NISSAN STANZA

MODEL U12 SERIES

QUICK REFERENCE INDEX

FOREWORD

This manual contains maintenance and repair procedures for the 1990 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

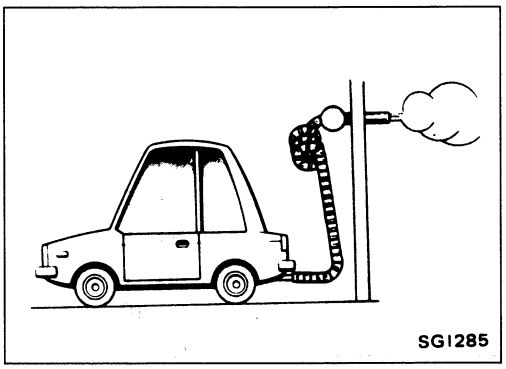
The proper performance of service is essential for both the safety of the technician and the efficient functioning of the vehicle.
The service methods in this Service Manual are described in such a manner that the service may be performed safely and accurately.
Service varies with the procedures used, 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

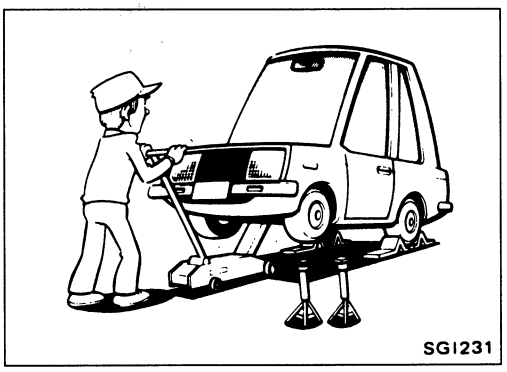
SECTION GI

CONTENTS

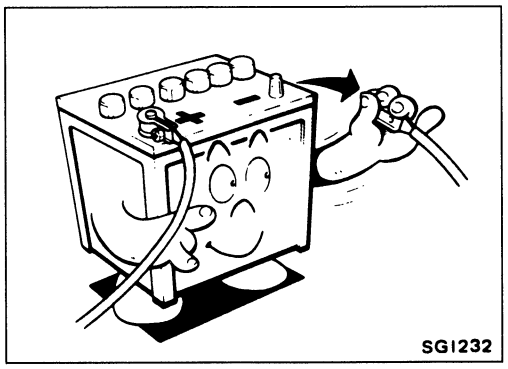
Observe the following precautions to ensure safe and proper servicing. These precautions are not described in each individual section.


SGI285

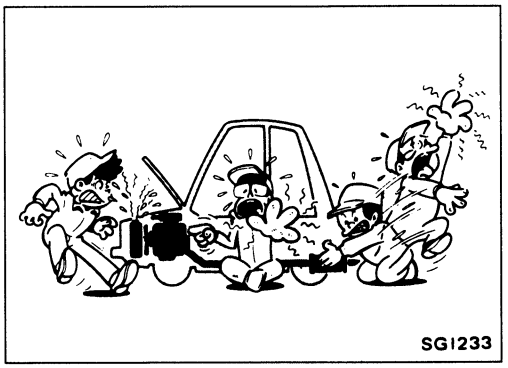
1. Do not operate the engine for an extended period of time without proper exhaust ventilation.
   Keep the work area well ventilated and free of any inflammable materials. Special care should be taken when handling any inflammable or poisonous materials, such as gasoline, refrigerant gas, etc. When 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.


SGI231

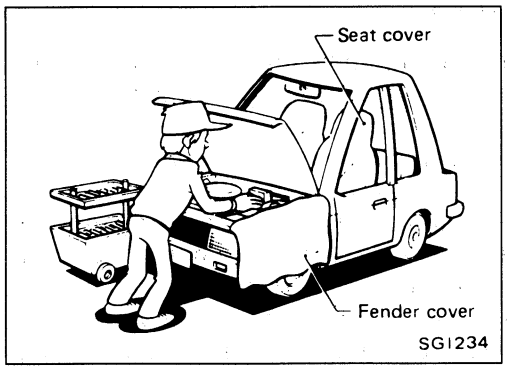
2. Before jacking up the vehicle, apply wheel chocks or other tire blocks to the wheels to prevent the vehicle from moving. After jacking up the vehicle, support the vehicle weight with safety stands at the points designated for proper lifting and towing before working on the vehicle.
   These operations 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.


SGI232

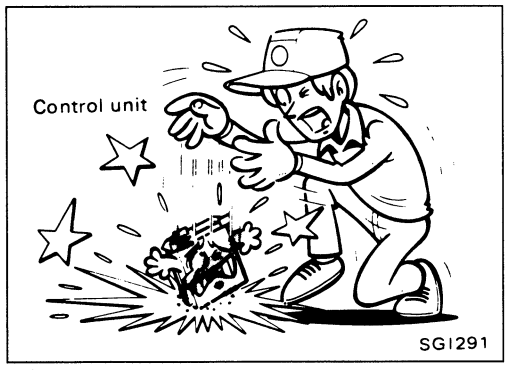
4. Before starting repairs which do not require battery power, always turn off the ignition switch, then disconnect the ground cable from the battery to prevent accidental short circuit.


SGI233

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.

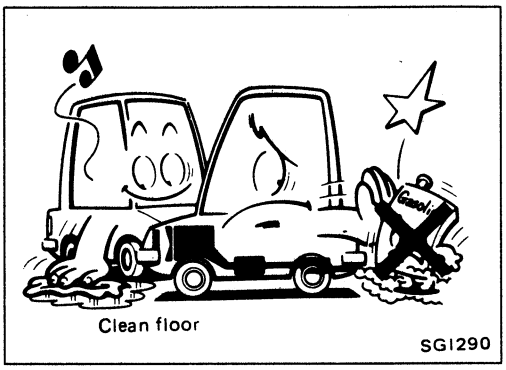


6. Before servicing the vehicle, protect fenders, upholstery and carpeting with appropriate covers.
   Take care that keys, buckles or buttons on your person do not scratch the paint.
7. Clean all disassembled parts in the designated liquid or solvent prior to inspection or assembly.
8. Replace oil seals, 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.



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

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



Precautions for Catalyst

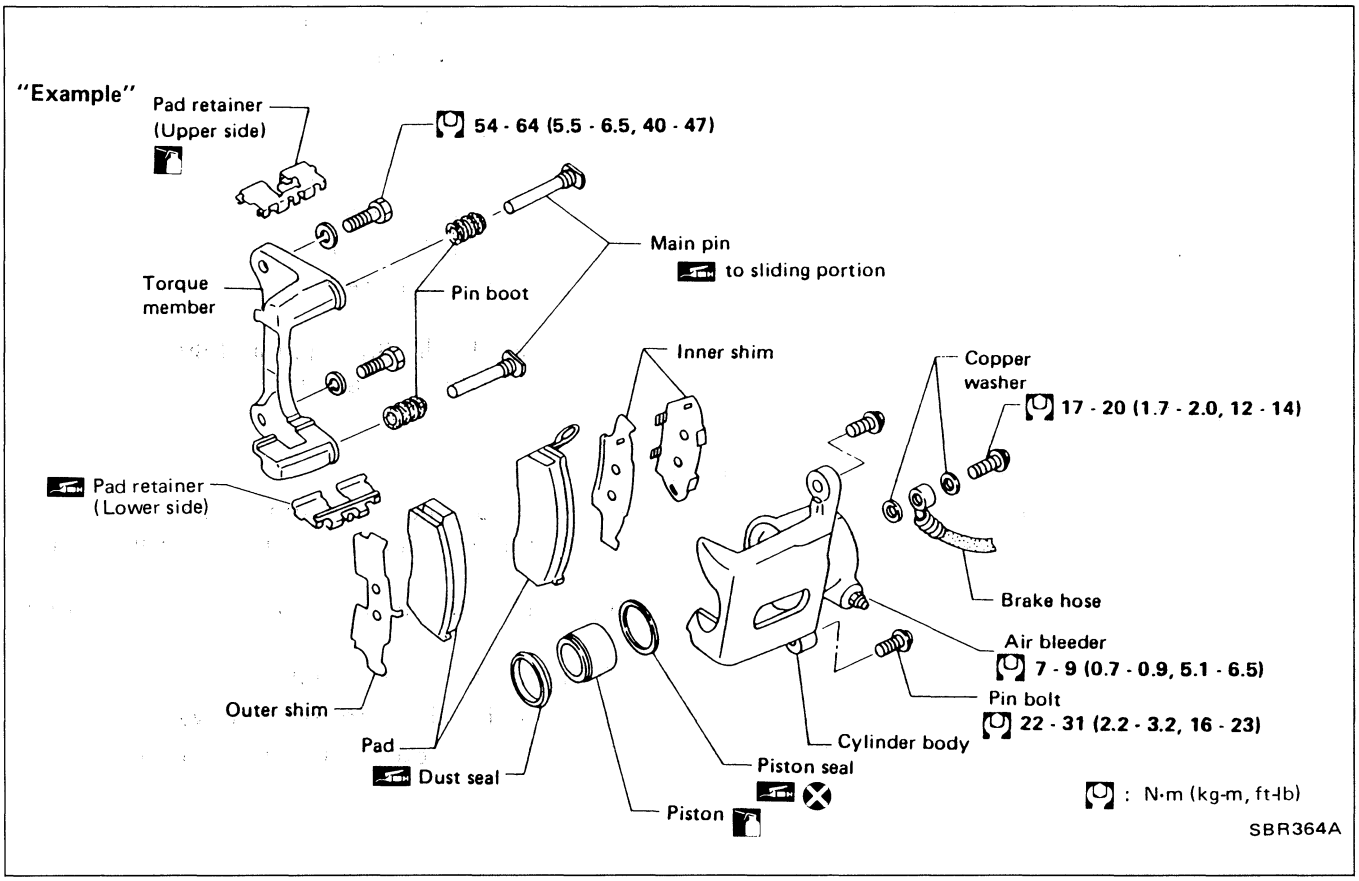
If a large amount of unburned fuel flows into the converter, the converter temperature will be excessively high. To prevent this, follow the procedure below:

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).

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:

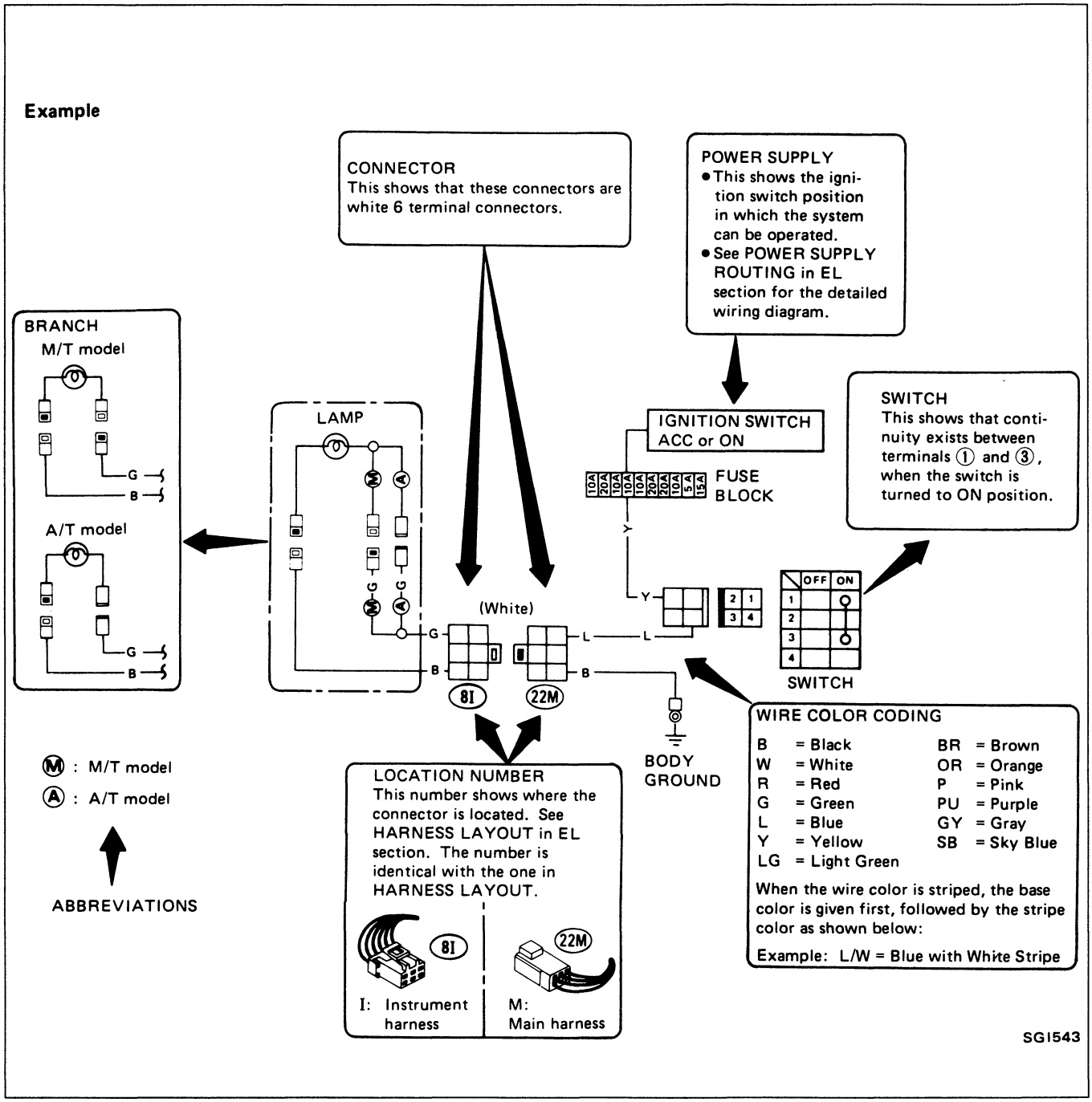
	: Tightening torque	M/T	: Manual Transaxle/Transmission
	: Should be lubricated with grease. Unless otherwise indicated, use recommended multi-purpose grease.	A/T	: Automatic Transaxle/Transmission
		Tool	: Special Service Tools
		L.H.D.	: Left-Hand Drive
	: Should be lubricated with oil.	R.H.D.	: Right-Hand Drive
	: Sealing point	A.T.F.	: Automatic Transmission Fluid
	: Checking point	D_1	: Drive range 1st gear
	: Always replace after every disassembly.	D_2	: Drive range 2nd gear
		D_3	: Drive range 3rd gear
	: Apply petroleum jelly.	D_4	: Drive range 4th gear
	: Apply A.T.F.	O.D.	: Overdrive
★	: Select with proper thickness.	2_2	: 2nd range 2nd gear
☆	: Adjustment is required.	2_1	: 2nd range 1st gear
S.D.S.	: Service Data and Specifications	1_2	: 1st range 2nd gear
L.H., R.H.	: Left-Hand, Right-Hand	1_1	: 1st range 1st gear

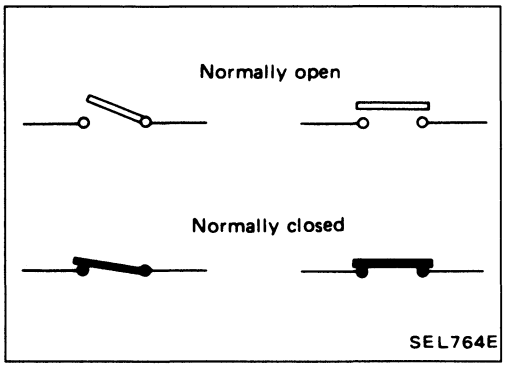
8. The **UNITS** given in this manual are primarily expressed as the SI UNIT (International System of Unit), and alternatively expressed in the metric system and in the yard/pound system.
   "Example"
   Tightening torque:
   59 - 78 N·m (6.0 - 8.0 kg-m, 43 - 58 ft-lb)
9. **TROUBLE DIAGNOSES** are included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



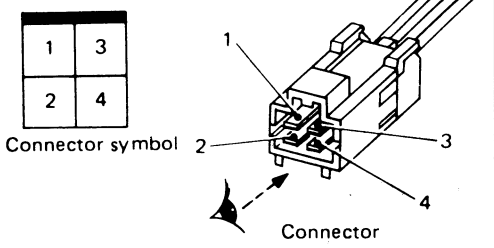


SWITCH POSITIONS

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.

Example



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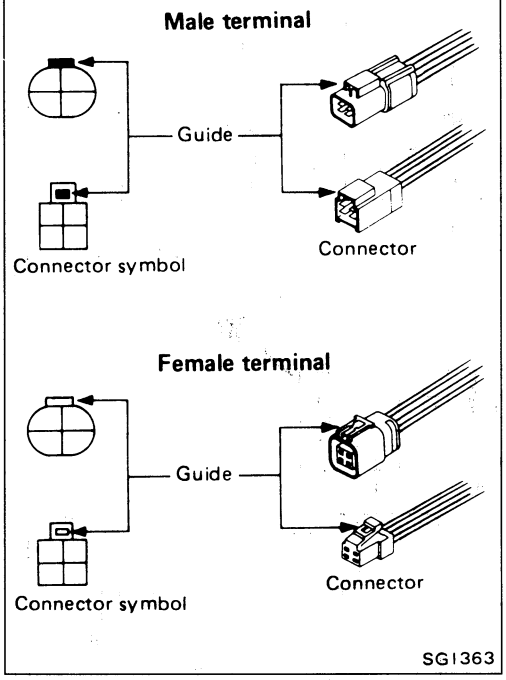
CONNECTOR SYMBOLS

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

Example



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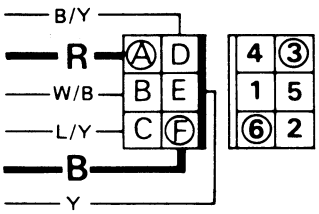
- Male and female terminals
  Connector guides for male terminals are shown in black and female terminals in white in wiring diagrams.

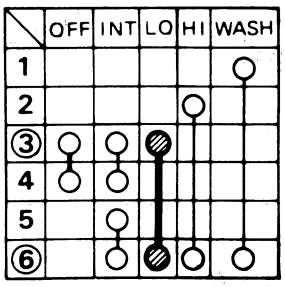
MULTIPLE SWITCH

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

Example



WIPER SWITCH



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

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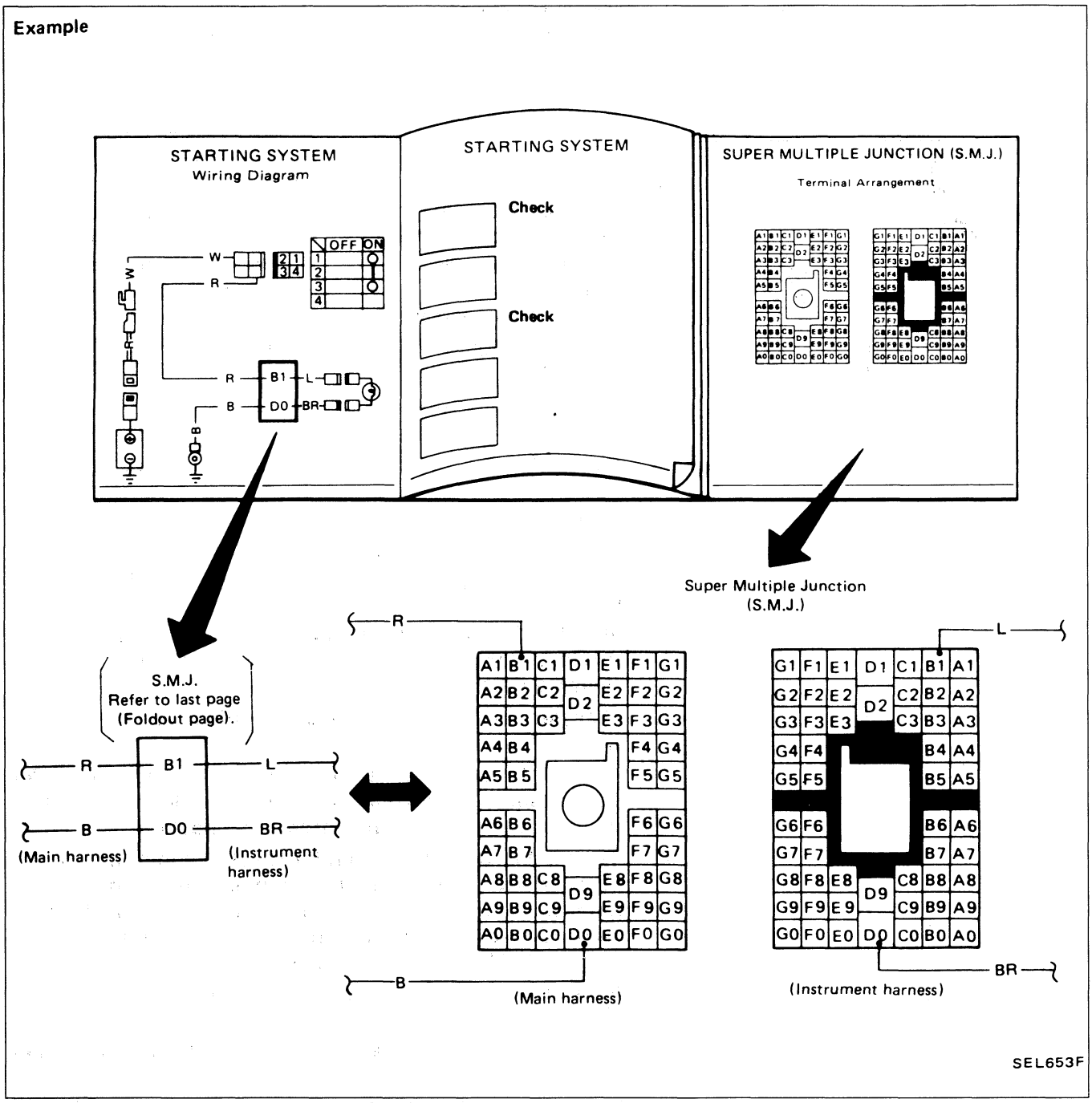
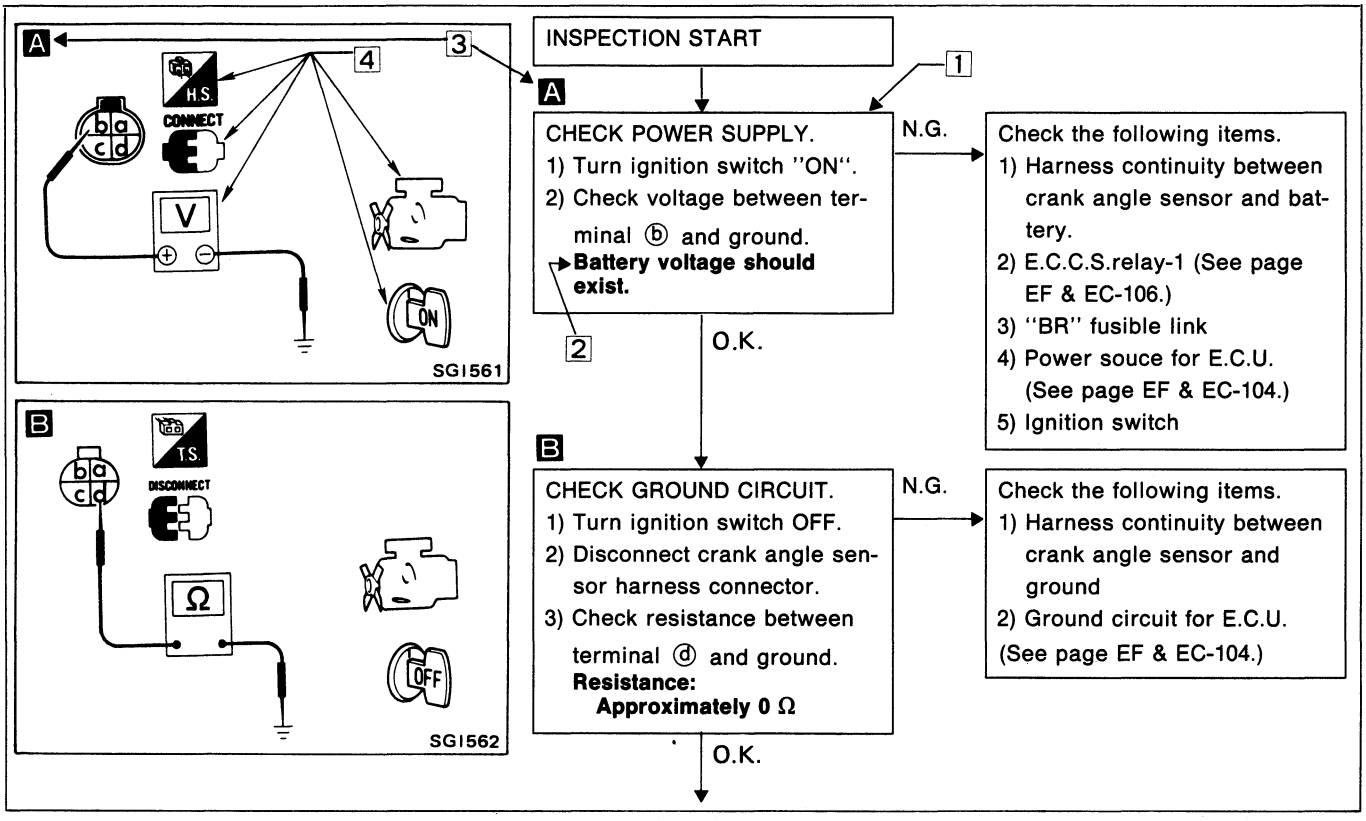
SUPER MULTIPLE JUNCTION (S.M.J.)

- 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



Example



NOTICE

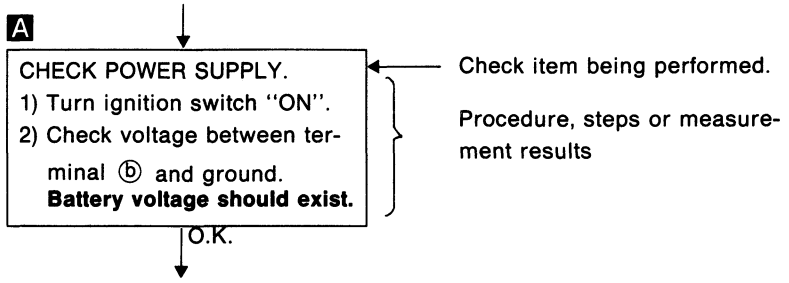
The flow chart indicates work procedures required to diagnose problems effectively. Observe the following instructions before diagnosing.

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

HOW TO FOLLOW THIS FLOW CHART

1 Work and diagnostic procedure

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



2 Measurement results

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

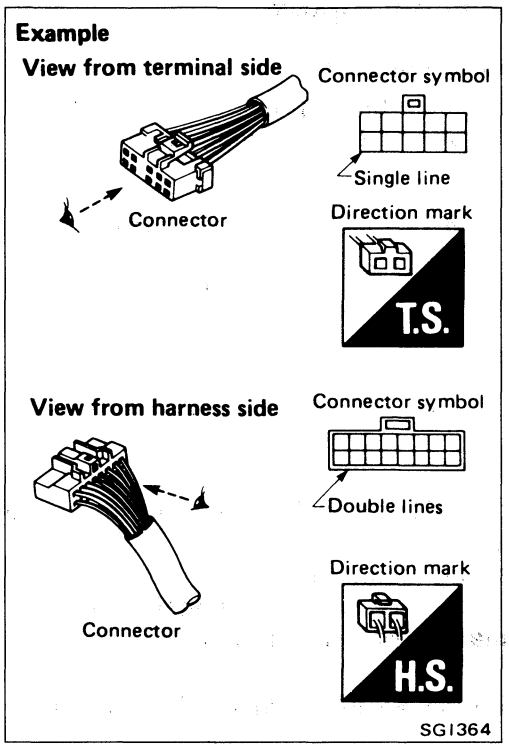
Battery voltage → 11 - 14V or approximately 12V
Voltage: Approximately 0V → Less than 1V

3 Cross reference of work symbols in the text and illustrations

Illustrations are provided as visual aids for work procedures. For example, symbol A indicated in the left upper portion of each illustration corresponds with the symbol in the 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.

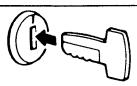
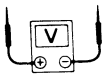
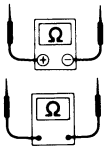
: View from terminal side ... T.S.

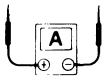
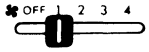
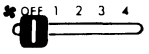
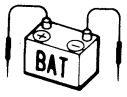
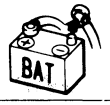
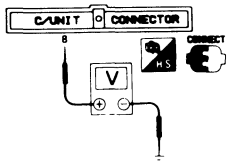
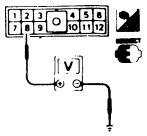
- **All connector symbols shown from the terminal side are enclosed by a single line.**

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

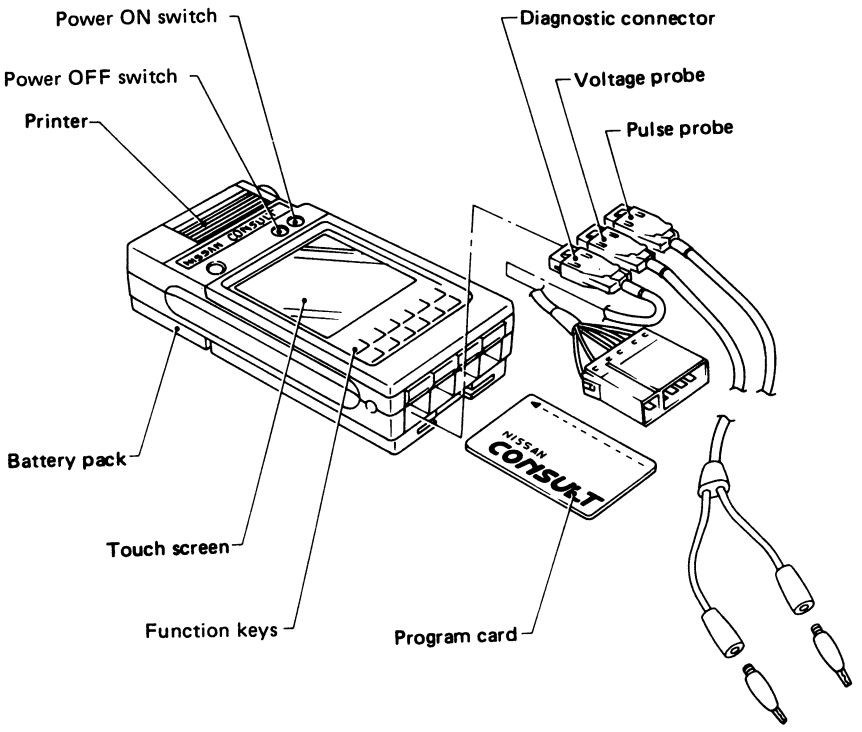
- **All connector symbols shown from the harness side are enclosed by a double line.**

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.** 

Outside View



SGI619

System Application

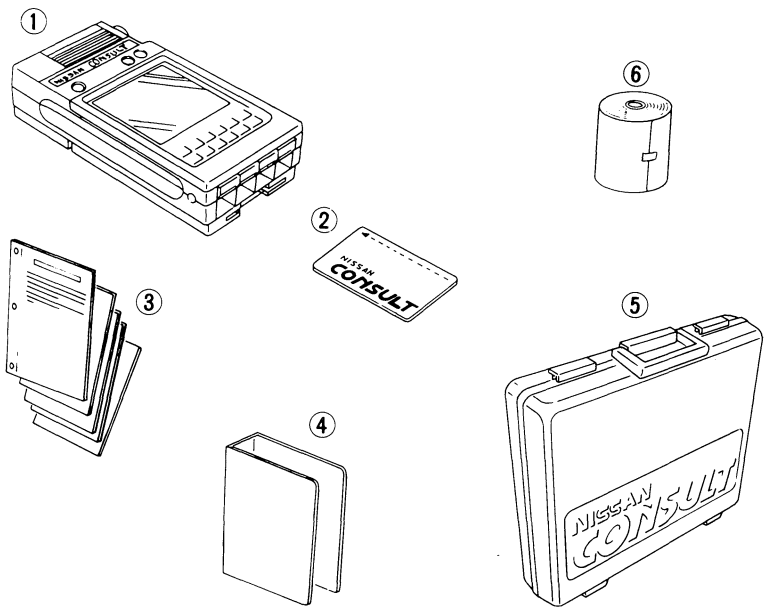
System / Diagnostic mode	E.C.C.S.	A/T
Work support	X	—
Self-diagnostic results	X	X
Data monitor	X	X
Active test	X	—
E.C.U. part number	X	X

X: Applicable

Function

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

Checking Equipment

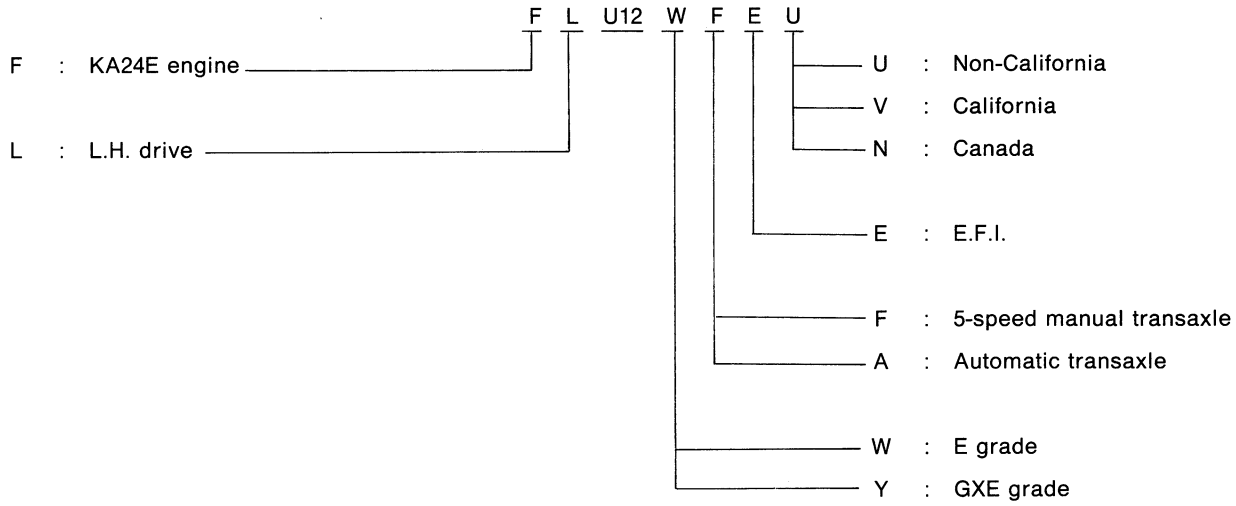
Tool name	Description
NISSAN CONSULT kit ① CONSULT unit and accessories ② Program card ③ Operation manuals ④ Binder ⑤ Carrying case ⑥ Thermal paper (Rolls)	

When ordering the above equipment, contact your NISSAN distributor.

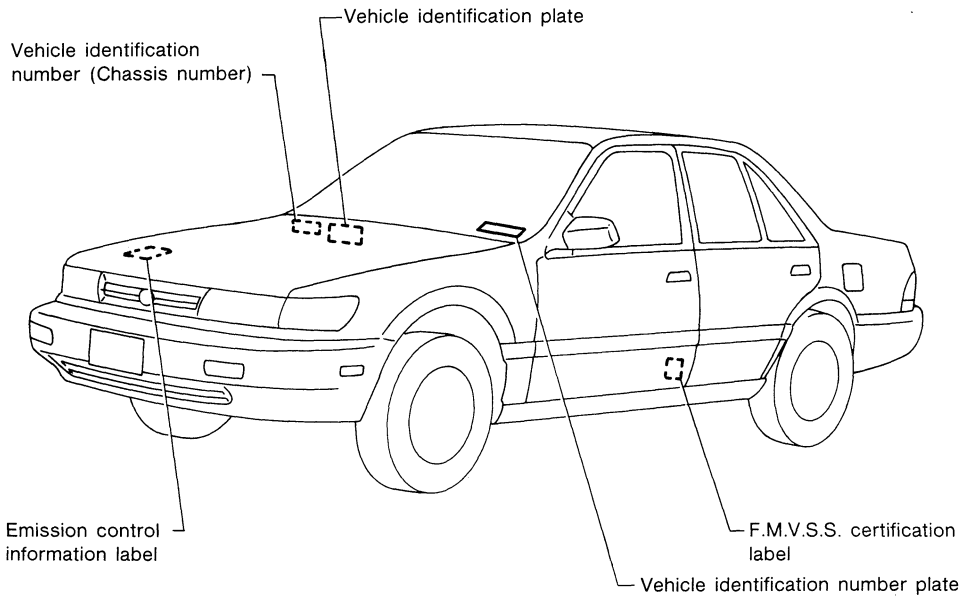
Model Variation

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

Prefix and suffix designations



Identification Number



SGI630

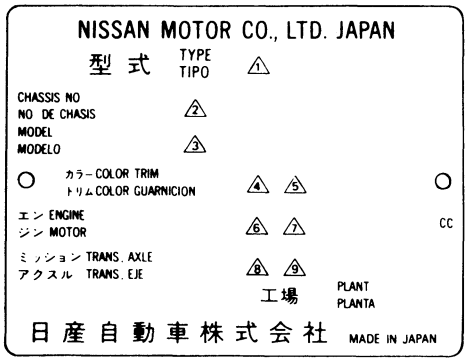
VEHICLE IDENTIFICATION NUMBER ARRANGEMENT

JN1 F U 2 1 S 3 L T 200054

- Manufacture
  - JN1 : Nissan passenger vehicle
- Engine type
  - F : KA24E engine
- Vehicle line
- Model change (0 to 9)
- Body type
  - 1 : Sedan
- Restraint system
  - S : Standard
  - P : Automatic
- Check digit (0 to 9 or X)
- Model year
  - L : 1990 year model
- Manufacture plant
  - T : Oppama
- Vehicle serial number

Identification Number (Cont'd)

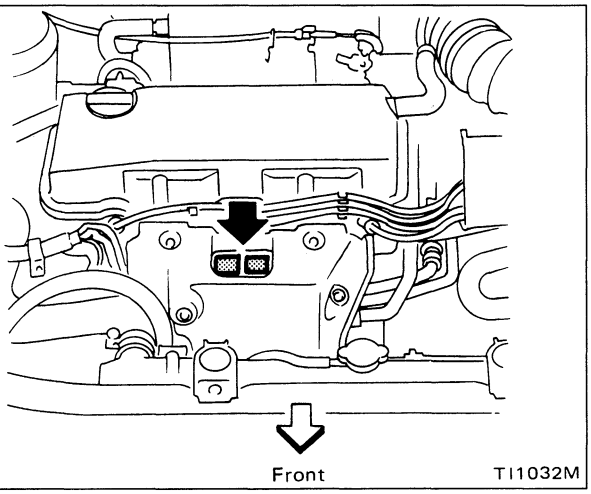
IDENTIFICATION PLATE



SGI315

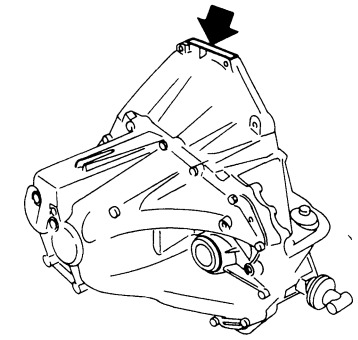
1 Type
2 Vehicle identification number (Chassis number)
3 Model
4 Body color code
5 Trim color code
6 Engine model
7 Engine displacement
8 Transaxle model
9 Axle model

ENGINE SERIAL NUMBER



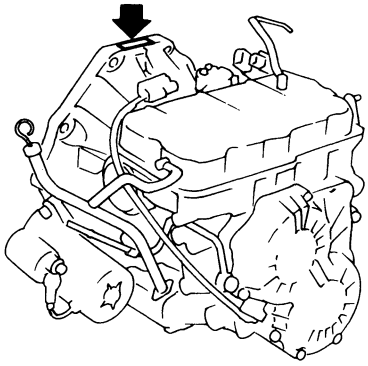
TI1032M

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

Road wheel	Conventional		14x5.5JJ
	Spare		15x4T*1 16x5T*2
	Off set	mm (in)	40 (1.57)
Tire size	Conventional		P195/65R14 89H
	Spare		T125/70D15*1 T135/70D16*2

*1: E grade
*2: GXE grade

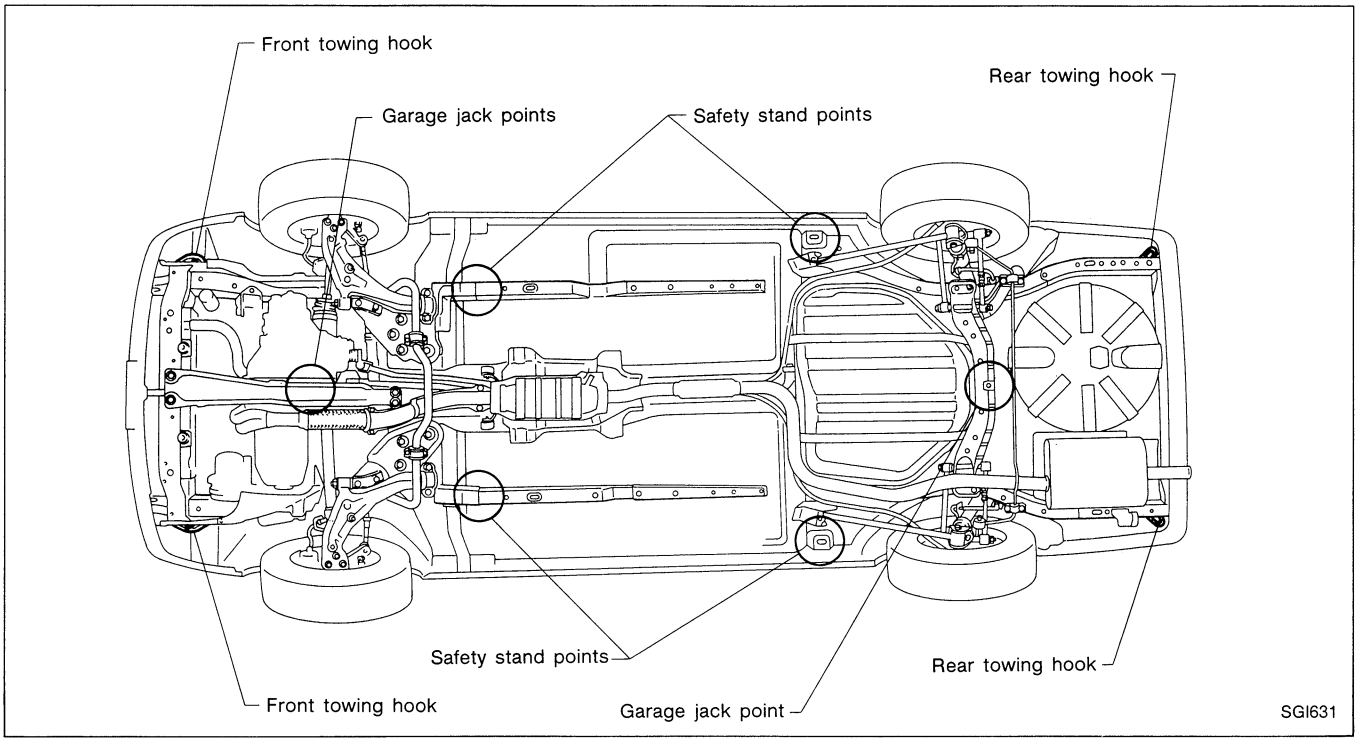
Garage Jack and Safety Stand

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 the front wheels when the rear wheels are raised and place wheel chocks at the rear wheels when the front wheels are raised.**

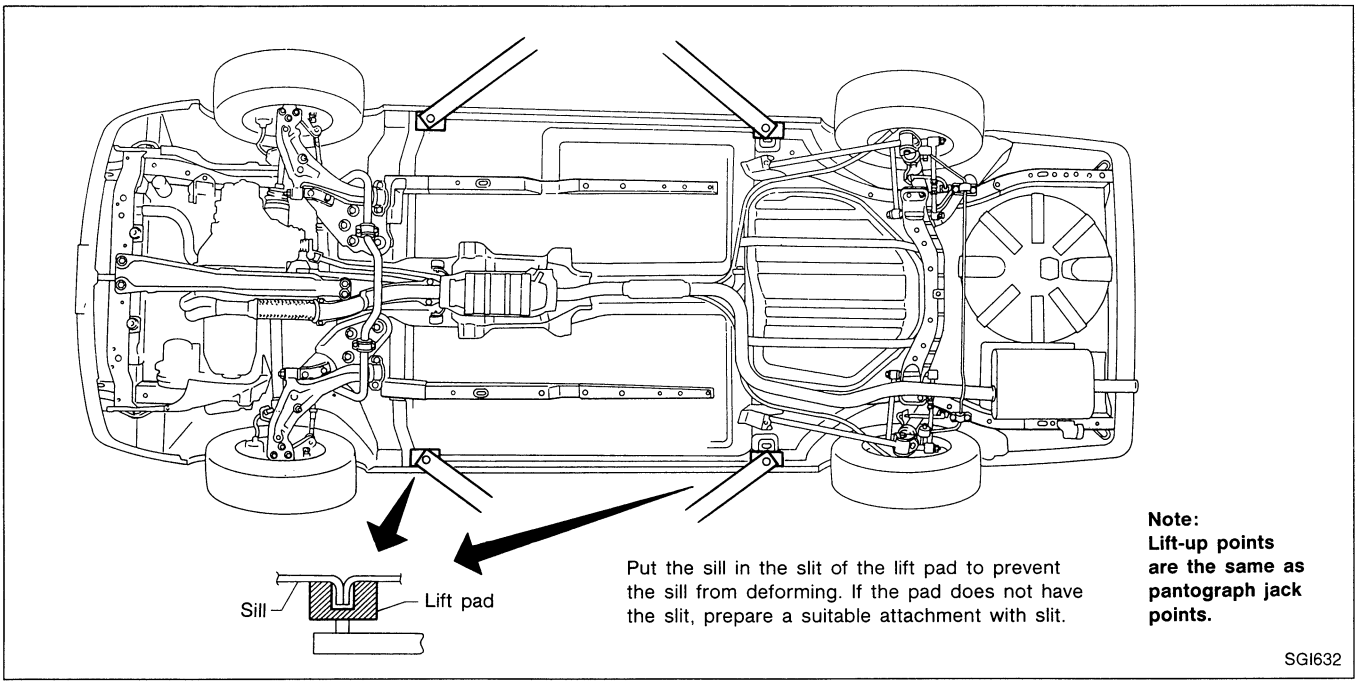
CAUTION:

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.



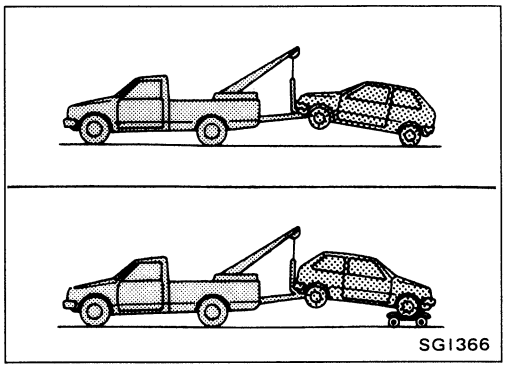
Put the sill in the slit of the lift pad to prevent the sill from deforming. If the pad does not have the slit, prepare a suitable attachment with slit.

Note:
Lift-up points are the same as pantograph jack points.

SGI632

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.**



SGI366

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

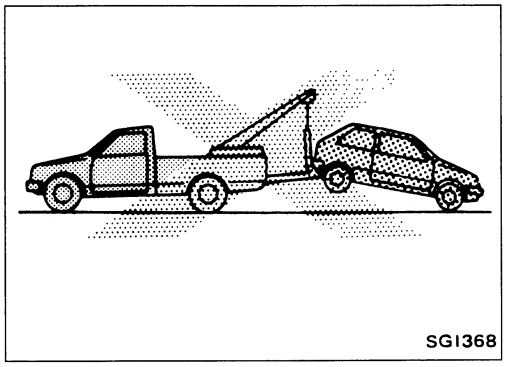
Tow Truck Towing (Cont'd)

TOWING AN AUTOMATIC TRANSAXLE MODEL WITH FOUR WHEELS ON GROUND

Observe the following restricted towing speeds and distances.

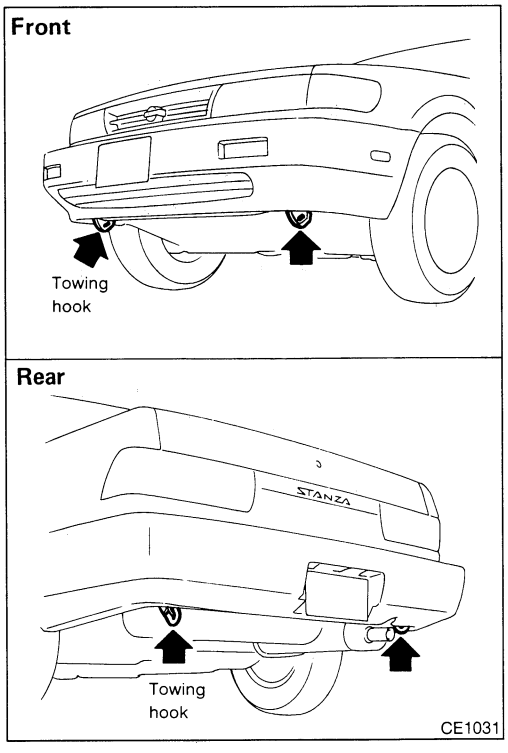
Speed:
Below 50 km/h (30 MPH)
Distance:
Less than 65 km (40 miles)

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.



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

MAINTENANCE

SECTION MA

CONTENTS

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.

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-9
Air cleaner filter	See NOTE (2)								[R]								[R]	MA-12
Vapor lines									I*								I*	MA-14
Fuel lines									I*								I*	MA-11
Fuel filter	See NOTE (3)*																	MA-11
Engine coolant									R*								R*	MA-10
Engine oil		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	MA-12
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-13
Spark plugs									[R]								[R]	MA-13
Chassis and body maintenance																		
Brake lines & cables					I				I				I				I	MA-17
Brake pads, discs, drums & linings			I		I		I		I		I		I		I		I	MA-17, 18
Manual & automatic trans-axle oil	See NOTE (4)				I				I				I				I	MA-15, 16
Steering gear & linkage, axle & suspension parts			I		I		I		I		I		I		I		I	MA-19, FA-4
Steering linkage ball joints & front suspension ball joints			I		I		I		I		I		I		I		I	MA-19, FA-4
Exhaust system			I		I		I		I		I		I		I		I	MA-19
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.

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

Schedule 2

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-9
Air cleaner filter					[R]				[R]	MA-12
Vapor lines					I*				I*	MA-14
Fuel lines					I*				I*	MA-11
Fuel filter	See NOTE (2)*									MA-11
Engine coolant					R*				R*	MA-10
Engine oil		R	R	R	R	R	R	R	R	MA-12
Engine oil filter (Use Nissan PREMIUM type or equivalent.)		R		R		R		R		MA-13
Spark plugs					[R]				[R]	MA-13
Chassis and body maintenance										
Brake lines & cables			I		I		I		I	MA-17
Brake pads, discs, drums & linings			I		I		I		I	MA-17, 18
Manual & automatic transaxle oil			I		I		I		I	MA-15, 16
Steering gear linkage, axle & suspension parts					I				I	MA-19, FA-4
Exhaust system			I		I		I		I	MA-20
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.

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

Item	Reference 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-19
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-19 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-21
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-21
Clutch pedal Make sure the pedal operates smoothly and check that it has the proper free travel.	CL-4
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.	BR-8

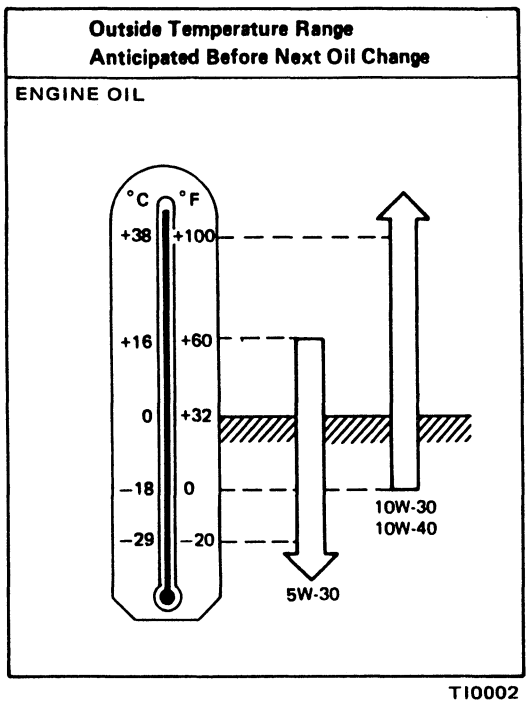
Item	Reference page
Parking brake Check that the lever has the proper travel and confirm that your vehicle is held securely on a fairly steep hill with only the parking brake applied.	BR-27
Automatic transaxle "Park" mechanism Check that the lock release button on the selector lever operates properly 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-15, 16
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-9
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-19
Automatic transaxle fluid level Check the level on the dipstick after putting the selector lever in "P" with the engine idling.	MA-15, 16
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-20
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.	—

Fluids and Lubricants

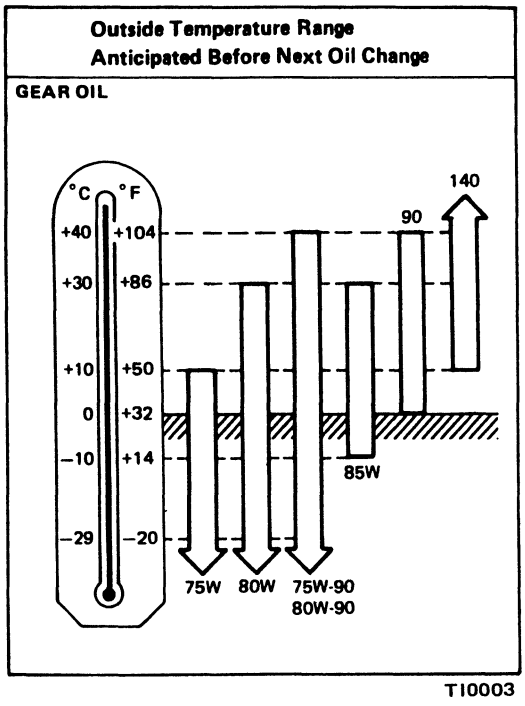
	Capacity (Approximate)			Recommended fluids and lubricants
	US measure	Imp measure	Liter	
Engine oil (Refill)				
With oil filter	3-3/4 qt	3-1/8 qt	3.5	Energy Conserving Oils of API SG *2, *3
Without oil filter	3-3/8 qt	2-7/8 qt	3.2	
Cooling system	7-7/8 qt	6-1/2 qt	7.4	Anti-freeze coolant (Ethylene 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	1 qt	3/4 qt	0.9	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

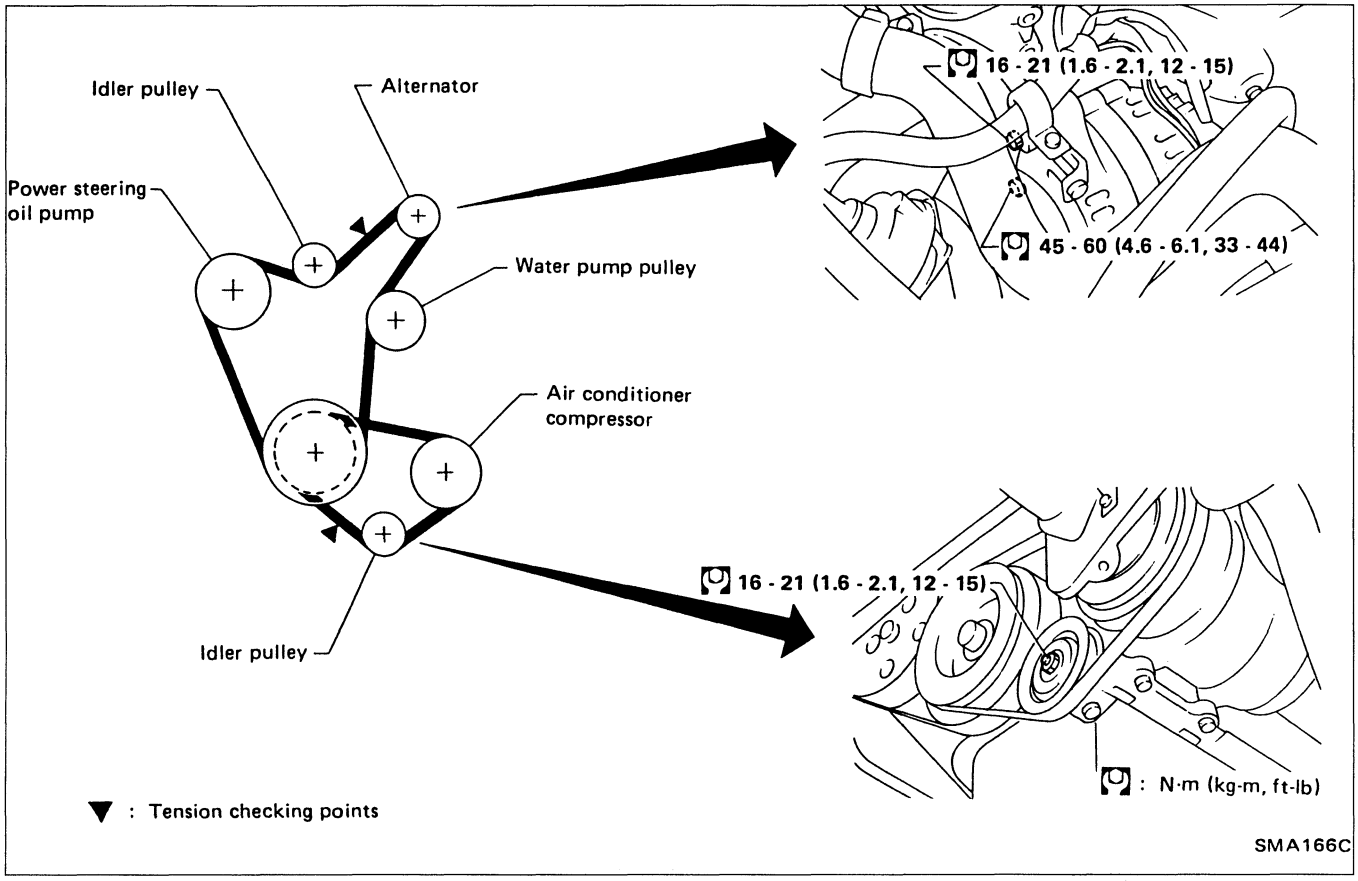


10W-30 is preferable if the ambient temperature is above -18°C (0°F). 20W-40 and 20W-50 are usable if the ambient temperature is above 10°C (50°F) for all seasons.



80W-90 is preferable if the ambient temperature is below 40°C (104°F).

Checking Drive Belts

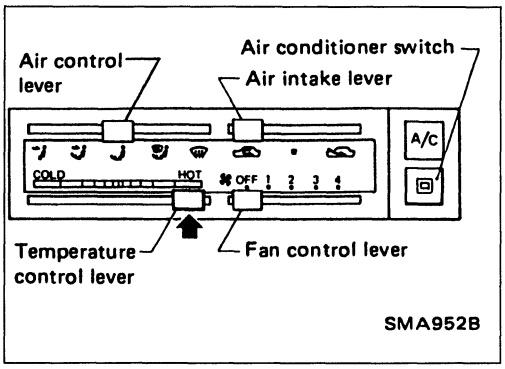


1. Inspect for cracks, fraying, wear or oil adhesion. If necessary, replace with a new one.
2. Inspect drive belt deflections by pushing on the belt midway between pulleys.

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)		

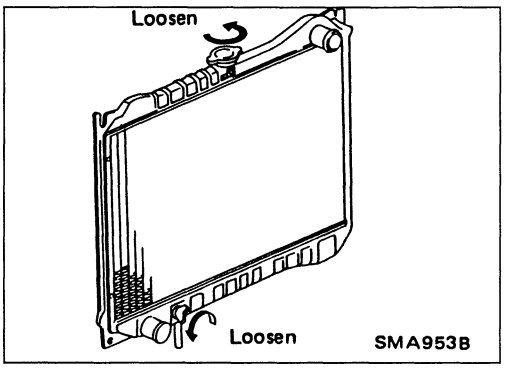


Changing Engine Coolant

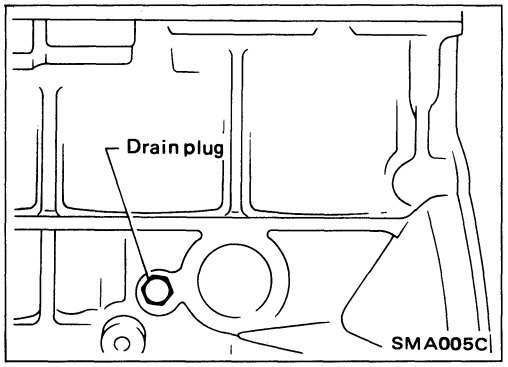
WARNING:

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.



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

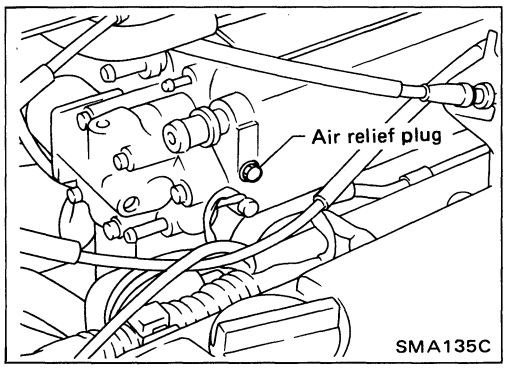


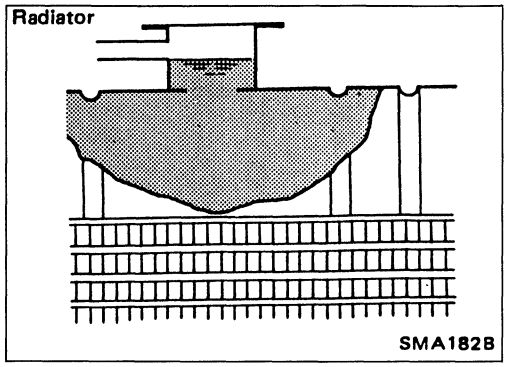
3. Remove cylinder block drain plug.
4. Close drain cock and tighten drain plug securely.

- **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.

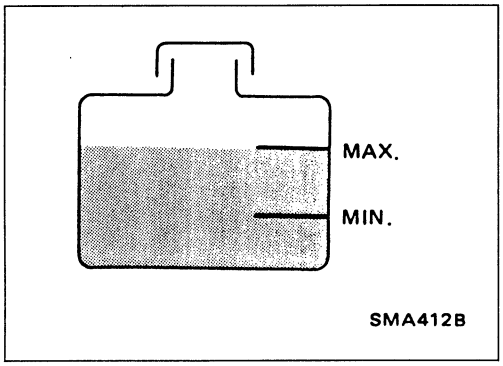




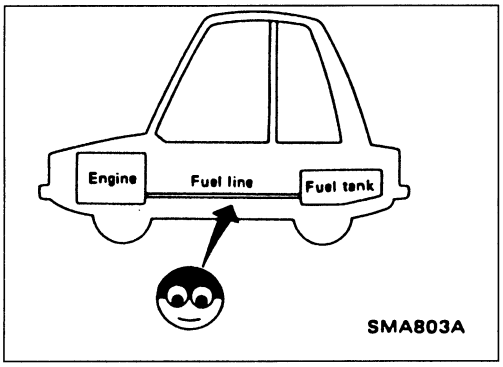
12. Open radiator cap and air relief plug.
13. Fill radiator with coolant up to specified level.
    Follow instructions attached to anti-freeze container for mixing ratio of anti-freeze to water.
    Coolant capacity (With reservoir tank):
    7.4 ℓ (7-7/8 US qt, 6-1/2 Imp qt)

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.

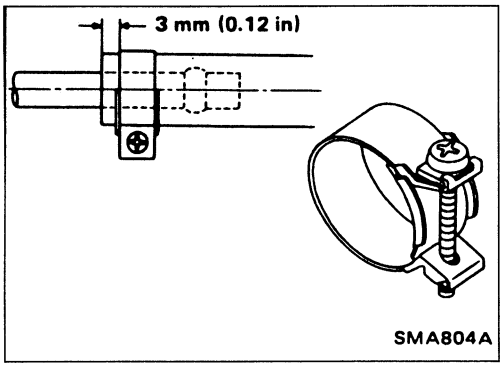


14. Close air relief plug.
15. Remove reservoir tank, drain coolant, then clean reservoir tank.
16. Install reservoir tank and fill it with coolant up to "MAX" level and then install radiator cap.
17. Run engine and warm it up sufficiently.
18. Race engine 2 or 3 times under no-load.
19. Stop engine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

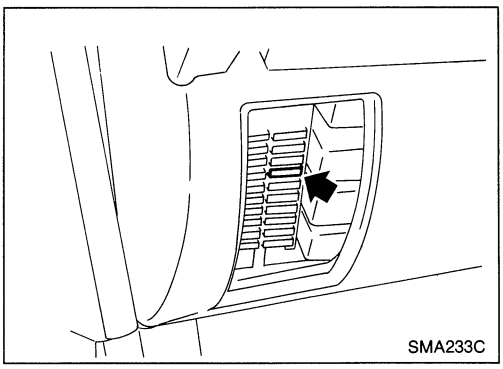


Checking Fuel Lines

Inspect fuel lines and tank for improper attachment and for leaks, cracks, damage, loose connections, chafing and deterioration.
If necessary, repair or replace faulty parts.



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

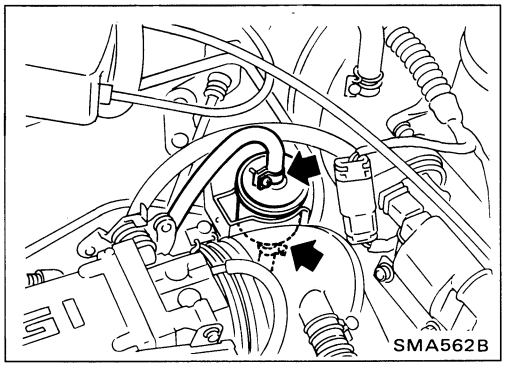


Changing Fuel Filter

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.

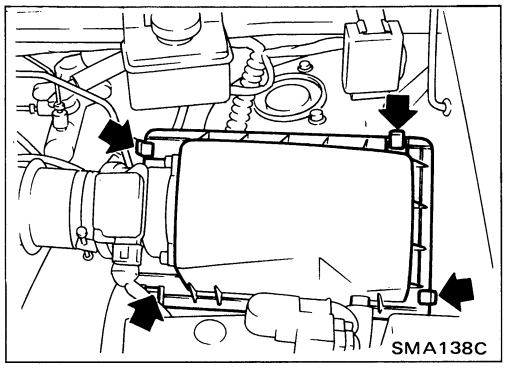
Changing Fuel Filter (Cont'd)


SMA562B

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

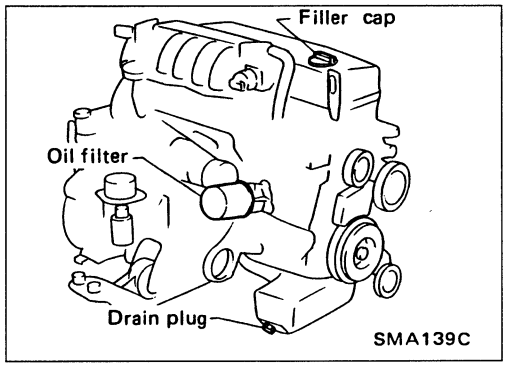
- **Use a high-pressure type fuel filter. Do not use a synthetic resinous fuel filter.**
- **When tightening fuel hose clamps, refer to "Checking Fuel Lines".**

Changing Air Cleaner Filter


SMA138C

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

Changing Engine Oil



SMA139C

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.

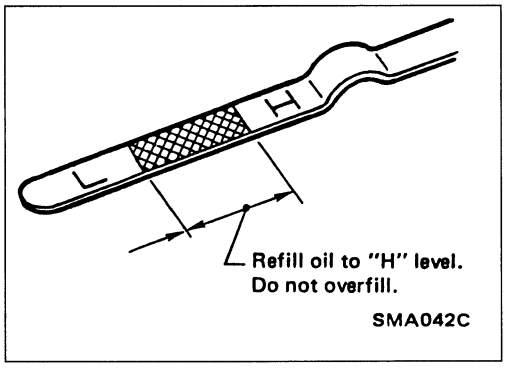
Refill oil capacity (Approximate):

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:
  [O]: 29 - 39 N·m
  (3.0 - 4.0 kg-m, 22 - 29 ft-lb)
- **Use recommended engine oil.**



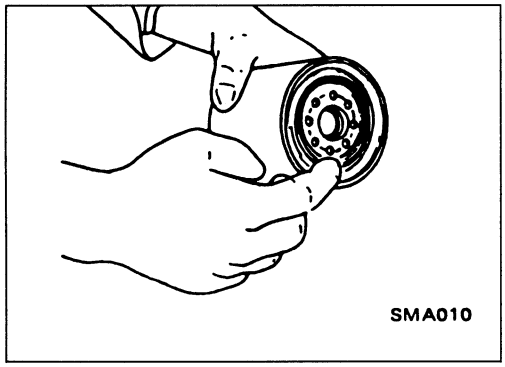
SMA042C

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.

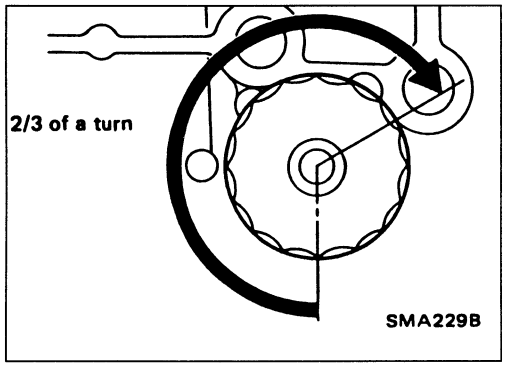
Changing Oil Filter

1. Remove oil filter with a suitable tool.

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

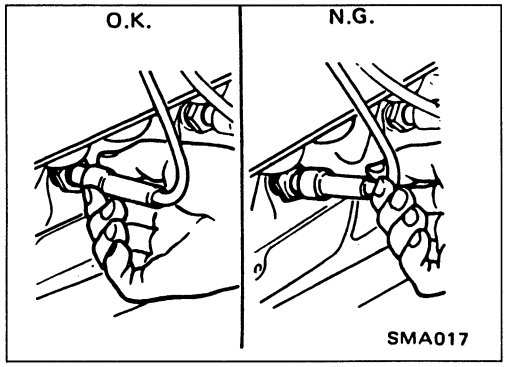


2. Before installing new oil filter, clean the oil filter mounting surface on cylinder block, and coat the rubber seal of oil filter with a little engine oil.



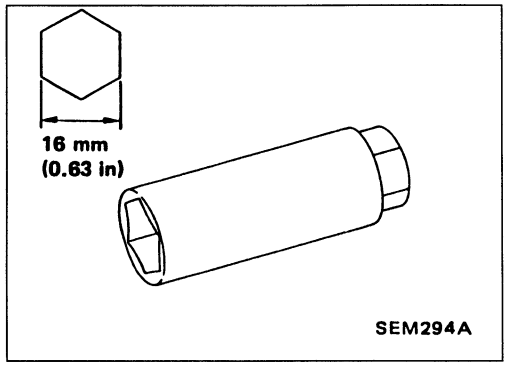
3. Screw in the oil filter until a slight resistance is felt, then tighten additionally more than 2/3 turn.
4. Add engine oil.

Refer to Changing Engine Oil.



Changing Spark Plugs

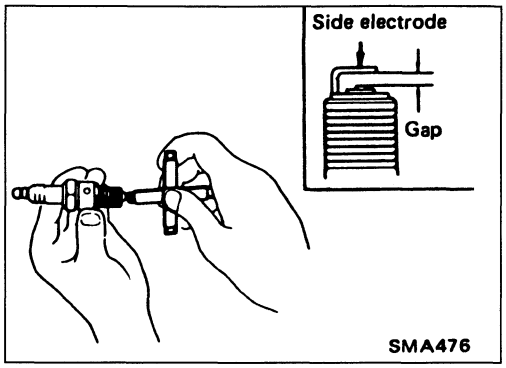
1. Disconnect ignition wires from spark plugs at boot. Do not pull on the wire.



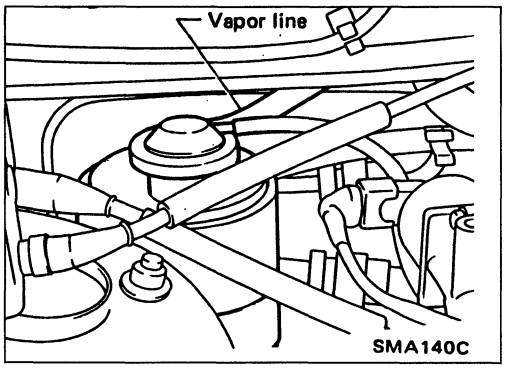
2. Remove spark plugs with spark plug wrench.

Spark plug:
Standard type
ZFR5E-11
Hot type
ZFR4E-11
Cold type
ZFR6E-11

Changing Spark Plugs (Cont'd)



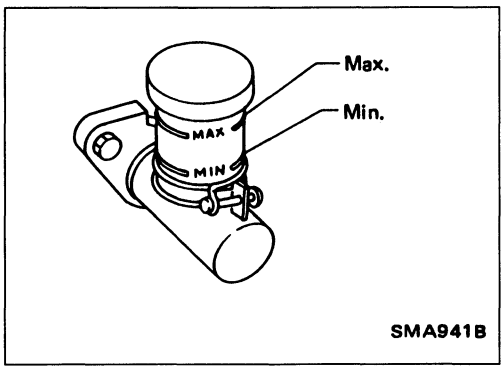
3. Check plug gap of each new spark plug.
   Gap: 1.0 - 1.1 mm (0.039 - 0.043 in)
4. Install spark plugs. Reconnect ignition wires according to nos. indicated on them.
   Spark plug:
   [⊙]: 20 - 29 N·m
   (2.0 - 3.0 kg-m, 14 - 22 ft-lb)



Checking Vapor Lines

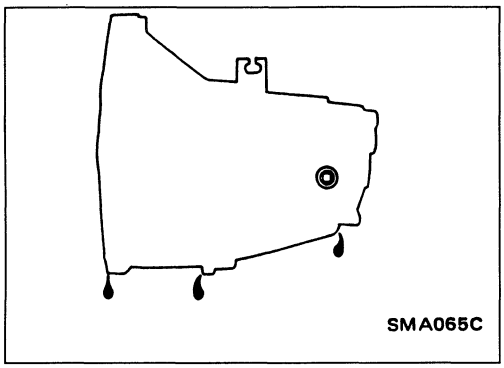
1. Visually inspect vapor lines for improper attachment and for cracks, damage, loose connections, chafing and deterioration.
2. Inspect vacuum relief valve of fuel tank filler cap for clogging, sticking, etc.

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



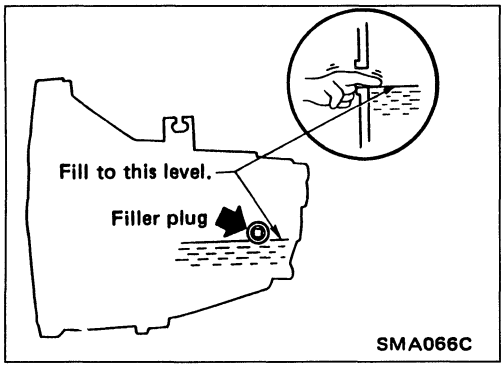
Checking Clutch Fluid Level and Leaks

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



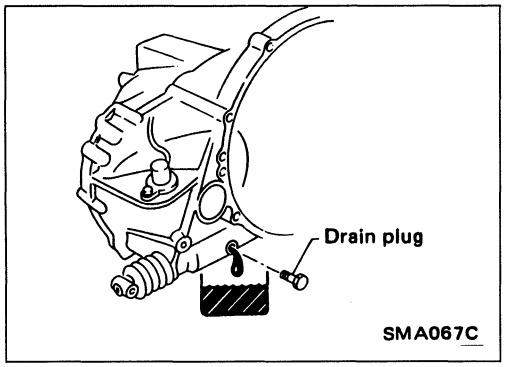
Checking M/T Oil

1. Check for oil leaks.



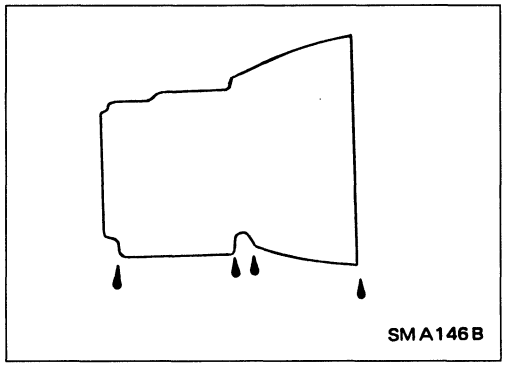
2. Check oil level.

Never start engine while checking oil level.



Changing M/T Oil

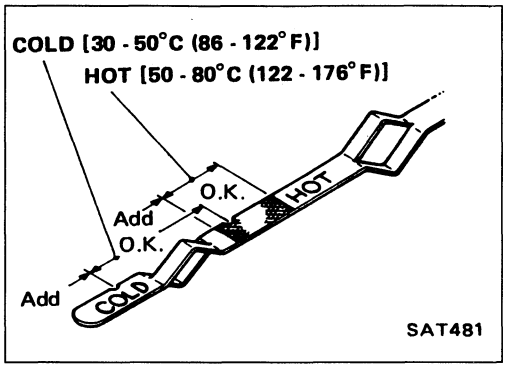
Oil capacity:
4.7 liters (10 US pt, 8-1/4 Imp pt)



Checking A/T Fluid Level

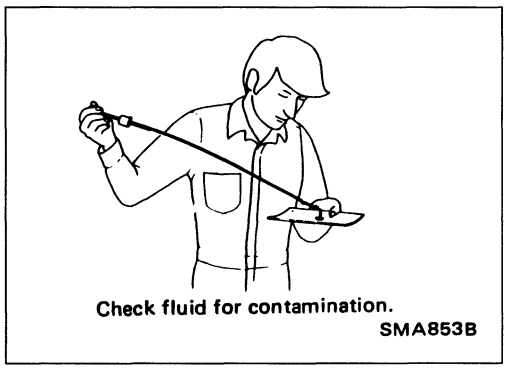
1. Check for fluid leakage.

Checking A/T Fluid Level (Cont'd)



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.

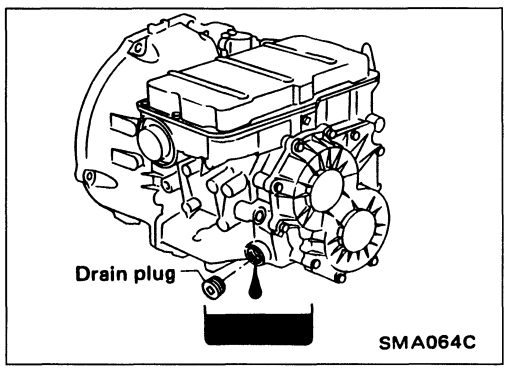
Do not overfill.



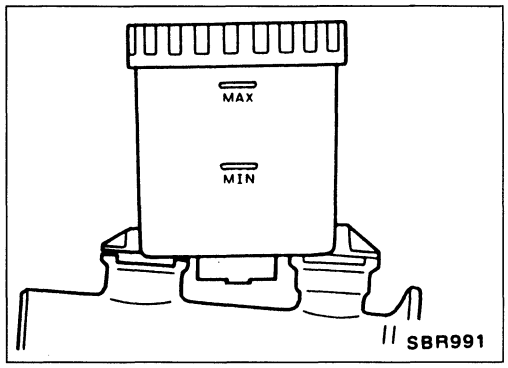
3. Check fluid condition.
   Check fluid for contamination. If fluid is very dark or smells burned, or contains frictional material (clutches, band, etc.), check operation of A/T.
   Refer to section AT for checking operation of A/T.

Changing A/T Fluid

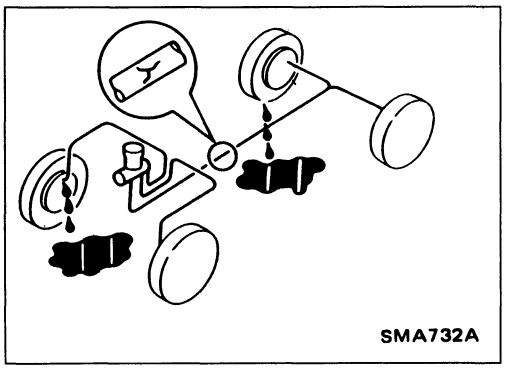
Oil capacity (With torque converter):
7.4 liters (7-7/8 US qt, 6-1/2 Imp qt)



Checking Brake Fluid Level and Leaks

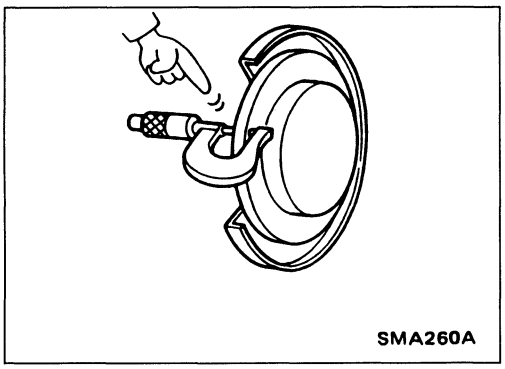


If fluid level is extremely low, check brake system for leaks.


SMA732A

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

Check condition of disc brake components.

ROTOR

Check condition and thickness.

CL25VA:

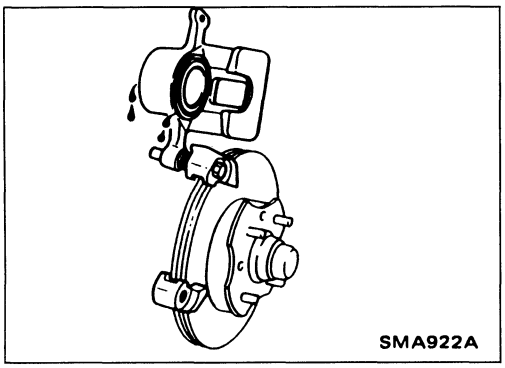
Standard thickness
22.0 mm (0.866 in)

Minimum thickness
20.0 mm (0.787 in)

CL9H:

Standard thickness
10.0 mm (0.394 in)

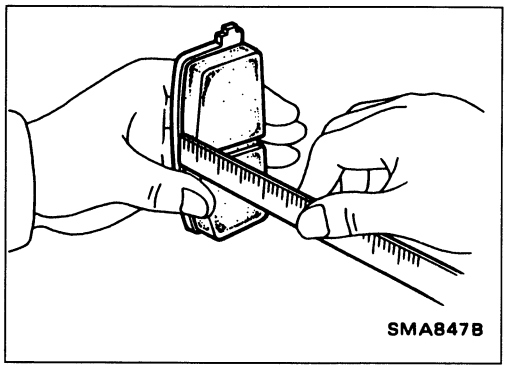
Minimum thickness
9.0 mm (0.354 in)


SMA922A

CALIPER

Check operation and for leakage.

Checking Disc Brake (Cont'd)


SMA847B

PAD

Check for wear or damage.

CL25VA:

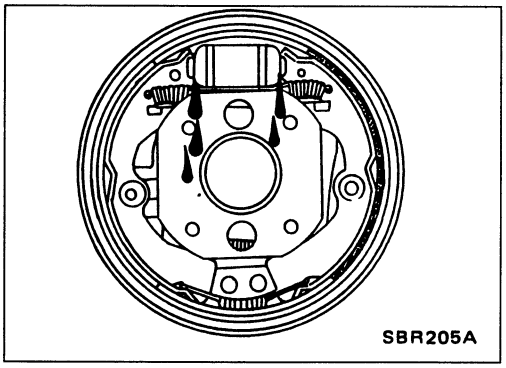
Standard thickness
11.0 mm (0.433 in)
Minimum thickness
2.0 mm (0.079 in)

CL9H:

Standard thickness
9.0 mm (0.354 in)
Minimum thickness
2.0 mm (0.079 in)

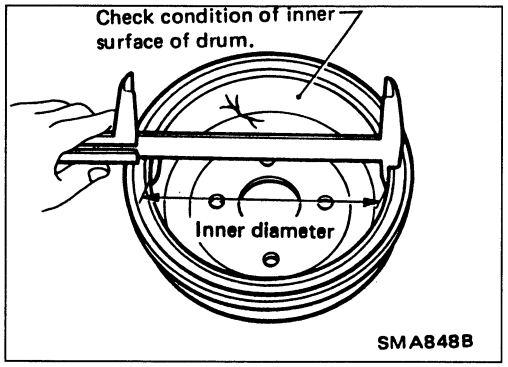
Checking Drum Brake

Check condition of drum brake components.


SBR205A

WHEEL CYLINDER

Check operation and for leakage.

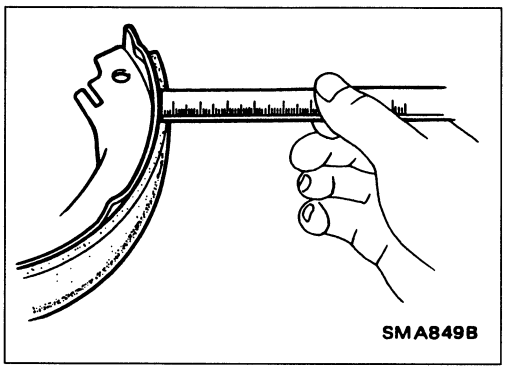


SMA848B

DRUM

Check condition of inner surface.

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


SMA849B

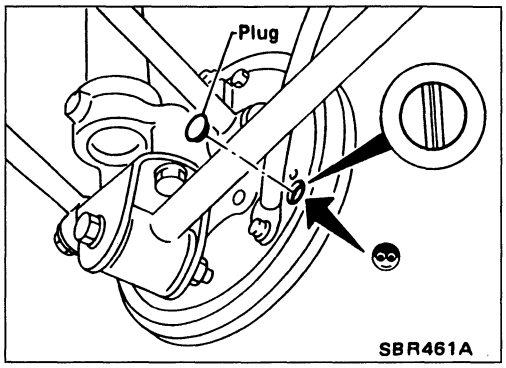
LINING

Check for wear or damage.

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

Refer to section BR for shoe replacement.

Checking Drum Brake (Cont'd)

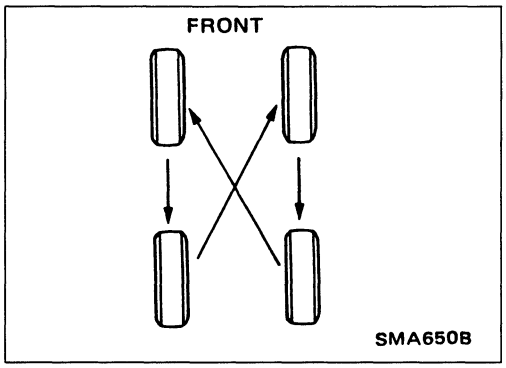


TEMPORARY METHOD FOR CHECKING LINING WEAR

Remove inspection hole plug and check for lining wear.

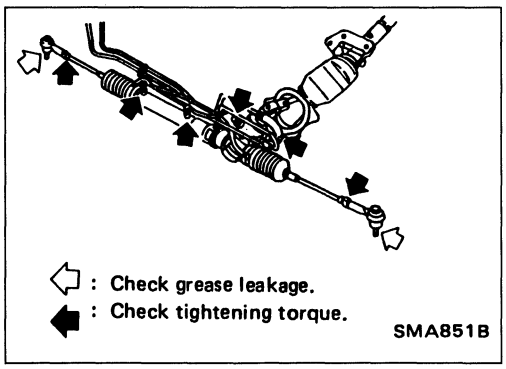
Balancing Wheels

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



Tire Rotation

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



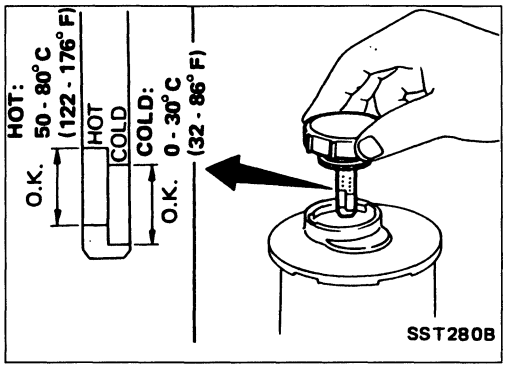
Checking Steering Gear and Linkage

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.



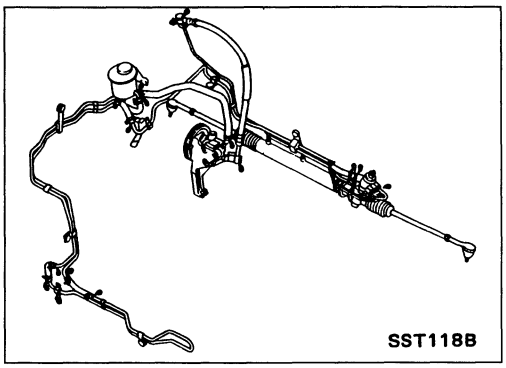
Checking Power Steering Fluid and Lines

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:

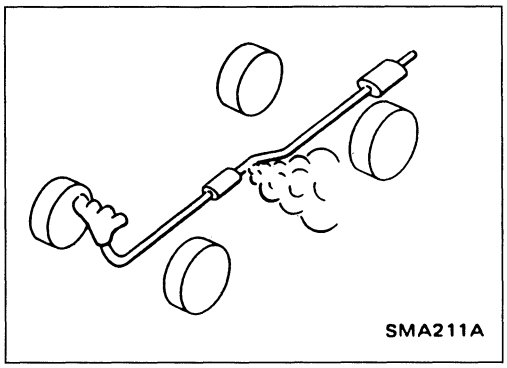
- **Do not overfill.**
- **Recommended fluid is Automatic Transmission Fluid "DEXRON™" type.**

Checking Power Steering Fluid and Lines (Cont'd)



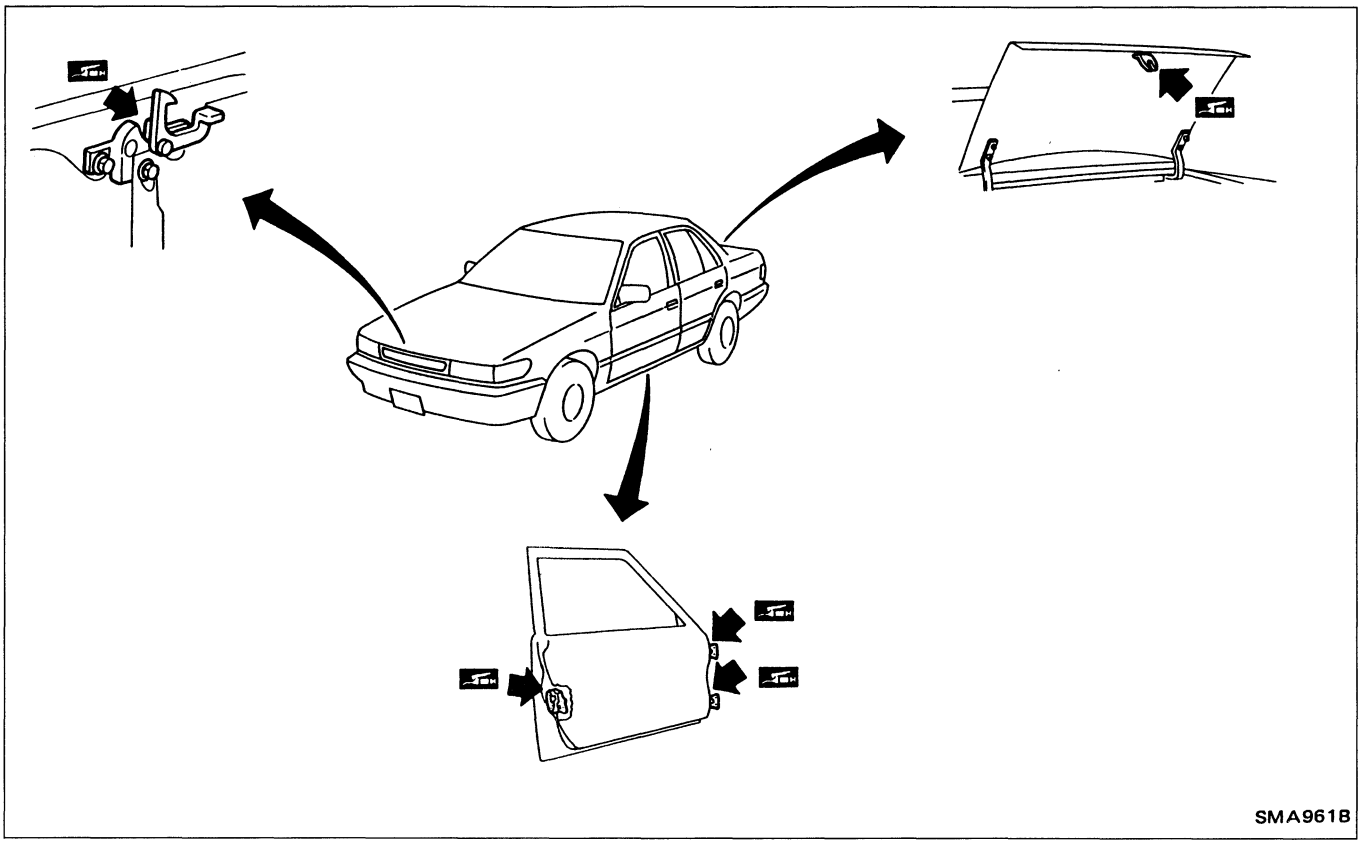
- Check lines for improper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.

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



SMA961B

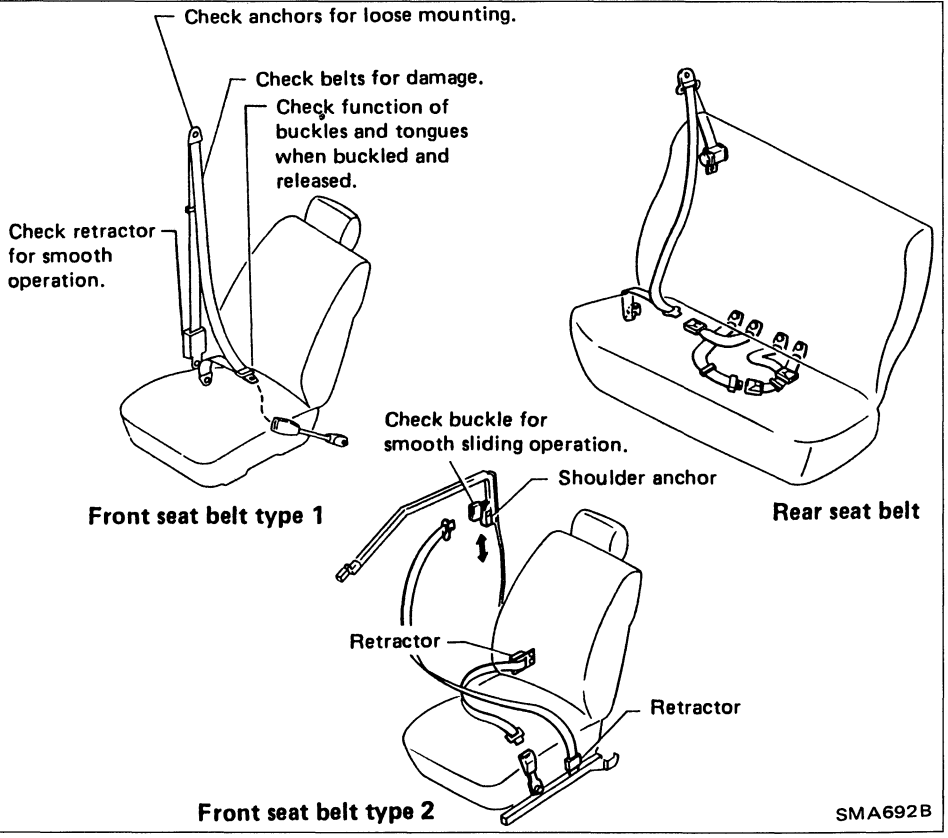
Checking Seat Belts, Buckles, Retractors, Anchors and Adjusters

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.



SMA692B

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	mm (in)	1 - 3 (0.04 - 0.12)
(Total toe-in)	degree	6' - 18'
Front wheel turning angle Full turn Inside/outside	degree	34° - 38°/27° - 31°

*: Tankful of fuel, radiator coolant and engine oil full
Spare tire, jack, hand tools, mats in designated positions

Rear axle and rear suspension (Unladen)*

Camber	degree	-1°20' to 10'
Toe-out	mm (in)	0 - 4 (0 - 0.16)
(Total toe-out)	degree	0' - 23'

*: Tankful of fuel, radiator coolant and engine oil full
Spare tire, jack, hand tools, mats in designated positions

Chassis and Body Maintenance (Cont'd)

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)
Pedal mm (in)	
Free height	
M/T	159 - 169 (6.26 - 6.65)
A/T	169 - 179 (6.65 - 7.05)
Free play	1 - 3 (0.04 - 0.12)
Depressed height [Under force of 490 N (50 kg, 110 lb) with engine running]	90 (3.54) or more
Parking brake	
Number of notches [at pulling force 196 N (20 kg, 44 lb)]	9 - 11

*: Rear disc brake

Wheel balance

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

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

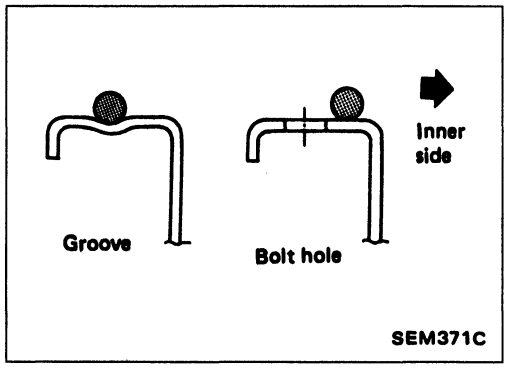
Unit	N·m	kg-m	ft-lb
Clutch			
Pedal stopper lock nut	16 - 22	1.6 - 2.2	12 - 16
Clutch switch lock nut	12 - 15	1.2 - 1.5	9 - 11
Manual transaxle			
Filler plug	25 - 34	2.5 - 3.5	18 - 25
Drain plug	20 - 29	2.0 - 3.0	14 - 22
Automatic transaxle			
Drain plug	25 - 34	2.5 - 3.5	18 - 25
Front axle and front 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
Brake lamp switch lock nut	12 - 15	1.2 - 1.5	9 - 11
Brake booster input rod lock nut	16 - 22	1.6 - 2.2	12 - 16
Wheel and tire			
Wheel nut	98 - 118	10.0 - 12.0	72 - 87

ENGINE MECHANICAL

SECTION EM

EM

CONTENTS



LIQUID GASKET APPLICATION PROCEDURE

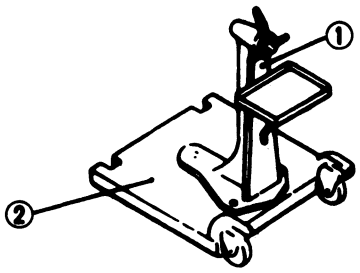
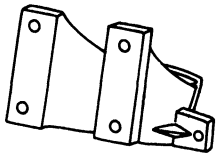
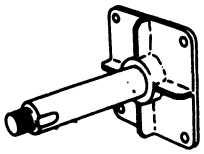
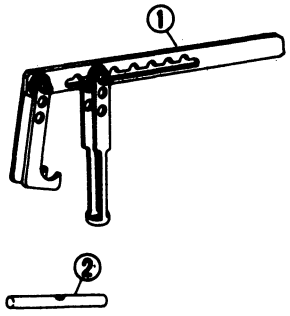
a. Before applying liquid gasket, use a scraper to remove all traces of old liquid gasket from mating surface.

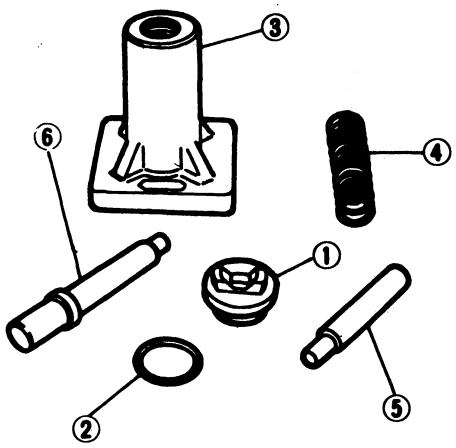
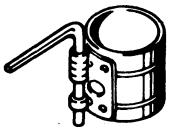
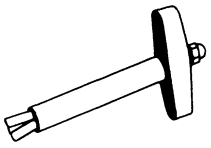
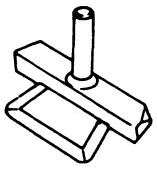
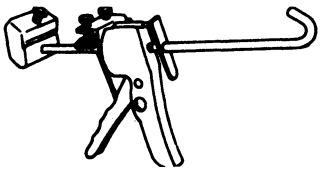
b. Apply a continuous bead of liquid gasket to mating surfaces. (Use Genuine Liquid Gasket or equivalent.)
   - Be sure liquid gasket is 3.5 to 4.5 mm (0.138 to 0.177 in) wide (for oil pan).
   - Be sure liquid gasket is 2.0 to 3.0 mm (0.079 to 0.118 in) wide (in areas except oil pan).

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

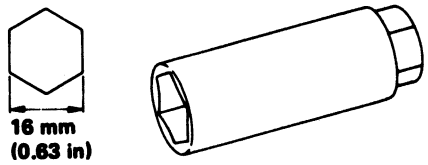
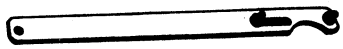
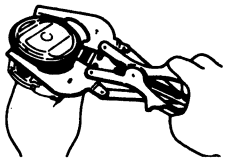
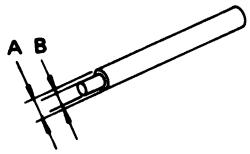
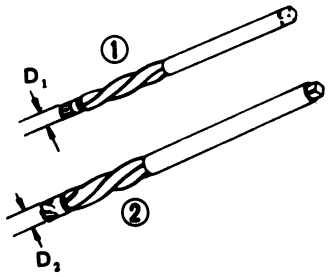
d. Wait at least 30 minutes before refilling engine oil .

SPECIAL SERVICE TOOLS

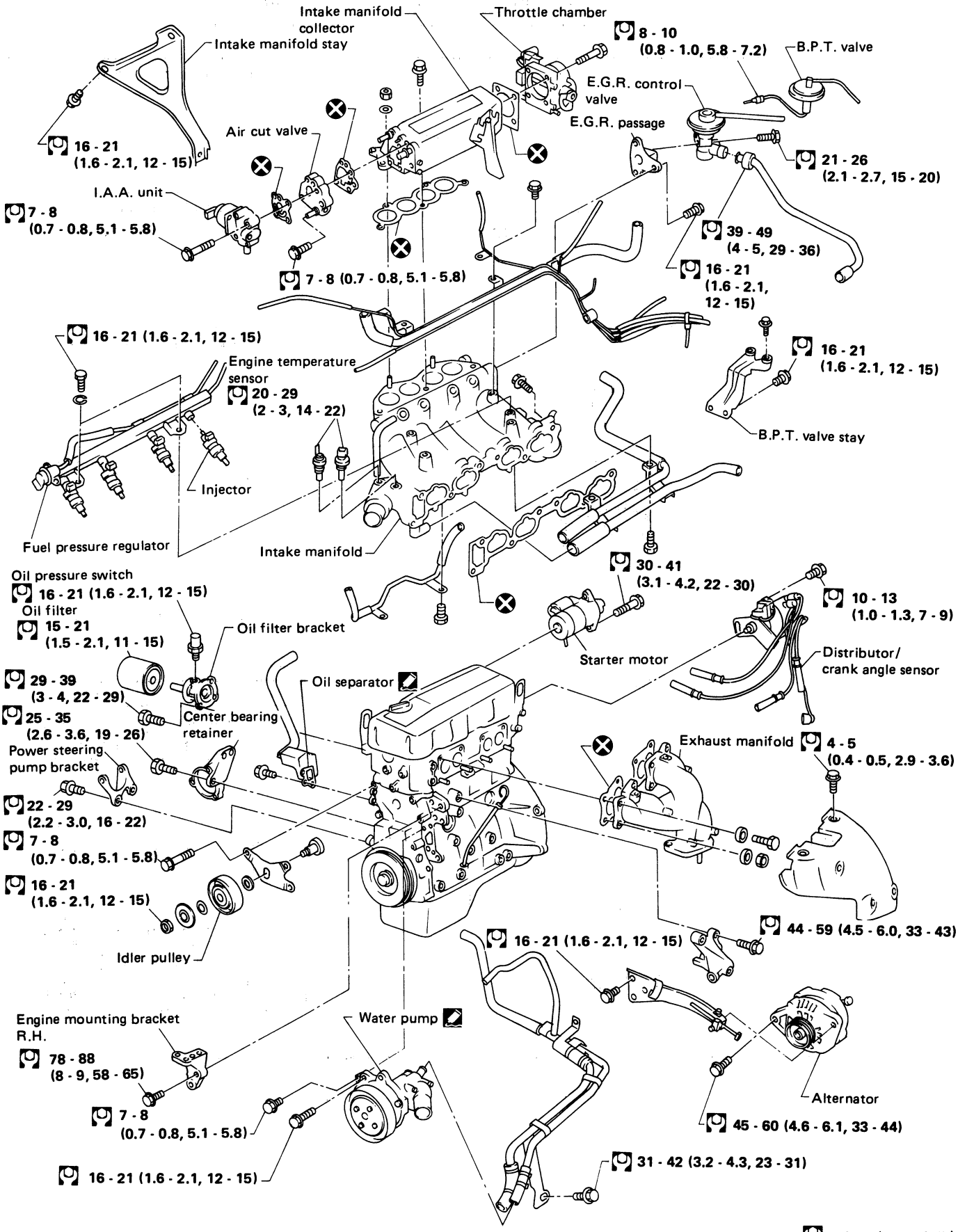
Tool number (Kent-Moore No.) Tool name	Description	
ST0501S000 (—) Engine stand assembly ①ST05011000 (—) Engine stand ②ST05012000 (—) Base		Disassembling and assembling
KV10114300 (—) Engine sub-attachment		
KV101065001 (—) Engine stand shaft		
KV101092S0 (—) Valve spring compressor ①KV10109210 (—) Compressor ②KV10109220 (—) 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 ①KV10110310 (—) Cap ②KV10110330 (—) Spacer ③ST13030020 (—) Press stand ④ST13030030 (—) Spring ⑤KV10110340 (—) Drift ⑥KV10110320 (—) 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

Tool name	Description	
Spark plug wrench		Removing and installing spark plug
Pulley holder		Holding camshaft pulley while tightening or loosening camshaft bolt
Valve seat cutter set		Finishing valve seat dimensions
Piston ring expander		Removing and installing piston ring
Valve guide drift		Removing and installing valve guide **Diameter:** mm (in) Intake: A 10.5 (0.413), B 6.6 (0.260) Exhaust: A 11.5 (0.453), B 7.6 (0.299)
Valve guide reamer		Reaming valve guide (①) or hole for oversize valve guide (②) **Diameter:** mm (in) Intake: D_1 7 (0.28), D_2 11.2 (0.441) Exhaust: D_1 8 (0.31), D_2 12.2 (0.480)

OUTER COMPONENT PARTS



: N·m (kg-m, ft-lb)

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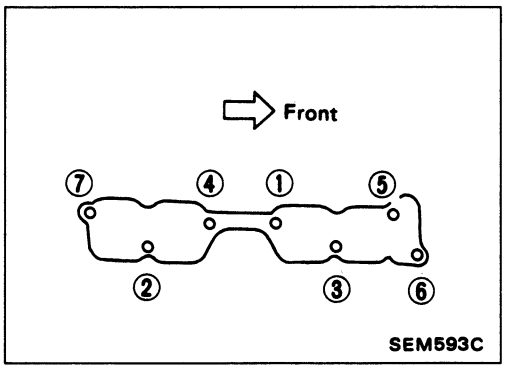
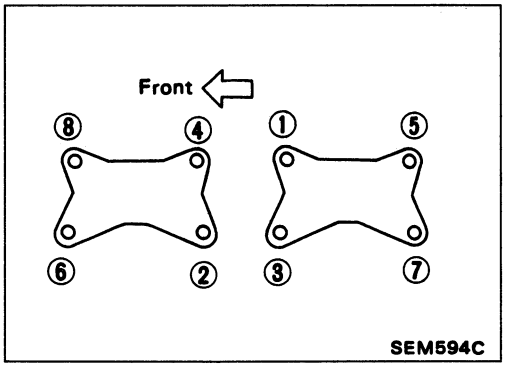


Tightening Procedure of each Part

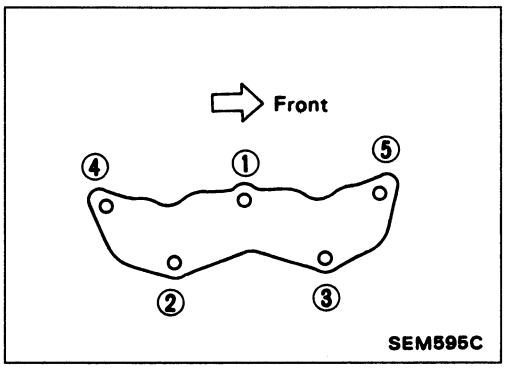
INTAKE MANIFOLD

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



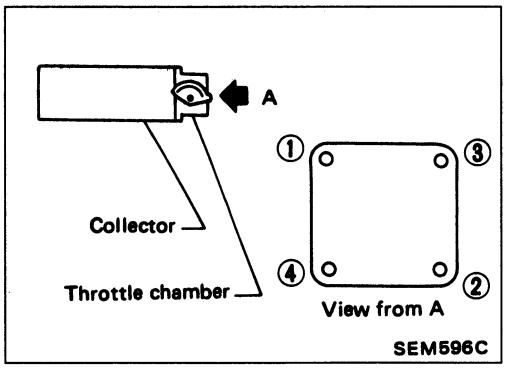
EXHAUST MANIFOLD

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



INTAKE MANIFOLD COLLECTOR

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



THROTTLE CHAMBER

[O]: Bolts should be tightened twice.

1st:

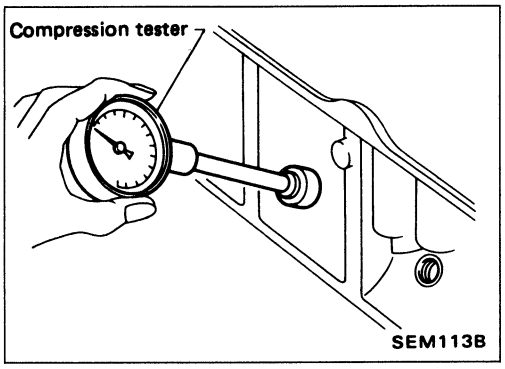
9 - 11 N·m (0.9 - 1.1 kg-m, 6.5 - 8.0 ft-lb)

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.



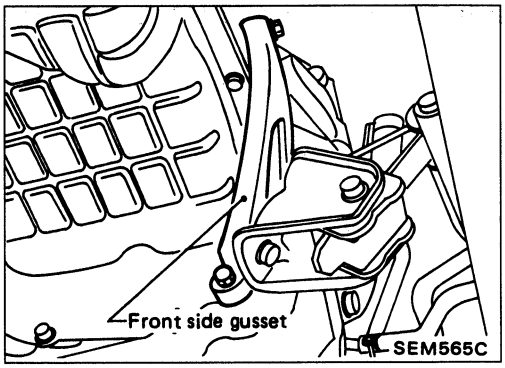
6. Attach a compression tester to No. 1 cylinder.
7. Depress accelerator pedal fully to keep throttle valve wide open.
8. Crank engine and record highest gauge indication.
9. Repeat the measurement on each cylinder as shown above.

- **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.

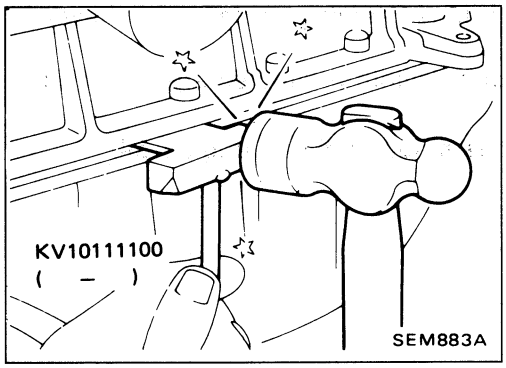
- **If adding oil helps compression, piston rings may be worn or damaged. If so, replace piston rings after checking piston.**
- **If pressure stays low, a valve may be sticking or seating improperly. Inspect and repair valve and valve seat. (Refer to S.D.S.) If valve or valve seat is damaged excessively, 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)

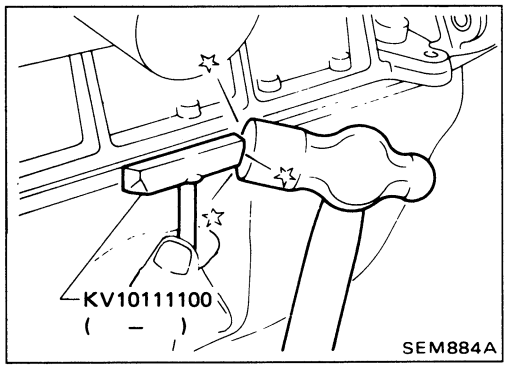
2. Remove oil pan bolts.



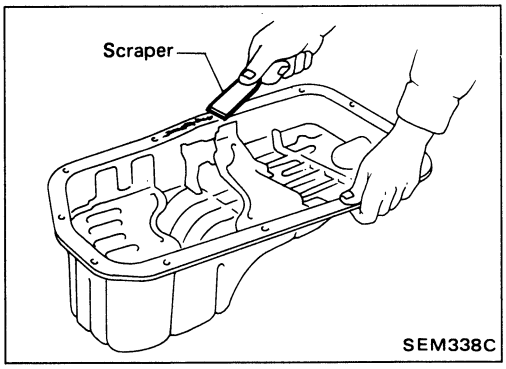
3. Remove oil pan.

(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.**

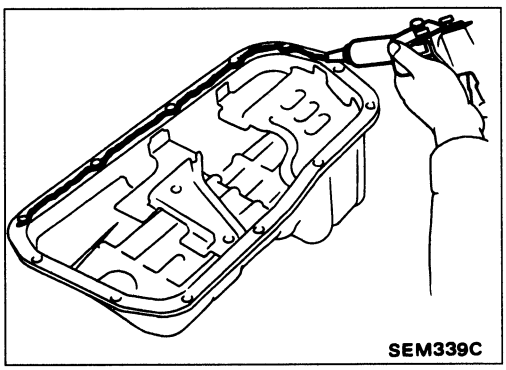


(2) Slide Tool by tapping its side with a hammer, and remove oil pan.



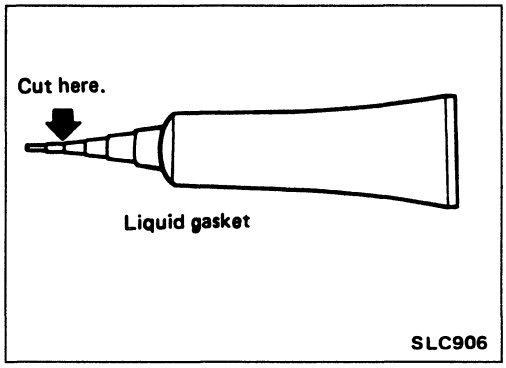
Installation

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.

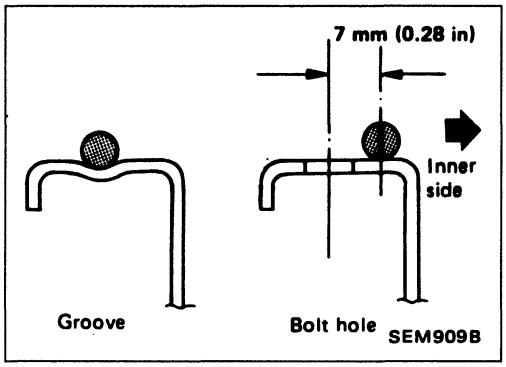


2. Apply a continuous bead of liquid gasket to mating surface of oil pan.
- **Use Genuine Liquid Gasket or equivalent.**

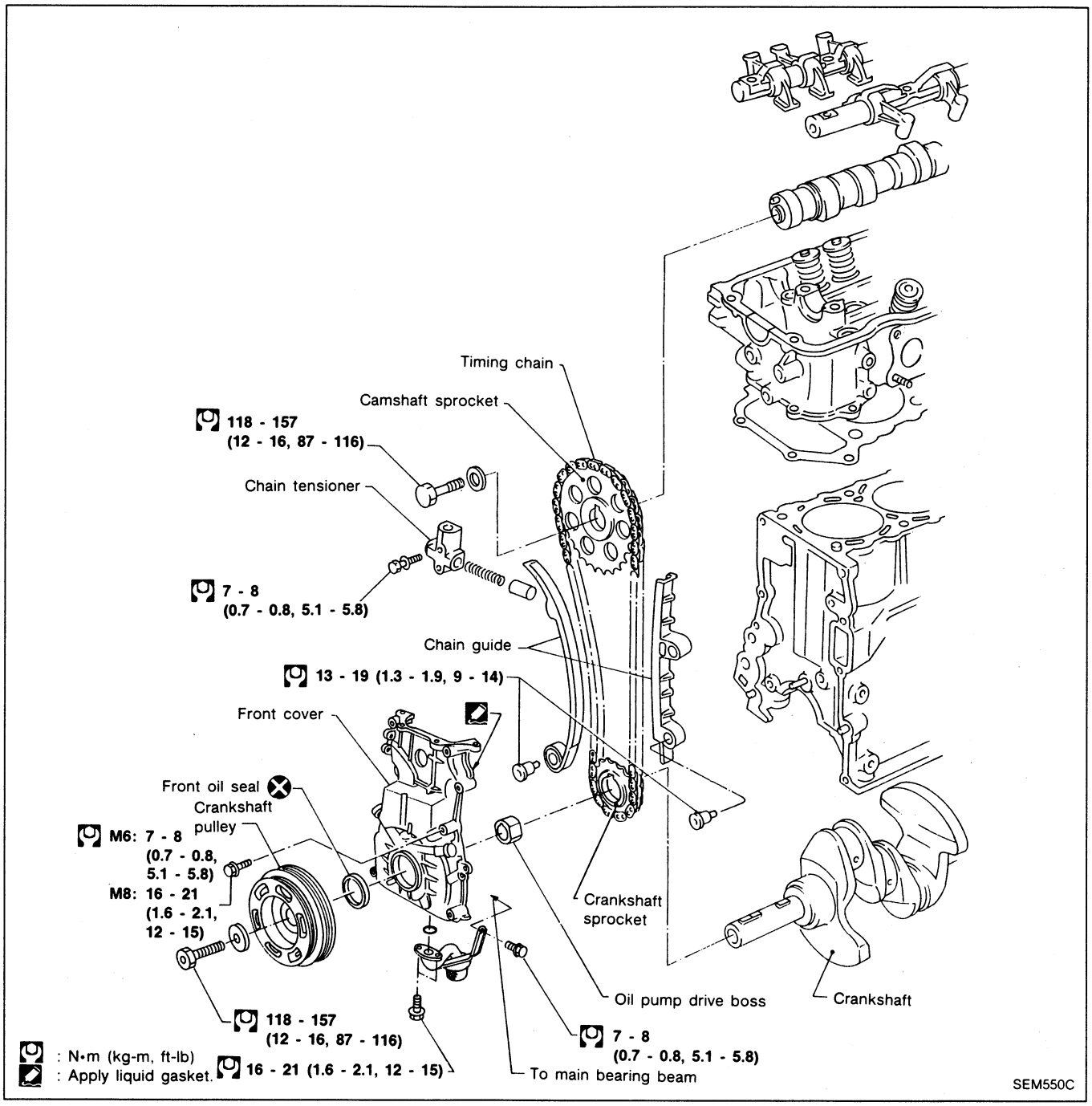
Installation (Cont'd)



- 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.**



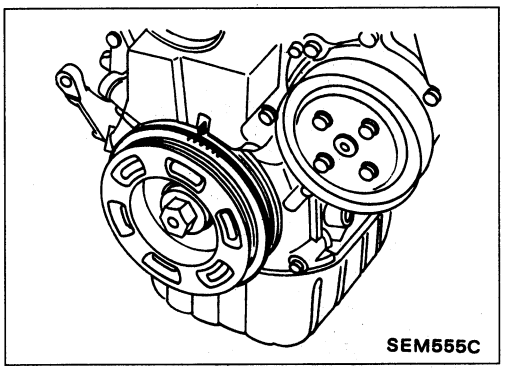
CAUTION:

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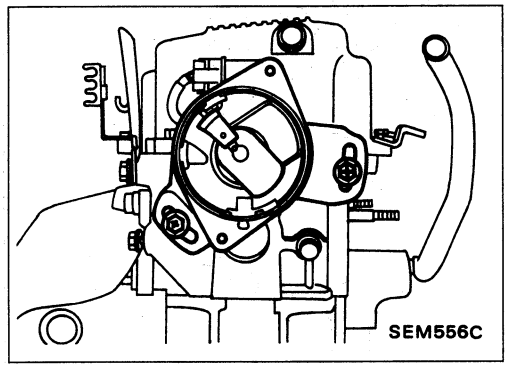
5. Set No. 1 piston at T.D.C. on its compression stroke.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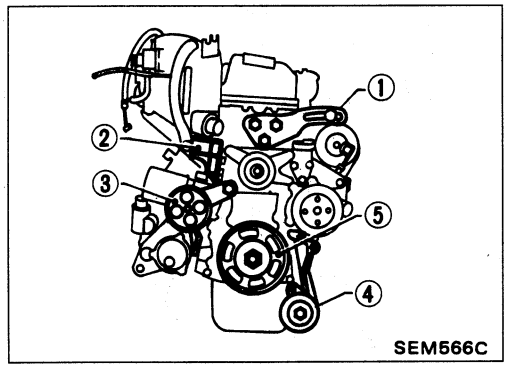

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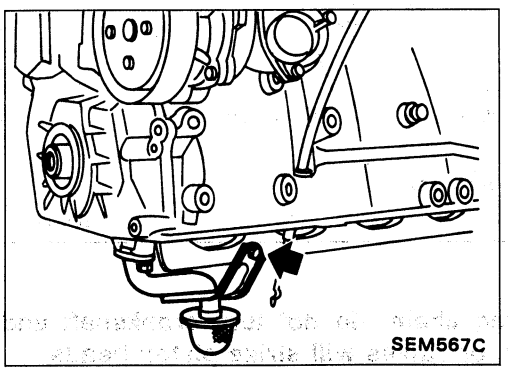
6. Remove the alternator and compressor drive belts.
7. Remove the following parts.
   ① Alternator and adjusting bar
   ② Oil separator
   ③ Power steering pump pulley, pump stay and bracket.
   ④ Compressor and bracket.
   ⑤ Crankshaft pulley and oil pump drive boss.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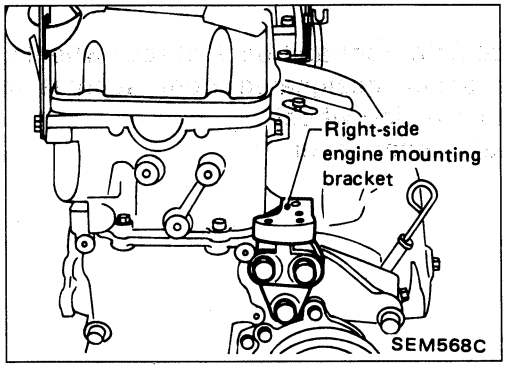
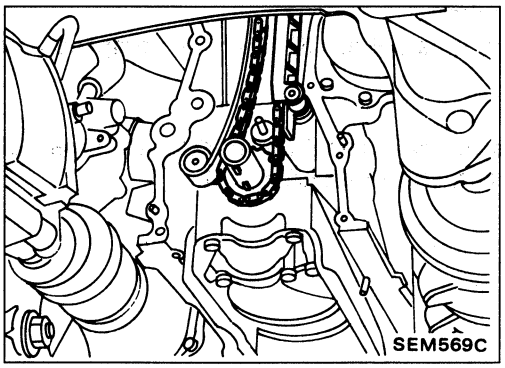
8. Remove oil pan. (Refer to OIL PAN.)
9. Remove oil strainer securing bolt.
10. Remove front cover securing bolts (cover to block and head to cover).



SEM568C

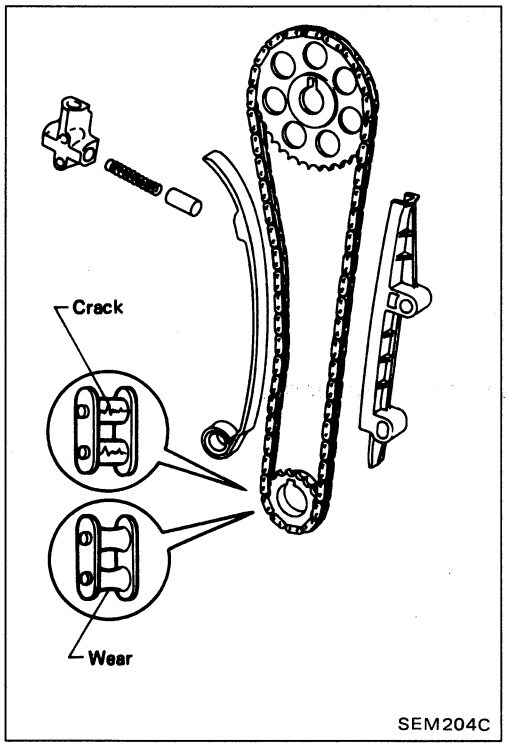
11. Remove rocker cover.
12. Support engine with hoist or chain block.
13. Remove right-side engine mounting bracket and lower the engine.

Removal (Cont'd)



14. Remove front cover.

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



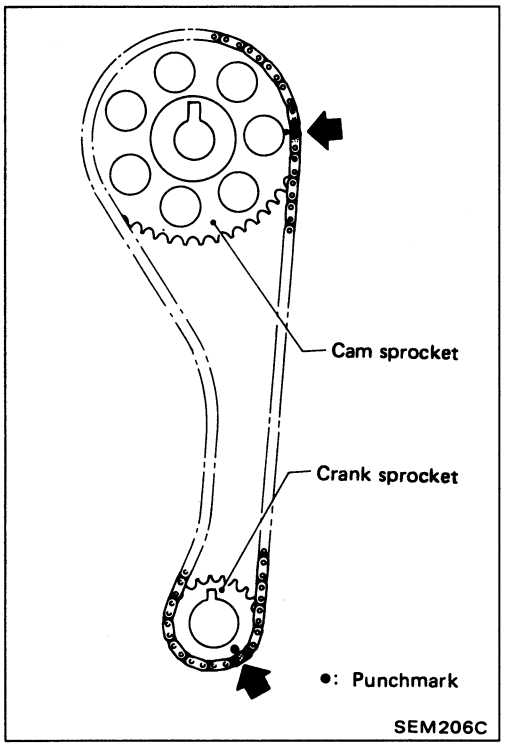
Inspection

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

Installation

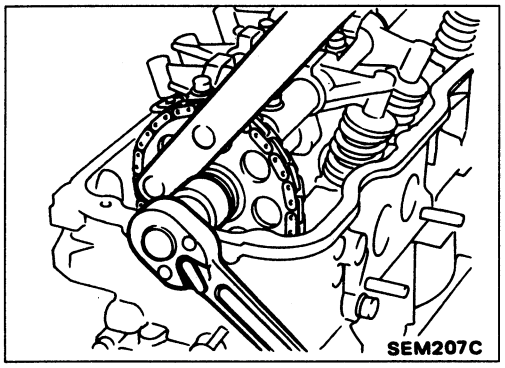
1. Install crankshaft sprocket.
- **Make sure that mating marks of crankshaft sprocket face engine front.**

Installation (Cont'd)

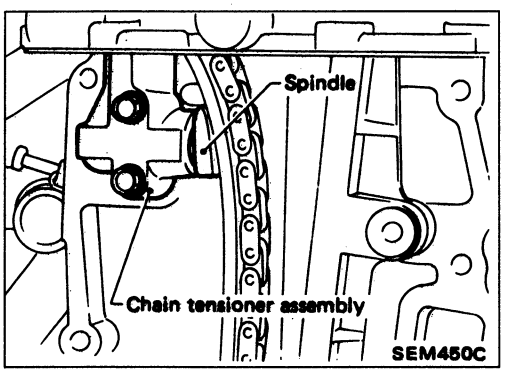


2. Install camshaft sprocket.
3. Confirm that No. 1 piston is set at T.D.C. on its compression stroke.
4. Install timing chain.

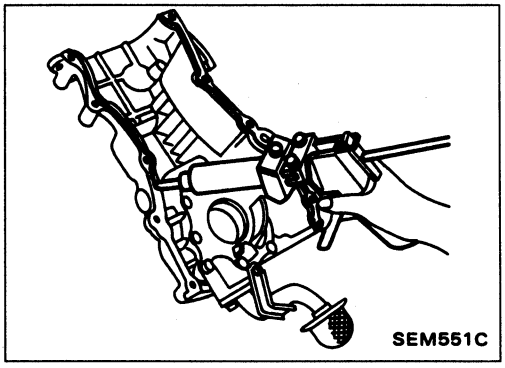
- **Set timing chain by aligning its mating marks with those of crankshaft sprocket and camshaft sprocket.**



5. Tighten camshaft sprocket bolt.

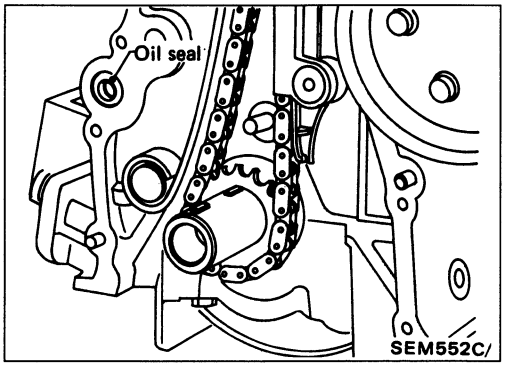


6. Install chain guide and chain tensioner.



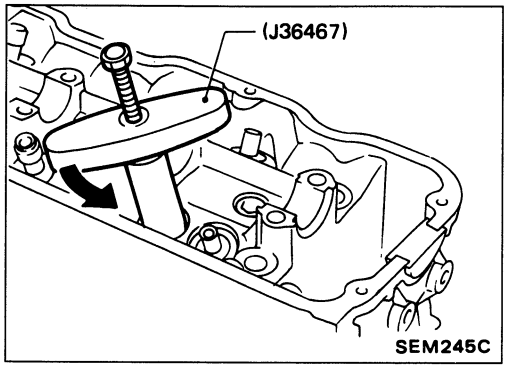
7. Apply liquid gasket to front cover.

Installation (Cont'd)



8. Install front cover.
- **Be careful not to damage cylinder head gasket.**
- **Do not forget oil seal.**

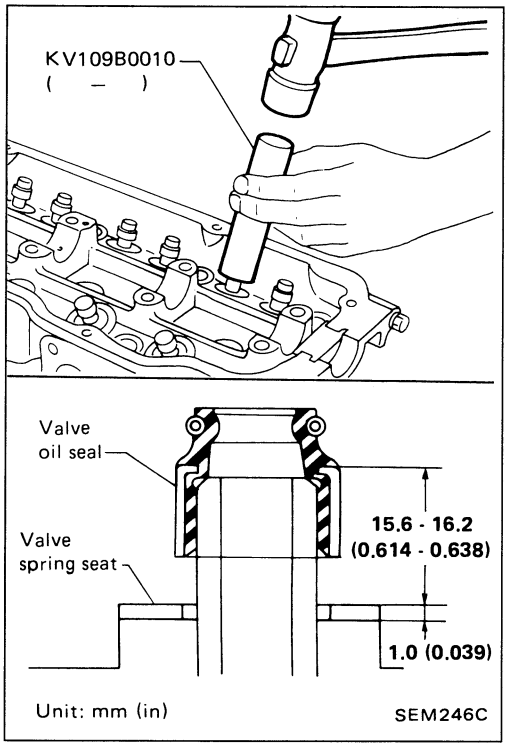
9. Install rubber plug onto cylinder head. (Refer to "Installation" of CYLINDER HEAD.)
10. Install oil pan. (Refer to OIL PAN.)
11. Install engine mounting.
12. Install any parts removed.



VALVE OIL SEAL

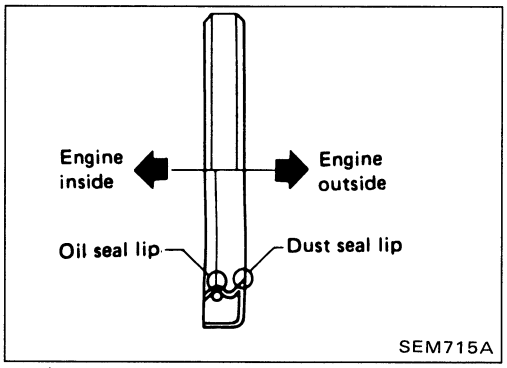
1. Remove rocker cover.
2. Remove rocker shaft assembly.
3. Remove valve spring and valve oil seal with Tool or a suitable tool.

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

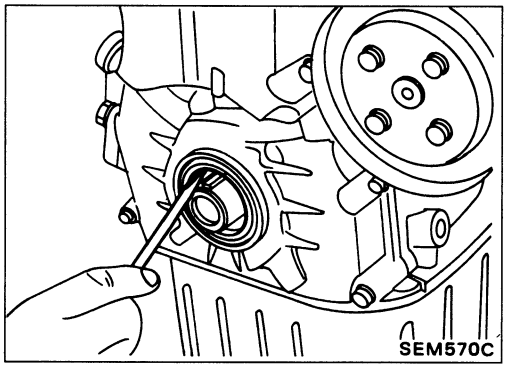


4. Apply engine oil to new valve oil seal and install it with Tool.

Before installing valve oil seal, install valve spring seat.



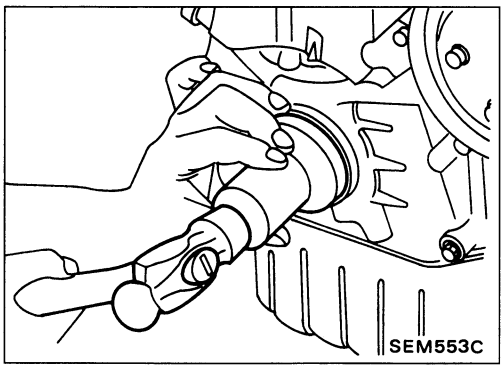
OIL SEAL INSTALLING DIRECTION



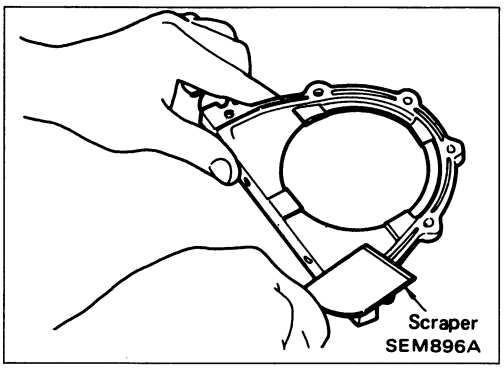
FRONT OIL SEAL

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

Be careful not to damage crankshaft.

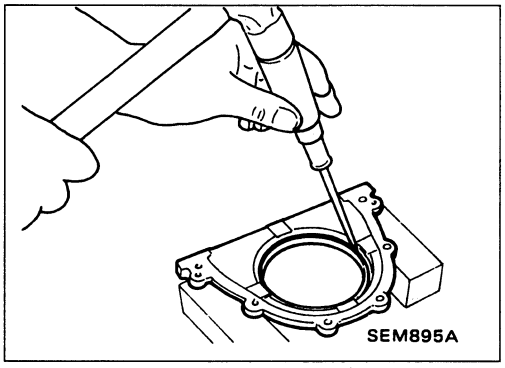


3. Apply engine oil to new oil seal and install it using a suitable tool.

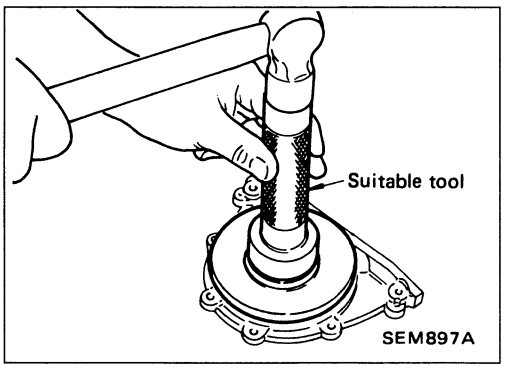


REAR OIL SEAL

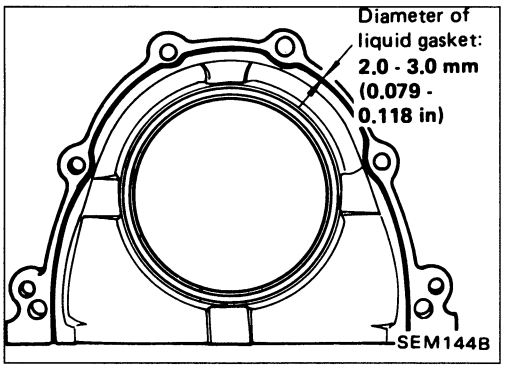
1. Remove transaxle.
2. Remove flywheel or drive plate.
3. Remove rear oil seal retainer.
4. Remove traces of liquid gasket using scraper.



