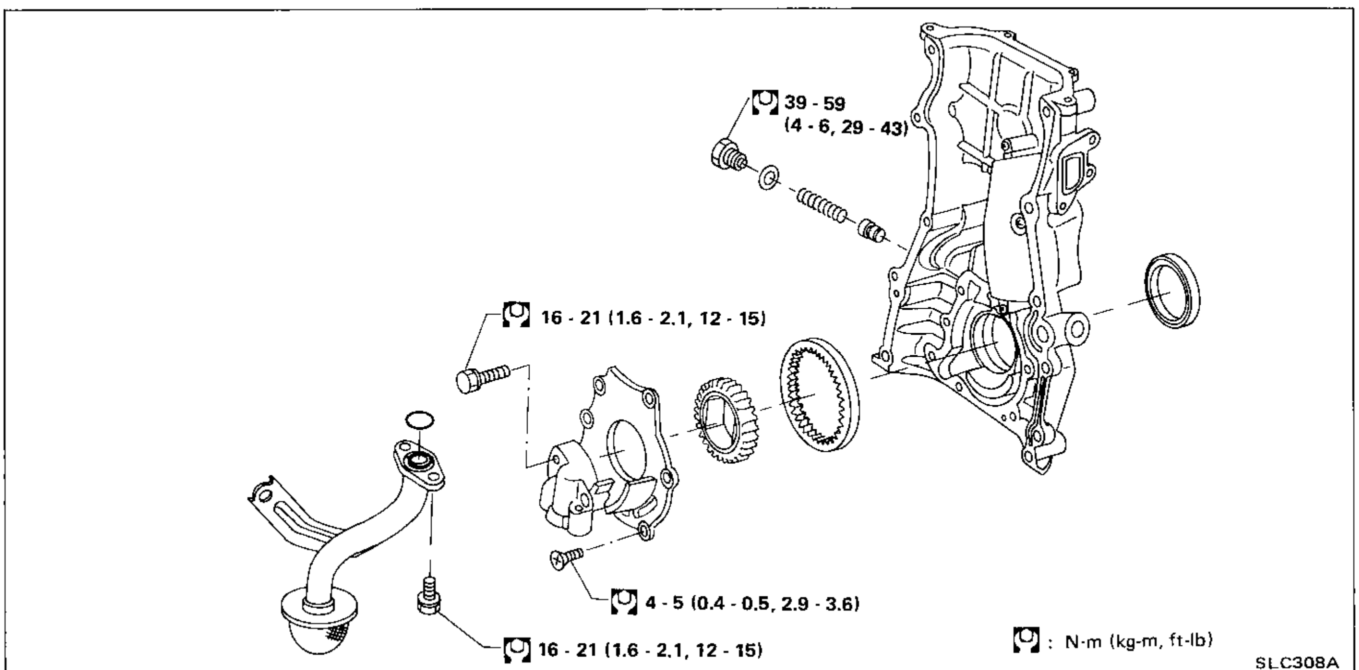
6. Install oil pressure switch with sealant.

Oil Pump

REMOVAL

1. Drain oil.
2. Remove front cover. (Refer to EM section.)
3. Remove oil pump assembly.

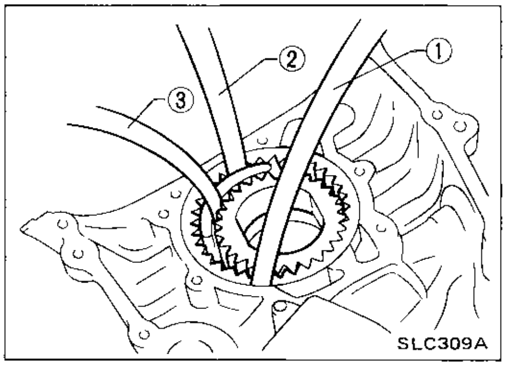
DISASSEMBLY AND ASSEMBLY



- **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.**

Oil Pump (Cont'd)

INSPECTION



SLC309A

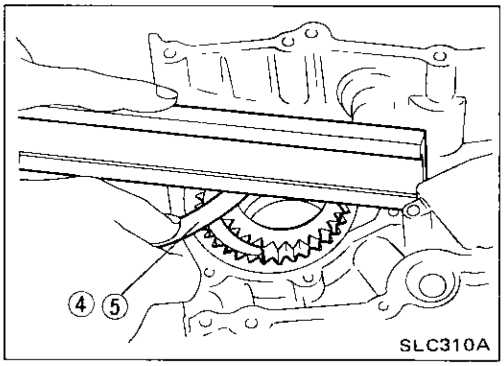
Using a feeler gauge, check the following clearances:

Standard clearance:

Unit: mm (in)

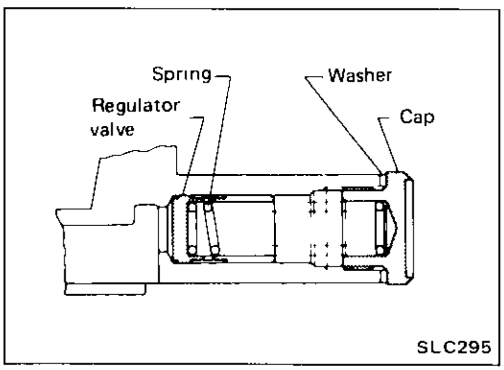
Body to outer gear clearance ①	0.11 - 0.20 (0.0043 - 0.0079)
Inner gear to crescent clearance ②	0.22 - 0.33 (0.0087 - 0.0130)
Outer gear to crescent clearance ③	0.21 - 0.32 (0.0083 - 0.0126)
Housing to inner gear clearance ④	0.05 - 0.09 (0.0020 - 0.0035)
Housing to outer gear clearance ⑤	0.05 - 0.11 (0.0020 - 0.0043)

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



SLC310A

REGULATOR VALVE INSPECTION

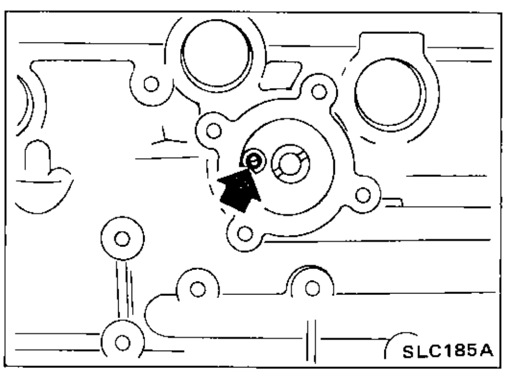


SLC295

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.

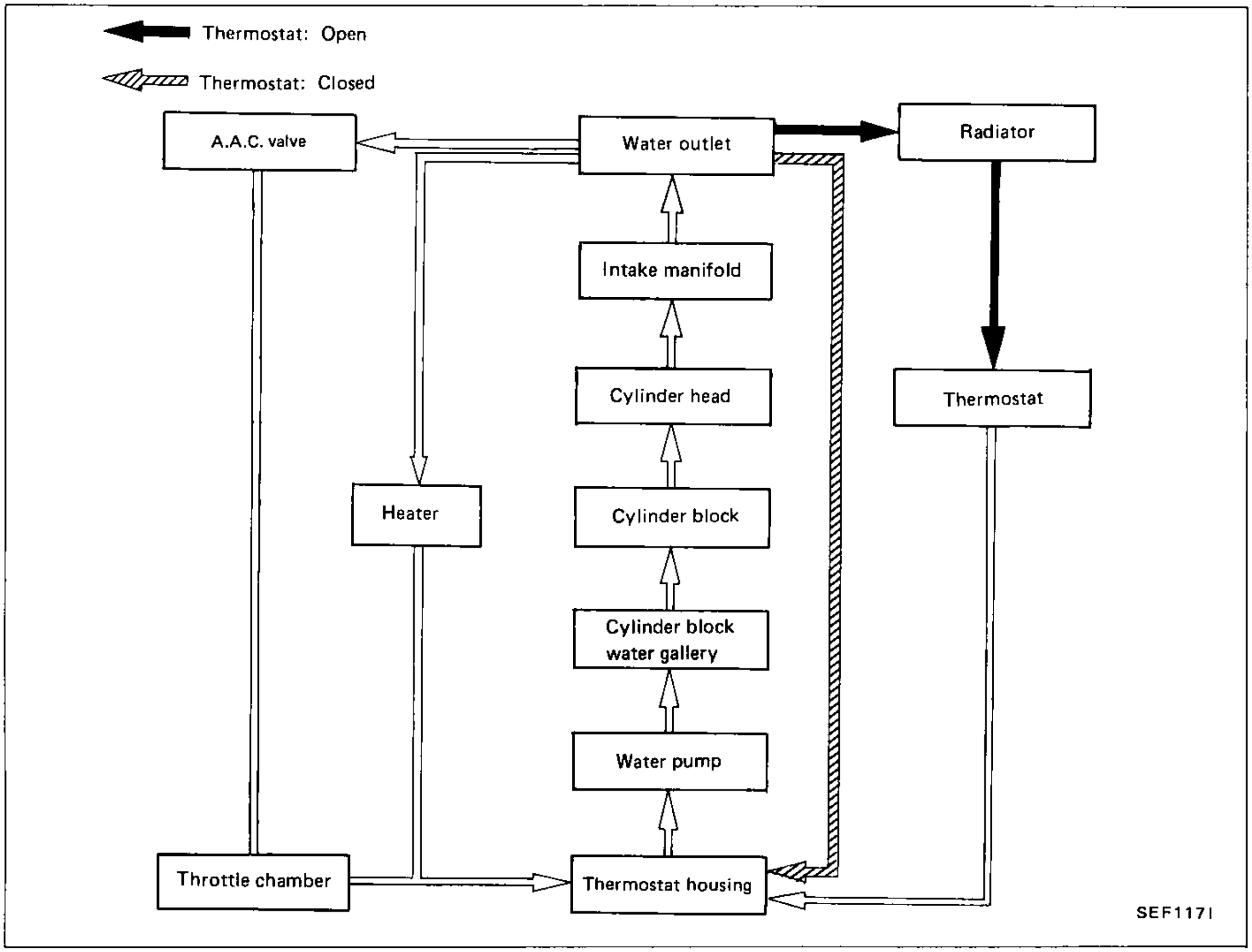
If damaged, replace regulator valve set or oil pump assembly.

OIL PRESSURE RELIEF VALVE INSPECTION


SLC185A

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.

Cooling Circuit



System Check

WARNING:

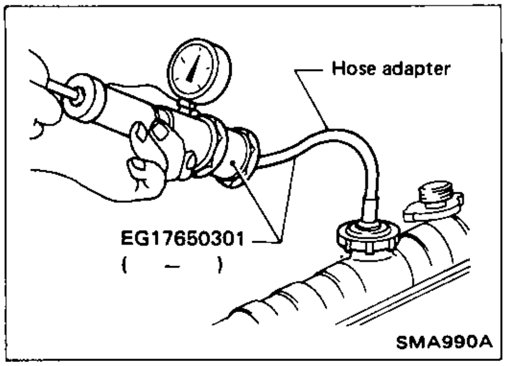
Never remove the radiator cap when the engine is hot; serious burns could be caused by high pressure fluid escaping from the radiator.

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.

System Check (Cont'd)

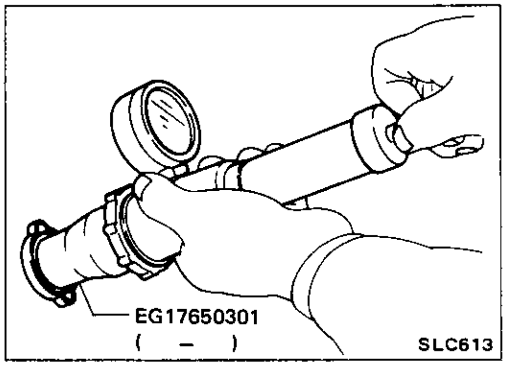


CHECKING COOLING SYSTEM FOR LEAKS

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

Testing pressure:
98 kPa (1.0 kg/cm², 14 psi)

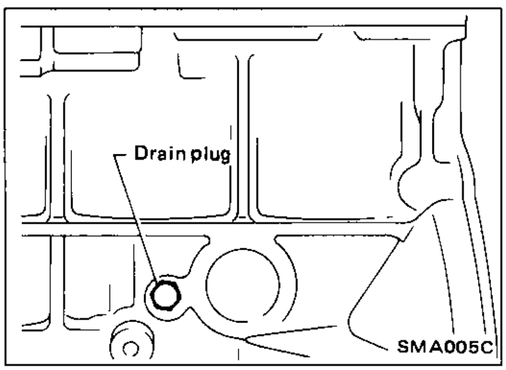
CAUTION:
Higher than the specified pressure may cause radiator damage.



CHECKING RADIATOR CAP

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

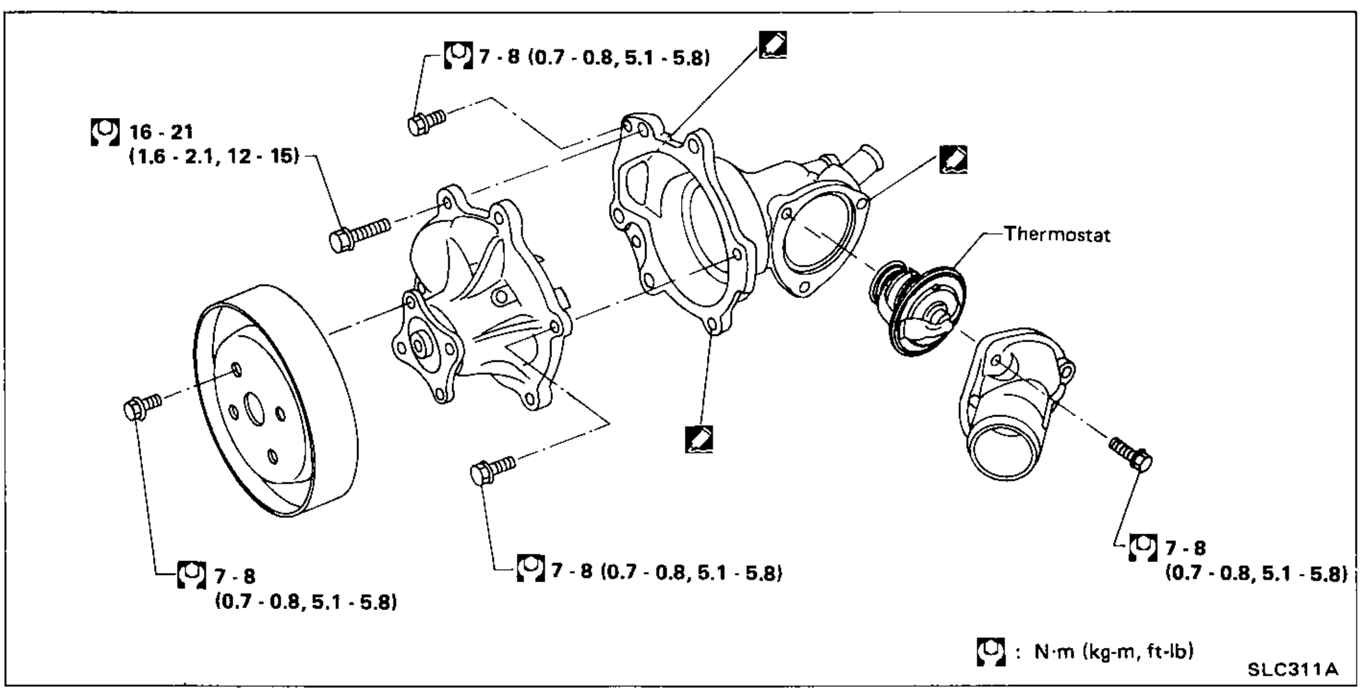
Radiator cap relief pressure:
78 - 98 kPa (0.8 - 1.0 kg/cm², 11 - 14 psi)



Water Pump

REMOVAL AND INSTALLATION

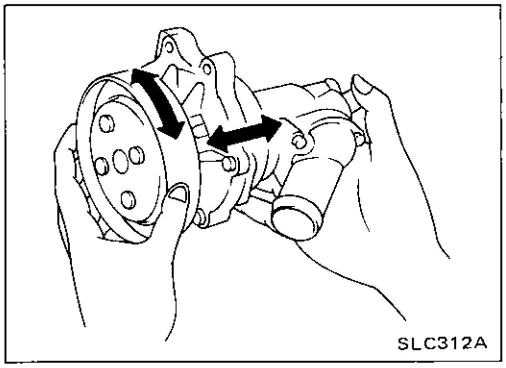
Drain coolant from drain cocks on both cylinder block and radiator.



Water Pump (Cont'd)

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.**
- **To avoid damaging timing cover, make sure there is adequate clearance between it and the hose clamp.**
- **After installing water pump, connect hose and clamp securely, then check for leaks using radiator cap tester.**



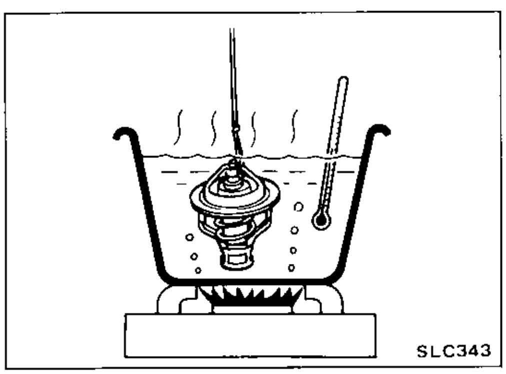
INSPECTION

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

Thermostat

INSPECTION

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



2. Check valve opening temperature and maximum valve lift.

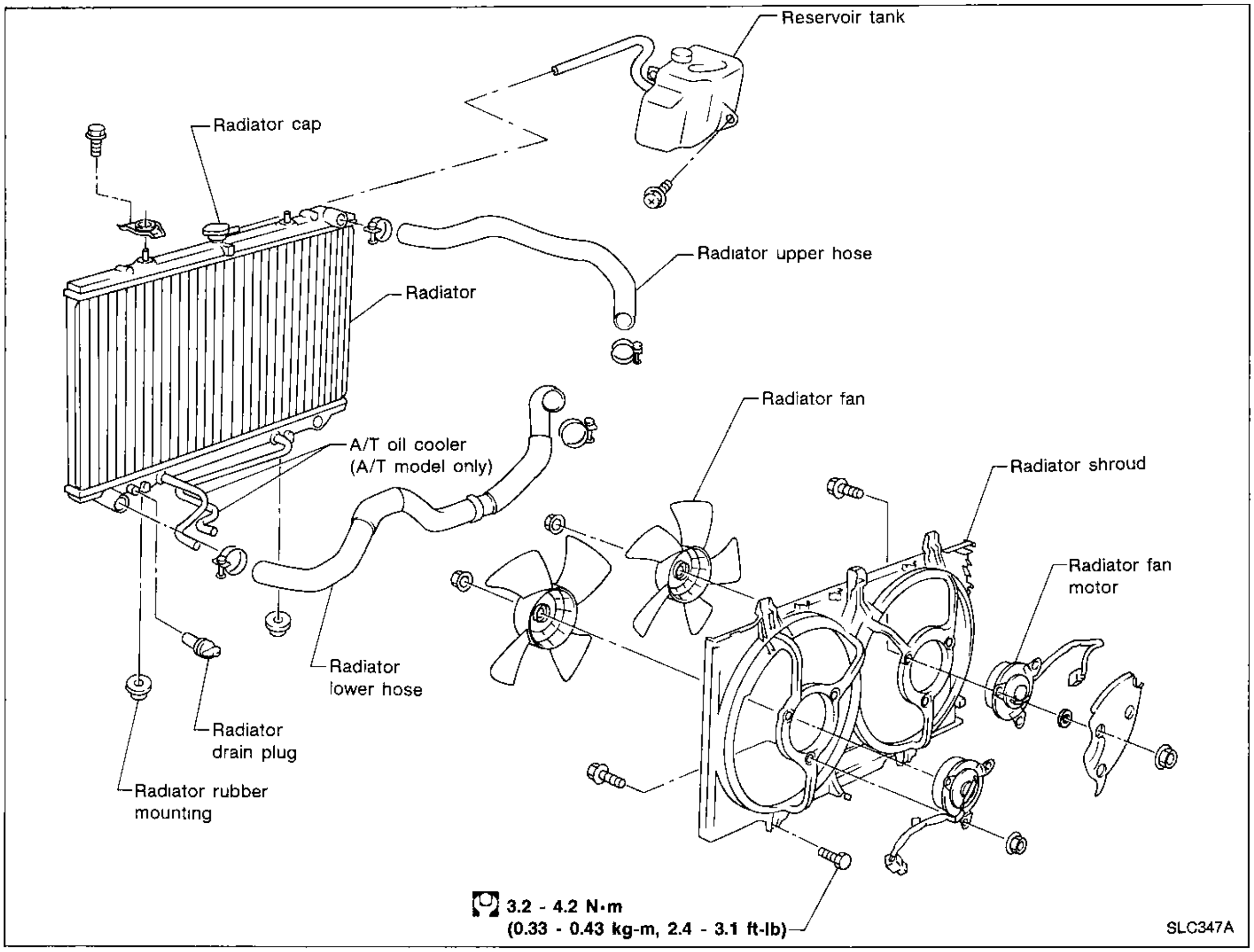
		Standard
Valve opening temperature	°C (°F)	76.5 (170)
Maximum valve lift	mm/°C (in/°F)	8/90 (0.31/194)

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.**

Radiator

REMOVAL AND INSTALLATION



Electric Cooling Fan Control System

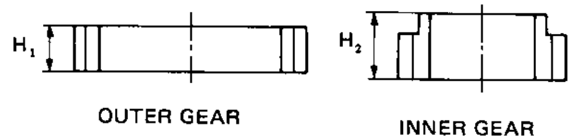
Radiator fan and condenser fan are both controlled by E.C.C.S. control unit.
For details, refer to EF & EC section.

Engine Lubrication System

Oil pressure check

Engine rpm	Approximate discharge pressure kPa (kg/cm², psi)
Idle speed	More than 78 (0.8, 11)
3,000	412 - 481 (4.2 - 4.9, 60 - 70)

Oil pump



SLC573

Unit: mm (in)

	H_1	H_2
Height	11.5 (0.453)	17.25 (0.6791)

Unit: mm (in)

Body to outer gear clearance ①	0.11 - 0.20 (0.0043 - 0.0079)
Inner gear to crescent clearance ②	0.22 - 0.33 (0.0087 - 0.0130)
Outer gear to crescent clearance ③	0.21 - 0.32 (0.0083 - 0.0126)
Housing to inner gear side clearance ④	0.05 - 0.09 (0.0020 - 0.0035)
Housing to outer gear side clearance ⑤	0.05 - 0.11 (0.0020 - 0.0043)

Engine Cooling System

Thermostat

	Standard
Valve opening temperature °C (°F)	76.5 (170)
Maximum valve lift mm/°C (in/°F)	8/90 (0.31/194)

Radiator

Unit: kPa (kg/cm², psi)

Cap relief pressure	78 - 98 (0.8 - 1.0, 11 - 14)
Leakage test pressure	98 (1.0, 14)

ENGINE FUEL &
EMISSION CONTROL SYSTEM

SECTION EF & EC

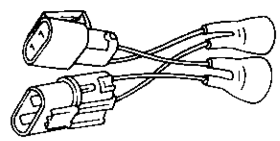
CONTENTS

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- 12
ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION .... EF & EC- 18
IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION .... EF & EC- 29
TROUBLE DIAGNOSES .... EF & EC- 34
FUEL INJECTION CONTROL SYSTEM INSPECTION .... EF & EC-179
EVAPORATIVE EMISSION CONTROL SYSTEM .... EF & EC-182
CRANKCASE EMISSION CONTROL SYSTEM .... EF & EC-184
SERVICE DATA AND SPECIFICATIONS (S.D.S.) .... EF & EC-185

When you read wiring diagrams:
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

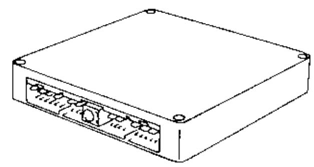
When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES".

SPECIAL SERVICE TOOL

Tool number (Kent-Moore No.) Tool name	Description	
EG11160000 (—) Ignition coil adapter harness		Measuring engine speed

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.
- Do not apply undue force to mounting bracket.
- Before connecting or disconnecting E.C.U. connector, make sure red and green LEDs are off after turning ignition key off.
- Always install the properly specified E.C.U. on car; otherwise, erroneous engine operation may result.



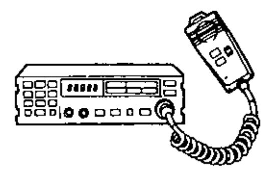
INJECTOR

- Do not disconnect injector harness connectors with engine running.
- Do not apply battery power directly to injectors; otherwise injectors will be damaged.

WIRELESS EQUIPMENT

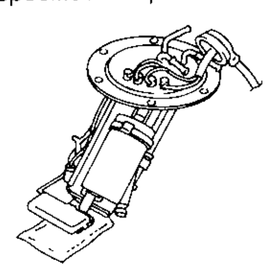
- When installing a C.B. ham radio or a mobile phone, be sure to observe the following, as installation location may affect the electronic control systems.

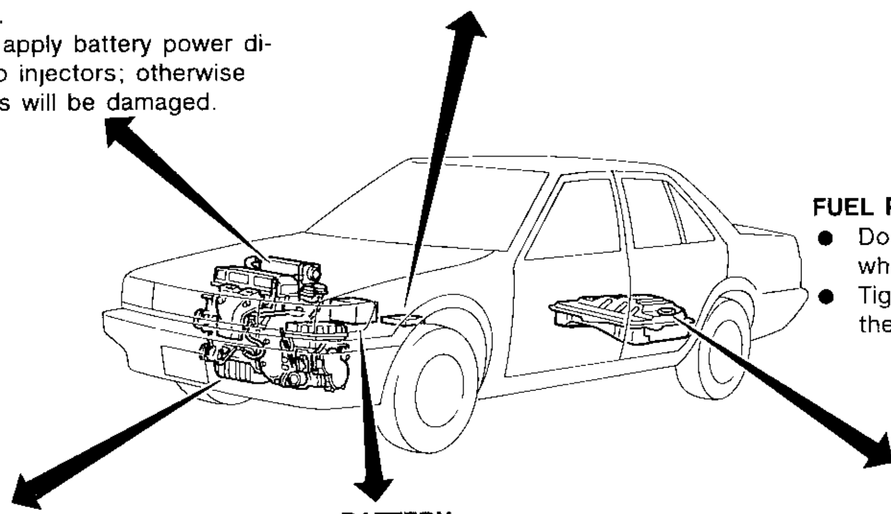
1) Keep antenna as far as possible away from electronic control units.
2) Keep antenna feeder line more than 20 cm (7.9 in) away from harness of electronic controls. Do not let them run parallel for a long distance.
3) Adjust antenna and feeder line so that standing-wave ratio can be kept smaller.
4) Be sure to ground 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. PARTS HANDLING

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

BATTERY

- Always use a 12 volt battery as a power source.
- Do not disconnect battery cables while the engine is running.
- Do not reverse polarity of battery when connecting it. Otherwise, E.C.U. and/or injectors may be burned.

WHEN STARTING

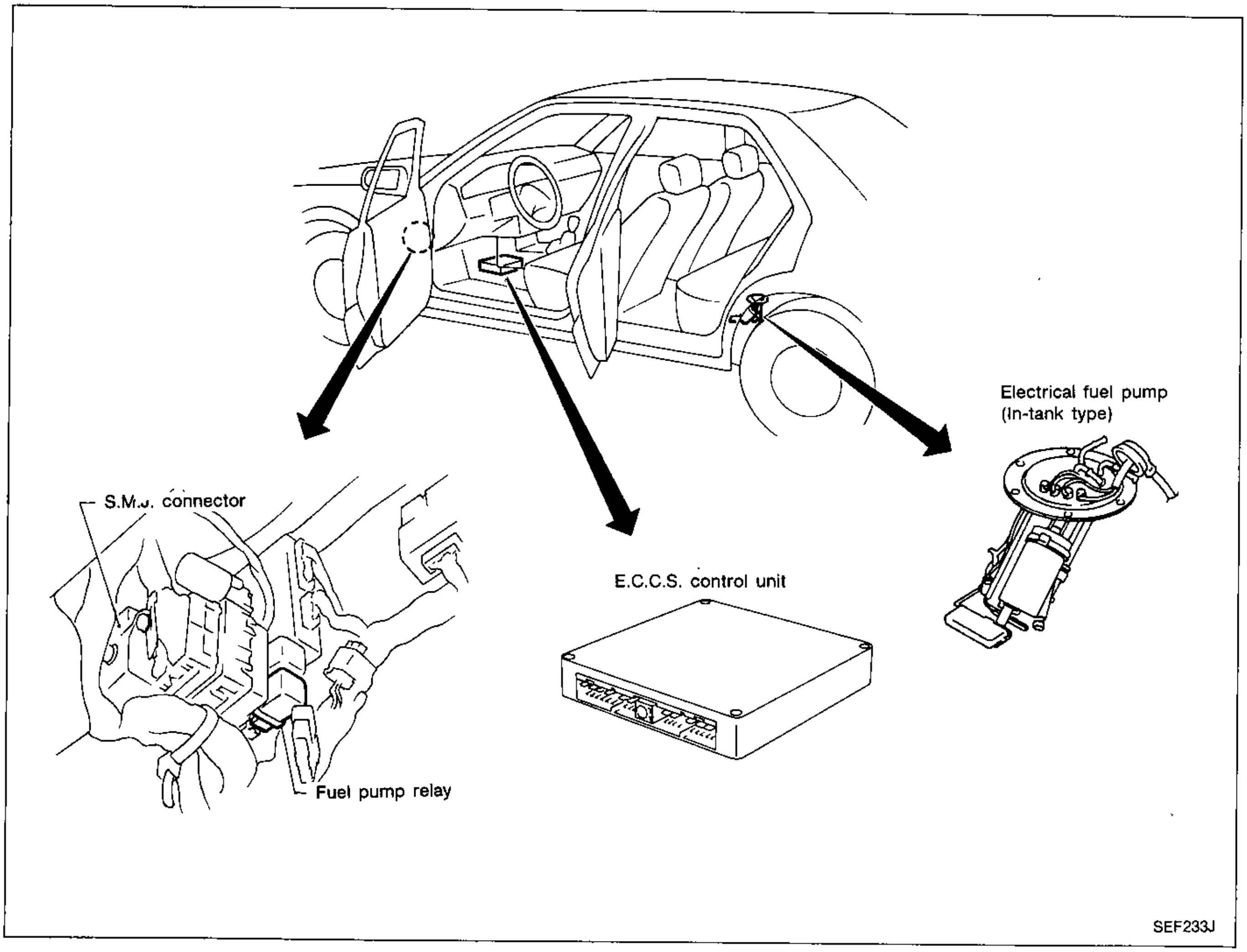
- Do not depress accelerator pedal when starting.
- Immediately after starting, do not rev up engine unnecessarily.
- Do not rev up engine just prior to shutdown.

E.C.C.S. HARNESS HANDLING

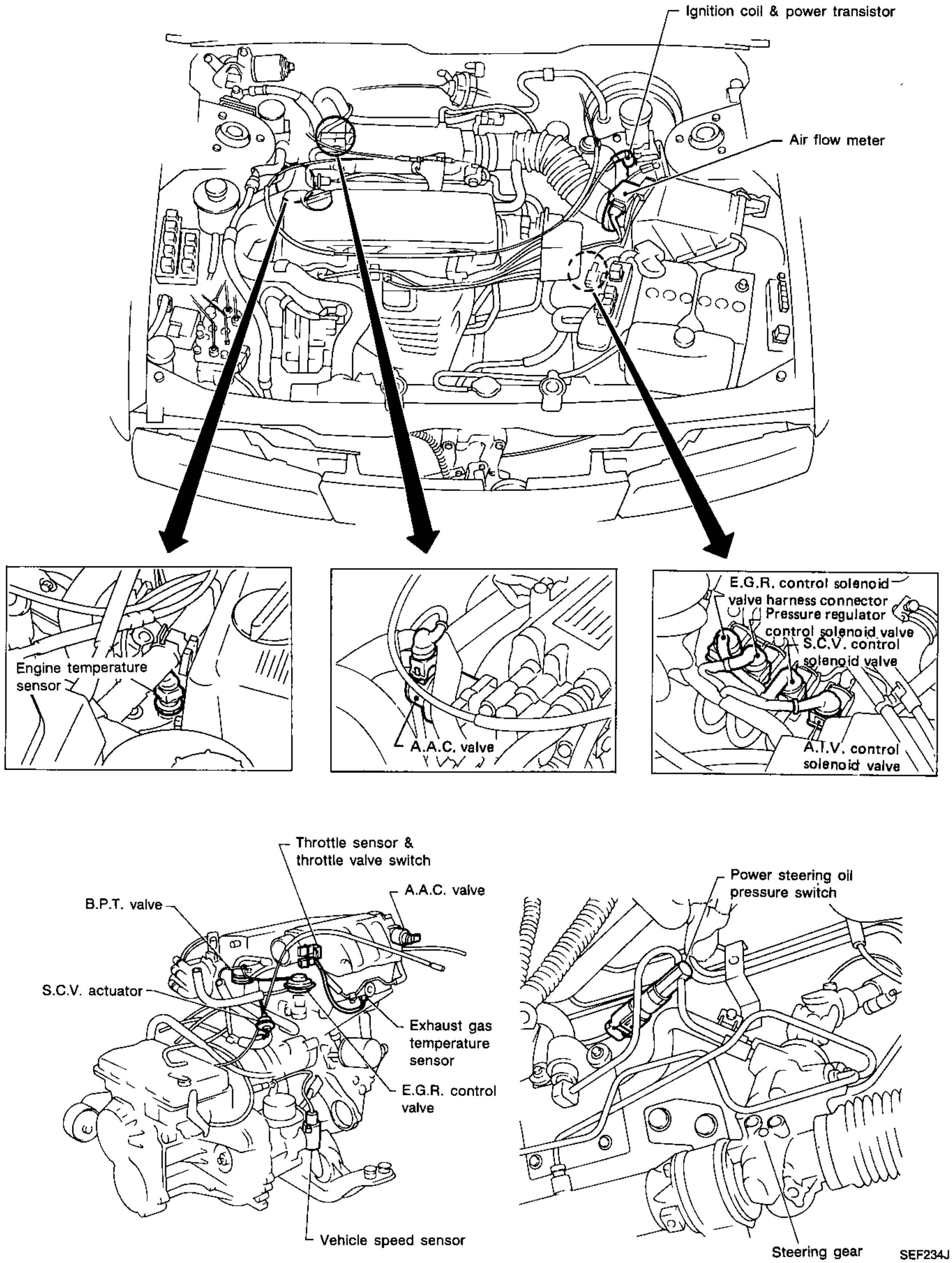
- Securely connect E.C.C.S. harness connectors.
  A poor connection can cause extremely high voltage to develop in the coil and condenser, resulting in damage to ICs.
- Keep E.C.C.S. harness at least 10 cm (3.9 in) away from adjacent harnesses, to prevent an E.C.C.S. system malfunction due to receiving 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.

SEF232J

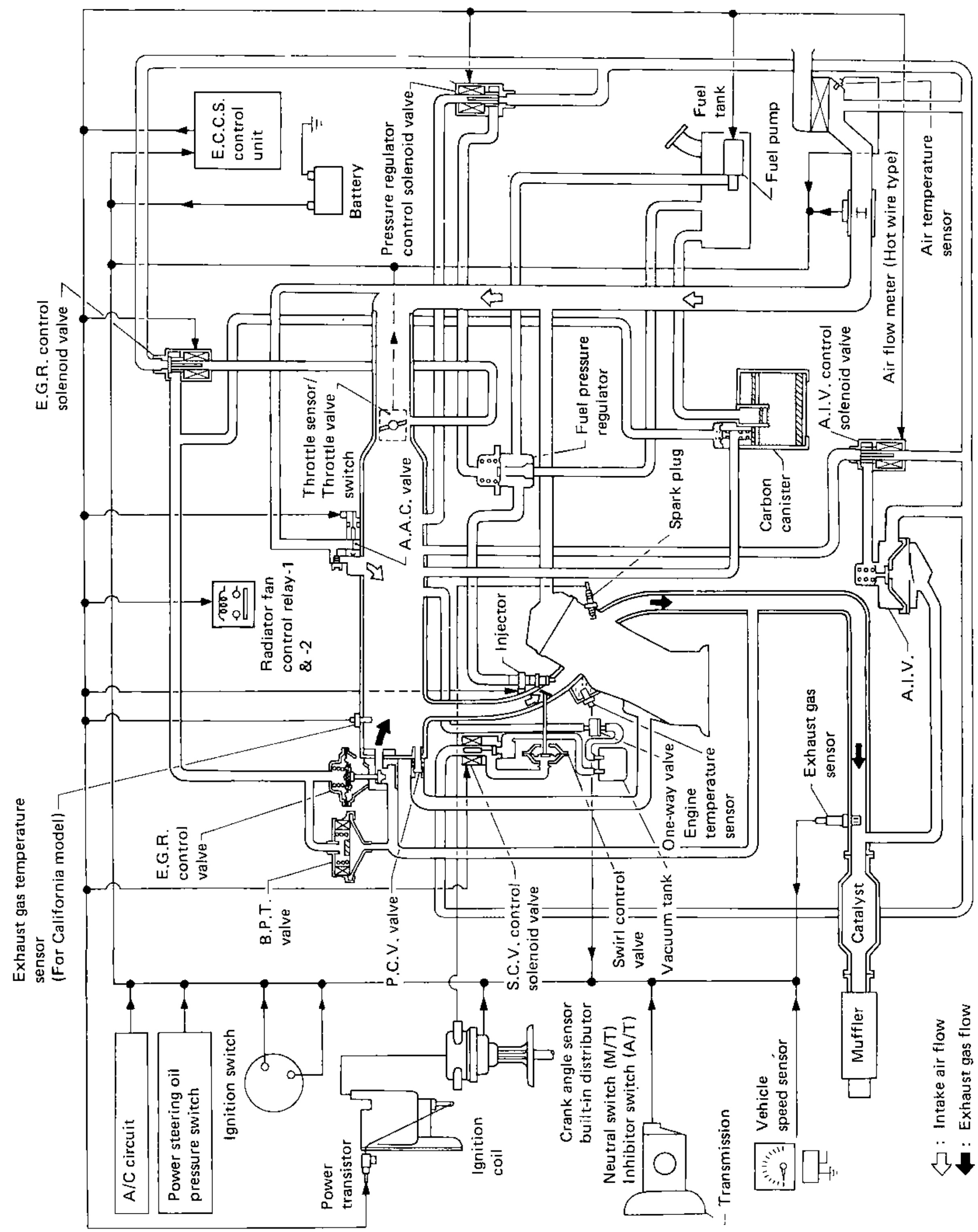
E.C.C.S. Component Parts Location



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



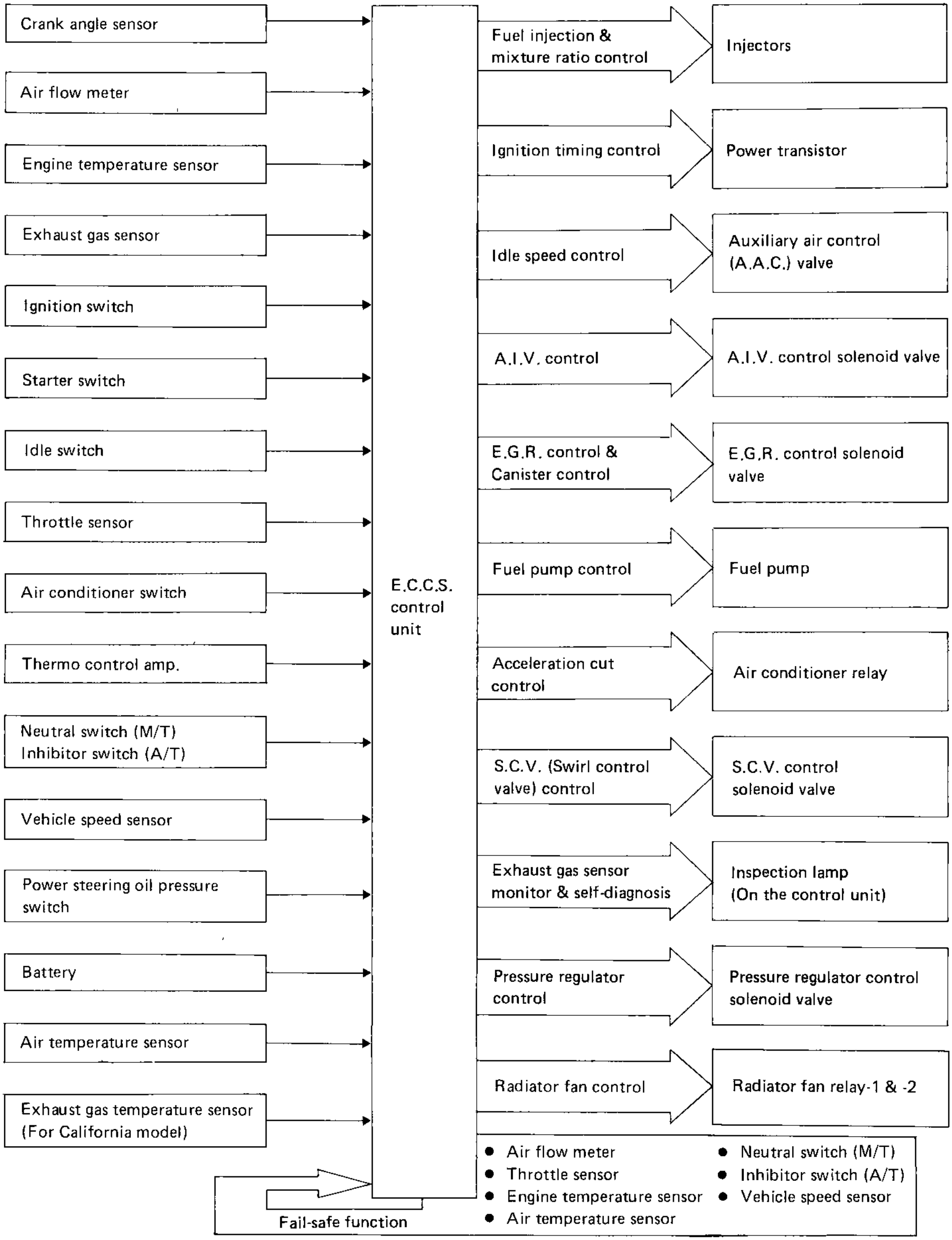
System Diagram



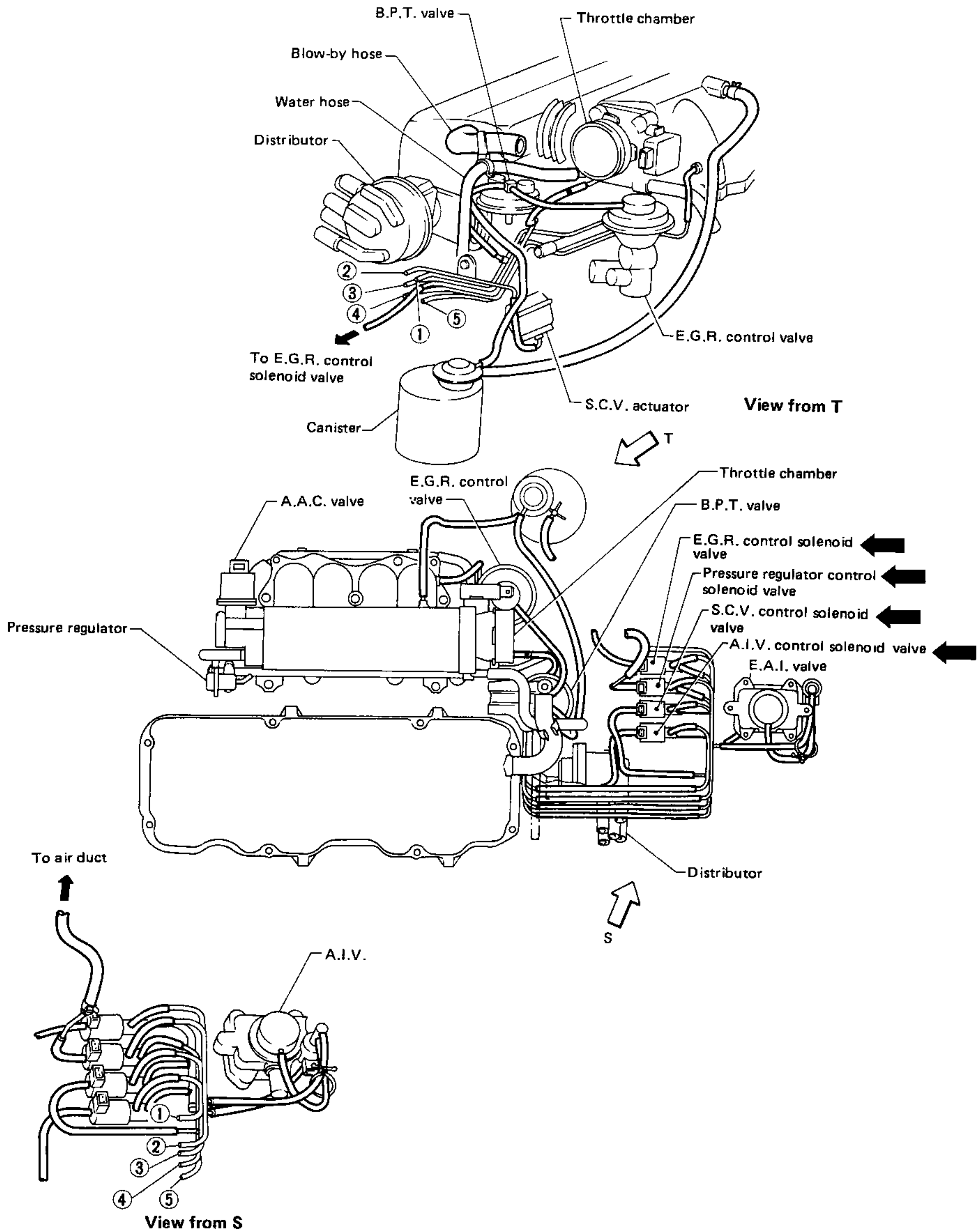
SEF405J

System Chart

E.C.C.S. CONTROL SYSTEM

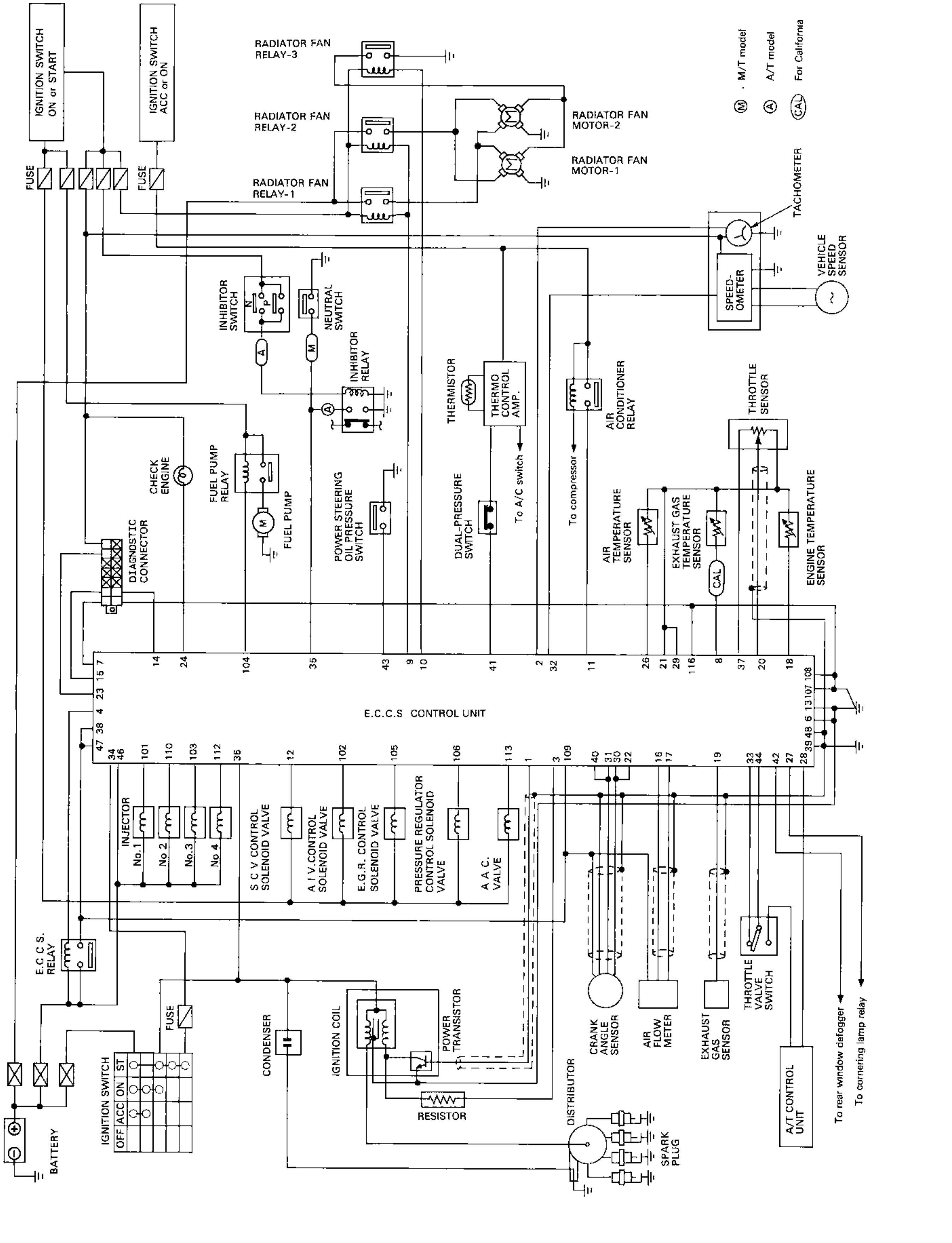


Vacuum Hose Drawing



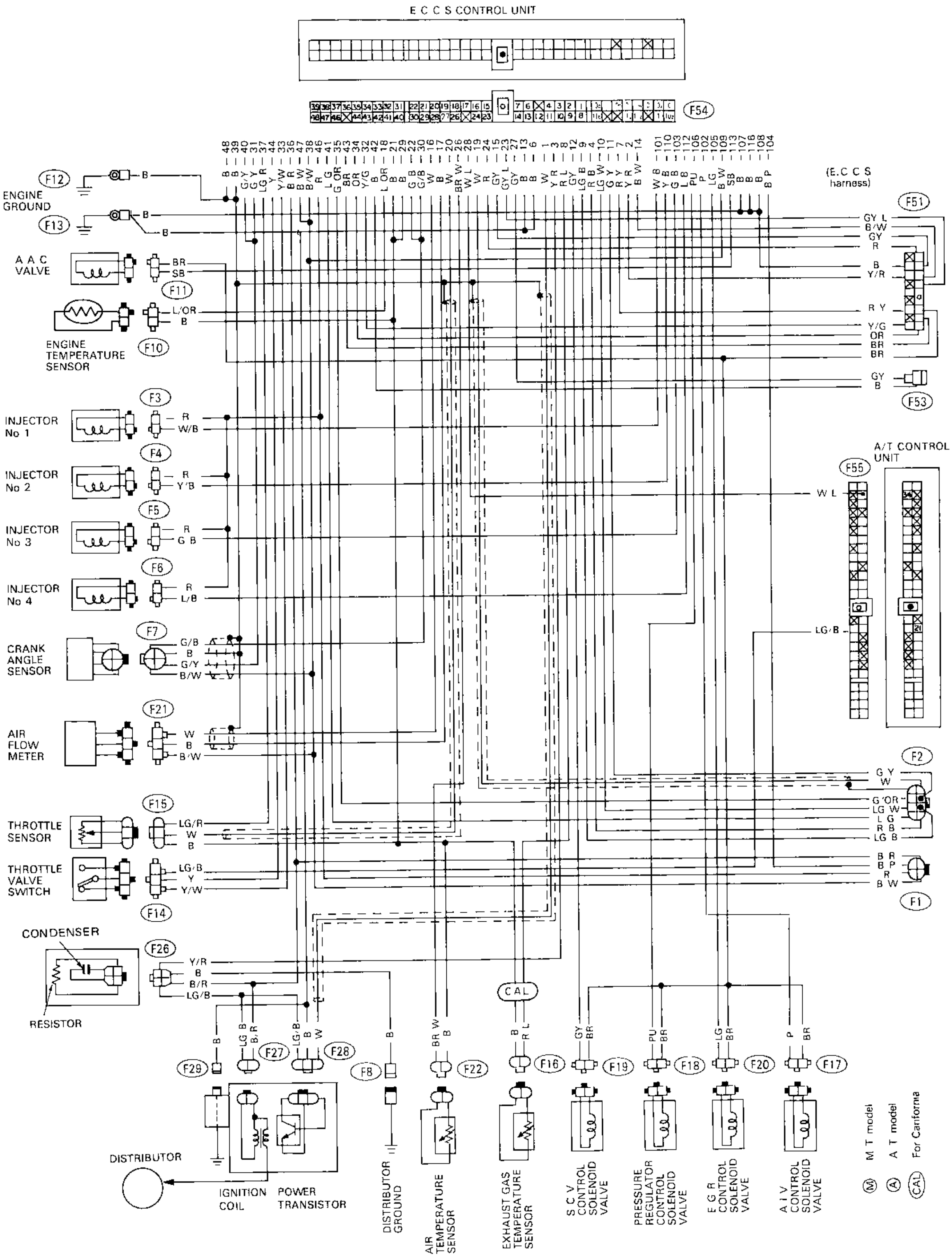
SEF412J

Circuit Diagram

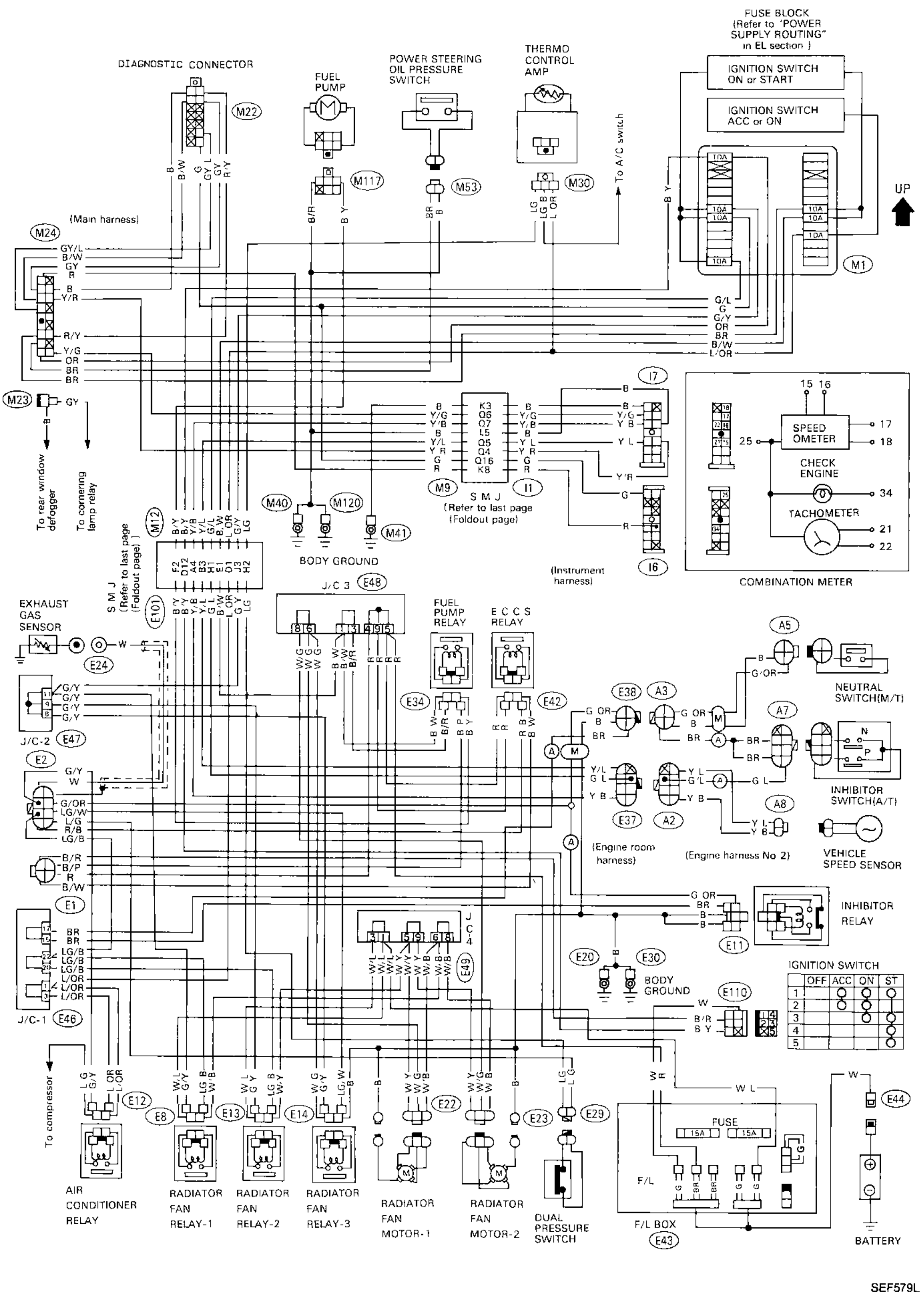


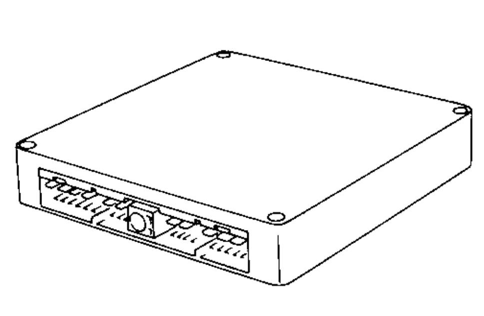
SEL728L

Wiring Diagram



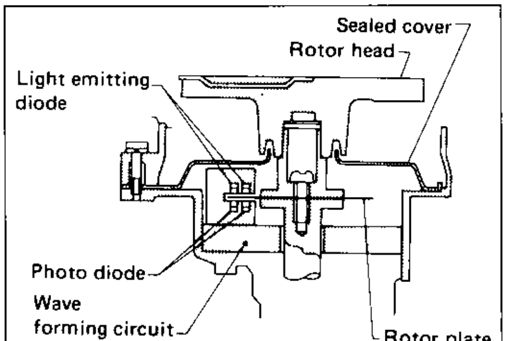
Wiring Diagram (Cont'd)



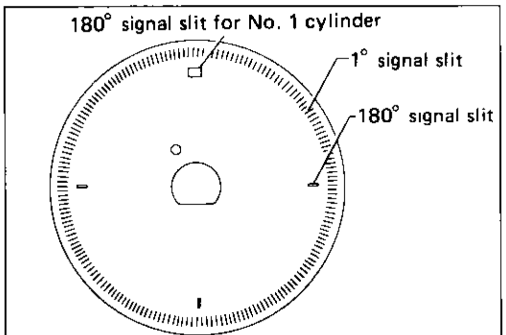

SEF297H

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

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



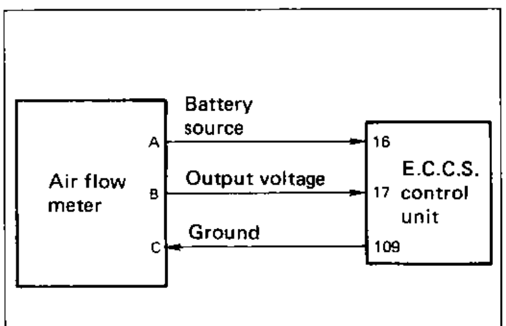
SEF613B



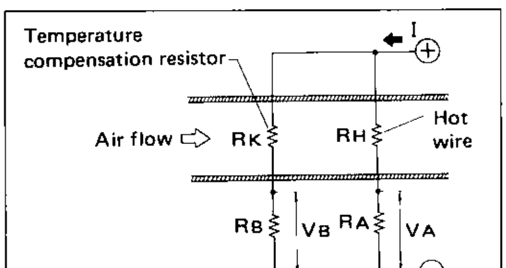
SEF853B

Crank Angle Sensor

The crank angle sensor is a basic component of the entire 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 4 slits for 180° 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 signals by the wave-forming circuit, which are then sent to the E.C.U.



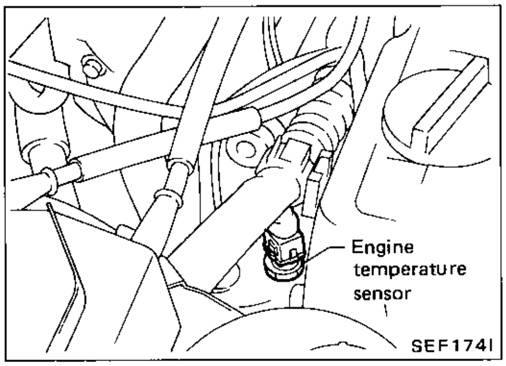
SEF285H



RH : Hot wire resistance
RK : Temperature compensation resistance
RA, RB : Constant resistance
SEF617B

Air Flow Meter

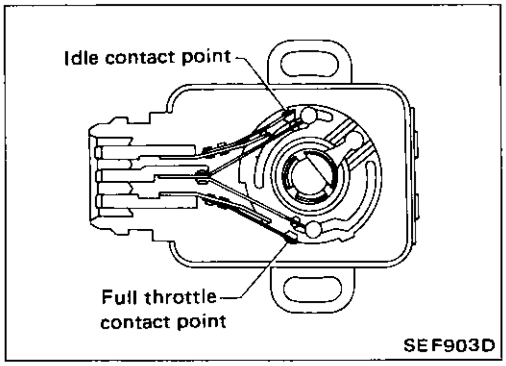
The air flow meter measures the mass flow rate of intake air. Measurements are made so that the control circuit will emit an electrical output signal corresponding to the amount of heat dissipated from a hot wire placed in the stream of intake air. The airflow past the hot wire removes the heat from the hot wire. The temperature of the hot wire is very sensitive to the mass flow rate. The higher the temperature of the hot wire, the greater its resistance value. This temperature change (resistance) is determined by the mass air flow rate. The control circuit accurately regulates current (I) in relation to the varying resistance value (R_H) so that V_A always equals V_B. The air flow meter transmits a voltage value V_A to the control unit where the output is converted into an intake air signal.



SEF174I

Engine Temperature Sensor

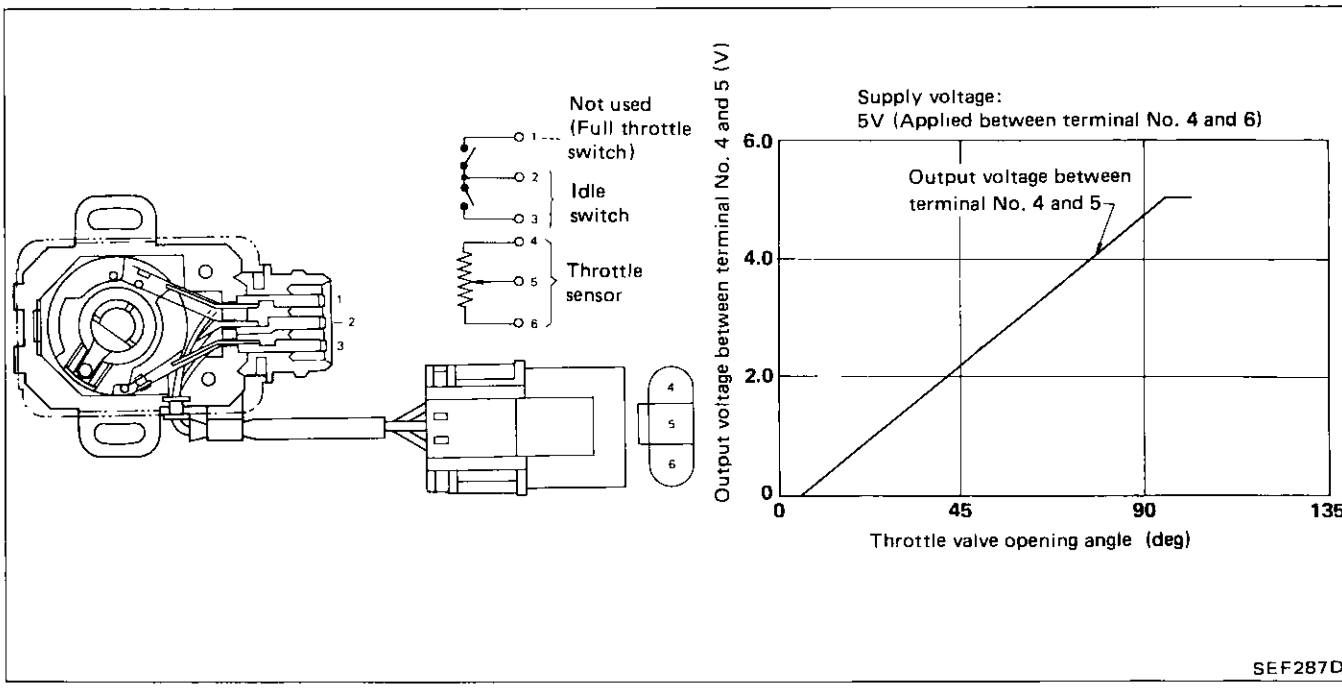
The engine temperature sensor detects the engine temperature, which is dependent on engine coolant temperature, and transmits a signal to the E.C.U.
The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



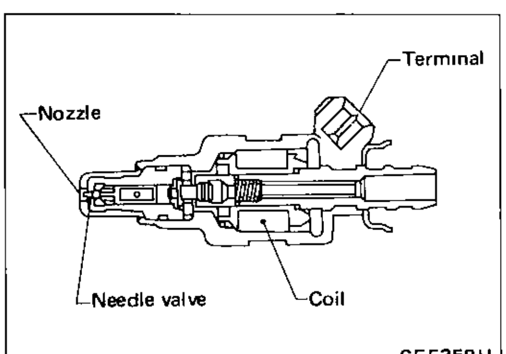
SEF903D

Throttle Sensor & Soft/Hard Idle Switch

The throttle sensor responds to the 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" and controls engine operation such as fuel cut. On the other hand, "hard idle switch", which is built in the throttle sensor unit, is used not for engine control but for self-diagnosis.



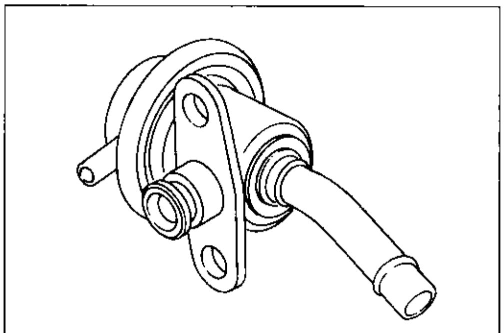
SEF287D



SEF359H

Fuel Injector

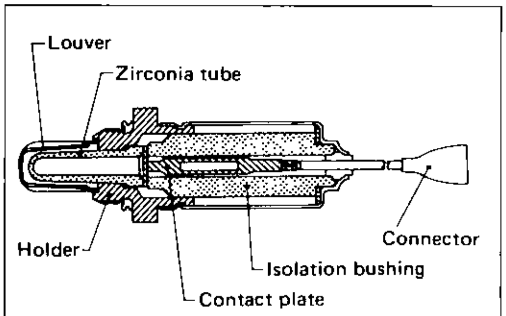
The fuel injector is a small, elaborate solenoid valve. As the E.C.U. sends injection signals to the injector, the coil in the injector pulls the needle valve back and fuel is released into the intake manifold through the nozzle. The injected fuel is controlled by the E.C.U. in terms of injection pulse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



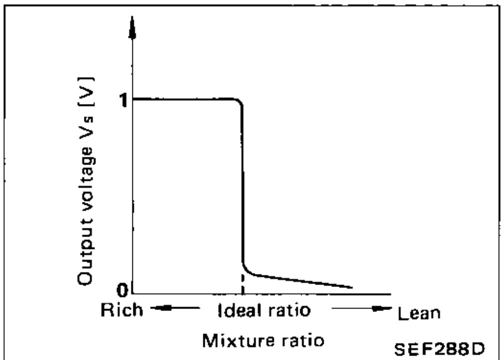
SEF231I

Pressure Regulator

The pressure regulator maintains the fuel pressure at 299.1 kPa (3.05 kg/cm^2, 43.4 psi). Since the injected fuel amount depends on injection pulse duration, it is necessary to maintain the pressure at the above value.



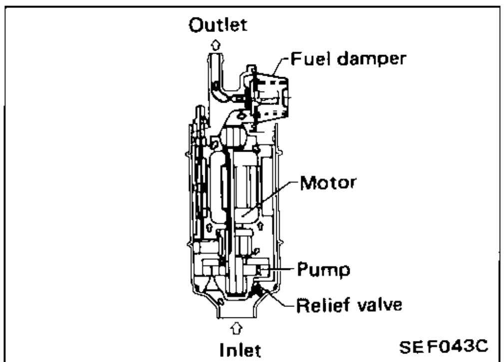
SEC336A



SEF288D

Exhaust Gas Sensor

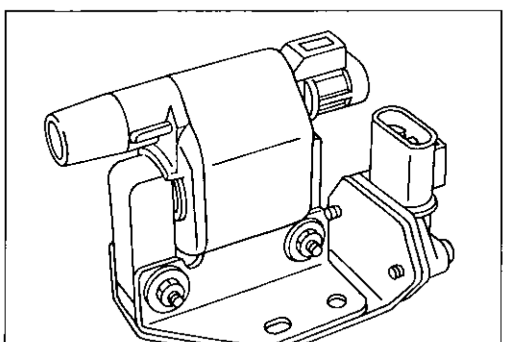
The exhaust gas sensor, which is placed into the exhaust manifold, monitors the amount of oxygen in the exhaust gas. The sensor has a closed-end tube made of ceramic zirconia. The outer surface of the tube is exposed to exhaust gas, and the inner surface to atmosphere. The zirconia of the tube compares the oxygen density of exhaust gas with that of atmosphere, and generates electricity. In order to improve the 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.



SEF043C

Fuel Pump

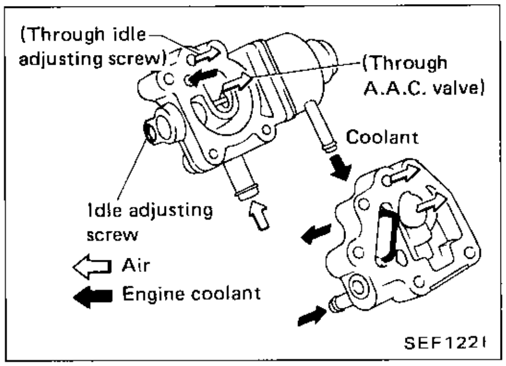
The fuel pump with a fuel damper is a submergible type, and are located in the fuel tank.



SEF125H

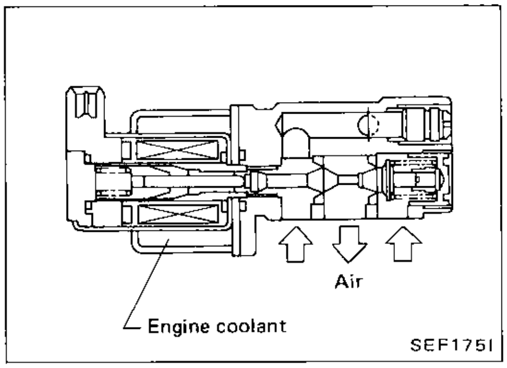
Power Transistor

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.



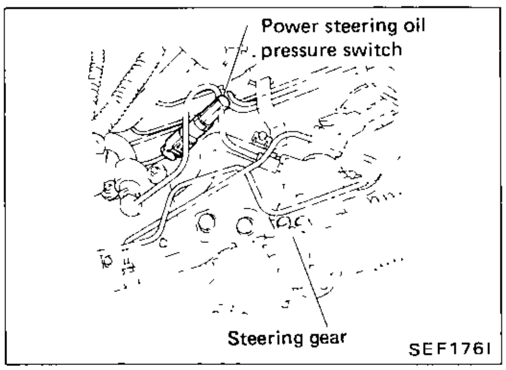
Idle Air Adjusting (I.A.A.) Unit

The I.A.A. unit is made up of the A.A.C. valve and air cut valve. It receives the signal from the E.C.U. and controls the idle speed at the preset value under various conditions.
The air cut valve prevents an abnormal rise of idle rpm when A.A.C. valve operates abnormally.



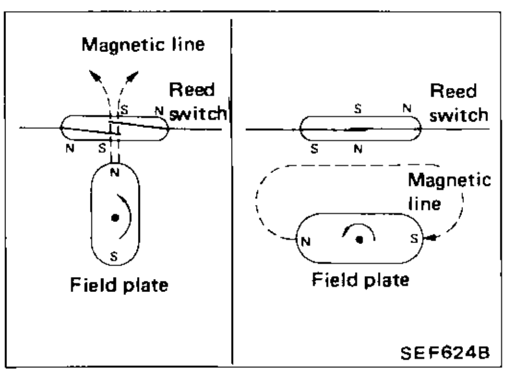
Auxiliary Air Control (A.A.C.) Valve

The E.C.U. actuates the A.A.C. valve by an ON/OFF pulse. The longer that ON pulse is received, the larger the amount of air that will flow through the A.A.C. valve.
This air flow also varies with the temperature of the engine coolant flowing through the A.A.C. valve. The higher the coolant temperature, the less the amount of air flow.



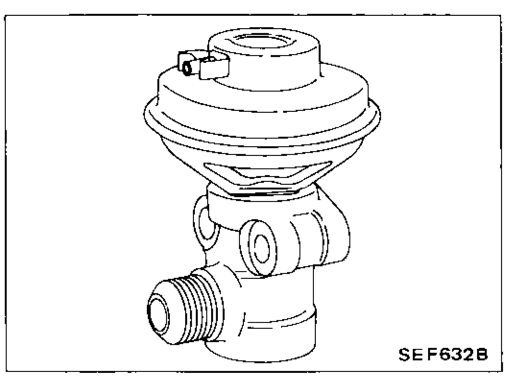
Power Steering Oil Pressure Switch

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.



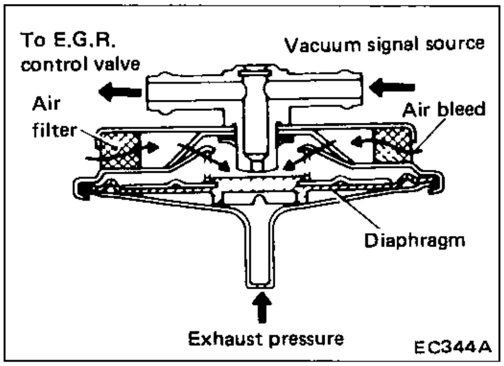
Vehicle Speed Sensor

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 on the transmission unit and transforms vehicle speed into a pulse signal.



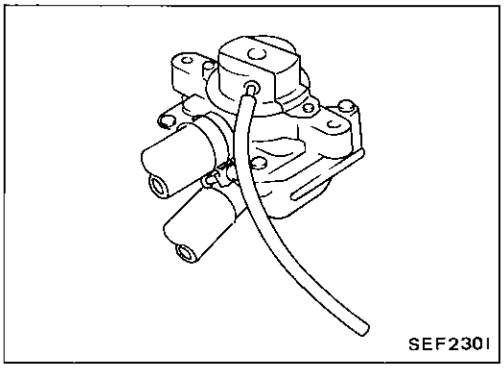
E.G.R. Control Valve

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



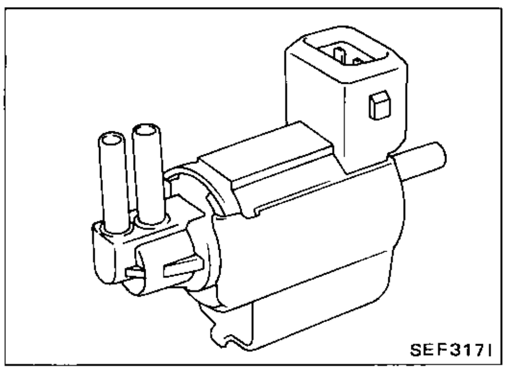
B.P.T. Valve

The B.P.T. valve monitors exhaust pressure to activate the diaphragm, controlling throttle chamber vacuum applied to the E.G.R. control valve. In other words, recirculated exhaust gas is controlled in response to positioning of the E.G.R. control valve or to engine operation.



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 air cleaner.



A.I.V. Control Solenoid Valve

The A.I.V. control solenoid valve cuts the intake manifold vacuum signal for A.I.V. control. It responses to the ON/OFF signal from the E.C.U. When the solenoid is off, the vacuum signal from the intake manifold is cut. When the control unit sends an ON signal, the coil pulls the plunger downward and feeds the vacuum signal to the A.I.V. control valve.

E.G.R. Control Solenoid Valve

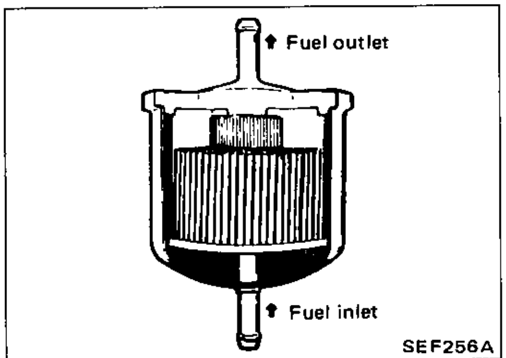
The E.G.R. system is controlled only by the E.C.U. At both low- and high-speed engine revolutions, the solenoid valve turns on and accordingly the E.G.R. valve cuts the exhaust gas leading to the intake manifold.

Pressure Regulator (P.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.

S.C.V. Control Solenoid Valve

The S.C.V. control solenoid valve cuts the intake manifold vacuum signal for swirl control valve. It responds to the ON/OFF signal from the E.C.U. When the solenoid is off, the vacuum signal from the intake manifold is cut. When the control unit sends an ON signal the coil pulls the plunger and feeds the vacuum signal to the swirl control valve actuator.



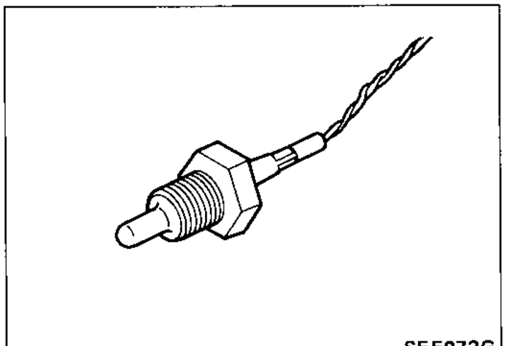
SEF256A

Fuel Filter

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

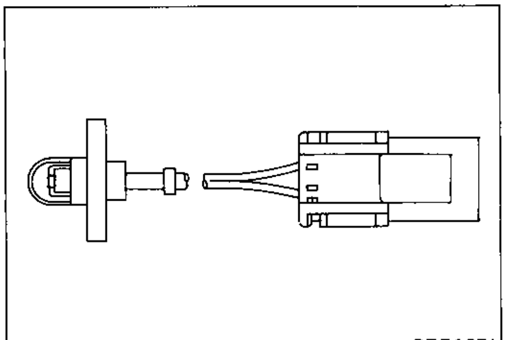
Carbon Canister

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.
The vacuum in the intake passage upstream of the throttle valve increases in response to the amount of the intake air.
When the vacuum of the intake passage is higher than a preset value, the 2nd purge control valve opens and the absorbed gases are sucked into the intake passage for combustion purposes.


SEF072G

Exhaust Gas Temperature Sensor (For California model)

The exhaust gas temperature sensor monitors in exhaust gas 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. Electric resistance of the thermistor decreases in response to the temperature rise.

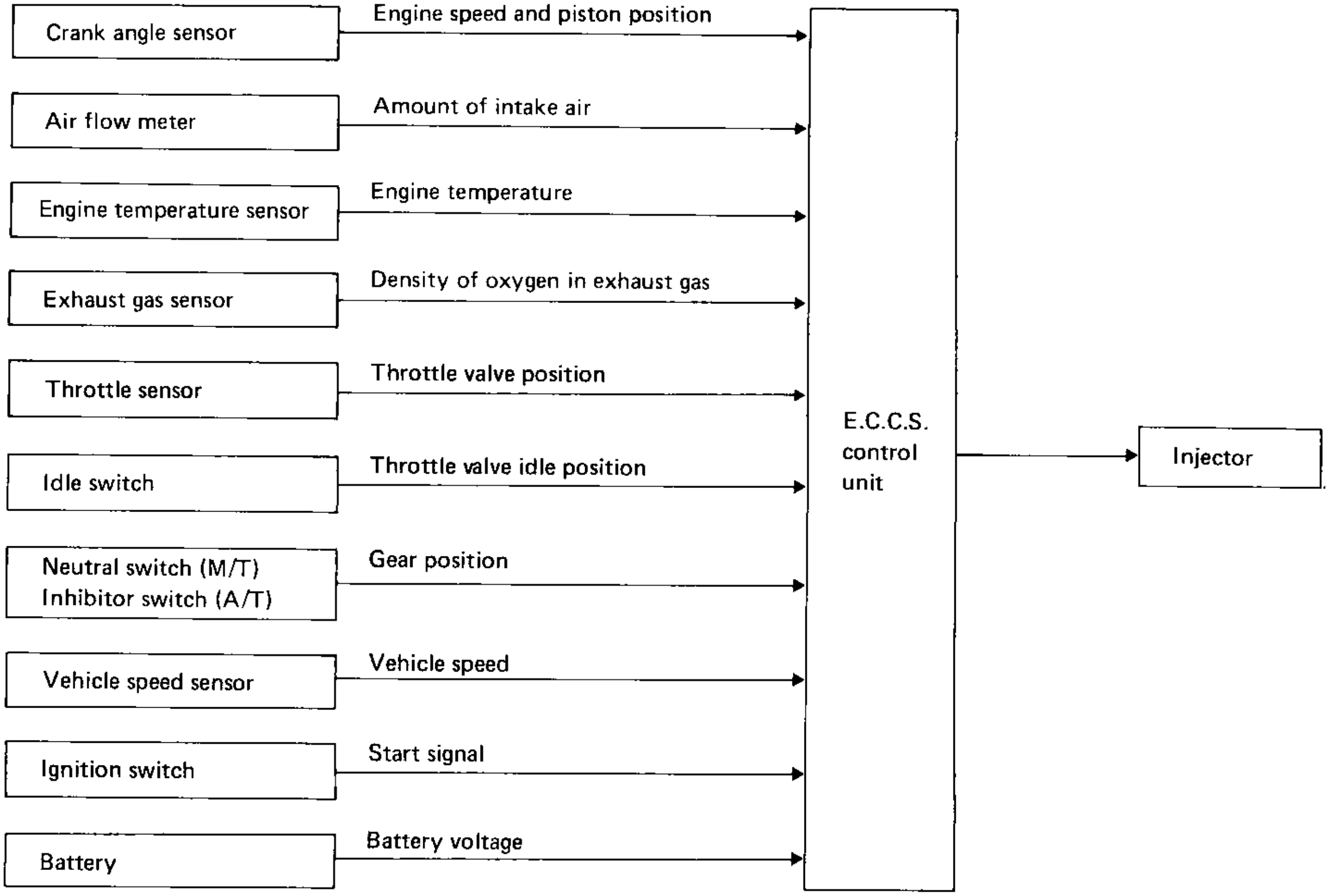

SEF165I

Air Temperature Sensor

The air temperature sensor controls ignition timing when the temperature of the intake air is extremely high, in order not to cause knocking.

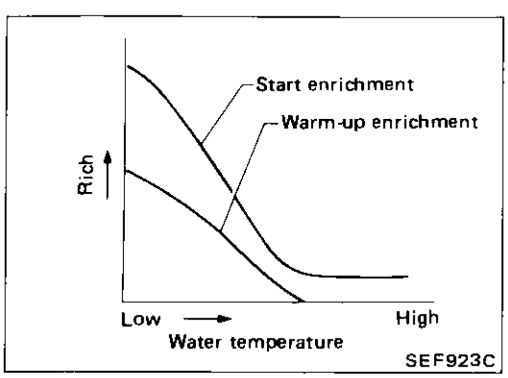
Fuel Injection Control

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 programmable value mapped in the E.C.U. ROM memory. In other words, the programmable 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

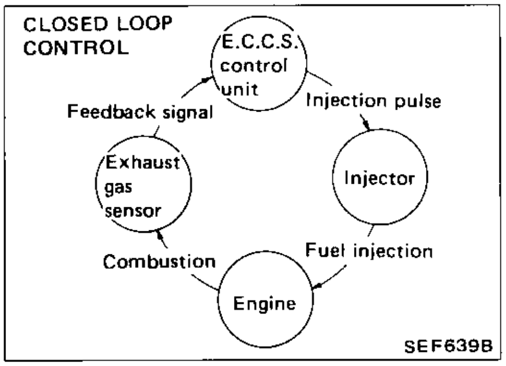
In addition, the amount of fuel injection is compensated for to improve engine performance under various operating conditions as listed below:

<Fuel increase>

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

<Fuel decrease>

1) During deceleration



SEF639B

Fuel Injection Control (Cont'd)

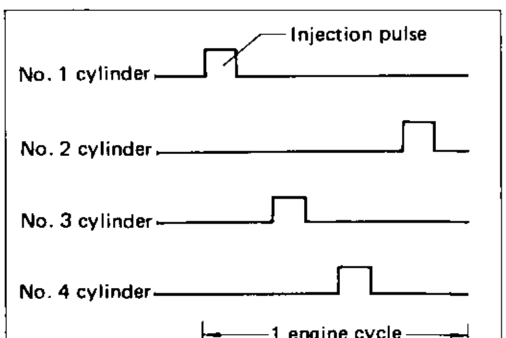
MIXTURE RATIO FEEDBACK CONTROL

Mixture ratio feedback system is designed to precisely control the mixture ratio to the stoichiometric point so that the three-way catalyst can reduce CO, HC and NOx 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) Malfunctioning 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

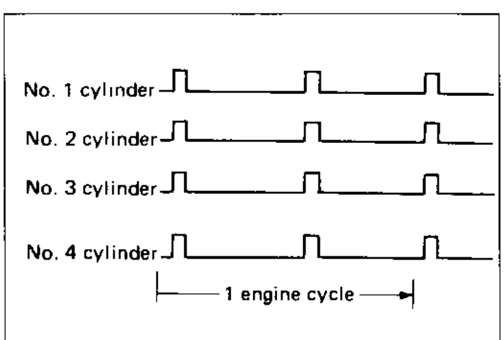
The mixture ratio feedback control system monitors the mixture ratio signal transmitted from the exhaust gas sensor. This feedback signal is then sent to the E.C.U. to control the amount of fuel injection to provide a basic mixture ratio as close to the theoretical mixture ratio as possible. However, 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 quantitatively monitored in this system. It is then computed in terms of "fuel injection duration" to automatically compensate for the difference between the two ratios.



SEF976E

FUEL INJECTION TIMING

Fuel is injected once a cycle for each cylinder in the firing order.



SEF841D

When engine starts, fuel is injected into all four cylinders simultaneously twice a cycle.

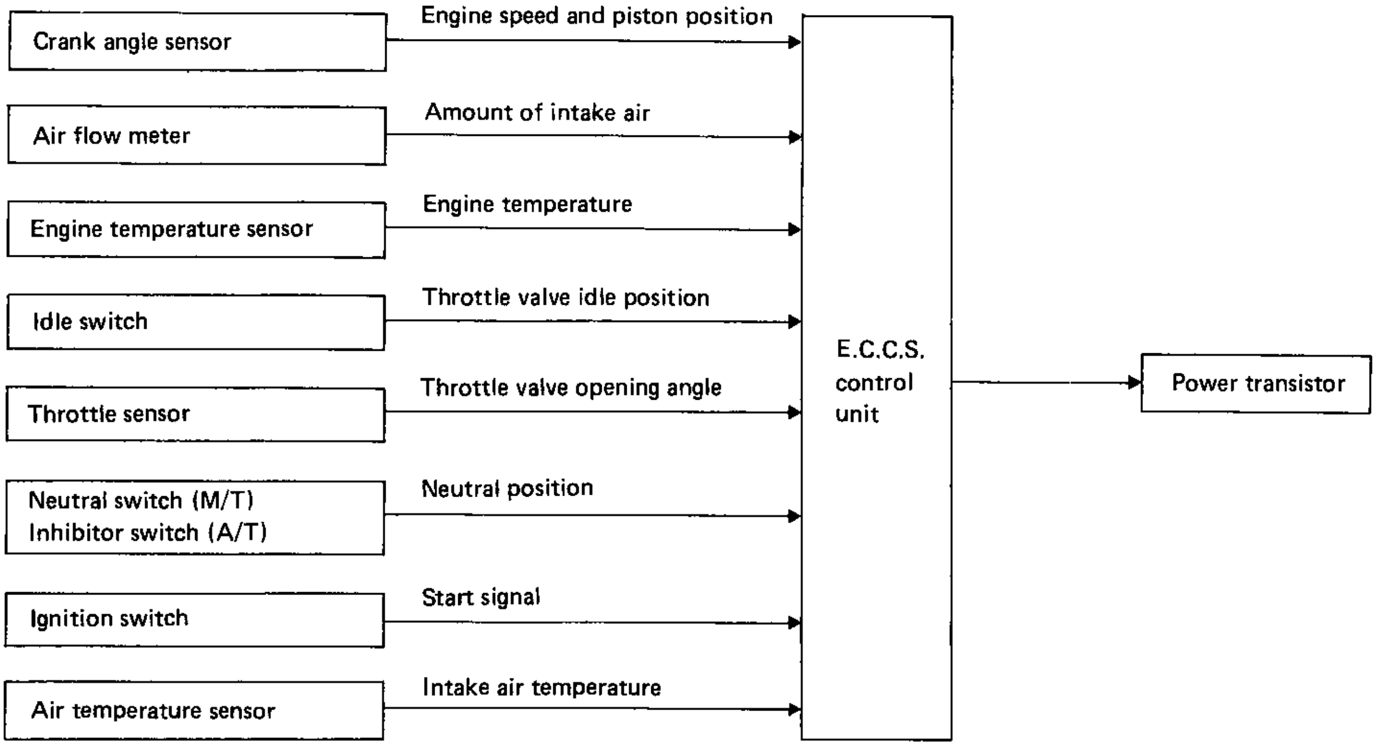
Fuel Injection Control (Cont'd)

FUEL SHUT-OFF

Fuel to all cylinders is cut off during deceleration or high-speed operation.

Ignition Timing Control

INPUT/OUTPUT SIGNAL LINE



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., in the form of the map shown below.

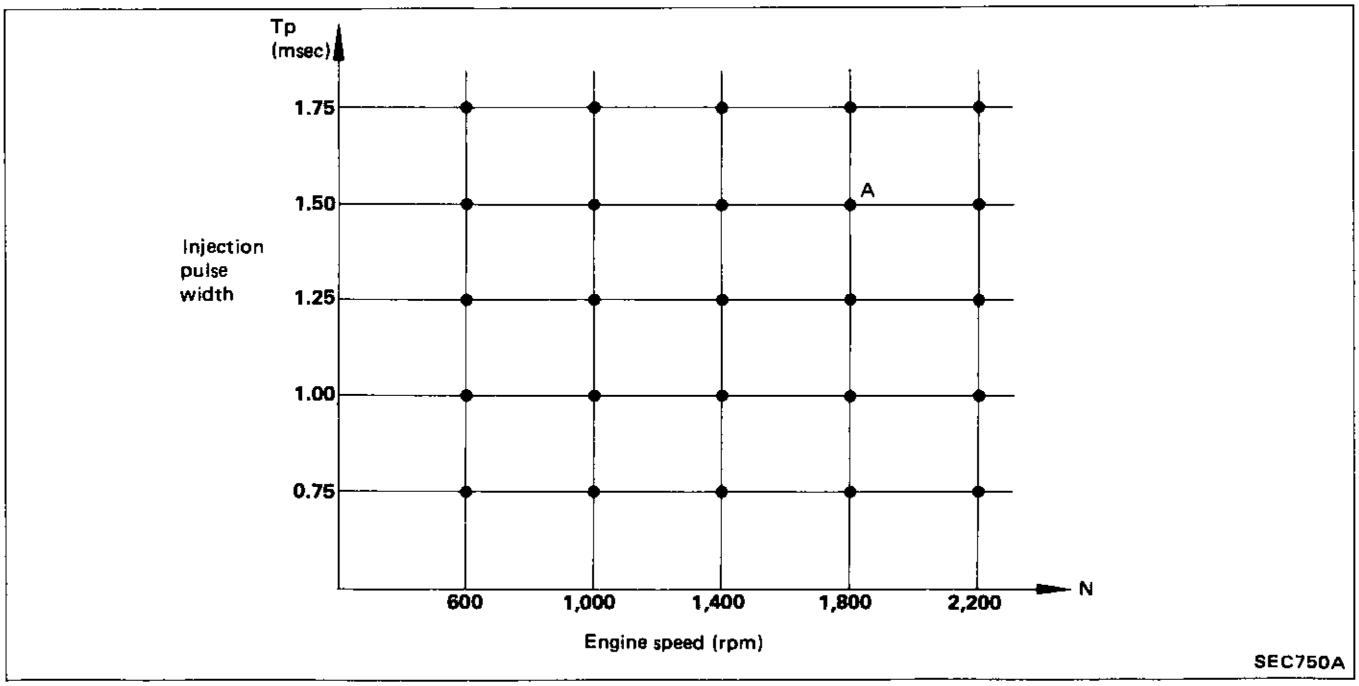
The E.C.U. detects information such as the injection pulse width and crank angle sensor signal which varies every moment. Then responding to this information, ignition signals are transmitted to the power transistor.

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

In addition to this,

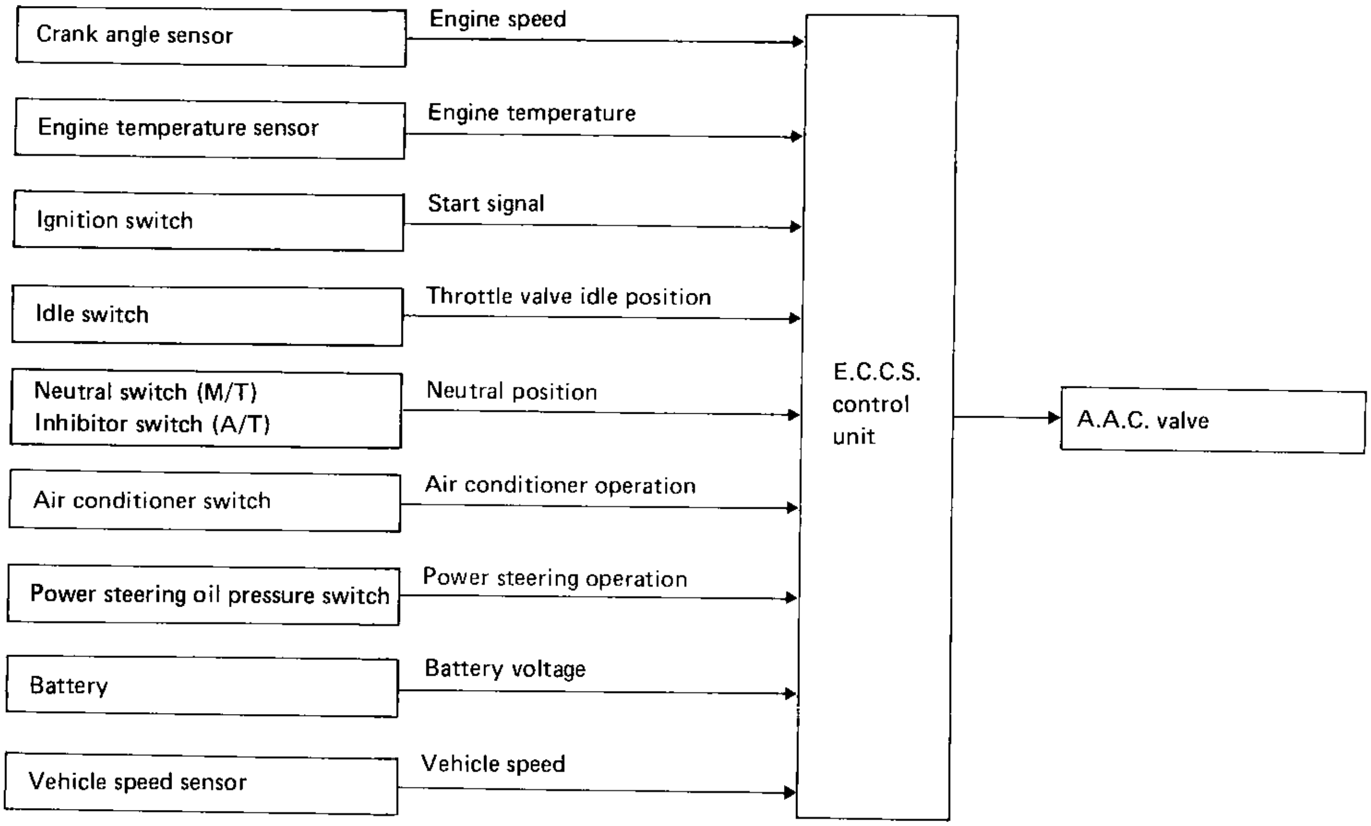
1 At starting
2 During warm-up
3 At idle
4 At low battery voltage
5 During swirl control valve operates
6 During hot engine operation
7 At acceleration
8 When intake air temperature is extremely high

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



Idle Speed Control

INPUT/OUTPUT SIGNAL LINE

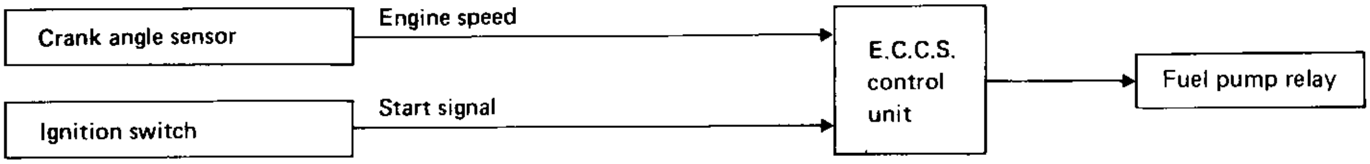


SYSTEM DESCRIPTION

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 compartment, fuel consumption, and engine load.

Fuel Pump Control

INPUT/OUTPUT SIGNAL LINE



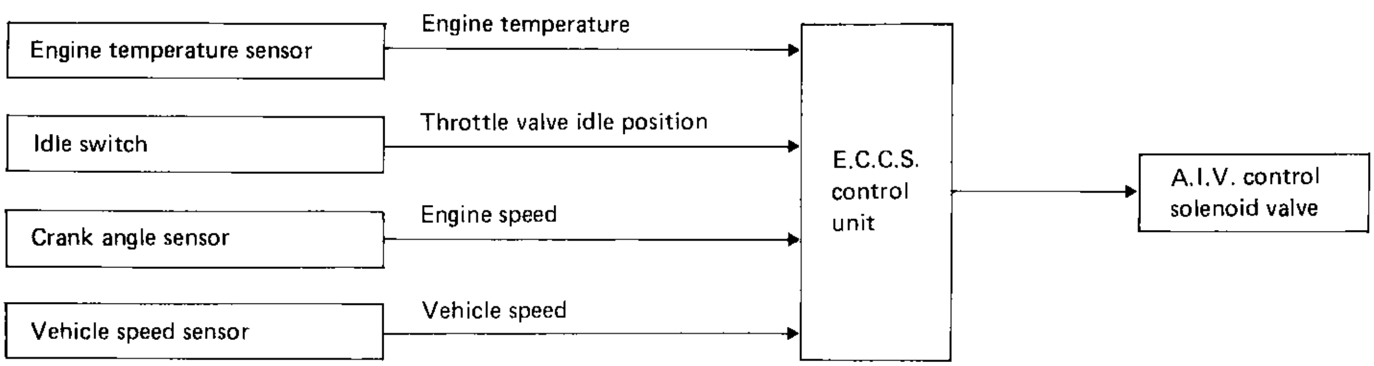
SYSTEM DESCRIPTION

The E.C.U. activates the fuel pump for several seconds after the ignition switch is turned on to improve engine startability. 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 perform. 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 5 seconds
Engine running and cranking	Operates
When engine is stopped	Stops in 1 second
Except as shown above	Stops

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.

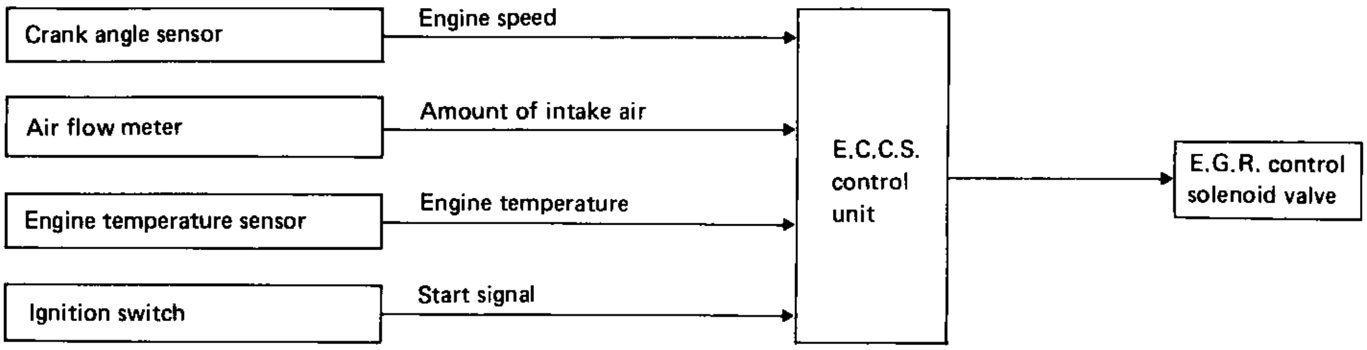
In extremely cold conditions, A.I.V. control system does not operate to reduce after-burning.

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

Engine condition	Water temperature °C (°F)	A.I.V. control solenoid valve	A.I.V. control system
Idle or deceleration	Between 28 (82) and 115 (239)	ON	Operates

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

E.G.R. control solenoid valve operation

Condition		E.G.R. control solenoid valve
When starting		ON
Water temperature °C (°F)	Below 60 (140)	ON
	Above 115 (239)	ON
Idle & heavy load conditions		ON
Other conditions		OFF

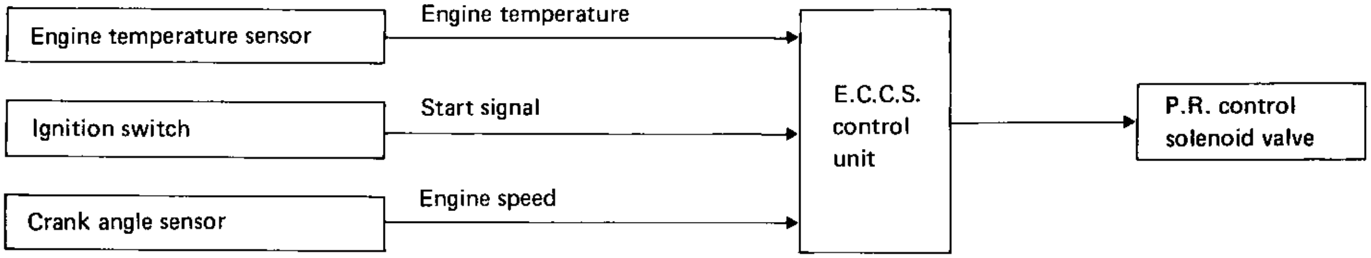
E.G.R. system operation

E.G.R. system operates under only the following conditions.

Water temperature °C (°F)	B.P.T. valve		Throttle position	E.G.R. control solenoid valve	E.G.R. system
	Exhaust gas pressure	Operation			
Between 60 (140) and 115 (239)	High	Closed	Partially open	OFF	Operates

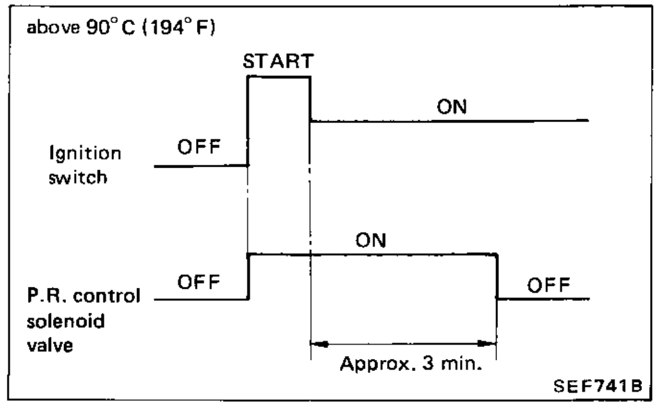
Fuel Pressure Regulator Control

INPUT/OUTPUT SIGNAL LINE



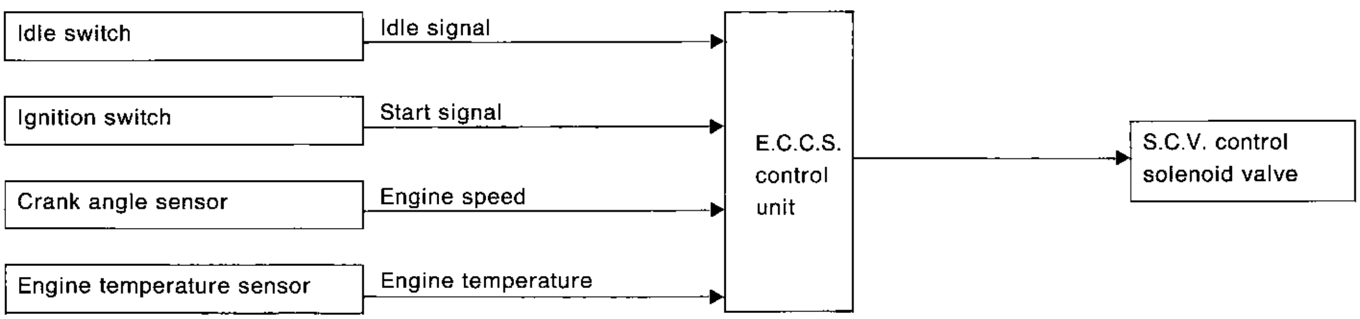
SYSTEM DESCRIPTION

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, throttling the fuel passage to increase fuel pressure.



Swirl Control Valve (S.C.V.) Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

This system has a swirl control valve (S.C.V.) in the intake passage of each cylinder.
While idling and when engine is running at low speed, the S.C.V. closes. Thus the velocity of the air in the intake passage increases, promoting the vaporization of the fuel and producing a swirl in the combustion chamber.
Because of this operation, this system tends to increase the burning speed of the gas mixture, improve fuel consumption, and increase the stability in running conditions.
Also, except when idling and when engine is running at low speed, this system opens the S.C.V. In this condition, this system tends to increase power by improving intake efficiency via reduction of intake flow resistance.

The solenoid valve controls S.C.V.'s shut/open condition. This solenoid valve is operated by the E.C.U.

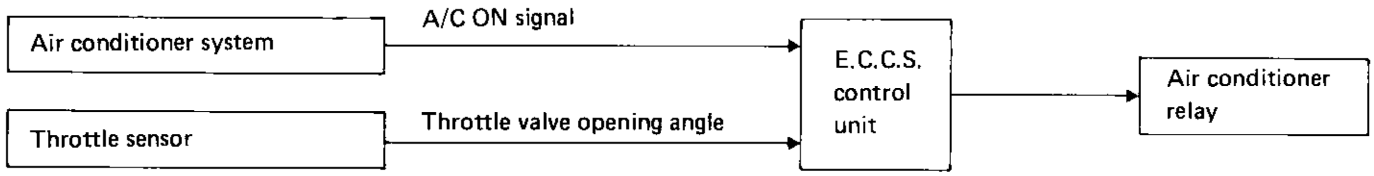
SYSTEM OPERATION

Idle switch	Engine speed rpm	Solenoid valve	S.C.V.
ON	Below 3,600	ON	Close
OFF	Less than 2,000	ON	Close
	More than 3,600	OFF	Open

S.C.V. is kept open, when engine temperature is below 0°C (32°F).

Acceleration Cut Control

INPUT/OUTPUT SIGNAL LINE



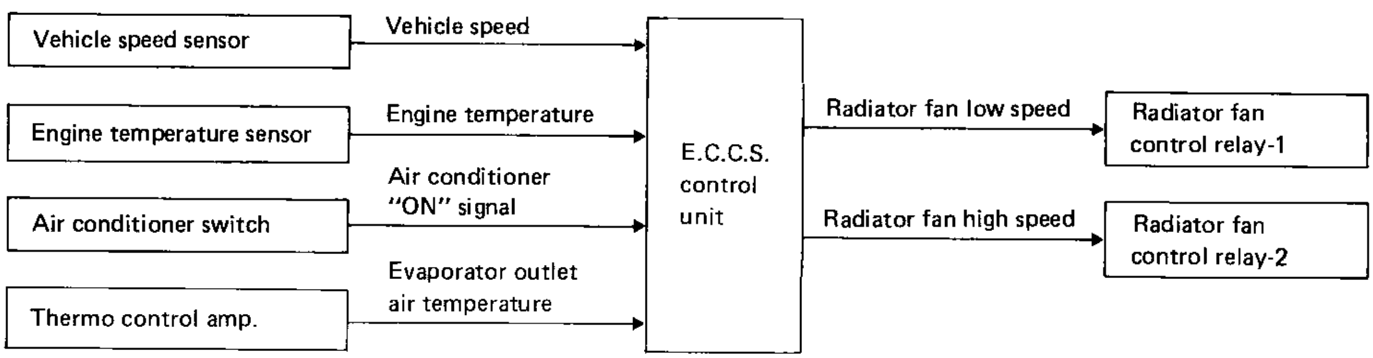
SYSTEM DESCRIPTION

When accelerator pedal is fully depressed, air conditioner is turned off for a few seconds.

This system improves acceleration when air conditioner is used.

Radiator Fan Control

INPUT/OUTPUT SIGNAL LINE



The E.C.U. performs ON/OFF control and LOW/HIGH speed control of the radiator fan corresponding to the vehicle speed, engine temperature, and air conditioner ON signal.

OPERATION

Air conditioner switch is "OFF"

Engine temperature °C (°F)	Radiator fan	Radiator fan control relay		Remarks
Below 94 (201)	OFF	Relay-1	OFF	—
		Relay-2	OFF	
Between 95 (203) and 99 (210)	LOW	Relay-1	ON	—
		Relay-2	OFF	
Above 100 (212)	HIGH	Relay-1	ON	—
		Relay-2	ON	

The radiator fan operates at HIGH if the self-diagnosing engine temperature sensor system results in "N.G.".

Radiator Fan Control (Cont'd)

Air conditioner switch and blower fan switch are "ON" [Evaporator outlet air temperature is over 8°C (46°F).]

Engine temperature °C (°F)	Radiator fan	Radiator fan control relay		Remarks
Below 94 (201)	*HIGH	Relay-1	ON	*OFF if vehicle speed is above 80 km/h (50 MPH).
		Relay-2	ON	
Between 95 (203) and 99 (210)	*HIGH	Relay-1	ON	*LOW if vehicle speed is above 80 km/h (50 MPH).
		Relay-2	ON	
Above 100 (212)	HIGH	Relay-1	ON	—
		Relay-2	ON	

The radiator fan operates at HIGH if the self-diagnosing engine temperature sensor system results in "N.G.".

Air conditioner switch and blower fan switch are "ON" [Evaporator outlet air temperature is between 3°C (37°F) and 8°C (46°F).]

Engine temperature °C (°F)	Radiator fan	Radiator fan control relay		Remarks
Below 94 (201)	*LOW	Relay-1	ON	*OFF if vehicle speed is above 80 km/h (50 MPH).
		Relay-2	OFF	
Between 95 (203) and 99 (210)	LOW	Relay-1	ON	—
		Relay-2	OFF	
Above 100 (212)	HIGH	Relay-1	ON	—
		Relay-2	ON	

The radiator fan operates at HIGH if the self-diagnosing engine temperature sensor system results in "N.G.".

Fail-safe System

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.
Though air flow meter is malfunctioning, it is possible to drive the vehicle and start the engine. 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

System	Fixed condition
E.G.R. control system	OFF
Idle speed control system	A duty ratio is fixed at the preprogrammed value.
Fuel injection control system	Fuel is shut off above 2,400 rpm. (Engine speed does not exceed 2,400 rpm.)

Fail-safe System (Cont'd)

ENGINE TEMPERATURE SENSOR MALFUNCTION

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

Operation

Condition	Engine temperature decided
Just as ignition switch is turned ON or Start	20°C (68°F)
More than 6 minutes after ignition ON or Start	80°C (176°F)
Except as shown above	20 - 80°C (68 - 176°F) (Depends on the time)

THROTTLE SENSOR MALFUNCTION

When throttle sensor output voltage is below or above the specified value, throttle sensor output is fixed at the preset value.

AIR TEMPERATURE SENSOR MALFUNCTION

When air temperature sensor is below or above the specified value, air temperature value is fixed at the preset value [20°C (68°F)].

VEHICLE SPEED SENSOR MALFUNCTION

When the vehicle speed sensor circuit is opened, fuel is temporarily shut off at 2,000 rpm during high-load operations. After this has occurred once, during all other types of driving operation fuel is shut off at 2,500 rpm. This fail-safe condition is released when the ignition switch is turned off.

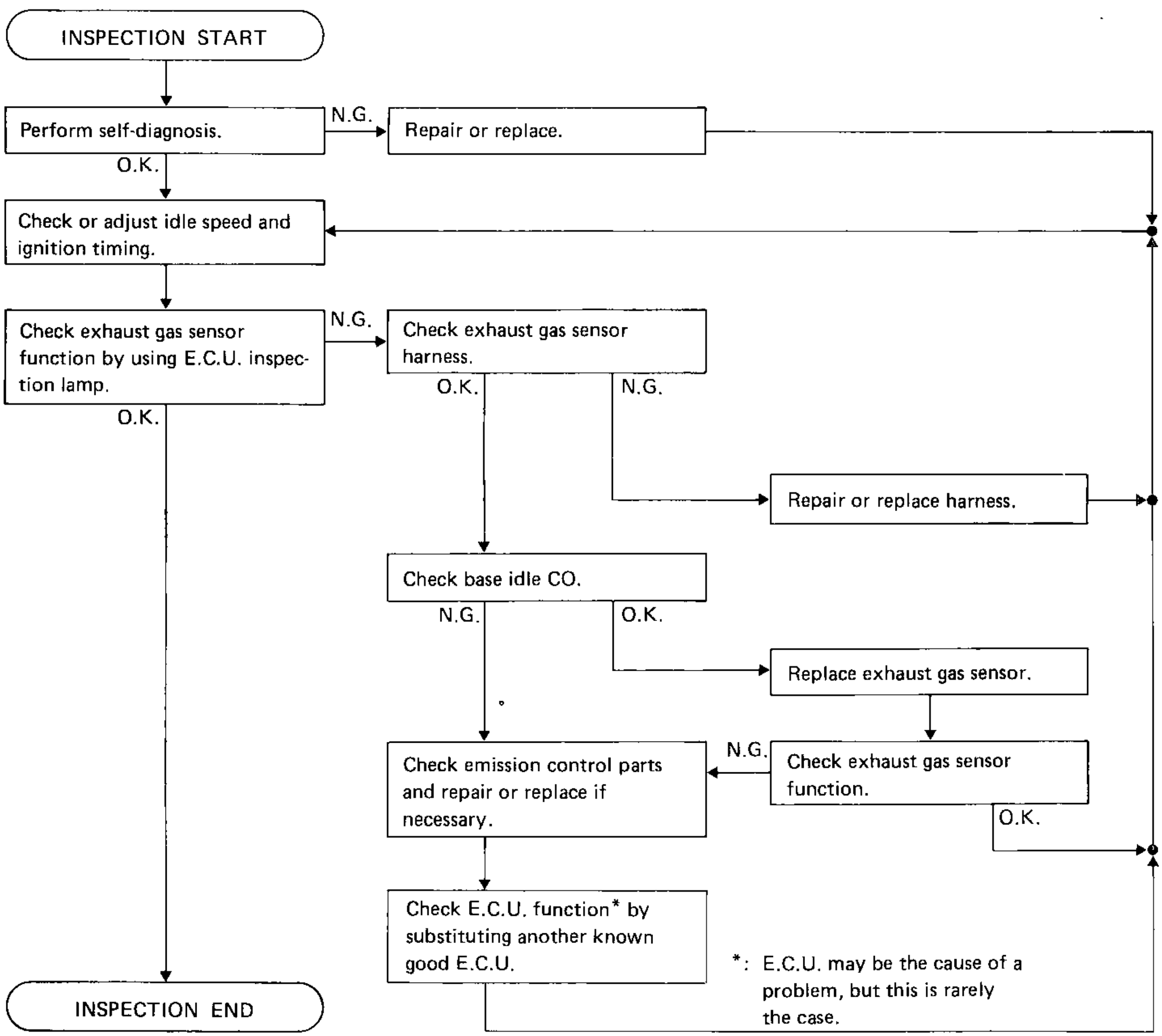
NEUTRAL SWITCH MALFUNCTION

When the neutral switch (M/T) or inhibitor switch (A/T) is shorted and the vehicle speed exceeds 60 km/h (37 MPH), fuel is shut off above 2,500 rpm.
The L.E.D. in the E.C.U. and the check engine light do not indicate a neutral switch (M/T) or inhibitor switch malfunction. This fail-safe condition is released when the ignition switch is turned off.

PREPARATION

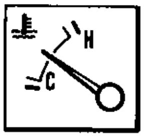
1. Make sure that the following parts are in good order.
- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- E.C.U. harness connector
- Vacuum hoses
- Air intake system
  (Oil filler cap, oil level gauge, etc.)
- Fuel pressure
- A.I.V. hose
- Engine compression
- E.G.R. control valve operation
- Throttle valve and idle switch
2. On air conditioner equipped models, checks should be carried out while the air conditioner is "OFF".
3. On automatic transaxle 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.

Overall inspection sequence



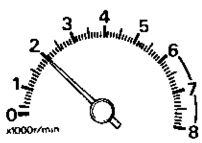
INSPECTION START

Visually check the following:
- Air cleaner clogging
- Hoses and ducts for leaks
- E.G.R. control valve operation
- Electrical connectors
- Gaskets
- Throttle valve and throttle sensor operation



SEF457C

Start engine and warm it up until water temperature indicator points to the middle of gauge.



SEF477B

Open engine hood and run engine at about 2,000 rpm for about 2 minutes under no-load.

Perform E.C.C.S. self-diagnosis (mode II).

O.K. / N.G.

N.G.: Check, correct or replace malfunctioning parts.

Does engine run smoothly?

Yes / No

No: Check and clean injectors, and replace injectors if necessary.

Race engine two or three times under no-load, then run engine at idle speed. (← Ⓒ)

Check idle speed.

M/T: 700±50 rpm*1
750±50 rpm*2
A/T: 700±50 rpm*1 (in "N" position)
750±50 rpm*2 (in "N" position)
***1: For U.S.A.**
***2: For Canada**

O.K. → Ⓐ

N.G. → Ⓑ

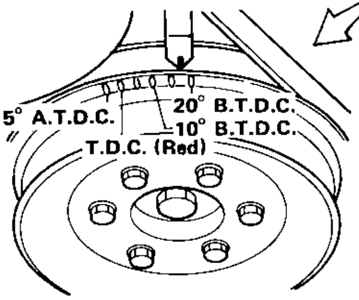
Ⓒ

Ⓐ Ⓑ Ⓒ

Check ignition timing with a timing light.

15°±2° B.T.D.C.

O.K. / N.G.



SMA189A

Disconnect throttle sensor harness connector.

Ensure that engine speed is below 800 rpm.

O.K. / N.G.

Adjust idle speed to less than 800 rpm by turning idle speed adjusting screw.

Check ignition timing with a timing light.

15°±2° B.T.D.C.

O.K. / N.G.

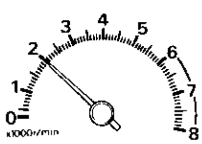
Adjust ignition timing by turning distributor after loosening bolt which secures distributor.

15°±2° B.T.D.C.

Adjust idle speed by turning idle speed adjusting screw.

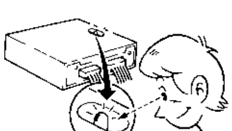
M/T: 650±50 rpm
A/T: 650±50 rpm (in "N" position)

Connect throttle sensor harness connector.



SEF477B

Run engine at about 2,000 rpm for about 2 minutes under no-load.



SEF362I

Set diagnosis mode of E.C.U. to Mode II.
Make sure that inspection lamp on E.C.U. goes on and off more than 5 times during 10 seconds at 2,000 rpm under no-load.

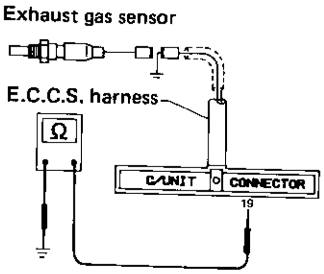
N.G. → Ⓓ

O.K.

INSPECTION END

Ⓓ Ⓒ

Ⓓ



SEF353H

Check exhaust gas sensor harness:
1) Turn off engine and disconnect battery ground cable.
2) Disconnect harness connector from E.C.U.
3) Disconnect exhaust gas sensor harness connector and connect terminal for exhaust gas sensor harness connector to ground with a jumping wire.
4) Check for continuity between terminal No. 19 of E.C.U. harness connector and ground metal on vehicle body.

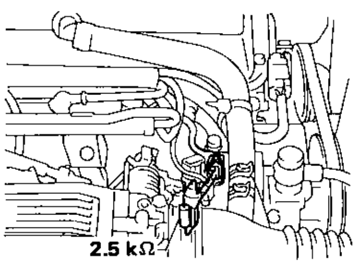
Continuity exists. .... O.K.
Continuity does not exist .... N.G.

N.G. → Repair or replace E.C.C.S. harness and connect battery ground cable. → Ⓒ

O.K. ↓

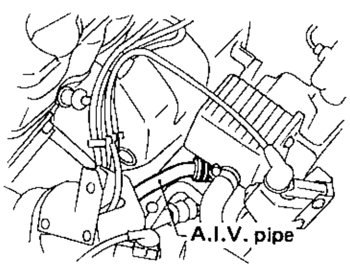
Connect harness connector to E.C.U. and disconnect jumping wire from exhaust gas sensor.

↓



SEF351H

- Disconnect engine temperature sensor harness connector.
- Connect a resistor (2.5 kΩ) between terminals of engine temperature sensor harness connector.
- Disconnect A.I.V. hose and install a suitable plug in A.I.V. pipe.
- Connect battery ground cable.



SEF354H

↓

Start engine and warm it up until water temperature indicator points to the middle of gauge. (Wait more than 5 minutes after starting.)

↓

Race engine two or three times under no-load then run engine at idle speed.

↓

Check "CO"% and if engine runs smoothly.

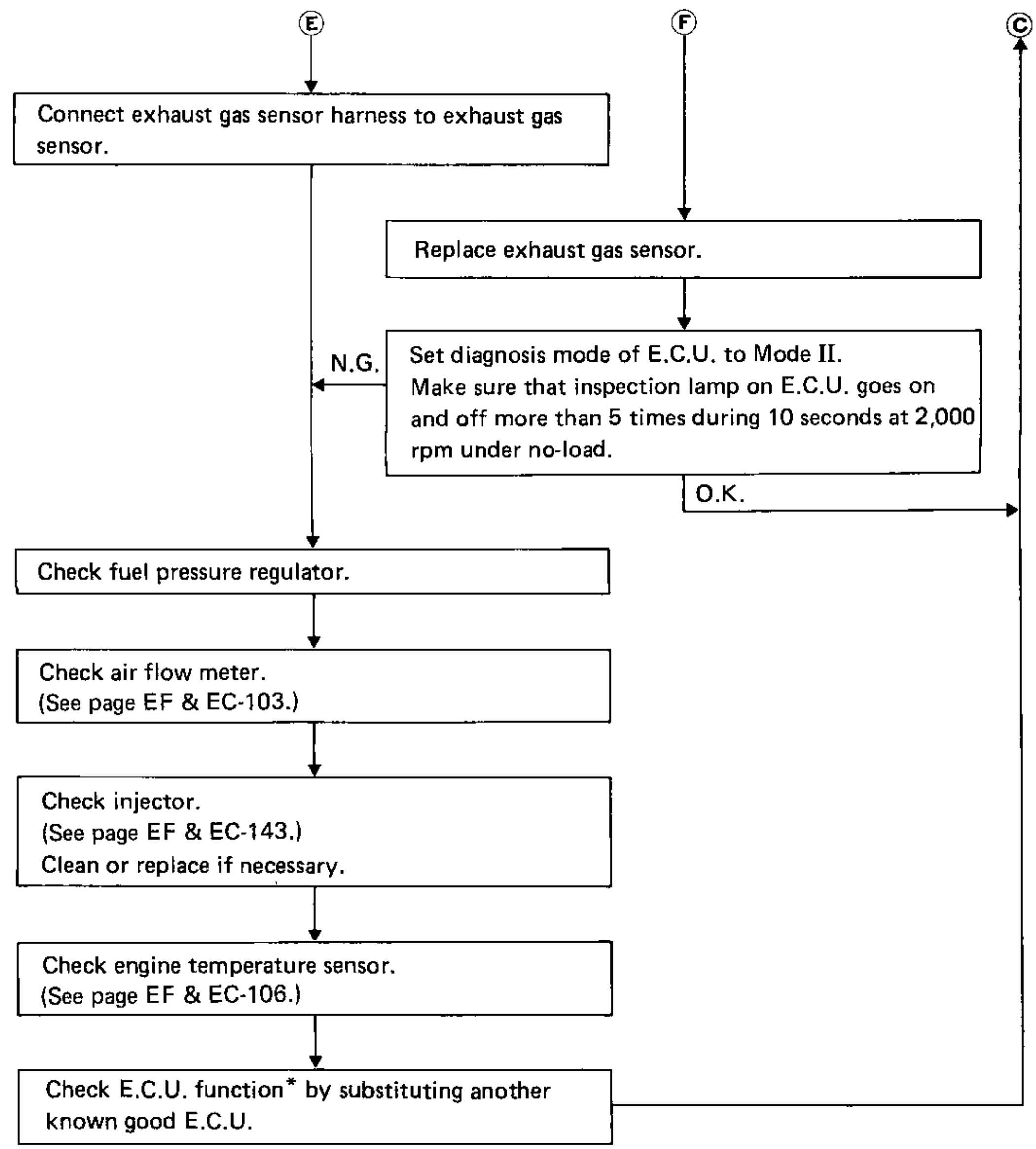
Idle CO: Less than 5%

After checking CO%
1) Turn off engine.
2) Disconnect the resistor (2.5 kΩ) from terminals of engine temperature sensor harness connector.
3) Connect engine temperature sensor harness connector to engine temperature sensor.
4) Connect A.I.V. hose.

N.G. → Ⓔ

O.K. → Ⓕ

Ⓒ



*: E.C.U. may be the cause of a problem, but this is rarely the case.

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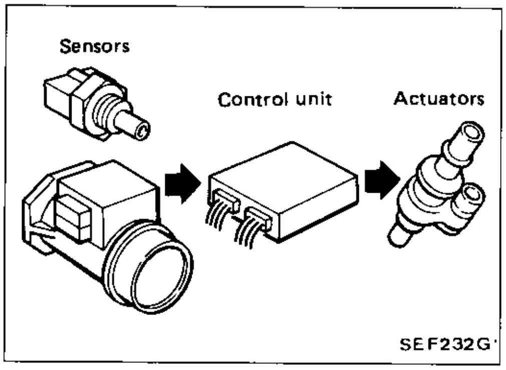

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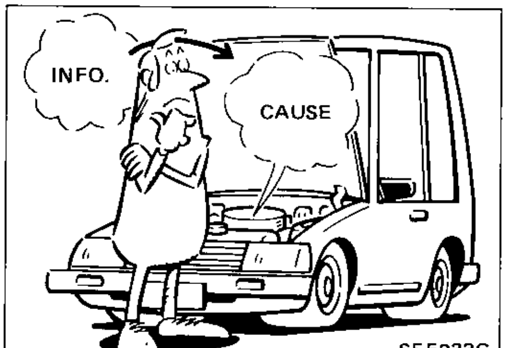

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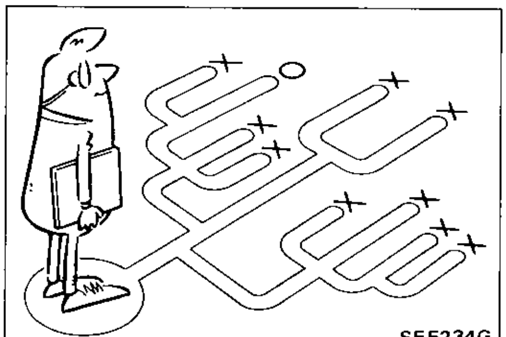

SEF234G

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 faulty wiring. In this case, careful checking of suspicious circuits may help prevent the replacement of good parts.

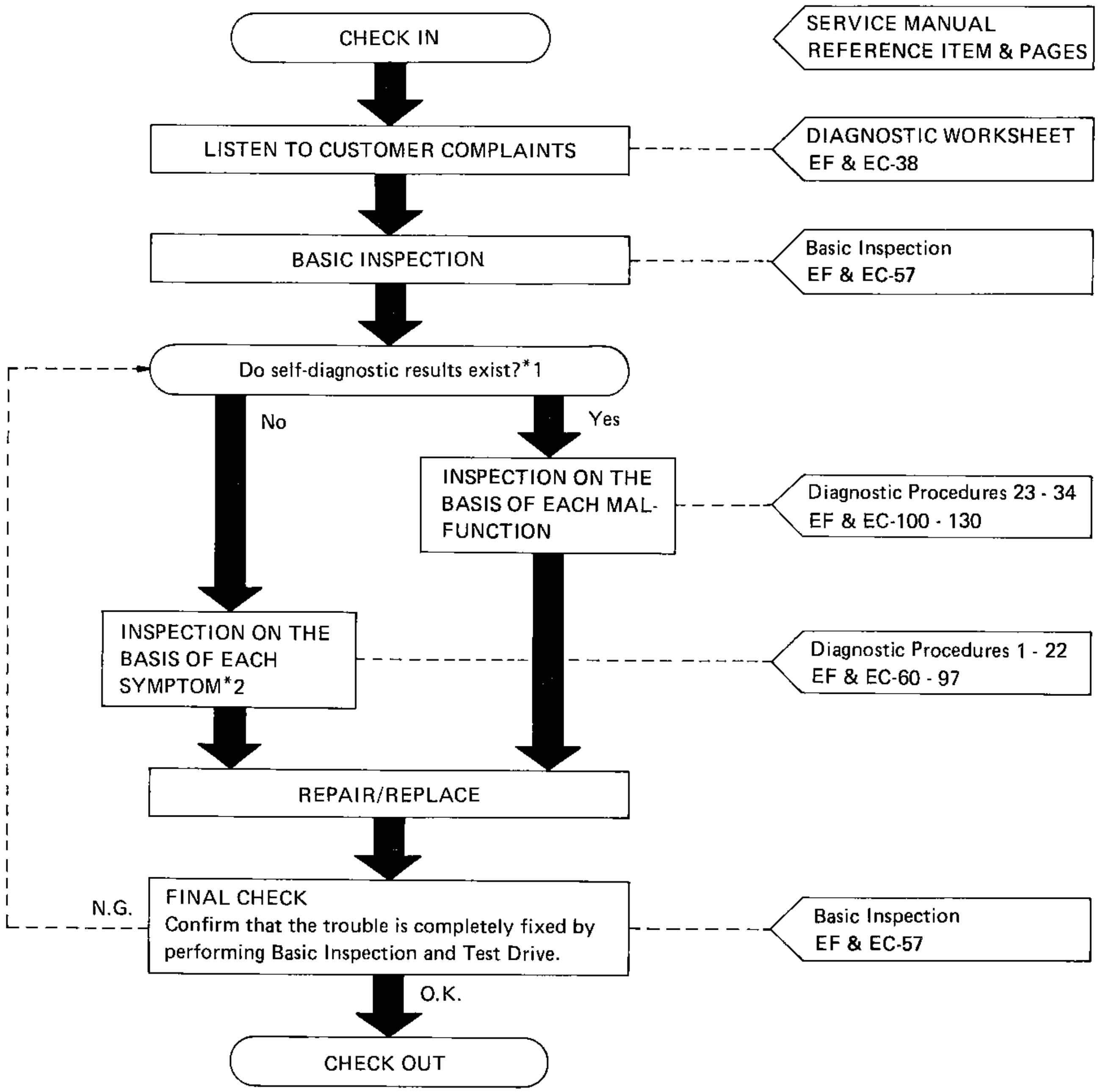
A visual check only may not find the cause of the problems. A road test with a circuit tester connected to a suspected circuit should be performed.

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 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 driveability problems on an electronically controlled engine vehicle.

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-39).

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

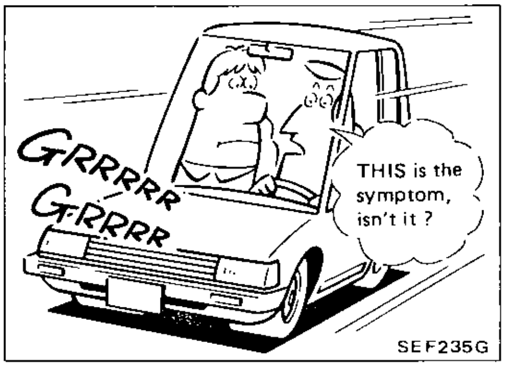
DIAGNOSTIC WORKSHEET

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	☐ Startability	☐ Impossible to start ☐ No combustion ☐ Partial combustion ☐ Partial combustion affected by throttle position ☐ Partial combustion NOT affected by throttle position ☐ Possible but hard to start ☐ Others [ ]
	☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [ ]
	☐ Driveability	☐ Stumble ☐ Surge ☐ Detonation ☐ Lack of power ☐ Intake backfire ☐ Exhaust backfire ☐ Others [ ]
	☐ Engine stall	☐ At the time of start ☐ While idling ☐ While accelerating ☐ While decelerating ☐ Just after stopping ☐ While loading
Incident occurrence		☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐ In the daytime
Frequency		☐ All the time ☐ Under certain conditions ☐ Sometimes
Weather conditions		☐ Note effected
	Weather	☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ]
	Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Humid °F
Engine conditions		☐ Cold During warm-up ☐ After warm-up Engine speed 0 2,000 4,000 6,000 8,000 rpm
Road conditions		☐ In town ☐In suburbs ☐ Highway ☐ Off road (up/down)
Driving conditions		☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH) Vehicle speed 0 10 20 30 40 50 60 MPH
Check engine light		☐ Turned on ☐ Not turned on

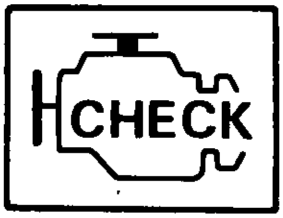
How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)



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	Distributor	Advanced	Rotate distributor clockwise.
			Retarded	Rotate distributor counterclockwise.
3	Mixture ratio feed-back control	Exhaust gas sensor	Suspended	Disconnect exhaust gas sensor harness connector.
		Control unit	Operation check	Perform self-diagnosis (Mode I/II) at 2,000 rpm.
4	Idle speed	I.A.A. unit	Raised	Turn idle adjusting screw counterclockwise.
			Lowered	Turn idle adjusting screw clockwise.
5	Electric connection (Electric continuity)	Harness connectors and wires	Poor electric connection or faulty 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 headlights, air conditioner, rear defogger, etc.
9	Idle switch condition	Control unit	ON-OFF switching	Perform self-diagnosis (Mode IV).
10	Ignition spark	Timing light	Spark power check	Try to flash timing light for each cylinder.



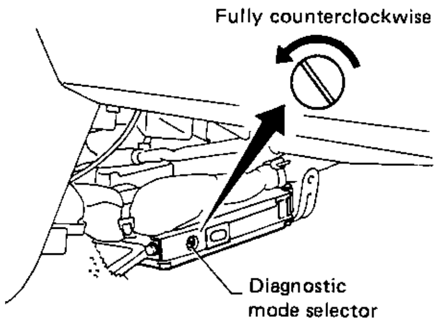
CHECK ENGINE LIGHT

SEF924F

Self-diagnosis

CHECK ENGINE LIGHT

A check engine light has been adopted on the California, Federal and Canada models. This light blinks simultaneously with the RED L.E.D. on the E.C.U.



SEC239B

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.

SELF-DIAGNOSTIC FUNCTION

Condition \ 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

Self-diagnosis (Cont'd)

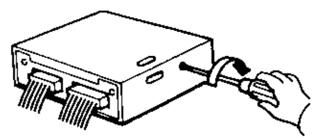
HOW TO SWITCH MODES

Turn ignition switch "ON".
(Do not start engine.)

↓

Mode I – BULB CHECK → Start engine. → Mode I – MALFUNCTION WARNING

↓

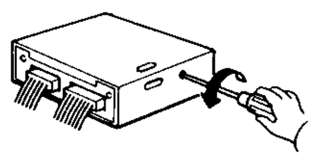


(Turn diagnostic mode selector on E.C.U. fully clockwise)

↓

Wait at least 2 seconds.

↓

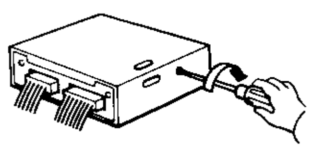


(Turn diagnostic mode selector fully counterclockwise.)

↓

Mode II – SELF-DIAGNOSTIC RESULTS → Start engine. → Mode II – EXHAUST GAS SENSOR MONITOR

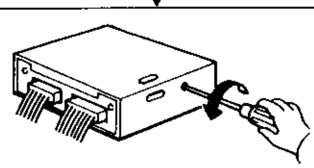
↓



↓

Wait at least 2 seconds.

↓



(→ back to Mode I – BULB CHECK)

- **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.**

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

FOR CALIFORNIA MODEL

CHECK ENGINE LIGHT AND RED L.E.D.	CONDITION
ON	WHEN THE FOLLOWING MALFUNCTION (CHECK ENGINE LIGHT ITEM) IS DETECTED OR THE E.C.U.'S C.P.U. IS MALFUNCTIONING.
OFF	O.K.

CODE NO.	MALFUNCTION
12	AIR FLOW METER CIRCUIT
13	ENGINE TEMPERATURE SENSOR CIRCUIT
14	VEHICLE SPEED SENSOR CIRCUIT
31	E.C.U.(E.C.C.S. CONTROL UNIT)
32	E.G.R. FUNCTION
33	EXHAUST GAS SENSOR CIRCUIT
35	EXHAUST GAS TEMPERATURE SENSOR CIRCUIT
43	THROTTLE SENSOR CIRCUIT
45	INJECTOR LEAK

- **These Code Numbers are clarified in Mode II — SELF-DIAGNOSTIC RESULTS.**
- **The RED L.E.D. and the CHECK ENGINE LIGHT will turn off when normal condition is detected. At this time, the Mode II — SELF-DIAGNOSTIC RESULTS memory must be cleared as the contents remain stored.**

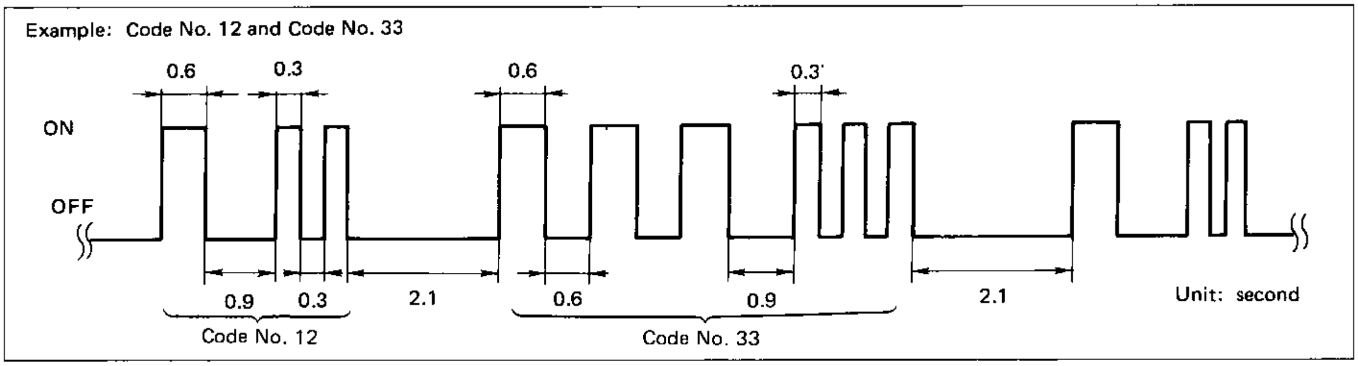
FOR NON-CALIFORNIA MODEL

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)

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.
The diagnostic results will remain in E.C.U. memory.

Display code table

Code No.		Detected items	California model	Non-California model
11		Crank angle sensor circuit	X	X
12	CHECK	Air flow meter circuit	X	X
13	CHECK	Engine temperature sensor circuit	X	X
14	CHECK	Vehicle speed sensor circuit	X	X
21		Ignition signal circuit	X	X
31	CHECK	E.C.U.	X	X
32	CHECK	E.G.R. function	X	—
33	CHECK	Exhaust gas sensor circuit (Left side)	X	X
35	CHECK	Exhaust gas temperature sensor circuit	X	—
41		Air temperature sensor circuit	X	X
43		Throttle sensor circuit	X	X
45		Injector leak	X	—
55		No malfunction in the above circuits	X	X

X: Available
—: Not available
CHECK: Check engine light item

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

Code No.	Detected items	Malfunction is detected when ...	Check item (remedy)
*11	Crank angle sensor circuit	• Either 1° or 180° signal is not entered for the first few seconds during engine cranking. • Either 1° or 180° signal is not input often enough while the engine speed is higher than the specified rpm.	• Harness and connector (If harness and connector are normal, replace crank angle sensor.)
12	Air flow meter circuit	• The air flow meter circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector (If harness and connector are normal, replace air flow meter.)
13	Engine temperature sensor circuit	• The engine temperature sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.)	• Harness and connector • Engine temperature sensor
14	Vehicle speed sensor circuit	• The vehicle speed sensor circuit is open or shorted.	• Harness and connector • Vehicle speed sensor (reed switch)
*21	Ignition signal circuit	• The ignition signal in the primary circuit is not entered during engine cranking or running.	• Harness and connector • power transistor unit
31	E.C.U.	• E.C.U. calculation function is malfunctioning.	(Replace E.C.C.S. control unit.)
32	E.G.R. function	• E.G.R. control valve does not operate. (E.G.R. control valve spring does not lift.)	• E.G.R. control valve • E.G.R. control solenoid valve
33	Exhaust gas sensor circuit	• The exhaust gas sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.)	• Harness and connector • Exhaust gas sensor • Fuel pressure • Injectors • Intake air leaks
35	Exhaust gas temperature sensor circuit	• The exhaust gas temperature sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Exhaust gas temperature sensor
41	Air temperature sensor circuit	• The air temperature sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Air temperature sensor
43	Throttle sensor circuit	• The throttle sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Throttle sensor
45	injector leak	• Fuel leaks from injector.	• Injector

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

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

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.**

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

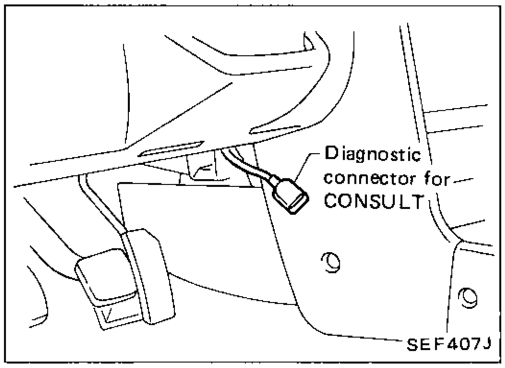
*: Maintains conditions just before switching to open loop.

HOW TO CHECK EXHAUST GAS SENSOR

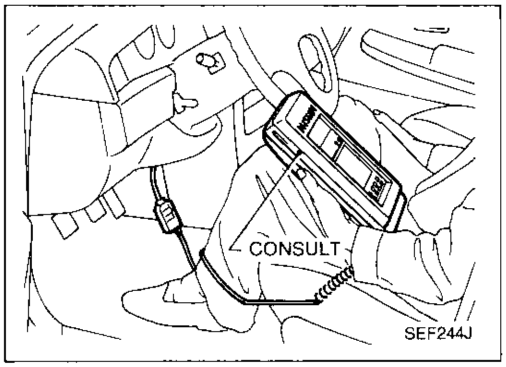
1. Set Mode II. (Refer to "HOW TO SWITCH MODES".)
2. Start engine and warm it up until engine coolant temperature indicator points to the middle of the gauge.
3. Run engine at about 2,000 rpm for about 2 minutes under no-load conditions.
4. Make sure RED L.E.D. or CHECK ENGINE LIGHT goes ON and OFF more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

Consult

CONSULT INSPECTION PROCEDURE

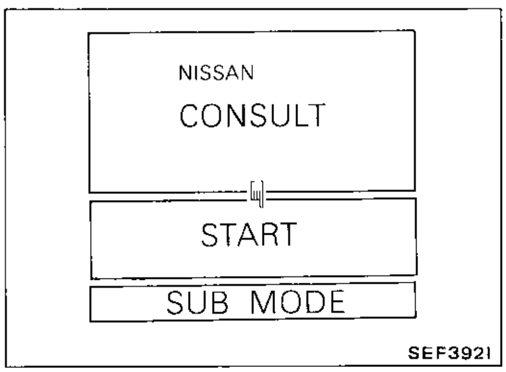


SEF407J



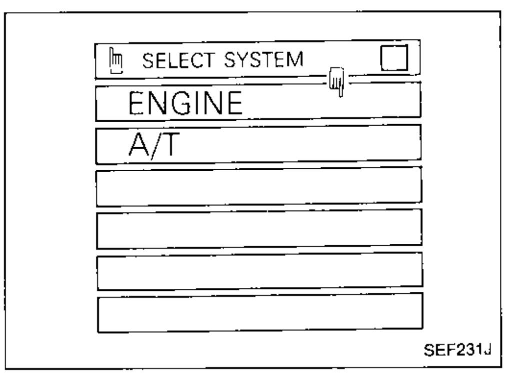
SEF244J

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



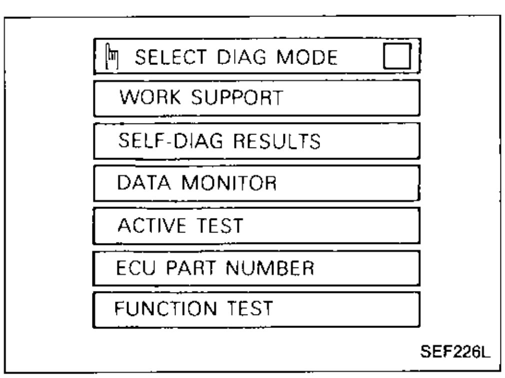
SEF392I

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



SEF231J

5. Touch "ENGINE".



SEF226L

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

For further information, read the CONSULT Operation Manual.

Consult (Cont'd)

E.C.C.S. COMPONENT PARTS APPLICATION

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

*: The E.C.C.S. component part marked * is applicable to vehicles for California only.
X: Applicable

CAUTION:

a. When servicing fuel system after performing "Fuel Pressure Release" in "Work Support" mode, turn off ignition key with CONSULT set in "Work Support" mode.

b. Be sure to set gears to "Neutral" before conducting "Active Test" on idle adjustment or A.A.C. valve.

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 numbers can be read.
Function test	Conducted by CONSULT instead of a technician to determine whether each system is "OK" or "NG".

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. ● IGN SW "ON" ● ENG NOT RUNNING ● ACC PEDAL NOT PRESSED	When adjusting throttle sensor initial position,
IGNITION TIMING ADJUSTMENT*	● 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. ● ENGINE WARMED UP ● NO-LOAD	When adjusting idle speed,
FUEL PRESSURE RELEASE	● FUEL PUMP WILL STOP BY TOUCHING "START" WHEN IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line,

Consult (Cont'd)

SELF-DIAGNOSTIC RESULTS MODE

DIAGNOSTIC ITEM	DIAGNOSTIC ITEM IS DETECTED WHEN ...	CHECK ITEM (REMEDY)
CRANK ANGLE SENSOR*	• Either 1° or 180° signal is not entered for the first few seconds during engine cranking. • Either 1° or 180° signal is not input often enough while the engine speed is higher than the specified rpm.	• Harness and connector (If harness and connector are normal, replace crank angle sensor.)
AIR FLOW METER	• The air flow meter circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector (If harness and connector are normal, replace air flow meter.)
ENGINE TEMP SENSOR	• The engine temperature sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.)	• Harness and connector • Engine temperature sensor
CAR SPEED SENSOR	• The vehicle speed sensor circuit is open or shorted.	• Harness and connector • Vehicle speed sensor (reed switch)
IGN SIGNAL-PRIMARY*	• The ignition signal in primary circuit is not entered during engine cranking or running.	• Harness and connector • Power transistor unit
CONTROL UNIT	• E.C.U. calculation function is malfunctioning.	(Replace E.C.C.S. control unit.)
EGR SYSTEM*, **	• E.G.R. control valve does not operate. (E.G.R. control valve spring does not lift.)	• E.G.R. control valve • E.G.R. control solenoid valve
EXH GAS SENSOR	• The exhaust gas sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.)	• Harness and connector • Exhaust gas sensor • Fuel pressure • Injectors • Intake air leaks
EXH GAS TEMP SENSOR**	• The exhaust gas temperature sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Exhaust gas temperature sensor
AIR TEMP SENSOR	• The air temperature sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Air temperature sensor
THROTTLE SENSOR	• The throttle sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Throttle sensor
INJECTOR LEAK**	• Fuel leaks from injector.	• Injector

* : Check items causing a malfuction of crank angle senser circuit first, if both "CRANK ANGLE SENSOR" and "IGN SIGNAL-PRIMARY" come out at the same time.

**: The diagnostic item marked ** is applicable to vehicles for California only.

Consult (Cont'd)

DATA MONITOR MODE

MONITOR ITEM	CONDITION		SPECIFICATION	CHECK ITEM WHEN OUTSIDE SPEC.
CAS. RPM (REF)	• Tachometer: Connect • Run engine and compare tachometer indication with the CONSULT value.		Almost the same speed as the CONSULT value.	• Harness and connector • Crank angle sensor
AIR FLOW MTR	• Engine: After warming up, idle the engine • A/C switch "OFF" • Shift lever "N" • No load	Idle	1.3 - 1.8V	• Harness and connector • Air flow meter
		2,000 rpm	1.8 - 2.2V	
ENG TEMP SEN	• Engine: After warming up		More than 70°C (158°F)	• Harness and connector • Engine temperature sensor
EXH GAS SEN	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ 0.6 - 1.0V	• Harness and connector • Exhaust gas sensor • Intake air leaks • Injectors
M/R F/C MNT			LEAN ←→ RICH Changes more than 5 times during 10 seconds.	
CAR SPEED SEN	• Turn drive wheels and compare speedometer indication with the CONSULT value		Almost the same speed as the CONSULT value	• Harness and connector • Vehicle speed sensor
BATTERY VOLT	• Ignition switch: ON (Engine stopped)		11 - 14V	• Battery • E.C.U. power supply circuit
THROTTLE SEN	• Ignition switch: ON (Engine stopped)	Throttle valve fully closed	0.4 - 0.5V	• Harness and connector • Throttle sensor • Throttle sensor adjustment
		Throttle valve fully opened	Approx. 4.0V	
AIR TEMP SEN	• Engine: After warming up		20 - 60°C (68 - 140°F)	• Harness and connector • Fuel temp. sensor
EGR TEMP SEN*	• Engine: After warming up		Less than 4.5V	• Harness and connector • Exhaust gas temperature sensor
START SIGNAL	• Ignition switch: ON → START		OFF → ON	• Harness and connector • Starter switch
IDLE POSITION	• Ignition switch: ON (Engine stopped)	Throttle valve: Idle position	ON	• Harness and connector • Throttle sensor • Throttle sensor adjustment
		Throttle valve: Slightly open	OFF	
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	Idle		2.9 - 3.6 msec.	• Harness and connector • Injector • Air flow meter
	2,000 rpm		2.6 - 3.3 msec.	

Consult (Cont'd)

MONITOR ITEM	CONDITION	SPECIFICATION	CHECK ITEM WHEN OUTSIDE SPEC.
IGN TIMING	Idle	15 deg.	• Harness and connector • Crank angle sensor
	2,000 rpm	More than 25 deg.	
ACC VALVE	Idle	15° - 40°	• Harness and connector • ACC valve
	2,000 rpm	—	

Remarks:

- The monitor item marked * is applicable to vehicles for California only.
- Specifications are reference values.
- Specification data are out-put/in-put values which are detected or supplied by the E.C.U. at the connector.

* Specification data may not be directly related to their components signals/values/operations.
i.e. 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 not being adjusted to the specification data. This IGN TIMING monitors the data calculated by the E.C.U. according to the input signals from the crank angle sensor and other ignition timing related sensors.

ACTIVE TEST MODE

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
FUEL INJECTION TEST	• Engine: Return to the original trouble condition • Change the amount of fuel injection with the CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Harness and connector • Fuel injectors • Exhaust gas sensors
AAC/V OPENING TEST	• Engine: After warming up, idle the engine. • Change the AAC valve opening percent with the CONSULT.	Engine speed changes according to the opening percent.	• Harness and connector • AAC valve
ENGINE TEMP TEST	• Engine: Return to the original trouble condition • Change the engine coolant temperature with the CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Harness and connector • Engine temperature sensor • Fuel injectors
IGN TIMING TEST	• Engine: Return to the original trouble condition • Timing light: Set • Retard the ignition timing with the CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Adjust initial ignition timing
POWER BALANCE TEST	• 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.	• Harness and connector • Compression • Injectors • Power transistor • Spark plugs • Ignition coils
RADIATOR FAN TEST	• Ignition switch: ON • Turn the radiator fan "ON" and "OFF" with the CONSULT.	Radiator fan moves and stops.	• Harness and connector • Radiator fan motor
FUEL PUMP RLY TEST	• 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.	• Harness and connector • Fuel pump relay
EGR CONT SOLV/V TEST	• Ignition switch: ON • Turn solenoid valve "ON" and "OFF" with the CONSULT and listen to operating sound.	Each solenoid valve makes an operating sound.	• Harness and connector • Solenoid valve
PRVR CONT SOL/V TEST			
AIV CONT SOL/V TEST			
SWIRL CONT SOL/V TEST			
SELF-LEARN CONT TEST	• In this test, the coefficient of self-learning control mixture ratio returns to the original coefficient by touching "CLEAR" on the screen.		

FUNCTION TEST MODE

FUNCTION TEST ITEM	CONDITION	JUDGEMENT		CHECK ITEM (REMEDY)
SELF-DIAG RESULTS	• Ignition switch: ON (Engine stopped) • Displays the results of self-diagnosis.	—		Objective system
IDLE POSITION (IDLE SWITCH CIRCUIT)	• Ignition switch: ON (Engine stopped) • Idle switch circuit is tested when throttle is opened and closed fully. ("IDLE POSITION" is the test item name for the vehicles in which idle is selected by throttle sensor.)	Throttle valve: opened	OFF	• Harness and connector • Throttle sensor (Idle switch) • Throttle sensor (Idle switch) adjustment • Throttle linkage • Verify operation in DATA MONITOR mode.
		Throttle valve: closed	ON	
THROTTLE SENSOR CKT	• Ignition switch: ON (Engine stopped) • Throttle sensor circuit is tested when throttle is opened and closed fully.	Range (Throttle valve fully opened — Throttle valve fully closed)	More than 3.0V	• Harness and connector • Throttle sensor • Throttle sensor adjustment • Throttle linkage • Verify operation in DATA MONITOR mode.
NEUTRAL SW CIRCUIT	• Ignition switch: ON (Engine stopped) • Neutral switch circuit is tested when shift lever is manipulated.	OUT OF N/P-RANGE	OFF	• Harness and connector • Neutral switch/Inhibitor switch • Linkage + Inhibitor switch adjustment
		IN N-RANGE	ON	
FUEL PUMP CIRCUIT	• Ignition switch: ON (Engine stopped) • Fuel pump circuit is tested by checking the pulsation in fuel pressure when fuel tube is pinched.	There is pressure pulsation on the fuel feed hose.		• Harness and connector • Fuel pump • Fuel pump relay • Fuel filter clogging • Fuel level
EGR CONT S/V CIRCUIT	• Ignition switch: ON (Engine stopped) • EGR control S/V circuit is tested by checking solenoid valve operating noise.	The solenoid valve makes an operating sound every 3 seconds.		• Harness and connector • EGR control solenoid valve
PRVR CONT S/V CIRCUIT	• Ignition switch: ON (Engine stopped) • PRVR CONT S/V circuit is tested by checking solenoid valve operating noise.	The solenoid valve makes an operating sound every 3 seconds.		• Harness and connector • P.R.V.R. control solenoid valve
RADIATOR FAN CIRCUIT	• Ignition switch: ON (Engine stopped) • Radiator fan circuit is tested by checking radiator fan peration.	• The radiator fan rotates and stops every 3 econds.		• Harness and connector • Radiator fan motor • Radiator fan relay

Consult (Cont'd)

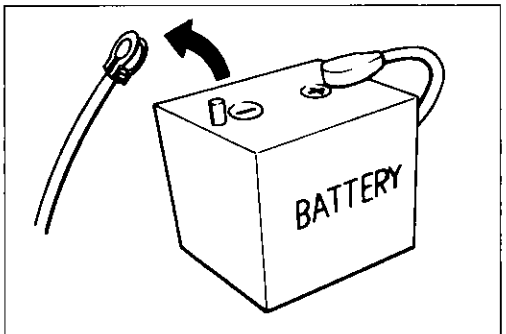
FUNCTION TEST ITEM	CONDITION	JUDGEMENT		CHECK ITEM (REMEDY)
START SIGNAL CIRCUIT	• Ignition switch: ON → START • Start signal circuit is tested when engine is started by perating the starter. Battery voltage and water temperature before ranking, and average battery voltage, air flow meter output voltage nd cranking speed during cranking are displayed.	Start signal: OFF → ON		• Harness and connector • Ignition switch
PW/ST SIGNAL CIRCUIT	• Ignition switch: ON (Engine running) • Power steering circuit is tested when steering wheel is rotated fully and then set to a straight line running position.	Locked position Neutral	ON OFF	• Harness and connector • Power steering oil pressure switch • Power steering oil pump
SWIRL CONTROL S/V CIRCUIT	• Ignition switch: ON (Engine stopped) • Swirl control S/V circuit is tested by checking swirl control actuator operation.	• The swirl control actuator moves every 3 seconds.		• Harness and connector • Swirl control solenoid valve • Swirl control actuator • Vacuum hose
CAR SPEED SEN CIRCUIT	• Car speed sensor circuit is tested when vehicle is running at a speed of 10 km/h (6 mph) or higher.	Car speed sensor input signal is greater than 4 km/h (2 MPH)		• Harness and connector • Car speed sensor • Electric speedometer
IGN TIMING ADJ	• After warming up, idle the engine. • Ignition timing adjustment is checked by reading ignition timing with a timing light and checking whether it agrees with specifications.	The timing light indicates the same value on the screen.		• Adjust ignition timing (by moving crank angle sensor or distributor) • Crank angle sensor drive mechanism

Consult (Cont'd)

FUNCTION TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
MIXTURE RATIO TEST	• Air-fuel ratio feedback circuit (injection system, ignition system, vacuum system, etc.) is tested by examining the O_2 sensor output at 2,000 rpm under non-loaded state.	• O_2 SEN COUNT: More than 5 times during 10 seconds (O_2 SEN-R COUNT: More than 5 times during 10 seconds)	• INJECTION SYS (Injector, fuel pressure regulator, harness or connector) • IGNITION SYS (Spark plug, power transistor, ignition coil, harness or connector) • VACUUM SYS (Intake air leaks) • O_2 sensor circuit • O_2 sensor operation • Fuel pressure high or low • Air flow meter
POWER BALANCE	• After warming up, idle the engine. • Injector operation of each cylinder is stopped one after another, and resultant change in engine rotation is examined to evaluate combustion of each cylinder. (This is only displayed for models where a sequential injection system is used.)	Difference in engine rpm is greater than 25 rpm before and after cutting off the injector of each cylinder.	• Injector circuit (Injector, harness or connector) • Ignition circuit (Spark plug, power transistor, ignition coil, harness or connector) • Compression • Valve timing
AAC VALVE SYSTEM	• After warming up, idle the engine. • AAC valve system is tested by detecting change in engine rpm when AAC valve opening is changed to 0%, 20% and 80%.	Difference in engine rpm is greater than 150 rpm between when valve opening is at 80% (102 steps) and at 20% (25 steps).	• Harness and connector • AAC valve • Air passage restriction between air inlet and AAC valve • IAS (Idle adjusting screw) adjustment

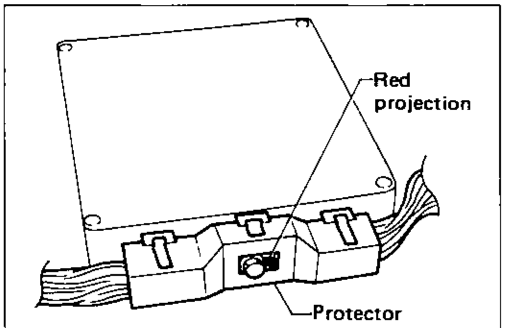
Diagnostic Procedure

CAUTION:



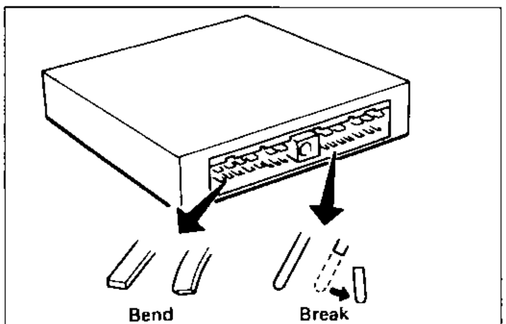
SEF289H

1. 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.



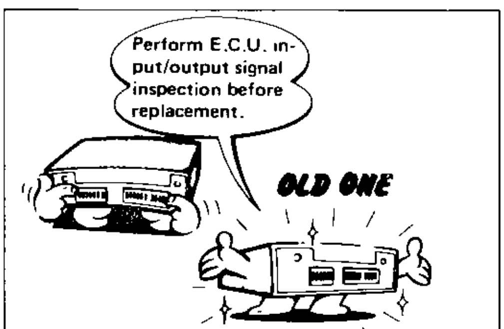
SEF725H

2. When connecting E.C.U. harness connector, tighten securing bolt until red projection is in line with connector face.



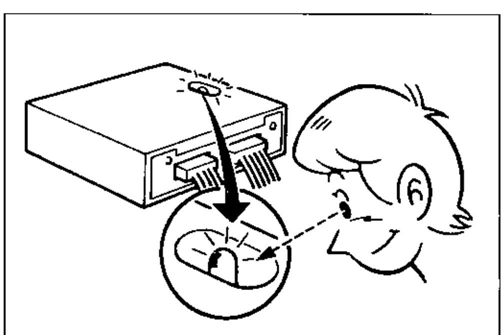
SEF291H

3. When connecting or disconnecting pin connectors into or from E.C.U., take care not to damage pin terminals (bend or break).
4. Make sure that there are not any bends or breaks on E.C.U. pin terminal, when connecting pin connectors.



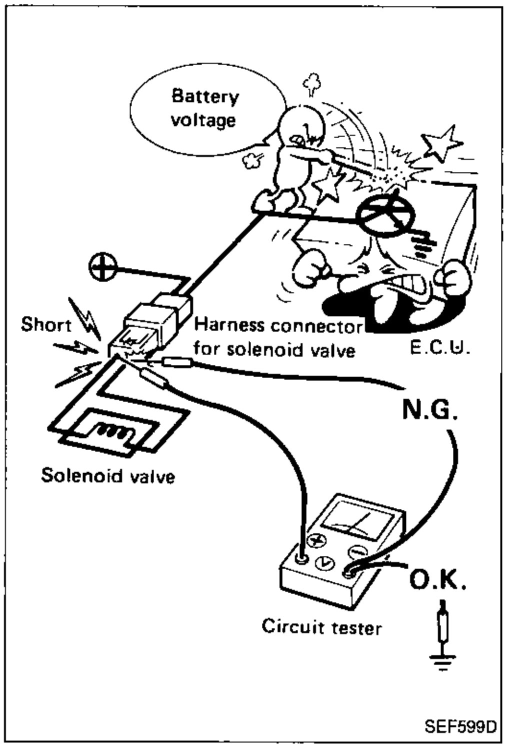
SEF330D

5. 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-168.)


SEF152I

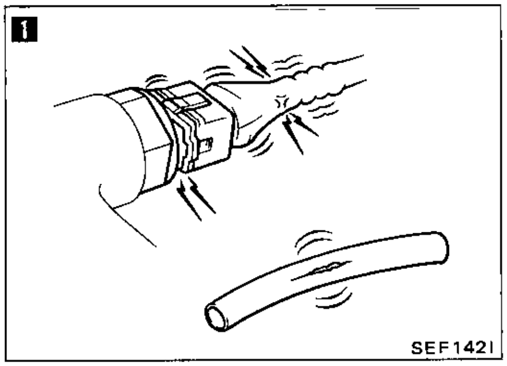
6. After performing this "Diagnostic Procedure", perform E.C.C.S. self-diagnosis and driving test.

Diagnostic Procedure (Cont'd)



7. **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.

Basic Inspection



SEF142I

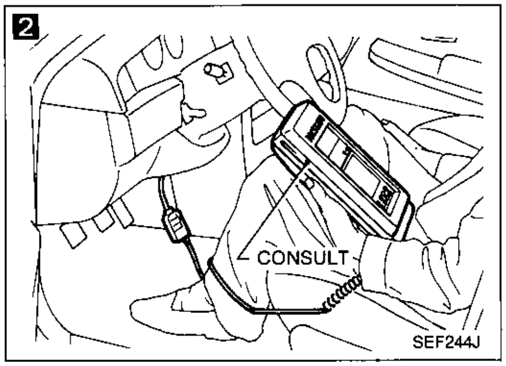
1

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

↓

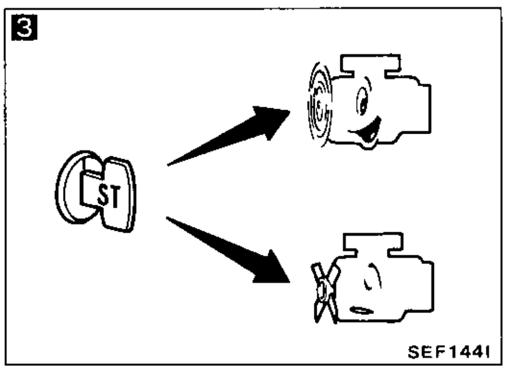


SEF244J

2

CONNECT CONSULT TO THE VEHICLE.
Connect "CONSULT" to the diagnostic connector and select "ENGINE" from the menu. (Refer to page EF & EC-46.)

↓

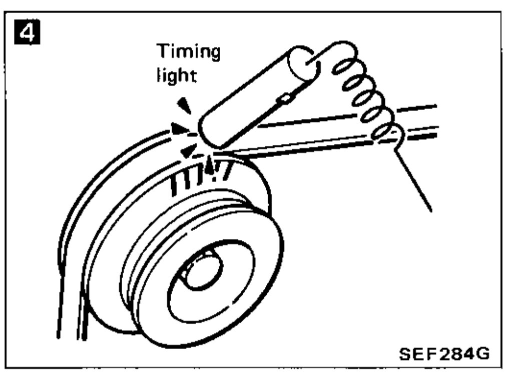


SEF144I

3

DOES ENGINE START? — No → Go to **6**.

Yes ↓



SEF284G

4

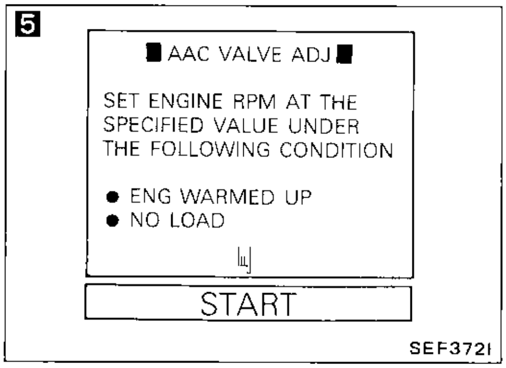
CHECK IGNITION TIMING.
Warm up engine sufficiently and check ignition timing at idle using timing light. (Refer to page EF & EC-30.)
Ignition timing: 15° ± 2° B.T.D.C.

— N.G. → Adjust ignition timing by turning crack angle sensor.

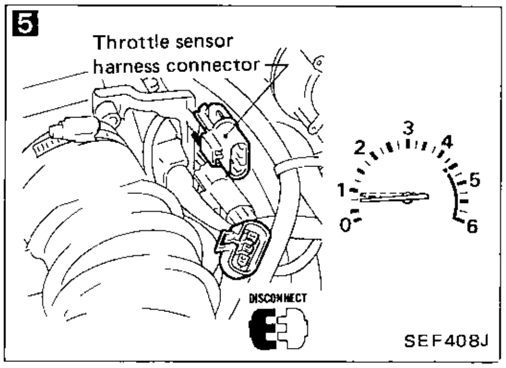
O.K. ↓

(Go to Ⓐ on next page.)

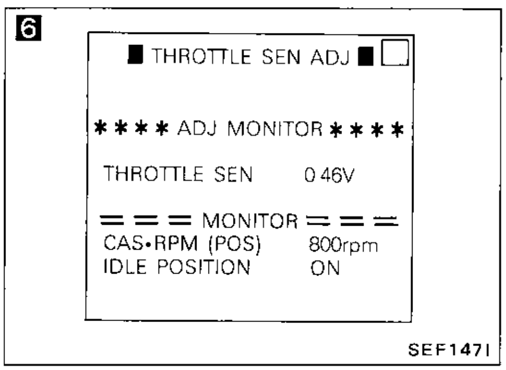
Basic Inspection (Cont'd)



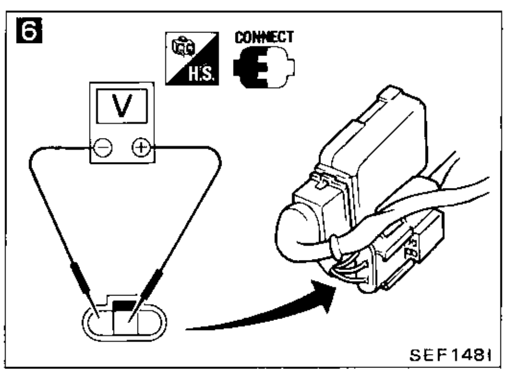
SEF372I



SEF408J



SEF147I



SEF148I

Ⓐ

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 the following values?
   M/T: 650±50 rpm
   A/T: 650±50 rpm
   ("N" position)

OR

When disconnecting throttle sensor harness connector, does engine rpm fall to the following values?
M/T: 650±50 rpm
A/T: 650±50 rpm
("N" position)

No → Adjust engine rpm by turning idle adjusting screw.

CAUTION
Be sure to set gears to "Neutral".

Yes ↓

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.)

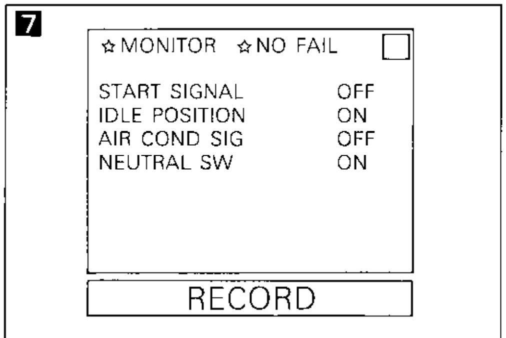
N.G. →
1. Adjust output voltage by rotating throttle sensor body.
2. Disconnect throttle sensor harness connector for a few seconds and then reconnect it.
3. Confirm that "IDLE POSITION" stays "ON".

O.K. ↓

(Go to Ⓑ on next page.)

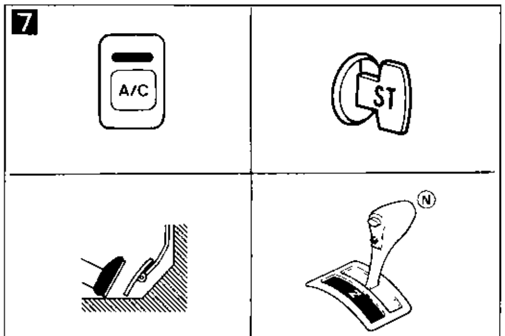
Basic Inspection (Cont'd)

7



SEF149I

7



SEF150I

B

7

CHECK SWITCH INPUT SIGNAL.

Select the following switches in "DATA MONITOR" mode,
a) Start signal,
b) Idle position,
c) Air conditioner signal,
d) Neutral (Parking) switch,
and check the switches' ON-OFF operation.

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 → IGN 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

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

O.K. ↓

8

READ SELF-DIAGNOSTIC RESULTS.

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

OR

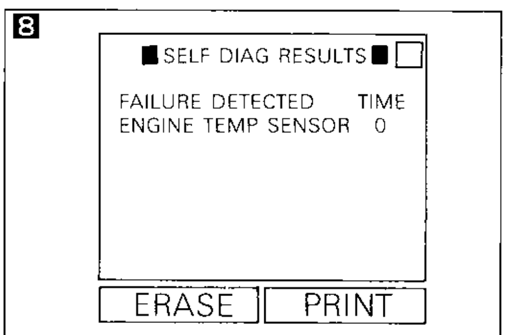
1. Set "Self-diagnostic results mode" in Mode II. (Refer to page EF & EC-41.)
2. Count the number of RED L.E.D. flashes and read out the codes.
3. Are the codes being output?

Yes → Go to the relevant inspection procedure.

No ↓

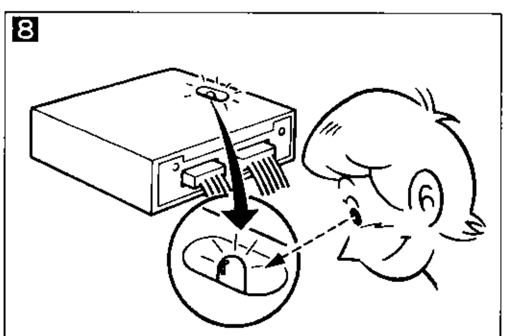
INSPECTION END

8

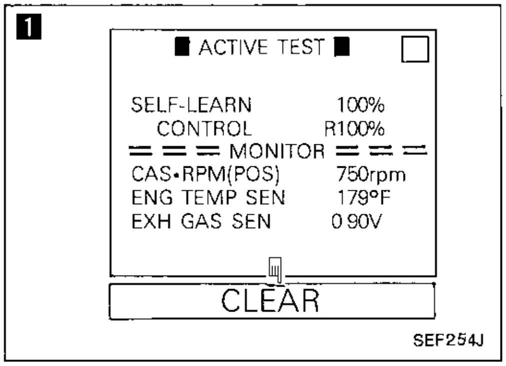


SEF151I

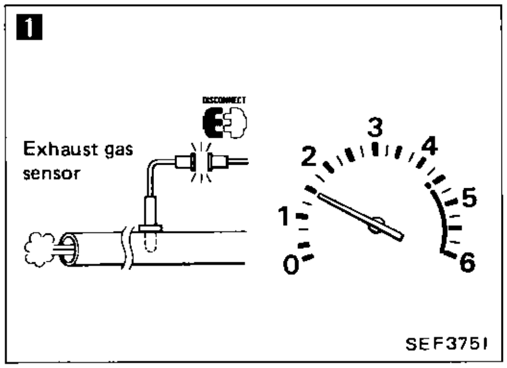
8



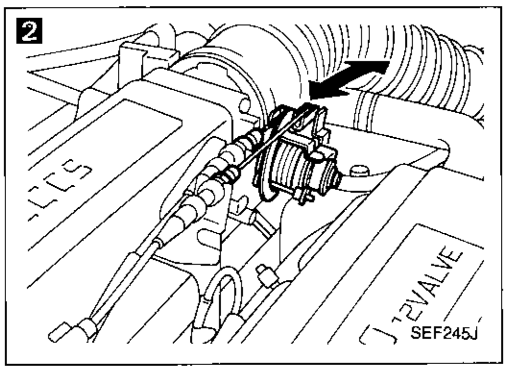
SEF152I



SEF254J



SEF375I



SEF245J

Diagnostic Procedure 1 — High Idling after Warm-up

1

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?

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?

Yes → Discover air leak location and repair.

No ↓

2

CHECK THROTTLE LINKAGE.

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

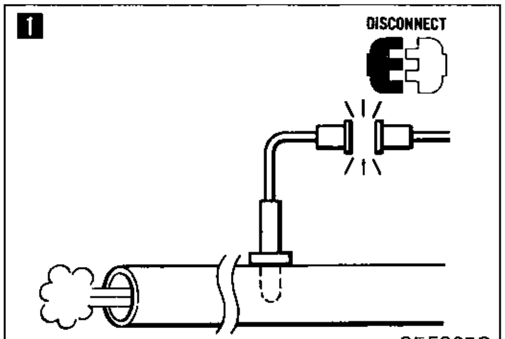
N.G. → Repair throttle linkage or sticking of throttle valve.

O.K. ↓

INSPECTION END

Diagnostic Procedure 2 — Hunting

1



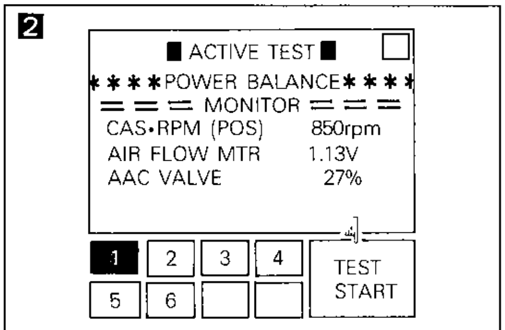
SEF307G

1

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

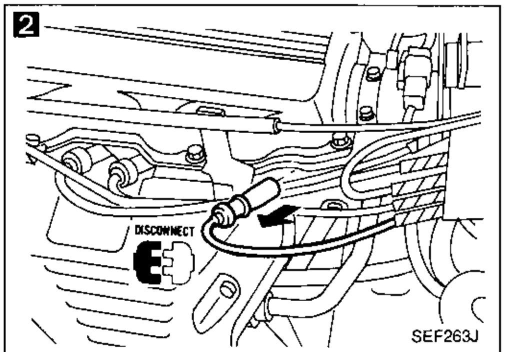
- Yes → Check exhaust gas sensor. (See page EF & EC-119.)
- No ↓

2



SEF157I

2



SEF263J

2

PERFORM POWER BALANCE TEST.

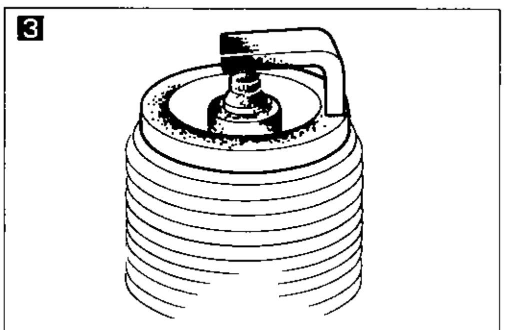
1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

OR

When disconnecting each spark plug cap one at a time, is there any cylinder which does not produce a momentary engine speed drop?

- No → Go to **4**.
- Yes ↓

3


SEF156I

3

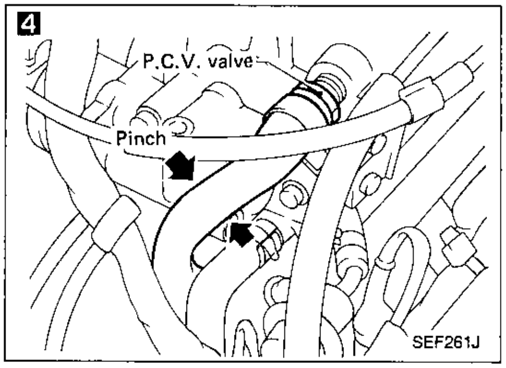
CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.

- N.G. → Repair or replace spark plug(s).
- O.K. ↓

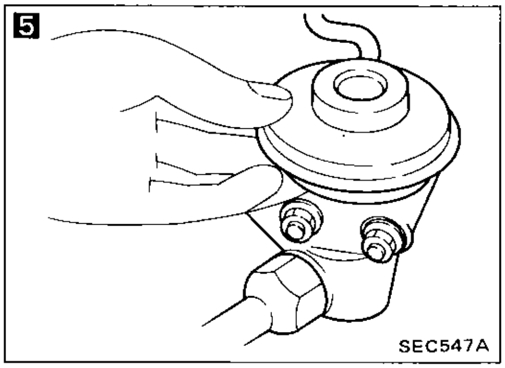
(Go to Ⓐ on next page.)

Diagnostic Procedure 2 — Hunting (Cont'd)

4



5



Ⓐ

4

CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

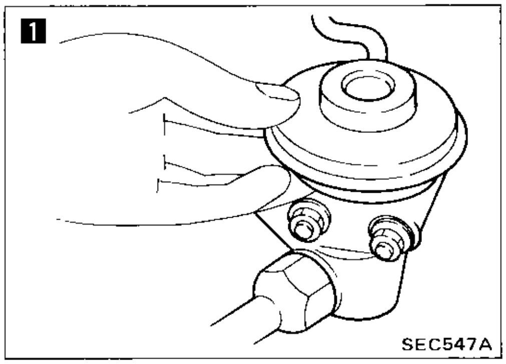
- Yes → Discover air leak location and repair.
- No ↓

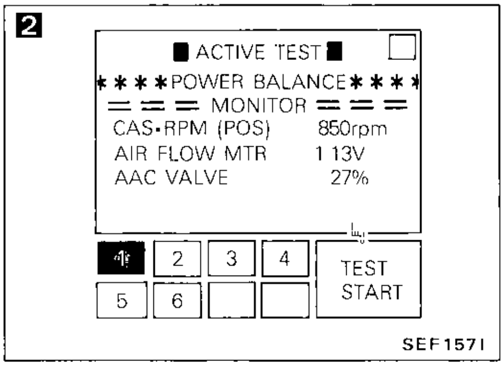
5

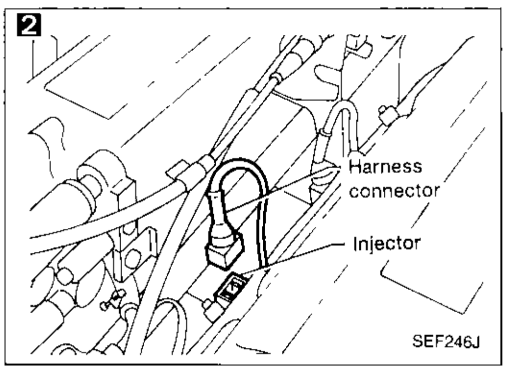
CHECK E.G.R. CONTROL VALVE.
Check E.G.R. control valve for sticking.

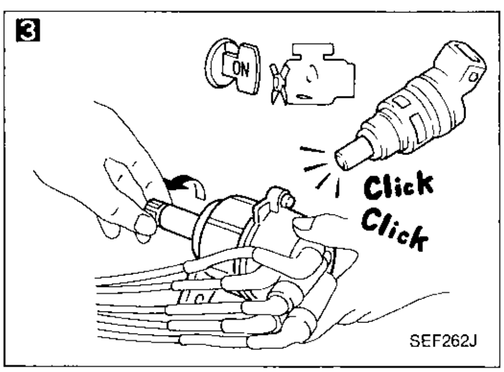
- N.G. → Repair or replace.
- O.K. ↓

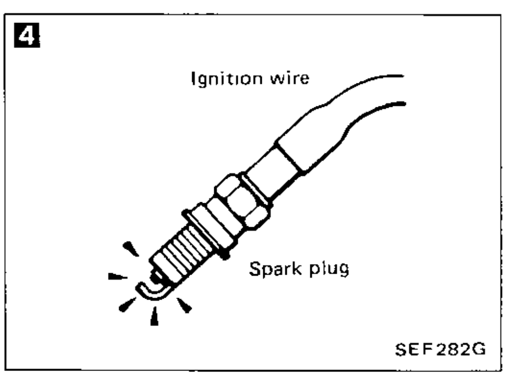
INSPECTION END











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?

OR

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 **6**.

Yes ↓

3

CHECK INJECTOR.
1. Remove crank angle sensor from engine. (Harness connector should remain connected.)
2. Disconnect each ignition wire.
3. Turn ignition switch ON. (Do not start engine.)
4. 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 each spark plug cap.
2. Connect a known good spark plug to each spark plug cap.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

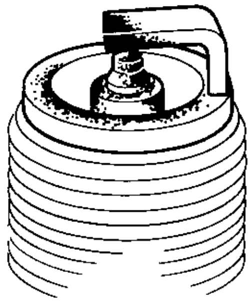
N.G. → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-112.)

O.K. ↓

(Go to Ⓐ on next page.)

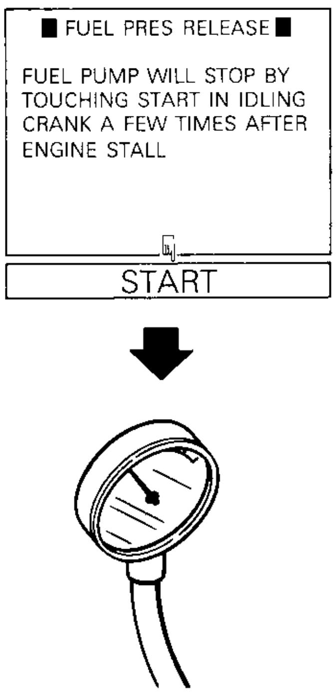
Diagnostic Procedure 3 — Unstable Idle (Cont'd)

5



SEF156I

6



SEF379I

Ⓐ

5

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

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

O.K.

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. 226 kPa (2.3 kg/cm^2, 33 psi)

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-179.)
2. Install fuel pressure gauge and check fuel pressure.

N.G. → Check fuel pump and circuit.

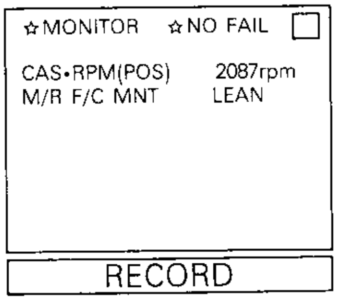
O.K.

(Go to Ⓑ on next page.)

CAUTION:
When servicing fuel system after performing "Fuel Pressure Release" in "Work Support" mode, turn off ignition key with CONSULT set in "Work Support" mode.

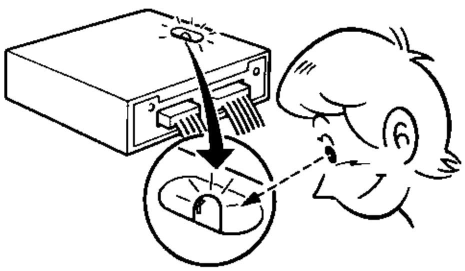
Diagnostic Procedure 3 — Unstable Idle (Cont'd)

7



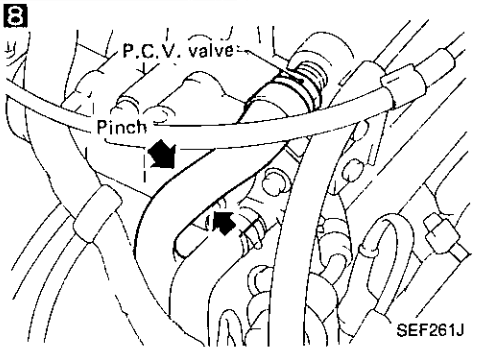
SEF265J

7



SEF152I

8



SEF261J

Ⓑ

7

CHECK EXHAUST GAS SENSOR.

1. See "M/R F/C MNT" in "Data monitor" mode.
2. Maintaining engine at 2,000 rpm under no-load (engine is warmed up sufficiently.), check 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-45.)
2. Maintaining engine at 2,000 rpm under no-load, check to make sure that RED L.E.D. on the E.C.U. goes ON and OFF more than 5 times during 10 seconds.

N.G. → Replace exhaust gas sensor.

O.K. ↓

8

CHECK FOR INTAKE AIR LEAK.

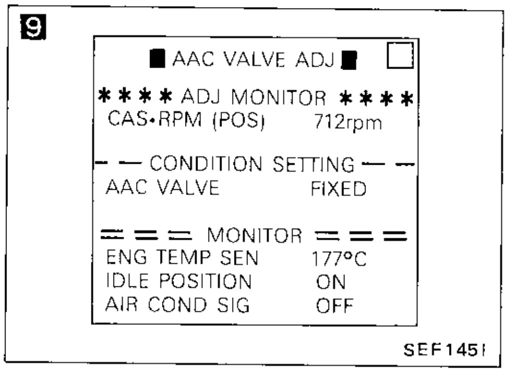
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

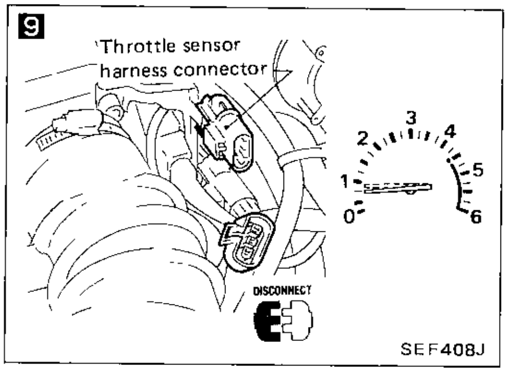
No ↓

(Go to Ⓒ on next page.)

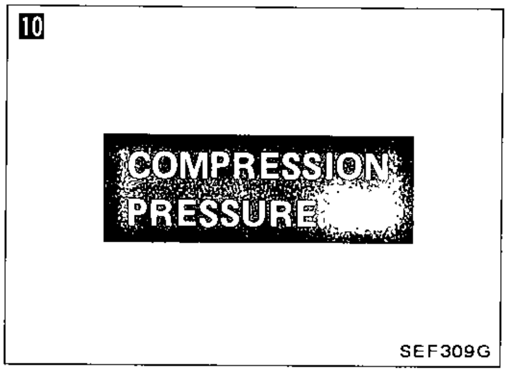
Diagnostic Procedure 3 — Unstable Idle (Cont'd)



SEF145I



SEF408J



SEF309G

Ⓒ

9

CHECK IDLE ADJ. SCREW CLOGGING.

1. Perform "AAC VALVE ADJ" in "WORK SUPPORT" mode.
2. Can you set engine rpm as follows by turning idle adjusting screw?
   M/T: 650 ± 50 rpm
   A/T: 650 ± 50 rpm ("N" position)

OR

1. Disconnect throttle sensor harness connector.
2. Can you set engine rpm as follows by turning idle adjusting screw?
   M/T: 650 ± 50 rpm
   A/T: 650 ± 50 rpm ("N" position)

No → Check for IAS clogging or throttle valve clogging.

Yes ↓

10

CHECK COMPRESSION PRESSURE.

- Check compression pressure.
  Standard: kPa (kg/cm^2, psi)/rpm
  1,206 (12.3, 175)/250
  Minimum: kPa (kg/cm^2, psi)/rpm
  1,010 (10.3, 146)/250
  Difference between each cylinder: kPa (kg/cm^2, psi)/rpm
  98 (1.0, 14)/250

N.G. → Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

O.K. ↓

11

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.

O.K. ↓

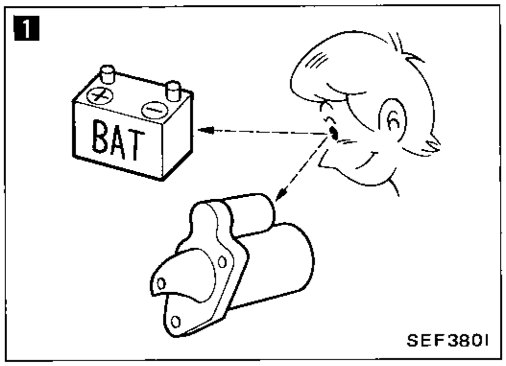
12

TRY A KNOWN GOOD E.C.U.

O.K. ↓

INSPECTION END

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



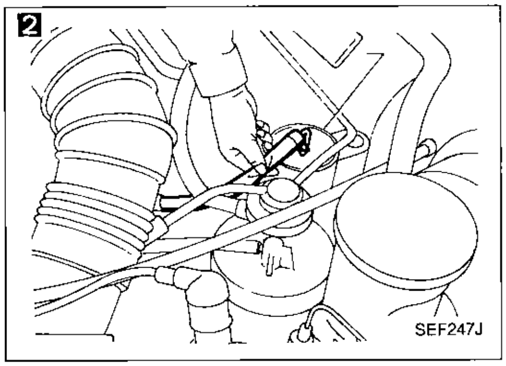
SEF380I

1

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

N.G. → Repair or replace.

O.K. ↓



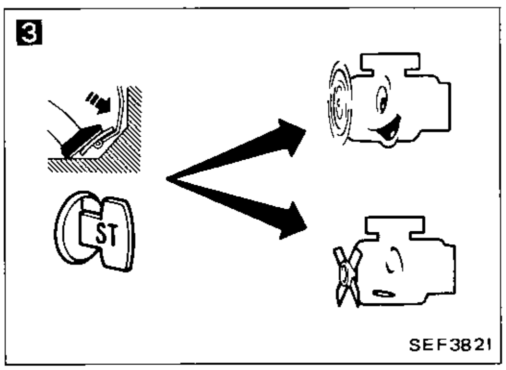
SEF247J

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-145.)

Yes ↓



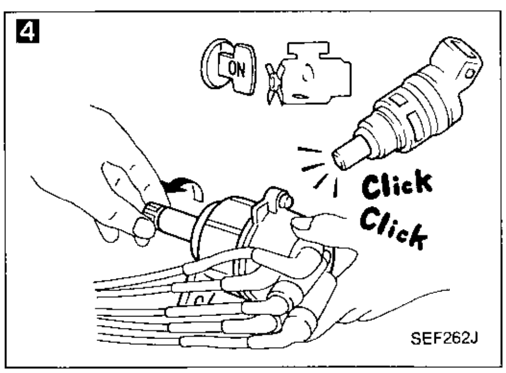
SEF382I

3

CHECK A.A.C. VALVE.
When pressing accelerator pedal fully, can you start the engine?

Yes → Check A.A.C. valve and circuits. (See pages EF & EC-141, 151.)

No ↓



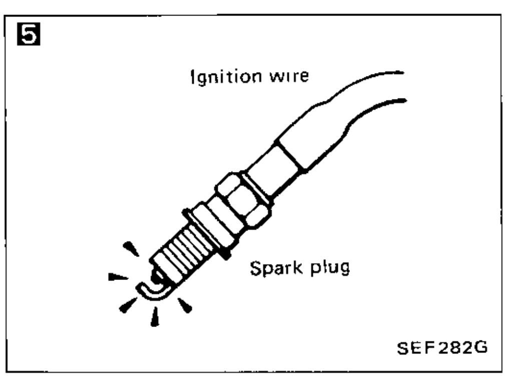
SEF262J

4

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

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

Yes ↓



SEF282G

5

CHECK IGNITION SPARK.
1. Disconnect each spark plug cap.
2. Connect a known good spark plug to each spark plug cap.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

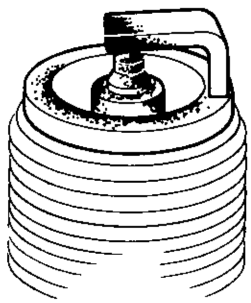
N.G. → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-112.)

O.K. ↓

(Go to Ⓐ on next page.)

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

6



SEF156I

Ⓐ

6

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

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

O.K. ↓

7

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.

O.K. ↓

8

CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-97.

N.G. → Repair or replace.

O.K. ↓

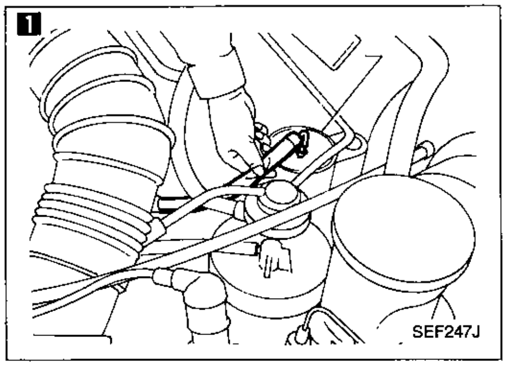
9

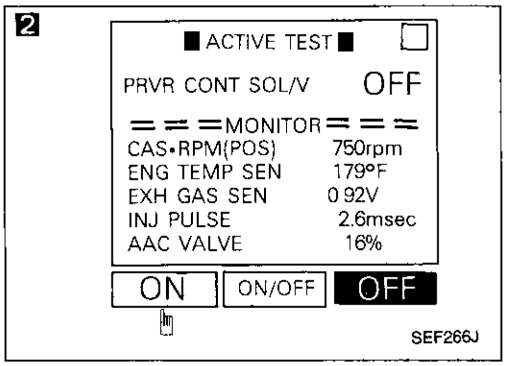
TRY A KNOWN GOOD E.C.U.

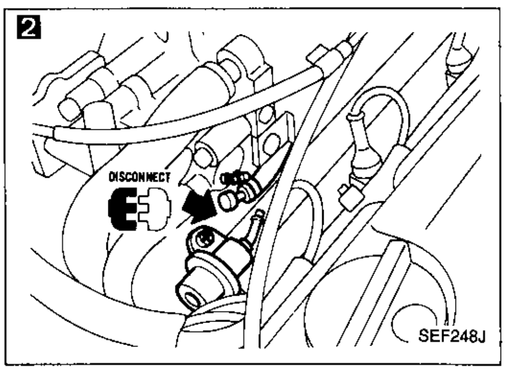
↓

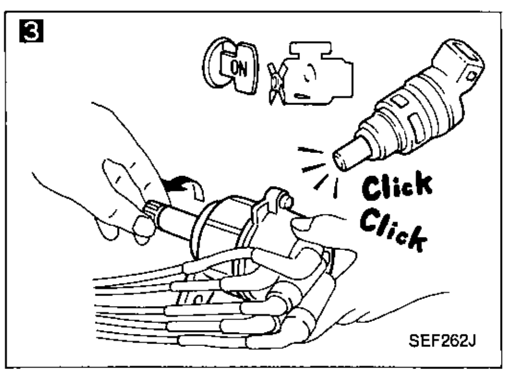
INSPECTION END

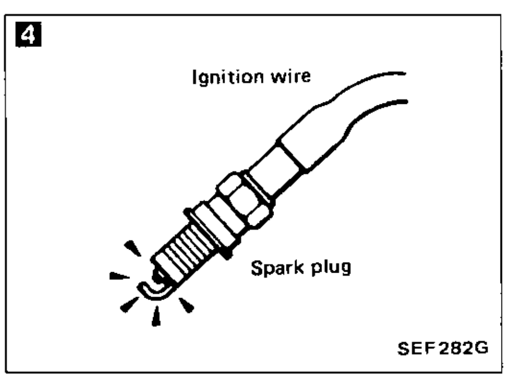
Diagnostic Procedure 5 — Hard to Start or Impossible to Start when the Engine is Hot











1

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-145.)

Yes ↓

2

CHECK FUEL VAPOR.
1. Select "PRVR CONT SOL VALVE" in "ACTIVE TEST" mode.
2. After touching "ON", can you start the engine?

OR

1. Disconnect fuel pressure regulator vacuum hose and plug hose.
2. Can you start engine?

Yes → Check fuel properties.

No ↓

3

CHECK INJECTOR.
1. Remove crank angle sensor from engine. (Harness connector should remain connected.)
2. Disconnect each ignition wire.
3. Turn ignition switch ON. (Do not start engine.)
4. 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 each spark plug cap.
2. Connect a known good spark plug to each spark plug cap.
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-112.)

O.K. ↓

(Go to Ⓐ on next page.)

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

Ⓐ

5

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.

O.K. ↓

6

CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-97.

N.G. → Repair or replace.

O.K. ↓

7

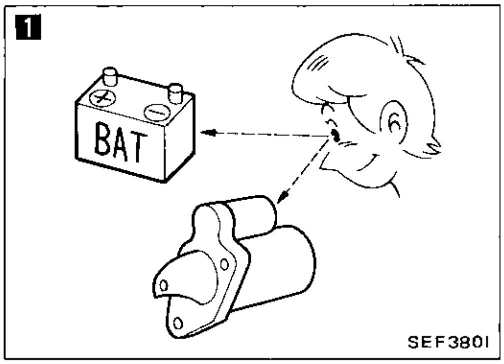
TRY A KNOWN GOOD E.C.U.

↓

INSPECTION END

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

1



SEF380I

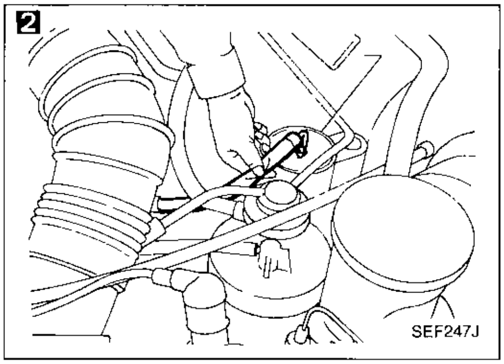
1

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

N.G. → Repair or replace.

O.K. ↓

2



SEF247J

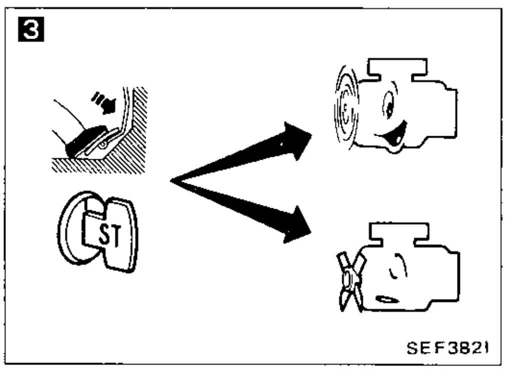
2

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-145.)

Yes ↓

3



SEF382I

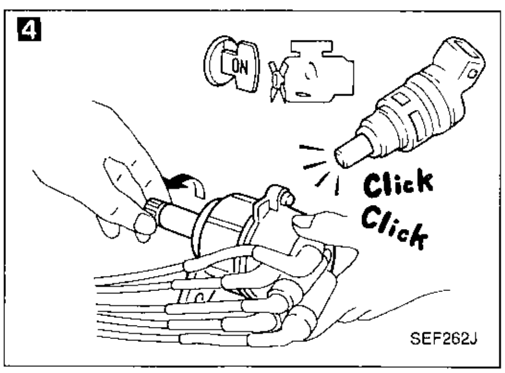
3

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

Yes → Check injector(s) for leakage.

No ↓

4



SEF262J

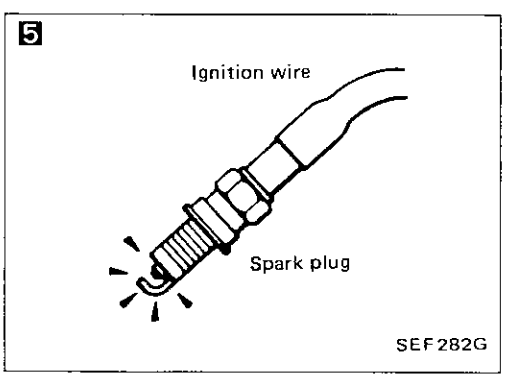
4

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

No → Check injectors and circuits.

Yes ↓

5



SEF282G

5

CHECK IGNITION SPARK.
1. Disconnect each spark plug cap.
2. Connect a known good spark plug to each spark plug cap.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

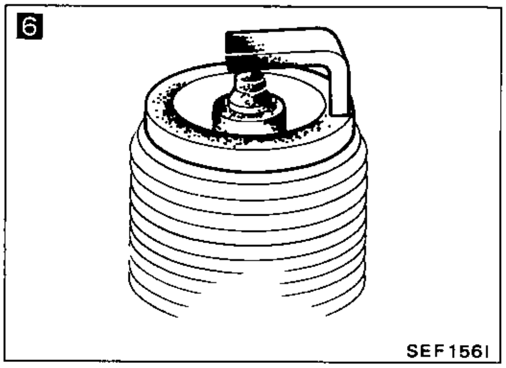
N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-112.)

O.K. ↓

(Go to Ⓐ on next page.)

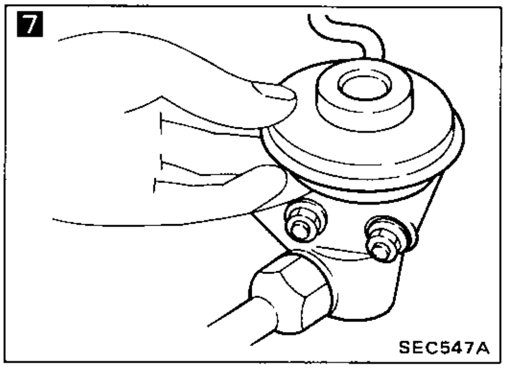
Diagnostic Procedure 6 — Hard to Start or Impossible to Start under Normal Conditions (Cont'd)

6



SEF156I

7



SEC547A

Ⓐ

6
CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.
- N.G. → Repair or replace spark plug(s).
- O.K. ↓

7
CHECK E.G.R. CONTROL VALVE.
Check E.G.R. control valve for sticking.
- N.G. → Repair or replace.
- O.K. ↓

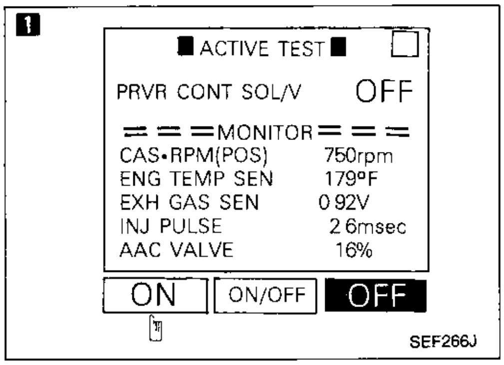
8
CHECK E.C.U. HARNESS CONNECTOR.
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.
- N.G. → Repair or replace.
- O.K. ↓

9
CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-97.
- N.G. → Repair or replace.
- O.K. ↓

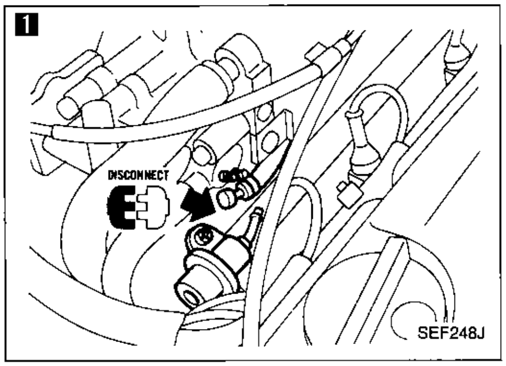
10
TRY A KNOWN GOOD E.C.U.
- Trouble is fixed. → Replace E.C.U.
- Trouble is not fixed. ↓

INSPECTION END

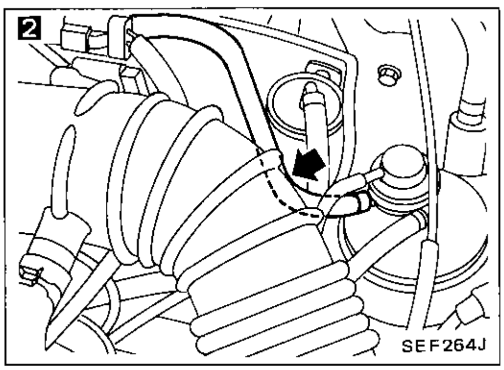
Diagnostic Procedure 7 — Hesitation when the Engine is Hot



SEF266J



SEF248J


SEF264J

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?

OR

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

Yes → Check fuel properties.

No ↓

2

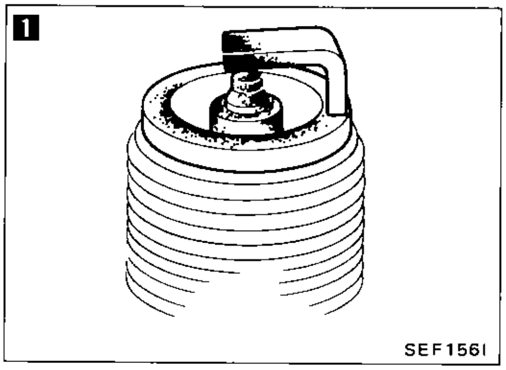
CHECK CANISTER PURGE.

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

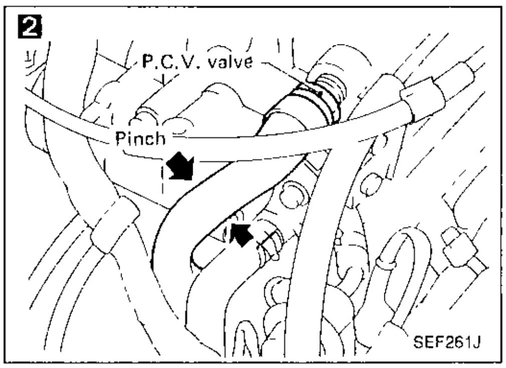
Yes → Install suitable small size orifice into the purge line hose.

No ↓

INSPECTION END



SEF156I



SEF261J

Diagnostic Procedure 8 — Hesitation when the Engine is Cold

1

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

- N.G. → Repair or replace spark plug(s).
- O.K. ↓

2

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 ↓

3

TRY A KNOWN GOOD AIR FLOW METER.

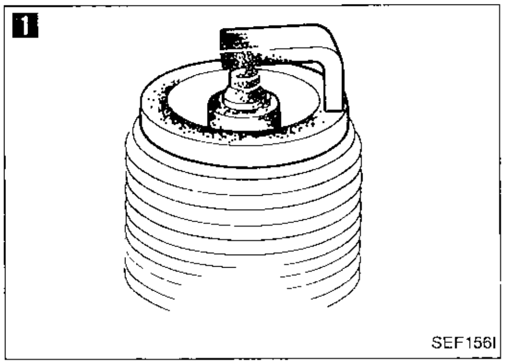
- Trouble is fixed. → Replace air flow meter.
- Trouble is not fixed. ↓

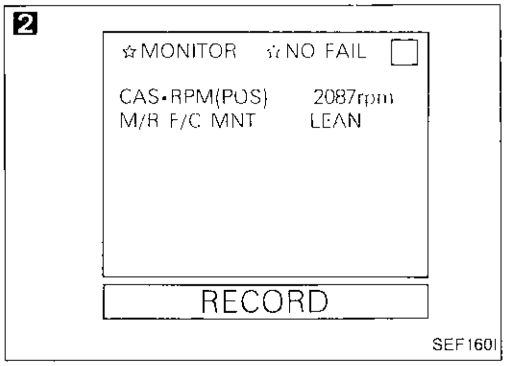
4

CHECK FOR INTAKE VALVE DEPOSITS.
If there are deposits on intake valves, remove them.

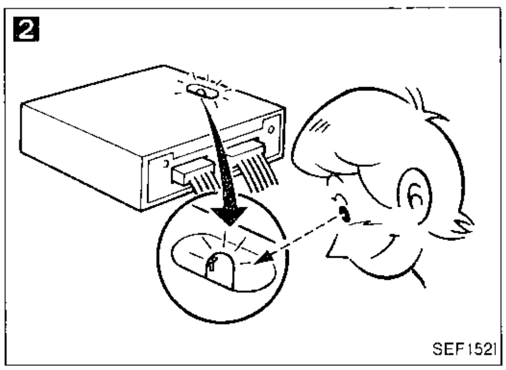
↓

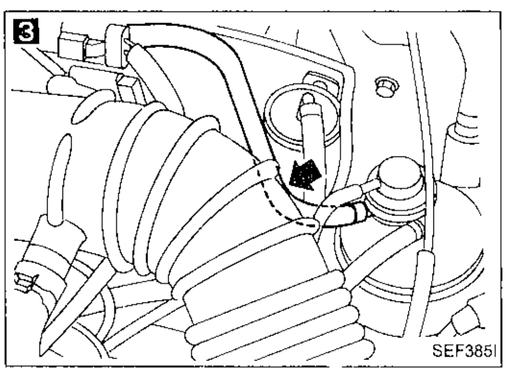
INSPECTION END

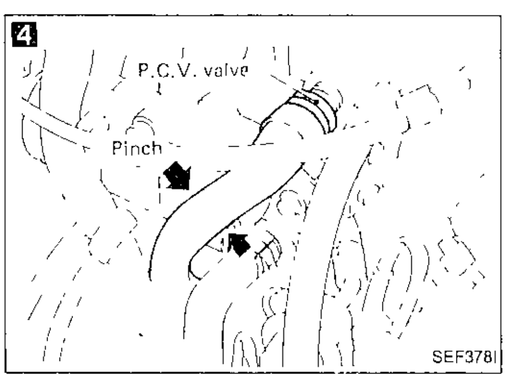

SEF156I



SEF160I


SEF152I


SEF385I



SEF378I

Diagnostic Procedure 9 — Hesitation under Normal Conditions

1

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

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

↓ O.K

2

CHECK EXHAUST GAS SENSOR.

1. See "M/R F/C MNT" 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-48.)
2. Maintaining engine at 2,000 rpm under no load, check that RED L.E.D. on the E.C.U. goes ON and OFF more than 5 times during 10 seconds.

→ Yes: Replace exhaust gas sensor.

↓ No

3

CHECK CANISTER PURGE.

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

→ Yes: Install small size orifice into the purge line hose.

↓ No

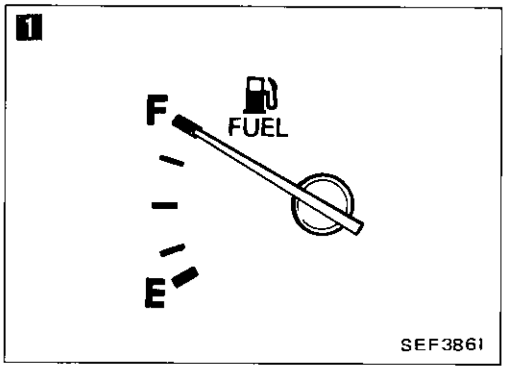
4

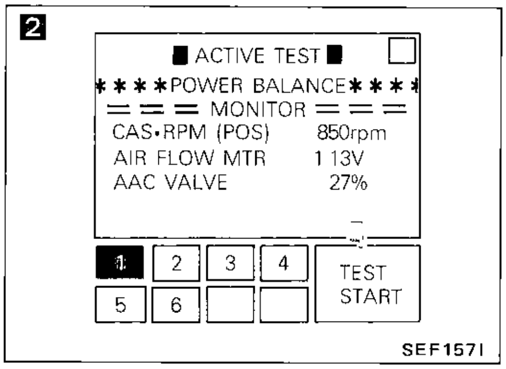
CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

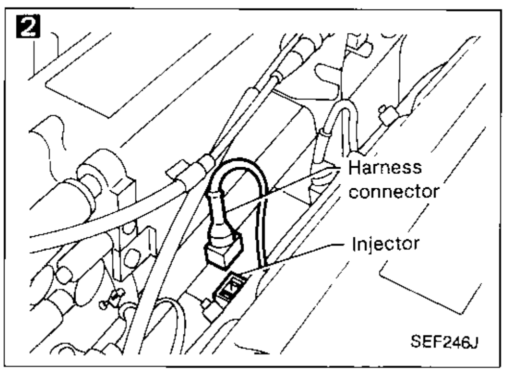
→ Yes: Discover air leak location and repair

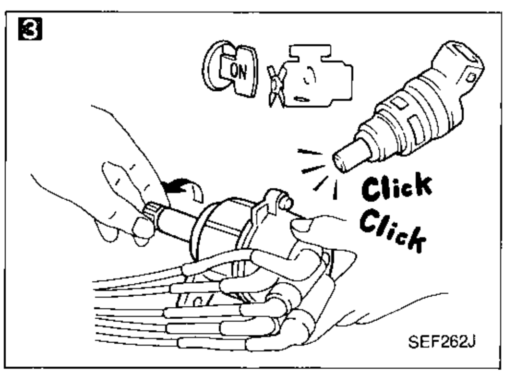
↓ No

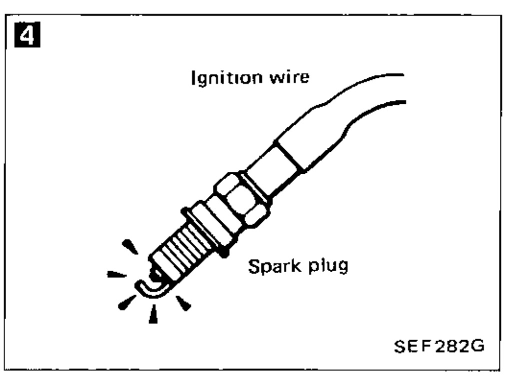
INSPECTION END











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?

OR

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. Disconnect each ignition wire.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating crank angle sensor shaft, does each injector make an operating sound?

- No → Check injector(s) and circuit(s).
- Yes ↓

4

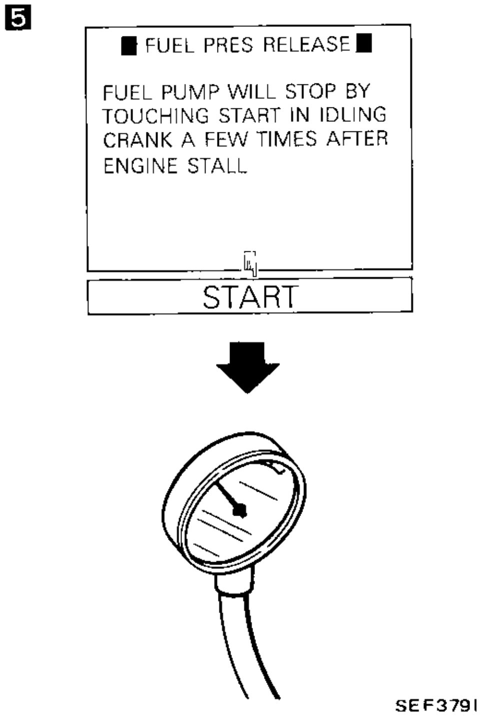
CHECK IGNITION SPARK.
1. Disconnect each spark plug cap.
2. Connect a known good spark plug to each spark plug cap.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

- N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-112.)
- O.K. ↓

(Go to Ⓐ on next page.)

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

5



SEF379I

Ⓐ

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. 226 kPa (2.3 kg/cm^2, 33 psi)

The moment throttle valve is fully open:

Approx. 294 kPa (3.0 kg/cm^2, 43 psi)

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-179.)
2. Install fuel pressure gauge and check fuel pressure.

N.G. → Check fuel pressure regulator diaphragm.

O.K. ↓

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.

O.K. ↓

7

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

Refer to page EF & EC-97.

N.G. → Repair or replace.

O.K. ↓

8

TRY A KNOWN GOOD E.C.U.

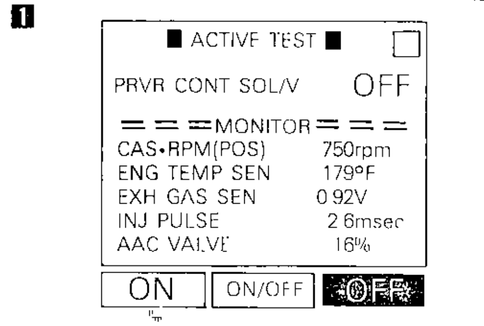
↓

INSPECTION END

CAUTION:

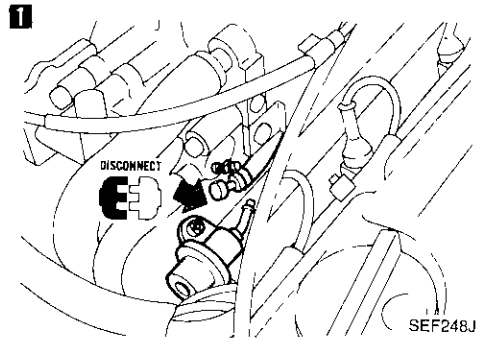
When servicing fuel system after performing "Fuel Pressure Release" in "Work Support" mode, turn off ignition key with CONSULT set in "Work Support" mode.

1



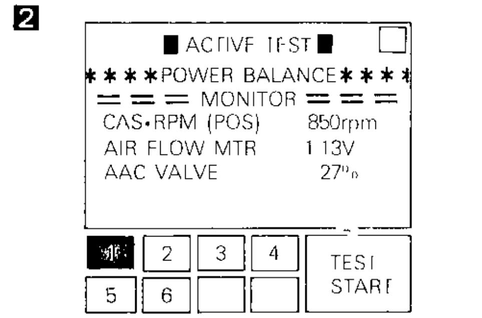
SEF266J

1



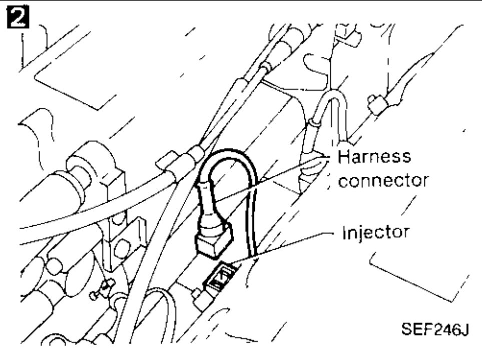
SEF248J

2



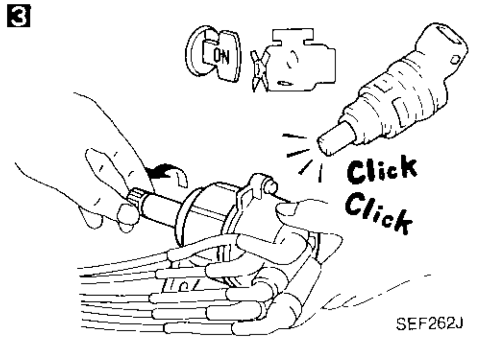
SEF157I

2



SEF246J

3



SEF262J

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?

OR

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

Yes → Check fuel properties.

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

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. Disconnect each ignition wire.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating crank angle sensor shaft, does each injector make an operating sound?

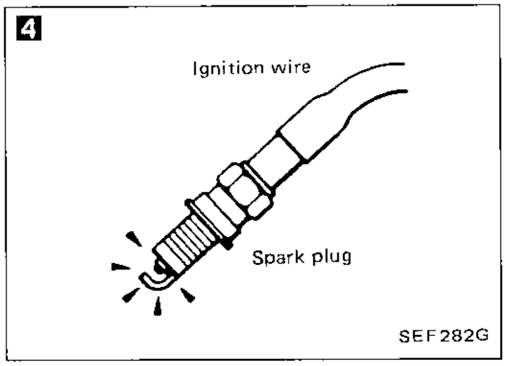
No → Check injector(s) and circuit(s).

Yes ↓

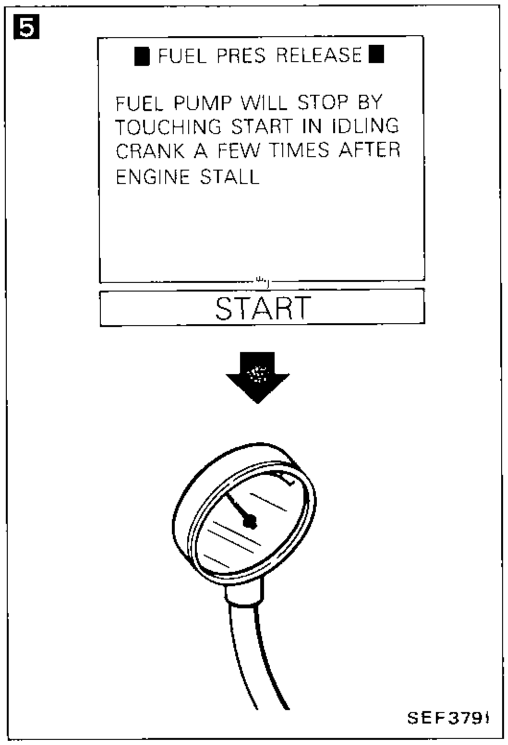
(Go to Ⓐ on next page.)

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

4



5



Ⓐ

4 **CHECK IGNITION SPARK.**
1. Disconnect each all spark plug cap.
2. Connect a known good spark plug to each spark plug cap.
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-112.)

O.K. ↓

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. 226 kPa (2.3 kg/cm², 33 psi)
The moment throttle valve is fully open:
Approx. 294 kPa (3.0 kg/cm², 43 psi)

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-179.)
2. Install fuel pressure gauge and check fuel pressure.

N.G. → Check fuel pressure regulator diaphragm.

O.K. ↓

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.

O.K. ↓

7 **CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.**
Refer to page EF & EC-100.

N.G. → Repair or replace.

O.K. ↓

8 **TRY A KNOWN GOOD E.C.U.**

Trouble is fixed. → Replace E.C.U.

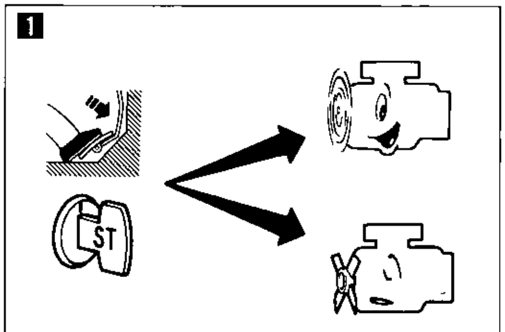
Trouble is not fixed. ↓

INSPECTION END

CAUTION:
When servicing fuel system after performing "Fuel Pressure Release" in "Work Support" mode, turn off ignition key with CONSULT set in "Work Support" mode.

Diagnostic Procedure 12 — Engine Stalls when the Engine is Cold

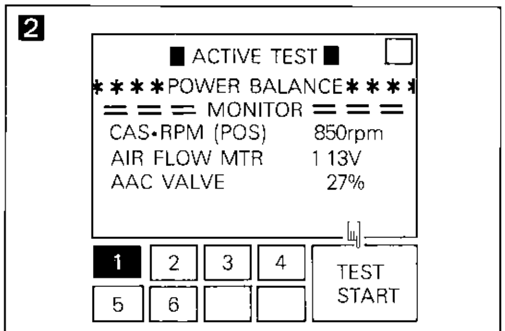
1


SEF382I

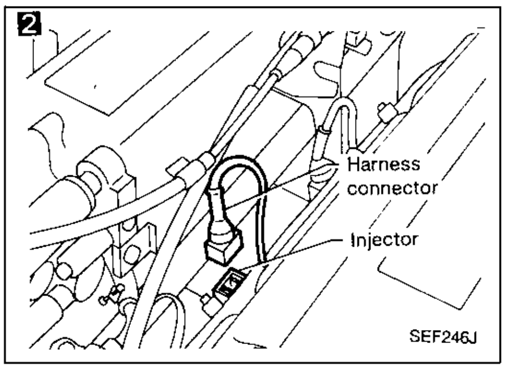
CHECK A.A.C. VALVE.
When the engine is cold, can you start the engine when pressing accelerator pedal fully?

- N.G. → Check A.A.C. valve and circuits. (See pages EF & EC-151.)
- O.K. ↓

2



SEF157I



SEF246J

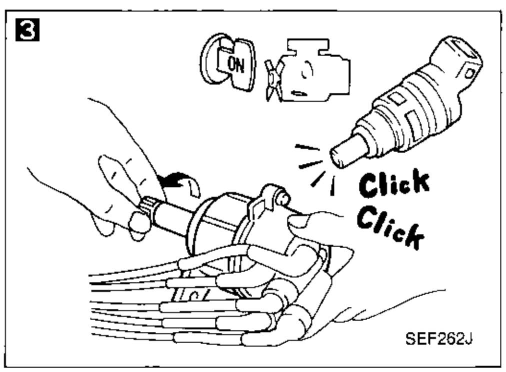
PERFORM POWER BALANCE TEST.
1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

OR

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

- N.G. → Go to **6**.
- O.K. ↓

3

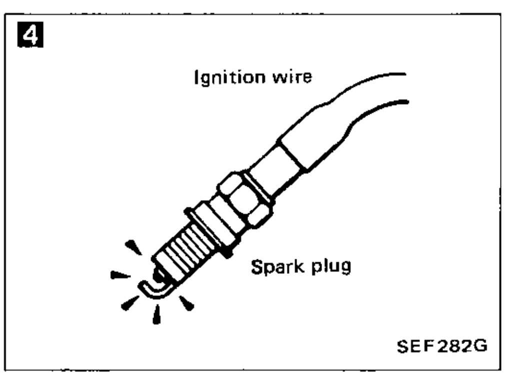


SEF262J

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

- N.G. → Check injector(s) and circuit(s).
- O.K. ↓

4



SEF282G

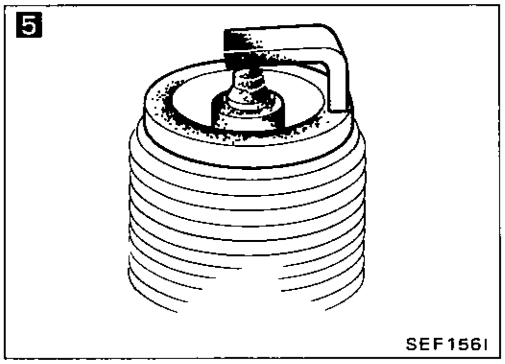
CHECK IGNITION SPARK.
1. Disconnect each spark plug cap.
2. Connect a known good spark plug to each spark plug cap.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

- N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-112.)
- O.K. ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 12 — Engine Stalls when the Engine is Cold (Cont'd)

5



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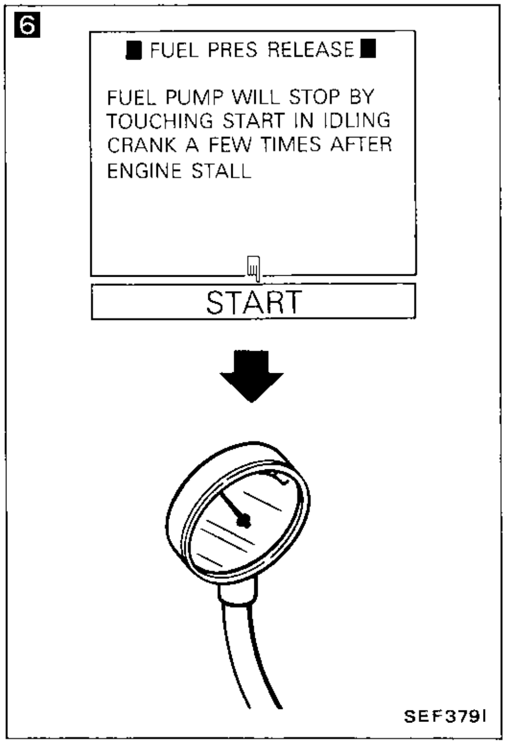


Ⓐ

5

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

- N.G. → Repair or replace spark plug(s).
- O.K. ↓

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. 226 kPa (2.3 kg/cm^2, 33 psi)
   The moment throttle valve is fully open:
   Approx. 294 kPa (3.0 kg/cm^2, 43 psi)

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-179.)
2. Install fuel pressure gauge and check fuel pressure.

- N.G. → Check fuel pressure regulator diaphragm.
- O.K. ↓

7

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.
- O.K. ↓

8

CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-97.

- N.G. → Repair or replace.
- O.K. ↓

9

TRY A KNOWN GOOD E.C.U.

↓

INSPECTION END

CAUTION:
When servicing fuel system after performing "Fuel Pressure Release" in "Work Support" mode, turn off ignition key with CONSULT set in "Work Support" mode.

Diagnostic Procedure 13 — Engine Stalls when Stepping on the Accelerator Momentarily

1

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Check idle speed.
M/T: 700 ± 50 rpm*1
750 ± 50 rpm*2
A/T: 700 ± 50 rpm*1 (in "N" position)
750 ± 50 rpm*2 (in "N" position)
***1 For U.S.A.**
***2 For Canada**
3) Perform "AAC VALVE SYSTEM" in "FUNCTION TEST" mode with CONSULT.

OR

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?

OR

When disconnecting throttle harness connector, does the engine speed drop?

Yes → **2**

No → Check A.A.C. valve and circuit. (See page EF & EC-143.)

CAUTION:
Be sure to set gears to "Neutral".

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?

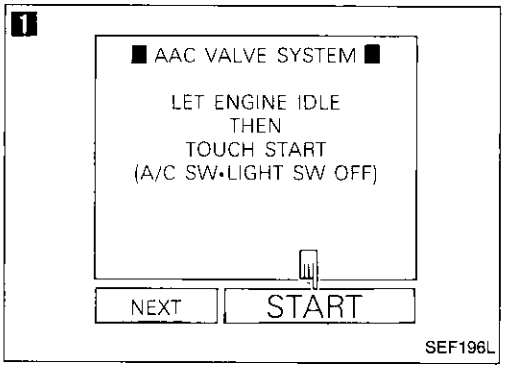
OR

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**.

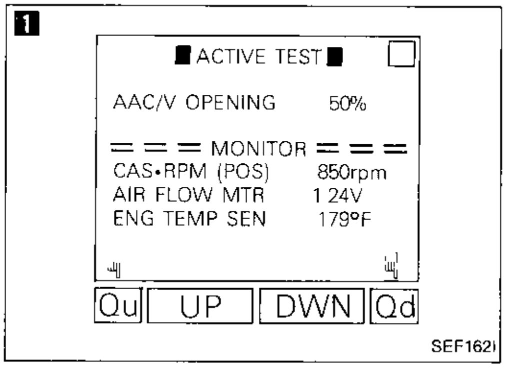
Yes → (Go to Ⓐ on next page.)

1



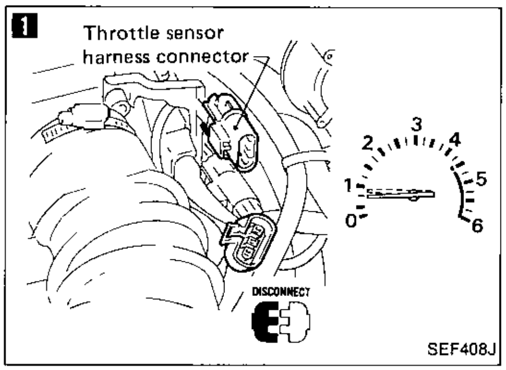
SEF196L

1



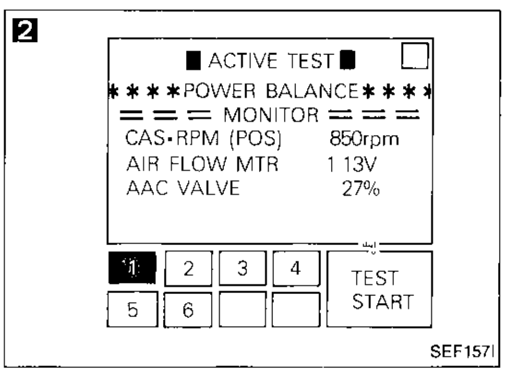
SEF162I

1



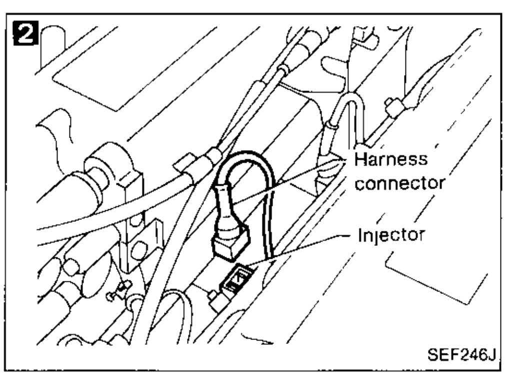
SEF408J

2



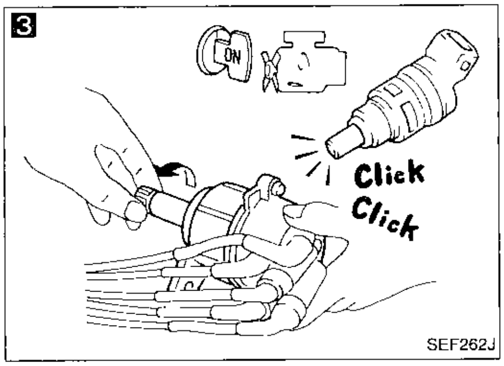
SEF157I

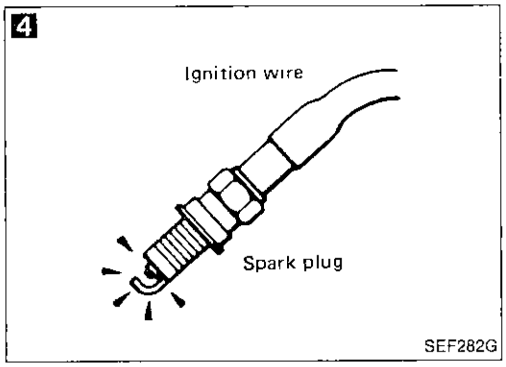
2

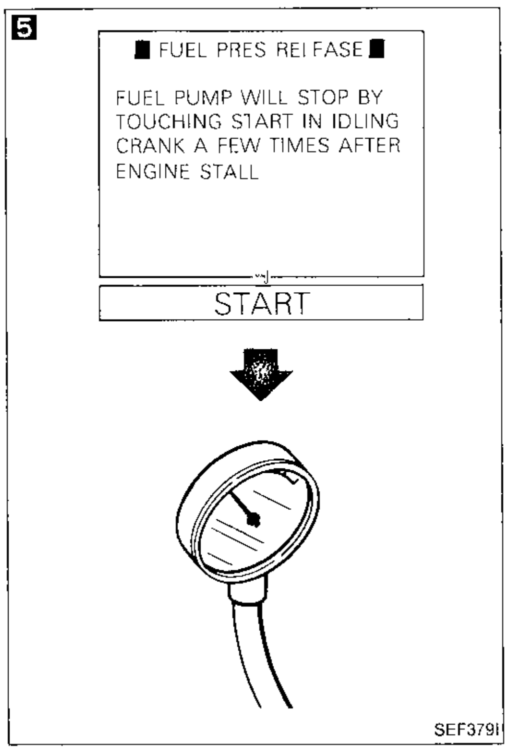


SEF246J

Diagnostic Procedure 13 — Engine Stalls when Stepping on the Accelerator Momentarily (Cont'd)







Ⓐ

3 **CHECK INJECTOR.**

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

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

Yes ↓

4 **CHECK IGNITION SPARK.**

1. Disconnect each spark plug cap.
2. Connect a known good spark plug to each spark plug cap.
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-111.)

O.K. ↓

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. 226 kPa (2.3 kg/cm², 33 psi)

The moment throttle valve is fully open:

Approx. 294 kPa (3.0 kg/cm², 43 psi)

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-179.)
2. Install fuel pressure gauge and check fuel pressure.

N.G. → Check fuel pressure regulator diaphragm.

O.K. ↓

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.

O.K. ↓

(Go to Ⓑ on next page.)

Diagnostic Procedure 13 — Engine Stalls when Stepping on the Accelerator Momentarily (Cont'd)

Ⓑ

7

CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-97.

N.G. → Repair or replace.

O.K. ↓

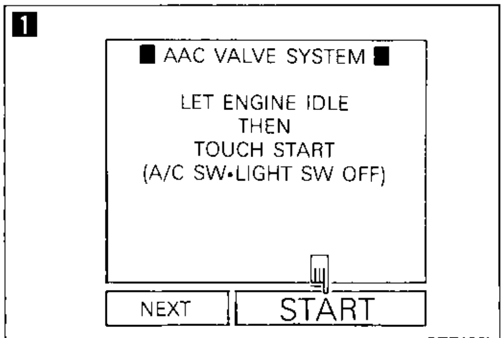
8

TRY A KNOWN GOOD E.C.U.

↓

INSPECTION END

CAUTION:
When servicing fuel system after performing "Fuel Pressure Release" in "Work Support" mode, turn off ignition key with CONSULT set in "Work Support" mode.



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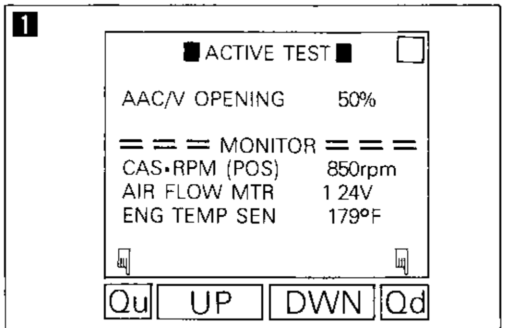
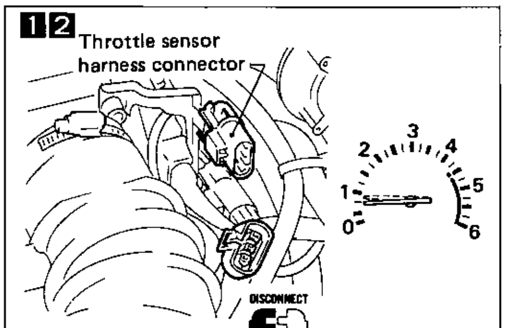
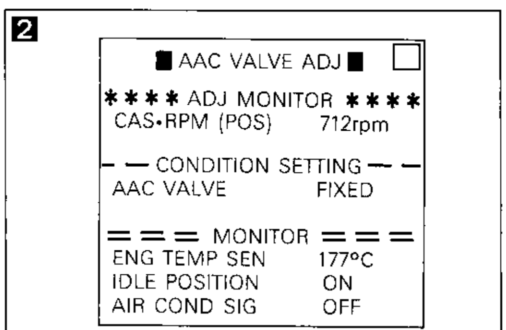


SEF162I



SEF408J



SEF145I

Diagnostic Procedure 14 — Engine Stalls after Decelerating

1

CHECK OVERALL FUNCTION.

1) Start engine and warm it up sufficiently.
2) Check idle speed.
   M/T: 700±50 rpm*1
   750±50 rpm*2
   A/T: 700±50 rpm*1 (in "N" position)
   750±50 rpm*2 (in "N" position)
   ***1 For U.S.A.**
   ***2 For Canada**
3) Perform "AAC VALVE SYSTEM" in "FUNCTION TEST" mode with CONSULT.

OR

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?

OR

When disconnecting throttle sensor harness connector, does the engine speed drop?

No → Check A.A.C. valve and circuit. (See page EF & EC-143.)

CAUTION:
Be sure to set gears to "Neutral".

Yes ↓

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?
   M/T: 650±50 rpm
   A/T: 650±50 rpm
   ("N" position)

OR

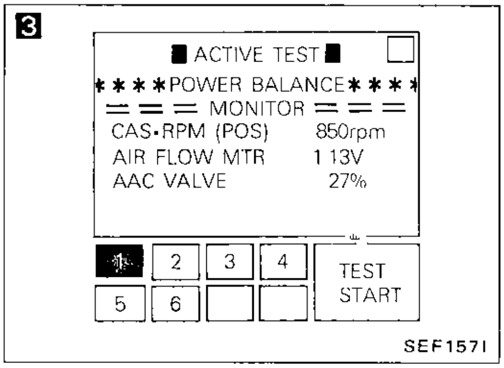
1. Disconnect throttle sensor harness connectors.
2. Can you set engine rpm as follows by turning idle adjusting screw?
   M/T: 650±50 rpm
   A/T: 650±50 rpm
   ("N" position)

No → Check for IAS clogging or throttle chamber clogging.

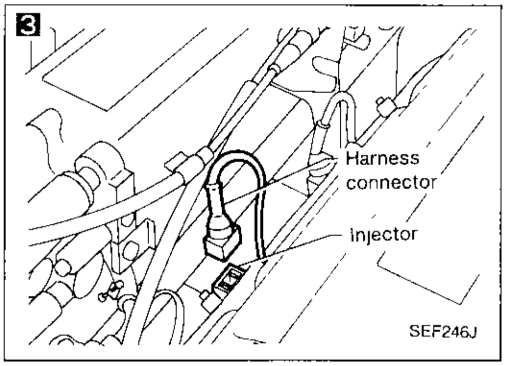
Yes ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)



SEF1571



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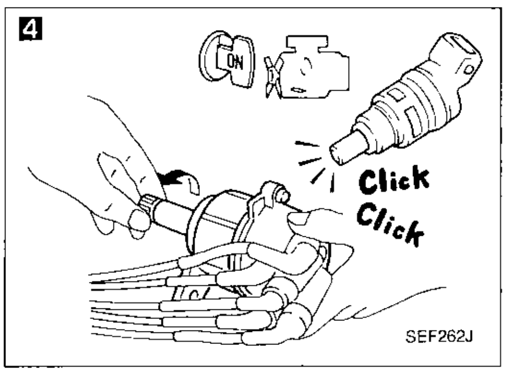
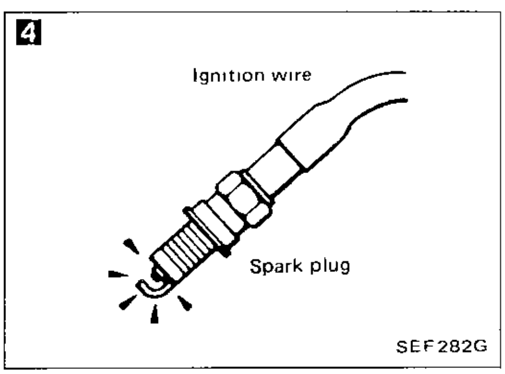


SEF262J



SEF282G

Ⓐ

3

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

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

No → Go to **6**.

Yes ↓

4

CHECK INJECTOR.

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

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

Yes ↓

5

CHECK IGNITION SPARK.

1. Disconnect each spark plug cap.
2. Connect a known good spark plug to each spark plug cap.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

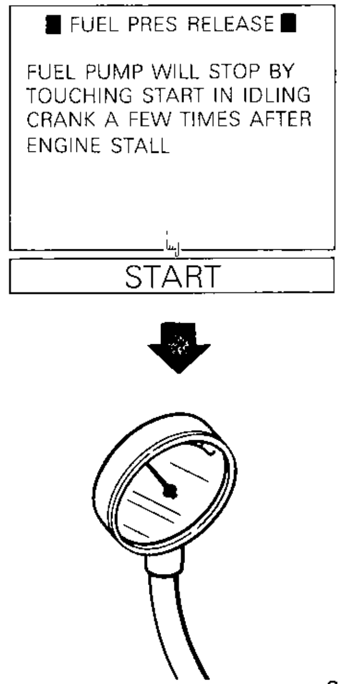
N.G. → Check ignition coil, power transistor unit and circuit. (See page EF & EC-112.)

O.K. ↓

(Go to Ⓑ on next page.)

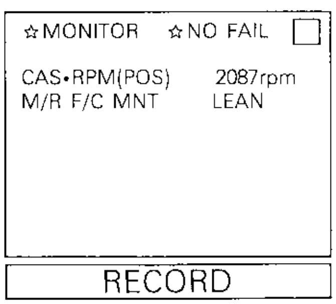
Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)

6



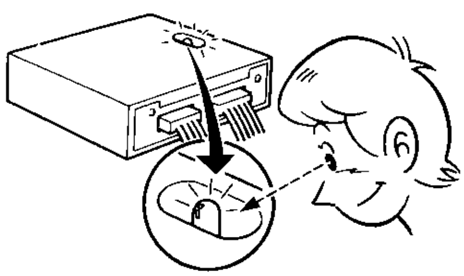
SEF379I

7



SEF265J

7



SEF152I

Ⓑ

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. 226 kPa (2.3 kg/cm², 33 psi)
The moment throttle valve is fully open:
Approx. 294 kPa (3.0 kg/cm², 43 psi)

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-179.)
2. Install fuel pressure gauge and check fuel pressure.

N.G. → Check fuel pressure regulator diaphragm.

O.K. ↓

7 **CHECK EXHAUST GAS SENSOR.**

1. See "M/R F/C MNT" 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-45.)
2. Maintaining engine at 2,000 rpm under no load, check that RED L.E.D. on the E.C.U. goes ON and OFF more than 5 times during 10 seconds.

N.G. → Replace exhaust gas sensor.

O.K. ↓

(Go to Ⓒ on next page.)

CAUTION:
When servicing fuel system after performing "Fuel Pressure Release" in "Work Support" mode, turn off ignition key with CONSULT set in "Work Support" mode.

Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)

Ⓒ

8 **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.
- O.K. ↓

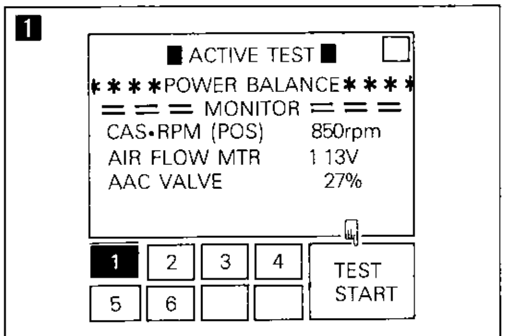
9 **CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.**
Refer to page EF & EC-97.

- N.G. → Repair or replace.
- O.K. ↓

10 **TRY A KNOWN GOOD E.C.U.**

↓

INSPECTION END



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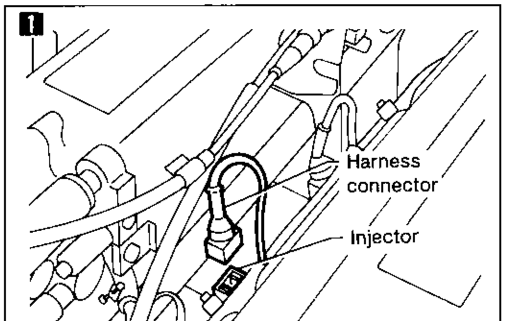

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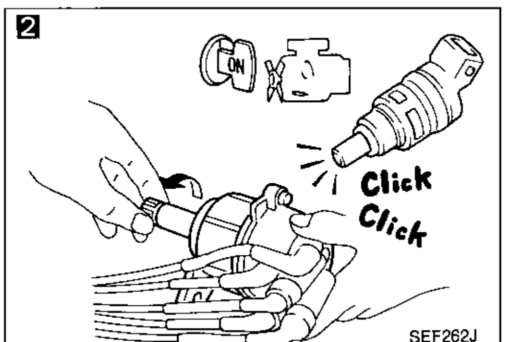

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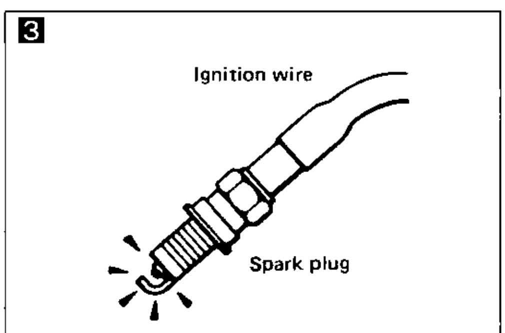


SEF282G

Diagnostic Procedure 15 — Engine Stalls when Accelerating or when Driving at Constant Speed

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?

OR

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 **4**.
- Yes ↓

2

CHECK INJECTOR.

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

- No → Check injector(s) and circuit(s).
- Yes ↓

3

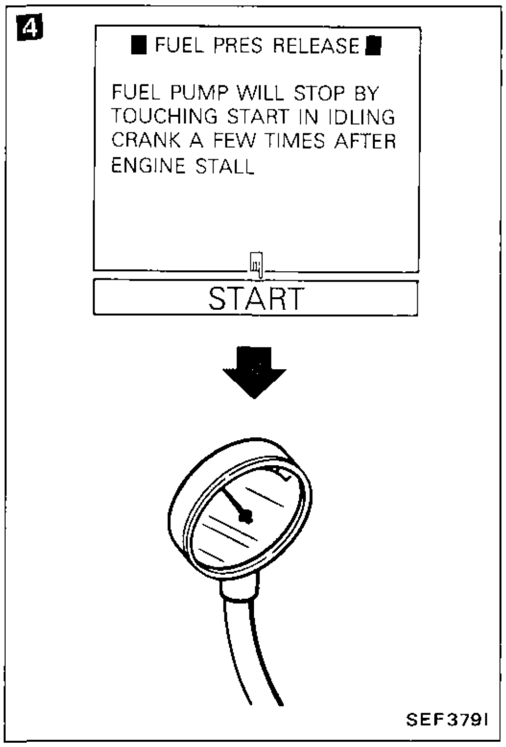
CHECK IGNITION SPARK.

1. Disconnect each spark plug cap.
2. Connect a known good spark plug to each spark plug cap.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

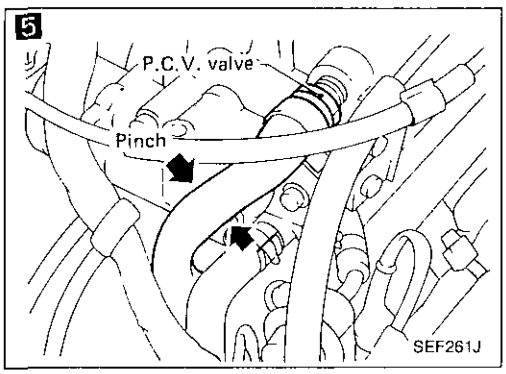
- N.G. → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-112.)
- O.K. ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 15 — Engine Stalls when Accelerating or when Driving at Constant Speed (Cont'd)



SEF379I



SEF261J

Ⓐ

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. 226 kPa (2.3 kg/cm^2, 33 psi)
   The moment throttle valve is fully open:
   Approx. 294 kPa (3.0 kg/cm^2, 43 psi)

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-169.)
2. Install fuel pressure gauge and check fuel pressure.

N.G. → Check fuel pump, circuit and fuel pressure regulator.

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 ↓

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.

O.K. ↓

7

CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EF & EC-100.

Yes → Repair or replace.

No ↓

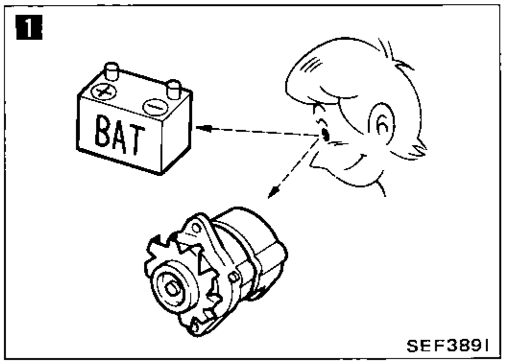
8

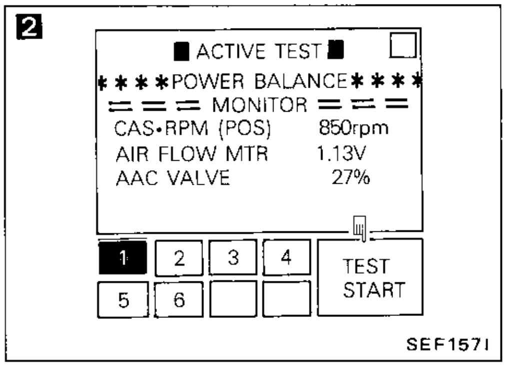
TRY A KNOWN GOOD E.C.U.

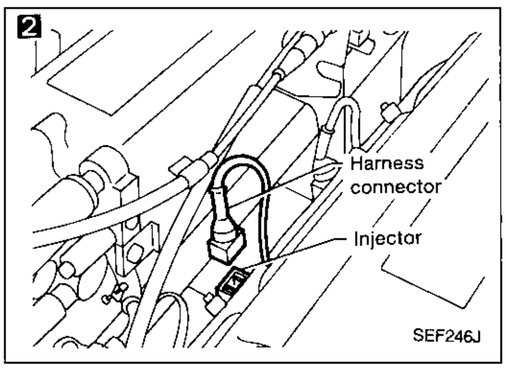
↓

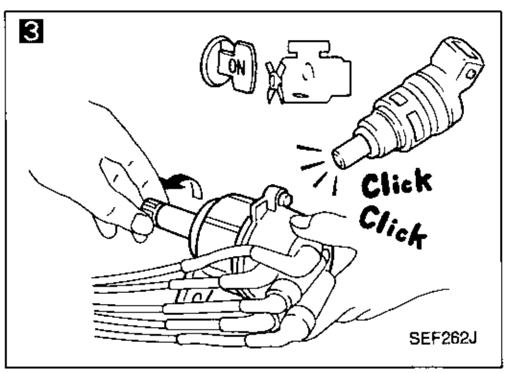
INSPECTION END

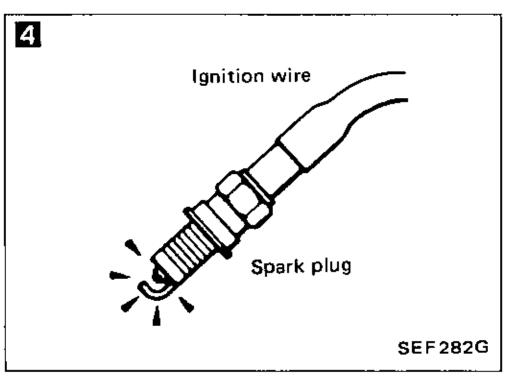
CAUTION:
When servicing fuel system after performing "Fuel Pressure Release" in "Work Support" mode, turn off ignition key with CONSULT set in "Work Support" mode.











Diagnostic Procedure 16 — Engine Stalls when the Electrical Load is Heavy

1

CHECK BATTERY AND ALTERNATOR.
Check battery and alternator condition.
(Refer to EL section.)

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?

OR

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. Disconnect each ignition wire.
3. Turn ignition switch ON. (Do not start engine.)
4. 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 each spark plug cap.
2. Connect a known good spark plug to each spark plug cap.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

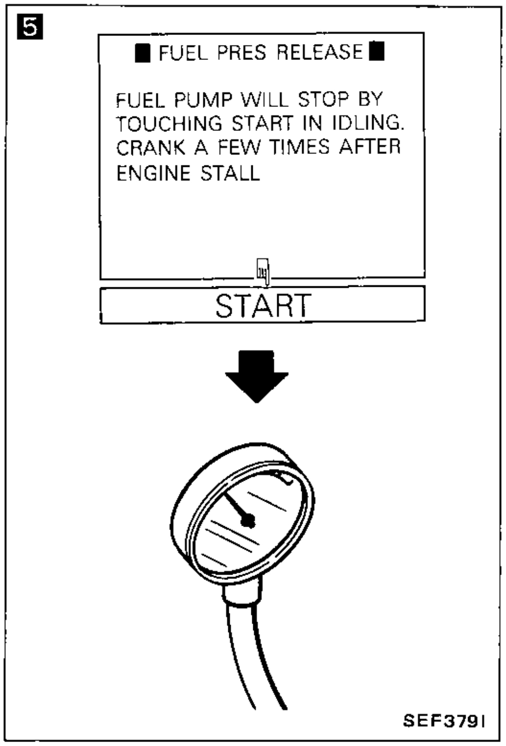
N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-112.)

O.K. ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 16 — Engine Stalls when the Electrical Load is Heavy (Cont'd)

5



SEF379I

Ⓐ

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. 226 kPa (2.3 kg/cm^2, 33 psi)

The moment throttle valve is fully open:

Approx. 294 kPa (3.0 kg/cm^2, 43 psi)

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-179.)
2. Install fuel pressure gauge and check fuel pressure.

N.G. → Check fuel pressure regulator diaphragm.

O.K. ↓

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.

O.K. ↓

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

Refer to page EF & EC-97.

N.G. → Repair or replace.

O.K. ↓

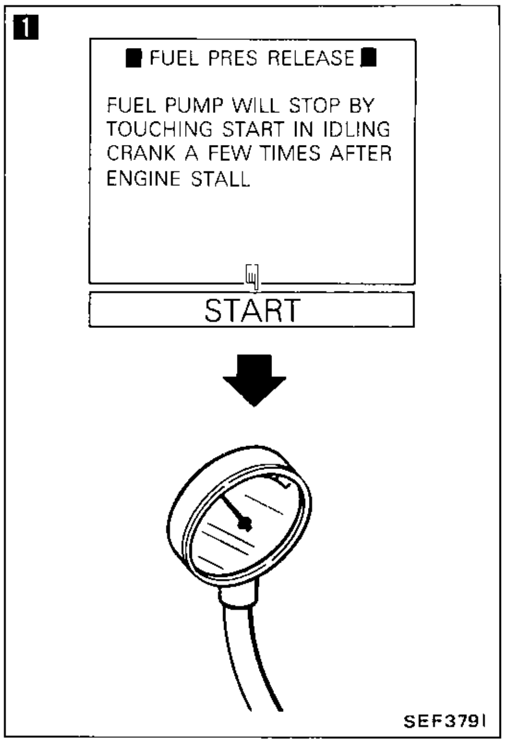
8 TRY A KNOWN GOOD E.C.U.

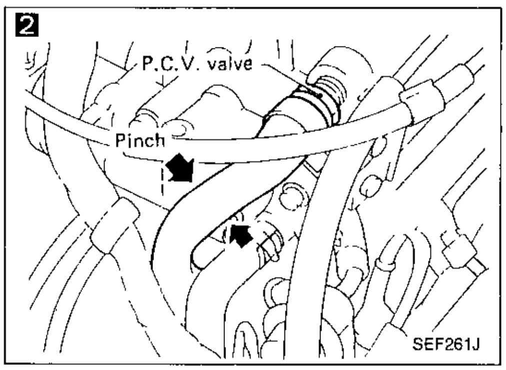
↓

INSPECTION END

CAUTION:

When servicing fuel system after performing "Fuel Pressure Release" in "Work Support" mode, turn off ignition key with CONSULT set in "Work Support" mode.





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. 226 kPa (2.3 kg/cm^2, 33 psi)
   The moment throttle valve is fully open:
   Approx. 294 kPa (3.0 kg/cm^2, 43 psi)

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-179.)
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?

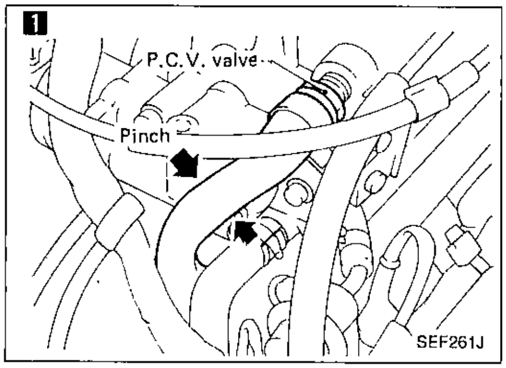
Yes → Discover air leak location and repair.

No ↓

INSPECTION END

CAUTION:
When servicing fuel system after performing "Fuel Pressure Release" in "Work Support" mode, turn off ignition key with CONSULT set in "Work Support" mode.

Diagnostic Procedure 18 — Detonation



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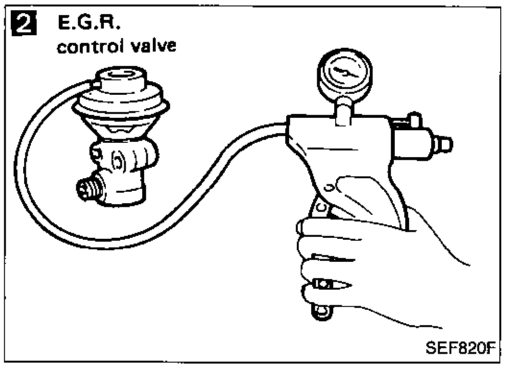
1

CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine rpm rise?

- Yes → Discover air leak location and repair.
- No → go to 2.

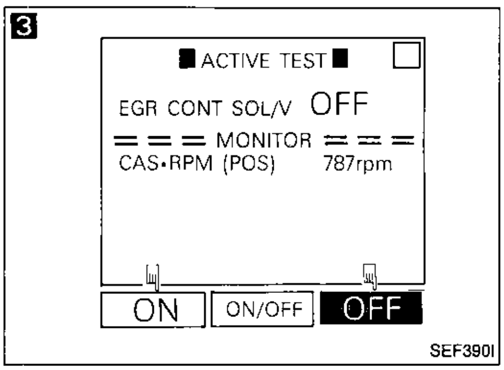


SEF820F

2

CHECK E.G.R. OPERATION.
1. Apply vacuum directly to the E.G.R. valve using a handy vacuum pump.
2. Check to see that the engine runs rough or dies.

- No → Check E.G.R. valve for sticking.
- Yes → go to 3.



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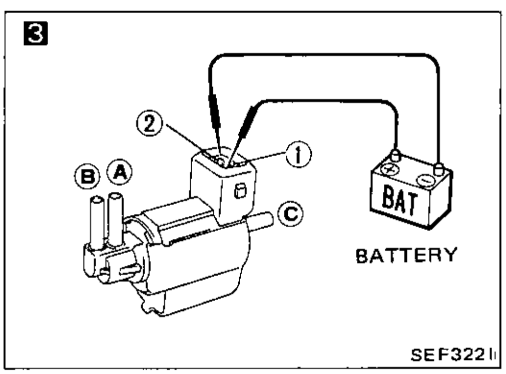


SEF322I

3

CHECK E.G.R. CONTROL SOLENOID VALVE.
1. Select "E.G.R. CONT SOL VALVE" in "ACTIVE TEST" mode.
2. Turn E.G.R. control solenoid valve ON and OFF.
3. Check operating sound.

OR

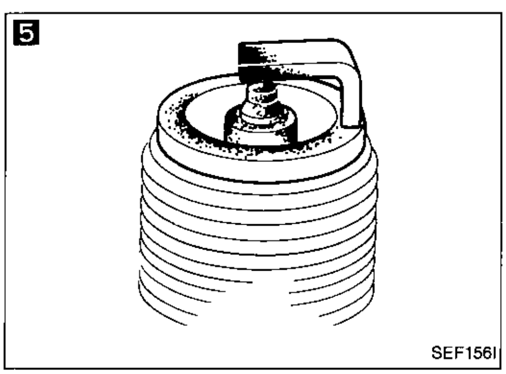
1. Disconnect E.G.R. control solenoid valve harness connector.
2. Supply E.G.R. control solenoid valve terminals with battery current and check operating sound.

- N.G. → Check solenoid valve and circuit.
- O.K. → go to 4.

4

CHECK VACUUM HOSES.
Check the following vacuum hoses for clogging, cracks and poor connection.
a) Vacuum hose between E.G.R. control valve and E.G.R. control solenoid valve.
b) Vacuum hose between E.G.R. control solenoid valve and throttle chamber port.
c) Vacuum hose between E.G.R. control solenoid valve and air duct.

- N.G. → Repair or replace.
- O.K. → go to 5.



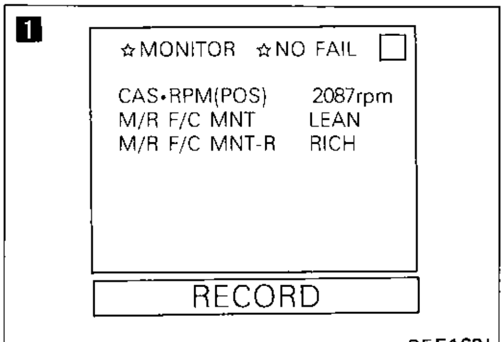
SEF156I

5

CHECK FOR OIL LEAK TO COMBUSTION CHAMBER.
Remove spark plugs and check for fouling with oil.

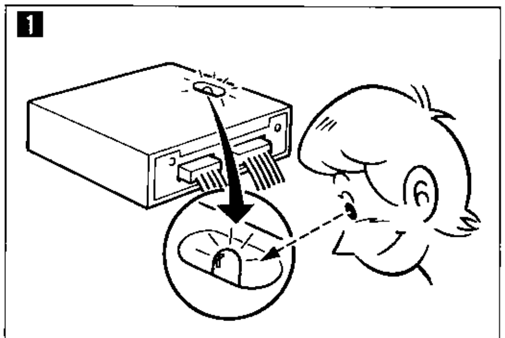
- Yes → Check pistons, piston rings, valves, valve seats, valve oil seal, engine oil level, etc.
- No → INSPECTION END

1



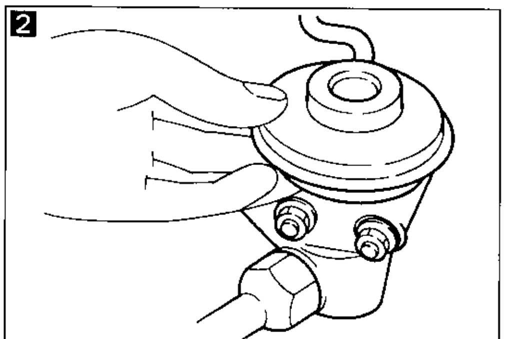
SEF160I

1



SEF152I

2



SEC547A

Diagnostic Procedure 19 — Surge

1

CHECK EXHAUST GAS SENSOR.

1. See "M/R F/C MNT" 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-45.)
2. Maintaining engine at 2,000 rpm under no load, check that RED L.E.D. on the E.C.U. goes ON and OFF more than 5 times during 10 seconds.

N.G. → Replace exhaust gas sensor.

O.K. ↓

2

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

N.G. → Repair or replace.

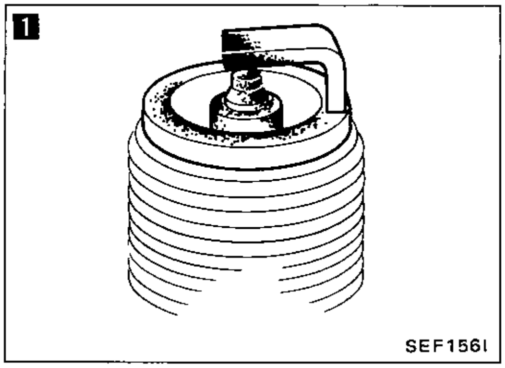
O.K. ↓

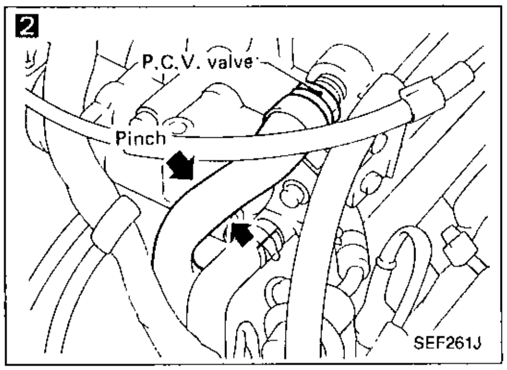
3

TRY A KNOWN GOOD E.C.U.

O.K. ↓

INSPECTION END





Diagnostic Procedure 20 — Backfire through the Intake

1

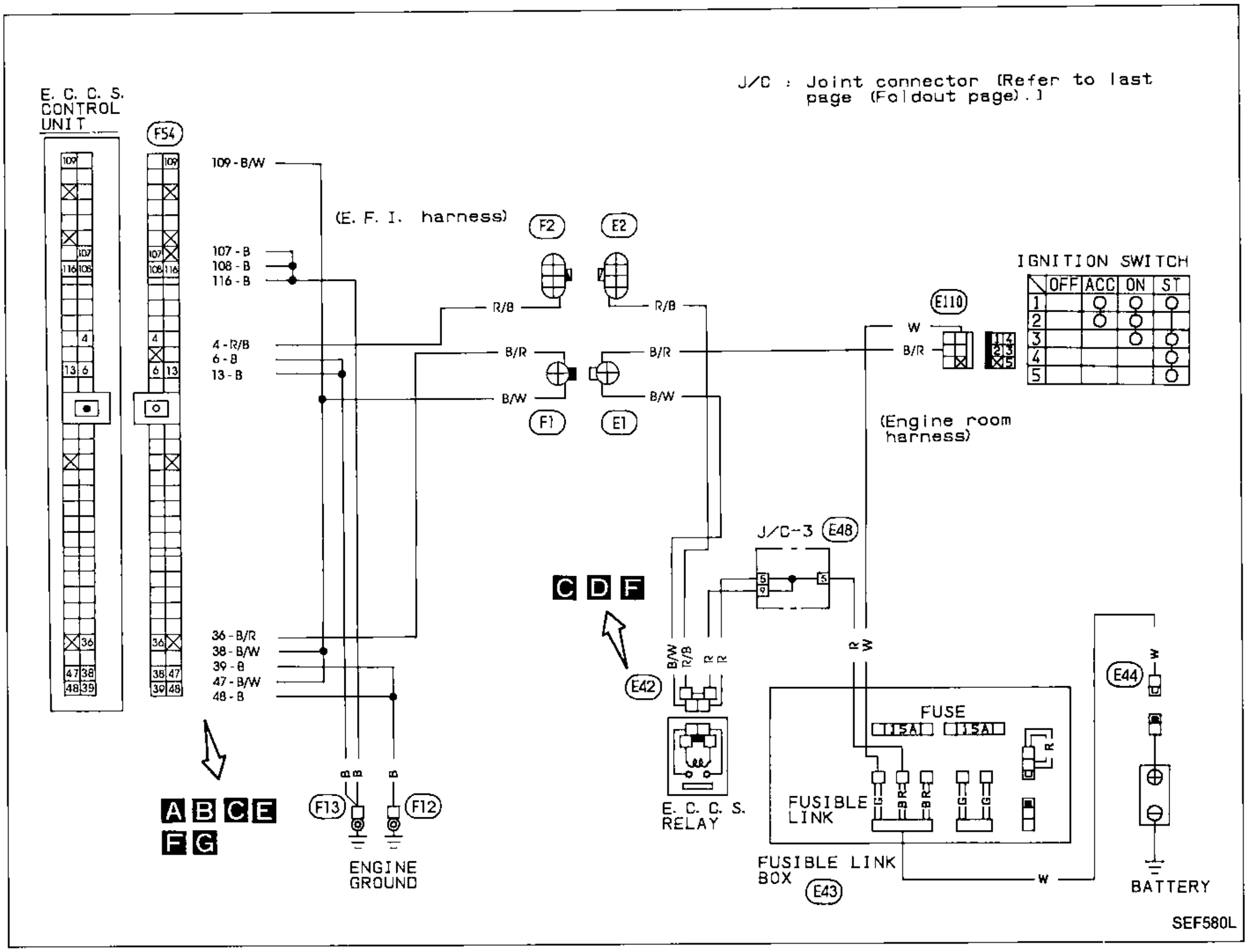
Step	Check	Result	Action
1	**CHECK SPARK PLUGS.** Remove the spark plugs and check for fouling, etc.	N.G.	Repair or replace spark plug(s).
		O.K.	Go to 2.
2	**CHECK INTAKE AIR LEAK.** When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?	Yes	Discover air leak location and repair.
		No	Go to 3.
3	**CHECK FOR INTAKE VALVE DEPOSITS.** If there are deposits on intake valves, remove them.		INSPECTION END

Diagnostic Procedure 21 — Backfire through the Exhaust

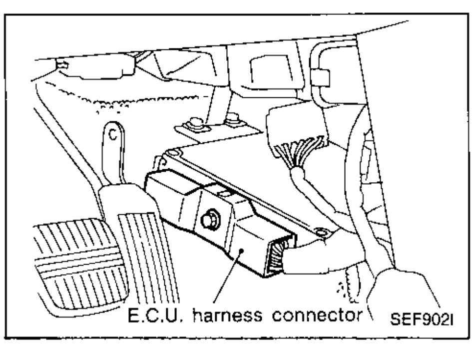
Step	Check	Result	Action
1	**CHECK ENGINE TEMPERATURE SENSOR.** Check engine temperature sensor and its circuit. (See page EF & EC-108.)	N.G.	Replace or repair.
		O.K.	INSPECTION END

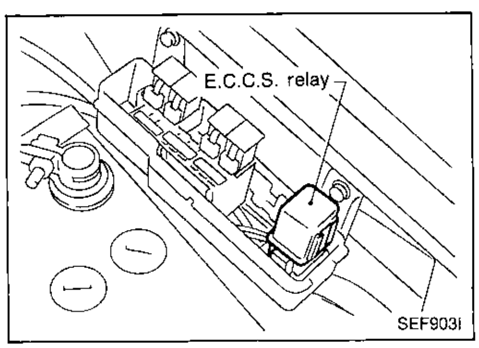
Diagnostic Procedure 22

MAIN POWER SUPPLY AND GROUND CIRCUIT (Not self-diagnostic item)

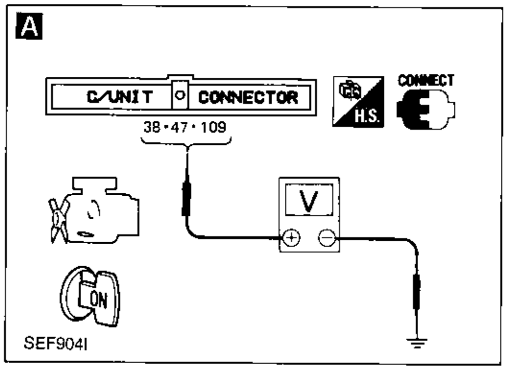


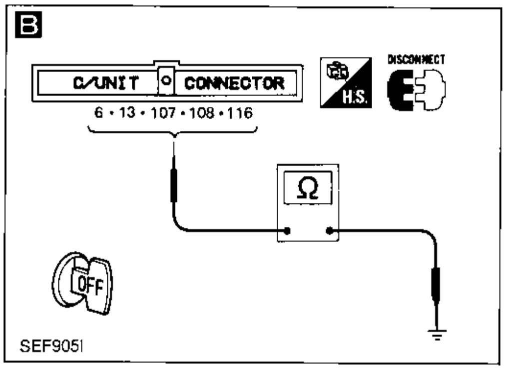
Harness layout

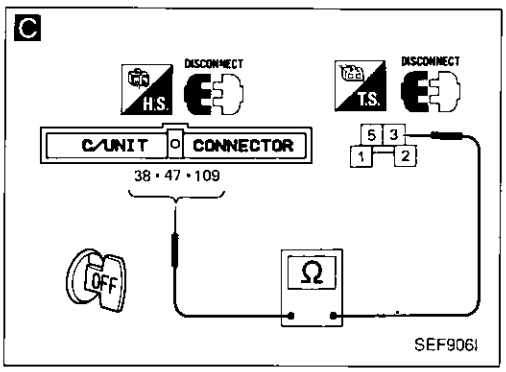


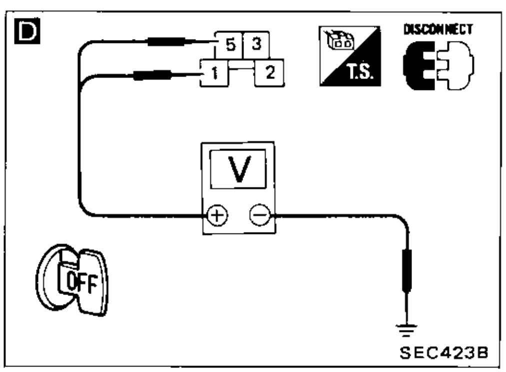


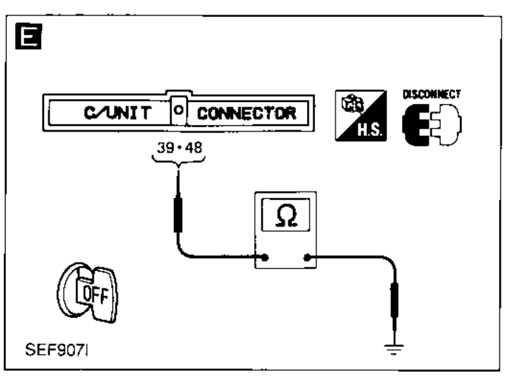
Diagnostic Procedure 22 (Cont'd)











INSPECTION START

A

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between E.C.U. terminals 38, 47, 109 and ground.
Voltage: Battery voltage

O.K. → **B**

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminals 6, 13, 107, 108, 116 and engine ground.
Continuity should exist.
If N.G., repair harness or connectors.

O.K. ↓

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

N.G. ↓

C

CHECK HARNESS CONTINUITY BETWEEN E.C.C.S. RELAY AND E.C.U.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Disconnect E.C.C.S. relay.
4) Check harness continuity between E.C.U. terminals 38, 47, 109 and terminal 3.
Continuity should exist.

N.G. → Check the following:
- Harness connectors (F1), (E1)
- Harness continuity between E.C.U. and E.C.C.S. relay

If N.G., repair harness or connectors.

O.K. ↓

D

CHECK VOLTAGE BETWEEN E.C.C.S. RELAY AND GROUND.
1) Check voltage between terminals 1, 5 and ground.
Voltage: Battery voltage

N.G. → Check the following:
- Joint connector-3 (E48)
- "BR" fusible link
- Harness continuity between E.C.C.S. relay and battery

If N.G., repair harness or connectors.

O.K. ↓

E

CHECK GROUND CIRCUIT.
1) Check harness continuity between E.C.U. terminals 39, 48 and engine ground.
Continuity should exist.

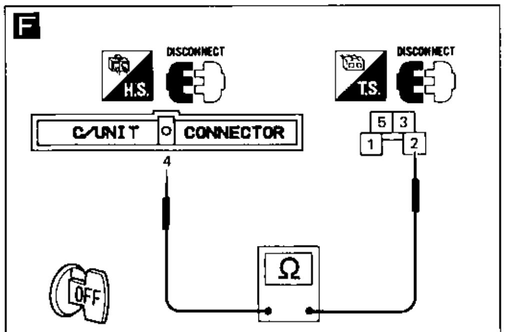
N.G. → Repair harness or connectors.

O.K. ↓

A

Diagnostic Procedure 22 (Cont'd)

F



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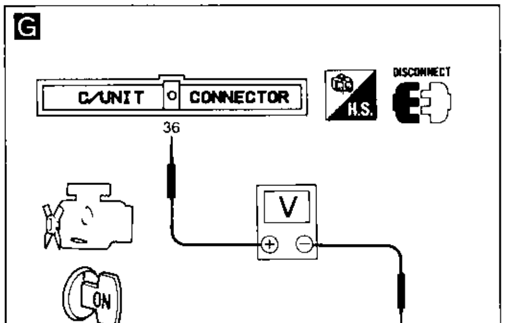
G



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Ⓐ

F CHECK OUTPUT SIGNAL CIRCUIT.
1) Check harness continuity between E.C.U. terminal ④ and terminal ②.
Continuity should exist.

N.G. → Check the following:
- Harness connectors (F2), (E2)
- Harness continuity between E.C.U. and E.C.C.S. relay

If N.G., repair harness or connectors.

O.K. ↓

G CHECK INPUT SIGNAL CIRCUIT.
1) Turn ignition switch "ON".
2) Check voltage between E.C.U. terminal ㊱ and ground.
Voltage: Battery voltage

N.G. → Check the following:
- Harness connectors (F1), (E1)
- Harness continuity between ignition switch and E.C.U.

If N.G., repair harness or connectors.

O.K. ↓

CHECK COMPONENT
(E.C.C.S. relay).
Refer to "Electrical Components Inspection". (See page EF & EC-173.)

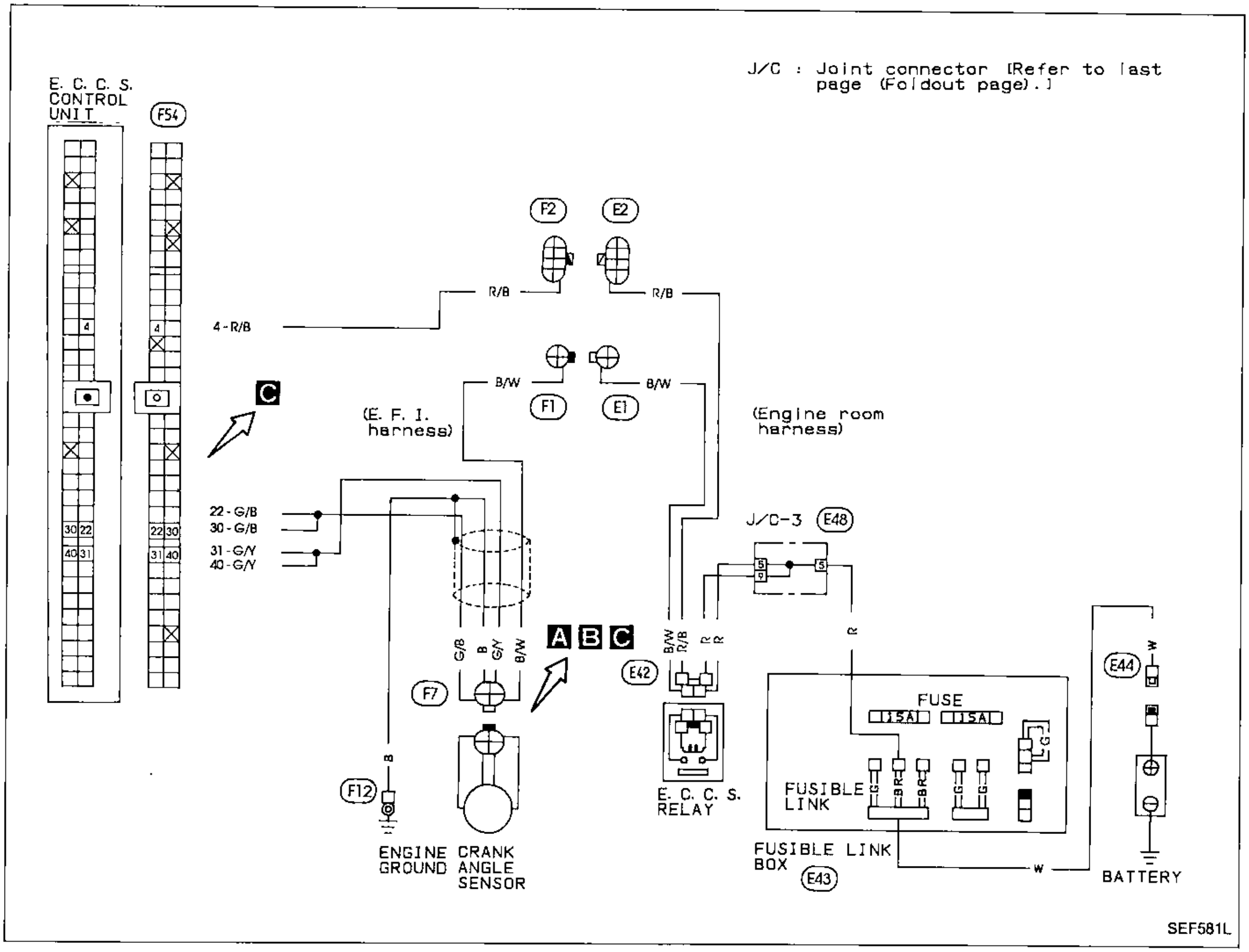
N.G. → Replace E.C.C.S. relay.

O.K. ↓

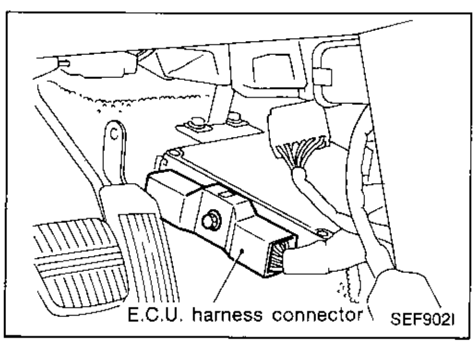
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

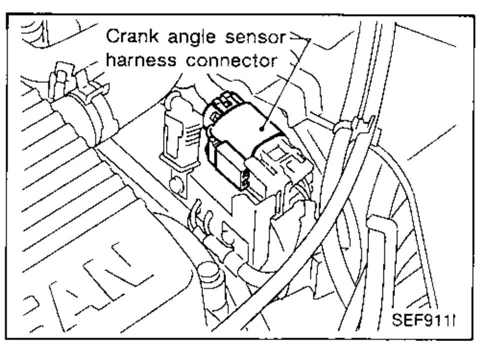
Diagnostic Procedure 23

CRANK ANGLE SENSOR (Code No. 11)

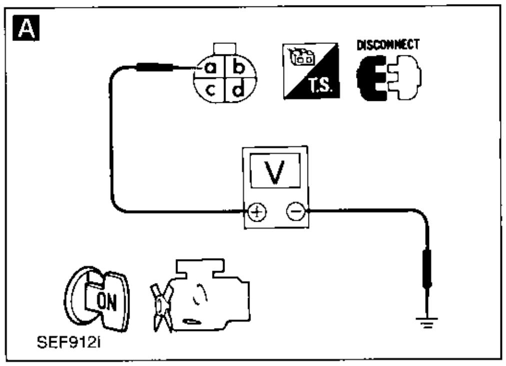


Harness layout





Diagnostic Procedure 23 (Cont'd)



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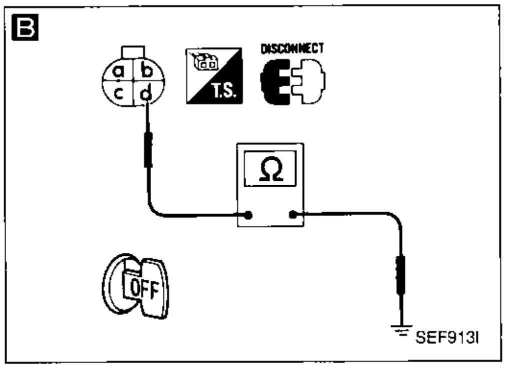

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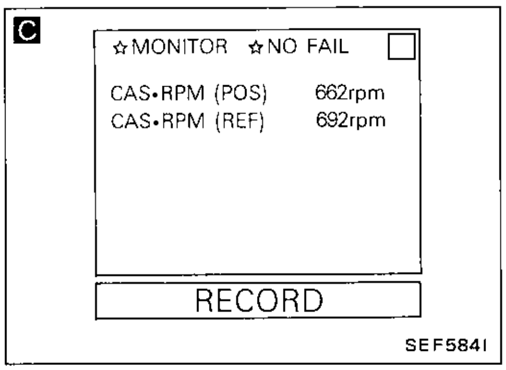

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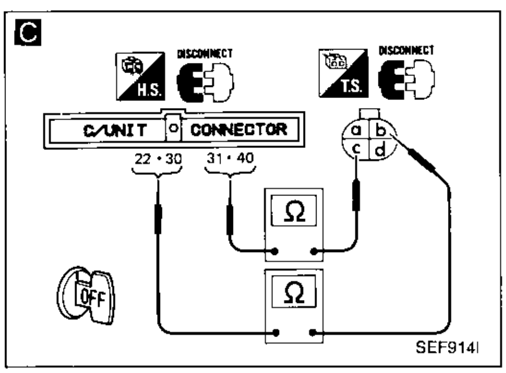


SEF914I

INSPECTION START

↓

A

CHECK POWER SUPPLY.
1) Disconnect crank angle sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. → Check the following:
- Harness connectors (F1), (E1)
- Harness continuity between crank angle sensor and E.C.C.S. relay

If N.G., repair harness or connectors.

↓ O.K.

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓓ and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

↓ O.K.

C

CHECK INPUT SIGNAL CIRCUIT.
1) Reconnect crank angle sensor harness connector.
2) Start engine.
3) Read crank angle sensor signals in "DATA MONITOR" mode with CONSULT.

rpm: M/T 700 ± 50*1
750 ± 50*2
A/T 700 ± 50*1
750 ± 50*2
***1: U.S.A. *2: CANADA**

OR

1) Disconnect E.C.U. harness connector.
2) Check harness continuity between terminal ⓒ and E.C.U. terminals ㉛, ㊵ (1° signal), terminal ⓑ and E.C.U. terminals ㉒, ㉚ (180° signal).
Continuity should exist.

N.G. → Repair harness or connectors.

↓ O.K.

Ⓐ

Diagnostic Procedure 23 (Cont'd)

Ⓐ

↓

CHECK COMPONENT
(Crank angle sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-173.)

N.G. → Replace crank angle sensor.

O.K. ↓

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

Perform FINAL CHECK by the following procedure after repair is completed.

FINAL CHECK

↓

Erase the self-diagnosis memory.

↓

Perform driving test.

↓

Perform self-diagnosis again.

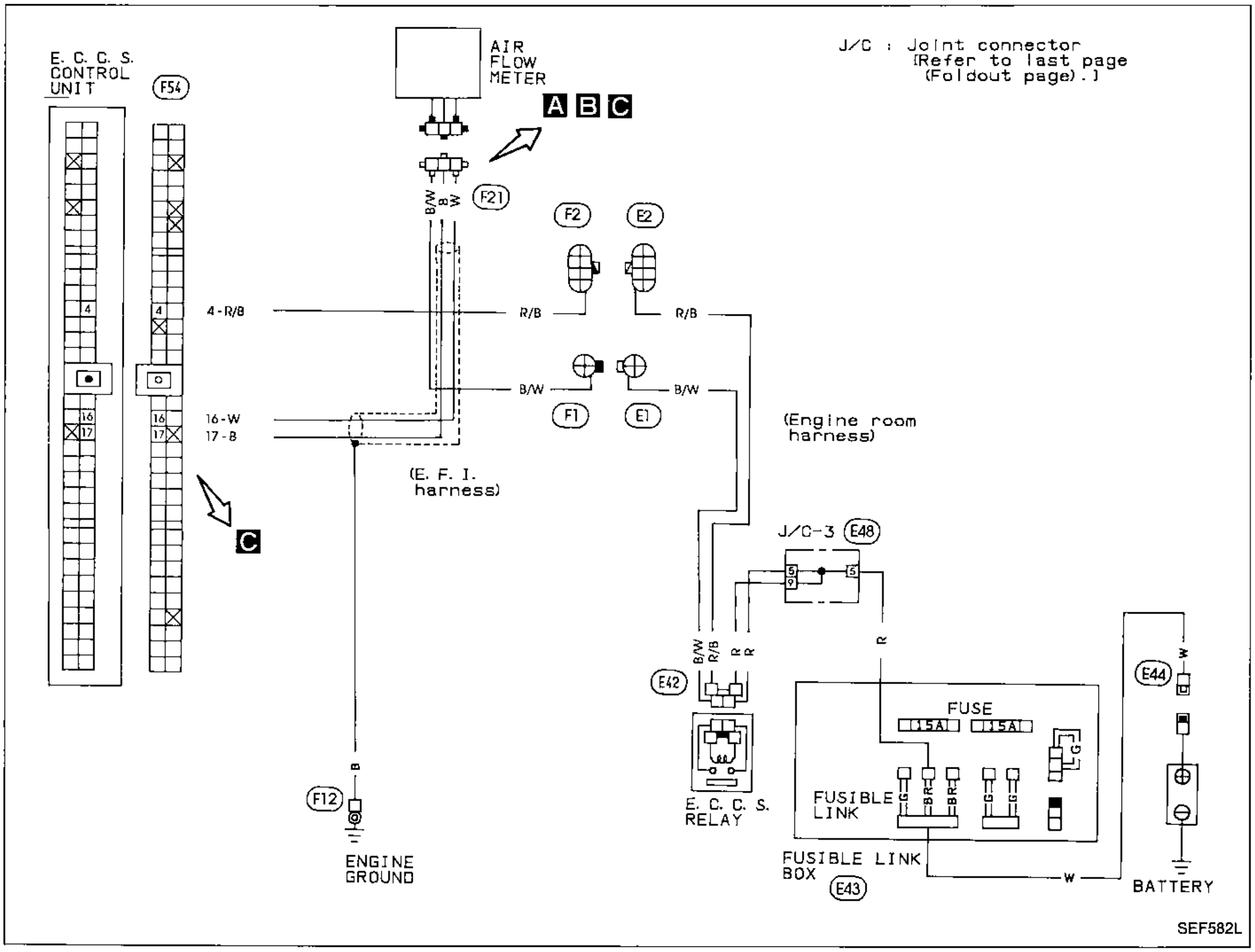
N.G. → Recheck E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

O.K. ↓

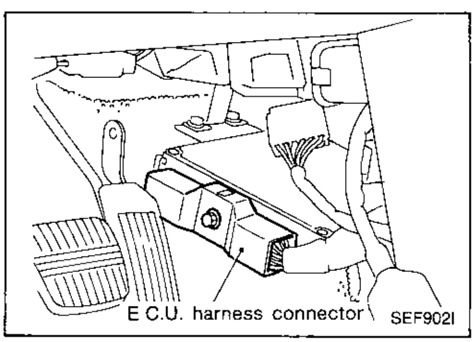
INSPECTION END

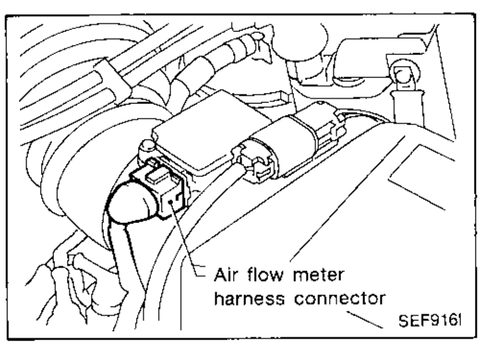
Diagnostic Procedure 24

AIR FLOW METER (Code No. 12) (CHECK ENGINE LIGHT ITEM)

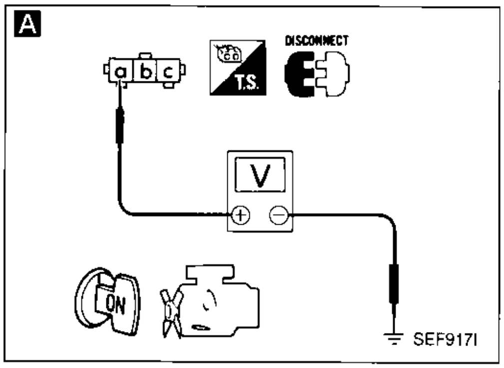


Harness layout





Diagnostic Procedure 24 (Cont'd)



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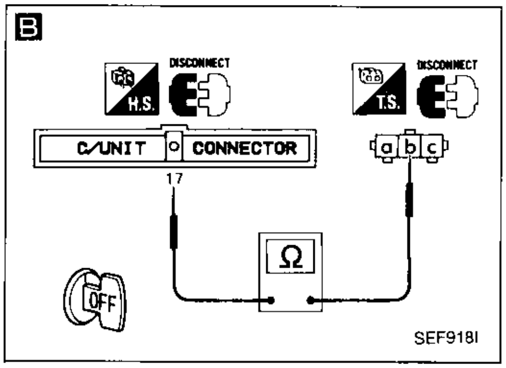

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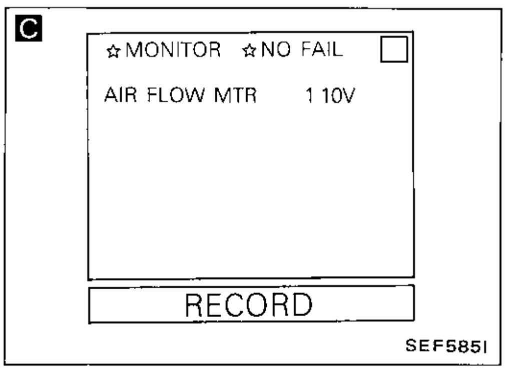
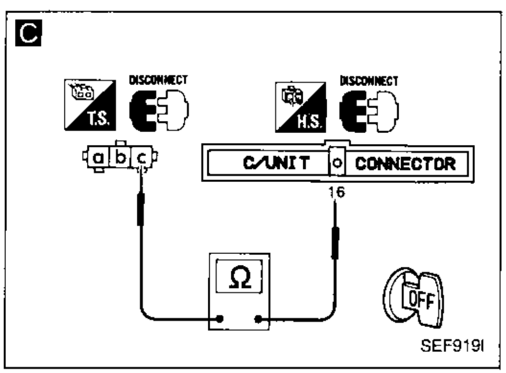


SEF585I



SEF919I

INSPECTION START

↓

A CHECK POWER SUPPLY.
1) Disconnect air flow meter harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. → Check the following:
- Harness connectors (F1), (E1)
- Harness continuity between E.C.C.S. relay and air flow meter

If N.G., repair harness or connectors.

O.K. ↓

B CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between terminal ⓑ and E.C.U. terminal ⑰.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

C CHECK INPUT SIGNAL CIRCUIT.
1) Reconnect air flow meter harness connector and E.C.U. harness connecor.
2) Start engine and warm it up sufficiently.
3) Read air flow meter signal in "DATA" MONITOR mode with CONSULT.
Voltage: 0.8 - 1.5V

OR

1) Check harness continuity between terminal ⓒ and E.C.U. terminal ⑯.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

CHECK COMPONENT
(Air flow meter).
Refer to "Electrical Components Inspection".
(See page EF & EC-173.)

N.G. → Replace air flow meter.

O.K. ↓

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

Diagnostic Procedure 24 (Cont'd)

Perform FINAL CHECK by the following procedure after repair is completed.

FINAL CHECK

↓

Erase the self-diagnosis memory.

↓

Perform driving test.

↓

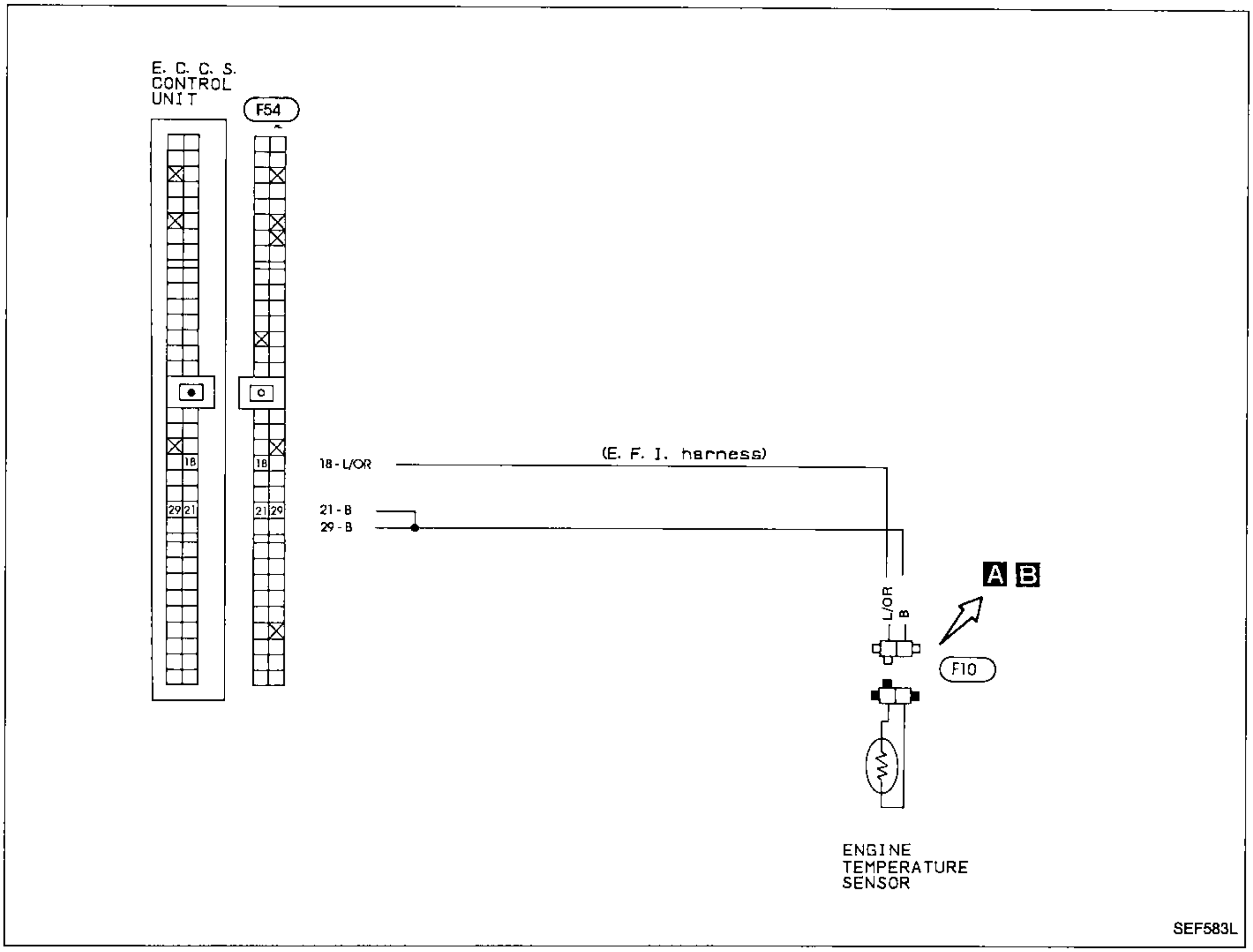
Perform self-diagnosis again. —N.G.→ Recheck E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

↓ O.K.

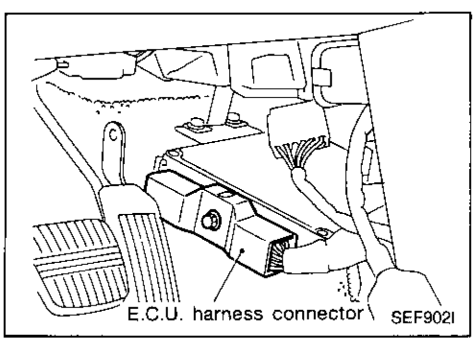
INSPECTION END

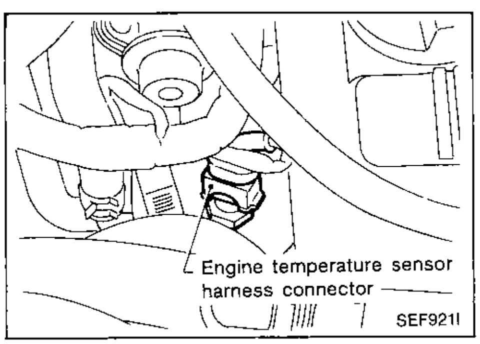
Diagnostic Procedure 25

ENGINE TEMPERATURE SENSOR (Code No. 13) CHECK (CHECK ENGINE LIGHT ITEM)

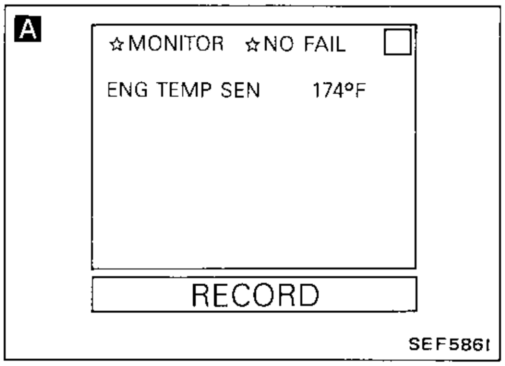


Harness layout

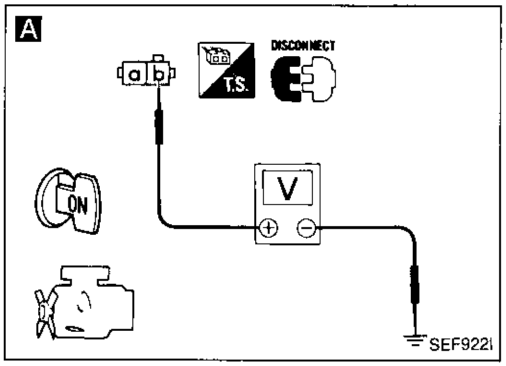




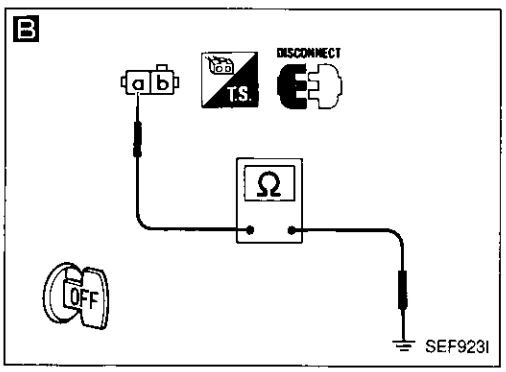
Diagnostic Procedure 25 (Cont'd)



SEF586I



SEF922I



SEF923I

INSPECTION START

↓

A

CHECK POWER SUPPLY.
1) Start engine.
2) Read engine temperature sensor signal in "DATA MONITOR" mode with CONSULT.
Engine temperature should gradually rise and reach more than 70°C (158°F) after engine warm-up.

— OR —

1) Disconnect engine temperature sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓑ and ground.
Voltage: Approximately 5V

N.G. → Repair harness or connectors.

O.K. ↓

Turn ignition switch "OFF".

↓

Disconnect engine temperature sensor harness connector.

↓

B

CHECK GROUND CIRCUIT.
1) Check harness continuity between terminal ⓐ and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

CHECK COMPONENT
(Engine temperature sensor).
Refer to "Electrical Components Inspection". (See page EF & EC-173.)

N.G. → Replace engine temperature sensor.

O.K. ↓

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

Diagnostic Procedure 25 (Cont'd)

Perform FINAL CHECK by the following procedure after repair is completed.

FINAL CHECK

↓

Erase the self-diagnosis memory.

↓

Perform driving test.

↓

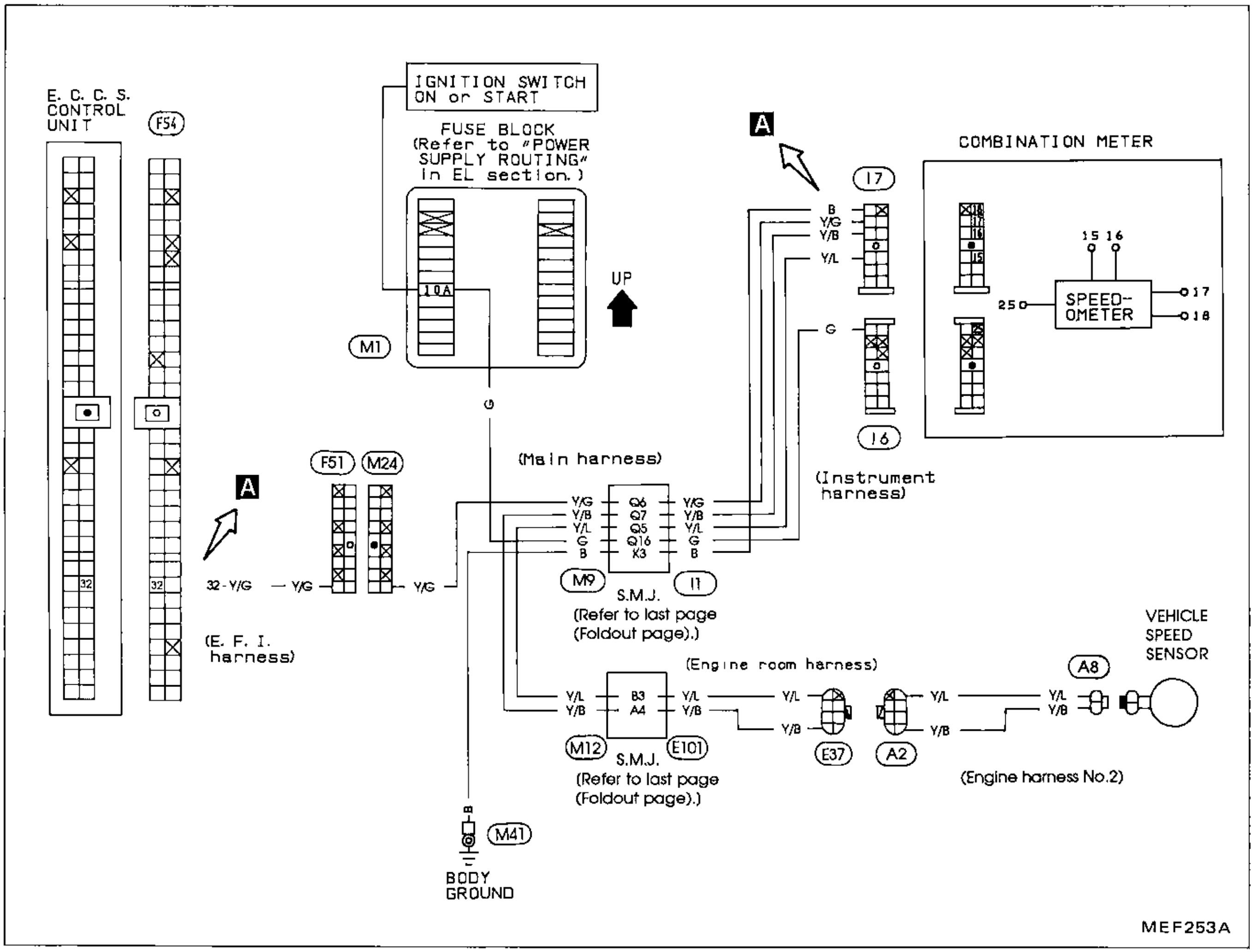
Perform self-diagnosis again. —N.G.→ Recheck E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

↓ O.K.

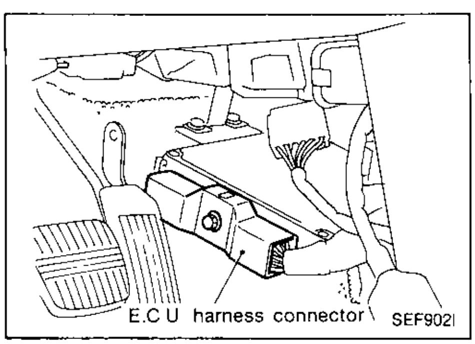
INSPECTION END

Diagnostic Procedure 26

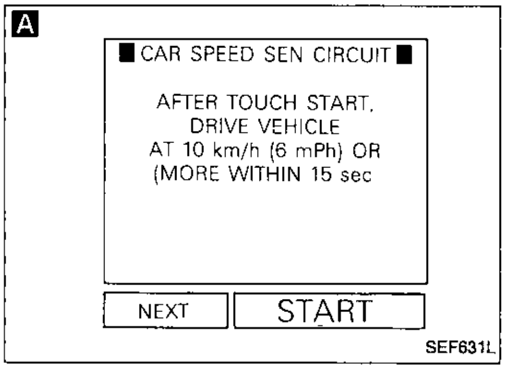
VEHICLE SPEED SENSOR (Code No. 14) (CHECK ENGINE LIGHT ITEM)



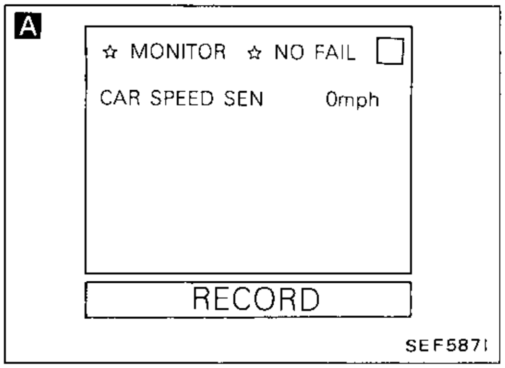
Harness layout



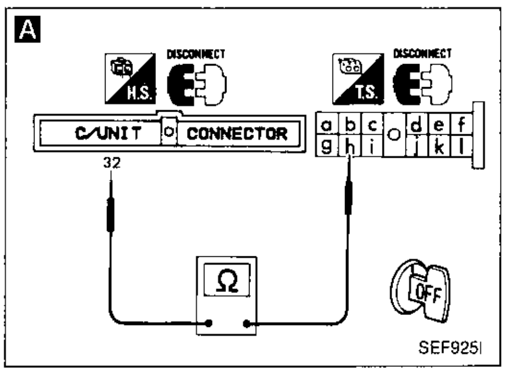
Diagnostic Procedure 26 (Cont'd)



SEF631L



SEF587I



SEF925I

INSPECTION START

↓

A CHECK SPEEDOMETER FUNCTION.
Make sure that speedometer functions properly.

- N.G. → Check vehicle speed sensor and its circuit. (Refer to EL section.)

↓ O.K.

A CHECK INPUT SIGNAL CIRCUIT.

1) Perform "CAR SPEED SEN CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

1) Read vehicle speed sensor signal in "DATA MONITOR" mode with CONSULT.

CONSULT value should be the same as the speedometer indication

OR

1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector and combination meter harness connector I7.
3) Check harness continuity between E.C.U. terminal 32 and terminal h.

Continuity should exist.

- N.G. → Check the following:
  - Harness connectors F51, M24
  - S.M.J. connectors M9, J1
  - Harness continuity between E.C.U. and combination meter.

  If N.G., repair harness or connectors.

↓ O.K.

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

Diagnostic Procedure 26 (Cont'd)

Perform FINAL CHECK by the following procedure after repair is completed.

FINAL CHECK

Erase the self-diagnosis memory.

Perform driving test.

Perform self-diagnosis again.

N.G.

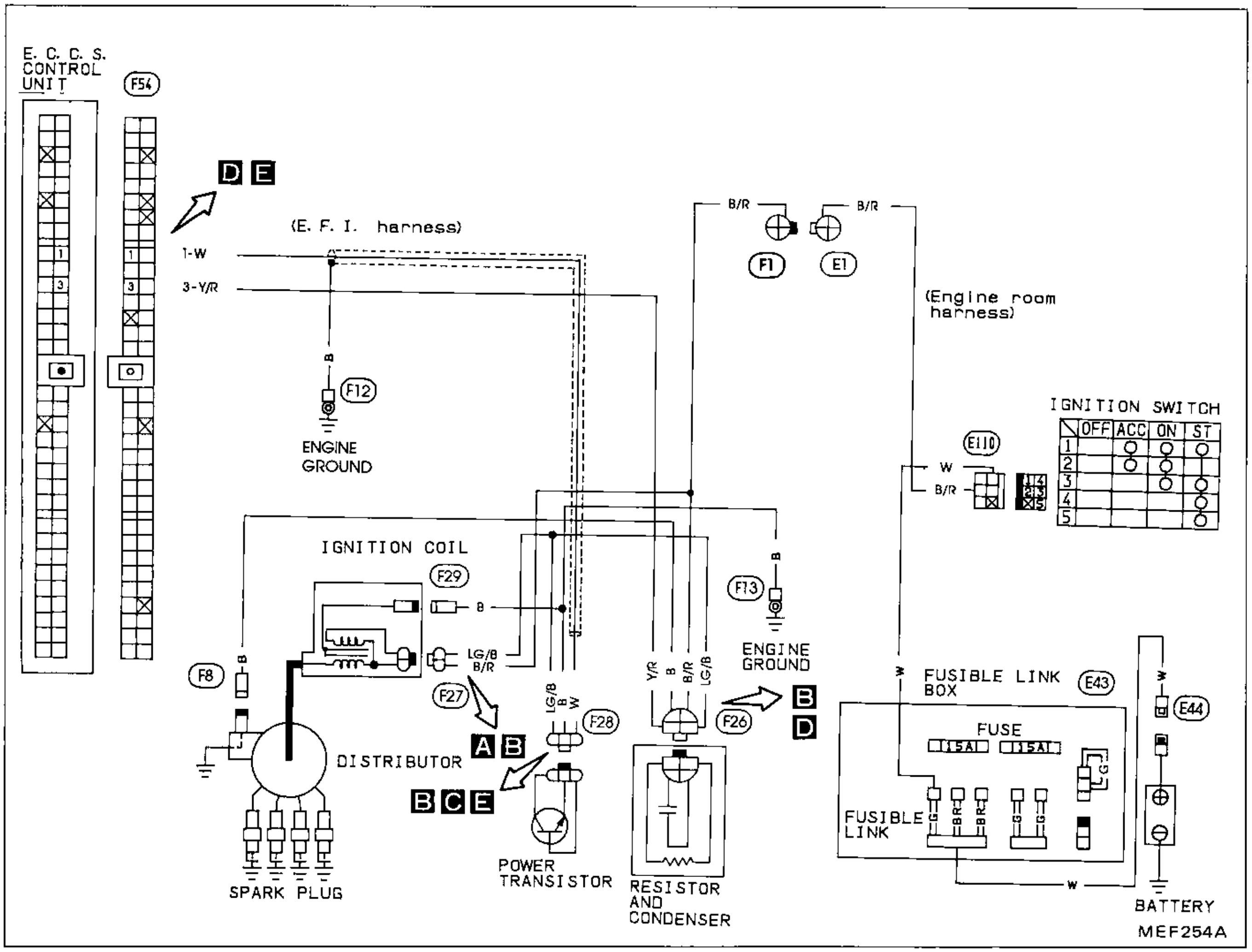
Recheck E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

O.K.

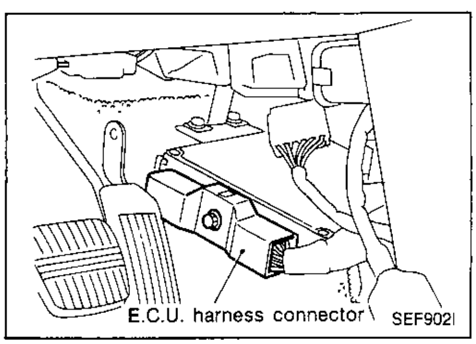
INSPECTION END

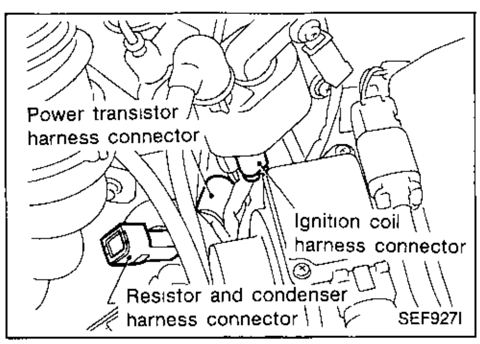
Diagnostic Procedure 27

IGNITION SIGNAL (Code No. 21)

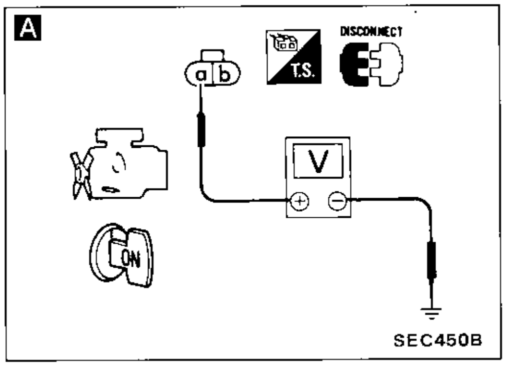


Harness layout

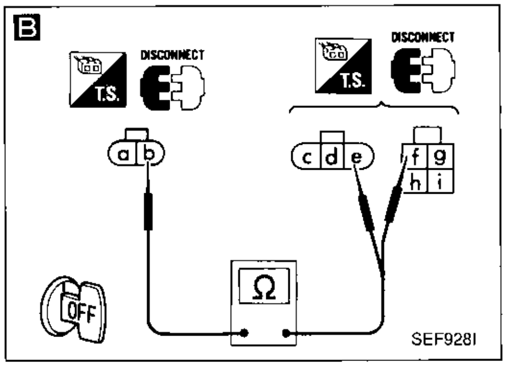




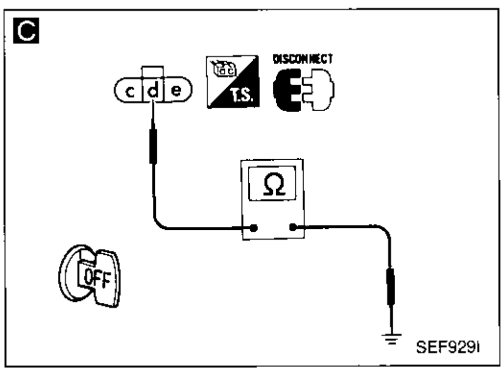
Diagnostic Procedure 27 (Cont'd)



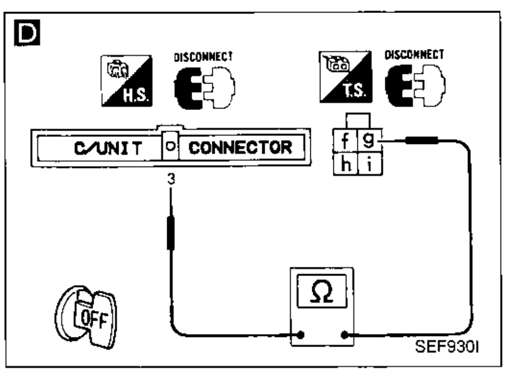
SEC450B



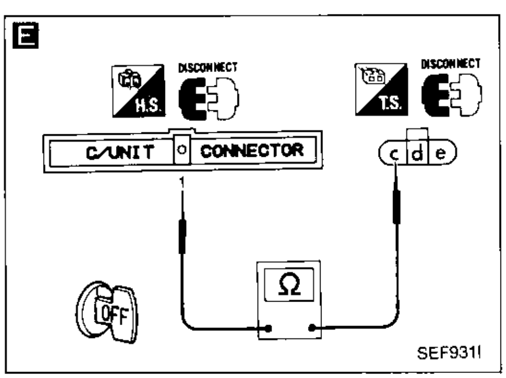
SEF928I



SEF929I



SEF930I



SEF931I

INSPECTION START

A CHECK POWER SUPPLY.
1) Disconnect ignition coil harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. → Check the following:
- Harness connectors (F1), (E1)
- Harness continuity between ignition switch and ignition coil

If N.G., repair harness or connectors.

O.K. ↓

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect power transistor harness connector and resistor and condenser harness connector.
B 3) Check harness continuity between terminal ⓑ and terminals ⓔ, ⓕ.
Continuity should exist.
C 4) Check harness continuity between terminal ⓓ and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

D CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal ③ and terminal ⓖ.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

E CHECK OUTPUT SIGNAL CIRCUIT.
1) Check harness continuity between E.C.U. terminal ① and terminal ⓒ.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

Ⓐ

Diagnostic Procedure 27 (Cont'd)

Ⓐ

CHECK COMPONENTS
(Ignition coil, power transistor, resistor and condenser)
Refer to "Electrical Components Inspection".
(See page EF & EC-174.)

- N.G. → Replace malfunctioning component(s).
- O.K. ↓

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

Perform FINAL CHECK by the following procedure after repair is completed.

FINAL CHECK

↓

Erase the self-diagnosis memory.

↓

Perform driving test.

↓

Perform self-diagnosis again.

- N.G. → Recheck E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.
- O.K. ↓

INSPECTION END

Diagnostic Procedure 28

E.C.C.S. CONTROL UNIT (Code No. 31) CHECK (CHECK ENGINE LIGHT ITEM)

INSPECTION START

↓

1) Turn ignition switch "ON".
2) Erase the self-diagnosis memory.

↓

Perform self-diagnosis again.

↓

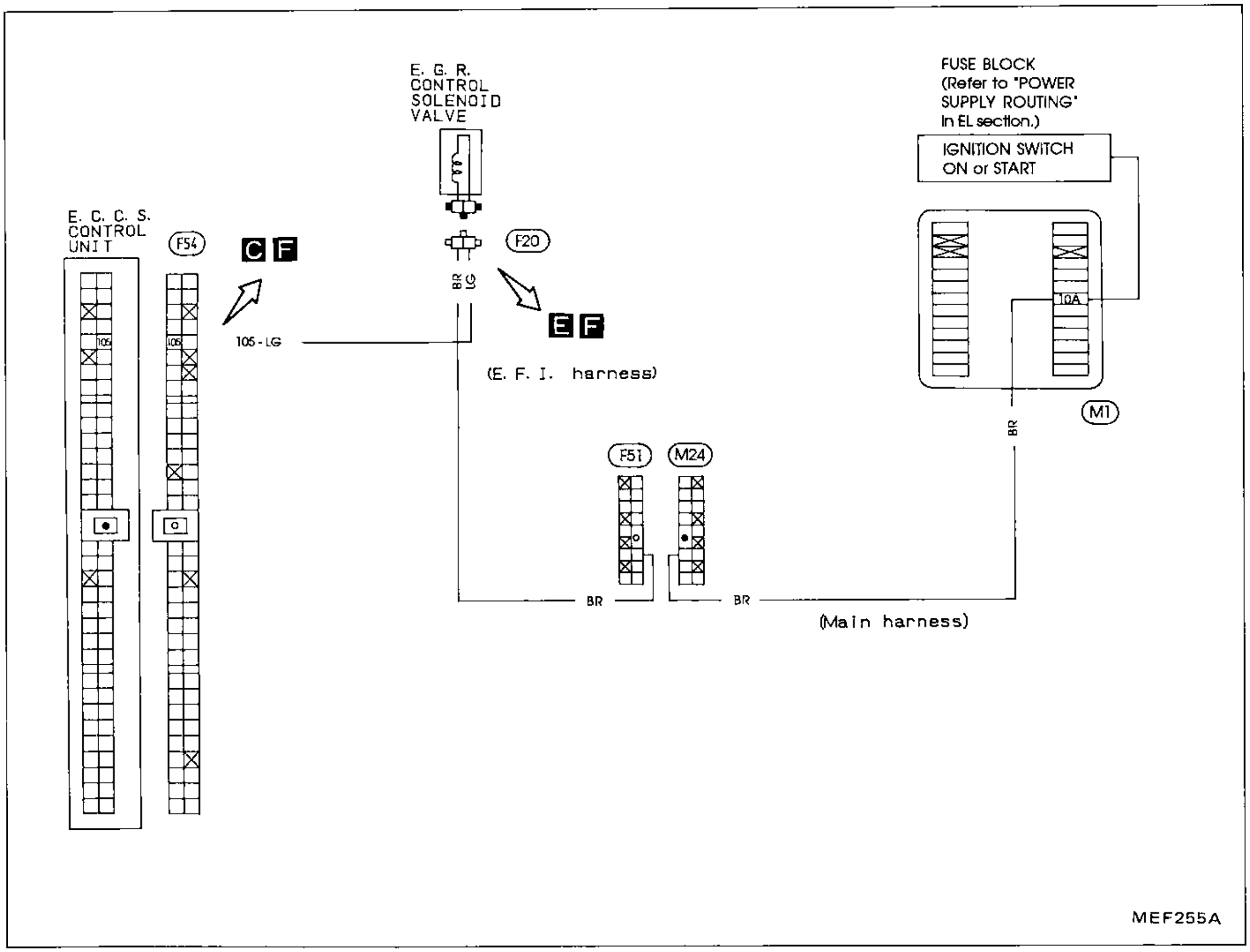
Does E.C.U. display Code No. 31 again?

- Yes → Replace E.C.U.
- No ↓

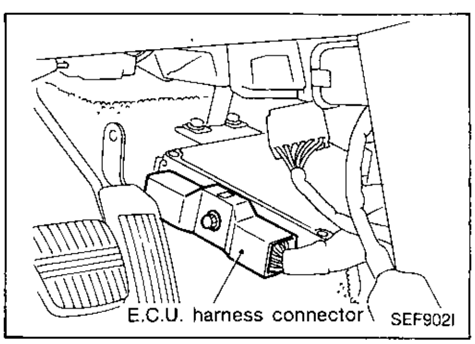
INSPECTION END

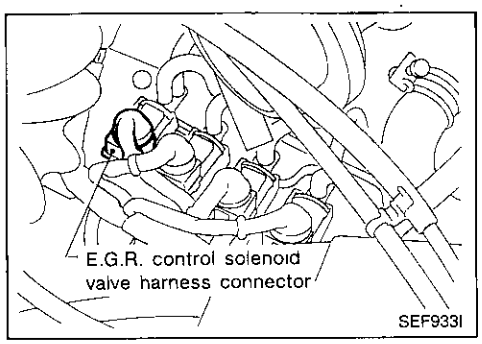
Diagnostic Procedure 29

E.G.R. FUNCTION (Code No. 32) CHECK [CHECK ENGINE LIGHT ITEM (For California model)]
E.G.R. CONTROL [Not self-diagnostic item (For non-California model)]

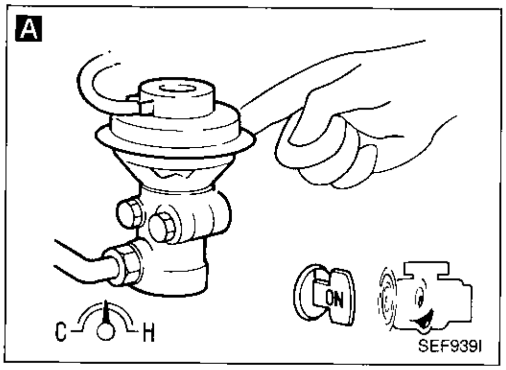


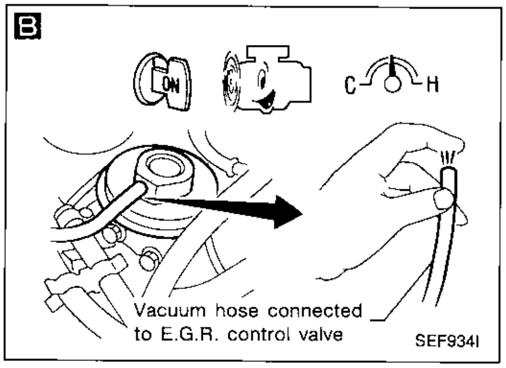
Harness layout

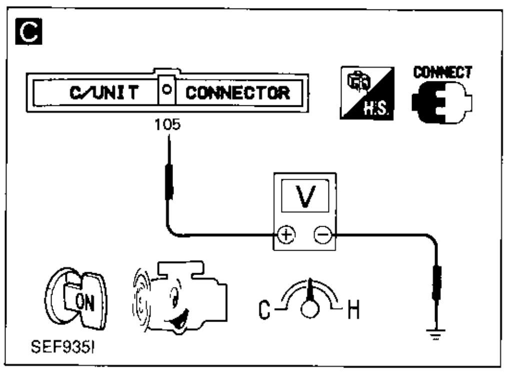


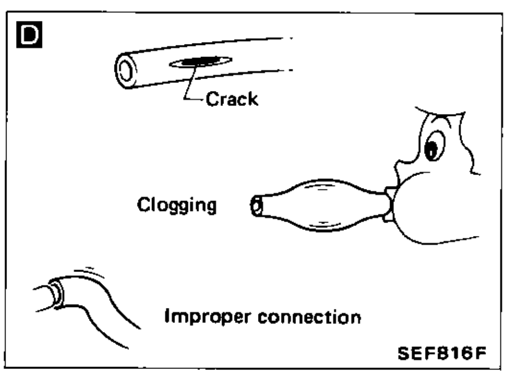


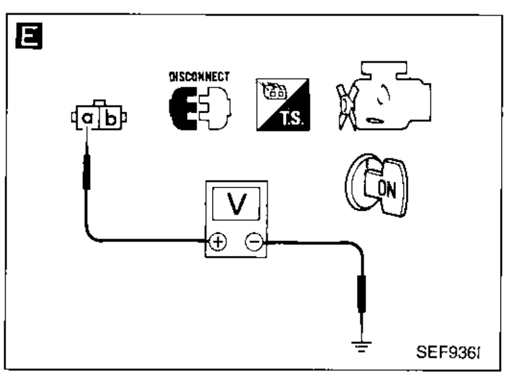
Diagnostic Procedure 29 (Cont'd)











INSPECTION START

↓

1 Start engine and warm it up sufficiently.
2 Perform self-diagnosis. Make sure that code No. 12 is not displayed.

↓

A

CHECK OVERALL FUNCTION.
(Non-California model)
1) Make sure that E.G.R. control valve spring is lifted up and down when racing engine.
(Use your finger.)

Is lifted up and down. → INSPECTION END

Is not lifted up and down. ↓

B

CHECK VACUUM SOURCE TO E.G.R. CONTROL VALVE.
1) Disconnect vacuum hose to E.G.R. control valve.
2) Make sure that vacuum exists under the following conditions.
At idle:
Vacuum should not exist.
Engine speed is about 2,000 rpm:
Vacuum should exist.

O.K. → CHECK COMPONENTS
[E.G.R. control valve, Fed & Cal B.P.T. valve and exhaust gas temperature sensor (California model).]
Refer to "Electrical Components Inspection".
(See page EF & EC-174, 175.)

N.G. ↓

Replace malfunctioning component(s).

N.G. ↓

C

CHECK CONTROL FUNCTION.
1) Check voltage between E.C.U. terminal (105) and ground under the following conditions.
Voltage:
At idle
Approximately 0V
Engine speed is about 2,000 rpm
Battery voltage

O.K. → **D**

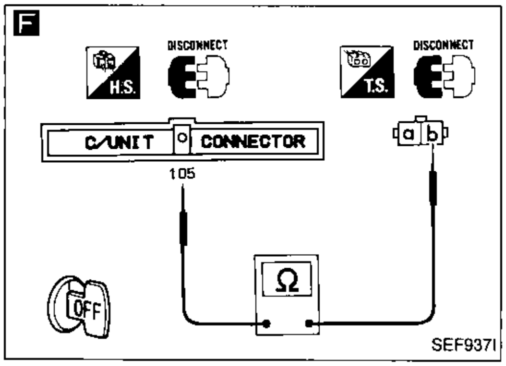
CHECK VACUUM HOSE.
1) Check vacuum hose for clogging, cracks and proper connection.

N.G. ↓

(A)

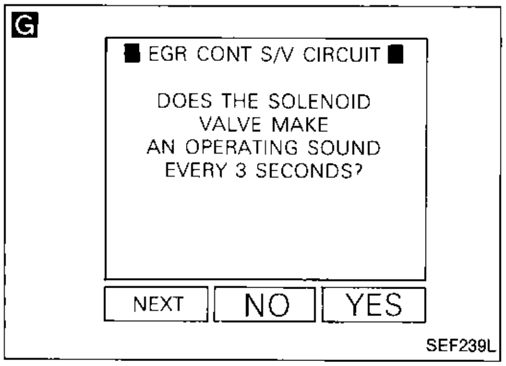
Diagnostic Procedure 29 (Cont'd)

F



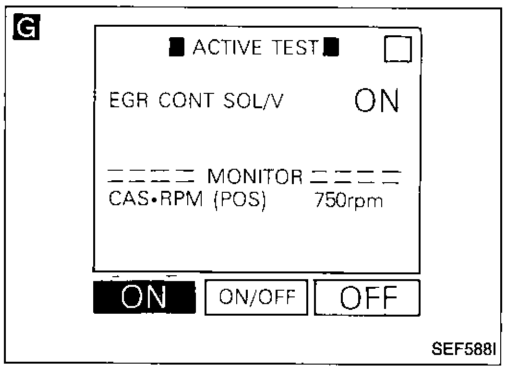
SEF937I

G



SEF239L

G



SEF588I

Ⓐ

E CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect E.G.R. control solenoid valve harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. → Check the following:
- Harness connectors (F51), (M24)
- 10A fuse
- Harness continuity between fuse and E.G.R. control solenoid valve

If N.G., repair harness or connectors.

O.K. ↓

F CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal (105) and terminal ⓑ.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

G CHECK COMPONENT (E.G.R. control solenoid valve).
1) Reconnect E.C.U. harness connector and E.G.R. control solenoid valve harness connector.
2) Turn ignition switch "ON".
3) Perform "EGR CONT S/V CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

2) Start engine.
3) Turn E.G.R. control solenoid valve "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT and check operating sound.

OR

Refer to "Electrical Components Inspection".
(See page EF & EC-175.)

N.G. → Replace E.G.R. control solenoid valve.

O.K. ↓

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

Diagnostic Procedure 29 (Cont'd)

H ROAD TEST

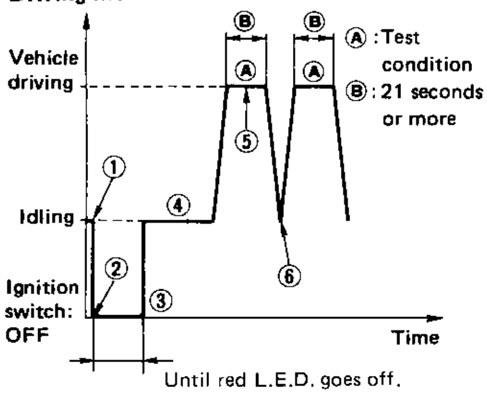
Test condition

Drive vehicle under the following conditions with a suitable shift position.

(1) Engine speed:
M/T: 2,200±200 rpm
A/T: 2,100±300 rpm

(2) Intake manifold vacuum:
M/T: −41.3±4.0 kPa
(−310±30 mmHg, −12.20±1.18 inHg)
A/T: −32.0±8.0 kPa
(−240±60 mmHg, −9.45±2.36 inHg)

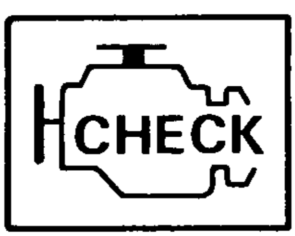
Driving mode



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 revolution to less than 2,000 rpm.
⑦ Repeat steps ⑤ through ⑥ at least 1 time.

SEF302H

I



CHECK ENGINE LIGHT

SEF924F

Perform FINAL CHECK by the following procedure after repair is completed. (California model)

FINAL CHECK

↓

Erase the self-diagnosis memory.

↓ H

Perform driving test under the following conditions.
1) Warm up engine sufficiently.
2) Use test driving modes indicated in figure H.

↓ I

Make sure that check engine light does not come on during driving test.

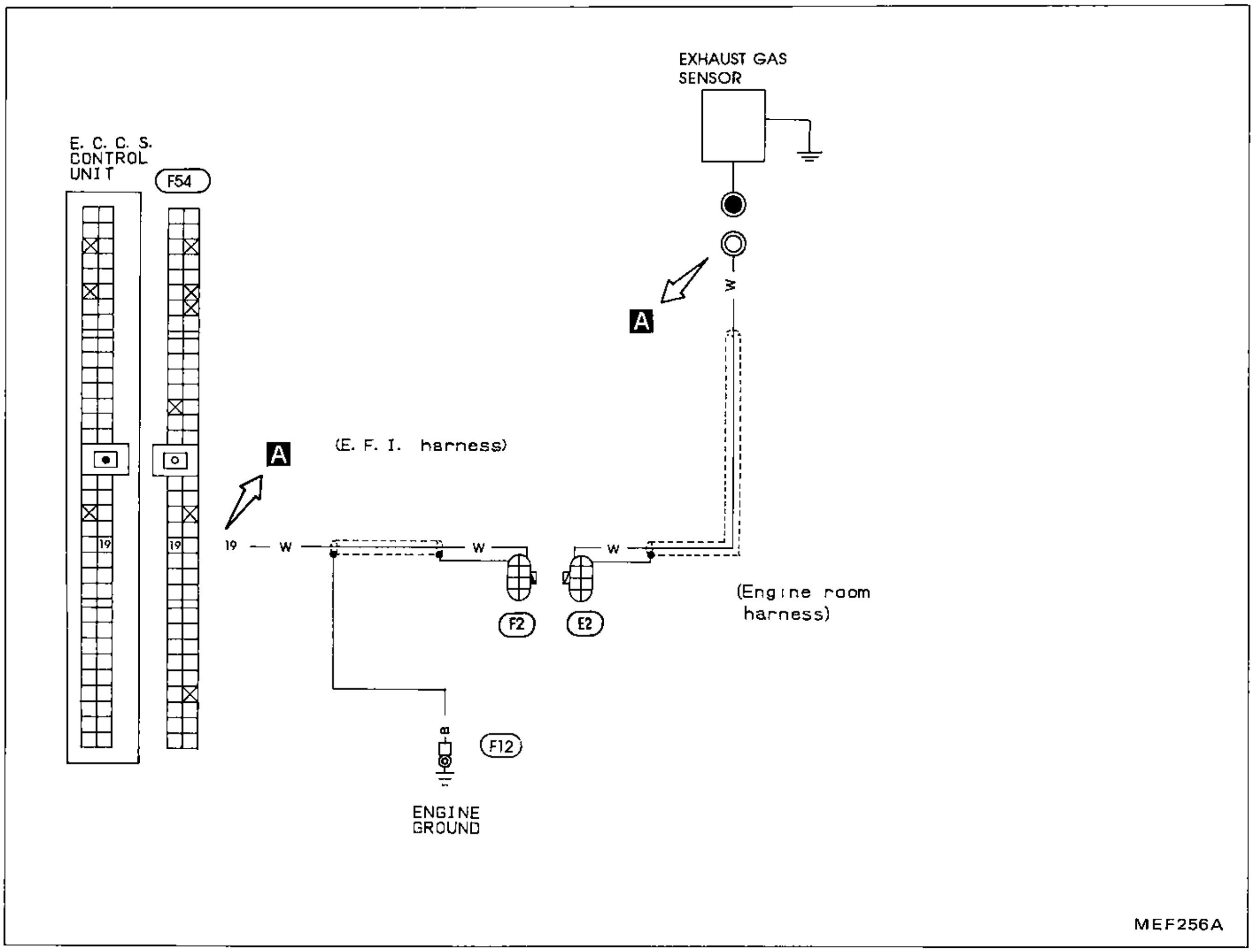
→ Comes on. → Recheck E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

↓ Does not come on.

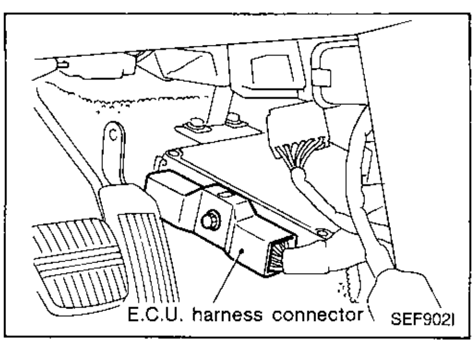
INSPECTION END

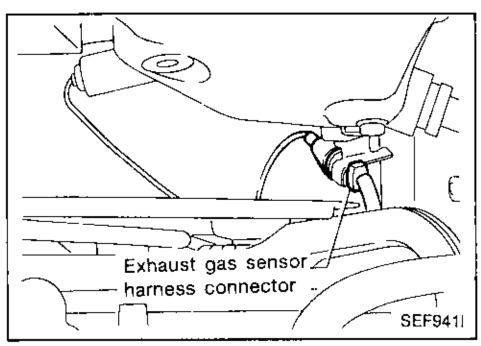
Diagnostic Procedure 30

EXHAUST GAS SENSOR (Code No. 33) CHECK (CHECK ENGINE LIGHT ITEM)

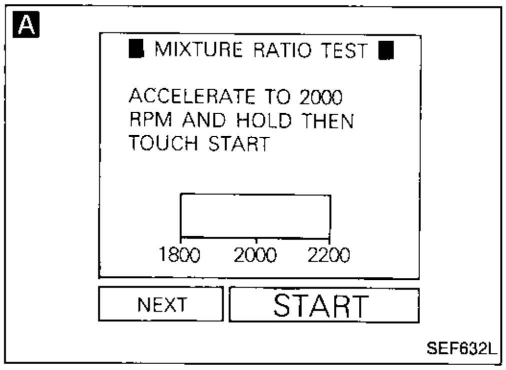


Harness layout

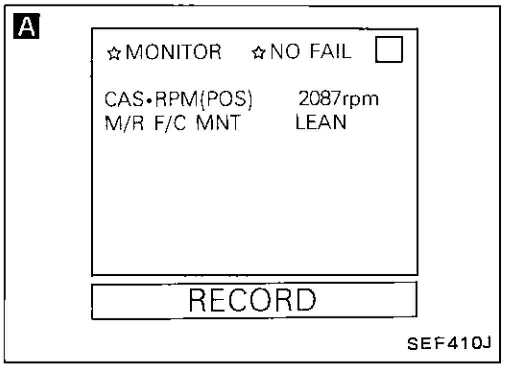




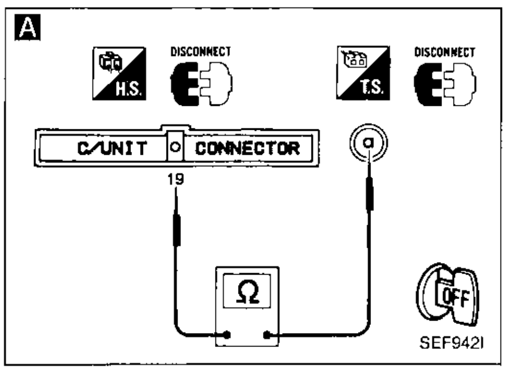
Diagnostic Procedure 30 (Cont'd)



SEF632L



SEF410J



SEF942I

INSPECTION START

↓

A

CHECK INPUT SIGNAL CIRCUIT.

1) Start engine and warm it up sufficiently.
2) Perform "MIXTURE RATIO TEST" in "FUNCTION TEST" mode with CONSULT.

OR

2) Make sure that "M/R F/C MNT" in "DATA MONITOR" mode indicates "RICH" and "LEAN" periodically more than 5 times during 10 seconds at 2,000 rpm.

OR

1) Disconnect E.C.U. harness connector and exhaust gas sensor harness connector.
2) Check harness continuity between terminal ⓐ and E.C.U. terminal ⑲.

Continuity should exist.

N.G. → Check the following:
- Harness connectors (F2), (E2)
- Harness continuity between E.C.U. and exhaust gas sensor

If N.G., repair harness or connectors.

↓ O.K.

CHECK COMPONENT (Exhaust gas sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-175.)

N.G. → Replace exhaust gas sensor.

↓ O.K.

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

Perform FINAL CHECK by the following procedure after repair is completed.

FINAL CHECK

↓

Erase the self-diagnosis memory.

↓

Perform driving test.

↓

Perform self-diagnosis again.

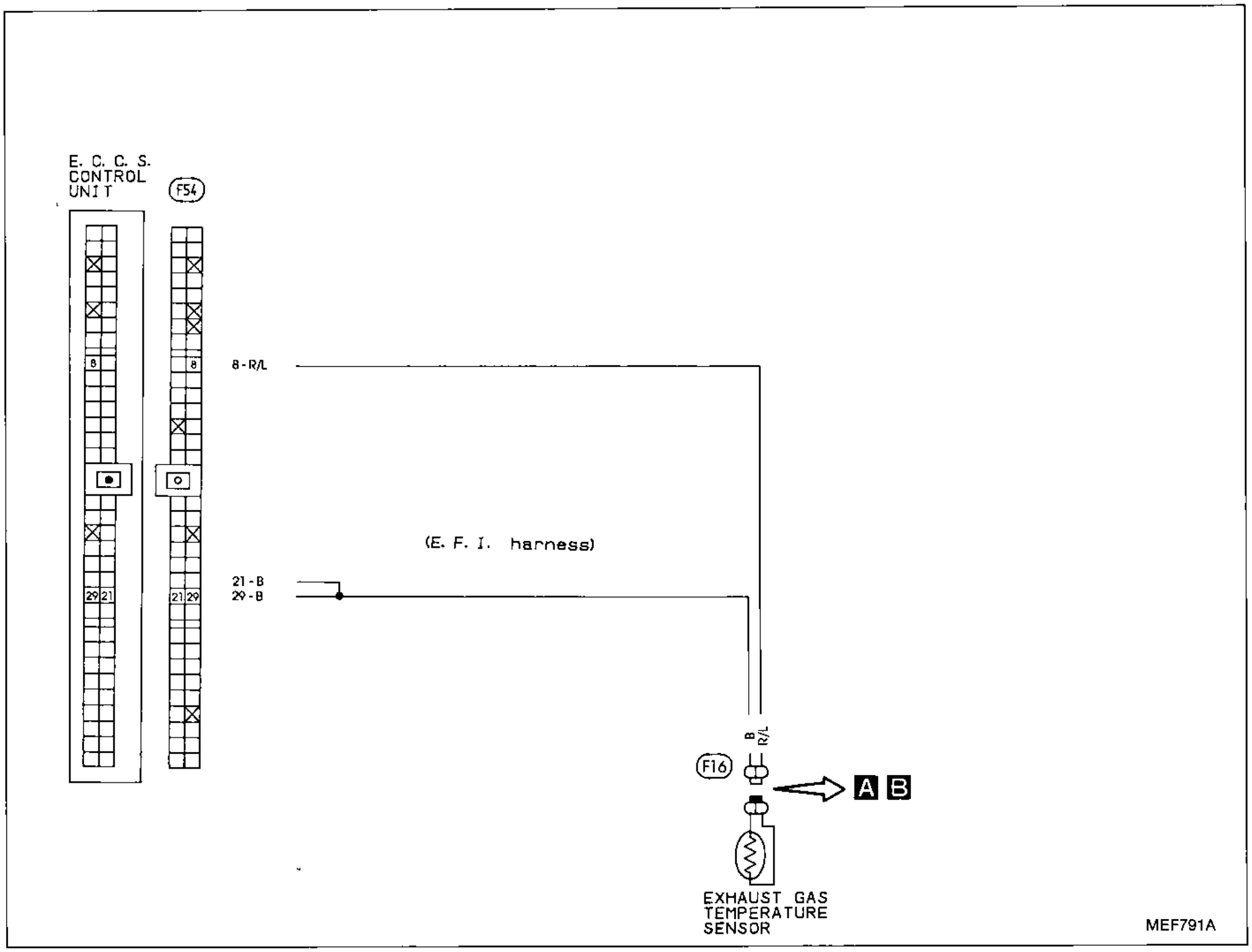
N.G. → Recheck E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

↓ O.K.

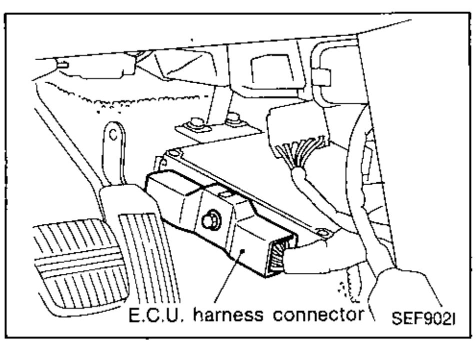
INSPECTION END

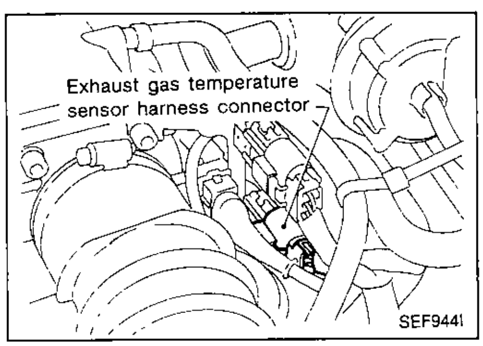
Diagnostic Procedure 31

EXHAUST GAS TEMPERATURE SENSOR (Code No. 35) CHECK (CHECK ENGINE LIGHT ITEM): CALIFORNIA MODEL ONLY

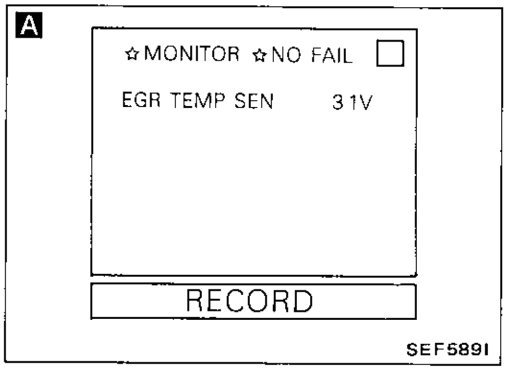


Harness layout

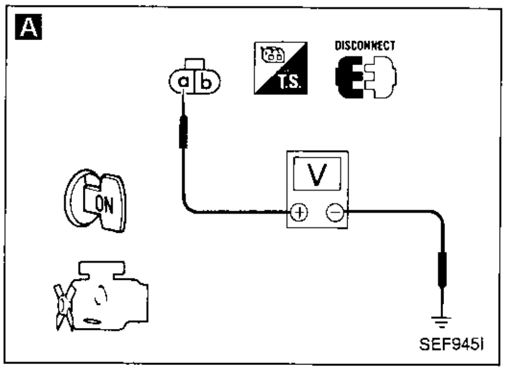




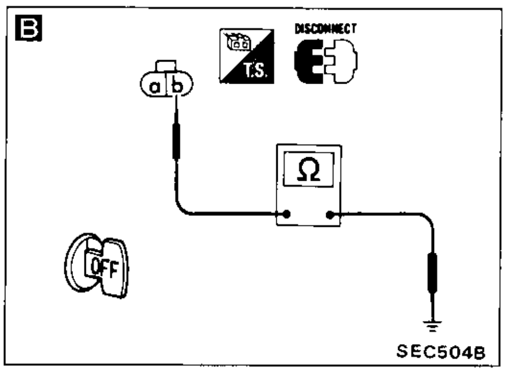
Diagnostic Procedure 31 (Cont'd)



SEF589I



SEF945I



SEC504B

INSPECTION START

↓

A CHECK POWER SUPPLY.
1) Start engine and warm it up sufficiently.
2) Read exhaust gas temperature sensor signal in "DATA MONITOR" mode with CONSULT.
Voltage: Less than 4.5V

— OR —

1) Disconnect exhaust gas temperature sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓐ and ground.
Voltage: Less than 4.5V

N.G. → Repair harness or connectors.

O.K. ↓

Turn ignition switch "OFF".

↓

Disconnect exhaust gas temperature sensor harness connector.

↓

B CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓑ and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

CHECK COMPONENT
(Exhaust gas temperature sensor).
Refer to "Electrical Components Inspection". (See page EF & EC-175.)

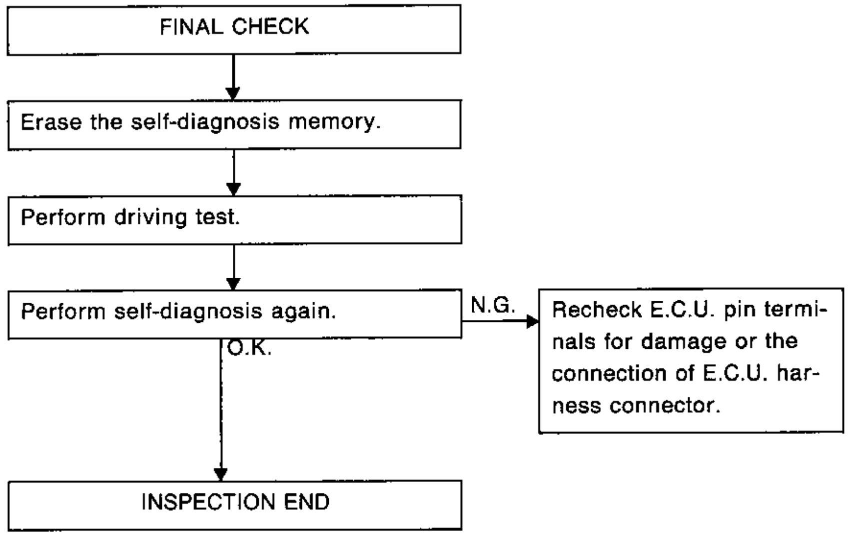
N.G. → Replace exhaust gas temperature sensor.

O.K. ↓

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

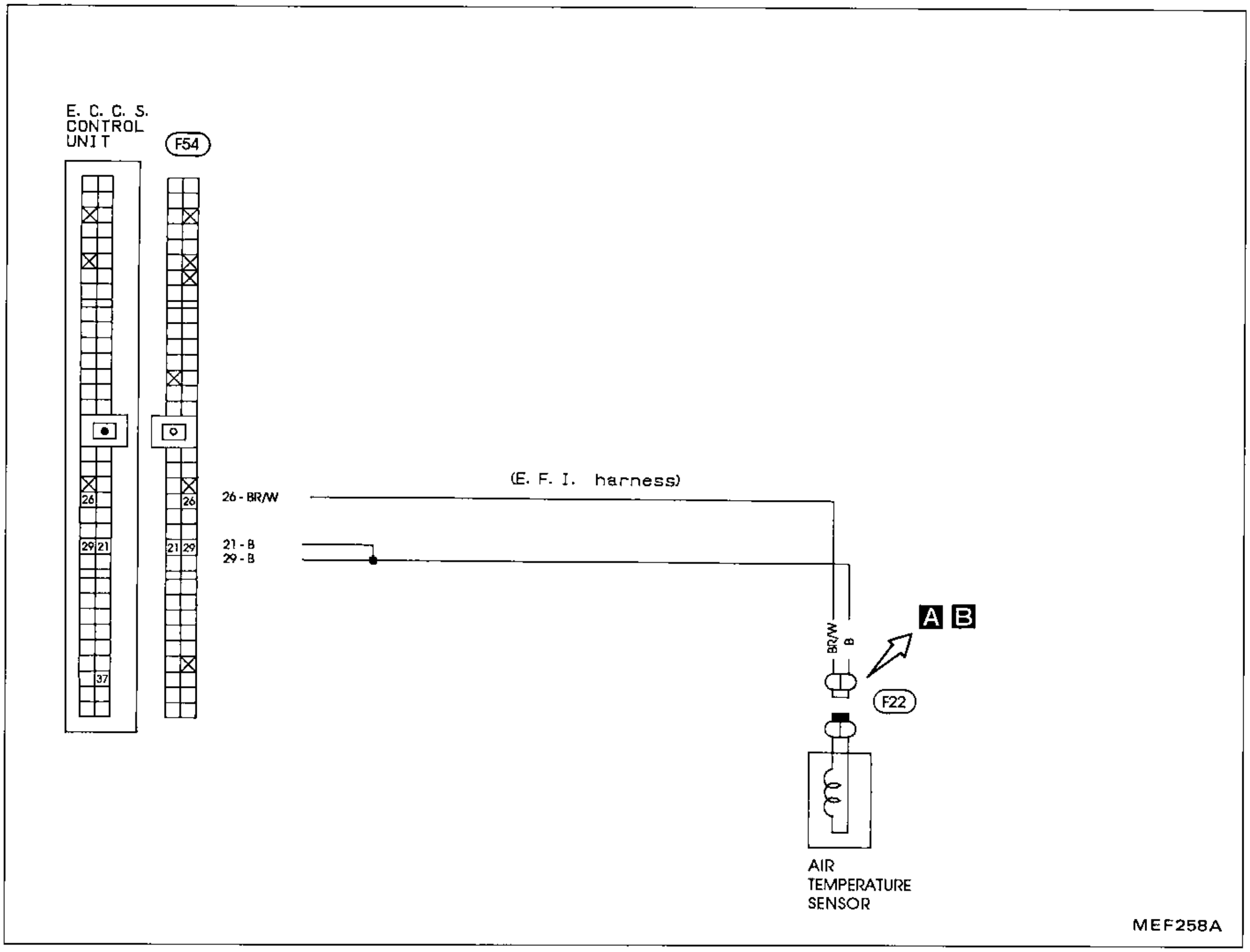
Diagnostic Procedure 31 (Cont'd)

Perform FINAL CHECK by the following procedure after repair is completed.

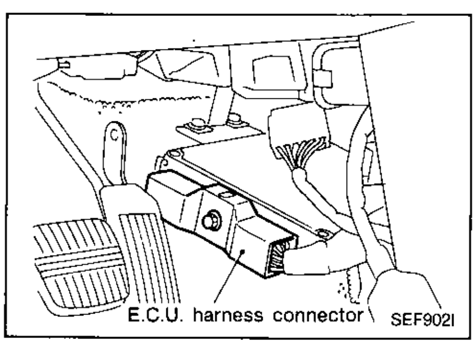


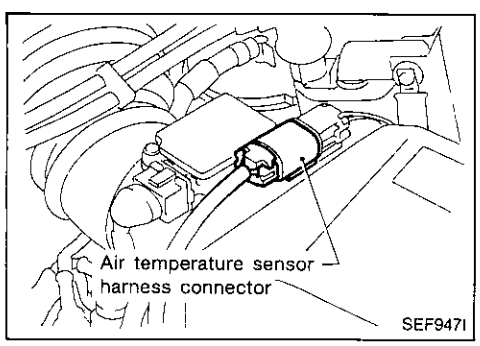
Diagnostic Procedure 32

AIR TEMPERATURE SENSOR (Code No. 41)

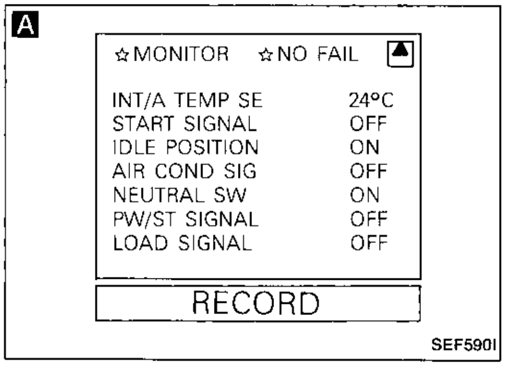


Harness layout

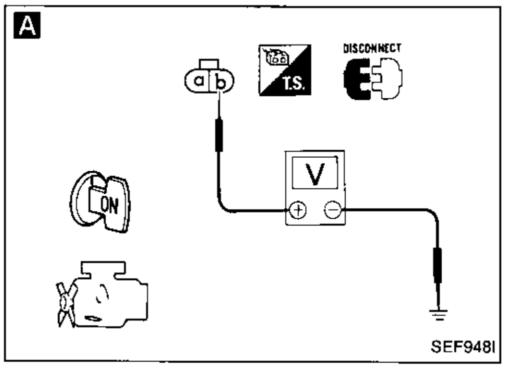




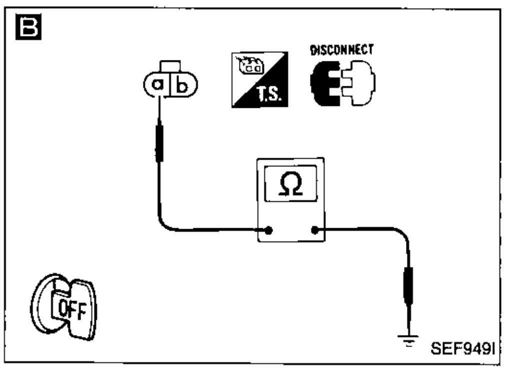
Diagnostic Procedure 32 (Cont'd)



SEF590I



SEF948I



SEF949I

INSPECTION START

↓

A

CHECK POWER SUPPLY.

Read fuel temperature sensor signal in "DATA MONITOR" mode with CONSULT after engine warm-up.
Intake air temperature:
20 - 60°C (68 - 140°F)

— OR —

1) Disconnect air temperature sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓑ and ground.
Voltage: Approximately 5V

N.G. → Repair harness or connectors.

O.K. ↓

Turn ignition switch "OFF".

↓

Disconnect air temperature sensor harness connector.

↓

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓐ and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

CHECK COMPONENT
(Air temperature sensor).
Refer to "Electrical Components Inspection". (See page EF & EC-175.)

N.G. → Replace air temperature sensor.

O.K. ↓

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

Diagnostic Procedure 32 (Cont'd)

Perform FINAL CHECK by the following procedure after repair is completed.

FINAL CHECK

↓

Erase the self-diagnosis memory.

↓

Perform driving test.

↓

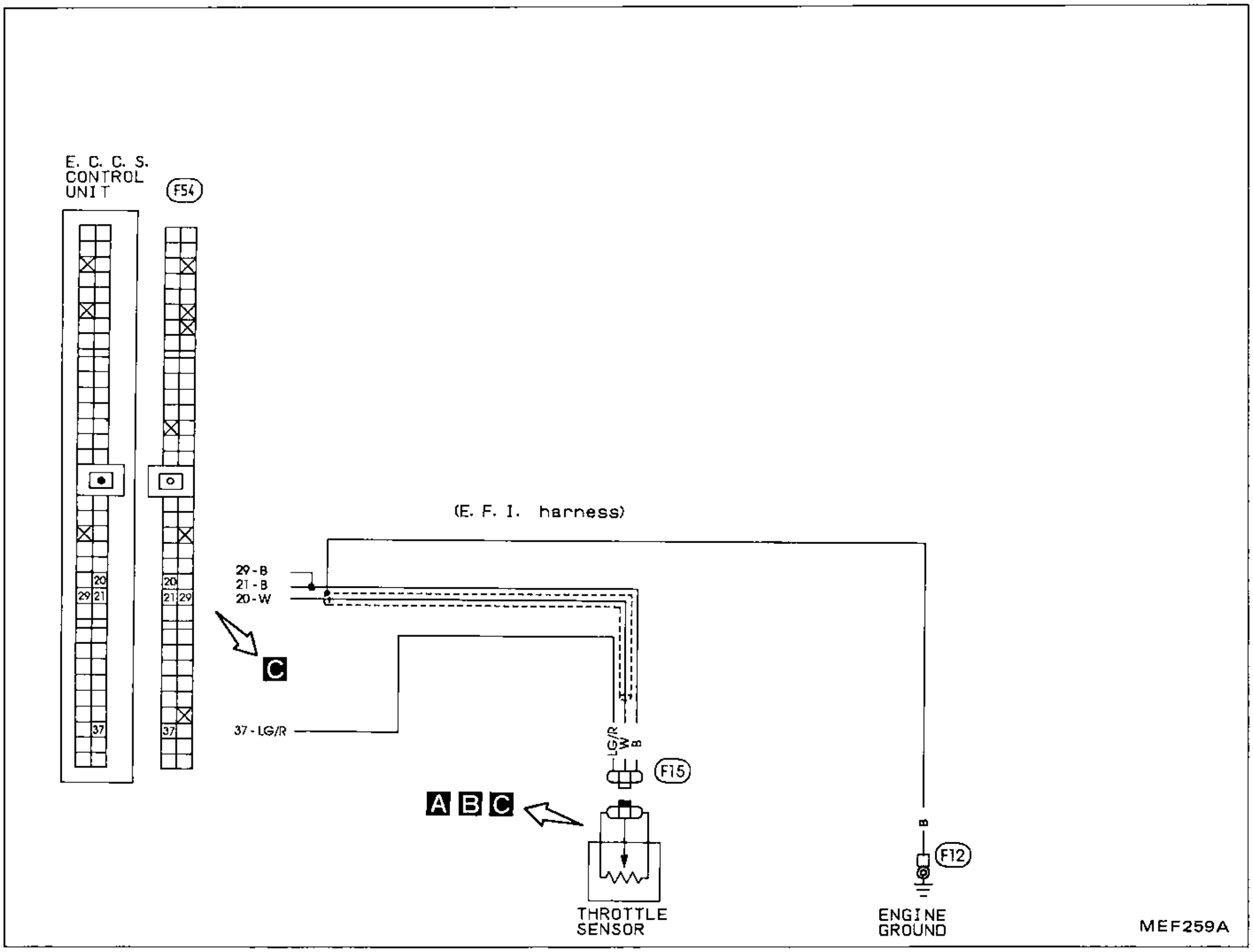
Perform self-diagnosis again. — N.G. → Recheck E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

↓ O.K.

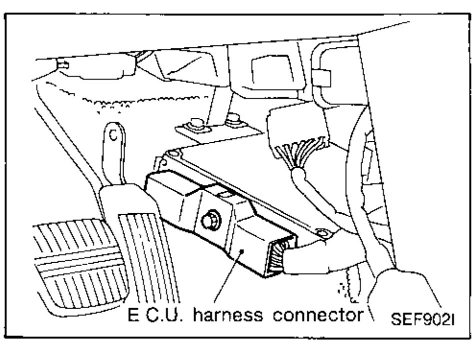
INSPECTION END

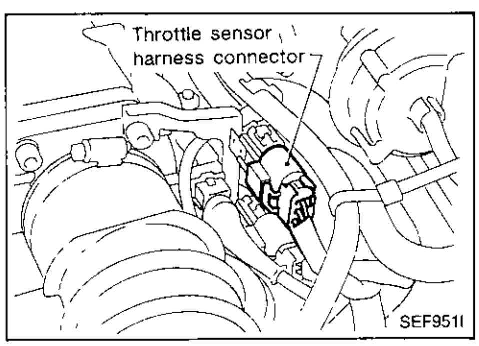
Diagnostic Procedure 33

THROTTLE SENSOR (Code No. 43) (CHECK ENGINE LIGHT ITEM)



Harness layout

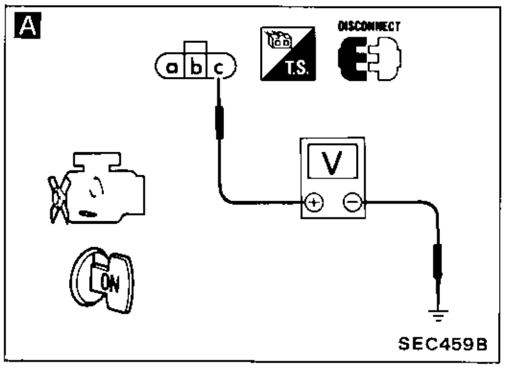




Diagnostic Procedure 33 (Cont'd)

INSPECTION START

A



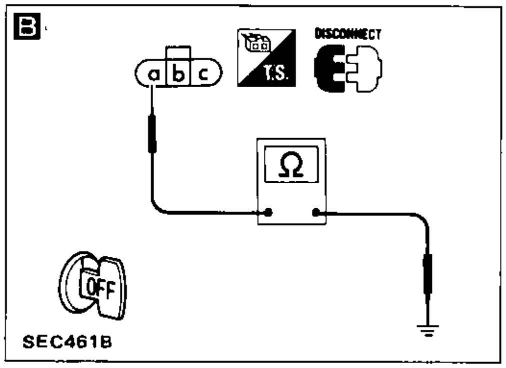
SEC459B

CHECK POWER SUPPLY.
1) Disconnect throttle sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal ⓒ and ground.
Voltage: Approximately 5V

N.G. → Repair harness or connectors.

O.K.

B



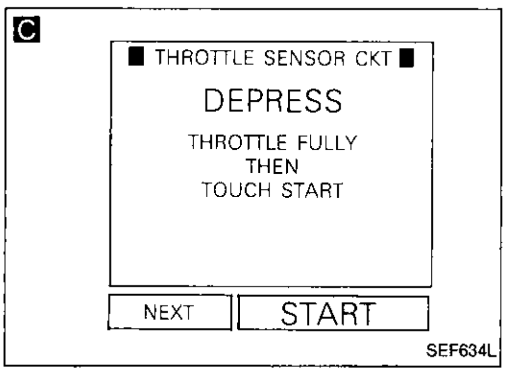
SEC461B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓐ and engine ground.
Continuity should exist.

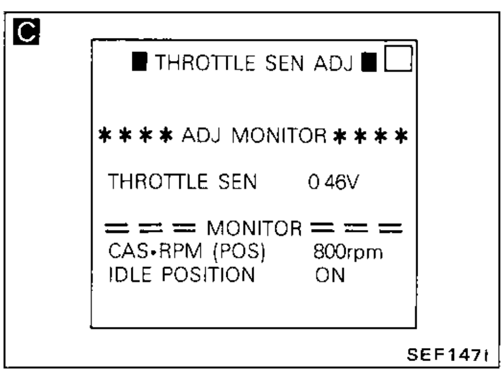
N.G. → Repair harness or connectors.

O.K.

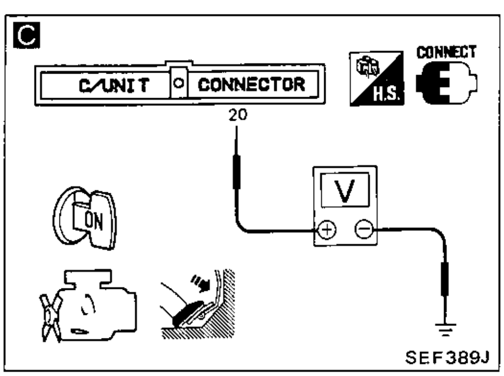
C



SEF634L



SEF147I



SEF389J

CHECK INPUT SIGNAL CIRCUIT.
1) Reconnect throttle sensor harness connector.
2) Turn ignition switch "ON".
3) Perform "THROTTLE SENSOR CKT" in "FUNCTION TEST" mode with CONSULT.

OR

3) Read throttle sensor output voltage in "WORK SUPPORT" mode with CONSULT.
Voltage:
Throttle valve fully closed
0.4 - 0.5V
Throttle valve fully open:Approx.
4.0V

OR

1) Reconnect throttle sensor harness connector.
2) Turn ignition switch "ON".
3) Make sure that voltage between E.C.U. terminal ⑳ and ground changes when accelerator pedal is depressed.
Voltage:
Throttle valve fully closed
0.4 - 0.5V
Throttle valve fully open
Approx. 4.0V

N.G. → Repair harness or connectors.

O.K.

Ⓐ

Diagnostic Procedure 33 (Cont'd)

Ⓐ

CHECK COMPONENT
(Throttle sensor).
Refer to "Electrical Components Inspection".
(See page EF & EC-176.)

N.G. → Replace throttle sensor.

O.K. ↓

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

Perform FINAL CHECK by the following procedure after repair is completed.

FINAL CHECK

↓

Erase the self-diagnosis memory.

↓

Perform driving test.

↓

Perform self-diagnosis again.

N.G. → Recheck E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

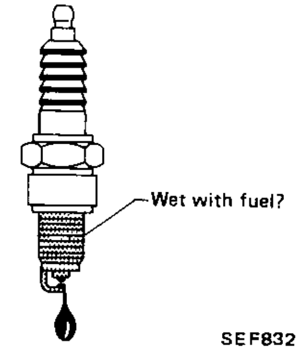
O.K. ↓

INSPECTION END

Diagnostic Procedure 34

INJECTOR LEAK (Code No. 45) (CHECK ENGINE LIGHT ITEM); CALIFORNIA MODEL ONLY

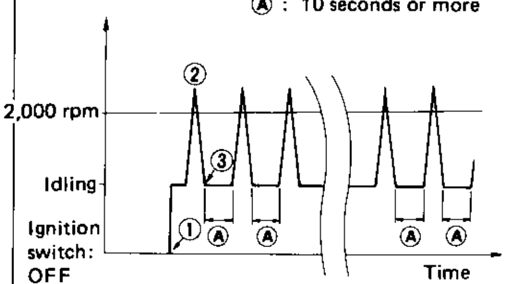
A



SEF832F

B

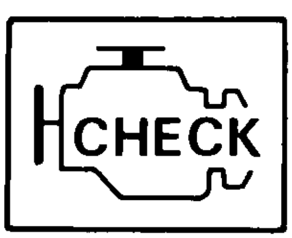
Engine racing mode



① Start engine and warm it up sufficiently.
② Race engine revolution higher than 2,000 rpm under no-load.
③ Keep engine at idle speed for at least 10 seconds.
④ Repeat steps ② through ③ at least 10 times.

SEF392G

C



CHECK ENGINE LIGHT

SEF924F

INSPECTION START

↓

Start engine and warm it up sufficiently.

↓

Make sure engine runs smoothly at idle after warming.

- Runs smoothly → Race engine two or three times under no-load, then run engine at idle speed.
  ↓
  Set diagnosis to Mode II and check that red and green L.E.D.s on E.C.U. blink almost simultaneously at 2,000 rpm under no-load.
  - Does not blink → Check idle CO. (See page EF & EC-29.)
  - Blinks → INSPECTION END
- Does not run smoothly → Set the diagnosis mode selector of E.C.U. to Mode II.
  ↓
  Check if the green L.E.D. on E.C.U. stays off for 10 seconds with engine at idle speed.
  - Does not stay off → Check mixture ratio feedback system. (See page EF & EC-29.)
  - Stays off → A

A

Remove all spark plugs from cylinder head. Is any plug wet with fuel?

- Yes → Replace injectors which supply cylinders having wet spark plugs.
- No ↓

Remove injector assembly.
(See page EF & EC-180.)
Keep fuel hose and all injectors connected to injector gallery.

↓

Turn ignition switch "ON".
Make sure fuel does not drip from injector.

- Drips → Replace the injectors from which fuel is dripping.
- Does not drip ↓

Go to FINAL CHECK.

Diagnostic Procedure 34 (Cont'd)

Perform FINAL CHECK by the following procedure after repair is completed.

FINAL CHECK

↓

Erase the self-diagnosis memory. Make sure Code No. 55 is displayed in Model II.
1) Start engine and warm it up sufficiently.
2) First disconnect air flow meter connector, and start and run engine for at least 30 seconds at 2,000 rpm.
3) Stop engine and reconnect air flow meter connector

↓ B

Perform engine racing test as indicated in figure B.

↓ C

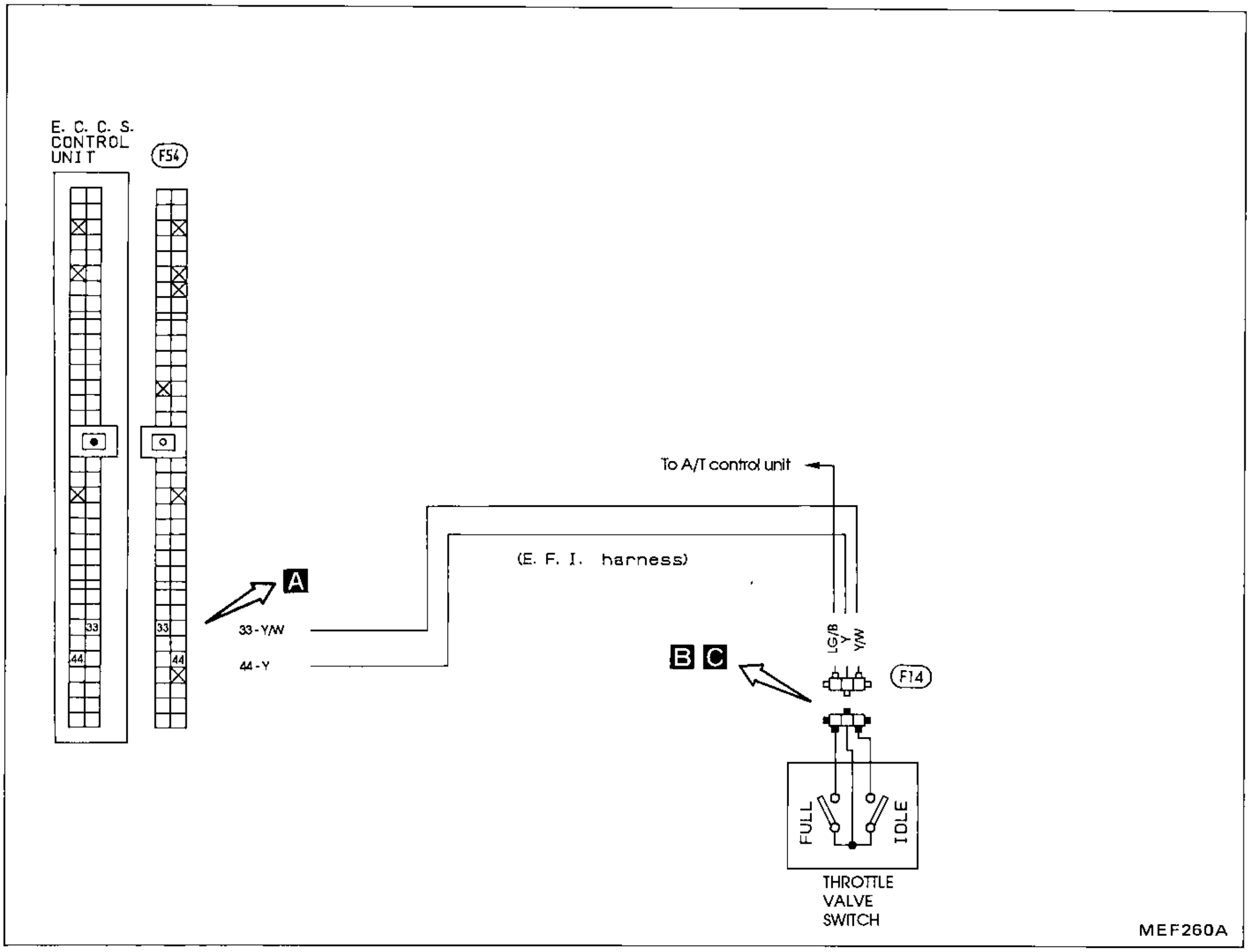
Make sure that check engine light does not come on during engine test.

- Comes on. → Recheck E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.
- Does not come on. ↓

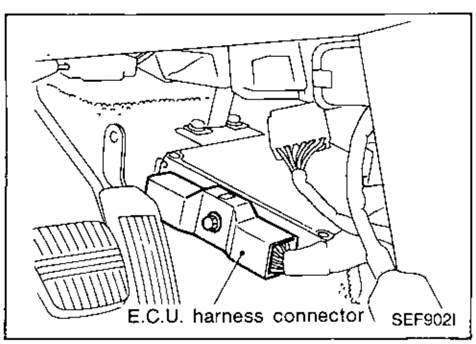
INSPECTION END

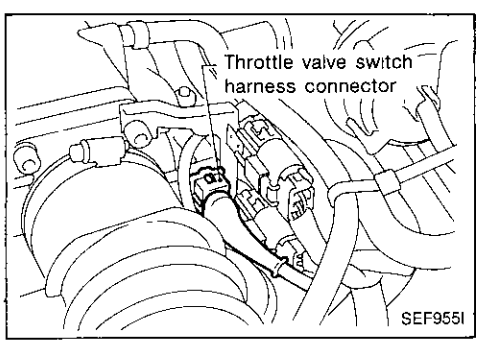
Diagnostic Procedure 35

THROTTLE VALVE SWITCH (Not self-diagnostic item)

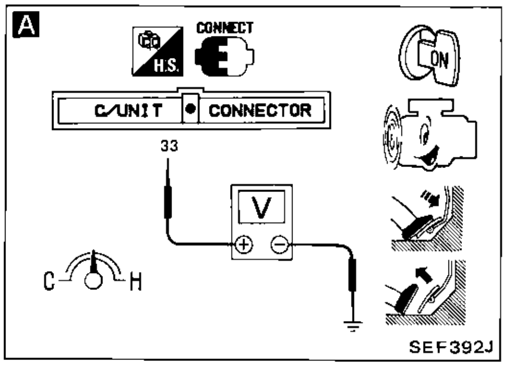


Harness layout

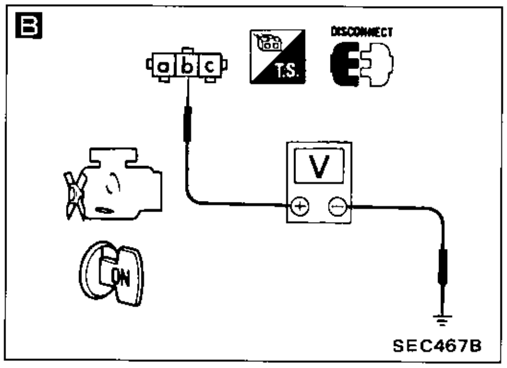




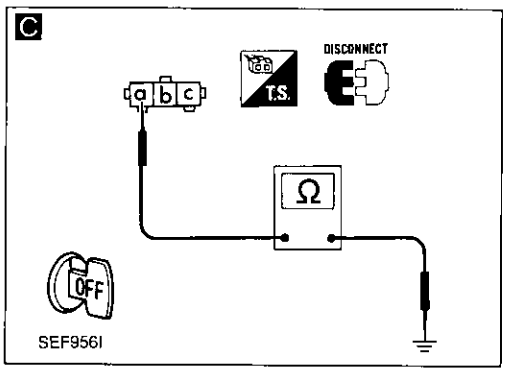
Diagnostic Procedure 35 (Cont'd)



SEF392J



SEC467B



SEF956I

INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Check voltage between E.C.U. terminal ㉝ and ground.
Voltage:
Accelerator pedal is released.
Approximately 9 - 10V
Accelerator pedal is depressed.
Approximately 0V

O.K. → INSPECTION END

N.G. ↓

B

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect throttle valve switch harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓑ and ground.
Voltage: Approximately 9 - 10V

N.G. → Repair harness or connectors.

O.K. ↓

C

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal ⓐ and engine ground.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

CHECK COMPONENT
(Throttle valve switch).
Refer to "Electrical Components Inspection".
(See page EF & EC-178.)

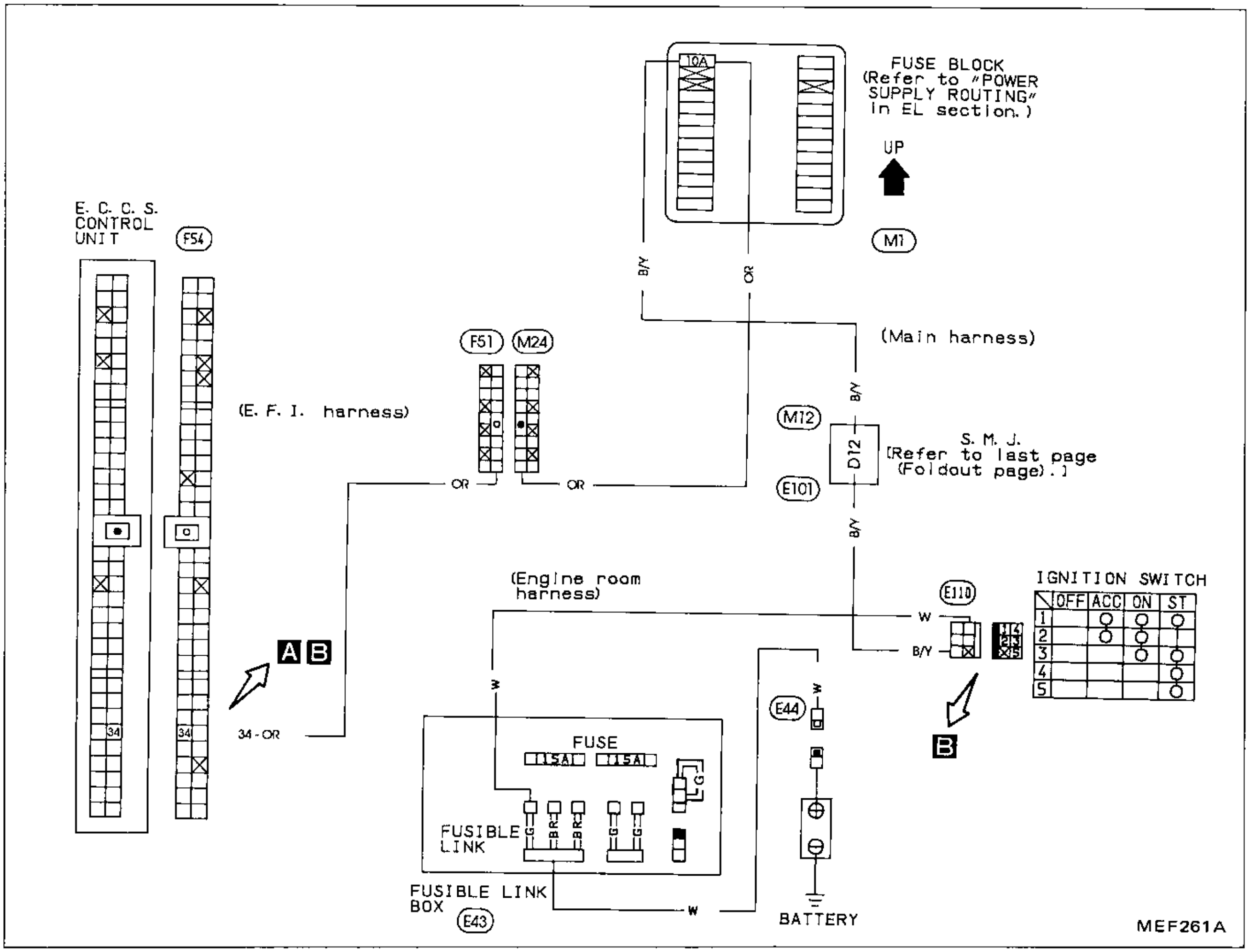
N.G. → Replace throttle valve switch.

O.K. ↓

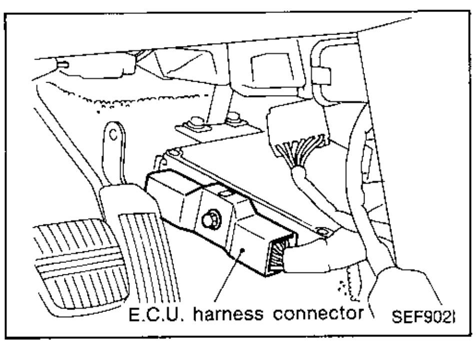
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 36

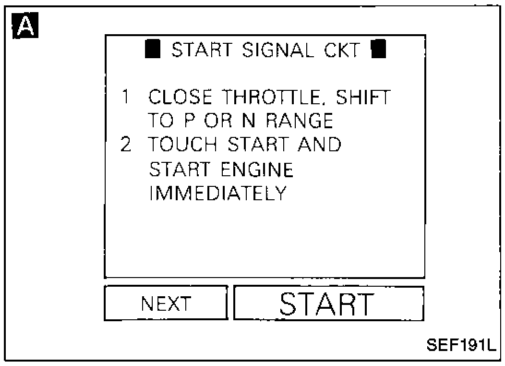
START SIGNAL (Not self-diagnostic item)



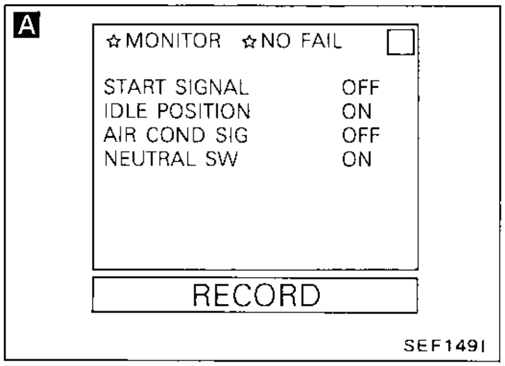
Harness layout



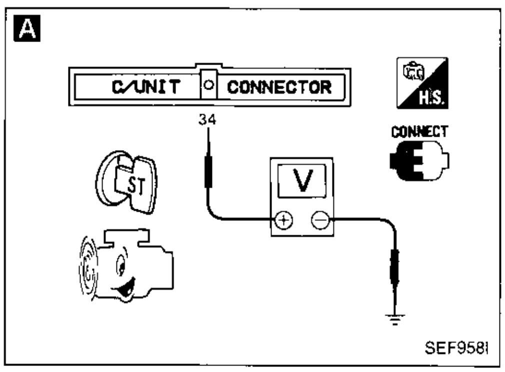
Diagnostic Procedure 36 (Cont'd)



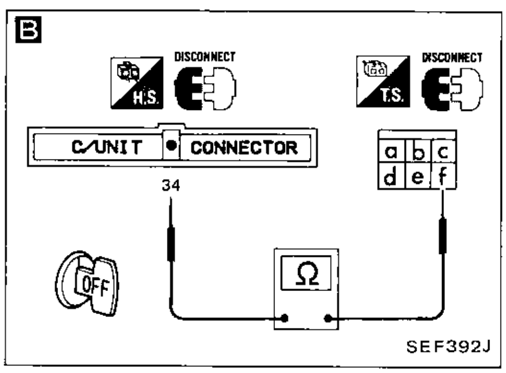
SEF191L



SEF149I



SEF958I



SEF392J

INSPECTION START

↓

A CHECK OVERALL FUNCTION.

1) Turn ignition switch "ON".
2) Perform "START SIGNAL CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

— OR —

1) Turn ignition switch "ON".
2) Check start signal in "DATA MONITOR" mode with CONSULT.

IGN "ON"	OFF
IGN "START"	ON

— OR —

1) Turn ignition switch to "START".
2) Check voltage between E.C.U. terminal ㉞ and ground.

Voltage:
Ignition switch "START"
Battery voltage
Except above
Approximately 0V

O.K. → INSPECTION END

N.G. ↓

B CHECK INPUT SIGNAL CIRCUIT.

1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector and ignition switch harness connector.
3) Check harness continuity between E.C.U. terminal ㉞ and terminal ⓕ.

Continuity should exist.

N.G. → Check the following:
- Harness connectors (F51), (M24)
- S.M.J. connectors (M12), (E101)
- 10A fuse
- Harness continuity between E.C.U. and ignition switch

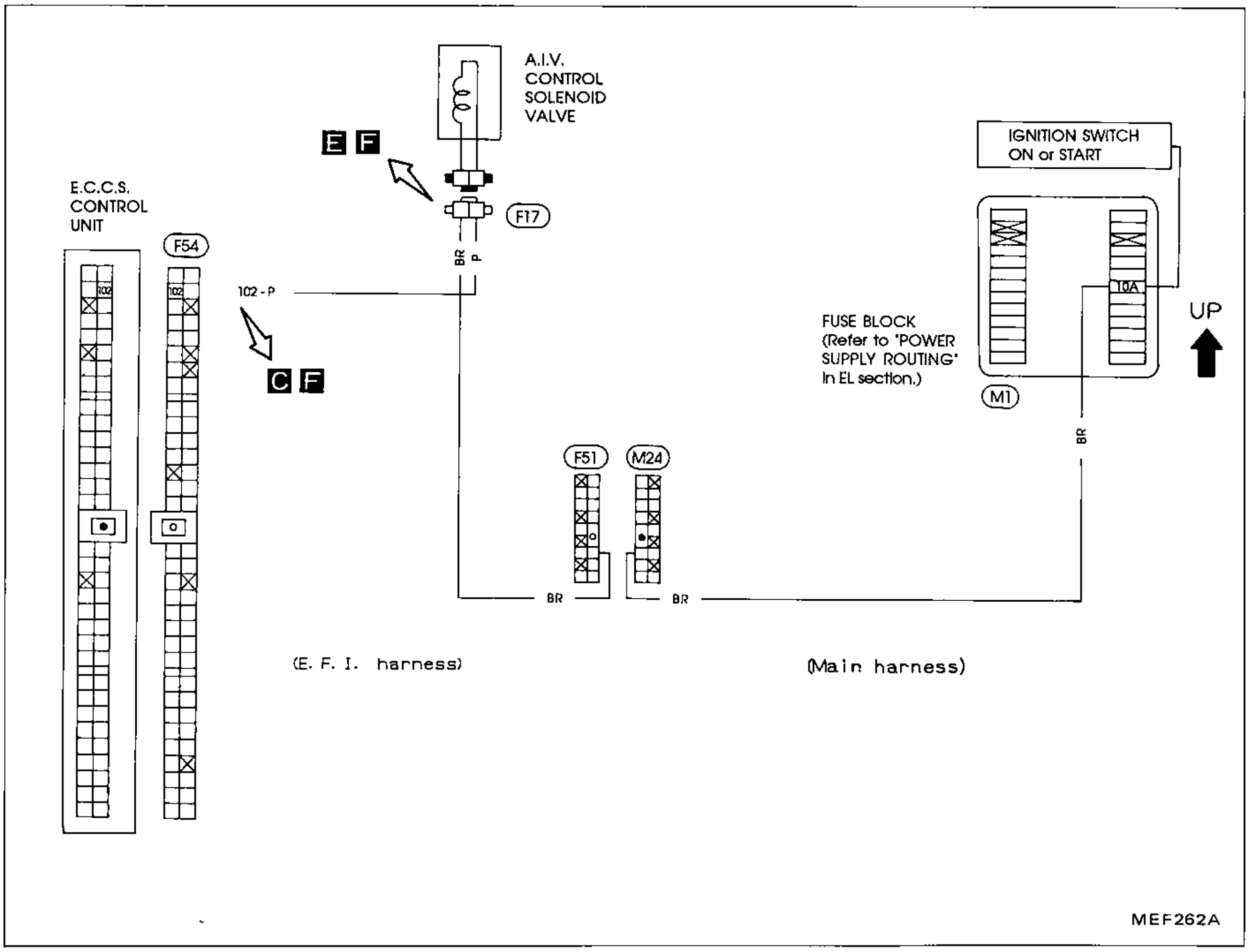
If N.G., repair harness or connectors.

O.K. ↓

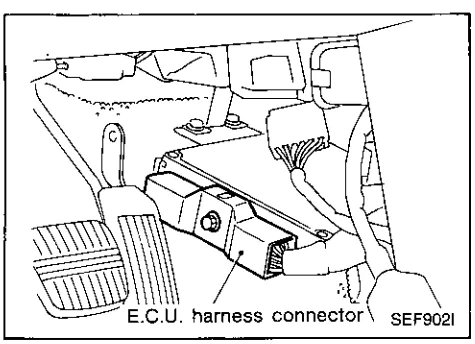
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

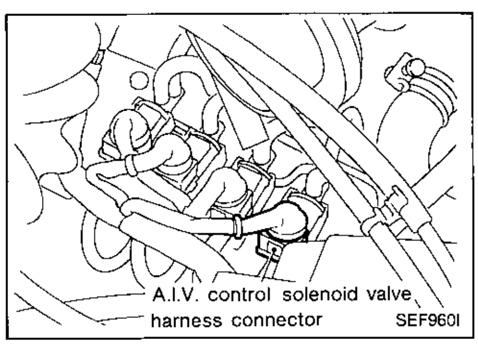
Diagnostic Procedure 37

A.I.V. CONTROL (Not self-diagnostic item)

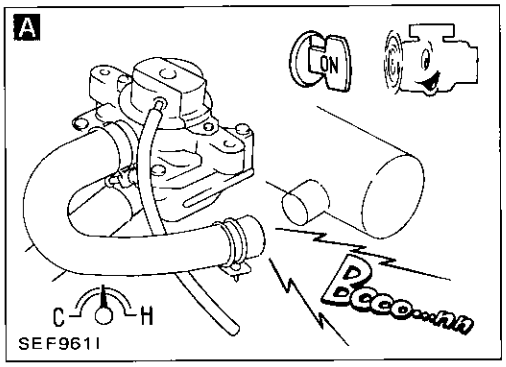


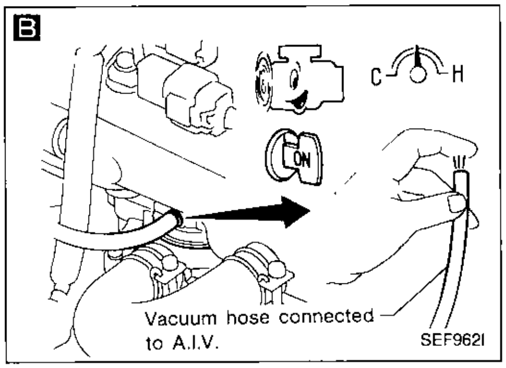
Harness layout

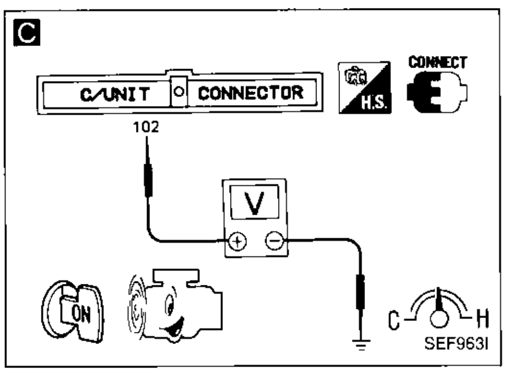


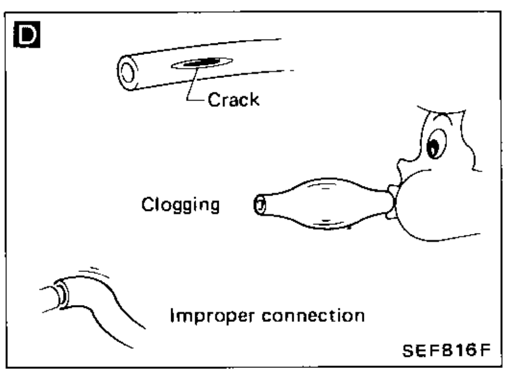


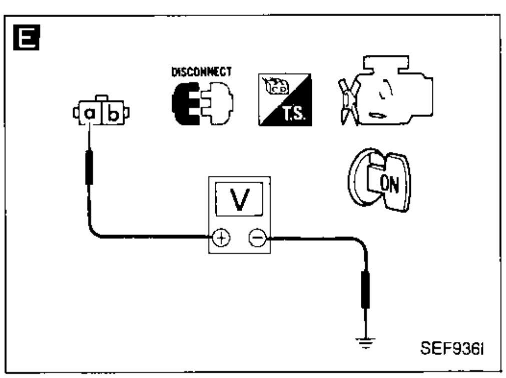
Diagnostic Procedure 37 (Cont'd)











INSPECTION START

↓

A

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Run engine at about 2,000 rpm for about 2 minutes under no-load.
3) Release accelerator pedal fully, and run engine at idle.
4) Listen to A.I.V. operating sound.
At idle and deceleration:
A.I.V. should operate.
Except above: A.I.V. should not operate.

O.K. → INSPECTION END

↓ N.G.

B

CHECK VACUUM SOURCE TO A.I.V.
1) Disconnect vacuum hose to A.I.V.
2) Make sure that vacuum exists under the following conditions.
At idle and deceleration:
Vacuum should exist.
Except above:
Vacuum should not exist.

O.K. → CHECK COMPONENT (A.I.V.). Refer to "Electrical Components Inspection". (See page EF & EC-178.)

↓ N.G.

C

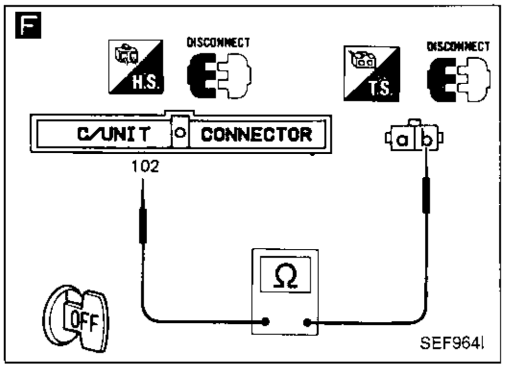
CHECK CONTROL FUNCTION.
1) Check voltage between E.C.U. terminal 102 and ground.
Voltage:
At idle and deceleration
Approximately 0V
Except above
Battery voltage

O.K. → CHECK VACUUM HOSE. Check vacuum hose for clogging, cracks and proper connections.

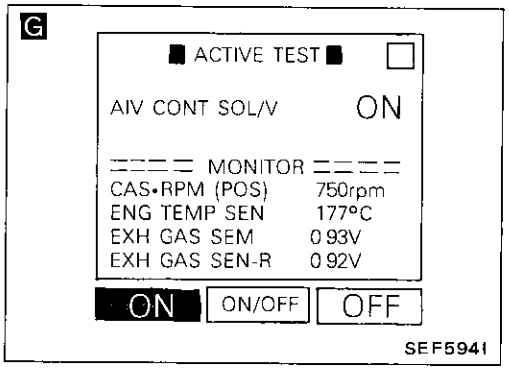
↓ N.G.

Ⓐ

Diagnostic Procedure 37 (Cont'd)



SEF964I



SEF594I

Ⓐ

E

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect A.I.V. control solenoid valve harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. → Check the following:
- Harness connectors (F51), (M24)
- 10A fuse
- Harness continuity between fuse and A.I.V. control solenoid valve

If N.G., repair harness or connectors.

O.K. ↓

F

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal (102) and terminal ⓑ.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

G

CHECK COMPONENT
(A.I.V. control solenoid valve).
1) Reconnect E.C.U. harness connector and A.I.V. control solenoid valve harness connector.
2) Start engine.
3) Perform "A.I.V. CONTROL SOLENOID VALVE TEST" in "ACTIVE TEST" mode with CONSULT.

OR

Refer to "Electrical Components Inspection".
(See page EF & EC-175.)

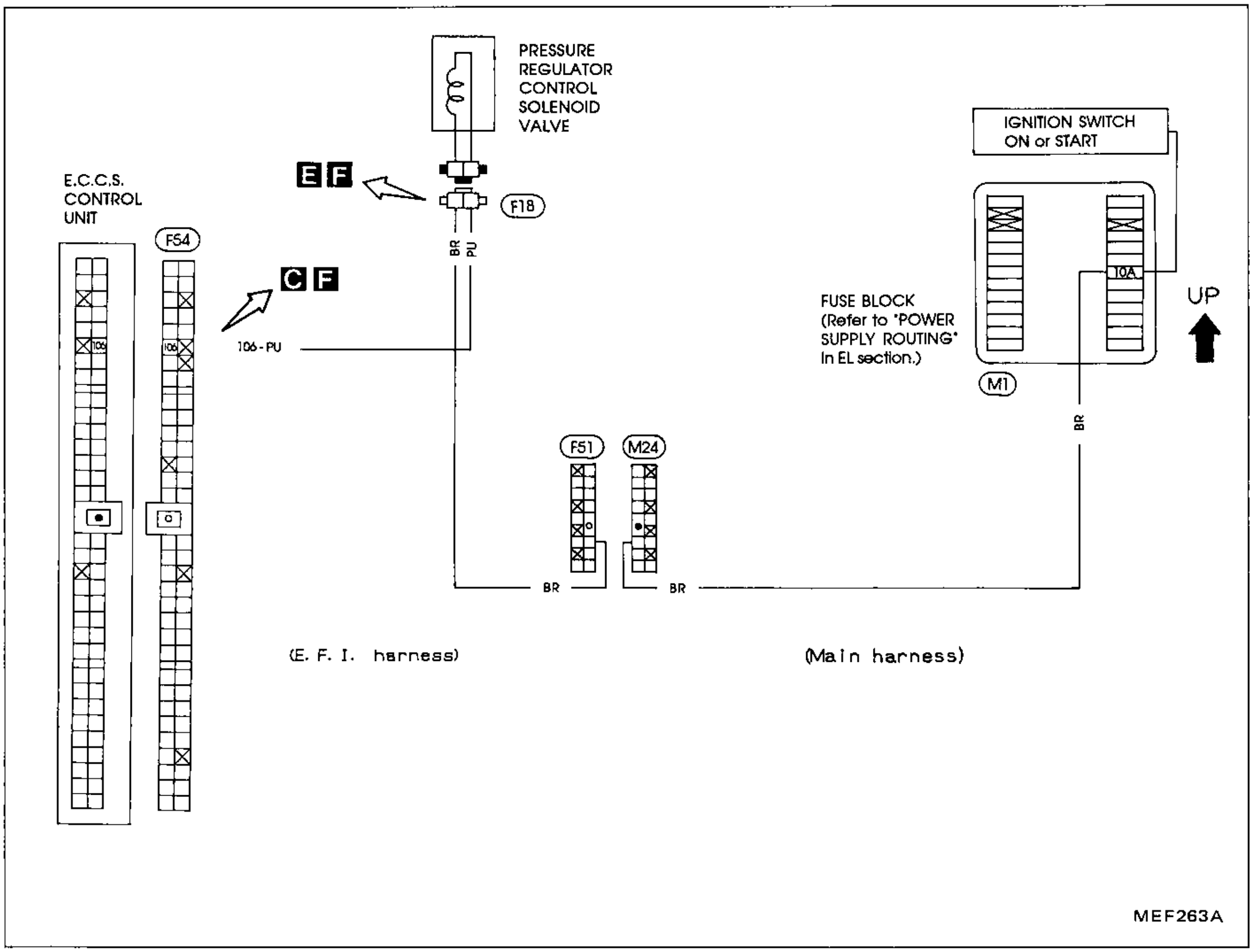
N.G. → Replace A.I.V. control solenoid valve.

O.K. ↓

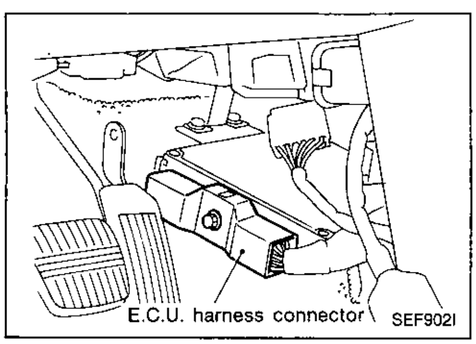
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

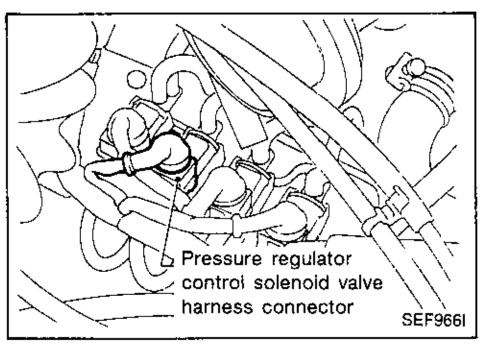
Diagnostic Procedure 38

P.R.V.R. CONTROL (Not self-diagnostic item)

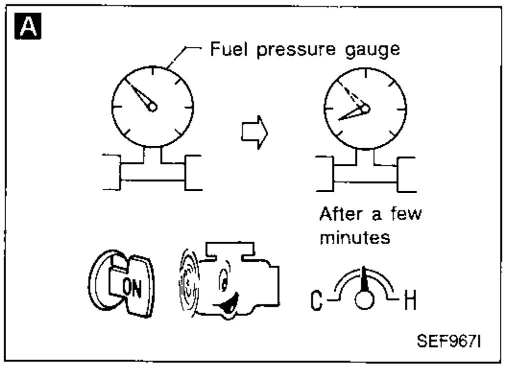


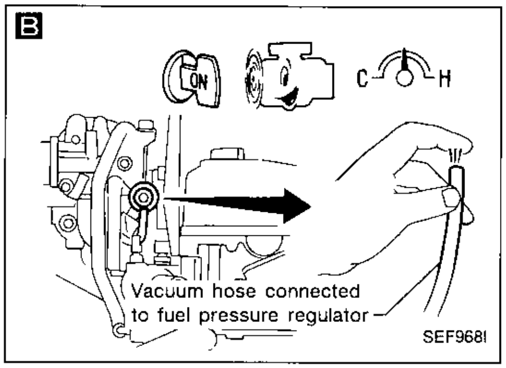
Harness layout

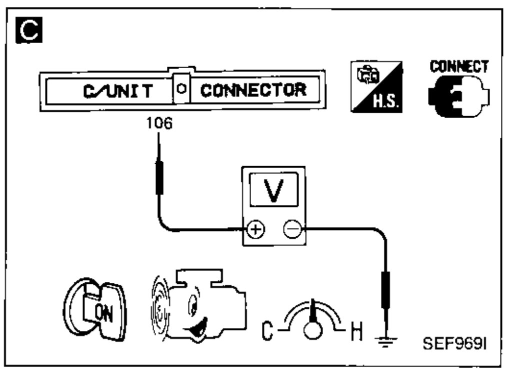


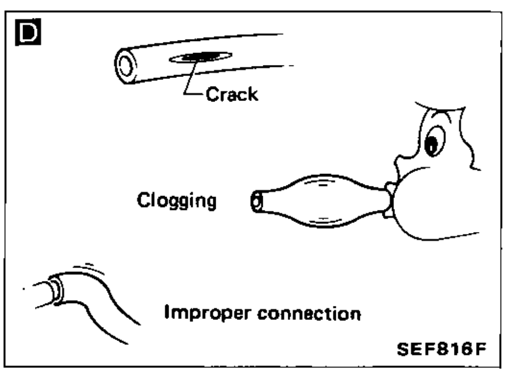


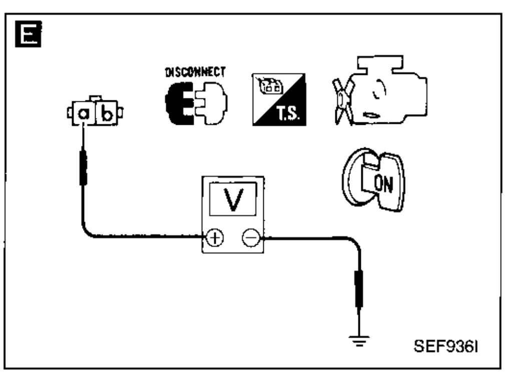
Diagnostic Procedure 38 (Cont'd)











INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Install fuel pressure gauge in fuel feed hose.
(See page EF & EC-179.)
2) Start engine and warm it up sufficiently. (*: See NOTE.)
3) Stop engine.
4) After a few seconds, restart engine and check fuel pressure.
Fuel pressure:
Approximately 294 kPa
(3.0 kg/cm^2, 43 psi)
5) Make sure that fuel pressure decreases after a few minutes.
Fuel pressure:
Approximately 226 kPa
(2.3 kg/cm^2, 33 psi)

O.K. → INSPECTION END

N.G. ↓

B

CHECK VACUUM SOURCE TO FUEL PRESSURE REGULATOR.
1) Stop engine.
2) Disconnect vacuum hose connected to fuel pressure regulator.
3) Restart engine.
4) Make sure that vacuum exists.

O.K. → CHECK COMPONENT (Fuel pressure regulator). Refer to "Fuel Pressure Check". (See page EF & EC-179.)

N.G. ↓

C

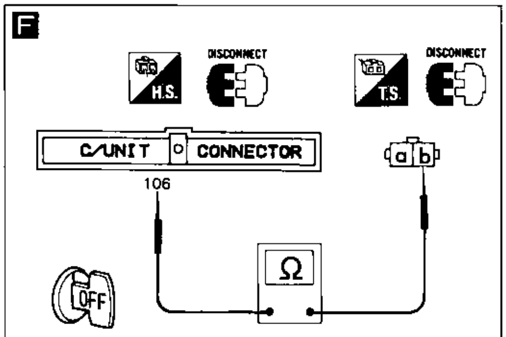
CHECK CONTROL FUNCTION.
1) Stop engine and reconnect vacuum hose to fuel pressure regulator.
2) Restart engine.
3) Check voltage between E.C.U. terminal 106 and ground.
Voltage: Approximately 0V
4) In 3 minutes, recheck voltage between E.C.U. terminal 106 and ground.
Voltage: Battery voltage

O.K. → **D** CHECK VACUUM HOSE.
1) Check vacuum hose for clogging, cracks and proper connections.

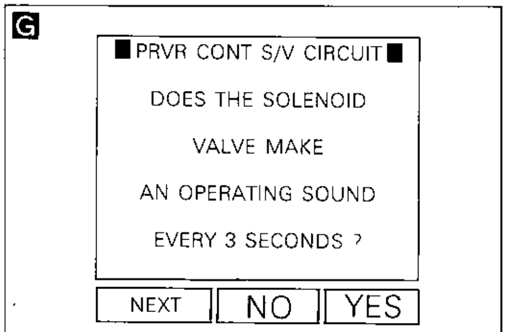
N.G. ↓

Ⓐ

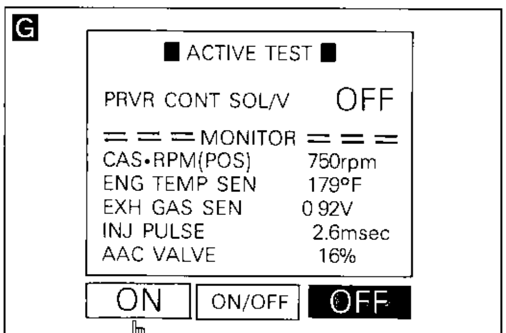
Diagnostic Procedure 38 (Cont'd)



SEF970I



SEF623L



SEF411J

Ⓐ

E

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect pressure regulator control solenoid valve harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

N.G. → Check the following:
- Harness connectors (F51), (M24)
- 10A fuse
- Harness continuity between fuse and pressure regulator control solenoid valve

If N.G., repair harness or connectors.

O.K.

F

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal (106) and terminal ⓑ.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

G

CHECK COMPONENT
(Pressure regulator control solenoid valve).
Perform "P.R.V.R. CONT S/V CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

1) Reconnect E.C.U. harness connector and pressure regulator control solenoid valve harness connector.
2) Start engine.
3) 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-175.)

N.G. → Replace pressure regulator control solenoid valve.

O.K.

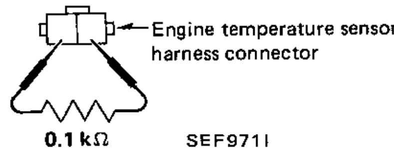
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 38 (Cont'd)

***NOTE**

If engine cannot be warmed up sufficiently for some reason (Extreme cold, etc.), disconnect engine temperature sensor harness connector, and connect a resistor (0.1 kΩ) to engine temperature sensor harness connector.

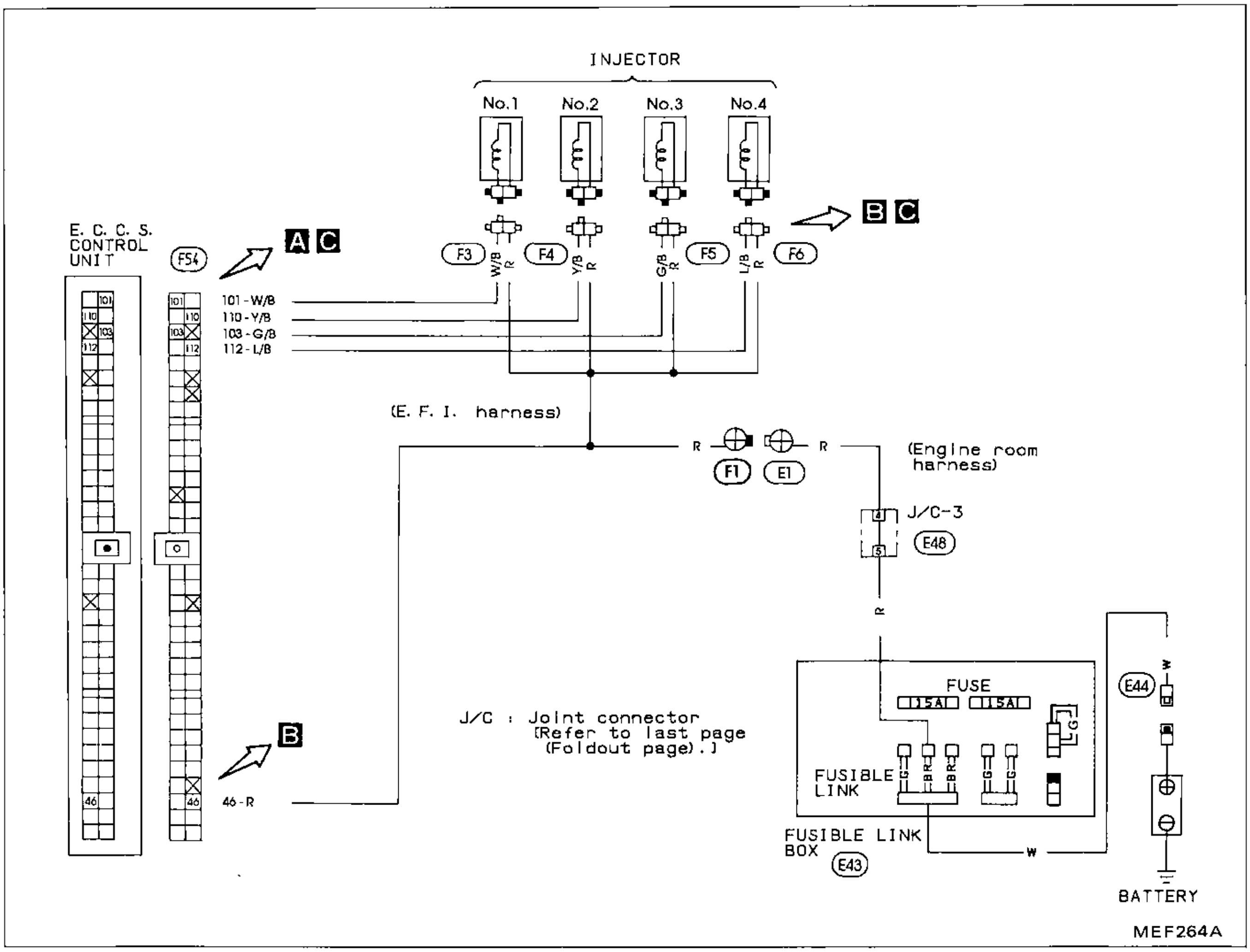
1) **Do not perform this test for a long time.**
2) **Perform self-diagnosis after this test. If code No. 13 is displayed, erase it.**



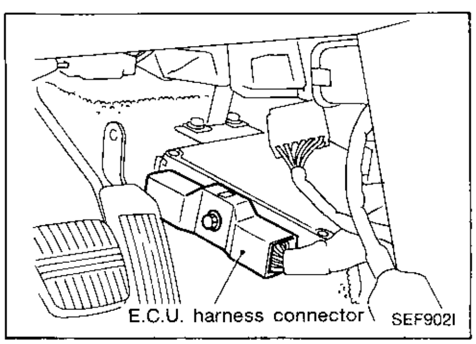
SEF971I

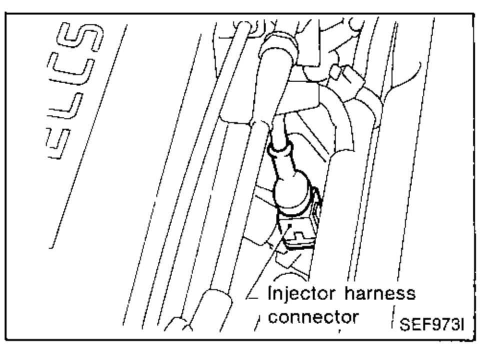
Diagnostic Procedure 39

INJECTOR (Not self-diagnostic item)

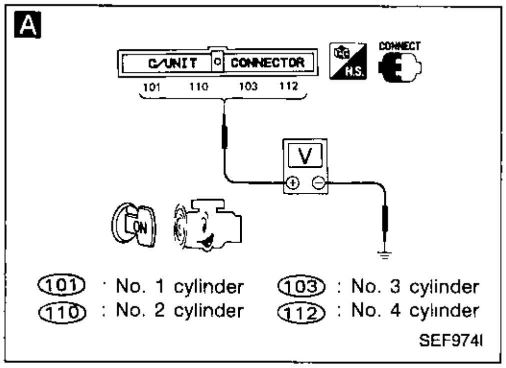


Harness layout

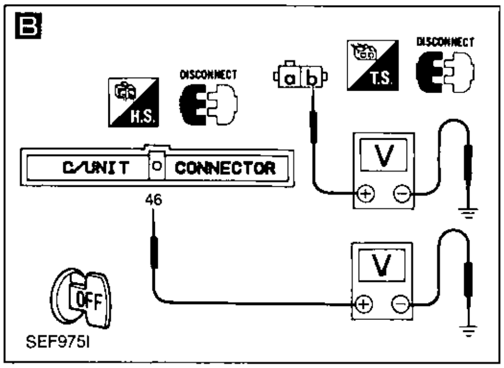




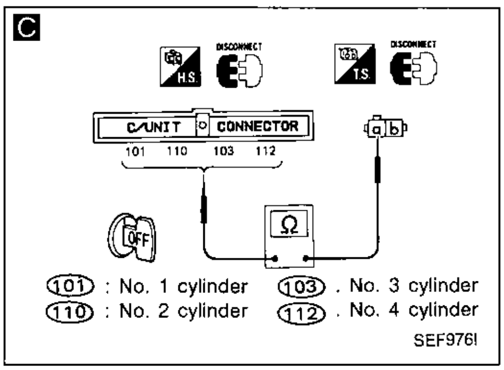
Diagnostic Procedure 39 (Cont'd)



SEF974I



SEF975I



SEF976I

INSPECTION START

↓

A

CHECK CONTROL FUNCTION.
1) Start engine.
2) Check voltage between E.C.U. terminals 101, 110, 103, 112 and ground.
Voltage: Battery voltage

O.K. → INSPECTION END

N.G. ↓

B

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect injector harness connector and E.C.U. harness connector.
3) Check voltage between terminal ⓑ and ground, E.C.U. terminal 46 and ground.
Voltage: Battery voltage

N.G. → Check the following:
- Harness connectors F1, E1
- Joint connector-3 E48
- "BR" fusible link
- Harness continuity between battery and injector
- Harness continuity between battery and E.C.U.

If N.G., repair harness or connectors.

O.K. ↓

C

CHECK OUTPUT SIGNAL CIRCUIT.
1) Check harness continuity between terminal ⓐ and E.C.U. terminals 101, 110, 103, 112
Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

CHECK COMPONENT (Injector).
Refer to "Electrical Components Inspection".
(See page EF & EC-177.)

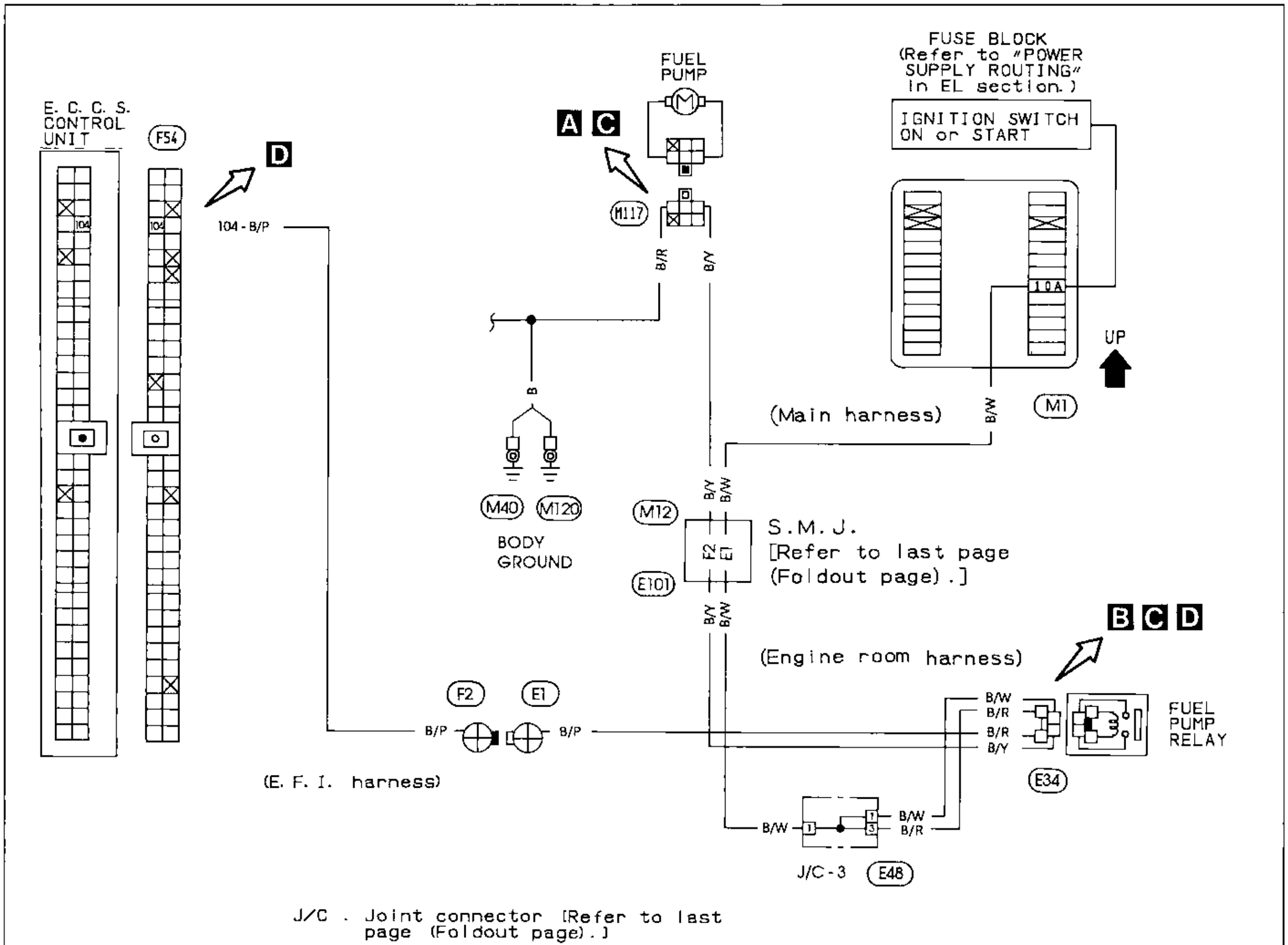
N.G. → Replace injector.

O.K. ↓

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

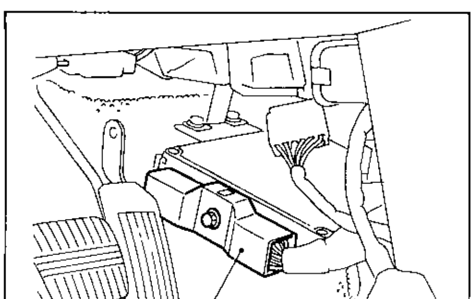
Diagnostic Procedure 40

FUEL PUMP (Not self-diagnostic item)

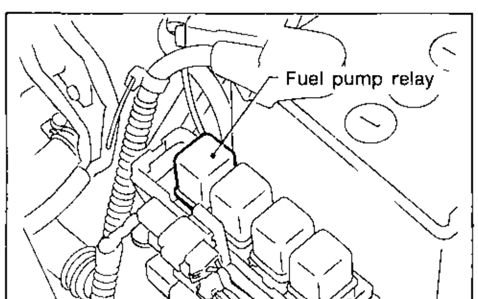


SEF584L

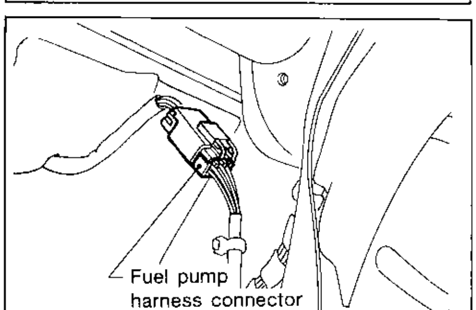
Harness layout



SEF902I

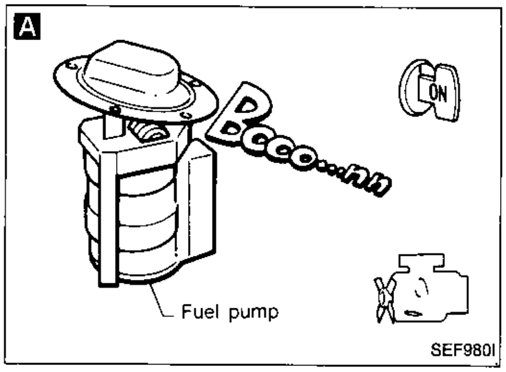


SEF978I

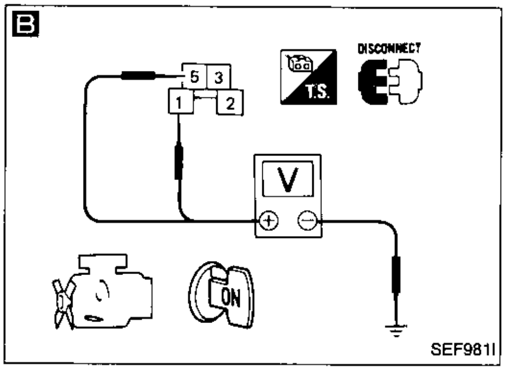


SEF979I

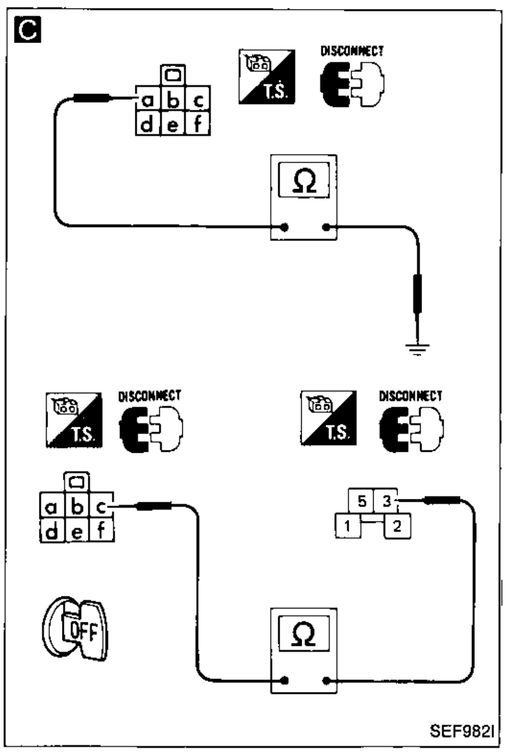
Diagnostic Procedure 40 (Cont'd)



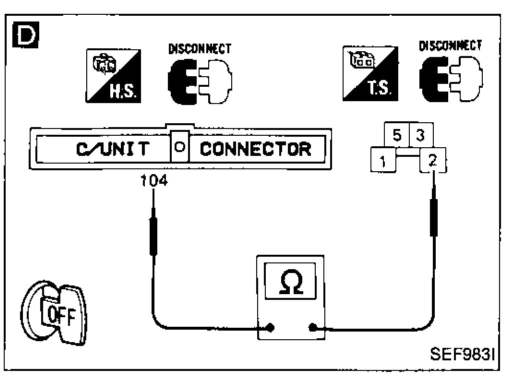
SEF980I



SEF981I



SEF982I



SEF983I

INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Turn ignition switch "ON".
2) Listen to fuel pump operating sound.
Fuel pump should operate for 5 seconds after ignition switch is turned "ON".

O.K. → INSPECTION END

N.G. ↓

B

CHECK POWER SUPPLY.
1) Turn ignition switch "OFF".
2) Disconnect fuel pump relay.
3) Turn ignition switch "ON".
4) Check voltage between terminals 1, 5 and ground.
Voltage: Battery voltage

N.G. → Check the following:
- S.M.J. connectors (E101), (M12)
- Joint connector-3 (E48)
- 10A fuse
- Harness continuity between fuse and fuel pump relay

If N.G., repair harness or connectors.

O.K. ↓

C

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect fuel pump harness connector.
3) Check harness continuity between terminal a and body ground, terminal c and terminal 3.
Continuity should exist.

N.G. → Check the following:
- S.M.J. connectors (E101), (M13)
- Harness continuity between fuel pump and body ground
- Harness continuity between fuel pump and fuel pump relay

If N.G., repair harness or connectors.

O.K. ↓

D

CHECK OUTPUT SIGNAL CIRCUIT.
1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal 104 and terminal 2.
Continuity should exist.

N.G. → Check the following:
- Harness connectors (F1), (E1)
- Harness continuity between E.C.U. and fuel pump relay

If N.G., repair harness or connectors.

O.K. ↓

A

Diagnostic Procedure 40 (Cont'd)

Ⓐ

CHECK COMPONENTS
(Fuel pump and fuel pump relay).
1) Reconnect fuel pump relay, fuel pump harness connector and E.C.U. harness connector.
2) Ignition switch "ON".
3) Perform "FUEL PUMP CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

Refer to "Electrical Components Inspection".
(See page EF & EC-176, 177.)

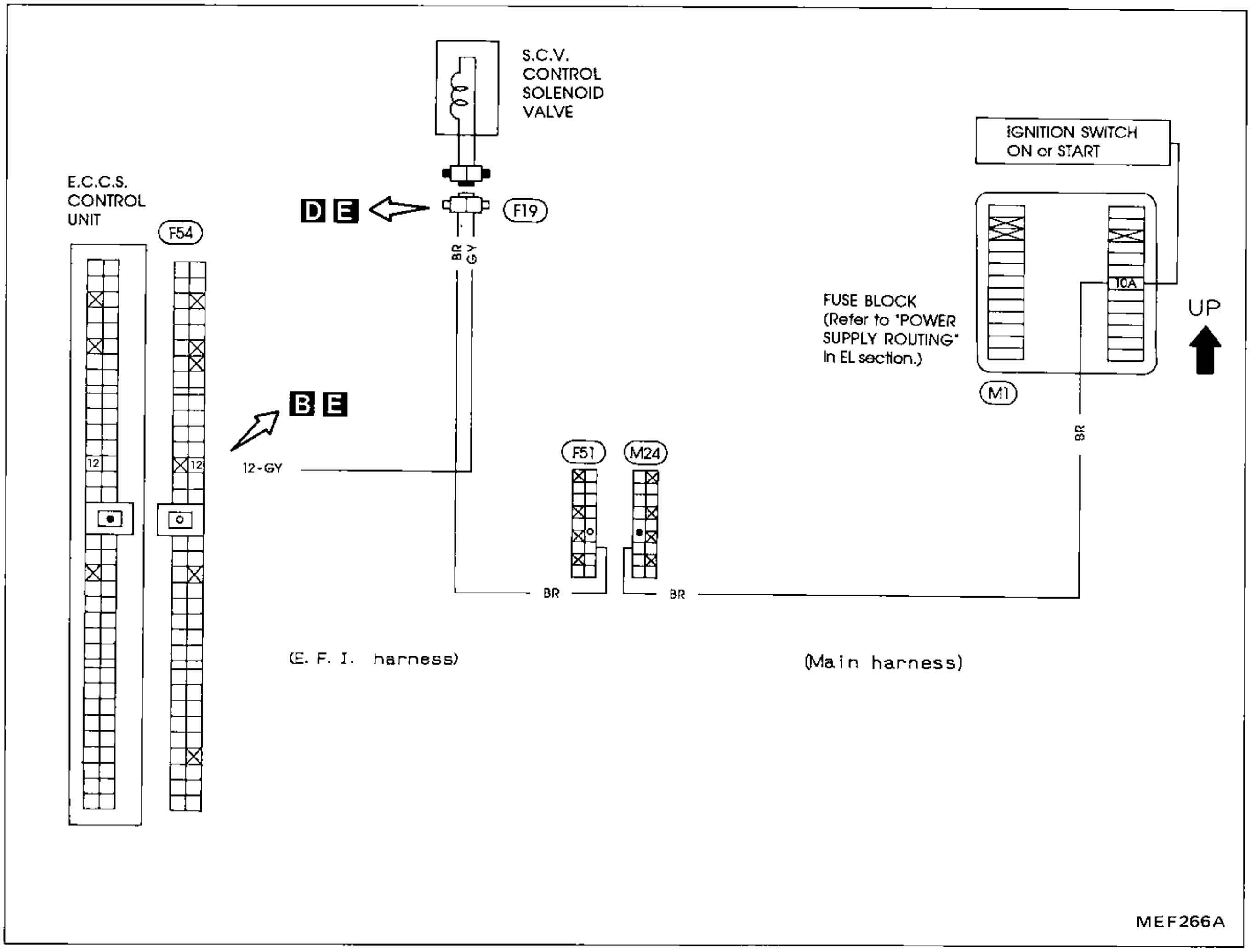
N.G. → Replace malfunctioning component(s).

O.K. ↓

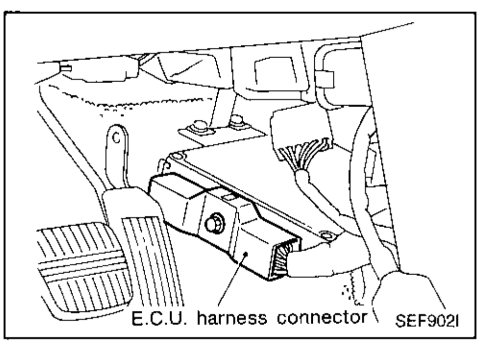
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

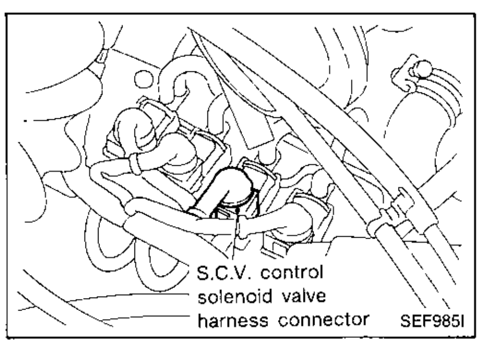
Diagnostic Procedure 41

S.C.V. CONTROL (Not self-diagnostic item)

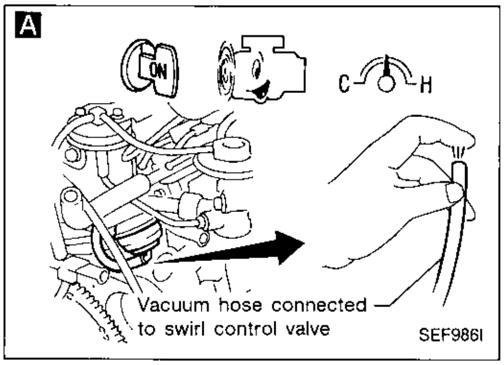


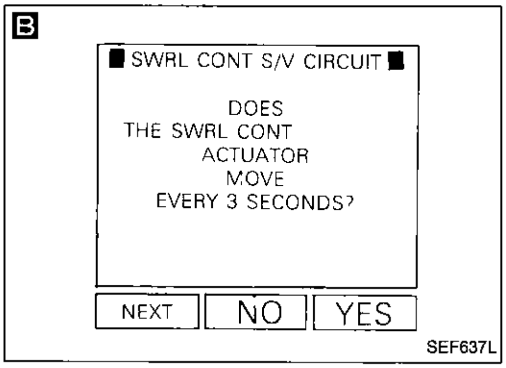
Harness layout

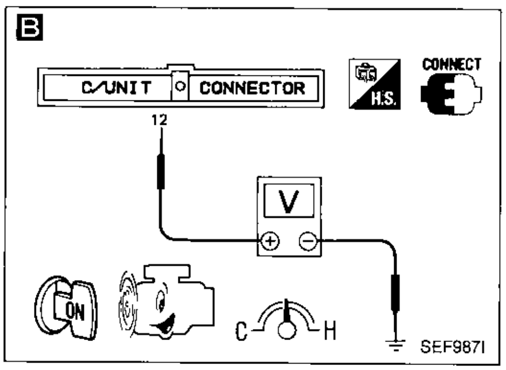


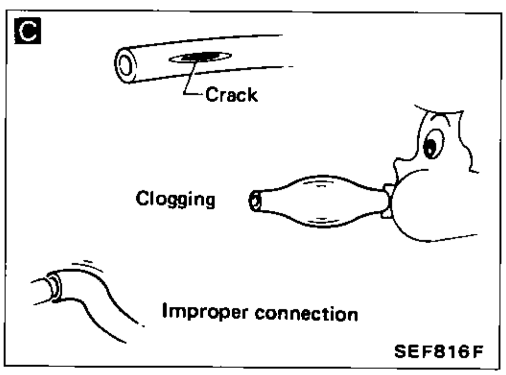


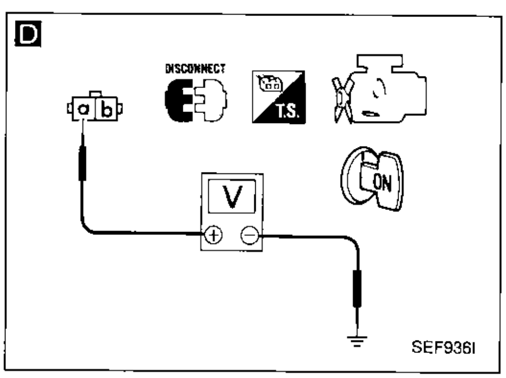
Diagnostic Procedure 41 (Cont'd)











INSPECTION START

A

CHECK VACUUM SOURCE TO SWIRL CONTROL VALVE.
1) Start engine and warm it up sufficiently.
2) Stop engine.
3) After a few seconds, disconnect vacuum hose to swirl control valve and restart engine.
4) Make sure that vacuum exists under the following conditions.
Engine speed is less than 1,800 rpm (M/T) or 1,500 rpm (A/T):
Vacuum should exist.
Engine speed is more than 1,800 rpm (M/T) or 1,500 rpm (A/T)
Vacuum should not exist.

O.K. → INSPECTION END

N.G. ↓

B

CHECK CONTROL FUNCTION.
1) Turn ignition switch "ON".
2) Perform "SWRL CONT S/V CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

1) Check voltage between E.C.U. terminal ⑫ and ground.
Voltage:
Engine speed is less than 1,800 rpm (M/T) or 1,500 rpm (A/T):
Approximately 0V
Engine speed is more than 1,800 rpm (M/T) or 1,500 rpm (A/T)
Battery voltage

O.K. → **C**

CHECK VACUUM HOSE AND SWIRL CONTROL VALVE.
1) Check vacuum hose and swirl control valve for clogging, cracks and proper connection.

N.G. ↓

D

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect S.C.V. control solenoid valve harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

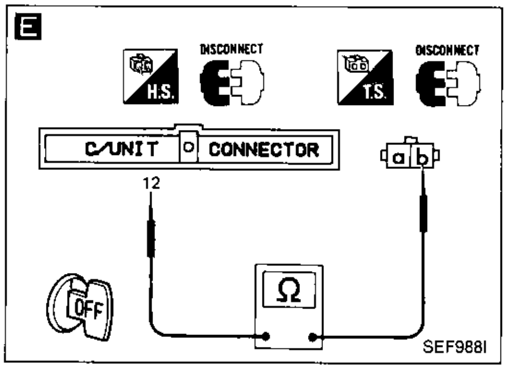
N.G. → Check the following:
- Harness connectors (F51), (M24)
- 10A fuse
- Harness continuity between fuse and S.C.V. control solenoid valve

If N.G., repair harness or connectors.

O.K. ↓

Ⓐ

Diagnostic Procedure 41 (Cont'd)



SEF988I

E

Ⓐ

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal ⑫ and terminal ⓑ.
Continuity should exist.

- N.G. → Repair harness or connectors.
- O.K. ↓

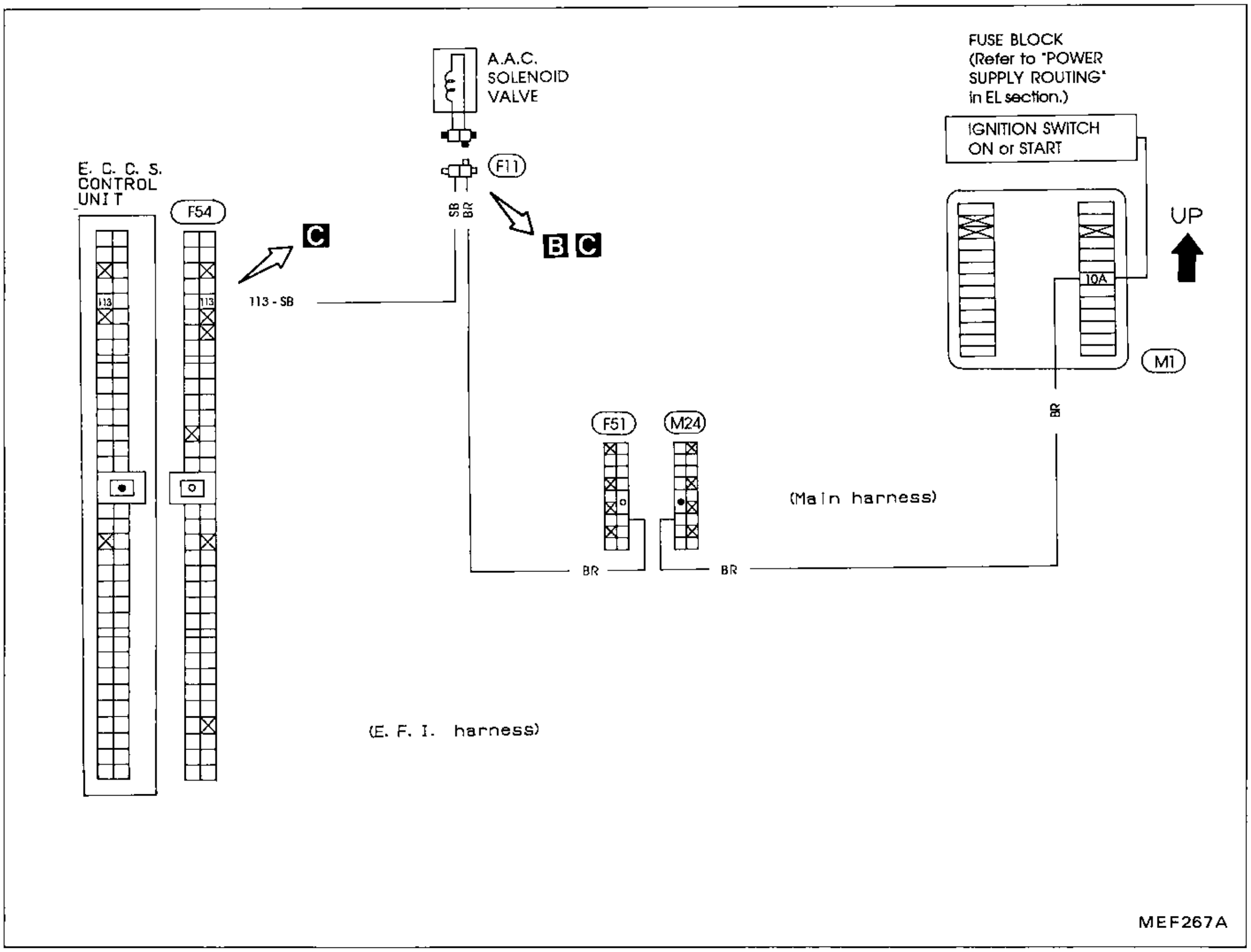
CHECK COMPONENT
(S.C.V. control solenoid valve).
Refer to "Electrical Components Inspection".
(See page EF & EC-175.)

- N.G. → Replace S.C.V. control solenoid valve.
- O.K. ↓

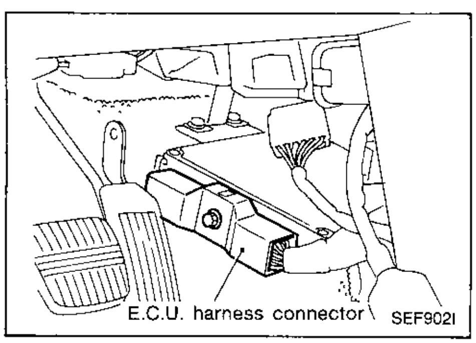
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

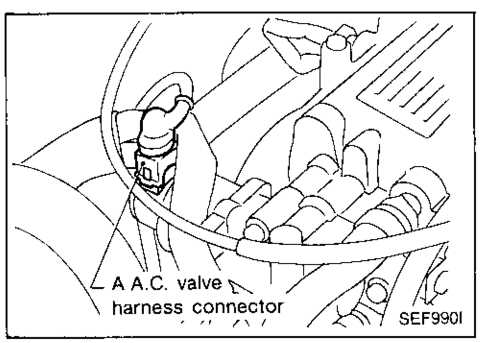
Diagnostic Procedure 42

A.A.C. VALVE (Not self-diagnostic item)

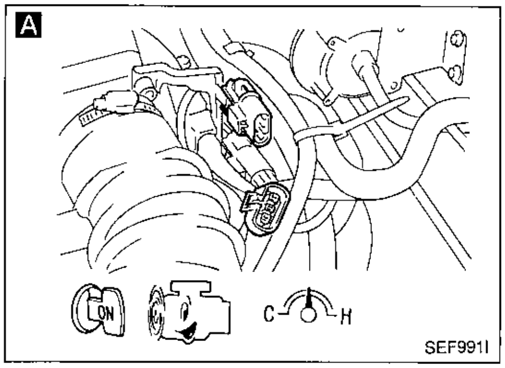


Harness layout

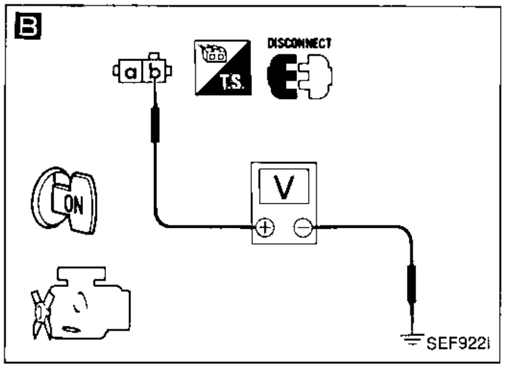




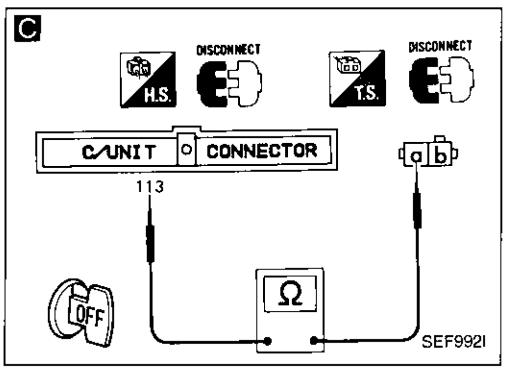
Diagnostic Procedure 42 (Cont'd)



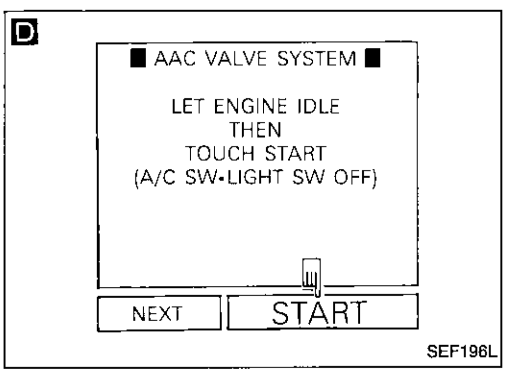
SEF991I



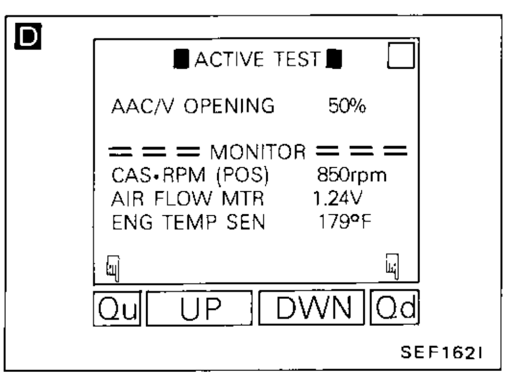
SEF922I



SEF992I



SEF196L



SEF162I

INSPECTION START

↓

A CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Check idle speed.
M/T: 700±50 rpm*1
750±50 rpm*2
A/T: 700±50 rpm*1
750±50 rpm *2
***1 U.S.A.**
***2 Canada**
If N.G., adjust idle speed.
3) Disconnect throttle sensor harness connector.
4) Make sure that idle speed drops.

→ Drops. → INSPECTION END

↓ Does not drop.

CHECK COMPONENT
(Throttle sensor)
Refer to "Electrical Components Inspection".
(See page EF & EC-176.)

→ N.G. → Replace throttle sensor.

↓ O.K.

B CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect A.A.C. valve harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage

→ N.G. → Check the following:
- Harness connectors (F51), (M24)
- 10A fuse
- Harness continuity between A.A.C. valve and fuse

If N.G., repair harness or connectors.

↓ O.K.

C CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal (113) and terminal ⓐ.
Continuity should exist.

→ N.G. → Repair harness or connectors.

↓ O.K.

Ⓐ

Diagnostic Procedure 42 (Cont'd)

Ⓐ

D

CHECK COMPONENT
(A.A.C. valve).

1) Reconnect E.C.U. harness connector and A.A.C. valve harness connector.
2) Start engine.
3) Perform "AAC VALVE SYSTEM" in "FUNCTION TEST" mode with CONSULT.

OR

3) Perform "AAC VALVE OPENING TEST" in "ACTIVE TEST" mode with CONSULT.

OR

Refer to "Electrical Components Inspection".
(See page EF & EC-177.)

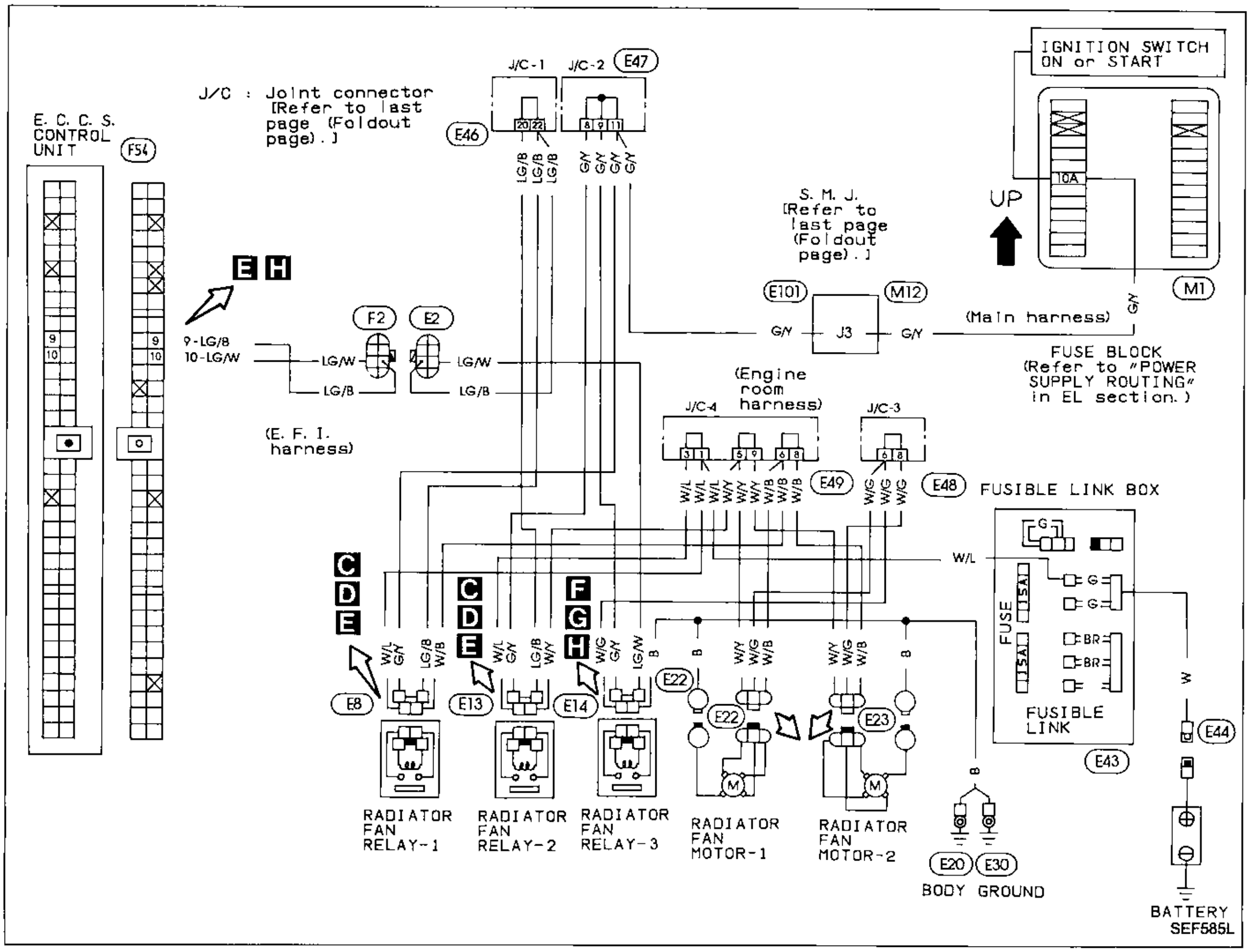
N.G. → Replace A.A.C. valve.

O.K. ↓

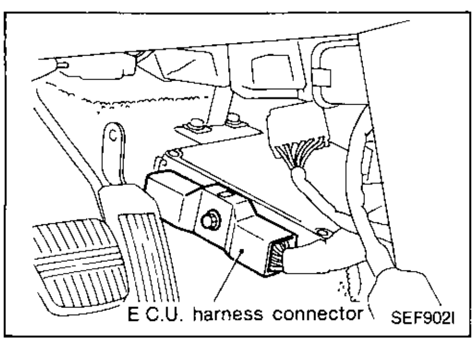
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

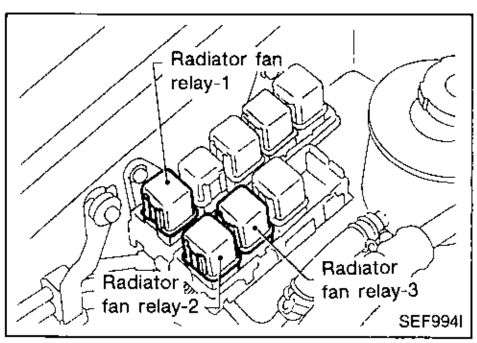
Diagnostic Procedure 43

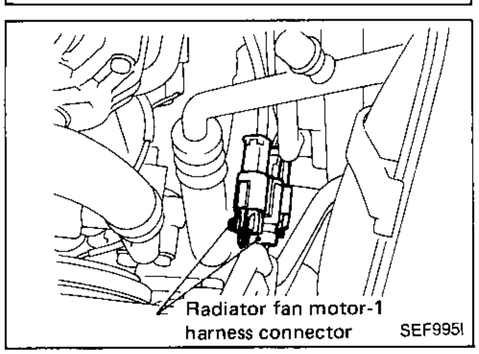
RADIATOR FAN CONTROL (Not self-diagnostic item)

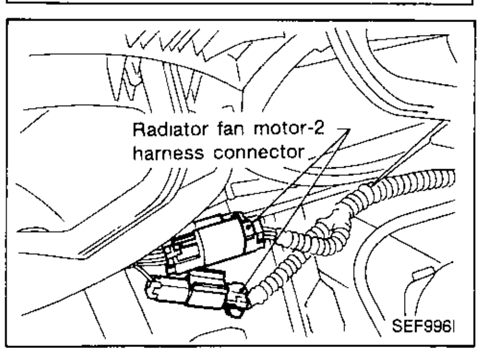


Harness layout

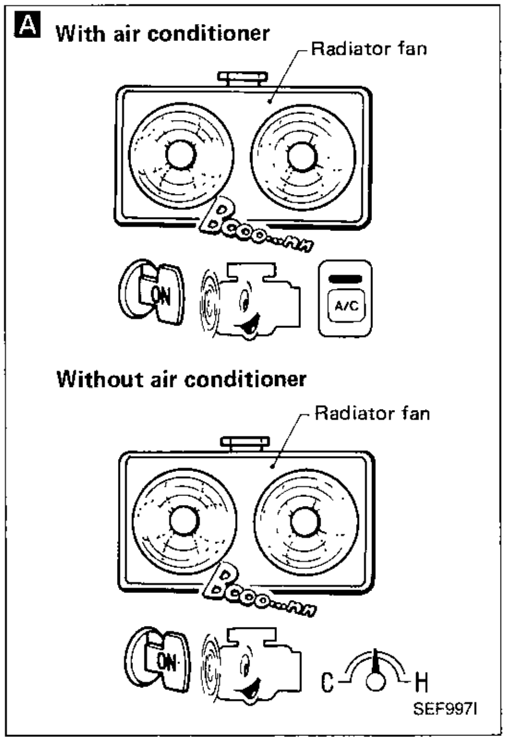


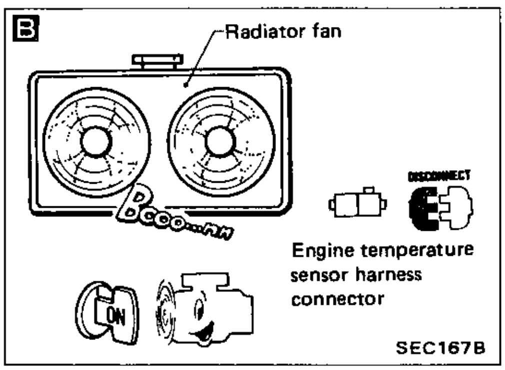






Diagnostic Procedure 43 (Cont'd)





INSPECTION START

↓

A

CHECK RADIATOR FAN LOW SPEED OPERATION.

With air conditioner

1) Start engine.
2) Set temperature lever at full cold position.
3) Turn air conditioner switch "ON".
4) Turn blower fan switch "ON".
5) Run engine at idle for a few minutes with air conditioner operating.
6) Make sure that radiator fan operates at low speed.

Without air conditioner

1) Start engine.
2) Keep engine speed at about 2,000 rpm until engine is warmed up sufficiently.
3) Make sure that radiator fan begins to operate at low speed during warm-up.

N.G. → Check radiator fan low speed control circuit. (Go to PROCEDURE A.)

↓ O.K.

B

CHECK RADIATOR FAN HIGH SPEED OPERATION.

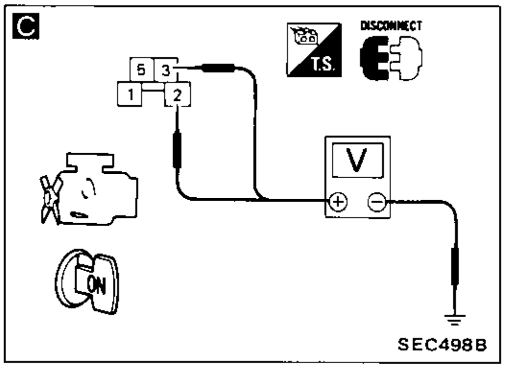
1) Turn air conditioner switch "OFF".
2) Turn blower fan switch "OFF". (Step 1) and 2) are only performed for model with air conditioner.)
3) Stop engine.
4) Disconnect engine temperature sensor harness connector.
5) Restart engine and make sure that radiator fan operates at high speed.

N.G. → Check radiator fan high speed control circuit. (Go to PROCEDURE B.)

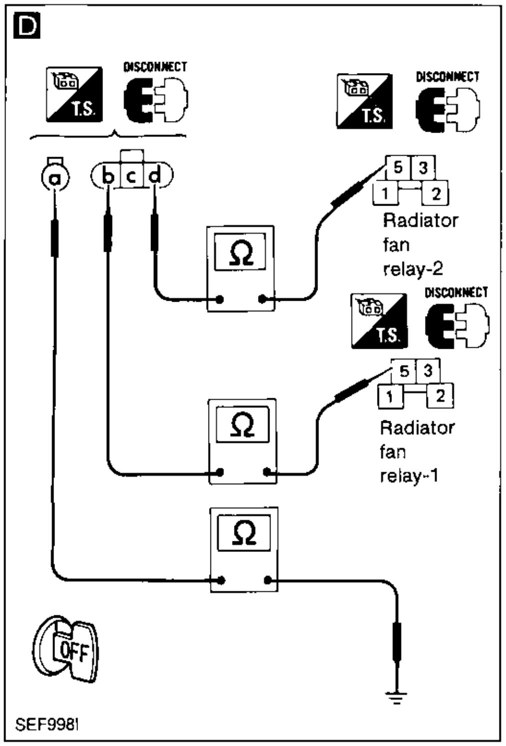
↓ O.K.

INSPECTION END

Diagnostic Procedure 43 (Cont'd)



SEC498B



SEF998I

PROCEDURE A

INSPECTION START

↓

C CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect radiator fan relay-1 and -2.
3) Turn ignition switch "ON".
4) Check voltage between terminals 2, 3 and ground.
Voltage: Battery voltage

N.G. → Check the following:
- Joint connector-2 (E47), -4 (E49)
- S.M.J. connectors (E101), (M12)
- "G" fusible link
- 10A fuse
- Harness continuity between battery and radiator fan relay- 1, -2
- Harness continuity between fuse and radiator fan relay-1, -2

If N.G., repair harness or connectors.

O.K. ↓

D CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect radiator fan motor-1 harness connector and radiator fan motor-2 harness connector.
3) Check harness continuity between terminal b and terminal 5 (radiator fan relay-1), terminal d and terminal 5 (radiator fan relay-2), terminal a and body ground.
Continuity should exist.

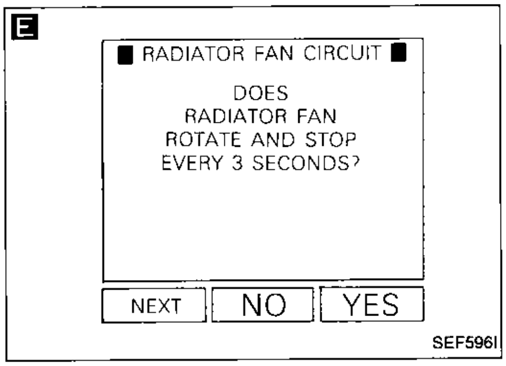
N.G. → Check the following:
- Joint connector-4 (E49)
- Harness continuity between radiator fan relay-1 and radiator fan motor-1, -2
- Harness continuity between radiator fan relay-2 and radiator fan motor-1, -2
- Harness continuity between radiator fan motor-1, -2 and body ground

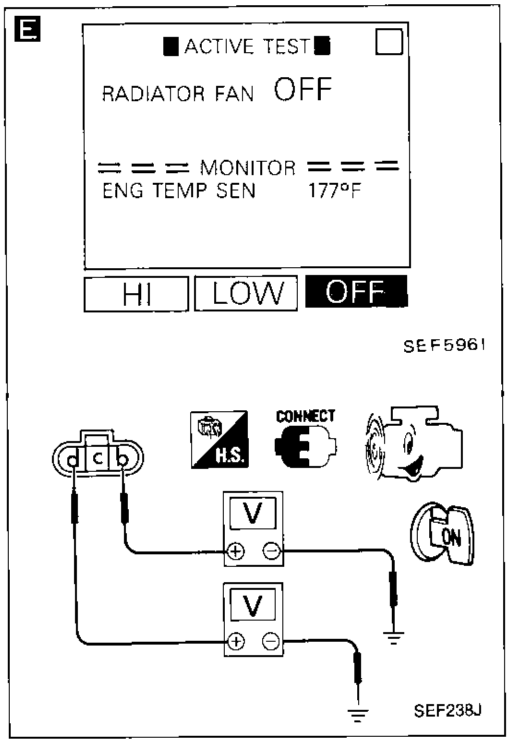
If N.G., repair harness or connectors.

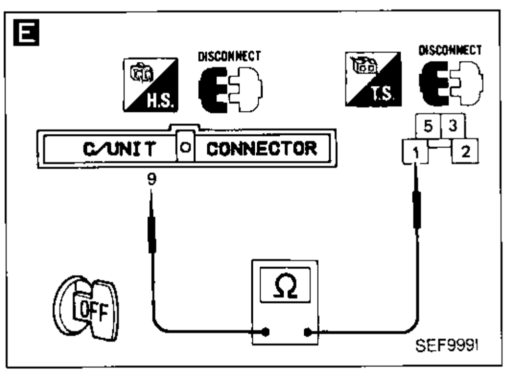
O.K. ↓

A

Diagnostic Procedure 43 (Cont'd)







Ⓐ

E

CHECK OUTPUT SIGNAL CIRCUIT.

1) Reconnect radiator fan relay-1 and -2, radiator fan motor-1 harness connector and radiator fan motor-2 harness connector.
2) Start engine.
3) Turn radiator fan relay "ON" in "ACTIVE TEST" mode with CONSULT.
4) Check voltage between terminals ⓑ, ⓓ and ground.
Voltage:
Battery voltage

OR

1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal ⑨ and terminal ①.
Continuity should exist.

N.G. → Check the following:
- Harness connectors (F2), (E2)
- Joint connector-1 (E46)
- Harness continuity between E.C.U. and radiator fan relay- 1, -2

If N.G., repair harness or connectors.

CHECK COMPONENTS (Radiator fan relay-1 and -2). Perform "RADIATOR FAN TEST CIRCUIT" in "ACTIVE TEST" mode with CONSULT.

OR

Perform "RADIATOR FAN TEST" in "ACTIVE TEST" mode with CONSULT.
If N.G., replace malfunctioning component(s).

O.K. ↓

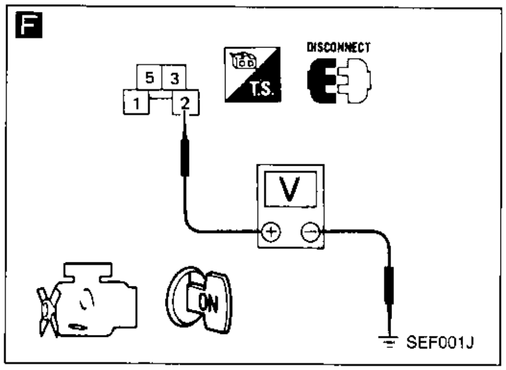
CHECK COMPONENTS
(Radiator fan relay-1, -2, radiator fan motor-1 and -2).
Refer to "Electrical Components Inspection".
(See page EF & EC-177.)

N.G. → Replace malfunctioning component(s).

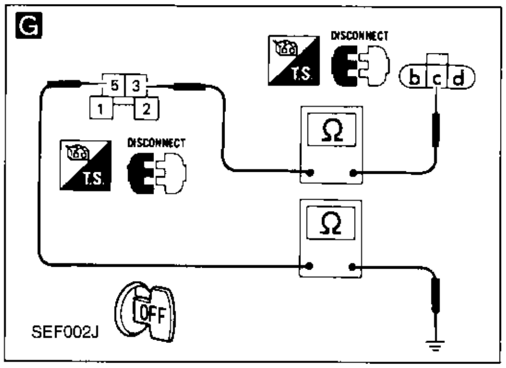
O.K. ↓

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

Diagnostic Procedure 43 (Cont'd)



SEF001J



SEF002J

PROCEDURE B

INSPECTION START

↓ F

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect radiator fan relay-3.
3) Turn ignition switch "ON".
4) Check voltage between terminal ② and ground.
Voltage: Battery voltage

N.G. → Check the following:
- Joint connector-2 (E47)
- S.M.J. connectors (E101), (M12)
- 10A fuse
- Harness continuity between fuse and radiator fan relay-3

If N.G., repair harness or connectors.

O.K. ↓ G

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect radiator fan motor-1 harness connector and radiator fan motor-2 harness connector.
3) Check harness continuity between terminal ⓒ and terminal ③, terminal ⑤ and body ground.
Continuity should exist.

N.G. → Check the following:
- Joint connector-3 (E48)
- Harness continuity between radiator fan relay-3 and radiator fan motor-1, -2
- Harness continuity between radiator fan relay-3 and body ground

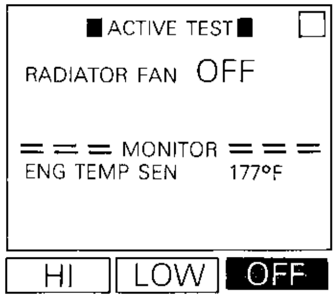
If N.G., repair harness or connectors.

O.K. ↓

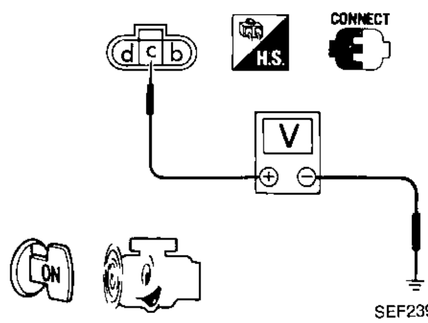
Ⓐ

Diagnostic Procedure 43 (Cont'd)

H

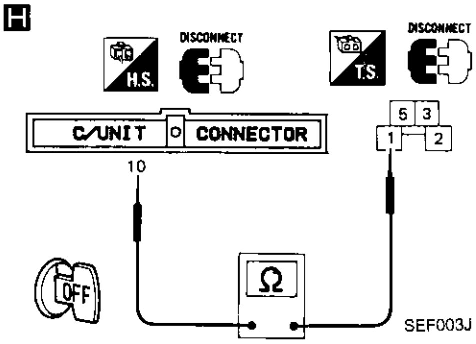


SEF596I



SEF239J

H



SEF003J

H

Ⓐ

CHECK OUTPUT SIGNAL CIRCUIT.

1) Reconnect radiator fan relay-3, radiator fan motor-1 harness connector and radiator fan motor-2 harness connector.
2) Start engine.
3) Turn radiator fan relay "ON" in "ACTIVE TEST" mode with CONSULT.
4) Check voltage between terminal ⓒ and ground.
Voltage:
Approximately 0V

— OR —

1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal ⑩ and terminal ①.
Continuity should exist.

N.G. → Check the following:
- Harness connectors (F2), (E2)
- Harness continuity between E.C.U. and radiator fan relay- 3

If N.G., repair harness or connectors.

CHECK COMPONENT (Radiator fan relay-3)
Perform "RADIATOR FAN TEST" in "ACTIVE TEST" mode with CONSULT.
If N.G., replace radiator fan relay-3.

O.K. ↓

CHECK COMPONENTS
(Radiator fan relay-3, radiator fan motor-1 and -2).
Refer to "Electrical Components Inspection".
(See page EF & EC-177.)

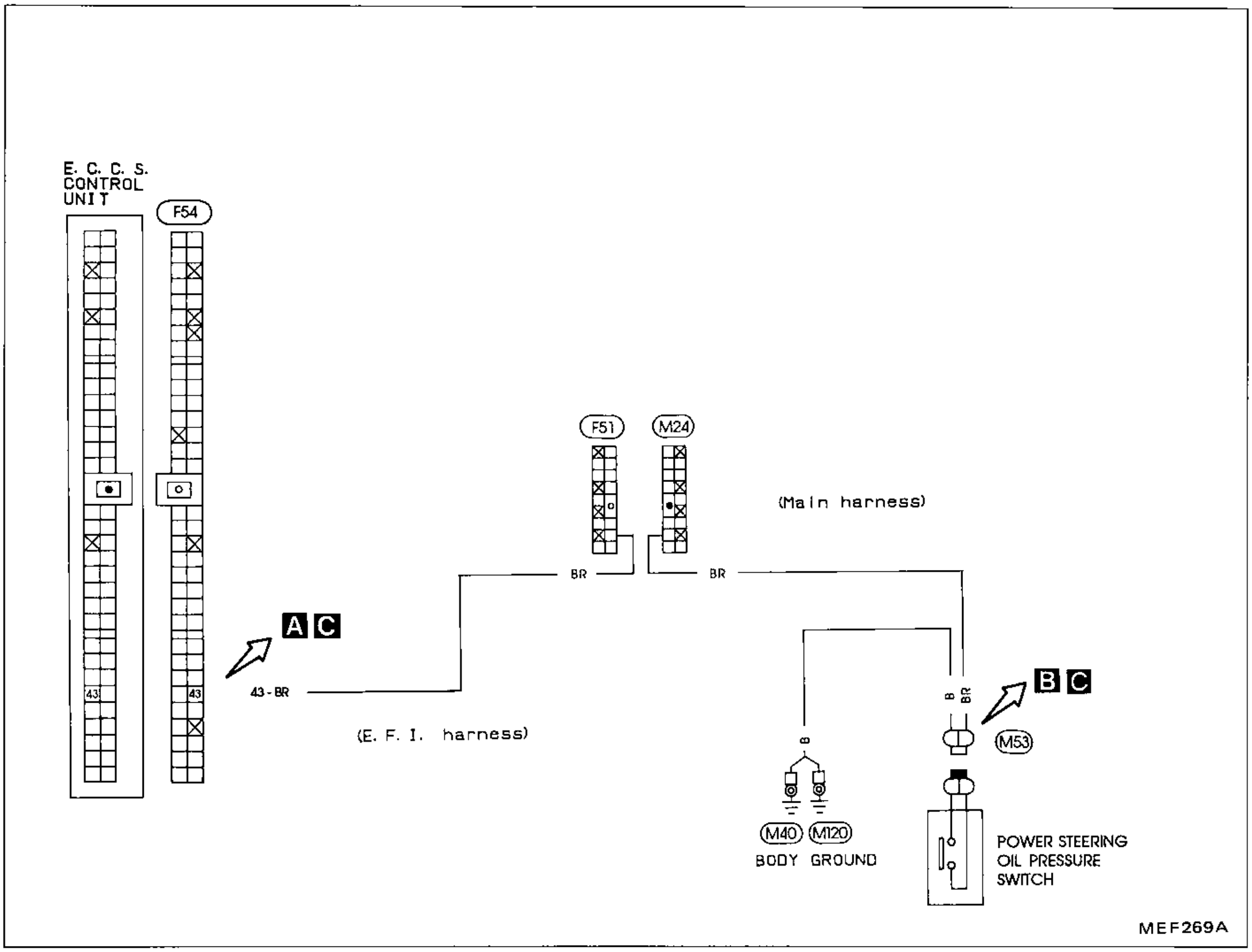
N.G. → Replace malfunctioning component(s).

O.K. ↓

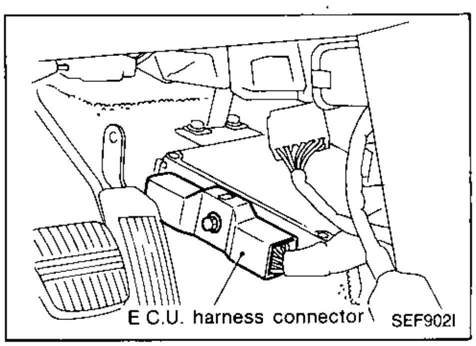
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

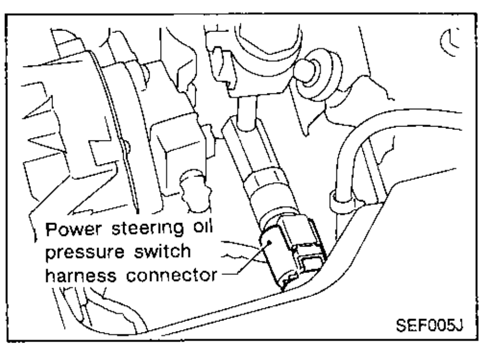
Diagnostic Procedure 44

POWER STEERING OIL PRESSURE SWITCH (Not self-diagnostic item)

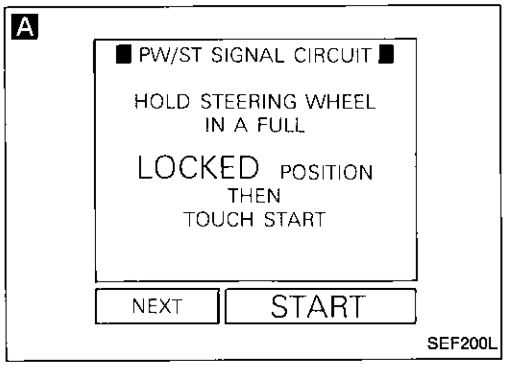


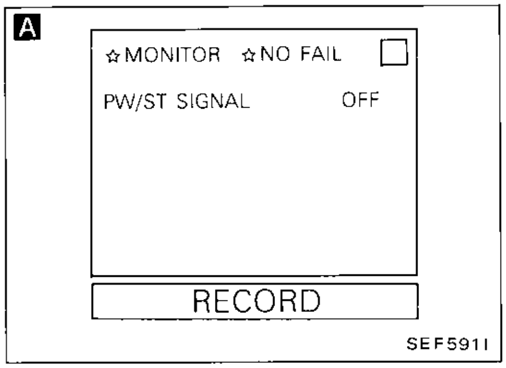
Harness layout

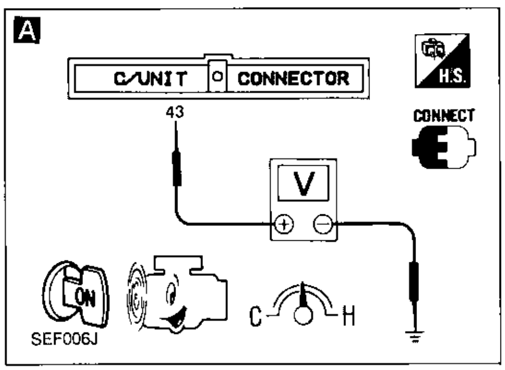


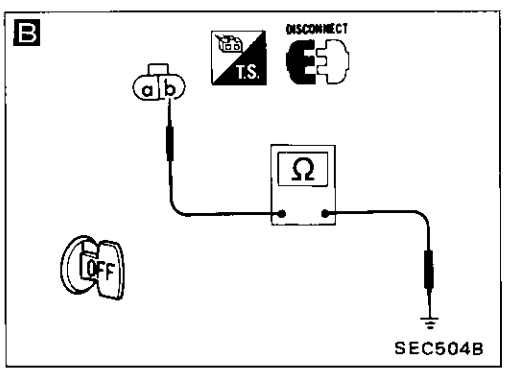


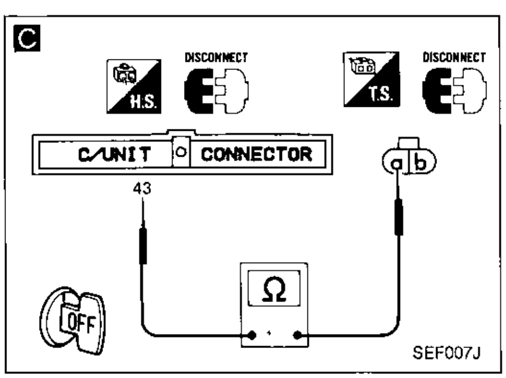
Diagnostic Procedure 44 (Cont'd)











INSPECTION START

↓

A CHECK OVERALL FUNCTION.

1) Turn ignition switch "ON".
2) Perform "PW/ST SIGNAL CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

1) Start engine.
2) Check power steering oil pressure switch signal in "DATA MONITOR" mode with CONSULT.

Steering is neutral: OFF
Steering is turned: ON

OR

1) Start engine.
2) Check voltage between E.C.U. terminal ⑩ and ground with CONSULT or tester.

Voltage:
When steering wheel is turned quickly
Approximately 0V
Except above
Approximately 8 - 9V

O.K. → INSPECTION END

N.G. ↓

B CHECK GROUND CIRCUIT.

1) Stop engine.
2) Disconnect power steering oil pressure switch harness connector.
3) Check harness continuity between terminal ⓑ and body ground.

Continuity should exist.

N.G. → Repair harness or connectors.

O.K. ↓

C CHECK INPUT SIGNAL CIRCUIT.

1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal ㊸ and terminal ⓐ.

Continuity should exist.

N.G. → Check the following.
- Harness connectors F51, M24
- Harness continuity between E.C.U. and power steering oil pressure switch

If N.G., repair harness or connectors.

O.K. ↓

Ⓐ

Diagnostic Procedure 44 (Cont'd)

Ⓐ

↓

CHECK COMPONENT (Power steering oil pressure switch).
Refer to "Electrical Components Inspection".
(See page EF & EC-175.)

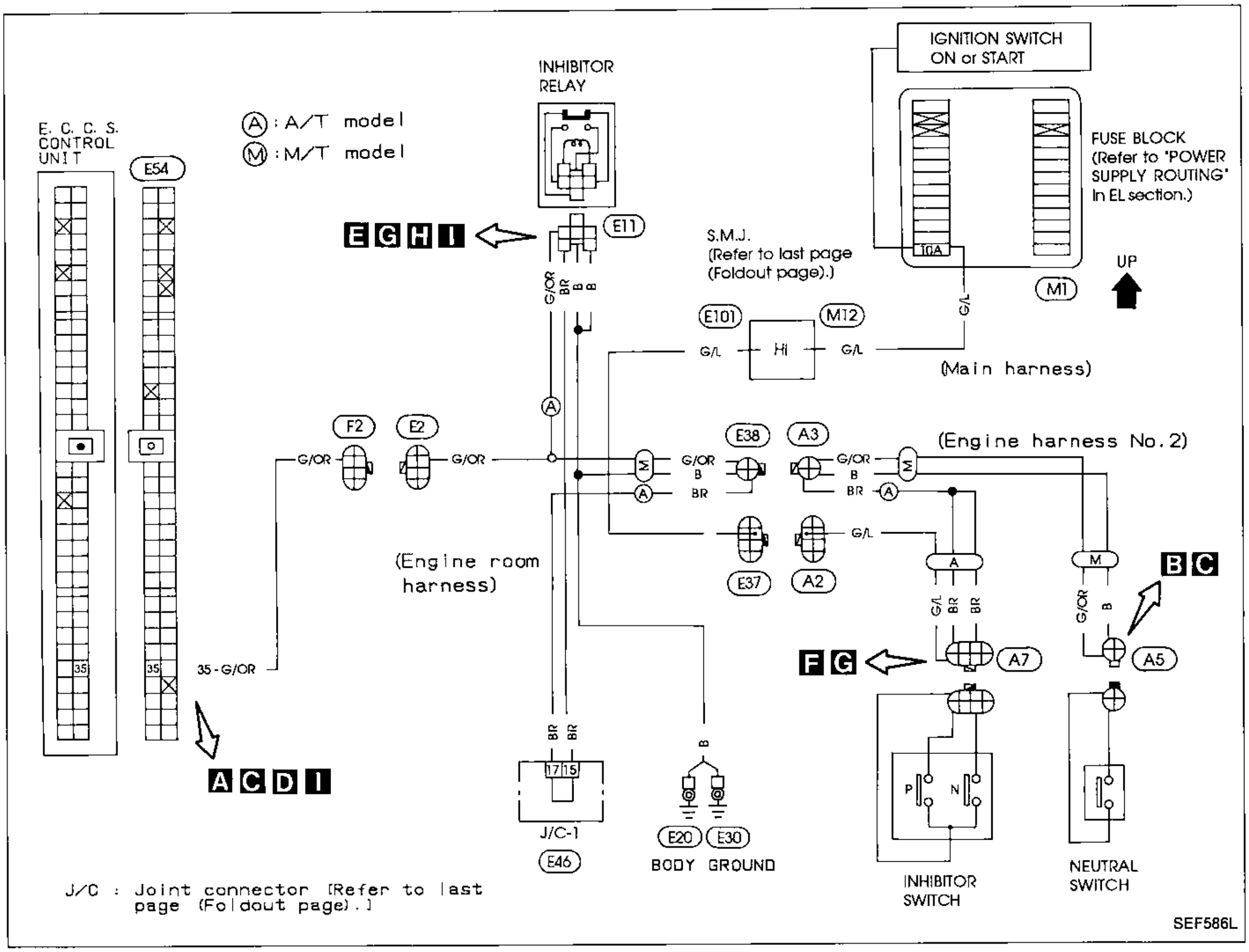
N.G. → Replace power steering oil pressure switch.

↓ O.K.

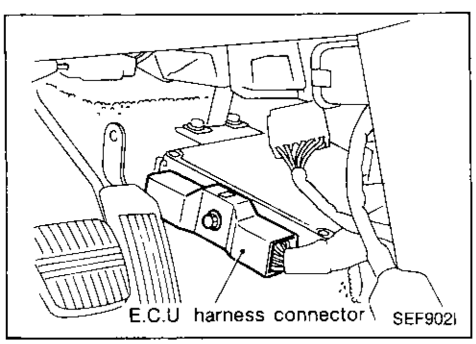
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

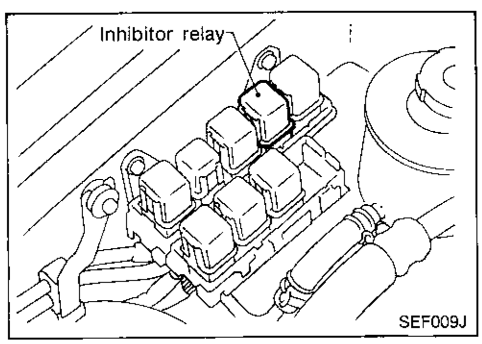
Diagnostic Procedure 45

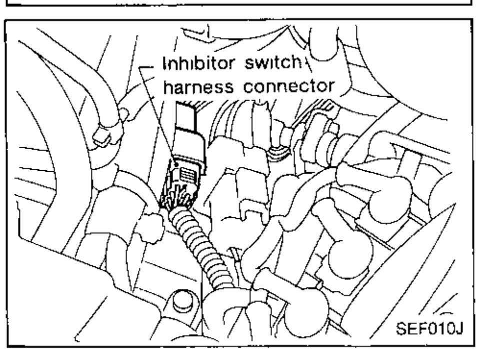
NEUTRAL/INHIBITOR SWITCH (Not self-diagnostic item)



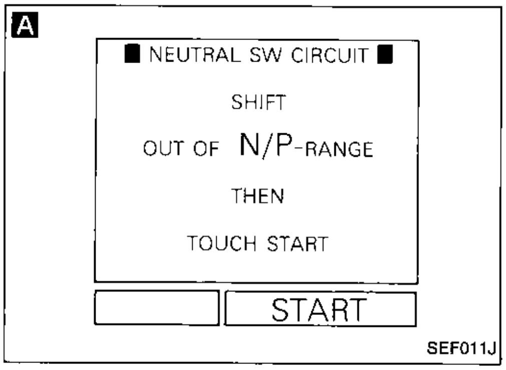
Harness layout

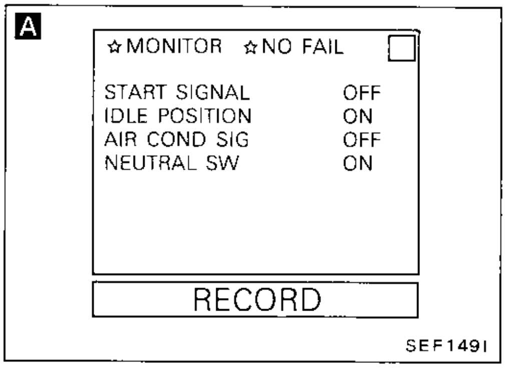


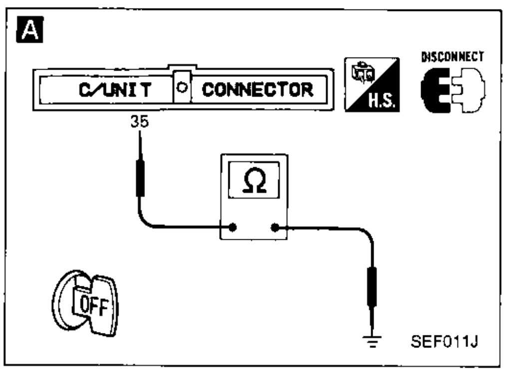


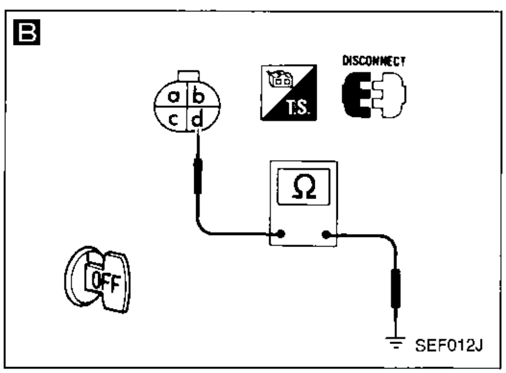


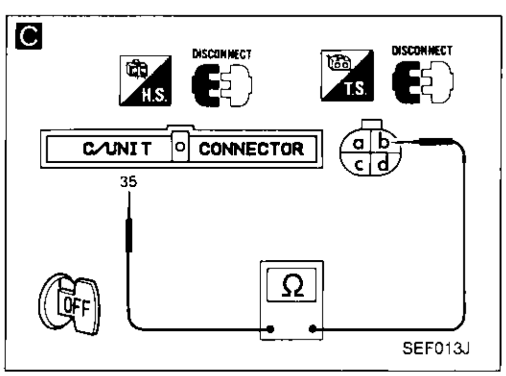
Diagnostic Procedure 45 (Cont'd)











Neutral switch

INSPECTION START

↓

A CHECK OVERALL FUNCTION.
1) Turn ignition switch "ON".
2) Perform "NEUTRAL SW CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

1) Turn ignition switch "ON".
2) Check neutral switch signal in "DATA MONITOR" mode with CONSULT.
Neutral position: ON
Except above: OFF

OR

1) Set shift lever to the neutral position.
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal 35 and body ground.
Continuity should exist.

O.K. → INSPECTION END

N.G. ↓

Turn ignition switch "OFF".

↓

B CHECK GROUND CIRCUIT.
1) Disconnect neutral switch harness connector.
2) Check harness continuity between terminal ⓓ and body ground.
Continuity should exist.

N.G. → Check the following:
- Harness connectors (E36), (A3)
- Harness continuity between neutral switch and body ground

If N.G., repair harness or connectors.

O.K. ↓

Disconnect E.C.U. harness connector.

↓

Ⓐ

Diagnostic Procedure 45 (Cont'd)

A

C

CHECK INPUT SIGNAL CIRCUIT.
1) Check harness continuity between E.C.U. terminal 35 and terminal b.
Continuity should exist.

N.G. → Check the following:
- Harness connectors F2, E2
- Harness connectors E38, A3
- Harness continuity between E.C.U. and neutral switch

If N.G., repair harness or connectors.

O.K. ↓

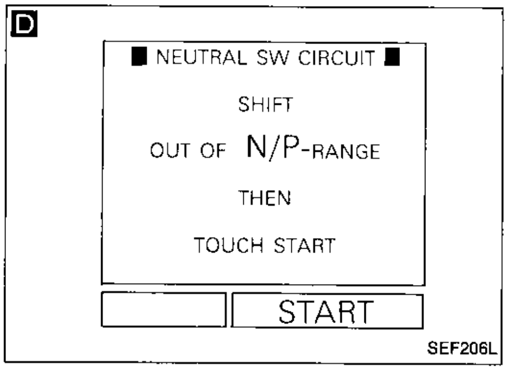
CHECK COMPONENT
(Neutral switch).
Refer to "Electrical Components Inspection".
(See page EF & EC-178.)

N.G. → Replace neutral switch.

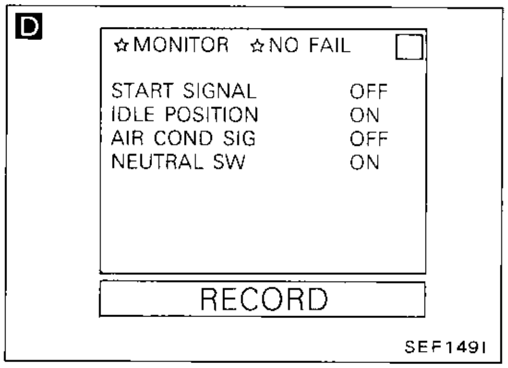
O.K. ↓

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

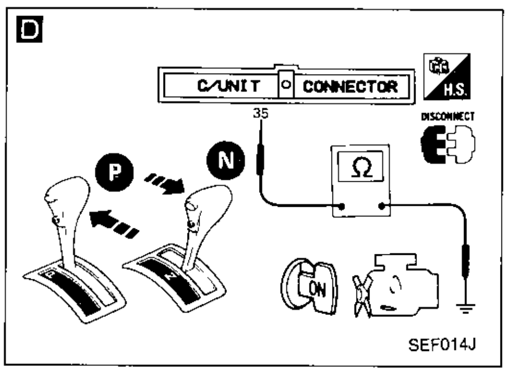
Diagnostic Procedure 45 (Cont'd)



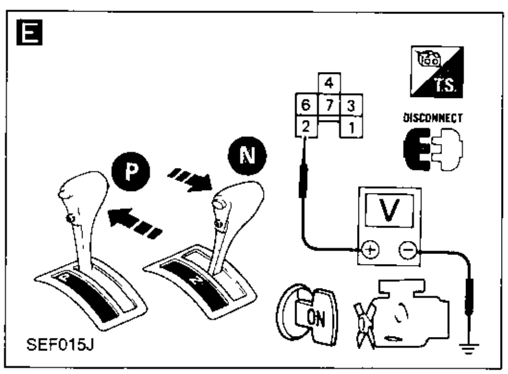
SEF206L



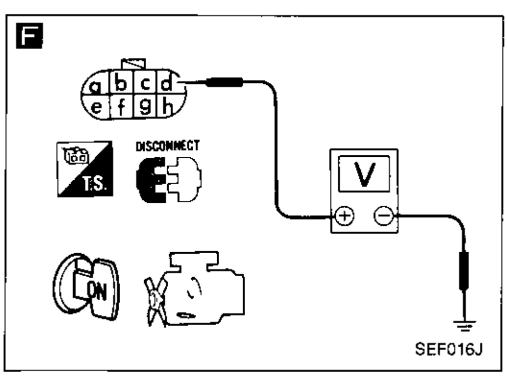
SEF149I



SEF014J



SEF015J



SEF016J

Inhibitor switch

INSPECTION START

D CHECK OVERALL FUNCTION.
1) Turn ignition switch "ON".
2) Perform "NEUTRAL SW" in "FUNCTION TEST" mode with CONSULT.

— OR —

1) Turn ignition switch "ON".
2) Perform "NEUTRAL SW" in "DATA MONITOR" mode with CONSULT.
"N" or "P": ON
Except above: OFF

— OR —

1) Shift selector lever to "P" range.
2) Disconnect E.C.U. harness connector.
3) Turn ignition switch "ON".
4) Check harness continuity between E.C.U. terminal ㉟ and body ground.
Continuity should exist.
5) Shift selector lever to "N" range.
6) Check harness continuity between E.C.U. terminal ㉟ and body ground.
Continuity should exist.

O.K. → INSPECTION END

N.G. ↓

E CHECK POWER SUPPLY.
1) Turn ignition switch "OFF".
2) Disconnect inhibitor relay.
3) Make sure that selector lever is in "N" range.
4) Turn ignition switch "ON".
5) Check voltage between terminal ② and ground.
Voltage: Battery voltage
6) Shift selector lever into "P" range.
7) Check voltage between terminal ② and ground.
Voltage: Battery voltage

N.G. → F

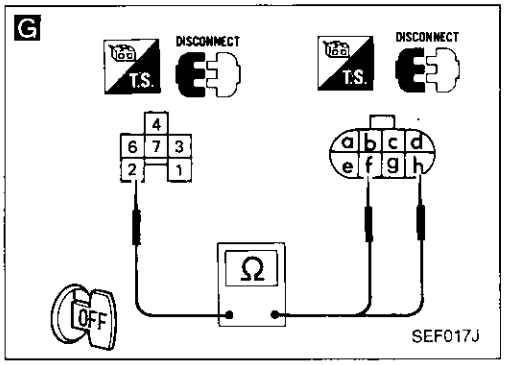
O.K. → Ⓐ

F CHECK HARNESS CONTINUITY BETWEEN INHIBITOR SWITCH AND BATTERY.
1) Turn ignition switch "OFF".
2) Disconnect inhibitor switch harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓓ and ground.
Voltage: Battery voltage
If N.G., check the following.
- 10A fuse
- S.M.J. connectors (M12), (E101)
- Harness connectors (E37), (A2)
- Harness continuity between fuse and inhibitor switch

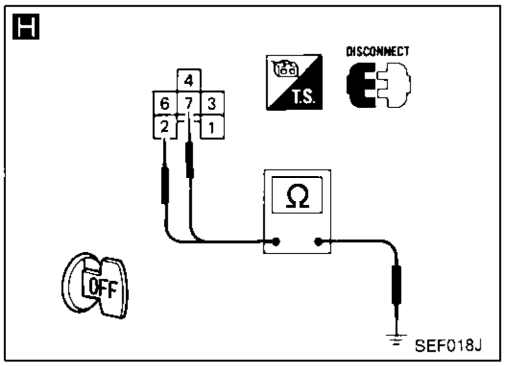
If N.G., repair harness or connectors.

→ Ⓑ

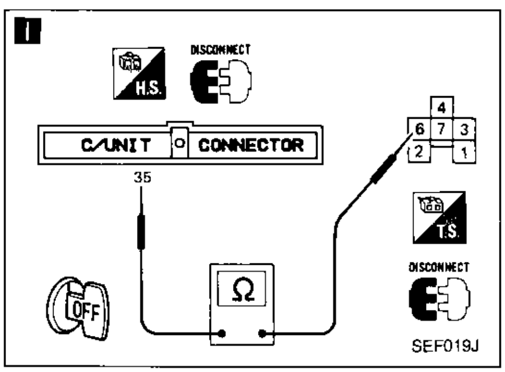
Diagnostic Procedure 45 (Cont'd)



SEF017J



SEF018J



SEF019J

Ⓐ

H CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminals ②, ⑦ and body ground.
Continuity should exist.

N.G. → Ⓑ

Ⓑ

G CHECK HARNESS CONTINUITY BETWEEN INHIBITOR SWITCH AND INHIBITOR RELAY.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminals ⓕ,ⓗ and terminal ②
"P" range:
terminal ⓗ and terminal ②
"N" range:
terminal ⓕ and terminal ②
Continuity should exist.
If N.G., check the following.
- Harness connectors (E38), (A1)
- Joint connector-1 (E46)
- Harness continuity between inhibitor switch and inhibitor relay

If N.G., repair harness or connectors.
CHECK COMPONENT (Inhibitor switch).
Refer to "Electrical Components Inspection".
(See page EF & EC-178.)

O.K. ↓

Disconnect E.C.U. harness connector.

↓

I CHECK INPUT SIGNAL CIRCUIT.
1) Check harness continuity between E.C.U. terminal ㉟ and terminal ⑥.
Continuity should exist.

N.G. → Repair harness or connectors.

N.G. → Check the following:
- Harness connectors (F2), (E2)
- Harness continuity between E.C.U. and inhibitor relay

If N.G., repair harness or connectors.

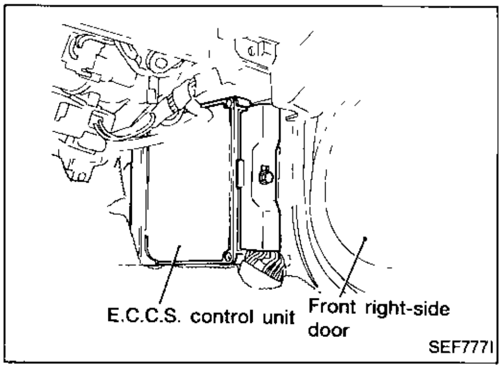
O.K. ↓

CHECK COMPONENT
(Inhibitor relay).
Refer to "Electrical Components Inspection".
(See page EF & EC-178.)

N.G. → Replace inhibitor relay.

O.K. ↓

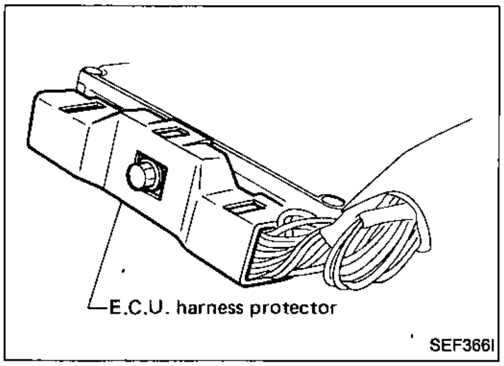
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.



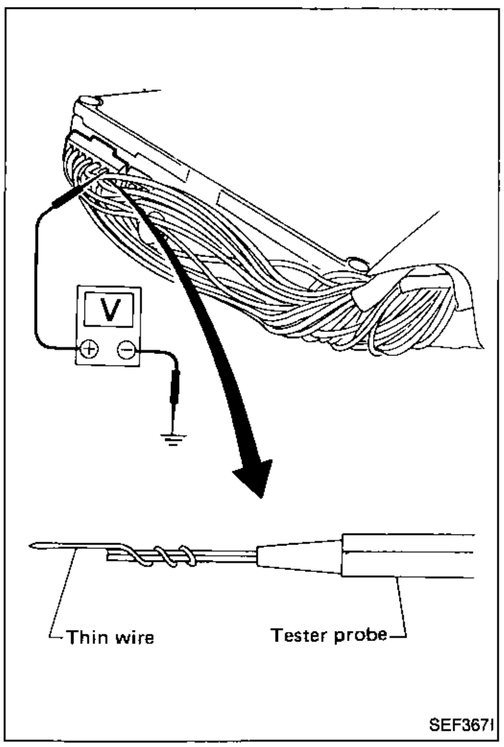
Electrical Components Inspection

E.C.U. INPUT/OUTPUT SIGNAL INSPECTION

1. E.C.U. is located behind front passenger side dash. For this inspection, remove the front passenger side dash.



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.

E.C.U. INPUT/OUTPUT SIGNAL INSPECTION

E.C.U. inspection table

*Date are reference values.

TER-MINAL NO.	ITEM	CONDITION	*DATA
1	Ignition signal	Engine is running. — Idle speed	0.3 - 0.6V
		Engine is running. — Engine speed is 2,000 rpm	Approximately 1.0V
3	Ignition check	Engine is running. — Idle speed	9 - 12V
4	E.C.C.S. relay (Main relay)	Engine is running. → Ignition switch "OFF" — Within approximately 1 second after turning ignition switch "OFF"	0 - 1V
		Ignition switch "OFF" — For approximately 1 second after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
8	Exhaust gas temperature sensor (Only for California model)	Engine is running. — Idle speed	1.0 - 2.0V
		Engine is running. — E.G.R. system is operating.	0 - 1.0V
11	Air conditioner relay	Engine is running. — Both A/C switch and blower switch are "ON".	0 - 1.0V
		Engine is running — A/C switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
12	S.C.V. control solenoid valve	Engine is running. — Idle speed	0 - 1.0V
		Engine is running. — Engine speed is 2,000 rpm.	BATTERY VOLTAGE (11 - 14V)
16	Air flow meter	Engine is running.	1.0 - 3.0V Output voltage varies with engine revolution.

Electrical Components Inspection (Cont'd)

*Date are reference values.

TER-MINAL NO.	ITEM	CONDITION	*DATA
18	Engine temperature sensor	Engine is running.	1.0 - 5.0V Output voltage varies with engine water temperature.
19	Exhaust gas sensor	Engine is running. └After warming up sufficiently.	0 - Approximately 1.0V
20	Throttle sensor	Ignition switch "ON"	0.4 - Approximately 4V Output voltage varies with the throttle valve opening angle.
22 30	Crank angle sensor (Reference signal)	Engine is running. **Do not run engine at high speed under no-load.**	0.2 - 0.5V
26	Air temperature sensor	Ignition switch "ON" └Temperature of intake air is 20°C (68°F)	Approximately 1.0 - 1.5V
		Ignition switch "ON" └Temperature of intake air is 80°C (176°F)	Approximately 0.3V
31 40	Crank angle sensor (Position signal)	Engine is running. **Do not run engine at high speed under no-load.**	2.0 - 3.0V
33	Idle switch (⊖side)	Ignition switch "ON" └Throttle valve: idle posion	Approximately 9 - 10V
		Ignition switch "ON" └Throttle valve: Any position except idle position	0V
34	Start signal	Cranking	8 - 12V
35	Neutral switch & Inhibitor switch	Ignition switch "ON" └Neutral/Parking	0V
		Ignition switch "ON" └Except the above gear position	Approximately 6V
36	Ignition switch	Ignition switch "OFF"	0V
		Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
37	Throttle sensor power supply	Ignition switch "ON"	Approximately 5V
38 47	Power supply for E.C.U.	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

Electrical Components Inspection (Cont'd)

*Date are reference values.

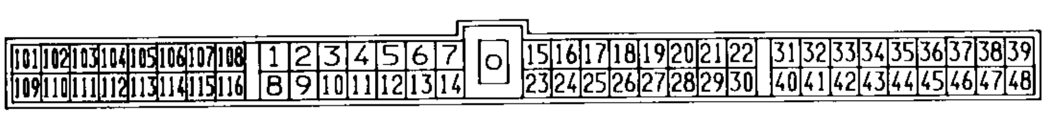
TER-MINAL NO.	ITEM	CONDITION	*DATA
41	Air conditioner switch	Engine is running. — Both air conditioner switch and blower switch are "ON".	0V
		Engine is running. — Air conditioner switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
43	Power steering oil pressure switch	Engine is running. — Steering wheel is being turned.	0V
		Engine is running. — Steering wheel is not being turned.	8 - 9V
44	Idle switch (⊕ side)	Ignition switch "ON" — Throttle valve: idle position	Approximately 9 - 10V
		Ignition switch "ON" — Throttle valve: Except idle position	BATTERY VOLTAGE (11 - 14V)
45	Thermo control amp.	Engine is running Air conditioner is operating. — Evaporator outlet air temperature is between 3.0 - 8.0°C (37 - 46°F)	Approximately 8 - 9V
		Engine is running. Air conditioner is operating. — Evaporator outlet air temperature is over 8°C (46°F)	Approximately 0V
46	Power supply (Back-up)	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
101	Injector No. 1	Engine is running	BATTERY VOLTAGE (11 - 14V)
103	Injector No. 3		
110	Injector No. 2		
112	Injector No. 4		
102	A.I.V. control solenoid valve	Engine is running. — Idle speed	0 - 1.0V
		Engine is running. — Accelerator pedal is depressed. After warning up	BATTERY VOLTAGE (11 - 14V)

Electrical Components Inspection (Cont'd)

*Date are reference values.

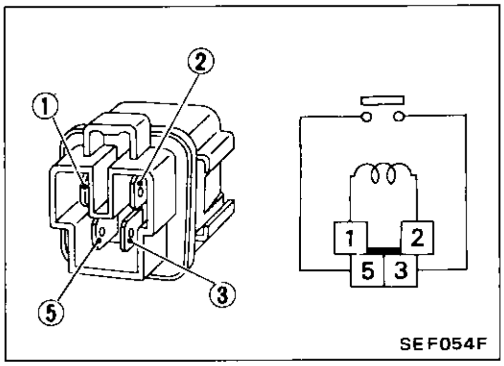
TERMINAL NO.	ITEM	CONDITION	*DATA
104	Fuel pump relay	Ignition switch "ON" └For 5 seconds after turning ignition switch "ON" Engine is running.	0.7 - 0.9V
		Ignition switch "ON" └Within 5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
105	E.G.R. control solenoid valve	Engine is running. └Engine is cold. [Water temperature is below 60°C (140°F).]	0.7 - 0.9V
		Engine is running. └After warning up [Water temperature is between 60°C (140°F) and 105°C (221°F)]	BATTERY VOLTAGE (11 - 14V)
106	Pressure regulator control solenoid valve	Stop and restart engine after warming it up. └Water temperature is above 90°C (194°F)	0 - 1.0V (for 3 minutes after ignition switch is turned off.) BATTERY VOLTAGE (After 3 minutes)
		Stop and restart engine after warming it up. └Water temperature is below 90°C (194°F)	BATTERY VOLTAGE (11 - 14V)
113	A.A.C. valve	Engine is running. └Idle speed	7 - 10V
		Engine is running. ├Steering wheel is being turned. ├Air conditioner is operating ├Rear defogger is "ON". └Headlamp are in high position.	4 - 7V

E.C.U. HARNESS CONNECTOR TERMINAL LAYOUT



SEF419H

Electrical Components Inspection (Cont'd)

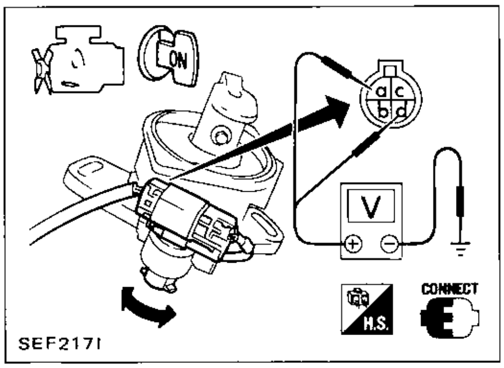


SEF054F

E.C.C.S. RELAY

Check continuity between terminals ③ and ⑤.

Condition	Continuity
12V direct current supply between terminals ① and ②	Yes
No supply	No

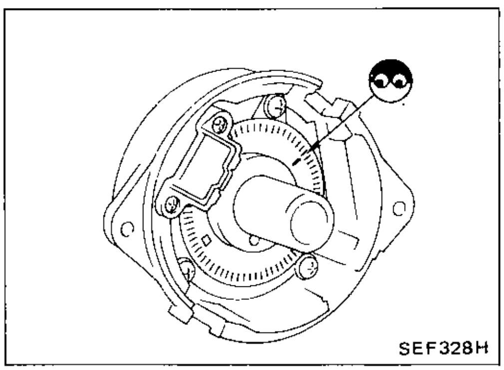


SEF217I

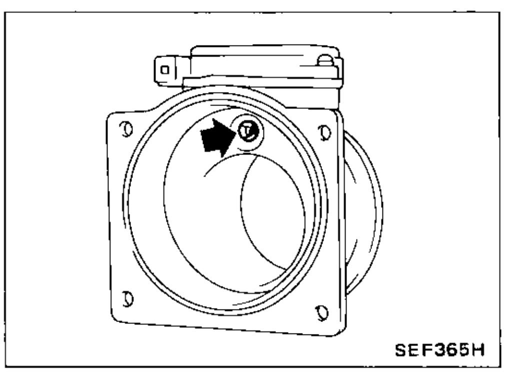
CRANK ANGLE SENSOR

1. Remove distributor from engine. (crank angle sensor harness connector is connected.)
2. Turn ignition switch "ON".
3. Rotate crank angle sensor shaft slowly and check voltage between terminals ⓐ, ⓑ and ground.

Voltage fluctuates between 5V and 0V.

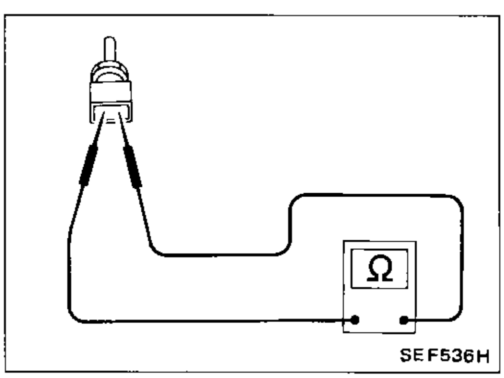

SEF328H

4. Visually check rotor plate for damage or dust.


SEF365H

AIR FLOW METER

- Visually check hot wire air passage for dust.



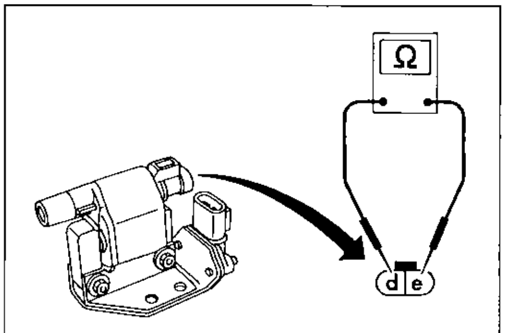
SEF536H

ENGINE TEMPERATURE SENSOR

Check engine temperature sensor resistance.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
80 (176)	0.30 - 0.33

Electrical Components Inspection (Cont'd)

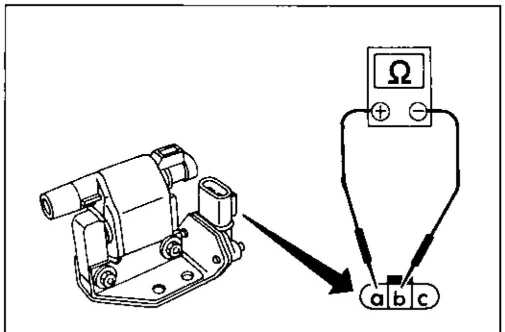


SEF332H

IGNITION COIL

Check ignition coil resistance.

Terminal	Resistance
ⓓ - ⓔ	Approximately 0.7Ω

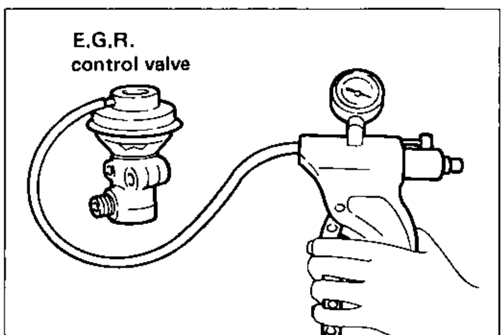


SEF333H

POWER TRANSISTOR

Check continuity between power transistor terminals.

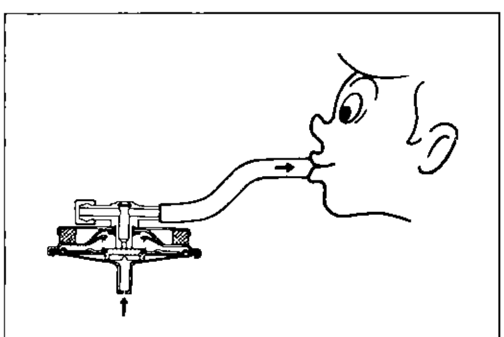
Terminal No.	Tester polarity	Continuity
ⓐ	⊕	No
ⓑ	⊖	
ⓐ	⊖	Yes
ⓑ	⊕	
ⓐ	⊕	No
ⓒ	⊖	
ⓐ	⊖	Yes
ⓒ	⊕	



SEF820F

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.

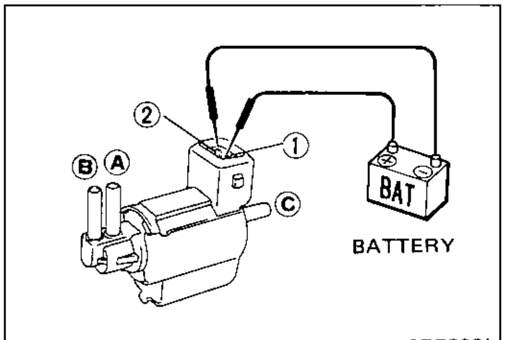

EC381A

B.P.T. VALVE

Plug one of two ports of B.P.T. valve.
Apply a pressure above 0.490 kPa (50 mmH_2O, 1.97 inH_2O) to check for leakage. If a leak is noted, replace valve.

Electrical Components Inspection (Cont'd)

E.G.R. CONTROL SOLENOID VALVE, A.I.V. CONTROL SOLENOID VALVE, P.R. CONTROL SOLENOID VALVE AND S.C.V. CONTROL SOLENOID VALVE

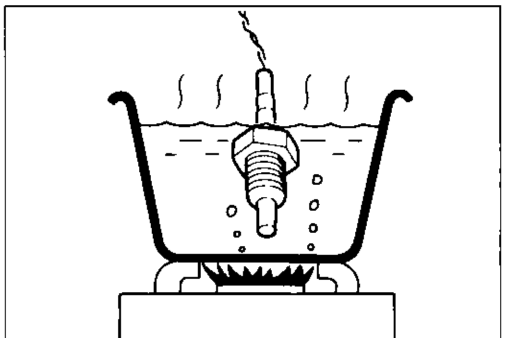


SEF322I

Check air passages continuity.

Condition	Air passage continuity between Ⓐ and Ⓑ	Air passage continuity between Ⓐ and Ⓒ
12V direct current supply between terminals ① and ②	Yes	No
No supply	No	Yes

EXHAUST GAS SENSOR


SEF830F

Refer to "Diagnostic Procedure 30". (See page EF & EC-119.)

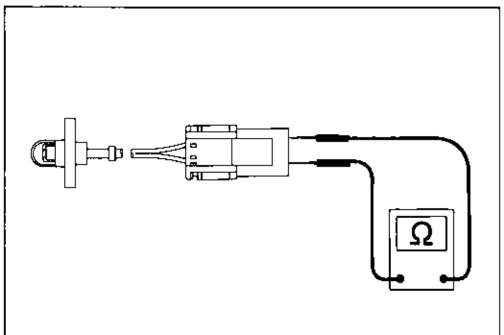
EXHAUST GAS TEMPERATURE SENSOR

Check resistance change and resistance value at 100°C (212°F).

- **Resistance should decrease in response to temperature increase.**
  Resistance: 100°C (212°F)
  85.3 ± 8.53 kΩ

If N.G., replace exhaust gas temperature sensor.

AIR TEMPERATURE SENSOR



SEF265I

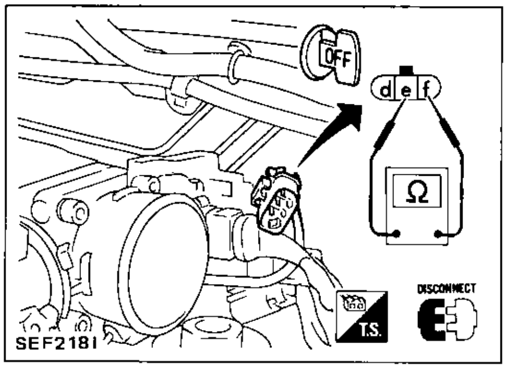
Check air temperature sensor resistance.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
80 (176)	0.27 - 0.38

POWER STEERING OIL PRESSURE SWITCH

1. Disconnect power steering oil pressure switch harness connector.
2. Check resistance between terminals.
   Resistance: Approximately 2 - 3Ω

Electrical Components Inspection (Cont'd)



SEF218I

THROTTLE SENSOR

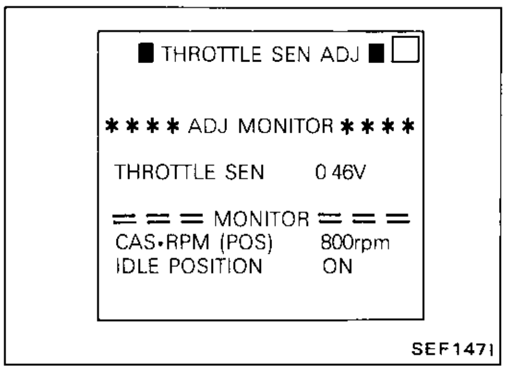
1. Disconnect throttle sensor harness connector.
2. Make sure that resistance between terminals ⓑ and ⓒ changes when opening throttle valve manually.

Accelerator pedal conditions	Resistance kΩ
Completely released	Approximately 1
Partially released	1 - 9
Completely depressed	Approximately 9

If N.G., replace throttle sensor.

Adjustment

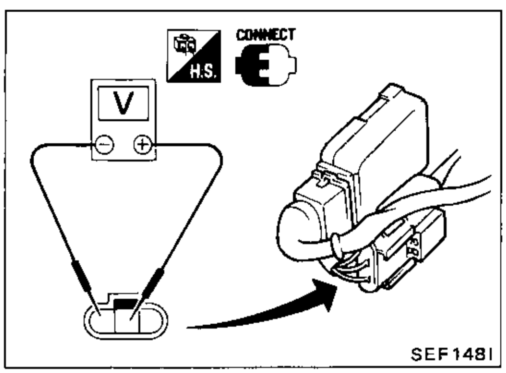
If throttle sensor is replaced or removed, it is necessary to install it in the proper position, by following the procedure as shown below:



SEF147I

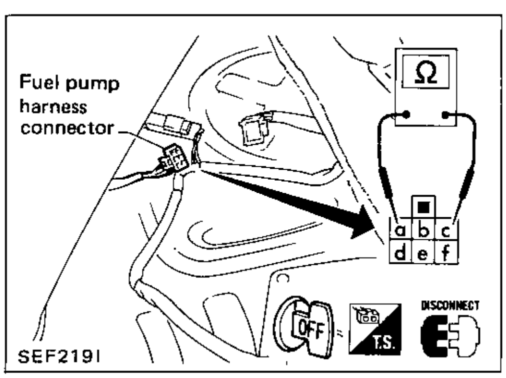
1. Install throttle sensor body in throttle chamber. Do not tighten bolts.
2. Connect throttle sensor and idle switch harness connector.
3. Start engine and warm it up sufficiently.
4. Perform "THROTTLE SEN. ADJ." in "WORK SUPPORT" mode.

   Measure output voltage of throttle sensor using voltmeter.



SEF148I

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.



SEF219I

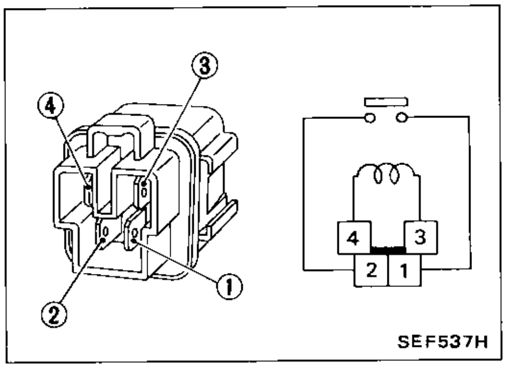
FUEL PUMP

Check continuity between terminals ⓐ and ⓒ .

Continuity should exist.

Electrical Components Inspection (Cont'd)

FUEL PUMP RELAY, RADIATOR FAN REAY-1, -2 AND-3

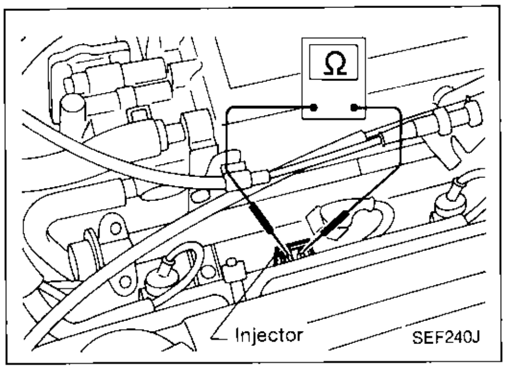


SEF537H

Check continuity between terminals ① and ②.

Condition	Continuity
12V direct current supply between terminals ③ and ④	Yes
No supply	No

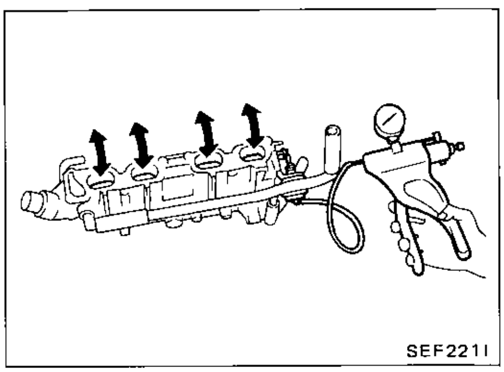
INJECTORS



SEF240J

- Check injector resistance.
  Resistance:
  Approximately 10 - 15Ω
- Remove injector and check nozzle for clogging.

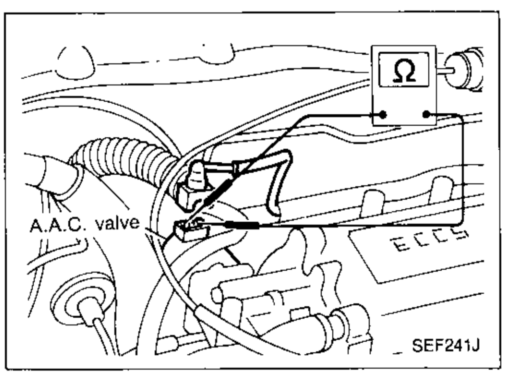
SWIRL CONTROL VALVE


SEF221I

Supply vacuum to actuator and check swirl control valve operation.

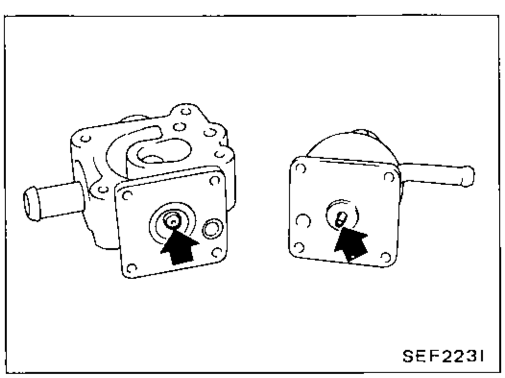
Condition	Swirl control valve
Supply vacuum to actuator	Close
No supply	Open

A.A.C. VALVE



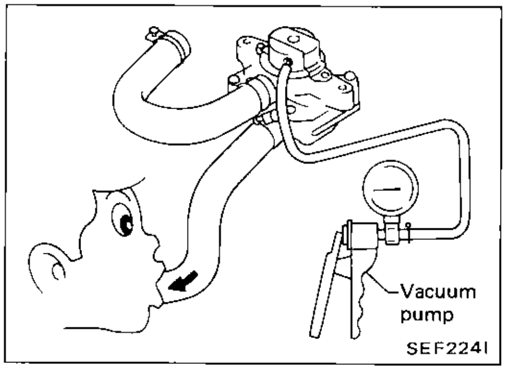
SEF241J

- Check A.A.C. valve resistance.
  Resistance:
  Approximately 10Ω [at 20°C (68°F)]


SEF223I

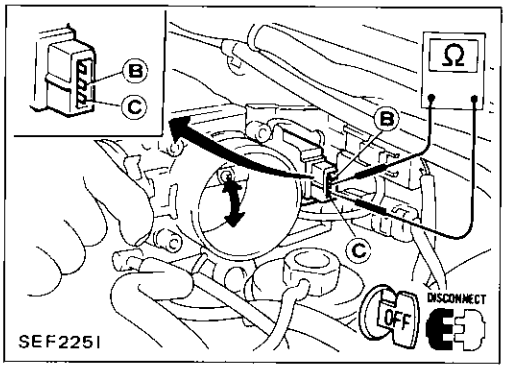
- Check plunger for seizure or sticking.
- Check spring for broken.

Electrical Components Inspection (Cont'd)



AIR INDUCTION VALVE

Apply vacuum to vacuum motor, suck or blow hose to make sure that air flows only towards the air induction side.

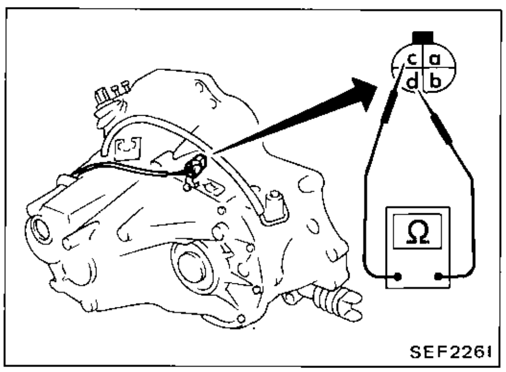


THROTTLE VALE SWITCH (Idle position)

Unit check

- Check continuity between terminals Ⓑ and Ⓒ while moving throttle valve.

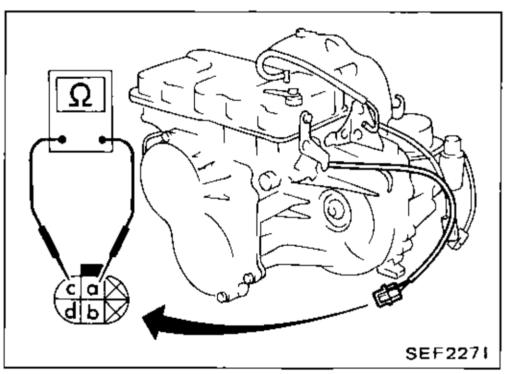
Throttle valve condition	Continuity
Fully closed	Yes
Open	No



NEUTRAL SWITCH

- Check continuity between terminals ⓒ and ⓓ.

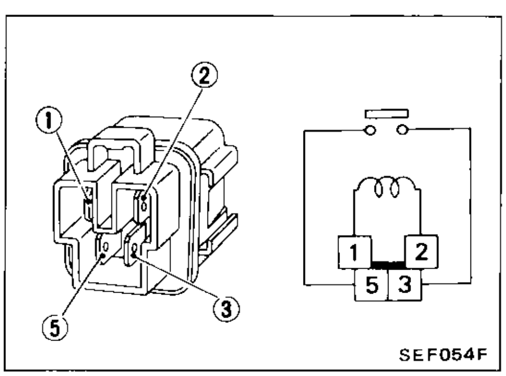
Conditions	Continuity
Shift to Neutral	Yes
Shift to other position	No



INHIBITOR SWITCH

Check continuity between terminals ⓐ and ⓒ.

Conditions	Continuity
Shift to "P" position	Yes
Shift to "N" position	Yes
Shift to positions other than "P" and "N"	No

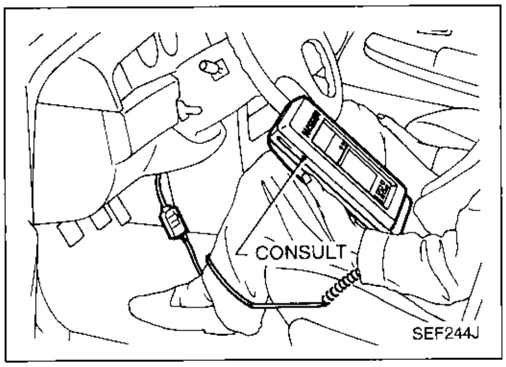


INHIBITOR RELAY

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.

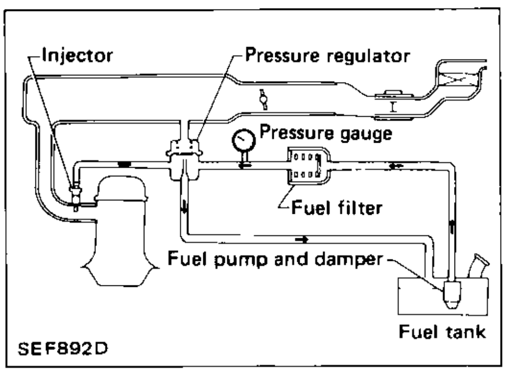


Releasing Fuel Pressure

Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.

Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT.

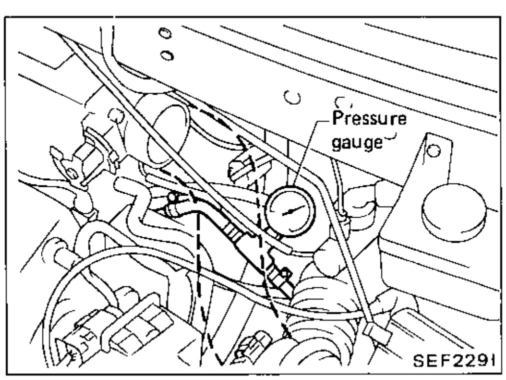
1. Remove fuel pump relay.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch off and reconnect fuel pump relay.



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.

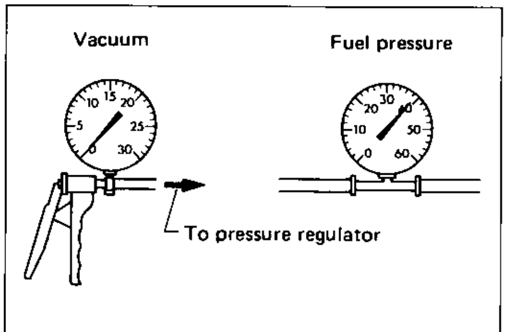
1. Release fuel pressure to zero.
2. Remove air duct.
3. Disconnect fuel hose between fuel filter and fuel tube (engine side).
4. Install pressure gauge between fuel filter and fuel tube.
5. Install air duct.
6. Start engine and check for fuel leakage.



7. Read the fuel pressure gauge indication.
   At idling:
   When fuel pressure regulator valve vacuum hose is connected
   More than 226 kPa (2.3 kg/cm^2, 33 psi)
   When fuel pressure regulator valve vacuum hose is disconnected
   Approximately 294 kPa (3.0 kg/cm^2, 43 psi)
8. Stop engine and disconnect vacuum hose from fuel pressure regulator.
9. Plug vacuum hose.

Fuel Pressure Check (Cont'd)

10. Connect variable vacuum source to fuel pressure regulator.

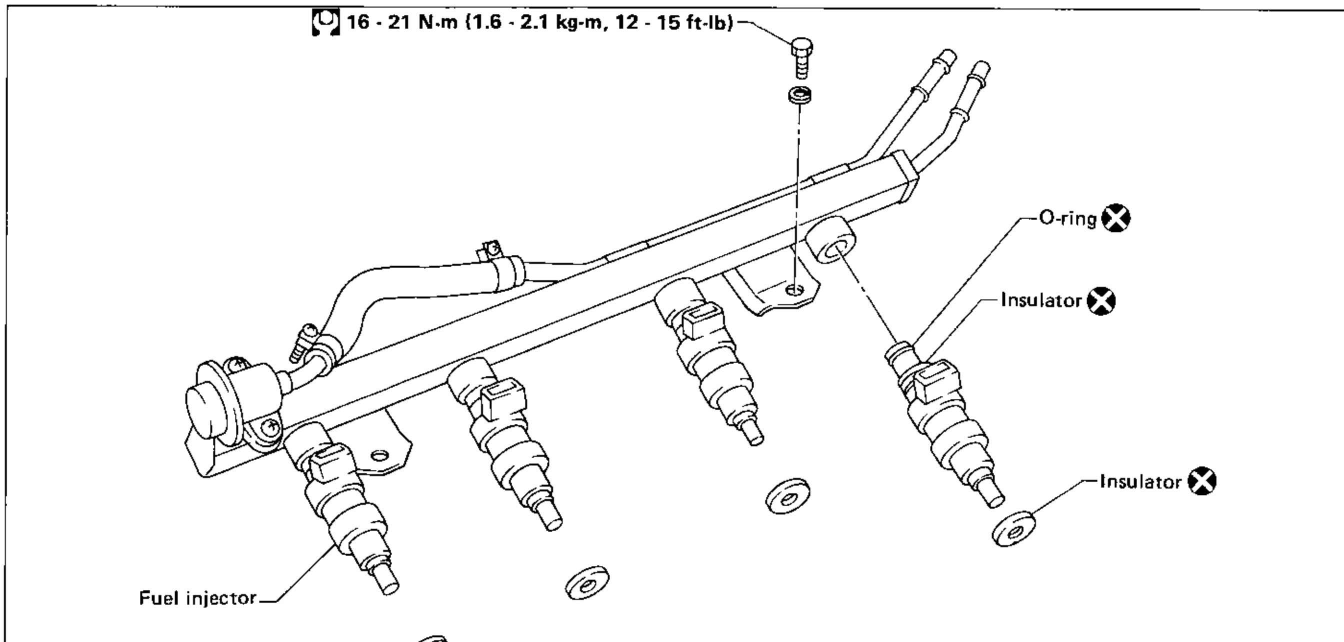


SEF718B

11. Start engine and read fuel pressure gauge indication as vacuum changes.

Fuel pressure should decrease as vacuum increases. If results are unsatisfactory, replace fuel pressure regulator.

Injector Removal and Installation

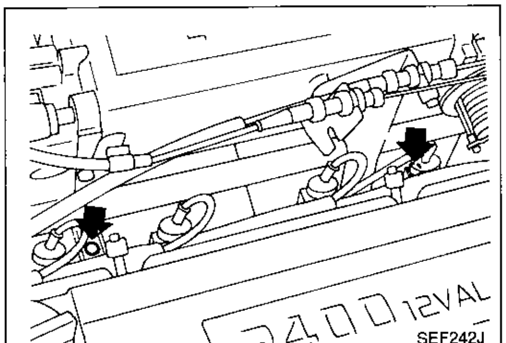


SEF267I

REMOVAL

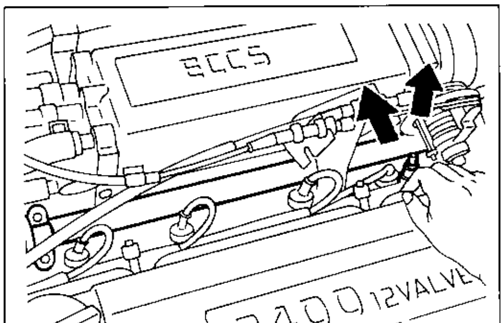
1. Release fuel pressure to zero.
2. Remove or disconnect the following:
- Air duct
- Fuel hoses
- Fuel pressure regulator.
- Accelerator wire bracket
- Fuel injector harness connectors

Injector Removal and Installation (Cont'd)



SEF242J

3. Remove fuel tube securing bolts.



SEF243J

4. Move fuel tube as shown and take out injectors from #4 injector.

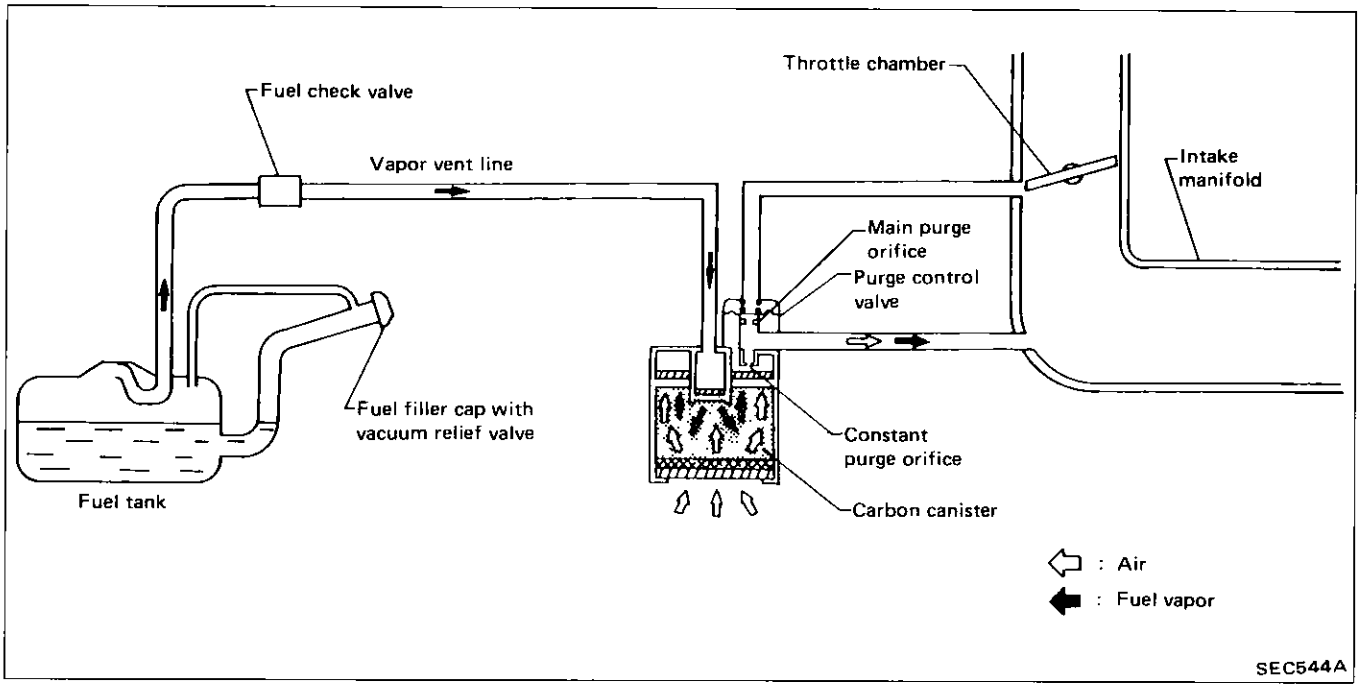
INSTALLATION

1. Clean exterior of injector tail piece.
2. Replace O-rings and insulators with new ones.
3. Install injectors.
4. Install any parts removed.

CAUTION:

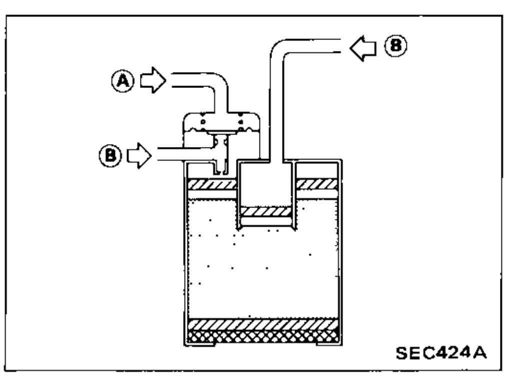
After properly connecting injectors to fuel tube, check connections for fuel leakage.

Description



SEC544A

The evaporative emission control system is used to reduce hydrocarbons emitted to 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 increases, 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.



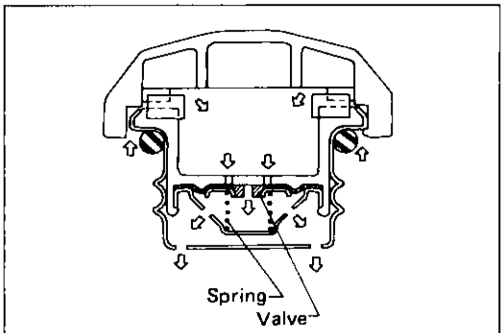
SEC424A

Inspection

CARBON CANISTER

Check carbon canister as follows:
Ⓐ: Blow air and ensure that there is no leakage.
Ⓑ: Blow air and ensure that there is leakage.

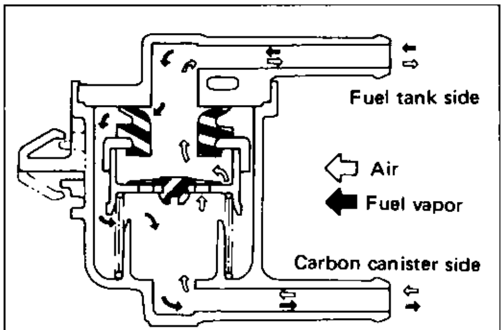
Inspection (Cont'd)



SEC308A

FUEL TANK VACUUM RELIEF VALVE

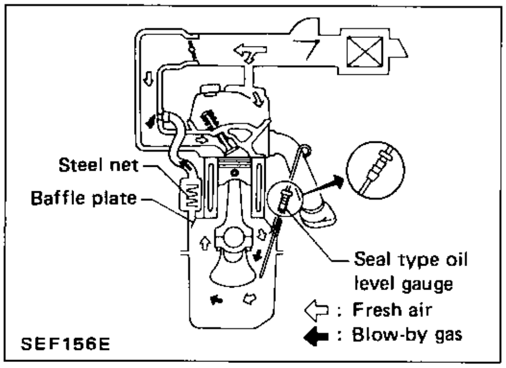
1. Wipe valve housing clean.
2. Suck air through the cap. A slight resistance accompanied by valve clicks indicates that valve is in good mechanical condition. Note also that, by further sucking air, the resistance should disappear with valve clicks.
3. If valve is clogged or if no resistance is felt, replace cap as an assembly.



SEC309A

FUEL CHECK VALVE

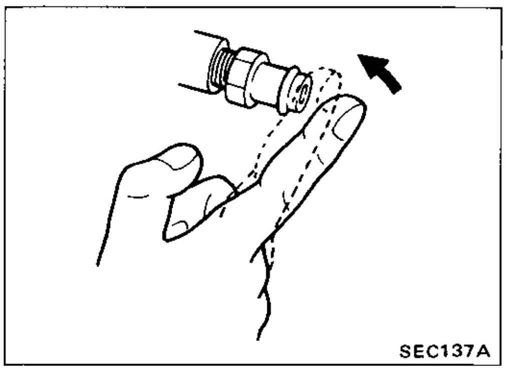
1. Blow air through connector on fuel tank side.
   A considerable resistance should be felt and a portion of air flow should be directed toward the canister.
2. Blow air through connector on canister side.
   Air flow should be smoothly directed toward fuel tank.
3. If fuel check valve is suspected of not properly functioning in steps 1 and 2 above, replace it.



SEF156E

Description

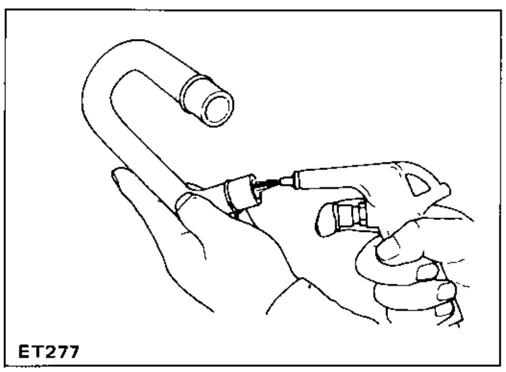
This system returns blow-by gas to both the intake manifold and air cleaner.
The positive crankcase ventilation (P.C.V.) valve is provided to conduct crankcase blow-by gas to the intake manifold.
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the P.C.V. 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 cleaner, through the hose connecting the air cleaner 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 cleaner under all conditions.


SEC137A

Inspection

P.C.V. (Positive Crankcase Ventilation)

With engine running at idle, remove ventilation hose from P.C.V. valve; if 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.


ET277

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.

General Specifications

IGNITION TIMING	B.T.D.C.	15° ± 2°
IDLE SPEED	rpm	M/T 700 ± 50*1, 750 ± 50*2 A/T 700 ± 50*1, 750 ± 50*2 (in "N" position)

*1: For U.S.A.
*2: For Canada

Inspection and Adjustment

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

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
80 (176)	0.30 - 0.33

AIR TEMPERATURE SENSOR

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
80 (176)	0.27 - 0.38

FUEL PRESSURE (at idling)

Unit: kPa (kg/cm^2, psi)

(Measuring point: between fuel filter and fuel pipe)	
Vacuum hose is connected	Approximately 226 (2.3, 33)
Vacuum hose is disconnected	Approximately 294 (3.0, 43)

IDLE SWITCH

Engine speed when idle switch is changed from "OFF" to "ON" rpm	M/T 1,000 ± 150 A/T 1,000 ± 150 (in "N" position)

EXHAUST GAS TEMPERATURE SENSOR

Resistance [at 100°C (212°F)]	kΩ	85.3 ± 8.53

A.A.C. VALVE

Resistance	Ω	Approximately 10

INJECTOR

Resistance	Ω	10 - 15

THROTTLE SENSOR

Accelerator pedal conditions	Resistance kΩ
Completely released	Approximately 1
Partially released	1 - 9
Completely depressed	Approximately 9

ACCELERATOR CONTROL, FUEL & EXHAUST SYSTEMS

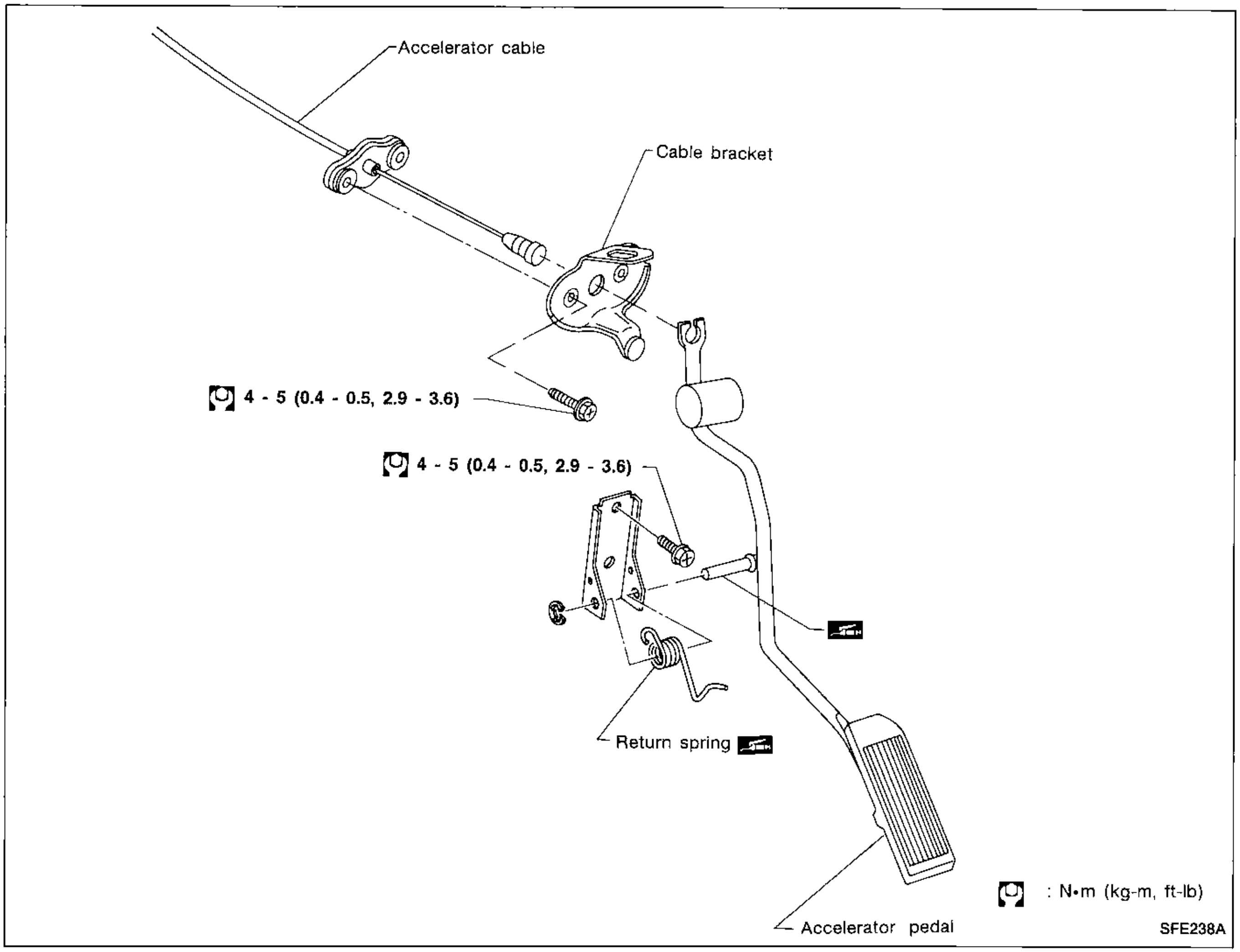
SECTION FE

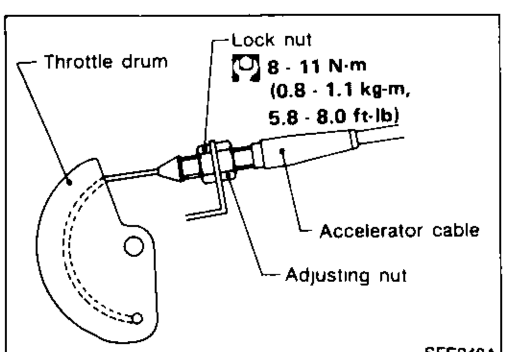
CONTENTS

ACCELERATOR CONTROL SYSTEM FE-2
FUEL SYSTEM FE-3
EXHAUST SYSTEM FE-4

CAUTION:

- **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.**
- **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.**
- **Refer to EL section for A.S.C.D. cable adjustment.**



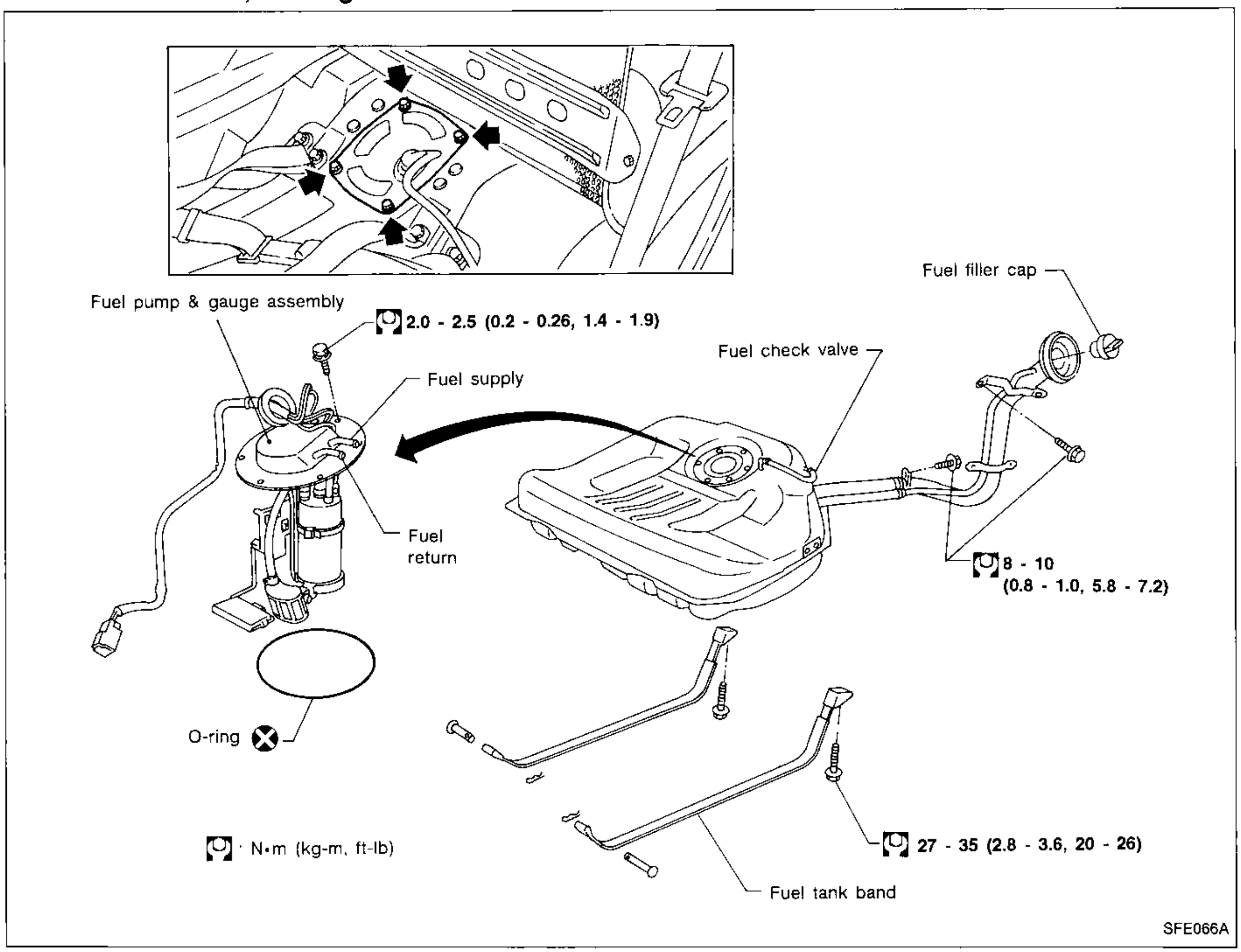


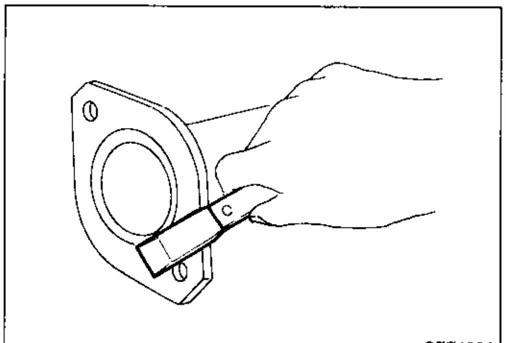
Adjusting Accelerator Cable

1. Loosen lock nut, and tighten adjusting nut until throttle drum starts to move.
2. From that position turn back adjusting nut 1.5 to 2 turns, and fasten it with lock nut.

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 CO_2 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.**
- **Drain fuel from fuel tank and 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 to avoid damaging hoses.**
- **Tighten bolts to specified torque.**
- **When installing fuel check valve, be careful of its designated direction. (Refer to section EF & EC.)**
- **After installation, run engine and check for fuel leaks at connections.**

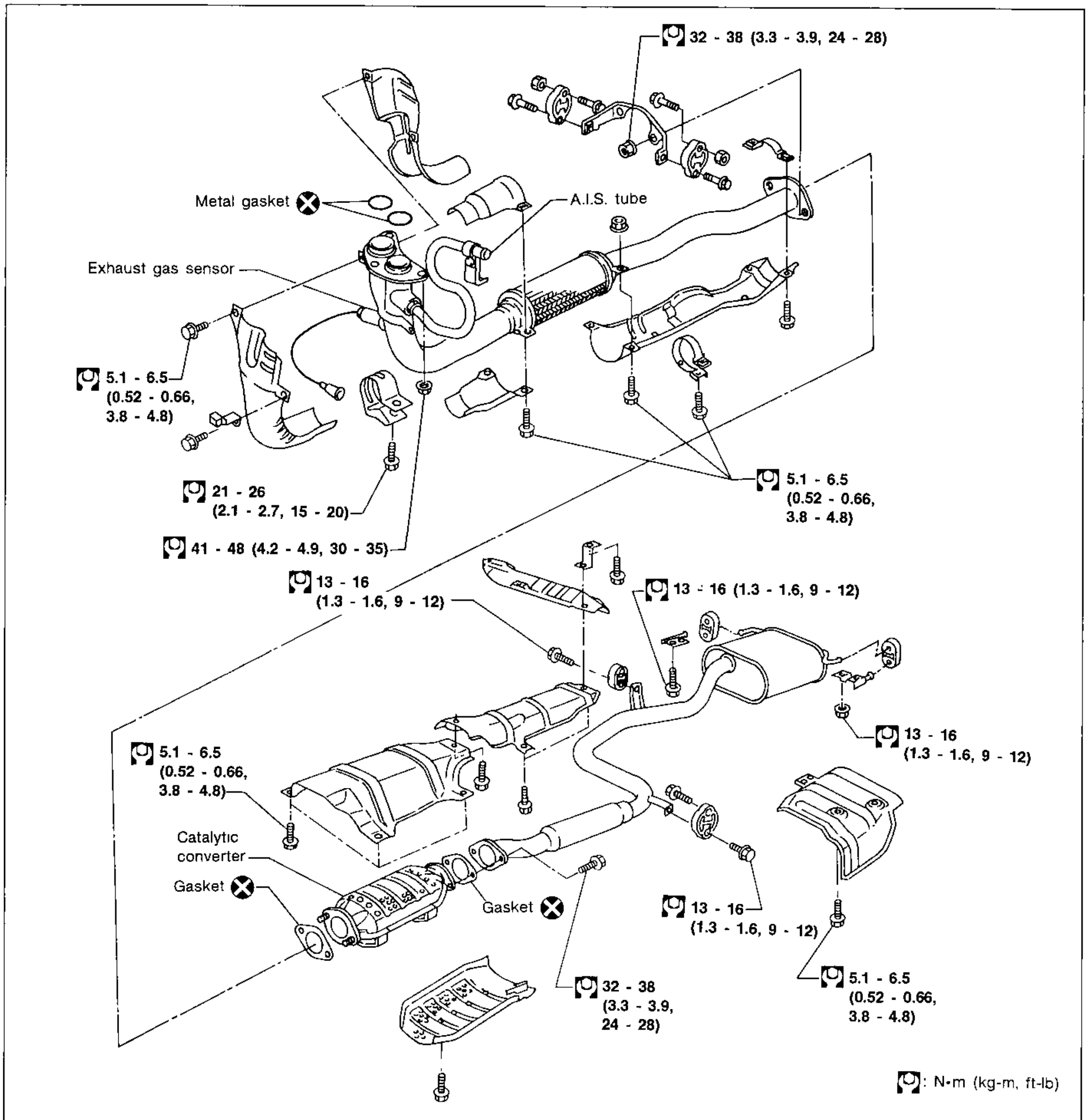




SFE180A

CAUTION:

- **Always replace exhaust gaskets with new ones when reassembling.**
  If gasket is left on flange surface, scrape off completely as shown at left.
- **With engine running, check all tube connections for exhaust gas leaks, and entire system for unusual noises.**
- **After installation, check to ensure that mounting brackets and mounting insulators are free from undue stress. If any of the above parts are not installed properly, excessive noise or vibration may be transmitted to the vehicle body.**



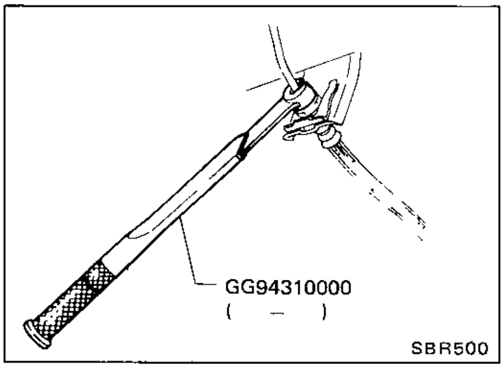
SFE245A

CLUTCH

SECTION CL

CONTENTS

PRECAUTIONS AND PREPARATION .... CL- 2
CLUTCH SYSTEM — Hydraulic Type .... CL- 3
INSPECTION AND ADJUSTMENT .... CL- 4
HYDRAULIC CLUTCH CONTROL .... CL- 6
CLUTCH RELEASE MECHANISM .... CL- 8
CLUTCH DISC AND CLUTCH COVER .... CL- 9
SERVICE DATA AND SPECIFICATIONS (S.D.S.) CL-11



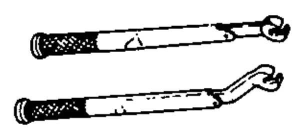
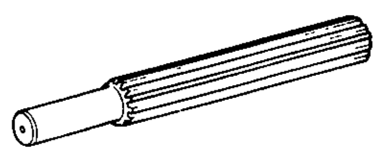
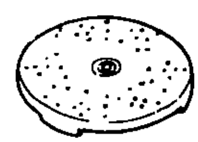
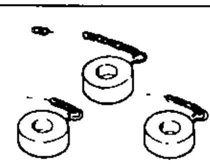
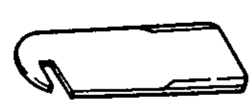
Precautions

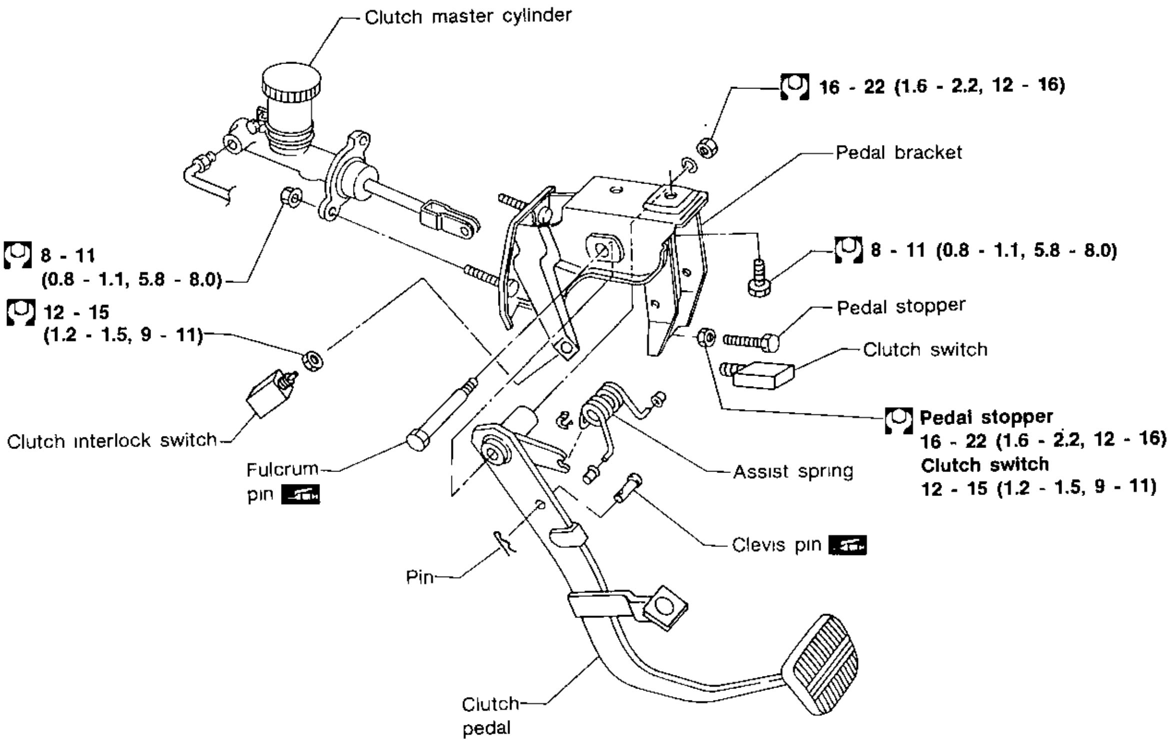
- Recommended fluid is brake fluid "DOT 3".
- Never reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas.
- When removing and installing clutch piping, use Tool.
- Use new brake fluid to clean or wash all parts of master cylinder, operating cylinder and clutch damper.
- Never use mineral oils such as gasoline or kerosene. It will ruin the rubber parts of the hydraulic system.

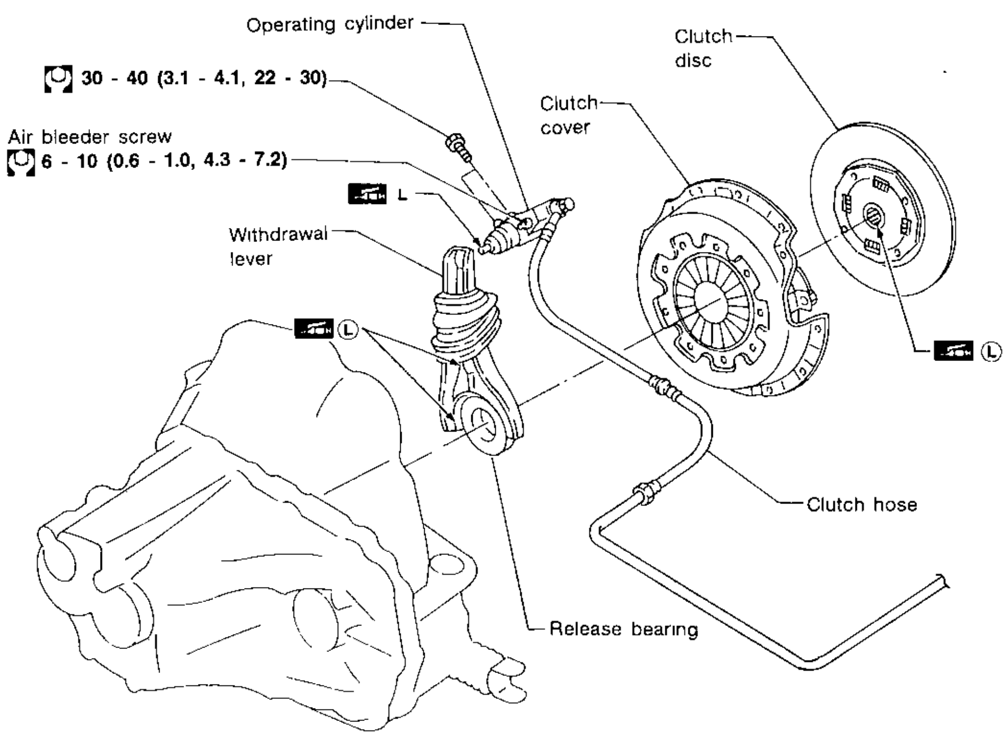
WARNING:
After cleaning clutch disc, wipe it with a dust collector. Do not use compressed air.

Preparation

SPECIAL SERVICE TOOLS

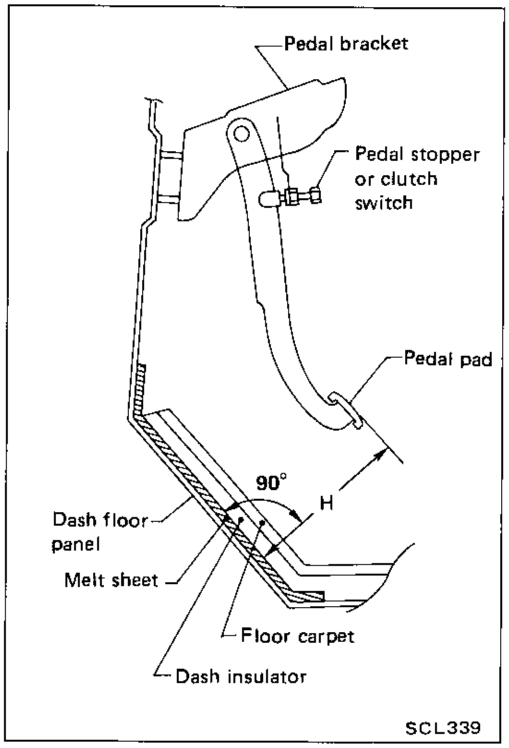
Tool number (Kent-Moore No.) Tool name	Description	
GG94310000 (—) Flare nut torque wrench	Removing and installing clutch piping	
KV30101000 (J33213) Clutch aligning bar	Installing clutch cover and clutch disc	
ST20050010 (—) Base plate	Inspecting diaphragm spring of clutch cover	
ST20050100 (—) Distance piece	Inspecting diaphragm spring of clutch cover	
ST20050240 (—) Diaphragm spring adjusting wrench	Adjusting unevenness of diaphragm spring of clutch cover	





(L) : Apply lithium-based grease including molybdenum disulphide.
: N·m (kg-m, ft-lb)

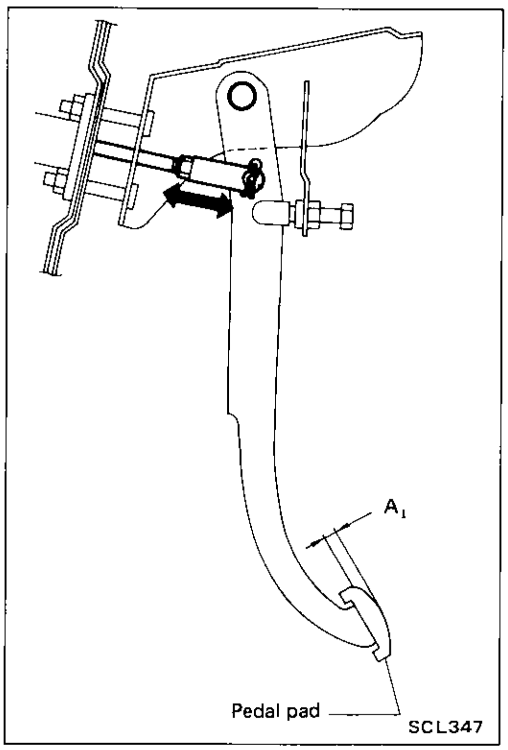
SCL387



SCL339

Adjusting Clutch Pedal

1. Adjust pedal height with pedal stopper or clutch switch.
   Pedal height "H":
   165 - 175 mm (6.50 - 6.89 in)



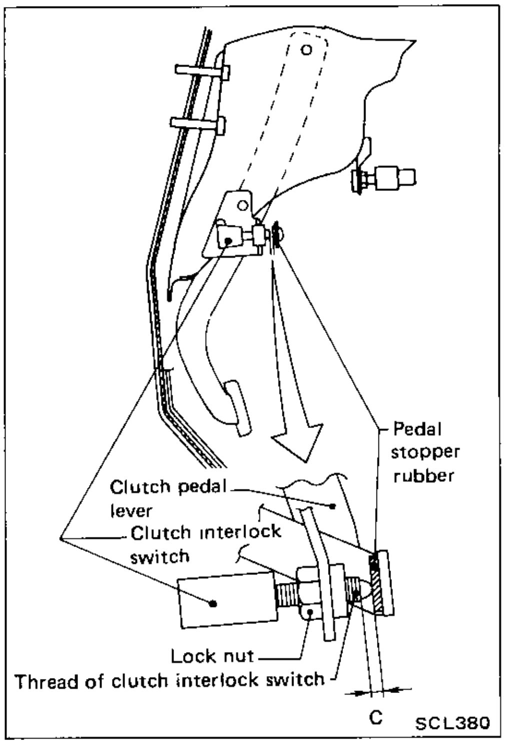
SCL347

2. Adjust pedal free play with master cylinder push rod. Then tighten lock nut.
   Pedal free play "A_1":
   1.0 - 3.0 mm (0.039 - 0.118 in)

Pedal free play means the following total, measured at position of pedal pad:

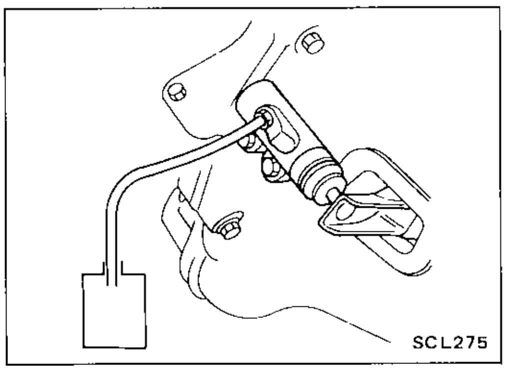
- **Play due to clevis pin and clevis pin hole in clutch pedal.**

Adjusting Clutch Pedal (Cont'd)



For U.S.A. model only

3. Adjust clearance "C" between pedal stopper rubber and threaded end of clutch interlock switch while depressing clutch pedal fully.
   Clearance C:
   0.1 - 1.0 mm (0.004 - 0.039 in)



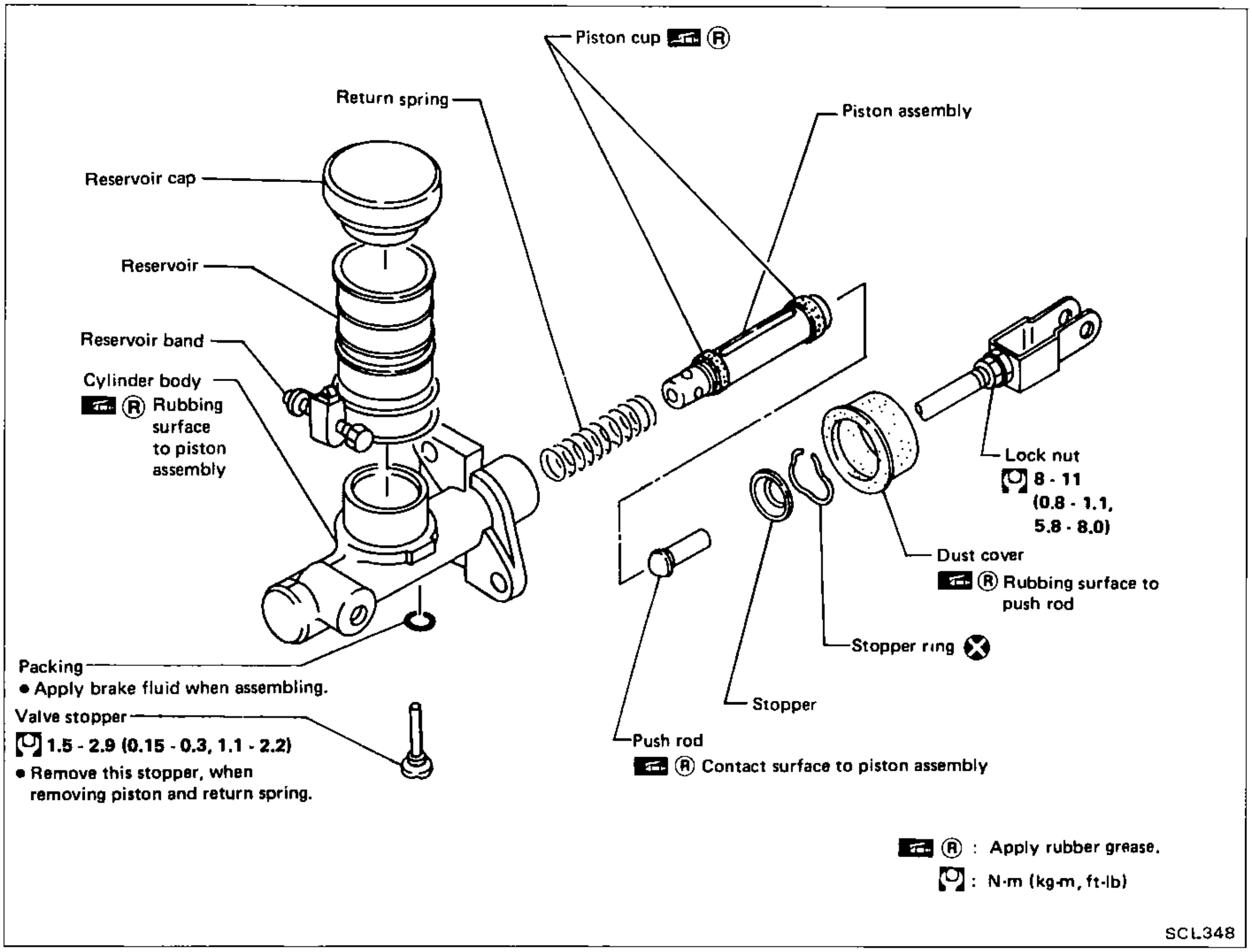
Bleeding Procedure

Bleed air according to the following procedure.

- **Carefully monitor fluid level at master cylinder during bleeding operation.**

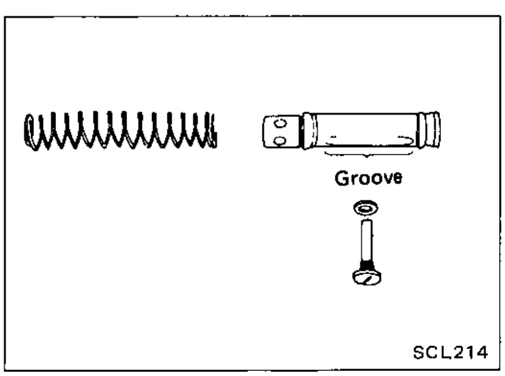
1. Top up reservoir with recommended brake fluid.
2. Connect a transparent vinyl tube to air bleeder valve of clutch operating cylinder.
3. Fully depress clutch pedal several times.
4. With clutch pedal depressed, open bleeder valve to release air.
5. Close bleeder valve.
6. Repeat steps 3 through 5 above until clear brake fluid comes out of air bleeder valve.

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.

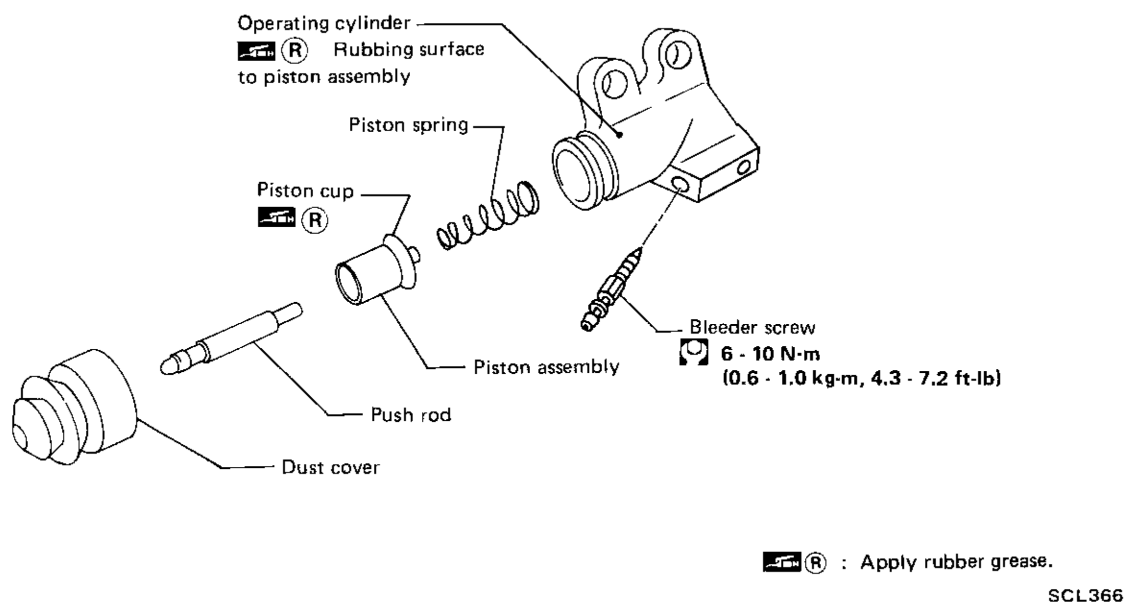
Clutch Master Cylinder (Cont'd)

INSPECTION

Check the following items, and replace if necessary.

- Rubbing surface of cylinder and piston, for uneven wear, rust or damage
- Piston with piston cup, for wear or damage
- Return spring, for wear or damage
- Dust cover, for cracks, deformation or damage
- Reservoir, for deformation or damage

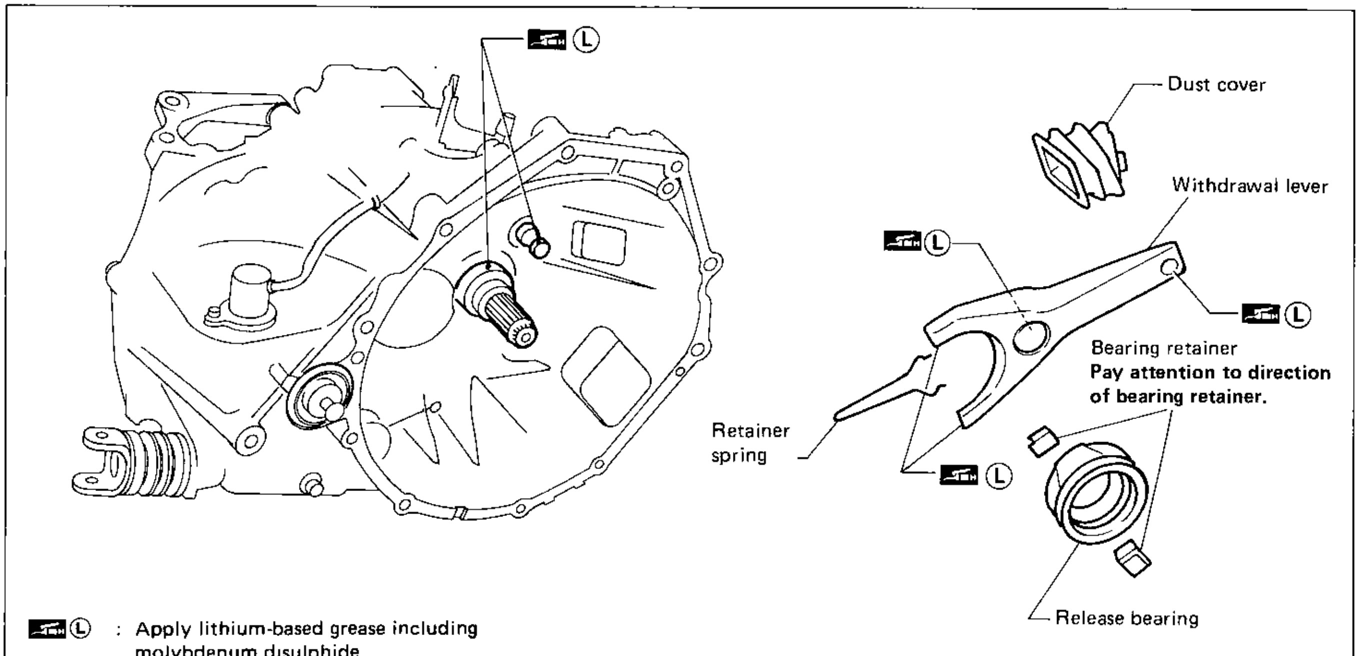
Operating Cylinder



INSPECTION

Check the following items, and replace if necessary.

- Rubbing surface of cylinder and piston, for uneven wear, rest or damage
- Piston with piston cup, for wear or damage
- Piston spring, for wear or damage
- Dust cover, for cracks, deformation or damage

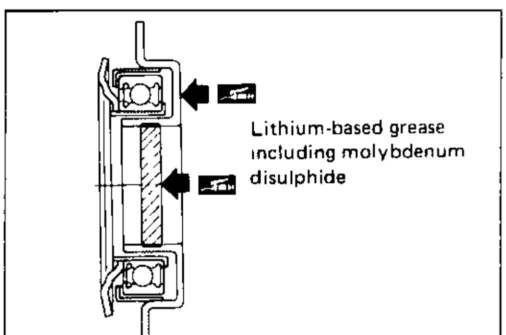


SCL367

INSPECTION

Check the following items, and replace if necessary.

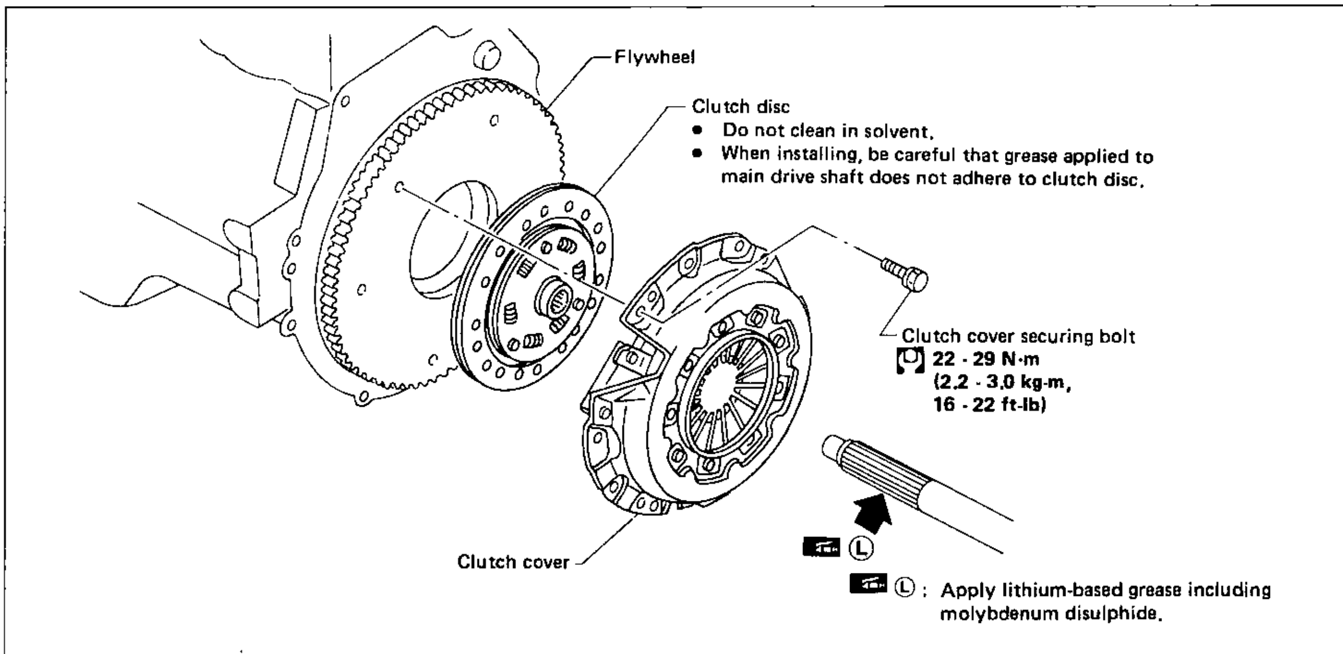
- Release bearing, to see that it rolls freely and is free from noise, cracks, pitting or wear
- Release sleeve and withdrawal lever rubbing surface, for wear, rust or damage



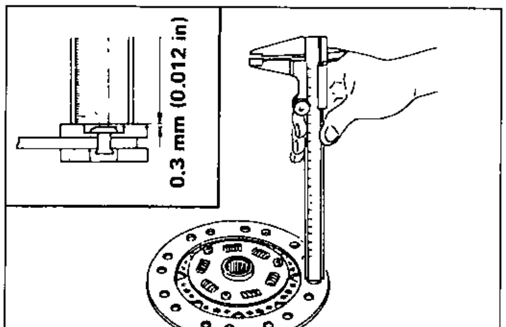
SCL150

LUBRICATION

- Apply recommended grease to contact surface and rubbing surface.
- **Too much lubricant might damage clutch disc facing.**



SCL354



SCL229

Clutch Disc

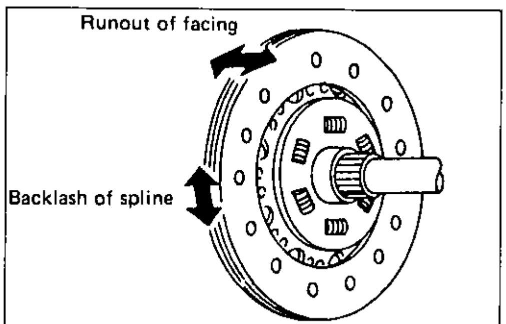
INSPECTION

Check the following items, and replace if necessary.

- Clutch disc, for burns, discoloration, oil or grease leakage
- Clutch disc, for wear of facing

  Wear limit of facing surface to rivet head:

  0.3 mm (0.012 in)



SCL221

- Clutch disc, for backlash of spline

  Maximum backlash of spline (at outer edge of disc):

  0.9 mm (0.035 in)
- Clutch disc, for runout of facing

  Runout limit:

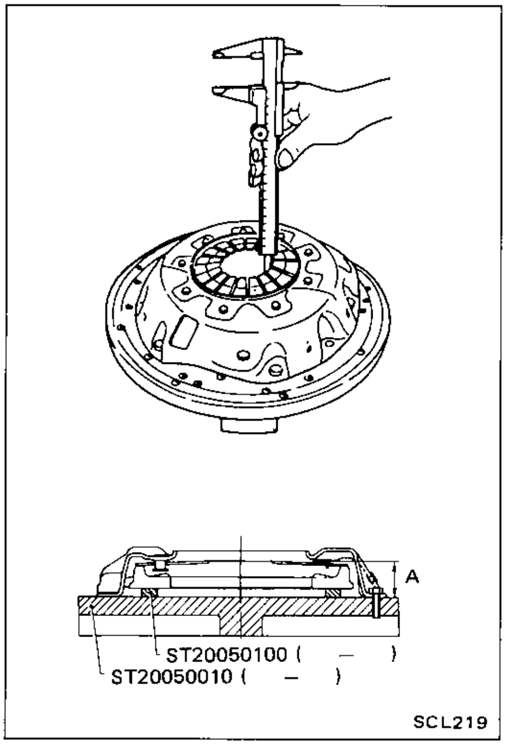
  1.0 mm (0.039 in)

  Distance of runout check point (from hub center)

  107.5 mm (4.23 in)

INSTALLATION

- Apply recommended grease to contact surface of spline portion.
- **Too much lubricant might damage clutch facing.**



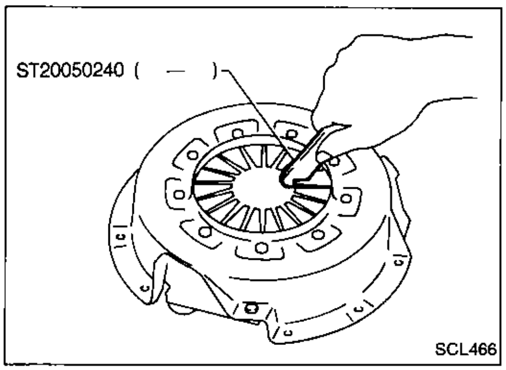
Clutch Cover and Flywheel

INSPECTION AND ADJUSTMENT

- Set Tool and check height and unevenness of diaphragm spring.
- Set 0.4 mm (0.016 in) feeler gauges on distance pieces (ST20050100) when checking diaphragm spring height.

  Diaphragm spring height "A":

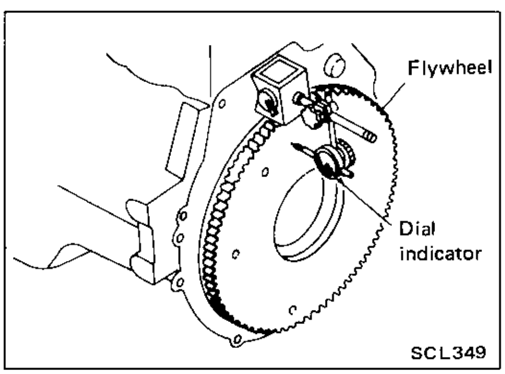
  33.0 - 35.0 mm (1.299 - 1.378 in)
- Check thrust rings for wear or damage by shaking cover assembly and listening for chattering noise, or lightly hammering on rivets for a slightly cracked noise. Replace clutch cover assembly if necessary.
- Check pressure plate and clutch disc contact surface for slight 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:

  0.7 mm (0.028 in)

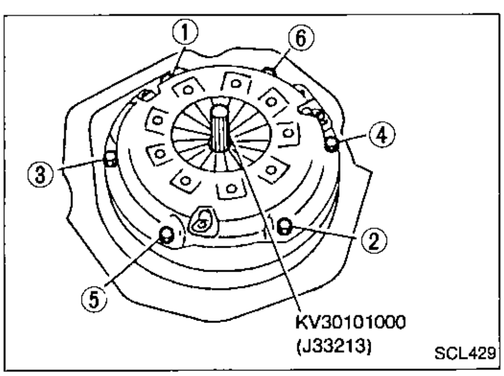


FLYWHEEL INSPECTION

- 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.
- Tighten bolts in numerical order.
- Be careful not to allow grease to contaminate clutch facing.

General Specifications

CLUTCH CONTROL SYSTEM

Type of clutch control	Hydraulic

CLUTCH MASTER CYLINDER

Inner diameter mm (in)	15.87 (5/8)

CLUTCH OPERATING CYLINDER

Inner diameter mm (in)	19.05 (3/4)

CLUTCH DISC

Unit: mm (in)

Model	225TBL
Facing size (Outer dia. x inner dia. x thickness)	225 x 150 x 3.5 (8.86 x 5.91 x 0.138)
Thickness of disc assembly With load	8.0 - 8.4 (0.315 - 0.331) with 5,394 N (550 kg, 1,213 lb)

CLUTCH COVER

Model	C225S
Full-load N (kg, lb)	4,413 (450, 992)

Inspection and Adjustment

CLUTCH PEDAL

Unit: mm (in)

Pedal height*	165 - 175 (6.50 - 6.89)
Pedal free play	1.0 - 3.0 (0.039 - 0.118)
Clearance between pedal stopper rubber and clutch interlock switch threaded end while clutch pedal is fully depressed.	0.1 - 1.0 (0.004 - 0.039)

*: Measured from surface of melt sheet to pedal pad

CLUTCH DISC

Unit: mm (in)

Model	225TBL
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)	107.5 (4.23)
Maximum backlash of spline (at outer edge disc)	0.9 (0.035)

CLUTCH COVER

Unit: mm (in)

Model	C225S
Diaphragm spring height	33.0 - 35.0 (1.299 - 1.378)
Uneven limit of diaphragm spring toe height	0.7 (0.028)

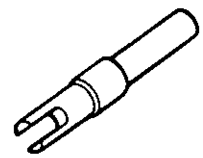
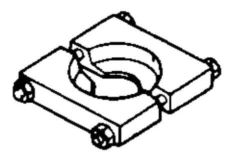
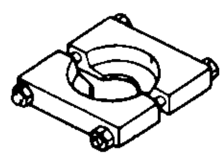
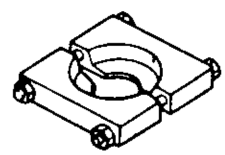
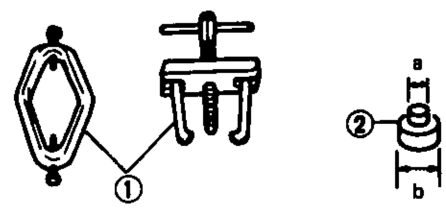
MANUAL TRANSAXLE

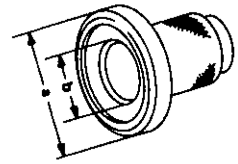
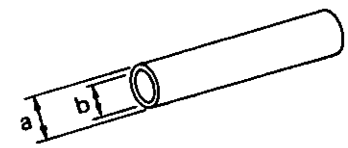
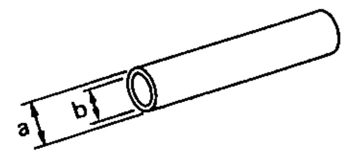
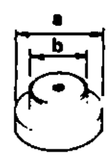
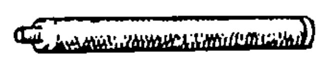
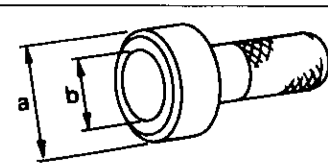
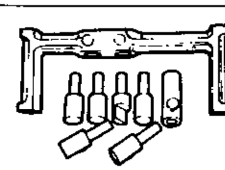
SECTION MT

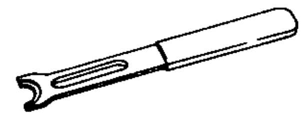
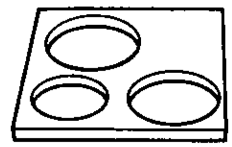
CONTENTS

PREPARATION .... MT- 2
ON-VEHICLE SERVICE .... MT- 5
REMOVAL AND INSTALLATION .... MT- 7
TRANSAXLE GEAR CONTROL .... MT- 9
MAJOR OVERHAUL MT-10
DISASSEMBLY MT-13
REPAIR FOR COMPONENT PARTS MT-16
ADJUSTMENT MT-30
ASSEMBLY MT-34
SERVICE DATA AND SPECIFICATIONS (S.D.S.) MT-38

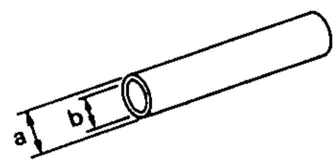
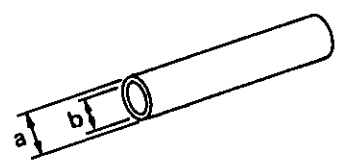
SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.) Tool name	Description
KV38106500 (J34284) Preload adapter	Measuring turning torque of final drive assembly Measuring total turning torque Measuring clearance between side gear and differential case with washer Selecting differential side bearing adjusting shim 
KV32101000 (J25689-A) Pin punch	Removing and installing retaining pin 
ST22730000 (J25681) Puller	Removing mainshaft front and rear bearing inner race 
ST30031000 (J22912-01) Puller	Removing input shaft front and rear bearing Removing 4th & 5th main gear 
ST30021000 (J22912-01) Puller	Removing 5th synchronizer Removing 3rd & 4th synchronizer Removing 2nd & 3rd main gear 
ST3306S001 (—) Differential side bearing puller set ① ST33051001 (—) Puller ② ST33061000 (J8107-2) Adapter	Removing differential side bearing inner race  a: 28.5 mm (1.122 in) dia. b: 38 mm (1.50 in) dia.
ST33290001 (J34286) Puller	Removing differential oil seal Removing mainshaft rear bearing outer race Removing differential side bearing outer race 

Tool number (Kent-Moore No.) Tool name	Description
ST33400001 (J26082) Drift	Installing differential oil seal  **a: 60 mm (2.36 in) dia.** **b: 47 mm (1.85 in) dia.**
ST30600000 (J25863-01) Drift	Installing input shaft front bearing  **a: 36 mm (1.42 in) dia.** **b: 31 mm (1.22 in) dia.**
ST22452000 (—) Drift	Installing 3rd, 4th and 5th main gear  **a: 45 mm (1.77 in) dia.** **b: 36 mm (1.42 in) dia.**
ST30621000 (J25742-5) Drift	Installing mainshaft rear bearing outer race (Use with ST30611000.)  **a: 79 mm (3.11 in) dia.** **b: 59 mm (2.32 in) dia.**
ST30611000 (J25742-1) Drift	Installing mainshaft rear bearing outer race (Use with ST30621000.) 
ST307200000 (—) Drift	Installing differential side bearing outer race  **a: 77 mm (3.03 in) dia.** **b: 55.5 mm (2.185 in) dia.**
(J34290) Shim selecting tool set	Selecting differential side bearing adjusting shim 

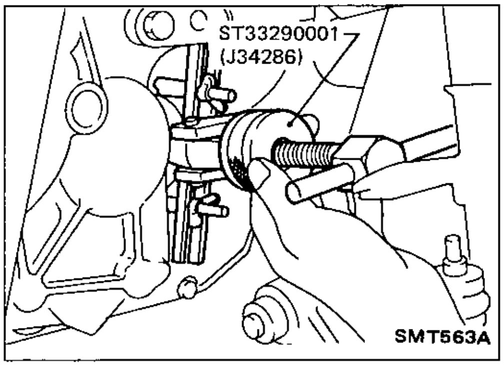
Tool number (Kent-Moore No.) Tool name	Description
(J34305) Snap ring remover and installer	Removing and installing stopper ring of shift fork 
(J25407-2)	Measuring reverse baulk ring wear 

COMMERCIAL SERVICE TOOLS

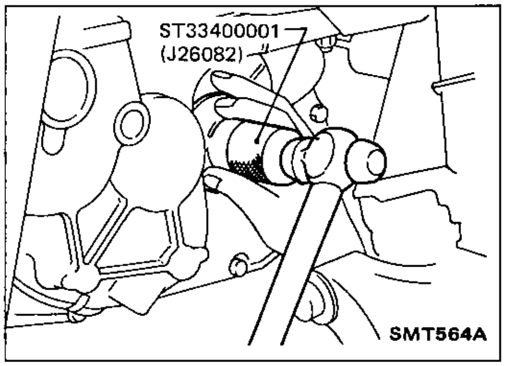
Tool name	Description
Drift	Installing differential side bearing inner race  a: 45 mm (1.77 in) dia. b: 41 mm (1.61 in) dia.
Drift	Installing striking rod oil seal  a: 38 mm (1.50 in) dia. b: 20 mm (0.79 in) dia.

Replacing Oil Seal

DIFFERENTIAL OIL SEAL



1. Drain gear oil from transaxle.
2. Remove drive shafts — Refer to section FA.
3. Remove differential oil seal.

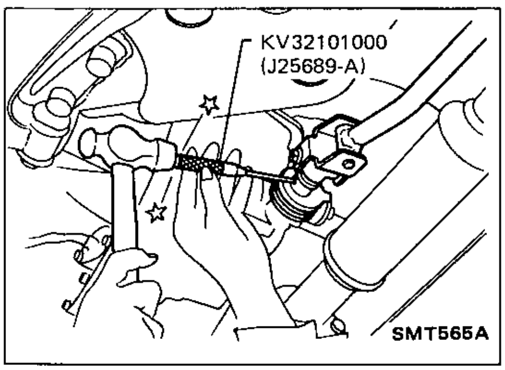


4. Install differential oil seal.

- **Apply multi-purpose grease to seal lip of oil seal before installing.**

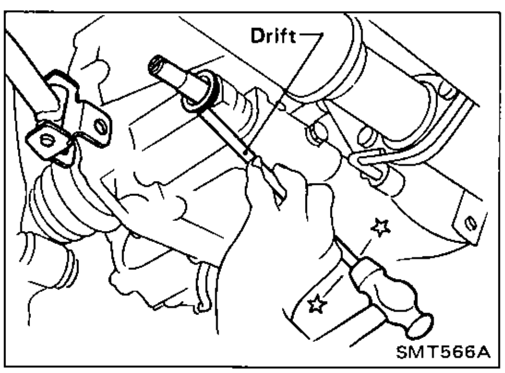
5. Install drive shafts — Refer to section FA.

STRIKING ROD OIL SEAL

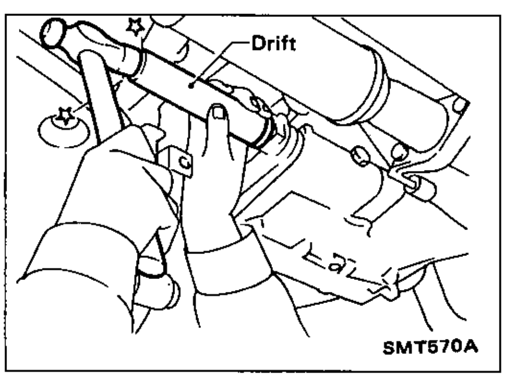


1. Remove transaxle control rod from yoke.
2. Remove retaining pin of yoke.

- **Be careful not to damage boot.**

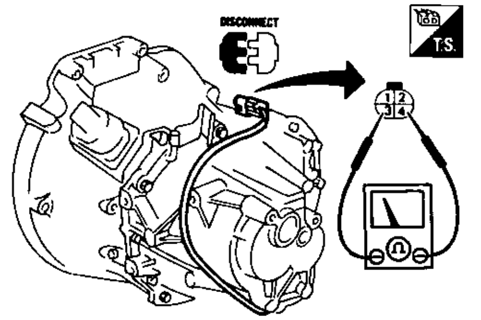


3. Remove striking rod oil seal.



4. Install striking rod oil seal.

- **Apply multi-purpose grease to seal lip of oil seal before installing.**



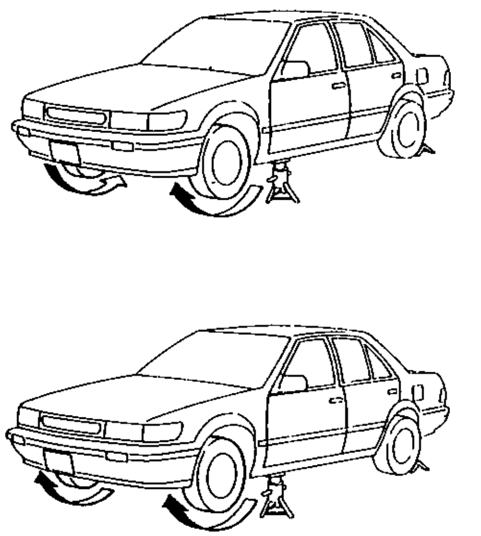
SMT346B

Position Switch Check

BACK-UP LAMP SWITCH AND NEUTRAL SWITCH

- Check continuity.