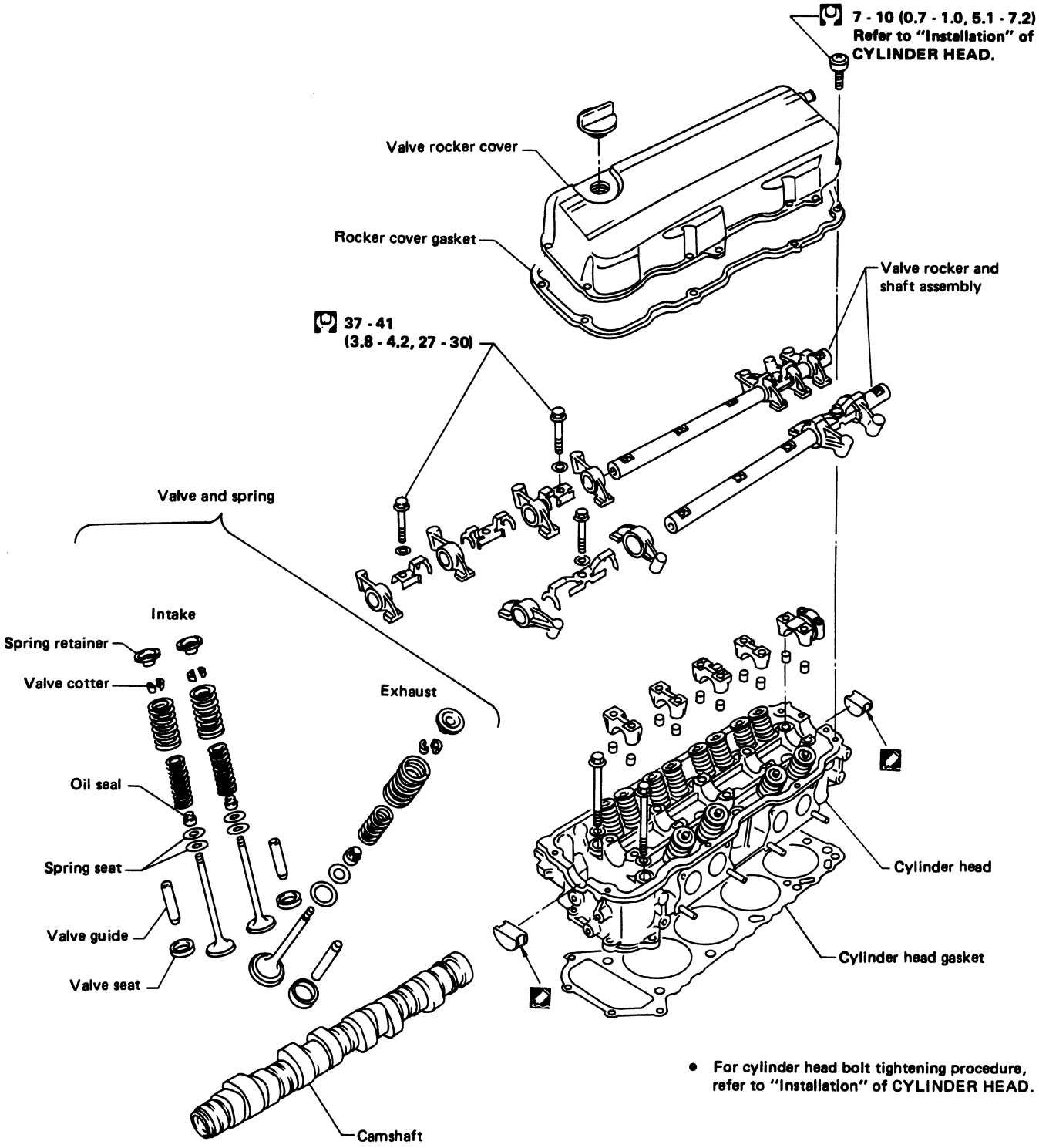
5. Remove rear oil seal from retainer.



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



7. Apply liquid gasket to rear oil seal retainer.



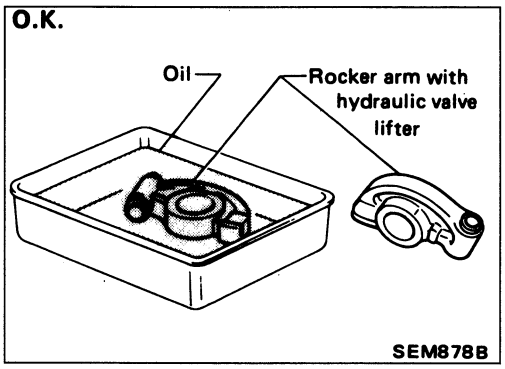
• For cylinder head bolt tightening procedure, refer to "Installation" of CYLINDER HEAD.

: N·m (kg-m, ft-lb)

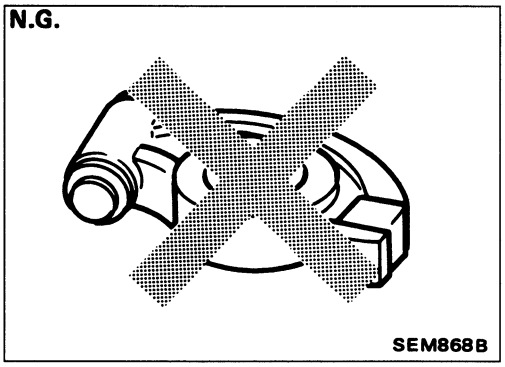
SEM554C

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.**



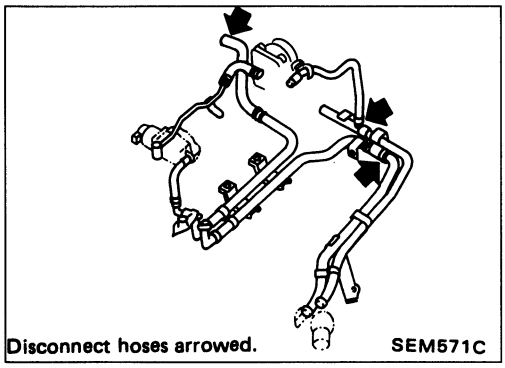
- **Do not disassemble hydraulic valve lifter.**
- **Attach tags to valve lifters so as not to mix them up.**

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



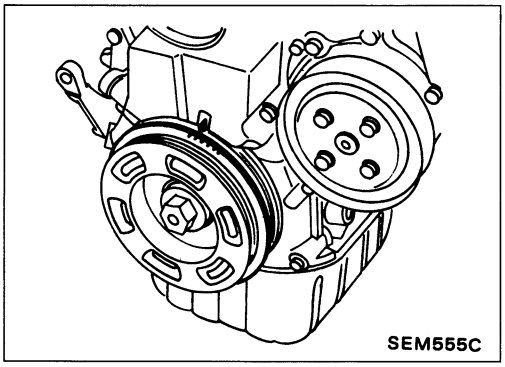
4. Disconnect hoses.
- Vacuum gallery hoses, which are installed on intake manifold.
- Fuel tube hoses

5. Disconnect water hoses as shown in figure.

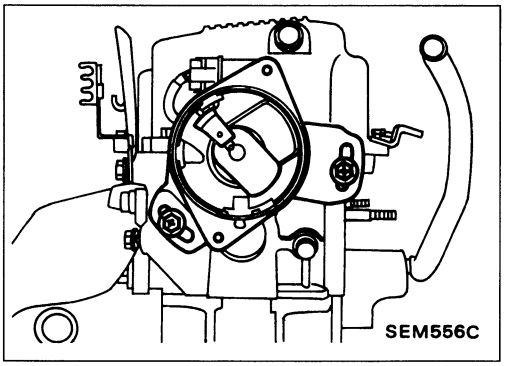
Removal (Cont'd)

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

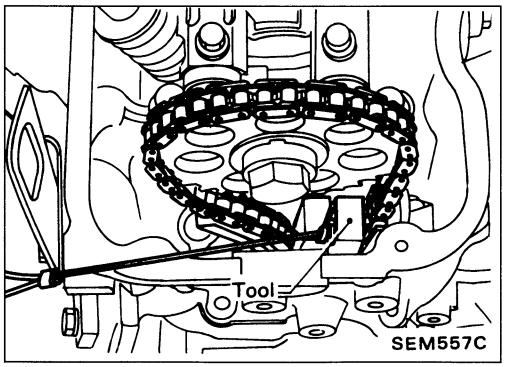
When removing rocker cover, do not knock rocker cover against rocker arms.


SEM555C

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

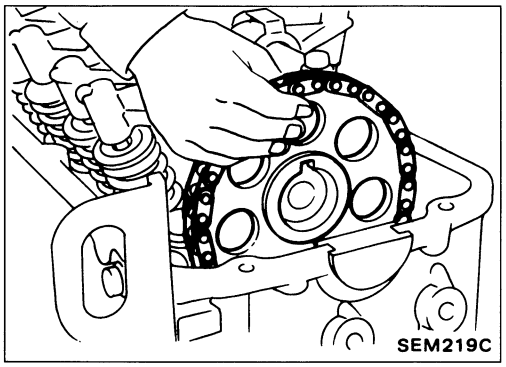

SEM556C

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

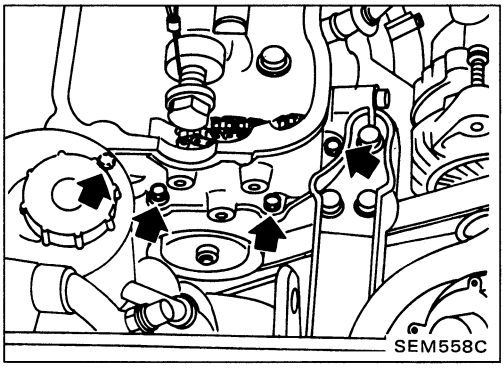


SEM557C

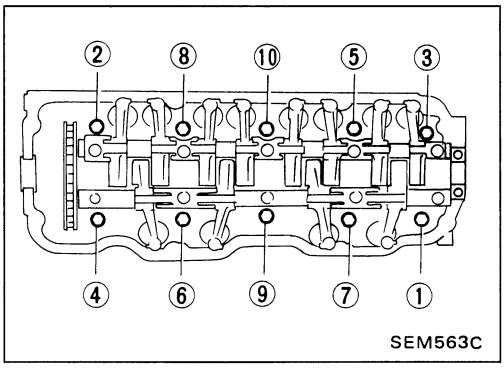
10. Remove camshaft sprocket.


SEM219C

Removal (Cont'd)



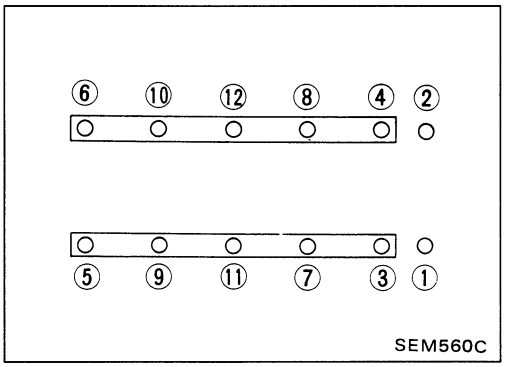
11. Remove front cover tightening bolts to cylinder head.



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



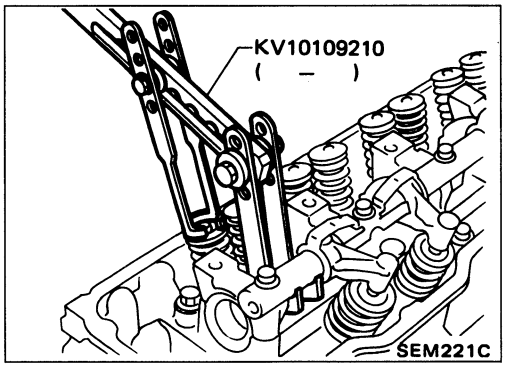
1. Remove rocker shaft assembly.

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

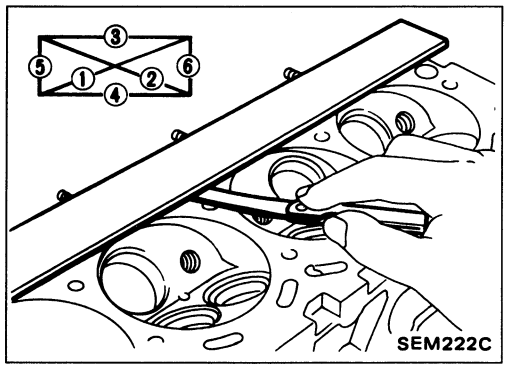
b. Bolts should be loosened in two or three steps.

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.)



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)

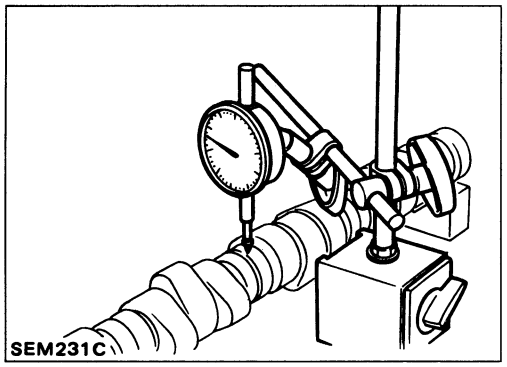
After resurfacing cylinder head, check that camshaft rotates freely by hand. If resistance is felt, cylinder head must be replaced.

Nominal cylinder head height:

98.8 - 99.0 mm (3.890 - 3.898 in)

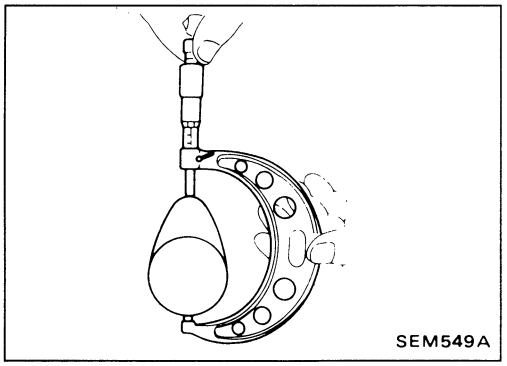
CAMSHAFT VISUAL CHECK

Check camshaft for scratches, seizure and wear.



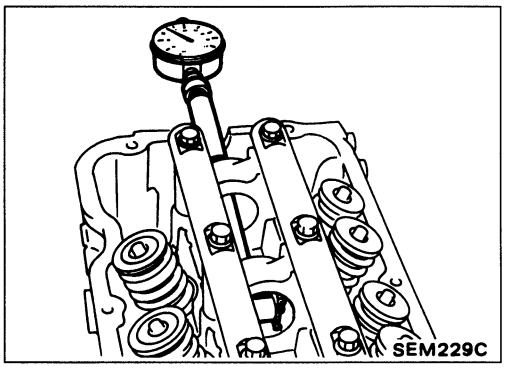
CAMSHAFT RUNOUT

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.



CAMSHAFT CAM HEIGHT

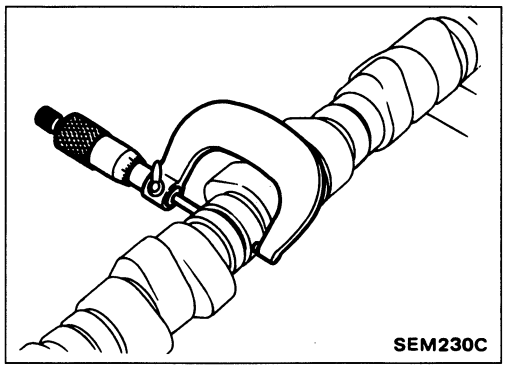
1. Measure camshaft cam height.
   Standard cam height:
   44.839 - 45.029 mm (1.7653 - 1.7728 in)
   Cam wear limit:
   0.2 mm (0.008 in)
2. If wear is beyond the limit, replace camshaft.



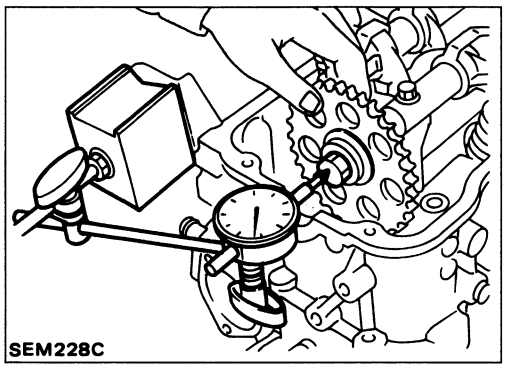
CAMSHAFT JOURNAL CLEARANCE

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)

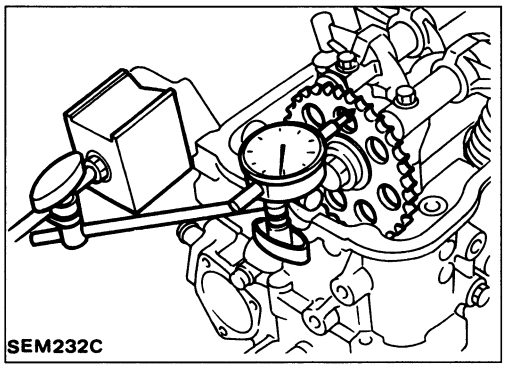


3. Measure outer diameter of camshaft journal.
   Standard outer diameter:
   32.935 - 32.955 mm (1.2967 - 1.2978 in)
4. If clearance exceeds the limit, replace camshaft and/or cylinder head.
   Camshaft journal clearance:
   Standard
   0.045 - 0.090 mm (0.0018 - 0.0035 in)
   Limit
   0.12 mm (0.0047 in)



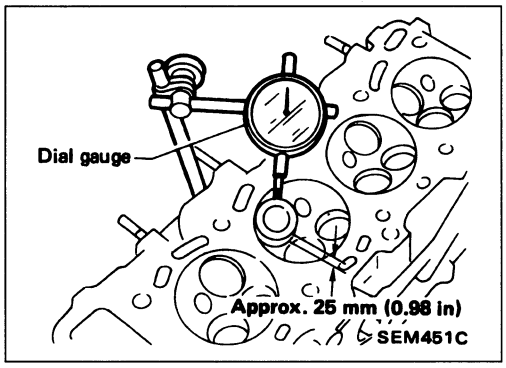
CAMSHAFT END PLAY

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)



CAMSHAFT SPROCKET RUNOUT

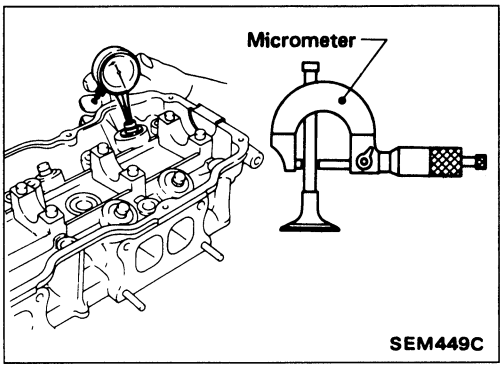
1. Install sprocket on camshaft.
2. Measure camshaft sprocket runout.
   Runout (Total indicator reading):
   Limit 0.12 mm (0.0047 in)
3. If it exceeds the limit, replace camshaft sprocket.



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)

Inspection (Cont'd)

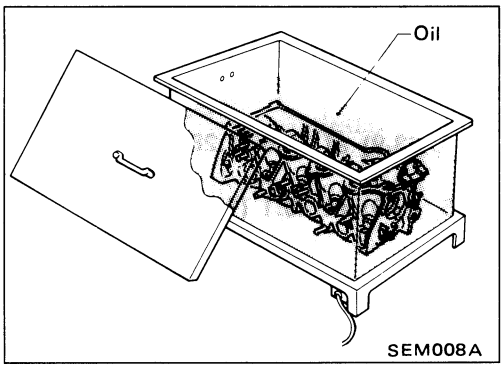


2. If it exceeds the limit, check valve to valve guide clearance.
a. Measure valve stem diameter and valve guide inner diameter.
b. Check that clearance is within specification.

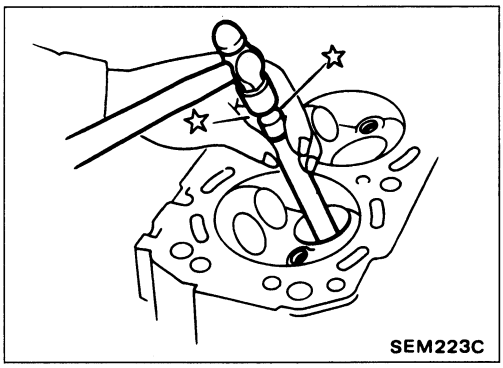
Valve to valve guide clearance:
Standard
0.020 - 0.053 mm
(0.0008 - 0.0021 in) (Intake)
0.040 - 0.070 mm
(0.0016 - 0.0028 in) (Exhaust)
Limit
0.1 mm (0.004 in)

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

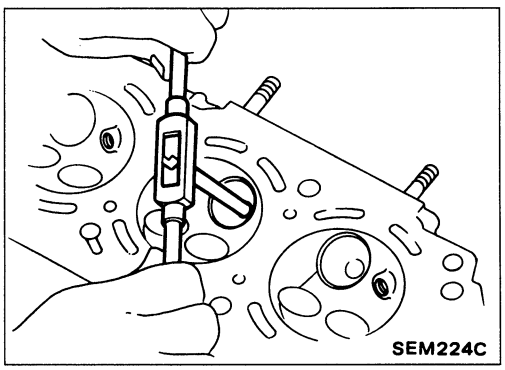
VALVE GUIDE REPLACEMENT



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



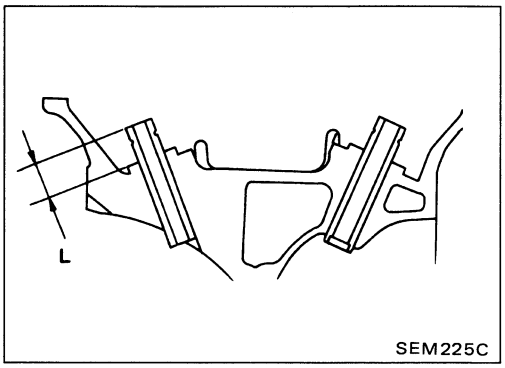
2. Drive out valve guide with a press [under a 20 kN (2 t, 2.2 US ton, 2.0 Imp ton) pressure] or hammer and a suitable tool.



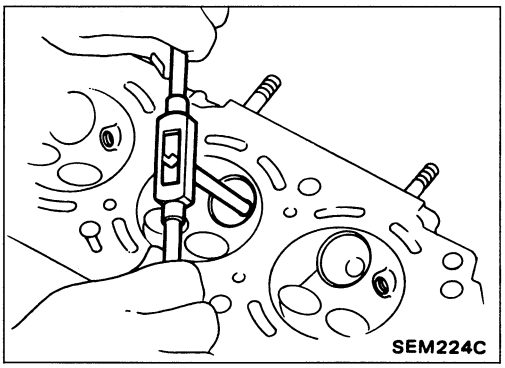
3. Ream cylinder head valve guide hole.

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)

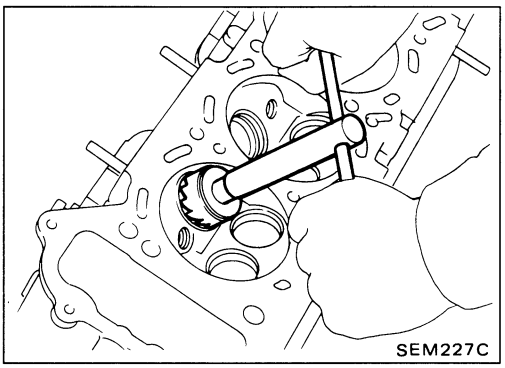
Inspection (Cont'd)



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)



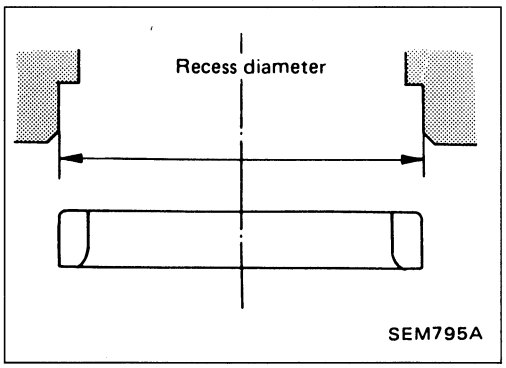
5. Ream valve guide.
   Finished size:
   Intake
   7.000 - 7.018 mm (0.2756 - 0.2763 in)
   Exhaust
   8.000 - 8.018 mm (0.3150 - 0.3157 in)



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.**

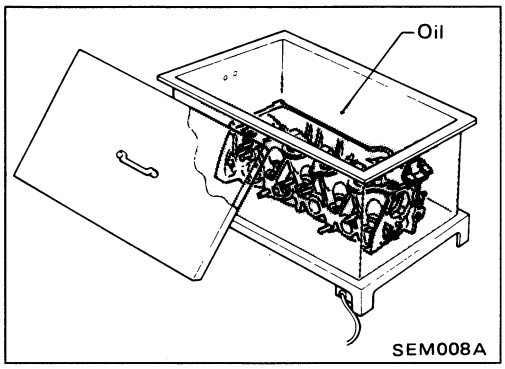


REPLACING VALVE SEAT FOR SERVICE PARTS

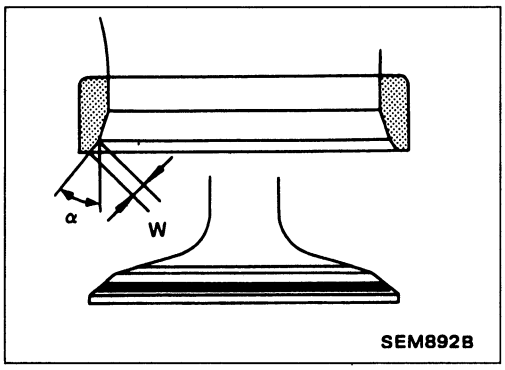
1. Bore out old seat until it collapses. The machine depth stop should be set so that boring cannot continue beyond the bottom face of the seat recess in cylinder head.
2. Ream cylinder head recess.
   Reaming bore for service valve seat
   Oversize [0.5 mm (0.020 in)]:
   Intake
   36.500 - 36.516 mm (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.

Inspection (Cont'd)

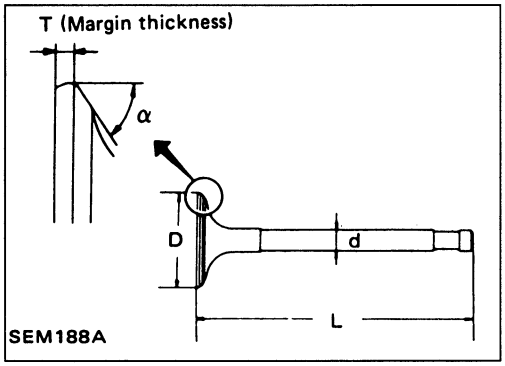


3. Heat cylinder head to 150 to 160°C (302 to 320°F).



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)

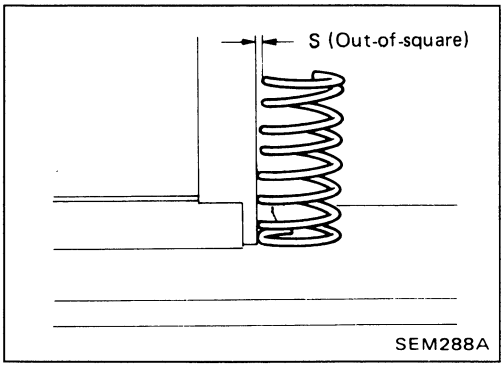


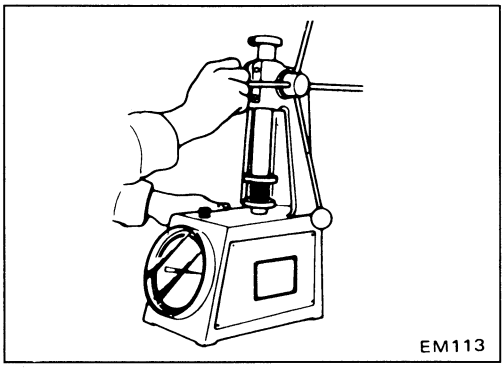
VALVE DIMENSIONS

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)





VALVE SPRING

Squareness

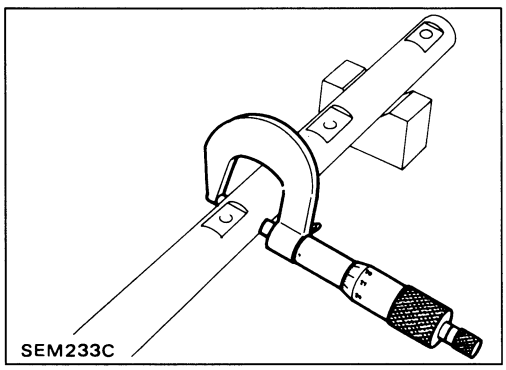
1. Measure "S" dimension.
   Out-of-square:
   Outer
   Intake
   Less than 2.5 mm (0.098 in)
   Exhaust
   Less than 2.3 mm (0.091 in)
   Inner
   Intake
   Less than 2.3 mm (0.091 in)
   Exhaust
   Less than 2.1 mm (0.083 in)
2. If it exceeds the limit, replace spring.

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)

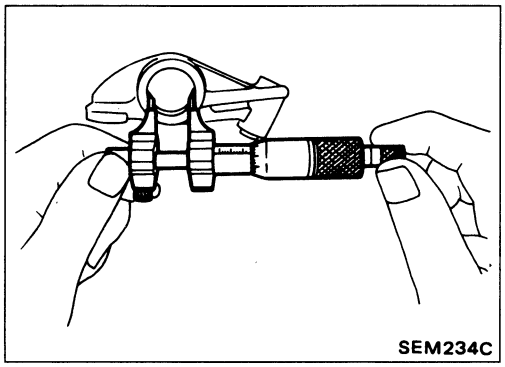
If it exceeds the limit, replace spring.



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)

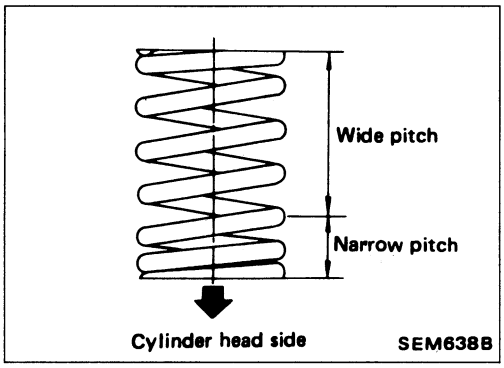
Inspection (Cont'd)


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.**

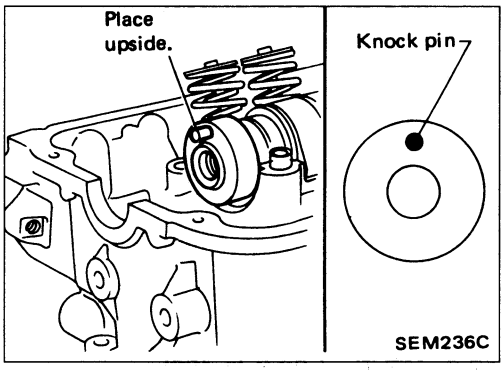


SEM638B

Assembly

1. Install valve component parts.

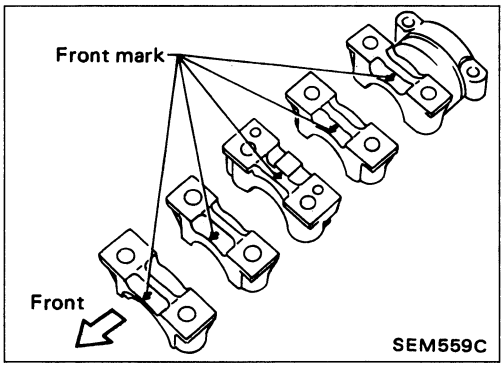
- **Always use new valve oil seal. Refer to OIL SEAL REPLACEMENT.**
- **Before installing valve oil seal, install inner valve spring seat.**
- **Install outer valve spring (uneven pitch type) with its narrow pitch side toward cylinder head side.**
- **After installing valve component parts, use plastic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



SEM236C

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.



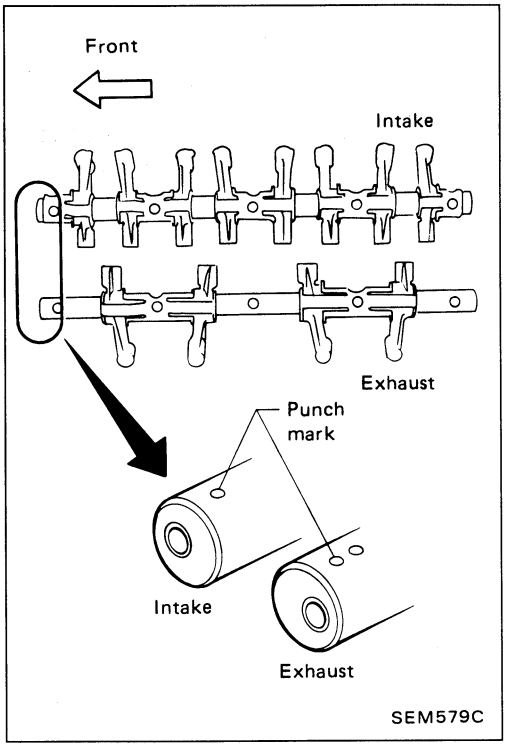
SEM559C

3. Install camshaft brackets.

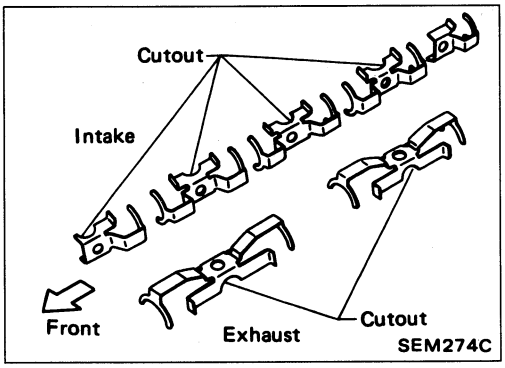
Front mark is punched on the camshaft bracket.

Assembly (Cont'd)

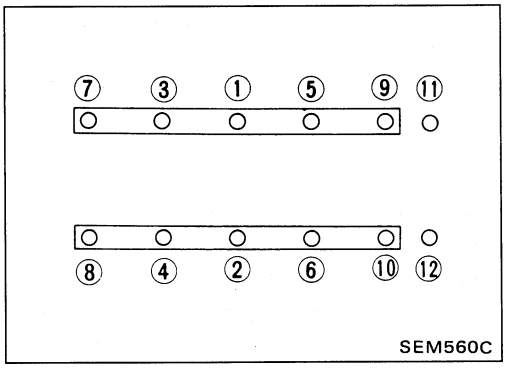
4. Install rocker shaft with rocker arms.

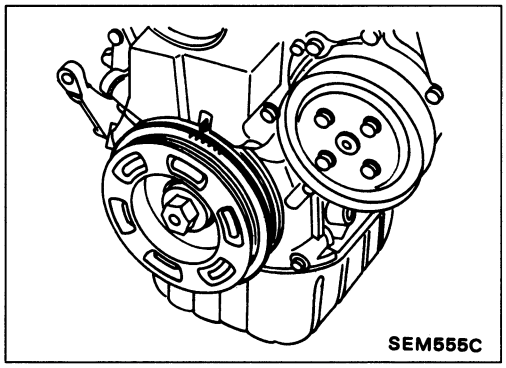


- Install retainer with cutout facing direction shown in figure at left.



5. Tighten bolts as shown in figure at left.

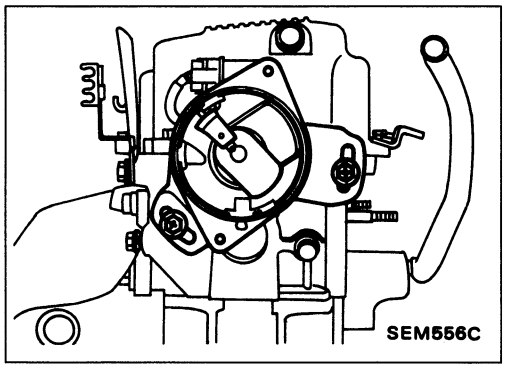


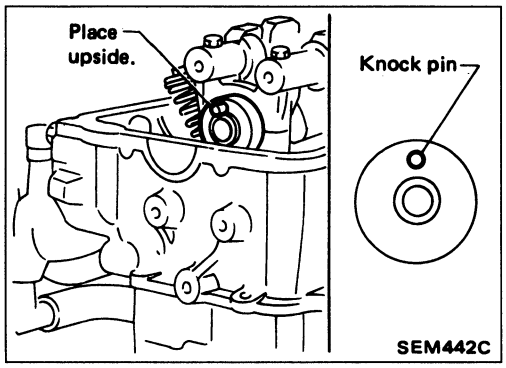

SEM555C

Installation

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

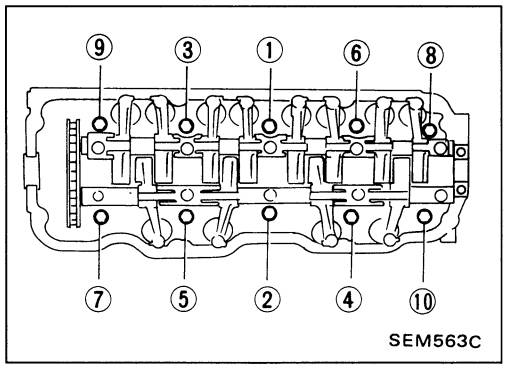
(1) Align mark on crankshaft pulley with "0°" position and confirm that distributor rotor head is set as shown in figure.


SEM556C



SEM442C

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



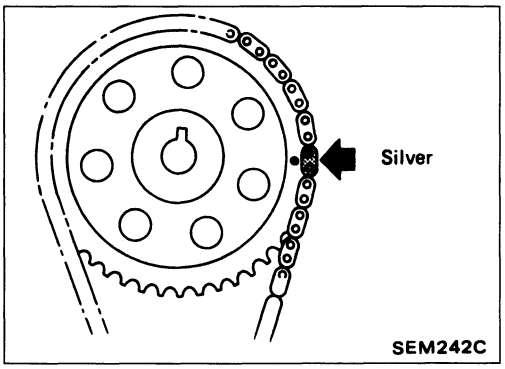
SEM563C

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

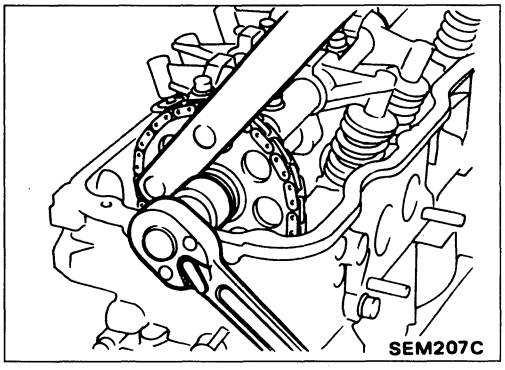
- **Do not rotate crankshaft and camshaft separately, or valves will hit piston heads.**
- **Tightening procedure**

(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).

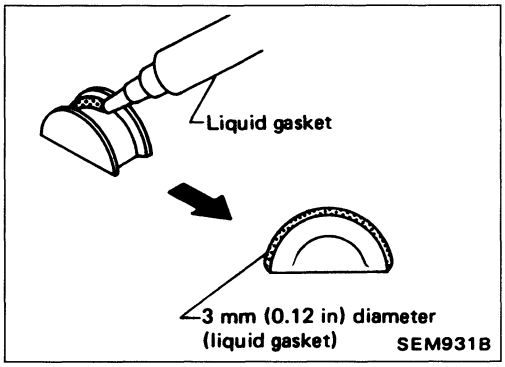
Installation (Cont'd)



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

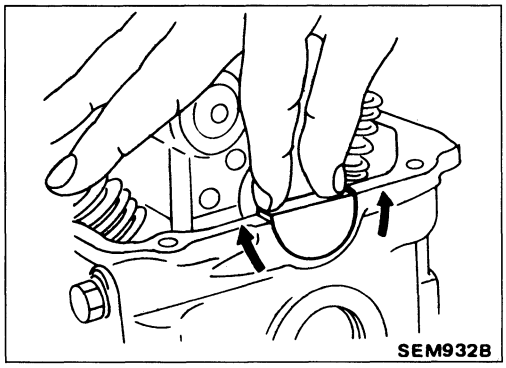


4. Tighten camshaft sprocket bolt.



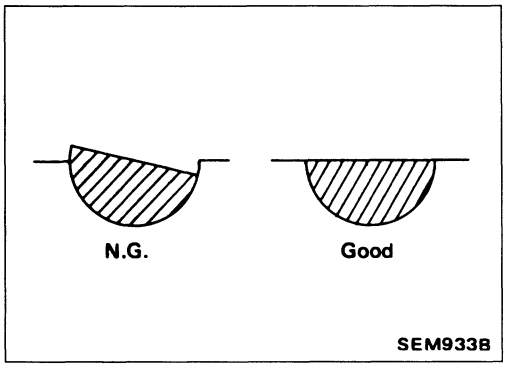
5. Install rubber plugs as follows:
(1) Apply liquid gasket to rubber plugs.

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

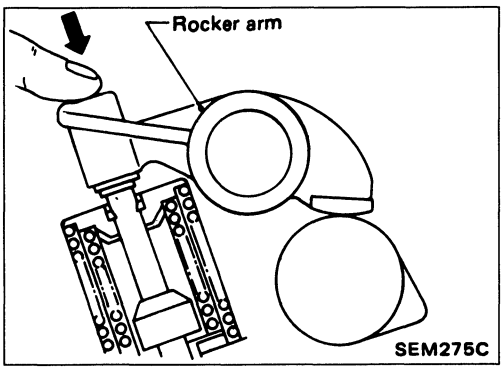


(2) Install rubber plugs, then move them with your fingers to uniformly spread the gasket on cylinder head surface.

- **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.**



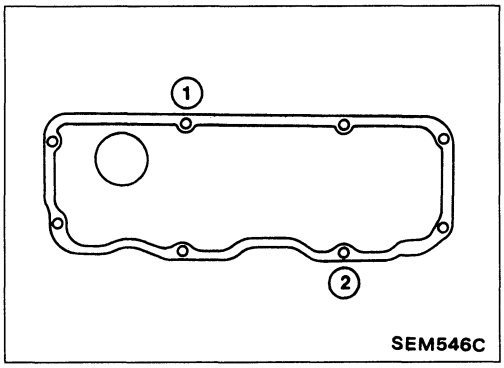
Installation (Cont'd)



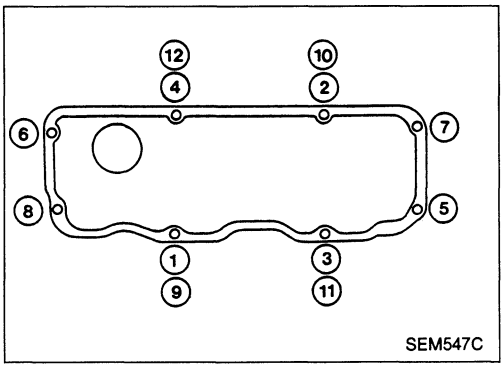
6. Check hydraulic valve lifter.
(1) Push hydraulic valve lifter forcefully with your finger.
- **Be sure to check it with rocker arm in its free position.**

(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).

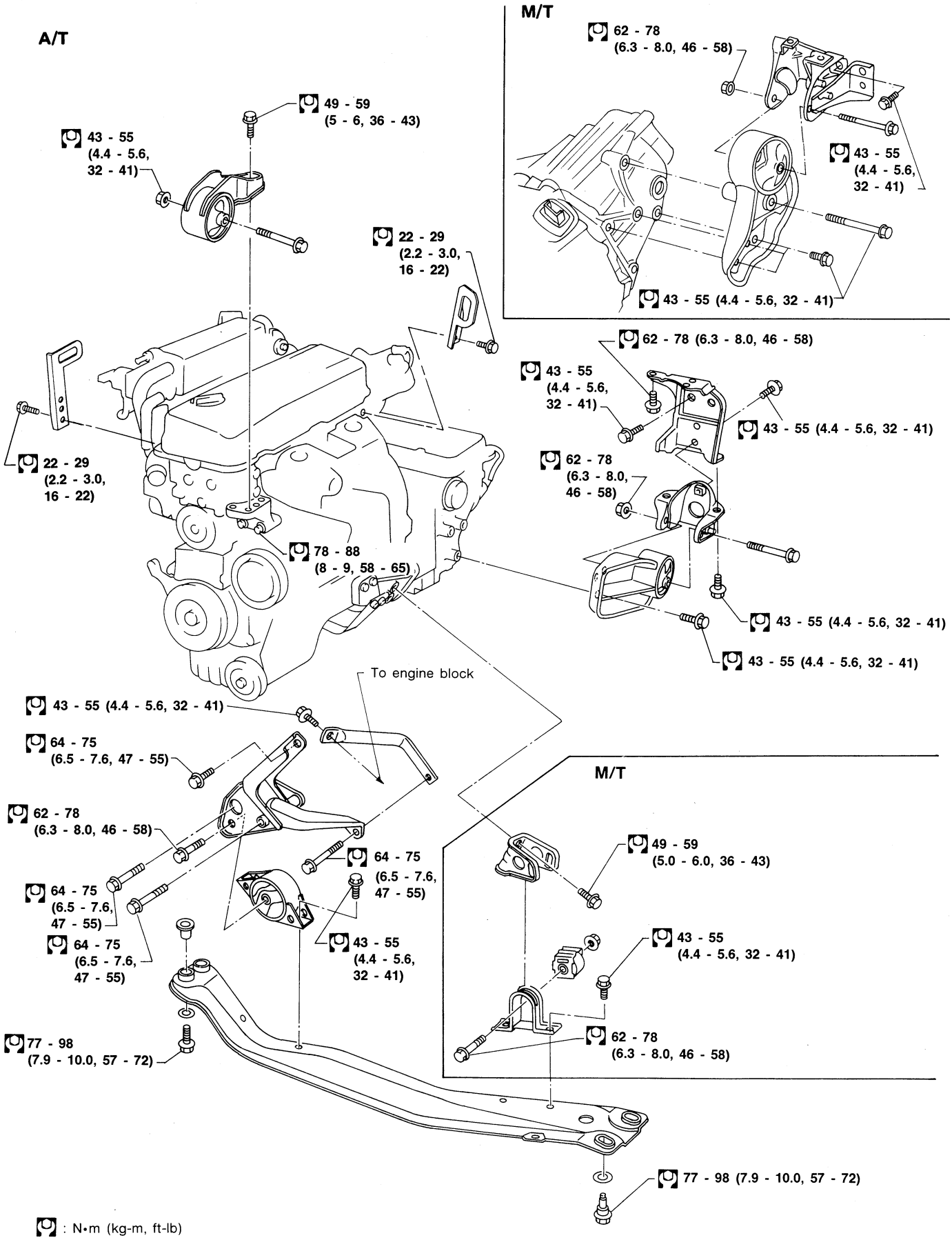
7. Install rocker cover.
- **Be sure to avoid interference between rocker cover and rocker arm.**



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.



(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
49 - 59 (5 - 6, 36 - 43)
43 - 55 (4.4 - 5.6, 32 - 41)
22 - 29 (2.2 - 3.0, 16 - 22)
62 - 78 (6.3 - 8.0, 46 - 58)
43 - 55 (4.4 - 5.6, 32 - 41)
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)
62 - 78 (6.3 - 8.0, 46 - 58)
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)
77 - 98 (7.9 - 10.0, 57 - 72)
M/T
49 - 59 (5.0 - 6.0, 36 - 43)
43 - 55 (4.4 - 5.6, 32 - 41)
62 - 78 (6.3 - 8.0, 46 - 58)
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.

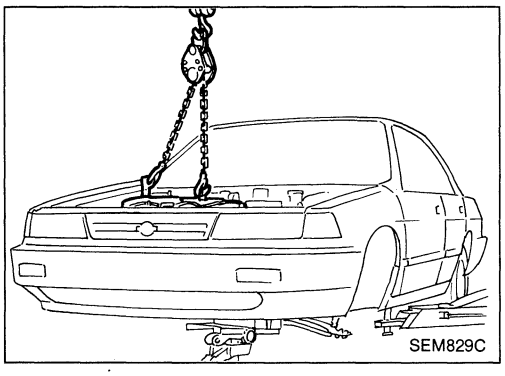
e. Before removing front axle from transaxle, place safety stands under designated front supporting points. Refer to GI section for lifting points and towing.

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.

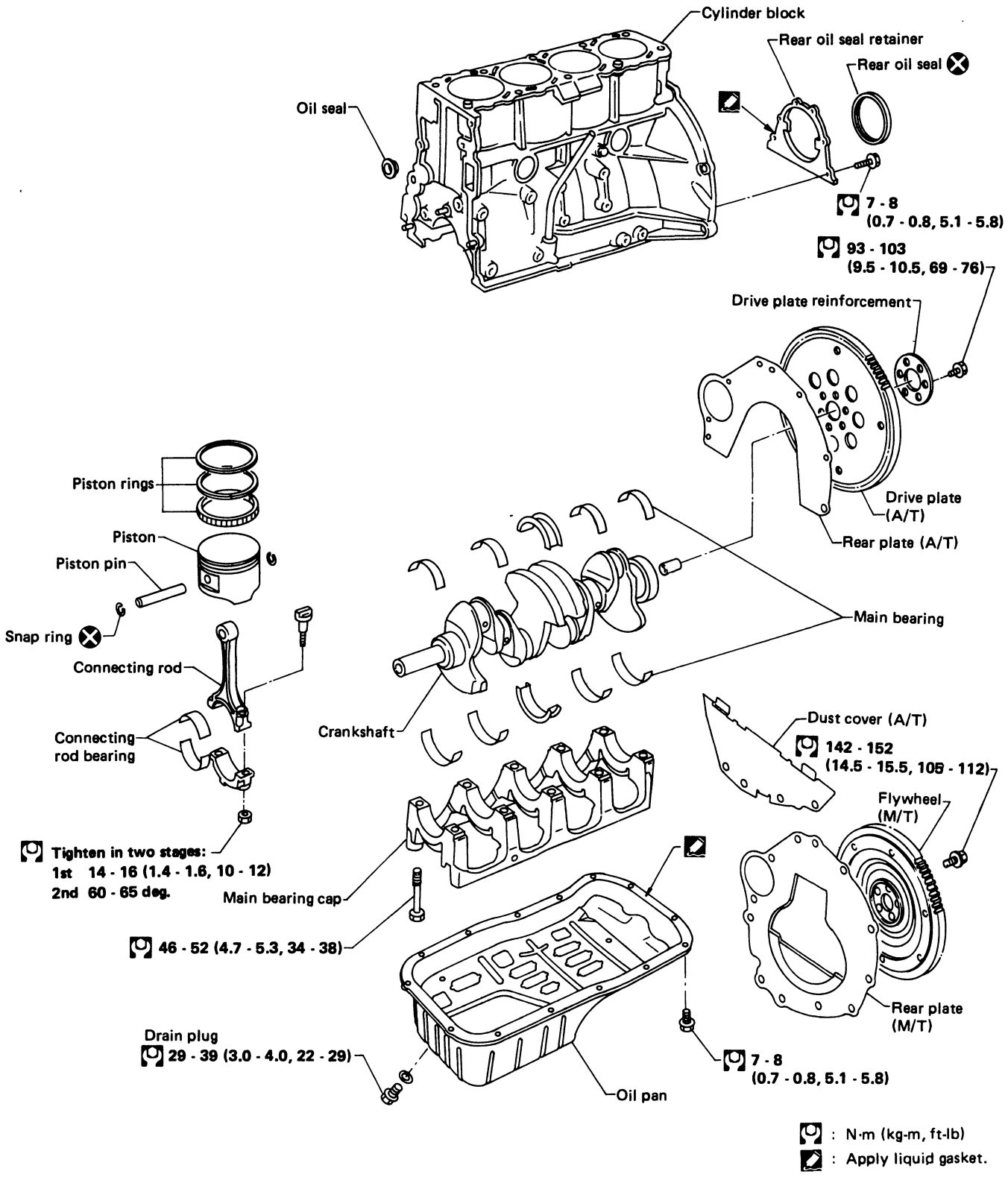
CAUTION:

- **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.**

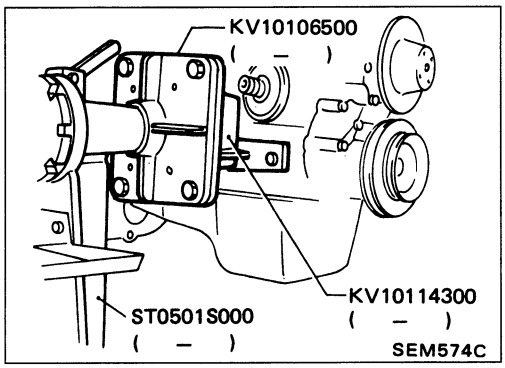


Removal

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
Drive plate
(A/T)
Rear plate (A/T)
Piston rings
Piston
Piston pin
Snap ring
Connecting rod
Connecting
rod bearing
Main bearing
Crankshaft
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.

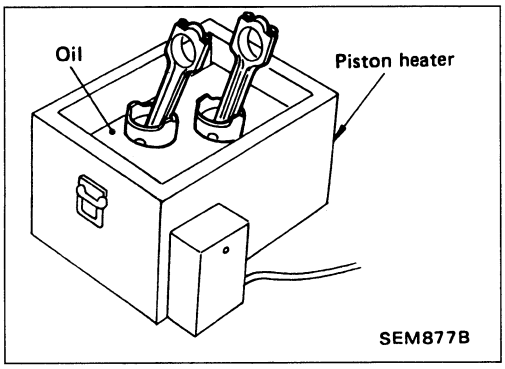
SEM564C



Disassembly

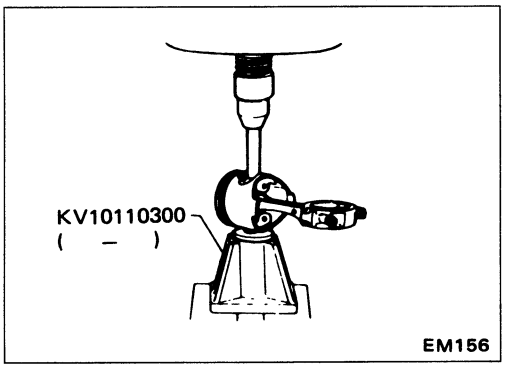
PISTON AND CRANKSHAFT

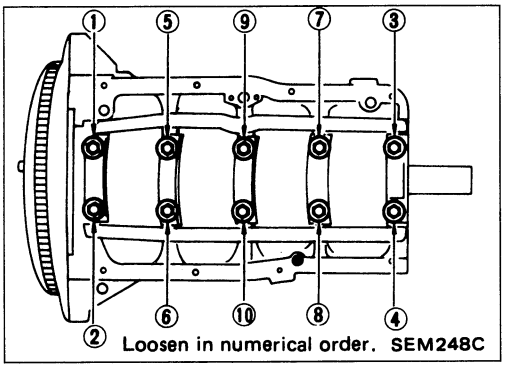
1. Place engine on a work stand.
2. Drain oil.
3. Remove oil pan.
4. Remove water pump.
5. Remove cylinder head.
6. Remove timing chain.



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.

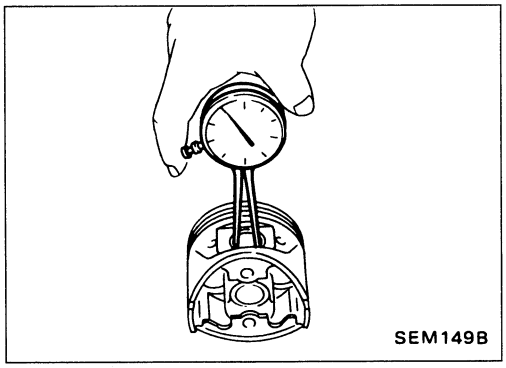
- **Before removing main bearing beam, measure crankshaft end play.**
- **Bolts should be loosened in two or three steps.**

Inspection

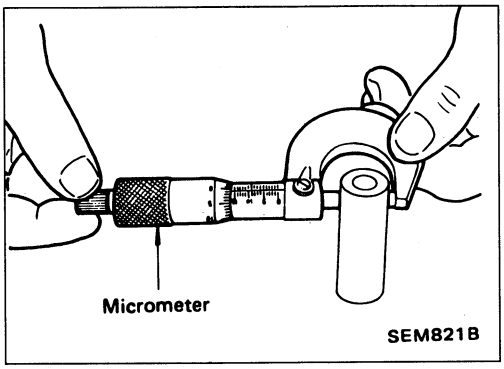
PISTON AND PISTON PIN CLEARANCE

1. Measure inner diameter of piston pin hole "dp".

Standard diameter "dp":
20.987 - 20.999 mm (0.8263 - 0.8267 in)

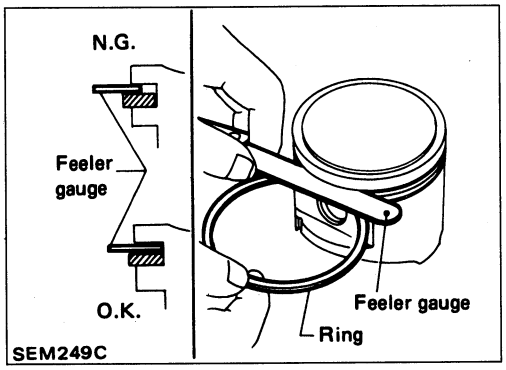


Inspection (Cont'd)



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)

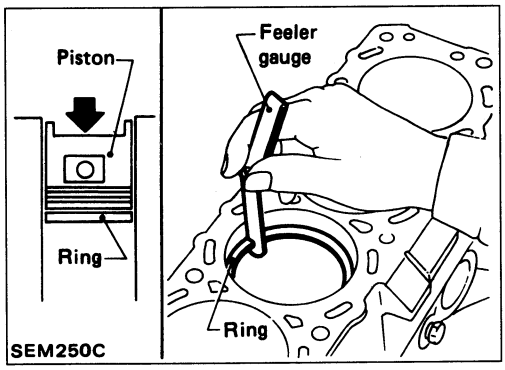
If it exceeds the above value, replace piston assembly with pin.



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.

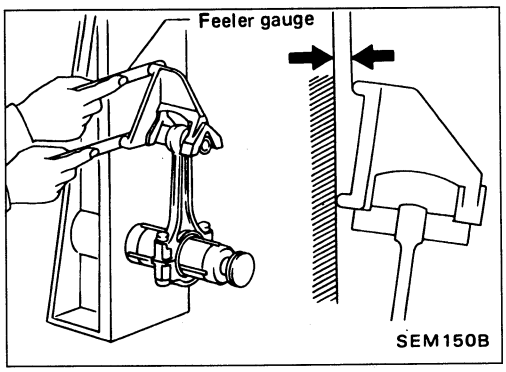


PISTON RING END GAP

End gap:
Top ring
0.28 - 0.43 mm (0.0110 - 0.0169 in)
2nd ring
0.45 - 0.60 mm (0.0177 - 0.0236 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 - 0.60 mm (0.0079 - 0.0236 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.



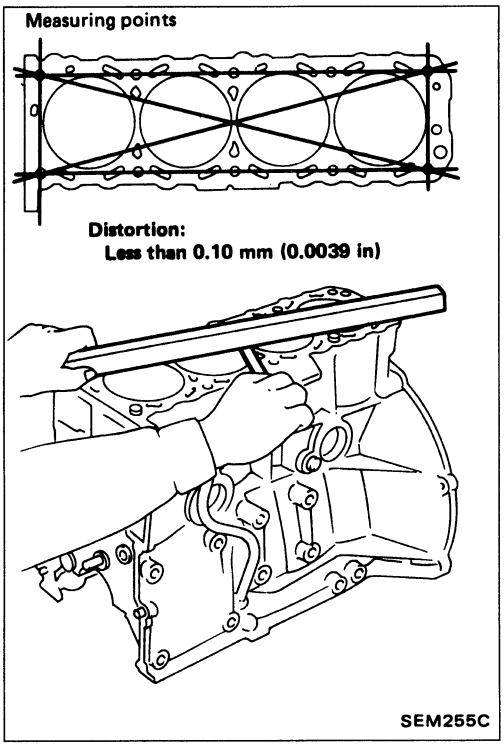
CONNECTING ROD BEND AND TORSION

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)

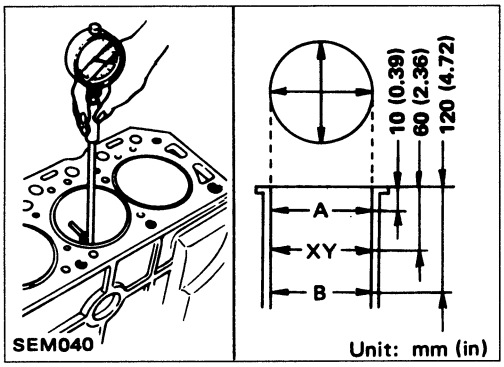
CYLINDER BLOCK DISTORTION AND WEAR



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.

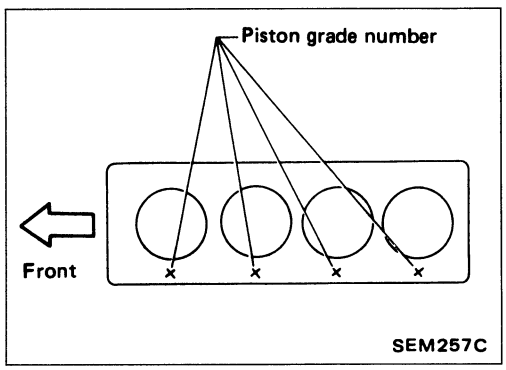


PISTON-TO-BORE CLEARANCE

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)

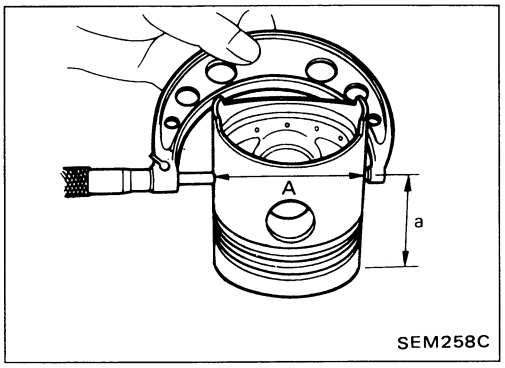
If it exceeds the limit, rebore all cylinders. Replace cylinder block if necessary.

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)



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.

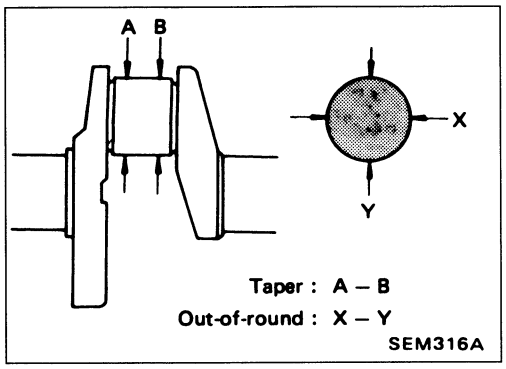
Oversize pistons are available for service. Refer to S.D.S.

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.

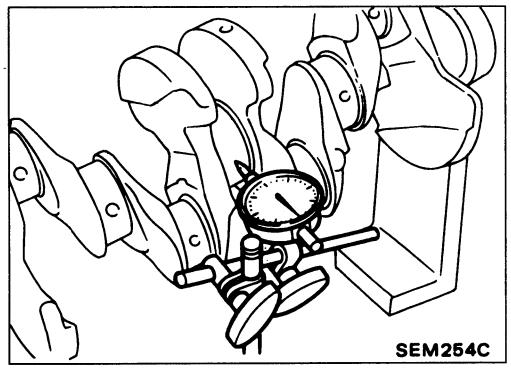
- **Measurement should be done after cylinder bore cools down.**



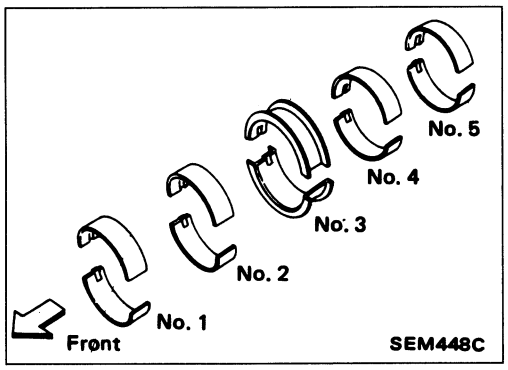
CRANKSHAFT

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)



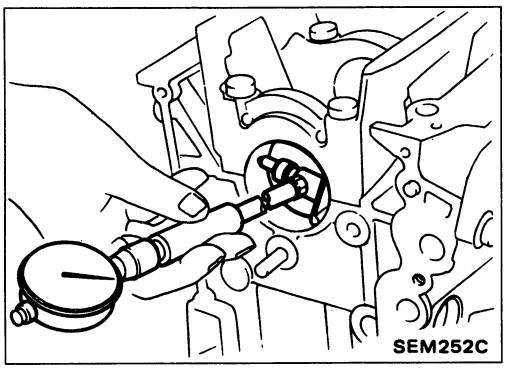
BEARING CLEARANCE

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

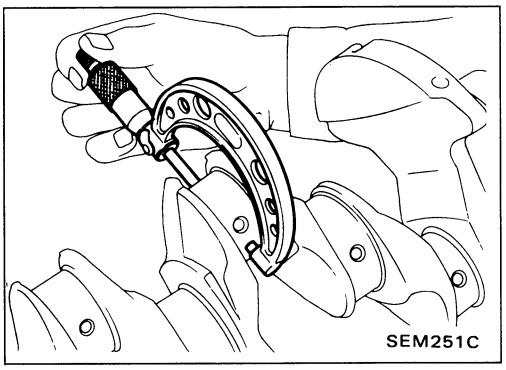
Method A (Using bore gauge and micrometer)

Main bearing

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

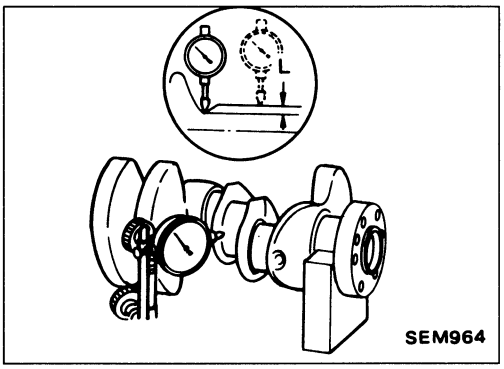


2. Install main bearing cap to cylinder block.
   Tighten all bolts in correct order in two or three stages. Refer to "Assembly".
3. Measure inner diameter "A" of each main bearing.



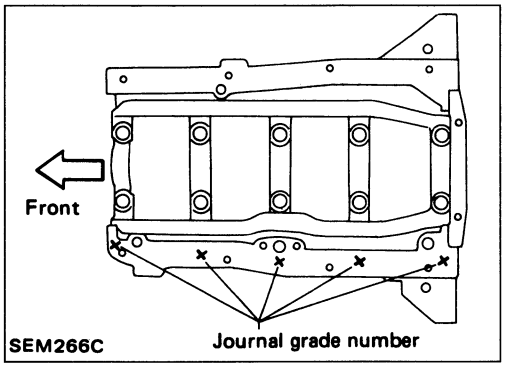
4. Measure outer diameter "Dm" of each crankshaft main journal.
5. Calculate main bearing clearance.
   Main bearing clearance = A – Dm
   Standard:
   0.020 - 0.047 mm (0.0008 - 0.0019 in)
   Limit:
   0.1 mm (0.004 in)
6. If it exceeds the limit, replace bearing.
7. If clearance cannot be adjusted within the standard of any bearing, grind crankshaft journal and use undersized bearing.

Inspection (Cont'd)



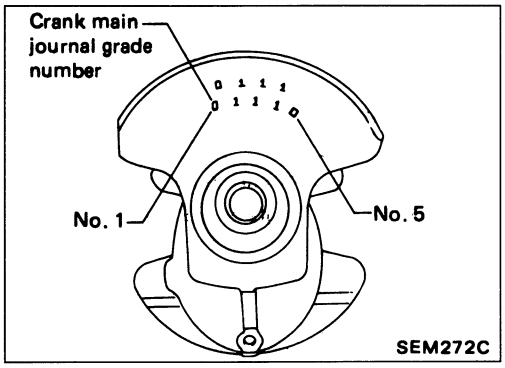
a. When grinding crankshaft journal, confirm that "L" dimension in fillet roll is more than the specified limit.
"L": 0.1 mm (0.004 in)

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



8. If crankshaft, 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.



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

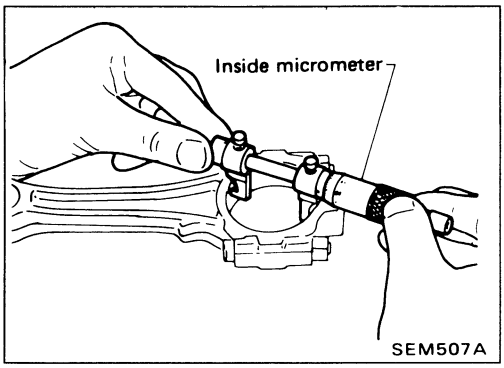
Inspection (Cont'd)

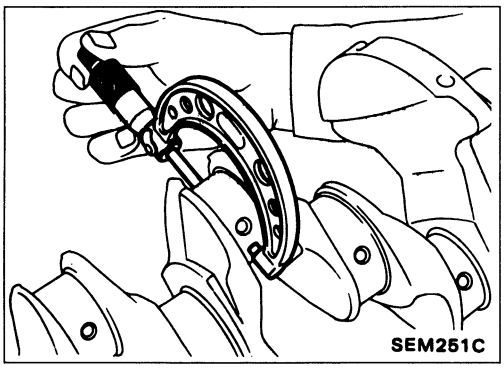
Connecting rod bearing (Big end)

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

Tighten bolts to the specified torque.

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





4. Measure outer diameter "Dp" of each crankshaft pin journal.
5. Calculate connecting rod bearing clearance.

   Connecting rod bearing clearance = C – Dp

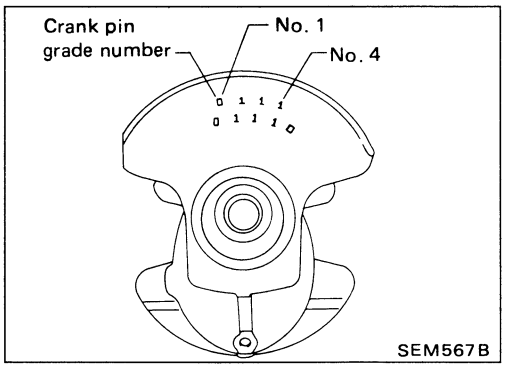
   Standard:

   0.010 - 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".



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

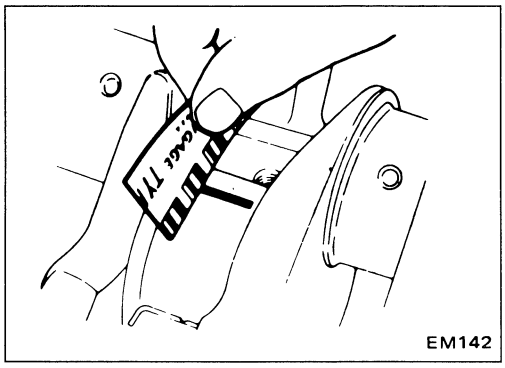
Connecting rod bearing grade number:

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

Method B (Using plastigauge)

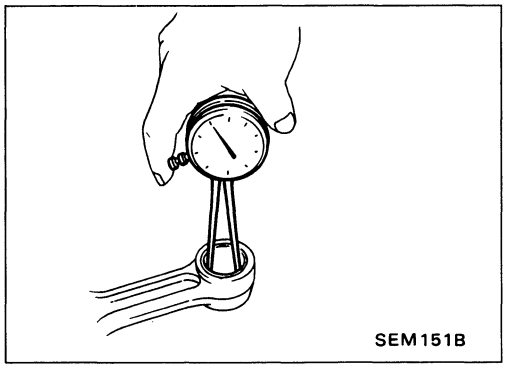
CAUTION:

- **Do not turn crankshaft or connecting rod while plastigauge 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.**

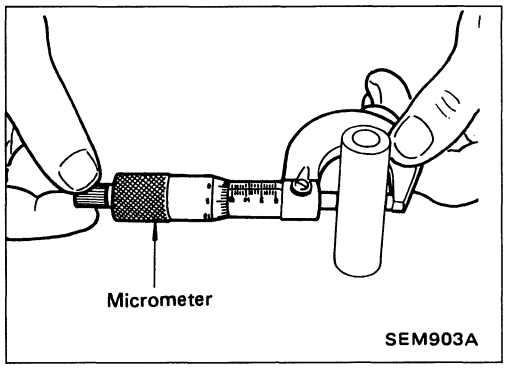


Inspection (Cont'd)

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.

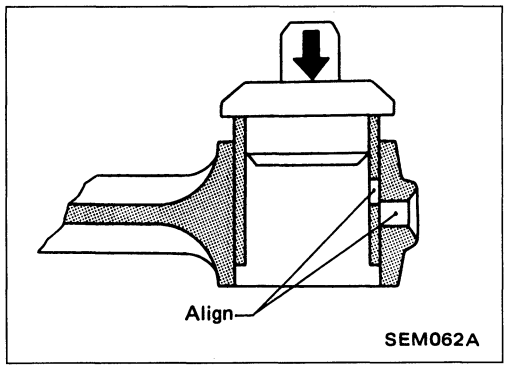
   C – Dp =

   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.

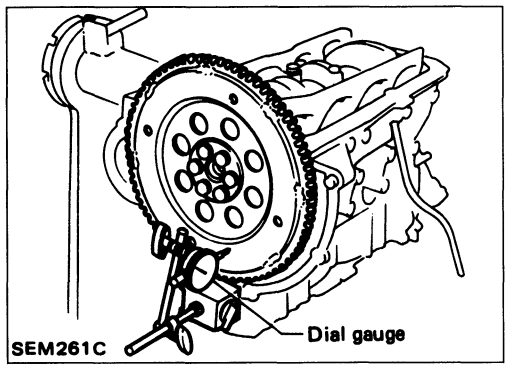
Be sure to align the oil holes.

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)

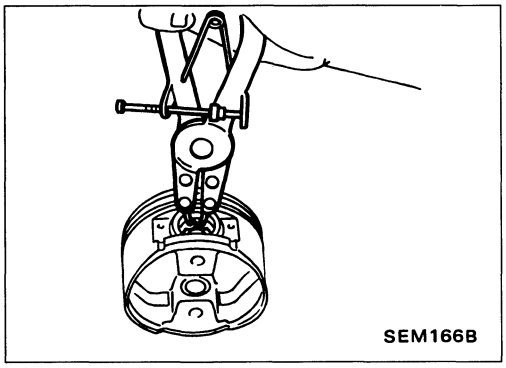
Less than 0.1 mm (0.004 in)

Drive plate (A/T model)

Less than 0.1 mm (0.004 in)

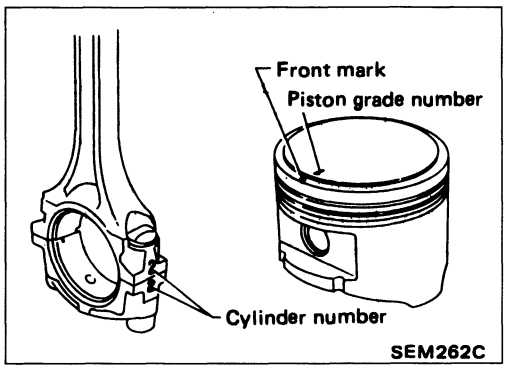
Assembly

PISTON


SEM166B

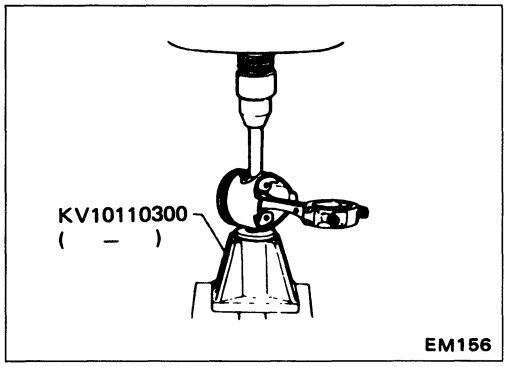
1. Install new snap ring on one side of piston pin hole.

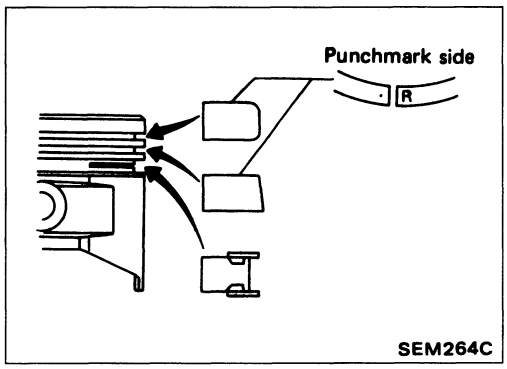
Assembly (Cont'd)



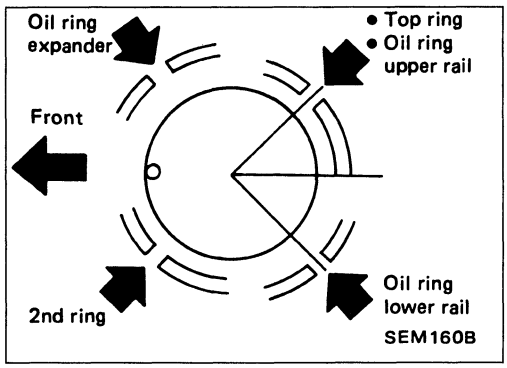
2. Heat piston to 60 to 70°C (140 to 158°F) and assemble piston, piston pin, connecting rod and new snap ring.

- **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.**





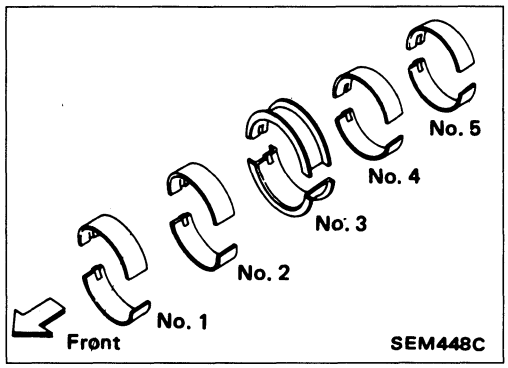
3. Set piston rings as shown.



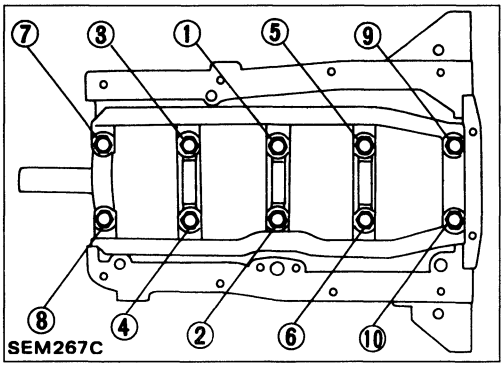
CRANKSHAFT

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.**

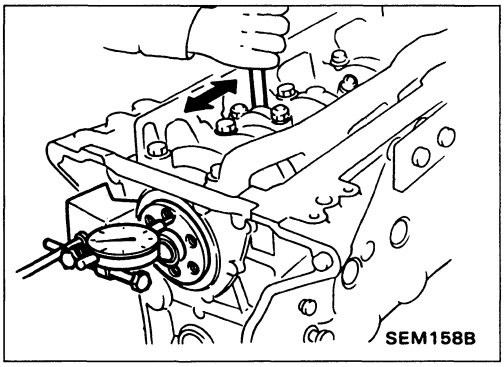


Assembly (Cont'd)



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

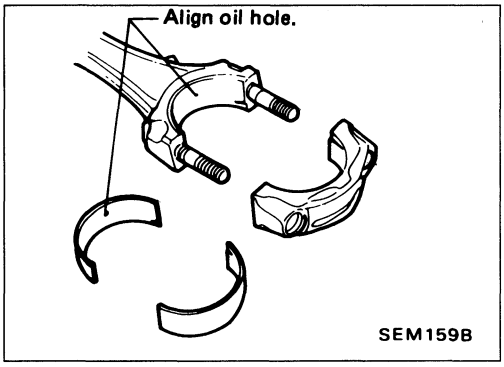
- **Prior to tightening bearing cap bolts, place bearing cap in its proper position by shifting crankshaft in the axial direction.**
- **Tighten bearing cap bolts gradually in two or three stages. Start with center bearing and move outward sequentially.**
- **After securing bearing cap bolts, make sure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



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)

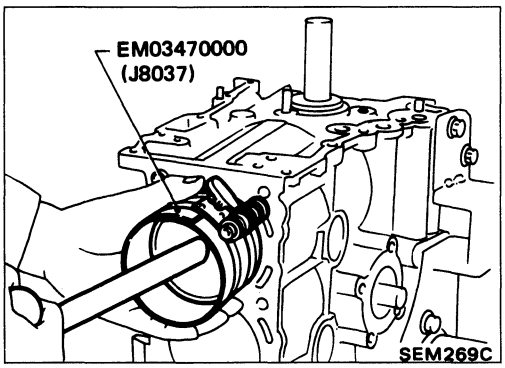
If beyond the limit, replace bearing with a new one.



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

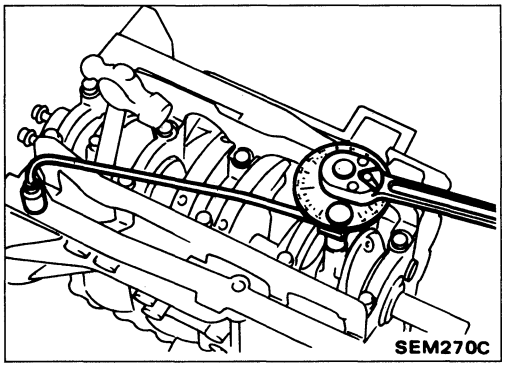
Refer to "Inspection".

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



5. Install pistons with connecting rods.
a. Install them into corresponding cylinders with Tool.

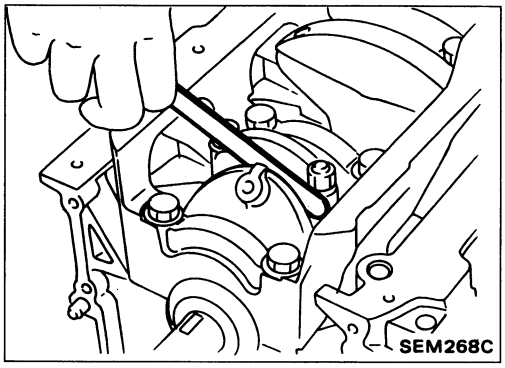
- **Be careful not to scratch cylinder wall by connecting rod.**
- **Arrange so that front mark on piston head faces toward front of engine.**



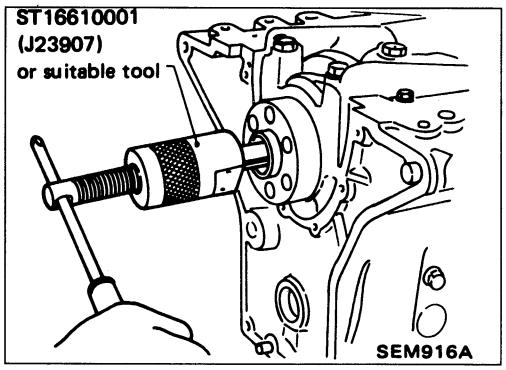
b. Install connecting rod bearing caps.
Tighten connecting rod bearing cap nuts to the specified torque.

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)

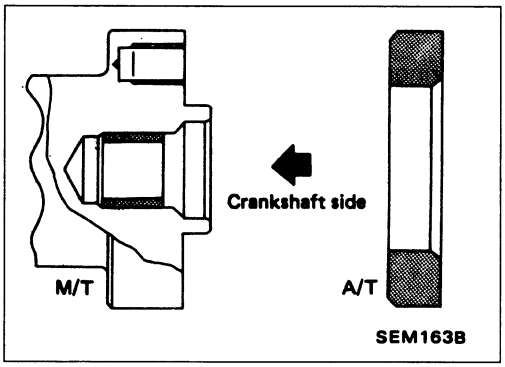


6. Measure connecting rod side clearance.
   Connecting rod side clearance:
   Standard
   0.2 - 0.4 mm (0.008 - 0.016 in)
   Limit
   0.6 mm (0.024 in)
   If beyond the limit, replace connecting rod and/or crankshaft.



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

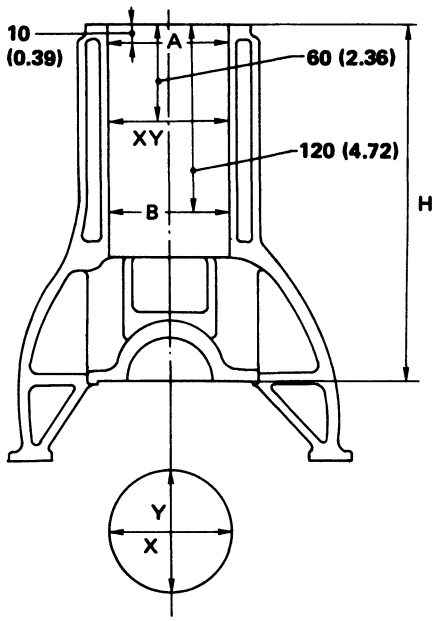
Engine model	KA24E
Cylinder arrangement	4, in-line
Displacement cm^3 (cu in)	2,389 (145.78)
Bore x stroke mm (in)	89 x 96 (3.50 x 3.78)
Valve arrangement	O.H.C.
Firing order	1-3-4-2
Number of piston rings	
Compression	2
Oil	1
Number of main bearings	5
Compression ratio	8.6

Unit: kPa (kg/cm^2, 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

CYLINDER HEAD

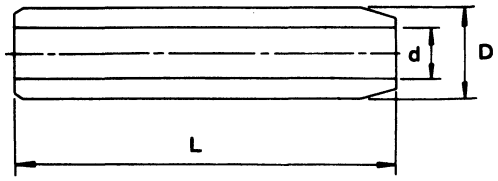
Unit: mm (in)

	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)

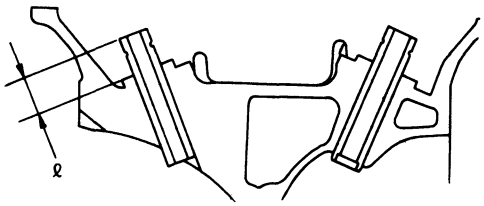
* Total amount of cylinder head resurfacing and cylinder block resurfacing

Inspection and Adjustment (Cont'd)

VALVE GUIDE



SEM571B



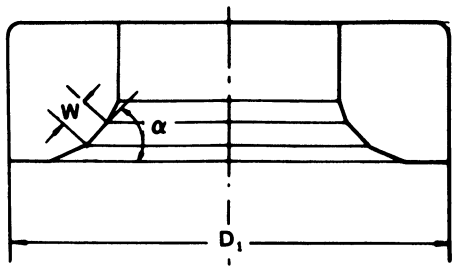
SEM225C

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 - 0.0209)	0.040 - 0.070 (0.0016 - 0.0028)	0.1 (0.004)
Tapping length (ℓ)	14.9 - 15.1 (0.587 - 0.594)				—

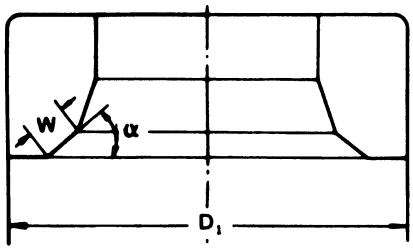
Inspection and Adjustment (Cont'd)

Standard



SEM177

Service



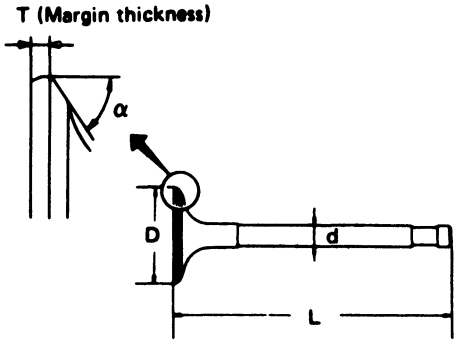
SEM178

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)	

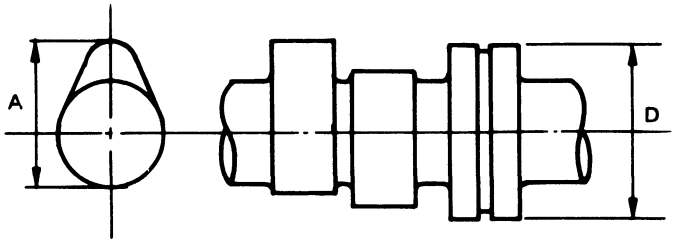
VALVE SPRING

Unit: mm (in)

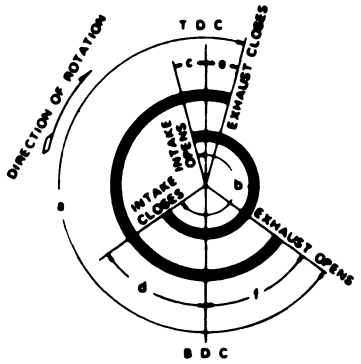
		Standard		Limit	
		Intake	Exhaust	Intake	Exhaust
Free height (H)	Outer	57.44 (2.2614)	53.21 (2.0949)	—	—
	Inner	53.34 (2.1000)	47.95 (1.8878)	—	—
Pressure N (kg, lb) at height	Outer	604.1 (61.6, 135.8) at 37.6 (1.480)	640.4 (65.3, 144.0) at 34.1 (1.343)	567.8 (57.9, 127.7) at 37.6 (1.480)	620.8 (63.3, 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

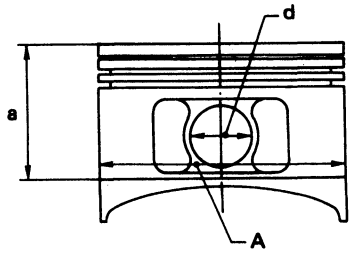
Unit: mm (in)

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)

Inspection and Adjustment (Cont'd)

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)

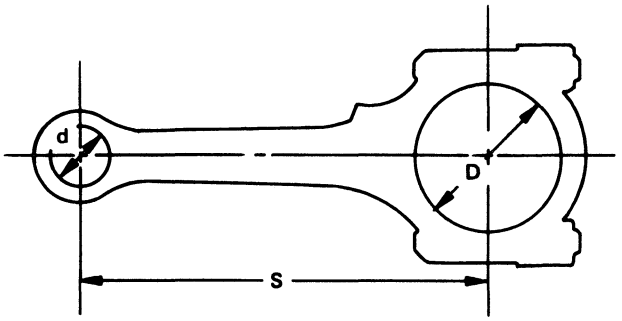
Piston ring

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 - 0.43 (0.0110 - 0.0169)	0.5 (0.020)
	2nd	0.45 - 0.60 (0.0177 - 0.0236)*1	0.5 (0.020)
		0.55 - 0.70 (0.0217 - 0.0276)*2	
	Oil (rail ring)	0.20 - 0.60 (0.0079 - 0.0236)	0.5 (0.020)

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

CONNECTING ROD



SEM570A

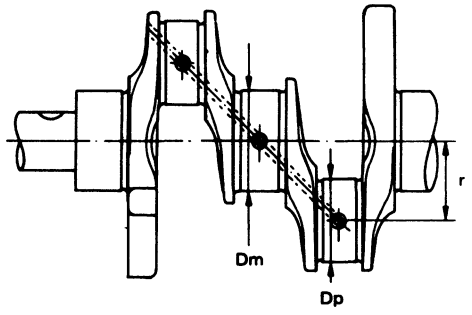
Unit: mm (in)

	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)

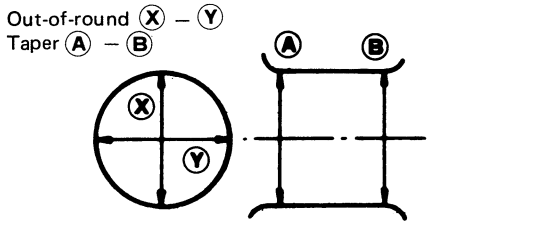
* Without bearing

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 (1.9672 - 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 roil			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)

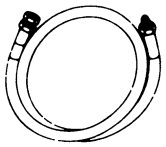
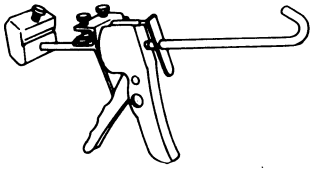
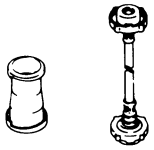
* Total indicator reading

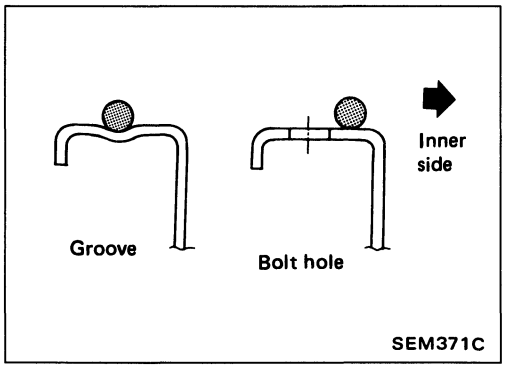
ENGINE LUBRICATION & COOLING SYSTEMS

SECTION LC

CONTENTS

SPECIAL SERVICE TOOLS

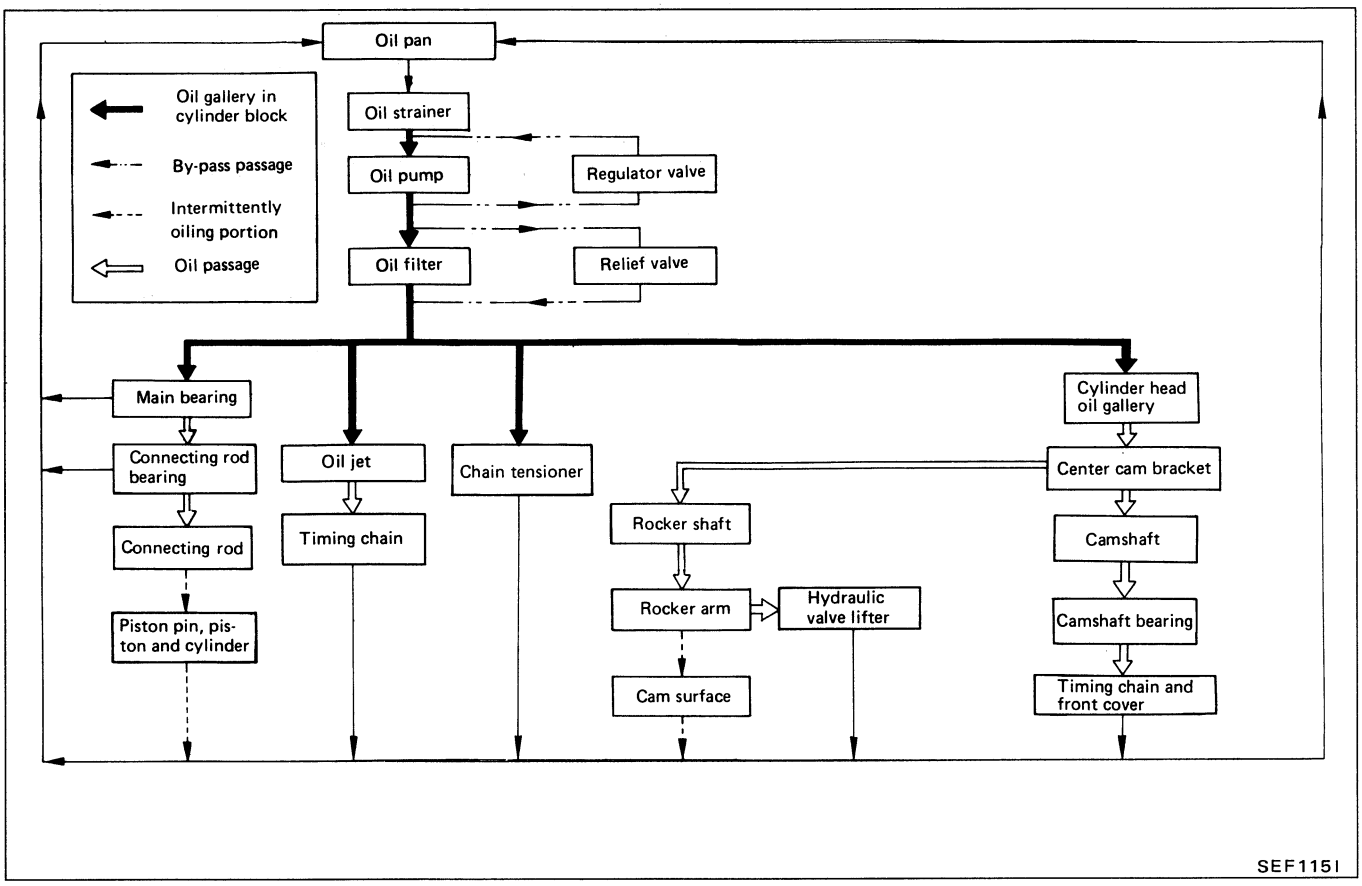
Tool number (Kent-Moore No.) Tool name	Description
ST25051001 (J25695-1) Oil pressure gauge	
ST25052000 (J25695-2) Hose	Adapting oil pressure gauge to cylinder block 
EG17650301 (—) Radiator cap tester adapter	Pressing the tube of liquid gasket 
WS39930000 (—) Tube presser	Adapting radiator cap tester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



LIQUID GASKET APPLICATION PROCEDURE

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

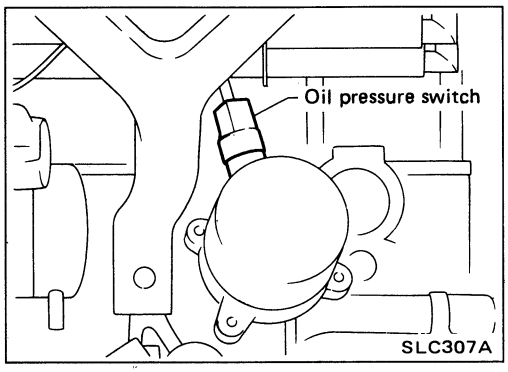
Lubrication Circuit



Oil Pressure Check

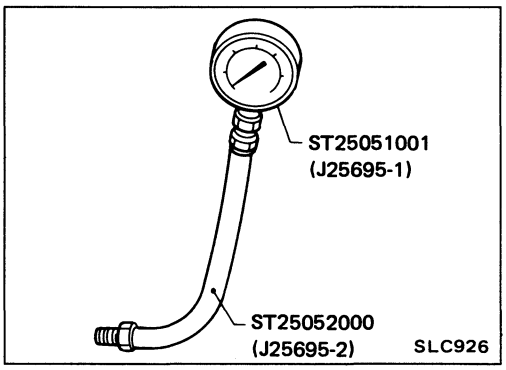
WARNING:

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



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

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.

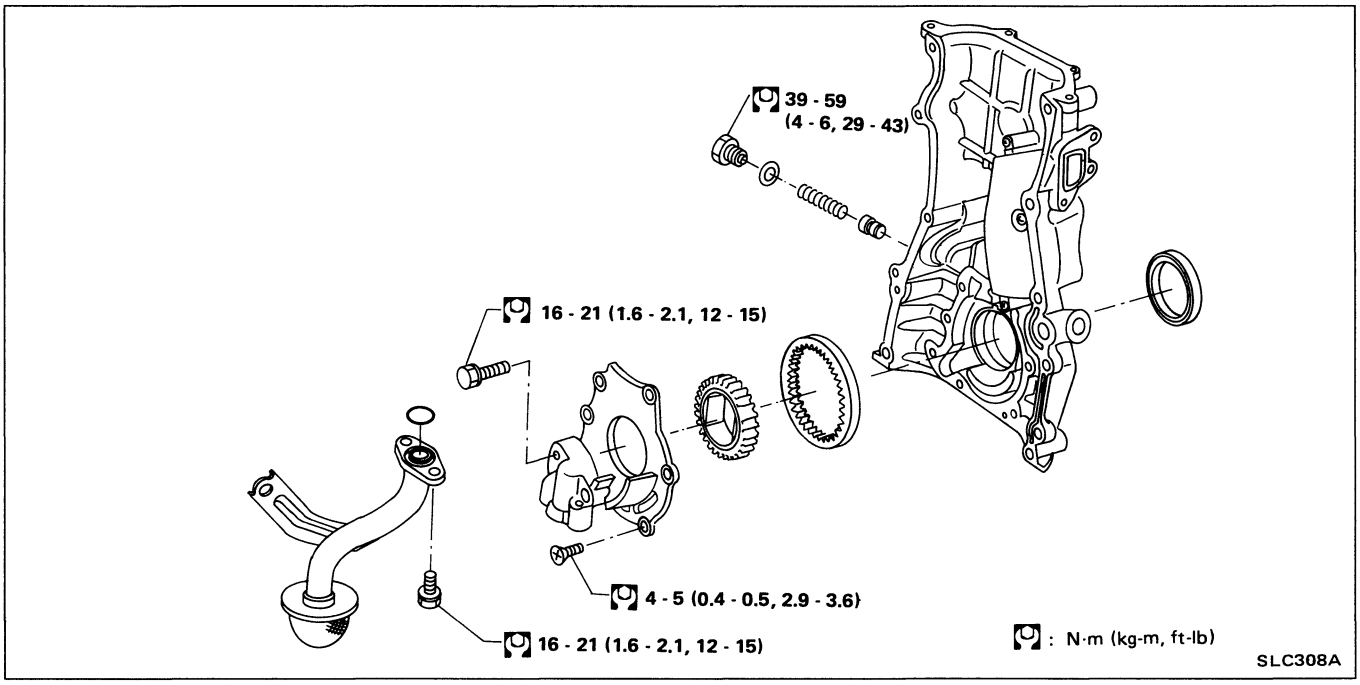
6. Install oil pressure switch with sealant.

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

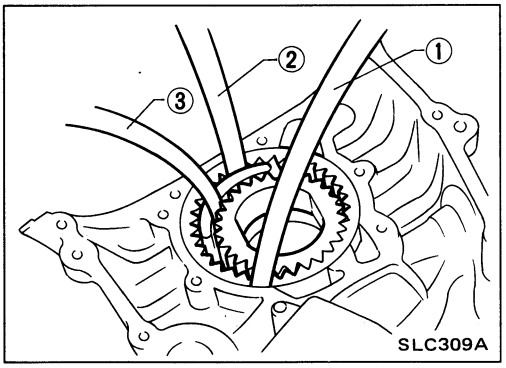
Using a feeler gauge, check the following clearances:

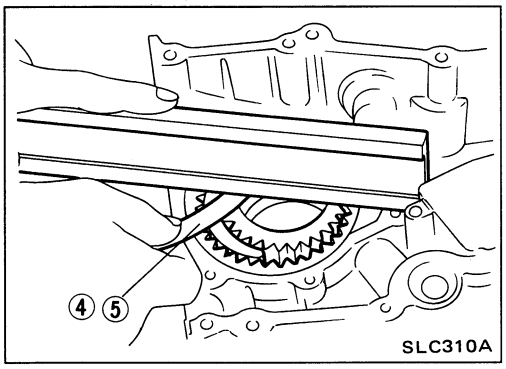
Standard clearance:

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.

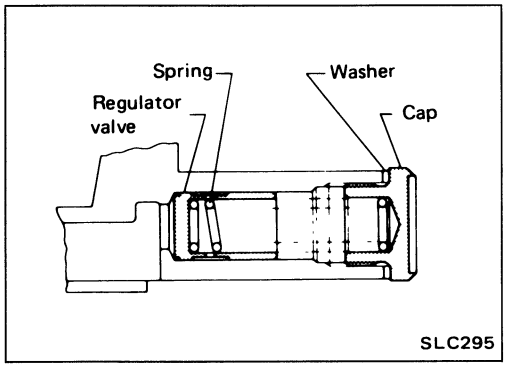




REGULATOR VALVE INSPECTION

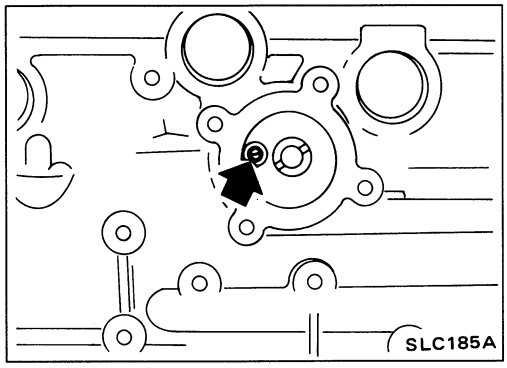
1. Visually inspect components for wear and damage.
2. Check oil pressure regulator valve sliding surface and valve spring.
3. Coat regulator valve with engine oil and check to make sure that it falls smoothly into the valve hole by its own weight.

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

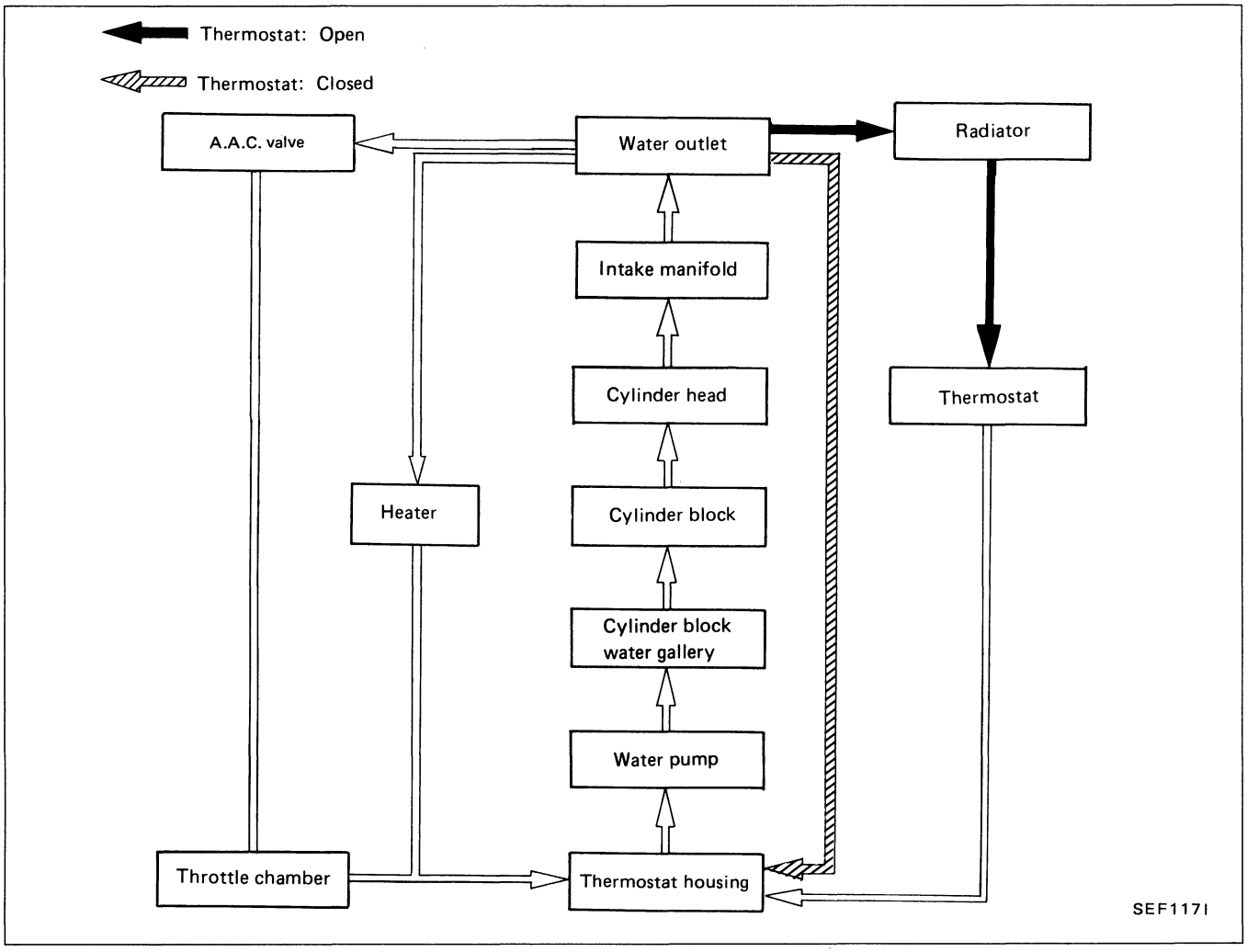


OIL PRESSURE RELIEF VALVE INSPECTION

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



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.

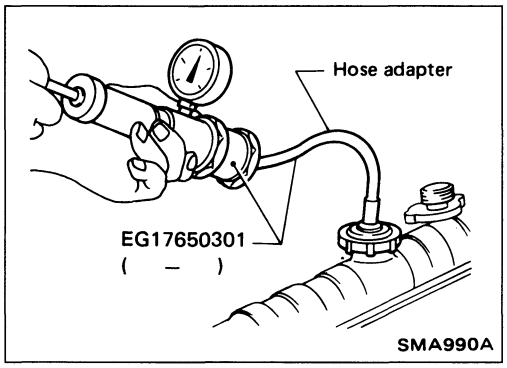
Wrap a thick cloth around the cap and carefully remove by turning it a quarter turn to allow built-up pressure to escape. Then continue to turn the cap until it can be removed safely.

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

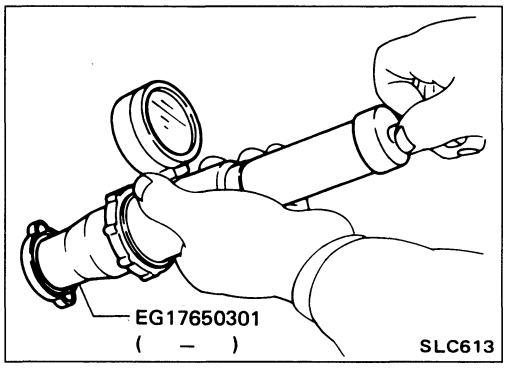


To check for leakage, apply pressure to the cooling system with a tester.

Testing pressure:
98 kPa (1.0 kg/cm^2, 14 psi)

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

CHECKING RADIATOR CAP

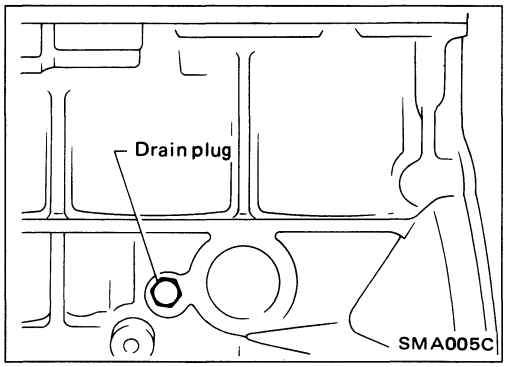


To check radiator cap, apply pressure to cap with a tester.

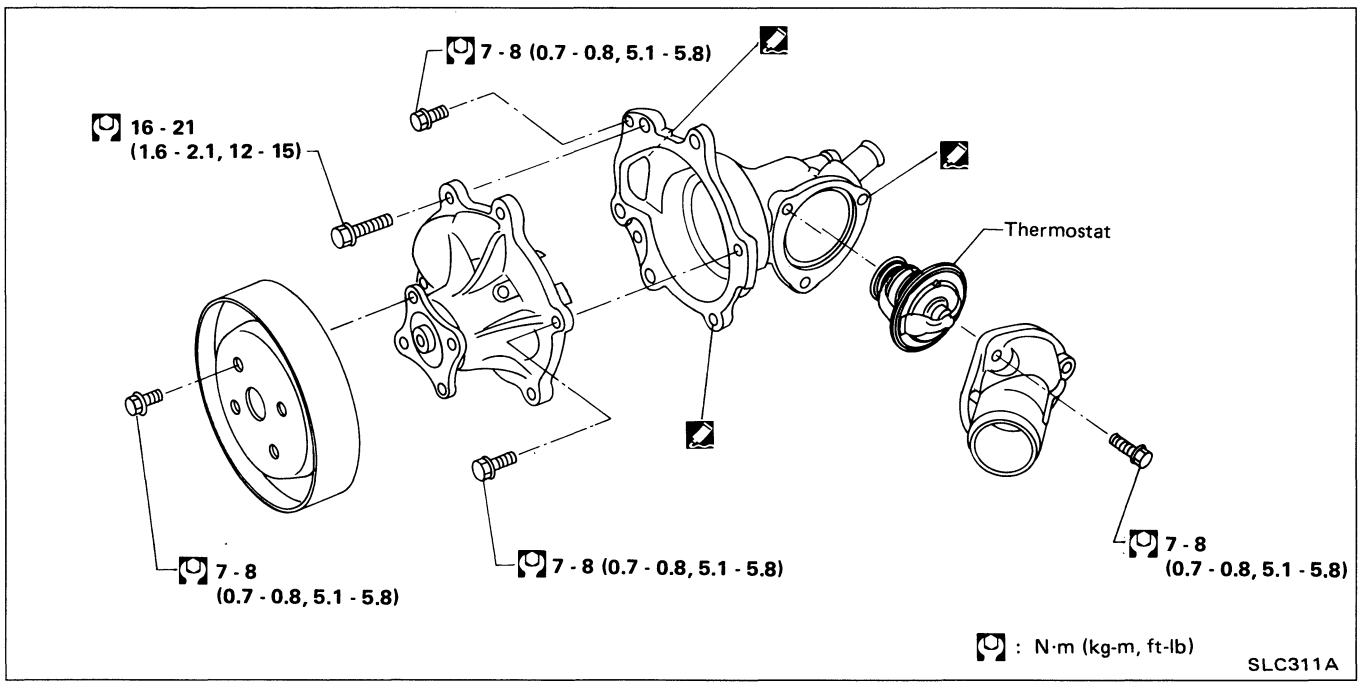
Radiator cap relief pressure:
78 - 98 kPa (0.8 - 1.0 kg/cm^2, 11 - 14 psi)

Water Pump

REMOVAL AND INSTALLATION



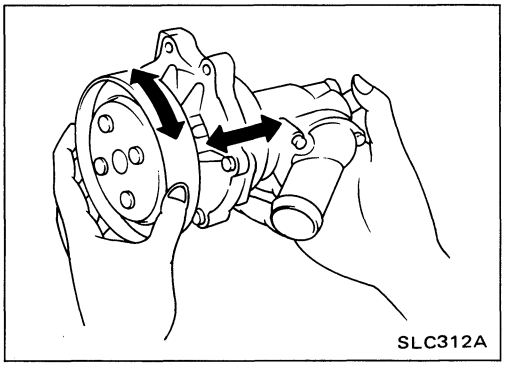
Drain coolant from drain cocks on both cylinder block and radiator.



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.**


SLC312A

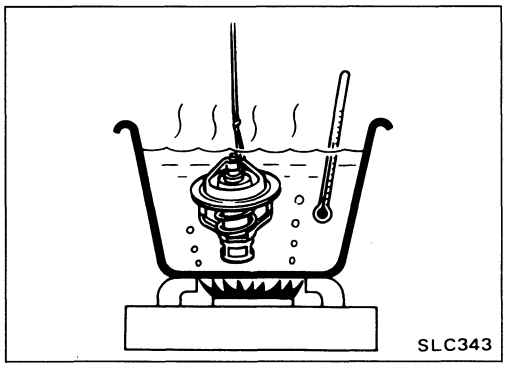
INSPECTION

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.


SLC343

2. Check valve opening temperature and maximum valve lift.

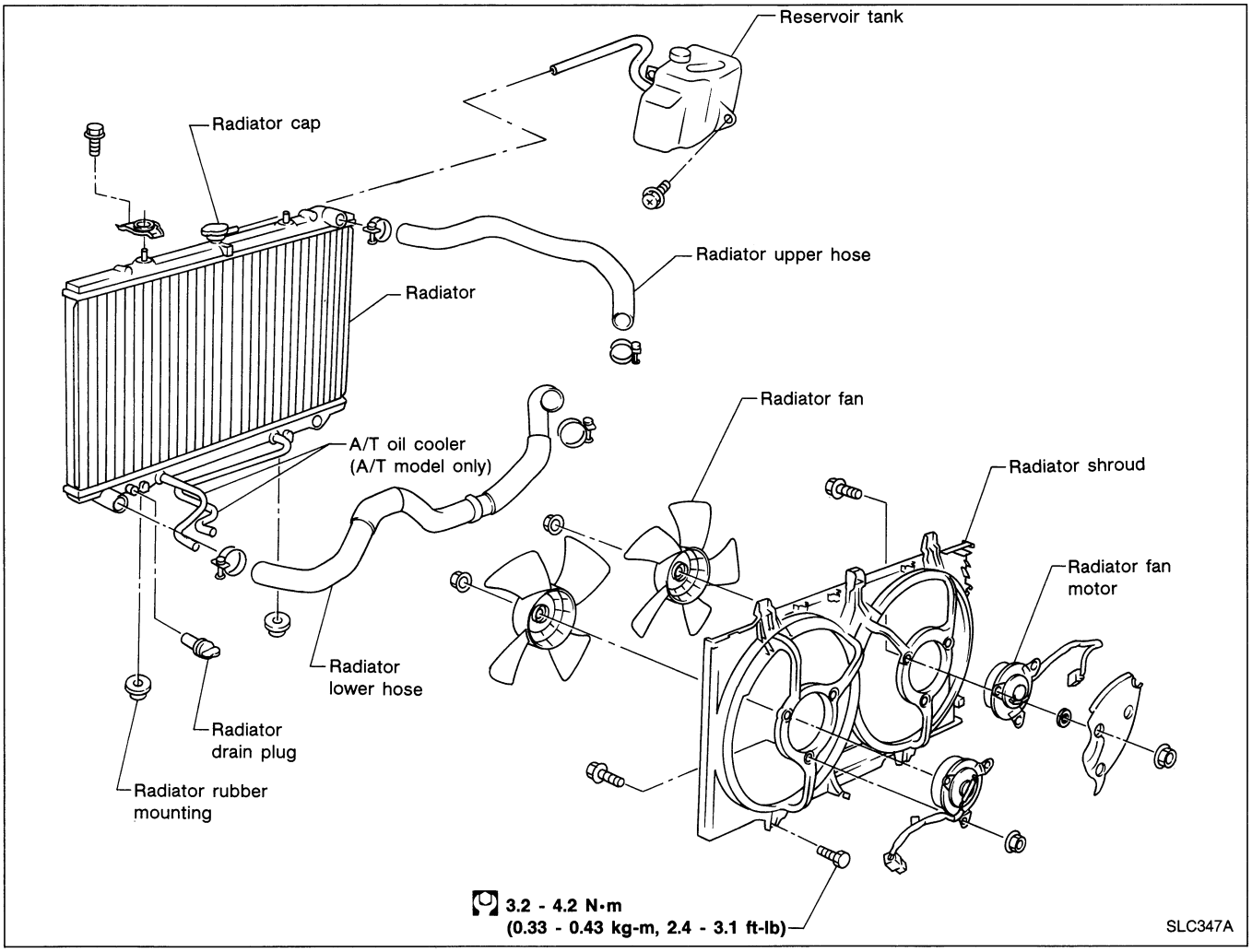
		Standard
Valve opening temperature	°C (°F)	76.5 (170)
Maximum valve lift	mm/°C (in/°F)	8/90 (0.31/194)

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

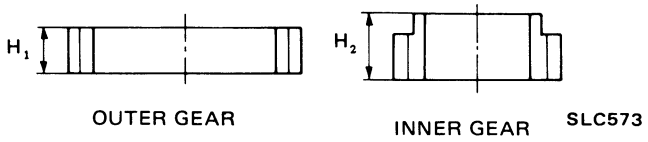
Radiator fan and condenser fan are both controlled by E.C.C.S. control unit.
For details, refer to EF & EC section.

Engine Lubrication System

Oil pressure check

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

Oil pump



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/cm^2, psi)

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

ENGINE FUEL & EMISSION CONTROL SYSTEM

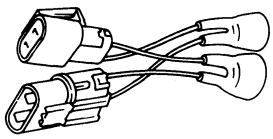
SECTION EF & EC

CONTENTS

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

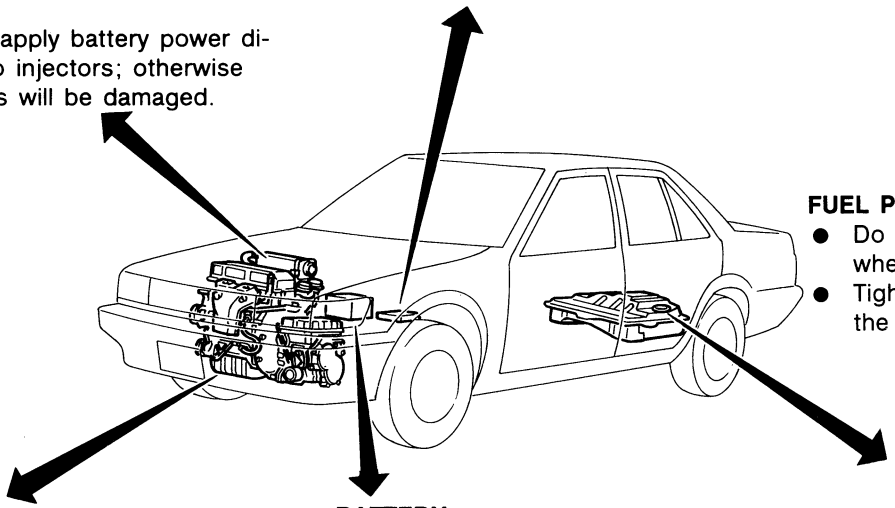
When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES".

SPECIAL SERVICE TOOL

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

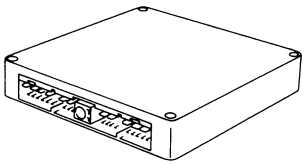
E.C.U.
- Do not disassemble E.C.C.S. control unit. (E.C.U.)
- Do not turn diagnosis mode selector forcibly.
- If a battery terminal is disconnected, the memory will return to the ROM value. The E.C.C.S. will now start to self-control at its initial value. Engine operation can vary slightly when the terminal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

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



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.

- 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.

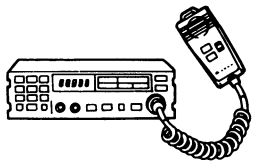


BATTERY
- Always use a 12 volt battery as a power source.
- Do not disconnect battery cables while the engine is running.
- Do not reverse polarity of battery when connecting it. Otherwise, E.C.U. and/or injectors may be burned.

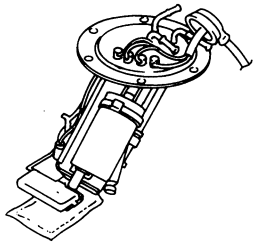
WHEN STARTING
- Do not depress accelerator pedal when starting.
- Immediately after starting, do not rev up engine unnecessarily.
- Do not rev up engine just prior to shutdown.

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.



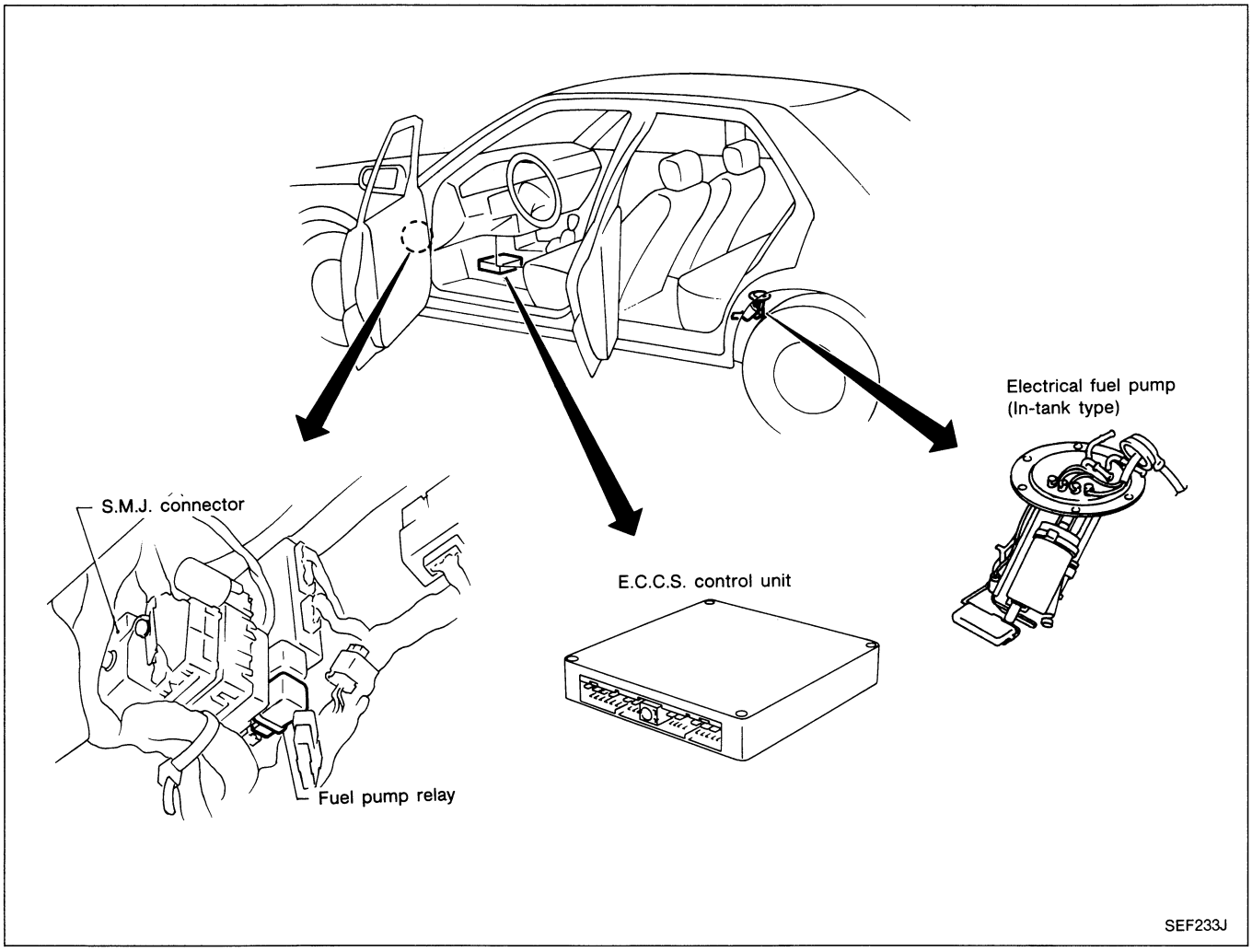
FUEL PUMP
- Do not operate fuel pump when there is no fuel in lines.
- Tighten fuel hose clamps to the specified torque.



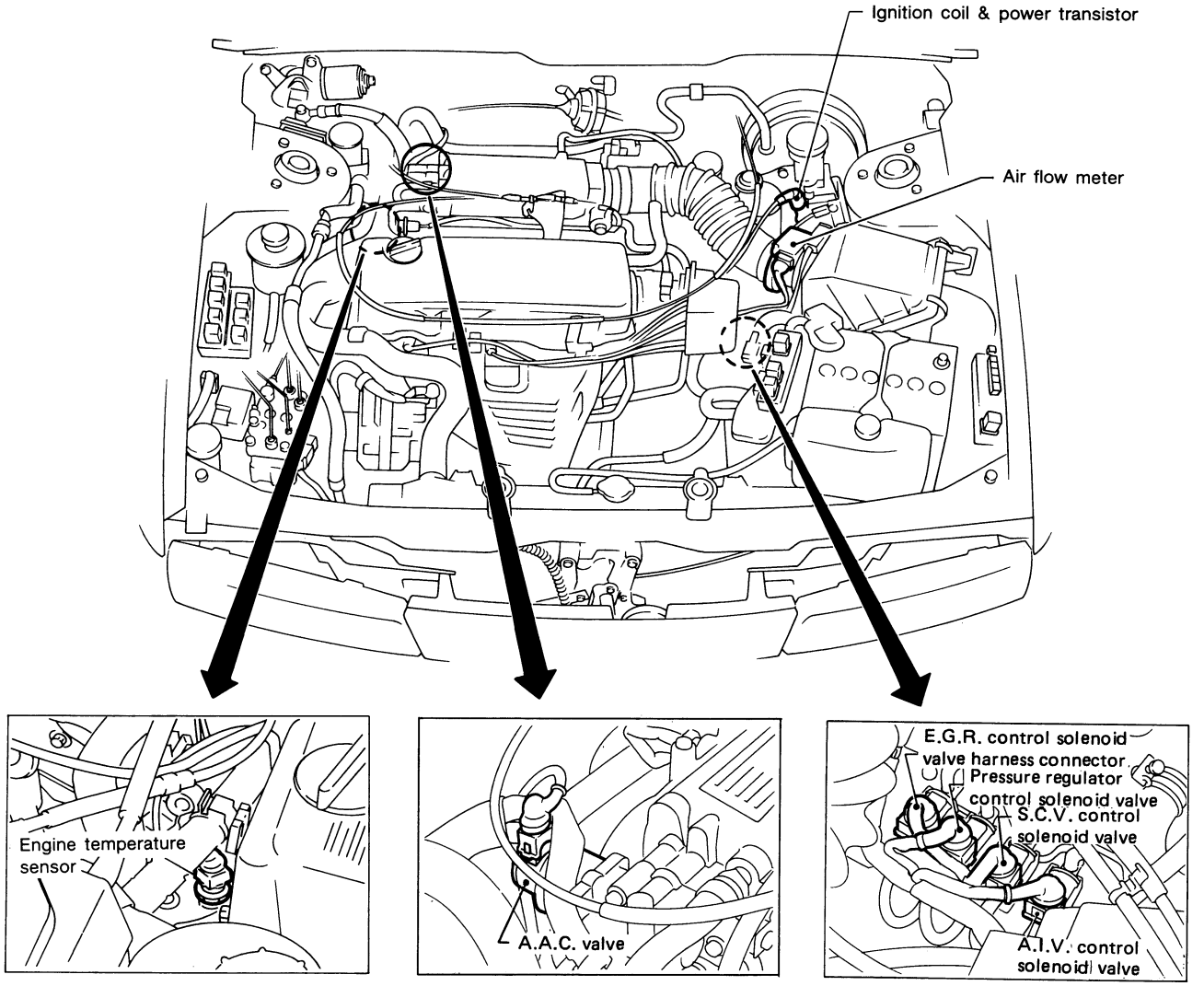
E.C.C.S. HARNESS HANDLING
- Securely connect E.C.C.S. harness connectors.
  A poor connection can cause extremely high voltage to develop in the coil and condenser, resulting in damage to ICs.
- Keep E.C.C.S. harness at least 10 cm (3.9 in) away from adjacent harnesses, to prevent an E.C.C.S. system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

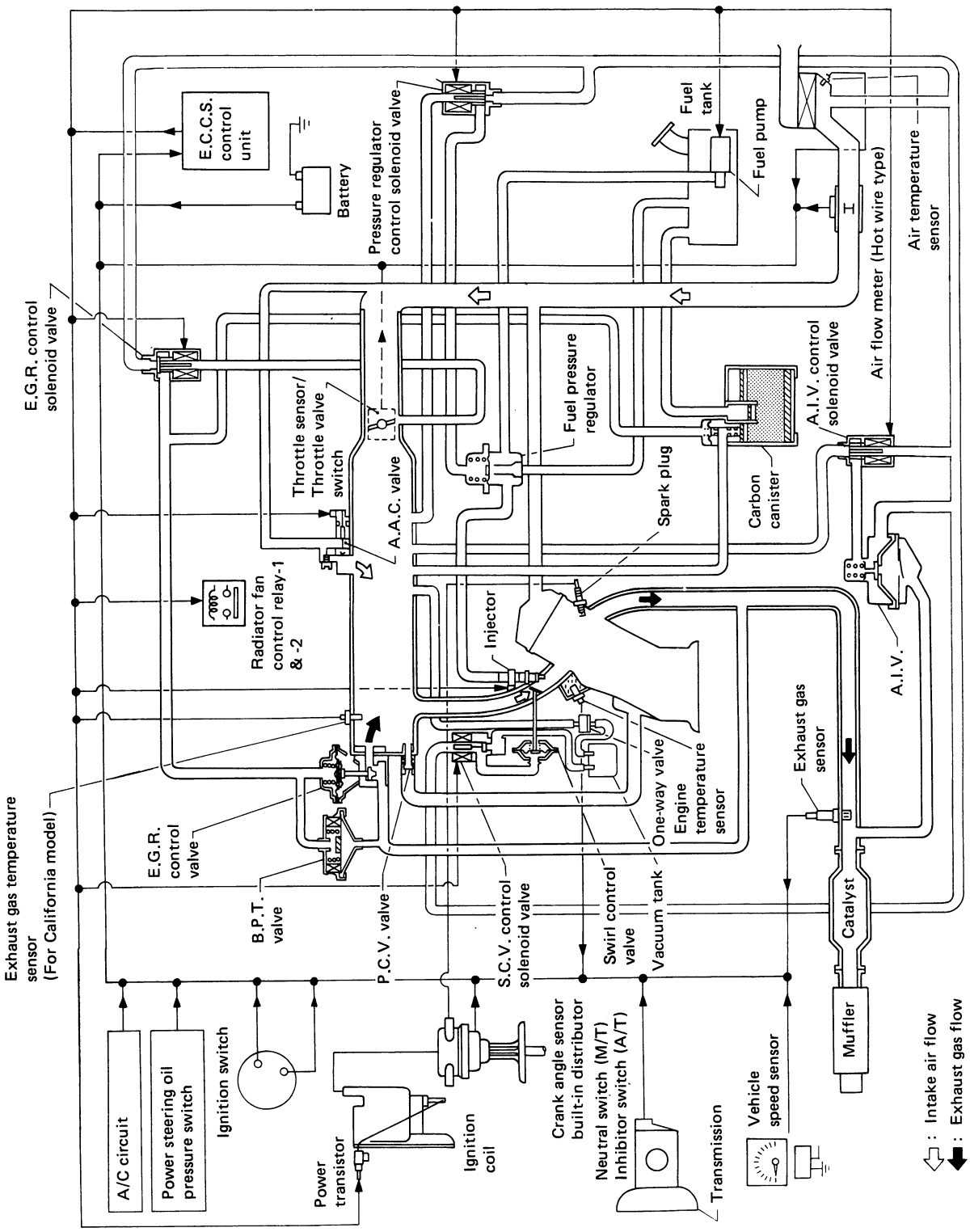
E.C.C.S. Component Parts Location



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



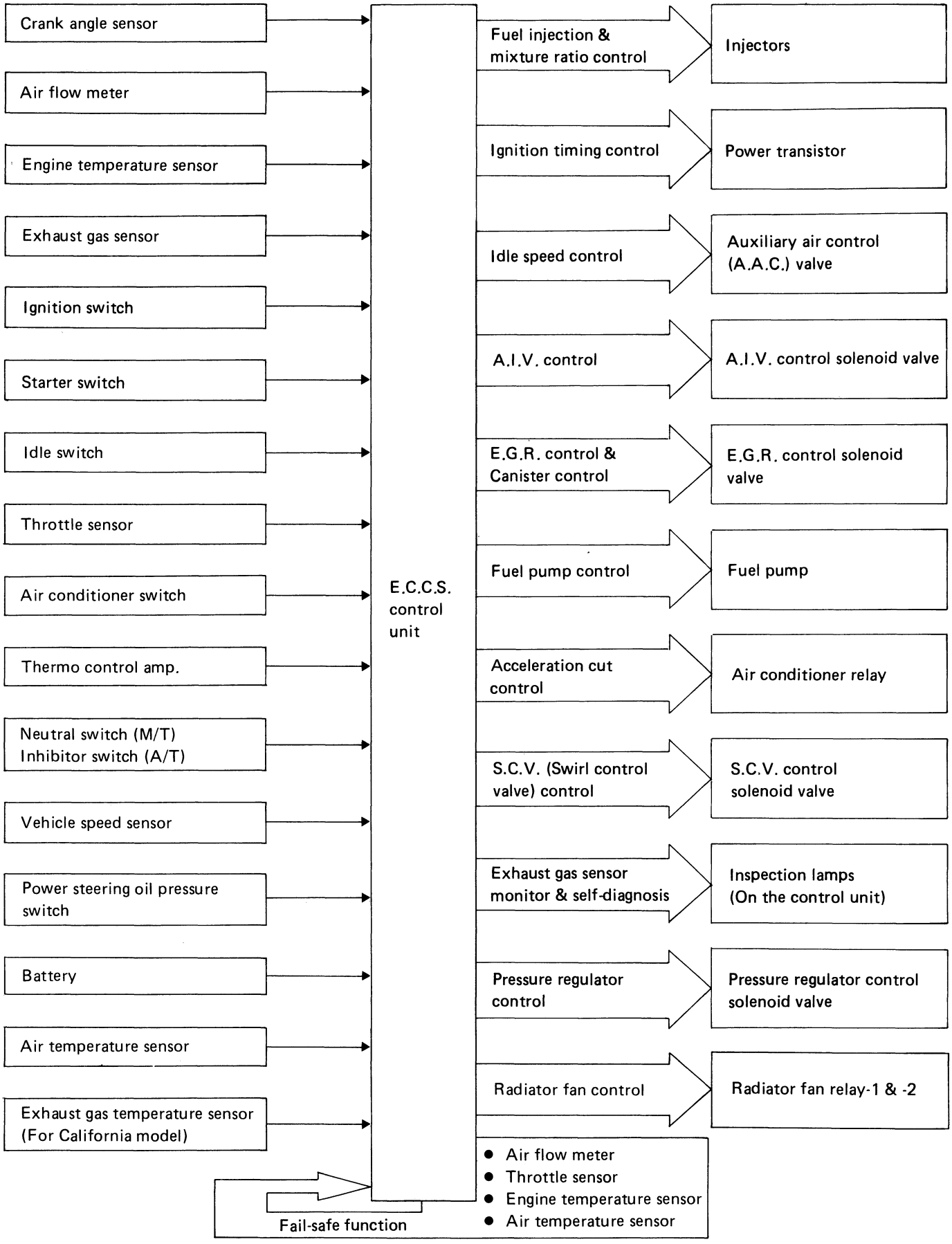
System Diagram



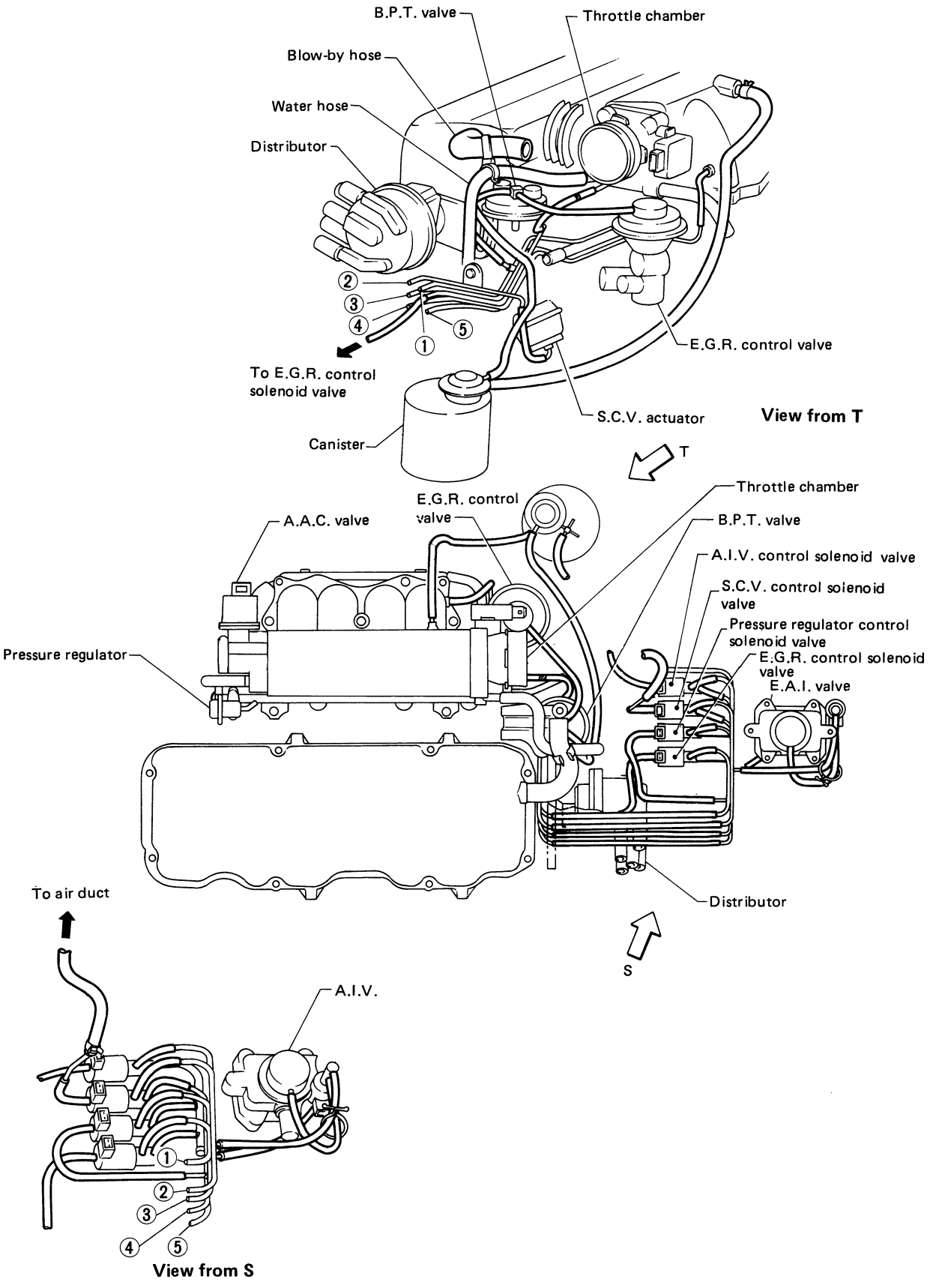
SEF405J

System Chart

E.C.C.S. CONTROL SYSTEM

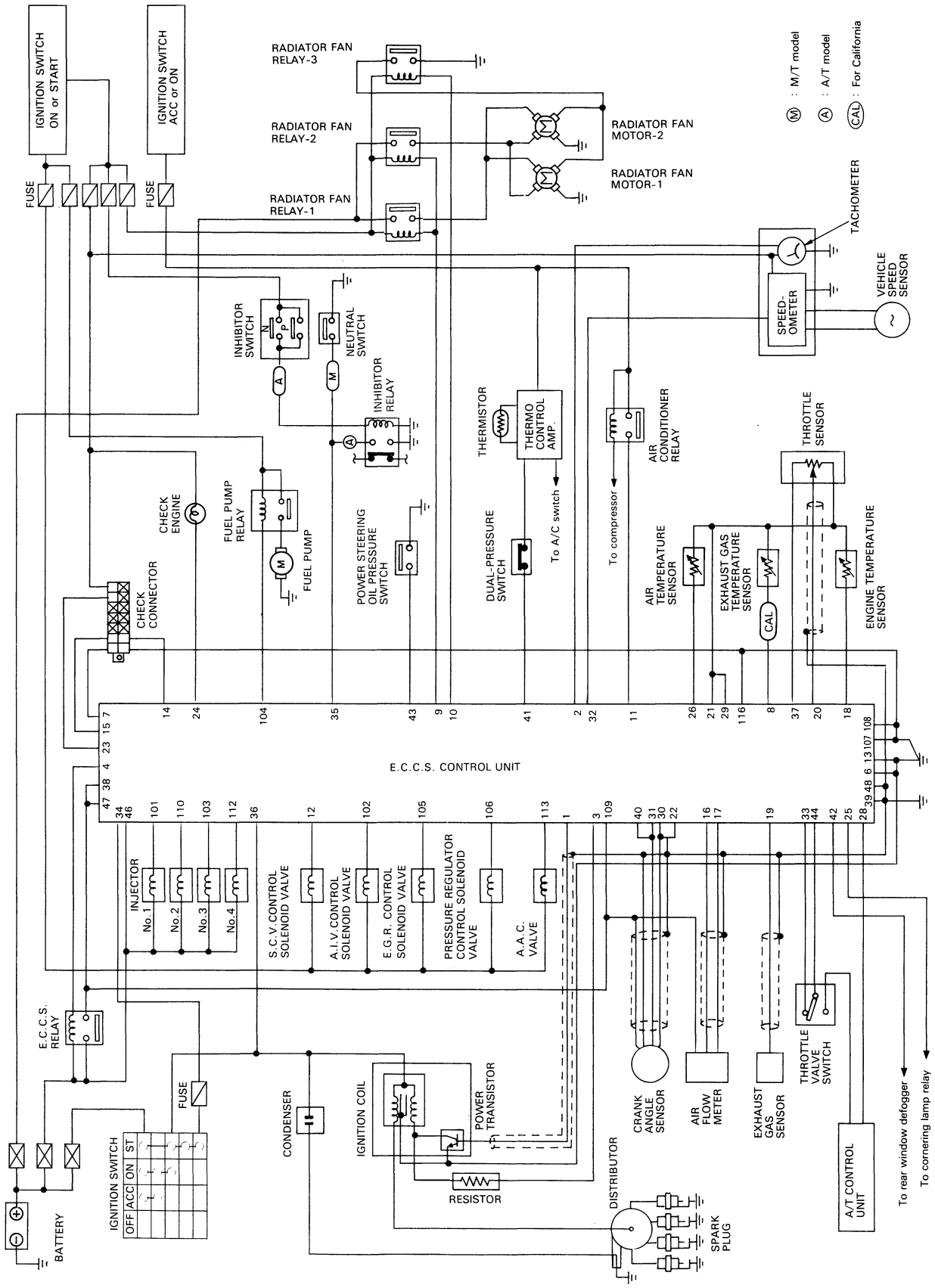


Vacuum Hose Drawing



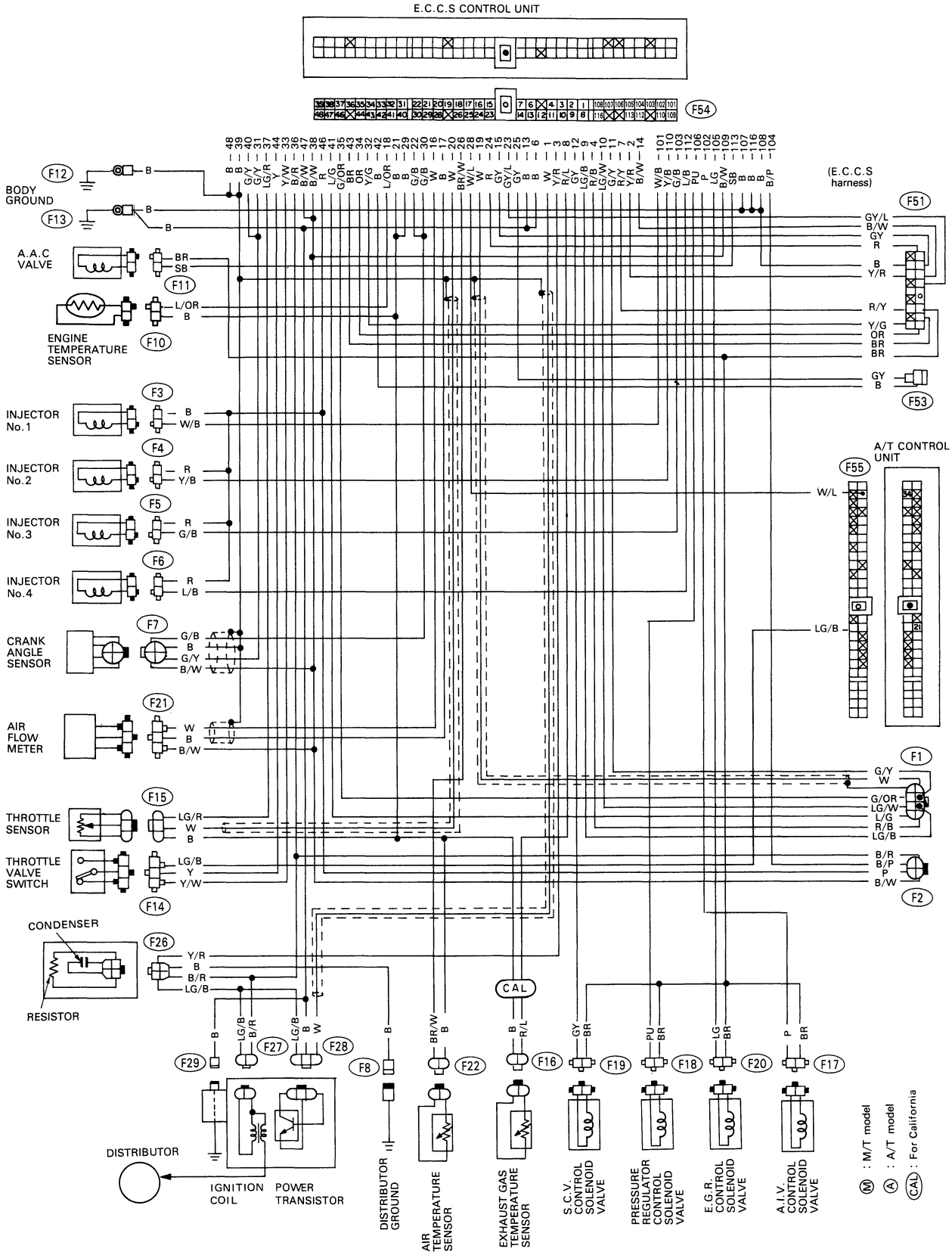
SEF412J

Circuit Diagram

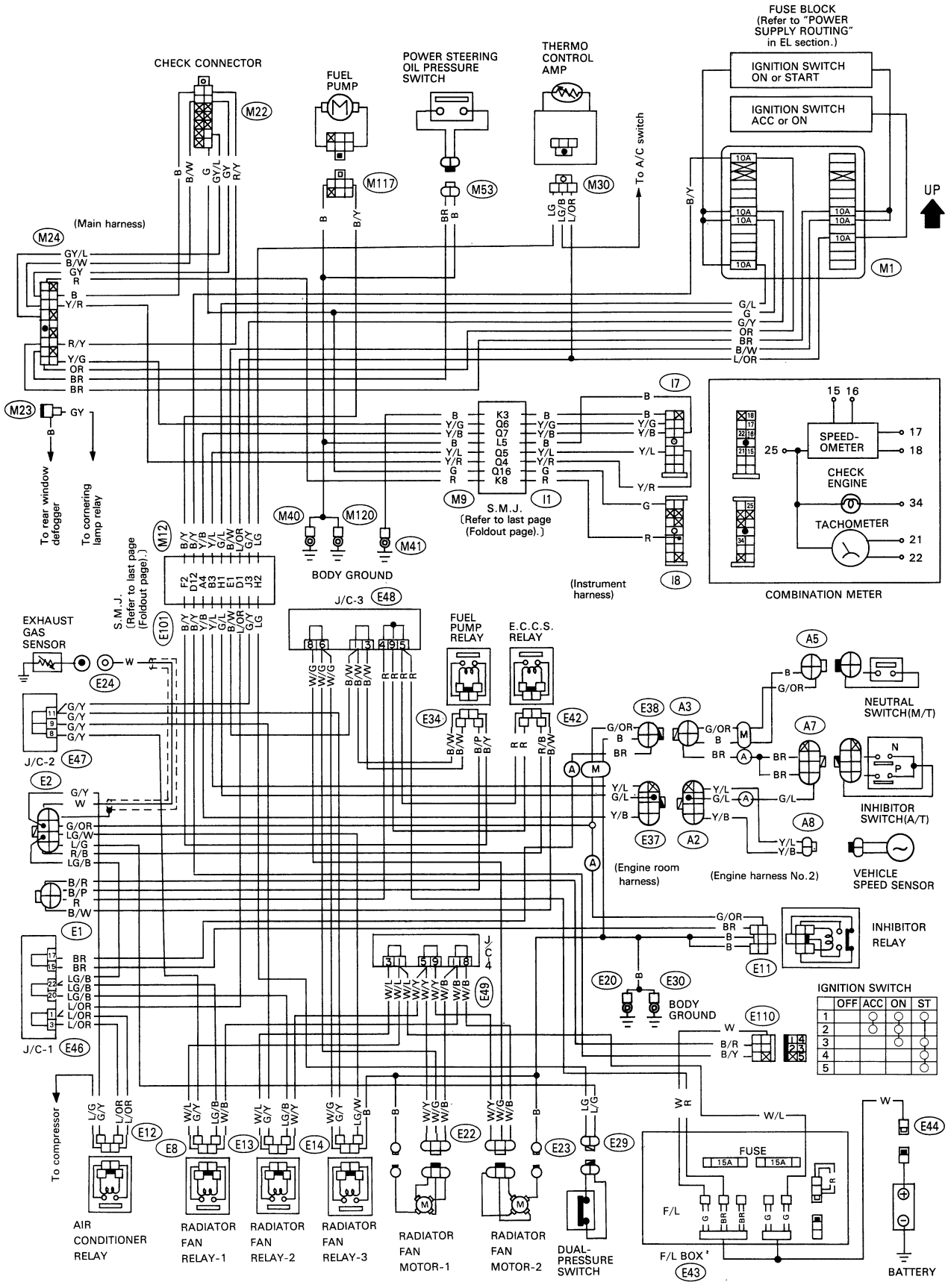


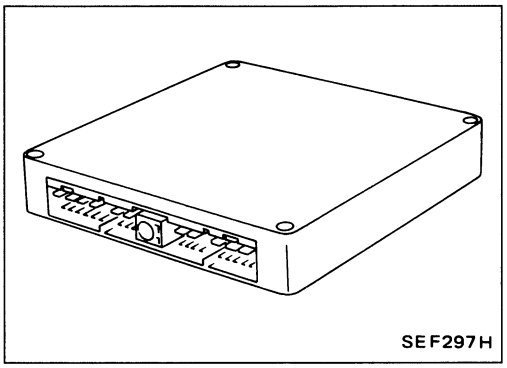
SEF897I

Wiring Diagram



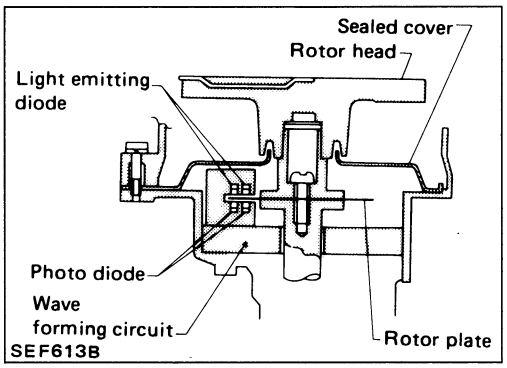
Wiring Diagram (Cont'd)




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.



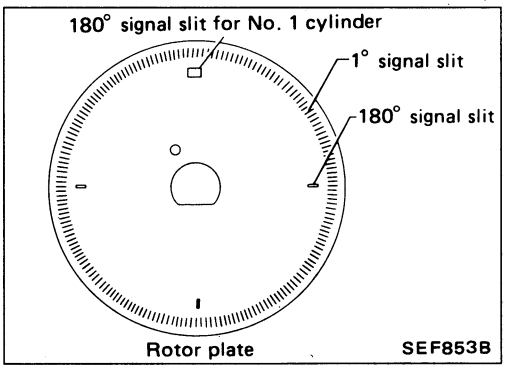
SEF613B

Crank Angle Sensor

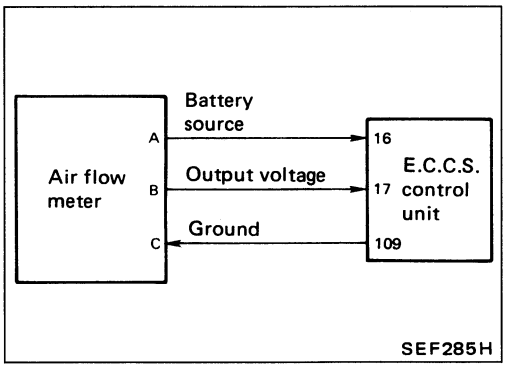
The crank angle sensor is a basic component of the entire E.C.C.S. It monitors engine speed and piston position, and sends signals to the E.C.U. to control fuel injection, ignition timing and other functions.

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.



SEF853B

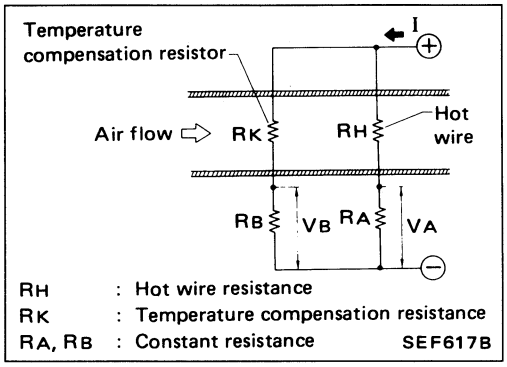


SEF285H

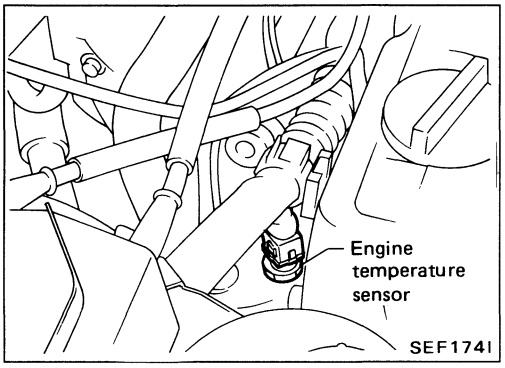
Air Flow Meter

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.

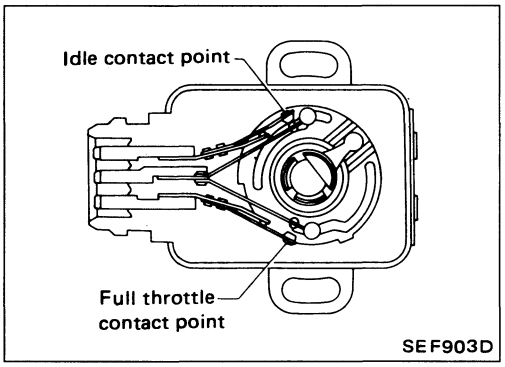


RH : Hot wire resistance
RK : Temperature compensation resistance
RA, RB : Constant resistance
SEF617B



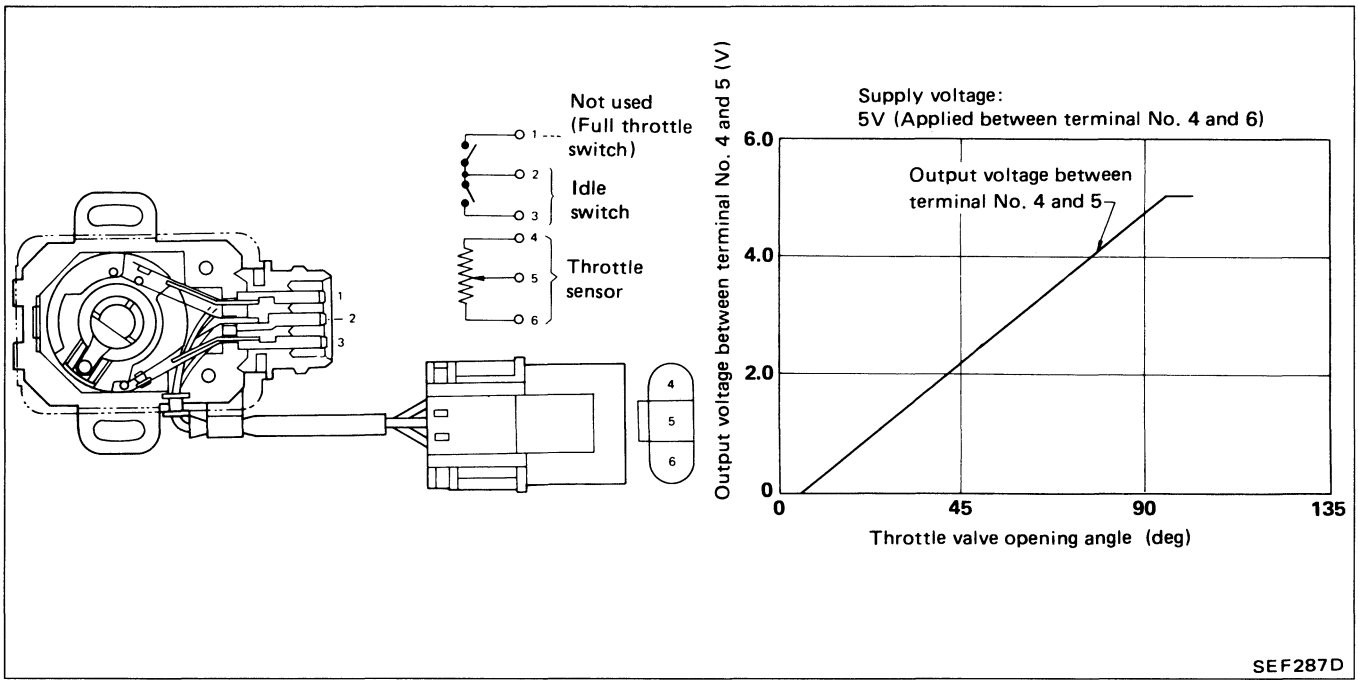
Engine Temperature Sensor

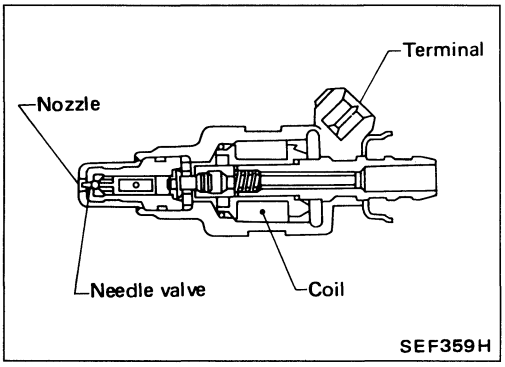
The engine temperature sensor detects the engine temperature, which is dependent on engine coolant temperature, and transmits a signal to the E.C.U.
The temperature sensing unit employs a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in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



Throttle Sensor & Soft/Hard Idle Switch

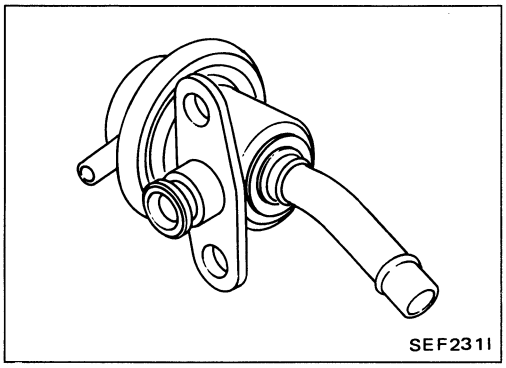
The throttle sensor responds to the accelerator pedal movement. This sensor is a kind of potentiometer which transforms the throttle valve position into output voltage, and emits the voltage signal to the E.C.U. In addition, the sensor detects the opening and closing speed of the throttle valve and feeds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





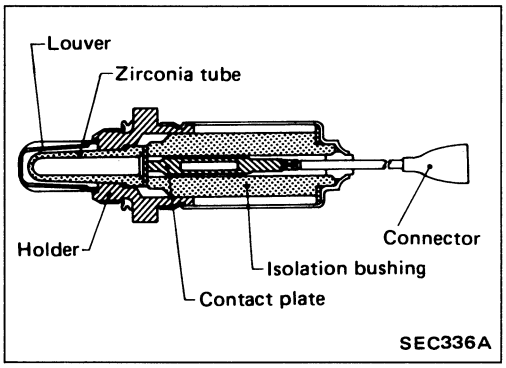
Fuel Injector

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

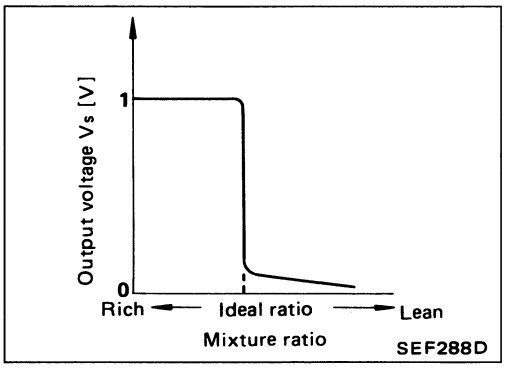
The pressure regulator maintains the fuel pressure at 299.1 kPa (3.05 kg/cm^2, 43.4 psi). Since the injected fuel amount depends on injection pulse duration, it is necessary to maintain the pressure at the above value.



SEC336A

Exhaust Gas Sensor

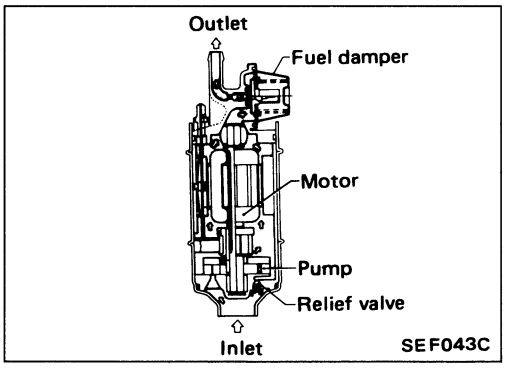
The exhaust gas sensor, which is placed into the exhaust manifold, monitors the amount of oxygen in the exhaust gas. The sensor has a closed-end tube made of ceramic zirconia. The outer surface of the tube is exposed to exhaust gas, and the inner surface to atmosphere. The zirconia of the tube compares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



SEF288D

Fuel Pump

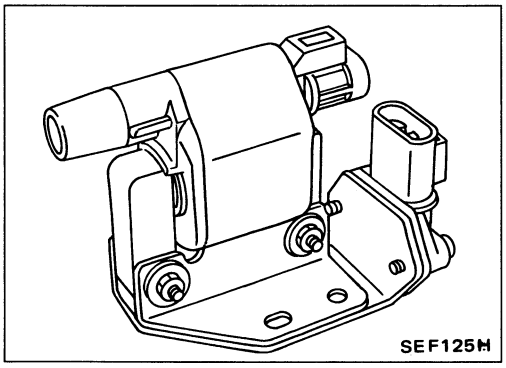
The fuel pump with a fuel damper is a submergible type, and are located in the fuel tank.

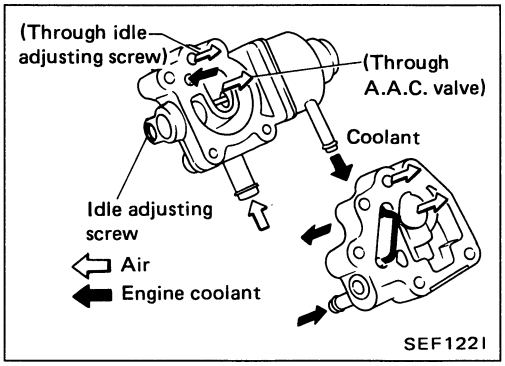


SEF043C

Power Transistor

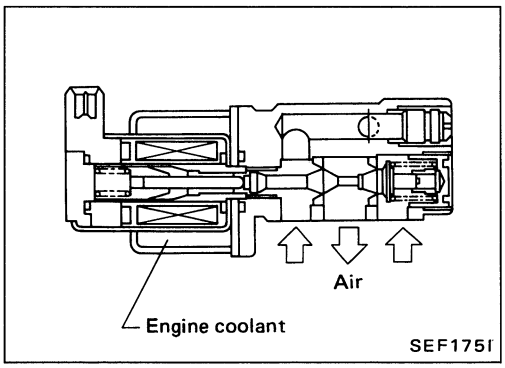
The ignition signal from the E.C.U. is amplified by the power transistor, which turns the ignition coil primary circuit on and off, inducing the proper high voltage in the secondary circuit. The ignition coil is a small, molded type.


SEF125H



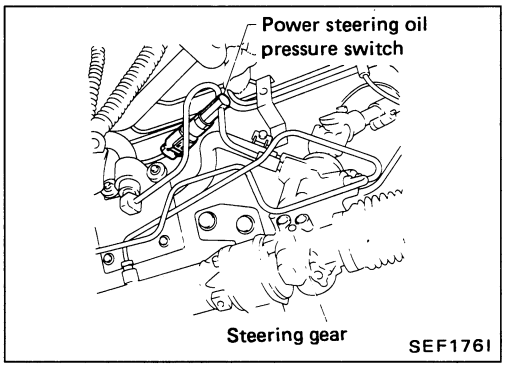
Idle Air Adjusting (I.A.A.) Unit

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.



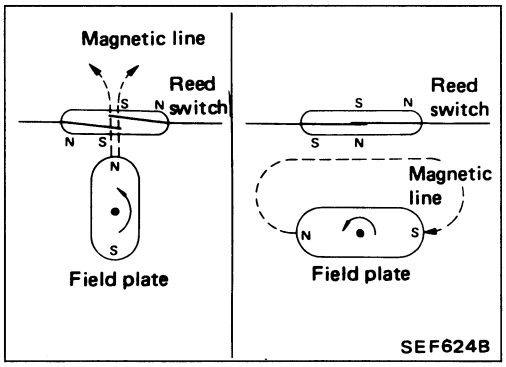
Auxiliary Air Control (A.A.C.) Valve

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.



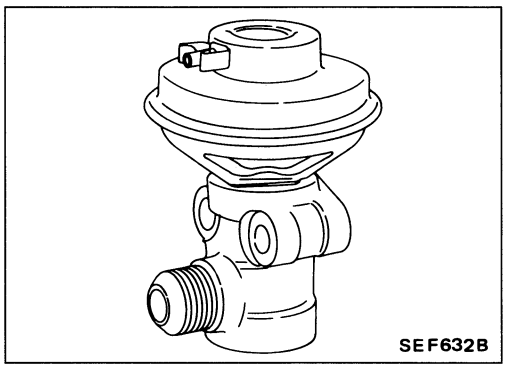
Power Steering Oil Pressure Switch

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.



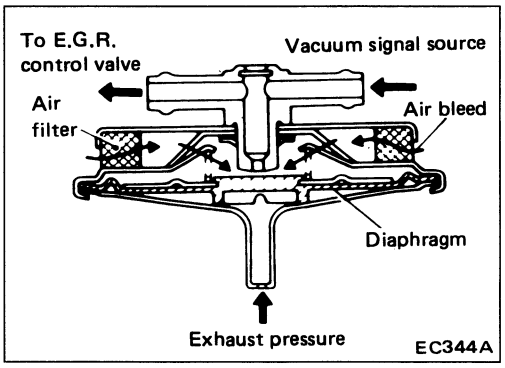
Vehicle Speed Sensor

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.



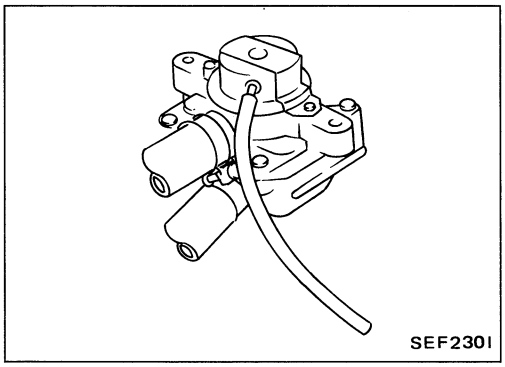
E.G.R. Control Valve

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.



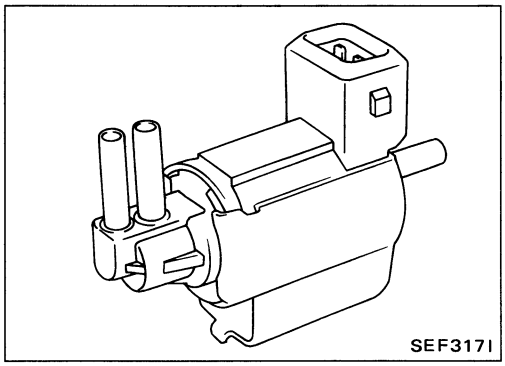
B.P.T. Valve

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

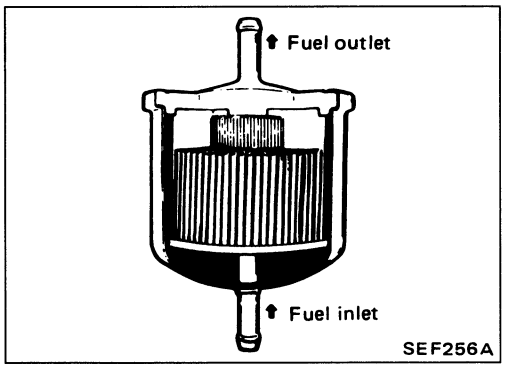
The E.G.R. system is controlled only by the E.C.U. At both low- and high-speed engine revolutions, the solenoid valve turns on and accordingly the E.G.R. valve cuts the exhaust gas leading to the intake manifold.

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.

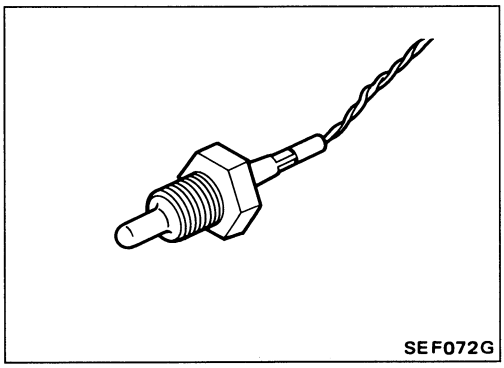


Fuel Filter

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

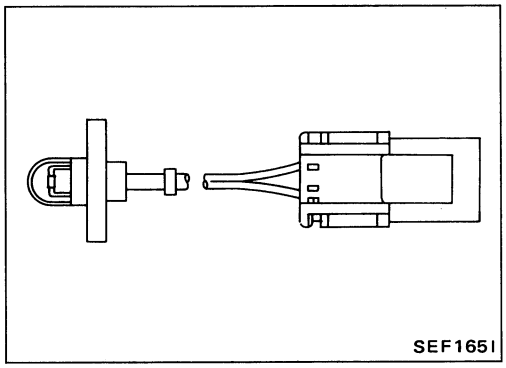
Carbon Canister

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.



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.

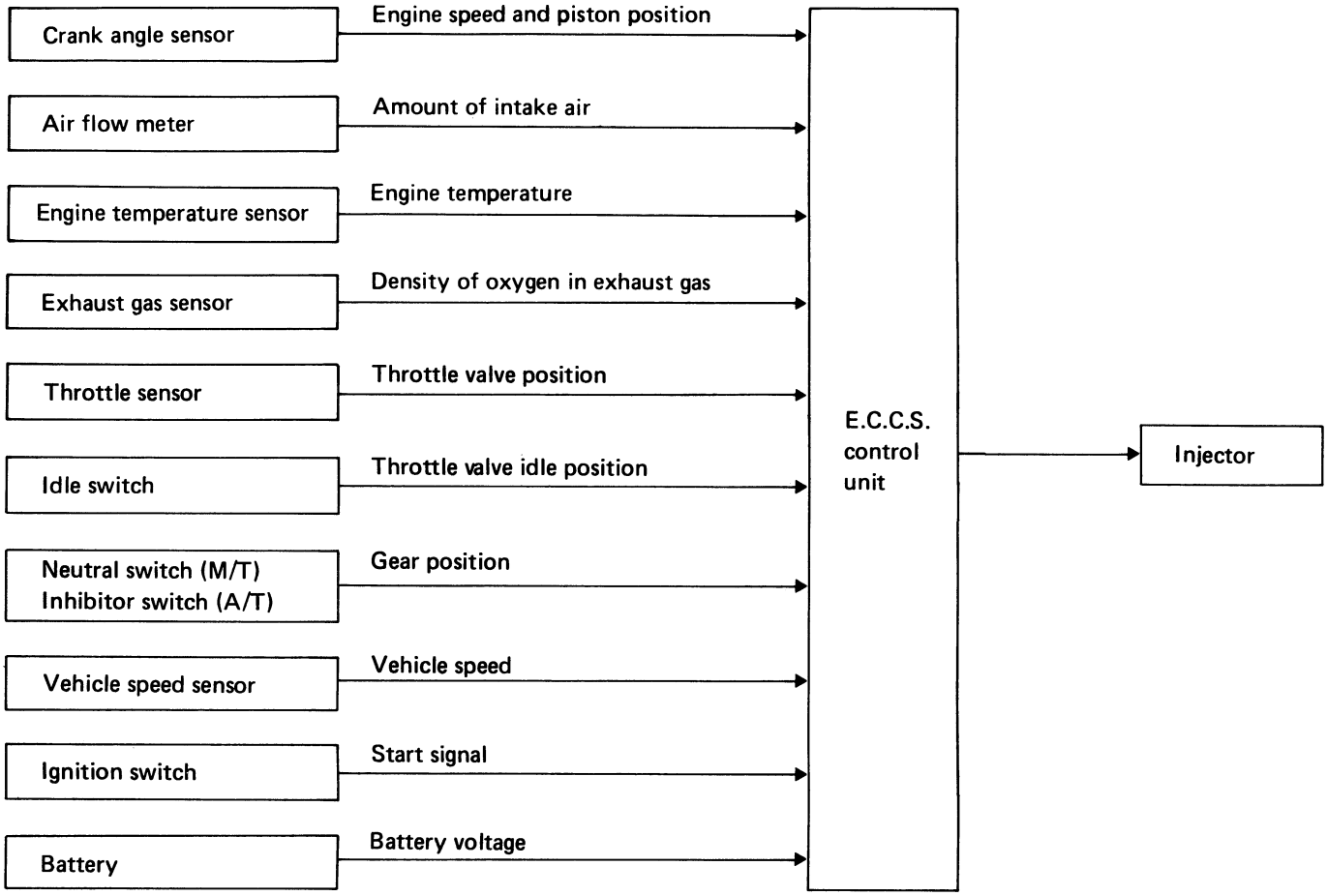


Air Temperature Sensor

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

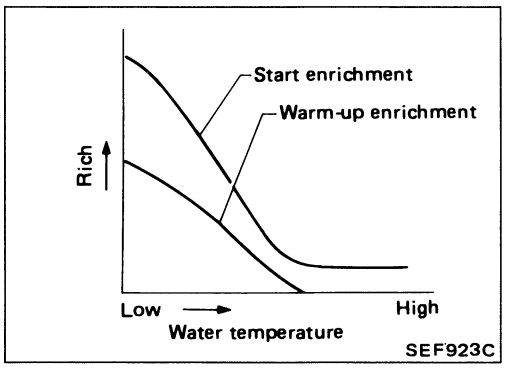
Fuel Injection Control

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.



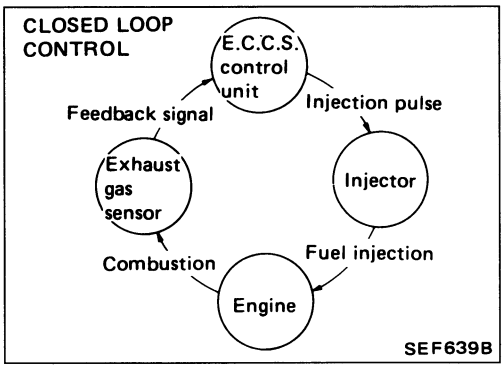
VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

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

Fuel Injection Control (Cont'd)



MIXTURE RATIO FEEDBACK CONTROL

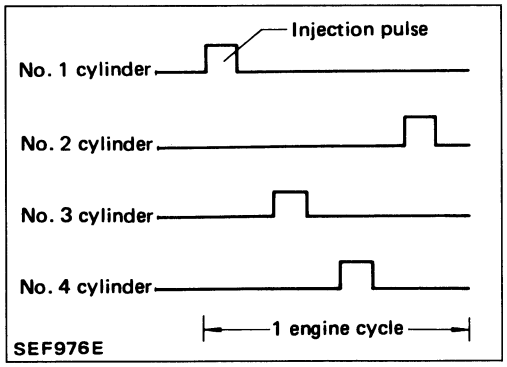
Mixture ratio feedback system is designed to precisely control the mixture ratio to the stoichiometric point so that the three-way catalyst can reduce CO, HC and NOx emissions. This system uses an exhaust gas sensor in the exhaust manifold to check the air-fuel ratio. The control unit adjusts the injection 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

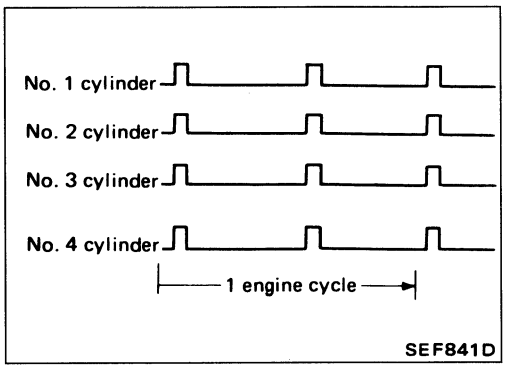
MIXTURE RATIO SELF-LEARNING CONTROL

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.

FUEL INJECTION TIMING



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



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

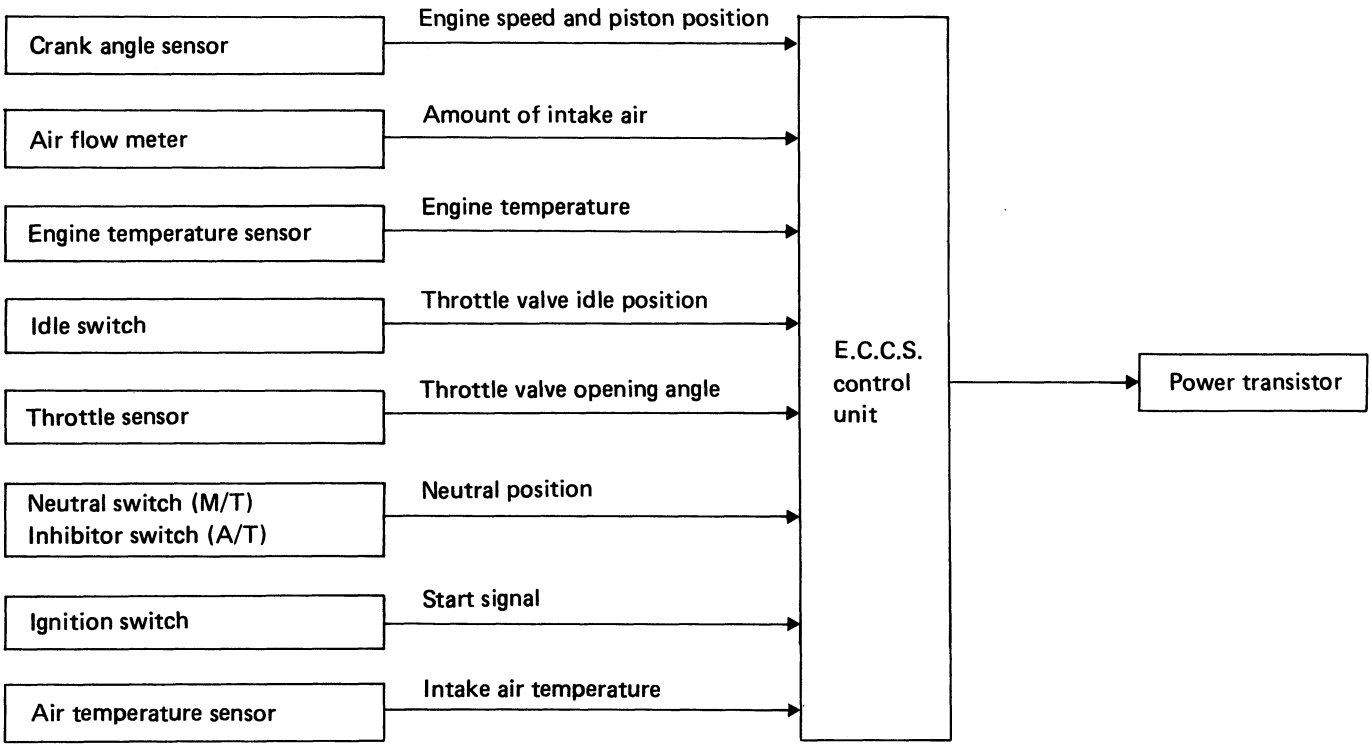
Fuel Injection Control (Cont'd)

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.

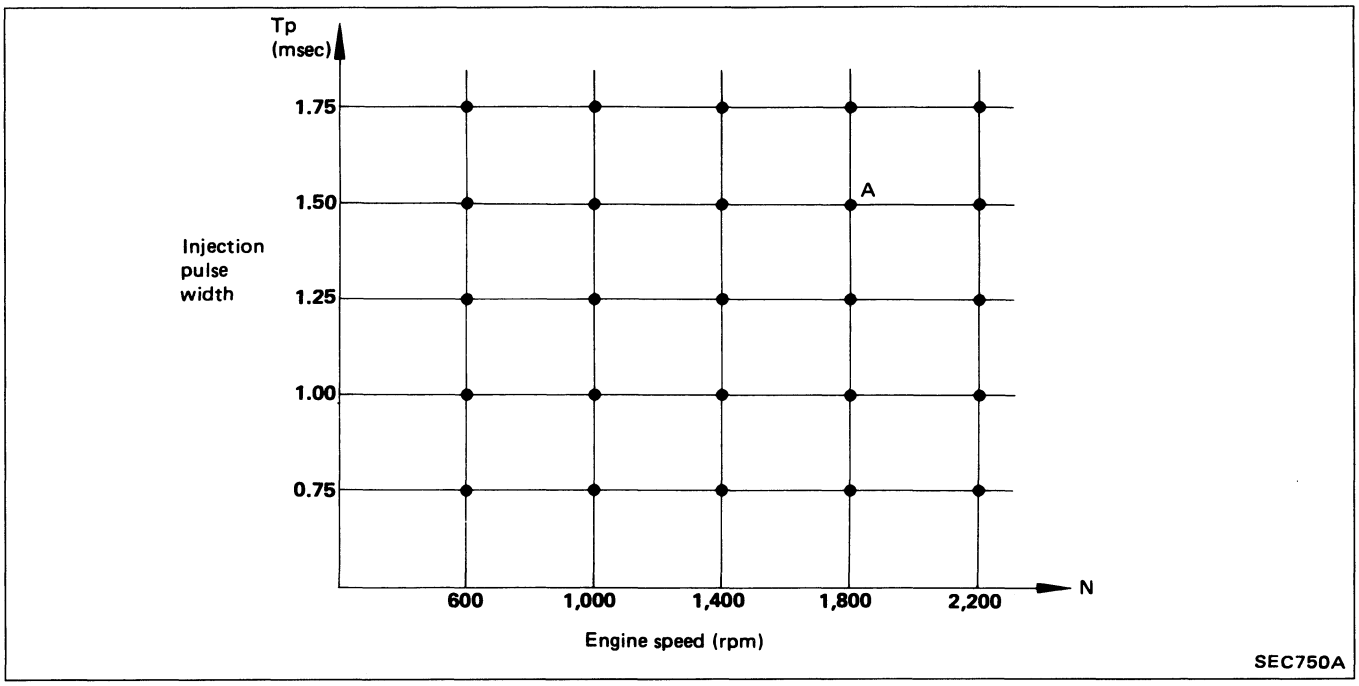
The E.C.U. detects information such as the injection pulse width and crank angle sensor signal which varies every moment. Then responding to this information, ignition signals are transmitted to the power transistor.

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

In addition to this,

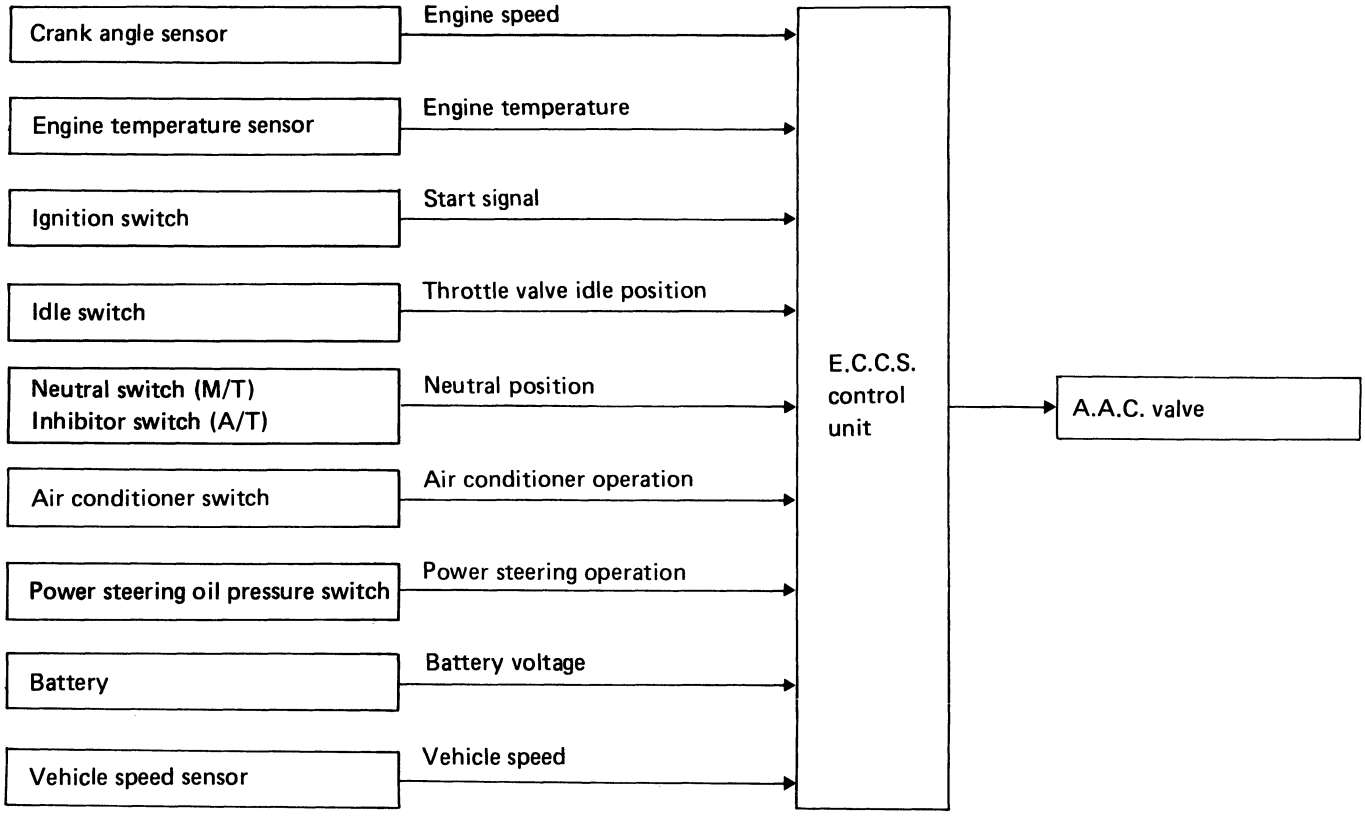
1 At starting
2 During warm-up
3 At idle
4 At low battery voltage
5 During swirl control valve operates
6 During hot engine operation
7 At acceleration
8 When intake air temperature is extremely high

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

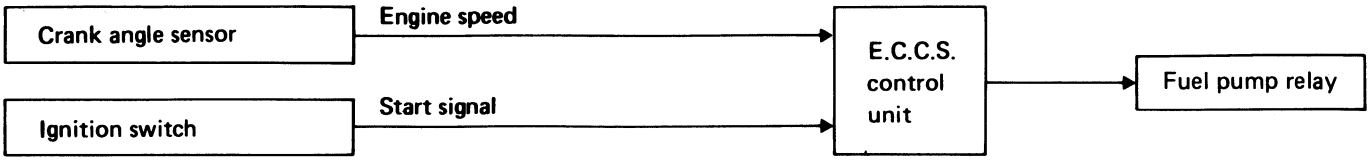


SYSTEM DESCRIPTION

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



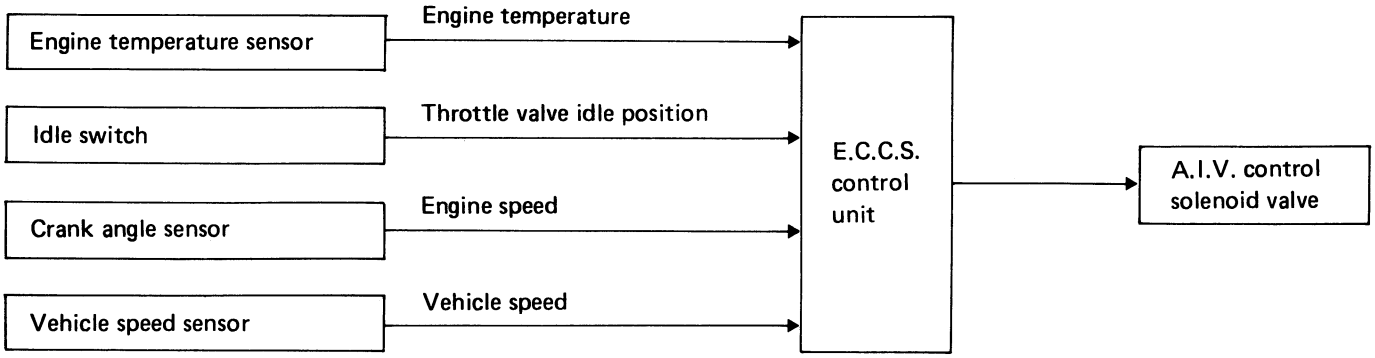
SYSTEM DESCRIPTION

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.

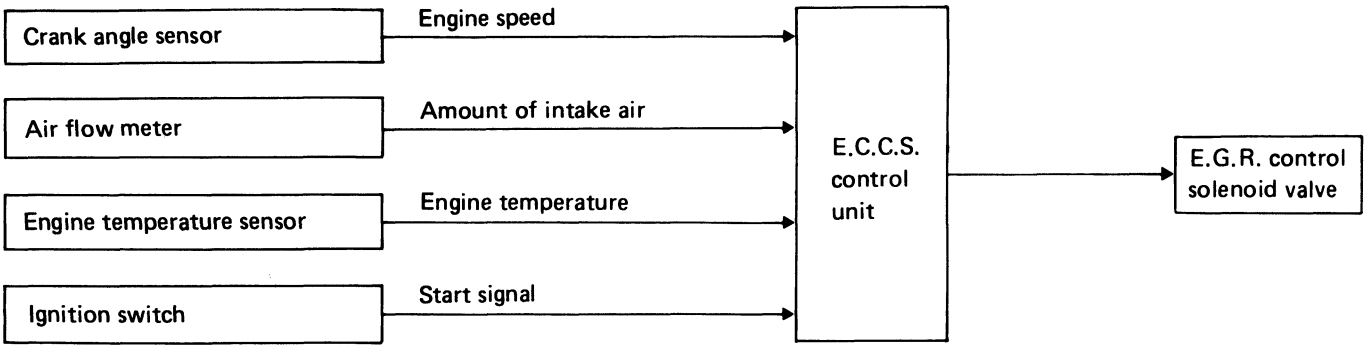
The air induction valve is controlled by the E.C.C.S. control unit, corresponding to the engine temperature. When the engine is cold, the A.I.V. control system operates to reduce HC and CO.

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)	
		Above 115 (239)	
Idle & heavy load conditions			
Other conditions			OFF

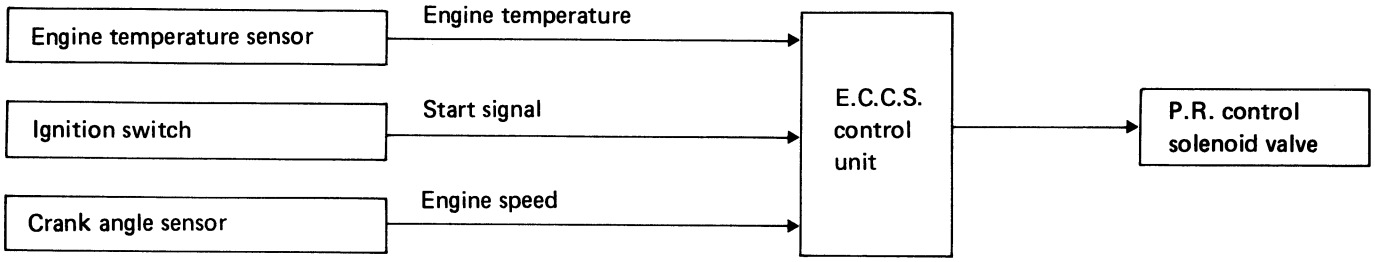
E.G.R. system operation

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

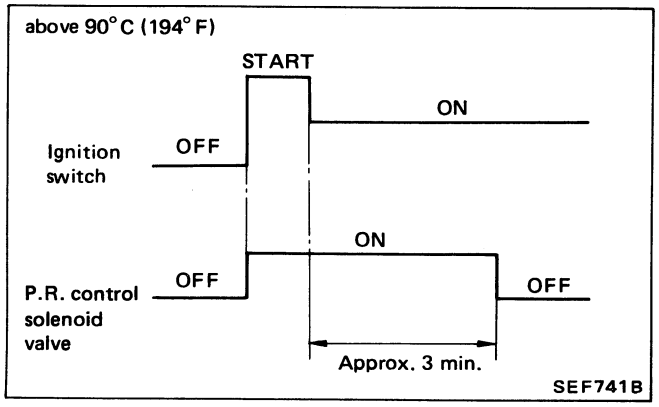
Fuel Pressure Regulator Control

INPUT/OUTPUT SIGNAL LINE



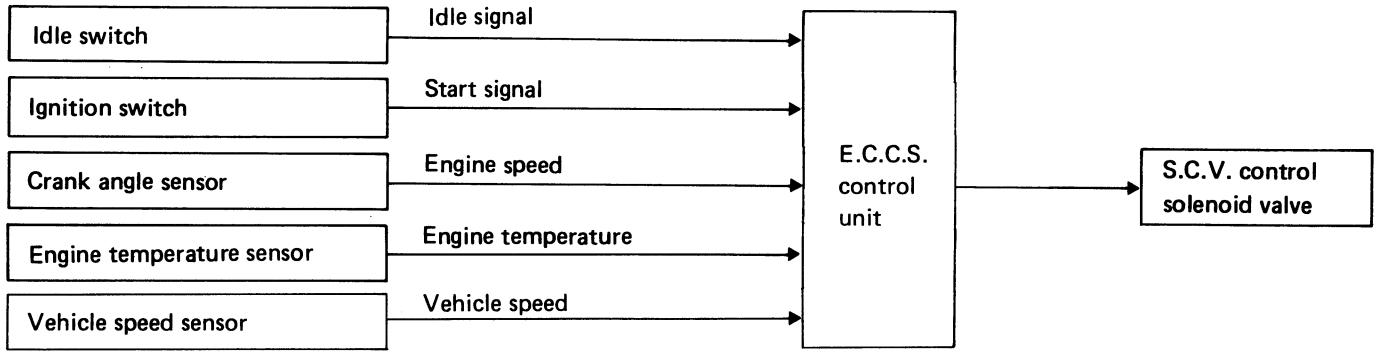
SYSTEM DESCRIPTION

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

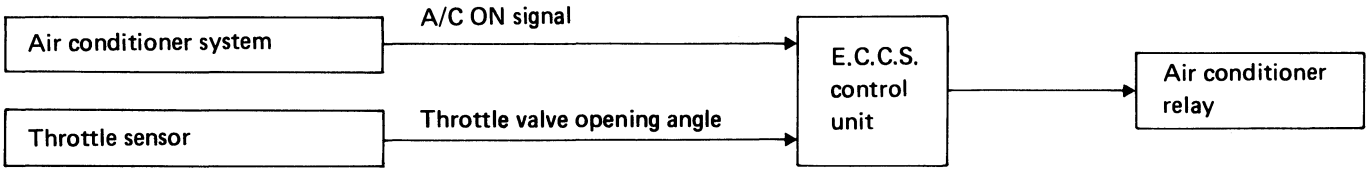
Water temperature is above 35°C (95°F) with vehicle stopped and engine running

Idle switch	Engine rpm	Solenoid valve	S.C.V.
ON	Below 1,800*1 Below 1,500*2	ON	Close
Except above		OFF	Open

*1: M/T *2: A/T

Acceleration Cut Control

INPUT/OUTPUT SIGNAL LINE



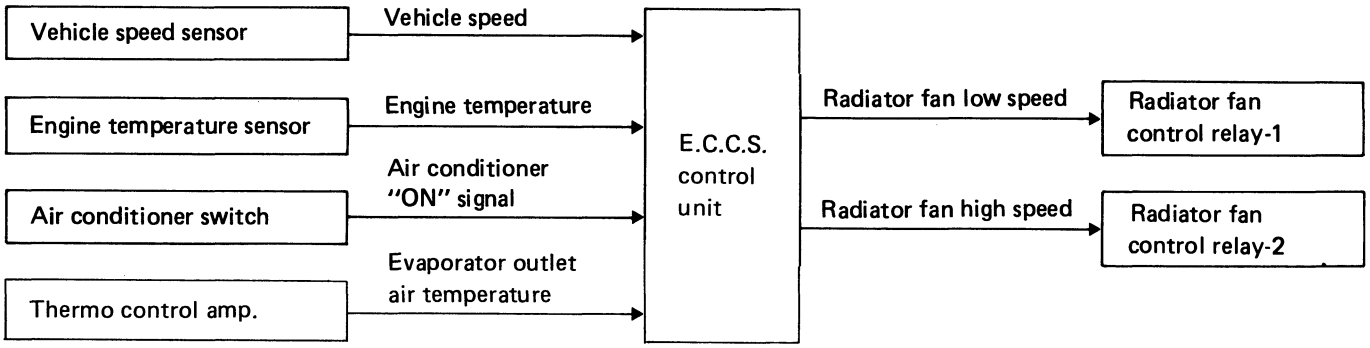
SYSTEM DESCRIPTION

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)].

PREPARATION

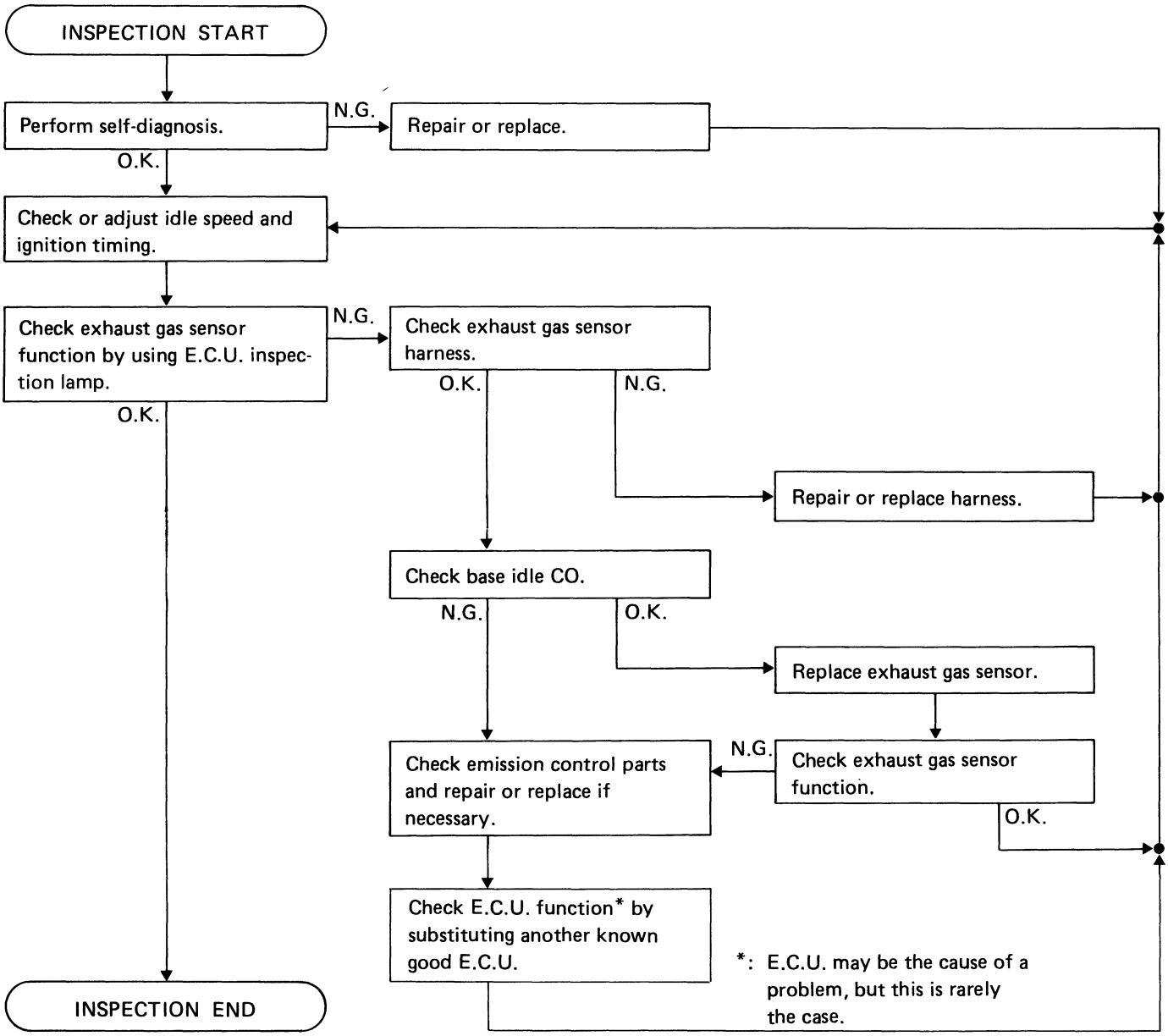
1. Make sure that the following parts are in good order.
- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- E.C.U. harness connector
- Vacuum hoses
- Air intake system
  (Oil filler cap, oil level gauge, etc.)
- Fuel pressure
- A.I.V. hose
- Engine compression
- E.G.R. control valve 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.

WARNING:

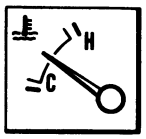
a. When checking or adjustment, move selector lever to "N" position, set parking brake and chock rear wheels.
b. After the adjustment has been made, remove wheel chocks.

Overall inspection sequence



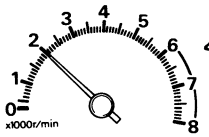
INSPECTION START

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.

O.K. / N.G.

Check, correct or replace malfunctioning parts.

Does engine run smoothly?

Yes / 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.

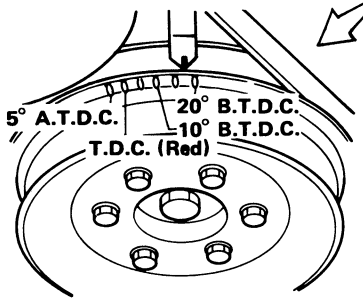
Check idle speed.

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**

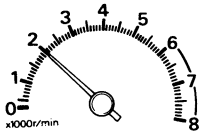
O.K. → Ⓐ

N.G. → Ⓑ

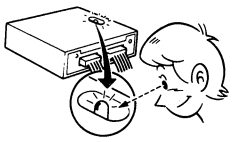
Ⓒ → Race engine two or three times under no-load, then run engine at idle speed.



SMA189A



SEF477B



SEF362I

Ⓐ

Check ignition timing with a timing light.

15°±2° B.T.D.C.

O.K.

N.G.

Ⓑ

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.

Ⓒ

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

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.

Ⓓ

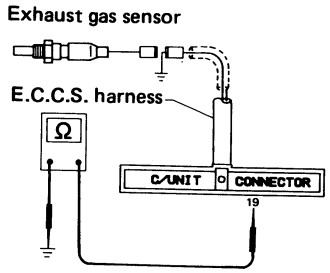
O.K.

INSPECTION END

Ⓓ

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.



SEF353H

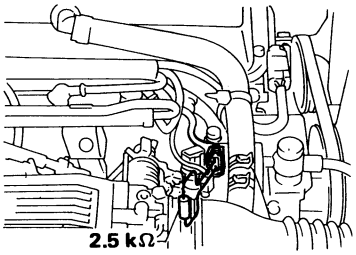
O.K.

N.G.

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

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

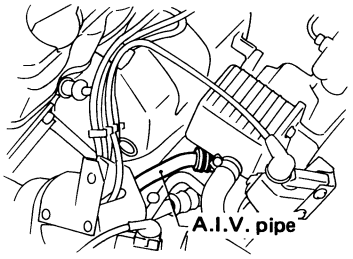
- Disconnect engine temperature sensor harness connector.
- Connect a resistor (2.5 kΩ) between terminals of engine temperature sensor harness connector.
- Disconnect A.I.V. hose and install a suitable plug in A.I.V. pipe.
- Connect battery ground cable.



SEF351H

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.



SEF354H

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.

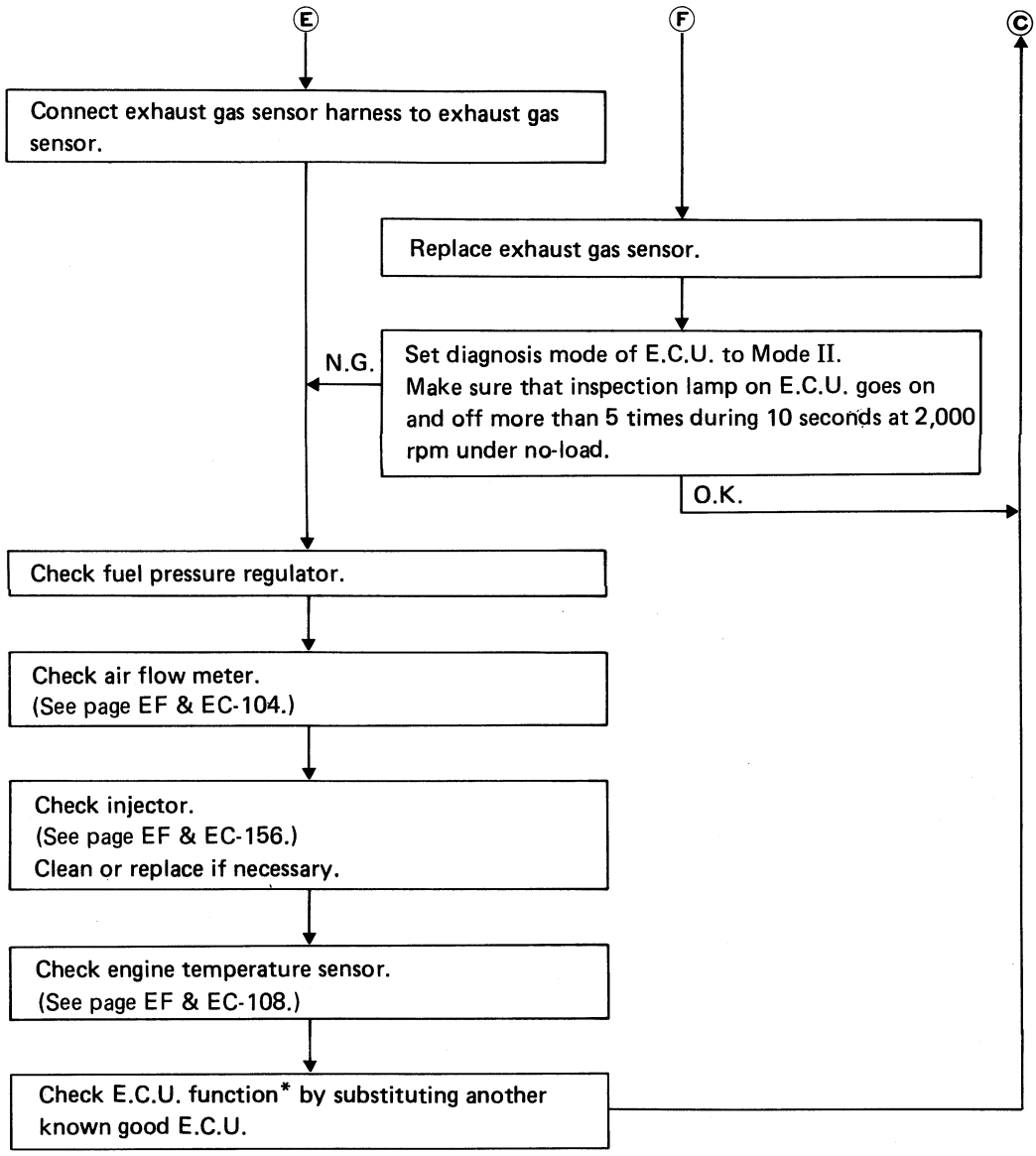
O.K.

N.G.

Ⓔ

Ⓕ

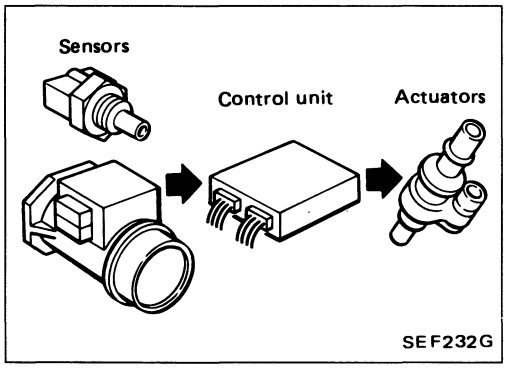
Ⓒ

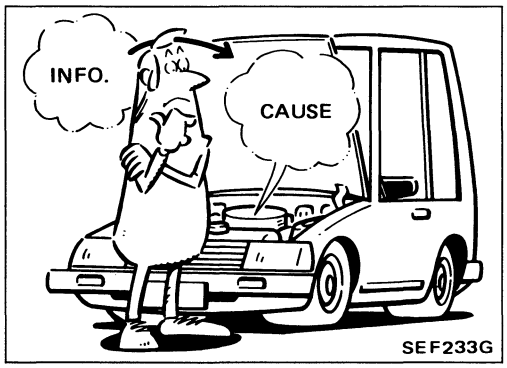


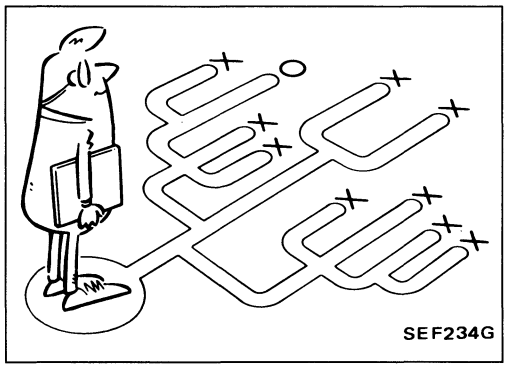
*: E.C.U. may be the cause of a problem, but this is rarely the case.

Contents

Contents (Cont'd)







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.

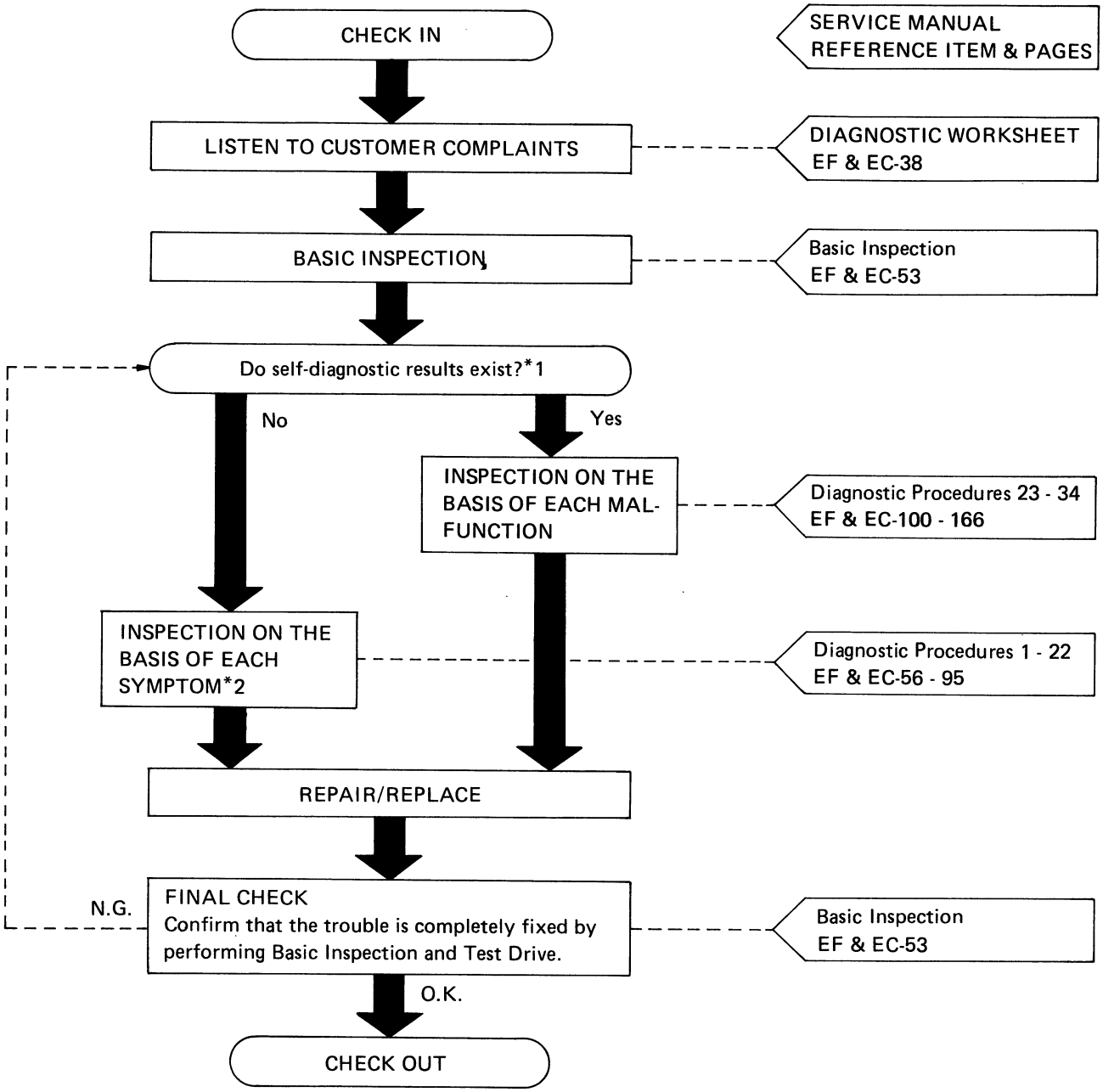
A visual check only may not find the cause of the problems. A road test with a circuit tester connected to a suspected circuit should be performed.

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

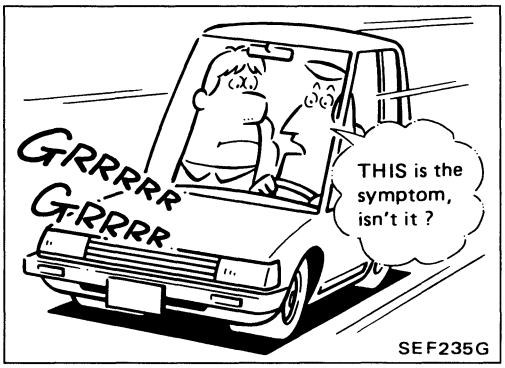
DIAGNOSTIC WORKSHEET

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	

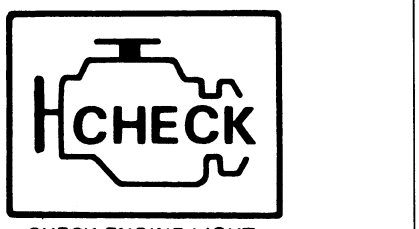
How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)



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 feedback 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.



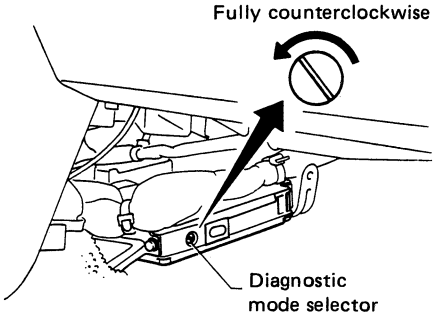
CHECK ENGINE LIGHT

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.

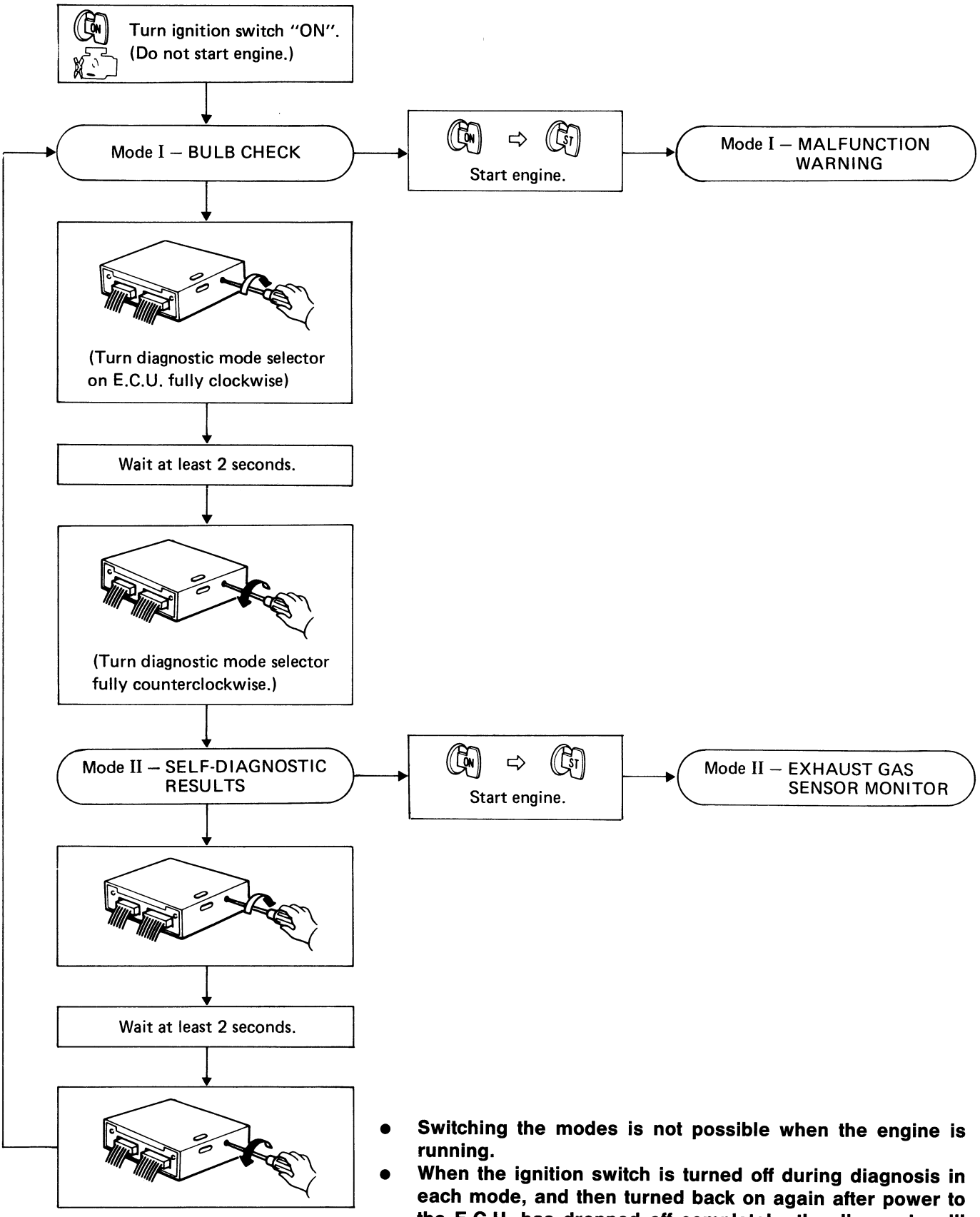
In the E.C.U., the Green and Red L.E.D.'s have now been permanently changed to one RED L.E.D.

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



- **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.**

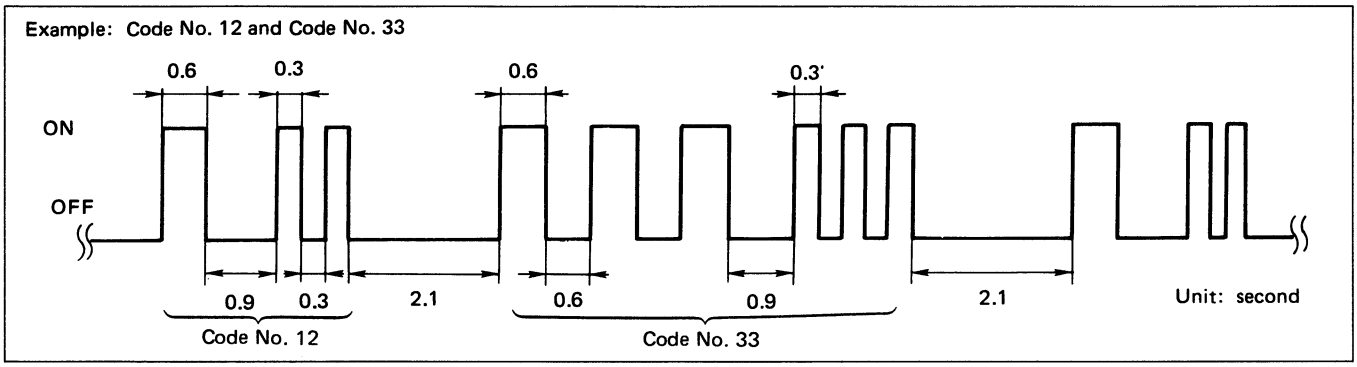
FOR NON-CALIFORNIA MODEL

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.

Display code table

Code No.	Detected items	California model	Non-California model
11	Crank angle sensor circuit	X	X
12	Air flow meter circuit	X	X
13	Engine temperature sensor circuit	X	X
14	Vehicle speed sensor circuit	X	X
21	Ignition signal circuit	X	X
31	E.C.U.	X	X
32	E.G.R. function	X	—
33	Exhaust gas sensor circuit	X	X
35	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

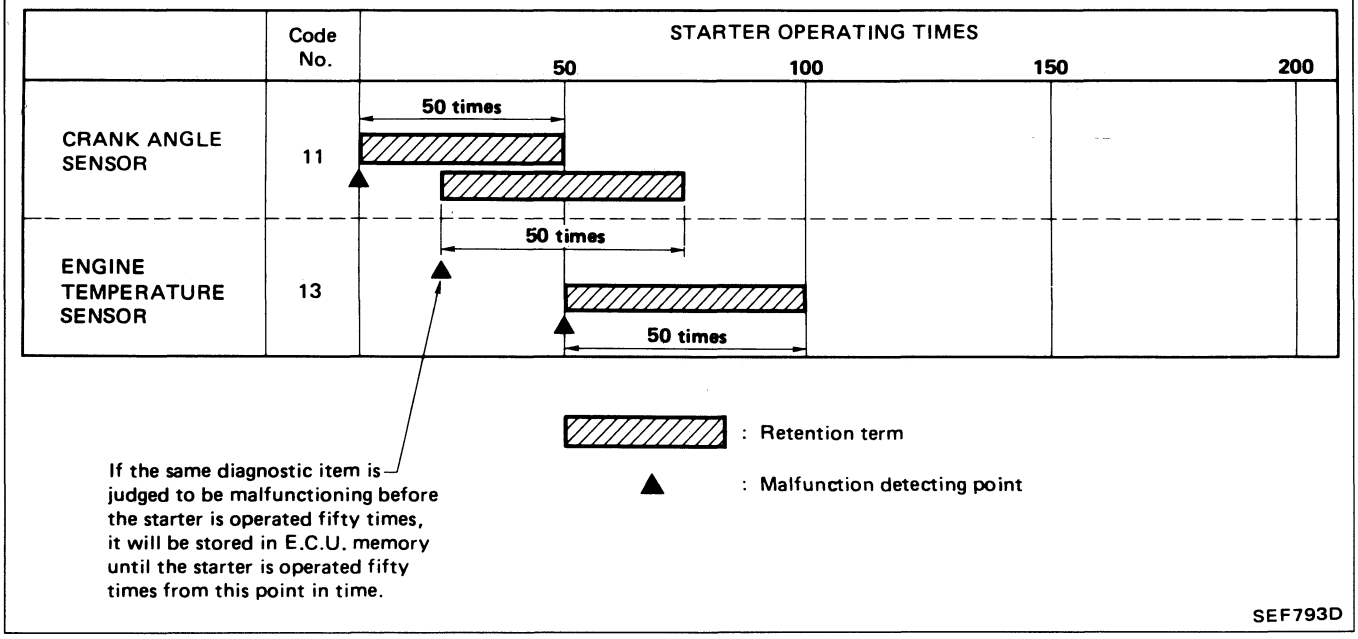
*: Check items causing a malfunction of crank angle sensor circuit first, if both code No. 11 and 21 come out at the same time.

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

RETENTION OF DIAGNOSTIC RESULTS

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

RETENTION TERM CHART (Example)



SEF793D

HOW TO ERASE SELF-DIAGNOSTIC RESULTS

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

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

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

DESCRIPTION

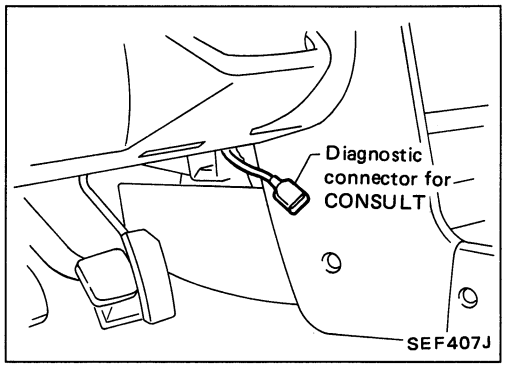
In this mode, the CHECK ENGINE LIGHT and RED L.E.D. display the condition of the fuel mixture (lean or rich) which is monitored by the exhaust gas sensor.

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

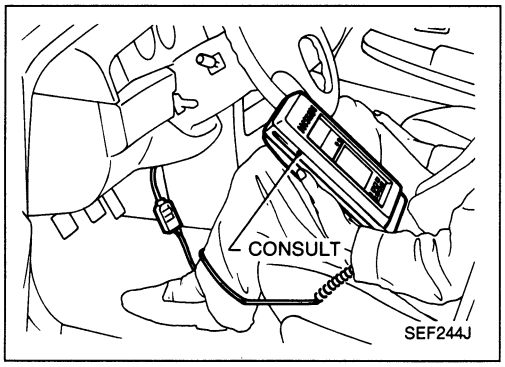
1. Set Mode II. (Refer to "HOW TO SWITCH MODES".)
2. Start engine and warm it up until engine coolant temperature indicator points to the middle of the gauge.
3. Run engine at about 2,000 rpm for about 2 minutes under no-load conditions.
4. Make sure RED L.E.D. or CHECK ENGINE LIGHT goes ON and OFF more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



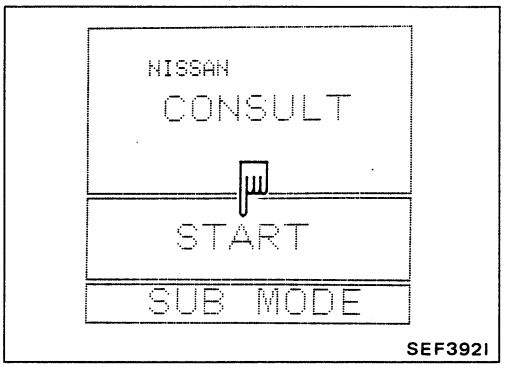
Consult

CONSULT INSPECTION PROCEDURE

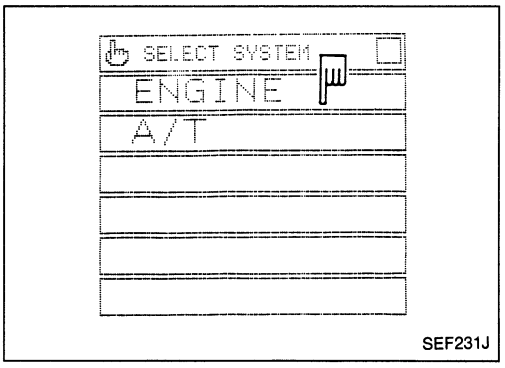
1. Turn off ignition switch.
2. Connect "CONSULT" to diagnostic connector. (Diagnostic connector is located in left dash side panel.)



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

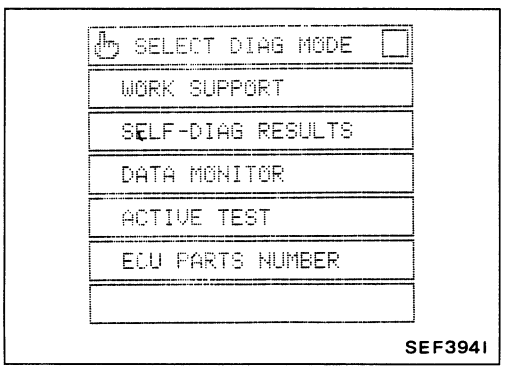


5. Touch "ENGINE".



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

For further information, read the CONSULT Operation Manual.



Consult (Cont'd)

E.C.C.S. COMPONENT PARTS APPLICATION

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

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.	
IGN TIMING	Idle		15 deg.	• Harness and connector • Crank angle sensor
	2,000 rpm		More than 25 deg.	
AAC VALVE	Idle		15° - 40°	• Harness and connector • AAC valve
	2,000 rpm		—	

Remarks: The monitor item marked * is applicable to vehicles for California only.
Specifications are reference values.

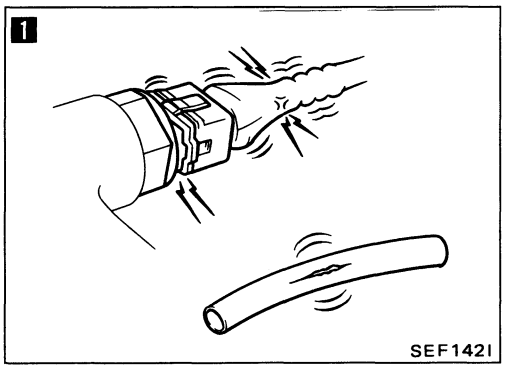
Consult (Cont'd)

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 PRVR CONT SOL/V TEST AIV CONT SOL/V TEST SWIRL CONT SOL/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
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.		

Basic Inspection

1


SEF142I

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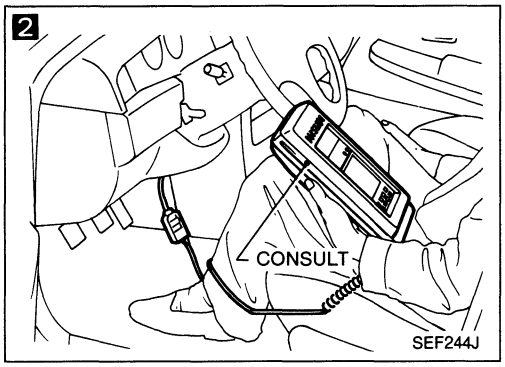

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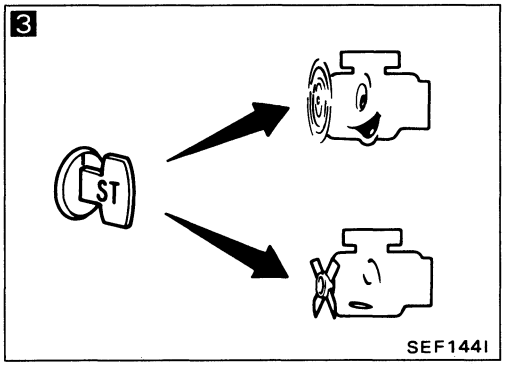

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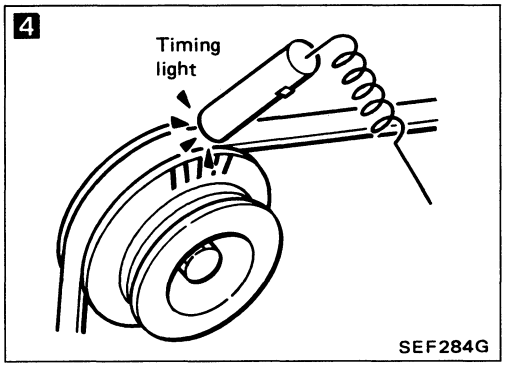


SEF284G

1

BEFORE STARTING

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

2

CONNECT CONSULT TO THE VEHICLE.
Connect "CONSULT" to the diagnostic connector and select "ENGINE" from the menu. (Refer to page EF & EC-47.)

3

DOES ENGINE START?

No → Go to **6**

Yes

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.

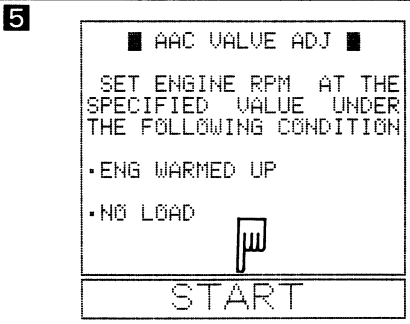
N.G. → Adjust ignition timing by turning crack angle sensor.

O.K.

(Go to Ⓐ on next page.)

Basic Inspection (Cont'd)

5



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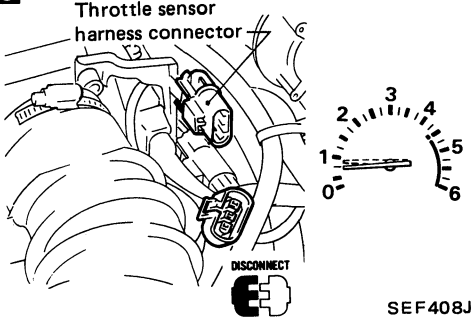

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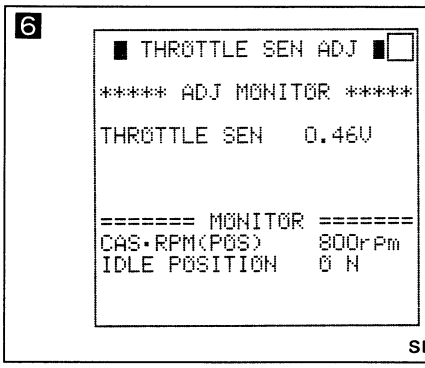
6



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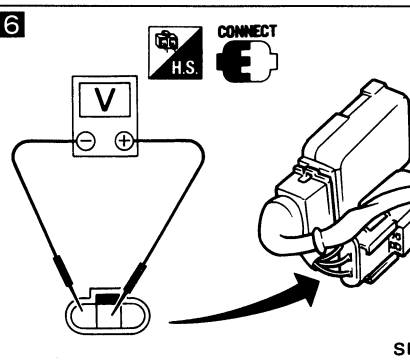
6



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)

No → Adjust engine rpm by turning idle adjusting screw.

CAUTION
Be sure to set gears to "Neutral".

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)

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".

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".

OR

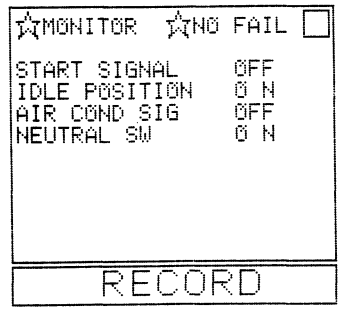
Measure output voltage of throttle sensor using voltmeter, and check that it is 0.4 to 0.5V. (Throttle valve fully closed.)

O.K. ↓

(Go to Ⓑ on next page.)

Basic Inspection (Cont'd)

7



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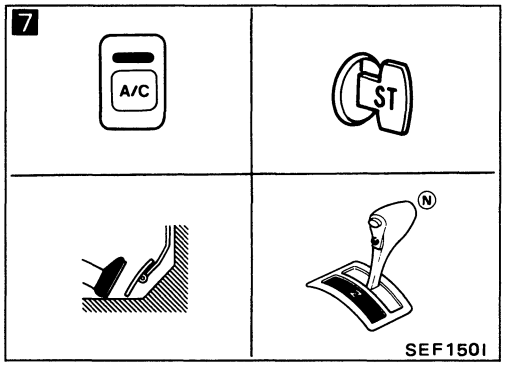

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Ⓑ

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.

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

OR

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

Switch	Condition	Voltage (V)
Start signal	IGN ON → 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

O.K.

8

READ SELF-DIAGNOSTIC RESULTS.

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

Yes → Go to the relevant inspection procedure.

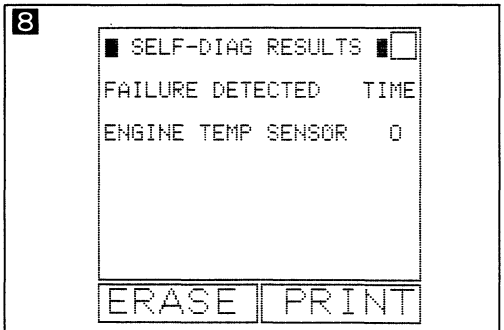
OR

1. Set "Self-diagnostic results mode" in Mode II. (Refer to page EF & EC-45.)
2. Count the number of RED L.E.D. flashes and read out the codes.
3. Are the codes being output?

No

INSPECTION END

8



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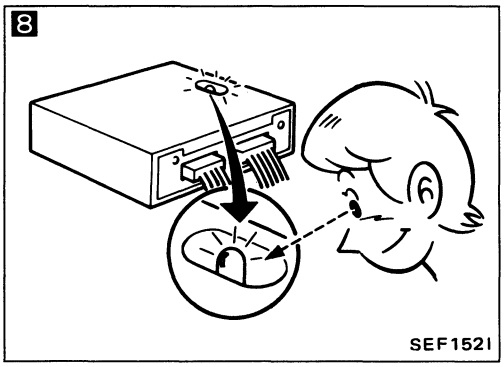
8



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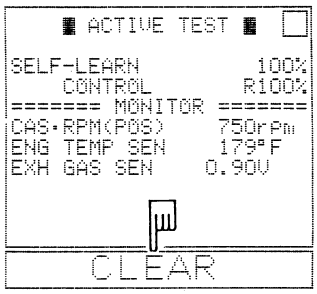
1



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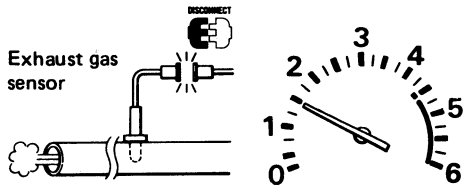
1



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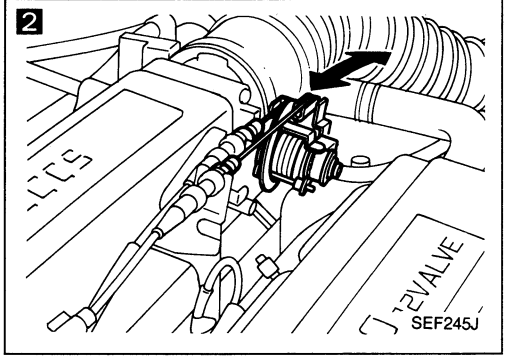
2



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?

Yes → Discover air leak location and repair.

OR

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

No ↓

2

CHECK THROTTLE LINKAGE.

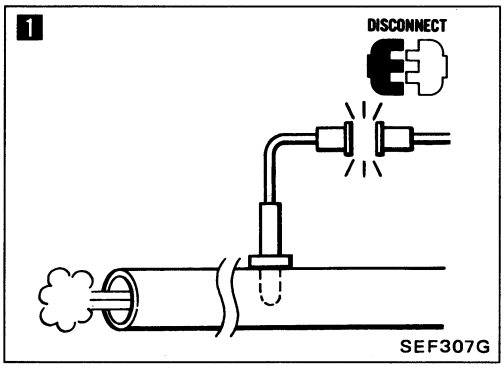
1. Check that throttle linkage moves smoothly.
2. Confirm that throttle valve both fully opens and fully closes.

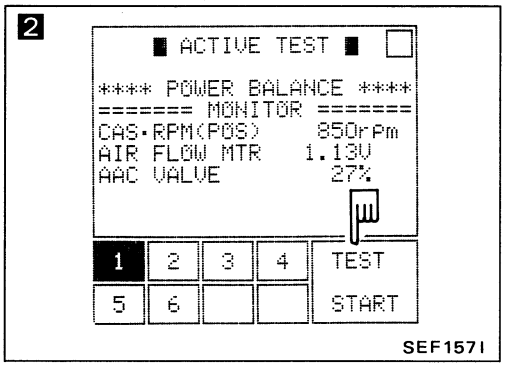
N.G. → Repair throttle linkage or sticking of throttle valve.

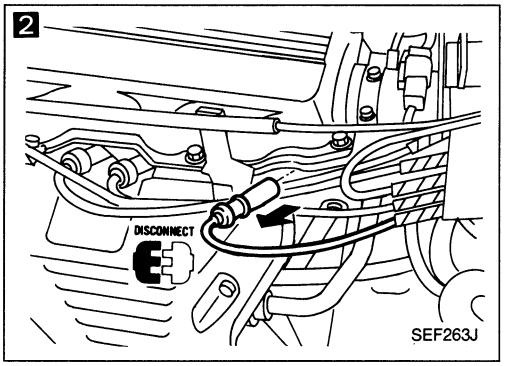
O.K. ↓

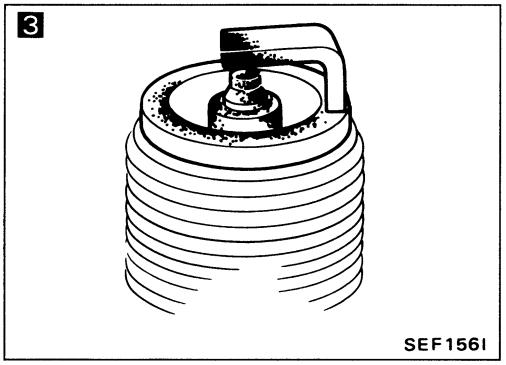
INSPECTION END

Diagnostic Procedure 2 — Hunting









1

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

Yes → Check exhaust gas sensor. (See page EF & EC-126.)

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 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

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

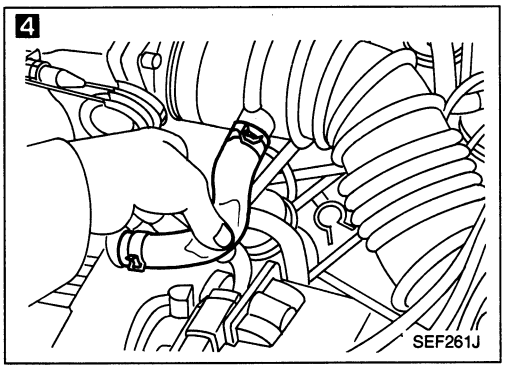
N.G. → Repair or replace spark plug(s).

O.K. ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 2 — Hunting (Cont'd)

4



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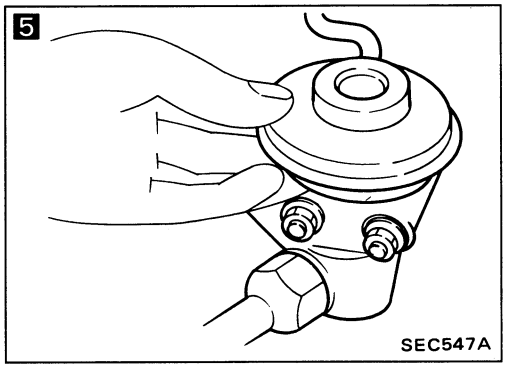


Ⓐ

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.

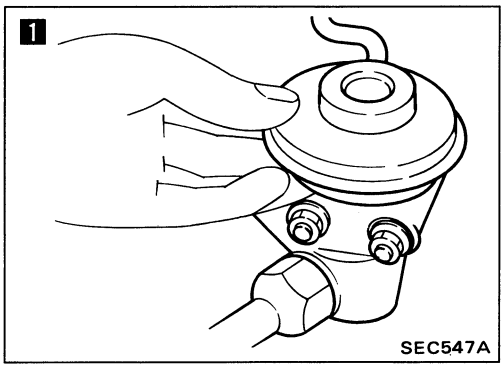
N.G. → Repair or replace.

O.K.

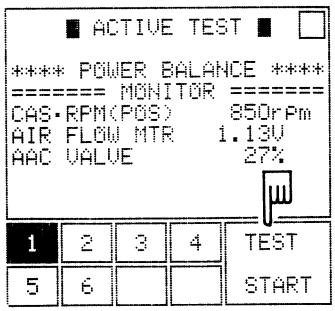
INSPECTION END

Diagnostic Procedure 3 — Unstable Idle

1

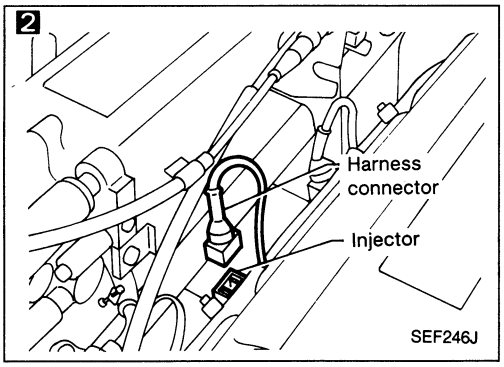

SEC547A

2



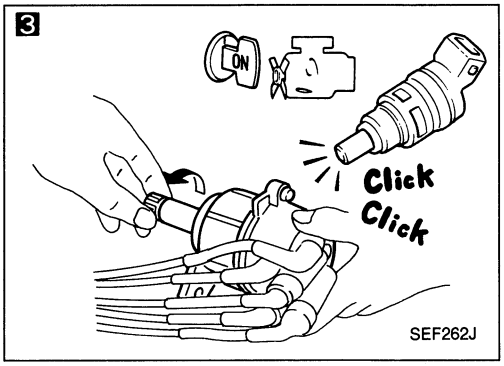
SEF157I

2



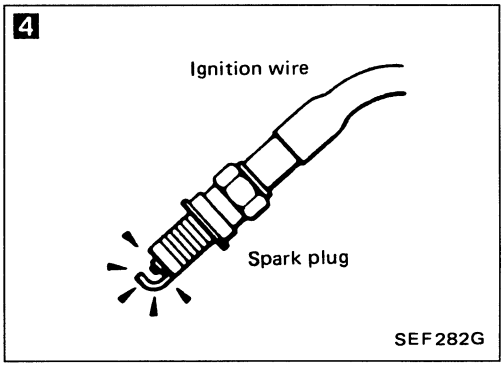
SEF246J

3



SEF262J

4



SEF282G

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.

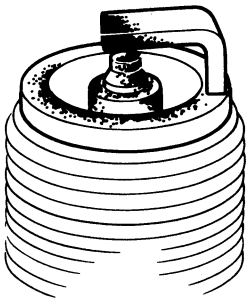
N.G. → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-116.)

O.K. ↓

(Go to Ⓐ on next page.)

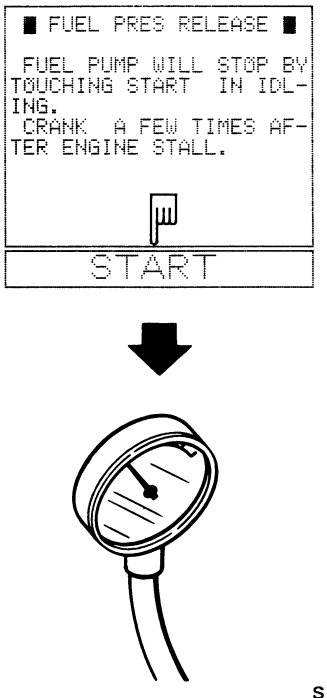
Diagnostic Procedure 3 — Unstable Idle (Cont'd)

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)

N.G. → Check fuel pump and circuit.

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-193.)
2. Install fuel pressure gauge and check fuel pressure.

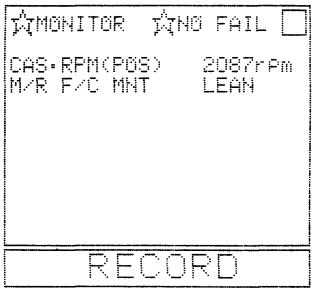
O.K.

(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.

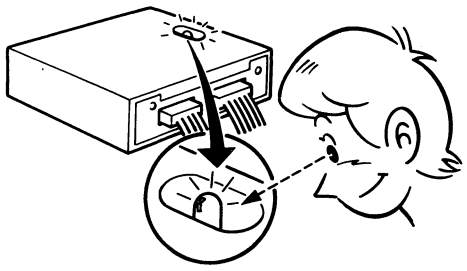
Diagnostic Procedure 3 — Unstable Idle (Cont'd)

7



SEF265J

7



SEF152I

Ⓑ

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→ LEAN→RICH.....
1 time 2 times

N.G. → Replace exhaust gas sensor.

OR

1. Set "Exhaust gas sensor monitor" in the self-diagnostic Mode II. (See page EF & EC-46.)
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.

O.K.

8

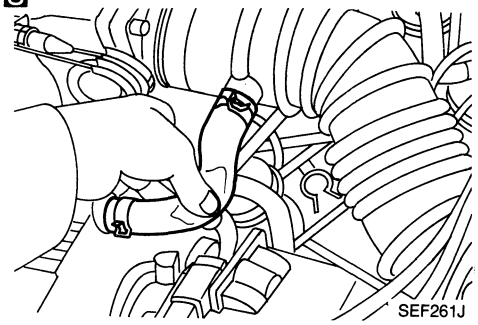
CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No

(Go to Ⓒ on next page.)

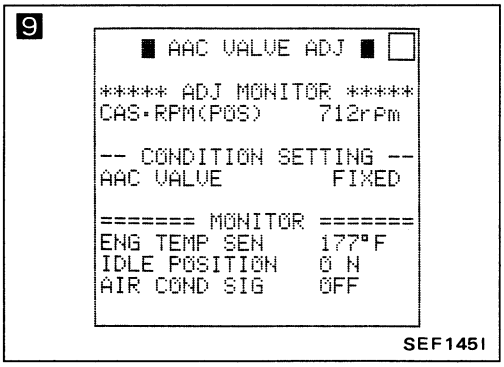
8



SEF261J

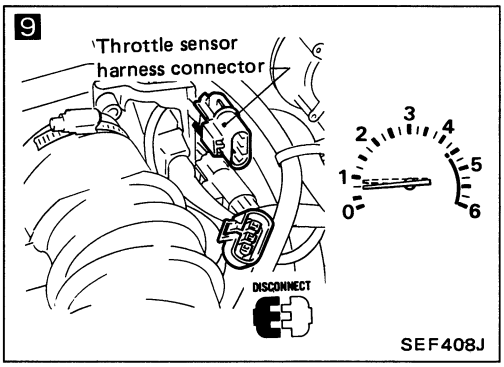
Diagnostic Procedure 3 — Unstable Idle (Cont'd)

9



SEF145I

9



SEF408J

10

COMPRESSION PRESSURE

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)

No → Check for IAS clogging or throttle valve clogging.

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)

Yes

10

CHECK COMPRESSION PRESSURE.

- Check compression pressure.
  Standard: kPa (kg/cm², psi)/rpm
  1,206 (12.3, 175)/250
  Minimum: kPa (kg/cm², psi)/rpm
  1,010 (10.3, 146)/250
  Difference between each cylinder: kPa (kg/cm², 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

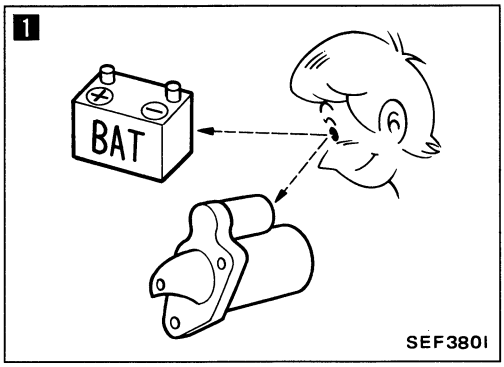
TRY A KNOWN GOOD E.C.U.

O.K.

INSPECTION END

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

1



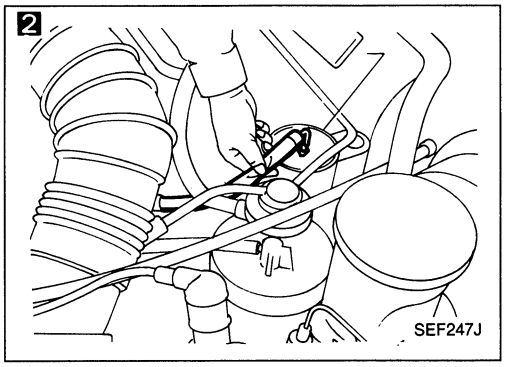
SEF380I

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

N.G. → Repair or replace.

O.K. ↓

2

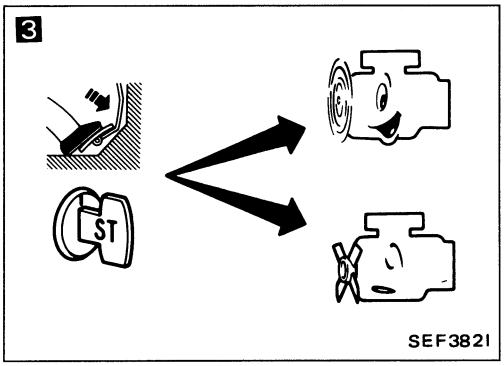

SEF247J

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-158.)

Yes ↓

3



SEF382I

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-154, 164.)

No ↓

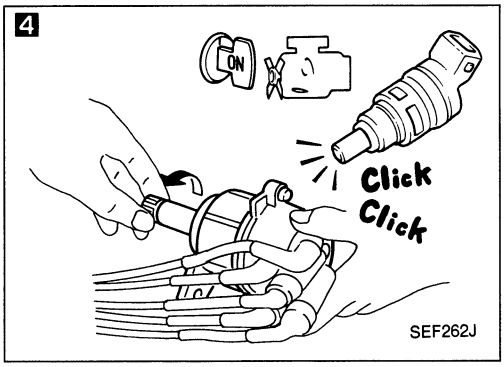
4

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



SEF262J

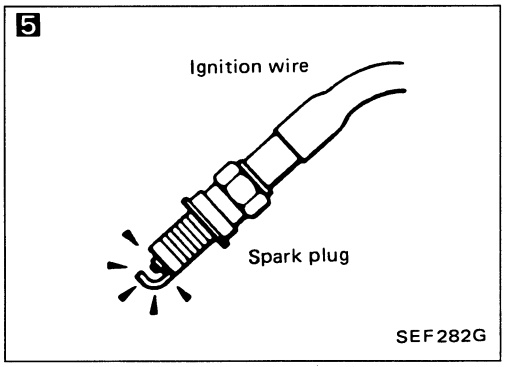
CHECK IGNITION SPARK.
1. Disconnect each spark plug cap.
2. Connect a known good spark plug to each spark plug cap.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-116.)

O.K. ↓

(Go to Ⓐ on next page.)

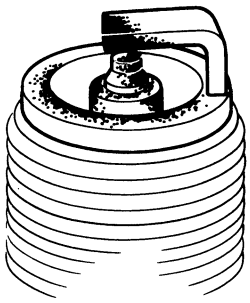
5



SEF282G

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-96.

N.G. → Repair or replace.

O.K.

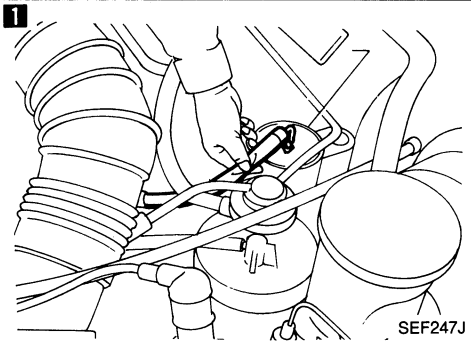
9

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

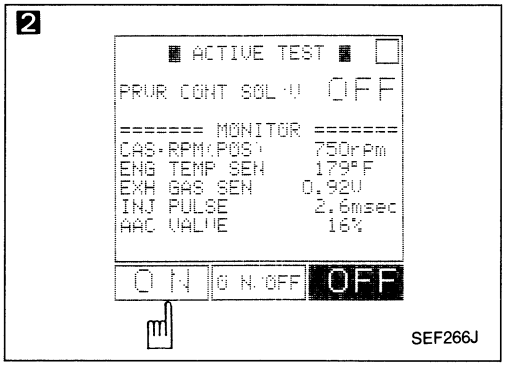

SEF247J

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-158.)

Yes ↓

2



SEF266J

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

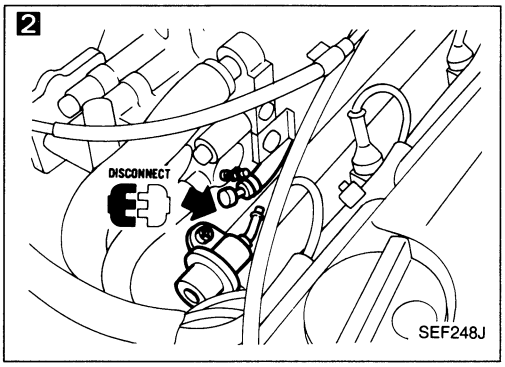
Yes → Check fuel properties.

— OR —

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

No ↓

2



SEF248J

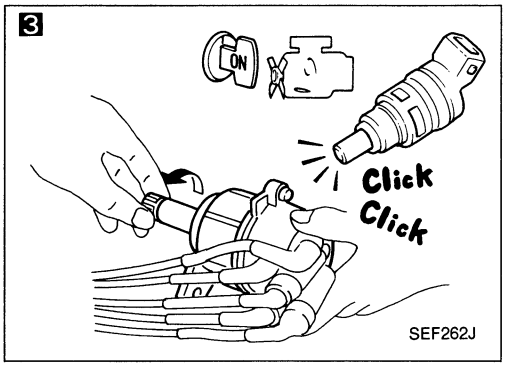
3

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 ↓

3



SEF262J

4

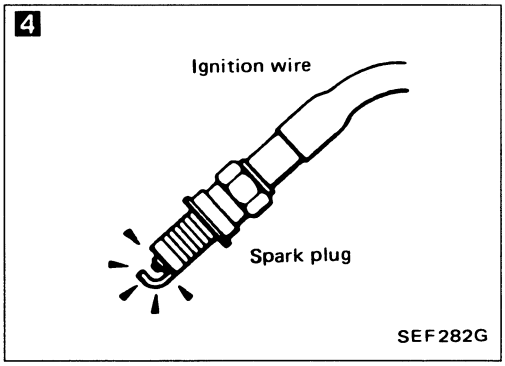
CHECK IGNITION SPARK.
1. Disconnect each spark plug cap.
2. Connect a known good spark plug to each spark plug cap.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-116.)

O.K. ↓

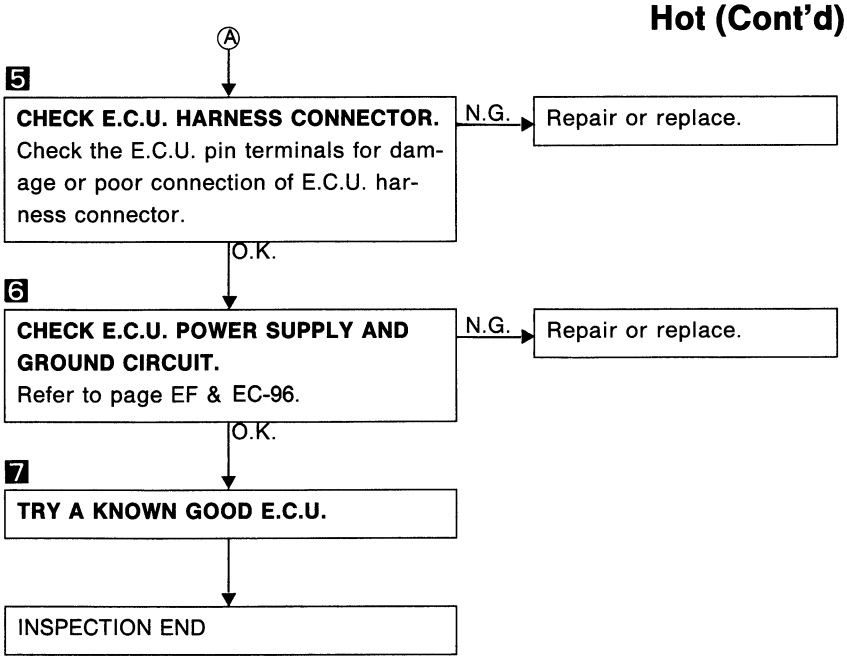
(Go to Ⓐ on next page.)

4



SEF282G

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



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

1

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

N.G. → Repair or replace.

O.K. ↓

2

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

No → Check fuel pump and circuit. (See page EF & EC-158.)

Yes ↓

3

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

Yes → Check injector(s) for leakage.

No ↓

4

CHECK INJECTOR.
1. Remove crank angle sensor from engine. (Harness connector should remain connected.)
2. 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

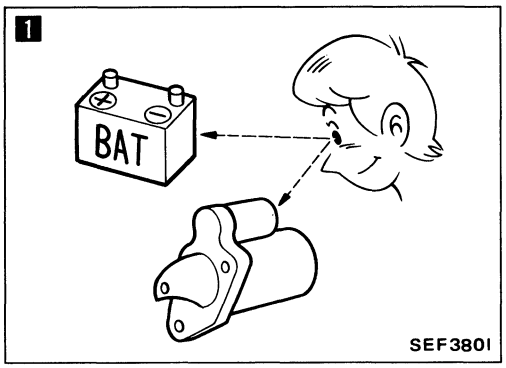
CHECK IGNITION SPARK.
1. Disconnect each spark plug cap.
2. Connect a known good spark plug to each spark plug cap.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-116.)

O.K. ↓

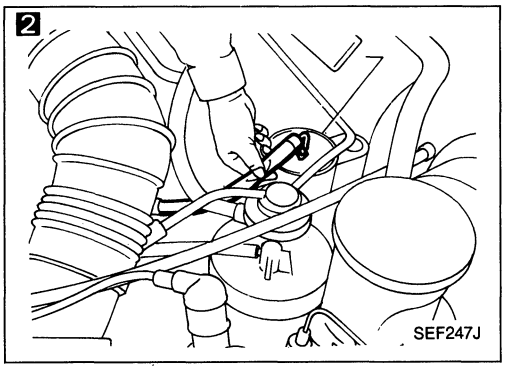
(Go to Ⓐ on next page.)

1

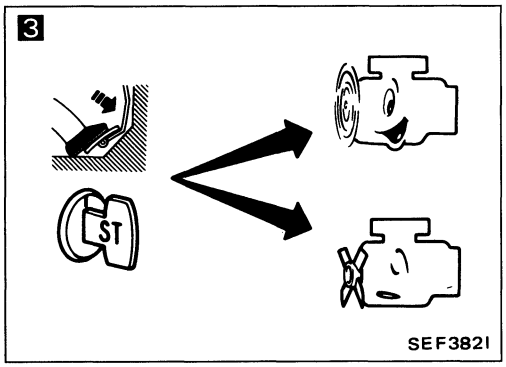


SEF380I

2

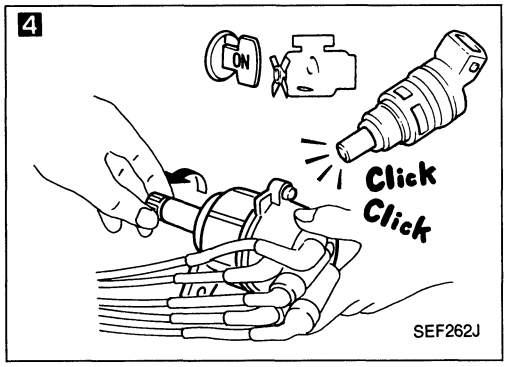

SEF247J

3



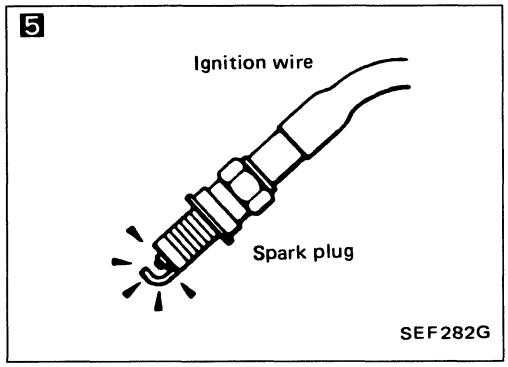
SEF382I

4



SEF262J

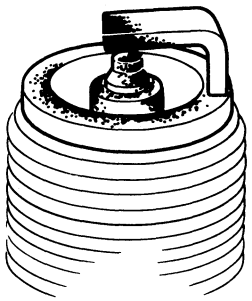
5



SEF282G

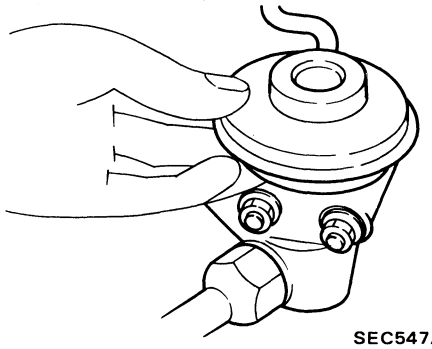
Diagnostic Procedure 6 — Hard to Start or Impossible to Start under Normal Conditions (Cont'd)

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. ↓

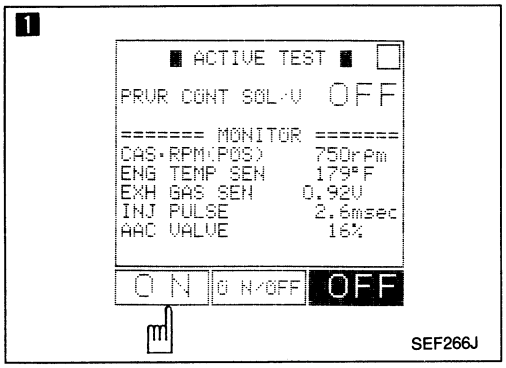
7 **CHECK E.G.R. CONTROL VALVE.**
Check E.G.R. control valve for sticking.
N.G. → Repair or replace.
O.K. ↓

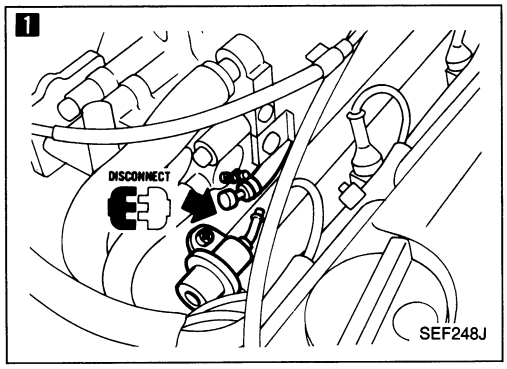
8 **CHECK E.C.U. HARNESS CONNECTOR.**
Check the E.C.U. pin terminals for damage or poor connection of E.C.U. harness connector.
N.G. → Repair or replace.
O.K. ↓

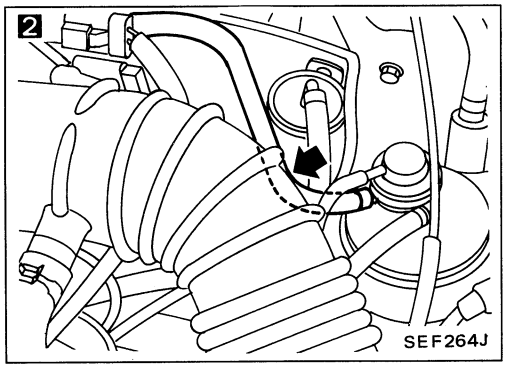
9 **CHECK E.C.U. POWER SUPPLY AND GROUND CIRCUIT.**
Refer to page EF & EC-96.
N.G. → Repair or replace.
O.K. ↓

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

1

CHECK FUEL VAPOR.

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

Yes → Check fuel properties.

OR

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

No ↓

2

CHECK CANISTER PURGE.

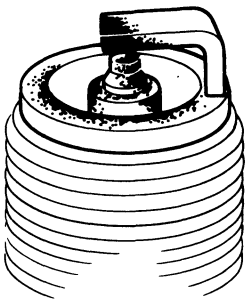
1. Disconnect canister purge line hose and plug hose.
2. Perform cruise test.
3. Does the hesitation disappear?

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

No ↓

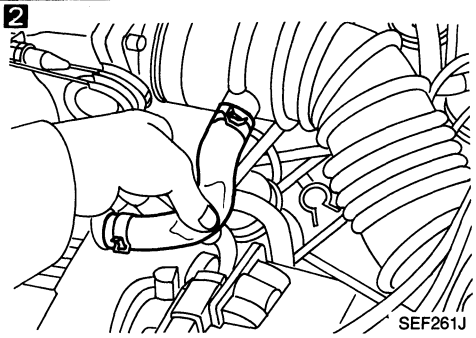
INSPECTION END

1



SEF156I

2



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.

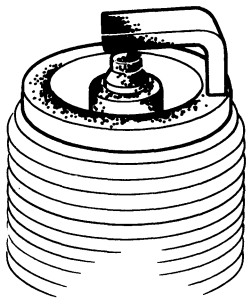
Trouble is not fixed.

4

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

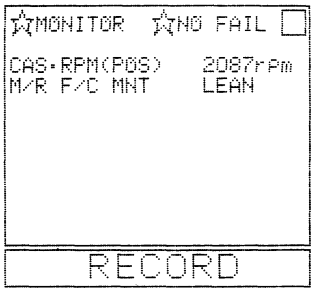
INSPECTION END

1



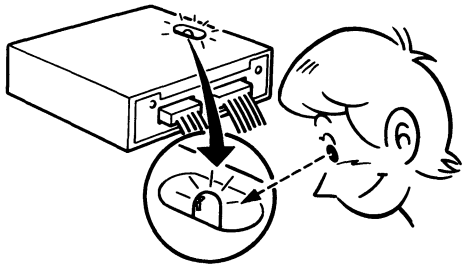
SEF156I

2



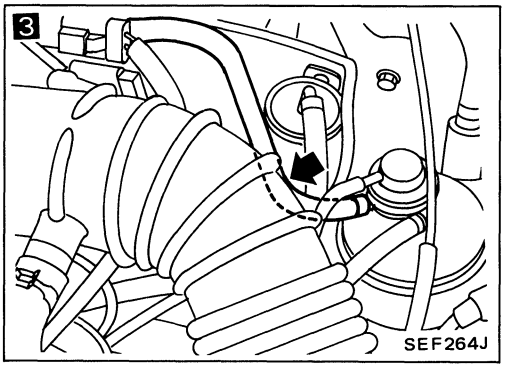
SEF265J

2



SEF152I

3



SEF264J

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→LEAN→RICH.....
1 time 2 times

Yes → Replace exhaust gas sensor.

OR

1. Set "Exhaust gas sensor monitor" in the self-diagnostic Mode II. (See page EF & EC-46.)
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.

No

3

CHECK CANISTER PURGE.

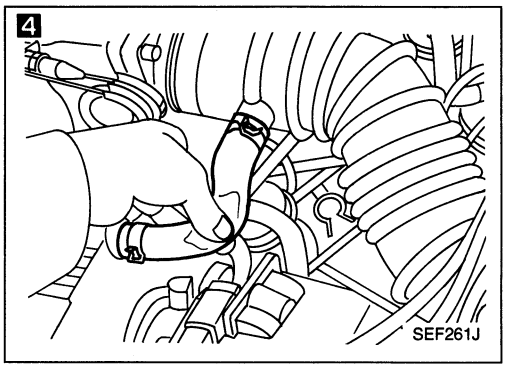
1. Disconnect canister purge line hose and plug hose.
2. Perform cruise test.
3. Does the hesitation disappear?

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

No

(Go to Ⓐ on next page.)

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



Ⓐ

4

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

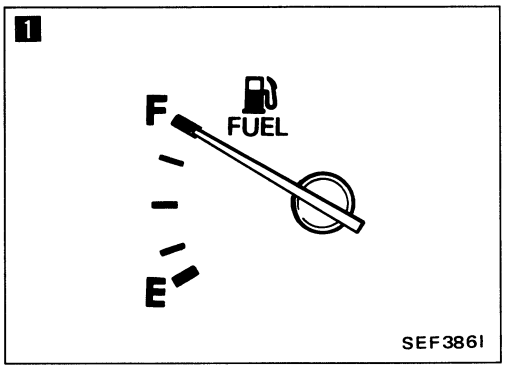
Yes → Discover air leak location and repair.

No ↓

INSPECTION END

Diagnostic Procedure 10 — Engine Stalls when Turning

1



SEF386I

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?

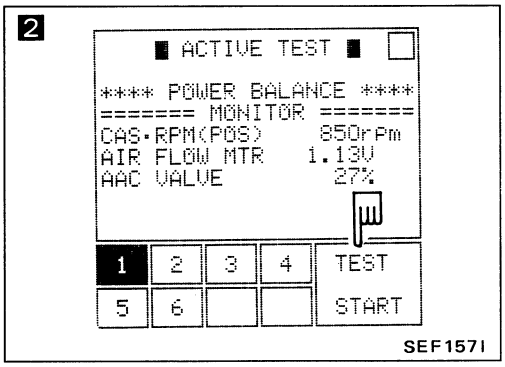
OR

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 ↓

2



SEF157I

3

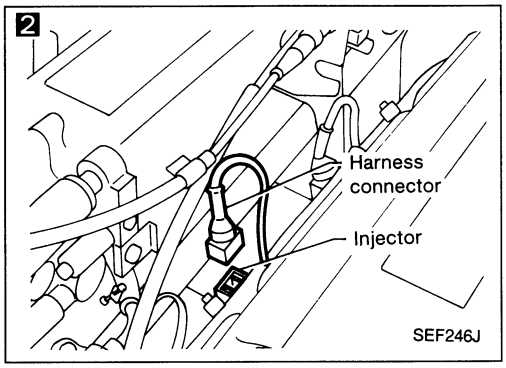
CHECK INJECTOR.

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 ↓

2



SEF246J

4

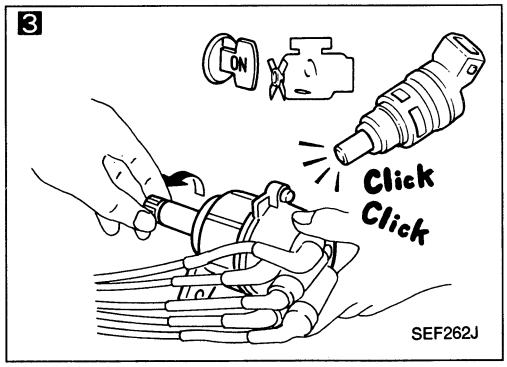
CHECK IGNITION SPARK.

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-116.)

O.K. ↓

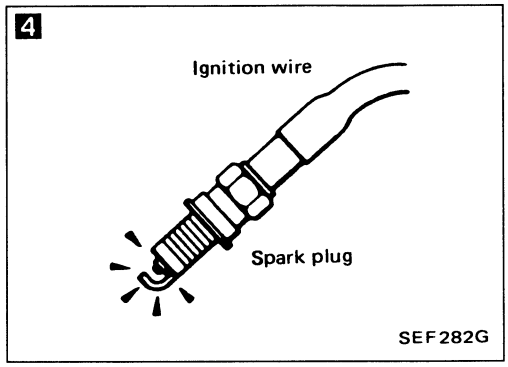
3



SEF262J

(Go to Ⓐ on next page.)