Gear position	Continuity
Reverse	② — ④
Neutral	① — ③
Except reverse and neutral	No



SMT633B

Viscous Coupling Check

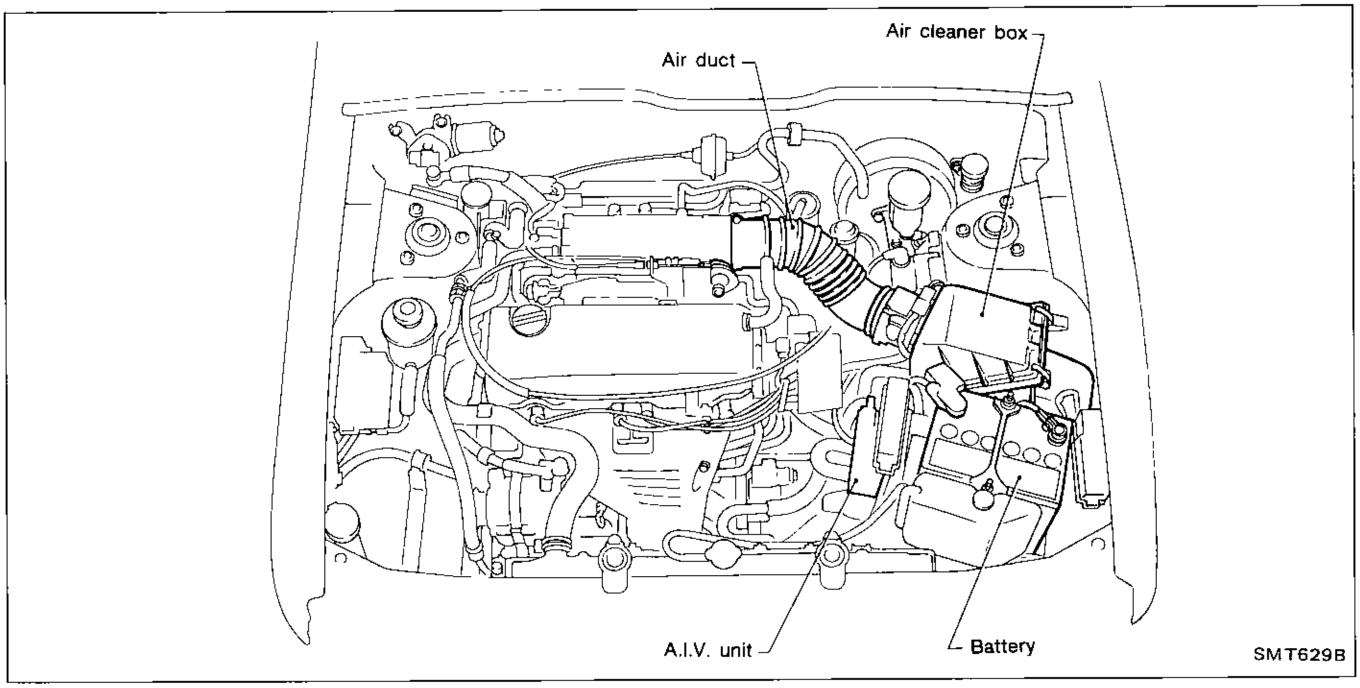
1. Apply parking brake firmly and place shift lever in the neutral position.
2. Jack up front wheels.
3. Rotate one front wheel and check turning direction of the other front wheel.

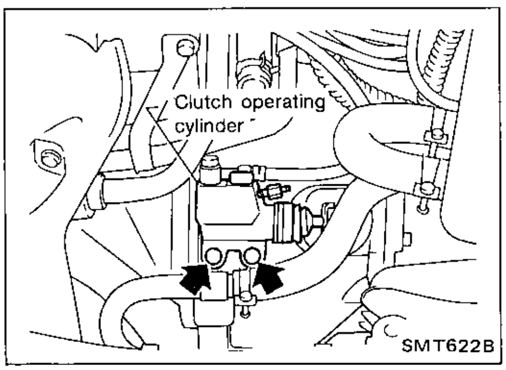
Turning direction of the two wheels is opposite:

The viscous coupling is not functioning normally.

Turning direction of the two wheels is the same:

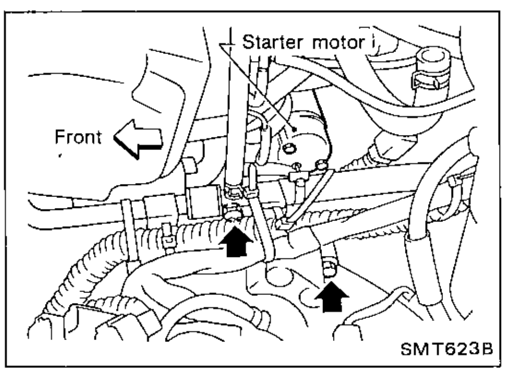
If differential side gear and pinion mate gear thrust washers are O.K., viscous coupling is functioning normally.



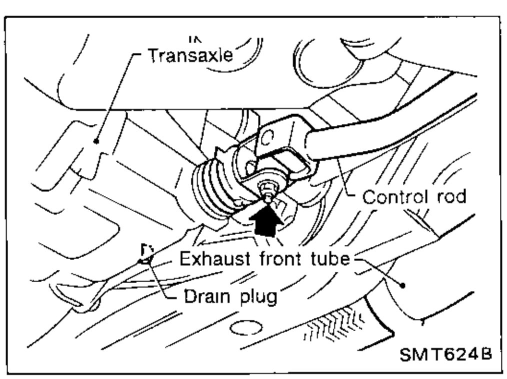


Removal

1. Remove battery and bracket.
2. Remove air cleaner box with air flow meter.
3. Remove air duct.
4. Remove A.I.V. unit.
5. Remove clutch operating cylinder from transaxle.
6. Remove clutch hose clamp.
7. Disconnect speedometer pinion and position switch connectors.
8. Remove transaxle breather hose clamp.

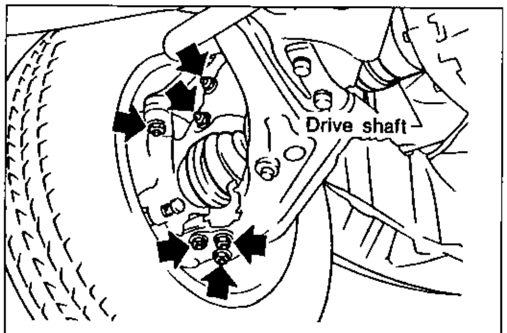


9. Remove starter motor from transaxle.



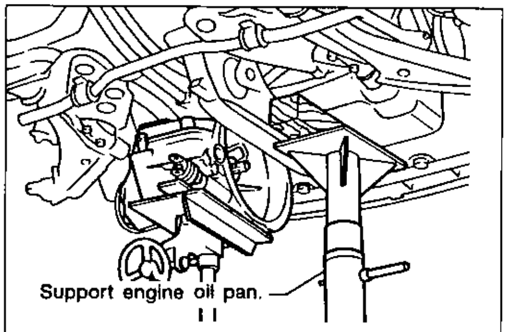
10. Remove shift control rod from transaxle.
11. Drain gear oil from transaxle.
12. Remove exhaust front tube.

Removal (Cont'd)



SMT625B

13. Draw out drive shafts from transaxle.

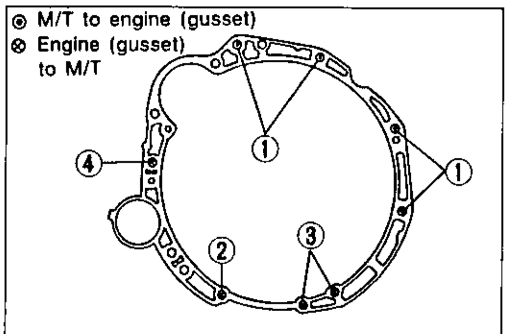


SMT626B

14. Support engine by placing a jack under oil pan.

CAUTION:
Do not place jack under oil pan drain plug.

15. Remove rear and L.H. mounts.
16. Remove bolts securing transaxle.
17. Lower transaxle while supporting it with a jack.

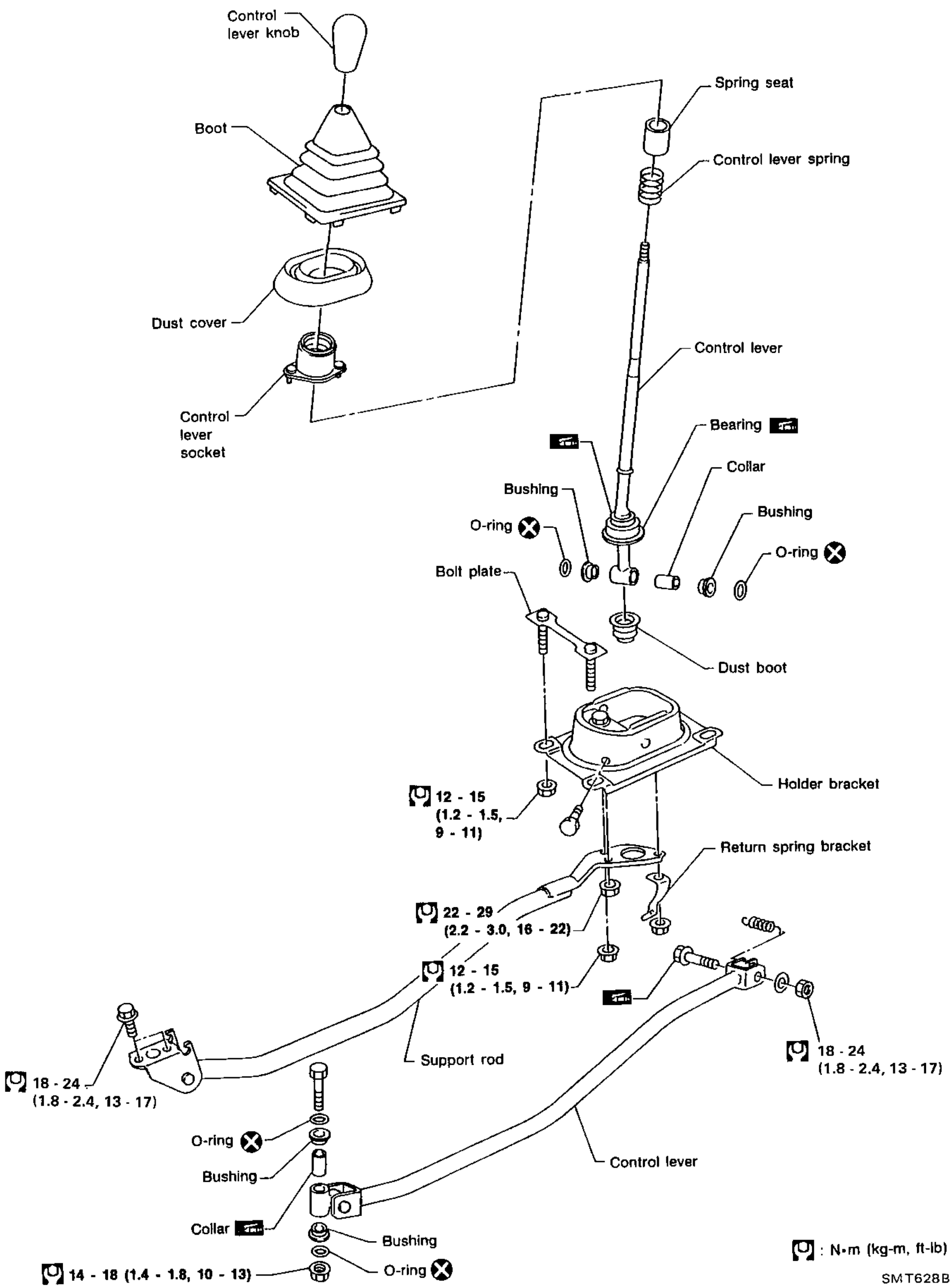


SMT627B

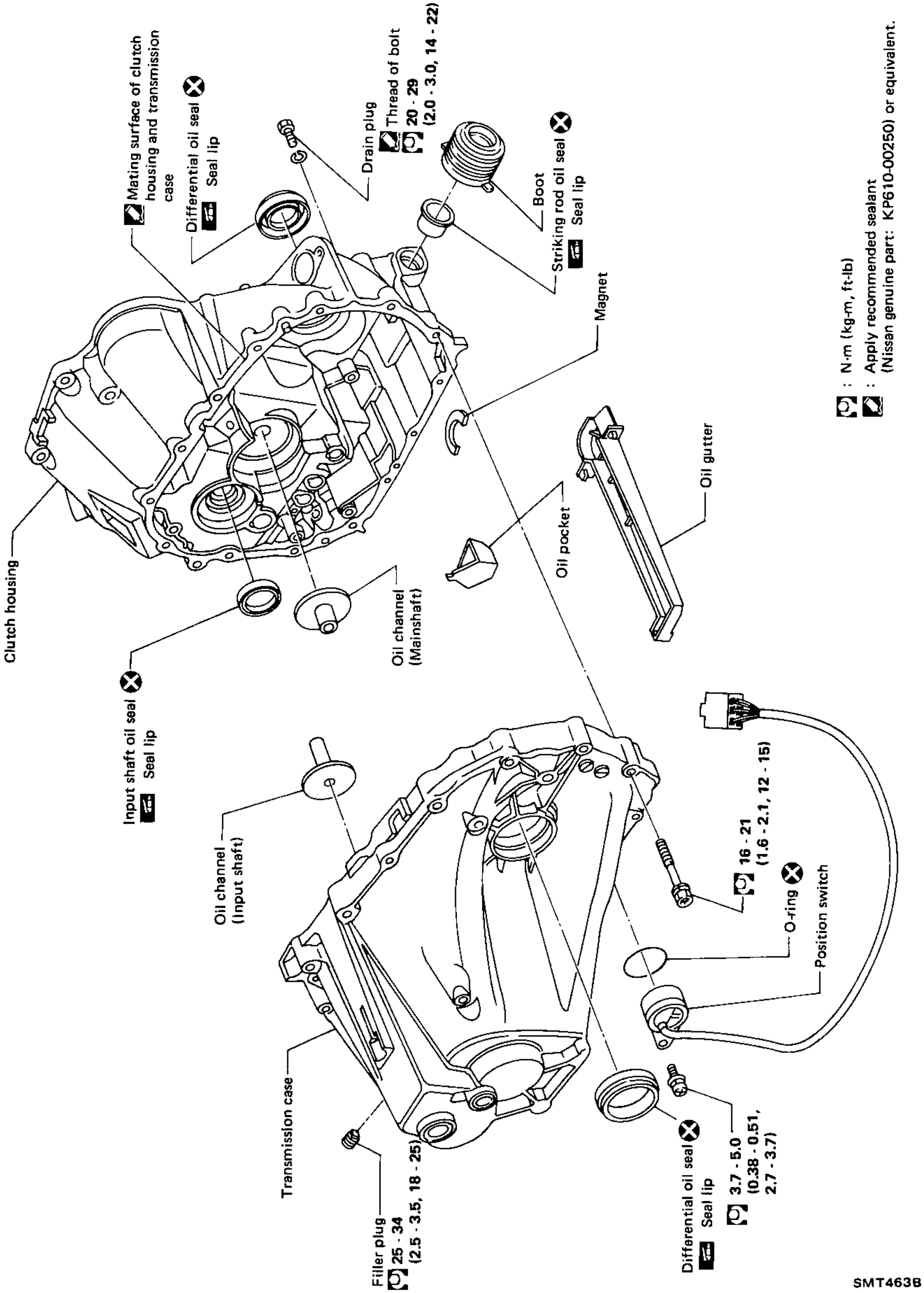
Installation

1. Tighten bolts securing transaxle.

Bolt No.	Tightening torque N·m (kg-m, ft-lb)	mm (in)
1	39 - 49 (4.0 - 5.0, 29 - 36)	45 (1.77)
2	39 - 49 (4.0 - 5.0, 29 - 36)	25 (0.98)
3	30 - 40 (3.1 - 4.1, 22 - 30)	30 (1.18)
4	30 - 40 (3.1 - 4.1, 22 - 30)	40 (1.57)

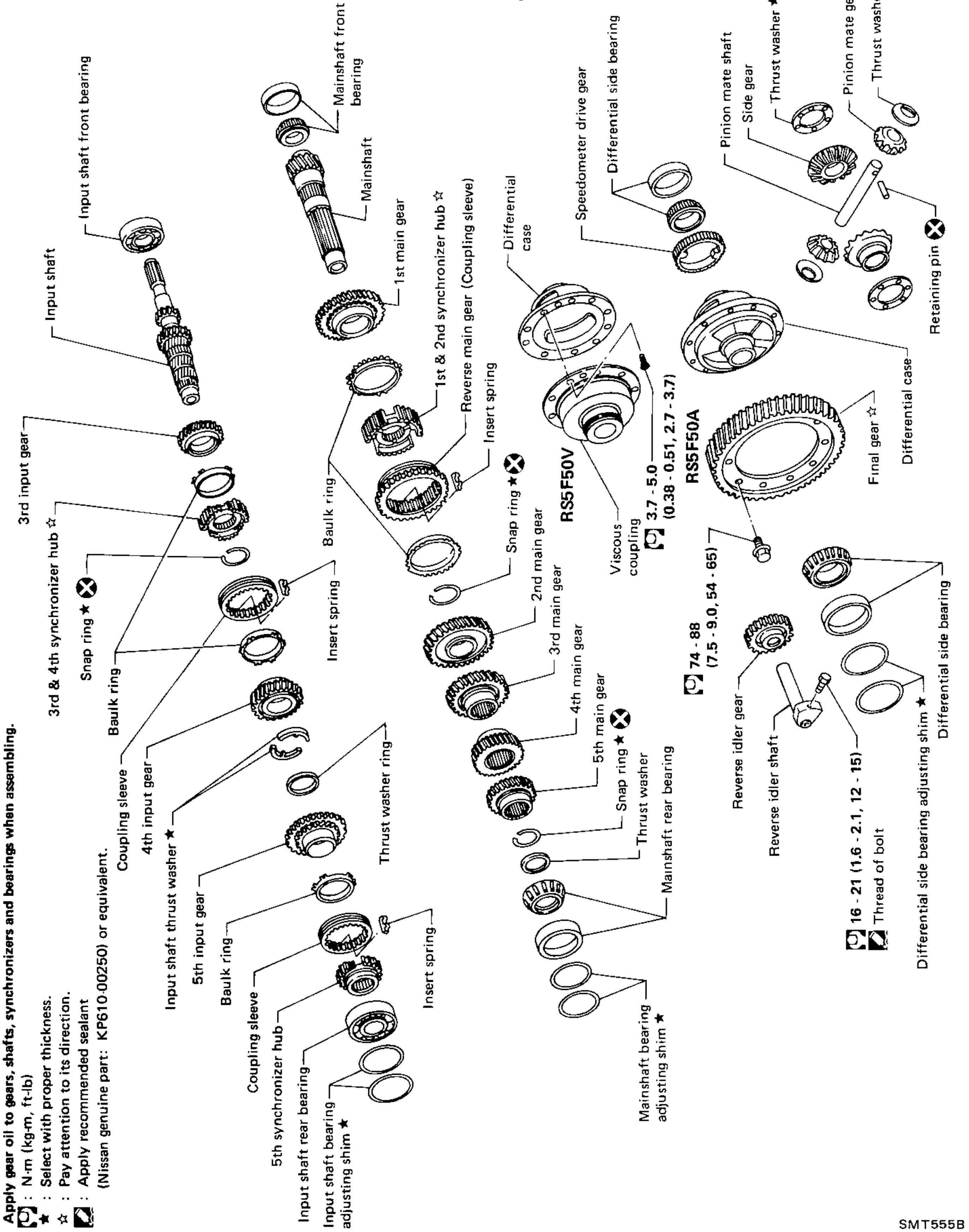

Control lever knob
Boot
Dust cover
Control lever socket
Spring seat
Control lever spring
Control lever
Bearing
Collar
Bushing
O-ring
Bushing
O-ring
Bolt plate
Dust boot
Holder bracket
12 - 15 (1.2 - 1.5, 9 - 11)
Return spring bracket
22 - 29 (2.2 - 3.0, 16 - 22)
12 - 15 (1.2 - 1.5, 9 - 11)
Support rod
18 - 24 (1.8 - 2.4, 13 - 17)
18 - 24 (1.8 - 2.4, 13 - 17)
O-ring
Bushing
Collar
Control lever
Bushing
O-ring
14 - 18 (1.4 - 1.8, 10 - 13)
: N•m (kg-m, ft-lb)
SMT628B

Case Components



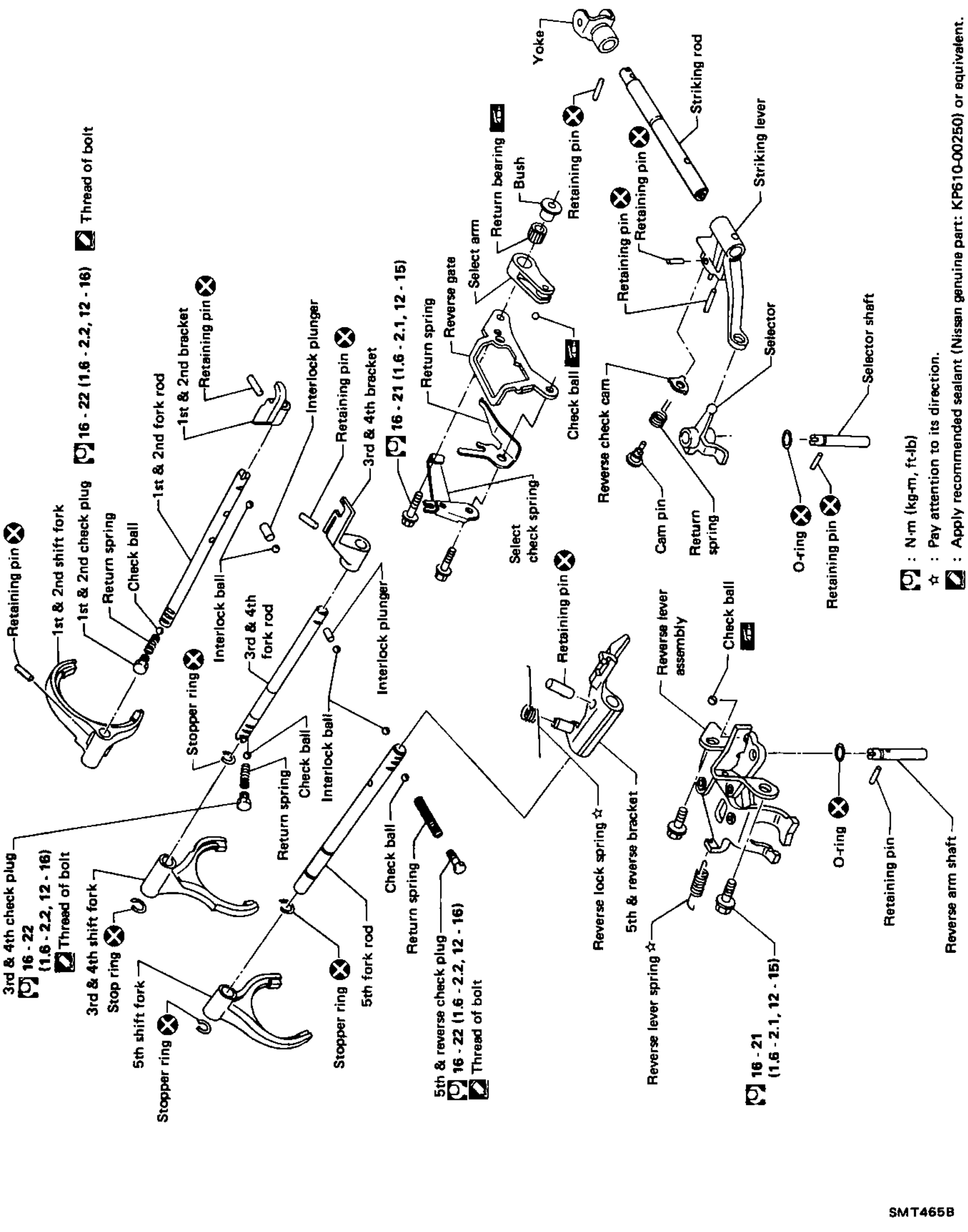
SMT463B

Gear Components

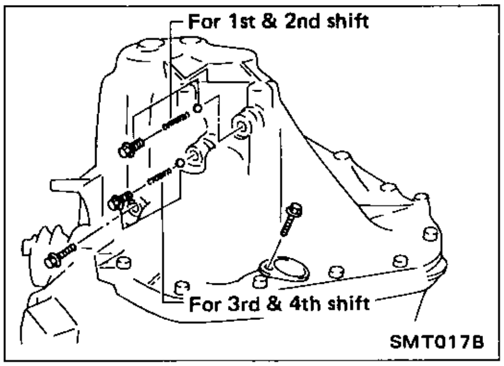


SMT555B

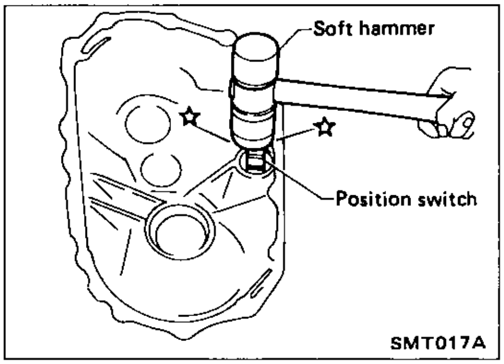
Shift Control Components



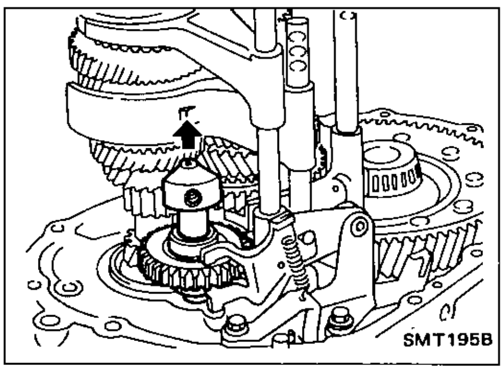
SMT465B



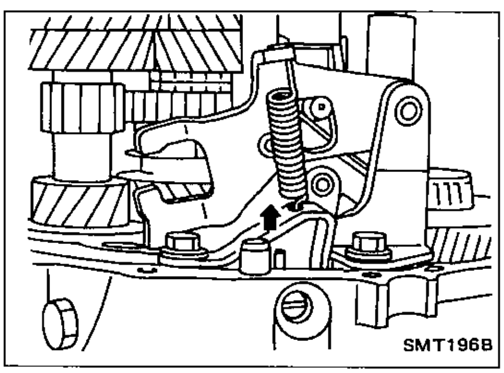
1. Before removing transmission case, remove bolts and plugs as shown left.
2. Remove transmission case.



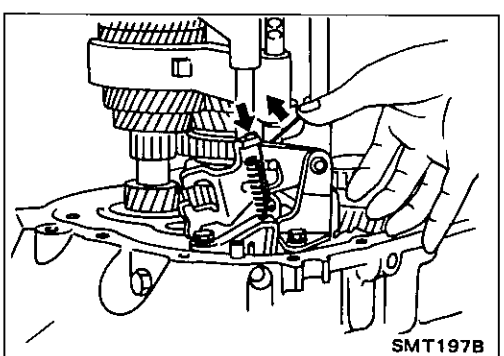
3. Remove position switch.



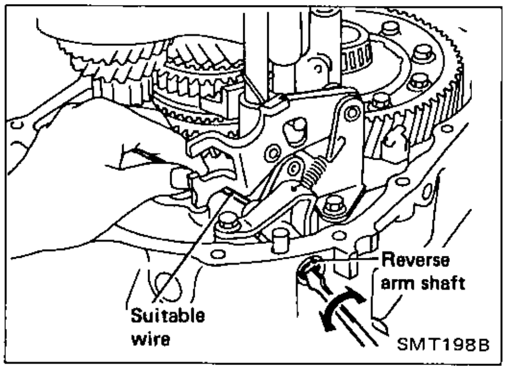
4. Mesh 4th gear, and then remove reverse idler shaft and reverse idler gear.



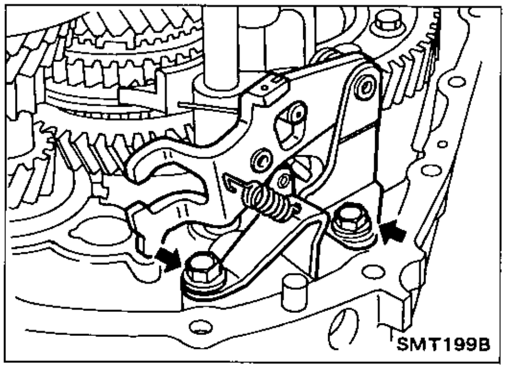
5. Pull out retaining pin from clutch housing.



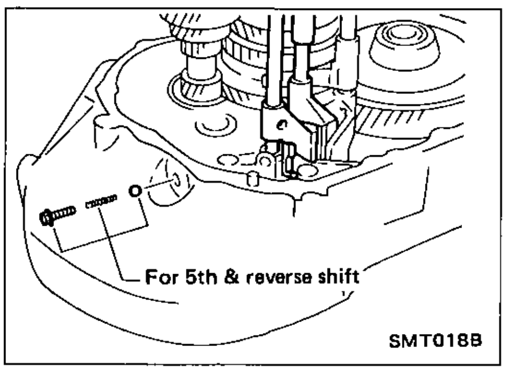
6. Remove reverse lever spring and reverse lock spring from reverse lever assembly.



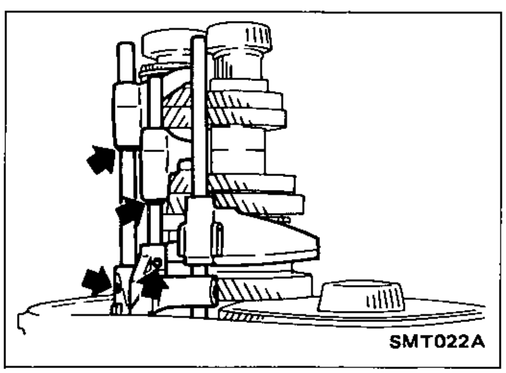
7. Remove reverse arm shaft while rotating it.



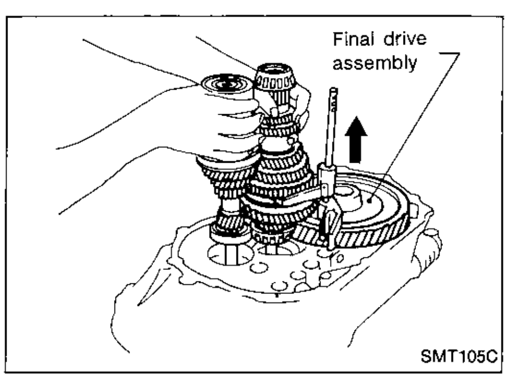
8. Remove reverse lever assembly.



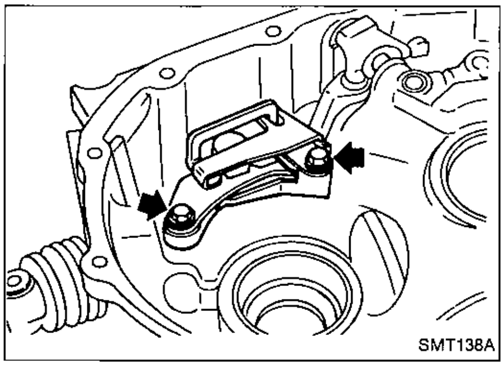
9. Remove 5th & reverse check plug, spring and ball.



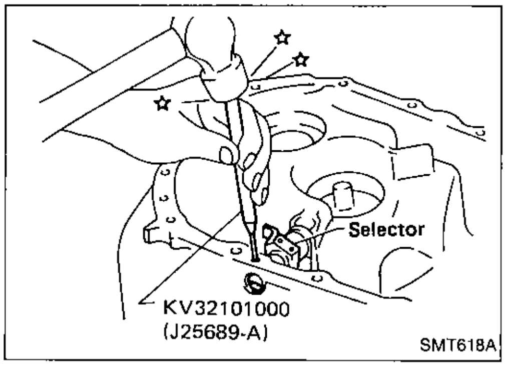
10. Remove stopper rings and retaining pins from 5th & reverse and 3rd & 4th fork rods.
11. Remove 5th & reverse and 3rd & 4th fork rods. Then remove forks and brackets.



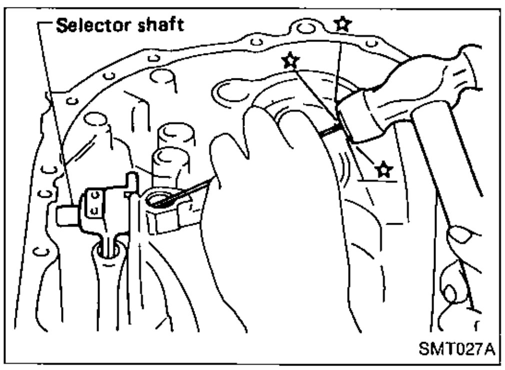
12. Remove both input and mainshafts with 1st & 2nd fork and fork rod as a set.
13. Remove final drive assembly.

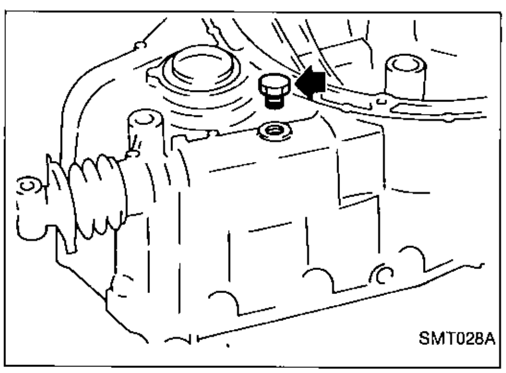


14. Remove reverse check assembly.

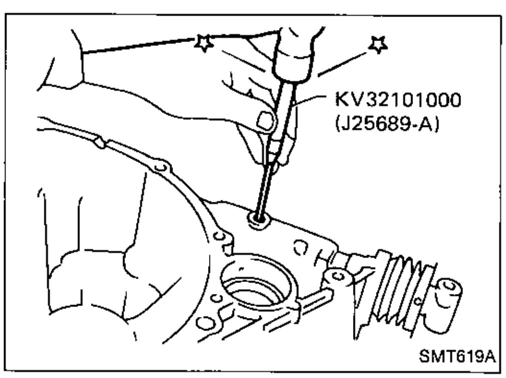


15. Remove retaining pin and detach the selector.





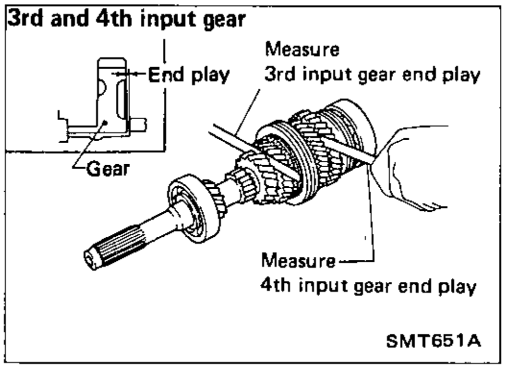
16. Remove drain plug for convenience in removing retaining pin which holds striking lever to striking rod.

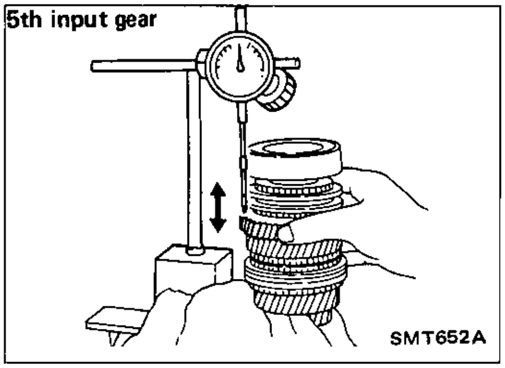


17. Remove retaining pin and then withdraw striking lever and striking rod.

Input Shaft and Gears

DISASSEMBLY



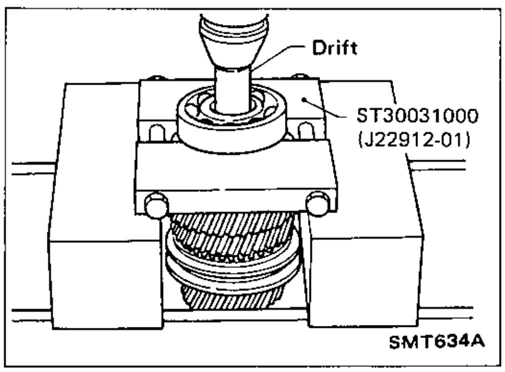


1. Before disassembly, check 3rd, 4th and 5th input gear end plays.

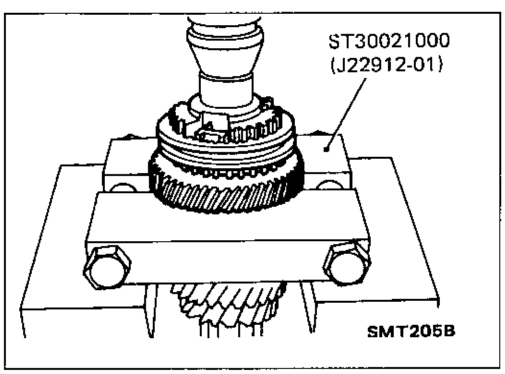
Gear end play

Gears	End play mm (in)
3rd input gear	0.23 - 0.43 (0.0091 - 0.0169)
4th input gear	0.25 - 0.55 (0.0098 - 0.0217)
5th input gear	0.23 - 0.48 (0.0091 - 0.0189)

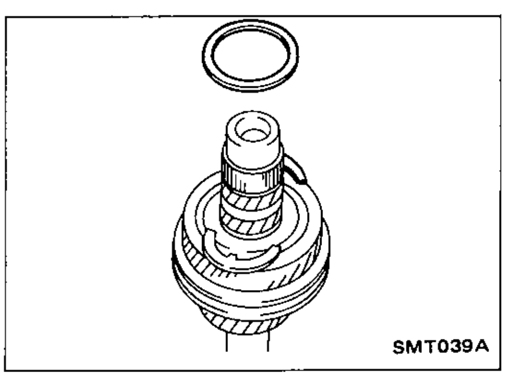
- If not within specification, disassemble and check contact surface of gear, shaft and hub. Then check clearance of snap ring and thrust washer — Refer to "Assembly".



2. Remove input shaft rear bearing.

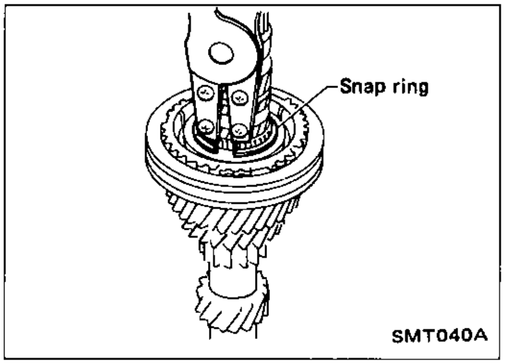


3. Remove 5th & reverse synchronizer and 5th input gear.

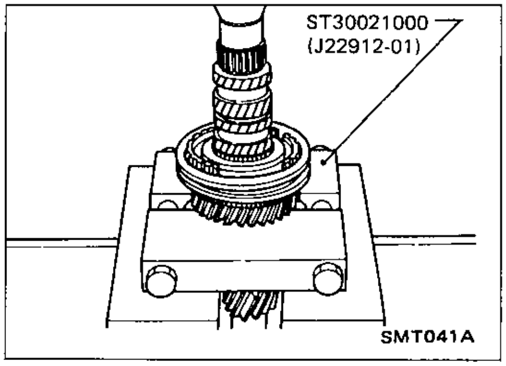


4. Remove thrust washer ring, thrust washers and 4th input gear.

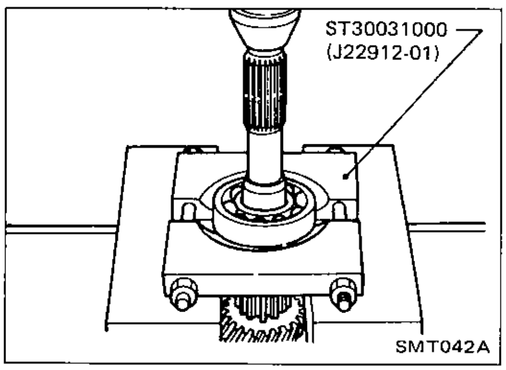
Input Shaft and Gears (Cont'd)



5. Remove snap ring.

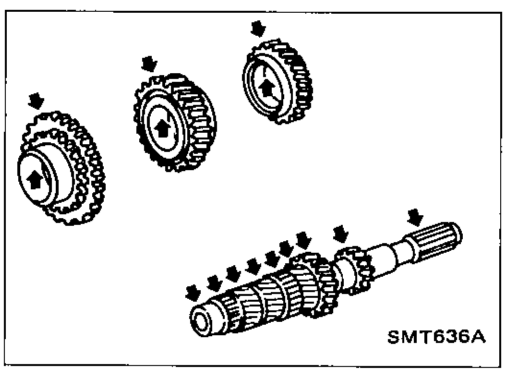


6. Remove 3rd & 4th synchronizer and 3rd input gear.



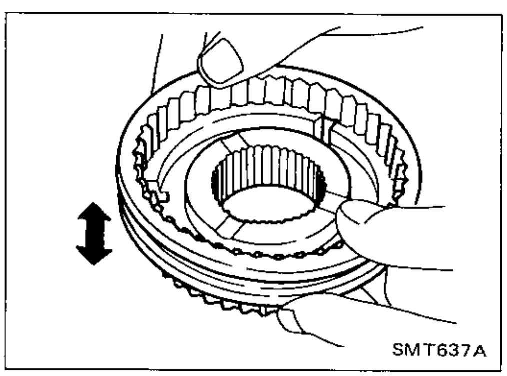
7. Remove input shaft front bearing.

INSPECTION



Gear and shaft

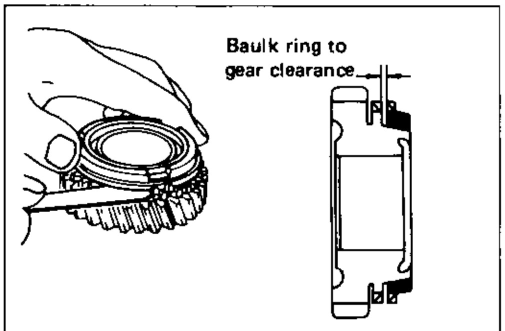
- Check shaft for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.



Synchronizer

- Check spline portion of coupling sleeves, hubs and gears for wear or cracks.
- Check baulk rings for cracks or deformation.
- Check insert springs for wear or deformation.

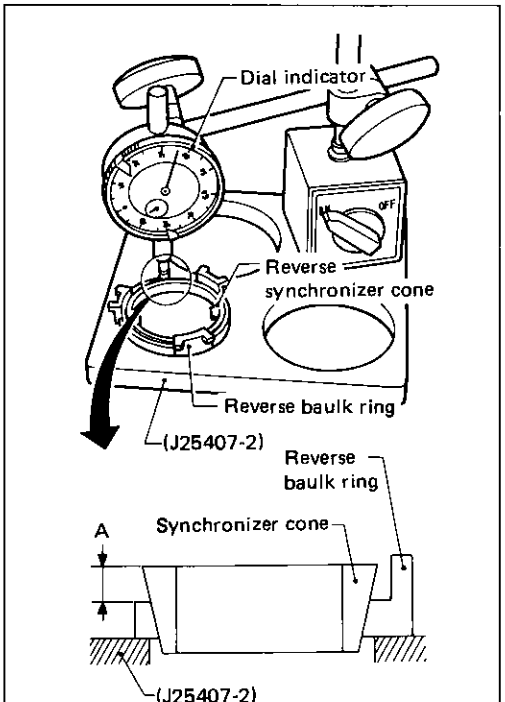
Input Shaft and Gears (Cont'd)



SMT140

- Measure clearance between baulk ring and gear (4th and 5th).

  Clearance between baulk ring and gear:
  Standard
  1.0 - 1.35 mm (0.0394 - 0.0531 in)
  Wear limit
  0.7 mm (0.028 in)



SMT580B

- **Measure wear of reverse baulk ring.**

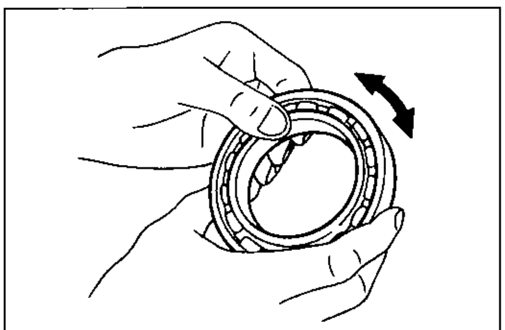
a. Place reverse baulk ring on Tool and then place reverse synchronizer cone on reverse baulk ring.

- **Make sure projection of synchronizer cone is positioned over the recess on Tool.**

b. While holding reverse synchronizer cone against reverse baulk ring as firmly as possible, measure dimension "A" with dial indicator.

  Wear limit:
  Dimension "A"
  1.2 mm (0.047 in)

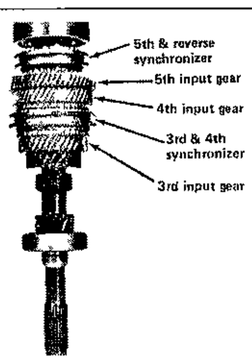
c. If dimension "A" is smaller than the wear limit, replace baulk ring.


SMT148A

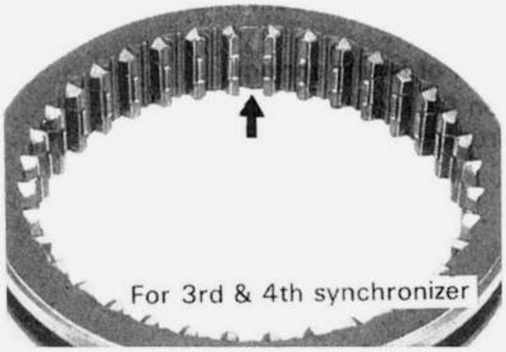
Bearing

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.

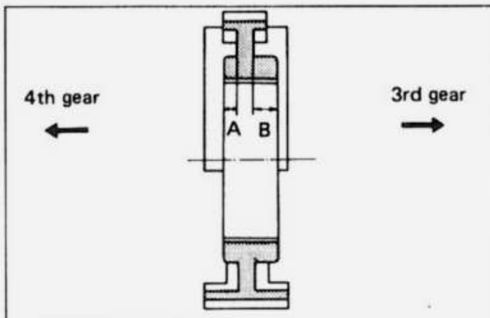
ASSEMBLY



Input Shaft and Gears (Cont'd)

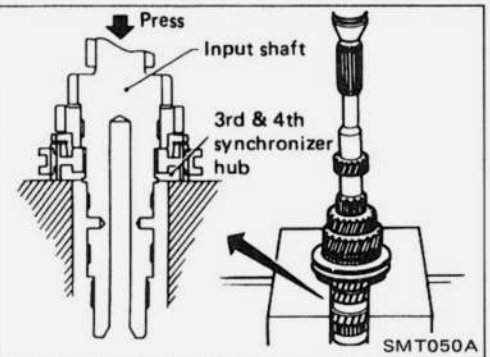


1. Place inserts in three grooves on coupling sleeve (3rd & 4th synchronizer).



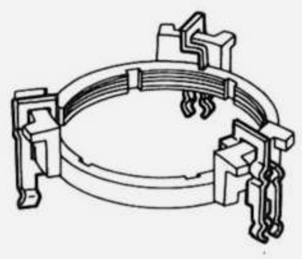
"B" is longer than "A". SMT049A

2. Install 3rd input gear and 3rd baulk ring.
3. Press on 3rd & 4th synchronizer hub.
- **Pay attention to its direction.**
4. Select proper snap ring of 3rd & 4th synchronizer hub to minimize clearance of groove, and then install it.
   Allowable clearance of groove:
   0 - 0.1 mm (0 - 0.004 in)
   Snap ring of 3rd & 4th synchronizer hub:
   Refer to S.D.S.



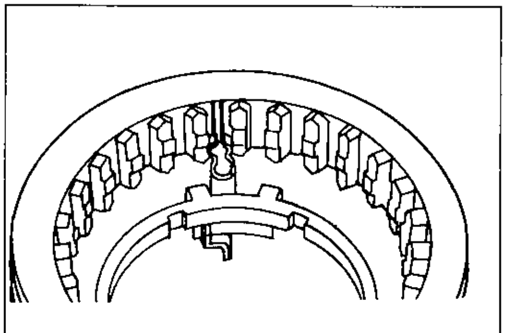
SMT050A

5. Install 4th input gear.
6. Select proper thrust washers to minimize clearance of groove.
   Then install them and thrust washer ring.
   Allowable clearance of groove:
   0 - 0.06 mm (0 - 0.0024 in)
   Input shaft thrust washer:
   Refer to S.D.S.


SMT206B

7. Install 5th & reverse synchronizer assembly.
a. Hook insert springs on reverse baulk ring.

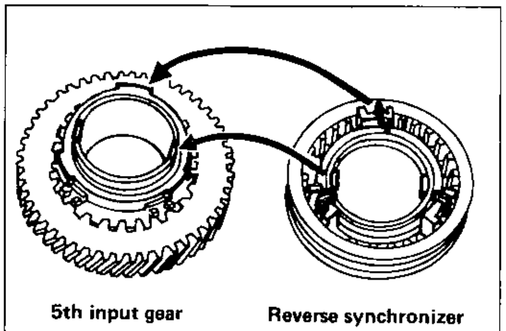
Input Shaft and Gears (Cont'd)



SMT207B

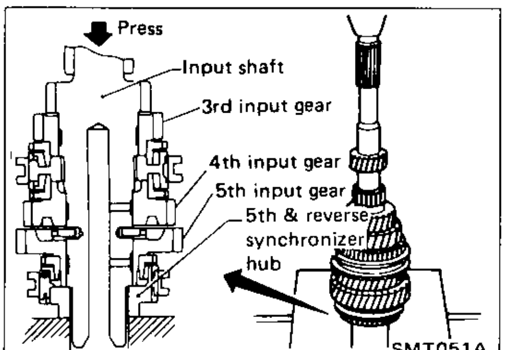
b. Install insert springs with reverse baulk ring onto coupling sleeve.
- **Pay attention to position of insert springs.**

c. Place 5th baulk ring on 5th input gear.
d. Install reverse synchronizer cone on reverse baulk ring.



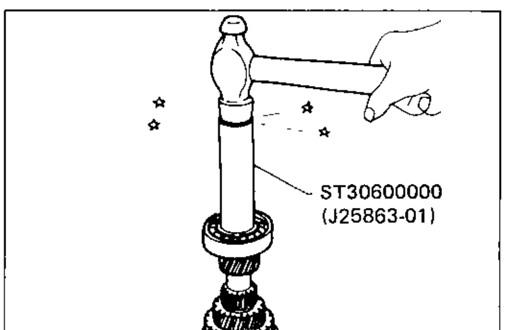
SMT208B

e. Place reverse synchronizer assembly on 5th input gear.
- **Mesh recesses of 5th input gear with projections of reverse synchronizer cone.**
- **Put insert spring mounts on reverse baulk ring upon those on 5th baulk ring.**



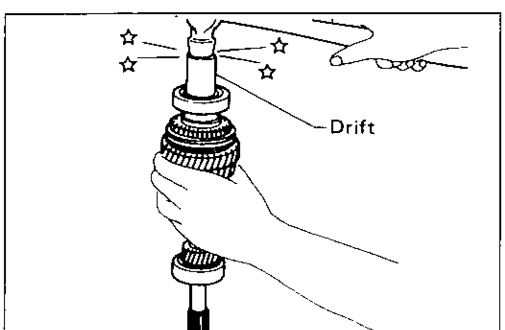
SMT051A

f. Press on 5th & reverse synchronizer assembly with 5th input gear.

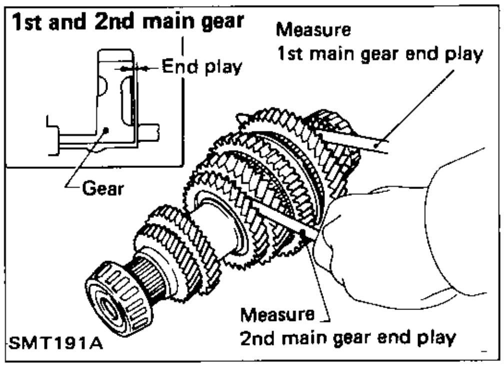


SMT052A

8. Install input shaft front and rear bearings.
9. Measure gear end play as the final check — Refer to "Disassembly".



SMT053A



Mainshaft and Gears

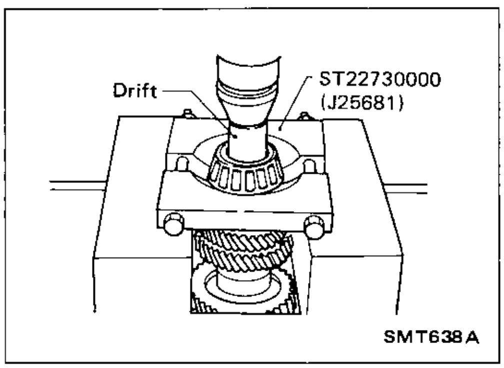
DISASSEMBLY

1. Before disassembly, check 1st and 2nd main gear end plays.

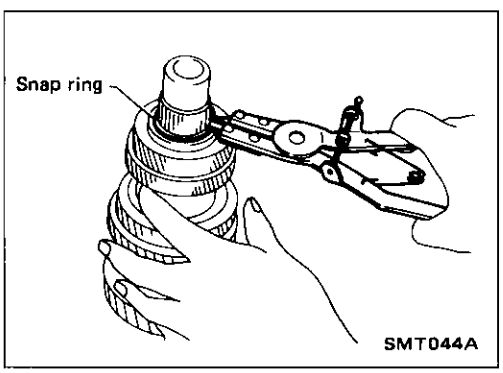
Gear end play

Gears	End play mm (in)
1st main gear	0.23 - 0.43 (0.0091 - 0.0169)
2nd main gear	0.23 - 0.58 (0.0091 - 0.0228)

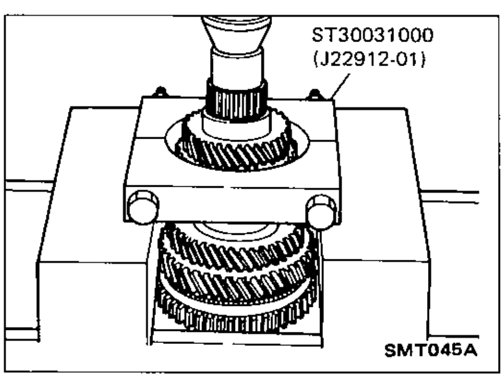
If not within specification, disassemble and check contact surface of gear, shaft and hub. Then check clearance of snap ring — Refer to "Assembly".



2. Press out mainshaft rear bearing.

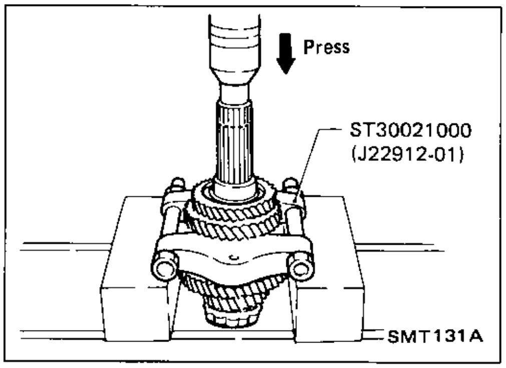


3. Remove thrust washer and snap ring.

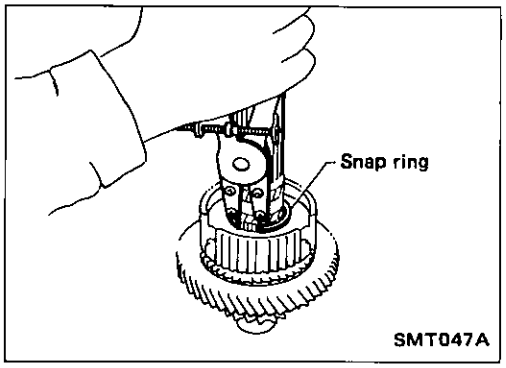


4. Press out 5th main gear and 4th main gear.

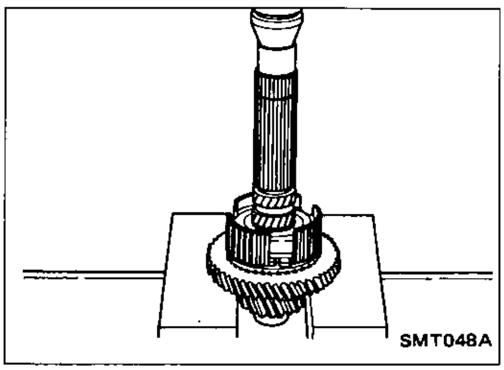
Mainshaft and Gears (Cont'd)



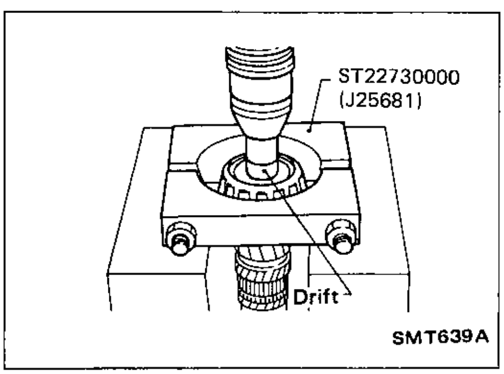
5. Press out 3rd main gear and 2nd main gear.



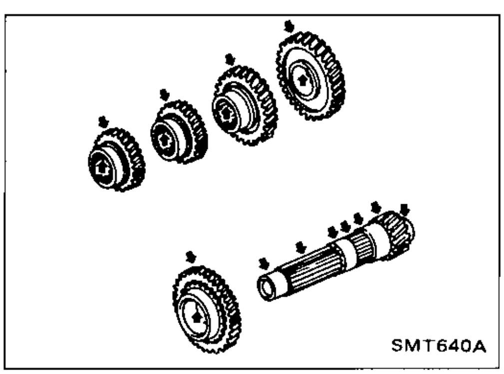
6. Remove snap ring.



7. Remove 1st & 2nd synchronizer and 1st main gear.



8. Remove mainshaft front bearing.



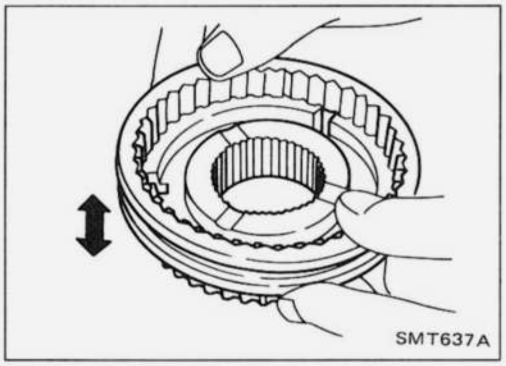
INSPECTION

Gear and shaft

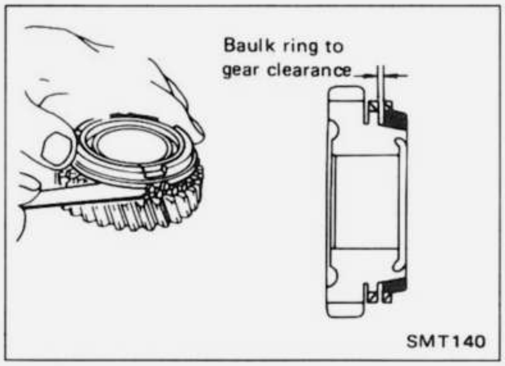
- Check shaft for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.

Mainshaft and Gears (Cont'd)

Synchronizer



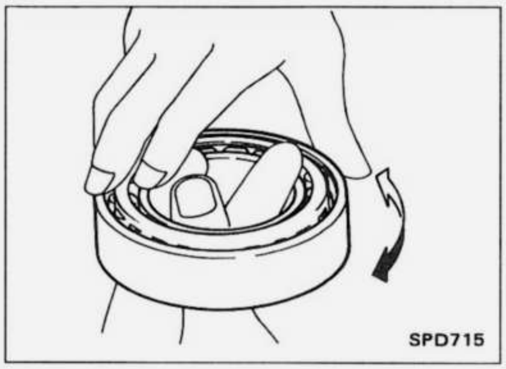
- Check spline portion of coupling sleeves, hubs and gears for wear or cracks.
- Check baulk rings for cracks or deformation.
- Check insert springs for deformation.



- Measure clearance between baulk ring and gear (1st & 2nd).

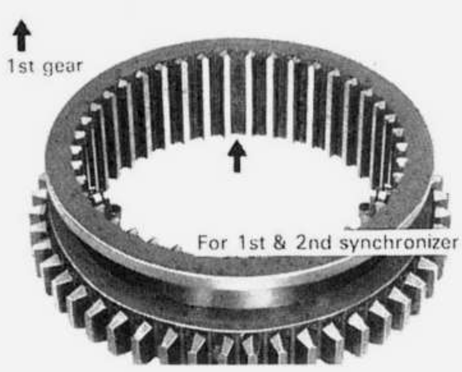
Clearance between baulk ring and gear:
Standard
1.0 - 1.35 mm (0.0394 - 0.0531 in)
Wear limit
0.7 mm (0.028 in)

Bearing



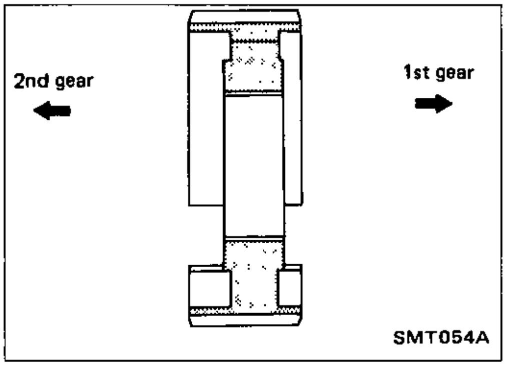
- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- **When replacing tapered roller bearing, replace outer and inner race as a set.**

ASSEMBLY



1. Place inserts in three grooves on coupling sleeve (1st & 2nd synchronizer).

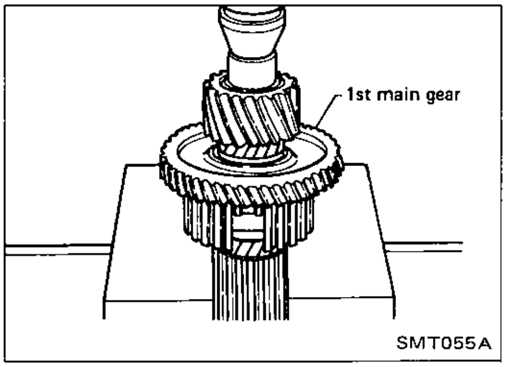
Mainshaft and Gears (Cont'd)



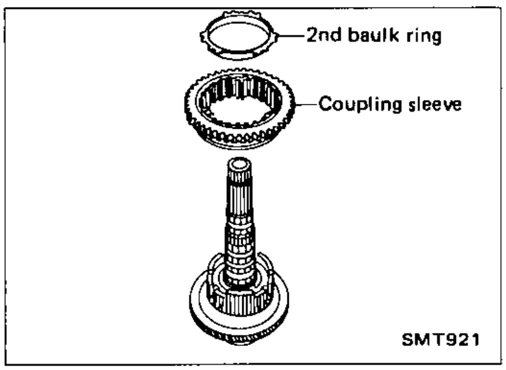
SMT054A

2. Install 1st main gear and 1st baulk ring.
3. Press on 1st & 2nd synchronizer hub.

- **Pay attention to its direction.**

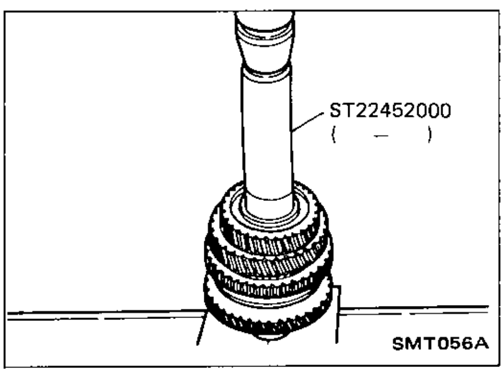


SMT055A



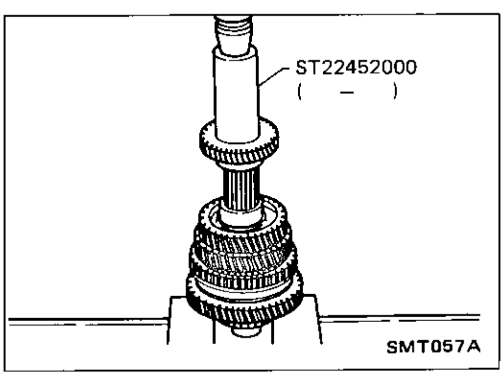
SMT921

4. Install coupling sleeve with three inserts and 2nd baulk ring.
5. Select proper snap ring of 1st & 2nd synchronizer hub to minimize clearance of groove and then install it.
   Allowable clearance of groove:
   0 - 0.1 mm (0 - 0.004 in)
   Snap ring of 1st & 2nd synchronizer hub:
   Refer to S.D.S.



SMT056A

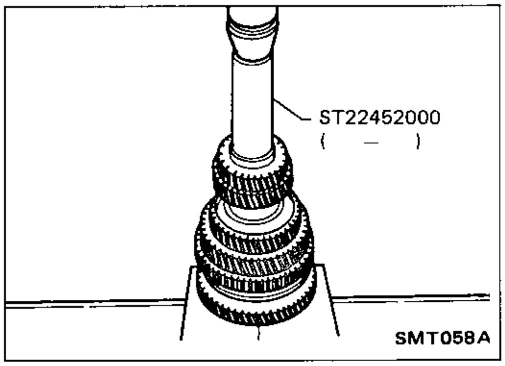
6. Install 2nd main gear.
7. Press on 3rd main gear.



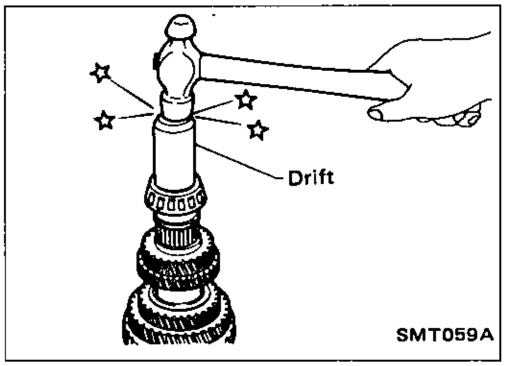
SMT057A

8. Press on 4th main gear.

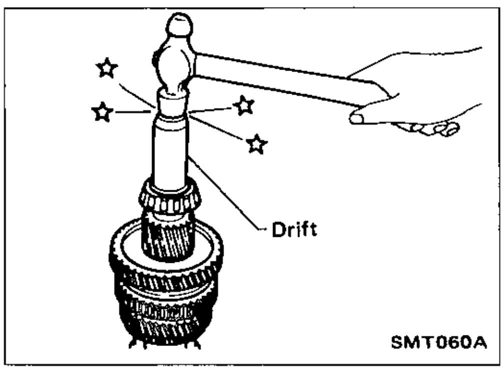
Mainshaft and Gears (Cont'd)



9. Press on 5th main gear.
10. Select proper snap ring of 5th main gear to minimize clearance of groove and then install it.
    Allowable clearance of groove:
    0 - 0.15 mm (0 - 0.0059 in)
    Snap ring of 5th main gear:
    Refer to S.D.S.



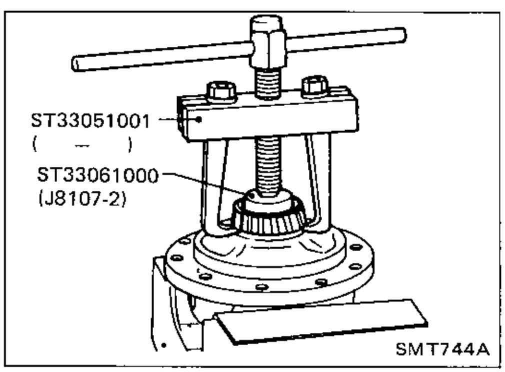
11. Press on thrust washer and press on mainshaft rear bearing.



12. Press on mainshaft front bearing.
13. Measure gear end play as the final check — Refer to "Disassembly".

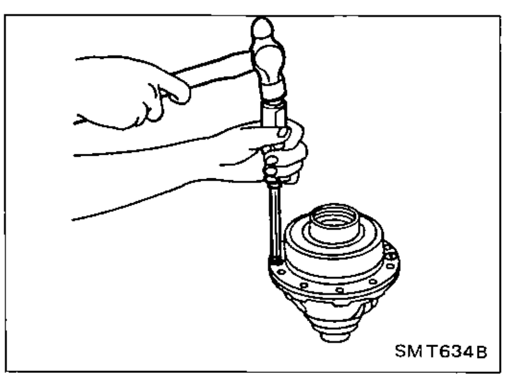
Final Drive

DISASSEMBLY



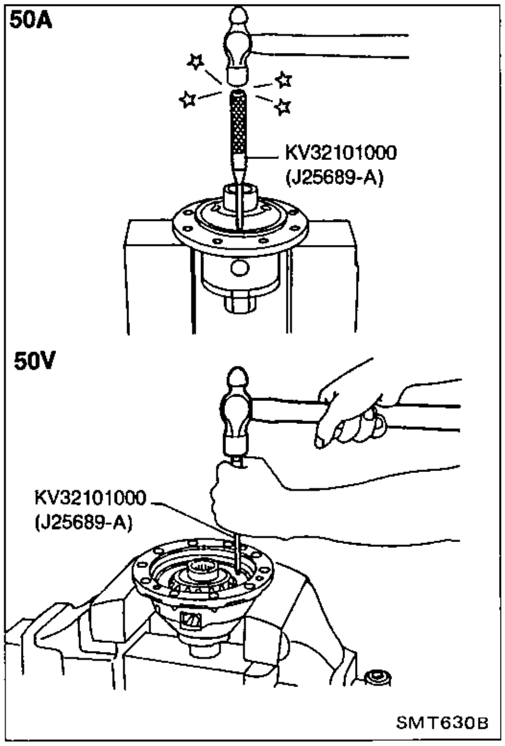
1. Remove final gear.
2. Remove speedometer drive gear by cutting it.
3. Press out differential side bearings.

- **Be careful not to mix up the right and left bearings.**

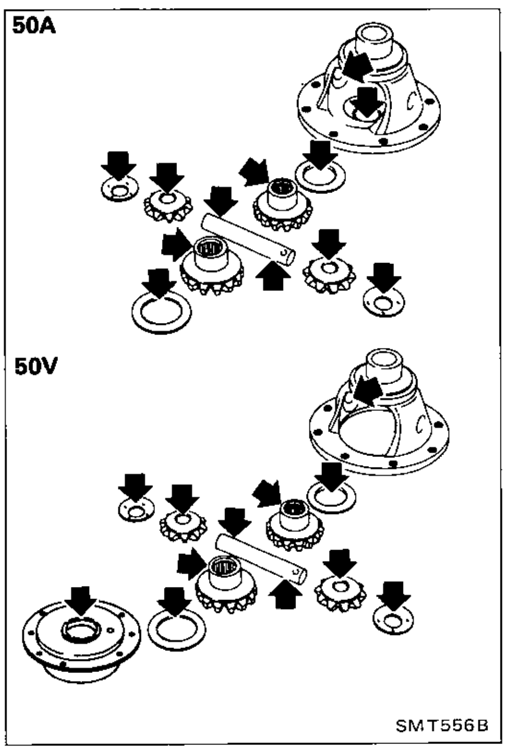


4. Remove viscous coupling (RS5F50V).

Final Drive (Cont'd)



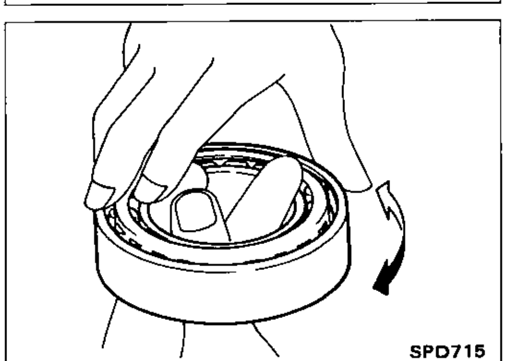
5. Drive out retaining pin and draw out pinion mate shaft.
6. Remove pinion mate gears and side gears.



INSPECTION

Gear, washer, shaft and case

- Check mating surfaces of differential case, side gears and pinion mate gears.
- Check washers for wear.

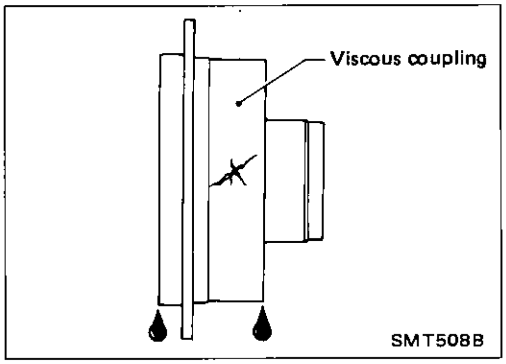


Bearing

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- **When replacing tapered roller bearing, replace outer and inner race as a set.**

Final Drive (Cont'd)

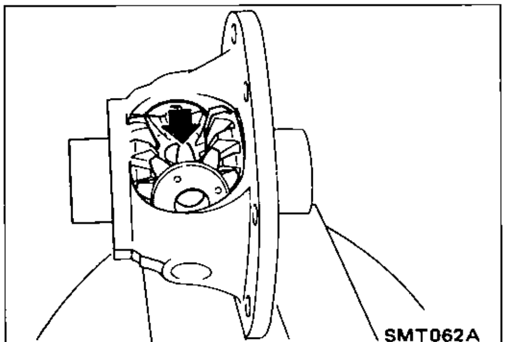
Viscous coupling — RS5F50V



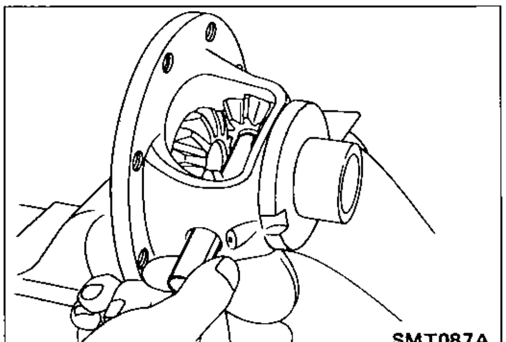
SMT508B

- Check case for cracks.
- Check silicone oil for leakage.

ASSEMBLY

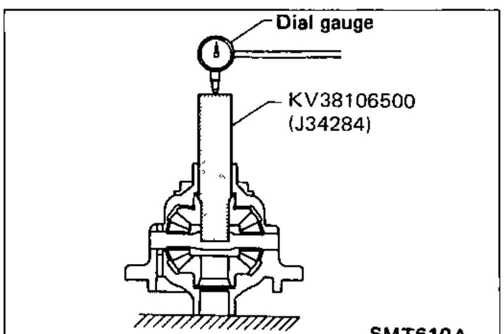

SMT062A

1. Attach side gear thrust washers to side gears, then install pinion mate washers and pinion mate gears in place.


SMT087A

2. Insert pinion mate shaft.

- **When inserting, be careful not to damage pinion mate thrust washers.**



SMT610A

3. Measure clearance between side gear and differential case with washers following the procedure below:

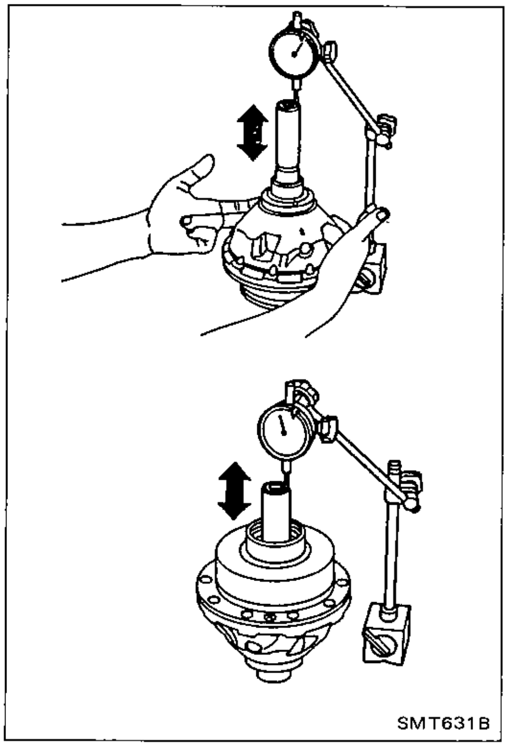
a. Set Tool and dial indicator on side gear.

b. Move side gear up and down to measure dial indicator deflection. Always measure indicator deflection on both side gears.

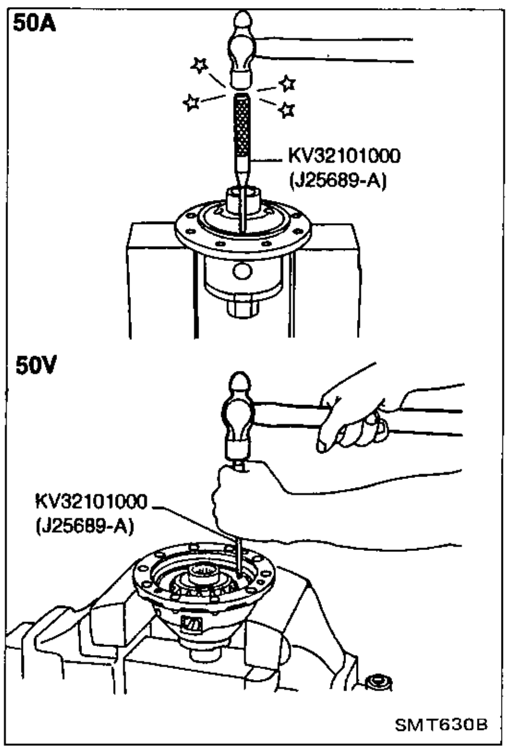
Clearance between side gear and differential case with washers:

0.1 - 0.2 mm (0.004 - 0.008 in)

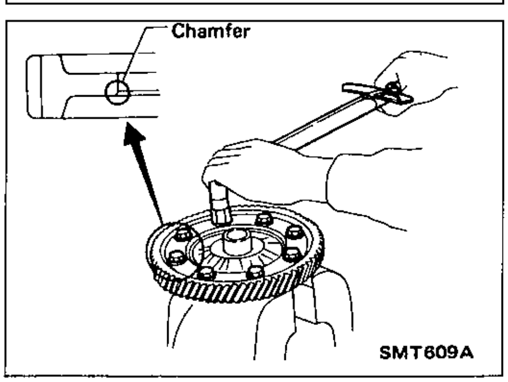
Final Drive (Cont'd)



c. If not within specification, adjust clearance by changing thickness of side gear thrust washers.
Side gear thrust washer:
Refer to S.D.S.

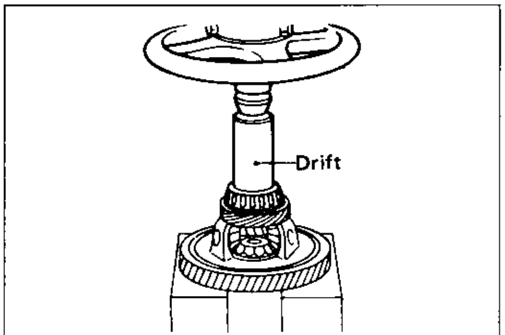


4. Install retaining pin.
- **Make sure that retaining pin is flush with case.**



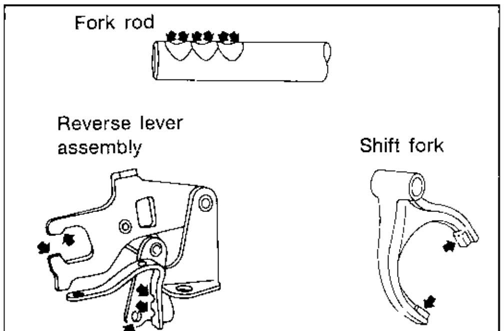
5. Install final gear.
6. Install speedometer drive gear.

Final Drive (Cont'd)



SMT648

7. Press on differential side bearings.

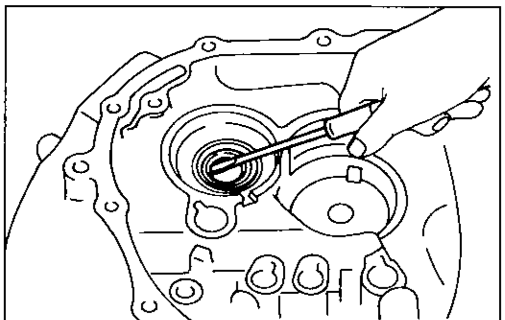


SMT106C

Shift Control Components

INSPECTION

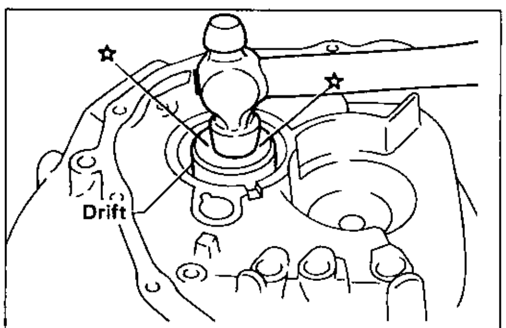
- Check contact surface and sliding surface for wear, scratches, projections or other damage.


SMT030A

Case Components

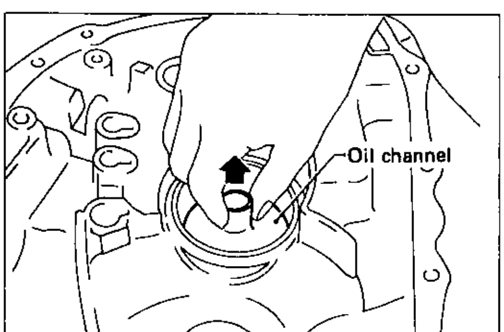
REMOVAL AND INSTALLATION

Input shaft oil seal



SMT031A

- **Apply multi-purpose grease to seal lip of oil seal before installing.**



SMT034A

Mainshaft front bearing outer race

Mainshaft rear bearing outer race — Refer to "ADJUSTMENT".
Differential side bearing outer race — Refer to "ADJUSTMENT".

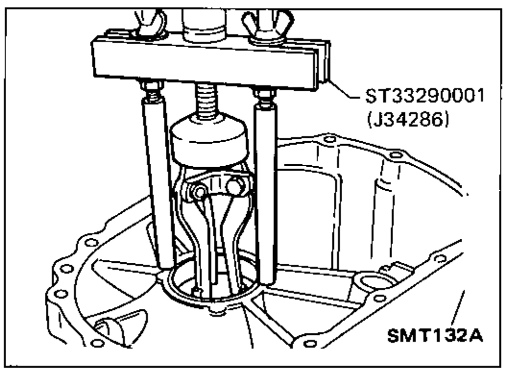
Input Shaft End Play and Differential Side Bearing Preload

If any of the following parts are replaced, adjust input shaft end play.

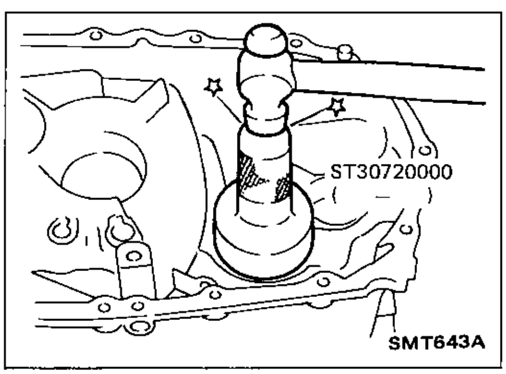
- **Input shaft**
- **Input shaft bearing**
- **Clutch housing**
- **Transmission case**

If any of the following parts are replaced, adjust differential side bearing preload.

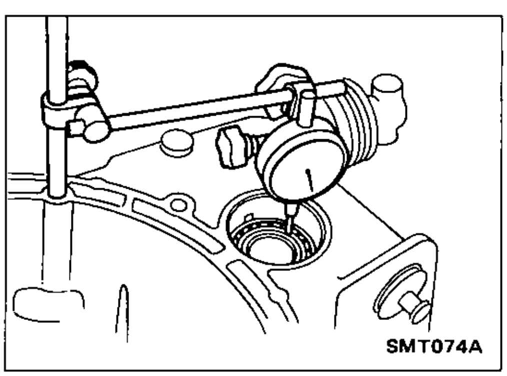
- **Differential case**
- **Differential side bearing**
- **Clutch housing**
- **Transmission case**



1. Remove differential side bearing outer race (transmission case side) and shim(s).



2. Reinstall differential side bearing outer race without shim(s).
3. Install input shaft and final drive assembly on clutch housing.
4. Install transmission case without input shaft bearing shim(s).
   Then tighten it to the specified torque.

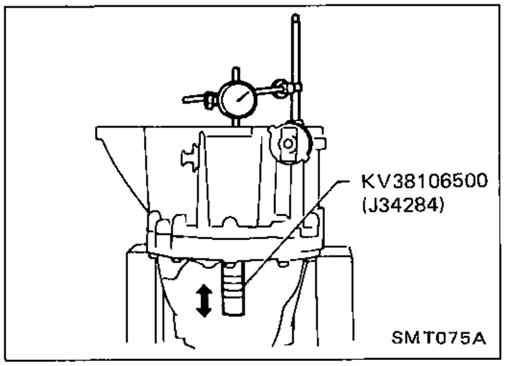


5. Using the following procedures, measure clearance between bearings and transmission case.

- **Differential side**

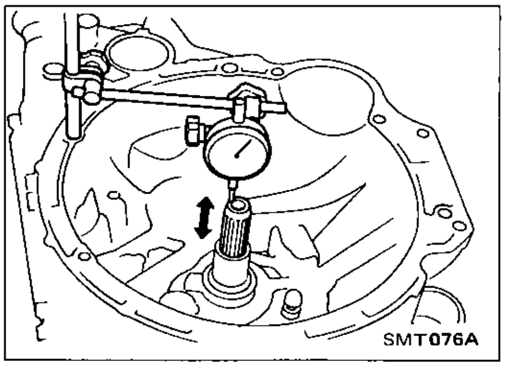
a. Attach dial indicator. If clamp diameter of dial indicator is too small or too large, attach dial indicator using a magnetic stand.

Input Shaft End Play and Differential Side Bearing Preload (Cont'd)



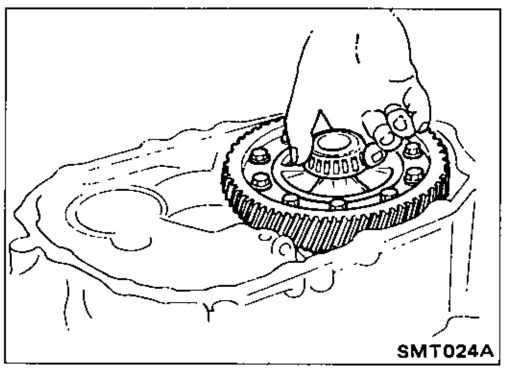
SMT075A

b. Insert Tool all the way into differential side gear. Move Tool up and down and measure dial indicator deflection.

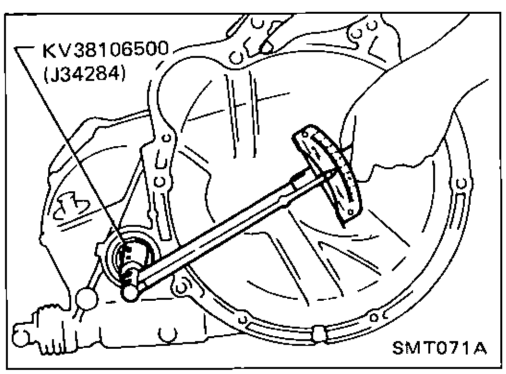

SMT076A

- **Input shaft side**

a. Set dial indicator on rear end of input shaft.
b. Move input shaft up and down and measure dial indicator deflection.
6. Select shims with proper thickness with S.D.S. table as a guide.
7. Install selected differential side bearing adjusting shim and differential side bearing outer race.


SMT024A

8. Check differential side bearing turning torque.
a. Install final drive assembly on clutch housing.
b. Install transmission case on clutch housing.
- **Tighten transmission case fixing bolts to the specified torque.**



SMT071A

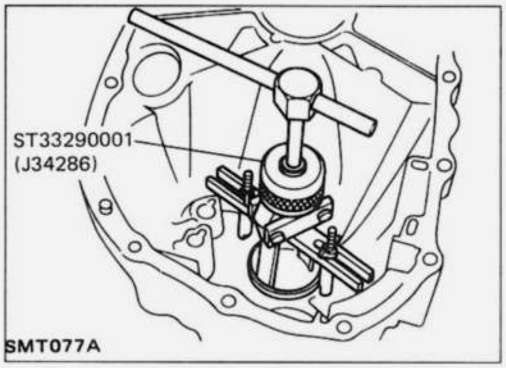
c. Measure turning torque of final drive assembly.
   Turning torque of final drive assembly (New bearing):
   4.9 - 7.8 N·m (50 - 80 kg-cm, 43 - 69 in-lb)
- **When old bearing is used again, turning torque will be slightly less than the above.**
- **Make sure torque is close to the specified range.**

Mainshaft Bearing Preload

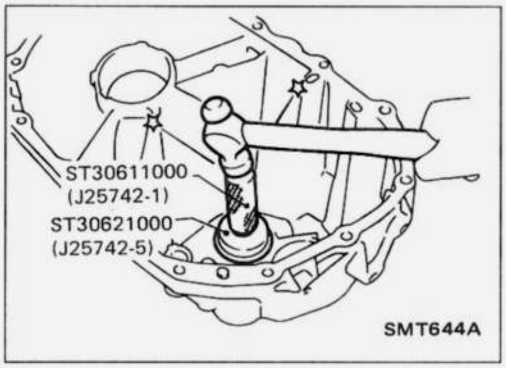
If any of the following parts are replaced, adjust mainshaft bearing preload.

- **Mainshaft**
- **Mainshaft bearings**
- **Clutch housing**
- **Transmission case**

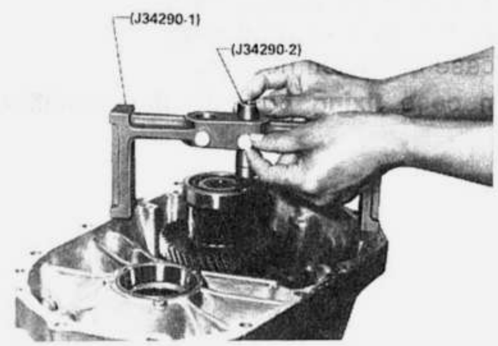
Mainshaft Bearing Preload (Cont'd)



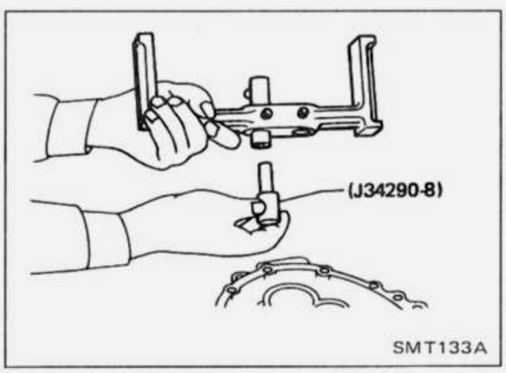
1. Remove mainshaft rear bearing outer race and shim(s).



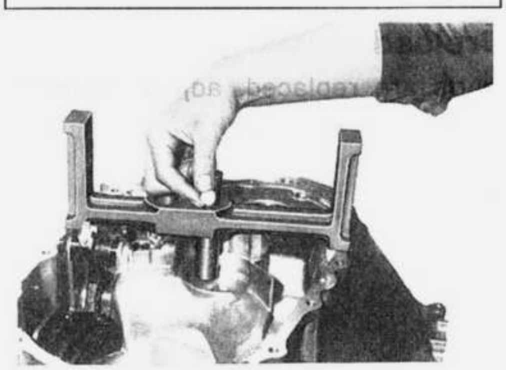
2. Reinstall mainshaft rear bearing outer race without shims.
3. Clean mating surfaces of clutch housing and transmission case with solvent.
4. Install mainshaft and mainshaft front bearing outer race into transmission case. Turn mainshaft while holding bearing outer race so that bearings are properly seated.



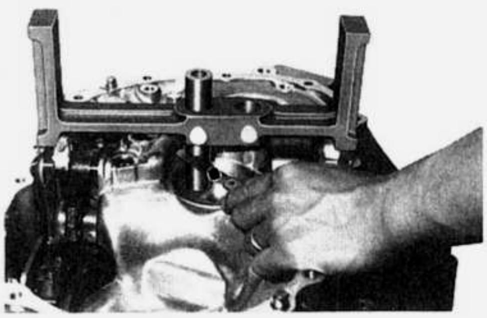
5. Place Tools (bridge and gauging cylinder) onto machined surface of transmission case, allowing gauging cylinder to rest on surface of mainshaft front bearing outer race. Use proper screw in bridge to lock gauging cylinder in place.

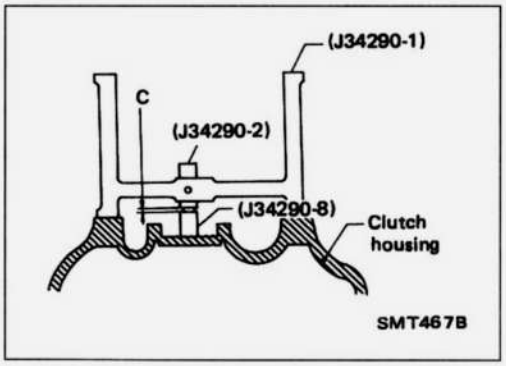


6. Turn bridge over and place Tool (gauging plunger) into gauging cylinder.



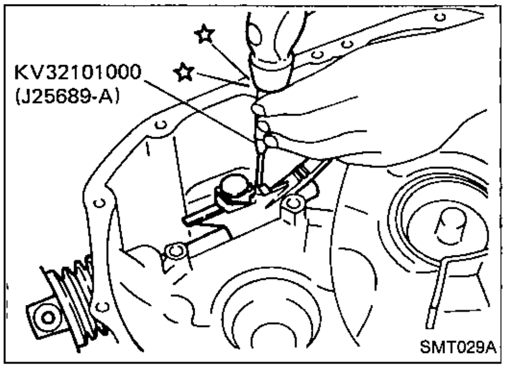
7. Place bridge, legs up, onto machined surface of clutch housing and allow gauging plunger to rest upon mating surface where mainshaft front bearing outer race fits.



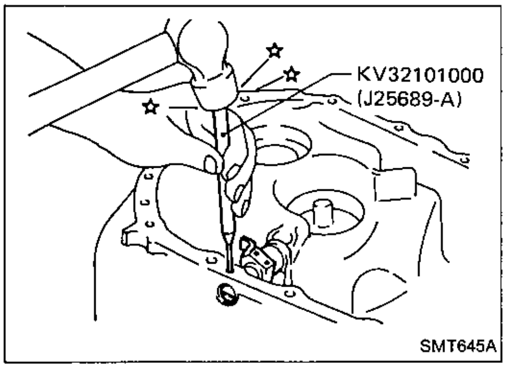


Mainshaft Bearing Preload (Cont'd)

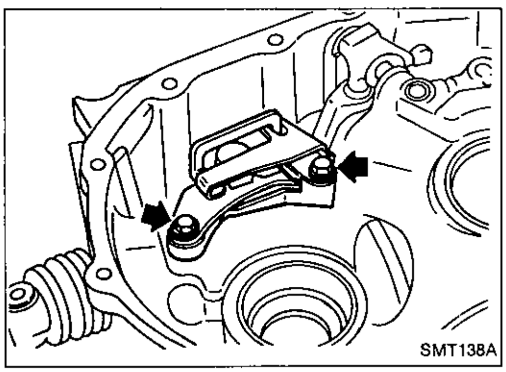
8. Measure with feeler gauge distance between gauging cylinder and shoulder of gauging plunger.
9. Use feeler gauge reading to select correct mainshaft preload shim(s).
   Mainshaft bearing adjusting shim:
   Refer to S.D.S.
10. Install selected mainshaft bearing adjusting shim and mainshaft bearing outer race.
11. Check total turning torque after assembly — Refer to "ASSEMBLY".



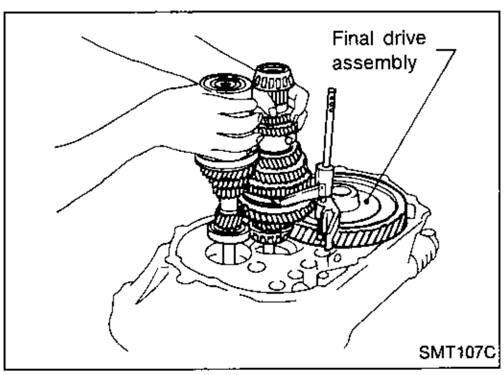
1. Install striking lever and striking rod.



2. Install selector and retaining pin.

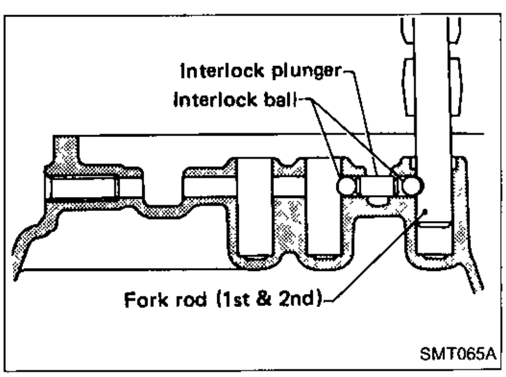


3. Install reverse gate assembly.

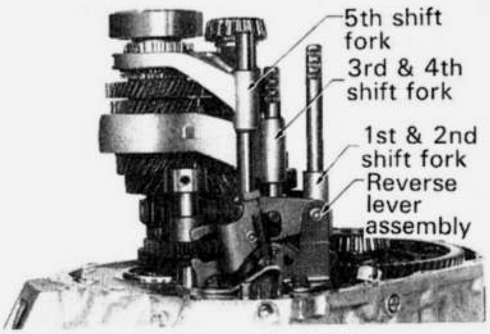


4. Install final drive assembly.
5. Install input shaft and mainshaft with 1st & 2nd shift fork assembly.

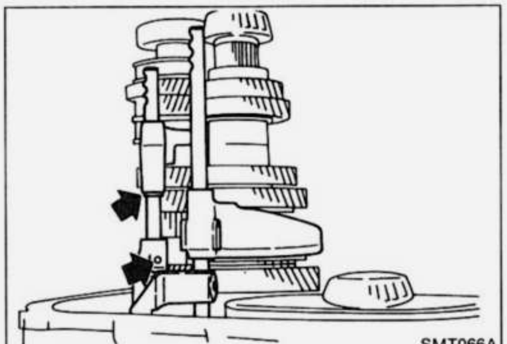
- **Be careful not to damage input shaft oil seal.**

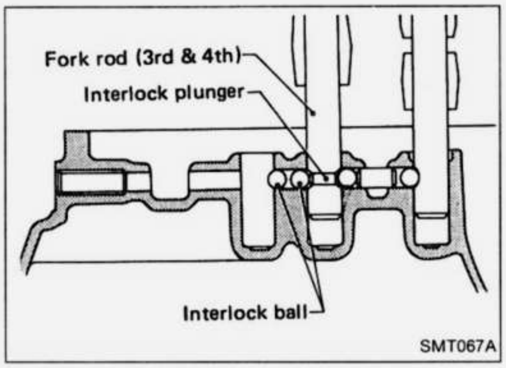


6. Install interlock balls and plunger.



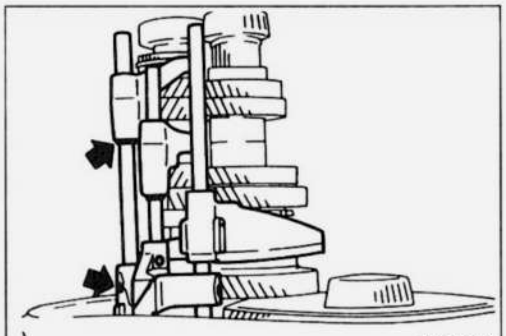
7. Install 3rd & 4th shift fork and bracket, then install 3rd & 4th shift rod, stopper ring and retaining pin.


SMT066A

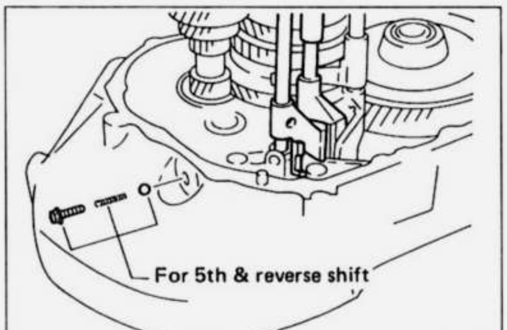


SMT067A

8. Install interlock balls.

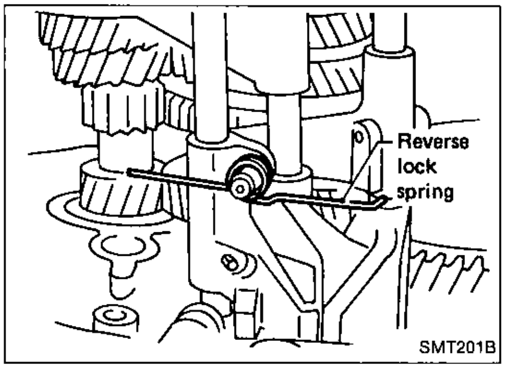

SMT068A

9. Install 5th shift fork and bracket, then install shift rod, stopper ring and retaining pin.

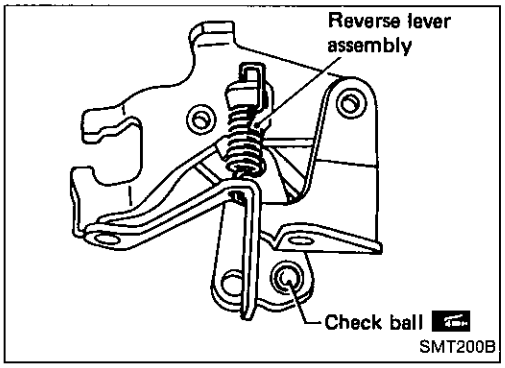


SMT018B

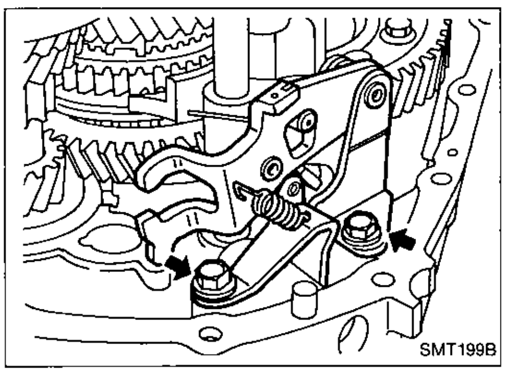
10. Install 5th & reverse check plug, spring and ball.



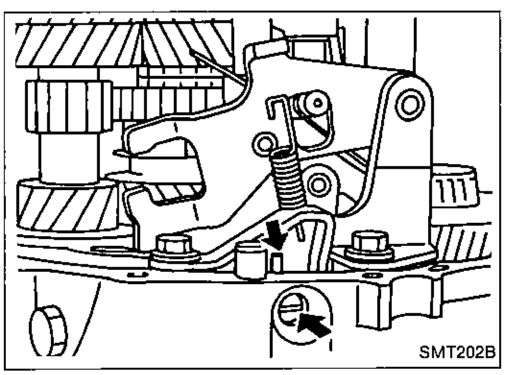
11. Install reverse lock spring on 5th & reverse bracket.
- **Pay attention to its direction.**



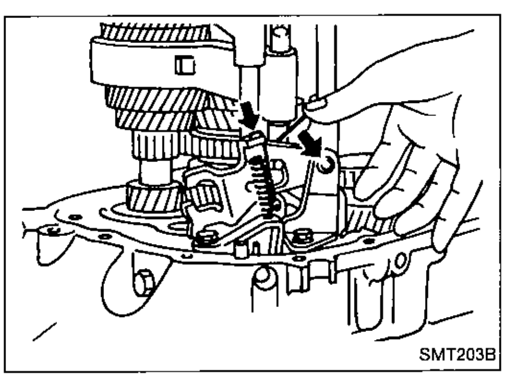
12. Install check ball and reverse lever spring on reverse lever assembly.
- **Apply multi-purpose grease to check ball.**
- **Pay attention to direction of reverse lever spring.**



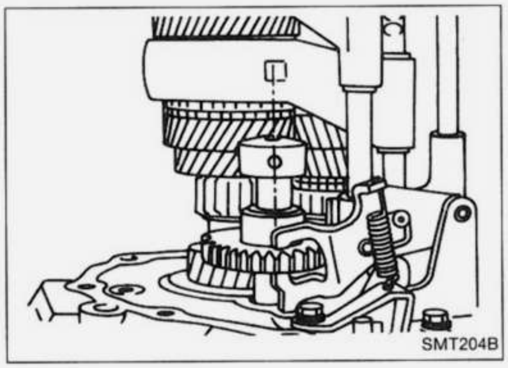
13. Install reverse lever assembly on clutch housing.



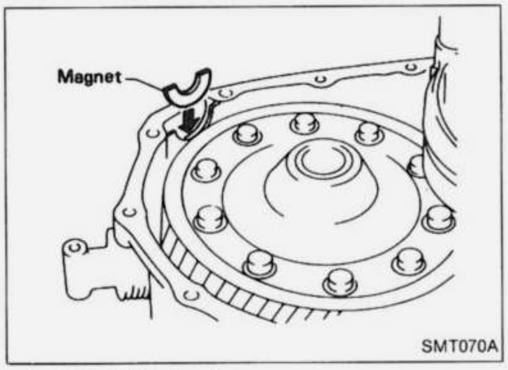
14. Install reverse arm shaft and retaining pin.



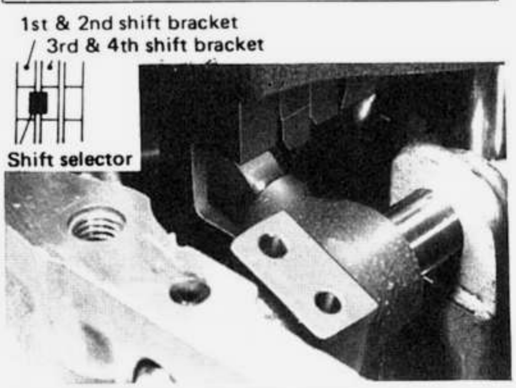
15. Hook reverse lock spring and reverse lever spring on reverse lever assembly.



16. Mesh 4th gear, then install reverse idler gear and shaft.
- **Pay attention to direction of tapped hole.**

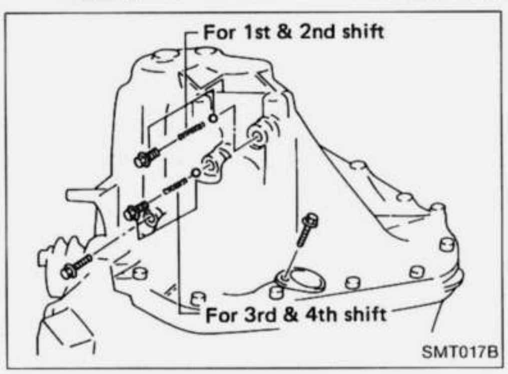


17. Place magnet on clutch housing.

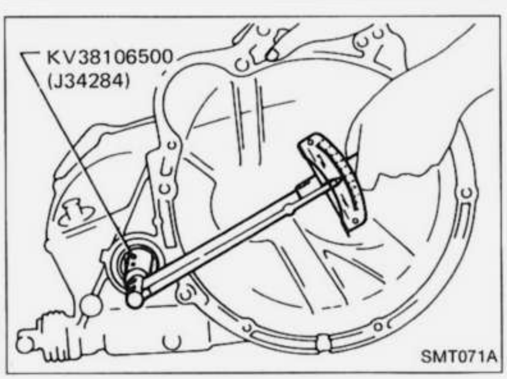


18. If bearing preload was adjusted, install selected shim(s) into transmission case.
- **To aid in installation of transmission case, place shift selector in the 1st & 2nd shift bracket or between 1st & 2nd bracket and 3rd & 4th bracket.**

19. Apply sealant to mating surface of transmission case and install it.
20. Install position switch.



21. Apply sealant to threads of check plugs. Install balls, springs and plugs.
22. After assembly, check that you can shift into each gear smoothly.



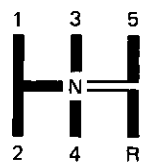
23. Measure total turning torque.

    Total turning torque (New bearing):

    8.8 - 21.6 N·m (90 - 220 kg-cm, 78 - 191 in-lb)
- **When old bearing is used again, preload will be slightly less than the above. Make sure torque is close to the specified range.**

General Specifications

TRANSAXLE

Engine			KA24E	
Transaxle model			RS5F50A	RS5F50V
Number of speeds			5	
Synchromesh type			Warner	
Shift pattern				
Gear ratio		1st	3.400	3.285
		2nd	1.955	1.850
		3rd	1.272	1.206
		4th	0.954	0.954
		5th	0.740	0.740
		Rev.	3.428	3.428
Number of teeth	Input gear	1st	15	14
		2nd	22	20
		3rd	33	29
		4th	44	44
		5th	50	50
		Rev.	14	14
	Main gear	1st	51	46
		2nd	43	37
		3rd	42	35
		4th	42	42
		5th	37	37
		Rev.	48	48
	Reverse idler gear		29	29
Oil capacity ℓ (US pt, Imp pt)			4.7 (10, 8-1/4)	

FINAL GEAR

Transaxle model	RS5F50A	RS5F50V
Final gear ratio	3.650	3.895
Number of teeth		
Final gear/Pinion	73/20	74/19
Side gear/Pinion	16/10	16/10

Inspection and Adjustment

GEAR END PLAY

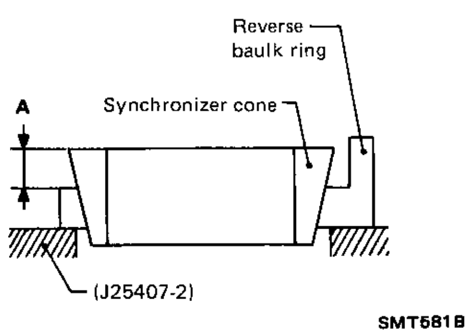
Gear	End play mm (in)
1st main gear	0.23 - 0.43 (0.0091 - 0.0169)
2nd main gear	0.23 - 0.58 (0.0091 - 0.0228)
3rd input gear	0.23 - 0.43 (0.0091 - 0.0169)
4th input gear	0.25 - 0.55 (0.0098 - 0.0217)
5th input gear	0.23 - 0.48 (0.0091 - 0.0189)

CLEARANCE BETWEEN BAULK RING AND GEAR

Unit: mm (in)

	Standard	Wear limit
1st & 2nd	1.0 - 1.35 (0.0394 - 0.0531)	0.7 (0.028)
3rd & 4th	1.0 - 1.35 (0.0394 - 0.0531)	0.7 (0.028)
5th	1.0 - 1.35 (0.0394 - 0.0531)	0.7 (0.028)

REVERSE BAULK RING



Dimension	Wear limit
A	1.2 mm (0.047 in)

AVAILABLE SNAP RING

3rd & 4th synchronizer hub (At input shaft)

Allowable clearance	0 - 0.1 mm (0 - 0.004 in)
Thickness mm (in)	**Part number**
1.95 (0.0768)	32269-03E03
2.00 (0.0787)	32269-03E00
2.05 (0.0807)	32269-03E01
2.10 (0.0827)	32269-03E02

1st & 2nd synchronizer hub

Allowable clearance	0 - 0.1 mm (0 - 0.004 in)
Thickness mm (in)	**Part number**
1.95 (0.0768)	32269-03E03
2.00 (0.0787)	32269-03E00
2.05 (0.0807)	32269-03E01
2.10 (0.0827)	32269-03E02

5th main gear

Allowable clearance	0 - 0.15 mm (0 - 0.0059 in)
Thickness mm (in)	**Part number**
1.95 (0.0768)	32348-05E00
2.05 (0.0807)	32348-05E01
2.15 (0.0846)	32348-05E02
2.25 (0.0886)	32348-05E03

AVAILABLE WASHER

Input shaft thrust washer

Allowable clearance	0 - 0.06 mm (0 - 0.0024 in)
Thickness mm (in)	**Part number**
4.500 (0.1772)	32278-03E01
4.525 (0.1781)	32278-03E02
4.550 (0.1791)	32278-03E03
4.575 (0.1801)	32278-03E04

Differential side gear thrust washer — RS5F50A

Allowable clearance between side gear and differential case with washer	0.1 - 0.2 mm (0.004 - 0.008 in)	
Thickness mm (in)	**Part number**	
0.75 - 0.80 (0.0295 - 0.0315)	38424-E3000	38424-E3020
0.80 - 0.85 (0.0315 - 0.0335)	38424-E3001	38424-E3021
0.85 - 0.90 (0.0335 - 0.0354)	38424-E3002	38424-E3022
0.90 - 0.95 (0.0354 - 0.0374)	38424-E3003	38424-E3023

Inspection and Adjustment (Cont'd)

Differential side gear thrust washer — RS5F50V

Allowable clearance between side gear and (differential case or viscous coupling) with washer	0.1 - 0.2 mm (0.004 - 0.008 in)	
	Thickness mm (in)	Part number
Differential case side	0.75 - 0.80 (0.0295 - 0.0315)	38424-E3000
	0.80 - 0.85 (0.0315 - 0.0335)	38424-E3001
	0.85 - 0.90 (0.0335 - 0.0354)	38424-E3002
	0.90 - 0.95 (0.0354 - 0.0374)	38424-E3003
Viscous coupling side	0.43 - 0.45 (0.0169 - 0.0177)	38424-51E10
	0.52 - 0.54 (0.0205 - 0.0213)	38424-51E11
	0.61 - 0.63 (0.0240 - 0.0248)	38424-51E12
	0.70 - 0.72 (0.0276 - 0.0283)	38424-51E13
	0.79 - 0.81 (0.0311 - 0.0319)	38424-51E14

Mainshaft bearing adjusting shim

Thickness mm (in)	Part number
0.40 (0.0157)	32139-03E11
0.44 (0.0173)	32139-03E00
0.48 (0.0189)	32139-03E01
0.52 (0.0205)	32139-03E12
0.56 (0.0220)	32139-03E02
0.60 (0.0236)	32139-03E03
0.64 (0.0252)	32139-03E04
0.68 (0.0268)	32139-03E05
0.72 (0.0283)	32139-03E06
0.76 (0.0299)	32139-03E07
0.80 (0.0315)	32139-03E08
1.20 (0.0472)	32139-03E13

AVAILABLE SHIM

— INPUT SHAFT END PLAY AND MAINSHAFT AND DIFFERENTIAL SIDE BEARING PRELOAD AND ADJUSTING SHIM

Bearing preload and end play

Unit: mm (in)

Mainshaft bearing preload	0.25 - 0.31 (0.0098 - 0.0122)
Input shaft end play	-0.06 to 0 (-0.0024 to 0)
Differential side bearing preload	0.40 - 0.46 (0.0157 - 0.0181)

Turning torque (New bearing)

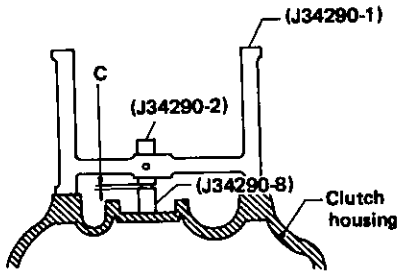
Unit: N·m (kg-cm, in-lb)

Final drive only	4.9 - 7.8 (50 - 80, 43 - 69)
Total	8.8 - 21.6 (90 - 220, 78 - 191)

Inspection and Adjustment (Cont'd)

Table for selecting mainshaft adjusting shim

Unit: mm (in)



SMT467B

Dimension "C"	Suitable shim(s)
0.30 - 0.34 (0.0118 - 0.0134)	0.60 (0.0236)
0.34 - 0.38 (0.0134 - 0.0150)	0.64 (0.0252)
0.38 - 0.42 (0.0150 - 0.0165)	0.68 (0.0268)
0.42 - 0.46 (0.0165 - 0.0181)	0.72 (0.0283)
0.46 - 0.50 (0.0181 - 0.0197)	0.76 (0.0299)
0.50 - 0.54 (0.0197 - 0.0213)	0.80 (0.0315)
0.54 - 0.58 (0.0213 - 0.0228)	0.40 + 0.44 (0.0157 + 0.0173)
0.58 - 0.62 (0.0228 - 0.0244)	0.44 + 0.44 (0.0173 + 0.0173)
0.62 - 0.66 (0.0244 - 0.0260)	0.44 + 0.48 (0.0173 + 0.0189)
0.66 - 0.70 (0.0260 - 0.0276)	0.48 + 0.48 (0.0189 + 0.0189)
0.70 - 0.74 (0.0276 - 0.0291)	0.48 + 0.52 (0.0189 + 0.0205)
0.74 - 0.78 (0.0291 - 0.0307)	0.52 + 0.52 (0.0205 + 0.0205)
0.78 - 0.82 (0.0307 - 0.0323)	0.52 + 0.56 (0.0205 + 0.0220)
0.82 - 0.86 (0.0323 - 0.0339)	0.56 + 0.56 (0.0220 + 0.0220)
0.86 - 0.90 (0.0339 - 0.0354)	0.56 + 0.60 (0.0220 + 0.0236)
0.90 - 0.94 (0.0354 - 0.0370)	0.60 + 0.60 (0.0236 + 0.0236)
0.94 - 0.98 (0.0370 - 0.0386)	0.60 + 0.64 (0.0236 + 0.0252)
0.98 - 1.02 (0.0386 - 0.0402)	0.64 + 0.64 (0.0252 + 0.0252)
1.02 - 1.06 (0.0402 - 0.0417)	0.64 + 0.68 (0.0252 + 0.0268)
1.06 - 1.10 (0.0417 - 0.0433)	0.68 + 0.68 (0.0268 + 0.0268)
1.10 - 1.14 (0.0433 - 0.0449)	0.68 + 0.72 (0.0268 + 0.0283)
1.14 - 1.18 (0.0449 - 0.0465)	0.72 + 0.72 (0.0283 + 0.0283)
1.18 - 1.22 (0.0465 - 0.0480)	0.72 + 0.76 (0.0283 + 0.0299)
1.22 - 1.26 (0.0480 - 0.0496)	0.76 + 0.76 (0.0299 + 0.0299)
1.26 - 1.30 (0.0496 - 0.0512)	0.76 + 0.80 (0.0299 + 0.0315)
1.30 - 1.34 (0.0512 - 0.0528)	0.80 + 0.80 (0.0315 + 0.0315)
1.34 - 1.38 (0.0528 - 0.0543)	0.44 + 1.20 (0.0173 + 0.0472)
1.38 - 1.42 (0.0543 - 0.0559)	0.48 + 1.20 (0.0189 + 0.0472)
1.42 - 1.46 (0.0559 - 0.0575)	0.52 + 1.20 (0.0205 + 0.0472)
1.46 - 1.50 (0.0575 - 0.0591)	0.56 + 1.20 (0.0220 + 0.0472)

Input shaft bearing adjusting shim

Thickness mm (in)	Part number
0.40 (0.0157)	32225-08E00
0.44 (0.0173)	32225-08E01
0.48 (0.0189)	32225-08E02
0.52 (0.0205)	32225-08E03
0.56 (0.0220)	32225-08E04
0.60 (0.0236)	32225-08E05
0.64 (0.0252)	32225-08E06
0.68 (0.0268)	32225-08E07
0.72 (0.0283)	32225-08E08
0.76 (0.0299)	32225-08E09
0.80 (0.0315)	32225-08E10
1.20 (0.0472)	32225-08E11

Table for selecting input shaft bearing adjusting shim

Unit: mm (in)

Dial indicator deflection	Suitable shim(s)
0.65 - 0.69 (0.0256 - 0.0272)	0.64 (0.0252)
0.69 - 0.73 (0.0272 - 0.0287)	0.68 (0.0268)
0.73 - 0.77 (0.0287 - 0.0303)	0.72 (0.0283)
0.77 - 0.81 (0.0303 - 0.0319)	0.76 (0.0299)
0.81 - 0.85 (0.0319 - 0.0335)	0.80 (0.0315)
0.85 - 0.89 (0.0335 - 0.0350)	0.40 + 0.44 (0.0157 + 0.0173)
0.89 - 0.93 (0.0350 - 0.0366)	0.44 + 0.44 (0.0173 + 0.0173)
0.93 - 0.97 (0.0366 - 0.0382)	0.44 + 0.48 (0.0173 + 0.0189)
0.97 - 1.01 (0.0382 - 0.0398)	0.48 + 0.48 (0.0189 + 0.0189)
1.01 - 1.05 (0.0398 - 0.0413)	0.48 + 0.52 (0.0189 + 0.0205)
1.05 - 1.09 (0.0413 - 0.0429)	0.52 + 0.52 (0.0205 + 0.0205)
1.09 - 1.13 (0.0429 - 0.0445)	0.52 + 0.56 (0.0205 + 0.0220)
1.13 - 1.17 (0.0445 - 0.0461)	0.56 + 0.56 (0.0220 + 0.0220)
1.17 - 1.21 (0.0461 - 0.0476)	0.56 + 0.60 (0.0220 + 0.0236)
1.21 - 1.25 (0.0476 - 0.0492)	0.60 + 0.60 (0.0236 + 0.0236)
1.25 - 1.29 (0.0492 - 0.0508)	0.60 + 0.64 (0.0236 + 0.0252)
1.29 - 1.33 (0.0508 - 0.0524)	0.64 + 0.64 (0.0252 + 0.0252)
1.33 - 1.37 (0.0524 - 0.0539)	0.64 + 0.68 (0.0252 + 0.0268)
1.37 - 1.41 (0.0539 - 0.0555)	0.68 + 0.68 (0.0268 + 0.0268)
1.41 - 1.45 (0.0555 - 0.0571)	0.68 + 0.72 (0.0268 + 0.0283)
1.45 - 1.49 (0.0571 - 0.0587)	0.72 + 0.72 (0.0283 + 0.0283)
1.49 - 1.53 (0.0587 - 0.0602)	0.72 + 0.76 (0.0283 + 0.0299)
1.53 - 1.57 (0.0602 - 0.0618)	0.76 + 0.76 (0.0299 + 0.0299)
1.57 - 1.61 (0.0618 - 0.0634)	0.76 + 0.80 (0.0299 + 0.0315)
1.61 - 1.65 (0.0634 - 0.0650)	0.80 + 0.80 (0.0315 + 0.0315)
1.65 - 1.69 (0.0650 - 0.0665)	0.44 + 1.20 (0.0173 + 0.0472)

Inspection and Adjustment (Cont'd)

Differential side bearing adjusting shim — RS5F50A

Thickness mm (in)	Part number
0.40 (0.0157)	38453-03E11
0.44 (0.0173)	38453-03E00
0.48 (0.0189)	38453-03E01
0.52 (0.0205)	38453-03E12
0.56 (0.0220)	38453-03E02
0.60 (0.0236)	38453-03E03
0.64 (0.0252)	38453-03E04
0.68 (0.0268)	38453-03E05
0.72 (0.0283)	38453-03E06
0.76 (0.0299)	38453-03E07
0.80 (0.0315)	38453-03E08
1.20 (0.0472)	38453-03E13

Table for selecting differential side bearing adjusting shim(s) — RS5F50A

Unit: mm (in)

Dial indicator deflection	Suitable shim(s)
0.47 - 0.51 (0.0185 - 0.0201)	0.44 + 0.48 (0.0173 + 0.0189)
0.51 - 0.55 (0.0201 - 0.0217)	0.48 + 0.48 (0.0189 + 0.0189)
0.55 - 0.59 (0.0217 - 0.0232)	0.48 + 0.52 (0.0189 + 0.0205)
0.59 - 0.63 (0.0232 - 0.0248)	0.52 + 0.52 (0.0205 + 0.0205)
0.63 - 0.67 (0.0248 - 0.0264)	0.52 + 0.56 (0.0205 + 0.0220)
0.67 - 0.71 (0.0264 - 0.0280)	0.56 + 0.56 (0.0220 + 0.0220)
0.71 - 0.75 (0.0280 - 0.0295)	0.56 + 0.60 (0.0220 + 0.0236)
0.75 - 0.79 (0.0295 - 0.0311)	0.60 + 0.60 (0.0236 + 0.0236)
0.79 - 0.83 (0.0311 - 0.0327)	0.60 + 0.64 (0.0236 + 0.0252)
0.83 - 0.87 (0.0327 - 0.0343)	0.64 + 0.64 (0.0252 + 0.0252)
0.87 - 0.91 (0.0343 - 0.0358)	0.64 + 0.68 (0.0252 + 0.0268)
0.91 - 0.95 (0.0358 - 0.0374)	0.68 + 0.68 (0.0268 + 0.0268)
0.95 - 0.99 (0.0374 - 0.0390)	0.68 + 0.72 (0.0268 + 0.0283)
0.99 - 1.03 (0.0390 - 0.0406)	0.72 + 0.72 (0.0283 + 0.0283)
1.03 - 1.07 (0.0406 - 0.0421)	0.72 + 0.76 (0.0283 + 0.0299)
1.07 - 1.11 (0.0421 - 0.0437)	0.76 + 0.76 (0.0299 + 0.0299)
1.11 - 1.15 (0.0437 - 0.0453)	0.76 + 0.80 (0.0299 + 0.0315)
1.15 - 1.19 (0.0453 - 0.0469)	0.80 + 0.80 (0.0315 + 0.0315)
1.19 - 1.23 (0.0469 - 0.0484)	0.44 + 1.20 (0.0173 + 0.0472)
1.23 - 1.27 (0.0484 - 0.0500)	0.48 + 1.20 (0.0189 + 0.0472)
1.27 - 1.31 (0.0500 - 0.0516)	0.52 + 1.20 (0.0205 + 0.0472)

Differential side bearing adjusting shim — RS5F50V

Thickness mm (in)	Part number
0.36 (0.0142)	38753-56E00
0.40 (0.0157)	38753-56E01
0.44 (0.0173)	38753-56E02
0.48 (0.0189)	38753-56E03
0.52 (0.0205)	38753-56E04
0.56 (0.0220)	38753-56E05
0.60 (0.0236)	38753-56E06
0.64 (0.0252)	38753-56E07
0.68 (0.0268)	38753-56E08
0.72 (0.0283)	38753-56E09
0.76 (0.0299)	38753-56E10
0.80 (0.0315)	38753-56E11
0.84 (0.0331)	38753-56E12
0.88 (0.0346)	38753-56E13
0.92 (0.0362)	38753-56E14

Table for selecting differential side bearing adjusting shim(s) — RS5F50V

Unit: mm (in)

Dial indicator deflection	Suitable shim(s)
0.47 - 0.51 (0.0185 - 0.0201)	0.44 + 0.48 (0.0173 + 0.0189)
0.51 - 0.55 (0.0201 - 0.0217)	0.48 + 0.48 (0.0189 + 0.0189)
0.55 - 0.59 (0.0217 - 0.0232)	0.48 + 0.52 (0.0189 + 0.0205)
0.59 - 0.63 (0.0232 - 0.0248)	0.52 + 0.52 (0.0205 + 0.0205)
0.63 - 0.67 (0.0248 - 0.0264)	0.52 + 0.56 (0.0205 + 0.0220)
0.67 - 0.71 (0.0264 - 0.0280)	0.56 + 0.56 (0.0220 + 0.0220)
0.71 - 0.75 (0.0280 - 0.0295)	0.56 + 0.60 (0.0220 + 0.0236)
0.75 - 0.79 (0.0295 - 0.0311)	0.60 + 0.60 (0.0236 + 0.0236)
0.79 - 0.83 (0.0311 - 0.0327)	0.60 + 0.64 (0.0236 + 0.0252)
0.83 - 0.87 (0.0327 - 0.0343)	0.64 + 0.64 (0.0252 + 0.0252)
0.87 - 0.91 (0.0343 - 0.0358)	0.64 + 0.68 (0.0252 + 0.0268)
0.91 - 0.95 (0.0358 - 0.0374)	0.68 + 0.68 (0.0268 + 0.0268)
0.95 - 0.99 (0.0374 - 0.0390)	0.68 + 0.72 (0.0268 + 0.0283)
0.99 - 1.03 (0.0390 - 0.0406)	0.72 + 0.72 (0.0283 + 0.0283)
1.03 - 1.07 (0.0406 - 0.0421)	0.72 + 0.76 (0.0283 + 0.0299)
1.07 - 1.11 (0.0421 - 0.0437)	0.76 + 0.76 (0.0299 + 0.0299)
1.11 - 1.15 (0.0437 - 0.0453)	0.76 + 0.80 (0.0299 + 0.0315)
1.15 - 1.19 (0.0453 - 0.0469)	0.80 + 0.80 (0.0315 + 0.0315)
1.19 - 1.23 (0.0469 - 0.0484)	0.72 + 0.92 (0.0283 + 0.0362)
1.23 - 1.27 (0.0484 - 0.0500)	0.76 + 0.92 (0.0299 + 0.0362)
1.27 - 1.31 (0.0500 - 0.0516)	0.80 + 0.92 (0.0315 + 0.0362)

AUTOMATIC TRANSAXLE

SECTION **AT**

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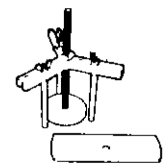
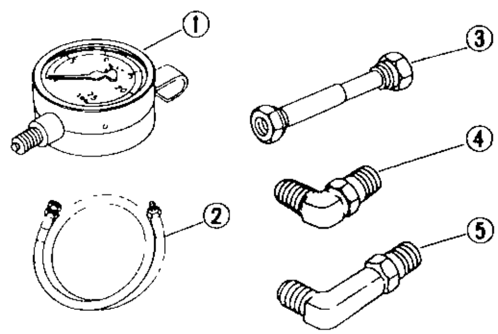
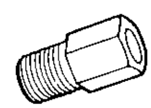
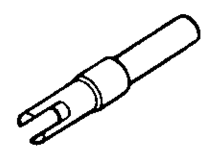
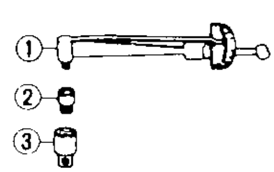
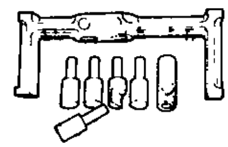
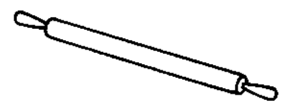
When you read wiring diagrams:
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

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

SPECIAL SERVICE TOOLS

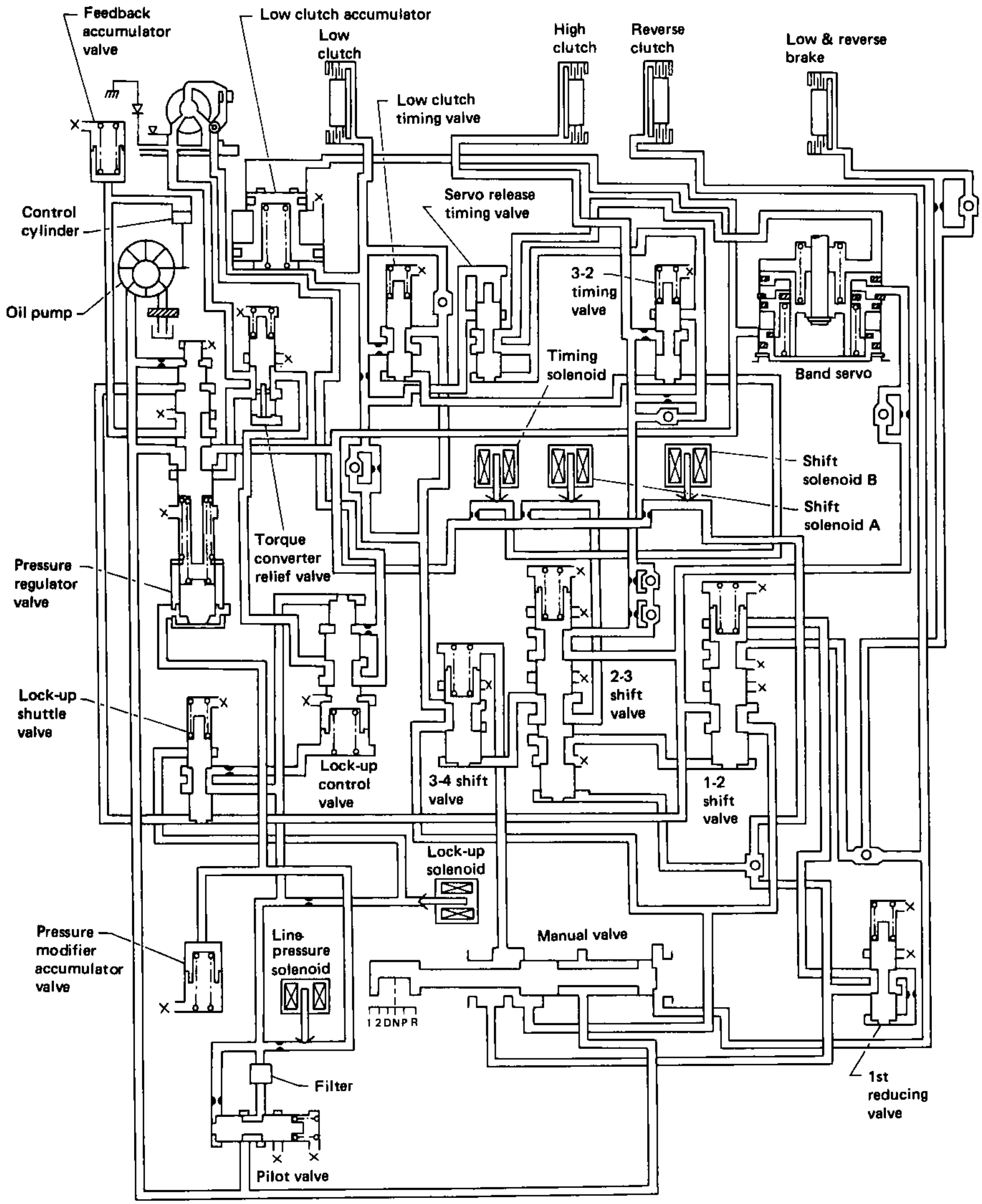
Tool number (Kent-Moore No.) Tool name	Description
ST25420001 (J34285) Clutch spring compressor	Removing and installing clutch springs. 
ST2505S001 (J25695-A) Oil pressure gauge set ① ST25051001 (J25695-1) Oil pressure gauge ② ST25052000 (J25695-2) Hose ③ ST25053000 (J25695-3) Joint pipe ④ ST25054000 (J25695-4) Adapter ⑤ ST25055000 (J25695-5) Adapter	Measuring oil pressure 
KV31101200 (J34282) Oil pressure gauge adapter	Measuring oil pressure 
KV38106500 (J34284) Preload adapter	Checking differential side bearing preload 
ST33290001 (J34286) Side bearing outer race puller	Removing differential side bearing outer race 
ST3127S000 (See J25765-A) Preload gauge ① GG91030000 (J25765-A) Torque wrench ② HT62940000 (—) Socket adapter ③ HT62900000 (—) Socket adapter	Checking differential side bearing preload 

Tool number (Kent-Moore No.) Tool name	Description
(J34290) Shim selecting tool	Selecting oil pump housing bearing race Selecting clutch pack thrust washer Selecting differential side bearing adjusting shim Selecting output shaft bearing adjusting shim Selecting idler gear bearing adjusting shim 
(J26774-A) Seal installation tool	Installing piston 

Service Notice

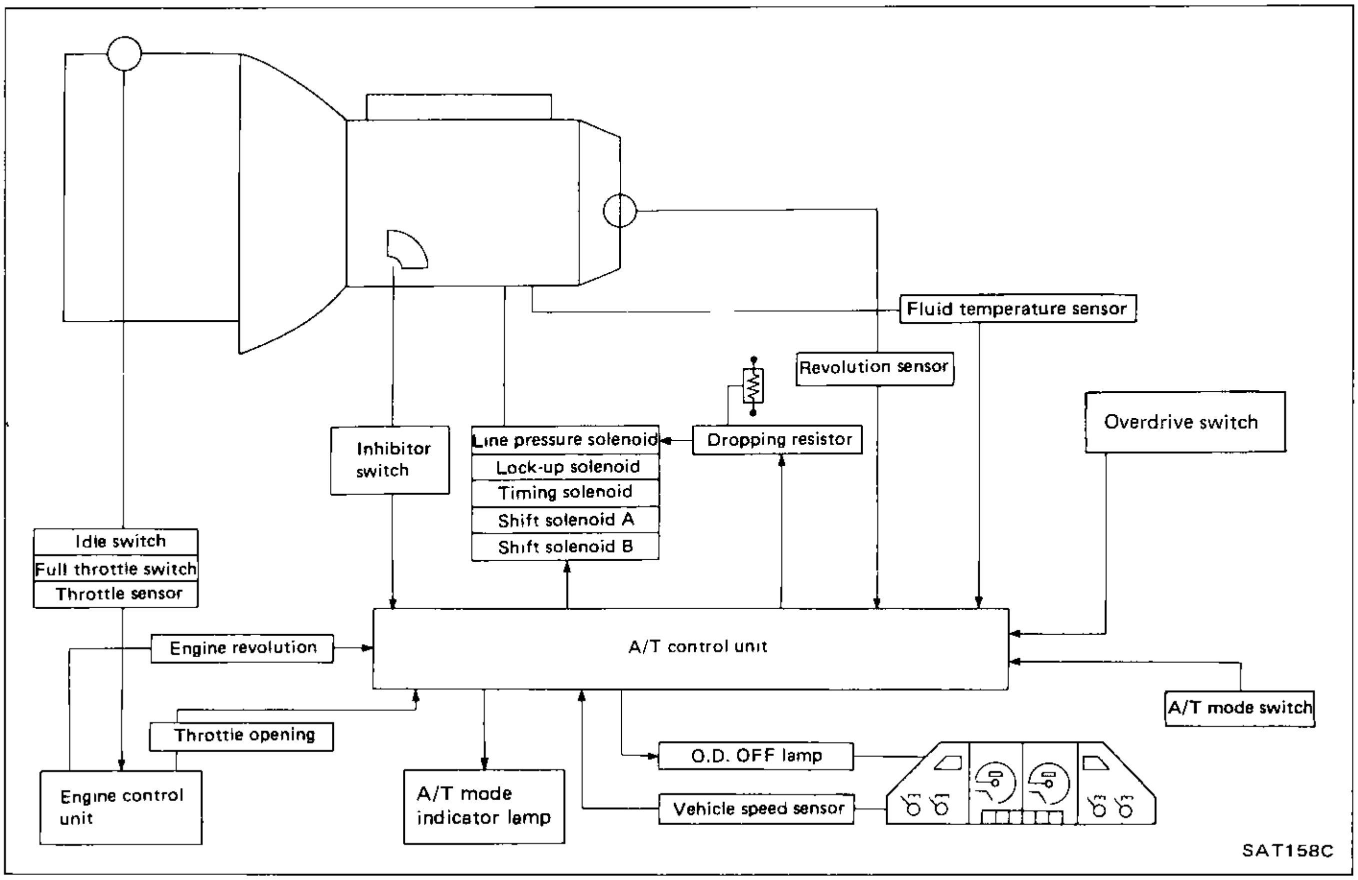
- Before proceeding with disassembly, thoroughly clean the outside of the transaxle. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
- Disassembly should be done in a clean work area.
- Use lint-free cloth or towels for wiping parts clean. Common shop rags can leave fibers that could interfere with the operation of the transaxle.
- 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 transaxle 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 transaxle with new A.T.F.

Hydraulic Control Circuits



SAT716B

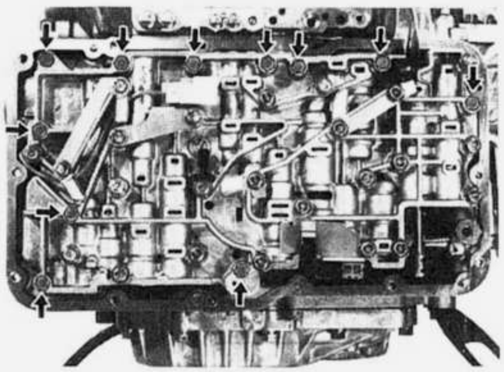
Electrical Control Chart



Mechanical Operation

Range			Reverse clutch	High clutch	Low clutch	Band servo		Low & reverse brake	One-way clutch	Parking pawl	Lock-up
						Operation	Release				
Park										on	
Reverse			on					on			
Neutral											
Drive	D_1	Low			on				on		
	D_2	Second			on	on					
	D_3	Top (3rd)		on	on	(on)	on				on*1
	D_4	O.D. (4th)		on		on					on*2
2	2_1	Low			on				on		
	2_2	Second			on	on					
1	1_1	Low			on			on	on		
	1_2	Second			on	on					

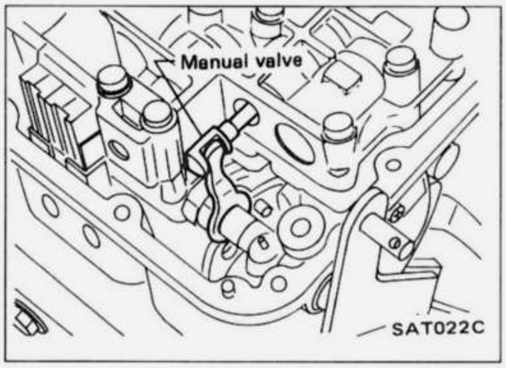
*1: Lock-up operates in 3rd speed (lock-up) range when O.D. control switch is "OFF" (Overdrive not allowed).
*2: Lock-up operates in 4th speed (lock-up) range when O.D. control switch is "ON" (Overdrive allowed).



Control Valve Assembly

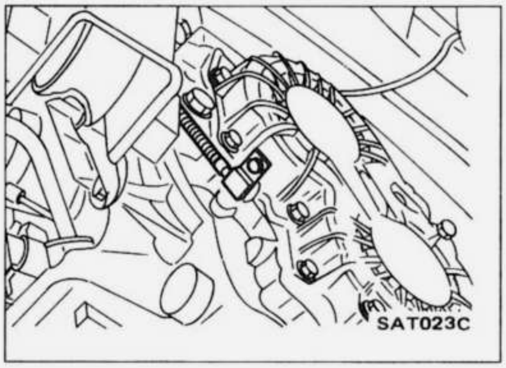
1. Remove air cleaner, battery and its bracket.
2. Remove control valve cover.
3. Remove control valve assembly by removing fixing bolts and disconnecting harness connector.

Be careful not to drop manual valve out of valve body.



4. Disassemble, inspect and assemble control valve assembly. Refer to "Control Valve Body".

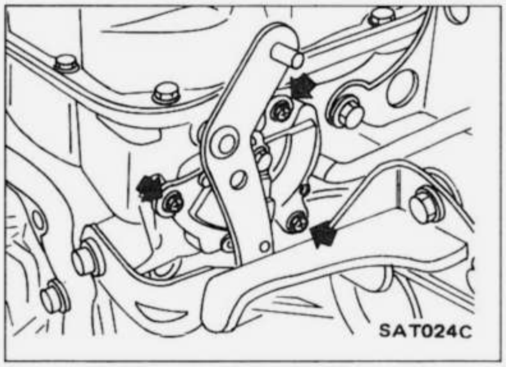
- **Set manual shaft in "N" position, then align manual plate with groove in manual valve of control valve assembly.**
- **After installing control valve to transmission case, make sure that selector lever can be moved to all positions.**



Revolution Sensor Replacement

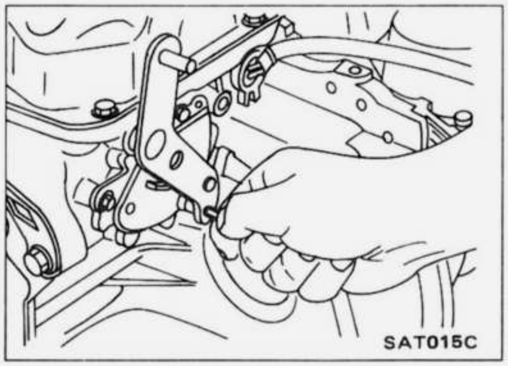
1. Remove under cover.
2. Remove revolution sensor from A/T.
3. Reinstall any part removed.

Always use new sealing parts.

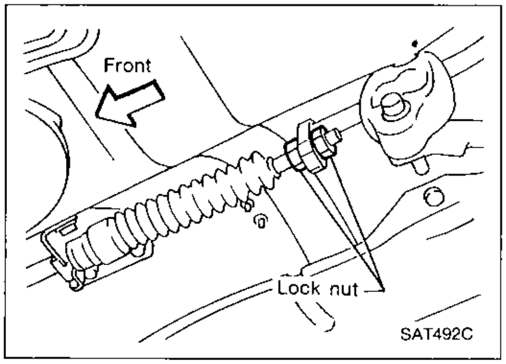


Inhibitor Switch Adjustment

1. Remove control cable from manual shaft.
2. Set manual shaft in "N" position.
3. Loosen inhibitor switch fixing bolts.



4. Insert pin into adjustment holes in both inhibitor switch and manual shaft as near vertical as possible.
5. Reinstall any part removed.
6. Check continuity of inhibitor switch. — Refer to "Electrical Components Inspection".

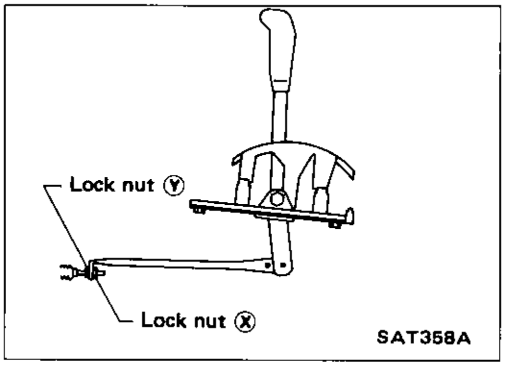


SAT492C

Control Cable Adjustment

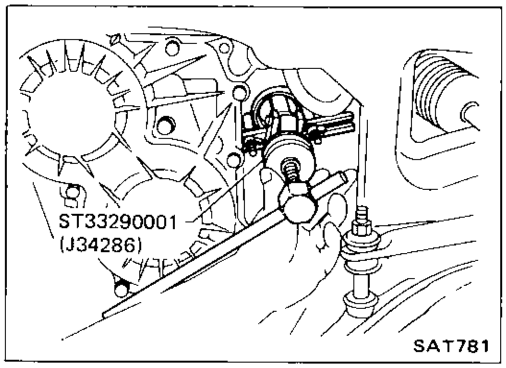
Move selector lever from "P" range to "1" range. You should be able to feel the detents in each range.
If the detents cannot be felt or the pointer indicating the range is improperly aligned, the linkage needs adjustment.

1. Place selector lever in "P" range.
2. Loosen lock nuts.



SAT358A

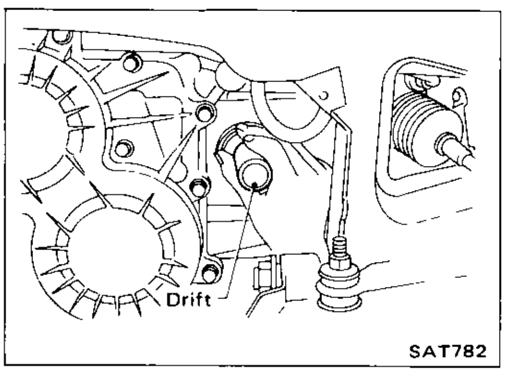
3. Screw lock nut Ⓧ until it touches select rod end while holding select rod horizontal, and tighten lock nut Ⓨ.
4. Move selector lever from "P" range to "1" range again. Make sure selector lever moves smoothly.



SAT781

Differential Side Oil Seal Replacement

1. Remove drive shaft assembly. — Refer to section FA.
2. Remove oil seal.



SAT782

3. Install oil seal.

Apply A.T.F. before installing.

4. Reinstall any part removed.

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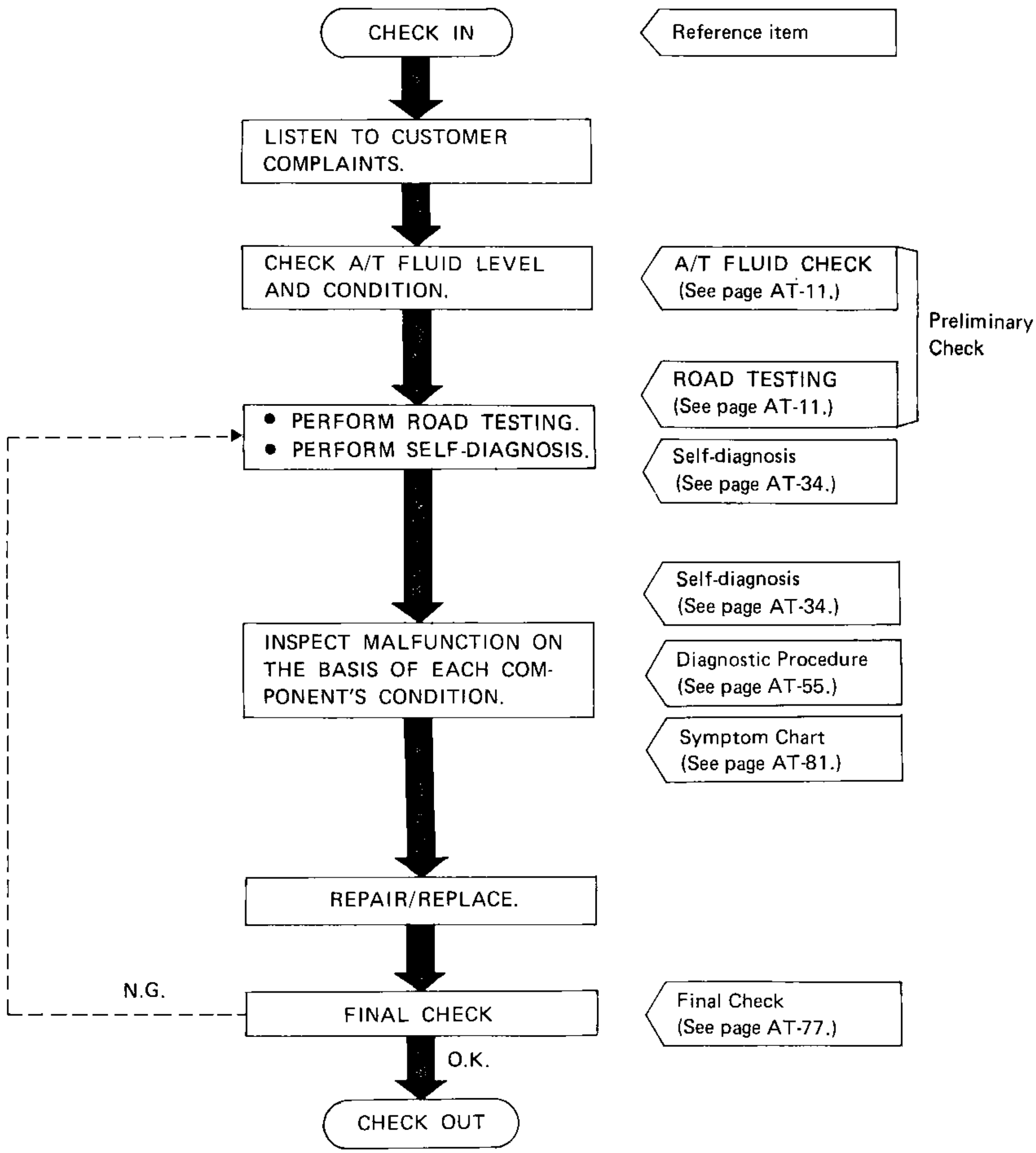
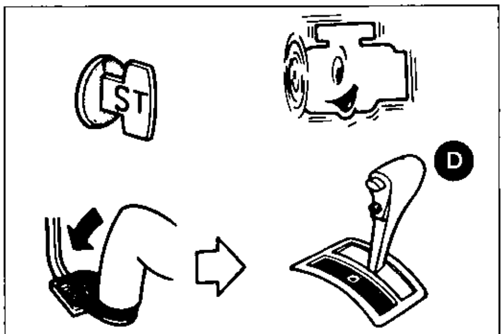
How to Perform Trouble Diagnoses for Quick and Accurate Repair

WORK FLOW



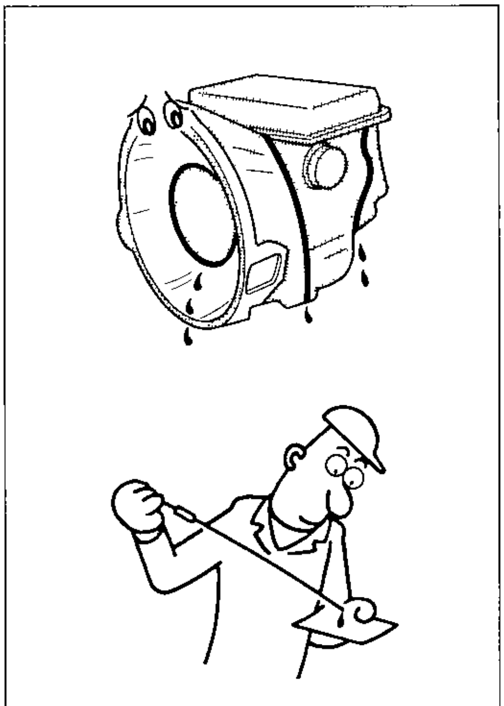

SAT767B

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.


SAT910E

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 any 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.

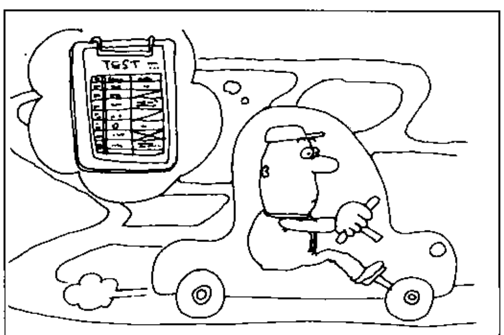
SAT786A

ROAD TESTING

Description

- The purpose of this road test is to determine overall performance of automatic transaxle and analyze causes of problems.
- The road test consists of the following three parts:

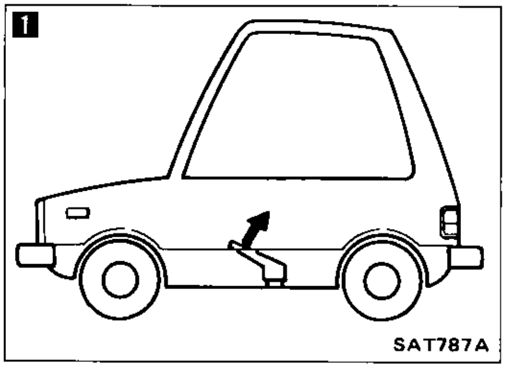
1. Check before engine is started
2. Check at idle
3. Cruise test

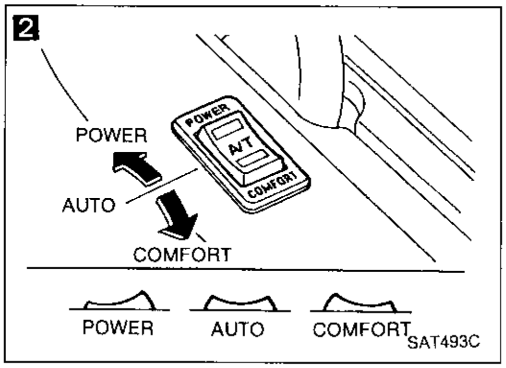

SAT639A

- 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".

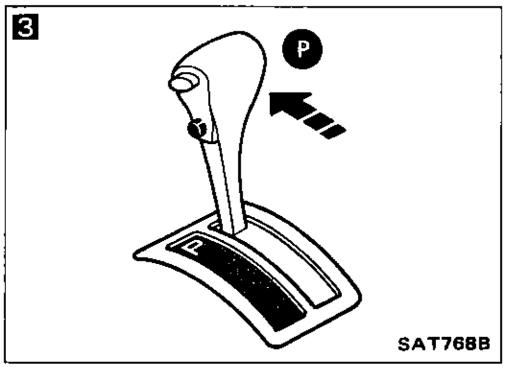
Preliminary Check (Cont'd)

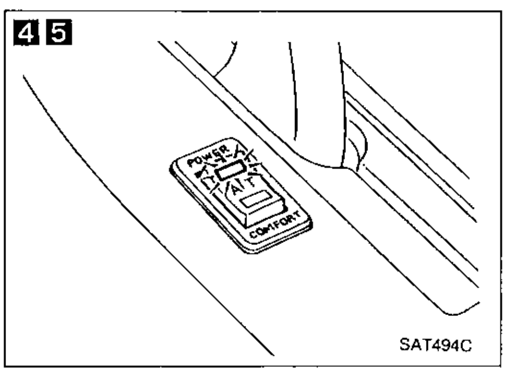
1. Check before engine is started

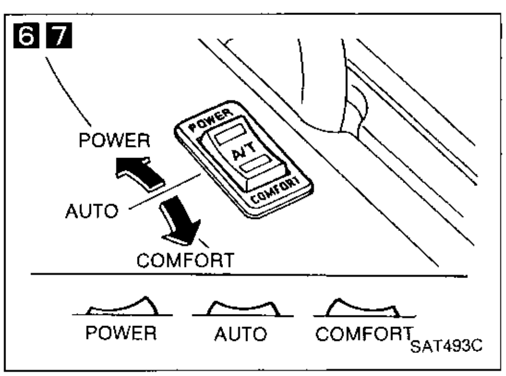
1

SAT787A

2


SAT493C

3

SAT768B

4 5

SAT494C

6 7


SAT493C

1 Park vehicle on flat surface.

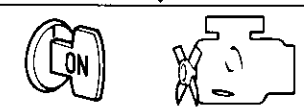
↓

2 Set A/T mode switch in "AUTO" position.

↓

3 Move selector lever to "P" range.

↓



↓

4 Does power indicator lamp come on for about 2 seconds?
- No → Go to Diagnostic Procedure 1.
- Yes ↓

5 Does power indicator lamp flicker for about 8 seconds?
- Yes → Perform self-diagnosis. — Refer to SELF-DIAGNOSIS PROCEDURE.
- No ↓

6 Set A/T mode switch in "POWER" position.

↓

Does power indicator lamp come on?
- No → Go to Diagnostic Procedure 2.
- Yes ↓

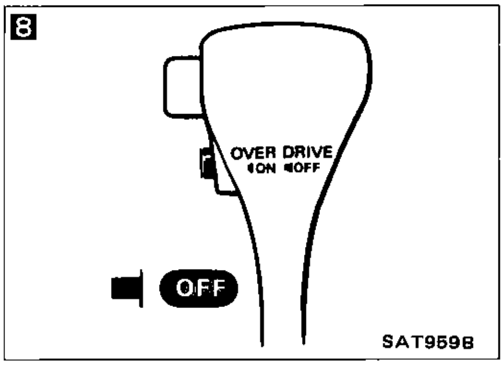
7 Set A/T mode switch in "COMFORT" position.

↓

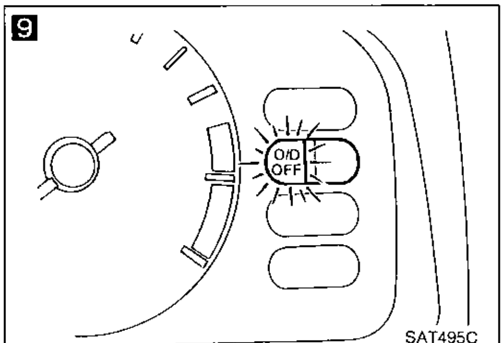
Does comfort indicator lamp come on?
- No → Go to Diagnostic Procedure 2.
- Yes ↓

Ⓐ

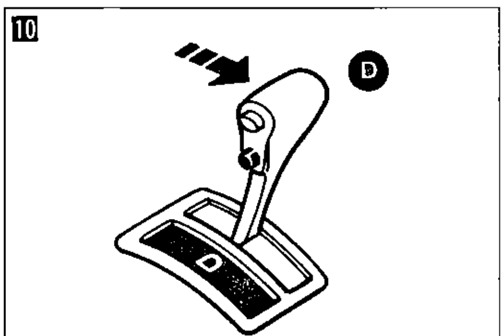
Preliminary Check (Cont'd)



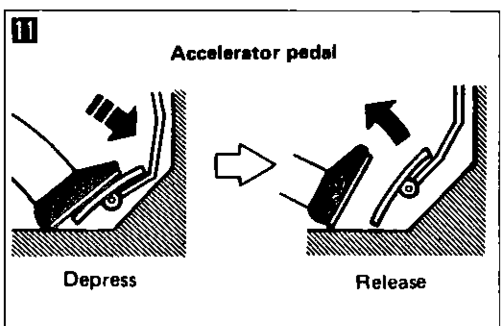
SAT959B



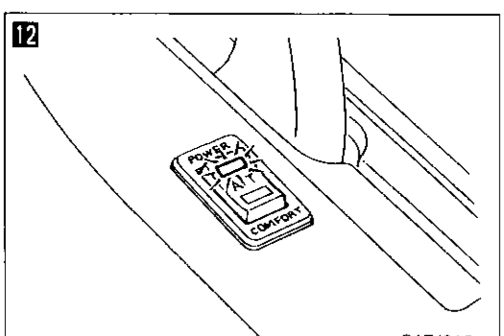
SAT495C



SAT775B



SAT754A



SAT494C

Ⓐ

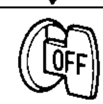
8 Set overdrive switch in "OFF" position.

9 Does O.D. OFF indicator lamp come on?
- No → Go to Diagnostic Procedure 3.
- Yes ↓

10 Move selector lever to "D" range.

11 Depress and release accelerator pedal quickly.

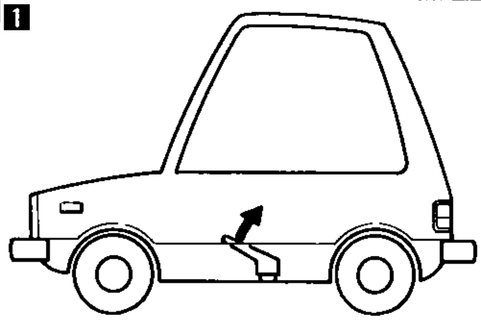
12 Does power indicator lamp come on for about 3 seconds after accelerator pedal is depressed?
- No → Go to Diagnostic Procedure 4.
- Yes ↓



Perform self-diagnosis.
— Refer to SELF-DIAGNOSIS PROCEDURE and note N.G. items.

Go to "ROAD TESTING
— Check at idle".

Preliminary Check (Cont'd)

1

SAT787A

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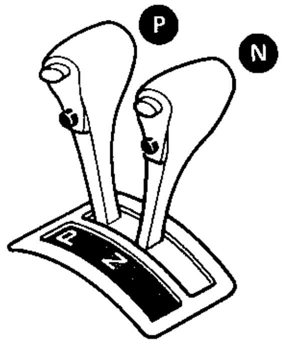

SAT769B

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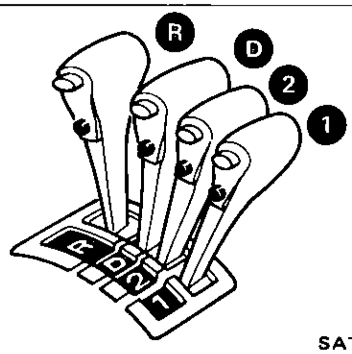
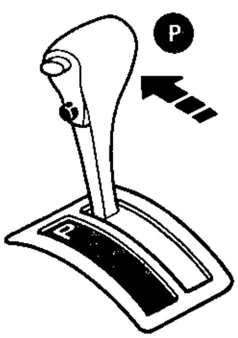


SAT770B

4


SAT768B

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 5.

↓ Yes

↓

3

Move selector lever to "D", "1", "2" or "R" range.

↓

↓

Is engine started? — Yes → Go to Diagnostic Procedure 5.

↓ No

↓

4

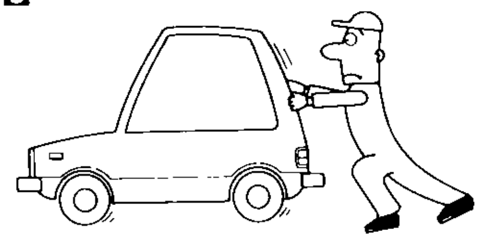
Move selector lever to "P" range.

↓

Ⓐ

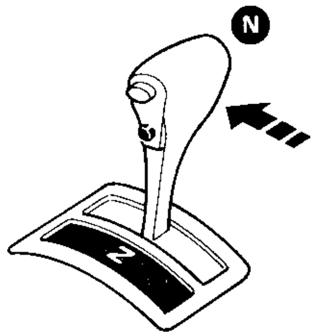
Preliminary Check (Cont'd)

5



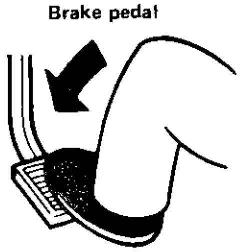
SAT796A

6



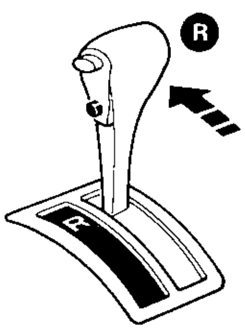
SAT771B

7



SAT797A

8



SAT772B

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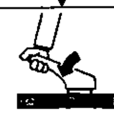
5

Push vehicle forward or backward.

Does vehicle move when it is pushed forward or backward?

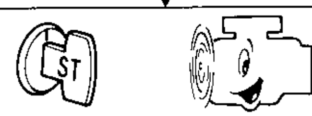
Yes → Go to Diagnostic Procedure 6.

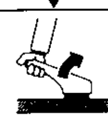
No ↓



6

Move selector lever to "N" range.





Does vehicle move forward or backward?

Yes → Go to Diagnostic Procedure 7.

No ↓

7

Apply foot brake.

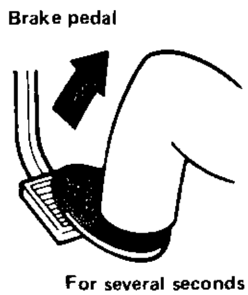
8

Move selector lever to "R" range.

Ⓑ

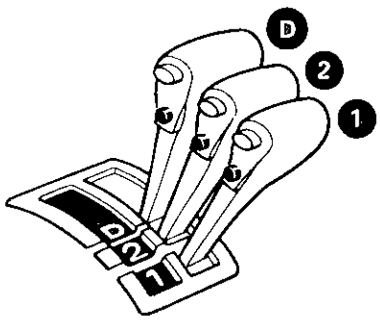
Preliminary Check (Cont'd)

9



SAT799A

10



SAT773B

Ⓑ

↓

Is there large shock when changing from "N" to "R" range?

- No → Go to Diagnostic Procedure 8.
- Yes ↓

9 Release foot brake for several seconds.

↓

Does vehicle creep backward when foot brake is released?

- No → Go to Diagnostic Procedure 9.
- Yes ↓

10 Move selector lever to "D", "2" and "1" ranges and check if vehicle creeps forward.

↓

Does vehicle creep forward in all three ranges?

- No → Go to Diagnostic Procedure 10.
- Yes ↓

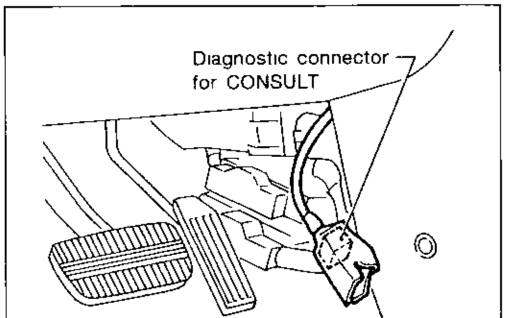
Go to Cruise test.

Preliminary Check (Cont'd)

3. Cruise test

With CONSULT

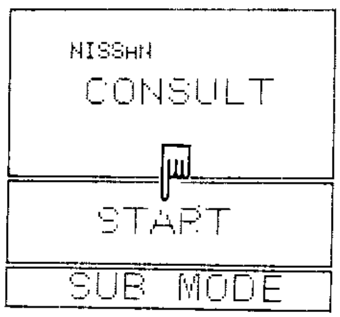
- Using CONSULT, conduct a cruise test and record the result.
- Print the result and ensure that shifts and lock-ups take place as per "Shift Schedule."
- Check all items listed in Parts 1 through 3.



SAT496C

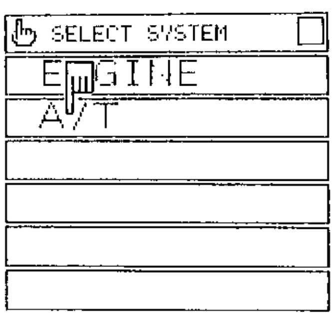
CONSULT setting procedure

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



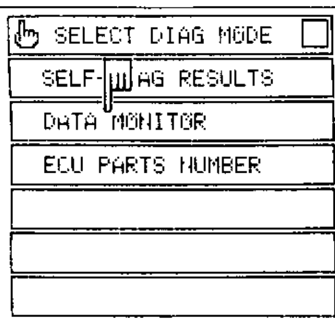
SEF392I

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



SAT497C

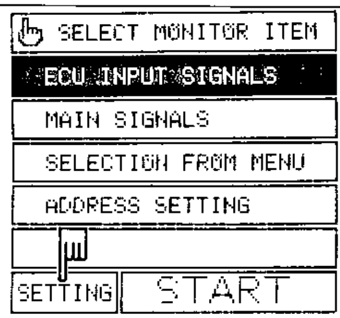
5. Touch "A/T".



SAT295C

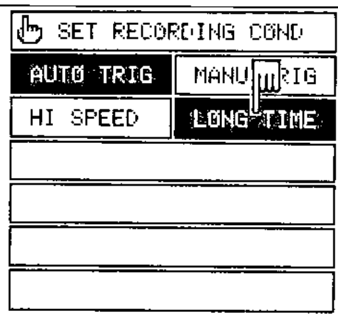
6. Touch "DATA MONITOR".

Preliminary Check (Cont'd)



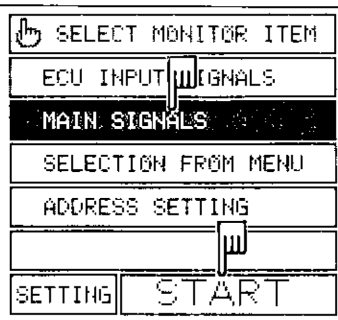
SAT296C

7. Touch "SETTING" to set recording condition.



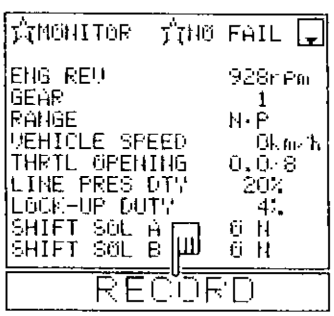
SAT297C

8. Touch "LONG TIME" and "ENTER" key.



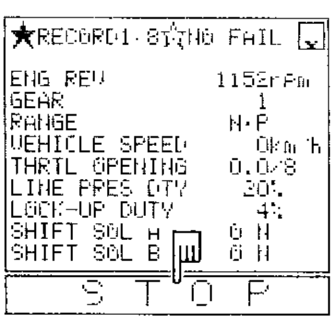
SAT298C

9. Go back to SELECT MONITOR ITEM and touch "MAIN SIGNALS".
10. Touch "START".



SAT498C

11. When performing cruise test, touch "RECORD".



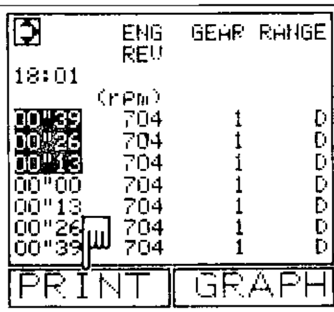
SAT499C

12. After finishing cruise test part 1, touch "STOP".

Preliminary Check (Cont'd)

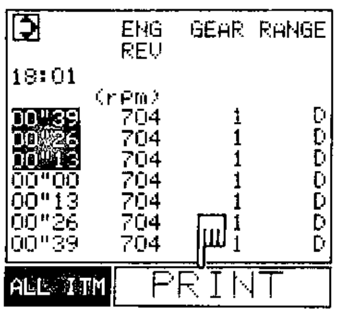
SAT301C

13. Touch "DISPLAY".



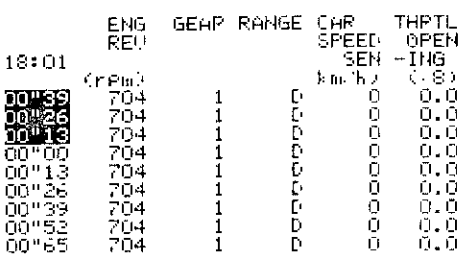
SAT302C

14. Touch "PRINT".



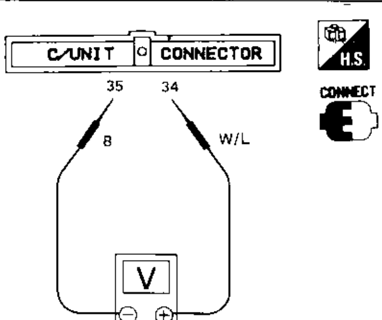
SAT303C

15. Touch "PRINT" again.



SAT304C

16. Check the monitor data printed out.
17. Continue cruise test part 2 and 3.



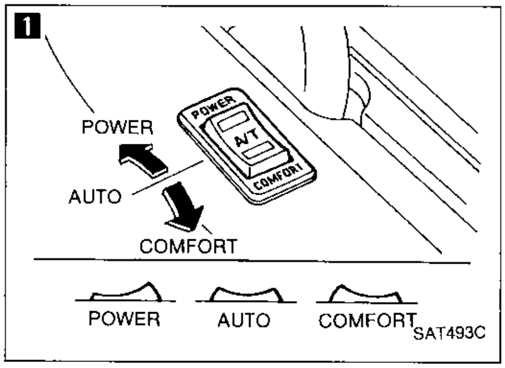
SAT960B

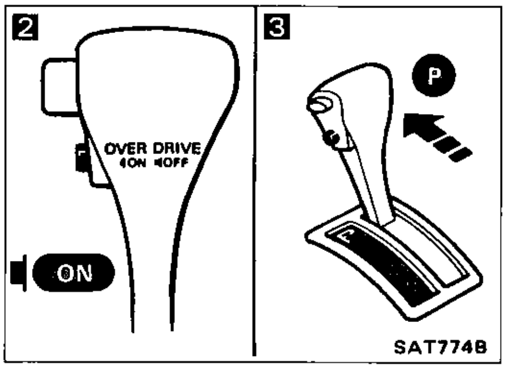
Without CONSULT

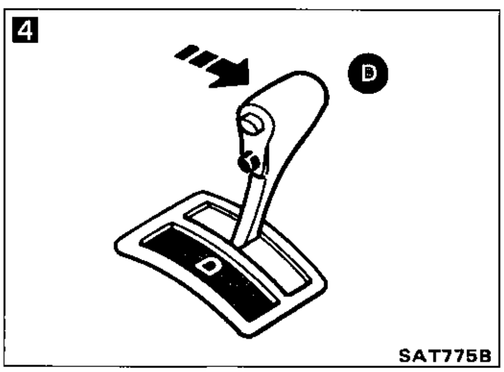
- Throttle position can be controlled by voltage across terminals (34) and (35) of A/T control unit.

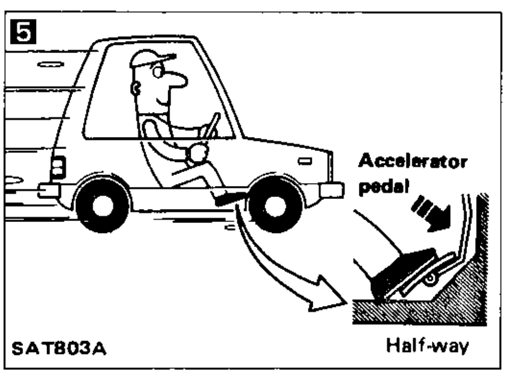
Preliminary Check (Cont'd)

Cruise test — Part 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.

↓ 1

Set A/T mode switch in "AUTO" position.

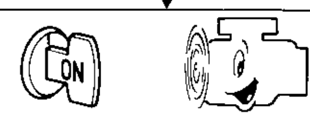
↓ 2

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.

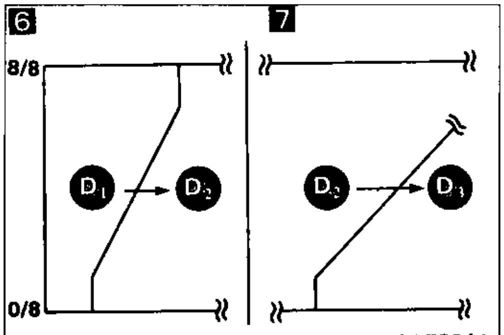
↓

Does vehicle start from D_1?
Read gear position.

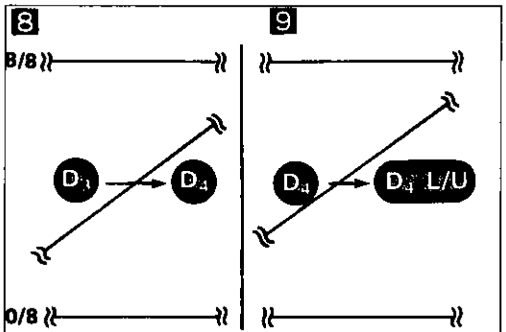
No → Go to Diagnostic Procedure 11.

Yes ↓ Ⓐ

Preliminary Check (Cont'd)



SAT804A



SAT805A

Ⓐ

6

Does A/T shift from D_1 to D_2 at the specified speed?

Read gear position, throttle opening and vehicle speed.

Specified speed when shifting from D_1 to D_2:
Refer to Shift schedule.

No → Go to Diagnostic Procedure 12.

Yes ↓

7

Does A/T shift from D_2 to D_3 at the specified speed?

Read gear position, throttle opening and vehicle speed.

Specified speed when shifting from D_2 to D_3:
Refer to Shift schedule.

No → Go to Diagnostic Procedure 13.

Yes ↓

8

Does A/T shift from D_3 to D_4 at the specified speed?

Read gear position, throttle opening and vehicle speed.

Specified speed when shifting from D_3 to D_4:
Refer to Shift schedule.

No → Go to Diagnostic Procedure 14.

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:
27X63 model:
135 - 145 km/h
(84 - 90 MPH)
(Throttle opening 4/8)
95 - 105 km/h
(59 - 65 MPH)
(Throttle opening 2/8)
27X70 model:
125 - 135 km/h
(78 - 84 MPH)
(Throttle opening 4/8)
90 - 100 km/h (56 - 62 MPH)
(Throttle opening 2/8)

No → Go to Diagnostic Procedure 15.

Yes ↓

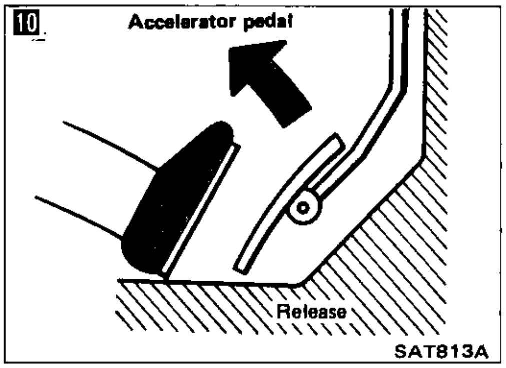
Does A/T hold lock-up condition for more than 30 seconds?

No → Go to Diagnostic Procedure 16.

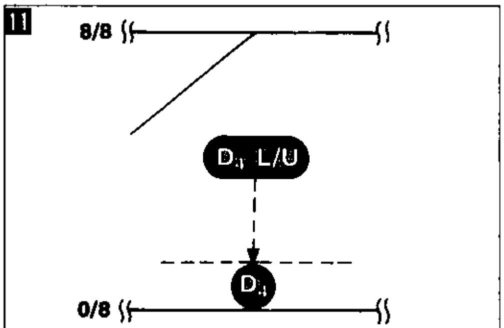
Yes ↓

Ⓑ

Preliminary Check (Cont'd)



SAT813A



SAT961B

Ⓑ

10

Release accelerator pedal.

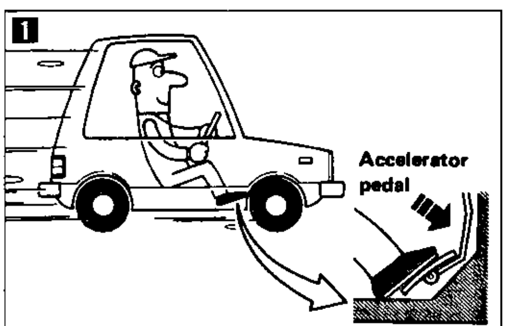
11

Is lock-up released when accelerator pedal is released?

- No → Go to Diagnostic Procedure 17.
- Yes ↓

Stop vehicle.

Go to "Cruise test — Part 2".



SAT803A

Cruise test — Part 2

Confirm A/T mode switch is in "AUTO" position and overdrive switch is in "ON" position.

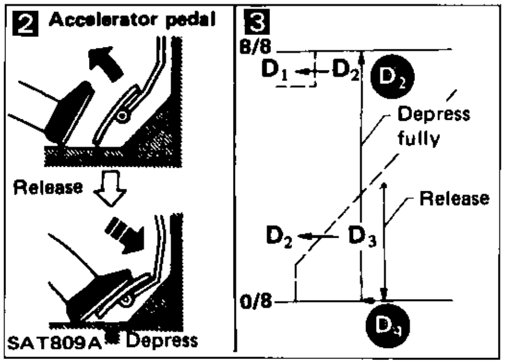
Confirm selector lever is in "D" range.

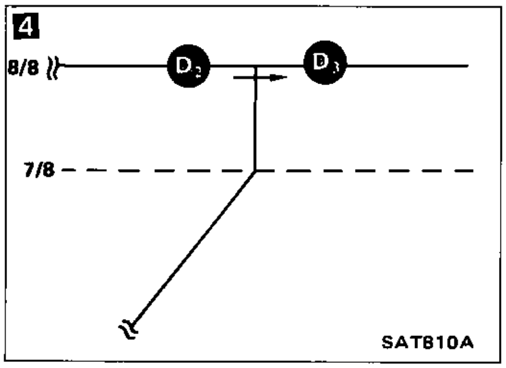
1

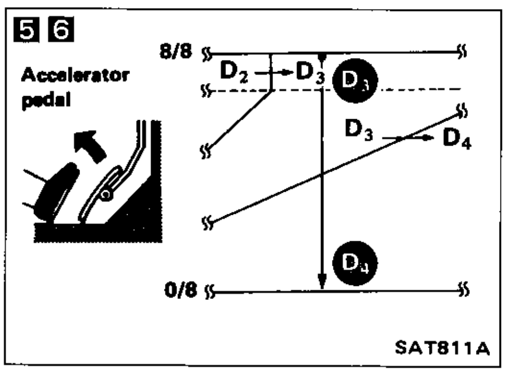
Accelerate vehicle to about 80 km/h (50 MPH) using half-throttle.

Ⓐ

Preliminary Check (Cont'd)







Ⓐ

2

Release accelerator pedal and then quickly depress it fully.

3

Does A/T shift from D_4 to D_2 as soon as accelerator pedal is depressed fully?

Read gear position and throttle opening.

- No → Go to Diagnostic Procedure 12.
- Yes ↓

4

Does A/T shift from D_2 to D_3 at the specified speed?

Read gear position, throttle opening and vehicle speed.

Specified speed when shifting from D_2 to D_3:

Refer to Shift schedule.

- No → Go to Diagnostic Procedure 13.
- Yes ↓

5

Release accelerator pedal after shifting from D_2 to D_3.

↓

6

Does A/T shift from D_3 to D_4 and does vehicle decelerate by engine brake?

Read gear position, throttle opening and vehicle speed.

- No → Go to Diagnostic Procedure 14.
- Yes ↓

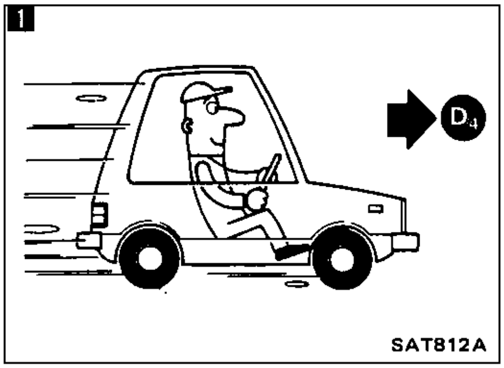
Stop vehicle.

↓

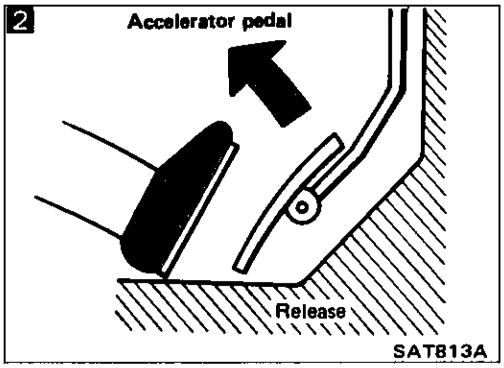
Go to "Cruise test — Part 3".

Preliminary Check (Cont'd)

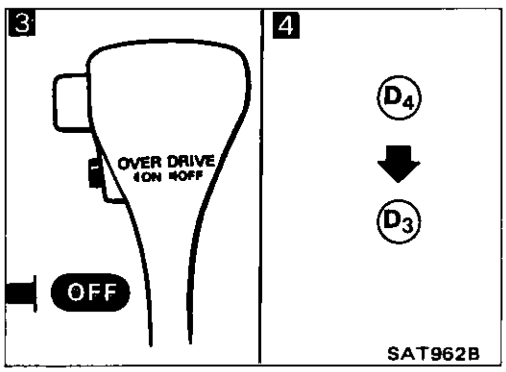
Cruise test — Part 3



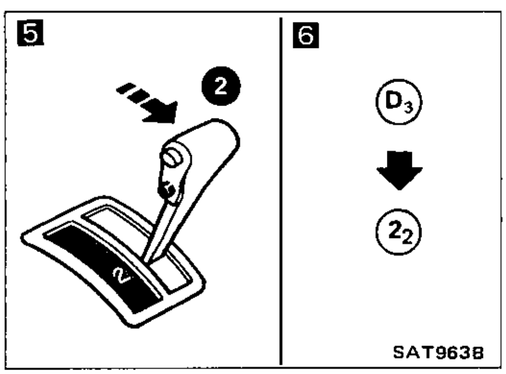
SAT812A



SAT813A



SAT962B



SAT963B

Confirm A/T mode switch is in "AUTO" position and overdrive switch is in "ON" position.

↓

Confirm selector lever is in "D" range.

↓

1 Accelerate vehicle to D_4 using half-throttle.

↓

2 Release accelerator pedal.

↓

3 Set overdrive switch in "OFF" position while driving in D_4 range.

↓

4 Does A/T shift from D_4 to D_3?
Read gear position and vehicle speed.

- No → Go to Diagnostic Procedure 18.
- Yes ↓

5 Move selector lever from "D" to "2" range while driving in D_3.

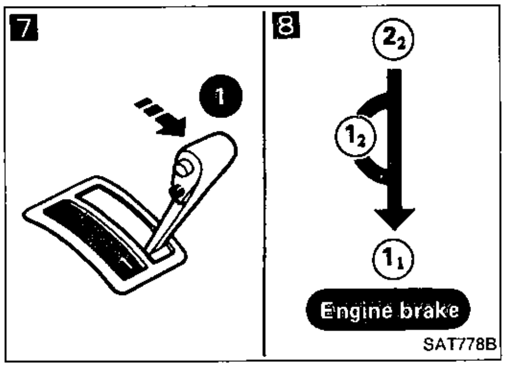
↓

6 Does A/T shift from D_3 to 2_2?
Read gear position.

- No → Go to Diagnostic Procedure 19.
- Yes ↓

Ⓐ

Preliminary Check (Cont'd)



SAT778B

Ⓐ

7

Move selector lever from "2" to "1" range while driving in 2_2.

↓

8

Does A/T shift from 2_2 to 1_1 range and does vehicle decelerate by engine brake?

Read gear position.

- No → Go to Diagnostic Procedure 20.
- Yes ↓

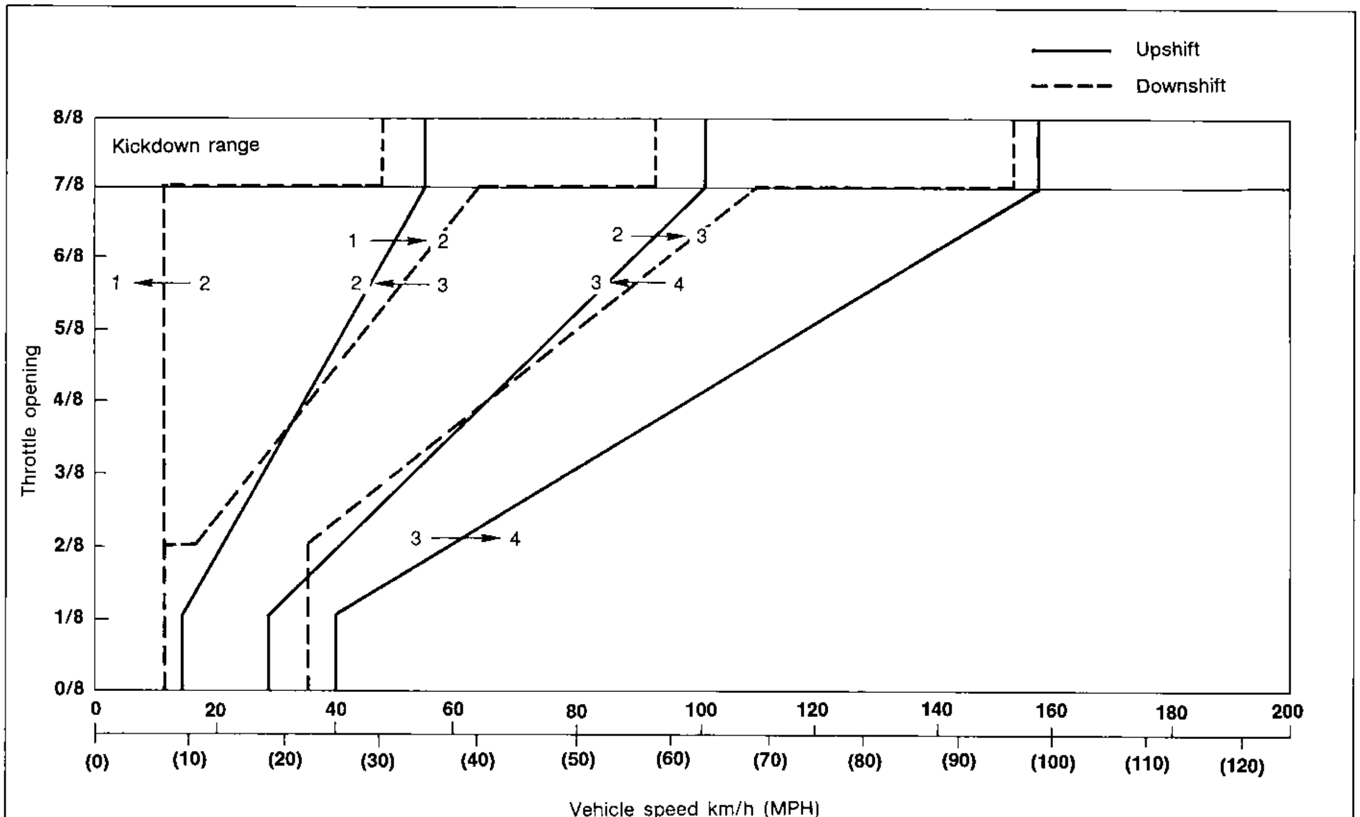
Stop vehicle.

↓

Perform self-diagnosis. — Refer to SELF-DIAGNOSIS PROCEDURE.

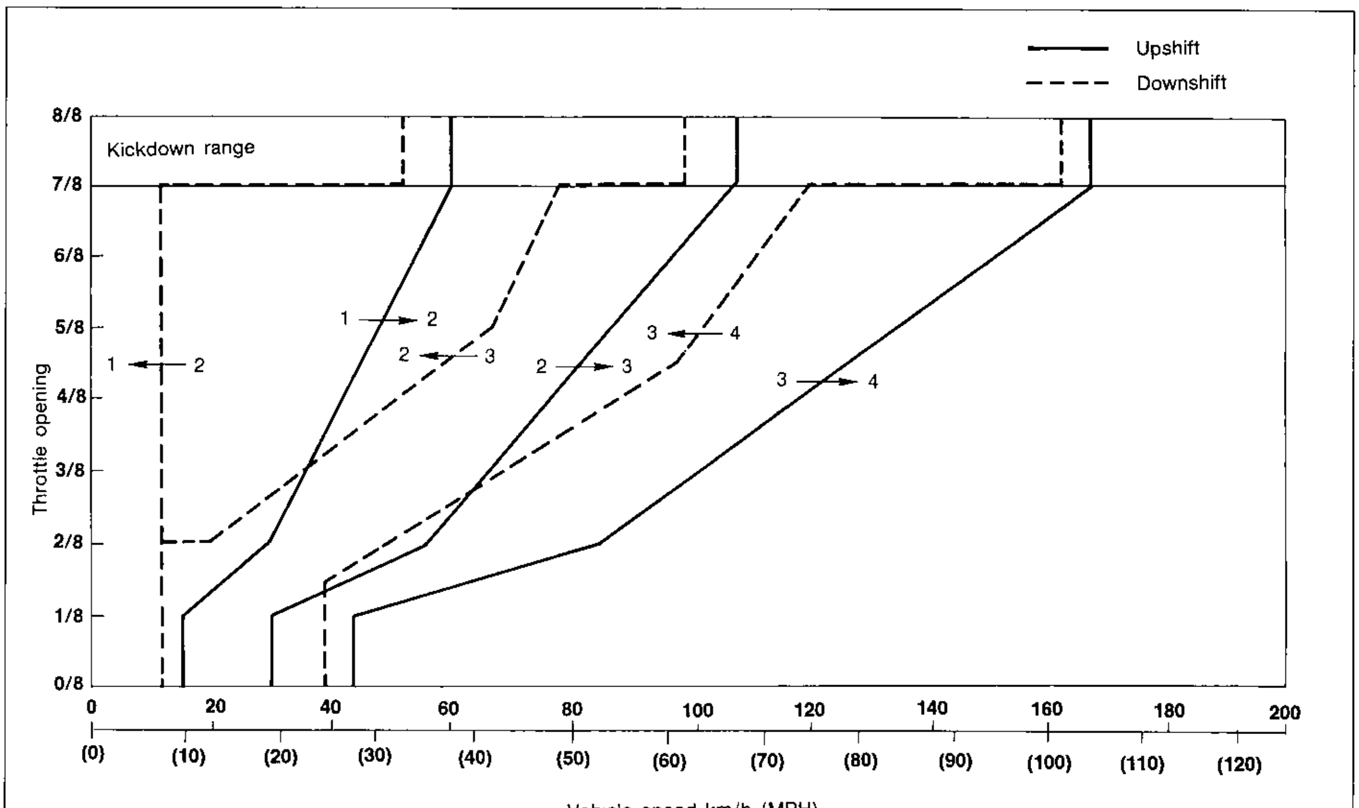
SHIFT SCHEDULE

27 X 63 model (COMFORT pattern)



SAT500C

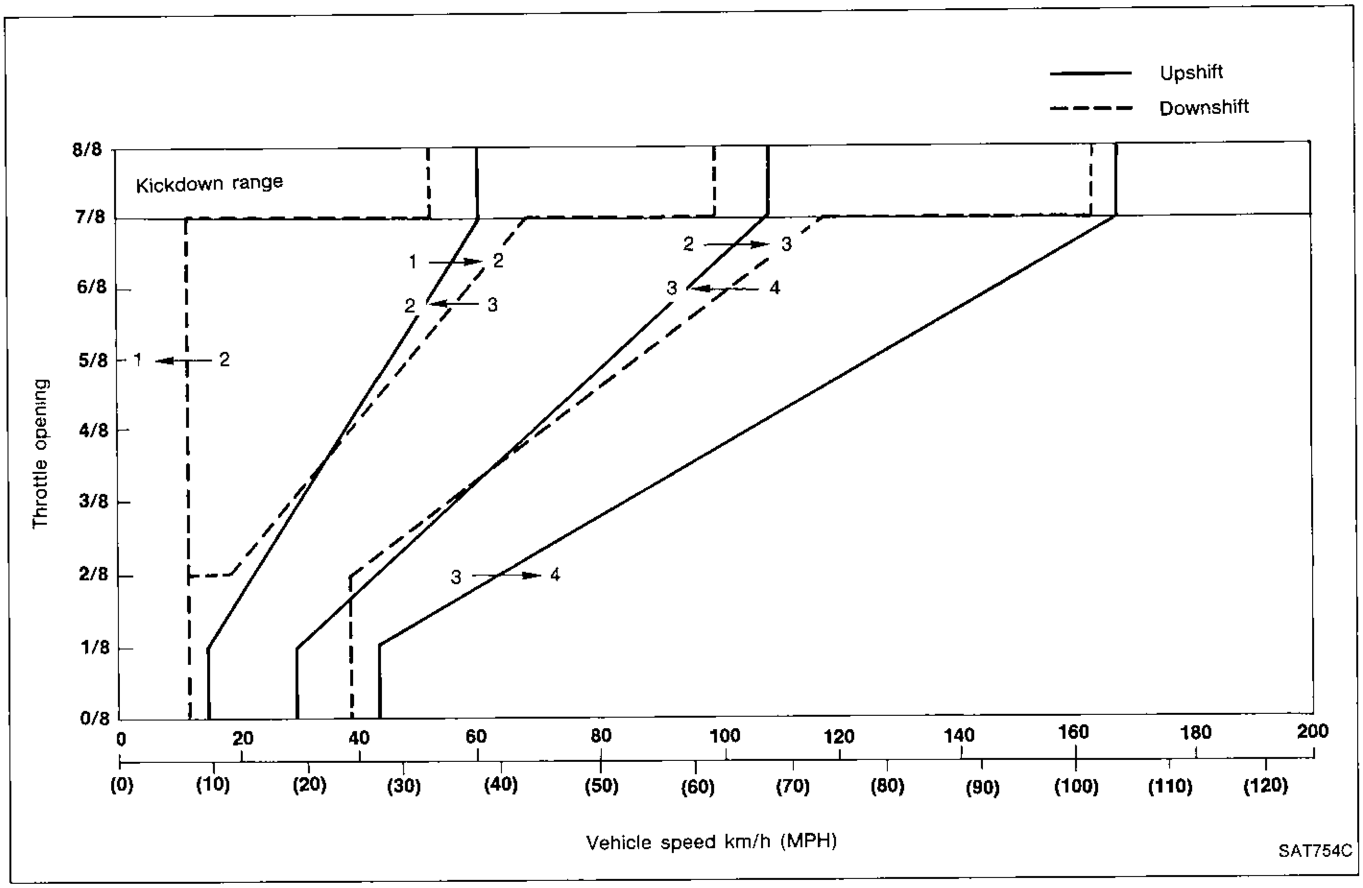
27 X 63 model (POWER pattern)



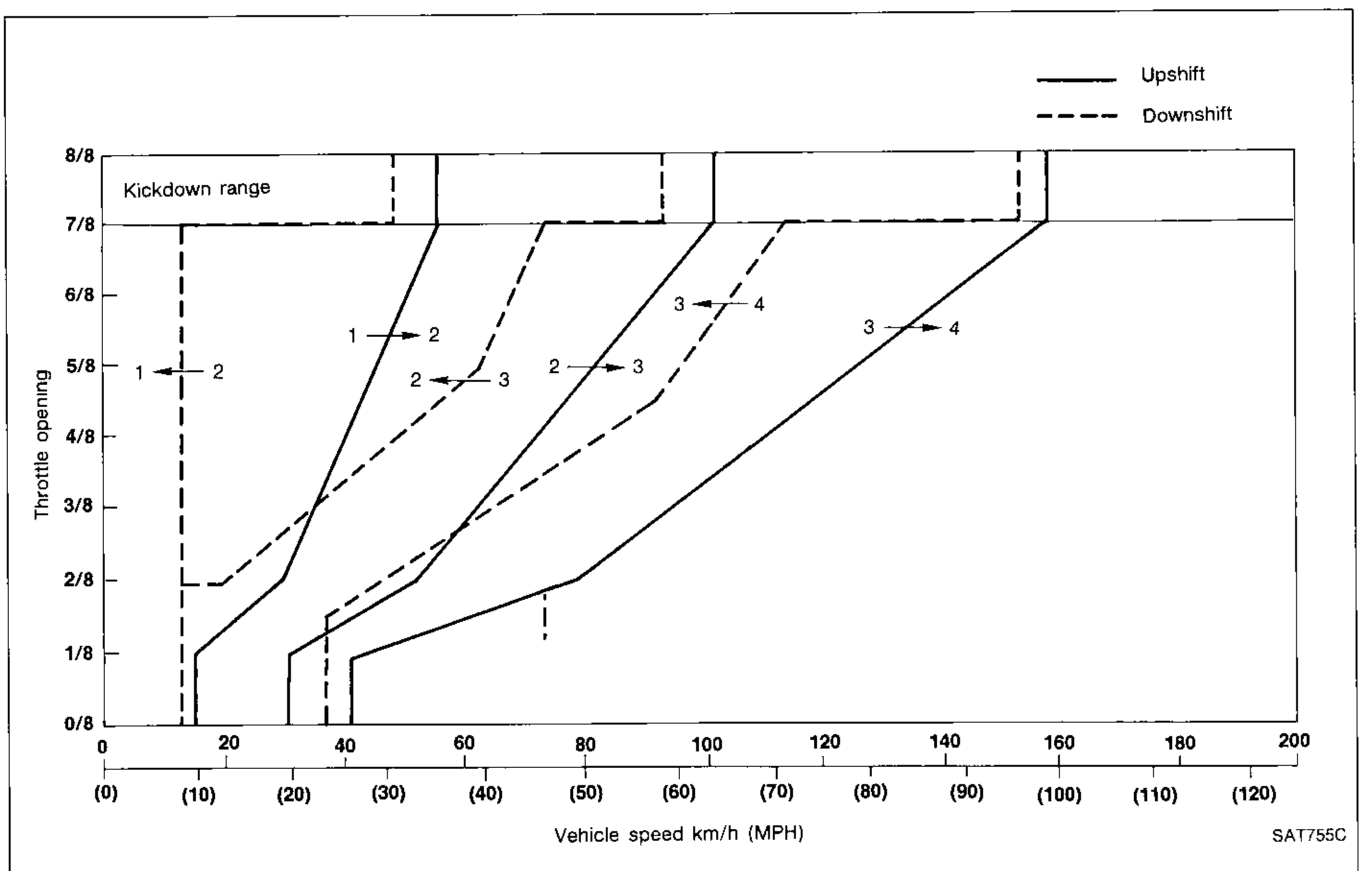
SAT501C

Preliminary Check (Cont'd)

27 X 70 model (COMFORT pattern)



27 X 70 model (POWER pattern)



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).

DATA MONITOR APPLICATION

Item	Application
Vehicle speed sensor 1 (A/T)	×
Vehicle speed sensor 2 (meter)	×
Throttle sensor	×
Fluid temperature sensor	×
Battery voltage	×
Engine rpm	×
Selector lever switch (O.D. switch)	×
A.S.C.D. — cruise signal	×
A.S.C.D. — O.D. cut signal	×
Kickdown switch	–
Power shift switch (A/T mode switch — POWER)	×
Idle switch	×
Full throttle switch	×
Shift solenoid A	×
Shift solenoid B	×

Item	Application
Timing solenoid	×
*Shift solenoid A (feedback)	×
*Shift solenoid B (feedback)	×
*Timing solenoid (feedback)	×
Hold mode switch (A/T mode switch — COMFORT)	×
1 range switch	×
2 range switch	×
D range switch	×
N range switch	×
R range switch	×
Gear position	×
Range position	×
Vehicle speed	×
Throttle opening	×
Line-pressure solenoid	×
Lock-up solenoid	×

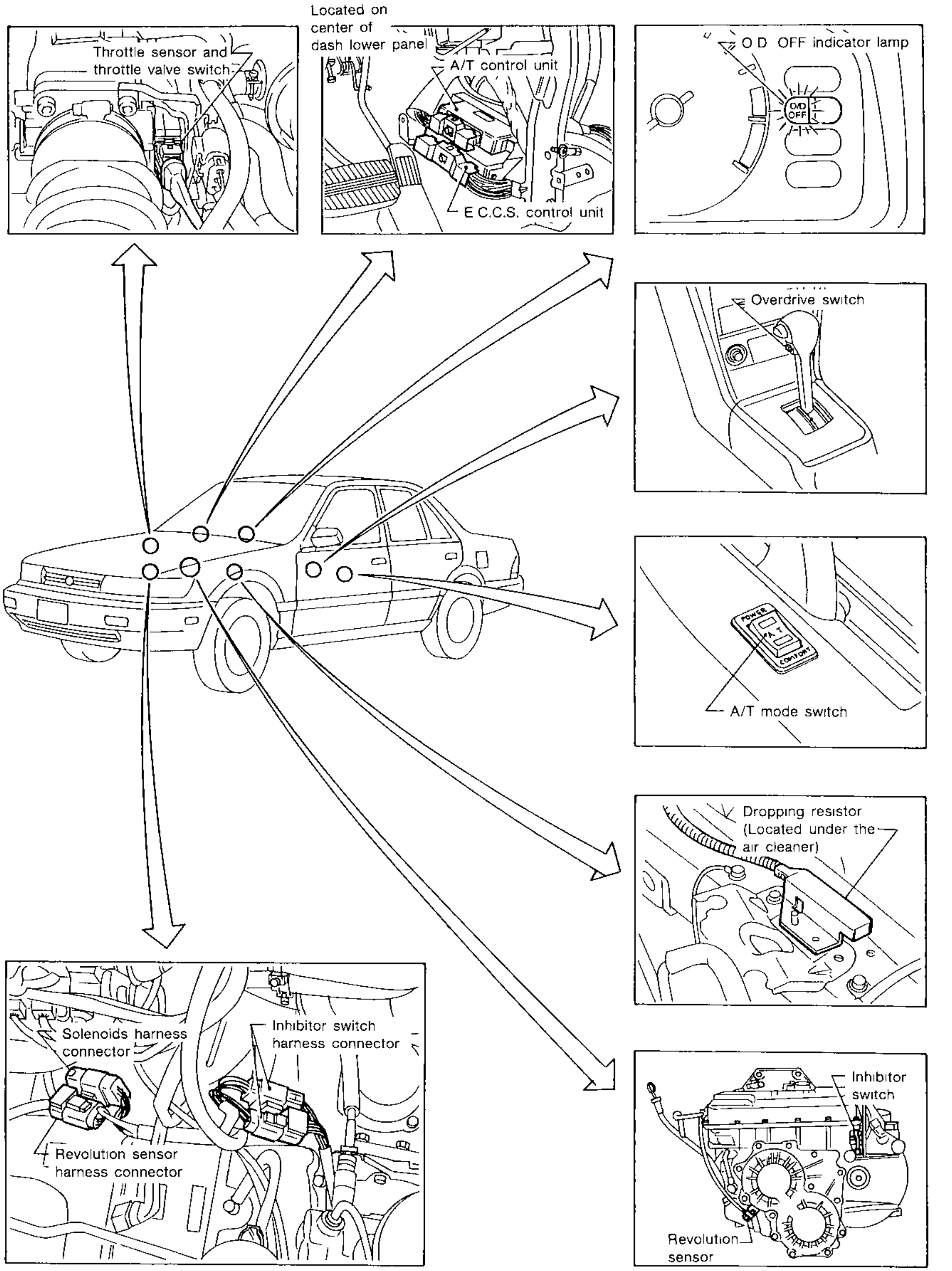
×: Applicable - : Not applicable

DATA ANALYSIS

Item	Display	Condition
Lock-up duty	Approximately 4% → Approximately 94%	Lock-up "OFF" → Lock-up "ON"
Line pressure duty	Approximately 20% → Approximately 94%	Low line-pressure (Small throttle opening) ↓ 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 → Approximately 0.5V	Cold [20°C (68°F)] → Hot [80°C (176°F)]

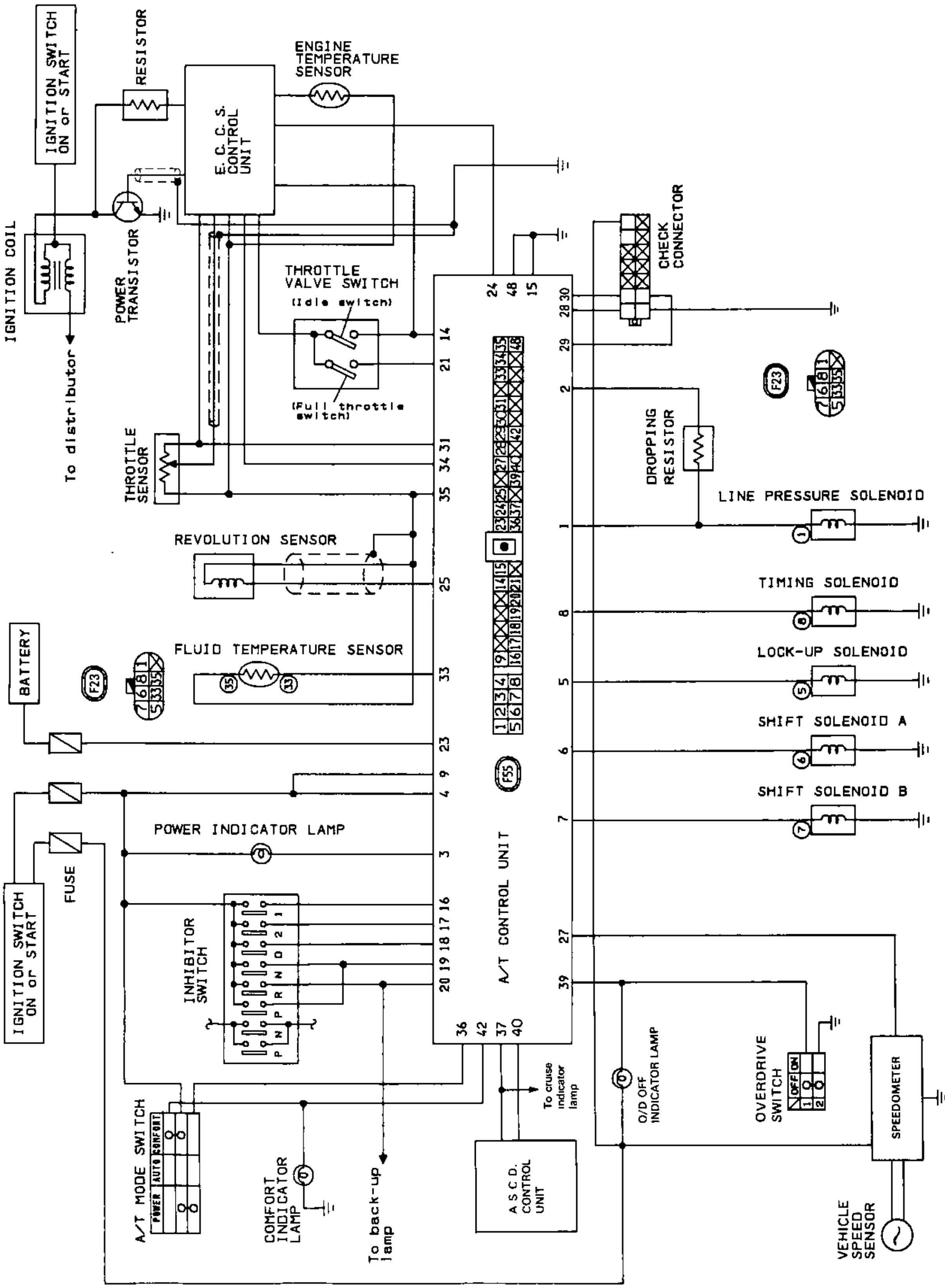
Gear position	1	2	3	4
Shift solenoid A	ON	OFF	OFF	ON
Shift solenoid B	ON	ON	OFF	OFF

A/T Electrical Parts Location



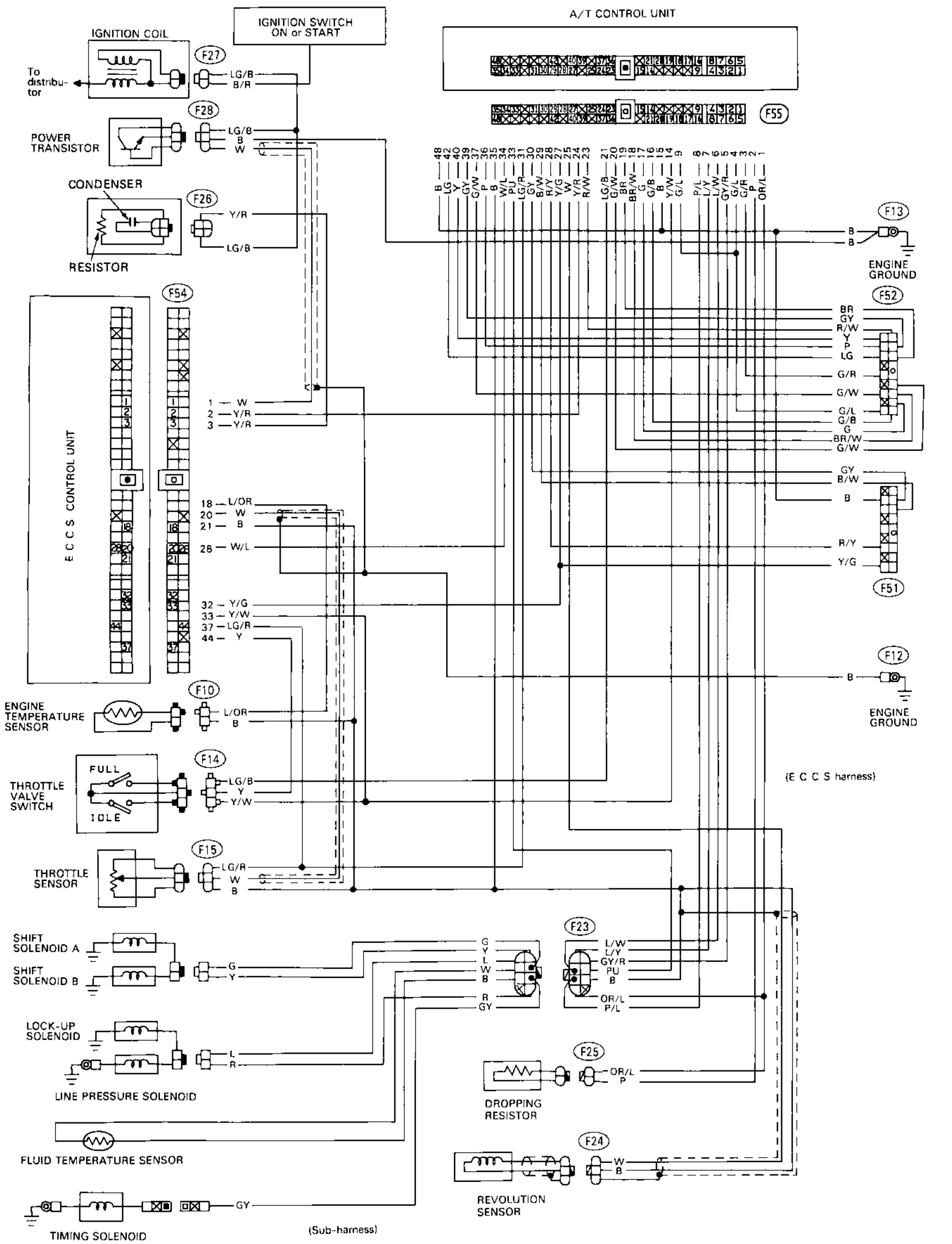
NOTE

Circuit Diagram for Quick Pinpoint Check

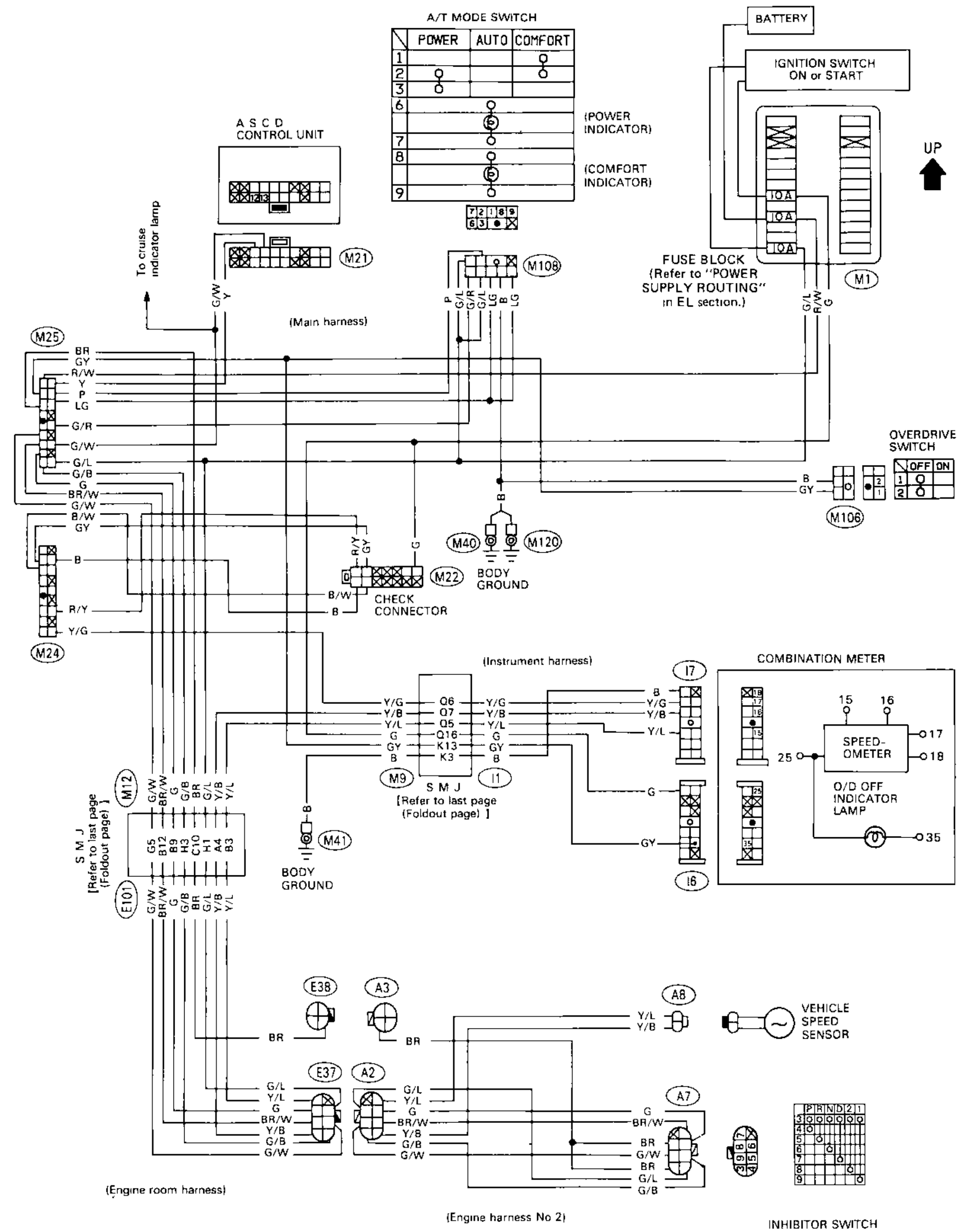


SAT907E

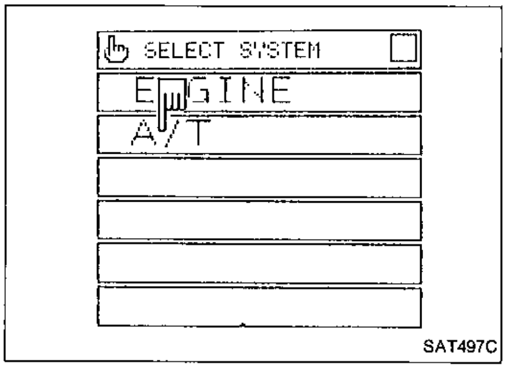
Wiring Diagram



Wiring Diagram (Cont'd)



SAT908E

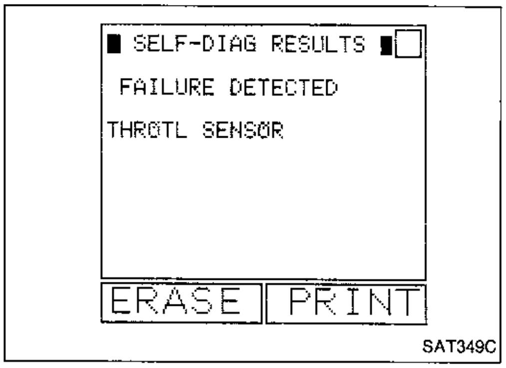


SAT497C

Self-diagnosis

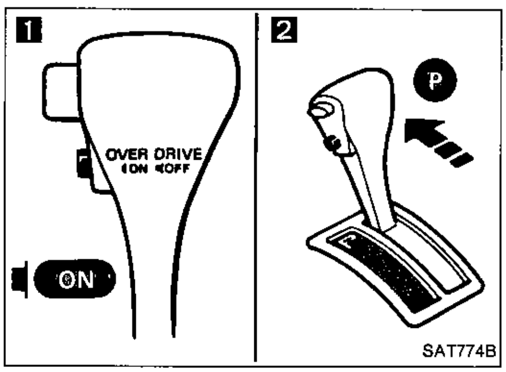
SELF-DIAGNOSTIC PROCEDURE (With CONSULT)

1. Turn on CONSULT.
2. Touch "A/T".

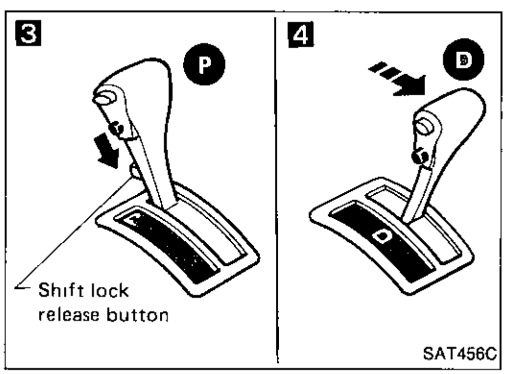


SAT349C

3. Touch "SELF-DIAGNOSIS".
   CONSULT performs REAL-TIME SELF-DIAGNOSIS.



SAT774B



SAT456C

SELF-DIAGNOSTIC PROCEDURE (Without CONSULT)

DIAGNOSIS START

↓

Start engine and warm it up to normal engine operating temperature.

↓

↓

Set A/T mode switch in "AUTO" position.

↓

1 Set overdrive switch in "ON" position.

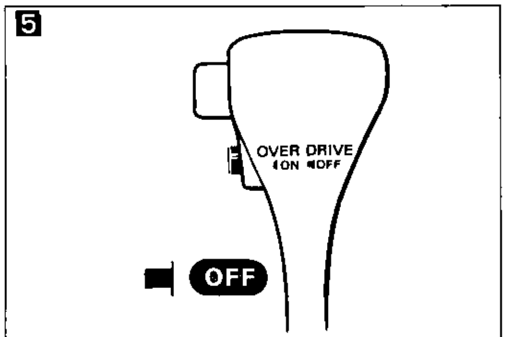
↓

2 Move selector lever to "P" range.

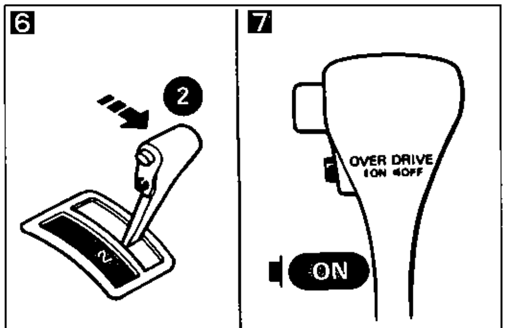
↓

Ⓐ

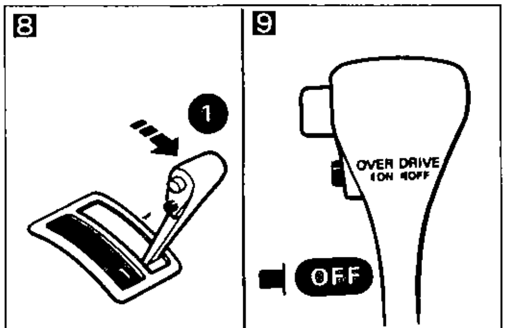
Self-diagnosis (Cont'd)



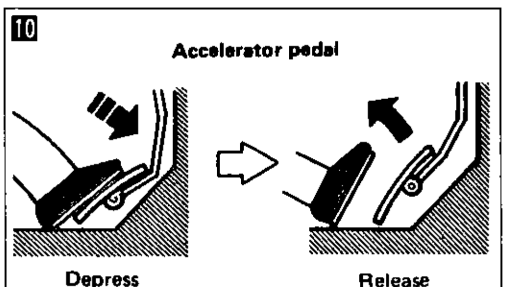
SAT401C



SAT780B



SAT781B



SAT754A

← Ⓐ

↓

Does power indicator lamp come on for about 2 seconds? — No → Go to Diagnostic Procedure 1.

↓ Yes

↓

3 Push shift lock release button.

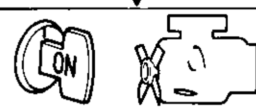
↓

4 Move selector lever to "D" range.

↓

5 Set overdrive switch in "OFF" position.

↓



Wait for more than 2 seconds after ignition switch "ON".

↓

6 Move selector lever to "2" range.

↓

7 Set overdrive switch in "ON" position.

↓

8 Move selector lever to "1" range.

↓

9 Set overdrive switch in "OFF" position.

↓

10 Depress accelerator pedal fully and release it.

↓

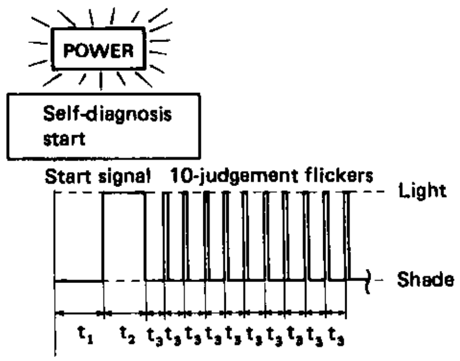
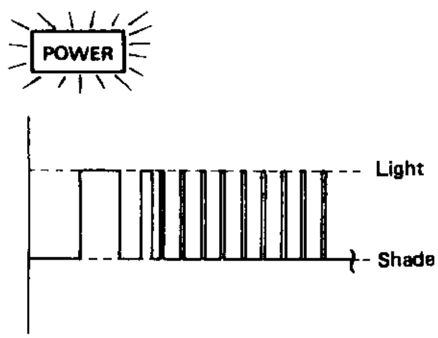
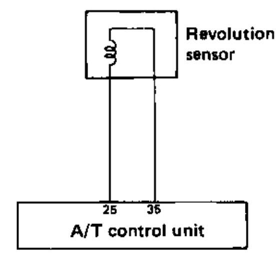
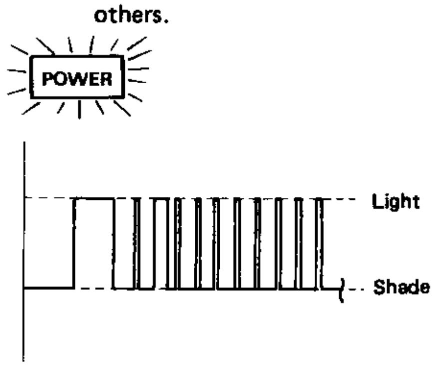
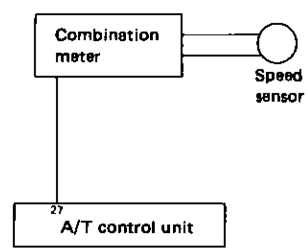
Check power indicator lamp.
Refer to JUDGEMENT OF SELF- DIAGNOSIS CODE on next page.

↓

DIAGNOSIS END

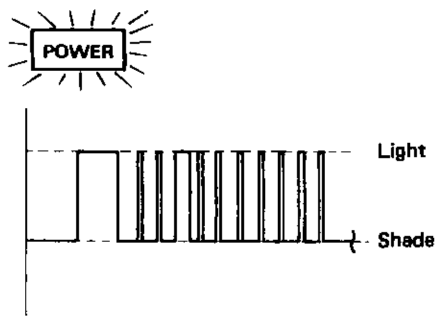
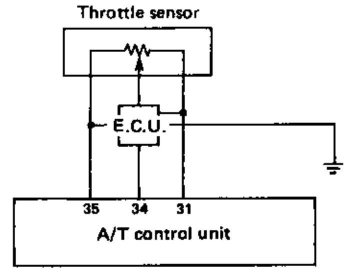
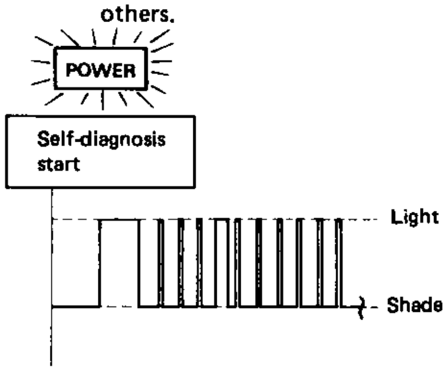
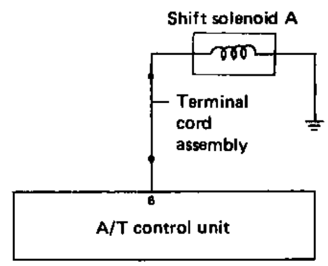
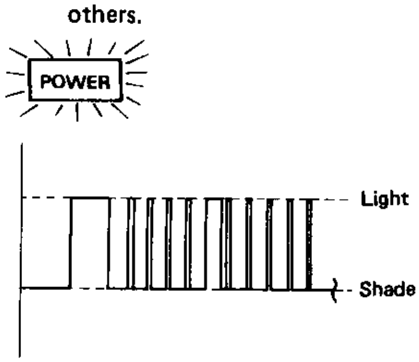
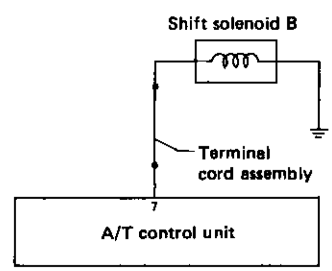
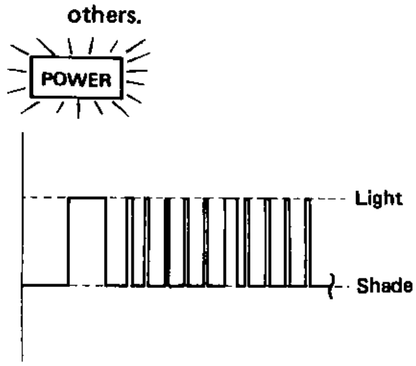
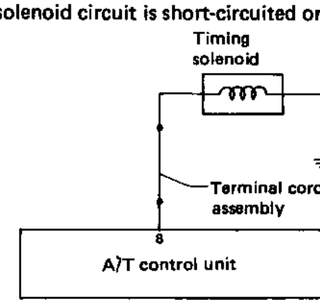
Self-diagnosis (Cont'd)

JUDGEMENT OF SELF-DIAGNOSIS CODE

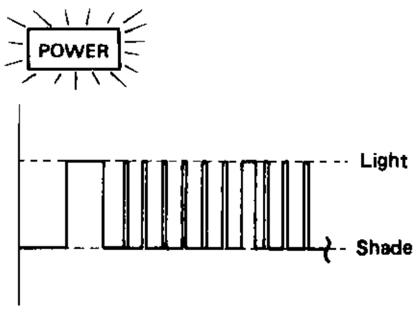
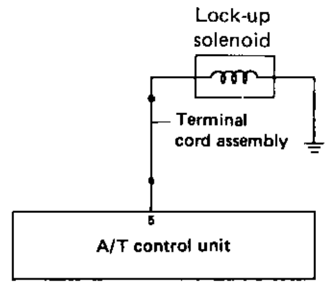
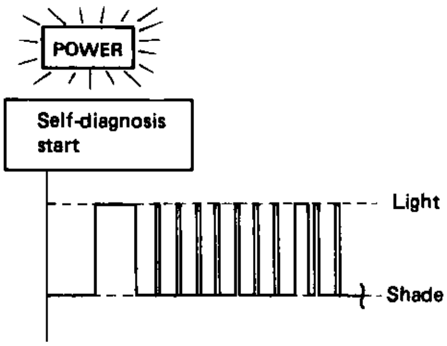
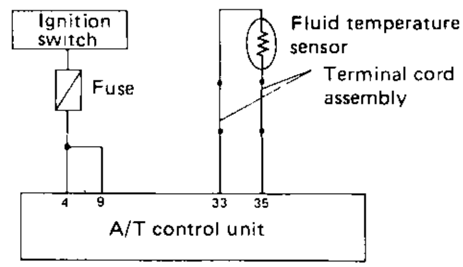
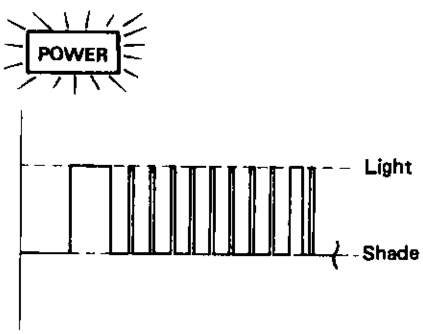
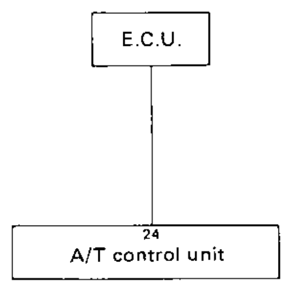
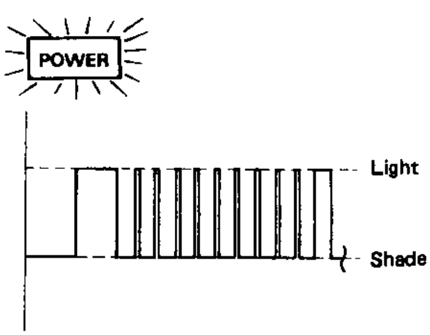
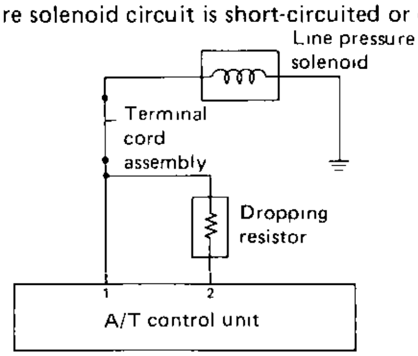
Power indicator lamp:	Damaged circuit
All judgement flickers are same.  SAT755A	All circuits that can be confirmed by self-diagnosis are O.K.
1st judgement flicker is longer than others.  SAT756A	Revolution sensor circuit is short-circuited or disconnected.  ➡ **Go to revolution sensor circuit check.** SAT965B
2nd judgement flicker is longer than others.  SAT757A	Speed sensor circuit is short-circuited or disconnected.  ➡ **Go to speed sensor circuit check.** SAT966B

t_1 = 2.5 seconds t_2 = 2.0 seconds t_3 = 1.0 second

Self-diagnosis (Cont'd)

Power indicator lamp:	Damaged circuit
3rd judgement flicker is longer than others.  SAT758A	Throttle sensor circuit is short-circuited or disconnected.  ➡ **Go to throttle sensor circuit check.** SAT967B
4th judgement flicker is longer than others.  SAT762A	Shift solenoid A circuit is short-circuited or disconnected.  ➡ **Go to shift solenoid A circuit check.** SAT968B
5th judgement flicker is longer than others.  SAT763A	Shift solenoid B circuit is short-circuited or disconnected.  ➡ **Go to shift solenoid B circuit check.** SAT969B
6th judgement flicker is longer than others.  SAT764A	Timing solenoid circuit is short-circuited or disconnected.  ➡ **Go to timing solenoid circuit check.** SAT970B

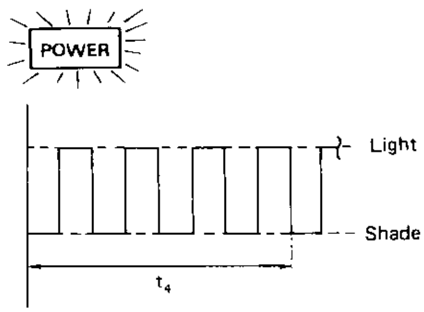
Self-diagnosis (Cont'd)

Power indicator lamp:	Damaged circuit
7th judgement flicker is longer than others.  SAT765A	**Lock-up solenoid circuit is short-circuited or disconnected.**  **➡ Go to lock-up solenoid circuit check.** SAT971B
8th judgement flicker is longer than others.  SAT770A	Fluid temperature sensor is disconnected or A/T control unit power source circuit is damaged.  **➡ Go to fluid temperature sensor circuit and A/T control unit power source circuit check.** SAT972B
9th judgement flicker is longer than others.  SAT771A	Engine revolution signal circuit is short-circuited or disconnected.  **➡ Go to engine revolution signal circuit check.** SAT973B
10th judgement flicker is longer than others.  SAT772A	Line pressure solenoid circuit is short-circuited or disconnected.  **➡ Go to line pressure solenoid circuit check.** SAT974B

Self-diagnosis (Cont'd)

<table>
<tr><th>Power indicator lamp:</th><th>Damaged circuit</th></tr>
<tr><td>

Flickers as shown below.



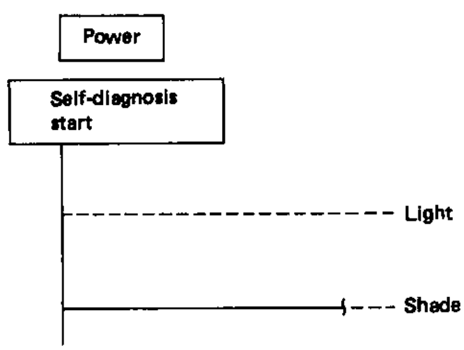
SAT773A

</td><td>

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.)

</td></tr>
<tr><td>

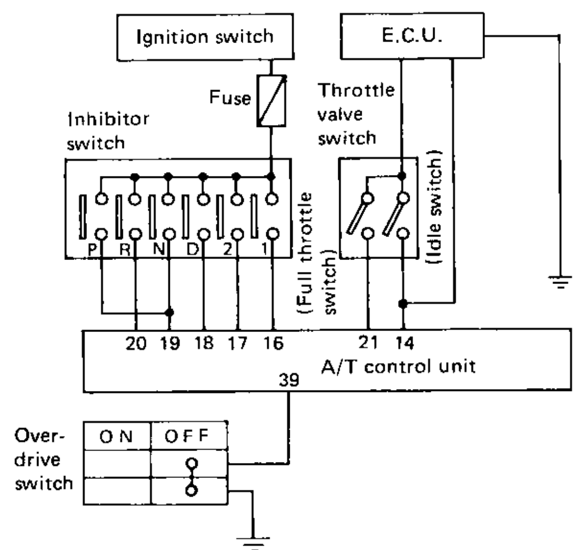
Does not come on.



SAT146B

</td><td>

Inhibitor switch, overdrive switch or throttle valve switch circuit is disconnected or A/T control unit is damaged.



➡ **Go to inhibitor, overdrive and throttle valve switch circuit checks.**

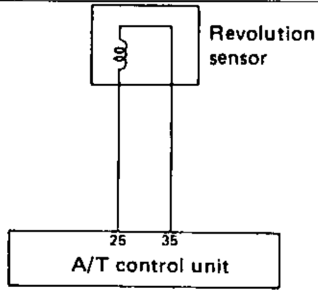
SAT975B

</td></tr>
</table>

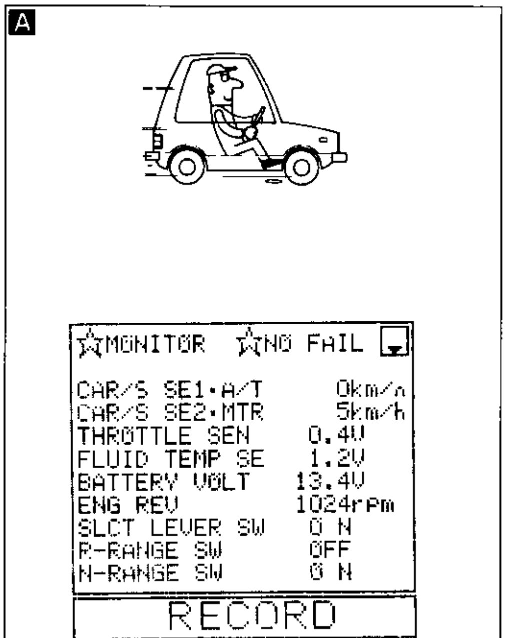
t_4 = 1.0 second

Self-diagnosis (Cont'd)

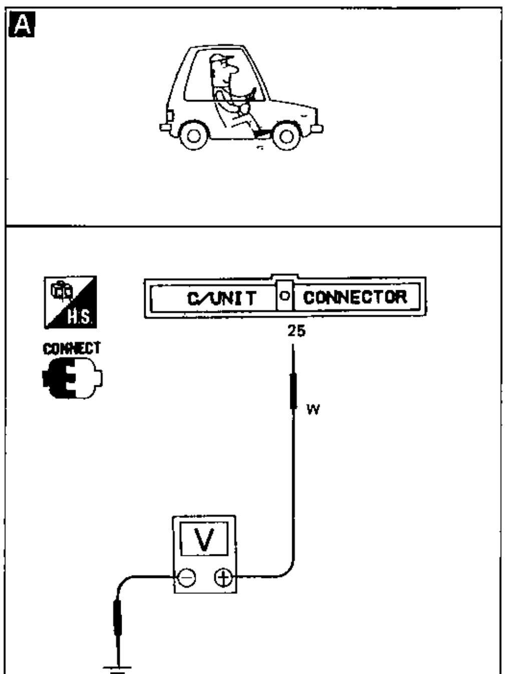
REVOLUTION SENSOR CIRCUIT CHECK



SAT965B



SAT320C

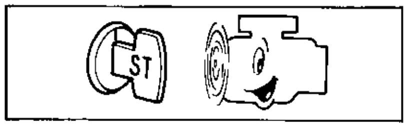


SAT976B

CHECK REVOLUTION SENSOR. — Refer to "Electrical Components Inspection".

- N.G. → Repair or replace revolution sensor.
- O.K. ↓

A **CHECK INPUT SIGNAL.**

1.


2.

- 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.)

- N.G. → Check harness continuity between A/T control unit and revolution sensor.
- O.K. ↓

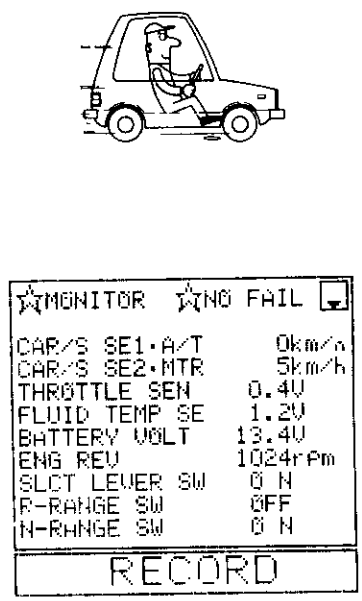
Perform self-diagnosis again after driving for a while.

- 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

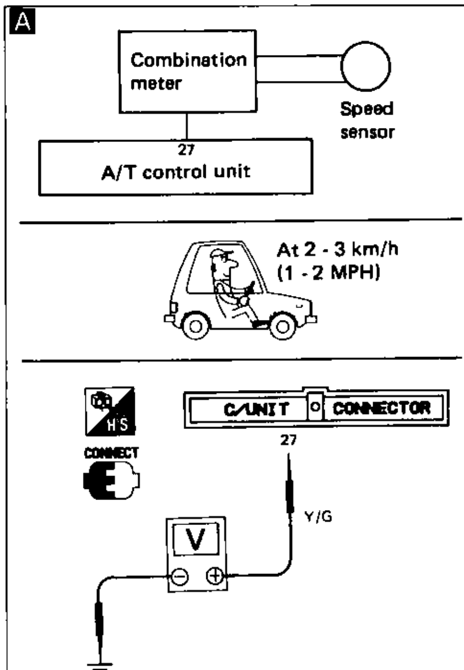
Self-diagnosis (Cont'd)

A



SAT320C

A

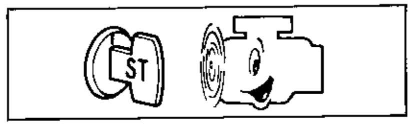


SAT977B

A SPEED SENSOR CIRCUIT CHECK

CHECK INPUT SIGNAL.

1.
2.



- 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

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

O.K. ↓

Perform self-diagnosis again after driving for a while.

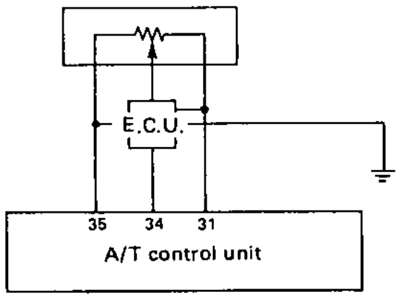
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

INSPECTION END

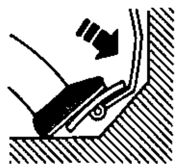
Self-diagnosis (Cont'd)

THROTTLE SENSOR CIRCUIT CHECK

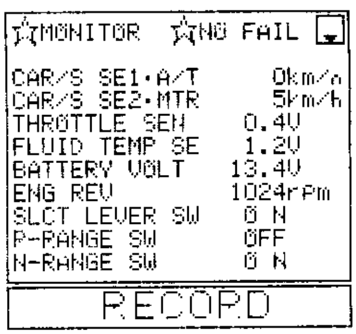


SAT967B

A



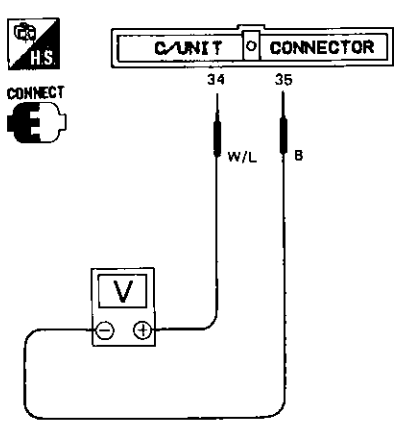
Depress slowly.



SAT321C

A

Depress slowly.



SAT978B

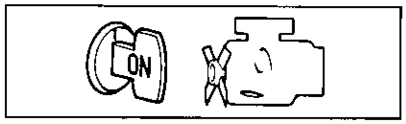
Perform self-diagnosis (Mode III) for engine control.

- N.G. → Check throttle sensor circuit for engine control. — Refer to section EF & EC.
- O.K. ↓

A

CHECK INPUT SIGNAL.

1.



2.

- Select "E.C.U. INPUT SIGNALS".
- Read out the value of "THROTTLE SENSOR"

Voltage:

Fully-closed throttle:
Approximately 0.5V

Fully-open throttle:
Approximately 4V

OR

- Check voltage between A/T control unit terminals ㉞ and ㉟ while accelerator pedal is depressed slowly.

Voltage:

Fully-closed throttle:
Approximately 0.5V

Fully-open throttle:
Approximately 4V

(Voltage rises gradually in response to throttle valve opening.)

- N.G. → Check harness continuity between E.C.U. and A/T control unit regarding throttle sensor circuit.
- O.K. ↓

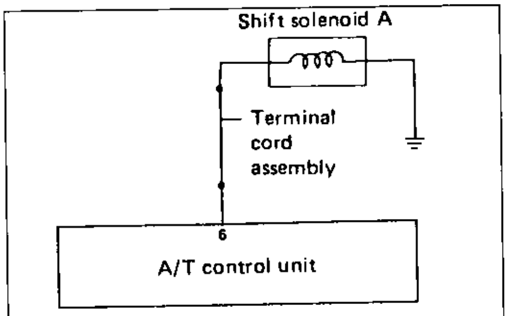
Perform self-diagnosis again after driving for a while.

- 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. ↓

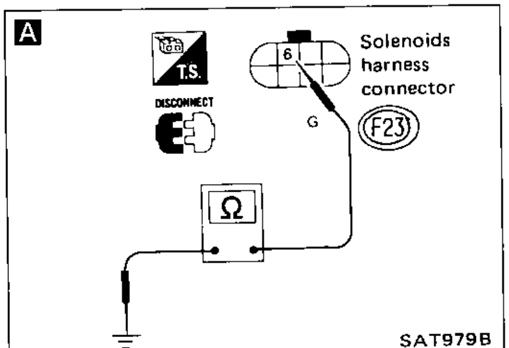
INSPECTION END

Self-diagnosis (Cont'd)

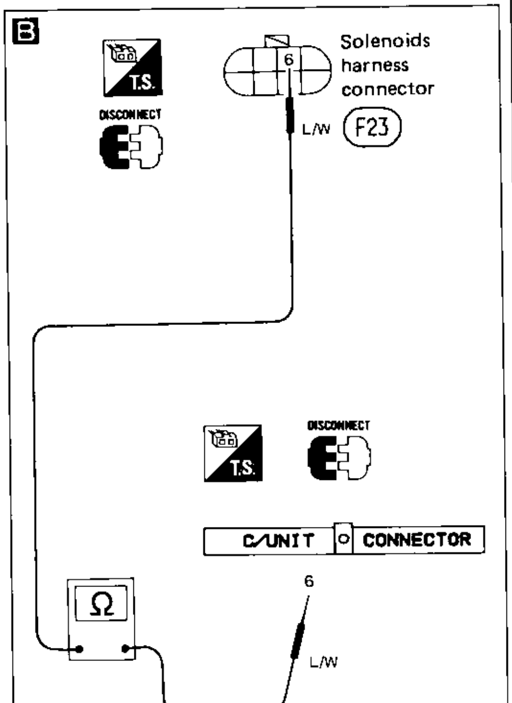
SHIFT SOLENOID A CIRCUIT CHECK



SAT968B



SAT979B



SAT504D

A

CHECK GROUND CIRCUIT.

1. OFF
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ⑥ 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. OFF
2. Disconnect A/T control unit connector.
3. Check resistance between terminal ⑥ and A/T control unit terminal ⑥.
   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.

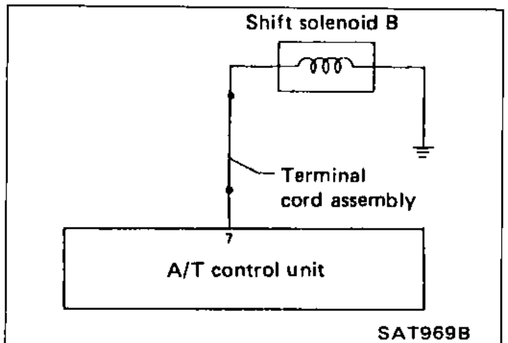
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

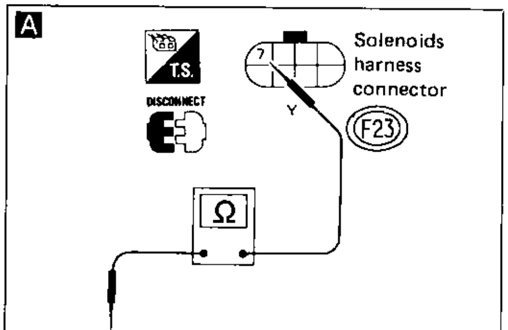
INSPECTION END

Self-diagnosis (Cont'd)

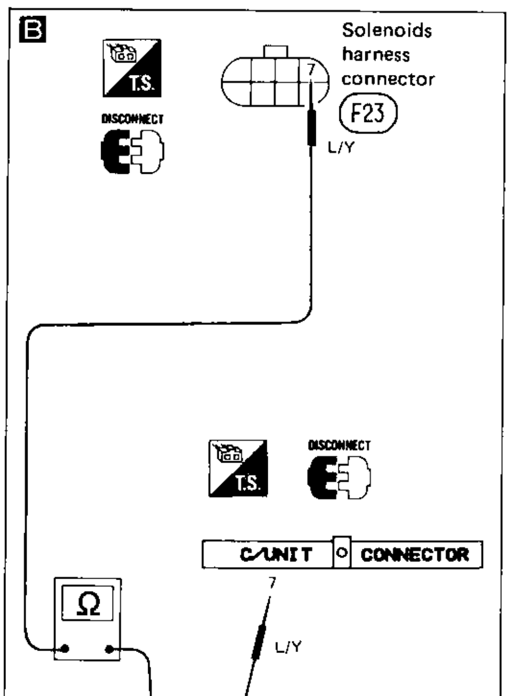
SHIFT SOLENOID B CIRCUIT CHECK



SAT969B



SAT982B

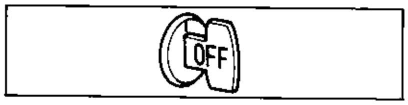


SAT983B

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

O.K. ↓

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. →

Repair or replace harness between A/T control unit and terminal cord assembly.

O.K. ↓

Perform self-diagnosis after driving for a while.

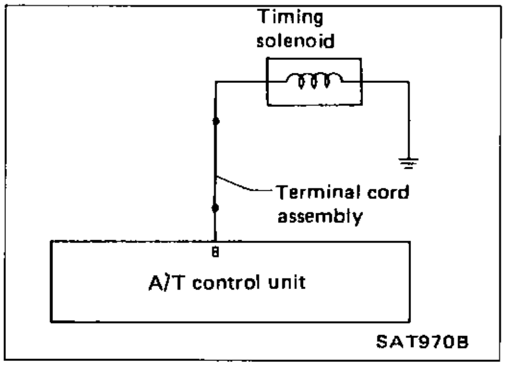
N.G. →

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.

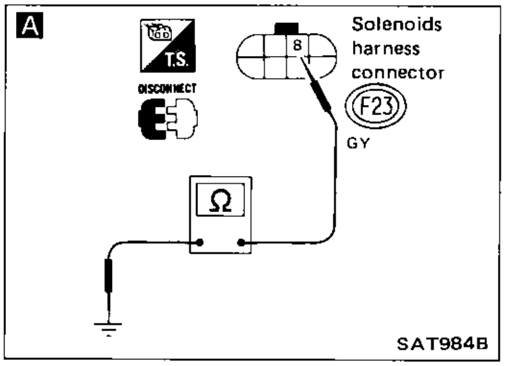
O.K. ↓

INSPECTION END

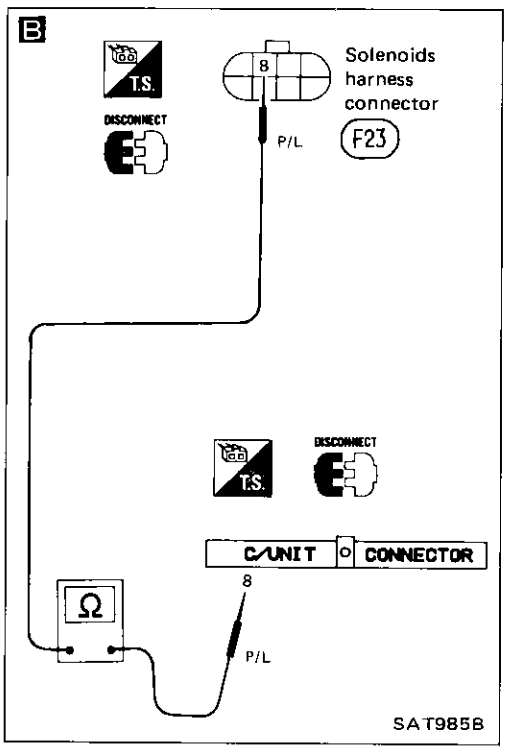
Self-diagnosis (Cont'd)



SAT970B



SAT984B



SAT985B

TIMING SOLENOID CIRCUIT CHECK

A

CHECK GROUND CIRCUIT.

1. (Ignition switch: OFF)
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ⑧ and ground.

Resistance: 20 - 40Ω

N.G. →

1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
   - Timing solenoid. — Refer to "Electrical Components Inspection".
   - Harness continuity of terminal cord assembly

O.K. ↓

B

CHECK POWER SOURCE CIRCUIT.

1. (Ignition switch: OFF)
2. Disconnect A/T control unit connector.
3. Check resistance between terminal ⑧ and A/T control unit terminal ⑧.

   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. →

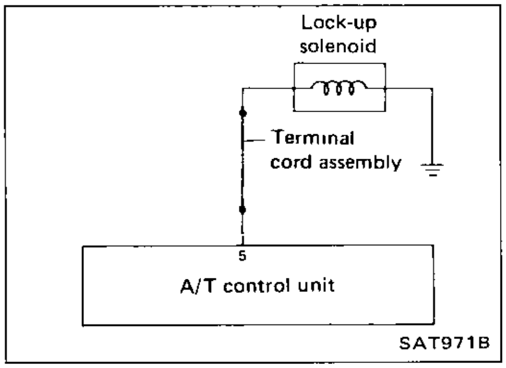
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

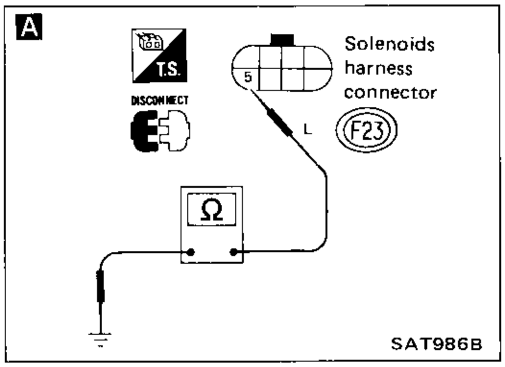
INSPECTION END

Self-diagnosis (Cont'd)

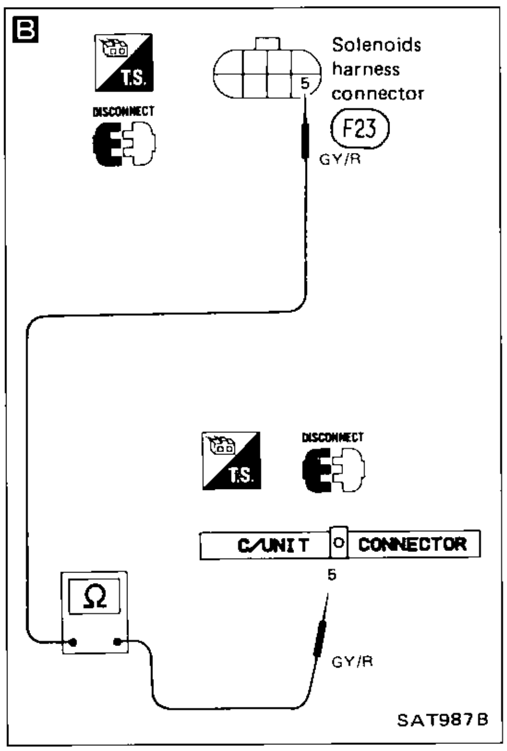
LOCK-UP SOLENOID CIRCUIT CHECK



SAT971B



SAT986B



SAT987B

A

CHECK GROUND CIRCUIT.

1. (Ignition switch: OFF)
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ⑤ and ground.
   Resistance: 10 - 20Ω

N.G. →
1. Remove control valve assembly. — 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. (Ignition switch: OFF)
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. ↓

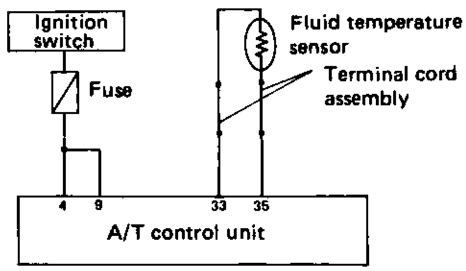
Perform self-diagnosis after driving for a while.

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.

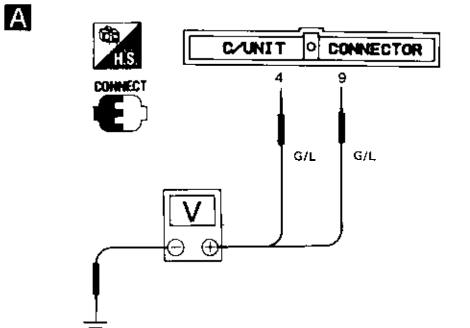
O.K. ↓

INSPECTION END

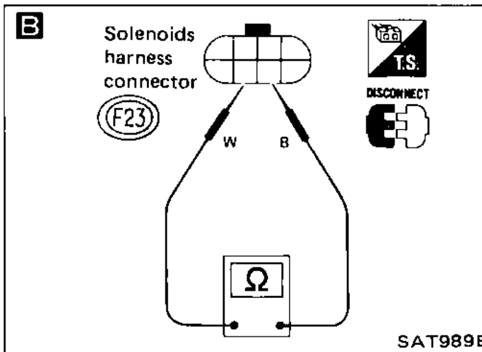
Self-diagnosis (Cont'd)



SAT972B



SAT988B



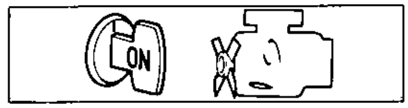
SAT989B

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.

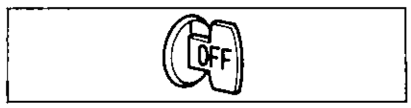
N.G. → Check the following items.
- Harness continuity between ignition switch and A/T control unit
- Ignition switch and fuse — Refer to section EL.

O.K. ↓

B

CHECK FLUID TEMPERATURE SENSOR WITH TERMINAL CORD ASSEMBLY.

1.



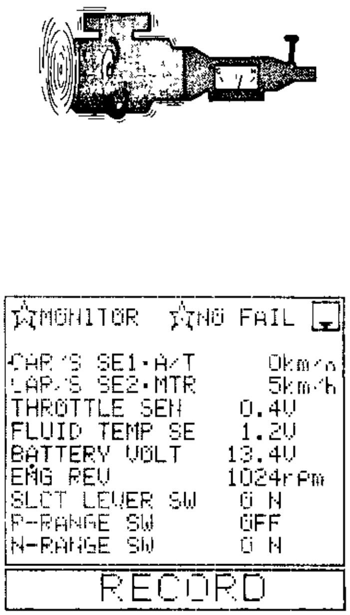
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminals ㉝ and ㉟ when A/T is cold.
   Resistance:
   Cold [20°C (68°F)]
   Approximately 2.5 kΩ
4. Reinstall any part removed.

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

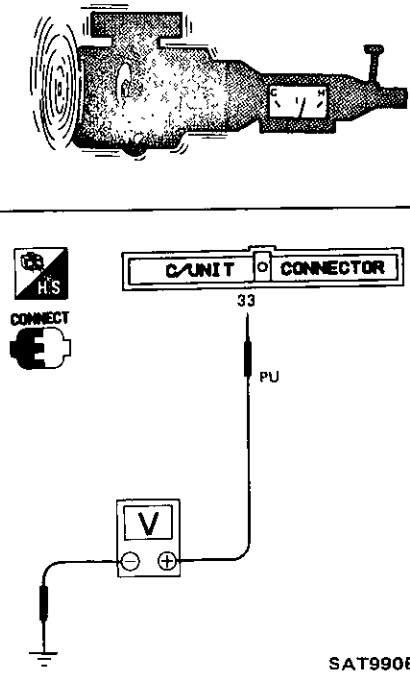
O.K. ↓

Ⓐ

Self-diagnosis (Cont'd)



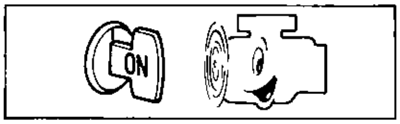
SAT330C



SAT990B

Ⓐ

CHECK INPUT SIGNAL OF FLUID TEMPERATURE SENSOR.

1.


2.

- Select "E.C.U. INPUT SIGNALS".
- Read out the value of "FLUID TEMPERATURE SENSOR".

Voltage:
Cold [20°C (68°F)] →
Hot [80°C (176°F)]:
Approximately
1.5V → 0.5V

OR

- Check voltage between A/T control unit terminal ㉝ and ground while warming up A/T.

Voltage:
Cold [20°C (68°F)] →
Hot [80°C (176°F)]:
Approximately
1.5V → 0.5V

N.G. → Check harness continuity between A/T control unit and terminal cord assembly.

O.K. ↓

Perform self-diagnosis after driving for a while.

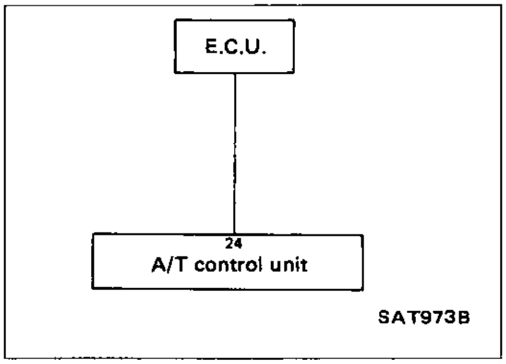
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

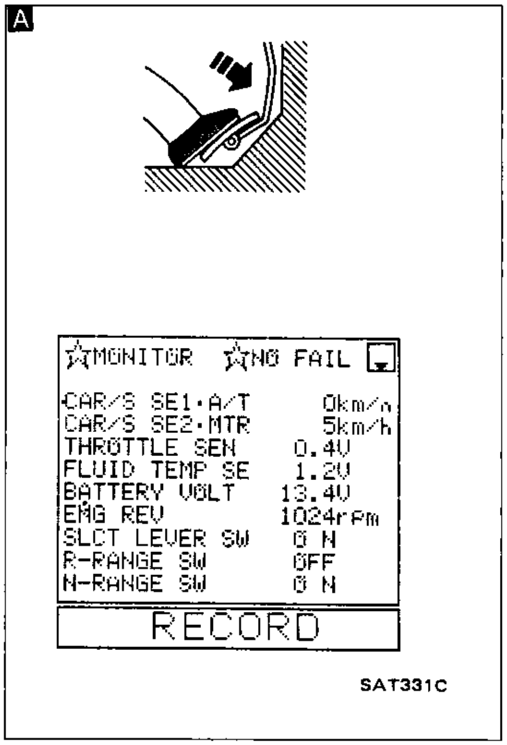
INSPECTION END

Self-diagnosis (Cont'd)

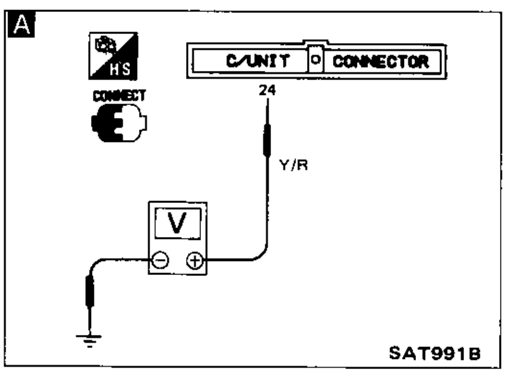
ENGINE REVOLUTION SIGNAL CIRCUIT CHECK



SAT973B



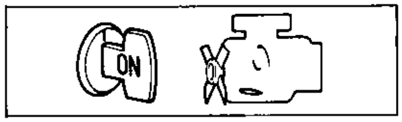
SAT331C



SAT991B

Check ignition circuit condition for engine.
- N.G. → Repair or replace. — Refer to section EF & EC.
- O.K. ↓

A **CHECK INPUT SIGNAL.**

1.


2.

- Select "E.C.U. INPUT SIGNALS".
- Read out the value of "ENGINE REVOLUTION".
- Check engine revolution changes according to throttle opening.

OR

- Check voltage between A/T control unit terminal 24 and ground.

Voltage: 0.9 - 4.5V

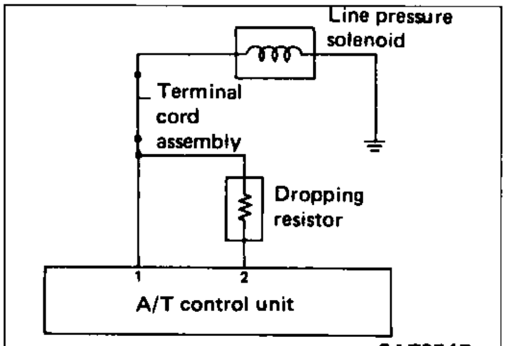
- N.G. → Check harness continuity between A/T control unit and E.C.C.S. control unit.
- O.K. ↓

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. ↓

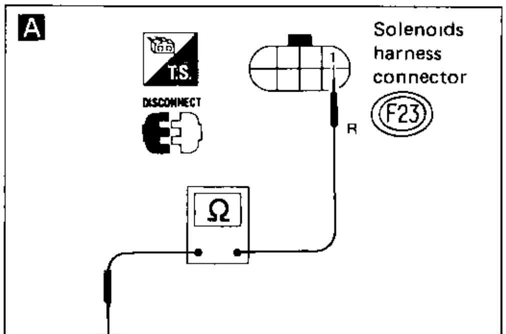
INSPECTION END

Self-diagnosis (Cont'd)

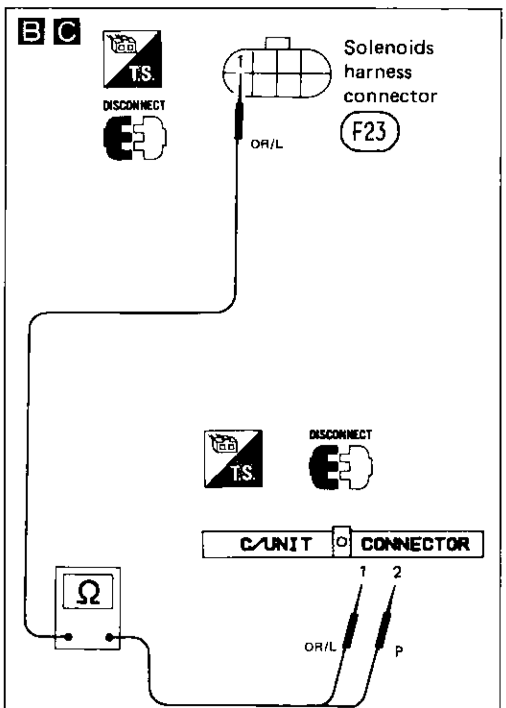
LINE PRESSURE SOLENOID CIRCUIT CHECK



SAT974B



SAT992B



SAT993B

A

CHECK GROUND CIRCUIT.

1. OFF
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. OFF
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. OFF
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.

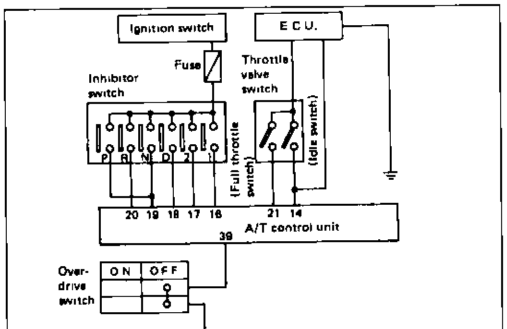
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

INSPECTION END

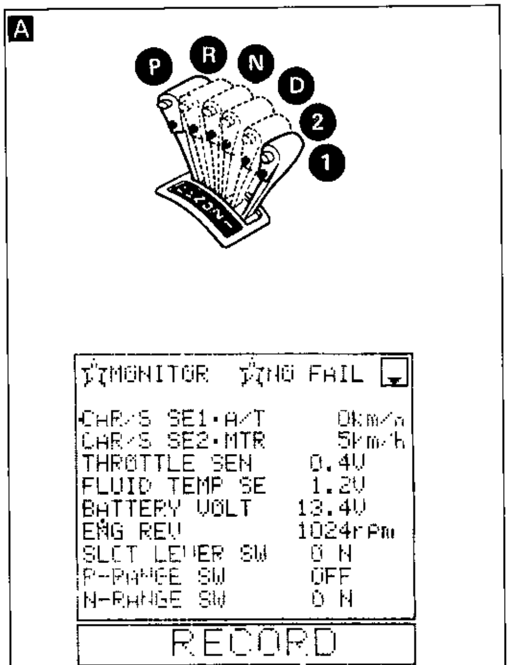
Self-diagnosis (Cont'd)

INHIBITOR, OVERDRIVE AND THROTTLE VALVE SWITCH CIRCUIT CHECKS



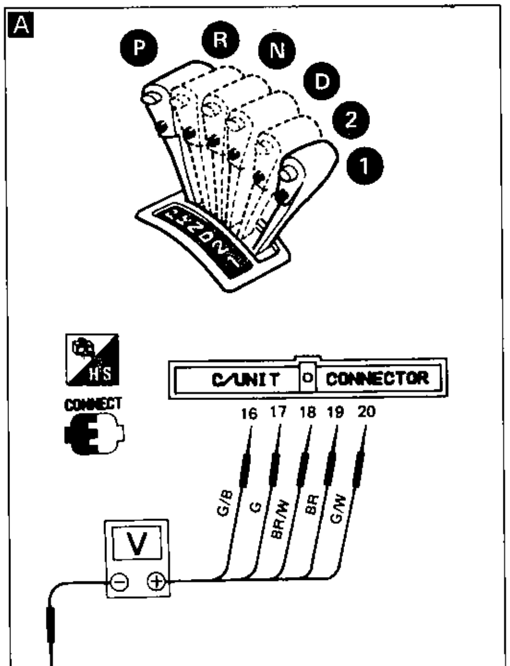
SAT975B

A



SAT334C

A

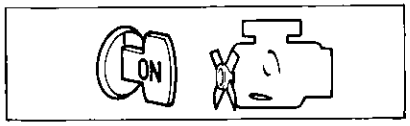


SAT994B

A

CHECK INHIBITOR SWITCH CIRCUIT.

1.
2.



- Select "E.C.U. INPUT signals".
- Read out "R, N, D, 1 and 2 range switches" moving selector lever to each range.
- Check the selector lever position is indicated properly.

OR

- Check voltage between A/T control unit terminals ⑯, ⑰, ⑱, ⑲, ⑳ and ground while moving selector lever through each range.

Voltage:

B: Battery voltage

0: 0V

Lever position \ Terminal No	⑲	⑳	⑱	⑰	⑯
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

N.G. → Check the following items.

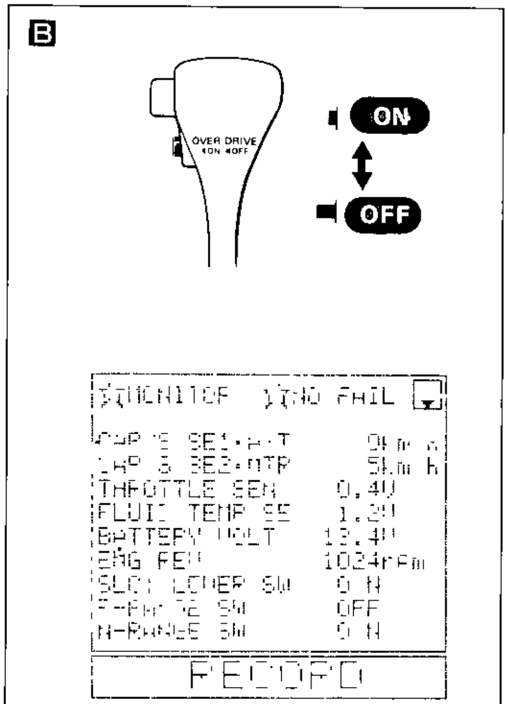
- Inhibitor switch — Refer to "Electrical Components Inspection".
- Harness continuity between ignition switch and inhibitor switch
- Harness continuity between inhibitor switch and A/T control unit

O.K. ↓

Ⓐ

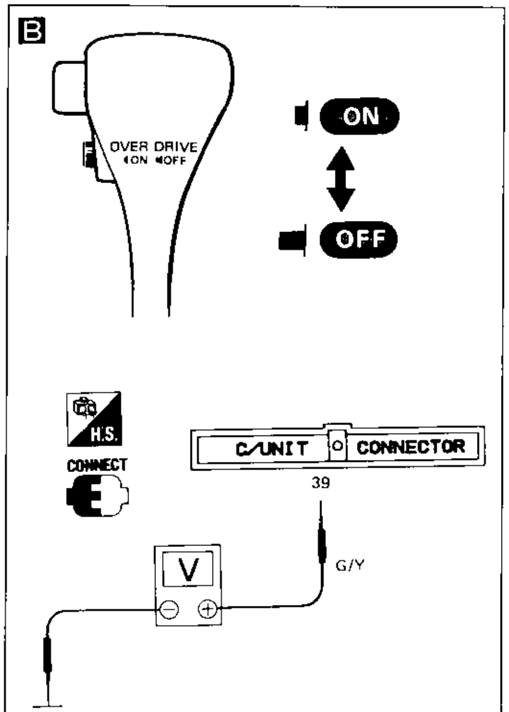
Self-diagnosis (Cont'd)

B



SAT335C

B



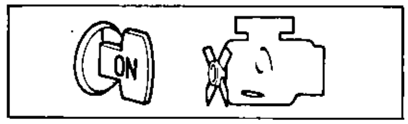
SAT995B

Ⓐ

B

CHECK OVERDRIVE SWITCH CIRCUIT.

1.
2.



- 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

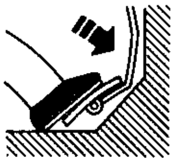
N.G. → Check the following items.
- Overdrive switch — Refer to "Electrical Components Inspection".
- Harness continuity between A/T control unit and overdrive switch
- Harness continuity of ground circuit for overdrive switch

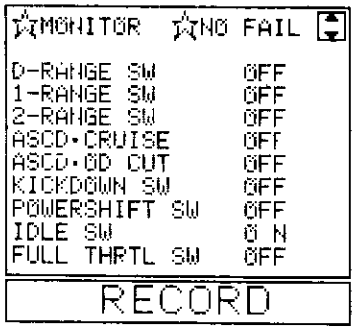
O.K. ↓

Ⓑ

Self-diagnosis (Cont'd)

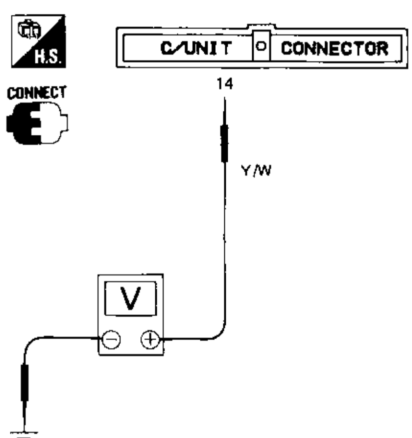
C





SAT338C

C



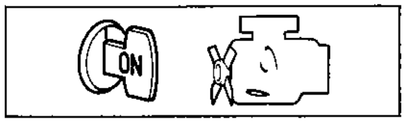
SAT339C

Ⓑ

C

CHECK IDLE SWITCH CIRCUIT.

1.
2.



- Select "E.C.U. INPUT SIGNALS".
- Read out "IDLE SWITCH" depressing and releasing accelerator pedal.
- Check idle switch changes ON or OFF.

OR

- Check voltage between A/T control unit terminal ⑭ and ground while depressing accelerator pedal slowly.

Voltage:

When releasing accelerator pedal:
8 - 15V
When depressing accelerator pedal fully:
1V or less

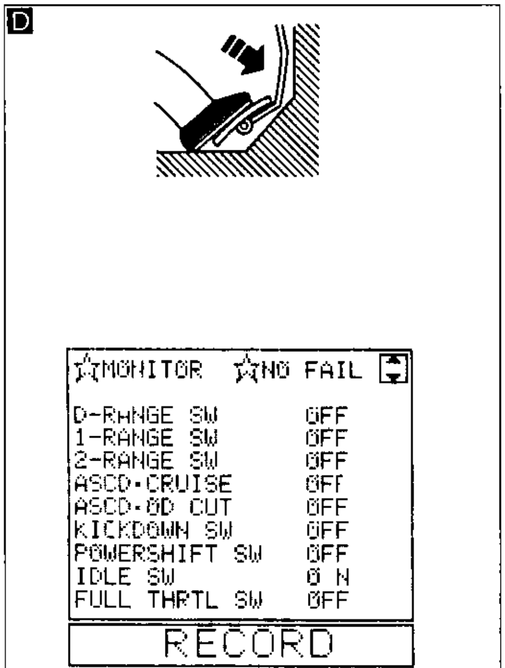
N.G. → Perform self-diagnosis (Mode IV) for engine control.
Check idle switch circuit.

- O.K. → Check harness continuity between A/T control unit and idle switch.
- N.G. → Check idle switch circuit for engine control. — Refer to section EF & EC.

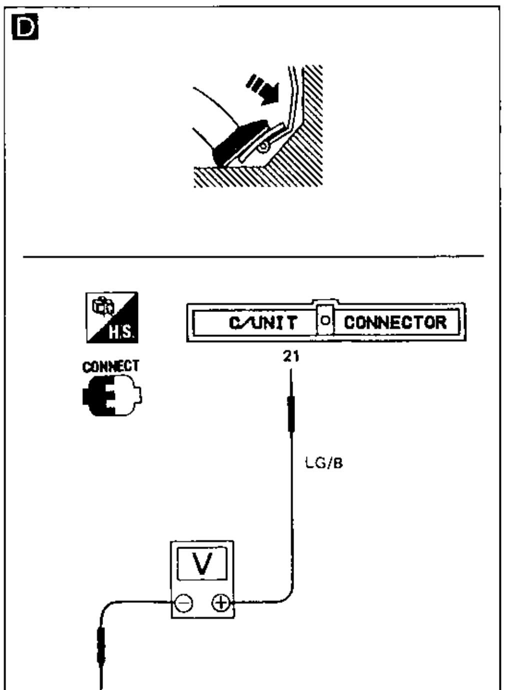
O.K. ↓

Ⓒ

Self-diagnosis (Cont'd)



SAT338C



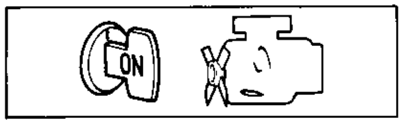
SAT505C

Ⓒ

D

CHECK FULL THROTTLE SWITCH CIRCUIT.

1.



2.

- Select "E.C.U. INPUT SIGNALS".
- Read out "FULL THROTTLE SWITCH" depressing and releasing accelerator pedal.
- Check full throttle switch changes ON or OFF.

OR

- Check voltage between A/T control unit terminal ㉑ and ground while depressing accelerator pedal slowly.

Voltage:

When releasing accelerator pedal:

1V or less

When depressing accelerator pedal fully:

8 - 15V

N.G. → Check harness continuity between A/T control unit and full throttle switch.

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.

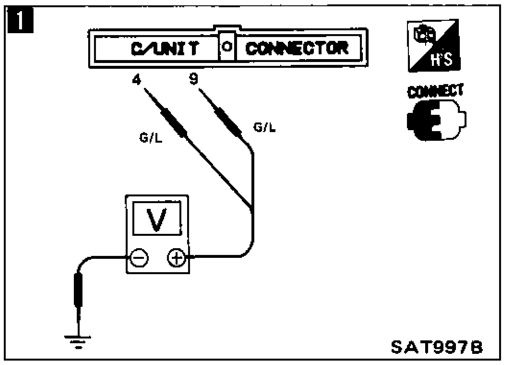
O.K. ↓

INSPECTION END

Diagnostic Procedure 1

SYMPTOM:

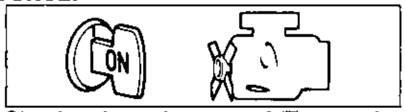
Power indicator lamp does not come on for about 2 seconds when turning ignition switch in "ON".



1

CHECK A/T CONTROL UNIT POWER SOURCE.

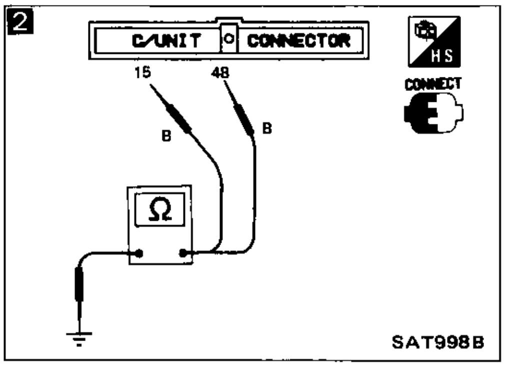
1.



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.

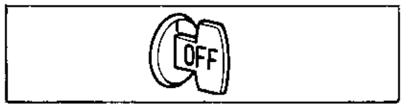
O.K. ↓



2

CHECK A/T CONTROL UNIT GROUND CIRCUIT.

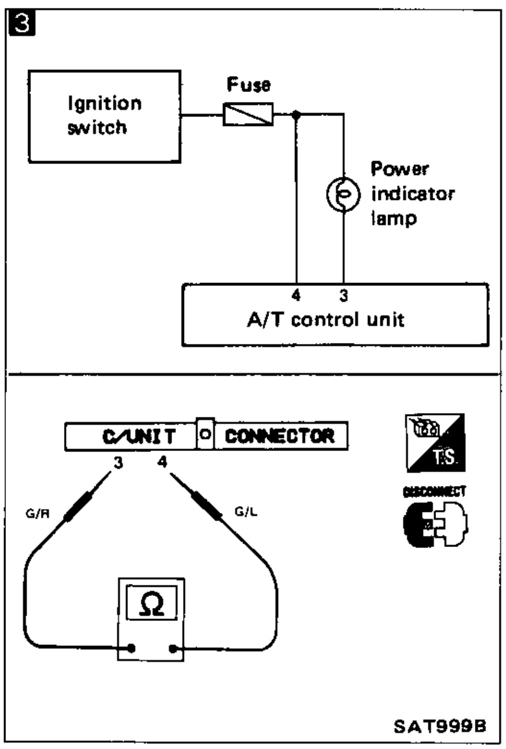
1.



2. Disconnect A/T control unit connector.
3. Check resistance between A/T control unit terminals ⑮, ⑱ and ground.
   Resistance:
   Approximately 0Ω

N.G. → Check harness continuity between A/T control unit and ground.

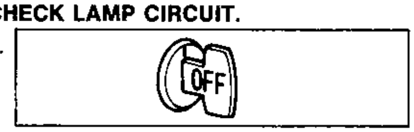
O.K. ↓



3

CHECK LAMP CIRCUIT.

1.

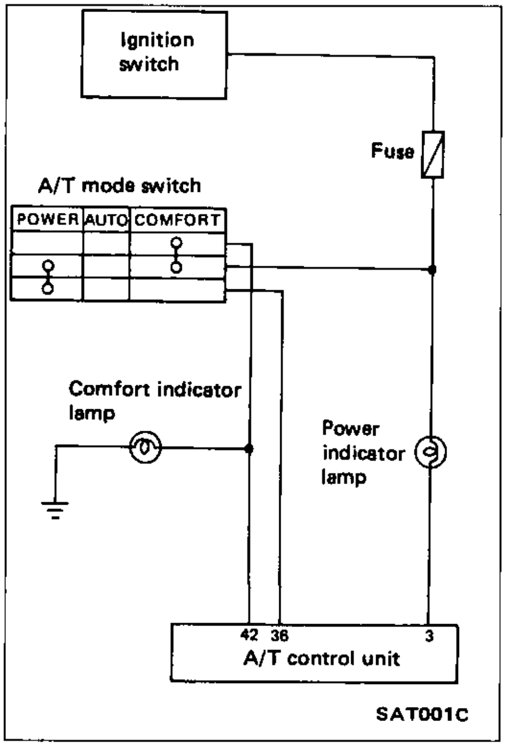


2. Disconnect A/T control unit connector.
3. Check resistance between A/T control unit terminals ③ and ④.
   Resistance: 5 - 20Ω
4. Reinstall any part removed.

N.G. → Check the following items.
- Power indicator lamp — Refer to section EL.
- Harness continuity between ignition switch and power indicator lamp
- Harness continuity between power indicator lamp and A/T control unit

O.K. ↓

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.



Diagnostic Procedure 2

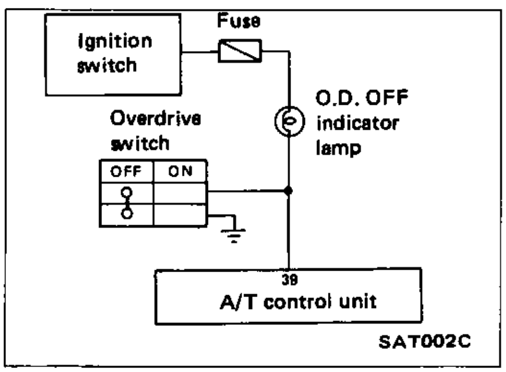
SYMPTOM:

Power indicator lamp or comfort indicator lamp does not come on when turning A/T mode switch to the appropriate position.

Is Diagnostic Procedure 1 O.K.?
- No → Go to Diagnostic Procedure 1.
- Yes ↓

Check the following items.
- A/T mode switch
- Comfort indicator lamp
- Harness continuity between ignition switch and A/T mode switch
- Harness continuity between A/T mode switch and A/T control unit

N.G. → Repair or replace damaged parts.



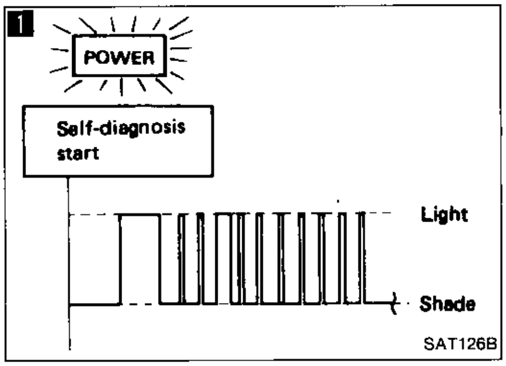
Diagnostic Procedure 3

SYMPTOM:

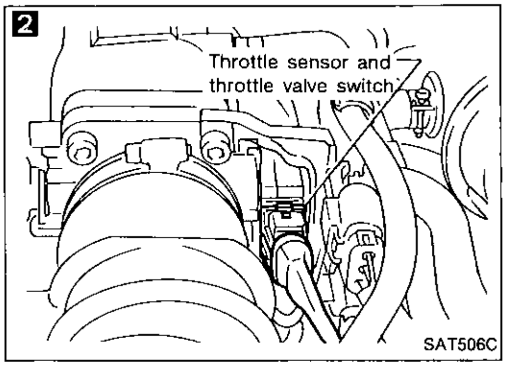
O.D. OFF indicator lamp does not come on when setting overdrive switch in "OFF" position.

Check the following items.
- Overdrive switch
- O.D. OFF indicator lamp
- Harness continuity between ignition switch and O.D. OFF indicator lamp

N.G. → Repair or replace damaged parts.



SAT126B



SAT506C

Diagnostic Procedure 4

SYMPTOM:

Power indicator lamp does not come on for about 3 seconds when depressing and releasing accelerator pedal fully.

1

Does self-diagnosis show damage to throttle sensor circuit?

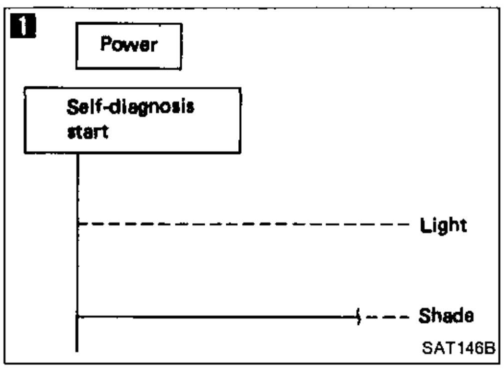
- No → Check throttle sensor circuit. — Refer to "Self-diagnosis".
- Yes ↓

2

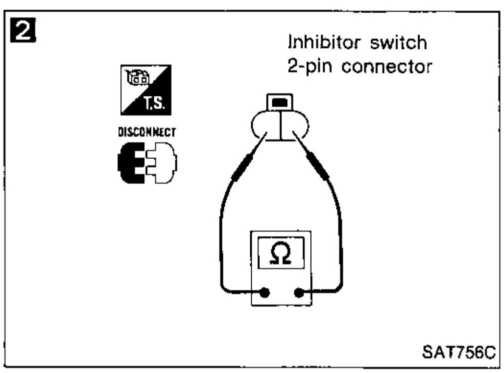
Check throttle sensor. — Refer to section EF & EC.

- N.G. → Repair or replace throttle sensor.
- O.K. ↓

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.



SAT146B



SAT756C

Diagnostic Procedure 5

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.

Does "E.C.U. INPUT SIGNALS" show damage to inhibitor switch circuit?

- Yes → Check inhibitor switch circuit. — Refer to "Self-diagnosis".

OR

1

Does self-diagnosis show damage to inhibitor switch circuit?

- No ↓

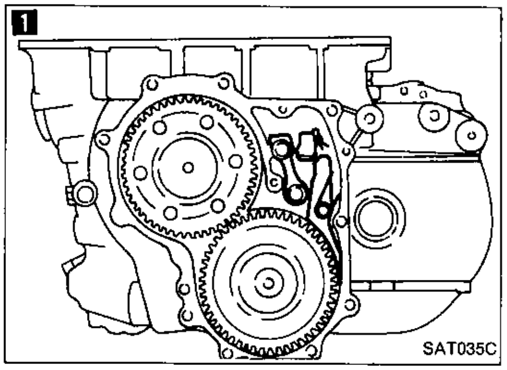
2

Check continuity of inhibitor switch 2-pin connector. — Refer to "Electrical Components Inspection".

- N.G. → Repair or replace inhibitor switch
- O.K. ↓

Check starting system. — Refer to section EL.

- N.G. → Repair or replace damaged parts.



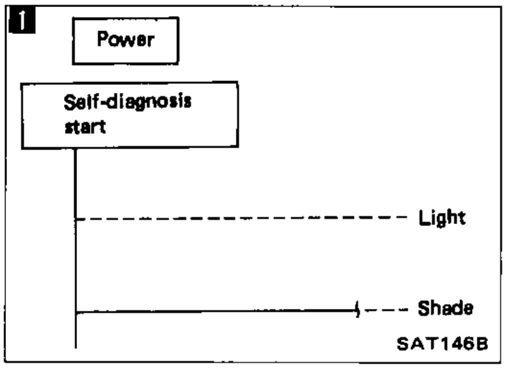
Diagnostic Procedure 6

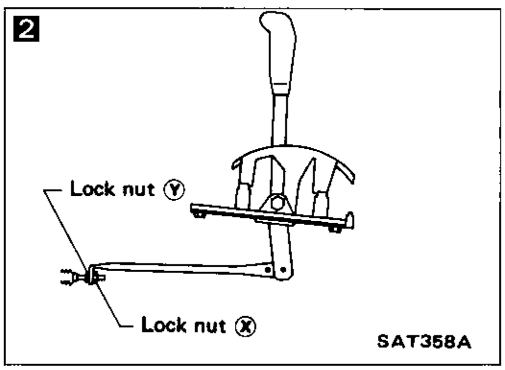
SYMPTOM:

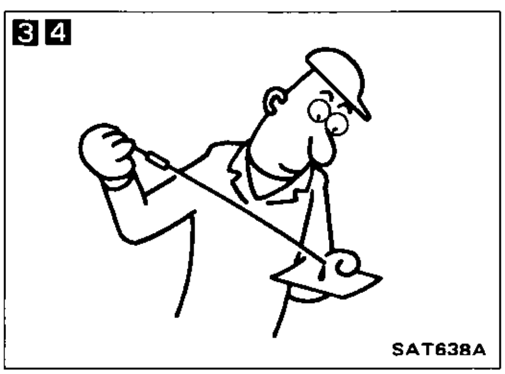
Vehicle moves when it is pushed forward or backward with selector lever in "P" range.

1

Check parking components. — N.G. → Repair or replace damaged parts.







Diagnostic Procedure 7

SYMPTOM:

Vehicle moves forward or backward when selecting "N" range.

Does "E.C.U. INPUT SIGNALS" show damage to inhibitor switch circuit? — Yes → Check inhibitor switch circuit. — Refer to "Self-diagnosis".

— OR —

1

Does self-diagnosis show damage to inhibitor switch circuit?

↓ No

2

Check manual control linkage. — Refer to "ON-VEHICLE SERVICE". — N.G. → Adjust manual control linkage. — Refer to "ON-VEHICLE SERVICE".

↓ O.K.

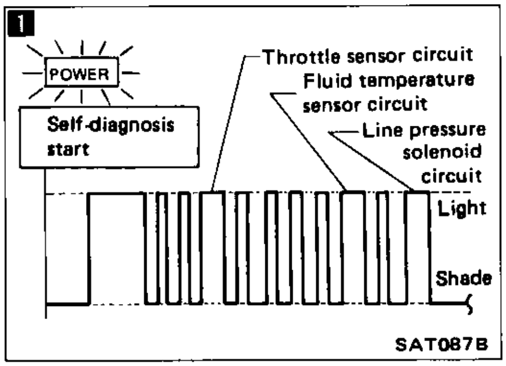
3

Check A/T fluid level again. — N.G. → Refill A.T.F.

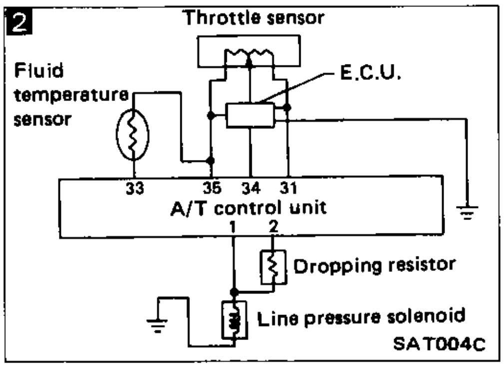
↓ O.K.

4

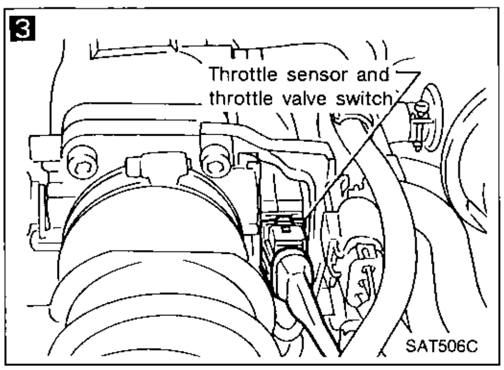
Check A/T fluid condition. — N.G. →
1. Disassemble A/T.
2. Check the following items.
- Low clutch assembly
- Reverse clutch assembly



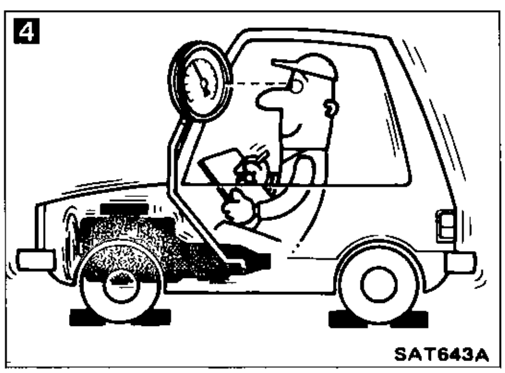
SAT087B



SAT004C



SAT506C



SAT643A

Diagnostic Procedure 8

SYMPTOM:

There is large shock when changing from "N" to "R" range.

- Check engine idling speed.
  - N.G. → Adjust engine idling speed. — Refer to section EF & EC.
  - O.K. ↓

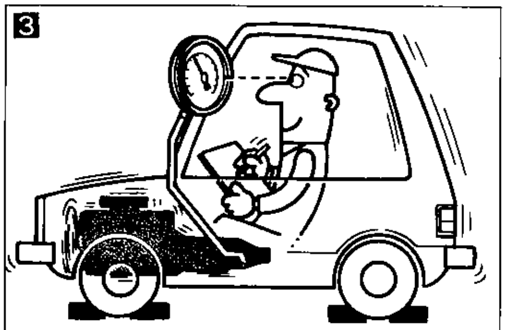
1 Does self-diagnosis show damage to throttle sensor, line pressure solenoid or fluid temperature sensor circuit?
  - Yes → **2** Check damaged circuit. — Refer to "Self-diagnosis".
  - No ↓

3 Check throttle sensor. — Refer to section EF & EC.
  - N.G. → Repair or replace throttle sensor.
  - O.K. ↓

4 Check line pressure at idle with selector lever in "D" range. — Refer to "PRESSURE TESTING".
  - N.G. →
    1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
    2. Check the following items.
       - Valves to control line pressure (Pressure regulator valve, pilot valve and oil filter)
       - Line pressure solenoid
  - O.K. ↓

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.

SAT642A



SAT643A

Diagnostic Procedure 9

SYMPTOM:

Vehicle does not creep backward when selecting "R" range.

1 Check A/T fluid level.
- N.G. → Refill A.T.F.
- O.K. → 2

2 Check stall revolution with selector lever in "1" and "R" ranges.
- N.G. in both "1" and "R" range → A
- O.K. in "1" range, N.G. in "R" range. → A
- O.K. → 3

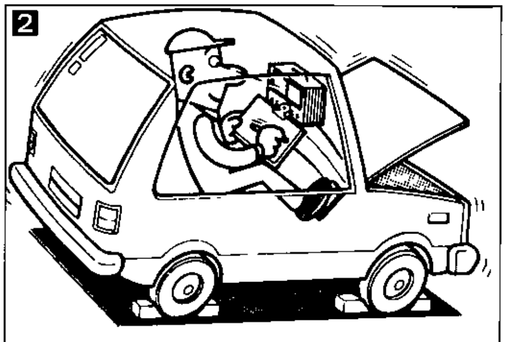
3 Check line pressure at idle with selector lever in "R" range.
— Refer to "PRESSURE TESTING".
- N.G. → A
- O.K. → 4

4 Check fluid condition.
- N.G. → A

A

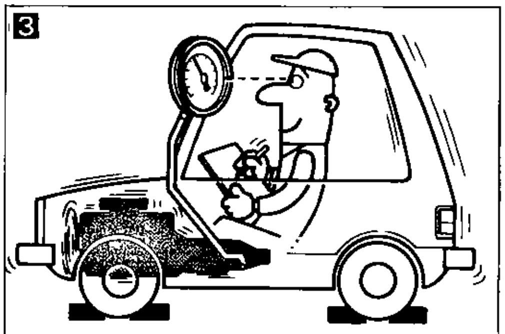
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
   - Valves to control line pressure (Pressure regulator valve, pilot valve and oil filter)
   - Line pressure solenoid
3. Disassemble A/T.
4. Check the following items.
   - Oil pump assembly
   - Reverse clutch assembly
   - Low & reverse brake assembly
   - Torque converter

2



SAT642A

3



SAT643A

Diagnostic Procedure 10

SYMPTOM:

Vehicle does not creep forward when selecting "D", "2" or "1" range.

1 Check A/T fluid level.
- N.G. → Refill A.T.F.
- O.K. ↓

2 Check stall revolution with selector lever in "D" and "1" ranges. — Refer to "STALL TESTING".
- N.G. → (see below)
- O.K. ↓

3 Check line pressure at idle with selector lever in "D", "2" and "1" ranges. — Refer to "PRESSURE TESTING".
- N.G. → (see below)
- O.K. ↓

4 Check A/T fluid condition.
- N.G. →

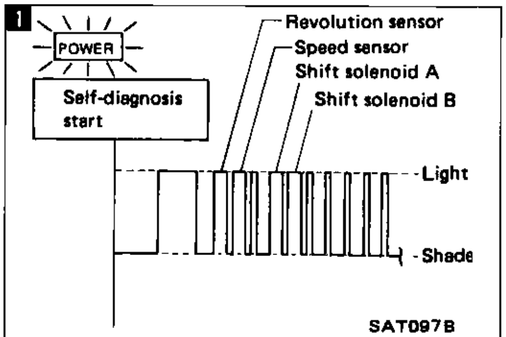
N.G. (from 2 and 3):

1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
   - Valves to control line pressure (Pressure regulator valve, pilot valve and oil filter)
   - Line pressure solenoid
3. Disassemble A/T.
4. Check the following items.
   - Oil pump assembly
   - Low clutch assembly
   - One-way clutch
   - Low & reverse brake assembly
   - Torque converter

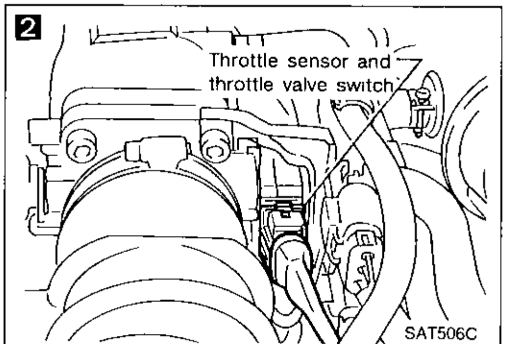
Diagnostic Procedure 11

SYMPTOM:

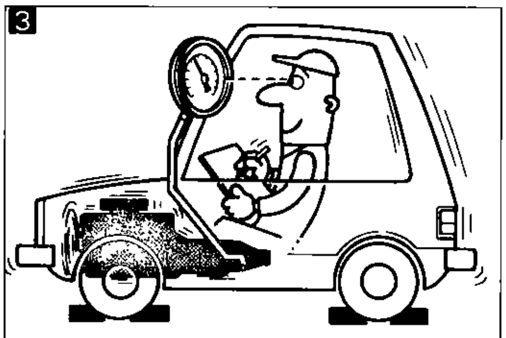
Vehicle cannot be started from D_1.