4



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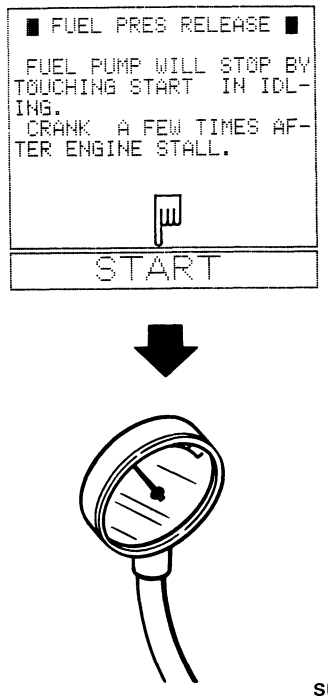
Diagnostic Procedure 10 — Engine Stalls when Turning (Cont'd)

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/cm², 33 psi)

The moment throttle valve is fully open:

Approx. 294 kPa (3.0 kg/cm², 43 psi)

N.G. → Check fuel pressure regulator diaphragm.

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-193.)
2. Install fuel pressure gauge and check fuel pressure.

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-96.

N.G. → Repair or replace.

O.K.

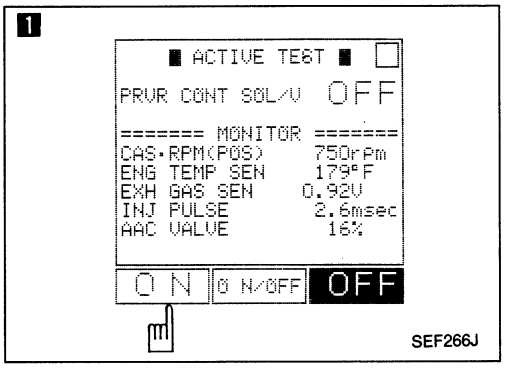
8

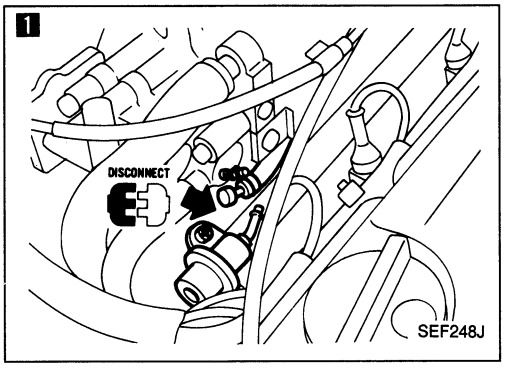
TRY A KNOWN GOOD E.C.U.

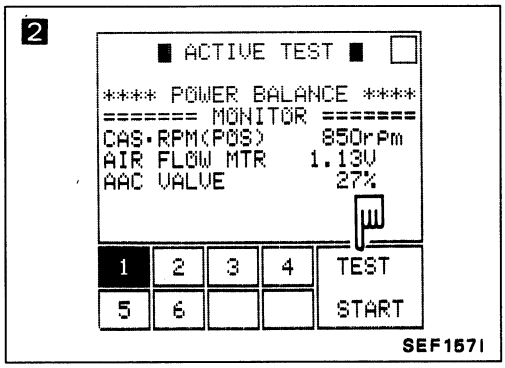
INSPECTION END

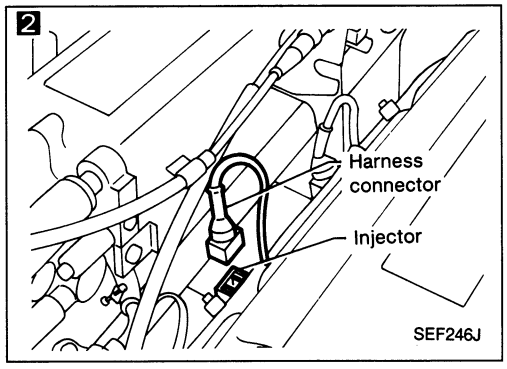
CAUTION:
When servicing fuel system after performing "Fuel Pressure Release" in "Work Support" mode, turn off ignition key with CONSULT set in "Work Support" mode.

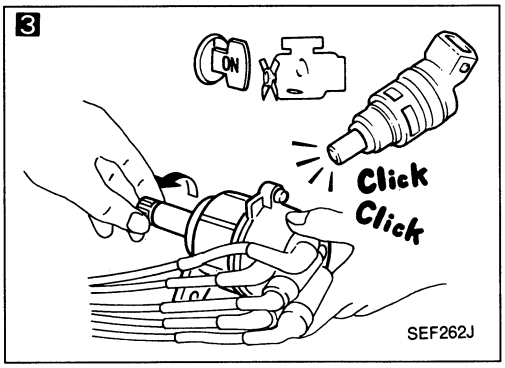
Diagnostic Procedure 11 — Engine Stalls when the Engine is Hot











1

CHECK FUEL VAPOR.

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

Yes → Check fuel properties.

OR

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

No

2

PERFORM POWER BALANCE TEST.

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

No → Go to 5

OR

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

Yes

3

CHECK INJECTOR.

1. Remove crank angle sensor from engine. (Harness connector should remain connected.)
2. 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?

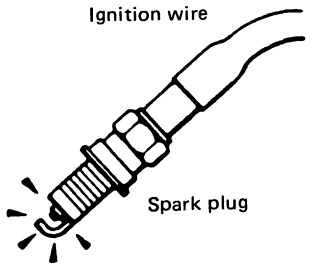
No → Check injector(s) and circuit(s).

Yes

(Go to Ⓐ on next page.)

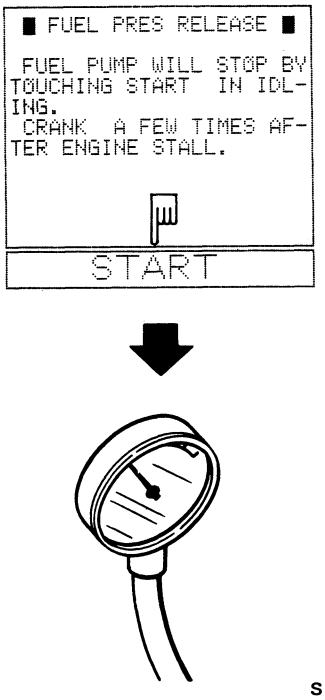
Diagnostic Procedure 11 — Engine Stalls when the Engine is Hot (Cont'd)

4



SEF282G

5



SEF379I

Ⓐ

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-116.)

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)

N.G. → Check fuel pressure regulator diaphragm.

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-193.)
2. Install fuel pressure gauge and check fuel pressure.

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.

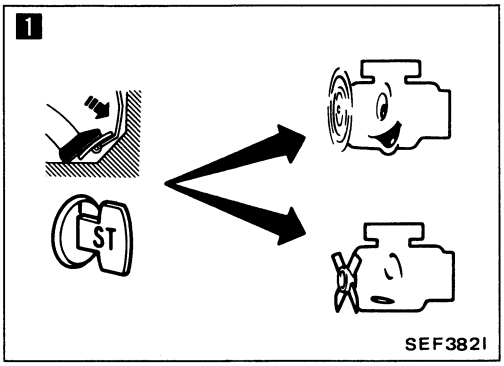
Trouble is fixed. → Replace E.C.U.

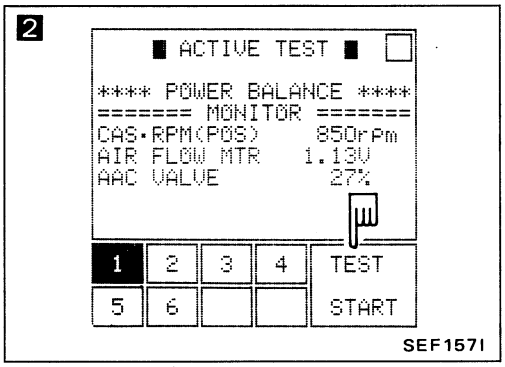
Trouble is not fixed.

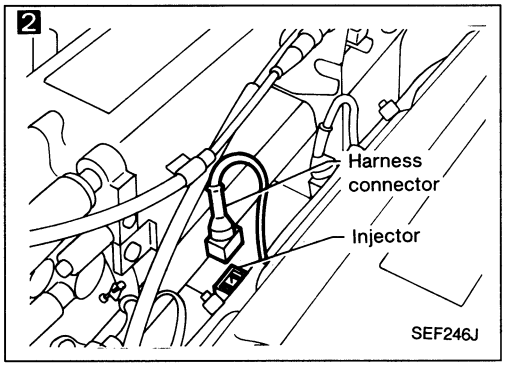
INSPECTION END

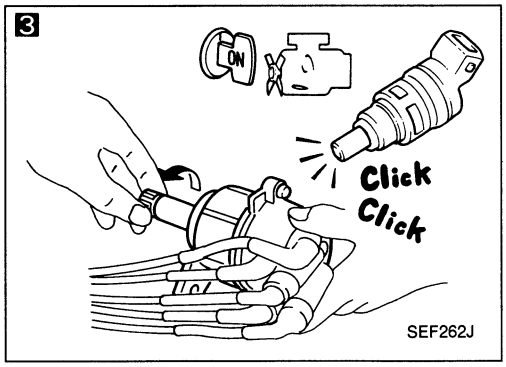
CAUTION:
When servicing fuel system after performing "Fuel Pressure Release" in "Work Support" mode, turn off ignition key with CONSULT set in "Work Support" mode.

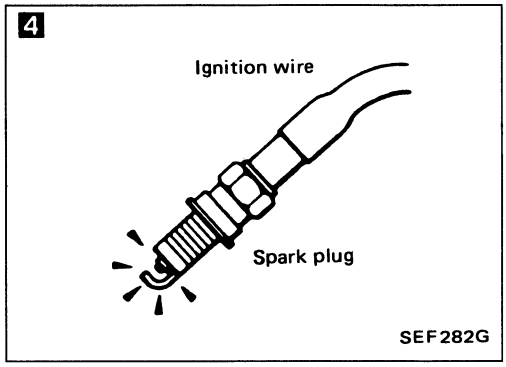
Diagnostic Procedure 12 — Engine Stalls when the Engine is Cold











1

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-164.)

O.K. ↓

2

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

N.G. → Go to 6

— OR —

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

O.K. ↓

3

CHECK INJECTOR.
1. Remove crank angle sensor from engine. (Harness connector should remain connected.)
2. 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

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.

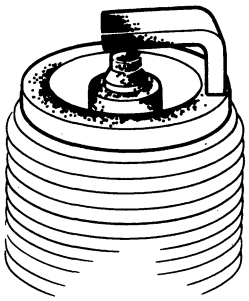
N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-116.)

O.K. ↓

(Go to Ⓐ on next page.)

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

5



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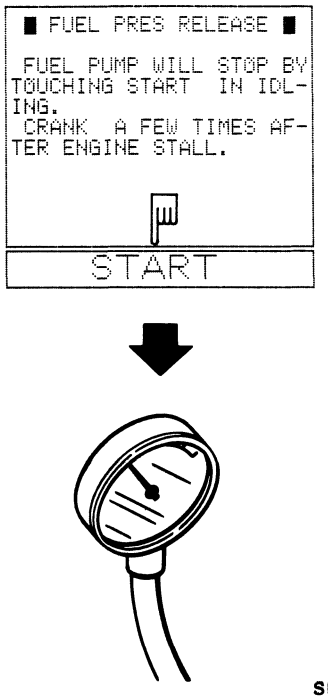
6



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

N.G. → Check fuel pressure regulator diaphragm.

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-193.)
2. Install fuel pressure gauge and check fuel pressure.

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-96.

N.G. → Repair or replace.

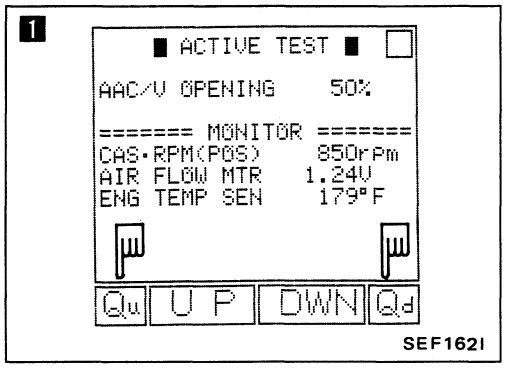
O.K.

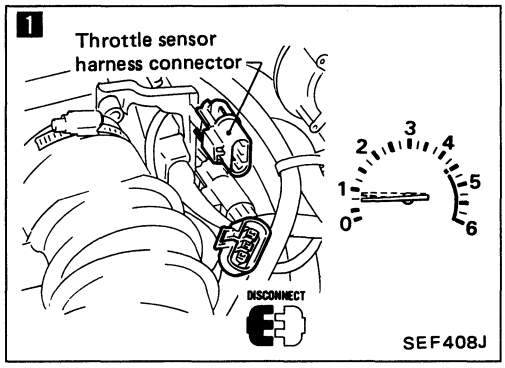
9 **TRY A KNOWN GOOD E.C.U.**

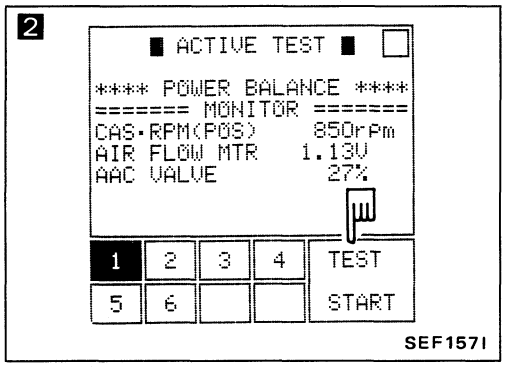
INSPECTION END

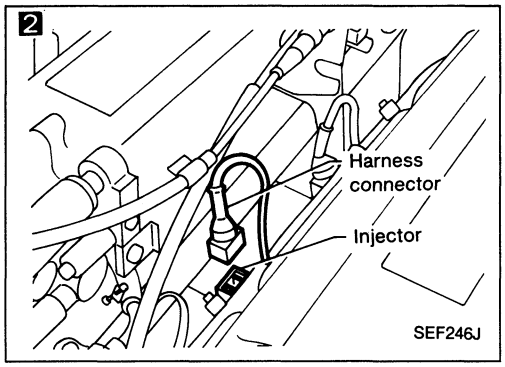
CAUTION:
When servicing fuel system after performing "Fuel Pressure Release" in "Work Support" mode, turn off ignition key with CONSULT set in "Work Support" mode.

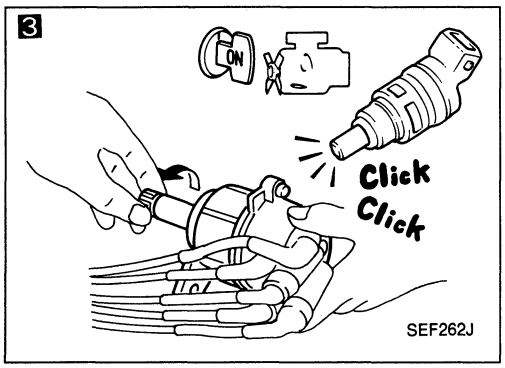
Diagnostic Procedure 13 — Engine Stalls when Stepping on the Accelerator Momentarily











1

CHECK A.A.C. VALVE.

1. Select "A.A.C. VALVE OPENING" in "ACTIVE TEST" mode.
2. When touching "Qu" and "Qd", does the engine speed change according to the percent of A.A.C. valve opening?

No → Check A.A.C. valve and circuit. (See page EF & EC-164.)

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

OR

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

Yes

2

PERFORM POWER BALANCE TEST.

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

No → Go to 5.

OR

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

Yes

3

CHECK INJECTOR.

1. Remove crank angle sensor from engine. (Harness connector should remain connected.)
2. 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?

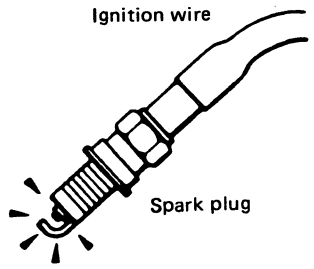
No → Check injector(s) and their circuit(s).

Yes

(Go to Ⓐ on next page.)

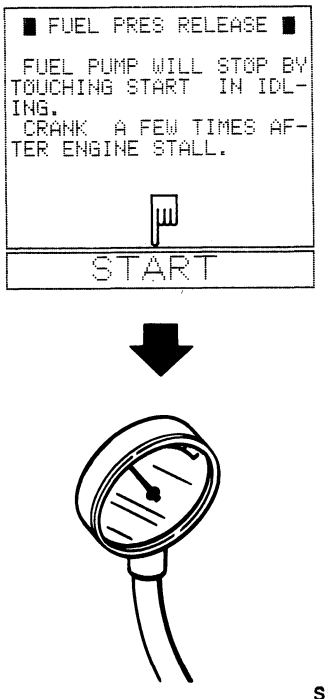
Diagnostic Procedure 13 — Engine Stalls when Stepping on the Accelerator Momentarily (Cont'd)

4



SEF282G

5



SEF379I

Ⓐ

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-114.)

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)

N.G. → Check fuel pressure regulator diaphragm.

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-193.)
2. Install fuel pressure gauge and check fuel pressure.

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-96.

N.G. → Repair or replace.

O.K.

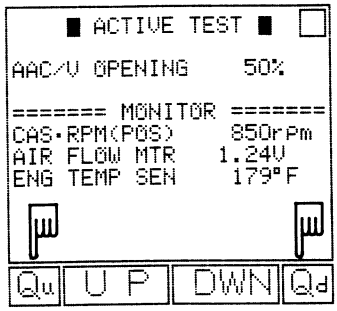
8

TRY A KNOWN GOOD E.C.U.

INSPECTION END

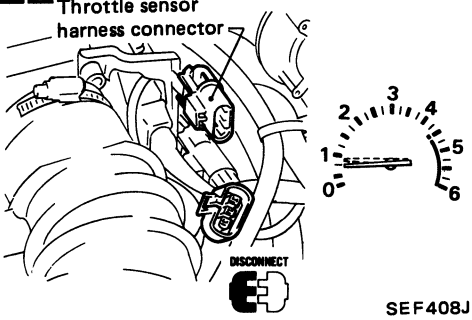
CAUTION:
When servicing fuel system after performing "Fuel Pressure Release" in "Work Support" mode, turn off ignition key with CONSULT set in "Work Support" mode.

1



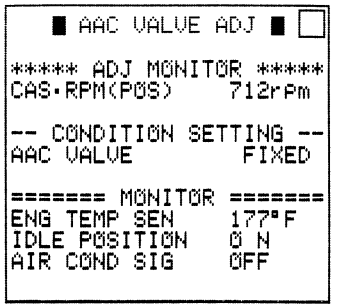
SEF162I

1 2



SEF408J

2



SEF145I

Diagnostic Procedure 14 — Engine Stalls after Decelerating

1

CHECK A.A.C. VALVE.

1. Select "A.A.C. VALVE OPENING" in "ACTIVE TEST" mode.
2. When touching "Qu" and "Qd", does the engine speed change according to the percent of A.A.C. valve opening?

No → Check A.A.C. valve and circuit. (See page EF & EC-164.)

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

OR

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

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)

No → Check for IAS clogging or throttle chamber clogging.

OR

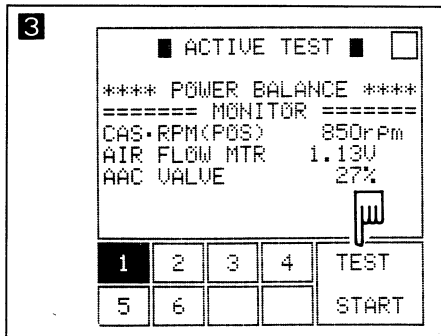
1. Disconnect throttle sensor harness connectors.
2. Can you set engine rpm as follows by turning idle adjusting screw?
   M/T: 650 ± 50 rpm
   A/T: 650 ± 50 rpm
   ("N" position)

Yes ↓

(Go to Ⓐ on next page.)

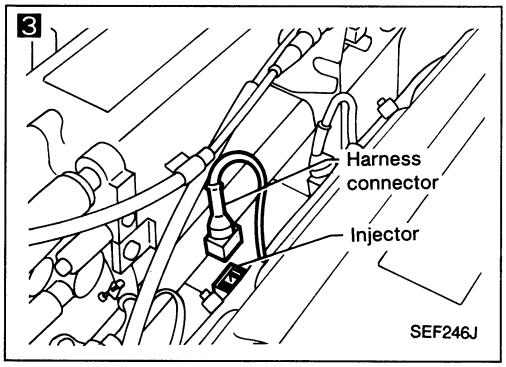
Diagnostic Procedure 14 — Engine Stalls after Decelerating (Cont'd)

3



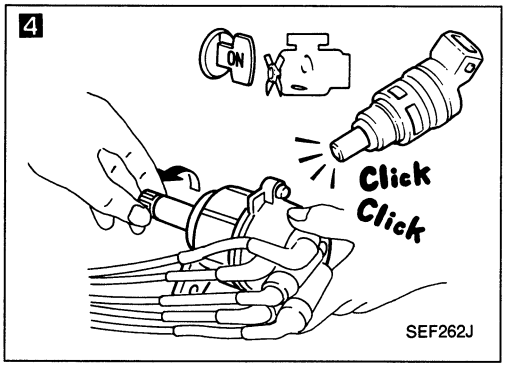
SEF157I

3



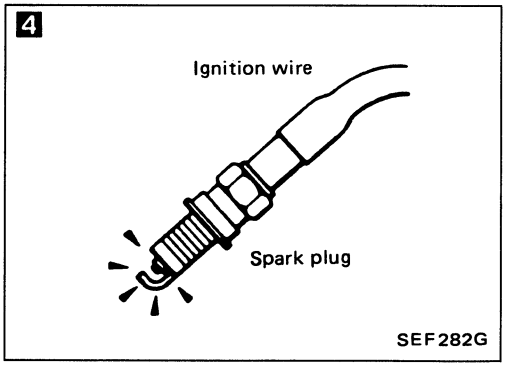
SEF246J

4



SEF262J

4



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?

No → Go to **6**

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?

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.

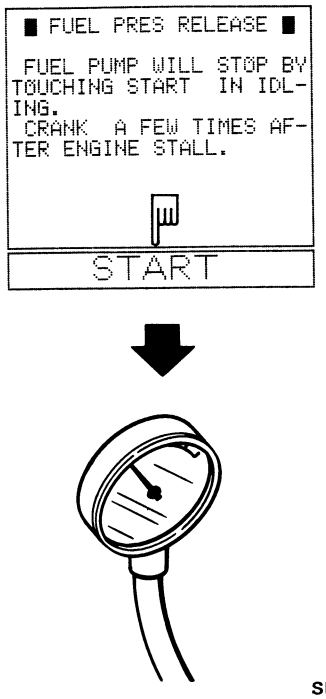
N.G. → Check ignition coil, power transistor unit and circuit. (See page EF & EC-116.)

O.K.

(Go to Ⓑ on next page.)

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

6



SEF379I

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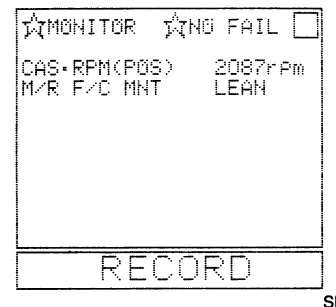
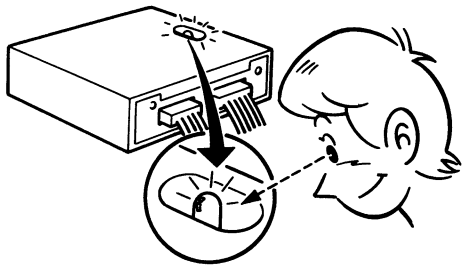


SEF265J

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)

N.G. → Check fuel pressure regulator diaphragm.

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-193.)
2. Install fuel pressure gauge and check fuel pressure.

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→ LEAN→RICH.....
(1 time, 2 times)

N.G. → Replace exhaust gas sensor.

OR

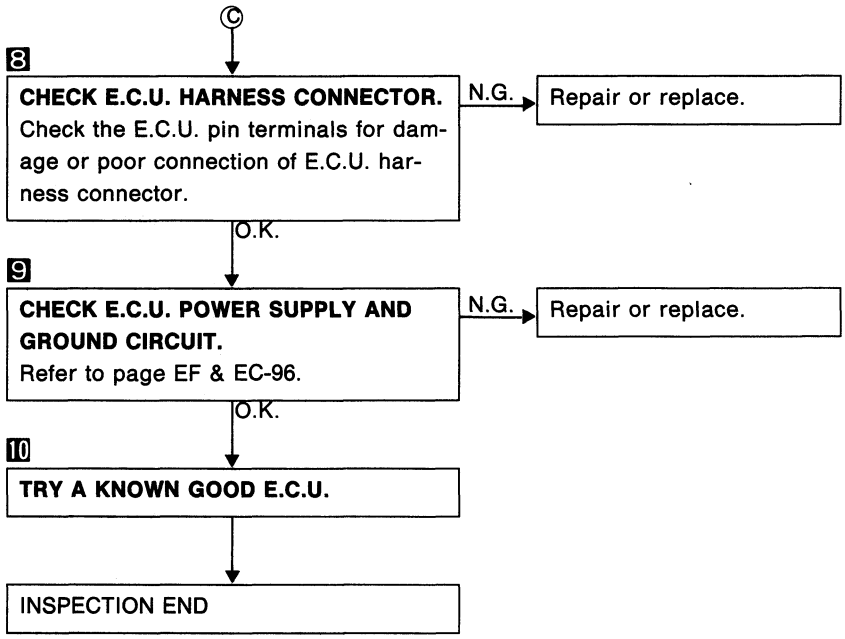
1. Set "Exhaust gas sensor monitor" in the self-diagnostic Mode II. (See page EF & EC-46.)
2. Maintaining engine at 2,000 rpm under no load, check that RED L.E.D. on the E.C.U. goes ON and OFF more than 5 times during 10 seconds.

O.K.

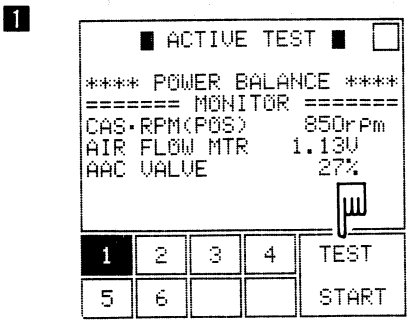
(Go to Ⓒ on next page.)

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)



1



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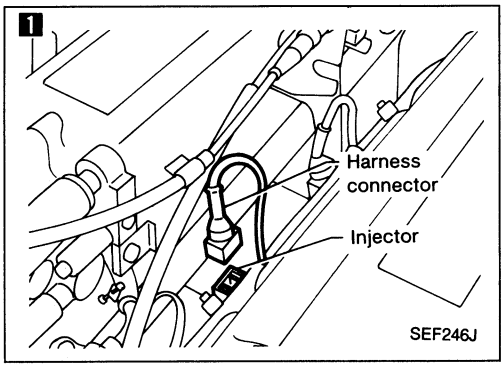
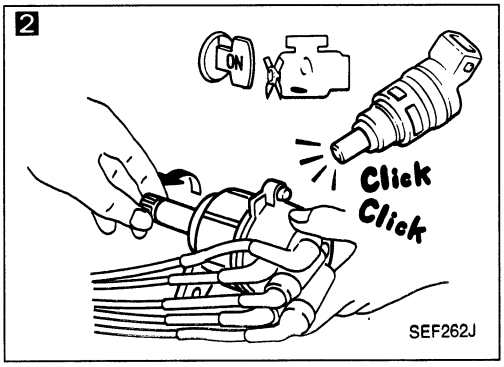
1



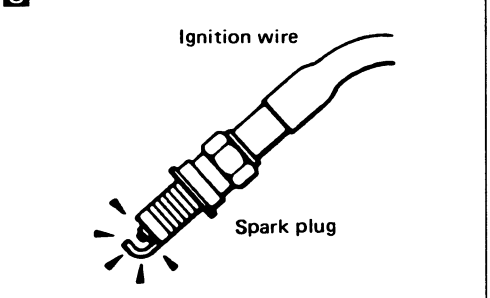
SEF246J

2



SEF262J

3



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?

No → Go to 4

— OR —

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

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.

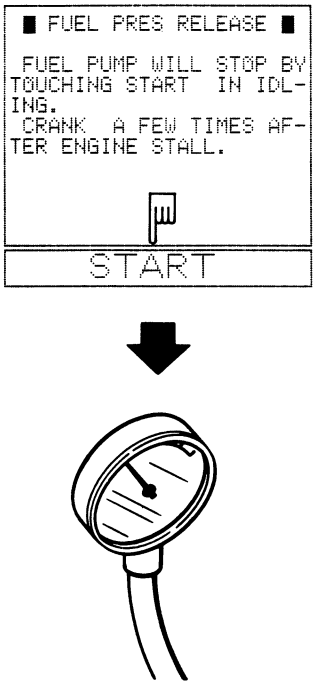
N.G. → Check ignition coil, power transistor unit and their circuits. (See page EF & EC-116.)

O.K. ↓

(Go to Ⓐ on next page.)

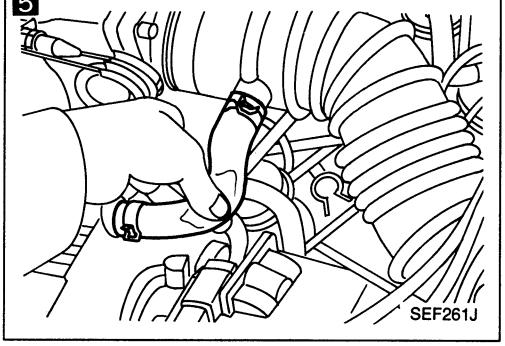
Diagnostic Procedure 15 — Engine Stalls when Accelerating or when Driving at Constant Speed (Cont'd)

4



SEF379I

5



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/cm², 33 psi)

The moment throttle valve is fully open:

Approx. 294 kPa (3.0 kg/cm², 43 psi)

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

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-193.)
2. Install fuel pressure gauge and check fuel pressure.

O.K.

5

CHECK FOR INTAKE AIR LEAK.

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

Yes → Discover air leak location and repair.

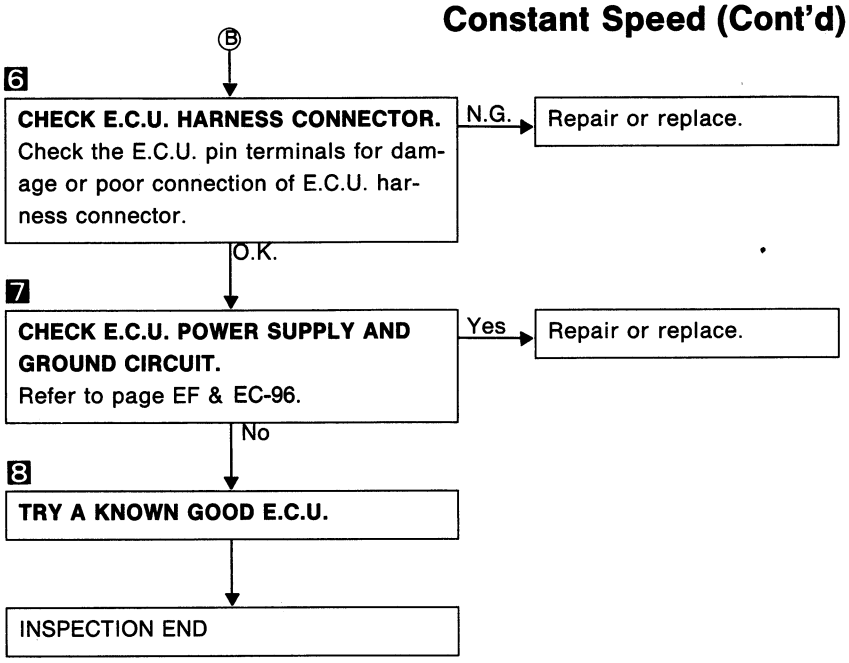
No

(Go to Ⓑ on next page.)

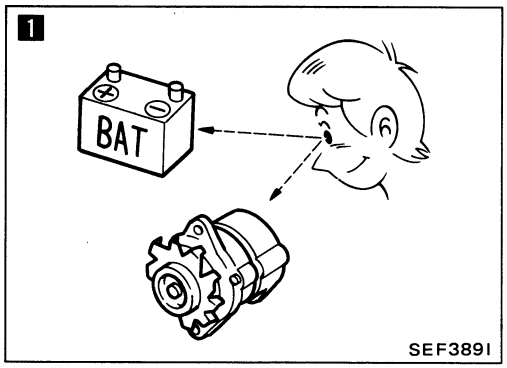
CAUTION:

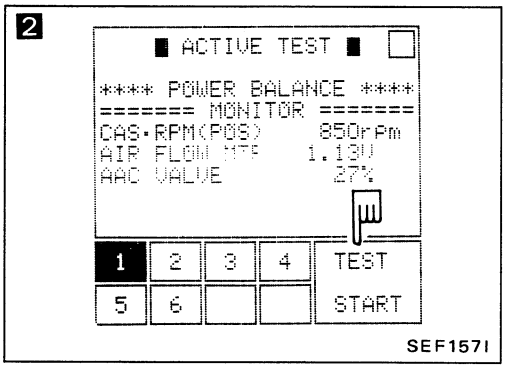
When servicing fuel system after performing "Fuel Pressure Release" in "Work Support" mode, turn off ignition key with CONSULT set in "Work Support" mode.

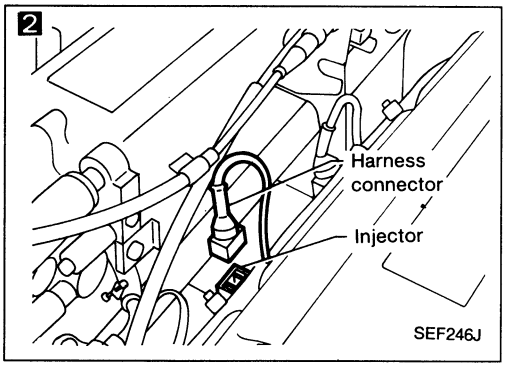
Diagnostic Procedure 15 — Engine Stalls when Accelerating or when Driving at Constant Speed (Cont'd)

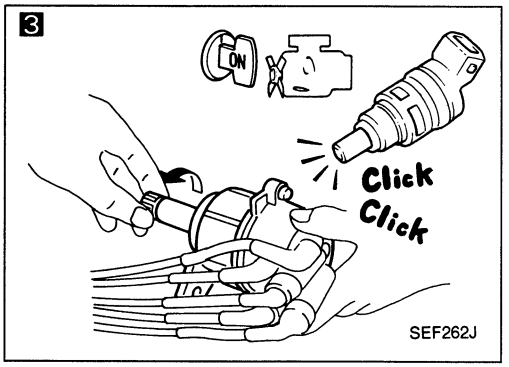


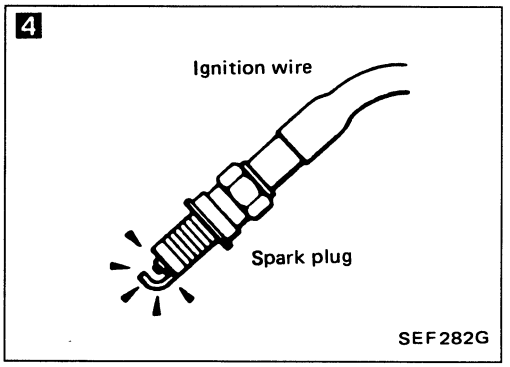
Diagnostic Procedure 16 — Engine Stalls when the Electrical Load is Heavy











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?

No → Go to **5**

OR

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

Yes ↓

3

CHECK INJECTOR.

1. Remove crank angle sensor from engine. (Harness connector should remain connected.)
2. 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.

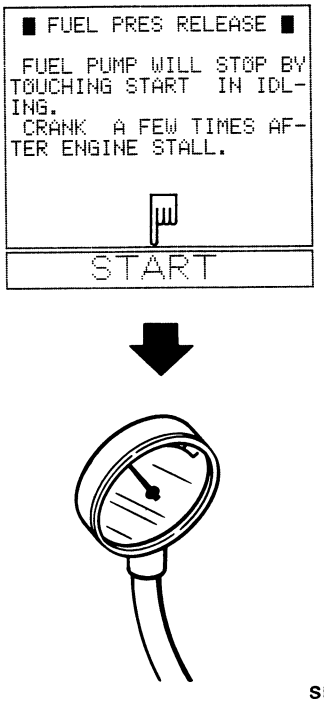
N.G. → Check ignition coil, power transistor unit and circuits. (See page EF & EC-116.)

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

N.G. → Check fuel pressure regulator diaphragm.

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-193.)
2. Install fuel pressure gauge and check fuel pressure.

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-96.

N.G. → Repair or replace.

O.K. ↓

8

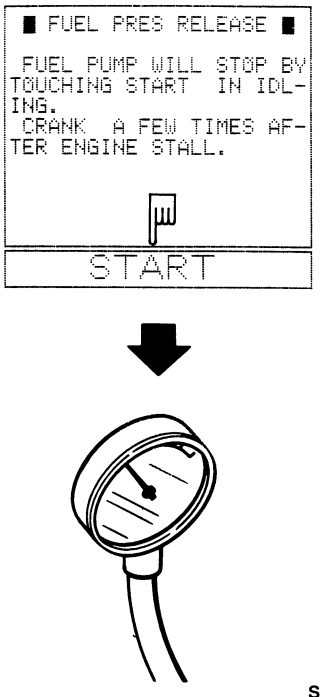
TRY A KNOWN GOOD E.C.U.

↓

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



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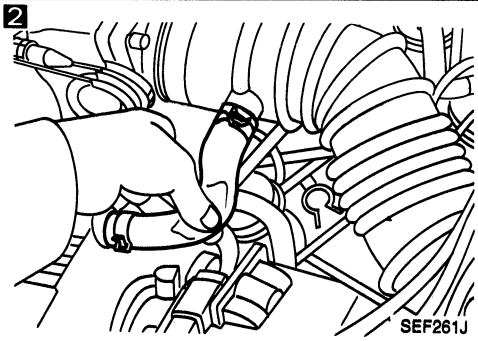


Diagnostic Procedure 17 — Lack of Power and Stumble

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)

N.G. → Check fuel pressure regulator diaphragm.

OR

1. Release fuel pressure to zero. (Refer to page EF & EC-193.)
2. Install fuel pressure gauge and check fuel pressure.

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.

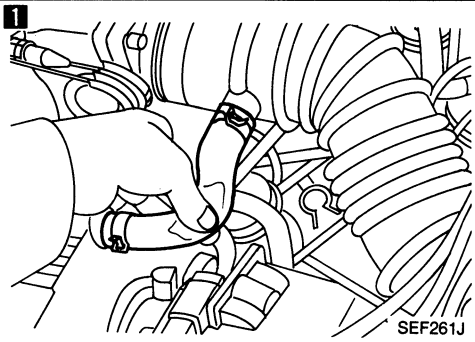
No ↓

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.

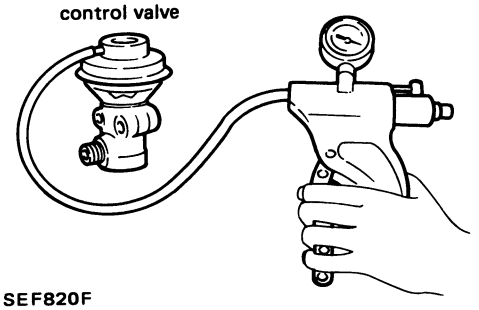
1



SEF261J

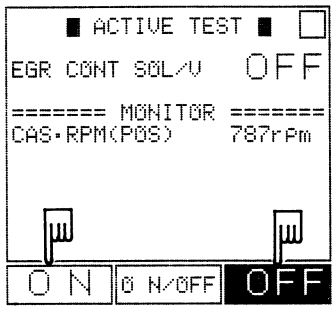
2

E.G.R.
control valve



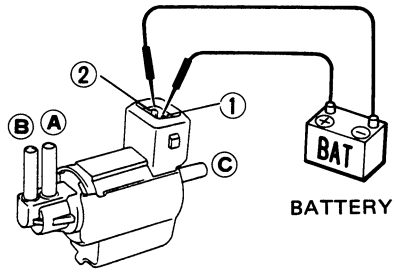
SEF820F

3



SEF390I

3



BATTERY

SEF322I

Diagnostic Procedure 18 — Detonation

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 ↓

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 ↓

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 Ⓐ on next page.)

Diagnostic Procedure 18 — Detonation (Cont'd)

Ⓐ

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. ↓

5

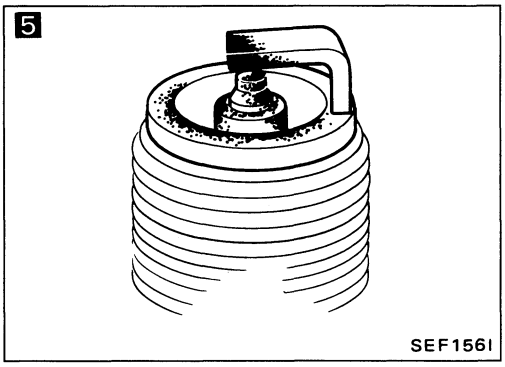
CHECK FOR OIL LEAK TO COMBUSTION CHAMBER.
Remove spark plugs and check for fouling with oil.

Yes → Check pistons, piston rings, valves, valve seats, valve oil seal, engine oil level, etc.

No ↓

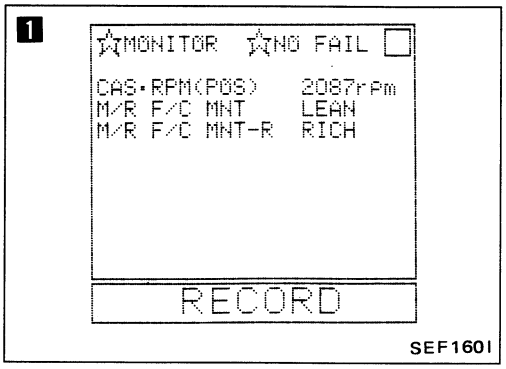
INSPECTION END

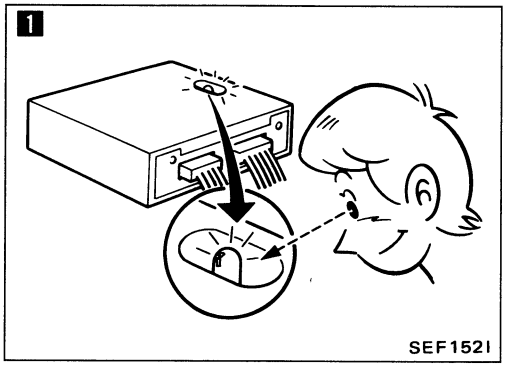
5

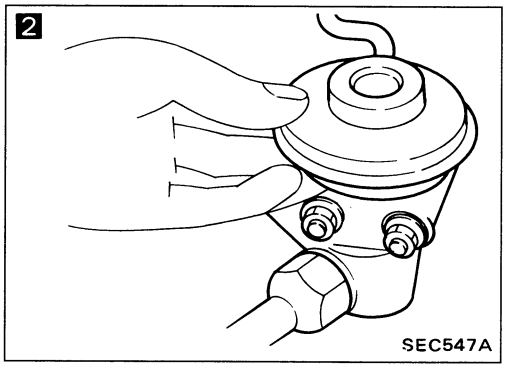


SEF156I

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→LEAN→RICH.....
1 time 2 times

N.G. → Replace exhaust gas sensor.

OR

1. Set "Exhaust gas sensor monitor" in the self-diagnostic Mode II. (See page EF & EC-46.)
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.

O.K. ↓

2

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

N.G. → Repair or replace.

O.K. ↓

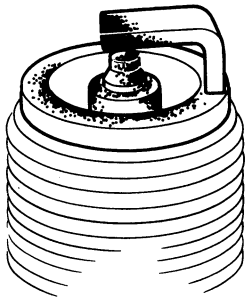
3

TRY A KNOWN GOOD E.C.U.

O.K. ↓

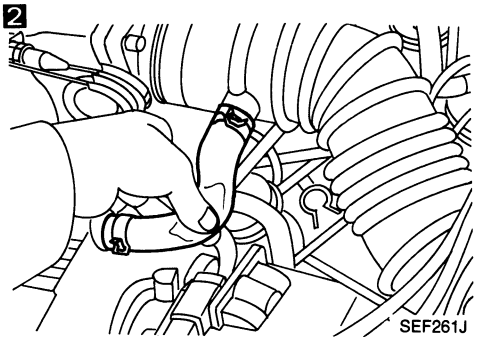
INSPECTION END

1



SEF156I

2



SEF261J

Diagnostic Procedure 20 — Backfire through the Intake

1

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

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

O.K. ↓

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 ↓

3

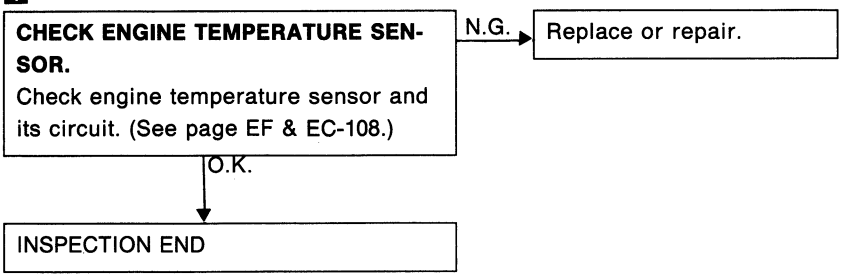
CHECK FOR INTAKE VALVE DEPOSITS.
If there are deposits on intake valves, remove them.

↓

INSPECTION END

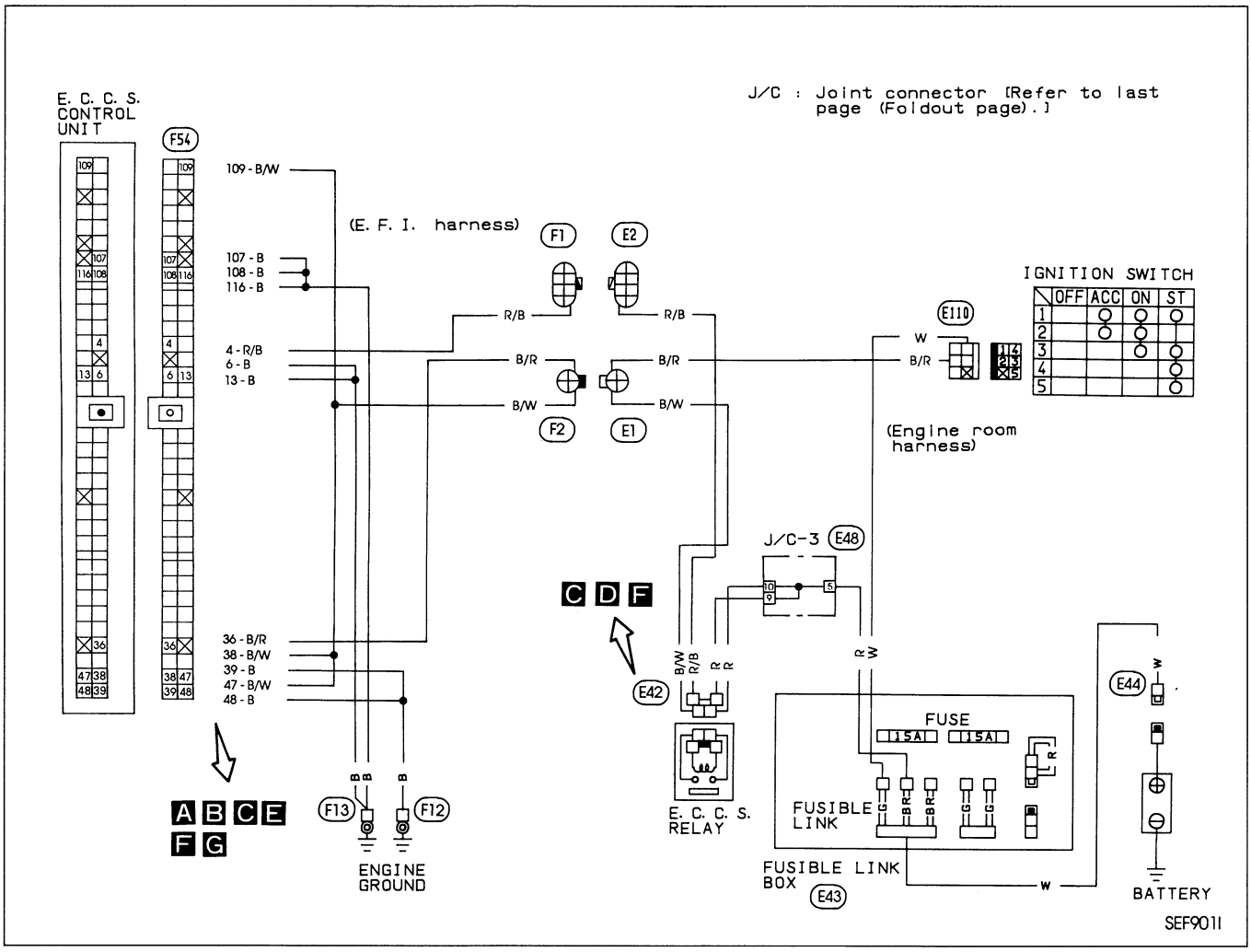
Diagnostic Procedure 21 — Backfire through the Exhaust

1

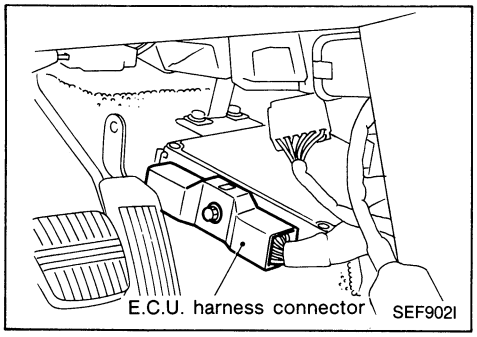


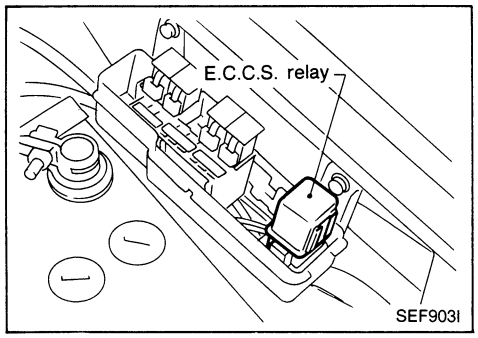
Diagnostic Procedure 22

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



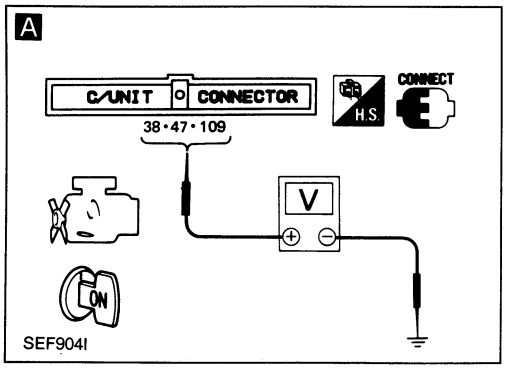
Harness layout





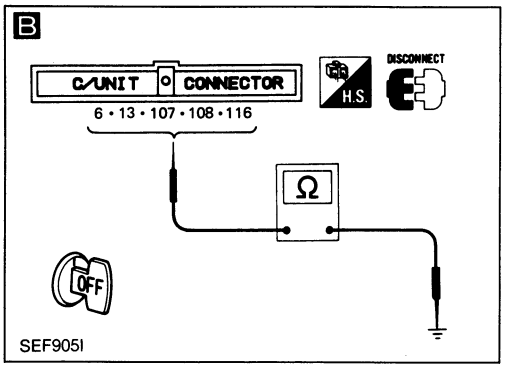
Diagnostic Procedure 22 (Cont'd)

A



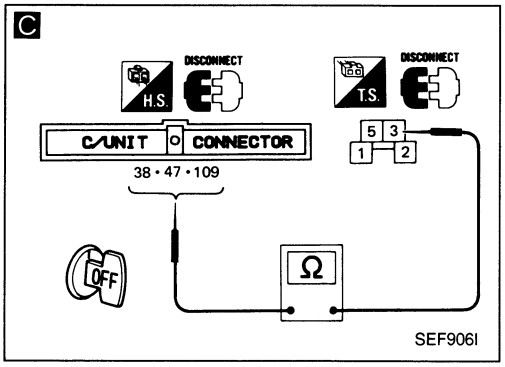
SEF904I

B



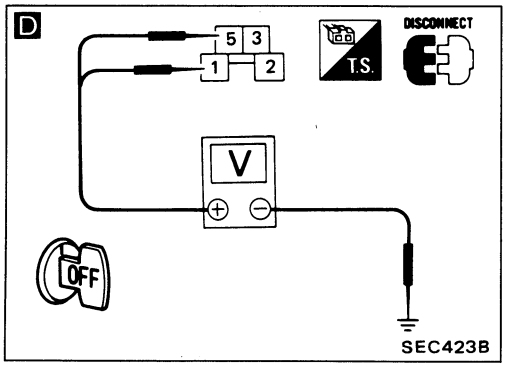
SEF905I

C



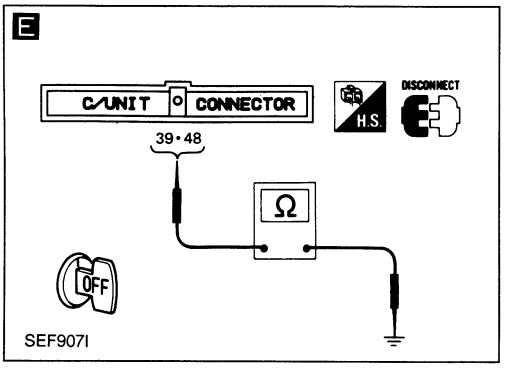
SEF906I

D



SEC423B

E



SEF907I

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

N.G.

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.

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 (F2), (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.

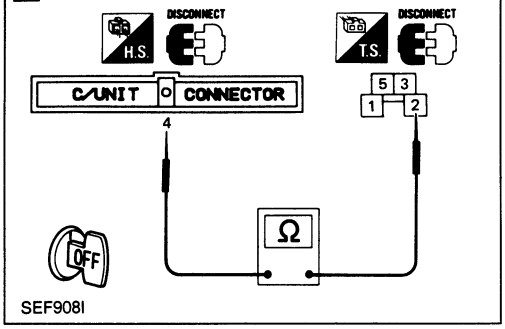
N.G. → Repair harness or connectors.

O.K.

Ⓐ

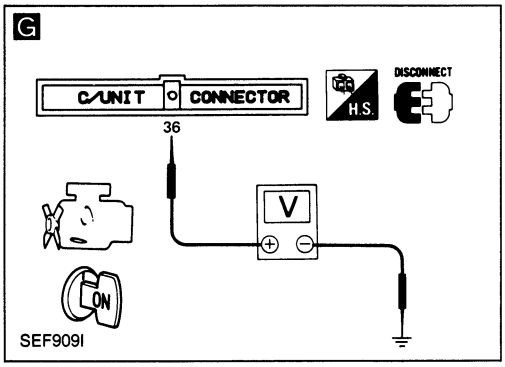
Diagnostic Procedure 22 (Cont'd)

F



SEF908I

G



SEF909I

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), (E1)
- 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 (F2), (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-187.)

N.G. → Replace E.C.C.S. relay.

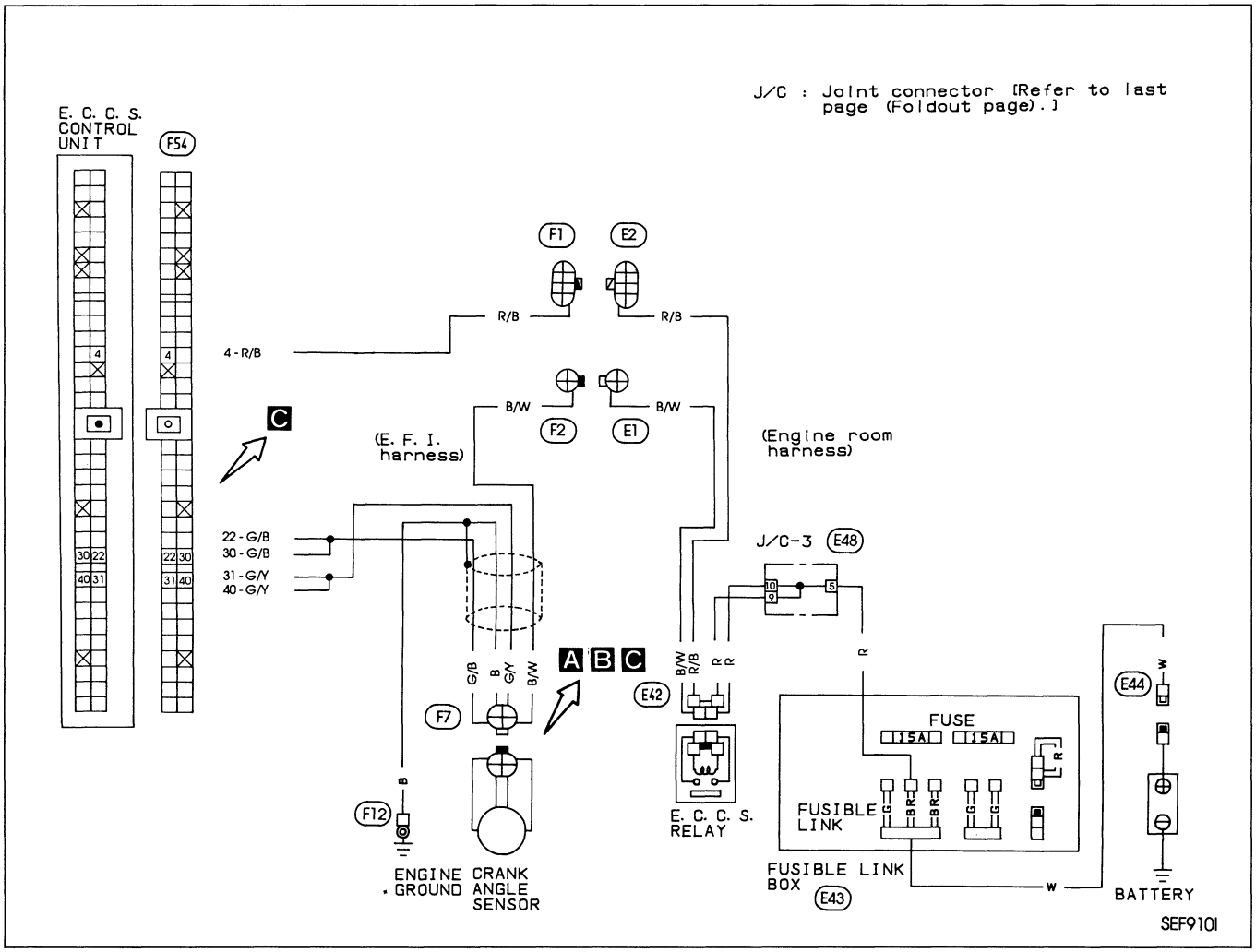
O.K. ↓

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

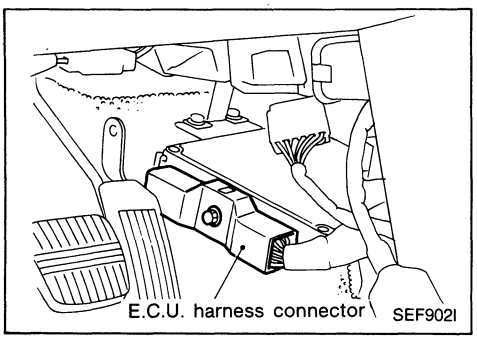
NOTE

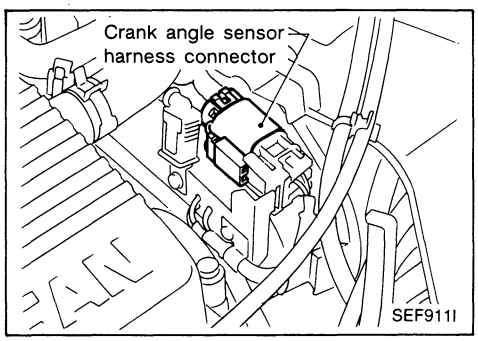
Diagnostic Procedure 23

CRANK ANGLE SENSOR (Code No. 11)



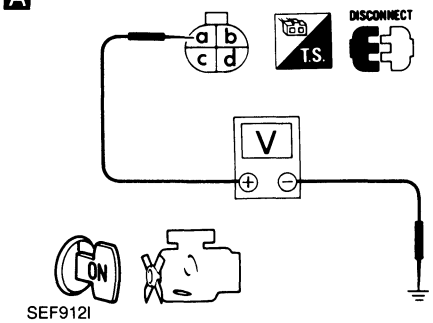
Harness layout





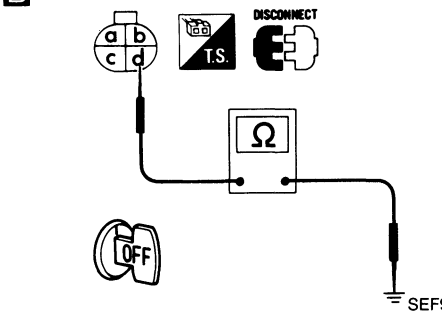
Diagnostic Procedure 23 (Cont'd)

A



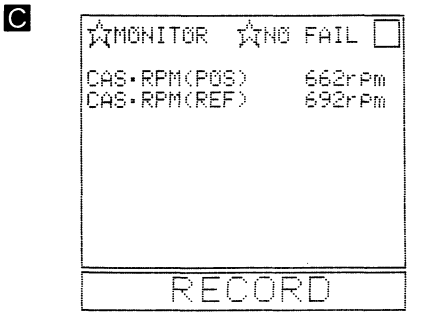
SEF912I

B



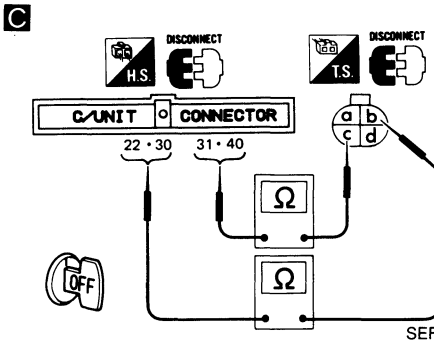
SEF913I

C



SEF584I

C



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 (F2), (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**

N.G. → Repair harness or connectors.

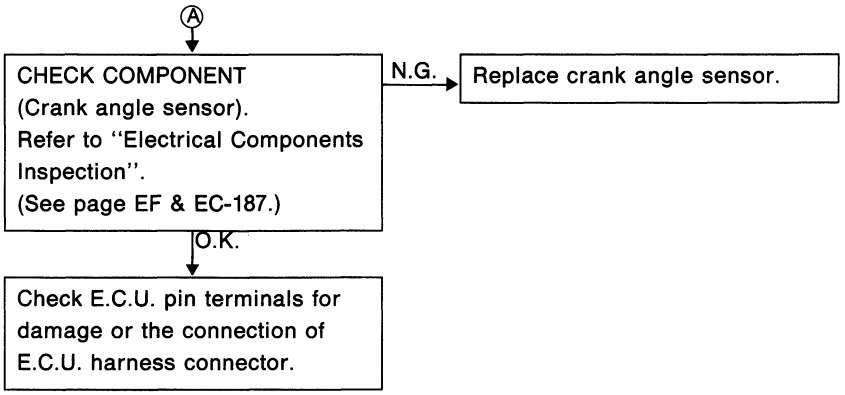
OR

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.

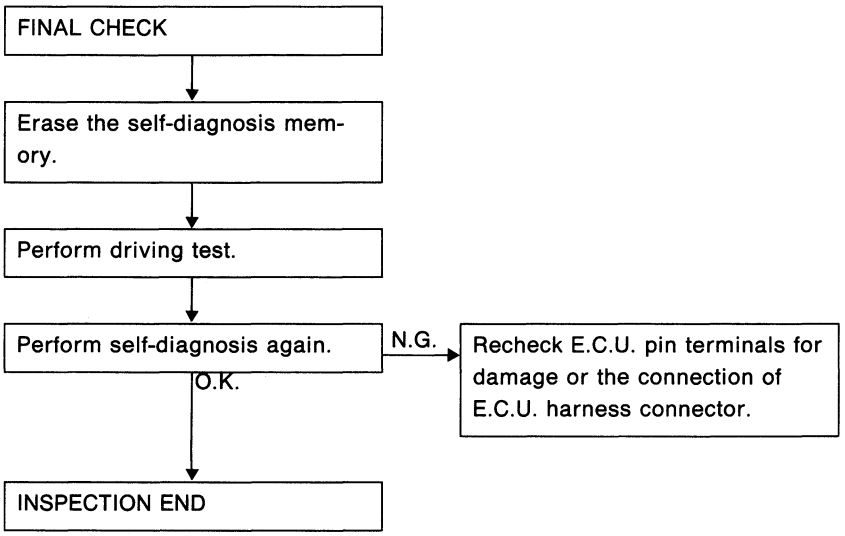
O.K.

Ⓐ

Diagnostic Procedure 23 (Cont'd)



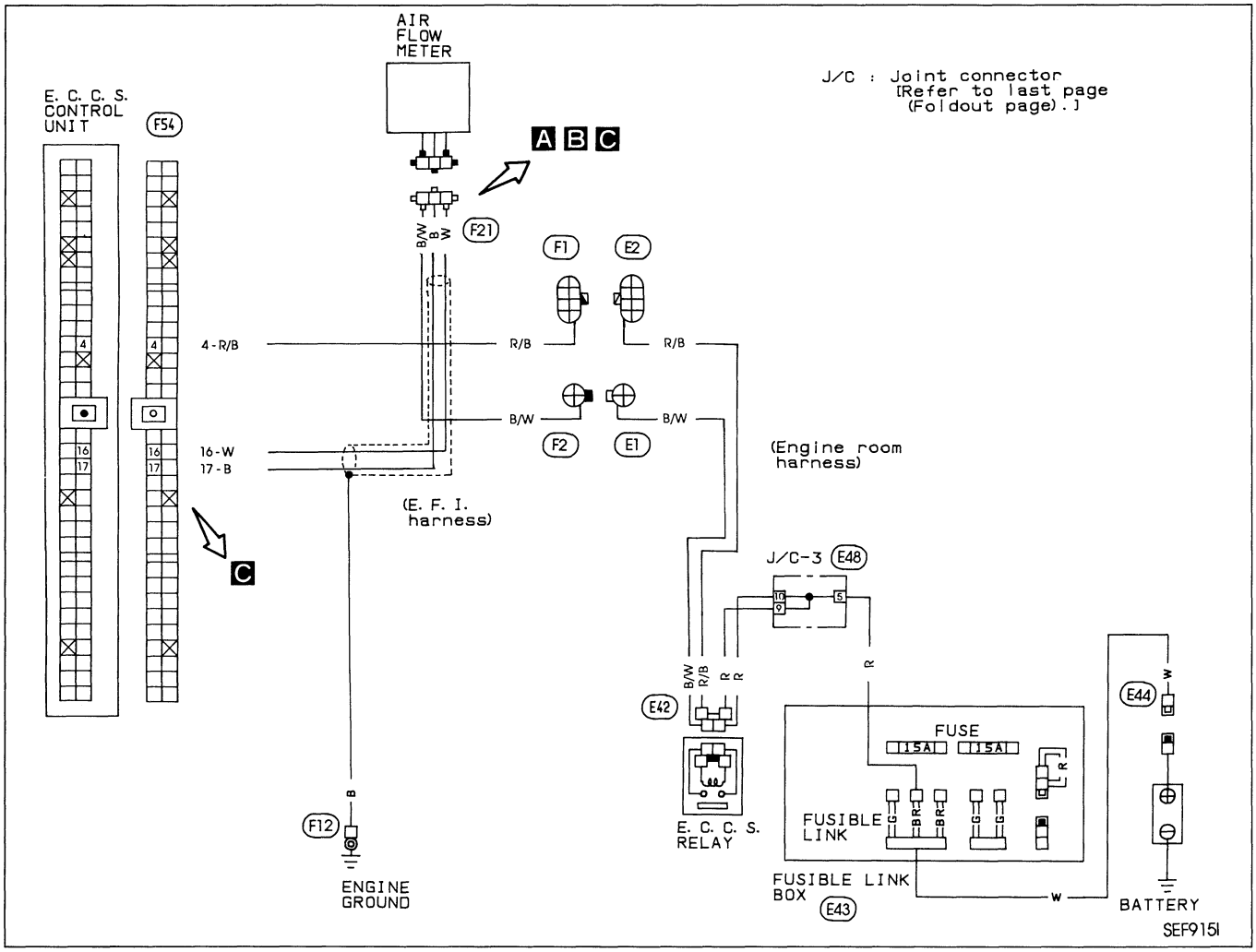
Perform FINAL CHECK by the following procedure after repair is completed.



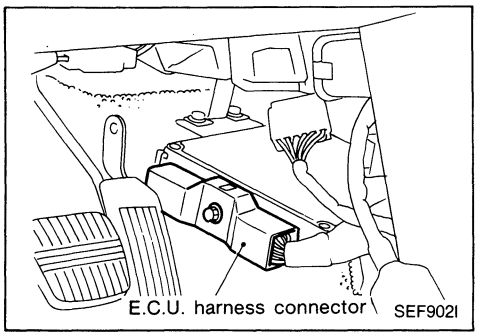
NOTE

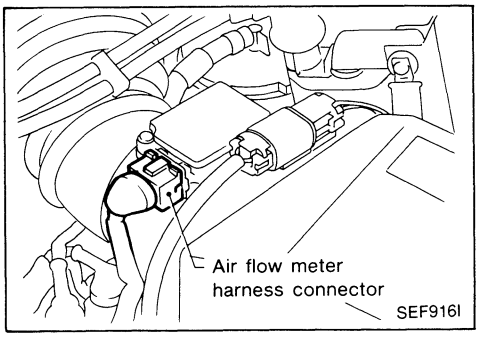
Diagnostic Procedure 24

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



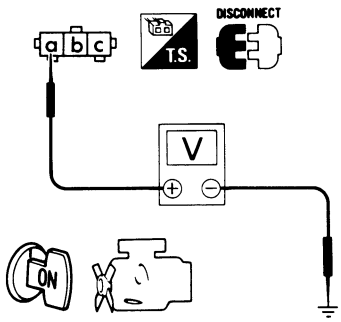
Harness layout



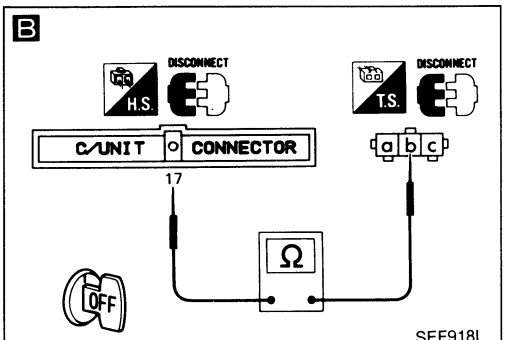


Diagnostic Procedure 24 (Cont'd)

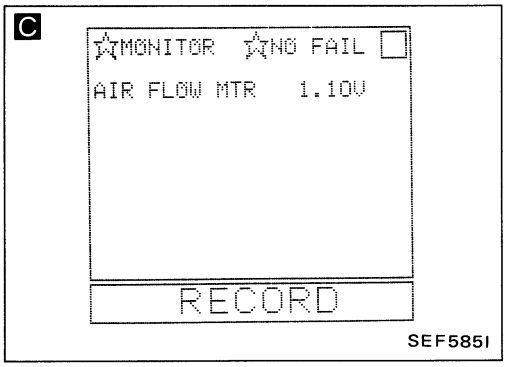
A



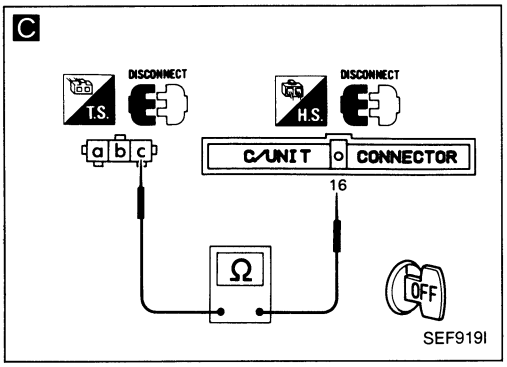
B



C



C



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 (F2), (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 connector.
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-187.)

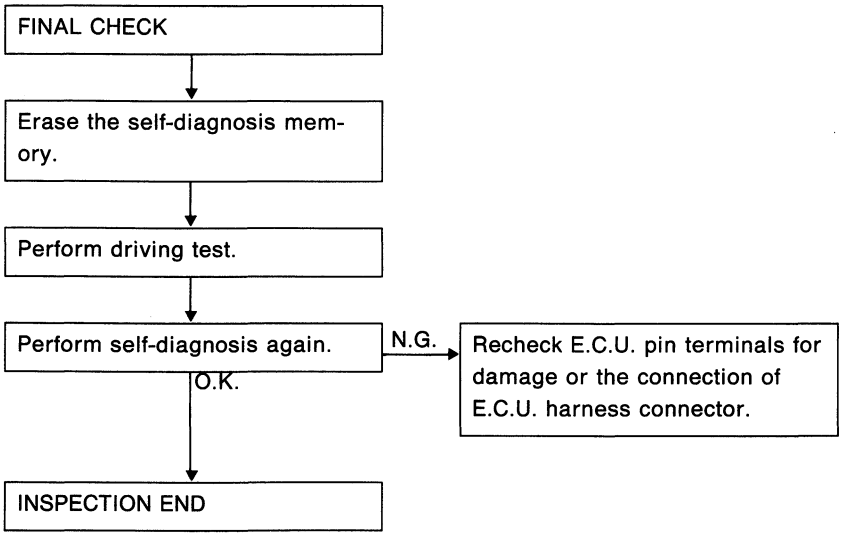
N.G. → Replace air flow meter.

O.K. ↓

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

Diagnostic Procedure 24 (Cont'd)

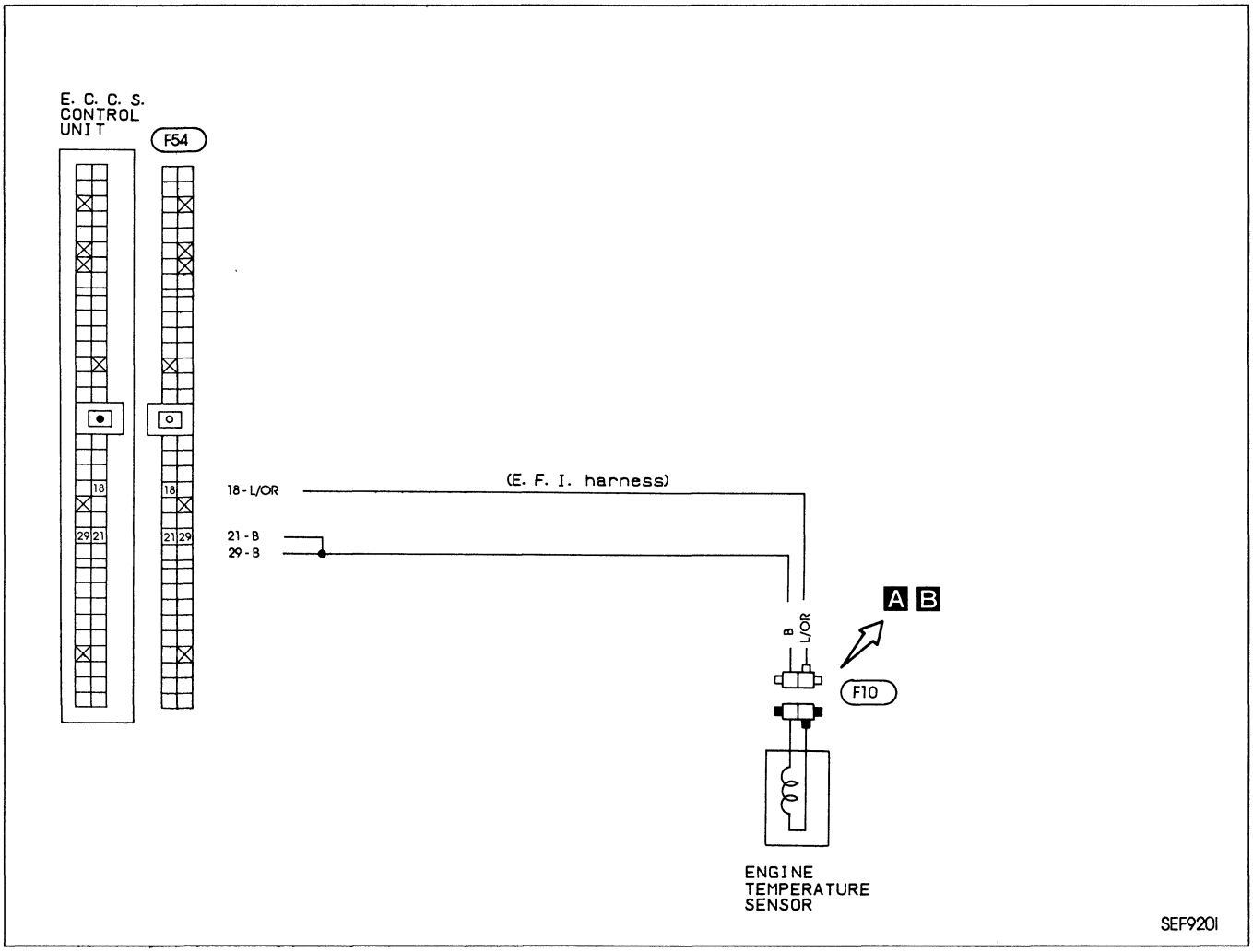
Perform FINAL CHECK by the following procedure after repair is completed.



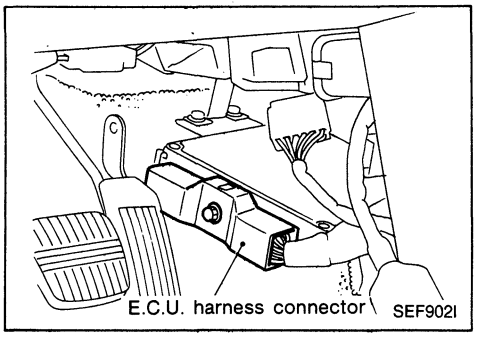
NOTE

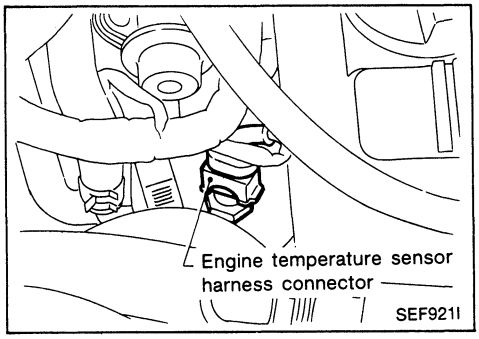
Diagnostic Procedure 25

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

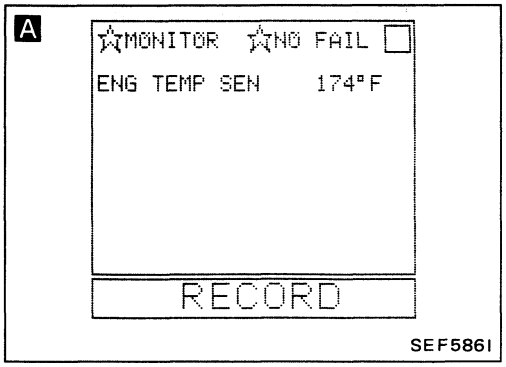


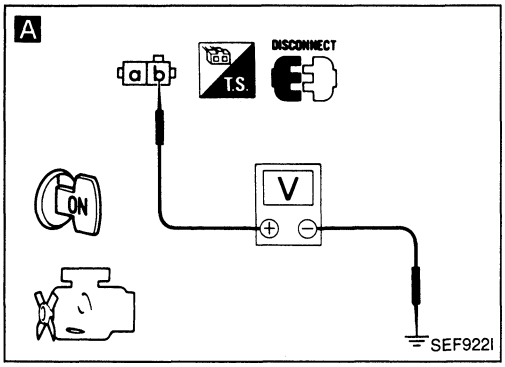
Harness layout

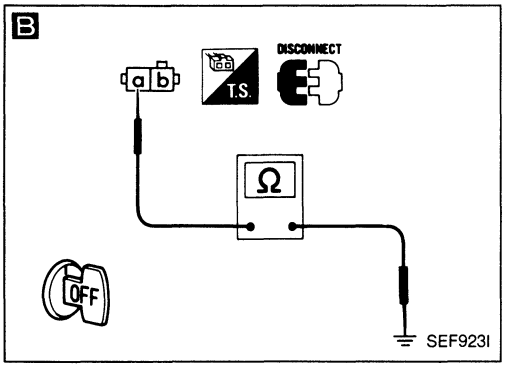




Diagnostic Procedure 25 (Cont'd)







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.

N.G. → Repair harness or connectors.

OR

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

Voltage: Approximately 5V

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-187.)

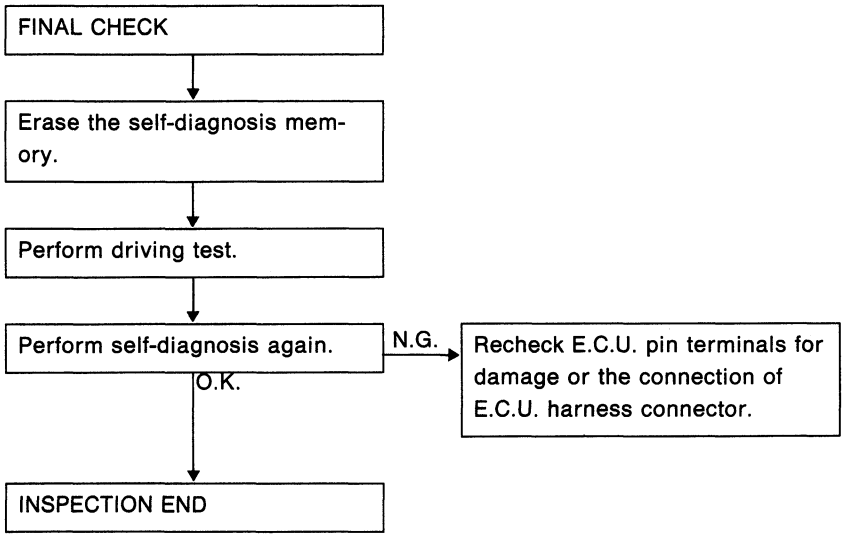
N.G. → Replace engine temperature sensor.

O.K.

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

Diagnostic Procedure 25 (Cont'd)

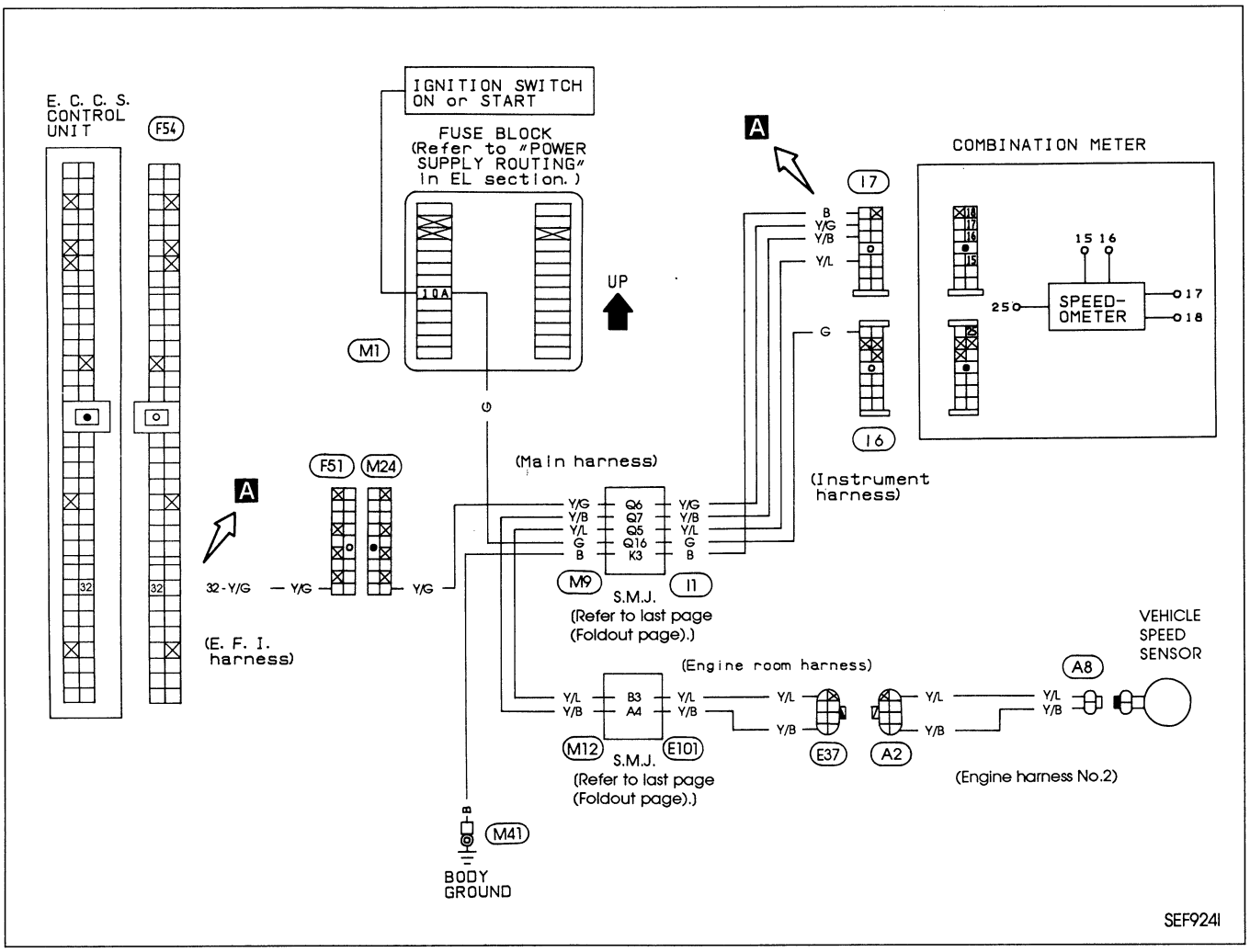
Perform FINAL CHECK by the following procedure after repair is completed.



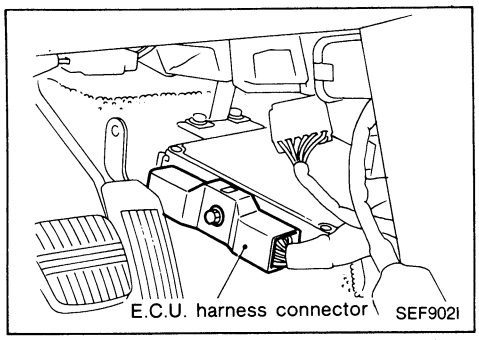
NOTE

Diagnostic Procedure 26

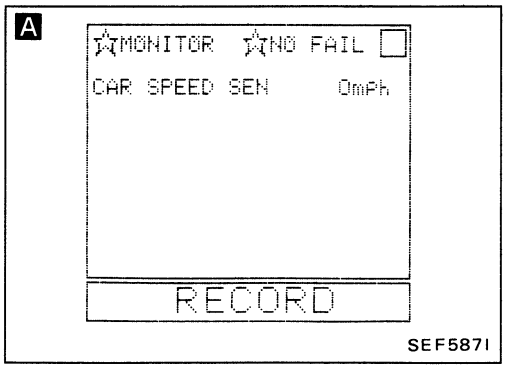
VEHICLE SPEED SENSOR (Code No. 14) (CHECK ENGINE LIGHT ITEM)

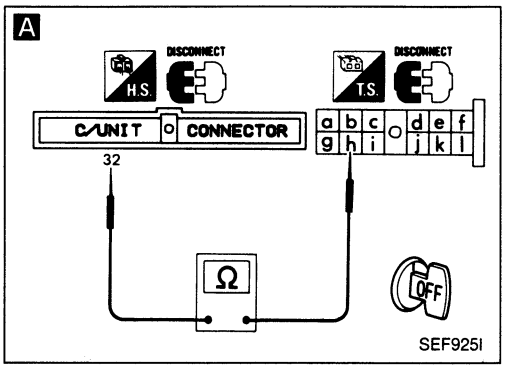


Harness layout



Diagnostic Procedure 26 (Cont'd)





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

CONSULT value should be the same as the speedometer indication

N.G. → Check the following:
- Harness connectors (F51), (M24)
- S.M.J. connectors (M9), (11)
- Harness continuity between E.C.U. and combination meter.

If N.G., repair harness or connectors.

OR

1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector and combination meter harness connector (17).
3) Check harness continuity between E.C.U. terminal (32) and terminal (h).

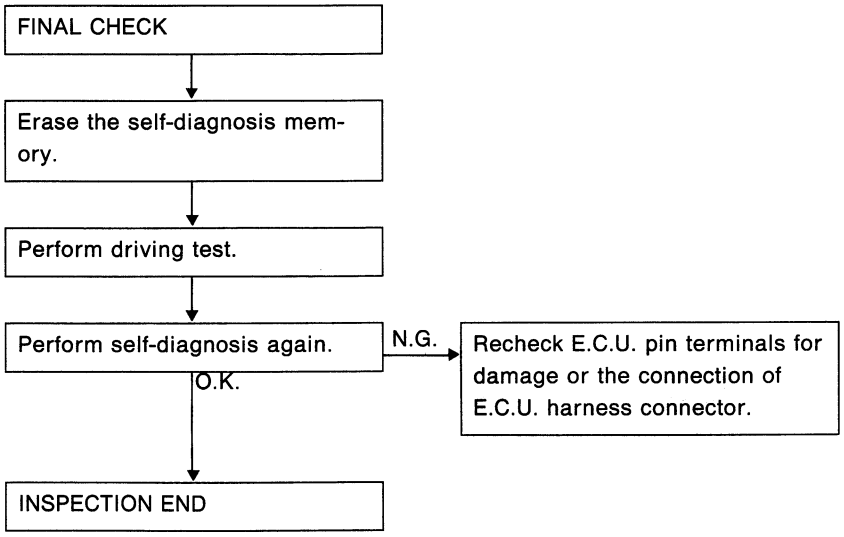
Continuity should exist.

O.K.

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

Diagnostic Procedure 26 (Cont'd)

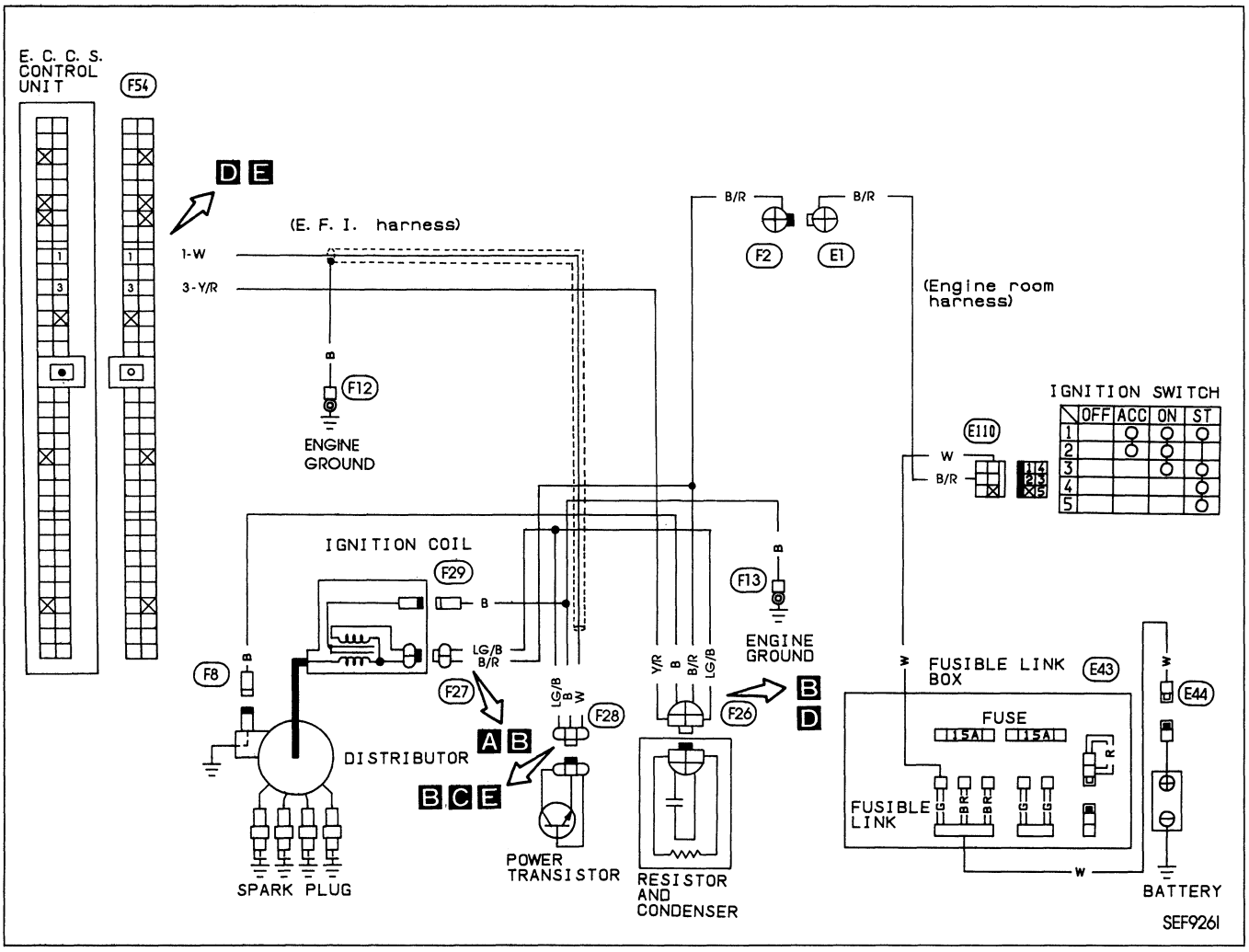
Perform FINAL CHECK by the following procedure after repair is completed.



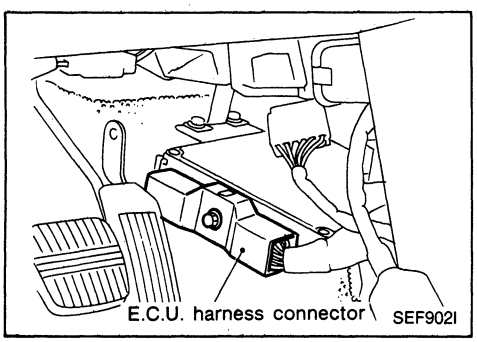
NOTE

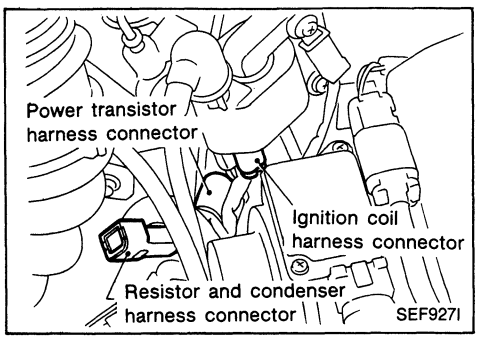
Diagnostic Procedure 27

IGNITION SIGNAL (Code No. 21)

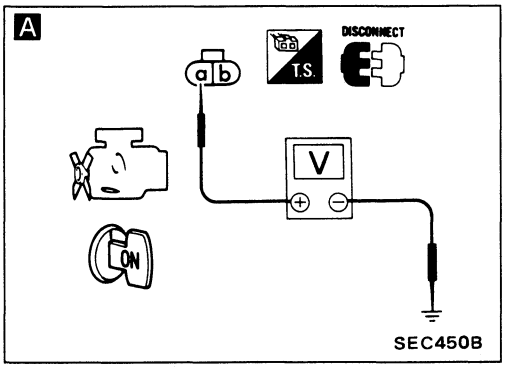


Harness layout





Diagnostic Procedure 27 (Cont'd)



INSPECTION START

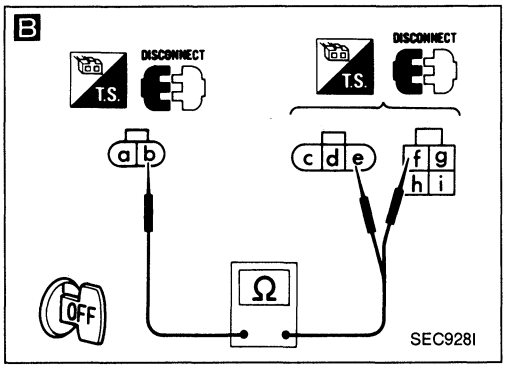
A

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 (F2), (E1)
- Harness continuity between ignition switch and ignition coil

If N.G., repair harness or connectors.

O.K.



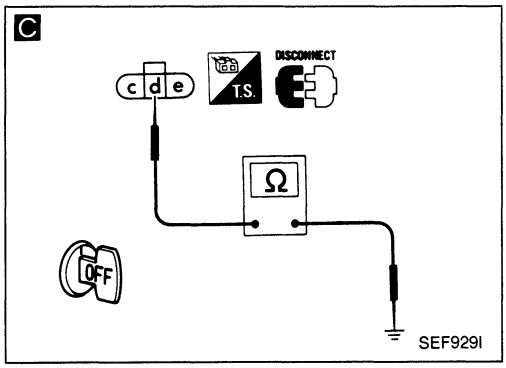
CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect power transistor harness connector and resistor and condenser harness connector.

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.

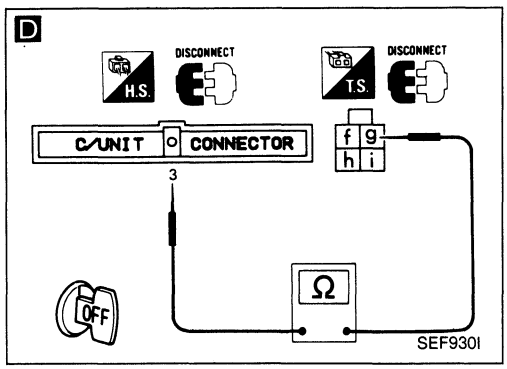


D

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.



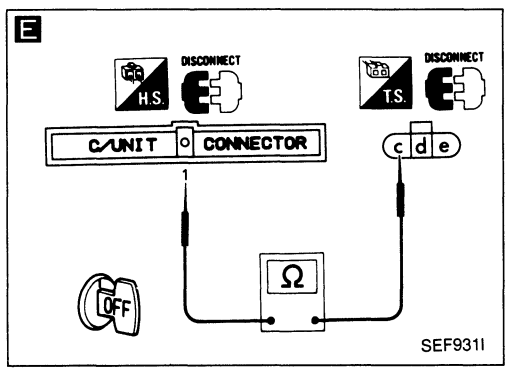
E

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

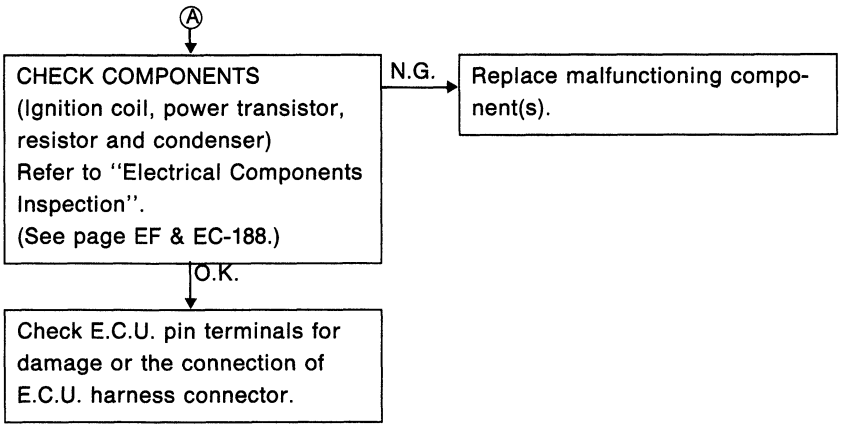
N.G. → Repair harness or connectors.

O.K.

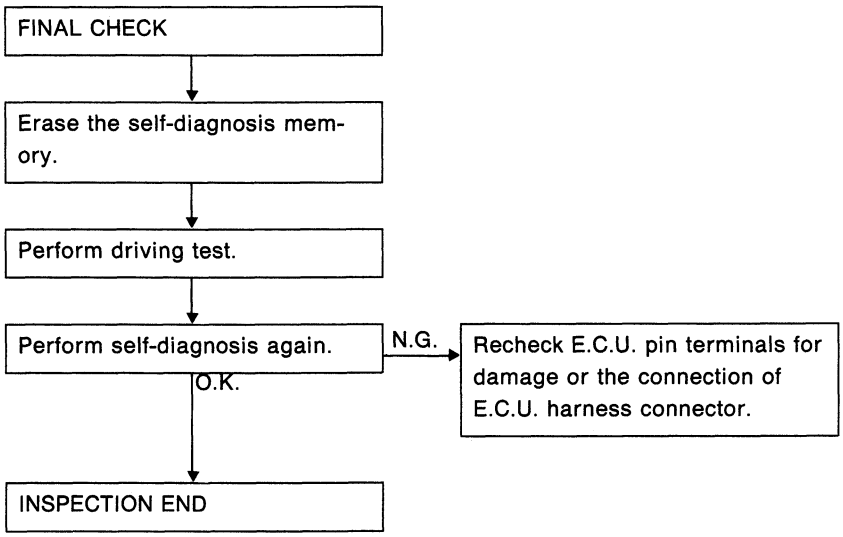
Ⓐ



Diagnostic Procedure 27 (Cont'd)



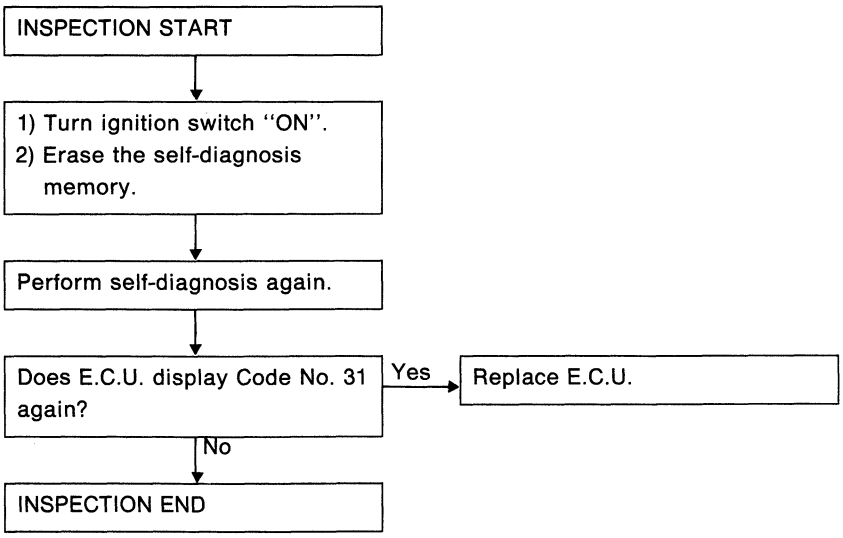
Perform FINAL CHECK by the following procedure after repair is completed.



NOTE

Diagnostic Procedure 28

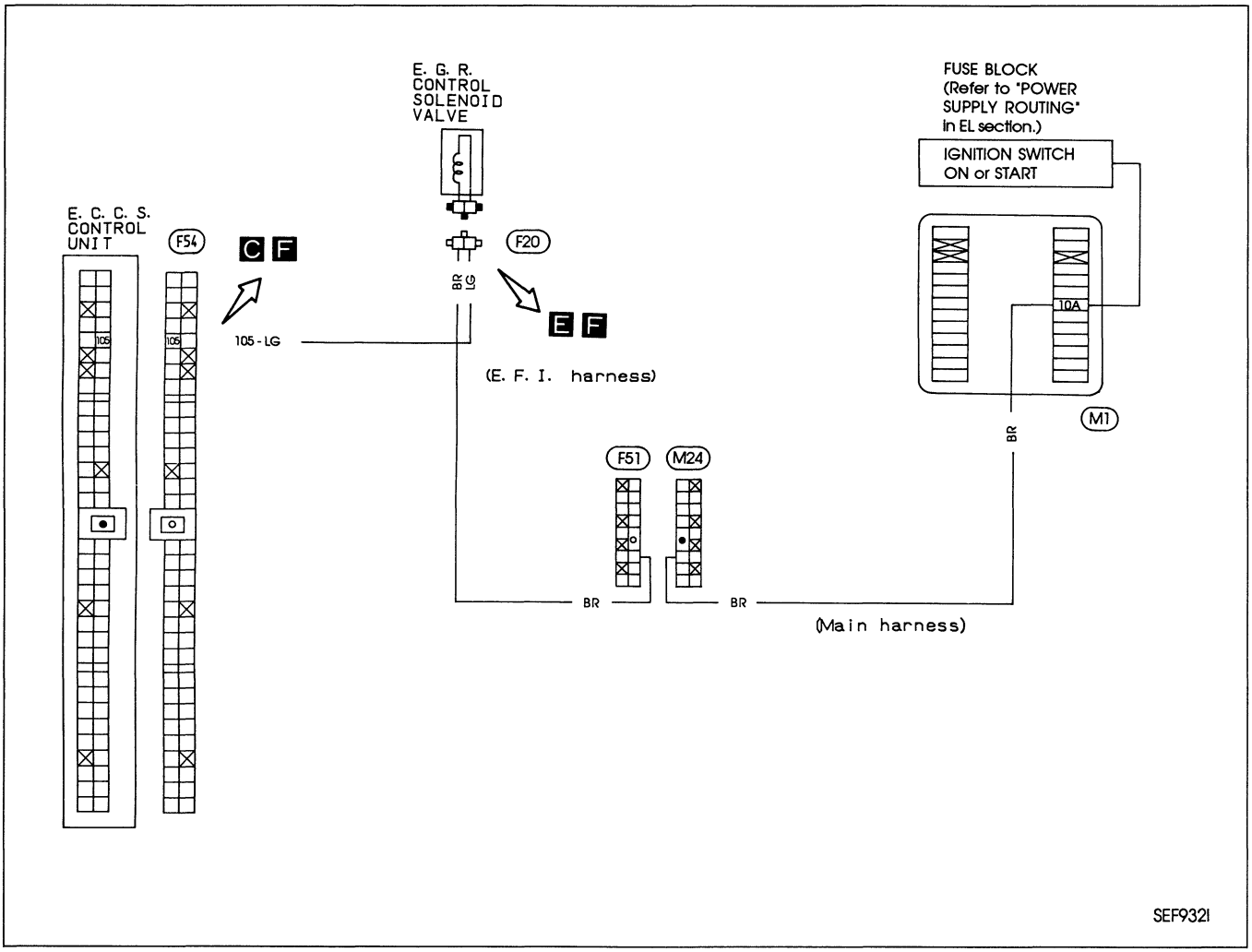
E.C.C.S. CONTROL UNIT (Code No. 31) (CHECK ENGINE LIGHT ITEM)



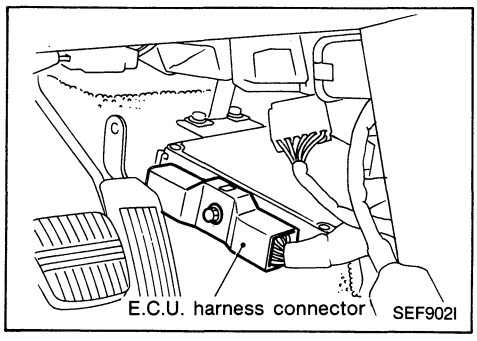
NOTE

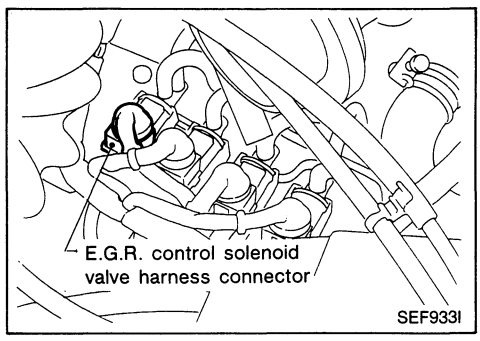
Diagnostic Procedure 29

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



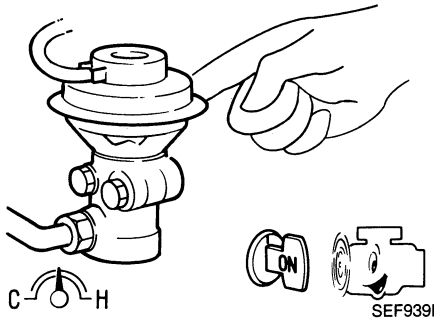
Harness layout





Diagnostic Procedure 29 (Cont'd)

A



SEF939I

INSPECTION START

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

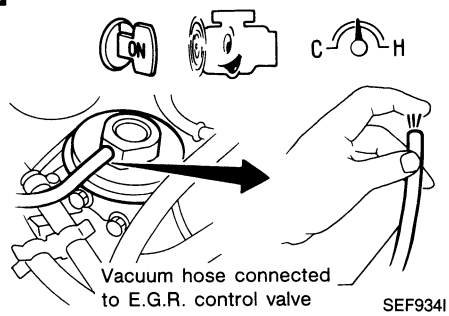
A

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



SEF934I

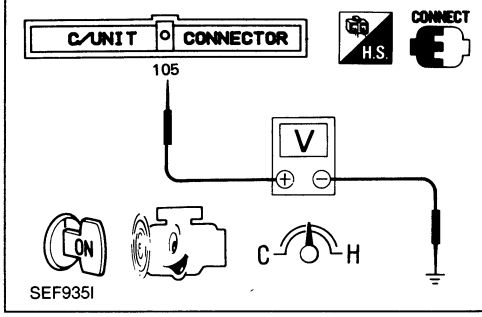
CHECK VACUUM SOURCE TO E.G.R. CONTROL VALVE.
1) Disconnect vacuum hose to E.G.R. control valve.
2) Make sure that vacuum exists under the following conditions.

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, B.P.T. valve and exhaust gas temperature sensor (California model)].
Refer to "Electrical Components Inspection".
(See page EF & EC-188.)

N.G. → Replace malfunctioning component(s).

C



SEF935I

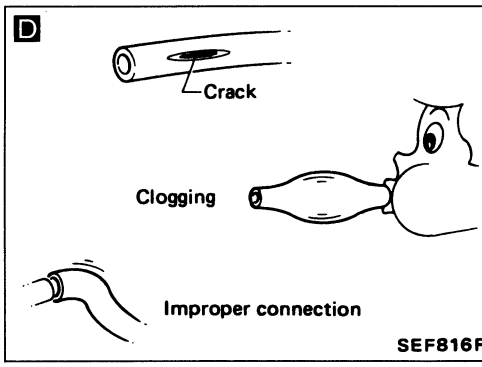
CHECK CONTROL FUNCTION.
1) Check voltage between E.C.U. terminal (105) and ground under the following conditions.

Voltage:
At idle
Approximately 0V
Engine speed is about 2,000 rpm
Battery voltage

O.K. → D

N.G. → Ⓐ

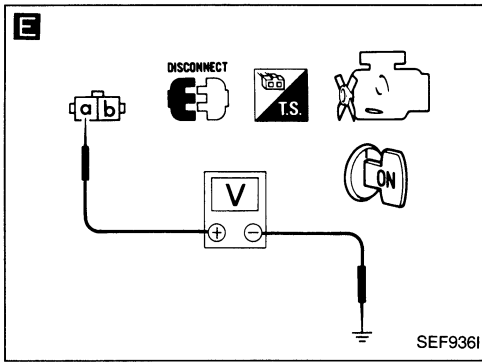
D



SEF816F

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

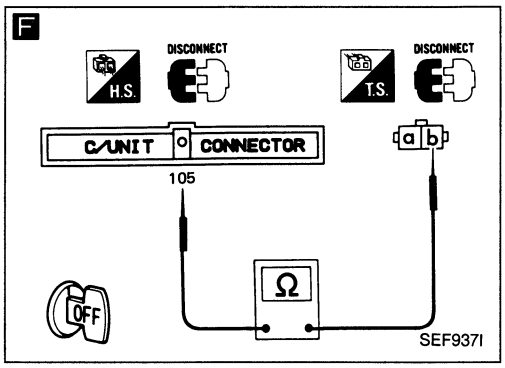
E



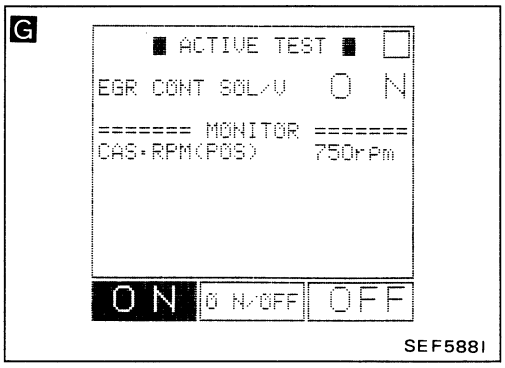
SEF936I

Diagnostic Procedure 29 (Cont'd)

F



G



Ⓐ

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

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

OR

Refer to "Electrical Components Inspection".
(See page EF & EC-189.)

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

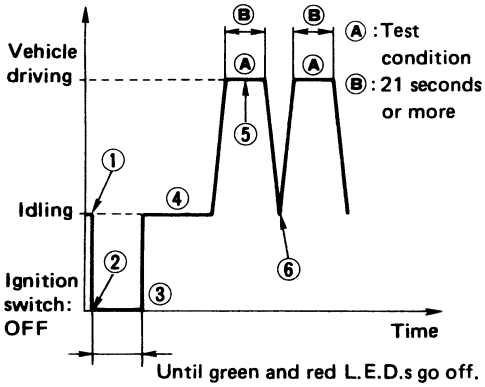
Test condition

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)

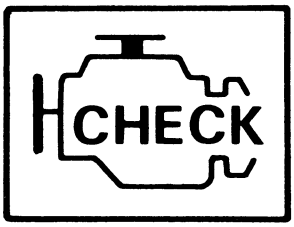
Driving mode



① Start engine and warm it up sufficiently.
② Turn off ignition switch and keep it off until green and red L.E.D.s go 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.

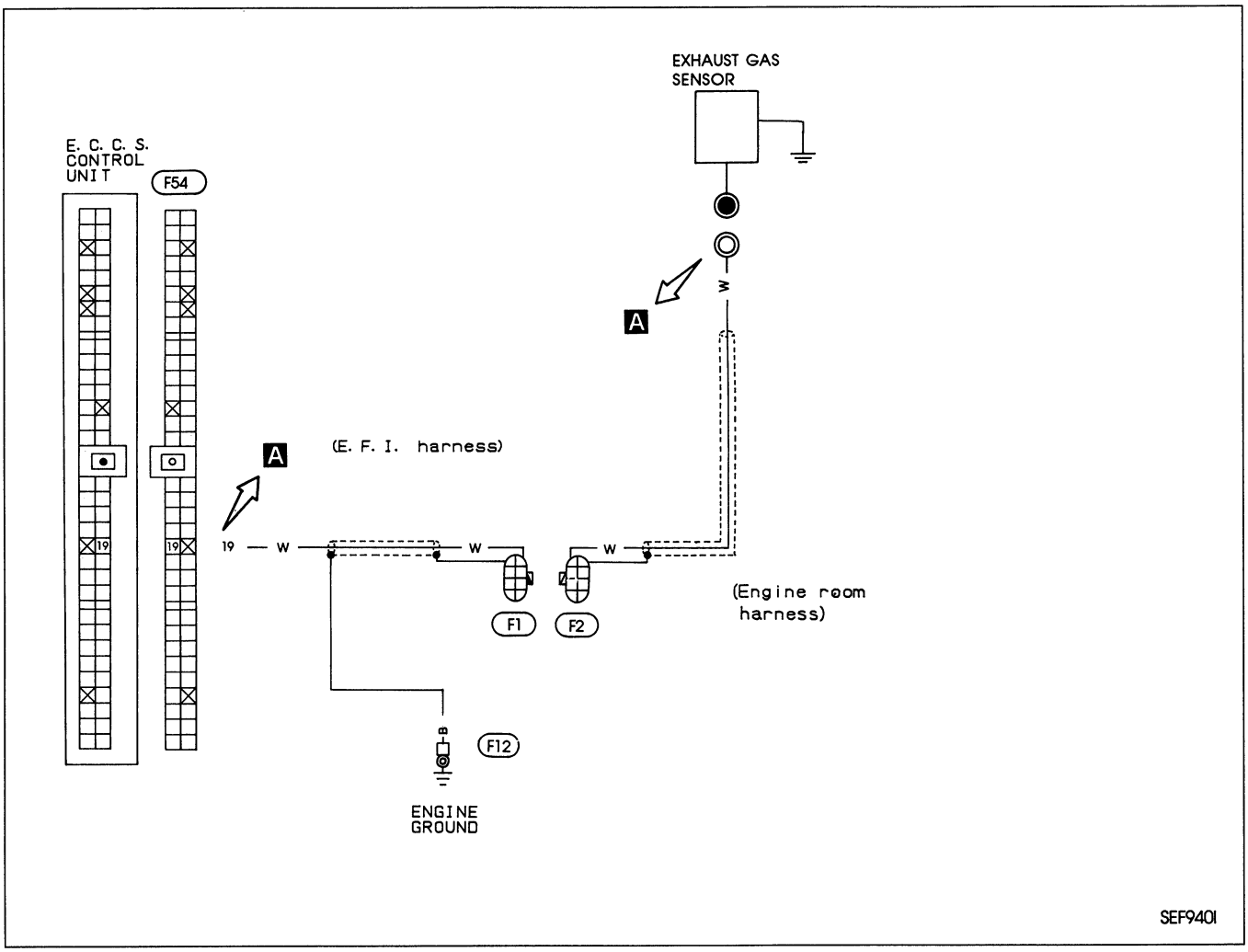
Comes on. → Recheck E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Does not come on. ↓

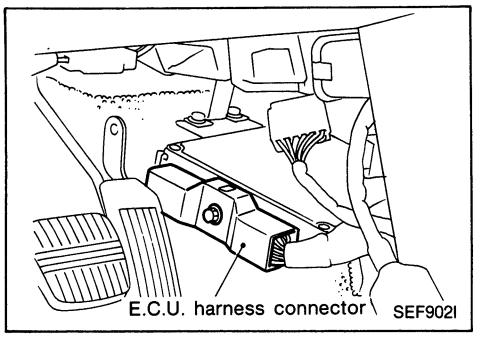
INSPECTION END

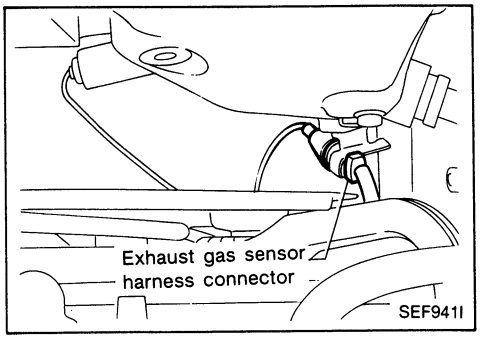
Diagnostic Procedure 30

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

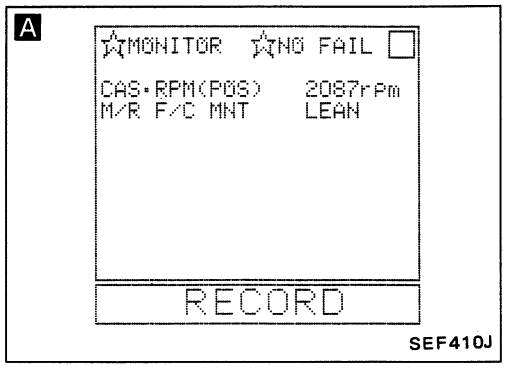


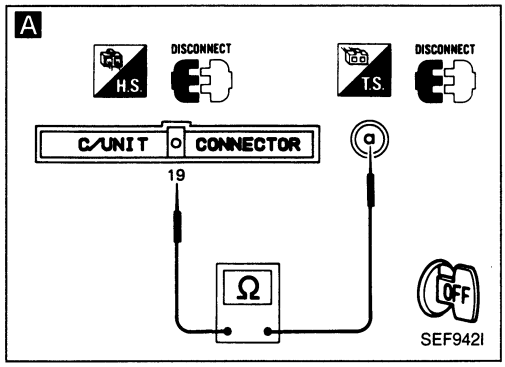
Harness layout





Diagnostic Procedure 30 (Cont'd)





INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.

1) Start engine and warm it up sufficiently.
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 (F1), (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-189.)

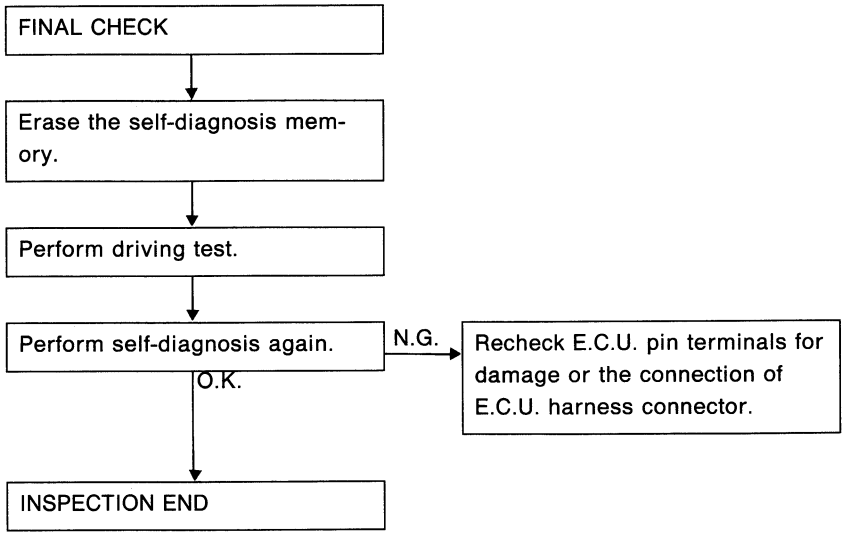
N.G. → Replace exhaust gas sensor.

O.K. ↓

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

Diagnostic Procedure 30 (Cont'd)

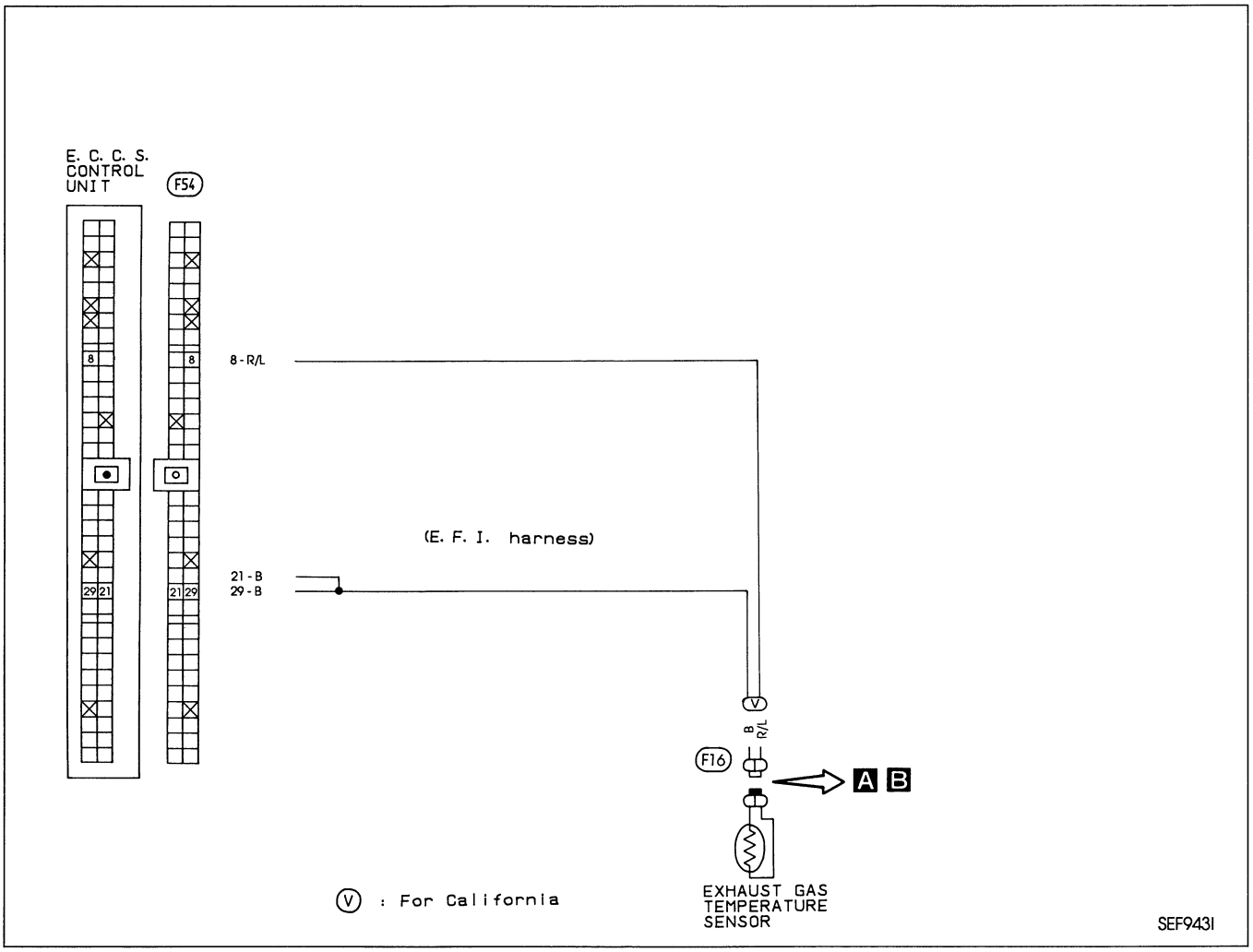
Perform FINAL CHECK by the following procedure after repair is completed.



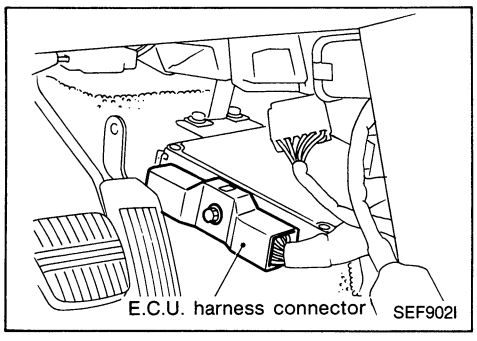
NOTE

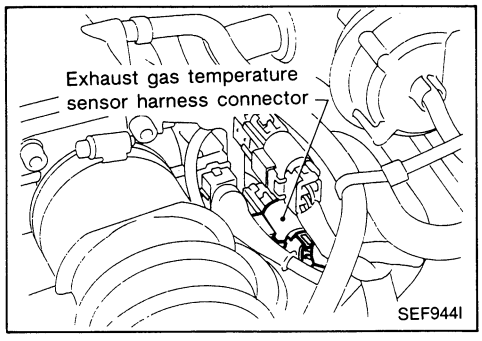
Diagnostic Procedure 31

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

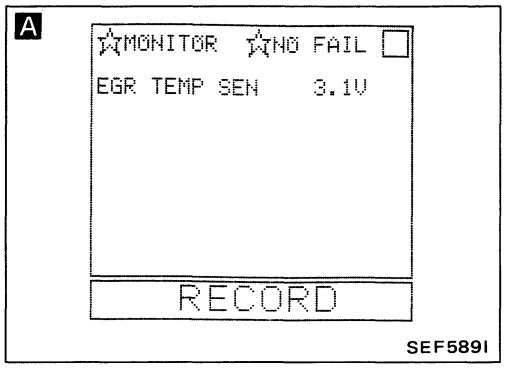


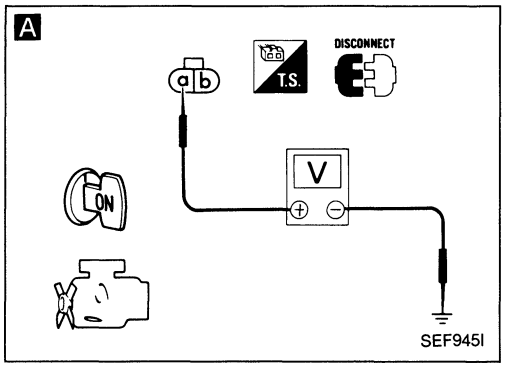
Harness layout

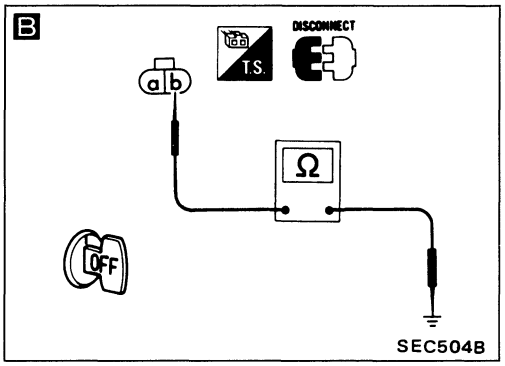




Diagnostic Procedure 31 (Cont'd)







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

N.G. → Repair harness or connectors.

OR

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

O.K.

Turn ignition switch "OFF".

Disconnect exhaust gas 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
(Exhaust gas temperature sensor).
Refer to "Electrical Components Inspection". (See page EF & EC-189.)

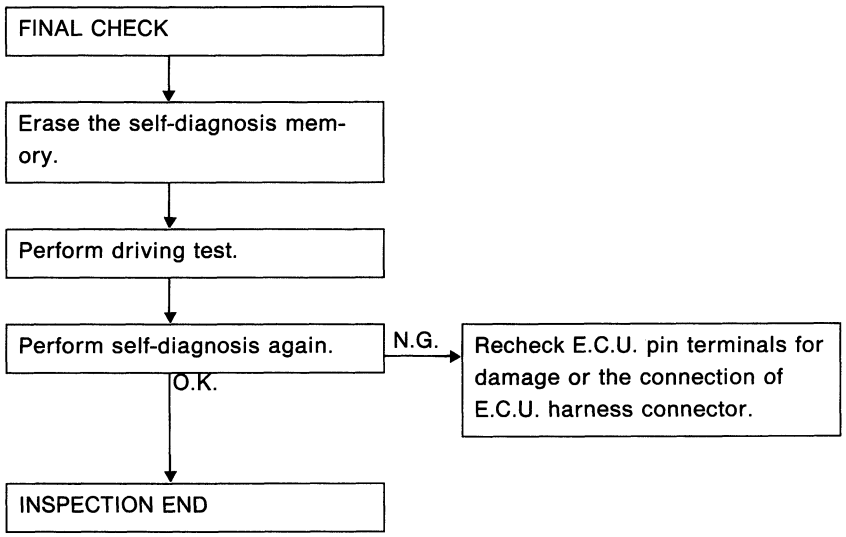
N.G. → Replace exhaust gas temperature sensor.

O.K.

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

Diagnostic Procedure 31 (Cont'd)

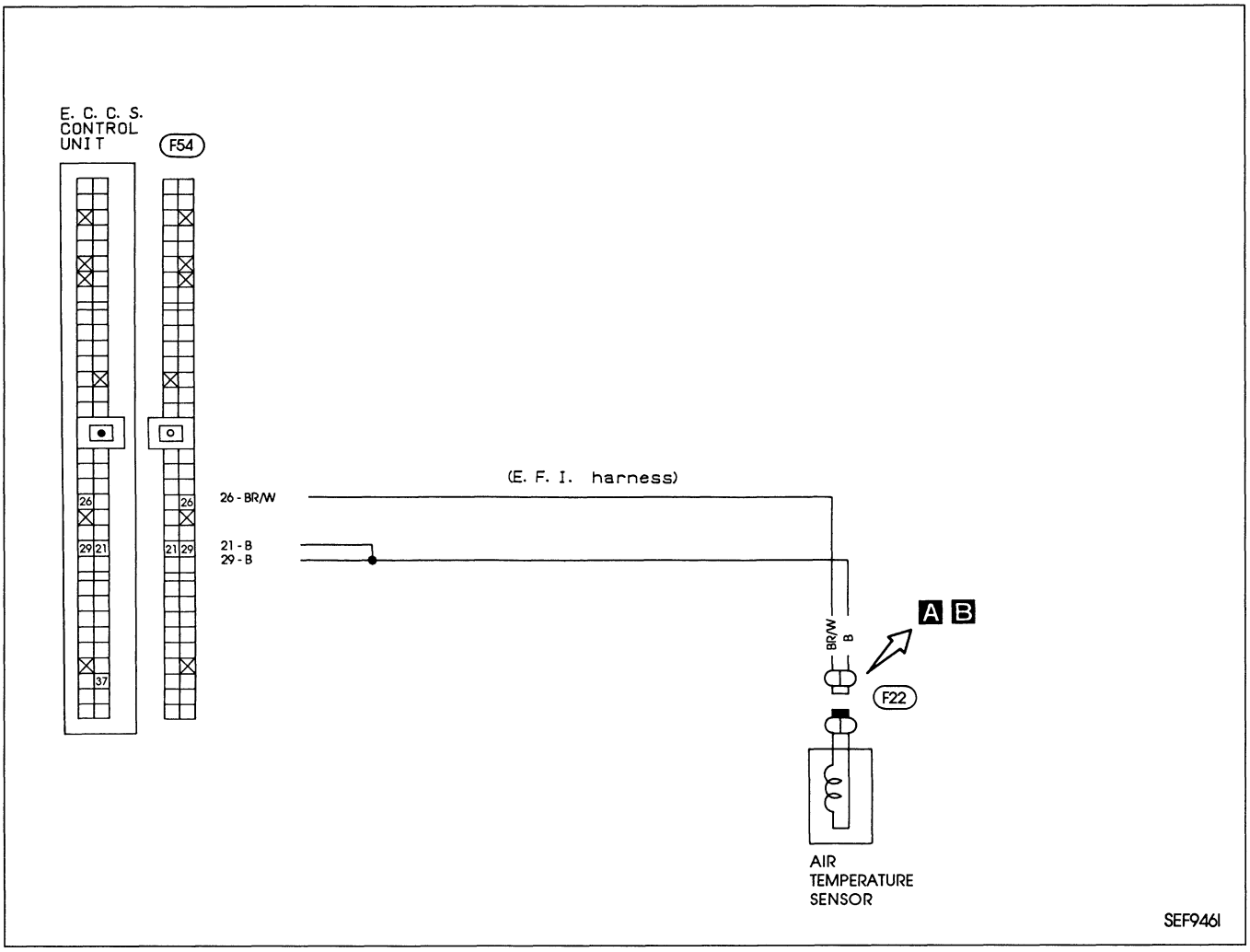
Perform FINAL CHECK by the following procedure after repair is completed.



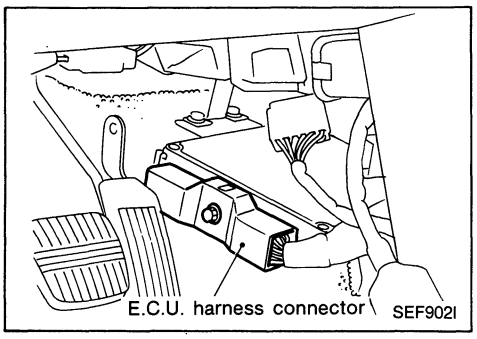
NOTE

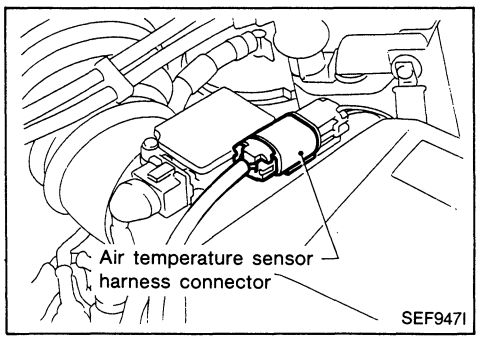
Diagnostic Procedure 32

AIR TEMPERATURE SENSOR (Code No. 41)

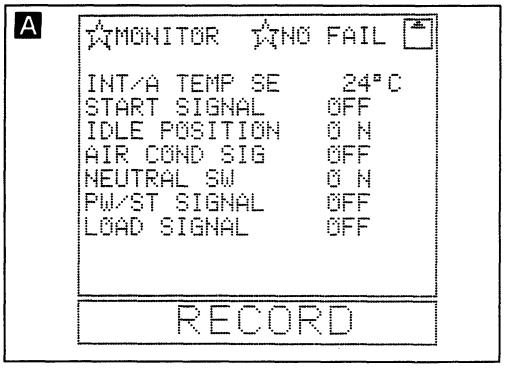


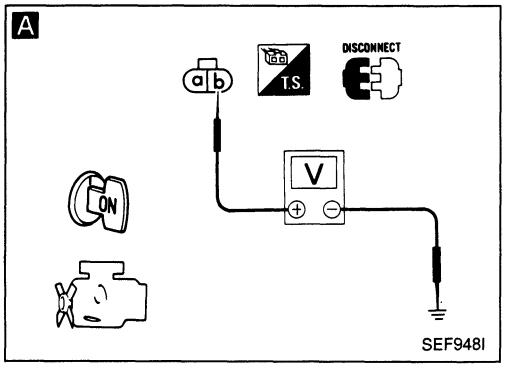
Harness layout

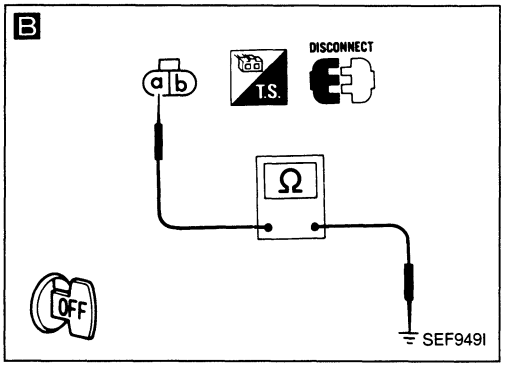




Diagnostic Procedure 32 (Cont'd)







INSPECTION START

A

CHECK POWER SUPPLY.

Read intake air temperature sensor signal in "DATA MONITOR" mode with CONSULT after engine warm-up.

Intake air temperature: 20 - 60°C (68 - 140°F)

N.G. → Repair harness or connectors.

OR

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

Voltage: Approximately 5V

O.K.

Turn ignition switch "OFF".

Disconnect air 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 (Air temperature sensor).

Refer to "Electrical Components Inspection". (See page EF & EC-189.)

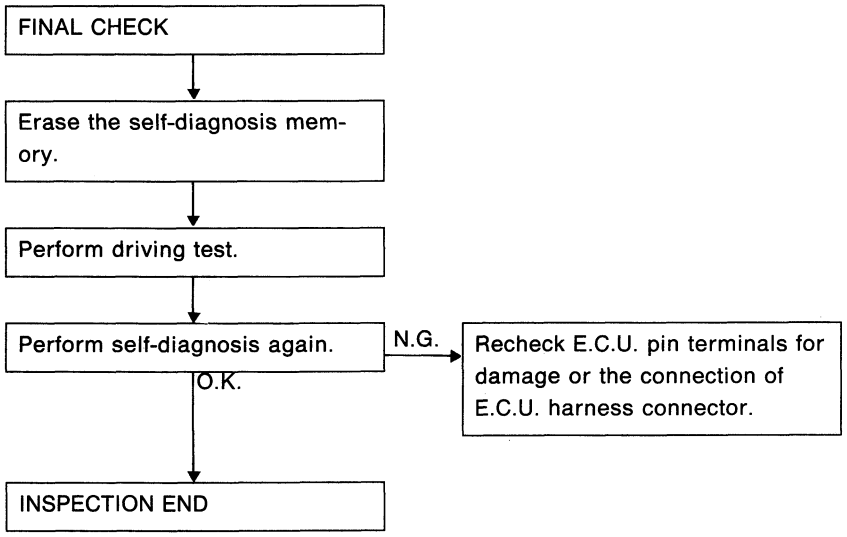
N.G. → Replace air temperature sensor.

O.K.

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

Diagnostic Procedure 32 (Cont'd)

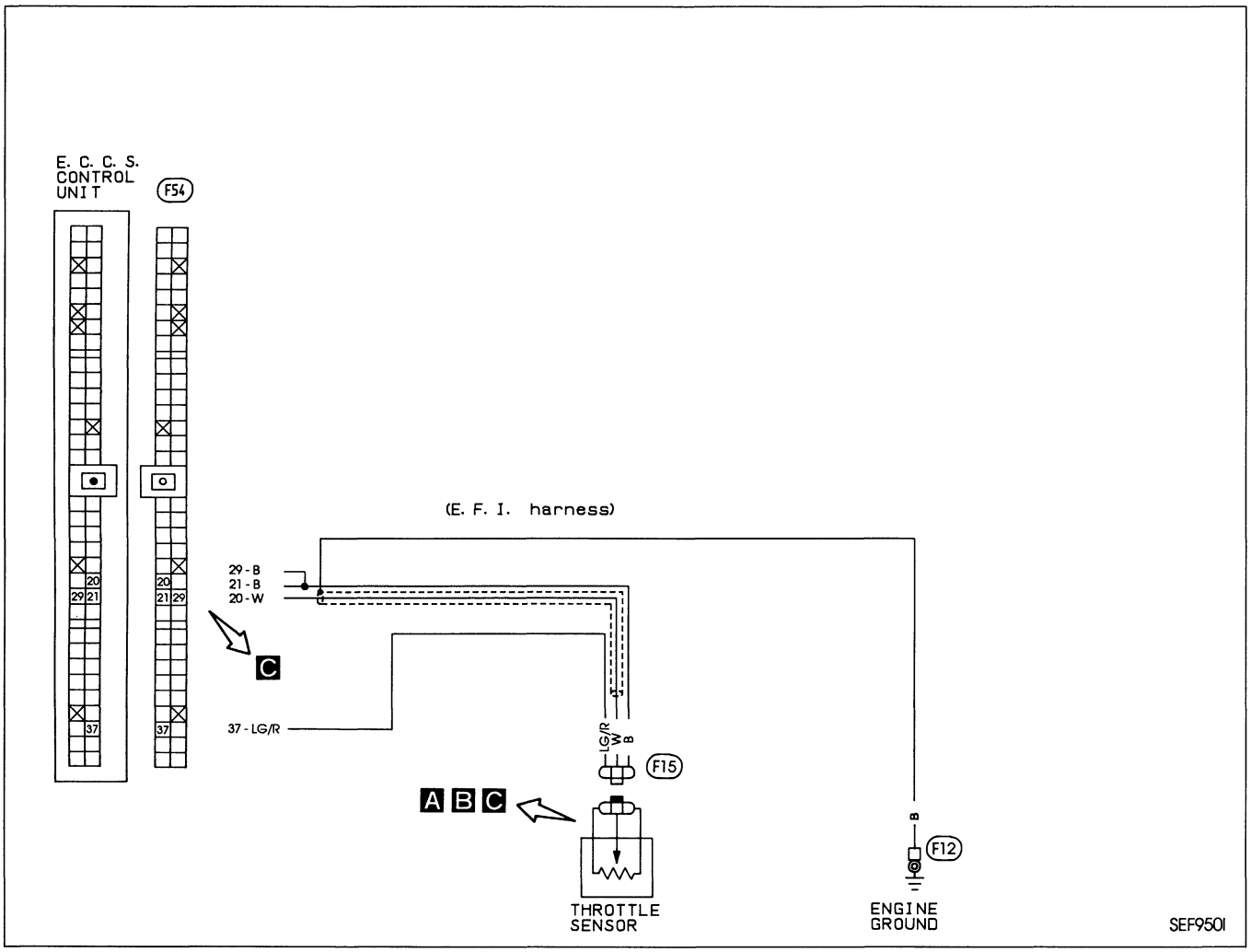
Perform FINAL CHECK by the following procedure after repair is completed.



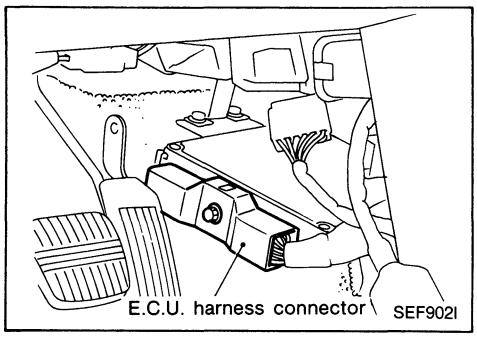
NOTE

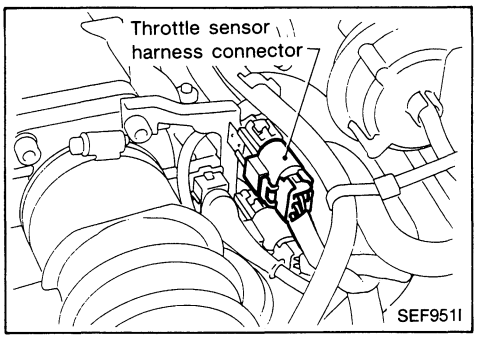
Diagnostic Procedure 33

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

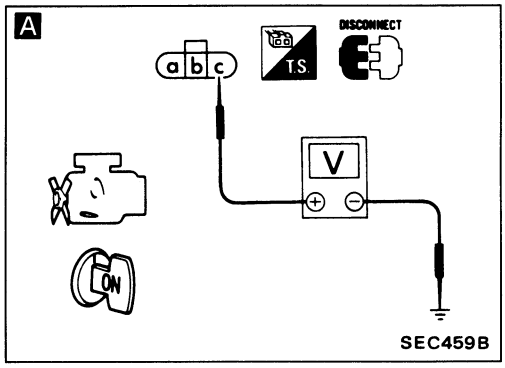


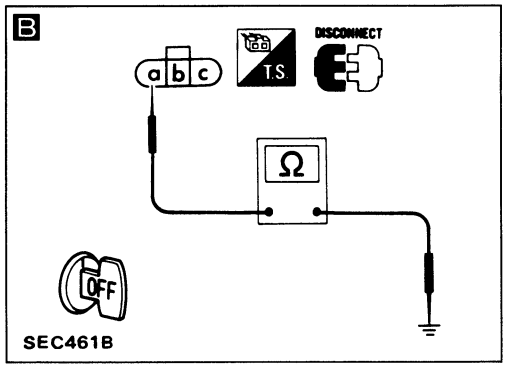
Harness layout

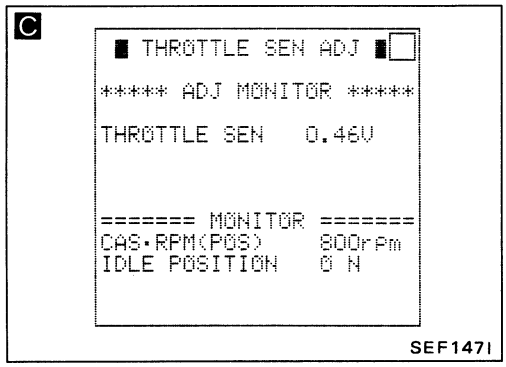


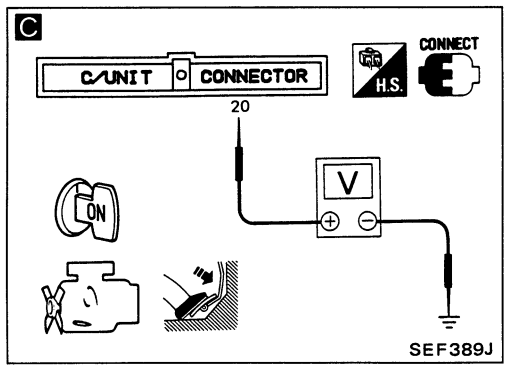


Diagnostic Procedure 33 (Cont'd)









INSPECTION START

A

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

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.

N.G. → Repair harness or connectors.

1) Reconnect throttle sensor harness connector.
2) Turn ignition switch "ON".
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

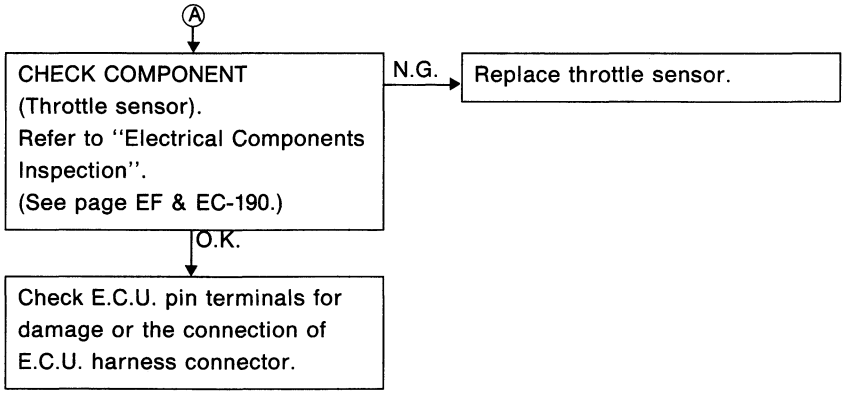
OR

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

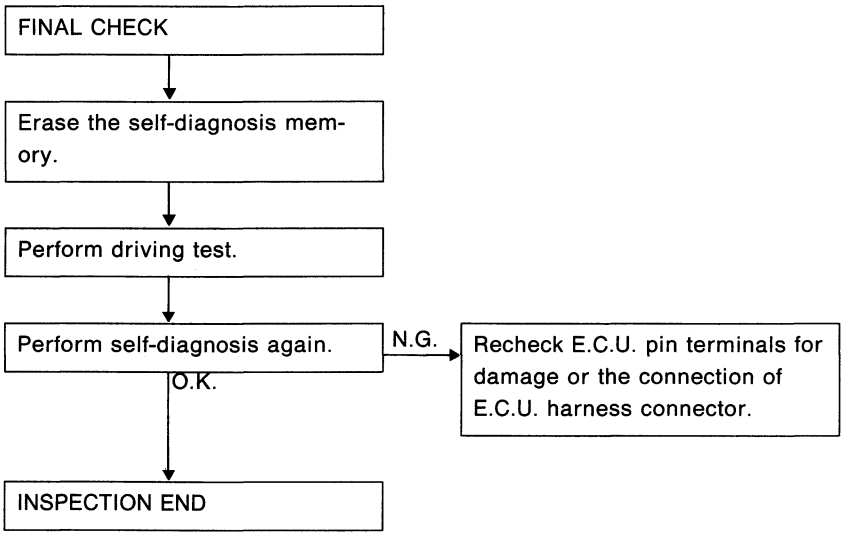
O.K.

Ⓐ

Diagnostic Procedure 33 (Cont'd)



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

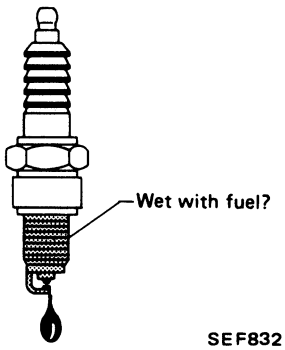


NOTE

Diagnostic Procedure 34

INJECTOR LEAK (Code No. 45) (CHECK ENGINE LIGHT ITEM); CALIFORNIA MODEL ONLY

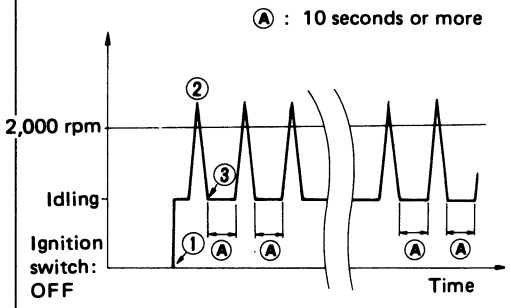
A



SEF832F

B

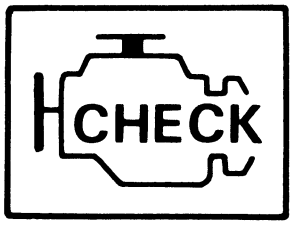
Engine racing mode



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.

Does not run smoothly → Set the diagnosis mode selector of E.C.U. to Mode I.

Check if the green L.E.D. on E.C.U. stays off for 10 seconds with engine at idle speed.

Stays off

Does not stay off → Check mixture ratio feedback system. (See page EF & EC-29.)

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

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-194.) Keep fuel hose and all injectors connected to injector gallery.

Turn ignition switch "ON". Make sure fuel does not drip from injector.

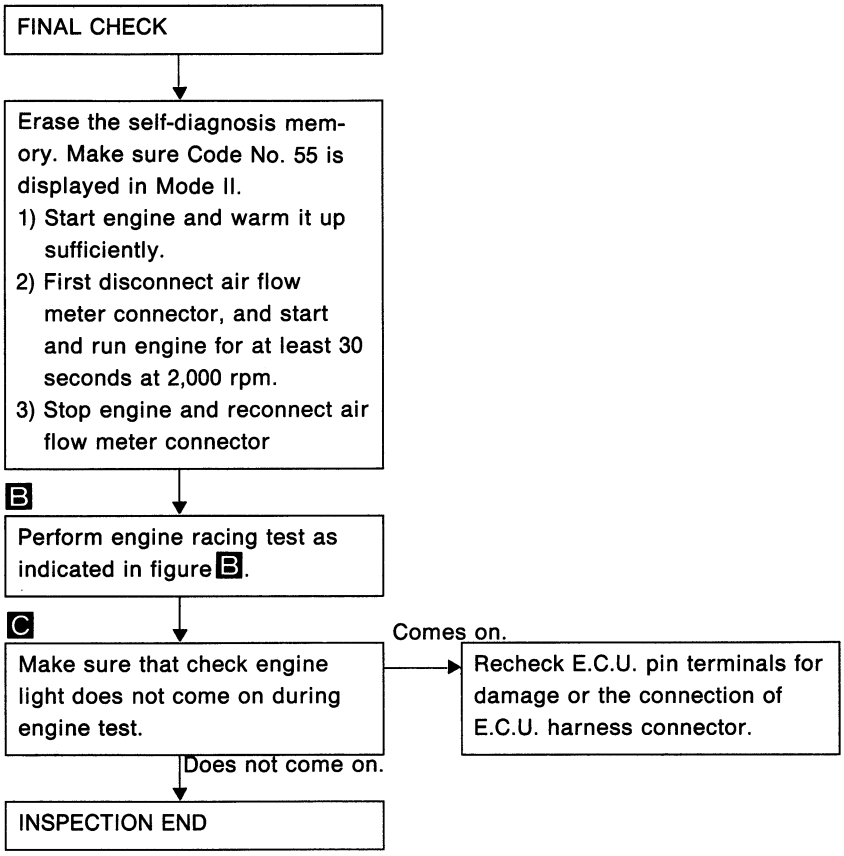
Drips → Replace the injectors from which fuel is dripping.

Does not drip

Go to FINAL CHECK.

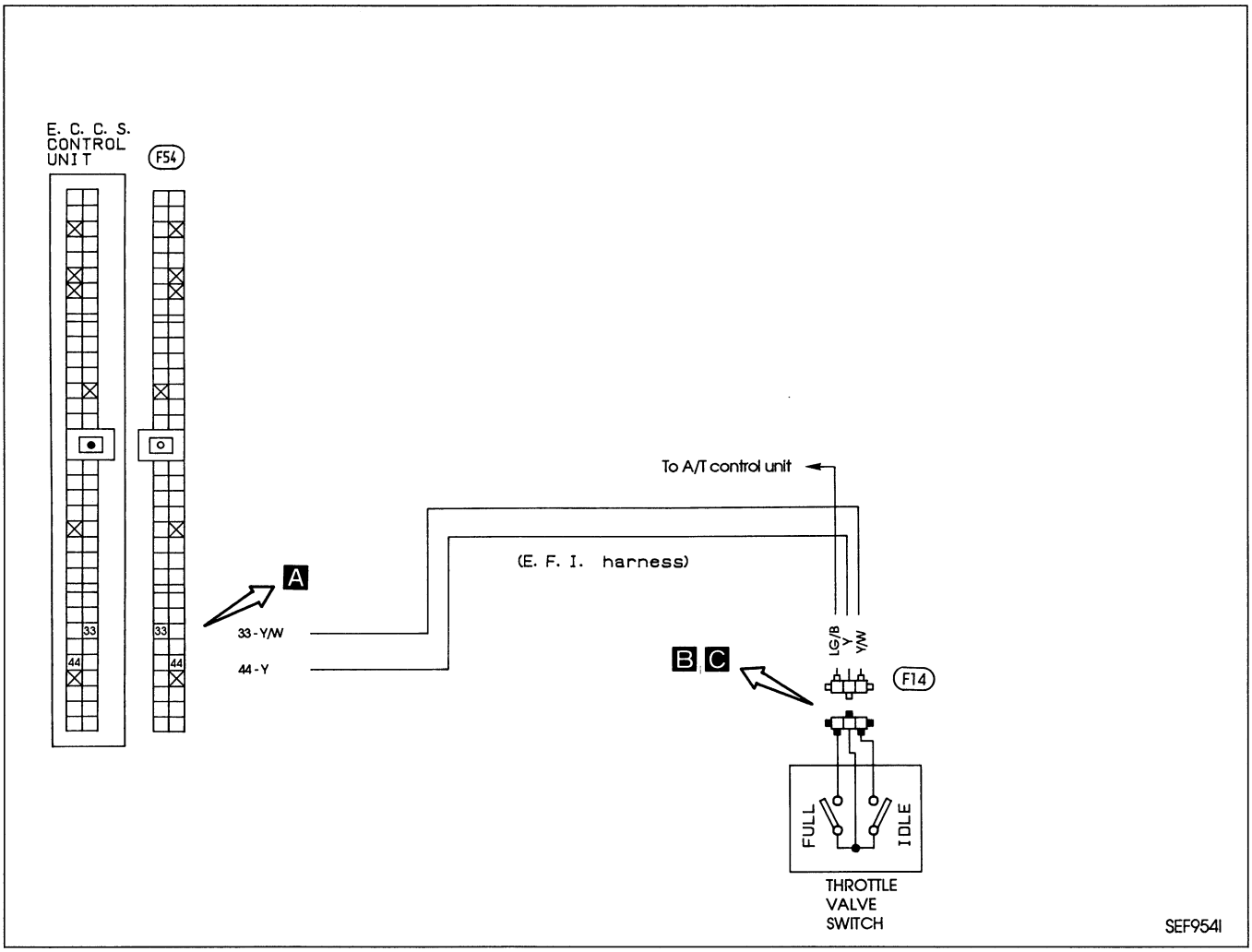
Diagnostic Procedure 34 (Cont'd)

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

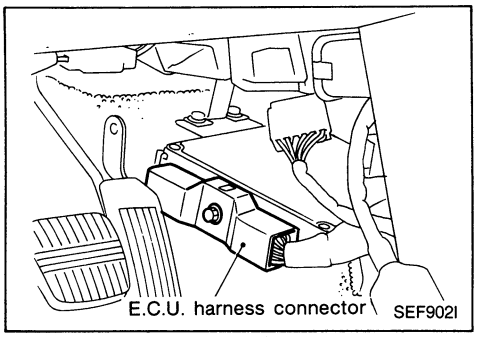


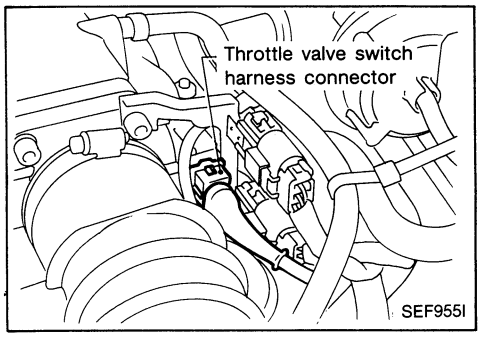
Diagnostic Procedure 35

THROTTLE VALVE SWITCH (Not self-diagnostic item)

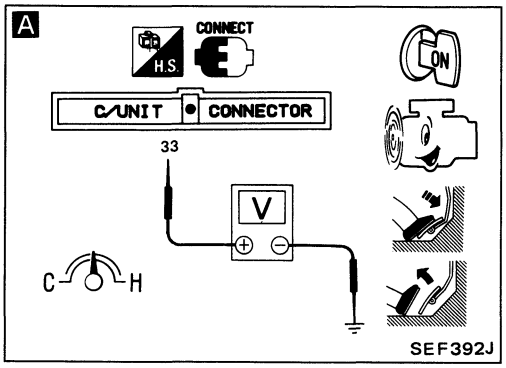


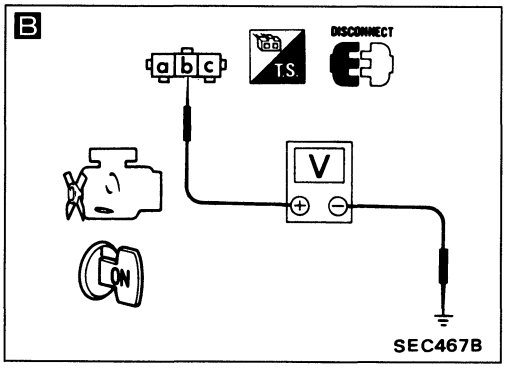
Harness layout

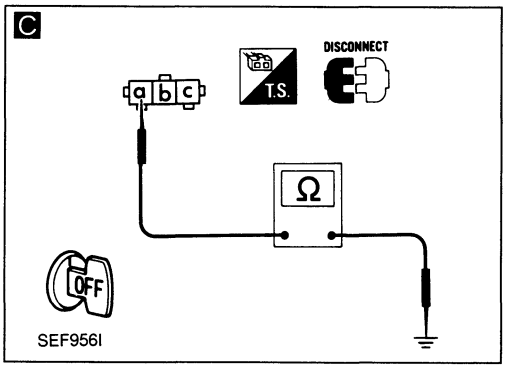




Diagnostic Procedure 35 (Cont'd)







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-192.)

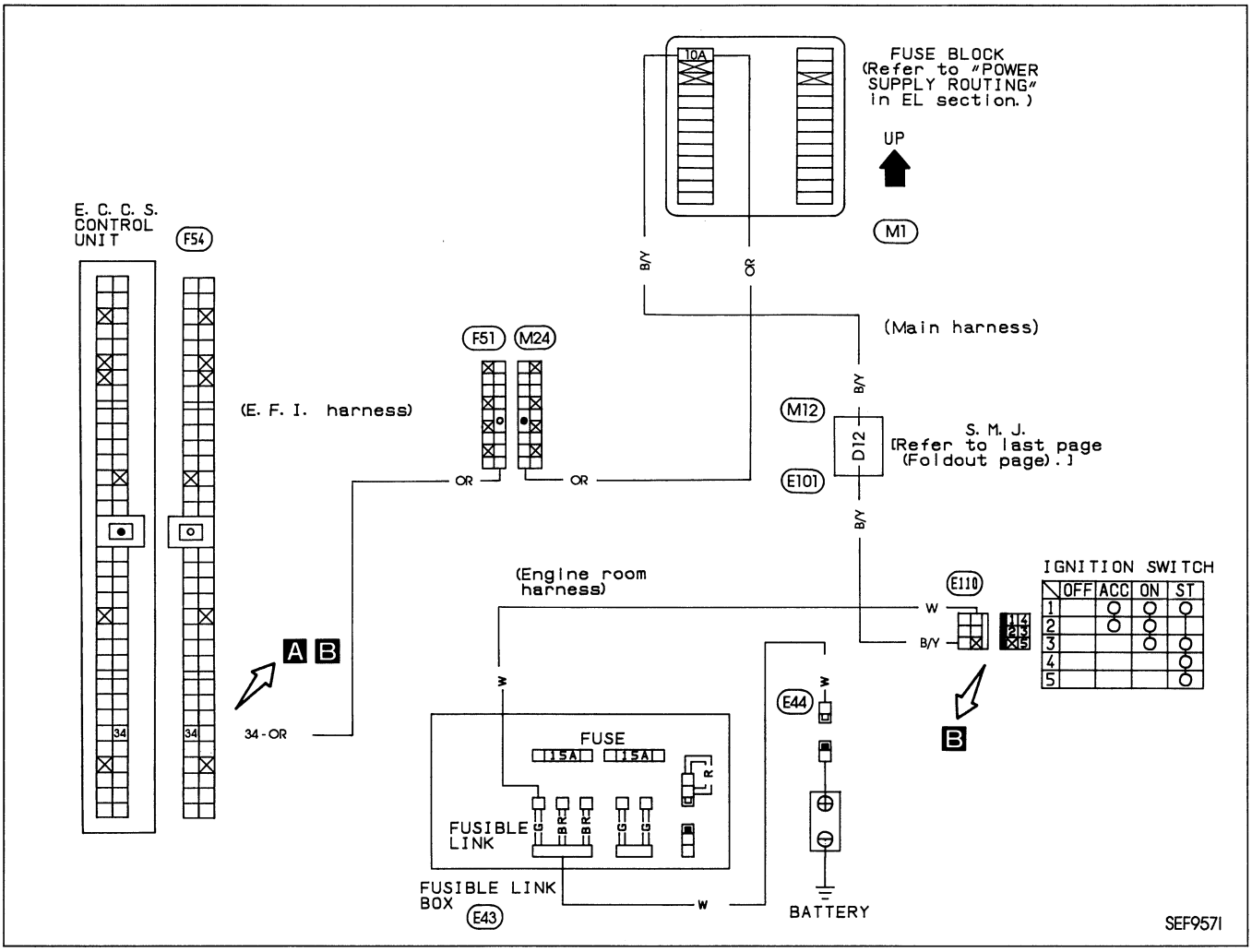
N.G. → Replace throttle valve switch.

O.K.

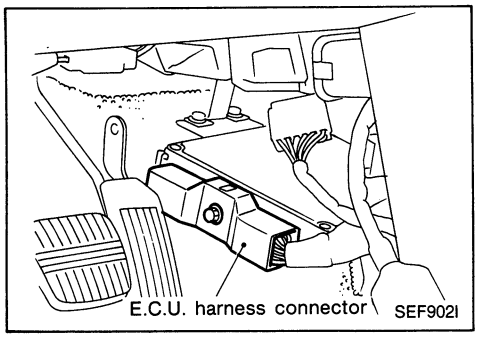
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 36

START SIGNAL (Not self-diagnostic item)

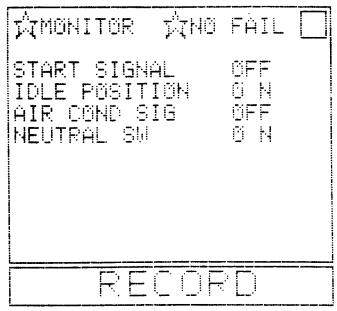


Harness layout



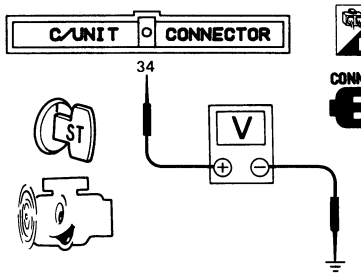
Diagnostic Procedure 36 (Cont'd)

A



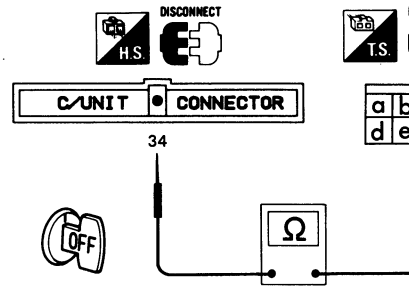
SEF149I

A



SEF958I

B



SEF392J

INSPECTION START

A

CHECK OVERALL FUNCTION.

1) Turn ignition switch "ON".
2) Check start signal in "DATA MONITOR" mode with CONSULT.

IGN "ON"	OFF
IGN "START"	ON

O.K. → INSPECTION END

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

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

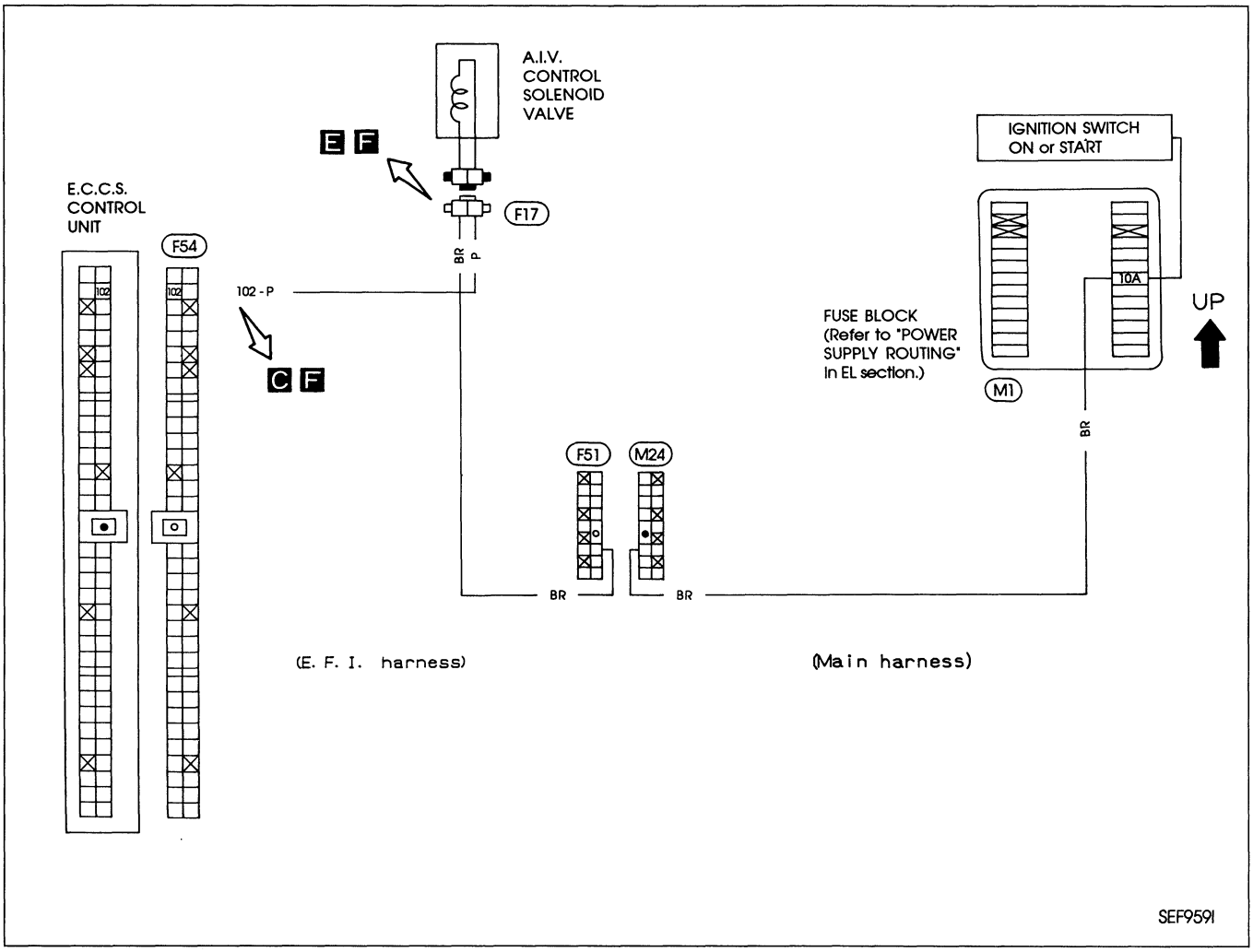
If N.G., repair harness or connectors.

O.K.

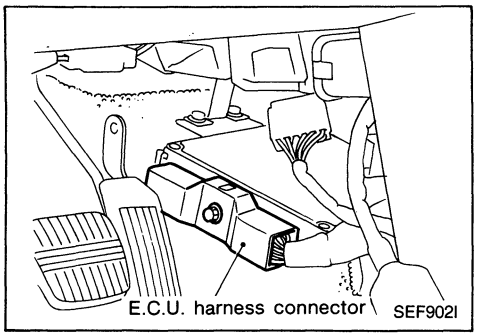
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

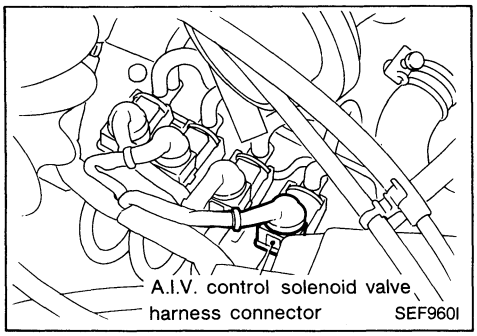
Diagnostic Procedure 37

A.I.V. CONTROL (Not self-diagnostic item)



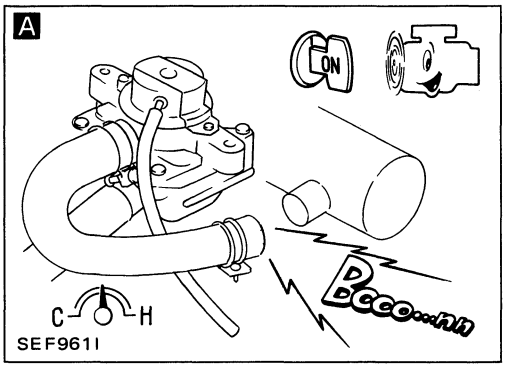
Harness layout



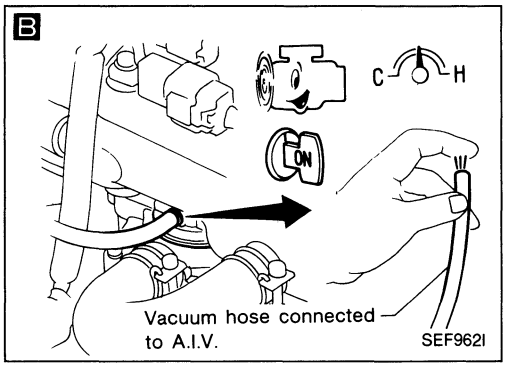


Diagnostic Procedure 37 (Cont'd)

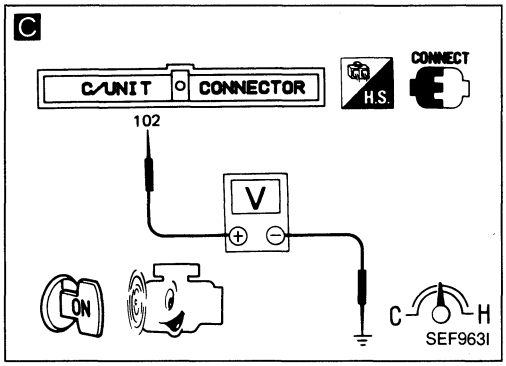
A



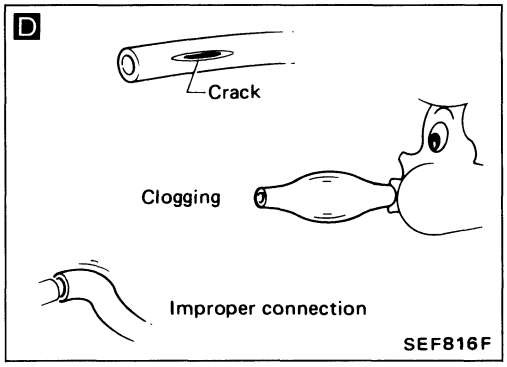
B



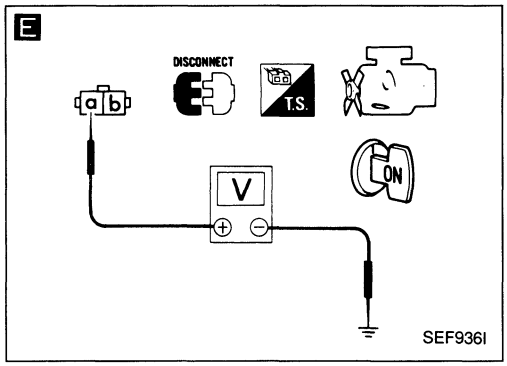
C



D



E



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-192.)

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

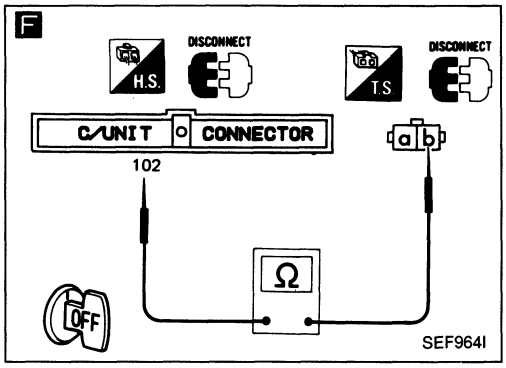
O.K. → CHECK VACUUM HOSE.
Check vacuum hose for clogging, cracks and proper connections.

N.G. ↓

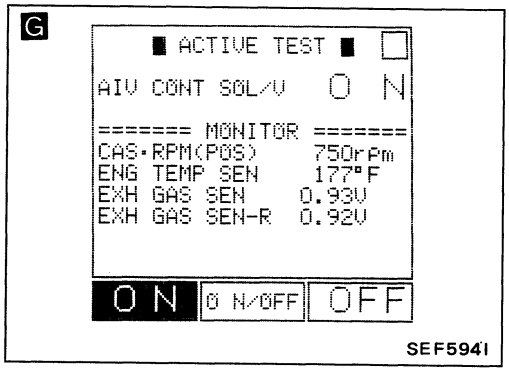
Ⓐ

Diagnostic Procedure 37 (Cont'd)

F



G



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.

N.G. → Replace A.I.V. control solenoid valve.

OR

Refer to "Electrical Components Inspection". (See page EF & EC-189.)

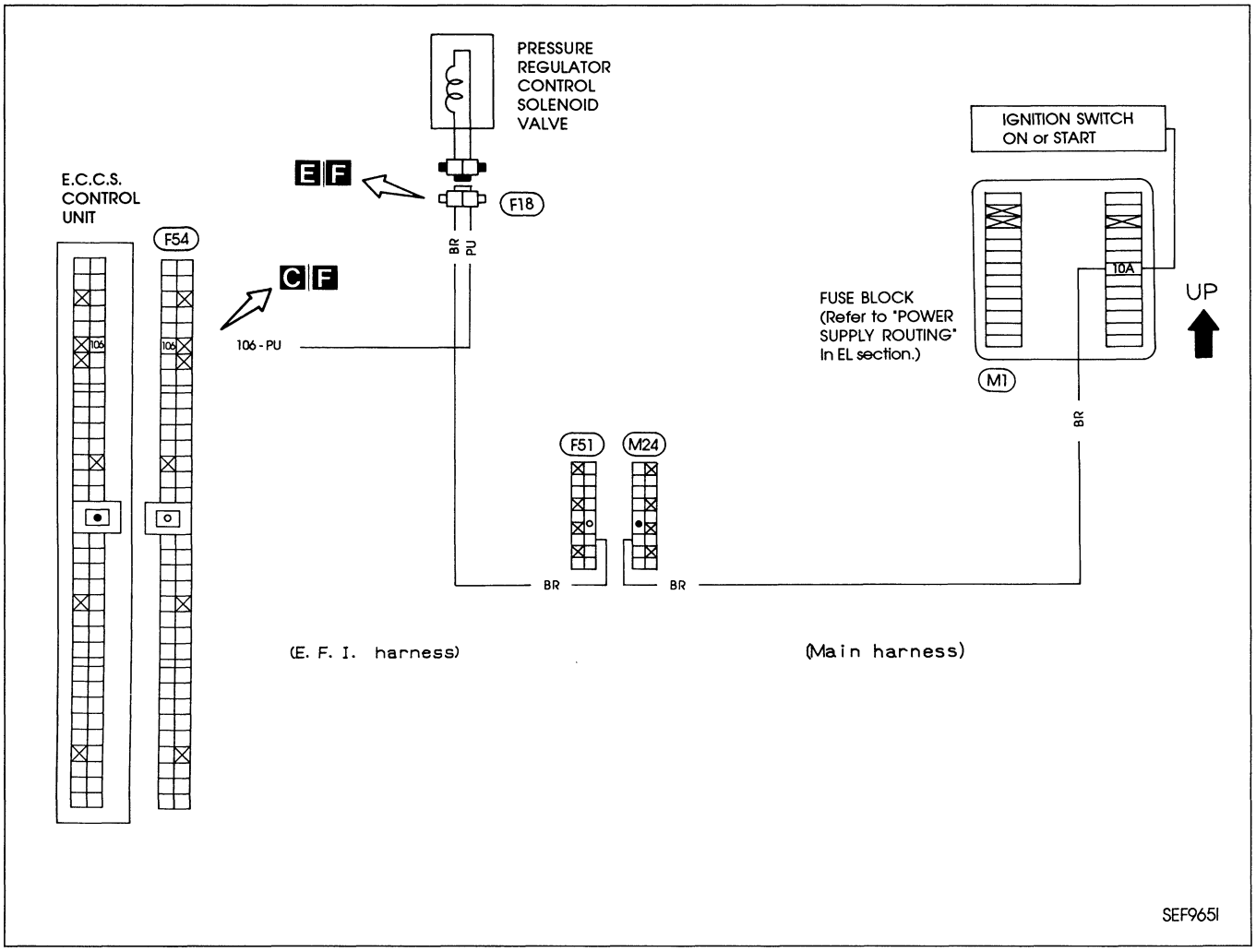
O.K. ↓

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

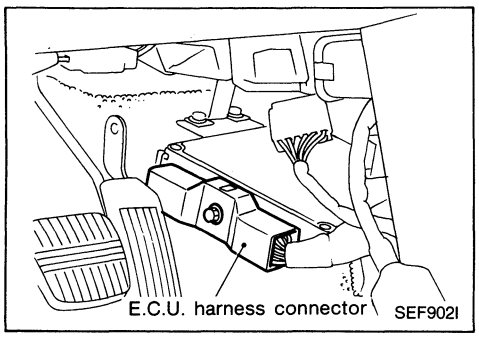
NOTE

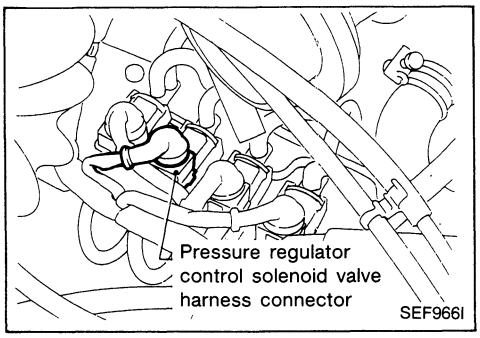
Diagnostic Procedure 38

P.R.V.R. CONTROL (Not self-diagnostic item)

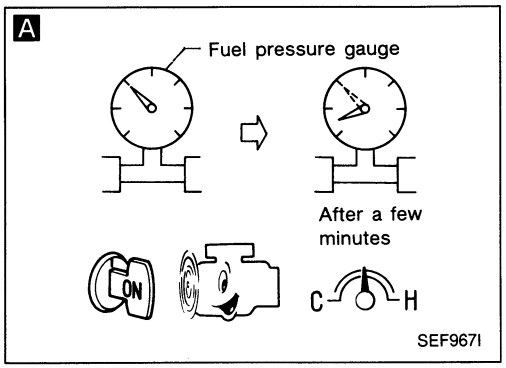


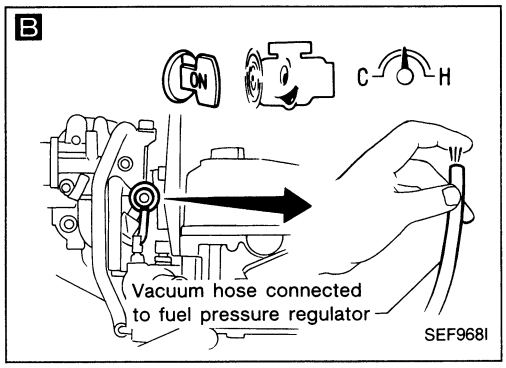
Harness layout

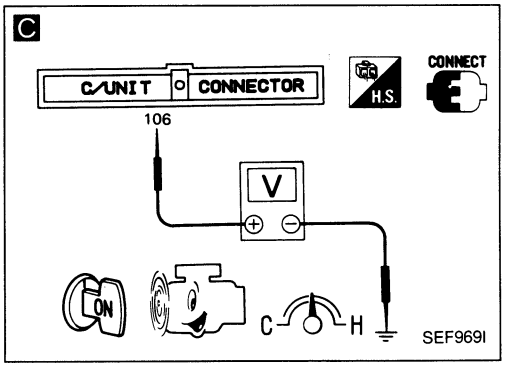


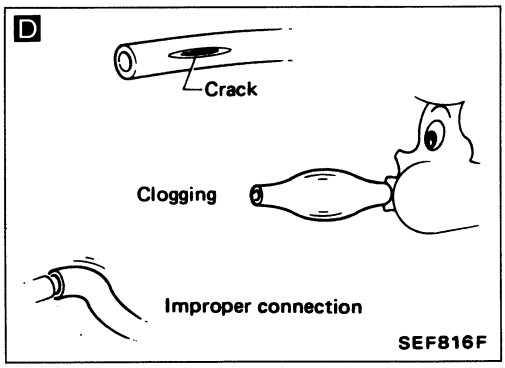


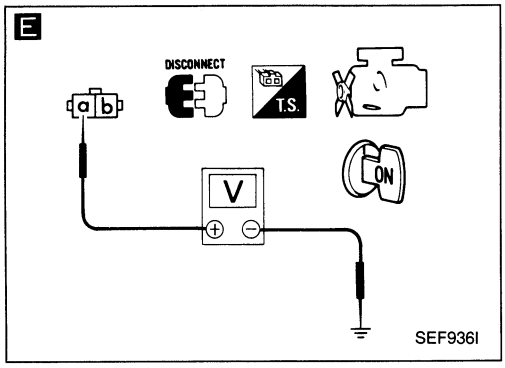
Diagnostic Procedure 38 (Cont'd)











INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Install fuel pressure gauge in fuel feed hose. (See page EF & EC-193.)
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/cm², 43 psi)
5) Make sure that fuel pressure decreases after a few minutes.
   Fuel pressure:
   Approximately 226 kPa (2.3 kg/cm², 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-193.)

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

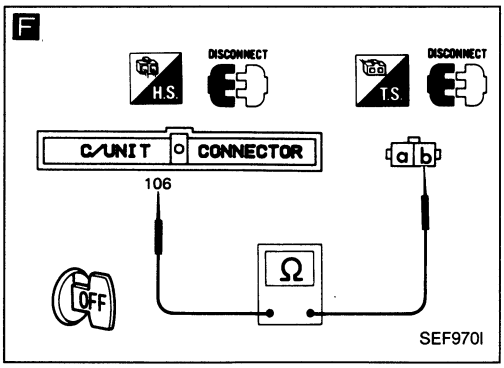
O.K. → **D** CHECK VACUUM HOSE.
1) Check vacuum hose for clogging, cracks and proper connections.

N.G. ↓

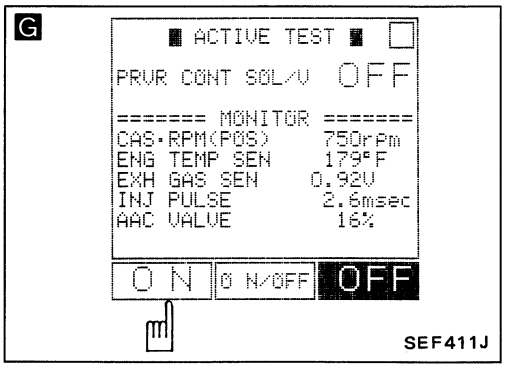
Ⓐ

Diagnostic Procedure 38 (Cont'd)

F



G



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).

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-189.)

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.

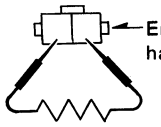
Diagnostic Procedure 38 (Cont'd)

***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.

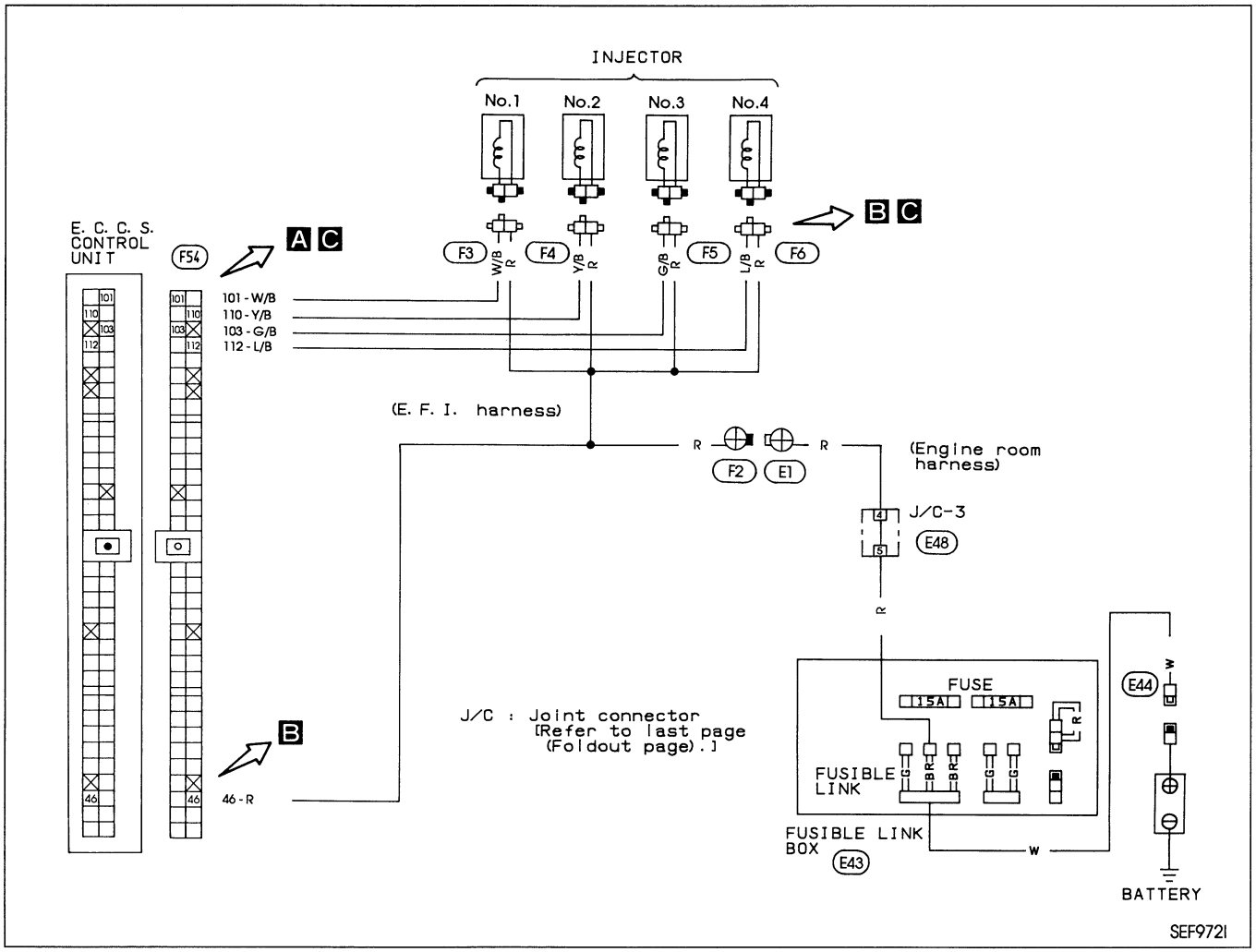
2) Perform self-diagnosis after this test. If code No. 13 is displayed, erase it.



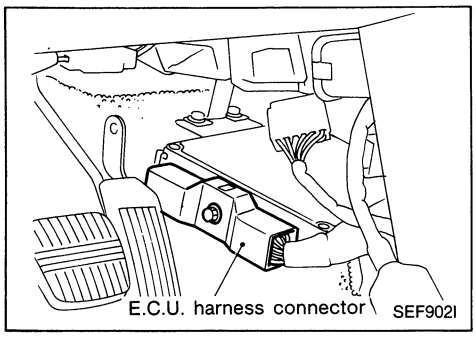
SEF971I

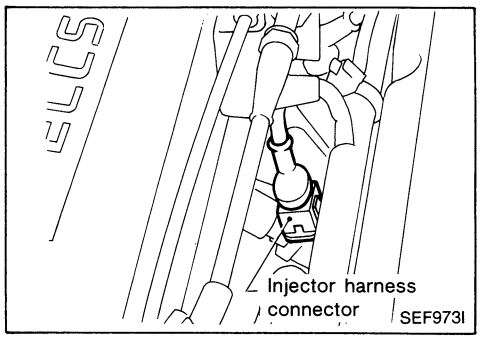
Diagnostic Procedure 39

INJECTOR (Not self-diagnostic item)



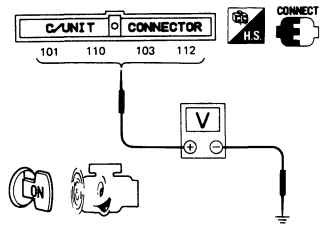
Harness layout





Diagnostic Procedure 39 (Cont'd)

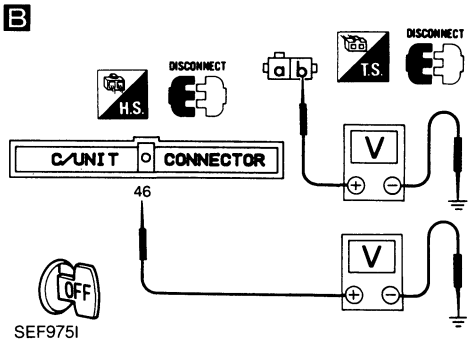
A



(101) : No. 1 cylinder (103) : No. 3 cylinder
(110) : No. 2 cylinder (112) : No. 4 cylinder

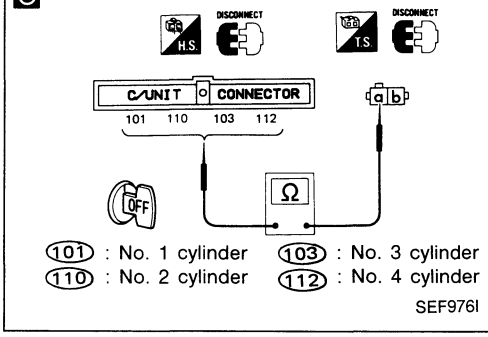
SEF974I

B



SEF975I

C



(101) : No. 1 cylinder (103) : No. 3 cylinder
(110) : No. 2 cylinder (112) : No. 4 cylinder

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 (F2), (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-191.)

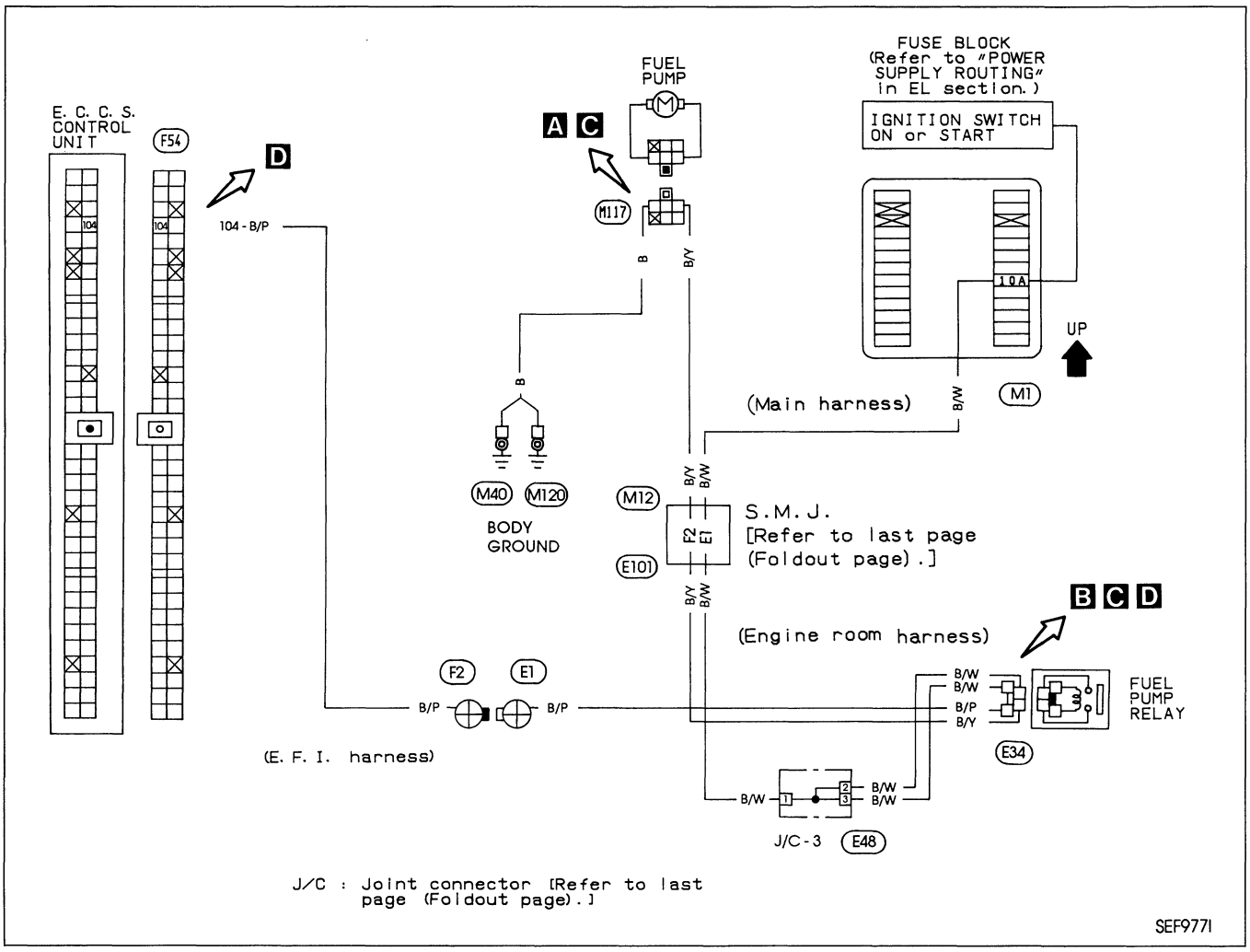
N.G. → Replace injector.

O.K. ↓

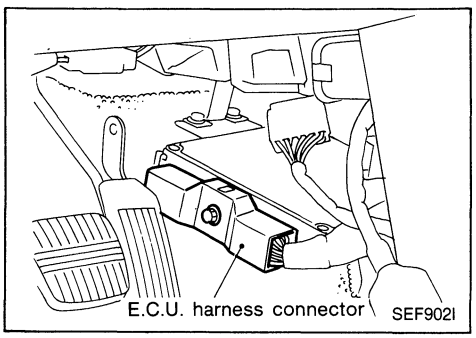
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

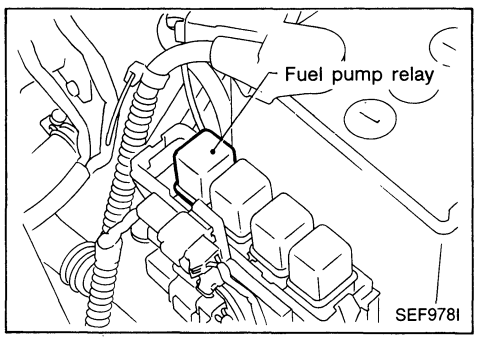
Diagnostic Procedure 40

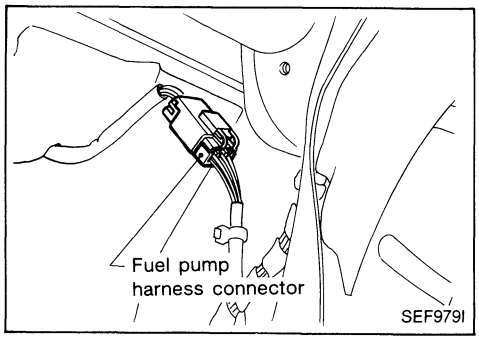
FUEL PUMP (Not self-diagnostic item)



Harness layout

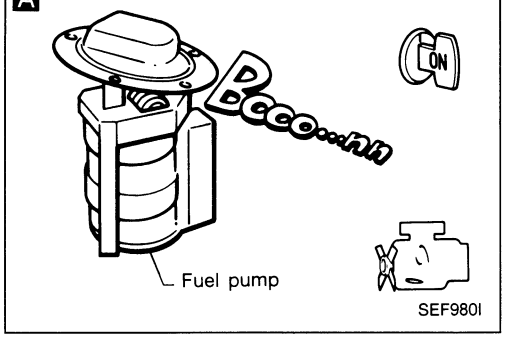




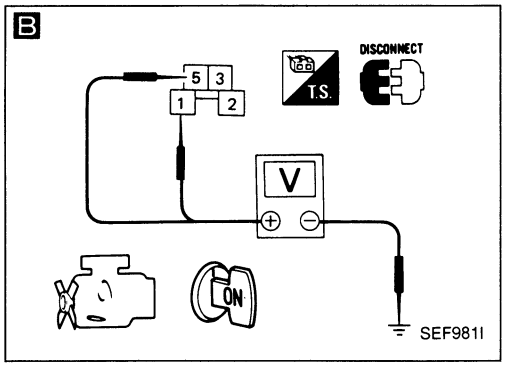


Diagnostic Procedure 40 (Cont'd)

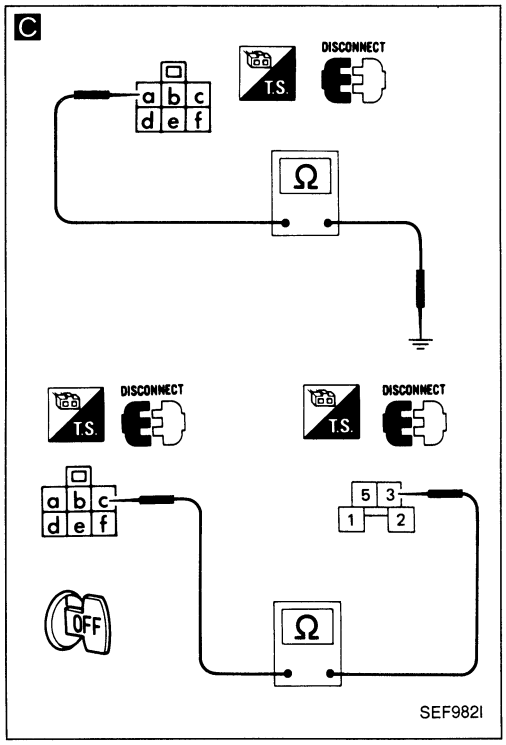
A



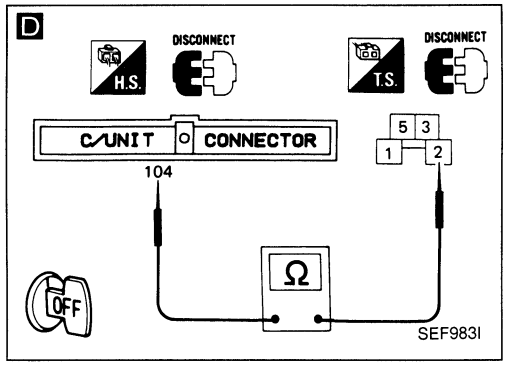
B



C



D



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 ⓐ and body ground, terminal ⓒ 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 (F2), (E1)
- Harness continuity between E.C.U. and fuel pump relay

If N.G., repair harness or connectors.

O.K.

CHECK COMPONENTS
(Fuel pump and fuel pump relay).
Refer to "Electrical Components Inspection".
(See page EF & EC-190/191.)

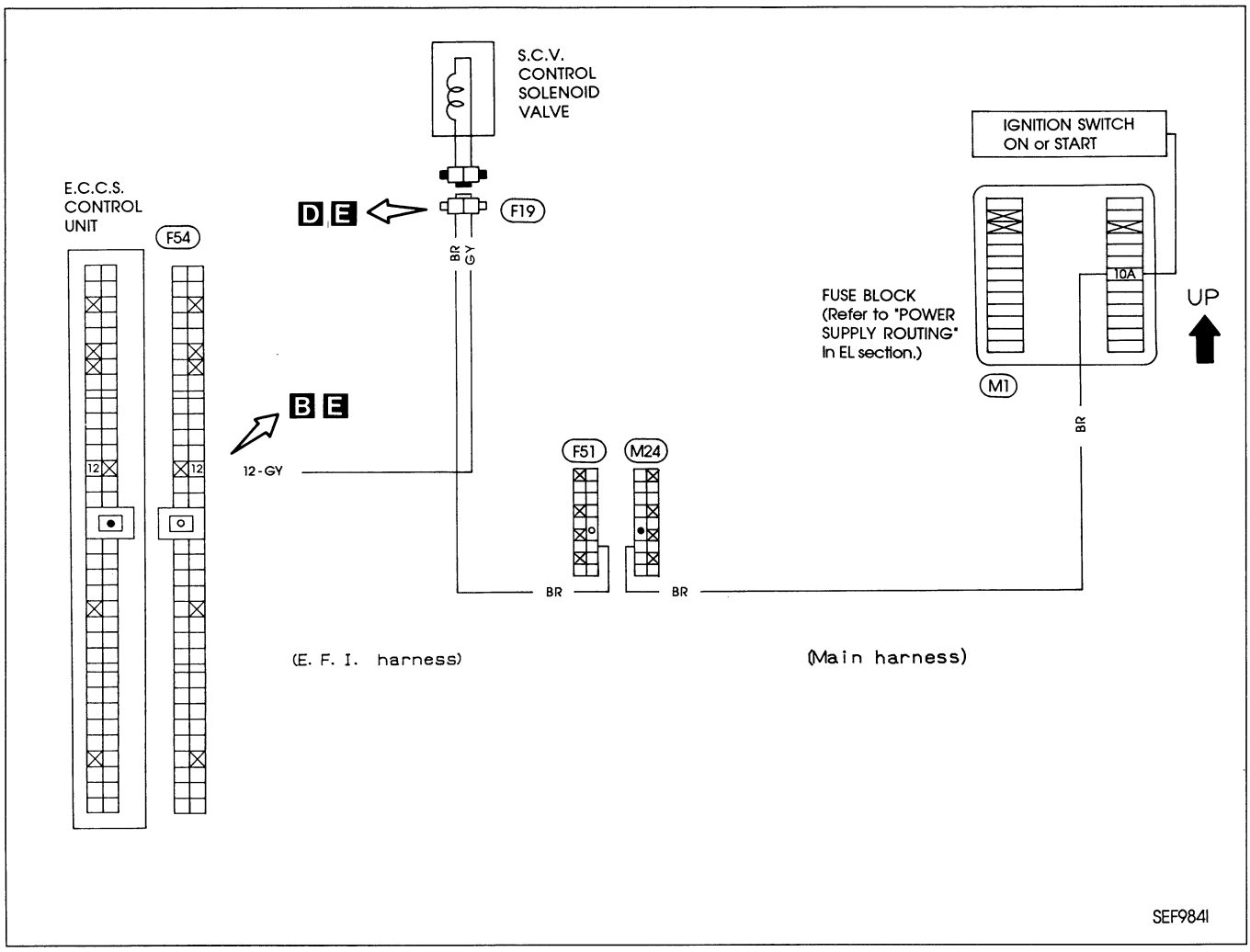
N.G. → Replace malfunctioning component(s).

O.K.

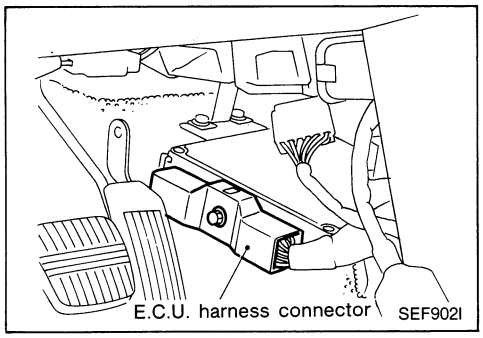
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

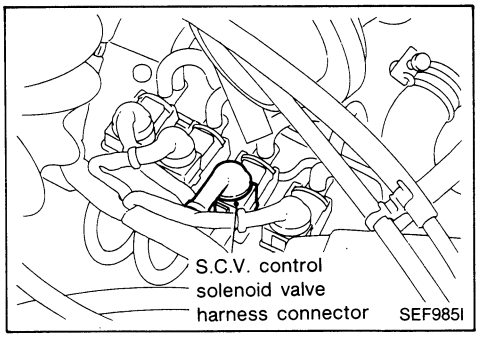
Diagnostic Procedure 41

S.C.V. CONTROL (Not self-diagnostic item)



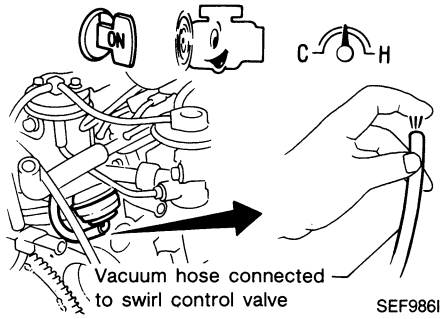
Harness layout



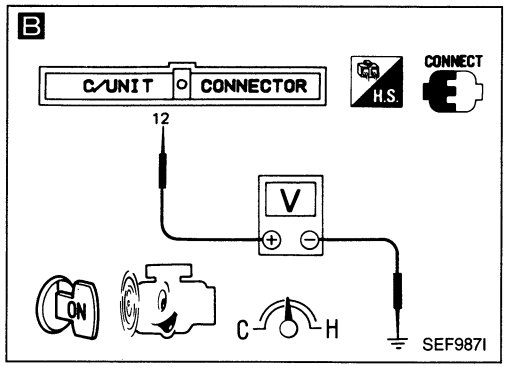


Diagnostic Procedure 41 (Cont'd)

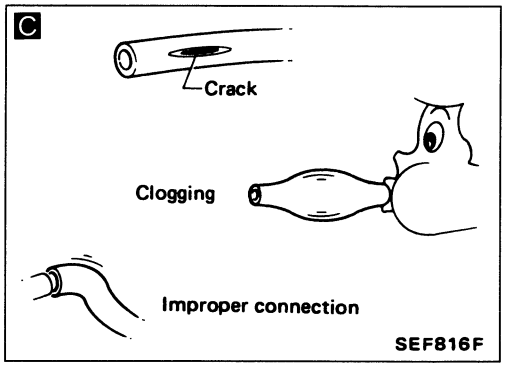
A



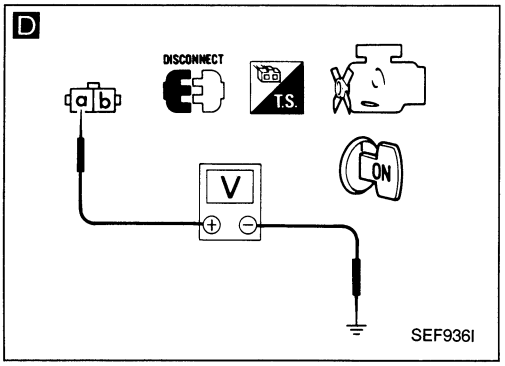
B



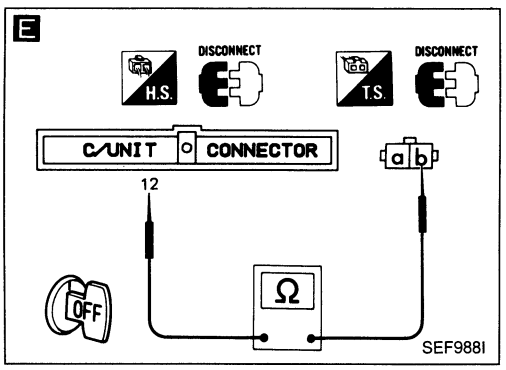
C



D



E



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) 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

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 a) and ground.

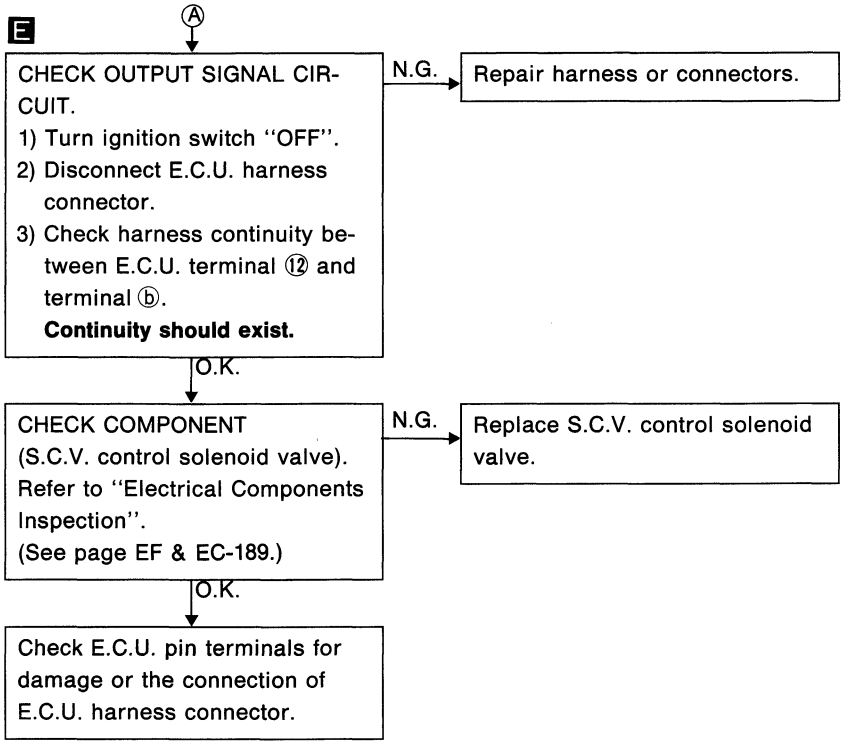
Voltage: Battery voltage

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. ↓ Ⓐ

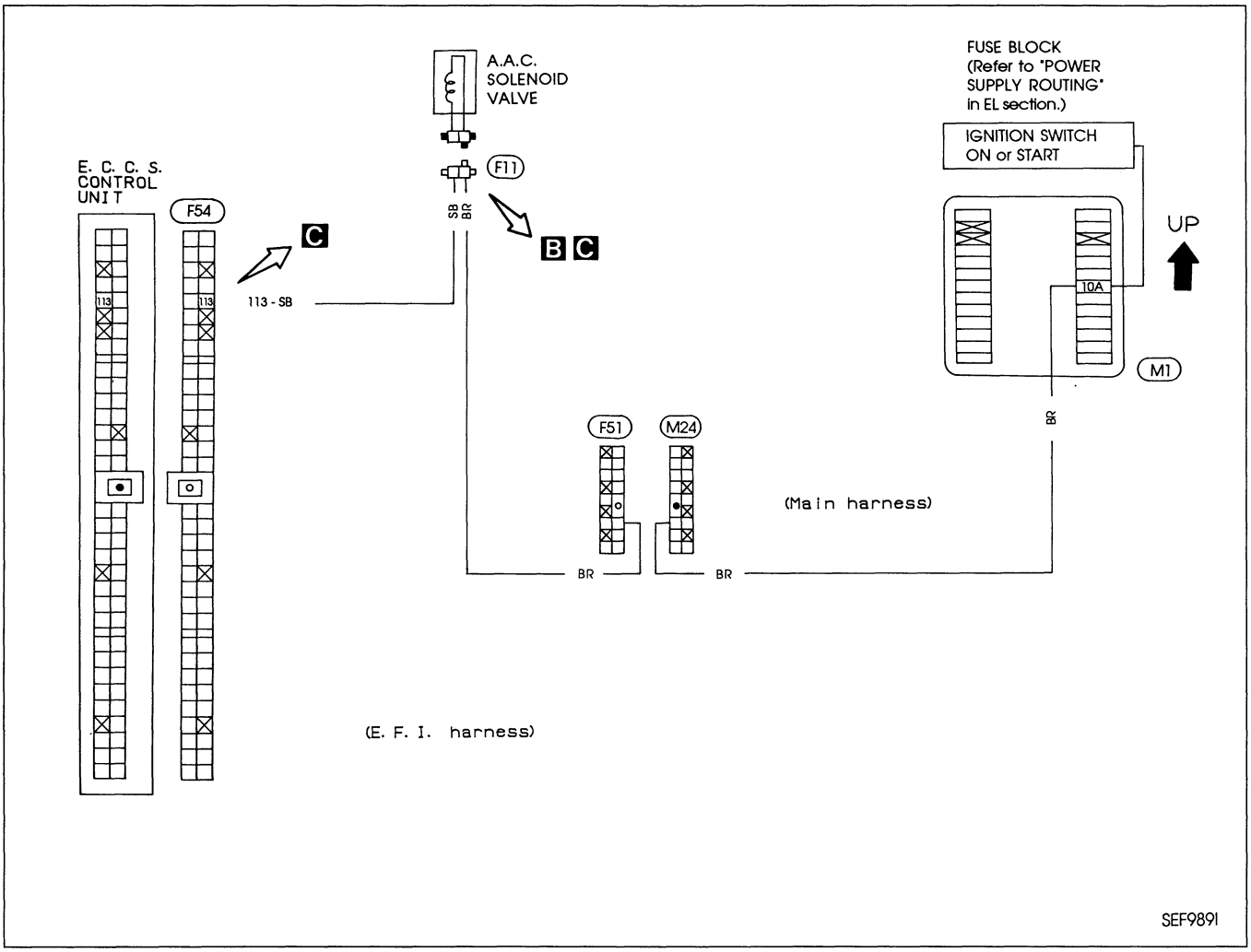
Diagnostic Procedure 41 (Cont'd)



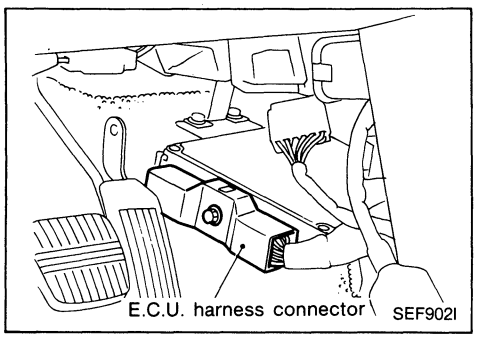
NOTE

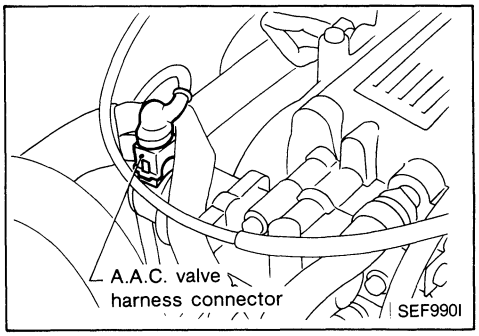
Diagnostic Procedure 42

A.A.C. VALVE (Not self-diagnostic item)



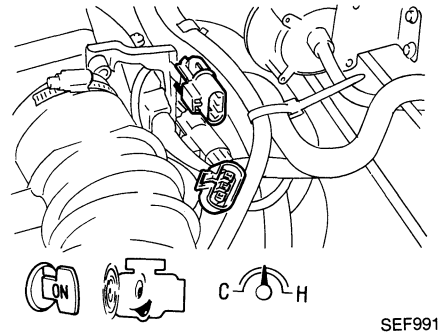
Harness layout





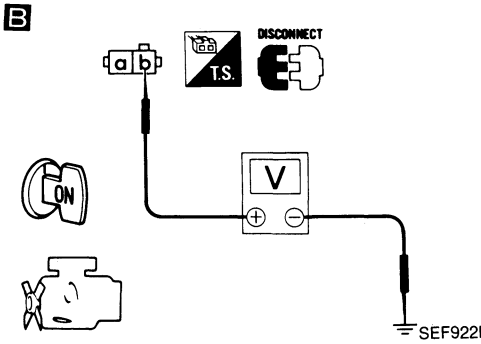
Diagnostic Procedure 42 (Cont'd)

A



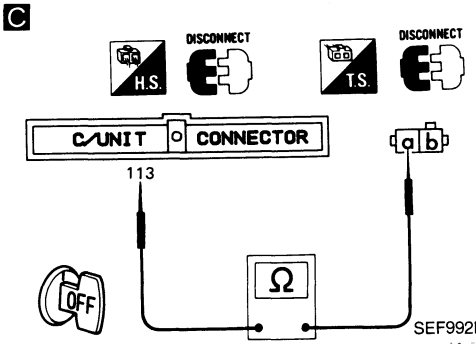
SEF991I

B



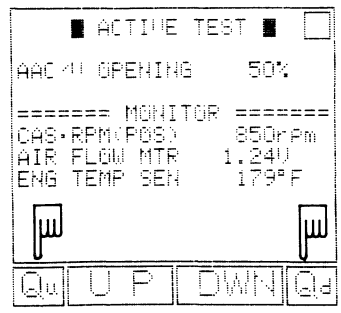
SEF922I

C



SEF992I

D



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-190.)

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 b) 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

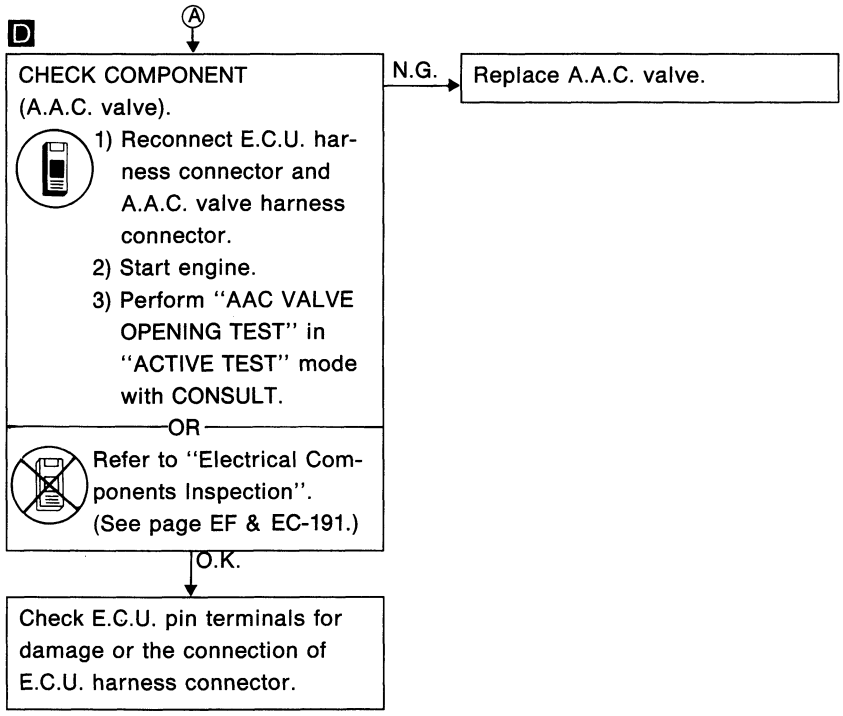
CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect E.C.U. harness connector.
3) Check harness continuity between E.C.U. terminal (113) and terminal ⓐ.
Continuity should exist.

N.G. → Repair harness or connectors.

O.K.

Ⓐ

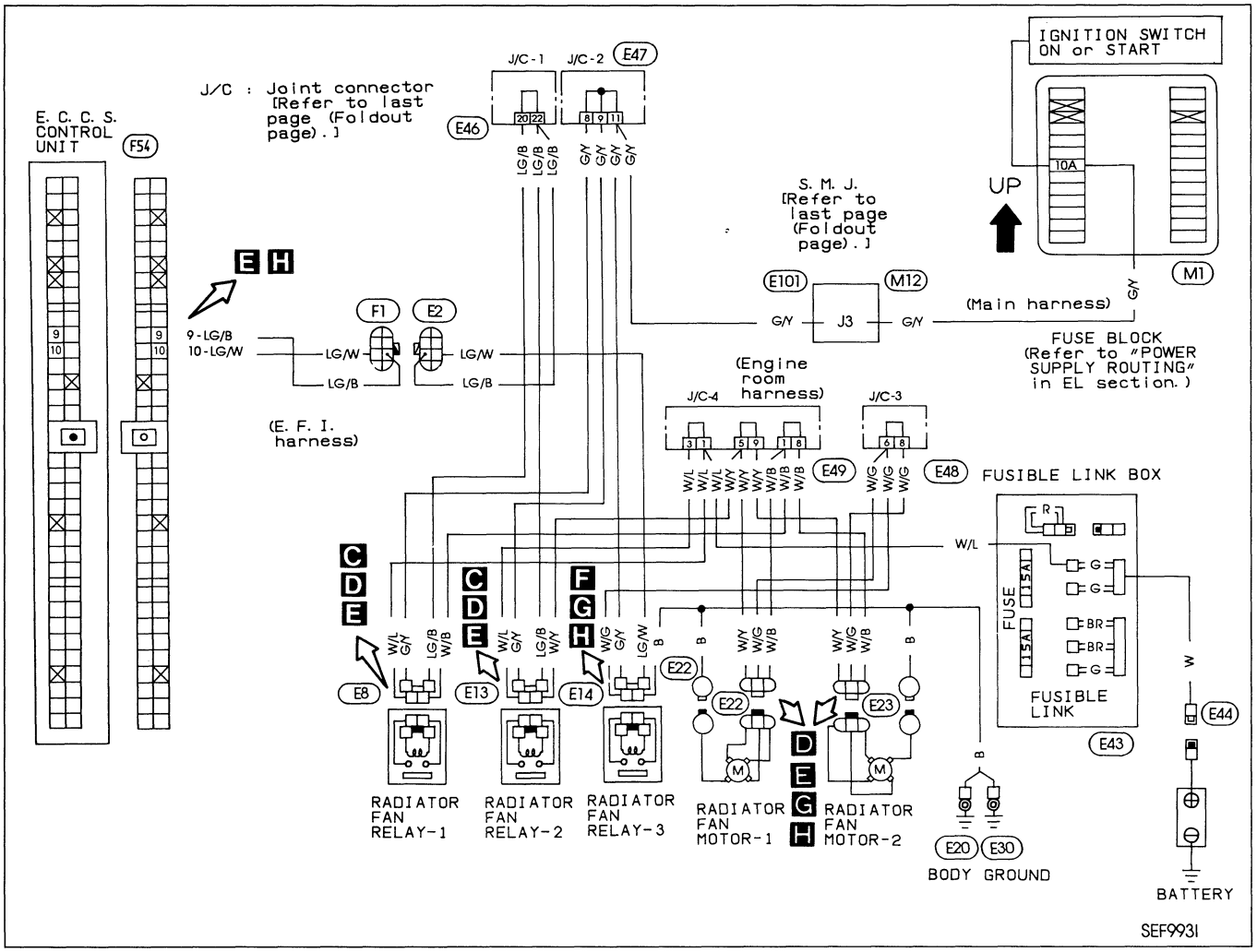
Diagnostic Procedure 42 (Cont'd)



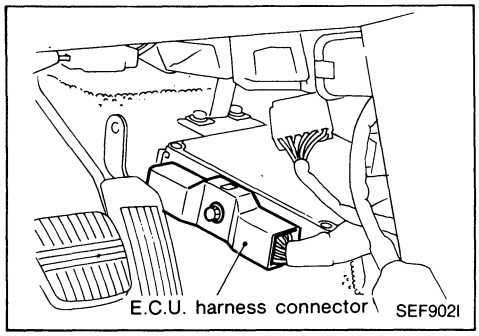
NOTE

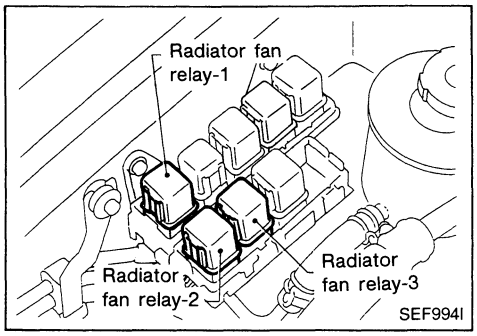
Diagnostic Procedure 43

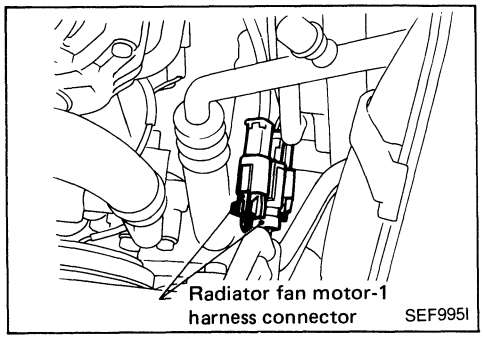
RADIATOR FAN CONTROL (Not self-diagnostic item)

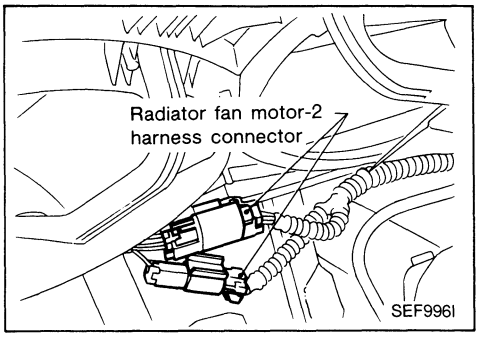


Harness layout



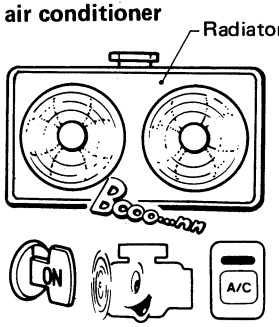




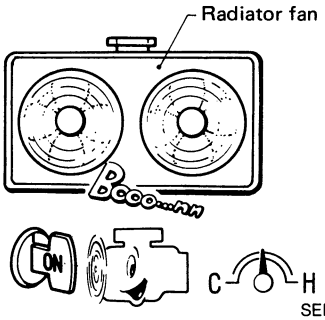


Diagnostic Procedure 43 (Cont'd)

A With air conditioner

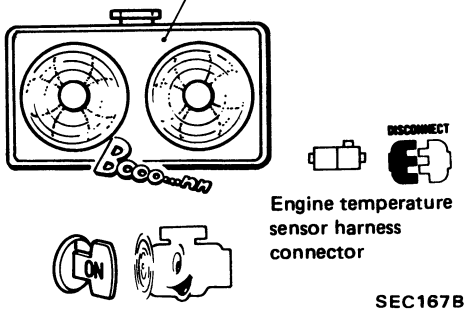


Without air conditioner



SEF997I

B



Engine temperature sensor harness connector

SEC167B

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.

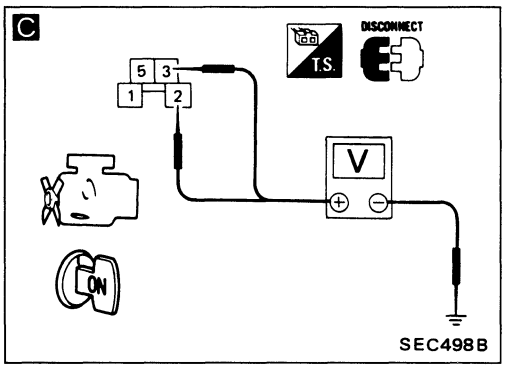
N.G. → Check radiator fan high speed control circuit. (Go to PROCEDURE B.)

O.K.

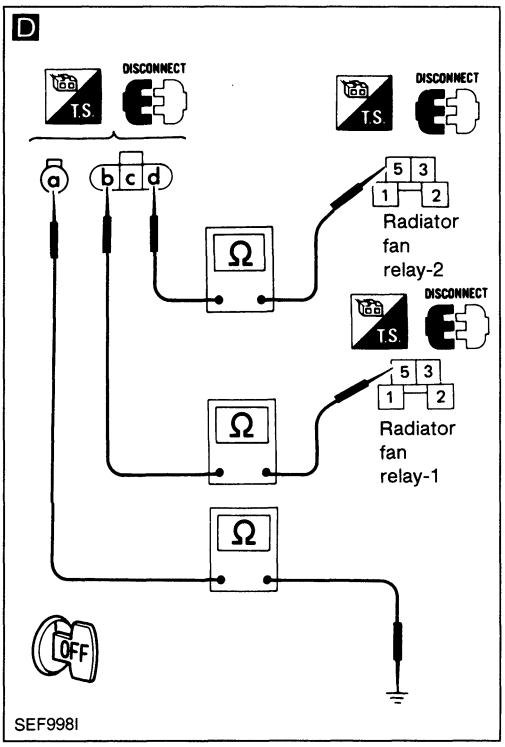
INSPECTION END

Diagnostic Procedure 43 (Cont'd)

C



D



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 ⓑ and terminal ⑤ (radiator fan relay-1), terminal ⓓ and terminal ⑤ (radiator fan relay-2), terminal ⓐ 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

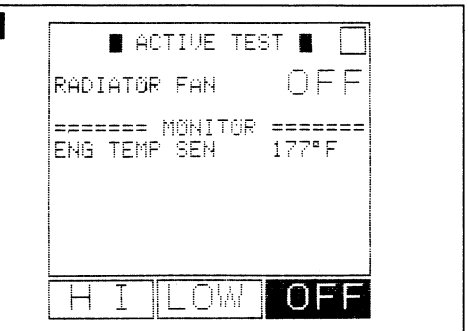
If N.G., repair harness or connectors.

O.K. ↓

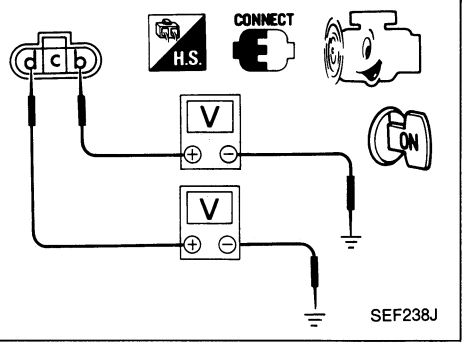
Ⓐ

Diagnostic Procedure 43 (Cont'd)

E

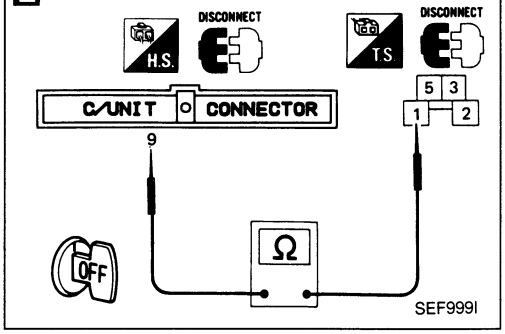


SEF596I



SEF238J

E



SEF999I

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

N.G. →

Check the following:
- Harness connectors (F1), (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" in "ACTIVE TEST" mode with CONSULT.
If N.G., replace malfunctioning component(s).

— OR —

1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal ⑨ and terminal ①.

Continuity should exist.

O.K. ↓

CHECK COMPONENTS (Radiator fan relay-1, -2, radiator fan motor-1 and -2).
Refer to "Electrical Components Inspection".
(See page EF & EC-191.)

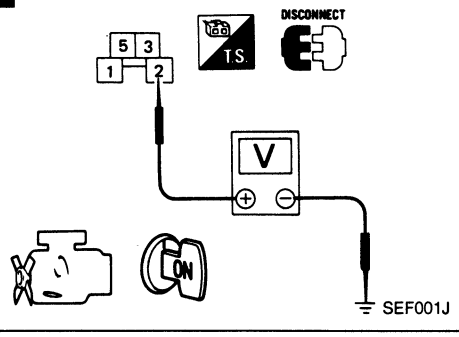
N.G. → Replace malfunctioning component(s).

O.K. ↓

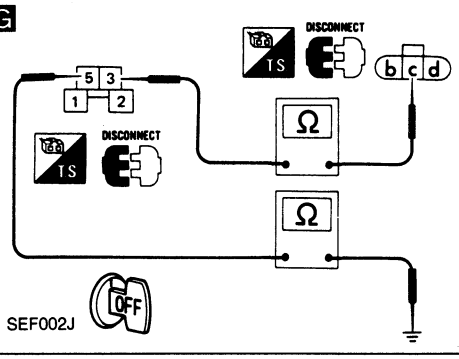
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

Diagnostic Procedure 43 (Cont'd)

F



G



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.

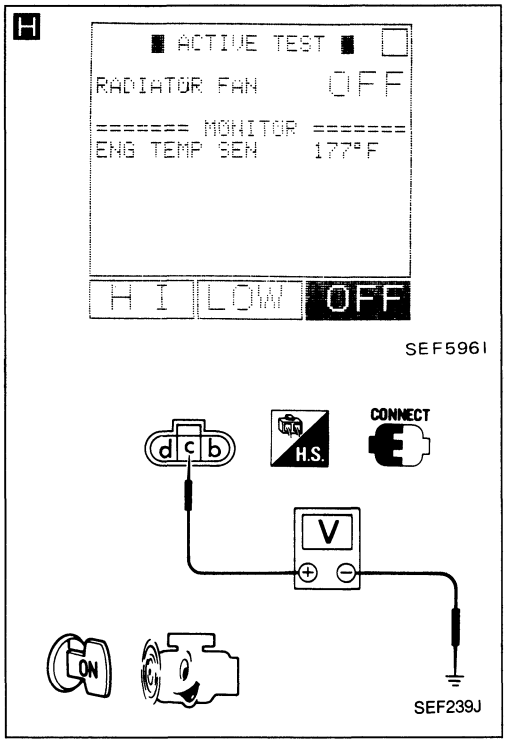
N.G. →
Check the following:
- Joint connector-3 (E48)
- Harness continuity between radiator fan relay-3 and radiator fan motor-1, -2
- Harness continuity between radiator fan relay-3 and body ground

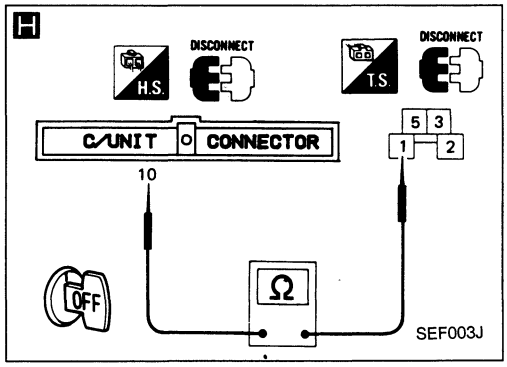
If N.G., repair harness or connectors.

O.K. ↓

Ⓐ

Diagnostic Procedure 43 (Cont'd)





Ⓐ

H

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

N.G. → Check the following:
- Harness connectors (F1), (E2)
- Harness continuity between E.C.U. and radiator fan relay-3

If N.G., repair harness or connectors.

OR

1) Disconnect E.C.U. harness connector.
2) Check harness continuity between E.C.U. terminal ⑩ and terminal ①.

Continuity should exist.

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-191.)

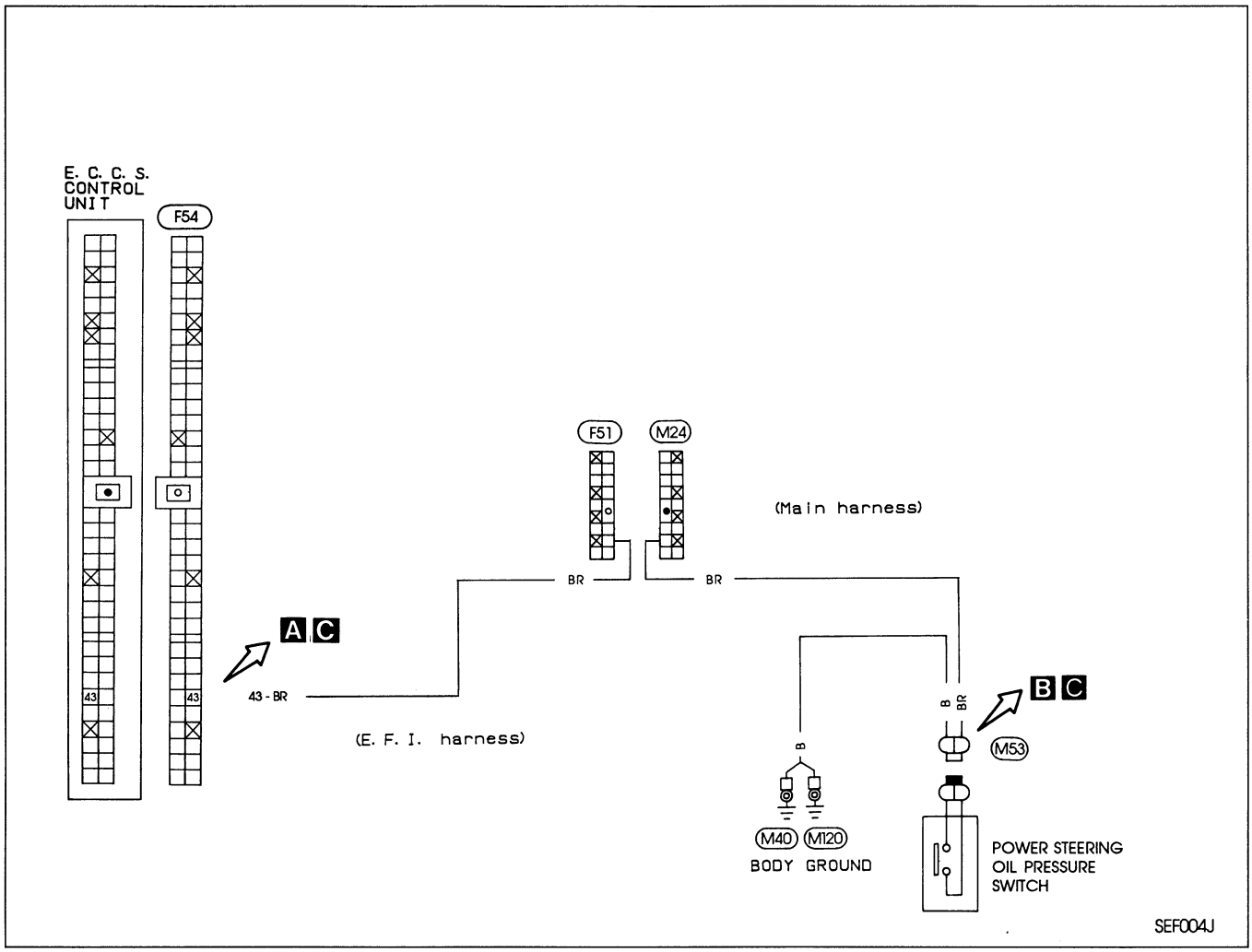
N.G. → Replace malfunctioning component(s).

O.K. ↓

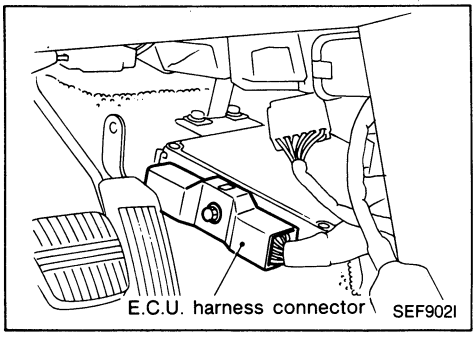
Check E.C.U. pin terminals for damage or the connection of E.C.U. harness connector.

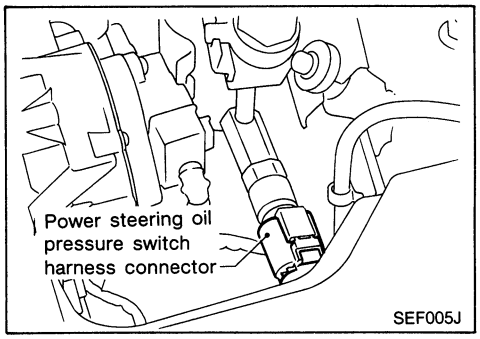
Diagnostic Procedure 44

POWER STEERING OIL PRESSURE SWITCH (Not self-diagnostic item)



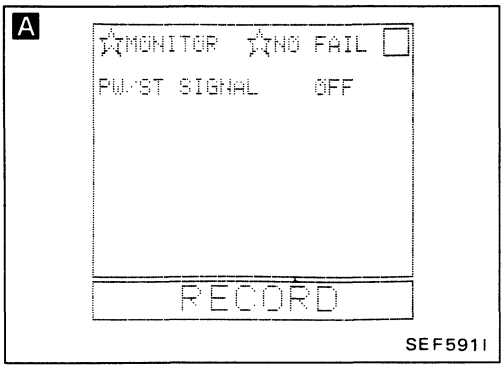
Harness layout





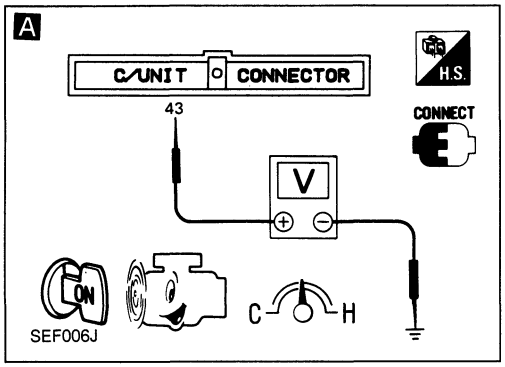
Diagnostic Procedure 44 (Cont'd)

A



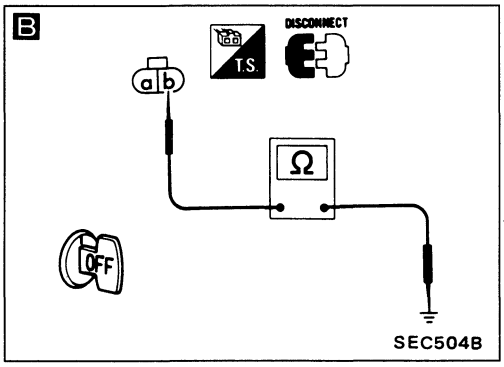
SEF591I

A



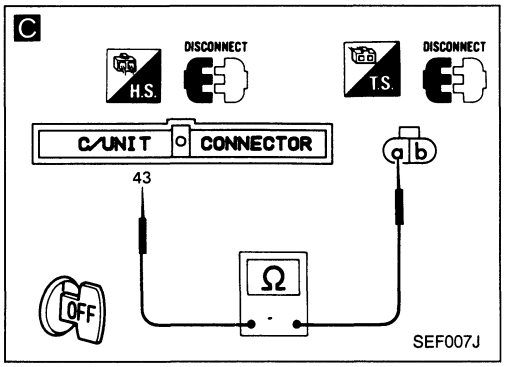
SEF006J

B



SEC504B

C



SEF007J

INSPECTION START

A

CHECK CONTROL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Check power steering oil pressure switch signal in "DATA MONITOR" mode with CONSULT.
Steering is neutral: OFF
Steering is turned: ON

— OR —

2) Check voltage between E.C.U. terminal ㊸ and ground.
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.

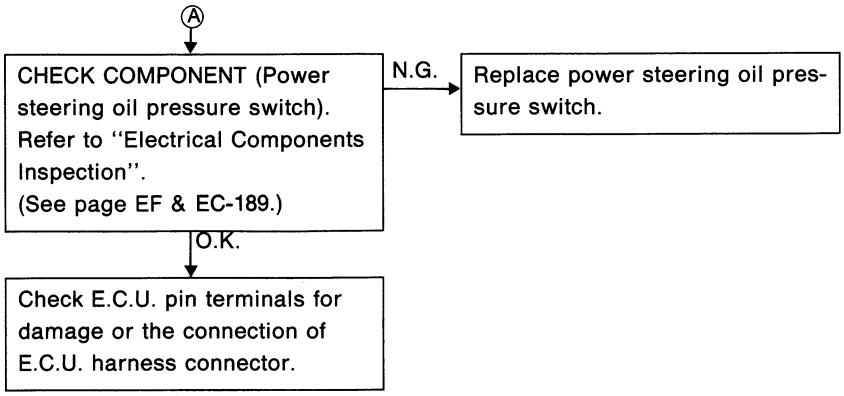
N.G. → Check the following.
- Harness connectors (F51), (M24)
- Harness continuity between E.C.U. and power steering oil pressure switch

If N.G., repair harness or connectors.

O.K. ↓

Ⓐ

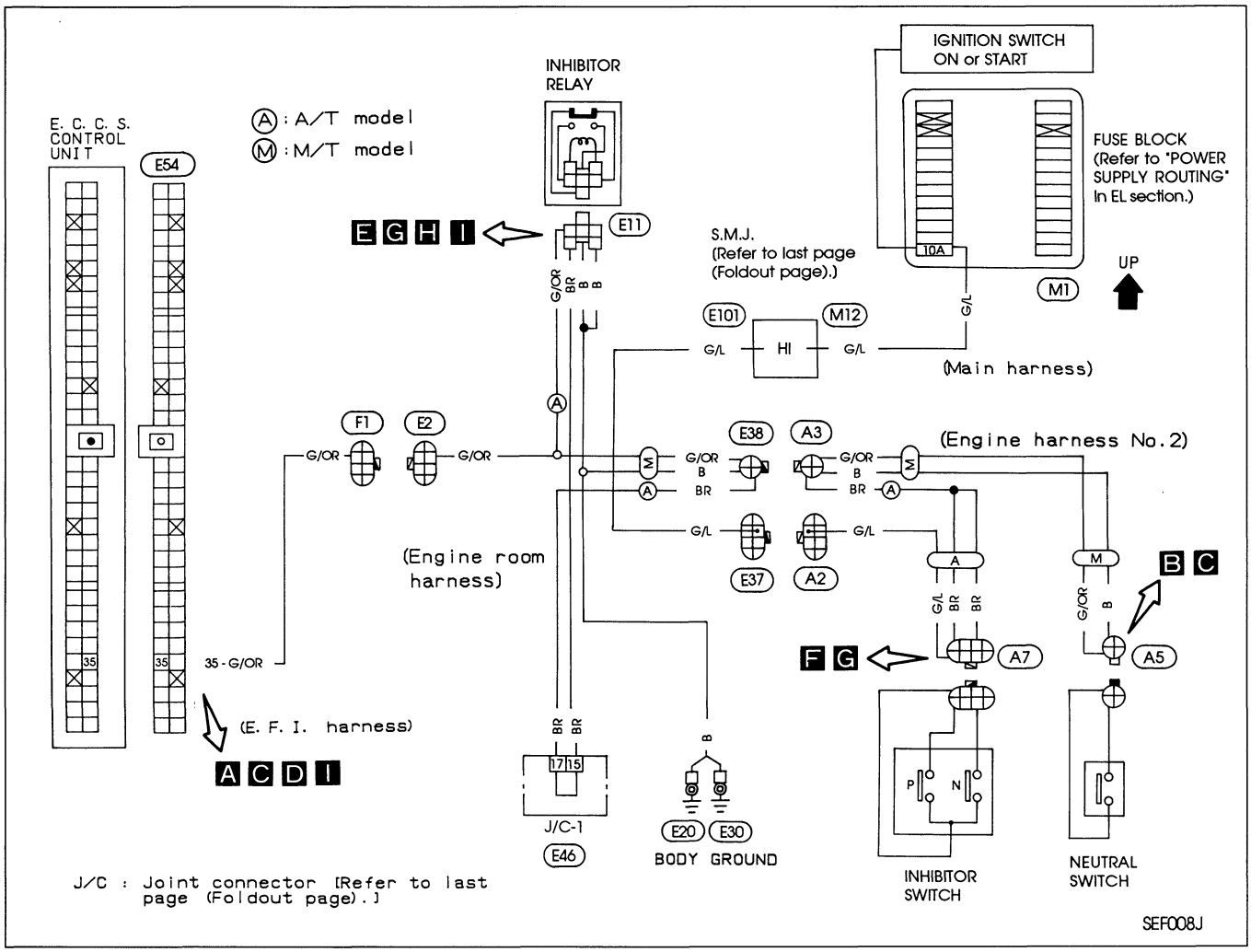
Diagnostic Procedure 44 (Cont'd)



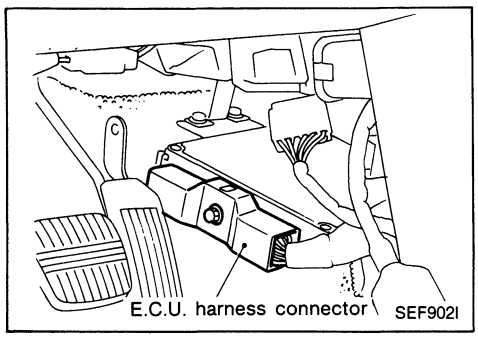
NOTE

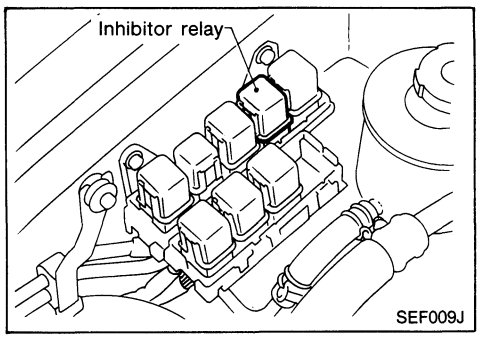
Diagnostic Procedure 45

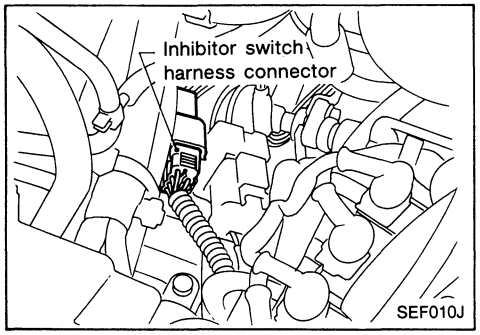
NEUTRAL/INHIBITOR SWITCH (Not self-diagnostic item)



Harness layout

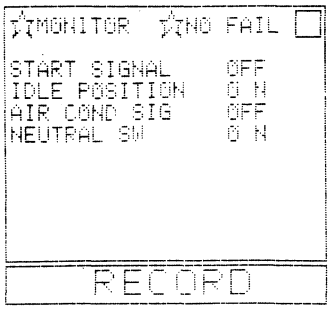






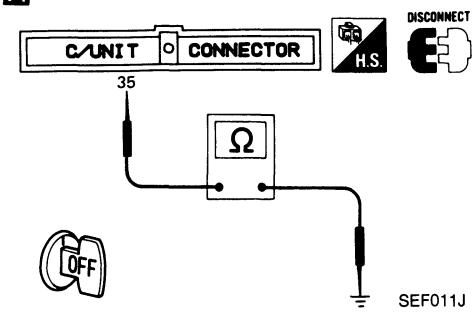
Diagnostic Procedure 45 (Cont'd)

A



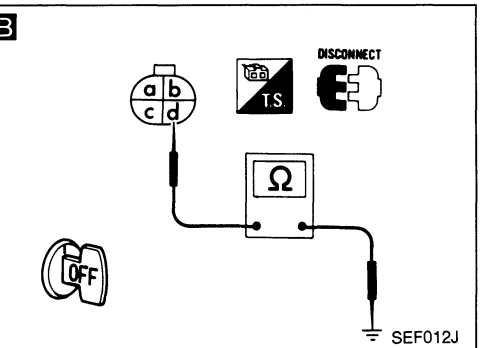
SEF149I

A



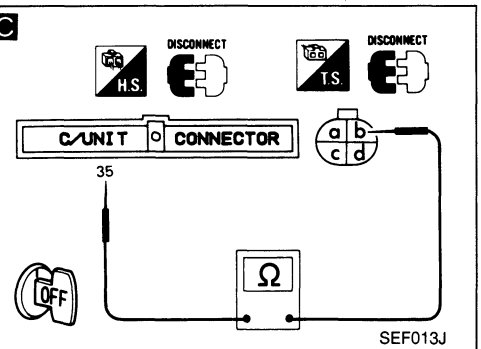
SEF011J

B



SEF012J

C



SEF013J

Neutral switch

INSPECTION START

A

CHECK OVERALL FUNCTION.

1) Turn ignition switch "ON".
2) Check neutral switch signal in "DATA MONITOR" mode with CONSULT.

Neutral position: ON
Except above: OFF

O.K. → INSPECTION END

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.

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 E38, A3
- Harness continuity between neutral switch and body ground

If N.G., repair harness or connectors.

O.K.

Disconnect E.C.U. harness connector.

C

CHECK INPUT SIGNAL CIRCUIT.

1) Check harness continuity between E.C.U. terminal ㉟ and terminal ⓑ.

Continuity should exist.

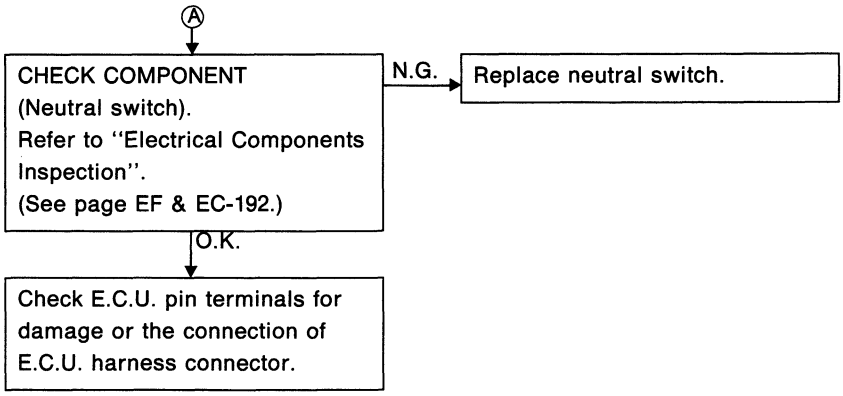
N.G. → Check the following:
- Harness connectors F1, E2
- Harness connectors E38, A3
- Harness continuity between E.C.U. and neutral switch

If N.G., repair harness or connectors.

O.K.

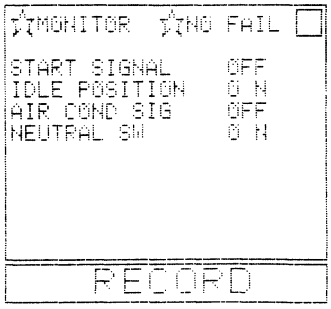
Ⓐ

Diagnostic Procedure 45 (Cont'd)



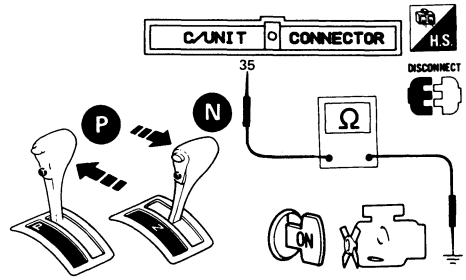
Diagnostic Procedure 45 (Cont'd)

D



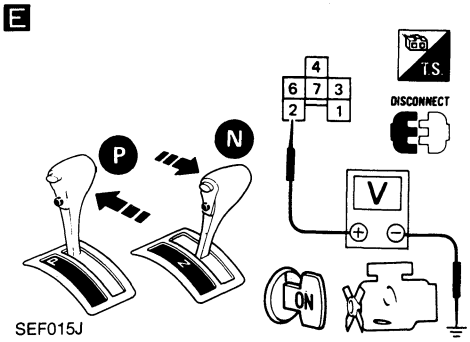
SEF149I

D



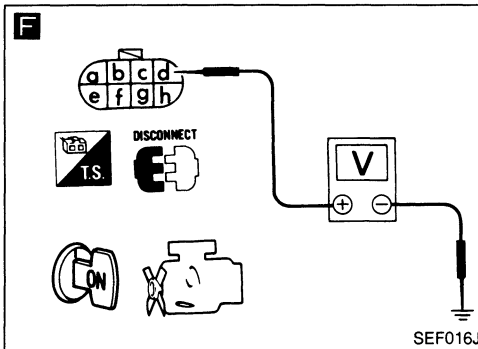
SEF014J

E



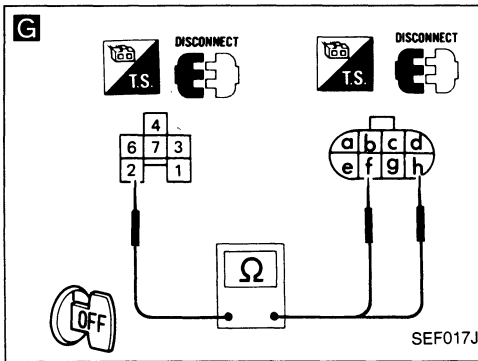
SEF015J

F



SEF016J

G



SEF017J

Inhibitor switch

INSPECTION START

D

CHECK OVERALL FUNCTION.

1) Turn ignition switch "ON"
2) Check neutral switch signal 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. →

O.K.

Ⓐ

Check the following:

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.

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.

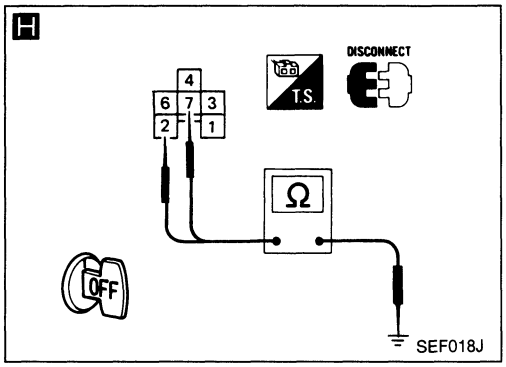
If N.G., check the following.

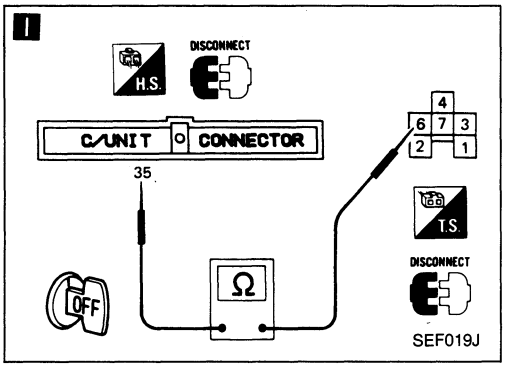
- Harness connectors (E38), (A1)
- Joint connector-1 (E46)
- Harness continuity between inhibitor switch and inhibitor relay

If N.G., repair harness or connectors.

CHECK COMPONENT (Inhibitor switch).
Refer to "Electrical Components Inspection".
(See page EF & EC-192.)

Diagnostic Procedure 45 (Cont'd)





Ⓐ

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. → Repair harness or connectors.

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. → Check the following:
- Harness connectors (F1), (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-192.)

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

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.

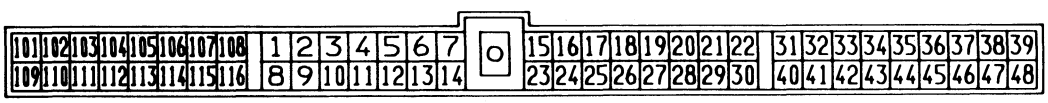
TER-MINAL NO.	ITEM	CONDITION	*DATA
41	Air conditioner switch	Engine is running. └Both air conditioner switch and blower switch are "ON".	0V
		Engine is running. └Air conditioner switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
43	Power steering oil pressure switch	Engine is running. └Steering wheel is being 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.

TER-MINAL 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

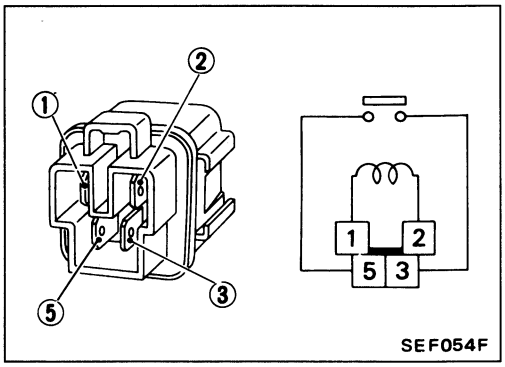
E.C.U. HARNESS CONNECTOR TERMINAL LAYOUT



SEF419H

Electrical Components Inspection (Cont'd)

E.C.C.S. RELAY

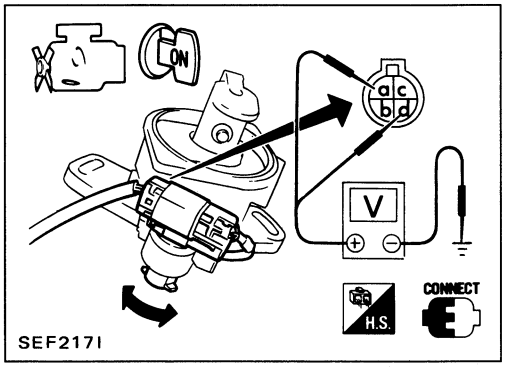


SEF054F

Check continuity between terminals ③ and ⑤.

Condition	Continuity
12V direct current supply between terminals ① and ②	Yes
No supply	No

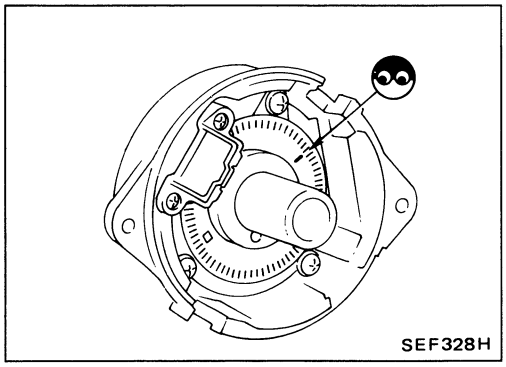
CRANK ANGLE SENSOR



SEF217I

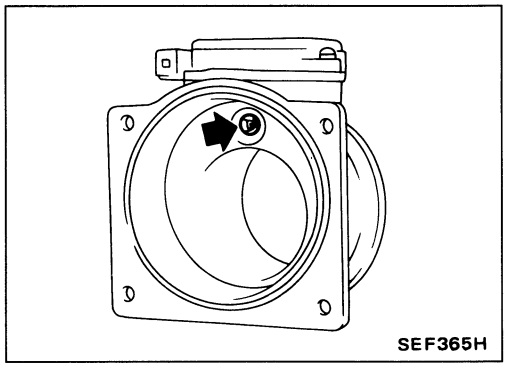
1. Remove distributor from engine. (crank angle sensor harness connector is connected.)
2. Turn ignition switch "ON".
3. Rotate crank angle sensor shaft slowly and check voltage between terminals ⓐ, ⓑ and ground.

Voltage fluctuates between 5V and 0V.


SEF328H

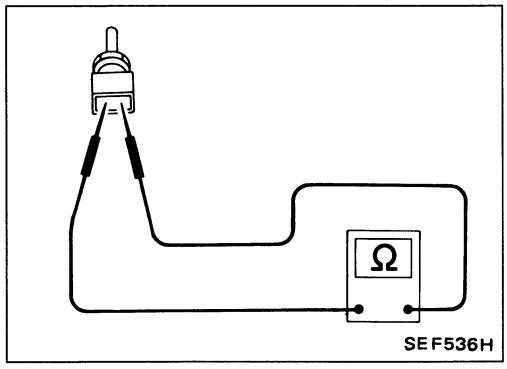
4. Visually check rotor plate for damage or dust.

AIR FLOW METER


SEF365H

- Visually check hot wire air passage for dust.

ENGINE TEMPERATURE SENSOR

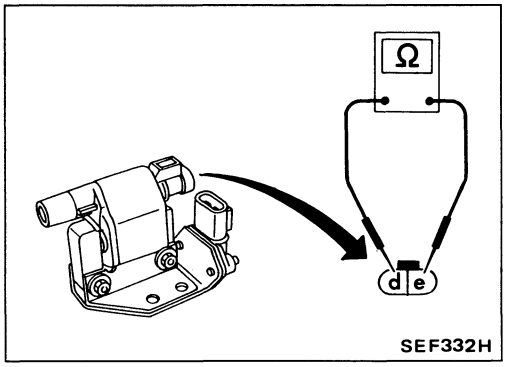


SEF536H

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)

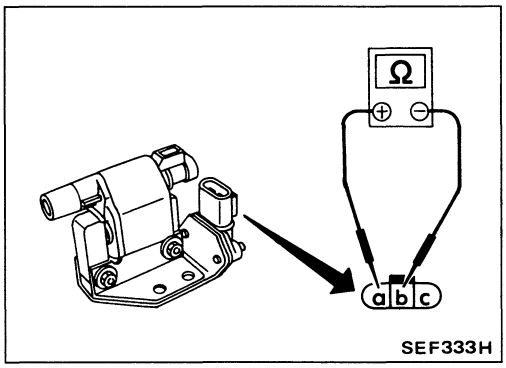


SEF332H

IGNITION COIL

Check ignition coil resistance.

Terminal	Resistance
ⓓ - ⓔ	Approximately 0.7Ω

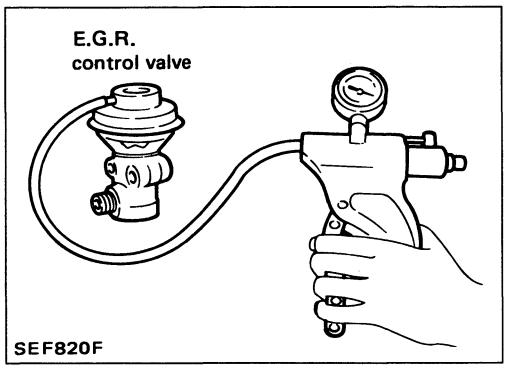


SEF333H

POWER TRANSISTOR

Check continuity between power transistor terminals.

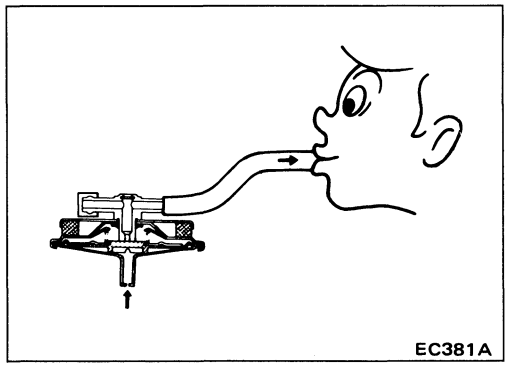
Terminal No.	Tester polarity	Continuity
ⓐ	⊕	No
ⓑ	⊖	
ⓐ	⊖	Yes
ⓑ	⊕	
ⓐ	⊕	No
ⓒ	⊖	
ⓐ	⊖	Yes
ⓒ	⊕	



SEF820F

E.G.R. CONTROL VALVE

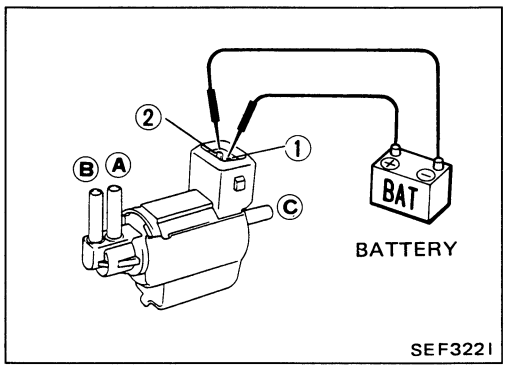
Apply vacuum to E.G.R. vacuum port with a hand vacuum pump.
E.G.R. control valve spring should lift.


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.

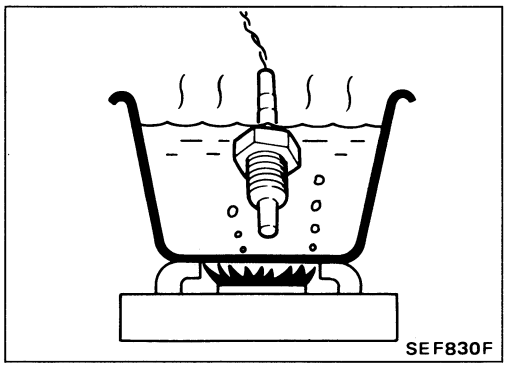
Electrical Components Inspection (Cont'd)



E.G.R. CONTROL SOLENOID VALVE, A.I.V. CONTROL SOLENOID VALVE, P.R. CONTROL SOLENOID VALVE AND S.C.V. CONTROL SOLENOID VALVE

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

Refer to "Diagnostic Procedure 30". (See page EF & EC-126.)

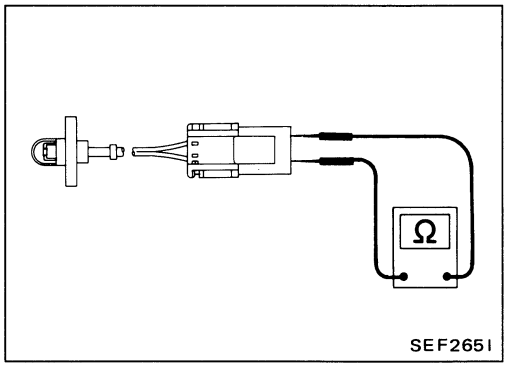
EXHAUST GAS TEMPERATURE SENSOR

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



AIR TEMPERATURE SENSOR

Check air temperature sensor resistance.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
80 (176)	0.27 - 0.38

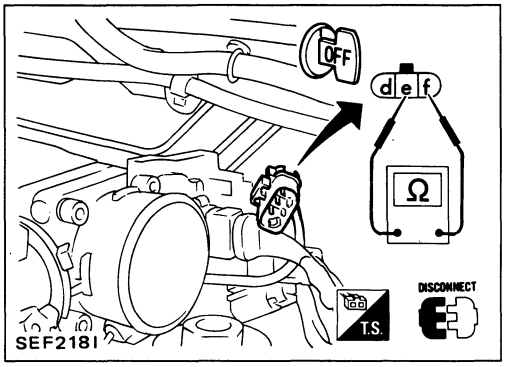
POWER STEERING OIL PRESSURE SWITCH

1. Disconnect power steering oil pressure switch harness connector.
2. Check resistance between terminals.

   Resistance: Approximately 2 - 3Ω

Electrical Components Inspection (Cont'd)

THROTTLE SENSOR



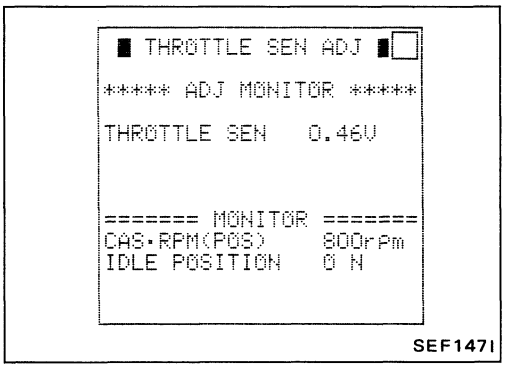
1. Disconnect throttle sensor harness connector.
2. Make sure that resistance between terminals ⓑ and ⓒ changes when opening throttle valve manually.

Accelerator pedal conditions	Resistance kΩ
Completely released	Approximately 1
Partially released	1 - 9
Completely depressed	Approximately 9

If N.G., replace throttle sensor.

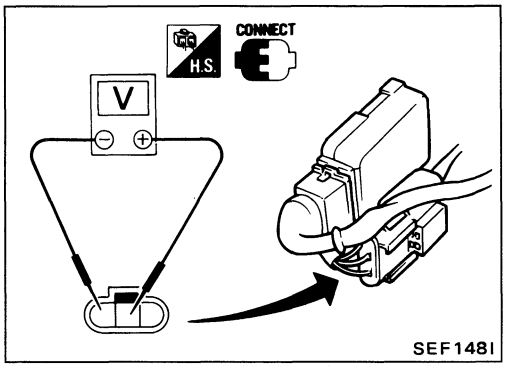
Adjustment

If throttle sensor is replaced or removed, it is necessary to install it in the proper position, by following the procedure as shown below:

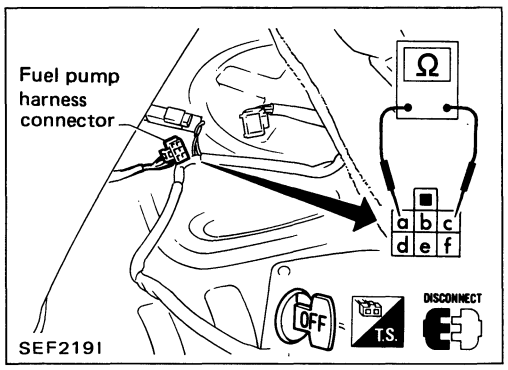


1. Install throttle sensor body in throttle chamber. Do not tighten bolts.
2. Connect throttle sensor and idle switch harness connector.
3. Start engine and warm it up sufficiently.
4. Perform "THROTTLE SEN. ADJ." in "WORK SUPPORT" mode.

   Measure output voltage of throttle sensor using voltmeter.



5. Adjust by rotating throttle sensor body so that output voltage is 0.4 to 0.5V.
6. Tighten mounting bolts.
7. Disconnect throttle sensor harness connector for a few seconds and then reconnect it.



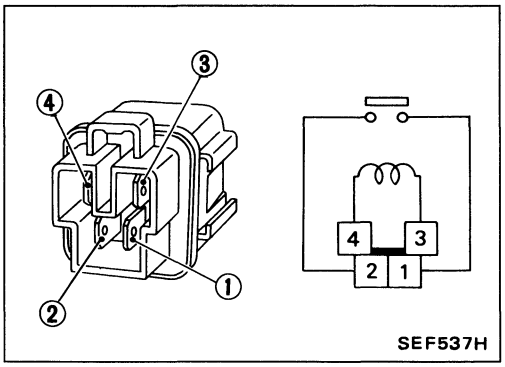
FUEL PUMP

Check continuity between terminals ⓐ and ⓒ .

Continuity should exist.

Electrical Components Inspection (Cont'd)

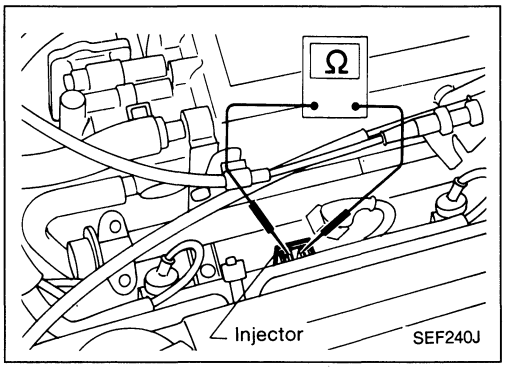
FUEL PUMP RELAY, RADIATOR FAN REAY-1, -2 AND-3



Check continuity between terminals ① and ②.