SAT097B



SAT506C



SAT643A

Is Diagnostic Procedure 10 O.K.?
- No → Go to Diagnostic Procedure 10.
- Yes ↓

1 Does self-diagnosis show damage to revolution sensor, speed sensor, shift solenoid A or B after cruise test?
- Yes → Check damaged circuit. — Refer to "Self-diagnosis".
- No ↓

2 Check throttle sensor. — Refer to section EF & EC.
- N.G. → Repair or replace throttle sensor.
- O.K. ↓

3 Check line pressure at stall point with selector lever in "D" range. — Refer to "PRESSURE TESTING".
- N.G. → (A)
- O.K. ↓

4 Check A/T fluid condition.
- O.K. → (A)
- N.G. → (B)

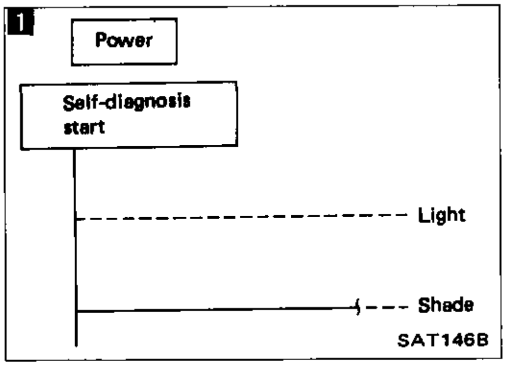
(A)
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
- 1-2 shift valve
- 2-3 shift valve
- 3-4 shift valve
- Shift solenoid A
- Shift solenoid B

O.K. ↓

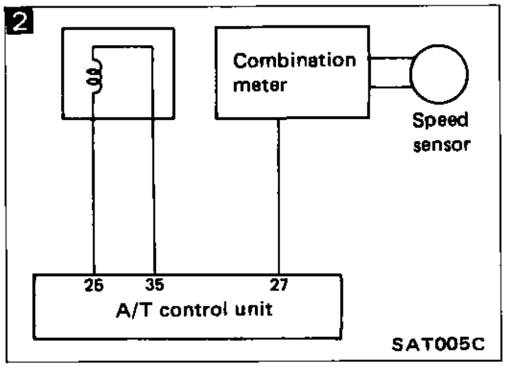
(B)
3. Disassemble A/T.
4. Check the following items.
- Low clutch assembly
- One-way clutch
- Torque converter
- Oil pump assembly

O.K. ↓

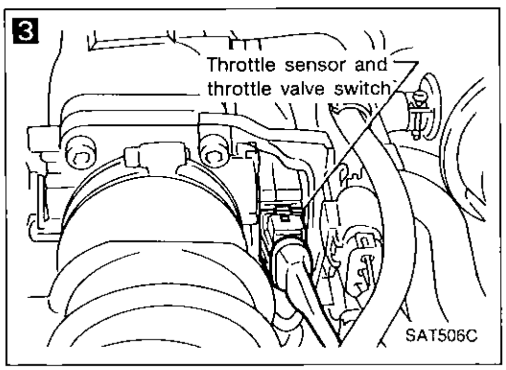
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.



SAT146B



SAT005C



SAT506C

Diagnostic Procedure 12

SYMPTOM:

A/T does not shift from D_1 to D_2 at the specified speed.
A/T does not shift from D_4 to D_2 when depressing accelerator pedal fully at the specified speed.

Are Diagnostic Procedures 10 and 11 O.K.?
- No → Go to Diagnostic Procedure 10 or 11.
- Yes ↓

Does "E.C.U. INPUT SIGNALS" show damage to inhibitor switch circuit?

— OR —

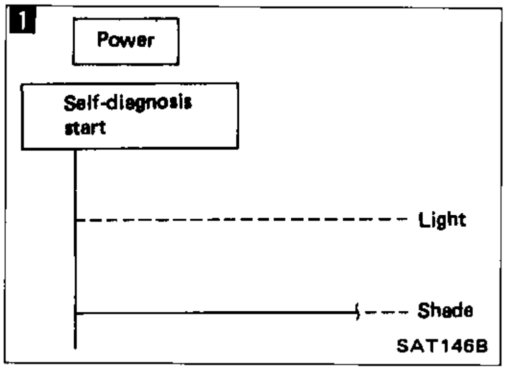
1 Does self-diagnosis show damage to inhibitor switch circuit?
- Yes → Check inhibitor switch circuit. — Refer to "Self-diagnosis".
- No ↓

2 Check revolution sensor and speed sensor circuit. — Refer to "Self-diagnosis".
- N.G. → Repair or replace revolution sensor and speed sensor circuits.
- O.K. ↓

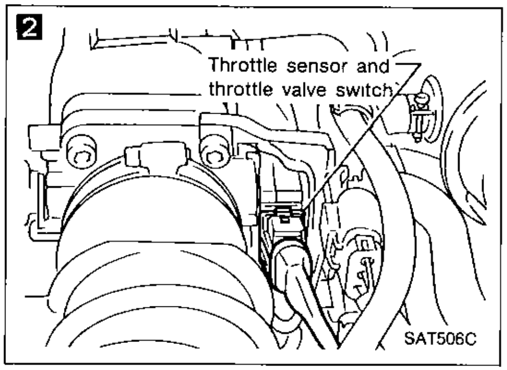
3 Check throttle sensor. — Refer to section EF & EC.
- N.G. → Repair or replace throttle sensor.
- O.K. ↓

4 Check A/T fluid condition.
- N.G. / O.K. →
  1. Remove control valve. — Refer to "ON-VEHICLE SERVICE".
  2. Check the following items.
     - 1-2 shift valve
     - 2-3 shift valve
     - 3-4 shift valve
     - Shift solenoid A
     - Shift solenoid B
  - O.K. ↓
  3. Disassemble A/T.
  4. Check the following items.
     - Servo piston assembly
     - Brake band
  - O.K. ↓

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.



SAT146B



SAT506C

Diagnostic Procedure 13

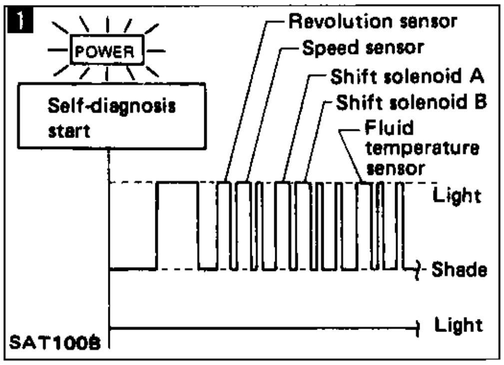
SYMPTOM:

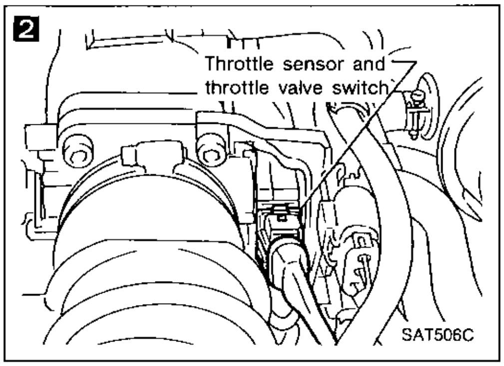
A/T does not shift from D_2 to D_3 at the specified speed.

- Are Diagnostic Procedures 10 and 11 O.K.?
  - No → Go to Diagnostic Procedure 10 or 11.
  - Yes ↓
- Does "E.C.U. INPUT SIGNALS" show damage to inhibitor switch circuit?

  — OR —

  1 Does self-diagnosis show damage to inhibitor switch circuit?
  - Yes → Check inhibitor switch circuit. — Refer to "Self-diagnosis".
  - No ↓
- 2 Check throttle sensor. — Refer to section EF & EC.
  - N.G. → Repair or replace throttle sensor.
  - O.K. ↓
- 3 Check A/T fluid condition.
  - N.G. / O.K. →
    1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
    2. Check the following items.
       - 2-3 shift valve
       - Shift solenoid B
    - O.K. ↓
    3. Disassemble A/T.
    4. Check the following items.
       - Servo piston assembly
       - High clutch assembly
    - O.K. ↓
- 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.





Diagnostic Procedure 14

SYMPTOM:

A/T does not shift from D_3 to D_4 at the specified speed.

- Are Diagnostic Procedures 10 and 11 O.K.?
  - No → Go to Diagnostic Procedure 10 or 11.
  - Yes ↓

1

- Does self-diagnosis show damage to inhibitor switch, overdrive switch, shift solenoid A, B, revolution sensor, speed sensor or fluid temperature sensor circuit after cruise test?
  - Yes → Check damaged circuit. — Refer to "Self-diagnosis".
  - No ↓

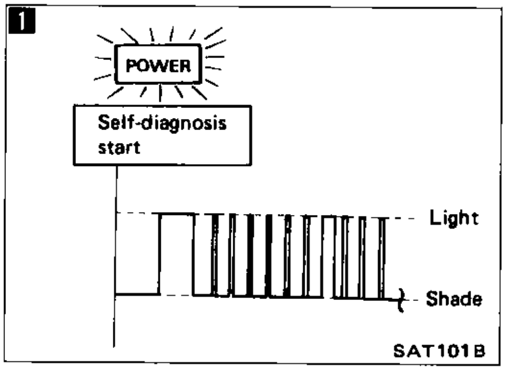
2

- Check throttle sensor. — Refer to section EF & EC.
  - N.G. → Repair or replace throttle sensor.
  - O.K. ↓

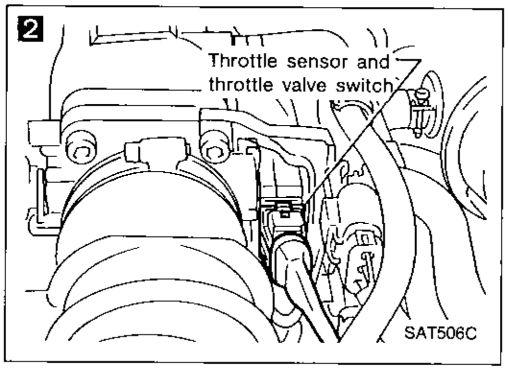
3

- Check A/T fluid condition.
  - N.G. / O.K. →
    1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
    2. Check the following items.
       - 3-4 shift valve
       - Servo release timing valve
       - Shift solenoid A
    - O.K. ↓
    3. Disassemble A/T.
    4. Check the following items.
       - Servo piston assembly
       - Brake band
    - O.K. ↓

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.



SAT101B



SAT506C

Diagnostic Procedure 15

SYMPTOM:

A/T does not perform lock-up at the specified speed.

1

Does self-diagnosis show damage to lock-up solenoid circuit after cruise test?

- Yes → Check lock-up solenoid circuit. — Refer to "Self-diagnosis".
- No ↓

2

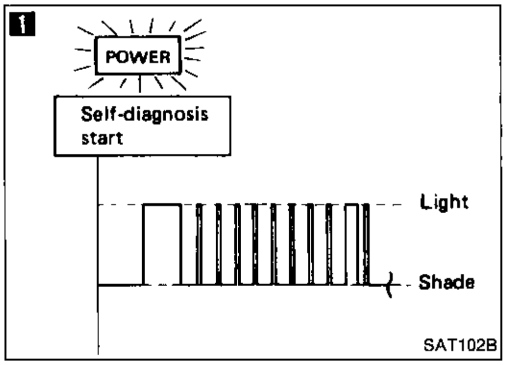
Check throttle sensor. — Refer to section EF & EC.

- N.G. → Repair or replace throttle sensor.
- O.K. ↓

1. Remove control valve.
   — Refer to "ON-VEHICLE SERVICE".
2. Check following items.
- Lock-up control valve
- Lock-up shuttle valve
- Torque converter relief valve
- Lock-up solenoid
- Pilot valve
- Oil filter

- N.G. → Repair or replace damaged parts.
- O.K. ↓

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.



SAT102B

Diagnostic Procedure 16

SYMPTOM:
A/T does not hold lock-up condition for more than 30 seconds.

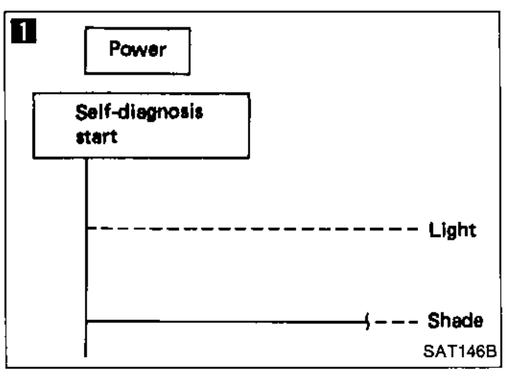
1 Does self-diagnosis show damage to engine revolution signal circuit after cruise test?

- Yes → Check revolution sensor circuit. — Refer to "Self-diagnosis".
- No ↓

2 Check A/T fluid condition.

- N.G. → 1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE". 2. Check the following items.
  - Lock-up control valve
  - Pilot valve
  - Oil filter
  - O.K. → 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.
  - 3. Disassemble A/T.
  - 4. Check torque converter and oil pump assembly.
  - O.K → 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. → 1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE". 2. Check the following items. (see above)

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.



SAT146B

Diagnostic Procedure 17

SYMPTOM:
Lock-up is not released when accelerator pedal is released.

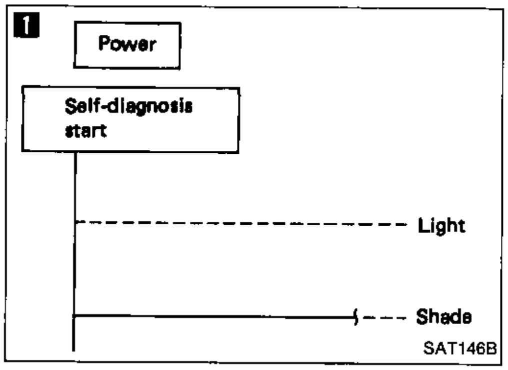
Does "E.C.U. INPUT SIGNALS" show damage to idle switch circuit?

OR

1 Does self-diagnosis show damage to idle switch circuit?

- Yes → Check idle switch circuit. — Refer to "Self-diagnosis".
- No ↓

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.



SAT146B

Diagnostic Procedure 18

SYMPTOM:

A/T does not shift from D_4 to D_3 when changing overdrive switch to "OFF" position.

Does "E.C.U. INPUT SIGNALS" show damage to overdrive switch circuit?

— OR —

1

Does self-diagnosis show damage to overdrive switch circuit?

Yes → Check overdrive switch circuit. — Refer to "Self-diagnosis".

No ↓

2

Check A/T fluid condition.

N.G. / O.K. →

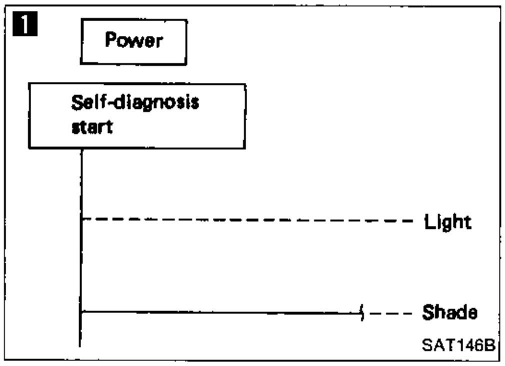
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
   - 3-4 shift valve
   - Servo release timing valve
   - Shift solenoid A

O.K. ←

3. Disassemble A/T.
4. Check the following items.
   - Servo piston assembly
   - Low clutch assembly

O.K. ←

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.



SAT146B

Diagnostic Procedure 19

SYMPTOM:

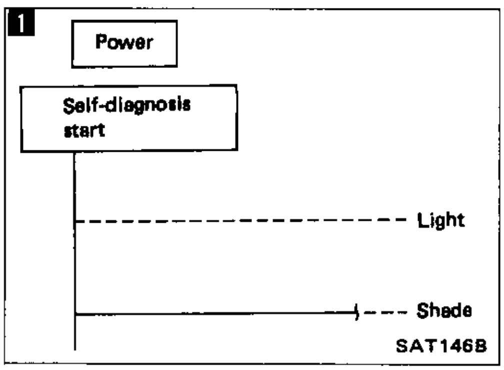
A/T does not shift from D_3 to 2_2 when changing selector lever from "D" to "2" range.

Does "E.C.U. INPUT SIGNALS" show damage to inhibitor switch circuit?

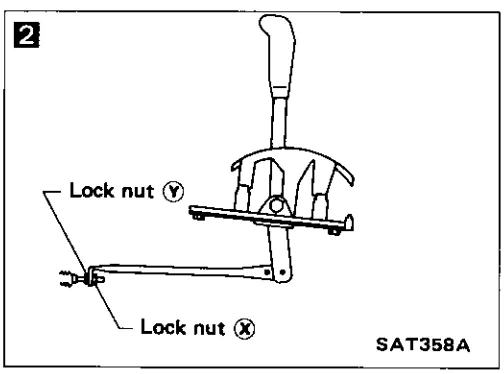
— OR —

1 Does self-diagnosis show damage to inhibitor switch circuit?

- Yes → Check inhibitor switch circuit. — Refer to "Self-diagnosis".
- No → Go to Diagnostic Procedure 12.



SAT146B



SAT358A

Diagnostic Procedure 20

SYMPTOM:

A/T does not shift from 2_2 to 1_1 when changing selector lever from "2" to "1" range.

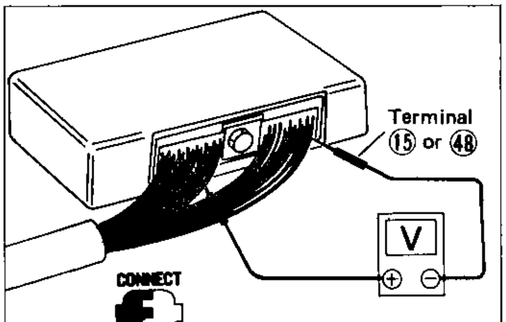
Vehicle does not decelerate by engine brake when shifting from 2_2 (1_2) to 1_1.

Does "E.C.U. INPUT SIGNALS" show damage to inhibitor switch circuit?

— OR —

1 Does self-diagnosis show damage to inhibitor switch circuit?

- Yes → Check inhibitor switch circuit. — Refer to "Self-diagnosis".
- No → Check manual control linkage. — Refer to "ON-VEHICLE SERVICE".
  - N.G. → 2 Adjust manual control linkage. — Refer to "ON-VEHICLE SERVICE".
  - O.K. → Go to Diagnostic Procedure 9.

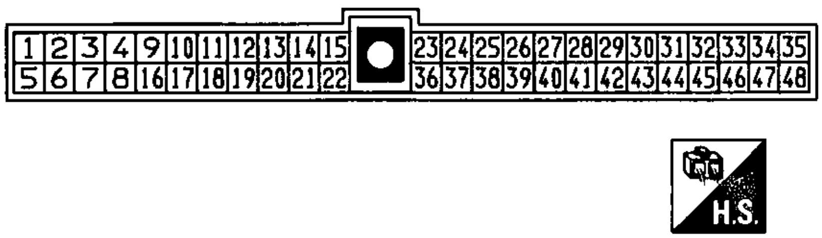


SAT010C

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.



SAT011C

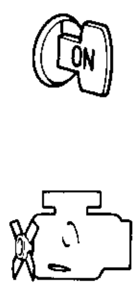
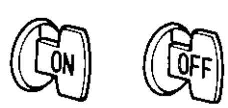
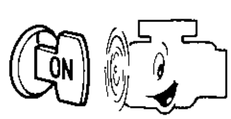
Electrical Components Inspection (Cont'd)

A/T CONTROL UNIT INSPECTION TABLE

(Data are reference values.)

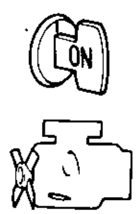
Terminal No.	Item	Condition		Judgement standard
1	Line pressure solenoid	 	When accelerator pedal is released after warming up engine.	1.5 - 2.5V
			When accelerator pedal is depressed fully after warming up engine.	0.5V or less
2	Line pressure solenoid (with dropping resistor)		When accelerator pedal is released after warming up engine.	5 - 14V
			When accelerator pedal is depressed fully after warming up engine.	0.5V or less
3	Power indicator lamp		When A/T mode switch is set in "POWER" position.	1V or less
			When A/T mode switch is set in any position except in "POWER" position.	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	Timing 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

Electrical Components Inspection (Cont'd)

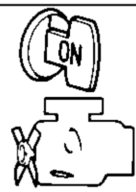
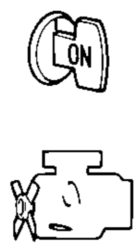
Terminal No.	Item	Condition		Judgement standard
9	Power source		Same as No. 4	
10*	—		—	—
11	—		—	—
12	—		—	—
13	—		—	—
14	Idle switch (in throttle valve switch)		When accelerator pedal is released after warming up engine.	8 - 15V
			When accelerator pedal is depressed after warming up engine.	1V or 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	—		—	—
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

*: 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.

Electrical Components Inspection (Cont'd)

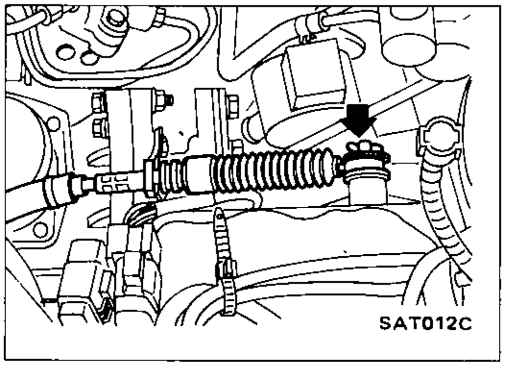
Terminal No.	Item	Condition		Judgement standard
25	Revolution sensor (Measure in AC range)		When vehicle is cruising at 30 km/h (19 MPH).	1V or more Voltage rises gradually in response to vehicle speed.
			When vehicle is parked.	0V
26	—		—	—
27	Speed sensor		When vehicle is moving at 2 to 3 km/h (1 to 2 MPH) for 1m (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. Voltage rises gradually in response to throttle opening angle.	Fully-closed throttle: Approximately 0.5V Fully-open throttle: Approximately 4V
35	Throttle sensor (Ground)		—	—
36	A/T mode switch "POWER"		When A/T mode switch is set in "POWER" position.	Battery voltage
			When A/T mode switch is set in any position except in "POWER" position.	1V or less
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

Electrical Components Inspection (Cont'd)

Terminal No.	Item	Condition		Judgement 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	—		—	—
42	A/T mode switch "COMFORT"		When A/T mode switch is set in "COMFORT" position.	Battery voltage
			When A/T mode switch is set in any position except in "COMFORT" position.	1V or less
43	—		—	—
44	—		—	—
45	—		—	—
46	—		—	—
47	—		—	—
48	Ground		—	—

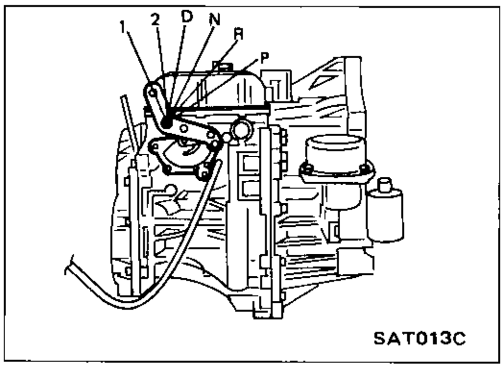
Electrical Components Inspection (Cont'd)

INHIBITOR SWITCH



SAT012C

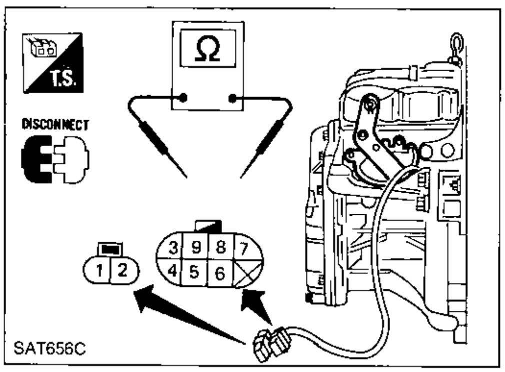
1. Disconnect control cable from manual shaft.



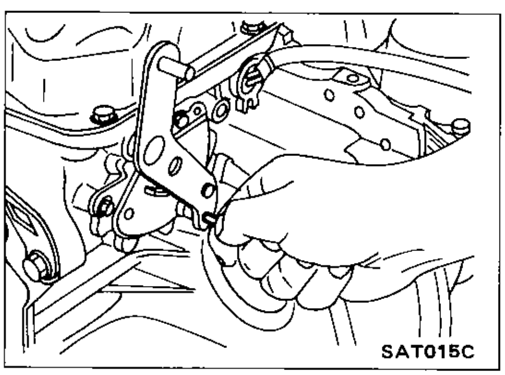
SAT013C

2. 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. / Lever position	①	②	③	④	⑤	⑥	⑦	⑧	⑨
P	○	○	○	○					
R			○	—	○				
N	○	○	○	—	—	○			
D			○	—	—	—	○		
2			○	—	—	—	—	○	
1			○	—	—	—	—	—	○

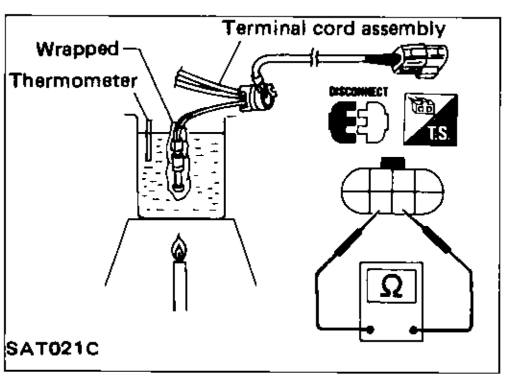


SAT656C



SAT015C

3. If N.G., adjust inhibitor switch.
4. Check terminal continuity again.
5. If N.G., replace inhibitor switch.



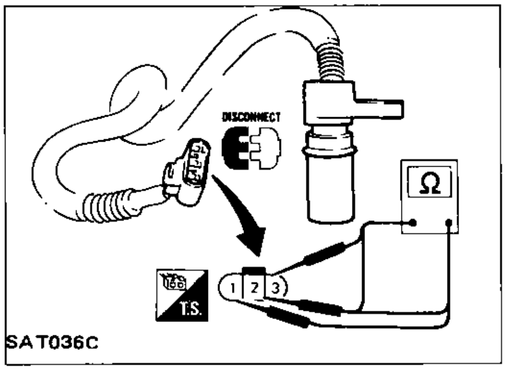
SAT021C

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 kΩ
20 (68)	Approximately 2.5
80 (176)	Approximately 0.3

Electrical Components Inspection (Cont'd)

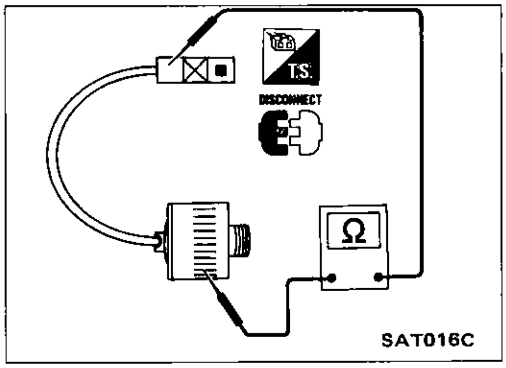


SAT036C

REVOLUTION SENSOR

- For removal and installation, refer to "ON-VEHICLE SERVICE".
- Check resistance between terminals ①, ② and ③.

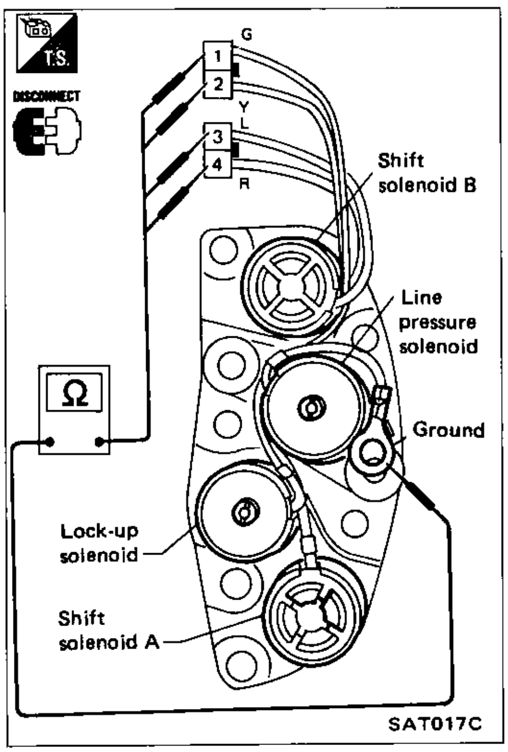
Terminal No.		Resistance
①	②	500 - 650Ω
②	③	No continuity
①	③	No continuity



SAT016C

TIMING SOLENOID

- For removal and installation, refer to "ON-VEHICLE SERVICE".
- Check resistance between two terminals.
  Resistance:
  Timing solenoid 20 - 40Ω



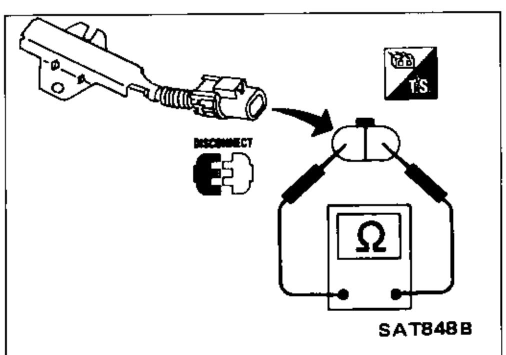
SAT017C

4-UNIT SOLENOID ASSEMBLY

(Shift solenoid A, B, lock-up 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 Ω
Shift solenoid A	①	Ground terminal	20 - 40
Shift solenoid B	②		
Lock-up solenoid	③		10 - 20
Line pressure solenoid	④		2.5 - 5



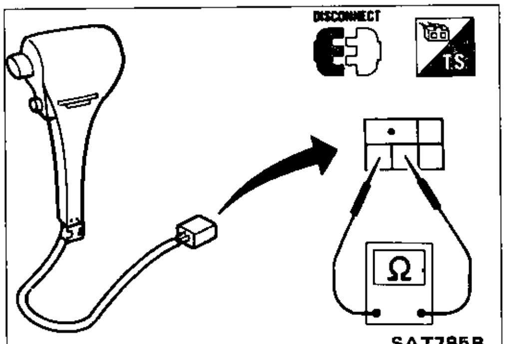
SAT848B

DROPPING RESISTOR

- Check resistance between two terminals.
  Resistance: 11.2 - 12.8Ω

Electrical Components Inspection (Cont'd)

OVERDRIVE SWITCH



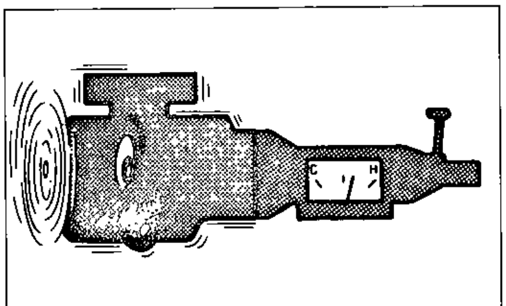
SAT785B

- Check continuity between two terminals.

O.D. switch position	Continuity
ON	No
OFF	Yes

Final Check

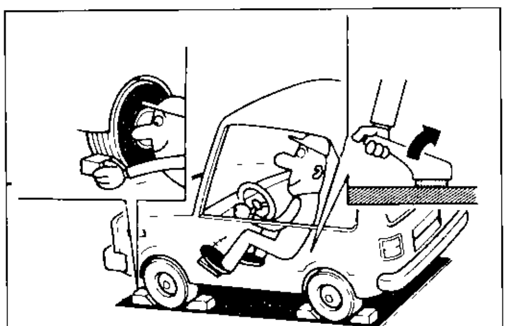
STALL TESTING



SAT779A

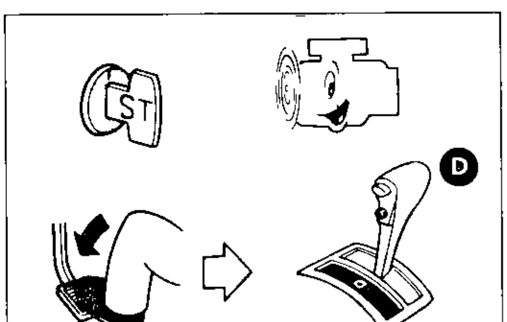
Stall test procedure

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)


SAT597

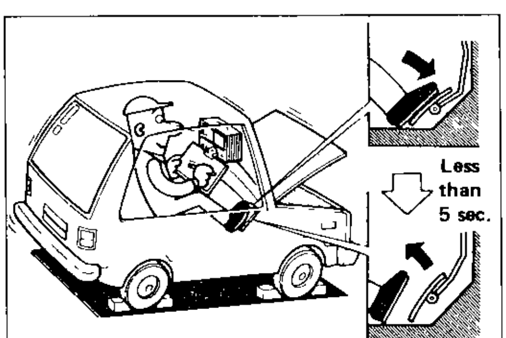
3. Set parking brake and block wheels.
4. Install a tachometer where it can be seen by driver during test.

- **It is good practice to put a mark on point of specified engine rpm on indicator.**



SAT767B

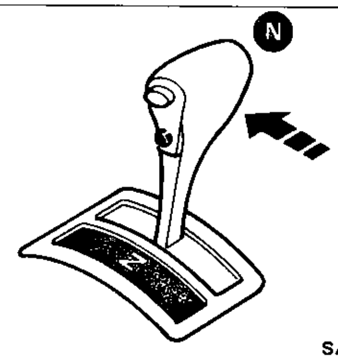
5. Start engine, apply foot brake, and place selector lever in "D" range.



SAT598

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:
  1,950 - 2,250 rpm



SAT771B

Final Check (Cont'd)

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 "1" and "R", respectively.

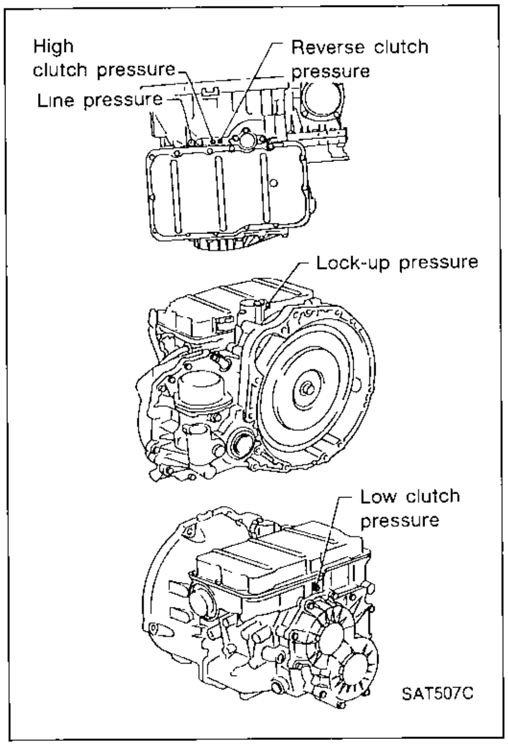
JUDGEMENT OF STALL TEST

- "D" range test
  - N.G. → Stall revolution is
    - Too high → Low clutch or one-way clutch slips → "1" range test
      - O.K. → One-way clutch slips
      - N.G. → Low clutch slips
    - Too low → Lock-up clutch is dragging, converter one-way clutch is malfunctioning (slipping), or engine is not performing properly.
  - O.K. → "R" range test → Stall revolution is
    - Too high → Reverse clutch or low & rev. brake slips → Perform road tests to determine whether reverse clutch or low & rev. brake slips. → When selector lever is in "1" range
      - No engine braking → Low & rev. brake slips
      - Effective engine braking → Reverse clutch slips
    - Too low → Lock-up clutch is dragging, converter one-way clutch is malfunctioning (slipping), or engine is not performing properly.

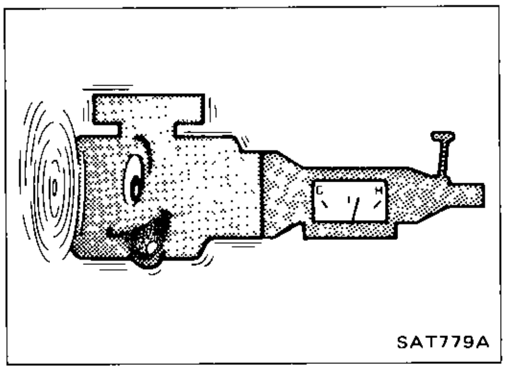
If converter one-way clutch is frozen, vehicle will have poor high-speed performance and low engine rpm when it is raced in "N" range. If converter one-way clutch is slipping, vehicle will be sluggish up to 50 or 60 km/h (30 or 40 MPH).

Final Check (Cont'd)

PRESSURE TESTING



- Location of line pressure test port
- **Always replace line pressure plugs as they are self-sealing bolts.**

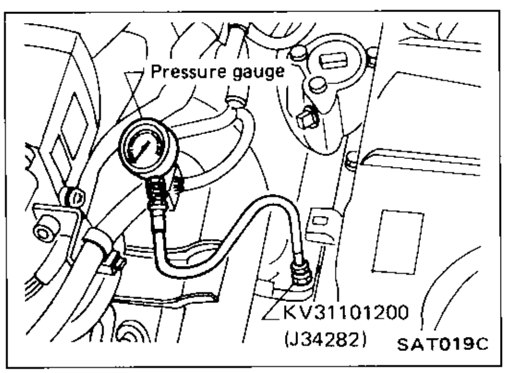


Line pressure test procedure

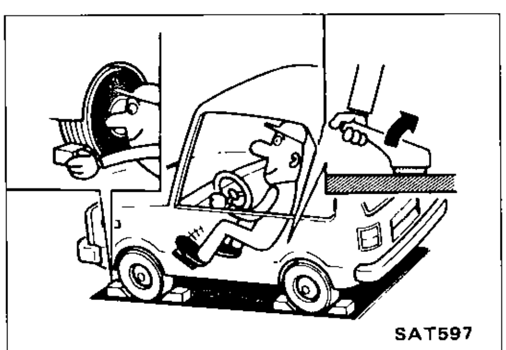
1. Check A/T and engine fluid levels. If necessary, add.
2. Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.

   A.T.F. operating temperature:

   50 - 80°C (122 - 176°F)



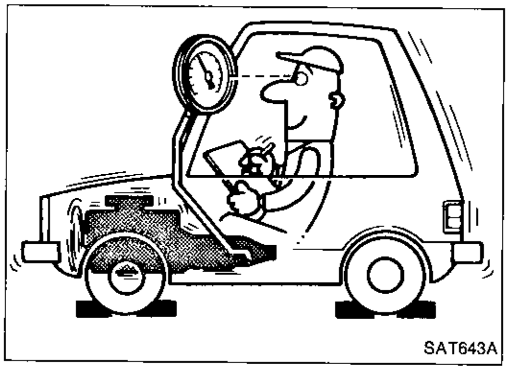
3. Install pressure gauge to line pressure port.



4. Set parking brake and block wheels.

- **Continue to depress brake pedal fully while line pressure test at stall speed is performed.**

Final Check (Cont'd)


SAT643A

5. Start engine and measure line pressure at idle and stall speed.

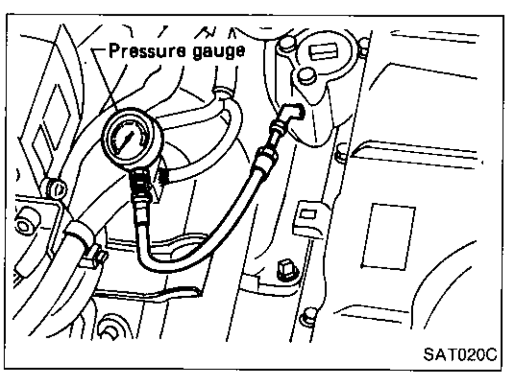
- **When measuring line pressure at stall speed, follow the stall test procedure.**

Line pressure:

Engine speed rpm	Line pressure kPa (kg/cm², psi)
	D, 2, 1 and R ranges
Idle	382 - 422 (3.9 - 4.3, 55 - 61)
Stall	1,285 - 1,363 (13.1 - 13.9, 186 - 198)

JUDGEMENT OF LINE PRESSURE TEST

Judgement		Suspected parts
At idle	Line pressure is low in all ranges.	• 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.	• 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.	• Mal-adjustment of throttle sensor • Fluid temperature sensor damaged • Line pressure solenoid sticking • Short circuit of line pressure solenoid circuit • Pressure regulator valve or plug sticking
At stall speed	Line pressure is low.	• Mal-adjustment of throttle sensor • Control position damaged • Line pressure solenoid sticking • Short circuit of line pressure solenoid circuit • Pressure regulator valve or plug sticking • Pilot valve sticking



SAT020C

LOCK-UP TEST

Install pressure gauge to lock-up pressure port. Shift selector lever in "D" range.

Condition	Torque converter lock-up pressure kPa (kg/cm², psi)
Lock-up "ON"	49 (0.5, 7) or less
Lock-up "OFF"	196 (2, 28) or more

If lock-up pressure is not within specifications, refer to Diagnostic Procedures 15 and 16.

Symptom Chart

Reference page (AT-)	Numbers are arranged in order of probability. Perform inspections starting with number one and working up.	Fuse	Fluid level	Control linkage	Inhibitor switch	Throttle sensor (Adjustment)	Revolution sensor and speed sensor	Engine revolution signal	Fluid temperature sensor	Engine idling rpm	Line pressure	Control valve assembly	Shift solenoid A	Shift solenoid B	Line pressure solenoid	Lock-up solenoid	Timing solenoid	Low clutch accumulator	Band servo accumulator	Ignition switch and starter	Overdrive switch	A/T mode switch	Torque converter	Oil pump	Reverse clutch	High clutch	Low clutch	One-way clutch	Low & reverse brake	Brake band	Band servo piston	Parking components
		ON vehicle																					OFF vehicle									
	Reference page (AT-)	–	7, 11		75		75, 76			79		76, 115		76		76		106, 132		–	77		99, 111		126, 130		109, 129		131, 132		132	156
57	Engine does not start in "N", "P" ranges.	1	3		4	.	.	.	.		.	.	.	.	.		.	.	.	2		.		.	.	.	.	.	.	.	.	.
57	Engine starts in range other than "N" and "P".	.		1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.		.		.	.	.	.	.
–	Transaxle noise in "P" and "N" ranges.	.	1	.	.	3	4	5	.		2	.	.				.	.	.	.	.	.	7	6	.	.	.			.	.	
58	Vehicle moves when changing into "P" range or parking gear does not disengage when shifted out of "P" range.	.	.	1	.	.	.	.	.	.	.	.		.	.	.	.	.		.	.	.	.		.	.	.	.	.	.	.	2
58	Vehicle runs in "N" range	.	.	1	.	.	.	.	.		.	.		.	.		.		.	.	.	.	.	.	3	.	2	.	.	.	.	.
60	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	.	.	.
–	Vehicle braked when shifting into "R" range.	.	1	2	.	.	.	.	.		3	5	.	.	4	.	.	.	.	.	.	.	.	.	.	6	8	.	.	7	.	.
-	Sharp shock in shifting from "N" to "D" range.	.	.	.	.	2	.	6	5	1	3	8	.	.	7	.	4	9	.	.	.	.	.	.	.	.	10	.		.	.	.
-	Vehicle will not run in "D" and "2" ranges (but runs in "1" and "R" ranges).	.	.	1	.	.	.	.	.				.		.	.	.	.			.	.	.				.	2	.	.	.	.
61	Vehicle will not run in "D", "1", "2" ranges (but runs in "R" range). Clutch slips. Very poor acceleration.	.	1	.	.	.			.	.	2	4	.	.	3	.	.	5	.	.	.	.	.	.	6	7	8	9	.	.		.
–	Clutches or brakes slip somewhat in starting.	.	1	3	.	4	.		.	.	5	7	.	.	6		.	8	.	.	.	.	13	12	10	.	9	.	11		2	.
-	Excessive creep.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.		.	.	.	.	.	.	.		.	.
60,61	No creep at all.	.	1	.		.	.	.	.	.	2	3	.	.		.	.	.	.	.	.	.	6	5	.	.	4	.		.		.
–	Failure to change gear.	1	.	.	.	5	2	.	.	.	.	.	3	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".	.	.	3	1	.	5		6		.	.	4	.	.		.		.	.	2	.	.	.	.		.	.	.	7	.	.
63,64, 65	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		.	.	.	.	4	5		.		.	.	.	.	3	.	.	.	.	.	.	.			
–	Gear change directly from "D_1" to "D_3" occurs.	.	3			.	.	.	.	.		.		.		.	.	2	.	.	.	.	.	.	.	.	.	.	.	1	.	.

Symptom Chart (Cont'd)

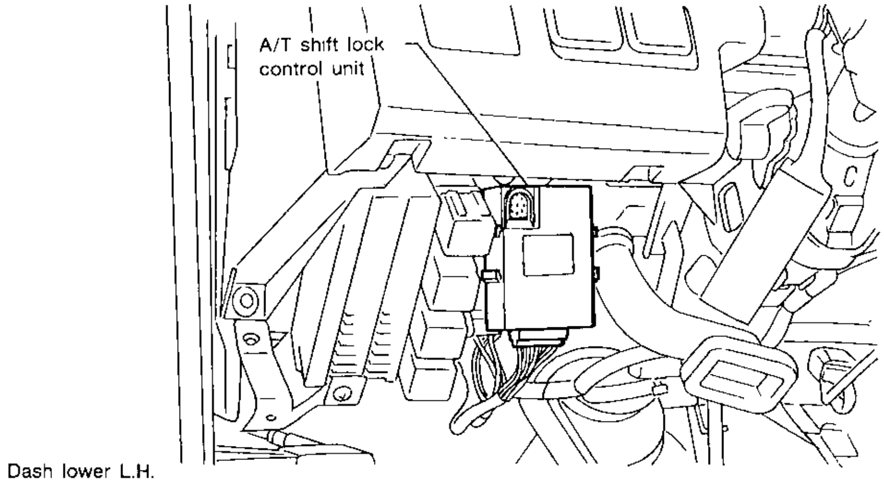
		ON vehicle																				OFF vehicle									
	Reference page (AT-)	–	7, 11		75		75, 76			79		76, 115		76		76		106, 132		–	77		99, 111		126, 130		109, 129		131, 132		132	156
Reference page(AT-)	Numbers are arranged in order of probability. Perform inspections starting with number one and working up.	Fuse	Fluid level	Control linkage	Inhibitor switch	Throttle sensor (Adjustment)	Revolution sensor and speed sensor	Engine revolution signal	Fluid temperature sensor	Engine idling rpm	Line pressure	Control valve assembly	Shift solenoid A	Shift solenoid B	Line pressure solenoid	Lock-up solenoid	Timing solenoid	Low clutch accumulator	Band servo accumulator	Ignition switch and starter	Overdrive switch	A/T mode switch	Torque converter	Oil pump	Reverse clutch	High clutch	Low clutch	One-way clutch	Low & reverse brake	Brake band	Band servo piston	Parking components
–	Engine stops when shifting lever into "R", "D", "2" and "1".	.	.	.	.	.	.	.	.	1	2	4	.	.	.	3	.	.	.	.	.	.	5	.	.	.	.	.	.	.	.	.
–	Too sharp a shock in change from "D_1" to "D_2".	.		.	.	1	.	7	8		2	5	.	.	3	.	4	.	6	.	.	.	.	.	.	.	.	.	.	9	.	.
–	Too sharp a shock in change from "D_2" to "D_3"	.			.	1	.		.	.	2	4	.	.	3	.	.	.	.	.	.	.	.	.	.	5	.	.	.	.	6	.
–	Too sharp a shock in change from "D_3" to "D_4".	.	.	.	.	1	.	.	.	.	2	4	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	.
–	Almost no shock or clutches slipping in change from "D_1" to "D_2".	.	1	.	.	2	.	.	.	.	3	7	.	.		.	4	.	6	.	.	.	.	.	.	.	.	.	.	8	5	.
–	Almost no shock or slipping in change from "D_2" to "D_3".	.	1	.	.	2	.	.	.	.	3	6	.	.	4	.		.		.	.	.	.	.	.	7	.	.	.	.	5	.
–	Almost no shock or slipping in change from "D_3" to "D_4".	.	1	.	.	2	.	.	.	.	3	4	.	.	8	.	.	.	.		.	.	.	.		6	.	.	.	7	5	.
–	Vehicle braked by gear change from "D_1" 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	.	.	.	.		.	.	.	.	.	.	.	.		.	.	.	.	.	.	.	3	.	2	.	.	.	.	.
–	Maximum speed not attained. Acceleration poor.	.	1	.	2	.		.	.	.	.	5	3	4	.	.	.				6	.	12	11	7	8	.	.	10	9	.	.
–	Failure to change gear from "D_4" 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	.	.	.	.		.	.	.	.	.	.	7	.	.	.	8	6	.
–	Failure to change gear from "D_2" to "D_1" 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	.	.	.	.	.	.	.	.	6	5	.	.	.	.	.
–	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	.	.	.	.		.	.		.	.	.		.	.	3	.	.	.	.	.		.	.	.	.
–	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	.	.	3	.	.	.	.	4	6	.	.	5	.	2	.	.	.	.	.	.	.	.	7	.	.	.	.	.	.

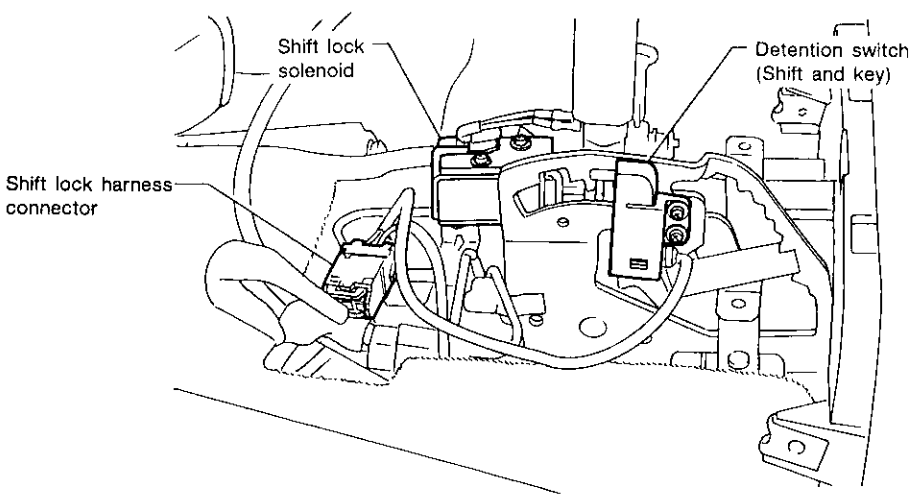
Symptom Chart (Cont'd)

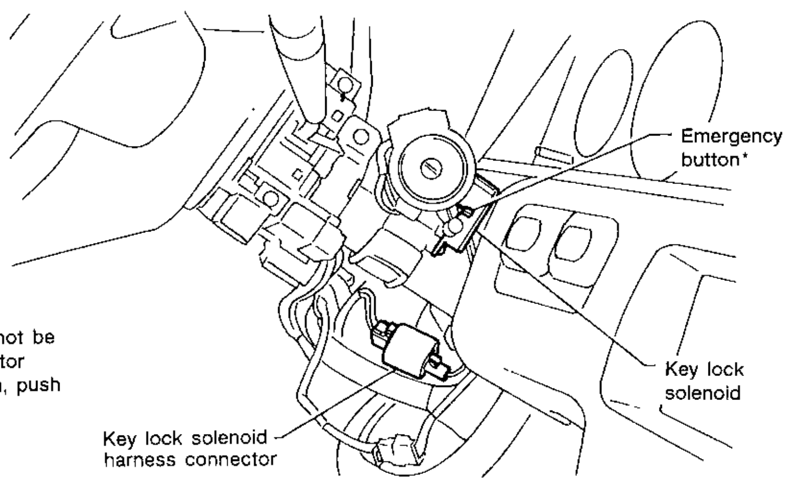
Reference page (AT-)	Numbers are arranged in order of probability. Perform inspections starting with number one and working up.	Fuse	Fluid level	Control linkage	Inhibitor switch	Throttle sensor (Adjustment)	Revolution sensor and speed sensor	Engine revolution signal	Fluid temperature sensor	Engine idling rpm	Line pressure	Control valve assembly	Shift solenoid A	Shift solenoid B	Line pressure solenoid	Lock-up solenoid	Timing solenoid	Low clutch accumulator	Band servo accumulator	Ignition switch and starter	Overdrive switch	A/T mode switch	Torque converter	Oil pump	Reverse clutch	High clutch	Low clutch	One-way clutch	Low & reverse brake	Brake band	Band servo piston	Parking components
		ON vehicle																					OFF vehicle									
	Reference page (AT-)	–	7, 11		75		75, 76			79		76, 115		76		76		106, 132		–	77		99, 111		126, 130		109, 129		131, 132		132	156
–	Races extremely fast or slips in changing from "D_4" to "D_2" when depressing pedal.		1			3					4	7	6		5		2													8		
–	Races extremely fast or slips in changing from "D_3" to "D_2" when depressing pedal.		1			3					4	6			5		2									8				7		
–	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				
–	Vehicle will not run in any range.		1	2							3				4								10	6		7	9	8			5	11
–	Transaxle noise in "D", "2", "1" and "R" ranges.		1																				2									
69	Failure to change from "D_3" to "2_3" when changing lever into "2" range			6	1	2						5	4	3													8			7		
–	Gear change from "2_2" to "2_3" in "2" range.			2	1																											
69	Engine brake does not operate in "1" range.			2	1		3					5	4														6		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		6			
–	Large shock changing from "1_2" to "1_1" in "1" range											1																	2			
–	Transaxle overheats.		1			3				2	4	6			5								13	7	8	9	11		12	10		
–	A.T.F. shoots out during operation White smoke emitted from exhaust pipe during operation.		1																						2	3	5		6	4		
–	Offensive smell at fluid charging pipe		1																				2	3	4	5	7		8	6		
–	Torque converter is not locked up.				3	1	2	4	5		6	8				7							9									
–	Lock-up piston slip.		1			2					3	6			5	4							7									
66	Lock-up point is extremely high or low.					1	2		4			5				3																
–	A/T does not shift to "D_4" when setting overdrive switch to "ON" position.				3	2	4		8		9	7	5				6				1											
–	Engine is stopped at "R", "D", "2" and "1" ranges.		1									5	4	3		2																
–	Lock-up judder occurs.					5			4		1				2	3							7	6								
–	Engine uses too much gasoline.		4			3				5											1	2										

A/T Shift Lock System

SHIFT LOCK ELECTRICAL PARTS LOCATION





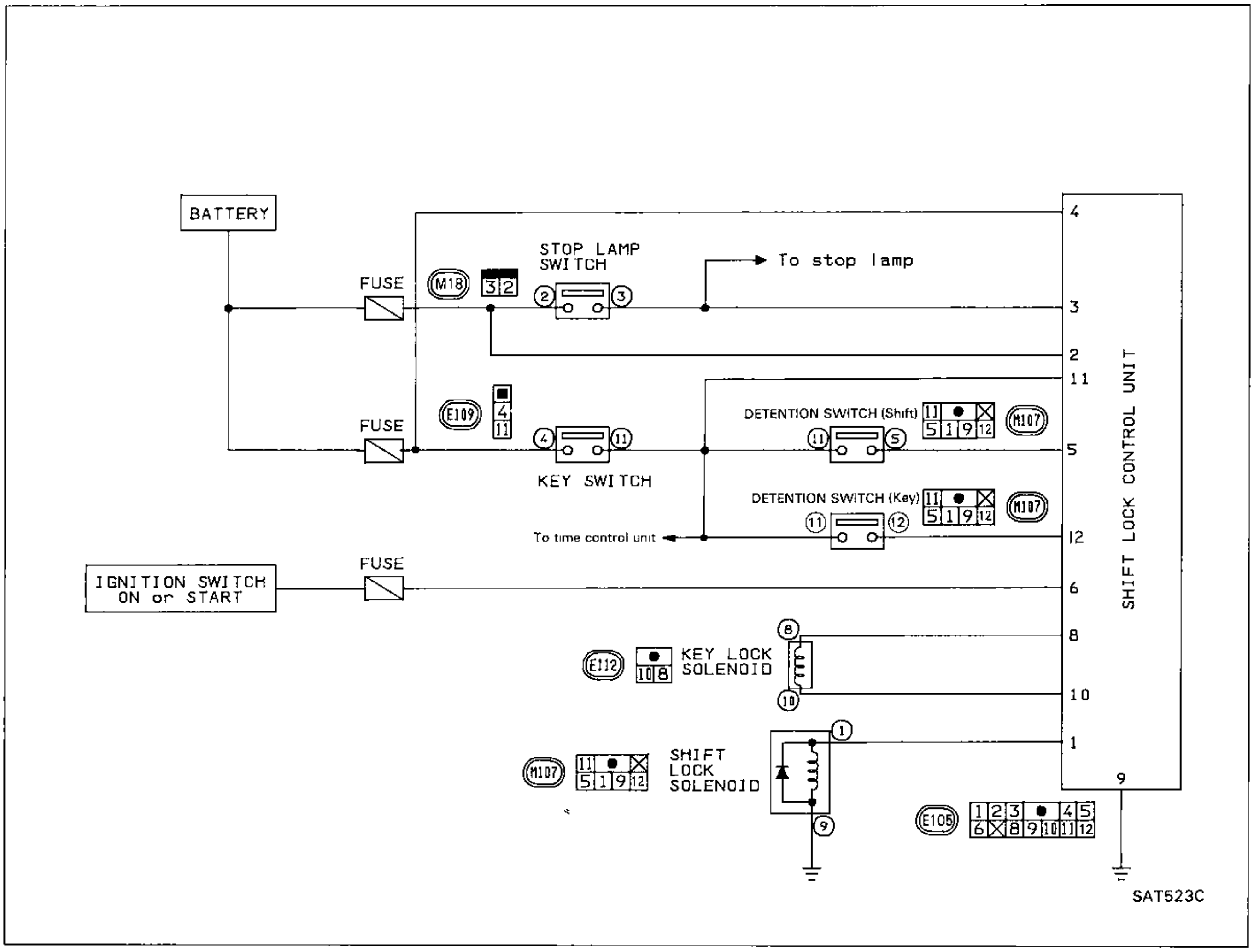


*: When ignition key cannot be removed, even if selector lever is in "P" position, push emergency button and remove ignition key.

SAT508C

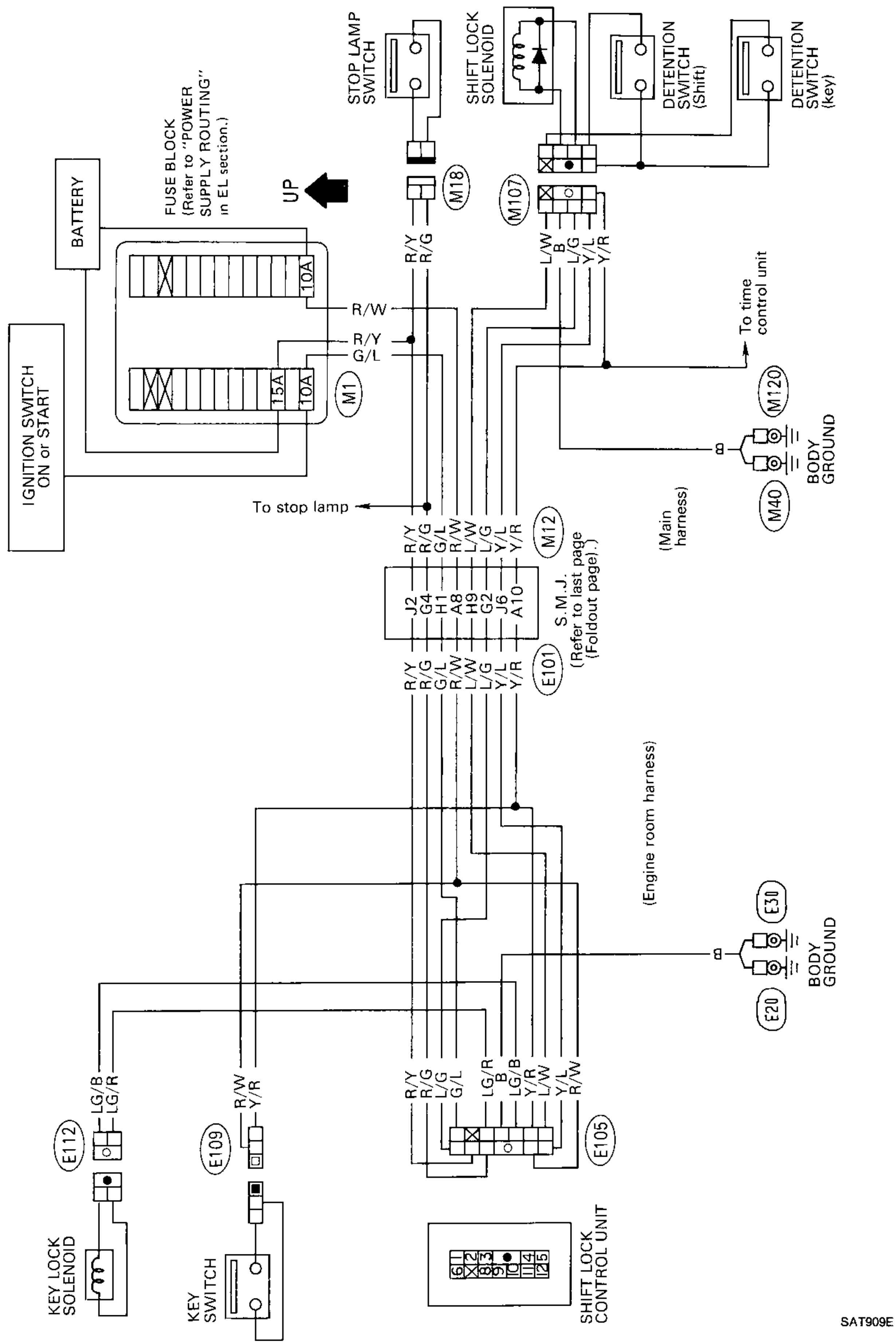
A/T Shift Lock System (Cont'd)

CIRCUIT DIAGRAM FOR QUICK PINPOINT CHECK

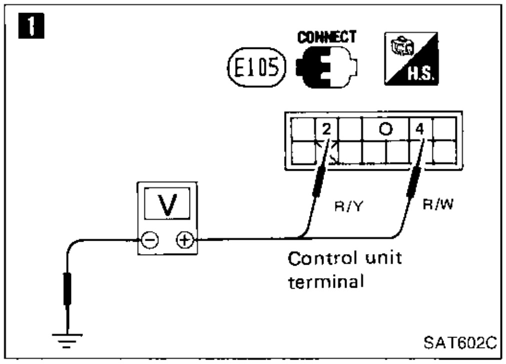


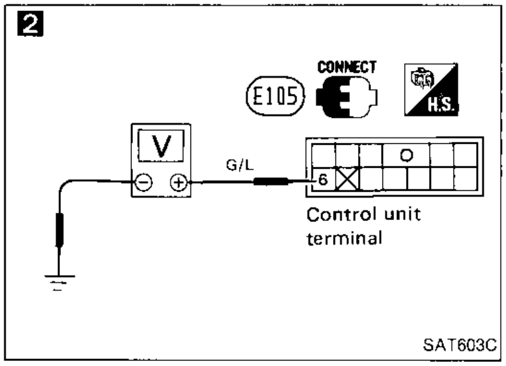
A/T Shift Lock System (Cont'd)

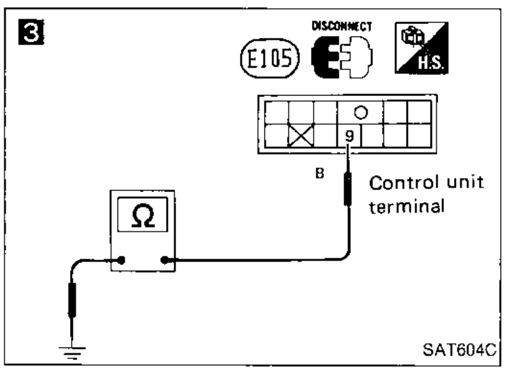
WIRING DIAGRAM



A/T Shift Lock System (Cont'd)







DIAGNOSTIC PROCEDURE 1

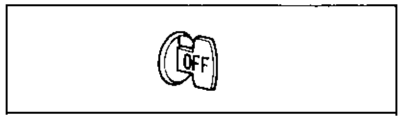
SYMPTOM:

Selector lever cannot be moved from "P" range when applying brake pedal or can be moved when releasing brake pedal. Selector lever can be moved from "P" range when key is removed from key cylinder.

1

CHECK POWER SOURCE.

1.



2. Check voltage between control unit harness terminals ②, ④ and ground.
   Battery voltage should exist.

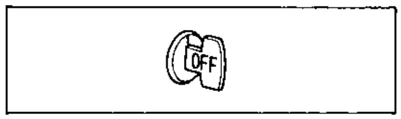
N.G. → Check the following items:
1. Harness continuity between battery and control unit harness terminals ②, ④
2. Fuse

O.K. ↓

2

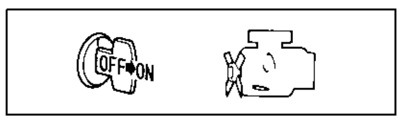
CHECK IGNITION SIGNAL.

1.



2. Check voltage between control unit harness terminal ⑥ and ground.
   0V

3.



4. Check voltage between control unit harness terminal ⑥ and ground.
   Battery voltage should exist.

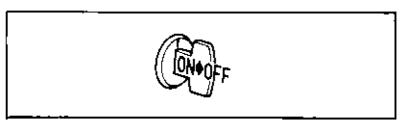
N.G. → Check the following items:
1. Harness continuity between battery and control unit harness terminal ⑥
2. Fuse
3. Ignition switch

O.K. ↓

3

CHECK GROUND CIRCUIT FOR CONTROL UNIT.

1.



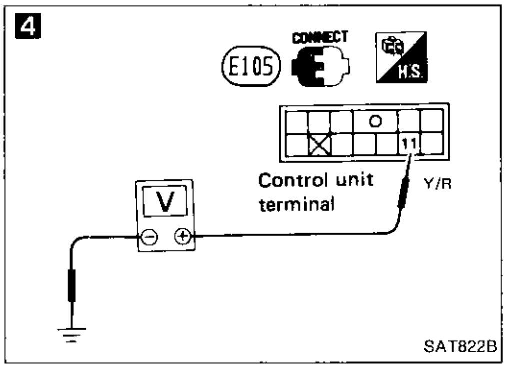
2. Disconnect control unit harness connector.
3. Check continuity between control unit harness terminal ⑨ and ground.
   Continuity should exist.

N.G. → Repair harness or connector.

O.K. ↓

Ⓐ

A/T Shift Lock System (Cont'd)

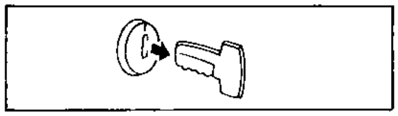


SAT822B

Ⓐ

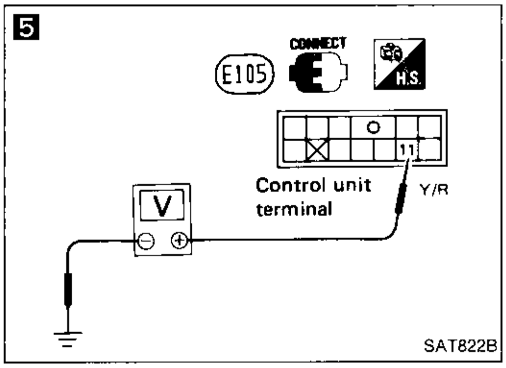
4

CHECK INPUT SIGNAL (KEY SWITCH).

1. Reconnect control unit harness connector.
2. 
3. Check voltage between control unit terminal ⑪ and ground.
   0V

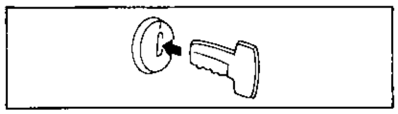
N.G. → Check key switch. (Refer to "COMPONENT CHECK".)

O.K. ↓



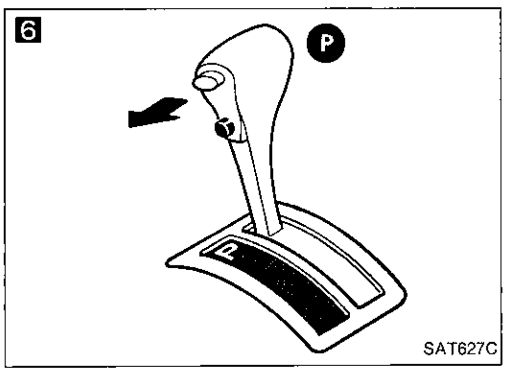
SAT822B

5

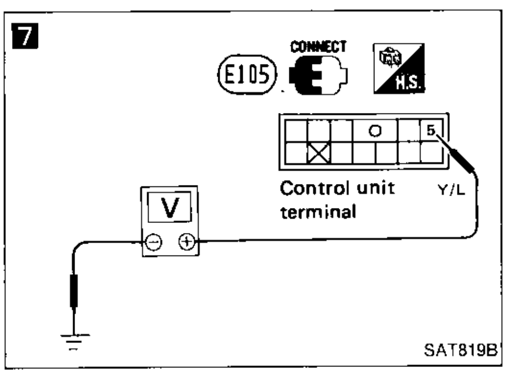
1. 
2. Check voltage between control unit harness terminal ⑪ and ground.
   Battery voltage should exist.

N.G. → Check the following items:
1. Harness continuity between control unit harness terminal ⑪ and key switch harness terminal ⑪ .
2. Harness continuity between key switch harness terminal ④ and fuse
3. Key switch (Refer to "COMPONENT CHECK".)

O.K. ↓

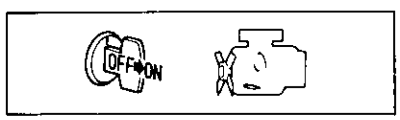


SAT627C



SAT819B

CHECK INPUT SIGNAL (DETENTION SWITCH—SHIFT).

1. 

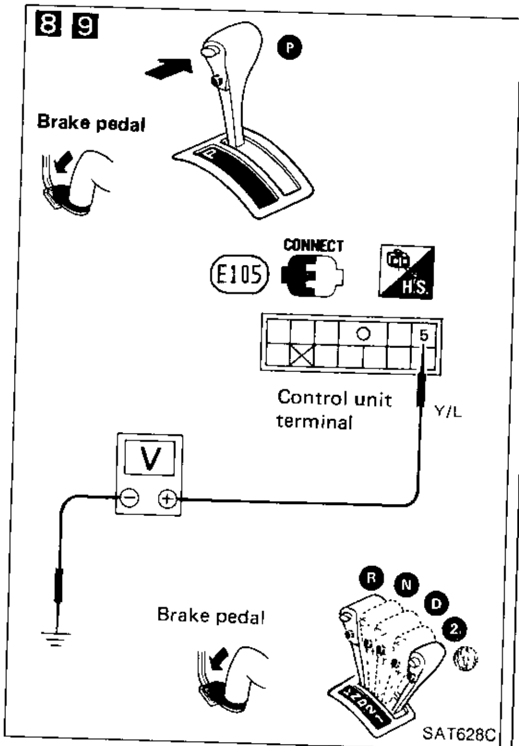
2. **6** Set selector lever in "P" position and release selector lever button.
3. **7** Check voltage between control unit harness terminal ⑤ and ground.
   0V

N.G. → Check detention switch—shift. (Refer to "COMPONENT CHECK".)

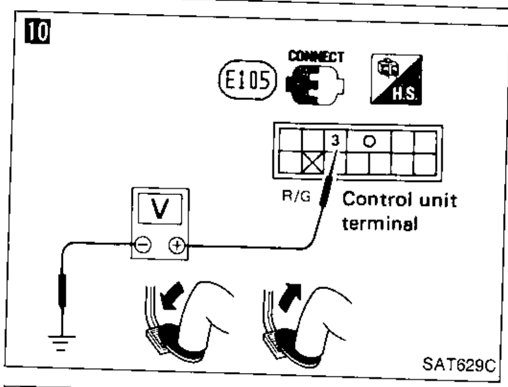
O.K. ↓

Ⓑ

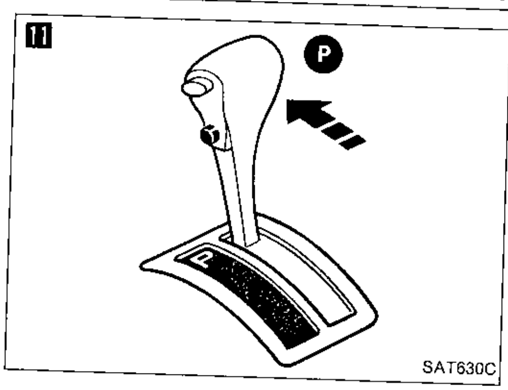
A/T Shift Lock System (Cont'd)



SAT628C



SAT629C

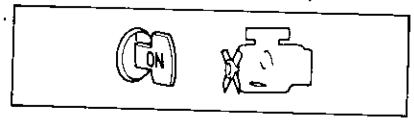


SAT630C

Ⓑ

CHECK INPUT SIGNAL (DETENTION SWITCH—SHIFT).

1.



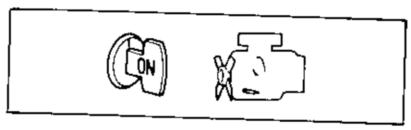
8 2. Check voltage between control unit harness terminal ⑤ and ground with brake pedal depressed and selector lever button pushed.
Battery voltage should exist.

9 3. Check voltage between control unit harness terminal ⑤ and ground with selector lever set in any position except "P".
When selector lever cannot be moved from "P" position with brake pedal depressed, push shift lock release knob.
Battery voltage should exist.

N.G. → Check the following items:
1. Harness continuity between control unit harness terminal ⑤ and detention switch harness terminal ⑤
2. Harness continuity between detention switch harness terminal ⑪ and key switch harness terminal ⑪
3. Detention switch—shift (Refer to "COMPONENT CHECK".)

O.K. ↓

10 **CHECK INPUT SIGNAL (STOP LAMP SWITCH).**



- Check voltage between control unit harness terminal ③ and ground.

Brake pedal	Voltage
Depressed	Battery voltage
Released	0V

N.G. → Check the following items:
1. Harness continuity between control unit harness terminal ③ and stop lamp switch harness terminal ③
2. Harness continuity between stop lamp switch harness terminal ② and fuse
3. Stop lamp switch (Refer to "COMPONENT CHECK".)

O.K. ↓

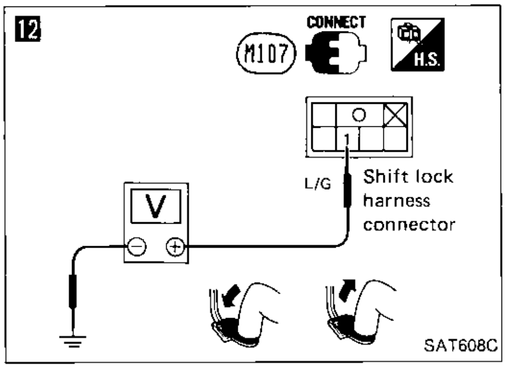
11 Set selector lever in "P" position.

↓

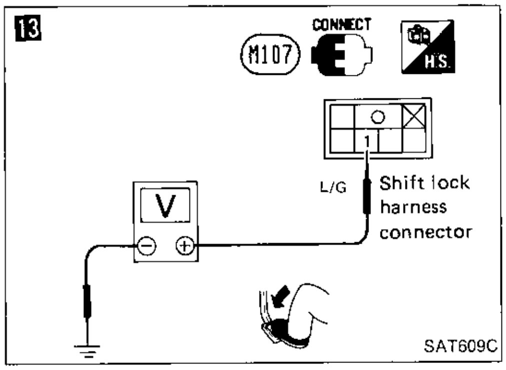
Ⓒ

A/T Shift Lock System (Cont'd)

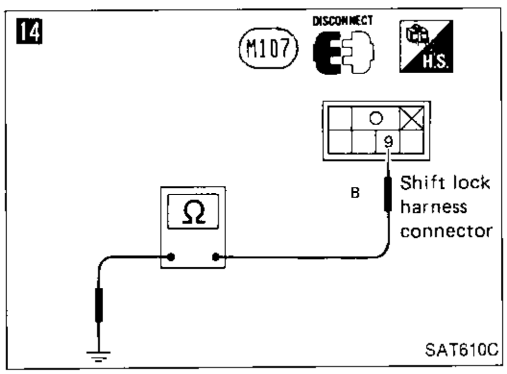
12



13



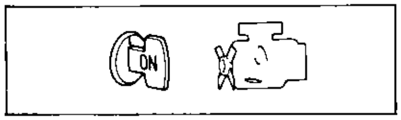
14



Ⓒ

CHECK OUTPUT SIGNAL (SHIFT LOCK SOLENOID).

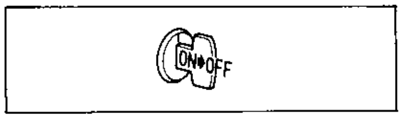
1.



12 2. Check voltage between shift lock harness connector terminal ① and body ground.

Brake pedal	Voltage
Depressed	Battery voltage
Released	0V

3.



13 4. Check voltage between shift lock harness connector terminal ① and ground with brake pedal depressed.
0V

N.G. → Check harness continuity between control unit harness terminal ① and shift lock solenoid harness terminal ① .

O.K. ↓

14

CHECK GROUND CIRCUIT FOR SHIFT LOCK SOLENOID.

1. Disconnect shift lock harness connector.
2. Check continuity between shift lock harness terminal ⑨ and ground.
   Continuity should exist.

N.G. → Repair harness or connector.

O.K. ↓

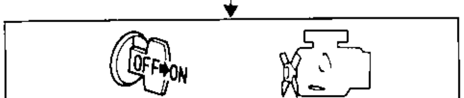
Check shift lock solenoid.
(Refer to "COMPONENT CHECK".)

N.G. → Replace A/T shift lock control device assembly.

O.K. ↓

Reconnect shift lock harness connector.

↓



↓

Recheck shift lock operation.

N.G. →
1. Perform control unit input/output signal inspection test.
2. If N.G., recheck harness connector connection.

O.K. ↓

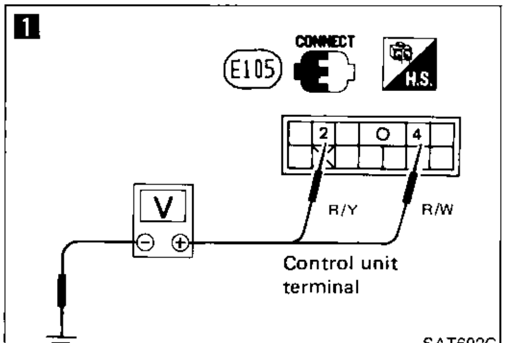
INSPECTION END

A/T Shift Lock System (Cont'd)

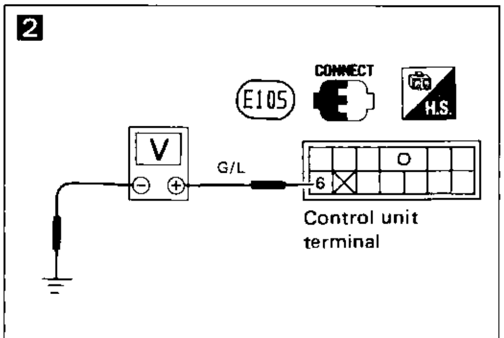
DIAGNOSTIC PROCEDURE 2

SYMPTOM:

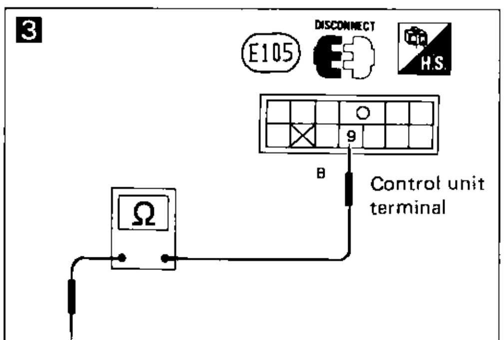
Ignition key cannot be removed when selector lever is set to "P" position or can be removed when selector lever is set to any position except "P".



SAT602C



SAT603C

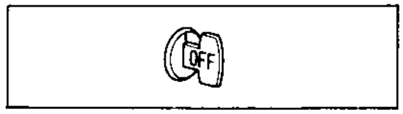


SAT604C

1

CHECK POWER SOURCE.

1.



2. Check voltage between control unit harness terminals ②, ④ and ground.
   Battery voltage should exist.

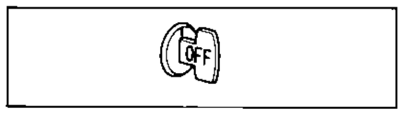
N.G. → Check the following items:
1. Harness continuity between battery and control unit harness terminals ②, ④
2. Fuse

O.K. ↓

2

CHECK IGNITION SIGNAL.

1.



2. Check voltage between control unit harness terminal ⑥ and ground.
   0V
3.

4. Check voltage between control unit harness terminal ⑥ and ground.
   Battery voltage should exist.

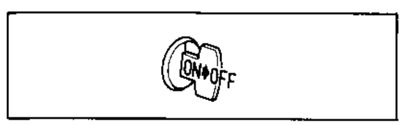
N.G. → Check the following items:
1. Harness continuity between battery and control unit harness terminal ⑥
2. Fuse
3. Ignition switch

O.K. ↓

3

CHECK GROUND CIRCUIT FOR CONTROL UNIT.

1.



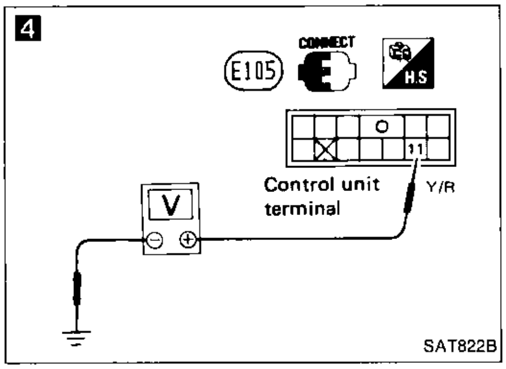
2. Disconnect control unit harness connector.
3. Check continuity between control unit harness terminal ⑨ and ground.
   Continuity should exist.

N.G. → Repair harness or connector.

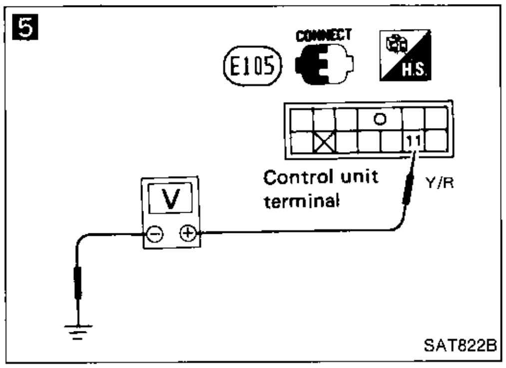
O.K. ↓

Ⓐ

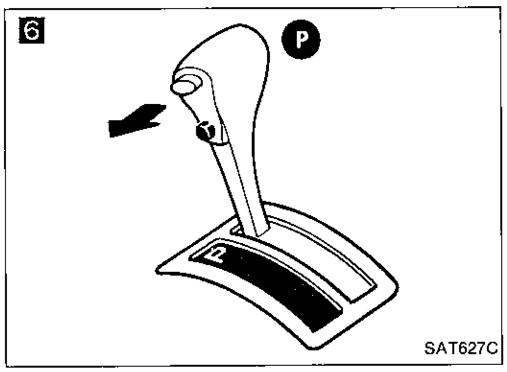
A/T Shift Lock System (Cont'd)



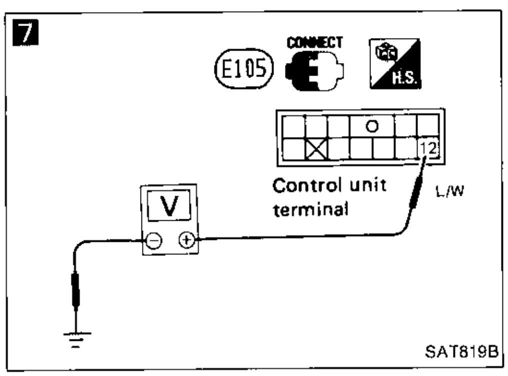
SAT822B



SAT822B



SAT627C

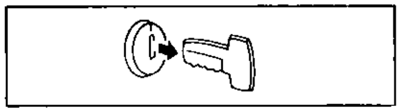


SAT819B

Ⓐ

4

CHECK INPUT SIGNAL (KEY SWITCH).

1. Reconnect control unit harness connector.
2. 

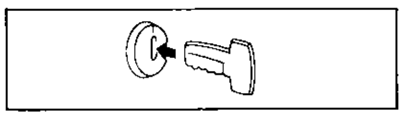
When ignition key cannot be removed, even if selector lever is in "P" position, use emergency button.

3. Check voltage between control unit terminal ⑪ and ground.
   0V

N.G. → Check key switch. (Refer to "COMPONENT CHECK".)

O.K. ↓

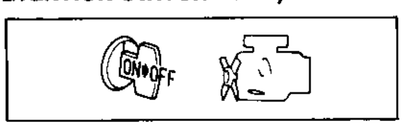
5

1. 
2. Check voltage between control unit harness terminal ⑪ and ground.
   Battery voltage should exist.

N.G. → Check the following items:
1. Harness continuity between control unit harness terminal ⑪ and key switch harness terminal ⑪ .
2. Harness continuity between key switch harness terminal ④ and fuse
3. Key switch (Refer to "COMPONENT CHECK".)

O.K. ↓

CHECK INPUT SIGNAL (DETENTION SWITCH—KEY).

1. 

6 2. Set selector lever in "P" position and release selector lever button.

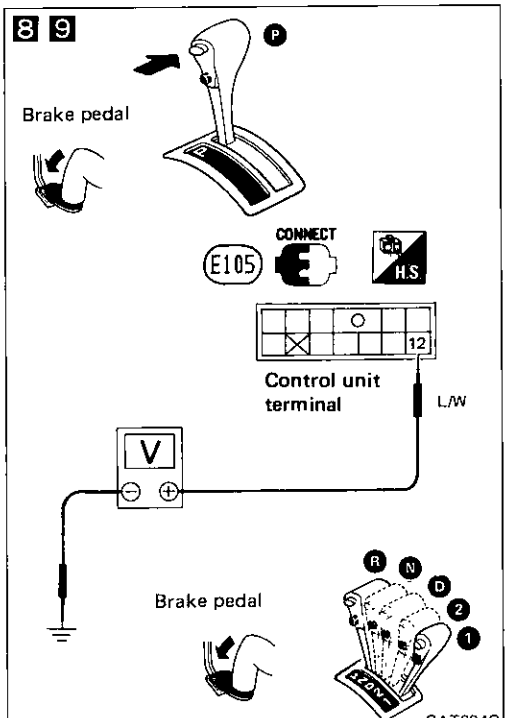
7 3. Check voltage between control unit harness terminal ⑫ and ground.
   0V

N.G. → Check detention switch—key. (Refer to "COMPONENT CHECK".)

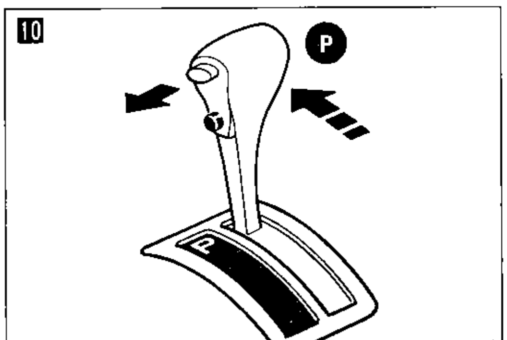
O.K. ↓

Ⓑ

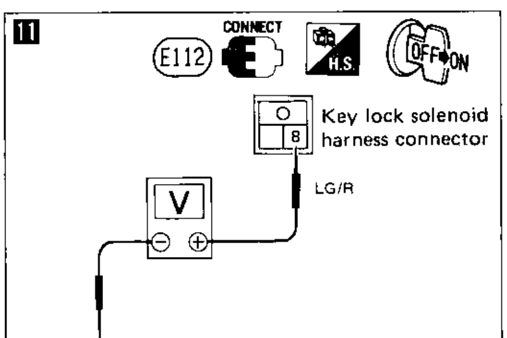
A/T Shift Lock System (Cont'd)



SAT634C



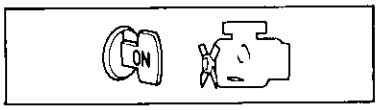
SAT631C



SAT612C

Ⓑ

CHECK INPUT SIGNAL (DETENTION SWITCH—KEY).



8 1. Check voltage between control unit harness terminal ⑫ and ground with brake pedal depressed and selector lever button pushed.
Battery voltage should exist.

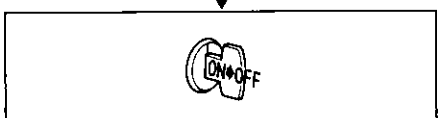
9 2. Check voltage between control unit harness terminal ⑫ and ground with selector lever set in any position except "P".
Battery voltage should exist.

N.G. → Check the following items:
1. Harness continuity between control unit harness terminal ⑫ and detention switch harness terminal ⑫
2. Harness continuity between detention switch harness terminal ⑪ and key switch harness terminal ⑪
3. Detention switch—key (Refer to "COMPONENT CHECK".)

O.K. ↓

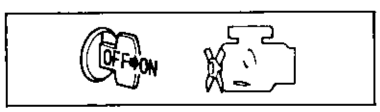
10 Set selector lever in "P" position and release selector lever button.

↓



↓

11 **CHECK OUTPUT SIGNAL (KEY LOCK SIGNAL).**



Check voltage between key lock solenoid harness terminal ⑧ and ground at the moment ignition key is turned from OFF to ON.
Battery voltage should exist for approximately 0.1 seconds.

N.G. → Check harness continuity between shift lock solenoid harness terminal ⑧ and control unit harness terminal ⑧ .

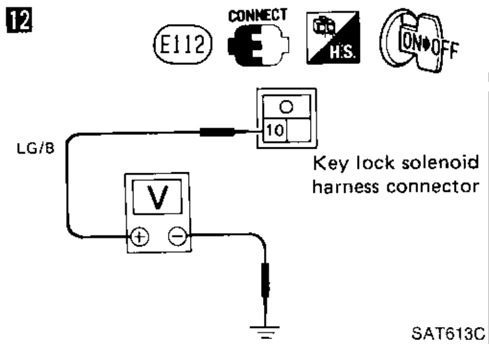
- N.G. → Repair harness or connector.
- O.K. → Replace control unit.

O.K. ↓

Ⓒ

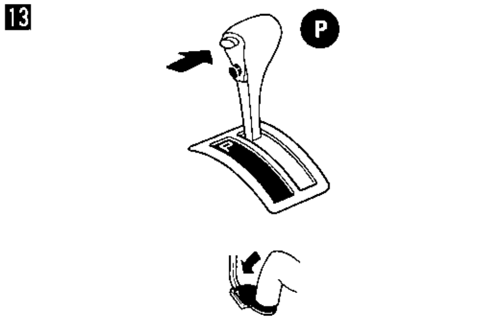
A/T Shift Lock System (Cont'd)

12



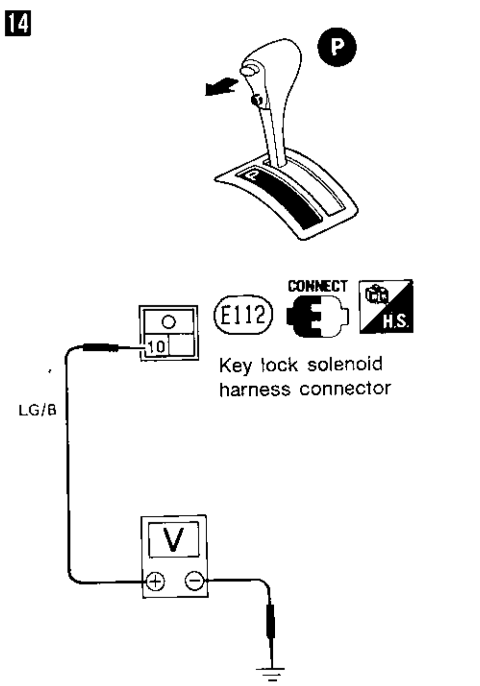
SAT613C

13



SAT632C

14



SAT633C

C

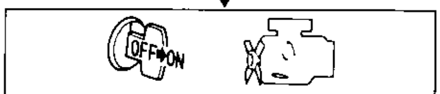
12

CHECK OUTPUT SIGNAL (KEY UNLOCK SIGNAL CAUSED BY IGNITION SIGNAL).

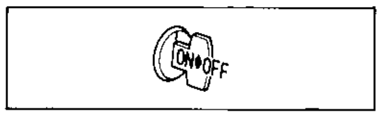
Check voltage between key lock solenoid harness terminal 10 and ground at the moment ignition key is turned from ON to OFF.
Battery voltage should exist for approximately 0.1 seconds.

- N.G. → Check harness continuity between shift lock solenoid harness terminal 10 and control unit harness terminal 10.
  - O.K. → Replace control unit.
  - N.G. → Repair harness or connector.

O.K. ↓



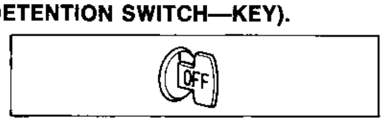
13

1. Push selector lever button with brake pedal depressed.
2. 

When turning ignition key, keep selector lever button pushed and brake pedal depressed.

14

CHECK OUTPUT SIGNAL (KEY UNLOCK SIGNAL CAUSED BY DETENTION SWITCH—KEY).



Check voltage between key lock solenoid harness terminal 10 and ground at the moment selector lever button is released.
Battery voltage should exist for approximately 0.1 seconds.

- N.G. → Replace control unit.

O.K. ↓

Check key lock solenoid.
(Refer to "COMPONENT CHECK".)

- N.G. → Replace key lock solenoid.

O.K. ↓

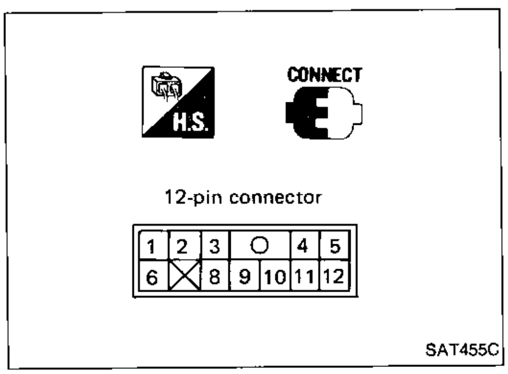
D

A/T Shift Lock System (Cont'd)

D

Recheck key lock operation.

- N.G. →
  1. Perform control unit input/output signal inspection test.
  2. If N.G., recheck harness connector connection.
- O.K. → INSPECTION END



SHIFT LOCK CONTROL UNIT INSPECTION

- Measure voltage between each terminal and terminal 9 by following "SHIFT LOCK CONTROL UNIT INSPECTION TABLE".
- Pin connector terminal layout.

A/T Shift Lock System (Cont'd)

SHIFT LOCK CONTROL UNIT INSPECTION TABLE (Data are reference values.)

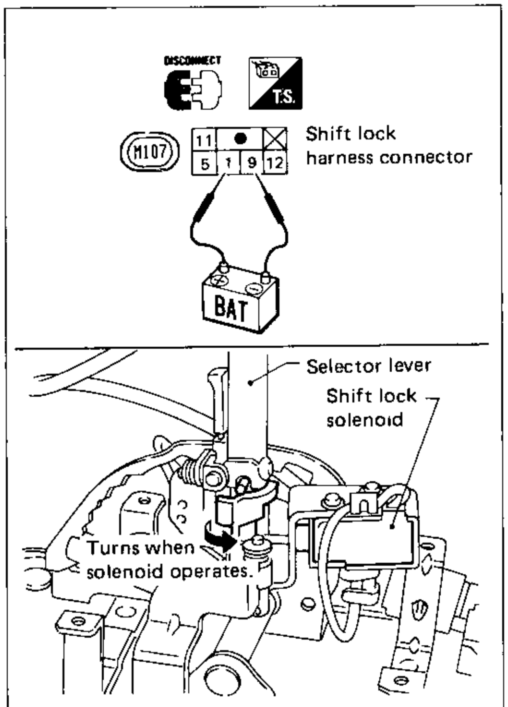
Terminal No. ⊕	Terminal No. ⊖	Item	Condition	Judgment standard
1	9	Shift lock signal	 When selector lever is set in "P" position and brake pedal is depressed.	Battery voltage
			Except above	0V
2		Power source	Any condition	Battery voltage
3		Stop lamp switch	When brake pedal is depressed.	Battery voltage
			When brake pedal is released.	0V
4		Power source	Any condition	Battery voltage
5		Detention switch (Shift)	• When key is inserted into key cylinder and selector lever is set in "P" position with selector lever button pushed. • When selector lever is set in any position except "P".	Battery voltage
			Except above	0V
6		Ignition signal		Battery voltage
			Except above	0V
8	10	Key lock signal	When ignition switch is turned from LOCK, OFF or ACC to ON.	Battery voltage (Approximately 0.1 seconds)
			Except above	0V
9	—	Ground	—	—
10	8	Key unlock signal	When selector lever is set in "P" position and ignition key is turned from ON to LOCK, OFF or ACC with selector lever button released.	Battery voltage (Approximately 0.1 seconds)
			Except above	0V
11	9	Key switch	When key is inserted into key cylinder.	Battery voltage
			When key is removed from key cylinder.	0V
12		Detention switch (Key)	• When key is inserted into key cylinder and selector lever is set in "P" position with selector lever button pushed. • When selector lever is set in any position except "P".	Battery voltage
			Except above	0V

A/T Shift Lock System (Cont'd)

COMPONENT CHECK

Shift lock solenoid

- Check operation by applying battery voltage to shift lock harness connector.

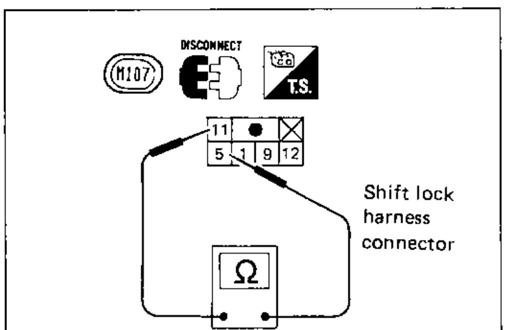


SAT551C

Detention switch—shift

- Check continuity between terminals ⑤ and ⑪ of shift lock harness connector.

Condition	Continuity
When selector lever is set in "P" position and selector lever button is released	No
Except above	Yes

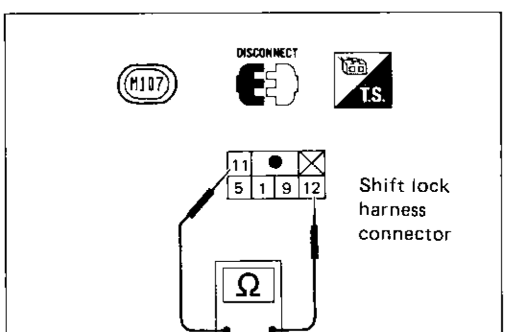


SAT649C

Detention switch—key

- Check continuity between terminals ⑪ and ⑫ of shift lock harness connector.

Condition	Continuity
When selector lever is set in "P" position and selector lever button is released	No
Except above	Yes

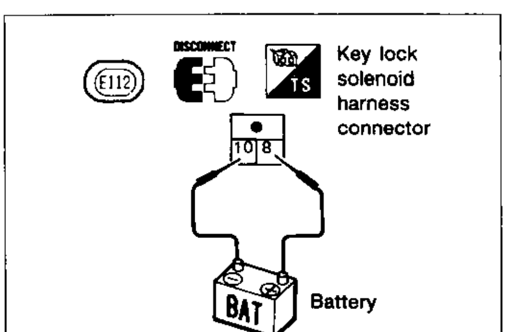


SAT650C

Key lock solenoid

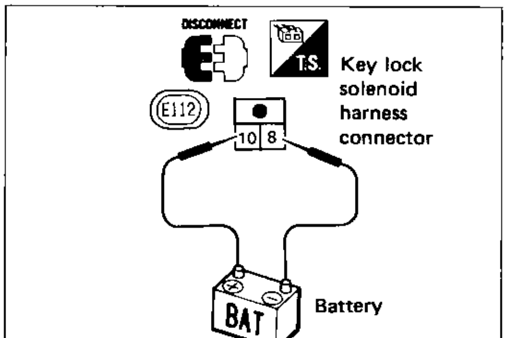
- **Operation of locking mechanism**
- Check operation by applying battery voltage to key lock solenoid harness connector.

Operating sound must be emitted.



SAT020E

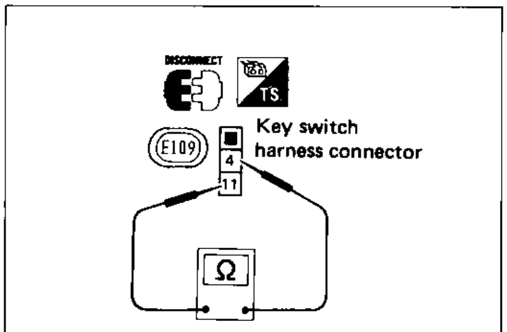
A/T Shift Lock System (Cont'd)



SAT833B

- **Operation of unlocking mechanism**
- Check operation by applying battery voltage to key lock solenoid harness connector.

Operating sound must be emitted.

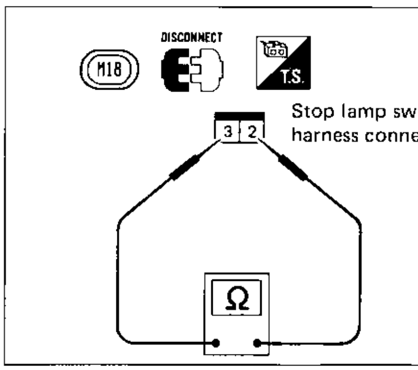


SAT834B

Key switch

- Check continuity between terminals ④ and ⑪ of key switch harness connector.

Condition	Continuity
When key is inserted into key cylinder	Yes
When key is removed from key cylinder	No



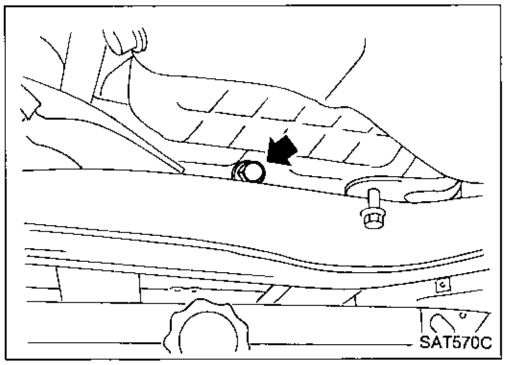
SAT635C

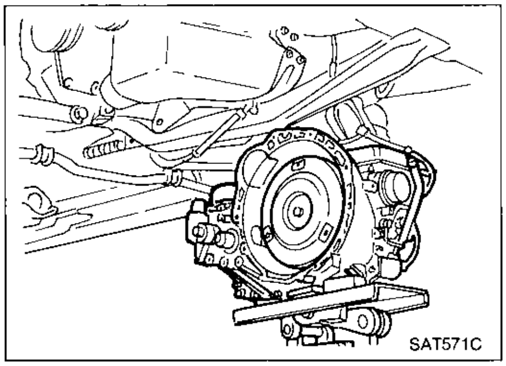
Stop lamp switch

- Check continuity between terminals ② and ③ of stop lamp switch harness connector.

Condition	Continuity
When brake pedal is depressed	Yes
When brake pedal is released	No

Check stop lamp switch after adjusting brake pedal — refer to section BR.


SAT570C


SAT571C

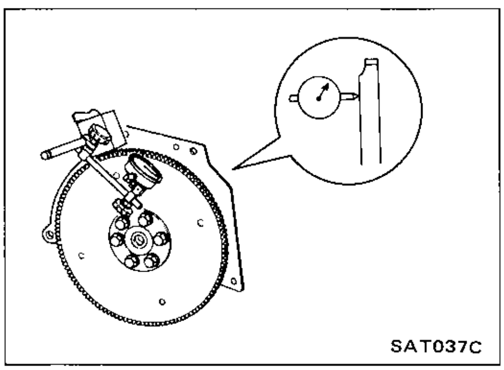
Removal

- Disconnect drive shafts. Refer to Drive Shaft (section FA) for removal.
- Support transaxle with transmission jack.
- Place wooden blocks between engine and center member to support engine.
- Remove bolts securing rear mounting to transaxle.
- Remove drive plate cover.
- Remove bolts securing torque converter to drive plate.

a. Remove those bolts by turning crankshaft.

b. Immediately after transaxle is disconnected, inscribe matching marks on torque converter and drive plate so that they may be reinstalled in their original positions.

- Plug up openings such as oil charging pipe, etc.


SAT037C

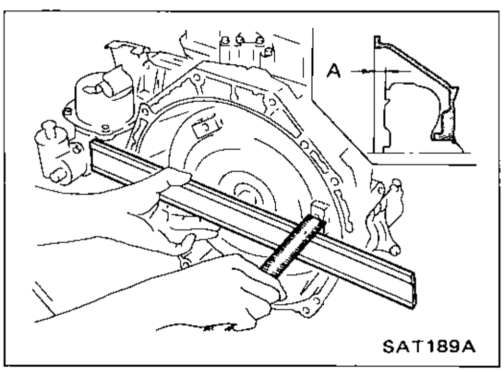
Installation

- Drive plate runout

  Maximum allowable runout:

  0.5 mm (0.020 in)

  If this runout is out of allowance, replace drive plate and ring gear.



SAT189A

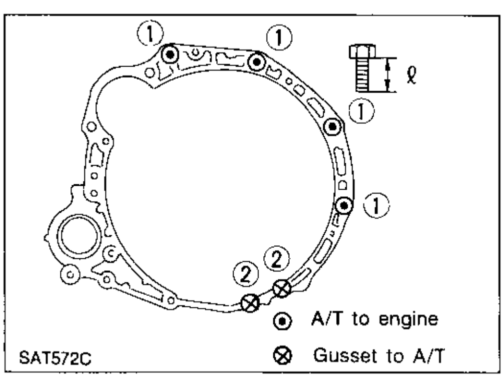
- When connecting torque converter to transaxle, measure distance "A" to be certain that they are correctly assembled.

  Distance "A":

  19 mm (0.75 in) or more

- Install converter to drive plate.

After converter is installed, rotate crankshaft several turns and check to be sure that transaxle rotates freely without binding.



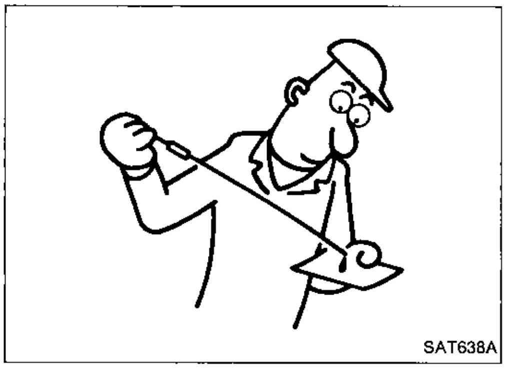
SAT572C

- Tighten bolt securing transaxle.

Bolt No.	Tightening torque N·m (kg-m, ft-lb)	ℓ mm (in)
1	39 - 49 (4.0 - 5.0, 29 - 36)	45 (1.77)
2	30 - 40 (3.1 - 4.1, 22 - 30)	20 (0.79)

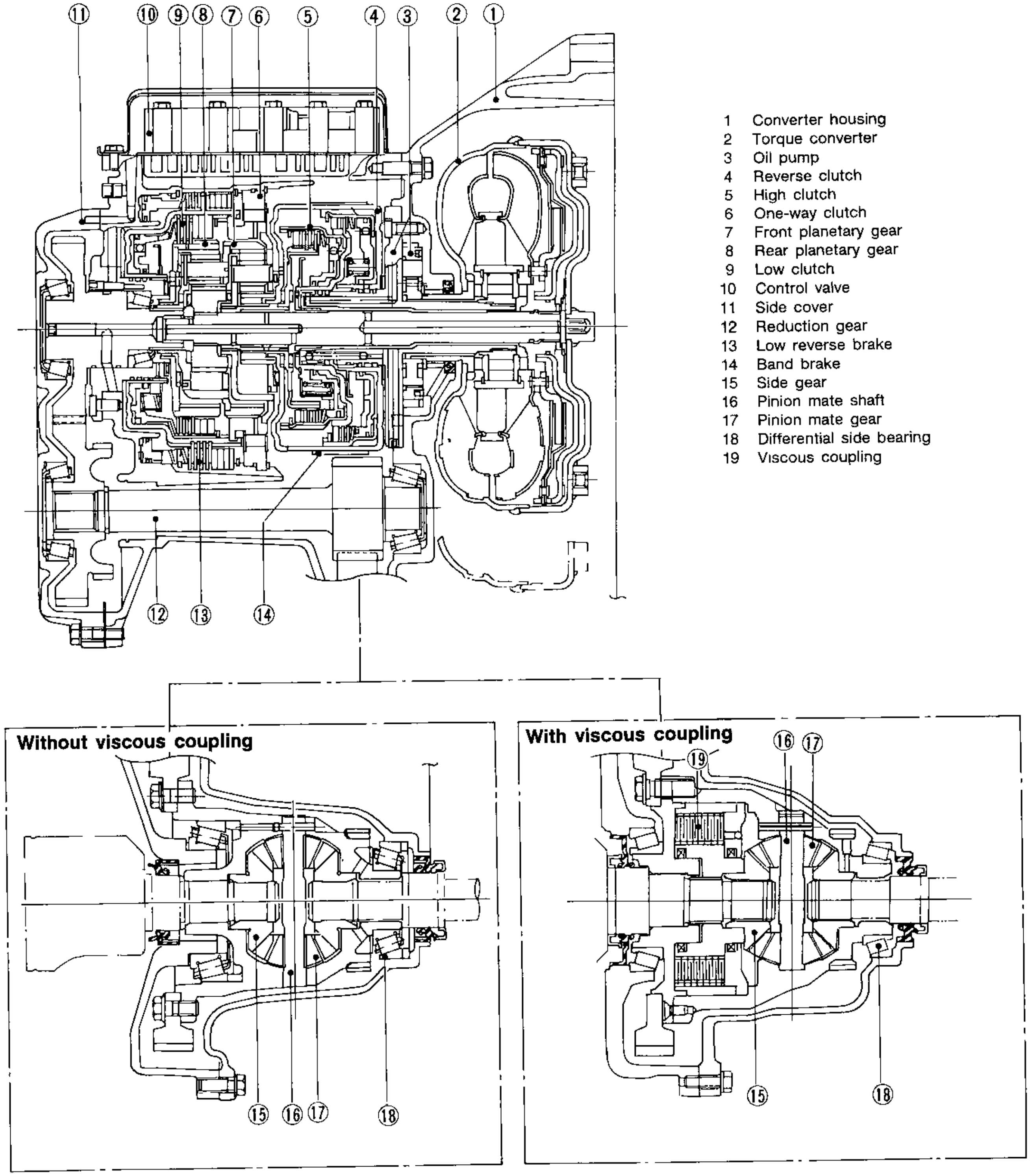
- Reinstall any part removed.

Installation (Cont'd)



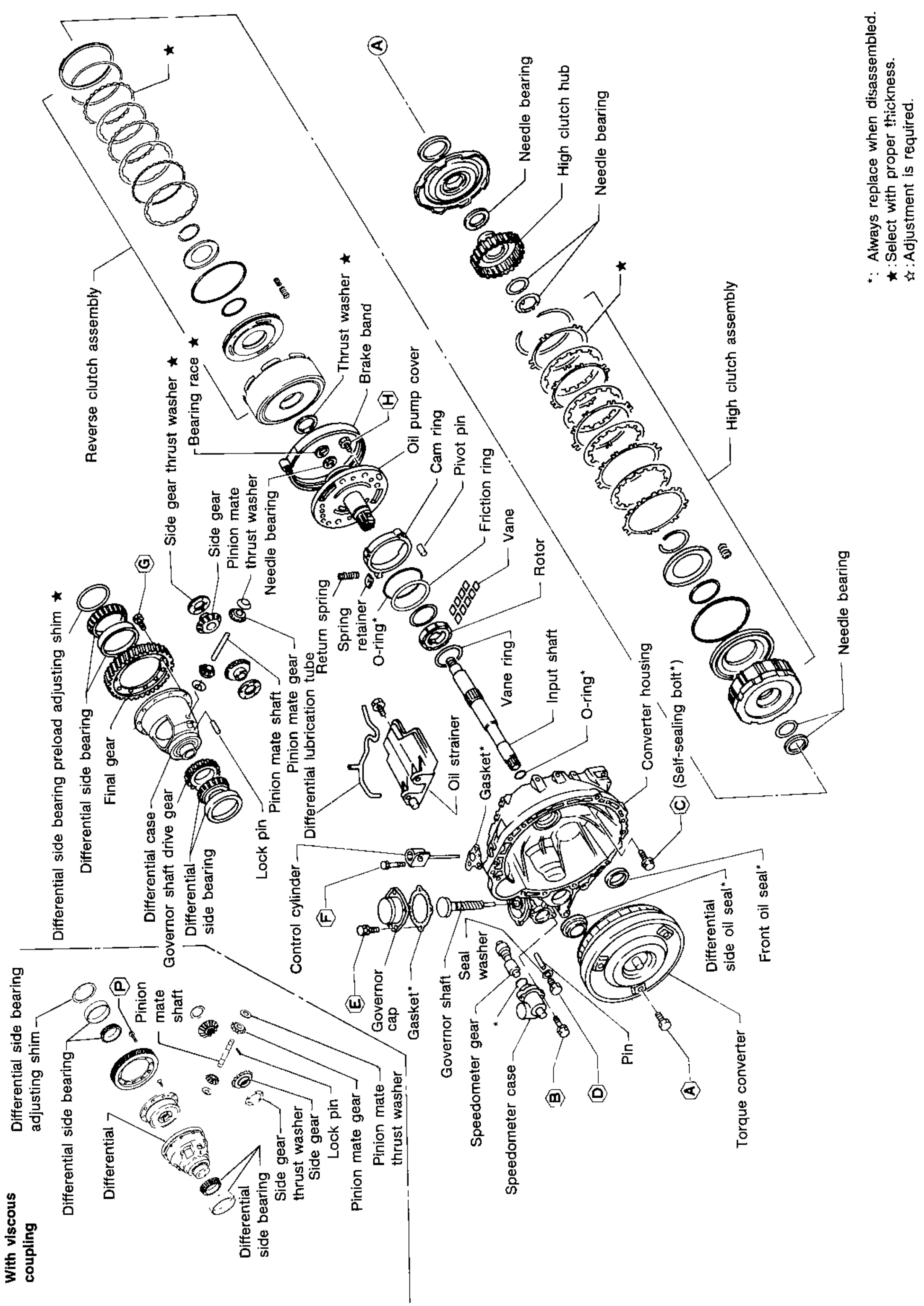
SAT638A

- Reinstall any part removed.
- Refill transaxle with A.T.F. and check fluid level.
- Adjust control cable and inhibitor switch. — Refer to "ON-VEHICLE SERVICE".
- Check continuity of inhibitor switch. — Refer to "Electrical Components Inspection".
- Move selector lever through all positions to be sure that transaxle 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 transaxle is shifted.
- Perform road test — Refer to "Road Testing".

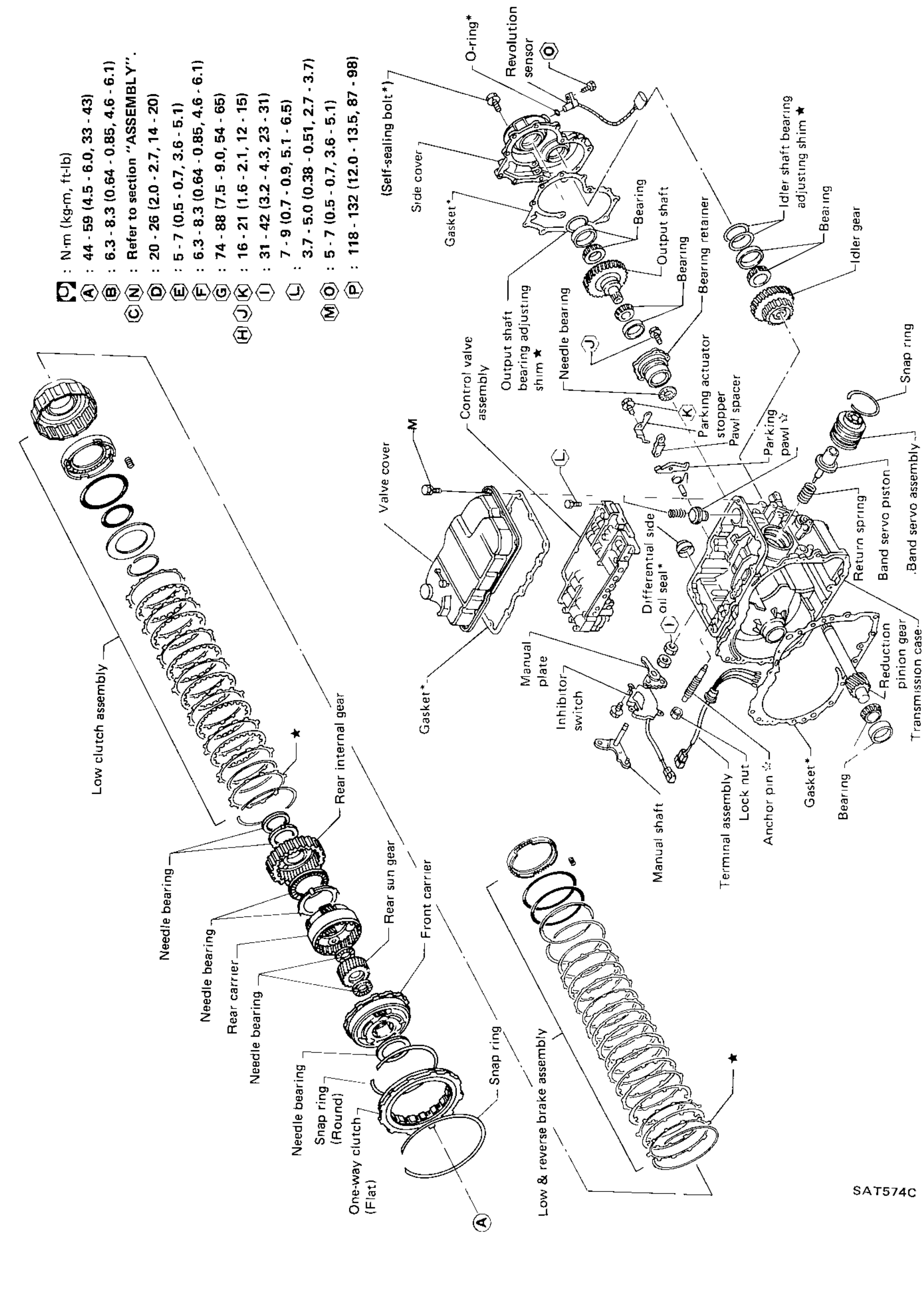


1 Converter housing
2 Torque converter
3 Oil pump
4 Reverse clutch
5 High clutch
6 One-way clutch
7 Front planetary gear
8 Rear planetary gear
9 Low clutch
10 Control valve
11 Side cover
12 Reduction gear
13 Low reverse brake
14 Band brake
15 Side gear
16 Pinion mate shaft
17 Pinion mate gear
18 Differential side bearing
19 Viscous coupling

SAT573C

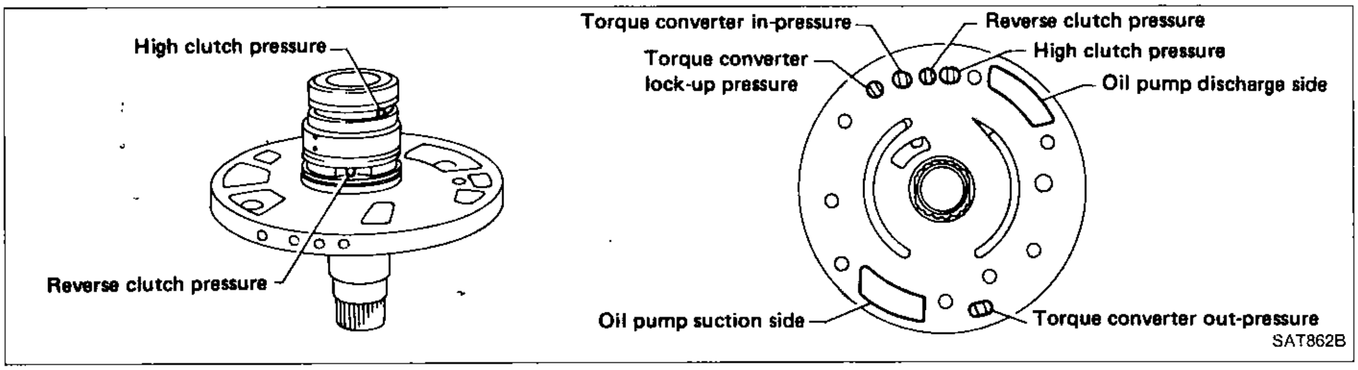


With viscous coupling
Differential side bearing adjusting shim
Differential side bearing
Differential
Differential side bearing
Side gear thrust washer
Side gear
Lock pin
Pinion mate gear
Pinion mate thrust washer
Pinion mate shaft
Differential side bearing preload adjusting shim ★
Differential side bearing
Final gear
Differential case
Governor shaft drive gear
Differential side bearing
Lock pin
Pinion mate shaft
Pinion mate gear
Differential lubrication tube
Side gear thrust washer
Side gear
Pinion mate thrust washer
Needle bearing
Reverse clutch assembly
Bearing race ★
Thrust washer ★
Brake band
Oil pump cover
Cam ring
Pivot pin
Friction ring
Vane
Rotor
Return spring
Spring retainer
O-ring*
Vane ring
Input shaft
O-ring*
Oil strainer
Gasket*
Control cylinder
Governor cap
Gasket*
Governor shaft
Seal washer
Speedometer gear
Speedometer case
Pin
Converter housing
(Self-sealing bolt*)
Differential side oil seal*
Front oil seal*
Torque converter
Needle bearing
High clutch hub
Needle bearing
High clutch assembly
Needle bearing
*: Always replace when disassembled.
★: Select with proper thickness.
☆: Adjustment is required.

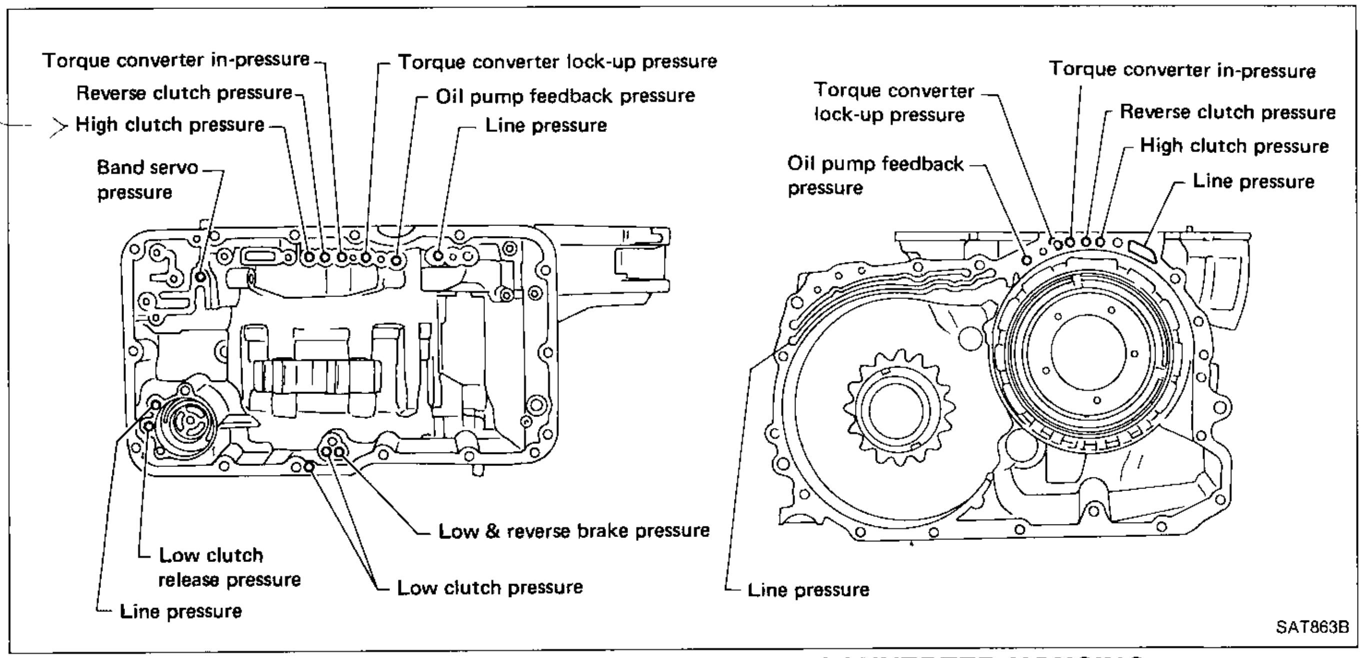

N·m (kg-m, ft-lb)
Ⓐ : 44 - 59 (4.5 - 6.0, 33 - 43)
Ⓑ : 6.3 - 8.3 (0.64 - 0.85, 4.6 - 6.1)
Ⓒ Ⓝ : Refer to section "ASSEMBLY".
Ⓓ : 20 - 26 (2.0 - 2.7, 14 - 20)
Ⓔ : 5 - 7 (0.5 - 0.7, 3.6 - 5.1)
Ⓕ : 6.3 - 8.3 (0.64 - 0.85, 4.6 - 6.1)
Ⓖ : 74 - 88 (7.5 - 9.0, 54 - 65)
Ⓗ Ⓙ Ⓚ : 16 - 21 (1.6 - 2.1, 12 - 15)
Ⓘ : 31 - 42 (3.2 - 4.3, 23 - 31)
Ⓛ : 7 - 9 (0.7 - 0.9, 5.1 - 6.5)
3.7 - 5.0 (0.38 - 0.51, 2.7 - 3.7)
Ⓜ Ⓞ : 5 - 7 (0.5 - 0.7, 3.6 - 5.1)
Ⓟ : 118 - 132 (12.0 - 13.5, 87 - 98)
(Self-sealing bolt*)
O-ring*
Revolution sensor
Side cover
Gasket*
Bearing
Output shaft
Bearing
Bearing retainer
Idler shaft bearing adjusting shim ★
Bearing
Idler gear
Output shaft bearing adjusting shim ★
Needle bearing
Control valve assembly
Parking actuator stopper
Pawl spacer
Parking pawl ☆
Snap ring
Valve cover
Differential side oil seal*
Return spring
Band servo piston
Band servo assembly
Low clutch assembly
Rear internal gear
Manual plate
Inhibitor switch
Reduction pinion gear
Transmission case
Gasket*
Manual shaft
Terminal assembly
Lock nut
Anchor pin ☆
Gasket*
Bearing
Needle bearing
Needle bearing
Rear sun gear
Front carrier
Rear carrier
Needle bearing
Needle bearing
Snap ring
Needle bearing
Snap ring (Round)
One-way clutch (Flat)
Low & reverse brake assembly
SAT574C

Oil Channel

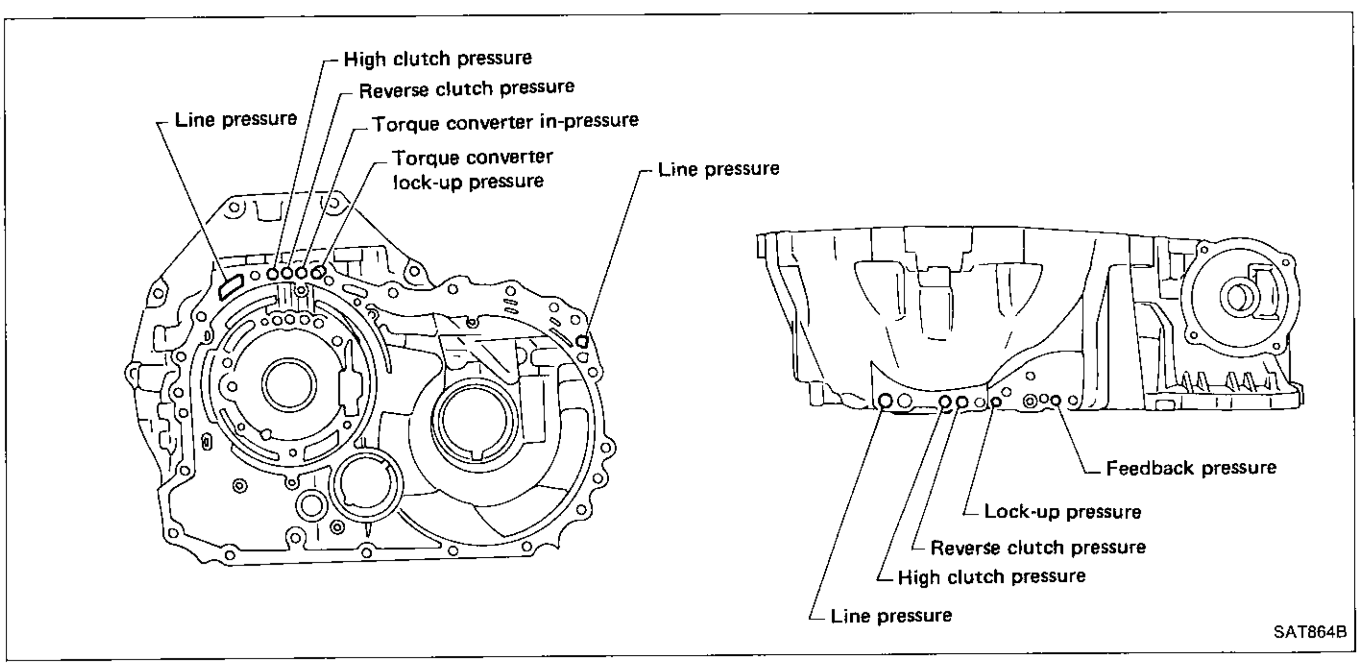
OIL CHANNELS IN OIL PUMP COVER



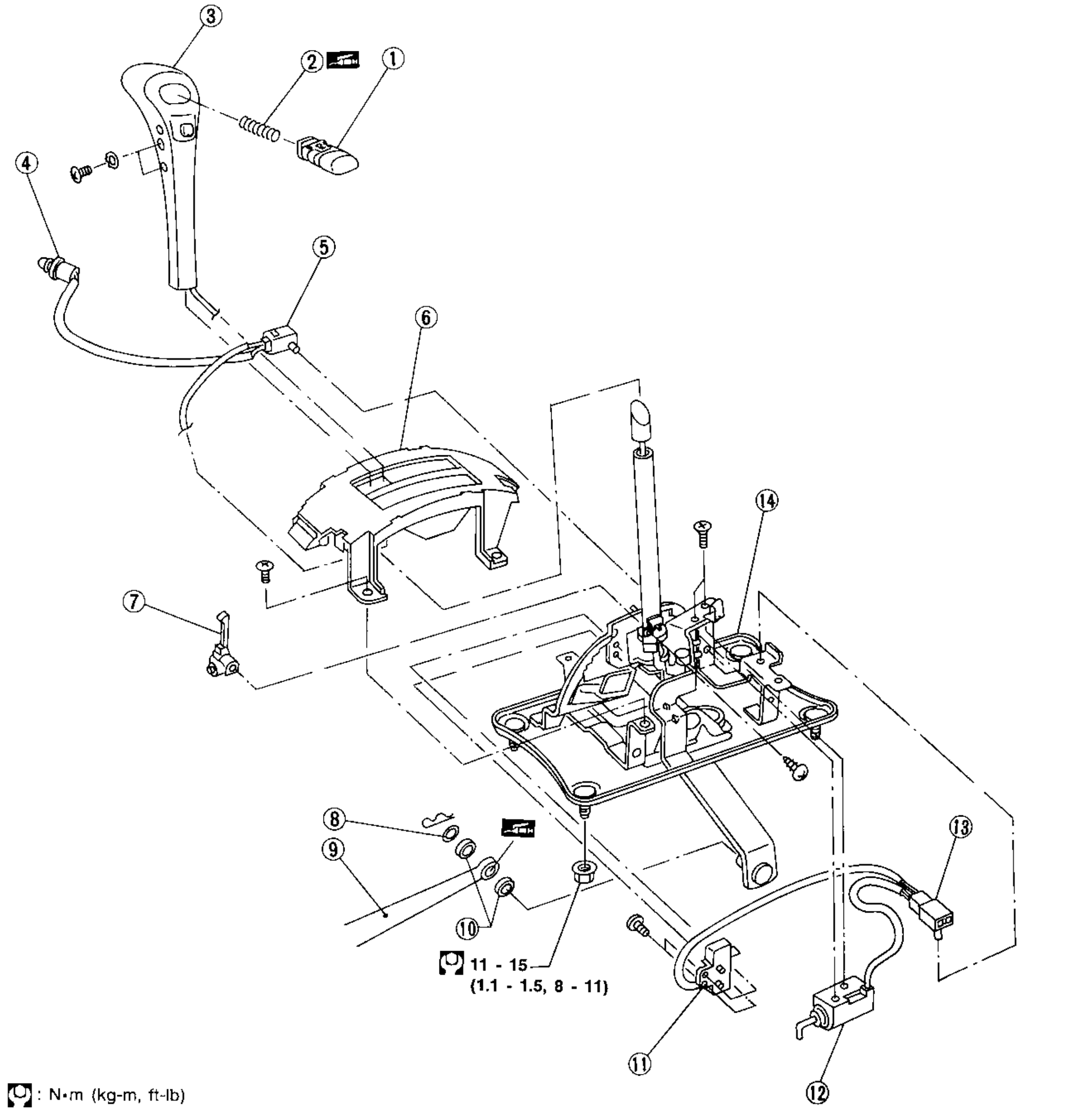
OIL CHANNELS IN TRANSMISSION CASE



OIL CHANNELS IN CONVERTER HOUSING

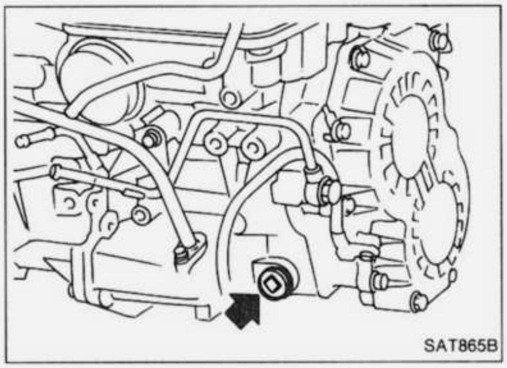


Shift Control Components



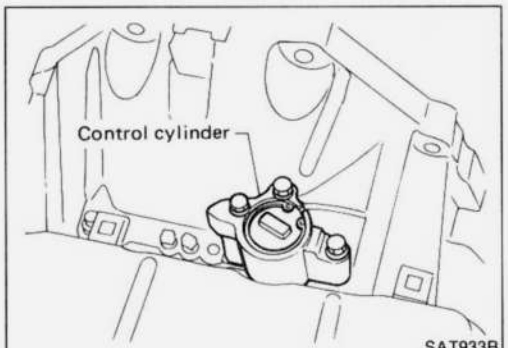
SAT019E

① Selector lever release knob
② Return spring
③ Selector lever knob
④ Position indicator lamp
⑤ O.D. control switch and position indicator lamp harness connector
⑥ Position indicator
⑦ Shift lock release knob
⑧ Washer
⑨ Control cable
⑩ Collar
⑪ Detention switch (Shift and key)
⑫ Shift lock solenoid
⑬ Shift lock solenoid and detention switch harness connector
⑭ Selector lever assembly



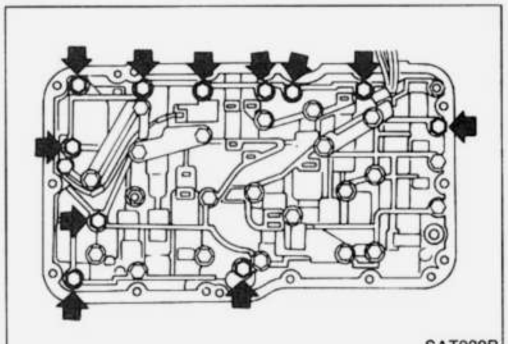
SAT865B

1. Drain A.T.F. through drain hole.
2. Remove torque converter.



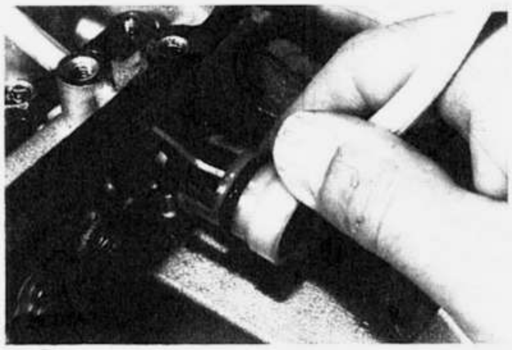
SAT933B

3. Remove control cylinder.
4. Remove control valve cover.



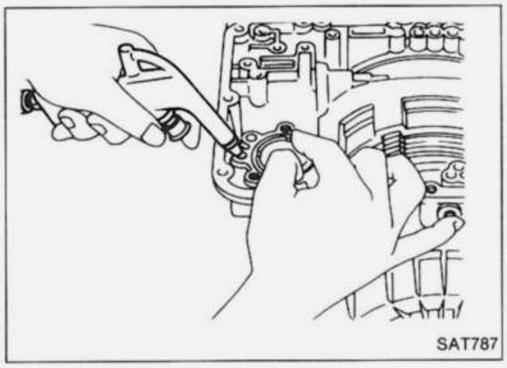
SAT929B

5. Disconnect harness connectors on control valve and remove control valve assembly.



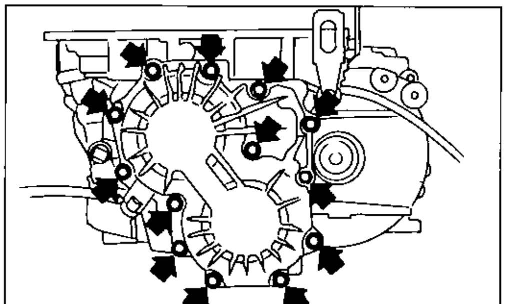
6. Remove terminal assembly.

The terminal retrieving hooks will break if they are forced inward too far. Bend them gently inward while pulling carefully outward on the terminal. Do not pull on the wires.

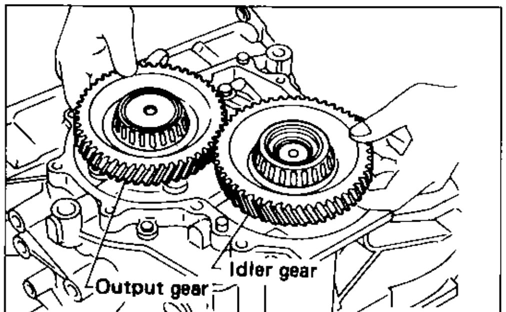


SAT787

7. Remove accumulator.

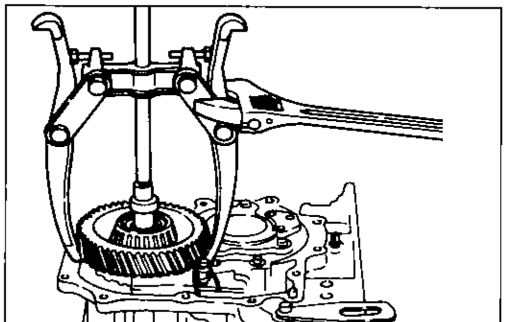

SAT038C

8. Remove side cover.

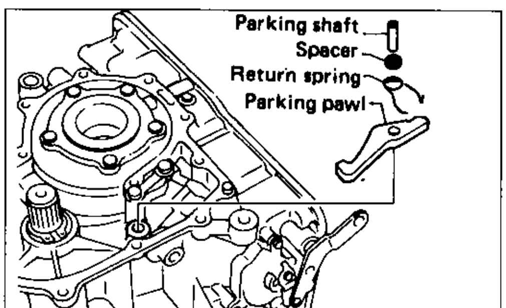


SAT788

9. Remove output gear.

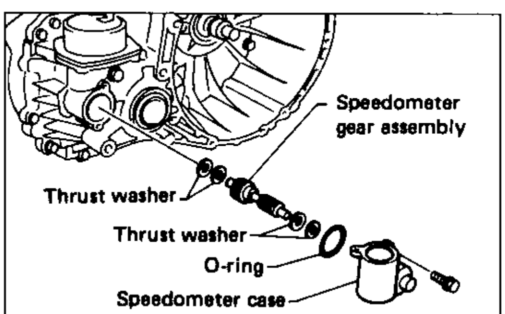

SAT003A

10. Draw out idler gear.



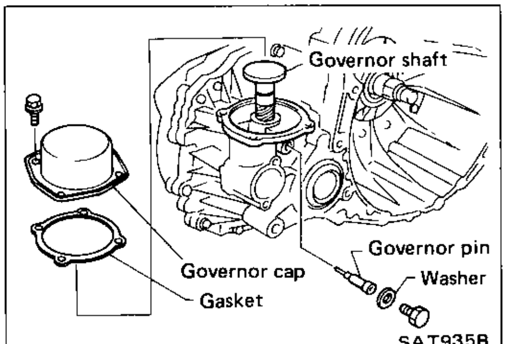
SAT789

11. Remove parking pawl, return spring, parking shaft and spacer.



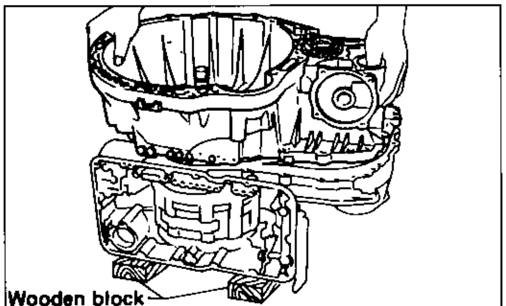
SAT888

12. Remove speedometer and speedometer gear.



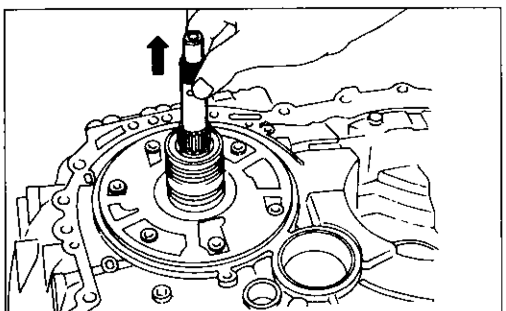
SAT935B

13. Remove governor shaft.

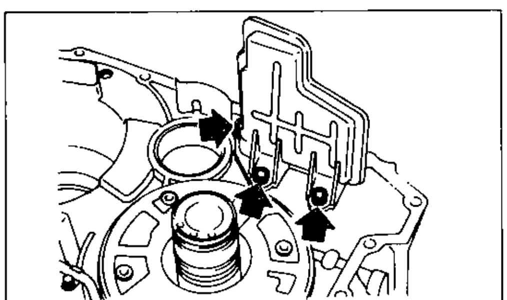


SAT792

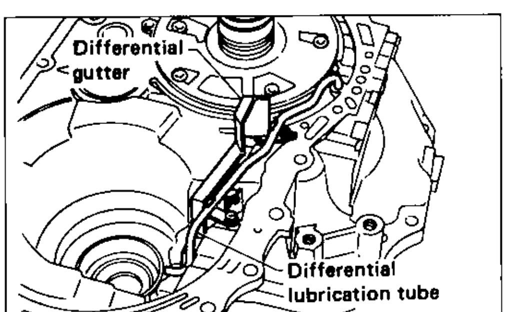
14. Put transaxle assembly on wooden block and remove converter housing.


SAT793

15. Remove final drive assembly and reduction pinion gear.
16. After removing O-ring from input shaft, extract input shaft from converter housing.

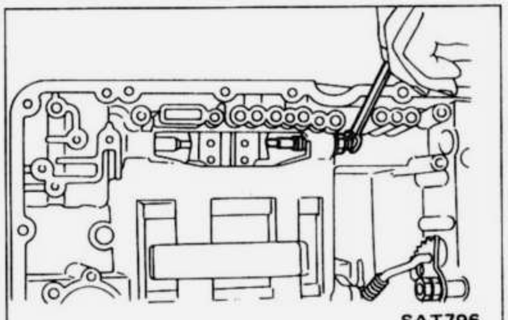

SAT794

17. Remove oil strainer.

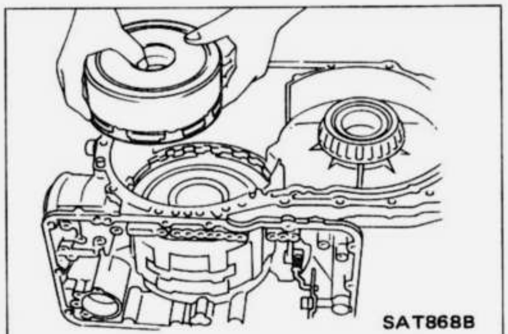


SAT795

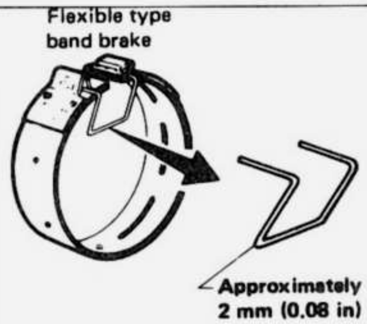
18. Remove differential lubrication tube and gutter.


SAT796

19. Loosen band brake stem lock nut, then back off piston stem.

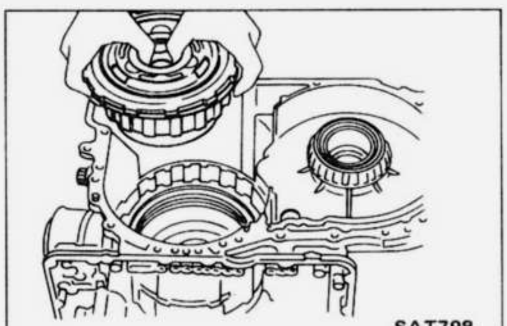

SAT868B

20. Remove brake band and high clutch & reverse clutch pack.

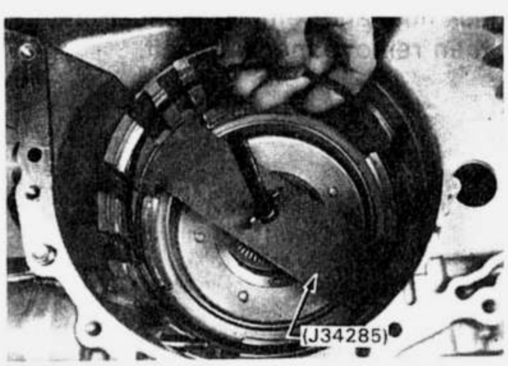


SAT656

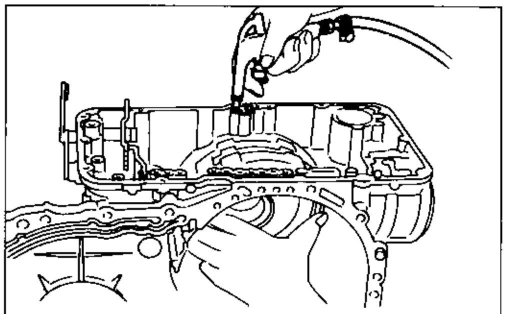
- **To prevent brake linings from cracking or peeling, do not stretch the flexible band unnecessarily. Before removing the brake band, always secure it with a clip as shown in the figure at left.**
  Leave the clip in position after removing the brake band.


SAT798

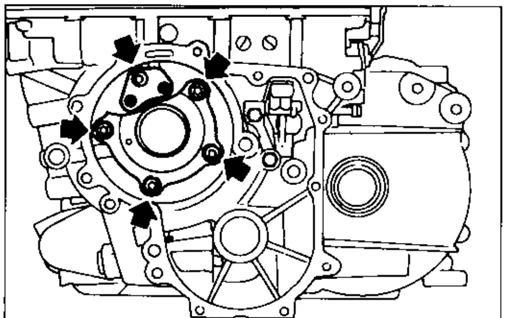
21. Remove one-way clutch, front carrier, rear carrier and low clutch as a set.



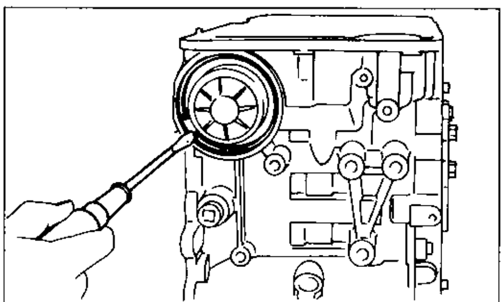
22. Remove low & reverse brake clutches, and detach low & reverse brake retainer snap ring pushing retainer.


SAT800

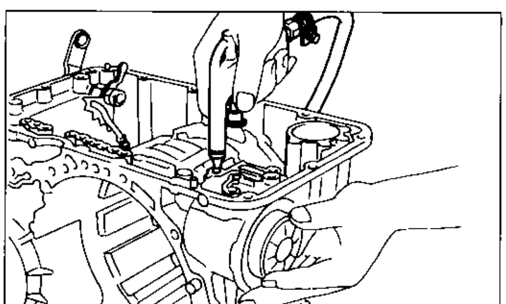
23. Remove low and reverse brake piston with compressed air.


SAT391A

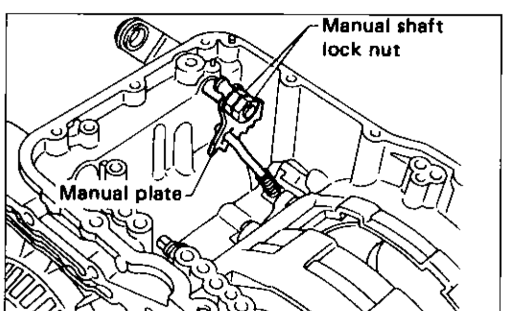
24. Remove bearing retainer assembly.


SAT802

25. Remove band servo snap ring.


SAT803

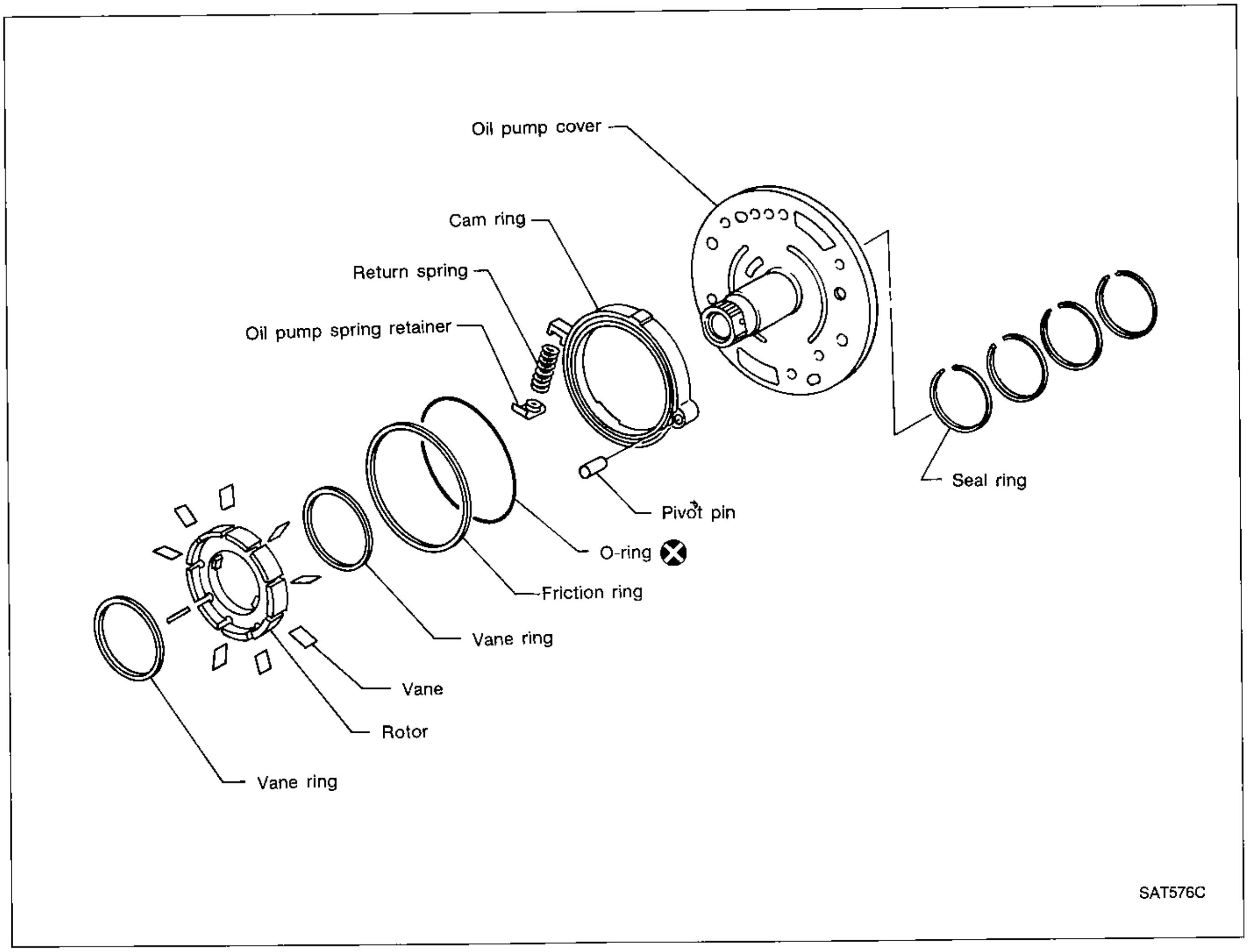
26. Remove band brake servo, retainer and return spring.

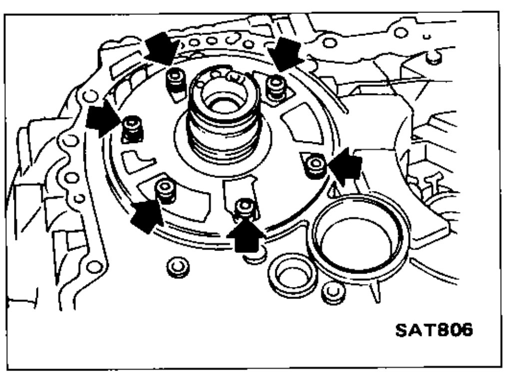


SAT804

27. Loosen manual shaft lock nuts and remove manual plate.
28. Pull out retaining pin, then remove manual shaft.

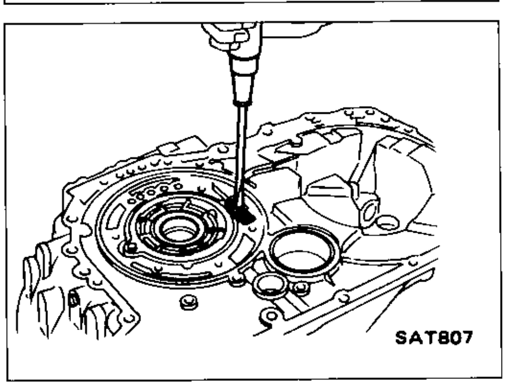
Oil Pump





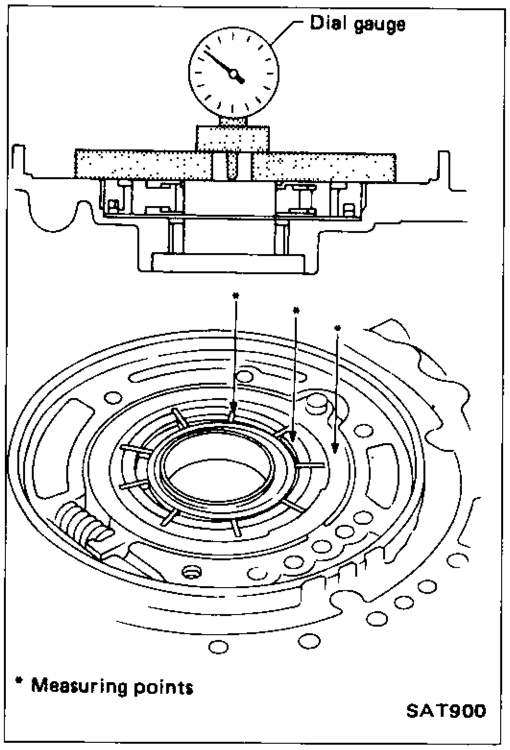
DISASSEMBLY

1. Remove oil pump cover.



2. Remove return spring taking care not to damage converter housing.

Oil Pump (Cont'd)



INSPECTION

1. Inspect oil pump cover, cam ring, rotor and vanes for damage and visible wear.
2. Measure clearance between oil pump cover and cam ring, rotor and vanes in at least four places along their circumstances. The maximum measured value should be within the specified range.

- **Be sure to remove friction ring and vane ring when measuring clearance.**

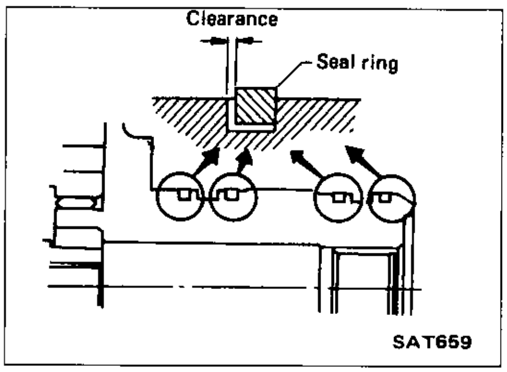
Standard clearance:

0.010 - 0.024 mm
(0.0004 - 0.0009 in) (Cam ring to oil pump cover)
0.017 - 0.031 mm
(0.0007 - 0.0012 in) (Rotor to oil pump cover)
0.017 - 0.031 mm
(0.0007 - 0.0012 in) (Vane to oil pump cover)

Wear limit:

0.034 mm (0.0013 in)

If the clearance is out of above specification, replace oil pump as an assembly.



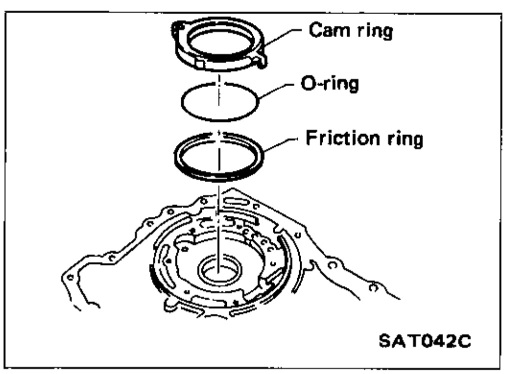
3. Measure clearance between seal ring and ring groove.

Standard clearance:

0.10 - 0.25 mm (0.0039 - 0.0098 in)

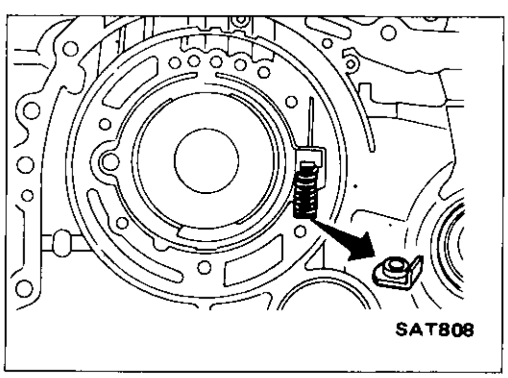
Wear limit:

0.25 mm (0.0098 in)



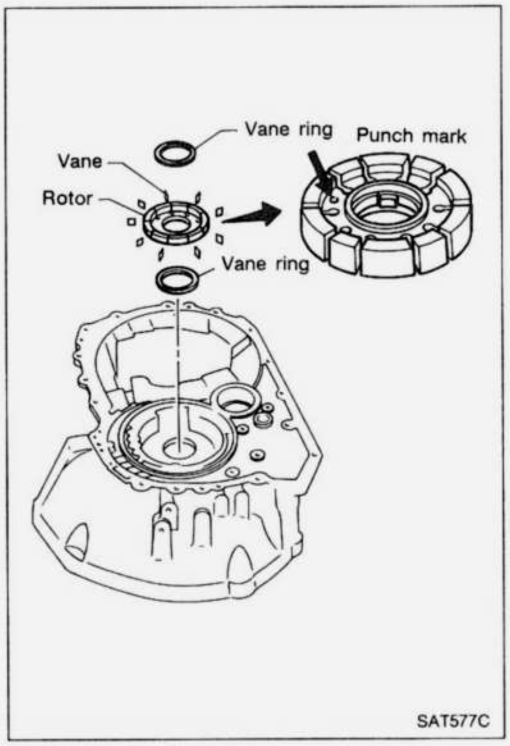
ASSEMBLY

1. Install cam ring, O-ring and friction ring.



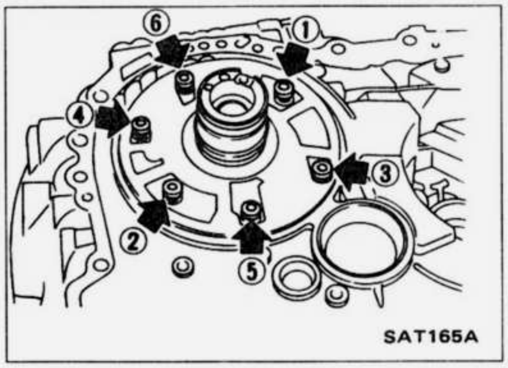
2. Install return spring and spring retainer.

Oil Pump (Cont'd)



SAT577C

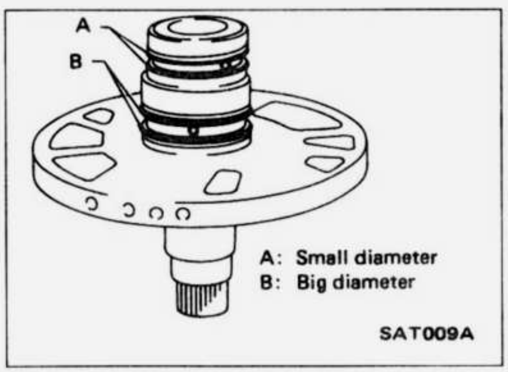
3. Assemble rotor, vanes and vane rings. Pay attention to direction of rotor.



SAT165A

4. Install oil pump cover.

Tighten down cover evenly in a criss-cross type pattern.



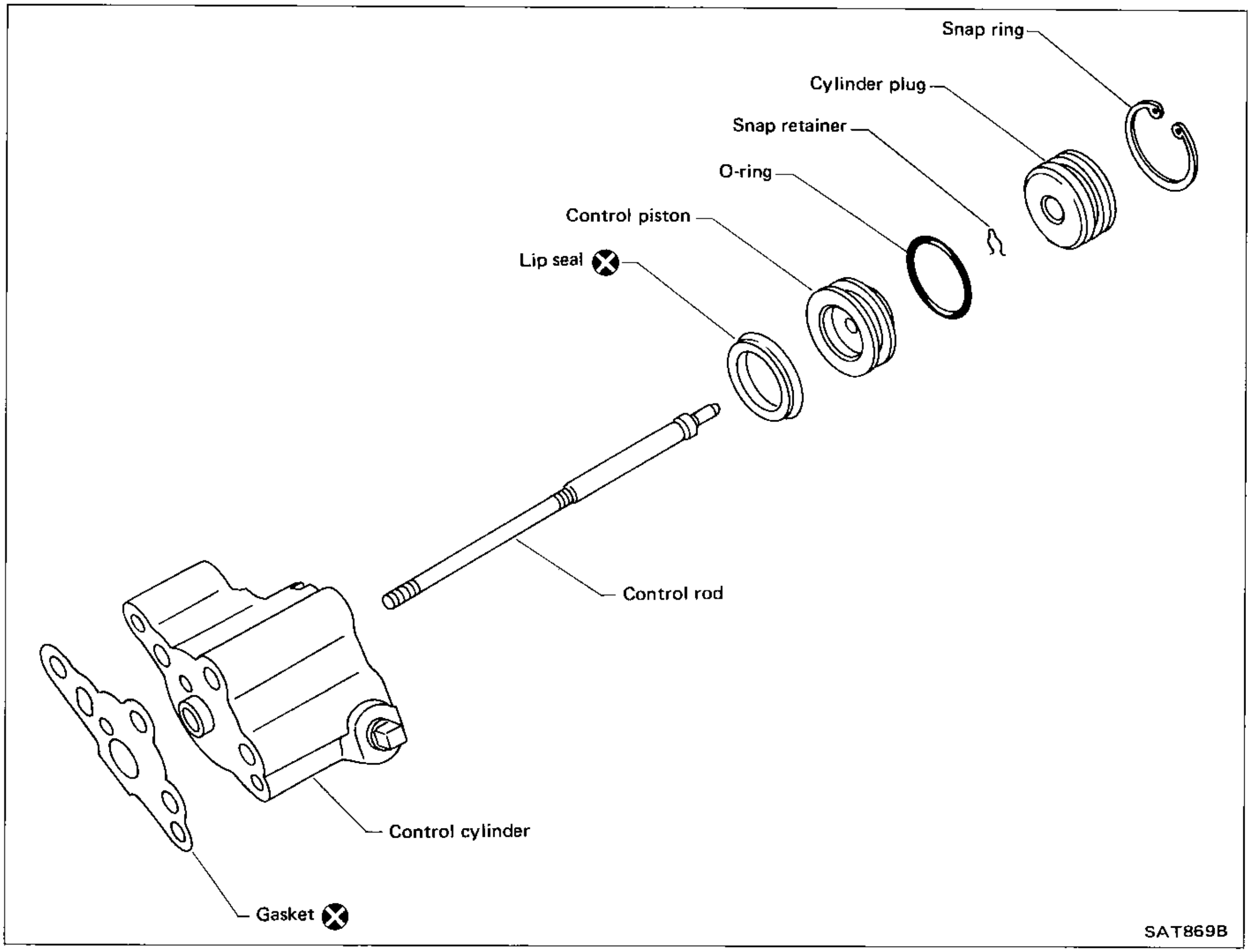
SAT009A

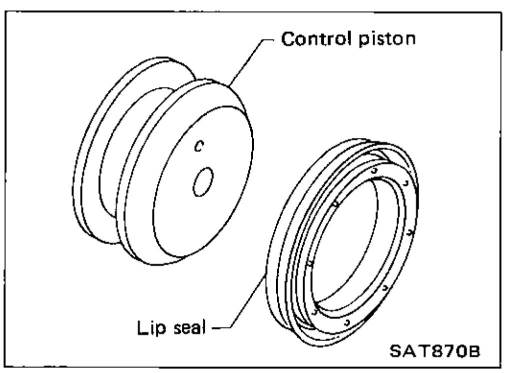
5. Rotate the pump when it has been assembled to ensure that all parts have been correctly assembled.
6. Install seal rings.

Refer to the figure at left for proper locations of the two different types of seal rings.

- **These seal rings can be cut or deformed if they are improperly seated in their grooves when the drum is installed. Clean the ring grooves carefully and fill them with petroleum jelly. Then install the rings making sure they fit into the grooves as tightly as possible.**

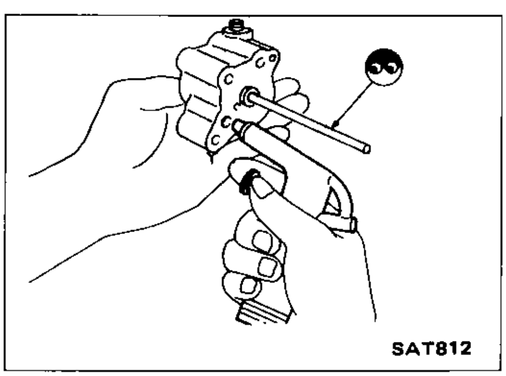
Control Cylinder





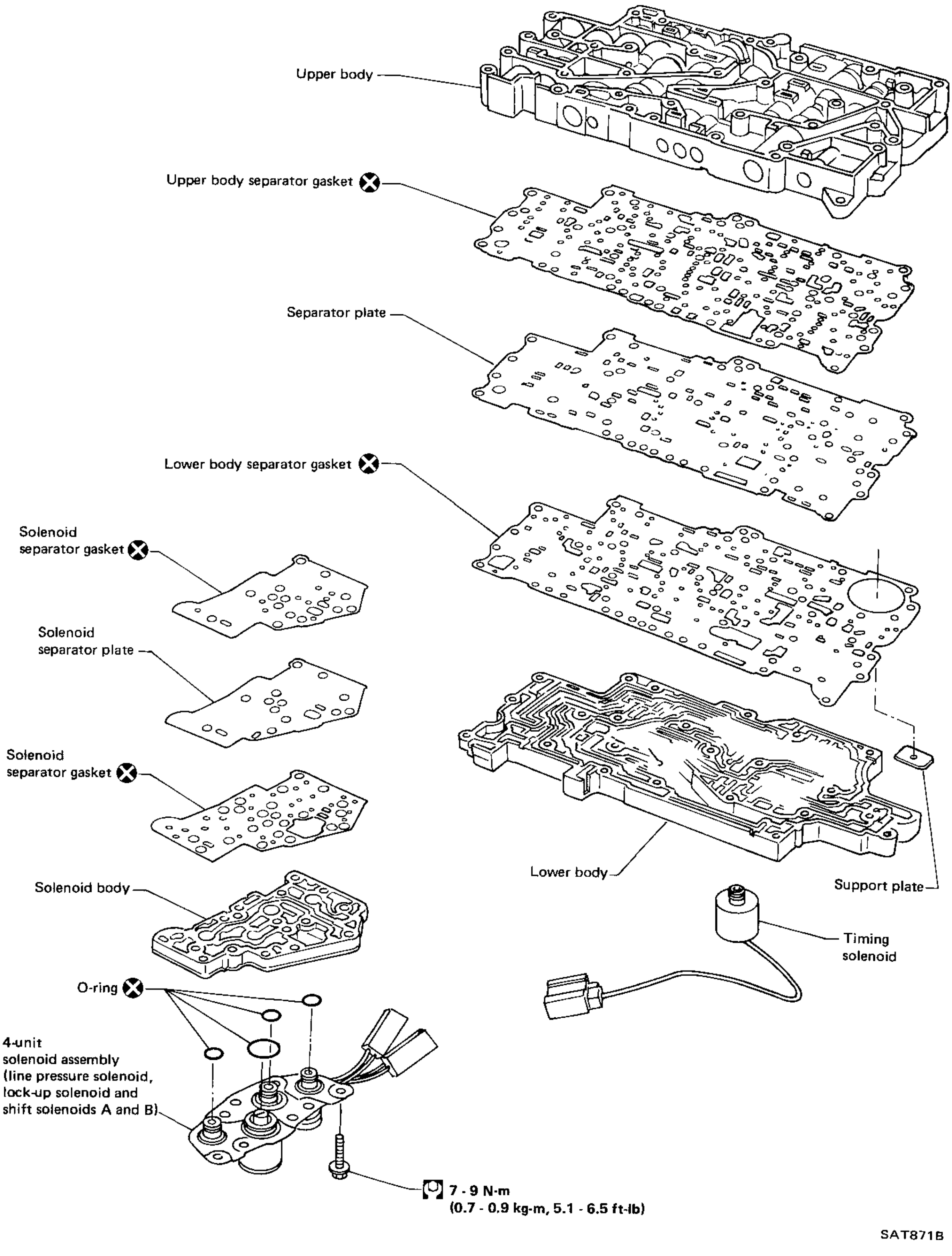
INSPECTION AND ASSEMBLY

- Inspect control cylinder body, control piston and cylinder plug for scratches or damage. Replace if necessary.
- When assembling, pay attention to the direction of lip seal.



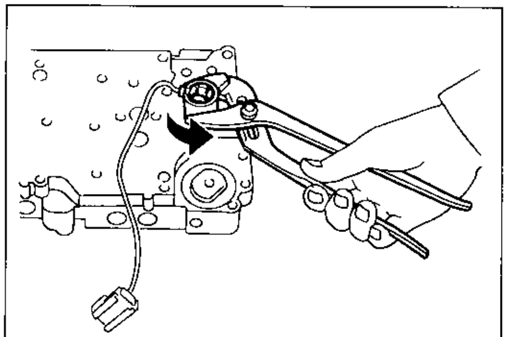
- After assembling, check the operation.

Control Valve Assembly

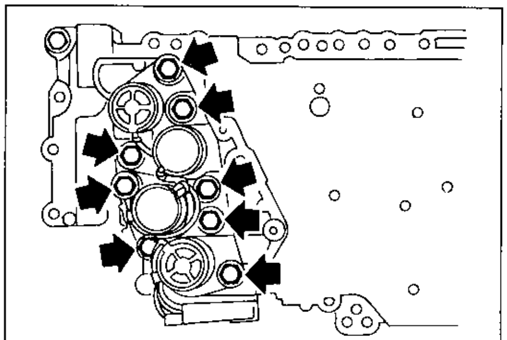


Control Valve Assembly (Cont'd)

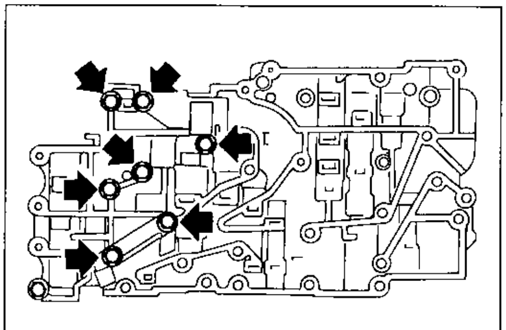
DISASSEMBLY


SAT872B

1. Remove solenoids.
a. Remove timing solenoid.
b. Remove O-ring from solenoid.

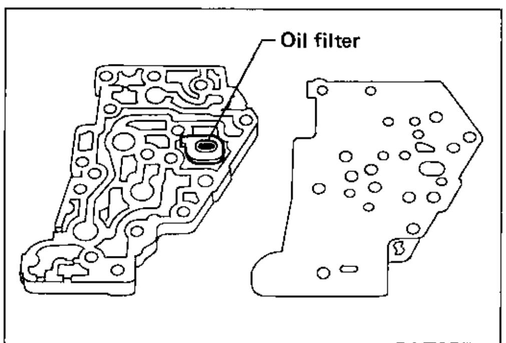

SAT873B

c. Remove shift solenoid A, shift solenoid B, line pressure solenoid and lock-up solenoid.
d. Remove O-rings from solenoids.


SAT874B

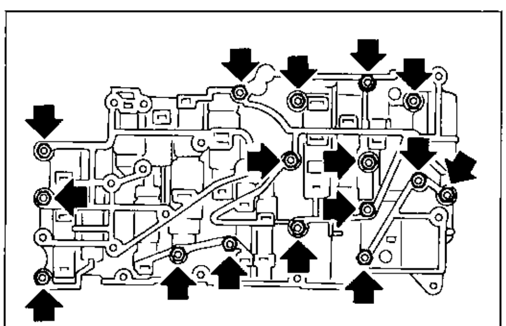
2. Remove solenoid body.
a. Place lower body facedown and remove bolts.

Be careful not to drop solenoid body.



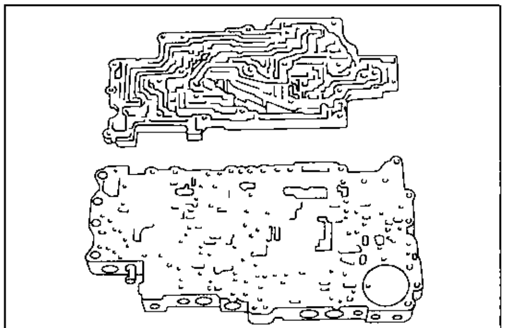
SAT875B

b. Place upper body face down, and remove solenoid body with separator gaskets and separator plate.
c. Remove separator gaskets, separator plate and oil filter from solenoid body.


SAT876B

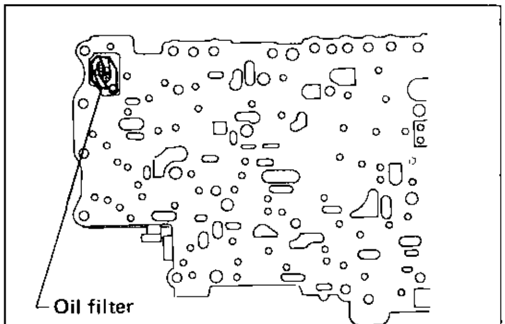
3. Disassemble upper and lower bodies.
a. Place lower body facedown, and remove bolts, reamer bolts and support plate.

Control Valve Assembly (Cont'd)



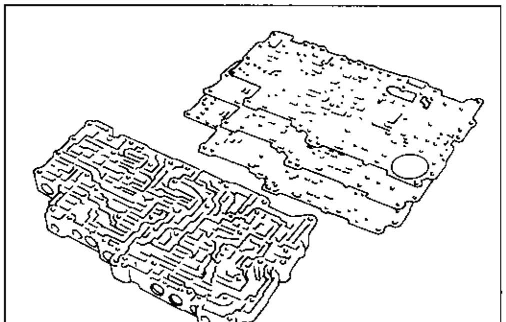
SAT877B

b. Position upper body downward. Remove lower body with separator plate and separator gasket attached to upper body.

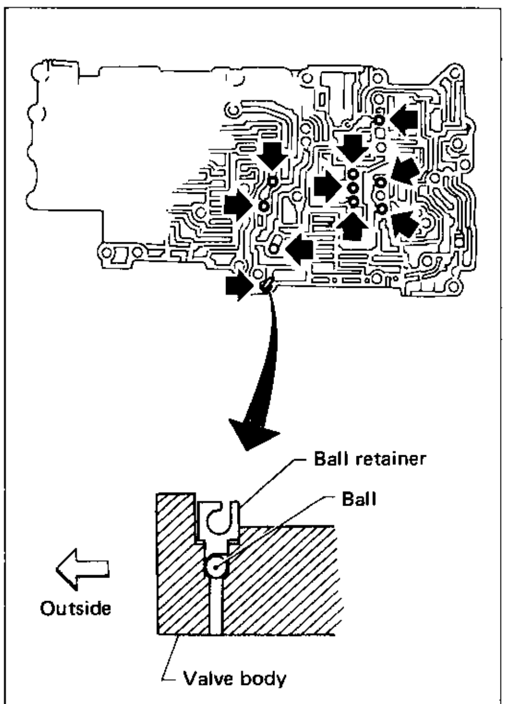


SAT878B

c. Remove oil filter, separator gaskets and separator plate from upper body.



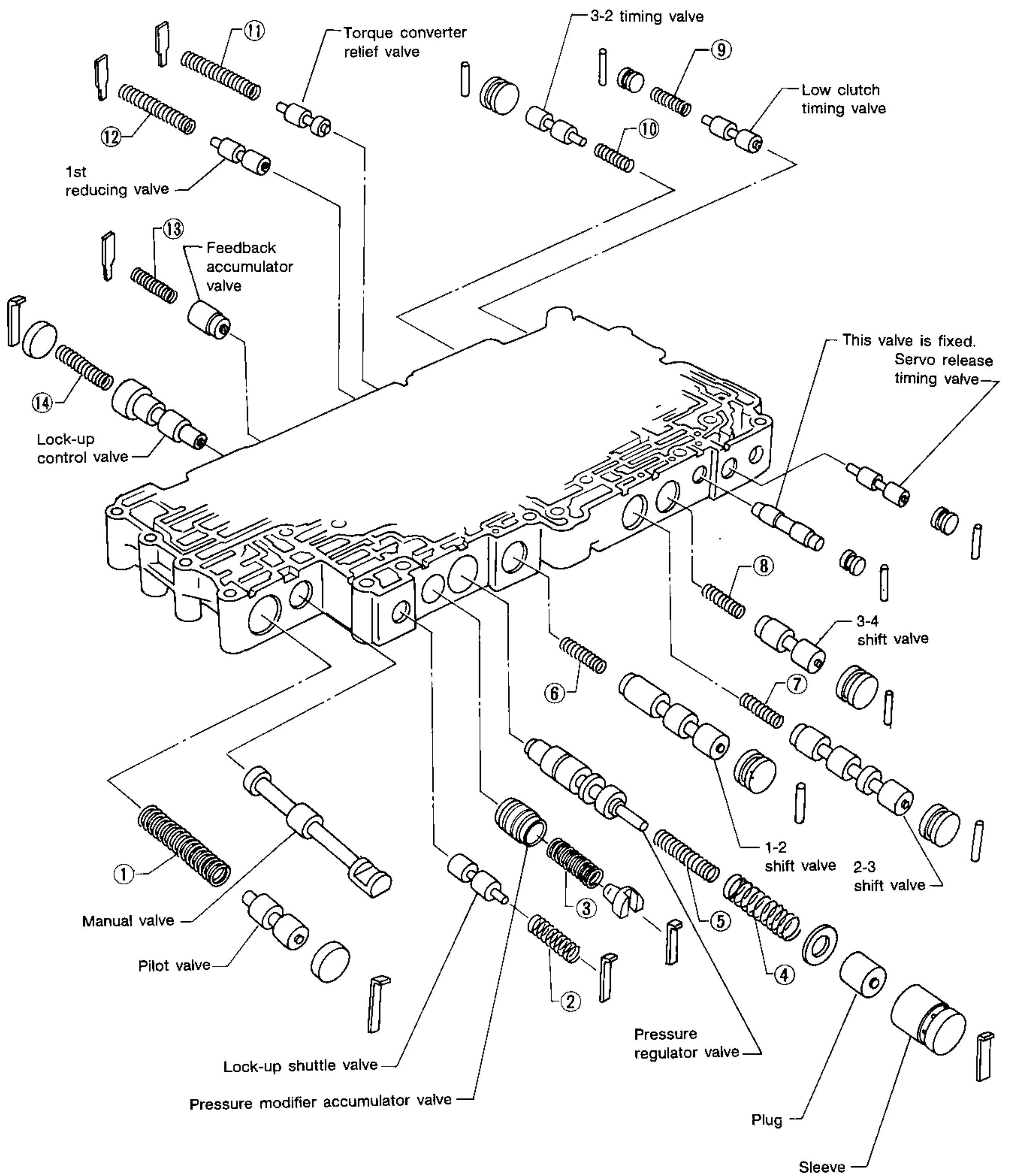
SAT879B



SAT880B

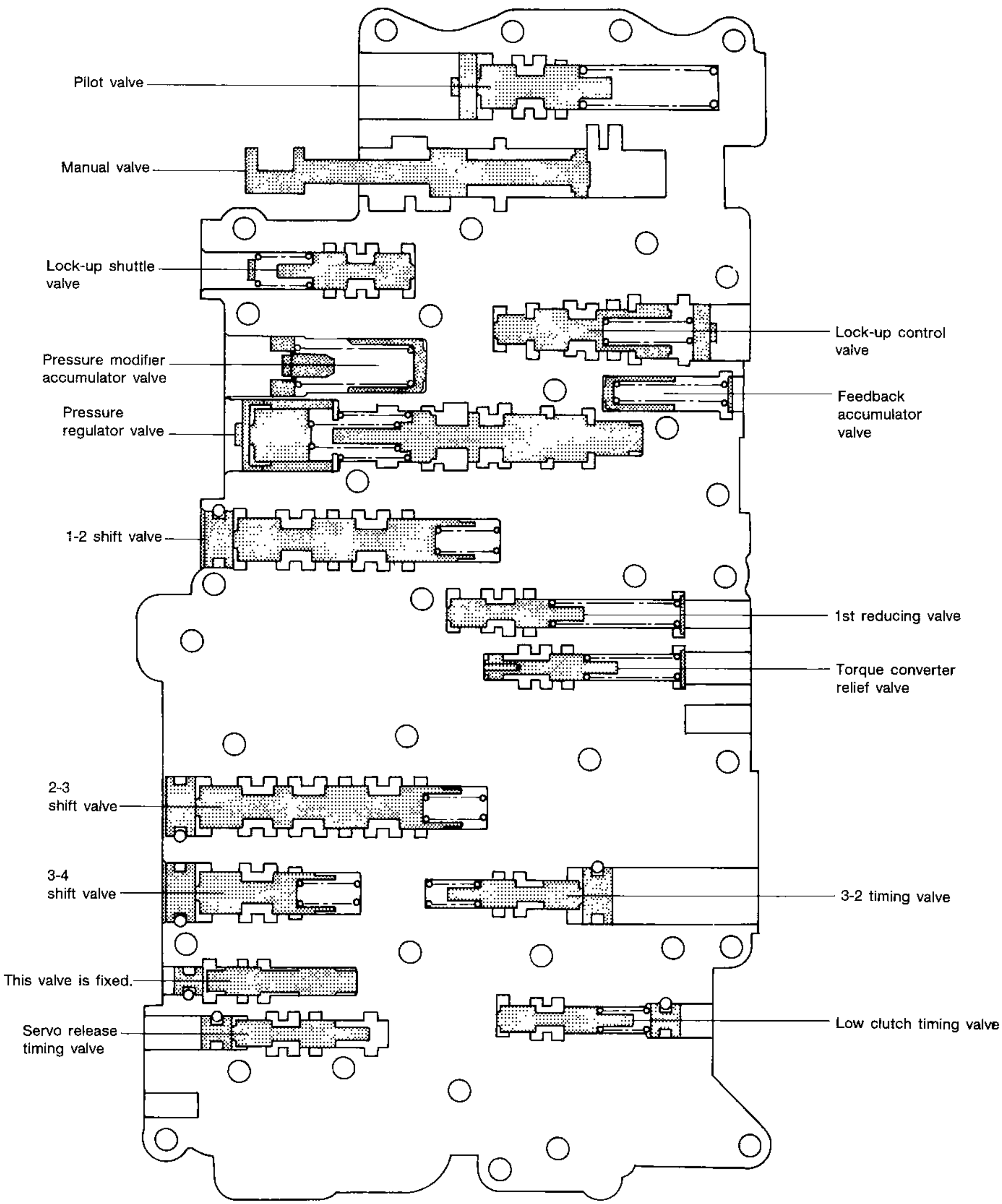
d. Check to see that steel balls are properly positioned in upper body and then remove them from upper body.

Control Valve Upper Body



SAT597C

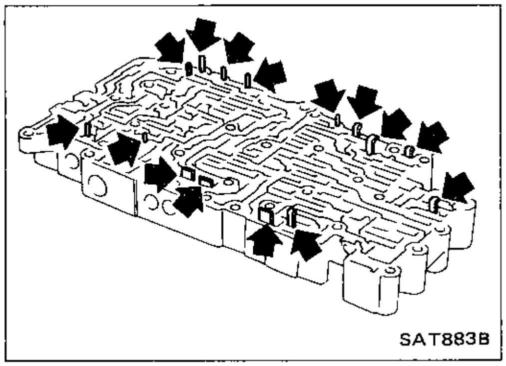
Control Valve Upper Body (Cont'd)



SAT598C

Control Valve Upper Body (Cont'd)

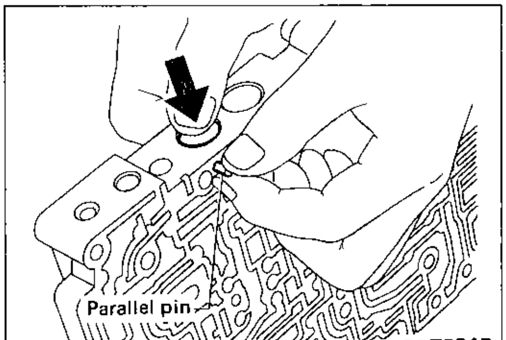
DISASSEMBLY



SAT883B

1. Remove valves at parallel pins.

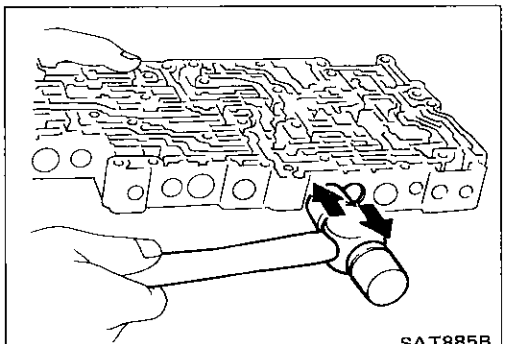
Do not use a magnetic hand.



SAT884B

a. Remove parallel pins while pressing their corresponding plugs and sleeves.

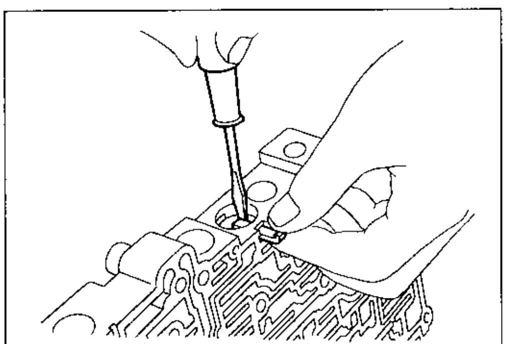
Remove plug slowly to prevent internal parts from jumping out.



SAT885B

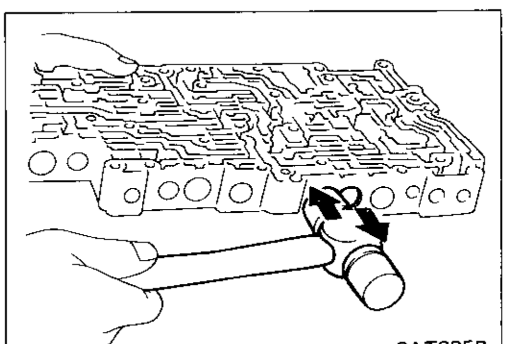
b. Place mating surface of valve facedown, and remove internal parts.

- **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.**



SAT886B

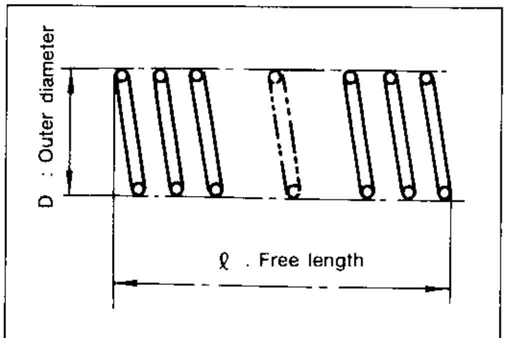
2. Remove valves at retainer plates.
a. Remove retainer plates while pressing their corresponding plugs, sleeves or springs.



SAT885B

b. 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.**



SAT829A

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 page AT-118.

Inspection standard

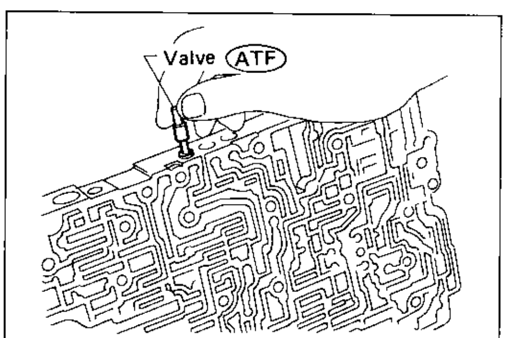
Unit: mm (in)

Parts \ Item	Part No.	ℓ	D
① Pilot valve spring	31742-27X60	56.6 (2.228)	10.9 (0.429)
② Lock-up shuttle valve spring	31742-27X65	28.8 (1.134)	9.0 (0.354)
③ Pressure modifier accumulator valve spring	31742-27X72	30.84 (1.2142)	9.8 (0.386
④ Pressure regulator valve outer spring	31742-27X61	37.3 (1.469)	12.9 (0.508)
⑤ Pressure regulator valve inner spring	31742-27X62	37.7 (1.484)	7.95 (0.3130)
⑥ 1 - 2 shift valve spring	31742-27X61	24.9 (0.980)	7.0 (0.276)
⑦ 2 - 3 shift valve spring	31762-27X61	24.9 (0.980)	7.0 (0.276)
⑧ 3 - 4 shift valve spring	31762-27X61	24.9 (0.980)	7.0 (0.276)
⑨ Low clutch timing valve spring	31736-01X02	21.7 (0.854)	6.65 (0.2618)
⑩ 3 - 2 timing valve spring	31736-01X02	21.7 (0.854)	6.65 (0.2618)
⑪ Torque converter relief valve spring	31742-27X01	44.7 (1.760)	7.0 (0.276)
⑫ 1st reducing valve spring	31742-27X67	48.8 (1.921)	6.8 (0.268)
⑬ Feedback accumulator valve spring	31742-27X	33.75 (1.3287)	6.35 (0.2500)
⑭ Lock-up control valve spring	31742-27X69	41.8 (1.646)	7.0 (0.276)

- Replace valve springs if deformed or fatigued.

Control valves

- Check sliding surfaces of valves, sleeves and plugs.



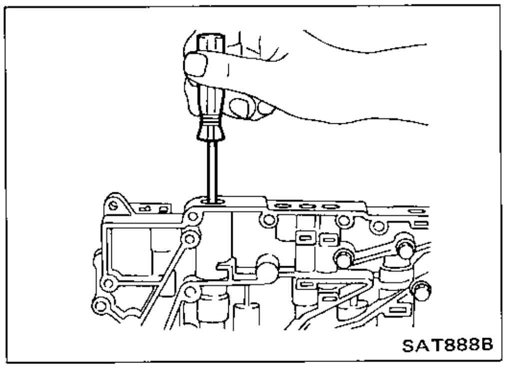
SAT887B

ASSEMBLY

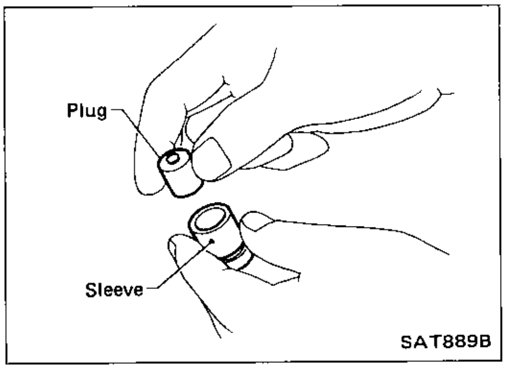
1. Lubricate the control valve body and all valves with A.T.F. Install control valves by sliding them carefully into their bores.

Be careful not to scratch or damage valve body.

Control Valve Upper Body (Cont'd)

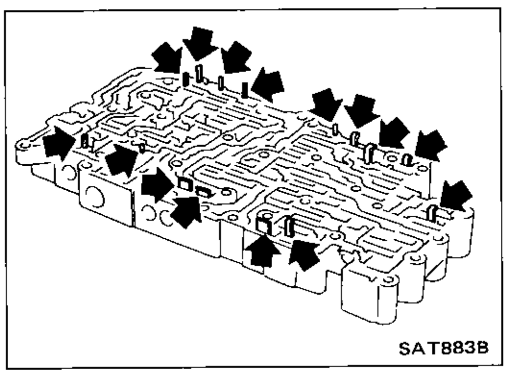


- Wrap a small screwdriver with vinyl tape and use it to insert the valves into proper position.

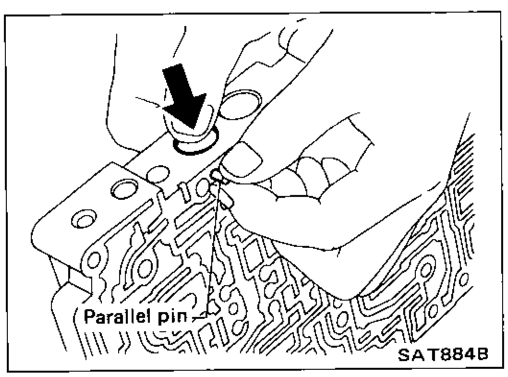


— Pressure regulator valve —

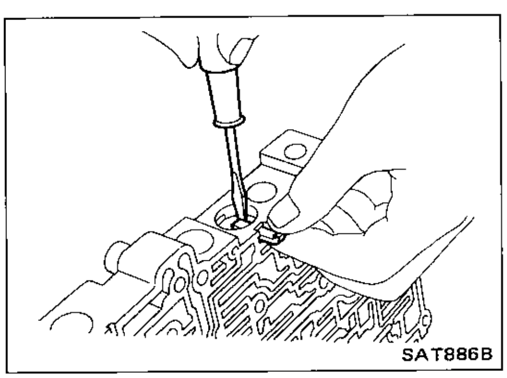
Position plug in sleeve and install pressure regulator valve on upper body.



2. Install parallel pins and retainer plates.



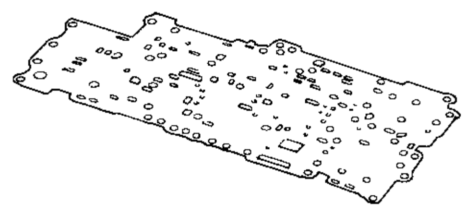
- **While pushing plug, install parallel pin.**



- Insert retainer plate while pressing their corresponding plugs, sleeves or springs.

Control Valve Assembly

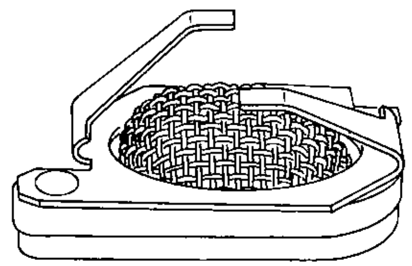
INSPECTION



SAT040C

Separator plates

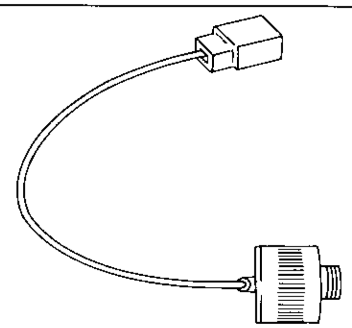
Check to make sure that separator plate is free of damage and not deformed and oil holes are clean.



SAT890B

Oil filter

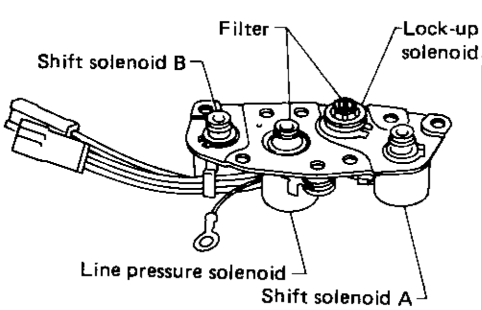
Check to make sure that filter is not clogged or damaged.



SAT891B

Timing solenoid

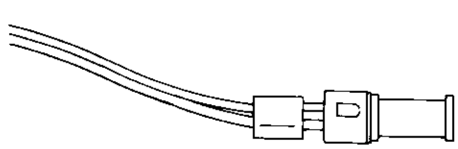
Measure resistance — Refer to "Electrical Components Inspection".



SAT892B

4-unit solenoid assembly (Line pressure solenoid, lock-up solenoid and shift solenoids A and B)

- Check that filter is not clogged or damaged (line pressure solenoid and lock-up solenoid).
- Measure resistance of each solenoid — Refer to "Electrical Components Inspection".



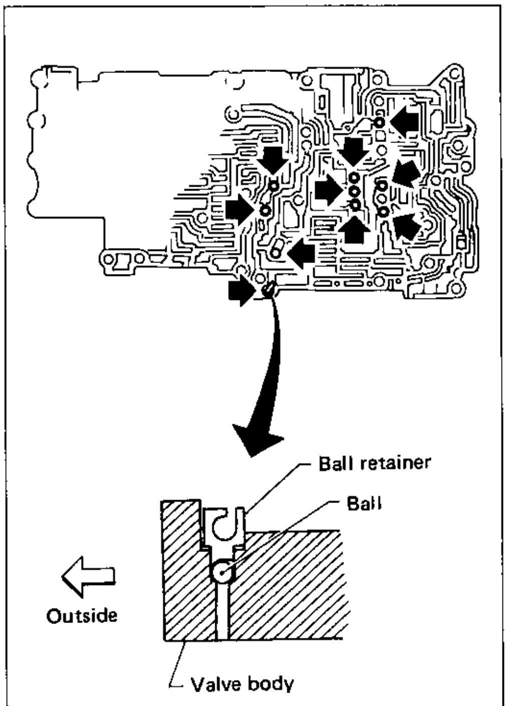
SAT893B

Fluid temperature sensor

Measure resistance — Refer to "Electrical Components Inspection".

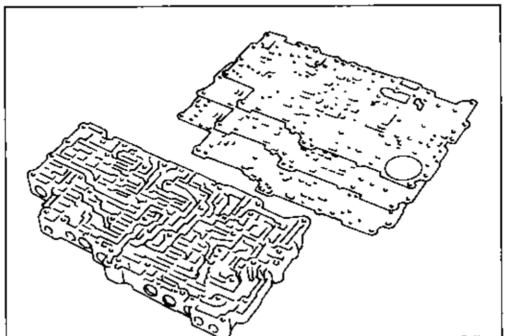
Control Valve Assembly (Cont'd)

ASSEMBLY

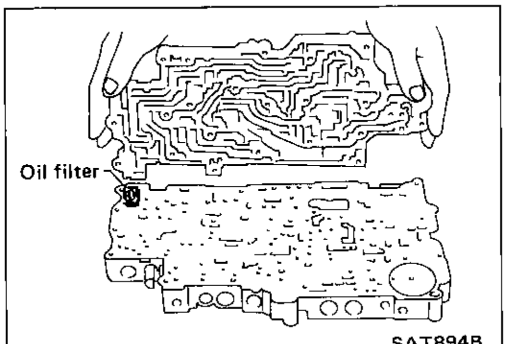


SAT880B

1. Assemble upper and lower bodies.
a. Place oil circuit of upper body face up. Install steel balls in their proper positions.

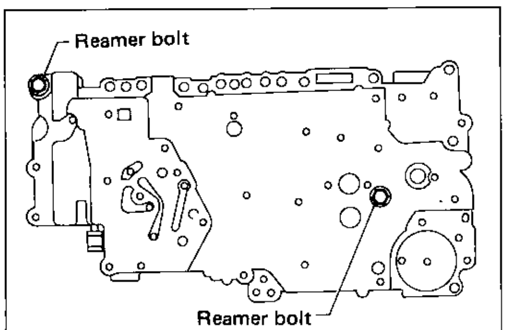

SAT879B

b. Install upper body separator gasket, separator plate and lower body separator gasket on upper body.



SAT894B

c. Fit oil filter and install lower body on upper body.

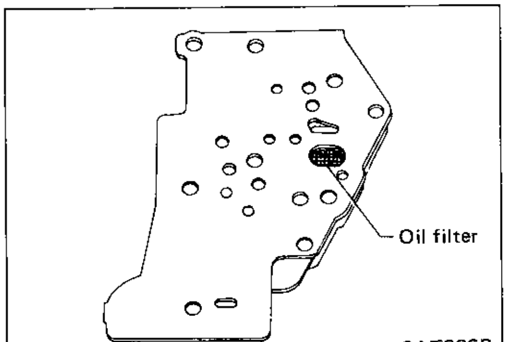


SAT895B

d. Temporarily assemble lower and upper bodies, using reamer bolt as a guide.

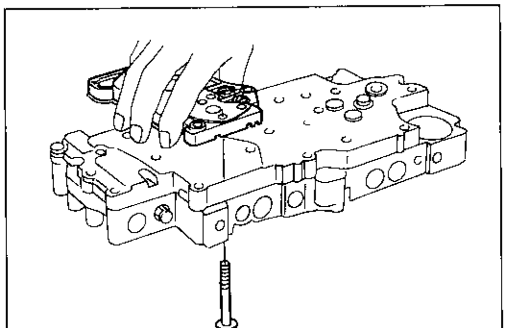
Be careful not to dislocate or drop steel balls and oil filter.

Control Valve Assembly (Cont'd)

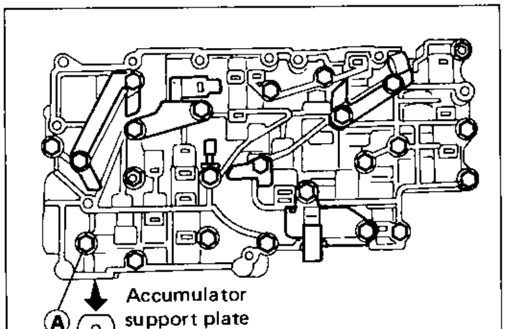


SAT896B

2. Install solenoid body on control valve body.
a. Fit oil filter and install solenoid body separator gaskets and separator plate on solenoid body.


SAT897B

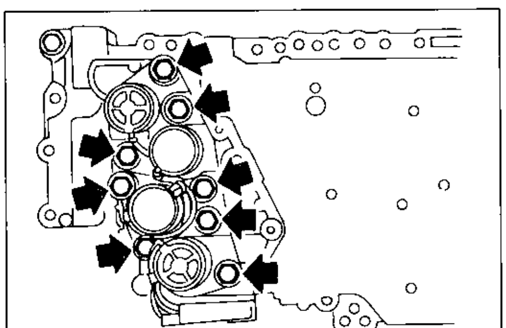
b. Install solenoid body on control valve body and temporarily tighten bolts.



SAT898B

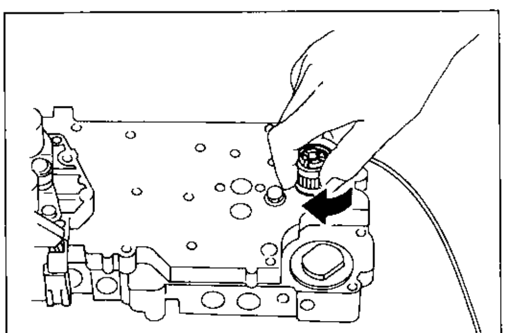
c. Install accumulator support plate and harness clips in their proper locations, and tighten all bolts.

Bolt Ⓐ:
: 3.4 - 4.4 N·m (0.35 - 0.45 kg-m, 2.5 - 3.3 ft-lb)
Other bolts:
: 7 - 9 N·m (0.7 - 0.9 kg-m, 5.1 - 6.5 ft-lb)


SAT873B

3. Install solenoids.
a. Attach O-ring and install 4-unit solenoid assembly on solenoid body.

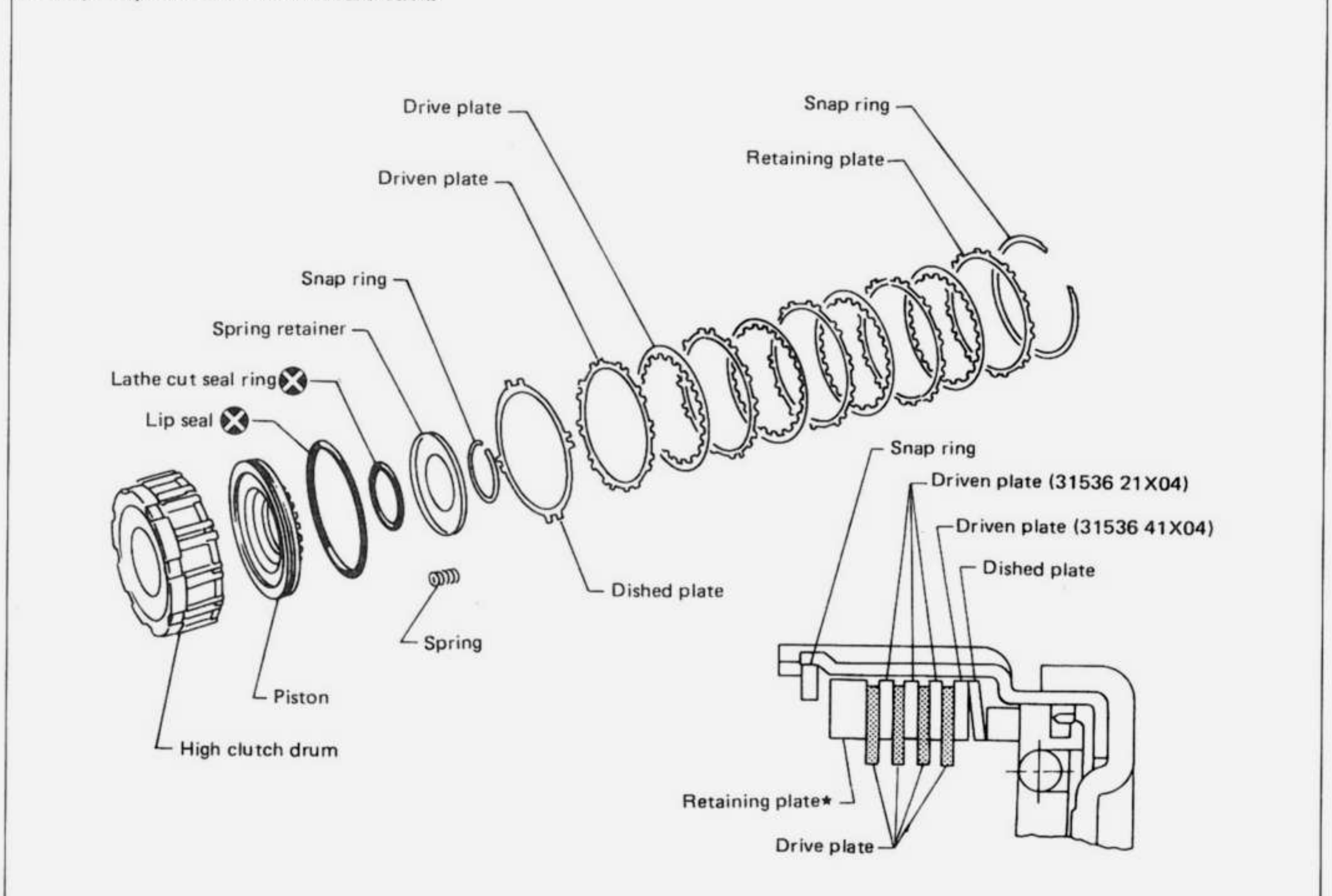
: 7 - 9 N·m (0.7 - 0.9 kg-m, 5.1 - 6.5 ft-lb)


SAT899B

b. Attach O-ring, and install and tighten timing solenoid firmly.

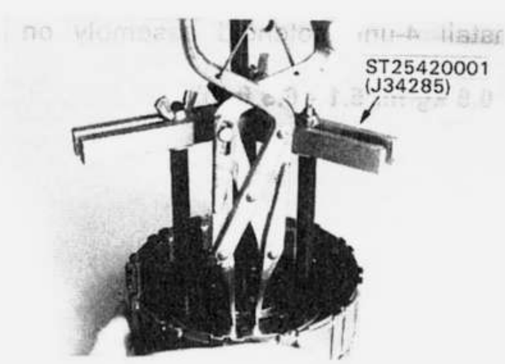
High Clutch

For the number of clutch sheets (drive plate and driven plate), refer to the below cross-section.



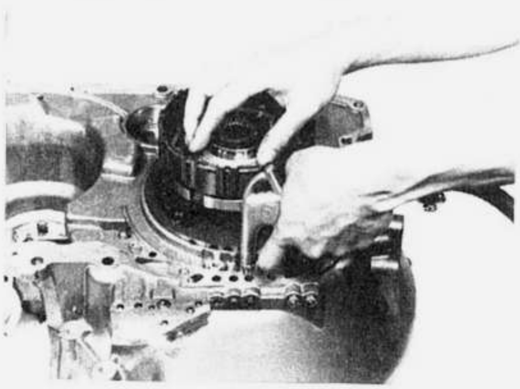
★: Select with proper thickness.

SAT211C



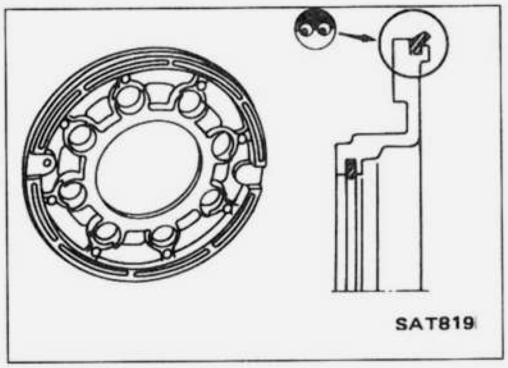
DISASSEMBLY

- Compress clutch springs and remove snap ring from spring retainer.



- Place clutch drum onto oil pump, and withdraw clutch piston with compressed air.

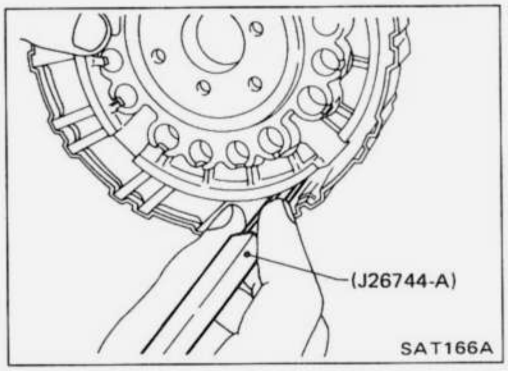
High Clutch (Cont'd)



INSPECTION AND ASSEMBLY

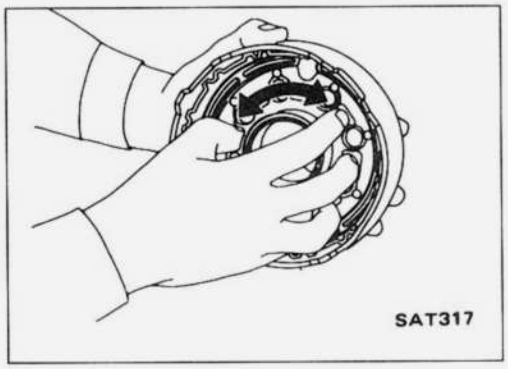
1. Check clutch drive plate facing for wear or damage.
   Standard drive plate thickness:
   1.6 mm (0.063 in)
2. Check for wear on snap ring, weak or broken coil springs, and warped spring retainer.
3. Lubricate clutch drum bushing, and install inner seal and piston seal as illustrated. Be careful not to stretch seals during installation.

- Never assemble clutch dry; always lubricate its components thoroughly.
- Always install piston seal in direction shown in figure at left.

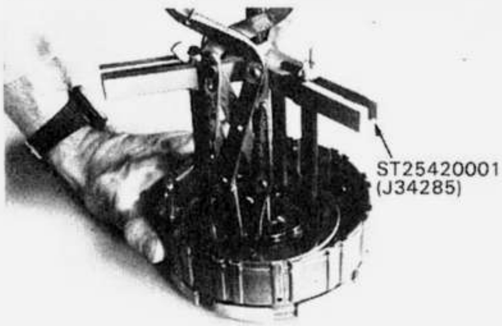


4. Assemble piston, being careful not to allow seal to kink or become damaged during installation.

Use Tool, which does not damage lip seal, to make sure the lip seal goes into place.

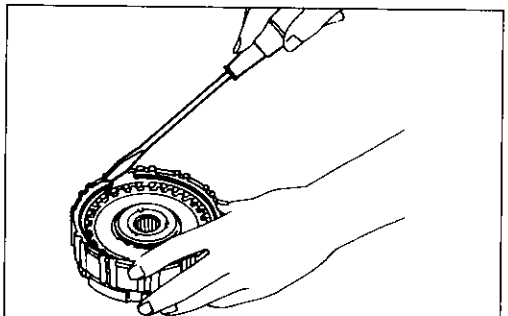


- After installing piston, turn piston by hand to ensure that there is no binding.



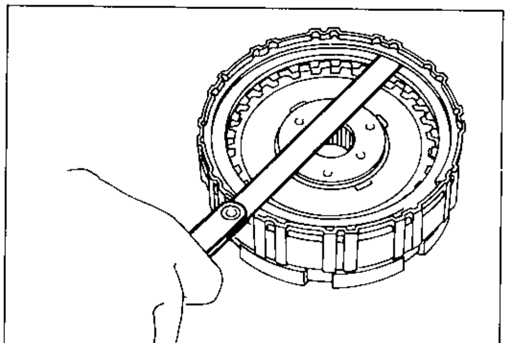
5. Install clutch springs.
6. Reinstall snap ring. Be sure snap ring is properly seated.

High Clutch (Cont'd)



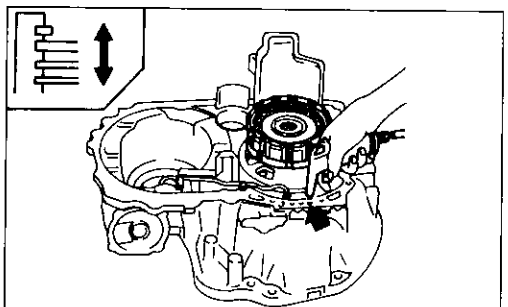
SAT821

7. Install driven plates, drive plates, and secure with snap ring.



SAT822

8. Measure clearance between retaining plate and snap ring. Always measure the existing minimum clearance, since snap ring is a wave type.
   Specified clearance:
   Standard
   1.4 - 1.8 mm (0.055 - 0.071 in)
   Allowable limit
   2.6 mm (0.102 in)
   Available retaining plates:
   Refer to S.D.S.

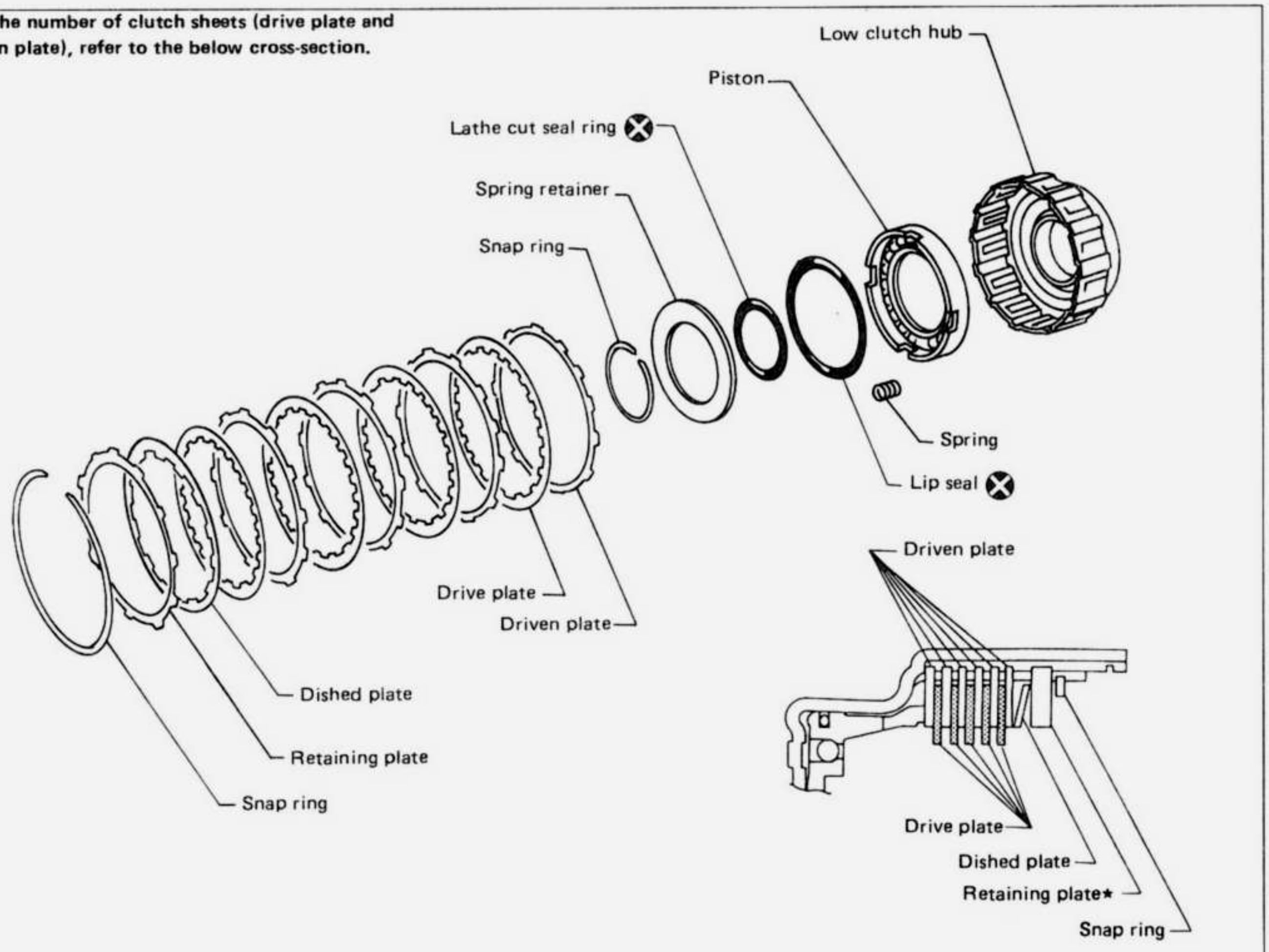


SAT823

9. Check high clutch operation using compressed air.

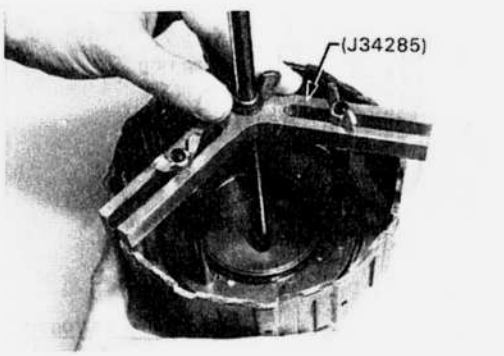
Low Clutch

For the number of clutch sheets (drive plate and driven plate), refer to the below cross-section.

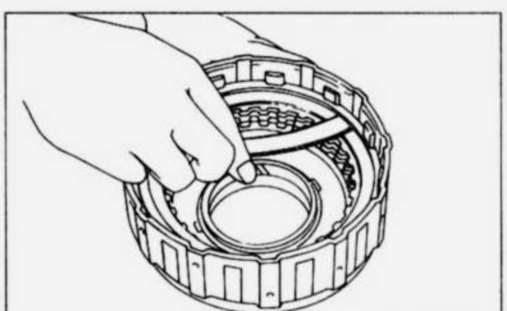


★: Select with proper thickness.

SAT212C



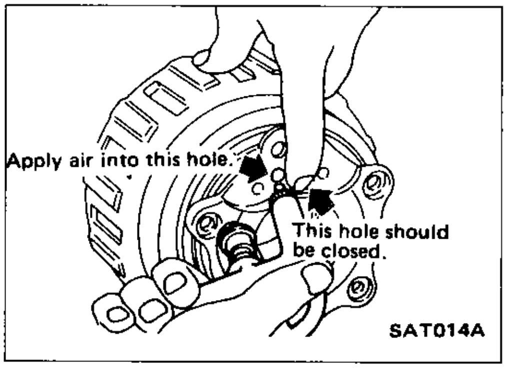
- Use Tool to remove the clutch spring snap ring.



SAT826

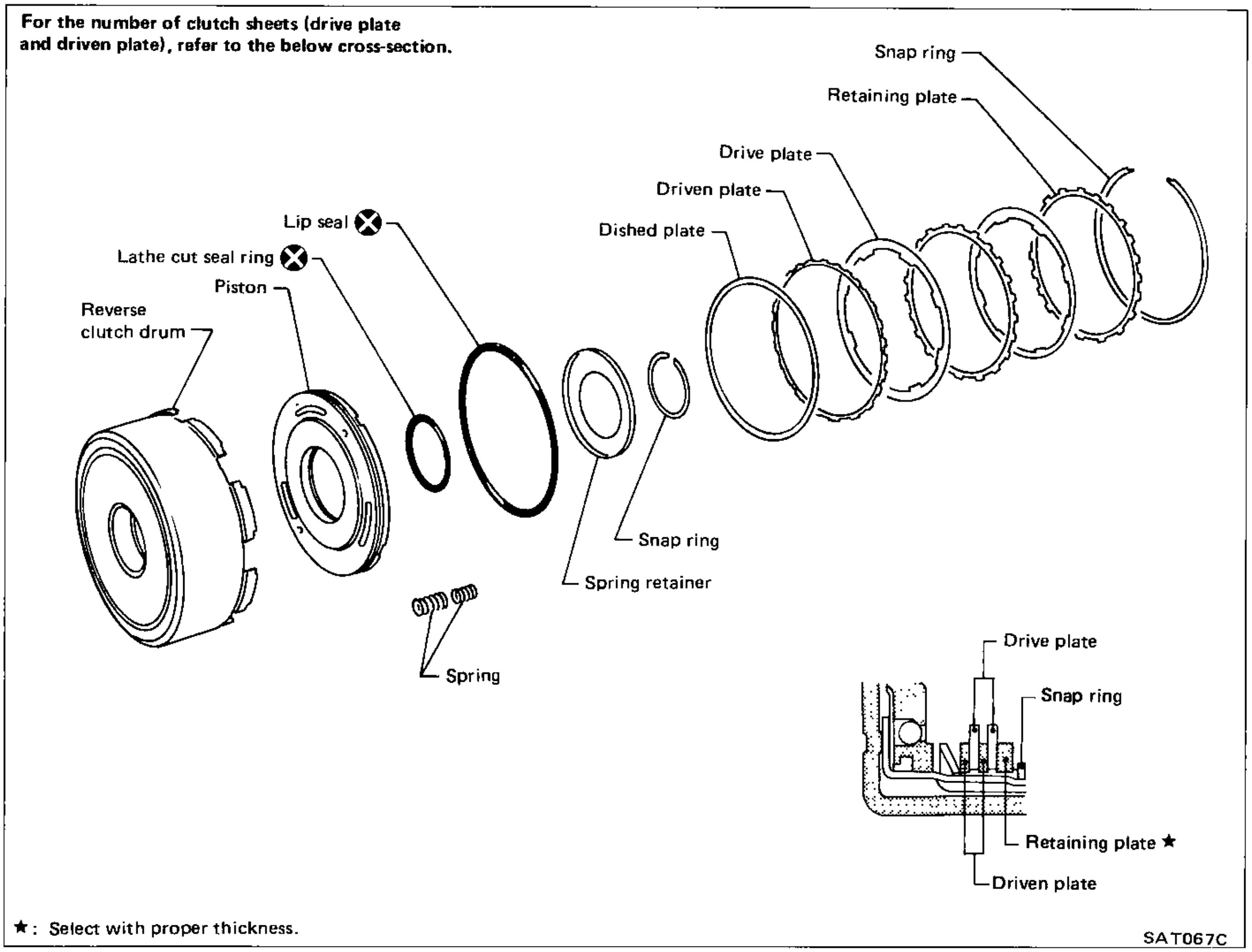
- Service procedures for low clutch are essentially the same as those for high clutch, with the following exception:
  Specified clearance between retaining plate and snap ring:
  Standard
  0.5 - 0.8 mm (0.020 - 0.031 in)
  Allowable limit
  1.8 mm (0.071 in)
  Available retaining plates:
  Refer to S.D.S.

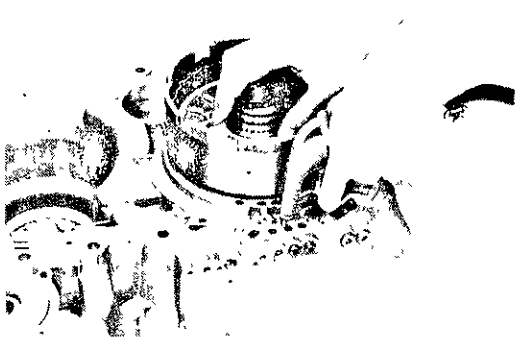
Low Clutch (Cont'd)



- After assembly, check the operation of clutch.

Reverse Clutch

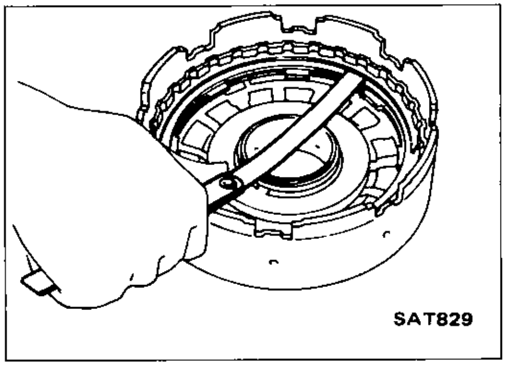




Service procedures for reverse clutch are essentially the same as those for high clutch, with the following exception:

- Remove reverse clutch piston.

Reverse Clutch (Cont'd)



SAT829

Specified clearance between retaining plate and snap ring:

Standard

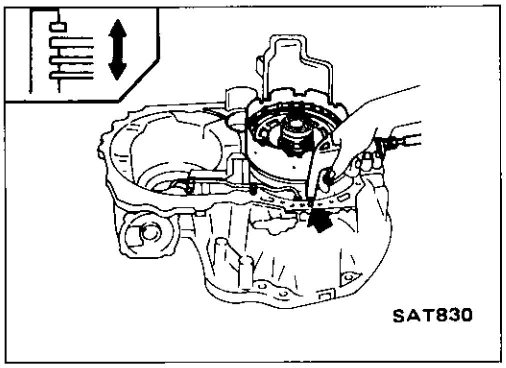
0.5 - 0.8 mm (0.020 - 0.031 in)

Allowable limit

1.2 mm (0.047 in)

Available retaining plates:

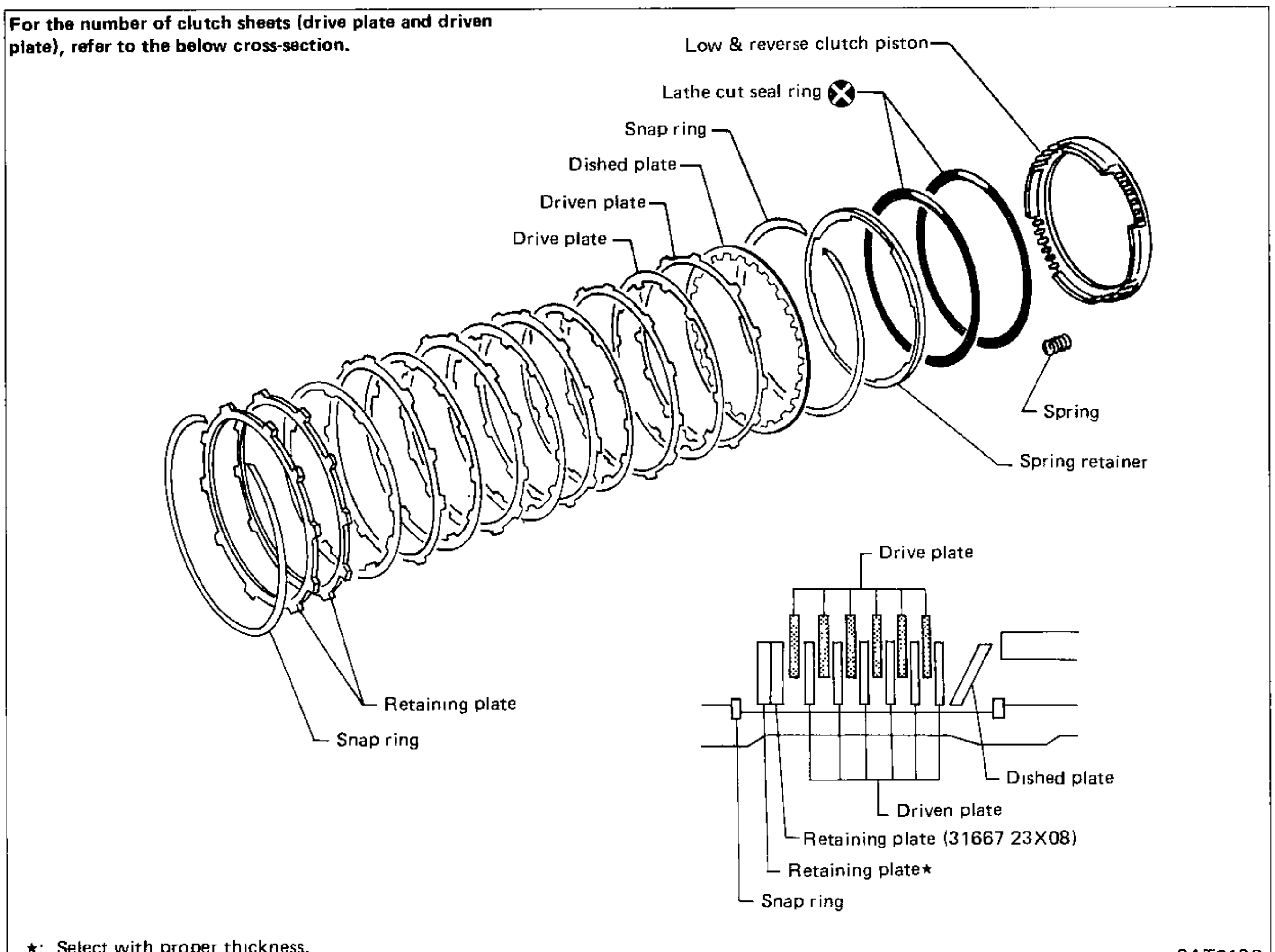
Refer to S.D.S.



SAT830

- After assembly, check the operation of clutch.

Low & Reverse Brake



SAT213C

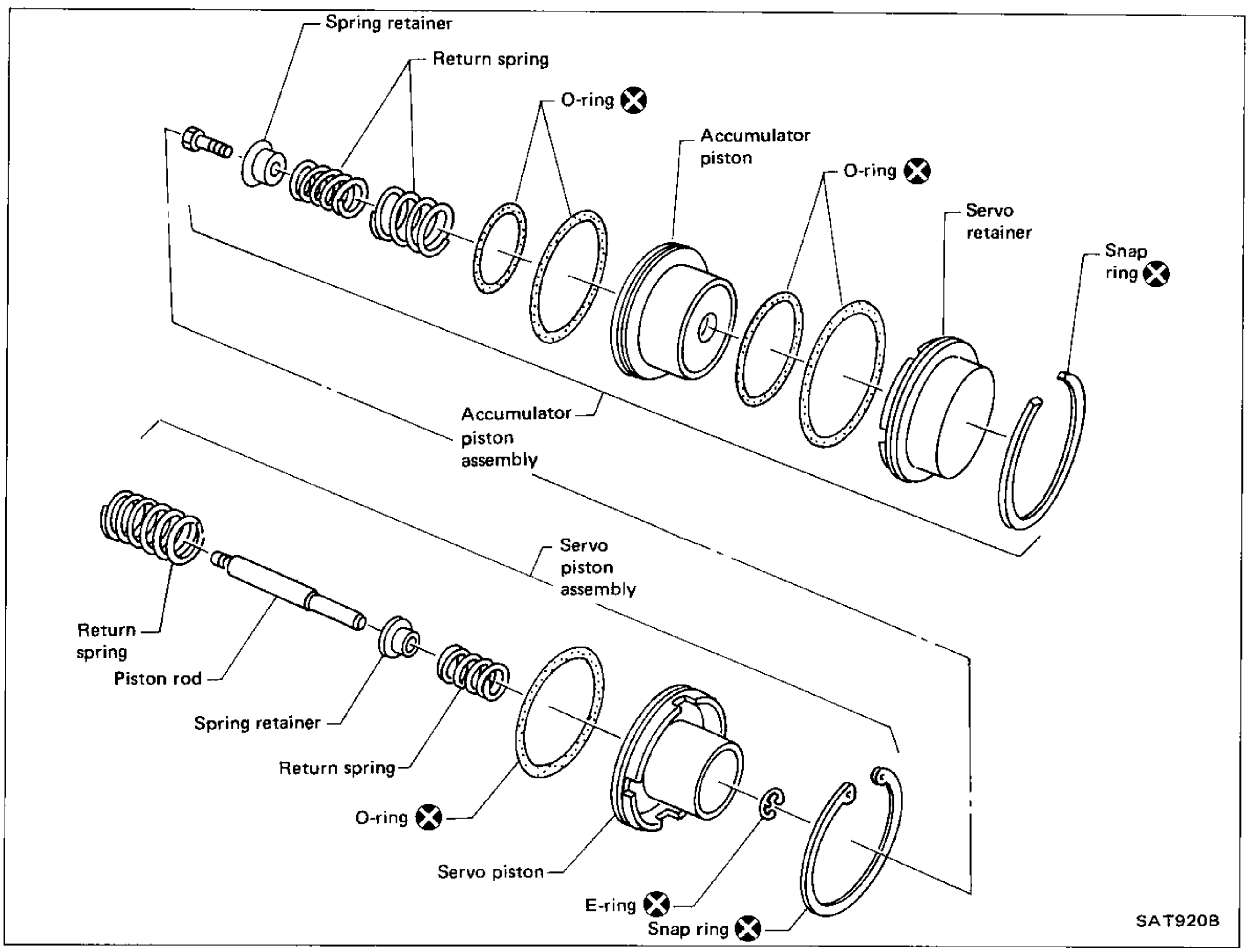
Low & Reverse Brake (Cont'd)

INSPECTION

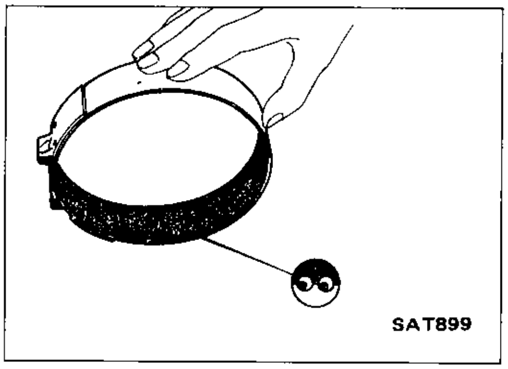
- Examine low and reverse brake for damaged clutch drive plate facing and worn snap ring.
- Check drive plate facing for wear or damage; if necessary, replace.

Specified clearance between retaining plate and snap ring:
Standard
1.2 - 1.6 mm (0.047 - 0.063 in)
Allowable limit
2.8 mm (0.110 in)
Available retaining plates:
Refer to S.D.S.

Brake Band and Band Servo

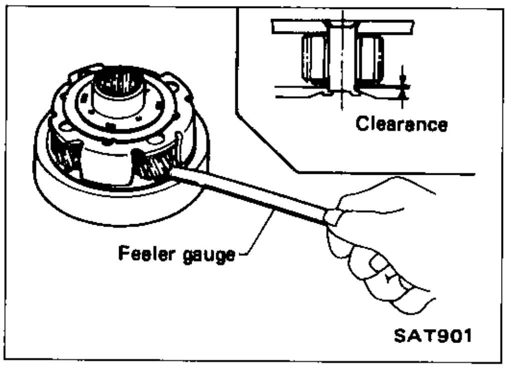


Brake Band and Band Servo (Cont'd)



INSPECTION

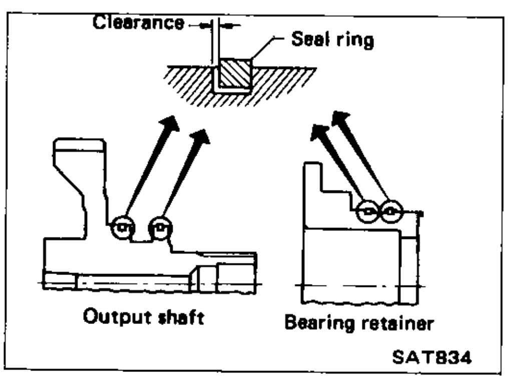
- Inspect band friction material for wear. If cracked, chipped or burnt spots are apparent, replace the band.
- Check band servo components for wear and scoring.



Planetary Carrier

INSPECTION

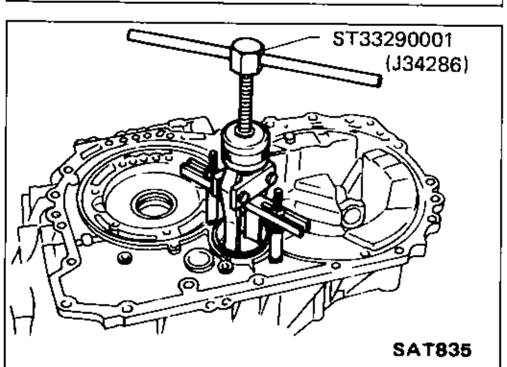
- Check clearance between pinion washer and planetary carrier with a feeler gauge.
  Standard clearance:
  Front carrier
  0.15 - 0.70 mm (0.0059 - 0.0276 in)
  Rear carrier
  0.20 - 0.70 mm (0.0079 - 0.0276 in)
  Replace if the clearance exceeds 0.80 mm (0.0315 in).
- Check planetary gear sets and bearings for damaged or worn gears.



Bearing Retainer and Output Shaft

INSPECTION

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)

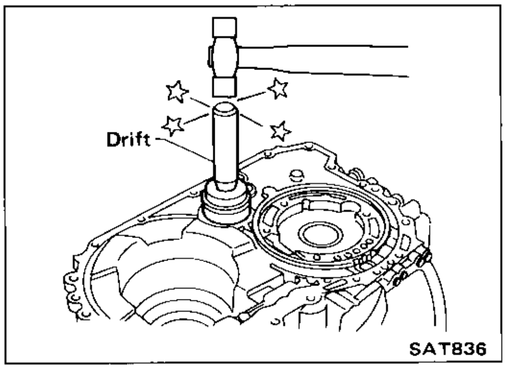


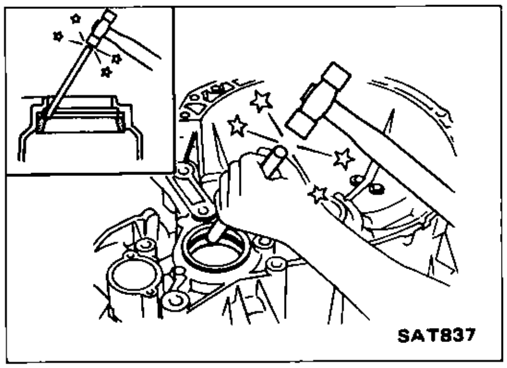
Converter Housing and Transmission Case

BEARING OUTER RACE

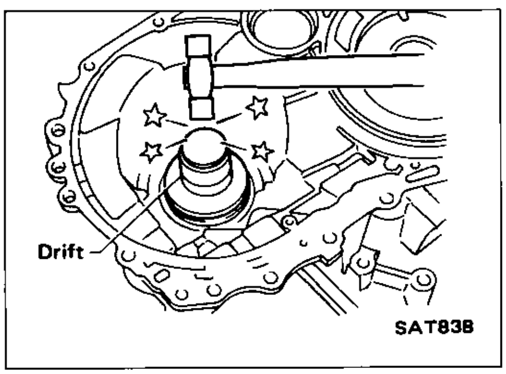
- Reduction pinion gear front bearing outer race.

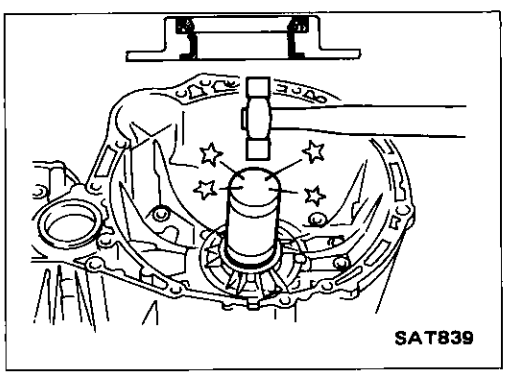
Converter Housing and Transmission Case (Cont'd)





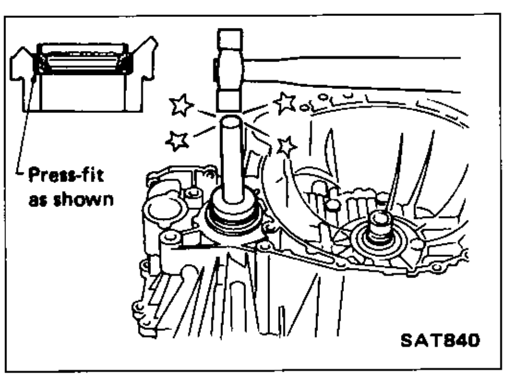
- Differential side bearing outer race





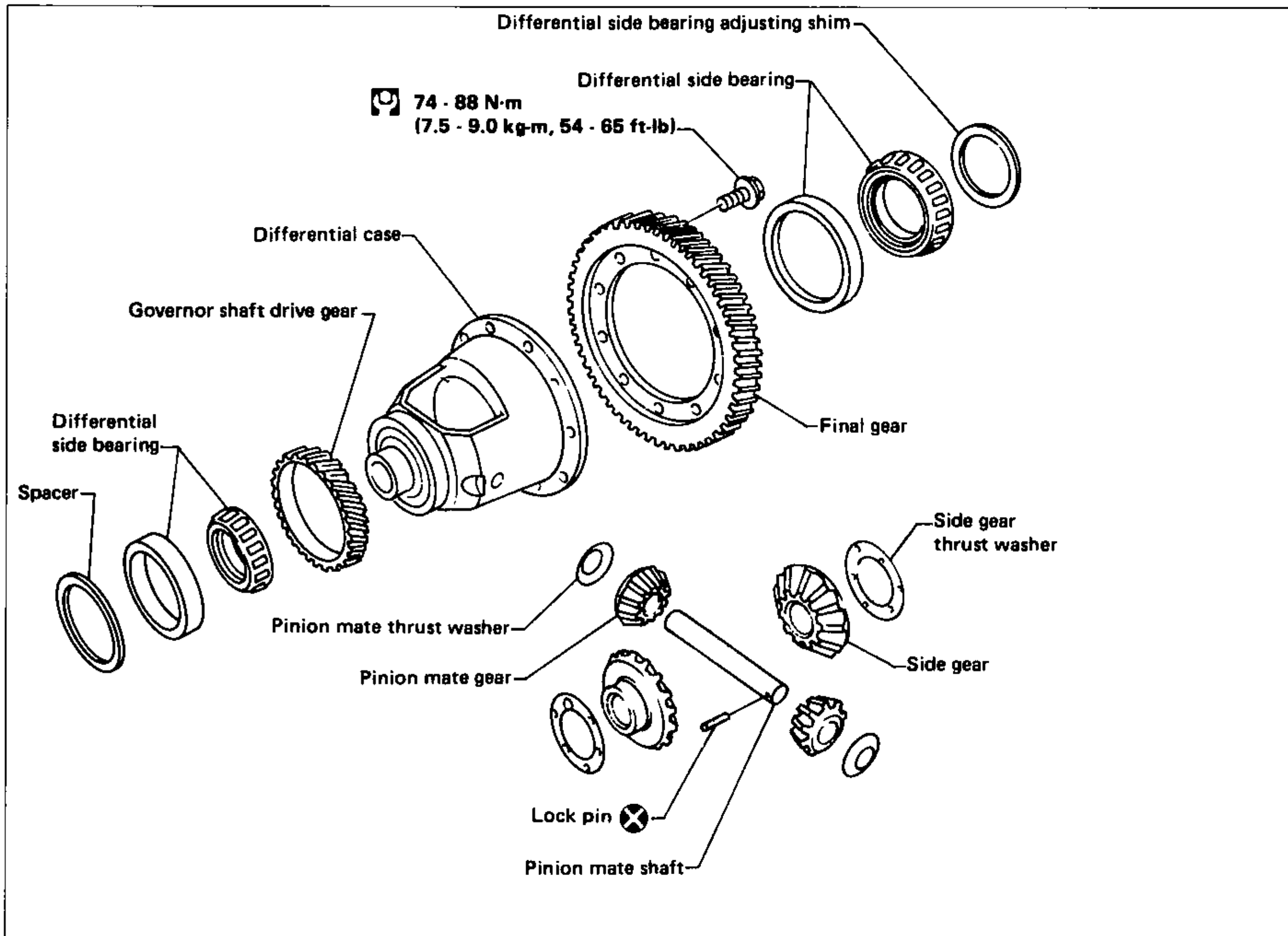
OIL SEAL

- Torque converter oil seal

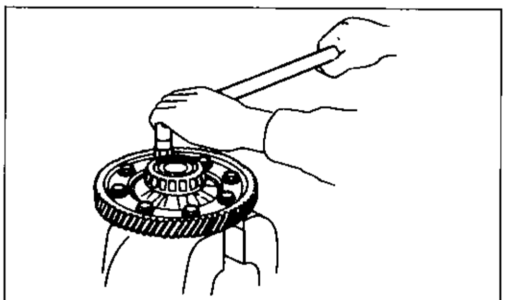


- Differential side oil seal

Final Drive (Without viscous coupling)

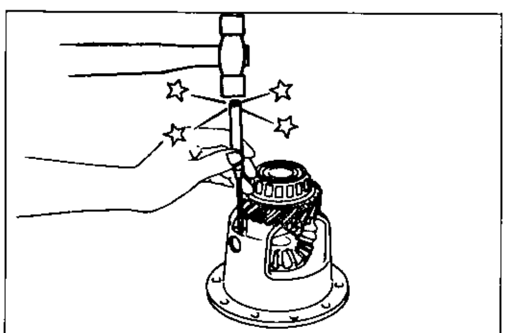


SAT841


SMT610

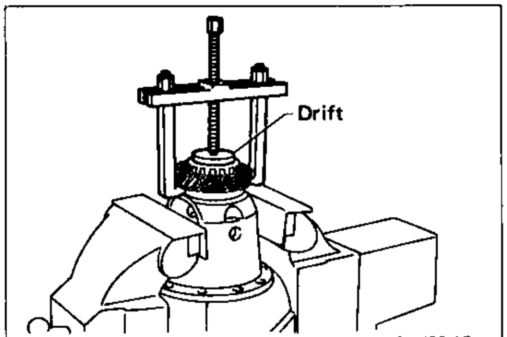
DISASSEMBLY

1. Remove final gear.


SAT842

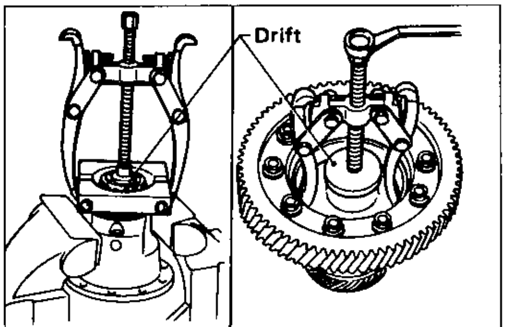
2. Drive out pinion mate shaft lock pin and draw out pinion mate shaft.

Final Drive (Without viscous coupling) (Cont'd)



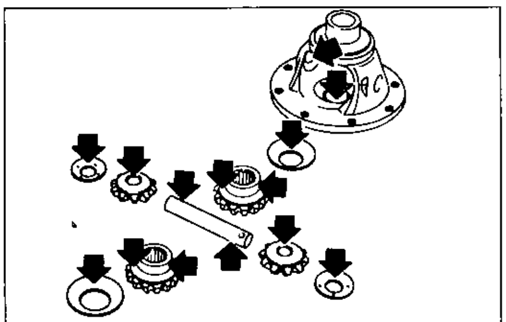
SAT843

3. Remove governor shaft drive gear.



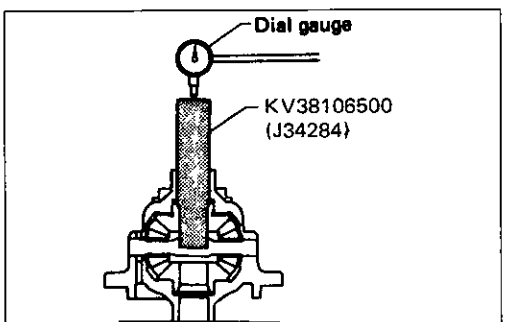
SAT844

4. Drive out differential side bearing outer race and inner cone.


SAT845

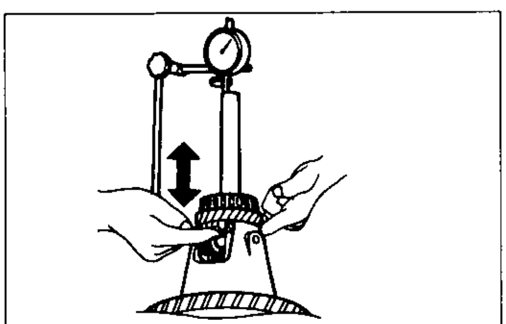
INSPECTION

1. Check mating surface of differential case, side gears and pinion mate gears. Replace as required.



SMT610A

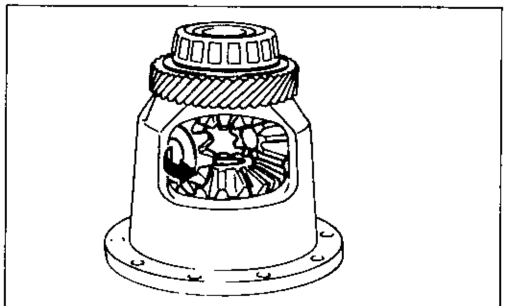
2. Check clearance between side gear and differential case with washer following the procedure below.
a. Set Tool and dial gauge on side gear.


SMT616

b. Move side gear up and down to measure dial gauge deflection. Always measure gauge deflection on both side gears.
Clearance between side gear and differential case with washer:
0.1 - 0.2 mm (0.004 - 0.008 in)
c. If clearance exceeds the specified value, check for wear and replace necessary parts.
3. Check tapered roller bearings for wear, scratches, pitching or flaking.

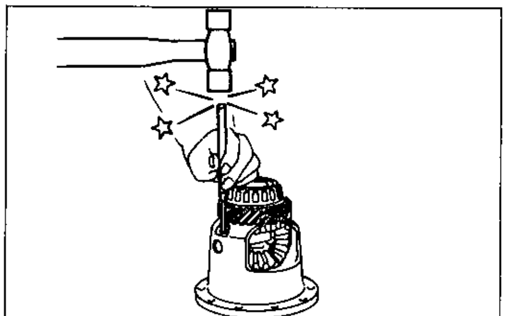
Final Drive (Without viscous coupling) (Cont'd)

ASSEMBLY



SAT846

1. Install the side gear and thrust washer in the differential case.
2. Install the pinion mate gear and thrust washer in the differential case while rotating them.



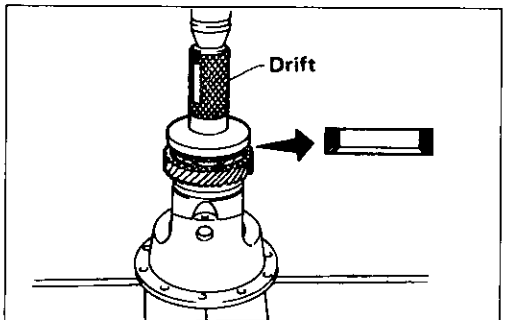
SAT847

3. Insert pinion mate shaft.

When inserting, be careful not to damage pinion mate washers.

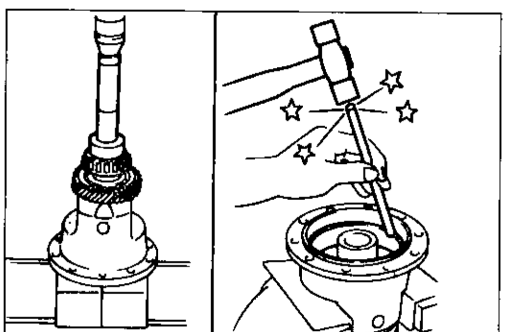
4. Measure clearance between side gear and pinion mate gear, referring to "Inspection". If necessary, adjust.
   Side gear to pinion mate clearance:
   0.1 - 0.2 mm (0.004 - 0.008 in)
   Side gear thrust washer:
   Refer to S.D.S.
5. Install pinion mate shaft lock pin using a punch.

Make sure that lock pin is flush with case.



SAT848

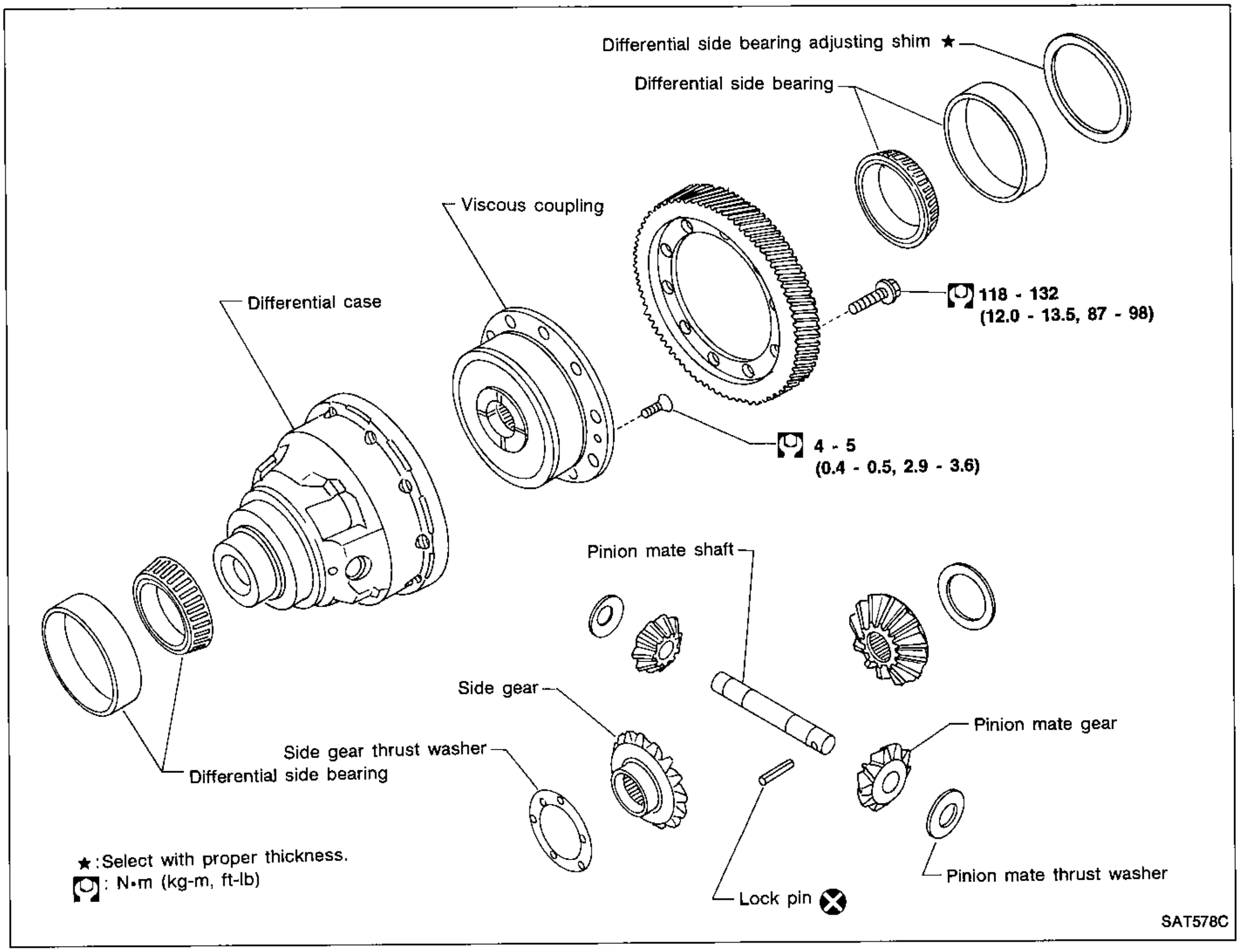
6. Install governor shaft drive gear.

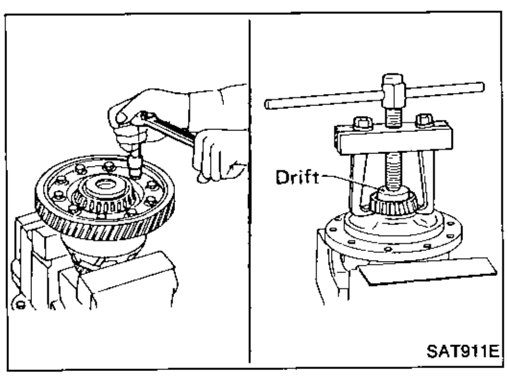


SAT849

7. Press on differential side bearing inner cone and outer race.
8. Install final gear.

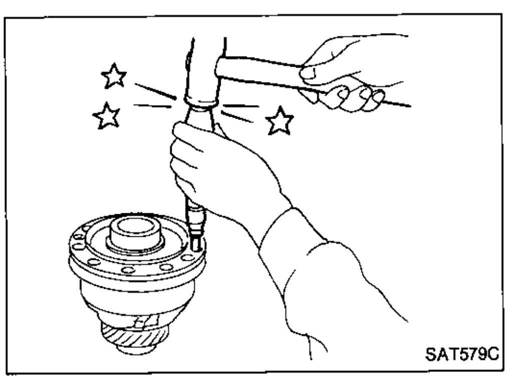
Final Drive (With viscous coupling)





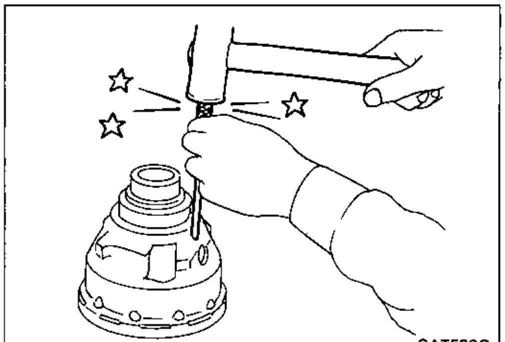
DISSEMBLY

1. Remove final gear.
2. Remove differential side bearings.

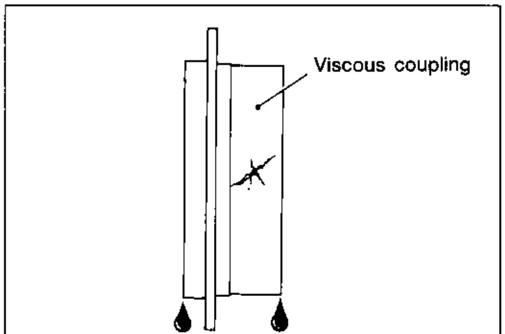


3. Remove viscous coupling.

Final Drive (With viscous coupling) (Cont'd)


SAT580C

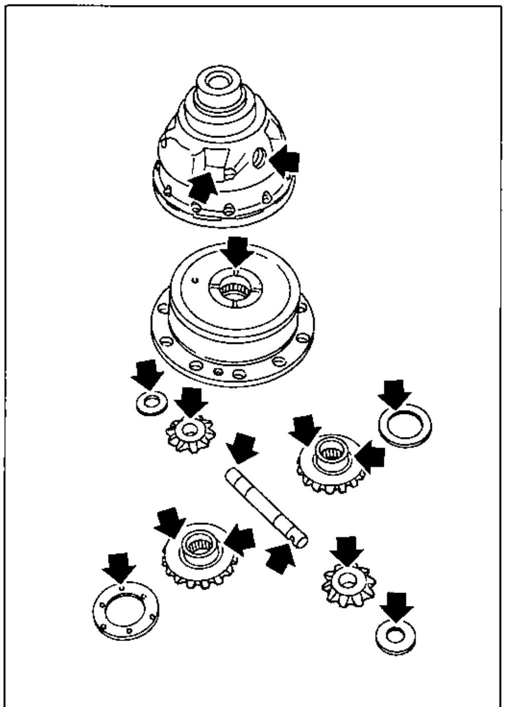
4. Drive out pinion mate shaft lock pin and draw out pinion mate shaft.



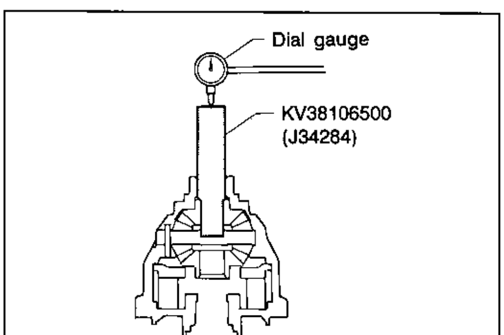
SAT581C

INSPECTION

1. Check viscous coupling case for cracks and silicone oil leakage.


SAT582C

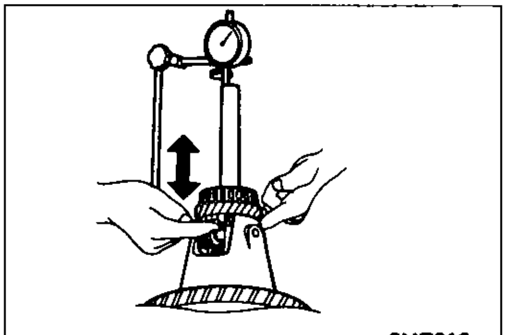
2. Check mating surface of differential case, side gears and pinion mate gears. Replace as required.



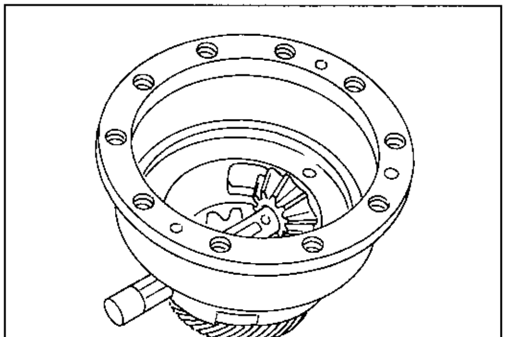
SAT583C

3. Check clearance between side gear and differential case with washer following the procedure below.
a. Set Tool and dial gauge on side gear.

Final Drive (With viscous coupling) (Cont'd)


SMT616

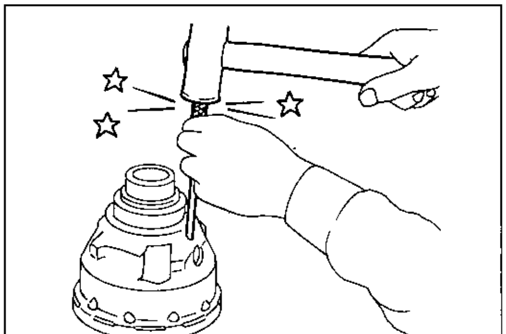
b. Move side gear up and down to measure dial gauge deflection. Always measure gauge deflection on both side gears.
   Clearance between side gear and differential case with washer:
   0.1 - 0.2 mm (0.004 - 0.008 in)
c. If clearance exceeds the specified value, check for wear and replace necessary parts.
4. Check tapered roller bearings for wear, scratches, pitching or flaking.


SAT584C

ASSEMBLY

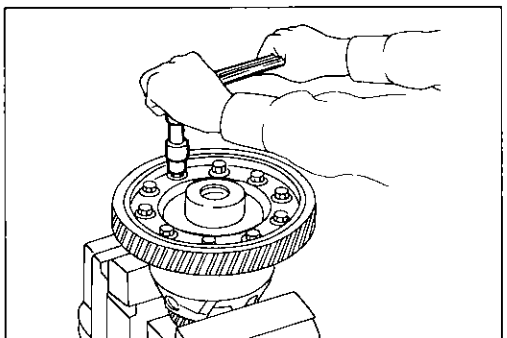
1. Install the side gear and thrust washer in the differential case.
2. Install the pinion mate gear and thrust washer in the differential case while rotating them.
3. Insert pinion mate shaft.

When inserting, be careful not to damage pinion mate washers.

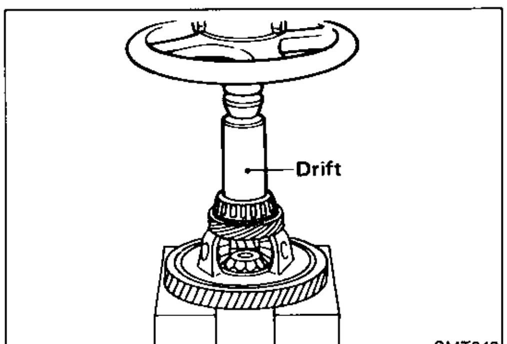

SAT580C

4. Measure clearance between side gear and pinion mate gear, referring to "Inspection". If necessary, adjust.
   Side gear to pinion mate clearance:
   0.1 - 0.2 mm (0.004 - 0.008 in)
   Side gear thrust washer:
   Refer to S.D.S.
5. Install pinion mate shaft lock pin using a punch.

Make sure that lock pin is flush with case.

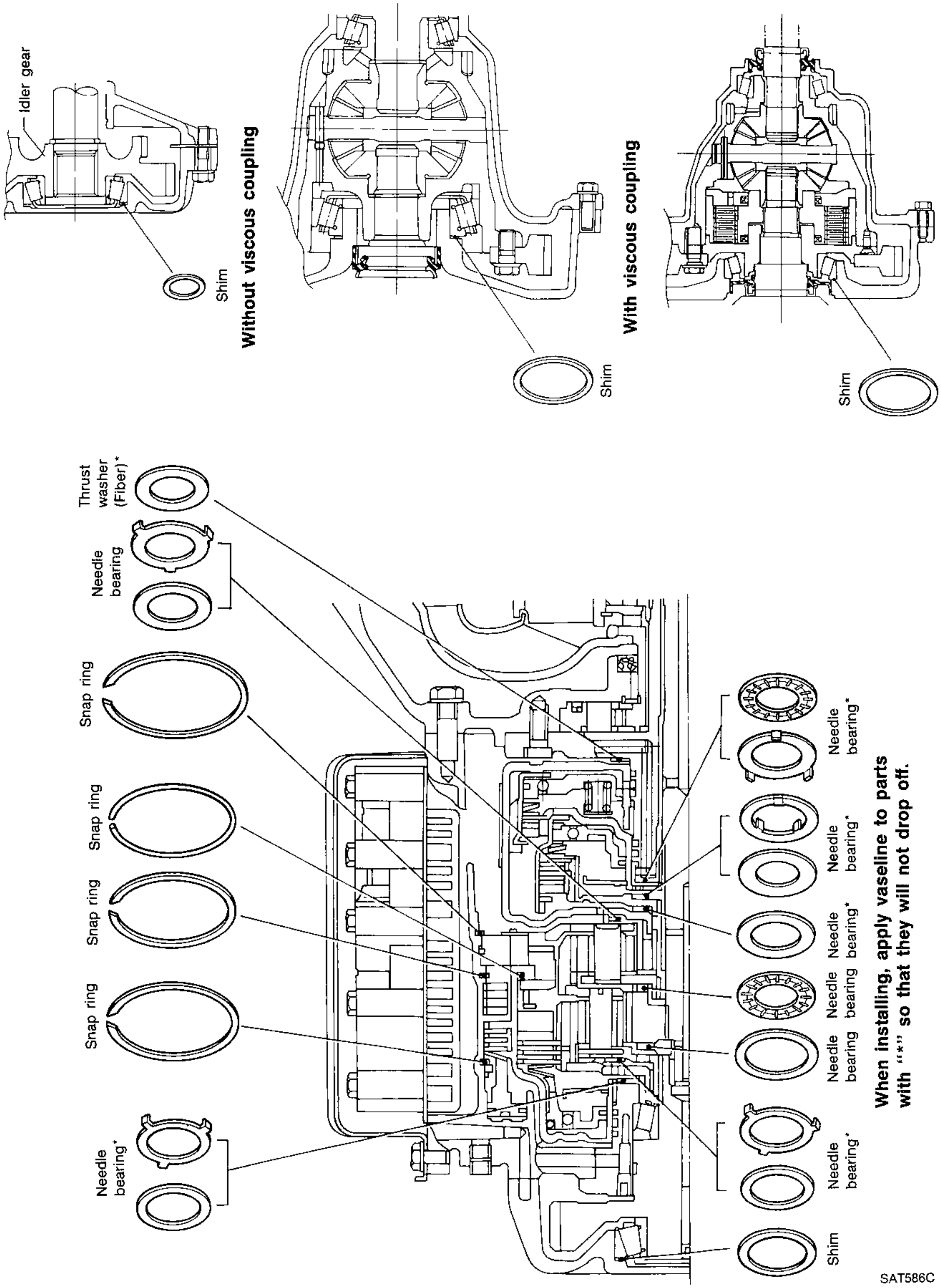

SAT585C

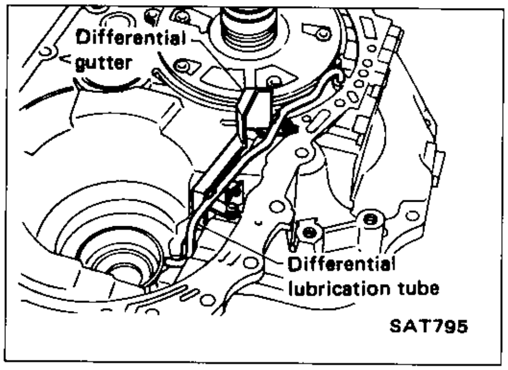
6. Install viscous coupling and final gear.



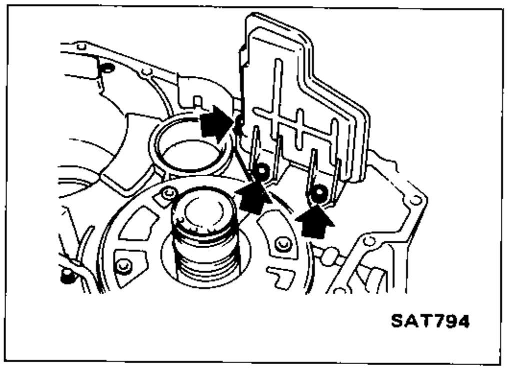
SMT648

7. Press on differential side bearings.

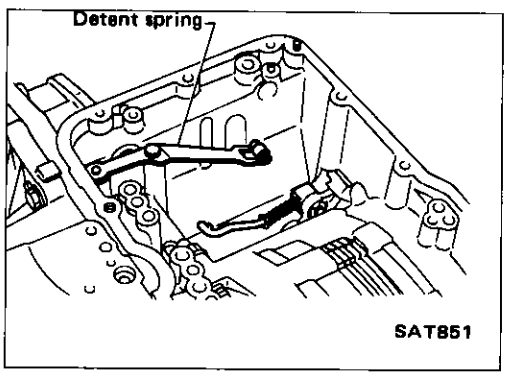

Idler gear
Shim
Without viscous coupling
Shim
With viscous coupling
Shim
Thrust washer (Fiber)*
Needle bearing
Snap ring
Snap ring
Snap ring
Snap ring
Needle bearing*
Needle bearing*
Needle bearing*
Needle bearing*
Needle bearing
Needle bearing
Needle bearing*
Shim
When installing, apply vaseline to parts with "*" so that they will not drop off.
SAT586C



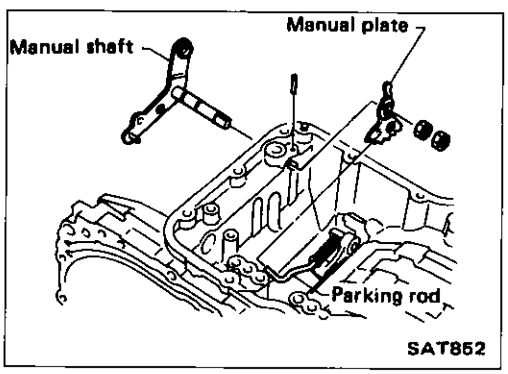
1. Install differential lubrication tube and differential gutter to converter housing.



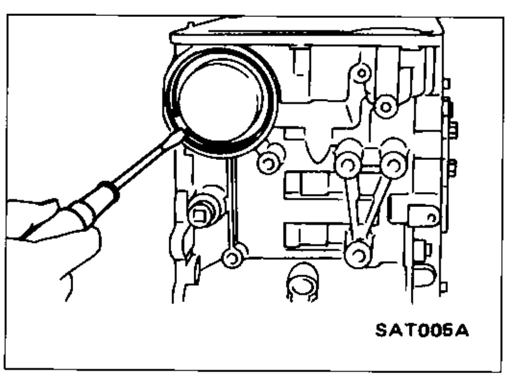
2. Install oil strainer.



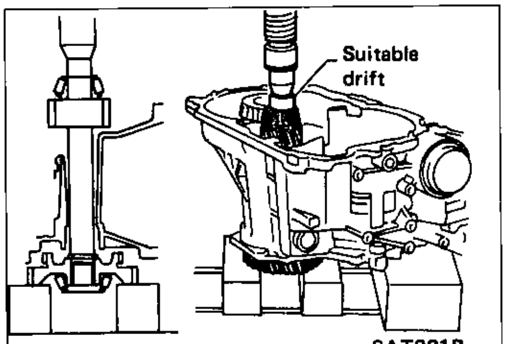
3. Install detent spring assembly.



4. Pass parking rod into the hole in the manual plate and then install manual plate on manual shaft.

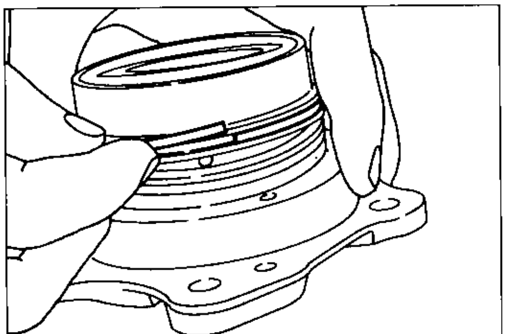


5. Install band brake servo, retainer and return spring and secure with snap ring.

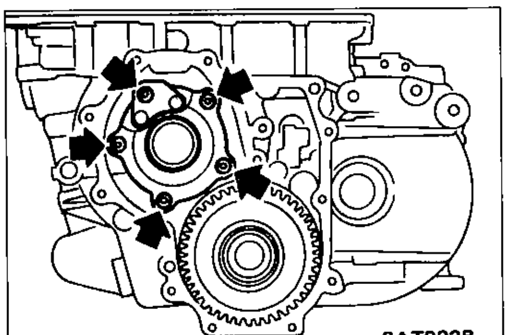


SAT921B

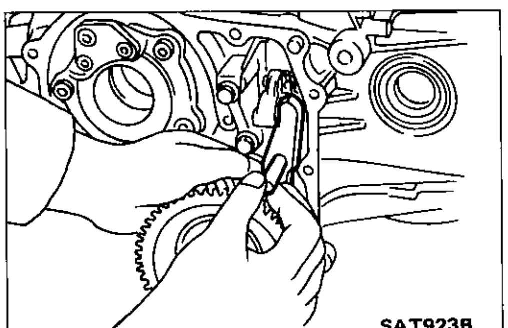
6. Install reduction gear.
a. Position reduction gear in transmission case so that it meshes with idler gear.
b. Press reduction gear into place using a drift, and install idler gear.


SAT022A

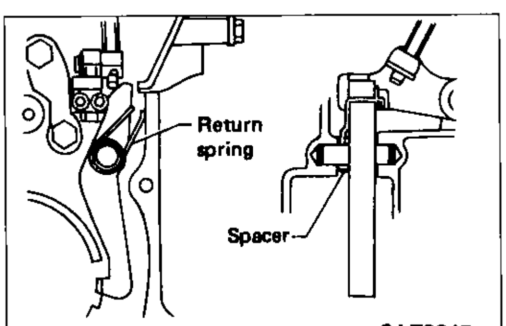
7. Install bearing retainer assembly.
a. Install seal rings onto bearing retainer with great care. Clean the grooves and liberally apply petroleum jelly to hold the rings in place. Otherwise, they could be cut or deformed when the low clutch and carrier assembly are installed.


SAT922B

b. Install bearing retainer assembly.

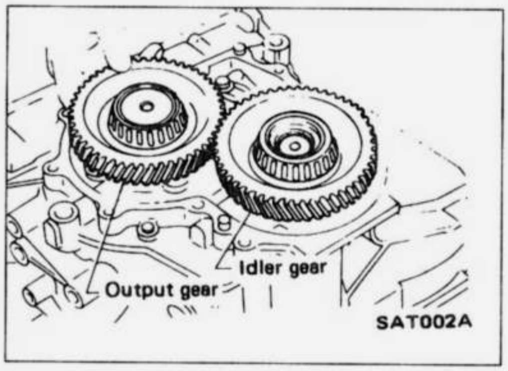

SAT923B

8. Install parking pawl and parking shaft.

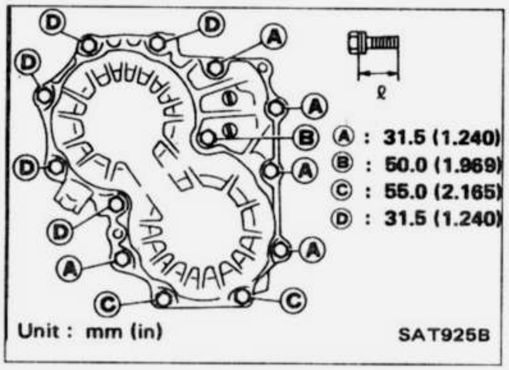


SAT924B

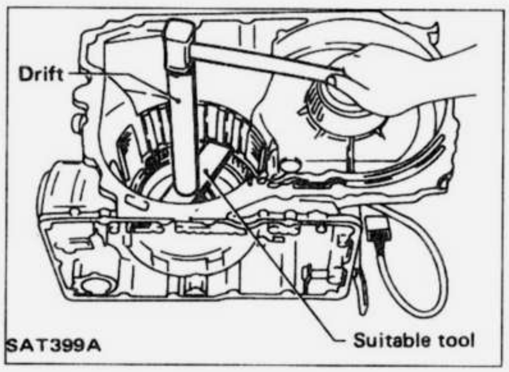
9. Install spacer and return spring.



10. Install output gear.

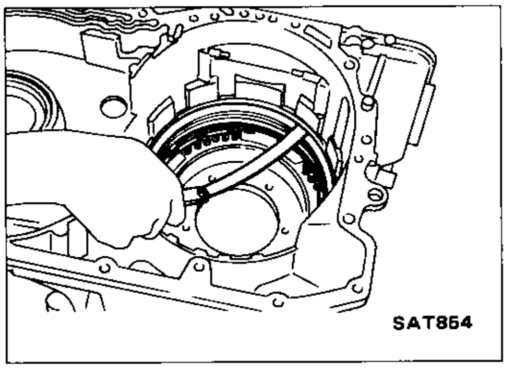


11. Temporarily install side cover and gasket.

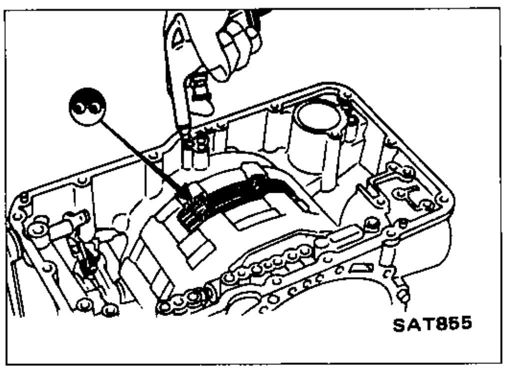


12. Lubricate low and reverse brake piston seal, then install piston by tapping it evenly with Tool.

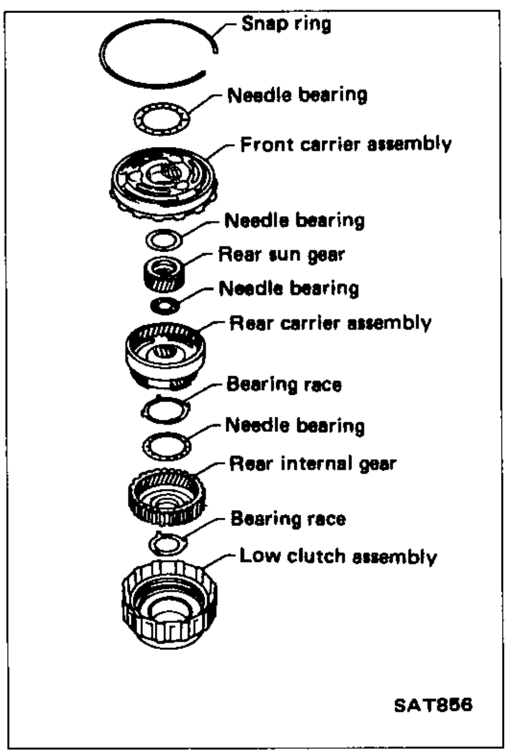
13. Install low and reverse brake retainer, and secure with snap ring.
14. Install low and reverse brake driven & drive plates and retaining plate, then secure with snap ring.


SAT854

15. After low and reverse brake has been completely assembled, measure clearance between snap ring and retainer plate. If measurement exceeds specifications, it can be adjusted by replacing retainer plate with one of a different thickness.
    Low and reverse brake clearance:
    Standard
    1.2 - 1.6 mm (0.047 - 0.063 in)
    Allowable limit
    3.0 mm (0.118 in)
    Retaining plate of low & reverse brake:
    Refer to S.D.S.

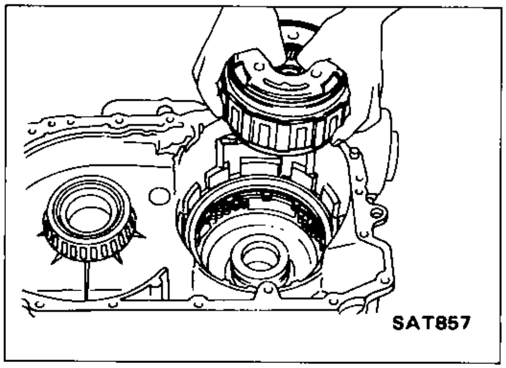

SAT855

- **Check low & reverse brake operation using air.**

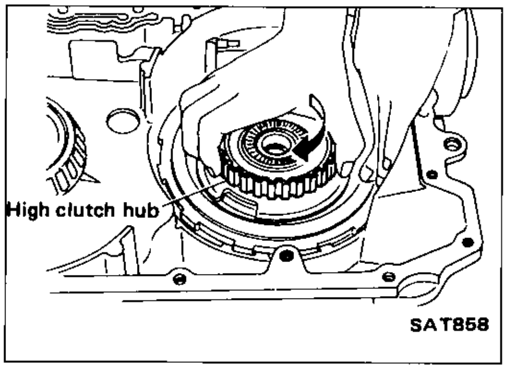


SAT856

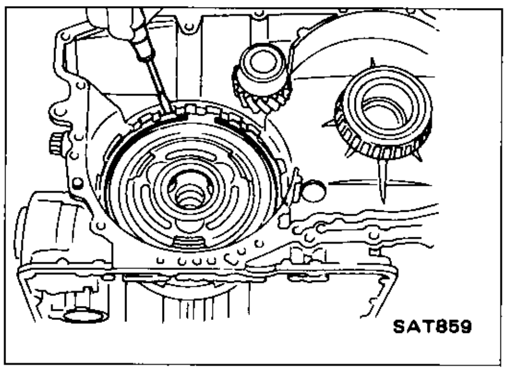
16. Assemble front carrier, rear carrier and low clutch.



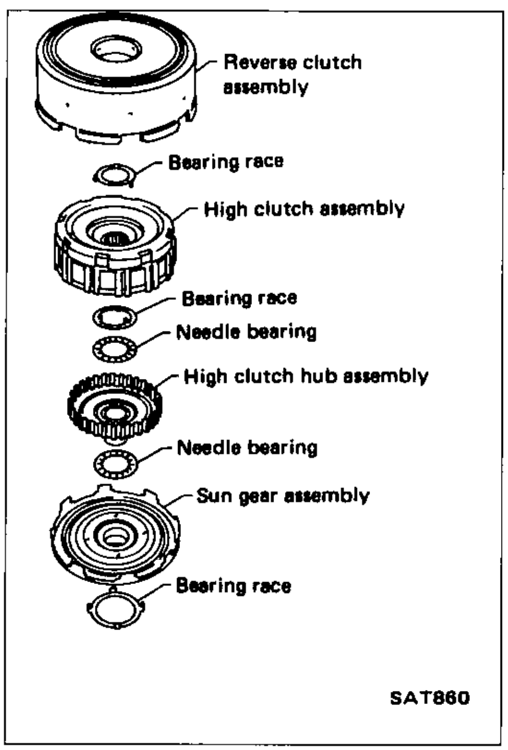
17. Install carrier set.



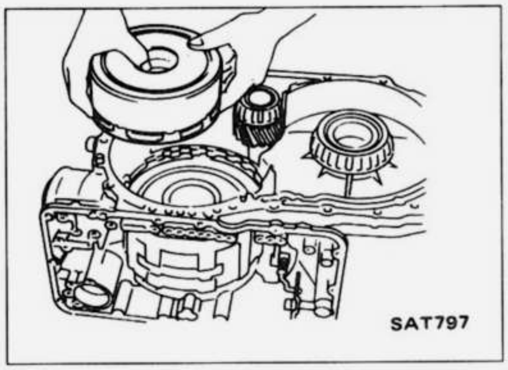
18. Install one-way clutch assembly while rotating front carrier with high clutch hub.



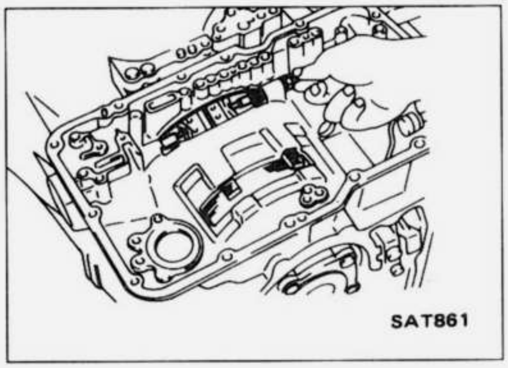
19. Remove high clutch hub, and install clutch snap ring.



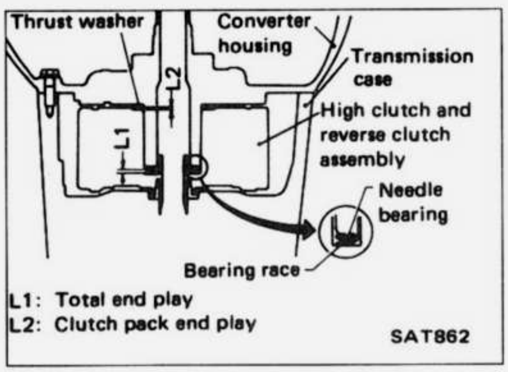
20. Assemble reverse clutch and high clutch.



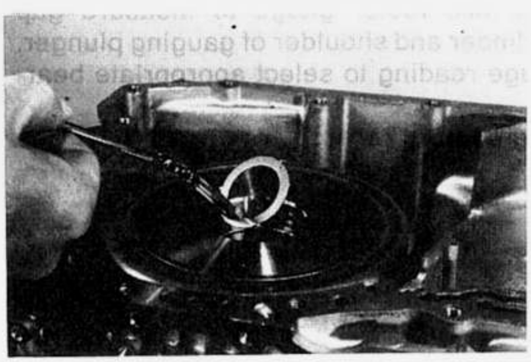
21. Install reverse and high clutch as a pack.



22. Install brake band and anchor pin. Temporarily tighten anchor bolt by hand.

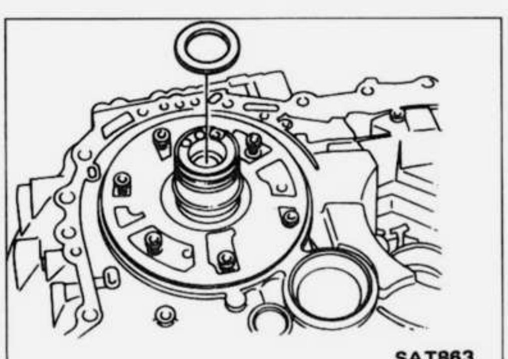


23. Adjust total end play and clutch pack end play as follows:

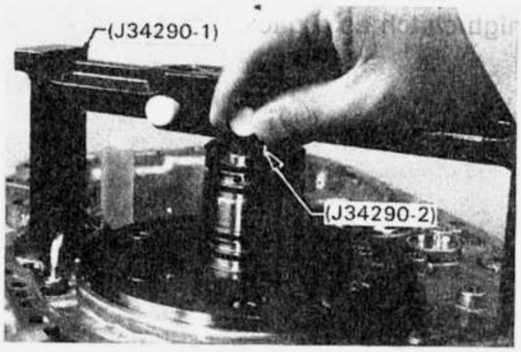


— Total end play —

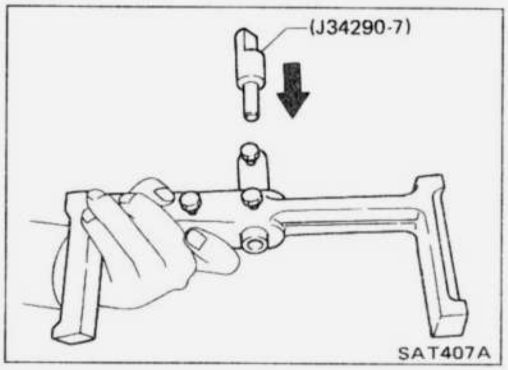
a. Remove thrust bearing race from high clutch drum.



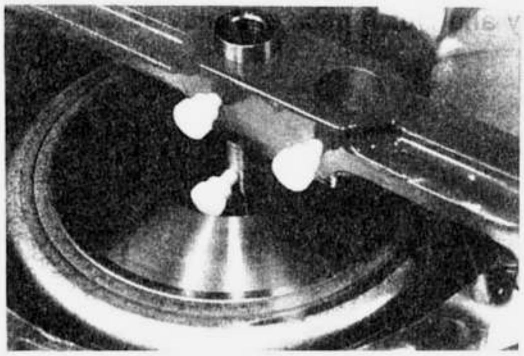
b. Install needle bearing on top of oil pump cover.



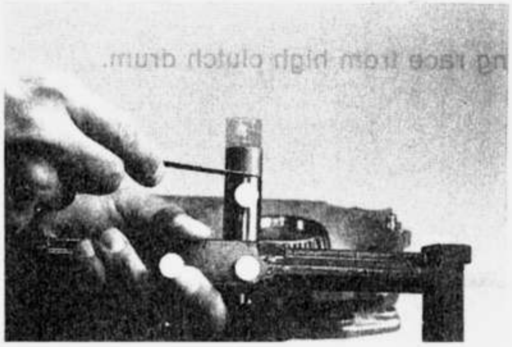
c. Place Tools (bridge and gauging cylinder) on machined gasket surface of converter housing. Allow gauging cylinder to rest on needle bearing and lock it in place with thumbscrew.



d. Insert Tool (total end play gauging plunger) into gauging cylinder.



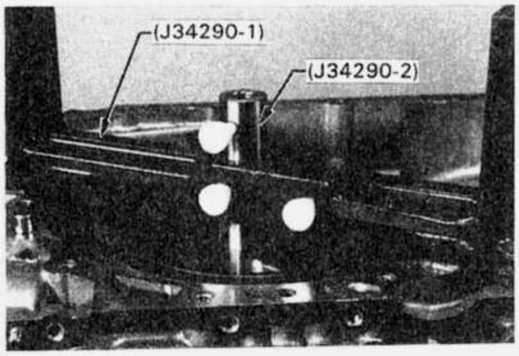
e. Place bridge, legs up, onto machined gasket surface of transaxle case, allowing gauging plunger to rest on surface where bearing race was removed. Lock plunger in place.



f. Remove bridge and use feeler gauge to measure gap between gauging cylinder and shoulder of gauging plunger.

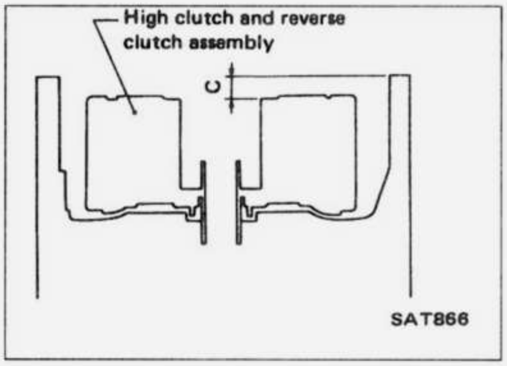
g. Use your feeler gauge reading to select appropriate bearing race thickness.

Oil pump housing bearing races:
Refer to S.D.S.

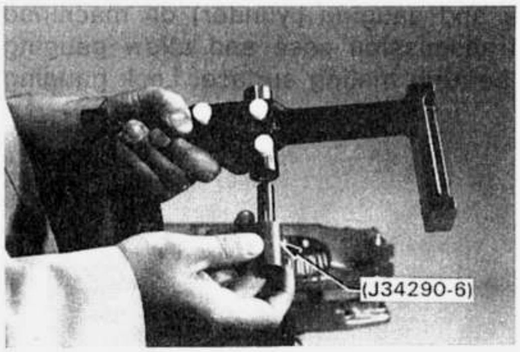


— Clutch pack end play —

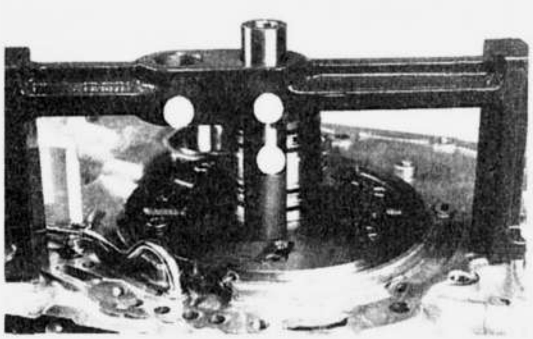
a. Place Tools (bridge and gauging cylinder) onto machined gasket surface of transaxle case and allow cylinder to rest on high clutch drum. Lock cylinder into place.

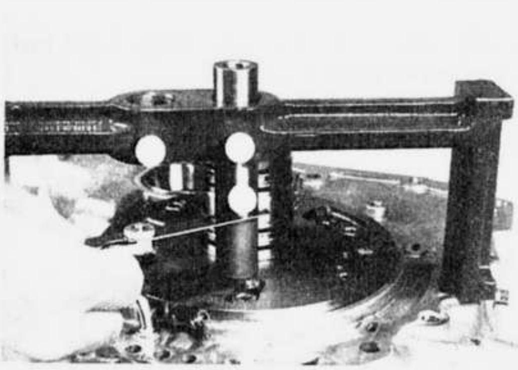


- You are now measuring dimension "C".



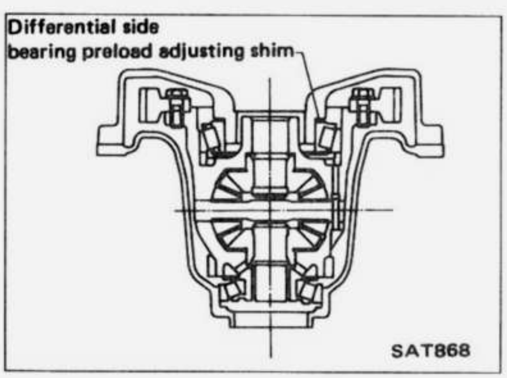
b. Now, insert Tool (clutch pack gauging plunger) into gauging cylinder.



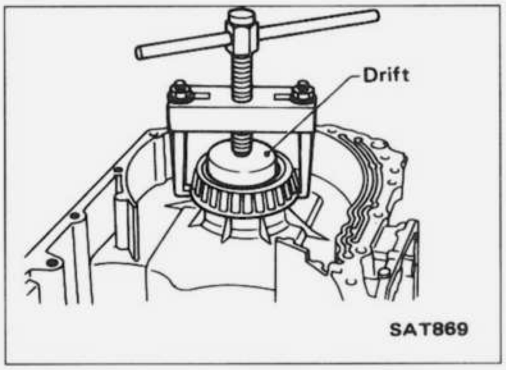


c. Place bridge, gauging cylinder, and gauging plunger onto machined gasket surface of converter housing. Make sure thrust washer is removed. Lock gauging plunger in place.
d. Use feeler gauge to measure gap between gauging cylinder and shoulder of gauging plunger.
e. Use your feeler gauge measurement to select correct washer thickness to give proper clutch pack end play.

Clutch pack thrust washers:
Refer to S.D.S.

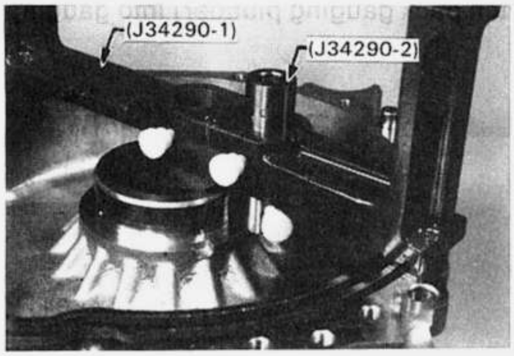


24. Adjust differential side bearing preload as follows:

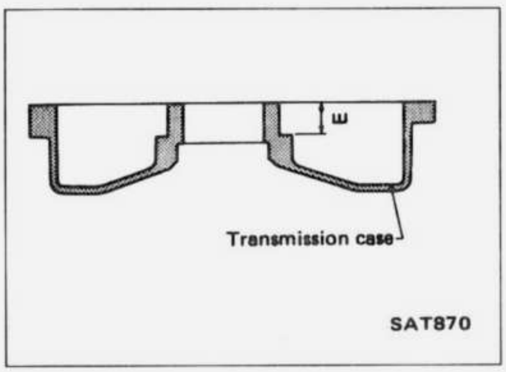


— Without viscous coupling —

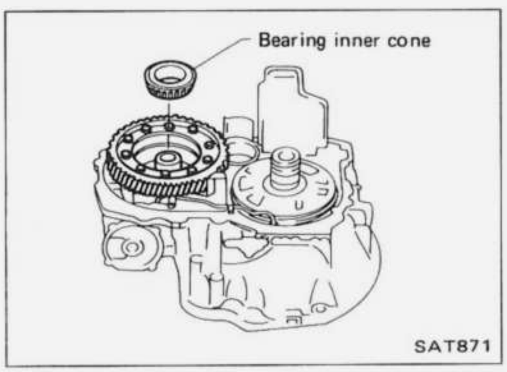
a. Remove left side bearing inner cone from transmission case.



b. Place Tools (bridge and gauging cylinder) on machined gasket surface of transmission case and allow gauging cylinder to rest on bearing mating surface. Lock gauging cylinder in place.

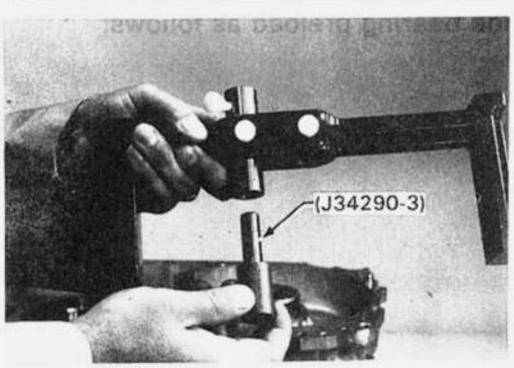


- You are now measuring dimension "E".

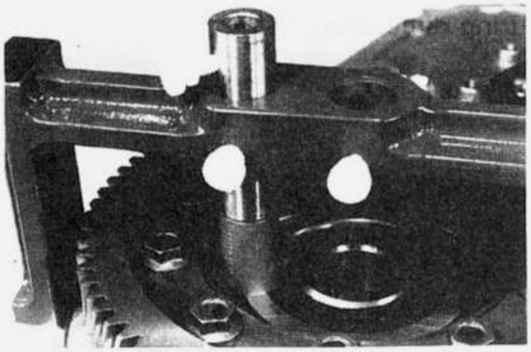


c. Put final drive assembly into converter housing, then put side bearing inner cone on differential case.

d. Hold inner bearing cone in place while spinning final drive assembly in order to seat bearings.

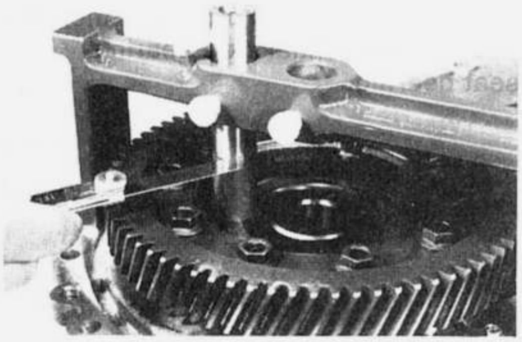


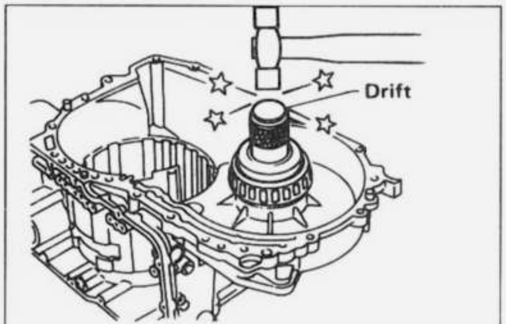
e. Insert Tool (differential side bearing gauging plunger) into gauging cylinder.



f. Place bridge, gauging cylinder, and gauging plunger onto machined gasket surface of converter housing and allow gauging plunger to rest on surface of bearing inner cone. Lock plunger in place.
g. Use feeler gauge to measure clearance between gauging cylinder and shoulder of the gauging plunger.
h. Use your feeler gauge reading to select appropriate side bearing preload shim(s).

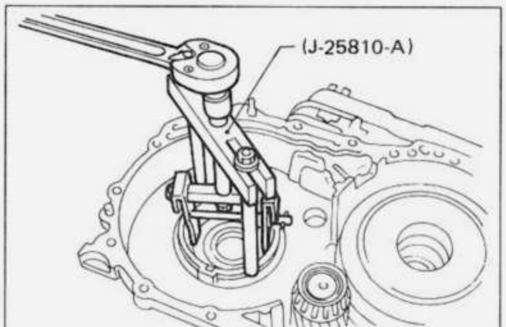
Differential side bearing adjusting shims:
Refer to S.D.S.





SAT873

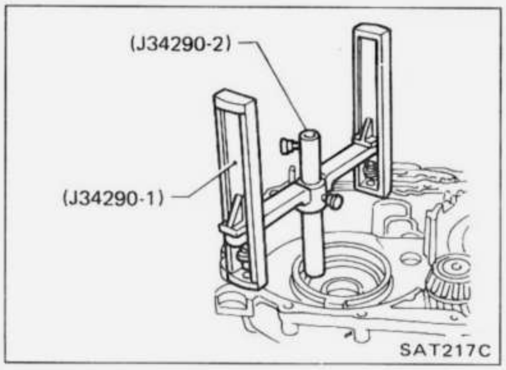
i. Install selected shims and left side bearing inner cone.



SAT216C

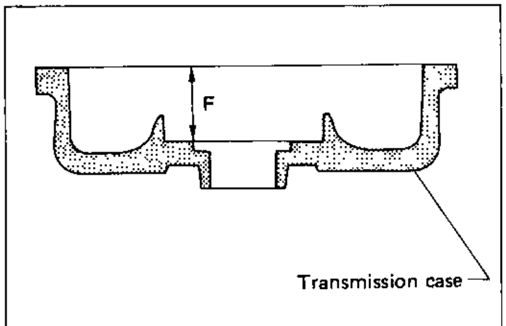
— With viscous coupling —

a. Remove left side bearing outer race and preload adjusting shims from transmission case.



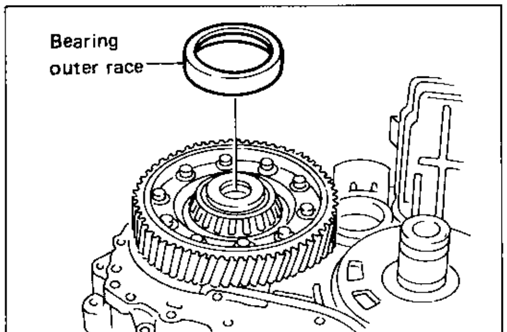
SAT217C

b. Place Tools (bridge and gauging cylinder) on machined gasket surface of transmission case and allow gauging cylinder to drop into bearing race bore until it bottoms. Lock gauging cylinder in place.