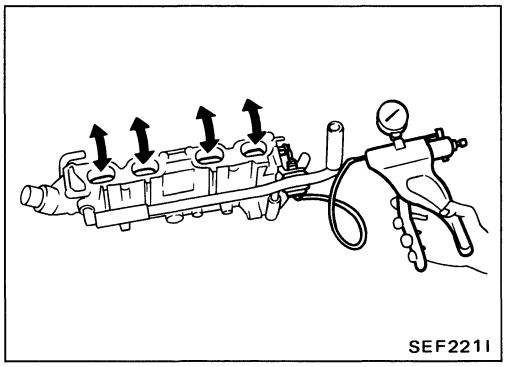
Condition	Continuity
12V direct current supply between terminals ③ and ④	Yes
No supply	No

INJECTORS



- Check injector resistance.
  Resistance:
  Approximately 10 - 15Ω
- Remove injector and check nozzle for clogging.

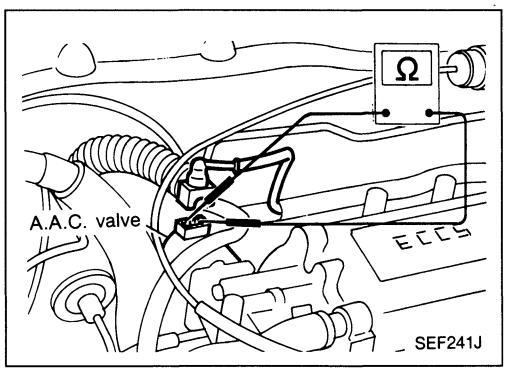
SWIRL CONTROL VALVE



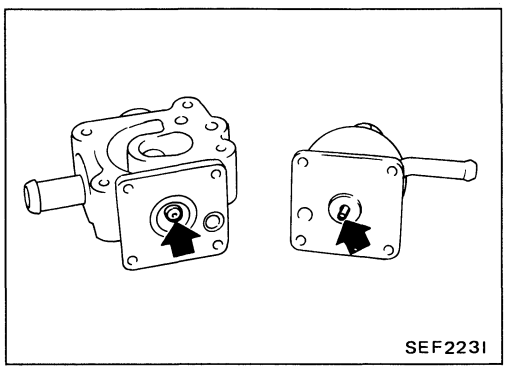
Supply vacuum to actuator and check swirl control valve operation.

Condition	Swirl control valve
Supply vacuum to actuator	Close
No supply	Open

A.A.C. VALVE

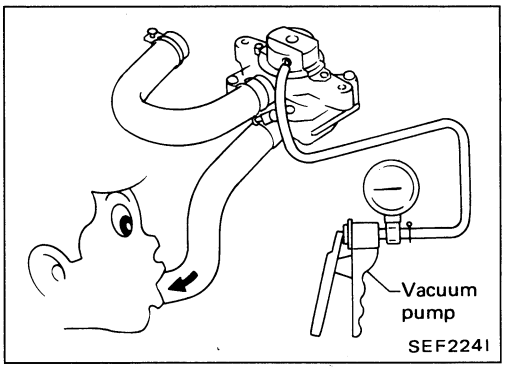


- Check A.A.C. valve resistance.
  Resistance:
  Approximately 10Ω [at 20°C (68°F)]



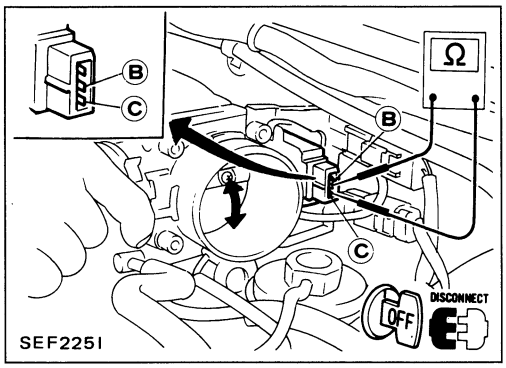
- Check plunger for seizure or sticking.
- Check spring for broken.

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.

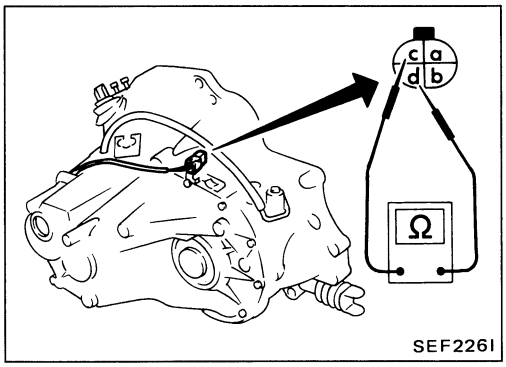


THROTTLE VALE SWITCH (Idle position)

Unit check

- Check continuity between terminals Ⓑ and Ⓒ while moving throttle valve.

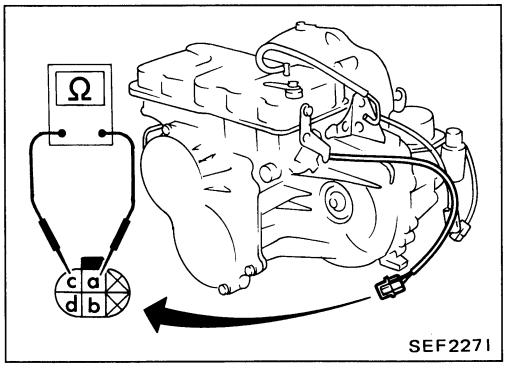
Throttle valve condition	Continuity
Fully closed	Yes
Open	No



NEUTRAL SWITCH

- Check continuity between terminals ⓒ and ⓓ.

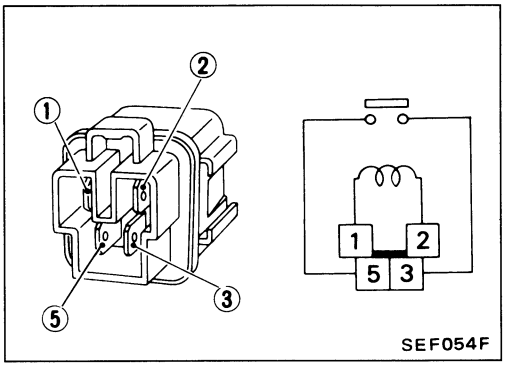
Conditions	Continuity
Shift to Neutral	Yes
Shift to other position	No



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

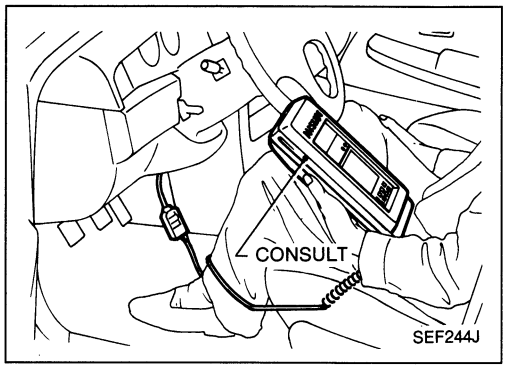


INHIBITOR RELAY

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.

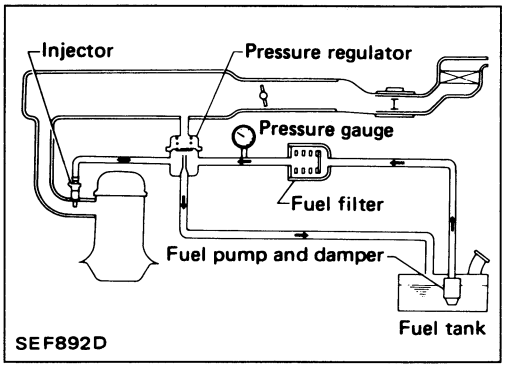


Releasing Fuel Pressure

Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.

Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT.

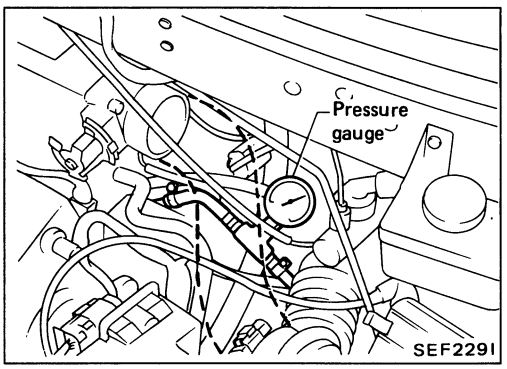
1. Remove fuel pump relay.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch off and reconnect fuel pump relay.



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.

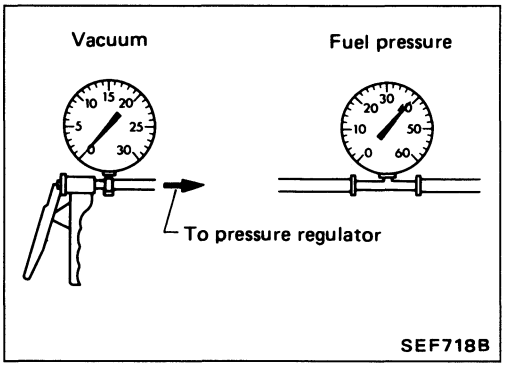
1. Release fuel pressure to zero.
2. Remove air duct.
3. Disconnect fuel hose between fuel filter and fuel tube (engine side).
4. Install pressure gauge between fuel filter and fuel tube.
5. Install air duct.
6. Start engine and check for fuel leakage.



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)

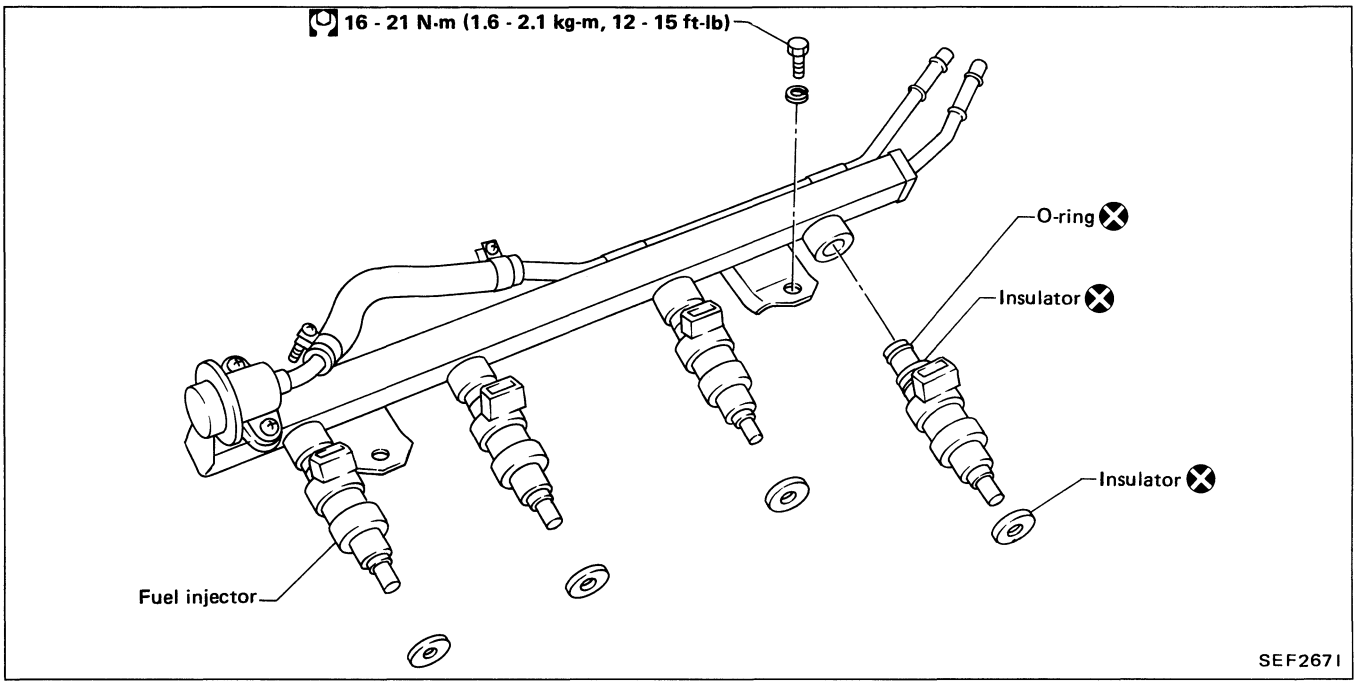
10. Connect variable vacuum source to fuel pressure regulator.



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

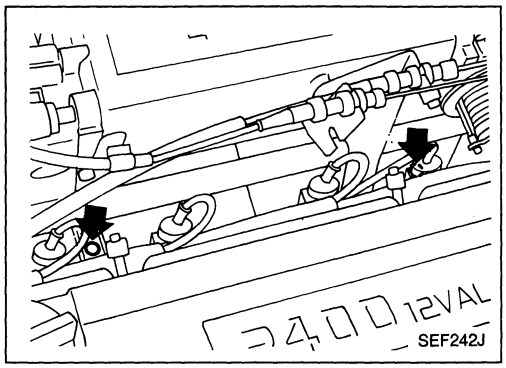


REMOVAL

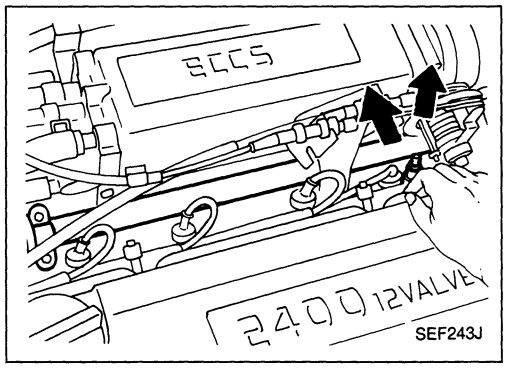
1. Release fuel pressure to zero.
2. Remove or disconnect the following:

- Air duct
- Fuel hoses
- Fuel pressure regulator.
- Accelerator wire bracket
- Fuel injector harness connectors

Injector Removal and Installation (Cont'd)



3. Remove fuel tube securing bolts.



4. Move fuel tube as shown and take out injectors from #4 injector.

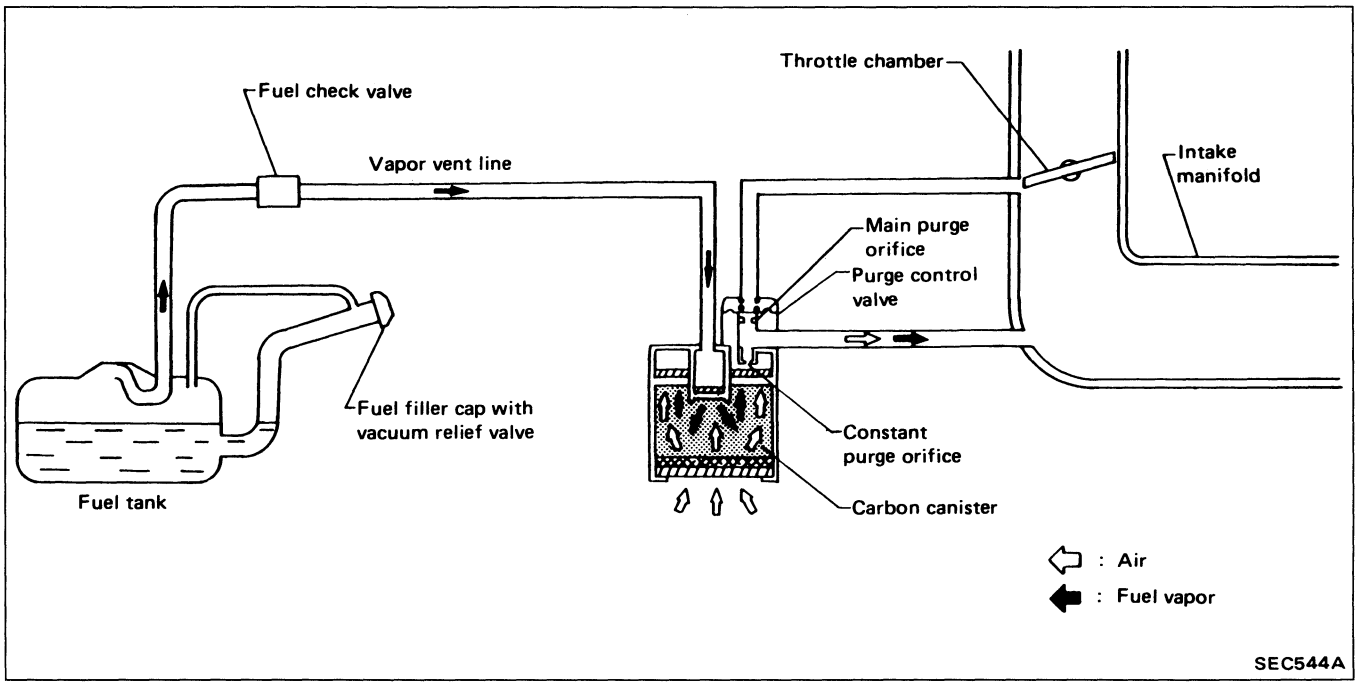
INSTALLATION

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

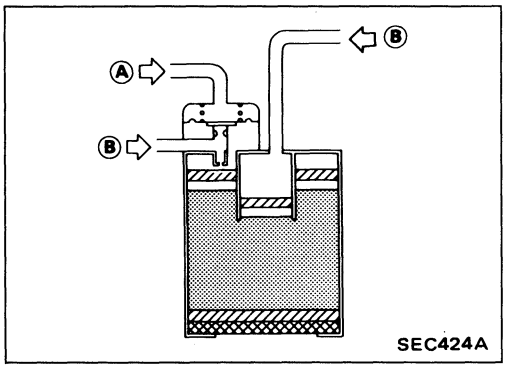


The evaporative emission control system is used to reduce hydrocarbons emitted to the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the carbon canister.

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.



Inspection

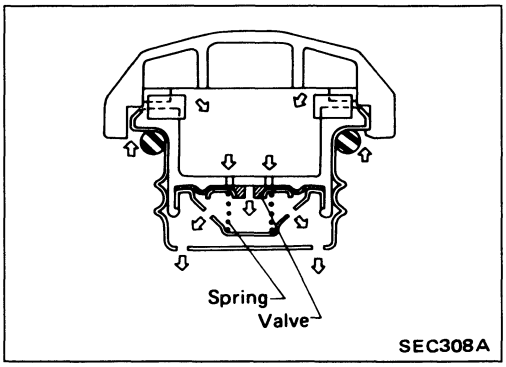
CARBON CANISTER

Check carbon canister as follows:

Ⓐ: Blow air and ensure that there is no leakage.

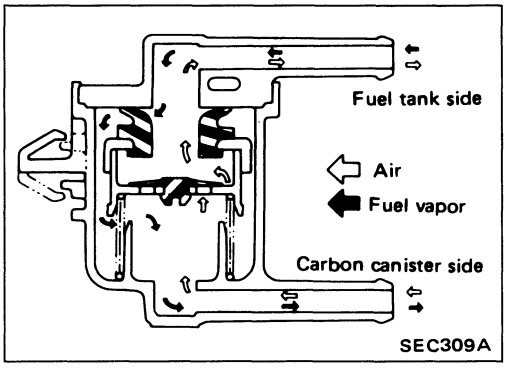
Ⓑ: Blow air and ensure that there is leakage.

Inspection (Cont'd)



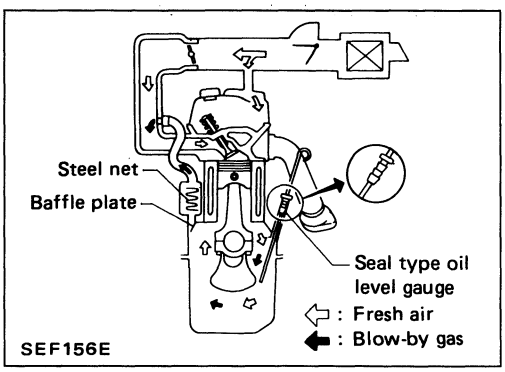
FUEL TANK VACUUM RELIEF VALVE

1. Wipe valve housing clean.
2. Inhale air through the cap. A slight resistance accompanied by valve clicks indicates that valve is in good mechanical condition. Note also that, by further inhaling air, the resistance should disappear with valve clicks.
3. If valve is clogged or if no resistance is felt, replace cap as an assembly.



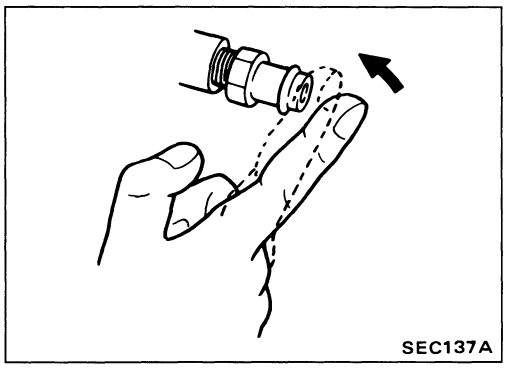
FUEL CHECK VALVE

1. Blow air through connector on fuel tank side.
   A considerable resistance should be felt and a portion of air flow should be directed toward the canister.
2. Blow air through connector on canister side.
   Air flow should be smoothly directed toward fuel tank.
3. If fuel check valve is suspected of not properly functioning in steps 1 and 2 above, replace it.



Description

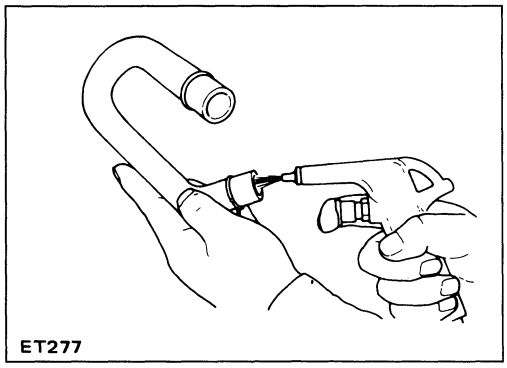
This system returns blow-by gas to both the intake manifold and air cleaner.
The positive crankcase ventilation (P.C.V.) valve is provided to conduct crankcase blow-by gas to the intake manifold.
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the P.C.V. 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.



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.



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

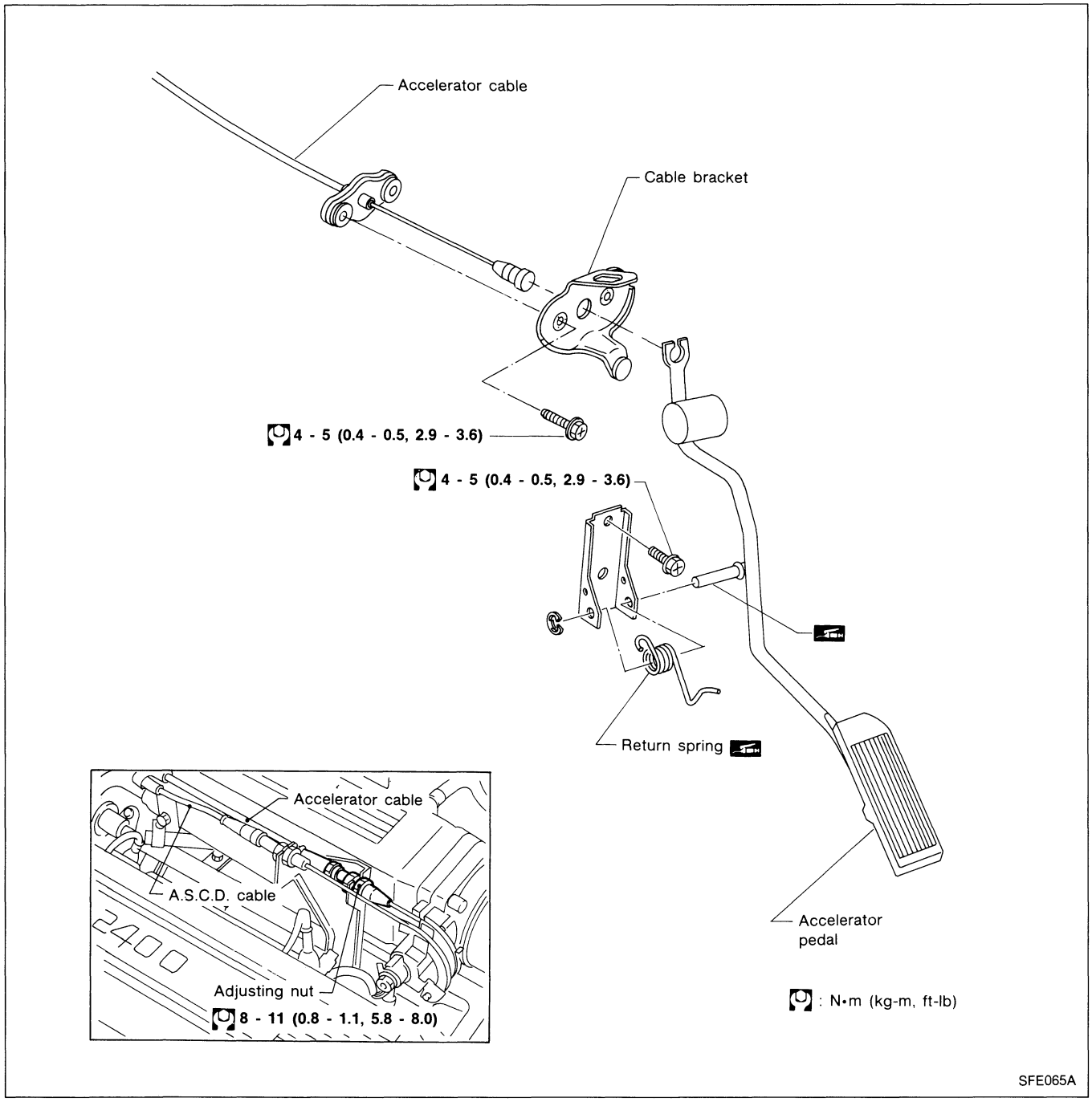
ENGINE CONTROL, FUEL & EXHAUST SYSTEMS

SECTION FE

CONTENTS

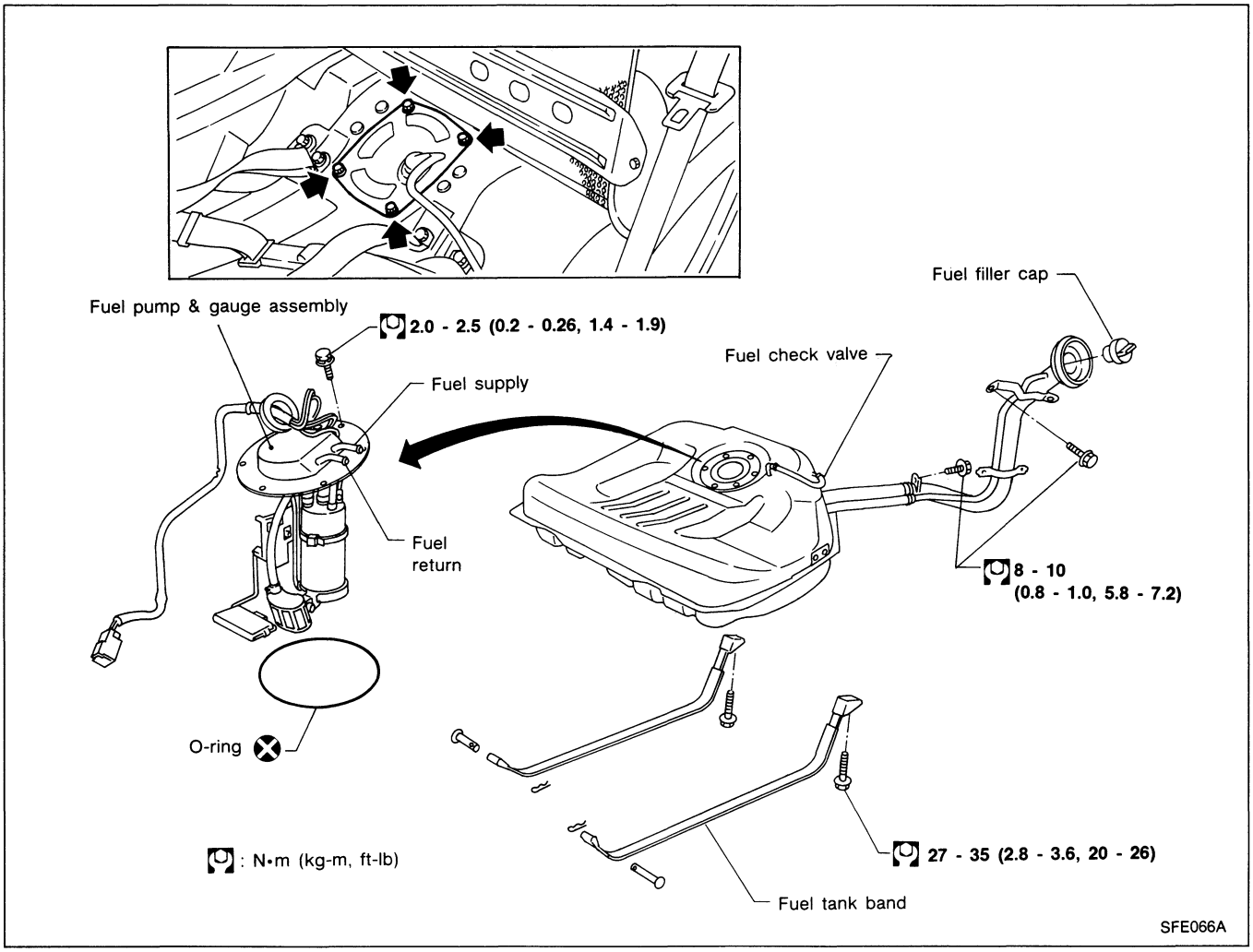
Accelerator Control System

- When removing accelerator cable, make a mark to indicate lock nut's initial position.
- Check that throttle valve opens fully when accelerator pedal is fully depressed and that it returns to idle position when pedal is released.
- Adjust accelerator cable according to the following procedure.
  Tighten "adjusting nut" until "throttle drum" starts to move.
  From that position turn back "adjusting nut" 1.5 to 2 turns, and fasten it with a lock nut.
- Check accelerator control parts for improper contact with any adjacent parts.
- When connecting accelerator cable, be careful not to twist or scratch its inner wire.



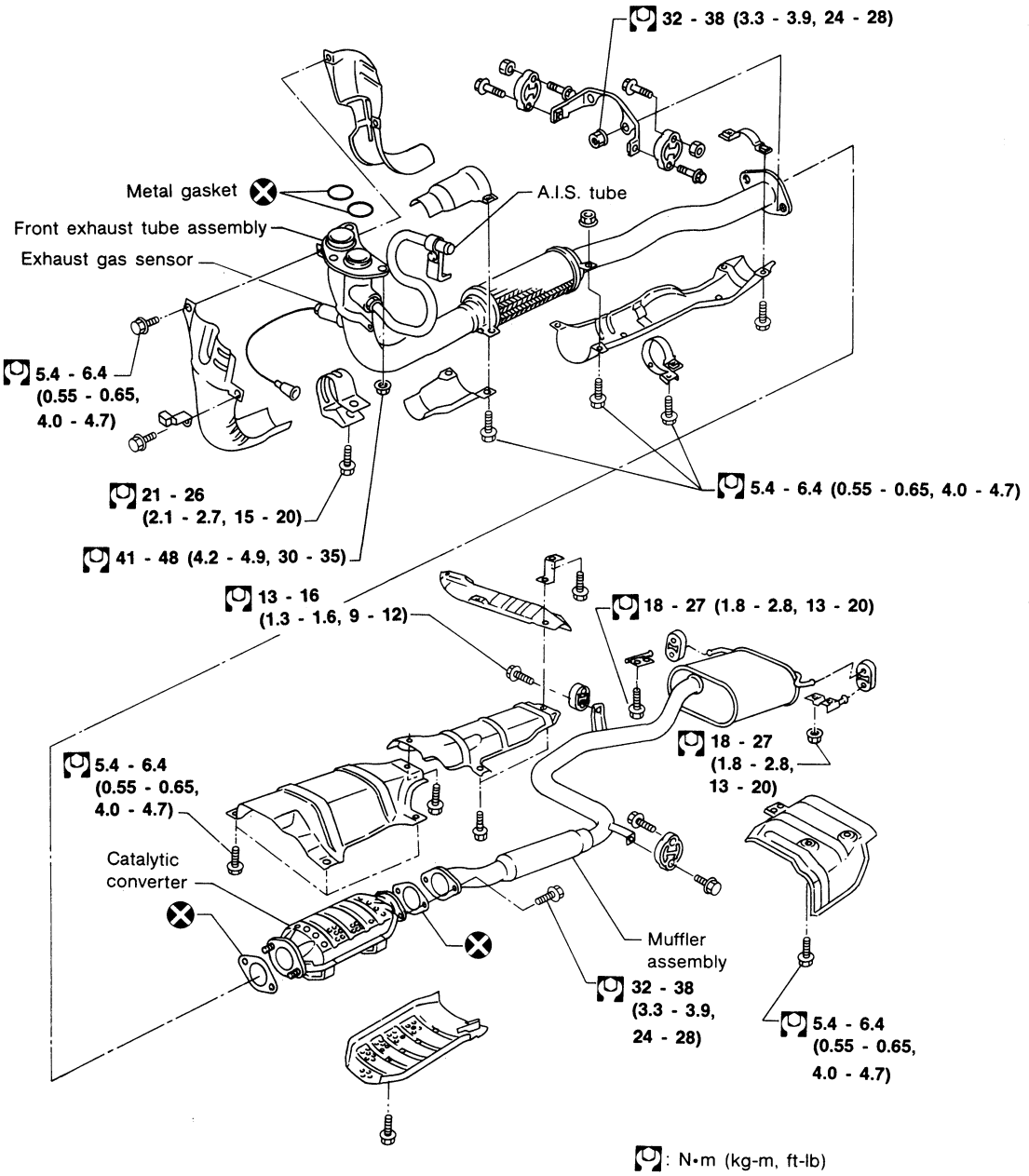
WARNING:
When replacing fuel line parts, be sure to observe the following:
- **Put a "CAUTION: INFLAMMABLE" sign in workshop.**
- **Be sure to furnish workshop with a CO_2 fire extinguisher.**
- **Do not smoke while servicing fuel system. Keep open flames and sparks away from work area.**
- **Be sure to disconnect battery ground cable before conducting operations.**
- **Put drained fuel in an explosion-proof container and put lid on securely.**

CAUTION:
- **Before disconnecting fuel hose, release fuel pressure from fuel line. Refer to "Changing Fuel Filter" in MA section.**
- **Do not disconnect any fuel line unless absolutely necessary.**
- **Plug hose and pipe openings to prevent entry of dust or dirt.**
- **Always replace O-ring and clamps with new ones.**
- **Do not kink or twist hose and tube when they are installed.**
- **Do not tighten hose clamps excessively.**
- **When installing fuel check valve, be careful of its designated direction. (Refer to section EF & EC.)**
- **After assembly, run engine and check for fuel leaks at connections.**



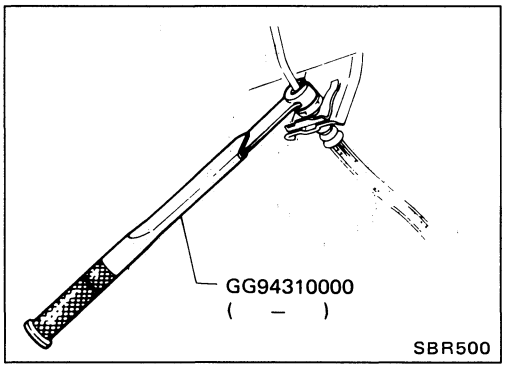
CAUTION:

- **Always replace exhaust gaskets with new ones when reassembling.**
- **With engine running, check all tube connections for exhaust gas leaks, and entire system for unusual noises.**
- **After installation, check to assure that mounting brackets and mounting insulator are free from undue stress. If any of above parts are not installed properly, excessive noise or vibration may be transmitted to vehicle body.**



SECTION CL

CONTENTS



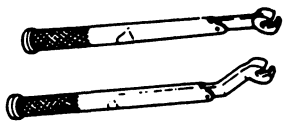
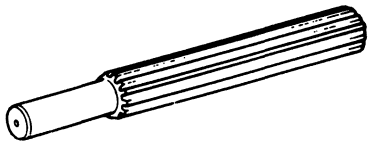
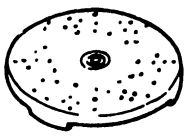
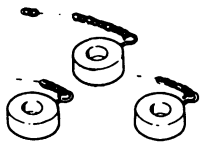
Precautions

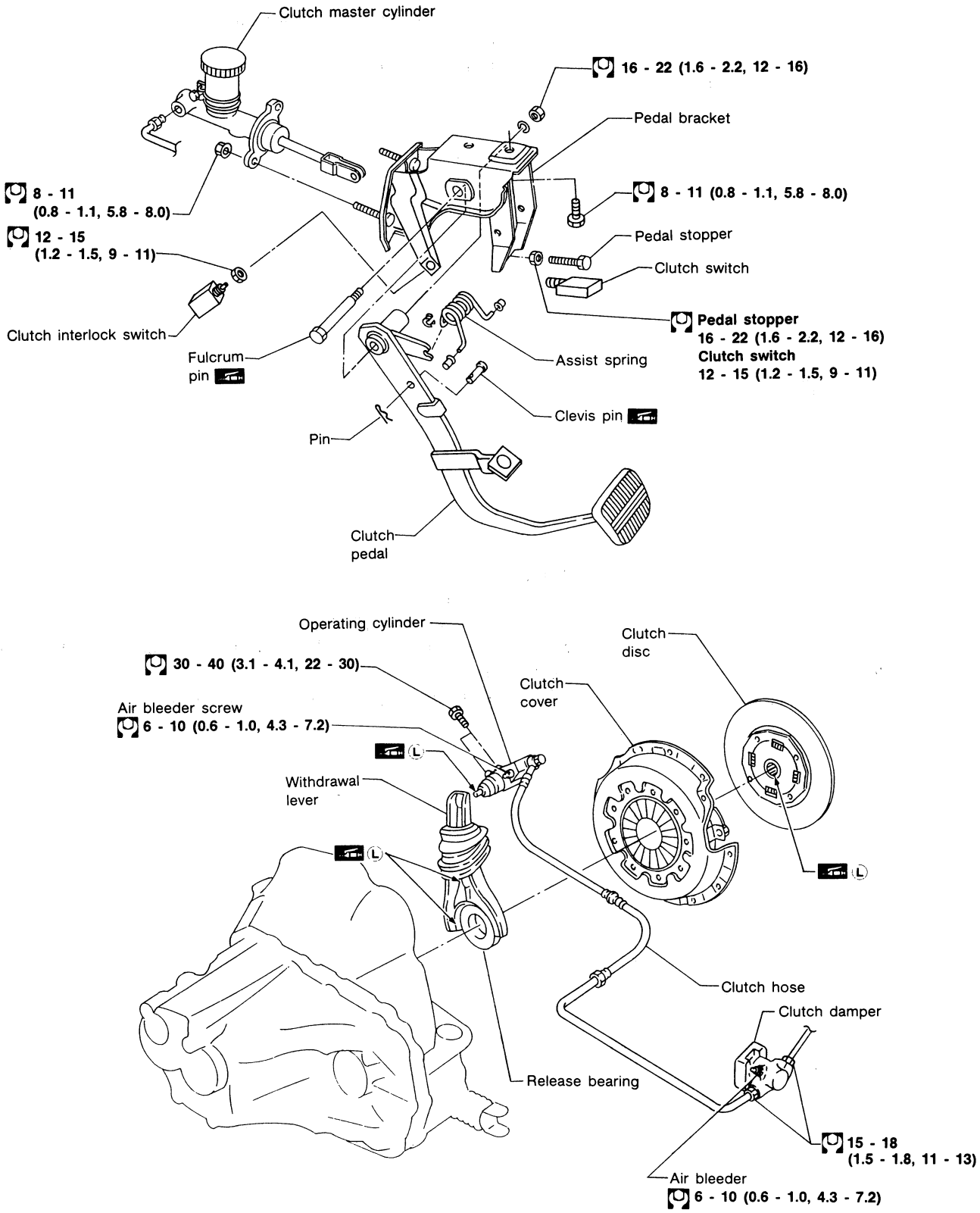
- **Recommended fluid is brake fluid "DOT 3".**
- **Never reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas.**
- **When removing and installing clutch piping, use Tool.**
- **Use new brake fluid to clean or wash all parts of master cylinder, operating cylinder and 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

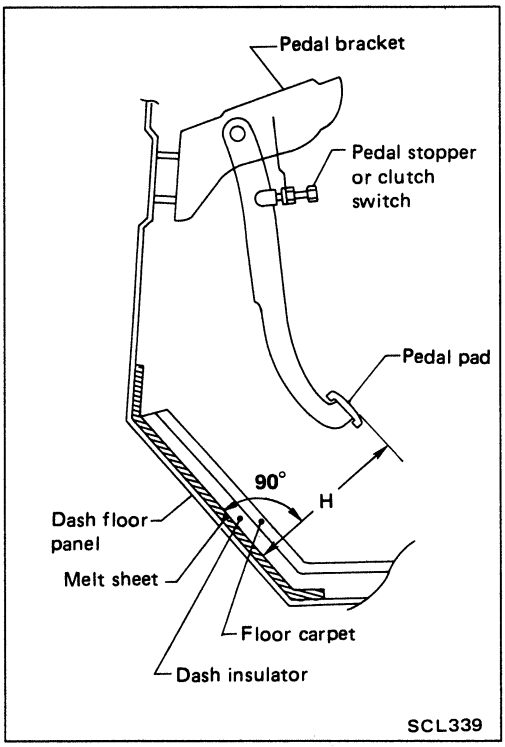
SPECIAL SERVICE TOOLS

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	



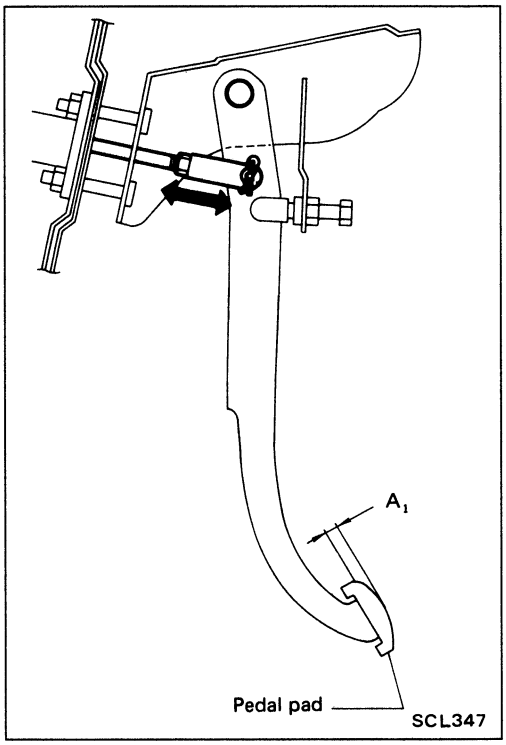
: Apply lithium-based grease including molybdenum disulphide.
: N•m (kg-m, ft-lb)

SCL387



Adjusting Clutch Pedal

1. Adjust pedal height with pedal stopper or clutch switch.
   Pedal height "H":
   165 - 175 mm (6.50 - 6.89 in)

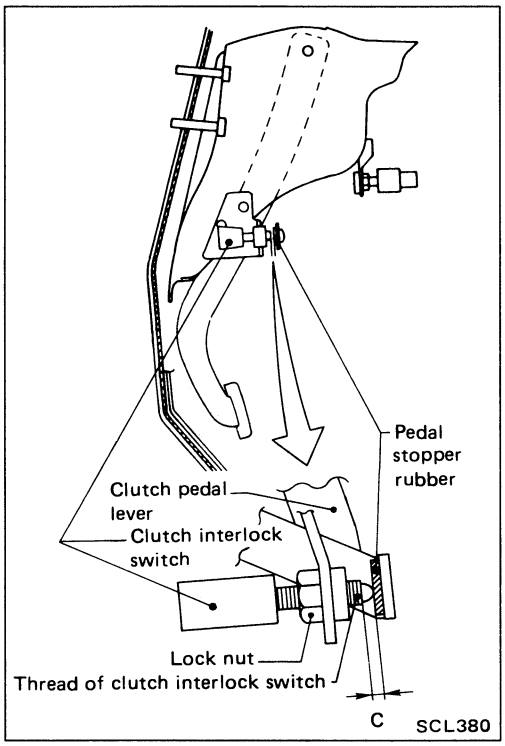


2. Adjust pedal free play with master cylinder push rod. Then tighten lock nut.
   Pedal free play "A_1":
   1.0 - 3.0 mm (0.039 - 0.118 in)

Pedal free play means the following total, measured at position of pedal pad:

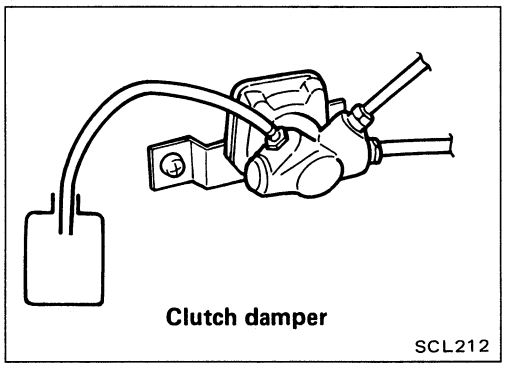
- **Play due to clevis pin and clevis pin hole in clutch pedal.**

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)

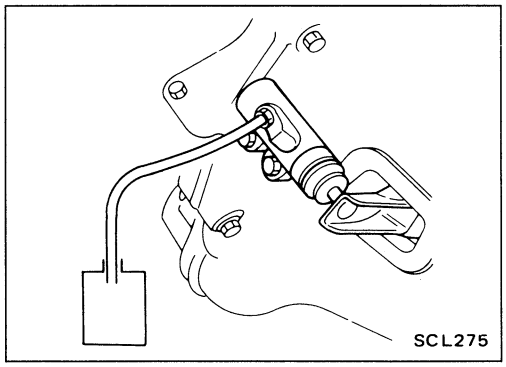


Bleeding Procedure

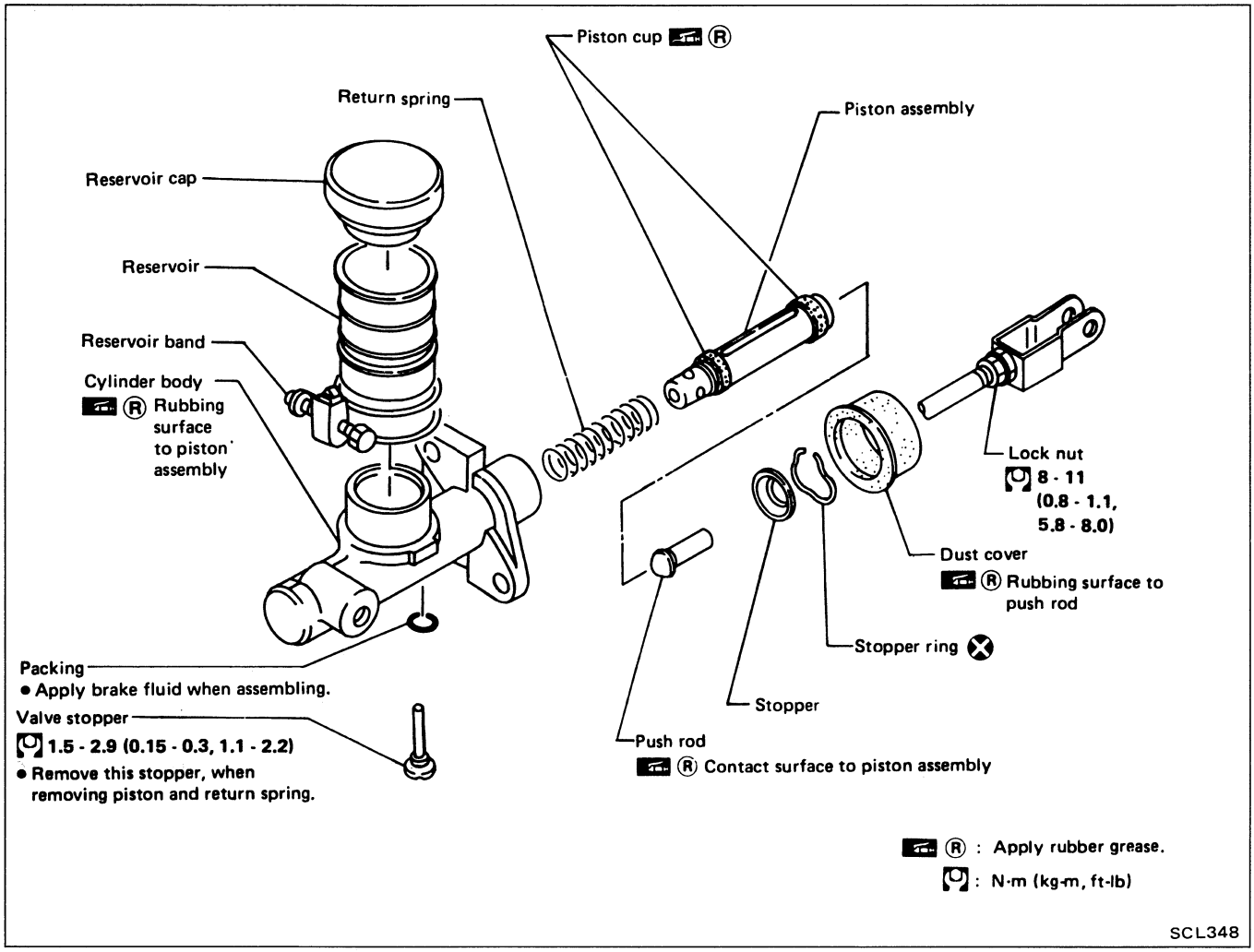
Bleed air according to the following procedure.
Clutch damper → Clutch operating cylinder

- **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.
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.

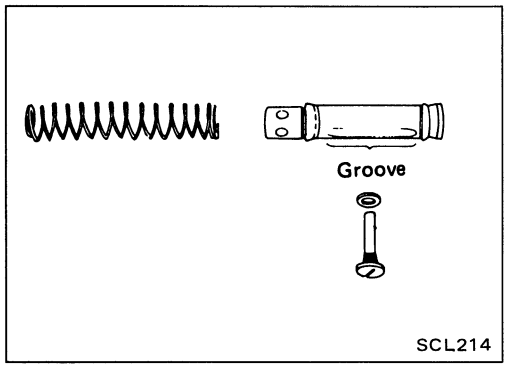


Clutch Master Cylinder



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.

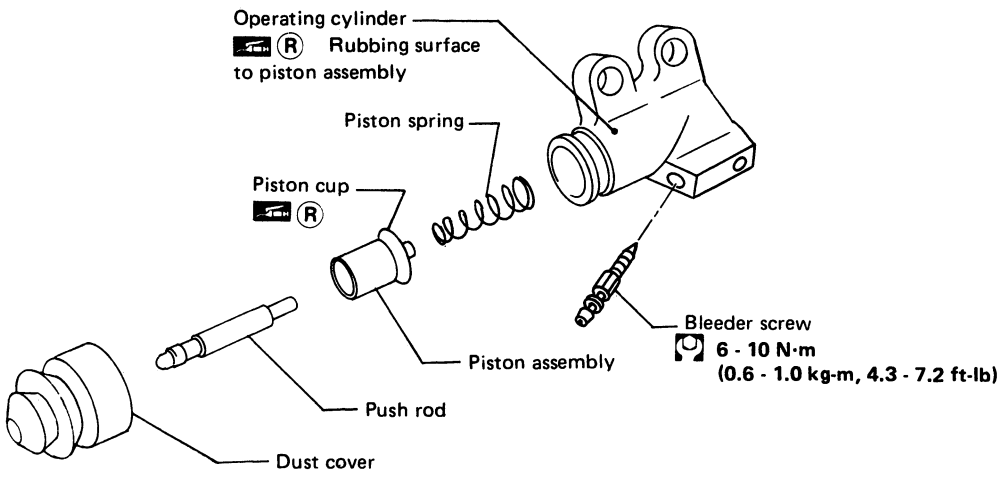
Clutch Master Cylinder (Cont'd)

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

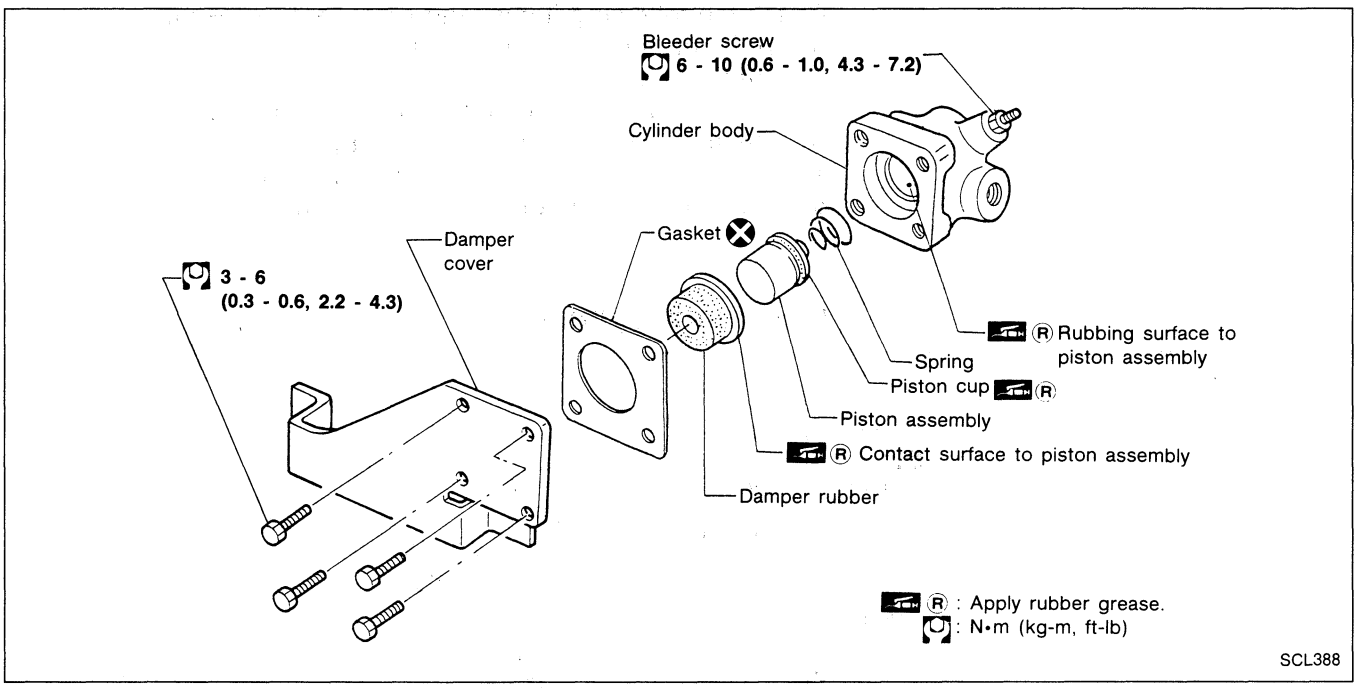


INSPECTION

Check the following items, and replace if necessary.

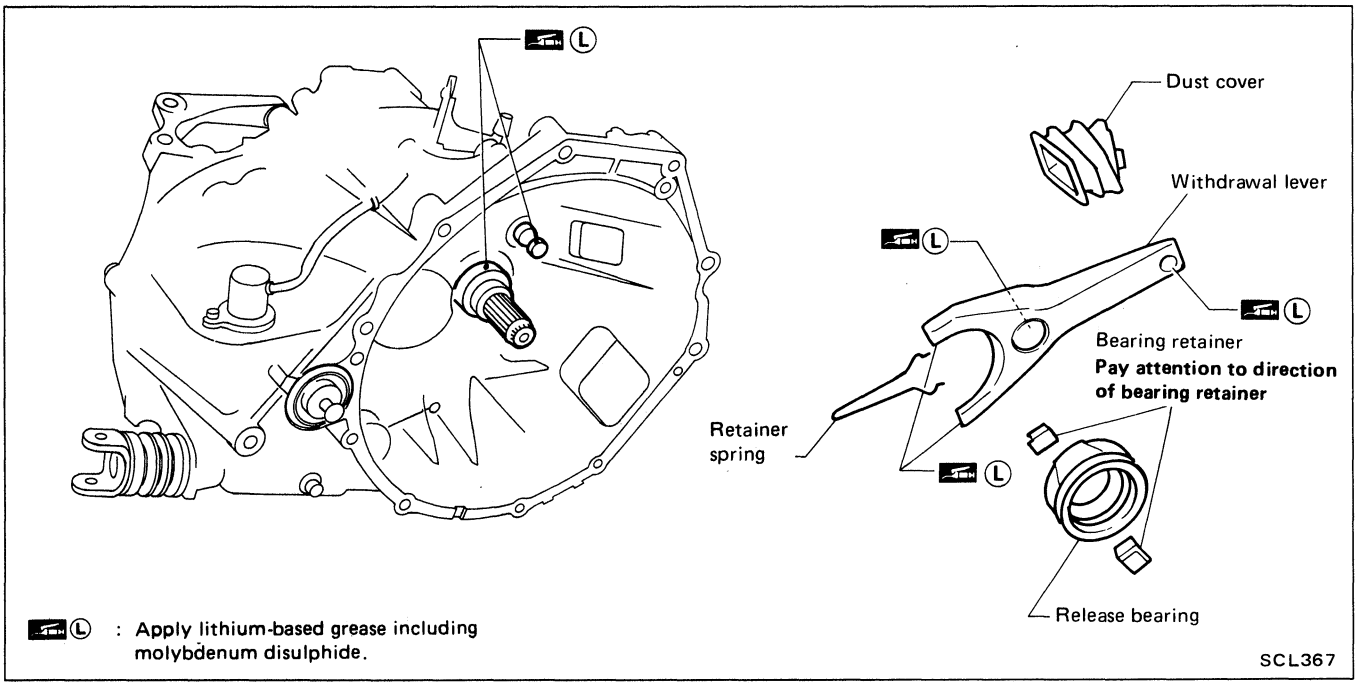
- Rubbing surface of cylinder and piston, for uneven wear, rest or damage
- Piston with piston cup, for wear or damage
- Piston spring, for wear or damage
- Dust cover, for cracks, deformation or damage

Clutch Damper



INSPECTION

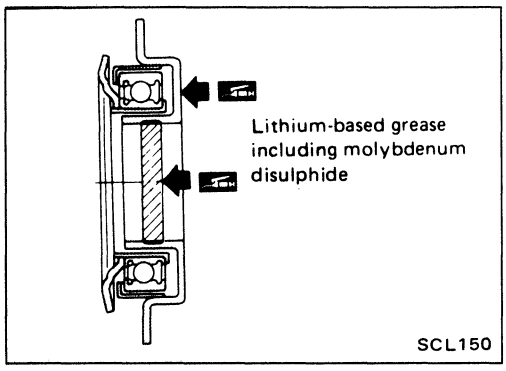
- Check cylinder and piston rubbing surface for uneven wear, rust or damage. Replace if necessary.
- Check damper rubber and piston cup for cracks, deformation or damage. Replace if necessary.



INSPECTION

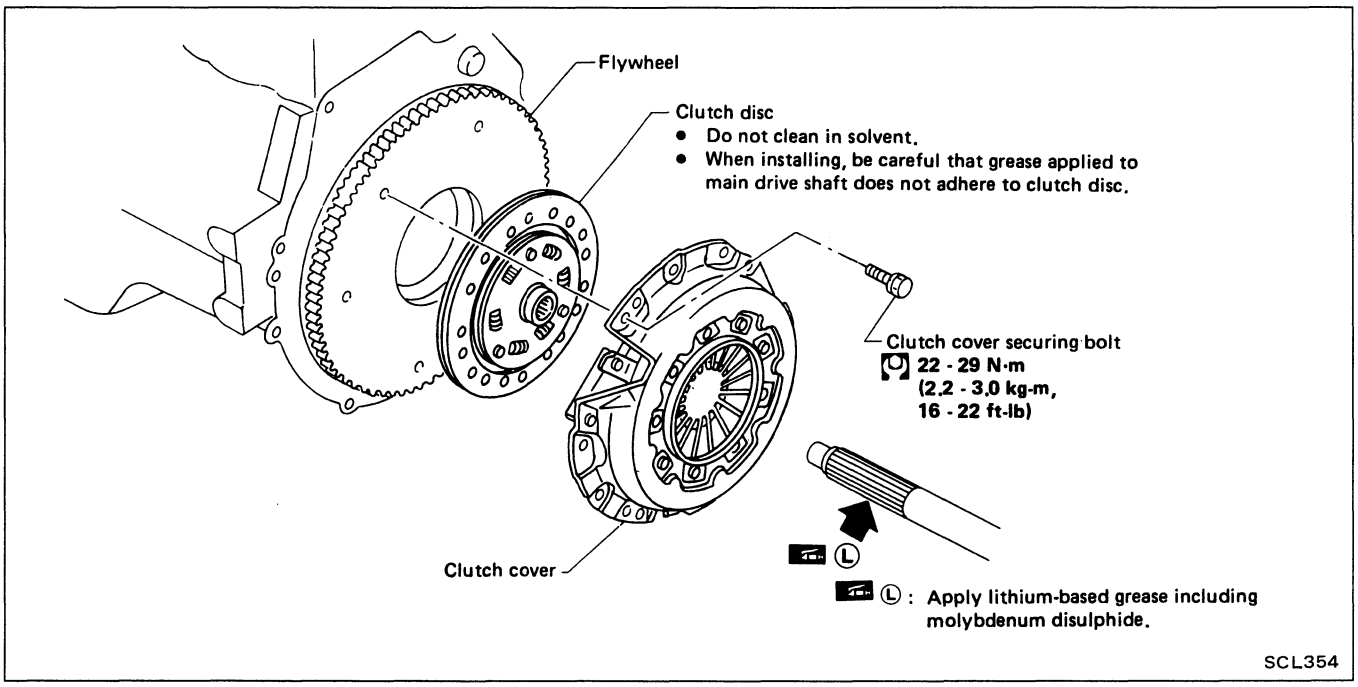
Check the following items, and replace if necessary.

- 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



LUBRICATION

- Apply recommended grease to contact surface and rubbing surface.
- **Too much lubricant might damage clutch disc facing.**

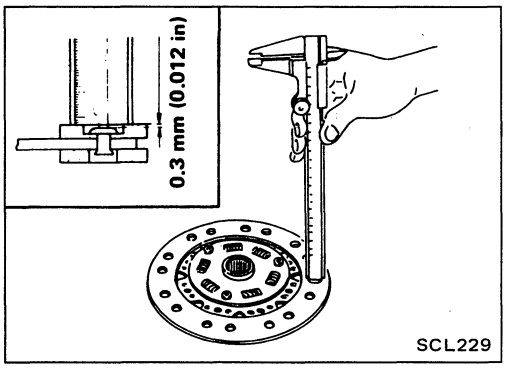


Clutch Disc

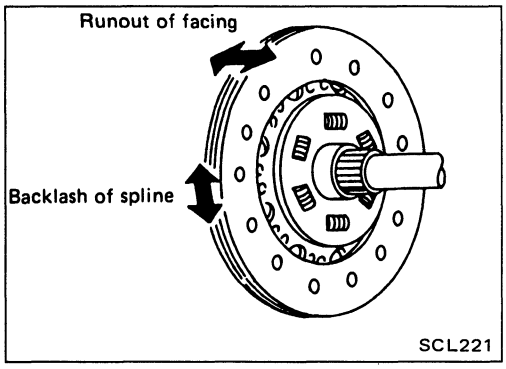
INSPECTION

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)

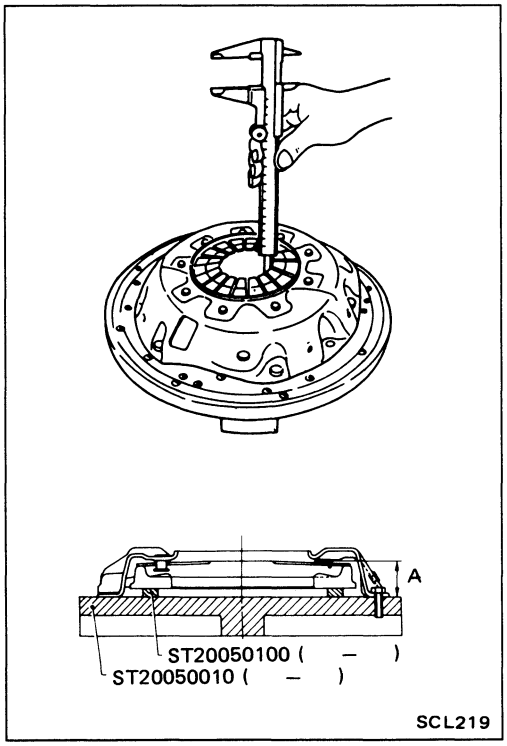


- Clutch disc, for backlash of spline
  Maximum backlash of spline (at outer edge of disc):
  0.9 mm (0.035 in)
- Clutch disc, for runout of facing
  Runout limit:
  1.0 mm (0.039 in)
  Distance of runout check point (from hub center)
  107.5 mm (4.23 in)

Clutch Disc (Cont'd)

INSTALLATION

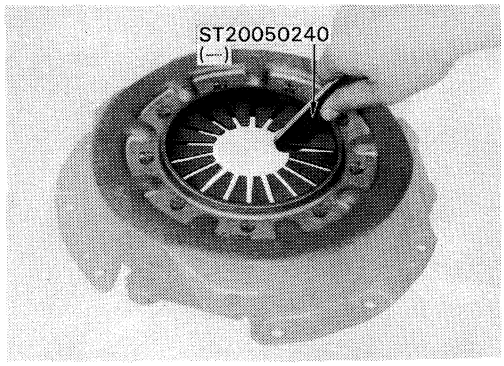
- Apply recommended grease to contact surface of spline portion.
- **Too much lubricant might damage clutch facing.**



Clutch Cover and Flywheel

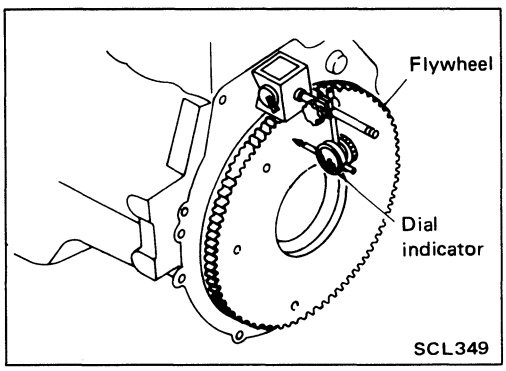
INSPECTION AND ADJUSTMENT

- 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.



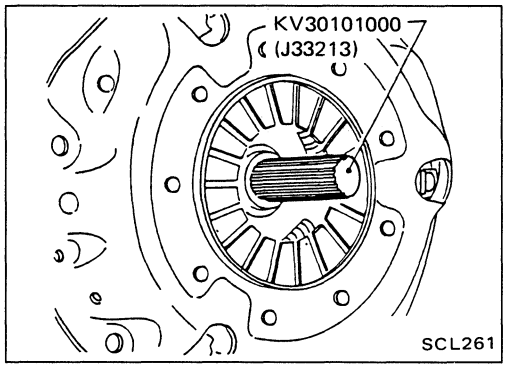
- Adjust unevenness of diaphragm spring with Tool.
  Uneven limit:
  0.7 mm (0.028 in)

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)

Clutch Cover and Flywheel (Cont'd)



INSTALLATION

- Align clutch disc with Tool when installing clutch cover and disc.

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 DAMPER

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 3,923 N (400 kg, 882 lb)

CLUTCH COVER

Model		C225S
Full-load	N (kg, lb)	5,394 (550, 1,213)

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)

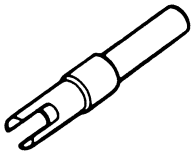
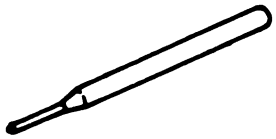
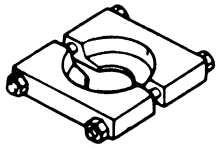
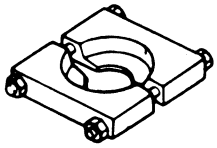
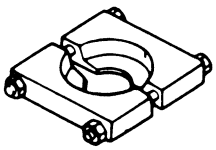
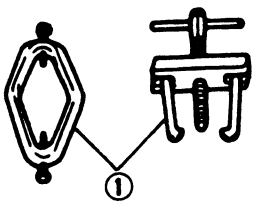
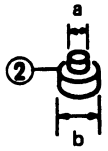
Model	C225S
Diaphragm spring height	33.0 - 35.0 (1.299 - 1.378)
Uneven limit of diaphragm spring toe height	0.7 (0.028)

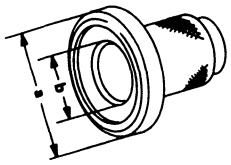
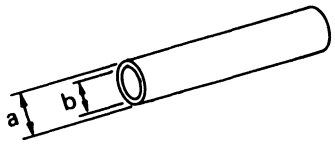
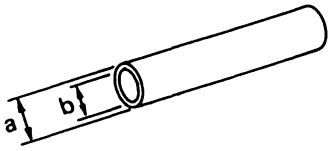
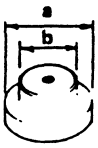
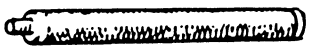
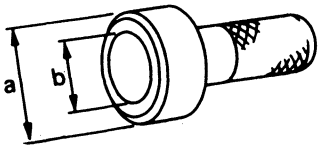
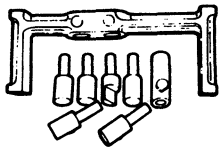
MANUAL TRANSAXLE

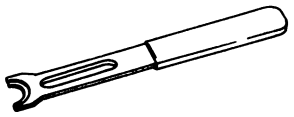
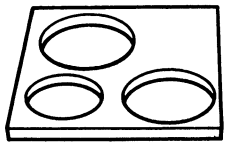
SECTION MT

CONTENTS

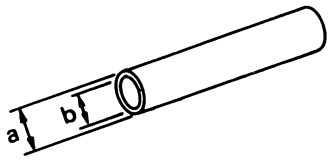
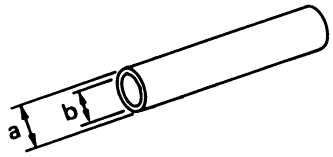
SPECIAL SERVICE TOOLS

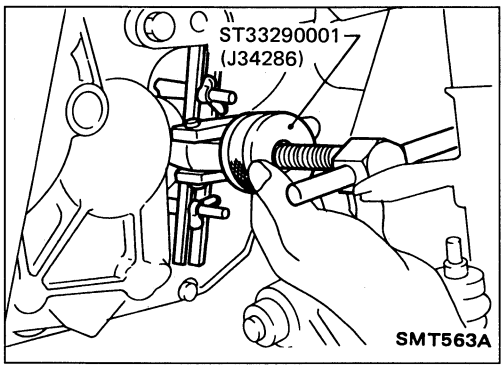
Tool number (Kent-Moore No.) Tool name	Description
KV38106500 (J34284) Preload adapter	Measuring turning torque of final drive assembly Measuring total turning torque Measuring clearance between side gear and differential case with washer Selecting differential side bearing adjusting shim 
KV32101000 (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

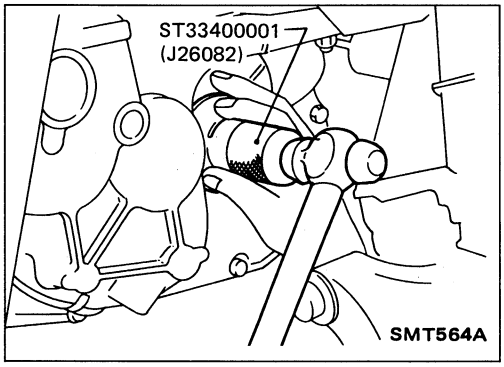
Tool name	Description
Drift	Installing differential side bearing inner race  **a: 45 mm (1.77 in) dia.** **b: 41 mm (1.61 in) dia.**
Drift	Installing striking rod oil seal  **a: 38 mm (1.50 in) dia.** **b: 20 mm (0.79 in) dia.**



Replacing Oil Seal

DIFFERENTIAL OIL SEAL

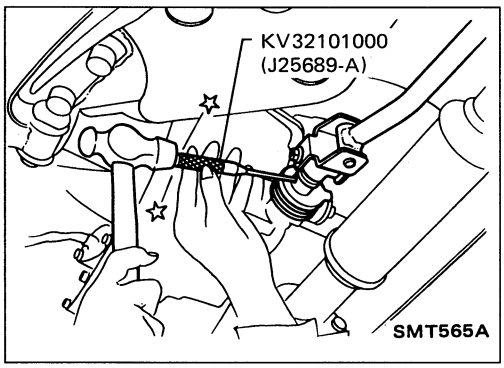
1. Drain gear oil from transaxle.
2. Remove drive shafts — Refer to section FA.
3. Remove differential oil seal.



4. Install differential oil seal.

- **Apply multi-purpose grease to seal lip of oil seal before installing.**

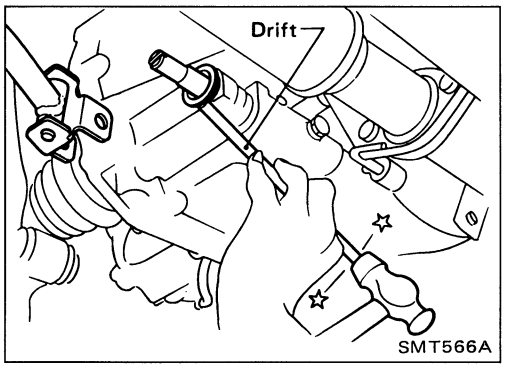
5. Install drive shafts — Refer to section FA.



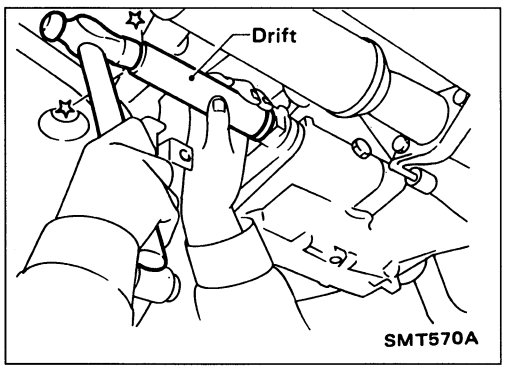
STRIKING ROD OIL SEAL

1. Remove transaxle control rod from yoke.
2. Remove retaining pin of yoke.

- **Be careful not to damage boot.**

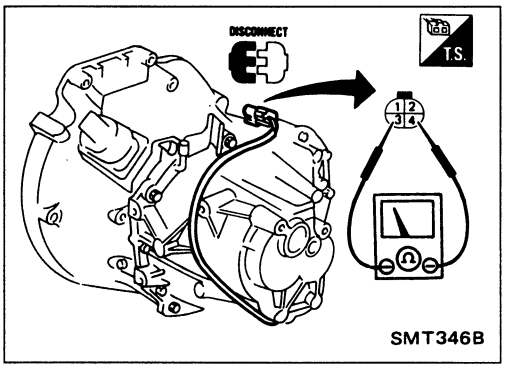


3. Remove striking rod oil seal.

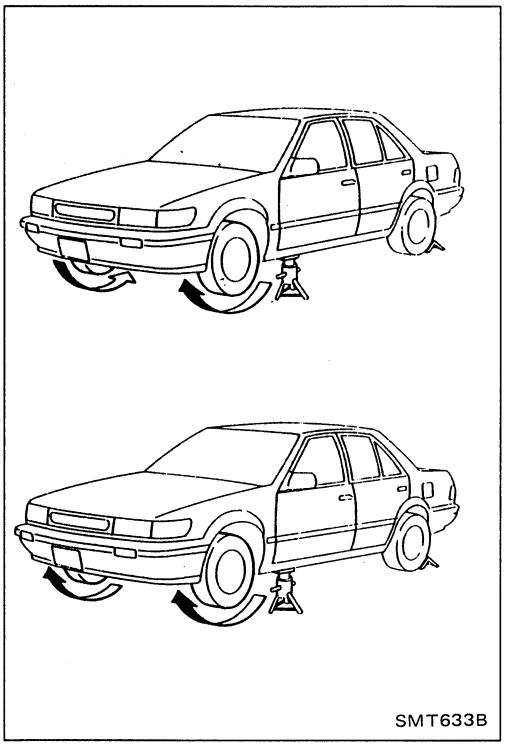


4. Install striking rod oil seal.

- **Apply multi-purpose grease to seal lip of oil seal before installing.**



SMT346B


SMT633B

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

Viscous Coupling Check

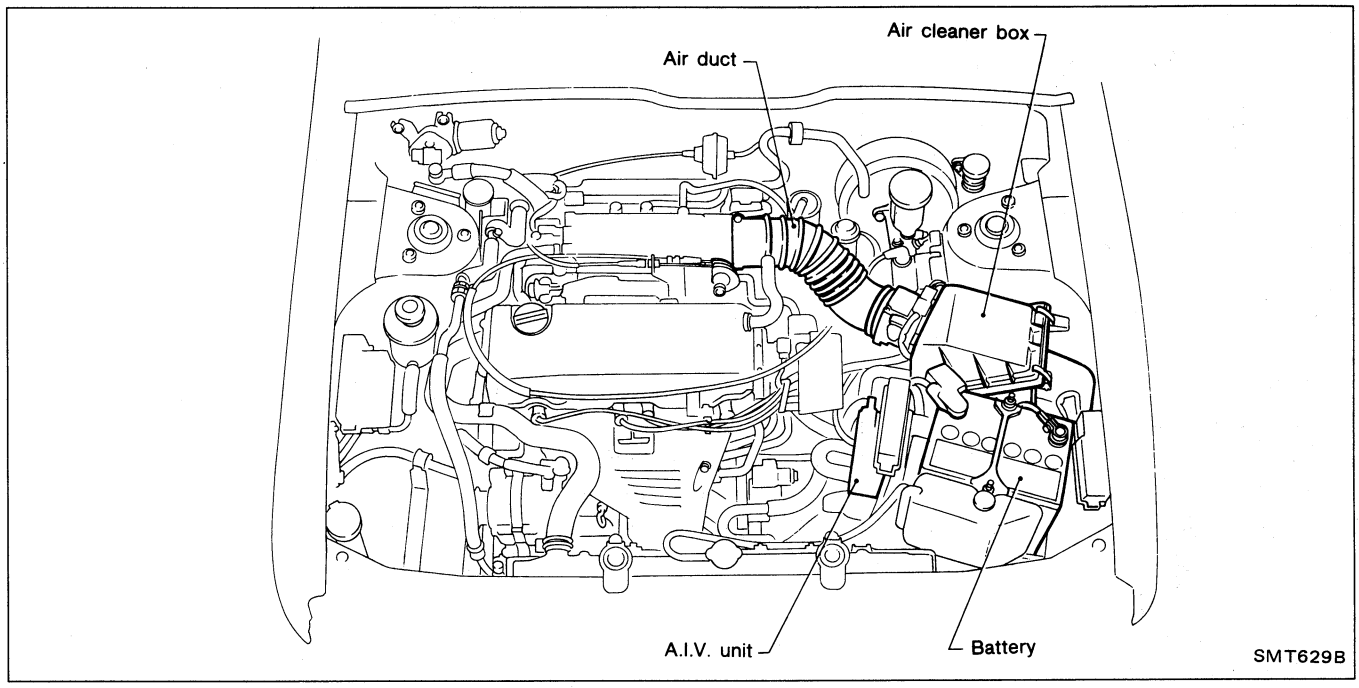
1. Apply parking brake firmly and place shift lever in the neutral position.
2. Jack up front wheels.
3. Rotate one front wheel and check turning direction of the other front wheel.

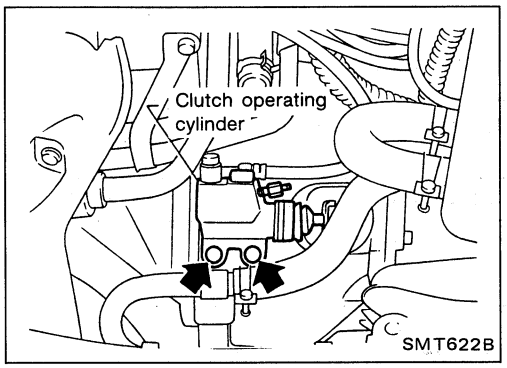
Turning direction of the two wheels is opposite:

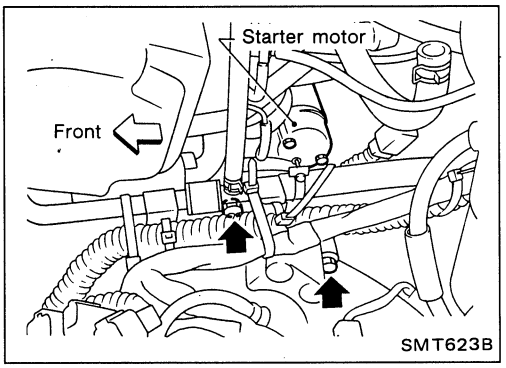
The viscous coupling is not functioning normally.

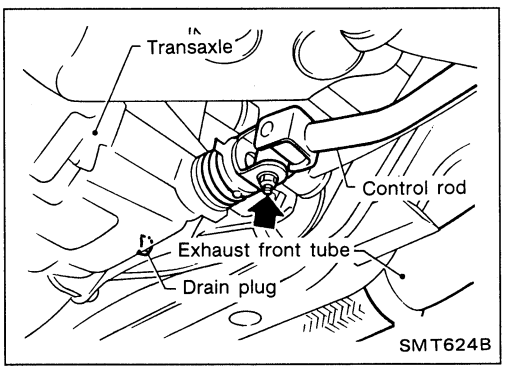
Turning direction of the two wheels is the same:

If differential side gear and pinion mate gear thrust washers are O.K., viscous coupling is functioning normally.





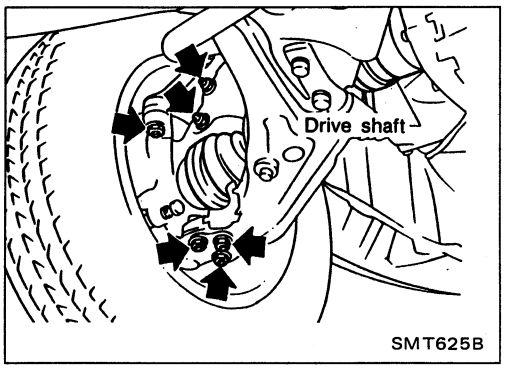




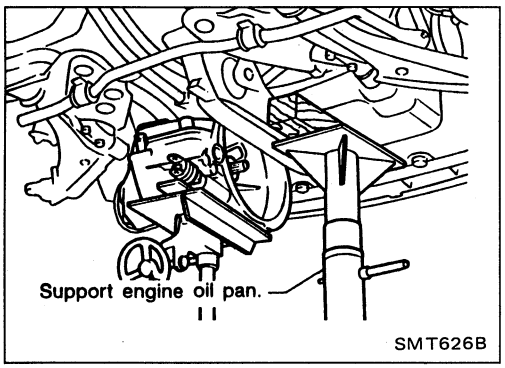
Removal

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)



13. Draw out drive shafts from transaxle.

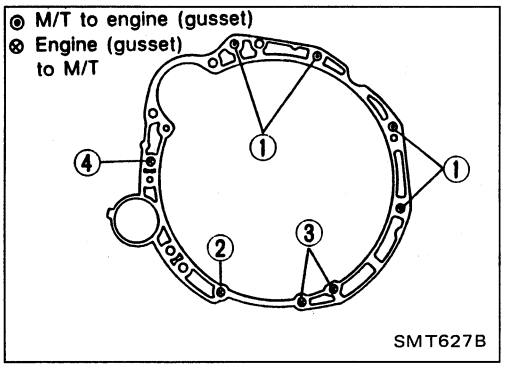


14. Support engine by placing a jack under oil pan.

CAUTION:

Do not place jack under oil pan drain plug.

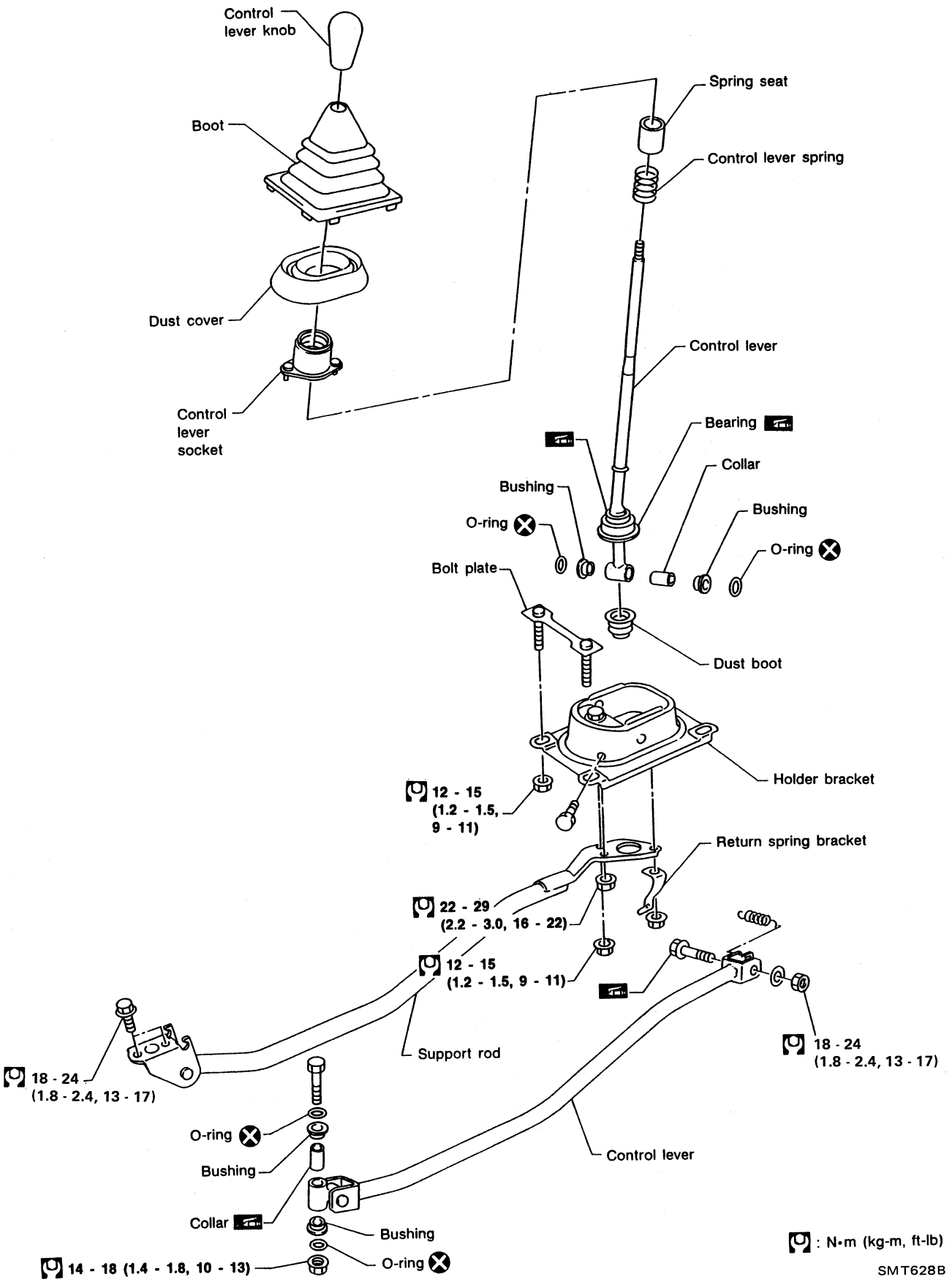
15. Remove rear and L.H. mounts.
16. Remove bolts securing transaxle.
17. Lower transaxle while supporting it with a jack.



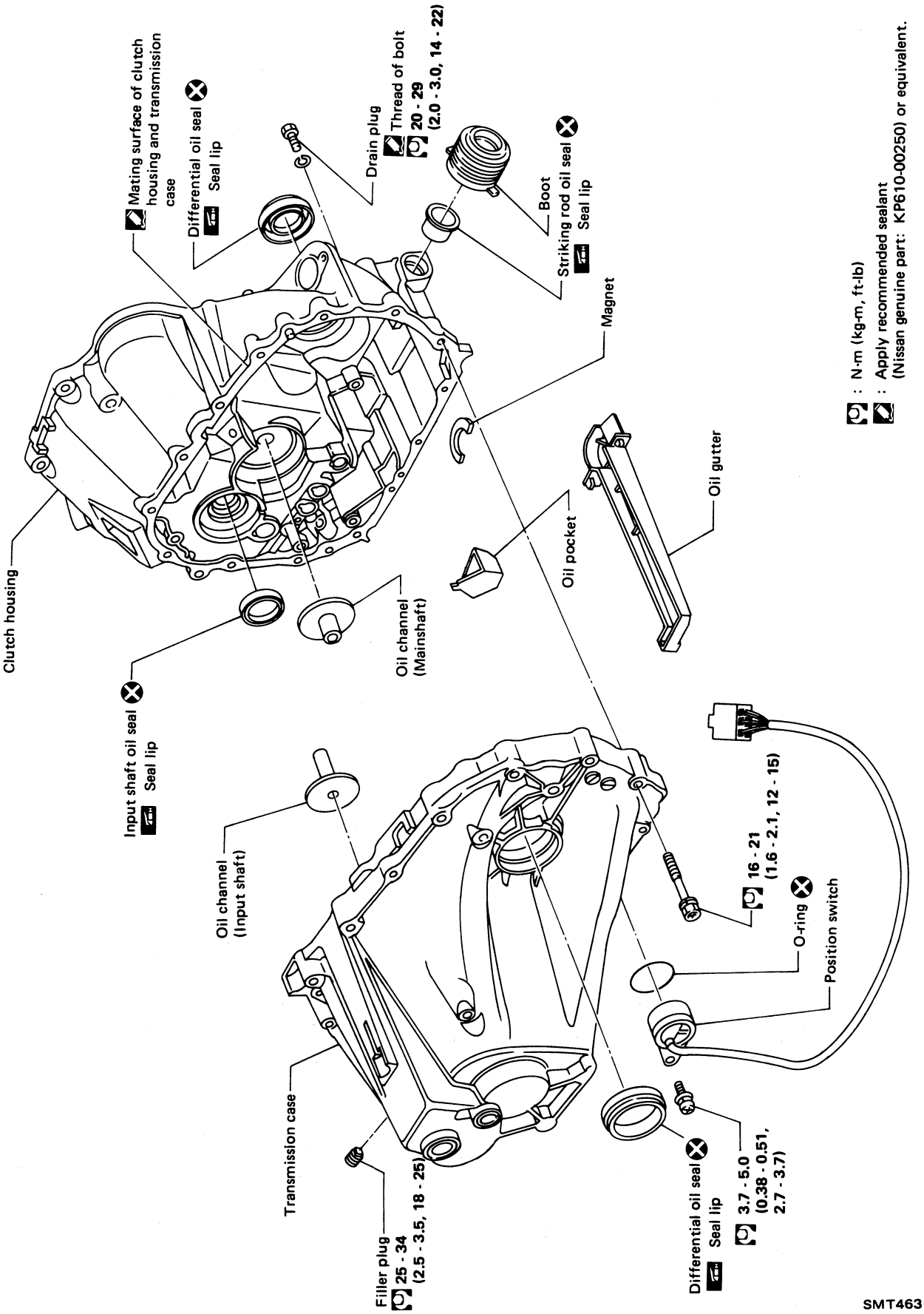
Installation

1. Tighten bolts securing transaxle.

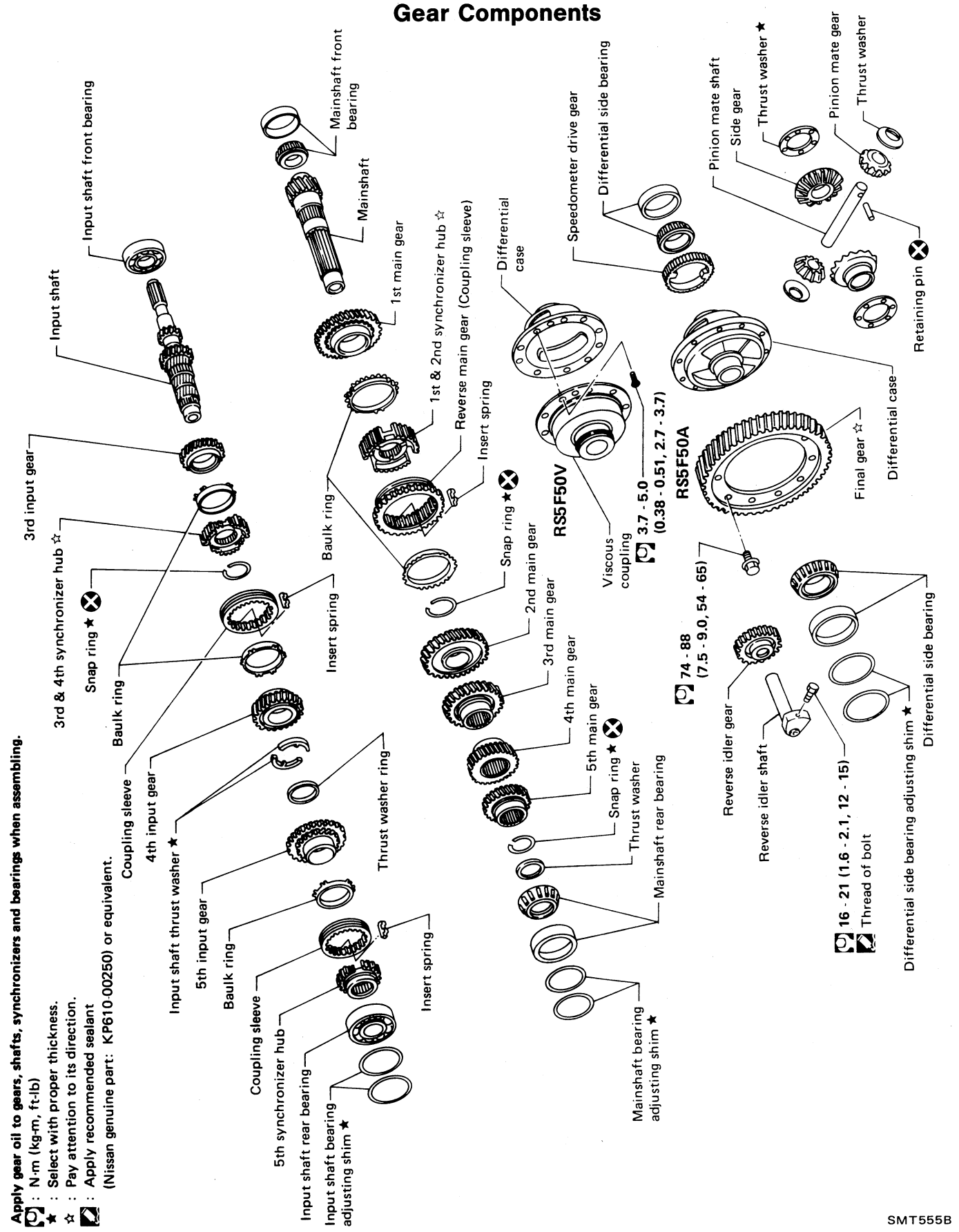
Bolt No.	Tightening torque N·m (kg-m, ft-lb)	mm (in)
1	39 - 49 (4.0 - 5.0, 29 - 36)	45 (1.77)
2	39 - 49 (4.0 - 5.0, 29 - 36)	25 (0.98)
3	30 - 40 (3.1 - 4.1, 22 - 30)	30 (1.18)
4	30 - 40 (3.1 - 4.1, 22 - 30)	40 (1.57)


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
Bushing
O-ring
14 - 18 (1.4 - 1.8, 10 - 13)
Control lever
: N•m (kg-m, ft-lb)
SMT628B

Case Components

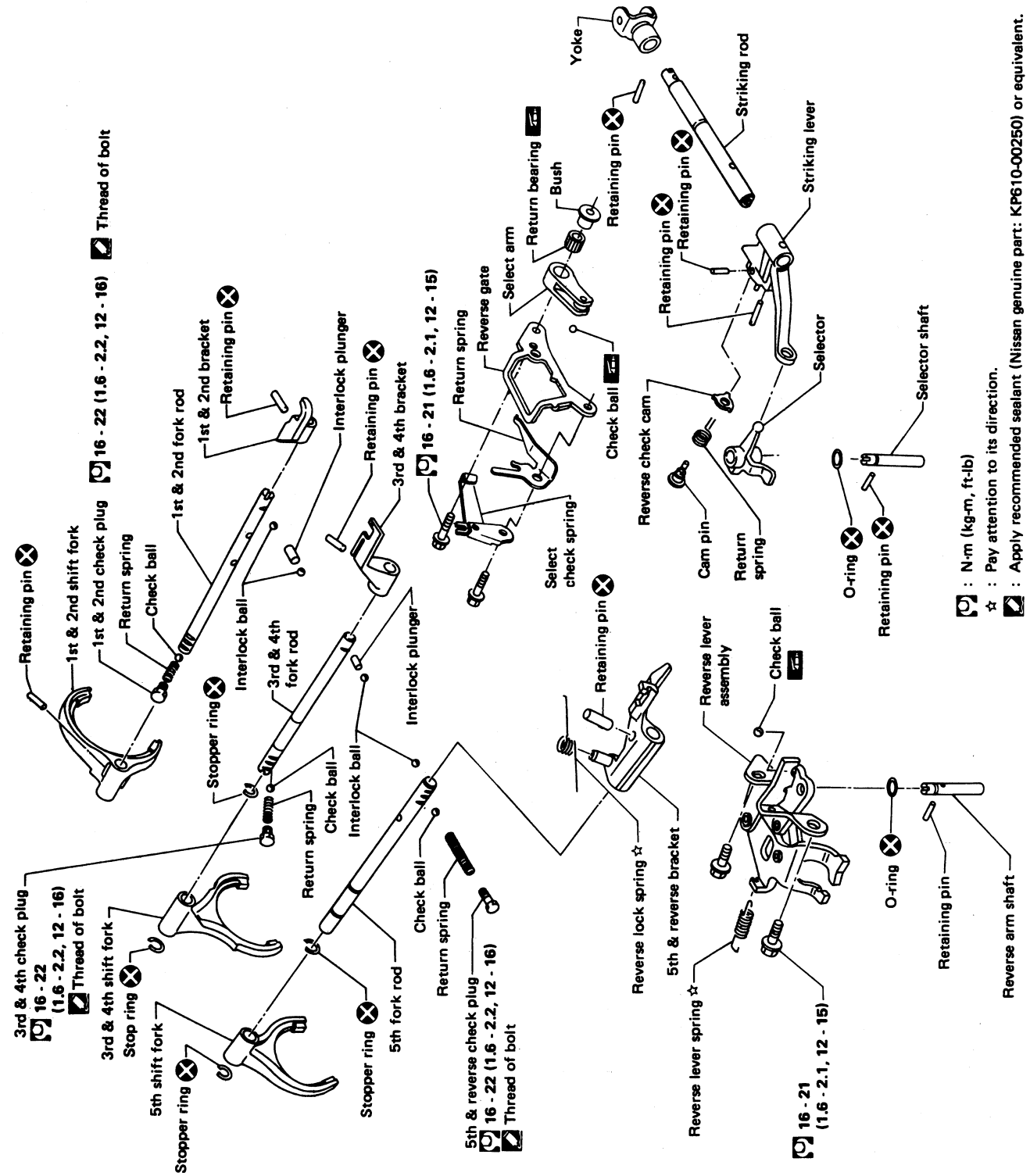


Gear Components

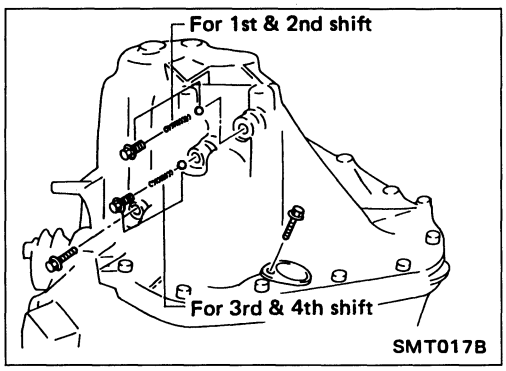


SMT555B

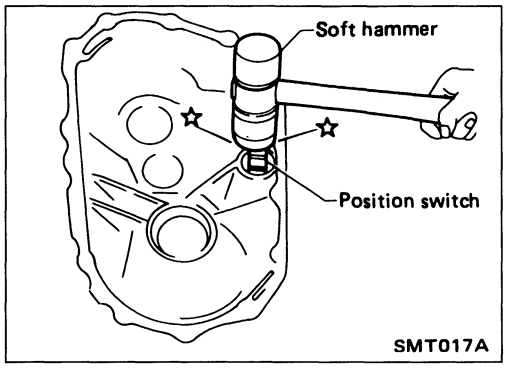
Shift Control Components



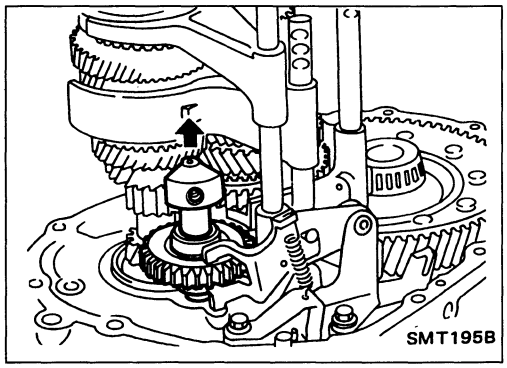
SMT465B



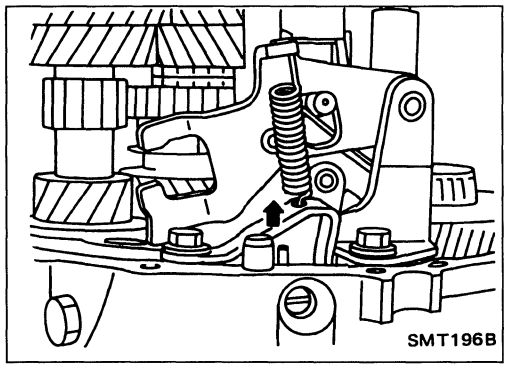
1. Before removing transmission case, remove bolts and plugs as shown left.
2. Remove transmission case.



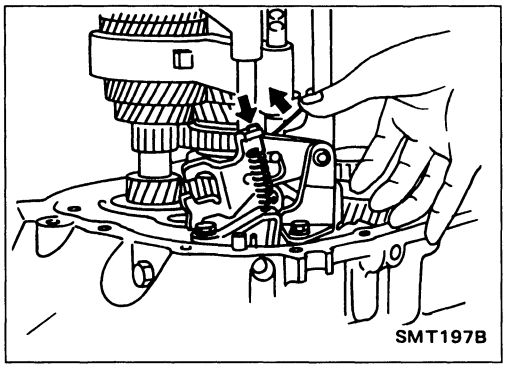
3. Remove position switch.



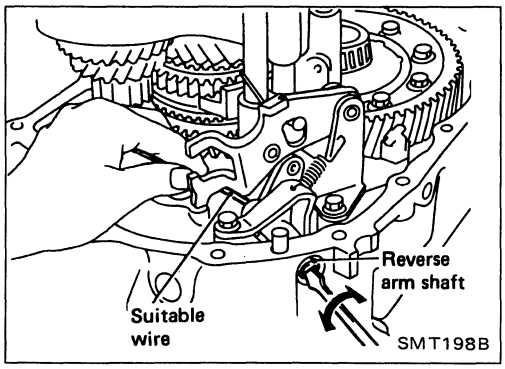
4. Mesh 4th gear, and then remove reverse idler shaft and reverse idler gear.



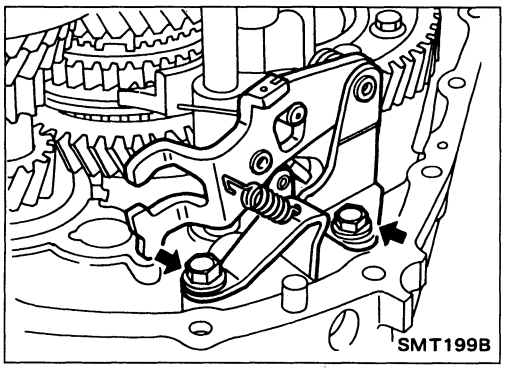
5. Pull out retaining pin from clutch housing.



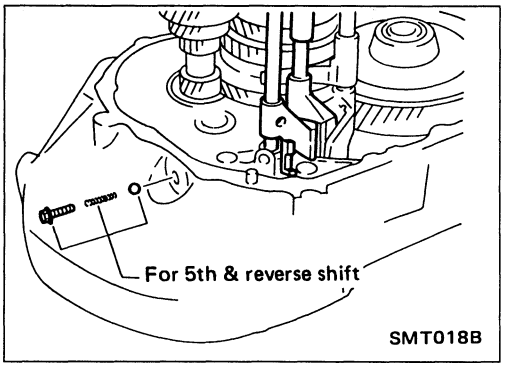
6. Remove reverse lever spring and reverse lock spring from reverse lever assembly.



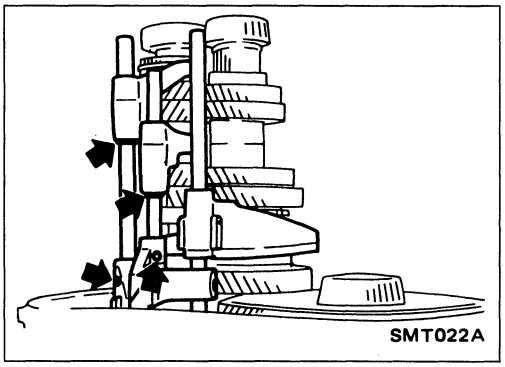
7. Remove reverse arm shaft while rotating it.



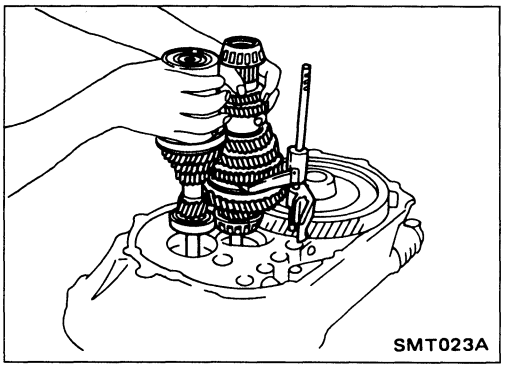
8. Remove reverse lever assembly.



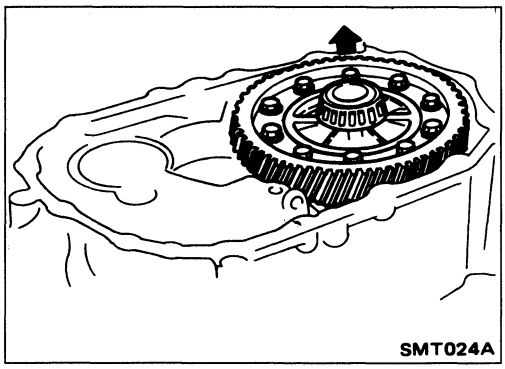
9. Remove 5th & reverse check plug, spring and ball.



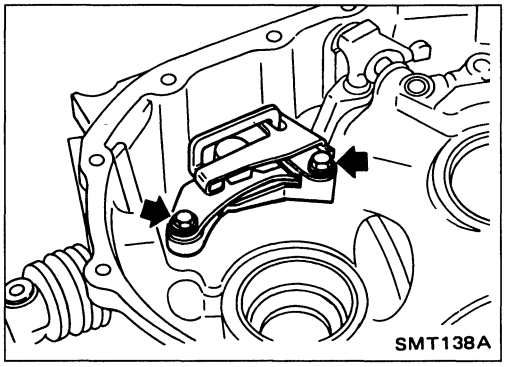
10. Remove stopper rings and retaining pins from 5th & reverse and 3rd & 4th fork rods.
11. Remove 5th & reverse and 3rd & 4th fork rods. Then remove forks and brackets.



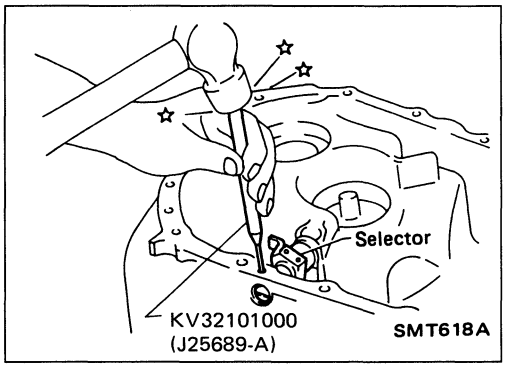
12. Remove both input and mainshafts with 1st & 2nd fork and fork rod as a set.



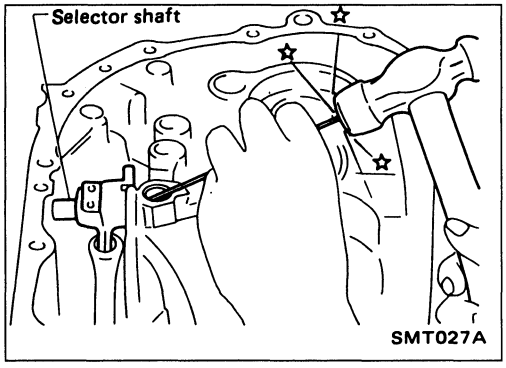
13. Remove final drive assembly.

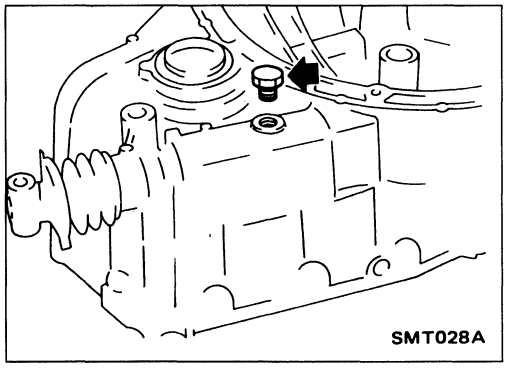


14. Remove reverse check assembly.

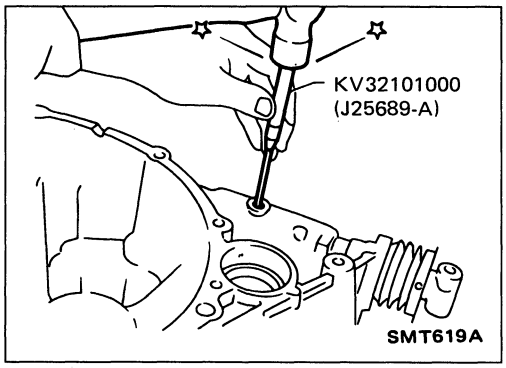


15. Remove retaining pin and detach the selector.

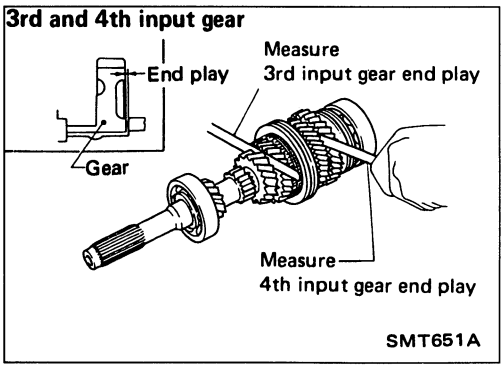


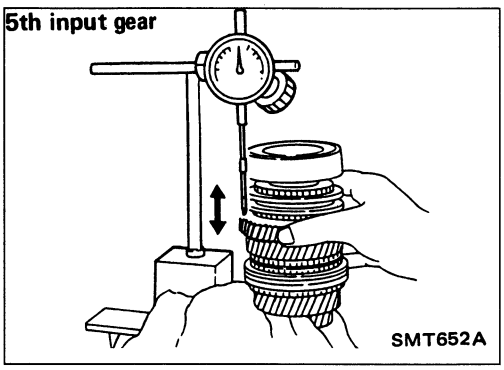


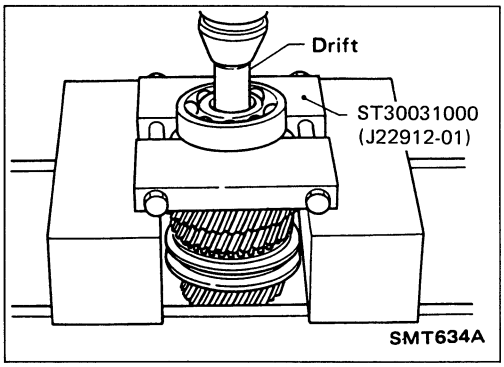
16. Remove drain plug for convenience in removing retaining pin which holds striking lever to striking rod.

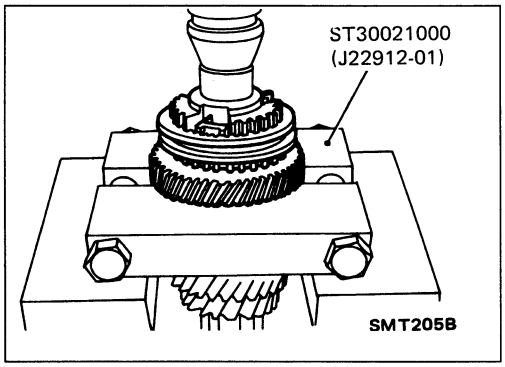


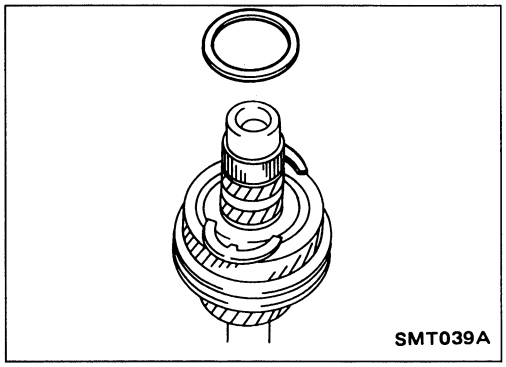
17. Remove retaining pin and then withdraw striking lever and striking rod.











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)

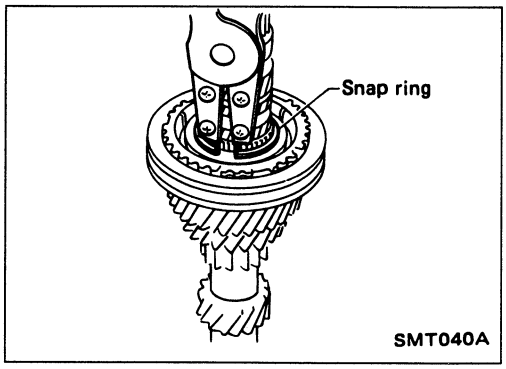
- If not within specification, disassemble and check contact surface of gear, shaft and hub. Then check clearance of snap ring and thrust washer — Refer to "Assembly".

2. Remove input shaft rear bearing.

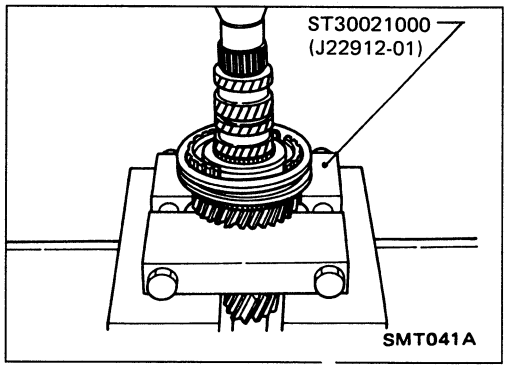
3. Remove 5th & reverse synchronizer and 5th input gear.

4. Remove thrust washer ring, thrust washers and 4th input gear.

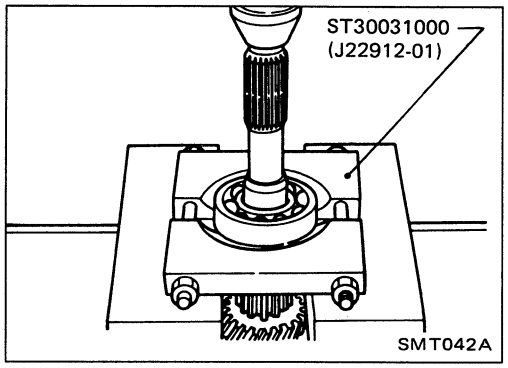
Input Shaft and Gears (Cont'd)



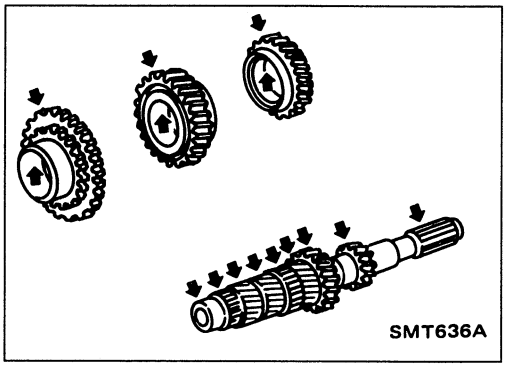
5. Remove snap ring.



6. Remove 3rd & 4th synchronizer and 3rd input gear.



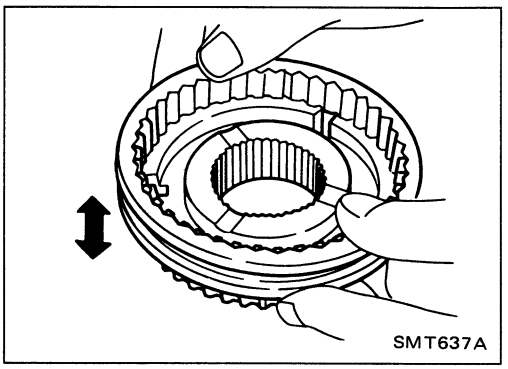
7. Remove input shaft front bearing.



INSPECTION

Gear and shaft

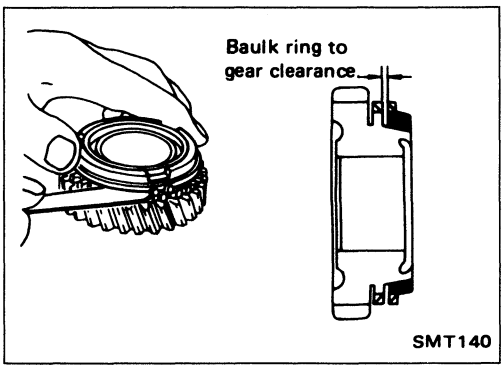
- Check shaft for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.



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)



- Measure clearance between baulk ring and gear (4th and 5th).

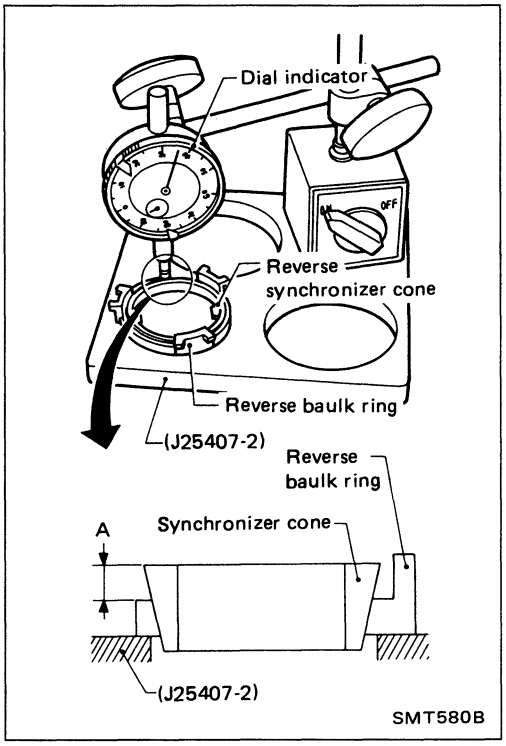
Clearance between baulk ring and gear:

Standard

1.0 - 1.35 mm (0.0394 - 0.0531 in)

Wear limit

0.7 mm (0.028 in)



- **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.**

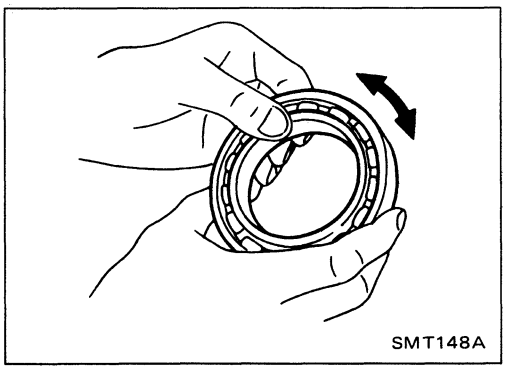
b. While holding reverse synchronizer cone against reverse baulk ring as firmly as possible, measure dimension "A" with dial indicator.

Wear limit:

Dimension "A"

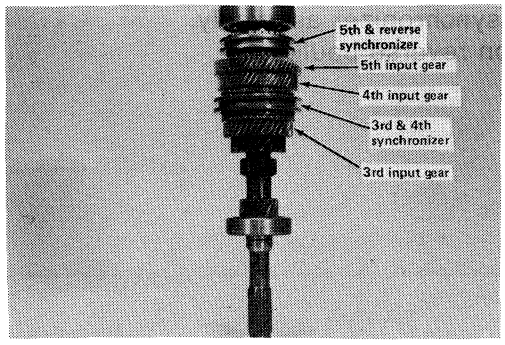
1.2 mm (0.047 in)

c. If dimension "A" is smaller than the wear limit, replace baulk ring.



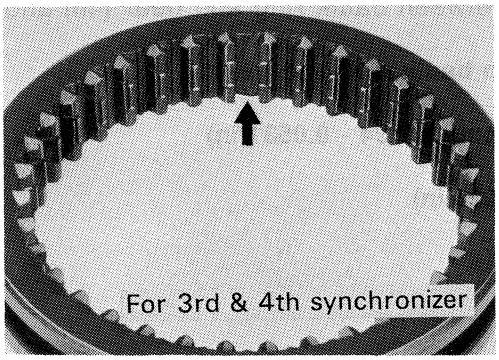
Bearing

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.

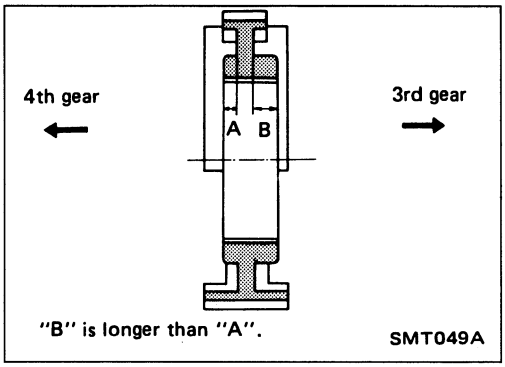


ASSEMBLY

Input Shaft and Gears (Cont'd)



1. Place inserts in three grooves on coupling sleeve (3rd & 4th synchronizer).

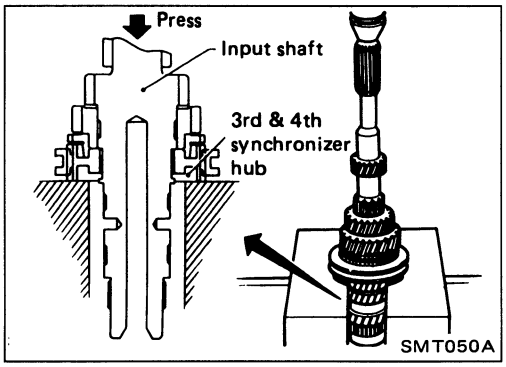


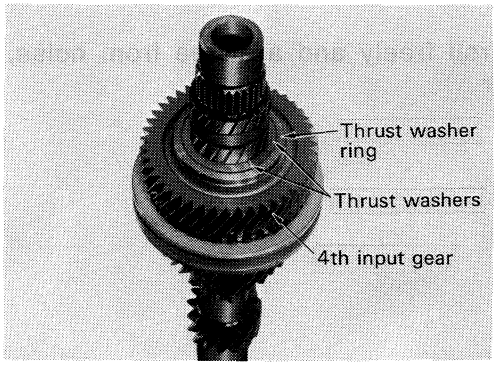
2. Install 3rd input gear and 3rd baulk ring.
3. Press on 3rd & 4th synchronizer hub.

- **Pay attention to its direction.**

4. Select proper snap ring of 3rd & 4th synchronizer hub to minimize clearance of groove, and then install it.

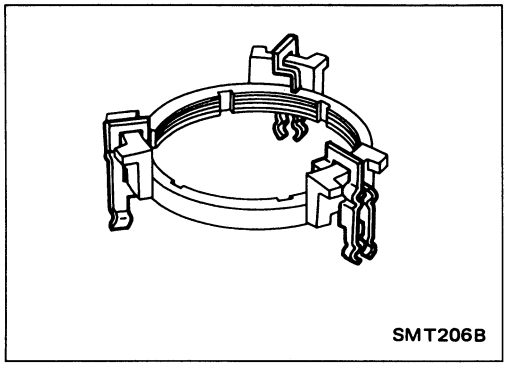
Allowable clearance of groove:
0 - 0.1 mm (0 - 0.004 in)
Snap ring of 3rd & 4th synchronizer hub:
Refer to S.D.S.





5. Install 4th input gear.
6. Select proper thrust washers to minimize clearance of groove.
   Then install them and thrust washer ring.

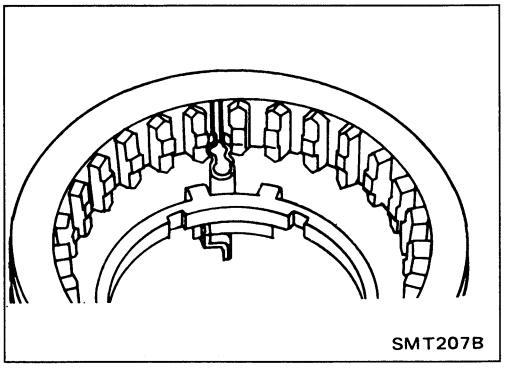
Allowable clearance of groove:
0 - 0.06 mm (0 - 0.0024 in)
Input shaft thrust washer:
Refer to S.D.S.



7. Install 5th & reverse synchronizer assembly.

a. Hook insert springs on reverse baulk ring.

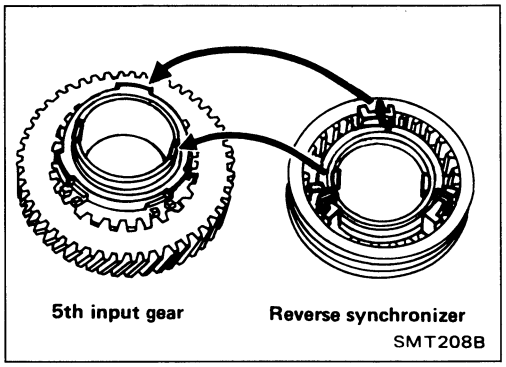
Input Shaft and Gears (Cont'd)


SMT207B

b. Install insert springs with reverse baulk ring onto coupling sleeve.

- **Pay attention to position of insert springs.**

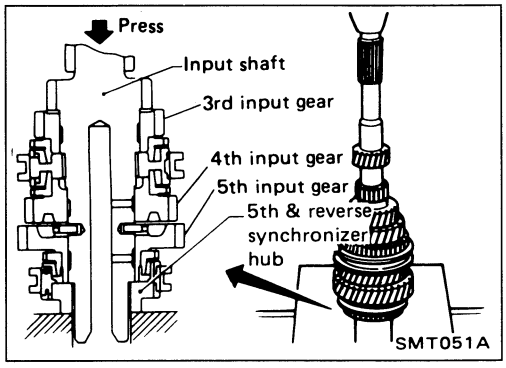
c. Place 5th baulk ring on 5th input gear.
d. Install reverse synchronizer cone on reverse baulk ring.



SMT208B

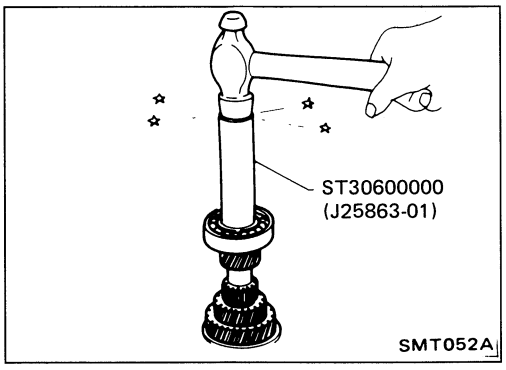
e. Place reverse synchronizer assembly on 5th input gear.

- **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.**



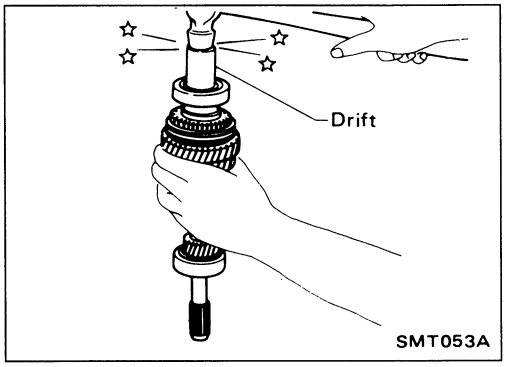
SMT051A

f. Press on 5th & reverse synchronizer assembly with 5th input gear.

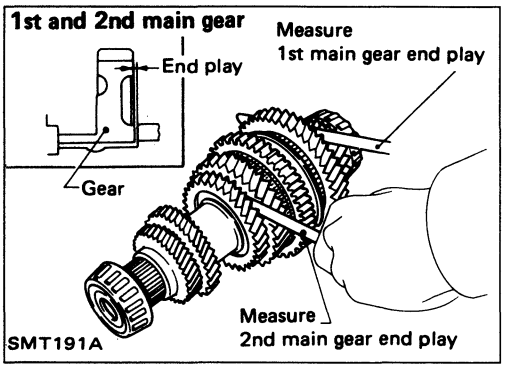


SMT052A

8. Install input shaft front and rear bearings.
9. Measure gear end play as the final check — Refer to "Disassembly".



SMT053A



Mainshaft and Gears

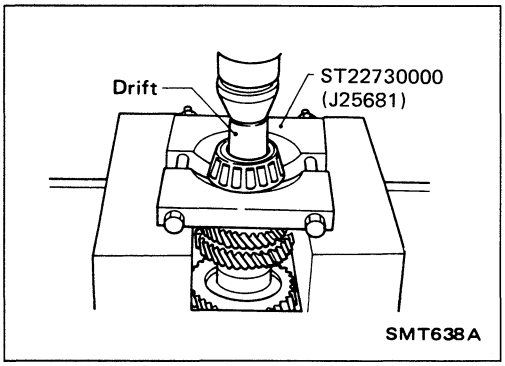
DISASSEMBLY

1. Before disassembly, check 1st and 2nd main gear end plays.

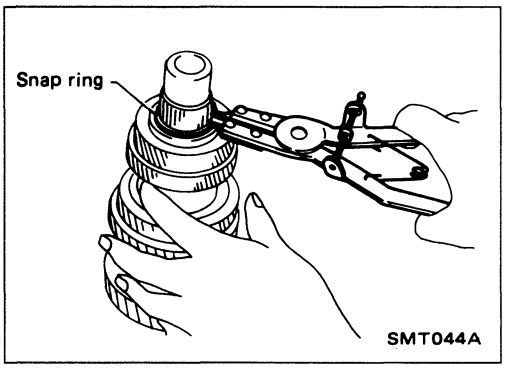
Gear end play

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)

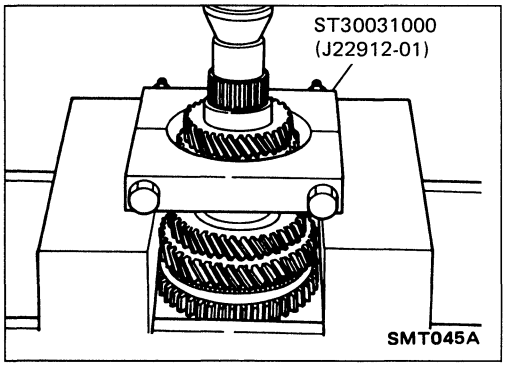
If not within specification, disassemble and check contact surface of gear, shaft and hub. Then check clearance of snap ring — Refer to "Assembly".



2. Press out mainshaft rear bearing.

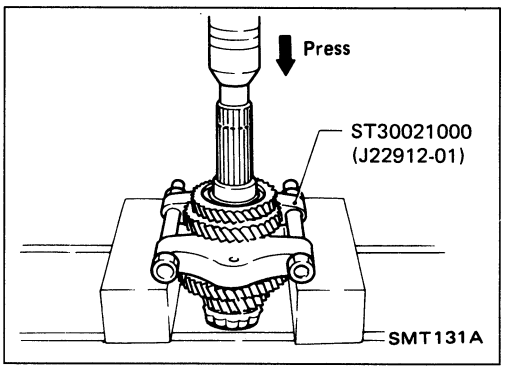


3. Remove thrust washer and snap ring.

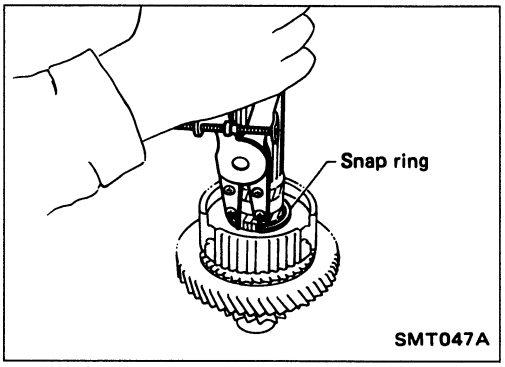


4. Press out 5th main gear and 4th main gear.

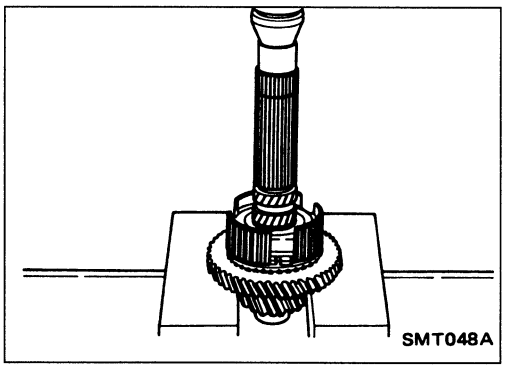
Mainshaft and Gears (Cont'd)



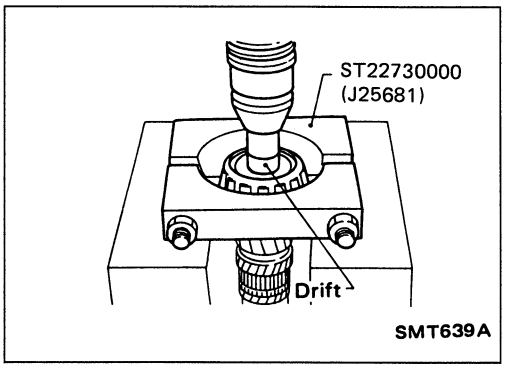
5. Press out 3rd main gear and 2nd main gear.



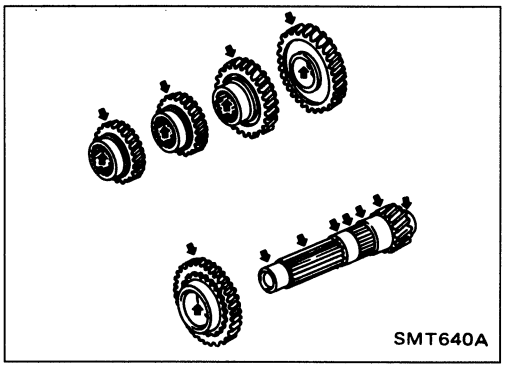
6. Remove snap ring.



7. Remove 1st & 2nd synchronizer and 1st main gear.



8. Remove mainshaft front bearing.

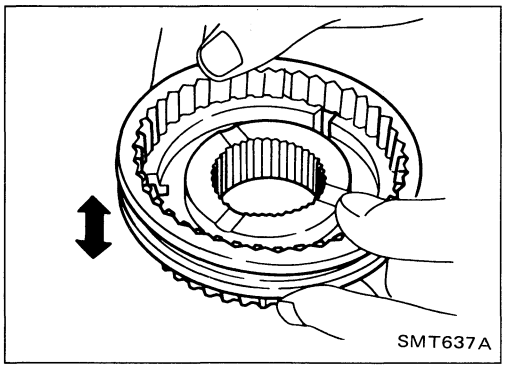


INSPECTION

Gear and shaft

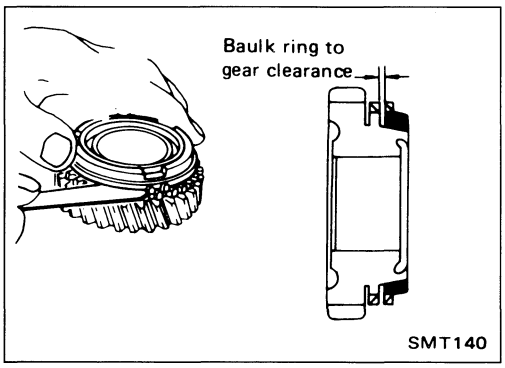
- Check shaft for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.

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).

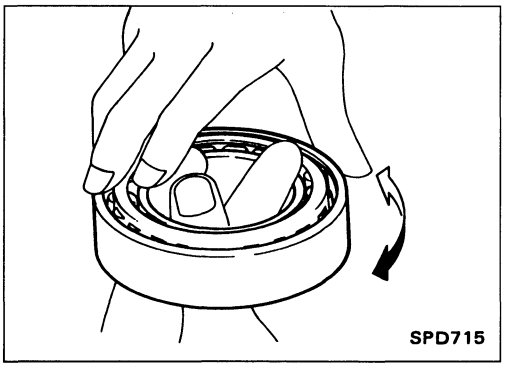
  Clearance between baulk ring and gear:

  Standard

  1.0 - 1.35 mm (0.0394 - 0.0531 in)

  Wear limit

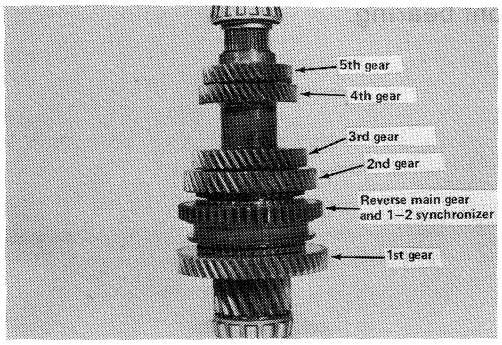
  0.7 mm (0.028 in)

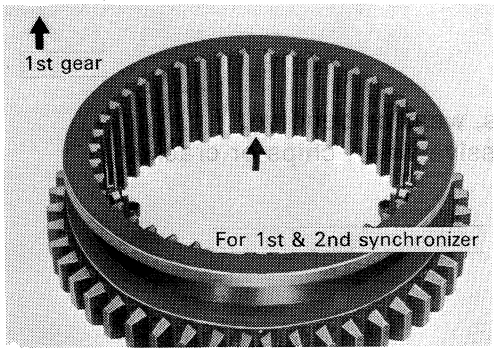


Bearing

- 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.**

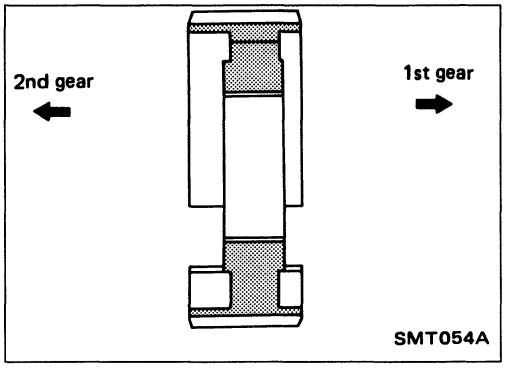
ASSEMBLY





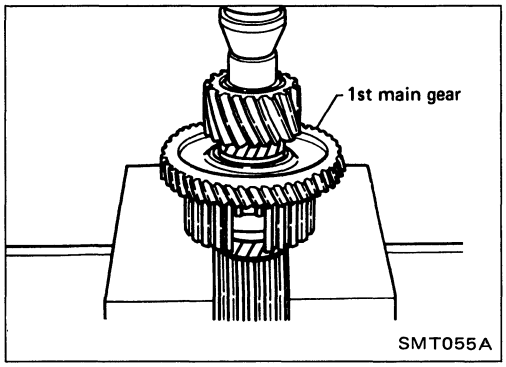
1. Place inserts in three grooves on coupling sleeve (1st & 2nd synchronizer).