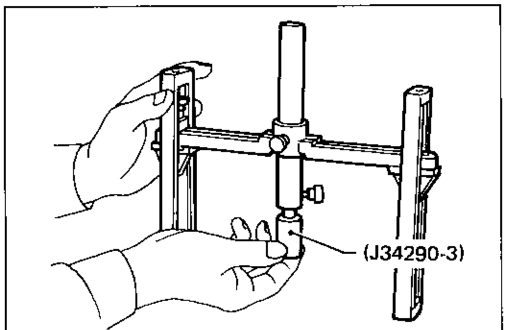
SAT218C

- You are now measuring dimension "F".



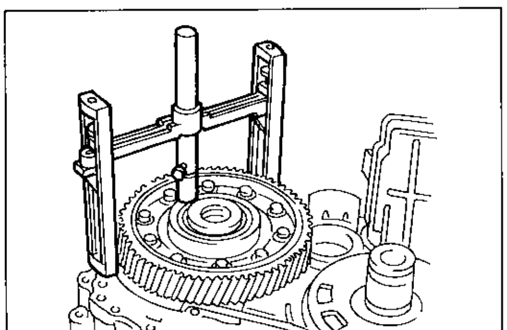
SAT219C

c. Put final drive assembly into converter housing, then put side bearing outer race on differential side bearing.
d. Turn outer race to seat bearing.

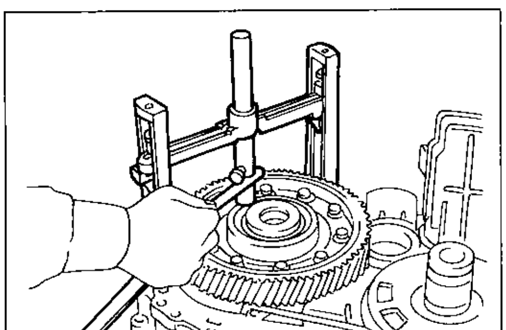


SAT220C

e. Insert Tool (differential side bearing gauging plunger) into gauging cylinder.

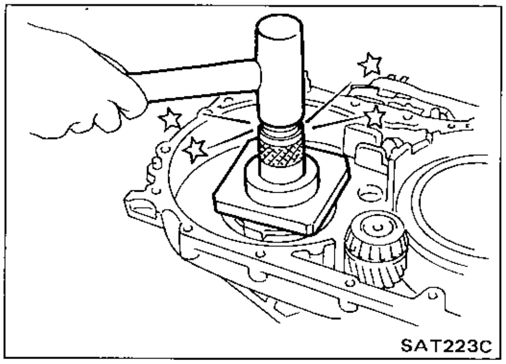

SAT221C

f. Place bridge, gauging cylinder, and gauging plunger onto machined gasket surface of converter housing and allow gauging plunger to drop onto rear surface of side bearing outer race. Lock plunger in place.

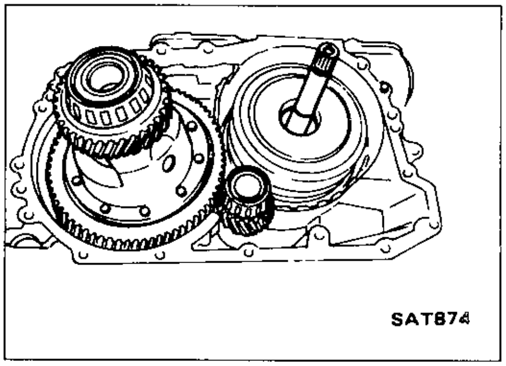

SAT222C

g. Use feeler gauge to measure clearance between gauging cylinder and shoulder of the gauging plunger.
h. Use your feeler gauge reading to select appropriate side bearing preload shim(s).

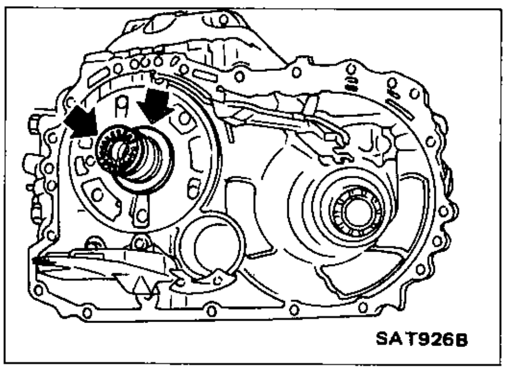
Available differential side bearing adjusting shims:
Refer to S.D.S.


SAT223C

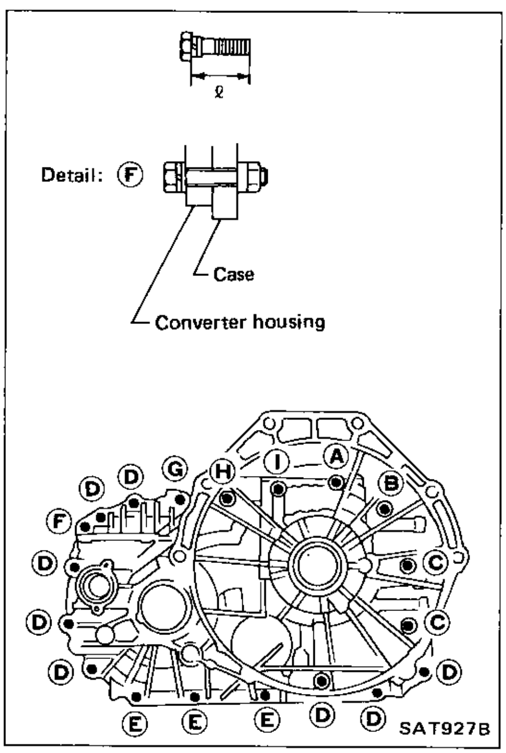
i. Install selected shims and left side bearing outer race.


SAT874

25. Install input shaft.


SAT926B

26. Install selected thrust washer and bearing on oil pump cover.

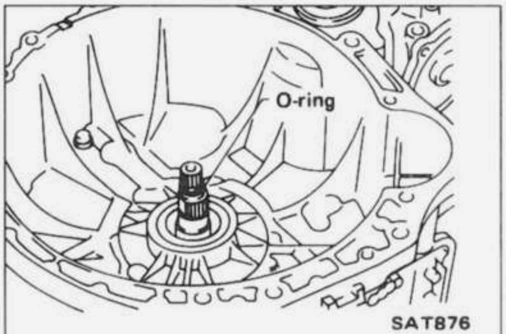


SAT927B

27. Place gasket on transmission case and install converter housing.

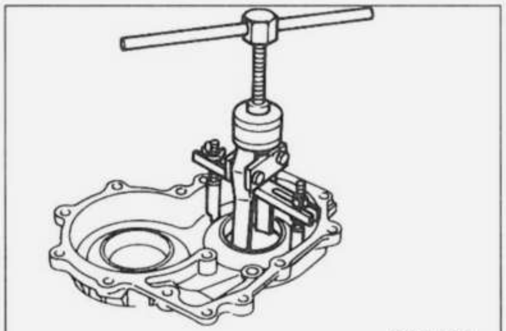
Bolt	Tightening torque N·m (kg-m, ft-lb)	ℓ mm (in)
Ⓐ	21 - 23 (2.1 - 2.3, 15 - 17)	31.5 (1.240)
Ⓑ		27 (1.06)
Ⓒ	19 - 23 (1.9 - 2.3, 14 - 17)	
Ⓓ		31.5 (1.240)
Ⓔ	43 - 47 (4.4 - 4.8, 32 - 35)	35 (1.38)
Ⓕ	21 - 25 (2.1 - 2.6, 15 - 19)	50 (1.97)
Ⓖ	43 - 47 (4.4 - 4.8, 32 - 35)	39 (1.54)
Ⓗ	45 - 47 (4.6 - 4.8, 33 - 35)	
Ⓘ		35 (1.38)

Always use new bolts at portions Ⓐ, Ⓑ, Ⓗ and Ⓘ as they are self-sealing bolts. Apply A.T.F. to thread of other bolts by that fix converter housing to transmission case when installing them.

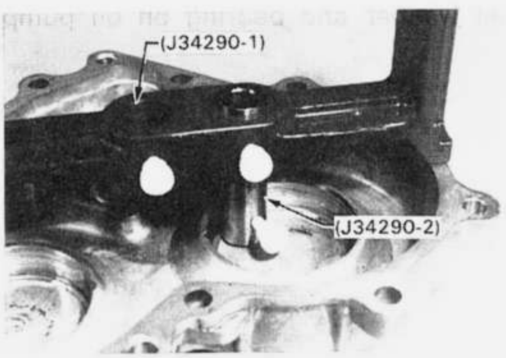


SAT876

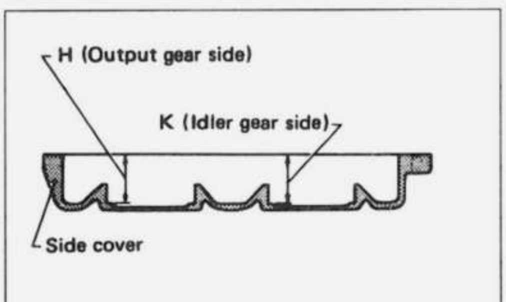
28. Install O-ring onto input shaft.


SAT877

29. Adjust output shaft and idler gear bearing preload as follows:
a. Remove side cover temporarily installed.
b. Remove output gear and idler gear bearing outer races and shims. (The races will interchange, so be sure to keep each race with its correct bearing.)



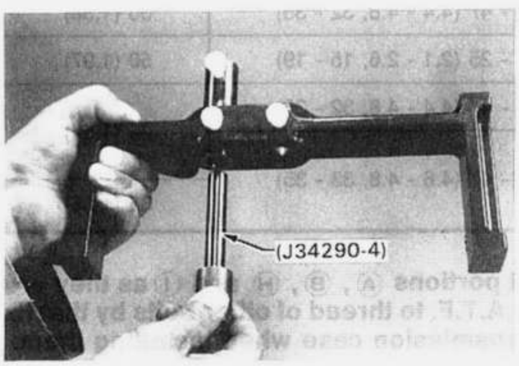
c. Place Tools (bridge and gauging cylinder) onto machined gasket surface of side cover. Allow gauging cylinder to drop into output gear bearing race bore until it bottoms. Lock cylinder in place with the thumbscrew.



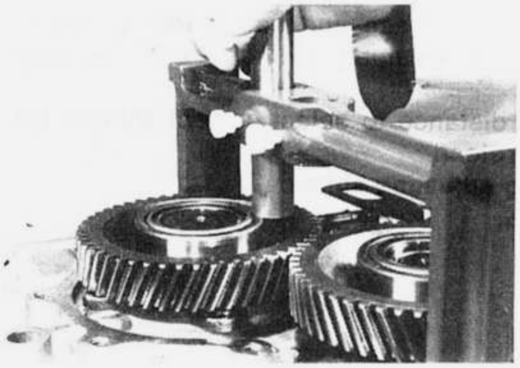
SAT878

- You are now measuring dimension "H".

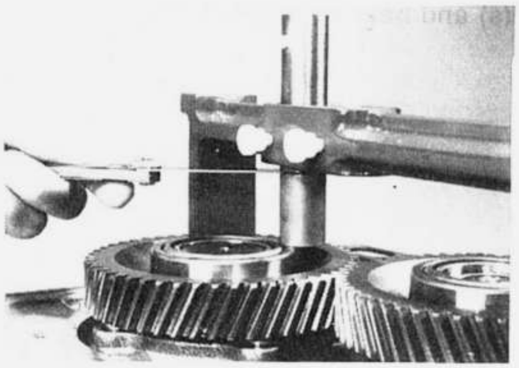
d. Put correct bearing races on the output gear and idler gear bearings, and turn races to seat bearings.



e. Place Tool (output gauging plunger) into the gauging cylinder.



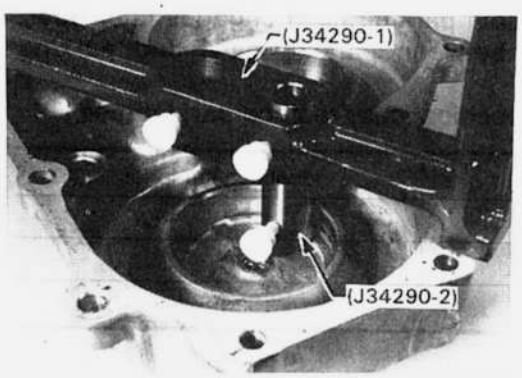
f. Now, place bridge onto machined gasket surface of transmission case and allow gauging plunger to drop onto rear surface of output gear bearing race.



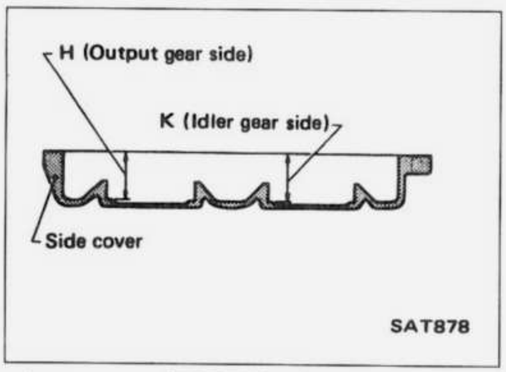
g. Lock gauging plunger in place with thumbscrew. Use feeler gauge to measure gap between gauging cylinder and shoulder of gauging plunger.

h. Use feeler gauge reading to select the correct shim(s).

Output shaft bearing adjusting shims:
Refer to S.D.S.

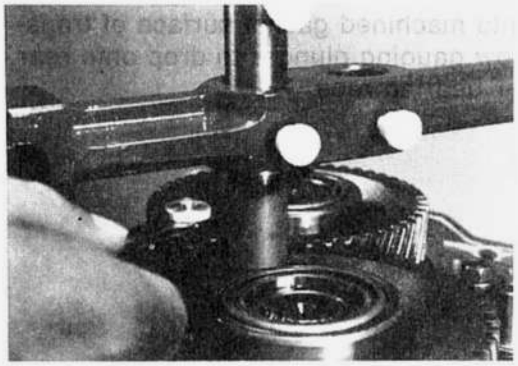


i. Now, measure for the correct preload shims at the idler gear bearing in the same way. Place bridge onto machined surface of side cover and allow gauging cylinder to drop until it contacts idler bearing race mating surface.



- You are now measuring dimension "K".

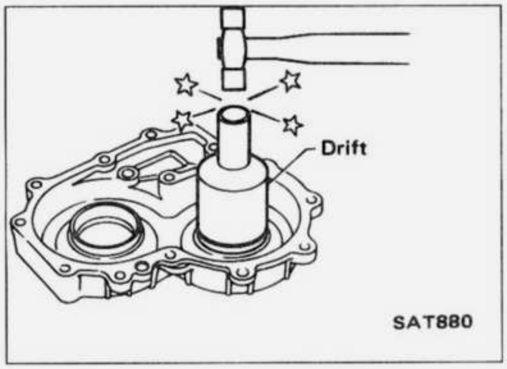
j. Lock gauging cylinder in place. Insert Tool (gauging plunger) into gauging cylinder and place bridge onto machined surface of case, so that gauging plunger meets idler bearing race rear surface.



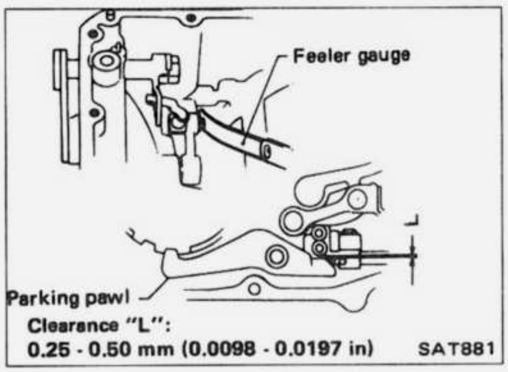
k. Lock gauging plunger in place and use feeler gauge to measure gap between gauging cylinder and gauging plunger.

l. Use your measured distance to select correct shim(s) for idler gear bearing preload.

Idler gear bearing adjusting shims:
Refer to S.D.S.



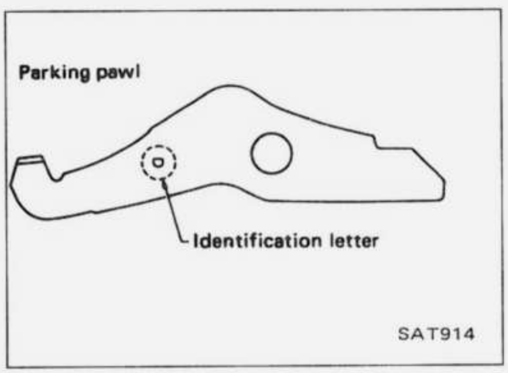
m. Install selected shim(s) and bearing outer races.



30. Move manual lever until parking pawl engages idler gear. Measure clearance between parking pawl and parking actuator.

If clearance is outside specifications, replace parking pawl.

Part number	Identification letter
31989-21X00	D
31989-21X01	E
31989-21X02	F



Example:

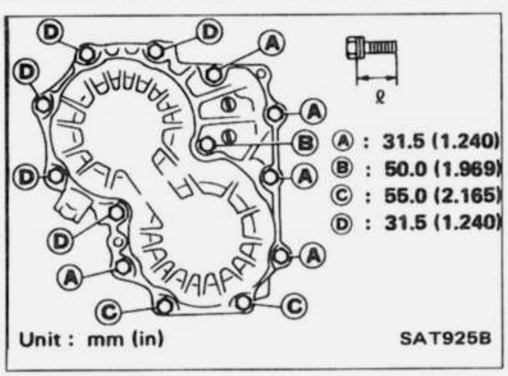
When parking pawl with identification letter "E" is used:

Clearance "L" is larger.

→Replace with parking pawl with identification letter "D".

Clearance "L" is smaller.

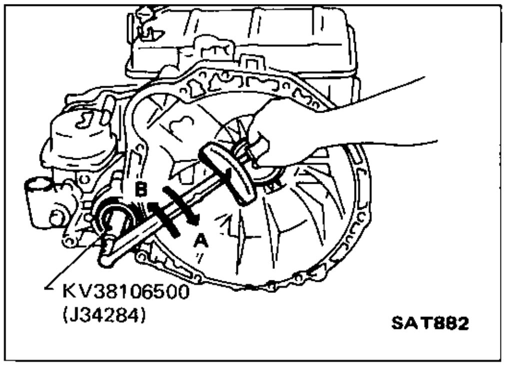
→Replace with parking pawl with identification letter "F".



31. Install side cover and gasket.

Always use new bolts at portions Ⓑ and Ⓓ as they are self-sealing bolts. Apply A.T.F. to thread of other bolts by that fix side cover to transmission case when installing them.

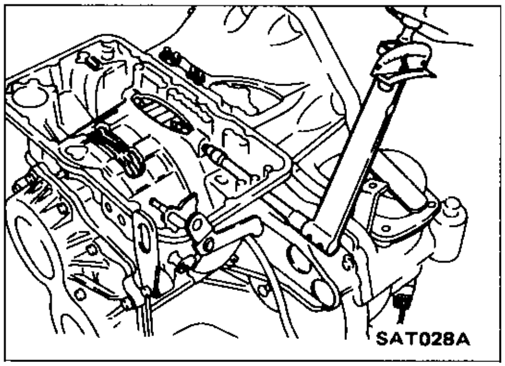
Bolts Ⓐ and Ⓒ:
: 19 - 23 N·m (1.9 - 2.3 kg-m, 14 - 17 ft-lb)
Bolts Ⓑ and Ⓓ:
: 21 - 23 N·m (2.1 - 2.3 kg-m, 15 - 17 ft-lb)



32. Insert Tool into final drive portion to see if internal parts rotates smoothly. Rotating in direction "B" is slightly harder than in direction "A".

If abnormalities are noted, proceed with the following:

- Disassemble parts to see if they are properly assembled.
- Readjust bearing preloads of final drive, output shaft and idler gear.

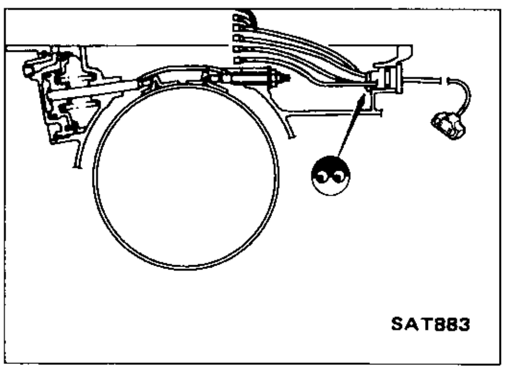


33. Adjust brake band.

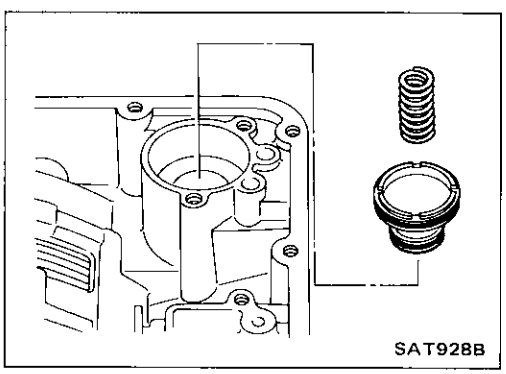
a. First tighten anchor end pin.
   Anchor end pin:
   : 4 - 6 N·m (0.4 - 0.6 kg-m, 2.9 - 4.3 ft-lb)

b. Back off anchor end pin "N" turns.
   Number of returning revolutions for anchor end pin "N":
   5.25 turn

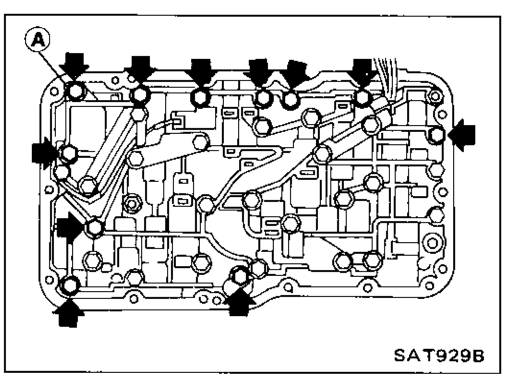
c. Tighten lock nut while holding anchor end pin stationary.
   Lock nut:
   : 31 - 42 N·m (3.2 - 4.3 kg-m, 23 - 31 ft-lb)



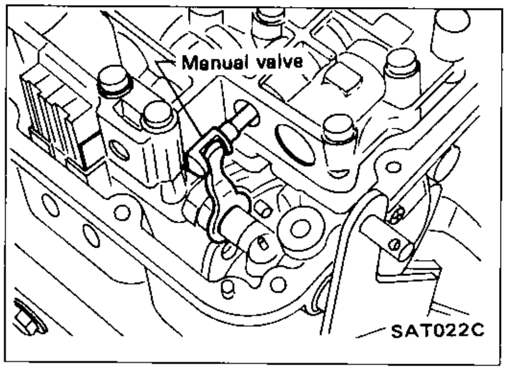
34. Install terminal assembly, paying attention to the direction of its hook.



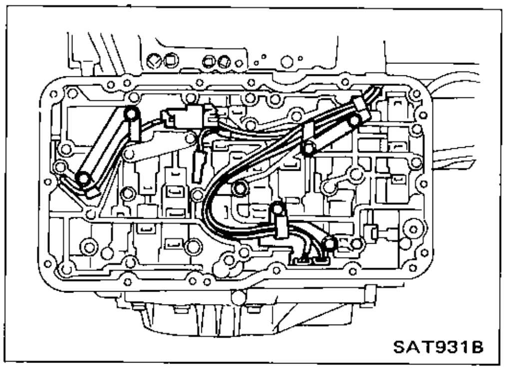
35. Install accumulator and spring.



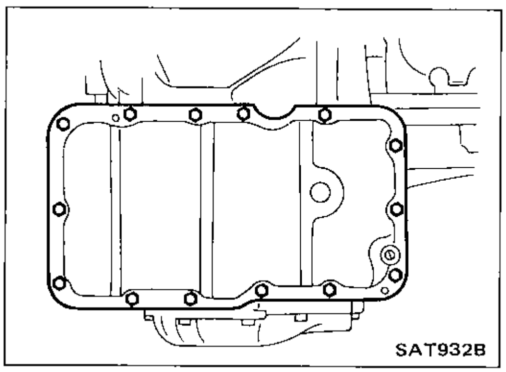
36. Insert manual valve to control valve body, then assemble them to transmission case.
   Bolt Ⓐ :
   : 3.7 - 5.0 N·m (0.38 - 0.51 kg-m, 2.7 - 3.7 ft-lb)
   Other bolts:
   : 7 - 9 N·m (0.7 - 0.9 kg-m, 5.1 - 6.5 ft-lb)



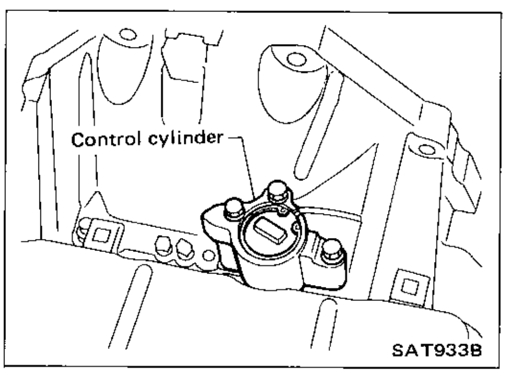
- **Pay attention to the direction of manual valve groove.**



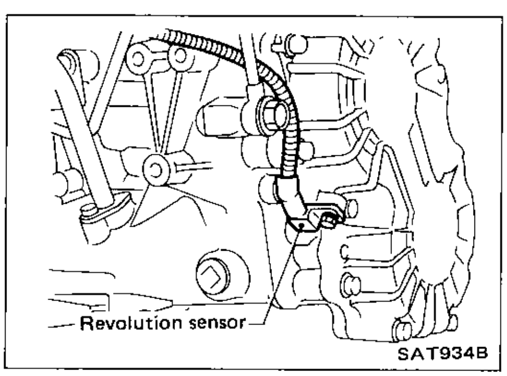
37. Connect harness connectors between terminal assembly and solenoids.



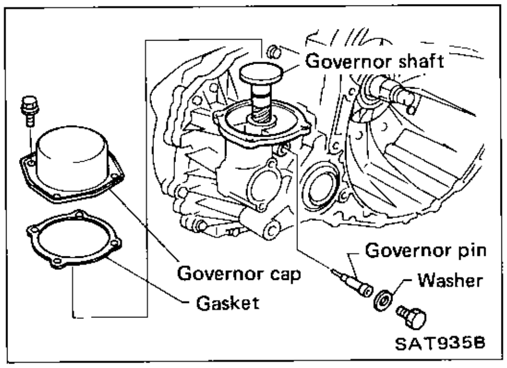
38. Put gasket on transmission case and install valve cover.
Always use new bolts as they are self-sealing bolts.



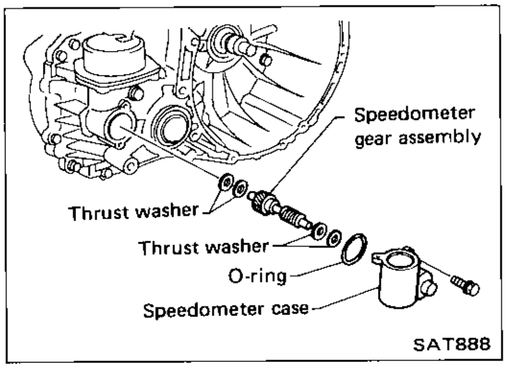
39. Install control cylinder.



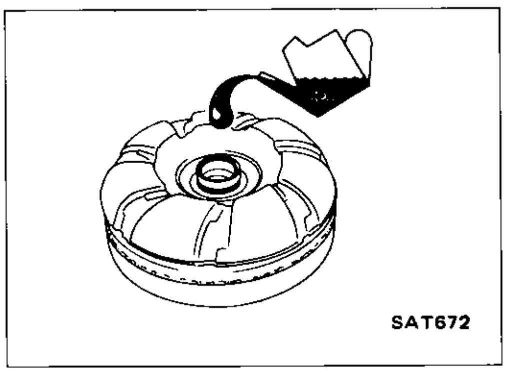
40. Install revolution sensor.



41. Install governor shaft.



42. Install speedometer parts.



43. Pour approximately 2 liters (2-1/8 US qt, 1-3/4 Imp qt) of automatic transmission fluid into converter housing.
44. Install torque converter to converter housing.

Be careful not to scratch front oil seal.

45. Apply sealant to threads of drain plug and install it in place.
46. Install inhibitor switch to transmission case.
47. Adjust inhibitor switch. Refer to On-vehicle Service.
48. Make sure that manual lever operates smoothly.

General Specifications

Automatic transaxle model	RE4F02A	RE4F02V
Automatic transaxle assembly Model code number	27 X 63 (Without viscous coupling)	27 X 70 (With viscous coupling)
Transaxle gear ratio		
1st	2.785	
2nd	1.545	
3rd	1.000	
4th	0.694	
Reverse	2.272	
Final drive (Center differential gear)	3.642	3.876
Recommended oil	Automatic transmission fluid Type DEXRON™	
Oil capacity (Approximately) ℓ (US qt, Imp qt)	7.4 (7-7/8, 6-1/2)	

Specifications and Adjustment

CLUTCHES AND BRAKES

High clutch		
Number of drive plates	4	
Number of driven plates	3+1	
Thickness of drive plate mm (in)		
Standard	1.6 (0.063)	
Allowable limit	1.4 (0.055)	
Clearance mm (in)		
Standard	1.4 - 1.8 (0.055 - 0.071)	
Allowable limit	2.6 (0.102)	
Thickness of retaining plate	Thickness mm (in)	Part number
	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
	5.0 (0.197)	31537-41X68

Reverse clutch		
Number of drive plates	2	
Number of drive plates	2	
Thickness of drive plate mm (in)		
Standard	2.0 (0.079)	
Allowable 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)	31537-21X60
	4.8 (0.189)	31537-21X61
	5.0 (0.197)	31537-21X62
	5.2 (0.205)	31537-21X63
	5.4 (0.213)	31537-21X64

Low clutch		
Number of drive plates	5	
Number of drive plates	6	
Thickness of drive plate mm (in)		
Standard	2.0 (0.079)	
Allowable limit	1.8 (0.071)	
Clearance mm (in)		
Standard	0.5 - 0.8 (0.020 - 0.031)	
Allowable limit	1.8 (0.071)	
Thickness of retaining plate	Thickness mm (in)	Part number
	4.8 (0.189)	31597-21X00
	5.0 (0.197)	31597-21X01
	5.2 (0.205)	31597-21X02
	5.4 (0.213)	31597-21X03
	5.6 (0.220)	31597-21X04
	5.8 (0.228)	31597-21X05
	6.0 (0.236)	31597-21X06

Specifications and Adjustment (Cont'd)

Brake band		
Piston size mm (in)		
Big dia.	75 (2.95)	
Small dia.	43 (1.69)	
Anchor end pin 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 pin	5.0 - 5.5	
Lock nut tightening torque N·m (kg-m, ft-lb)	31 - 42 (3.2 - 4.3, 23 - 31)	
Low & reverse brake		
Number of drive plates	6	
Number of driven plates	6	
Thickness of drive plate mm (in)		
Standard	2.0 (0.079)	
Allowable limit	1.8 (0.071)	
Clearance mm (in)		
Standard	1.2 - 1.6 (0.047 - 0.063)	
Allowable limit	2.8 (0.110)	
Thickness of retaining plate	Thickness mm (in)	Part number
	3.4 (0.134)	31667-23X00
	3.6 (0.142)	31667-23X01
	3.8 (0.150)	31667-23X02
	4.0 (0.157)	31667-23X03
	4.2 (0.165)	31667-23X04
	4.4 (0.173)	31667-23X05
	4.6 (0.181)	31667-23X06
	4.8 (0.189)	31667-23X07
	5.0 (0.197)	31667-23X08

PLANETARY CARRIER

Unit: mm (in)

	Front carrier	Rear carrier
Clearance between pinion washer and planetary carrier		
Standard	0.15 - 0.70 (0.0059 - 0.0276)	0.20 - 0.70 (0.0079 - 0.0276)
Allowable limit	0.80 (0.0315)	

OIL PUMP, BEARING RETAINER AND OUTPUT SHAFT

Unit: mm (in)

Oil pump clearance	
Cam ring — oil pump cover	
Standard	0.010 - 0.024 (0.0004 - 0.0009)
Allowable limit	0.034 (0.0013)
Rotor — oil pump cover	
Standard	0.017 - 0.031 (0.0007 - 0.0012)
Allowable limit	0.034 (0.0013)
Vane — oil pump cover	
Standard	0.017 - 0.031 (0.0007 - 0.0012)
Allowable limit	0.034 (0.0013)
Seal ring clearance	
Standard	0.10 - 0.25 (0.0039 - 0.0098)
Allowable limit	0.25 (0.098)

TOTAL END PLAY

Total end play	0.25 - 0.55 mm (0.0098 - 0.0217 in)	
Thickness of oil pump housing 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

CLUTCH PACK END PLAY

Clutch pack end play	0.4 - 0.8 mm (0.016 - 0.031 in)	
Thickness of clutch pack 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

DIFFERENTIAL SIDE GEAR THRUST WASHER

Without viscous coupling

Allowable clearance between side gear and differential case with washer	0.1 - 0.2 mm (0.004 - 0.008 in)
Thickness mm (in)	Part number
0.75 - 0.80 (0.0295 - 0.0315)	38424-E3000 or 38424-E3020
0.80 - 0.85 (0.0315 - 0.0335)	38424-E3001 or 38424-E3021
0.85 - 0.90 (0.0335 - 0.0354)	38424-E3002 or 38424-E3022
0.90 - 0.95 (0.0354 - 0.0374)	38424-E3003 or 38424-E3023

With viscous coupling (L.H. side gear)

Allowable clearance between side gear and viscous coupling with washer	0.1 - 0.2 mm (0.004 - 0.008 in)
Thickness mm (in)	Part number
0.43 - 0.45 (0.0169 - 0.0177)	38424-51E10
0.52 - 0.54 (0.0205 - 0.0213)	38424-51E11
0.61 - 0.63 (0.0240 - 0.0248)	38424-51E12
0.70 - 0.72 (0.0276 - 0.0283)	38424-51E13
0.79 - 0.81 (0.0311 - 0.0319)	38424-51E14

With viscous coupling (R.H. side gear)

Allowable clearance between side gear and differential case with washer	0.1 - 0.2 mm (0.004 - 0.008 in)
Thickness mm (in)	Part number
0.75 - 0.80 (0.0295 - 0.0315)	38424-21X00
0.80 - 0.85 (0.0315 - 0.0335)	38424-21X01
0.85 - 0.90 (0.0335 - 0.0354)	38424-21X02
0.90 - 0.95 (0.0354 - 0.0374)	38424-21X03

DIFFERENTIAL SIDE BEARING PRELOAD

Differential side bearing adjusting shim (Without viscous coupling)

Thickness mm (in)	Part number
0.12 (0.0047)	38453-21X13
0.16 (0.0063)	38453-21X14
0.20 (0.0079)	38453-21X15
0.24 (0.0094)	38453-21X16
0.28 (0.0110)	38453-21X17
0.32 (0.0126)	38453-21X18
0.36 (0.0142)	38453-21X19
0.40 (0.0157)	38453-21X20
0.44 (0.0173)	38453-21X00
0.48 (0.0189)	38453-21X01
0.52 (0.0205)	38453-21X02
0.56 (0.0220)	38453-21X03
0.60 (0.0236)	38453-21X04
0.64 (0.0252)	38453-21X05
0.68 (0.0268)	38453-21X06
0.72 (0.0283)	38453-21X07
0.76 (0.0299)	38453-21X08
0.80 (0.0315)	38453-21X09
0.84 (0.0331)	38453-21X10
0.88 (0.0346)	38453-21X11
0.92 (0.0362)	38453-21X12

Differential side bearing adjusting shim (With viscous coupling)

Thickness mm (in)	Part number
0.12 (0.0047)	38753-56E15
0.16 (0.0063)	38753-56E16
0.20 (0.0079)	38753-56E17
0.24 (0.0094)	38753-56E18
0.28 (0.0110)	38753-56E19
0.32 (0.0126)	38753-56E20
0.36 (0.0142)	38753-56E00
0.40 (0.0157)	38753-56E01
0.44 (0.0173)	38753-56E02
0.48 (0.0189)	38753-56E03
0.52 (0.0205)	38753-56E04
0.56 (0.0220)	38753-56E05
0.60 (0.0236)	38753-56E06
0.64 (0.0252)	38753-56E07
0.68 (0.0268)	38753-56E08
0.72 (0.0283)	38753-56E09
0.76 (0.0299)	38753-56E10
0.80 (0.0315)	38753-56E11
0.84 (0.0331)	38753-56E12
0.88 (0.0346)	38753-56E13
0.92 (0.0362)	38753-56E14

Specifications and Adjustment (Cont'd)

OUTPUT SHAFT PRELOAD

Output shaft preload adjusting shim

Thickness mm (in)	Part number
0.12 (0.0047)	31499-21X00
0.16 (0.0063)	31499-21X01
0.20 (0.0079)	31499-21X02
0.24 (0.0094)	31499-21X03
0.28 (0.0110)	31499-21X04
0.32 (0.0126)	31499-21X05
0.36 (0.0142)	31499-21X06
0.40 (0.0157)	31499-21X07
0.44 (0.0173)	31499-21X08
0.48 (0.0189)	31499-21X09
0.52 (0.0205)	31499-21X10
0.56 (0.0220)	31499-21X11
0.60 (0.0236)	31499-21X12
0.64 (0.0252)	31499-21X13
0.68 (0.0268)	31499-21X14
0.72 (0.0283)	31499-21X15
0.76 (0.0299)	31499-21X16
0.80 (0.0315)	31499-21X17
0.84 (0.0331)	31499-21X18
0.88 (0.0346)	31499-21X19
0.92 (0.0362)	31499-21X20
1.44 (0.0567)	31499-21X21
1.96 (0.0772)	31499-21X22

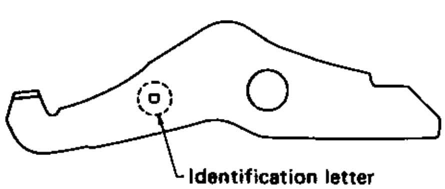
IDLER GEAR PRELOAD

Idler gear preload adjusting shim

Thickness mm (in)	Part number
0.36 (0.0142)	31499-21X06
0.40 (0.0157)	31499-21X07
0.44 (0.0173)	31499-21X08
0.48 (0.0189)	31499-21X09
0.52 (0.0205)	31499-21X10
0.56 (0.0220)	31499-21X11
0.60 (0.0236)	31499-21X12
0.64 (0.0252)	31499-21X13
0.68 (0.0268)	31499-21X14
0.72 (0.0283)	31499-21X15
0.76 (0.0299)	31499-21X16
0.80 (0.0315)	31499-21X17
0.84 (0.0331)	31499-21X18
0.88 (0.0346)	31499-21X19
0.92 (0.0362)	31499-21X20
1.44 (0.0567)	31499-21X21
1.96 (0.0772)	31499-21X22

PARKING PAWL

Clearance "L"	0.25 - 0.50 mm (0.0098 - 0.0197 in)
Identification letter	Part number
D	31989-21X00
E	31989-21X01
F	31989-21X02



SAT914

REMOVAL AND INSTALLATION

Throttle wire	Stroke "L"	39 - 43 mm (1.54 - 1.69 in)
	Number of returning revolution for lock nut	2.75 - 3.25
	Lock nut tightening torque	8 - 10 N·m (0.8 - 1.0 kg-m, 5.8 - 7.2 ft-lb)
Distance between end of clutch housing and torque converter		19.0 mm (0.748 in) or more
Drive plate runout limit		0.5 mm (0.020 in)

FRONT AXLE & FRONT SUSPENSION

SECTION **FA**

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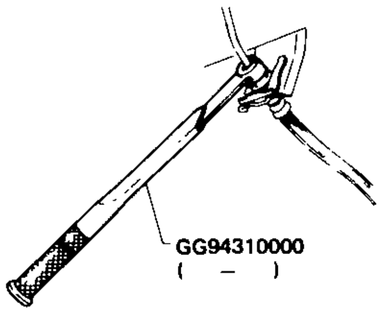


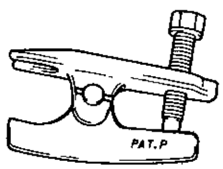
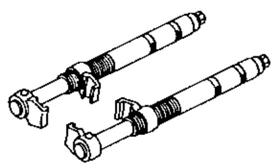
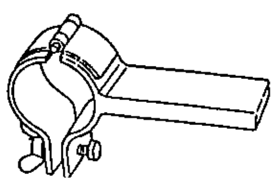
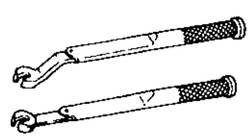
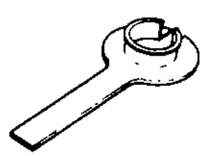
SBR500

Precautions

- **When installing rubber parts, 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 tubes.**

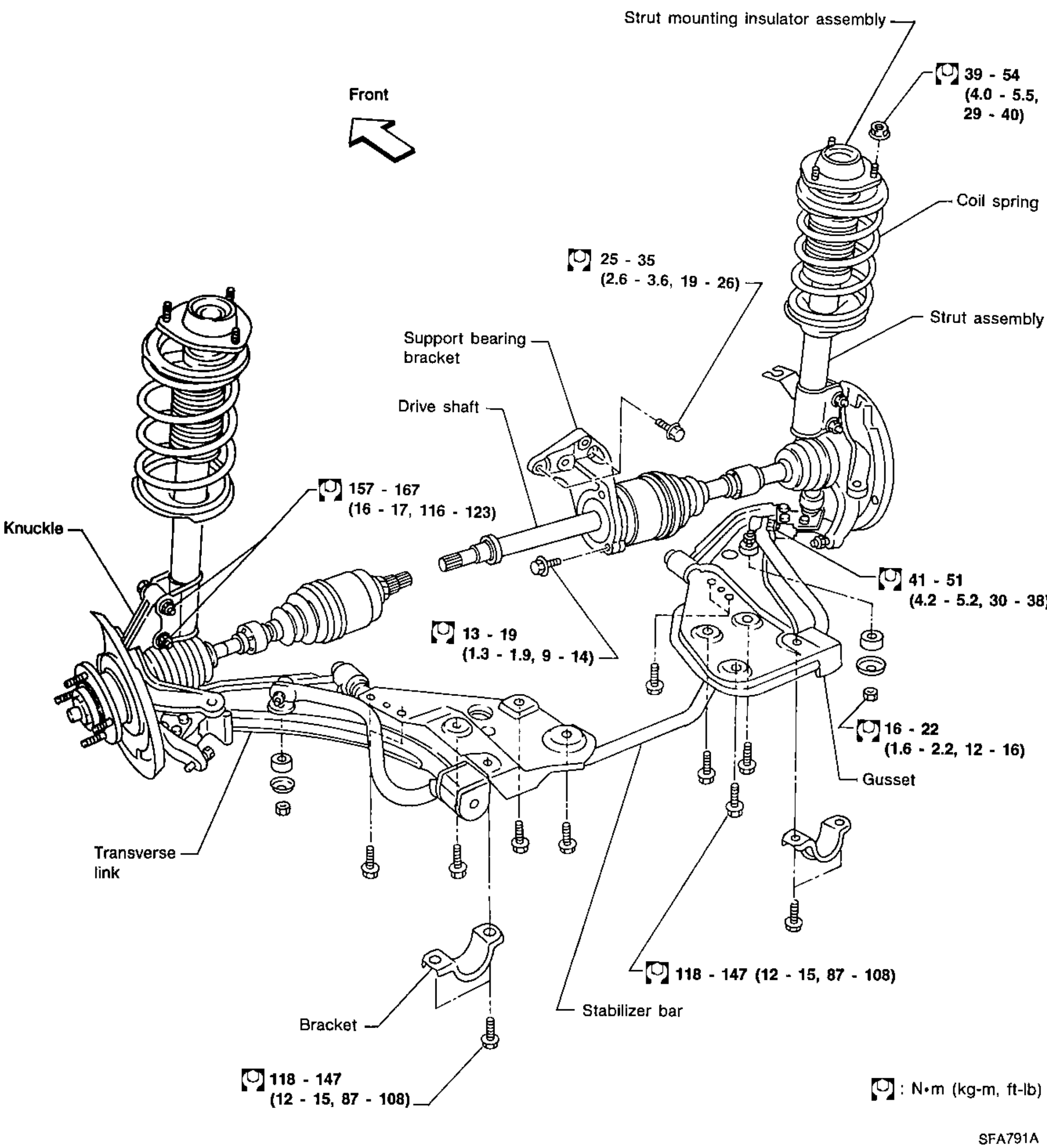
Preparation

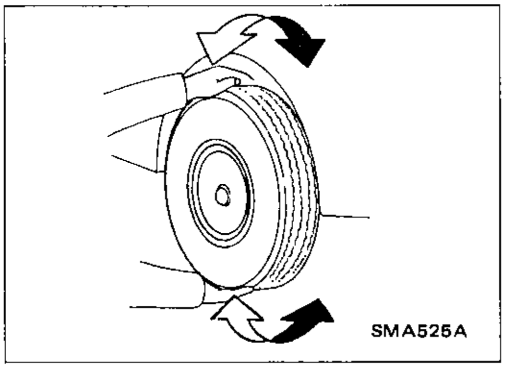
SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.) Tool name	Description	
HT72520000 (J25730-A) Ball joint remover	 	Removing tie-rod outer end and lower ball joint
HT71780000 (—) Spring compressor		Removing and installing coil spring
ST35652000 (—) Strut attachment		Fixing strut assembly
GG94310000 (—) Flare nut torque wrench		Removing and installing brake piping
KV38106700 (J34296) KV38106800 (J34297) Differential side oil seal protector	 L.H.: KV38106700 R.H.: KV38106800	Installing drive shaft

When instaling rubber parts, 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.**

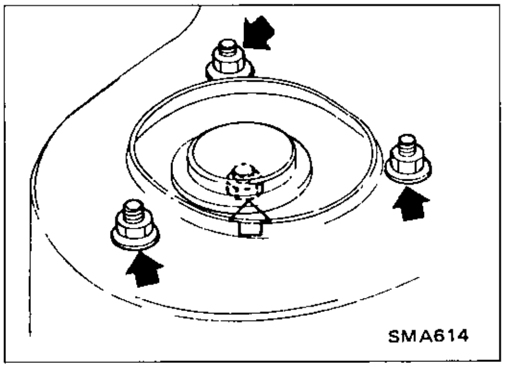




Front Axle and Front Suspension Parts

Check front axle and front suspension parts for looseness, cracks, wear or other damage.

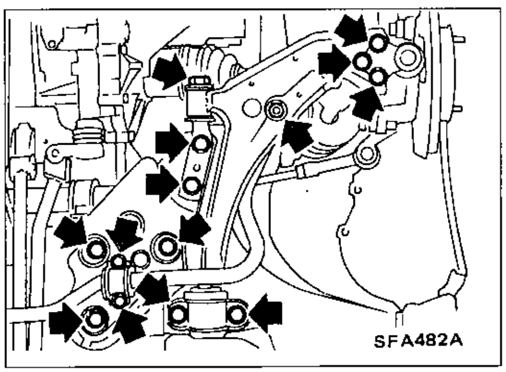
- Shake each front wheel to check for excessive play.

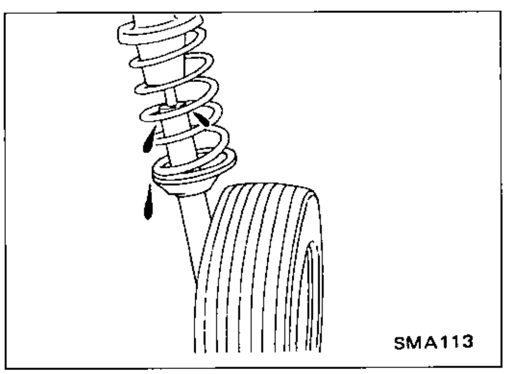


- Make sure that cotter pin is inserted.
- Retighten all nuts and bolts to the specified torque.

  Tightening torque:

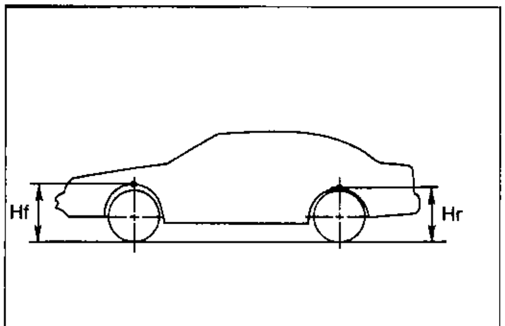
  Refer to FRONT SUSPENSION.





- Check strut (shock absorber) for oil leakage or other damage.

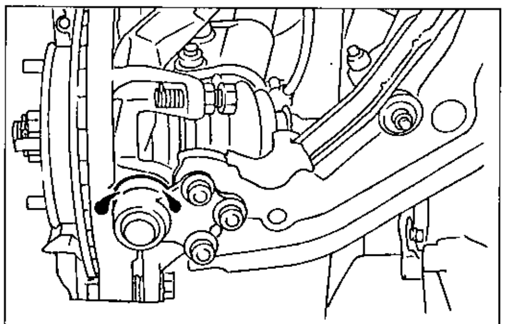
Front Axle and Front Suspension Parts (Cont'd)



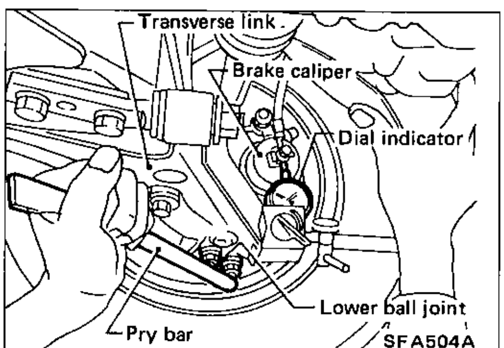
SFA818A

- Check spring height from the top of the wheelarch to the ground.

(1) Vehicle must be unladen*, parked on a level surface, and tires checked for proper inflation and wear (tread wear indicator must not be showing).
*: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.
(2) Bounce the vehicle up and down several times before measuring.
Standard height:
Front (Hf): 676 mm (26.61 in)
Rear (Hr): 645 mm (25.39 in)
(3) Spring height is not adjustable. If out of specification, check for worn springs or suspension parts.


SFA483A

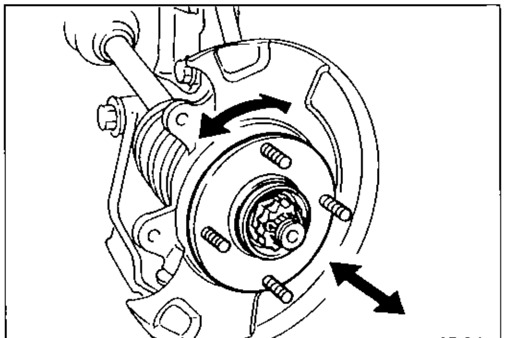
- Check suspension ball joint for grease leakage and ball joint dust cover for cracks or other damage.



SFA504A

- Check suspension ball joint end play.

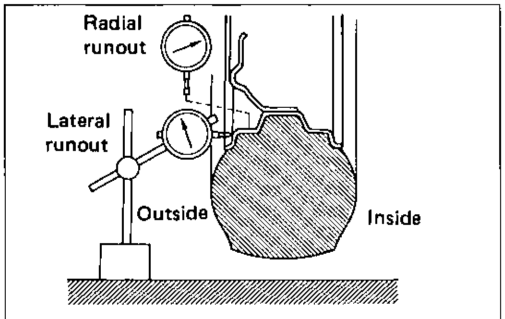
(1) Jack up front of vehicle and set the stands.
(2) Clamp dial indicator onto transverse link and place indicator tip on lower edge of brake caliper.
(3) Make sure front wheels are straight and brake pedal is depressed.
(4) Place a pry bar between transverse link and inner rim of road wheel.
(5) While raising and releasing pry bar, observe maximum dial indicator value.
Vertical end play:
0 mm (0 in)
(6) If ball joint movement is beyond specifications, remove and recheck it.



SFA484A

Front Wheel Bearing

- Check that wheel bearings operate smoothly.
- 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.



SFA575B

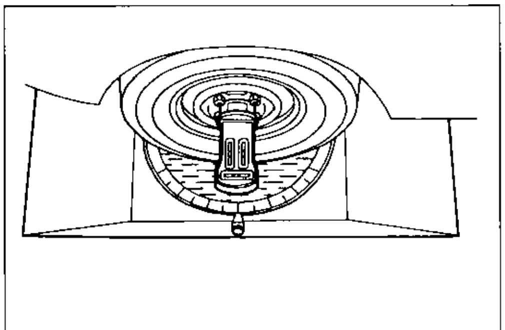
Front Wheel Alignment

Before checking front wheel alignment, be sure to make a preliminary inspection (Unladen*).

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

PRELIMINARY INSPECTION

1. Check tires for wear and improper inflation.
2. Check wheel runout.
   Wheel runout:
   Refer to S.D.S.
3. Check front wheel bearings for looseness.
4. Check front suspension for looseness.
5. Check steering linkage for looseness.
6. Check that front shock absorbers work properly by using the standard bounce test.
7. Check vehicle posture (Unladen).

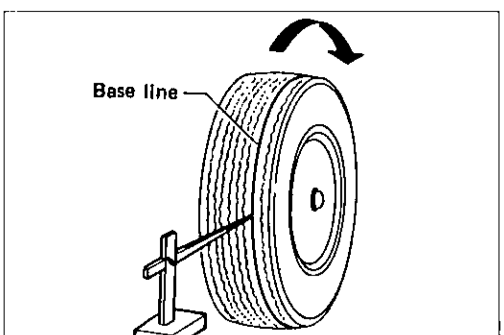


SFA894

CAMBER, CASTER AND KINGPIN INCLINATION

Camber, caster and kingpin inclination are preset at factory and cannot be adjusted.

1. Measure camber, caster and kingpin inclination of both right and left wheels with a suitable alignment gauge.
   Camber, Caster and Kingpin inclination:
   Refer to S.D.S.
2. If camber, caster and kingpin inclination are not within specification, inspect and replace any damaged or worn front suspension parts.

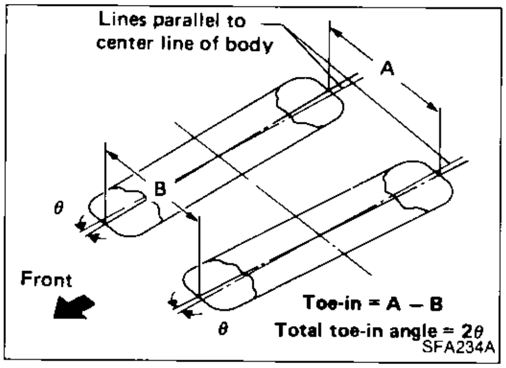


SMA123

TOE-IN

1. Draw a base line across the tread.
- After lowering front of vehicle, move it up and down to eliminate friction, and set steering wheel in straight-ahead position.

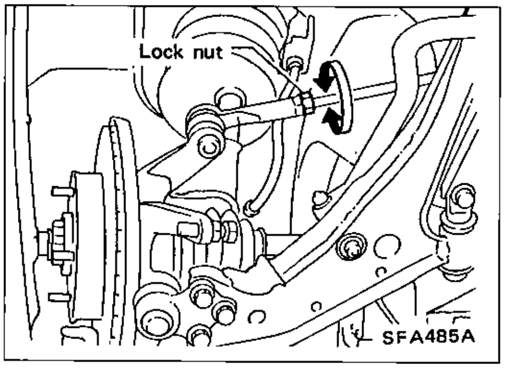
Front Wheel Alignment (Cont'd)



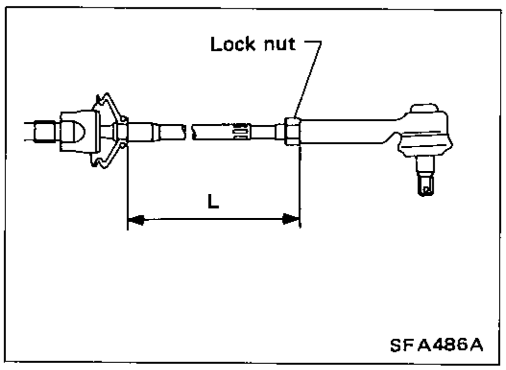
2. Measure toe-in.
- Measure distance "A" and "B" at the same height as hub center.

  Toe-in :

  Refer to S.D.S.



3. Adjust toe-in by varying the length of steering tie-rods.
(1) Loosen lock nuts.
(2) Adjust toe-in by screwing tie-rods in and out.



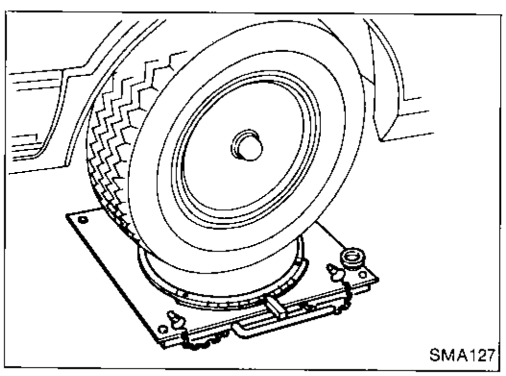
Standard length "L":

Refer to ST section.

(3) Tighten lock nuts to specified torque.

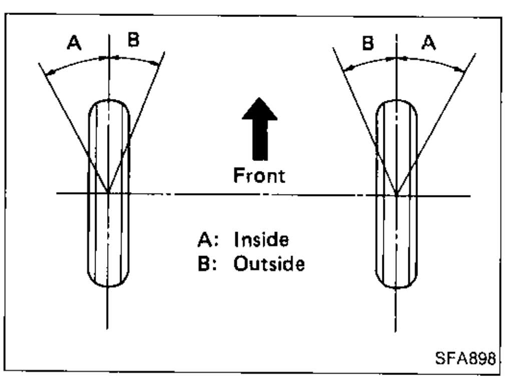
Lock nut tightening torque:

Refer to ST section.



FRONT WHEEL TURNING ANGLE

1. Set wheels in straight-ahead position and then move vehicle forward until front wheels rest on turning radius gauge properly.



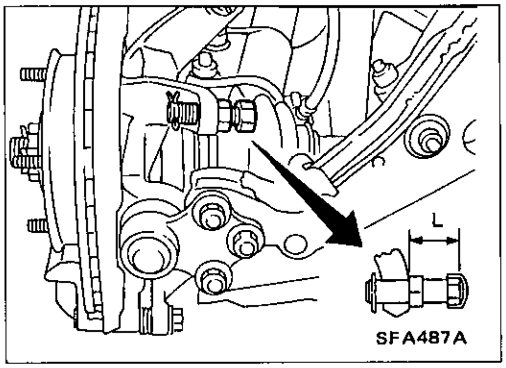
2. Rotate steering wheel all the way right and left; measure turning angle.

   Wheel turning angle (Full turn):

   Inside wheel: 34° - 38°

   Outside wheel: 27° - 31°

Front Wheel Alignment (Cont'd)

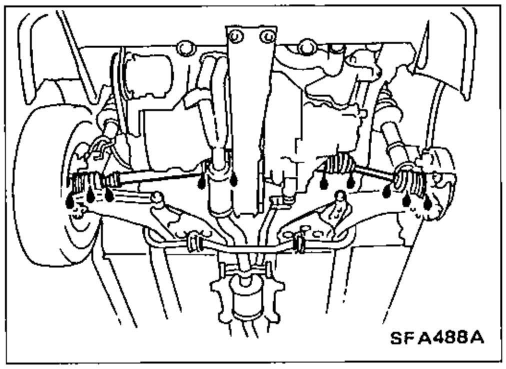


SFA487A

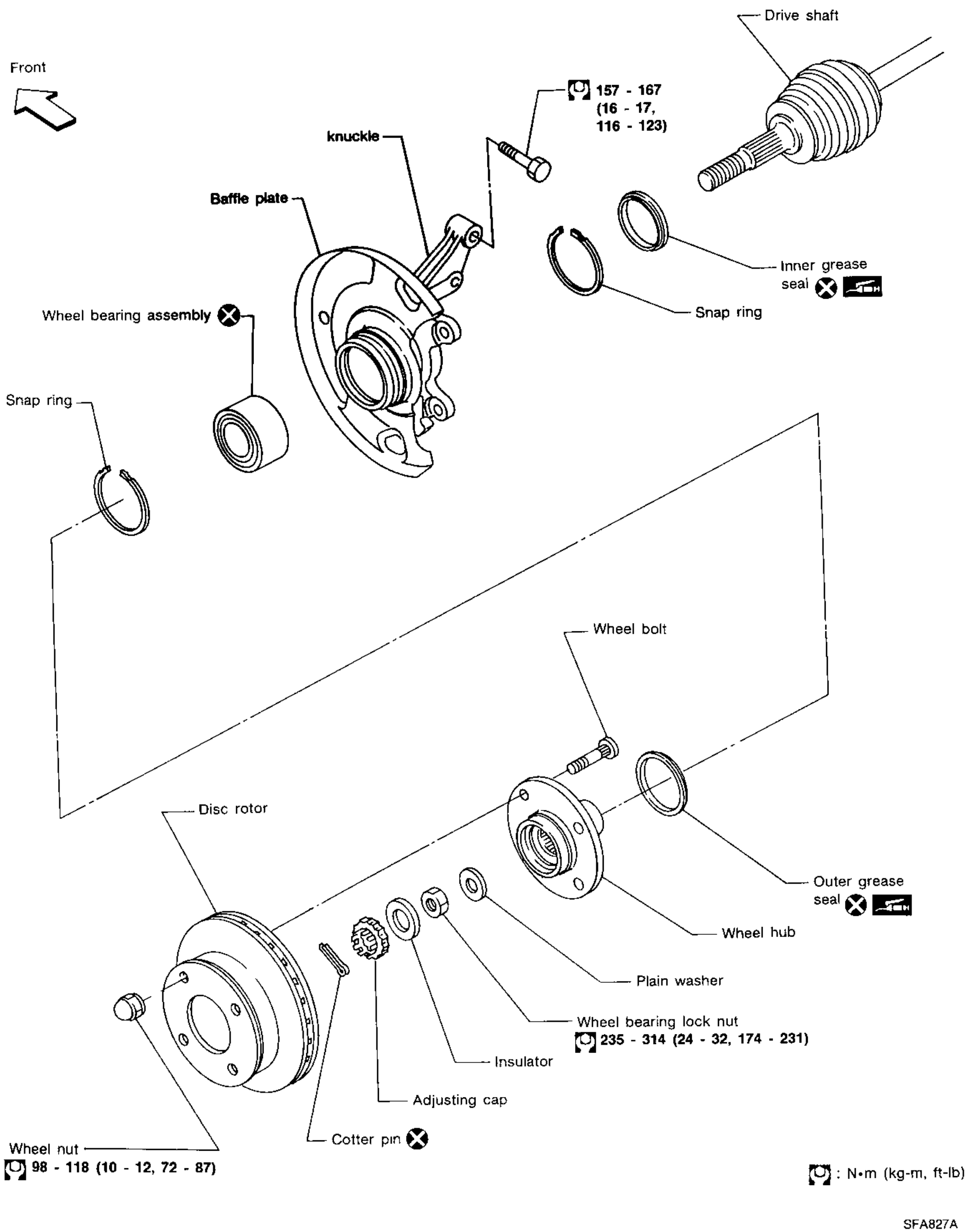
3. Adjust with stopper bolt if necessary.

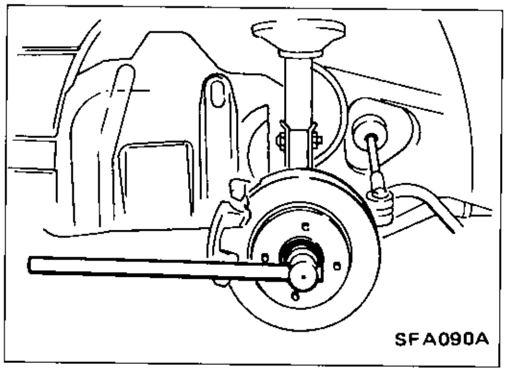
Stopper bolt lock nut tightening torque:
54 - 72 N·m (5.5 - 7.3 kg-m, 40 - 53 ft-lb)

Drive Shaft


SFA488A

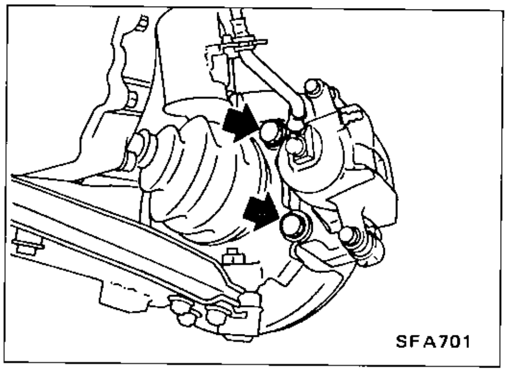
Check for grease leakage or other damage.


Drive shaft
Front
157 - 167
(16 - 17,
116 - 123)
knuckle
Baffle plate
Inner grease
seal
Wheel bearing assembly
Snap ring
Snap ring
Wheel bolt
Disc rotor
Outer grease
seal
Wheel hub
Plain washer
Wheel bearing lock nut
235 - 314 (24 - 32, 174 - 231)
Insulator
Adjusting cap
Cotter pin
Wheel nut
98 - 118 (10 - 12, 72 - 87)
: N•m (kg-m, ft-lb)
SFA827A



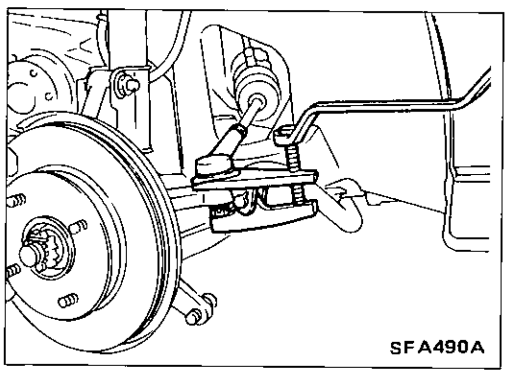
Removal

- Remove wheel bearing lock nut.



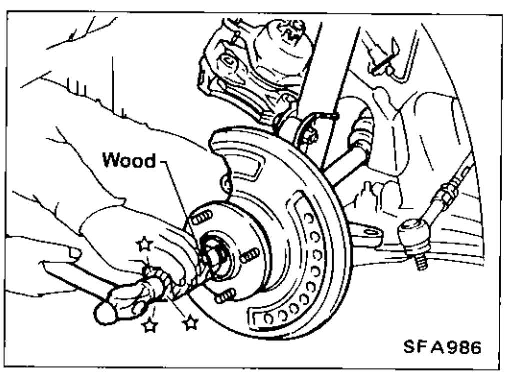
- Remove brake caliper assembly.

Brake hose need not be disconnected from brake caliper. Be careful not to depress brake pedal, or piston will pop out. Make sure brake hose is not twisted.



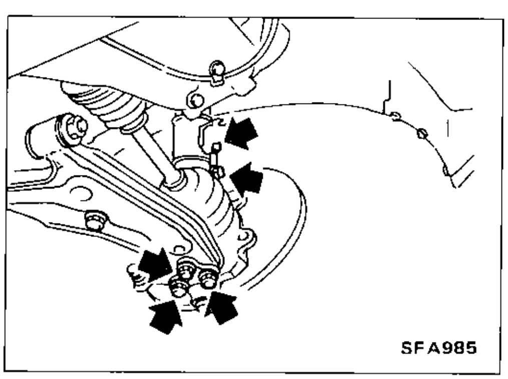
- Separate tie-rod from knuckle with Tool.

Install stud nut conversely on stud bolt to prevent damage to stud bolt.

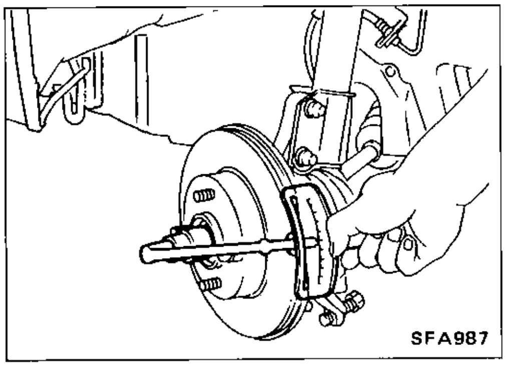


- Separate drive shaft from knuckle by lightly tapping it. If it is hard to remove, use a puller.

When removing drive shaft, cover boots with shop towel to prevent damage to them.

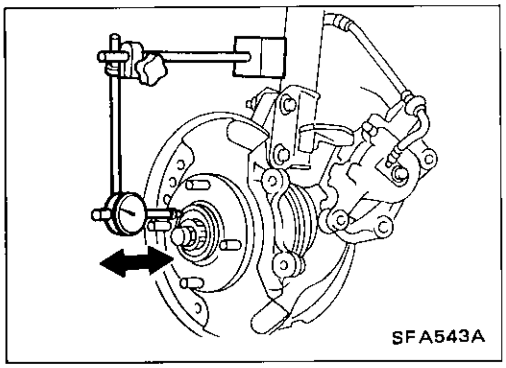


- Remove bolts and nuts as shown at left.

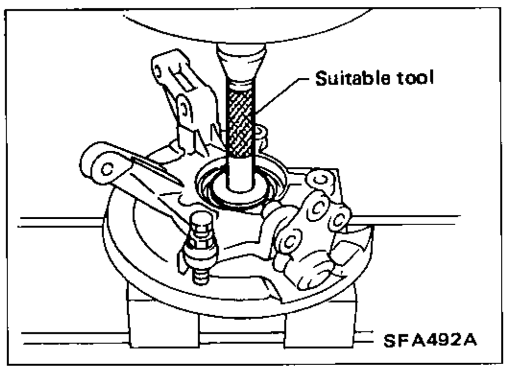

SFA987

Installation

- Install knuckle with wheel hub.
- Tighten wheel bearing lock nut.
  : 235 - 314 N·m
  (24 - 32 kg-m, 174 - 231 ft-lb)


SFA543A

- Check wheel bearing axial end play.
  Axial end play:
  0.05 mm (0.0020 in) or less.



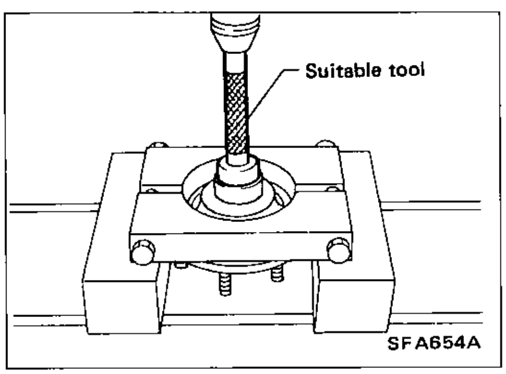
SFA492A

Disassembly

CAUTION:
When removing wheel hub or wheel bearing from knuckle, replace wheel bearing assembly (outer race, inner races and grease seals) with a new one.

WHEEL HUB

Drive out hub with inner race (outside) from knuckle with a suitable tool.

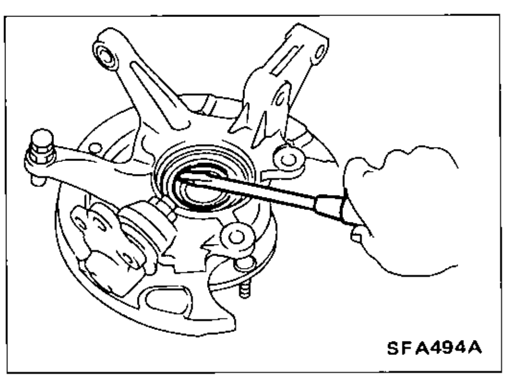


SFA654A

WHEEL BEARING

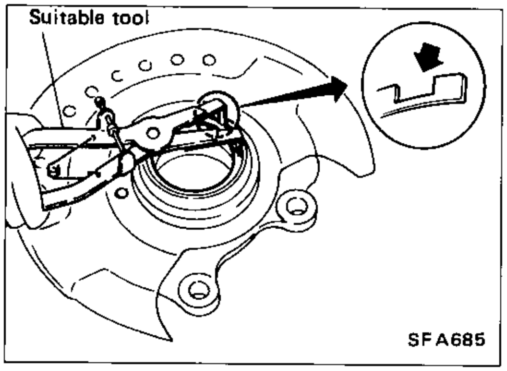
When replacing wheel bearing, replace wheel bearing assembly (inner races and outer race).

- Remove bearing inner race (outside), then remove outer grease seal.

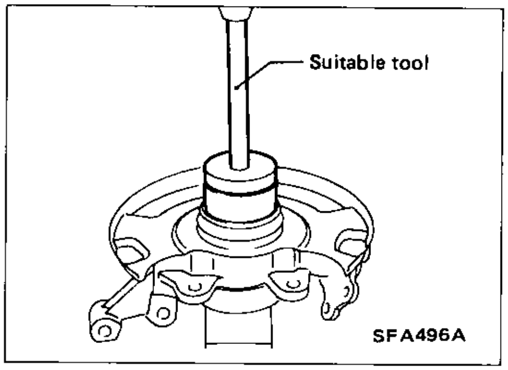

SFA494A

- Remove inner grease seal from knuckle.

Disassembly (Cont'd)



- Remove inner and outer snap rings.



- Press out bearing outer race.

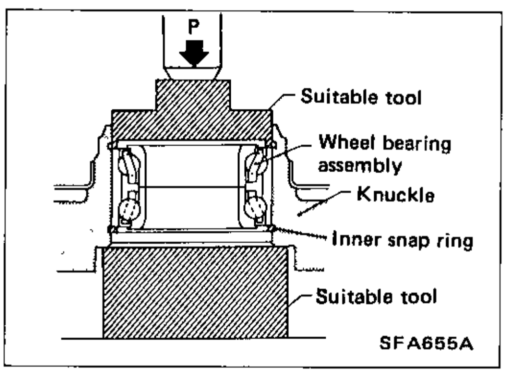
Inspection

WHEEL HUB AND KNUCKLE

Check wheel hub and knuckle for cracks by using a magnetic exploration or dyeing test.

SNAP RING

Check snap ring for wear or cracks. Replace if necessary.

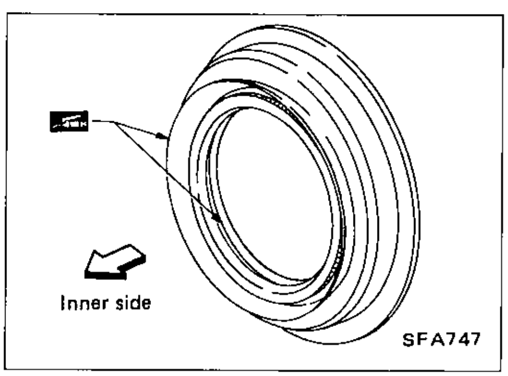


Assembly

1. Install inner snap ring into groove of knuckle.
2. Press new wheel bearing assembly into knuckle.
   Maximum load P:
   29 kN (3 ton, 3.3 US ton, 3.0 Imp ton)

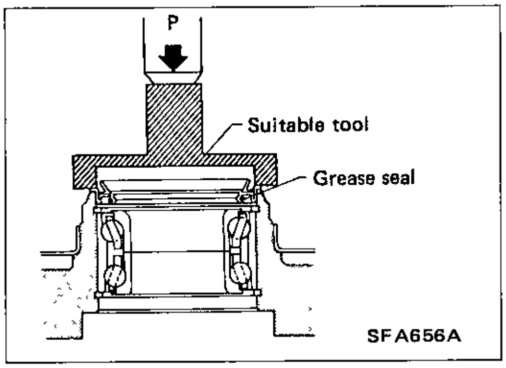
CAUTION:
- **Do not press inner race of wheel bearing assembly.**
- **Do not apply oil or grease to mating surfaces of wheel bearing outer race and knuckle.**

3. Install outer snap ring into groove of knuckle.

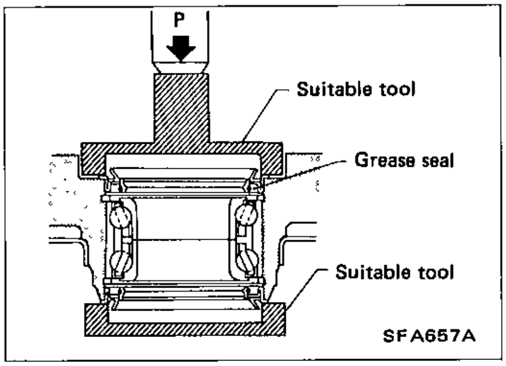


4. Pack grease seal lip with multi-purpose grease.

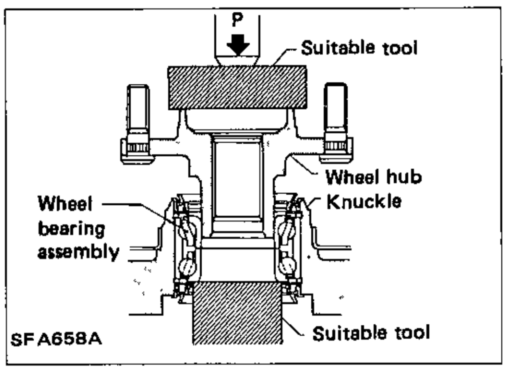
Assembly (Cont'd)



5. Install outer grease seal.

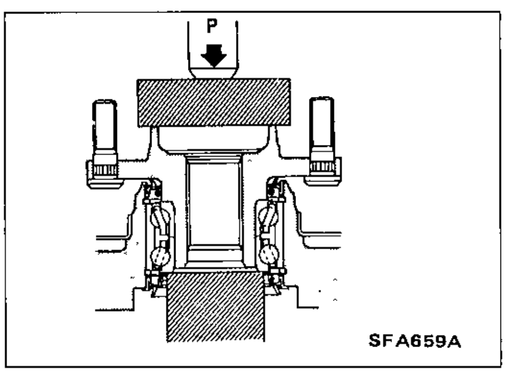


6. Install inner grease seal.



7. Press wheel hub into knuckle.
   Maximum load P:
   29 kN (3 ton, 3.3 US ton, 3.0 Imp ton)

Be careful not to damage grease seal.

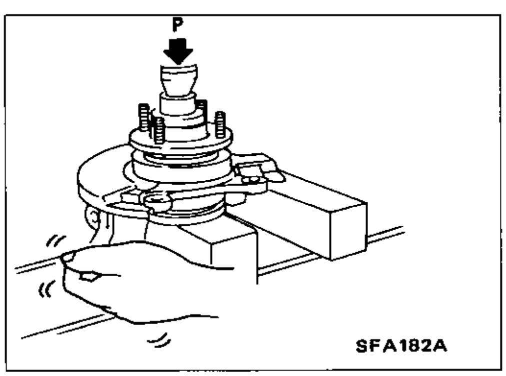


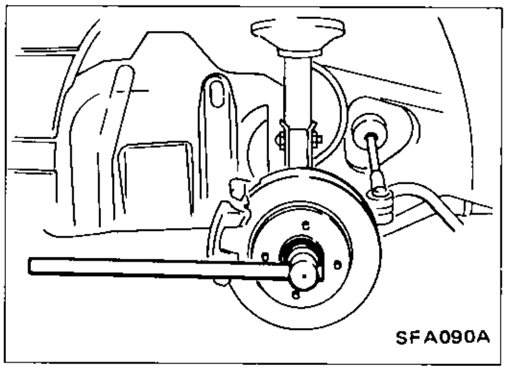
8. Check bearing operation.

(1) Add load P with press.
   Load P:
   34.3 - 49.0 kN
   (3.5 - 5.0 ton, 3.9 - 5.5 US ton, 3.44 - 4.92 Imp ton)

(2) Spin knuckle several turns in both directions.

(3) Make sure that wheel bearings operate smoothly.

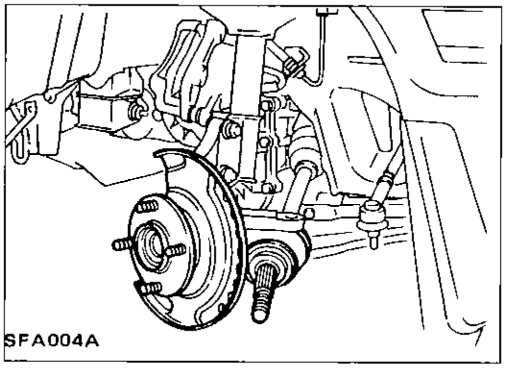




Removal

- Remove wheel bearing lock nut.
- Remove brake caliper assembly.

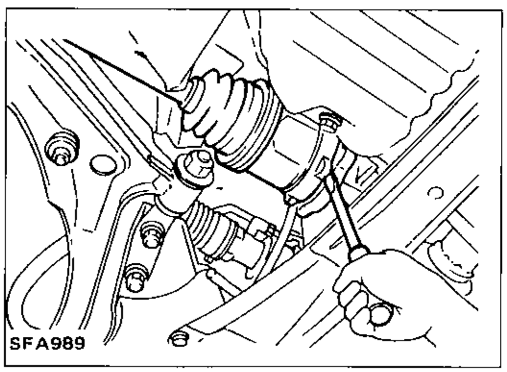
Brake hose need not be disconnected from brake caliper.
Be careful not to depress brake pedal, or piston will pop out.
Make sure brake hose is not twisted.



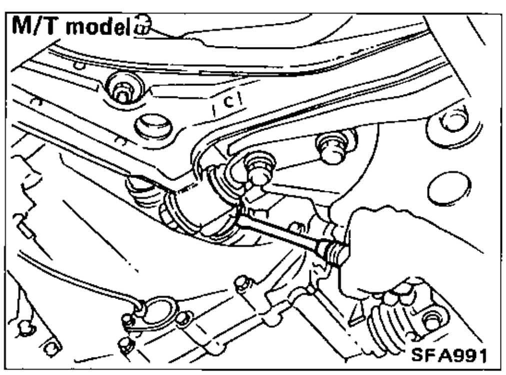
- Remove tie-rod ball joint.
- Separate drive shaft from knuckle by slightly tapping it.

When removing drive shaft, cover boots with shop towel to prevent damage to them.

Refer to FRONT AXLE — Wheel Hub and Knuckle.



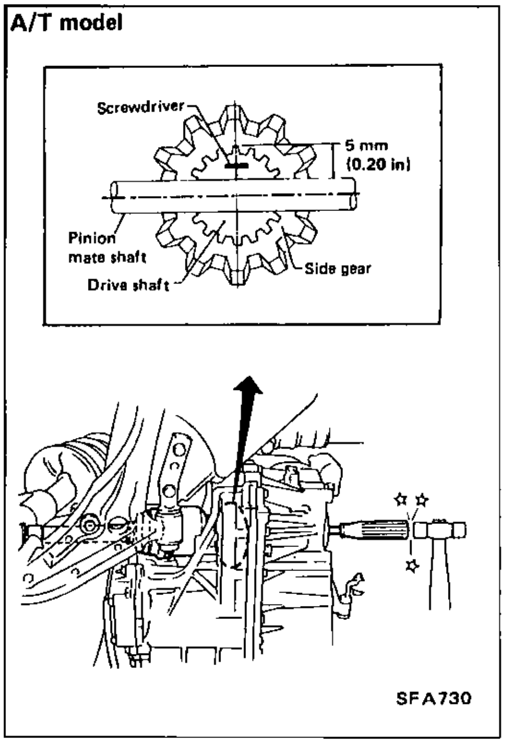
1. Remove right drive shaft from transaxle.



2. Remove left drive shaft from transaxle.

— FOR M/T MODELS —

Removal (Cont'd)



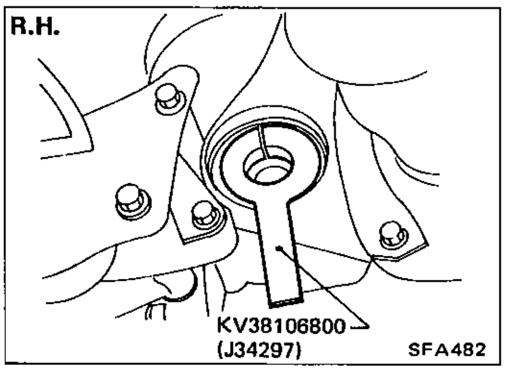
— FOR A/T MODELS —

- Remove left drive shaft with a suitable tool.

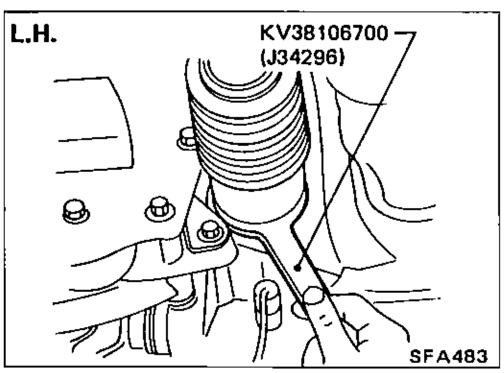
Be careful not to damage pinion mate shaft and side gear.

Installation

TRANSAXLE SIDE



1. Drive a new oil seal to transaxle. Refer to section MT or AT.
2. Set Tool along the inner circumference of oil seal (transaxle side).

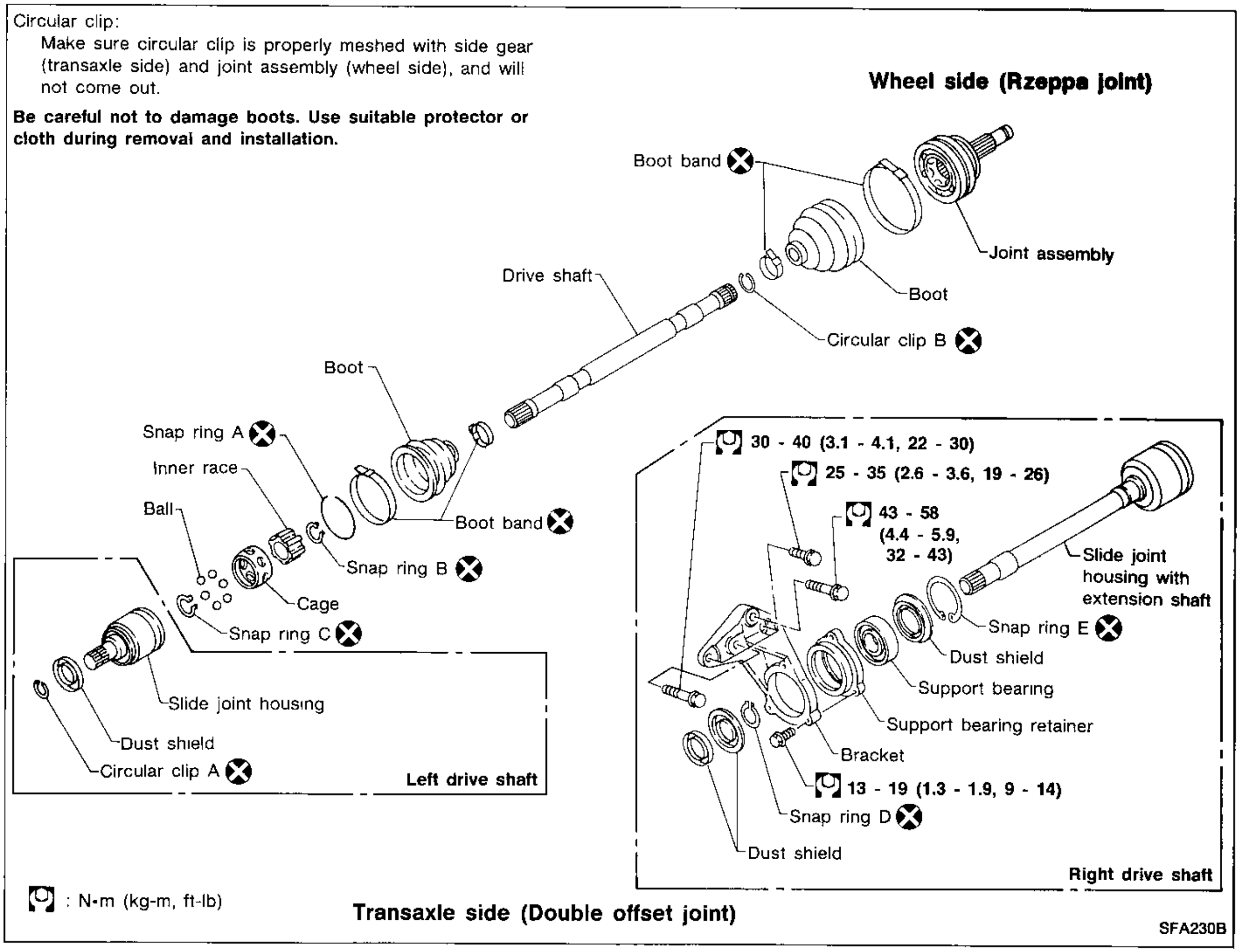


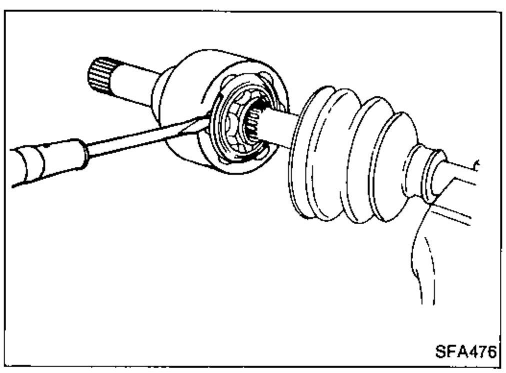
3. Insert drive shaft into transaxle. Be sure to properly align the serrations and then withdraw Tool.
4. Push drive shaft, then press-fit circular clip on the drive shaft into circular clip groove of side gear.
5. After its insertion, try to pull the flange out of the slide joint by hand. If it pulls out, the circular clip is not properly meshed with the side gear.

WHEEL SIDE

- Install drive shaft into knuckle.
- Tighten wheel bearing lock nut.

Components

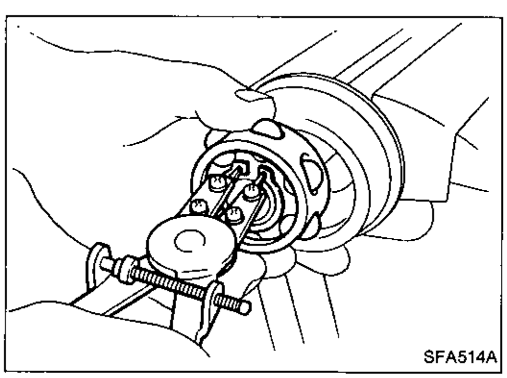




Disassembly

TRANSAXLE SIDE

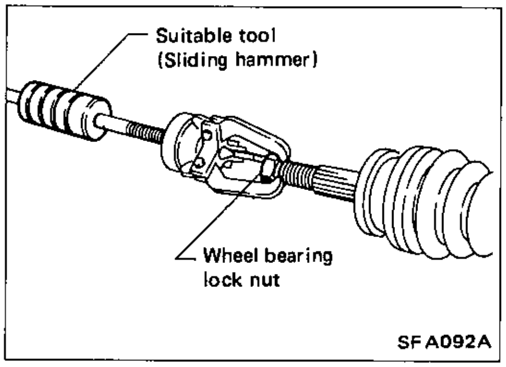
1. Remove boot bands.
2. Put matchmarks on slide joint housing and inner race, before separating joint assembly.
3. Pry off snap ring "A" with a screwdriver, and pull out slide joint housing.



4. Put matchmarks on inner race and drive shaft.
5. Pry off snap ring "C", then remove ball cage, inner race and balls as a unit.
6. Pry off snap ring "B".
7. Draw out boot.

Cover drive shaft serrations with tape so as not to damage the boot.

Disassembly (Cont'd)



WHEEL SIDE

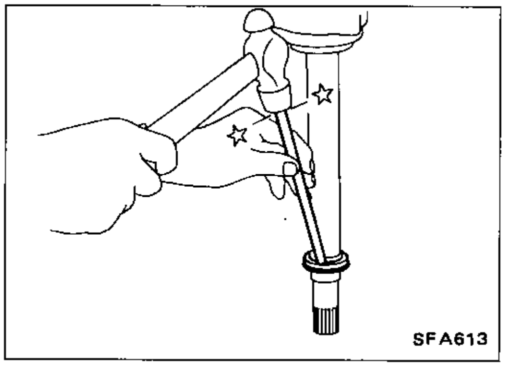
CAUTION:

The joint on the wheel side cannot be disassembled.

- Before separating joint assembly, put matchmarks on drive shaft and joint assembly.
- Separate joint assembly with a suitable tool.

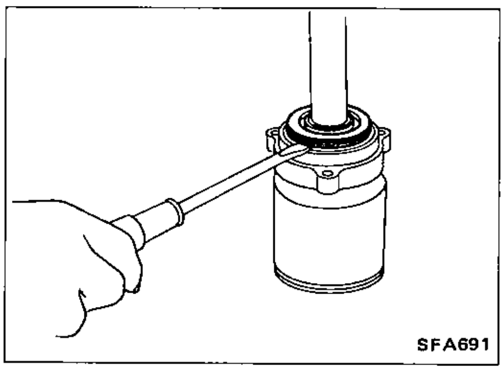
Be careful not to damage threads on drive shaft.

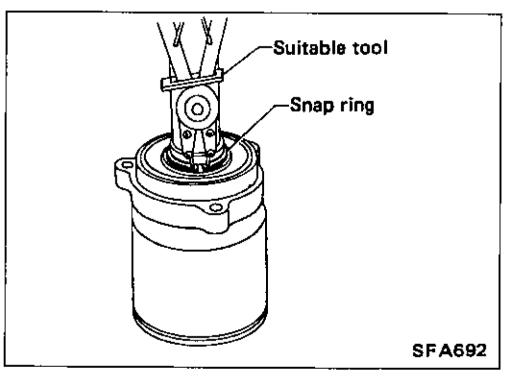
- Remove boot bands.



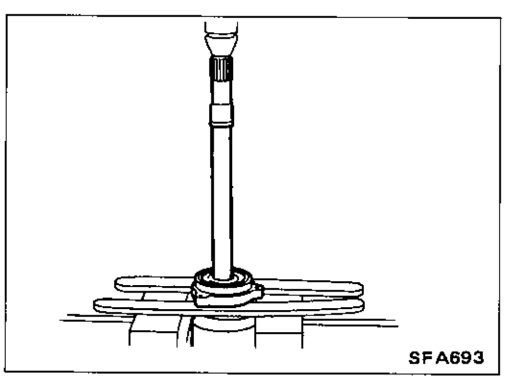
SUPPORT BEARING

- Remove dust shield.



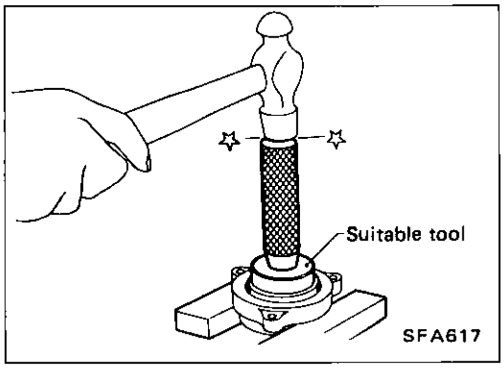


- Pry off snap ring.



- Press support bearing assembly out of drive shaft.

Disassembly (Cont'd)



- Press support bearing out of retainer.

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 (Transaxle 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.

SUPPORT BEARING

Make sure wheel bearing rolls freely and is free from noise, cracks, pitting or wear.

SUPPORT BEARING BRACKET

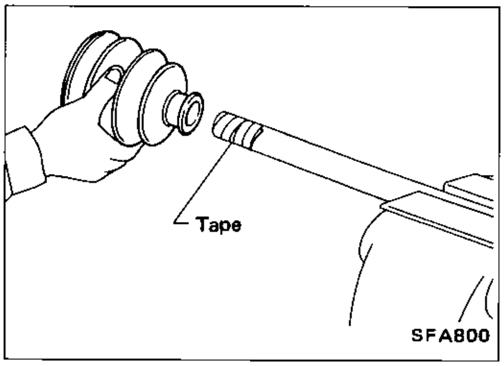
Check support bearing bracket for cracks with a magnetic exploration or dyeing test.

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.**

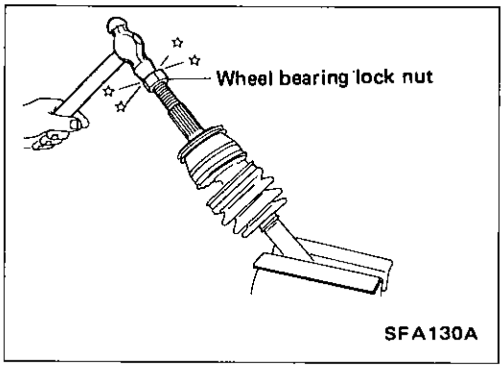
Assembly (Cont'd)

WHEEL SIDE

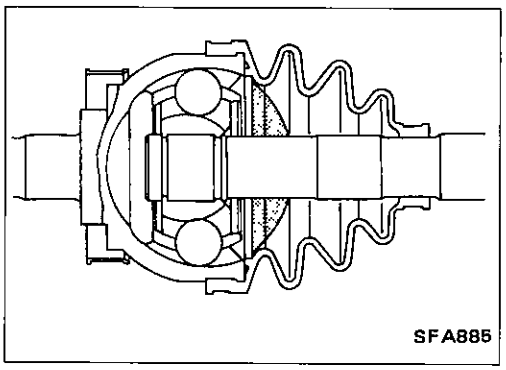


1. Install boot and new small boot band on drive shaft.

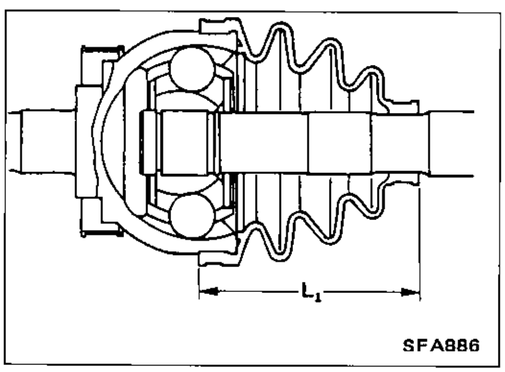
Cover drive shaft serration with tape so as not to damage boot during installation.



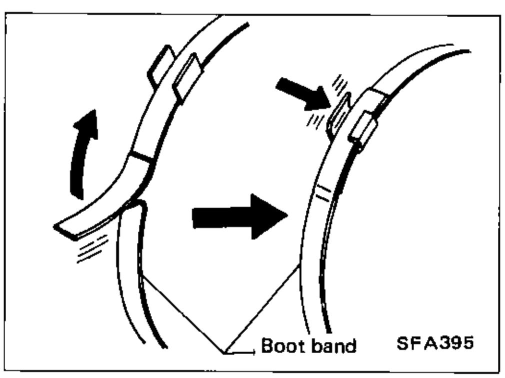
2. Set joint assembly onto drive shaft by lightly tapping it. Install joint assembly securely, ensuring marks which were made during disassembly are properly aligned.



3. Pack drive shaft with specified amount of grease.
   Specified amount of grease:
   205 - 225 g (7.23 - 7.94 oz)

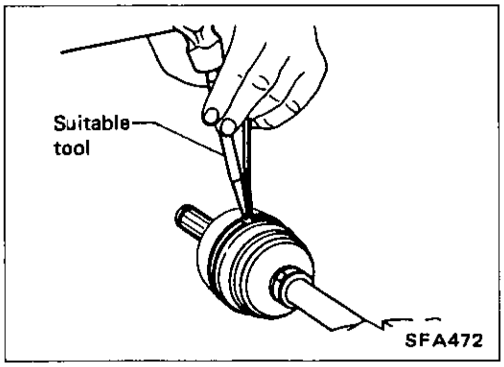


4. Make sure that boot is properly installed on the drive shaft groove.
   Set boot so that it does not swell and deform when its length is "L_1".
   Length "L_1":
   96 - 98 mm (3.78 - 3.86 in)

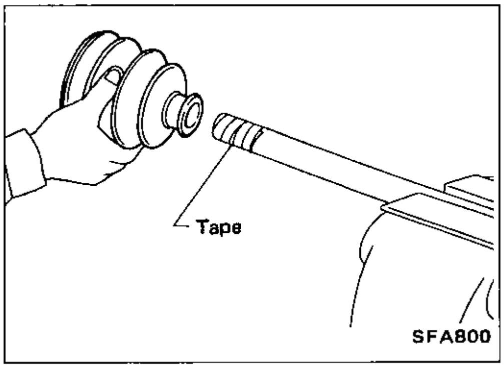


5. Lock new larger and smaller boot bands securely with a suitable tool.

Assembly (Cont'd)

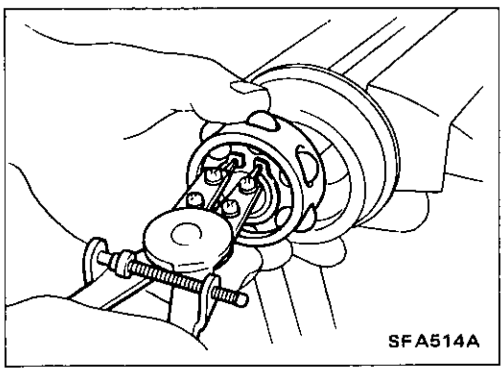


TRANSAXLE SIDE

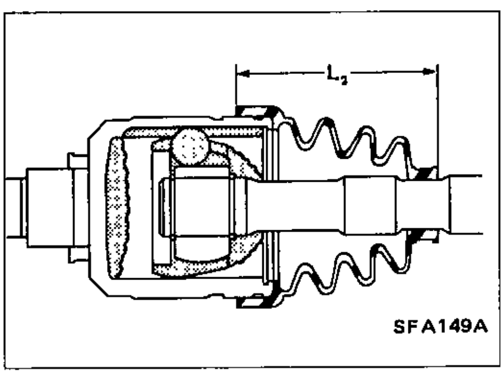


1. Install boot and new small boot band on drive shaft.

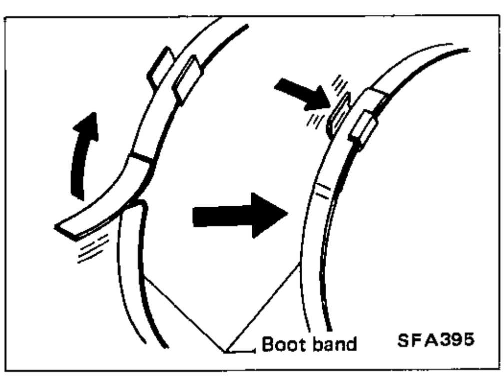
Cover drive shaft serration with tape so as not to damage boot during installation.



2. Install new snap ring "B", then 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 "C".



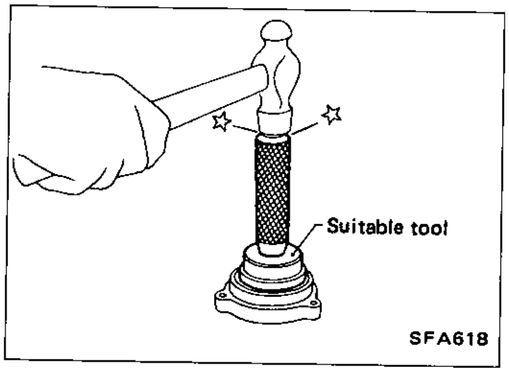
4. Pack drive shaft with specified amount of grease.
   Specified amount of grease:
   160 - 180 g (5.64 - 6.35 oz)
5. Install slide joint housing, then install new snap ring "A".
6. Make sure that boot is properly installed on the drive shaft groove.
   Set boot so that it does not swell and deform when its length is "L_2".
   Length "L_2":
   97 - 99 mm (3.82 - 3.90 in)



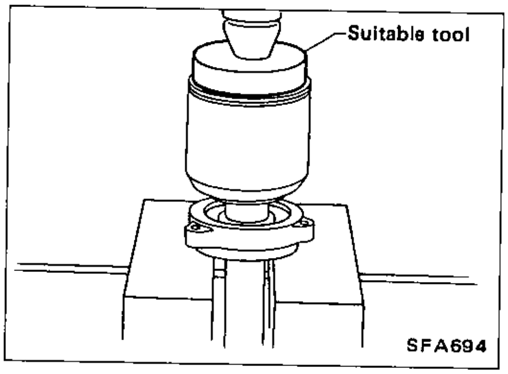
7. Lock new larger and smaller boot bands securely with a suitable tool.

Assembly (Cont'd)

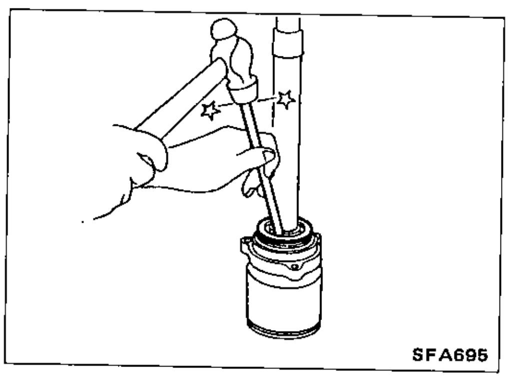
SUPPORT BEARING



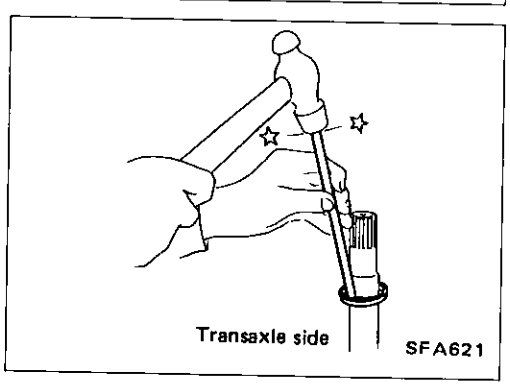
- Press bearing into retainer.



- Press drive shaft into bearing.

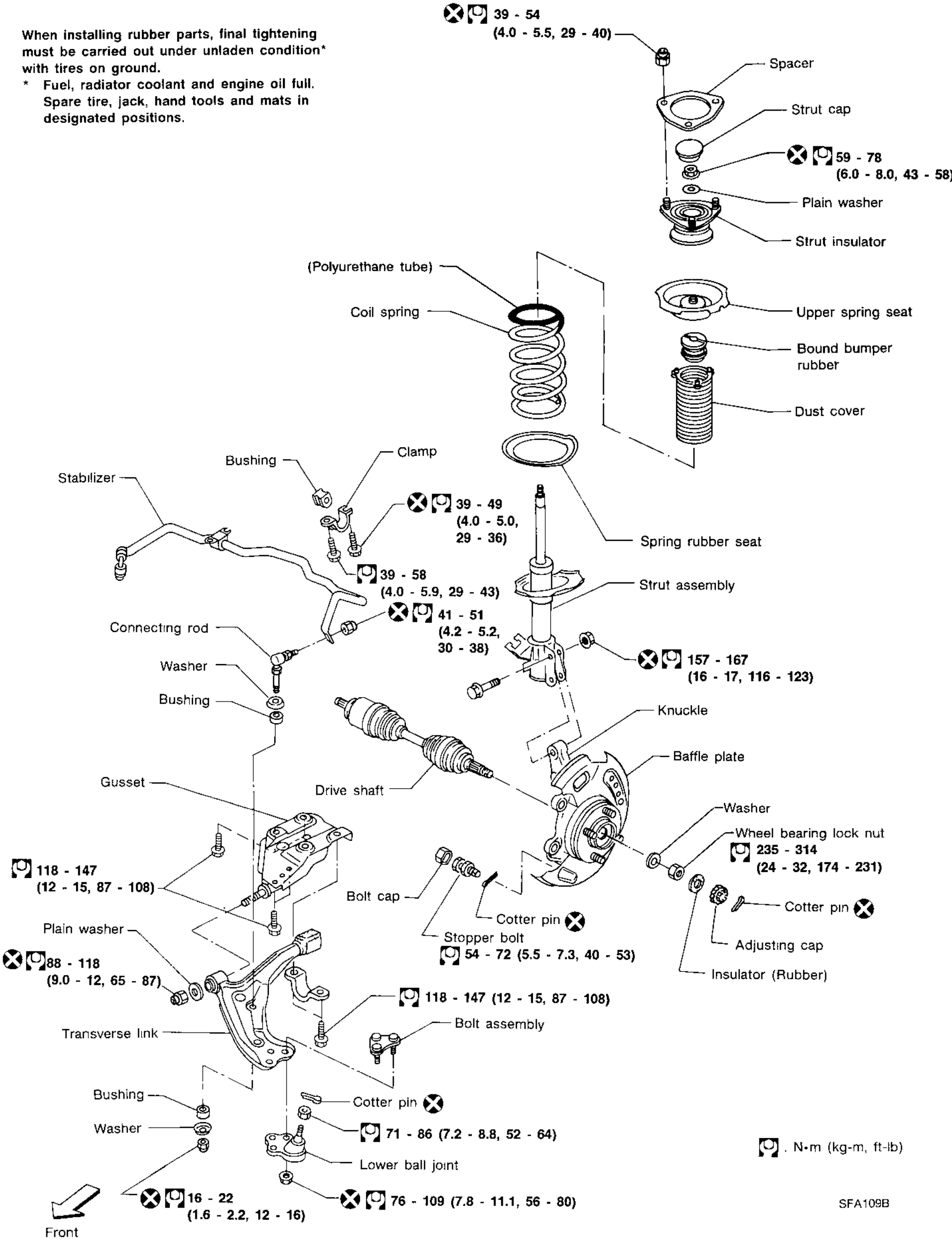


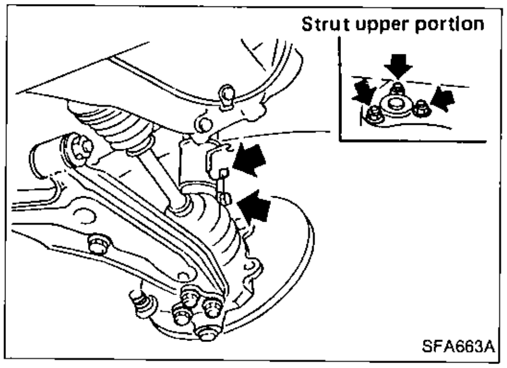
- Install snap ring.
- Install new dust shield.



When installing rubber parts, 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.



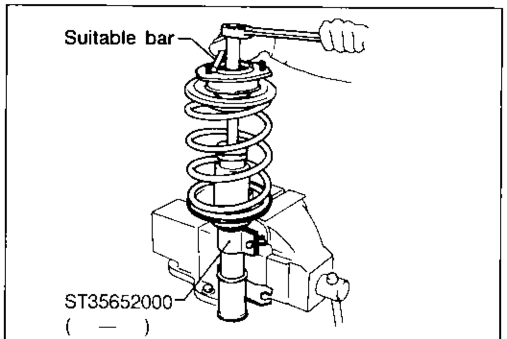


SFA663A

Removal and Installation

- Remove strut assembly fixing bolts and nuts (to hoodledge).

Do not remove piston rod lock nut on vehicle.

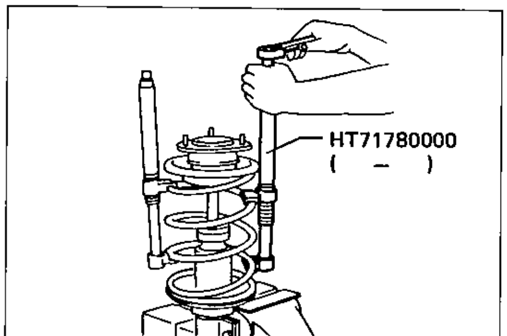


SFA222B

Disassembly

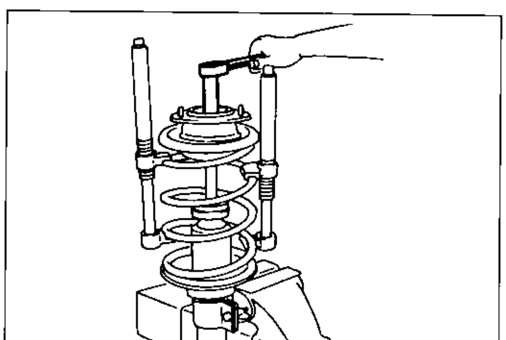
1. Set strut assembly on vise with Tool, then loosen piston rod lock nut.

Do not remove piston rod lock nut.



SFA021A

2. Compress spring with Tool so that the strut mounting insulator can be turned by hand.


SFA022A

3. Remove piston rod lock nut.

Inspection

STRUT ASSEMBLY

- Check for smooth operation through a full stroke, both compression and extension.
- Check for oil leakage occurring on welded or gland packing portion.
- Check piston rod for cracks, deformation or other damage.
- Replace if necessary.

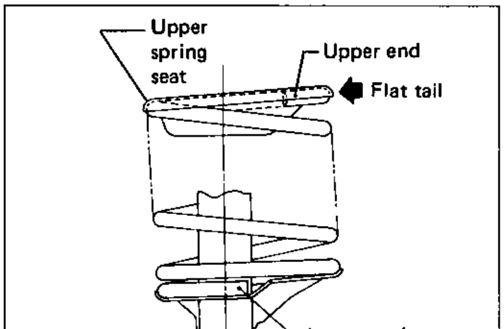
STRUT MOUNTING INSULATOR

- Check cemented rubber-to-metal portion for separation or cracks.
- Check rubber parts for deterioration.

COIL SPRING

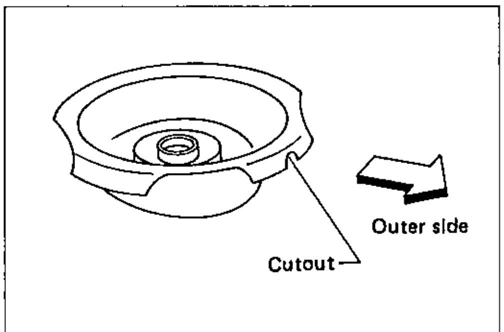
Check for cracks, deformation or other damage. Replace if necessary.

Assembly



SFA508A

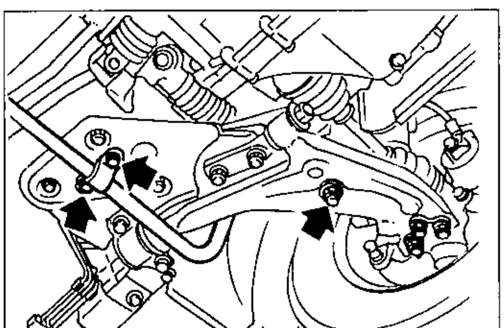
- When installing coil spring on strut, it must be positioned as shown in the figure at left.



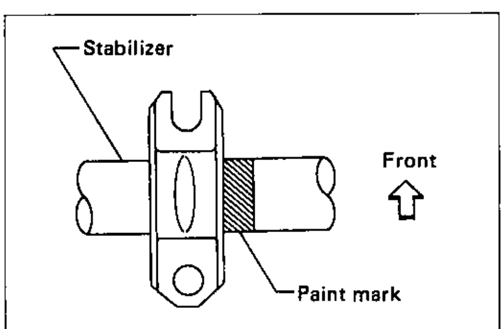
SFA664A

- Install upper spring seat with its cutout facing the outer side of vehicle.

Stabilizer Bar — Removal and Installation

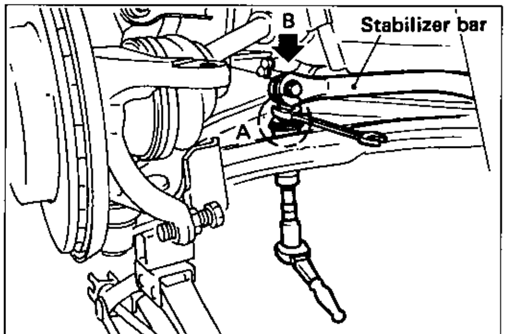

SFA999

- Remove stabilizer bar.



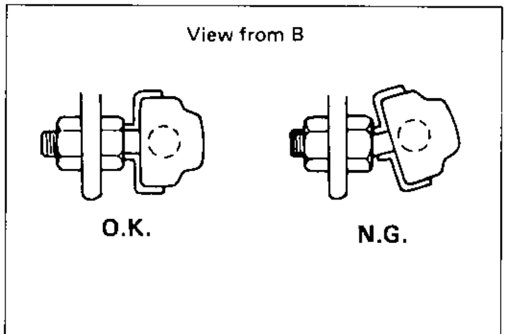
SRA198A

- When installing stabilizer, make sure that paint mark and clamp face in their correct directions.



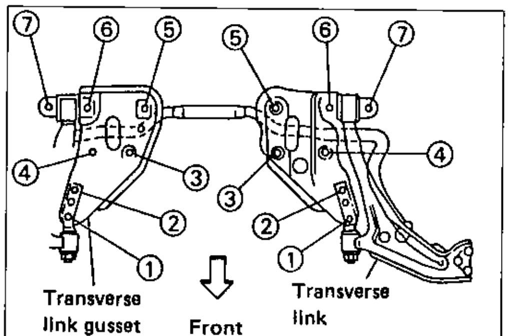
SFA001A

- When removing and installing stabilizer bar, fix portion A.



SFA002A

- Install stabilizer bar with ball joint socket properly placed.



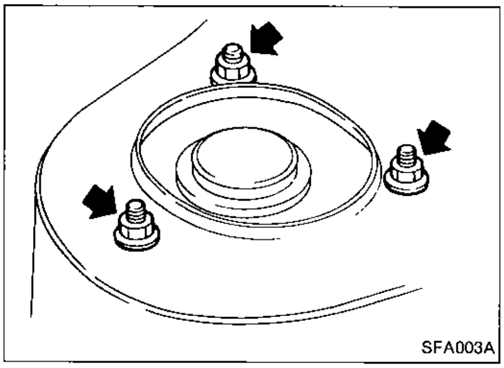
SFA503A

Transverse Link and Transverse Link Gusset — Removal and Installation

- Remove stabilizer bar.
- Remove fixing bolts.
- Install bolts in order of number.
  Tightening torque:
  Refer to FRONT SUSPENSION.
- During installation, final tightening must be carried out at curb weight with tires on the ground.
- After installation, check wheel alignment. Refer to ON-VEHICLE SERVICE.

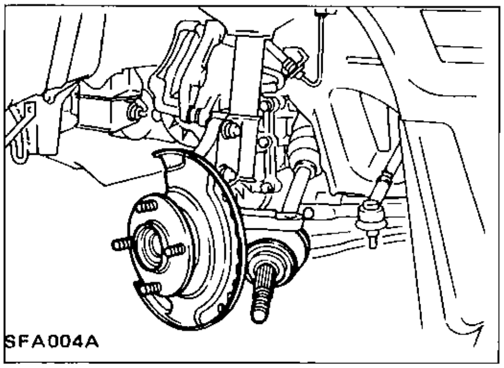
Inspection

- 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.
- Check transverse link gusset for damage, cracks or deformation. Replace it if necessary.



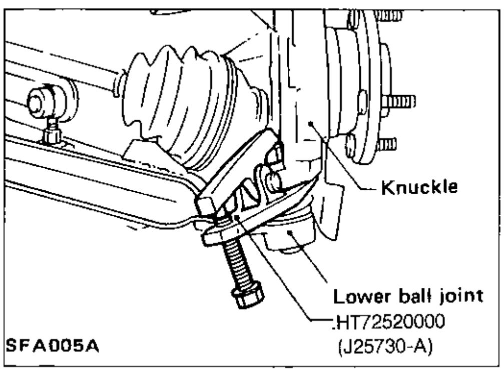
Removal and Installation

1. Remove wheel bearing lock nut.
2. Remove tie-rod ball joint.
3. Loosen (do not remove) strut mounting nuts.

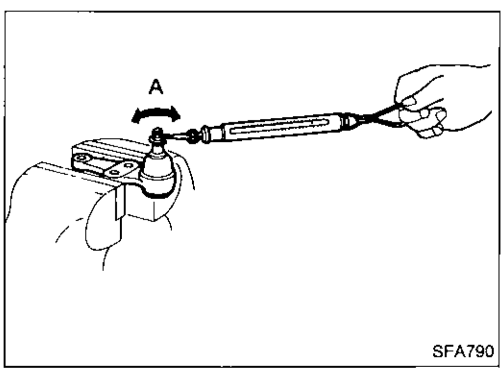


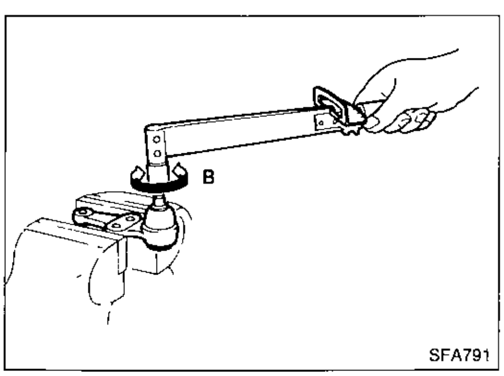
4. Remove nut securing lower ball joint to transverse link.
5. Separate drive shaft from knuckle by slightly tapping drive shaft end.

Cover boots with shop towel so as not to damage them when removing drive shaft.



6. Remove lower ball joint from knuckle with Tool.





Inspection

- Check ball joint for play. If ball stud is worn, play in axial direction is excessive or joint is hard to swing, replace lower ball joint.
  Before checking, turn ball joint at least 10 revolutions so that ball joint is properly broken in.
  Swinging force "A":
  (measuring point: cotter pin hole of ball stud)
  7.8 - 54.9 N (0.8 - 5.6 kg, 1.8 - 12.3 lb)
  Turning torque "B":
  0.49 - 3.43 N·m (5.0 - 35 kg-cm, 4.3 - 30.4 in-lb)
  Vertical end play:
  0 mm (0 in)
- Check dust cover for damage. Replace it and cover clamp if necessary.

General Specifications

COIL SPRING

Applied model	M/T	A/T
Wire diameter mm (in)	12.3 (0.484)	12.7 (0.500)
Coil diameter mm (in)	130 (5.12)	
Free length mm (in)	344 (13.54)	361 (14.21)
Spring constant N/mm (kg/mm, lb/in)	23.5 (2.4, 134)	
Identification color	Red x 1, Blue x 2	Yellow x 1, Blue x 2

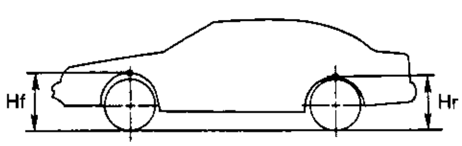
STRUT

Applied model	All
Piston rod diameter mm (in)	22 (0.87)
Damping force [at 0.3 m (1.0 ft)/sec.] N (kg, lb)	
Expansion	1,089 - 1,461 (111 - 149, 245 - 329)
Compression	471 - 706 (48 - 72, 106 - 159)

FRONT STABILIZER BAR

Applied model	All
Stabilizer diameter mm (in)	26.5 (1.043)
Identification color	Blue

WHEELARCH HEIGHT (Unladen*)



SFA818A

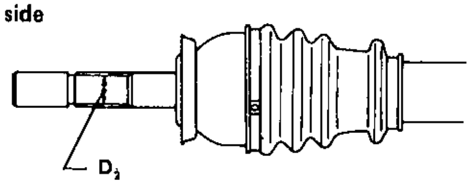
Applied model	All
Front (Hf) mm (in)	676 (26.61)
Rear (Hr) mm (in)	645 (25.39)

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

DRIVE SHAFT

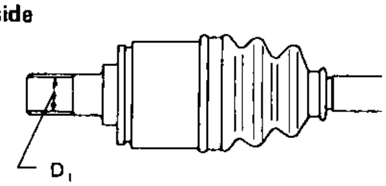
Applied model	All
Joint type	
Transaxle side	DS90
Wheel side	ZF100
Diameter mm (in)	
Transaxle side D_1	28 (1.10)
Wheel side D_2	28 (1.10)
Grease	Nissan genuine grease or equivalent
Capacity g (oz)	
Transaxle side	160 - 180 (5.64 - 6.35)
Wheel side	205 - 225 (7.23 - 7.94)

Wheel side



SFA562

Transaxle side



SFA563

Inspection and Adjustment

WHEEL ALIGNMENT (Unladen*1)

Applied model		All
Camber	degree	– 30′ to 1° 00′
Caster	degree	35′ - 2° 05′
Kingpin inclination	degree	13°45′ - 15°15′
Toe-in		
A – B	mm (in)	1 - 3 (0.04 - 0.12)
Total angle 2θ	degree	6′ - 18′
Front wheel turning angle		
Full turn*2	Inside	34° - 38°
	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.

WHEEL BEARING

Wheel bearing axial end play limit mm (in)	0.05 (0.0020)
Wheel bearing lock nut tightening torque N·m (kg-m, ft-lb)	235 - 314 (24 - 32, 174 - 231)

LOWER BALL JOINT

Swinging force (Measured at cotter pin hole) N (kg, lb)	7.8 - 54.9 (0.8 - 5.6, 1.8 - 12.3)
Turning torque N·m (kg-cm, in-lb)	0.49 - 3.43 (5.0 - 35, 4.3 - 30.4)
Vertical end play limit mm (in)	0 (0)

WHEEL RUNOUT

Unit: mm (in)

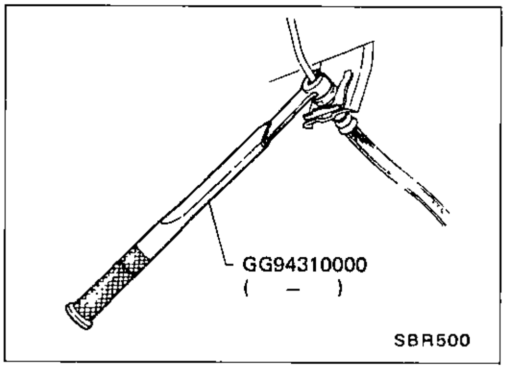
Wheel type	Aluminum wheel	Steel wheel
Maximum radial runout limit	0.3 (0.012) or less	0.5 (0.020) or less
Maximum lateral runout limit	0.3 (0.012) or less	0.8 (0.031) or less

REAR AXLE & REAR SUSPENSION

SECTION RA

CONTENTS

PRECAUTIONS AND PREPARATION ..... RA- 2
REAR AXLE AND REAR SUSPENSION ..... RA- 3
ON-VEHICLE SERVICE ..... RA- 4
REAR AXLE — Wheel Hub ..... RA- 7
REAR SUSPENSION ..... RA- 9
REAR SUSPENSION — Coil Spring and Strut Assembly RA-11
REAR SUSPENSION — Stabilizer Bar RA-13
SERVICE DATA AND SPECIFICATIONS (S.D.S.) RA-14

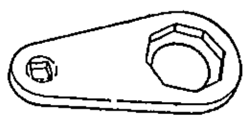
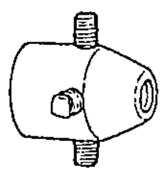
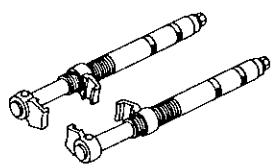
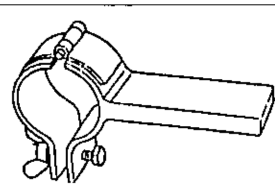
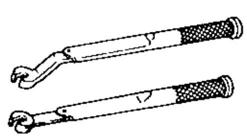


Precautions

- When installing rubber parts, 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 tubes.
- When removing each suspension part, check wheel alignment and adjust if necessary.
- Do not jack up at the parallel links.

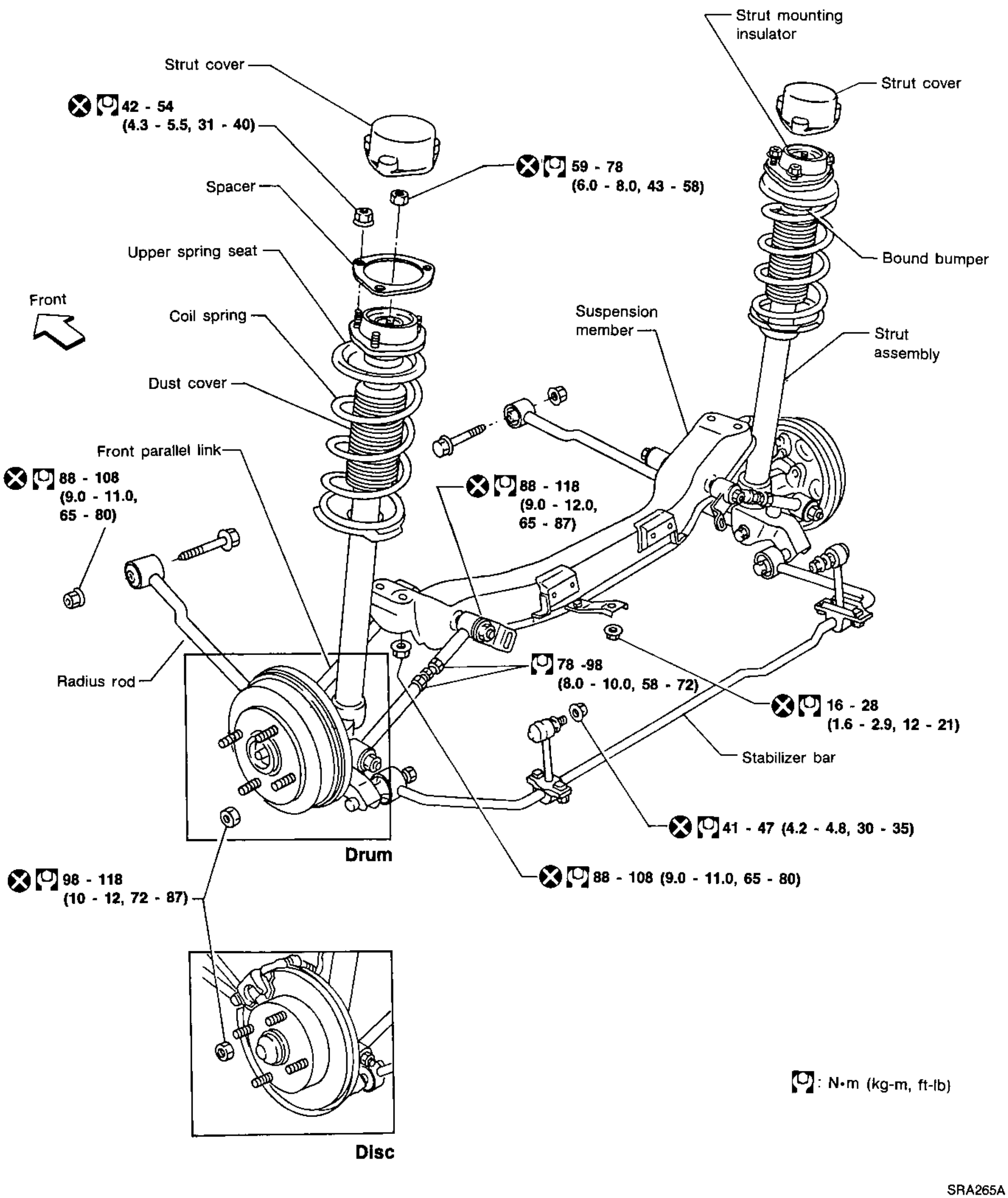
Preparation

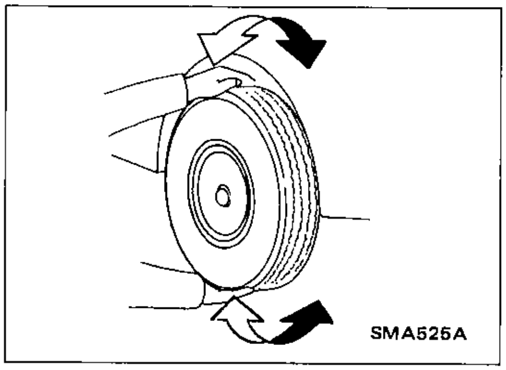
SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.) Tool name	Description	
ST35490000 (J26083) Gland packing wrench		Removing and installing gland packing
KV401021S0 (—) Bearing race drift		Installing wheel bearing outer race
HT71780000 (—) Spring compressor		Removing and installing coil spring
ST35652000 (—) Strut attachment		Fixing strut assembly
GG94310000 (—) Flare nut torque wrench		Removing and installing brake piping

When installing rubber parts, 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.

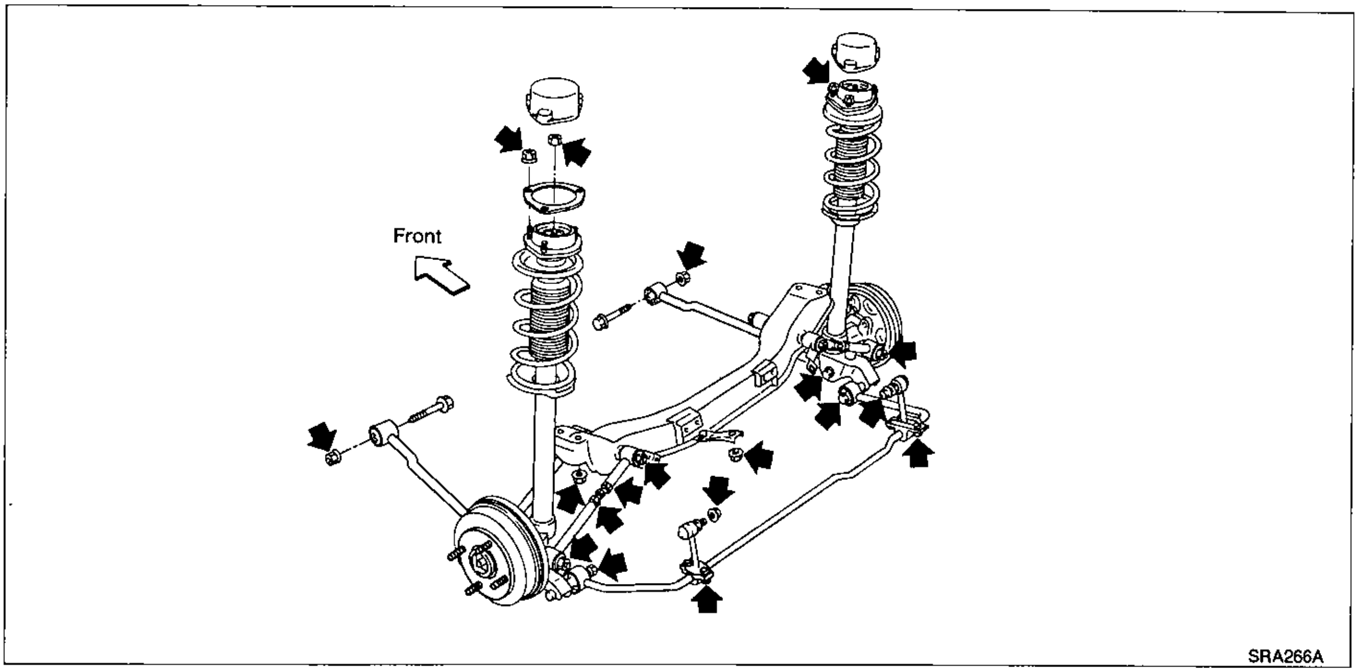



SMA525A

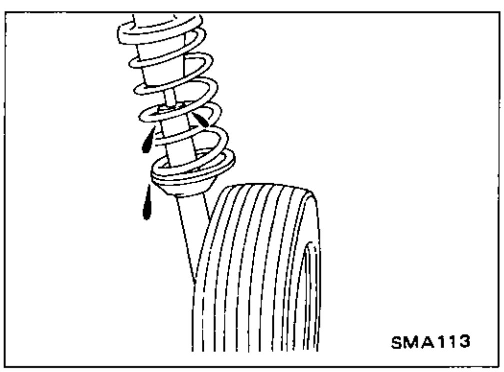
Rear Axle and Rear Suspension Parts

Check axle and suspension parts for looseness, wear or damage.

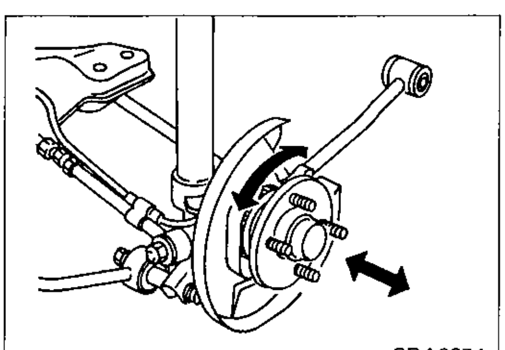
- Shake each rear wheel to check for excessive play.
- Retighten all nuts and bolts to the specified torque.
  Tightening torque: Refer to REAR SUSPENSION.



SRA266A

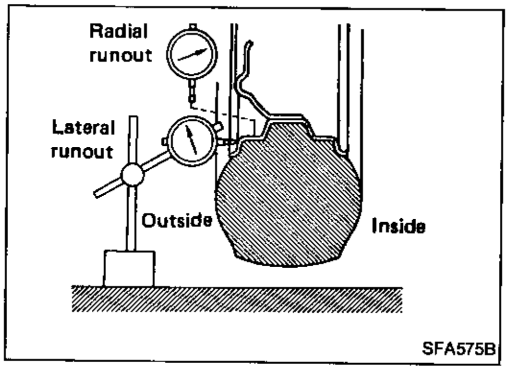

SMA113

- Check strut (shock absorber) for oil leakage or other damage.
- Check wheelarch height. Refer to ON-VEHICLE SERVICE in section FA.


SRA267A

Rear Wheel Bearing

- Check axial end play.
  Axial end play:
  0.05 mm (0.0020 in) or less
- Check that wheel bearings operate smoothly.
- Check tightening torque of wheel bearing lock nut.
  : 186 - 255 N·m
  (19 - 26 kg-m, 137 - 188 ft-lb)
- If there is any axial end play or wheel bearing does not turn smoothly, replace wheel bearing assembly. Refer to REAR AXLE — Wheel Hub.



Rear Wheel Alignment

PRELIMINARY INSPECTION

Make 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 FA section.
- Check that rear strut (shock absorber) works properly.
- Check rear axle and rear suspension parts for looseness.
- Check vehicle posture (Unladen*).
  *: Fuel, radiator and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

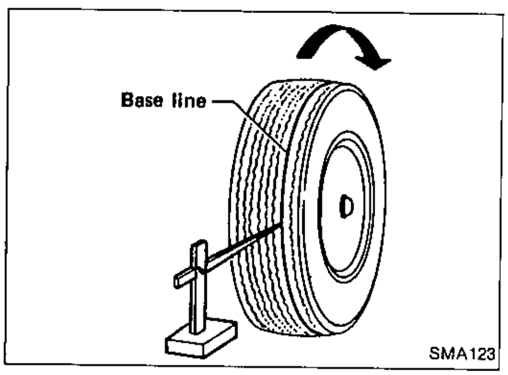
CAMBER

Camber is preset at factory and cannot be adjusted.

Camber:

Refer to S.D.S.

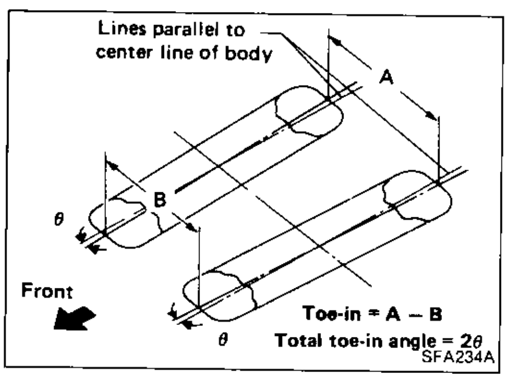
- If the camber is not within specification, inspect and replace any damaged or worn rear suspension parts.



TOE-IN

1. Draw a base line across the tread.

- After lowering rear of vehicle, move it up and down to eliminate friction.

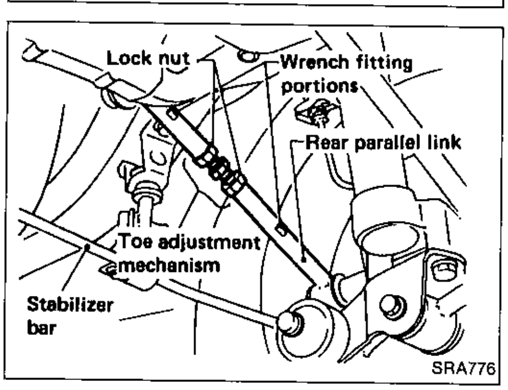


2. Measure toe-in.

- Measure distance "A" and "B" at the same height as hub center.

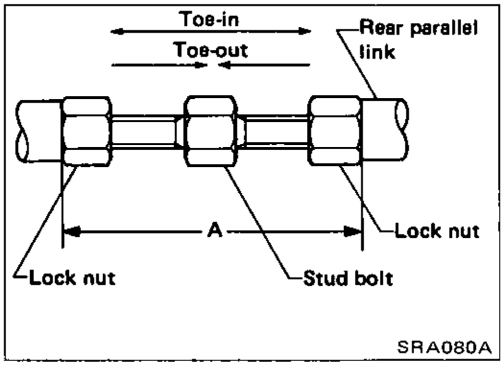
  Toe-in:

  Refer to S.D.S.



3. Adjust toe-in by varying the lengths of rear parallel links.

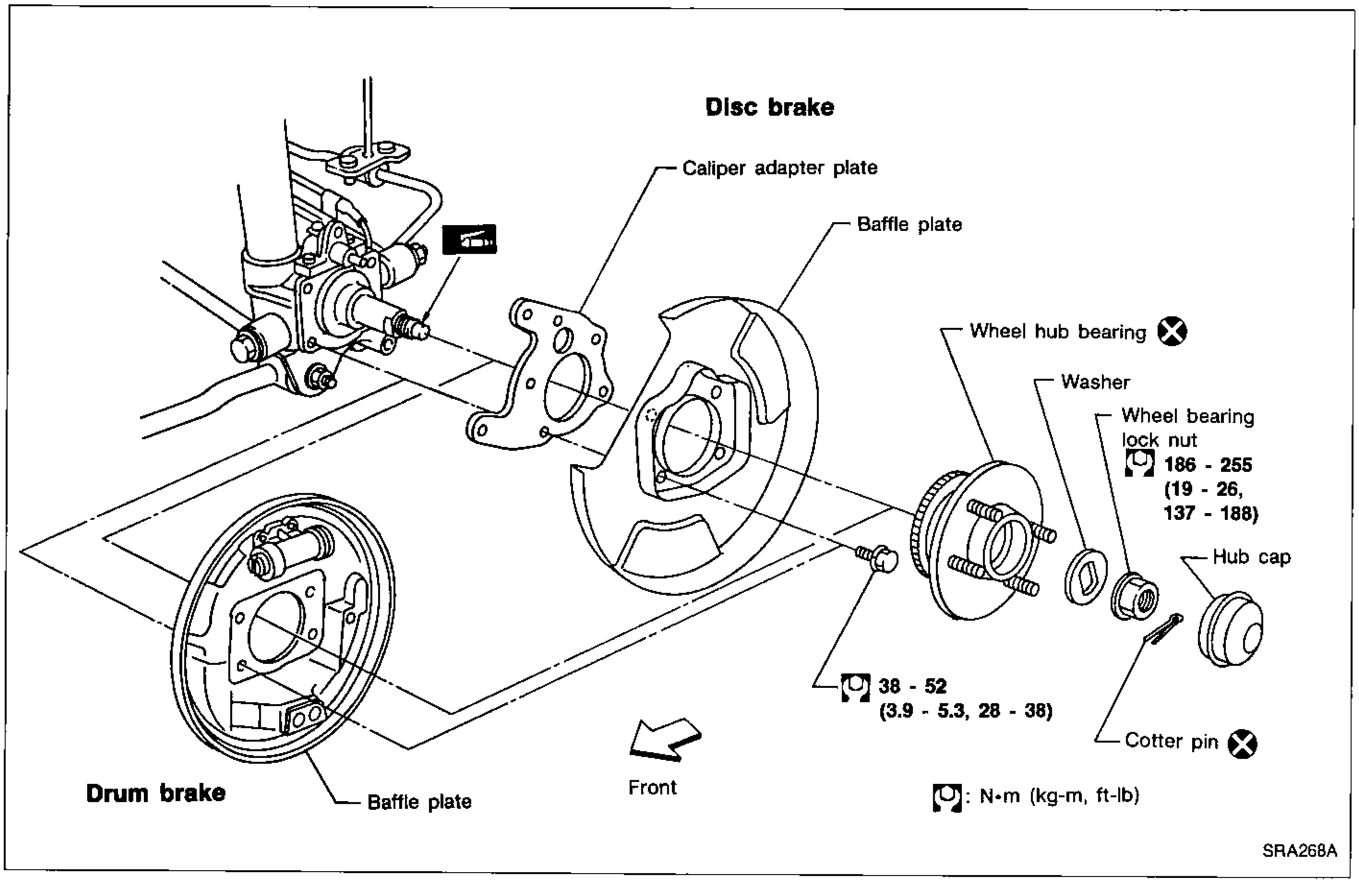
Rear Wheel Alignment (Cont'd)



- Adjust left and right rear parallel links to the same length "A".
- Tighten lock nut while holding rear parallel link with wrench to prevent bushing from twisting.

  Standard length "A":

  50 - 55 mm (1.97 - 2.17 in)

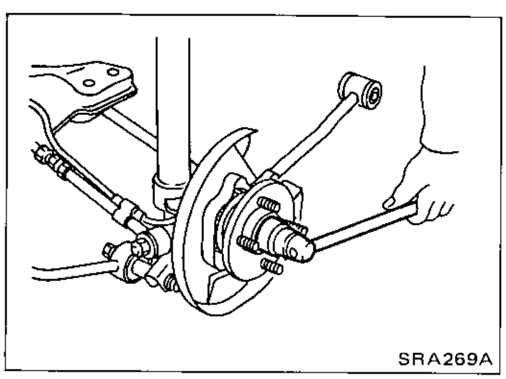


Removal

CAUTION:

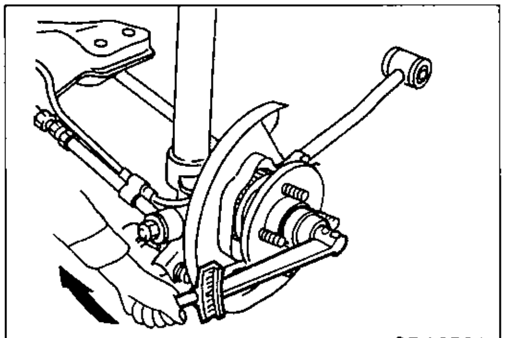
Wheel hub bearing usually does not require maintenance. If any of the following symptoms are noted, replace wheel hub bearing assembly.

- Growling noise is emitted from wheel hub bearing during operation.
- Wheel hub bearing drags or turns roughly when hub is turned with your hand after bearing lock nut is tightened to specified torque.
- After wheel hub bearing is removed from knuckle spindle.



1) Remove brake caliper assembly.
2) Remove wheel bearing lock nut.

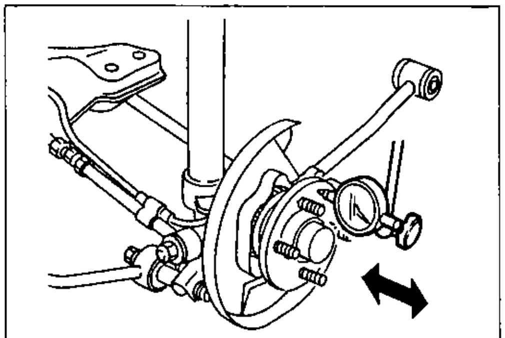
Brake hose does not need to be disconnected from brake caliper.
Be careful not to depress brake pedal, or piston will pop out.
Make sure brake hose is not twisted.


SRA270A

Installation

- Install wheel hub bearing.
- Tighten wheel bearing lock nut.

  : 186 - 255 N·m
  (19 - 26 kg-m, 137 - 188 ft-lb)
- Check that wheel bearings operate smoothly.


SRA271A

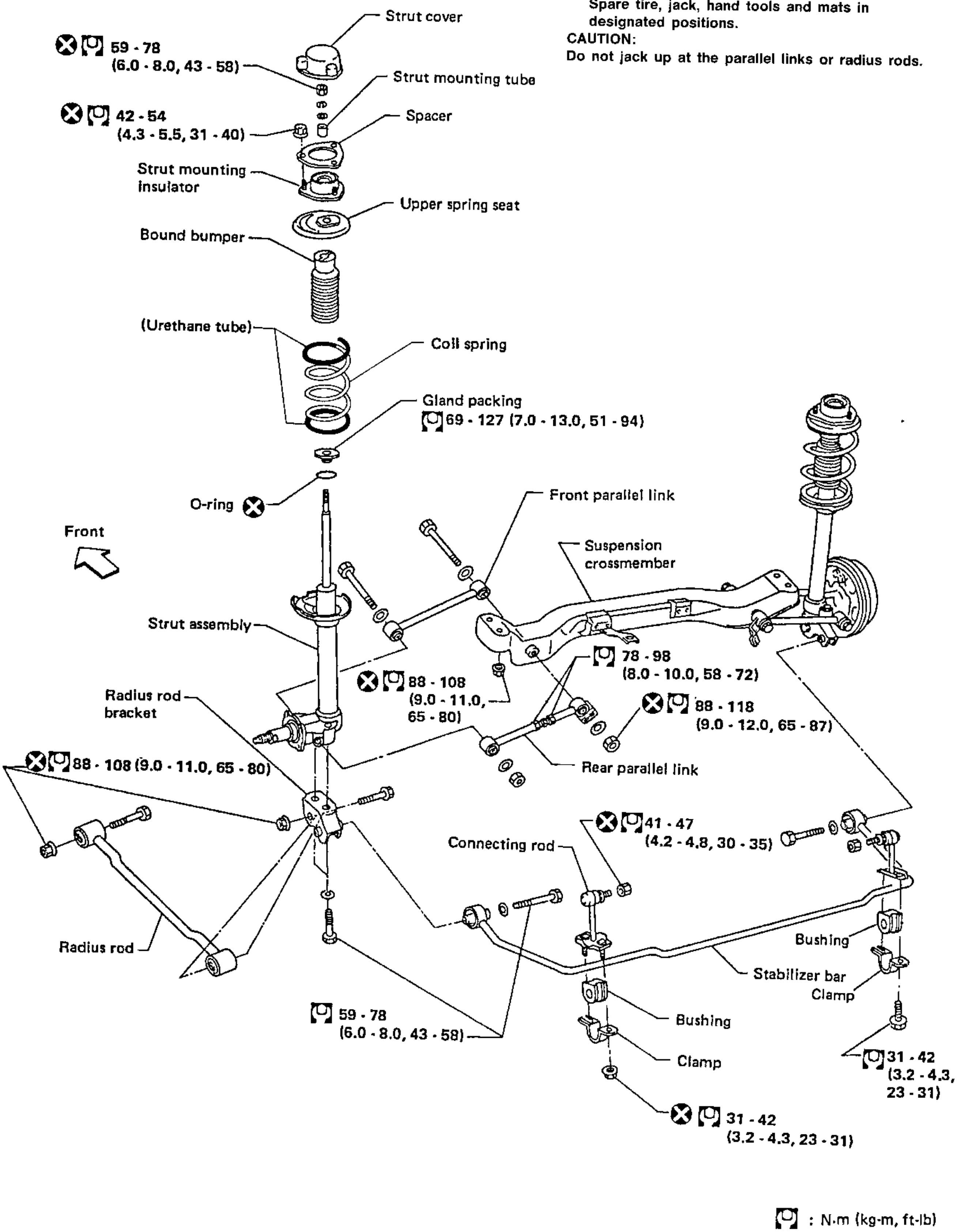
- Check wheel bearing axial end play.

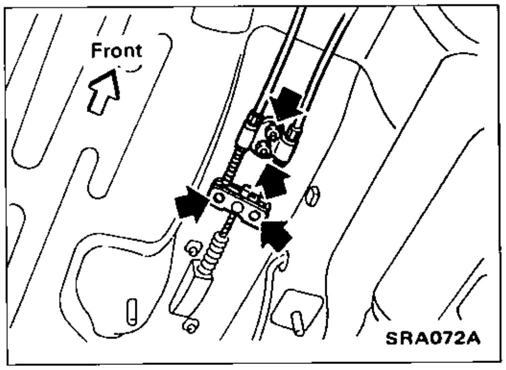
  Axial end play:
  0.05 mm (0.0020 in) or less

When installing rubber parts, 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.

CAUTION:
Do not jack up at the parallel links or radius rods.



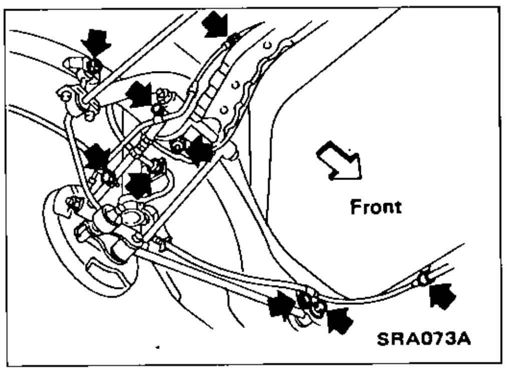


Removal and Installation

CAUTION:

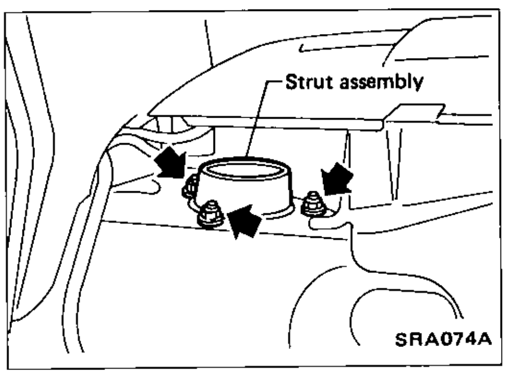
Do not jack up at the parallel links or radius rods.

- Disconnect brake hydraulic line and parking brake cable at equalizer.

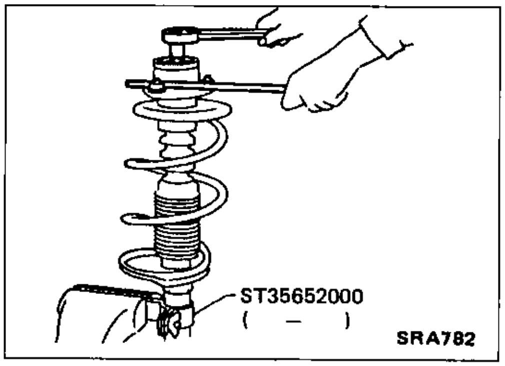


- Remove suspension assembly.

1) Remove parallel link fixing bolt, radius rod fixing bolt, stabilizer fixing bolt, stabilizer connecting rod brackets and parking brake cable fixing bolts.



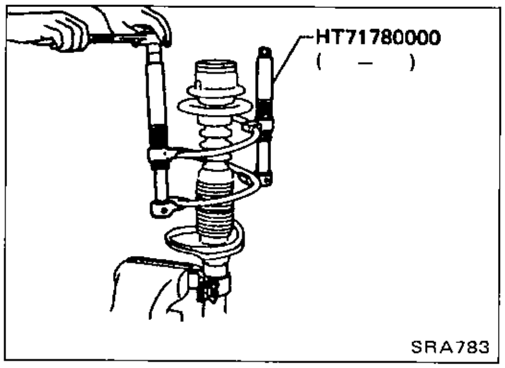
2) Remove rear seat and parcel shelf. Refer to section BF.
3) Remove strut securing nuts (Upper side). Then pull out strut assembly.



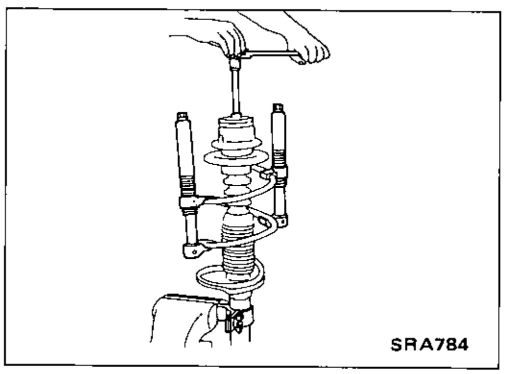
Disassembly

1. Set strut assembly on vise with attachment, then loosen piston rod lock nut.

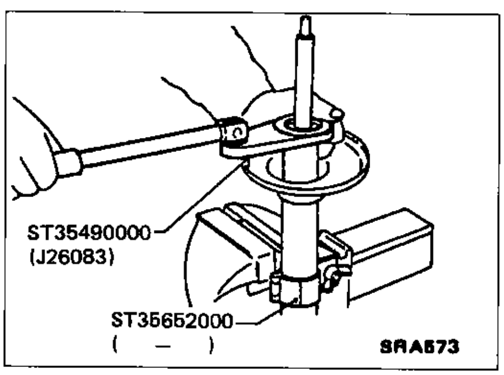
Do not remove piston rod lock nut.



2. Compress spring with Tool so that the strut mounting insulator can be turned by hand.



3. Remove piston rod lock nut.



4. Remove gland packing with Tool.

Avoid getting dirt and dust into gland packing portion.

5. Retract piston rod by pushing it down until it bottoms. Then, slowly withdraw piston rod from cylinder together with piston guide.

Inspection

STRUT ASSEMBLY

- Check for smooth operation through a full stroke, both compression and extension.
- Check for oil leakage occuring on welded or gland packing portions.
- Check piston rod for cracks, deformation or other damage. Replace if necessary.

Inspection (Cont'd)

UPPER RUBBER SEAT AND BUSHING

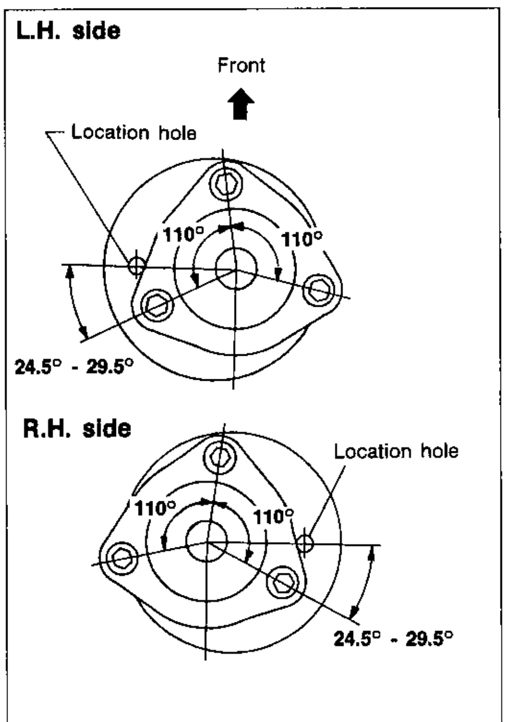
Check rubber parts for deterioration or cracks.
Replace if necessary.

STRUT MOUNTING INSULATOR

- Check cemented rubber-to-metal portion for melting or cracks.
- Check rubber parts for deterioration.

COIL SPRING

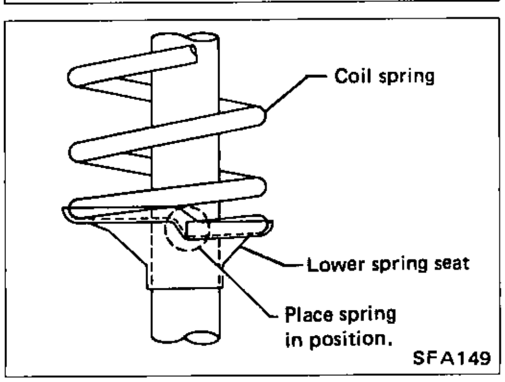
Check for cracks, deformation or other damage.
Replace if necessary.



SRA272A

Assembly

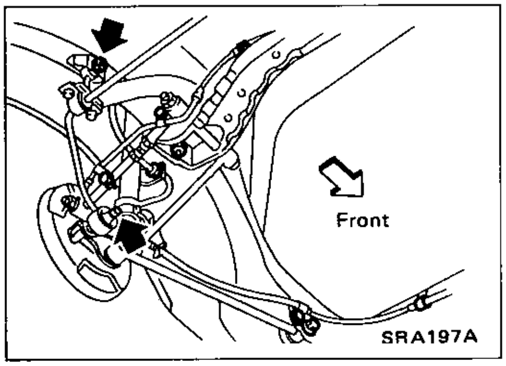
1. Locate upper spring seat as shown.



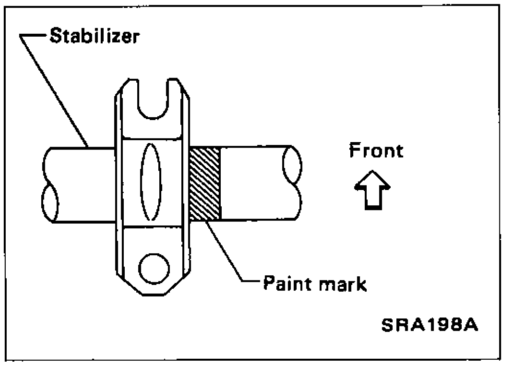
SFA149

2. After placing coil spring in position on lower spring seat, release spring compressor gradually.

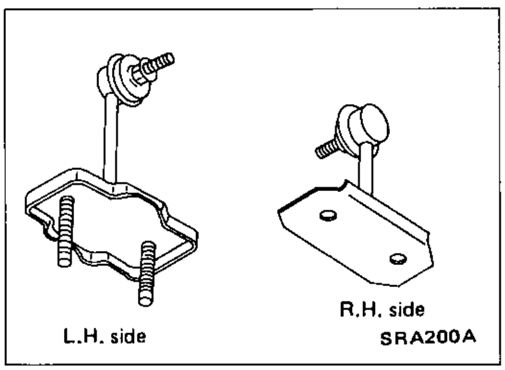
Removal and Installation



- Remove stabilizer bar.



- When installing stabilizer, refer to paint marks to mount it even.



- When installing connecting rod, make sure that parts are in their correct position.

General Specifications

COIL SPRING

Applied model	All
Wire diameter mm (in)	12 (0.47)
Coil diameter mm (in)	130 (5.12)
Free length mm (in)	299 (11.77)
Spring constant N/mm (kg/mm, ib/in)	21.6 (2.2, 123)
Identification color	Purple x 1, Pink x 1

STRUT

Applied model	All
Piston rod diameter mm (in)	22 (0.87)
Damping force [at 0.3 m (1.0 ft)/sec.] N (kg, lb)	
Expansion	667 - 902 (68 - 92, 150 - 203)
Compression	226 - 363 (23 - 37, 51 - 82)

STABILIZER BAR

Applied model	All
Diameter mm (in)	12 (0.47)

Inspection and Adjustment

WHEEL ALIGNMENT (Unladen*)

Applied model	All
Camber degree	– 1°20′ to 0°10′
Toe-in	
A – B mm (in)	– 4 to 0 (– 0 16 to 0)
Total angle 2θ degree	– 23′ to 0′

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

WHEEL BEARING

Applied model	All
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)	186 - 255 (19 - 26, 137 - 188)

BRAKE SYSTEM

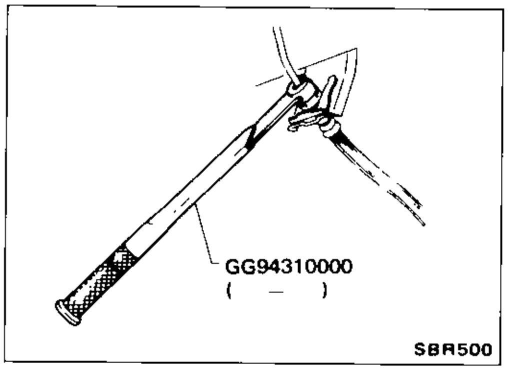
SECTION BR

CONTENTS

PRECAUTIONS AND PREPARATION .... BR- 2
CHECK AND ADJUSTMENT .... BR- 3
BRAKE HYDRAULIC LINE .... BR- 4
BRAKE PEDAL AND BRACKET .... BR- 6
BRAKE BOOSTER .... BR- 8
VACUUM PIPING BR-10
MASTER CYLINDER BR-11
FRONT DISC BRAKE BR-12
REAR DRUM BRAKE BR-15
REAR DISC BRAKE BR-17
PARKING BRAKE CONTROL BR-22
ANTI-LOCK BRAKING SYSTEM BR-24
TROUBLE DIAGNOSES BR-28
SERVICE DATA AND SPECIFICATIONS (S.D.S.) BR-50

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 the hydraulic system.



SBR500

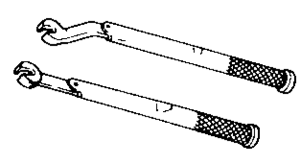
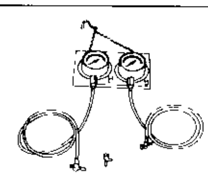
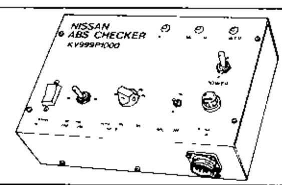
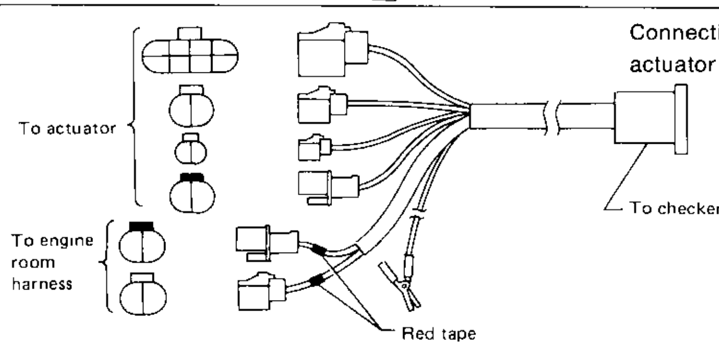
- Use Tool when removing and installing brake tube.

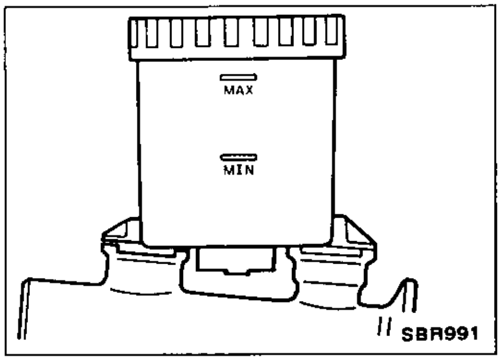
WARNING:

- Clean brake pads and shoes with a waste cloth, then wipe with a dust collector.

Preparation

SPECIAL SERVICE TOOL

Tool number (Kent-Moore No.) Tool name	Description	
GG94310000 (—) Flare nut torque wrench		Removing and installing each brake piping
KV991V0010 (—) Brake fluid pressure gauge		Measuring brake fluid pressure
KV999P1000 (—) ABS checker		Checking ABS actuator operation
KV999P1010 (—) ABS checker adapter harness		Connecting ABS checker with actuator



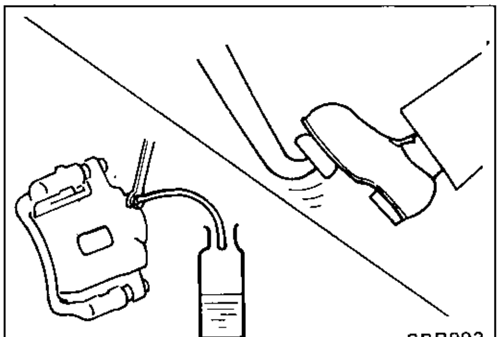
SBR991

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

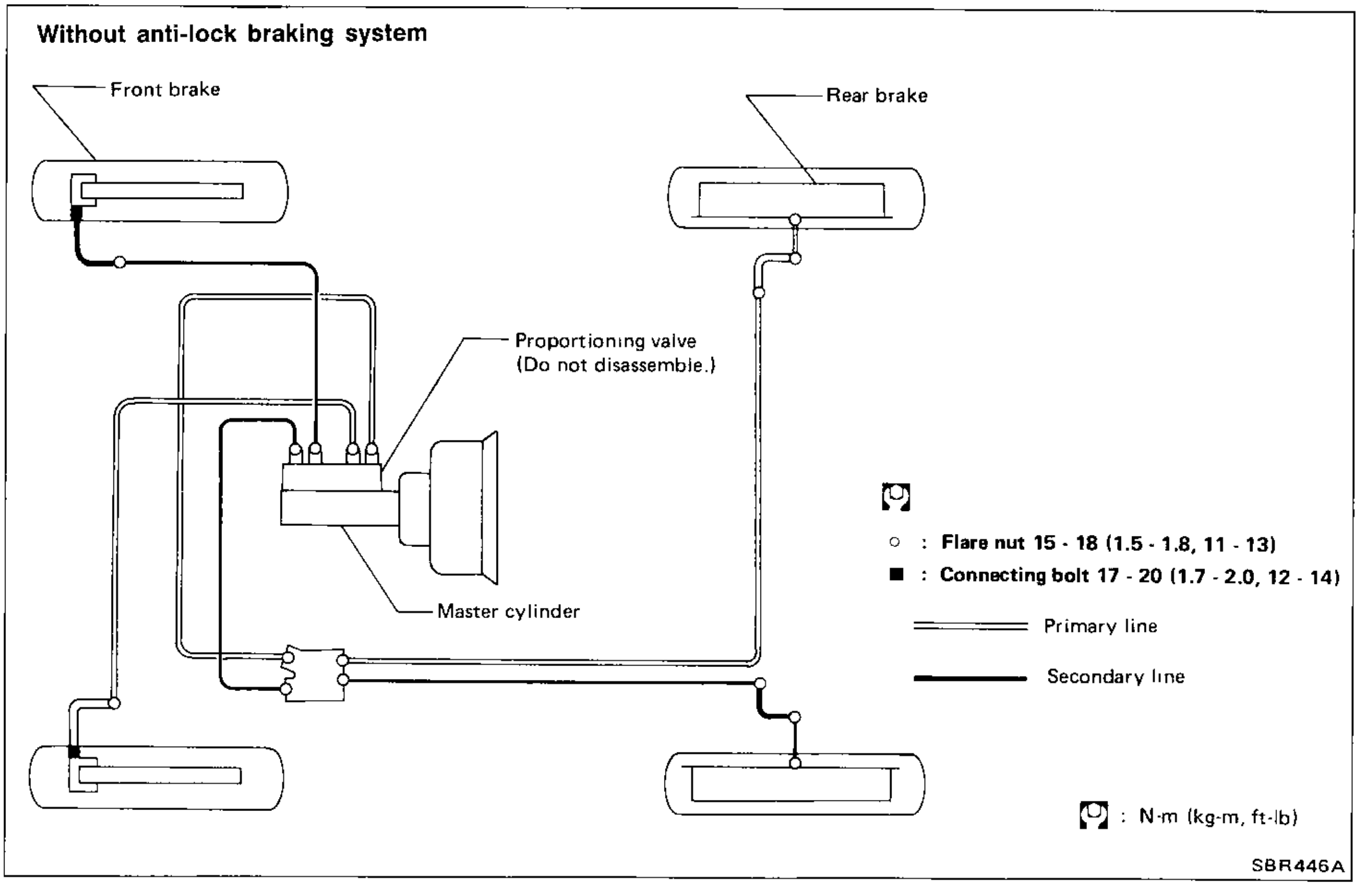
- Check brake lines (tubes and hoses) for cracks, deterioration or other damage. Replace any damaged parts.
  If leakage occurs around joints, retighten or, if necessary, replace damaged parts.
- Check for oil leakage by fully depressing brake pedal.

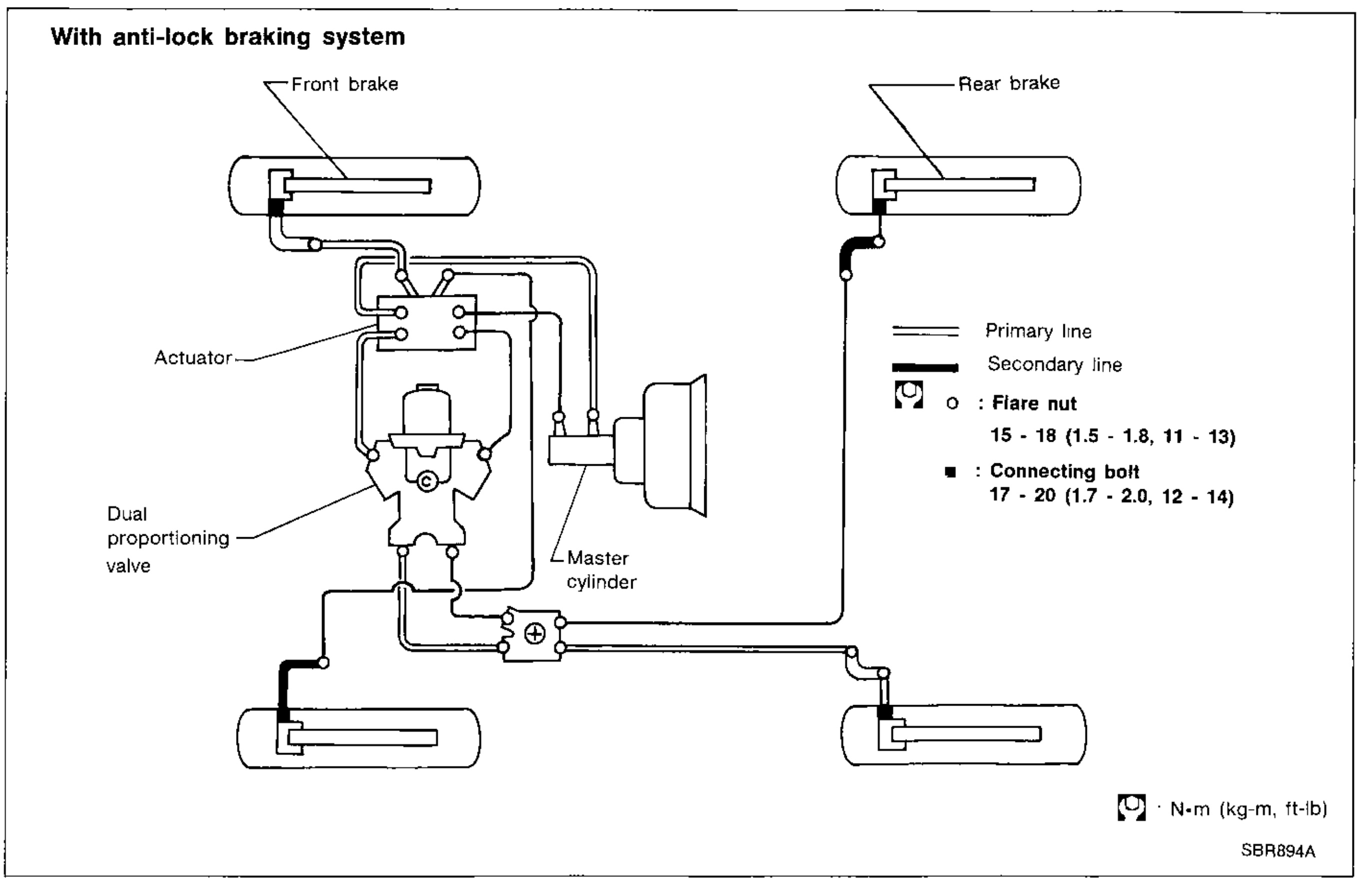

SBR992

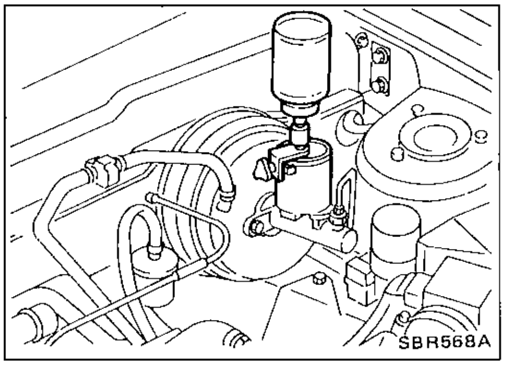
Changing Brake Fluid

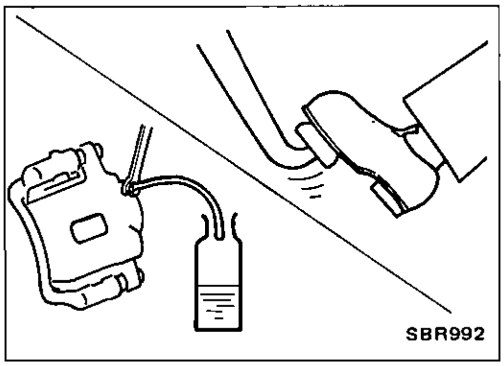
1. Drain brake fluid from each air bleeder valve.
2. Refill until new brake fluid comes out of each air bleeder valve.
   Use same procedure as in bleeding hydraulic system to refill brake fluid.
   Refer to Bleeding Procedure.

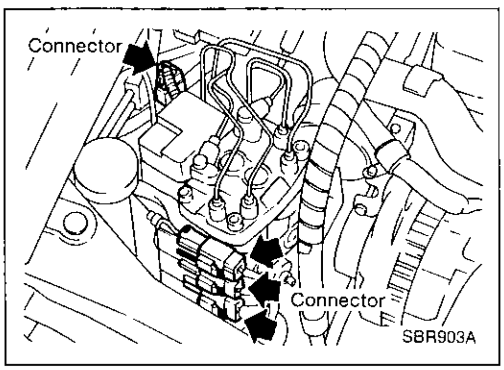
- **Refill with recommended brake fluid "DOT 3".**
- **Never reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas.**


Without anti-lock braking system
Front brake
Rear brake
Proportioning valve
(Do not disassemble.)
Master cylinder
○ : Flare nut 15 - 18 (1.5 - 1.8, 11 - 13)
■ : Connecting bolt 17 - 20 (1.7 - 2.0, 12 - 14)
Primary line
Secondary line
: N·m (kg-m, ft-lb)
SBR446A


With anti-lock braking system
Front brake
Rear brake
Actuator
Dual proportioning valve
Master cylinder
Primary line
Secondary line
○ : Flare nut
15 - 18 (1.5 - 1.8, 11 - 13)
■ : Connecting bolt
17 - 20 (1.7 - 2.0, 12 - 14)
· N·m (kg-m, ft-lb)
SBR894A







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 order.
  Left rear wheel cylinder (or caliper) → Right front caliper → Right rear wheel cylinder (or caliper) → Left front caliper
- **To bleed air out of lines, wheel cylinders and calipers, use the following procedure.**

WITHOUT ANTI-LOCK BRAKING SYSTEM

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.

WITH ANTI-LOCK BRAKING SYSTEM

1) Turn ignition switch to "OFF" position, and then disconnect ABS actuator connectors.
2) Connect a transparent vinyl tube to air bleeder valve.
3) Fully depress brake pedal several times.
4) With brake pedal depressed, open air bleeder valve to release air.
5) Close air bleeder valve.
6) Release brake pedal slowly.
7) Repeat steps 3) through 6) until clear brake fluid comes out of air bleeder valve.

Removal and Installation

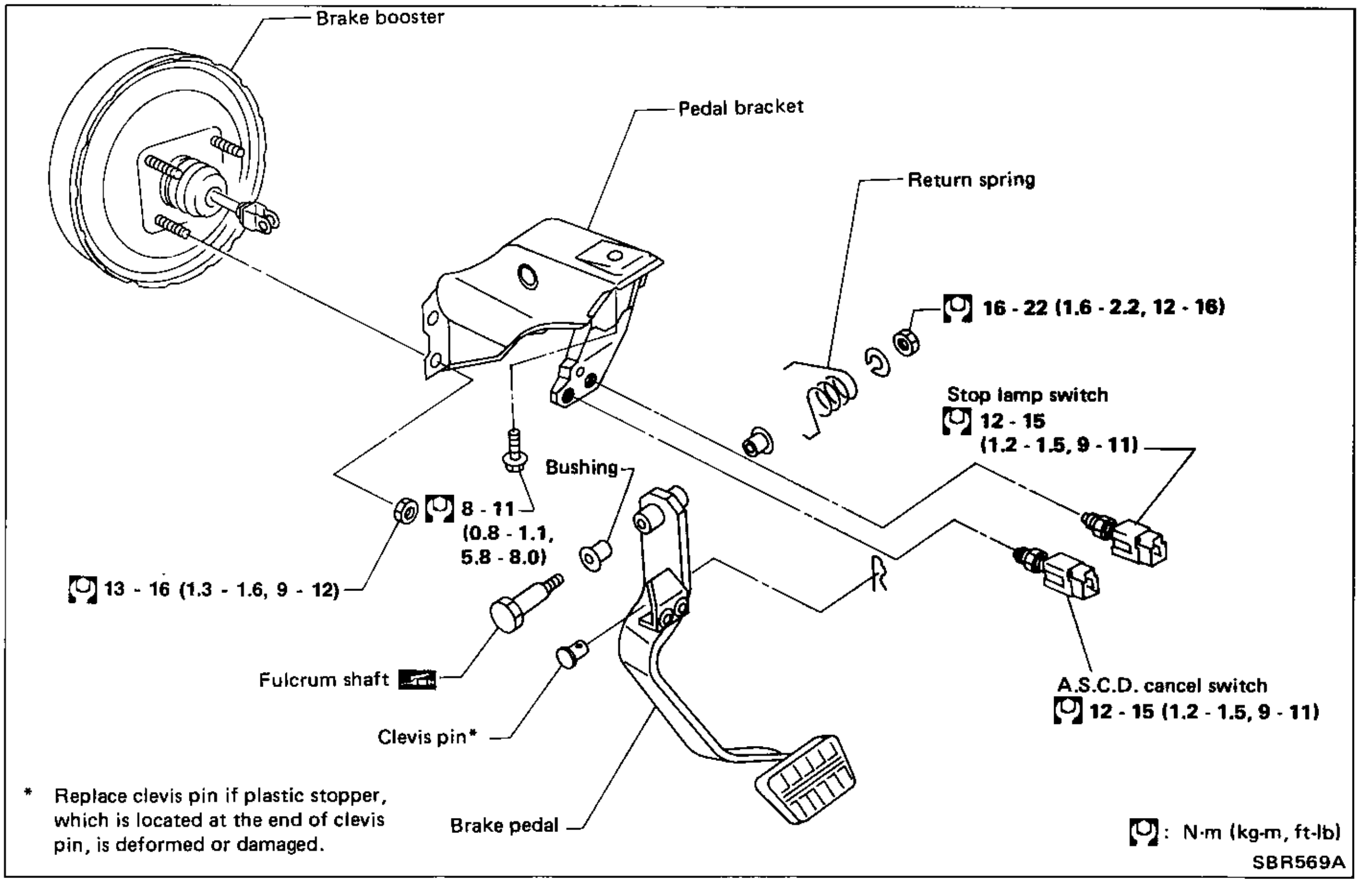
1. To remove brake hose, first remove flare nut securing brake tube to hose, then withdraw lock spring.
2. Cover openings to prevent entrance of dirt whenever disconnecting hydraulic line.
3. All hoses must be free from excessive bending, twisting and pulling.
4. After installing brake lines, check for oil leakage by fully depressing brake pedal.

Inspection

Check brake lines (tubes and hoses) for cracks, deterioration or other damage. Replace any damaged parts.

If leakage occurs around joints, retighten or, if necessary, replace damaged parts.

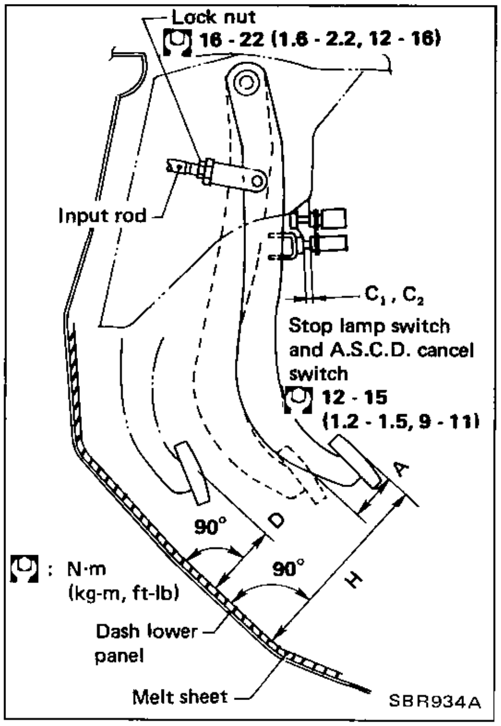
Removal and Installation



Inspection

Check brake pedal for the following items.

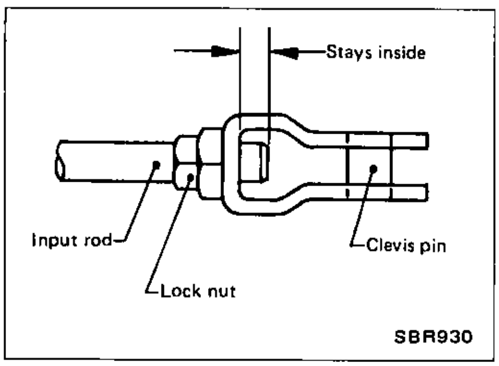
- Brake pedal bend
- Clevis pin deformation
- Crack of any welded portion



Pedal Adjustment

Check brake pedal free height from melt sheet. 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
C_1: Clearance between pedal stopper and threaded end of stop lamp switch
0.3 - 1.0 mm (0.012 - 0.039 in)
C_2: Clearance between pedal stopper and threaded end of A.S.C.D. cancel 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.

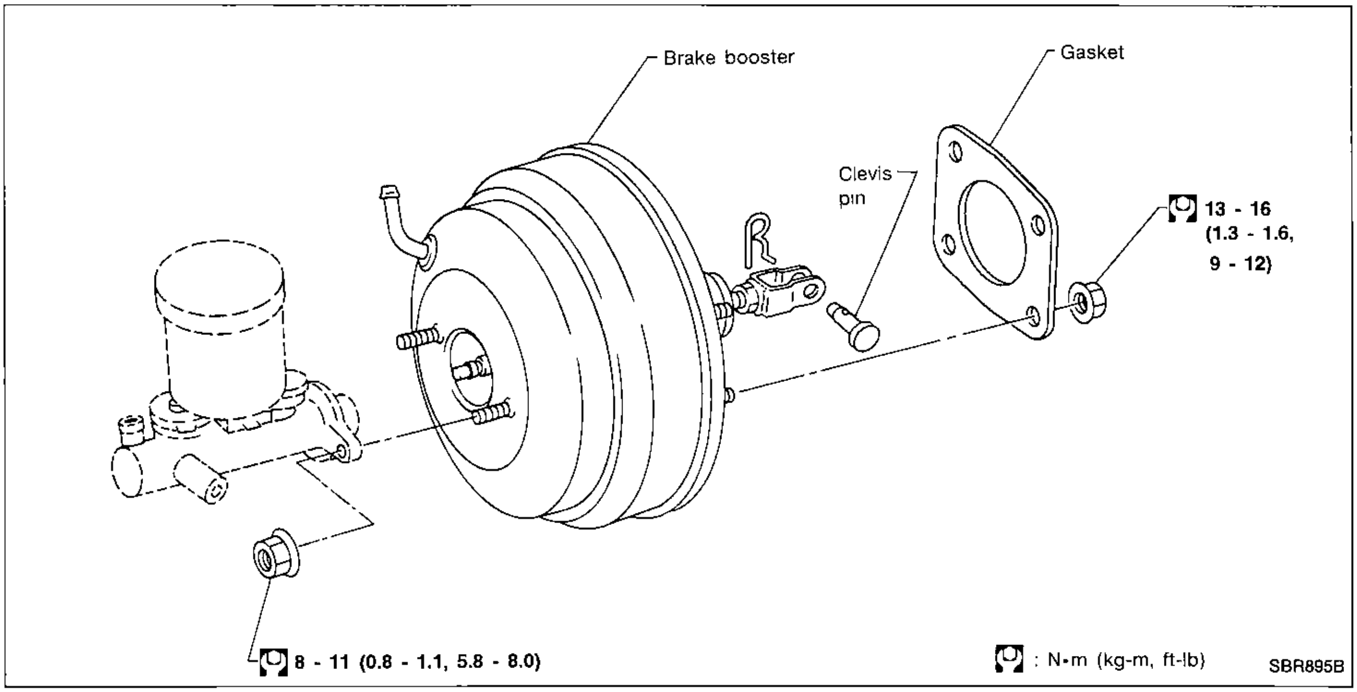
Make sure that tip of input rod stays inside.

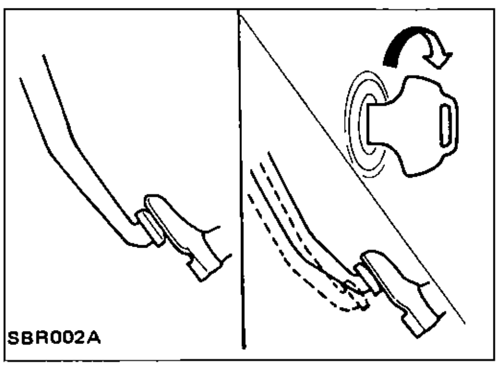
2. Adjust clearance "C_1" and "C_2" with stop lamp switch and A.S.C.D. cancel switch respectively. Then tighten lock nuts.
3. Check pedal free play.

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.

Removal and Installation

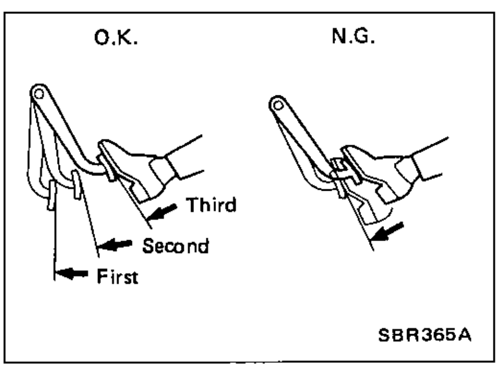




Inspection

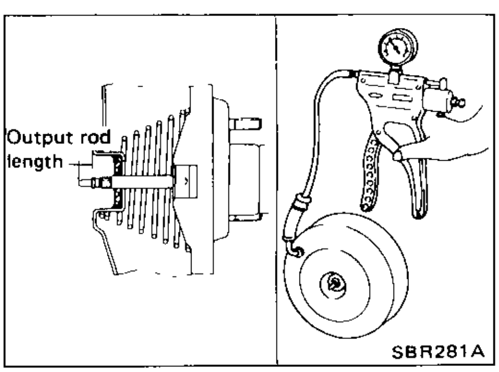
OPERATING CHECK

- 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.



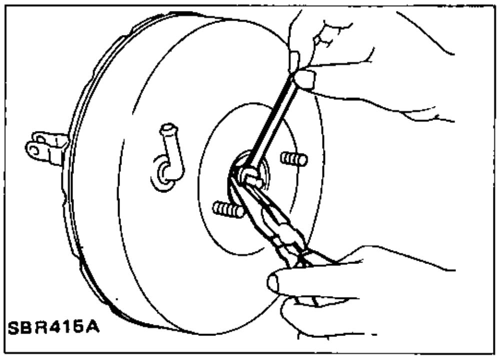
OUTPUT ROD LENGTH CHECK

1. Supply brake booster with vacuum of –66.7 kPa (–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)

Inspection (Cont'd)

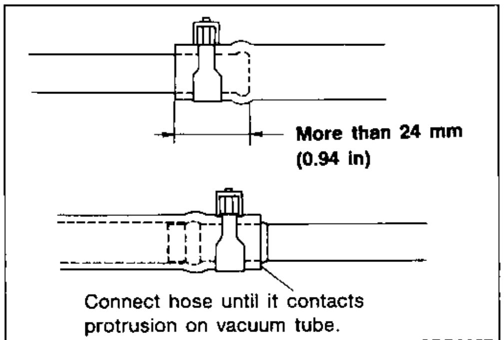

SBR415A

3. Adjust rod length if necessary.
4. If rod length is without specification, replace brake booster.

Removal and Installation

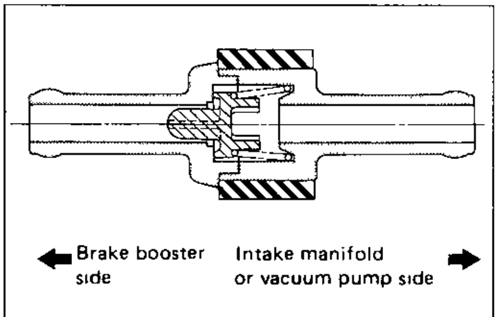
CAUTION:

Do not apply any oil or lubricants to vacuum hoses and check valve.



SBR225B

- Insert vacuum tube into vacuum hose more than 24 mm (0.94 in).

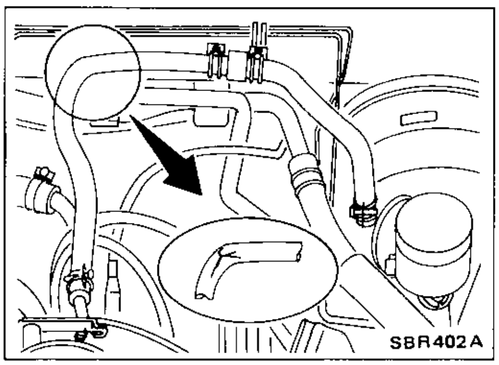


SBR202A

- Install check valve, paying attention to its direction.

Inspection

HOSES AND CONNECTORS

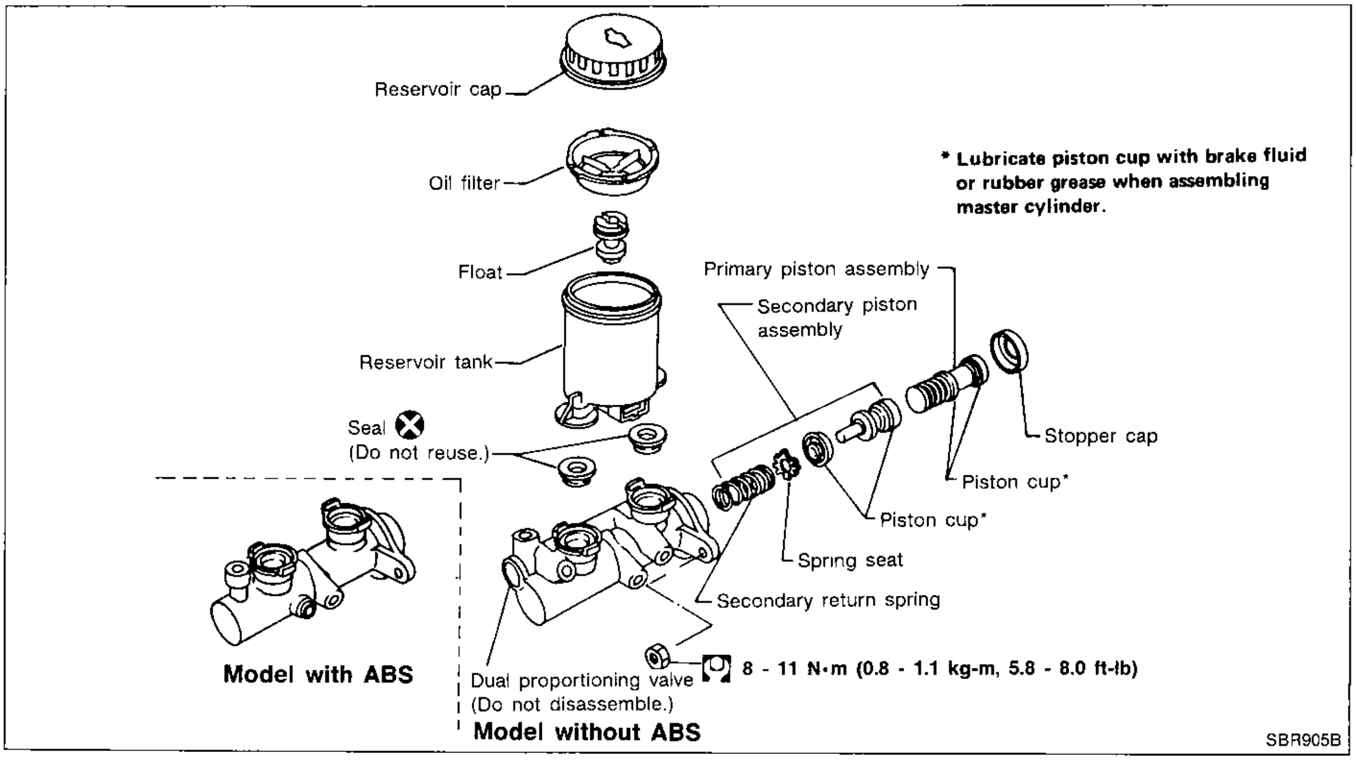

SBR402A

- Check vacuum lines, connections and check valve for airtightness, chafing and deterioration.

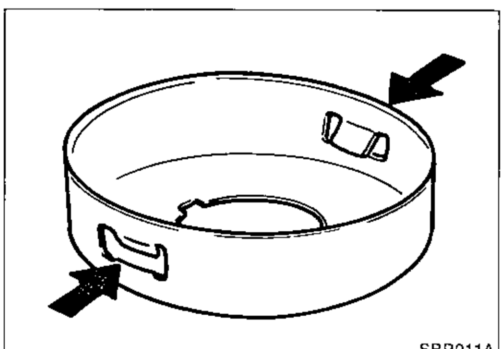
CHECK VALVE

- When pressure is applied to brake booster side of check valve and valve does not open, replace check valve with a new one.

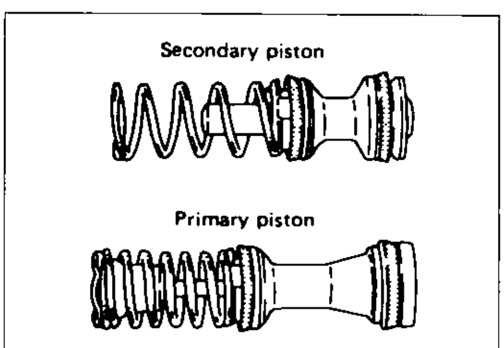
Removal and Installation



SBR905B

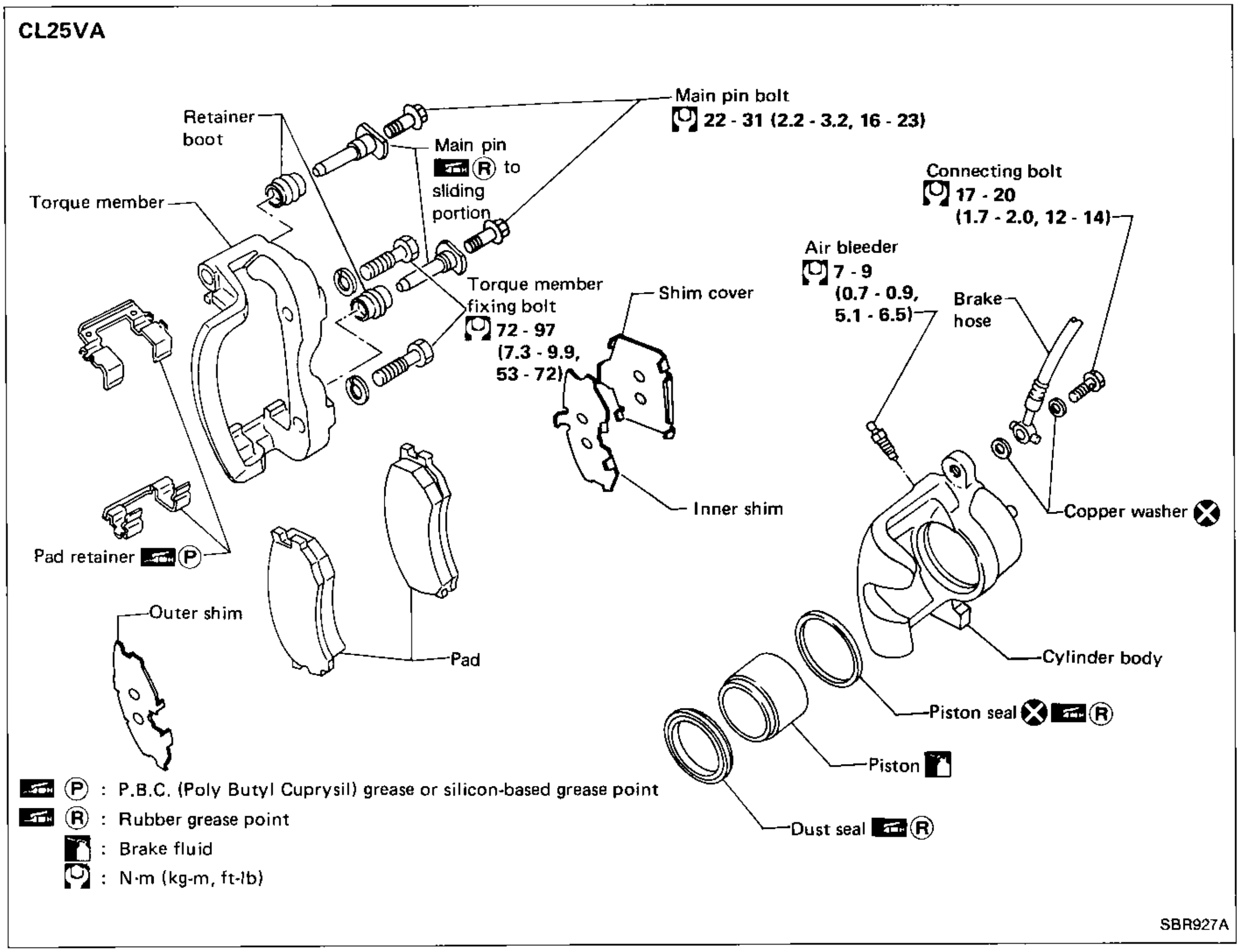

SBR011A

- Replace stopper cap if claw is damaged or deformed.
- Bend claws inward when installing stopper cap.



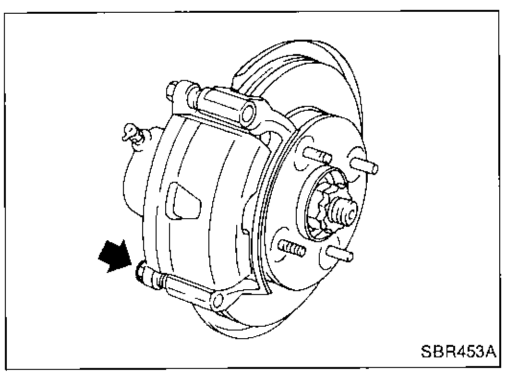
SBR012A

- Pay attention to direction of piston cups in figure at left.
- Check parts for wear or damage. Replace if necessary.

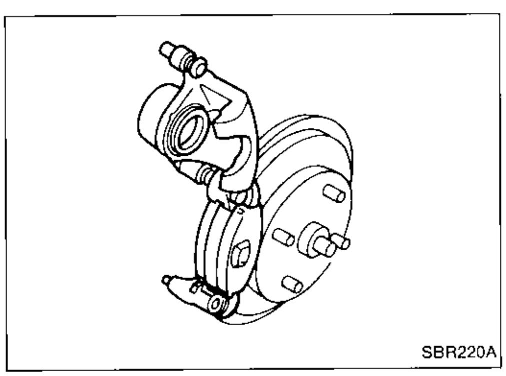


SBR927A

Pad Replacement


SBR453A

1. Remove pin bolt.

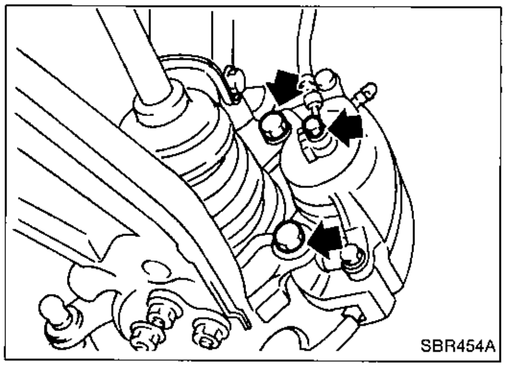

SBR220A

2. Swing cylinder body upward. Then remove pad retainer, and inner and outer shims.

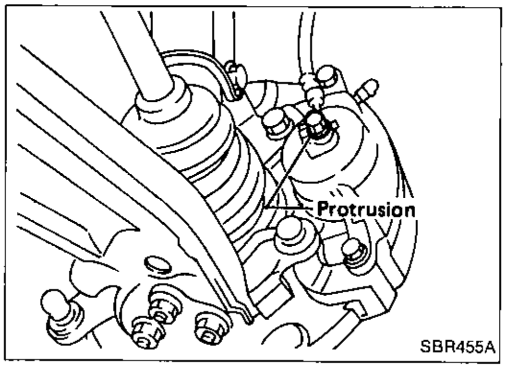
CAUTION:

- **When cylinder body is swung up, 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 or if shims are rusted or rubber coat is separated.**

Removal and Installation

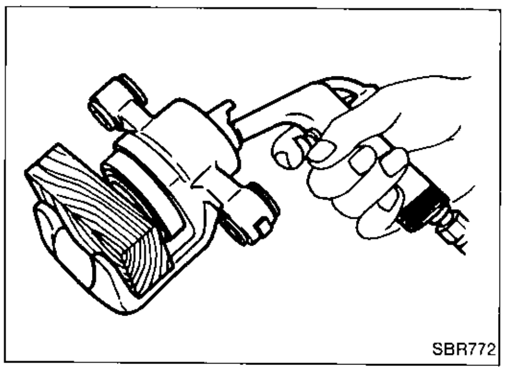


- Remove torque member fixing bolts and connecting bolt.



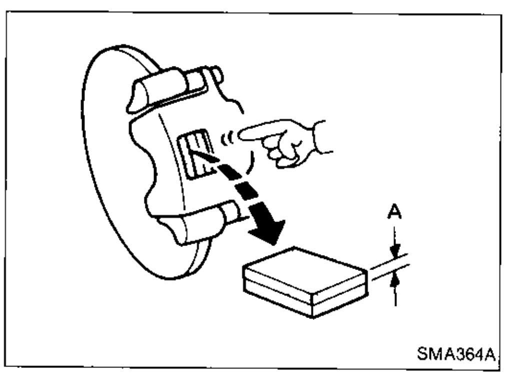
- Install brake hose to caliper at protrusions securely.

Disassembly



- Push out piston with dust seal using compressed air.

Inspection



DISC PAD

Check disc pad for wear or damage.

Pad standard thickness (A):
11.0 mm (0.433 in)
Pad wear limit (A):
2.0 mm (0.079 in)

CYLINDER BODY

- 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.

Inspection (Cont'd)

PISTON

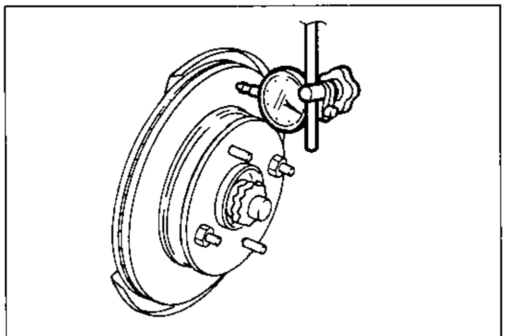
Check piston for scoring, rust, wear, damage or foreign materials. Replace if any condition exists.

CAUTION:

Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign materials are stuck to sliding surface.

PIN, PIN BOLT AND PIN BOOT

Check for wear, cracks or other damage. Replace if any condition exists.


SBR830B

ROTOR RUNOUT

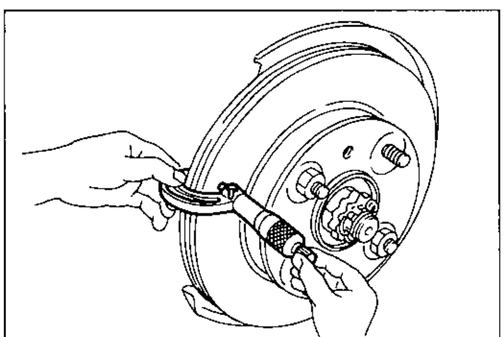
1. Secure rotor to wheel hub with at least two nuts (M12 x 1.25).
2. Check runout using a dial indicator.

Make sure that wheel bearing axial end play is within the specifications before measuring. Refer to section FA.

Maximum runout:

0.07 mm (0.0028 in)

3. If the runout is out of specification, find minimum runout position as follows:
   a. Remove nuts and rotor from wheel hub.
   b. Shift the rotor one hole and secure rotor to wheel hub with nuts.
   c. Measure runout.
   d. Repeat steps a. to c. so that minimum runout position can be found.
4. If the runout is still out of specification, turn rotor with on-car brake lathe ("MAD, DL-8700", "AMMCO 700 and 705" or equivalent).


SBR831B

ROTOR THICKNESS

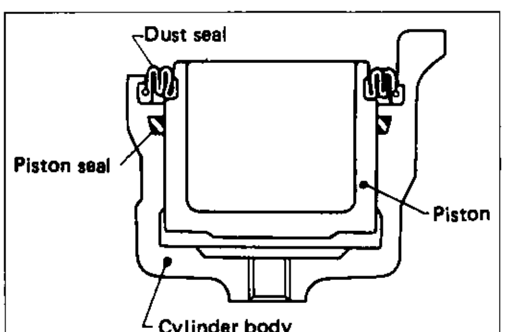
Thickness variation (At least 8 positions):

Maximum 0.01 mm (0.0004 in)

If thickness variation exceeds the specification, turn rotor with on-car brake lathe.

Rotor repair limit:

20.0 mm (0.787 in)



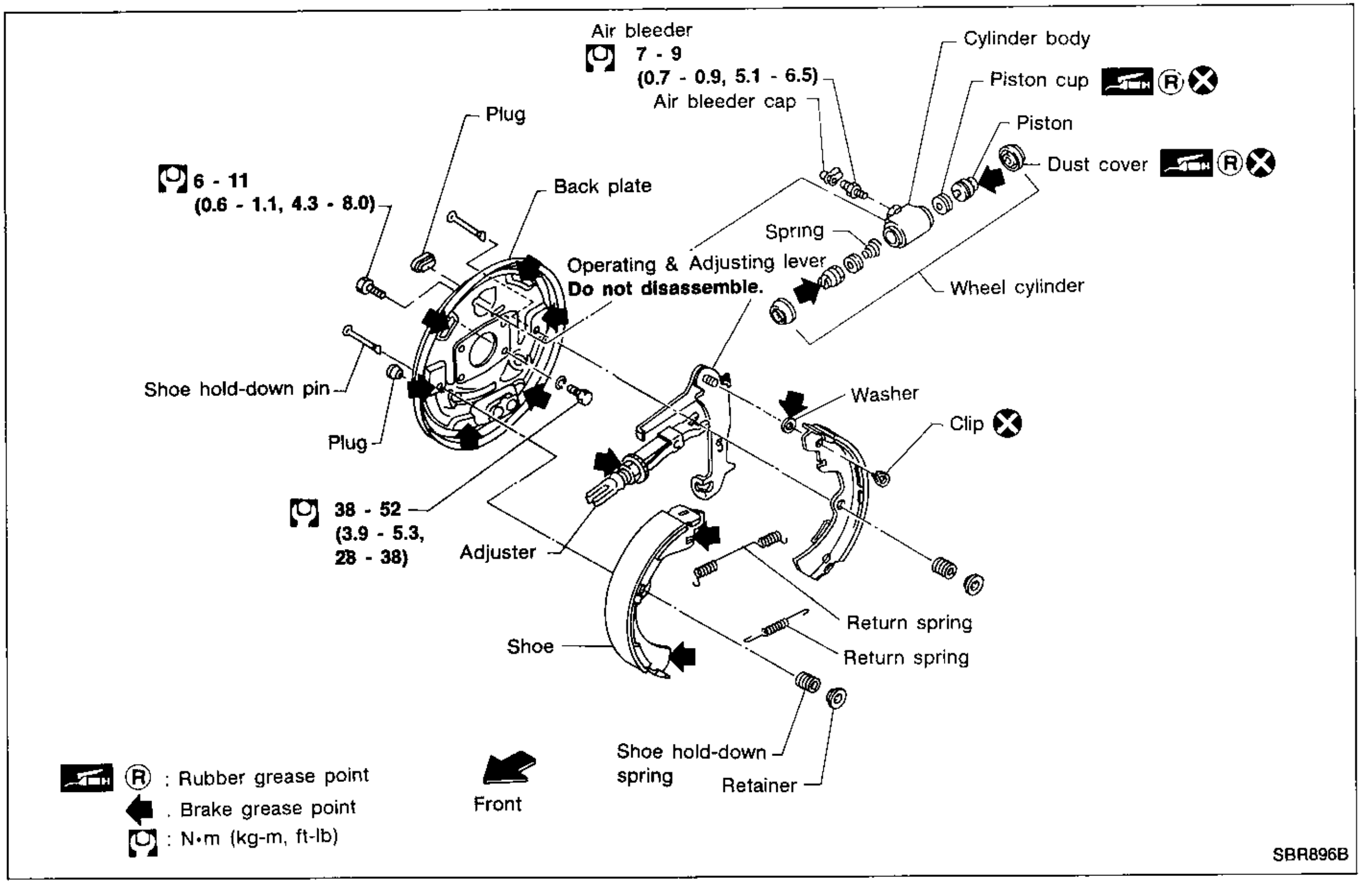
SBR574

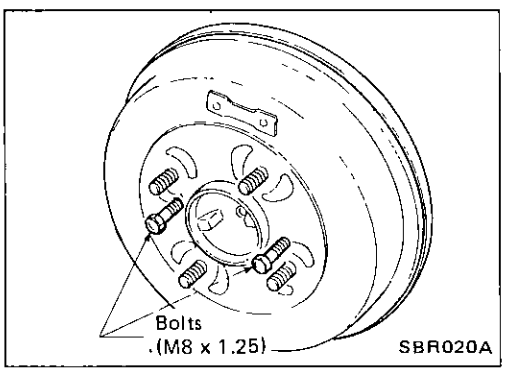
Assembly

- Insert piston seal into groove on cylinder body.
- With dust seal fitted to piston, install piston into cylinder body.

CAUTION:

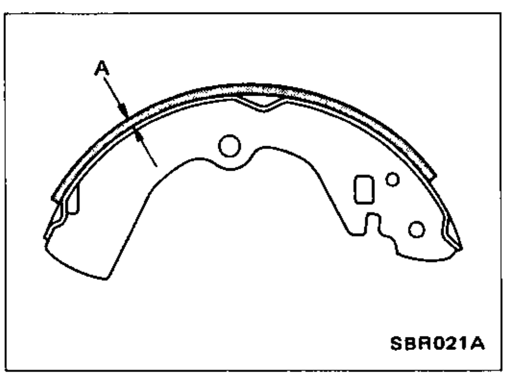
- **Secure dust seal properly.**





Brake Drum Removal

- Release parking brake control lever fully.
- Tighten two bolts gradually if brake drum is hard to remove.



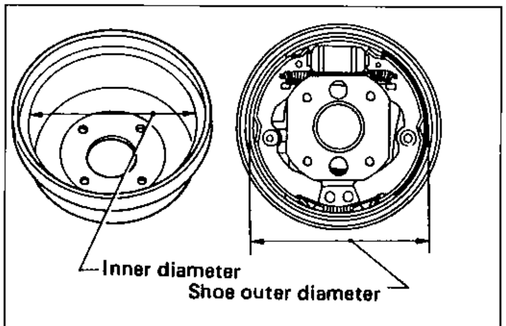
Shoe Replacement

- Measure lining thickness.
  Standard thickness:
  4.5 mm (0.177 in)
  Lining wear limit (A):
  1.5 mm (0.059 in)

Before installing new shoes, rotate nut until adjuster rod is at its shortest point.
After installation, adjust shoe-to-drum clearance. Refer to Removal and Installation.

Wheel Cylinder Inspection

- Check wheel cylinder for leakage.
- Check for wear, damage and loose conditions.
  Replace if any such condition exists.



SBR042A

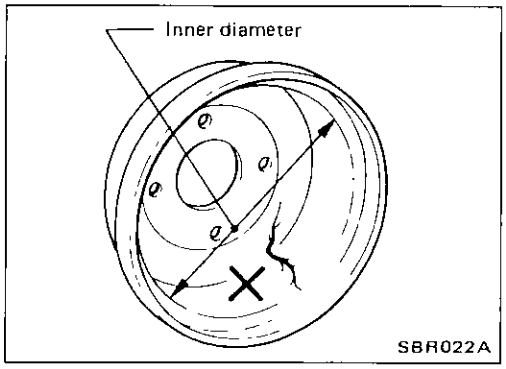
Removal and Installation

When installing, measure brake drum inside diameter and diameter of brake shoes. Check that difference between diameters is correct shoe clearance.

Shoe clearance:

0.35 - 0.55 mm (0.0138 - 0.0217 in)

If necessary, adjust by rotating adjuster.



SBR022A

Drum Inspection

Standard inner diameter:

228.6 mm (9 in)

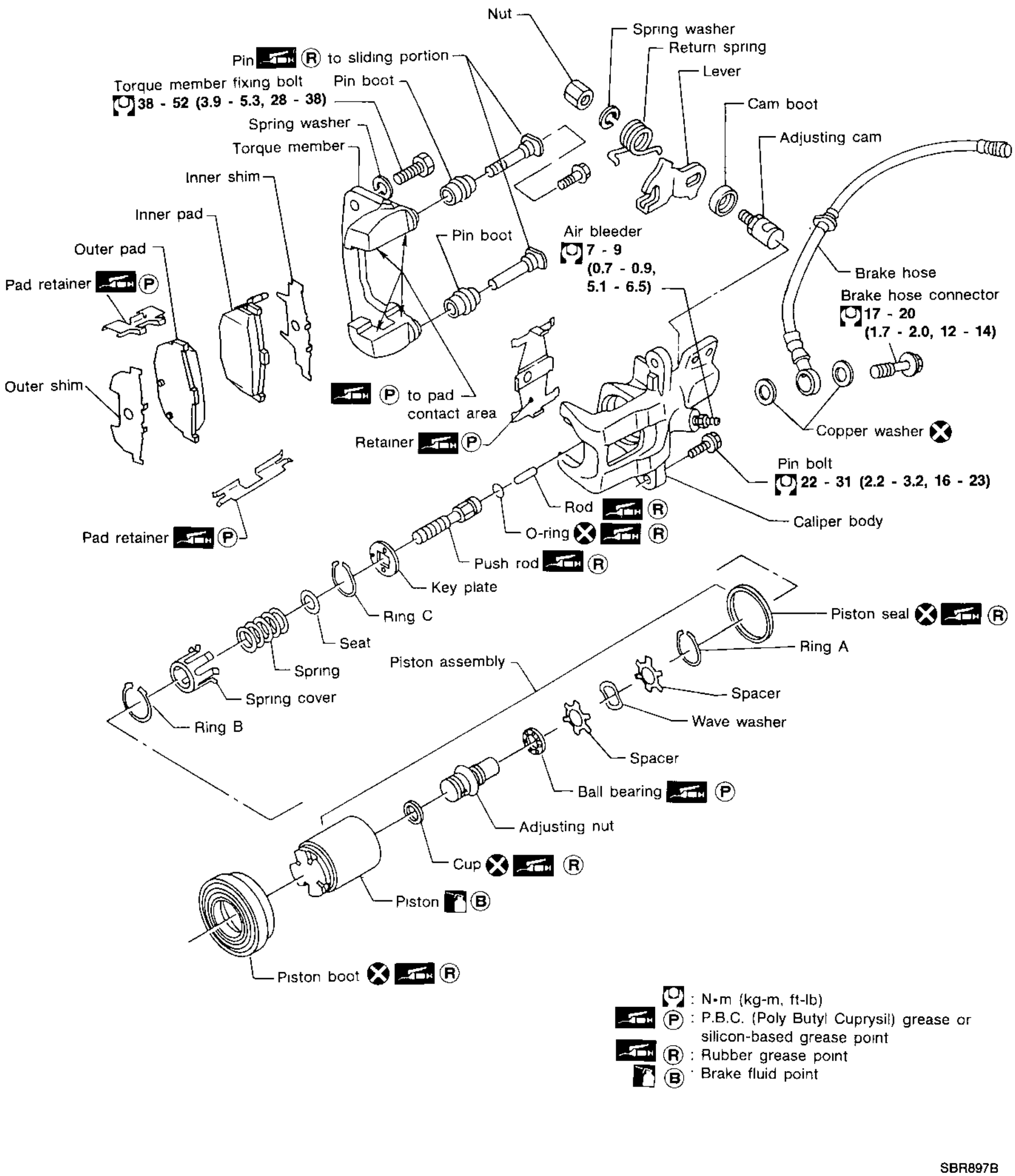
Maximum inner diameter:

230.0 mm (9.06 in)

Out-of-roundness (Ellipticity):

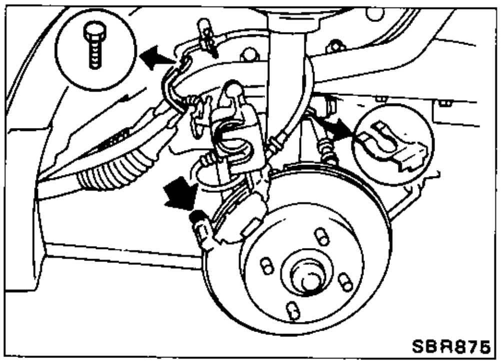
0.03 mm (0.0012 in) or less

- Contact surface should be finefinished with No. 120 to 150 emery paper.
- Using a drum lathe, lathe brake drum if it shows scoring, partial wear or stepped wear.
- After brake drum has been completely reconditioned or replaced, check drum and shoes for proper contact pattern.



Nut
Spring washer
Return spring
Lever
Cam boot
Adjusting cam
Pin (R) to sliding portion
Torque member fixing bolt
38 - 52 (3.9 - 5.3, 28 - 38)
Pin boot
Spring washer
Torque member
Inner shim
Inner pad
Outer pad
Pad retainer (P)
Outer shim
Pin boot
Air bleeder
7 - 9
(0.7 - 0.9,
5.1 - 6.5)
Brake hose
Brake hose connector
17 - 20
(1.7 - 2.0, 12 - 14)
(P) to pad contact area
Retainer (P)
Copper washer
Pin bolt
22 - 31 (2.2 - 3.2, 16 - 23)
Caliper body
Rod (R)
O-ring (R)
Pad retainer (P)
Push rod (R)
Key plate
Ring C
Seat
Spring
Spring cover
Ring B
Piston assembly
Piston seal (R)
Ring A
Spacer
Wave washer
Spacer
Ball bearing (P)
Adjusting nut
Cup (R)
Piston (B)
Piston boot (R)
: N•m (kg-m, ft-lb)
(P) : P.B.C. (Poly Butyl Cuprysil) grease or silicon-based grease point
(R) : Rubber grease point
(B) : Brake fluid point
SBR897B

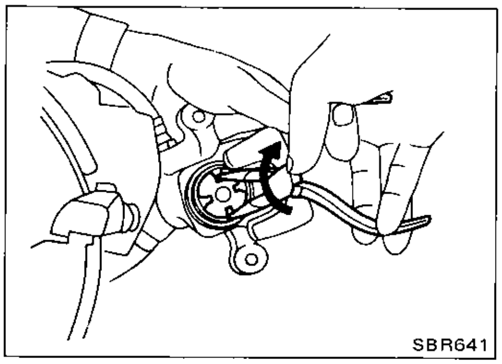
Pad Replacement


SBR875

1. Remove parking cable stay fixing bolt, pin bolt and lock spring. Then remove pad retainers, pads and shims.

CAUTION:

When cylinder body is swung up, do not depress brake pedal because piston will pop out.

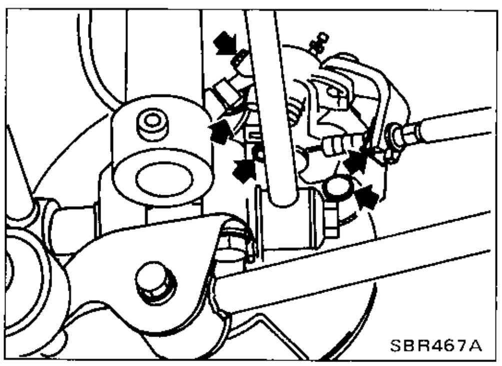

SBR641

2. When installing pads, retract piston into cylinder body by turning piston clockwise.

CAUTION:

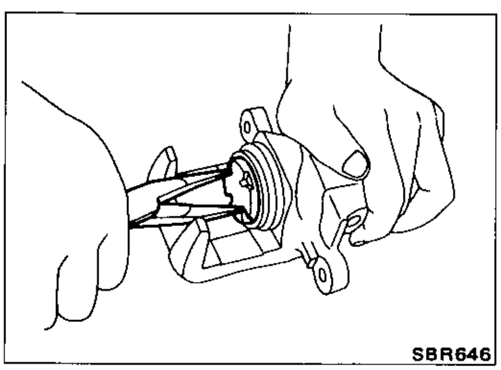
Be careful not to damage piston boot or get oil on rotor.
Always replace shims when replacing pads.

Removal and Installation

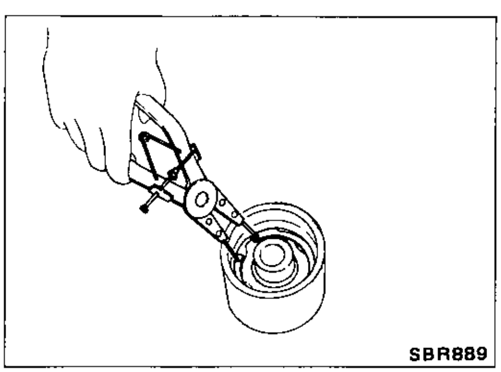

SBR467A

Disconnect parking brake cable and brake hose, then remove caliper assembly.

Disassembly

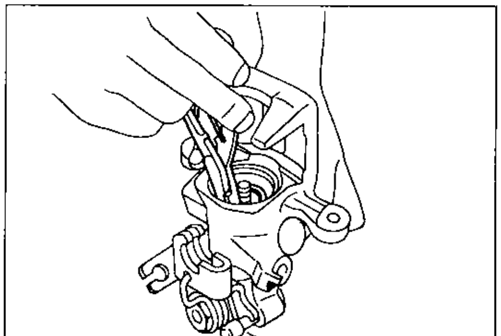

SBR646

1. Remove piston by turning it counterclockwise with suitable long nose pliers.

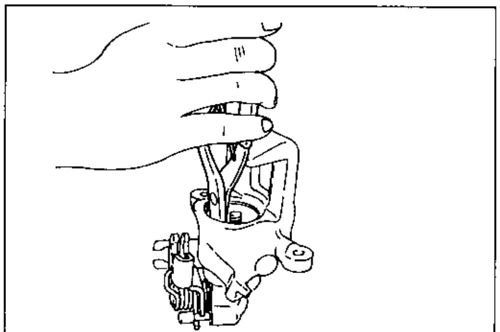

SBR889

2. Pry off ring A from piston with suitable pliers and remove adjusting nut.

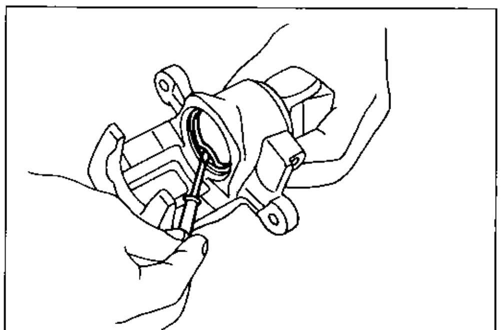
Disassembly (Cont'd)


SBR890

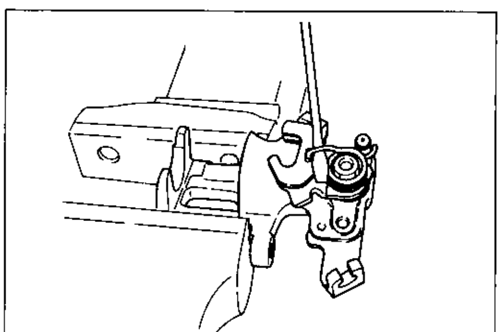
3. Disassemble cylinder body.
(1) Pry off ring B with suitable pliers, then remove spring cover, spring and seat.


SBR891

(2) Pry off ring C, then remove key plate, push rod and rod.


SBR656

(3) Remove piston seal.
Be careful not to damage cylinder body.


SBR877

4. Remove return spring and lever.

Inspection

CAUTION:
Use brake fluid to clean cylinder. Never use mineral oil.

CYLINDER BODY

- Check inside surface of cylinder for score, rust, wear, damage or presence of foreign materials. If any of the above conditions are observed, replace cylinder body.
- Minor damage from rust or foreign materials may be eliminated by polishing surface with a fine emery paper. Replace cylinder body if necessary.

Inspection (Cont'd)

TORQUE MEMBER

Check for wear, cracks or other damage. Replace if necessary.

PISTON

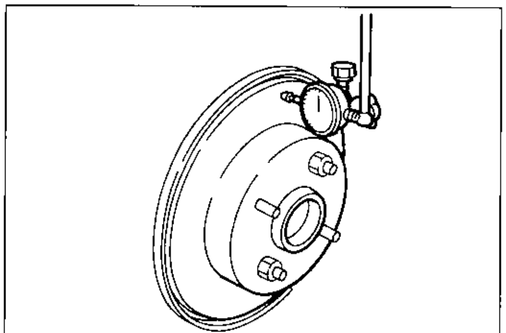
Check piston for score, rust, wear, damage or presence of foreign materials.
Replace if any of the above conditions are observed.

CAUTION:

Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign matter is stuck to sliding surface.

PIN AND PIN BOOT

Check for wear, cracks or other damage.
Replace if any of the above conditions are observed.

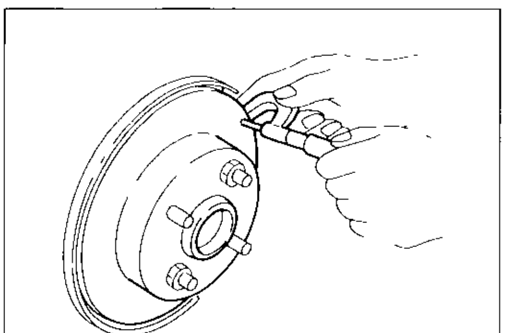


SBR936A

RUNOUT

Make sure that axial end play is within the specifications before measuring. Refer to section RA.
Then check runout with a dial indicator.

Rotor repair limit:
Maximum runout
(Total indicator reading at center of rotor pad contact surface)
0.07 mm (0.0028 in)

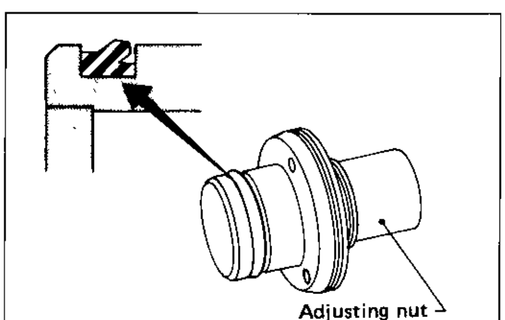


SBR944A

THICKNESS

Rotor repair limit:
Minimum thickness
9.0 mm (0.354 in)
Thickness variation (At least 8 portions)
Maximum 0.02 mm (0.0008 in)

Replace rotor if any of the above do not meet the specifications.

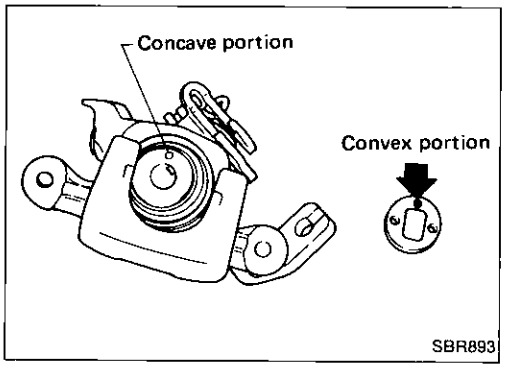


SBR892

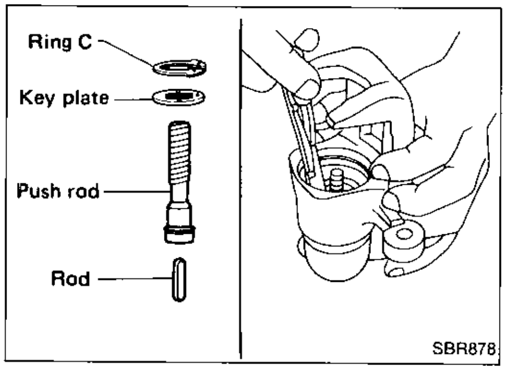
Assembly

1. Install cup in the specified direction.

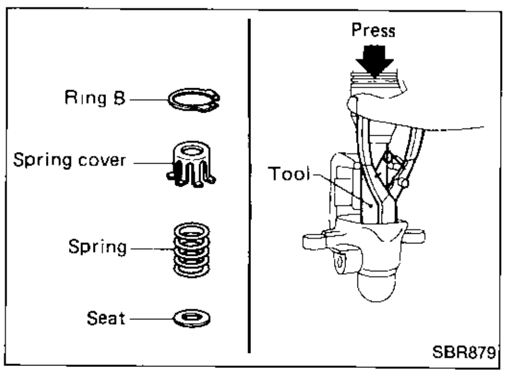
Assembly (Cont'd)



2. Fit push rod into square hole in key plate. Also match convex portion of key plate with concave portion of cylinder.

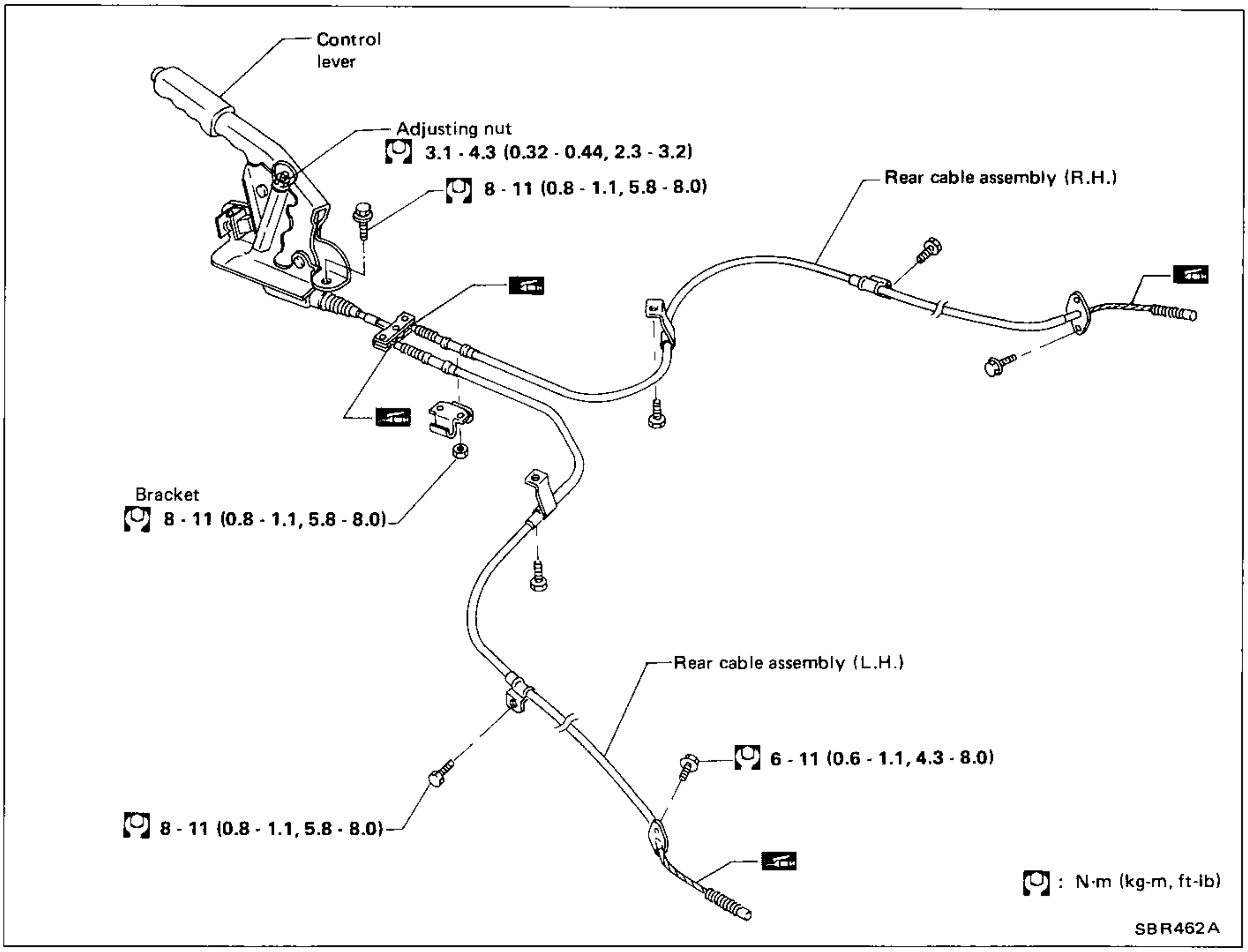


3. Install ring C with a suitable tool.



4. Install seat, spring, spring cover and ring B with suitable press and drift.

Removal and Installation



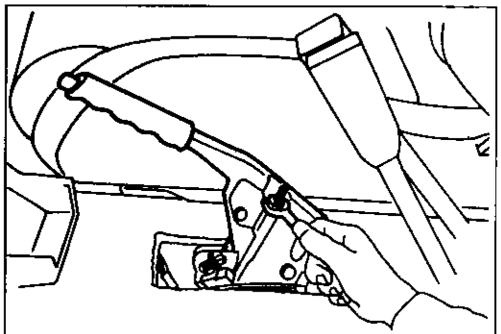
- Before removing parking brake control assembly, remove console box.
- Make sure there is no free play after installing.

Inspection

1. Check control lever for wear or other damage. Replace if necessary.
2. Check parking brake cables and lamp switch. Replace if necessary.
3. Check parts at each connecting portion for deformation or damage, and if found, replace.

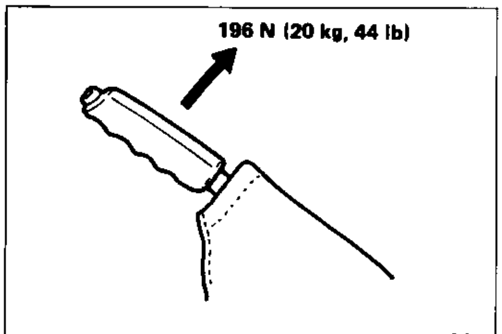
Adjustment

Adjust control lever stroke as follows:



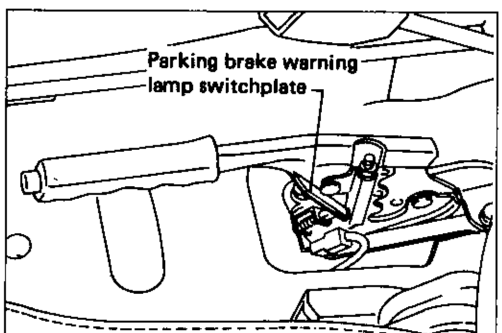
SBR370A

1. Adjust control lever by turning adjusting nut.



SBR033A

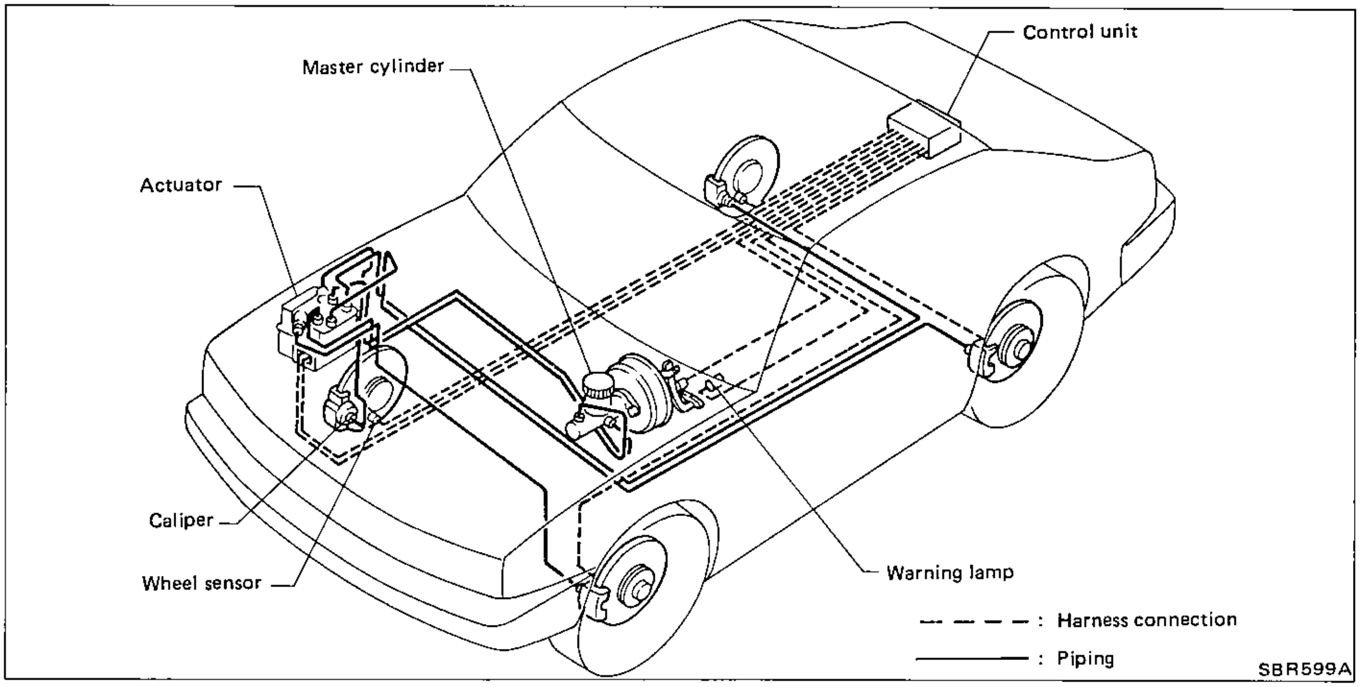
2. Pull control lever with specified amount of force. Check lever stroke and ensure smooth operation.
   Number of notches
   Center lever type: 9 - 11



SBR463A

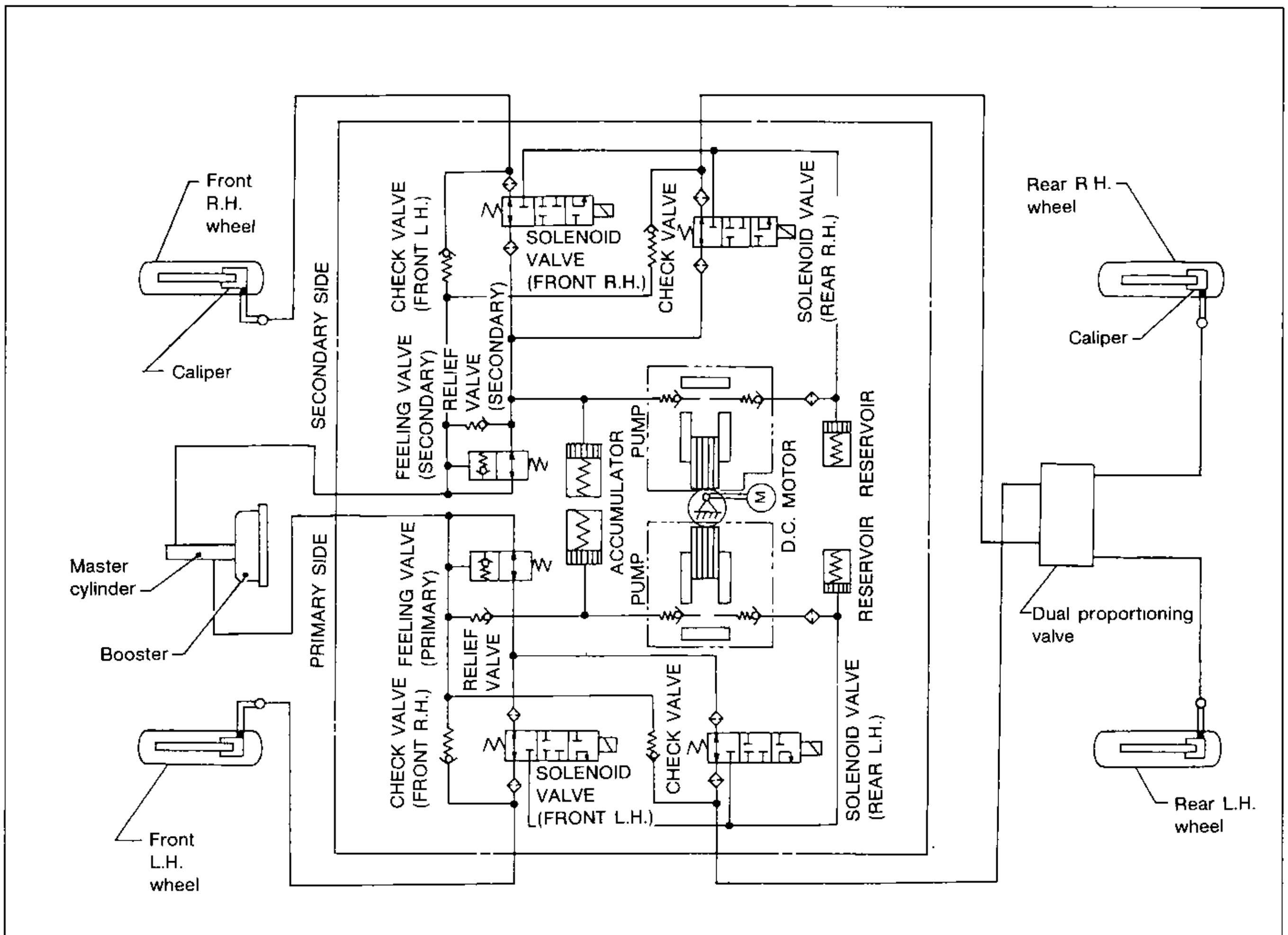
3. Bend parking brake warning lamp switch plate so that brake warning lamp comes on when ratchet at parking brake lever is pulled "A" notches and goes out when fully released.
   Number of "A" notches: 1

System Components



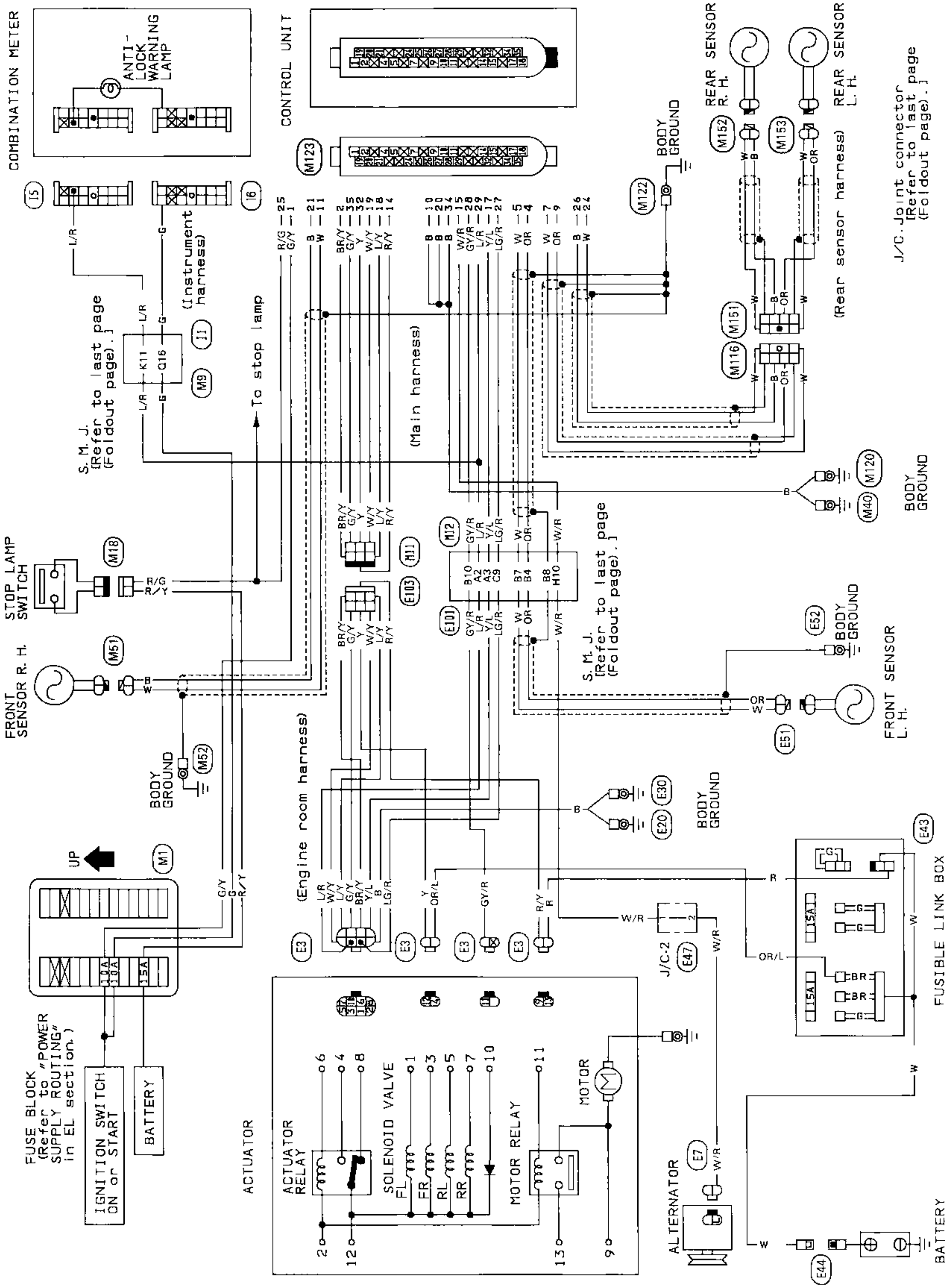
SBR599A

Hydraulic Circuit



SBR896A

Wiring Diagram

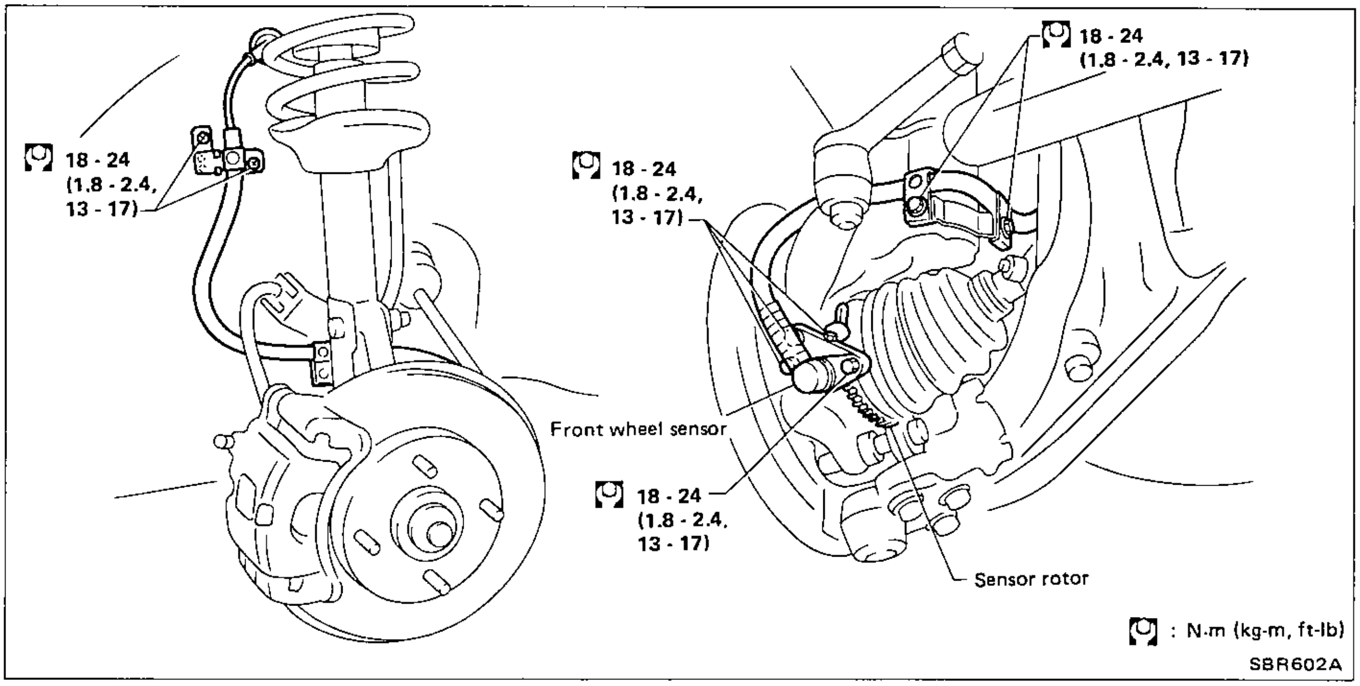


MBR001A

Removal and Installation

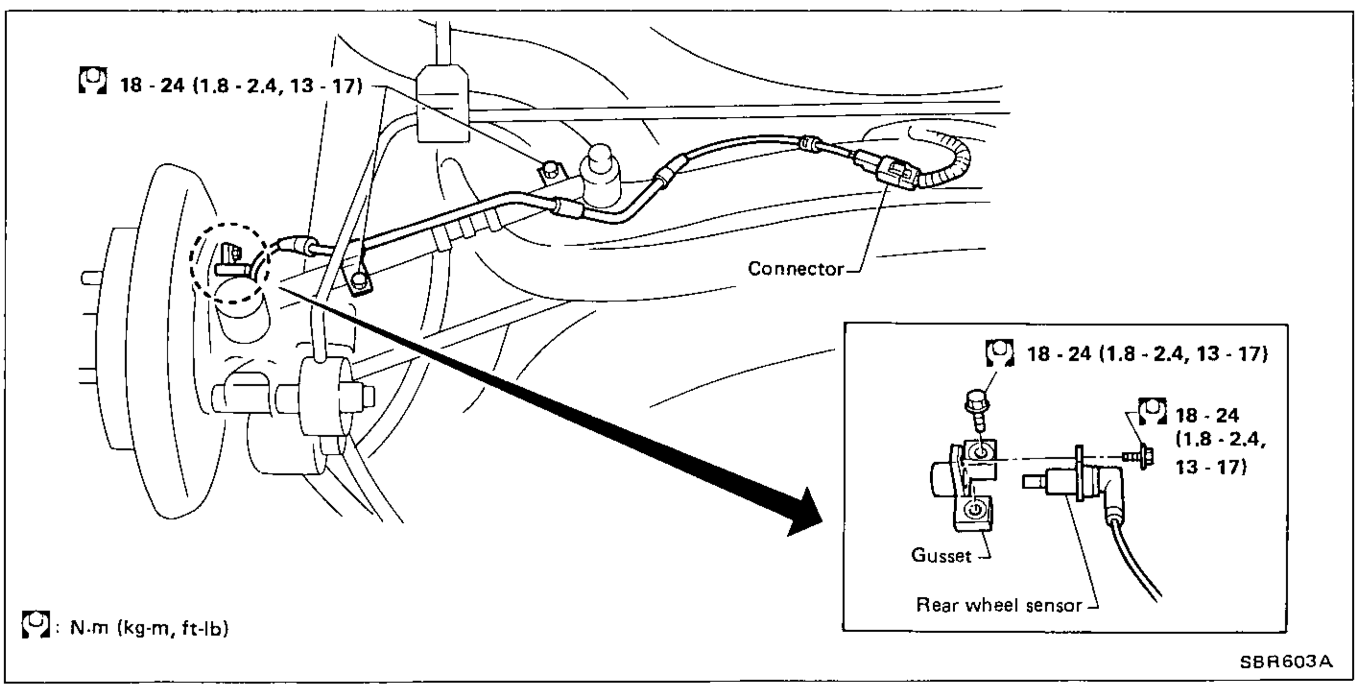
CAUTION:
Be careful not to damage sensor edge and sensor rotor teeth.

FRONT WHEEL SENSOR



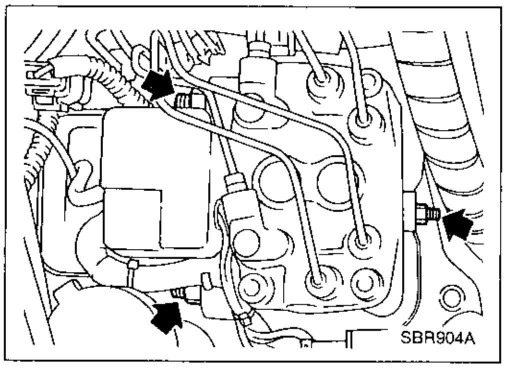
- Remove sensor rotor with front wheel hub, referring to FA section.

REAR WHEEL SENSOR



Removal and Installation (Cont'd)

ACTUATOR



- Disconnect 4 connectors and brake tubes.
- Remove 3 nuts fixing actuator to bracket.

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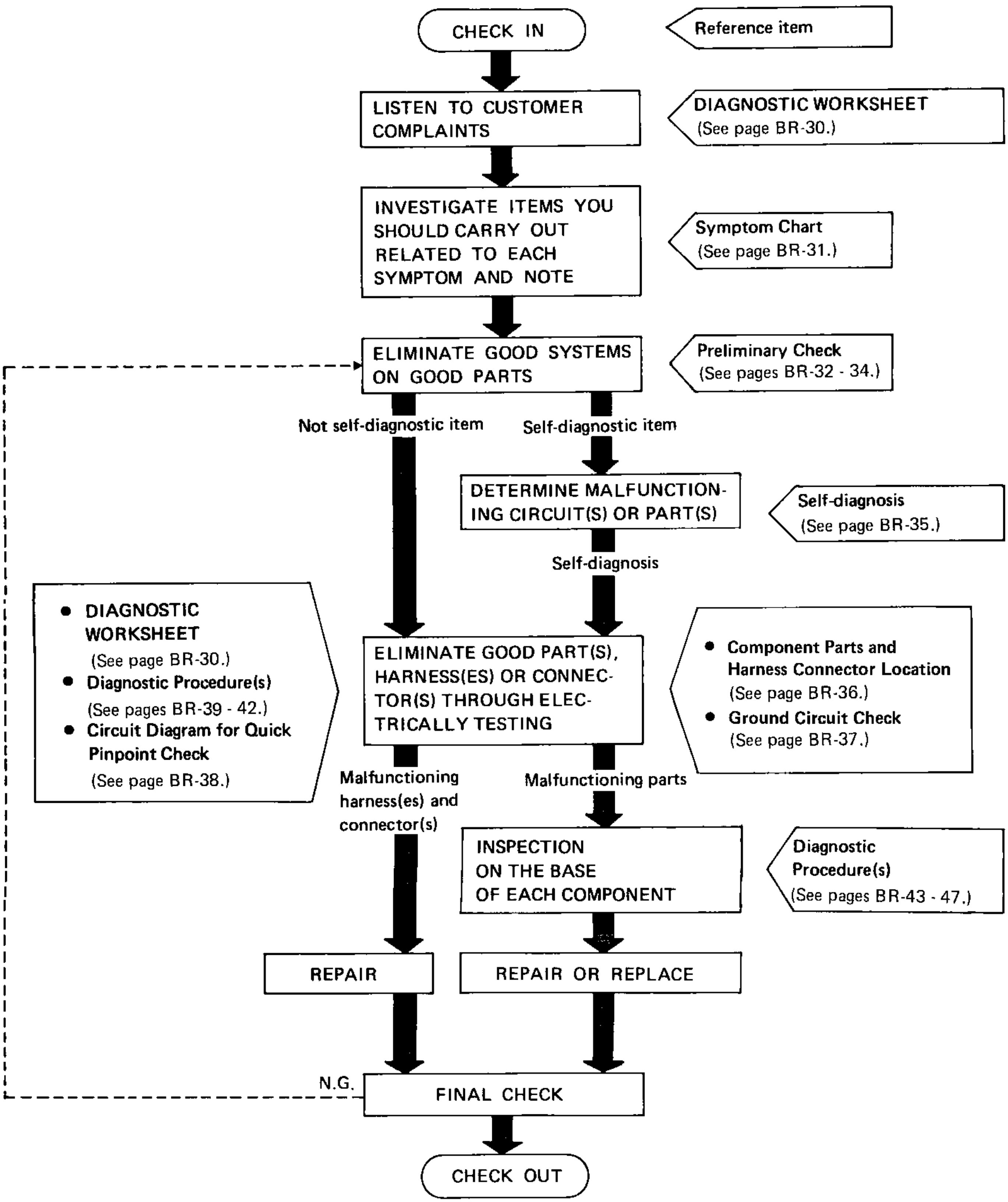
How to Perform Trouble Diagnoses for Quick and Accurate Repair

WORK FLOW



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

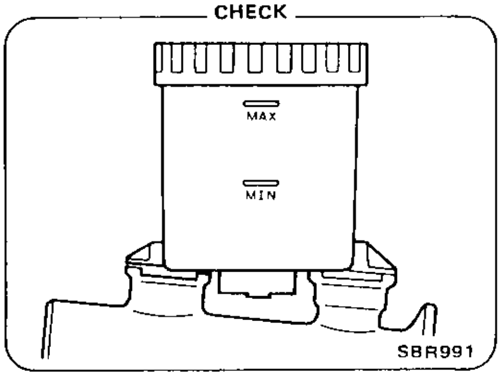
Customer name MR/MS		Model & Year			VIN		
Engine #		Trans.			Mileage		
Incident Date		Manuf. Date			In Service Date		
Symptoms	☐ Pedal vibration and noise	☐ Warning activates	☐ Long stopping distance	☐ Abnormal pedal action	☐ ABS doesn't work	☐ ABS works but warning activates	☐ ABS works frequently
Engine conditions		☐ When starting ☐ After starting ☐ Engine speed: 5,000 rpm or more					
Road conditions		☐ Low friction road (☐ Snow ☐ Gravel ☐ Other) ☐ Protrusion					
Driving conditions		☐ High speed cornering ☐ Vehicle speed: Greater than 10 km/h (6 MPH) ☐ Vehicle speed: 10 km/h (6 MPH) or less ☐ Vehicle is stopped					
Applying brake conditions		☐ Suddenly ☐ Gradually					
Other conditions		☐ Operation of electrical equipment ☐ Large pedal stroke ☐ Operation of clutch					

Symptom Chart

PROCEDURE	REFERENCE PAGE	SYMPTOM	Pedal vibration & noise	Warning activates	Long stopping distance	Abnormal pedal action	ABS doesn't work	ABS works but warning activates	ABS works frequently
Electrical Com- ponents Inspec- tion	BR-48	Actuator inspection					○		
Ground Circuit Check	BR-37	Motor ground					○		
Diagnostic Procedure (Select inspection with L.E.D. flashing No.)	BR-47	L.E.D. is off	○	○	○	○	○	○	
	BR-47	L.E.D. flashing 16	○	○	○	○	○	○	
	BR-46	L.E.D. flashing 10	○	○	○	○	○	○	
	BR-45	L.E.D. flashing 9	○	○	○	○	○	○	
	BR-44	L.E.D. flashing 5 - 8	○	○	○	○	○	○	
	BR-43	L.E.D. flashing 1 - 4	○	○	○	○	○	○	
Diagnostic Procedure	BR-42	Diagnostic Procedure 6							○
	BR-42	Diagnostic Procedure 5						○	
	BR-41	Diagnostic Procedure 4					○		
	BR-41	Diagnostic Procedure 3				○			
	BR-40	Diagnostic Procedure 2			○				
	BR-39	Diagnostic Procedure 1	○						
Preliminary Check	BR-34	Preliminary Check 4	○	○	○	○	○	○	
	BR-34	Preliminary Check 3	○	○					
	BR-33	Preliminary Check 2		○			○		○
	BR-32	Preliminary Check 1			○	○			○

Preliminary Check 1

CHECK

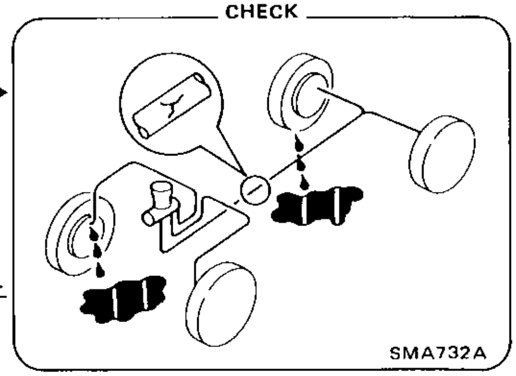


Check brake fluid level in reservoir tank.

N.G. → Fill up brake fluid.

O.K. ↓

CHECK

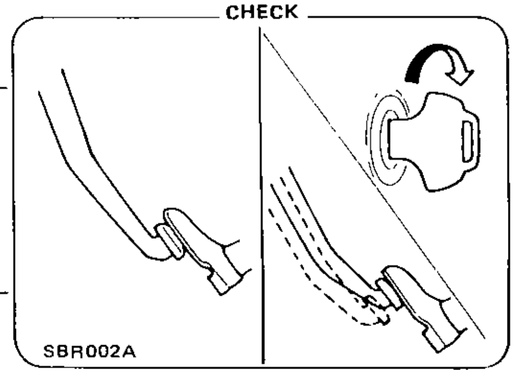


Check brake system.
Refer to CHECK AND ADJUSTMENT.

N.G. → Repair brake system.

O.K. ↓

CHECK

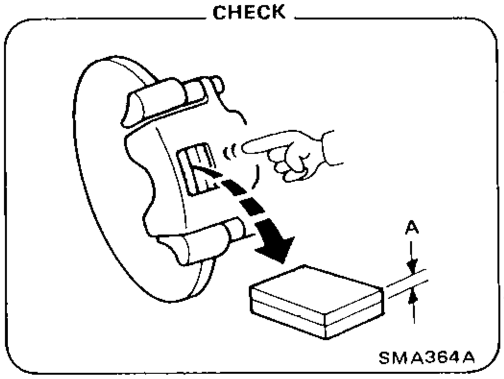


Check brake booster operation and airtightness.
Refer to "Inspection" of BRAKE BOOSTER.

N.G. → Repair or replace booster system.

O.K. ↓

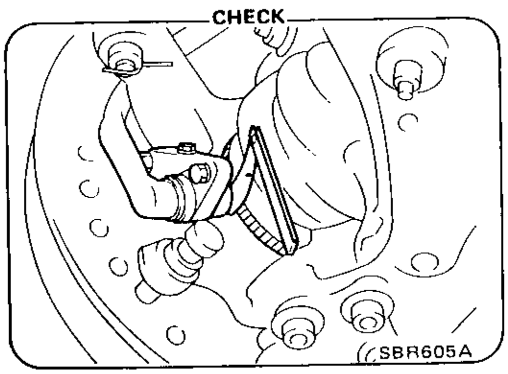
CHECK

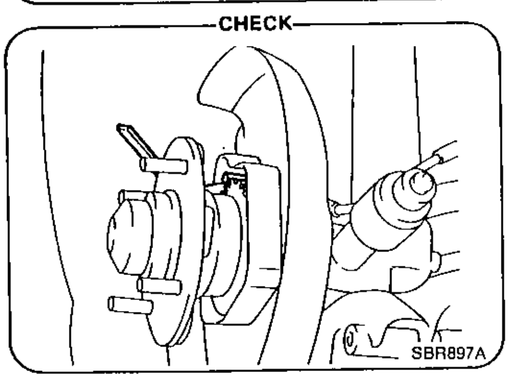


Check brake pads and rotor.
Refer to "Inspection" of FRONT and REAR DISC BRAKE.

N.G. → Replace malfunctioning parts.

Preliminary Check 2





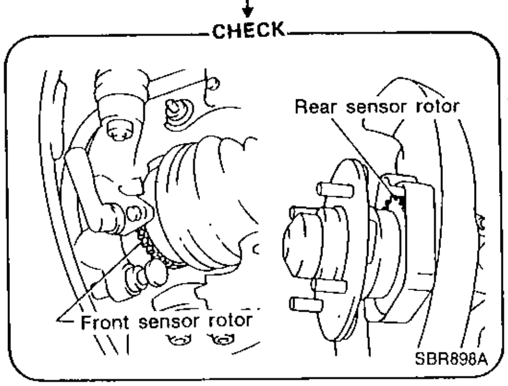
Check sensor clearance.
Clearance:
0.2 - 1.0 mm
(0.008 - 0.039 in)

N.G. → Check sensor for the following items:
- Dust, foreign materials, etc., at fastening portion
- Improper installation
- Breakage

O.K. → (to Check sensor rotor for teeth damage)

N.G. → Repair or replace malfunctioning sensor.

O.K. ↓



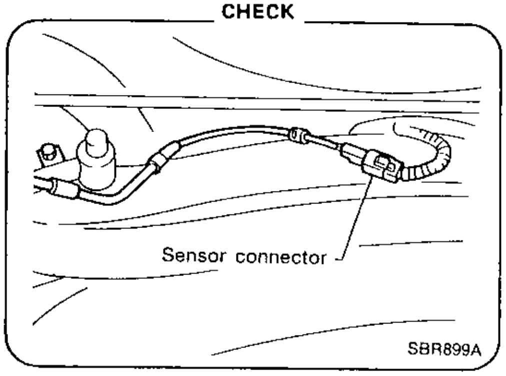
Check sensor rotor for teeth damage.

N.G. → Replace sensor rotor with wheel hub or companion flange as a set..

Preliminary Check 3, 4

Preliminary Check 3

CHECK



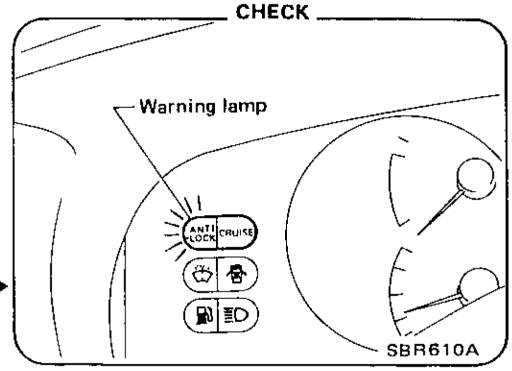
Measure each sensor resistance.
0.8 - 1.2 kΩ

N.G. → Replace.

O.K. → Preliminary Check 4

Preliminary Check 4

CHECK

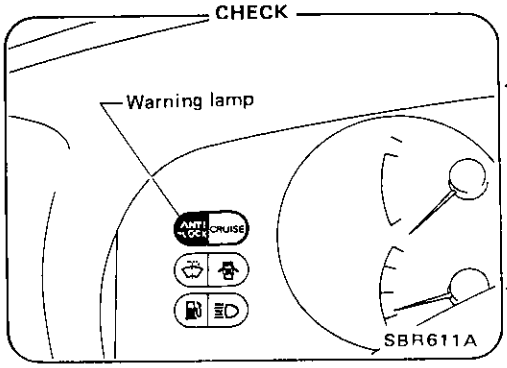


Check warning lamp activation.
When ignition switch is turned on, warning lamp turns on.

N.G. → Check fuse.
Check bulb condition and remedy.

O.K. ↓

CHECK

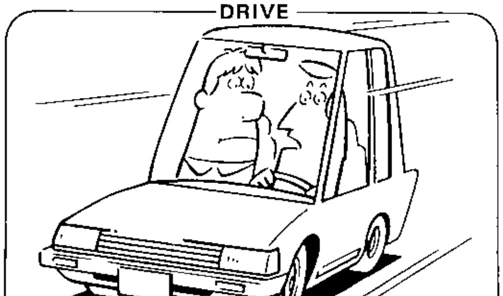


Check warning lamp for deactivation.
When engine starts, warning lamp deactivates.

N.G. → (L.E.D. check below)

O.K. ↓

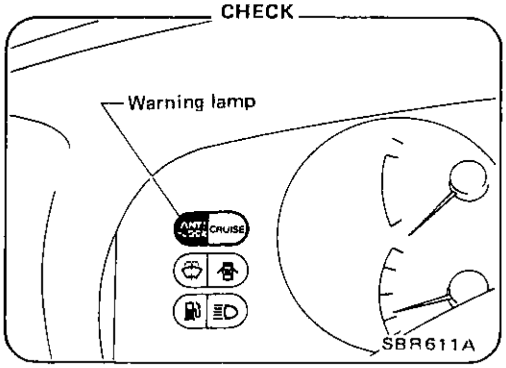
DRIVE



Drive vehicle at 30 km/h (19 MPH) for at least one minute. SBR530A

↓

CHECK

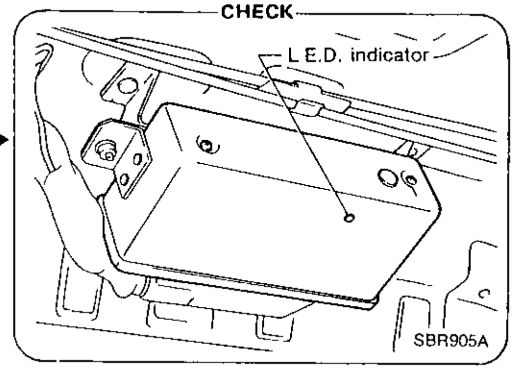


Ensure warning lamp remains off while driving.

N.G. → (L.E.D. check below)

O.K. → If Preliminary Check 2 is not performed and there is abnormal ABS operation, perform Preliminary Check 2.

CHECK



- 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 next page.)

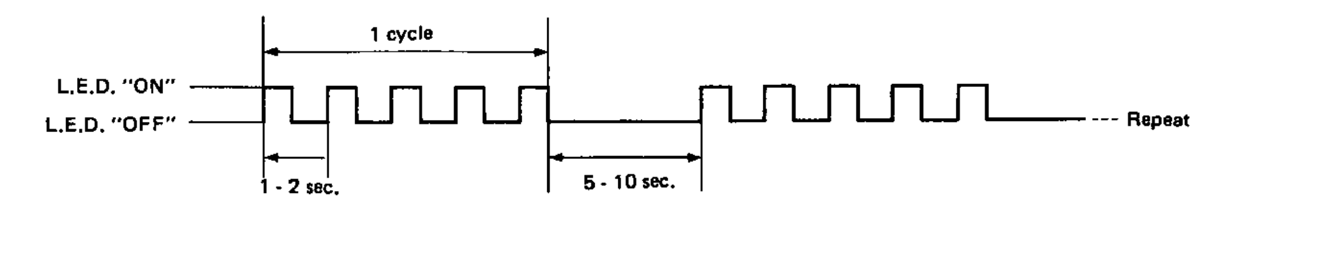
Self-diagnosis

CHECKING THE NUMBER OF L.E.D. FLASHES

When a problem occurs in the ABS, 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.

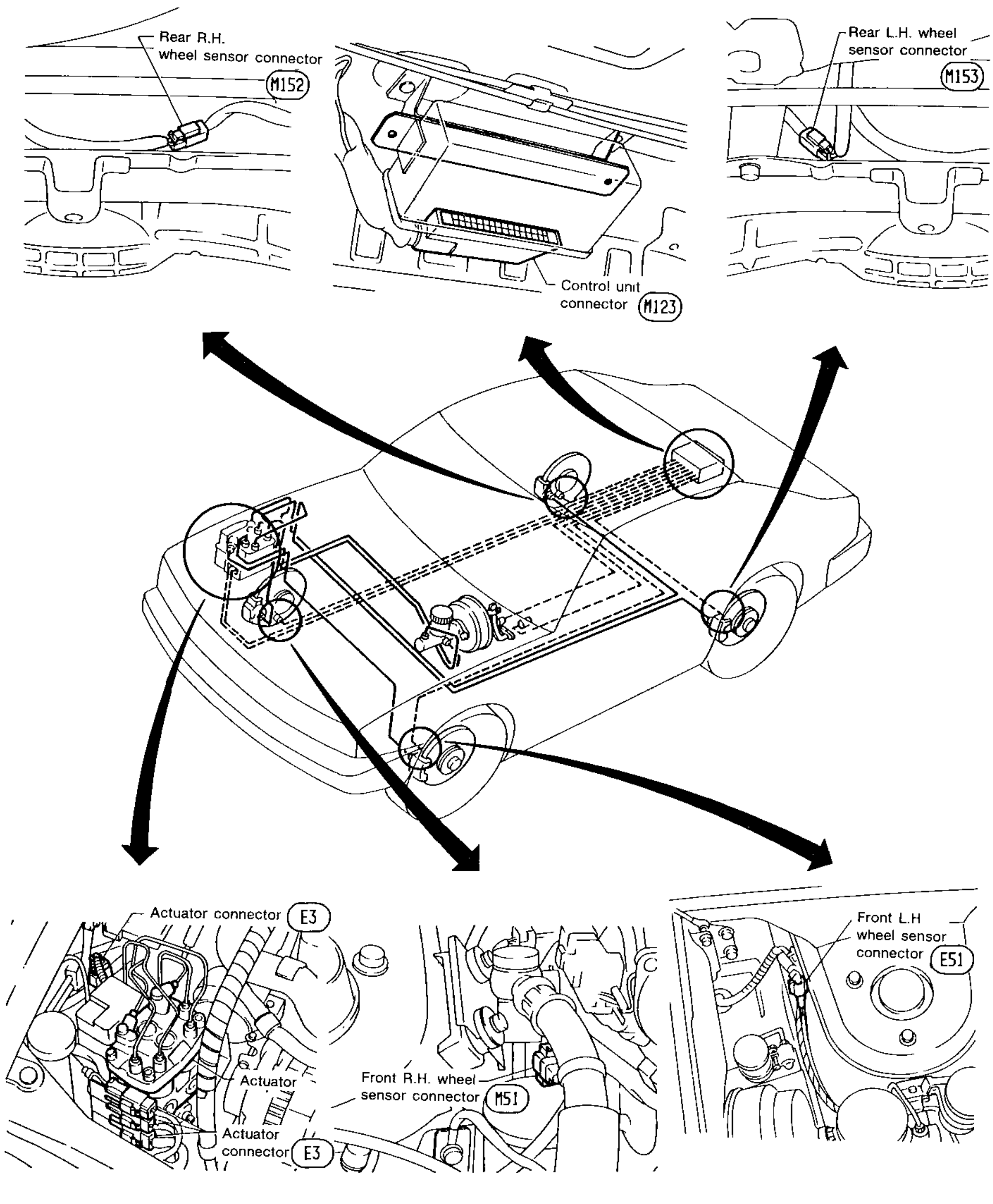
No. of L.E.D. flashes	Malfunctioning part or unit
1	Left front actuator solenoid circuit
2	Right front actuator solenoid circuit
3	Right rear actuator solenoid circuit
4	Left rear actuator solenoid circuit
5	Left front wheel sensor circuit
6	Right front wheel sensor circuit
7	Right rear wheel sensor circuit
8	Left rear wheel sensor circuit
9	Motor and motor relay
10	Solenoid valve relay
16 or continuous	Control unit
Warning activates and L.E.D. "OFF"	Power supply or ground circuit for control unit

Example
Improper operation of left front rotor sensor circuit

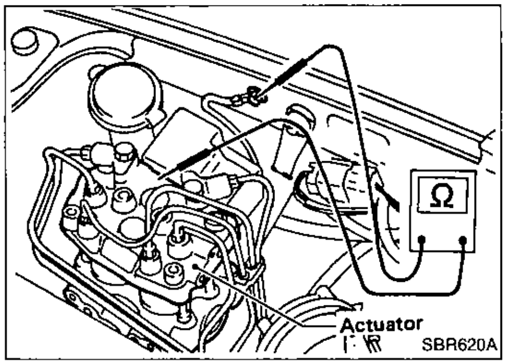


Go to Diagnostic Procedures 7-12, where malfunction portion is concerned.

Component Parts and Harness Connector Location



SBR907A



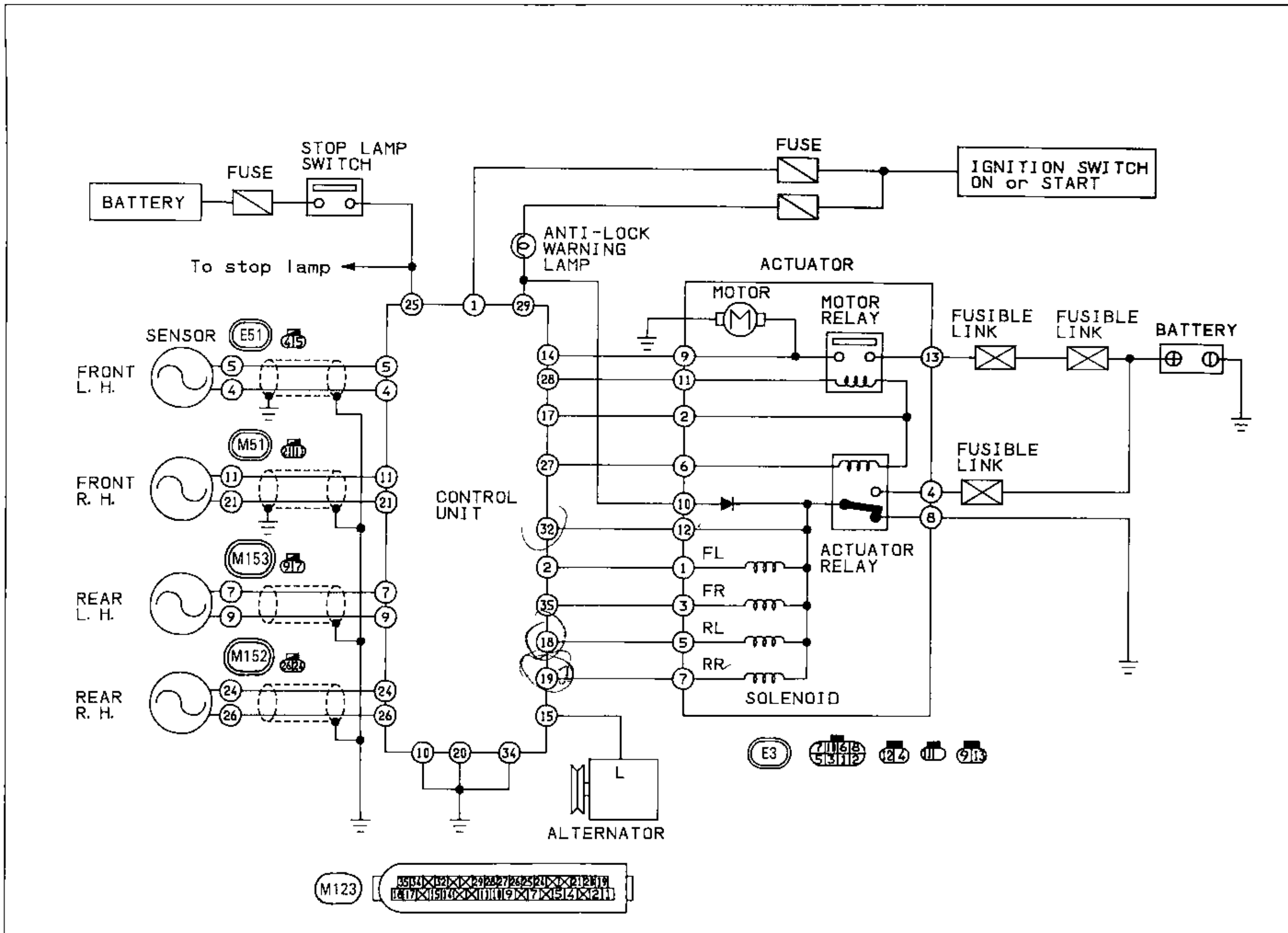
Ground Circuit Check

ACTUATOR MOTOR GROUND

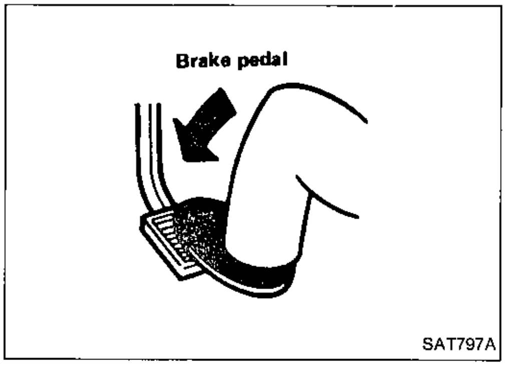
- Check resistance between both terminals.
  Resistance: 0Ω

Circuit Diagram for Quick Pinpoint Check

- The unit side connectors with a double circle "◯" are connected to the harness side connectors shown in the "Component Parts and Harness Connector Location". (See page BR-36.)
- The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle " ○ ".



SBR879A



SAT797A

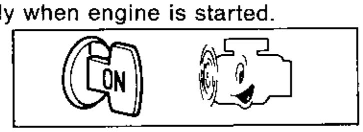
Diagnostic Procedure 1

SYMPTOM: Pedal vibration and noise

Refer to worksheet result.

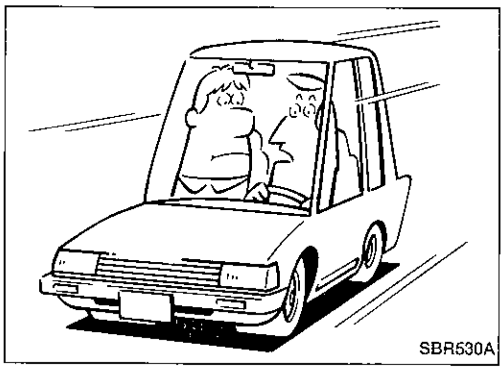
Check whether the symptom appears only when brake is applied suddenly.
- Yes → When brake is normally applied, ABS works and produces pedal vibration or noise.
- No ↓

Check whether the symptom appears only when engine is started.

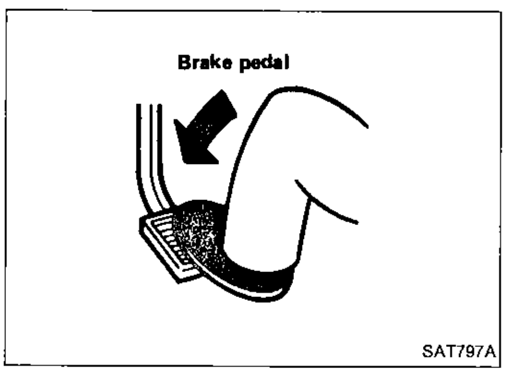


- Yes → Refer to Preliminary Check 4 result.
- No ↓

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 → Ⓐ
  - Yes → ABS may sometimes operate when load is high and voltage is low due to insufficient alternator output.
- No ↓


SBR530A

Check whether the symptom appears while the vehicle is being driven.
- No → Ⓐ
- Yes ↓



SAT797A

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 protrusion
  - No → Ⓑ
  - Yes → Under these conditions individual wheel speed can change suddenly. This may sometimes cause the ABS to operate.
- Yes → Ⓑ

Diagnostic Procedure 1 (Cont'd)

Ⓑ

↓

Check if there are any conditions, among those listed below, when symptom appears.
- Low friction road
- High speed cornering
- Passing protrusion

Yes → For such conditions, if wheel speed is considerably different between front and rear or left and right, ABS will work normally.

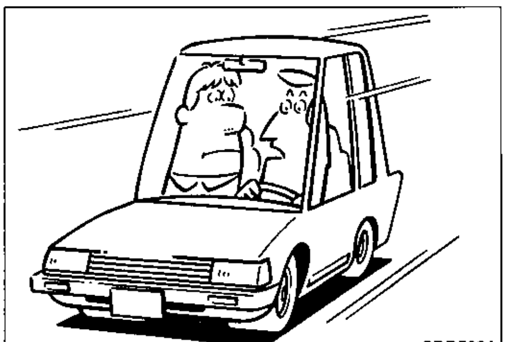
No ↓ (← Ⓐ)

Check whether engine speed is over 5,000 rpm with vehicle stopped.

Yes → Vibration related to sensor may cause ABS operation.

No ↓

Refer to Preliminary Check 4 result.
Go to Self-diagnosis. (See page BR-35.)



SBR530A

Diagnostic Procedure 2

SYMPTOM: Long stopping distance

Refer to worksheet results.

Check if road condition is slippery with snow or gravel.

Yes → Stopping distance may be longer than vehicles which are not equipped with ABS

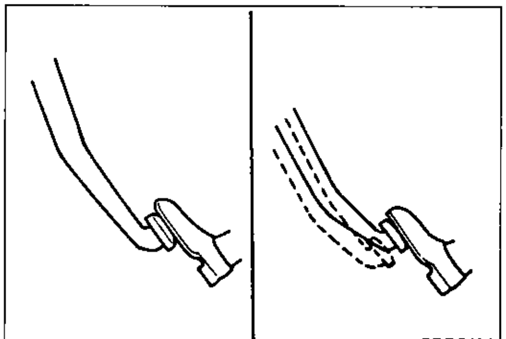
No ↓

Disconnect actuator connector and check whether stopping distance is still long.

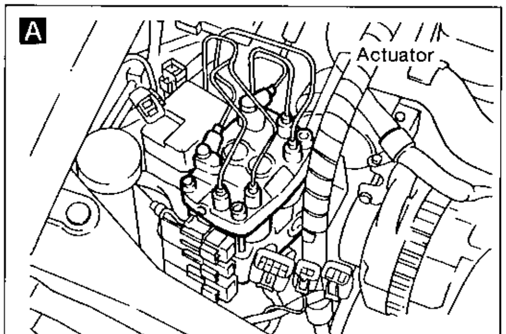
No → Refer to Preliminary Check 4 result.
Go to Self-diagnosis.
(See page BR-35.)

Yes ↓

Perform Preliminary Check 1 and air bleeding.



SBR540A



SBR909A

Diagnostic Procedure 3

SYMPTOM: Abnormal pedal action

Refer to worksheet results.

Check whether brake pedal stroke is abnormally large.
- Yes → Vehicle equipped with ABS may have a tendency for large pedal strokes.
- No ↓

Check that brake pedal force is firm but brake is effective.
- Yes → Normal condition.
- No ↓

A

Disconnect actuator connector and check whether brake is effective.
- Yes → Refer to Preliminary Check 4 result. Go to Self-diagnosis. (See page BR-35.)
- No ↓

Perform Preliminary Check 1.

Diagnostic Procedure 4

SYMPTOM: ABS doesn't work.

Refer to worksheet results.

Check whether warning activates.
- Yes → Refer to Preliminary Check 4 result. Go to Self-diagnosis. (See page BR-35.)
- No ↓

Check whether vehicle speed is under 10 km/h (6 MPH).
- Yes → ABS doesn't work in this condition.
- No ↓

Refer to Preliminary Check 3 result.
- O.K. but ABS still doesn't work. ↓

Check actuator by referring to Electrical Components Inspection — ACTUATOR.
(See page BR-48.)

Diagnostic Procedure 5

SYMPTOM: ABS works but warning activates.

Check whether alternator produces proper output.
Refer to EL section.

→ No: Remedy.

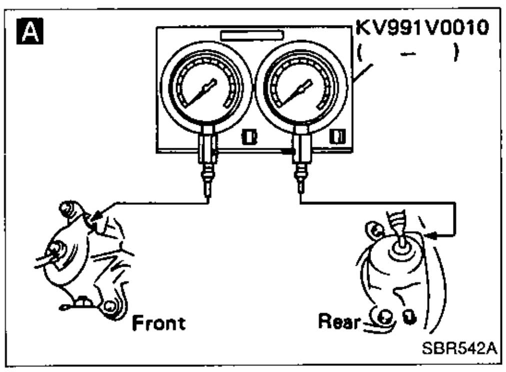
↓ Yes

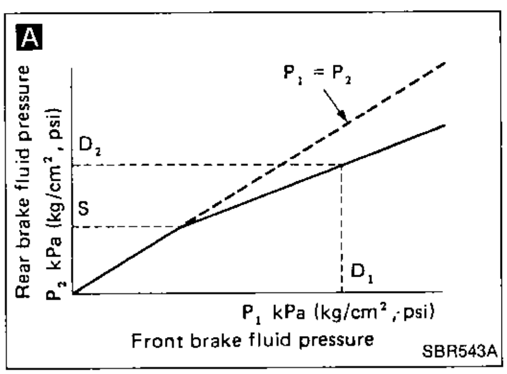
Check whether battery has enough voltage.
Refer to EL section.

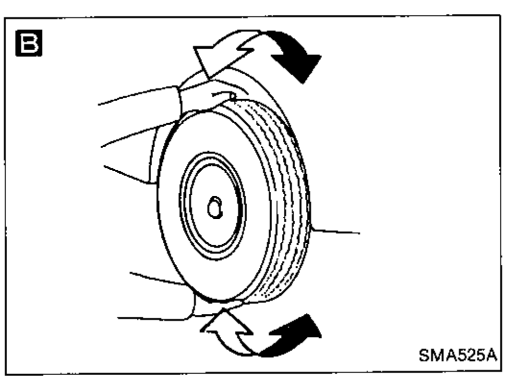
→ No: Remedy.

↓ Yes

Refer to Preliminary Check 4 result.
Go to Self-diagnosis. (See page BR-35.)







Diagnostic Procedure 6

SYMPTOM: ABS works frequently.

A

CHECK BRAKE FLUID PRESSURE.
Check whether brake fluid pressure distribution is normal.
D_2/D_1: 5,100 - 6,473 kPa (52 - 66 kg/cm², 739 - 939 psi)/9,807 kPa (100 kg/cm², 1,422 psi)

→ No: Perform Preliminary Check 1.

↓ Yes

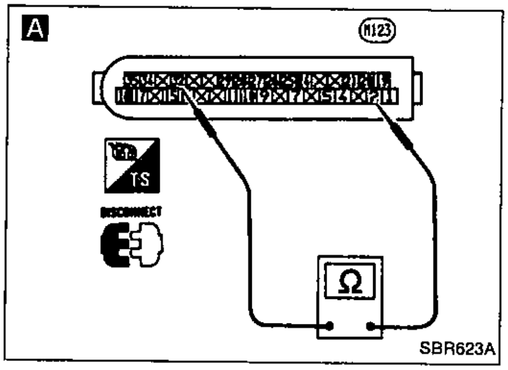
B

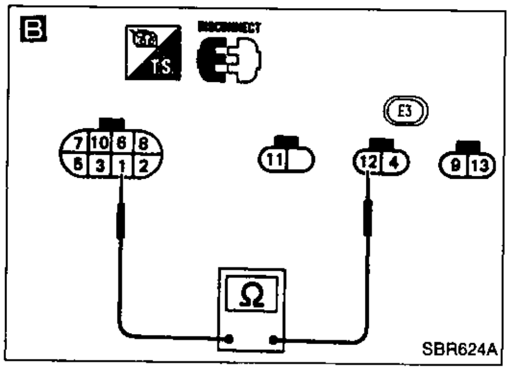
Check whether front axles have excessive looseness.

→ Yes: Remedy.

↓ No

Perform Preliminary Check 2 and Ground Circuit Check.





Diagnostic Procedure 7

ACTUATOR SOLENOID (L.E.D. flashing number 1 - 4)

INSPECTION START
Remove battery negative terminal connector.

↓

A

CHECK SOLENOID VALVE RESISTANCE.
Check resistance between control unit connector (vehicle side) terminals.
Flashing number 1:
Terminals 32 and 2
Flashing number 2:
Terminals 32 and 35
Flashing number 3:
Terminals 32 and 19 ⬅
Flashing number 4:
Terminals 32 and 18 ⬅
Resistance: 0.7 - 1.6Ω

O.K. → Replace control unit.

↓ N.G.

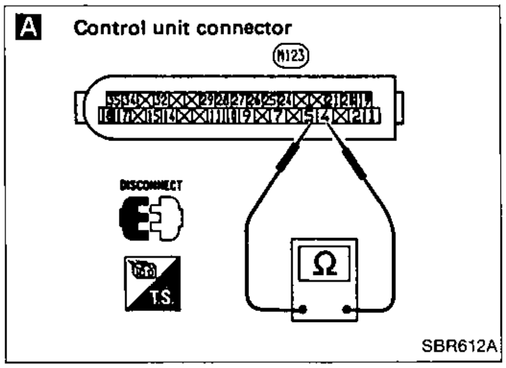
B

Check resistance between actuator connector (actuator side) terminals.
Flashing number 1:
Terminals 12 and 1
Flashing number 2:
Terminals 12 and 3
Flashing number 3:
Terminals 12 and 7
Flashing number 4:
Terminals 12 and 5
Resistance: 0.7 - 1.6Ω

O.K. → Repair harness between actuator connector and control unit connector.

↓ N.G.

Replace actuator.



Diagnostic Procedure 8

WHEEL SPEED SENSOR (L.E.D. flashing number 5 - 8)

INSPECTION START
Remove battery negative terminal connector.

↓

A

CHECK SPEED SENSOR RESISTANCE.
Check resistance between control unit connector (vehicle side) terminals.
Flashing number 5 (Fr. L.H.):
Terminals ④ and ⑤
Flashing number 6 (Fr. R.H.):
Terminals ⑪ and ㉑
Flashing number 7 (Rr. R.H.):
Terminals ㉔ and ㉖
Flashing number 8 (Rr. L.H.):
Terminals ⑦ and ⑨
Resistance: 0.8 - 1.2kΩ

O.K. → Replace control unit.

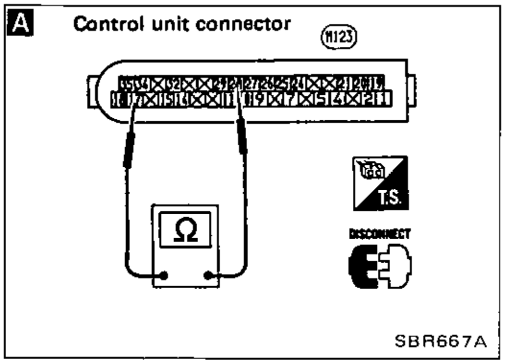
N.G. ↓

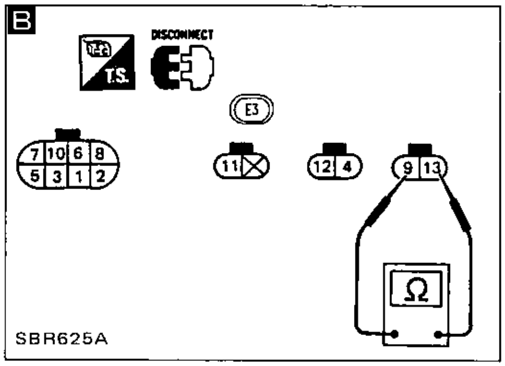
Refer to Preliminary Check 3 result.
Check whether sensor has 0.8 to 1.2 kΩ resistance.

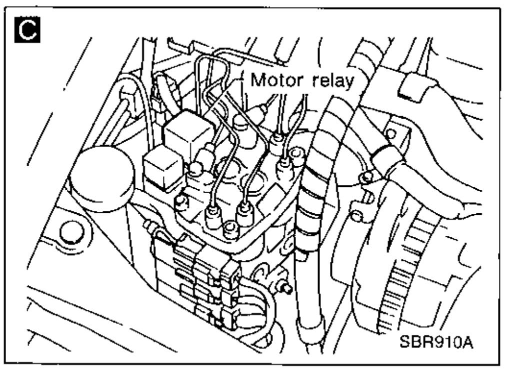
N.G. → Replace sensor.

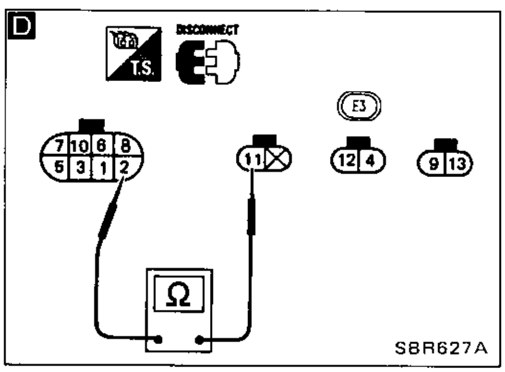
O.K. ↓

Repair harness between sensor connector and control unit connector.









Diagnostic Procedure 9

ACTUATOR MOTOR RELAY (L.E.D. flashing number 9)

INSPECTION START
Remove battery negative terminal connector.

↓

A CHECK MOTOR RELAY SOLENOID RESISTANCE.
Check resistance between control unit connector (vehicle side) terminals ⑰ and ㉘.
Resistance: 45 - 55Ω

- N.G. → **D** Check resistance between actuator connector (actuator side) terminals ② and ⑪.
  Resistance: 45 - 55Ω
  - O.K. → Repair harness between actuator and control unit.
  - N.G. → **C** Replace motor relay.
- O.K. ↓

B CHECK MOTOR RELAY DEACTIVATION.
Check continuity between actuator connector (actuator side) terminals ⑬ and ⑨.

- Yes → **C** Replace motor relay.
- No ↓

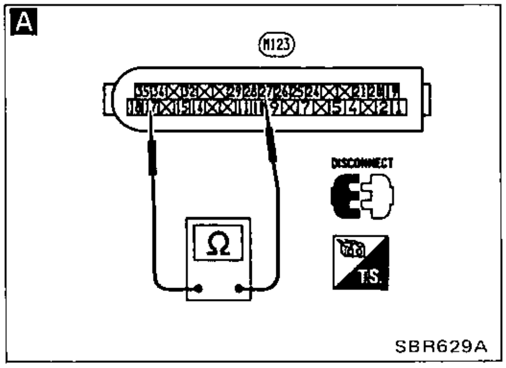
Check if motor fusible link is blown.

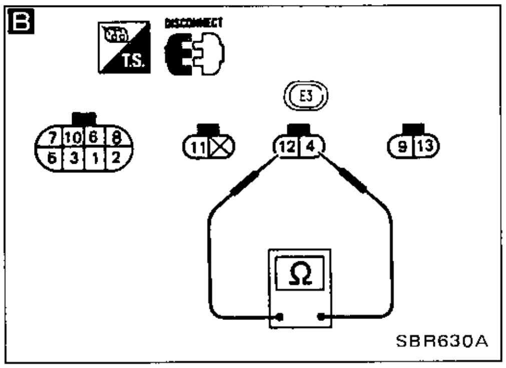
- Yes → Replace fusible link.
- No ↓

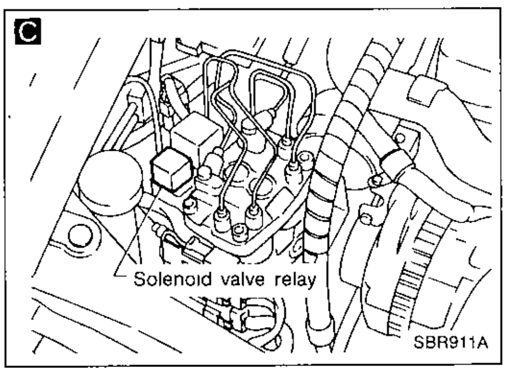
Perform Electrical Components Inspection — ACTUATOR.
(See page BR-48.)

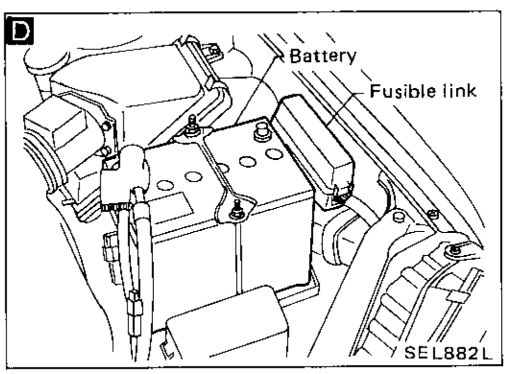
- N.G. → Replace actuator.
- O.K. ↓

Replace control unit.









Diagnostic Procedure 10

ACTUATOR SOLENOID VALVE RELAY (L.E.D. flashing number 10)

INSPECTION START
Remove battery negative terminal connector.

↓

A CHECK SOLENOID VALVE RELAY RESISTANCE.
Check resistance between control unit connector (vehicle side) terminals ㉗ and ⑰.
Resistance: 80 - 90Ω

- N.G. → Check resistance between actuator connector (actuator side) terminals ⑥ and ②.
  Resistance: 80 - 90Ω
  - O.K. → Repair harness between actuator and control unit.
  - N.G. → **C** Replace solenoid valve relay.
- O.K. ↓

B CHECK SOLENOID VALVE RELAY MOVEMENT.
Disconnect actuator connector. Check continuity between actuator connector (actuator side) terminals ④ and ⑫.

- Yes → **C** Replace solenoid valve relay.
- No ↓

D Check if solenoid valve relay 30A fusible link is melted ("ANTI-SKID" written on cover).

- Yes → Repair harness between terminal ④ and fusible link box. Then replace 30A fusible link.
- No ↓

Perform Electrical Components Inspection — ACTUATOR.
(See page BR-48.)

- N.G. → Replace actuator.
- O.K. ↓

Replace control unit.

Diagnostic Procedure 11

CONTROL UNIT (L.E.D. flashing number 16 or continuous)

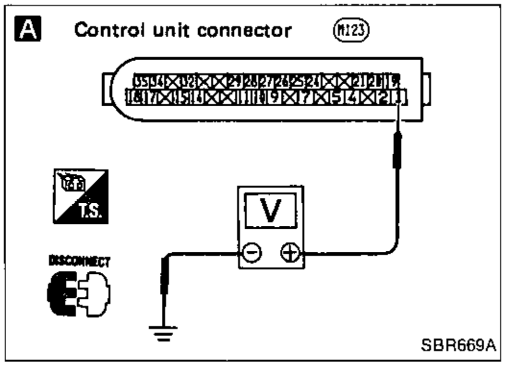
INSPECTION START

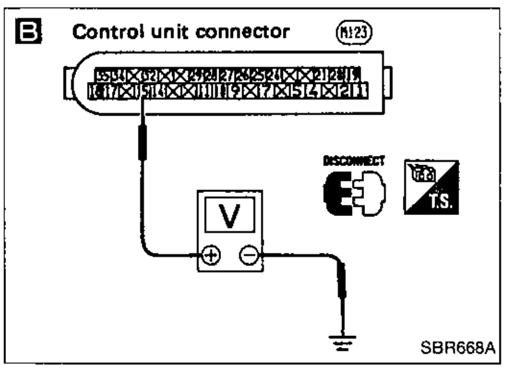
↓

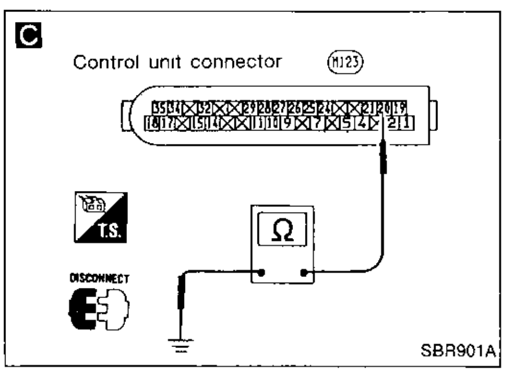
Control unit malfunction.

↓

Replace control unit.







Diagnostic Procedure 12

CONTROL UNIT OR POWER SUPPLY AND GROUND CIRCUIT (Warning activates but L.E.D. comes off.)