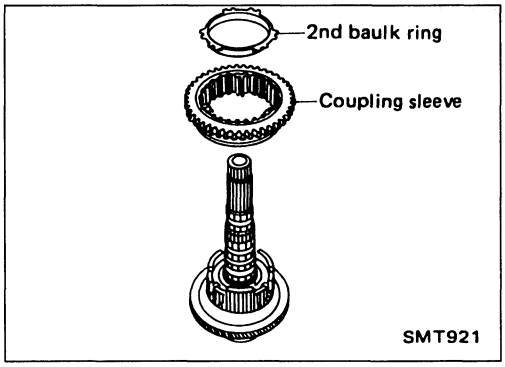
Mainshaft and Gears (Cont'd)



2. Install 1st main gear and 1st baulk ring.
3. Press on 1st & 2nd synchronizer hub.

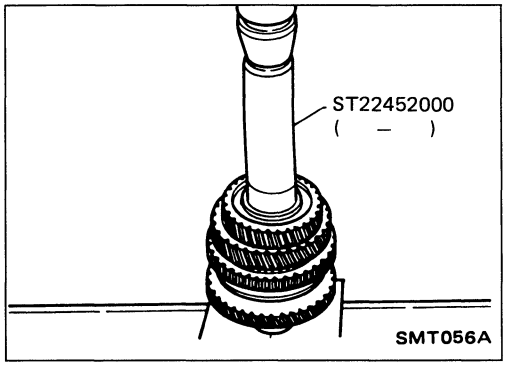
- **Pay attention to its direction.**



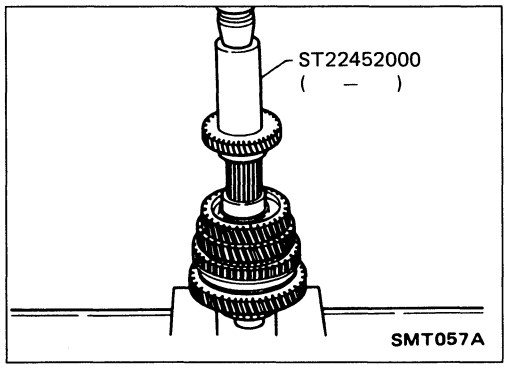


4. Install coupling sleeve with three inserts and 2nd baulk ring.
5. Select proper snap ring of 1st & 2nd synchronizer hub to minimize clearance of groove and then install it.

Allowable clearance of groove:
0 - 0.1 mm (0 - 0.004 in)
Snap ring of 1st & 2nd synchronizer hub:
Refer to S.D.S.

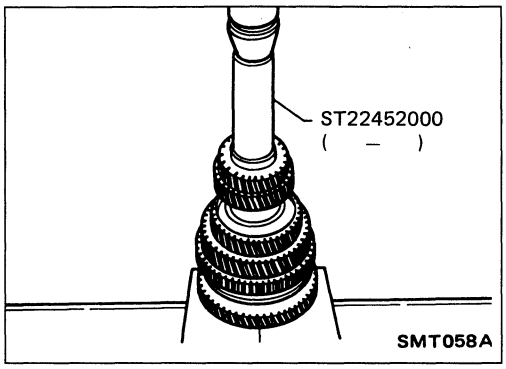


6. Install 2nd main gear.
7. Press on 3rd main gear.

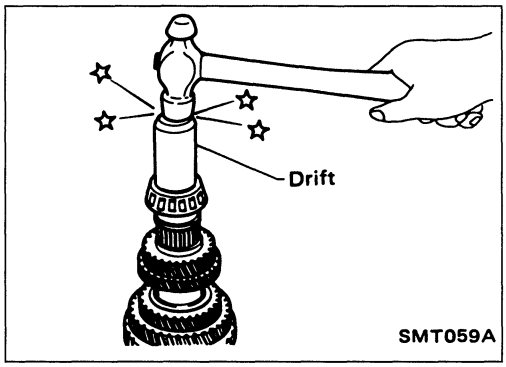


8. Press on 4th main gear.

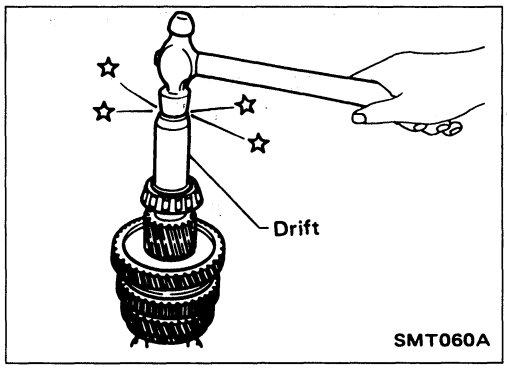
Mainshaft and Gears (Cont'd)



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.



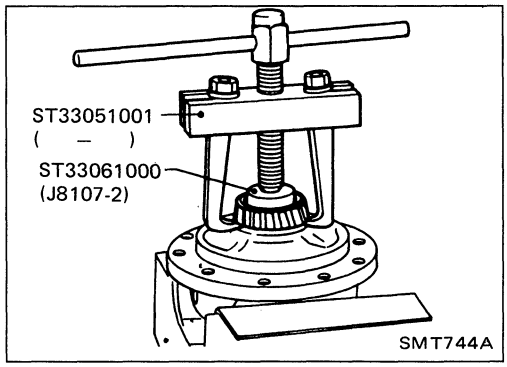
11. Press on thrust washer and press on mainshaft rear bearing.



12. Press on mainshaft front bearing.
13. Measure gear end play as the final check — Refer to "Disassembly".

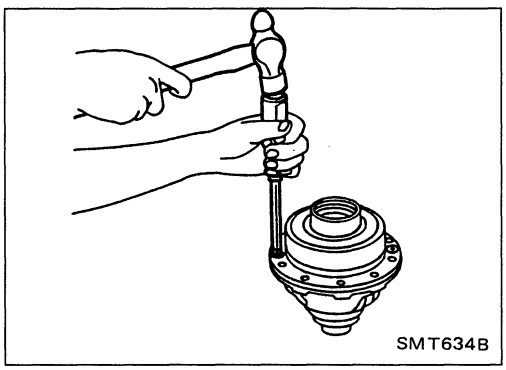
Final Drive

DISASSEMBLY



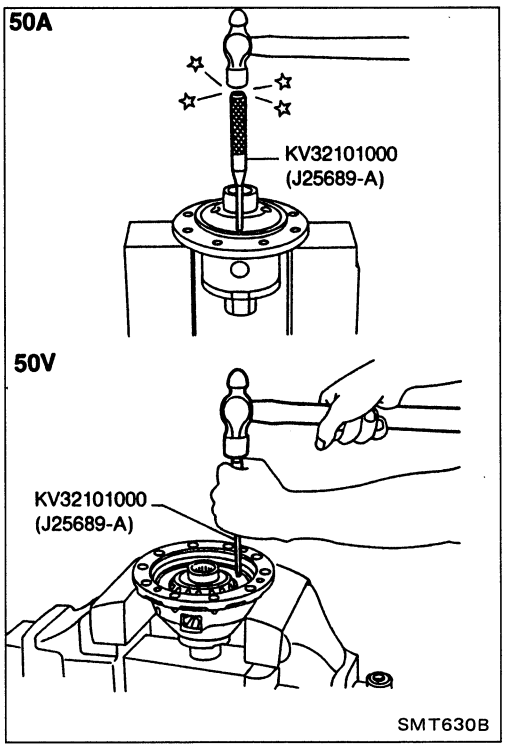
1. Remove final gear.
2. Remove speedometer drive gear by cutting it.
3. Press out differential side bearings.

- **Be careful not to mix up the right and left bearings.**

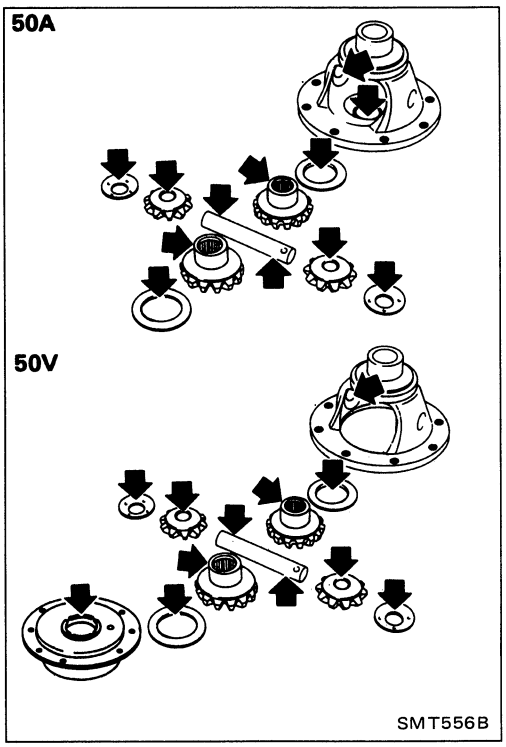


4. Remove viscous coupling (RS5F50V).

Final Drive (Cont'd)



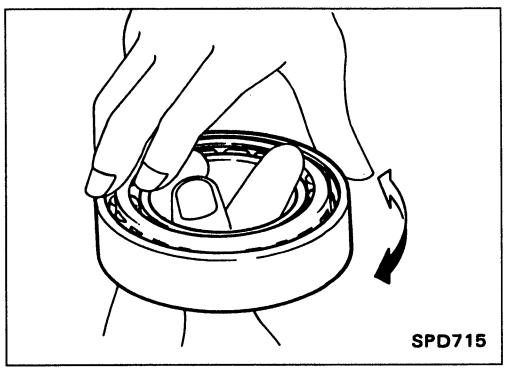
5. Drive out retaining pin and draw out pinion mate shaft.
6. Remove pinion mate gears and side gears.



INSPECTION

Gear, washer, shaft and case

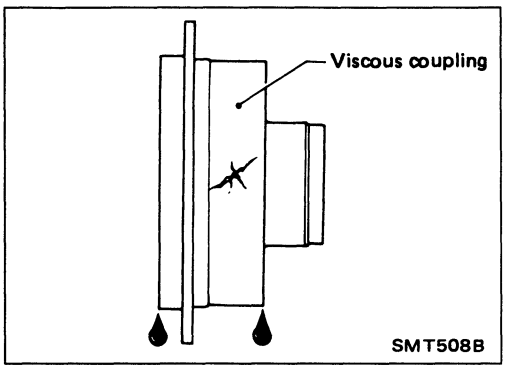
- Check mating surfaces of differential case, side gears and pinion mate gears.
- Check washers for wear.



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.**

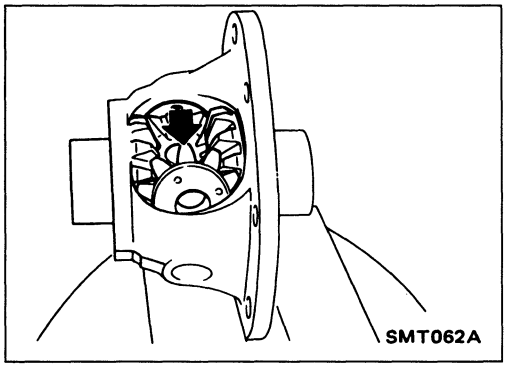
Final Drive (Cont'd)



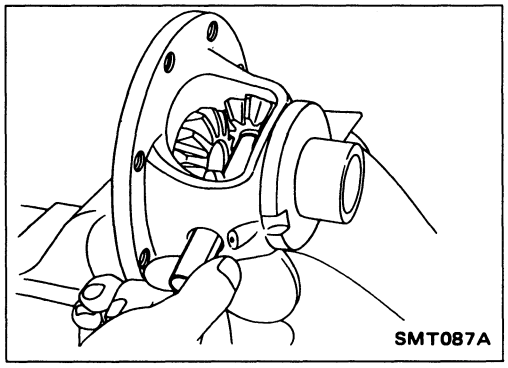
Viscous coupling — RS5F50V

- Check case for cracks.
- Check silicone oil for leakage.

ASSEMBLY

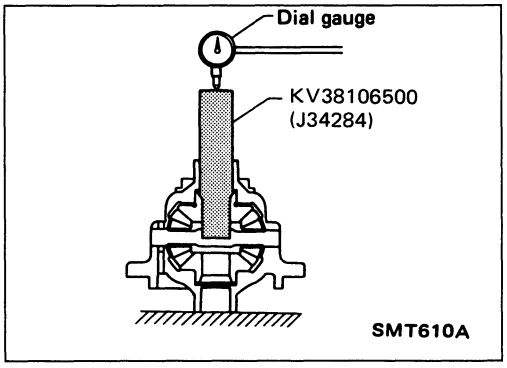


1. Attach side gear thrust washers to side gears, then install pinion mate washers and pinion mate gears in place.



2. Insert pinion mate shaft.

- **When inserting, be careful not to damage pinion mate thrust washers.**



3. Measure clearance between side gear and differential case with washers following the procedure below:

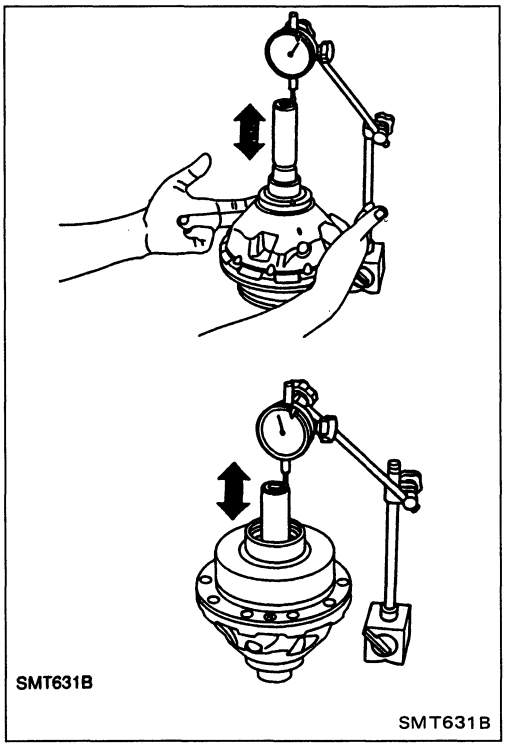
a. Set Tool and dial indicator on side gear.

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:

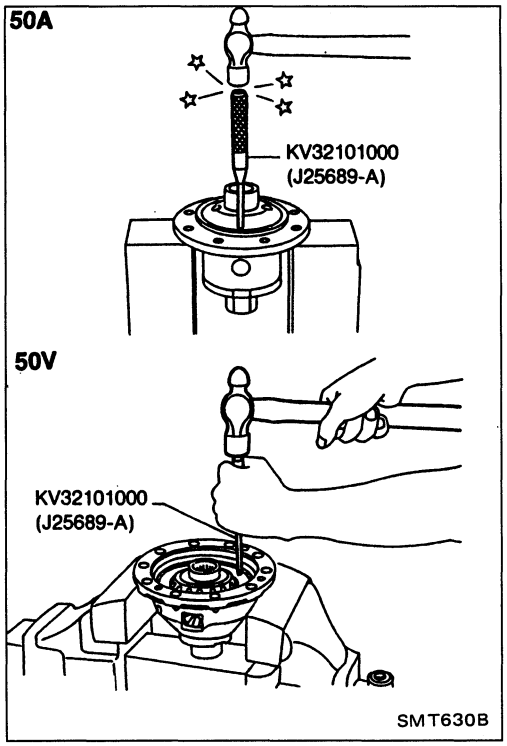
0.1 - 0.2 mm (0.004 - 0.008 in)

Final Drive (Cont'd)



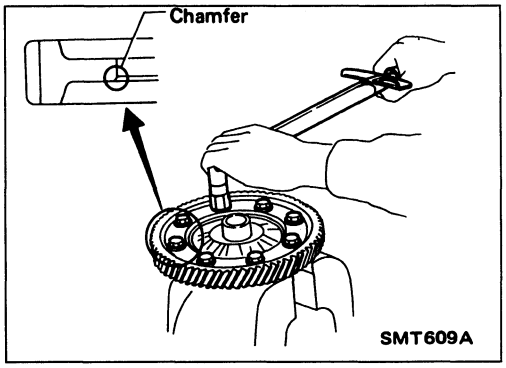
c. If not within specification, adjust clearance by changing thickness of side gear thrust washers.

Side gear thrust washer:
Refer to S.D.S.



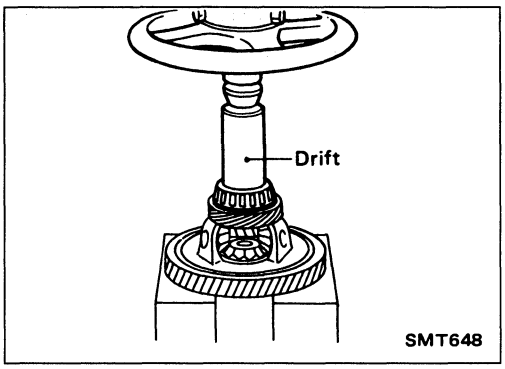
4. Install retaining pin.

- **Make sure that retaining pin is flush with case.**

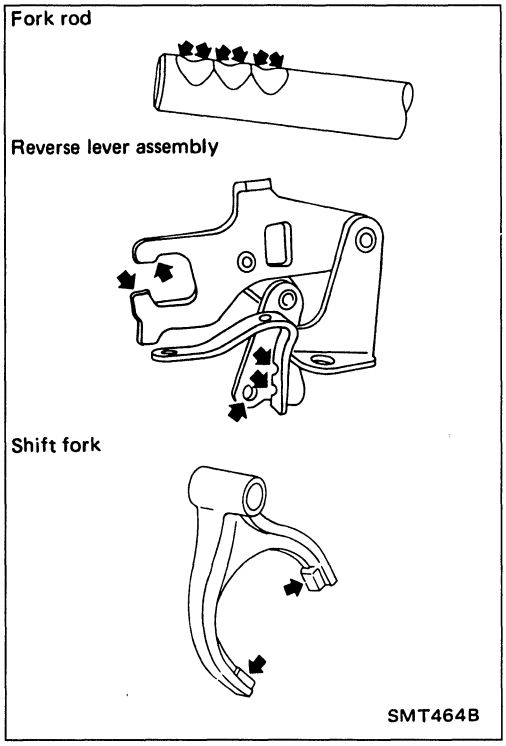


5. Install final gear.
6. Install speedometer drive gear.

Final Drive (Cont'd)



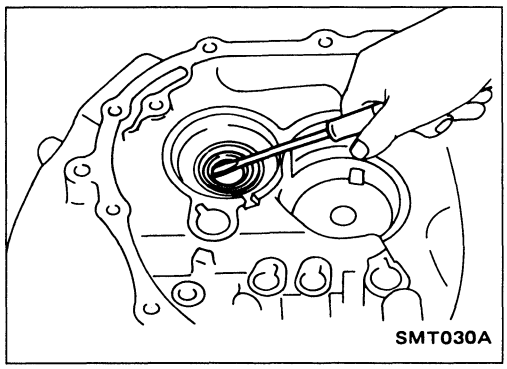
7. Press on differential side bearings.



Shift Control Components

INSPECTION

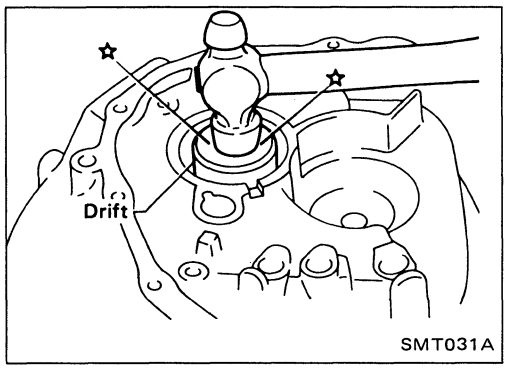
- Check contact surface and sliding surface for wear, scratches, projections or other damage.



Case Components

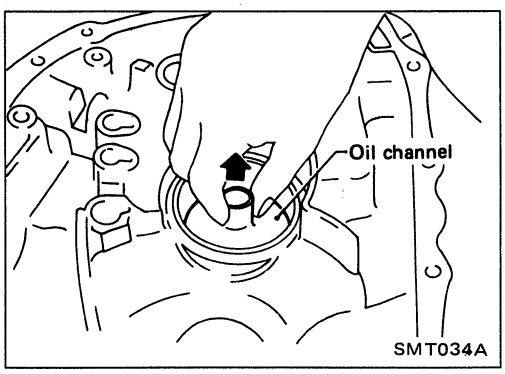
REMOVAL AND INSTALLATION

Input shaft oil seal



- **Apply multi-purpose grease to seal lip of oil seal before installing.**

Case Components (Cont'd)



Mainshaft front bearing outer race

Mainshaft rear bearing outer race — Refer to "ADJUSTMENT".

Differential side bearing outer race — Refer to "ADJUSTMENT".

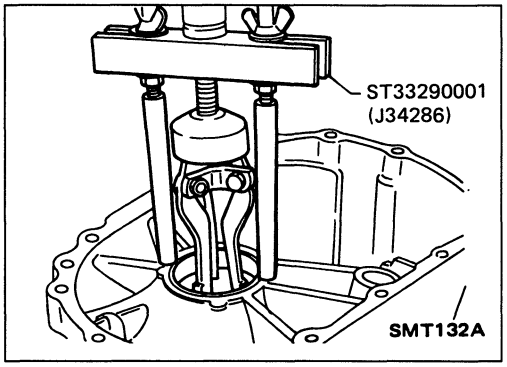
Input Shaft End Play and Differential Side Bearing Preload

If any of the following parts are replaced, adjust input shaft end play.

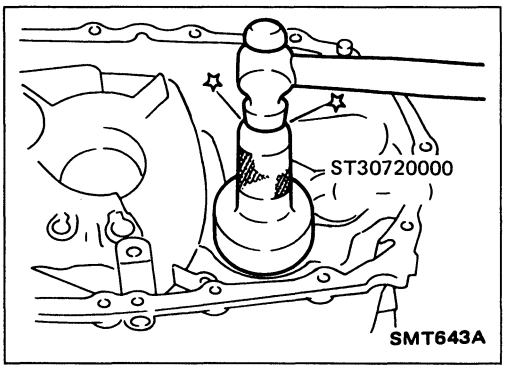
- **Input shaft**
- **Input shaft bearing**
- **Clutch housing**
- **Transmission case**

If any of the following parts are replaced, adjust differential side bearing preload.

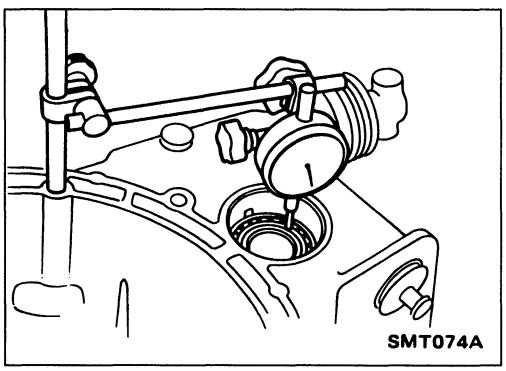
- **Differential case**
- **Differential side bearing**
- **Clutch housing**
- **Transmission case**



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.

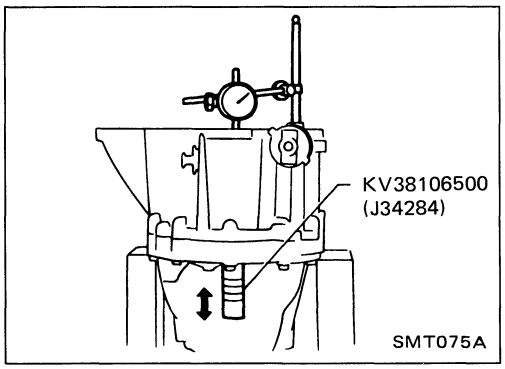


5. Using the following procedures, measure clearance between bearings and transmission case.

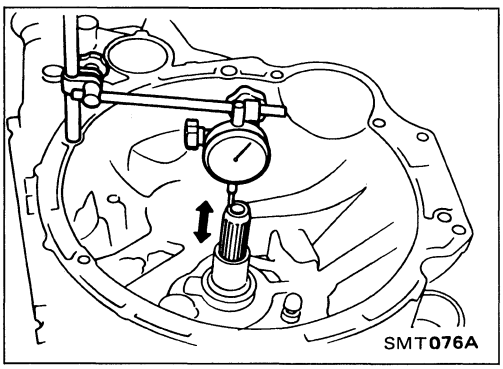
- **Differential side**

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)

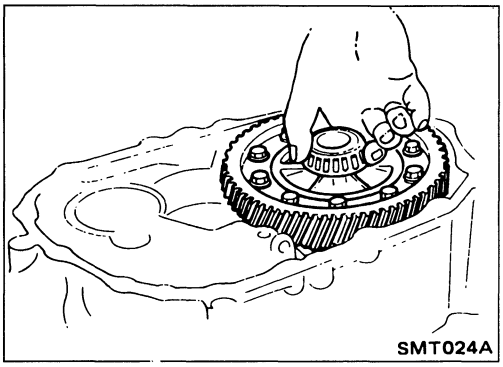


b. Insert Tool all the way into differential side gear. Move Tool up and down and measure dial indicator deflection.

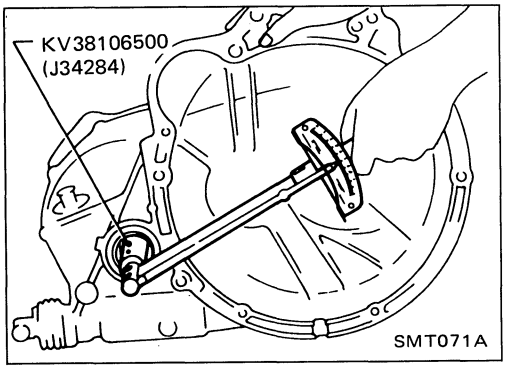


- **Input shaft side**

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.



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.**



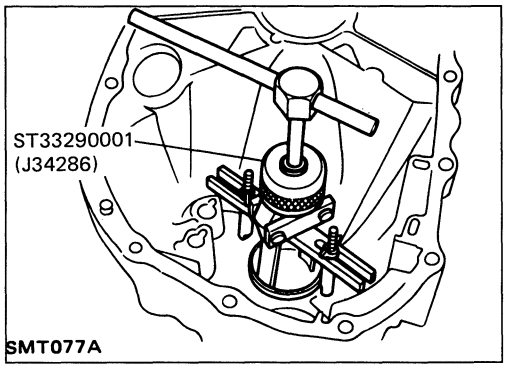
c. Measure turning torque of final drive assembly.
Turning torque of final drive assembly
(New bearing):
4.9 - 7.8 N·m (50 - 80 kg-cm, 43 - 69 in-lb)
- **When old bearing is used again, turning torque will be slightly less than the above.**
- **Make sure torque is close to the specified range.**

Mainshaft Bearing Preload

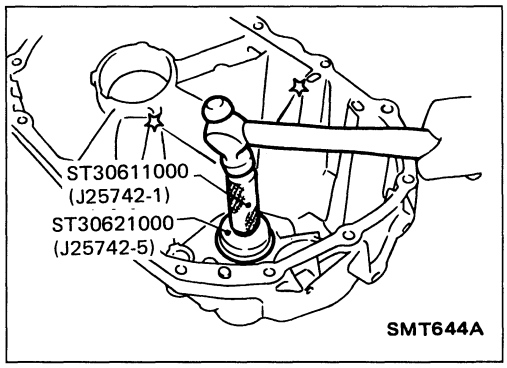
If any of the following parts are replaced, adjust mainshaft bearing preload.

- **Mainshaft**
- **Mainshaft bearings**
- **Clutch housing**
- **Transmission case**

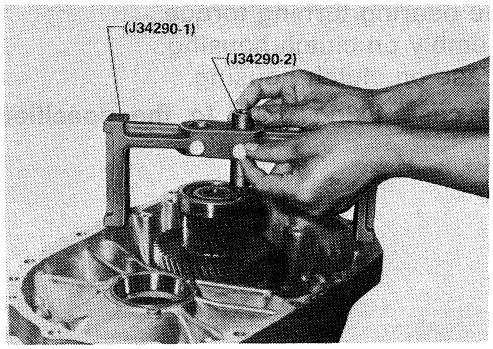
Mainshaft Bearing Preload (Cont'd)



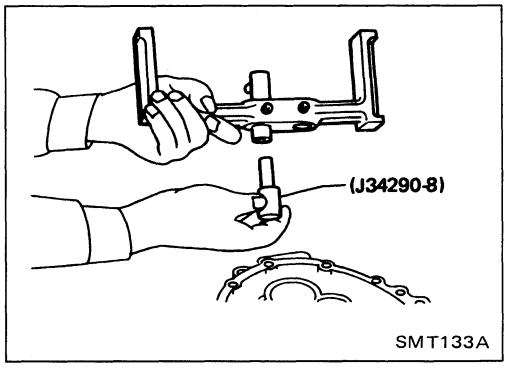
1. Remove mainshaft rear bearing outer race and shim(s).



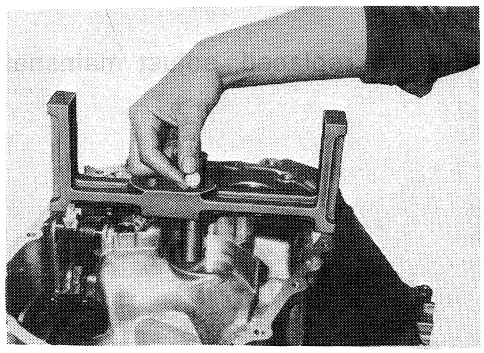
2. Reinstall mainshaft rear bearing outer race without shims.
3. Clean mating surfaces of clutch housing and transmission case with solvent.
4. Install mainshaft and mainshaft front bearing outer race into transmission case. Turn mainshaft while holding bearing outer race so that bearings are properly 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.

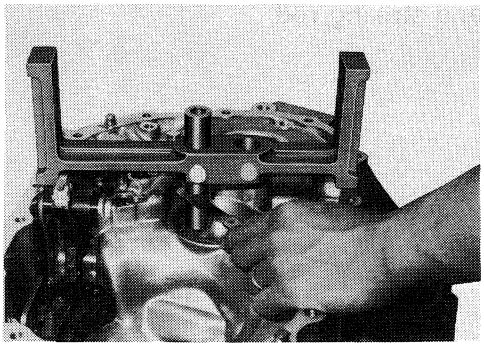


6. Turn bridge over and place Tool (gauging plunger) into gauging cylinder.

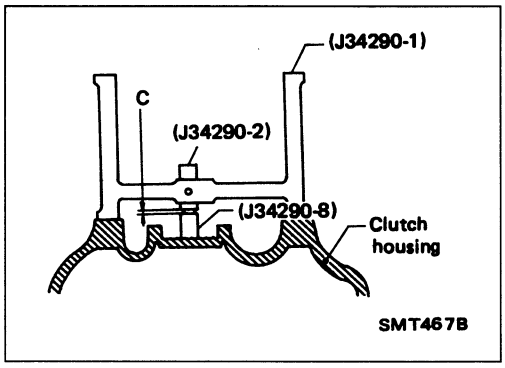


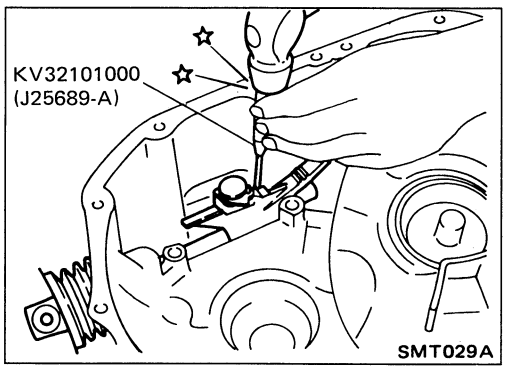
7. Place bridge, legs up, onto machined surface of clutch housing and allow gauging plunger to rest upon mating surface where mainshaft front bearing outer race fits.

Mainshaft Bearing Preload (Cont'd)

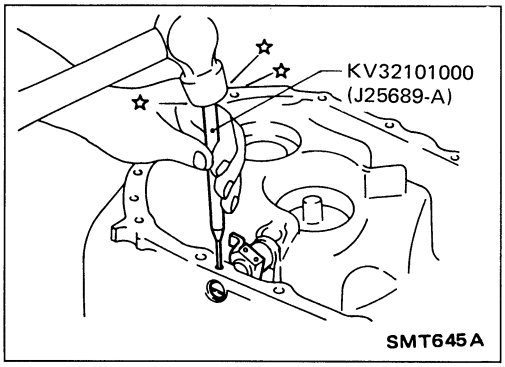


8. Measure with feeler gauge distance between gauging cylinder and shoulder of gauging plunger.
9. Use feeler gauge reading to select correct mainshaft preload shim(s).
   Mainshaft bearing adjusting shim:
   Refer to S.D.S.
10. Install selected mainshaft bearing adjusting shim and mainshaft bearing outer race.
11. Check total turning torque after assembly — Refer to "ASSEMBLY".

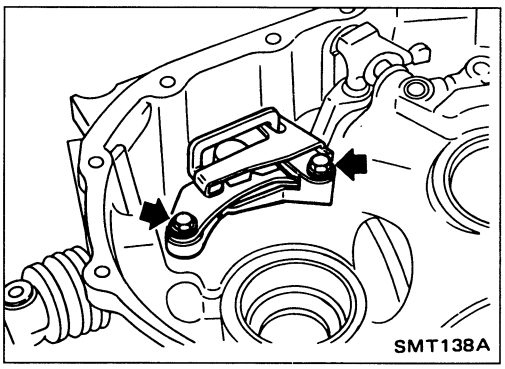




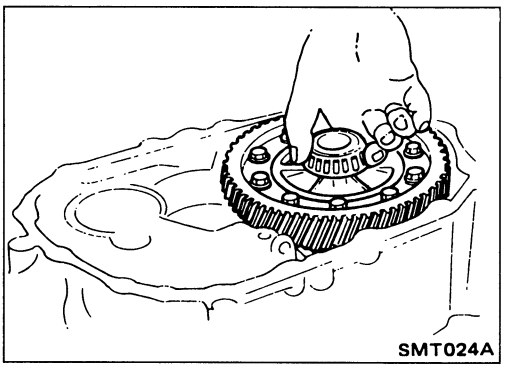
1. Install striking lever and striking rod.



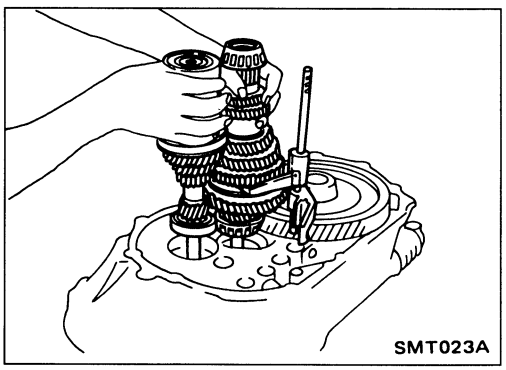
2. Install selector and retaining pin.



3. Install reverse gate assembly.

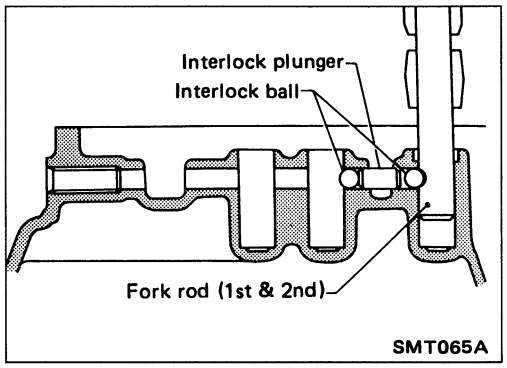


4. Install final drive assembly.

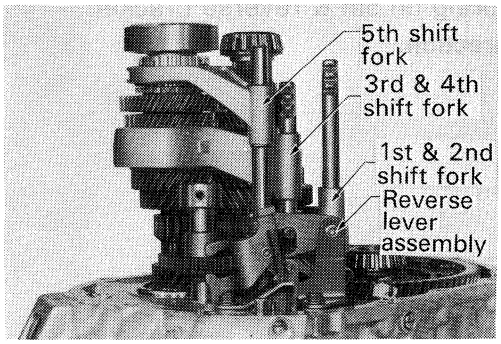


5. Install input shaft and mainshaft with 1st & 2nd shift fork assembly.

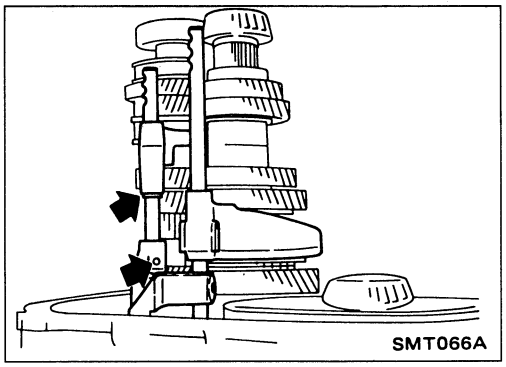
- **Be careful not to damage input shaft oil seal.**

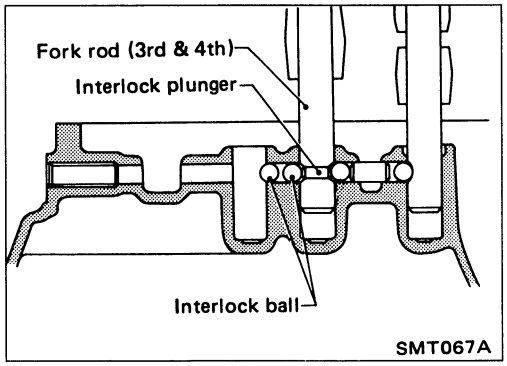


6. Install interlock balls and plunger.

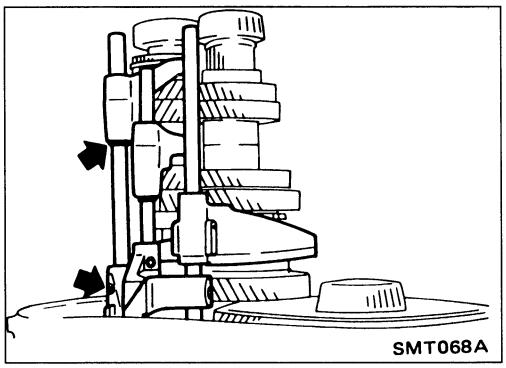


7. Install 3rd & 4th shift fork and bracket, then install 3rd & 4th shift rod, stopper ring and retaining pin.

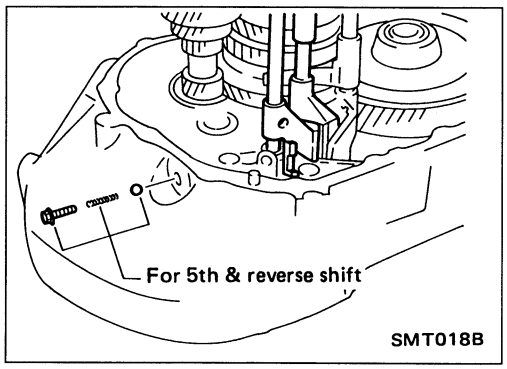




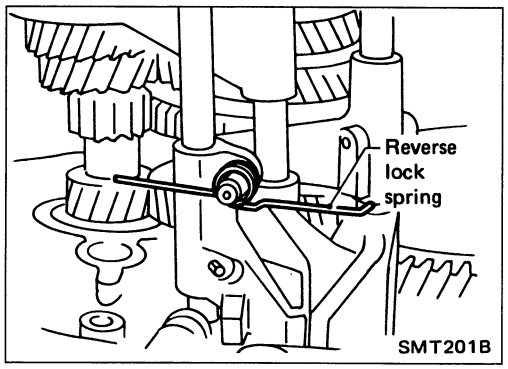
8. Install interlock balls.



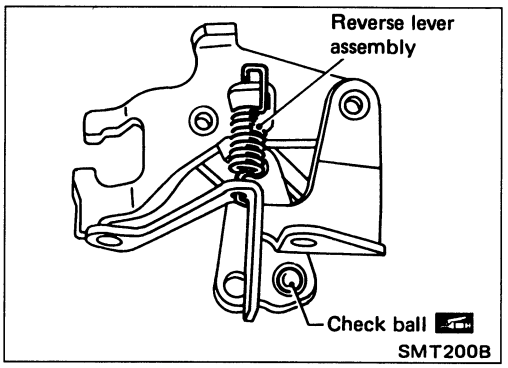
9. Install 5th shift fork and bracket, then install shift rod, stopper ring and retaining pin.



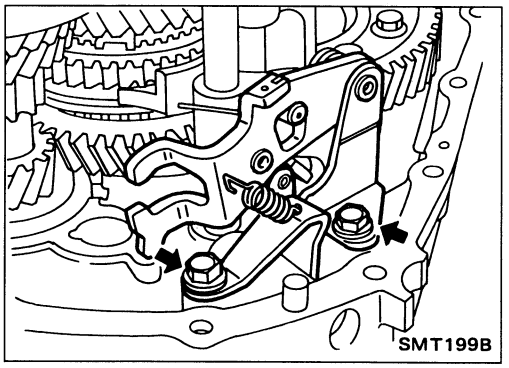
10. Install 5th & reverse check plug, spring and ball.



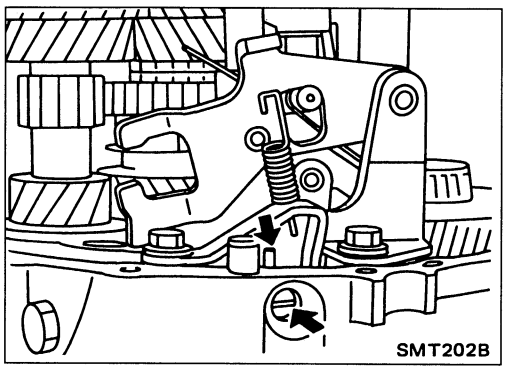
11. Install reverse lock spring on 5th & reverse bracket.
- **Pay attention to its direction.**



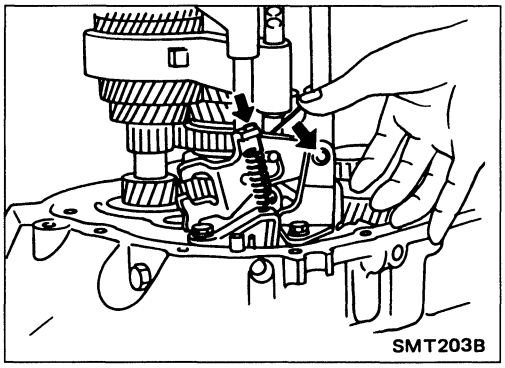
12. Install check ball and reverse lever spring on reverse lever assembly.
- **Apply multi-purpose grease to check ball.**
- **Pay attention to direction of reverse lever spring.**



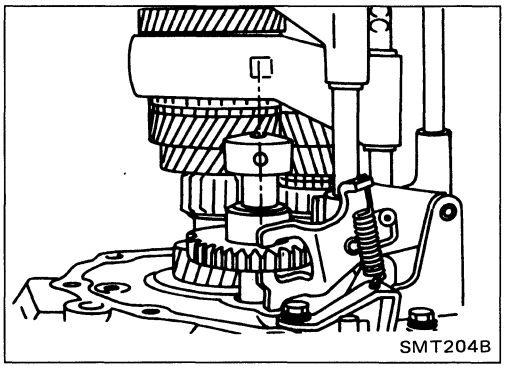
13. Install reverse lever assembly on clutch housing.



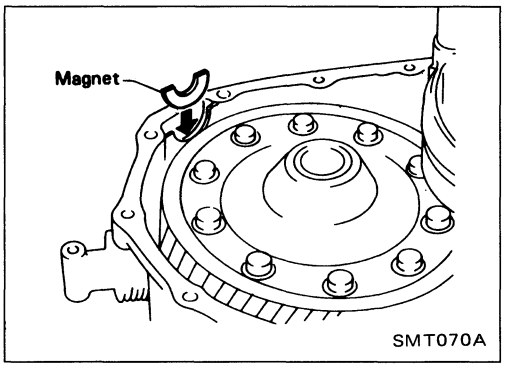
14. Install reverse arm shaft and retaining pin.


SMT203B

15. Hook reverse lock spring and reverse lever spring on reverse lever assembly.

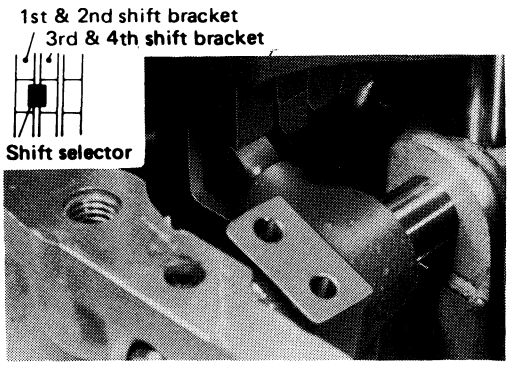

SMT204B

16. Mesh 4th gear, then install reverse idler gear and shaft.
- **Pay attention to direction of tapped hole.**

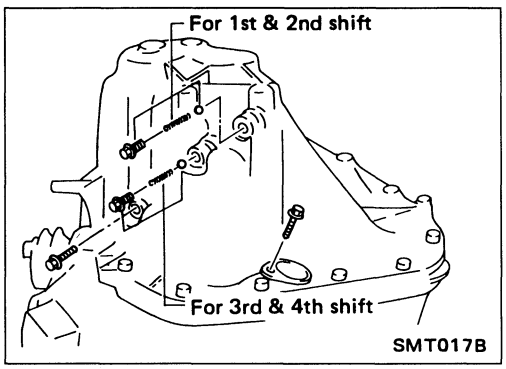


SMT070A

17. Place magnet on clutch housing.

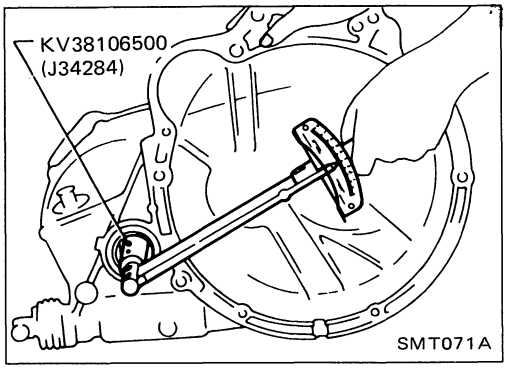


18. If bearing preload was adjusted, install selected shim(s) into transmission case.
- **To aid in installation of transmission case, place shift selector in the 1st & 2nd shift bracket or between 1st & 2nd bracket and 3rd & 4th bracket.**
19. Apply sealant to mating surface of transmission case and install it.
20. Install position switch.



SMT017B

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.

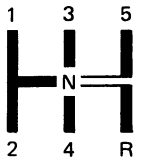


23. Measure total turning torque.
    Total turning torque (New bearing):
    8.8 - 21.6 N·m (90 - 220 kg-cm, 78 - 191 in-lb)

- **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	0.964	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

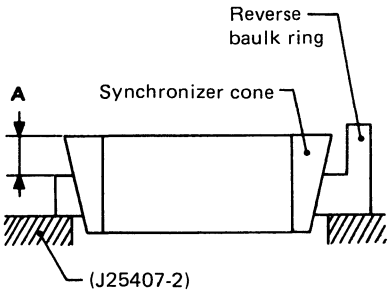
Gear	End play mm (in)
1st main gear	0.23 - 0.43 (0.0091 - 0.0169)
2nd main gear	0.23 - 0.58 (0.0091 - 0.0228)
3rd input gear	0.23 - 0.43 (0.0091 - 0.0169)
4th input gear	0.25 - 0.55 (0.0098 - 0.0217)
5th input gear	0.23 - 0.48 (0.0091 - 0.0189)

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



SMT581B

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)

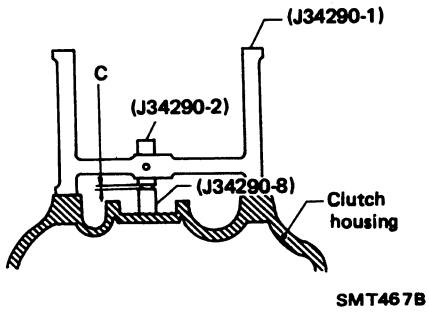
Unit: N·m (kg-cm, in-lb)

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)



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

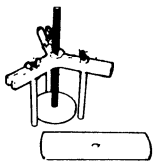
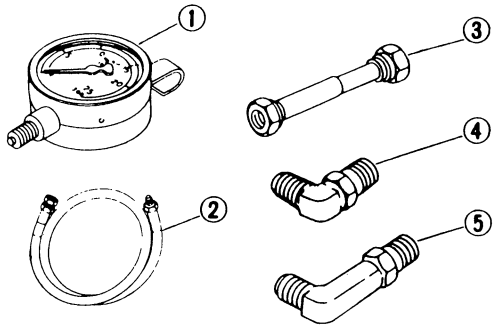
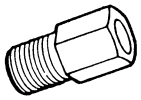
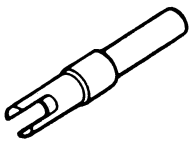
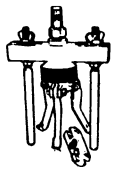
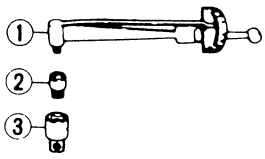
SECTION AT

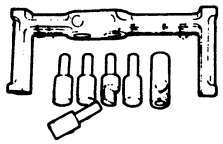
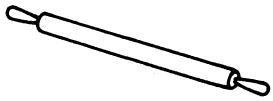
CONTENTS

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

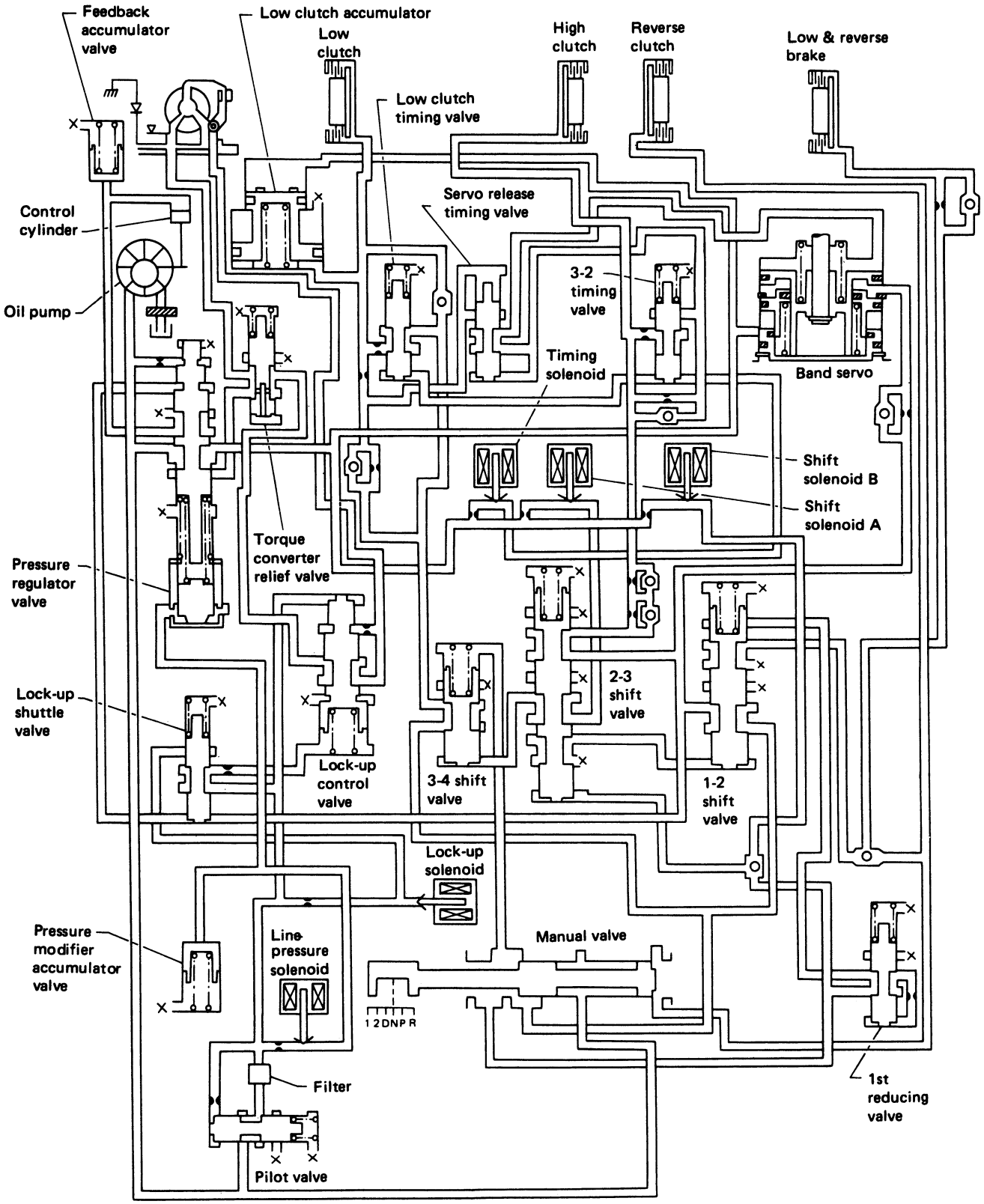
Tool number (Kent-Moore No.) Tool name	Description
ST25420001 (J34285) Clutch spring compressor	Removing and installing clutch springs. 
ST2505S001 (J25695-A) Oil pressure gauge set ① ST25051001 (J25695-1) Oil pressure gauge ② ST25052000 (J25695-2) Hose ③ ST25053000 (J25695-3) Joint pipe ④ ST25054000 (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

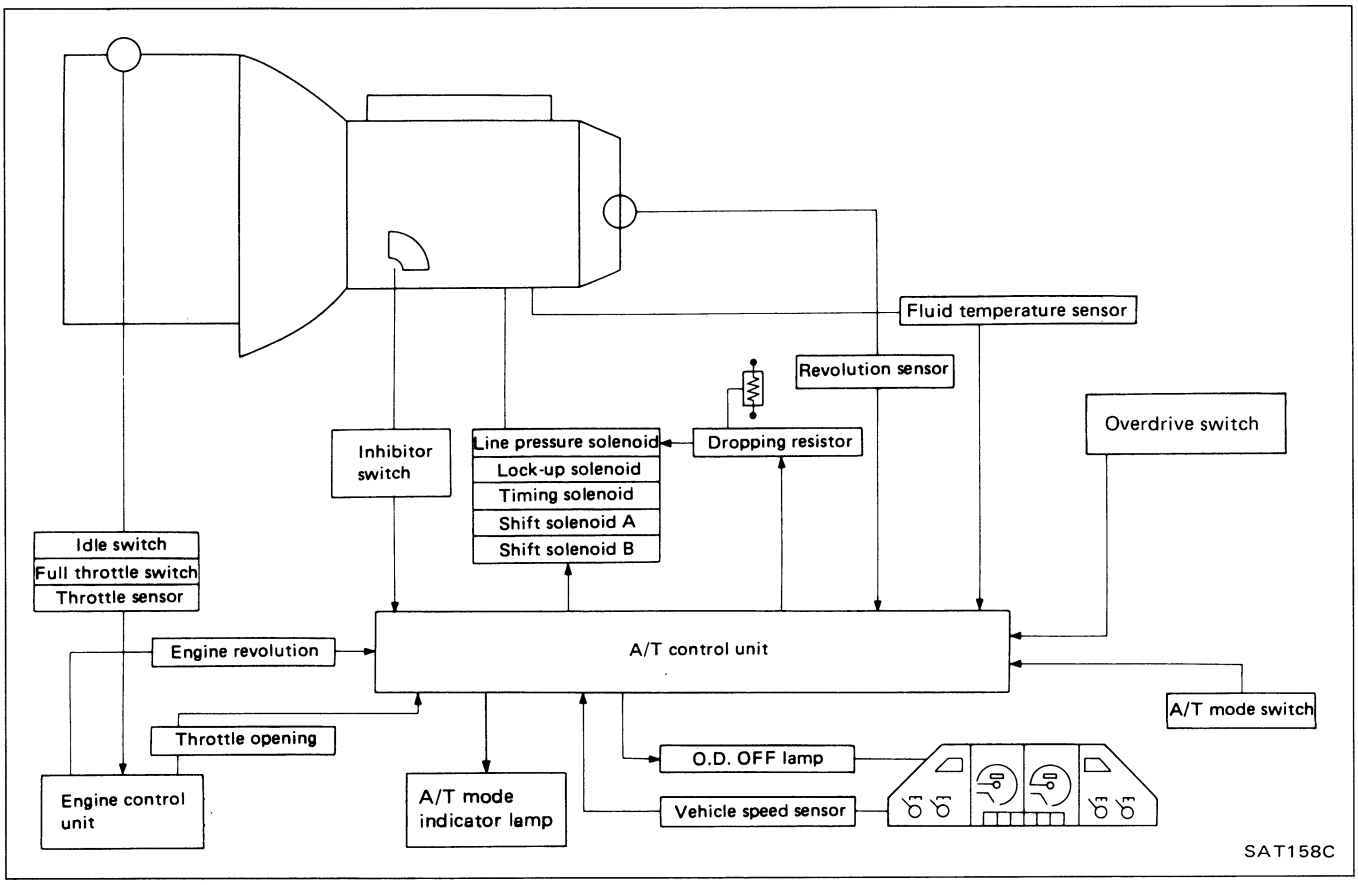
- Before proceeding with disassembly, thoroughly clean the outside of the transaxle. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
- Disassembly should be done in a clean work area.
- Use lint-free cloth or towels for wiping parts clean. Common 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

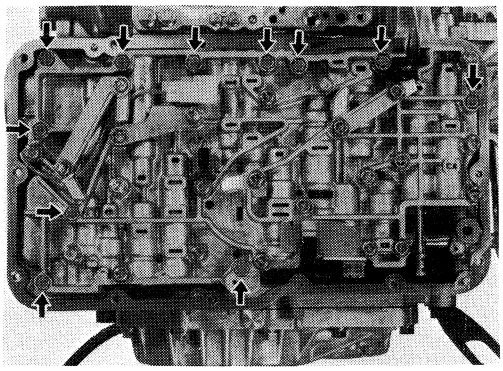
Electrical Control Chart



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					

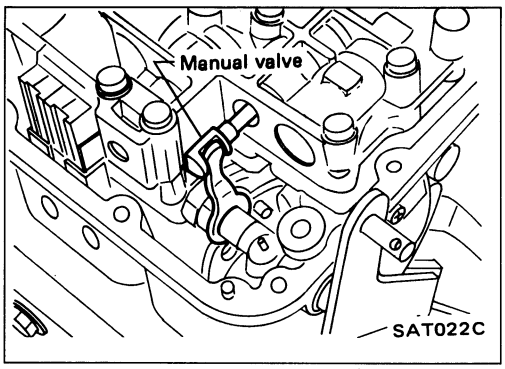
*1: Lock-up operates in 3rd speed (lock-up) range when O.D. control switch is "OFF" (Overdrive not allowed).
*2: Lock-up operates in 4th speed (lock-up) range when O.D. control switch is "ON" (Overdrive allowed).



Control Valve Assembly

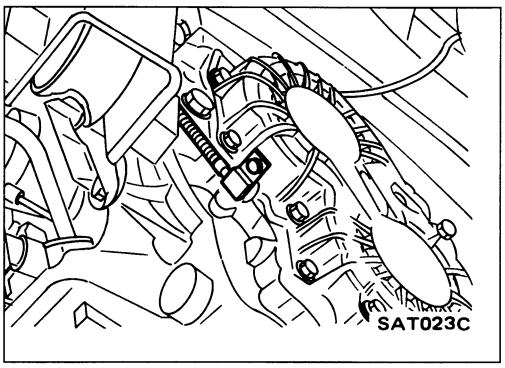
1. Remove air cleaner, battery and its bracket.
2. Remove control valve cover.
3. Remove control valve assembly by removing fixing bolts and disconnecting harness connector.

Be careful not to drop manual valve out of valve body.



4. Disassemble, inspect and assemble control valve assembly. Refer to "Control Valve Body".

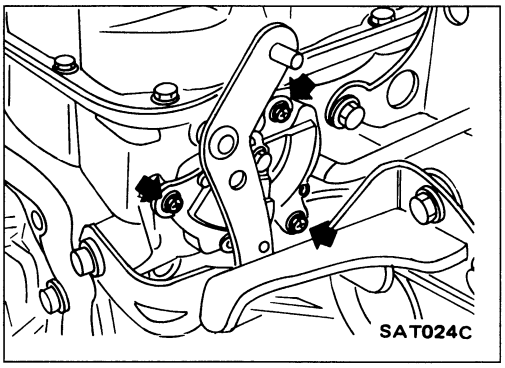
- **Set manual shaft in "N" position, then align manual plate with groove in manual valve of control valve assembly.**
- **After installing control valve to transmission case, make sure that selector lever can be moved to all positions.**



Revolution Sensor Replacement

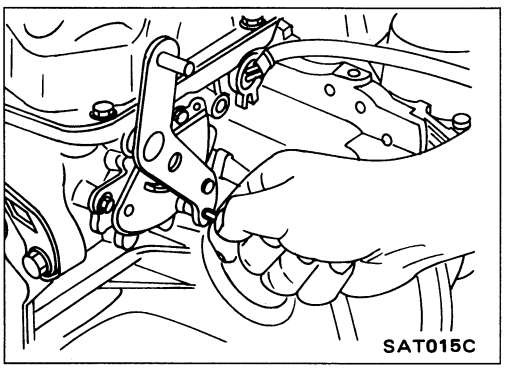
1. Remove under cover.
2. Remove revolution sensor from A/T.
3. Reinstall any part removed.

Always use new sealing parts.

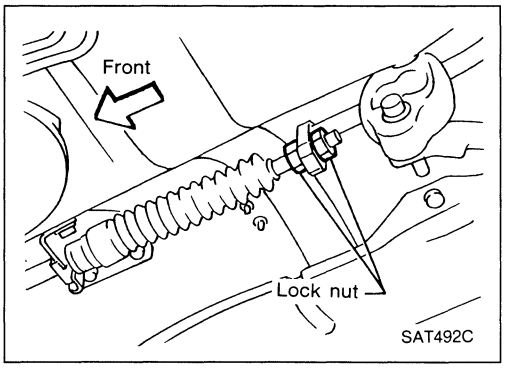


Inhibitor Switch Adjustment

1. Remove control cable from manual shaft.
2. Set manual shaft in "N" position.
3. Loosen inhibitor switch fixing bolts.



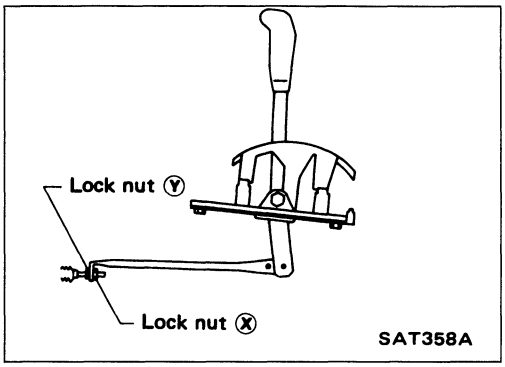
4. Insert pin into adjustment holes in both inhibitor switch and manual shaft as near vertical as possible.
5. Reinstall any part removed.
6. Check continuity of inhibitor switch. — Refer to "Electrical Components Inspection".



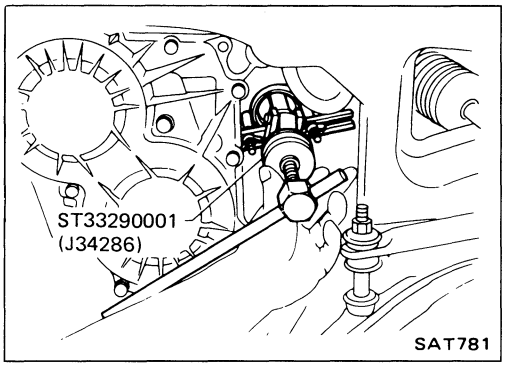
Control Cable Adjustment

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.

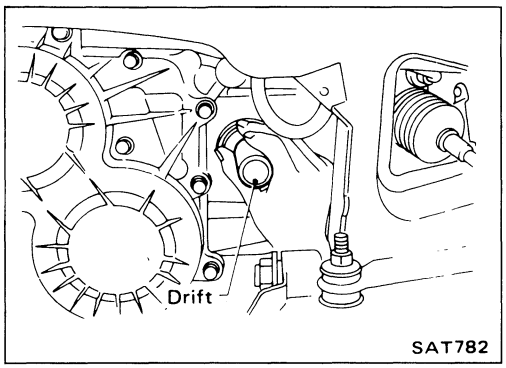


3. Screw lock nut Ⓧ until it touches select rod end while holding select rod horizontal, and tighten lock nut Ⓨ.
4. Move selector lever from "P" range to "1" range again. Make sure selector lever moves smoothly.



Differential Side Oil Seal Replacement

1. Remove drive shaft assembly. — Refer to section FA.
2. Remove oil seal.



3. Install oil seal.

Apply A.T.F. before installing.

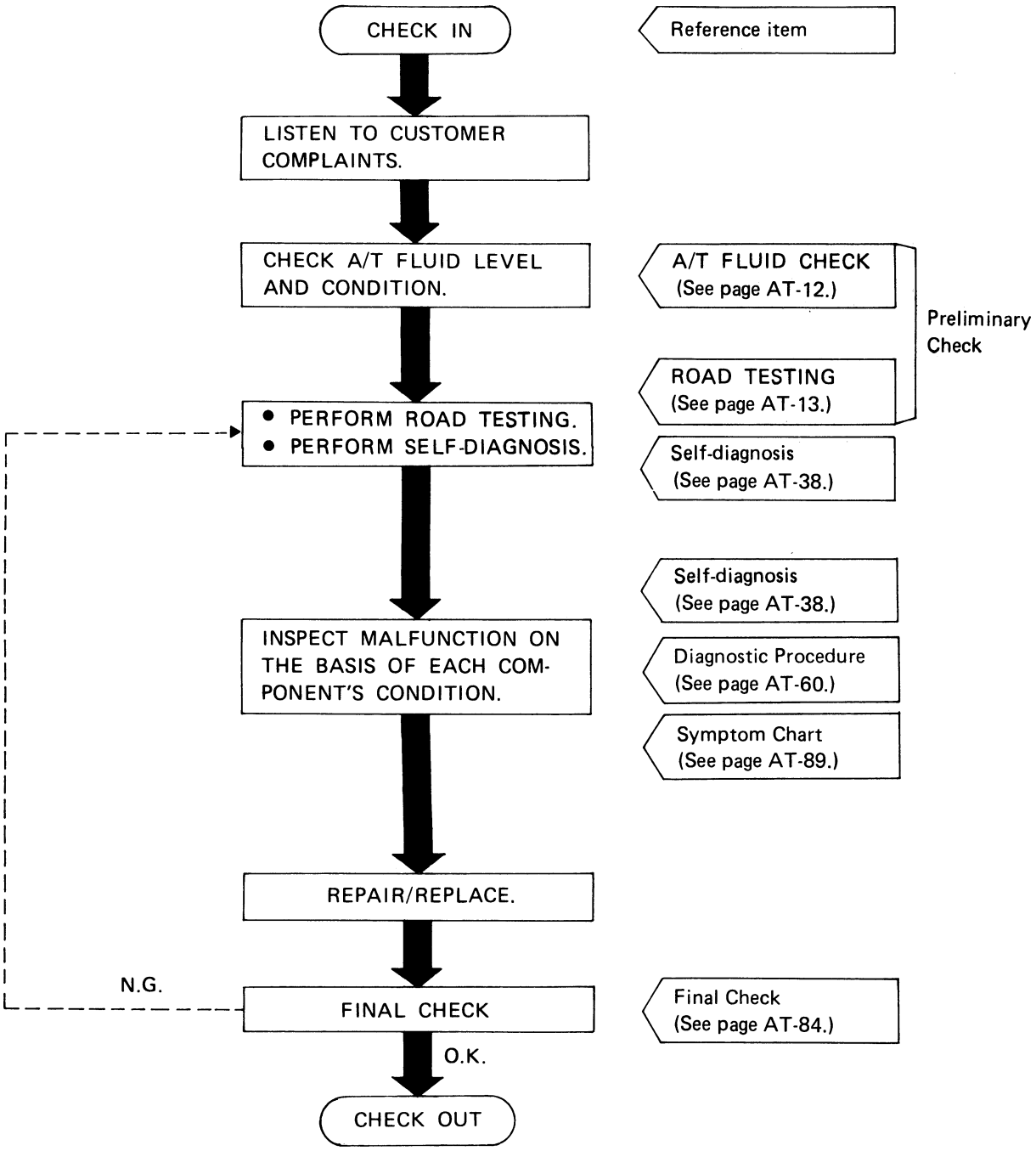
4. Reinstall any part removed.

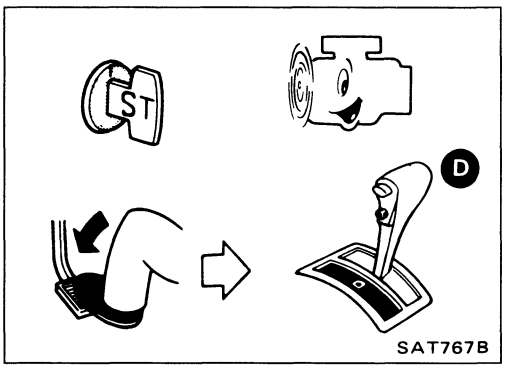
Contents

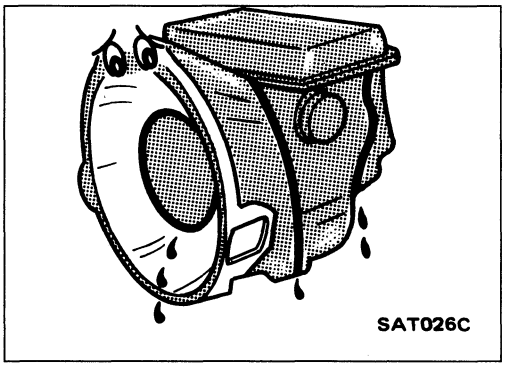
Contents (Cont'd)

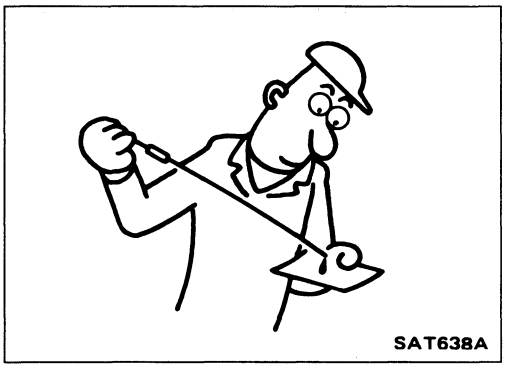
How to Perform Trouble Diagnoses for Quick and Accurate Repair

WORK FLOW









Preliminary Check

A/T FLUID CHECK

Fluid leakage check

1. Clean area suspected of leaking. — for example, mating surface of converter housing and transmission case.
2. Start engine, apply foot brake, place selector lever in "D" range and wait a few minutes.
3. Stop engine.
4. Check for fresh leakage.

Fluid condition check

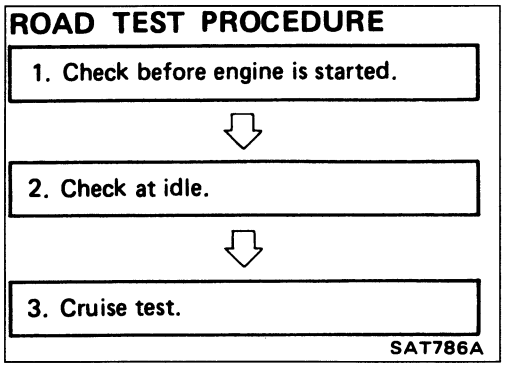
Fluid color	Suspected problem
Dark or black with burned odor	Wear of frictional material
Milky pink	Water contamination — Road water entering through filler tube or breather
Varnished fluid, light to dark brown any tacky	Oxidation — Over or under filling — Overheating

Fluid level check

Refer to section MA.

Preliminary Check (Cont'd)

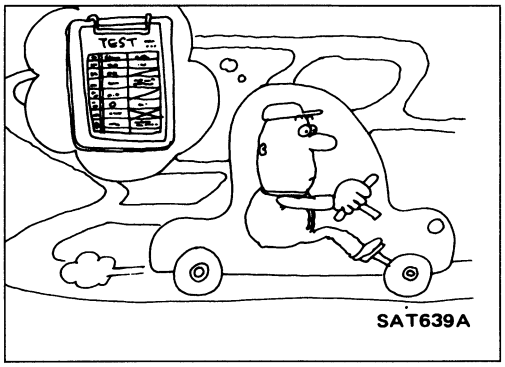
ROAD TESTING



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:

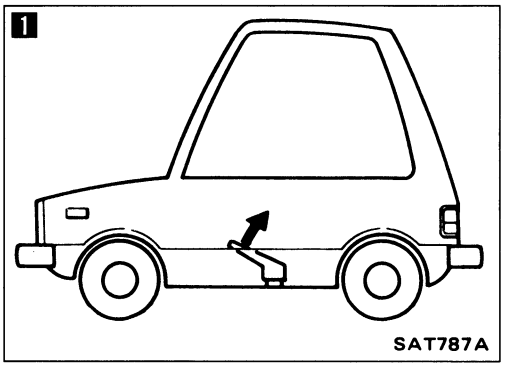
1. Check before engine is started
2. Check at idle
3. Cruise test

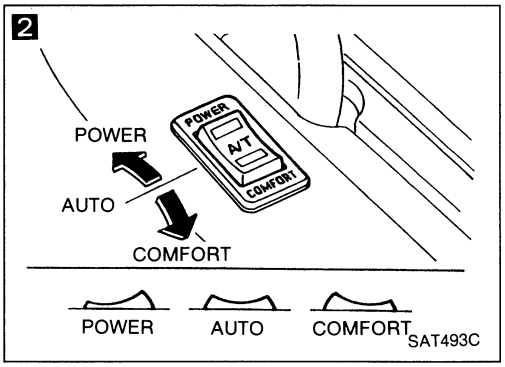


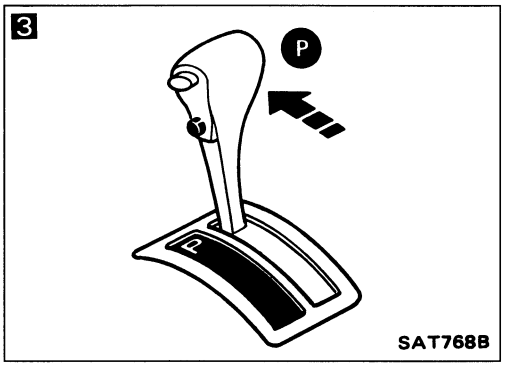
- Before road test, familiarize yourself with all test procedures and items to check.
- Conduct tests on all items. Troubleshoot items which check out No Good after road test. Refer to "Self-diagnosis" and "Diagnostic Procedure".

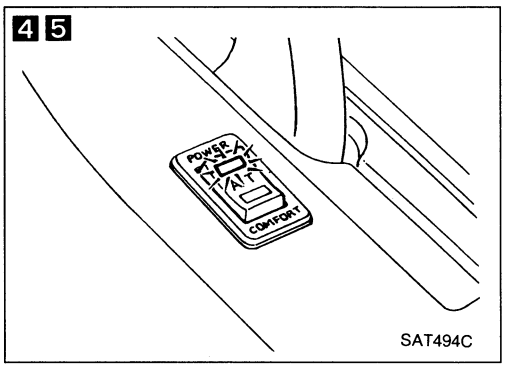
Preliminary Check (Cont'd)

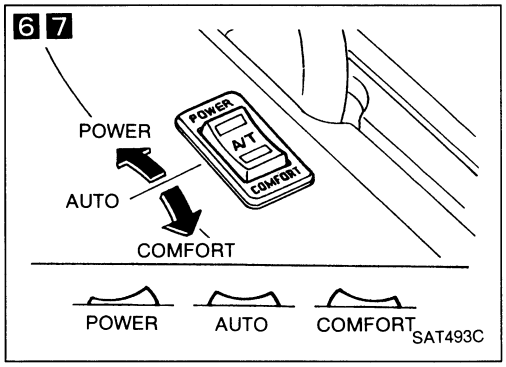
1. Check before engine is started







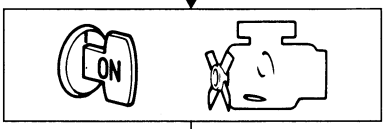




1 Park vehicle on flat surface.

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 ↓

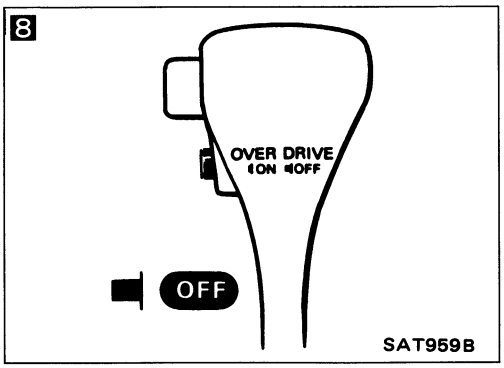
7 Set A/T mode switch in "COMFORT" position.

Does comfort indicator lamp come on?
- No → Go to Diagnostic Procedure 2.
- Yes ↓

Ⓐ

Preliminary Check (Cont'd)

8



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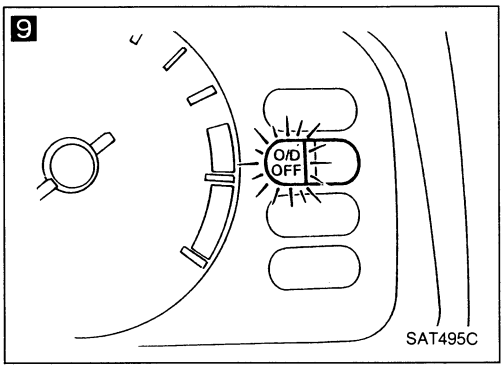

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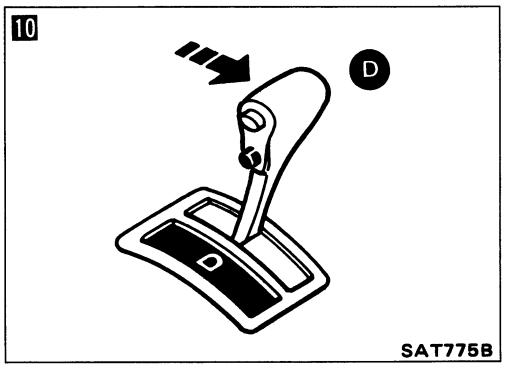

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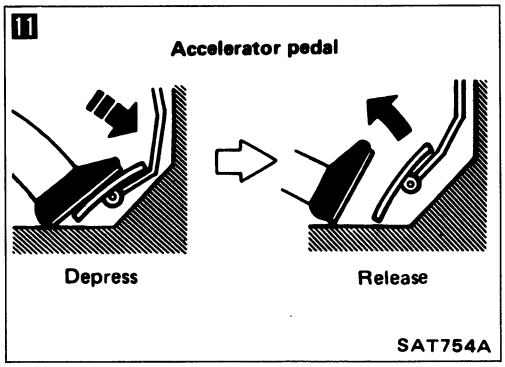

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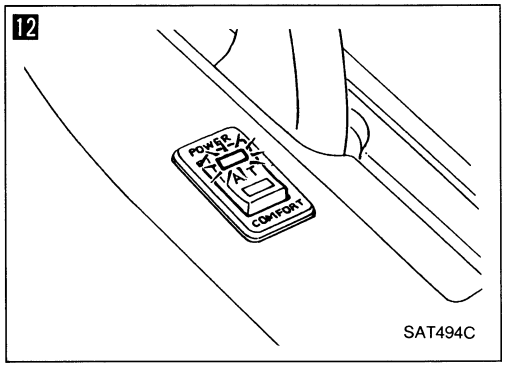


8 (A)

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.

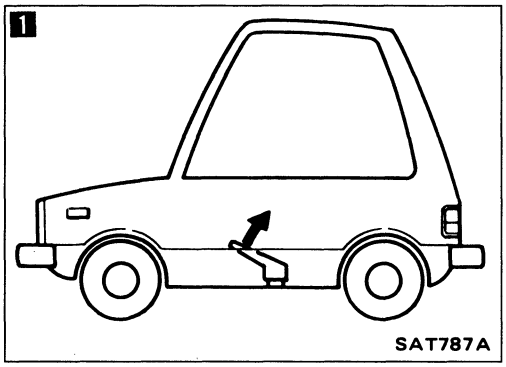
Yes

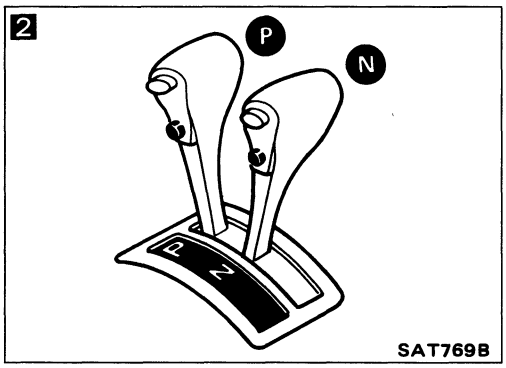
Perform self-diagnosis.
— Refer to SELF-DIAGNOSIS PROCEDURE and note N.G. items.

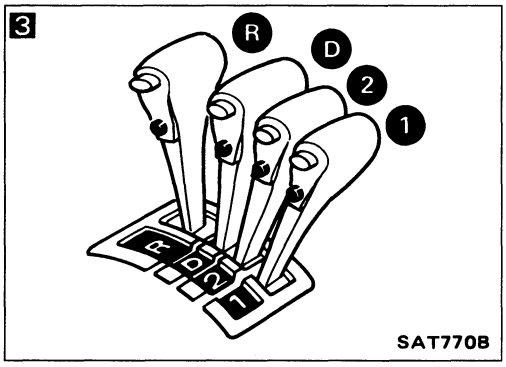
Go to "ROAD TESTING — Check at idle".

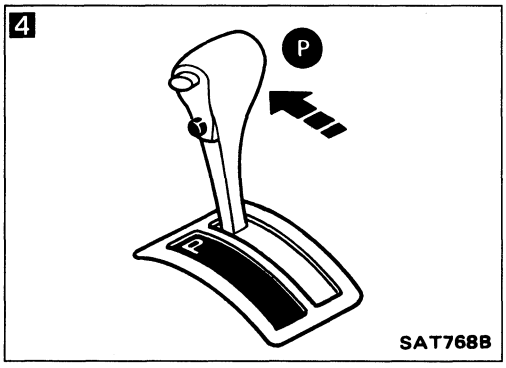
Preliminary Check (Cont'd)

2. Check at idle









1. Park vehicle on flat surface.
2. Move selector lever to "P" or "N" range.
3. Move selector lever to "D", "1", "2" or "R" range.
4. Move selector lever to "P" range.

Is engine started?

No → Go to Diagnostic Procedure 5.

Yes

Is engine started?

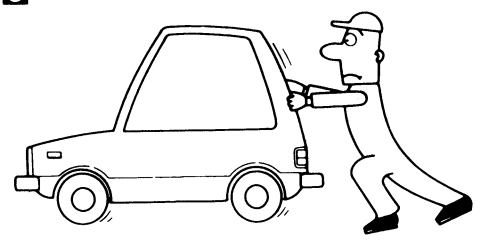
Yes → Go to Diagnostic Procedure 5.

No

Ⓐ

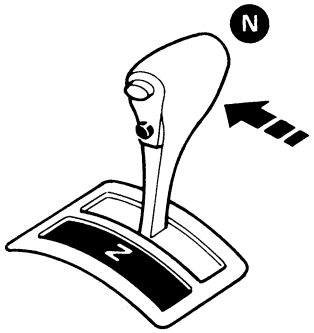
Preliminary Check (Cont'd)

5



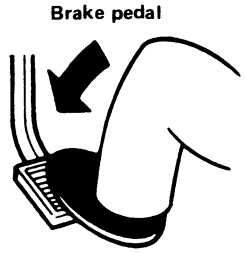
SAT796A

6



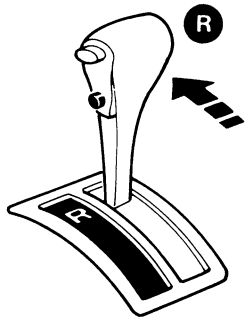
SAT771B

7



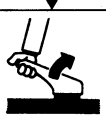
SAT797A

8



SAT772B

Ⓐ



5

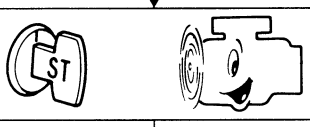
Push vehicle forward or backward.

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.

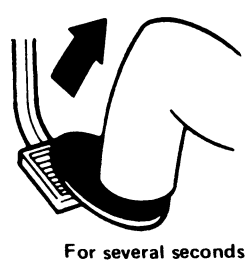
8

Move selector lever to "R" range.

Ⓑ

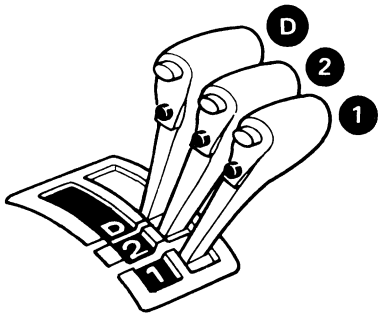
Preliminary Check (Cont'd)

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

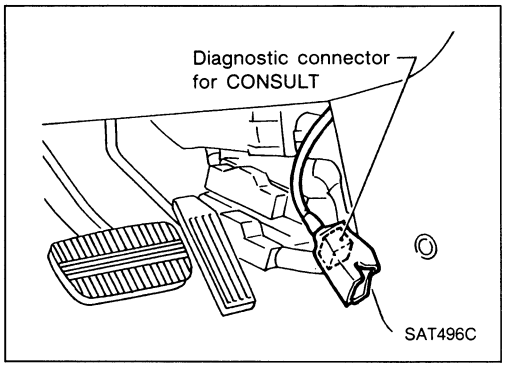
Go to Cruise test.

Preliminary Check (Cont'd)

3. Cruise test

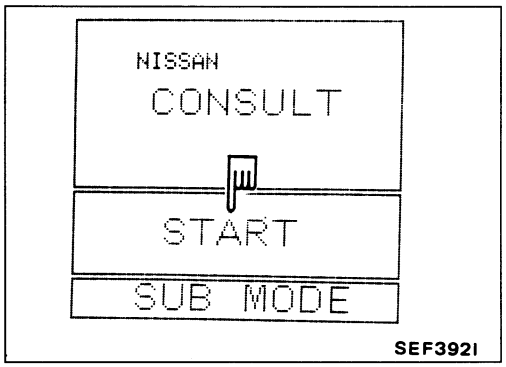
With CONSULT

- 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.

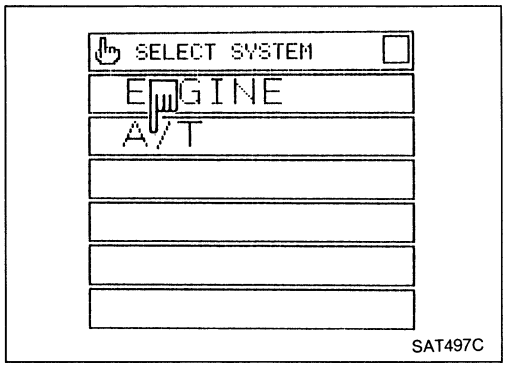


CONSULT setting procedure

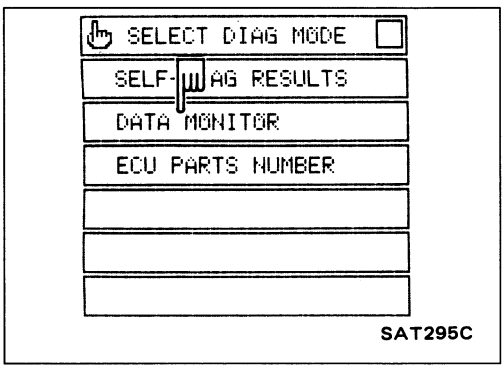
1. Turn off ignition switch.
2. Connect "CONSULT" to diagnostic connector. (Diagnostic connector is located in left dash side panel.)



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

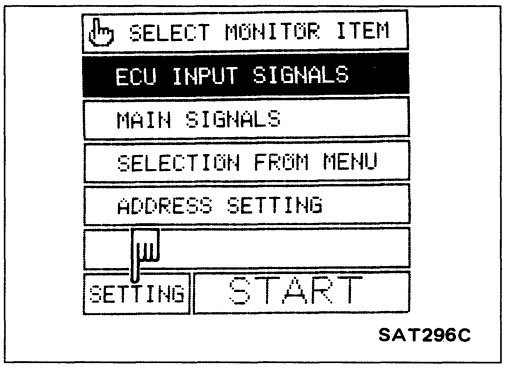


5. Touch "A/T".



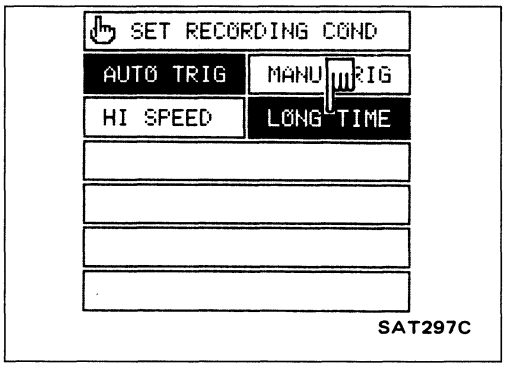
6. Touch "DATA MONITOR".

Preliminary Check (Cont'd)



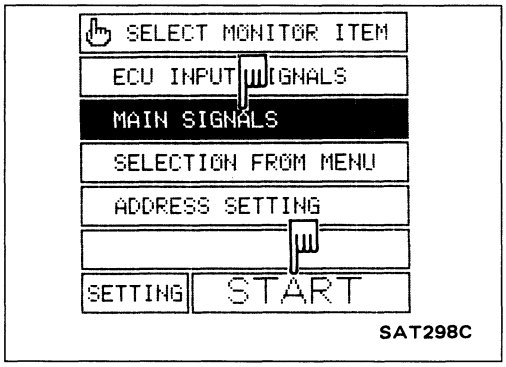
SAT296C

7. Touch "SETTING" to set recording condition.



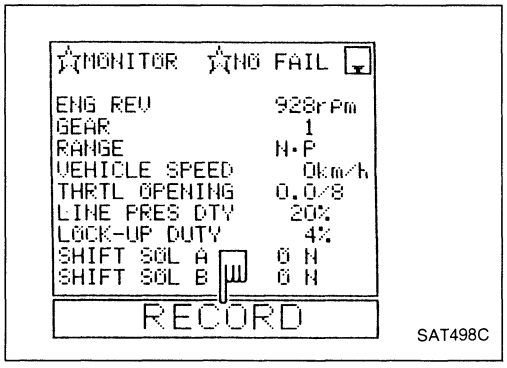
SAT297C

8. Touch "LONG TIME" and "ENTER" key.



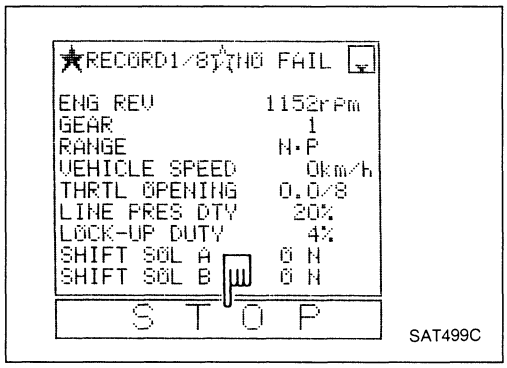
SAT298C

9. Go back to SELECT MONITOR ITEM and touch "MAIN SIGNALS".
10. Touch "START".



SAT498C

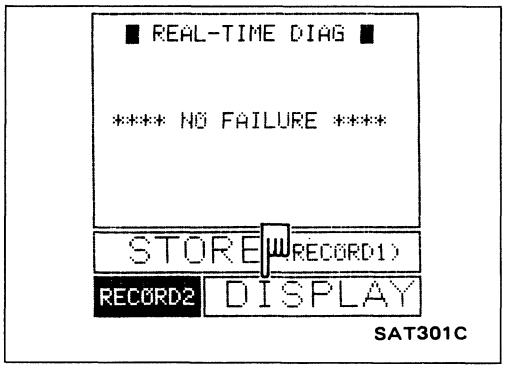
11. When performing cruise test, touch "RECORD".



SAT499C

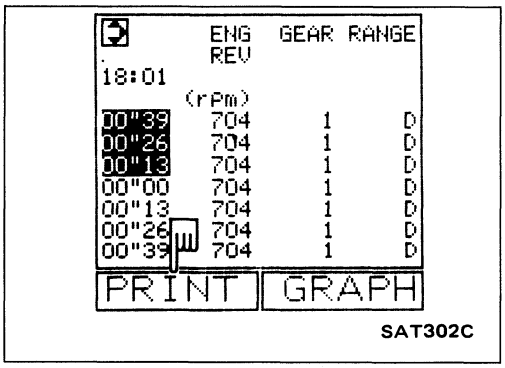
12. After finishing cruise test part 1, touch "STOP".

Preliminary Check (Cont'd)



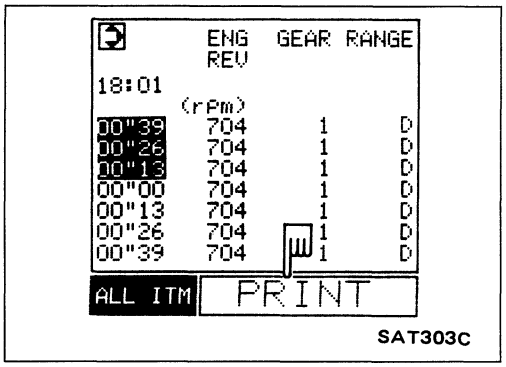
SAT301C

13. Touch "DISPLAY".



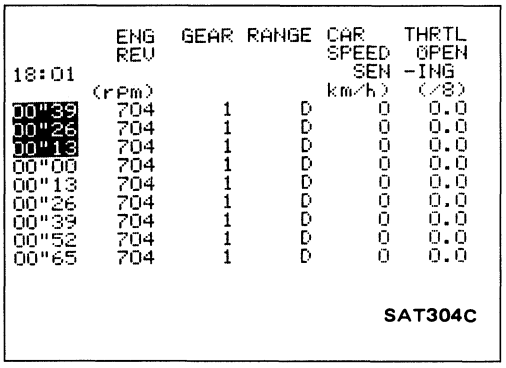
SAT302C

14. Touch "PRINT".



SAT303C

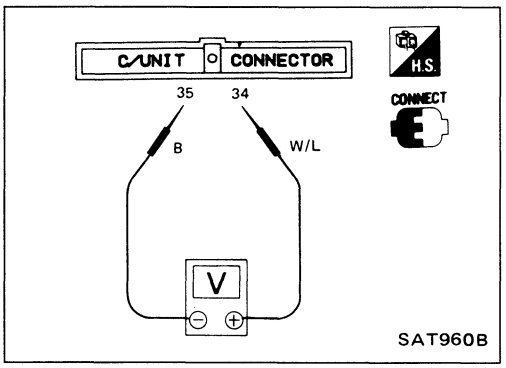
15. Touch "PRINT" again.



	ENG REV	GEAR	RANGE	CAR SPEED SEN	THRTL OPEN -ING
18:01	(rPm)			km/h	(/8)
00"39	704	1	D	0	0.0
00"26	704	1	D	0	0.0
00"13	704	1	D	0	0.0
00"00	704	1	D	0	0.0
00"13	704	1	D	0	0.0
00"26	704	1	D	0	0.0
00"39	704	1	D	0	0.0
00"52	704	1	D	0	0.0
00"65	704	1	D	0	0.0

SAT304C

16. Check the monitor data printed out.
17. Continue cruise test part 2 and 3.

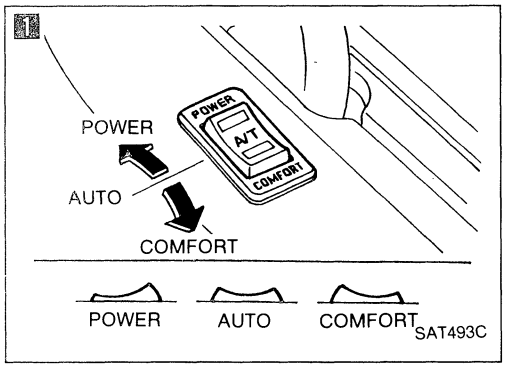


SAT960B

Without CONSULT

- Throttle position can be controlled by voltage across terminals ㉞ and ㉟ of A/T control unit.

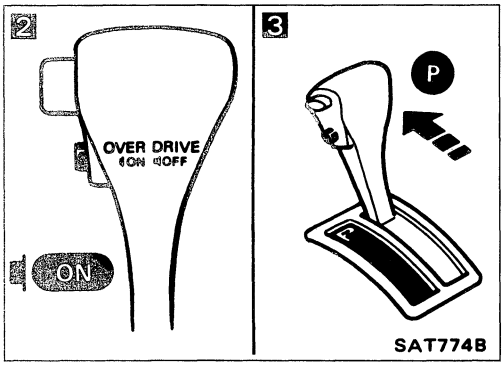
Preliminary Check (Cont'd)



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)

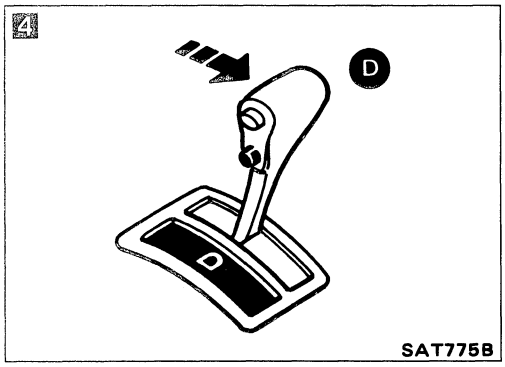
Park vehicle on flat surface.

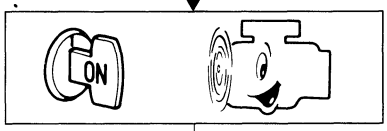


1 Set A/T mode switch in "AUTO" position.

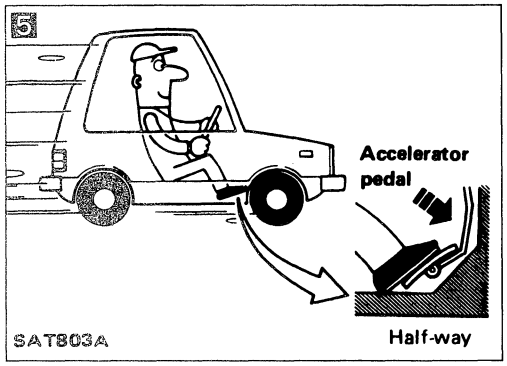
2 Set overdrive switch in "ON" position.

3 Move selector lever to "P" range.





4 Move selector lever to "D" range.



5 Accelerate vehicle to half throttle.

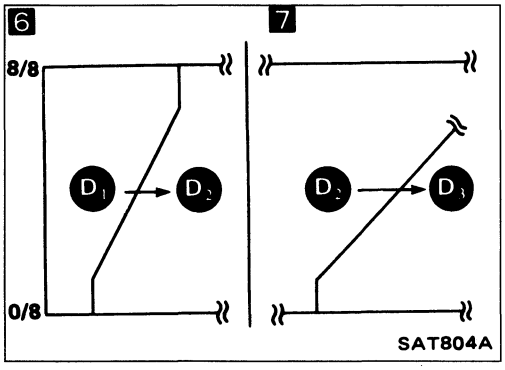
Does vehicle start from D_1? — No → Go to Diagnostic Procedure 11.

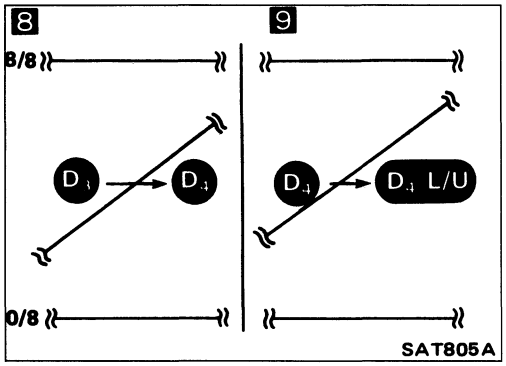
Read gear position.

Yes

Ⓐ

Preliminary Check (Cont'd)





Ⓐ

6 Does A/T shift from D_1 to D_2 at the specified speed? — No → Go to Diagnostic Procedure 12.

Read gear position, throttle opening and vehicle speed.

Specified speed when shifting from D_1 to D_2:

Refer to Shift schedule.

Yes ↓

7 Does A/T shift from D_2 to D_3 at the specified speed? — No → Go to Diagnostic Procedure 13.

Read gear position, throttle opening and vehicle speed.

Specified speed when shifting from D_2 to D_3:

Refer to Shift schedule.

Yes ↓

8 Does A/T shift from D_3 to D_4 at the specified speed? — No → Go to Diagnostic Procedure 14.

Read gear position, throttle opening and vehicle speed.

Specified speed when shifting from D_3 to D_4:

Refer to Shift schedule.

Yes ↓

9 Does A/T perform lock-up at the specified speed? — No → Go to Diagnostic Procedure 15.

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)

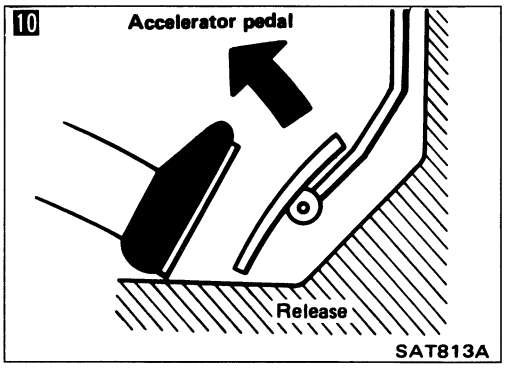
Yes ↓

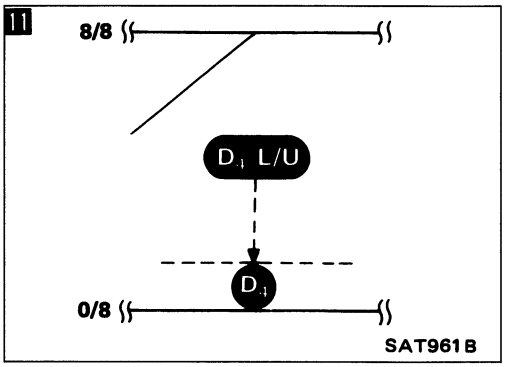
Does A/T hold lock-up condition for more than 30 seconds? — No → Go to Diagnostic Procedure 16.

Yes ↓

Ⓑ

Preliminary Check (Cont'd)





Ⓑ

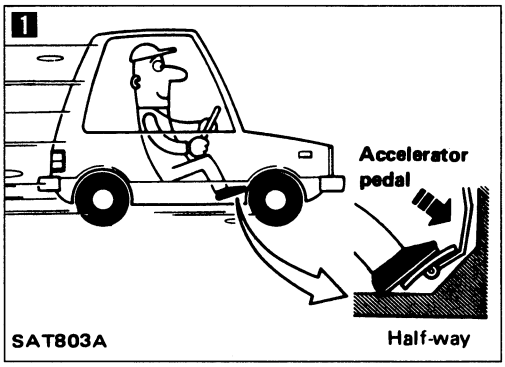
10 Release accelerator pedal.

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".



Cruise test — Part 2

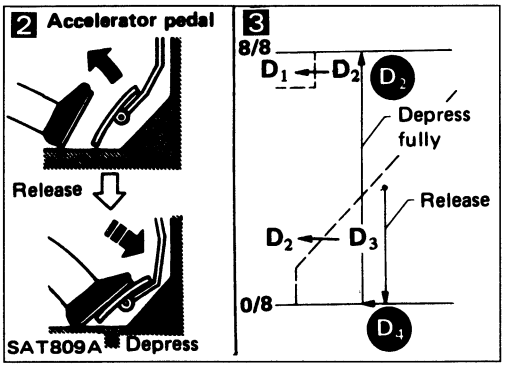
Confirm A/T mode switch is in "AUTO" position and overdrive switch is in "ON" position.

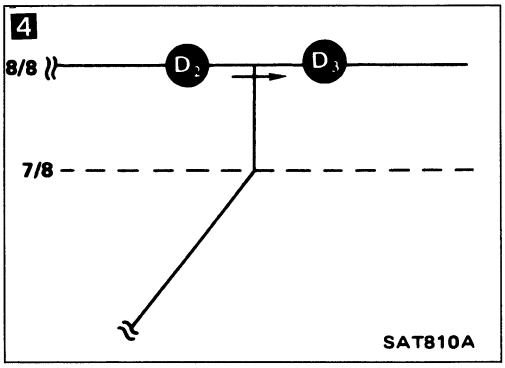
Confirm selector lever is in "D" range.

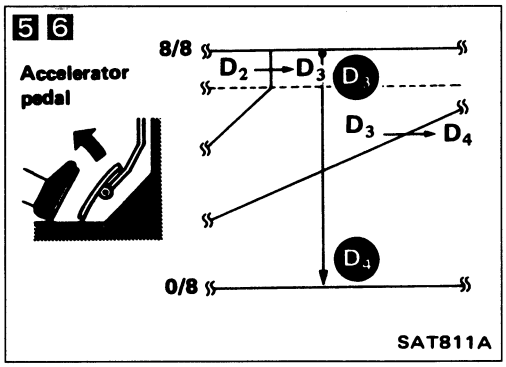
1 Accelerate vehicle to about 80 km/h (50 MPH) using half-throttle.

Ⓐ

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.

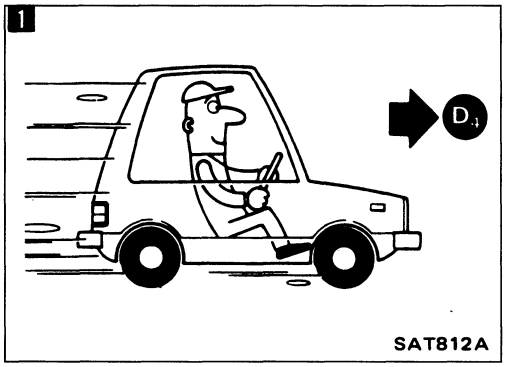
6 Does A/T shift from D_3 to D_4 and does vehicle decelerate by engine brake?
Read gear position, throttle opening and vehicle speed.
No → Go to Diagnostic Procedure 14.
Yes

Stop vehicle.

Go to "Cruise test — Part 3".

Preliminary Check (Cont'd)

Cruise test — Part 3



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? — No → Go to Diagnostic Procedure 18.

Read gear position and vehicle speed.

↓ Yes

5

Move selector lever from "D" to "2" range while driving in D_3.

↓

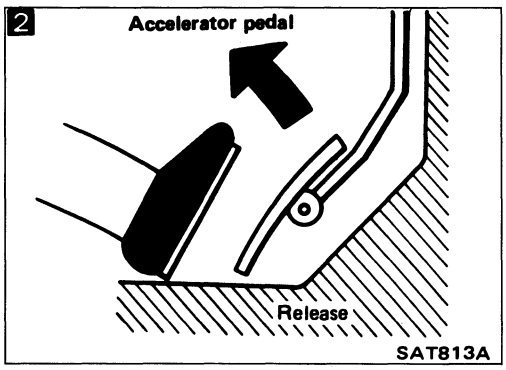
6

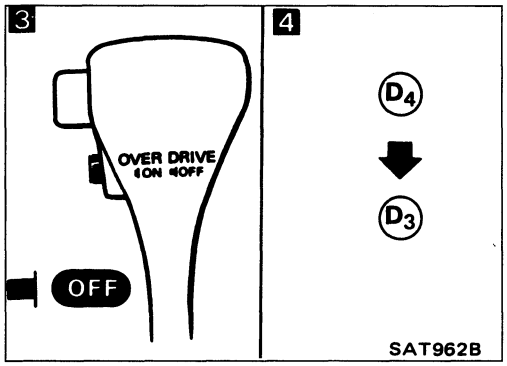
Does A/T shift from D_3 to 2_2? — No → Go to Diagnostic Procedure 19.

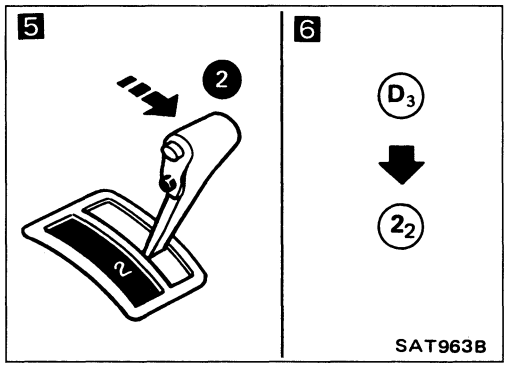
Read gear position.

↓ Yes

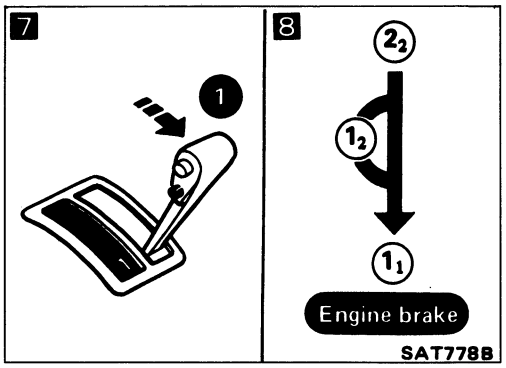
Ⓐ

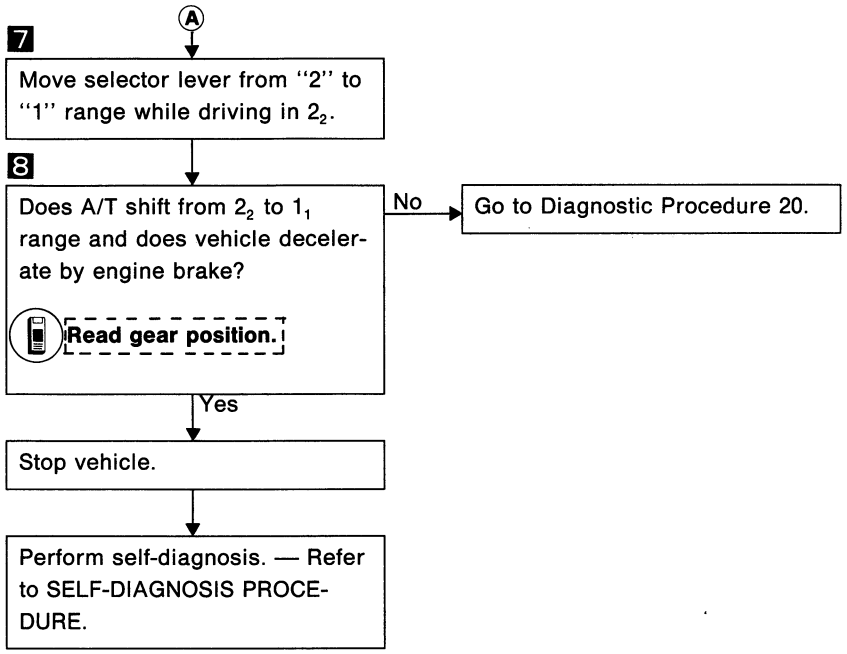






Preliminary Check (Cont'd)

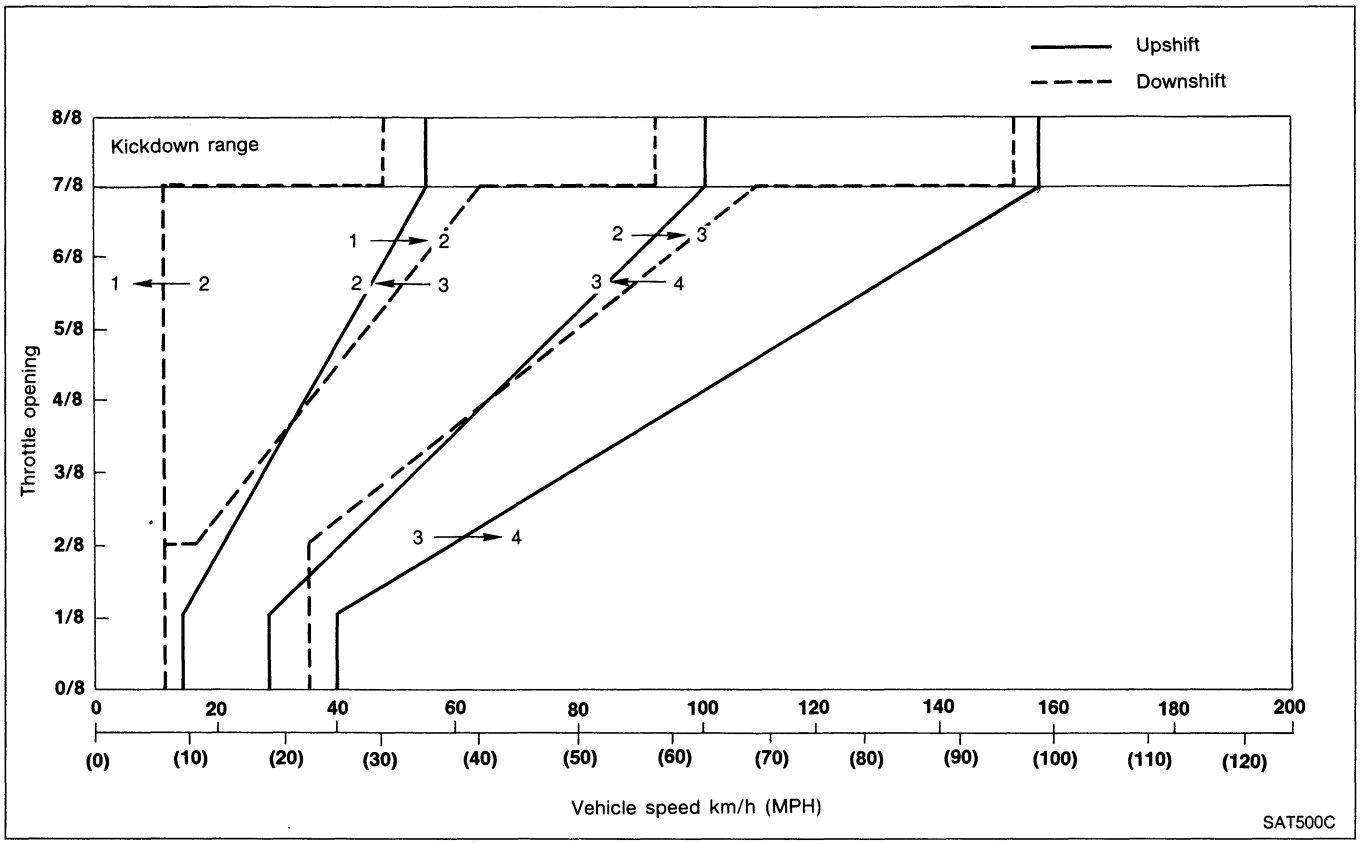




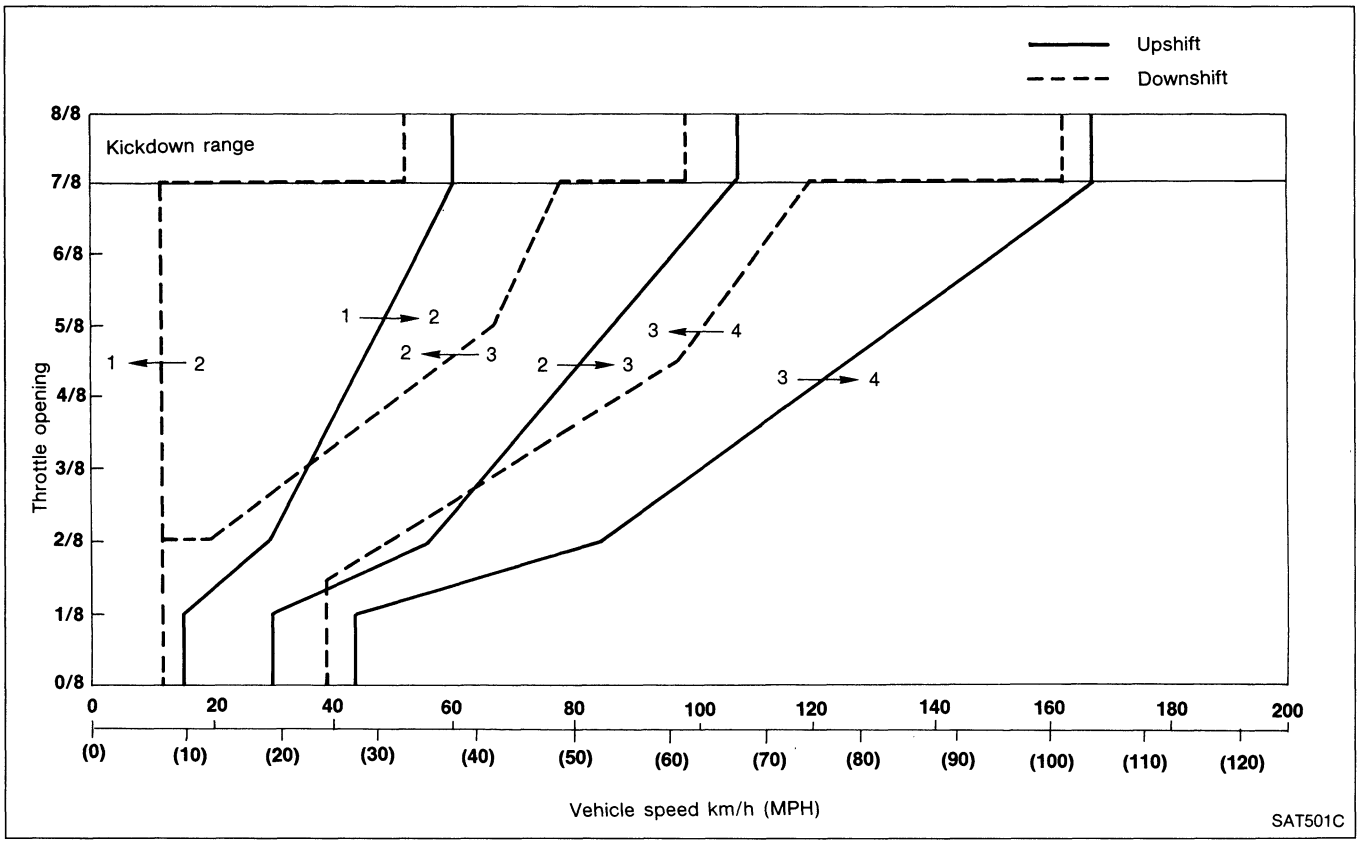
Preliminary Check (Cont'd)

SHIFT SCHEDULE

27 X 63 model (COMFORT pattern)

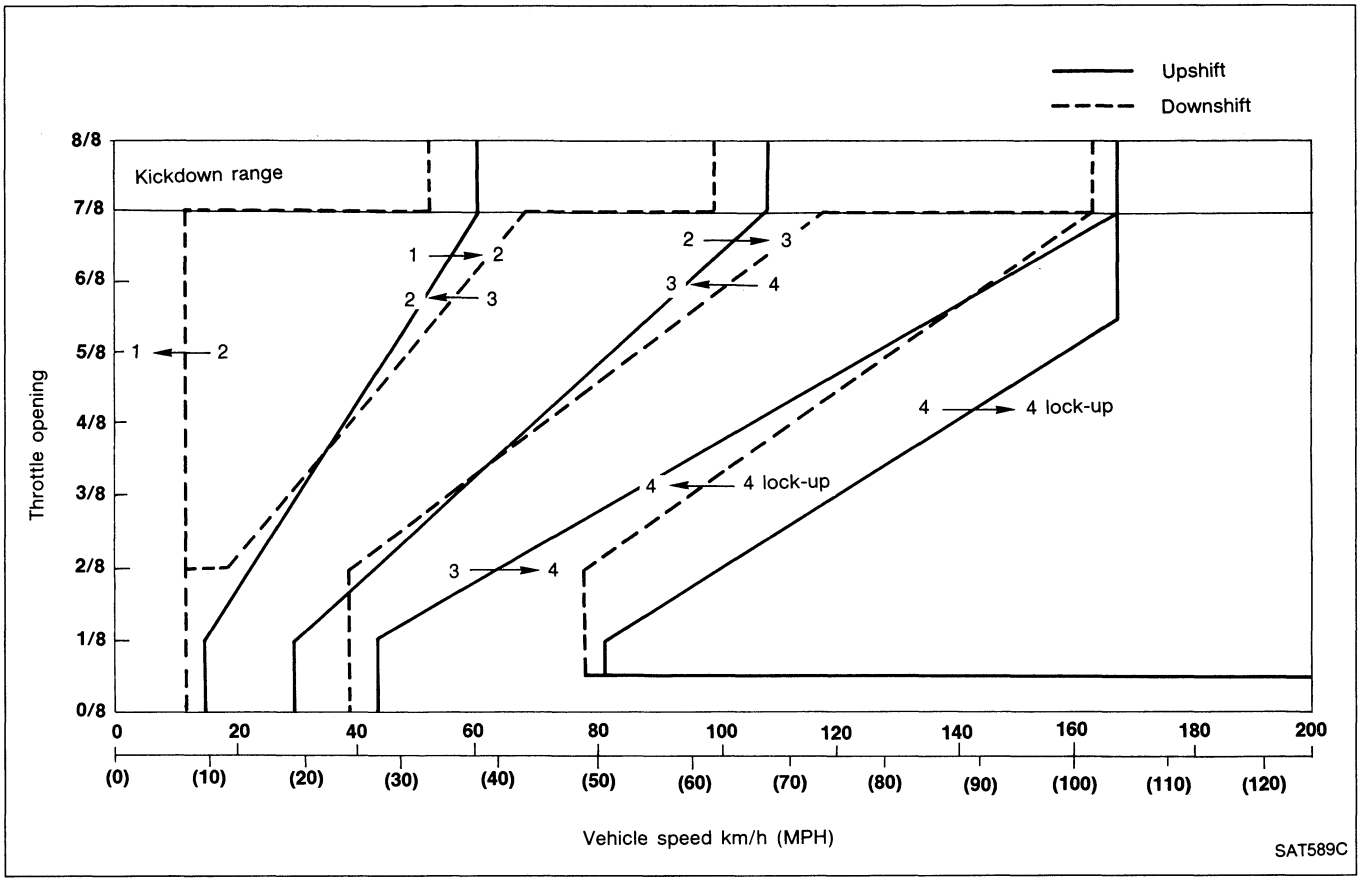


27 X 63 model (POWER pattern)

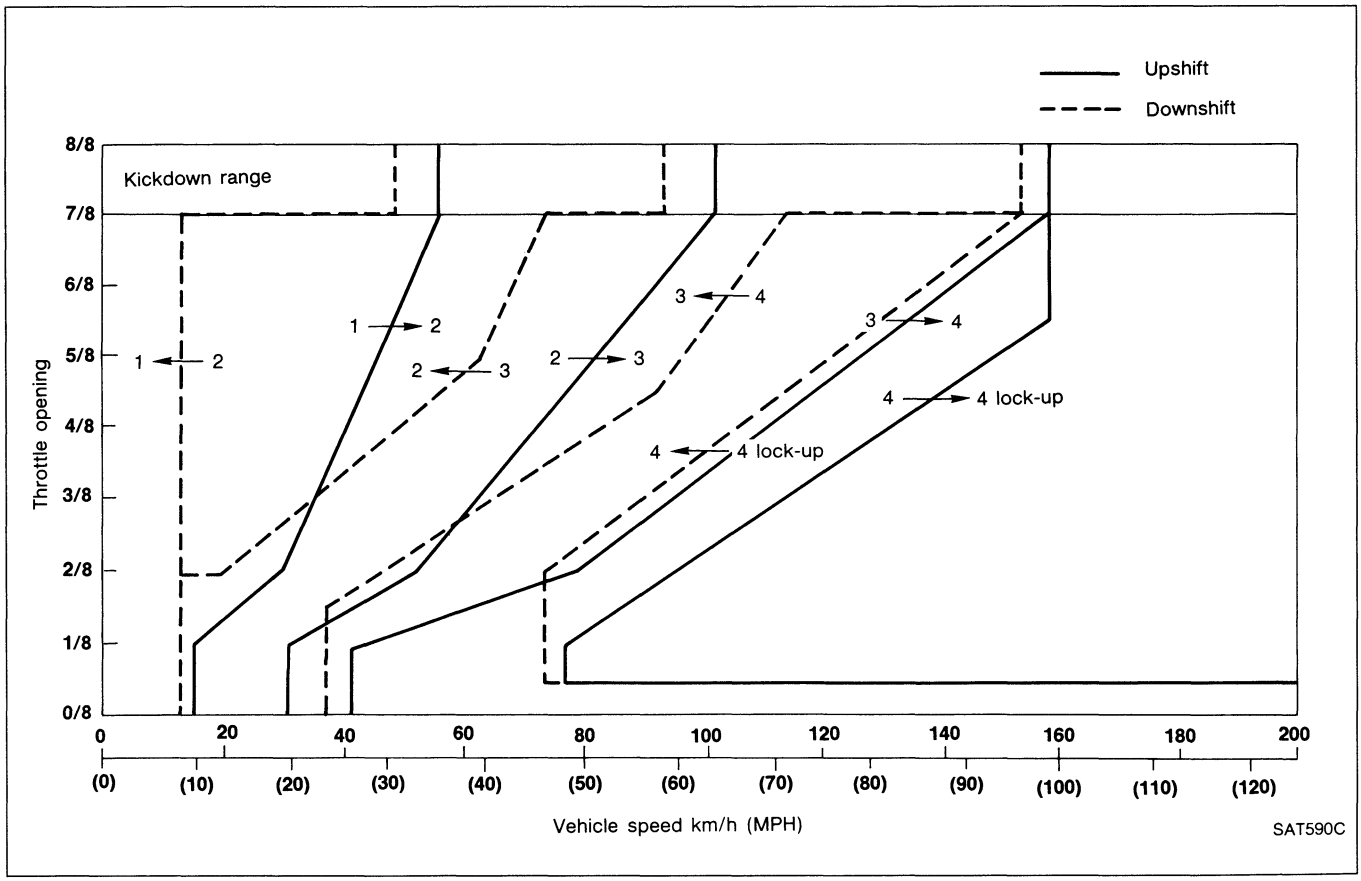


Preliminary Check (Cont'd)

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).

Diagnosis by CONSULT (Cont'd)

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	×
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

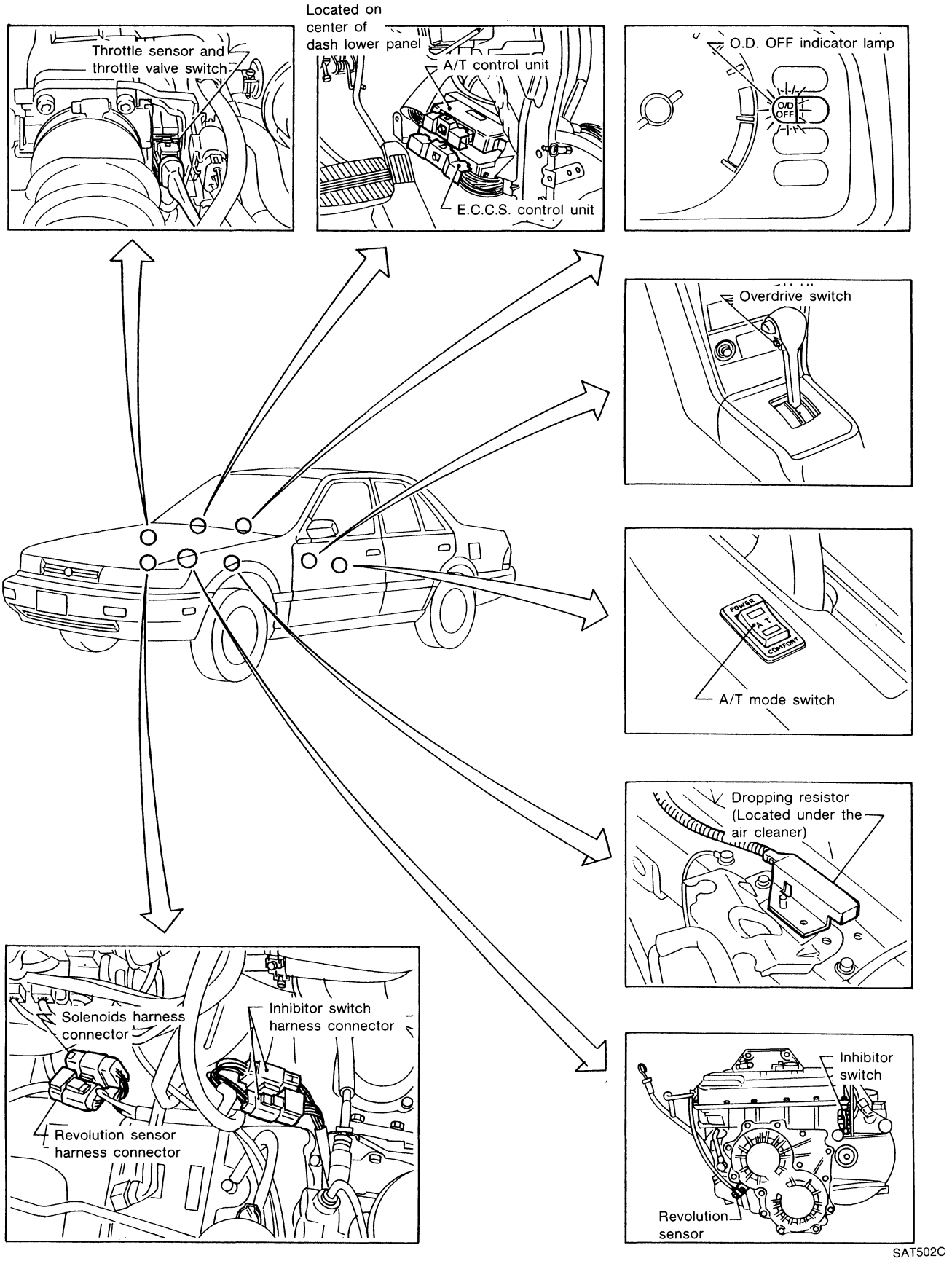
Diagnosis by CONSULT (Cont'd)

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

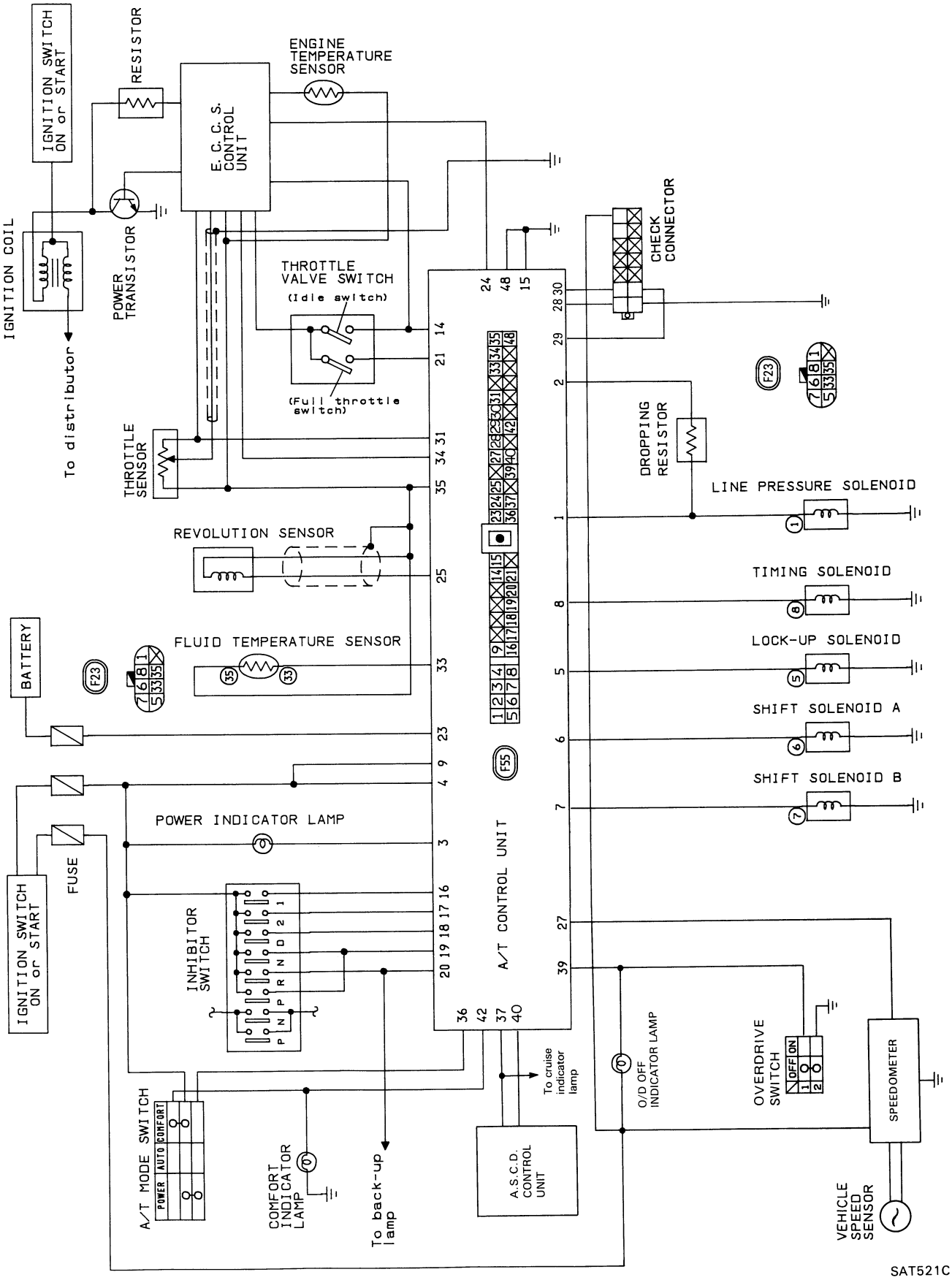
A/T Electrical Parts Location



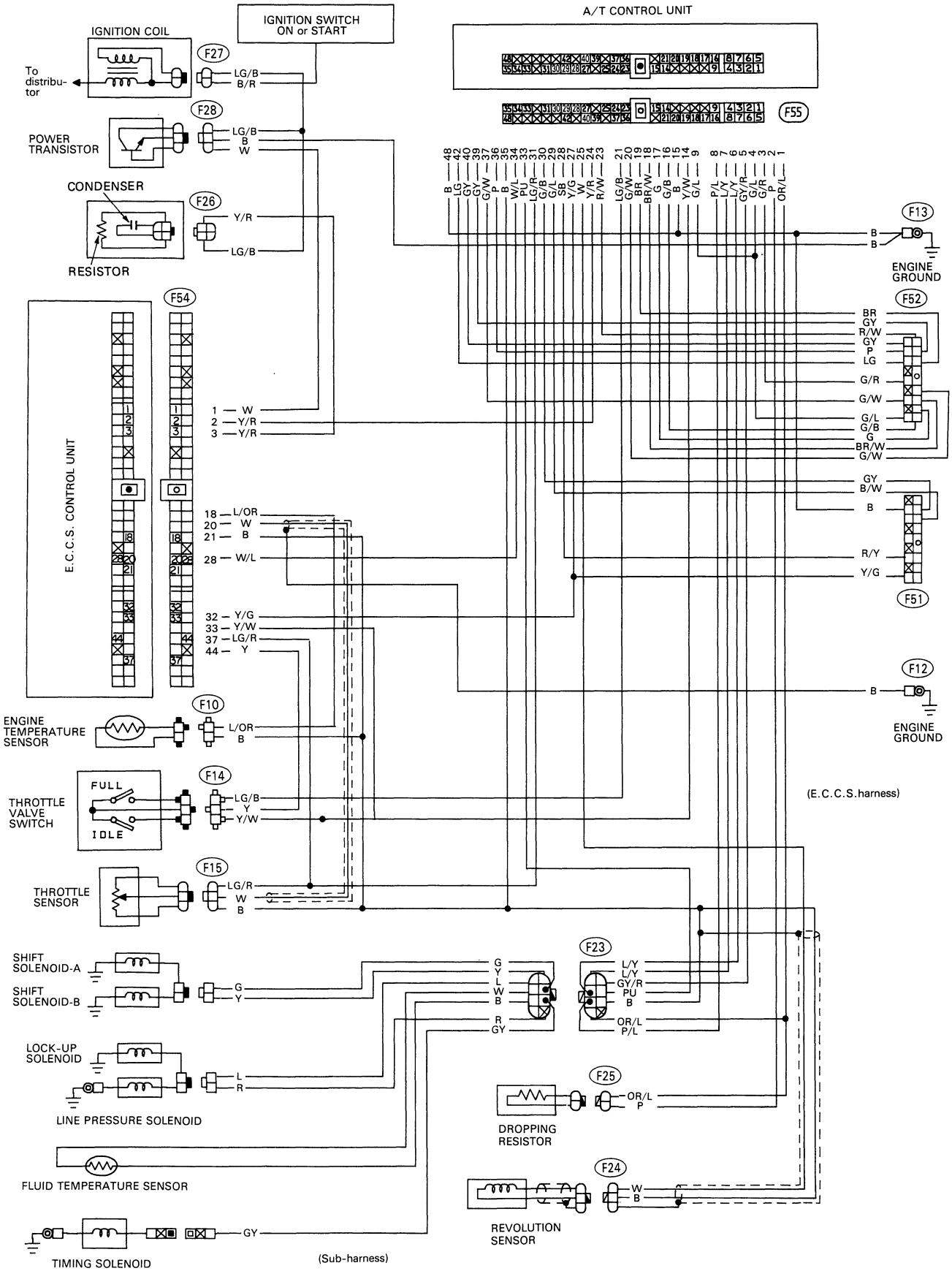
SAT502C

NOTE

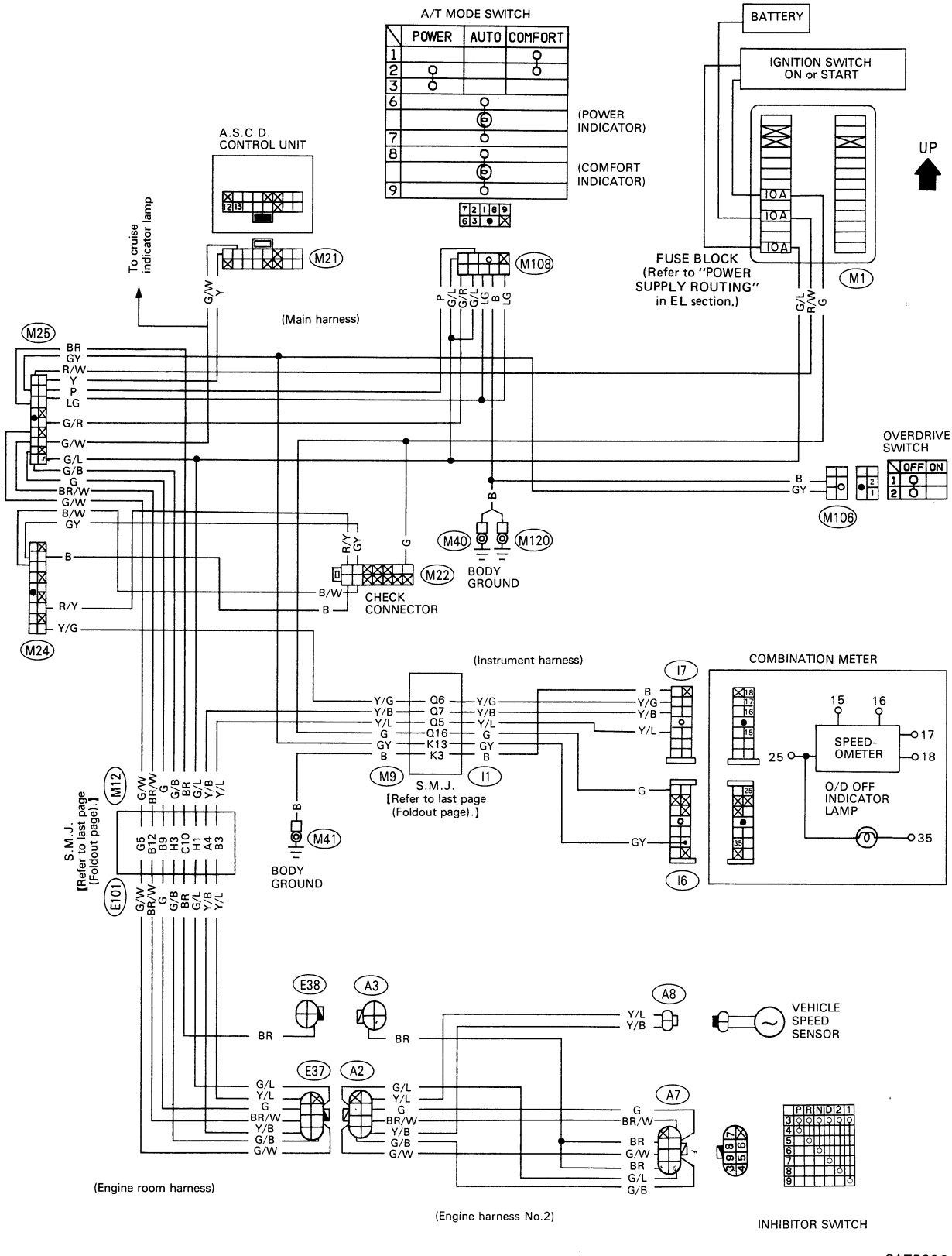
Circuit Diagram for Quick Pinpoint Check



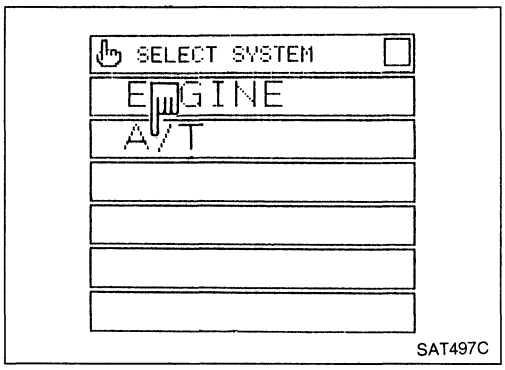
Wiring Diagram



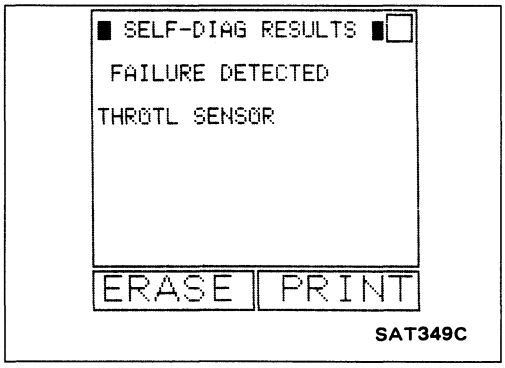
Wiring Diagram (Cont'd)



SAT522C



SAT497C



SAT349C

Self-diagnosis

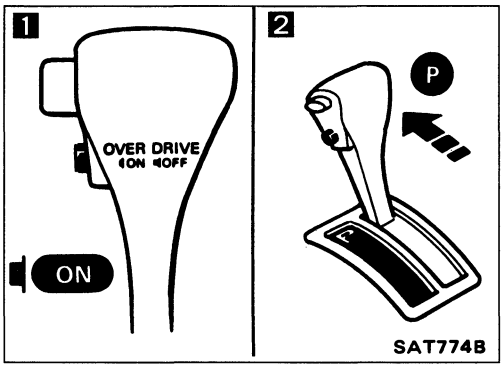
SELF-DIAGNOSTIC PROCEDURE (With CONSULT)

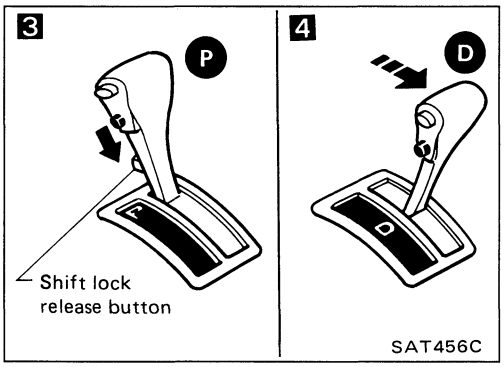
1. Turn on CONSULT.
2. Touch "A/T".