INSPECTION START

↓

A

CHECK CONTROL UNIT POWER SUPPLY.
Disconnect control unit connector.
Check voltage between control unit connector (vehicle side) terminal ① and body ground with ignition switch turned on.
Voltage: 10V or more

- N.G. → Check if control unit 10A fuse is blown.
  - Yes → Replace fuse.
  - No → Repair power supply harness.

O.K. ↓

B

CHECK ALTERNATOR L TERMINAL VOLTAGE.
Check voltage between control unit connector (vehicle side) terminal ⑮ and body ground after engine starting.
Voltage: 6V or more

- N.G. → Check if other warning activate.
  - Yes → Repair harness between alternator and control unit.
  - No → Malfunctioning alternator.

O.K. ↓

C

Check continuity between control unit connector (vehicle side) terminal ⑳ and body ground with ignition switch "OFF".

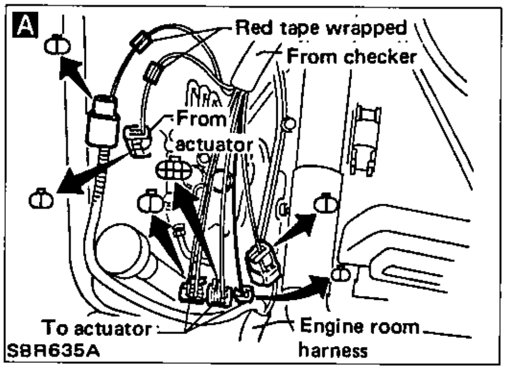
- N.G. → Repair ground harness.

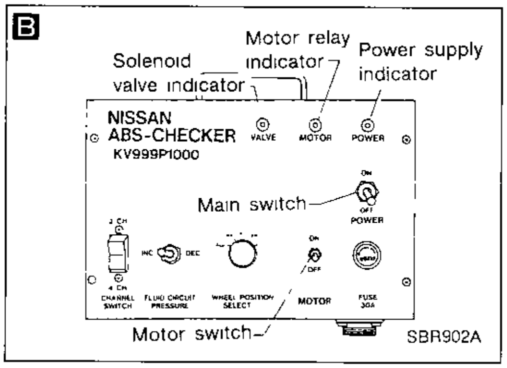
O.K. ↓

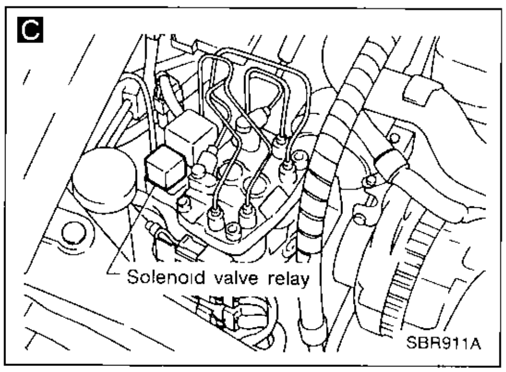
Replace control unit

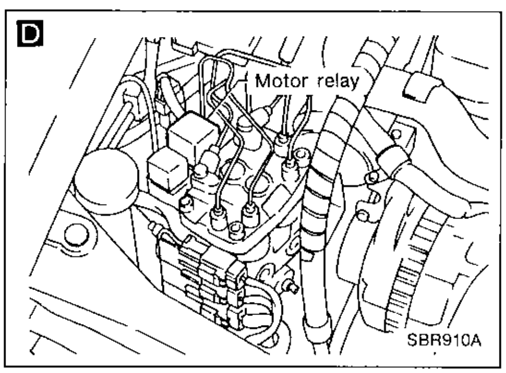
Electrical Components Inspection

ACTUATOR (Not self-diagnostic item)









INSPECTION START

↓

A

Connect ABS checker to actuator connector and vehicle harness with battery terminal connected and all checker switches turned off.
Use harness for 4 channel.
Set channel select switch to 4 channel.

↓

B

Turn checker main switch on.
Check power supply indicator for coming on.

- No → Replace battery with fully charged new one, if checker connection is correct.
- Yes ↓

B

Check checker valve relay indicator for coming on.

- No → C Replace solenoid valve relay, if checker connection is correct.
- Yes ↓

B step Ⓐ

Select one valve — FL, FR, RL or RR.
(valves corresponding to each wheel position.)
Select brake circuit pressure decreasing position by switch then turn motor switch on.
Select pressure increasing position.

↓

B

Check motor relay indicator for coming on while motor switch is turned on.

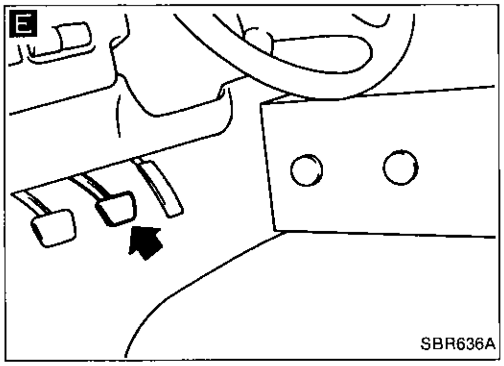
- No → D Replace motor relay, if checker connection is correct.
- Yes ↓

Check motor for operational sound beside the actuator in a quiet place

- No → Replace actuator as assembly, if Diagnostic Procedures 7 - 12 are already performed and checker connection is correct.
- Yes ↓

Ⓑ

Electrical Components Inspection (Cont'd)



Ⓑ

E

Bring checker in the vehicle and depress the brake pedal.

↓

Check brake pedal for vibration when motor switch is turned on or while operating solenoid valve selecting switch with motor switch turned on.
N.G.: No vibration
O.K.: Vibration

- N.G. → Replace actuator as assembly.
- O.K. ↓

Check brake pedal for depression when select pressure increases.

- N.G. → Replace actuator as assembly.
- O.K. ↓

Have all wheel positions been checked?

- No → Repeat from step Ⓐ .
- Yes ↓

Actuator works normally.

CAUTION:
Do not set checker at pressure decrease position for more than 5 seconds at a time. Actuator solenoid valve may be damaged.

General Specifications

Item \ Model	Without ABS	With ABS
Front brake		
Brake model	CL25VA disc brake	
Cylinder bore diameter mm (in)	57.2 (2.252)	
Pad mm (in) Length x width x thickness	125.6 x 45.3 x 11.0 (4.94 x 1.783 x 0.433)	
Rotor outer diameter x thickness mm (in)	257 x 22 (10.12 x 0.87)	
Rear brake		
Brake model	LT23B drum brake	CL9H disc brake
Cylinder bore diameter mm (in)	20.64 (13/16)	33.96 (1.3370)
Lining or pad mm (in) Length x width x thickness	219.4 x 40.0 x 4.5 (8.64 x 1.575 x 0.177)	75 x 40.0 x 9 (2.95 x 1.575 x 0.35)
Drum inner diameter or rotor outer diameter x thickness mm (in)	228.6 (9)	258 x 10 (10.16 x 0.39)

Item \ Model	Without ABS	With ABS
Master cylinder		
Cylinder bore diameter mm (in)	23.81 (15/16)	25.40 (1)
Control valve		
Valve model	Dual proportioning valve (within master cylinder)	Dual proportioning valve
Split point kPa (kg/cm^2, psi) x reducing ratio	2,452 (25, 356) x 0.2	2,452 (25, 356) x 0.4
Brake booster		
Booster model	M195T	M215T
Diaphragm diameter mm (in)	Primary: 205 (8.07) Secondary: 180 (7.09)	Primary: 230 (9.06) Secondary: 205 (8.07)
Recommended brake fluid	DOT 3	

Inspection and Adjustment

DISC BRAKE

Brake model	CL25VA	CL9H
Pad wear limit mm (in)		
Minimum thickness	2.0 (0.079)	
Rotor repair limit mm (in)		
Minimum thickness	20.0 (0.787)	9.0 (0.354)
Maximum runout	0.07 (0.0028)	

DRUM BRAKE

Brake model	LT23B
Lining wear limit mm (in)	
Minimum thickness	1.5 (0.059)
Drum repair limit mm (in)	
Maximum inner diameter	230 (9.06)
Out-of-roundness	0.03 (0.0012)
Radial runout	0.05 (0.0020)

BRAKE PEDAL

Free height "H" mm (in)	
M/T	159 - 169 (6.26 - 6.65)
A/T	169 - 179 (6.65 - 7.05)
Depressed height "D" mm (in) [under force of 490 N (50 kg, 110 lb) with engine running]	90 (3.54)
Clearance between switches and pedal stopper bracket "C" mm (in)	0.3 - 1.0 (0.012 - 0.039)
Pedal free play "A" mm (in)	1 - 3 (0.04 - 0.12)

PARKING BRAKE

Number of notches [under force of 196 N (20 kg, 44 lb)]	9 - 11
Number of notches when warning lamp switch comes on	1

STEERING SYSTEM

SECTION ST

CONTENTS

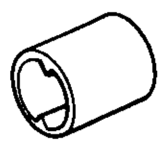
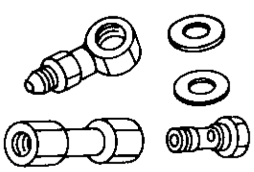
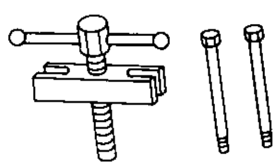
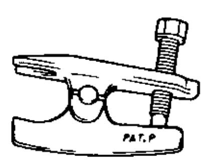
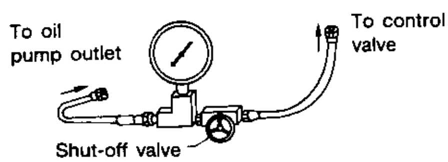
PRECAUTIONS AND PREPARATION .... ST- 2
ON-VEHICLE SERVICE .... ST- 4
STEERING WHEEL AND STEERING COLUMN .... ST- 8
POWER STEERING GEAR AND LINKAGE ST-12
POWER STEERING OIL PUMP ST-24
SERVICE DATA AND SPECIFICATIONS (S.D.S.) ST-27

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 on a part 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**

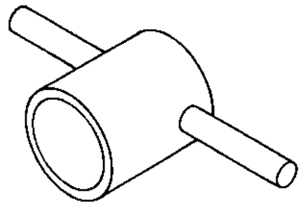
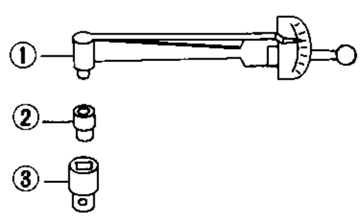
Preparation

SPECIAL SERVICE TOOLS

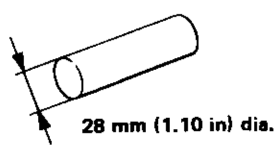
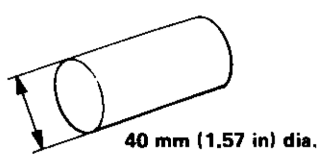
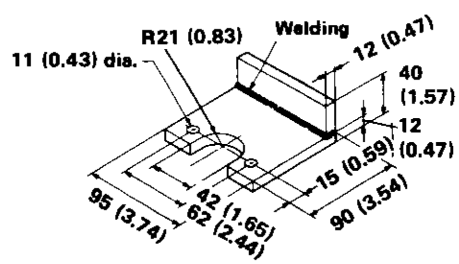
Tool number (Kent-Moore No.) Tool name	Description	
KV48100700 (J26364) Torque adapter		Measuring pinion rotating torque
KV48102500 (—) Pressure gauge adapter		Measuring oil pressure
St27180001 (J25726-A) Steering wheel puller		Removing and installing steering wheel
HT72520000 (J25730-A) Ball joint remover		Removing ball joint
St27091000 (J26357) Pressure gauge		Measuring oil pressure

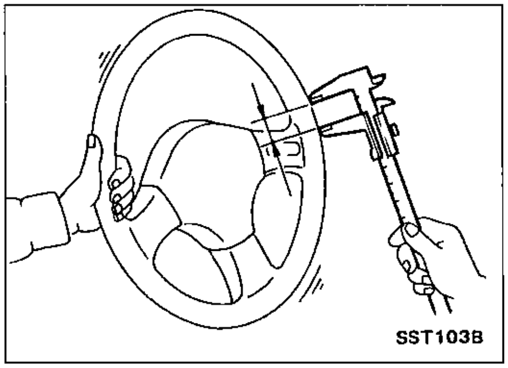
Preparation (Cont'd)

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.) Tool name	Description
KV48104400 (—) Rack seal ring reformer	 Reforming teflon ring
ST3127S000 (See J25765-A) ① GG91030000 (J25765-A) Torque wrench ② HT62940000 (—) Socket adapter ③ HT62900000 (—) Socket adapter	 Measuring turning torque

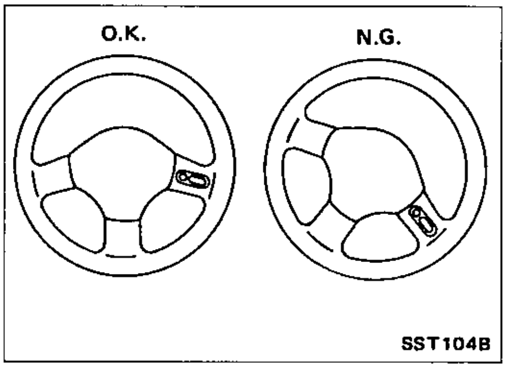
COMMERCIAL SERVICE TOOLS

Tool name	Description
Rear oil seal drift	 Installing rear oil seal
Pinion oil seal drift	 Installing pinion oil seal
Oil pump attachment	 SST481A Unit: mm (in) Disassembling and assembling oil pump



Checking Steering Wheel Play

1. With wheels in a straight-ahead position, check steering wheel play.
   Steering wheel play:
   35 mm (1.38 in) or less
2. If it is not within specification, check steering gear assembly when front suspension and axle, steering gear assembly and steering column are mounted correctly.



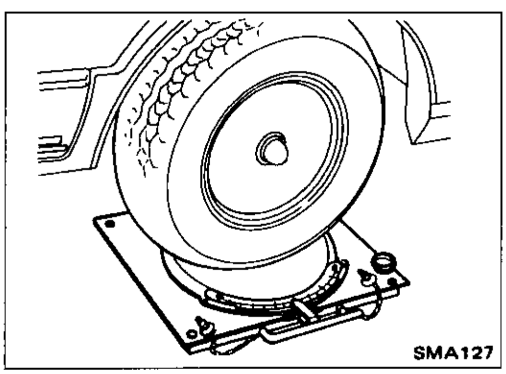
Checking Neutral Position on Steering Wheel

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.

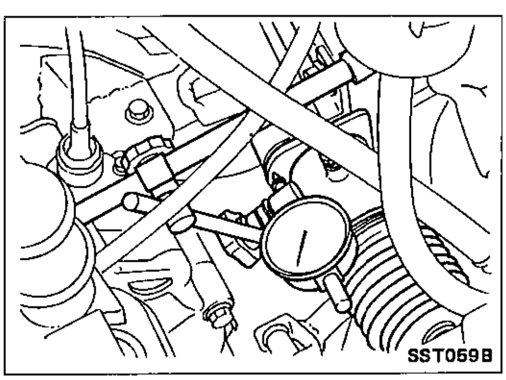
Checking

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.

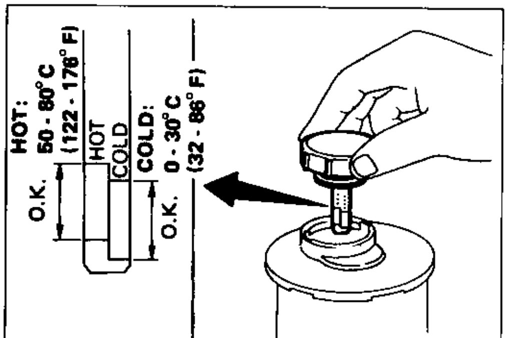


Checking Gear Housing Movement

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$2 mm ($\pm$0.08 in) or less
2. If movement exceeds the limit, replace mount insulator after confirming proper installation of gear housing clamps.

Checking and Adjusting Drive Belts

Refer to section MA for Drive Belt Inspection.



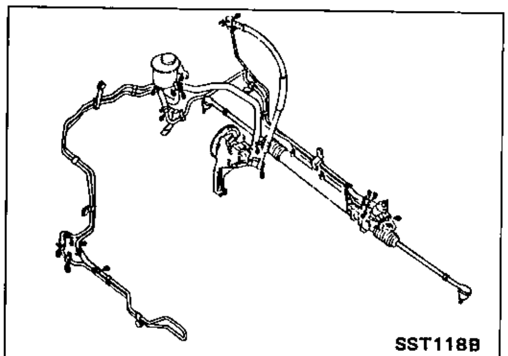
SST280B

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.**


SST118B

Checking Fluid Leakage

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

1. Run engine between idle speed and 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

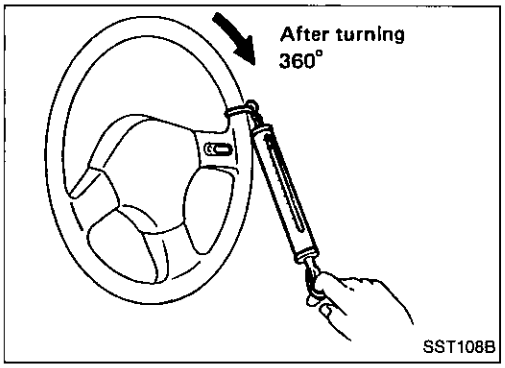
1. Raise front end of vehicle until wheels are clear of the ground.
2. Add fluid into oil tank to specified level. Meanwhile quickly turn steering wheel fully to right and left and lightly touch steering stoppers.
   Repeat steering wheel operation until fluid level no longer decreases.
3. Start engine.
   Repeat step 2 above.

Bleeding Hydraulic System (Cont'd)

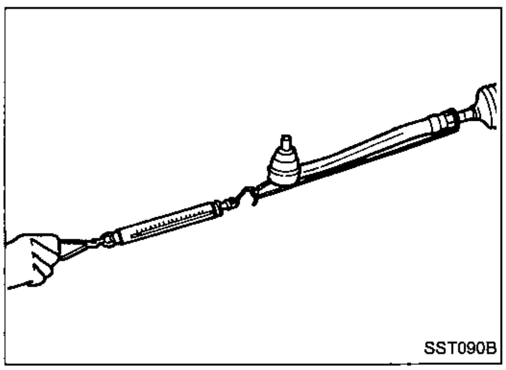
- Incomplete air bleeding will cause the following to occur. When this happens, bleed air again.

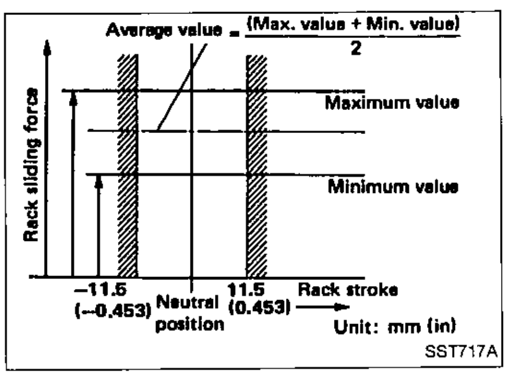
a. Generation of air bubbles in reservoir tank
b. Generation of clicking noise in oil pump
c. Excessive buzzing in oil pump

While the vehicle is stationary or while moving 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.



SST108B


SST090B



SST717A

Checking Steering Wheel Turning Force

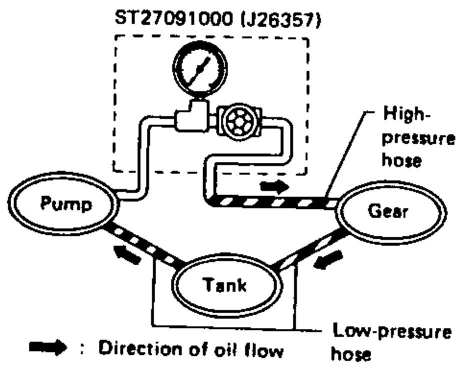
1. Park vehicle on a level, dry surface and set parking brake.
2. Start engine.
3. Bring power steering fluid up to adequate operating temperature. [Make sure temperature of fluid is approximately 60 to 80°C (140 to 176°F).]

Tires need to be inflated to normal pressure.

4. Check steering wheel turning force when steering wheel has been turned 360° from 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:
   284 N (29 kg, 64 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.



SST834

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:
7,649 - 8,238 kPa (78 - 84 kg/cm^2, 1,109 - 1,194 psi)

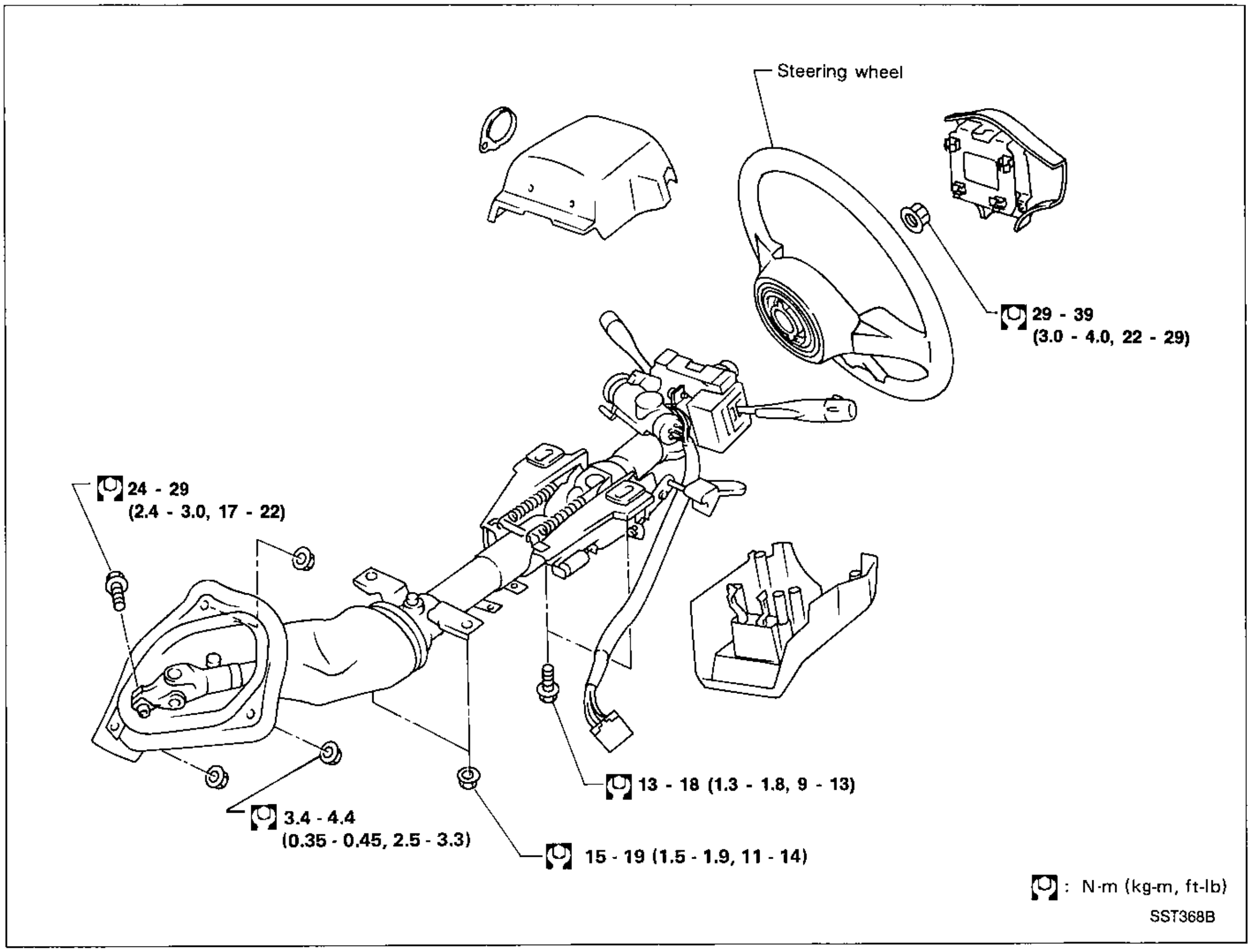
4. If oil pressure is below the standard pressure, slowly close shut-off valve and check pressure.

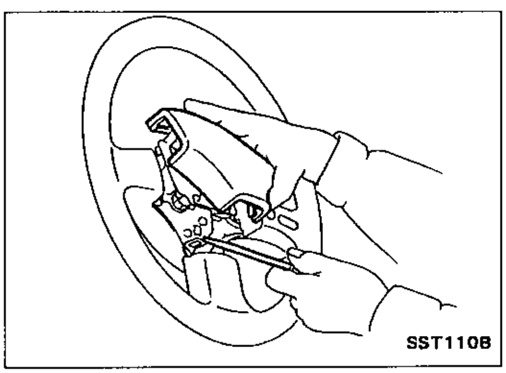
- When pressure reaches standard pressure, gear is damaged.
- When pressure remains below standard pressure, pump is damaged.

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.

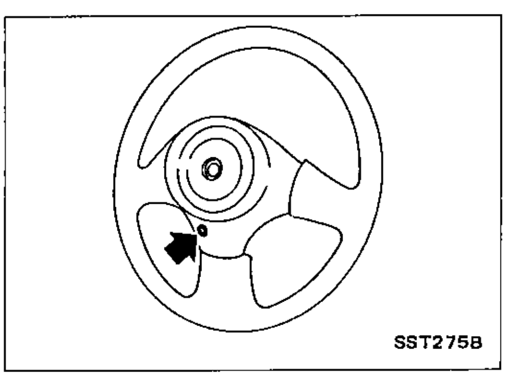




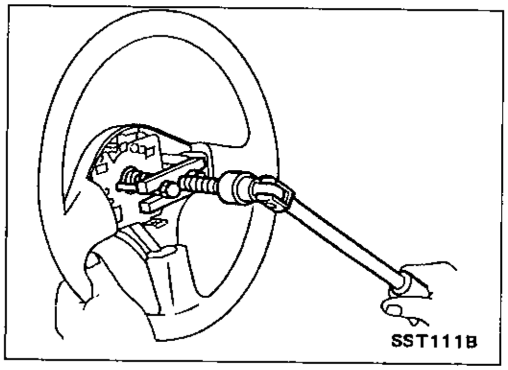
Removal

STEERING WHEEL

1. Pull out horn pad.



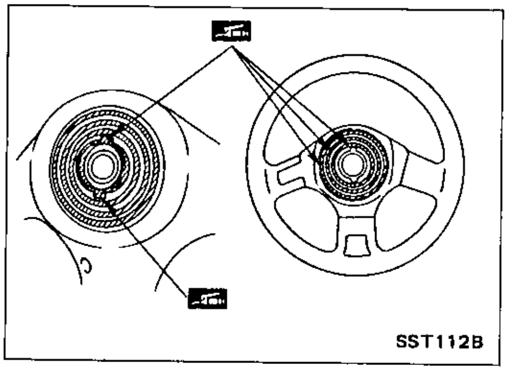
- If it is hard to pull out horn pad, temporarily loosen fixing screw of horn pad retaining spring.



SST111B

Removal (Cont'd)

2. Remove steering wheel with Tool.

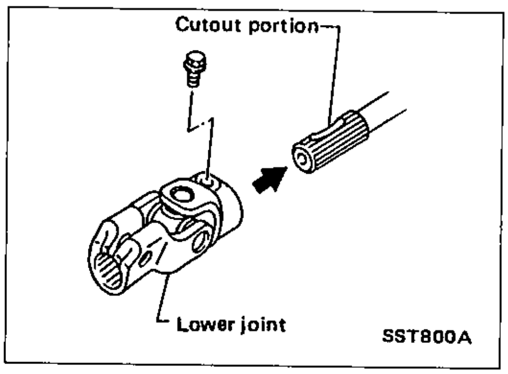


SST112B

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.



SST800A

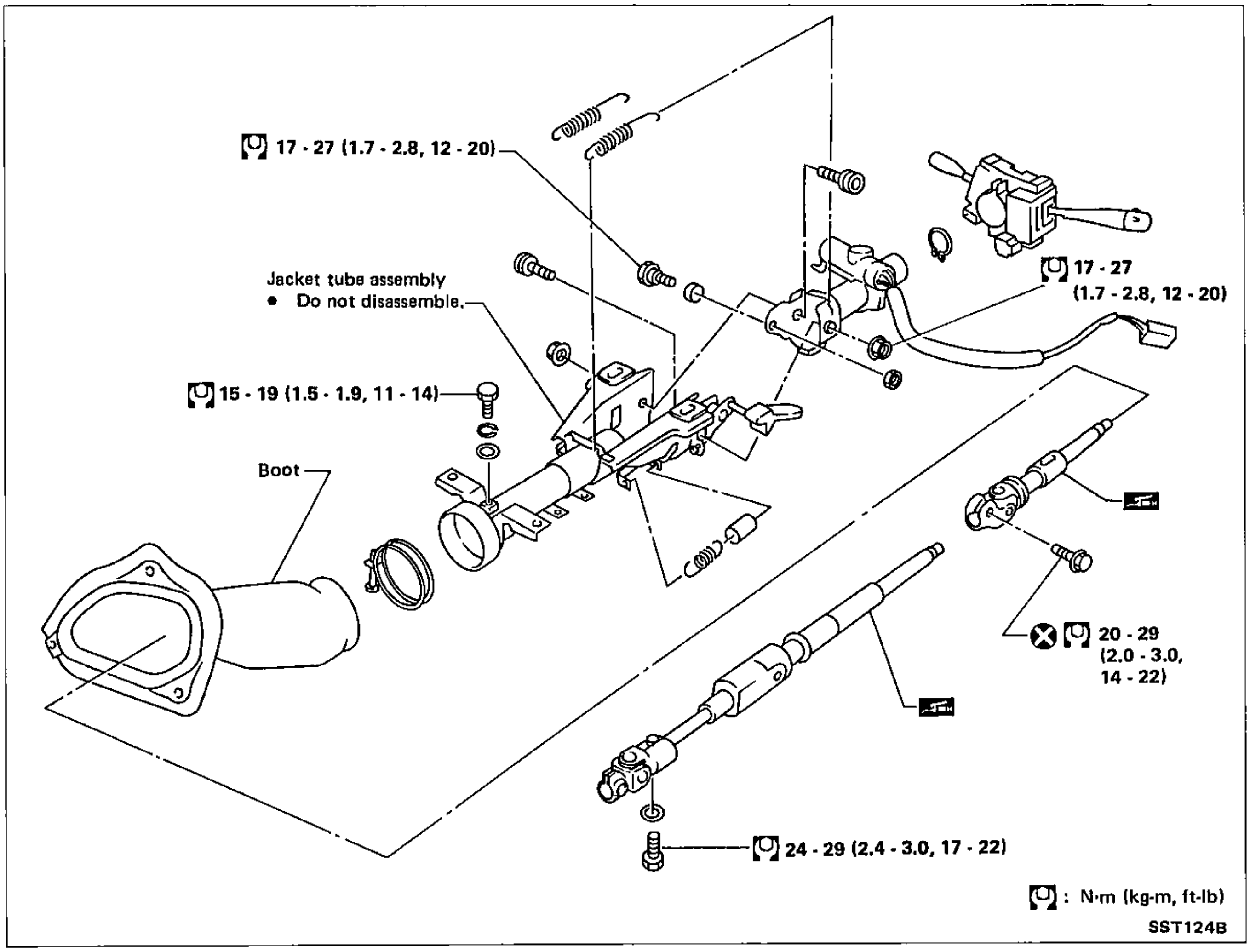
STEERING COLUMN

- 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.

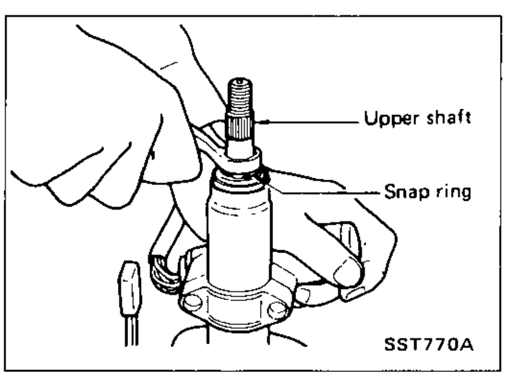
CAUTION:

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

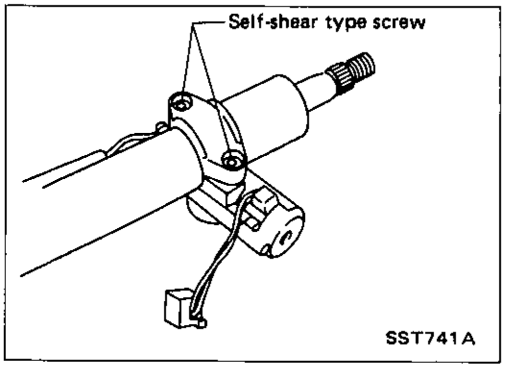


- When disassembling and assembling, unlock steering lock with key.
- Ensure that rounded surface of snap ring faces toward bearing when snap ring is installed.



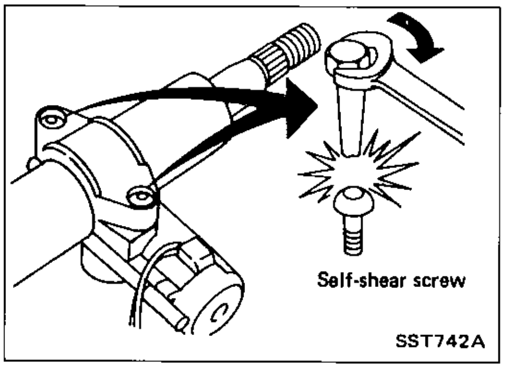
- Install snap ring on upper shaft with a suitable tool.

Disassembly and Assembly (Cont'd)

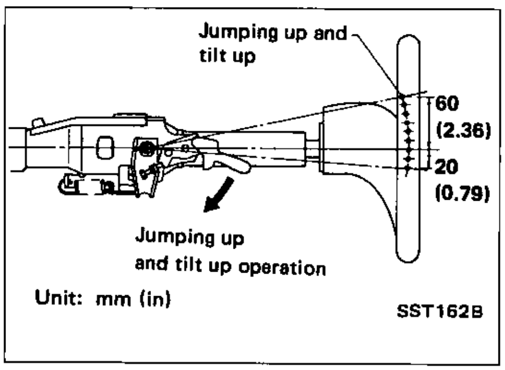


- Steering lock

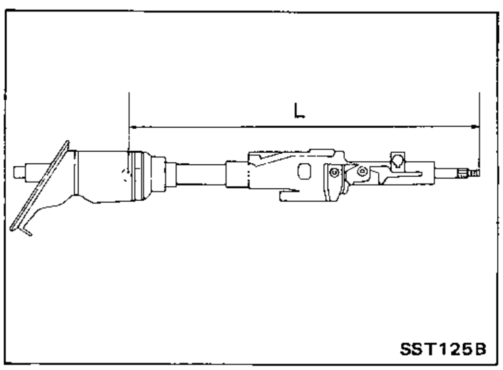
a. Break self-shear type screws with a drill or other appropriate tool.



b. Install self-shear type screws and then cut off self-shear type screw heads.



- After installing steering column, check tilt mechanism operation.



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.

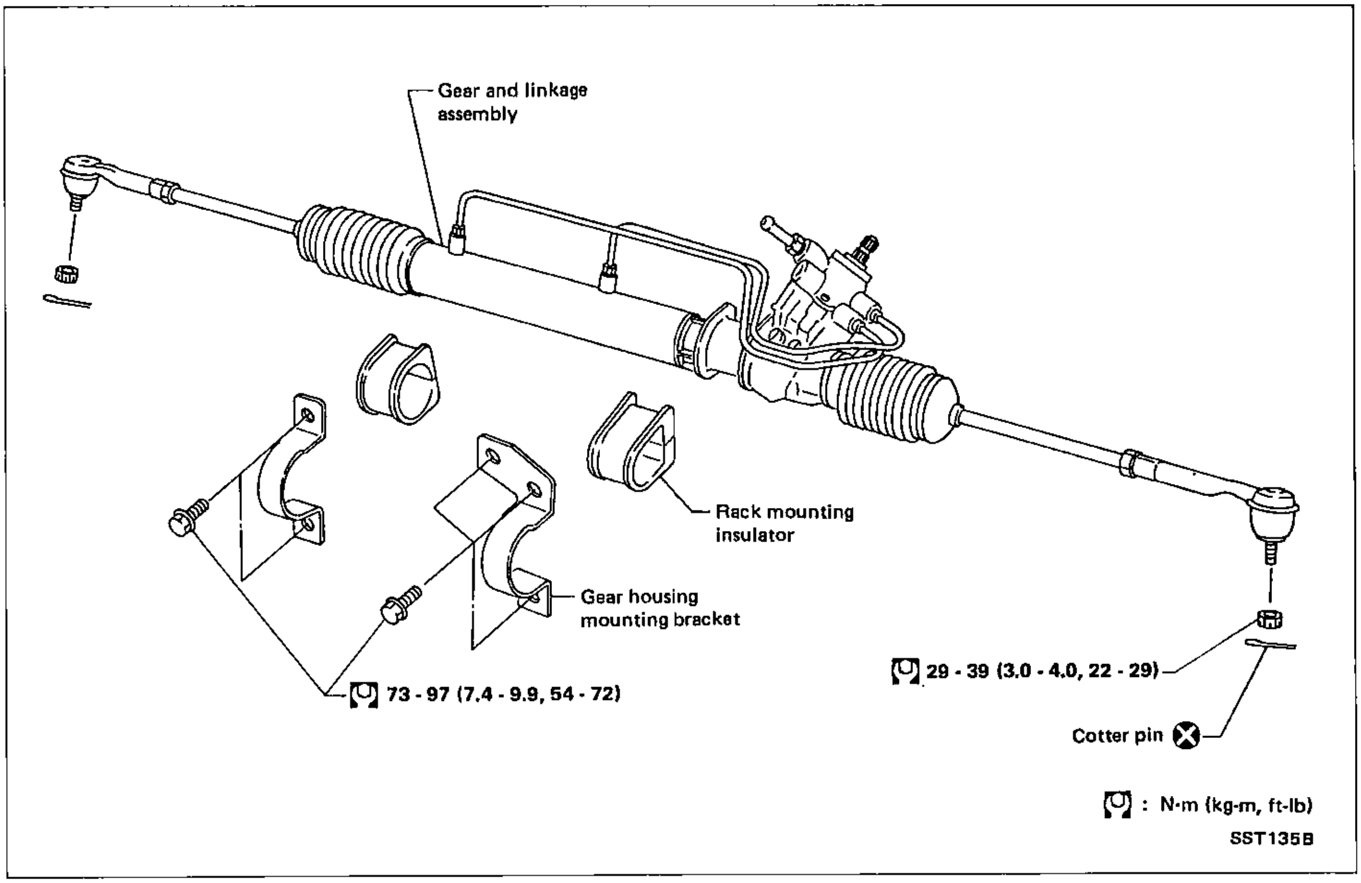
b. Check jacket tube for deformation or breakage. Replace if necessary.

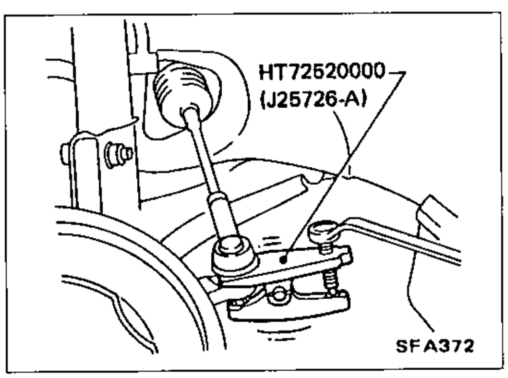
- When the vehicle is involved in a light collision, check column length "L". If it is not within specifications, replace steering column as an assembly.

  Column length "L":

  581.2 - 582.8 mm (22.88 - 22.94 in)

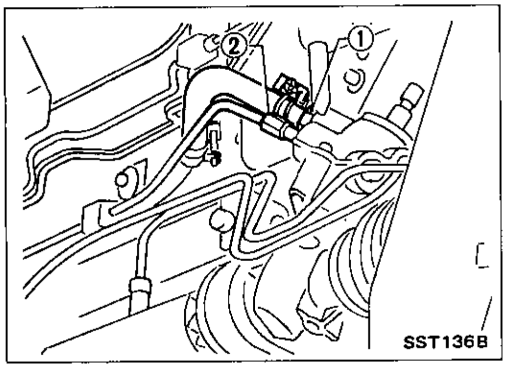
Removal and Installation





- Detach tie-rod outer sockets from knuckle arms with Tool.

Removal and Installation (Cont'd)



- Install pipe connector.
- 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.

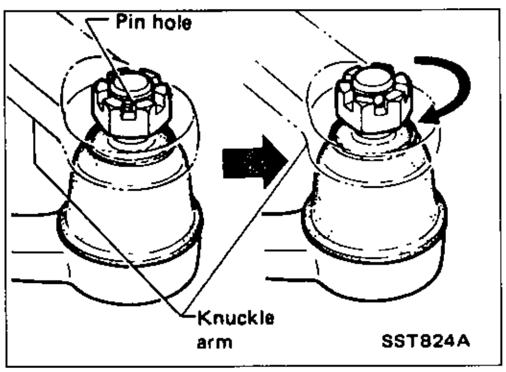
Connector tightening torque:

Low-pressure side "1"

27 - 39 N·m (2.8 - 4.0 kg-m, 20 - 29 ft-lb)

High-pressure side "2"

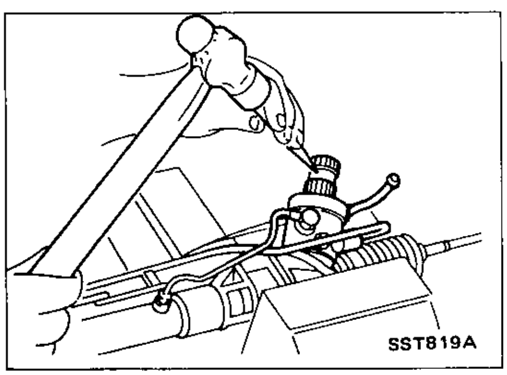
15 - 25 N·m (1.5 - 2.5 kg-m, 11 - 18 ft-lb)



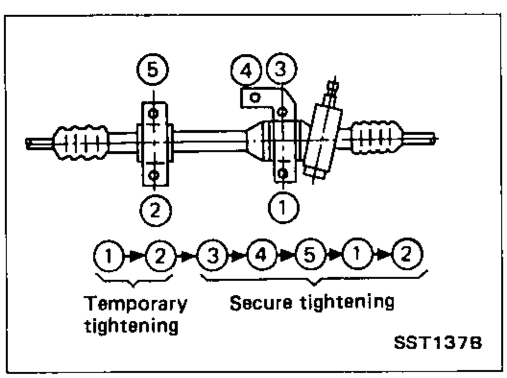
- Initially, tighten nut on tie-rod outer socket and knuckle arm to 29 to 39 N·m (3 to 4 kg-m, 22 to 29 ft-lb). Then tighten further to align nut groove with first pin hole so that cotter pin can be installed.

CAUTION:

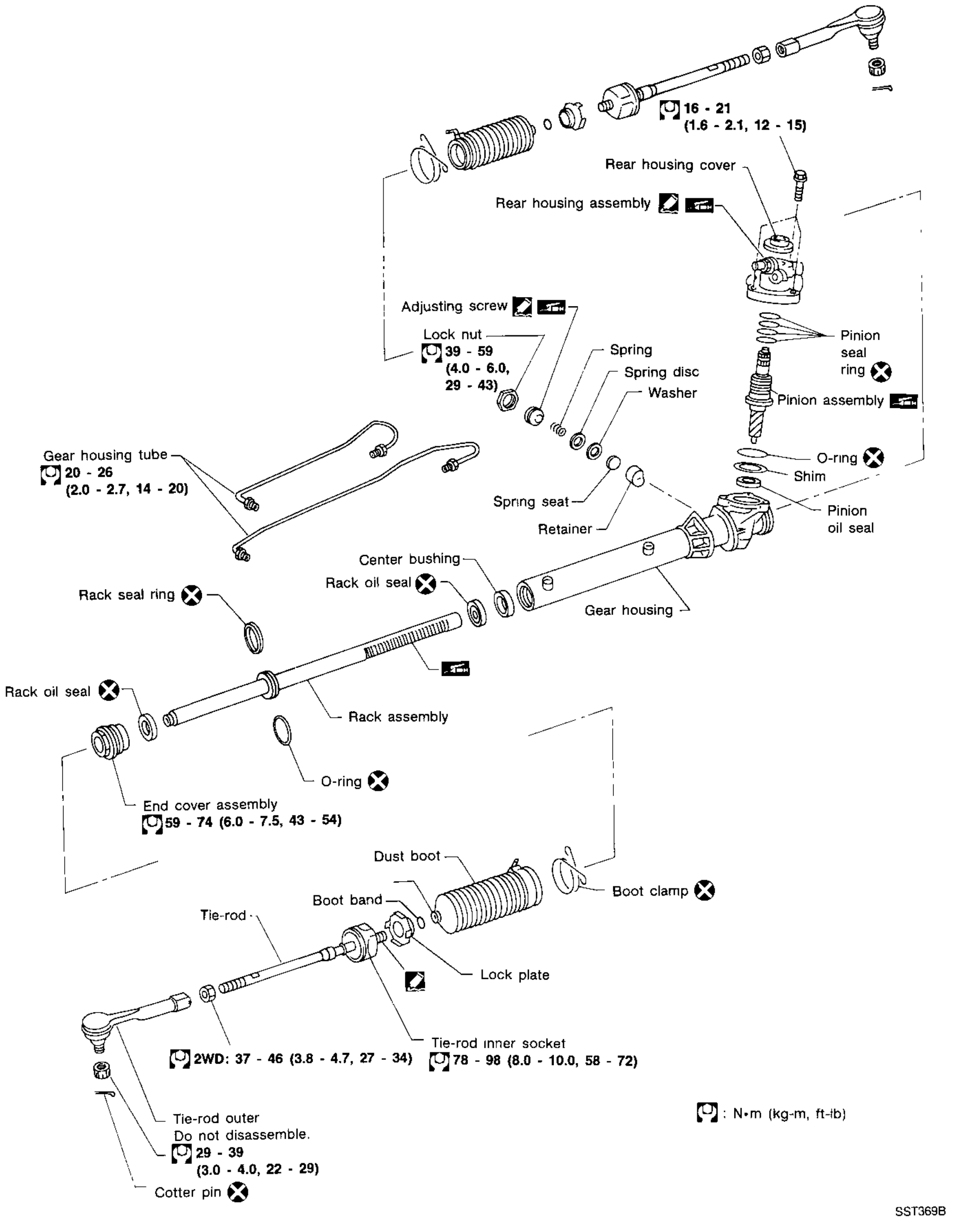
Tightening torque must not exceed 49 N·m (5 kg-m, 36 ft-lb).

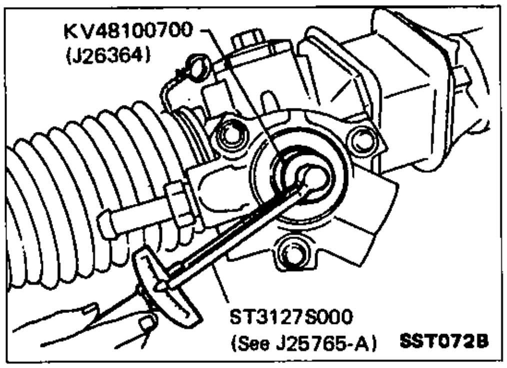


- Before removing lower joint from gear, set gear in neutral (wheels in straight-ahead position). After removing lower joint, put matching mark on pinion shaft and pinion housing to record neutral position of gear.
- To install, set left and right dust boots to equal deflection, and attach lower joint by aligning matching marks of pinion shaft and pinion housing.



- Tighten gear housing mounting bracket bolts in the order shown.


16 - 21
(1.6 - 2.1, 12 - 15)
Rear housing cover
Rear housing assembly
Adjusting screw
Lock nut
39 - 59
(4.0 - 6.0,
29 - 43)
Spring
Spring disc
Washer
Pinion
seal
ring
Pinion assembly
O-ring
Shim
Pinion
oil seal
Gear housing tube
20 - 26
(2.0 - 2.7, 14 - 20)
Spring seat
Retainer
Center bushing
Rack oil seal
Rack seal ring
Gear housing
Rack oil seal
Rack assembly
O-ring
End cover assembly
59 - 74 (6.0 - 7.5, 43 - 54)
Dust boot
Boot band
Boot clamp
Tie-rod
Lock plate
Tie-rod inner socket
2WD: 37 - 46 (3.8 - 4.7, 27 - 34)
78 - 98 (8.0 - 10.0, 58 - 72)
: N•m (kg-m, ft-lb)
Tie-rod outer
Do not disassemble.
29 - 39
(3.0 - 4.0, 22 - 29)
Cotter pin
SST369B



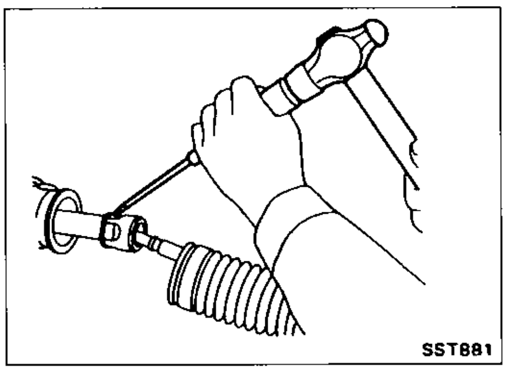
Disassembly

1. Prior to disassembling, measure pinion rotating torque. Record the pinion rotating torque as a reference.

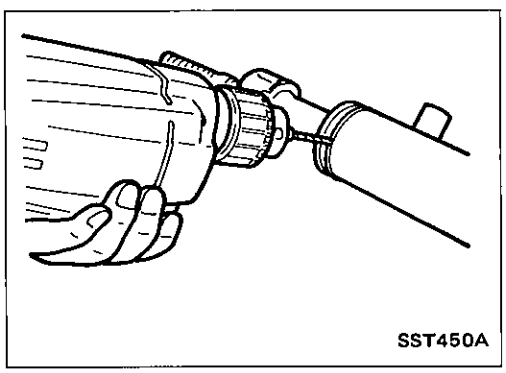
- **Before measuring, disconnect gear housing tube and drain fluid.**
- **Use soft jaws when holding steering gear housing. Handle gear housing carefully, as it is made of aluminum. Do not grip cylinder in a vise.**

2. Remove pinion gear.

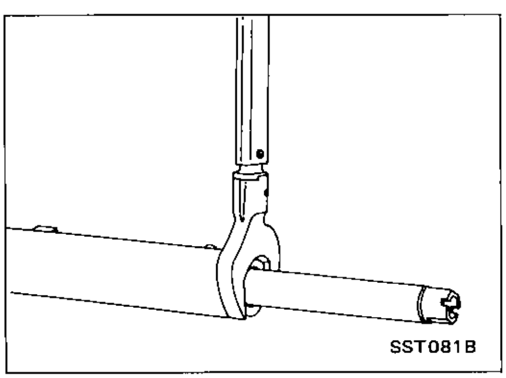
Be careful not to damage pinion gear when removing pinion seal ring.



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.

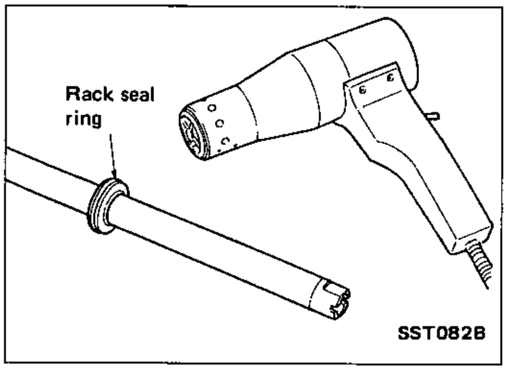


7. Drill staked portion of gear housing end with drill of 2 to 2.5 mm (0.079 to 0.098 in) diameter, until the staking is eliminated.



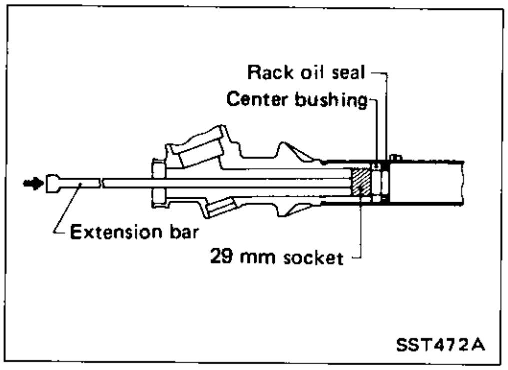
8. Remove end cover assembly with a suitable tool.
9. Draw out rack assembly.

Disassembly (Cont'd)



10. Remove rack seal ring.
- Using a heat gun, heat rack seal to approximately 40°C (104°F).
- Remove rack seal ring.

Be careful not to damage rack.



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

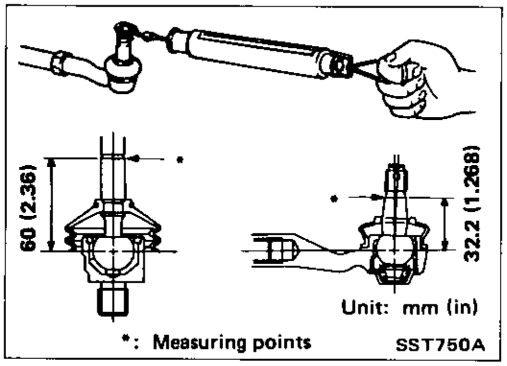
- Thoroughly examine pinion gear. If pinion gear is damaged, cracked or worn, replace it.
- Inspect bearings to see that they roll freely and are free from cracked, pitted, or worn balls, rollers and races. Replace if necessary.

GEAR HOUSING CYLINDER

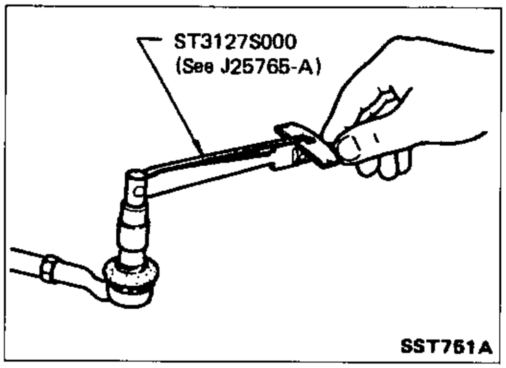
Check gear housing cylinder bore for scratches or other damage. Replace if necessary.

Inspection (Cont'd)

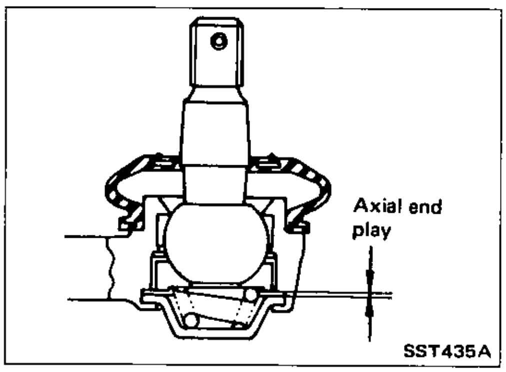
TIE-ROD OUTER AND INNER SOCKET



- Check ball joint for swinging force.
  Tie-rod outer ball joint:
  6.9 - 63.7 N
  (0.7 - 6.5 kg, 1.5 - 14.3 lb)
  Tie-rod inner ball joint:
  8.8 - 122.6 N
  (0.9 - 12.5 kg, 2.0 - 27.6 lb)

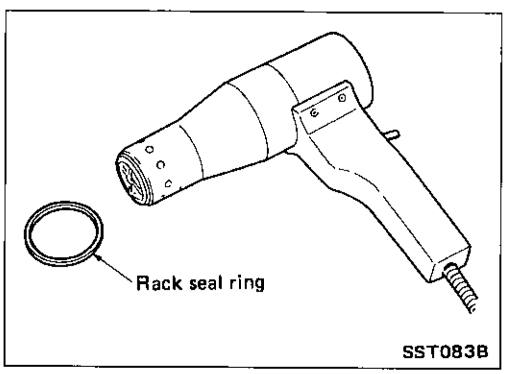


- Check ball joint for rotating torque.
  Tie-rod outer ball joint:
  0.3 - 2.9 N·m
  (3 - 30 kg-cm, 2.6 - 26.0 in-lb)

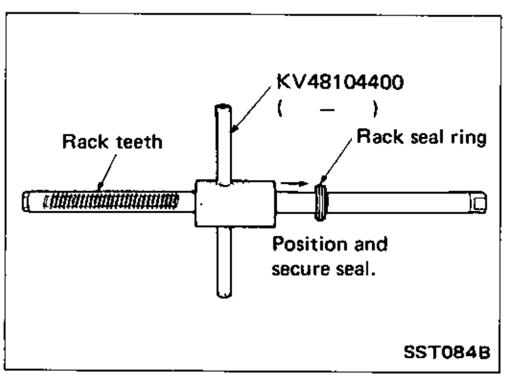


- Check ball joint for axial end play.
  Tie-rod outer ball joint:
  0.5 mm (0.020 in) or less
  Tie-rod inner ball joint:
  0 mm (0 in)
- Check condition of dust cover. If cracked excessively, replace it.

Assembly



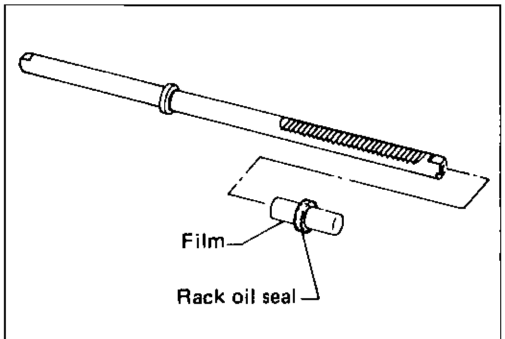
1. Using a heat gun, heat new rack seal ring (made of Teflon) to approximately 40°C (104°F) and install it onto rack with your hand.



2. Using Tool, compress periphery of rack seal ring to position and secure it on rack.

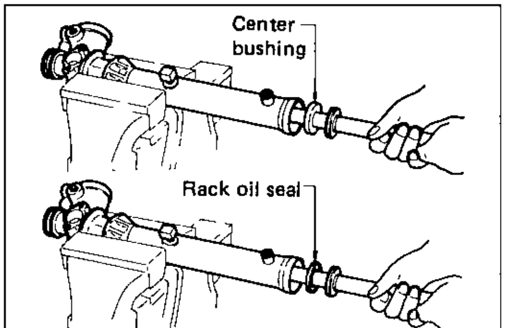
Always insert Tool from the rack gear side.

Assembly (Cont'd)



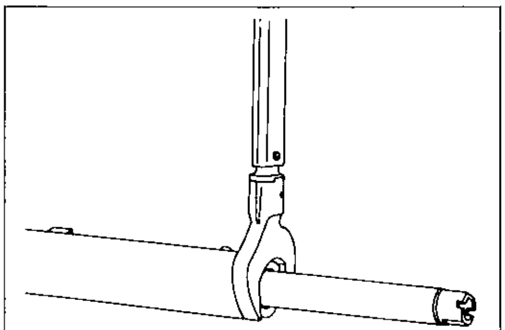
SST201A

3. Insert new rack oil seal.
- **Place plastic film into rack oil seal to prevent damage by rack teeth.**
- **Do not forget to remove plastic film after rack oil seal is positioned properly.**
- **Make sure lips of rack oil seal face each other.**

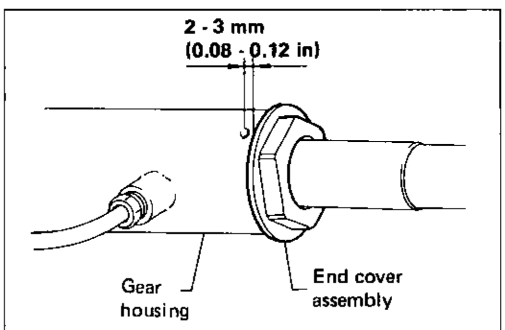


SST830A

4. Install center bushing and rack oil seal with rack assembly.

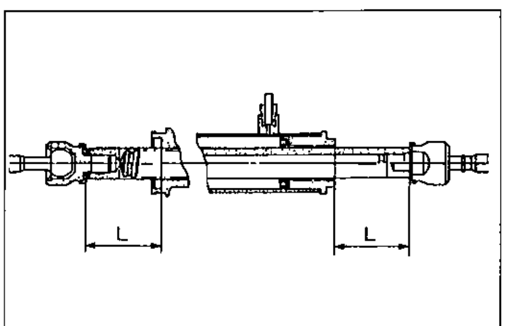

SST081B

5. Tighten end cover assembly with a suitable tool.



SST073B

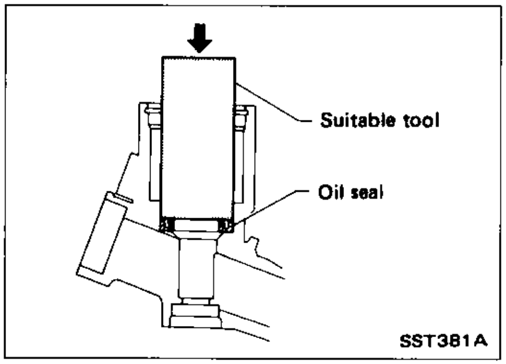
6. Fasten end cover assembly to gear housing by staking.



SST086B

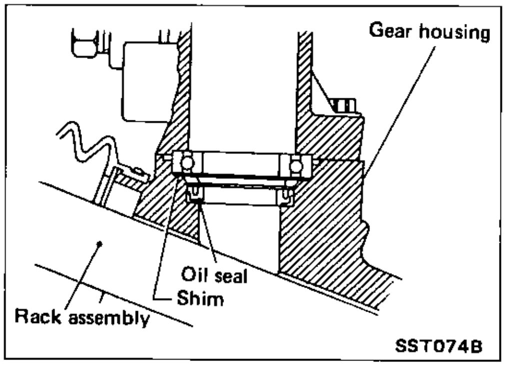
7. Set rack gear in neutral position.
   Rack stroke "L":
   Refer to S.D.S.

Assembly (Cont'd)



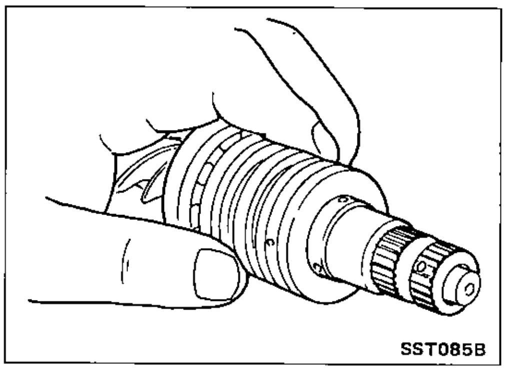
8. Coat seal lip of new pinion oil seal with multi-purpose grease and install it to pinion housing of gear housing with a suitable tool.

Make sure lip of oil seal faces up when installed.



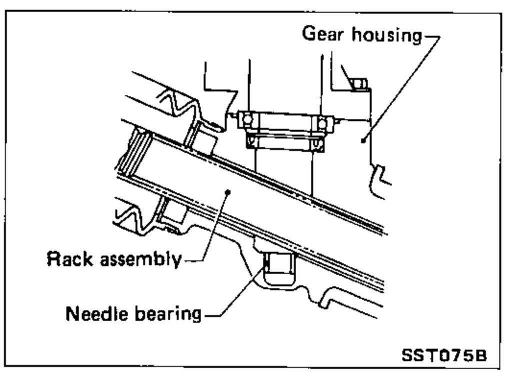
9. Install pinion bearing adjusting shim(s).

- 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.

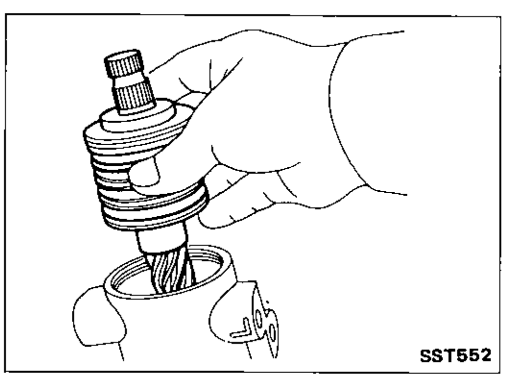


10. Install new pinion seal ring (made of Teflon) on pinion gear assembly.

- 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.



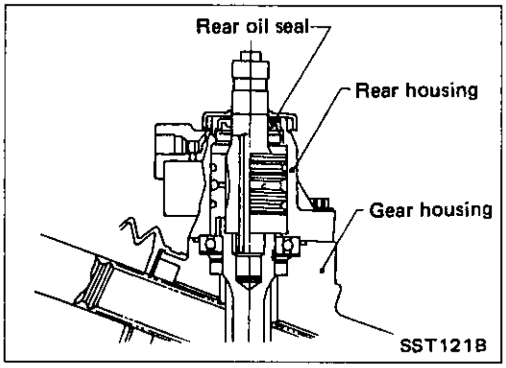
11. Apply a coat of multi-purpose grease to needle bearing roller and oil seal lip before installing pinion assembly in gear housing.



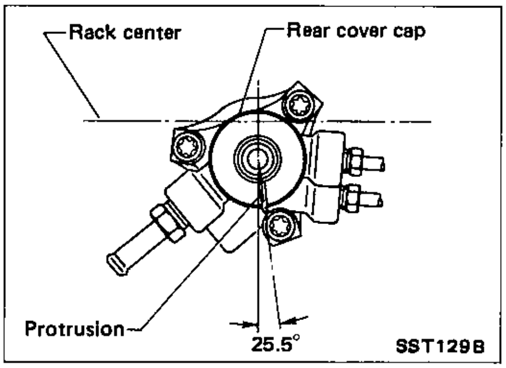
12. Install pinion assembly to pinion housing.

Be careful not to damage pinion oil seal.

Assembly (Cont'd)

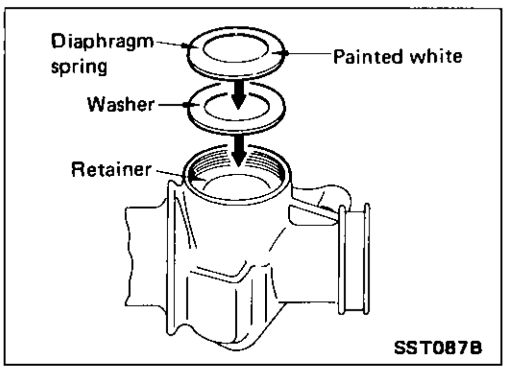


13. Apply a coat of multi-purpose grease to new rear oil seal lip before installing rear housing.



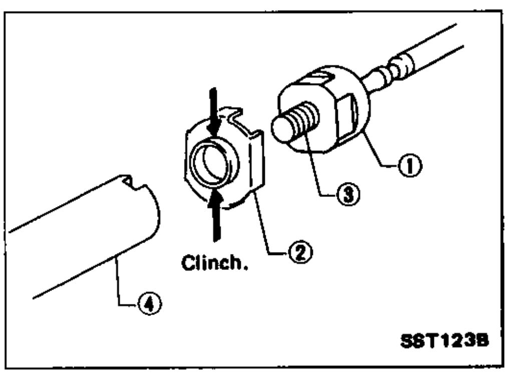
14. Install rear cover cap so that protrusion of rear housing cover is positioned as shown in figure at left.

Be careful not to damage worm ring and oil seal.



15. Install diaphragm spring into gear housing.
- Always install retainer, spring washer and diaphragm spring in that order.
- Make sure convex end (painted white) of diaphragm spring faces outward when installing.

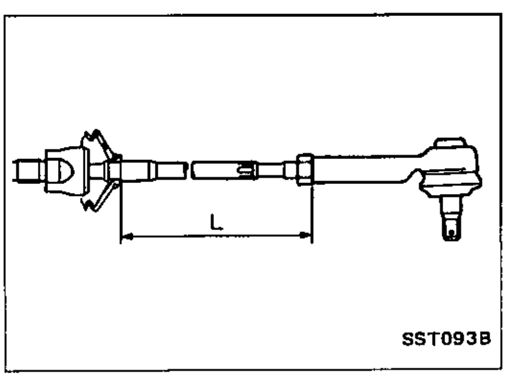
16. Install retainer spring and adjusting screw temporarily.



17. Install new lock plate.
- Attach lock plate ② to side rod inner socket ①.
- Apply locking sealant to inner socket threads ③.
  Screw inner socket into rack ④ and tighten to specified torque.
- Clinch two places of lock plate at rack's groove.

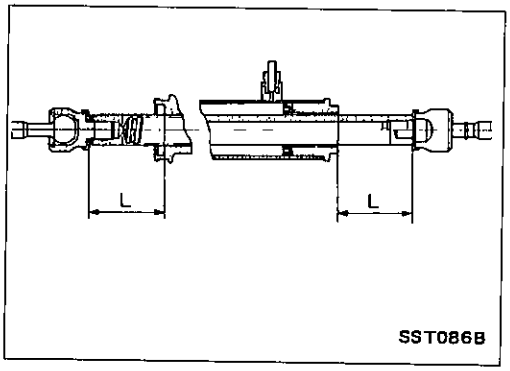
CAUTION:

To prevent scratching the boot, remove burrs from lock plate.



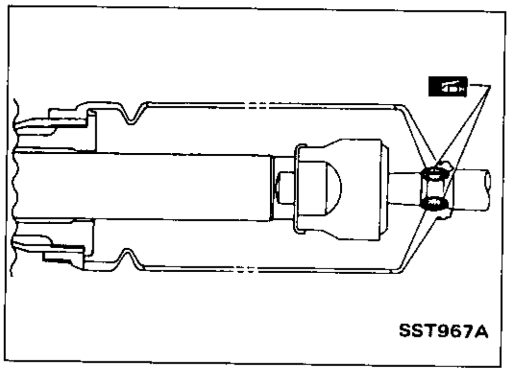
18. Tighten outer socket lock nut.
    Tie-rod length "L":
    Refer to S.D.S.

Assembly (Cont'd)

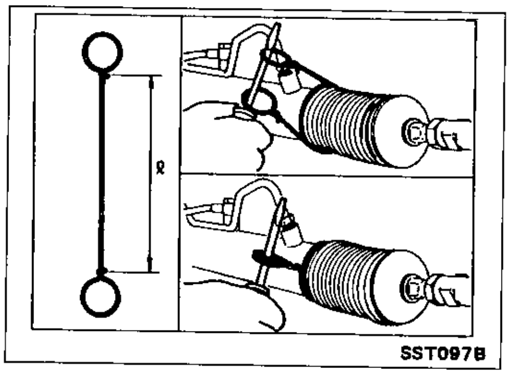


SST086B

19. Measure rack stroke.
    Rack stroke "L":
    Refer to S.D.S.

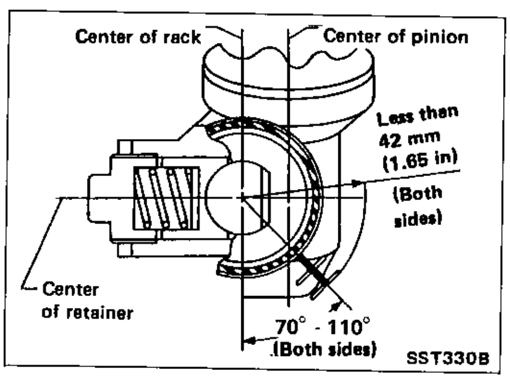

SST967A

20. Before installing boot, coat the contact surfaces between boot and tie-rod with grease.



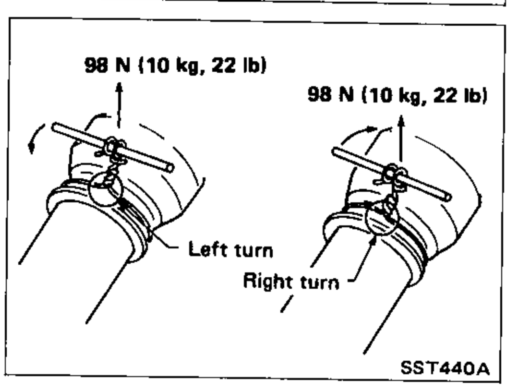
SST097B

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).



SST330B

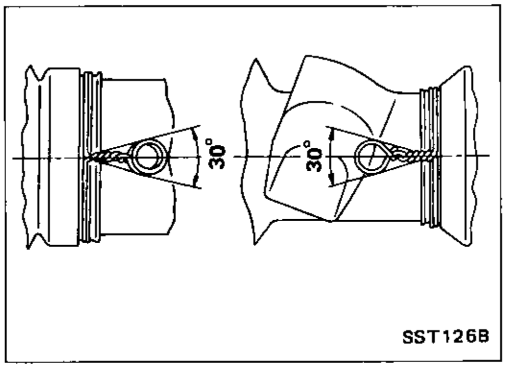
- Install boot clamp so that it is to the rear of the vehicle when gear housing is attached to the body. (This will prevent interference with other parts.)



SST440A

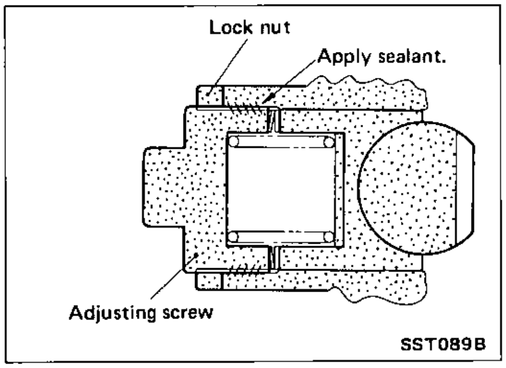
- Twist boot clamp in the direction shown in figure at left.

Assembly (Cont'd)



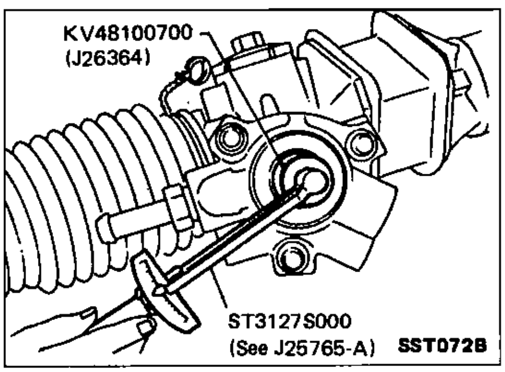
- After twisting boot clamp, bend twisted and diagonally so it does not contact boot.

Adjustment

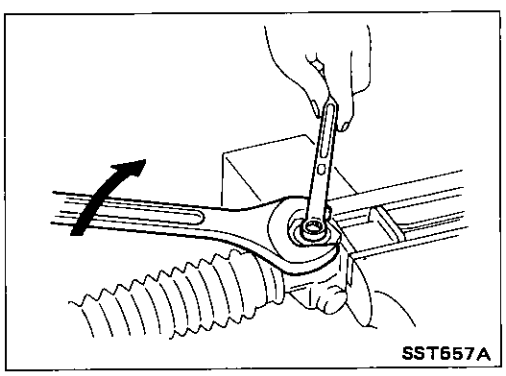


Adjust pinion rotating torque as follows:

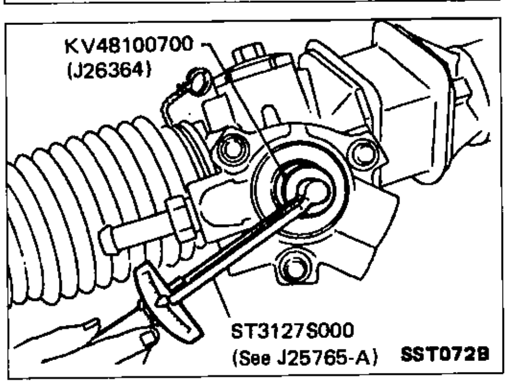
1. Set rack to the neutral position without fluid in the gear.
2. Coat the adjusting screw with locking sealant and screw it in.
3. Lightly tighten lock nut.
4. Tighten adjusting screw to a torque of 4.9 to 5.9 N·m (50 to 60 kg-cm, 43 to 52 in-lb).
5. Loosen adjusting screw, then retighten it to 0.2 N·m (2 kg-cm, 1.7 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 40° to 60°.



10. Prevent adjusting screw from turning, and tighten lock nut to specified torque.

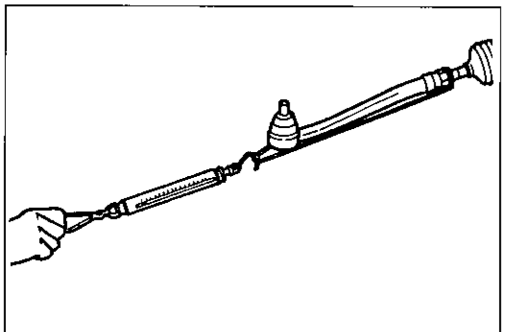


11. Measure pinion rotating torque.

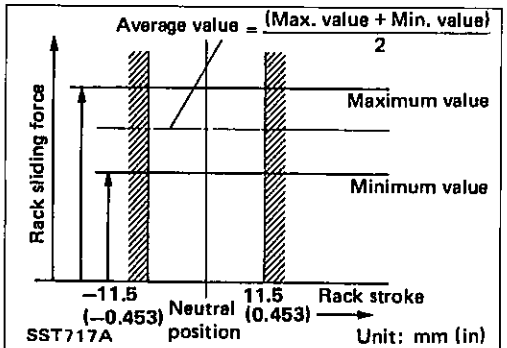
Within ±100° from the neutral position:
Average rotating torque
0.8 - 1.3 N·m (8 - 13 kg-cm, 6.9 - 11.3 in-lb)
Maximum torque deviation
0.4 N·m (4 kg-cm, 3.5 in-lb)
Except for above measuring range:
Maximum rotating torque
1.9 N·m (19 kg-cm, 16 in-lb)
Maximum force deviation
0.6 N·m (6 kg-cm, 5.2 in-lb)

Adjustment (Cont'd)

- If pinion rotating torque is not within specifications, readjust it starting from procedure 4. If pinion rotating torque is still out of specifications after readjustment, replace steering gear assembly.



SST090B



SST717A

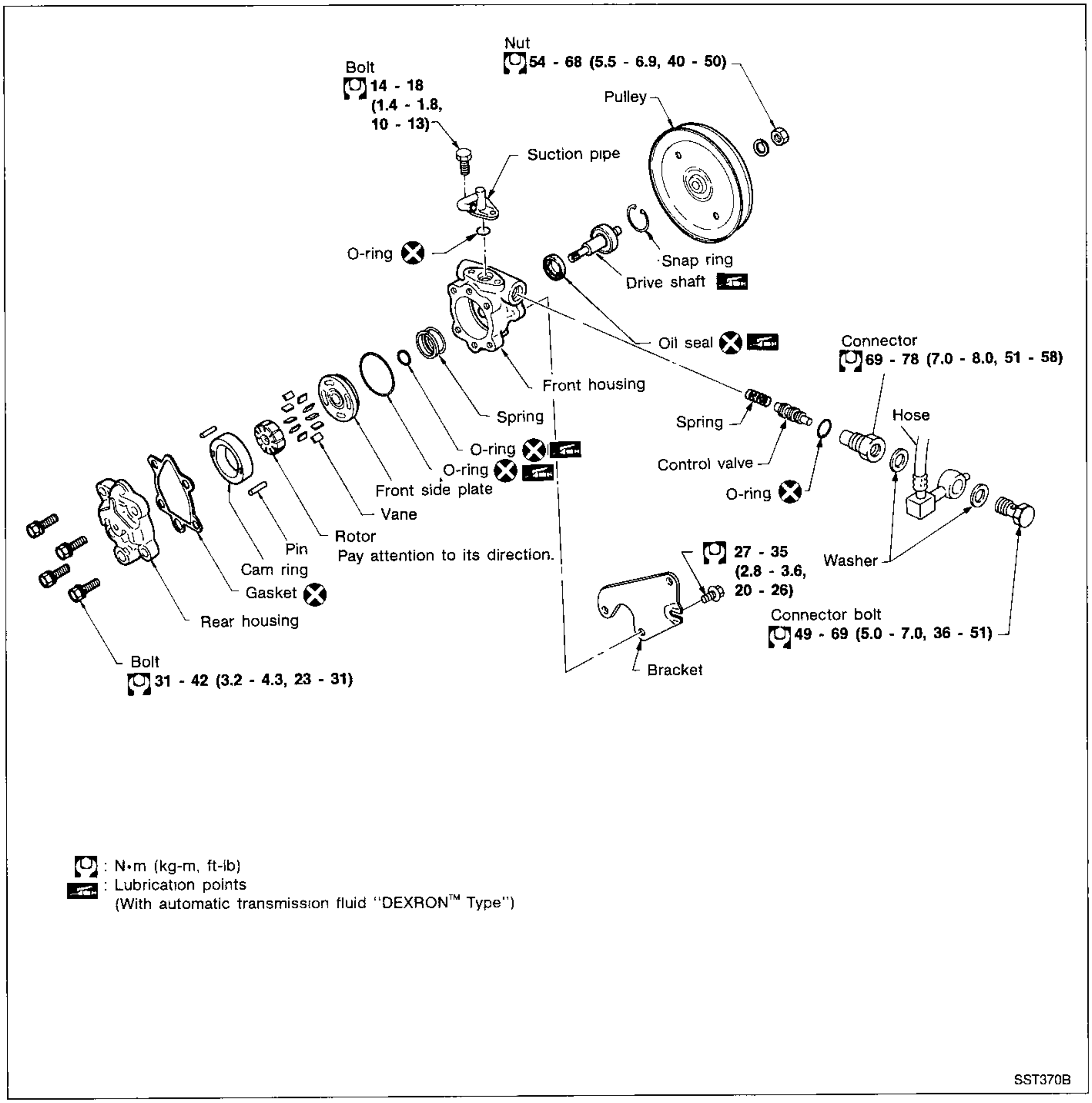
12. Check rack sliding force on vehicle as follows:
a. Install steering gear onto vehicle, but do not connect tie-rod to knuckle arm.
b. Connect all piping and fill with steering fluid.
c. Start engine and bleed air completely.
d. Disconnect steering column lower joint from the gear.
e. Keep engine at idle and make sure steering fluid has reached normal operating temperature.
f. 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.

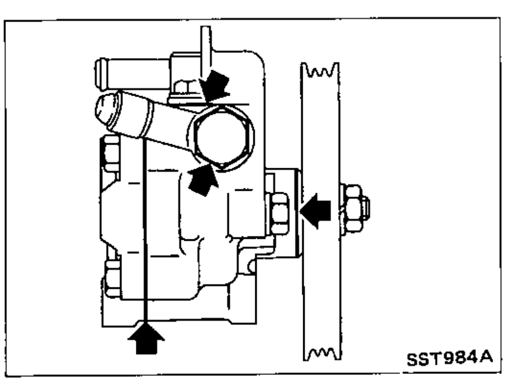
   Average rack sliding force:
   284 N (29 kg, 64 lb)
g. Check sliding force outside above range.

   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.

Disassembly and Assembly





Pre-disassembly Inspection

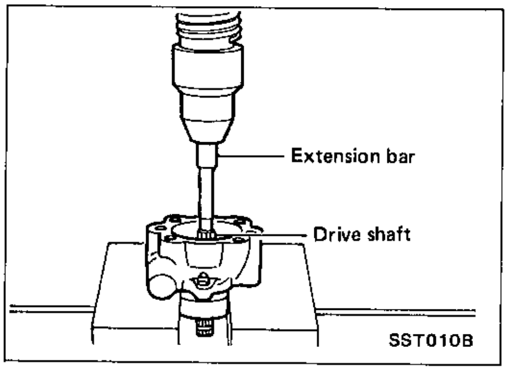
Disassemble the power steering oil pump only if the following items are found.

- Oil leak from any point shown in the figure.
- Deformed or damaged pulley.
- Poor performance.

Disassembly

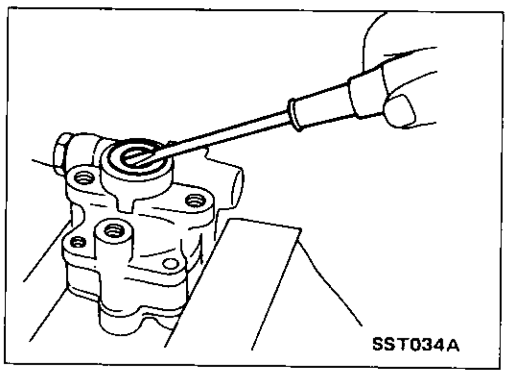
CAUTION:

- **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.**



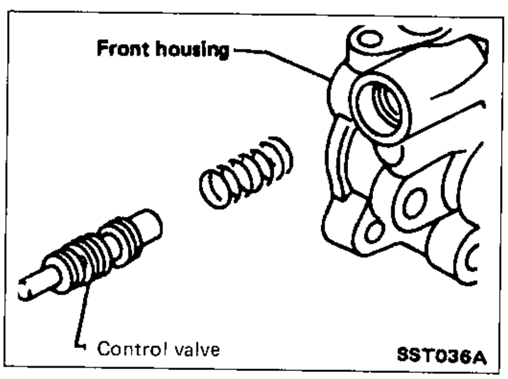
- Remove snap ring, then draw drive shaft out.

Be careful not to drop drive shaft.



- Remove oil seal.

Be careful not to damage front housing.

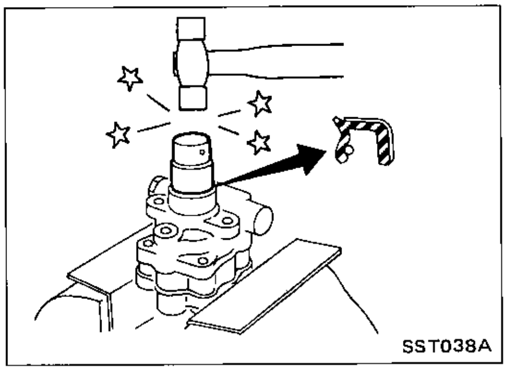


- Remove connector.

Be careful not to drop control valve.

Inspection

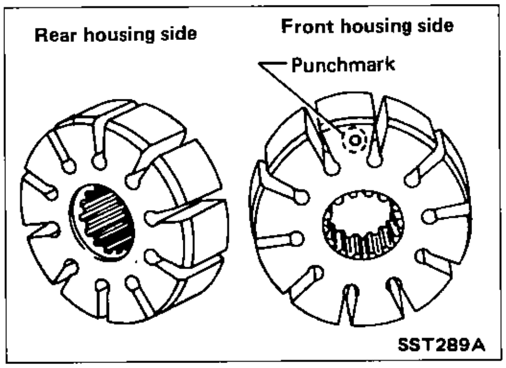
Inspect each component part for wear, deformation, scratches, and cracks. If damage is found, replace the part.



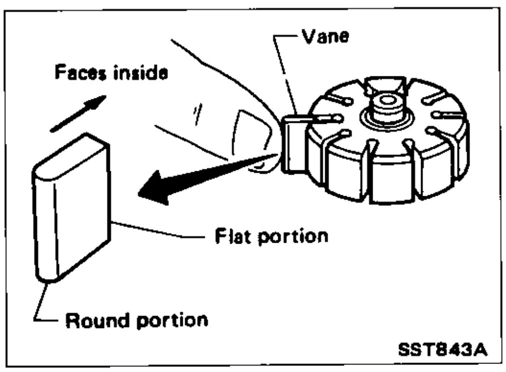
Assembly

Assemble oil pump, noting the following instructions.

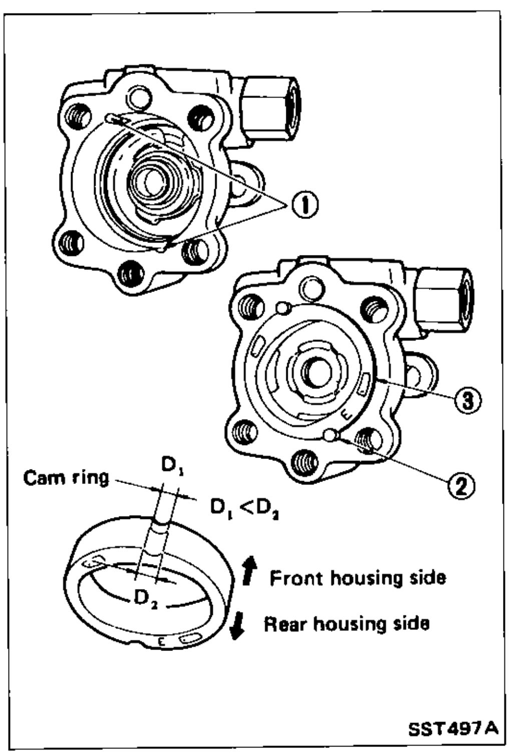
- Make sure O-rings and oil seal are properly installed.
- Always install new O-rings and oil seal.
- Be careful of oil seal direction.
- Cam ring, rotor and vanes must be replaced as a set if necessary.
- Coat each part with A.T.F. when assembling.



- Pay attention to the direction of rotor.



- 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.

General Specifications

Applied model	All
Steering model	Power steering
Steering gear type	PR26SC
Steering overall gear ratio	17.3
Turns of steering wheel (Lock to lock)	3.01
Steering column type	Collapsible, tilt

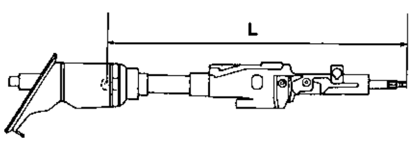
Inspection and Adjustment

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 column length "L" mm (in)	581.2 - 582.8 (22.88 - 22.94)

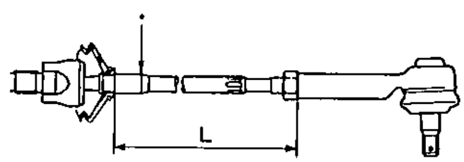


SST126B

STEERING GEAR AND LINKAGE

Steering gear type	PR26SC
Side rod outer ball joint Swinging force at cotter pin hole N (kg, lb)	6.9 - 63.7 (0.7 - 6.5, 1.5 - 14.3)
Rotating torque N·m (kg-cm, in-lb)	0.3 - 2.9 (3 - 30, 2.6 - 26.0)
Axial end play mm (in)	0.5 (0.020) or less
Side rod inner ball joint Swinging force* N (kg, lb)	8.8 - 122.6 (0.9 - 12.5, 2.0 - 27.6)
Axial end play mm (in)	0 (0)
Side rod standard length "L" mm (in)	179 (7.05)

*: Measuring point

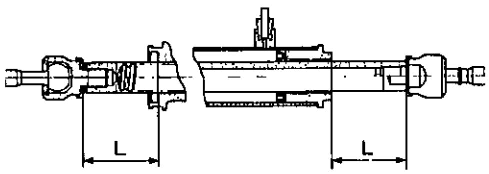


SST371B

Inspection and Adjustment (Cont'd)

STEERING GEAR AND LINKAGE (Cont'd)

Steering gear type	PR26SC
Rack stroke "L" mm (in)	72 (2.83)



SST086B

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)

POWER STEERING

Rack sliding force N (kg, lb)	
Under normal operating oil pressure	
Range within ±11.5 mm (±0.453 in) from the neutral position	284 (29, 64)
Maximum force deviation	39 (4, 9)
Except above range	Not more than 39 (4, 9) beyond above value
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	40° - 60°
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 (US qt, Imp qt)	0.9 (1, 3/4)
Oil pump maximum pressure kPa (kg/cm², psi)	7,649 - 8,238 (78 - 84, 1,109 - 1,194)

SECTION BF

CONTENTS

GENERAL SERVICING
(Including all clips & fasteners) .... BF- 2
BODY END .... BF- 5
DOOR
(Including "Power Door Lock" & "Power Window") .... BF- 8
INSTRUMENT PANEL BF-16
INTERIOR AND EXTERIOR
(In EXTERIOR, including "Weatherstrips") BF-18
SEAT BF-26
AUTOMATIC SEAT BELT SYSTEM BF-28
AUTOMATIC SEAT BELT SYSTEM — Trouble Diagnoses BF-33
SUN ROOF BF-51
WINDSHIELD AND WINDOWS BF-56
MIRROR BF-59
REAR AIR SPOILER BF-60
BODY ALIGNMENT BF-61

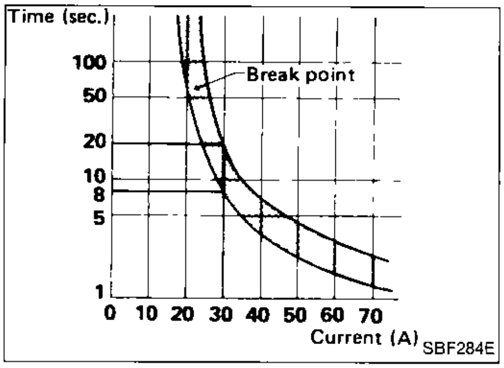
When you read wiring diagrams:
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

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

*** For seat belt, refer to MA section.**

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 removing 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.



SBF284E

Circuit Breaker Inspection

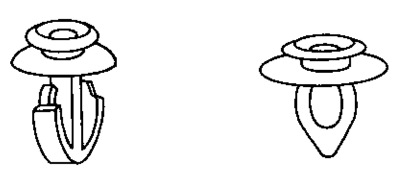
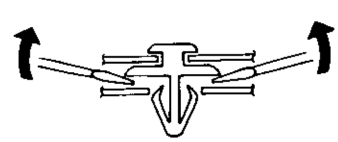
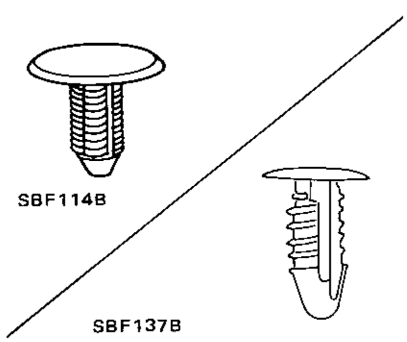
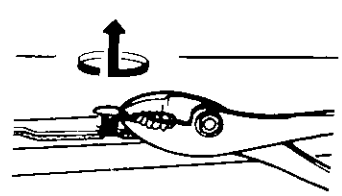
For example, when current is 30A, the circuit is broken within 8 to 20 seconds.

Circuit breakers are used in the following systems.

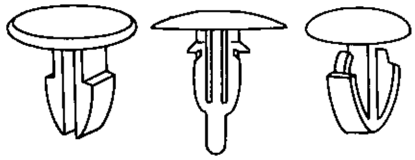
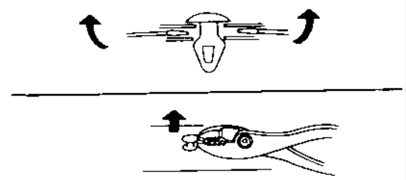
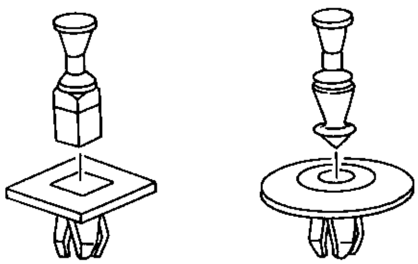
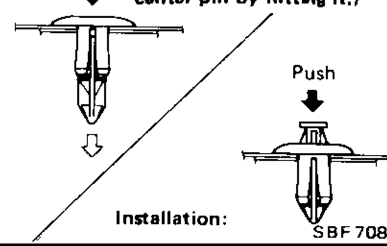
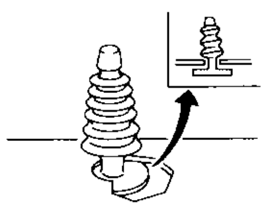
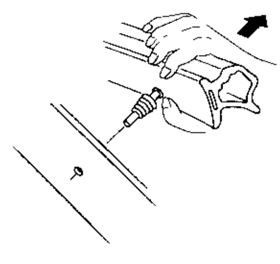
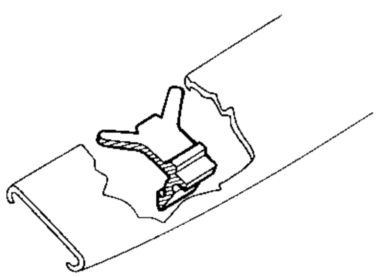
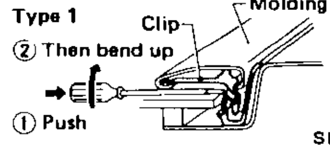
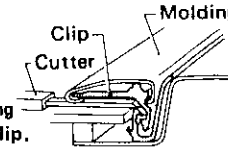
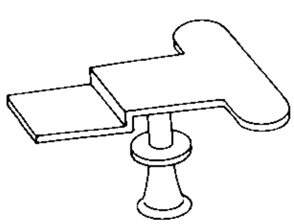
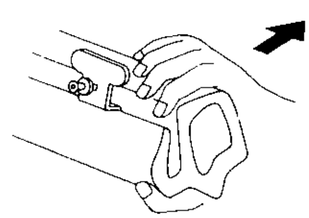
- Power window & power door lock
- Automatic seat belt
- Power sun roof

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.

Symbol No.	Shapes	Removal & Installation
C101 	 SBF256G	**Removal:** **Remove by bending up with flat-bladed screwdrivers.**  SBF367B
C102 	 SBF114B SBF137B	 **Removal:** **Pull up by rotating.** SBF115B

Clip and Fastener (Cont'd)

Symbol No.	Shapes	Removal & Installation
C103 	 SBF257G	Removal: Remove with a flat-bladed screwdriver or pliers.  SBF292C
C203 	 SBF258G	 SBF708E
CE103 	 SBF104B	Removal:  SBF147B
C106	 SBF653B	Removal: Type 1  SBF654B Type 2 Remove molding by cutting off the clip.  SBF914B
CE112	 SBF028C	Removal:  SBF029C

Clip and Fastener (Cont'd)

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<td>CF118
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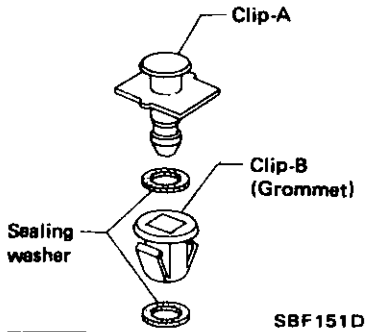
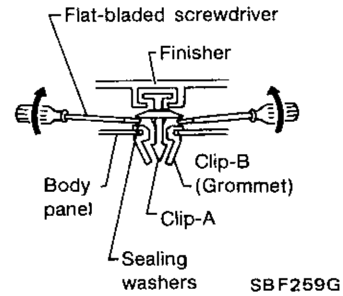
<td>

SBF151D</td>
<td>Removal:


SBF259G</td>
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<tr>
<td>CG101
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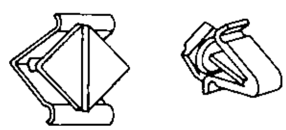
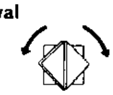
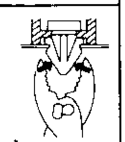
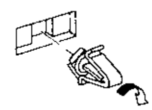
<td>
SBF145B</td>
<td>Removal

Rotate 45°
to remove.

Removal
Installation

SBF085B</td>
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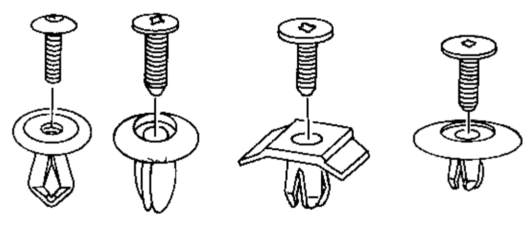
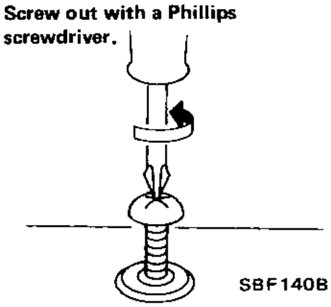
<tr>
<td>CS101
</td>
<td>
SBF260G</td>
<td>Removal:
Screw out with a Phillips screwdriver.

SBF140B</td>
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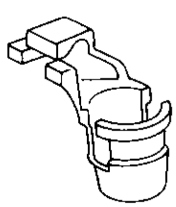
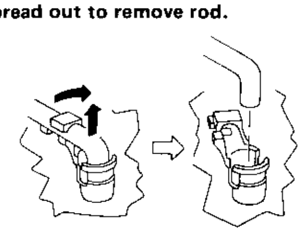
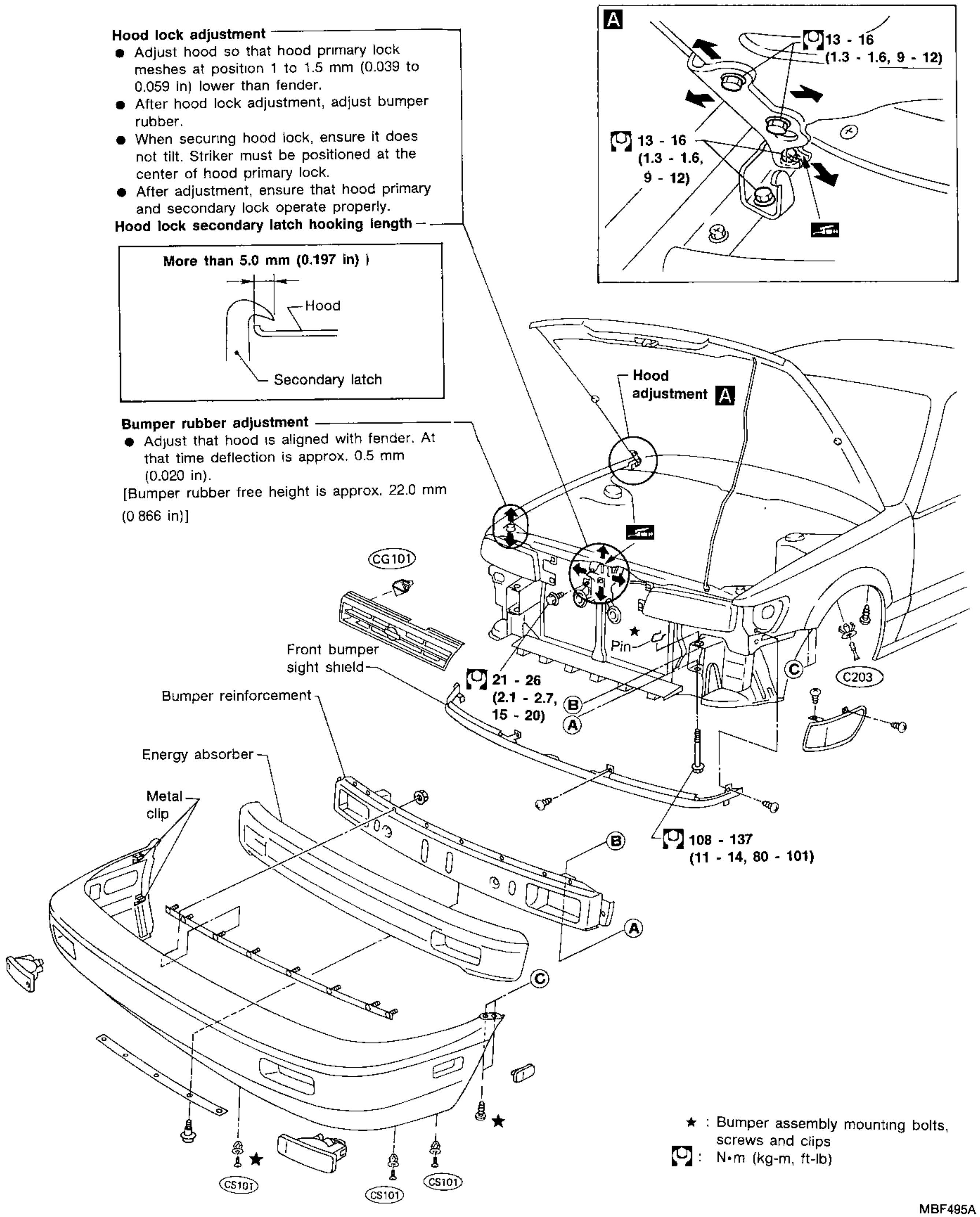
<td>CR103</td>
<td>
SBF768B</td>
<td>Removal:
Holder portion of clip must be spread out to remove rod.

SBF770B</td>
</tr>
</table>

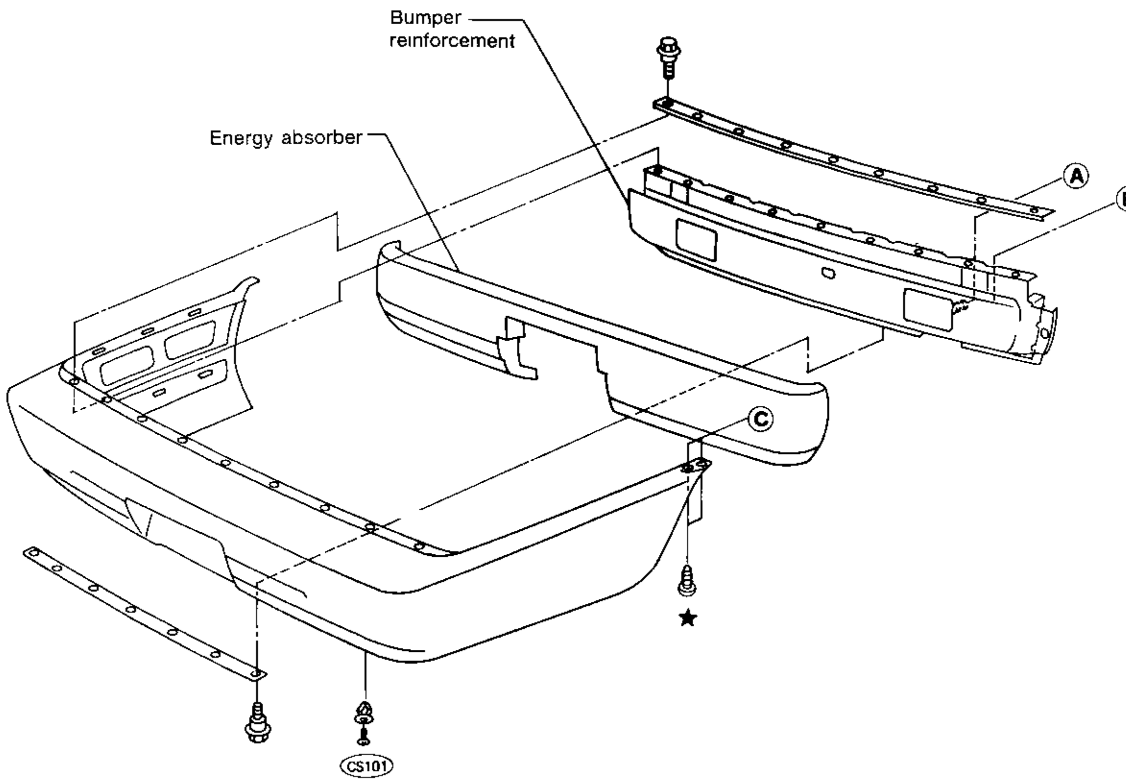
Body Front End

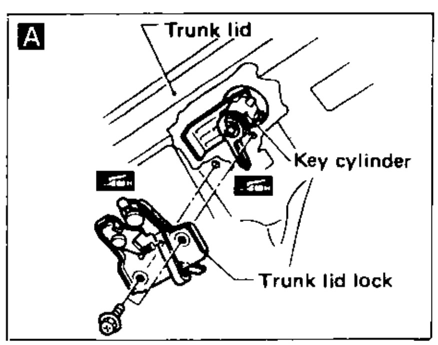
- Hood adjustment: Adjust at hinge portion.
- Hood lock adjustment: After adjusting, check hood lock control operation. Apply a coat of grease to hood locks engaging mechanism.
- Hood opener: Do not attempt to bend cable forcibly. Doing so increases effort required to unlock hood.

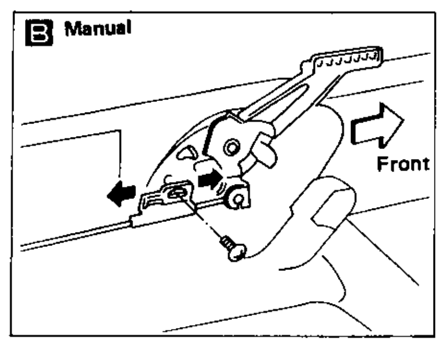


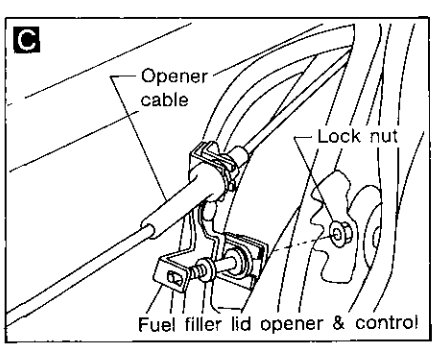
Body Rear End and Opener

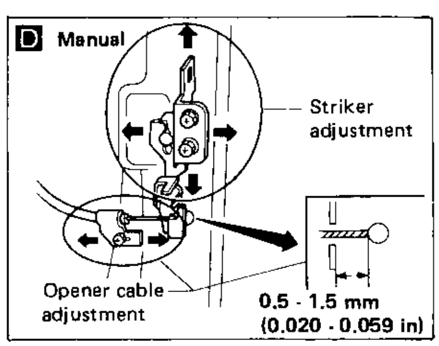
- Trunk lid adjustment: Adjust at hinge-trunk lid portion for proper trunk lid fit.
- Trunk lid lock system adjustment: Adjust striker so that it is in the center of the lock. After adjustment, check trunk lid lock operation.
- Opener cable: Do not attempt to bend cable using excessive force.
- After installation, make sure that trunk lid and fuel filler lid open smoothly.

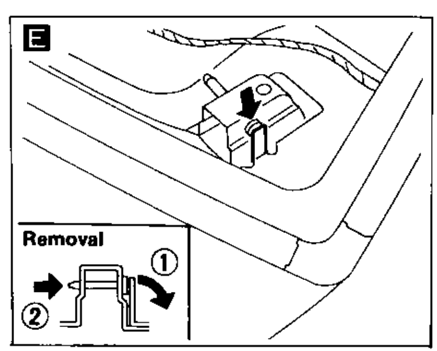




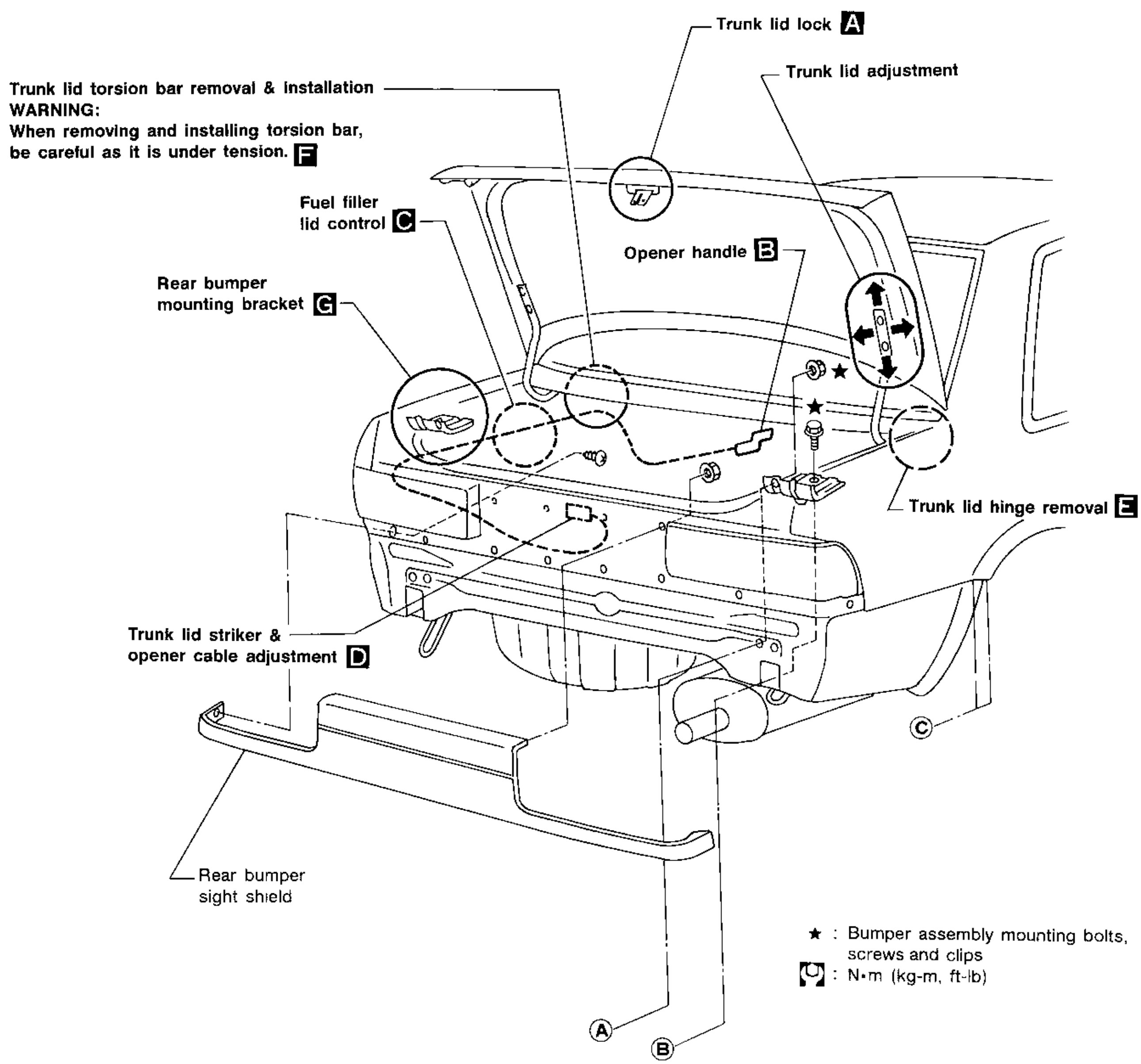


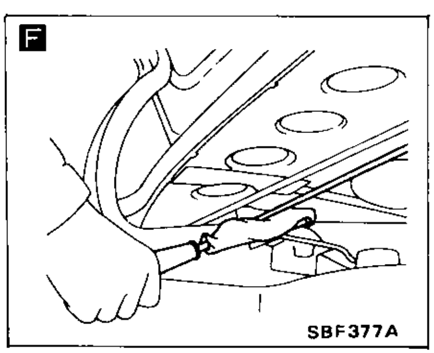


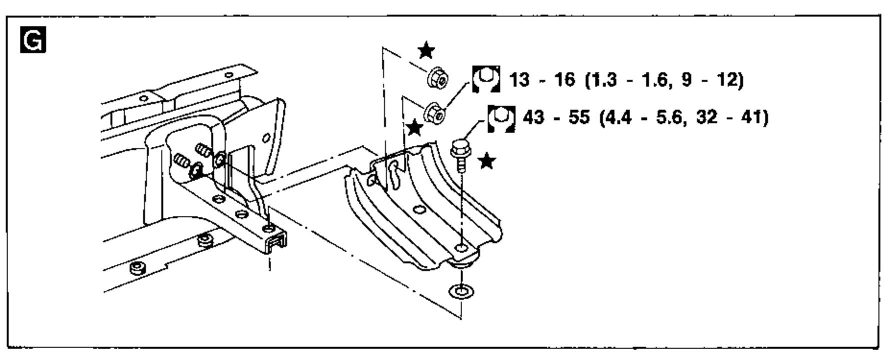




Body Rear End and Opener (Cont'd)

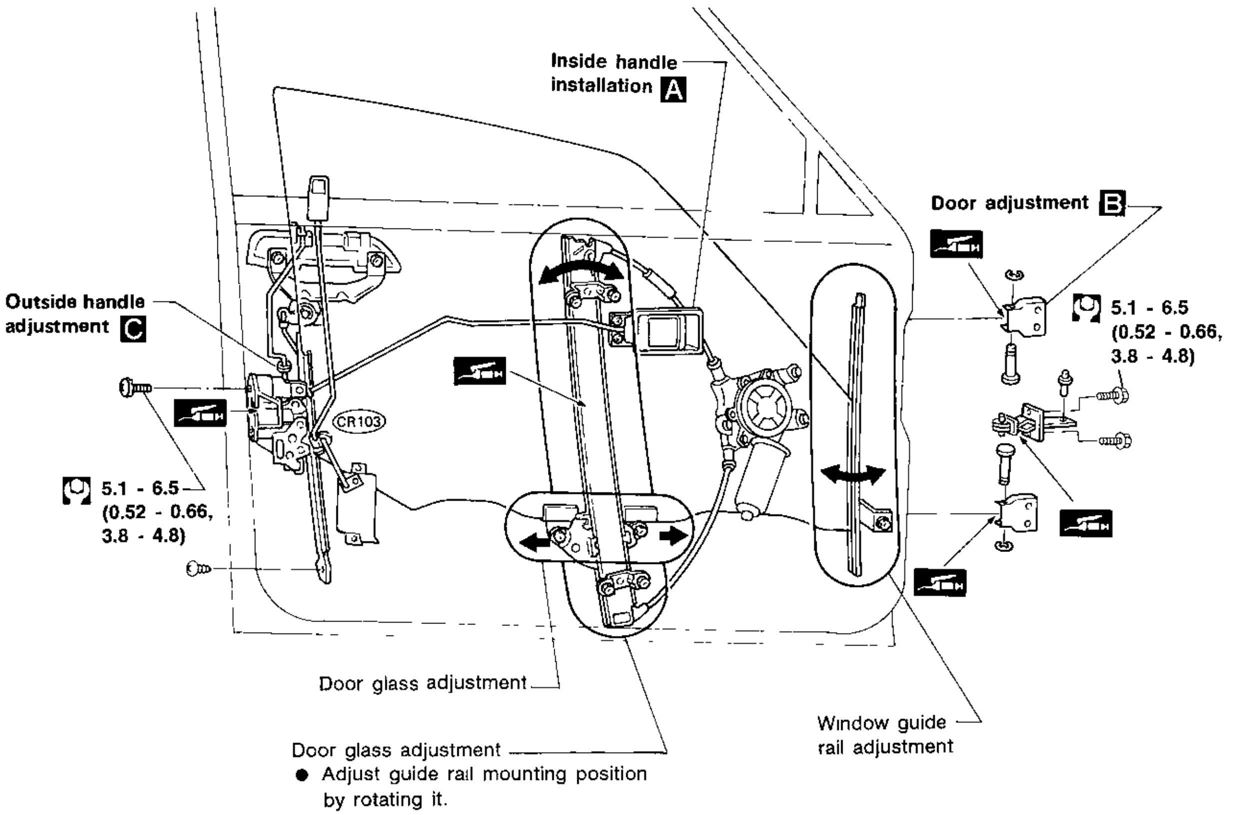


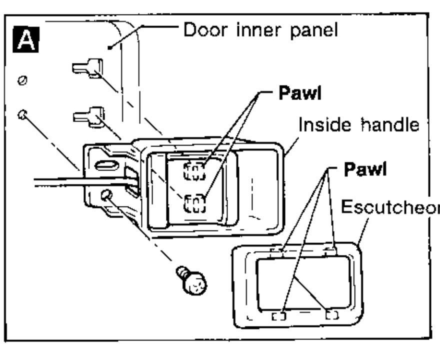


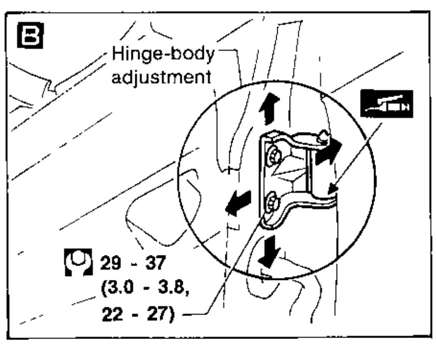


SBF310G

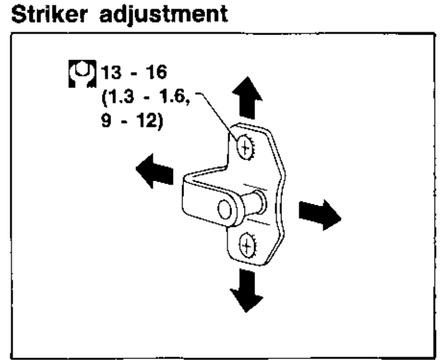
Front Door

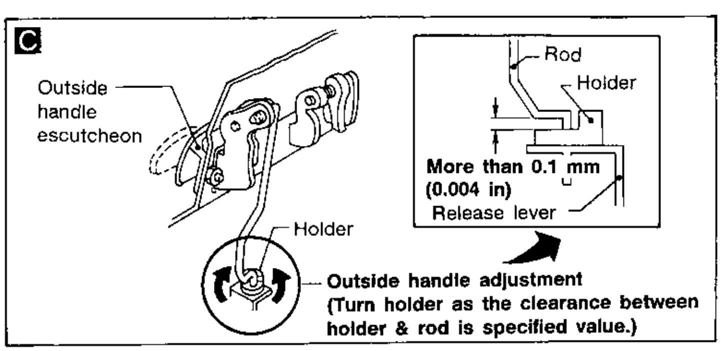






Striker adjustment

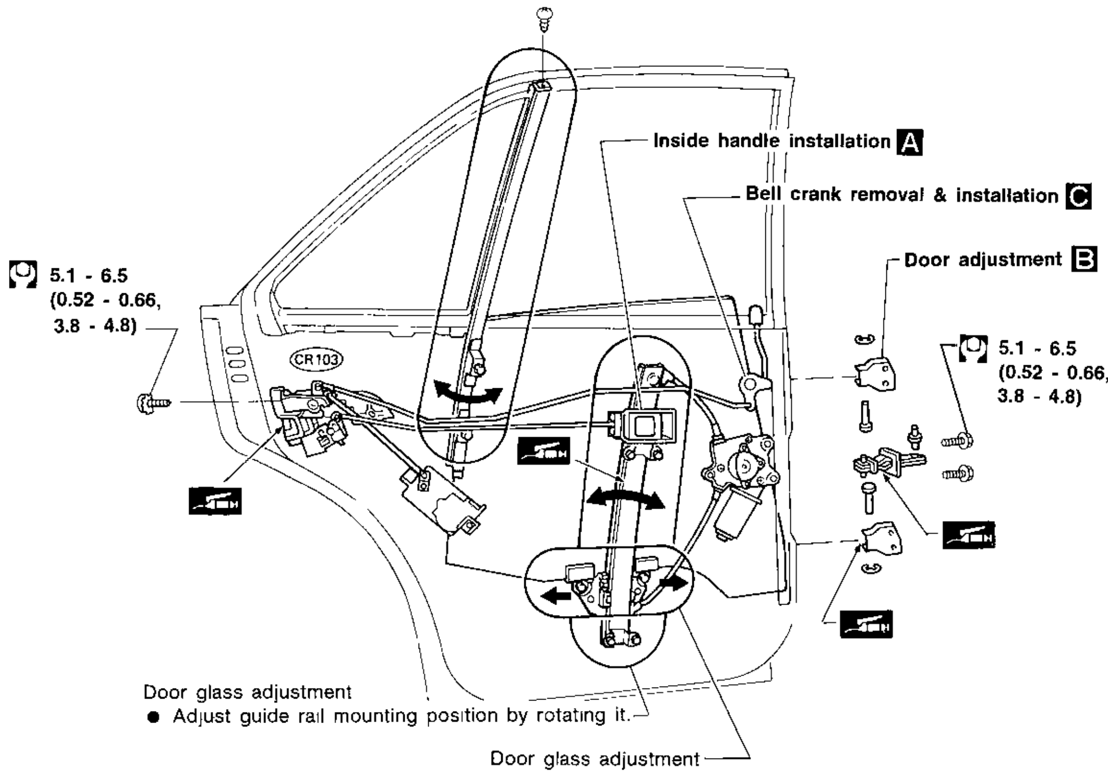


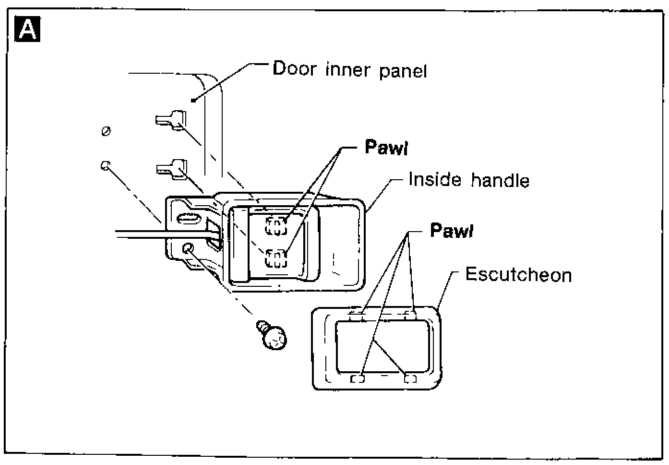


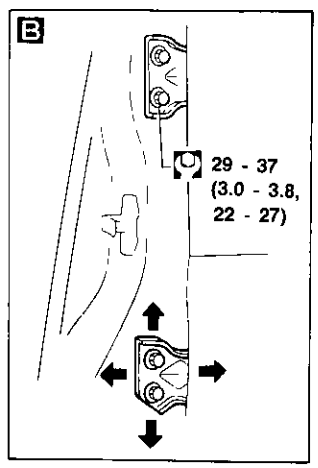
: N•m (kg-m, ft-lb)

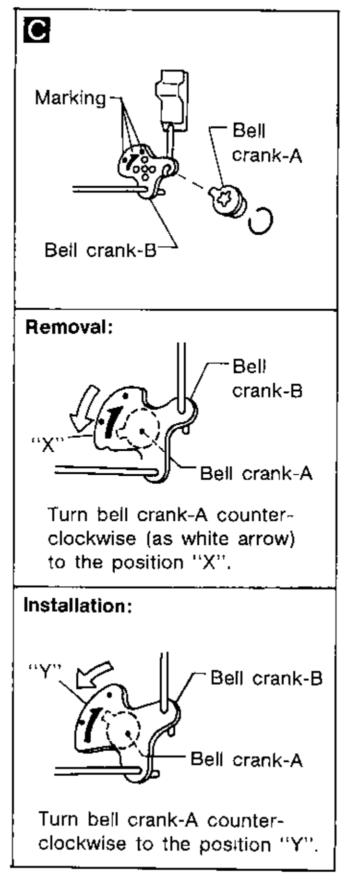
MBF496A

Rear Door

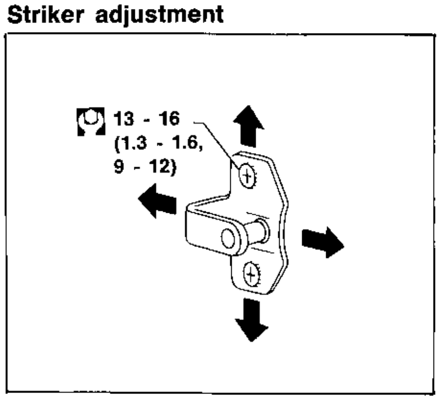








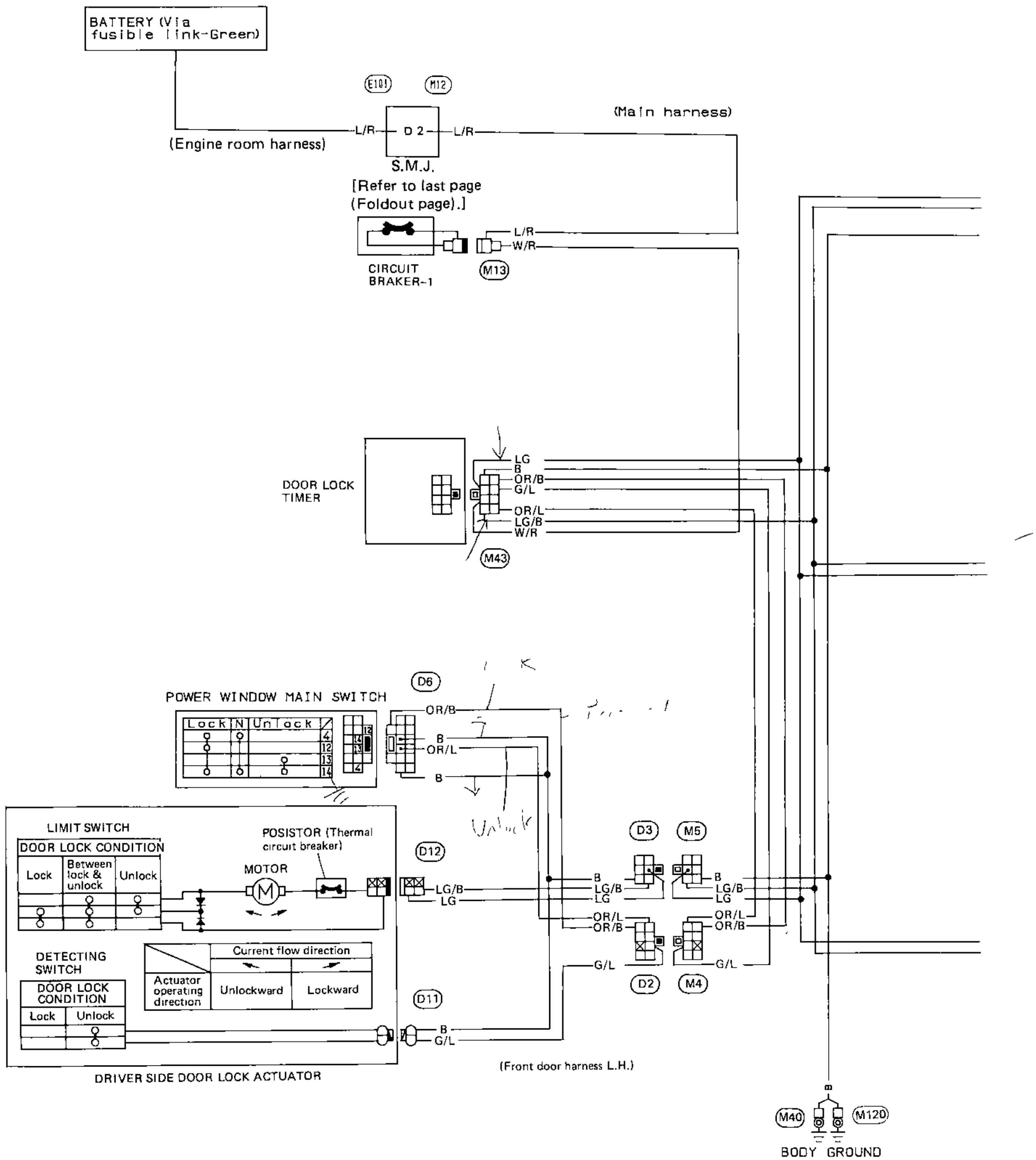
Striker adjustment



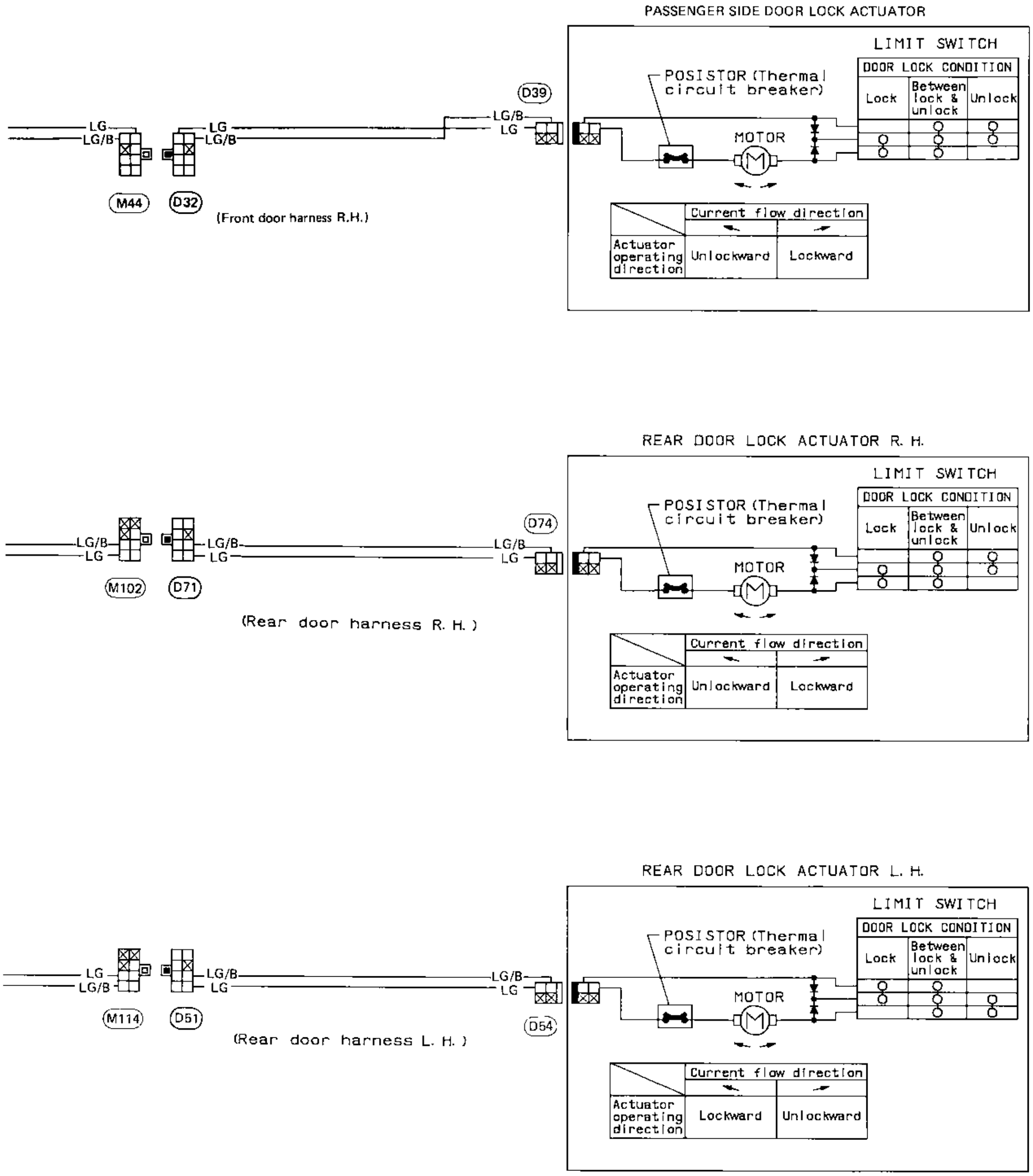
MBF497A

Power Door Lock

WIRING DIAGRAM



Power Door Lock (Cont'd)



SBF287G

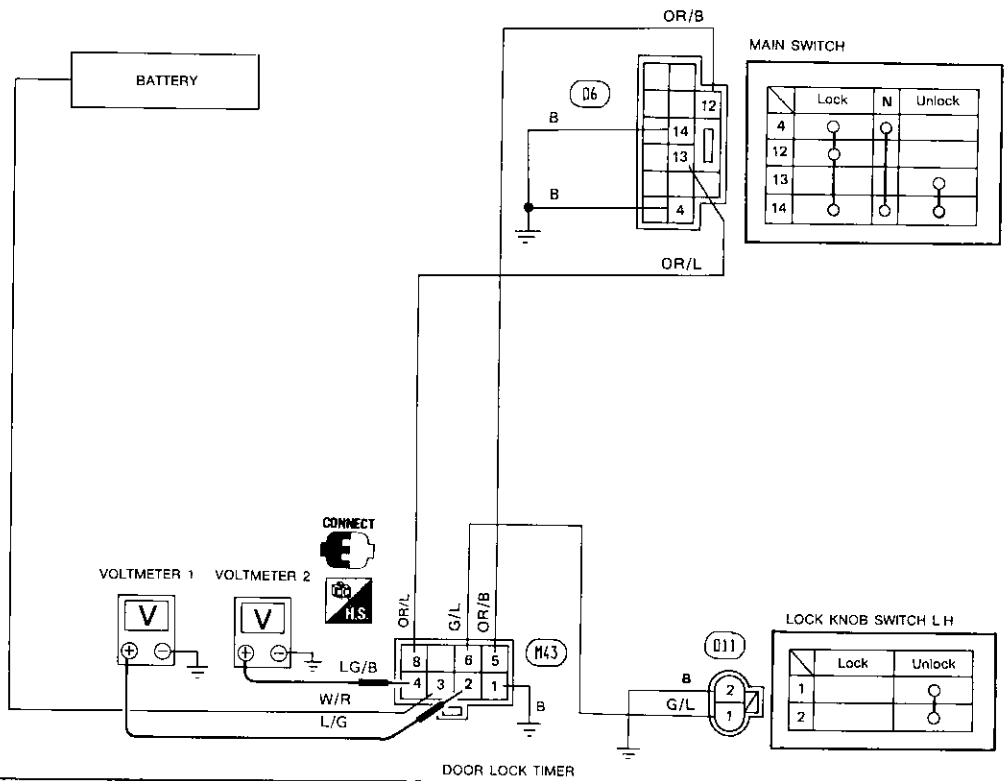
Power Door Lock

DOOR LOCK TIMER INSPECTION

Door lock timer

- Carry out the inspections below.

(1) Power source and ground: Battery voltage should exist between terminals ③ and ①.
(2) Input signals: Continuity should exist between terminals ⑤, ⑥, and ⑧ and ground in "ON" condition, and should not exist in "OFF" condition.
(3) Output signals: Voltage shown in the chart should exist.



		Connections	Operations: Main switch N	Main switch Unlock	Main switch Lock	Lock knob switch L H: Lock	→ Unlock	→ Lock
3		Power source	12V	12V	12V	12V	12V	12V
1		Ground	Ground	Ground	Ground	Ground	Ground	Ground
5	Input signal	Main switch (D6) (Input signal for lock)	OFF	OFF	ON	OFF	OFF	OFF
6	Input signal	Lock knob switch (D11) L H	—	—	—	OFF	ON	OFF
8	Input signal	Main switch (D6) (Input signal for unlock)	OFF	ON	OFF	OFF	OFF	OFF
2	Output signal	Door lock actuator (Lock power source) VOLTMETER 1	0V	0V	12V (Approx 1.0 sec) → 0V	0V	0V	12V (Approx 1.0 sec) → 0V
4	Output signal	Door lock actuator (Unlock power source) VOLTMETER 2	0V	12V (Approx 1.0 sec) → 0V	0V	0V	12V (Approx 1.0 sec) → 0V	

- Carry out the complete inspection in the chart from left to right

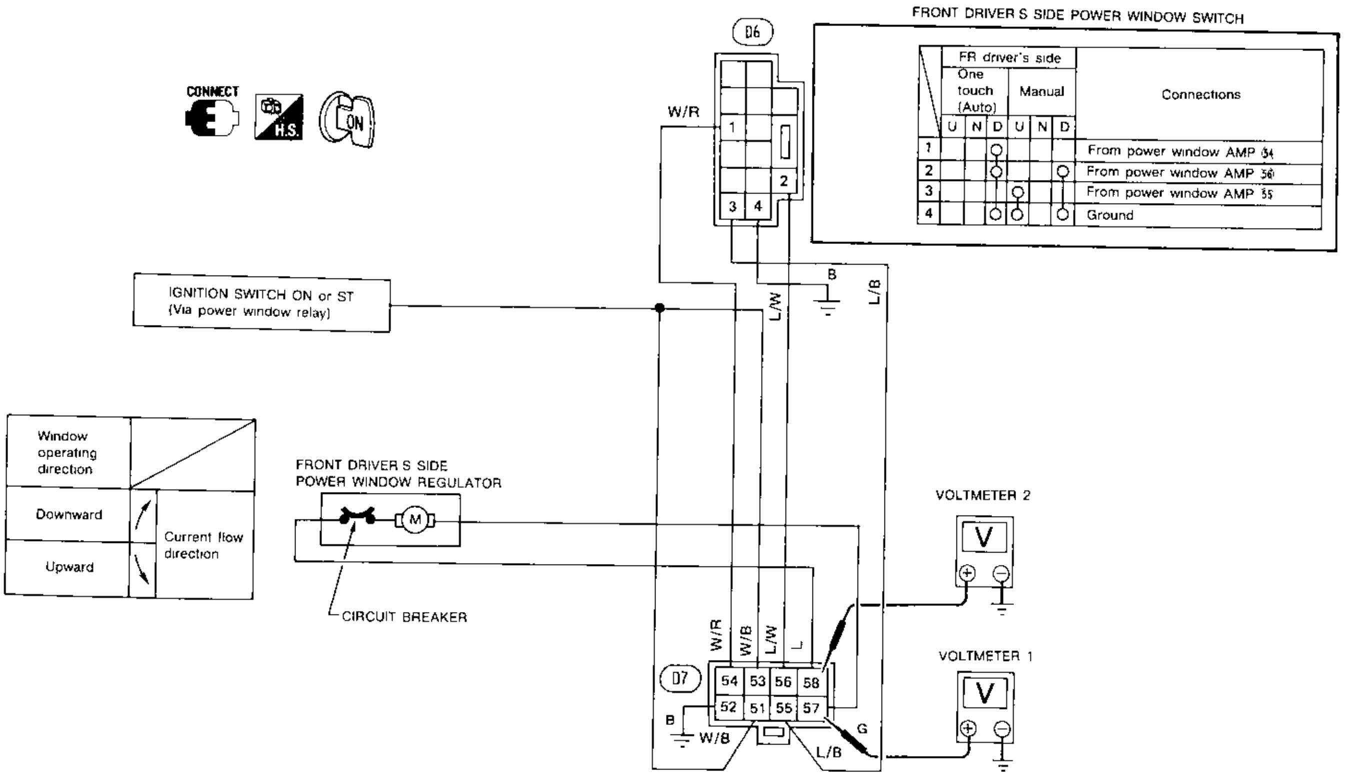
SBF311G

Power Window

POWER WINDOW AMP. INSPECTION

Carry out the inspections below.

(1) Power source and ground: Battery voltage should exist between terminals ⑤① and ⑤②.
(2) Input signals: Battery voltage should exist between terminal ⑤③ and ground (IGN "ON" or "ST"). Continuity should exist between terminal ⑤④, ⑤⑤ or ⑤⑥ and ground in "ON" condition, and should not exist in "OFF" condition.
(3) Output signals: Battery voltage shown in the chart should exist.



AMP OPERATION

	Connections		Operations					
			Manual operation			One-touch (Auto) operation		
			N	UP	Down	N	Down ——►	N
51	Power source (IGN)		12V	12V	12V	12V	12V	12V
52	Ground		Ground	Ground	Ground	Ground	Ground	Ground
53	Input signal	From ignition SW (ON or ST)	12V	12V	12V	12V	12V	12V
54	Input signal	To FR driver s side power window SW (AUTO) (1)	OFF	OFF	OFF	OFF	ON	OFF
55	Input signal	To FR driver s side power window SW (UP) 3	OFF	ON	OFF	OFF	OFF	OFF
56	Input signal	To FR driver's side power window SW (DOWN) (2	OFF	OFF	ON	OFF	ON	OFF
57	Output signal	FR driver's side regulator (Upward power source) VOLTMETER 1	Approx 0V	Approx over 9V	Approx 0V	Approx 0V	Approx 0V	Approx 0V
58	Output signal	FR driver s side regulator (Downward power source) VOLTMETER 2	Approx 0V	Approx 0V	Approx over 9V	Approx 0V	Approx over 9V	Approx over 9V

Regulator Operating Condition	Stop	Upward operation	Downward operation	Stop	Starting	Keeping operation until fully open, then stops automatically
					Downward operation	

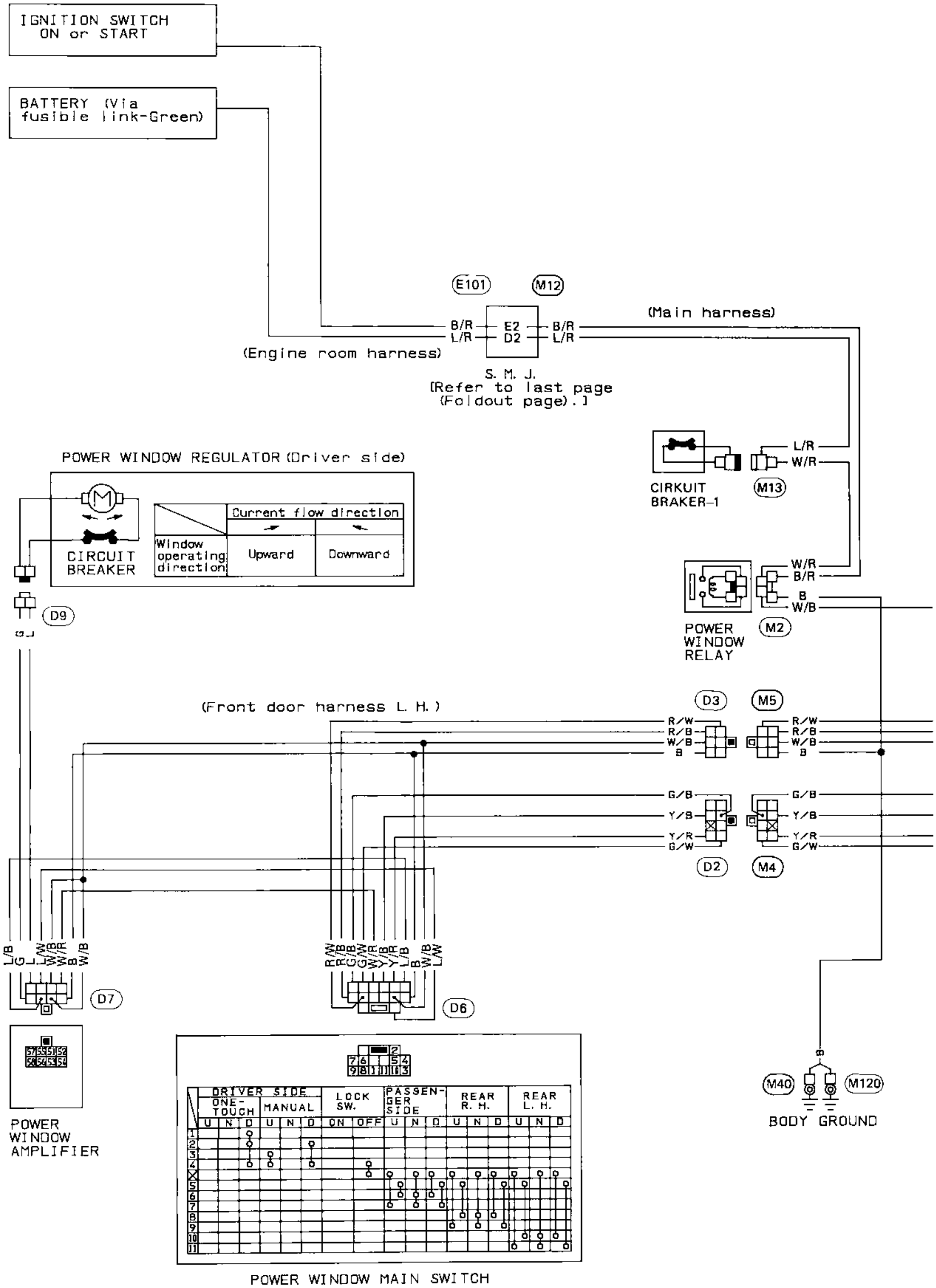
Carry out the operation check in this chart from left to right continuously

POWER WINDOW AMP — Driver s side door

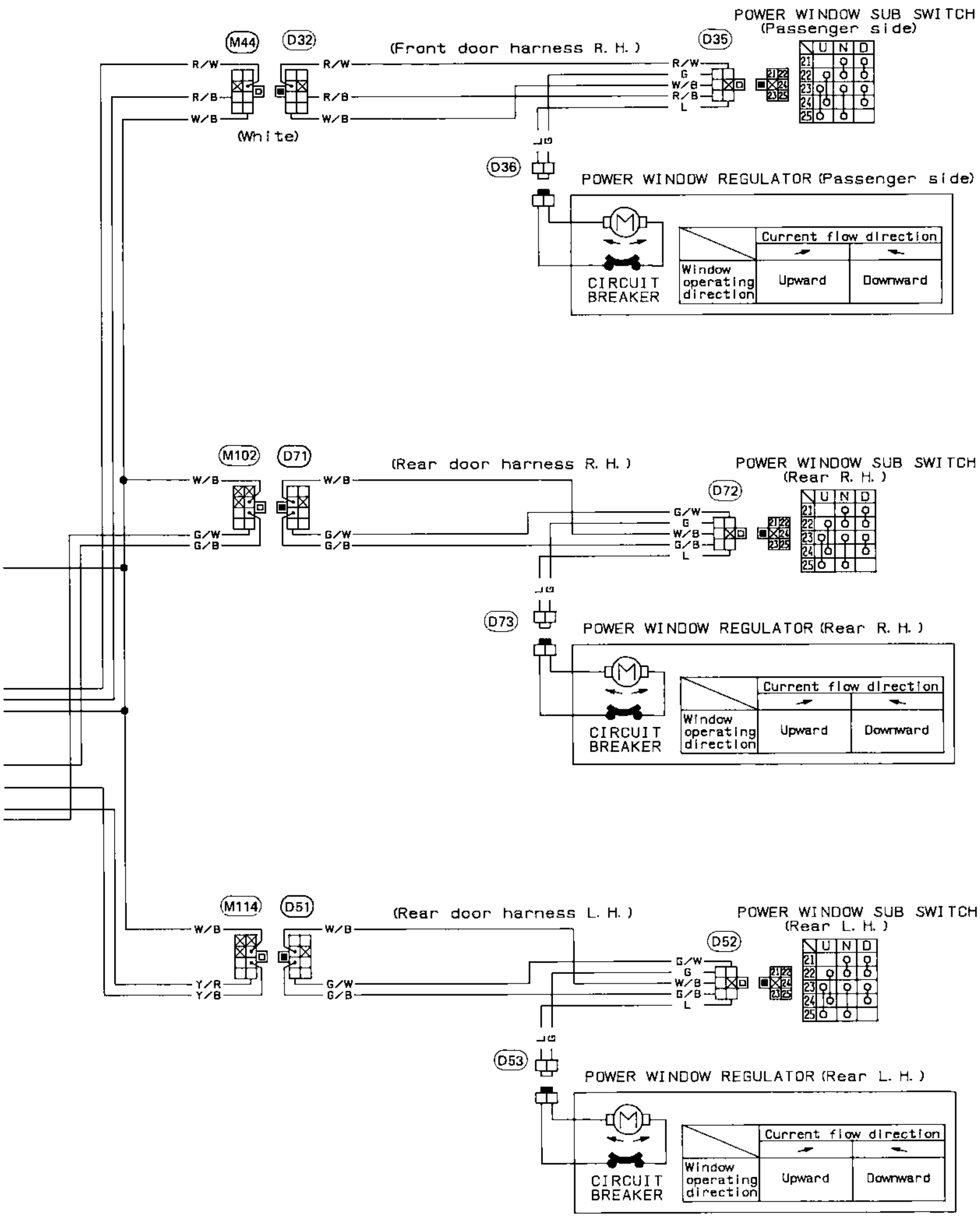
SBF312G

Power Window

WIRING DIAGRAM

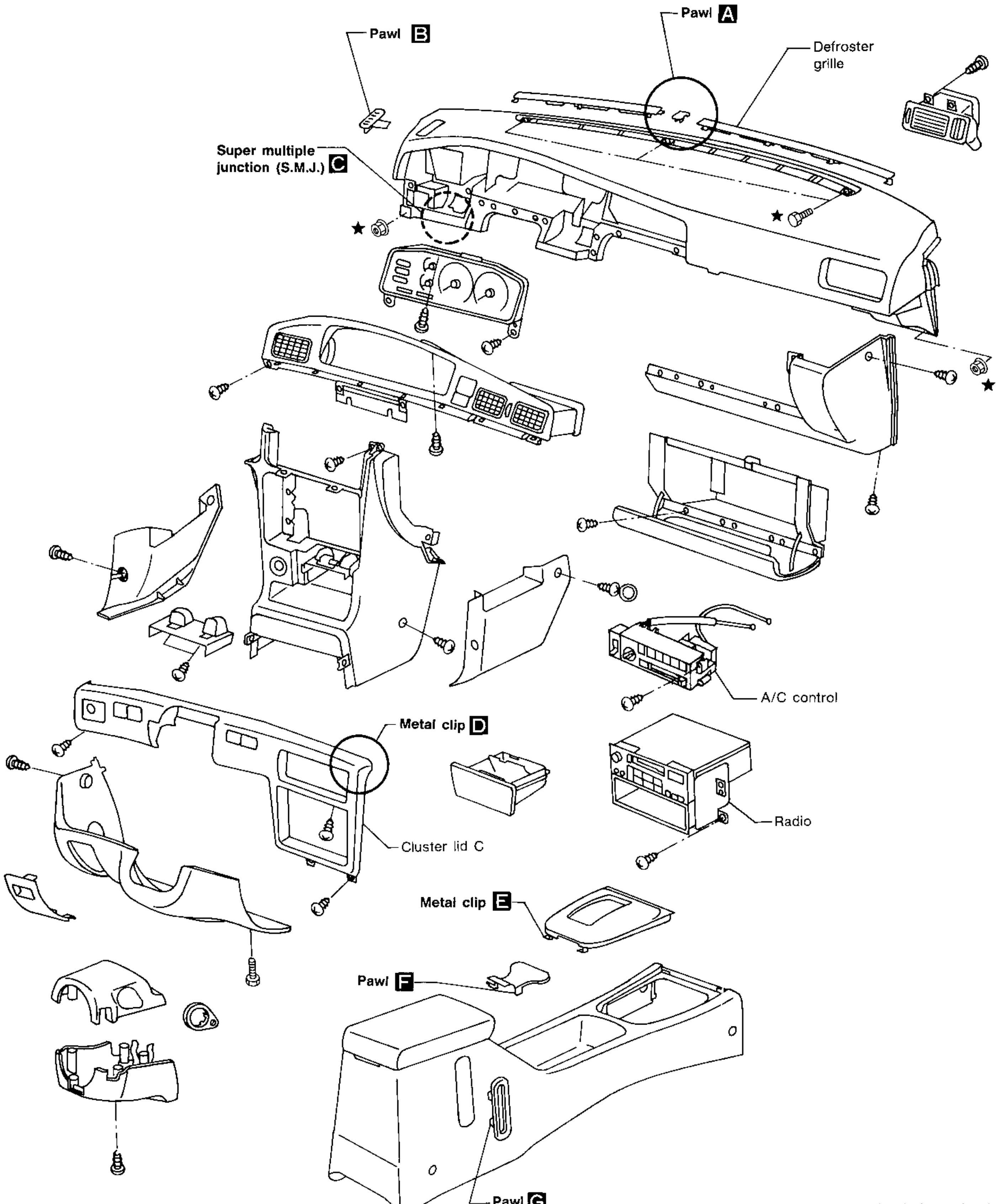


Power Window (Cont'd)

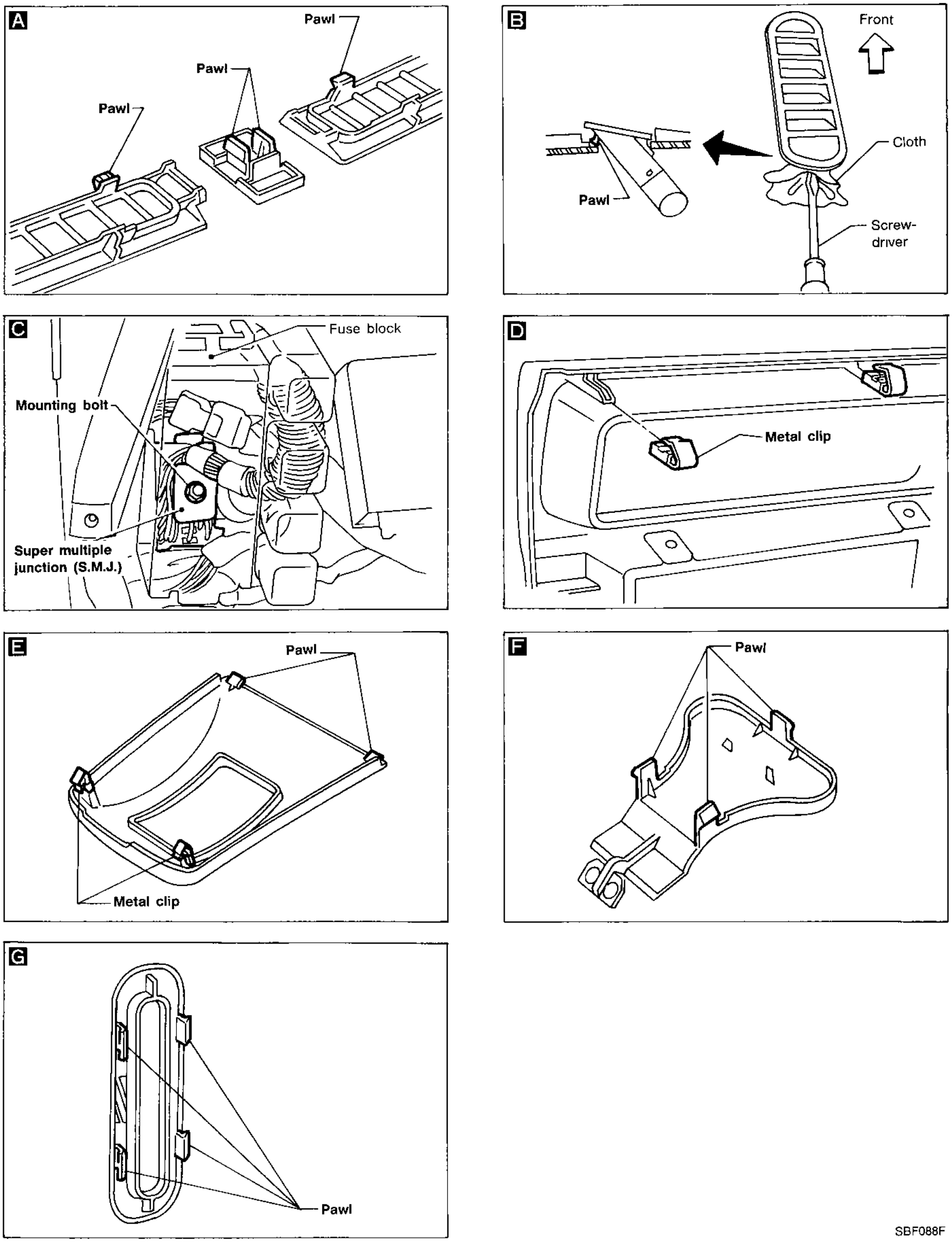


SBF144F

- When removing instrument panel assembly, remove defroster grille, combination meter, A/C or heater control, cluster lid C and S.M.J. first.



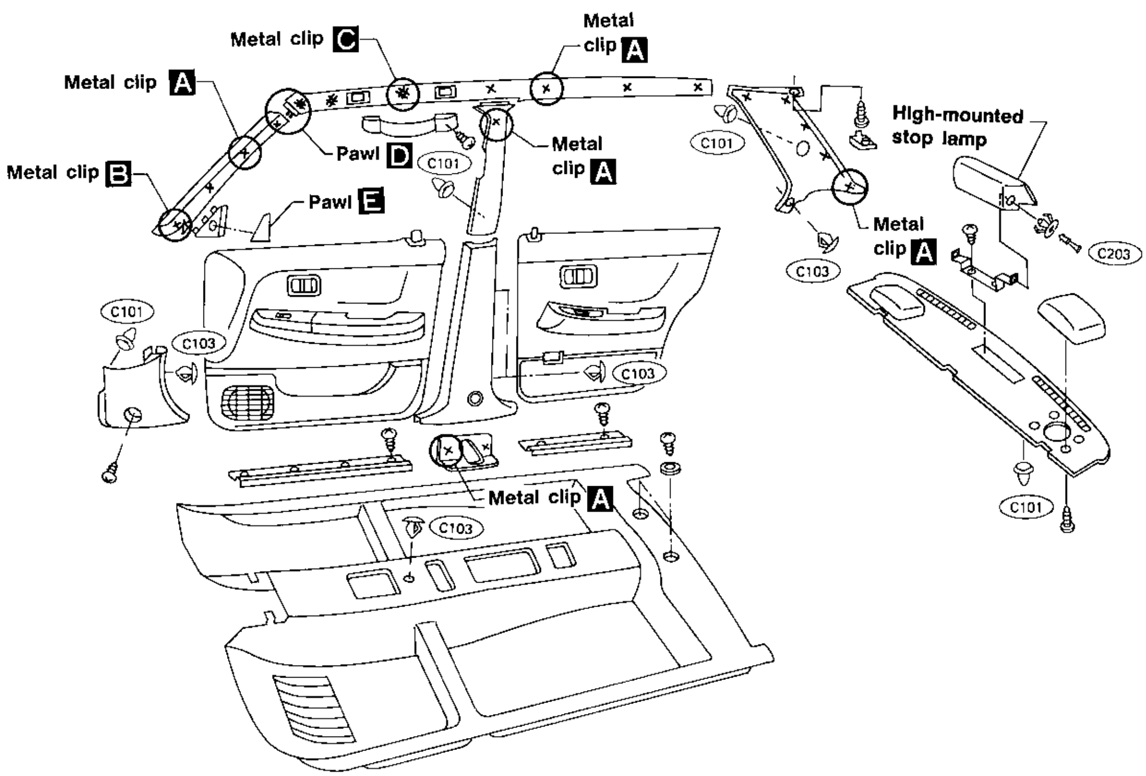
★ . Instrument panel assembly mounting bolts and nuts

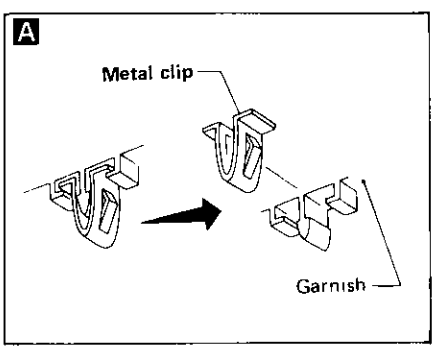

A
Pawl
Pawl
Pawl
B
Front
Cloth
Pawl
Screw-
driver
C
Fuse block
Mounting bolt
Super multiple
junction (S.M.J.)
D
Metal clip
E
Pawl
Metal clip
F
Pawl
G
Pawl

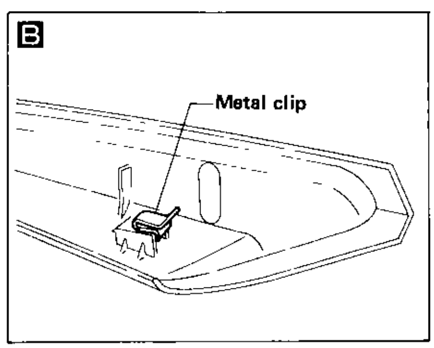
SBF088F

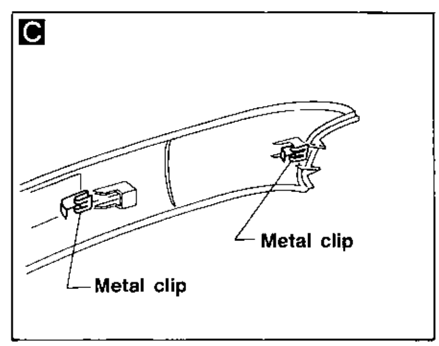
Interior

SIDE AND FLOOR TRIM — Passenger room



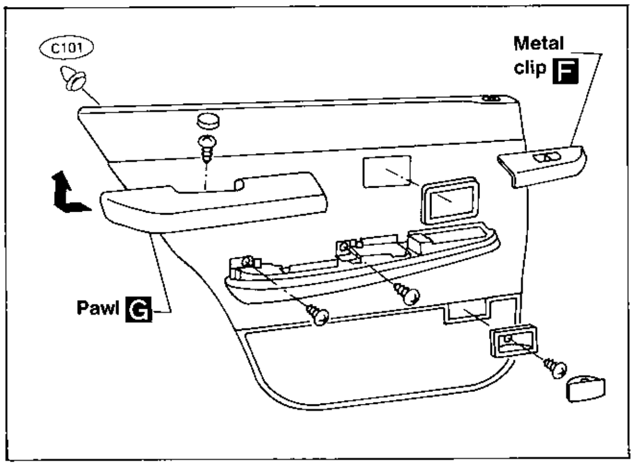




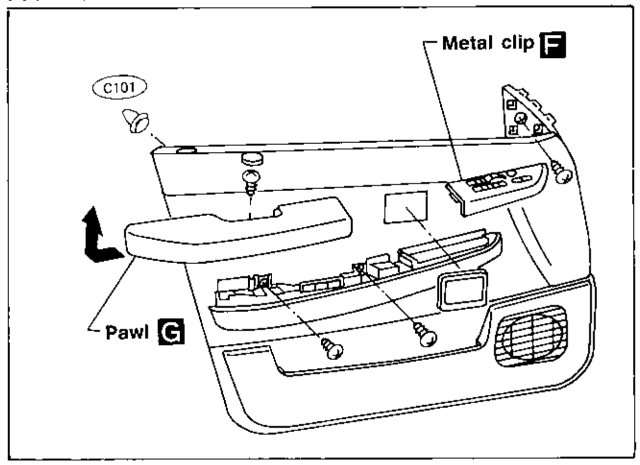


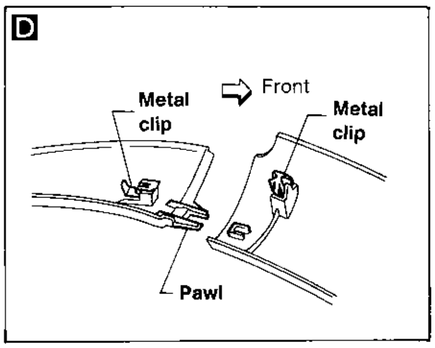
Interior (Cont'd)

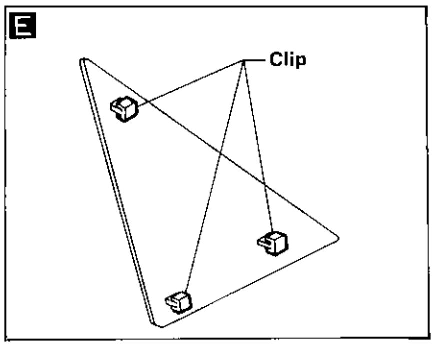
Rear door

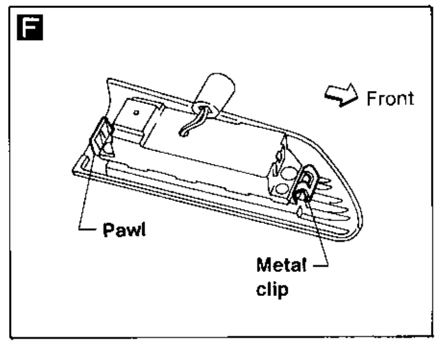


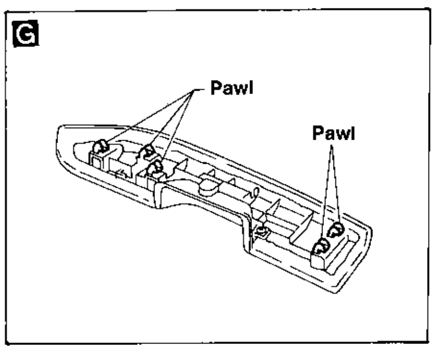
Front door







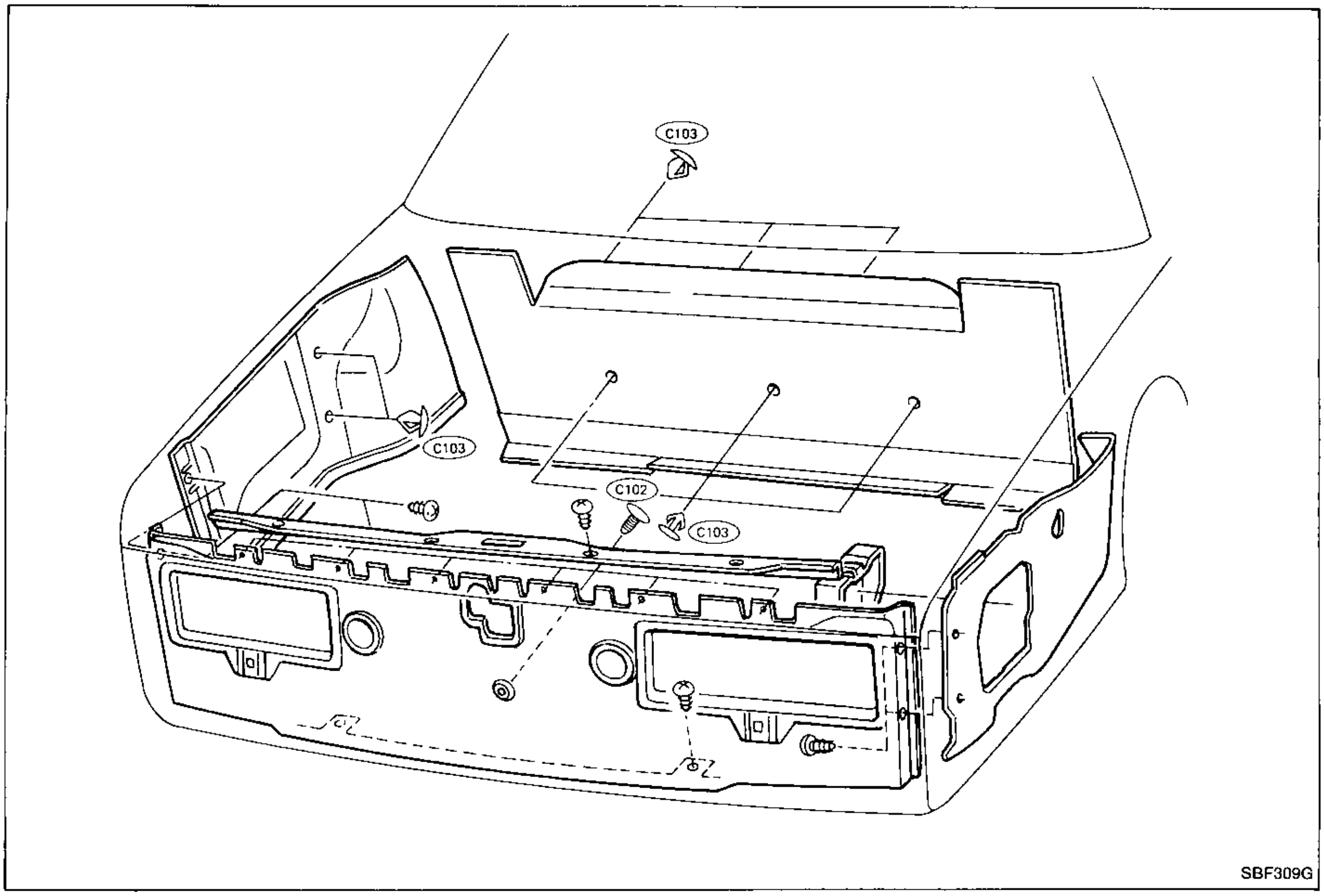




SBF307G

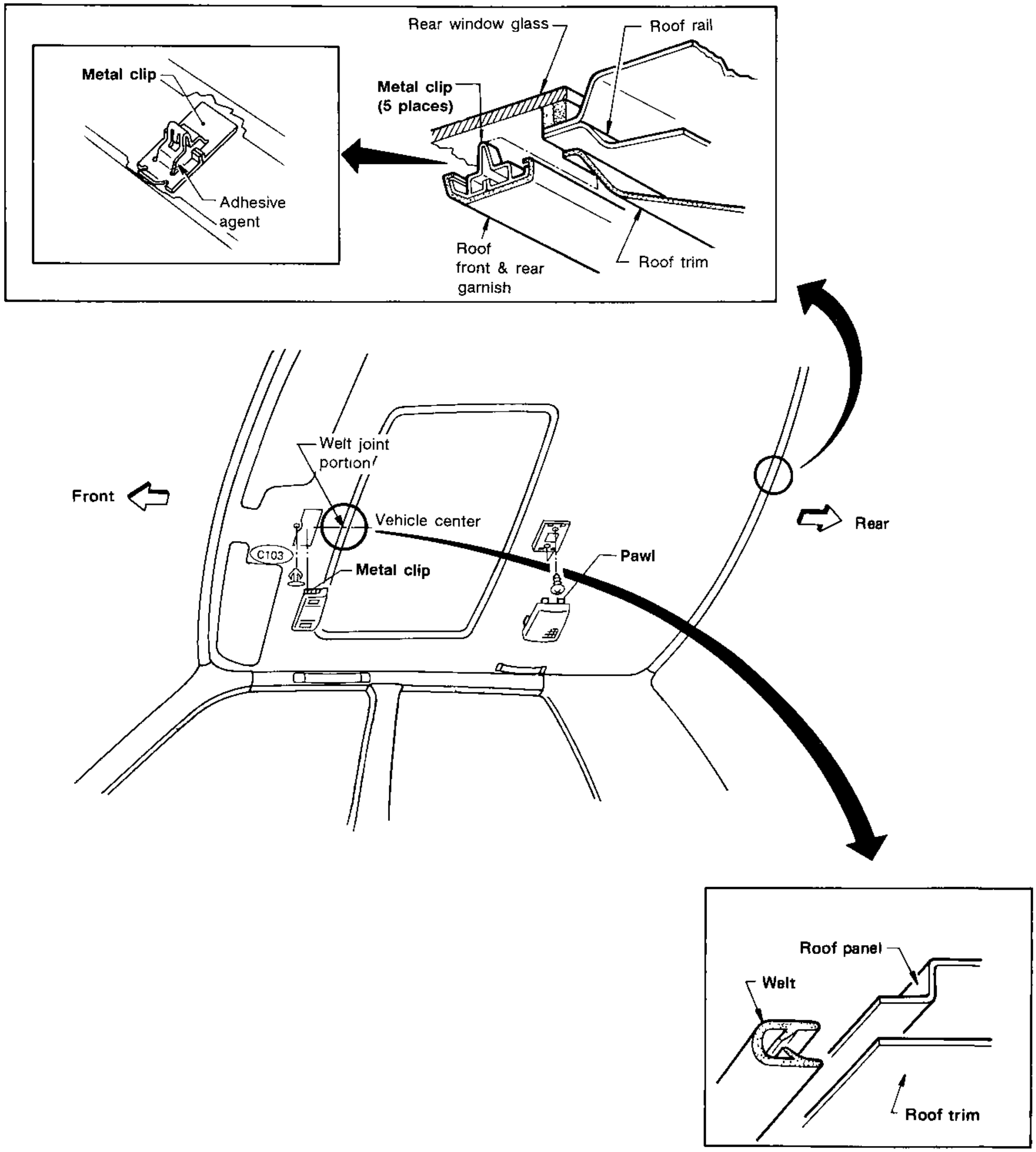
Interior (Cont'd)

LUGGAGE ROOM TRIM — Trunk space



Interior (Cont'd)

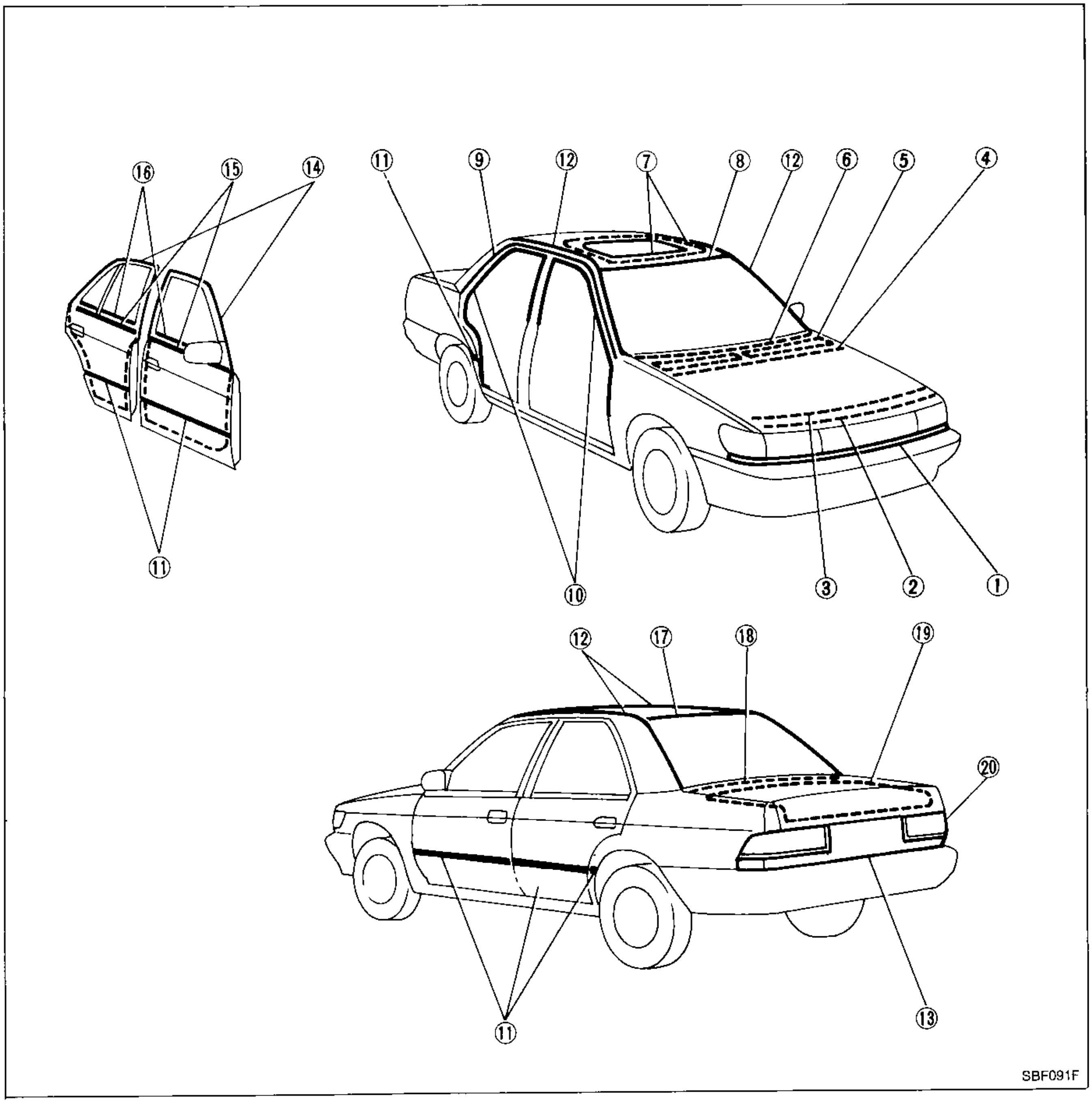
ROOF TRIM



SBF090F

Exterior

- Apply sealing compound where necessary while installing parts.
- When applying sealing compound, be careful that the sealing compound does not protrude from parts.

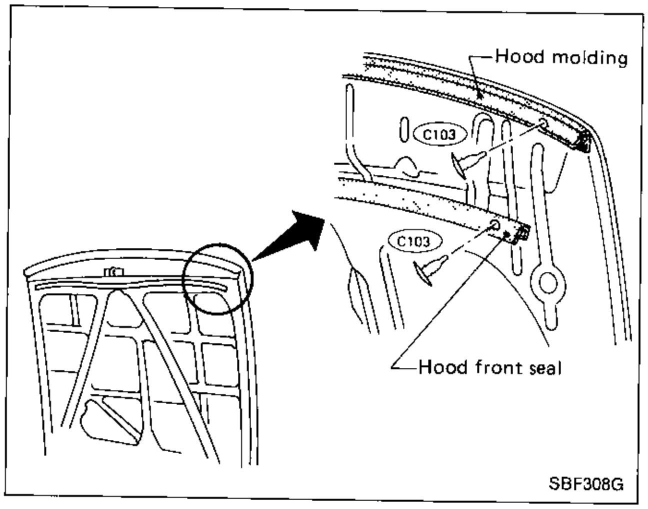


Exterior (Cont'd)

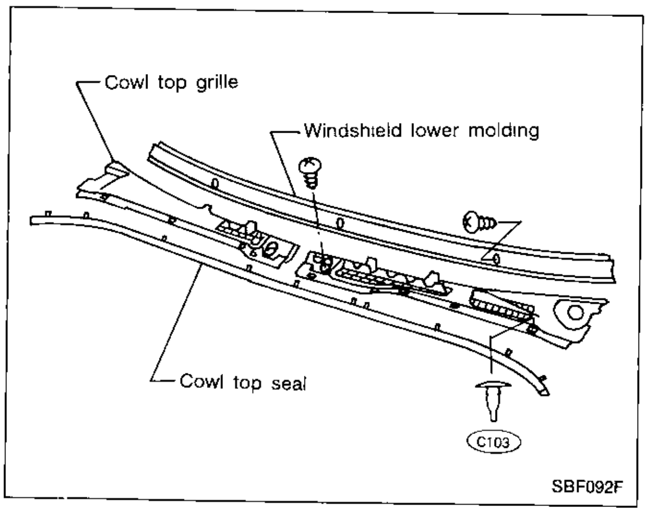
① Front bumper sight shield

Refer to "Body Front End".

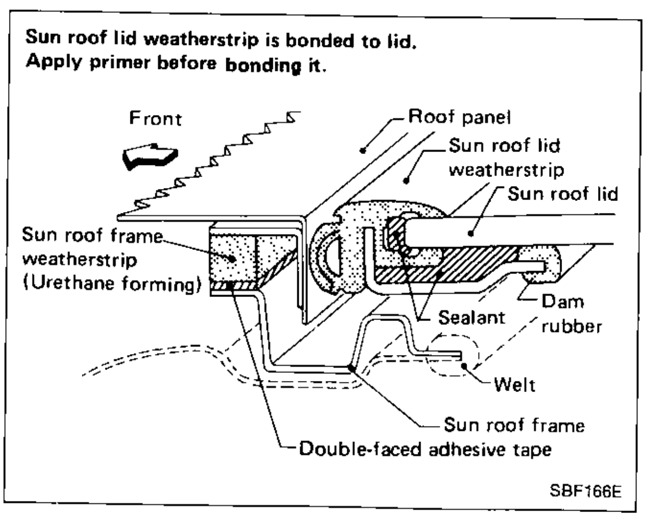
② ③ Hood molding and hood front seal



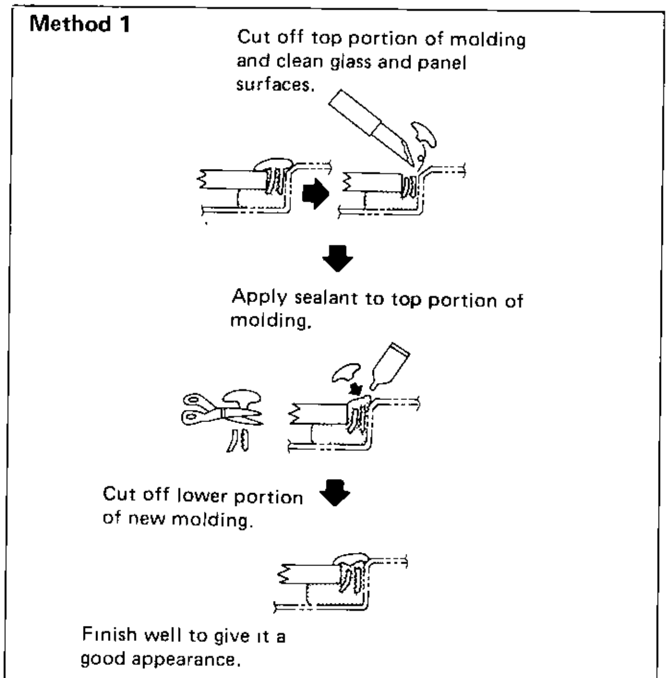
④ ⑤ ⑥ Cowl top seal, cowl top grille and windshield lower molding



⑦ Sun roof frame weatherstrip and sun roof lid weatherstrip

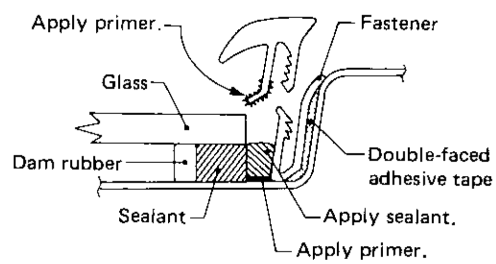


⑧ Windshield upper molding



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 to body panel, and apply primer to molding and body.



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.

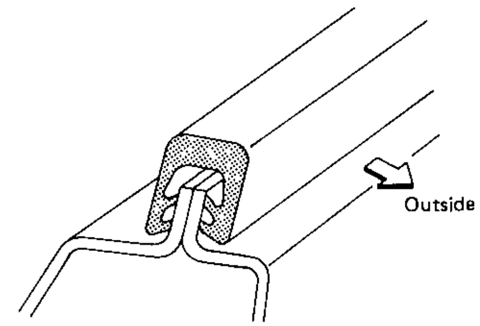
SBF161E

⑨ Drip molding

It is mounted with screws.

Exterior (Cont'd)

⑩ Body side welt



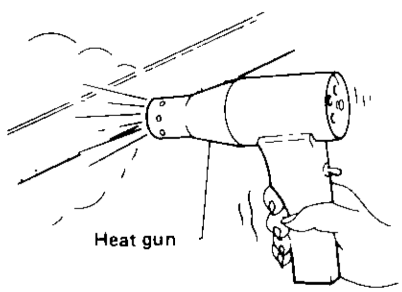
SBF110E

⑪ Side guard molding

- Side guard molding is affixed with double-faced adhesive tape.

- **Removal:**

1. Heat molding portion to 30 to 40°C (86 to 104°F) with a heat gun.



SBF455A

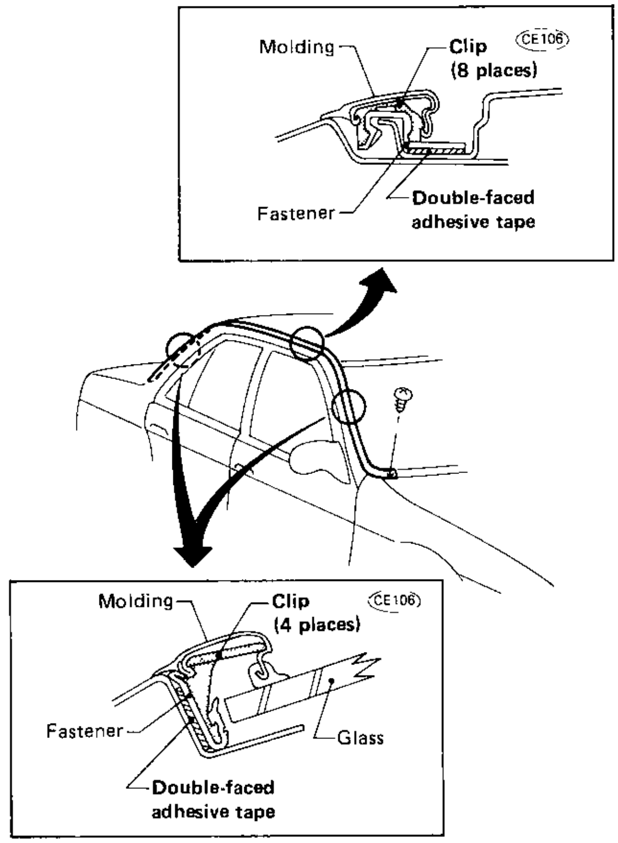
2. Raise end of molding and, while cutting off bonding agent, detach molding.

- **Installation:**

1. Remove all traces of bonding agent from body panel. Then clean contact face of body.
2. Heat body panel and molding to 30 to 40°C (86 to 104°F) with a heat gun. Then install molding.

SBF742C

⑫ Roof side molding

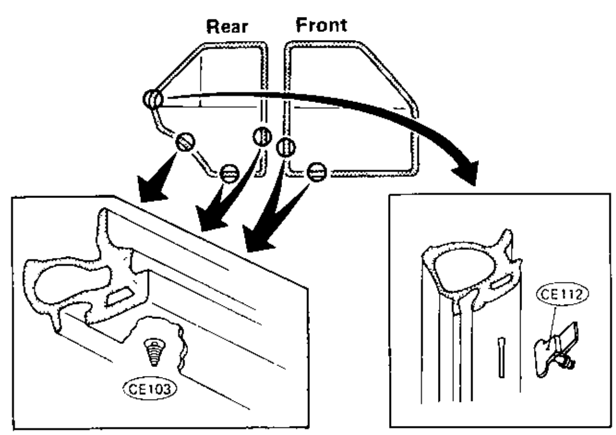


SBF111E

⑬ Rear bumper sight shield

Refer to "Body Rear End".

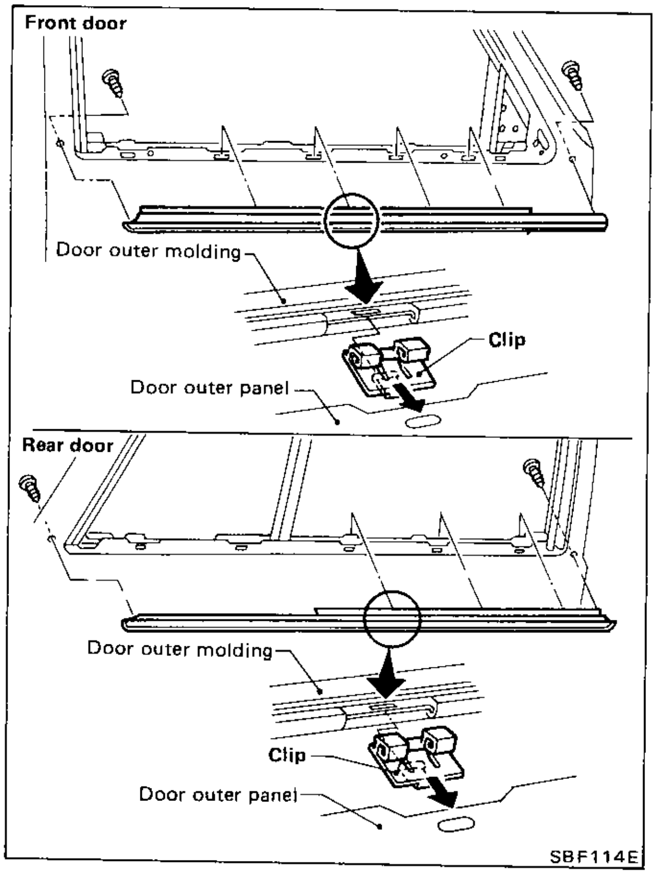
⑭ Door weatherstrip



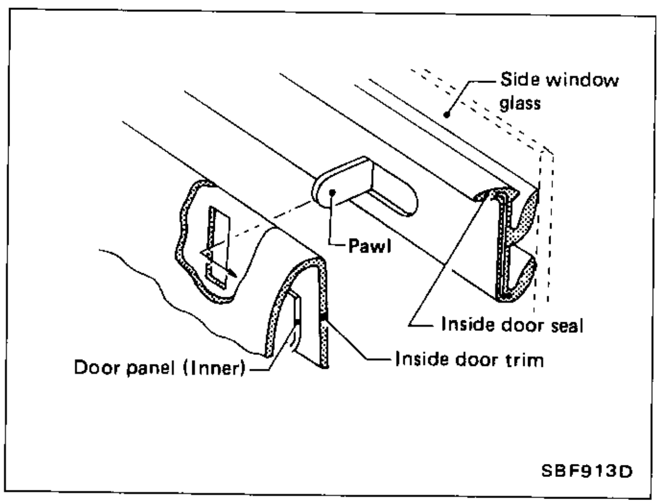
SBF113E

Exterior (Cont'd)

⑮ Door outside molding



⑯ Door inside seal



⑰ Rear window upper molding

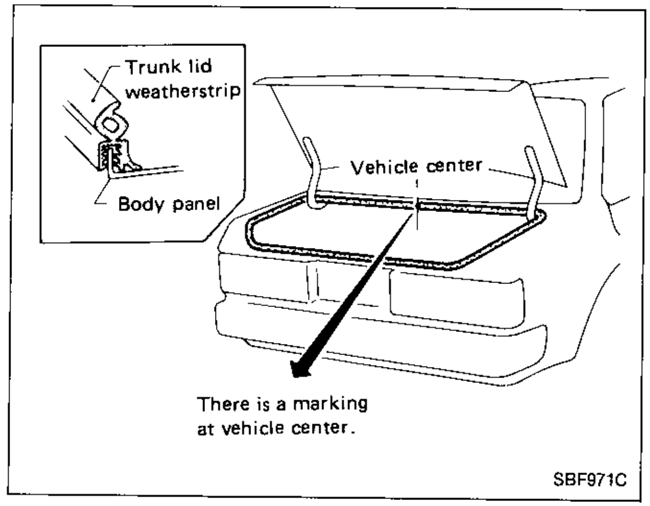
Basically the same as windshield upper molding.

Refer to ⑦ Windshield upper molding.

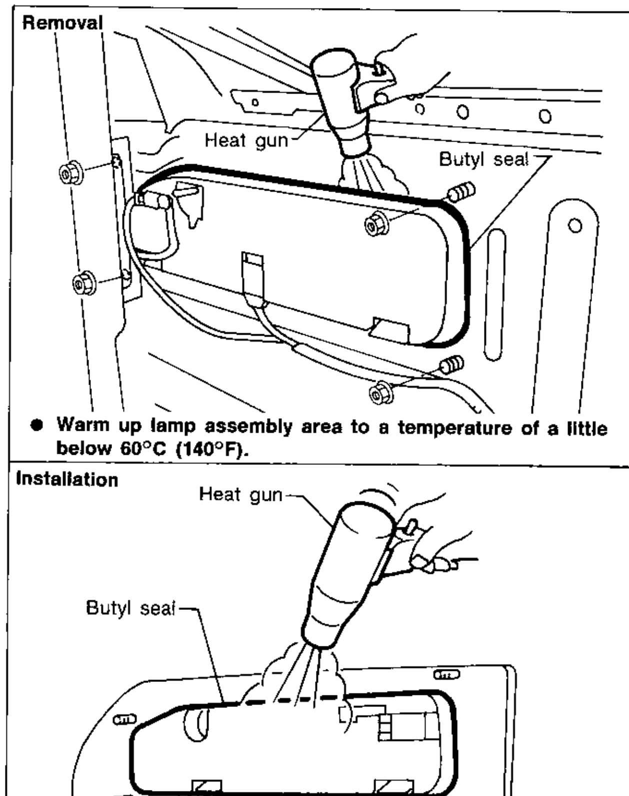
⑱ Rear window lower molding

It is mounted with screws.

⑲ Trunk lid weatherstrip



⑳ Rear combination lamp

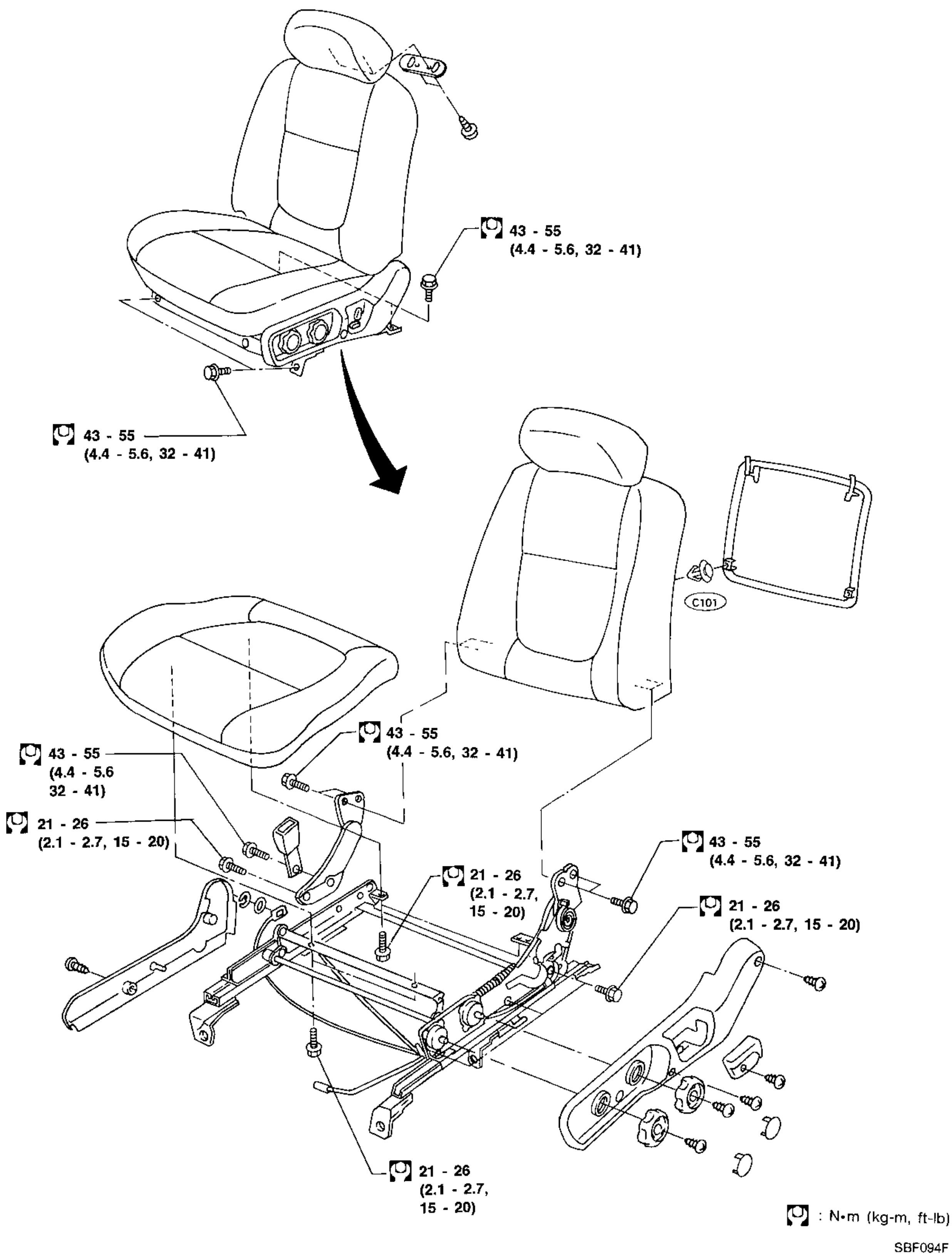


Removal
- Warm up lamp assembly area to a temperature of a little below 60°C (140°F).

Installation
- Apply butyl seal evenly as it tends to become thin in the corners.
- Warm up lamp assembly area to a temperature of a little below 60°C (140°F).

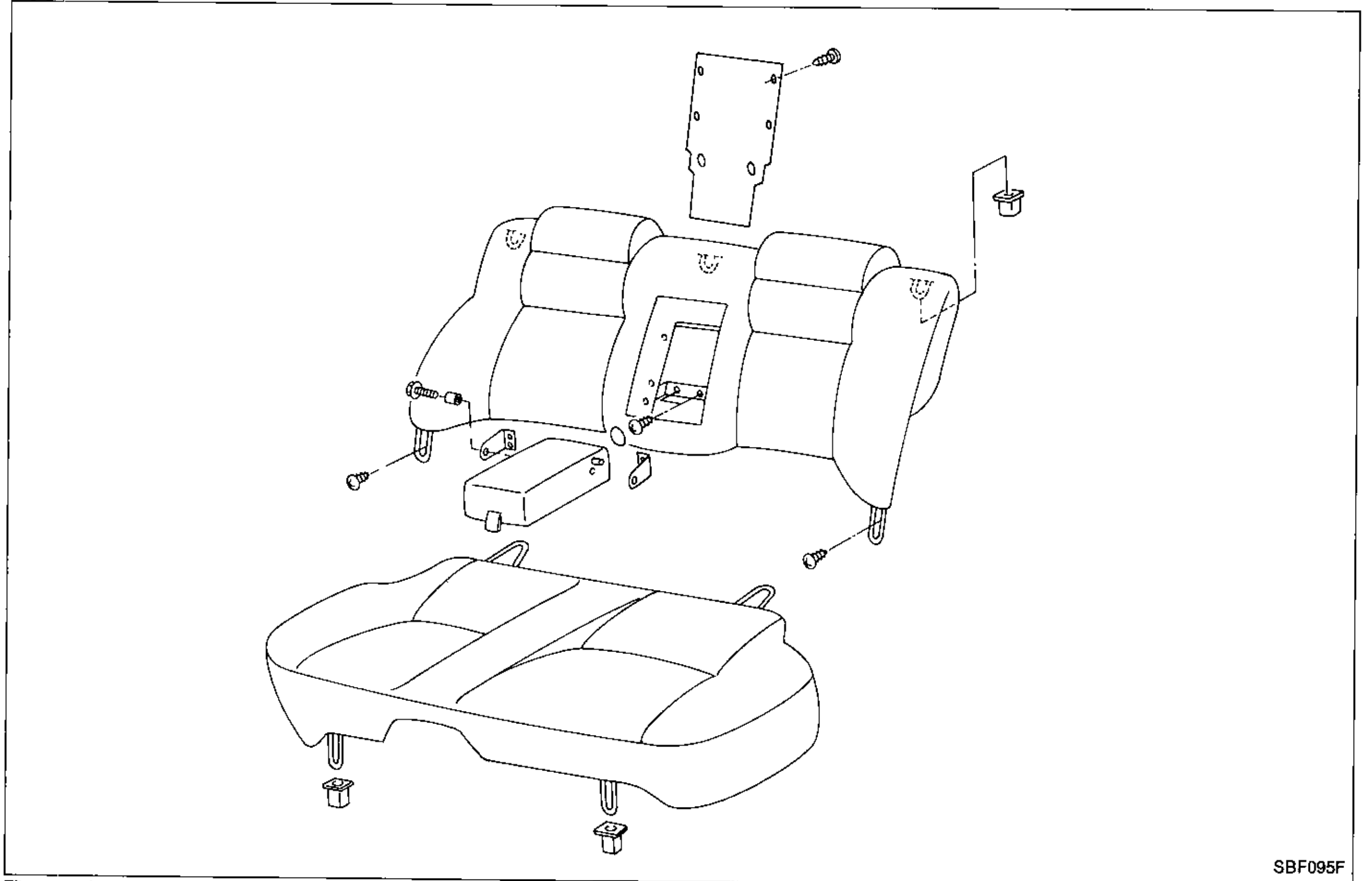
- When removing or installing the seat trim, carefully handle it to keep dirt out and avoid damage.

Front Seat

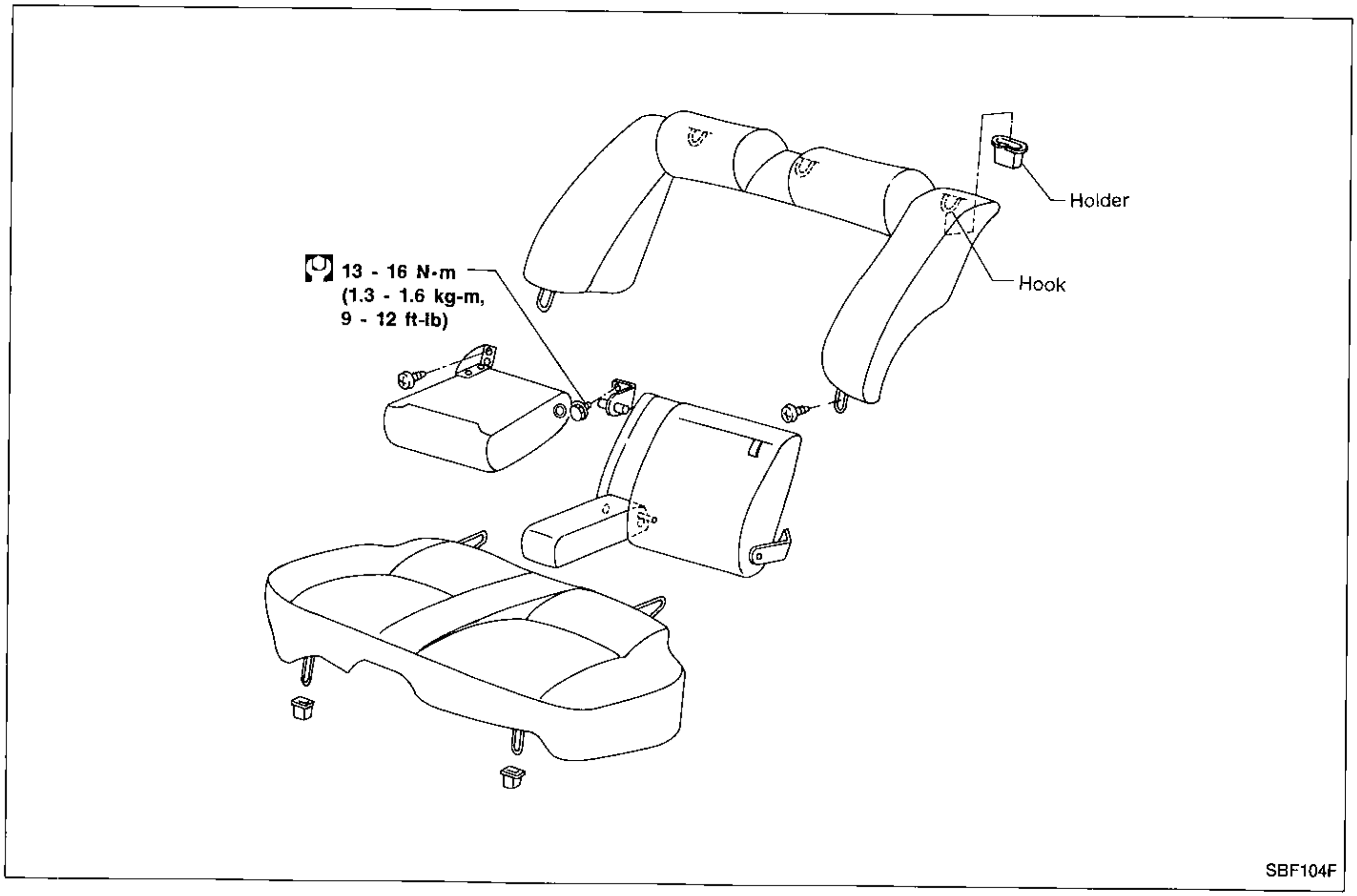


Rear Seat

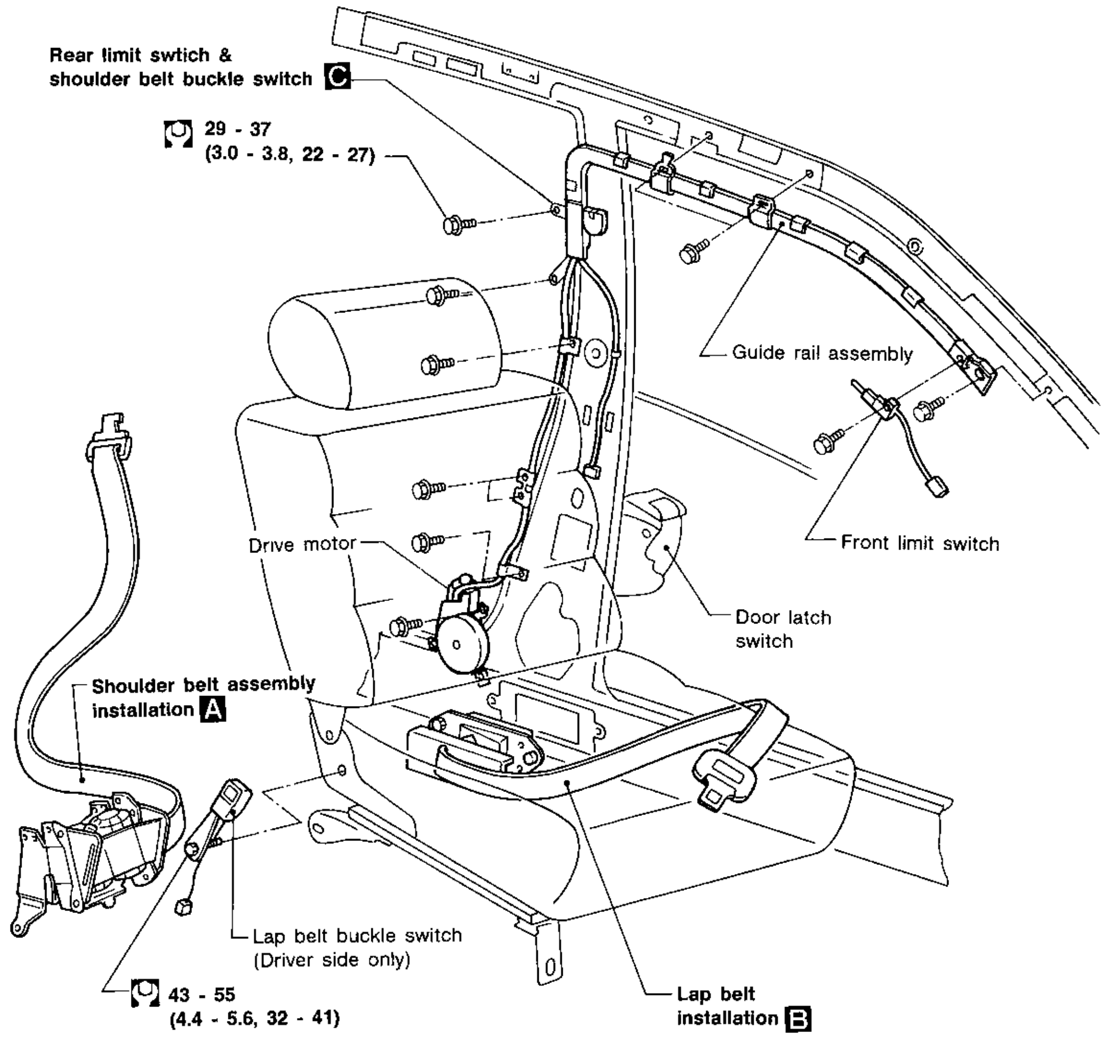
Type 1



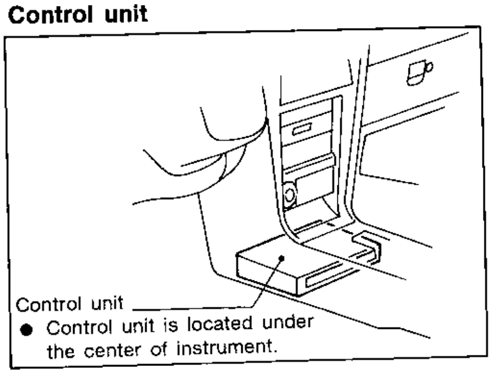
Type 2



Unit Location

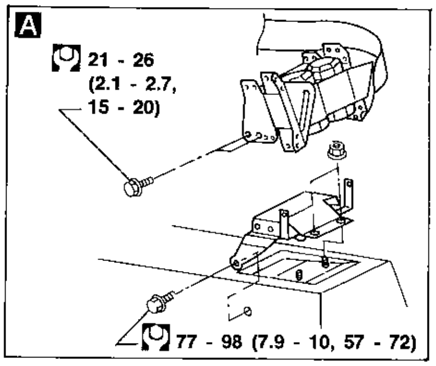


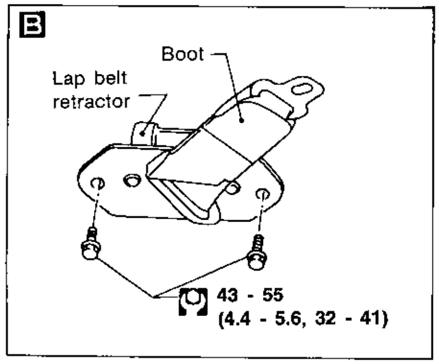
Control unit

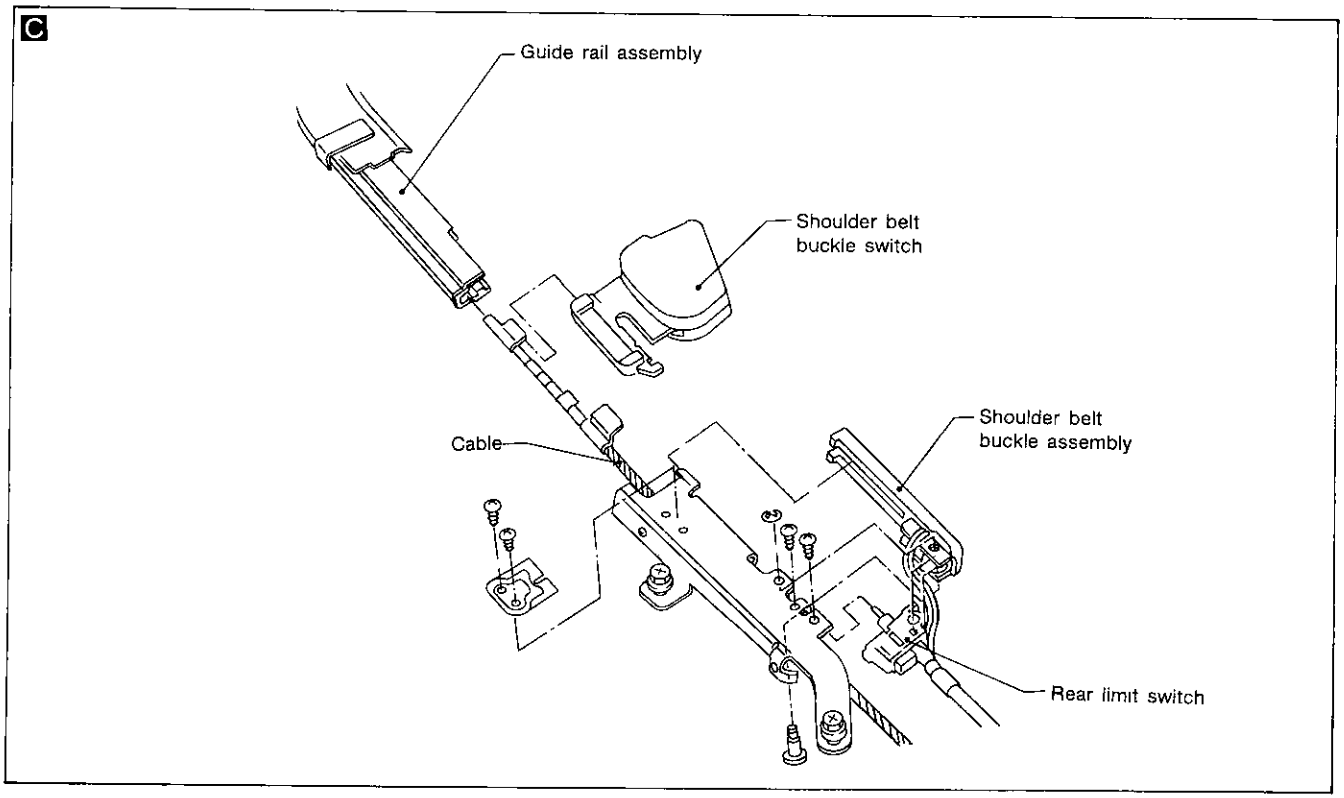


: N•m (kg-m, ft-lb)

Unit Location (Cont'd)

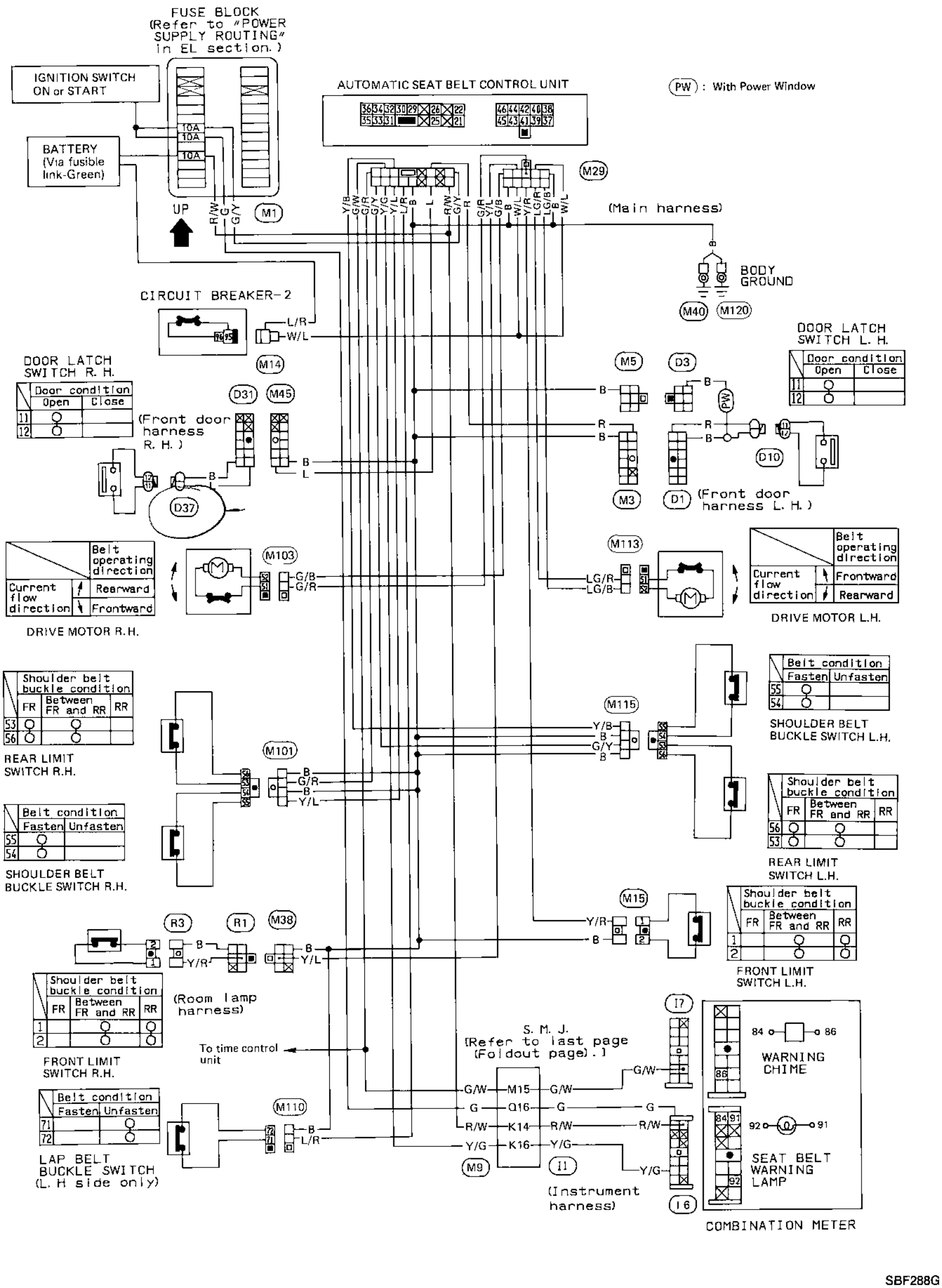






SBF096F

Wiring Diagram



Description

FUNCTION

Shoulder belt buckle is mainly operated while ignition switch is "ON".

Condition (A): Ignition switch is "ON".

When door is opened, shoulder belt buckle is moved frontward and when door is closed, buckle is moved rearward.

Condition (B): Ignition switch is "OFF".

When door is opened, shoulder belt buckle is moved frontward. When the door is closed, buckle will remain in front position.

(Voltage of output signal is approximate value.)

Input signal	Ignition swich		OFF	OFF	ON	ON	ON	ON	ON	ON	OFF	O FF	OFF
	Door latch switch		OFF	ON	OFF	OFF	OFF	ON	ON	ON	OFF	ON	ON
	Front limit switch		OFF	OFF	OFF	ON	ON	ON	ON	OFF	ON	ON	ON
	Rear limit switch		ON	ON	ON	ON	OFF	OFF	ON	ON	OFF	O FF	ON
Output signal	Drive motor power source for frontward operation		0V	0V	0V	0V	0V	12V	12V	0V	0V	1 2V	12V
	Drive motor power source for rearward operation		0V	0V	12V	12V	0V	0V	0V	0V	0V	0V	0V
Shoulder belt buckle		Function	Stop	Stop	Start to move	Moving	Stop	Start to move	Moving	Stop	Stop	Start to move	Moving
		Position	Front	Front	Front	Between Front & Rear	Rear	Rear	Between Front & Rear	Front	Rear	Rear	Between Front & Rear

TIMER (Ignition switch either "ON" or "OFF")

If limit switch does not operate (when accomplishing frontward operation when door is opened, front limit switch can not be turned "OFF" or when accomplishing rearward operation, rear limit switch can not be turned "OFF"), control unit will continue to supply power to drive motor for 15 seconds.

QUICK WARNING (Ignition switch "ON")

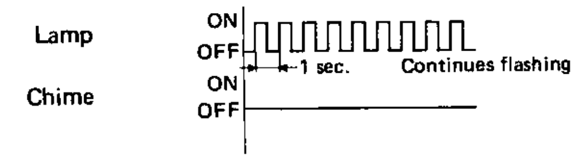
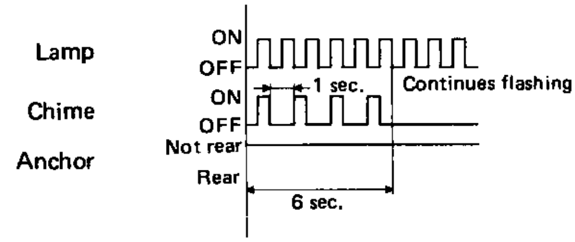
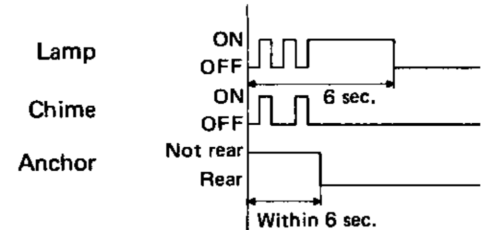
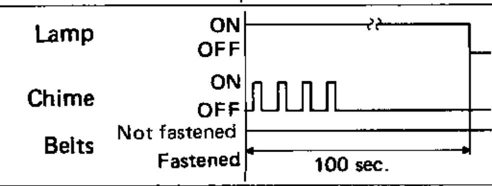
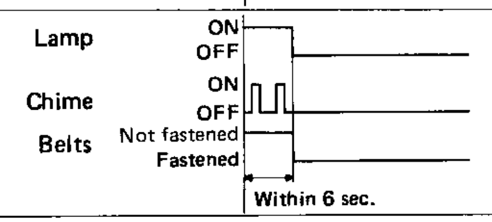
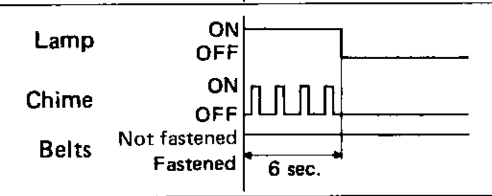
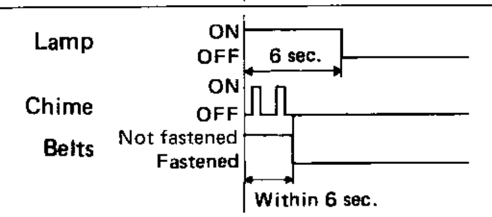
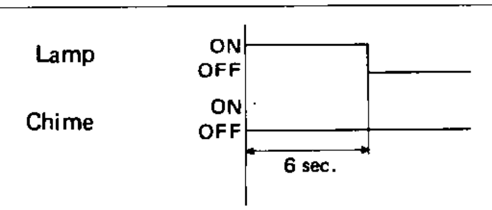
If front limit switch is not turned "OFF" after accomplishing frontward operation (when door is opened), control unit will stop supplying power 15 seconds later and warning lamp will flash and chime will operate rapidly for approximately 6 seconds.

REAR LOCK (Fail safe operation)

If quick warning functions twice successively while ignition switch is "ON", shoulder belt buckle will move to rear position when the door is closed as normal but will remain in rear position even if door is opened. This oparation is canceled when ignition switch is "OFF".

Description (Cont'd)

WARNING

Priority	Warning item	Ignition switch	Indication of warning (Indicating time is approximate value.)
1	Shoulder anchors are not at rear lock position. (All belts are fastened.) Condition: • Door is opened. • When closing door within 6 sec.	ON	
		OFF → ON	
			
2	Either or both shoulder belts are not fastened. Condition: • Doors are closed. • When unfastening shoulder belt with doors closed.	ON	
			
3	Only driver side lap belt is not fastened. Condition: • Doors are closed.	OFF → ON	
			
4	Normal (All belts are fastened and shoulder anchors are in rear lock position.) Condition: • Doors are closed.	OFF → ON	

Contents

RF Door lock

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(Check motor circuit and stop signals.) BF-40
Diagnostic Procedure 2
(Check door switch circuit.) BF-43
Diagnostic Procedure 3
(Check front limit switch circuit.) BF-44
Diagnostic Procedure 4
(Check rear limit switch circuit.) BF-45
Diagnostic Procedure 5
(Check shoulder belt switch circuit.) BF-46
Diagnostic Procedure 6
(Check lap belt switch circuit.) BF-47
Diagnostic Procedure 7
(Check warning chime circuit.) BF-48
Diagnostic Procedure 8
(Check warning lamp circuit.) BF-49
Electrical Components Inspection BF-49

Since left and right component parts are basically the same, harness layout and methods for electrical components inspection are shown for one side only.
For those methods enclosed by double rectangles, component parts on both sides must be checked.

Harness Layout

Refer to EL section.

Symptom Chart

Procedure	Reference page		SYMPTOM	No operation has made (No warning indicated and no buckles movement performed)	Shoulder belt buckle in L.H. or R.H. side does not move.	Shoulder belt buckle moves frontwards only. (not rearwards)	Shoulder belt buckle moves rearwards only. (not frontwards)	Warnings indicate incorrectly or do not function.	Quick warning operates.
Electrical Components Inspection	BF-50	R.H. side	Motor	○	○				
	BF-50		Shoulder belt buckle switch	○				○	
	BF-50		Door latch switch	○		○	○		
	BF-50		Rear limit switch	○	○	○		○	
	BF-49		Front limit switch	○	○		○		○
	BF-50	L.H. side	Lap belt switch	○				○	
	BF-50		Motor	○	○				
	BF-50		Shoulder belt buckle switch	○				○	
	BF-50		Door latch switch	○		○	○		
	BF-50		Rear limit switch	○	○	○		○	
	BF-49		Front limit switch	○	○		○		○
	—		Warning chime	○				○	
	—		Warning lamp	○				○	
Diagnostic Procedure	BF-49		Procedure 8					○	
	BF-48		Procedure 7					○	
	BF-47		Procedure 6					○	
	BF-46		Procedure 5					○	
	BF-45		Procedure 4	○	○	○		○	
	BF-44		Procedure 3	○	○		○		○
	BF-43		Procedure 2			○	○		
	BF-40		Procedure 1	○	○				
Main Power Supply and Ground Circuit Check	BF-38		Procedure 2		○				
	BF-38		Procedure 1	○					
Preliminary Check	BF-36		Procedure 2					○	
	BF-35		Procedure 1		○	○	○		

Preliminary Check

PROCEDURE 1

START

↓

Turn ignition switch and all other electrical switches "OFF", and close door.

↓

Disconnect negative cable from battery.

↓

Open door.

↓

Move shoulder belt buckle to center (not rear lock position and not front stop position) by wrench supplied in tool bag or equivalent.

↓

Close door.

↓

Connect battery cable.

↓

STEP 1

Does shoulder belt buckle move frontwards?
- Yes → Go to Diagnostic Procedure 2. (See page BF-43.)
- No ↓

Open door.

↓

STEP 2

Does shoulder belt buckle move frontwards?
- No → (Go to Ⓐ on next page.)
- Yes ↓

Close door, and turn ignition switch "ON".

↓

STEP 3

Does shoulder buckle move rearwards?
- No → Go to Diagnostic Procedure 4. (See page BF-45.)
- Yes ↓

END

Preliminary Check (Cont'd)

Ⓐ

Turn ignition switch "ON".

STEP 4

Does shoulder belt buckle move rearwards?

- Yes → Go to Diagnostic Procedure 2. (See page BF-43.)
- No ↓

Close door.

STEP 5

Does shoulder belt buckle move rearwards?

- No → Go to PROCEDURE 2 in Main Power Supply and Ground Circuit Check. (See page BF-38.) Then go to Diagnostic Procedure 1. (See page BF-40.)
- Yes ↓

Go to Diagnostic Procedure 3. (See page BF-56.)

PROCEDURE 2

START

Fasten all seat belt and open both doors.

Turn ignition switch "ON".

STEP 1

Does warning chime sound for 6 seconds after switch is turned on?

- No → Go to Diagnostic Procedure 7. (See page BF-48.)
- Yes ↓

STEP 2

Is warning lamp flashing now?

- No → Go to Diagnostic Procedure 8. (See page BF-49.)
- Yes ↓

Close both doors.

STEP 3

Is warning lamp flashing although shoulder belt buckles reached rear lock position?

- Yes → Go to Diagnostic Procedure 4. (See page BF-45.)
- No ↓

Ⓑ

Preliminary Check (Cont'd)

Ⓑ

Unfasten L.H. shoulder belt.

STEP 4

Does warning chime sound for 6 seconds and warning lamp glow after belt is unfastened?

- No → Go to Diagnostic Procedure 5. (See page BF-46.)
- Yes ↓

Fasten L.H. shoulder belt.

Unfasten R.H. shoulder belt.

STEP 5

Does warning chime sound for 6 seconds and warning lamp glow after belt is unfastened?

- No → Go to Diagnostic Procedure 5. (See page BF-46.)
- Yes ↓

Fasten R.H. shoulder belt.

Unfasten L.H. lap belt, and turn ignition switch "OFF".

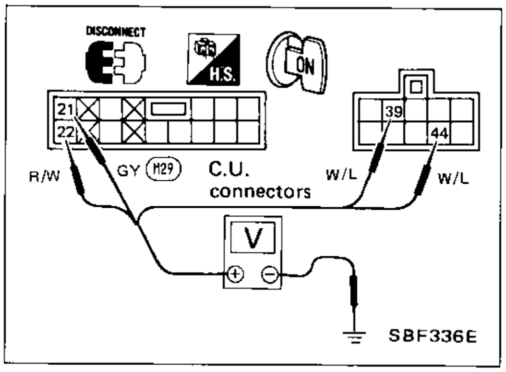
Turn ignition switch "ON".

STEP 6

Does warning chime sound and warning lamp glow for 6 seconds after the switch is turned on?

- No → Go to Diagnostic Procedure 6. (See page BF-47.)
- Yes ↓

END

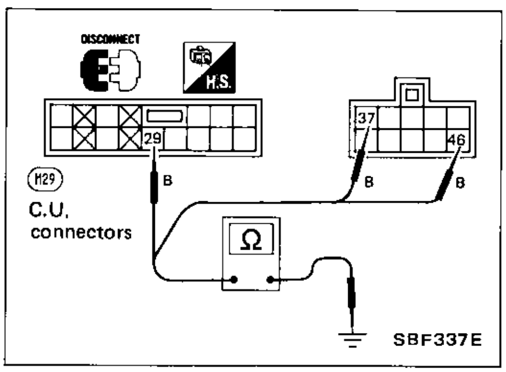


Main Power Supply and Ground Circuit Check

PROCEDURE 1

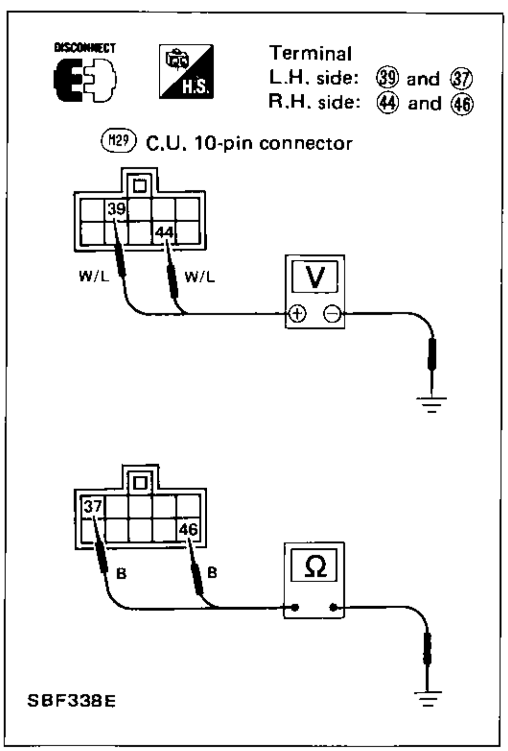
Main power supply

Terminals	Battery voltage existence condition	
	Ignition switch "ON"	Other than ignition switch "ON"
21 - Ground	Yes	No
22 - Ground	Yes	Yes
39 - Ground	Yes	Yes
44 - Ground	Yes	Yes



Ground circuit

Terminals	Continuity
29 - Ground	Yes
37 - Ground	Yes
46 - Ground	Yes



PROCEDURE 2

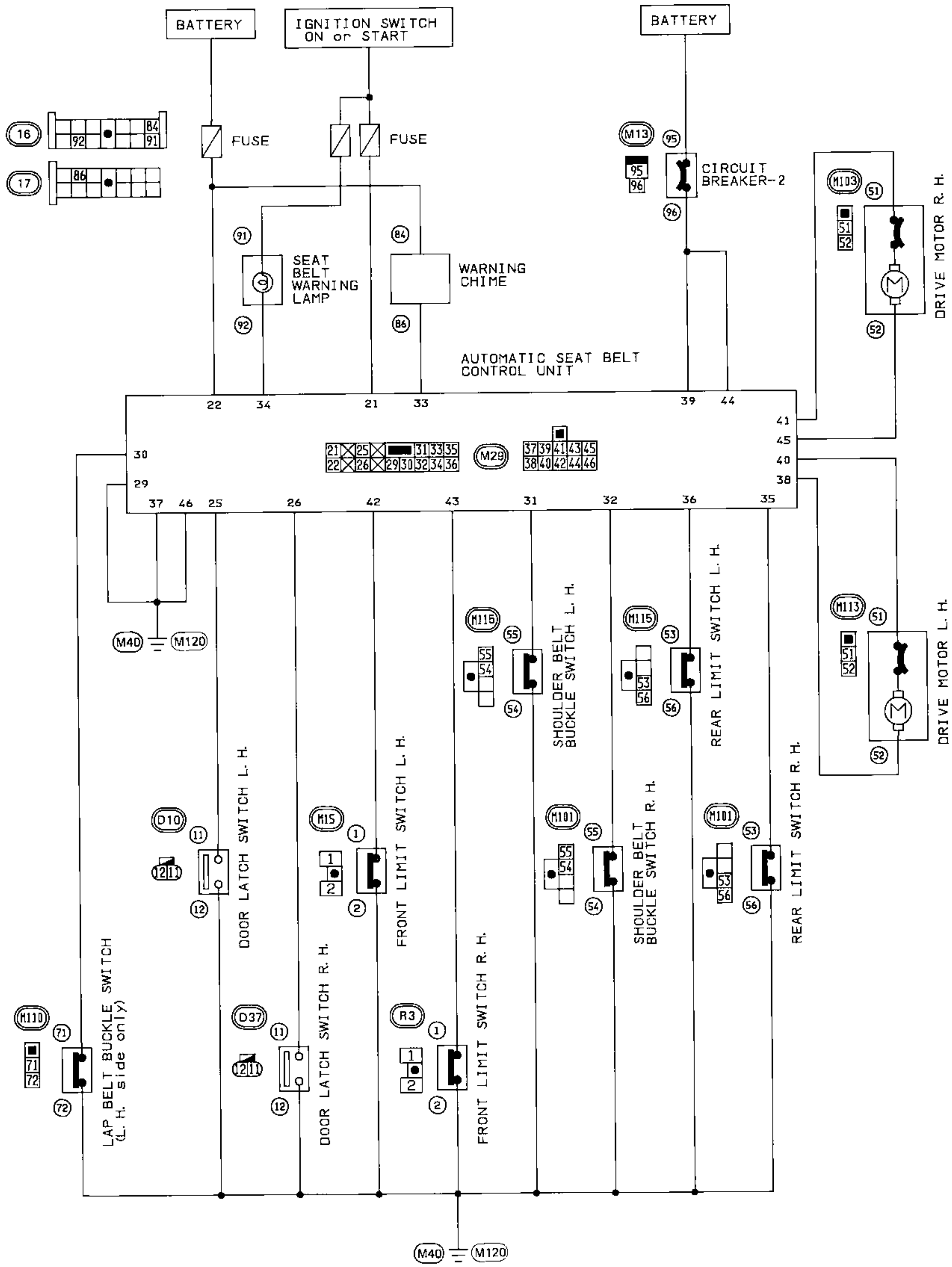
Power supply for motor drive

	Terminals	Battery voltage existence
L.H. side	39 - Ground	Yes
R.H. side	44 - Ground	Yes

Ground circuit for motor drive

	Terminals	Continuity
L.H. side	37 - Ground	Yes
R.H. side	46 - Ground	Yes

Circuit Diagram for Quick Pinpoint Check



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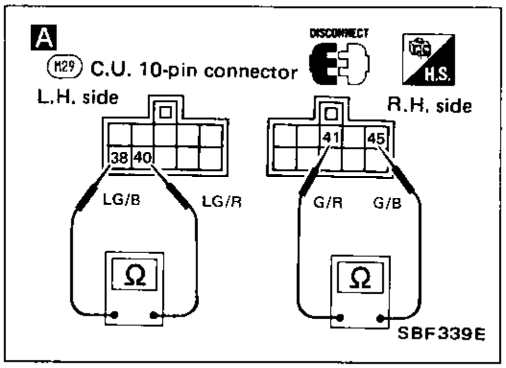
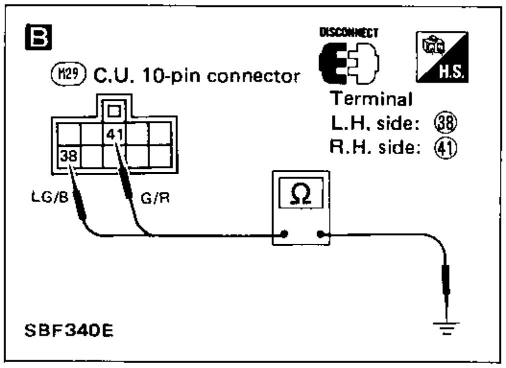
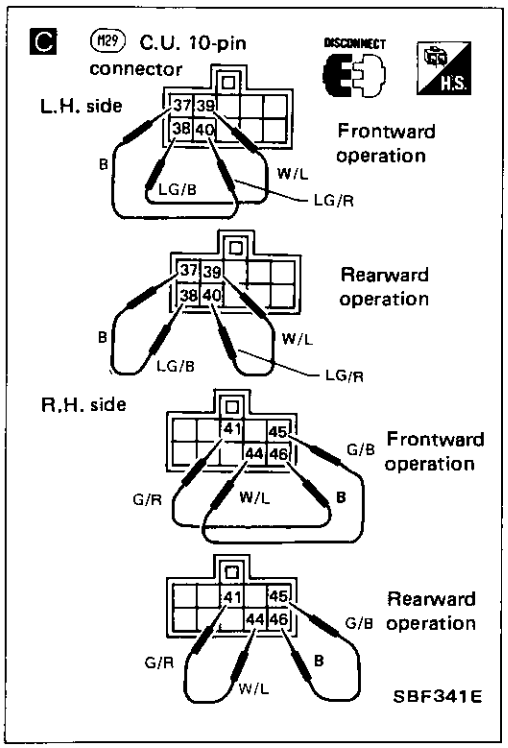






Diagnostic Procedure 1

START

A

CHECK MOTOR CIRCUIT.
1) Disconnect 10-pin connector from control unit.
2) Check continuity.

	Terminals
L.H. side	38 - 40
R.H. side	41 - 45

Continuity should exist.

N.G. → (Go to Ⓐ on next page.)

O.K. ↓

B

Does continuity exist?

	Terminals
L.H. side	38 - Ground
R.H. side	41 - Ground

Yes → (Go to Ⓑ on next page.)

No ↓

C

CHECK MOTOR OPERATION.
Check shoulder belt buckle movement.

O.K. → (Go to Ⓒ on page BF-42.)

N.G. ↓

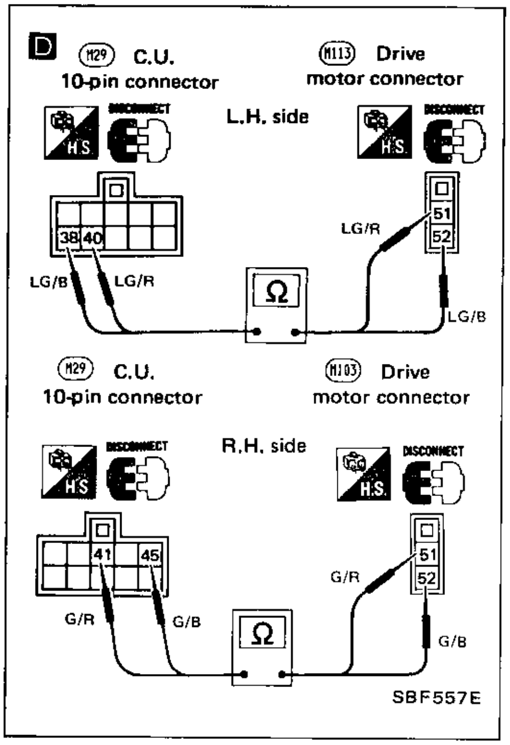
Go to DRIVE MOTOR ASSEMBLY in Electrical Components Inspection. (See page BF-50.)

N.G. → Replace drive motor assembly.

O.K. ↓

Replace guide rail assembly.

Diagnostic Procedure 1 (Cont'd)



Ⓐ

D

1) Disconnect connector from drive motor assembly.
2) Check harness for continuity.

	Terminals
L.H. side	㊳ - ㊾
	㊵ - ㊿
R.H. side	㊶ - ㊿
	㊺ - ㊾

Continuity should exist.

N.G → Repair harness.

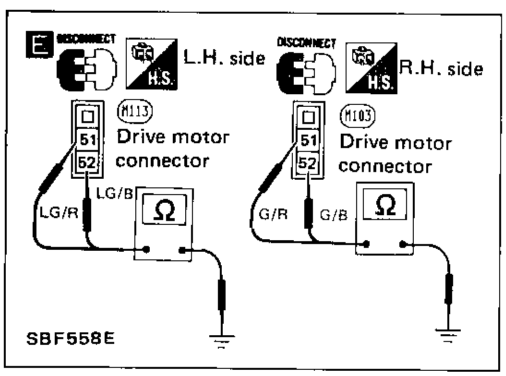
O.K. ↓

Check drive motor harness for open circuit.

N.G → Repair drive motor harness.

O.K. ↓

Replace drive motor.



Ⓑ

E

1) Disconnect connector from drive motor assembly.
2) Does continuity exist in at least one point?

	Terminals
L.H. side	51 - Ground
	52 - Ground
R.H. side	51 - Ground
	52 - Ground

Yes → Repair harness. There will be incorrect grounding.

No ↓

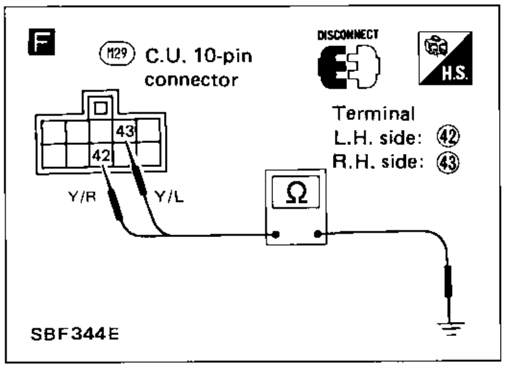
Check drive motor harness for incorrect grounding.

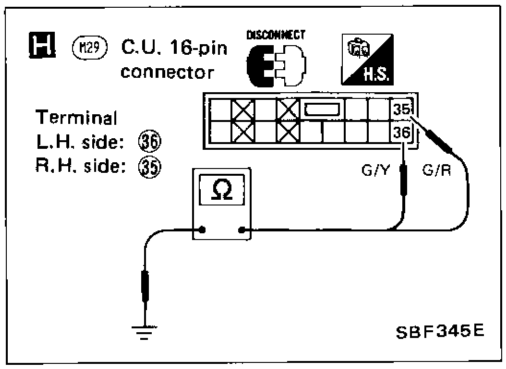
N.G → Repair drive motor harness.

O.K. ↓

Replace drive motor assembly.

Diagnostic Procedure 1 (Cont'd)





(C)

F

CHECK STOP SIGNAL.
1) Move shoulder belt buckle to center (not rear lock position and not front).
2) Check harness for continuity.

	Terminals
L.H. side	42 - Ground
R.H. side	43 - Ground

Continuity should exist.
G Refer to figure C (BF-40) to move shoulder belt buckle.

N.G. → Go to Diagnostic Procedure 3 (See page BF-44.) and return to next step.

O.K. ↓

H

1) Disconnect 16-pin connector from control unit.
2) Check harness for continuity.

	Terminals
L.H. side	36 - Ground
R.H. side	35 - Ground

Continuity should exist.

N.G. → Go to Diagnostic Procedure 4 (See page BF-45.) and return to next step.

O.K. ↓

Is this the second time?

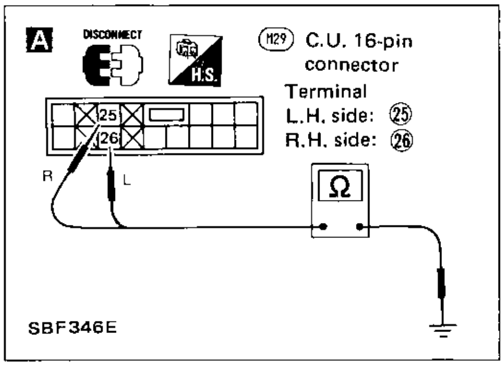
Yes → Replace control unit.

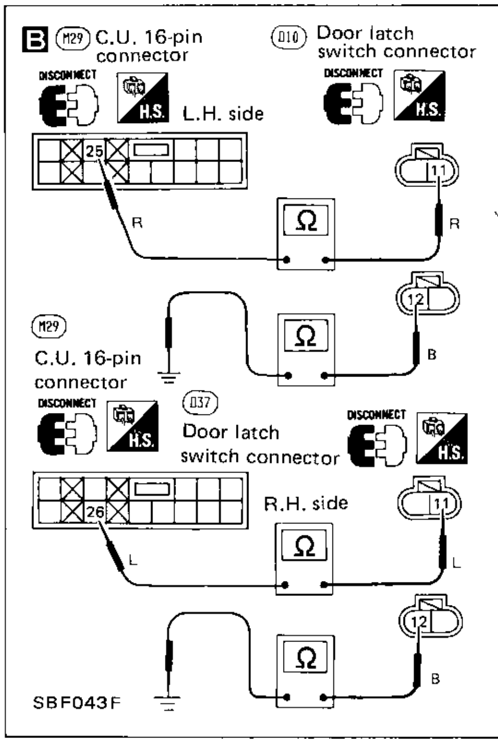
No ↓

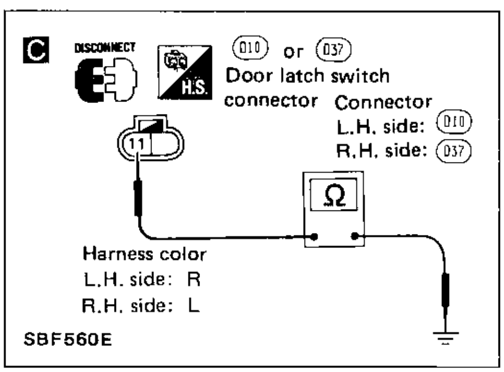
Reinstall any part removed.

↓

Go to PROCEDURE 1 (START) in Preliminary Check. (See page BF-35.)







Diagnostic Procedure 2

START

↓

A CHECK DOOR SWITCH CIRCUIT.
1) Disconnect 16-pin connector from control unit.
2) Check continuity.

	Terminals	Door condition	Continuity
L.H. side	25 - Ground	Open	Yes
		Close	No
R.H. side	26 - Ground	Open	Yes
		Close	No

- O.K. → Is this the second time?
  - Yes → Replace control unit.
  - No → Reinstall any part removed. → Go to PROCEDURE 1 (START) in Preliminary Check. (See page BF-35)
- N.G. ↓

B 1) Disconnect door latch switch connector.
2) Check continuity.

	Terminals
L.H. side	25 - 11 12 - Ground (M40, M120)
R.H. side	26 - 11 12 - Ground (M40, M120)

Continuity should exist.

- N.G. → Repair harness.
- O.K. ↓

C Does continuity exist?

	Connector	Terminals
L.H. side	D10	11 - Ground
R.H. side	D37	11 - Ground

- Yes → Repair harness. There will be incorrect grounding between terminals 25 an 11 d or 26 and 11.
- No ↓

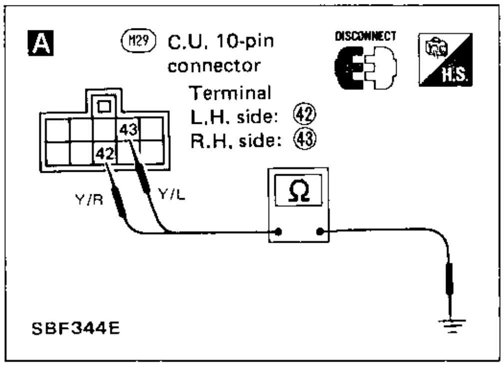
Go to DOOR LATCH SWITCH in Electrical Components Inspection. (See page BF-50.)

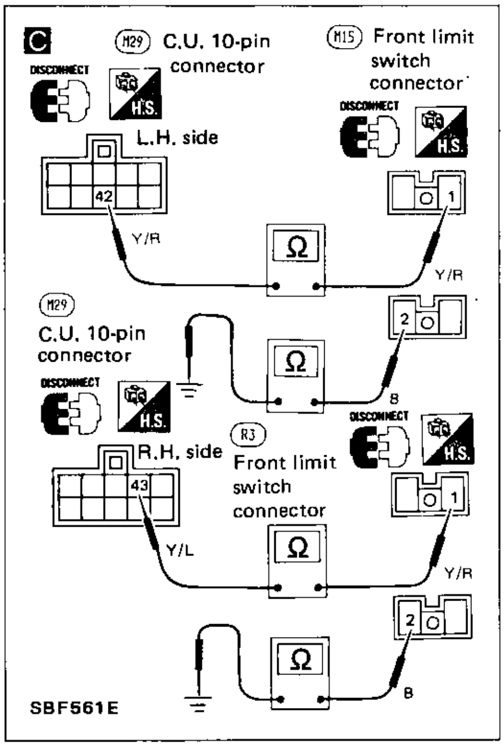
- O.K. → Reinstall any part removed. → Go to PROCEDURE 1 (START) in Preliminary Check. (See page BF-35.)
- N.G. ↓

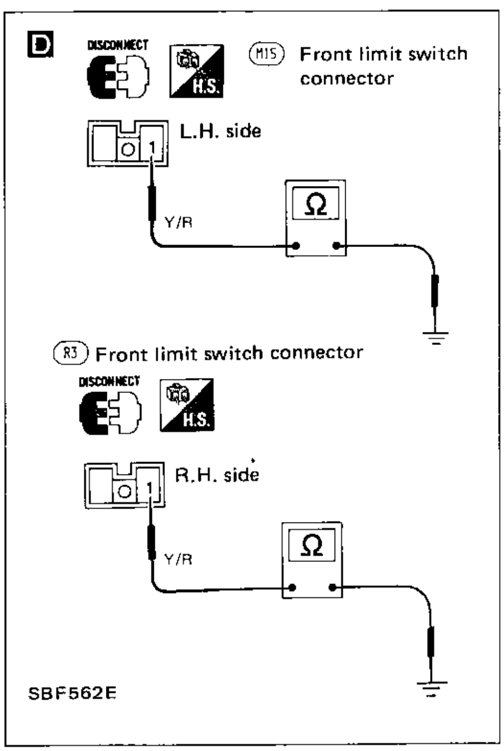
Check door latch switch harness for open and short circuit.

- N.G. → Repair door latch switch harness.
- O.K. ↓

Replace door lock assembly.







Diagnostic Procedure 3

START

A CHECK FRONT LIMIT SWITCH CIRCUIT.
1) Disconnect 10-pin connector from control unit.
2) Check continuity.

	Terminals	Shoulder belt buckle position	Continuity
L.H. side	42 - Ground	At front	No
		Not at front	Yes
R.H. side	43 - Ground	At front	No
		Not at front	Yes

B **Refer to figure C (BF-40) to move shoulder belt buckle.**

O.K. → Is this second time?
- Yes → Replace control unit.
- No → Reinstall any part removed. → Go to PROCEDURE 1 (START) in Preliminary Check. (See page BF-35.)

N.G. ↓

C 1) Disconnect connector from front limit switch.
2) Check continuity.

	Terminals
L.H. side	42 - 1 2 - Ground (M40, M120)
R.H. side	43 - 1 2 - Ground (M40, M120)

Continuity should exist.

N.G. → Repair harness.

O.K. ↓

D Does continuity exist?

	Connector	Terminals
L.H. side	M15	1 - Ground
R.H. side	R3	1 - Ground

Yes → Repair harness. There will be incorrect grounding between terminals 42 and 1 or 43 and 1.

No ↓

Go to FRONT LIMIT SWITCH in Electrical Components Inspection. (See page BF-49.)

O.K. → Replace guide rail assembly.

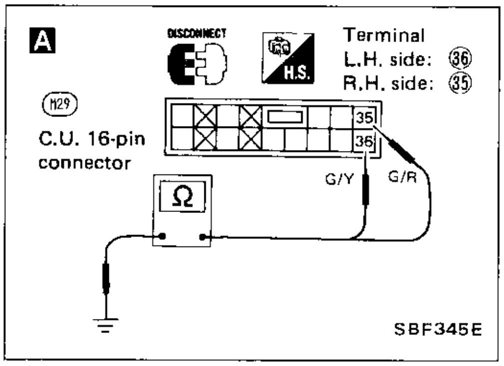
N.G. ↓

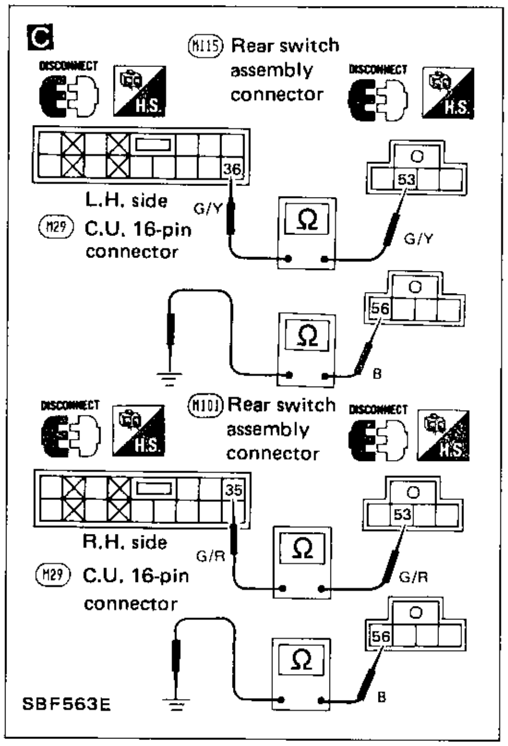
Check front limit switch harness for open and short circuit.

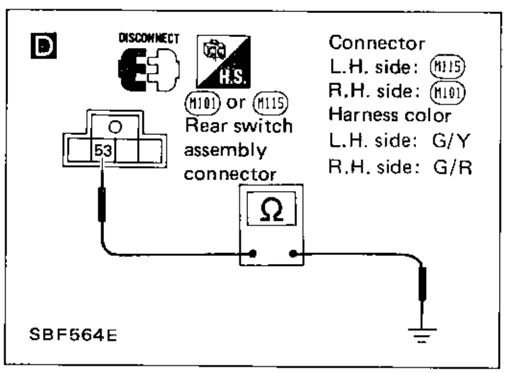
N.G. → Repair front limit switch harness.

O.K. ↓

Replace front limit switch.







Diagnostic Procedure 4

START

A

CHECK REAR LIMIT SWITCH CIRCUIT.
1) Disconnect 16-pin connector from control unit.
2) Check continuity.

	Terminals	Shoulder belt buckle position	Continuity
L.H. side	36 - Ground	At rear	No
		Not at rear	Yes
R.H. side	35 - Ground	At rear	No
		Not at rear	Yes

B Refer to figure C (BF-40) to move shoulder belt buckle.

O.K. → Is this second time?
- Yes → Replace control unit.
- No → Reinstall any part removed. → Go to PROCEDURE 1 (STEP 3) (See page BF-35.) or PROCEDURE 2 (STEP 3) (See page BF-36.) in Preliminary check.

(A)

N.G. ↓

C

1) Disconnect connector from rear switch assembly.
2) Check continuity.

	Terminals
L.H. side	36 - 53 56 - Ground (M40, M120)
R.H. side	35 - 53 56 - Ground (M40, M120)

Continuity should exist.

N.G. → Repair harness.

O.K. ↓

D

Does continuity exist?

	Connector	Terminals
L.H. side	M115	53 - Ground
R.H. side	M101	53 - Ground

Yes → Repair harness. There will be incorrect grounding between terminals 36 and 53 or 35 and 53.

No ↓

Go to REAR LIMIT SWITCH in Electrical Components Inspection. (See page BF-50.)

O.K. → (Go to (A) above.)

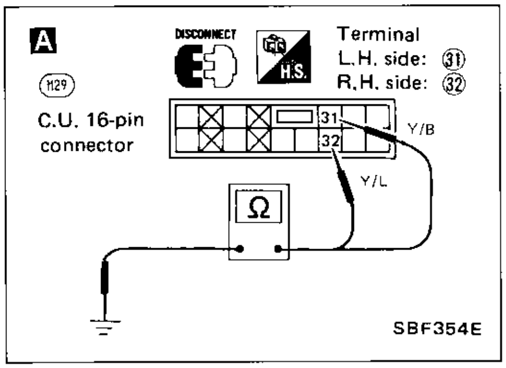
N.G. ↓

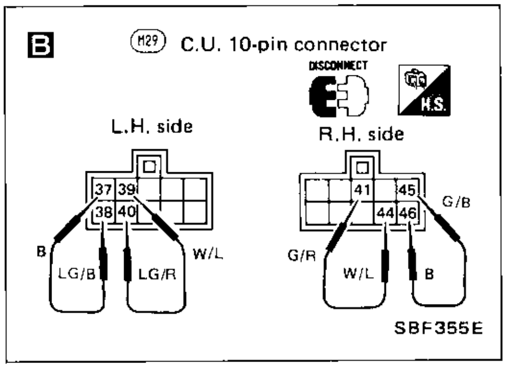
Check rear limit switch harness for open and short circuit.

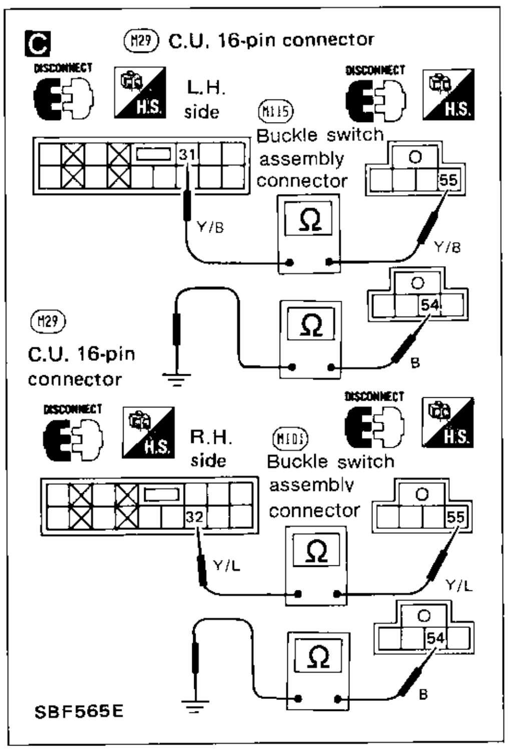
N.G. → Repair rear limit switch harness.

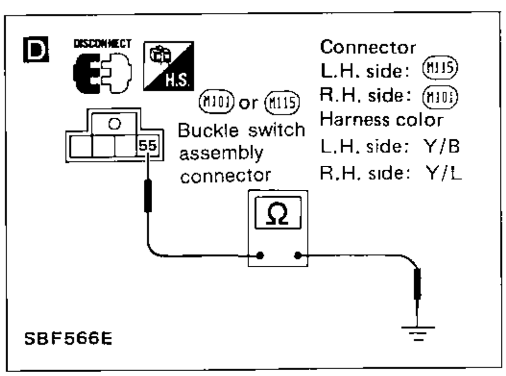
O.K. ↓

Replace rear switch assembly.









Diagnostic Procedure 5

START

↓

A

CHECK SHOULDER BELT BUCKLE SWITCH CIRCUIT.

1) Disconnect 16-pin connector from control unit.
2) Check continuity when shoulder belt buckle is at rear lock position.

	Terminals	Shoulder belt	Continuity
L.H. side	31 - Ground	Fasten	Yes
		Unfasten	No
R.H. side	32 - Ground	Fasten	Yes
		Unfasten	No

B If shoulder belt buckle is not at rear lock position, check drive motor operation.

O.K. → Is this the second time?
- Yes → Replace control unit.
- No → Reinstall any part removed. → Go to PROCEDURE 2 (STEP 4) in Preliminary Check. (See page BF-37.)

↓ N.G.

C

1) Disconnect connector from rear switch assembly.
2) Check continuity.

	Terminals
L.H. side	31 - 55 54 - Ground (M40, M120)
R.H. side	32 - 55 54 - Ground (M40, M120)

Continuity should exist.

N.G. → Repair harness.

↓ O.K.

D

Does continuity exist?

	Connector	Terminals
L.H. side	M115	55 - Ground
R.H. side	M101	55 - Ground

Yes → Repair harness. There will be incorrect grounding between terminals 31 and 55 or 32 and 55.

↓ No

Go to SHOULDER BELT BUCKLE SWITCH in Electrical Components Inspection. (See page BF-50.)

O.K. → (Go to A above.)

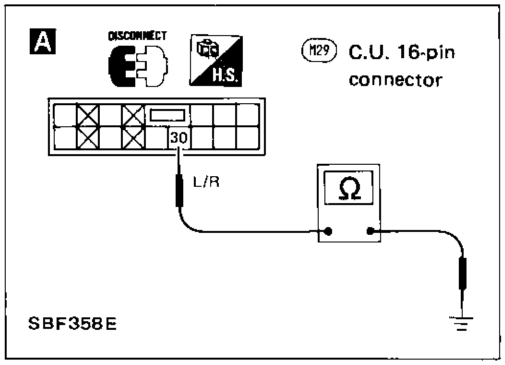
↓ N.G.

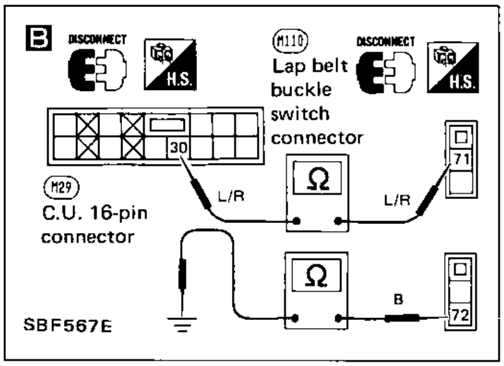
Check shoulder belt buckle switch harness for open or short circuit.

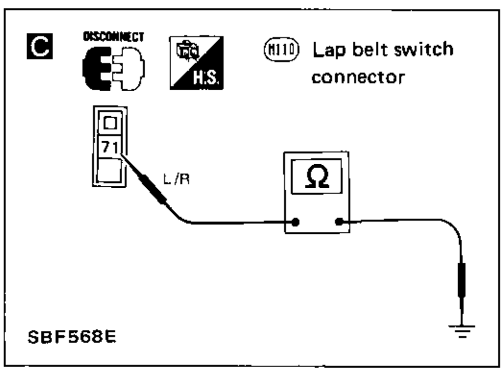
N.G. → Repair shoulder belt buckle switch harness.

↓ O.K.

Replace rear switch assembly.







Diagnostic Procedure 6

START

↓

A CHECK LAP BELT BUCKLE SWITCH CIRCUIT (L.H. only).
1) Disconnect 16-pin connector from control unit.
2) Check continuity.

Terminals	Lap belt	Continuity
30 - Ground	Fasten	No
	Unfasten	Yes

O.K. → (Ⓐ →) Is this the second time?
- Yes → Replace control unit.
- No → Reinstall any part removed. → Go to PROCEDURE 2 (STEP 6) in Preliminary Check. (See page BF-37.)

N.G. ↓

B 1) Disconnect lap belt switch connector.
2) Check continuity.

Terminals
30 - 71
72 - Ground (M40, M120)

Continuity should exist.

N.G. → Repair harness.

O.K. ↓

C Does continuity exist?

Terminals
71 - Ground

Yes → Repair harness. There will be incorrect grounding.

No ↓

Go to LAP BELT BUCKLE SWITCH in Electrical Components Inspection. (See page BF-50.)

O.K. → (Go to Ⓐ above.)

N.G. ↓

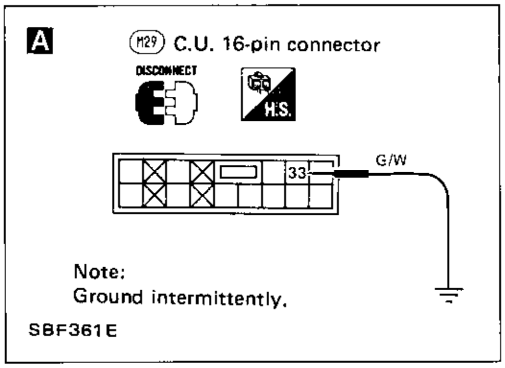
Check lap belt buckle switch harness for open and short circuit.

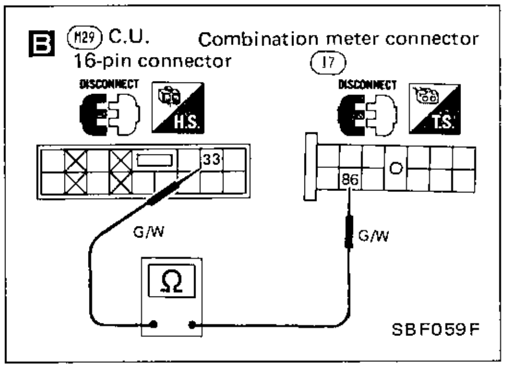
N.G. → Repair lap belt buckle switch harness.

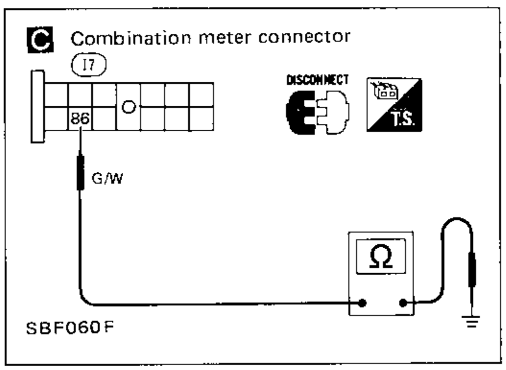
O.K. ↓

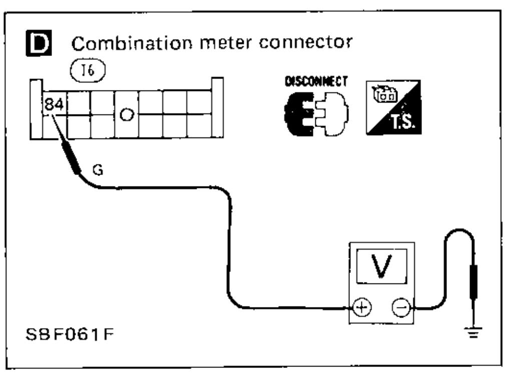
Replace shoulder belt buckle assembly.

Diagnostic Procedure 7









START

A

CHECK WARNING CHIME CIRCUIT.
1) Disconnect 16-pin connector from control unit.
2) Check warning chime.

Terminals	Method	Result
33 - Ground	Ground inter-mittently.	Sound

O.K. → (Go to Ⓐ below.)

N.G. ↓

B

1) Disconnect connector(s) from combination meter.
2) Check continuity.

Terminals
33 - 86

Continuity should exist.

N.G. → **Repair harness.**

O.K. ↓

C

Does continuity exist?

Terminals
86 - Ground

Yes → **Repair harness. There will be incorrect grounding.**

No ↓

D

Check battery voltage existence.

Terminals
84 - Ground

Battery voltage should exist.

N.G. → Repair harness. For details, refer to POWER SUPPLY ROUTING in EL section.

O.K. ↓

Is this the first time?

Yes → Replace warning chime.

No ↓ ← Ⓐ

Is this the second time?

Yes → Replace control unit.

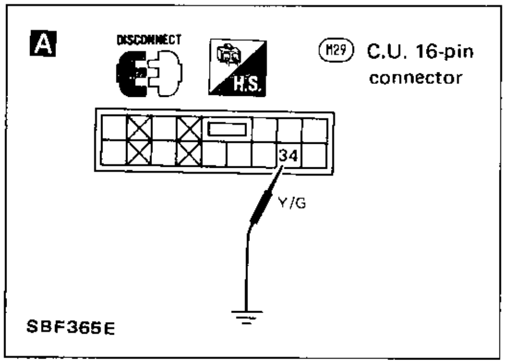
No ↓

Reinstall any part removed.

↓

Go to PROCEDURE 2 (START) in Preliminary Check.
(See page BF-36.)

Diagnostic Procedure 8



START

A

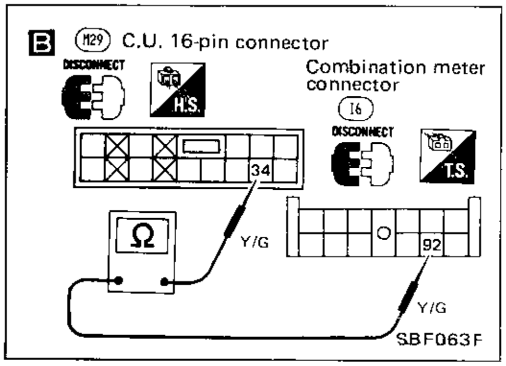
CHECK WARNING LAMP CIRCUIT.
1) Disconnect 16-pin connector from control unit.
2) Check warning lamp.

Terminals	Result
34 - Ground	Glow

O.K. → Is this the second time?
- Yes → Replace control unit.
- No → Reinstall any part removed. → Go to PROCEDURE 2 (START) in Preliminary Check. (See page BF-36.)

Ⓐ

N.G. ↓



B

1) Disconnect connector from combination meter.
2) Check continuity.

Terminals
34 - 92

Continuity should exist.

N.G. → Repair harness

O.K. ↓

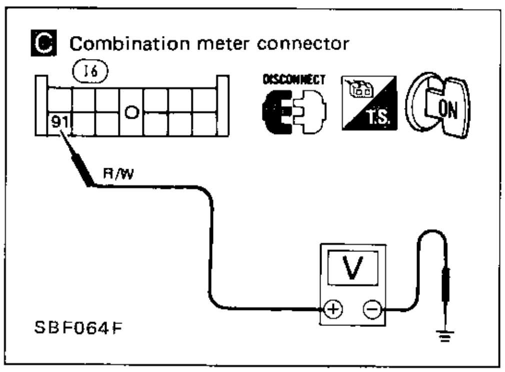
B

Does continuity exist?

Terminals
92 - Ground

Yes → Repair harness. There will be incorrect grounding.

No ↓



C

Check battery voltage existence.

Terminals
91 - Ground

Battery voltage should exist.

N.G. → Repair harness. For details, refer to POWER SUPPLY ROUTING in EL section.

O.K. ↓

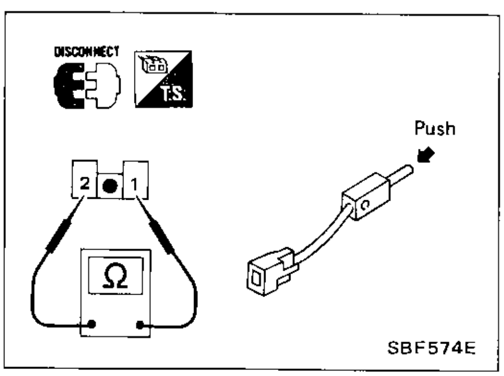
Is warning lamp bulb burn out?

Yes → Replace bulb.

No → (Go to Ⓐ above.)

Electrical Components Inspection

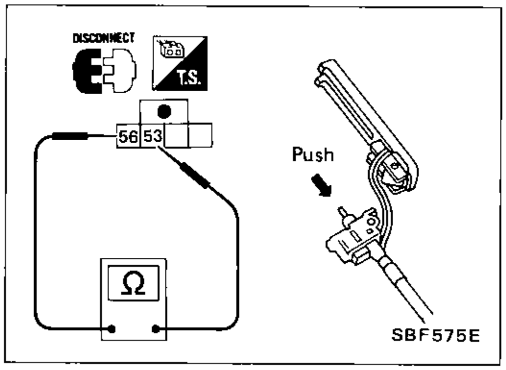
FRONT LIMIT SWITCH



Condition	Continuity
Pushed	No
Released	Yes

Electrical Components Inspection (Cont'd)

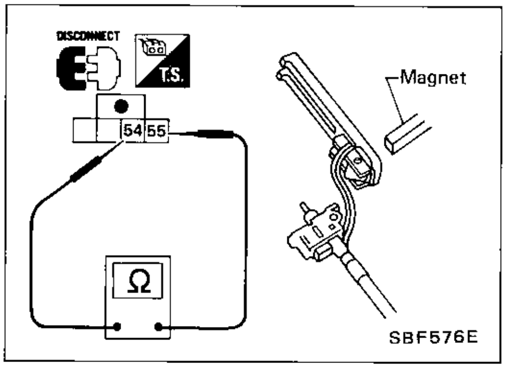
REAR LIMIT SWITCH



SBF575E

Condition	Continuity
Pushed	No
Released	Yes

SHOULDER BELT BUCKLE SWITCH

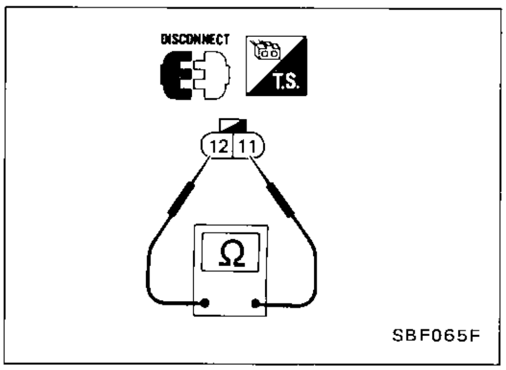


SBF576E

Condition	Continuity
Move magnet toward buckle switch.	Yes
Move magnet away from buckle switch.	No

DOOR LATCH SWITCH

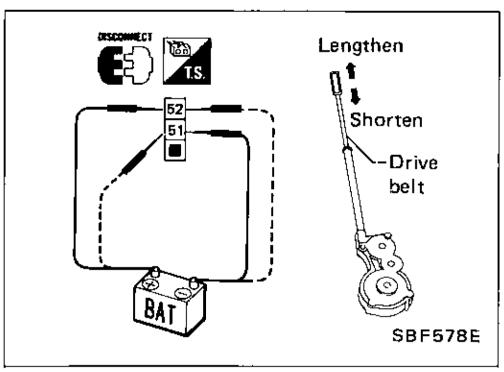
(Built-in door lock assembly)



SBF065F

Door condition	Continuity
Open	Yes
Closed	No

DRIVE MOTOR ASSEMBLY

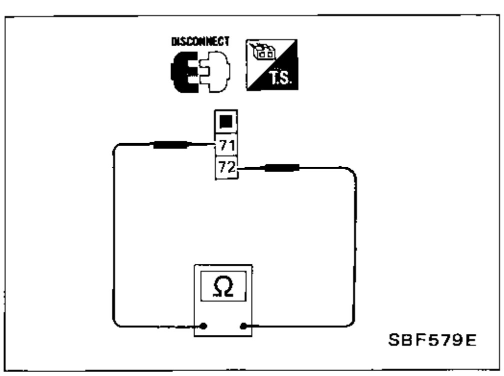


SBF578E

Terminals		Drive belt operation
⊕	⊖	
52	51	Lengthen
51	52	Shorten

LAP BELT BUCKLE SWITCH

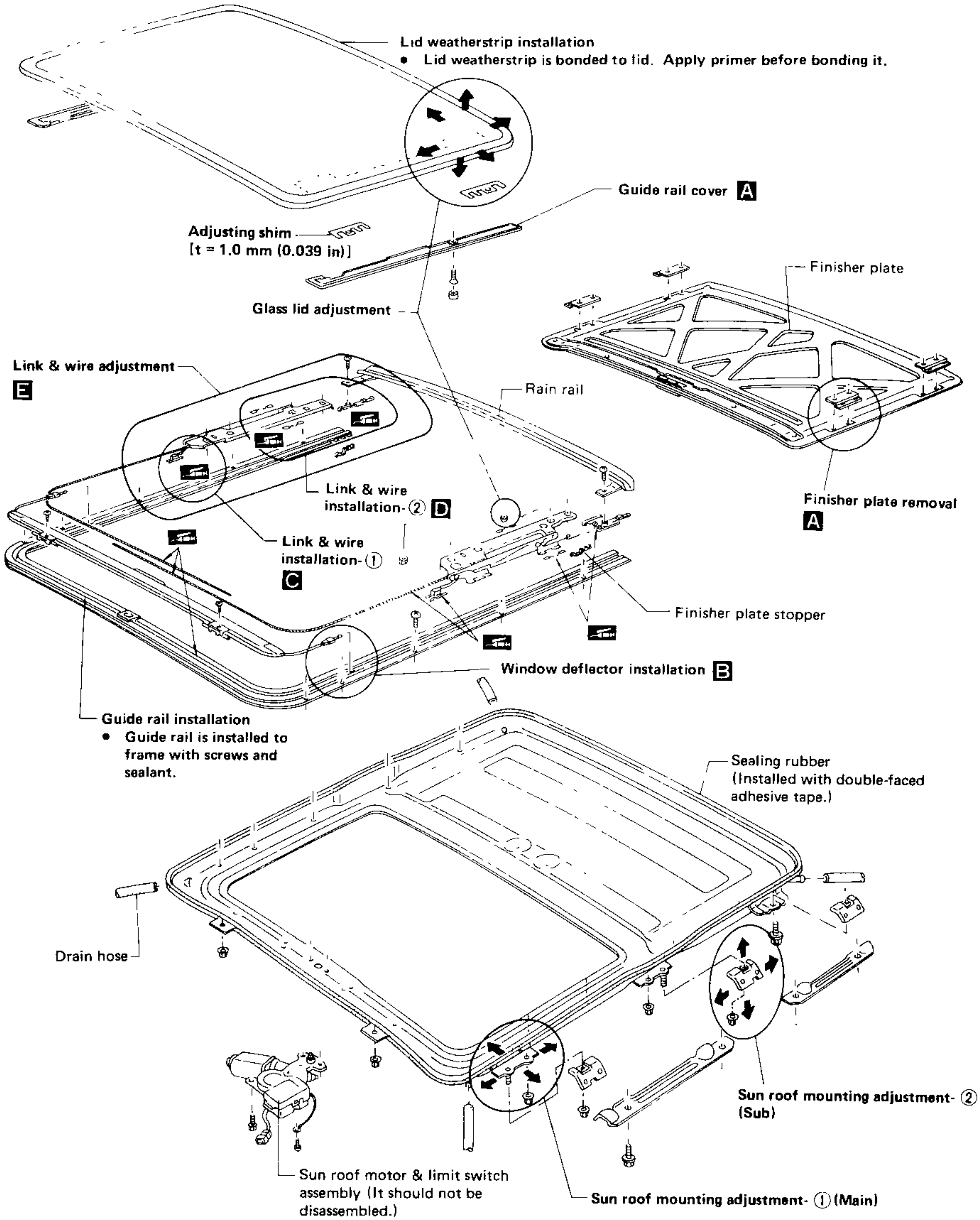
(L.H. side only)



SBF579E

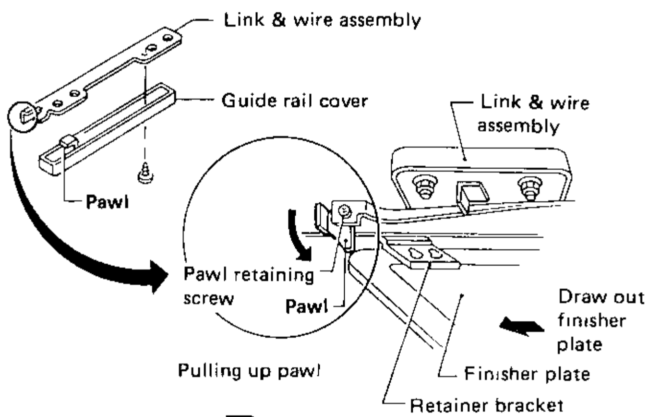
Condition	Continuity
Fastened	No
Unfastened	Yes

- After any adjustment, check sun roof operation and lid alignment.
- Handle finisher plate and glass lid with care so not to damage it.
- It is desirable for easy installation to mark each point before removal.

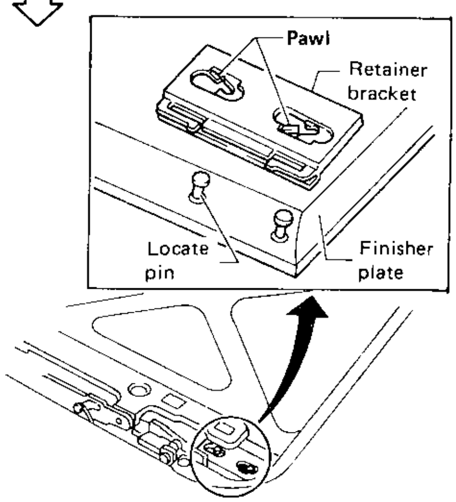


Finisher plate removal A

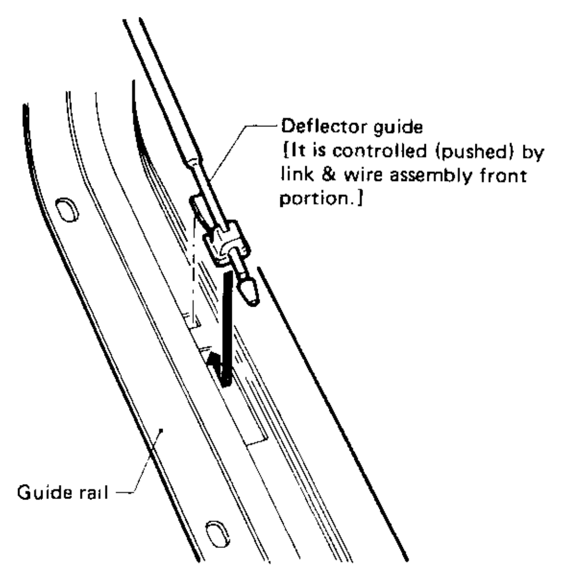
Remove guide rail cover and pull up pawl by loosening retaining screw, then draw out finisher plate with sun roof lid open.



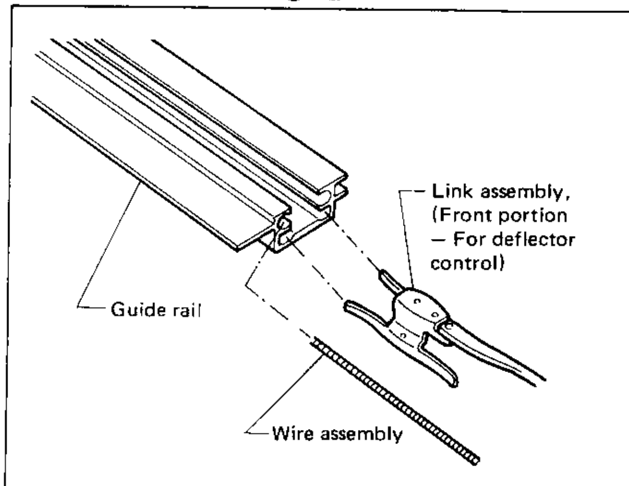
Removal:
Raise pawl of retainer bracket, shift finisher plate and remove locate pins from retainer bracket. Then remove finisher plate.



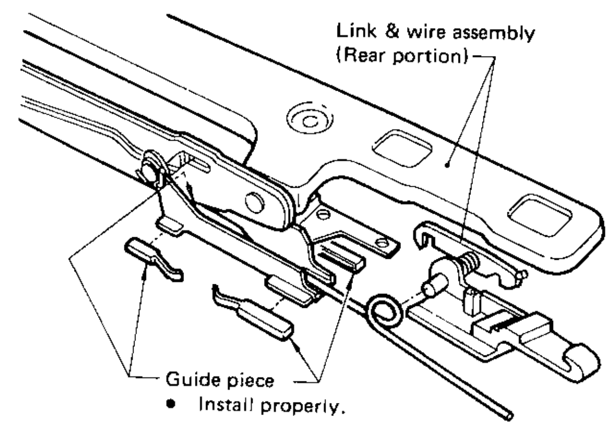
Wind deflector installation B



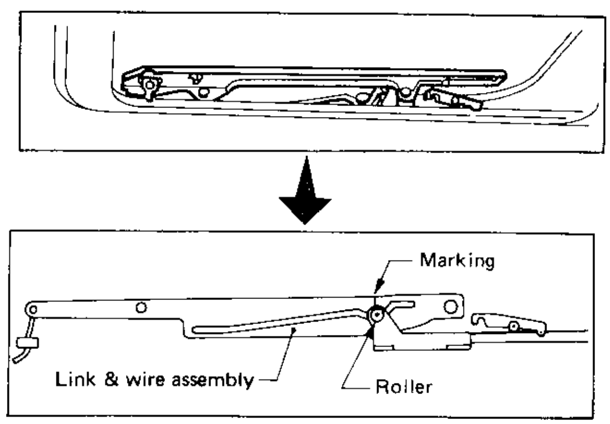
Link & wire installation- ① C



Link & wire installation- ② D



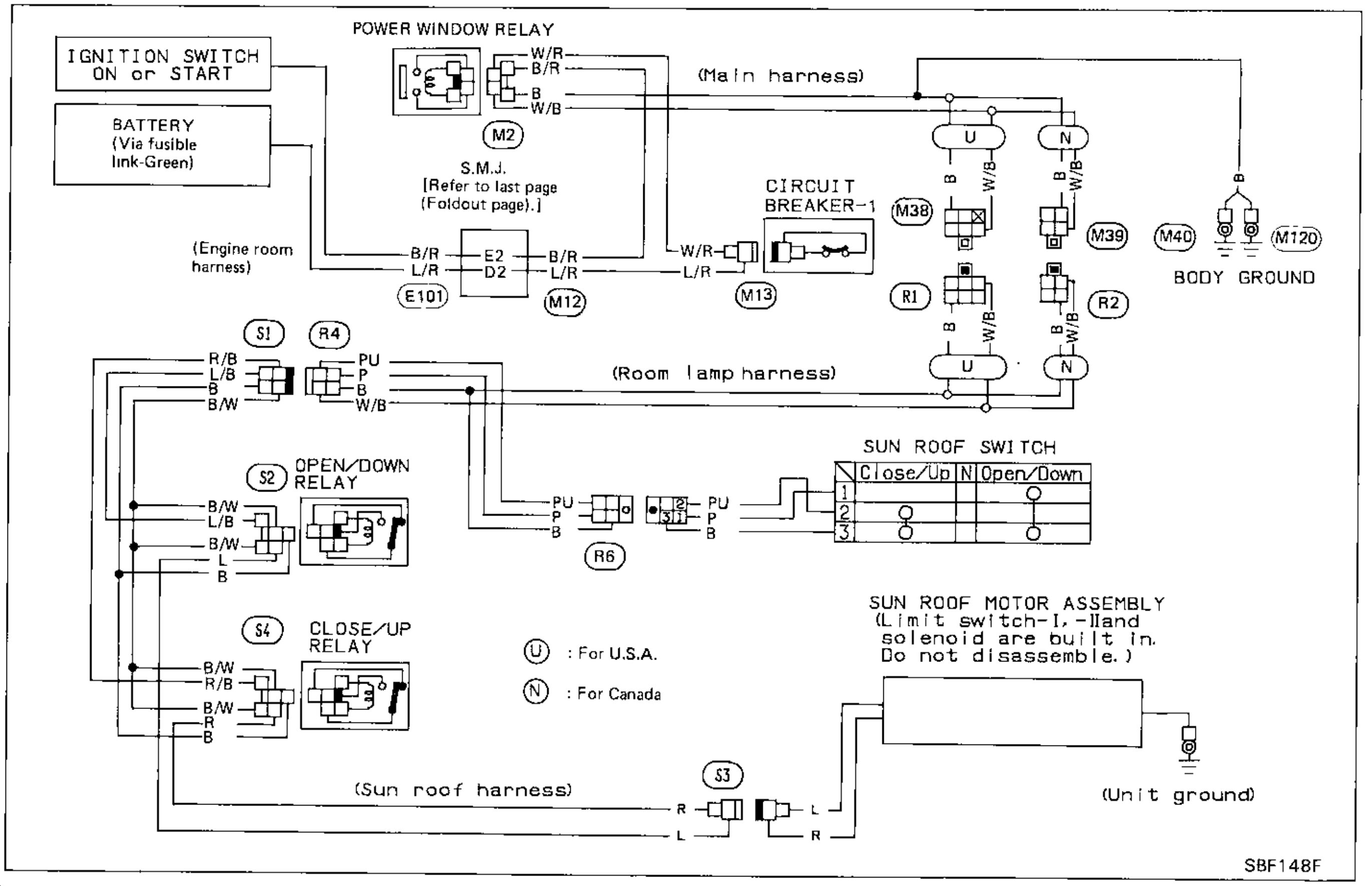
Link & wire adjustment E

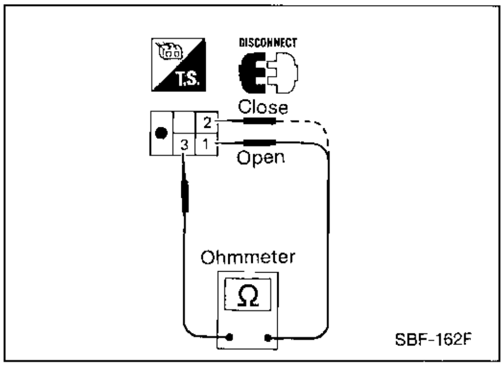


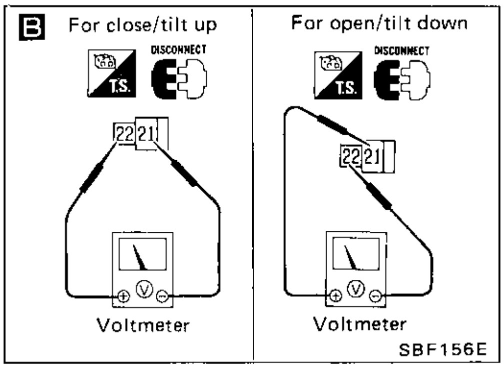
When installing motor & limit switch assembly, set motor & limit switch assembly to fully closed condition using the vehicle's harness and switch first. And adjust link & wire assembly's position as the roller line up at the marking. Then install the motor & limit switch assembly.

SBF617C

Wiring Diagram







Sun Roof Trouble-shooting

Does sun roof motor operating sound exist?

- Yes → Disassemble sun roof motor assembly and link & wire assembly, then reassemble them. For details, refer to "Sun roof replacement".
- No ↓

Does power window system operate?

- No → • Check fusible link—Green.
  • Check power window relay.
  Refer to "Power window trouble- shooting procedure 1" of DOOR.
- Yes ↓

Remove sun roof switch.

↓

A

Check sun roof switch for continuity.

Operation	Continuity
Close/tilt up	③ - ②
Open/tilt down	③ - ①

- N.G. → Replace sun roof switch.
- O.K. ↓

Connect sun roof switch connector and disconnect sun roof motor connector.

↓

B

Does battery voltage exist?

Operation	Terminals	
	⊕	⊖
Close/tilt up	㉒	㉑
Open/tilt down	㉑	㉒

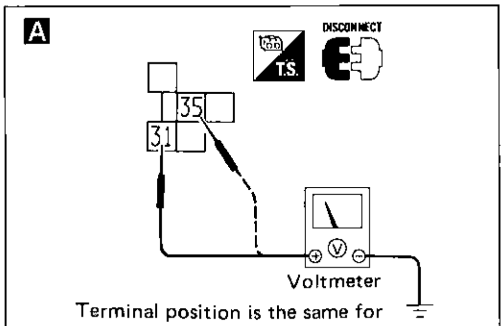
- No → Disconnect close/up relay and open/down relay connectors. → Ⓐ
- Yes ↓

Replace sun roof motor assembly.

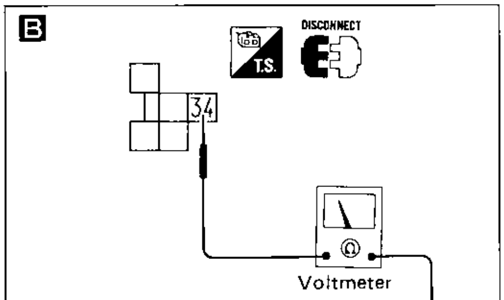
↓

END

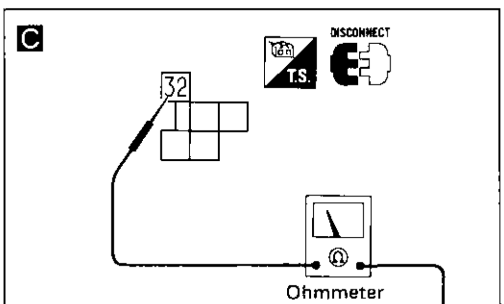
Sun Roof Trouble-shooting (Cont'd)



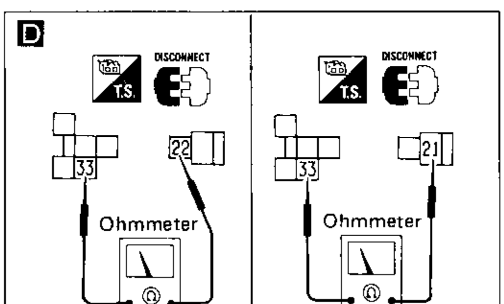
Terminal position is the same for both close and open relays. SBF157E



Terminal position is the same for both close and open relays. SEF158E



Terminal position is the same for both close and open relays. SEF159E



For close/tilt up relay
For open/tilt down relay
SEF160E

(A)

A

Does battery voltage exist?

Relay	Terminals (+)	Terminals (−)
Close/tilt up	31	Ground
	35	Ground
Open/tilt down	31	Ground
	35	Ground

No → Repair harness between terminals 31, 35 and 41 (power window relay output side).

Yes ↓

B

Check continuity.

Relay	Terminals	
Close/tilt up	34	Ground
Open/tilt down	34	Ground

N.G. → Repair harness between terminal 34 and body ground (M40 and M120).

O.K. ↓

C

Check continuity between terminal 32 and body ground under switch operation.

Operation	Relay	Continuity
Close/tilt up	Close/tilt up	Yes
	Open/tilt down	No
Open/tilt down	Close/tilt up	No
	Open/tilt down	Yes

N.G. → Repair harness between terminal 32 and body ground (M40 and M120).

O.K. ↓

D

Check continuity.

Terminals
33 for close/tilt up relay - 22
33 for open/tilt down relay - 21

N.G. → Repair harness between terminals 33 and 22 or 21.

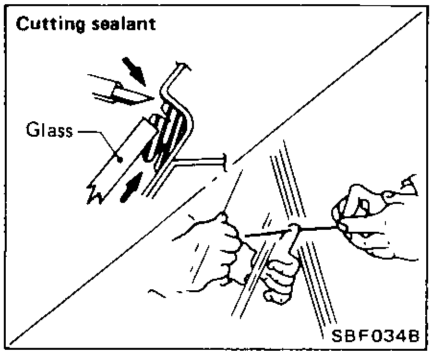
O.K. ↓

Replace relay.

Windshield and Rear Window

REMOVAL

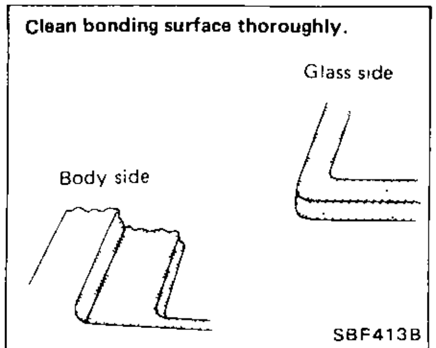
After removing moldings, remove glass.



CAUTION:
Be careful not to scratch glass when removing.

INSTALLATION

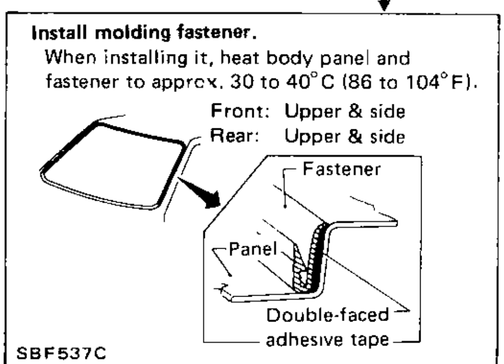
- Use genuine Nissan Sealant kit or equivalent. Follow instructions furnished with it.
- After installation, the vehicle should remain stationary for about 24 hours.
- Do not use sealant which is more than 12 months past its production date.
- Do not leave cartridge unattended with its cap open.
- Keep primers and sealant in a cool, dry place. Ideally, they should be stored in a refrigerator.

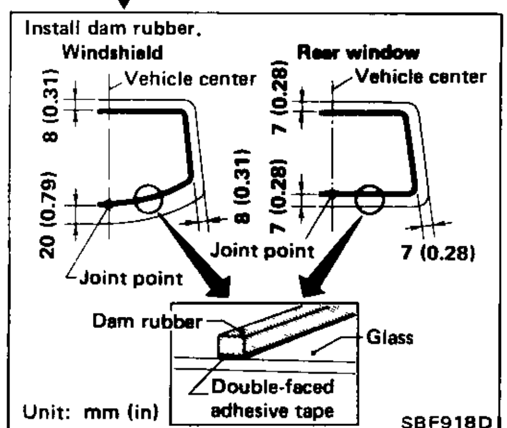


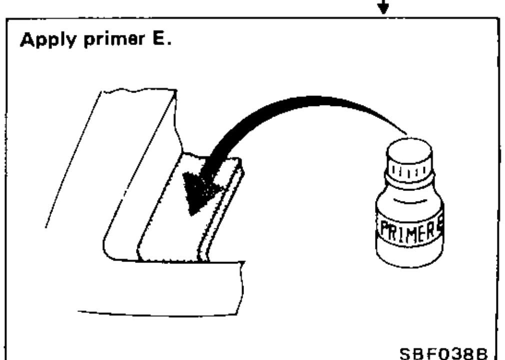
WARNING:
Keep heat or open flames away as primers are flammable.

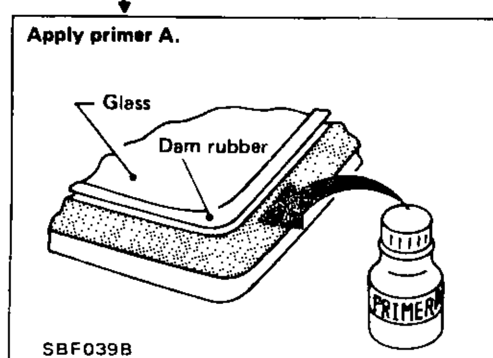
Body side

Glass side









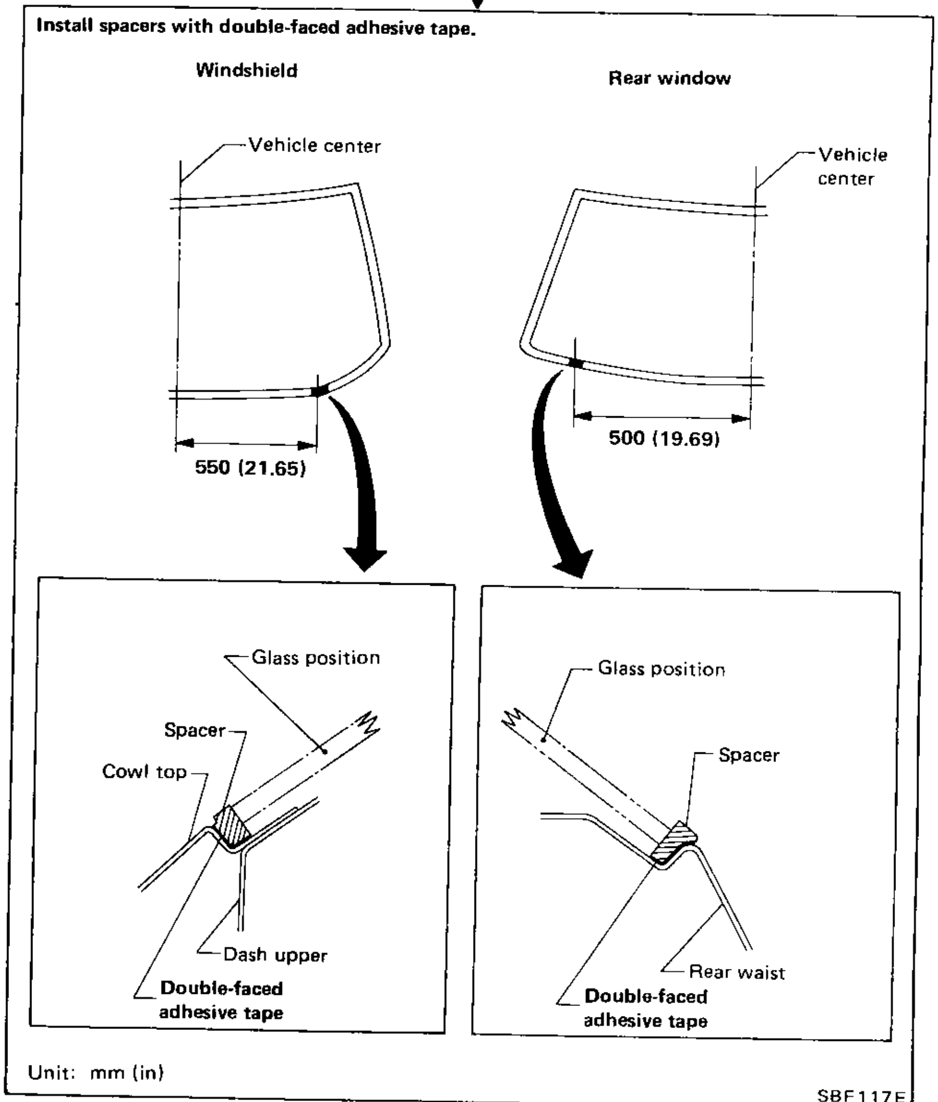
CAUTION:
Allow primers to dry for 10 to 15 minutes before proceeding to the next step.

CAUTION:
Do not apply primer A to windshield opening flanges.

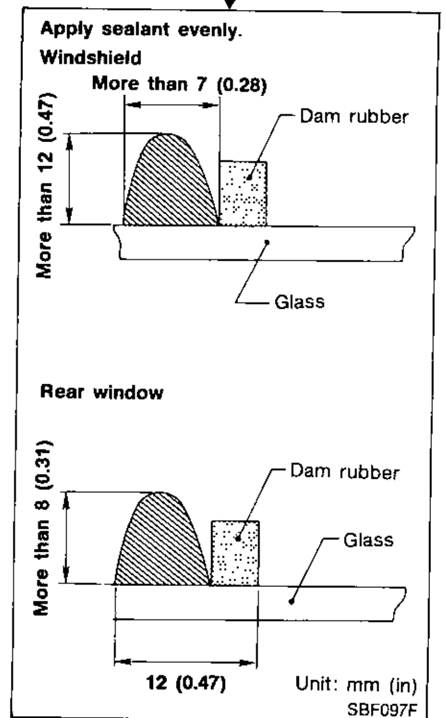
Ⓐ Ⓑ

Windshield and Rear Window (Cont'd)

Ⓐ



Ⓑ



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.

↓

Install moldings.

CAUTION:
Molding must be installed securely so that it is in position and leaves no gap.

Drying Time for Sealant

Reference: Time required for sealant to dry to desired hardness.

Unit: days

Temperature °C (°F) \ Relative humidity	Windshield			Rear window		
	90	50	25	90	50	25
40 (104)	1.5	2.5	5.0	2.0	2.5	5.5
25 (77)	2.5	4.0	7.5	2.5	4.5	8.0
5 (41)	5.0	13.0	20.5	5.5	14.0	22.0

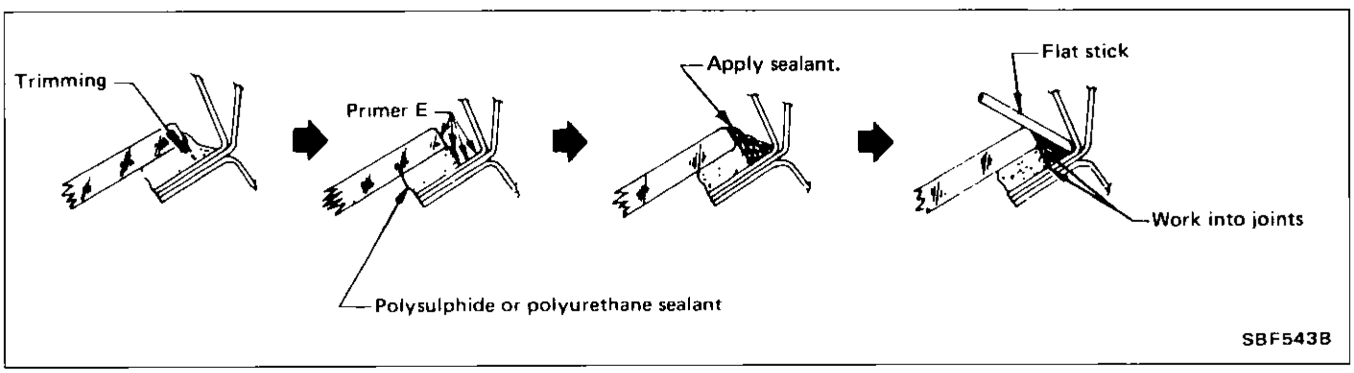
CAUTION:
Advise the user of the fact that vehicle should not be driven on rough roads or surfaces until sealant has properly vulcanized.

Repairing Water Leaks for Windshield and Rear Window

Leaks can be repaired without removing and reinstalling glass.

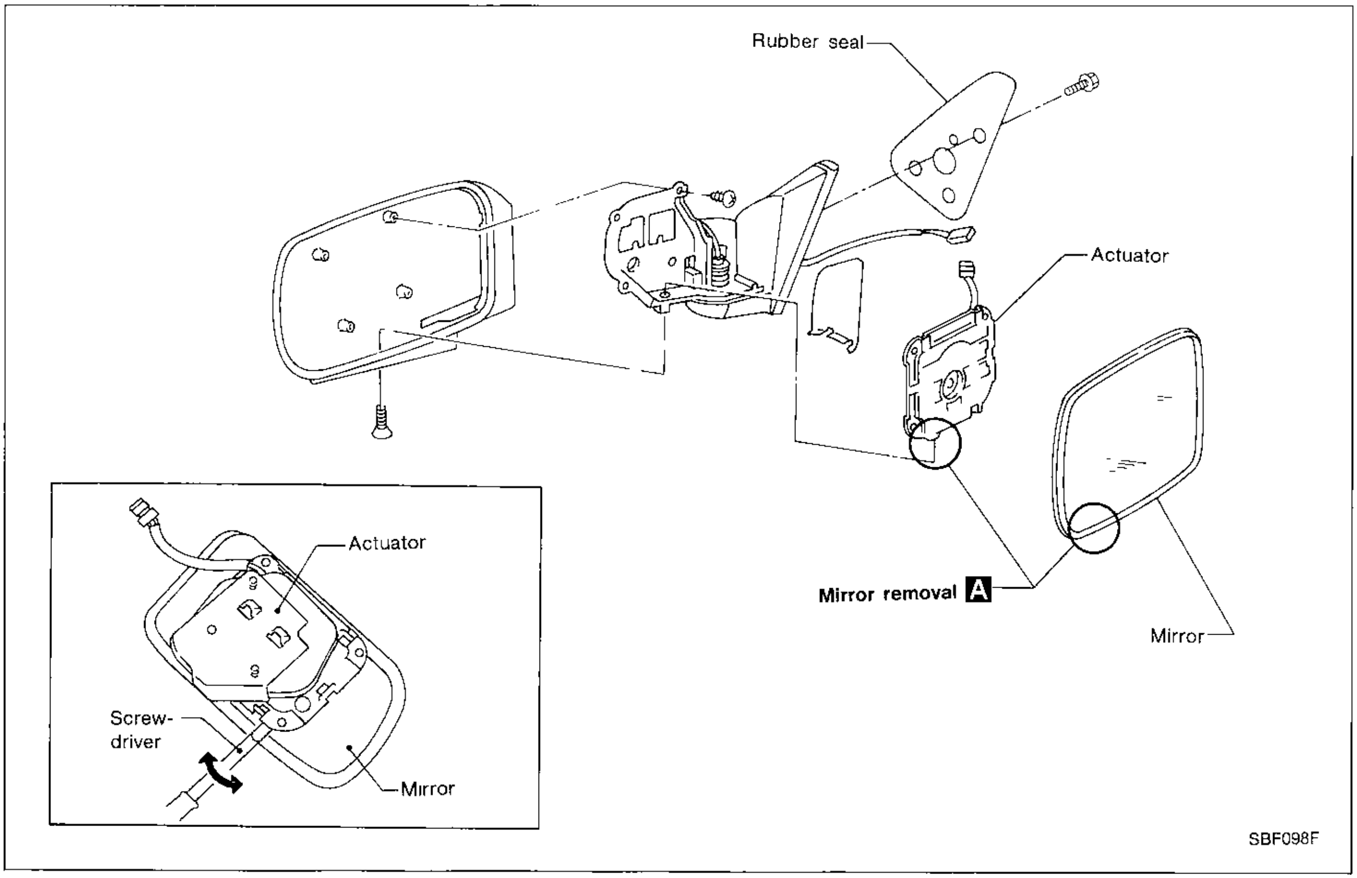
If water is leaking between caulking material and body or between glass and caulking material, determine the extent of the leak by applying water while pushing glass outward.

To stop the leak, apply primer and then sealant to the leak point.

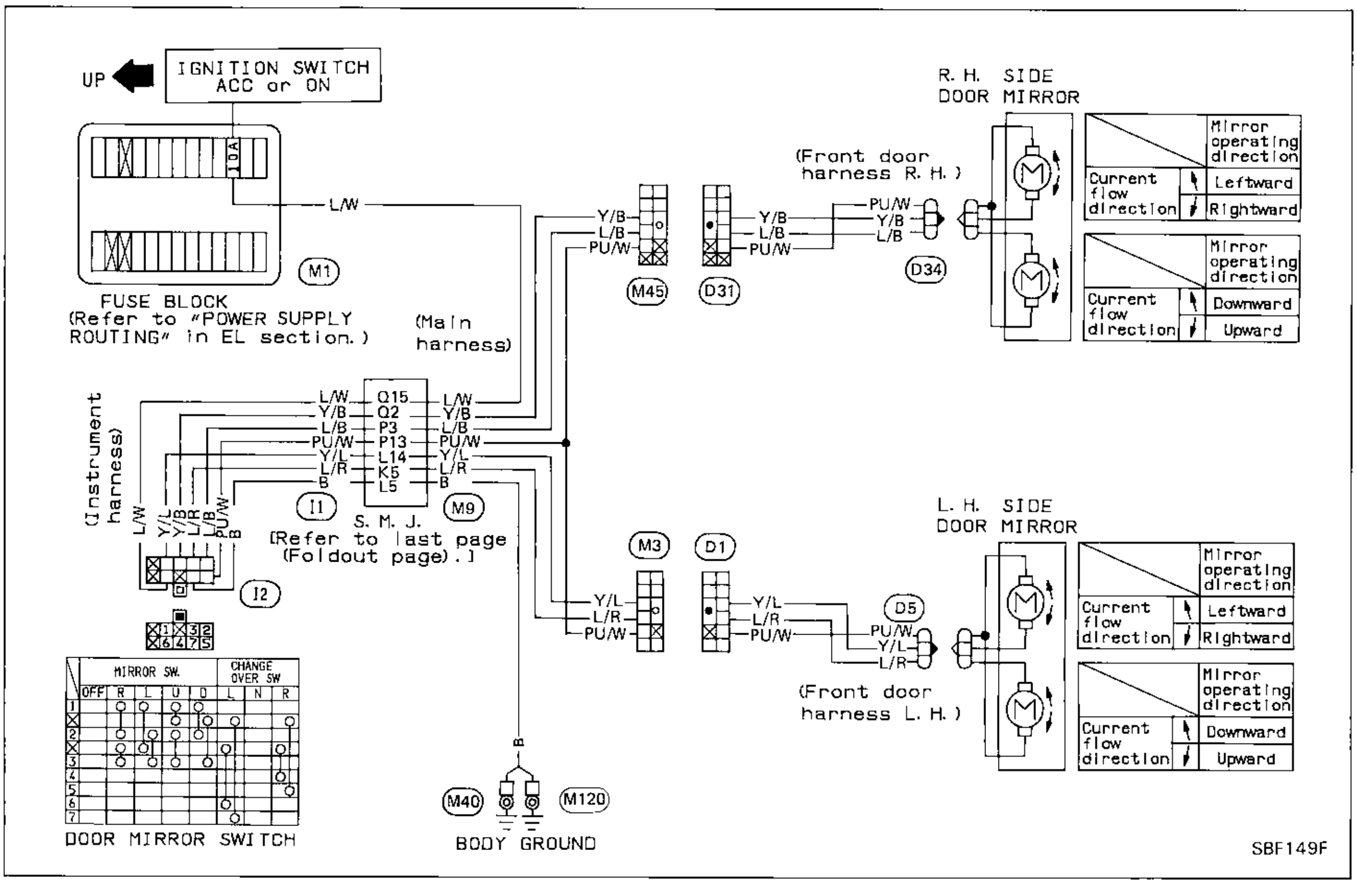


Afterwards, install molding securely.

Door Mirror



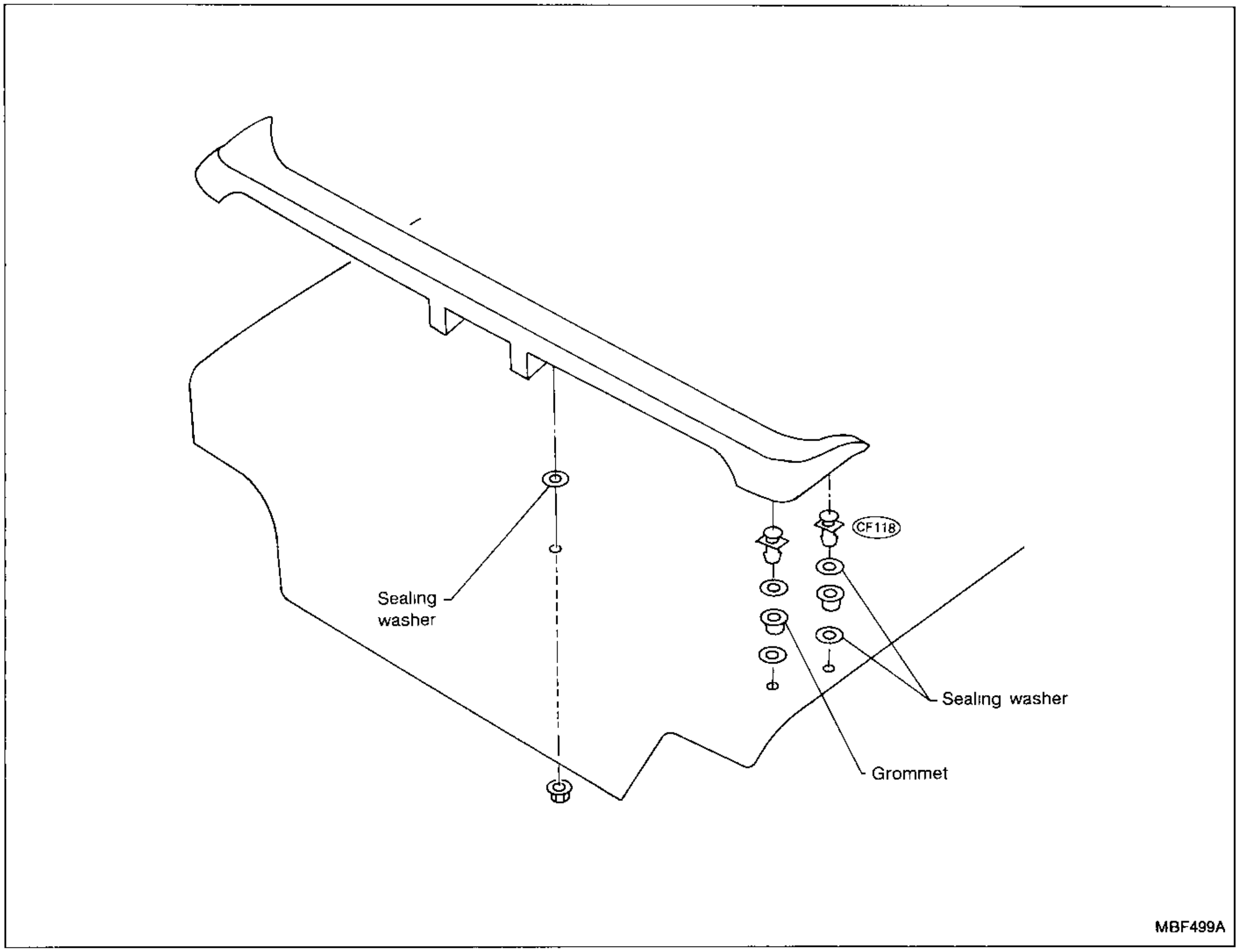
WIRING DIAGRAM



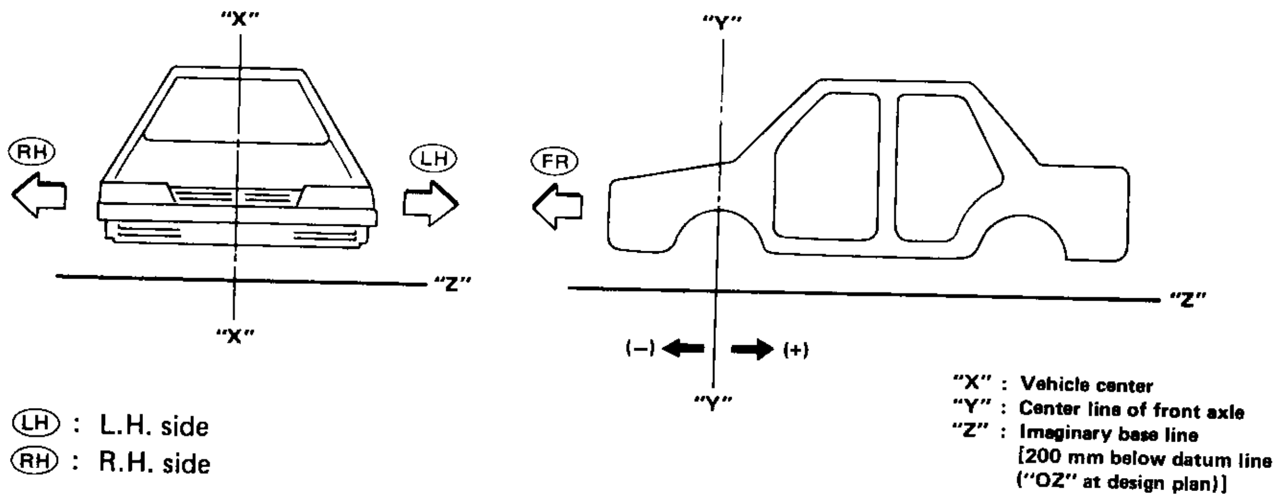
Door Mirror (Cont'd)

- 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

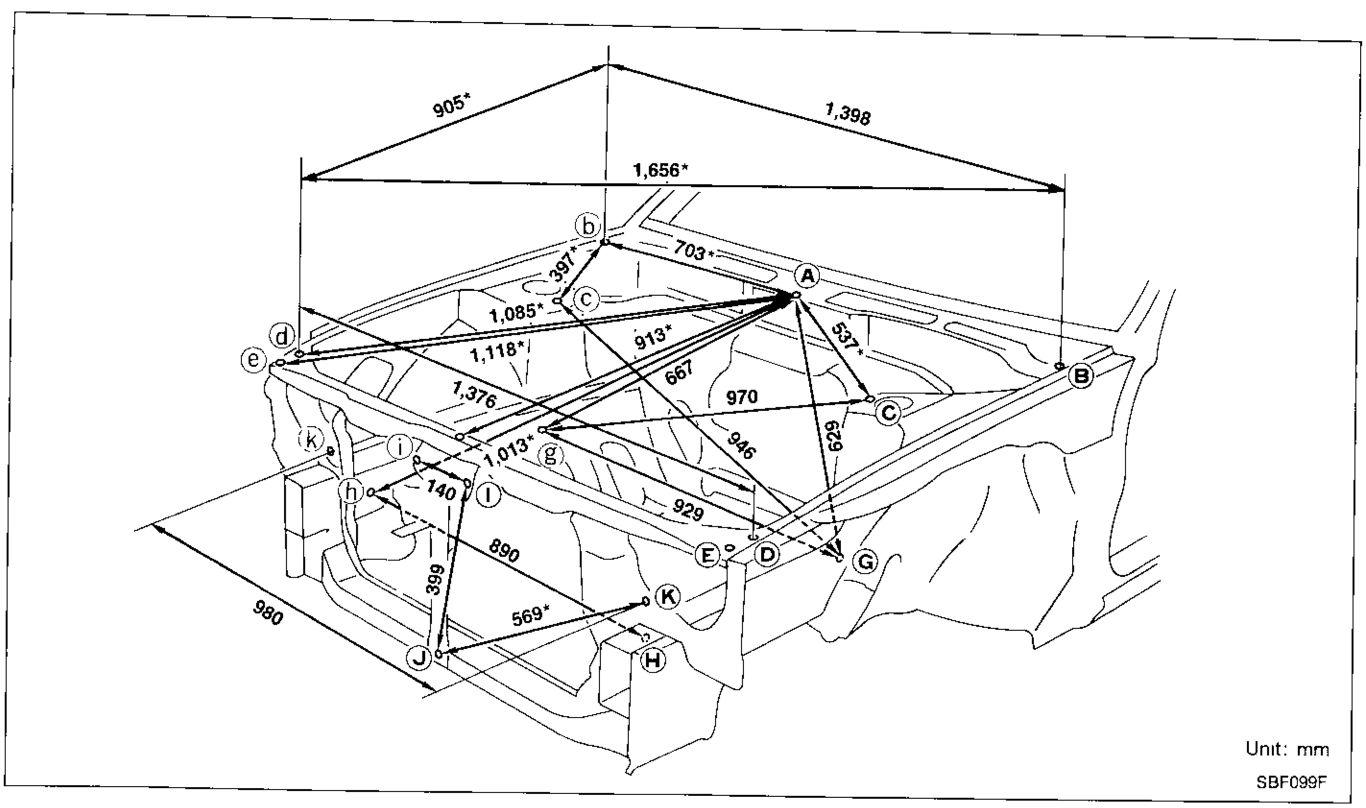


- All dimensions indicated in figures are actual ones.
- When a tram tracking gauge is used, adjust both pointers to equal length and check the pointers and gauge itself to make sure there is no free play.
- When a measuring tape is used, check to be sure there is no elongation, twisting or bending.
- 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

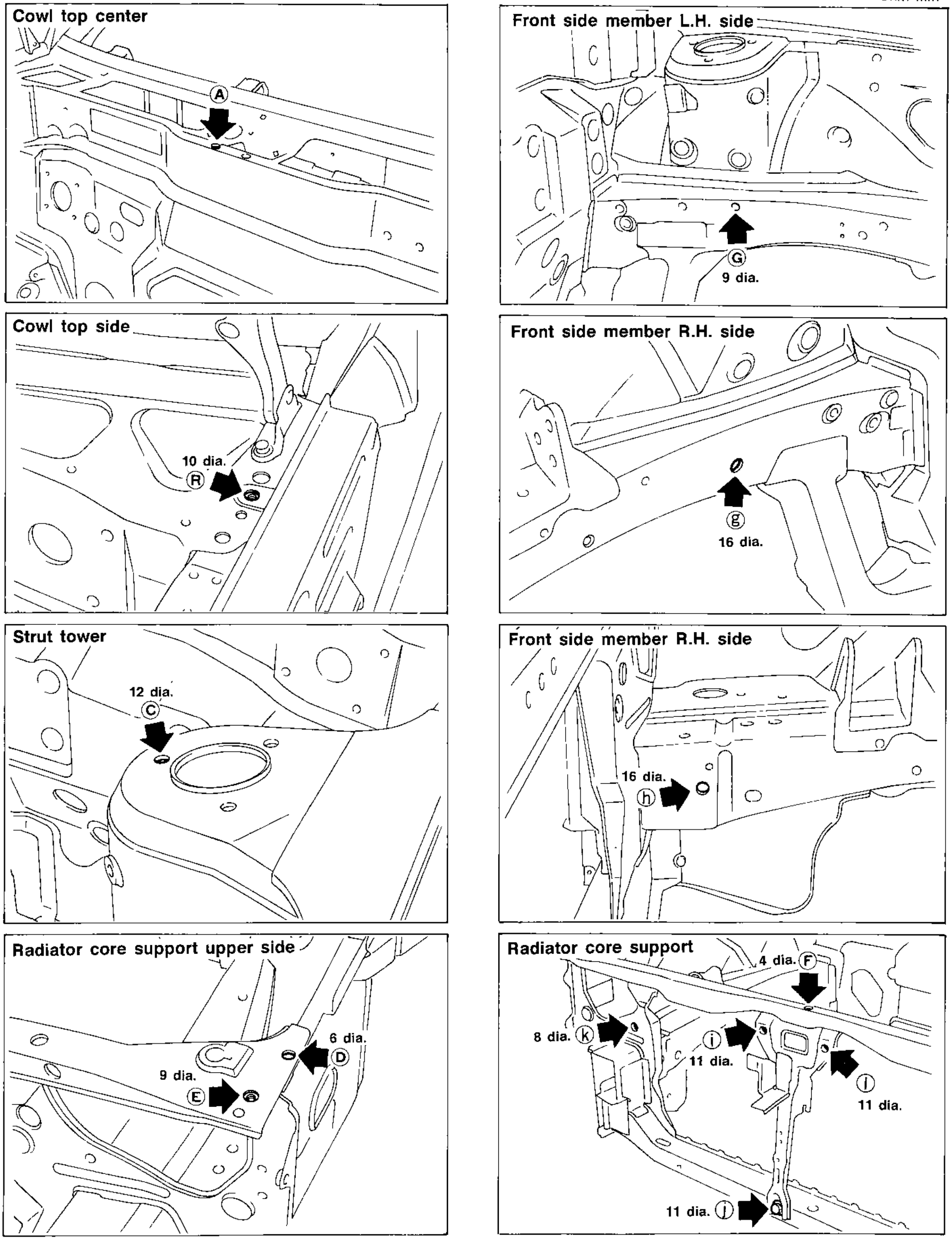
MEASUREMENT



Engine Compartment (Cont'd)

MEASUREMENT POINTS

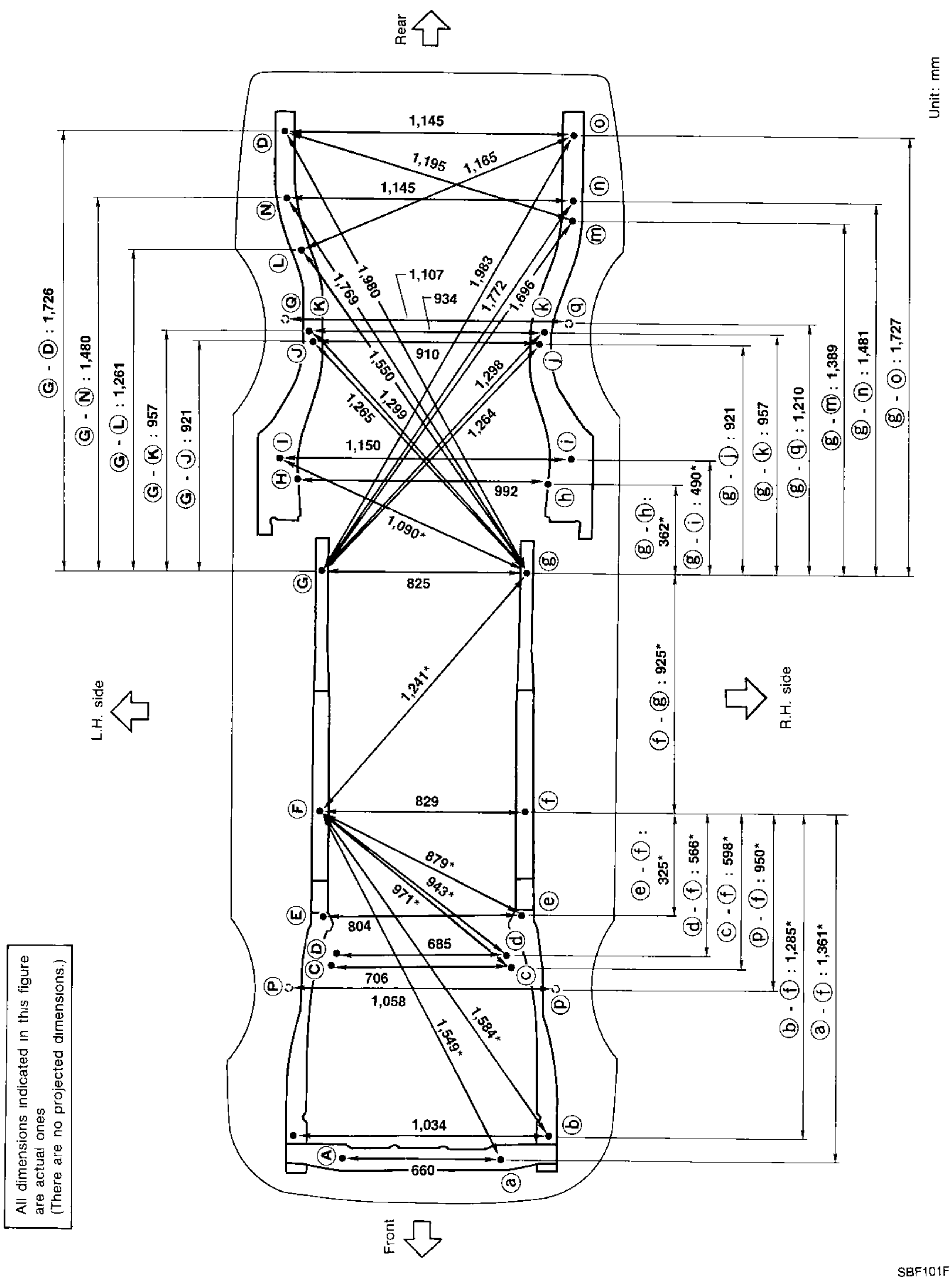
Unit: mm



SBF100F

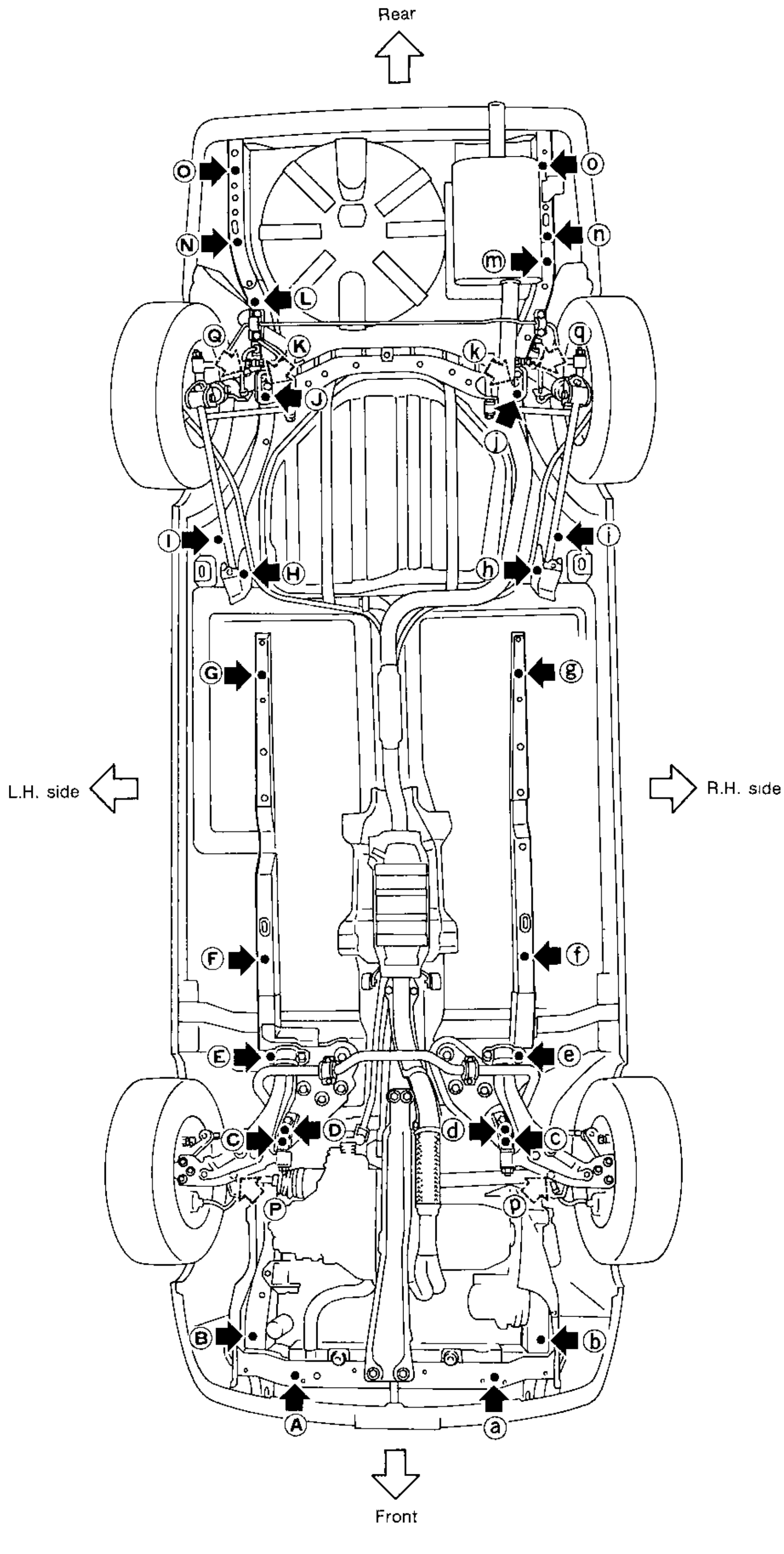
Underbody

MEASUREMENT



Underbody (Cont'd)

MEASUREMENT POINTS

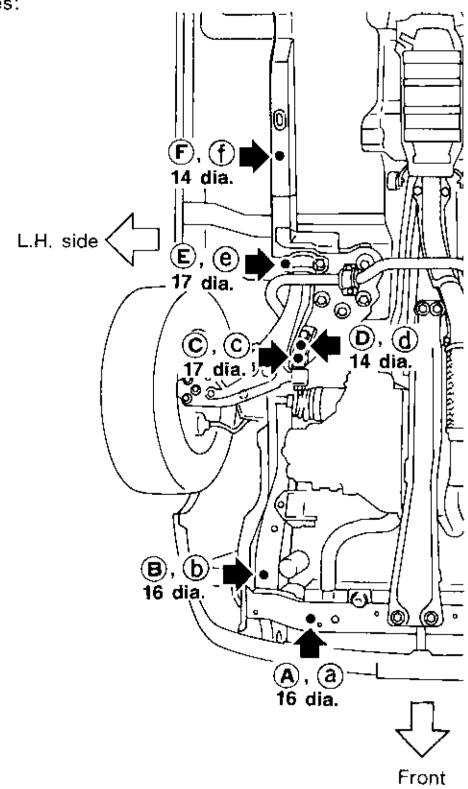


SBF102F

Unit: mm

Radiator core lower support, front side member, front side member extension, front suspension mounting lower member and dash lower cross-member

Coordinates:
Ⓐ, ⓐ
X: 330.0
Y: −655.0
Z: 208.0
Ⓑ, ⓑ
X: 517.0
Y: −560.0
Z: 340.0
Ⓒ, ⓒ
X: 353.0
Y: 106.2
Z: 142.7
Ⓓ, ⓓ
X: 342.5
Y: 139.5
Z: 145.6
Ⓔ, ⓔ
X: 402.0
Y: 378.9
Z: 157.2
Ⓕ, ⓕ
X: 414.5
Y: 700.0
Z: 110.0



Front side member rear extension, rear side member, rear suspension radius rod bracket and rear suspension mounting bolt top

Coordinates:
Ⓖ, ⓖ
X: 412.5
Y: 1,625.0
Z: 109.3
Ⓗ, ⓗ
X: 496.0
Y: 1,969.2
Z: 183.9
Ⓘ, ⓘ
X: 575.0
Y: 2,070.0
Z: 234.0

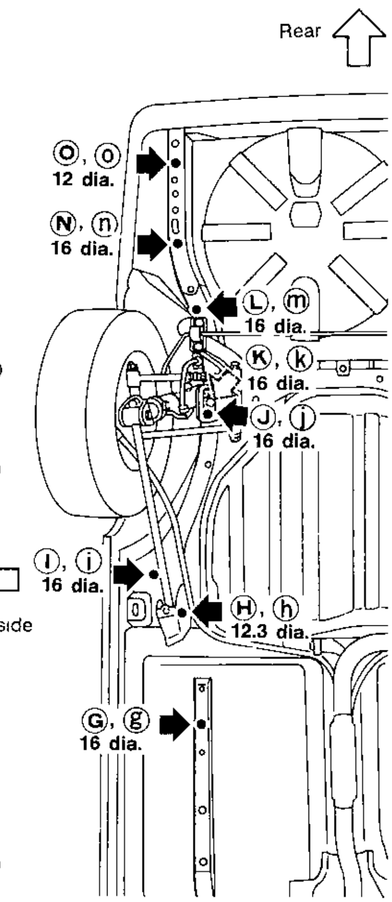
Ⓙ (LH)	ⓙ (RH)
X: 456.0	X: 454.0
Y: 2,525.0	Y: 2,525.0
Z: 300.0	Z: 300.0

Ⓚ (LH)	ⓚ (RH)
X: 468.0	X: 466.0
Y: 2,555.0	Y: 2,555.0
Z: 328.0	Z: 328.0

Ⓛ (LH)
X: 493.0
Y: 2,864.0
Z: 328.0
ⓜ (RH)
X: 575.0
Y: 2,987.0
Z: 328.0

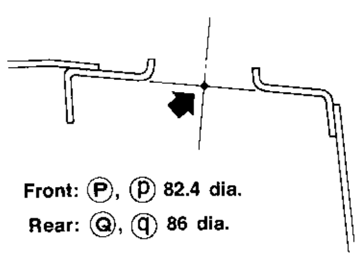
Ⓝ (LH)	ⓝ (RH)
X: 570.0	X: 575.0
Y: 3,080.0	Y: 3,080.0
Z: 330.0	Z: 330.0

Ⓞ (LH)	ⓞ (RH)
X: 570.0	X: 575.0
Y: 3,330.0	Y: 3,330.0
Z: 330.0	Z: 330.0



Front and rear strut tower centers

Coordinate:
Ⓟ, ⓟ
X: 529.0
Y: 13.5
Z: 756.1
Ⓠ, ⓠ
X: 553.7
Y: 2,598.6
Z: 813.1



SBF103F

HEATER & AIR CONDITIONER

SECTION HA

CONTENTS

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DESCRIPTION — Refrigeration System .... HA- 8
PREPARATION .... HA- 9
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COMPRESSOR OIL — Checking and Adjusting HA-29
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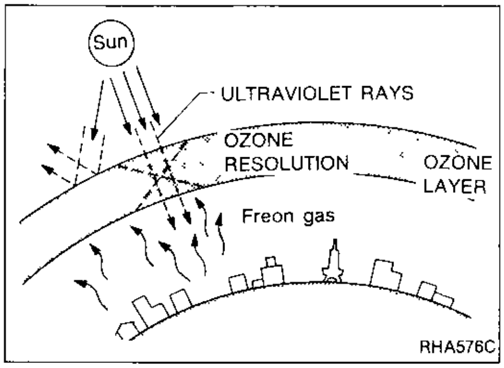
When you read wiring diagrams:
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

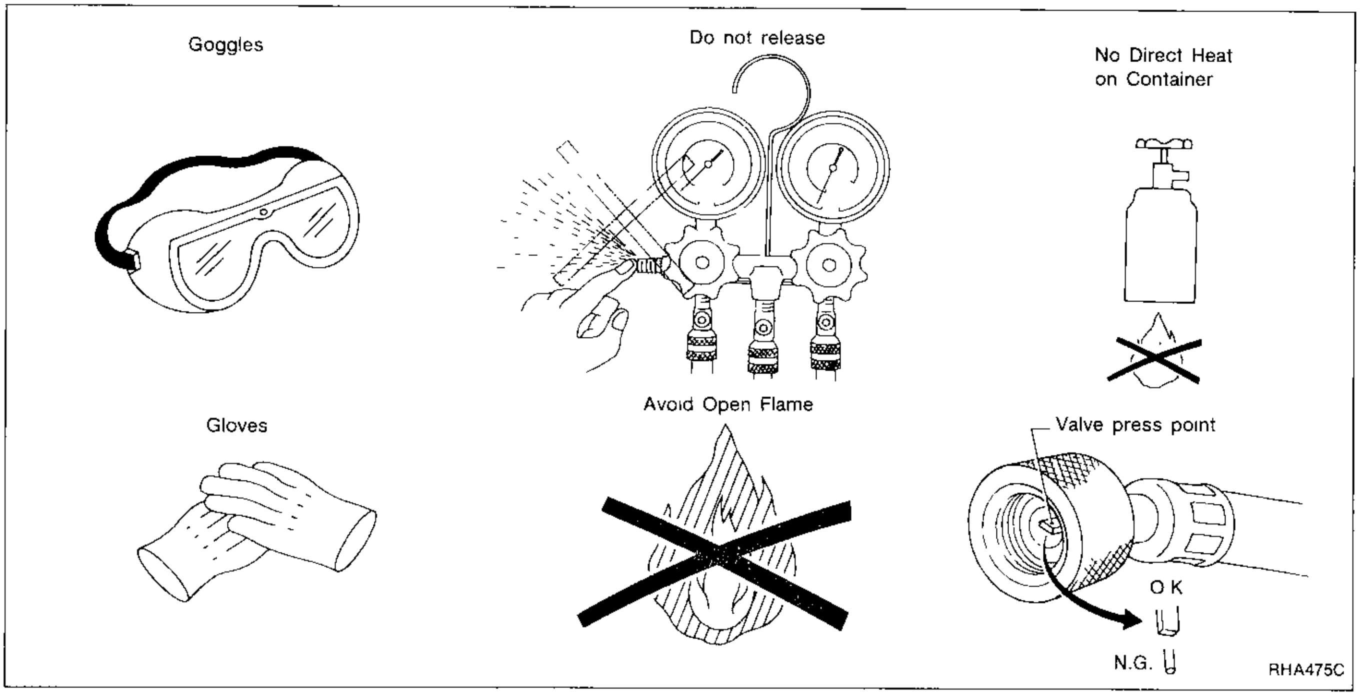
When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES".



Precautions for the Handling of Refrigerant

- **Do not release refrigerant into the air. Use your refrigerant recycling equipment to capture the refrigerant every time you need to discharge an air conditioning system.**

  The release of refrigerant into the air can cause damage to the Earth's ozone layer.



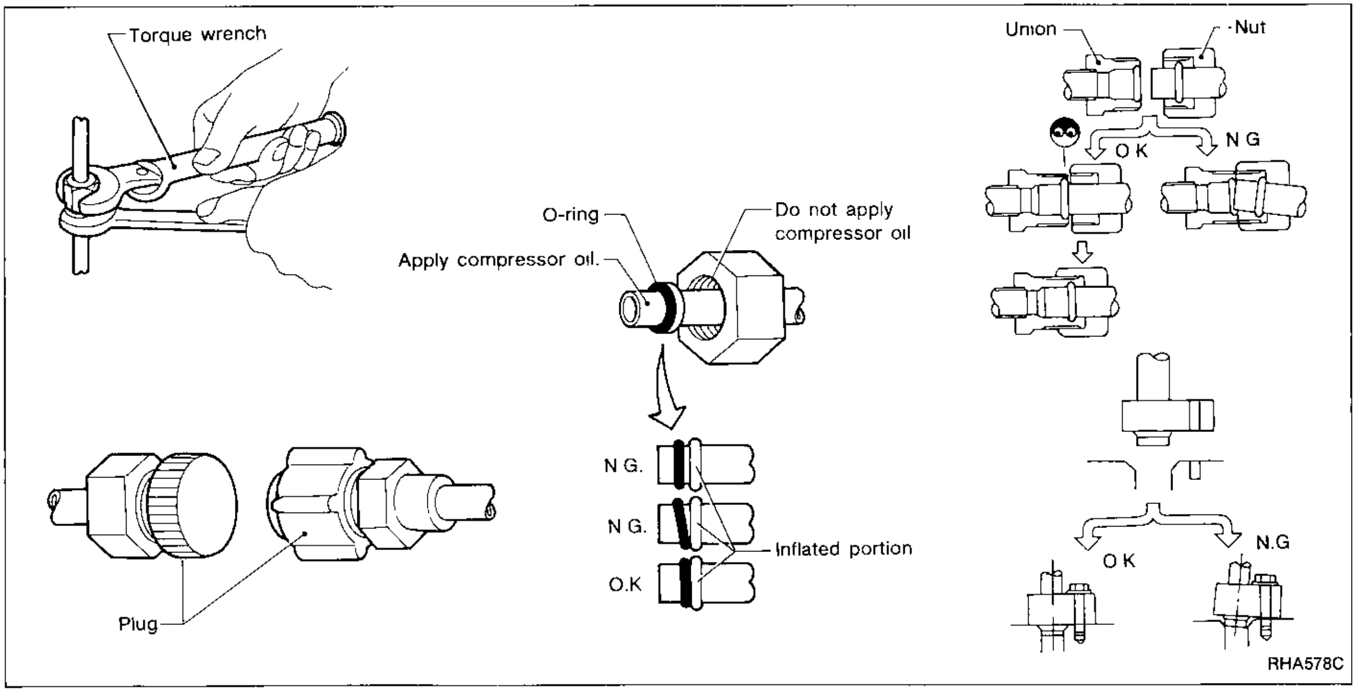
- **Always wear eye protection when working around the system.**
- **Always be careful that refrigerant does not come in contact with your skin.**
- **Keep refrigerant containers stored below 40°C (104°F) and never drop from high places.**
- **Work in well-ventilated area because refrigerant gas evaporates 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.**
- **Do not use compressed air to clean out a contaminated A/C tube or hose. Shake the line over a clean, white paper towel. If it contains obvious moisture or contaminants, replace it. Do not blow out the line with refrigerant.**
- **Do not use manifold gauge set whose press point shape is different from that shown. Otherwise, insufficient evacuating may occur.**
- **Do not over-tightening service valve cap.**
- **Follow the manufacturer's instructions for discharging into your refrigerant recycling equipment.**

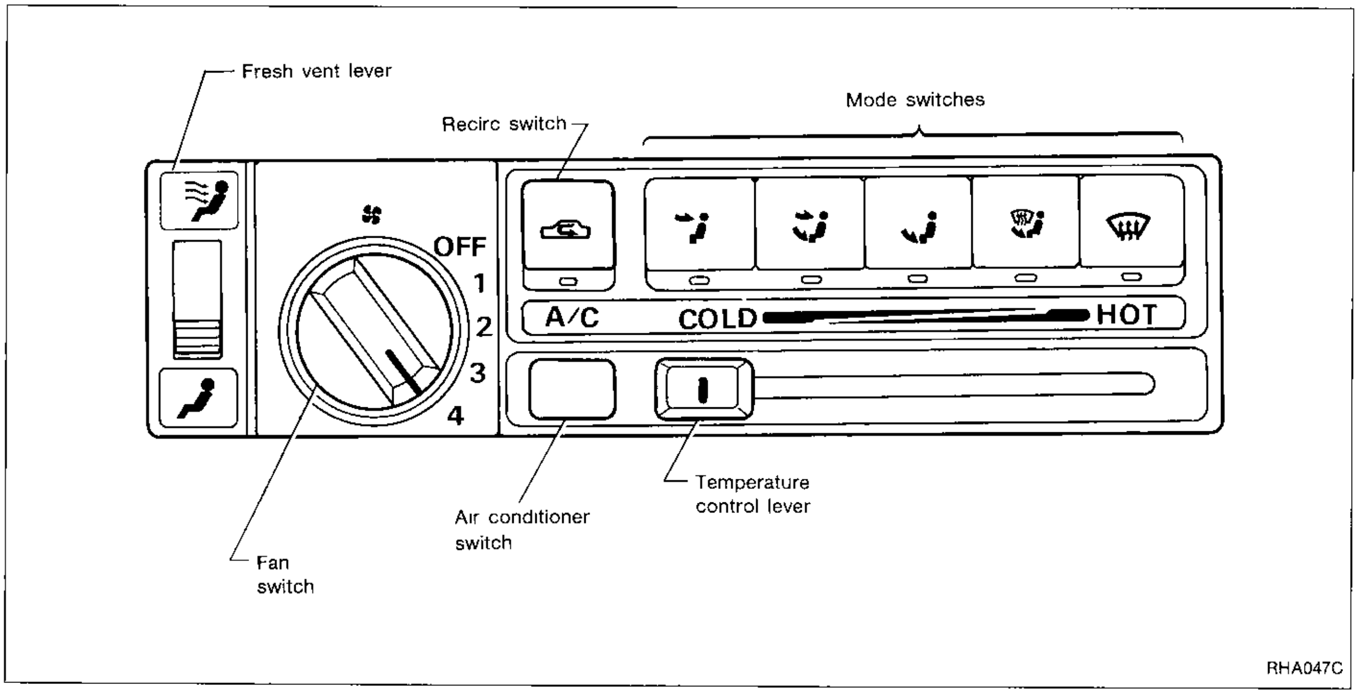
CAUTION:

- **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.**
- **Always replace used O-rings.**
- **When connecting tube, apply compressor oil to portions 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. When the gas leaking point is found, disconnect that line and replace the O-ring. Then tighten connections of seal seat to the specified torque.**



- Pay attention so as not to allow dirt and oil to attach on the friction surfaces between clutch and pulley. If the surface is contaminated with oil, wipe it off by using a clean waste cloth moistened with thinner.
- After completing the compressor service operation, be sure to rotate the compressor shaft more than five turns in both directions by hand to equalize oil distribution inside the compressor, then run the compressor for about one hour by idling the engine.
- When the compressor magnet clutch has been replaced, be sure to check the magnet clutch for normal operation by applying voltage to the clutch.

Control Operation



FAN SWITCH

This switch turns the fan ON and OFF, and controls fan speed.

MODE SWITCHES

These switches allow you to select the outlet air flow. When the MODE is set to "DEF" or "F/D", the push control unit sets the intake door to "FRE". In the DEF mode, the compressor turns on.

TEMPERATURE CONTROL LEVER

This lever allows you to adjust the temperature of the outlet air.

RECIRC SWITCH

OFF position:
Outside air is drawn into the passenger compartment when this switch is OFF.
ON position:
Interior air is recirculated inside the vehicle. RECIRC is canceled when DEF or F/D are selected, RECIRC resumes when another mode is chosen.

AIR CONDITIONER SWITCH

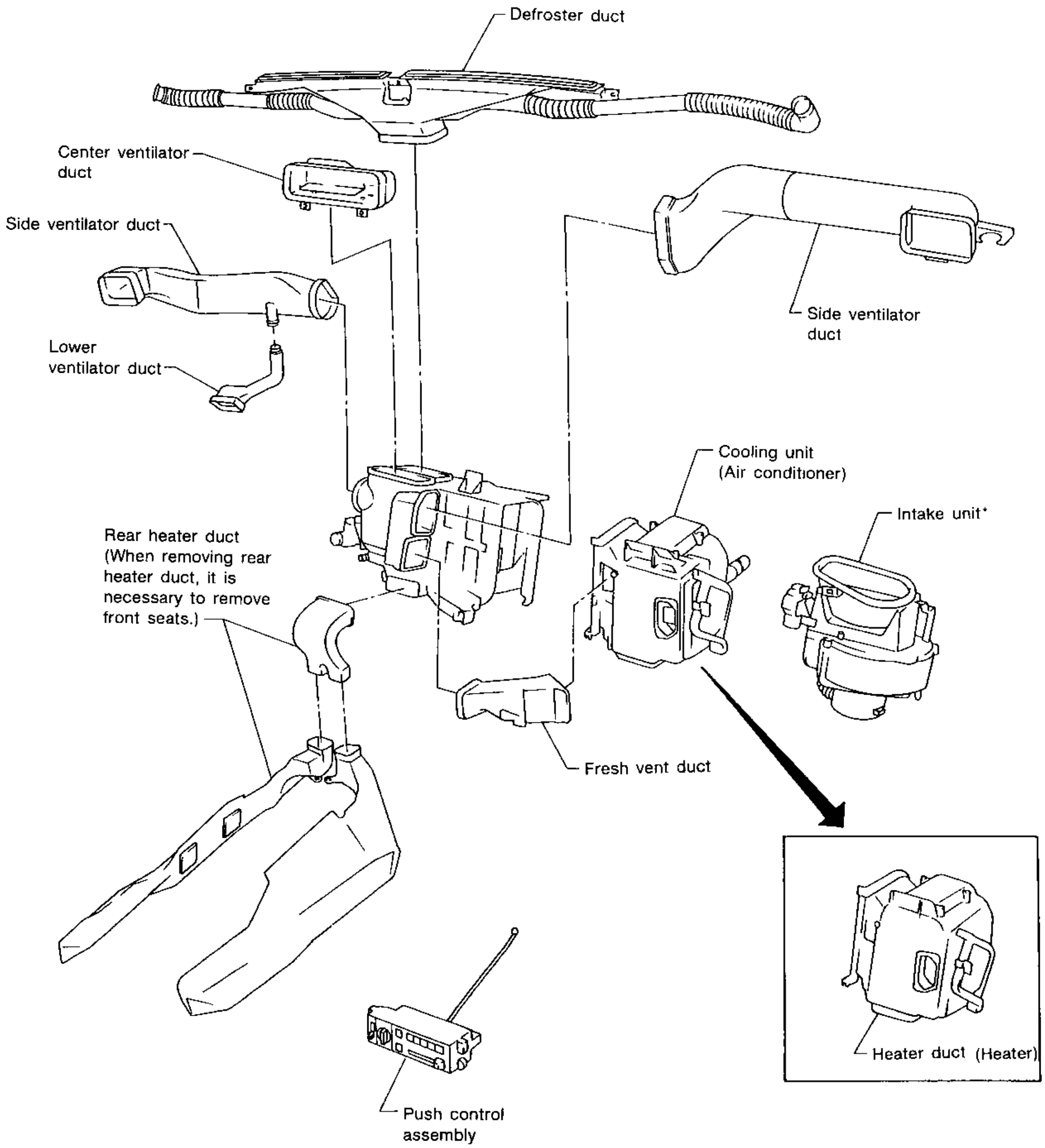
Start the engine, move the fan control lever to the desired (1 to 4) position and push the air conditioner switch to turn ON the air conditioner. The indicator light will come on when the air conditioner is ON. To stop the air conditioner, push the switch again to return it to the original position.

The air conditioner cooling function operates only when the engine is running.

FRESH VENT LEVER

In order to prevent unpleasant hot air on the face in the heater mode or especially in the FOOT, FOOT/DEF or DEF modes, this system allows cold air to flow from the ventilator ducts directly (without passing through the heater core) by means of a fresh vent lever beside the push control unit.

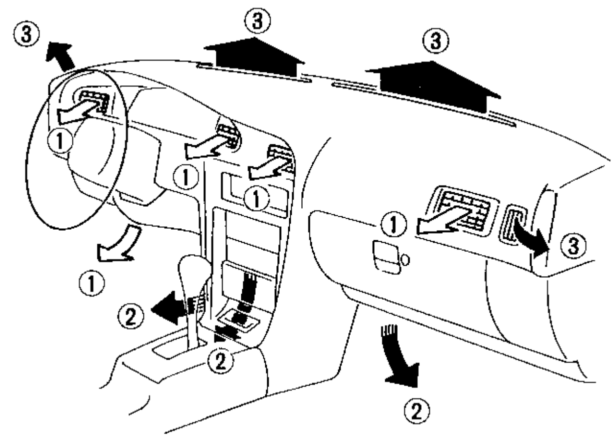
Component Layout



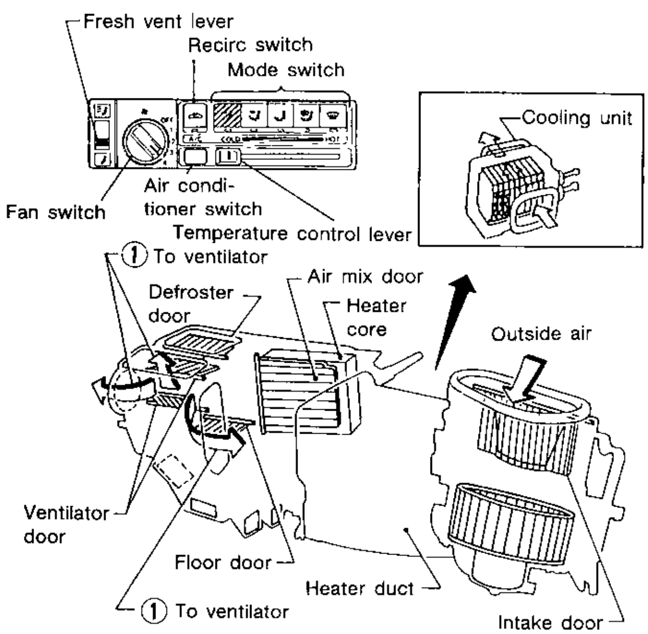
*: For removal, it is necessary to remove instrument assembly

RHA153B

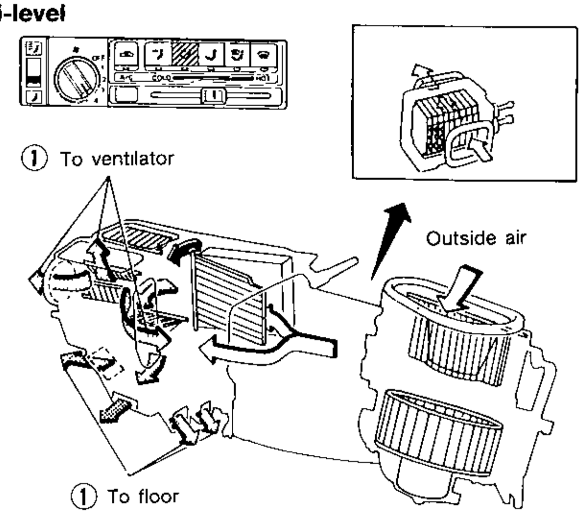
Air Flow



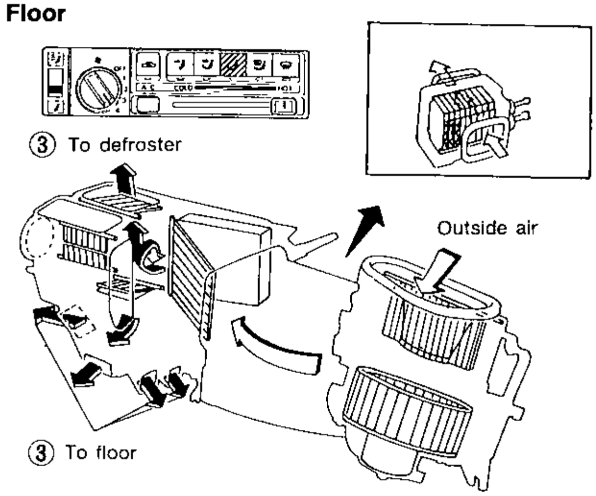
Ventilation



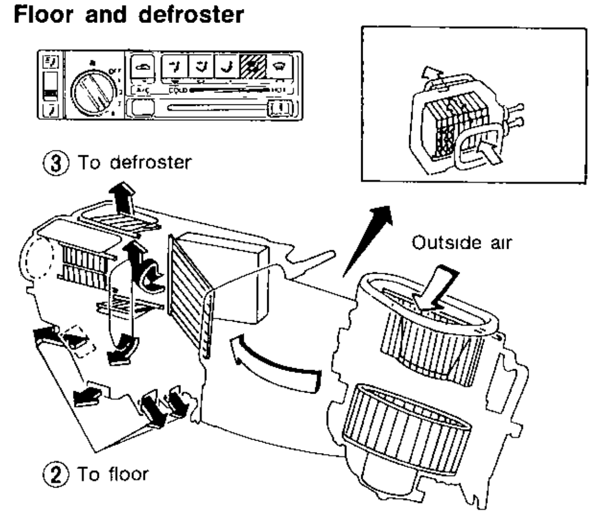
Bi-level



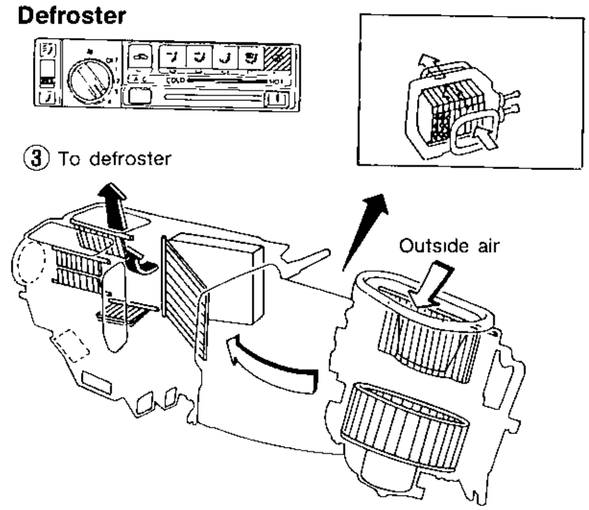
Floor



Floor and defroster



Defroster



Air passed through heater core

: Mixed air (+)

: Air not passed through heater core

RHA150B

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.
The refrigerant evaporation through the evaporator coil is controlled by an externally equalized expansion valve, located inside the evaporator case.

FREEZE PROTECTION

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

Dual-pressure switch

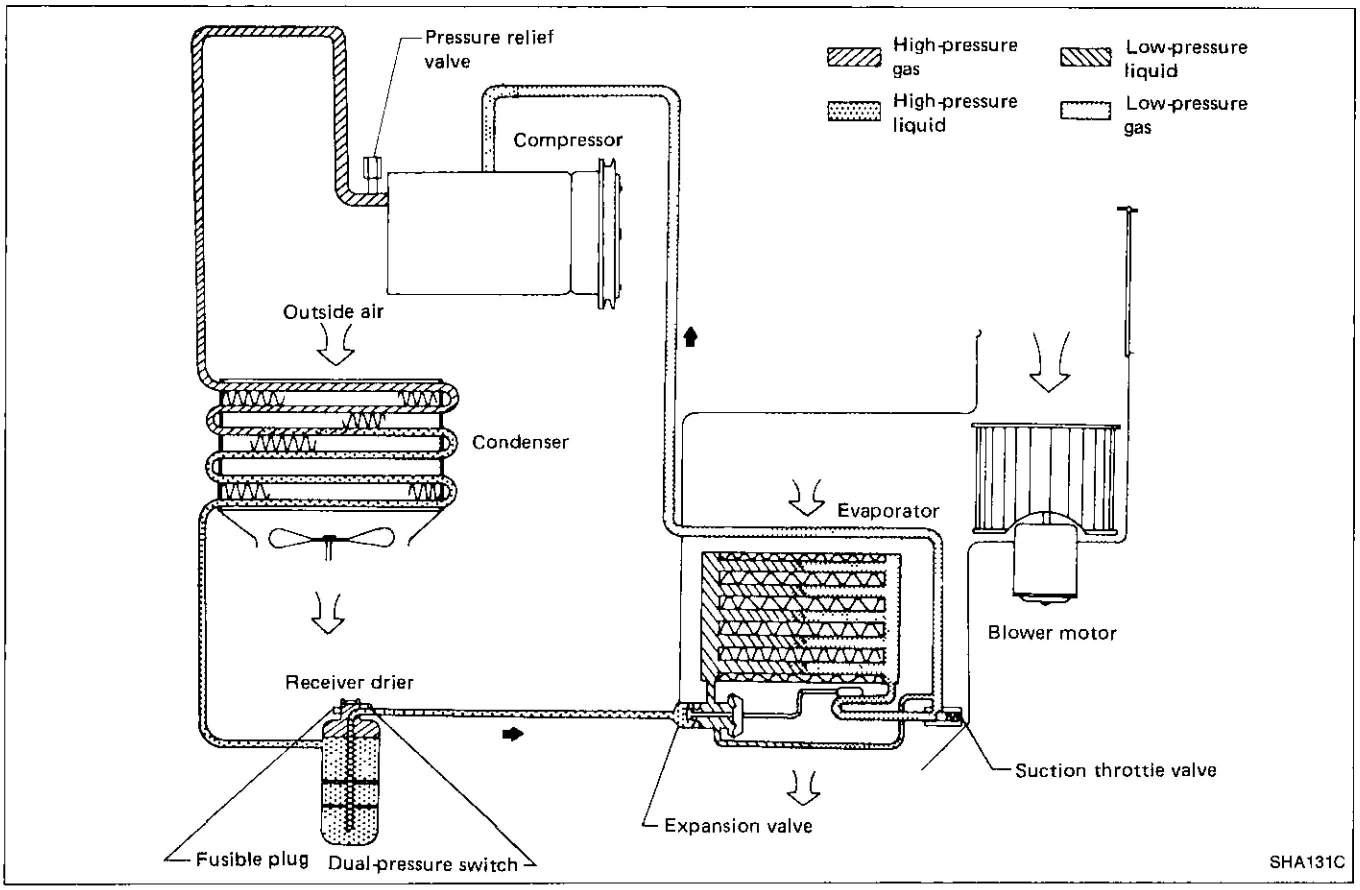
The refrigerant system is protected against excessively high or low pressures by the dual-pressure switch, located on the receiver drier. If the system pressure rises above, or falls below the specifications, the dual-pressure switch opens to interrupt the compressor operation.

Fusible plug

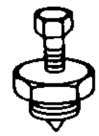
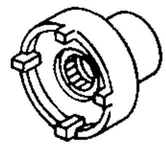
Open at temperature above 105°C (221°F), thereby discharging refrigerant to the atmosphere. If this plug is melted and opened, check the refrigerant line and replace receiver drier.

Pressure relief valve

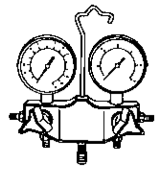
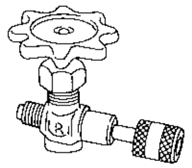
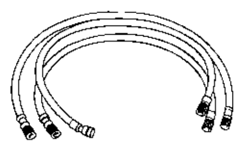
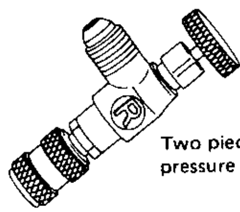
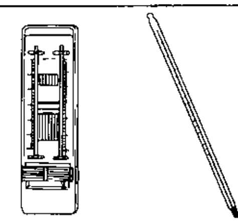
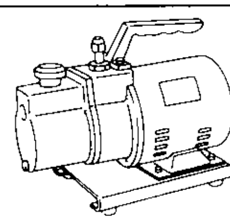
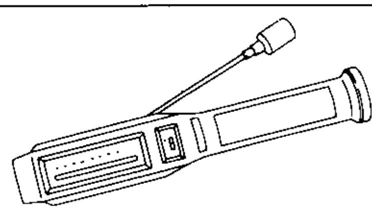
The refrigerant system is also protected by a pressure relief valve, located on the end of high flexible hose near compressor. When the pressure of refrigerant in the system increases to an abnormal level [more than 3,727 kPa (38 kg/cm^2, 540 psi)], the release port on the pressure relief valve automatically opens and releases refrigerant into the atmosphere.



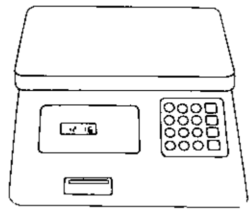
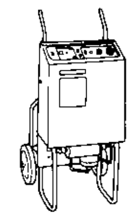
Special Service Tools

Tool number (Kent-Moore No.) Tool name	Description	
KV998VR001 (—) Clutch disc puller		Removing clutch disc
KV99231010 (—) Clutch disc wrench		Removing shaft nut and clutch disc
KV99235160 (J29751) Nut wrench		Removing lock nut

Service Tools

Tool name	Description	
Manifold gauge	 SHA899C	Discharging, evacuating and charging refrigerant
Manifold gauge	 SHA898C	Discharging, evacuating and charging refrigerant
Charging hose	 SHA897C	Discharging, evacuating and charging refrigerant
Adapter valve	 RHA573B	Discharging, evacuating and charging refrigerant
Thermometer and hygrometer	 SHA900C	Checking temperature and humidity
Vacuum pump	 RHA575B	Evacuating
Gas leak detector	 RHA577B	Checking refrigerant leaks

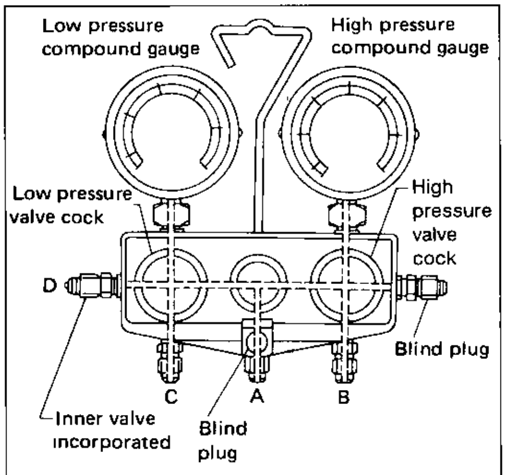
Service Tools (Cont'd)

Tool name	Description	
Charging cylinder	 RHA578B	Checking amount of refrigerant and charging refrigerant
Weight scale	 RHA579B	Checking amount of refrigerant
Refrigerant recycling equipment	 SHA732C	Capturing and recycling refrigerant

For details of such handling methods, refer to the Instruction Manual attached to each of the service tools.

Service Tools (Cont'd)

HANDLING METHOD AND STRUCTURE



Center joint (A):
Use for evacuating.
High pressure side joint (B):
Connect to high pressure side service valve of refrigerating system.
Low pressure side joint (C):
Connect to low pressure side service valve of refrigerating system.
Refrigerant joint (D).
Use for charging refrigerant.

SHA044D

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 (–760 mmHg, –29.92 inHg) to 2,942 kPa (30 kg/cm^2, 427 psi), and the low pressure gauge measures generally from –101.3 kPa (–760 mmHg, –29.92 inHg) to 1,471 kPa (15 kg/cm^2, 213 psi).

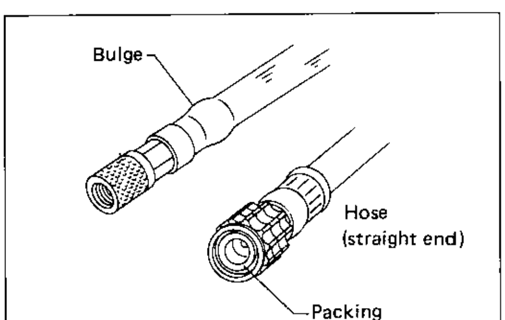
CAUTION:
- **When installing the gauge to the refrigerating system, use utmost care not to mistake high pressure and low pressure line connections. (Wrong connections will lead to a damaged gauge.)**
- **Before evacuating, confirm that the gauge has a negative pressure scale. (If not, the gauge will 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 charging cylinder.
4. Connect the vacuum pump hose to the vacuum pump.

The high and low pressure hoses are color coded to prevent wrong connection.

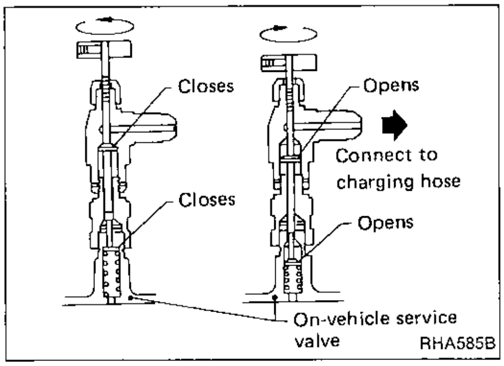
High pressure line hose	Red
Low pressure line hose	Yellow
Charging hose	Blue or green (with valve core)
Vacuum pump hose	Blue or green



RHA581B

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.**

Service Tools (Cont'd)



RHA585B

Installing the adapter valve

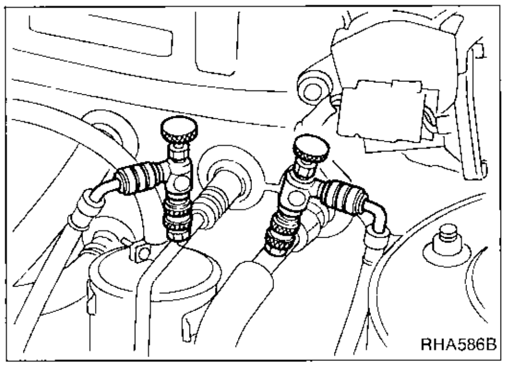
Install the adapter valve to each of the high pressure and low pressure service valves so that air purging from the charging hose can be omitted. This also ensures that refrigerant leakage upon disconnection of the hose can be prevented.

1. Before connecting the adapter valve to the on-vehicle service valve, turn the adapter valve handle fully counter-clockwise to retract the pin.

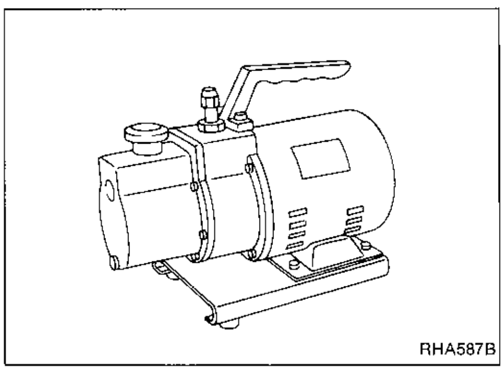
CAUTION:
Check the packing for any sign of deterioration or cracks. If any abnormality is found, replace it with a new one.

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.


RHA586B

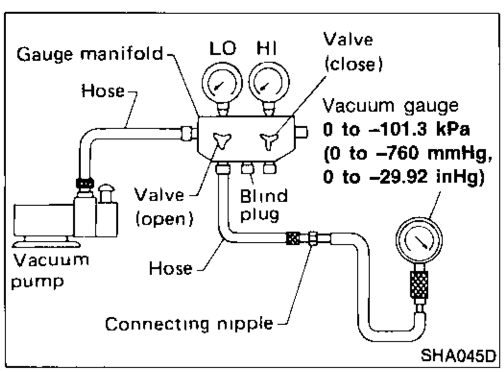
Vacuum pump


RHA587B

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 (–750 mmHg, –29.53 inHg).

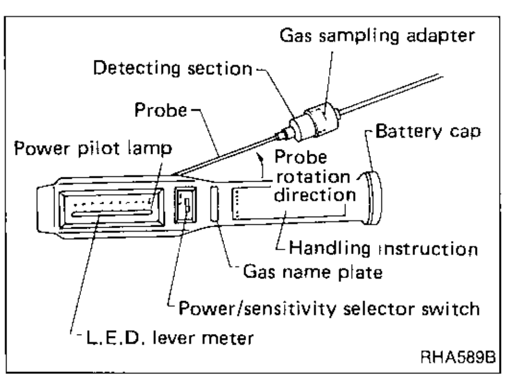
Vacuum pump performance check procedure



SHA045D

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 capacity of the vacuum pump.

Gas leak detector



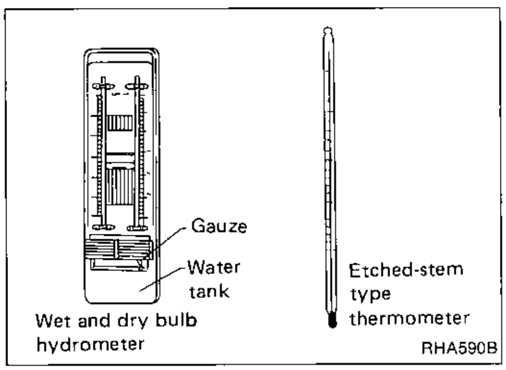
RHA589B

The gas leak detector is used to check whether the refrigeration system is leaking. The features of this gas leak detector are listed on the next page.

Service Tools (Cont'd)

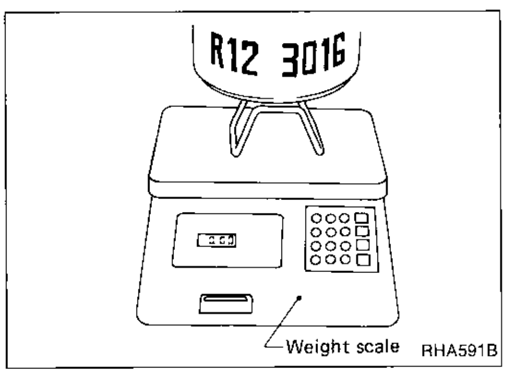
Type		Detection ability	Features
Electrical	Discharge type (Suction type)	3 - 50 g (0.11 - 1.76 oz)/year	• Easy handling • Medium sensitivity • Each point needs tow or more seconds for detection.
	Positive ion emission type (Suction type)	2 g (0.07 oz)/year	• High sensitivity • High price • Warm-up time 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 (100 mmHg, 3.94 inHg) change in vacuum is detected in 10 minutes.	• 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

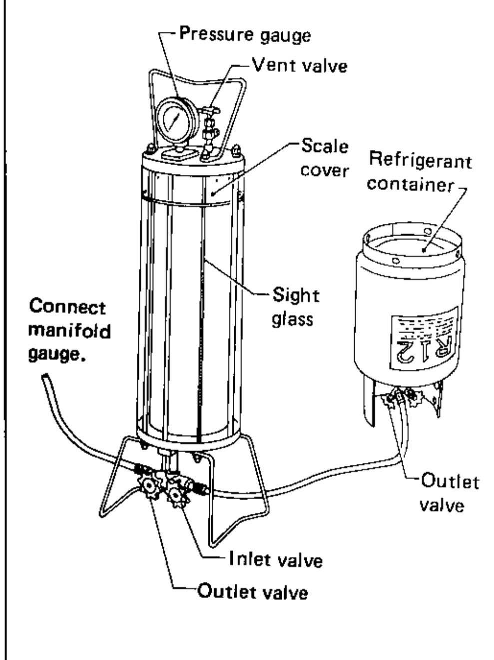
Use to check the air conditioner performance. An etched stem type thermometer may be used. A hygrometer must also be used because the air conditioner performance depends on the humidity.



Scale

Measure the weight of the refrigerant to determine how much the refrigerant is charged.

Service Tools (Cont'd)



RHA674B

Charging cylinder

The charging cylinder is used to correctly measure the amount of refrigerant to be charged.

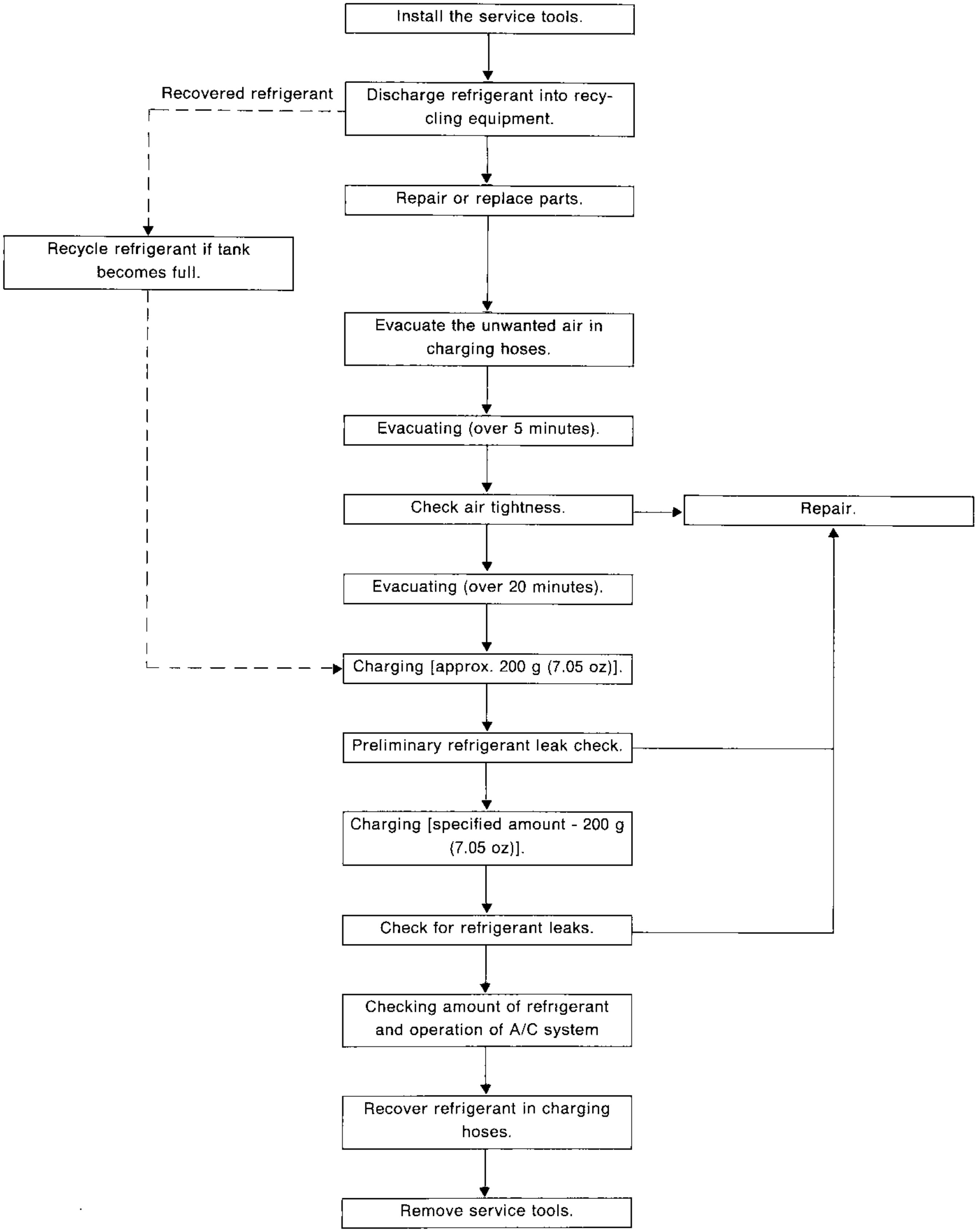
Features

- 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.

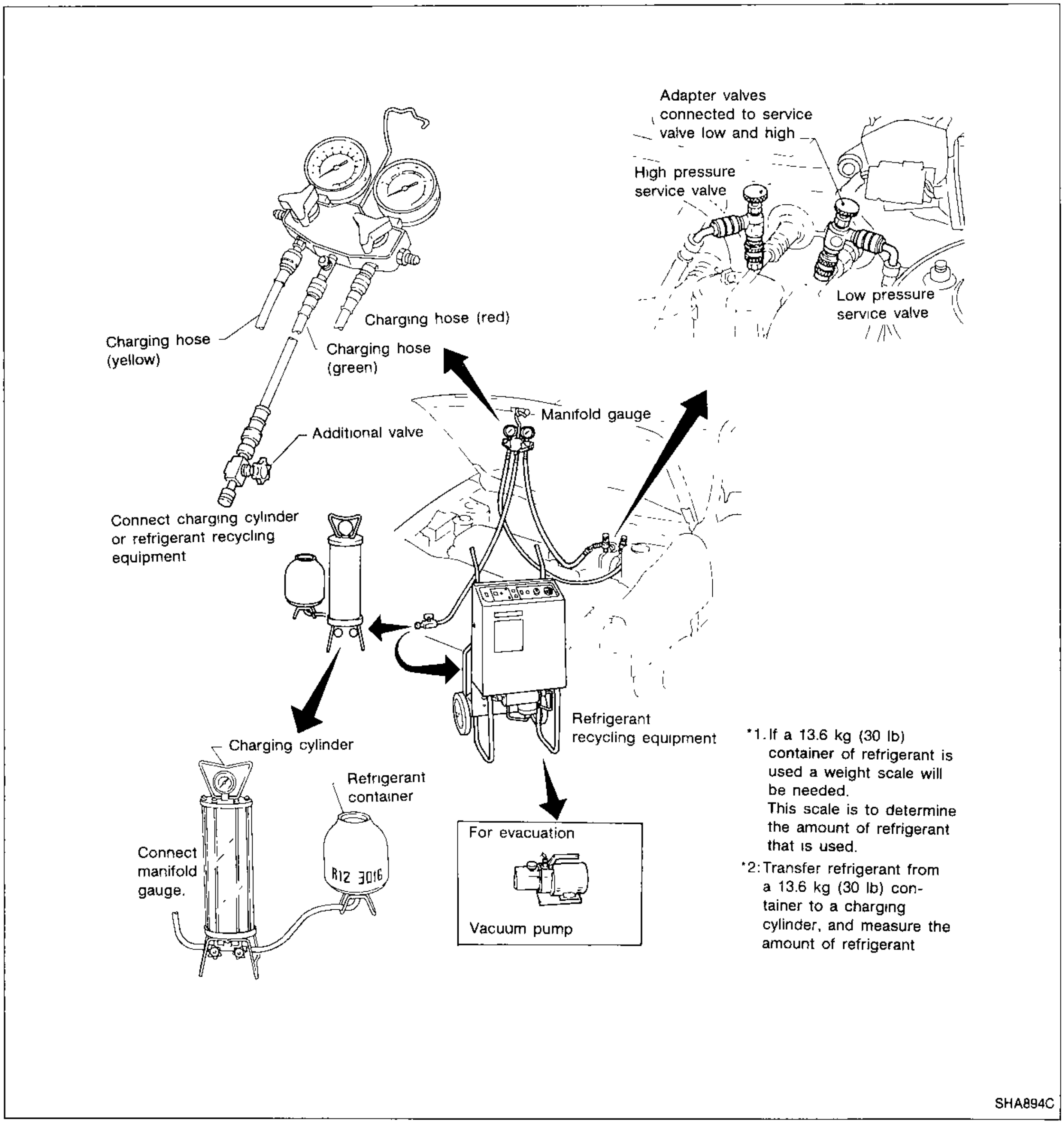
CAUTION:

- **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.**

Work Procedure

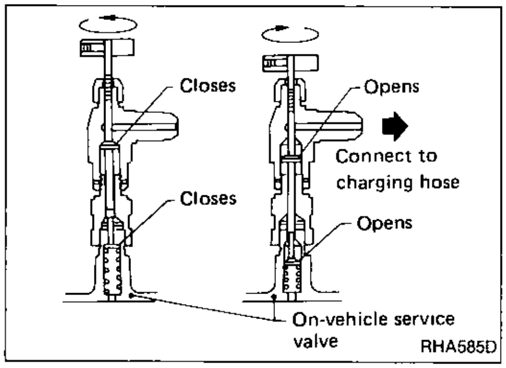


Setting of Service Tools

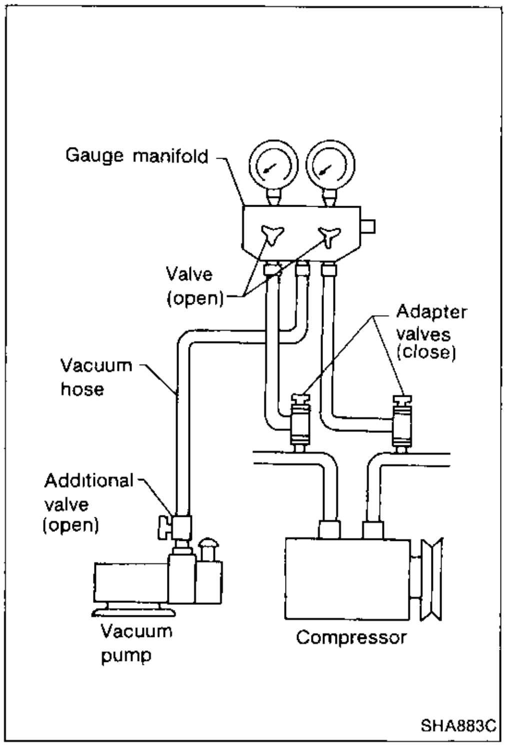


WARNING:
Discharge only into your recycling equipment. Do not release refrigerant into the air.

Setting of Service Tools (Cont'd)



RHA585D

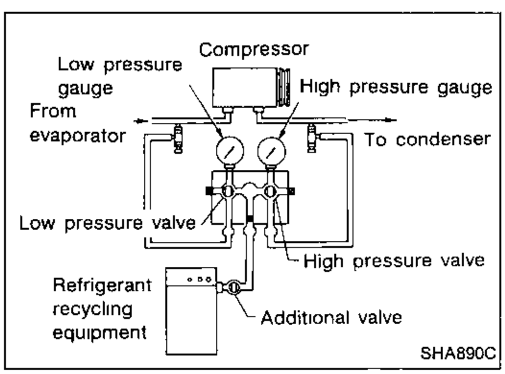


SHA883C

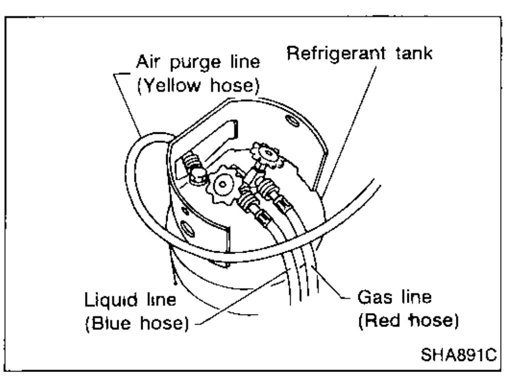
1. Install adapter valve to each of high pressure and low pressure service valves.

Before connecting adapter valve, turn adapter valve handle fully counterclockwise to retract pin.

2. Connect charging hoses to adapter valves and connect vacuum hose to vacuum pump.
3. Run vacuum pump and open additional valve and both valves on gauge manifold set.
4. After evacuating unwanted air in gauge set, close additional valve and stop vacuum pump.
5. Disconnect vacuum hose from vacuum pump and connect it to refrigerant recycling equipment.



SHA890C



SHA891C

Discharging

WARNING:

Discharge only into your recycling equipment.

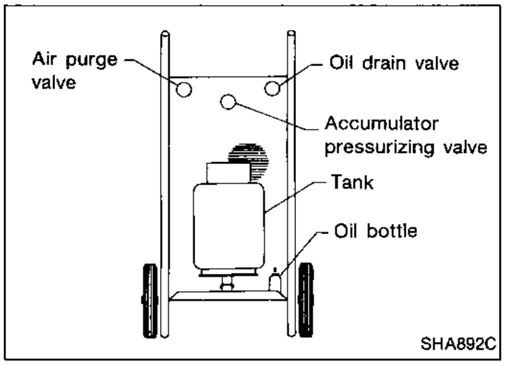
Do not release refrigerant into the air.

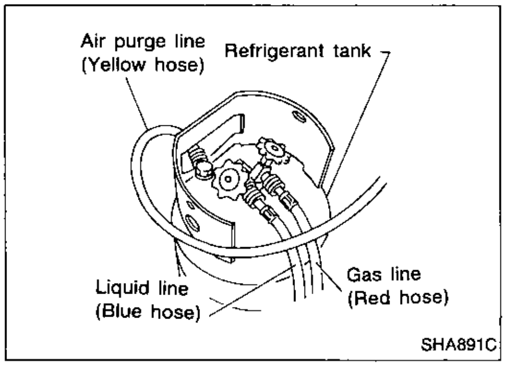
Use only authorized refillable refrigerant tanks for your recycling equipment.

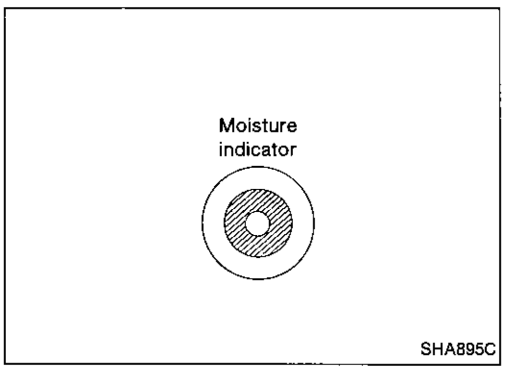
Use of other tanks could cause personal injury.

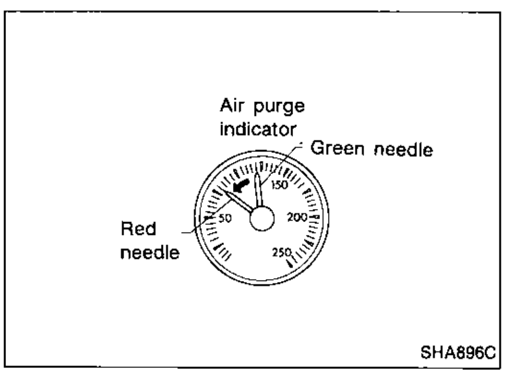
REFRIGERANT RECOVERY

1. Connect vacuum hose to refrigerant recycling equipment and open additional valve and adapter valves.
2. Open both valves of manifold gauge set. Make certain refrigerant tank "Gas" and "Liquid" valves are open.
3. Plug unit's power cord into a suitable AC outlet and turn on "Main Power" switch.
4. Turn on "Recovery" switch.
5. Depress "Start" switch. Compressor will start. Compressor will shut off automatically when recovery is complete. Watch for pressure rise to above 0 kPa (0 kg/cm^2, 0 psi) within two minutes. If this occurs, repeat this step.









Discharging (Cont'd)

6. To drain A/C system oil accumulator, open "Accumulator Pressurizing" valve for approximately 15 seconds to allow some compressor discharge pressure back into accumulator. Close "Accumulator Pressurizing" valve and open "Oil Drain" valve slowly and drain accumulator. Do not allow accumulator to completely depressurize. When oil stops draining, close "Oil Drain" valve. Be sure to replace oil in A/C system before servicing.
7. Turn off "Recovery" switch.
8. When recovery tank is full, trip switch at the bottom of weight platform will de-energize compressor and "Tank Full" light will come on. Recycle refrigerant in tank before removing.

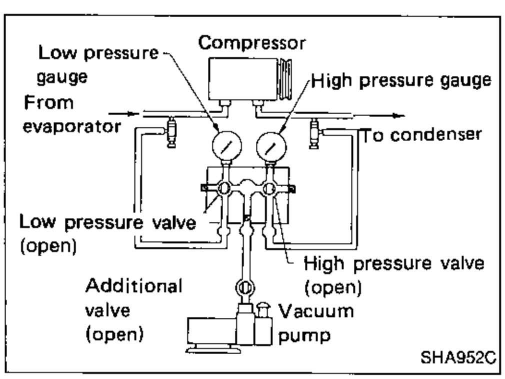
REFRIGERANT RECYCLING

The recycling of reclaimed refrigerant is essential in order to assure that the refrigerant which meets the standards is re-used.

For maximum efficiency, full tanks of recovered refrigerant should be recycled. As required, tanks containing a minimum of 3.6 kg (8 lb) of refrigerant can be recycled.

For greatest efficiency, recycling full tanks of refrigerant is recommended.

1. Make certain both valves on recovery tank are open.
2. Turn on "Recycling" switch. Recycling solenoid will be energized.
3. Depress start switch. Compressor will start, and "Recycling On" light will come. Refrigerant will be seen going through moisture indicator at start up. The sightglass will not completely fill with refrigerant.
4. Allow the station to operate until moisture indicator turns green. If moisture indicator does not turn green after 40 minutes, remove and replace filter.
5. After recycling for approximately 5 minutes, check air purge indicator. If green pointer on air purge indicator leads red pointer by more than 10 psi (2 small divisions), bleed tank through air purge valve on the back of unit until both pointers are equal. Repeat as necessary.

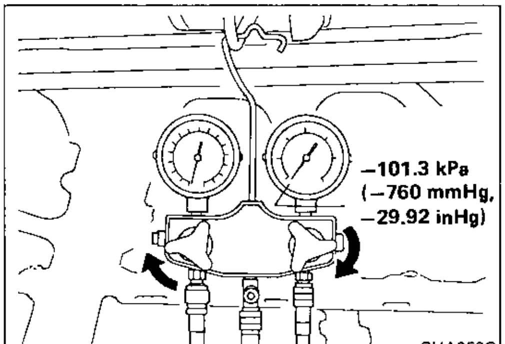


Evacuation

EVACUATION PROCEDURE

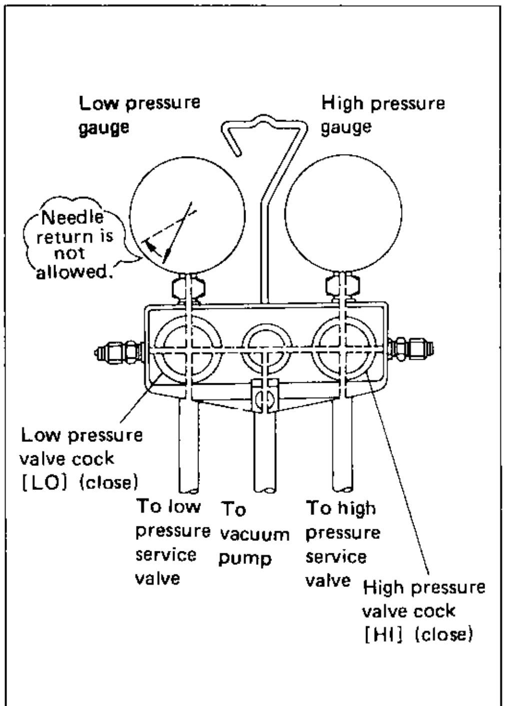
1. Connect vacuum hose to vacuum pump.
2. Open high and low pressure valves of manifold gauge set and additional valve.
3. Run vacuum pump.

Evacuation (Cont'd)



SHA953C

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 (–740 to –760 mmHg, –29.13 to –29.92 inHg).
5. Shut off the high and low pressure valves and additional valve.



SHA854C

CHECKING AIRTIGHTNESS

1. Shut off high and low pressure valves and additional valve, and leave the system as it is for 5 to 10 minutes.
2. Make sure that the needle of low pressure gauge will not move back toward the atmospheric pressure side (gauge pressure 0).

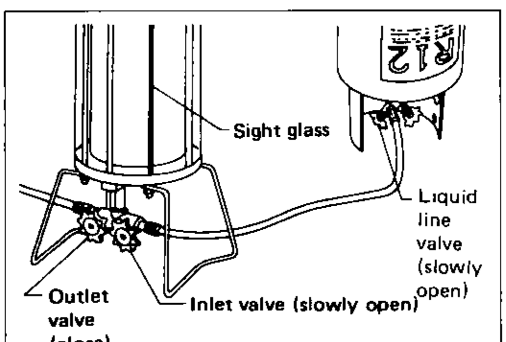
If any reverse movement is noted, it indicates poor system airtightness. Service the system until airtightness is complete. If pressure changes approx. 13.3 kPa (100 mmHg, 3.94 inHg) in 10 minutes, the refrigerant in the system will be exhausted in about one month.

EVACUATION

If no abnormality is found during airtightness check, perform evacuation again for more than 20 minutes.

1. Run vacuum pump.
2. Open high and low pressure valve and additional valve.
3. Evacuate for more than 20 minutes.
4. Close high and low pressure valves and additional valve.

Charging Refrigerant

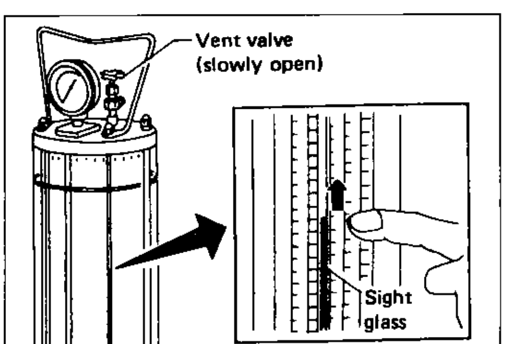


RHA677B

SETTING OF CHARGING CYLINDER

1. Make sure that inlet and outlet valves of charging cylinder are closed.
2. Slowly open liquid line valve of refrigerant tank.
3. Slowly open inlet valve of charging cylinder.

The refrigerant will flow into the sight glass of charging cylinder as inlet valve is opened.



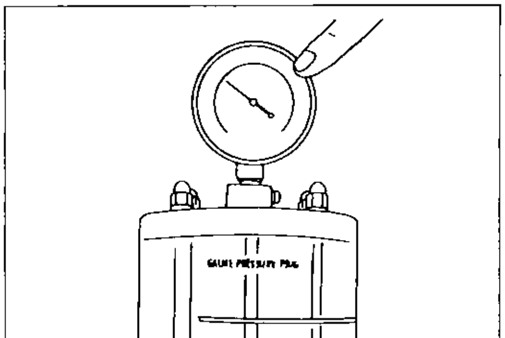
RHA678B

4. Slowly open upper vent valve to release pressure from charging cylinder. While doing so, continue charging until required amount of refrigerant is reached.

The refrigerant volume changes with temperature and pressure. It is necessary to charge refrigerant with a little more than required amount (indicated on sight glass).

5. Close inlet valve and upper vent valve of charging cylinder.

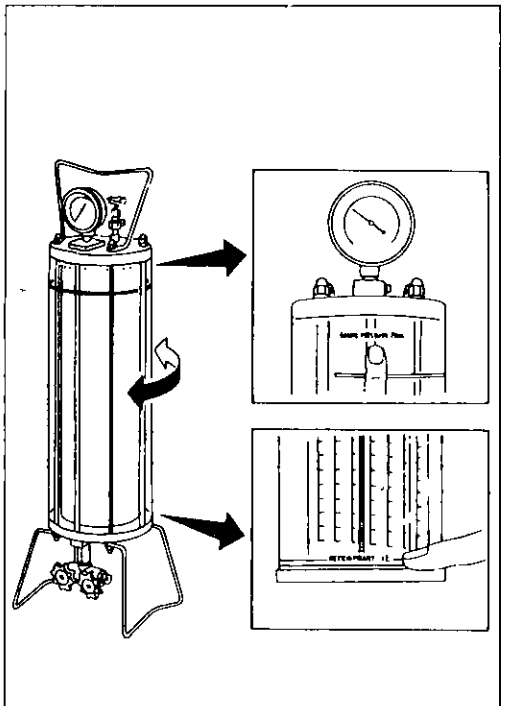
Charging Refrigerant (Cont'd)



RHA679B

6. Turn on heater switch (charging cylinder is provided with a heater.)

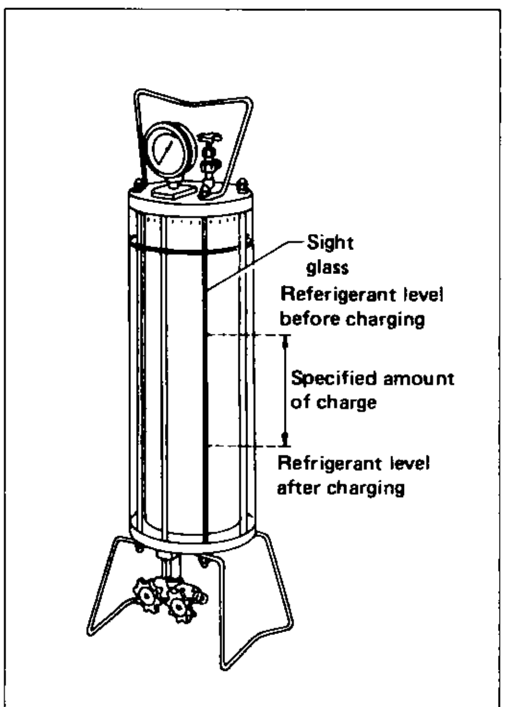
The refrigerant charging time can be reduced by heating refrigerant to increase its pressure. In this case, do not allow the pressure in cylinder to rise higher than 1,030 kPa (10.5 kg/cm^2, 150 psi). (If pressure rises above this level, turn off the heater.) The pressure in the charging cylinder can be measured by upper pressure gauge.



RHA680B

SETTING OF FLOW METER

1. Rotate charging cylinder main body until scale for R12 is at the correct position on sight glass.
2. Read charging cylinder pressure gauge.
3. Rotate charging cylinder so that scale of charging cylinder agrees with pressure value indicated on pressure gauge.



RHA681B

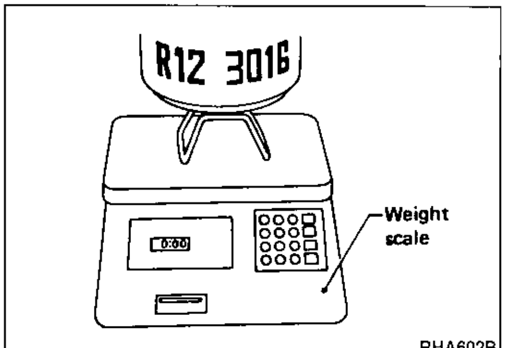
CALCULATING CHARGING AMOUNT OF REFRIGERANT

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:

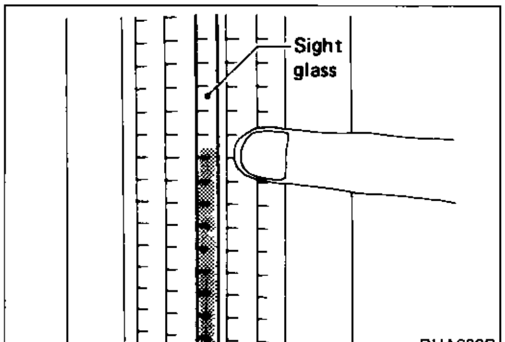
Level in sight glass: 3 lb 8 oz
Charge specification (from Service Manual) 2.0 - 2.4 lb.
Calculate charge quantity into lb and oz as follows: 1 lb = 16 oz, and 0.1 lb = 1.6 oz, so that 2.0 lb = 32 oz, 2.4 lb = 32 + (4 x 1.6) = 32 + 6.4 = 38.4, round off to 38. Therefore our charge quantity will be between 32 and 38 oz, or 2 lb 0 oz to 2 lb 6 oz.
Subtract 2 lb 6 oz from level in sight glass (3 lb 8 oz) = 1 lb 2 oz.
This will be our ending point.

Charging Refrigerant (Cont'd)



RHA602B

If a flow meter is not available, the amount of charged refrigerant also can be determined by subtracting the weight of the container measured after charging from its weight measured before charging.



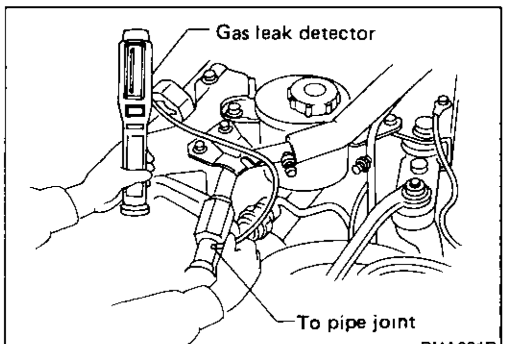
RHA682B

PRELIMINARY CHARGING OF REFRIGERANT

1. Open outlet valve of charging cylinder.
2. Slowly open high pressure side valve of manifold gauge to charge refrigerant from the high pressure side.
3. Close high pressure valve after charging approx. 200 g (7.05 oz) refrigerant.

CAUTION:

The refrigerant in charging cylinder is kept in liquid state, so the refrigerant should be charged from high pressure side. Do not start engine with high pressure valve kept open.



RHA601B

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. Slowly open high pressure valve of manifold gauge, and charge calculated amount of refrigerant in "CALCULATING CHARGING AMOUNT OF REFRIGERANT".

CAUTION:

The refrigerant in charging cylinder is kept in liquid state, so the refrigerant should be charged from high pressure side. Do not start engine with high pressure valve kept open.

2. Close high pressure valve of manifold gauge.
3. Make sure that the calculated amount of refrigerant remains in sight glass.
4. Close charging cylinder outlet valve.
5. Turn off heater if it is on (when using heater equipped type).

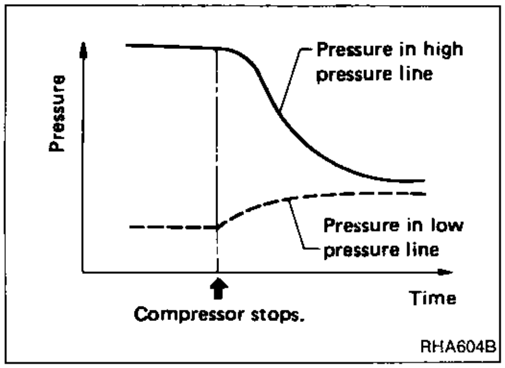
Inspection for Refrigerant Leaks

WORK PROCEDURE

To facilitate inspection for refrigerant leaks, establish the following conditions:

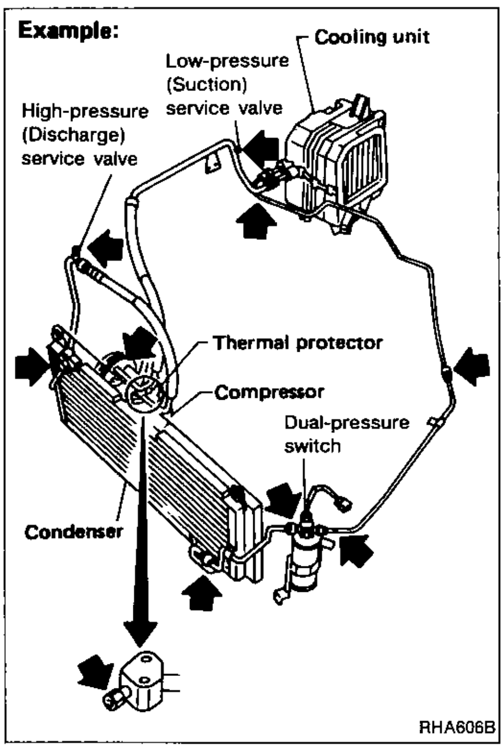
- Start engine.
- Run air conditioner.
- Set blower fan control to MAX.
- Set temperature control to FULL COLD.
- Run the refrigerant system for more than 5 minutes after setting the above-mentioned conditions (to circulate refrigerant through the system).

Inspection for Refrigerant Leaks (Cont'd)



Refrigerant leaks should be checked immediately after stopping engine, beginning with high pressure line, using a gas leak detector. This is because the pressure in high pressure line drops gradually after refrigerant circulation stops while the pressure in low pressure line rises gradually as shown in the graph at left. Leaks can be detected easily when pressure is high.

To prevent detecting errors, make sure that there is no refrigerant vapor or tobacco smoke in the vicinity of vehicle. It is also necessary to shield vehicle from wind so that leaking refrigerant is not blown away.



INSPECTION POINTS

Check carefully each of tube joints. To check, wipe the portion to be checked with waste cloth, and move tester probe all around the joint.

Compressor

Check shaft seals and bolt holes, and also around magnet clutch.

Receiver drier

Check pressure valve, safety valve and fusible plug mounts.

Service valve

Check all around service valves.
Ensure that valve core is not loose.
Service valve caps must be attached to valves (to prevent leak).
Also check that there are no foreign objects inside the cap.

Inside of cooling unit

To check, insert leak tester probe into drain hose immediately after stopping engine. (Keep probe inserted for more than 10 seconds.)

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

- Doors:
  Close completely.
- Window glasses:
  Close completely.
- Intake door position:
  RECIRC
- Mode door position:
  VENT
- Blower fan:
  HI
- TEMP control:
  Optional (Set so that intake air temperature is 30 to 35°C (86 to 95°F).
- AIR CON switch:
  ON
- Engine speed:
  Approx. 1,500 rpm

WORK PROCEDURE

Engine speed: Approx. 1,500 rpm

↓

After warming up engine, adjust intake air temperature to 30 to 35°C (86 to 95°F).
Wait until high pressure is stabilized at approx. 1,471 kPa (15 kg/cm^2, 213 psi).*1

*1: Cover the entire condenser until the required pressure is indicated.

↓

Check the sight glass of the refrigerant system.*2
Touch the high and low pressure tubes of the system to get an idea of the temperature.

*2: Refer to sight glass inspection.

↓

Check to see whether the refrigerant is free of white clouding and bubbles.

N.G. → If white clouding or bubbles are found:

↓

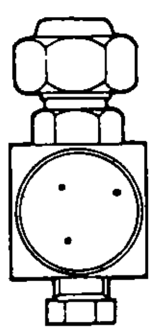
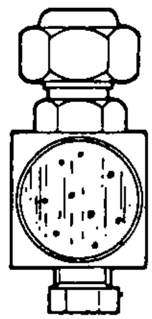
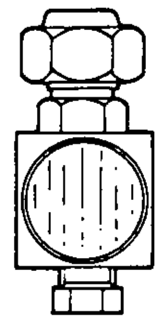
Recover the refrigerant from the A/C system.
Recharge the system to specification using an accurate refrigerant measuring device.

→ Charged amount of refrigerant is O.K.

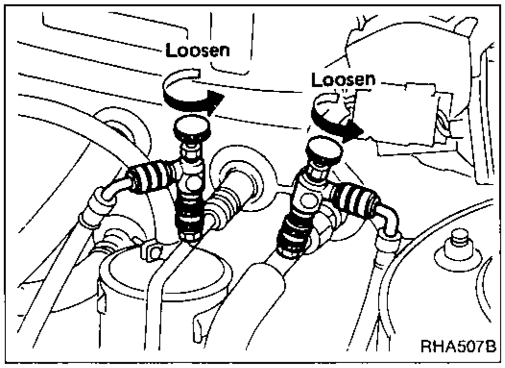
O.K. ↓

Charged amount of refrigerant is O.K.

Confirmation of Amount of Charged Refrigerant (Cont'd)

Check item \ Amount of charge	Appropriate	Refrigerant is insufficient	Almost no refrigerant	Overcharged, or air in system
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 presser 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 (14 - 18 kg/cm^2, 199 - 256 psi) Normal low pressure: 147 - 294 kPa (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	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.

CAUTION:
The condition of bubbles seen through the sight glass as well as the intake and discharge pressures are influenced by the ambient temperature, wind velocity, weather, and by the air temperature in front of the condenser, etc.



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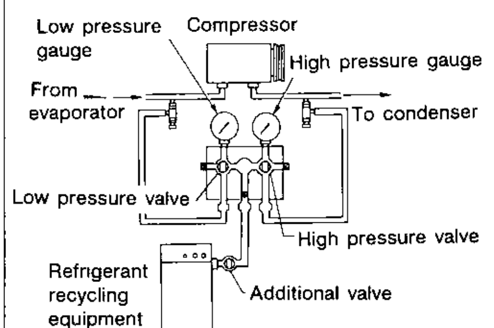
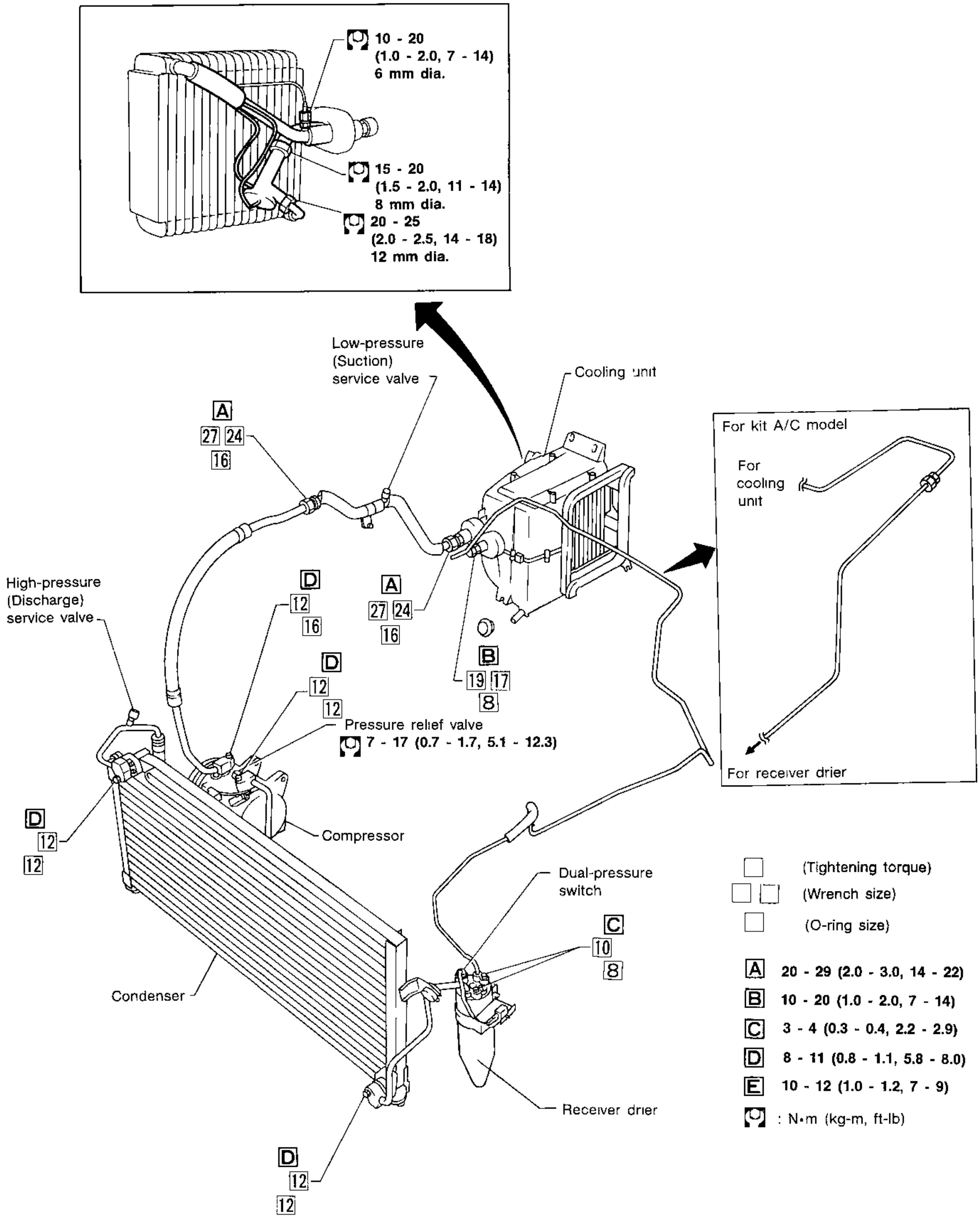


SHA890C

Removal of Service Tools

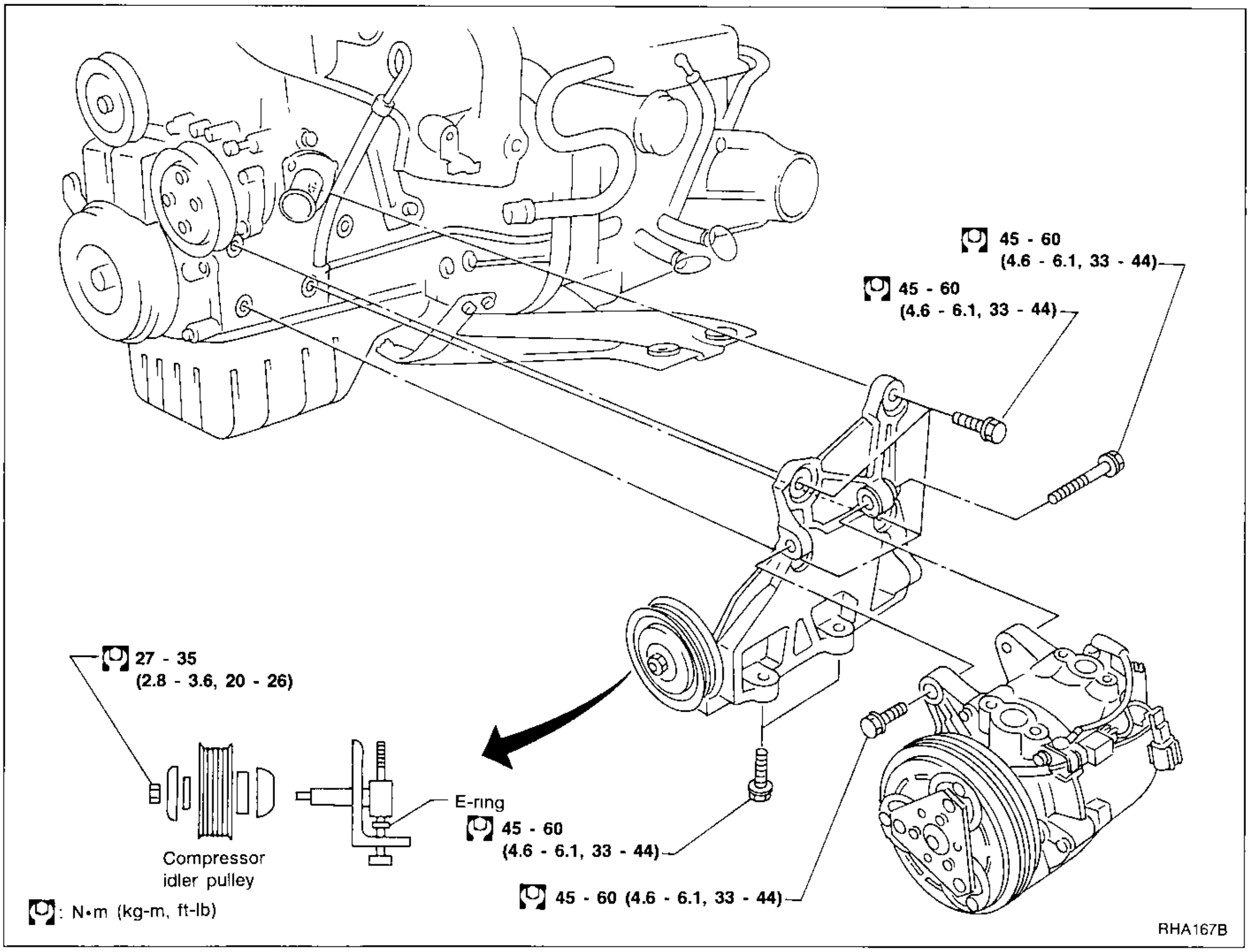
1. Completely loosen adapter valves of low pressure and high pressure lines.
2. Close additional valve and remove center hose from charging cylinder.
3. Connect center hose to refrigerant recycling equipment.
4. Open additional valve and both valves on gauge manifold.
5. Capture refrigerant in charging system.
6. After recovering refrigerant, remove adapter valves from on-car service valves.

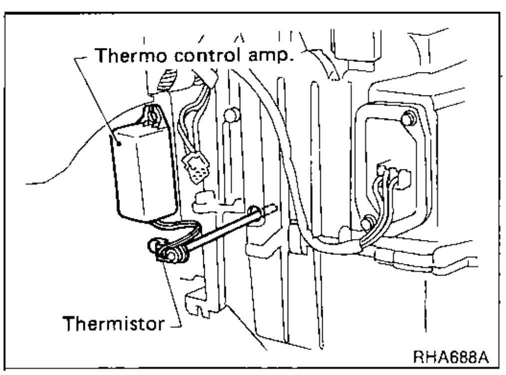
Refrigerant Lines



RHA577C

Compressor Mounting





Thermo Control Amp.

REPLACEMENT

Remove screws, which secure thermistor locating stay, from front of cooling unit. Replace thermo control amp. assembly with a new one. (Cooling unit need not be removed during the replacement.)

Belt Tension

- **Refer to MA section.**

Fast Idle Control Device (F.I.C.D.)

- **Refer to EF & EC section.**

General

When replacing any refrigerant cycle component part of a compressor, condenser, receiver drier, cooling unit, etc., it is essential to drain the refrigerant in advance.
The refrigerant has a large affinity for the compressor oil, and a part of the oil is always circulating throughout the cycle together with the refrigerant. In other words, the oil is distributed throughout the cycle. Before draining the refrigerant, it is therefore necessary to collect as much compressor oil as possible by performing the oil return operation. If the compressor oil is not replenished, or added fully after replacing component parts of refrigerant cycle, the following trouble may occur:

- **Insufficient oil: Seized compressor**
- **Excessive oil: Poor cooling (Excess oil attached to parts obstructs normal heat exchange.)**

For this reason, whenever replacing any parts of the refrigerant cycle (except the compressor), it is necessary to replenish the compressor oil removed together with such parts. On the other hand, a new compressor contains a specified amount of compressor oil, and simple installation of the new compressor results in excessive oil quantity in the cycle. To prevent this, the oil must be extracted from the cycle so that the optimum oil quantity can be ensured inside the refrigerant cycle.

Checking and Adjusting

Adjust the oil quantity according to the flowchart shown below.

Air conditioner system service

Perform trouble-shooting, and repair or replace failed and other necessary parts, if any.

↓

When repairing or replacing the following parts, perform oil quantity control according to the flowchart before starting the operation.

- **Compressor**
- **Cooling unit assembly, or evaporator**
- **Condenser assembly**
- **Receiver drier**
- **In case of refrigerant leak**
  (if a considerable oil leak is found)

↓

Is oil return operation possible? — Yes →

Perform oil return operation, proceeding as follows:

1. Start engine, and set the following conditions:
   - **Test condition**
     Engine speed: Idling to 1,200 rpm
     A/C switch: ON
     Blower speed: Max. position
     Intake: Recirculation
2. Perform oil return operation for about 10 minutes.
3. Stop engine.

No ↓

Is compressor replacement needed? — No → Add oil according to the **oil control reference table** for major equipment. Refer to the next page.

Yes ↓

Go to Ⓐ of next page.

Checking and Adjusting (Cont'd)

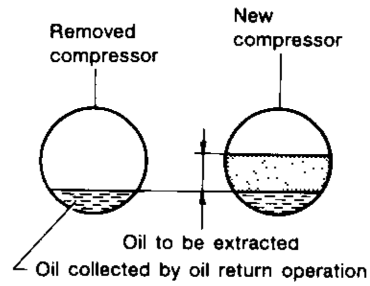
Ⓐ

Remove compressor oil from the new compressor according to the following table so that the remaining amount of oil in the new compressor is equal to the amount of recollected oil in the removed compressor.

Unit: mℓ (US fl oz, Imp fl oz)

		Oil quantity contained in new compressor	Amount of collected oil	Amount of oil extracted from new compressor
Rotary type	DKV14C DKV14B	200 (6.8, 7.0)	70 (2.4, 2.5) or over	200 (6.8, 7.0) — [Amount collected +20 (0.7, 0.7)]
			Below 70 (2.4, 2.5)	110 (3.7, 3.9)
	NVR140 NVR140S	200 (6.8, 7.0)	90 (3.0, 3.2) or over	200 (6.8, 7.0) — [Amount collected +20 (0.7, 0.7)]
			Below 90 (3.0, 3.2)	90 (3.0, 3.2)
Swash plate type	DKS16H DKS16N	200 (6.8, 7.0)	130 (4.4, 4.6) or over	200 (6.8, 7.0) — [Amount collected +20 (0.7, 0.7)]
			Below 130 (4.4, 4.6)	70 (2.4, 2.5)
	MJS170 MJS130	150 (5.1, 5.3)	—	80 (2.7, 2.8)

Precharged amount of oil for some models differes from figures listed above. Refer to S.D.S. of each model when servicing compressor oil.



Is it necessary to replace any parts other than compressor?

Yes → Add oil according to the oil management table for major equipment. Refer to oil management standard.

No ↓

Perform performance test. Refer to **performance test.**

If the result of performance test is N.G., carry out oil return operation again, and check the oil quantity.

Oil Management Standard for Major Equipment

When any major unit of the air conditioner has been replaced, add the following amount of oil.

Major unit	Amount of oil to be added		Remarks
	mℓ (US fl oz, Imp fl oz)	Percent (%)*1	
Cooling unit, evaporator	45 - 75 (1.5 - 2.5, 1.6 - 2.6)	30	Add compressor oil little by little from the low pressure side of the system cycle.
Condenser	30 - 50 (1.0 - 1.7, 1.1 - 1.8)	20	
Receiver drier	15 - 25 (0.5 - 0.8, 0.5 - 0.9)	10	
In case of refrigerant leak	30 - 50 (1.0 - 1.7, 1.1 - 1.8)	—	Add if large of oil leak is indicated.*2
	—	—	Addition of oil is not required if no oil leak is indicated.

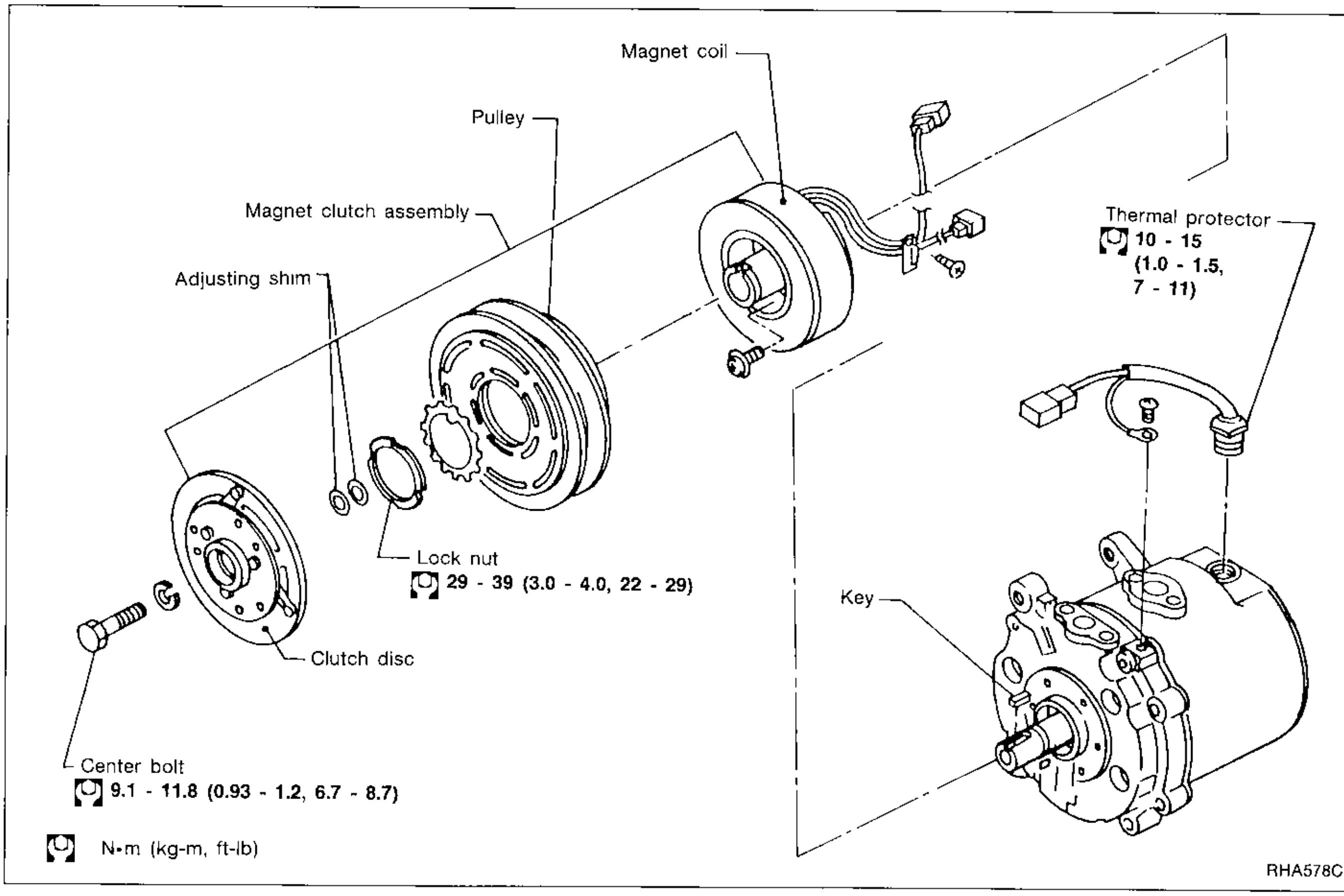
*1: The percentage of the total amount of system oil
*2: Sudden leakage of refrigerant due to fusion of a fusible plug, opening of a relief valve, or damage of a component may accompany oil leak.

Compressor Oil

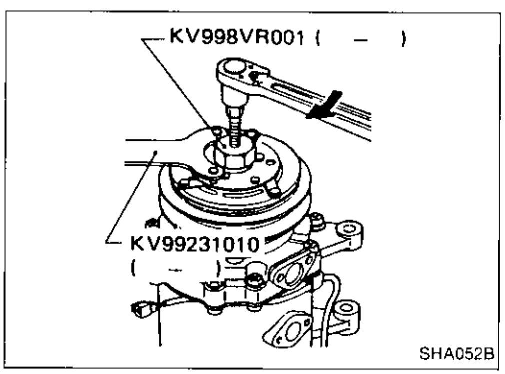
The recommended brand of compressor oil for a car air conditioner system is shown below. For the oil quantity, refer to the section **"Checking and Adjusting"**.

SUNISO 5GS or equivalent

Compressor Oil (Cont'd)



RHA578C

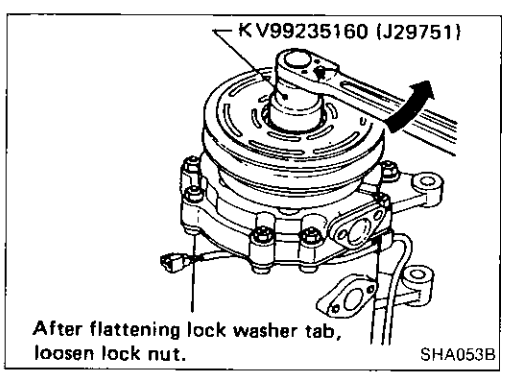


SHA052B

Compressor Clutch

REPLACEMENT

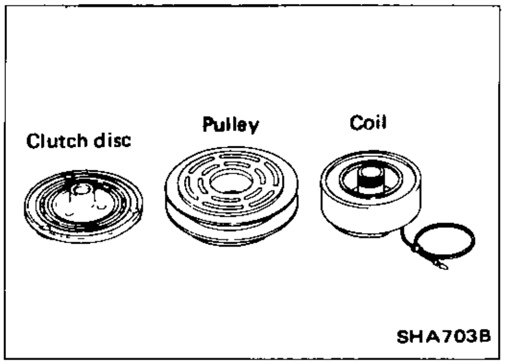
- When removing center bolt, hold clutch disc with clutch disc wrench.
- Using clutch disc puller, clutch disc can be removed.



SHA053B

- Bend down pawl of lock washer.
- When removing pulley, remove lock nut with nut wrench.

Compressor Clutch (Cont'd)



INSPECTION

Clutch disc

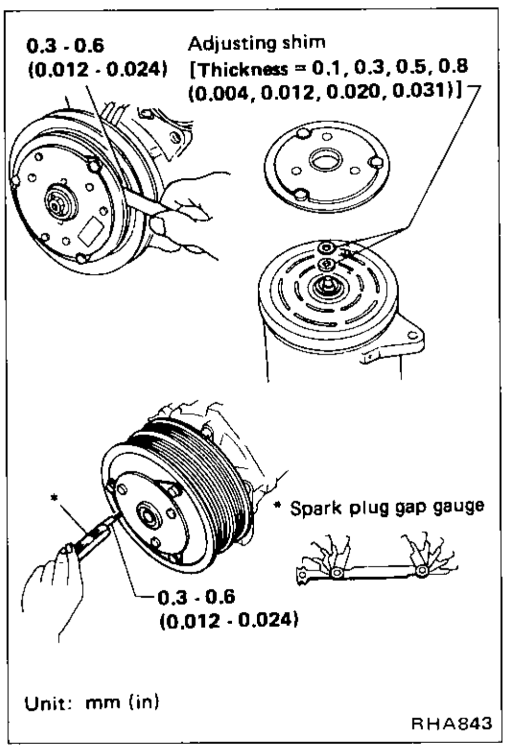
If the contact surface shows signs of damage due to excessive heat, the drive plate and pulley should be replaced.

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.

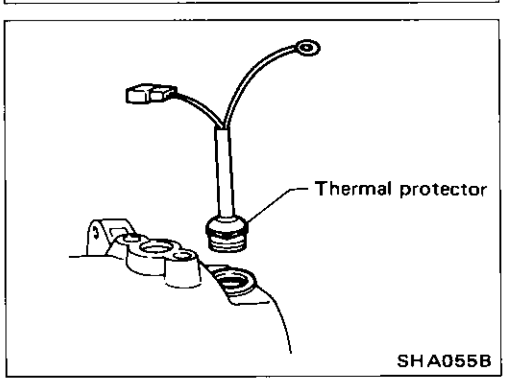


ADJUSTMENT

- 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.

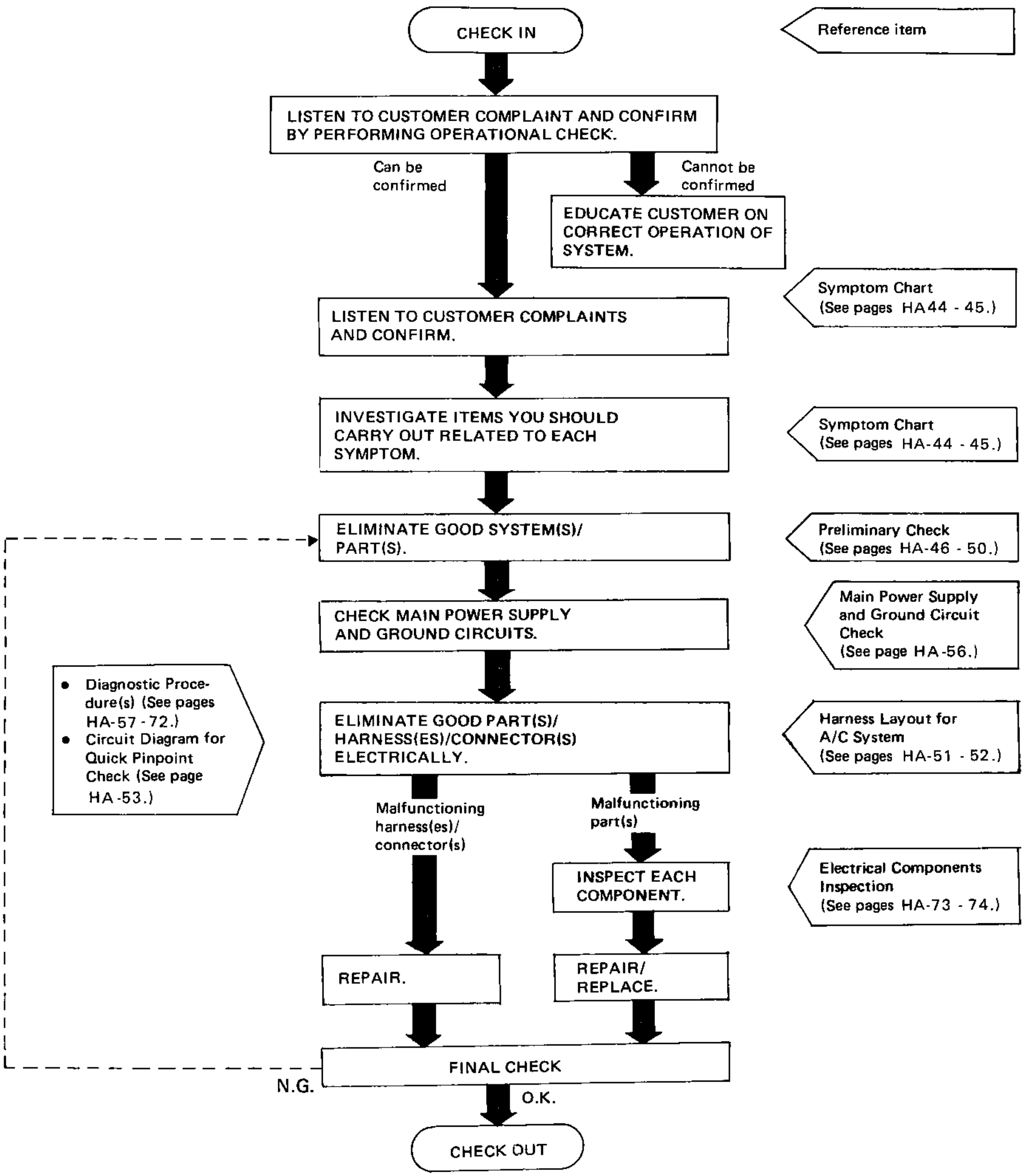


Thermal Protector

- When servicing, do not allow foreign matter to get into compressor.
- Check continuity between two terminals.

How to Perform Trouble Diagnoses for Quick and Accurate Repair

WORK FLOW

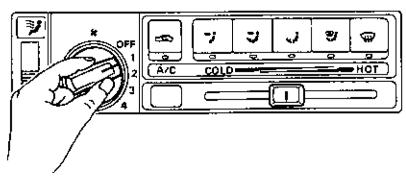


Operational Check

The purpose of the operational check is to confirm that the system operates as it should. The systems which are checked are the blower, mode (discharge air), intake air, temperature decrease, temperature increase.

CONDITIONS:

Engine running at normal operating temperature.
Fresh vent "OFF"

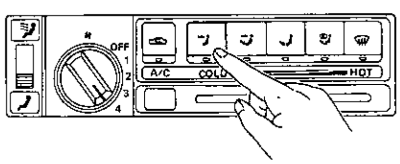


RHA048C

PROCEDURE:

1. Check blower

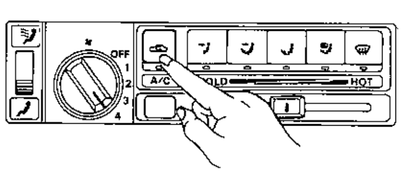
1) Turn Fan switch to 1-speed.
   Blower should operate on 1-speed.
2) Then turn Fan switch to 2-speed.
3) Continue checking blower speed until all four speeds are checked.
4) Leave blower on 4-speed.



RHA049C

2. Check discharge air

1) Press the VENT button.
   VENT indicator should light.
2) Confirm that all discharge air comes out of face vents.
3) Press the B/L button.
   B/L indicator should light.
4) Confirm that discharge air comes out of face vents and foot vents.
5) Press the FOOT button.
   FOOT indicator should light.
6) Confirm that discharge air comes out of foot vents, with some air from defroster vents.
7) Press the F/D button.
   F/D indicator should light.
8) Confirm that discharge air comes out of foot vents, with some air from defroster vents, and that intake door position is at FRE.
9) Press the DEF button.
   DEF indicator should light.
10) The discharge air should be coming only from defroster vents. At the same time compressor should turn ON and intake door position be at FRE.

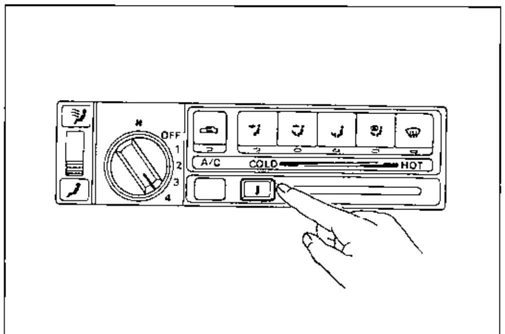


RHA050C

3. Check recirc

1) Press RECIRC button.
   RECIRC indicator should light.
2) Listen for intake door position change (you should hear blower sound change slightly).

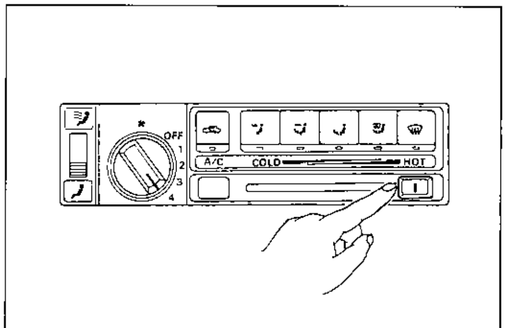
Operational Check (Cont'd)



RHA051C

4. Check temperature decrease

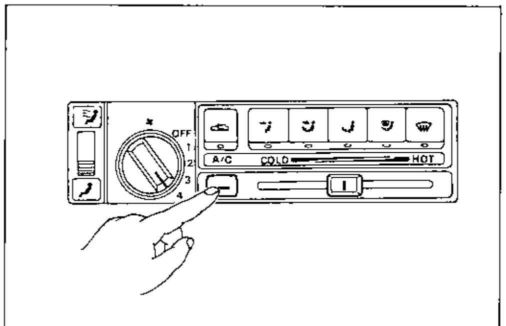
1) Slide temperature control lever to **full cold.**
2) Check for cold air at discharge **air outlets.**



RHA052C

5. Check temperature increase

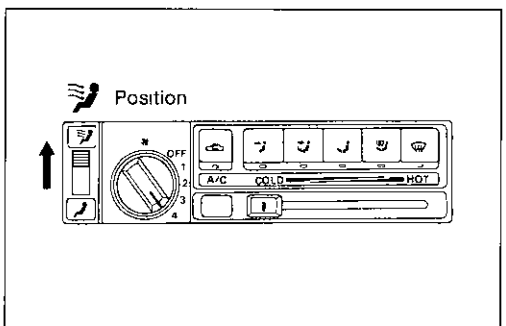
1) Slide temperature control **lever to full hot.**
2) Check for hot air at discha**rge air outlets.**



RHA053C

6. Check air conditioner switch

Move the fan switch **to the desired** (1 to 4-speed) position and push the **air conditioner** button to turn ON the air conditioner.
The indicator **light should** come on when air conditioner is ON.



RHA054C

7. Check fresh vent lever

1) Press FOOT, FOOT/DEF or DEF.
2) Move fresh vent lever in direction of arrow.
3) Confirm that discharge air comes out of foot & def vents with a cold air from face vents.

Performance Chart

TEST CONDITION

Testing must be performed as follows:

Vehicle location: Indoors or in the shade (in a well ventilated place)
Doors: Closed
Door window: Open
Hood: Open
TEMP. lever position: Max. COLD
OUTLET air: (Ventilation)
INTAKE air: (Recirculation)
FAN speed: Max.
Engine speed: 1,500 rpm
Time required before starting testing after air conditioner starts operating: More than 10 minutes

TEST READING

Recirculating-to-discharge air temperature table

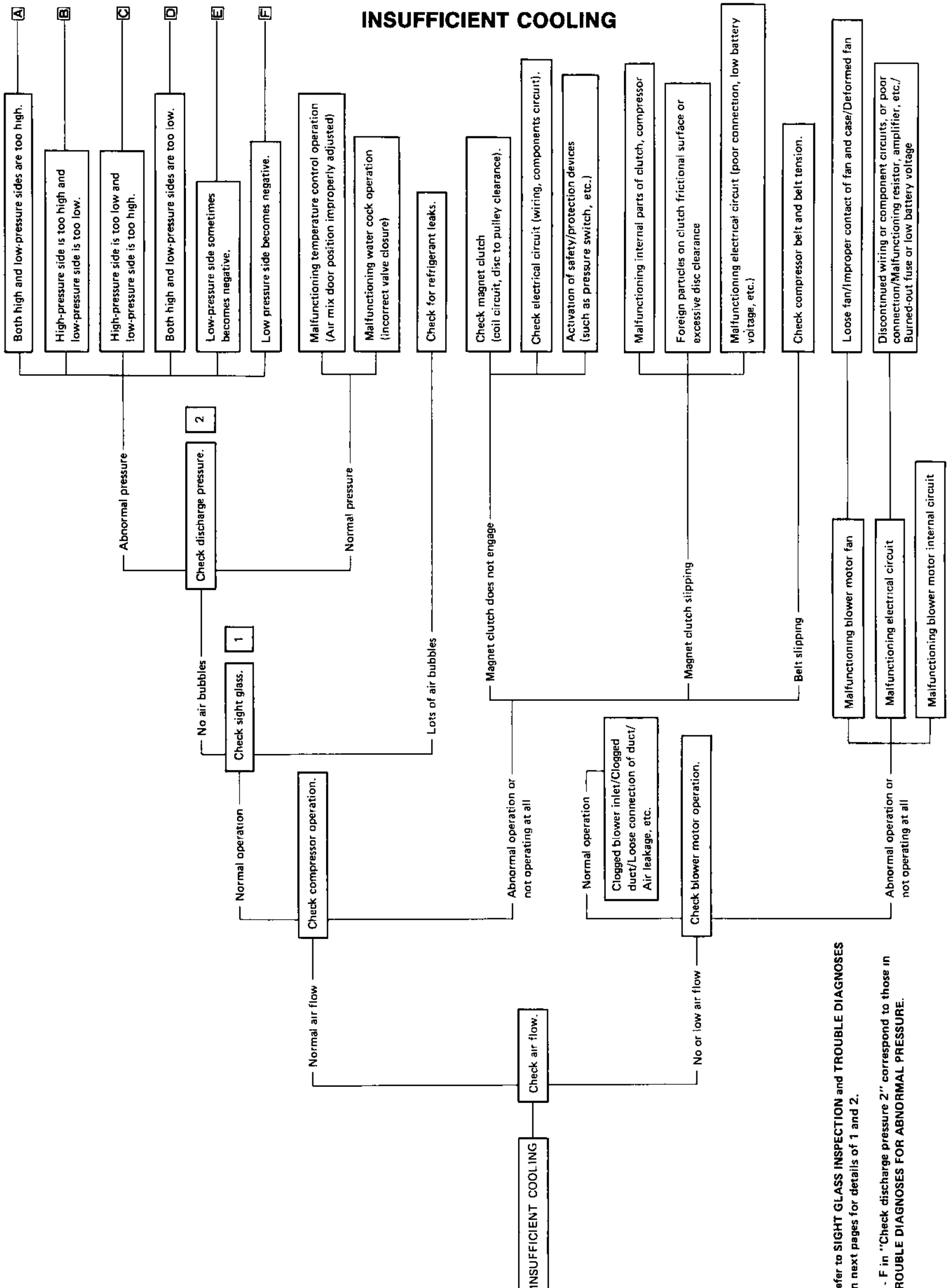
Inside air (Recirculating air) at blower assembly inlet		Discharge air temperature at center ventilator °C (°F)
Relative humidity %	Air temperature °C (°F)	
50 - 60	20 (68)	6.0 (43)
	25 (77)	9.0 (48)
	30 (86)	13.8 (57)
	35 (95)	18.2 (65)
	40 (104)	23.0 (73)
60 - 70	20 (68)	6.0 (43)
	25 (77)	10.8 (51)
	30 (86)	15.8 (60)
	35 (95)	21.0 (70)
	40 (104)	26.0 (79)

Ambient air temperature-to-compressor pressure table

Ambient air		High-pressure (Discharge side) kPa (kg/cm², psi)	Low-pressure (Suction side) kPa (kg/cm², psi)
Relative humidity %	Air temperature °C (°F)		
50 - 70	20 (68)	1,128 (11.5, 164) or less	157 (1.6, 23) or less
	25 (77)	1,275 (13.0, 185)	171.6 (1.75, 24.9)
	30 (86)	1,608 (16.4, 233)	226 (2.3, 33)
	35 (95)	1,961 (20.0, 284)	284 (2.9, 41)
	40 (104)	2,275 (23.2, 330)	343 (3.5, 50)

Performance Test Diagnoses

INSUFFICIENT COOLING



Note:

1) Refer to **SIGHT GLASS INSPECTION** and **TROUBLE DIAGNOSES** on next pages for details of 1 and 2.

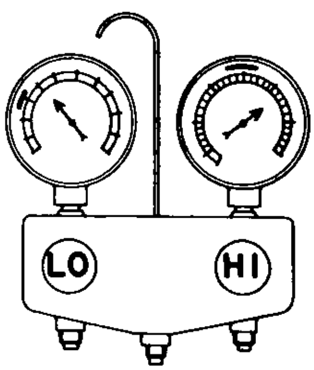
2) A - F in "Check discharge pressure 2" correspond to those in **TROUBLE DIAGNOSES FOR ABNORMAL PRESSURE**.

Performance Test Diagnoses

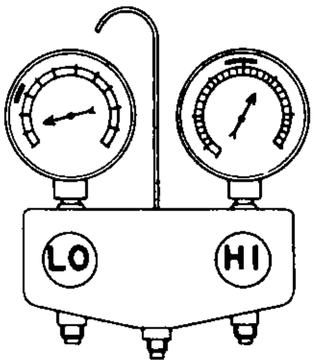
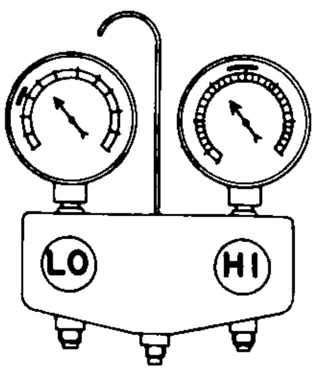
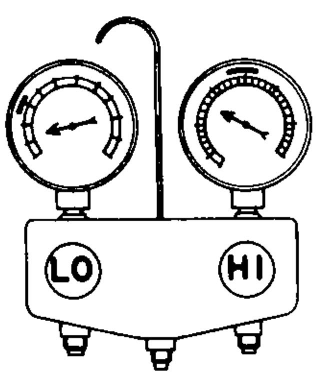
TROUBLE DIAGNOSES FOR ABNORMAL PRESSURE

Whenever abnormal pressure of high and/or low sides of the system is noted, diagnosis must be conducted by using a manifold gauge. The large-line zone on the gauge scale (see illustrations.) shown in the following table refers to the standard (normal) pressure range for the corresponding pressure side (high or low). Since the standard (normal) pressure, however, differs from vehicle to vehicle, refer to the "Ambient Temperature-Pressure Characteristics" chart.

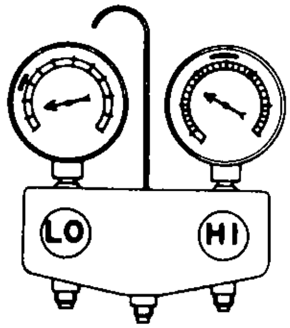
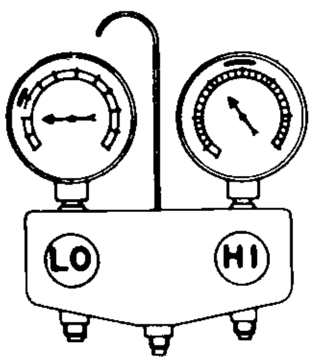
Pressure measurements are effective only when ambient temperature is in the range indicated under the heading "INSPECTION DATA (2) Measurement of compressor's high and low pressures".

Gauge indication	Refrigerant cycle	Probable cause	Corrective action
Both high and low-pressure sides are too high.  AC359A	• Pressure is reduced soon after water is splashed on condenser. • No air bubbles appear in sight glass when pressure is reduced.	Excessive refrigerant charge in refrigeration cycle	Reduce refrigerant until specified pressure is obtained.
	Air suction by radiator or condenser fan is insufficient.	Insufficient condenser cooling performance ↓ ① Condenser fins are clogged. ② Improper rotation of radiator fan or condenser fan	• Clean condenser. • Check and repair radiator or condenser fan as necessary.
	• Low-pressure pipe is not cold. • When compressor is stopped high-pressure value quickly drops by approximately 196 kPa (2 kg/cm^2, 28 psi). It then decreases gradually thereafter.	Poor heat exchange in condenser (After compressor operation stops, high pressure decreases too slowly.) ↓ Air in refrigeration cycle	Evacuate repeatedly and recharge system.
	Engine tends to overheat.	Engine cooling systems malfunction.	Check and repair each engine cooling system.
	• Areas near low-pressure pipe connection and service valves are considerably cold compared with areas near expansion valve outlet or evaporator. • Plates are sometimes covered with frost.	• Excessive liquid refrigerant on low-pressure side • Excessive refrigerant discharge flow • Expansion valve is open a little compared with the specification. ↓ ① Improper thermal valve installation ② Improper expansion valve adjustment	Replace expansion valve.

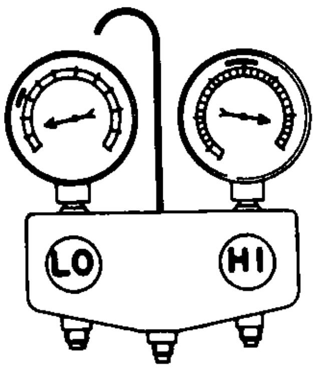
Performance Test Diagnoses (Cont'd)

Gauge indication	Refrigerant cycle	Probable cause	Corrective action
High-pressure side is too high and low-pressure side is too low.  AC360A	Upper side of condenser and high-pressure side are hot, however, receiver drier is not so hot.	High-pressure tube or parts located between compressor and condenser are clogged or crushed.	• Check and repair or replace malfunctioning parts. • Check compressor oil for contamination.
High-pressure side is too low and low-pressure side is too high.  AC356A	High and low-pressure sides become equal soon after compressor operation stops.	Compressor pressure operation is improper. ↓ Damaged inside compressor packings	Replace compressor.
	No temperature difference between high and low- pressure sides	Compressor discharge capacity does not change. (Compressor stroke is set at maximum.)	Replace compressor.
Both high-and low-pressure sides are too low.  AC353A	• There is a big temperature difference between receiver drier outlet and inlet. Outlet temperature is extremely low. • Receiver drier inlet and expansion valve are frosted.	Receiver drier inside is clogged a little.	• Replace receiver drier • Check compressor oil for contamination.
	• Temperature of expansion valve inlet is extremely low as compared with areas near receiver drier. • Expansion valve inlet may be frosted. • Temperature difference occurs somewhere in high-pressure side	High-pressure pipe located between receiver drier and expansion valve is clogged.	• Check and repair malfunctioning parts. • Check compressor oil for contamination.

Performance Test Diagnoses (Cont'd)

Gauge indication	Refrigerant cycle	Probable cause	Corrective action
Both high and low-pressure sides are too low.  AC353A	There is a big temperature difference between expansion valve inlet and outlet while the valve itself is frosted.	Expansion valve closes a little compared with the specification. ↓ ① Improper expansion valve adjustment ② Malfunctioning thermal valve ③ Outlet and inlet may be clogged.	• Remove foreign particles by using compressed air. • Check compressor oil for contamination.
	Areas near low-pressure pipe connection and service valve are extremely cold as compared with areas near expansion valve outlet and evaporator.	Low-pressure pipe is clogged or crushed.	• Check and repair malfunctioning parts. • Check compressor oil for contamination.
	Air flow volume is not enough or is too low.	Evaporator is frozen. ↓ Compressor discharge capacity does not change. (Compressor stroke is set at maximum length.)	Replace compressor.
Low-pressure side sometimes becomes negative.  AC354A	• Air conditioning system does not function and does not cyclically cool the compartment air. • The system constantly functions for a certain period of time after compressor is stopped and restarted.	Refrigerant does not discharge cyclically. ↓ Moisture is frozen at expansion valve outlet and inlet. ↓ Water is mixed with refrigerant.	• Drain water from refrigerant or replace refrigerant. • Replace receiver drier.

Performance Test Diagnoses (Cont'd)

Gauge indication	Refrigerant cycle	Probable cause	Corrective action
Low-pressure side becomes negative.  AC362A	Receiver drier or front/rear side of expansion valve's pipe is frosted or dewed.	High-pressure side is closed and refrigerant does not flow. ↓ Expansion valve or receiver drier is frosted.	After the system is left at rest, start it again in order to confirm whether or not problem is caused by water or foreign particles. • If the problem is due to water, drain water from refrigerant or replace refrigerant. • If it is due to foreign particles, remove expansion valve and remove them with dry and compressed air. • If either of the above methods cannot correct the problem, replace expansion valve. • Replace receiver drier. • Check compressor oil for contamination.

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Symptom Chart

DIAGNOSTIC TABLE

PROCEDURE	Preliminary Check					Diagnostic Procedure					Main Power Supply and Ground Circuit Check			
REFERENCE PAGE	HA-46	HA-47	HA-48	HA-49	HA-50	HA-57 - 60	HA-61 - 62	HA-63	HA-64 - 68	HA-68 - 72	HA-56	HA-56	HA-56	HA-56
SYMPTOM	Preliminary check 1	Preliminary check 2	Preliminary check 3	Preliminary check 4	Preliminary check 5	Diagnostic procedure 1	Diagnostic procedure 2	Diagnostic procedure 3	Diagnostic procedure 4	Diagnostic procedure 5	20A Fuses	15A Fuse	Push control unit	Thermo control amp.
A/C does not blow cold air.		❶				○			○		○	○		○
Blower motor does not rotate.		❶				❷					○			
Air outlet does not change.				❶			❷					○	○	
Intake door does not change in VENT, B/L or FOOT mode.								❷				○	○	
Intake door is not set at "FRESH" in DEF or FOOT mode.	❶							○				○	○	
Magnet clutch does not operate with A/C switch and fan switch are ON.		❶							❷			○		○
Magnet clutch does not operate in DEF mode.		❶	❷						○			○		○
Illumination or indicators of push control unit do not come on.										❶		○		
Noise					❶									

❶, ❷: The number means checking order.
○ : As for checking order, refer to each flow chart. (It depends on malfunctioning portion.)

Electrical Components Inspection

Blower relay	Blower motor	Resistor	A/C switch	REC switch	VENT switch	B/L switch	FOOT switch	F/D switch	DEF switch	Fan switch	Mode door motor	Intake door motor	A/C relay	Thermo control amp.	Dual-pressure switch	Compressor (Magnet clutch)	Thermal protector	E.C.C.S. control unit	Illumination system	Knob illumination	Harness
			Push control unit													Compressor					
HA-74	HA-73	HA-73	HA-73	—	—	—	—	—	—	HA-73	HA-75	HA-75	HA-74	HA-74	HA-74	HA-33	HA-74	Refer to EF & EC section	Refer to EL section	—	—
○	○	○	○							○			○	○	○	○	○	○			○
○	○	○								○											○
					○	○	○	○	○		○										○
				○								○									○
				○								○									○
○			○							○			○	○	○	○	○	○			○
○									○	○			○	○	○	○	○	○			○
			○	○	○	○	○	○	○	○					○				○	○	○

Preliminary Check

PRELIMINARY CHECK 1

Intake door is not set at "FRESH" in DEF or F/D mode.

Is intake door in "Fresh" position when REC switch is turned from ON to OFF at VENT, B/L or FOOT mode with ignition switch at ACC and fan speed at 4?
(Can you hear air moving from the intake unit?)

- No → Go to **Diagnostic Procedure 3.**
- Yes ↓

Is intake door in "REC" position when REC switch is turned from OFF to ON at VENT, B/L or FOOT mode with ignition switch at ACC and fan speed at 4?
(Can you hear air moving from the intake unit?)

- No → Go to **Diagnostic Procedure 3.**
- Yes ↓

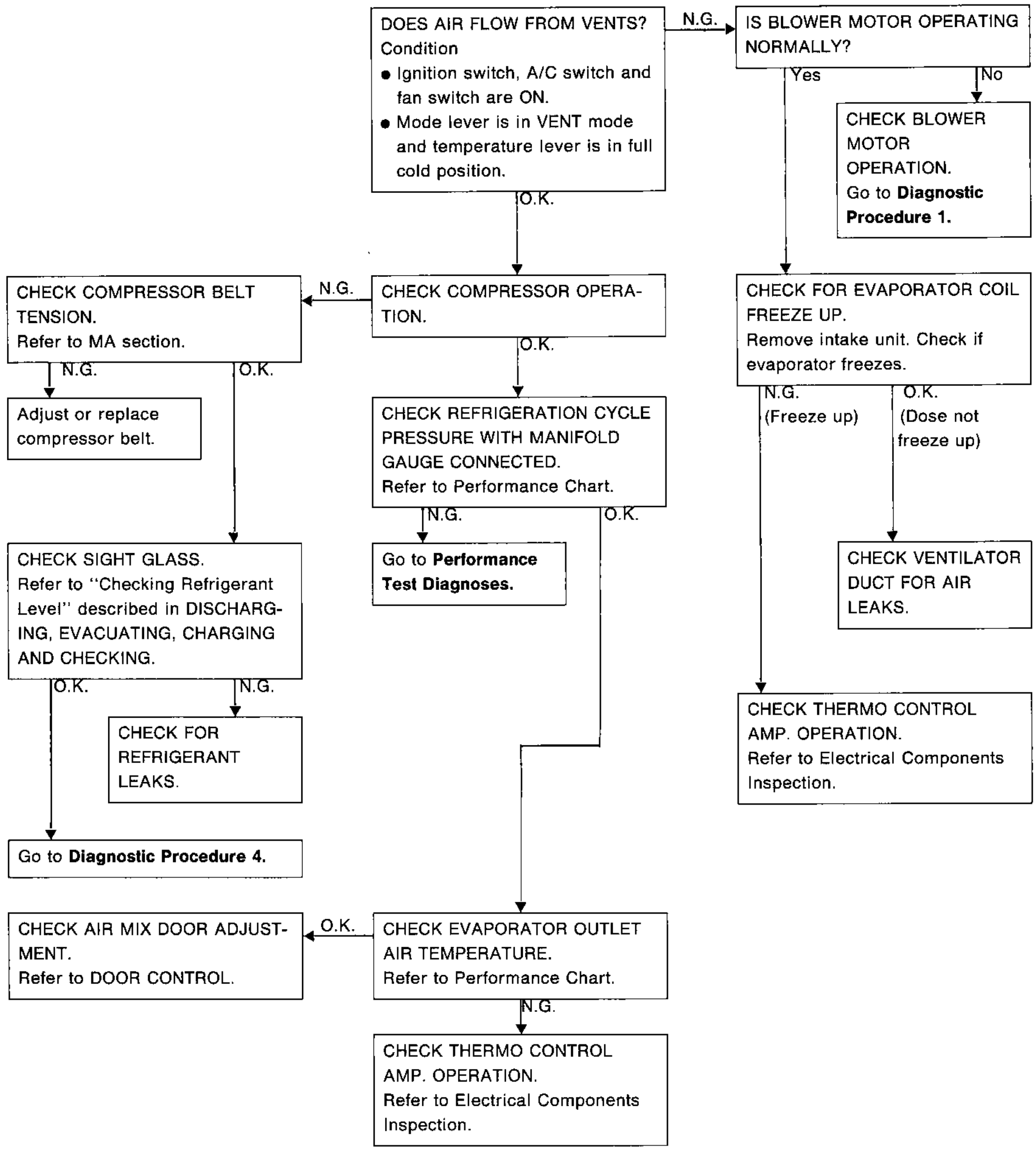
Is intake door in "Fresh" position when F/D switch or DEF switch is pushed?
(Can you hear air moving from the intake unit?)

- No → Replace control amp. built-in push control unit.
- Yes ↓

INSPECTION END

PRELIMINARY CHECK 2

A/C does not blow cold air.



Preliminary Check (Cont'd)

PRELIMINARY CHECK 3

Magnet clutch does not engage in DEF mode.

- **Perform PRELIMINARY CHECK 2 before referring to the following flow chart.**

With engine running, does magnet clutch engage normally when A/C switch and fan switch are ON?
- No → Go to **Diagnostic Procedure 4.**
- Yes ↓

Push A/C switch and turn A/C system OFF. Make sure that magnet clutch is disengaged.

↓

With engine running, does magnet clutch engage normally when DEF switch and fan switch are ON?
- No → Replace control amp. built-in push control unit.
- Yes ↓

INSPECTION END

Preliminary Check (Cont'd)

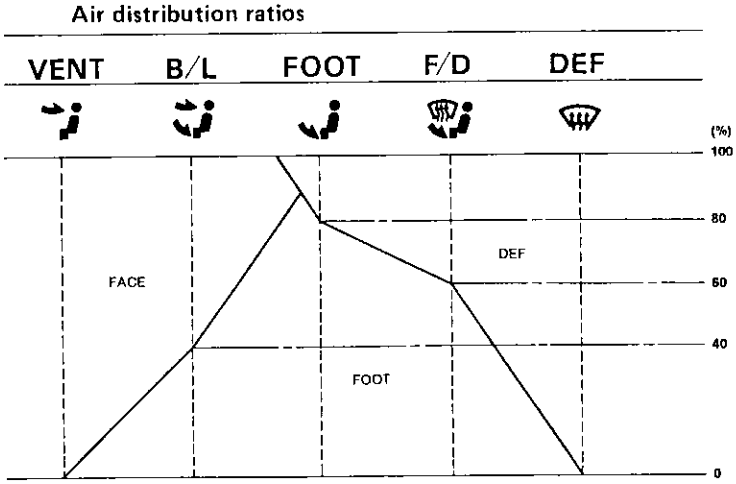
PRELIMINARY CHECK 4

Air outlet does not change.

DOES AIR COME OUT FROM EACH DUCT NORMALLY WHEN EACH MODE SWITCH IS PUSHED WITH IGNITION SWITCH AT ON?

Switch		Indicator illuminates					Air outlet
Mode		○					VENT
			○				FOOT & VENT
				○			FOOT & DEF
					○		FOOT & DEF
						○	DEF

Air distribution ratios



No → Go to **Diagnostic Procedure 2.**

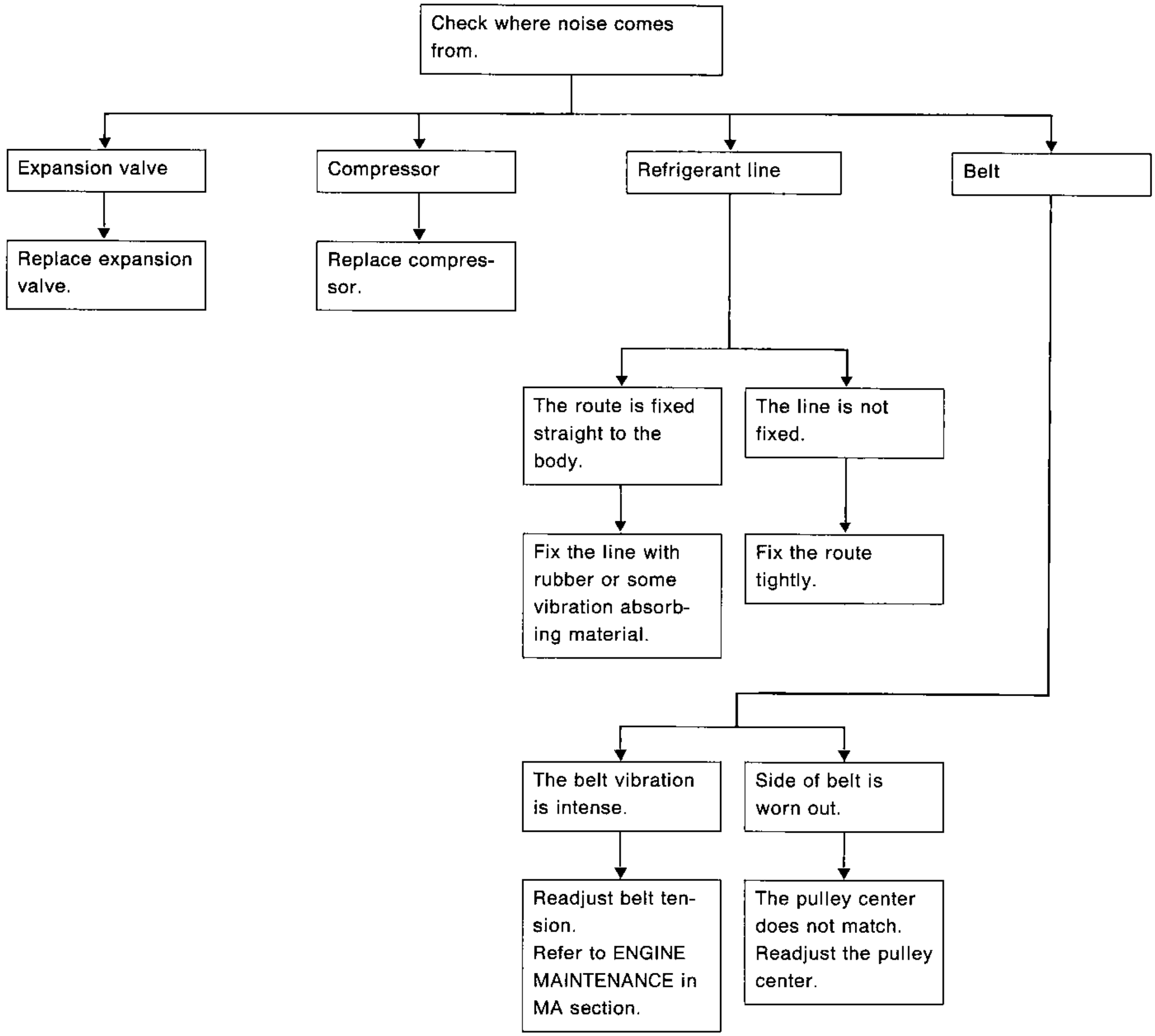
Yes ↓

INSPECTION END

Preliminary Check (Cont'd)

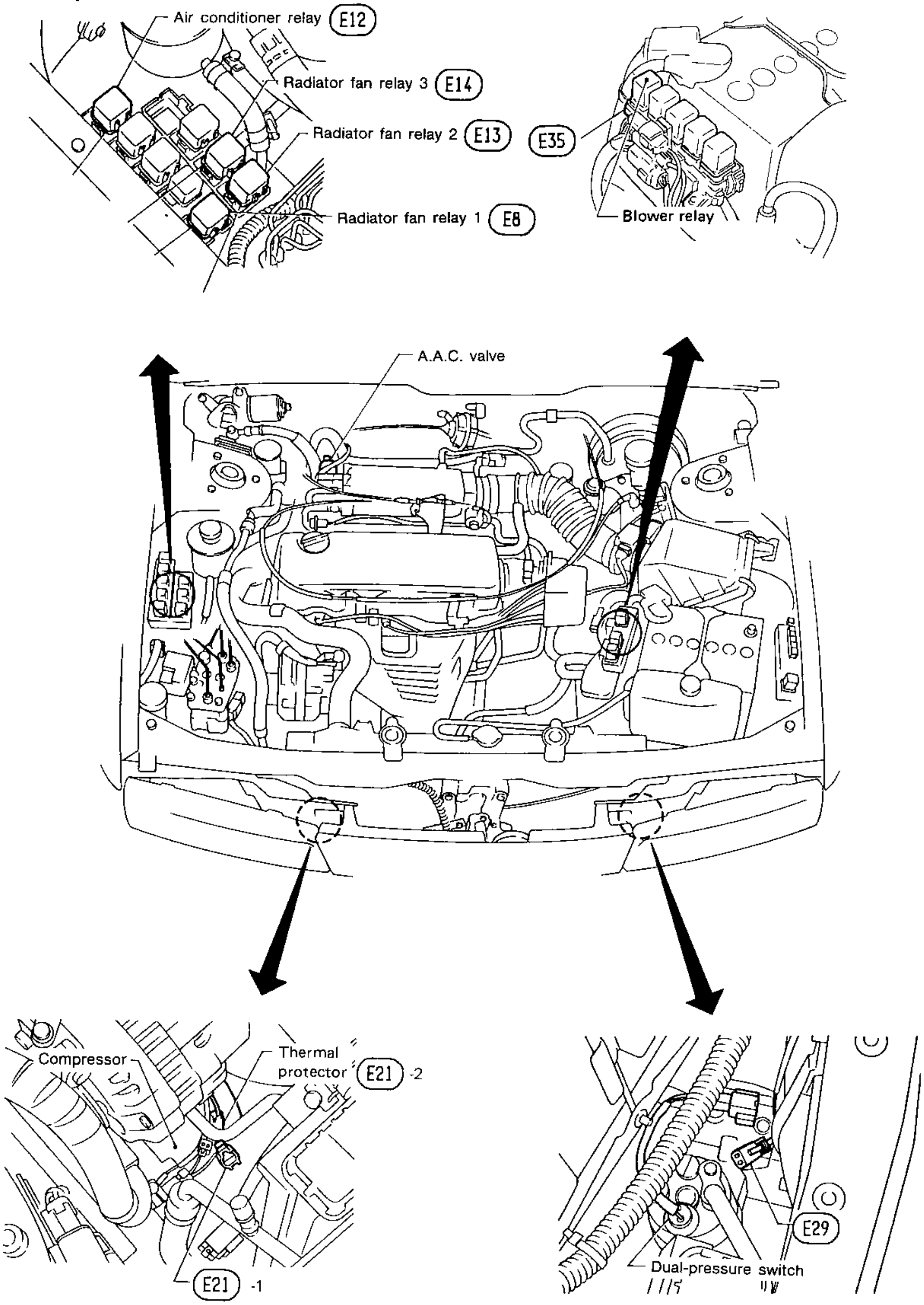
PRELIMINARY CHECK 5

Noise



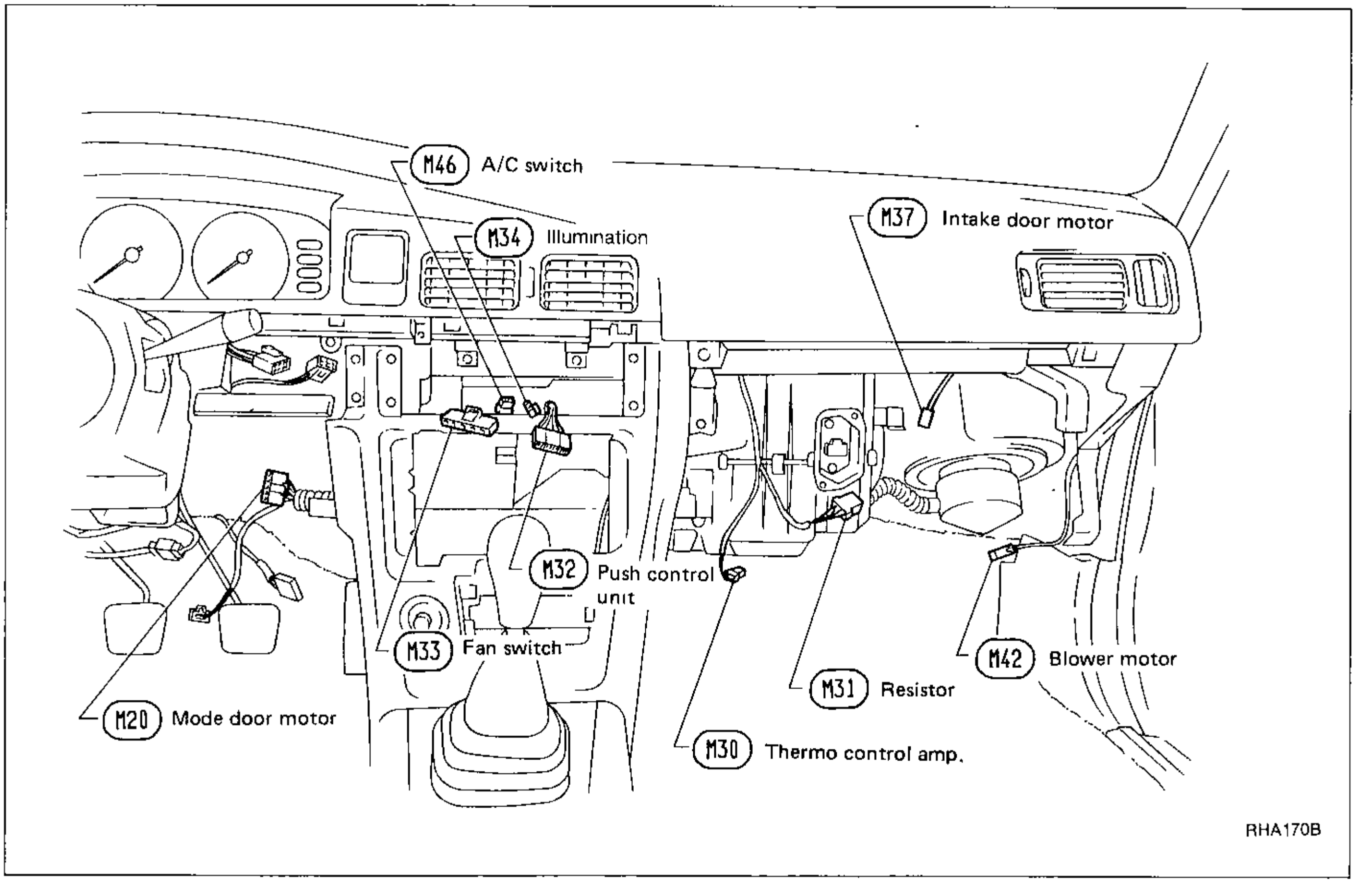
Harness Layout for A/C System

Engine compartment

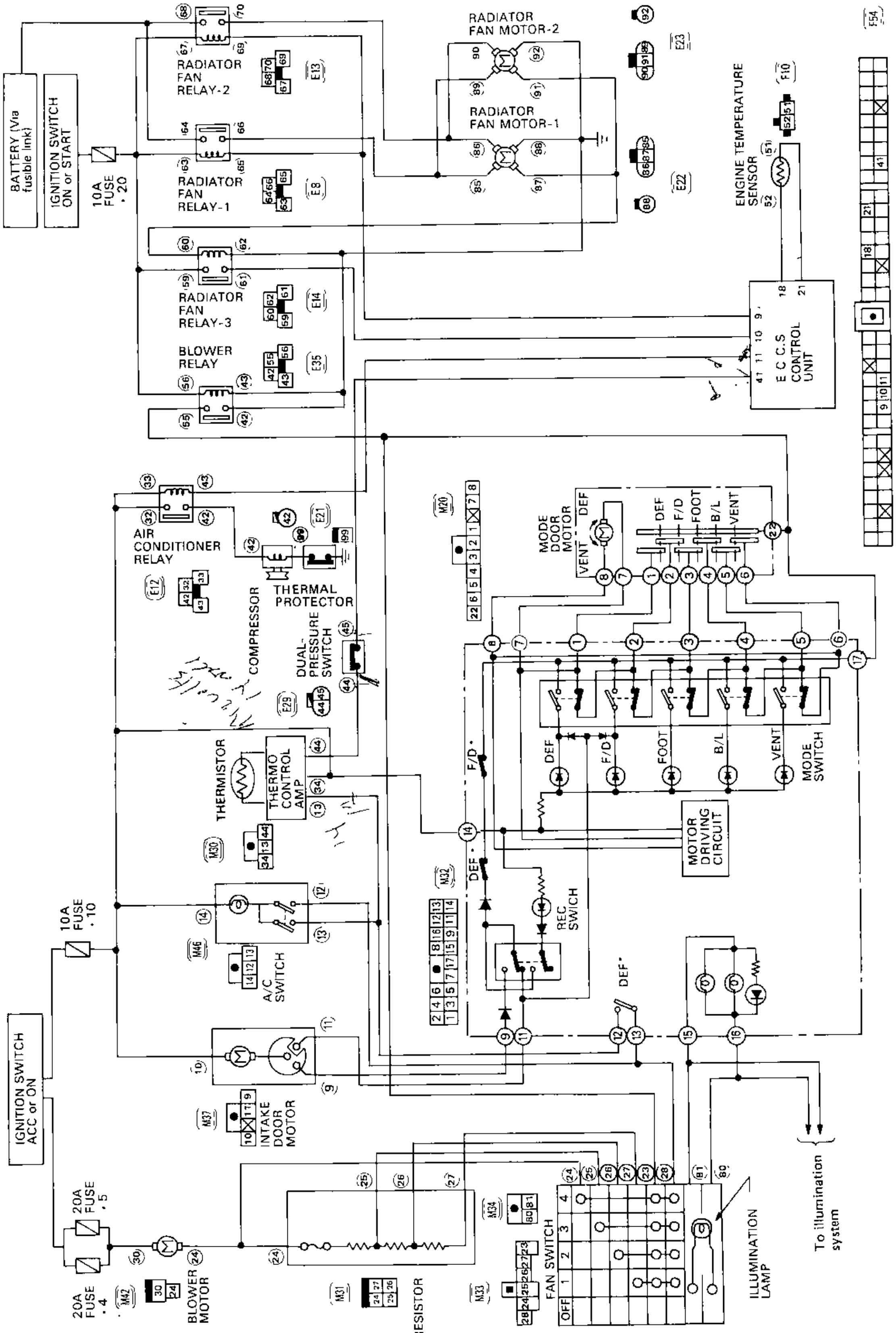


RHA169B

Harness Layout for A/C System (Cont'd)



Circuit Diagram for Quick Pinpoint Check

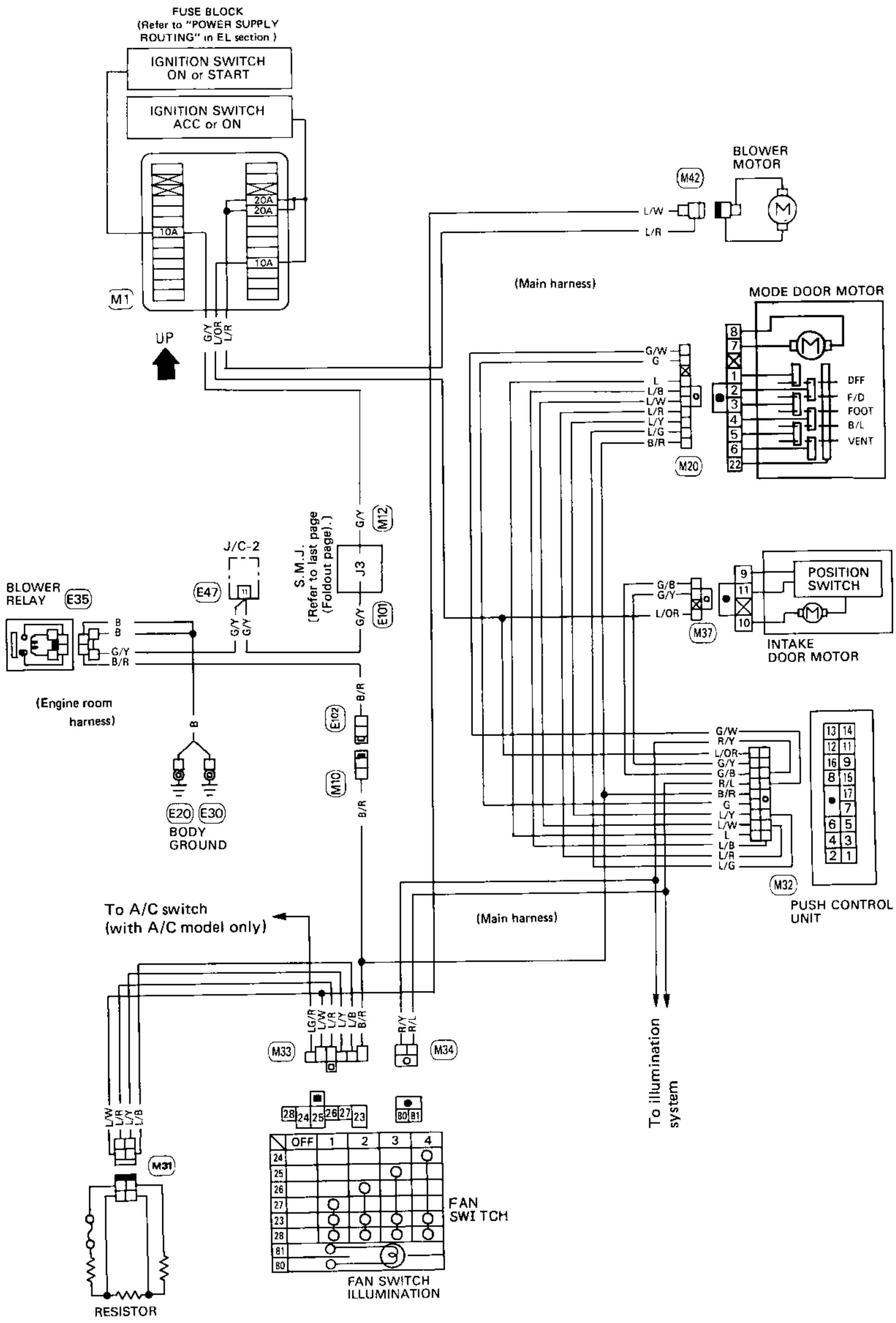


- All connectors shown in this illustration are unit side connectors.
- The unit side connectors with a double circle "◎" are connected to the harness side connectors shown in the "Harness Layout for A/C System". (See pages HA-51 - HA-52.)
- The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle "○".
- *: These switches are built in push control unit and mechanically linked to corresponding switches.

SHA944C

Wiring Diagram

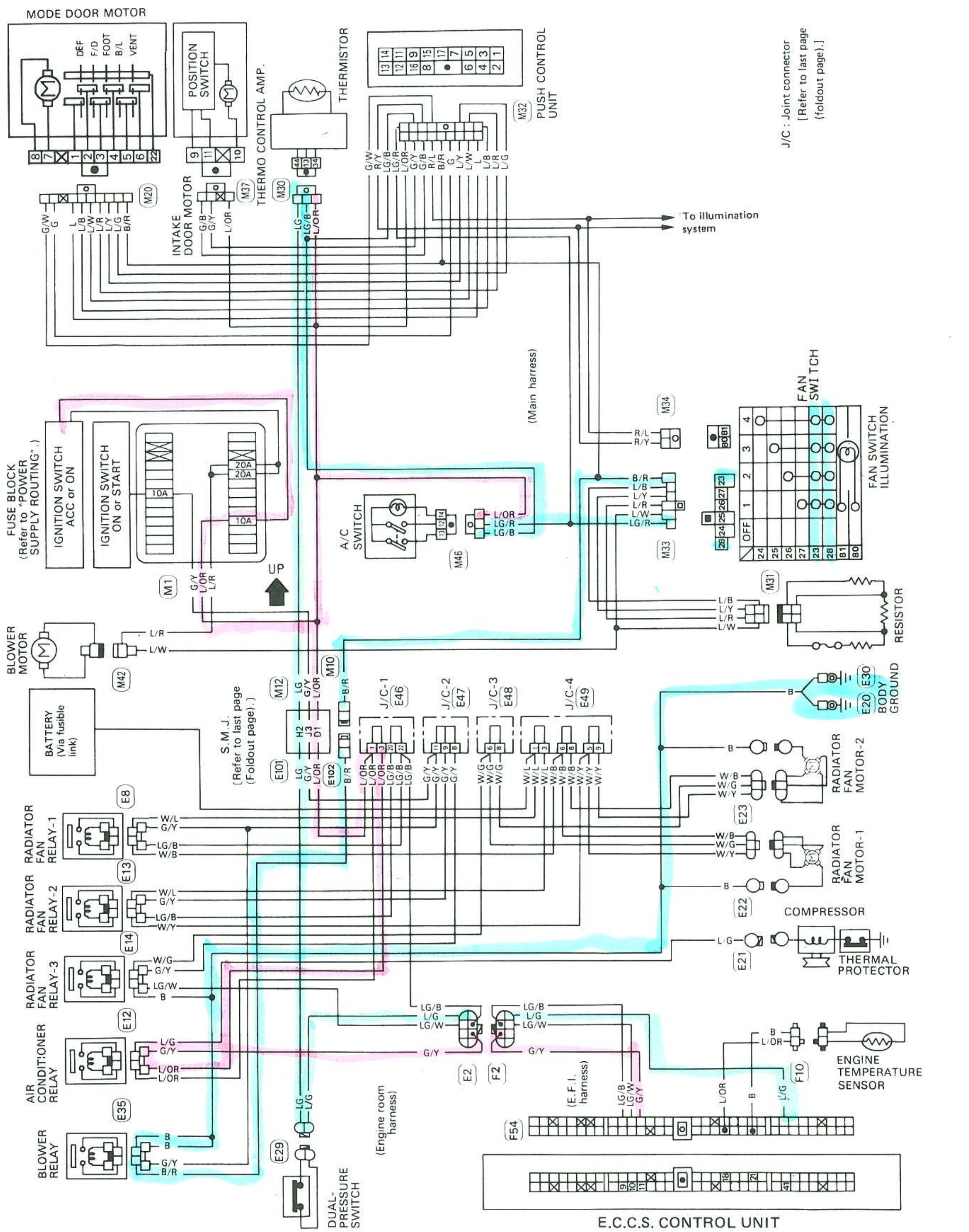
HEATER ELECTRICAL CIRCUIT



SHA687C

Wiring Diagram (Cont'd)

A/C ELECTRICAL CIRCUIT



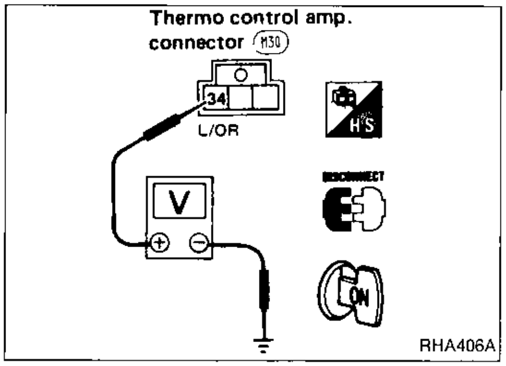
SHA995C

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 EL section and A/C ELECTRICAL CIRCUIT.

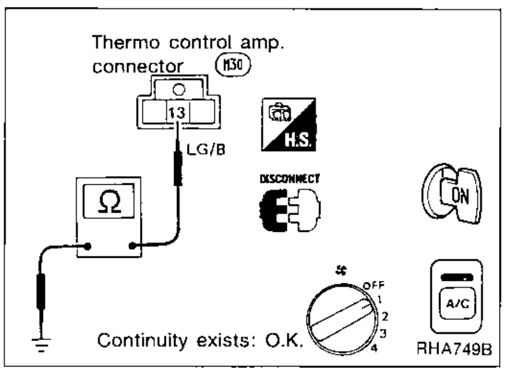


THERMO CONTROL AMP. CHECK

Check power supply circuit for thermo control amp. with ignition switch ON.

1. Disconnect thermo control amp. harness connector.
2. Connect voltmeter from harness side.
3. Measure voltage across terminal No. 34 and body ground.

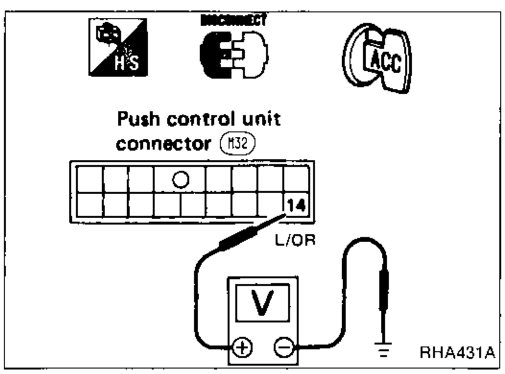
Voltmeter terminal		Voltage
⊕	⊖	
34	Body ground	Approx. 12V



Check body ground circuit for thermo control amp. with ignition switch OFF, A/C switch ON and fan switch ON.

1. Disconnect thermo control amp. harness connector.
2. Connect ohmmeter from harness side.
3. Check for continuity between terminal No. 13 and body ground.

Ohmmeter terminal		Continuity
⊕	⊖	
13	Body ground	Yes

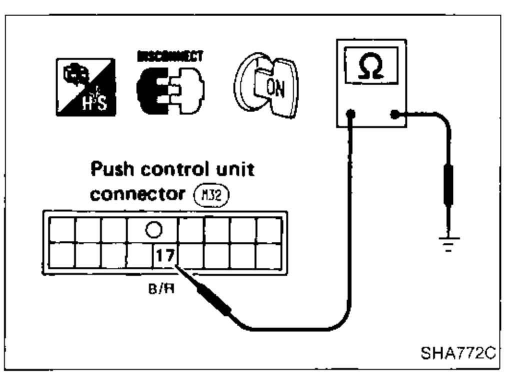


PUSH CONTROL UNIT CHECK

Check power supply circuit for push control unit with ignition switch at ACC.

1. Disconnect push control unit harness connector.
2. Connect voltmeter from harness side.
3. Measure voltage across terminal No. 14 and body ground.

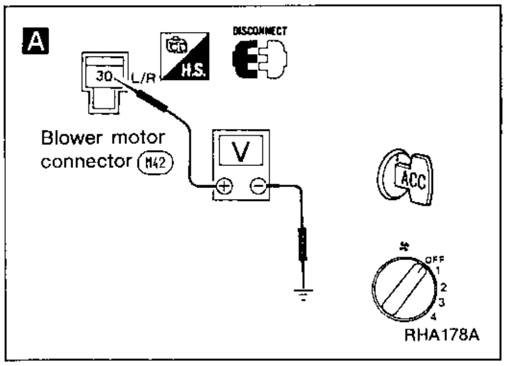
Voltmeter terminal		Voltage
⊕	⊖	
14	Body ground	Approx. 12V

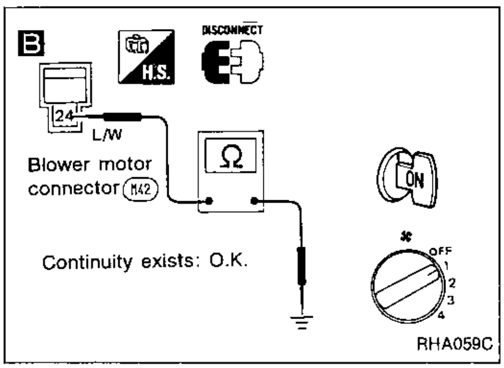


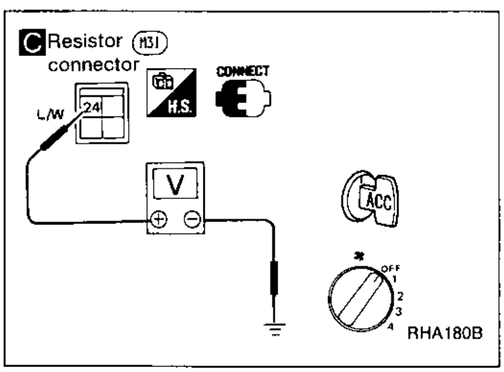
Check body ground circuit for push control unit with ignition switch ON.

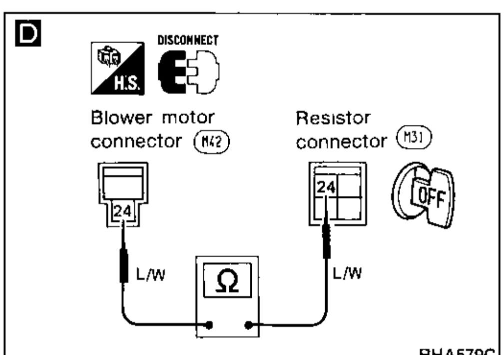
1. Disconnect push control unit harness connector.
2. Connect ohmmeter from harness side.
3. Check for continuity between terminal No. 17 and body ground.

	INCIDENT	Flow chart No.
1	Fan fails to rotate.	1
2	Fan does not rotate at 1-speed.	2
3	Fan does not rotate at 2-speed.	3
4	Fan does not rotate at 3-speed.	4
5	Fan does not rotate at 4-speed.	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 check as per flow chart at left.

→ 1: go to A
→ 2, 3: go to B, C
→ 4, 5: go to D, E
(Go to next page.)

A CHECK POWER SUPPLY FOR BLOWER MOTOR.
Disconnect blower motor harness connector.
Do approx. 12 volts exist between blower motor harness terminal No. 30 and body ground?

- N.G. → Check 20A 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. 24 and body ground.

- N.G. → Reconnect blower motor harness connector. → go to C
- O.K. ↓

CHECK BLOWER MOTOR.
(Refer to Electrical Components Inspection.)

↓

Replace blower motor.

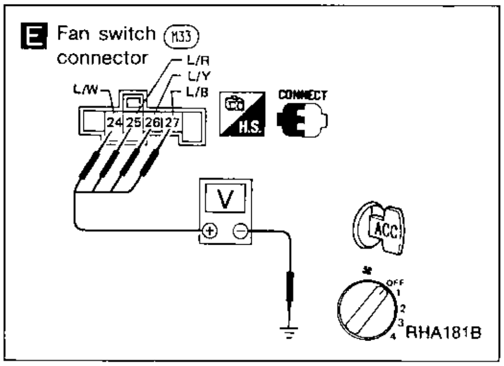
C CHECK BLOWER MOTOR CIRCUIT BETWEEN BLOWER MOTOR AND RESISTOR.
Do approx. 12 volts exist between resistor harness terminal No. 24 and body ground?

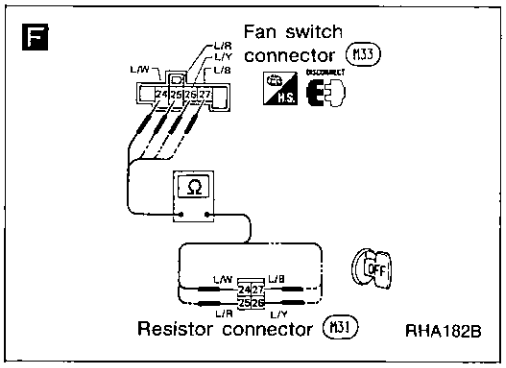
- N.G. → Disconnect blower motor and resistor harness connectors.
  ↓
  D Note
  Check circuit continuity between blower motor harness terminal No. 24 and resistor harness terminal No. 24.
- O.K. ↓

A
(Go to next page.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 1 (Cont'd)





Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

1 2 3 4 5

CHECK RESISTOR AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection.)

O.K. → Reconnect resistor harness connector.

N.G. → Replace resistor.

Reconnect resistor harness connector.
- 1 → CHECK FAN SWITCH AFTER DISCONNECTING IT.
- 2 3 4 5 → CHECK FAN SWITCH CIRCUIT.

E

CHECK FAN SWITCH CIRCUIT.
Do approx. 12 volts exist between each fan switch harness terminal and body ground?

Flow chart No.	Terminal No. ⊕	Terminal No. ⊖	Voltage
2	24	Body ground	Approx. 12V
3	25		
4	26		
5	27		

O.K. 2 3 4 5 → CHECK FAN SWITCH AFTER DISCONNECTING IT.

N.G. → F
Check circuit continuity between fan switch and resistor. (Note)

CHECK FAN SWITCH AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection.)

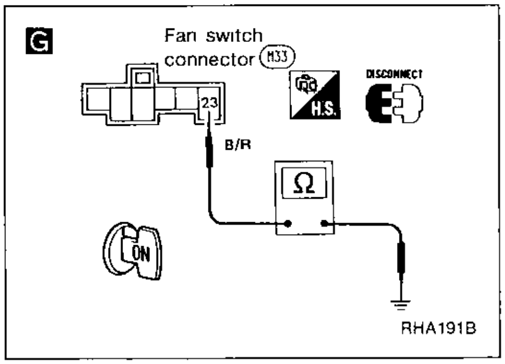
N.G. → Replace fan switch.

O.K. → Ⓕ

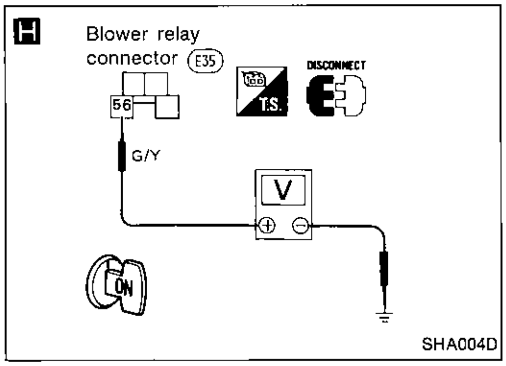
(Go to next page.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

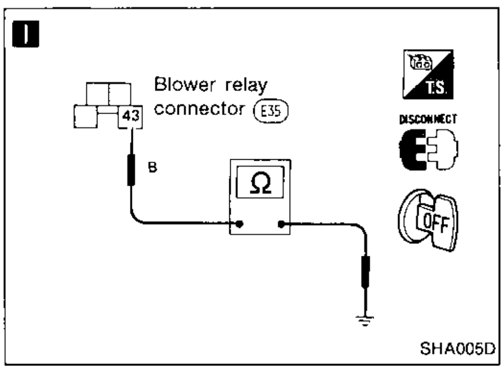
Diagnostic Procedure 1 (Cont'd)



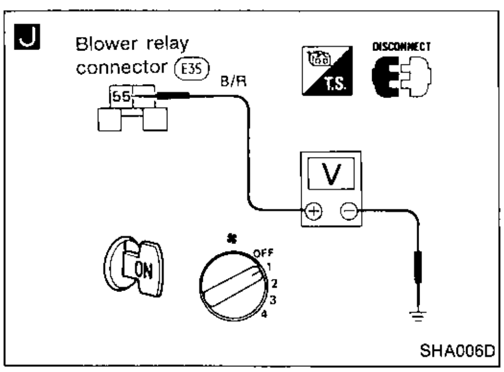
RHA191B



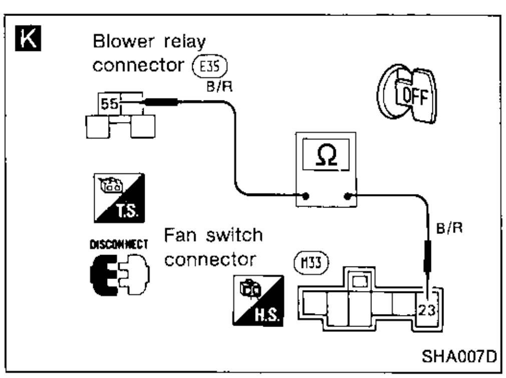
SHA004D



SHA005D



SHA006D



SHA007D

(F)

G CHECK BODY GROUND CIRCUIT FOR FAN SWITCH.
Does continuity exist between fan switch harness terminal No. (23) and body ground?

- N.G. → **H** CHECK POWER SUPPLY FOR BLOWER RELAY.
  Disconnect blower relay harness connector. Do approx. 12 volts exist between blower relay harness terminal No. (56) and body ground?
  - O.K. → go to **I**
  - N.G. → Check 10A fuse at fuse block.
    (Refer to Electrical Components Inspection.)
- O.K. → Replace fan switch.

I Check circuit continuity between blower relay harness terminal No. (43) and body ground. (Note)

↓ O.K.

CHECK BLOWER RELAY.
(Refer to Electrical Components Inspection.)

- N.G. → Replace blower relay.

↓ O.K.

Reconnect fan switch harness connector.

↓

J CHECK POWER SUPPLY FOR BLOWER MOTOR.
Do approx. 12 volts exist between blower relay harness terminal No. (55) and body ground?

- N.G. → Disconnect fan switch harness connector.
  ↓
  K Check circuit continuity between fan switch harness terminal No. (23) and blower relay harness terminal No. (55). (Note)

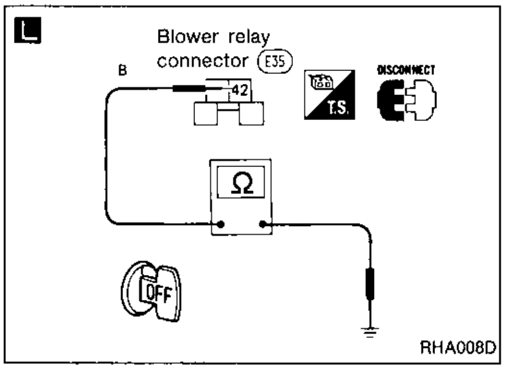
↓ O.K.

(G)

(Go to next page.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 1 (Cont'd)

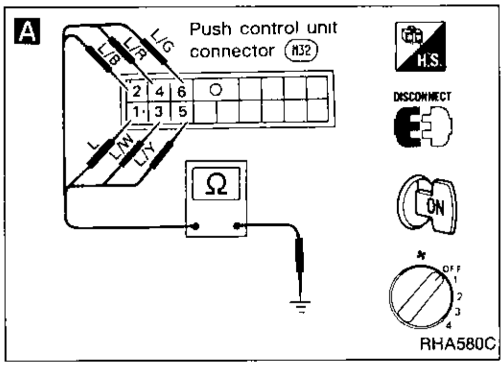


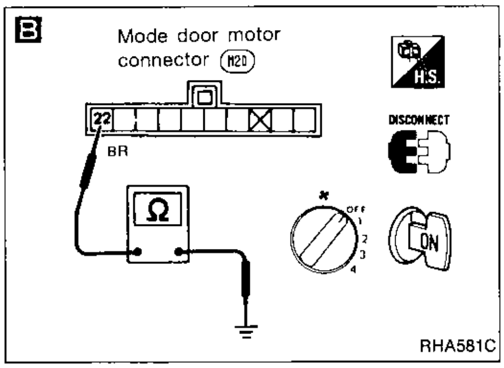
G

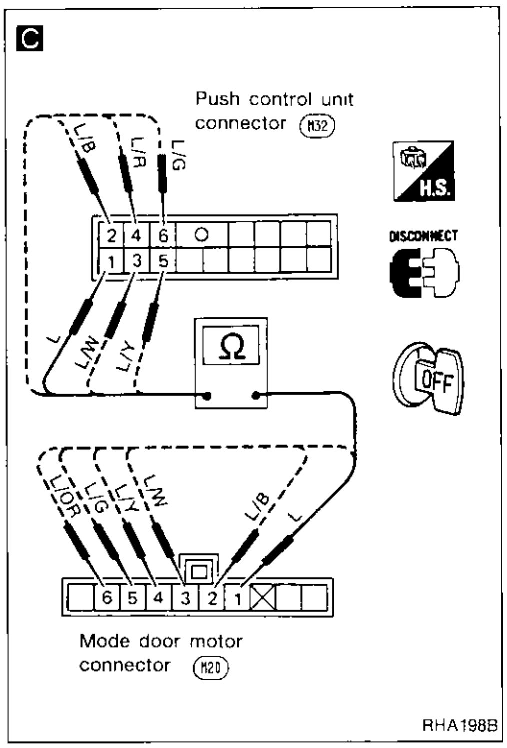
Note

CHECK BODY GROUND CIRCUIT FOR BLOWER RELAY. Does continuity exist between blower relay harness terminal No. 42 and body ground?

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.







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.**

A

CHECK MODE DOOR MOTOR POSITION SWITCH.
1. Turn VENT switch ON with ignition switch at ON position.
2. Disconnect push control unit connector.
3. Check if continuity exists between terminal No. ① or ② of push control unit harness connector and body ground.
4. Using above procedures, check for continuity in any other mode, as indicated in chart.

Mode switch	Terminal No. ⊕	Terminal No. ⊖	Continuity
VENT	① or ②	Body ground	Yes
B/L	② or ③		
FOOT	③ or ④		
F/D	④ or ⑤		
DEF	⑤ or ⑥		

O.K. → CHECK SIDE LINK.
Refer to DOOR CONTROL.

N.G. → Disconnect mode door motor harness connector.

↓ Note

B

CHECK BODY GROUND CIRCUIT FOR MODE DOOR MOTOR.
Does continuity exist between mode door motor harness terminal No. ㉒ and body ground?

↓ O.K. Note

C

Check circuit continuity between each terminal on push control unit and on mode door motor.

Terminal No. ⊕ Push control unit	Terminal No. ⊖ Mode door motor	Continuity
①	①	Yes
②	②	
③	③	
④	④	
⑤	⑤	
⑥	⑥	

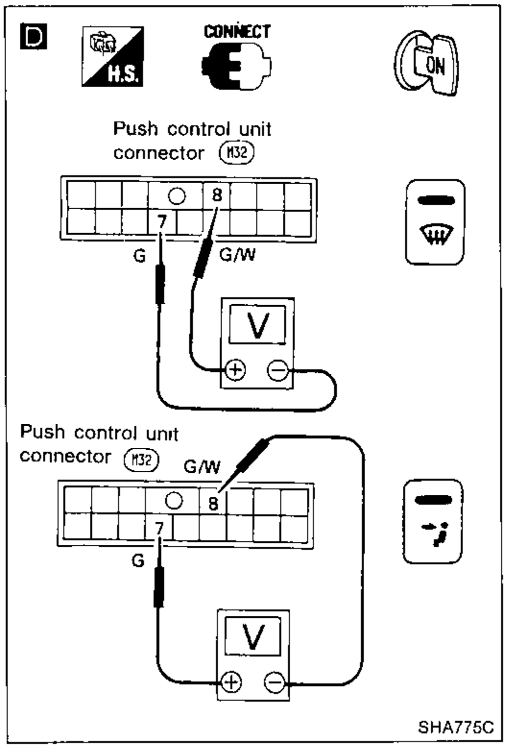
↓ O.K.

Ⓐ

(Go to next page.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 2 (Cont'd)



SHA775C

Ⓐ

Reconnect push control unit and mode door motor harness connectors.

D

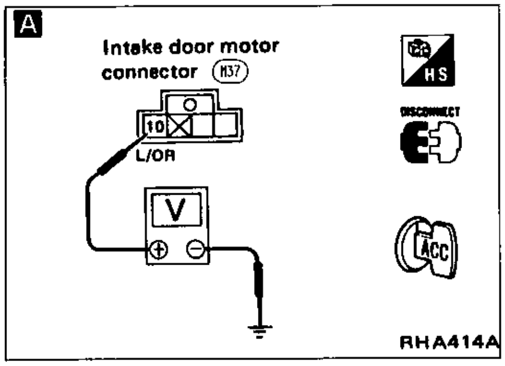
CHECK FOR OUTPUT OF PUSH CONTROL UNIT.
Do approx. 12 volts exist between push control unit harness terminal No. ⑦ and ⑧ when mode is switched from "VENT" to "DEF" or when mode is switched from "DEF" to "VENT"?

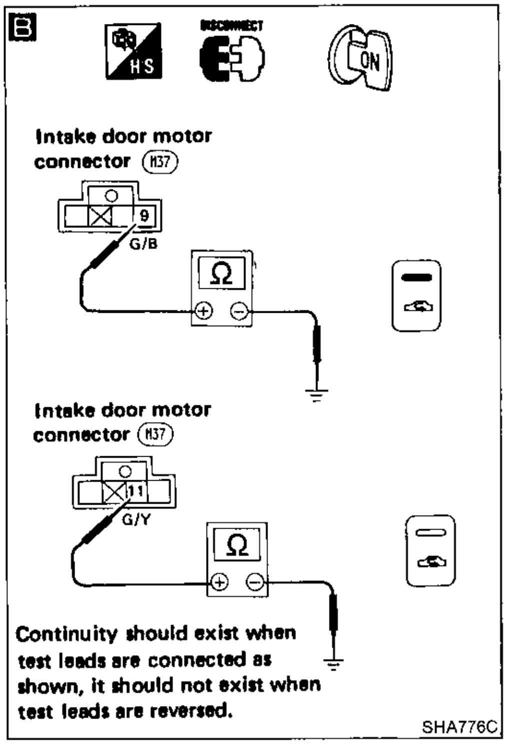
Terminal No.		Mode door motor	
⑦	⑧	Mode door operation	Direction of linkage rotation
⊖	⊖	Stop	Stop
⊖	⊕	VENT → DEF	Clockwise
⊕	⊖	DEF → VENT	Counter-clockwise

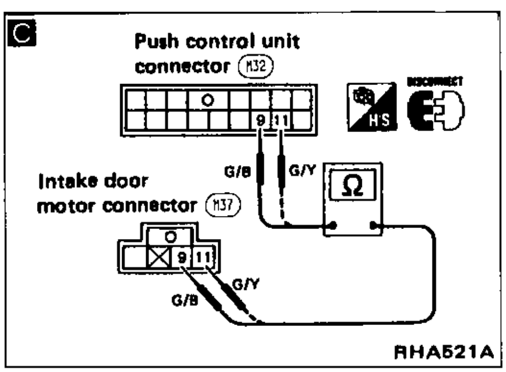
N.G. → Replace control amp. built-in push control unit.

O.K. ↓

Replace mode door motor.







Diagnostic Procedure 3

SYMPTOM: Intake door does not change in VENT, B/L or FOOT mode.

- **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 approx. 12 volts exist between intake door motor harness terminal No. ⑩ and body ground?

- N.G. → Check 10A fuses at fuse block.
(Refer to "POWER SUPPLY ROUTING" in EL section and A/C ELECTRICAL CIRCUIT.)
- O.K. ↓

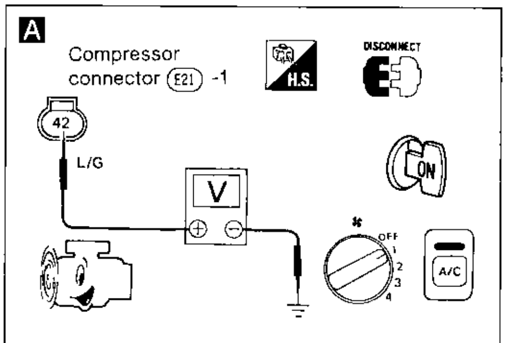
B

CHECK BODY GROUND CIRCUIT FOR INTAKE DOOR MOTOR.
Does continuity exist between intake door motor harness terminal No. ⑨ and body ground when REC switch is ON?
Does continuity exist between intake door motor harness terminal No. ⑪ and body ground when REC switch is OFF?

- N.G. → Disconnect push control unit harness connector.
  ↓ Note
  C
  Check circuit continuity between push control unit harness terminal No. ⑨ (⑪)and intake door motor harness terminal No. ⑨ (⑪)?
  - O.K. → Replace control amp. built-in push control unit.
- O.K. ↓

Replace intake door motor.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.



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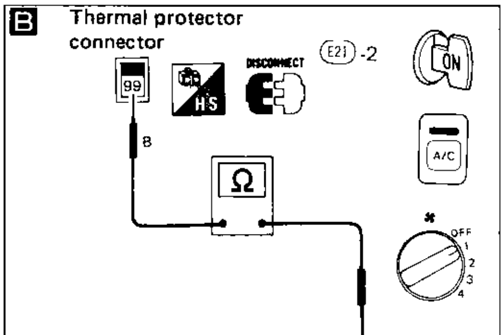


SHA083D

Diagnostic Procedure 4

SYMPTOM: Magnet clutch does not engage when A/C switch and fan switch are ON.

- **Perform PRELIMINARY CHECK 2 before referring to the following flow chart.**

A

CHECK POWER SUPPLY FOR COMPRESSOR.
Disconnect compressor harness connector.
Do approx. 12 volts exist between compressor harness terminal No. 42 and body ground?

N.G. → A

O.K. ↓

B

CHECK THERMAL PROTECTOR.
Disconnect thermal protector harness connector.
Does continuity exist between thermal protector harness terminal No. 99 and body ground?

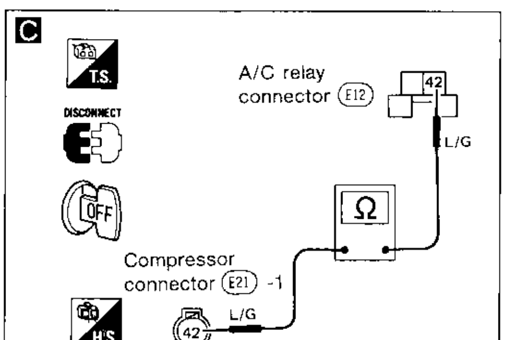
N.G. → Replace thermal protector.

O.K. ↓

Check magnet clutch coil.

O.K. ↓

Replace magnet clutch.
Refer to COMPRESSOR — Model NVR 140S (ATSUGI make).



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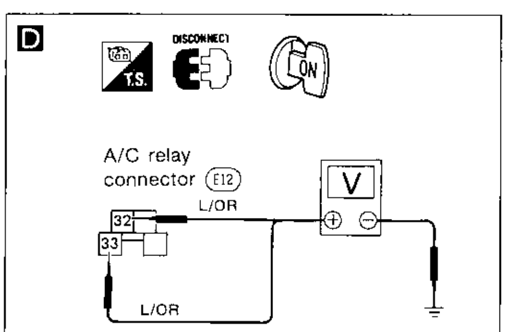


RHA584C

A ↓

Disconnect A/C relay harness connector.

↓

C

Check circuit continuity between A/C relay harness terminal No. 42 and compressor harness terminal No. 42. Note

O.K. →

D

CHECK POWER SUPPLY FOR A/C RELAY.
Disconnect A/C relay.
Do approx. 12 volts exist between A/C relay harness terminal No. 32, 33 and body ground?

O.K. → B

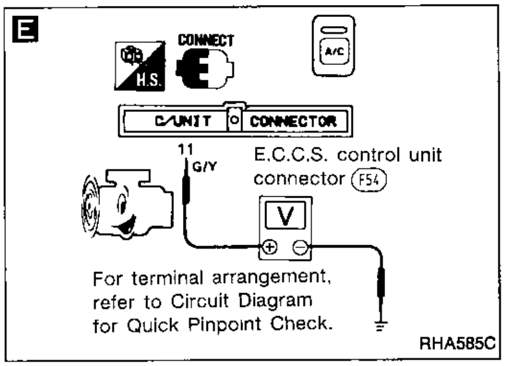
N.G. ↓

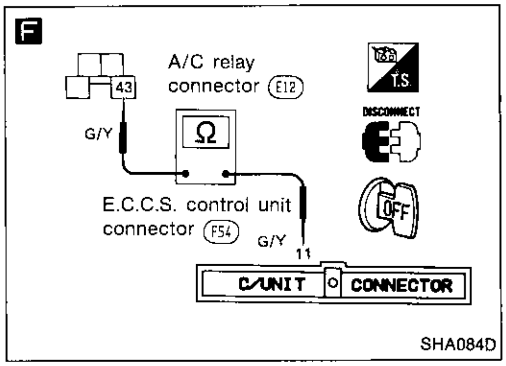
Check 20A fuses at fuse block.
(Refer to "POWER SUPPLY ROUTING" in EL section and A/C ELECTRICAL CIRCUIT.)

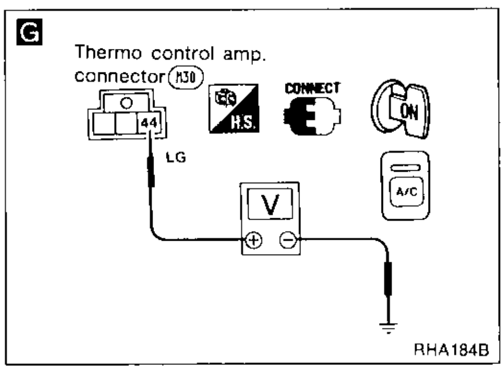
B (Go to next page.)

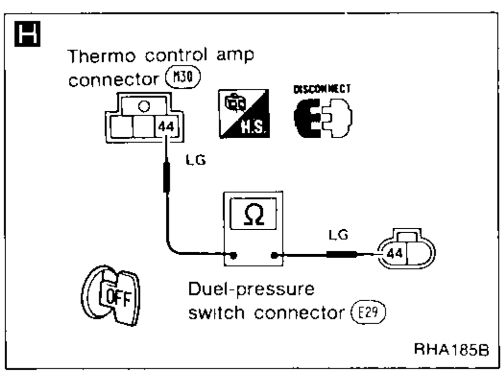
Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

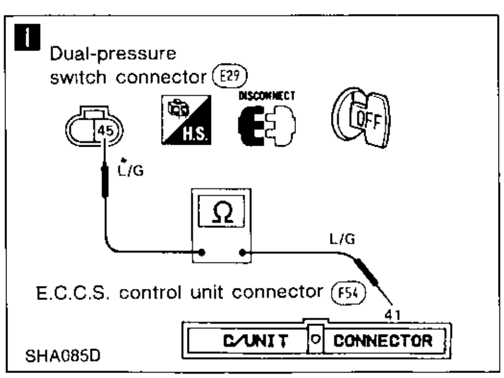
Diagnostic Procedure 4 (Cont'd)











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↓

CHECK A/C RELAY AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection.)

- N.G. → Replace A/C relay.
- O.K. ↓

Reconnect A/C relay.

↓

E CHECK COIL SIDE CIRCUIT OF A/C RELAY.
Do approx. 12 volts exist between E.C.C.S. control unit harness terminal No. ⑪ and body ground?

- N.G. → **F** Check circuit continuity between A/C relay harness terminal No. ㊸ and E.C.C.S. control unit harness terminal No. ⑪. (Note)
- O.K. ↓

G CHECK VOLTAGE FOR THERMO CONTROL AMP.
Do more than 8 volts exist between thermo control amp. harness terminal No. ㊹ and body ground?

- N.G. → **H** Check circuit continuity between thermo control amp. harness terminal No. ㊹ and dual-pressure switch terminal No. ㊹. (Note)
  - O.K. ↓

  CHECK DUAL-PRESSURE SWITCH.
  (Refer to Electrical Components Inspection.)

  - N.G. → Replace dual-pressure switch.
  - O.K. ↓

  I Check circuit continuity between E.C.C.S. control unit harness terminal No. ㊶ and dual-pressure switch harness terminal No. ㊺. (Note)

  - O.K. ↓

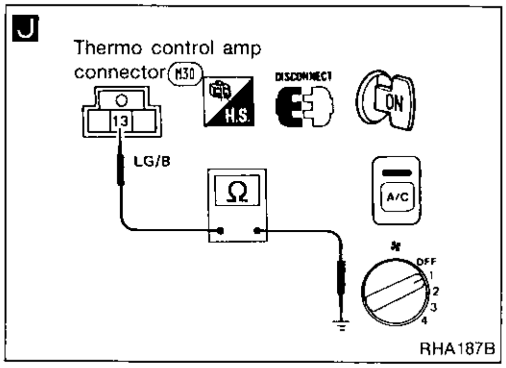
  CHECK E.C.C.S. CONTROL UNIT.
  (Refer to EF & EC section.)
- O.K. ↓

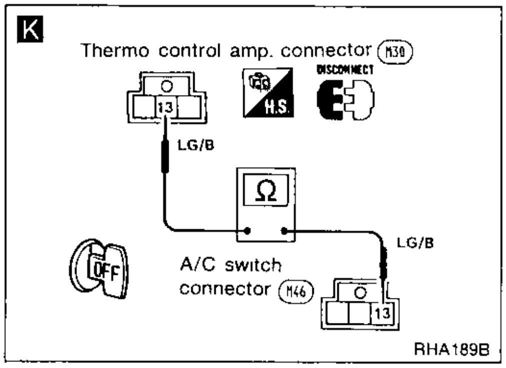
Ⓒ

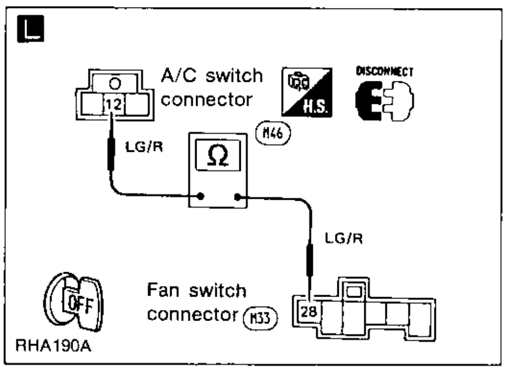
(Go to next page.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 4 (Cont'd)







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CHECK POWER SUPPLY FOR THERMO CONTROL AMP.
Go to Main Power Supply and Ground Circuit Check.

↓ O.K.

J CHECK BODY GROUND CIRCUIT FOR THERMO CONTROL AMP.
Disconnect thermo control amp. harness connector.
Does continuity exist between thermo control amp. harness terminal No. ⑬ and body ground?

- O.K. → Replace thermo control amp.
- N.G. → Disconnect A/C switch harness connector.
  - ↓ **K** Note: Check circuit continuity between thermo control amp. harness terminal No. ⑬ and A/C switch harness terminal No. ⑬.
  - ↓ O.K.

CHECK A/C SWITCH.
(Refer to Electrical Components Inspection.)

- N.G. → Replace A/C switch.

↓ O.K.

Disconnect fan switch harness connector.

↓

L Note: Check circuit continuity between A/C switch harness terminal No. ⑫ and fan switch harness terminal No. ㉘.

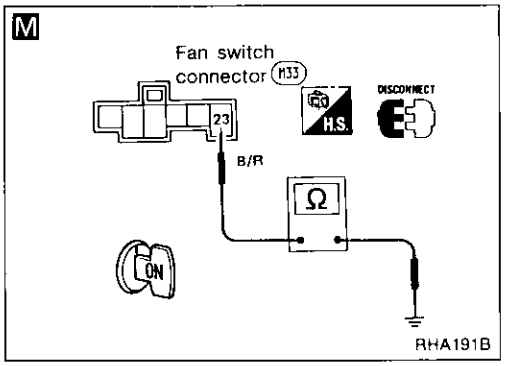
↓ O.K.

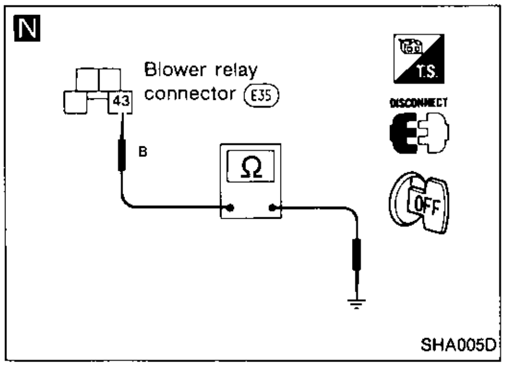
Ⓓ

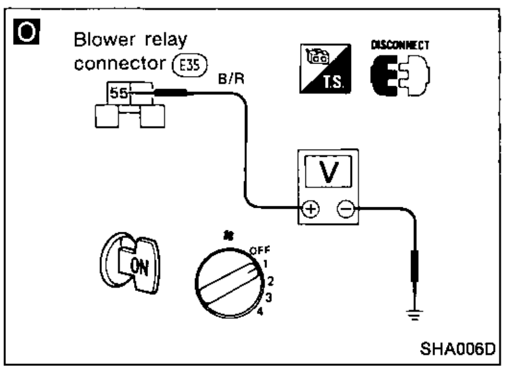
(Go to next page.)

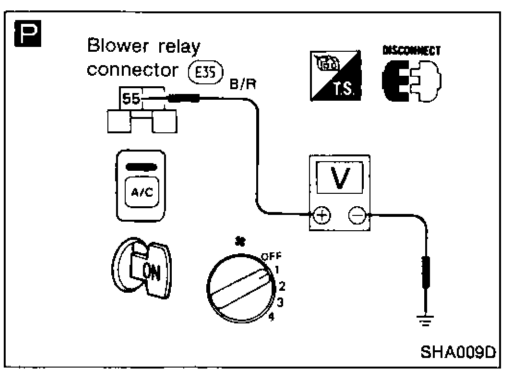
Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

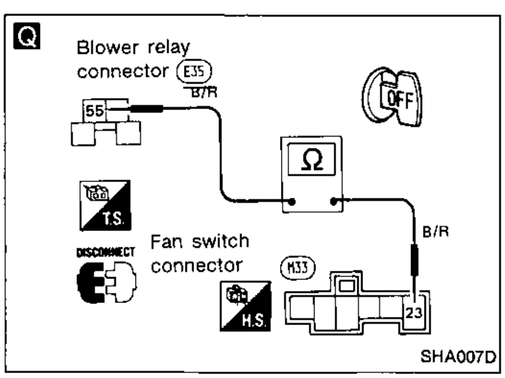
Diagnostic Procedure 4 (Cont'd)











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M — Note

CHECK BODY GROUND CIRCUIT FOR FAN SWITCH.
Does continuity exist between fan switch harness terminal No. ㉓ and body ground?

- N.G. → **N** CHECK POWER SUPPLY FOR BLOWER RELAY.
  Disconnect blower relay harness connector. Do approx. 12 volts exist between blower relay harness terminal No. ㊸ and body ground?
  - O.K. → go to **O**
  - N.G. → Check 10A fuses at fuse block. (Refer to Electrical Components Inspection.)
- O.K. ↓

CHECK FAN SWITCH.
(Refer to Electrical Components Inspection.)

↓

Replace fan switch.

O — Note

Check circuit continuity between blower relay harness terminal No. 55 and body ground.

O.K. ↓

CHECK BLOWER RELAY.
(Refer to Electrical Components Inspection.)

- N.G. → Replace blower relay.
- O.K. ↓

Reconnect thermo control amp. A/C switch and fan switch harness connectors.

↓

P

CHECK POWER SUPPLY FOR BLOWER MOTOR.
Do approx. 12 volts exist between blower relay harness terminal No. 55 and body ground?

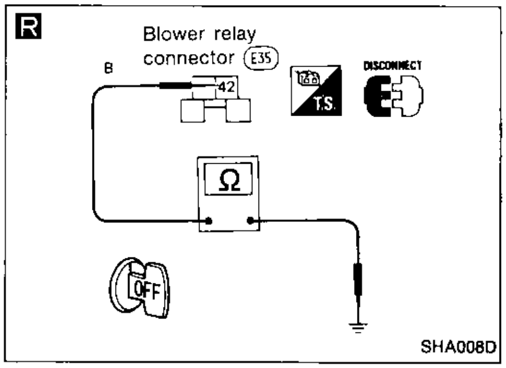
- N.G. → Disconnect fan switch harness connector.
  ↓
  Q — Note
  Check circuit continuity between fan switch harness terminal No. ㉓ and blower relay harness terminal No. 55.
- O.K. ↓

Ⓔ

(Go to next page.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 4 (Cont'd)



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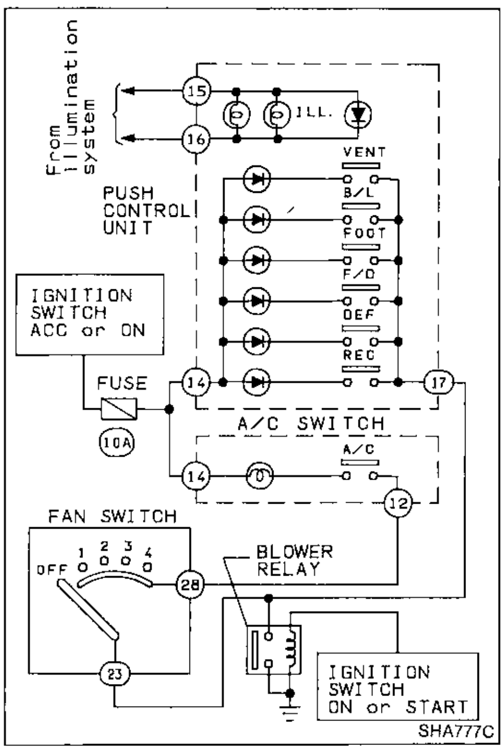
R

Note

CHECK BODY GROUND CIRCUIT FOR BLOWER RELAY. Does continuity exist between blower relay harness terminal No. ㊷ and body ground?

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.



Diagnostic Procedure 5

SYMPTOM: Illumination or indicators of push control unit 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 switches ON.
- Push VENT, B/L, FOOT, F/D and DEF switches in order.
- Check for incidents and follow the repairing methods as shown:

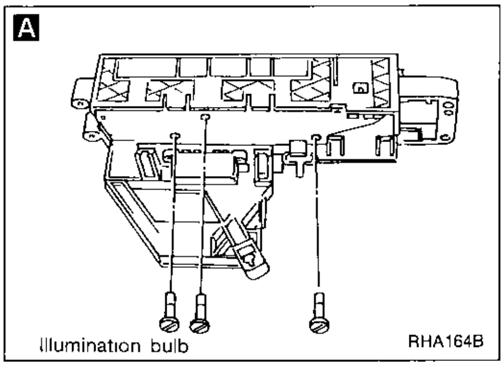
INCIDENTS										"How to repair"
ILL.										
Push control unit	Fresh vent	VENT	B/L	FOOT	F/D	DEF	REC	A/C		
X	O	O	O	O	O	O	O			Go to DIAGNOSTIC PROCEDURE 5-1.
O	X	O	O	O	O	O	O			Go to DIAGNOSTIC PROCEDURE 5-2.
		O	O	O	O	O	O	X		Go to DIAGNOSTIC PROCEDURE 5-3.
O		X	X	X	X	X	X			Go to DIAGNOSTIC PROCEDURE 5-4.
		Δ								Replace control amp. built in push control unit.
O		X	X	X	X	X	X	O		Replace control amp. built-in push control unit.
		X	X	X	X	X	X	O		Go to DIAGNOSTIC PROCEDURE 5-5.

O: Illumination or indicator comes on.
X: Illumination or indicator does not come on.
Δ: Some indicators for VENT, B/L, FOOT, F/D, DEF or REC come on.

Diagnostic Procedure 5 (Cont'd)

DIAGNOSTIC PROCEDURE 5-1

A



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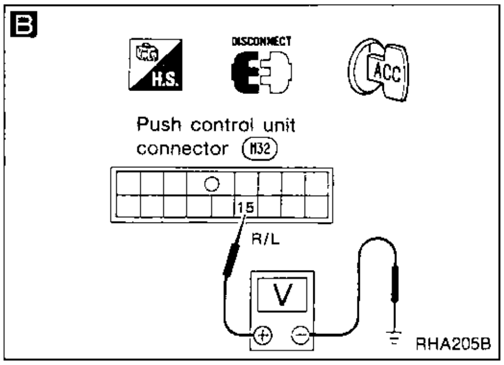

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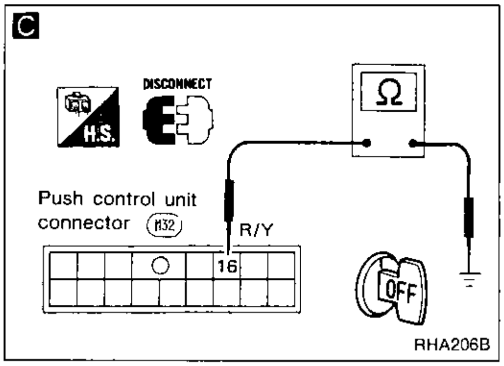


CHECK THE OTHER ILLUMINATION SYSTEMS EXCEPT FOR A/C SYSTEM.
Do the other illumination come on with ignition switch and lighting switch ON?

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 push control 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 approx. 12 volts exist between push control unit harness terminal No. 15 and body ground?

N.G. → CHECK POWER SUPPLY FOR A/C ILLUMINATION SYSTEM. Refer to illumination/ Wiring Diagram in EL section.

O.K. ↓

C Note

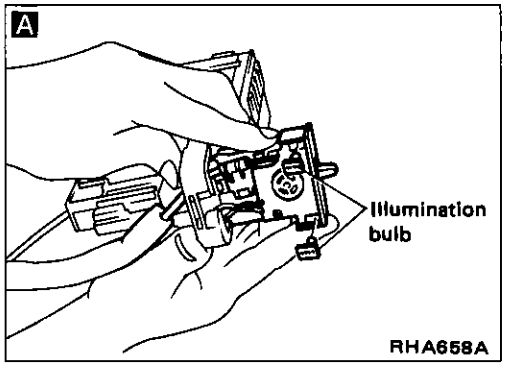
CHECK BODY GROUND CIRCUIT FOR ILLUMINATION.
Does continuity exist between push control unit harness terminal No. 16 and body ground?

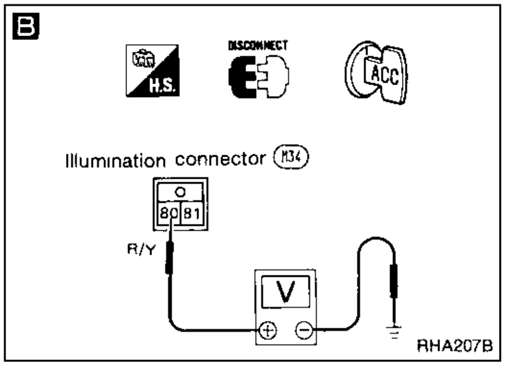
O.K. ↓

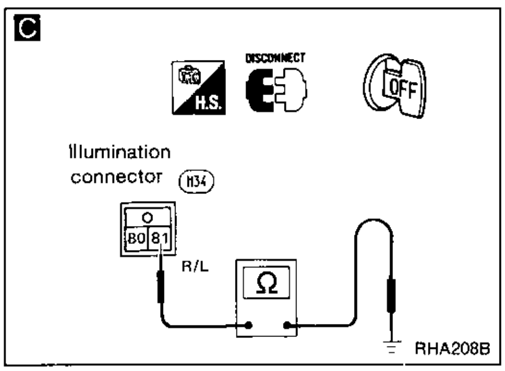
Replace control amp. built-in push control unit.

Diagnostic Procedure 5 (Cont'd)

DIAGNOSTIC PROCEDURE 5-2







CHECK THE OTHER ILLUMINATION SYSTEMS EXCEPT FOR A/C SYSTEM.
Do the other illumination 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 fresh vent assembly 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 approx. 12 volts exist between push control unit harness terminal No. 80 and body ground?

- N.G. → CHECK POWER SUPPLY FOR A/C ILLUMINATION SYSTEM. Refer to illumination/ Wiring Diagram in EL section.
- O.K. ↓

C Note

CHECK BODY GROUND CIRCUIT FOR ILLUMINATION.
Does continuity exist between push control unit harness terminal No. 81 and body ground?

- O.K. ↓

Replace control amp. built-in push control unit.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 5 (Cont'd)

DIAGNOSTIC PROCEDURE 5-3

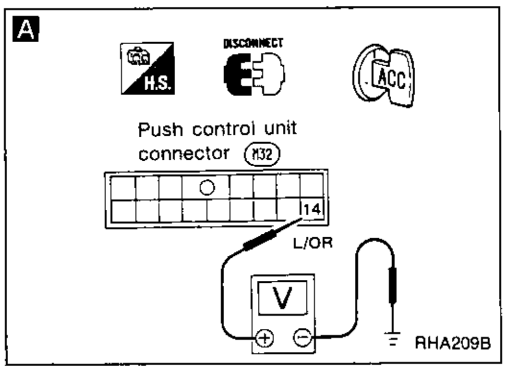
CHECK MAGNET CLUTCH ENGAGEMENT.
Does magnet clutch engage normally when engine ON, A/C switch, fan switch are ON?

- N.G. → Go to Diagnostic Procedure 4.
- O.K. ↓

Check bulb.

- N.G. ↓

Replace bulb.



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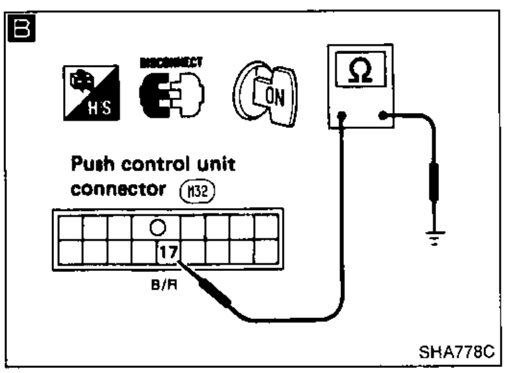

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DIAGNOSTIC PROCEDURE 5-4

Turn ignition switch and lighting switch OFF.

↓

Disconnect push control unit harness connector.

↓

A
CHECK POWER SUPPLY FOR PUSH CONTROL UNIT.
Do approx. 12 volts exist between push control unit harness terminal No. ⑭ and body ground?

- N.G. → Check 10A fuse at fuse block. (Refer to "POWER SUPPLY ROUTING" in EL section and A/C ELECTRICAL CIRCUIT.)
- O.K. ↓

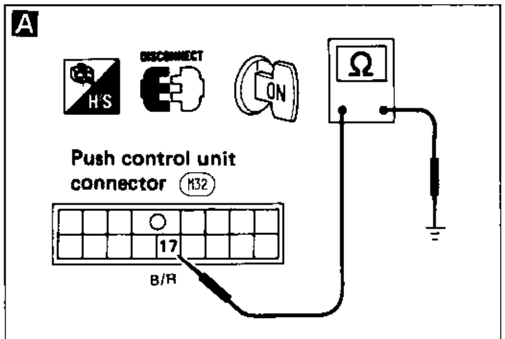
B
Note
CHECK BODY GROUND CIRCUIT FOR PUSH CONTROL UNIT.
Does continuity exist between push control unit harness terminal No. ⑰ and body ground?

- O.K. ↓

Replace control amp. built-in push control unit.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 5 (Cont'd)



SHA779C

DIAGNOSTIC PROCEDURE 5-5

Turn ignition switch and lighting switch OFF.

↓

Disconnect push control unit harness connector.

↓

A — Note

CHECK BODY GROUND CIRCUIT FOR PUSH CONTROL UNIT.
Does continuity exist between push control unit harness terminal No. 17 and body ground?

↓ O.K.

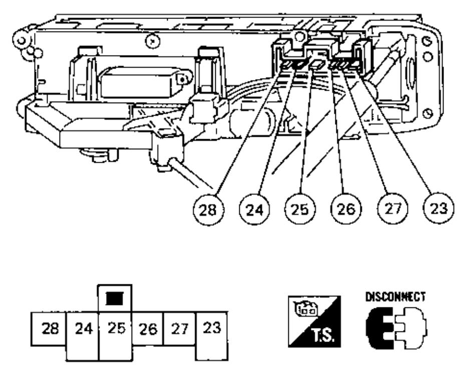
Replace control amp. built-in push control unit.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Electrical Components Inspection

FAN SWITCH

Check continuity between terminals at each switch position.



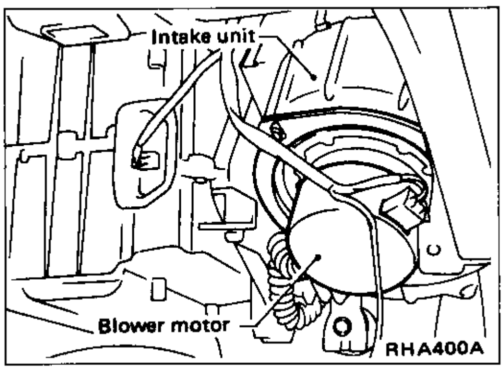
LEVER POSITION / TERMINAL	OFF	1	2	3	4
24					○
25				○	
26			○		
27		○			
23		○	○	○	○
28		○	○	○	○

RHA171B

BLOWER MOTOR

Confirm smooth rotation of the blower motor.

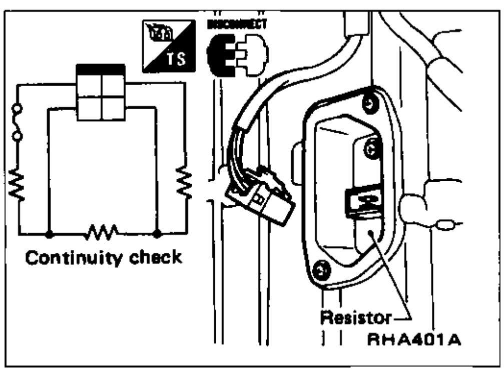
- Ensure that there are no foreign particles inside the intake unit.



RHA400A

BLOWER RESISTOR

Check continuity between terminals.

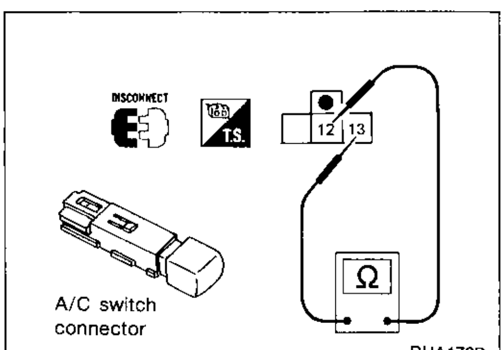


RHA401A

A/C SWITCH

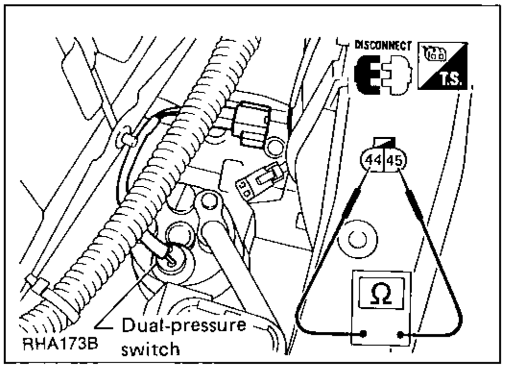
Check continuity between terminals at each switch position.

Switch condition	Terminal No. ⊕	Terminal No. ⊖	Continuity
ON	⑬	⑫	Yes
OFF	⑬	⑫	No



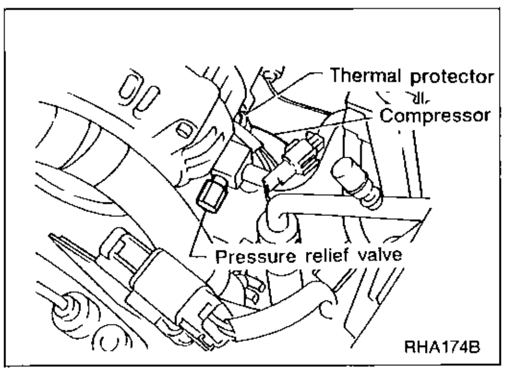
RHA172B

Electrical Components Inspection (Cont'd)



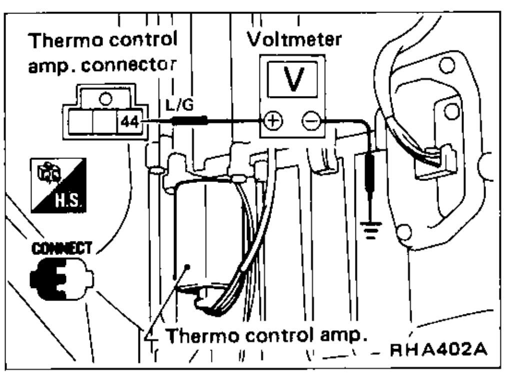
DUAL-PRESSURE SWITCH

High-pressure side line pressure kPa (kg/cm², psi)	Operation	Continuity
Decreasing to 177 - 216 (1.8 - 2.2, 26 - 31) Increasing to 2,452 - 2,844 (25 - 29, 356 - 412)	Turn OFF	Does not exist
Increasing to 177 - 235 (1.8 - 2.4, 26 - 34) Decreasing to 1,863 - 2,354 (19 - 24, 270 - 341)	Turn ON	Exists



THERMAL PROTECTOR

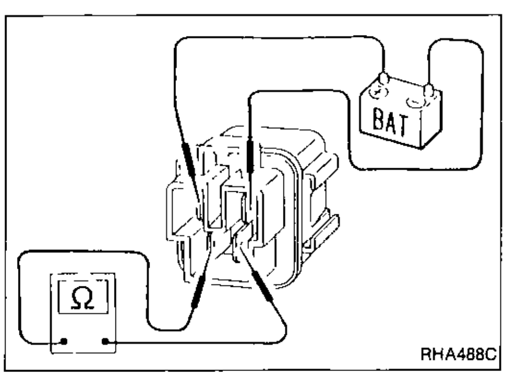
Temperature of compressor °C (°F)	Operation
Increasing to approx. 135 - 145 (275 - 293)	Turn OFF
Decreasing to approx. 120 - 130 (248 - 266)	Turn ON



THERMO CONTROL AMP.

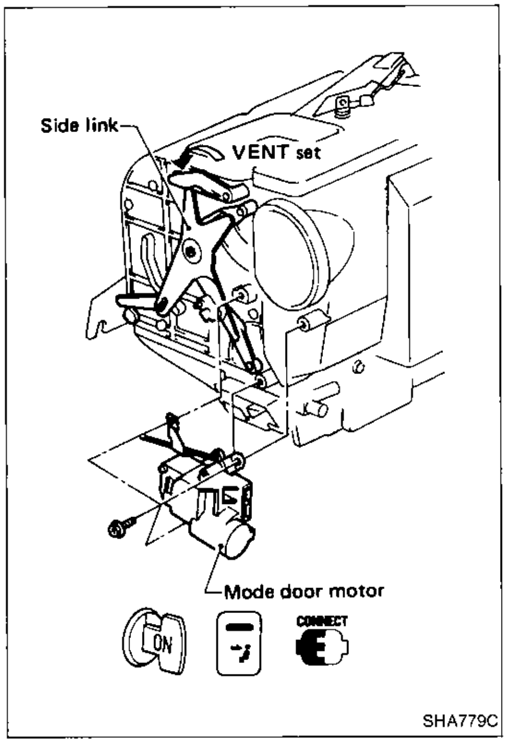
1. Run engine, and operate A/C system.
2. Connect the voltmeter from harness side.
3. Check thermo control amp. operation shown in the table.

Evaporator outlet air temperature °C (°F)	Thermo amp. operation	Tester
Decreasing to 2.5 - 3.5 (37 - 38)	Turn OFF	Approx. 12V
Increasing to 4.0 - 5.0 (39 - 41)	Turn ON	Approx. 0V



RELAYS

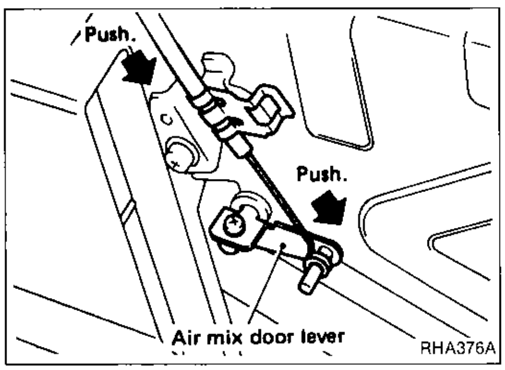
Check circuit continuity between terminals by supplying 12 volts to coil side terminals of the relay.



Control Linkage Adjustment

MODE DOOR

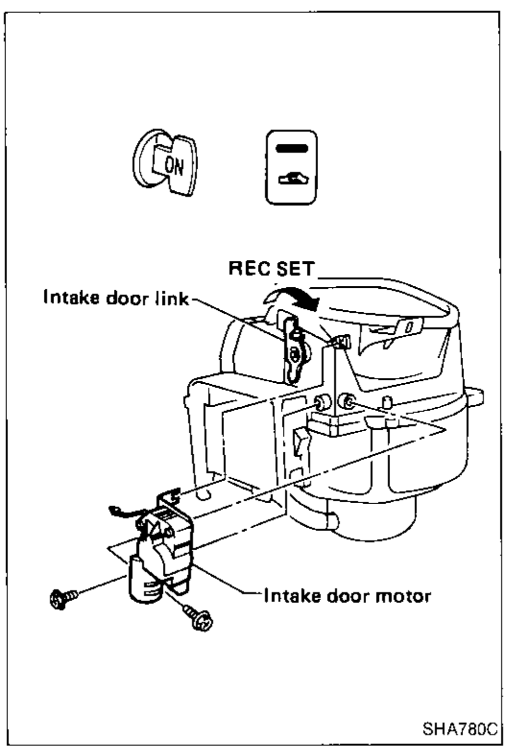
1. Move side link with hand and hold mode door in VENT mode.
2. Install mode door motor on heater unit and connect it to body harness.
3. Turn ignition switch to ON.
4. Turn VENT switch ON.
5. Attach mode door motor rod to side link rod holder.
6. Turn DEF switch ON. Check that side link operates at the fully-open position. Also turn VENT switch ON to check that side link operates at the fully-open position.



TEMPERATURE CONTROL CABLE

- Move the temperature control lever to the full hot position. Set the air mix door lever in the full hot position. Pull on the outer cable in the direction of the arrow and then clamp it.

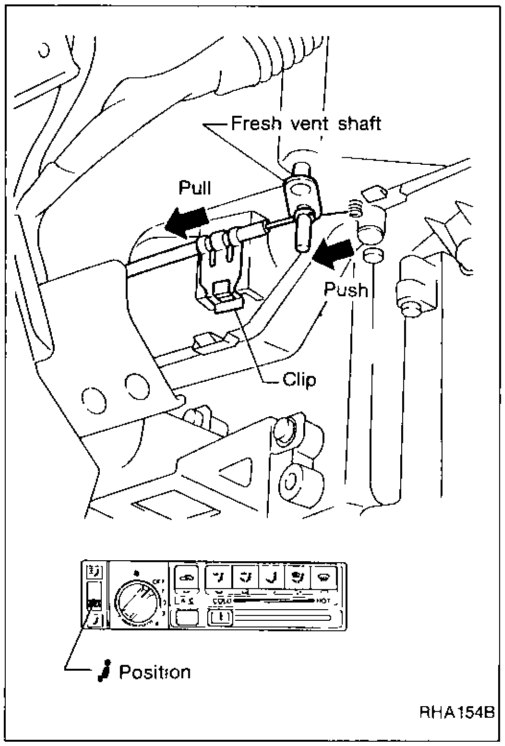
After positioning control cable, check it operates properly.



INTAKE DOOR

1. Connect the intake door motor harness connector before installing to the intake door motor.
2. Turn ignition switch to ON.
3. Turn REC switch ON.
4. Install intake door motor on intake unit.
5. Install intake door lever.
6. Set intake door rod in REC position and fasten door rod to holder on intake door lever.
7. Check that intake door operates properly when REC switch is turned ON and OFF.

Control Linkage Adjustment (Cont'd)

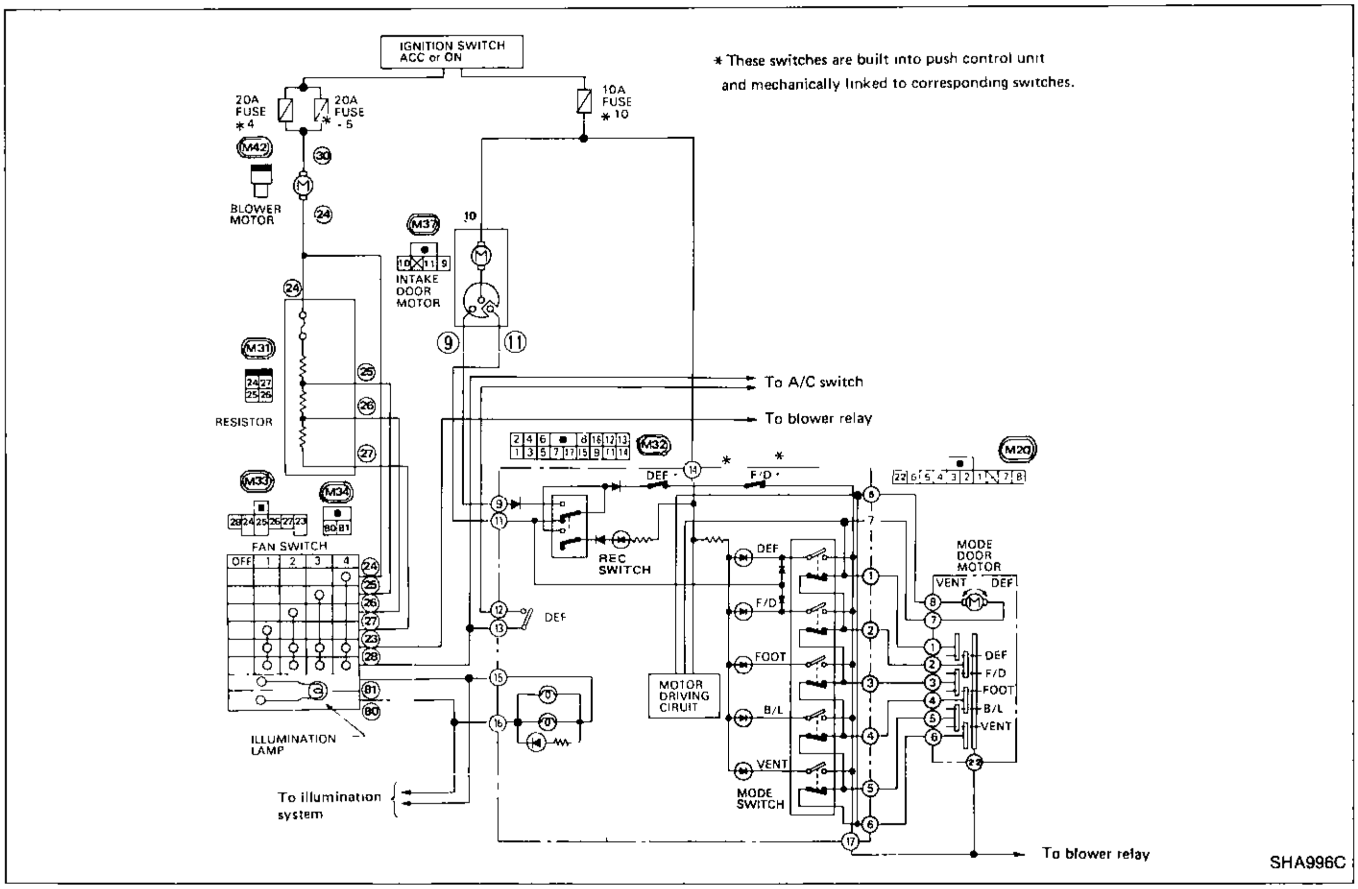


FRESH VENT DOOR

- Set the fresh vent shaft in the direction of the arrow. Pull on the outer cable and then clamp it.

After positioning control cable, check it operates properly.

Push Control System

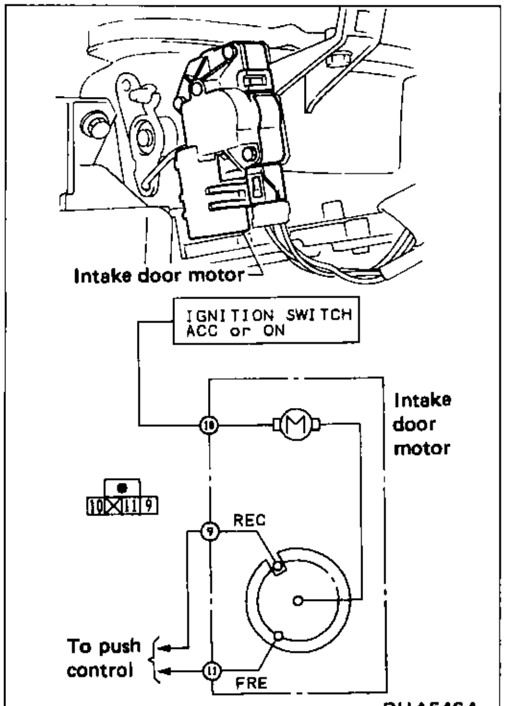


This push control system operates the intake and mode door motors to activate their corresponding doors.

SWITCHES AND THEIR CONTROL FUNCTIONS

Switch		Indicator illuminates							Air outlet	Intake air	Compressor
		A/C									
A/C		○									ON*1
Mode			○						VENT		
				○					B/L		
					○				FOOT		
						○			F/D	FRE	
							○		DEF	FRE	ON*1
								○*2		REC*2	

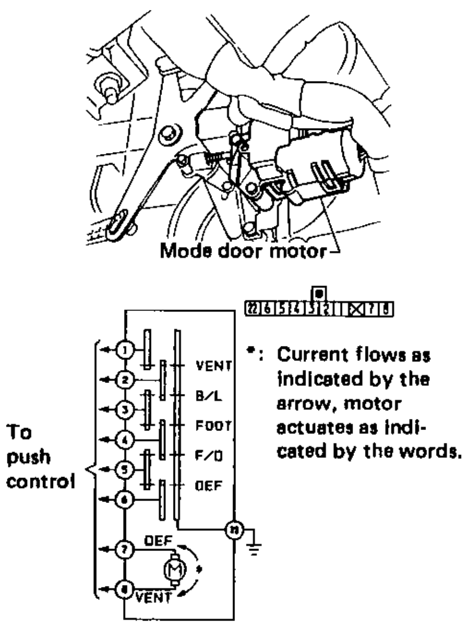
*1: Compressor is operated by thermo control amp.
*2: Depending on mode switch position



RHA546A

Intake Door Motor

The intake door motor is installed on the front 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 ⑪ to ⑨ (⑨ to ⑪). This causes the motor to start because the position switch contacts built into it are 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.



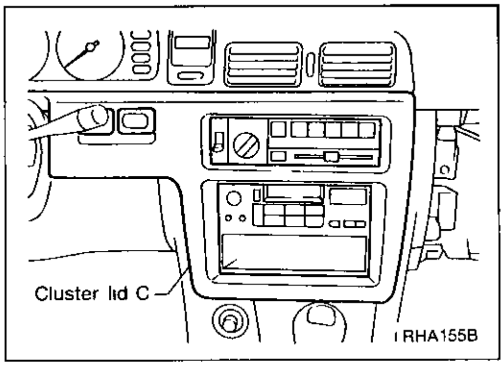
Terminal No.		Mode door motor	
⑦	⑧	Mode door operation	Direction of linkage rotation
⊖	⊖	Stop	Stop
⊖	⊕	VENT → DEF	Clockwise
⊕	⊖	DEF → VENT	Counter-clockwise

RHA547A

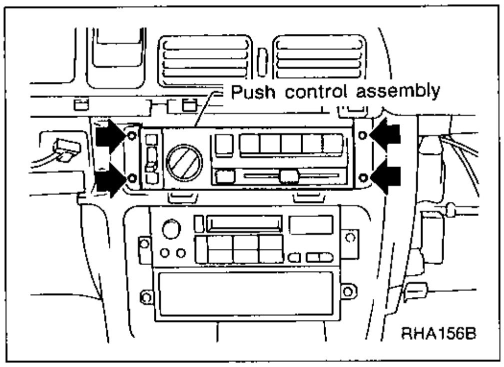
Mode Door Motor

The mode door motor is located on the left side of the heater unit. Through the side link it opens and closes the vent, foot and defroster door.
When one mode switch is pushed, the position switch built into it reads the corresponding mode to determine the direction of the motor rotation. As soon as the desired mode is set, the position switch stops the motor.

Removal and Installation



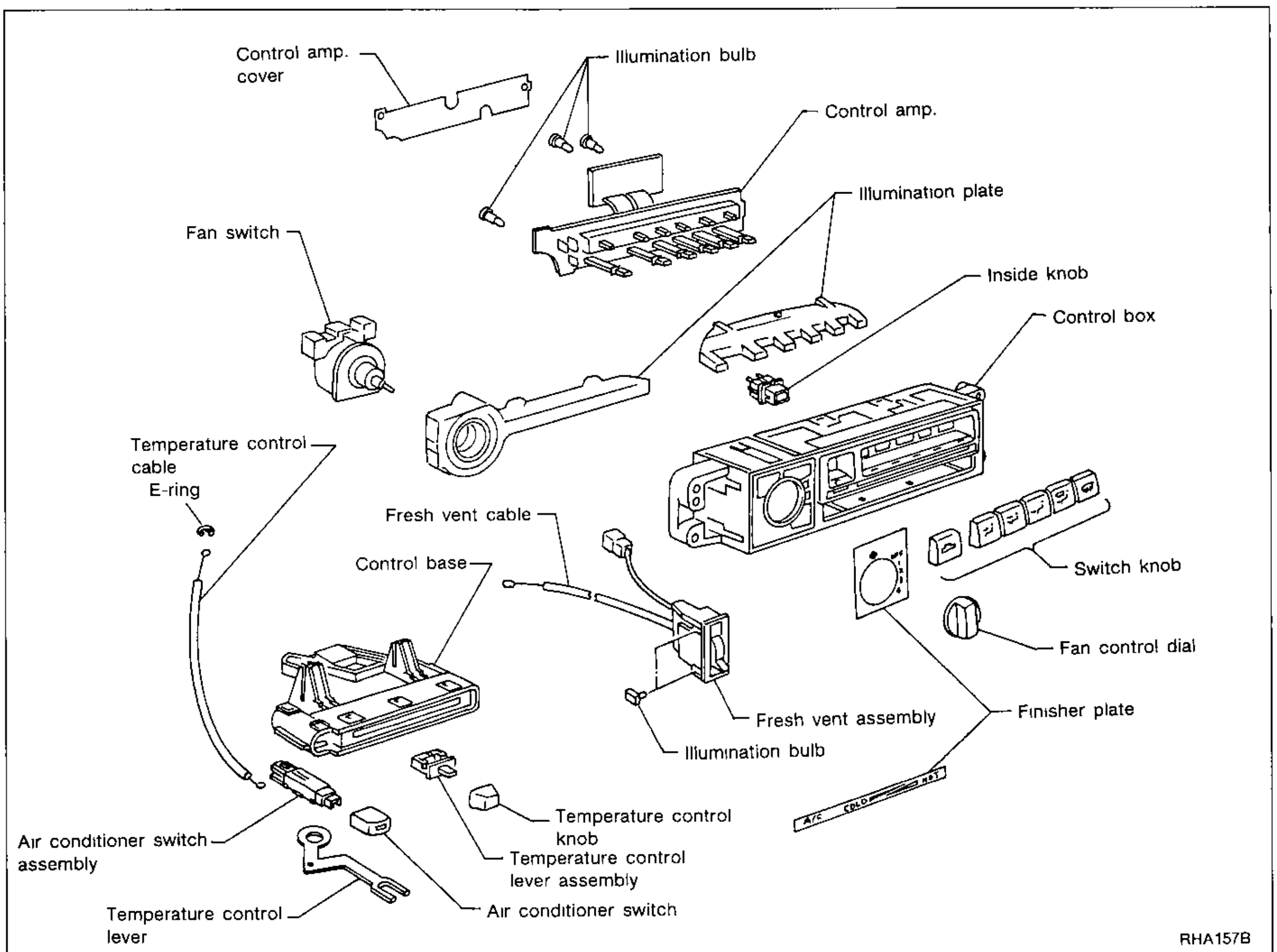
1. Remove cluster lid C.



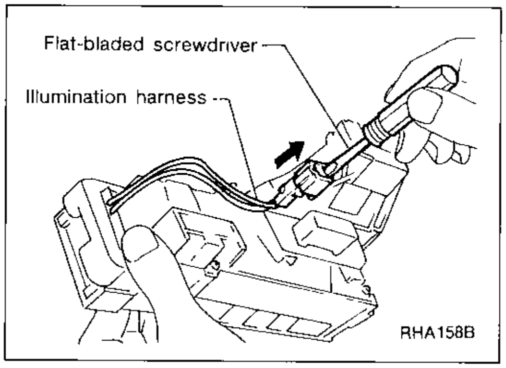
2. Remove audio (radio).
3. Remove four screws of push control unit.
4. Remove temperature control cable.
5. Remove fresh vent door cable.
6. Disconnect push control unit harness connectors.
7. Remove push control unit.
8. Installation is in the reverse order of removal.

Refer to "Control Linkage Adjustment" for temperature control cable.

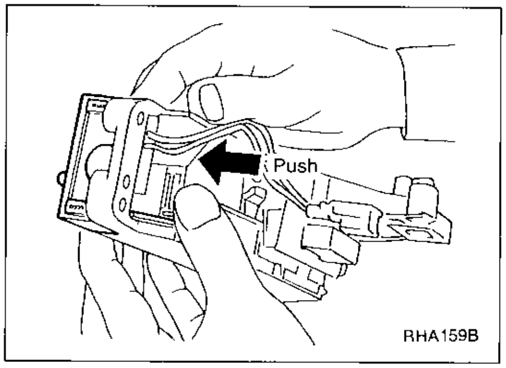
Overhaul — Push control unit assembly



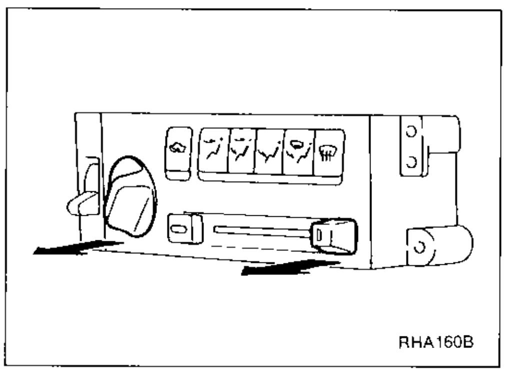
Overhaul — Push control unit assembly (Cont'd)



1. Disconnect illumination harness connector.

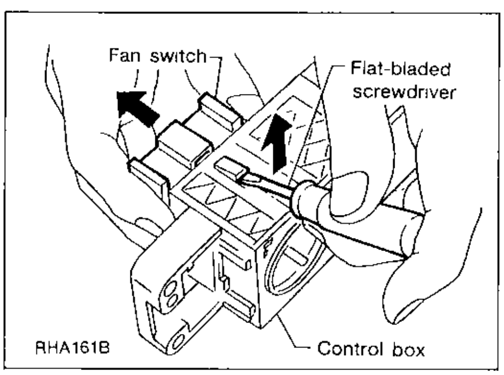


2. Remove fresh vent assembly.

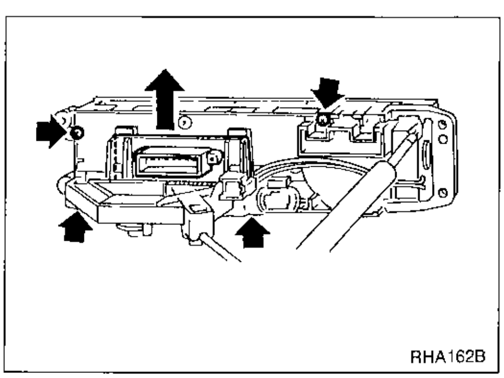


3. Remove temperature control knob & fan control dial.

Wrap temperature knob & fan control dial with a cloth and pull in direction indicated by arrow as shown in figure at left. Be careful not to scratch knobs during removal.

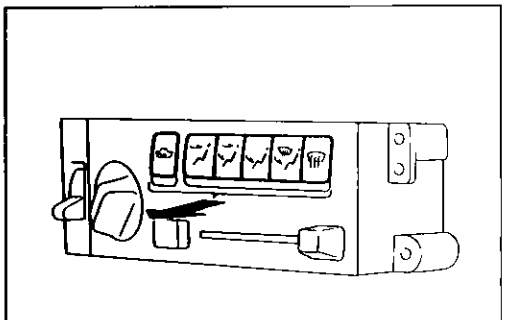


4. Remove fan switch.



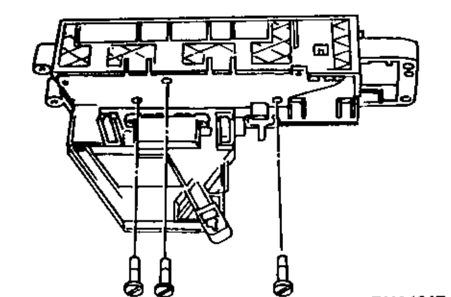
5. Remove control base & control amp. cover.

Overhaul — Push control unit assembly (Cont'd)


RHA163B

6. Remove control knobs.

Wrap finisher with a cloth and remove knobs using flat-bladed screwdriver or similar tool. Be careful not to scratch finisher surface.



RHA164B

7. Remove illumination bulbs.

8. Remove control amp.

Be careful not to damage substrate when removing.

9. Remove illumination plate.
10. Remove finisher plate.
11. Disconnect temperature control cable.
12. Installation is in reverse order of removal.

General Specifications

COMPRESSOR

Model	ATSUGI make NVR 140S
Type	Vane rotary
Displacement cm^3 (cu in)/Rev.	140 (8.54)
Direction of rotation	Clockwise (Viewed from drive end)
Drive belt	Poly V

LUBRICATION OIL

Model	ATSUGI make NVR 140S
Type	SUNISO 5GS or equivalent
Capacity $m\ell$ (US fl oz, Imp fl oz)	
Total in system	200 (6.8, 7.0)
Amount of oil which can be drained	Approx. 100 (3.4, 3.5)
Compressor (Service parts) charging amount	200 (6.8, 7.0)

REFRIGERANT

Type	R-12
Capacity kg (lb)	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	NVR 140S
Clutch disc-pulley clearance mm (in)	0.3 - 0.6 (0.012 - 0.024)

ELECTRICAL SYSTEM

SECTION EL

When you read wiring diagrams:
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**

CONTENTS

HARNESS CONNECTOR .... EL- 2
STANDARDIZED RELAY .... EL- 3
POWER SUPPLY ROUTING .... EL- 5
BATTERY .... EL- 7
STARTING SYSTEM EL-15
STARTING SYSTEM — Starter — EL-17
CHARGING SYSTEM EL-25
CHARGING SYSTEM — Alternator — EL-27
COMBINATION SWITCH EL-32
HEADLAMP EL-34
EXTERIOR LAMP EL-39
INTERIOR LAMP EL-44
METER AND GAUGES EL-46
WARNING LAMPS AND CHIME EL-51
TIME CONTROL SYSTEM EL-55
WIPER AND WASHER EL-65
HORN, CIGARETTE LIGHTER, CLOCK EL-69
REAR WINDOW DEFOGGER EL-70
AUDIO AND POWER ANTENNA EL-73
AUTOMATIC SPEED CONTROL DEVICE (A.S.C.D.) EL-77
LOCATION OF ELECTRICAL UNITS EL-86
HARNESS LAYOUT EL-89
SUPER MULTIPLE JUNCTION (S.M.J.) .... Foldout page
JOINT CONNECTOR (J/C) .... Foldout page

WIRING DIAGRAM REFERENCE CHART

E.C.C.S. (Ignition system) .... EF & EC SECTION
AUTOMATIC TRANSAXLE CONTROL SYSTEM, SHIFT LOCK SYSTEM .... AT SECTION
ANTI-LOCK BRAKING SYSTEM .... BR SECTION
POWER WINDOW AND POWER DOOR LOCK, AUTOMATIC SEAT BELT SYSTEM,
SUN ROOF, DOOR MIRROR .... BF SECTION
HEATER AND AIR CONDITIONER .... HA SECTION

Description

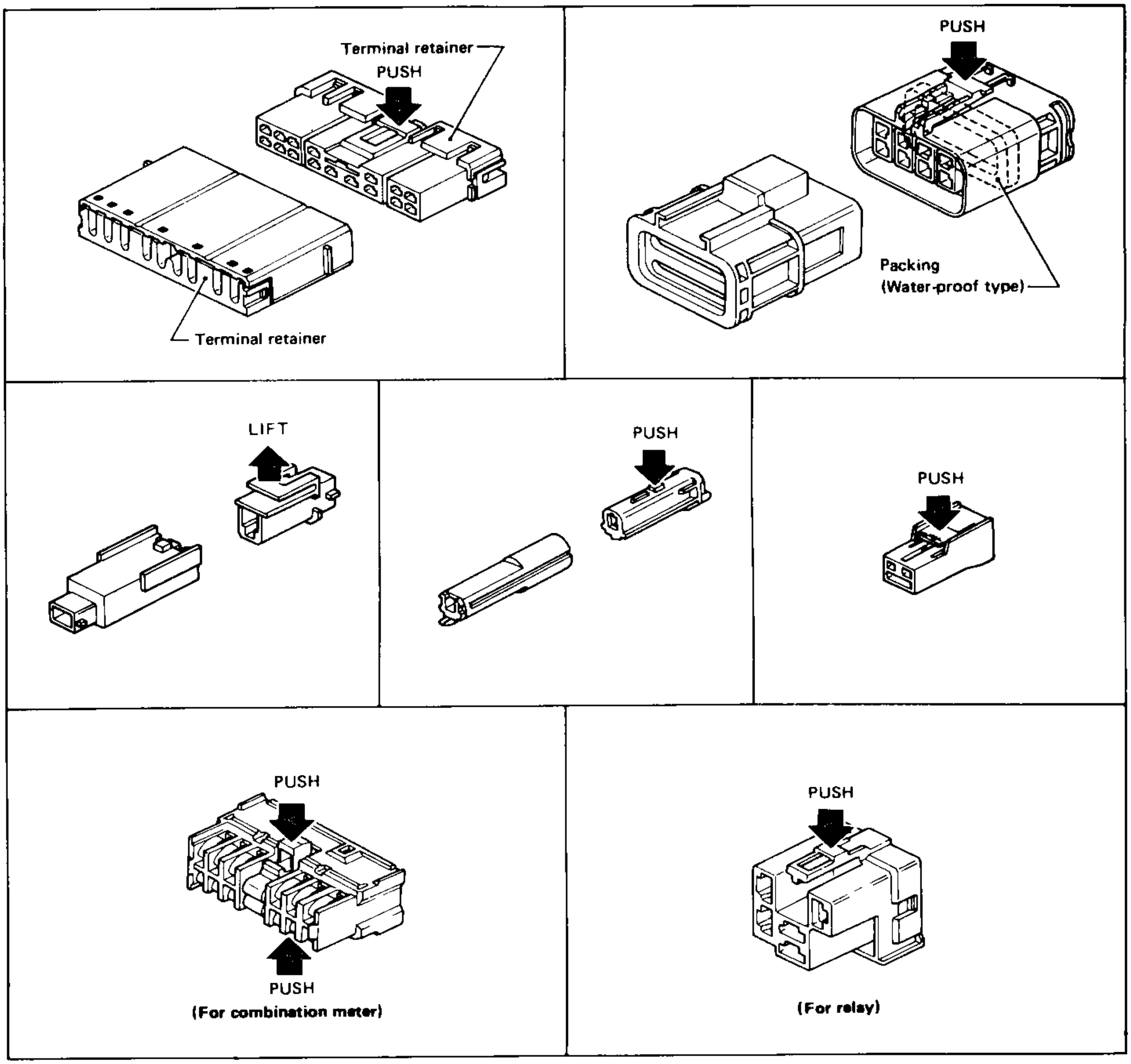
HARNESS CONNECTOR

- All harness connectors have been modified to prevent accidental looseness 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]

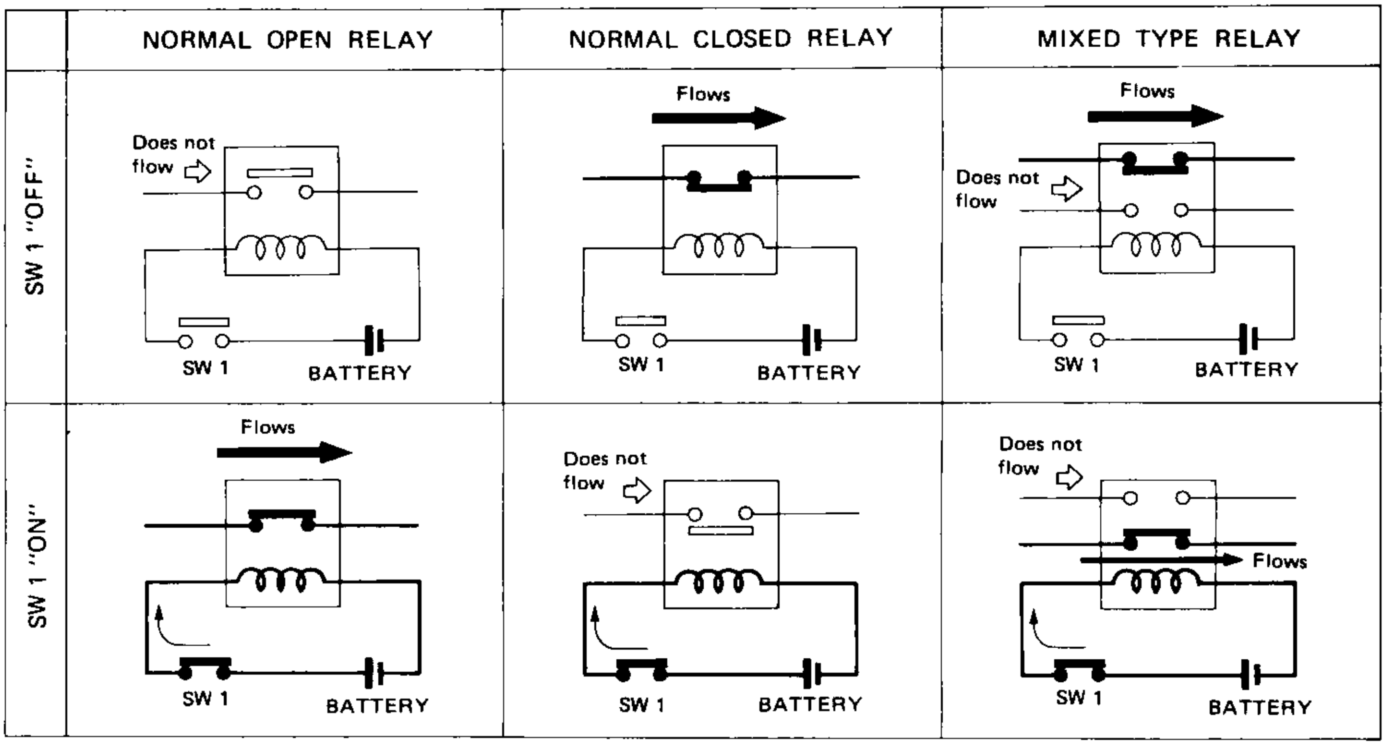


SEL769D

Description

NORMAL OPEN, NORMAL CLOSED AND MIXED TYPE RELAYS

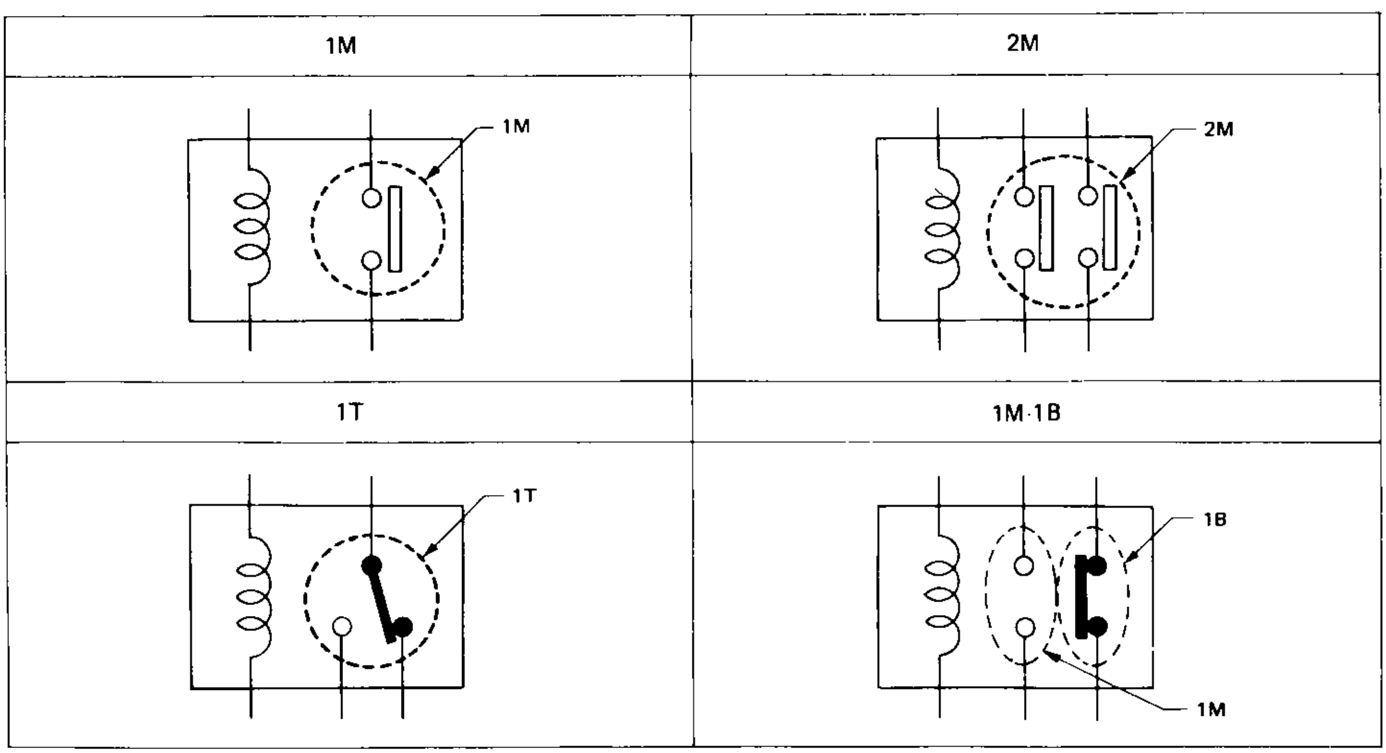
Relays can mainly be divided into three types: normal open, normal closed and mixed type relays.



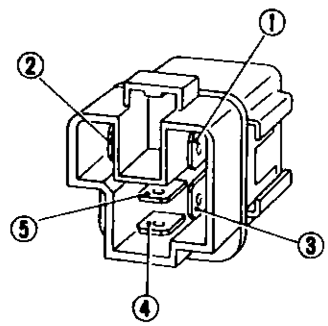
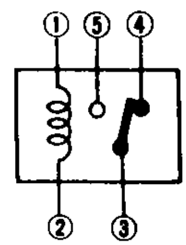
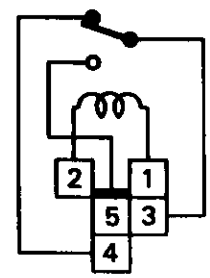
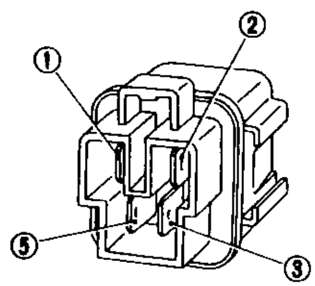
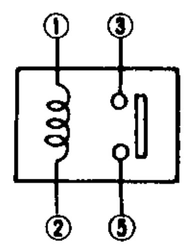
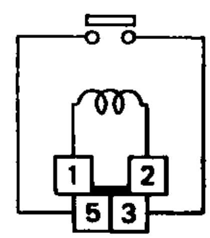
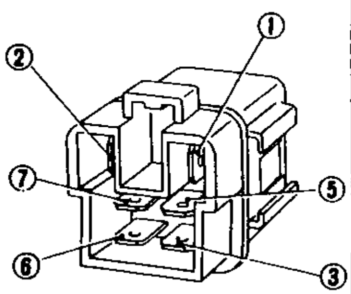
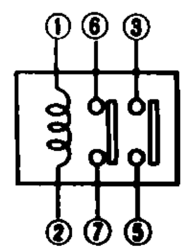
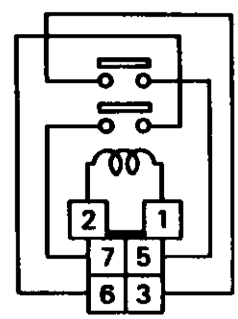
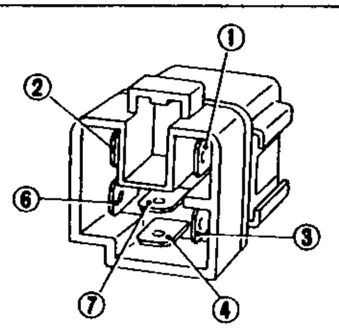
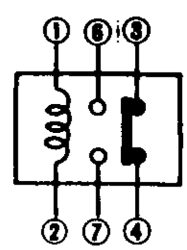
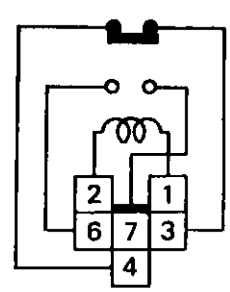
SEL881H

TYPE OF STANDARDIZED RELAYS

1M	....	1 Make	2M	....	2 Make
1T	....	1 Transfer	1M·1B	....	1 Make 1 Break

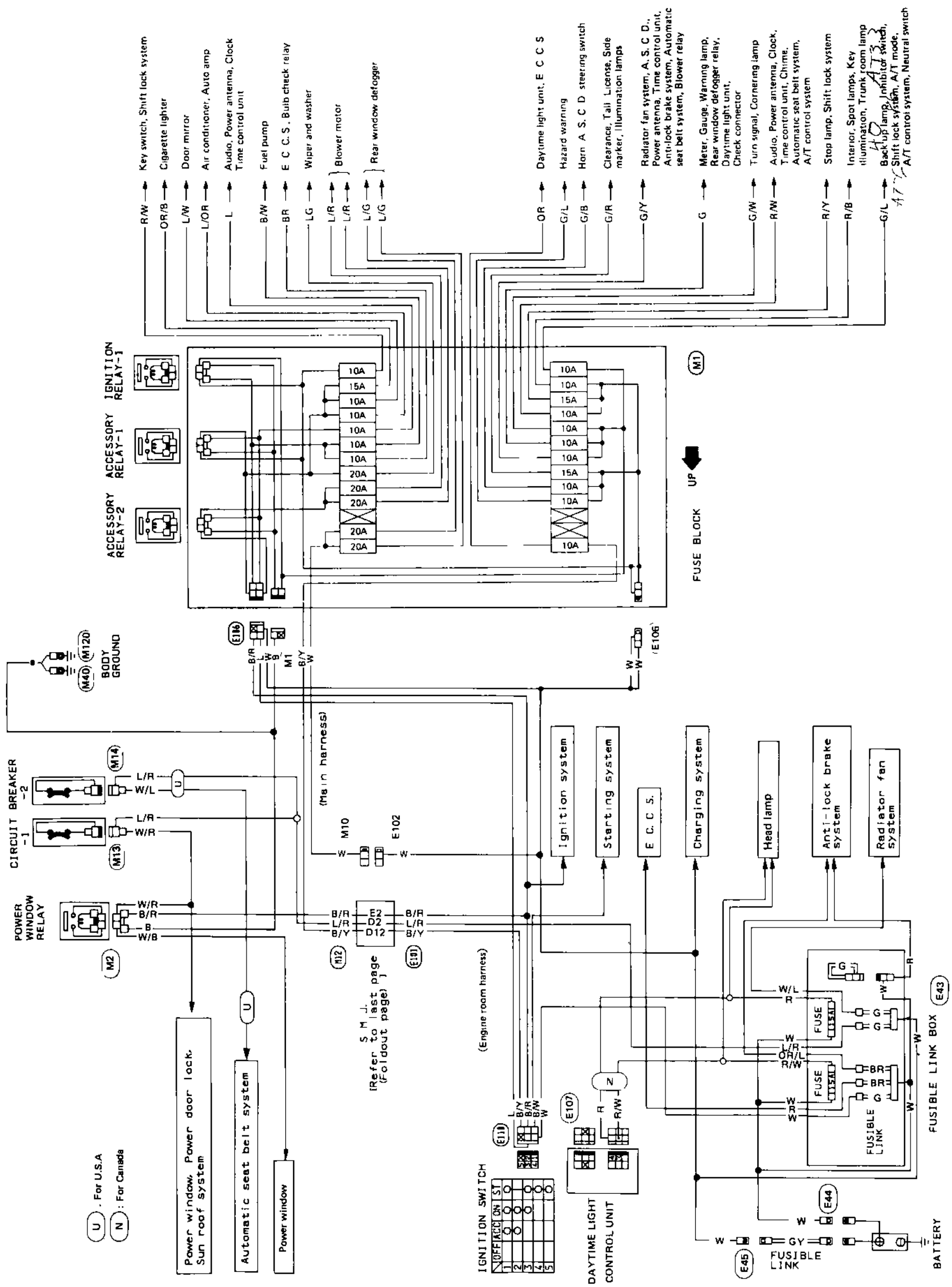


SEL882H

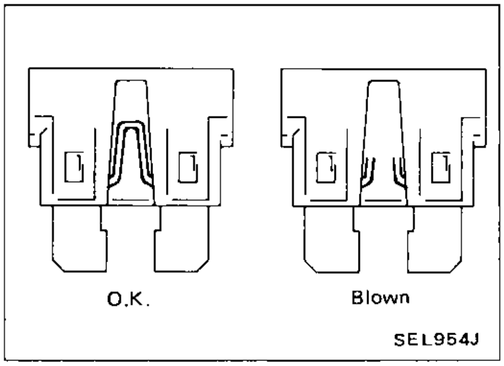
Type	Outer view	Circuit	Connector symbol and connection	Case color
1T				BLACK
1M				BLUE or GREEN
2M				BROWN
1M·1B				GRAY

SEL883H

Wiring Diagram

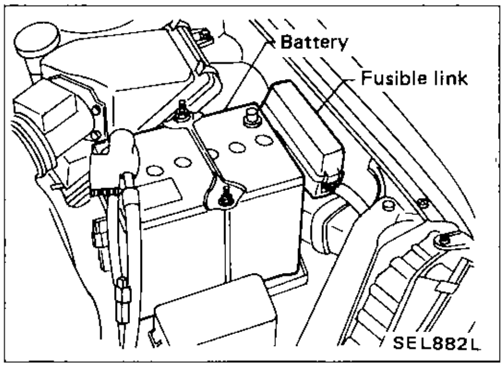


SEL565Q



Fuse

a. If fuse is blown, be sure to eliminate cause of problem before installing new fuse.
b. Use fuse of specified rating. Never use fuse of more than specified rating.
c. Do not install fuse in oblique direction; always insert it into fuse holder properly.
d. Remove fuse for clock if vehicle is not used for a long period of time.



Fusible Link

A melted fusible link can be detected by visual inspection. If its condition is questionable, use circuit tester or test lamp.

CAUTION:

a. If fusible link should melt, it is possible that critical circuit (power supply or large current carrying circuit) is shorted. In such a case, carefully check and eliminate cause of problem.
b. 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.

FUSIBLE LINK (WIRE TYPE) VARIATION

Color	Maximum amperage (A)
Brown	15
Green	20
Red	30
Black	35
Gray	40

*Temperature condition: Less than 80°C (176°F)

CAUTION:

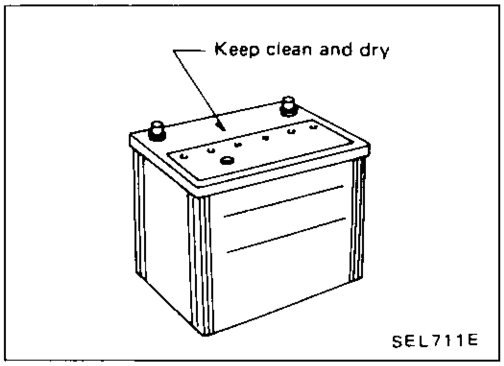
a. If it becomes necessary to start the engine with a booster battery and jumper cables, use a 12-volt booster battery.

b. After connecting battery cables, ensure that they are tightly clamped to battery terminals for good contact.

c. Never add distilled water through the hole used to check specific gravity.

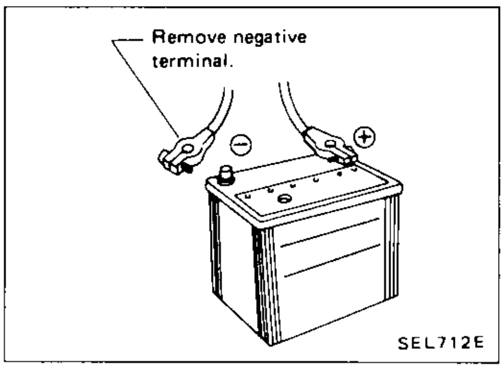
How to Handle Battery

METHODS OF PREVENTING OVER-DISCHARGE

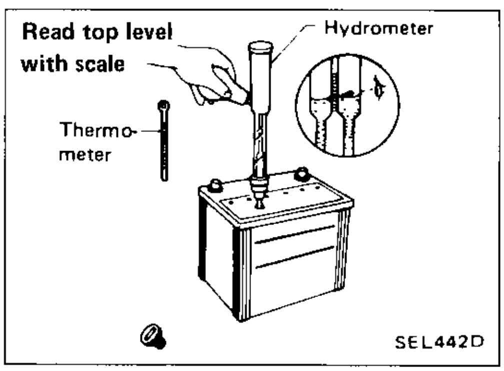


The following precautions must be taken to prevent over-discharging a battery.

- 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.

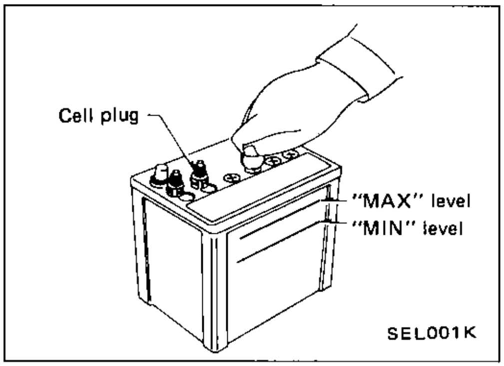
How to Handle Battery (Cont'd)

CHECKING ELECTROLYTE LEVEL

WARNING:

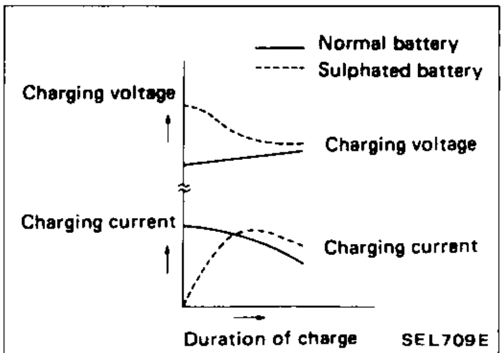
Do not allow battery fluid to come in contact with skin, eyes, fabrics, or painted surfaces. After touching a battery, do not touch or rub your eyes until you have thoroughly washed your hands. If the acid contacts the eyes, skin or clothing, immediately flush with water for 15 minutes and seek medical 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.



SEL001K

- Remove the cell plug using a suitable tool.
- Add distilled water up to the MAX level.

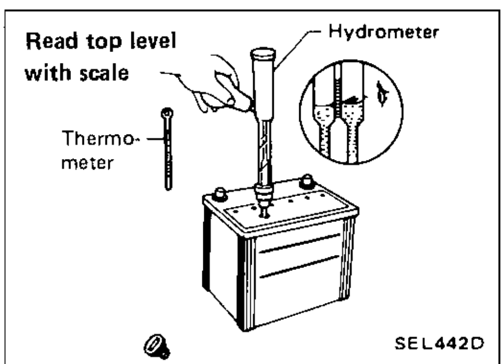


SEL709E

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.

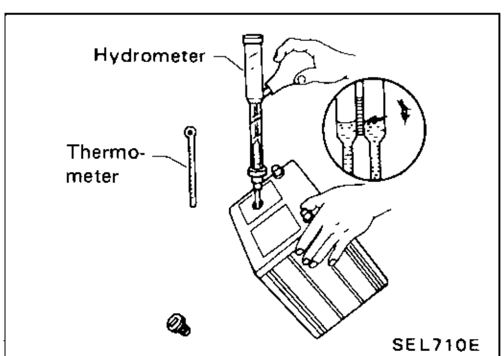
Compared with a battery discharged under normal conditions, the current flow in a "sulphated" battery is not as smooth although its voltage is high during the initial stage of charging, as shown in the figure at the left.



SEL442D

SPECIFIC GRAVITY CHECK

1. Read hydrometer and thermometer indications at eye level.



SEL710E

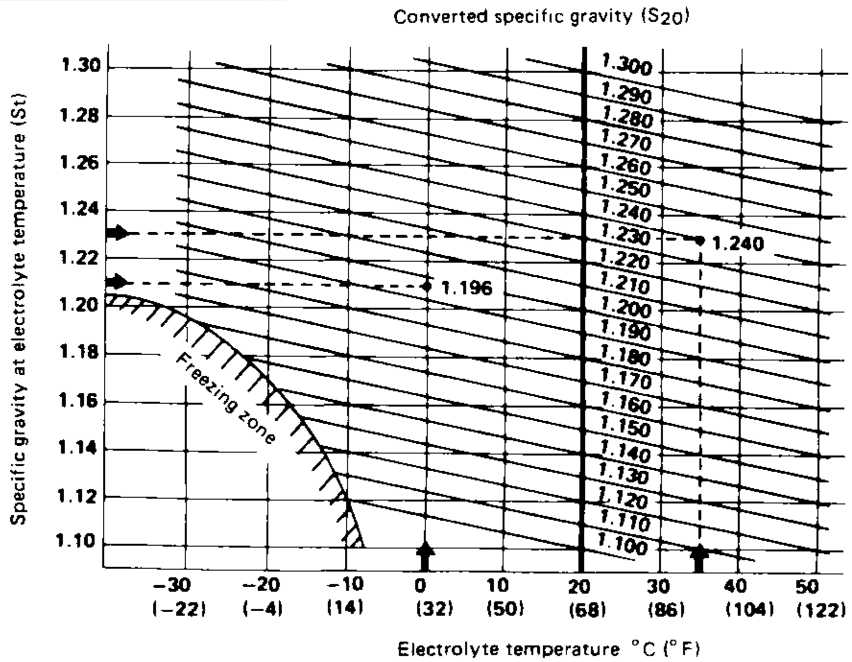
- When electrolyte level is too low, tilt battery case to raise it for easy measurement.

How to Handle Battery (Cont'd)

2. Convert into specific gravity at 20°C (68°F).

Example:

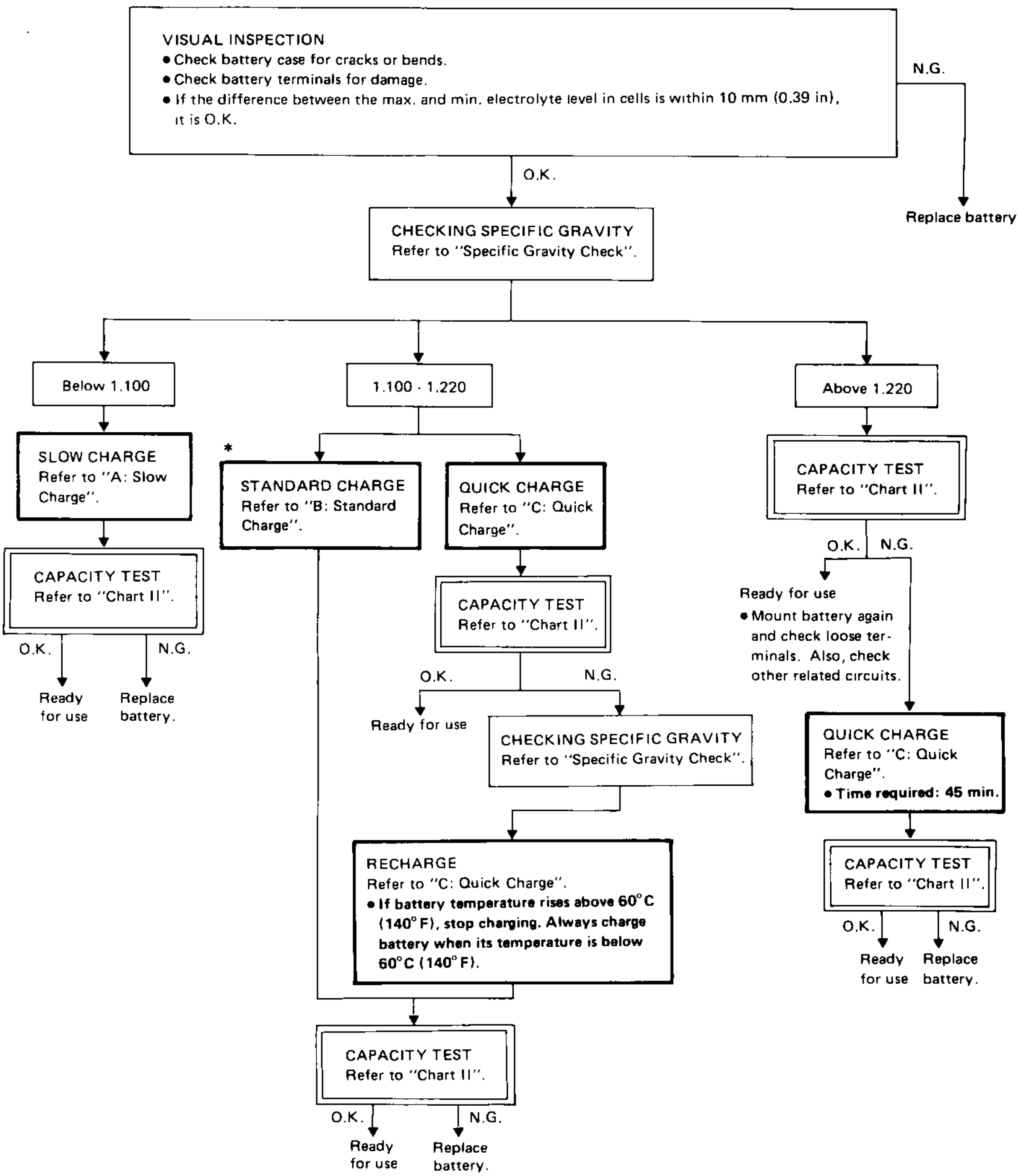
- When electrolyte temperature is 35°C (95°F) and specific gravity of electrolyte is 1.230, converted specific gravity at 20°C (68°F) is 1.240.
- When electrolyte temperature is 0°C (32°F) and specific gravity of electrolyte is 1.210, converted specific gravity at 20°C (68°F) is 1.196.



SEL042D

Battery Test and Charging Chart

Chart I



* **"STANDARD CHARGE" is recommended in case that the vehicle is in storage after charging.**

Battery Test and Charging Chart (Cont'd)

Chart II

CAPACITY TEST

Test using battery checker.

Follow manufacturer's instructions to check and determine if battery is serviceable.

O.K. → Ready for use

N.G. → Go to next step.

Test using load tester.

Read load tester voltage when specified discharging current (Refer to Fig. 1.) flows through battery for 15 seconds.

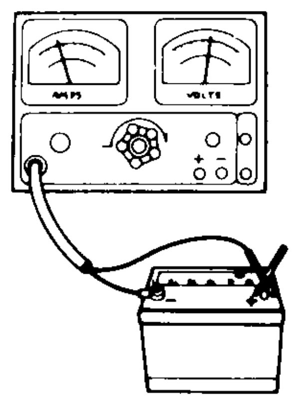
Above 9 6 volts — O.K. → Ready for use

Below 9.6 volts — N.G. → Go to next step

- 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



SEL697B

Battery Test and Charging Chart (Cont'd)

A: SLOW CHARGE

Determine initial charging current from specific gravity referring to Fig. 2.

↓

- Charge battery.
- Check charging voltage 30 minutes after starting the battery charge.

↓

- 12 to 15 volts → O.K. → Continue to charge for 12 hours.
- Below 12 volts or above 15 volts → N.G. → Replace battery.

↓

CHECKING SPECIFIC GRAVITY
Refer to "Specific Gravity Check".

↓

Conduct additional charge as per Fig 3, if necessary.

↓

Go to "CAPACITY TEST".

Fig. 2 INITIAL CHARGING CURRENT SETTING (Slow charge)

CONVERTED SPECIFIC GRAVITY \ BATTERY TYPE	28B19R(L) 34B19R(L)	46B24R(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)

- Below 1.150 → Charge for 5 hours at initial charging current setting.
- 1.150 - 1.200 → Charge for 4 hours at initial charging current setting.
- 1.200 - 1.240 → Charge for 2 hours at initial charging current setting.
- Above 1.240

→ Go to "CAPACITY TEST".

CAUTION:

a. 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.

b. Keep battery away from open flame while it is being charged.

c. When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.

d. If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).

Battery Test and Charging Chart (Cont'd)

B: STANDARD CHARGE

Determine initial charging current from specific gravity, referring to Fig. 4.

↓

Charge battery for 8 hours.

↓

CHECKING SPECIFIC GRAVITY
Refer to "Specific Gravity Check".

↓

Conduct additional charge as per Fig. 5, if necessary.

↓

Go to "CAPACITY TEST".

Fig. 4 INITIAL CHARGING CURRENT SETTING
(Standard charge)

CONVERTED SPECIFIC GRAVITY \ BATTERY TYPE	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)	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)

Below 1.150	1.150 - 1.200	1.200 - 1.240	Above 1.240
Charge for 3.5 hours at initial charging current setting.	Charge for 2.5 hours at initial charging current setting.	Charge for 1.5 hours at initial charging current setting.	

↓

Go to "CAPACITY TEST".

CAUTION:

a. Do not use standard charge method on a battery whose specific gravity is less than 1.100.

b. 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.

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. If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).

Battery Test and Charging Chart (Cont'd)

C: QUICK CHARGE

Determine initial charging current setting and charging time from specific gravity, referring to Fig. 6.

↓

Charge battery

↓

Go to "CAPACITY TEST"

Fig. 6 INITIAL CHARGING CURRENT SETTING AND CHARGING TIME (Quick charge)

CONVERTED SPECIFIC GRAVITY \ BATTERY TYPE / CURRENT [A]	28B19R(L) 34B19R(L) 10 (A)	46B24R(L) 55B24R(L) 50D23R(L) 15 (A)	55D23R(L) 65D26R(L) 80D26R(L) 20 (A)	75D31R(L) 95D31R(L) 95E41R(L) 30 (A)	130E41R(L) 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.

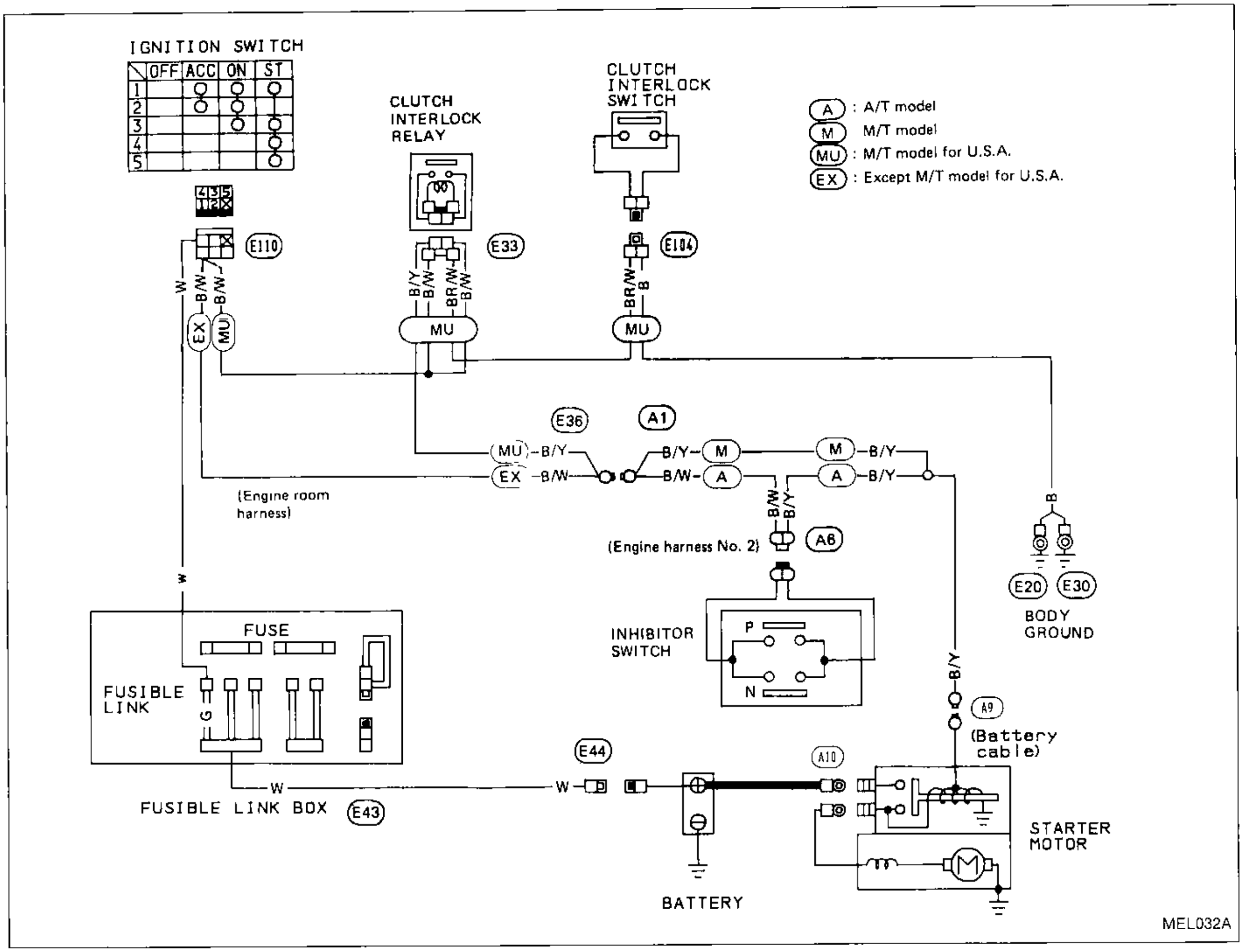
e. Be careful of a rise in battery temperature because a large current flow is required during quick-charge operation.
If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).

f. Do not exceed the charging time specified in Fig. 6, because charging battery over the charging time can cause deterioration of the battery.

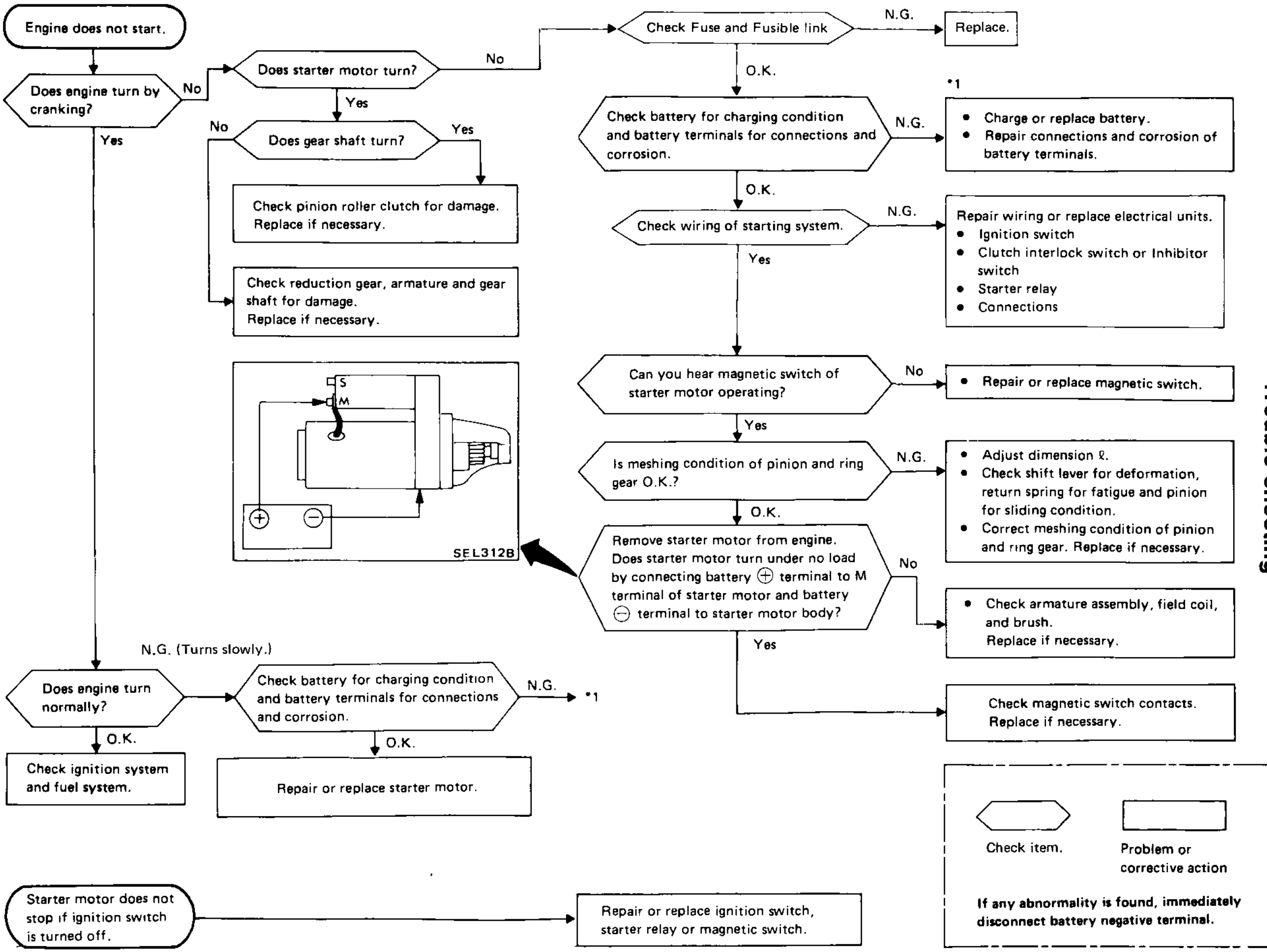
Service Data and Specifications (S.D.S.)

Applied model		For U.S.A.	For Canada
Type		55D23L	65D26L
Capacity	V-AH	12-60	12-65

Wiring Diagram

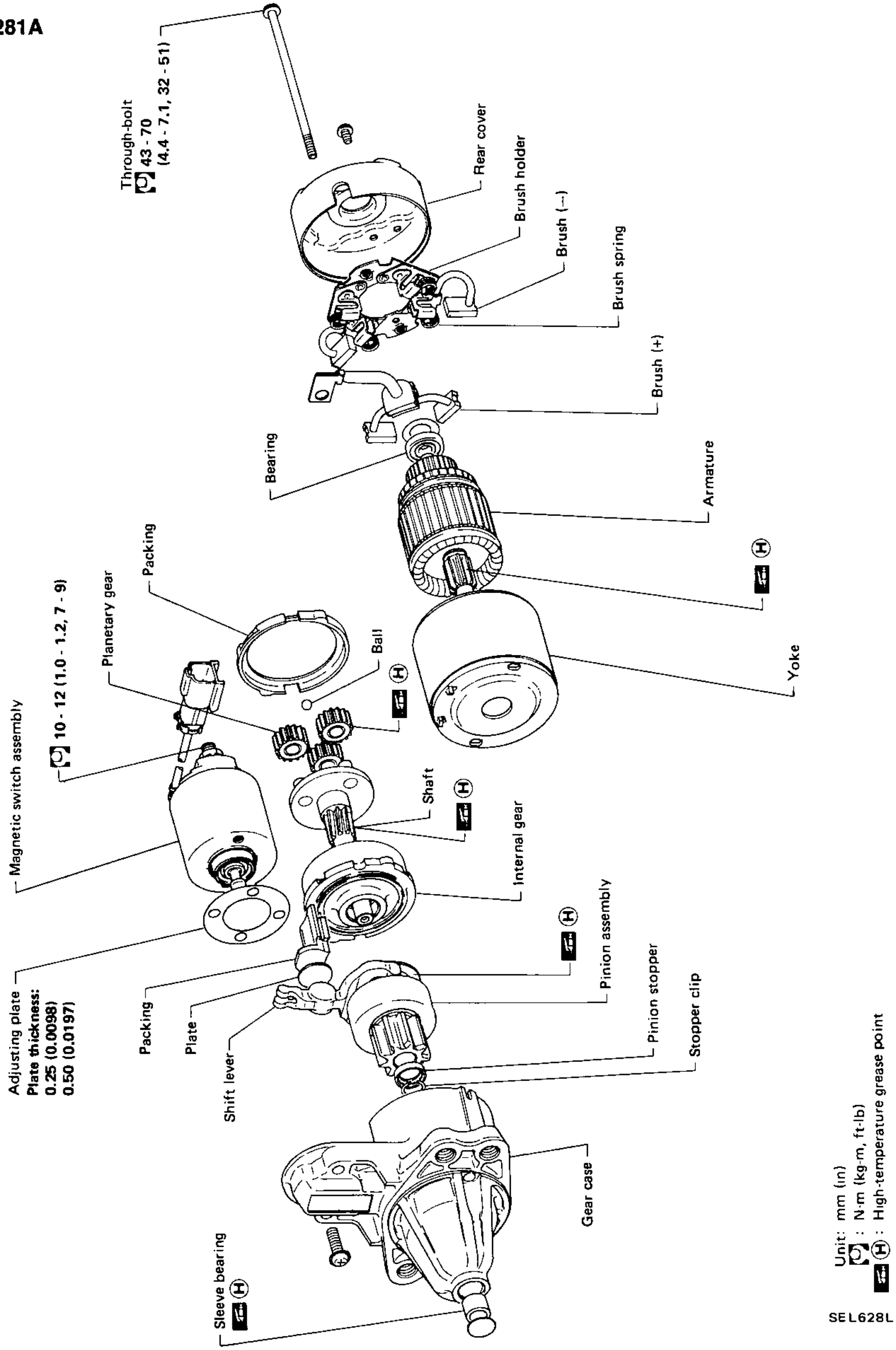


Trouble-shooting



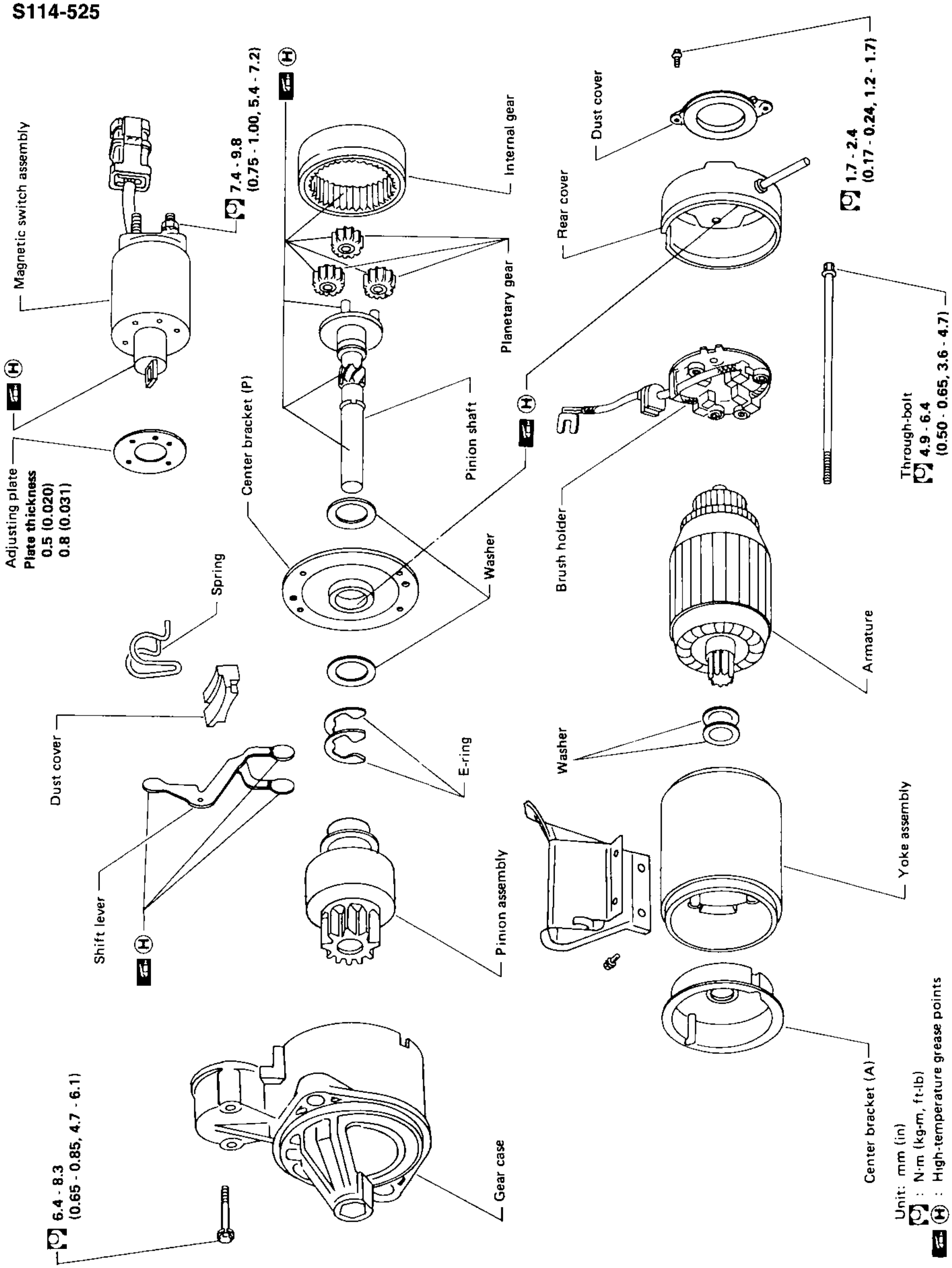
Construction

M1T72281A

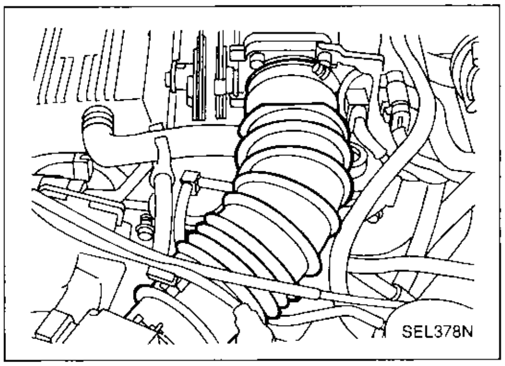


Construction (Cont'd)

S114-525



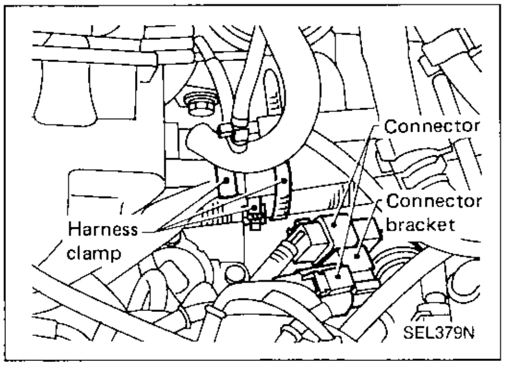
SEL647J



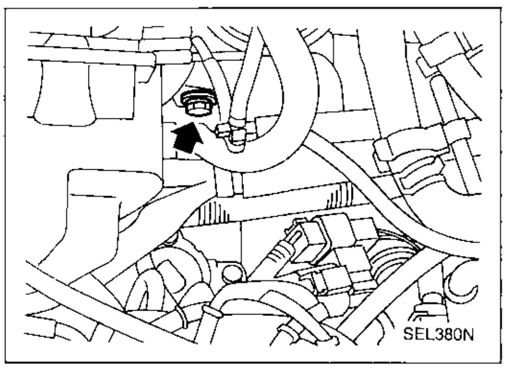
Removal and Installation

REMOVAL

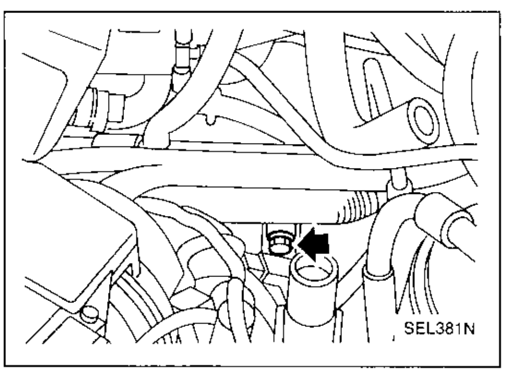
1. Remove air duct.



2. Remove harness clamps. For A/T model, remove harness connectors from harness connector bracket.
3. Remove starter cable from starter.



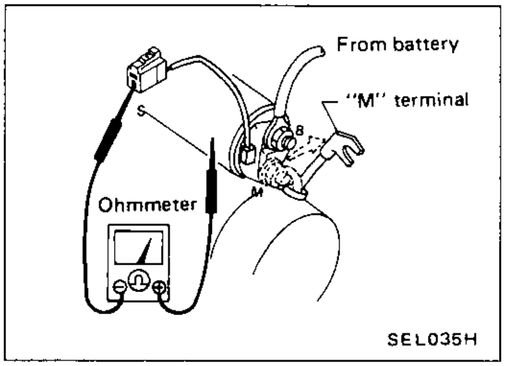
4. Remove starter fixing bolts.



INSTALLATION

- Installation is in reverse order of removal.

Starter upper fixing bolt is shorter than lower bolt.

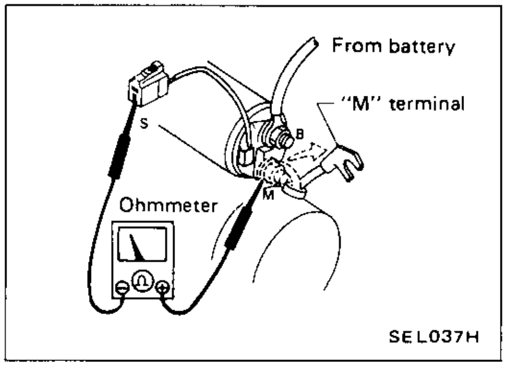


Magnetic Switch Check

- Before starting to check, disconnect battery ground cable.
- Disconnect "M" terminal of starter motor.

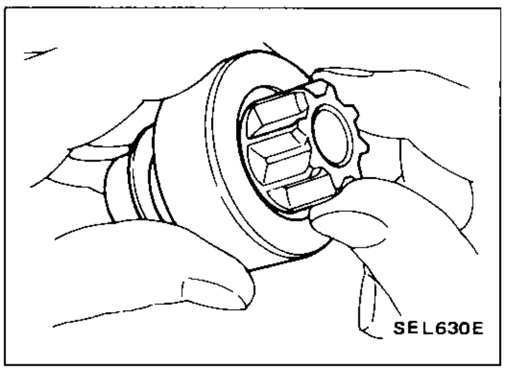
1. Continuity test (between "S" terminal and switch body).

- No continuity ... Replace.



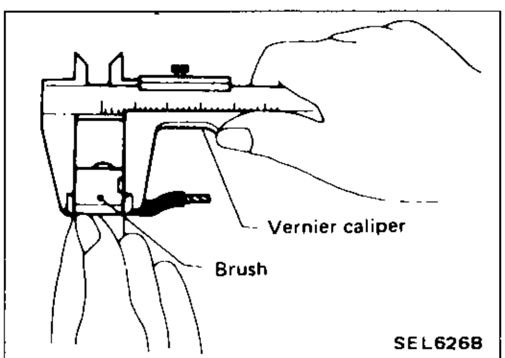
2. Continuity test (between "S" terminal and "M" terminal).

- 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.)



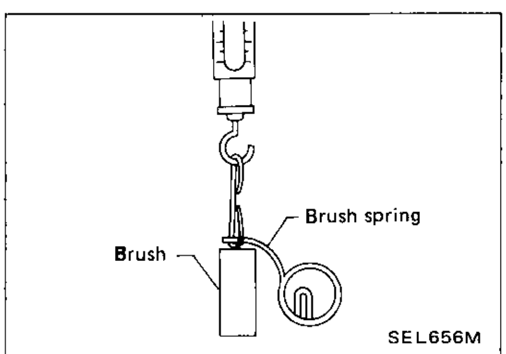
Brush Check

BRUSH

Check brush for wear.

Wear limit length:
Refer to S.D.S.

- Excessive wear ... Replace.

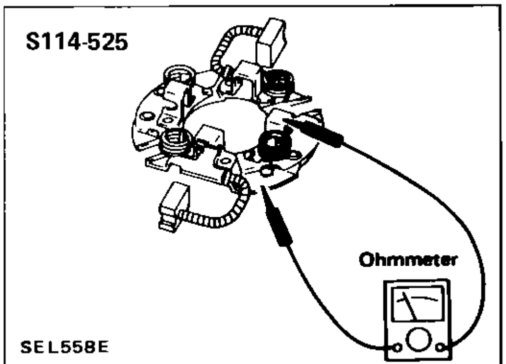


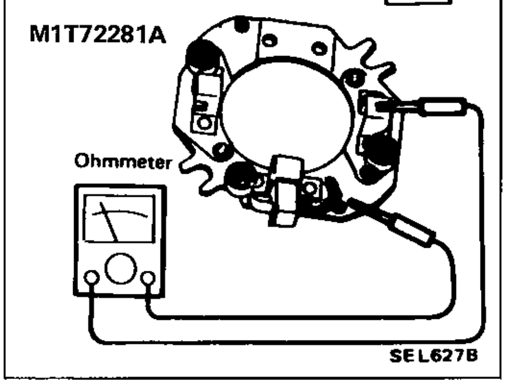
BRUSH SPRING PRESSURE

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.

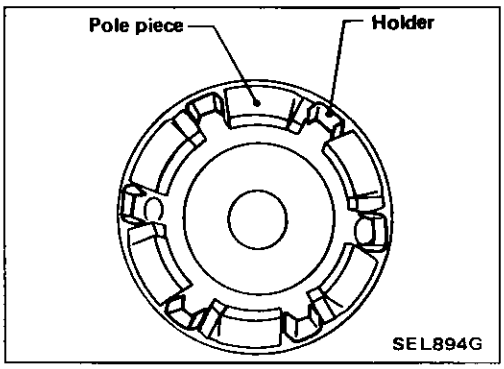




Brush Check (Cont'd)

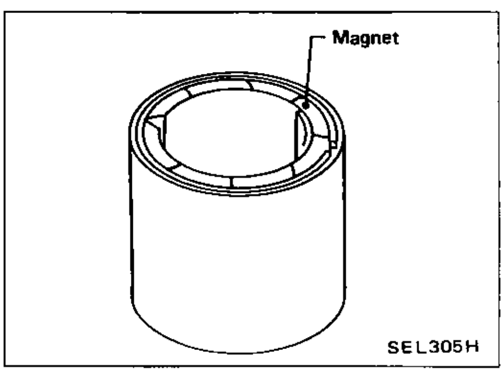
BRUSH HOLDER

1. Perform insulation test between brush holder (positive side) and its base (negative side).
- Continuity exists. ... Replace.
2. Check brush to see if it moves smoothly.
- If brush holder is bent, replace it; if sliding surface is dirty, clean.



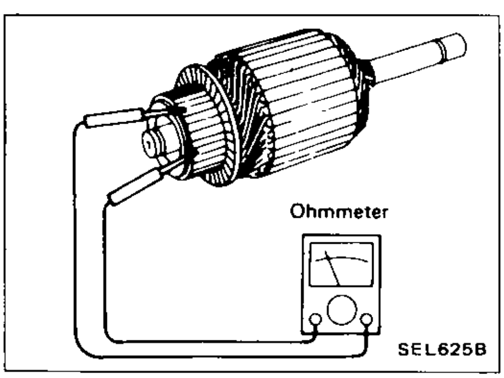
Pole Piece Check (M1T72281A)

Pole piece is secured to yoke by bonding agent. Check pole piece to see that it is secured to yoke and for any cracks. Replace malfunctioning parts as an assembly.
Holder may move slightly as it is only inserted and not bonded.



Yoke Assembly Check (S114-525)

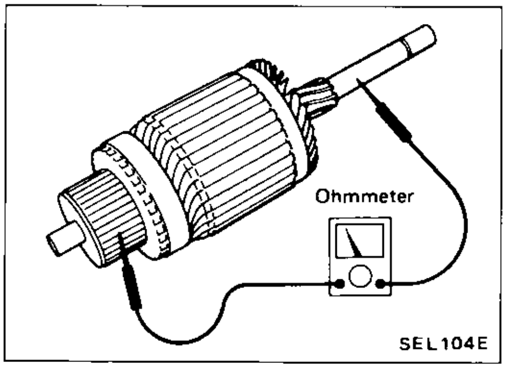
Check magnet for cracks. If there is any crack, replace malfunctioning parts as an assembly.



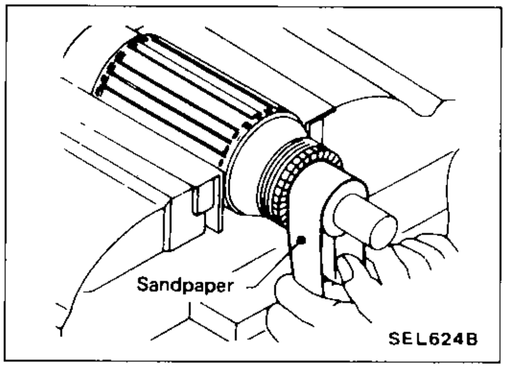
Armature Check

1. Continuity test (between two segments side by side).
- No continuity ... Replace.

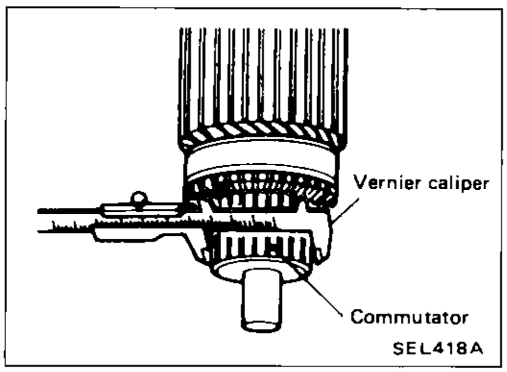
Armature Check (Cont'd)



2. Insulation test (between each commutator bar and shaft).
- Continuity exists. ... Replace.

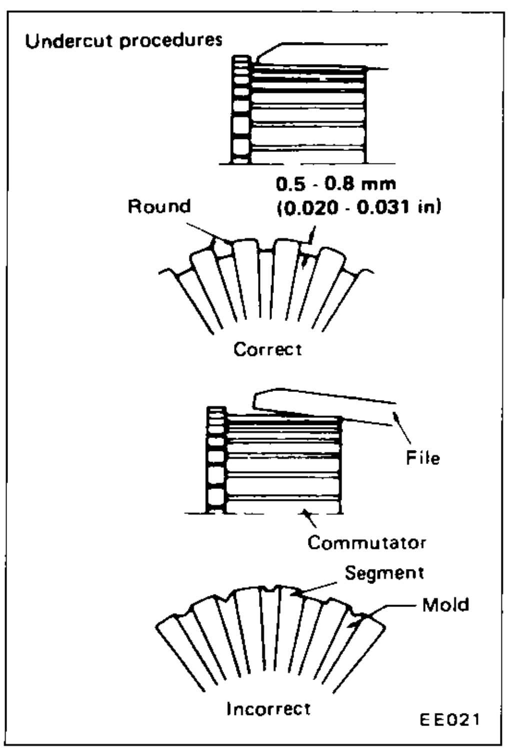


3. Check commutator surface.
- Rough ... Sand lightly with No. 500 - 600 sandpaper.



4. Check diameter of commutator.

   Commutator minimum diameter:
   Refer to S.D.S.
- Less than specified value ... Replace.

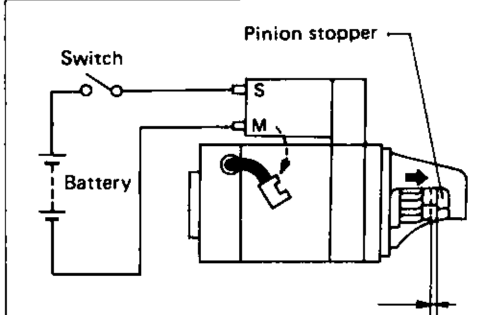


5. Check depth of insulating mold from commutator surface.
- Less than 0.2 mm (0.008 in) ... Undercut to 0.5 to 0.8 mm (0.020 to 0.031 in)

Assembly

Apply high-temperature grease to lubricate the bearing, gears and frictional surface when assembling the starter.
Carefully observe the following instructions.

PINION PROTRUSION LENGTH ADJUSTMENT

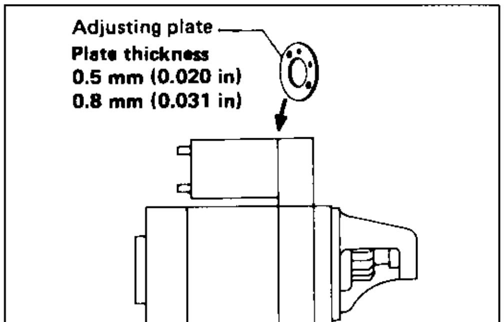


SEL299E

M1T72281A

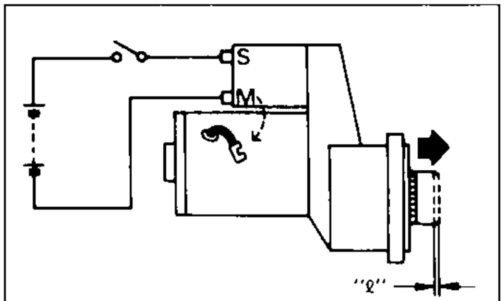
With pinion driven out by magnetic switch, push pinion back to remove slack and measure clearance "ℓ" between the front edge of the pinion and the pinion stopper.

Clearance "ℓ":
Refer to S.D.S.



SEL633B

- Not in the specified value ... Adjust with adjusting plate.

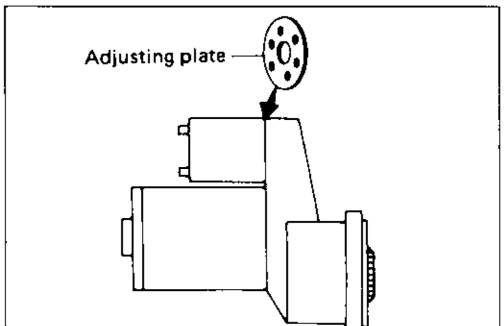


SEL497D

S114-525

Compare movement "ℓ" in height of pinion when it is pushed out with magnetic switch energized and when it is pulled out by hand until it touches stopper.

Movement "ℓ":
Refer to S.D.S.



SEL573B

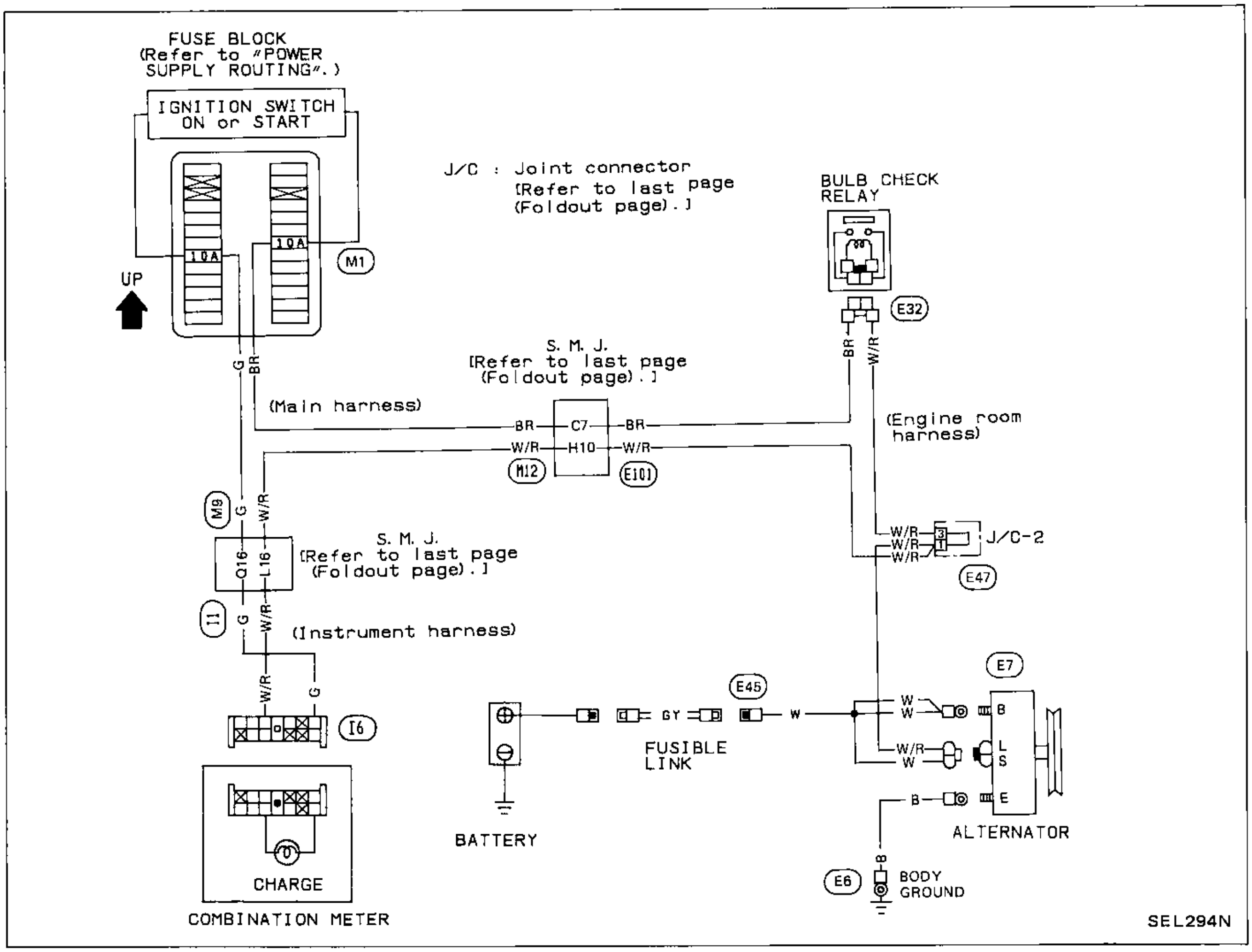
- Not in the specified value ... Adjust by adjusting plate.

Service Data and Specifications (S.D.S.)

STARTER

Type			M1T72281A	S114-525
			MITSUBISHI make	HITACHI make
			Reduction gear	
System voltage		V	12	
No-load	Terminal voltage	V	11.0	
	Current	A	50 - 75	Less than 90
	Revolution	rpm	3,000 - 4,000	More than 2,950
Minimum length of brush		mm (in)	12.0 (0.472)	11.0 (0.433)
Brush spring tension (With new brush)		N (kg, lb)	13.7 - 25.5 (1.4 - 2.6, 3.1 - 5.7)	17.7 - 21.6 (1.8 - 2.2, 4.0 - 4.9)
Minimum diameter of commutator		mm (in)	28.8 (1.134)	32.0 (1.260)
Clearance "ℓ" between pinion front edge and pinion stopper		mm (in)	0.5 - 2.0 (0.020 - 0.079)	—
Movement "ℓ" in height of pinion assembly		mm (in)	—	0.3 - 1.5 (0.012 - 0.059)
Clearance between bearing metal and armature shaft		mm (in)	—	Less than 0.3 (0.012)

Wiring Diagram

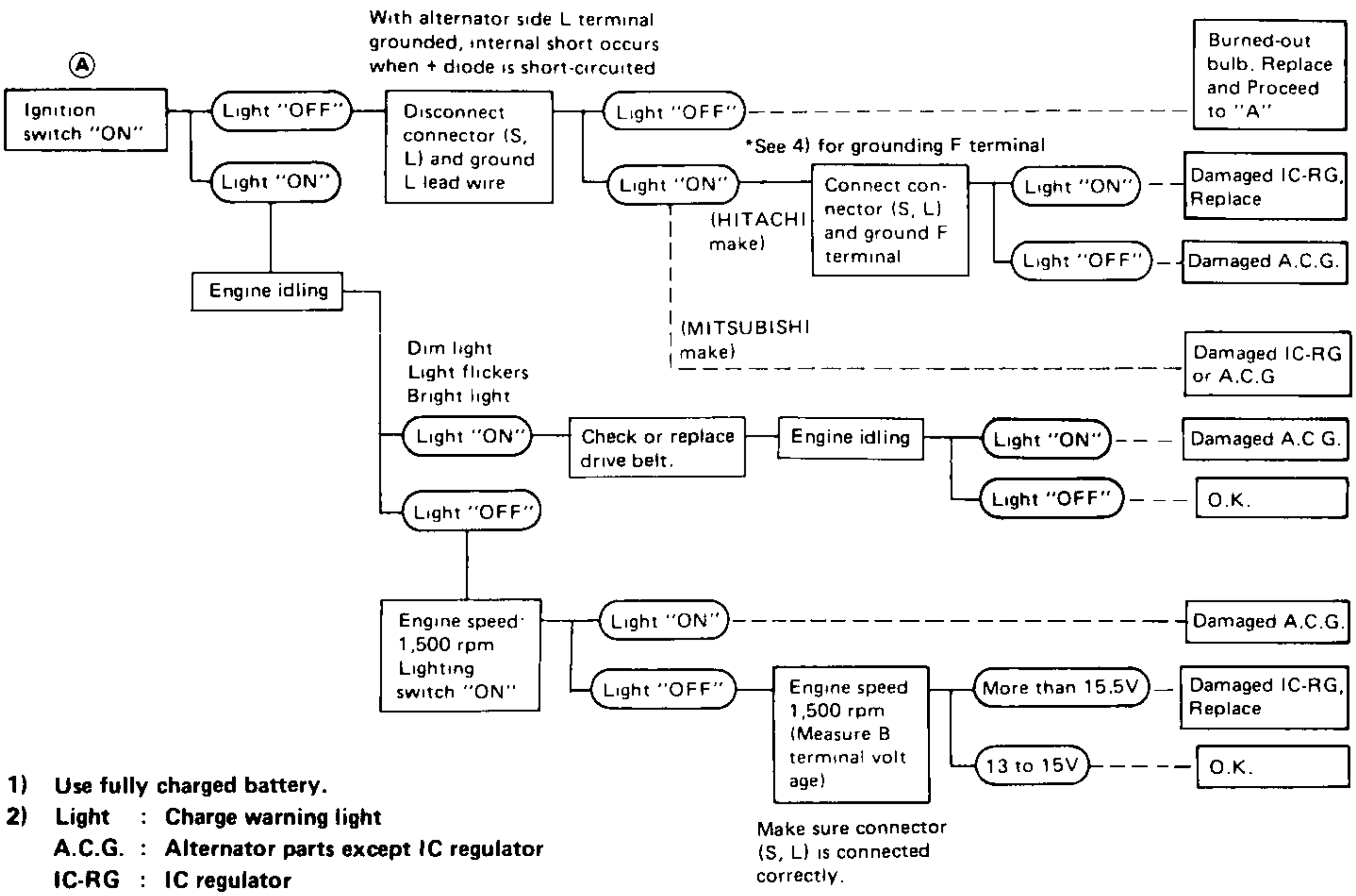


Trouble-shooting

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.

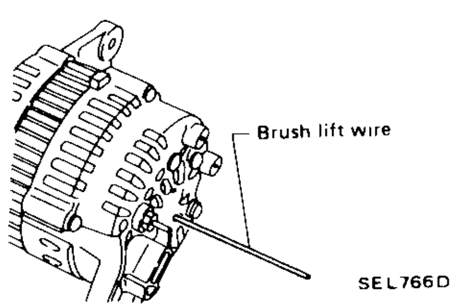
Before starting trouble-shooting, inspect the fusible link.

WITH IC REGULATOR



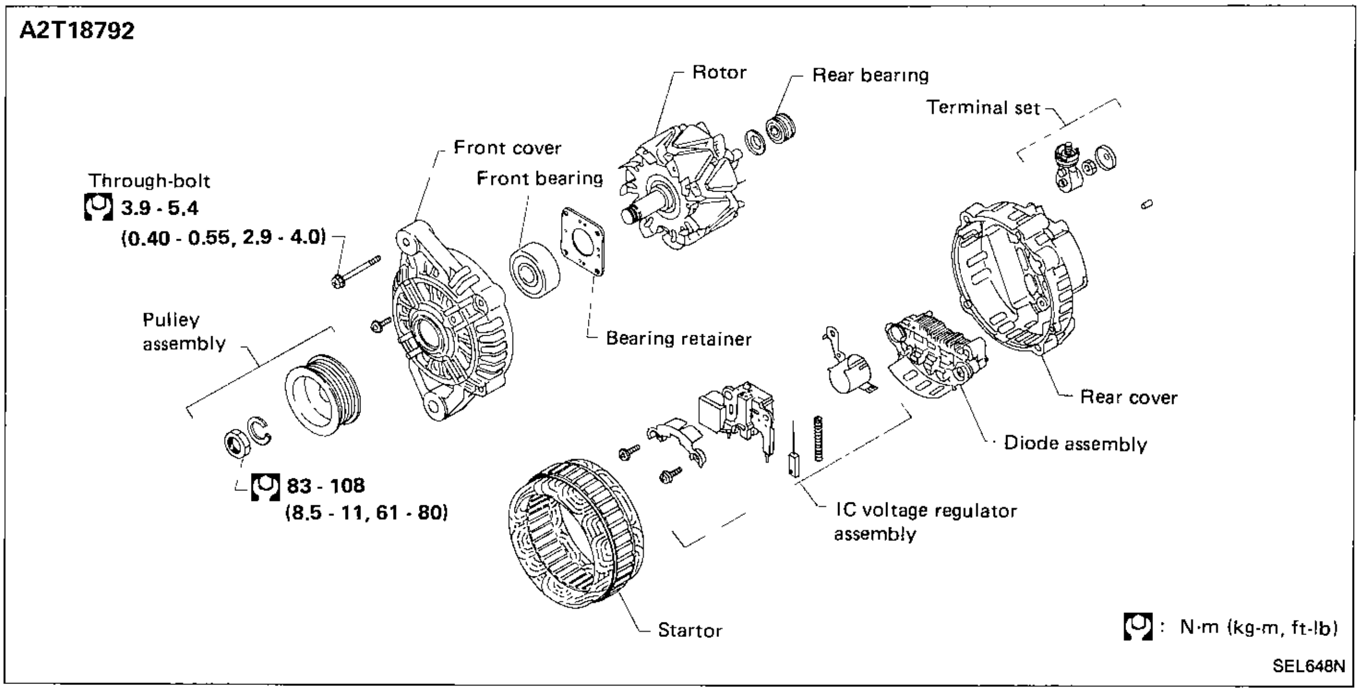
1) **Use fully charged battery.**
2) **Light : Charge warning light**
   A.C.G. : Alternator parts except IC regulator
   IC-RG : IC regulator
   O.K. : IC alternator is in good condition.
3) **When reaching "Damaged A.C.G.", remove alternator from vehicle and disassemble, inspect and correct or replace faulty parts.**
4) ***Method of grounding F terminal (HITACHI make only)**

   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.**

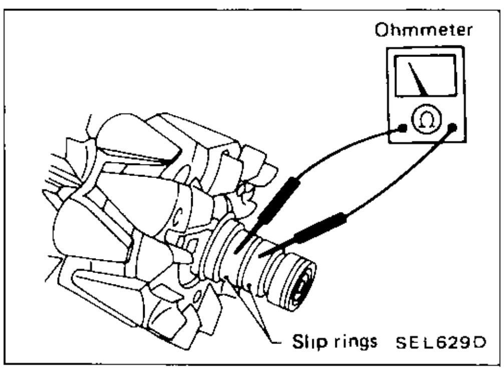
Construction



REAR BEARING

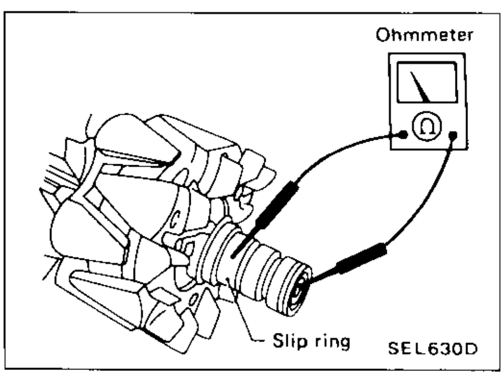
CAUTION:

Do not reuse bearing or oil seal after removal. Replace with a new one.
Do not lubricate rear bearing outer race.



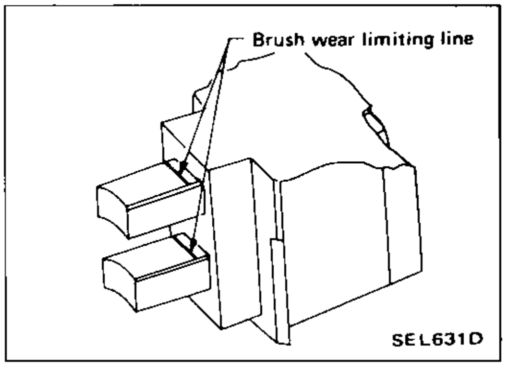
Rotor Slip Ring Check

1. Continuity test
- No continuity ... Replace rotor.



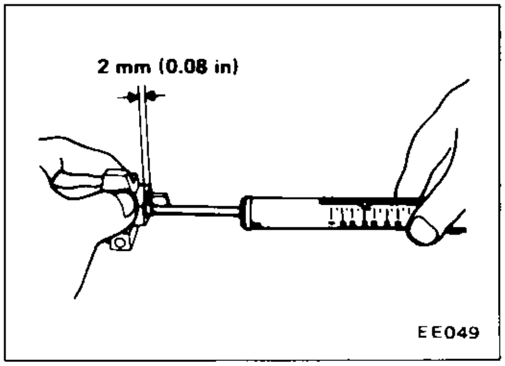
2. Insulator test
- Continuity exists. ... Replace rotor.
3. Check slip ring for wear.

   Slip ring minimum outer diameter:
   Refer to S.D.S.

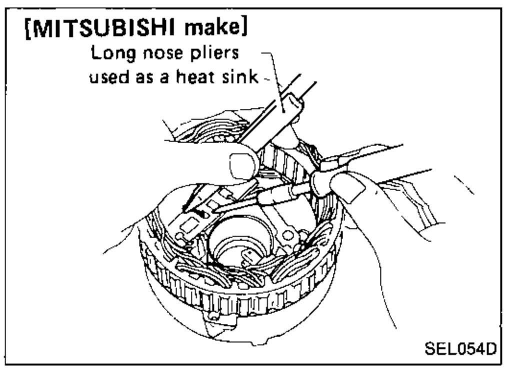


Brush Check

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.



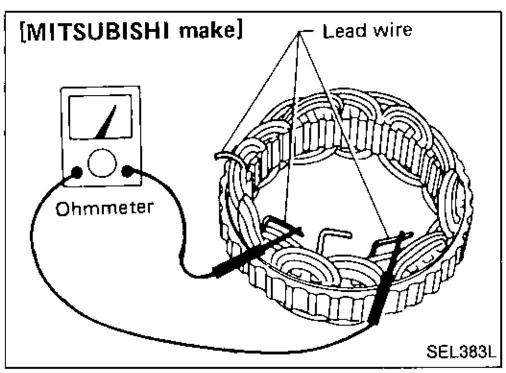
3. Check brush lead wire for damage.
- Damaged ... Replace.
4. Check brush spring pressure.
   Measure brush spring pressure with brush projected approximately 2 mm (0.08 in) from brush holder.
   Spring pressure:
   Refer to S.D.S.
- Not within the specified values ... Replace.



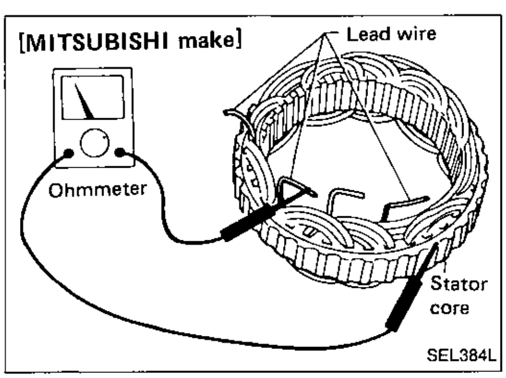
Stator Check

To test the stator or diode, 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.

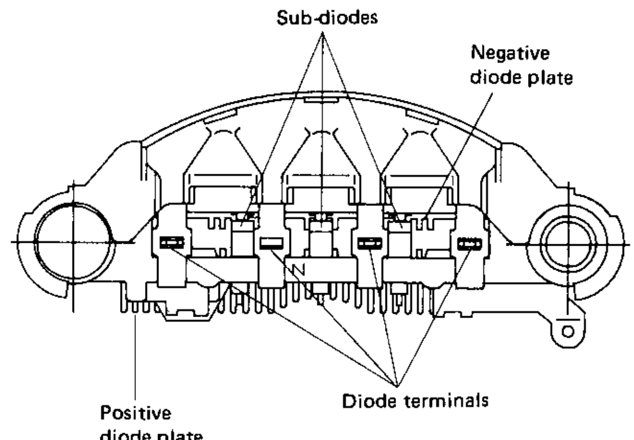
Diode Check

MAIN DIODES

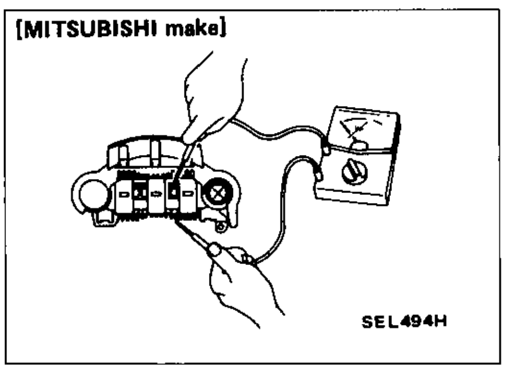
- Use an ohmmeter to check condition of diodes as indicated in chart below:
- If any of the test results is not satisfactory, replace diode assembly.

	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

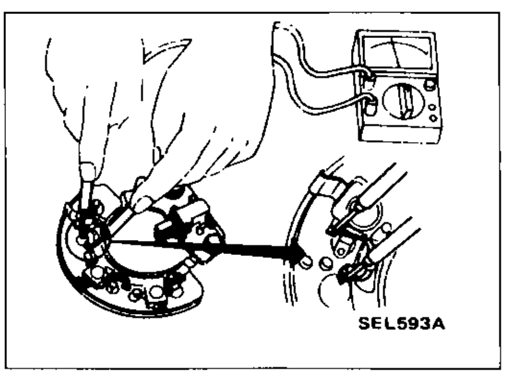
[MITSUBISHI make]



SEL385L



SEL494H


SEL593A

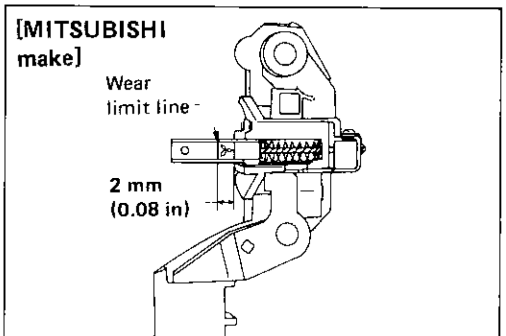
SUB-DIODES

- Attach ohmmeter's probe to each end of diode to check for continuity.
- Continuity is N.G. ... Replace diode assembly.

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.

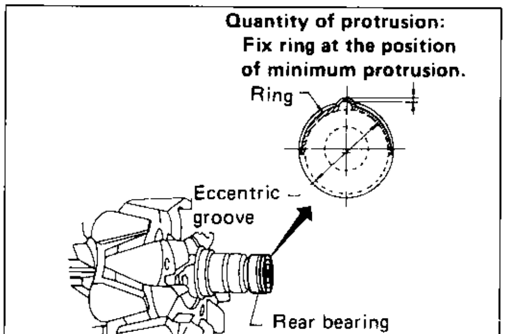


SEL386L

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.



SEL633D

RING FITTING IN REAR BEARING

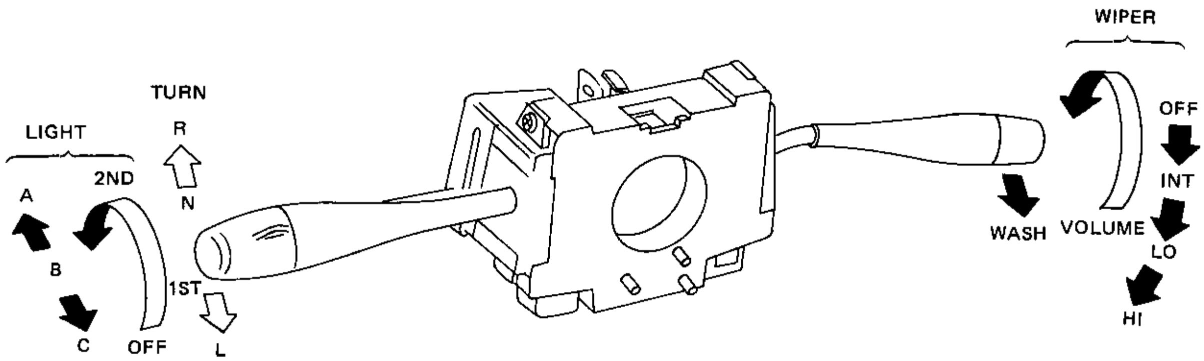
- Fix ring into groove in rear bearing so that it is as close to the adjacent area as possible.

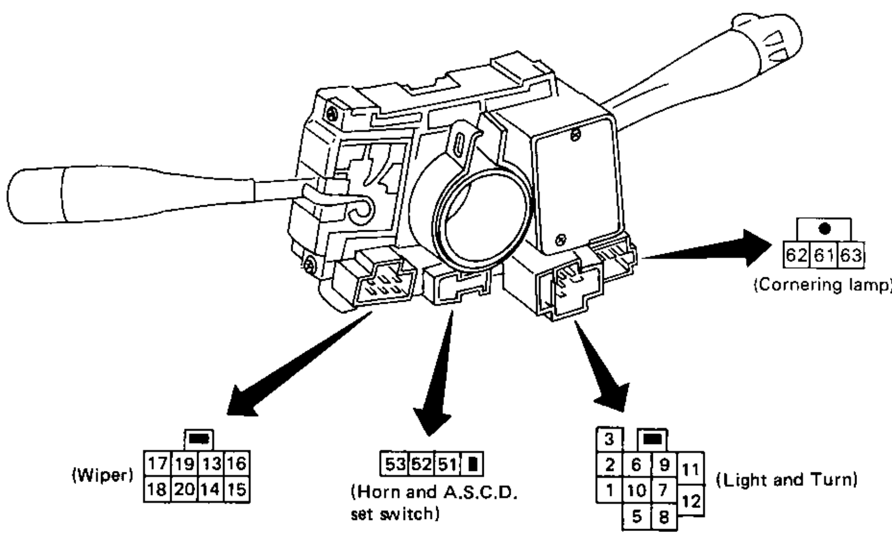
Service Data and Specifications (S.D.S.)

ALTERNATOR

Type		A2T18792
		MITSUBISHI
Nominal rating	V-A	12 - 80
Ground polarity		Negative
Minimum revolution under no-load (When 13.5 volts is applied)	rpm	1,100
Hot output current	A/rpm	More than 21/1,300 More than 60/2,500
Regulated output voltage	V	14.1 - 14.7
Minimum length of brush	mm (in)	8 (0.31)
Brush spring pressure	N (g, oz)	3.138 - 4.315 (320 - 440, 11.29 - 15.52)
Slip ring minimum outer diameter	mm (in)	22.1 (0.870)

Check





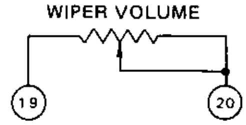
LIGHTING SWITCH

	OFF			1ST			2ND		
	A	B	C	A	B	C	A	B	C
5			O			O	O	O	O
6			O			O	O		O
7								O	
8			O			O	O	O	O
9			O			O	O		O
10								O	
11				O	O	O	O	O	O
12				O	O	O	O	O	O

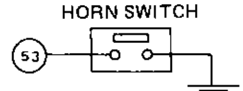
WIPER SWITCH

	OFF	INT	LO	HI	WASH
13	O	O			
14	O	O	O		
15		O			
16				O	
17		O	O	O	O
18					O

INTERMITTENT WIPER VOLUME



HORN SWITCH



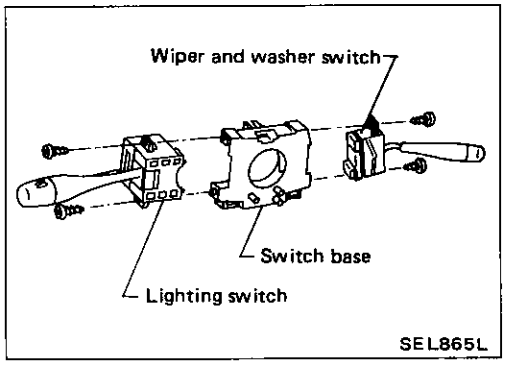
TURN SIGNAL SWITCH

	R	N	L
1	O		O
2	O		
3			O

CORNERING LAMP SWITCH

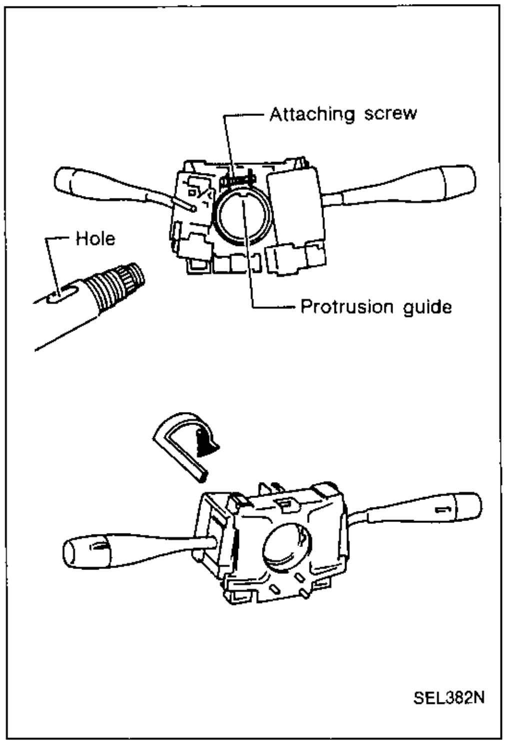
	R	N	L
61	O		O
62	O		
63			O

SEL295N



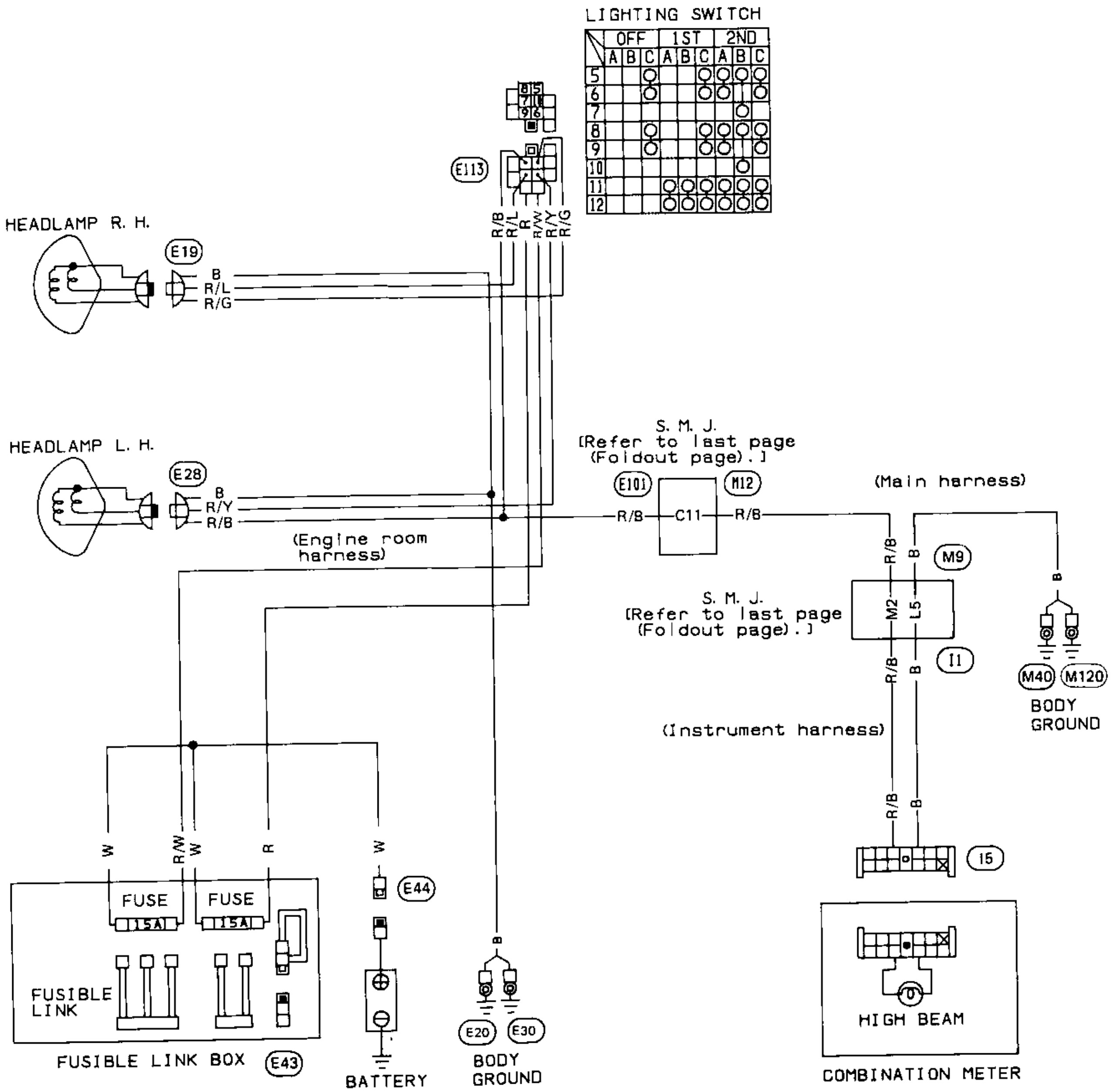
Replacement

- Each switch can be replaced without removing combination switch base.



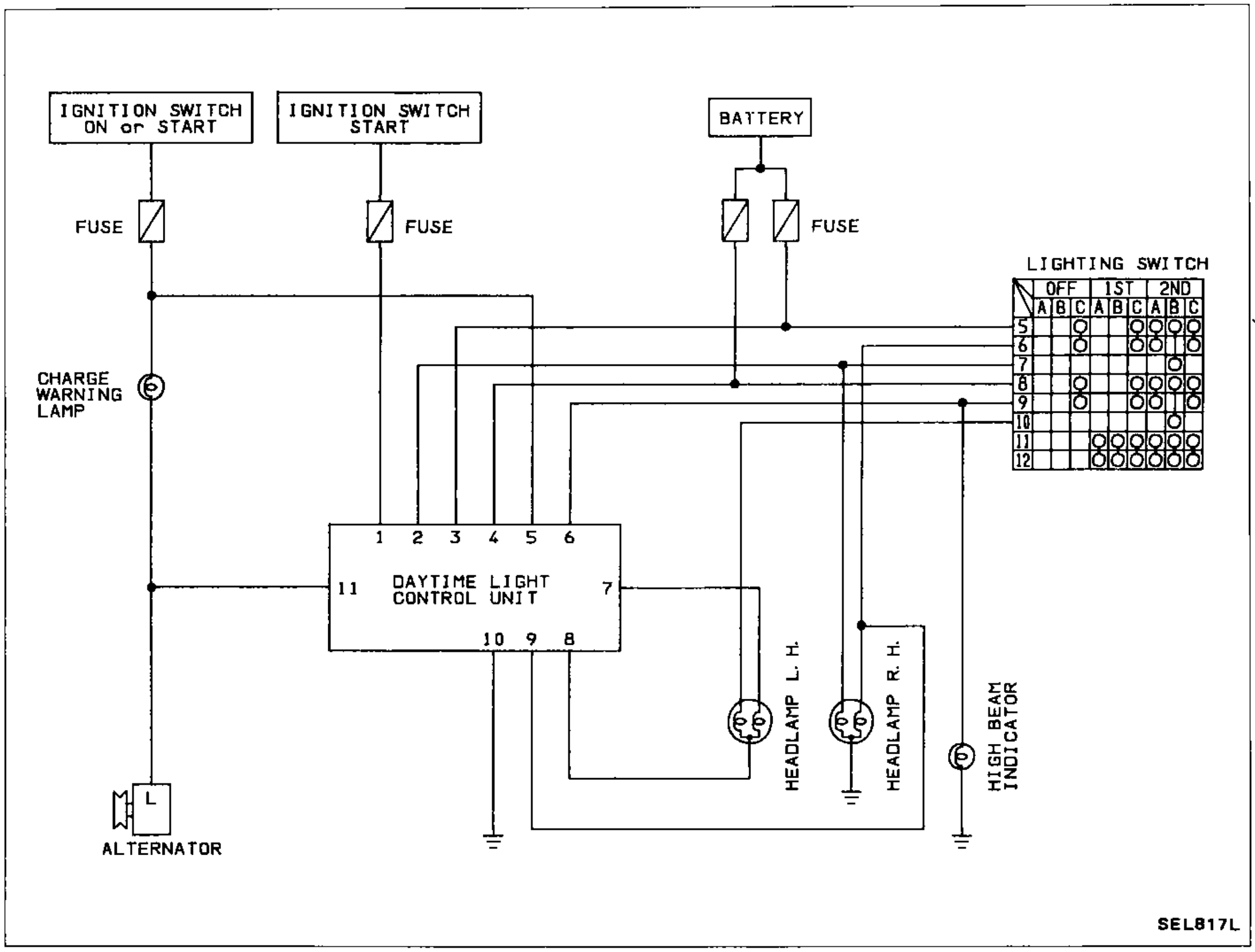
- To remove combination switch base, remove base attaching screw and turn after pushing on it.

Wiring Diagram (For U.S.A.)



SEL566Q

Schematic (For Canada)



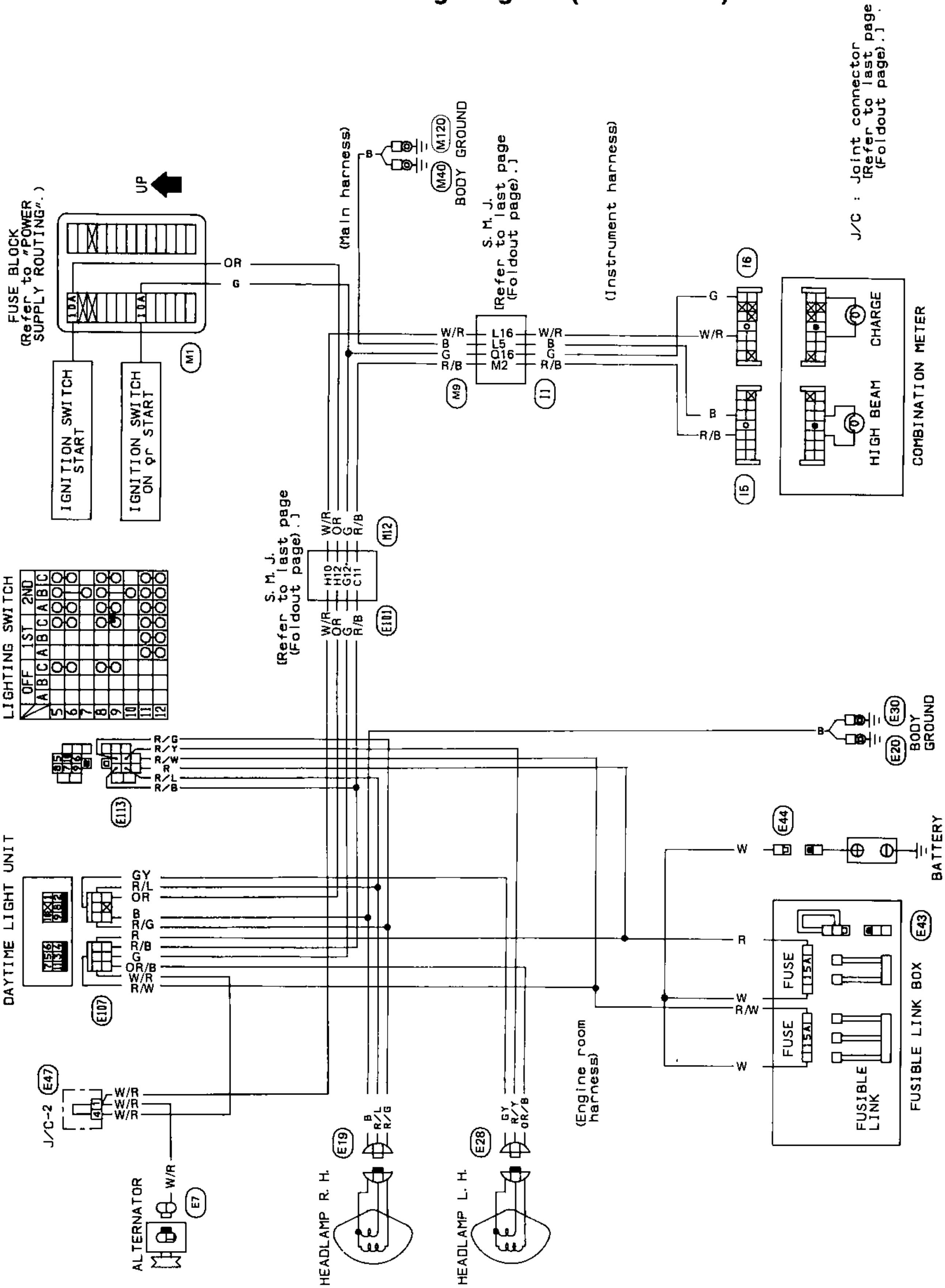
Operation (Daytime light system equipped model)

After starting the engine with the lighting switch in the "OFF" position or "1ST" position, the headlamp high beam automatically turns on. Lighting switch operations other than the above are the same as conventional light systems.

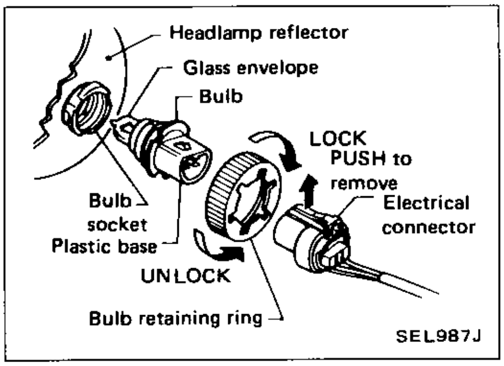
Engine		With engine stopped									With engine running								
Lighting switch		OFF			1ST			2ND			OFF			1ST			2ND		
		A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Headlamp	High beam	X	X	O	X	X	O	O	X	O	△	△	O	△	△	O	O	X	O
	Low beam	X	X	X	X	X	X	X	O	X	X	X	X	X	X	X	X	O	X
Clearance and tail lamp		X	X	X	O	O	O	O	O	O	X	X	X	O	O	O	O	O	O
License and instrument illumination lamp		X	X	X	O	O	O	O	O	O	X	X	X	O	O	O	O	O	O

O: Lamp "ON"
X: Lamp "OFF"
△: Lamp dims.
□: Added functions

Wiring Diagram (For Canada)



SEL567Q



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. Turn the bulb retaining ring counterclockwise until it is free from the headlamp reflector, and then remove it.
3. Disconnect the harness connector from the back side of the bulb.
4. Remove the headlamp bulb carefully. Do not shake or rotate the bulb when removing it.
5. Install in the reverse order of removal.

CAUTION:

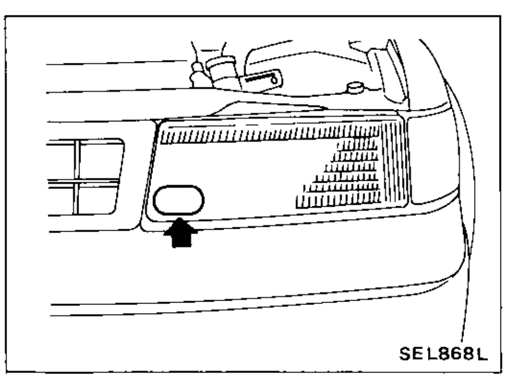
- **Do not leave the bulb out of the headlamp reflector for a long period of time as dust, moisture, smoke, etc. may enter the headlamp body and affect the performance of the headlamp. Thus, the headlamp bulb should not be removed from the headlamp reflector until just before a replacement bulb is to be installed.**

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.

a. Keep all tires inflated to correct pressures.
b. Place vehicle and tester on one and same flat surface.
c. 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).



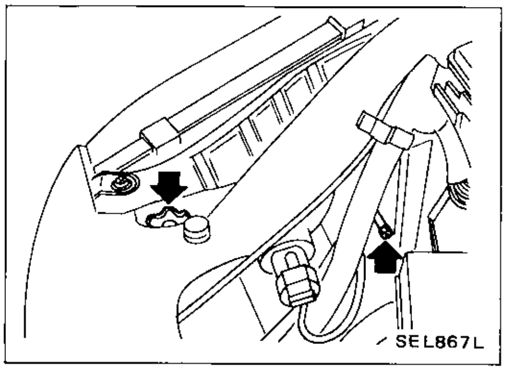
AIMER ADJUSTMENT MARK

When using a mechanical aimer, adjust adapter legs to the data marked on the headlamps.
Example:

4H2V
- Vertical side: 2
- Horizontal side: 4

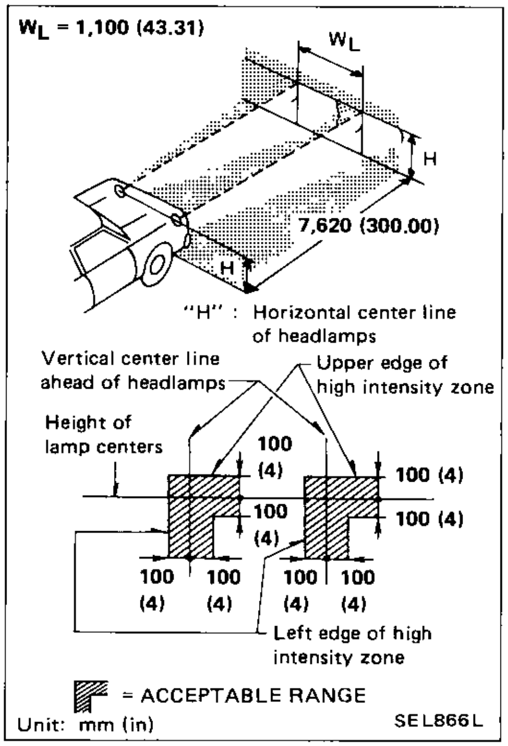
Aiming Adjustment (Cont'd)

LOW BEAM



1. Turn headlamp low beam on.
2. Use adjusting screws to perform aiming adjustment.

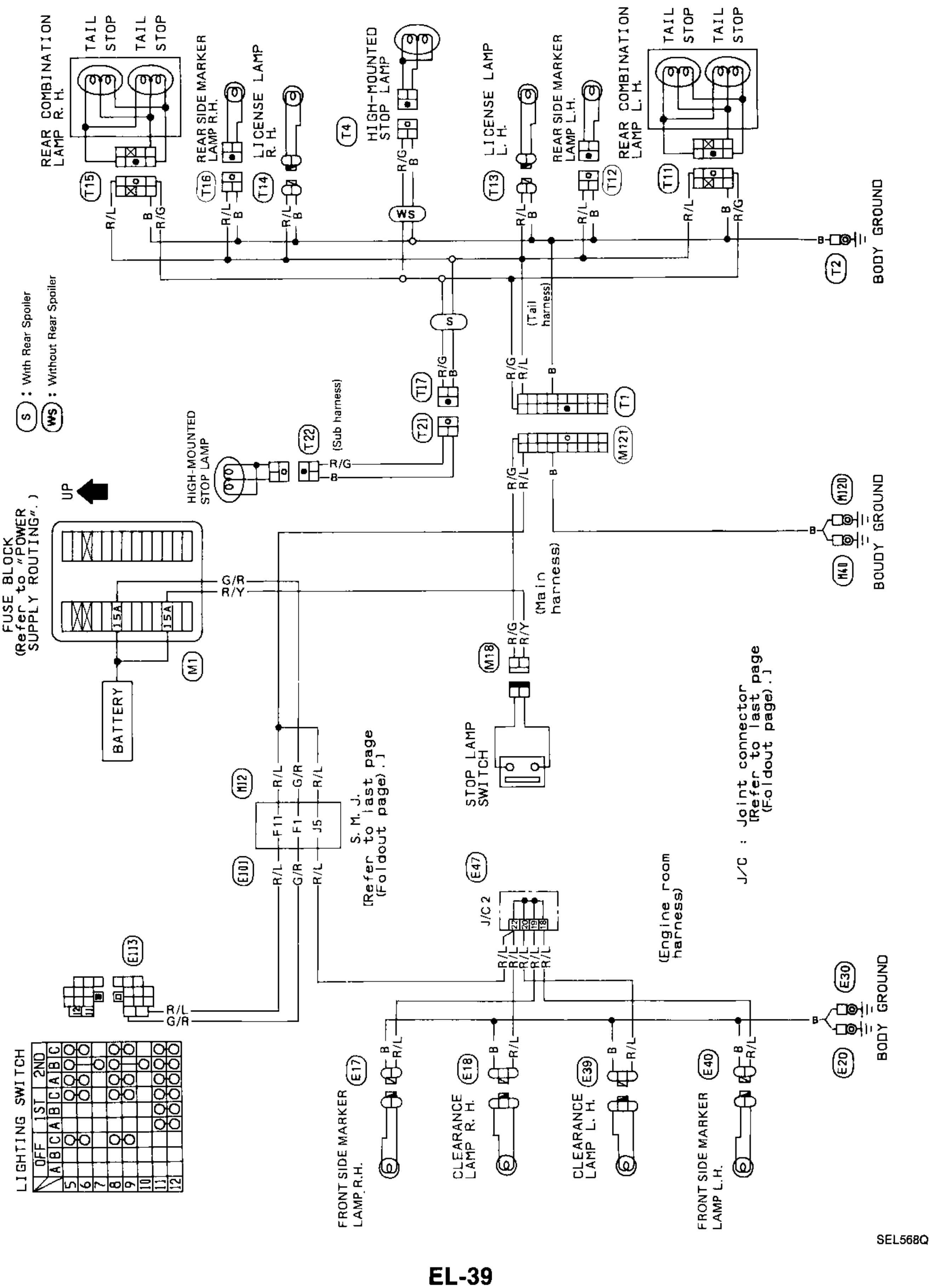
- **First tighten the adjusting screw all the way and then make adjustment by loosening the screw.**



- **Adjust headlamps so that upper edge and left edge of high intensity zone are within the acceptable range as shown at left.**
- **Dotted lines in illustration show center of headlamp.**

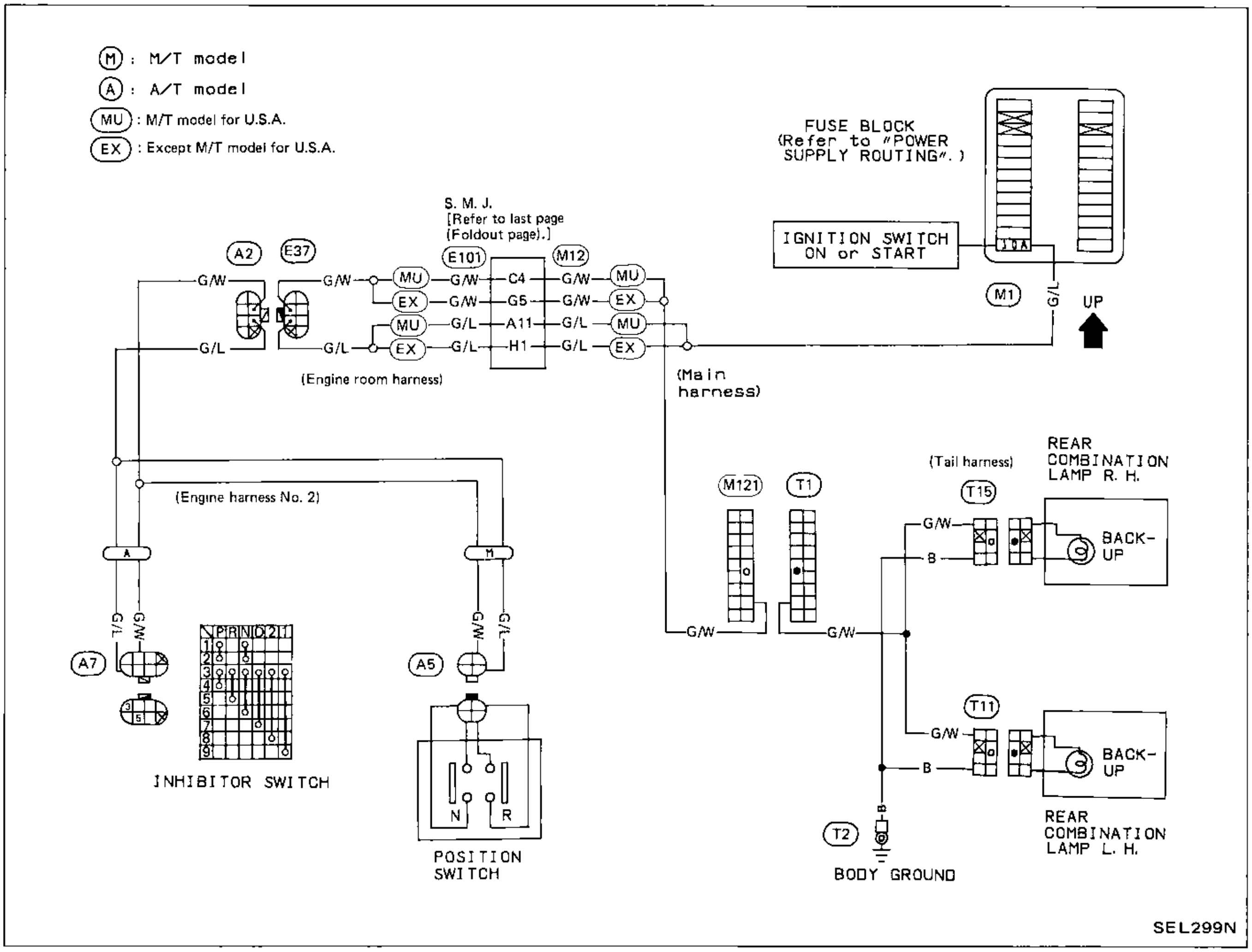
"H": Horizontal center line of headlamps
"W_L": Distance between each headlamp center

Clearance, License, Tail and Stop Lamps/Wiring Diagram

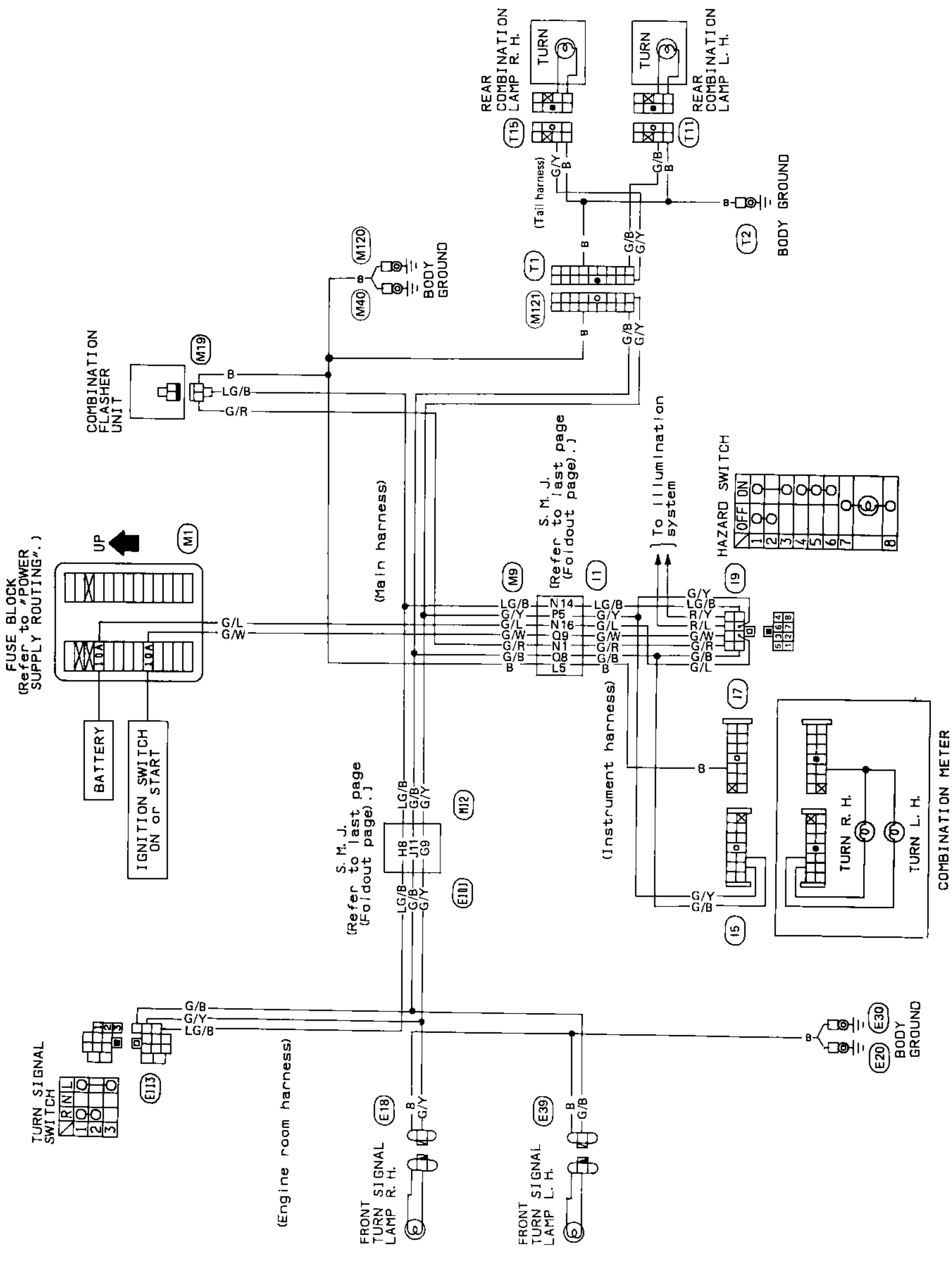


SEL568Q

Back-up Lamp/Wiring Diagram

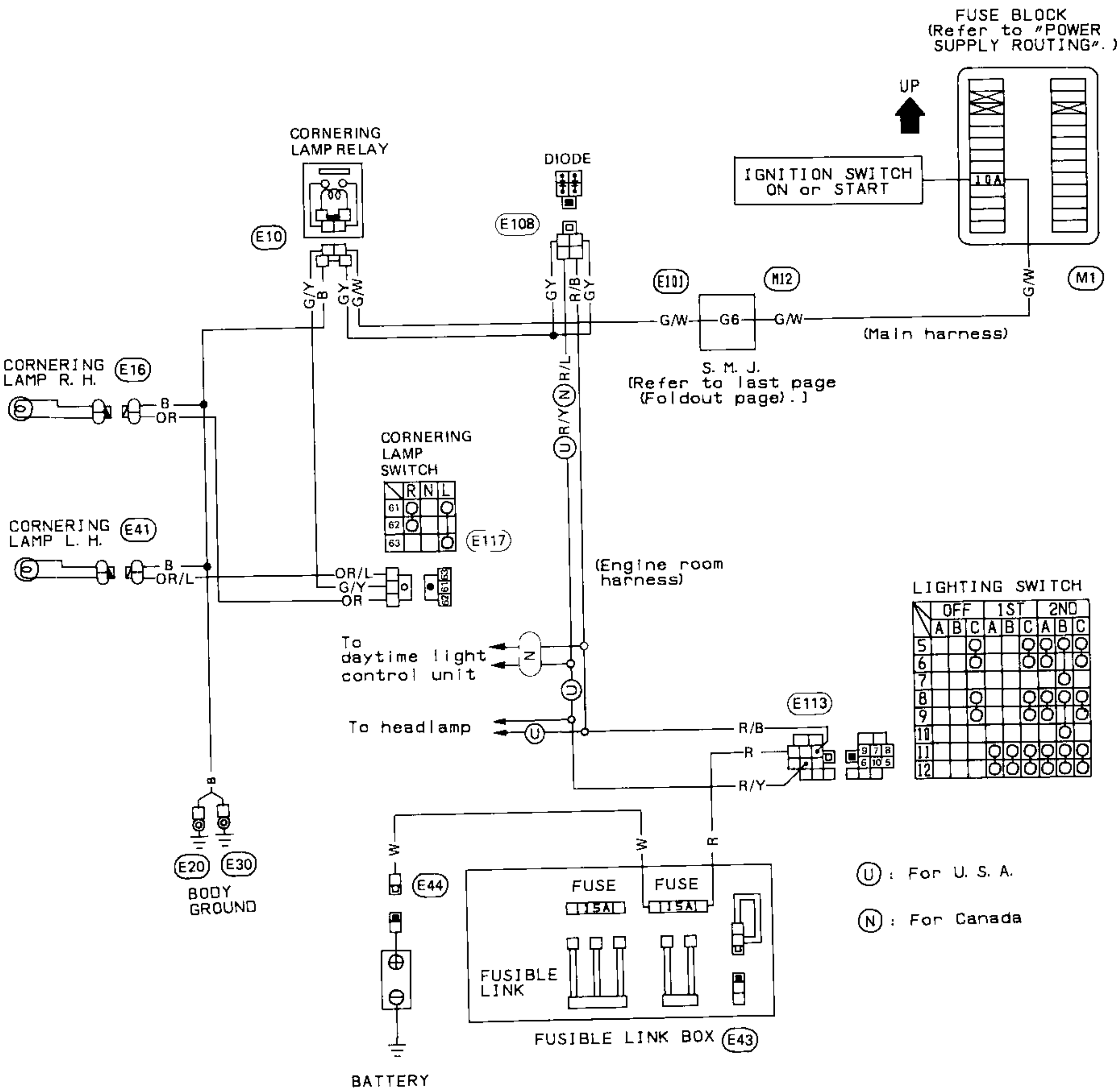


Turn Signal and Hazard Warning Lamps/Wiring Diagram

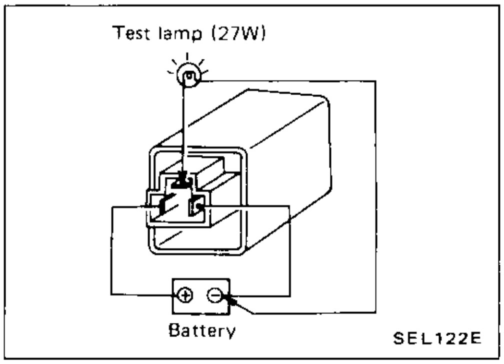


SEL569Q

Cornering Lamp/Wiring Diagram



SEL570Q



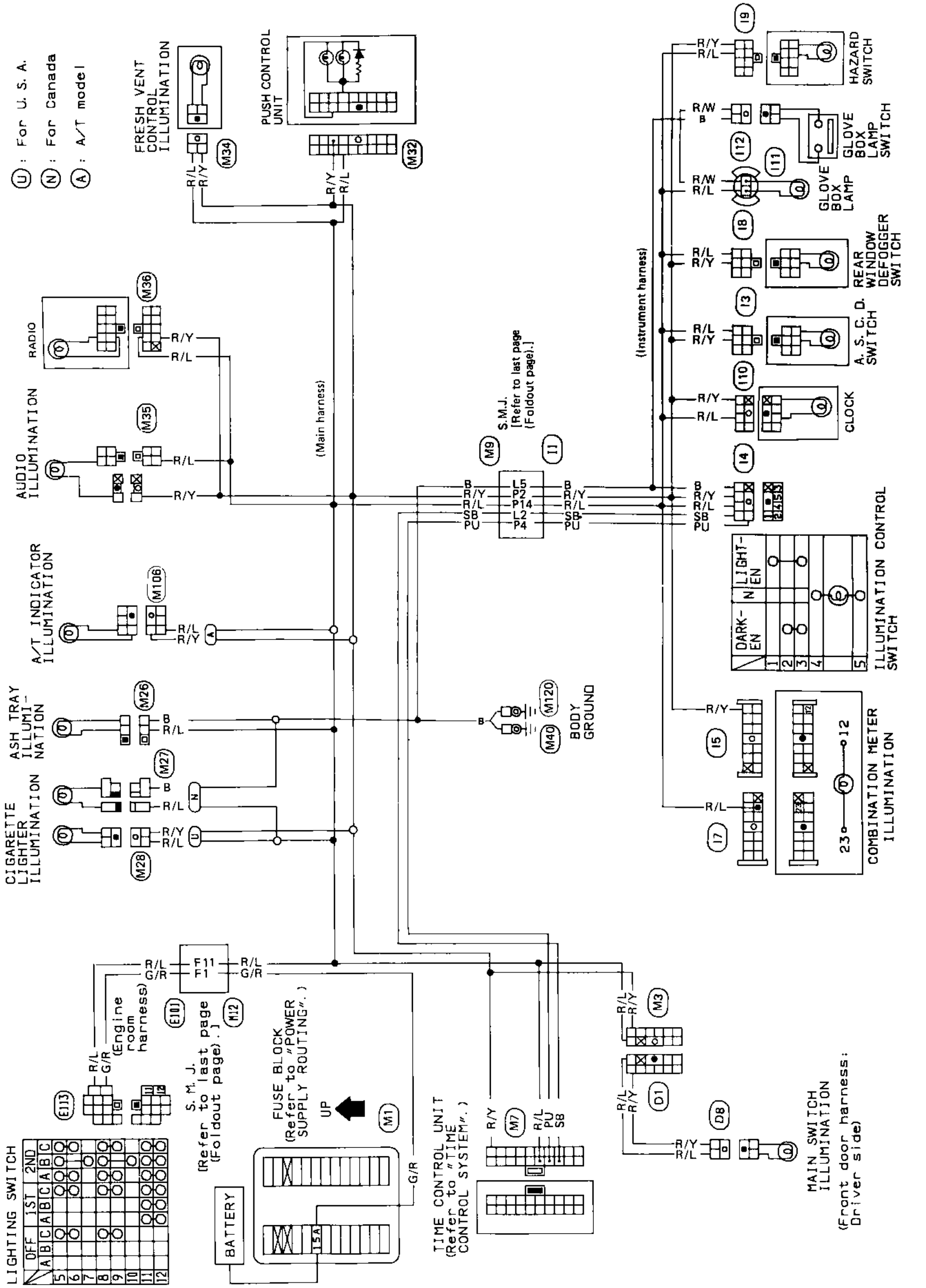
Combination Flasher Unit Check

- 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

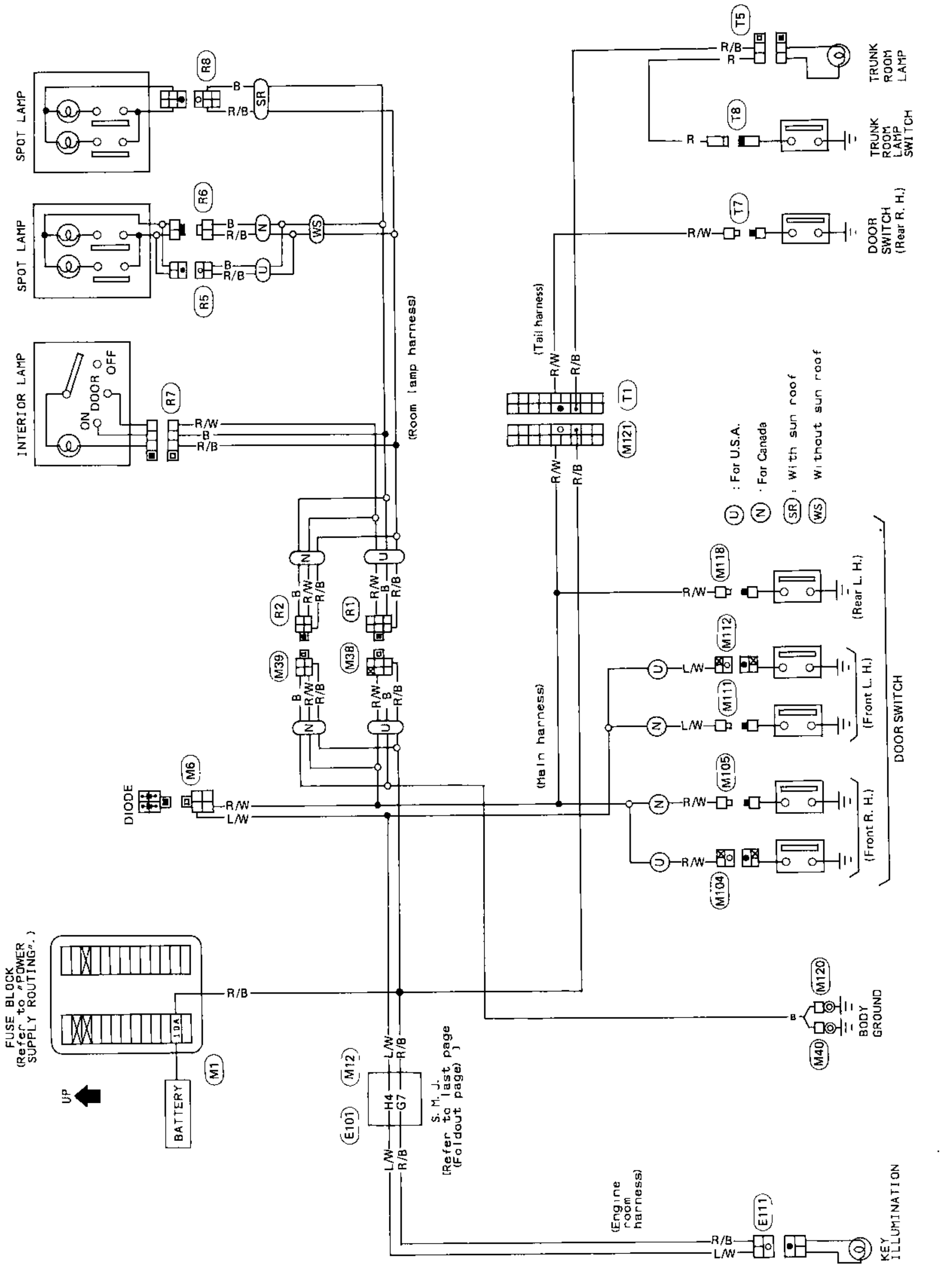
	Wattage (12 volt)
Headlamp (Semi-sealed beam)	
High/Low	65/45
Front turn signal lamp	27
Cornering lamp/Front clearance lamp	27/8
Front side marker lamp	3.8
Rear combination lamp	
Turn signal	27
Stop/Tail	27/8
Back-up	27
Rear side marker lamp	3.8
License plate lamp	5
High-mounted stop lamp	18
Interior lamp	10
Spot lamp	8
Trunk room lamp	3.4

Illumination/Wiring Diagram



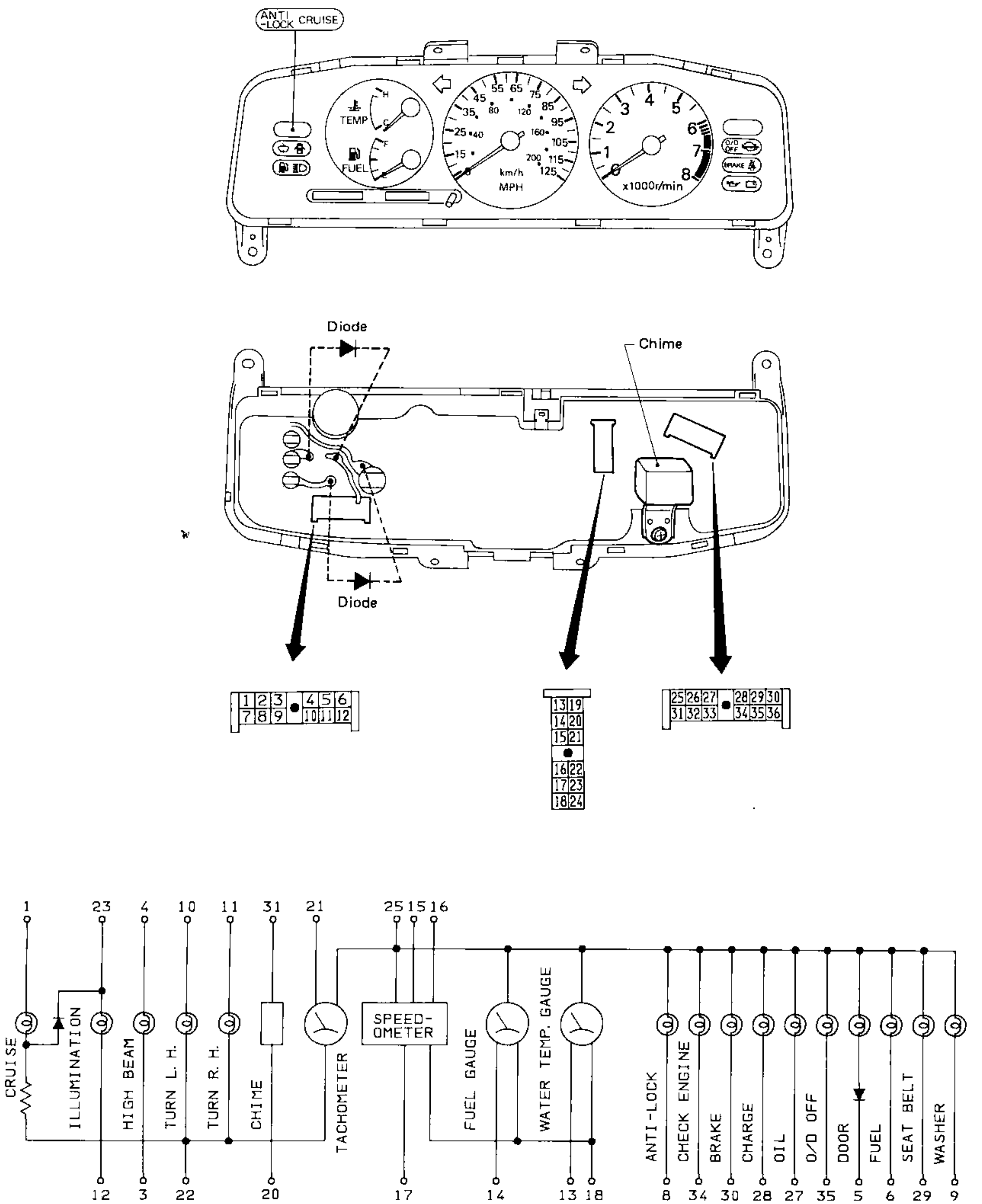
SEL571Q

Interior, Spot and Trunk Room Lamps/Wiring Diagram



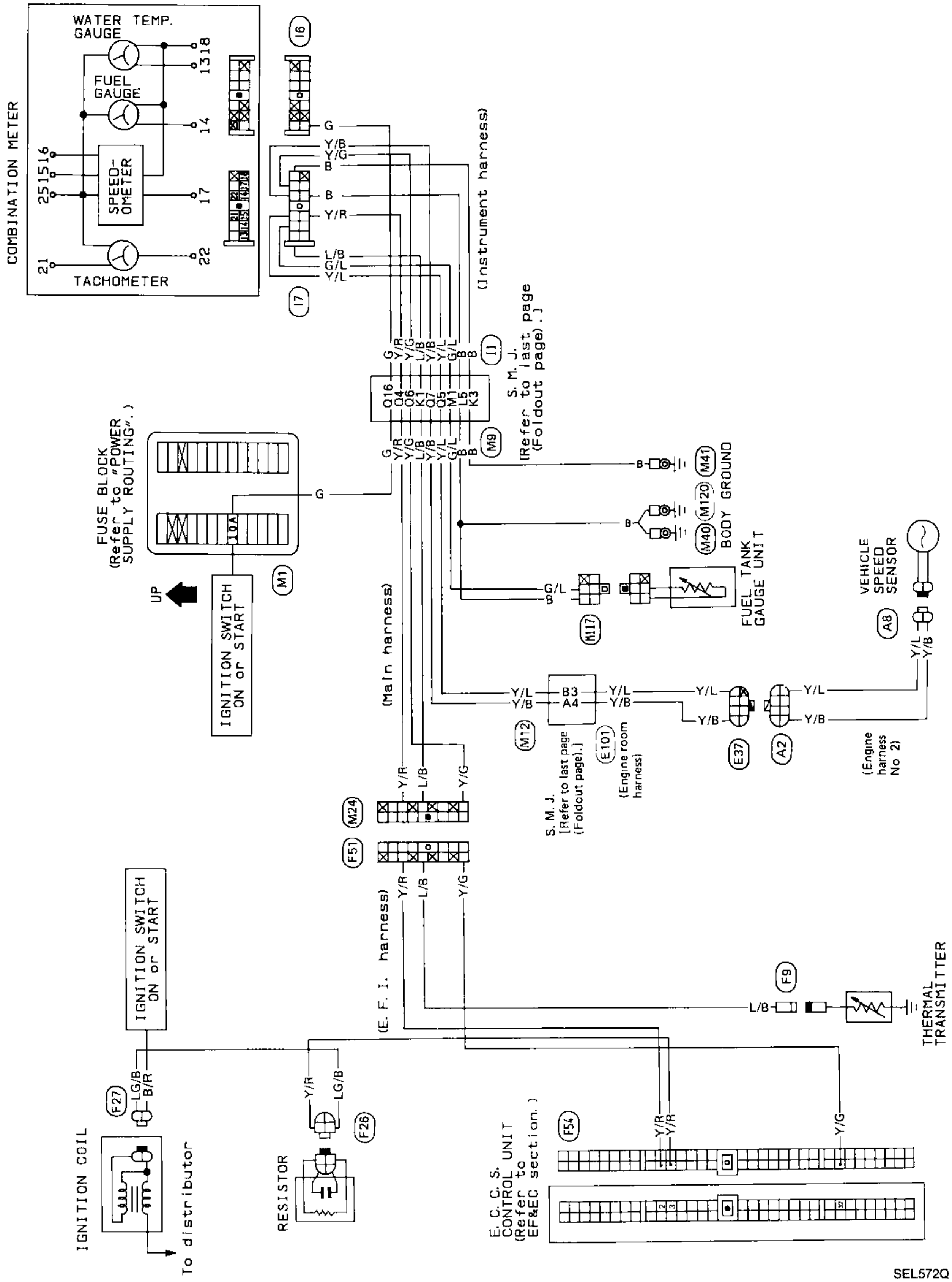
SEL303N

Combination Meter

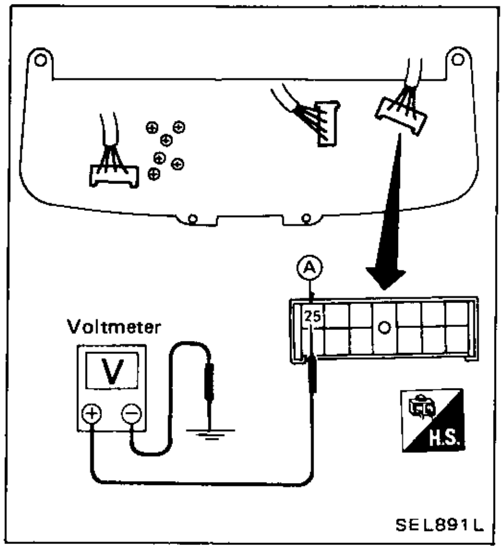


SEL304N

Speedometer, Tachometer, Temp., and Fuel Gauges/Wiring Diagram



SEL572Q



Inspection/Fuel Gauge and Water Temperature Gauge

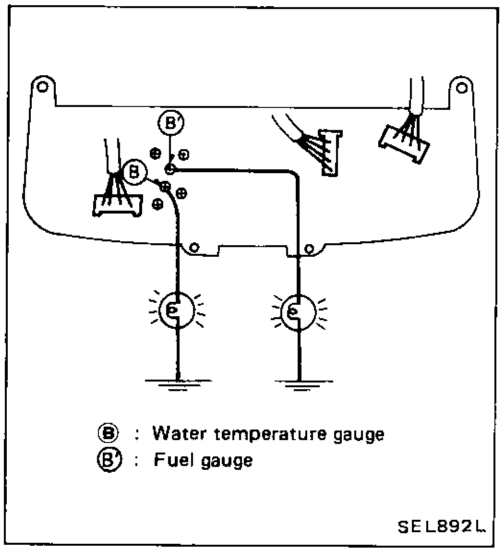
INSPECTION START

↓ O.K.

CHECK POWER SOURCE
1) Turn ignition switch "ON".
2) Check voltage between terminal Ⓐ and ground.
Battery voltage should exist.

N.G. → Check the following items.
1) Harness continuity between battery terminal and combination meter
2) Ignition relay
3) Fusible link and fuse
4) Ignition switch

↓ O.K.



CHECK GAUGE OPERATION
1) Turn ignition switch "ON".
2) Connect terminals Ⓑ, Ⓑ' and ground with wire through 3.4 W test bulb.
3) Check operation of gauge.
Gauge should move smoothly to full scale.

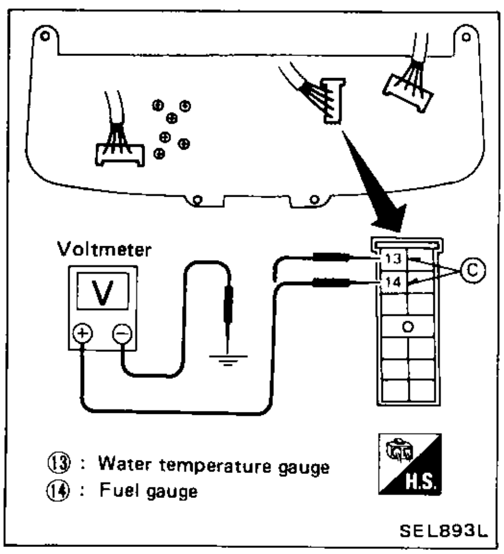
N.G. → Repair or replace gauge.

↓ O.K.

Check harness continuity between component and combination meter Ⓒ.

N.G. → Repair or replace.

↓ O.K.



CHECK COMPONENT
Check gauge units and harness.
Refer to "Fuel Tank Gauge Unit Check", "Thermal Transmitter Check".

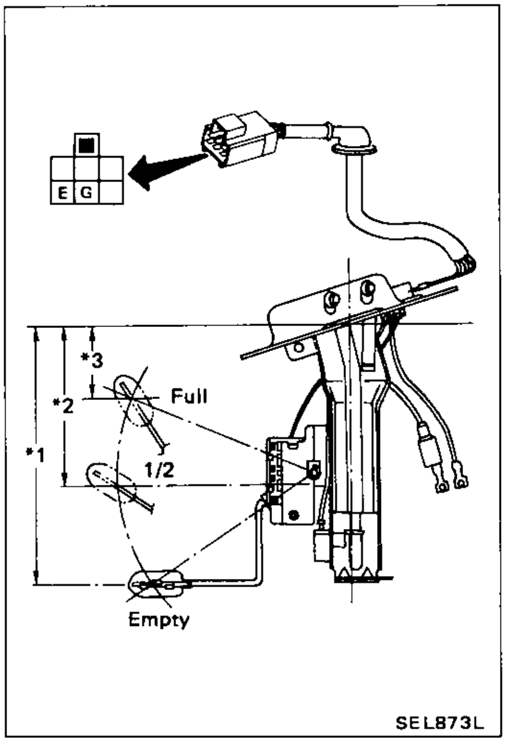
N.G. → Repair or replace. **Refer to FE section. (Fuel tank gauge unit)**

↓ O.K.

Reinstall any part removed.

↓

INSPECTION END

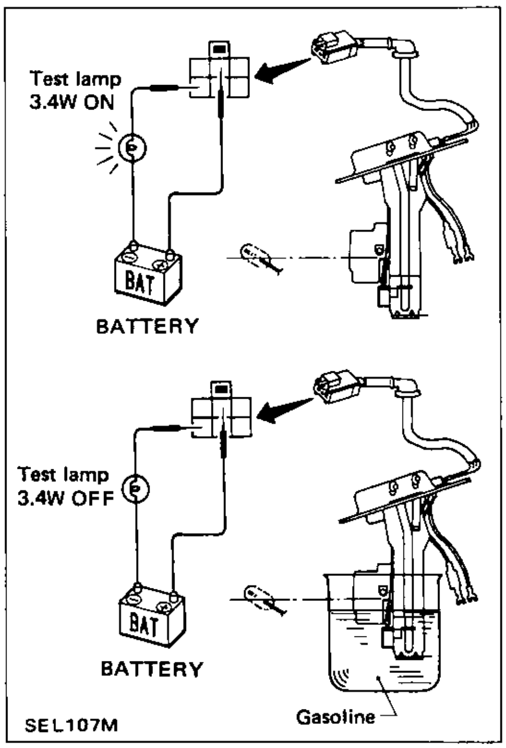


Fuel Tank Gauge Unit Check

Ohmmeter		Float position mm (in)			Resistance value (Ω)
(+)	(-)				
G	E	*3	Full	50 (1.97)	Approx. 4 - 6
		*2	1/2	111 (4.37)	28 - 34
		*1	Empty	160 (6.30)	74 - 85

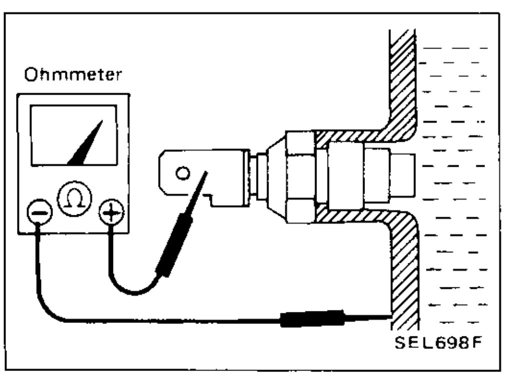
- For removal, refer to FE section.

Check the resistance between terminals Ⓖ and Ⓔ.



Fuel Warning Lamp Sensor Check

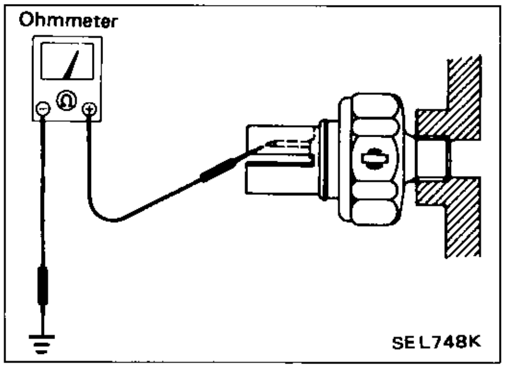
- It will take a short time for the bulb to light.



Thermal Transmitter Check

Check the resistance between the terminals of thermal transmitter and body ground.

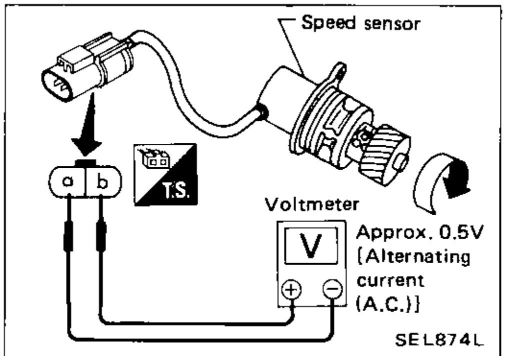
Water temperature	Resistance
60°C (140°F)	Approx. 70 - 90Ω
100°C (212°F)	Approx. 21 - 24Ω



Oil Pressure Switch Check

	Oil pressure kPa (kg/cm², psi)	Continuity
Engine start	More than 10 - 20 (0.1 - 0.2, 1.4 - 2.8)	NO
Engine stop	Less than 10 - 20 (0.1 - 0.2, 1.4 - 2.8)	YES

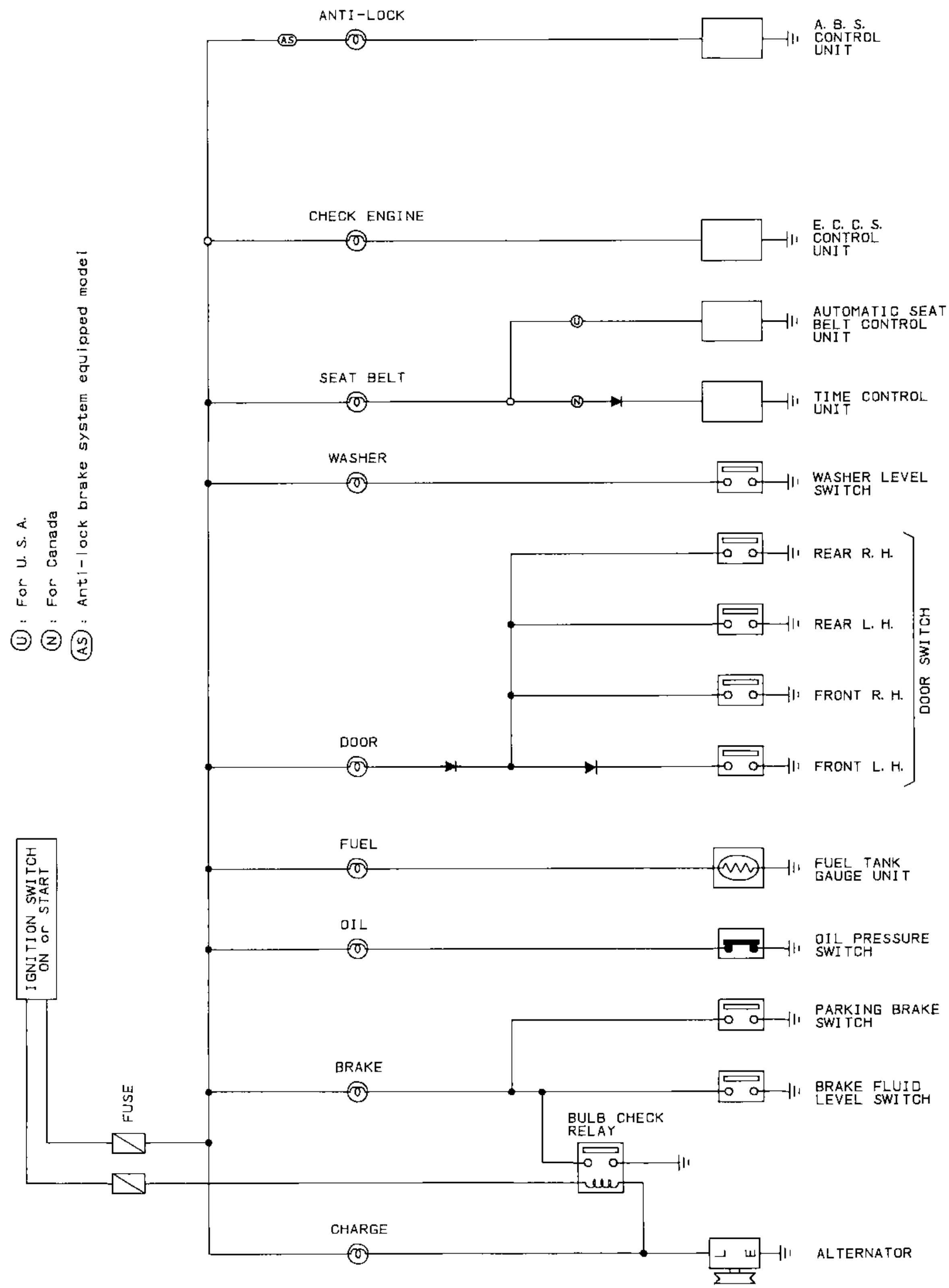
Check the continuity between the terminals of oil pressure switch and body ground.



Speed Sensor Signal Check

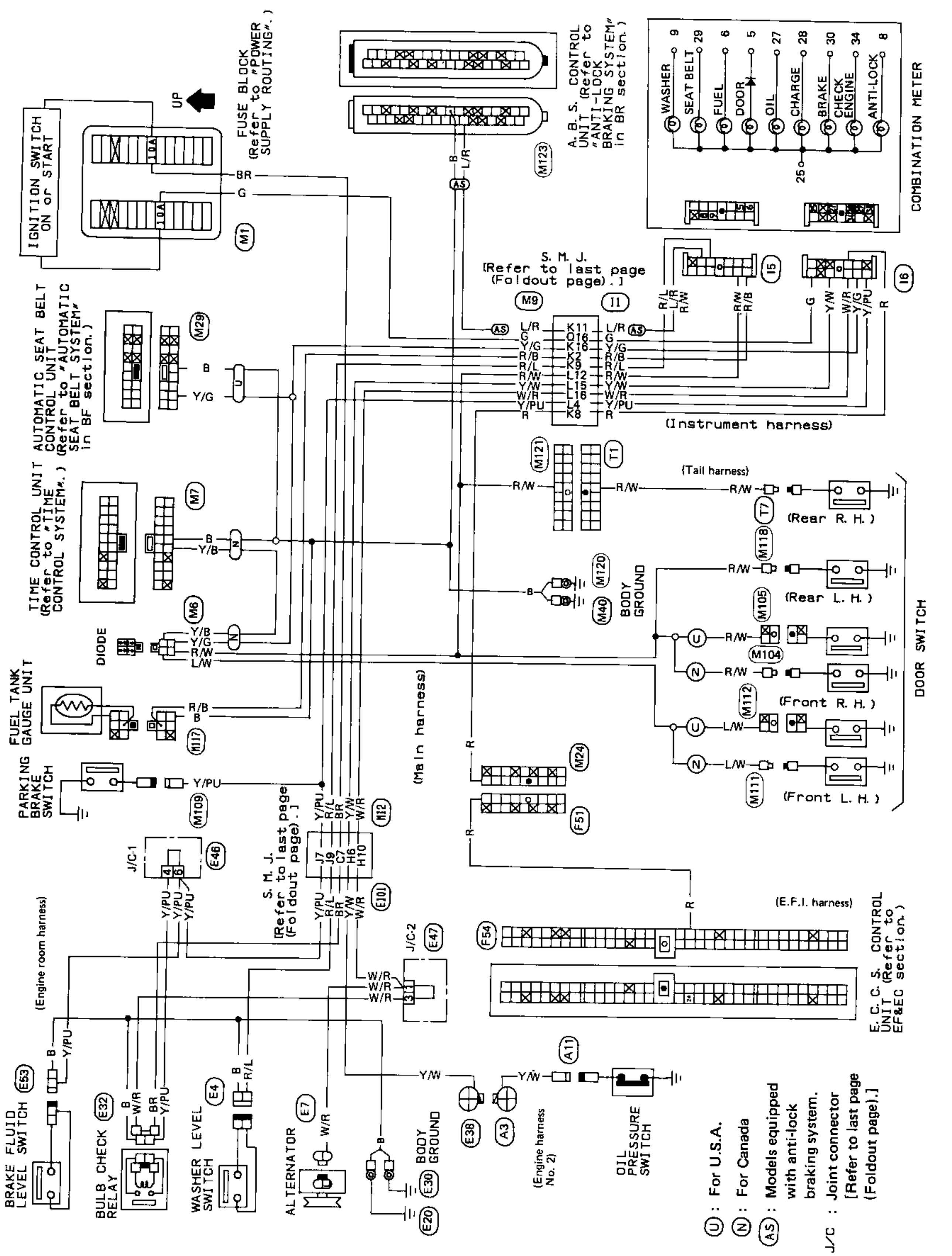
1. Remove speed sensor from transmission.
   Location: Refer to "Location of Electrical Units"
2. Turn speedometer pinion quickly and measure voltage across ⓐ and ⓑ.

Warning Lamps/Schematic



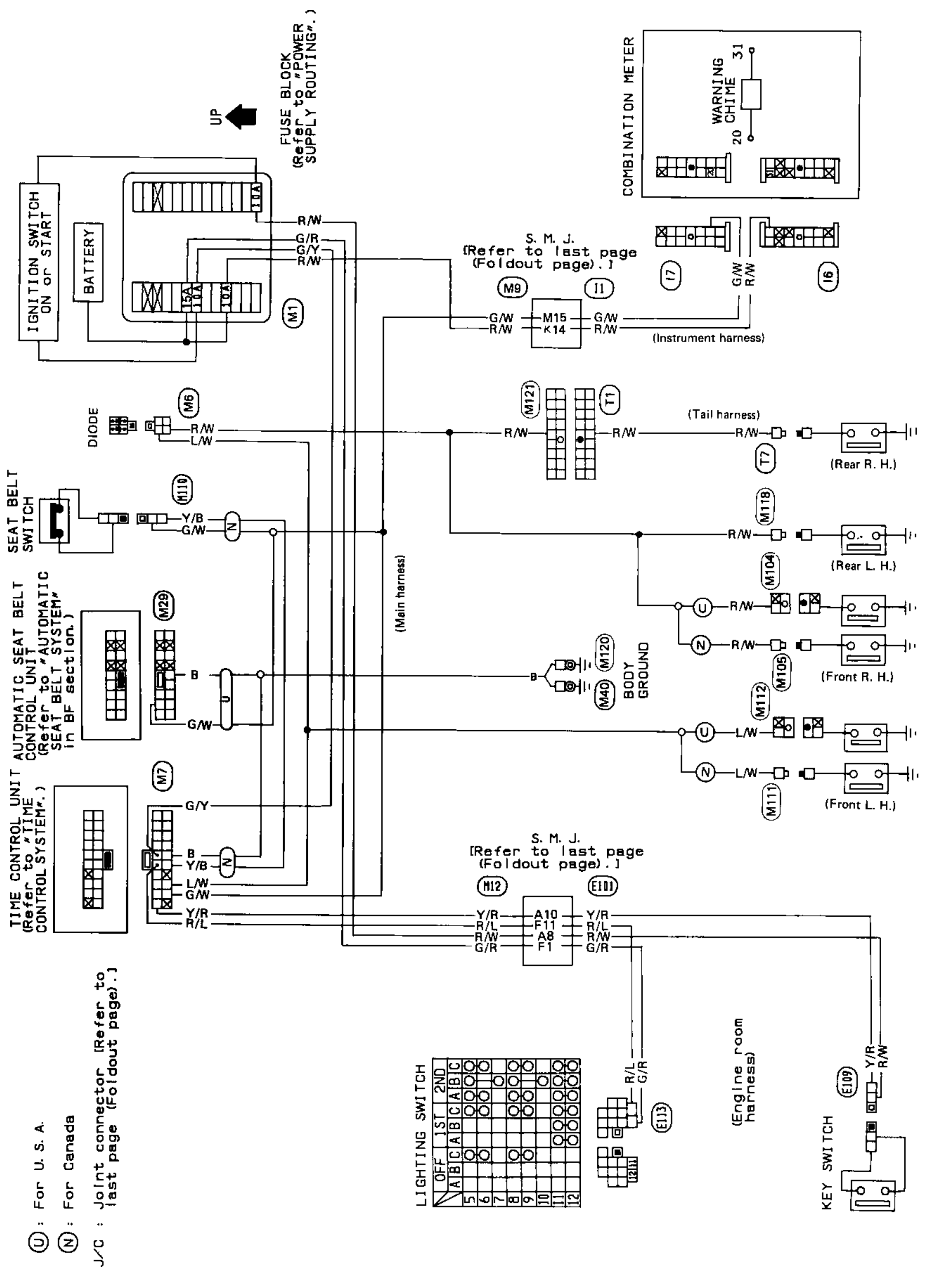
SEL306N

Warning Lamps/Wiring Diagram

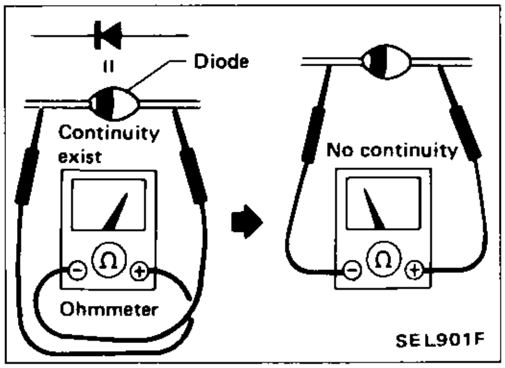


SEL574Q

Warning Chime/Wiring Diagram

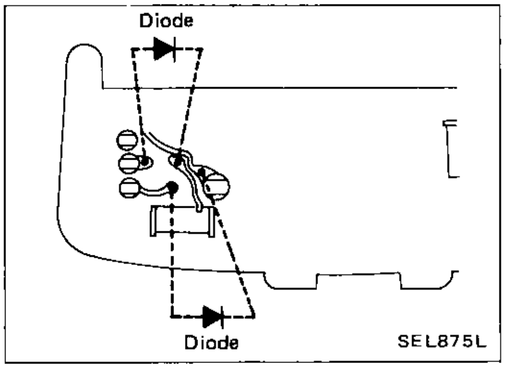


SEL575Q



Diode Check

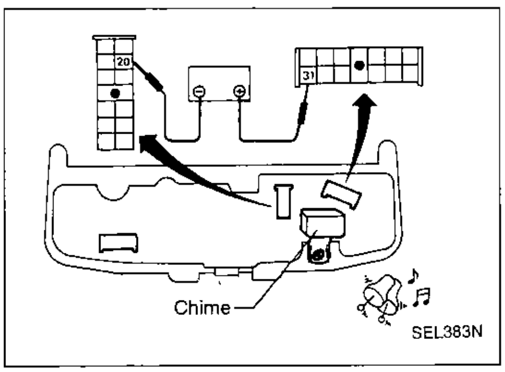
- Check continuity using an ohmmeter.
- Diode is functioning properly if test results are as shown in the figure at left.



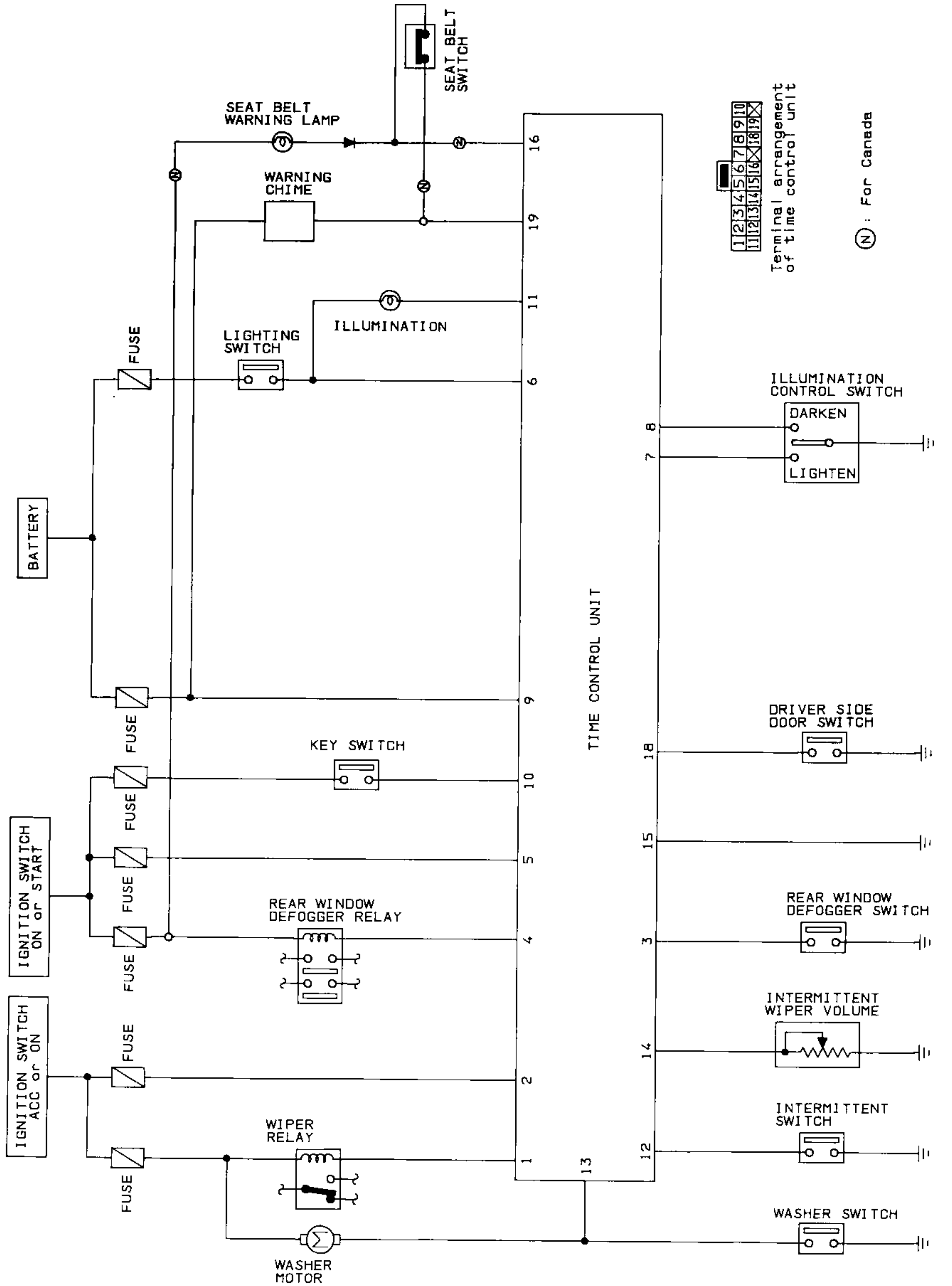
- Diodes for warning lamps are built into the combination meter printed circuit.

Refer to "Combination Meter".

Warning Chime Check

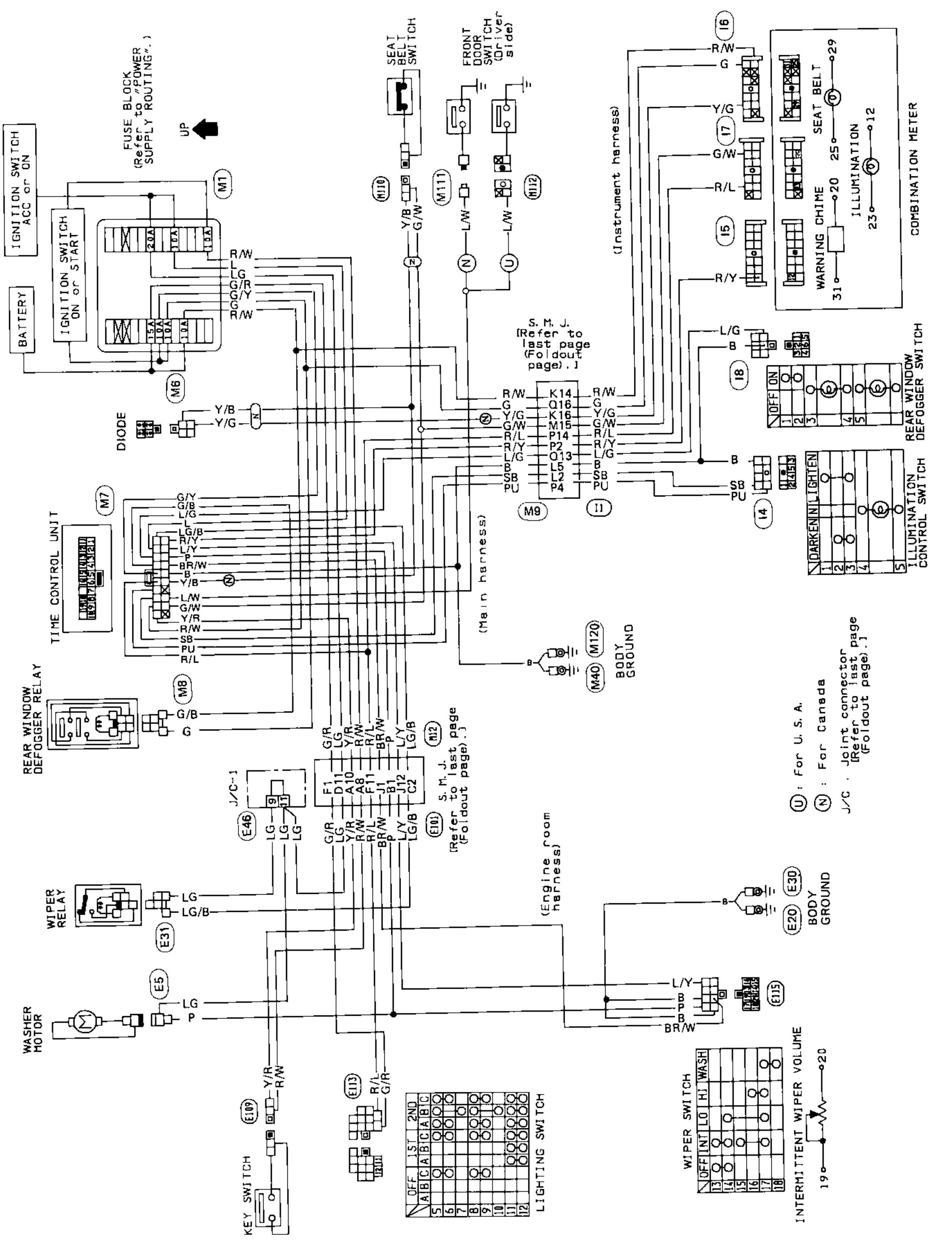


Schematic



SEL576Q

Wiring Diagram



SEL577Q

Description

FUNCTION

- Time control unit has the following functions.

	Item	Details of control
1	Intermittent wiper control	Regulates intermittent time from approximately 3 to 12 seconds depending on the intermittent wiper volume setting.
2	Washer and wiper combination control	Wiper is operated in conjunction with washer switch.
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.
5	Seat belt warning lamp timer	Seat-belt warning lamp blinks for about 7 seconds when ignition switch is turned to "ON".
6	Seat belt warning chime timer	Sounds warning chime for about 7 seconds if ignition switch is turned "ON" when seat belt switch is "ON" (seat belt is unfastened).

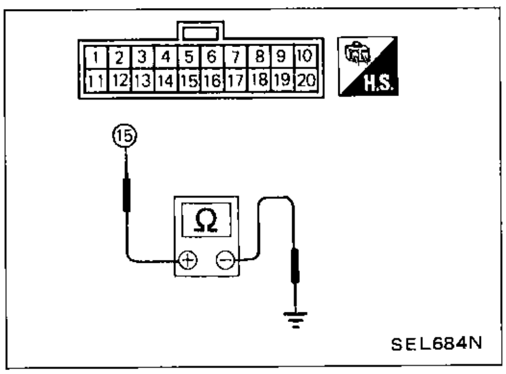
OPERATING CONDITIONS

Item / Input signal (Input terminal / Output terminal)		Power source from battery	Ignition switch	Light switch	Wiper switch "INT"	Washer switch	Driver's side door switch *1	Seat belt switch *2	Illumination control switch
		9	2 or 5	6	12	13	18	16	7 or 8
Intermittent wiper control	1	ON	ACC or ON		ON				
Washer and wiper combination control	12	ON	ACC or ON			ON			
Illumination control	11	ON		ON					ON
Light warning chime timer	19	ON	OFF or ACC	ON			ON		
Seat belt warning lamp timer	16	ON	OFF or ACC → ON						
Seat belt warning chime timer	19	ON	OFF or ACC → ON					ON	

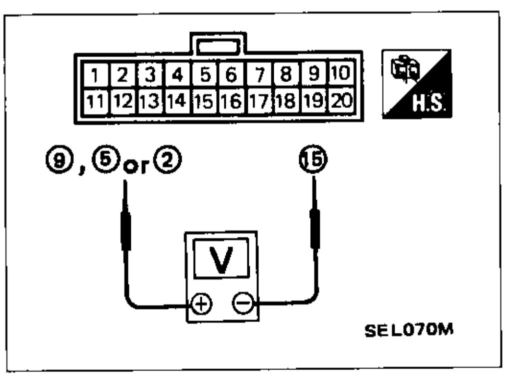
*1: Door switch is turned "ON" when door is opened.
*2: Seat belt switch is turned "ON" when driver's side seat belt is unfastened.

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
	Seat belt warning chime does not activate.	6
	Seat belt warning lamp does not go off nor come on.	7
	Ignition key warning chime does not activate.	8
Rear defogger	Rear defogger does not activate, or does not go off.	9



SEL684N



SEL070M

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

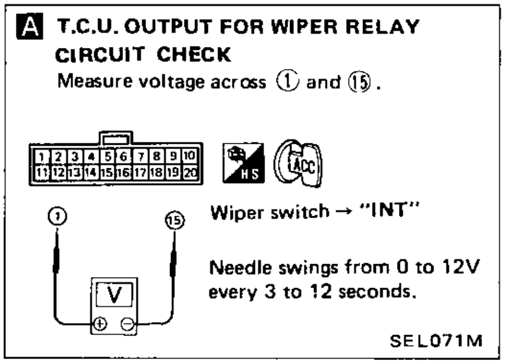
3. Connect voltmeter from harness side.
4. Measure voltage across terminal ⑮ and terminals ②, ⑤or ⑨.

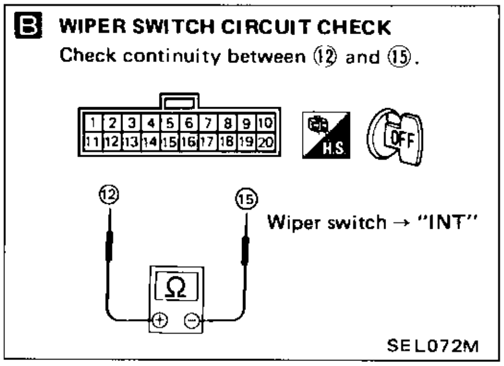
Voltmeter terminals		Ignition switch position		
(+)	(-)	OFF	ACC	ON
⑨	⑮	Approx. 12V	Approx. 12V	Approx. 12V
⑤	⑮	0V	0V	Approx. 12V
②	⑮	0V	Approx. 12V	Approx. 12V

Trouble-diagnosis (Cont'd)

DIAGNOSTIC PROCEDURE-1

Intermittent wiper does not operate.

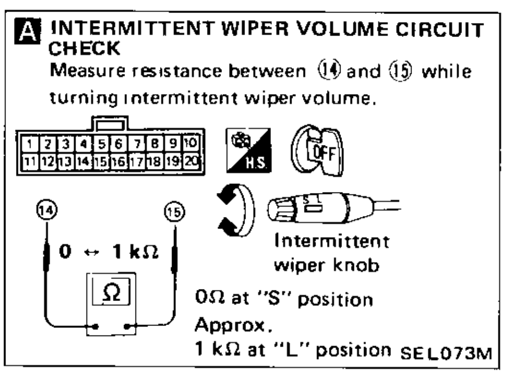




- Go to "Power Supply Circuit Check".
  - N.G. → Check harness for T.C.U. power supply circuit.
  - O.K. ↓
- **A** Check T.C.U. output for wiper relay circuit.
  - O.K. → Check wiper relay. Refer to "WIPER AND WASHER".
    - O.K. → Check harness between T.C.U. and wiper relay.
    - N.G. → Replace wiper relay.
  - N.G. ↓
- **B** Check wiper switch circuit.
  - O.K. → Replace T.C.U.
  - N.G. ↓
- Check wiper switch.
  - N.G. → Replace wiper switch.
  - O.K. → Check harness between T.C.U. and wiper switch.

DIAGNOSTIC PROCEDURE-2

Intermittent time of wiper cannot be adjusted.



- **A** Check intermittent wiper volume circuit.
  - O.K. → Replace T.C.U.
  - N.G. ↓
- Check intermittent wiper volume.
  - N.G. → Replace wiper switch.
  - O.K. → Check harness between T.C.U. and intermittent wiper volume.

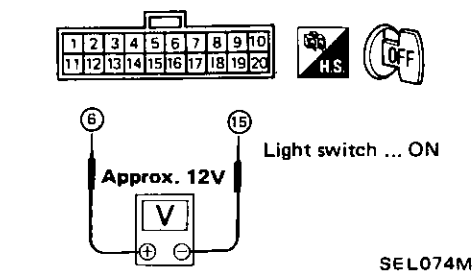
Trouble-diagnosis (Cont'd)

DIAGNOSTIC PROCEDURE-3

Wiper and washer activate individually but not in combination.

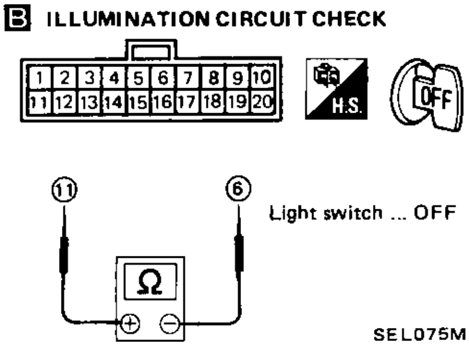
- Check washer switch circuit.
  - O.K. → Check harness between T.C.U. and wiper switch.
  - N.G. ↓
- Check T.C.U. output for wiper motor.
  - N.G. → Replace T.C.U.
  - O.K. ↓
- Replace wiper relay.

A T.C.U. OUTPUT FOR LIGHT SWITCH CIRCUIT CHECK



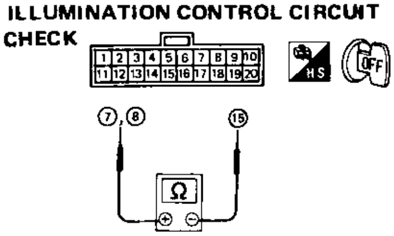
SEL074M

B ILLUMINATION CIRCUIT CHECK



SEL075M

C ILLUMINATION CONTROL CIRCUIT CHECK



Ohmmeter		Illumination control switch	
(+)	(−)	DARK	BRIGHT
⑧	⑮	0Ω	Except 0Ω
⑦	⑮	Except 0Ω	0Ω

SEL076M

DIAGNOSTIC PROCEDURE-4

Illumination control system does not actuate.

- **A** Check T.C.U. output for light switch circuit.
  - N.G. → Check harness between T.C.U. and light switch.
  - O.K. ↓
- **B** Check illumination circuit.
  - N.G. → Check for loose harness connector.
  - O.K. ↓
- **C** Check illumination control circuit.
  - N.G. → Check illumination control switch.
  - O.K. ↓
- Replace T.C.U.

Trouble-diagnosis (Cont'd)

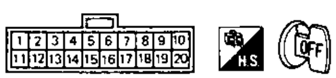
DIAGNOSTIC PROCEDURE-5

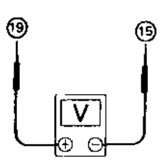
Light warning chime does not activate.

- Do other warning chimes activate?
  - O.K. → Go to "T.C.U. output for light switch circuit check".
  - N.G. → Go to "Power Supply Circuit Check".
- Go to "Power Supply Circuit Check".
  - N.G. → Check harness for T.C.U. power supply circuit.
  - O.K. → Check T.C.U. output for chime circuit.
- Check T.C.U. output for chime circuit.
  - N.G. → Check chime, and harness between T.C.U. and chime.
  - O.K. → Go to "T.C.U. output for light switch circuit check".
- Go to "T.C.U. output for light switch circuit check". (Refer to back page.)
  - N.G. → Check harness between T.C.U. and light switch.
  - O.K. → Replace T.C.U.

A T.C.U. OUTPUT FOR CHIME CIRCUIT CHECK

Measure voltage across ⑲ and ⑮ when driver side door is opened and close.



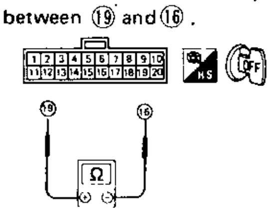


Light switch ... 1ST
- Approx. 12V when driver side door is closed.
- Voltmeter needle swings (0 – 12V) when driver side door is opened.

SEL077M

B SEAT BELT SWITCH CIRCUIT CHECK

1. Unfasten driver side seat belt.
2. Check continuity between ⑲ and ⑯.
3. Fasten driver side seat belt.
4. Check to determine if continuity does not exist between ⑲ and ⑯.



SEL078M

DIAGNOSTIC PROCEDURE-6

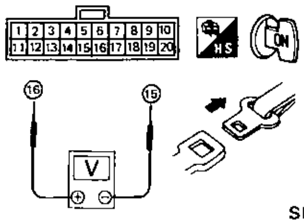
Seat belt warning chime does not activate.

- Go to "Power Supply Circuit Check".
  - N.G. → Check harness for T.C.U. power supply circuit.
  - O.K. → A Check T.C.U. output for chime circuit.
- A Check T.C.U. output for chime circuit.
  - O.K. → Check chime, and harness between T.C.U. and chime.
  - N.G. → B Check seat belt switch circuit.
- B Check seat belt switch circuit.
  - N.G. → Check harness between T.C.U. and seat belt switch.
  - O.K. → Replace T.C.U.

Trouble-diagnosis (Cont'd)

A T.C.U. OUTPUT FOR BELT WARNING LAMP CIRCUIT CHECK

Measure voltage across ⑯ and ⑮ when ignition switch is "ON".



SEL079M

DIAGNOSTIC PROCEDURE-7

Seat belt warning lamp does not go off nor comes on.

Go to "Power Supply Circuit Check".
- N.G. → Check harness for T.C.U. power supply circuit.
- O.K. ↓

A Check T.C.U. output for belt warning lamp circuit.

Voltmeter needle keeps swinging (approx. 0 ←→ 12V) for about 7 seconds after ignition switch is turned "ON".
- N.G. → Replace T.C.U.
- O.K. ↓

Check warning lamp, and harness between T.C.U. and warning lamp.

Trouble-diagnosis (Cont'd)

DIAGNOSTIC PROCEDURE-8

Ignition key warning chime does not activate.

Go to "Power Supply Circuit Check".
- N.G. → Check harness for T.C.U. power supply circuit.
- O.K. ↓

A Check key switch circuit.
- N.G. → Check key switch or harness.
- O.K. ↓

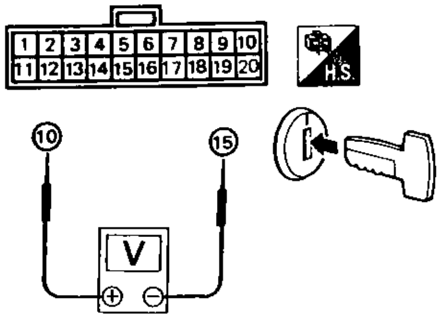
B Check T.C.U. output for chime circuit.
- O.K. → Check chime and harness between T.C.U. and chime.
- N.G. ↓

C Check driver's door switch circuit.
- N.G. → Check harness between T.C.U. and driver's door switch.
- O.K. ↓

Replace T.C.U.

A KEY SWITCH CIRCUIT CHECK

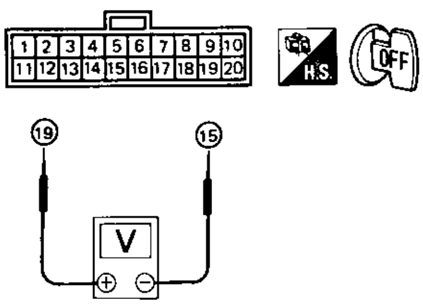
Measure voltage across ⑩ and ⑮.



SEL082M

B T.C.U. OUTPUT FOR CHIME CIRCUIT CHECK

Measure voltage across ⑲ and ⑮ when driver side door is opened and closed.

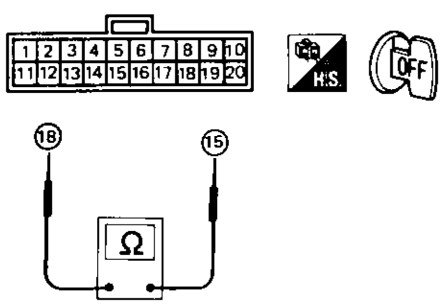


- Approx. 12V when driver side door is opened.

SEL080M

C DRIVER'S DOOR SWITCH CIRCUIT CHECK

Check continuity between ⑱ and ⑮.



Driver side door ... Open

SEL081M

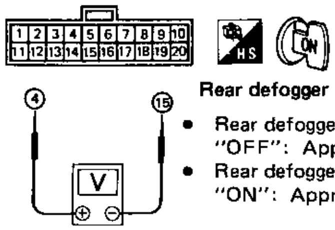
Trouble-diagnosis (Cont'd)

DIAGNOSTIC PROCEDURE-9

Rear defogger does not activate, or does not go off.

A T.C.U. OUTPUT FOR REAR DEFOGGER CIRCUIT CHECK

Measure voltage across ④ and ⑮ while operating rear defogger switch.

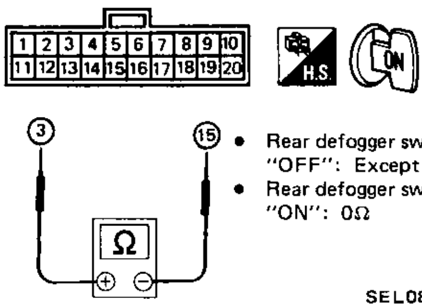


Rear defogger switch → ON

- Rear defogger switch "OFF": Approx. 12V
- Rear defogger switch "ON": Approx. 0V

SEL083M

B DEFOGGER SWITCH CIRCUIT CHECK



- Rear defogger switch "OFF": Except 0Ω
- Rear defogger switch "ON": 0Ω

SEL084M

Go to "Power Supply Circuit Check". — N.G. → Check harness for T.C.U. power supply circuit.

↓ O.K.

A

Check T.C.U. output for rear defogger circuit. — N.G. → Check rear defogger relay, and harness between T.C.U. and rear defogger relay.

↓ O.K.

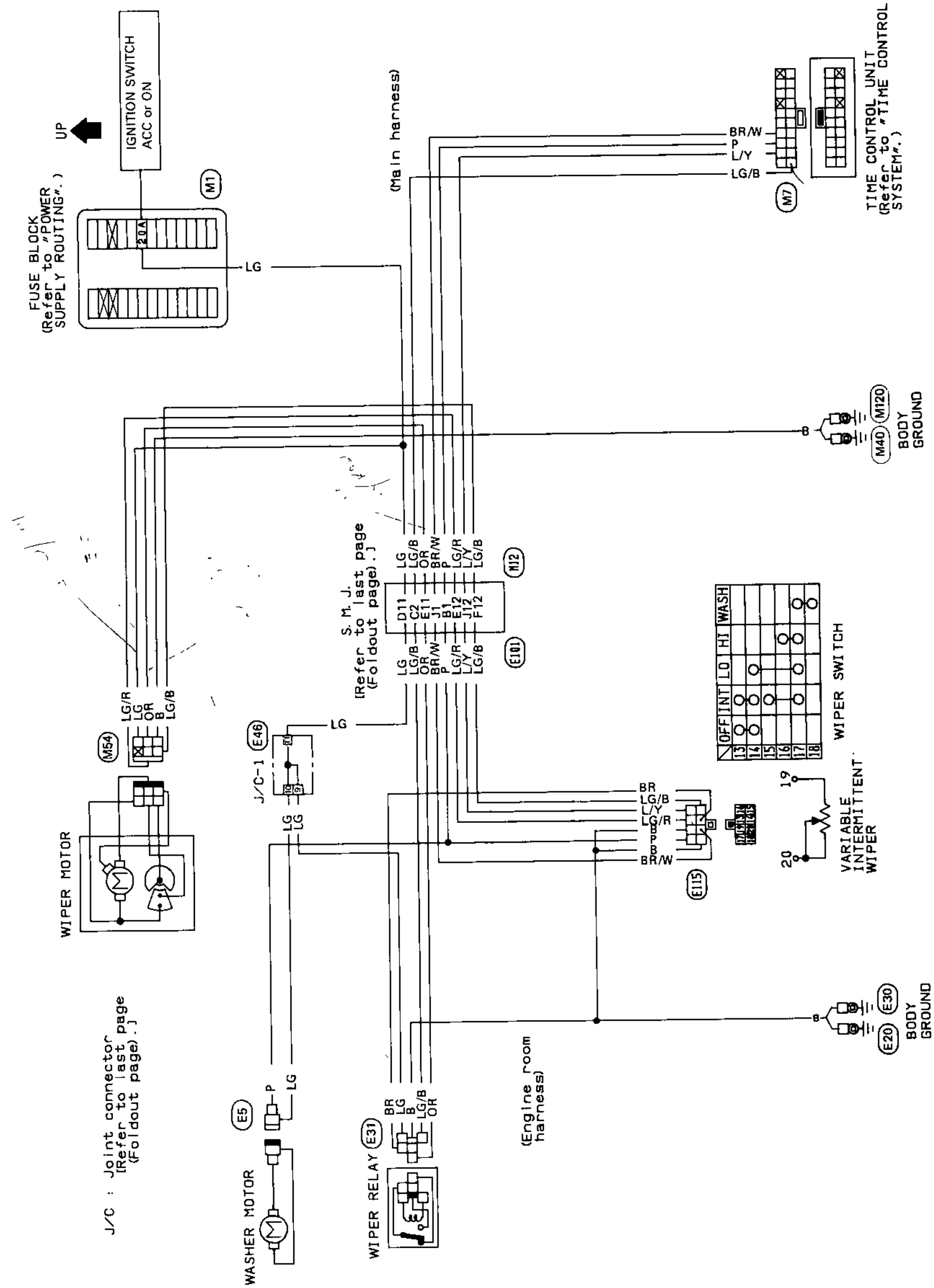
B

Check defogger switch circuit. — N.G. → Check defogger switch, and harness between T.C.U. and defogger switch.

↓ O.K.

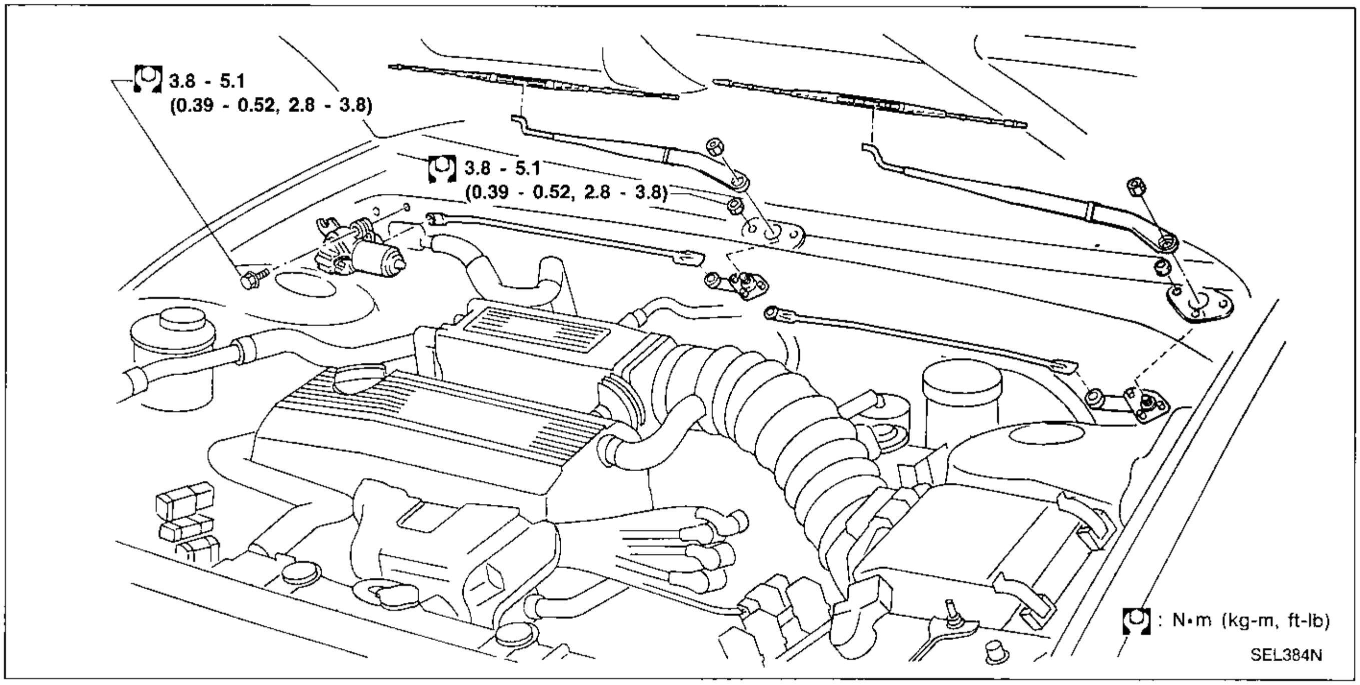
Replace T.C.U.

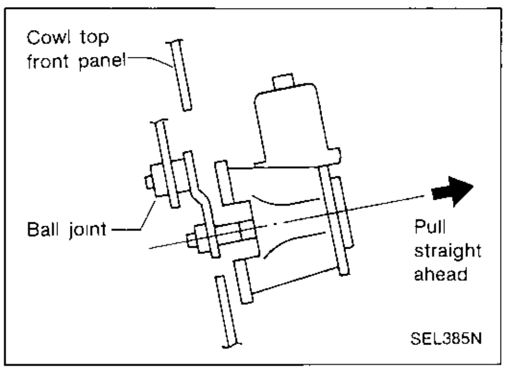
Front Wiper and Washer/Wiring Diagram



SEL578Q

Wiper Removal and Installation

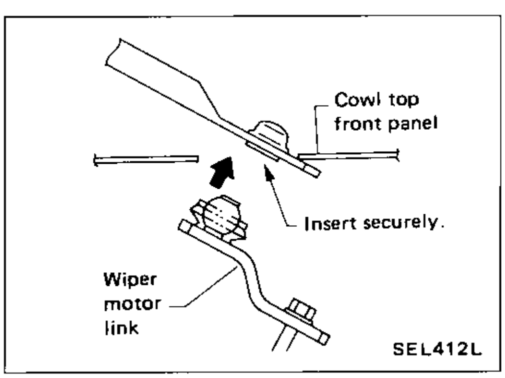




FRONT WIPER REMOVAL

Before removing front wiper motor link, turn wiper switch OFF and disconnect motor leads at connectors.

1. Remove wiper arm.
2. Remove cowl cover.
3. Remove bolts which secure wiper motor.
4. Extract wiper motor so that wiper motor link comes out of hole in front cowl top panel. Then, pull motor straight out to disconnect ball joint which connects motor link and wiper link. Wiper motor can then be removed.
5. Remove wiper link pivot blocks on driver and passenger sides.
6. Extract wiper link and pivot blocks (as one unit) from oblong hole on left side (L.H.D.) of cowl top.



FRONT WIPER INSTALLATION

1. Position wiper link and pivot blocks (as one unit) in cowl top through oblong hole.
2. Before installing pivot blocks on cowl top, hold end (motor link side) of wiper link at hole in front cowl top panel and insert motor link's ball pin into hole in wiper link.
3. Install front wiper in reverse order of above removal procedures.

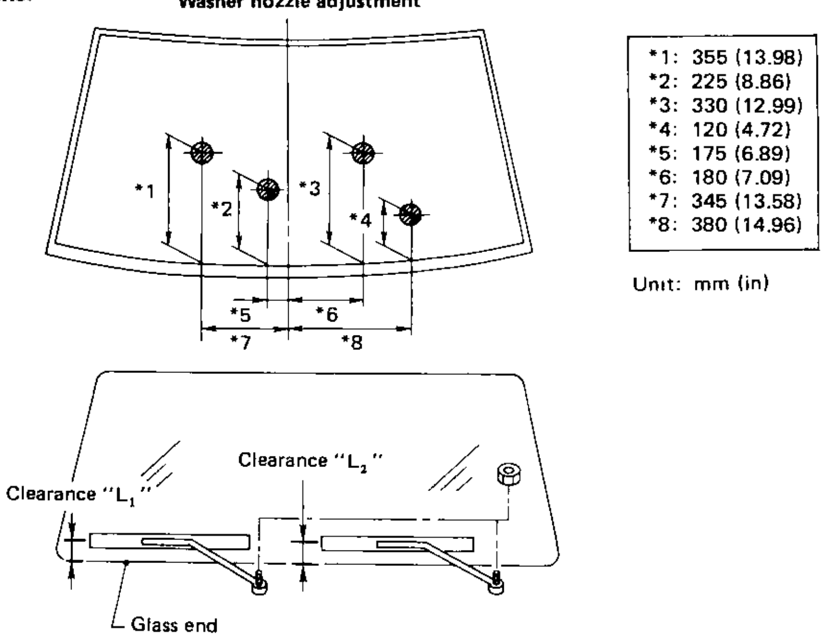
- Apply a small amount of grease to ball joints before installation.

Installation

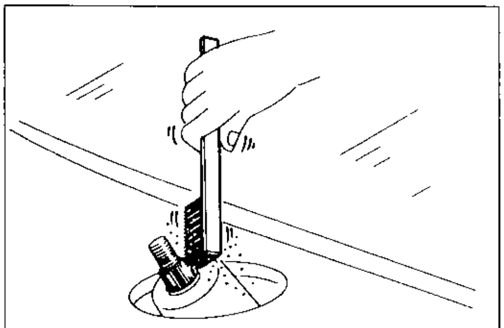
1. Prior to wiper arm installation, turn on wiper switch to operate wiper motor and then turn it "OFF" (Auto Stop).
2. Lift the blade up and then set it down onto glass surface to set the blade center to clearance "L_1" or "L_2" immediately before tightening nut.
3. Eject washer fluid. Turn on wiper switch to operate wiper motor and then turn it "OFF".
4. Ensure that wiper blades stop within clearance "L_1" & "L_2".
   Clearance "L_1": 22 - 32 mm (0.87 - 1.26 in)
   Clearance "L_2": 43 - 53 mm (1.69 - 2.09 in)

- Tighten windshield wiper arm nuts to specified torque.
  Windshield wiper:
  17 - 23 N·m (1.7 - 2.3 kg-m, 12 - 17 ft-lb)

Windshield wiper and washer

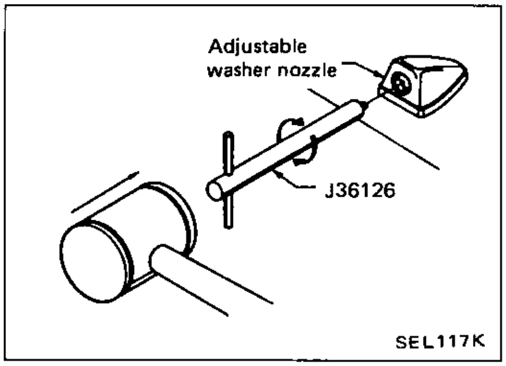


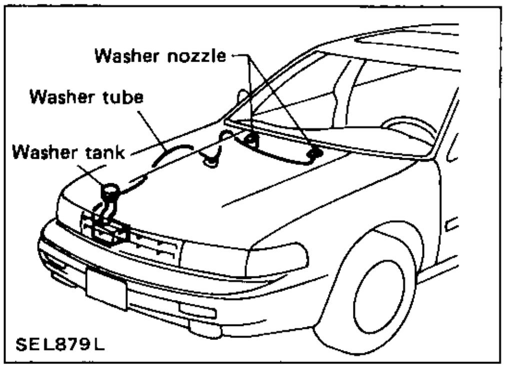
SEL877L



SEL024J

- **Before reinstalling wiper arm, clean up the pivot area as illustrated. This will reduce possibility of wiper arm looseness.**



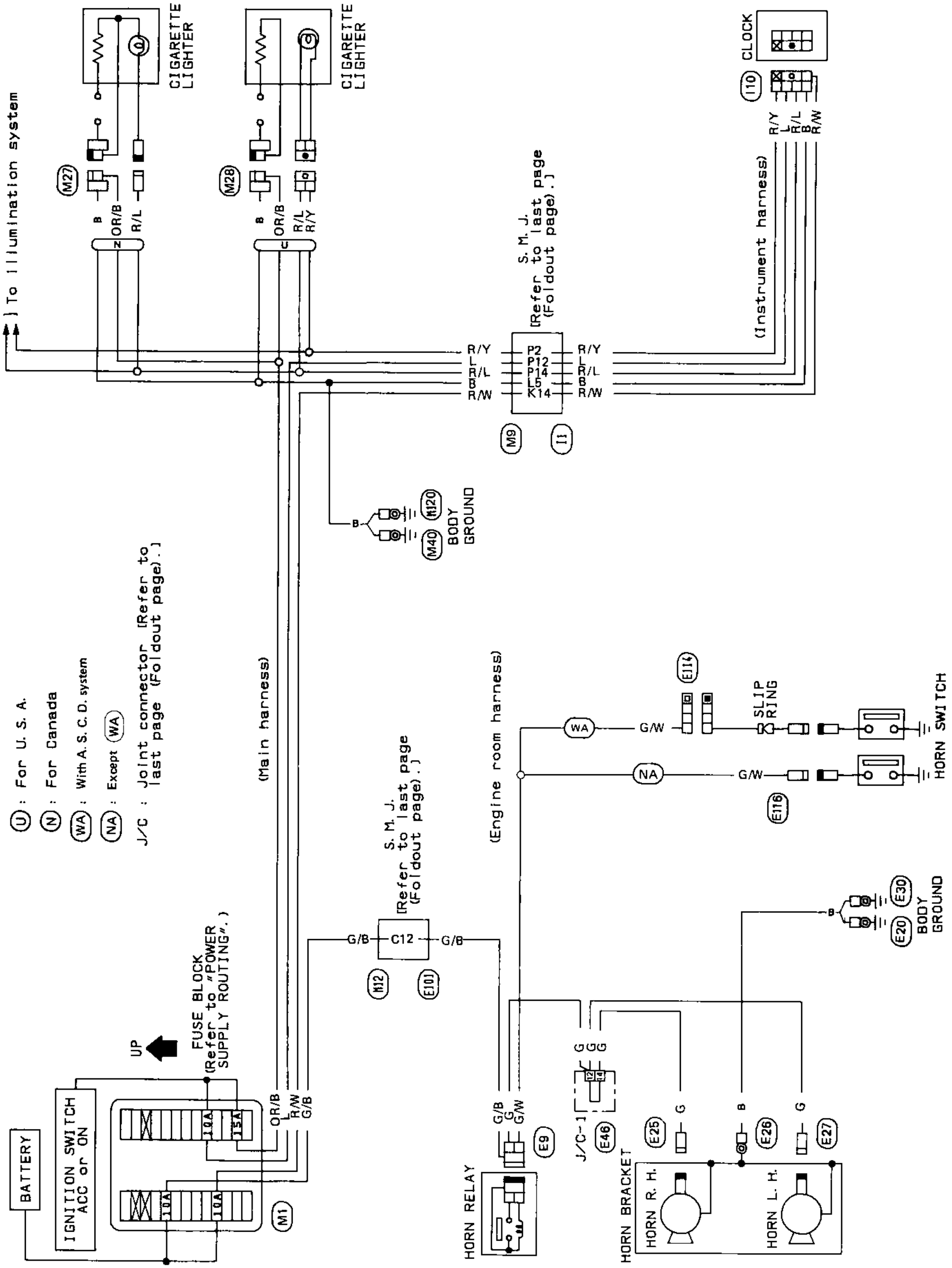


Washer Nozzle Adjustment

- Using Tool J36126, adjust windshield washer nozzle to correct its spray pattern.
  Special Service tool:
  Tool Number: J36126
  Tool Name: Washer nozzle adjusting tool

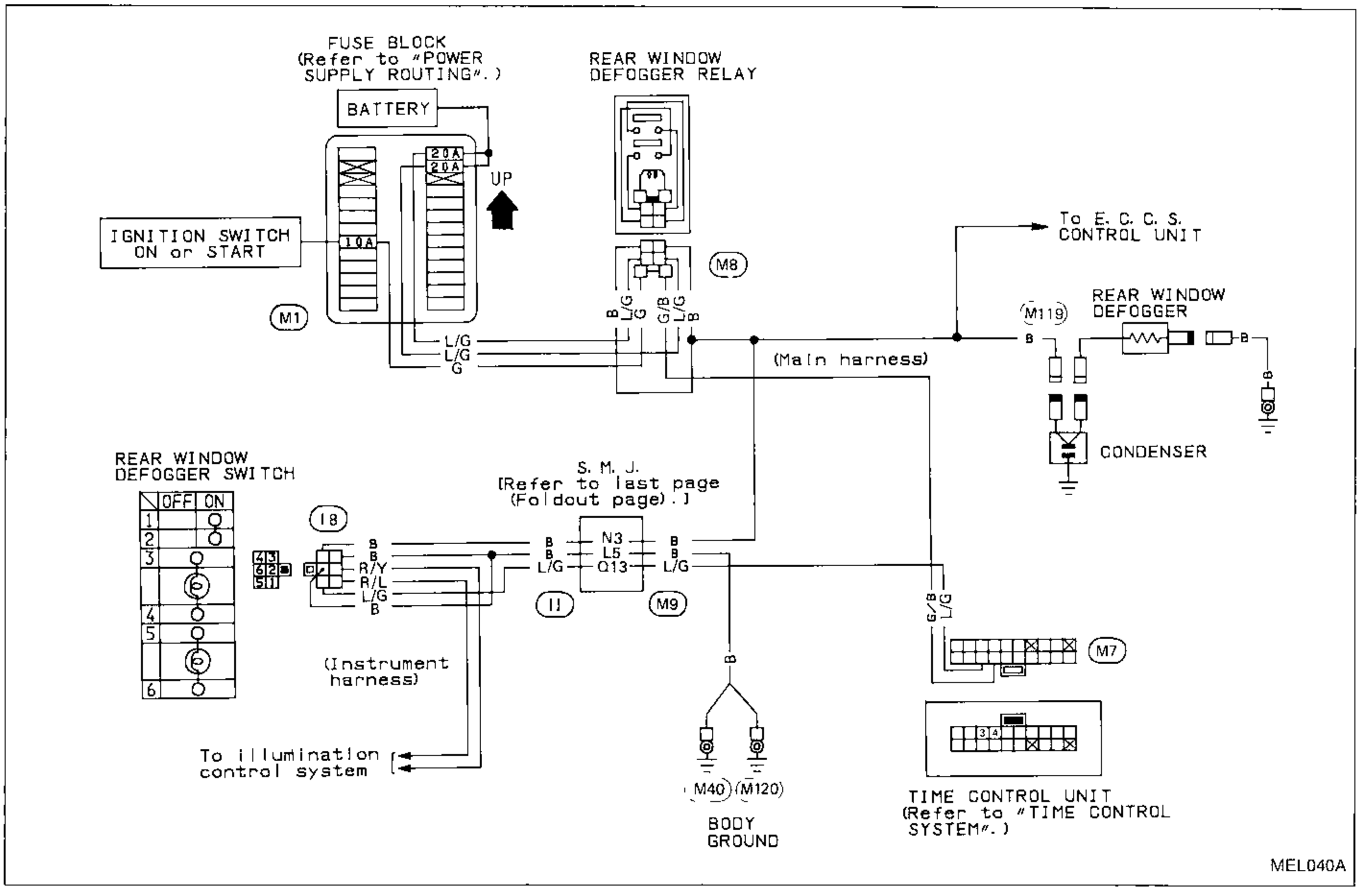
Before attempting to turn the nozzle, gently tap the end of the tool to free the nozzle.
This will prevent "rounding out" the small female square in the center of the nozzle.

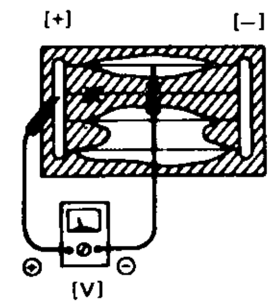
Wiring Diagram



SEL579Q

Wiring Diagram



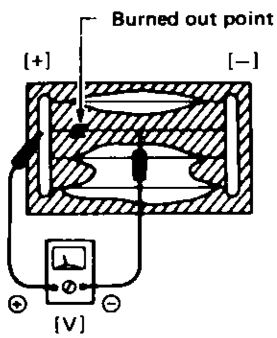


6 volts (normal filament)

SEL263

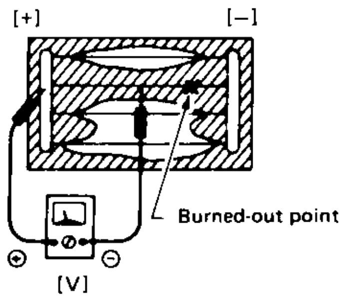
Filament Check

1. Attach probe circuit tester (in volt range) to middle portion of each filament.



SEL264

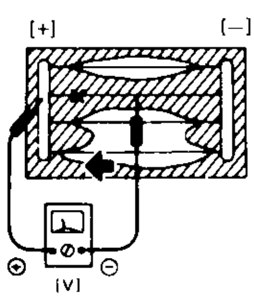
12 volts



0 volts

SEL265

2. If a filament is burned out, circuit tester registers 0 or 12 volts.



SEL266

3. To locate burned out point, move probe to left and right along filament to determine point where tester needle swings abruptly.

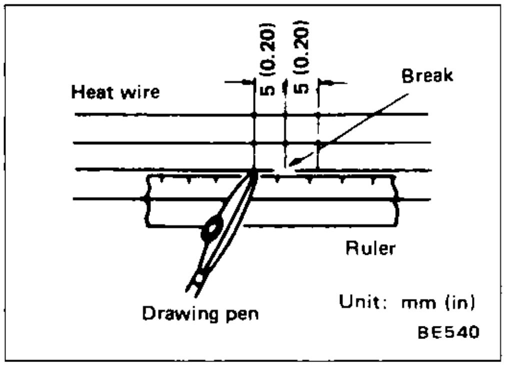
Filament Repair

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

Filament Repair (Cont'd)

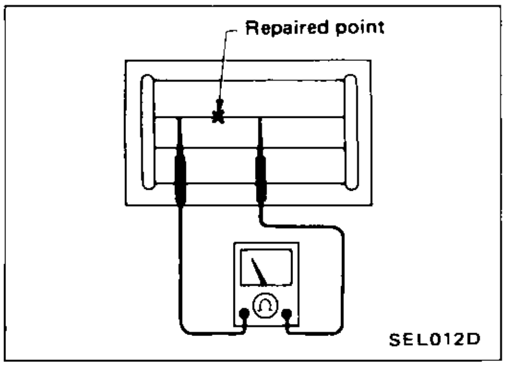
REPAIRING PROCEDURE



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.

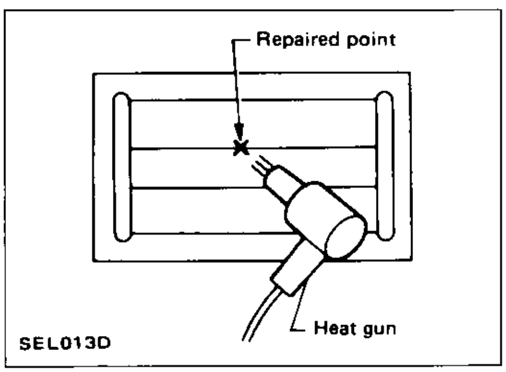
Shake silver composition container before use.

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.



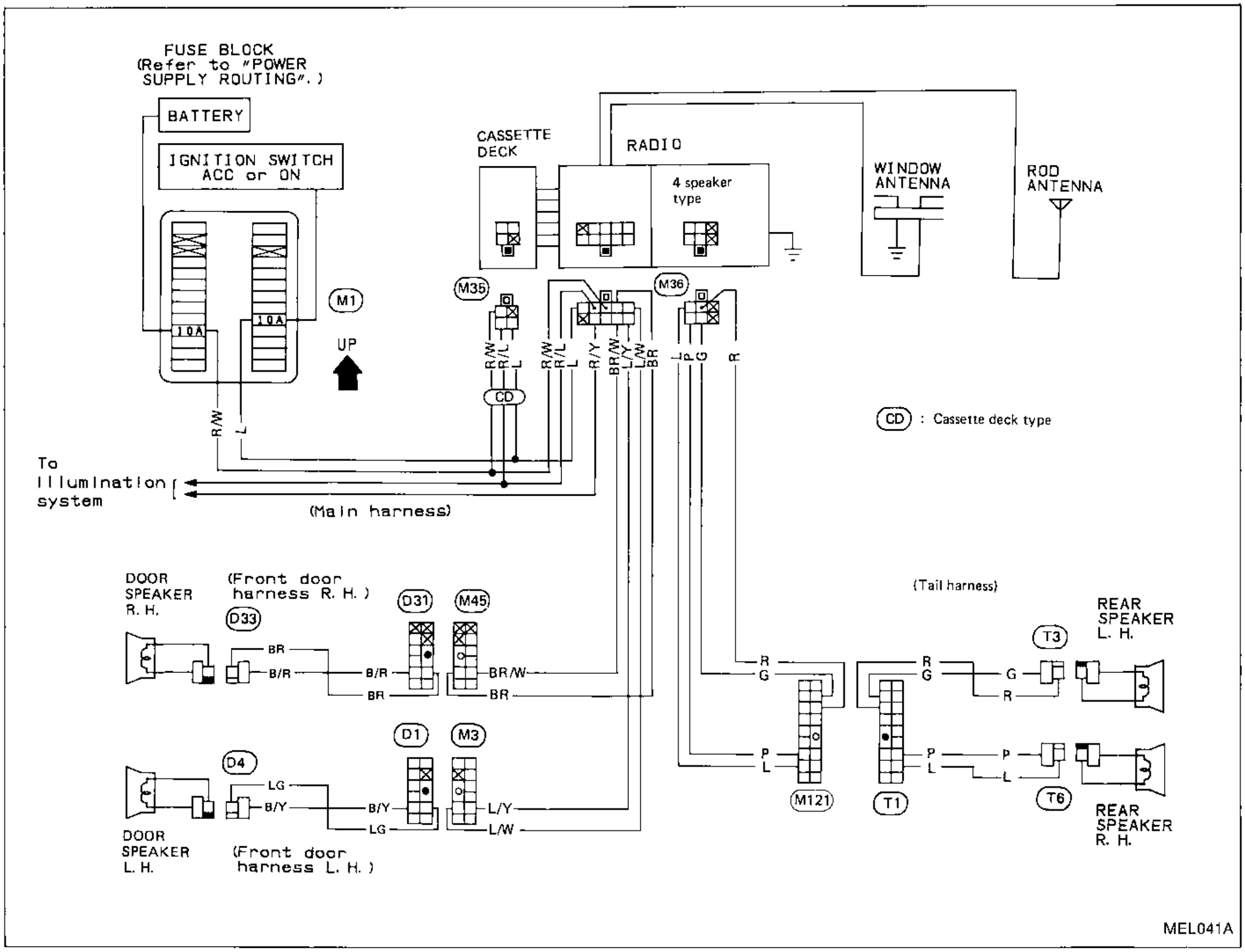
4. After repair has been completed, check repaired wire for continuity. This check should be conducted 10 minutes after silver composition is deposited.

Do not touch repaired area while test is being conducted.

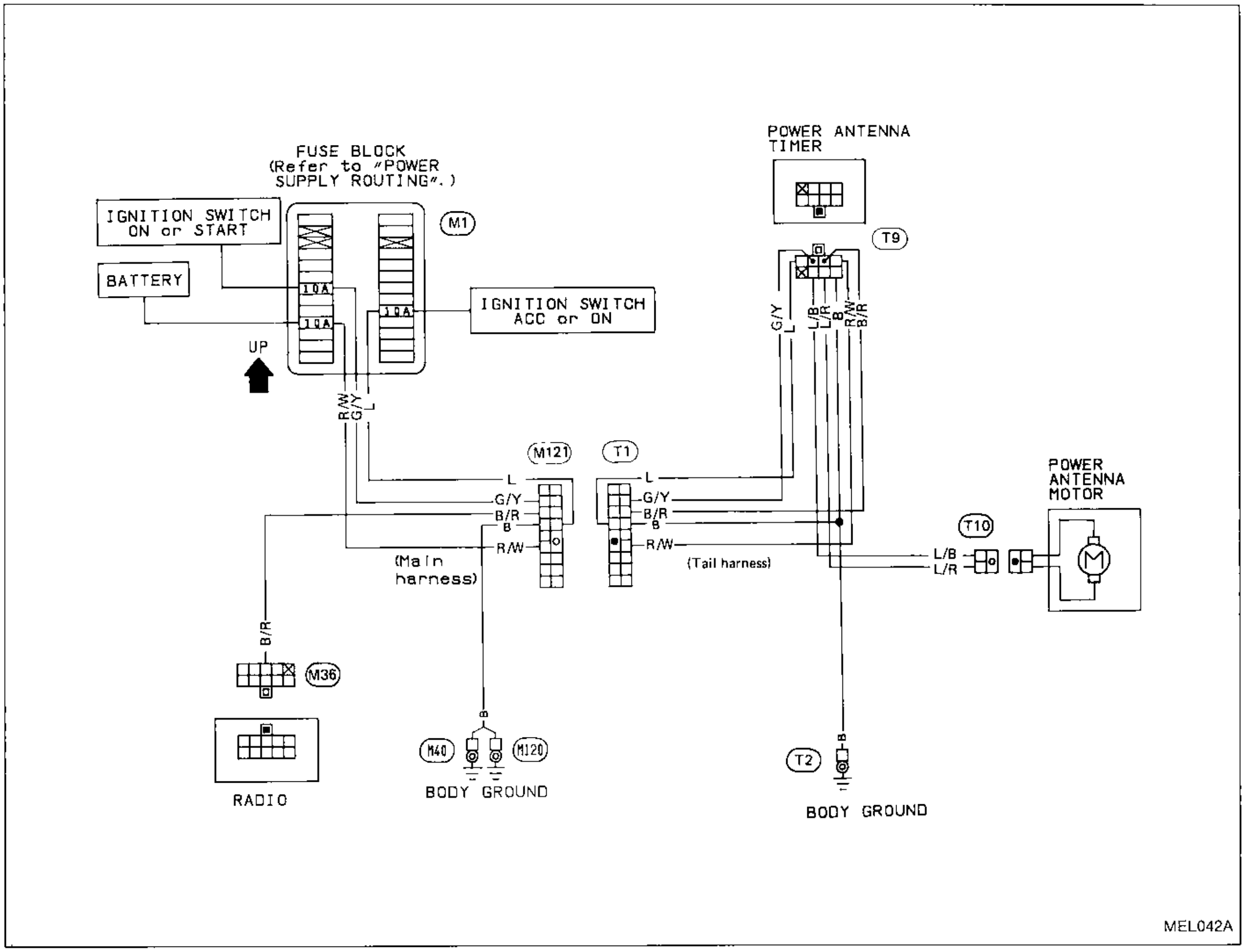


5. Apply a constant stream of hot air directly to the repaired area for approximately 20 minutes with a heat gun. A minimum distance of 3 cm (1.2 in) should be kept between repaired area and hot air outlet. If a heat gun is not available, let the repaired area dry for 24 hours.

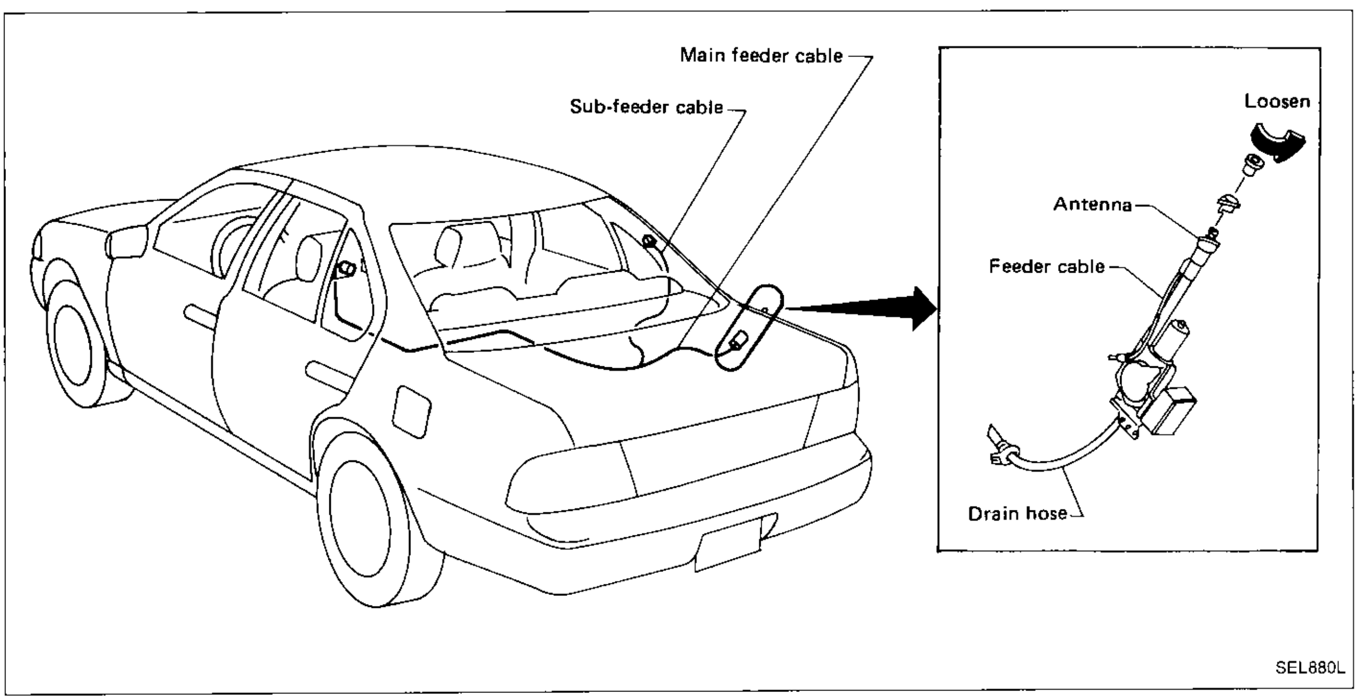
Audio/Wiring Diagram

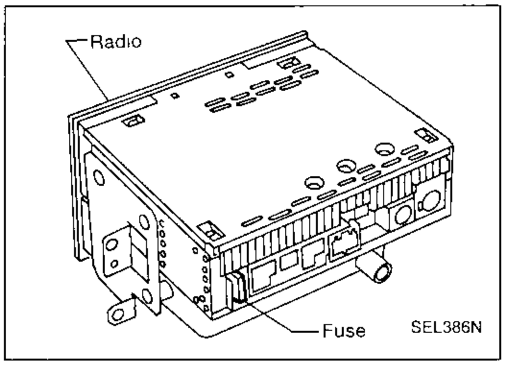


Power Antenna/Wiring Diagram

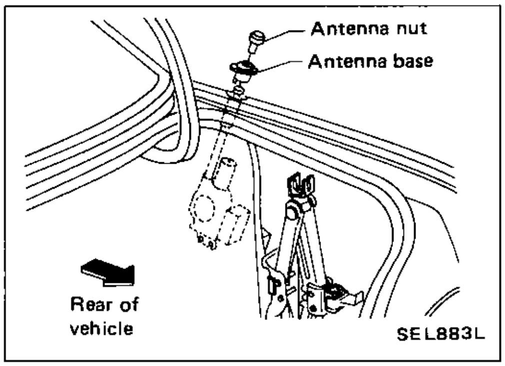


Location of Antenna





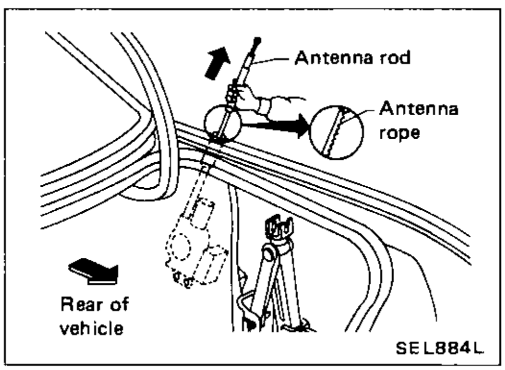
Radio Fuse Check



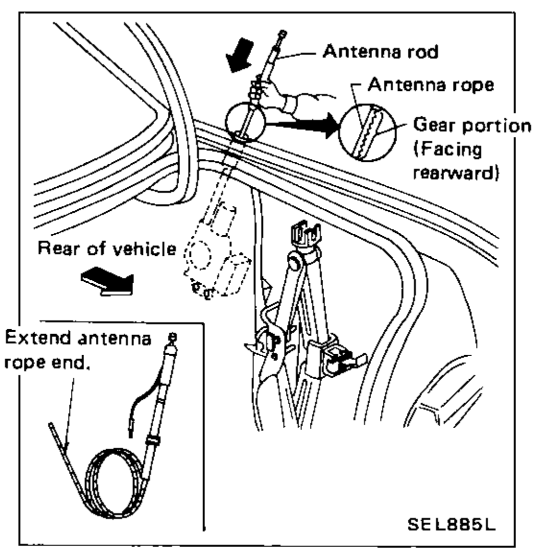
Antenna Rod Replacement

REMOVAL

1. Remove antenna nut and antenna base.



2. Withdraw antenna rod while raising it by operating antenna motor.

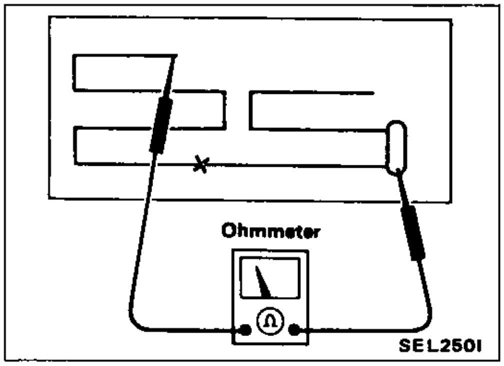


INSTALLATION

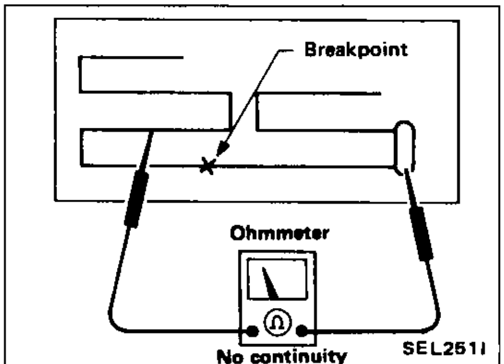
1. Lower antenna rod by operating antenna motor.
2. Insert gear section of antenna rope into place with it facing toward antenna motor.
3. As soon as antenna rope is wound on antenna motor, stop antenna motor. Insert antenna rod lower end into antenna motor pipe.
4. Retract antenna rod completely by operating antenna motor.
5. Install antenna nut and base.

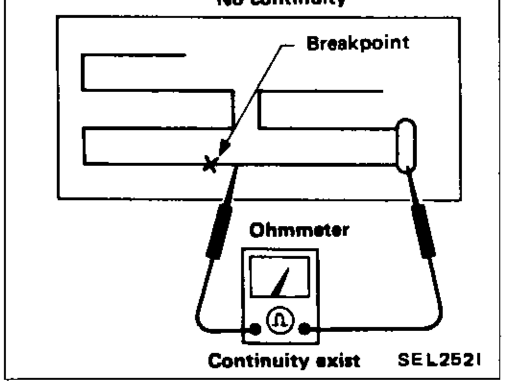
Window Antenna Repair

ELEMENT CHECK

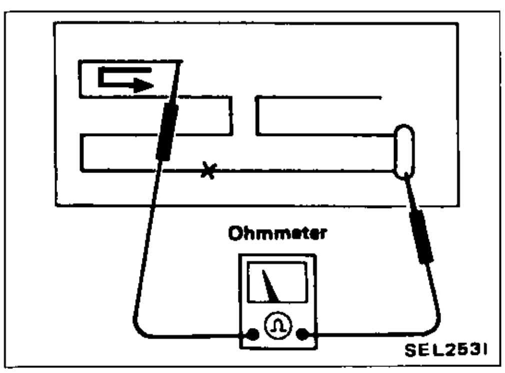


1. Attach probe circuit tester (in ohm range) to antenna terminal on each side.





2. If an element is broken, no continuity will exist.

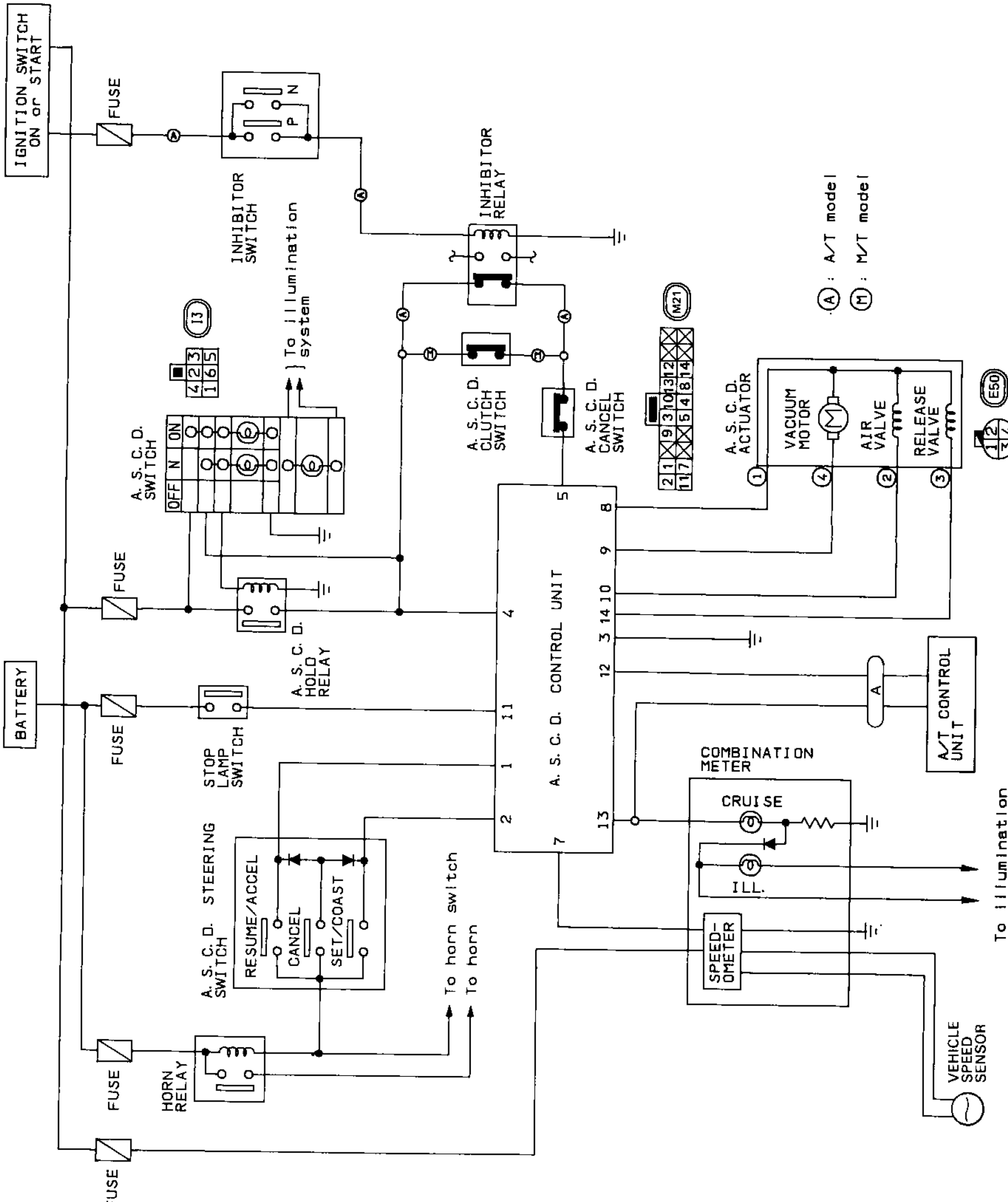


3. To locate broken point, move probe to left and right along element to determine point where tester needle swings abruptly.

ELEMENT REPAIR

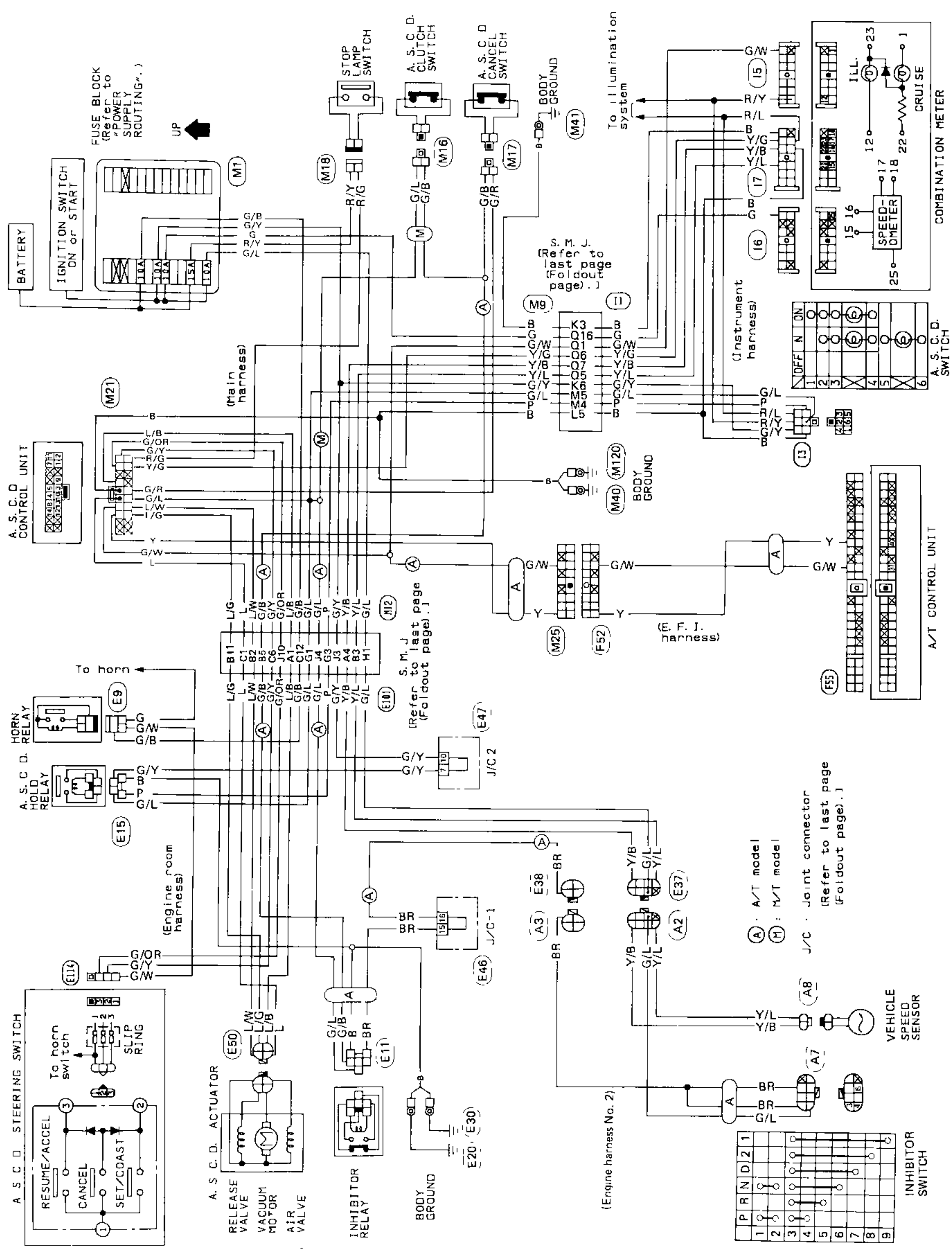
Refer to REAR WINDOW DEFOGGER "Filament Repair".

Schematic



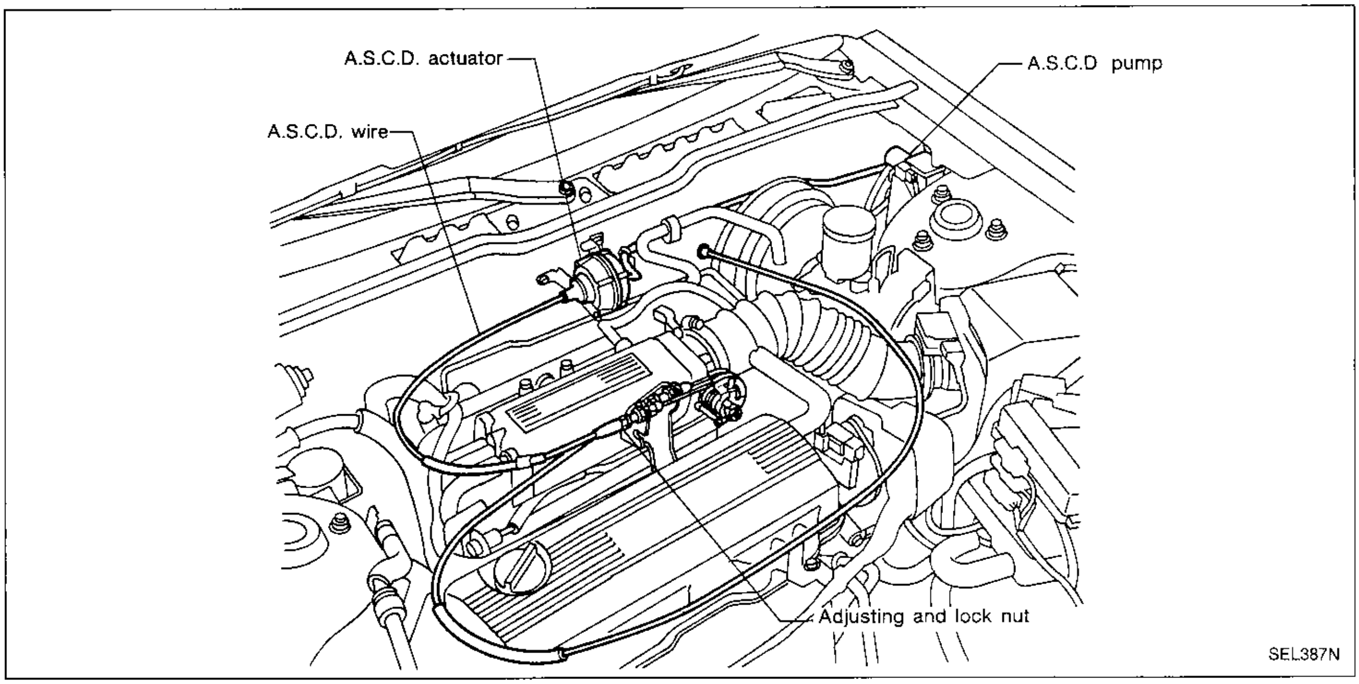
SEL580Q

Wiring Diagram



SEL581Q

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 securely 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.

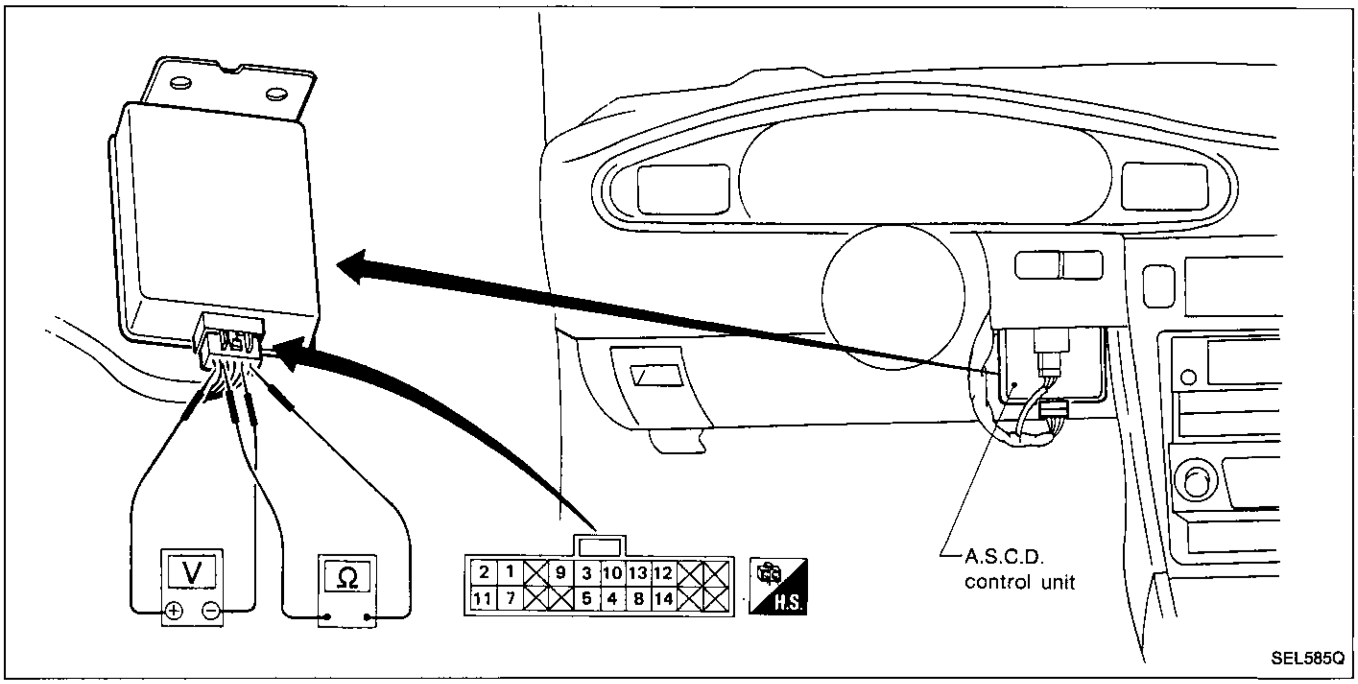
- For A.S.C.D. cancel switch, stop lamp switch and clutch switch adjustment, refer to BR and CL sections.

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.

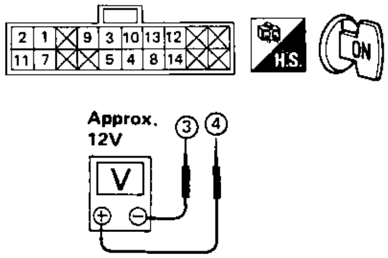
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE-1

A.S.C.D. control unit cannot be set properly.

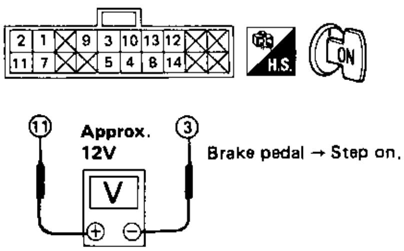
POWER SUPPLY CIRCUIT CHECK

1. Turn A.S.C.D. main switch to "ON".
2. Check voltage between ④ and ③.



CUT-OFF CIRCUIT CHECK

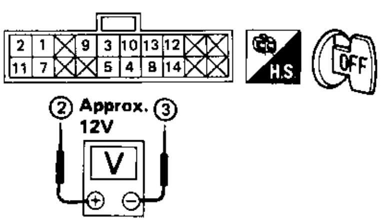
1. Step on brake pedal.
2. Turn A.S.C.D. main switch to "ON".
3. Check voltage between ⑪ and ③.



SEL586Q

SET SWITCH CIRCUIT CHECK

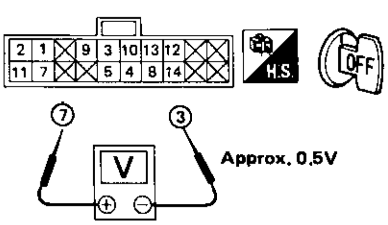
1. Push A.S.C.D. set switch.
2. Check voltage between ② and ③.



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.**



SEL587Q

Turn A.S.C.D. main switch "OFF" and then "ON" to make sure indicator illuminates. — N.G. → Check indicator bulb, A.S.C.D. main switch and hold relay.

↓ O.K.

Check power supply circuit for A.S.C.D. control unit. — N.G. → Check A.S.C.D. power supply harness.

↓ O.K.

Check cut-off circuit for A.S.C.D. control unit. — N.G. → Check A.S.C.D. cancel switch, clutch switch (M/T model), inhibitor relay and inhibitor switch (A/T model).

↓ O.K.

Check A.S.C.D. set switch circuit for A.S.C.D. control unit. — N.G. → Check A.S.C.D. set switch and harness between control unit and set switch.

↓ O.K.

Check speed sensor circuit. — N.G. → Check speed sensor and harness between A.S.C.D. control unit and speed sensor signal output terminal of combination meter.

↓ O.K.

Check actuator. Refer to "Actuator Check". — N.G. → Replace actuator.

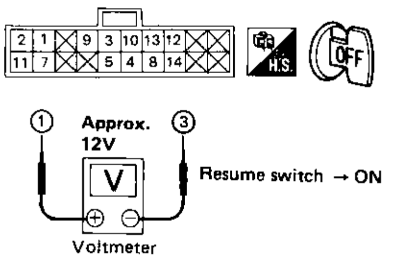
↓ O.K.

Replace A.S.C.D. control unit.

Trouble Diagnoses (Cont'd)

RESUME SWITCH CIRCUIT CHECK

1. Turn resume switch to "ON".
2. Check voltage between ① and ③.



SEL588Q

DIAGNOSTIC PROCEDURE-2

Resume switch will not operate.

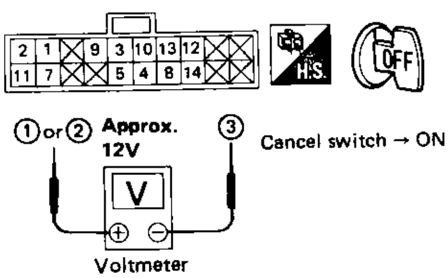
Check resume switch circuit. — N.G. → Check resume switch.

↓ O.K.

Replace A.S.C.D. control unit.

CANCEL SWITCH CIRCUIT CHECK

1. Turn cancel switch to "ON".
2. Check voltage between ② and ③ or ① and ③.



SEL589Q

DIAGNOSTIC PROCEDURE-3

Cancel switch will not operate.

Check cancel switch circuit. — N.G. → Check cancel switch.

↓ O.K.

Replace A.S.C.D. control unit.

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE-4

Engine hunts.

Check vacuum hose for breakage, cracks or fracture. — N.G. → Repair or replace hose.

↓ O.K.

Does A.S.C.D. wire move smoothly? — N.G. → Repair or replace wire.

↓ O.K.

Go to "Actuator Check". — N.G. → Replace actuator.

↓ O.K.

Replace A.S.C.D. control unit.

DIAGNOSTIC PROCEDURE-5

Large difference between set vehicle speed and actual speed.

Check A.S.C.D. wire and actuator moves smoothly. — N.G. → Replace wire or actuator.

↓ O.K.

Check vacuum hose for breakage, cracks of fracture. — N.G. → Repair or replace hose.

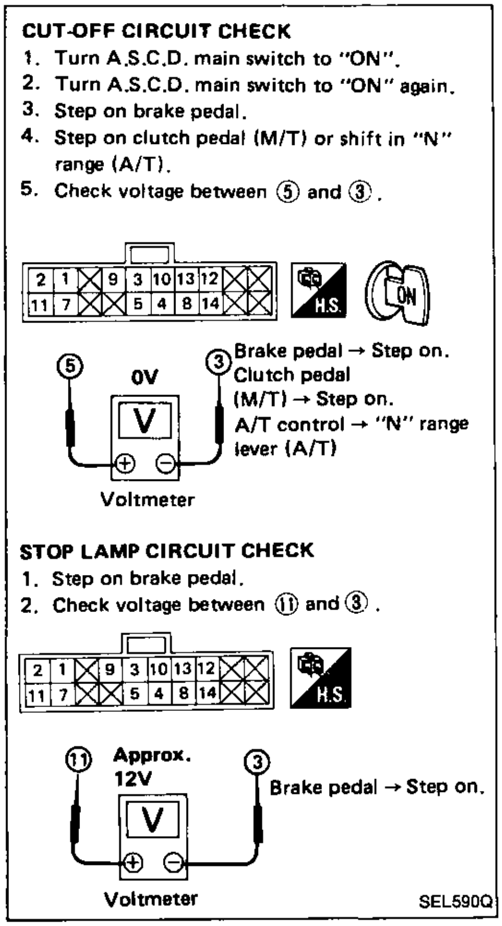
↓ O.K.

Go to "Actuator Check". — N.G. → Replace actuator.

↓ O.K.

Replace A.S.C.D. control unit.

Trouble Diagnoses (Cont'd)



DIAGNOSTIC PROCEDURE-6

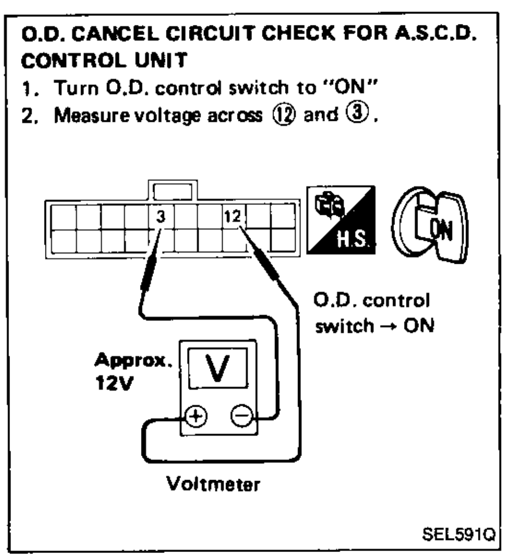
Set speed cannot be canceled.

Check cut-off circuit.
- N.G. → Check A.S.C.D. cancel switch, clutch switch (M/T model), inhibitor relay and inhibitor switch (A/T model).
- O.K. ↓

Check stop lamp circuit.
- N.G. → Check stop lamp switch and power supply harness.
- O.K. ↓

Check actuator. Refer to "Actuator Check".
- N.G. → Replace actuator.
- O.K. ↓

Replace A.S.C.D. control unit.



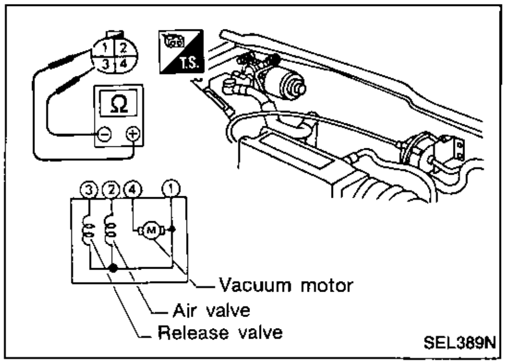
DIAGNOSTIC PROCEDURE-7

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".**

Check O.D. cancel circuit for A.S.C.D. control unit.
- N.G. → Check harness between O.D. cancel solenoid, O.D. control switch and A.S.C.D. control unit.
- O.K. ↓

Replace A.S.C.D. control unit.



SEL389N

Actuator Check

1. Disconnect A.S.C.D. actuator/A.S.C.D. pump connector.
2. Check A.S.C.D. actuator/A.S.C.D. pump operations as shown.

A

Check to see if motor starts when 12V D.C. is applied across ① and ④.
- N.G. → Replace A.S.C.D. pump.
- O.K. ↓

B

Check to see if A.S.C.D. wire is pulled when 12V D.C. is applied across ①, ②, ③ and ④.
- N.G. → Disconnect vacuum hose from A.S.C.D. actuator and check for presence of vacuum pressure at A.S.C.D. pump.
  - N.G. → Replace A.S.C.D. pump.
  - O.K. → Replace A.S.C.D. actuator.
- O.K. (Wire is pulled.) ↓

C

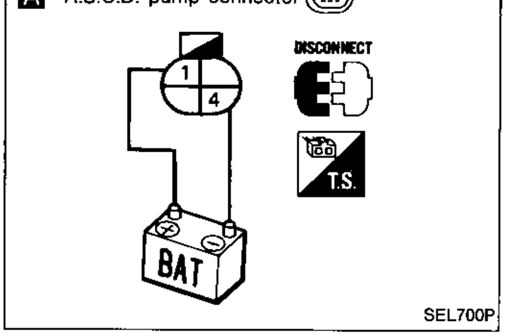
Check to see if A.S.C.D. wire returns to original position 50 to 60 seconds after disconnecting lead from ④.
- N.G. → Replace A.S.C.D. pump.
- O.K. (Wire does not return.) ↓

D

Disconnect lead from ① to see if A.S.C.D. wire returns immediately.
- N.G. → Replace A.S.C.D. pump.
- O.K. (Wire returns.) ↓

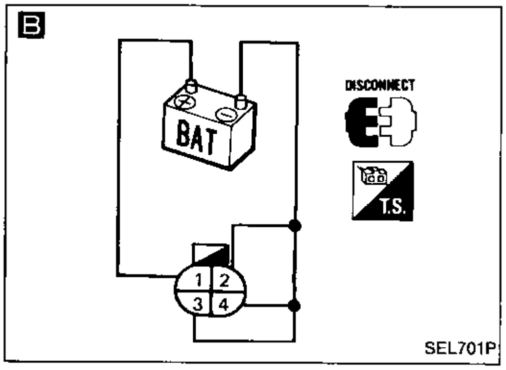
A.S.C.D. actuator/A.S.C.D. pump are O.K.

A A.S.C.D. pump connector (E50)



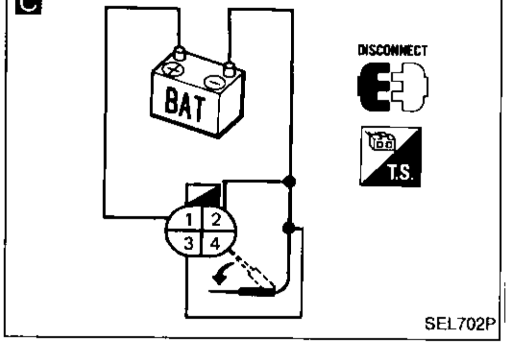
SEL700P

B



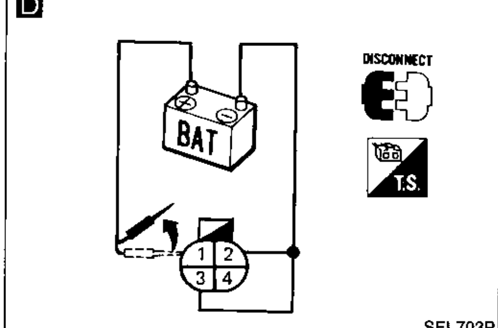
SEL701P

C



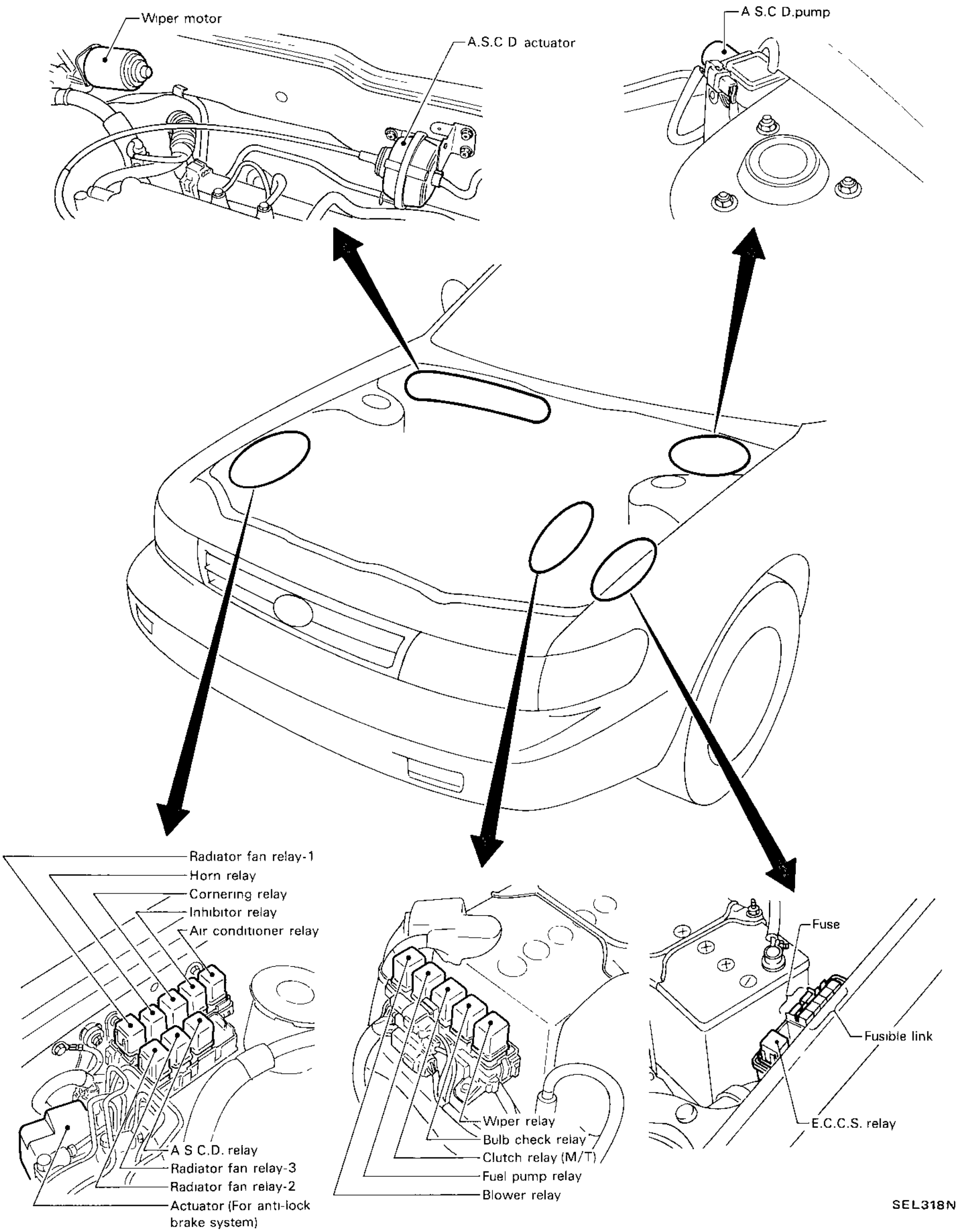
SEL702P

D

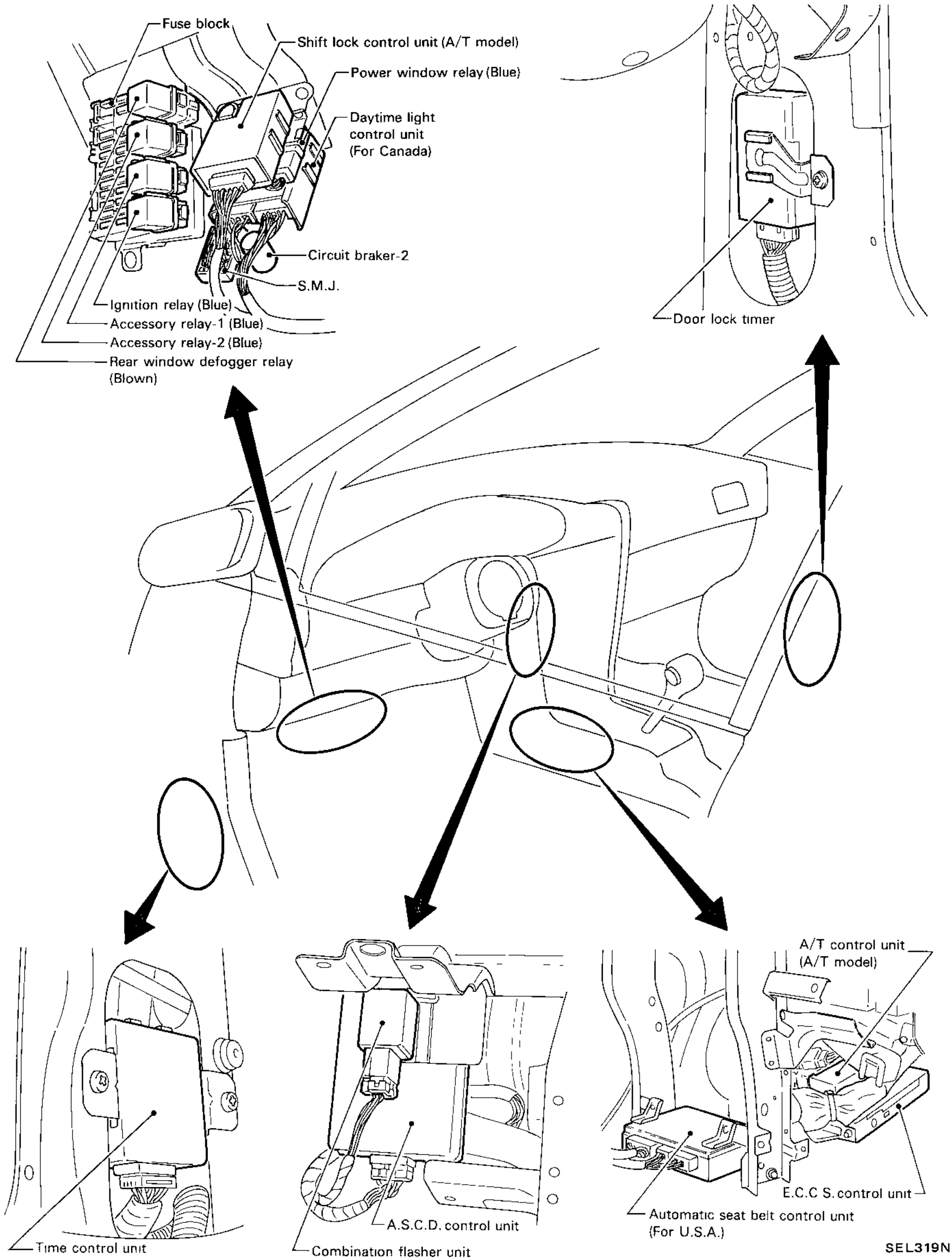


SEL703P

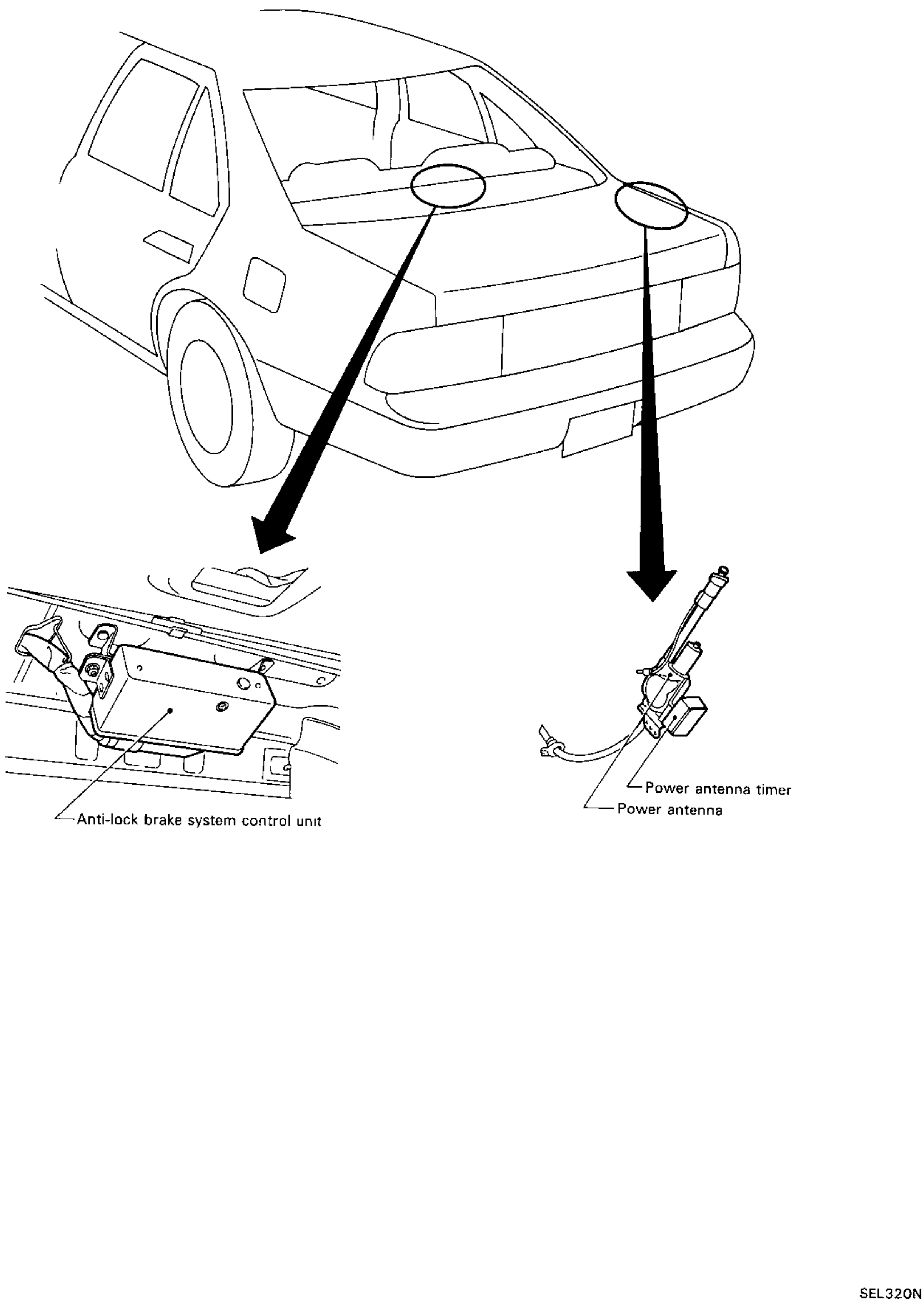
Engine Compartment



Passenger Compartment

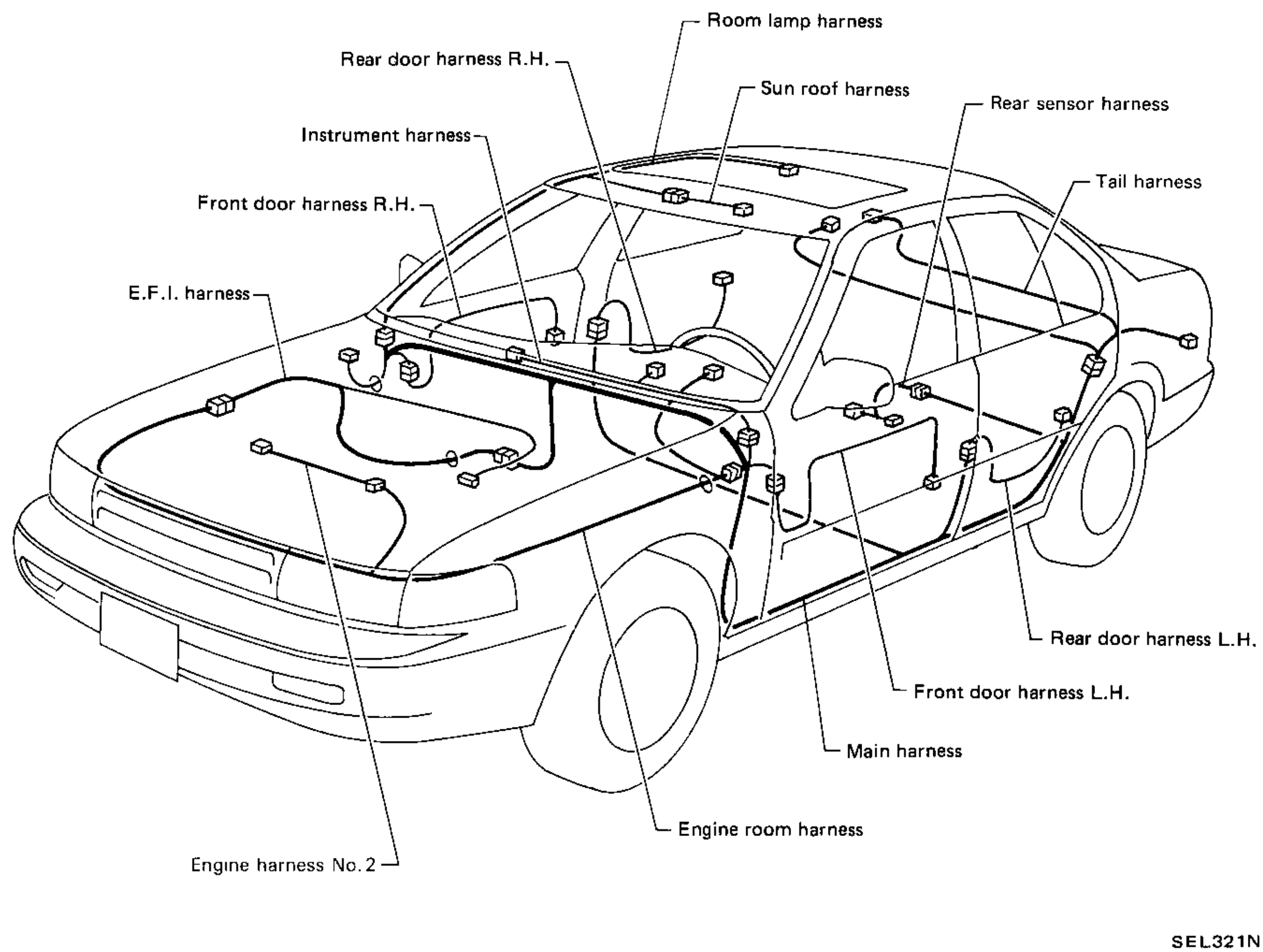


Luggage Compartment



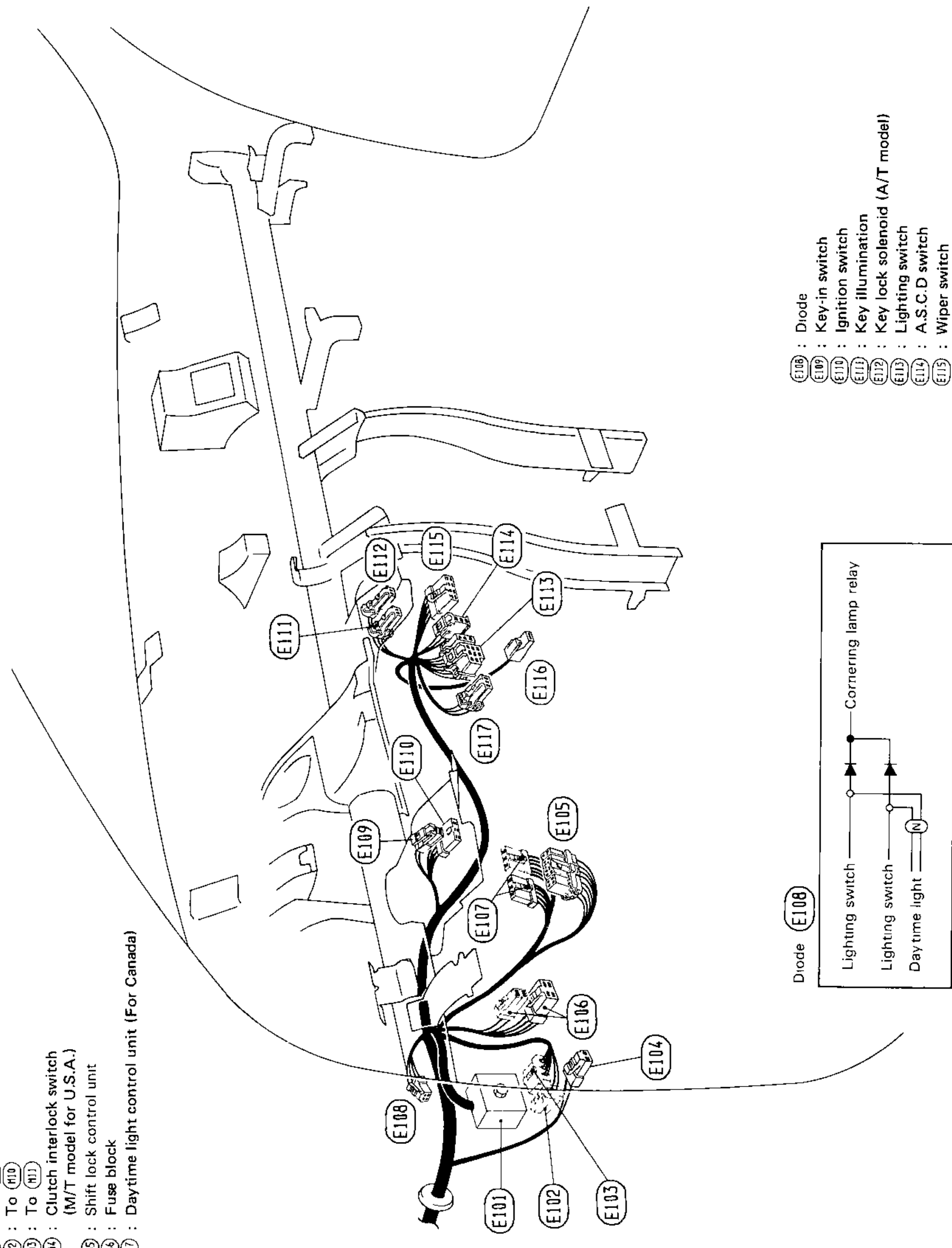
NOTE

Outline


Room lamp harness
Rear door harness R.H.
Sun roof harness
Rear sensor harness
Instrument harness
Tail harness
Front door harness R.H.
E.F.I. harness
Rear door harness L.H.
Front door harness L.H.
Main harness
Engine room harness
Engine harness No. 2
SEL321N

Engine Room Harness

PASSENGER COMPARTMENT

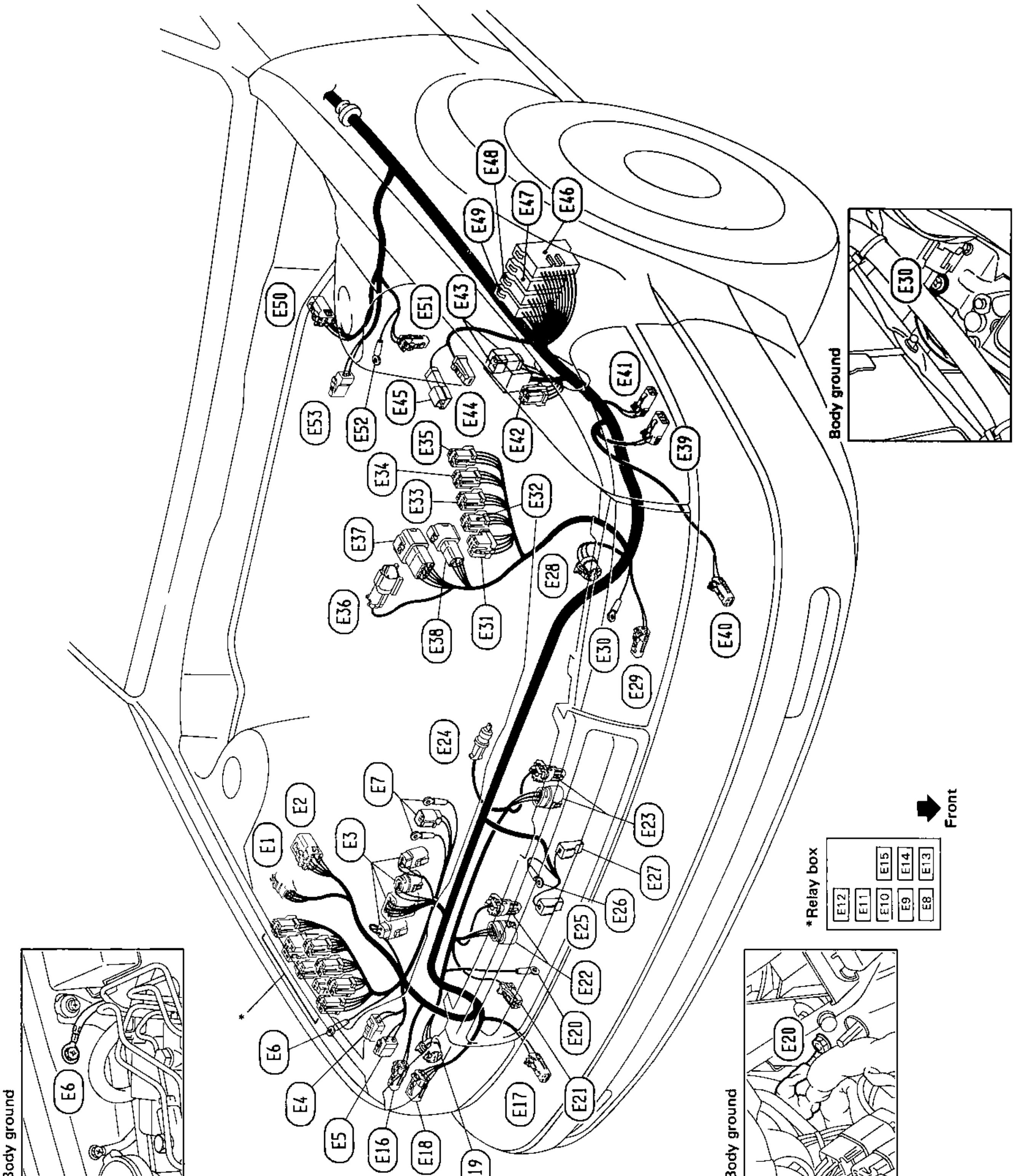


- E101 : To M12 (S.M.J.)
- E102 : To M10
- E103 : To M11
- E104 : Clutch interlock switch (M/T model for U.S.A.)
- E105 : Shift lock control unit
- E106 : Fuse block
- E107 : Daytime light control unit (For Canada)

- E108 : Diode
- E109 : Key-in switch
- E110 : Ignition switch
- E111 : Key illumination
- E112 : Key lock solenoid (A/T model)
- E113 : Lighting switch
- E114 : A.S.C.D switch
- E115 : Wiper switch
- E116 : Horn switch (Without A S C.D. system)
- E117 : Cornering lamp switch

SEL323N

ENGINE COMPARTMENT



Engine Room Harness (Cont'd)

E1 : To F1
E2 : To F2
E3 : Actuator (For anti-lock brake system)
E4 : Washer sensor
E5 : Washer motor
E6 : Body ground
E7 : Alternator
E8 : Radiator fan relay-1
E9 : Horn relay
E10 : Cornering lamp relay
E11 : Inhibitor relay (A/T model)
E12 : Air conditioner relay
E13 : Radiator fan relay-2
E14 : Radiator fan relay-3
E15 : A.S.C.D. hold relay
E16 : Cornering lamp R.H.
E17 : Front turn signal lamp R.H.
E18 : Front combination lamp R.H.
E19 : Headlamp R.H.
E20 : Body ground
E21 : Compressor
E22 : Radiator fan motor-1
E23 : Radiator fan motor-2
E24 : Exhaust gas sensor
E25 : Horn R.H.
E26 : Horn ground
E27 : Horn L.H.
E28 : Headlamp L.H.
E29 : Dual-pressure switch
E30 : Body ground
E31 : Wiper relay
E32 : Bulb check relay
E33 : Interlock relay (M/T model for U.S.A.)
E34 : Fuel pump relay
E35 : Blower relay
E36 : To A1
E37 : To A2
E38 : To A3
E39 : Front combination lamp L.H.
E40 : Front turn signal lamp L.H.
E41 : Cornering lamp L.H.
E42 : E.C.C.S. relay
E43 : Fusible link box
E44 : Battery
E45 : Fusible link
E46 : Joint connector-1
E47 : Joint connector-2
E48 : Joint connector-3
E49 : Joint connector-4
E50 : A.S.C.D. pump
E51 : Front sensor L.H.
(For anti-lock brake system)
E52 : Body ground (For anti-lock brake system)
E53 : Brake fluid level switch

SEL322N

Main Harness

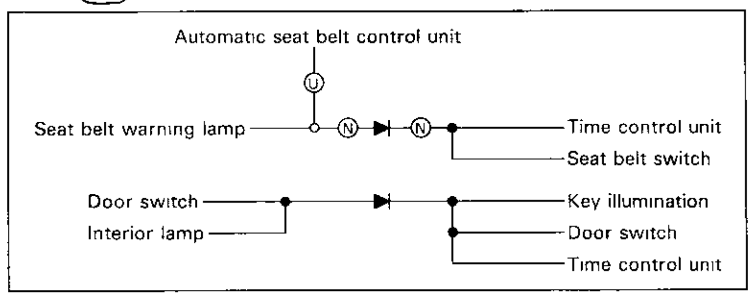
Main Harness (Cont'd)

- M1 : Fuse block
- M2 : Power window relay
- M3 : To D1
- M4 : To D2
- M5 : To D3
- M6 : Diode
- M7 : Time control unit
- M8 : Rear window defogger relay
- M9 : To I1 (S.M.J.)
- M10 : To E102
- M11 : To E103
- M12 : To E101 (S.M.J.)
- M13 : Circuit breaker-1
- M14 : Circuit breaker-2
- M15 : Front limit switch L.H. (For U.S.A.)
- M16 : A.S.C.D clutch switch
- M17 : A.S.C.D. cancel switch
- M18 : Stop lamp switch
- M19 : Combination flasher unit
- M20 : Mode door motor
- M21 : A.S.C.D. control unit
- M22 : Check connector
- M23 : To F53
- M24 : To F51
- M25 : To F52
- M26 : Ash tray illumination
- M27 : Cigarette lighter (For Canada)
- M28 : Cigarette lighter (For U.S.A.)
- M29 : Automatic seat belt control unit (For U.S.A.)
- M30 : Thermo control amp
- M31 : Resistor
- M32 : Push control unit
- M33 : Fan switch
- M34 : Fresh vent control illumination
- M35 : Cassete deck
- M36 : Radio
- M37 : Intake door motor
- M38 : To R1 (For U.S.A.)
- M39 : To R2 (For Canada)
- M40 : Body ground
- M41 : Body ground
- M42 : Blower motor
- M43 : Door lock timer
- M44 : To D32
- M45 : To D31
- M46 : A/C switch

Engine compartment

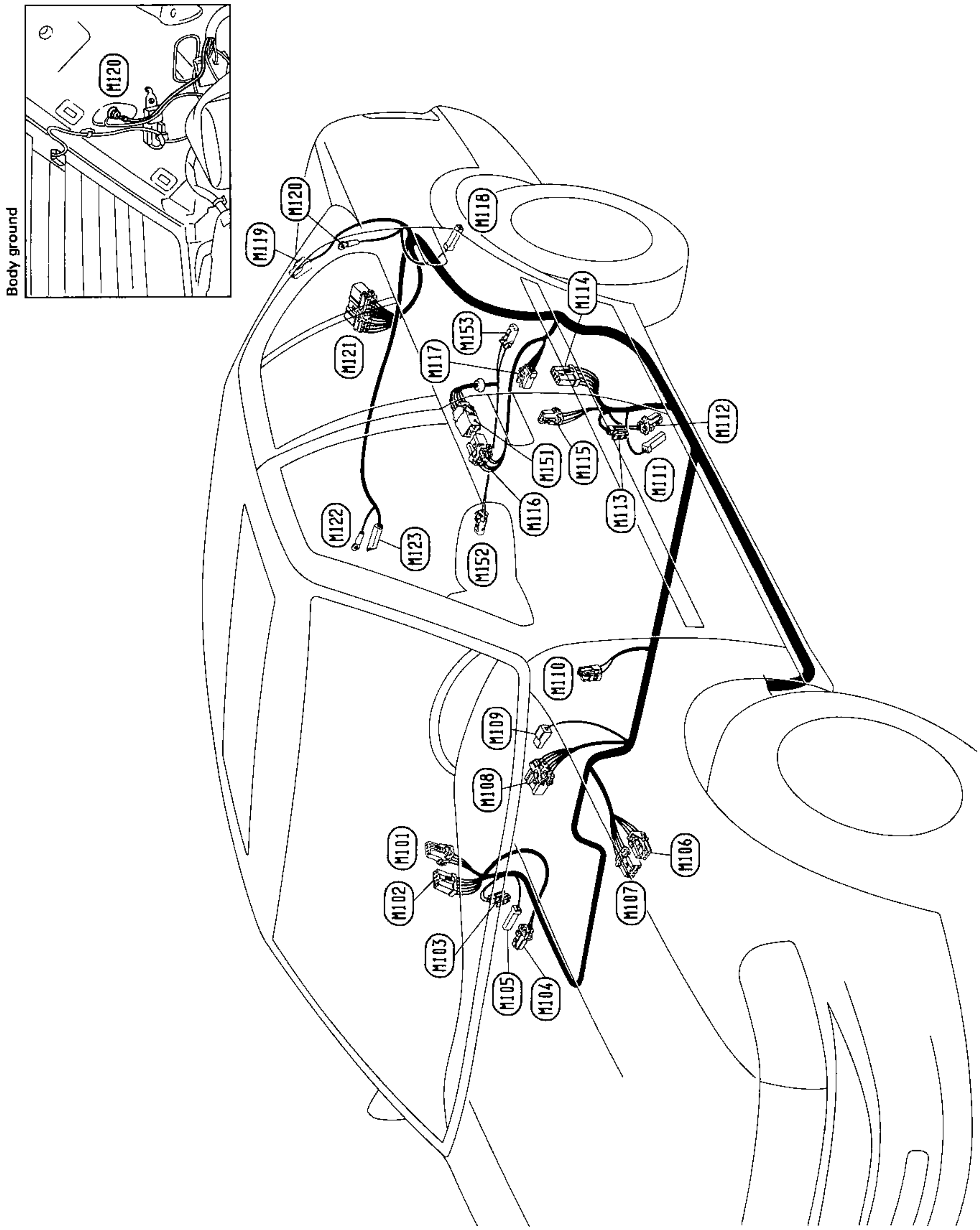
- M51 : Front sensor R.H. (For anti-lock brake system)
- M52 : Body ground (For anti-lock brake system)
- M53 : Power stearing oil pressure switch
- M54 : Wiper motor

Diode M6



SEL583Q

Main Harness (Cont'd)



Main Harness (Cont'd)

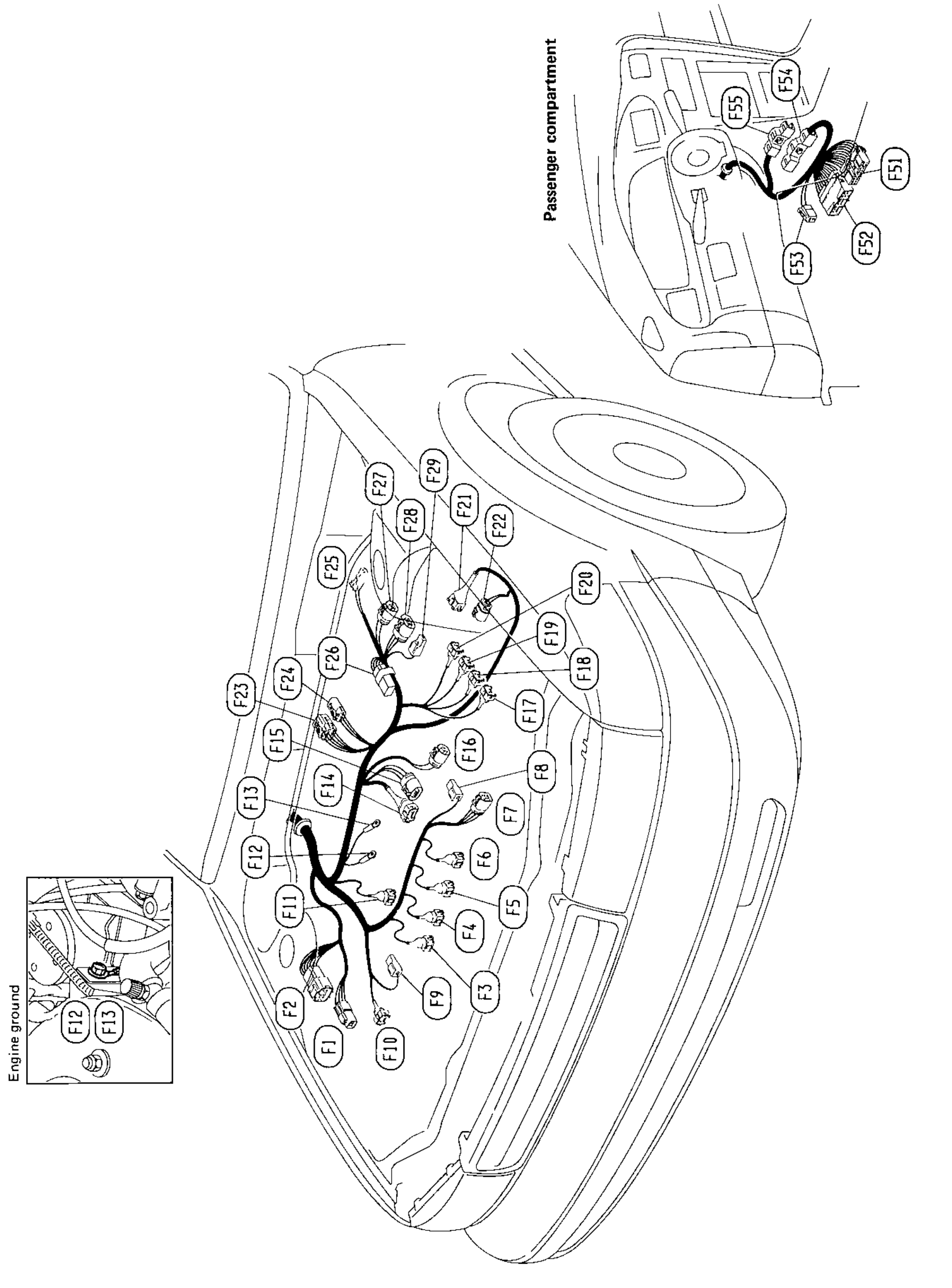
M101 : Rear limit switch and shoulder belt buckle switch R.H. (For U.S.A.)
M102 : To D71
M103 : Drive motor R.H. (For U.S.A)
M104 : Front door switch R.H. (For U.S.A)
M105 : Front door switch R.H. (For Canada)
M106 : Overdrive switch and A/T indicator illumination (A/T model)
M107 : Shift lock solenoid and detention switch (A/T model)
M108 : A/T mode switch
M109 : Parking brake switch
M110 : Lap belt buckle switch (For U.S.A.)
Seat belt switch (For Canada)
M111 : Front door switch L.H. (For Canada)
M112 : Front door switch L.H.
M113 : Drive motor L.H. (For U.S.A.)
M114 : To D51
M115 : Rear limit switch and shoulder belt buckle switch L.H. (For U.S.A.)
M116 : To M151 (For anti-lock brake system)
M117 : Fuel tank gauge unit
M118 : Rear door switch L.H.
M119 : Rear window defogger
M120 : Body ground
M121 : To T1
M122 : Body ground (For anti-lock brake system)
M123 : Anti-lock brake system control unit

Rear sensor harness (For anti-lock brake system)

M151 : To M116
M152 : Rear sensor R.H.
M153 : Rear sensor L.H.

SEL325N

E.F.I. Harness


Passenger compartment
F51
F52
F53
F54
F55
Engine ground
F12
F13
F1
F2
F3
F4
F5
F6
F7
F8
F9
F10
F11
F12
F13
F14
F15
F16
F17
F18
F19
F20
F21
F22
F23
F24
F25
F26
F27
F28
F29

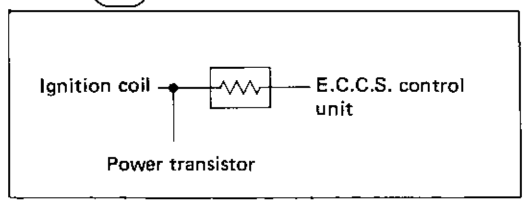
E.F.I. Harness (Cont'd)

F1 : To E1
F2 : To E2
F3 : Injector No 1
F4 : Injector No.2
F5 : Injector No 3
F6 : Injector No.4
F7 : Crank angle sensor
F8 : Distributor ground
F9 : Thermal transmitter
F10 : Engine temperature sensor
F11 : A.A.C. valve
F12 : Engine ground
F13 : Engine ground
F14 : Throttle valve switch
F15 : Throttle sensor
F16 : Exhaust gas temperature sensor (For California)
F17 : A.I.V. control solenoid valve
F18 : Pressure regulator control solenoid valve
F19 : S.C.V control solenoid valve
F20 : E.G.R. control solenoid valve
F21 : Air flow meter
F22 : Air temperature sensor
F23 : To terminal cord assembly (A/T model)
F24 : Speed sensor
F25 : Dropping resistor (A/T model)
F26 : Resistor and condenser
F27 : Ignition coil
F28 : Power transistor
F29 : Ignition coil

Passenger compartment

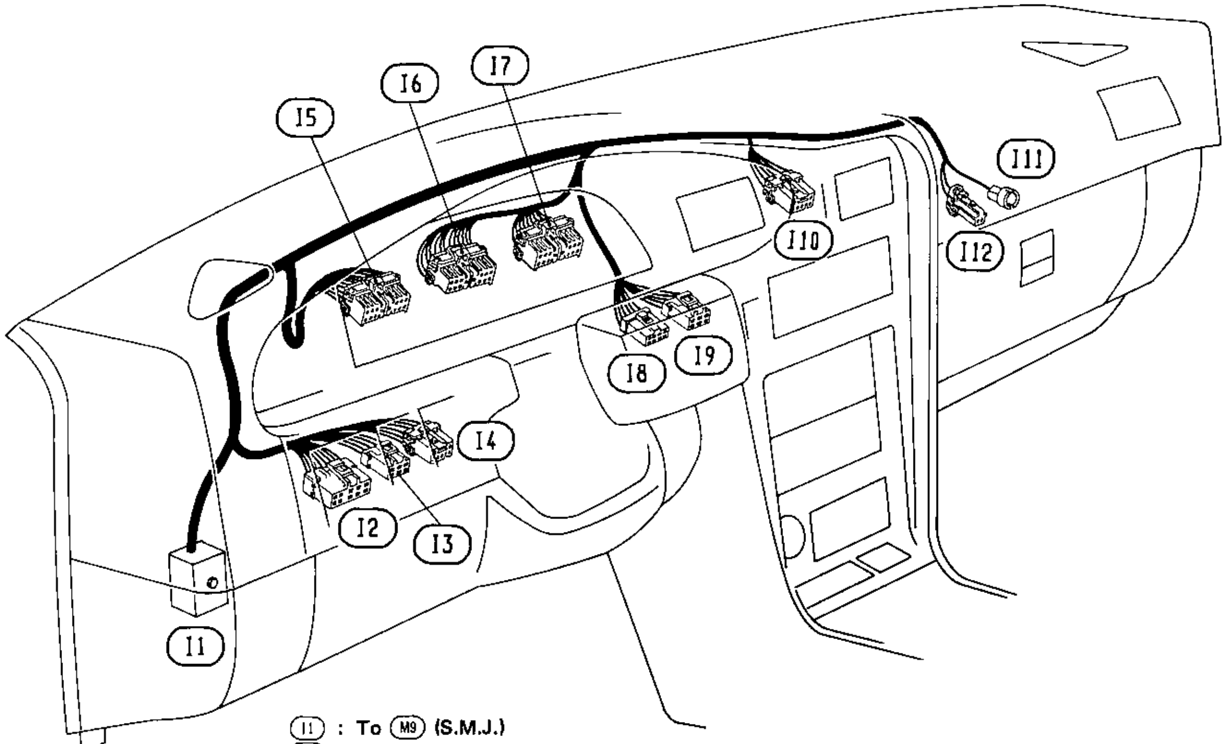
F51 : To M24
F52 : To M25
F53 : To M23
F54 : E.C.C.S. control unit
F55 : A/T control unit (A/T model)

Resistor F26



SEL326N

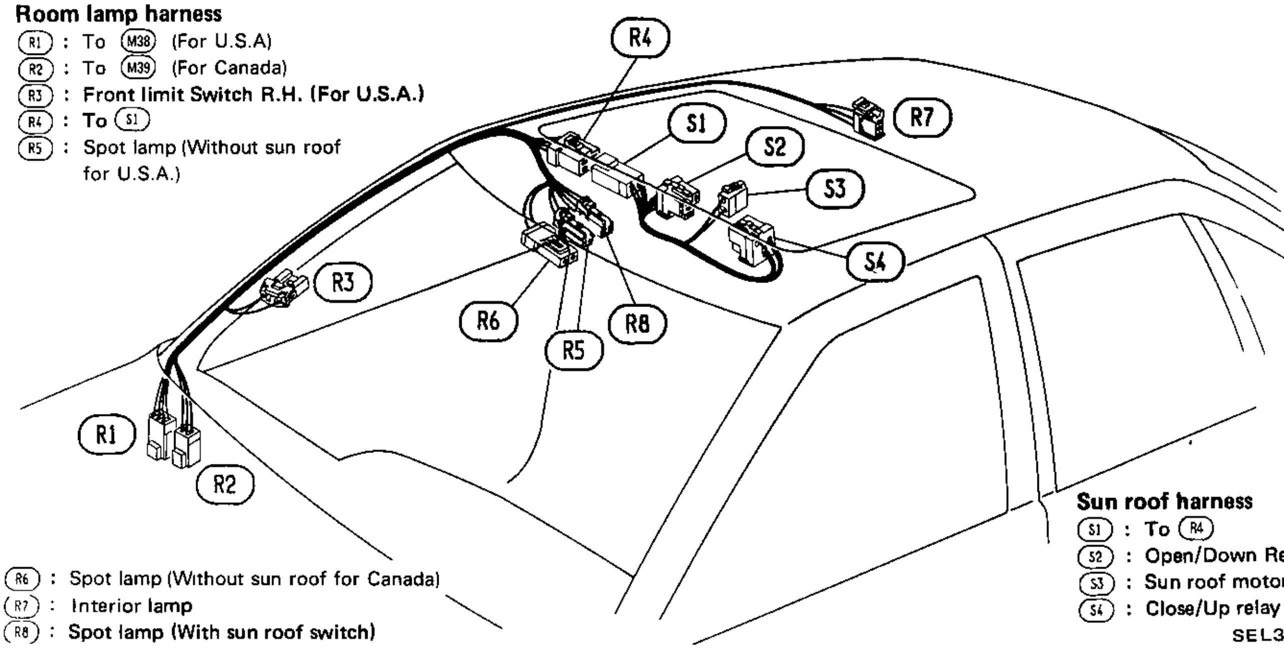
Instrument Harness



- (I1) : To (M9) (S.M.J.)
- (I2) : Door mirror switch
- (I3) : A.S.C.D. main switch
- (I4) : Illumination control switch
- (I5) : Combination meter
- (I6) : Combination meter
- (I7) : Combination meter
- (I8) : Rear window defogger switch
- (I9) : Hazard switch
- (I10) : Clock
- (I11) : Glove box lamp
- (I12) : Glove box lamp switch

SEL327N

Room Lamp and Sun Roof Harness



Room lamp harness

- (R1) : To (M38) (For U.S.A)
- (R2) : To (M39) (For Canada)
- (R3) : Front limit Switch R.H. (For U.S.A.)
- (R4) : To (S1)
- (R5) : Spot lamp (Without sun roof for U.S.A.)
- (R6) : Spot lamp (Without sun roof for Canada)
- (R7) : Interior lamp
- (R8) : Spot lamp (With sun roof switch)

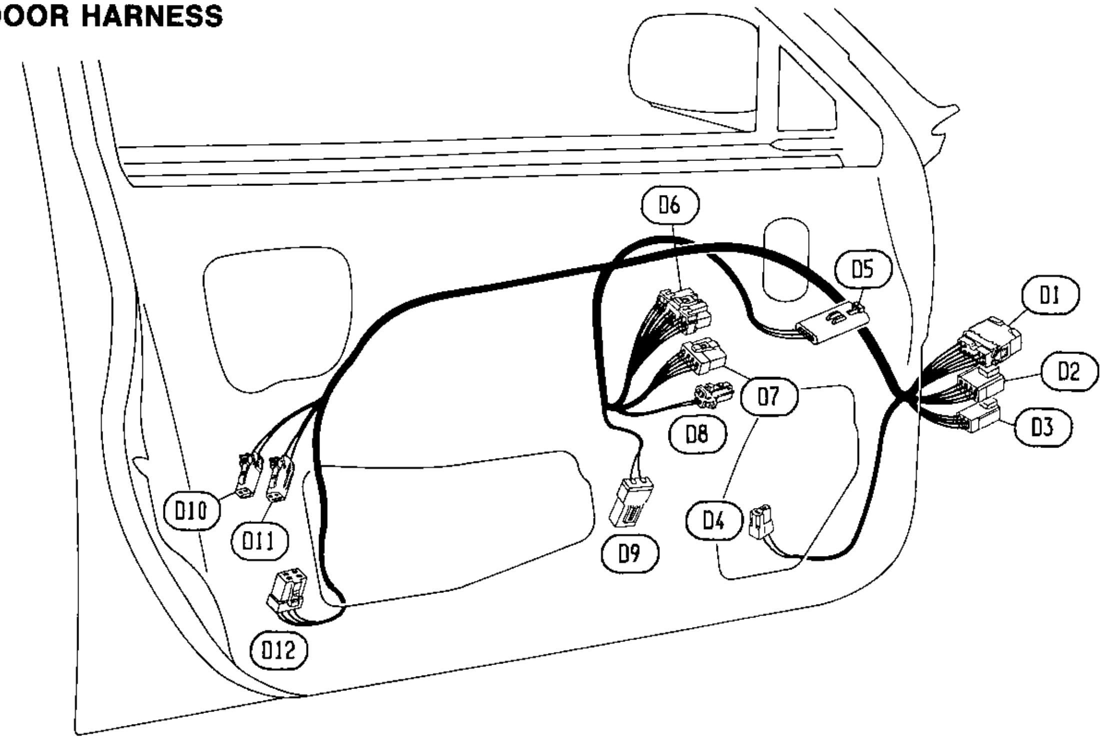
Sun roof harness

- (S1) : To (R4)
- (S2) : Open/Down Relay
- (S3) : Sun roof motor
- (S4) : Close/Up relay

SEL328N

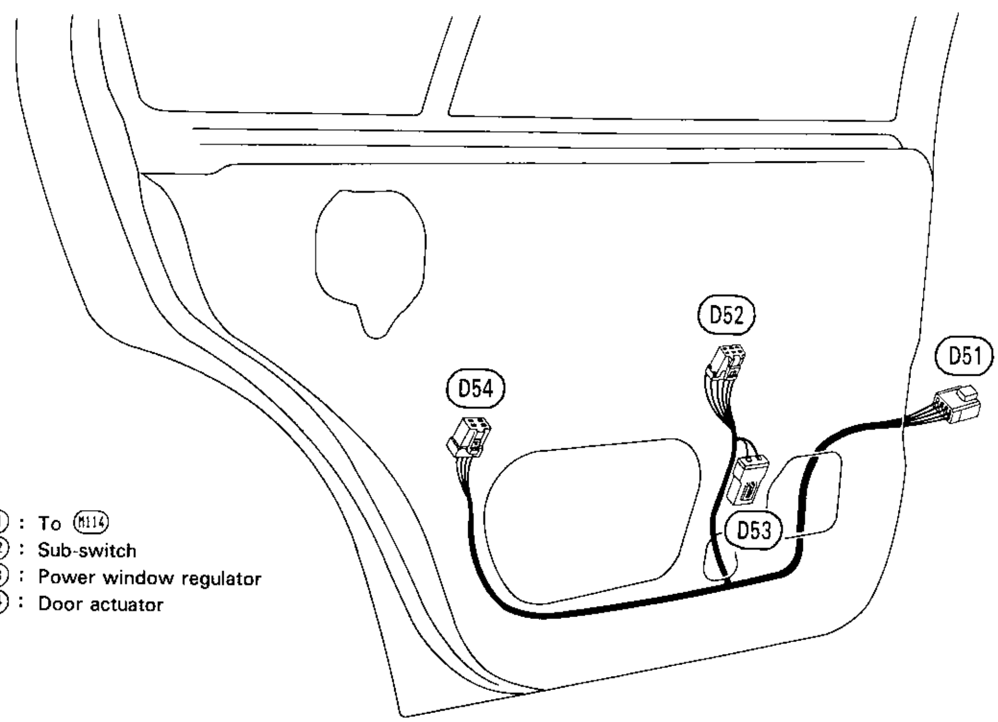
Door Harness (L.H. side)

FRONT DOOR HARNESS



D1 : To M3
D2 : To M4
D3 : To M5
D4 : Door speaker
D5 : Door mirror
D6 : Main switch
D7 : Power window amp
D8 : Main switch illumination
D9 : Power window regulator
D10 : Door latch switch (For U.S.A.)
D11 : Door lock knob switch
D12 : Door actuator

REAR DOOR HARNESS

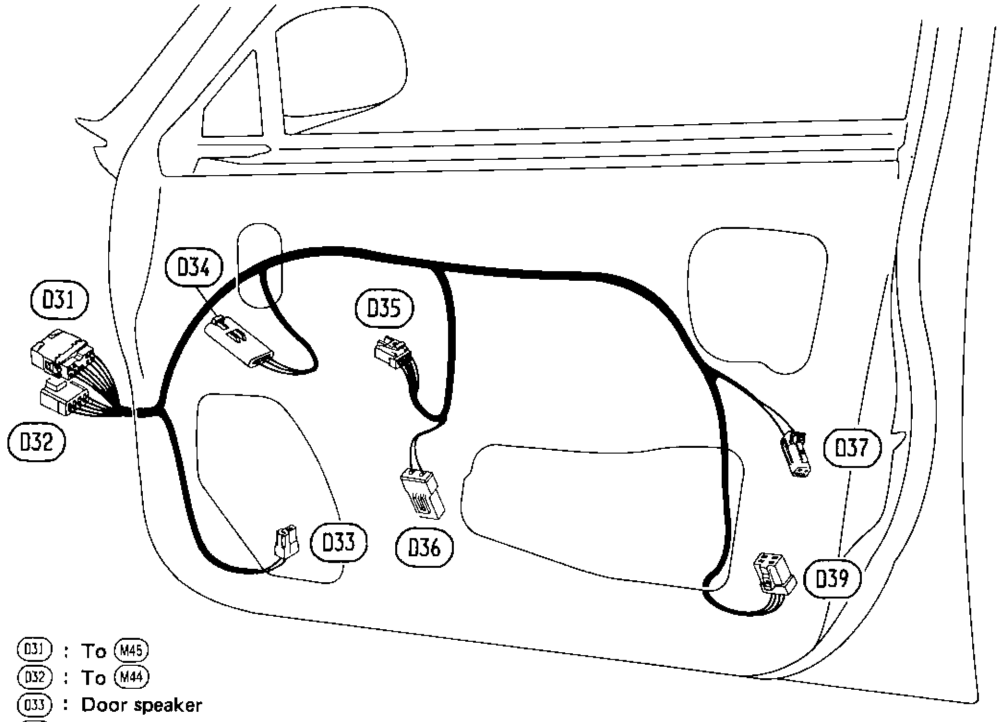


D51 : To M114
D52 : Sub-switch
D53 : Power window regulator
D54 : Door actuator

SEL329N

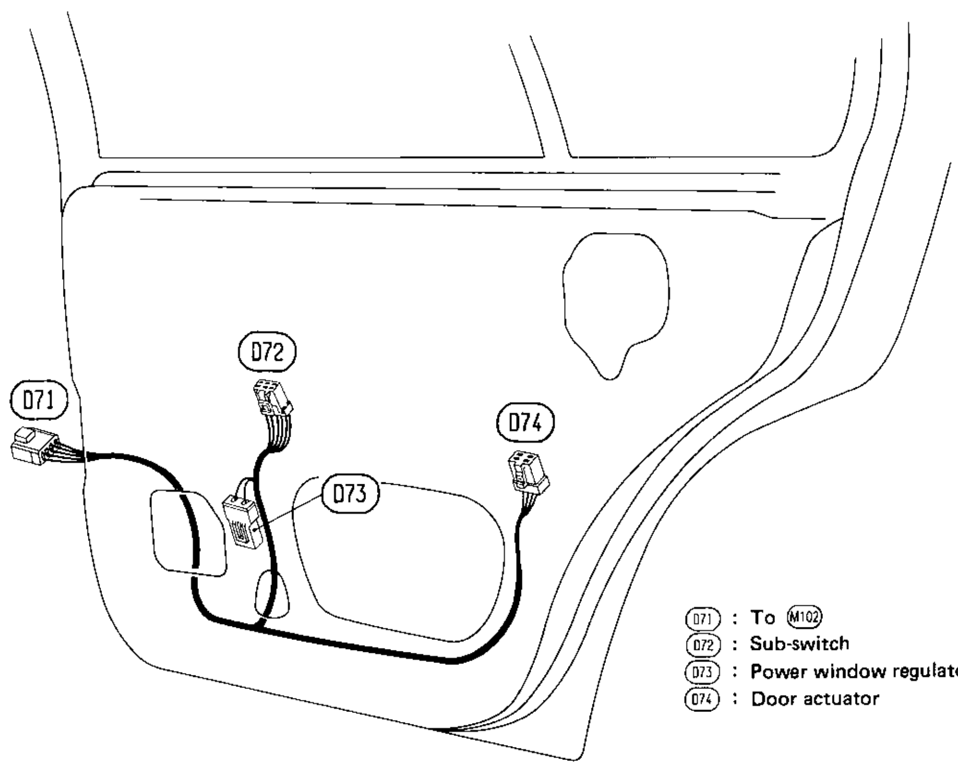
Door Harness (R.H. side)

FRONT DOOR HARNESS



D31 : To M45
D32 : To M44
D33 : Door speaker
D34 : Door mirror
D35 : Sub-switch
D36 : Power window regulator
D37 : Door latch switch (For U.S.A.)
D39 : Door actuator

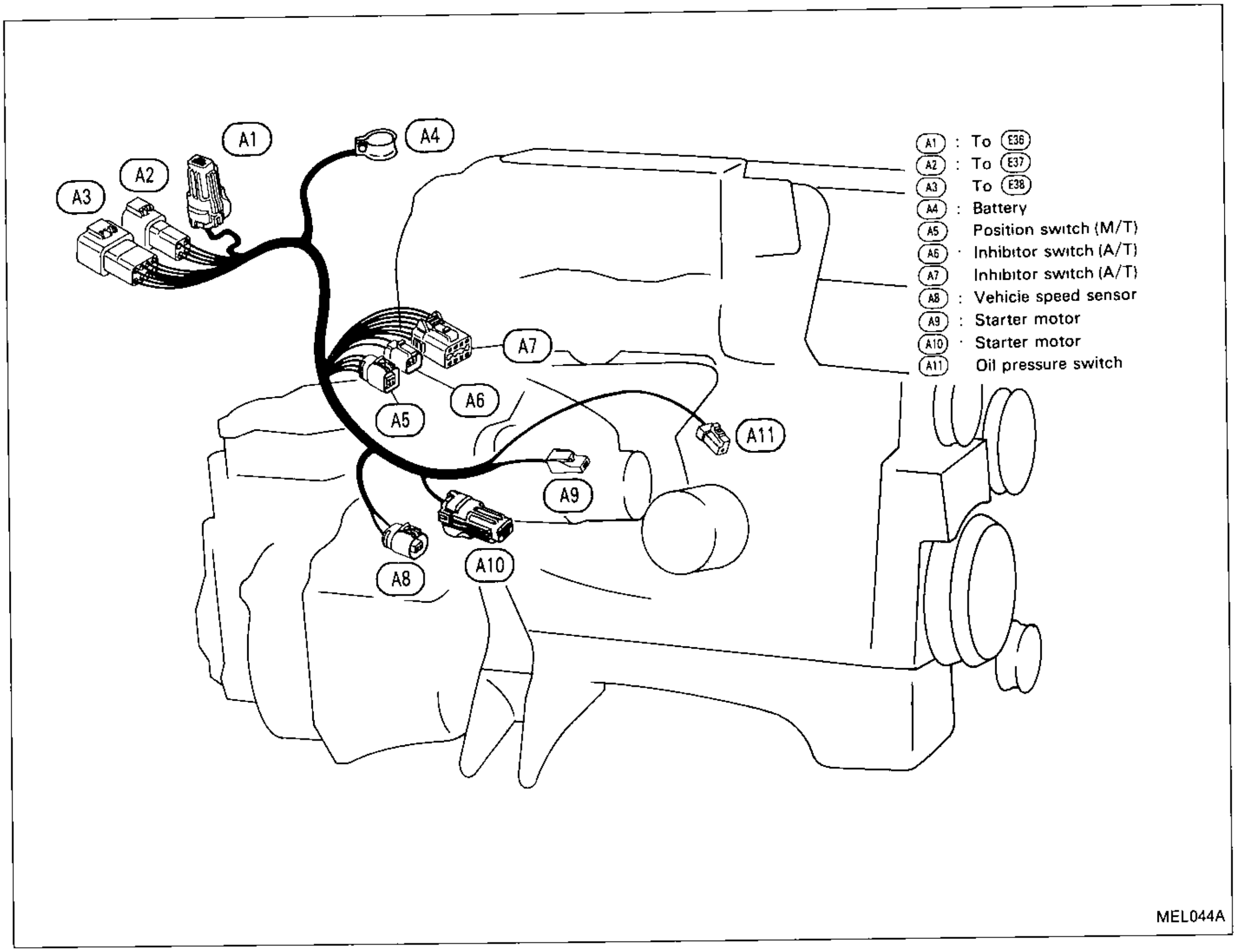
REAR DOOR HARNESS



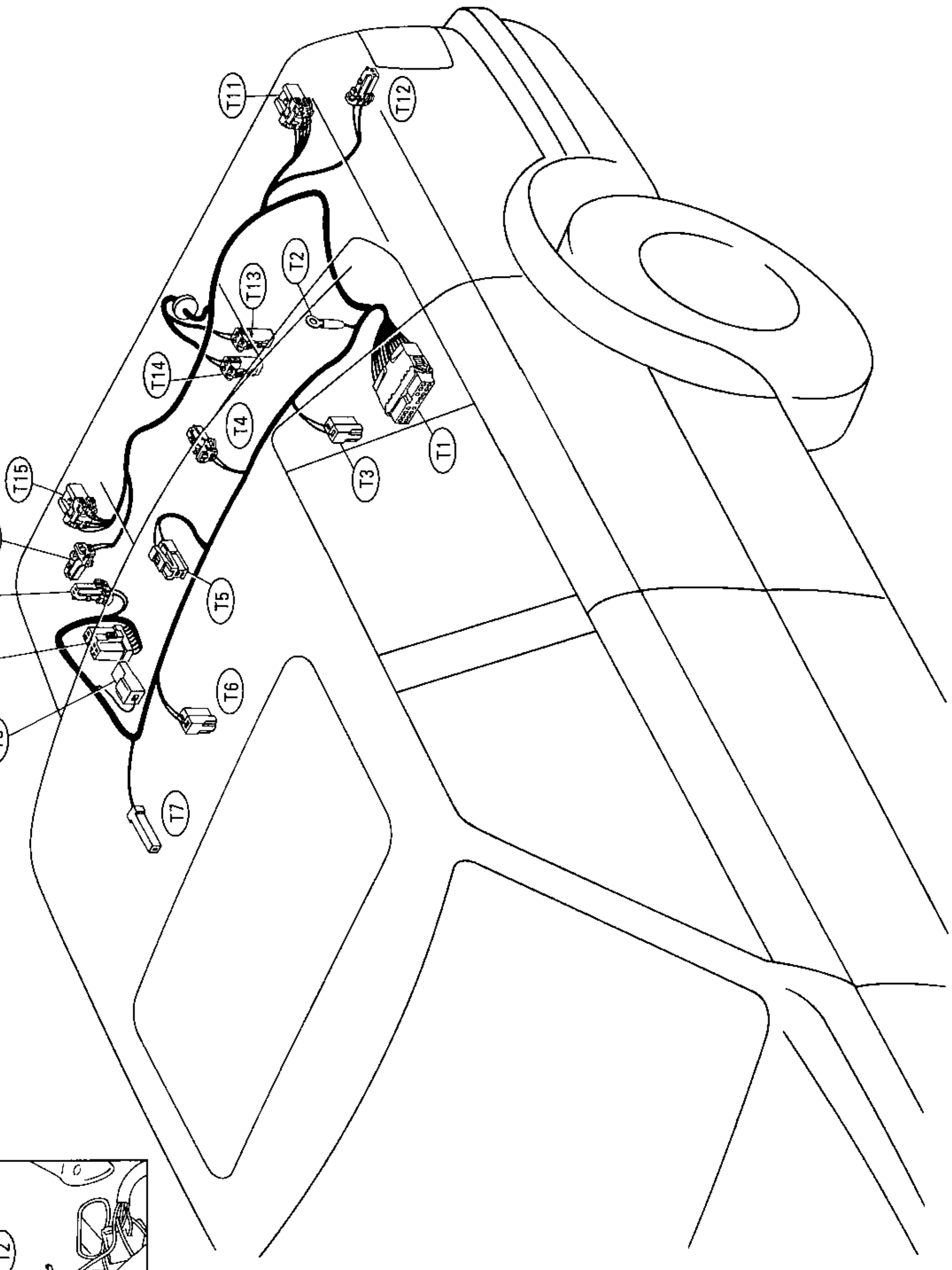
D71 : To M102
D72 : Sub-switch
D73 : Power window regulator
D74 : Door actuator

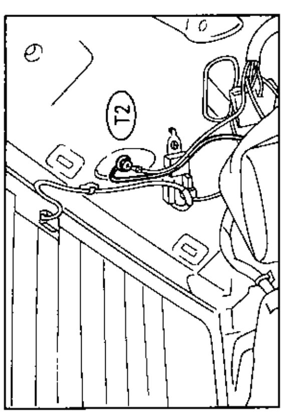
SEL584Q

Engine Harness No. 2



Tail Harness

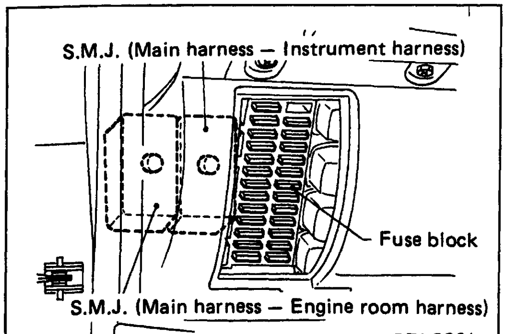




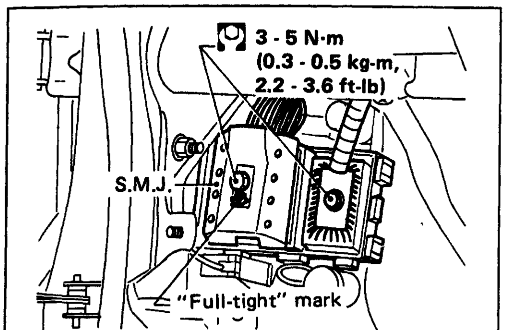
Body ground

- (T1) : To (M121)
- (T2) : **Body ground**
- (T3) : **Rear speaker L.H.**
- (T4) : High-mounted stop lamp
- (T5) : **Trunk room lamp**
- (T6) : **Rear speaker R.H.**
- (T7) : **Rear door switch R.H.**
- (T8) : **Trunk room lamp switch**
- (T9) : **Power antenna timer**
- (T10) : **Power antenna motor**
- (T11) : **Rear combination lamp L.H.**
- (T12) : Rear side marker L.H.
- (T13) : **License lamp L.H.**
- (T14) : **License lamp R.H.**
- (T15) : **Rear combination lamp R.H.**
- (T16) : Rear side marker lamp R.H.

SEL332N



SEL889L



SEL890L

INSTALLATION

To install S.M.J., tighten bolts until orange "fulltight" mark appears and then retighten to specified torque as required.

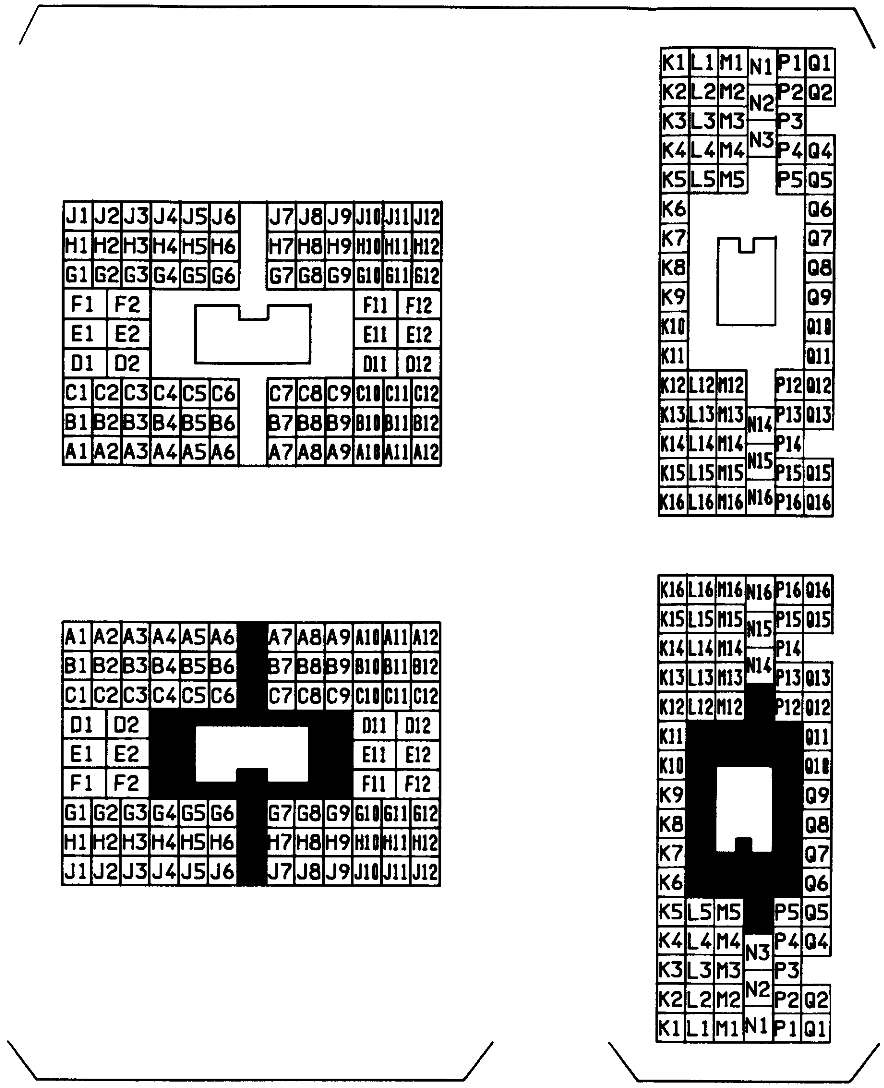
: 3 - 5 N·m
(0.3 - 0.5 kg-m, 2.2 - 3.6 ft-lb)

CAUTION:

Do not overtighten bolts, otherwise, they may be damaged.

Terminal Arrangement

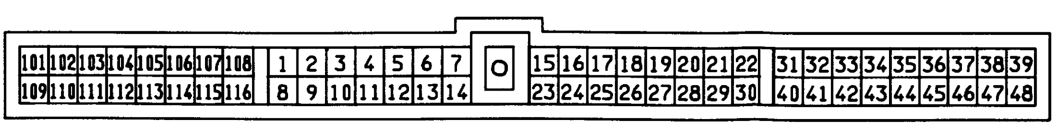
MAIN HARNESS



ENGINE ROOM HARNESS

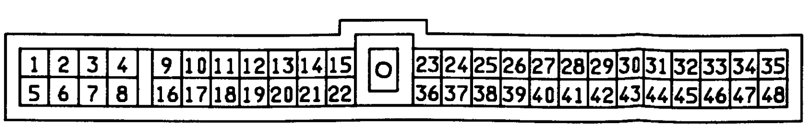
INSTRUMENT HARNESS

E. C. C. S. CONTROL UNIT



View from harness side

A/T CONTROL UNIT

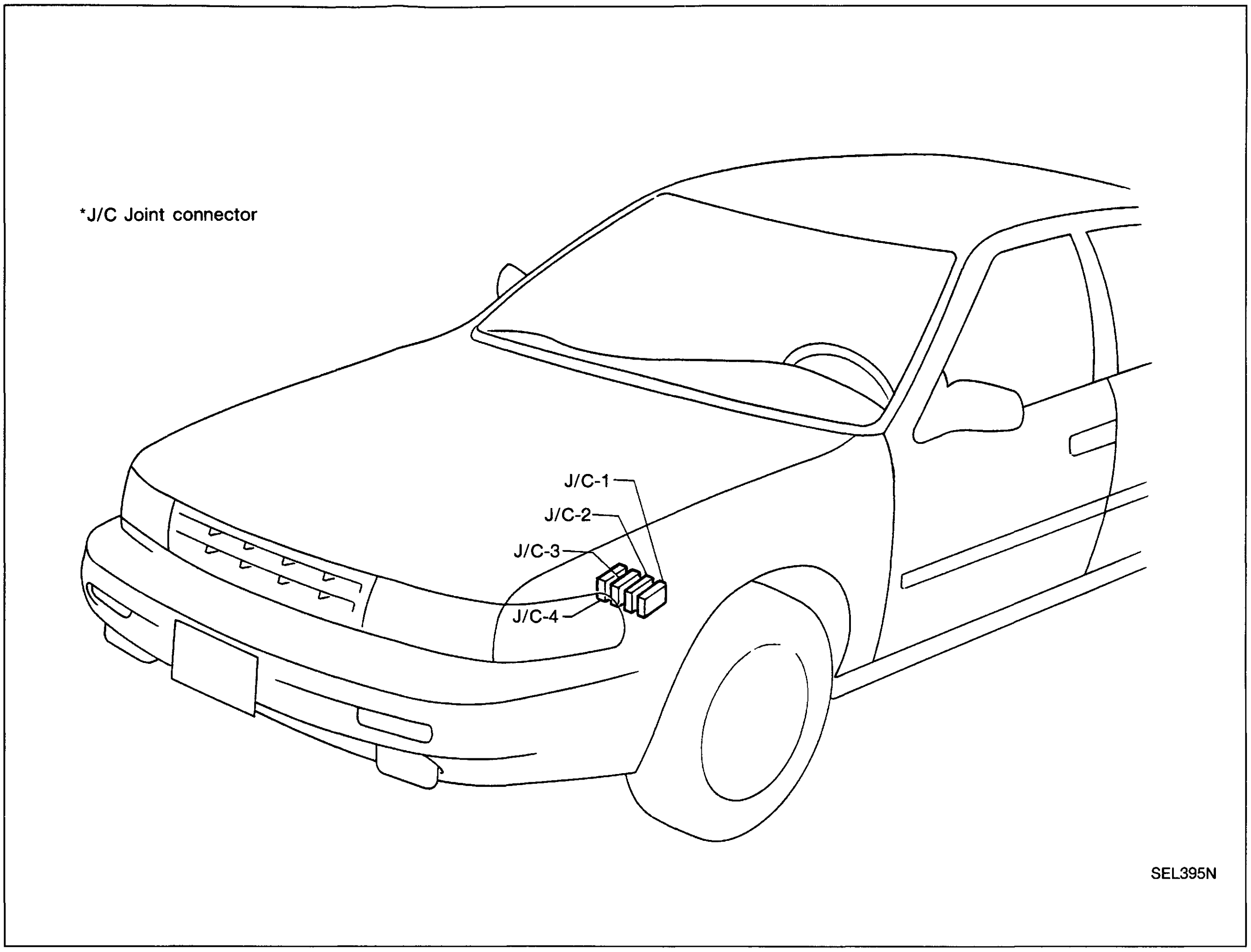


View from harness side

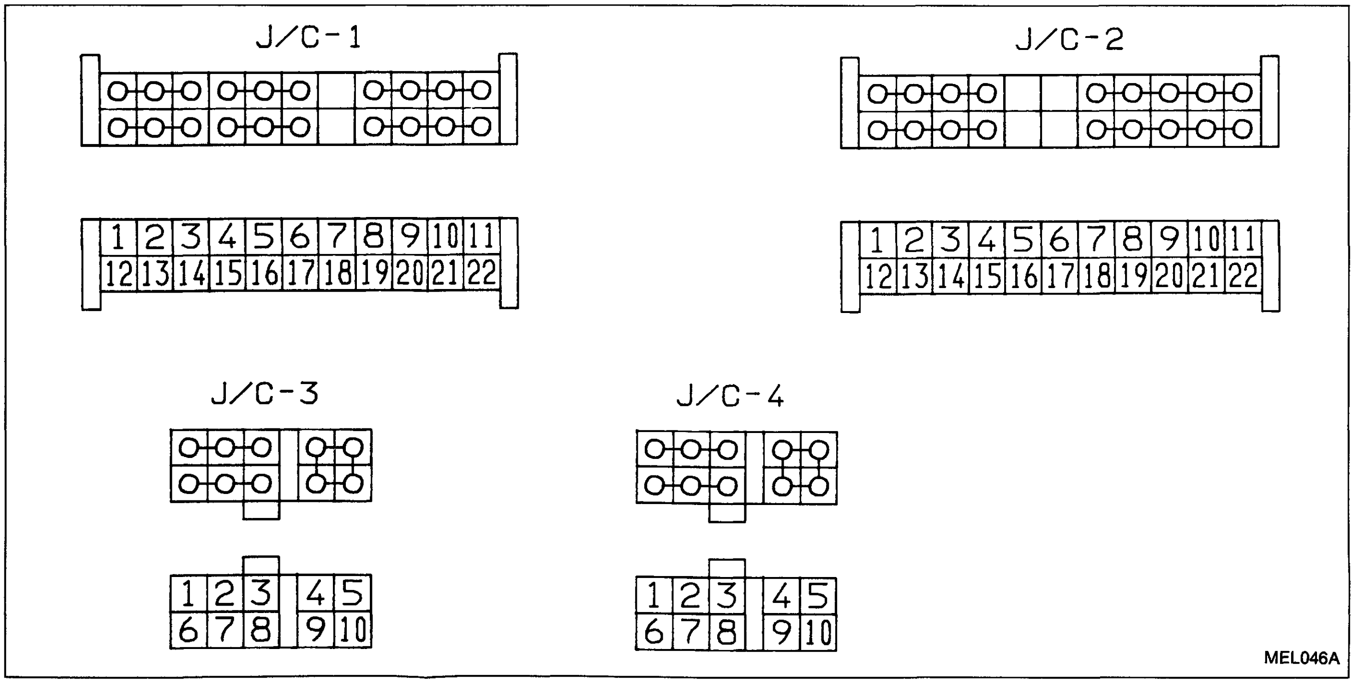
SEL582Q

JOINT CONNECTOR (J/C)

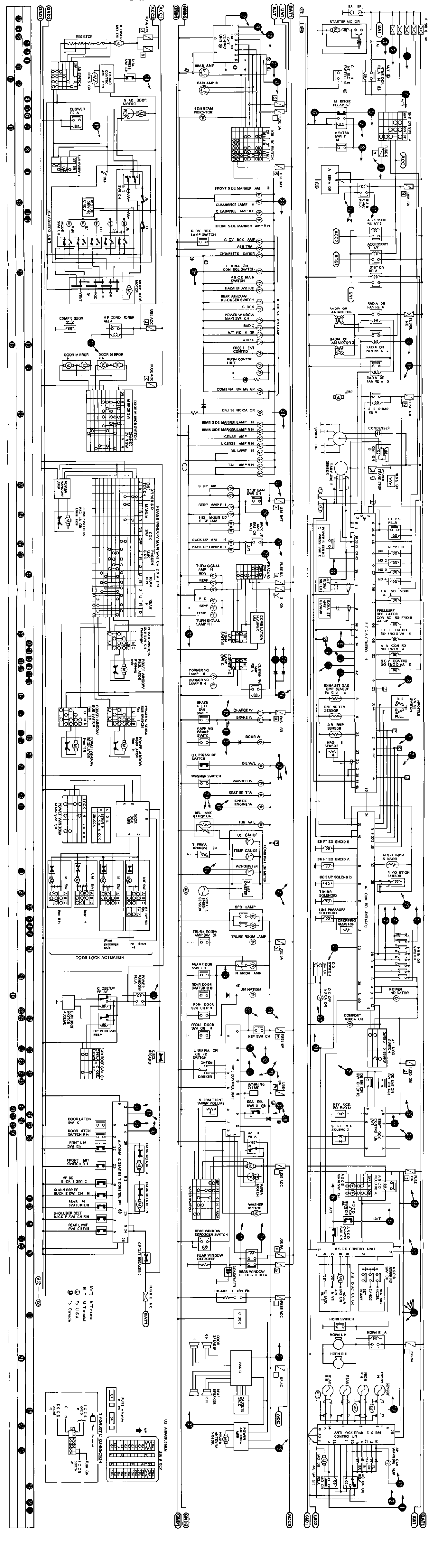
Location



Terminal Arrangement



1992 NISSAN STANZA
CIRCUIT DIAGRAM



INCH TO METRIC CONVERSION TABLE
(Rounded-off for automotive use)

inches	mm	inches	mm
.100	2.54	.610	15.49
.110	2.79	.620	15.75
.120	3.05	.630	16.00
.130	3.30	.640	16.26
.140	3.56	.650	16.51
.150	3.81	.660	16.76
.160	4.06	.670	17.02
.170	4.32	.680	17.27
.180	4.57	.690	17.53
.190	4.83	.700	17.78
.200	5.08	.710	18.03
.210	5.33	.720	18.29
.220	5.59	.730	18.54
.230	5.84	.740	18.80
.240	6.10	.750	19.05
.250	6.35	.760	19.30
.260	6.60	.770	19.56
.270	6.86	.780	19.81
.280	7.11	.790	20.07
.290	7.37	.800	20.32
.300	7.62	.810	20.57
.310	7.87	.820	20.83
.320	8.13	.830	21.08
.330	8.38	.840	21.34
.340	8.64	.850	21.59
.350	8.89	.860	21.84
.360	9.14	.870	22.10
.370	9.40	.880	22.35
.380	9.65	.890	22.61
.390	9.91	.900	22.86
.400	10.16	.910	23.11
.410	10.41	.920	23.37
.420	10.67	.930	23.62
.430	10.92	.940	23.88
.440	11.18	.950	24.11
.450	11.43	.960	24.38
.460	11.68	.970	24.64
.470	11.94	.980	24.89
.480	12.19	.990	25.15
.490	12.45	1.000	25.40
.500	12.70	2.000	50.80
.510	12.95	3.000	76.20
.520	13.21	4.000	101.60
.530	13.46	5.000	127.00
.540	13.72	6.000	152.40
.550	13.97	7.000	177.80
.560	14.22	8.000	203.20
.570	14.48	9.000	228.60
.580	14.73	10.000	254.00
.590	14.99	20.000	508.00
.600	15.24		

METRIC TO INCH CONVERSION TABLE
(Rounded-off for automotive use)

mm	inches	mm	inches
1	.0394	51	2.008
2	.079	52	2.047
3	.118	53	2.087
4	.157	54	2.126
5	.197	55	2.165
6	.236	56	2.205
7	.276	57	2.244
8	.315	58	2.283
9	.354	59	2.323
10	.394	60	2.362
11	.433	61	2.402
12	.472	62	2.441
13	.512	63	2.480
14	.551	64	2.520
15	.591	65	2.559
16	.630	66	2.598
17	.669	67	2.638
18	.709	68	2.677
19	.748	69	2.717
20	.787	70	2.756
21	.827	71	2.795
22	.866	72	2.835
23	.906	73	2.874
24	.945	74	2.913
25	.984	75	2.953
26	1.024	76	2.992
27	1.063	77	3.031
28	1.102	78	3.071
29	1.142	79	3.110
30	1.181	80	3.150
31	1.220	81	3.189
32	1.260	82	3.228
33	1.299	83	3.268
34	1.339	84	3.307
35	1.378	85	3.346
36	1.417	86	3.386
37	1.457	87	3.425
38	1.496	88	3.465
39	1.535	89	3.504
40	1.575	90	3.543
41	1.614	91	3.583
42	1.654	92	3.622
43	1.693	93	3.661
44	1.732	94	3.701
45	1.772	95	3.740
46	1.811	96	3.780
47	1.850	97	3.819
48	1.890	98	3.858
49	1.929	99	3.898
50	1.969	100	3.937

QUICK REFERENCE CHART : STANZA 1992

ENGINE TUNE-UP DATA

Item			
Engine model	KA24E		
Firing order	1-3-4-2		
Idle speed rpm M/T	700±50, 750±50*		
A/T (in "N" position)	700±50, 750±50*		
Ignition timing (degree B.T.D.C. at idle speed)	15±2		
Idle "CO" (% at idle speed)	Idle mixture screw is preset and sealed at factory.		
High tension cable resistance kΩ/m (kΩ/ft)	Less than 30 (9.14)		
Spark plug Type Standard	ZFR5E-11		
Type Hot	ZFR4E-11		
Type Cold	ZFR6E-11		
Gap mm (in)	1.0 - 1.1 (0.039 - 0.043)		
Drive belt deflection (Cold) mm (in)	Used belt deflection		Deflection of new belt
	Limit	Deflection after adjustment	
Alternator	8 (0.31)	6 - 7 (0.24 - 0.28)	5 - 6 (0.20 - 0.24)
Air conditioner compressor	8 (0.31)	5 - 6 (0.20 - 0.24)	4 - 5 (0.16 - 0.20)
Applied pressed force N (kg, lb)	98 (10, 22)		
Tightening torque	N·m	kg-m	ft-lb
Spark plug	20 - 29	2.0 - 3.0	14 - 22
Oil pan drain plug	29 - 39	3.0 - 4.0	22 - 29

*. For Canada

CLUTCH PEDAL

Unit: mm (in)

Pedal height	165 - 175 (6.50 - 6.89)
Pedal free play	1 - 3 (0.04 - 0.12)

FRONT WHEEL ALIGNMENT (Unladen*)

Camber	degree	−30′ to 1°00′
Caster	degree	35′ - 2°05′
Kingpin inclination	degree	13°45′ - 15°15′
Toe-in A − B	mm (in)	1 - 3 (0.04 - 0.12)
Total angle 2θ	degree	6′ - 18′
Turning angle Inside		34° - 38°
Outside		27° - 31°

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

REAR WHEEL ALIGNMENT (Unladen*)

Camber	degree	−1°20′ to 0°10′
Toe-in A − B	mm (in)	−4 to 0 (−0.16 to 0)
Total angle 2θ	degree	−23′ to 0′

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

BRAKE

Unit: mm (in)

Disc brake Pad minimum thickness	2.0 (0.079)
Rotor repair limit Minimum thickness	20.0 (0.787)*1, 9.0 (0.354)*2
Drum brake Lining minimum thickness	1.5 (0.059)
Drum repair limit Maximum inner diameter	230.0 (9.06)

*1 Front disc brake
*2 Rear disc brake

REFILL CAPACITIES

Unit		Liter	US measure
Fuel tank		62	16-3/8 gal
Coolant		7.4	7-7/8 qt
Engine	With oil filter	3.5	3-3/4 qt
	Without oil filter	3.1	3-1/4 qt
Transaxle	M/T	4.7	10 pt
	A/T	6.8	7-1/4 qt
Power steering system		0.9	1 qt
Air conditioning system	Compressor oil	0.2	6.8 fl oz
	Refrigerant	0.75 - 0.85	1.65 - 1.87 lb

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Overseas Service Department
Tokyo, Japan

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