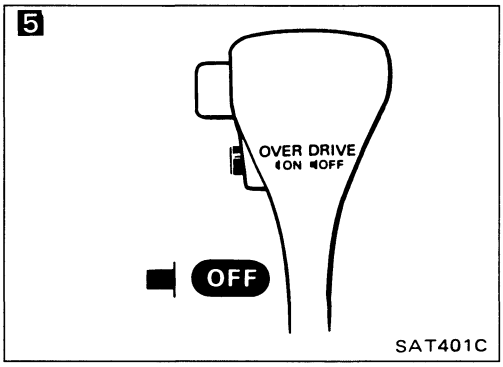
3. Touch "SELF-DIAGNOSIS".
   CONSULT performs REAL-TIME SELF-DIAGNOSIS.

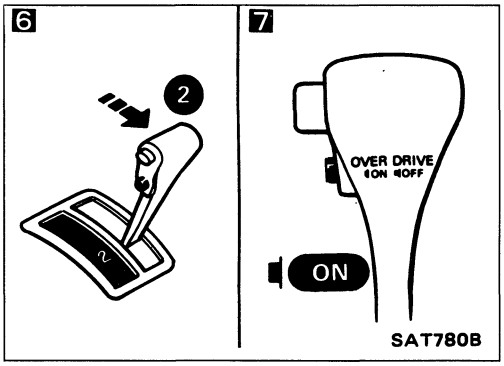
Self-diagnosis (Cont'd)

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.

Does power indicator lamp come on for about 2 seconds?

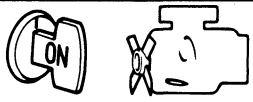
No → Go to Diagnostic Procedure 1.

Yes

3 Push shift lock release button.

4 Move selector lever to "D" range.

5 Set overdrive switch in "OFF" position.



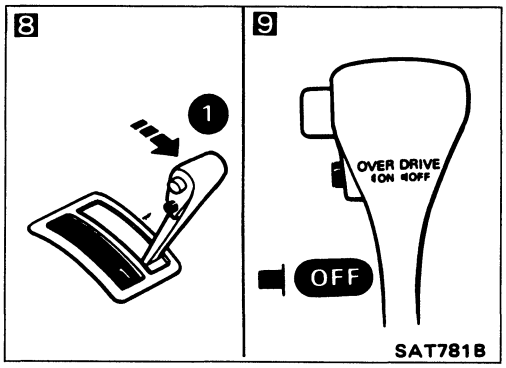
Wait for more than 2 seconds after ignition switch "ON".

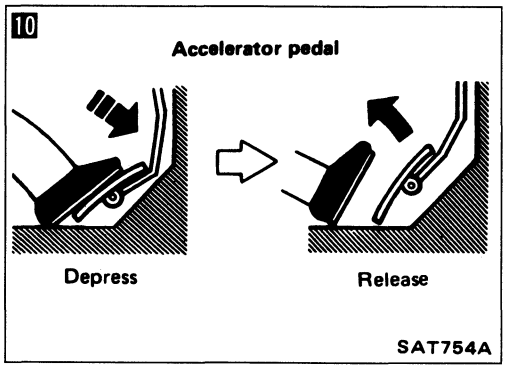
6 Move selector lever to "2" range.

7 Set overdrive switch in "ON" position.

Ⓐ

Self-diagnosis (Cont'd)





Ⓐ

8 Move selector lever to "1" range.

↓

9 Set overdrive switch in "OFF" position.

↓

10 Depress accelerator pedal fully and release it.

↓

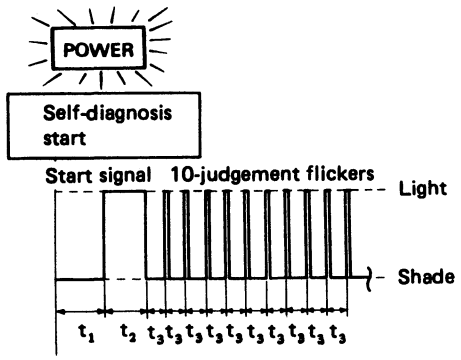
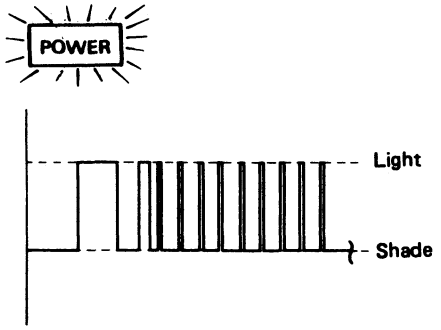
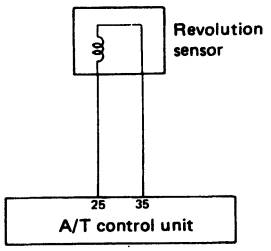
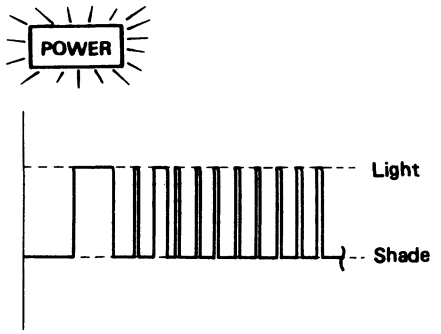
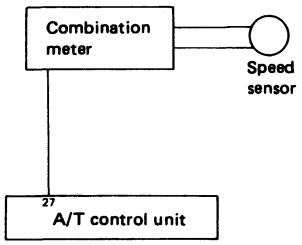
Check power indicator lamp. Refer to JUDGEMENT OF SELF-DIAGNOSIS CODE on next page.

↓

DIAGNOSIS END

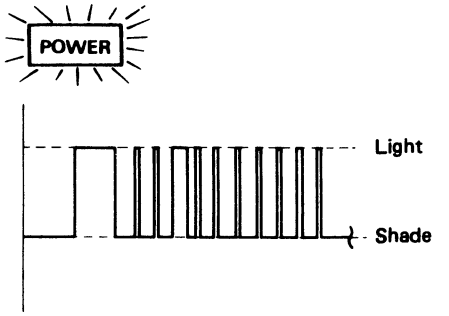
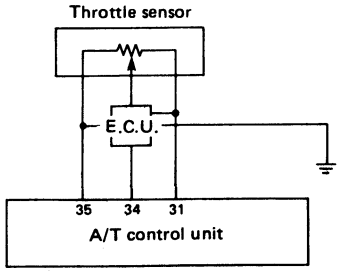
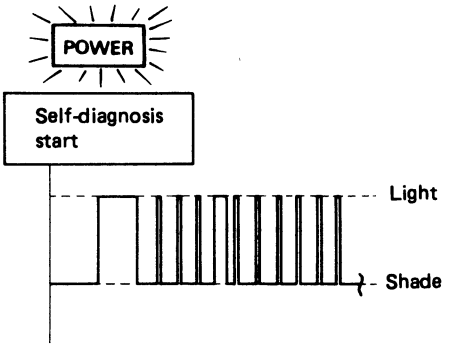
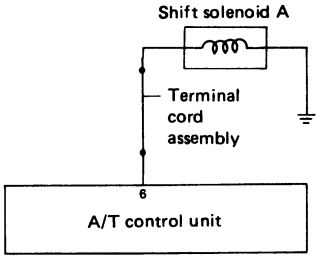
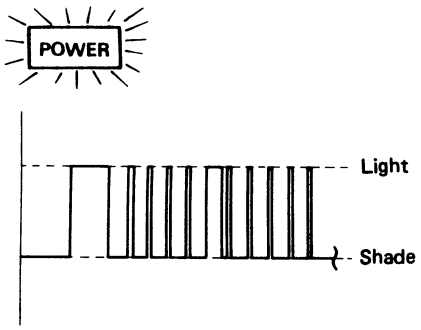
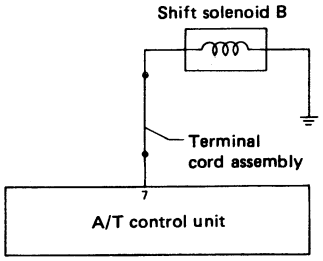
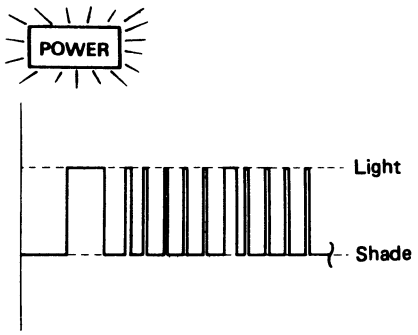
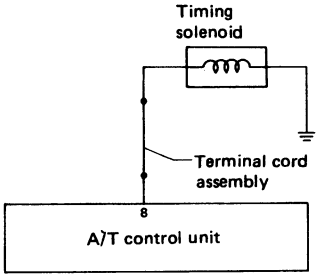
Self-diagnosis (Cont'd)

JUDGEMENT OF SELF-DIAGNOSIS CODE

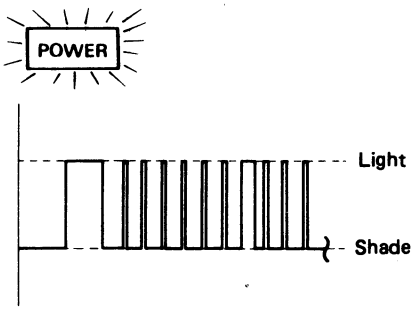
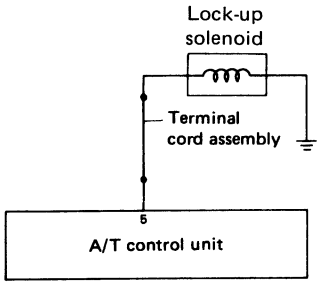
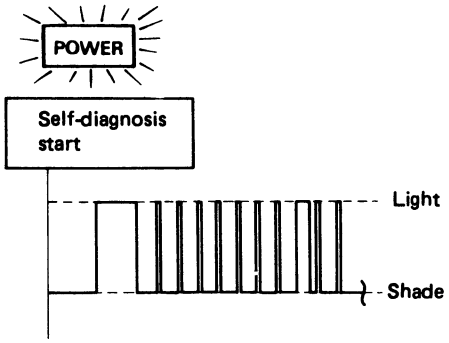
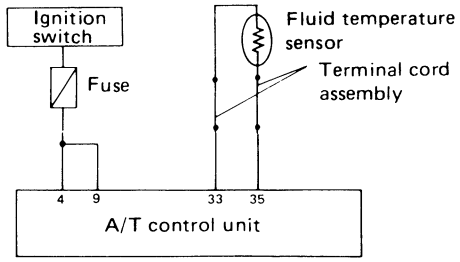
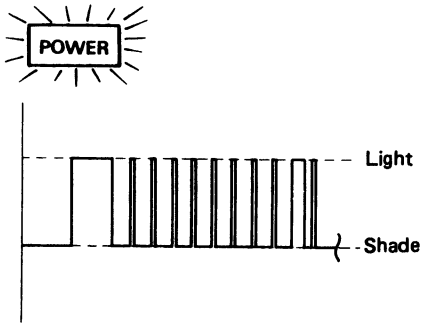
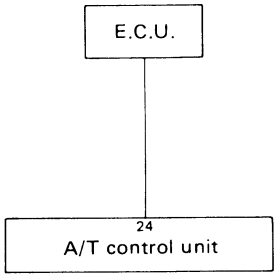
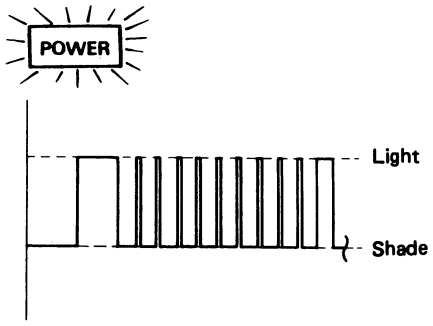
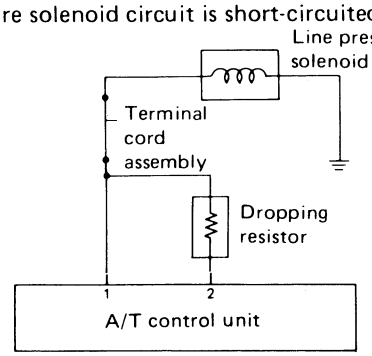
Power indicator lamp:	Damaged circuit
All judgement flickers are same.  SAT755A	All circuits that can be confirmed by self-diagnosis are O.K.
1st judgement flicker is longer than others.  SAT756A	Revolution sensor circuit is short-circuited or disconnected.  ➡ **Go to revolution sensor circuit check.** 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

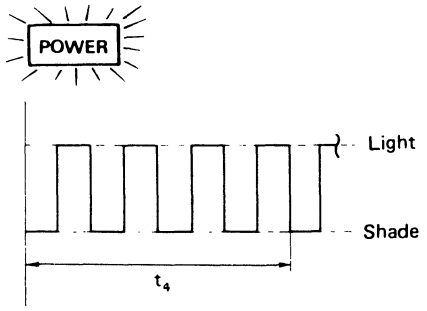
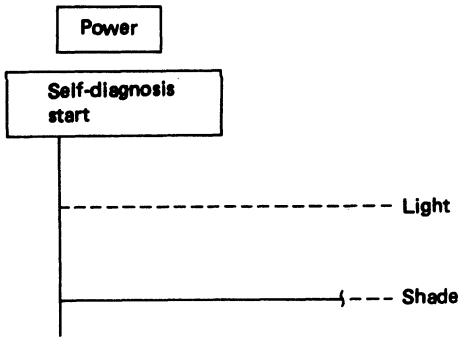
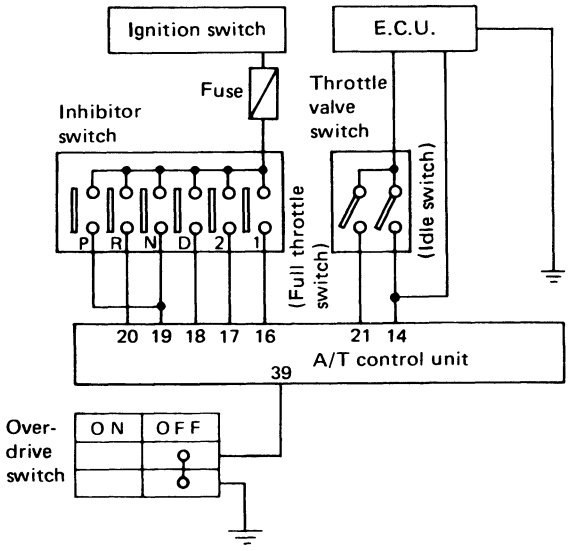
Self-diagnosis (Cont'd)

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

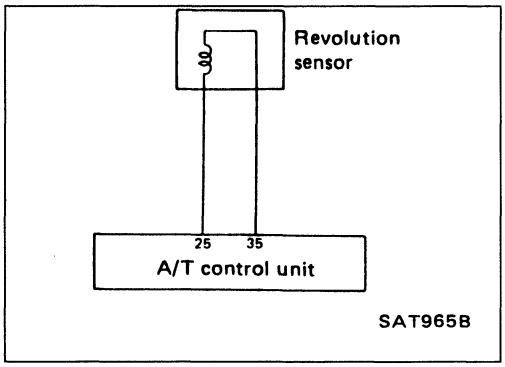
Self-diagnosis (Cont'd)

Power indicator lamp:	Damaged circuit
Flickers as shown below.  SAT773A	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.)
Does not come on.  SAT146B	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

t_4 = 1.0 second

Self-diagnosis (Cont'd)

REVOLUTION SENSOR CIRCUIT CHECK



SAT965B

CHECK REVOLUTION SENSOR.
— Refer to "Electrical Components Inspection".

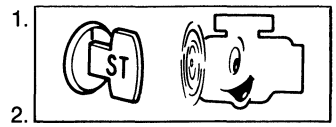
N.G. → Repair or replace revolution sensor.

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.

N.G. → Check harness continuity between A/T control unit and revolution sensor.

OR

Check voltage between A/T control unit terminal ㉕ and ground while driving.
(Measure with A.C. range.)

Voltage:
At 0 km/h (0 MPH):
0V
At 30 km/h (19 MPH):
1V or more
(Voltage rises gradually in response to vehicle speed.)

O.K. ↓

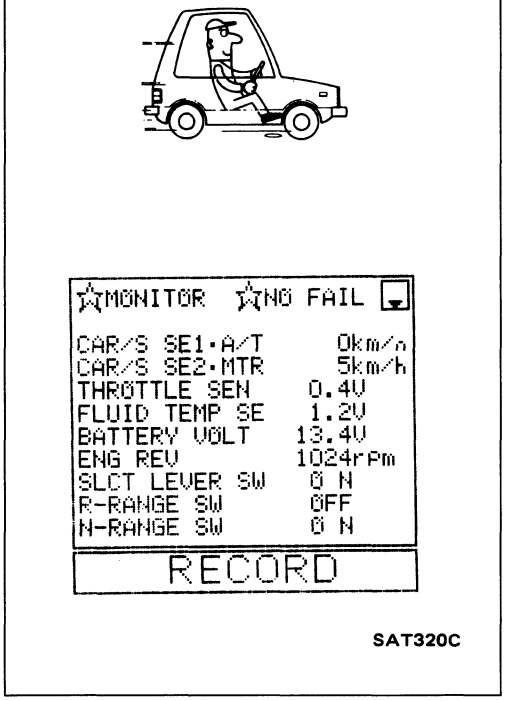
Perform self-diagnosis again after driving for a while.

N.G. → 1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

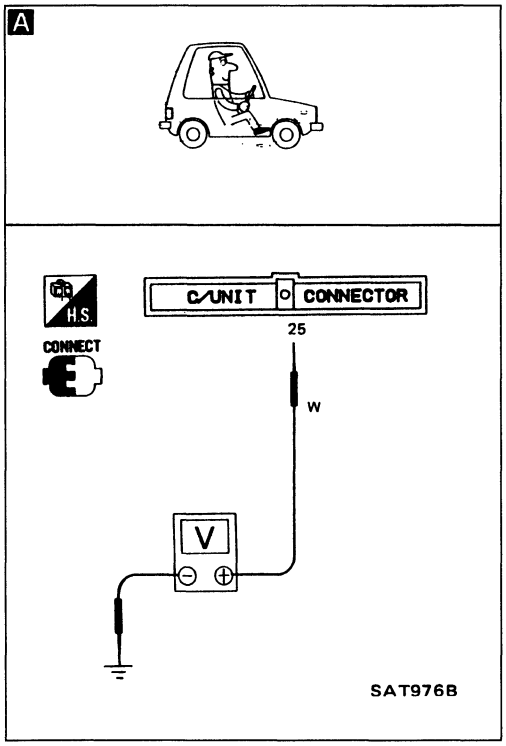
INSPECTION END

A



SAT320C

A

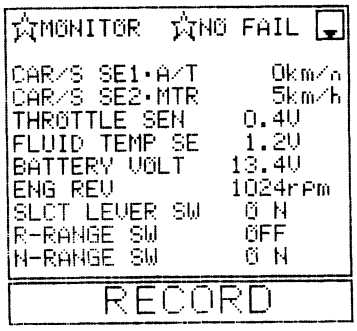


SAT976B

Self-diagnosis (Cont'd)

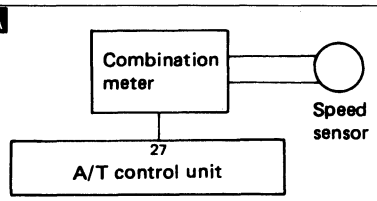
SPEED SENSOR CIRCUIT CHECK

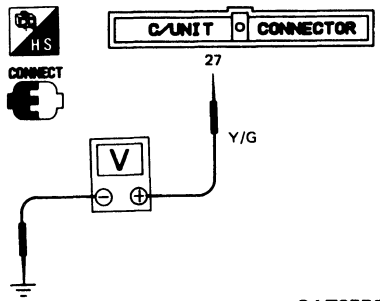
A



SAT320C

A

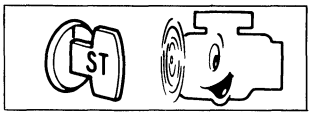




SAT977B

A

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.

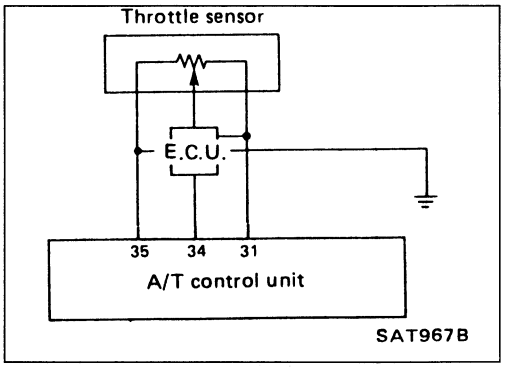
N.G. → 1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

INSPECTION END

Self-diagnosis (Cont'd)

THROTTLE SENSOR CIRCUIT CHECK



Perform self-diagnosis (Mode III) for engine control.

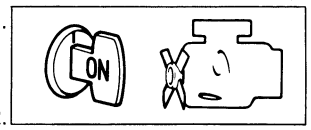
N.G. → Check throttle sensor circuit for engine control. — Refer to section EF & EC.

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

N.G. → Check harness continuity between E.C.U. and A/T control unit regarding throttle sensor circuit.

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.)

O.K.

Perform self-diagnosis again after driving for a while.

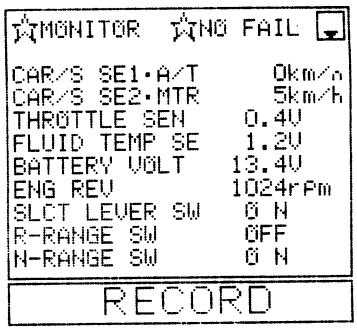
N.G. → 1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K.

INSPECTION END

A

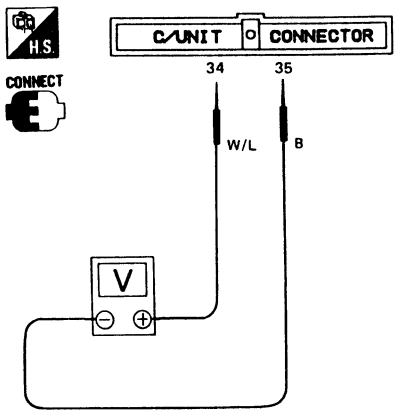
Depress slowly.



SAT321C

A

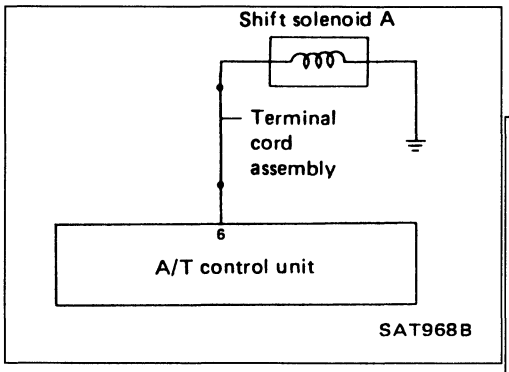
Depress slowly.

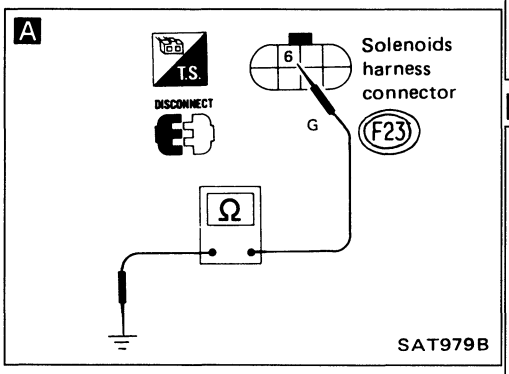


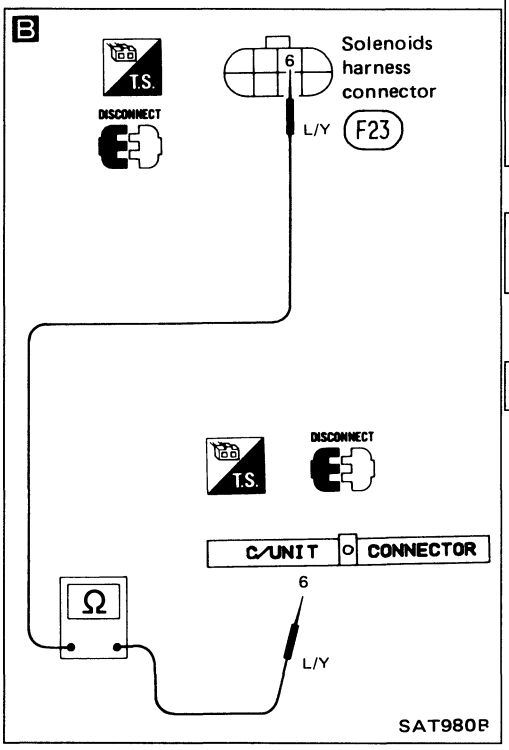
SAT978B

Self-diagnosis (Cont'd)

SHIFT SOLENOID A CIRCUIT CHECK

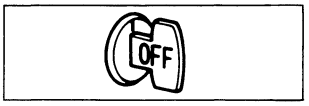






A

CHECK GROUND CIRCUIT.

1. 

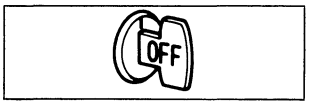
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ⑥ and ground.
   Resistance: 20 - 40Ω

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. 

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.

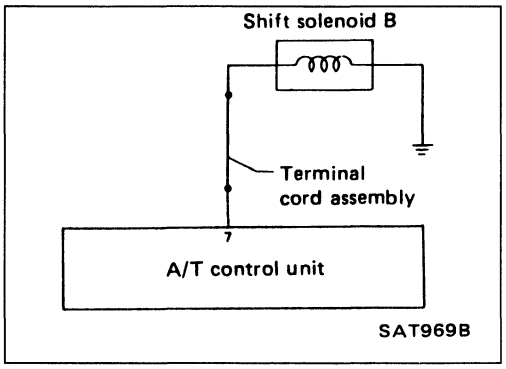
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

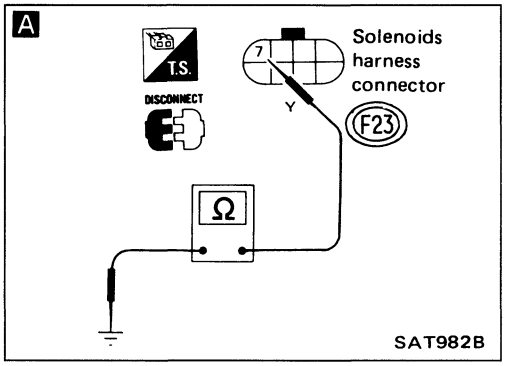
O.K. ↓

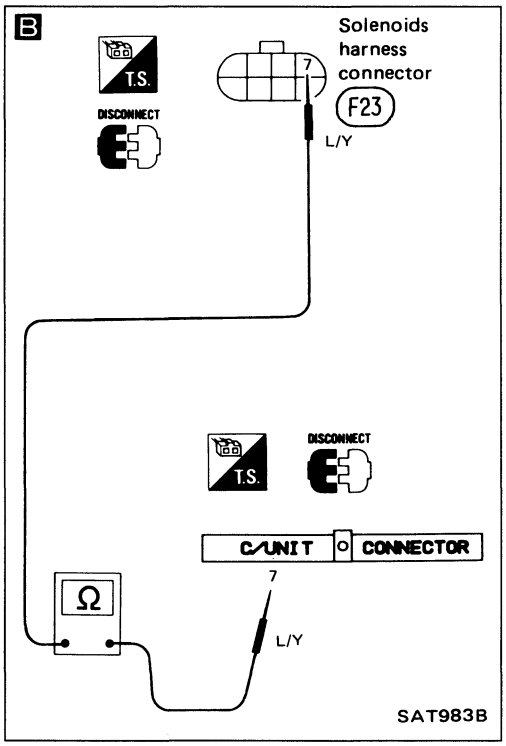
INSPECTION END

Self-diagnosis (Cont'd)

SHIFT SOLENOID B CIRCUIT CHECK

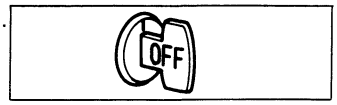






A

CHECK GROUND CIRCUIT.

1. 

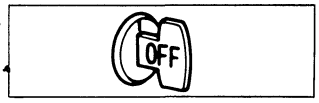
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ⑦ and ground.
   Resistance: 20 - 40Ω

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.

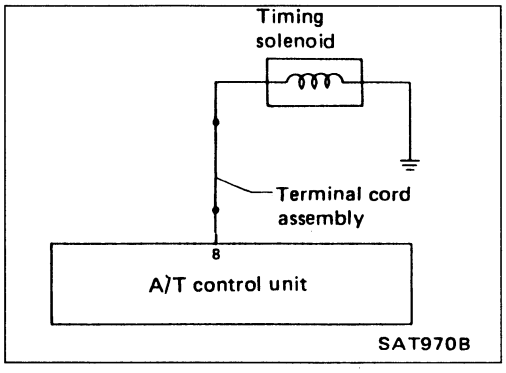
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

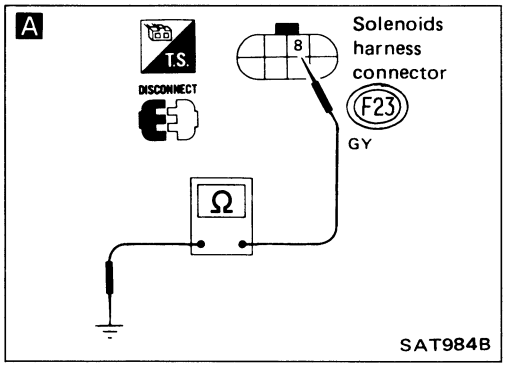
O.K. ↓

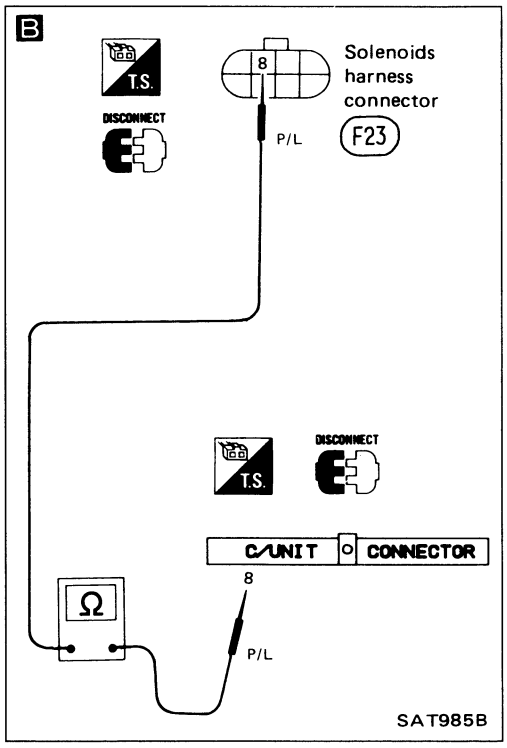
INSPECTION END

Self-diagnosis (Cont'd)

TIMING SOLENOID CIRCUIT CHECK

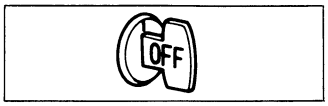






A

CHECK GROUND CIRCUIT.

1. 

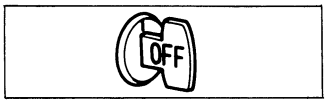
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ⑧ and ground.
   Resistance: 20 - 40Ω

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. 

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.

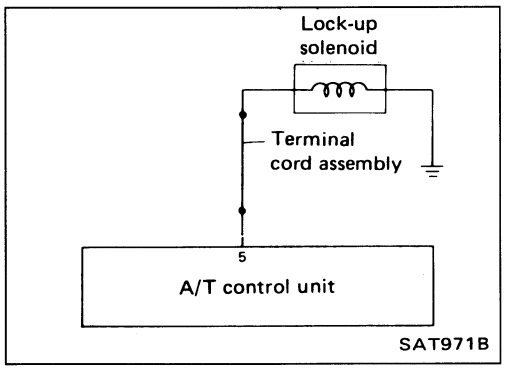
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

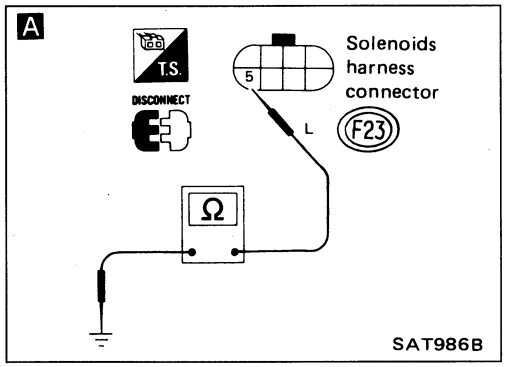
O.K. ↓

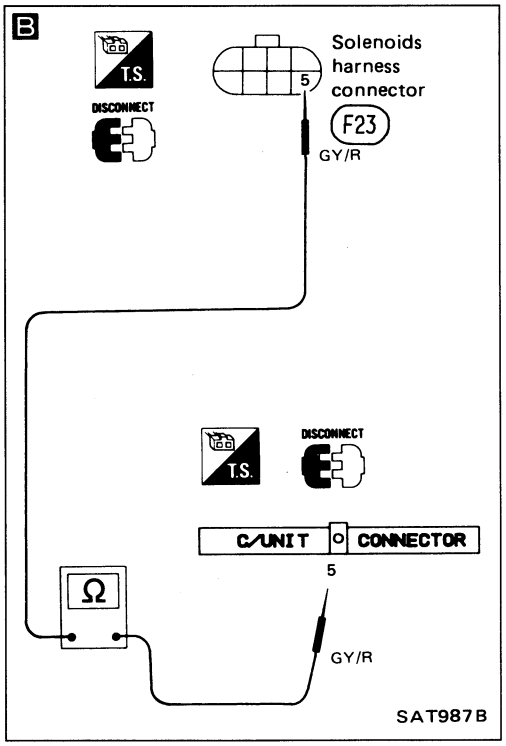
INSPECTION END

Self-diagnosis (Cont'd)

LOCK-UP SOLENOID CIRCUIT CHECK

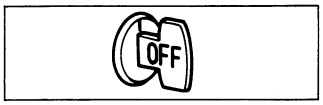






A

CHECK GROUND CIRCUIT.

1. 

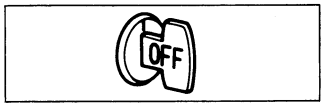
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ⑤ and ground.
   Resistance: 10 - 20Ω

N.G. →
1. Remove 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. 

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.

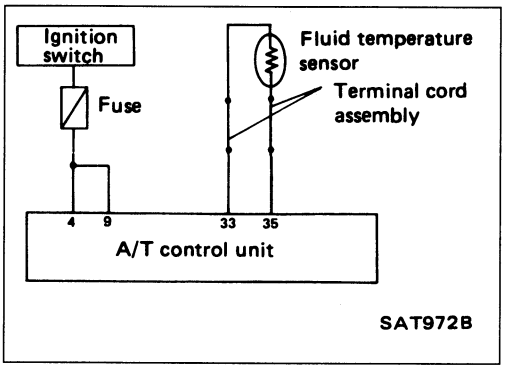
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

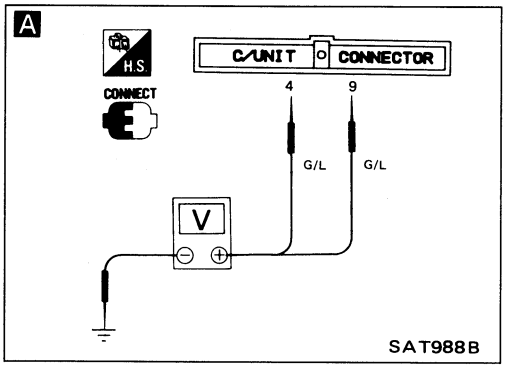
O.K. ↓

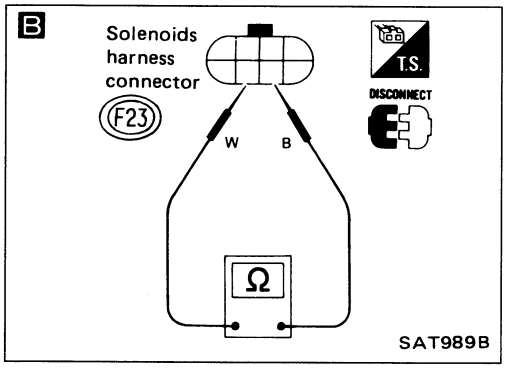
INSPECTION END

Self-diagnosis (Cont'd)

FLUID TEMPERATURE SENSOR CIRCUIT AND A/T CONTROL UNIT POWER SOURCE CIRCUIT CHECKS

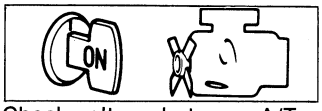






A

CHECK A/T CONTROL UNIT POWER SOURCE.

1. 

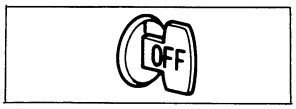
2. Check voltage between A/T control unit terminals ④, ⑨ and ground.
Battery voltage should exist.

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.

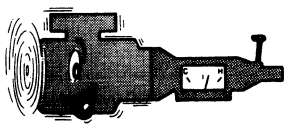
N.G. → 1. Remove control valve cover.
2. Check the following items.
- Fluid temperature sensor — Refer to "Electrical Components Inspection".
- Harness continuity of terminal cord assembly

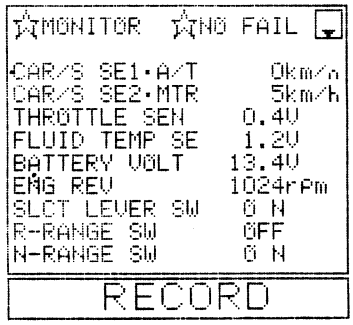
O.K. ↓

Ⓐ

Self-diagnosis (Cont'd)

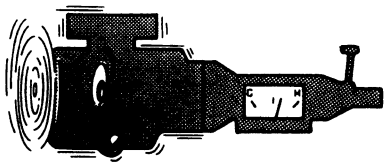
C

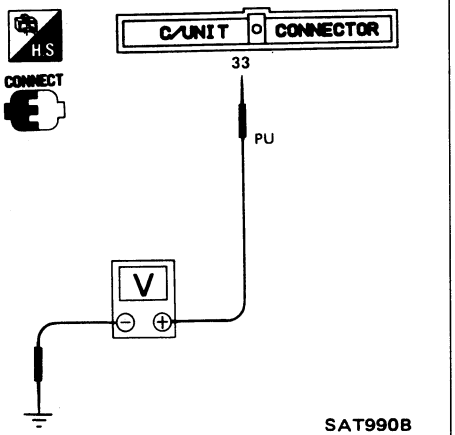




SAT330C

C





SAT990B

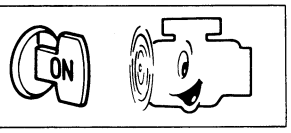
Ⓐ

C

CHECK INPUT SIGNAL OF FLUID TEMPERATURE SENSOR.

N.G. → Check harness continuity between A/T control unit and terminal cord assembly.

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

O.K.

Perform self-diagnosis after driving for a while.

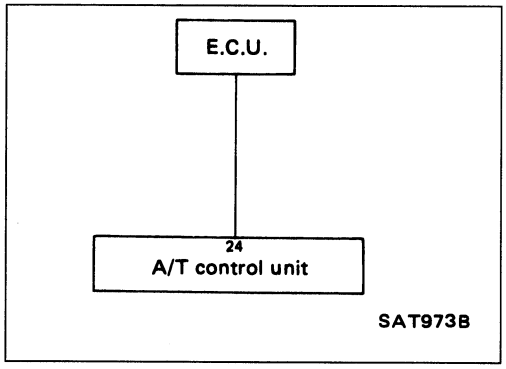
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

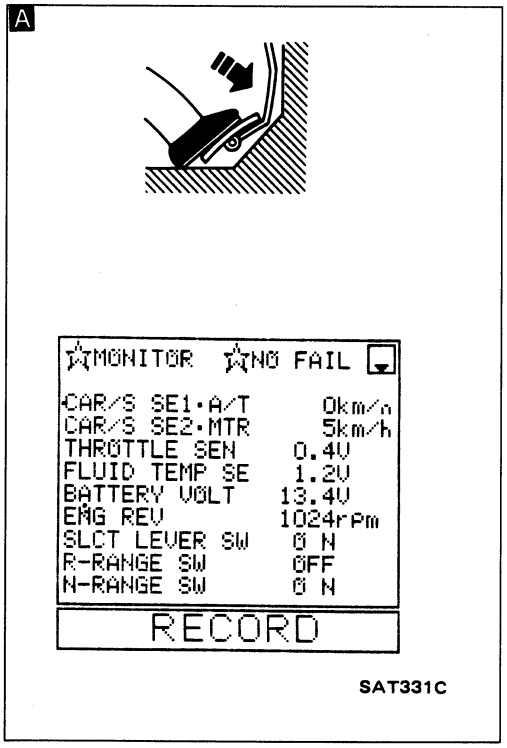
O.K.

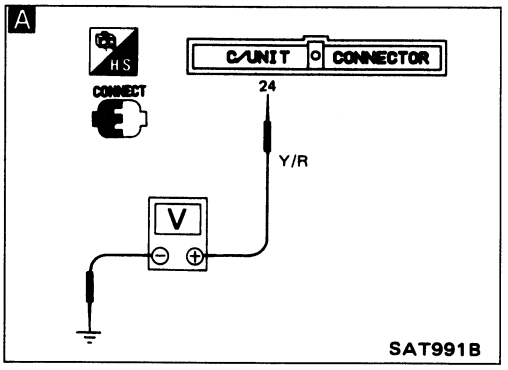
INSPECTION END

Self-diagnosis (Cont'd)

ENGINE REVOLUTION SIGNAL CIRCUIT CHECK







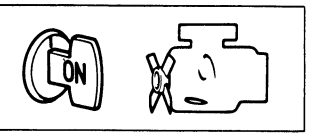
Check ignition circuit condition for engine. — N.G. → Repair or replace. — Refer to section EF & EC.

O.K. ↓

A

CHECK INPUT SIGNAL. — N.G. → Check harness continuity between A/T control unit and E.C.C.S. control unit.

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

O.K. ↓

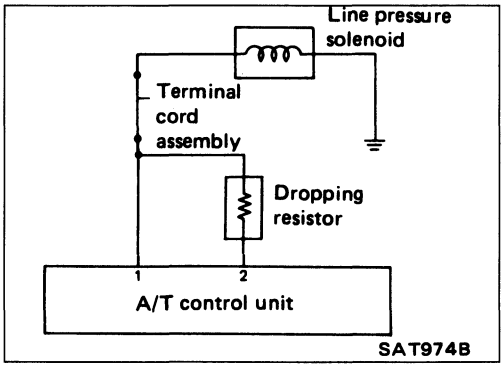
Perform self-diagnosis again after driving for a while. — N.G. → 1. Perform A/T control unit input/output signal inspection. 2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

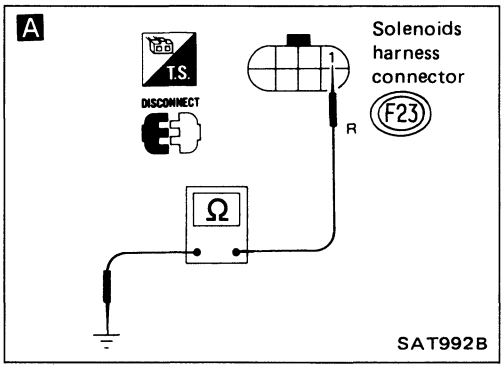
O.K. ↓

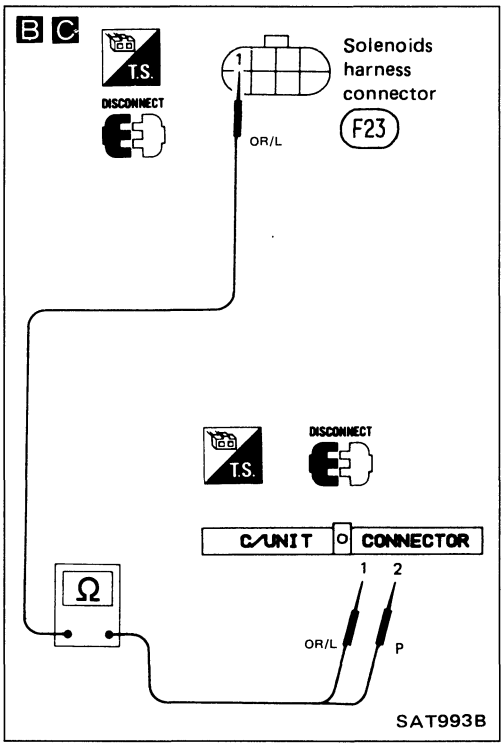
INSPECTION END

Self-diagnosis (Cont'd)

LINE PRESSURE SOLENOID CIRCUIT CHECK

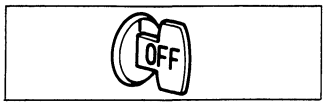






A

CHECK GROUND CIRCUIT.

1. 

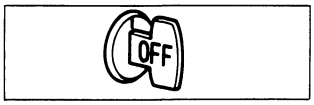
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ① and ground.
   Resistance: 2.5 - 5Ω

N.G. →
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
- Line pressure solenoid — Refer to "Electrical Components Inspection".
- Harness continuity of terminal cord assembly

O.K. ↓

B

CHECK POWER SOURCE CIRCUIT.

1. 

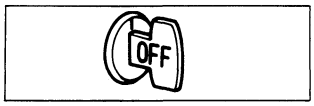
2. Disconnect A/T control unit connector.
3. Check resistance between terminal ① and A/T control unit terminal ②.
   Resistance: 11.2 - 12.8Ω

N.G. →
Check the following items.
- Dropping resistor — Refer to "Electrical Components Inspection".
- Harness continuity between A/T control unit ② and terminal cord assembly

O.K. ↓

C

CHECK POWER SOURCE CIRCUIT.

1. 

2. Check resistance between terminal ① and A/T control unit terminal ①.
   Resistance:
   Approximately 0Ω
3. Reinstall any part removed.

N.G. →
Repair or replace harness between A/T control unit ① and terminal cord assembly.

O.K. ↓

Perform self-diagnosis after driving for a while.

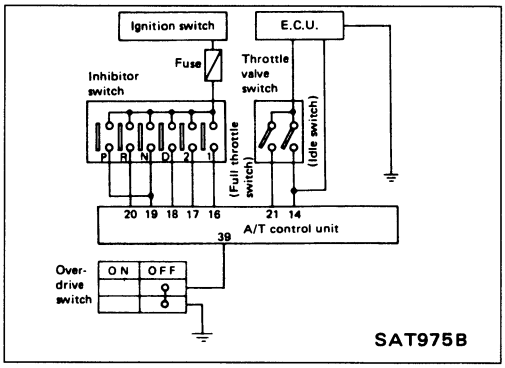
N.G. →
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

O.K. ↓

INSPECTION END

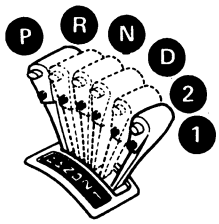
Self-diagnosis (Cont'd)

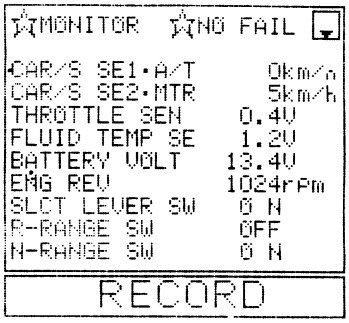
INHIBITOR, OVERDRIVE AND THROTTLE VALVE SWITCH CIRCUIT CHECKS



SAT975B

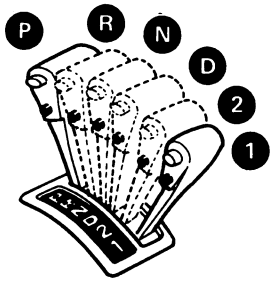
A

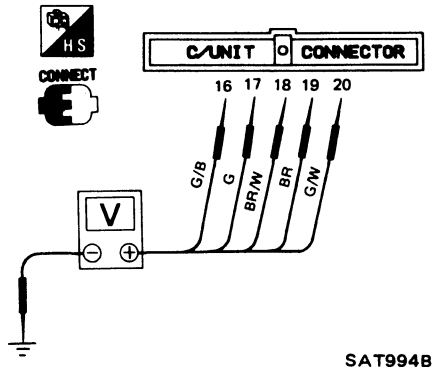




SAT334C

A

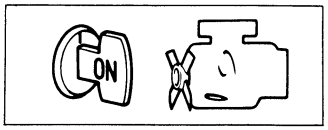




SAT994B

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.

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

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

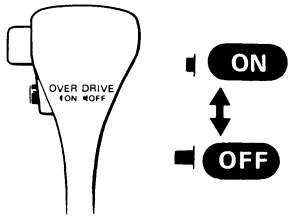
0: 0V

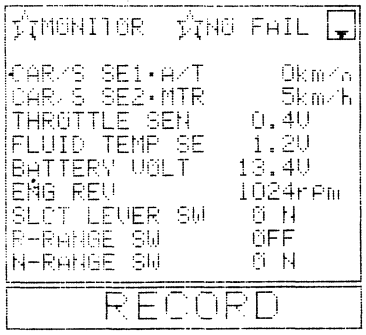
Lever position \ Terminal No.	⑲	⑳	⑱	⑰	⑯
P, N	**B**	0	0	0	0
R	0	**B**	0	0	0
D	0	0	**B**	0	0
2	0	0	0	**B**	0
1	0	0	0	0	**B**

O.K. → Ⓐ

Self-diagnosis (Cont'd)

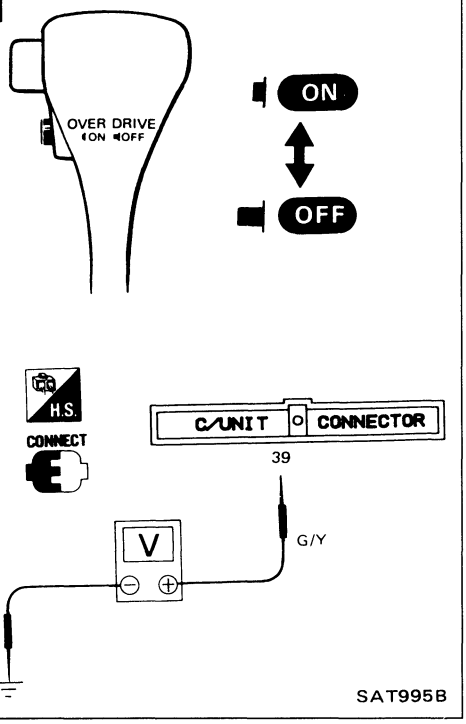
B





SAT335C

B



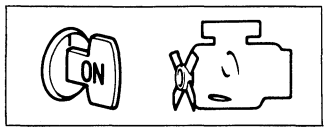
SAT995B

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.

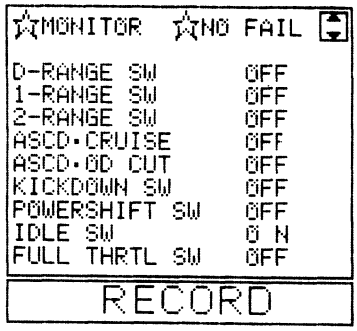
Switch position	Voltage
ON	Battery voltage
OFF	1V or less

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. → Ⓑ

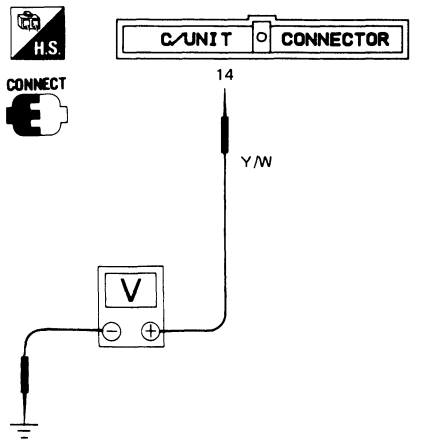
Self-diagnosis (Cont'd)

C



SAT338C

C



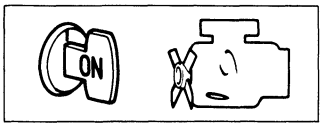
SAT339C

Ⓑ

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.

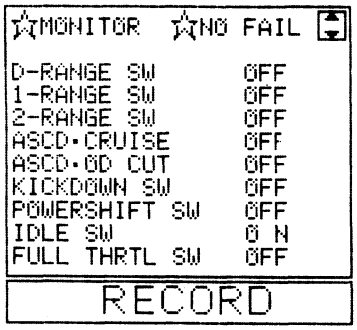
O.K. → Check harness continuity between A/T control unit and idle switch.

N.G. → Check idle switch circuit for engine control. — Refer to section EF & EC.

O.K. → Ⓒ

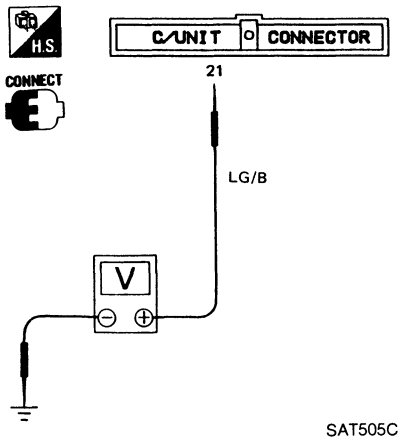
Self-diagnosis (Cont'd)

D



SAT338C

D



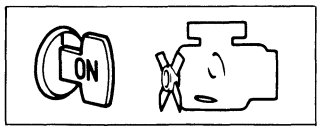
SAT505C

Ⓒ

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.

N.G. → Check harness continuity between A/T control unit and full throttle switch.

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

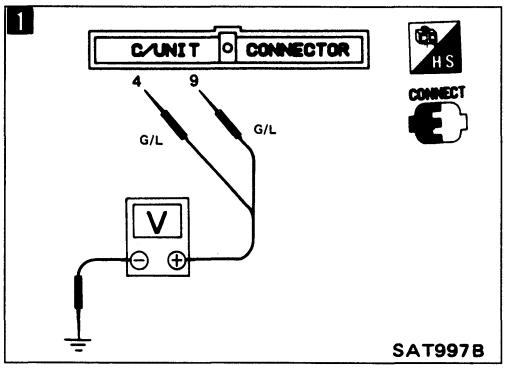
O.K.

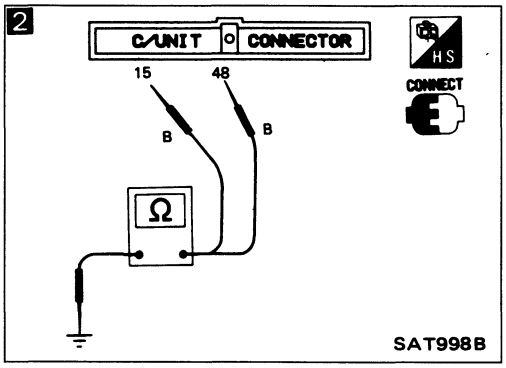
Perform self-diagnosis again after driving for a while.

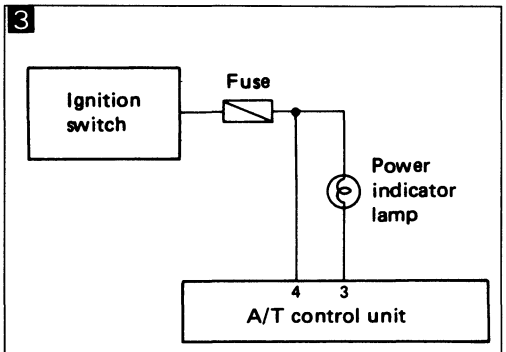
N.G. → 1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

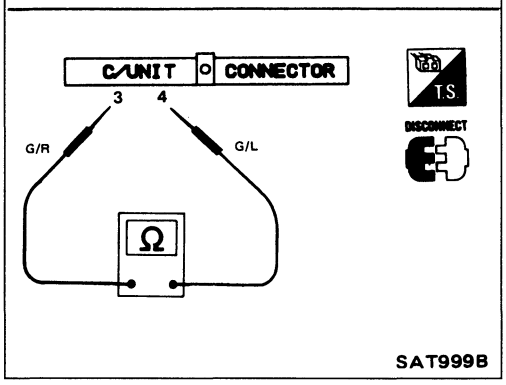
O.K.

INSPECTION END









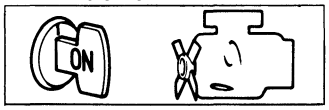
Diagnostic Procedure 1

SYMPTOM:

Power indicator lamp does not come on for about 2 seconds when turning ignition switch to "ON".

1

CHECK A/T CONTROL UNIT POWER SOURCE.

1. 

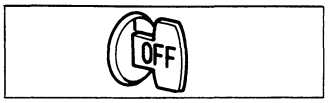
2. Check voltage between A/T control unit terminals ④, ⑨ and ground.
   Battery voltage should exist.

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. 

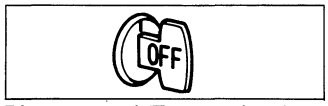
2. Disconnect A/T control unit connector.
3. Check resistance between A/T control unit terminals ⑮, ㊽ and ground.
   Resistance:
   Approximately 0Ω

N.G. → Check harness continuity between A/T control unit and ground.

O.K. ↓

3

CHECK LAMP CIRCUIT.

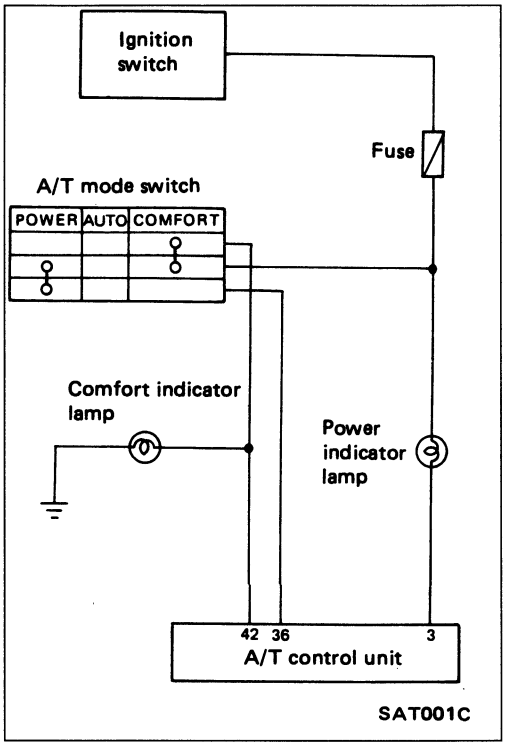
1. 

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:

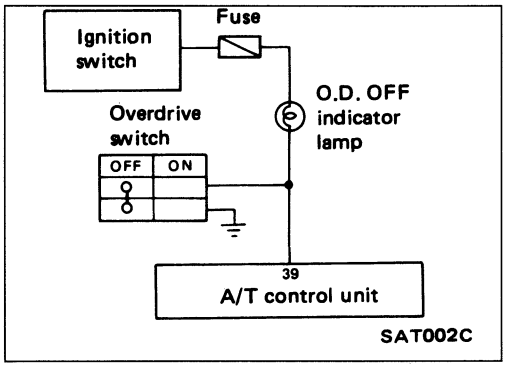
Power indicator lamp or comfort indicator lamp does not come on when turning A/T mode switch to the appropriate position.

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.



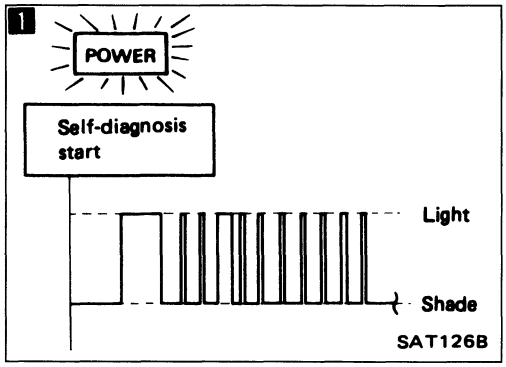
Diagnostic Procedure 3

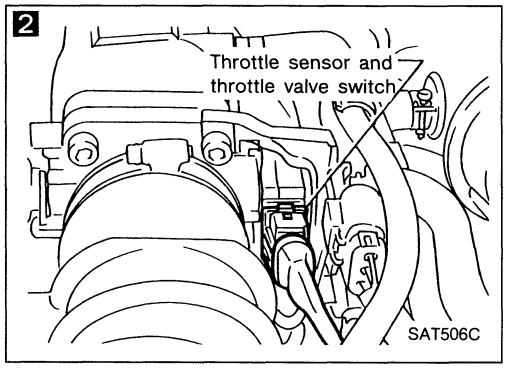
SYMPTOM:

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.





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".

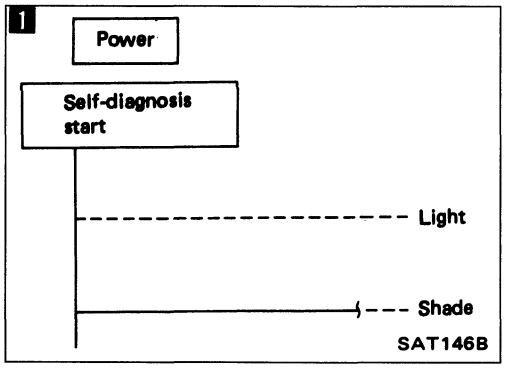
Yes ↓

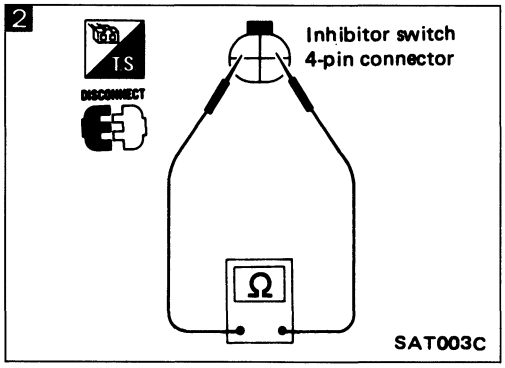
2

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.





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?

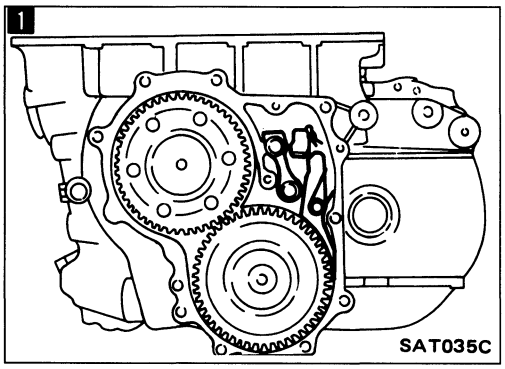
No ↓

2

Check continuity of inhibitor switch 4-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

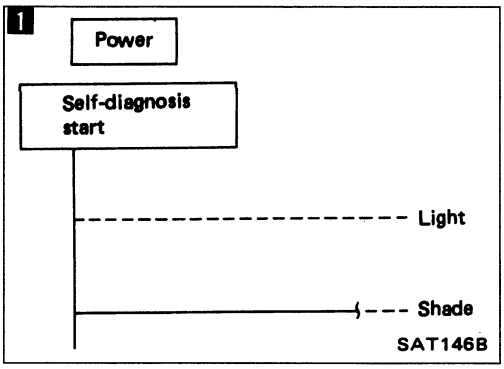
SYMPTOM:

Vehicle moves when it is pushed forward or backward with selector lever in "P" range.

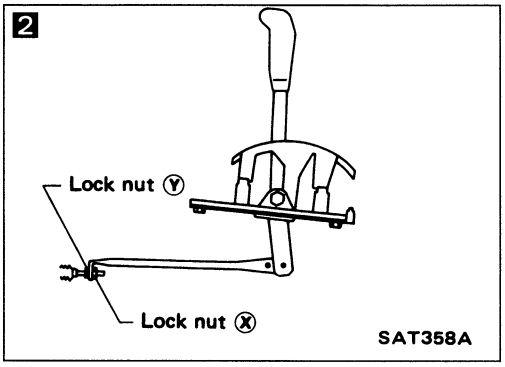
1

Check parking components. — N.G. → Repair or replace damaged parts.

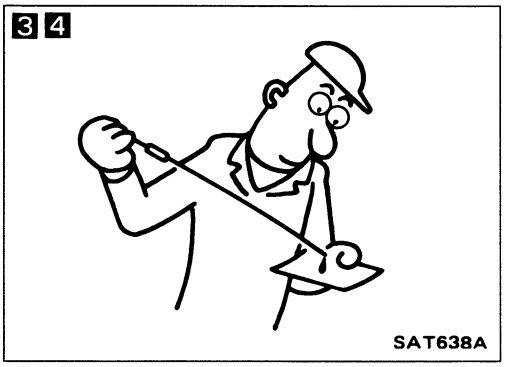
1



2



3 4



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 ↓

Check manual control linkage. — Refer to "ON-VEHICLE SERVICE". — N.G. → 2 Adjust manual control linkage. — Refer to "ON-VEHICLE SERVICE".

O.K. ↓

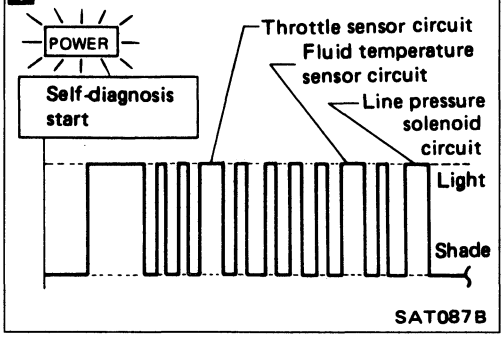
3 Check A/T fluid level again. — N.G. → Refill A.T.F.

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

1



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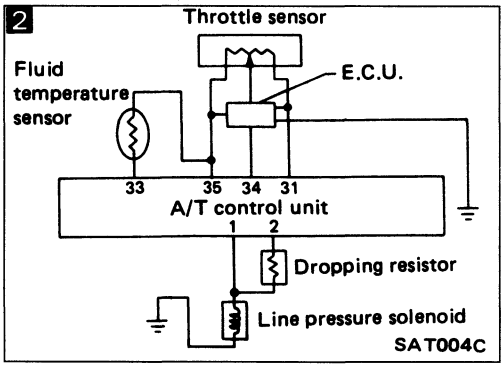

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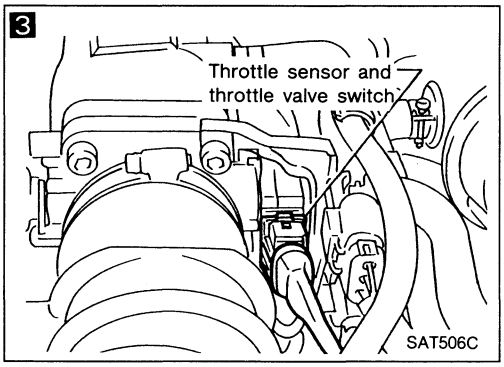

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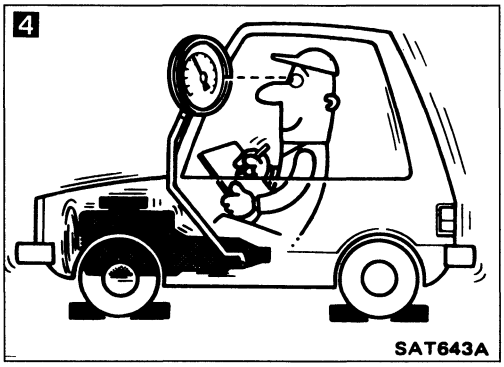

Diagnostic Procedure 8

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.

1 4

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2

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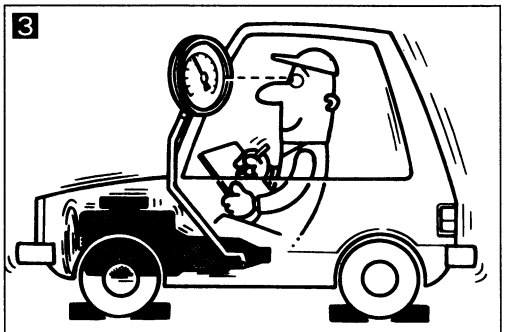
3



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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.

N.G. in both "1" and "R" range

2

Check stall revolution with selector lever in "1" and "R" ranges.

O.K.

O.K. in "1" range
N.G. in "R" range.

3

Check line pressure at idle with selector lever in "R" range.
— Refer to "PRESSURE TESTING".

N.G. →

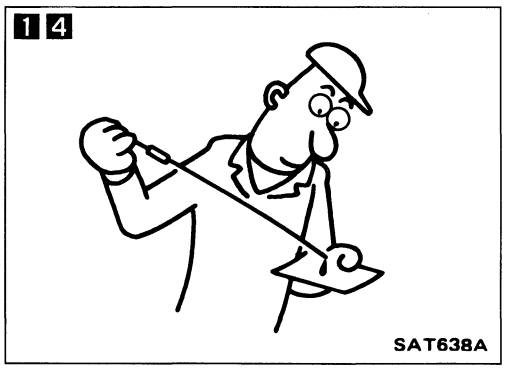
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
- Valves to control line pressure (Pressure regulator valve, pilot valve and oil filter)
- Line pressure solenoid
3. Disassemble A/T.
4. Check the following items.
- Oil pump assembly
- Reverse clutch assembly
- Low & reverse brake assembly
- Torque converter

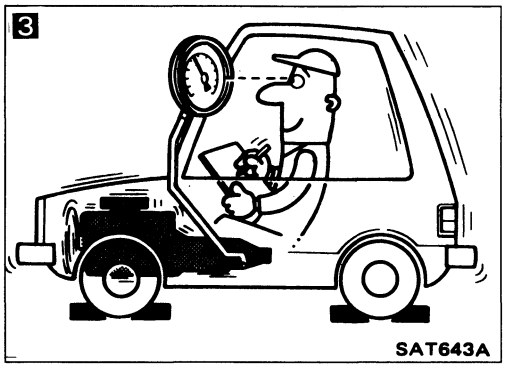
O.K.

4

Check fluid condition.

N.G. →





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. ↓

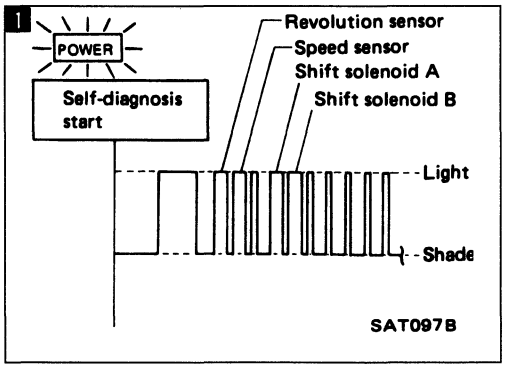
2
Check stall revolution with selector lever in "D" and "1" ranges. — Refer to "STALL TESTING".
N.G. →
1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
- Valves to control line pressure (Pressure regulator valve, pilot valve and oil filter)
- Line pressure solenoid
3. Disassemble A/T.
4. Check the following items.
- Oil pump assembly

O.K. ↓

3
Check line pressure at idle with selector lever in "D", "2" and "1" ranges. — Refer to "PRESSURE TESTING".
N.G. → (same box as above)
O.K. ↓

4
Check A/T fluid condition.
N.G. →
- Low clutch assembly
- One-way clutch
- Low & reverse brake assembly
- Torque converter

1



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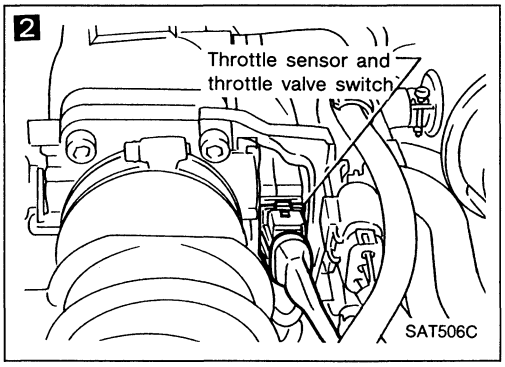

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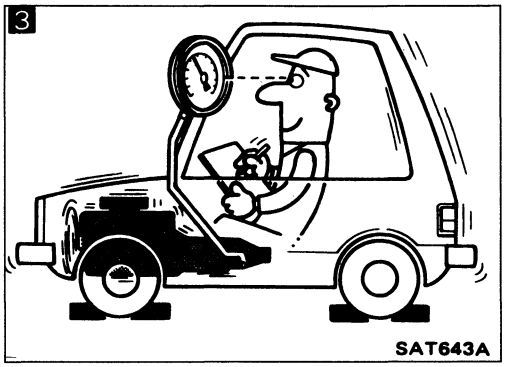

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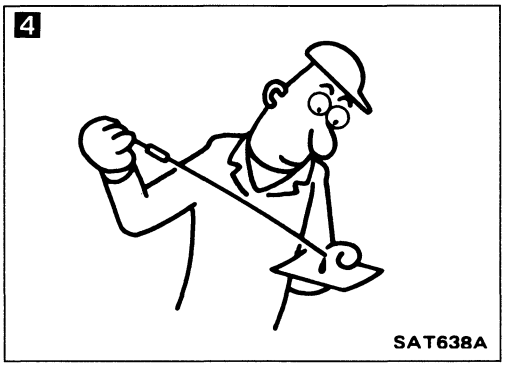


Diagnostic Procedure 11

SYMPTOM:
Vehicle cannot be started from D_1.

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. → 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. ↓

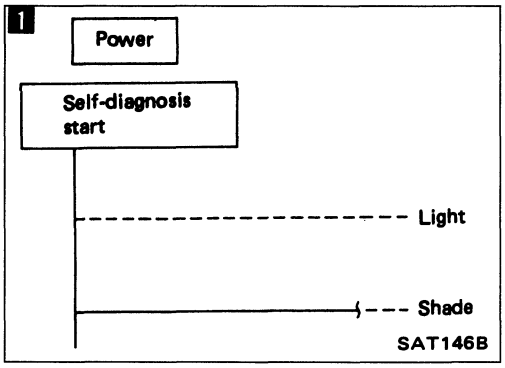
4

Check A/T fluid condition.
- O.K. → (1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".)
- N.G. → 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.

1



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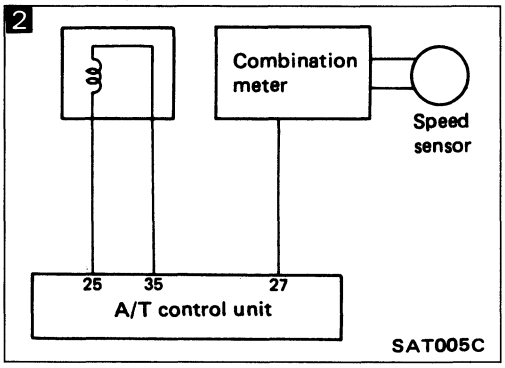

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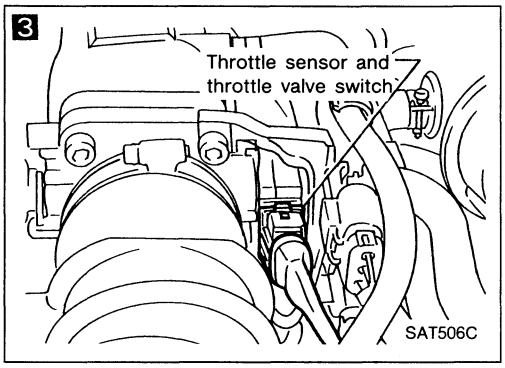

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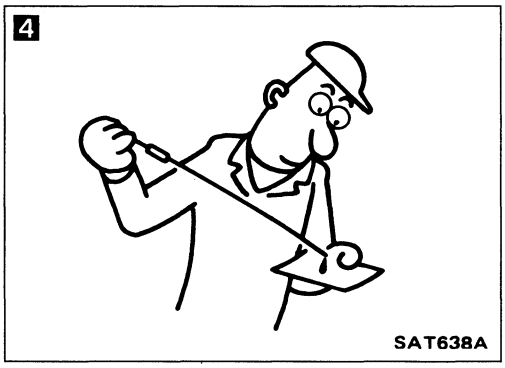


Diagnostic Procedure 12

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?
- Yes → Check inhibitor switch circuit. — Refer to "Self-diagnosis".

OR

1

Does self-diagnosis show damage to inhibitor switch circuit?
- 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

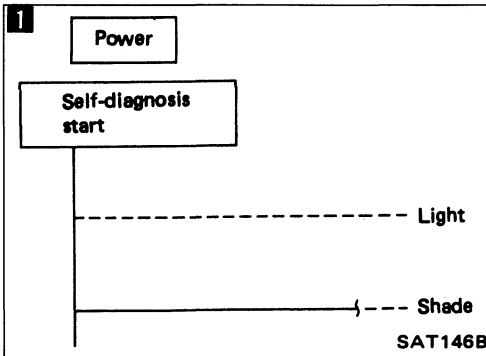
Check throttle sensor. — Refer to section EF & EC.
- N.G. → Repair or replace throttle sensor.
- O.K. ↓

4

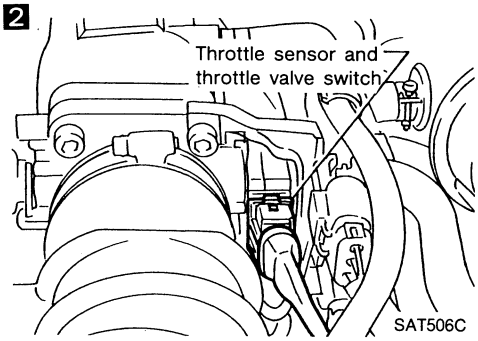
Check A/T fluid condition.
- N.G. →
  1. Remove control valve. — Refer to "ON-VEHICLE SERVICE".
  2. Check the following items.
     - 1-2 shift valve
     - 2-3 shift valve
     - 3-4 shift valve
     - Shift solenoid A
     - Shift solenoid B
  3. Disassemble A/T.
  4. Check the following items.
     - 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.

1



2



3

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? — Yes → Check inhibitor switch circuit. — Refer to "Self-diagnosis".

OR

1 Does self-diagnosis show damage to inhibitor switch circuit?

No ↓

2 Check throttle sensor. — Refer to section EF & EC. — N.G. → Repair or replace throttle sensor.

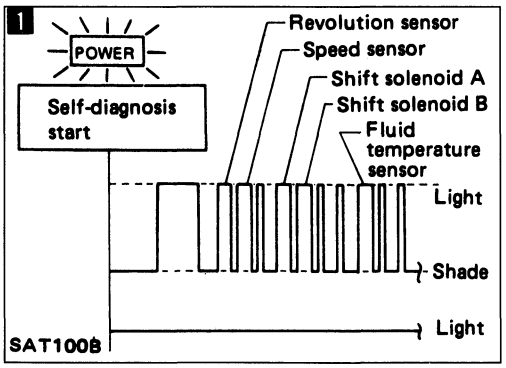
O.K. ↓

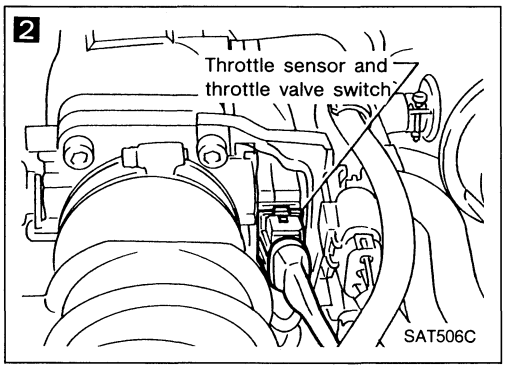
3 Check A/T fluid condition. — N.G. → 1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
2. Check the following items.
- 2-3 shift valve
- Shift solenoid B

O.K. ↓ / O.K. ↓

3. Disassemble A/T.
4. Check the following items.
- Servo piston assembly
- High clutch assembly

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 ↓

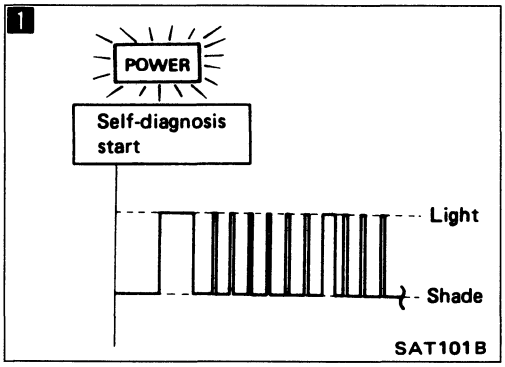
2 Check throttle sensor. — Refer to section EF & EC.
- N.G. → Repair or replace throttle sensor.
- O.K. ↓

3 Check A/T fluid condition.
- N.G. → 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. ↓

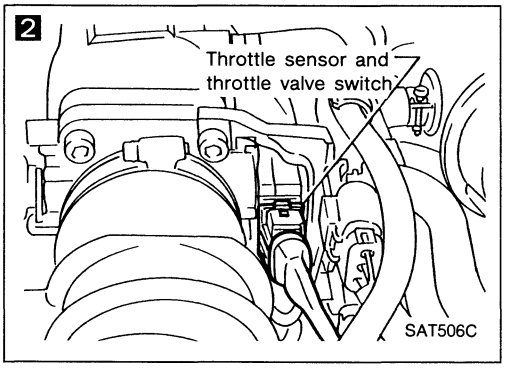
O.K. ← 3. Disassemble A/T.
4. Check the following items.
- Servo piston assembly
- Brake band

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.

1



2



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. ↓

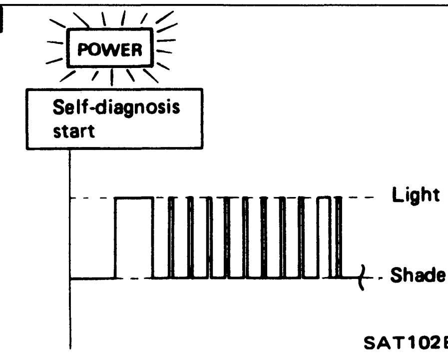
1. Remove control valve. — Refer to "ON-VEHICLE SERVICE".
2. Check following items.
- Lock-up control valve
- Lock-up shuttle valve
- Torque converter relief valve
- Lock-up solenoid
- Pilot valve
- Oil filter

N.G. → Repair or replace damaged parts.

O.K. ↓

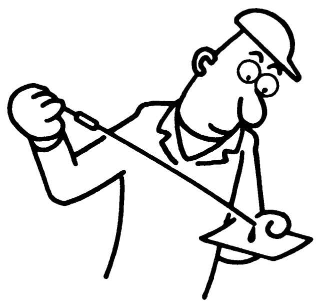
1. Perform A/T control unit input/output signal inspection.
2. If N.G., recheck A/T control unit pin terminals for damage or connection of A/T control unit harness connector.

1



SAT102B

2



SAT638A

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?

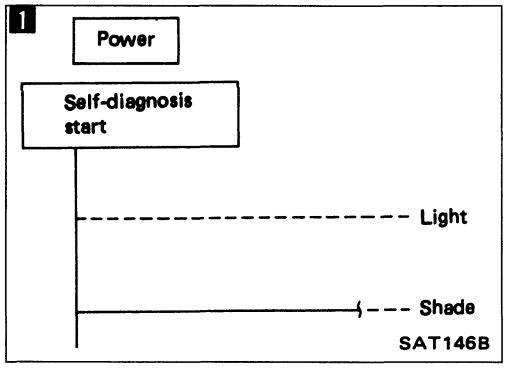
- Yes → Check revolution sensor circuit. — Refer to "Self-diagnosis".
- No ↓

2

Check A/T fluid condition.

- N.G. → 1. Remove control valve assembly. — Refer to "ON-VEHICLE SERVICE".
- O.K. → 2. Check the following items.
  - Lock-up control valve
  - Pilot valve
  - Oil filter
  - O.K. ↓
  - 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.



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?

Yes → Check idle switch circuit.
— Refer to "Self-diagnosis".

OR

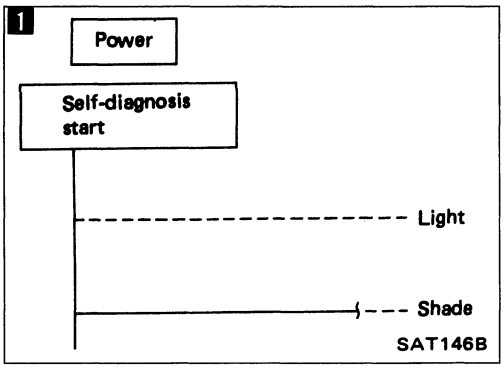
1

Does self-diagnosis show damage to idle switch circuit?

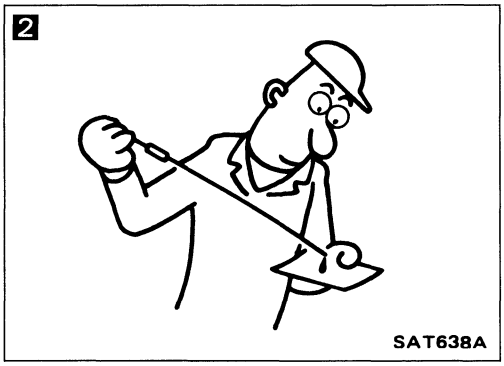
No ↓

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.

1



2



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?

Yes → Check overdrive switch circuit. — Refer to "Self-diagnosis".

OR

1

Does self-diagnosis show damage to overdrive switch circuit?

No

2

Check A/T fluid condition.

N.G. →

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

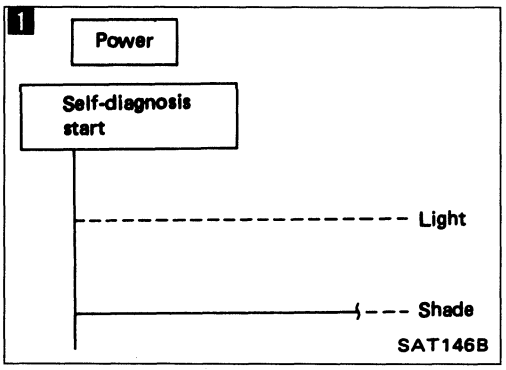
O.K. ↓

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.



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?

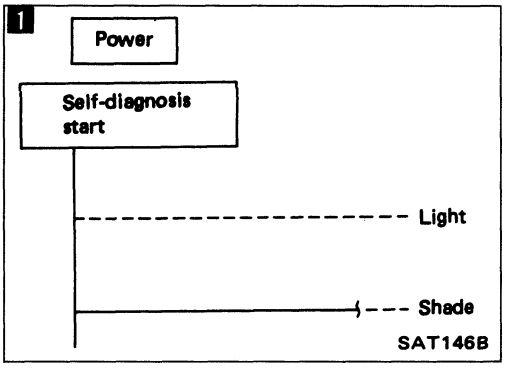
Yes → Check inhibitor switch circuit. — Refer to "Self-diagnosis".

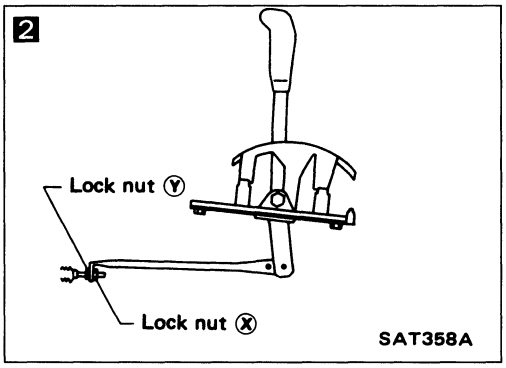
OR

1

Does self-diagnosis show damage to inhibitor switch circuit?

No → Go to Diagnostic Procedure 12.





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?

Yes → Check inhibitor switch circuit. — Refer to "Self-diagnosis".

OR

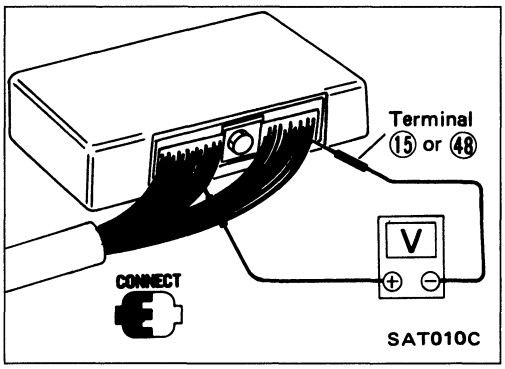
1

Does self-diagnosis show damage to inhibitor switch circuit?

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.

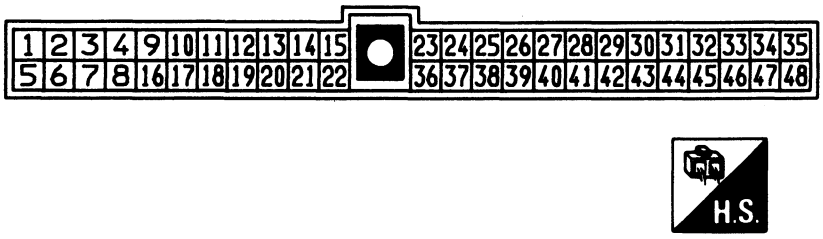


Electrical Components Inspection

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.

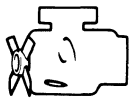


SAT011C

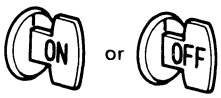
Electrical Components Inspection (Cont'd)

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)

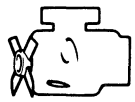
Terminal No.	Item	Condition		Judgement standard
9	Power source		Same as No. 4	
10*	—		—	—
11	—		—	—
12	—		—	—
13	—		—	—
14	Idle switch (in throttle valve switch)		When accelerator pedal is released after warming up engine.	8 - 15V
			When accelerator pedal is depressed after warming up engine.	1V or 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)

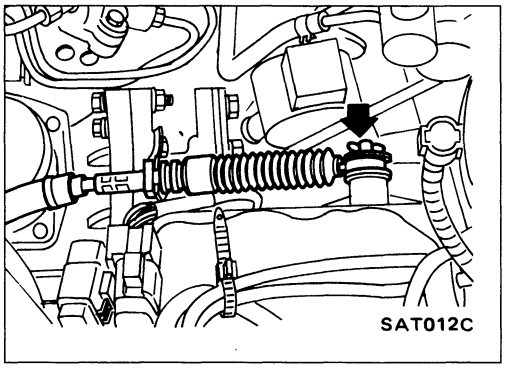
Terminal No.	Item	Condition		Judgement standard
25	Revolution sensor (Measure in AC range)		When vehicle is cruising at 30 km/h (19 MPH).	1V or more Voltage rises gradually in response to vehicle speed.
			When vehicle is parked.	0V
26	—		—	—
27	Speed sensor		When vehicle is moving at 2 to 3 km/h (1 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)

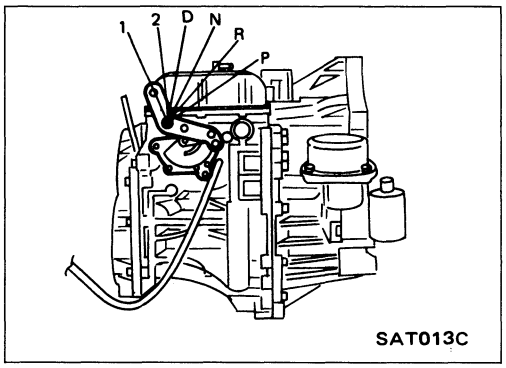
Terminal No.	Item	Condition		Judgement standard
38	—		—	—
39	Overdrive switch		When overdrive switch is set in "ON" position.	Battery voltage
			When overdrive switch is set in "OFF" position.	1V or less
40	A.S.C.D. O.D. cut signal		When "ACCEL" set switch on A.S.C.D. cruise is released.	5 - 8V
			When "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

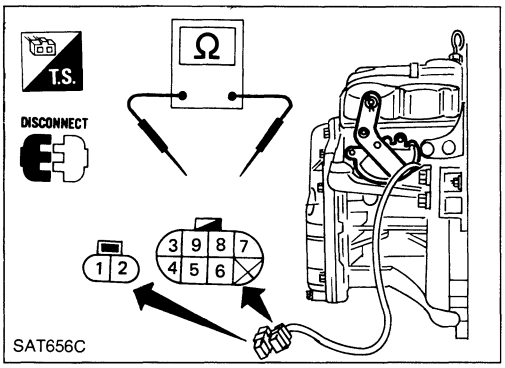


1. Disconnect control cable from manual shaft.

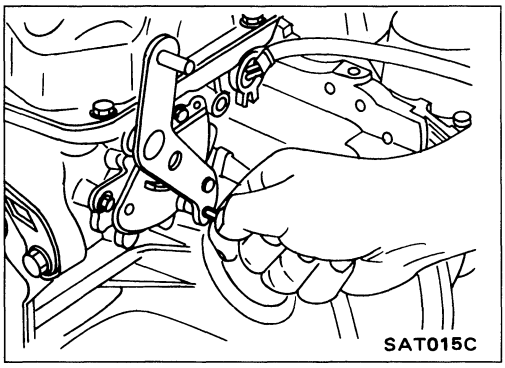


2. Check continuity between terminals ① and ② and between terminals ③ and ④, ⑤, ⑥, ⑦, ⑧, ⑨ while moving selector lever through each range.

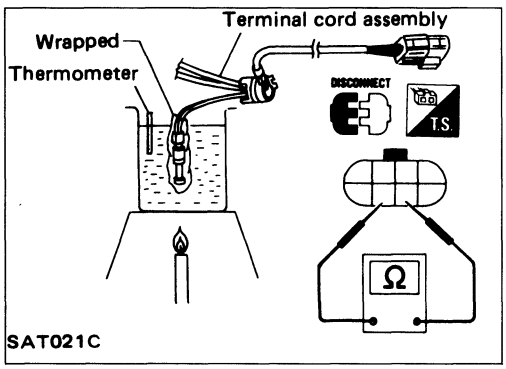
Lever position \ Terminal No.	①	②	③	④	⑤	⑥	⑦	⑧	⑨
P	○	○	○	○					
R			○		○				
N	○	○	○			○			
D			○				○		
2			○					○	
1			○						○



3. If N.G., adjust inhibitor switch.
4. Check terminal continuity again.
5. If N.G., replace inhibitor switch.



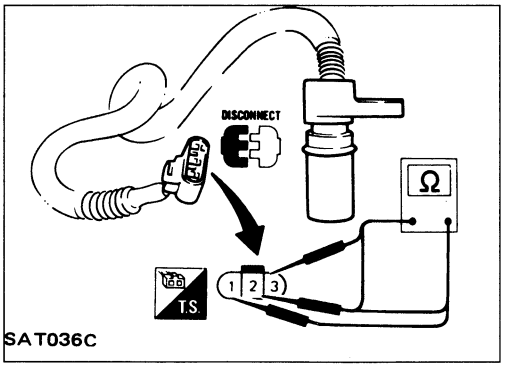
FLUID TEMPERATURE SENSOR



- 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

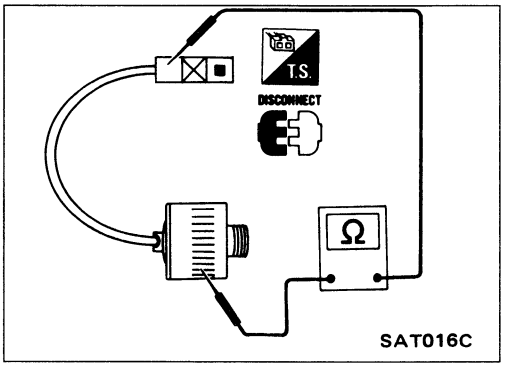
Electrical Components Inspection (Cont'd)



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

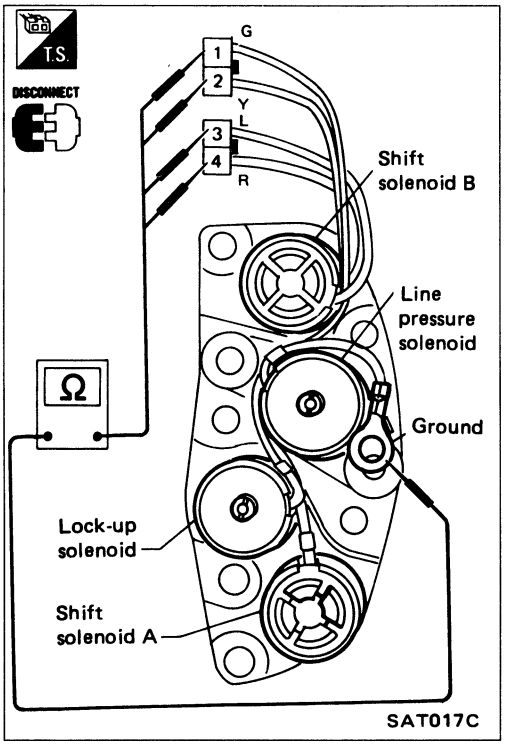


TIMING SOLENOID

- For removal and installation, refer to "ON-VEHICLE SERVICE".
- Check resistance between two terminals.

Resistance:

Timing solenoid 20 - 40Ω

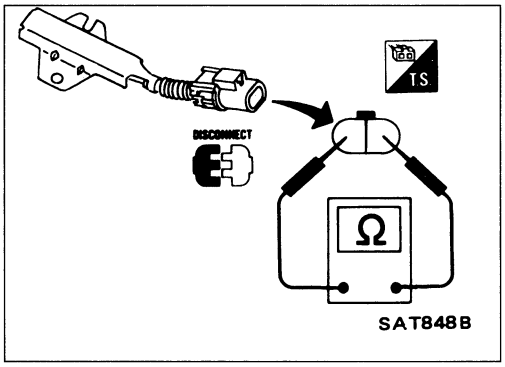


4-UNIT SOLENOID ASSEMBLY

(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



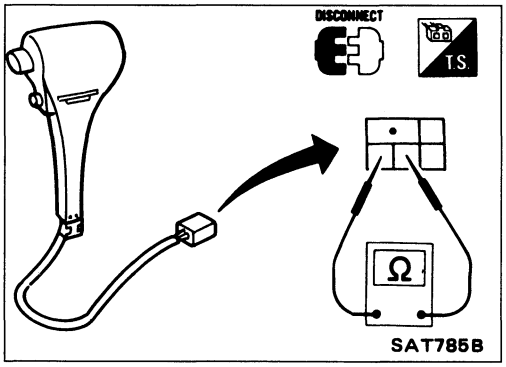
DROPPING RESISTOR

- Check resistance between two terminals.

Resistance: 11.2 - 12.8Ω

Electrical Components Inspection (Cont'd)

OVERDRIVE SWITCH



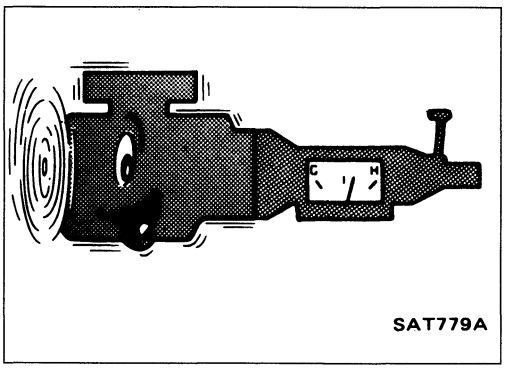
- Check continuity between two terminals.

O.D. switch position	Continuity
ON	No
OFF	Yes

Final Check

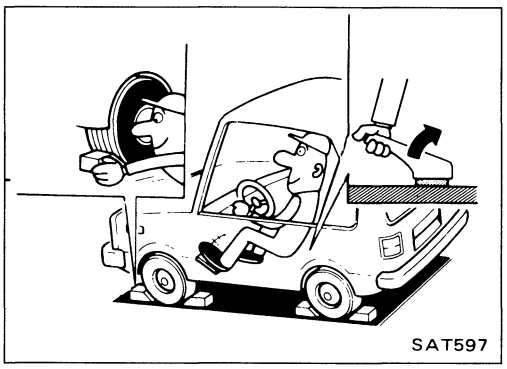
STALL TESTING

Stall test procedure



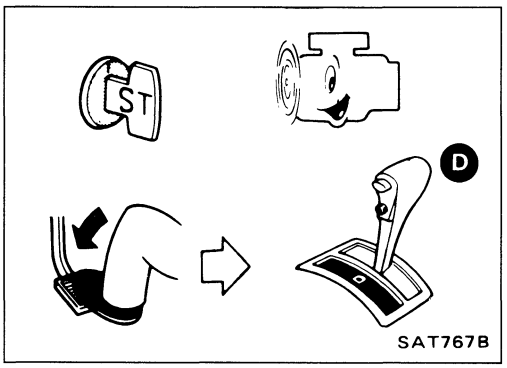
1. Check A/T and engine fluid levels. If necessary, add.
2. Warm up engine until engine oil and A.T.F. reach operating temperature after vehicle has been driven approx. 10 minutes.

   A.T.F. operating temperature:
   50 - 80°C (122 - 176°F)

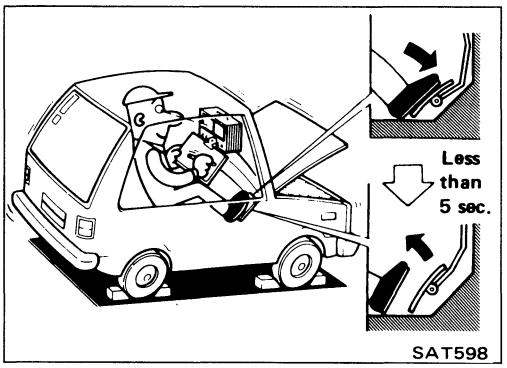


3. Set parking brake and block wheels.
4. Install a tachometer where it can be seen by driver during test.

- **It is good practice to put a mark on point of specified engine rpm on indicator.**



5. Start engine, apply foot brake, and place selector lever in "D" range.

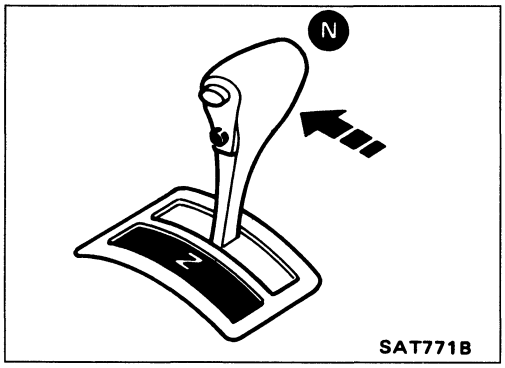


6. Accelerate to wide-open throttle gradually while applying foot brake.
7. Quickly note the engine stall revolution and immediately release throttle.

- **During test, never hold throttle wide-open for more than 5 seconds.**

  Stall revolution:
  1,950 - 2,250 rpm

Final Check (Cont'd)

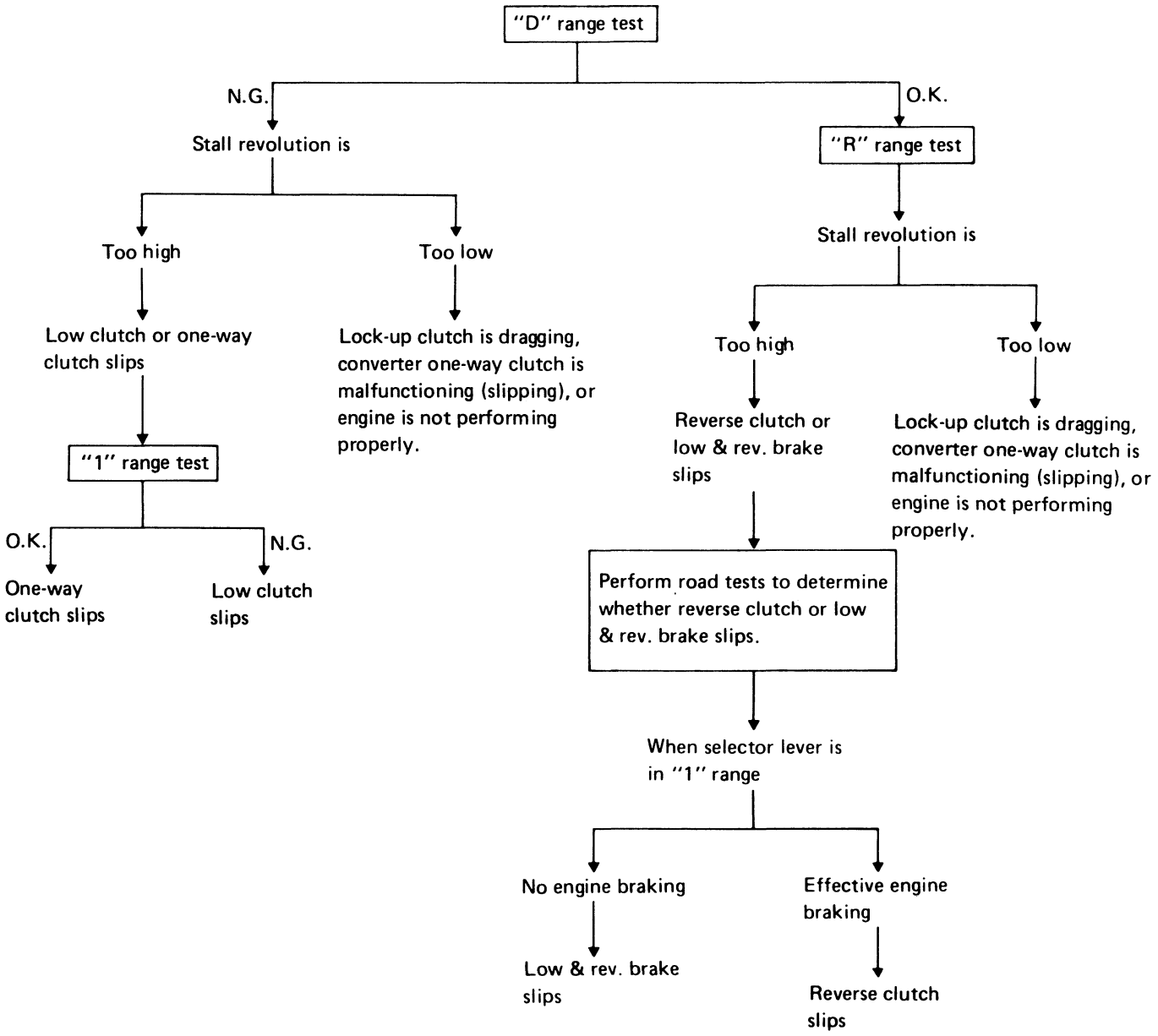


8. Shift selector lever to "N".
9. Cool off A.T.F.

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.

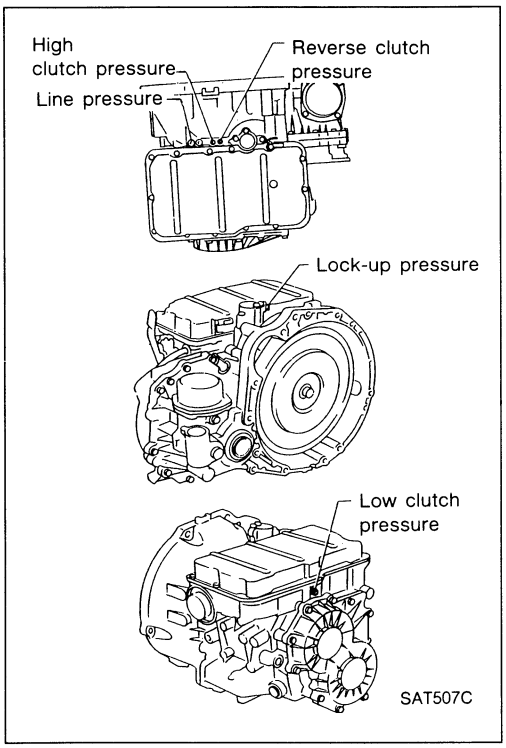
JUDGEMENT OF STALL TEST



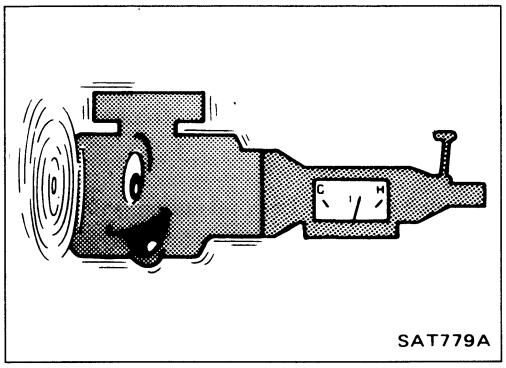
If converter one-way clutch is frozen, vehicle will have poor high-speed performance and low engine rpm when it is raced in "N" range. If converter one-way clutch is slipping, vehicle will be sluggish up to 50 or 60 km/h (30 or 40 MPH).

Final Check (Cont'd)

PRESSURE TESTING



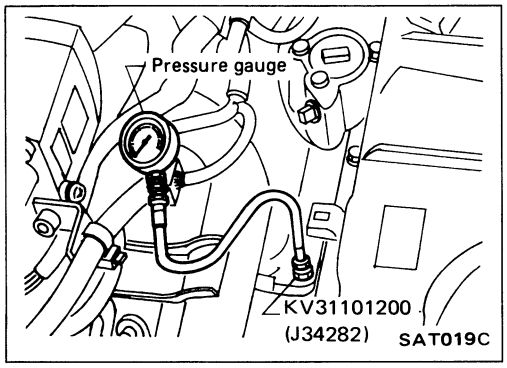
- Location of line pressure test port
- **Always replace line pressure plugs as they are self-sealing bolts.**



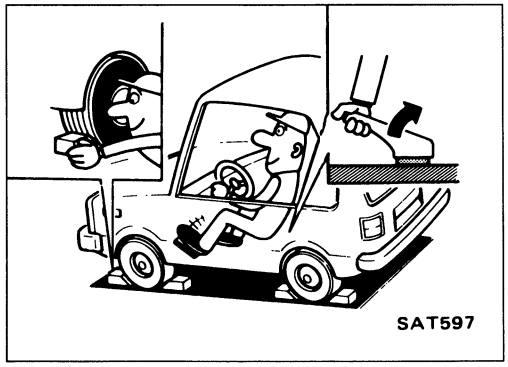
Line pressure test procedure

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)



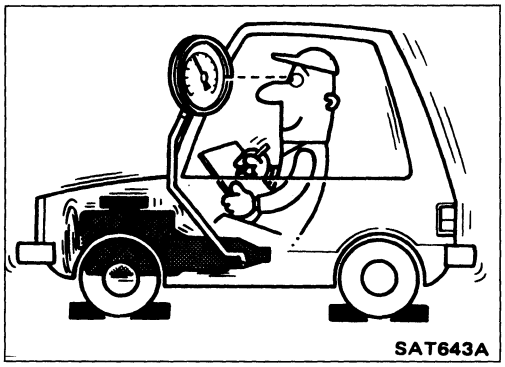
3. Install pressure gauge to line pressure port.



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:

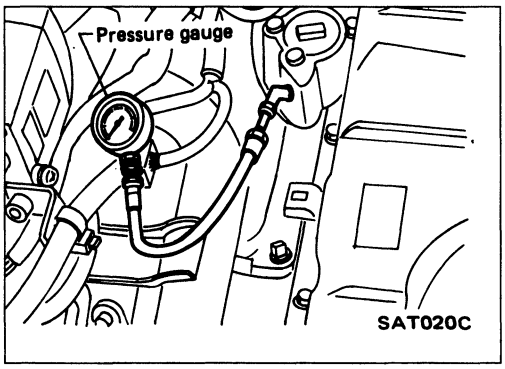
Engine speed rpm	Line pressure kPa (kg/cm^2, psi)
	D, 2, 1 and R ranges
Idle	382 - 422 (3.9 - 4.3, 55 - 61)
Stall	1,285 - 1,363 (13.1 - 13.9, 186 - 198)

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

Final Check (Cont'd)

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/cm^2, 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
Reference page (AT-)		-	8, 12	82	82, 83	86	83, 125	83	83	116, 142	-	84	108, 121	136, 140	119, 139	141, 142	142	167
		ON vehicle											OFF vehicle					
63	Engine does not start in "N", "P" ranges.	1	3	4							2							
63	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					
63	Vehicle moves when changing into "P" range or parking gear does not disengage when shifted out of "P" range.		1															2
64	Vehicle runs in "N" range.		1											3	2			
66	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			
67	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												
66,67	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		
69,70, 71	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)

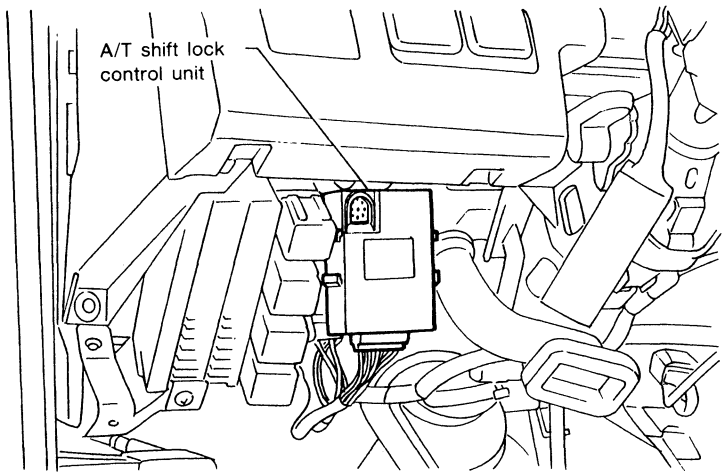
		ON vehicle											OFF vehicle					
	Reference page (AT-)	-	8, 12	82	82, 83	86	83, 125	83	83	116, 142	-	84	108, 121	136, 140	119, 139	141, 142	142	167
Reference page(AT-)	Numbers are arranged in order of probability. Perform inspections starting with number one and working up.	Fuse	Fluid level Control 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)

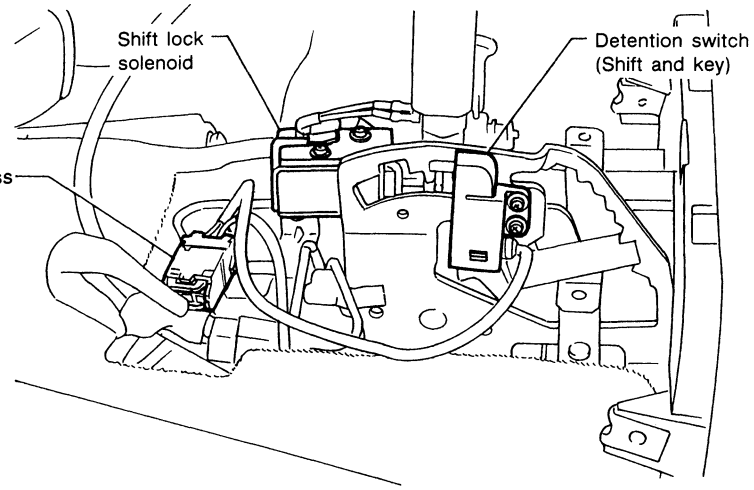
Reference page(AT-)	Numbers are arranged in order of probability. Perform inspections starting with number one and working up.	ON vehicle: Fuse	Fluid level Control linkage	Inhibitor switch Throttle sensor (Adjustment)	Revolution sensor and speed sensor Engine revolution signal Fluid temperature sensor	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	OFF vehicle: Torque converter Oil pump	Reverse clutch High clutch	Low clutch One-way clutch	Low & reverse brake Brake band	Band servo piston	Parking components
Reference page		-	8, 12	82	82, 83	86	83, 125	83	83	116, 142	-	84	108, 121	136, 140	93,139	141, 142	142	167
-	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 .	. .	. .	. .	.	.
76	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 .	. . .	. .	. .	. .	. .	. .	.	. .	. .	. .	. .	. .	.	.
76	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 .	. .	. .	. .	.	.
72	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	. .	. .	. .	. .	.	.

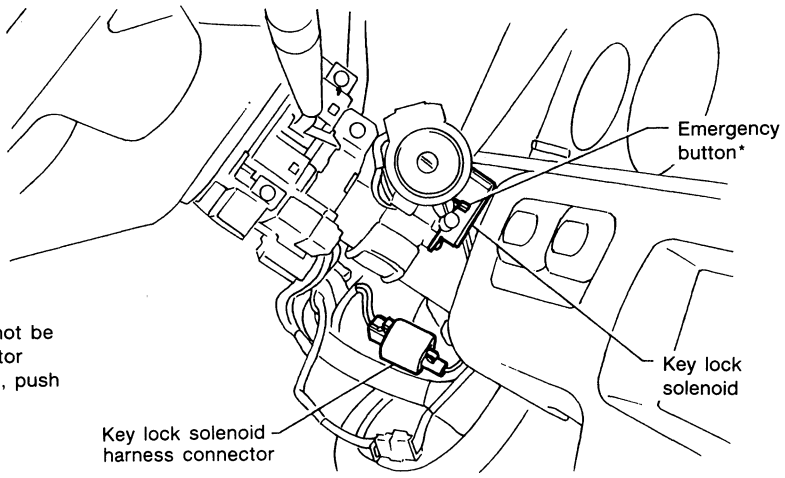
A/T Shift Lock System

SHIFT LOCK ELECTRICAL PARTS LOCATION



Dash lower L.H.



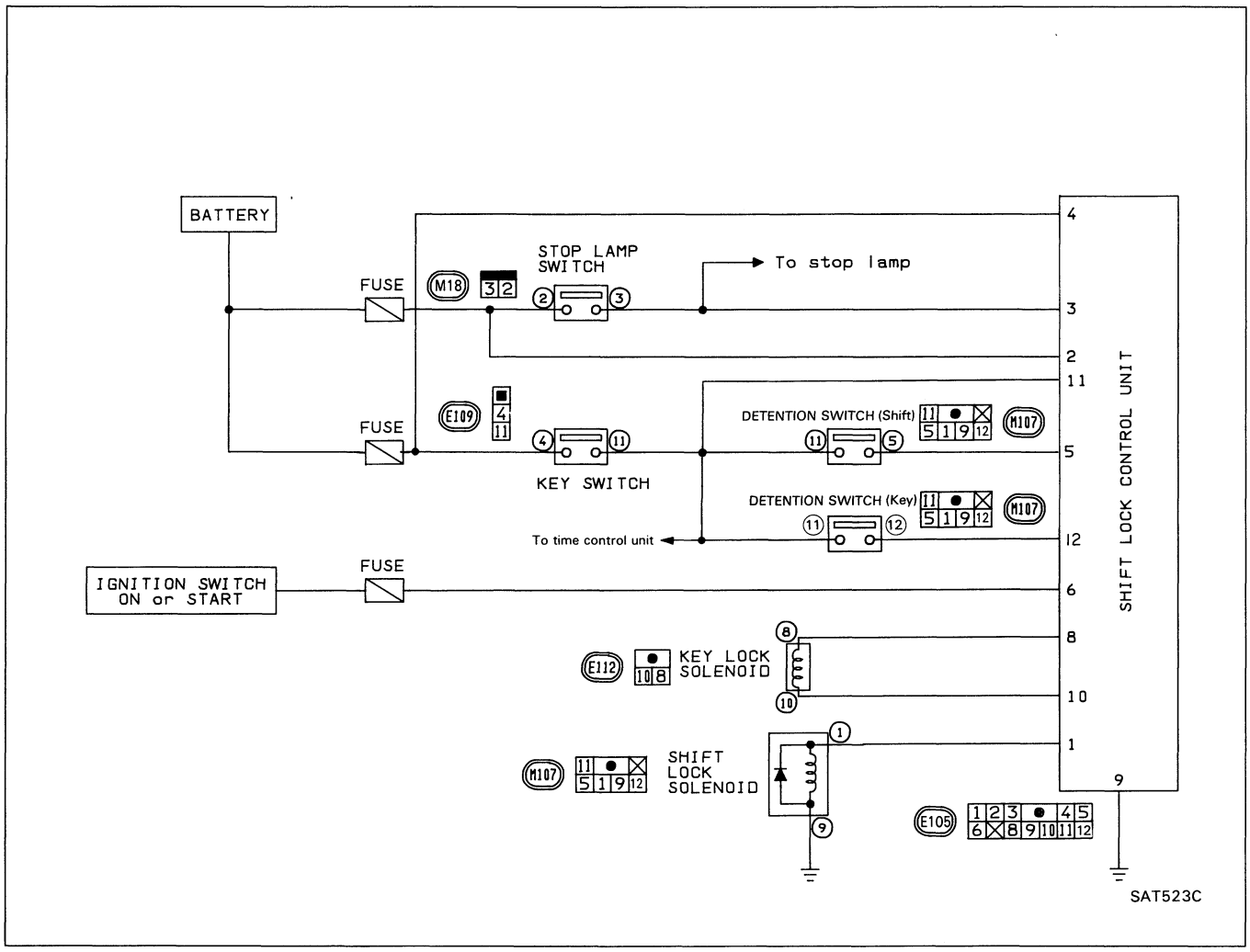


*: When ignition key cannot be removed, even if selector lever is in "P" position, push emergency button and remove ignition key.

SAT508C

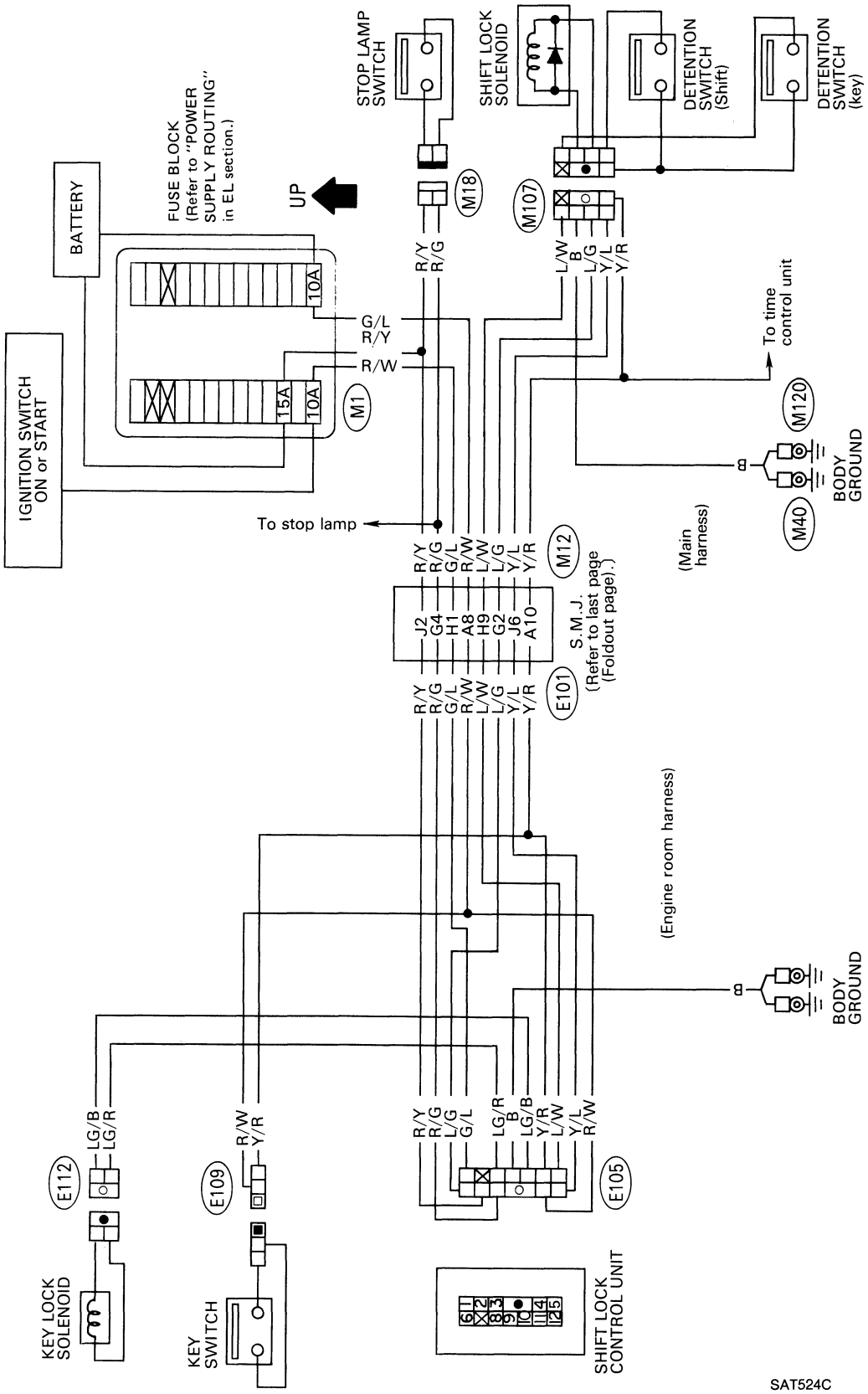
A/T Shift Lock System (Cont'd)

CIRCUIT DIAGRAM FOR QUICK PINPOINT CHECK



A/T Shift Lock System (Cont'd)

WIRING DIAGRAM

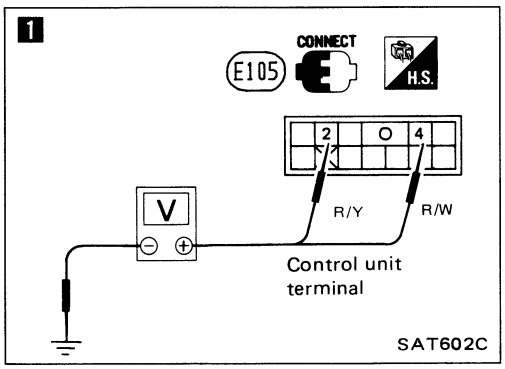


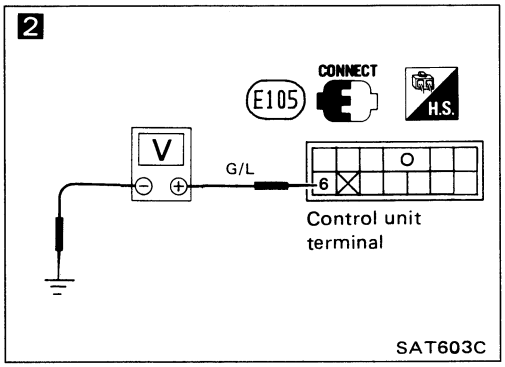
A/T Shift Lock System (Cont'd)

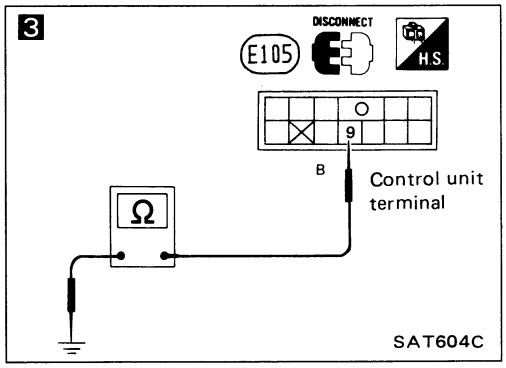
DIAGNOSTIC PROCEDURE 1

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.

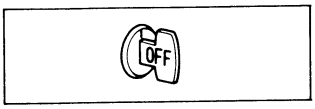






1

CHECK POWER SOURCE.

1. 

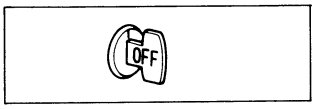
2. Check voltage between control unit harness terminals ②, ④ and ground.
   Battery voltage should exist.

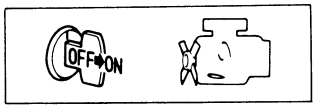
N.G. → Check the following items:
1. Harness continuity between battery and control unit harness terminals ②, ④
2. Fuse

O.K. ↓

2

CHECK IGNITION SIGNAL.

1. 

2. Check voltage between control unit harness terminal ⑥ and ground.
   0V
3. 

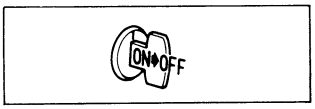
4. Check voltage between control unit harness terminal ⑥ and ground.
   Battery voltage should exist.

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. 

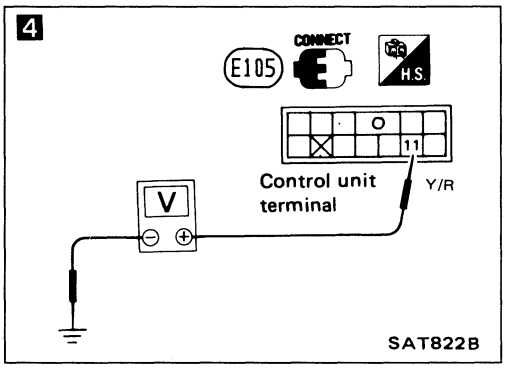
2. Disconnect control unit harness connector.
3. Check continuity between control unit harness terminal ⑨ and ground.
   Continuity should exist.

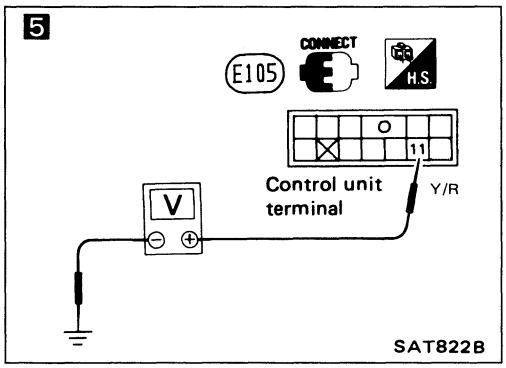
N.G. → Repair harness or connector.

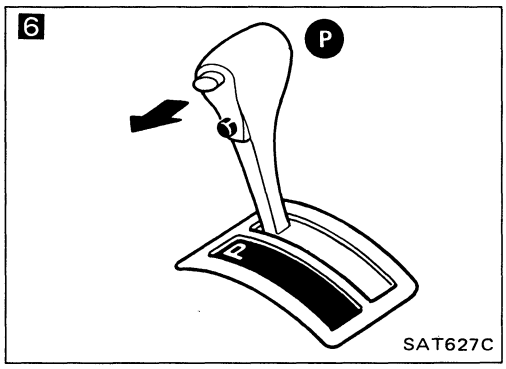
O.K. ↓

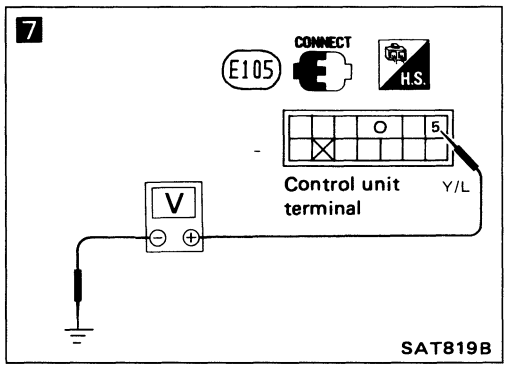
Ⓐ

A/T Shift Lock System (Cont'd)



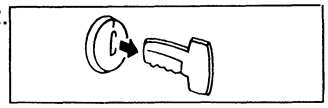






Ⓐ

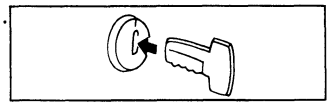
4 **CHECK INPUT SIGNAL (KEY SWITCH).**

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. ↓

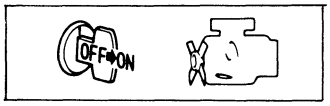
5

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–SHIFT).

1. 

6 2. Set selector lever in "P" position and release selector lever button.

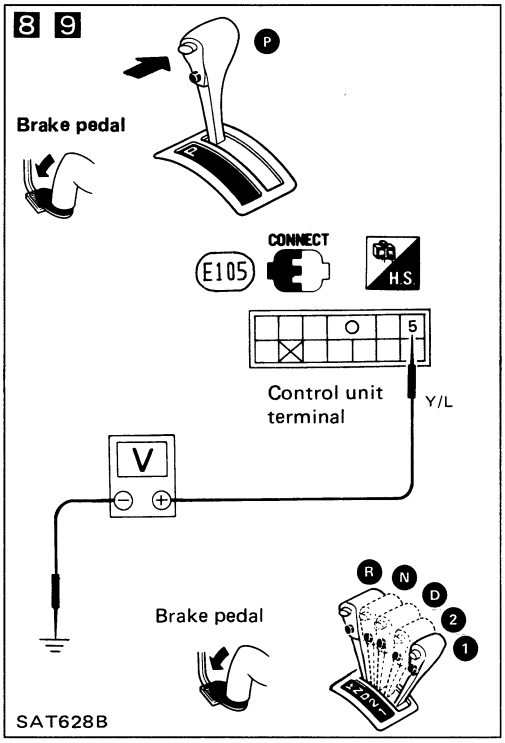
7 3. Check voltage between control unit harness terminal ⑤ and ground.
0V

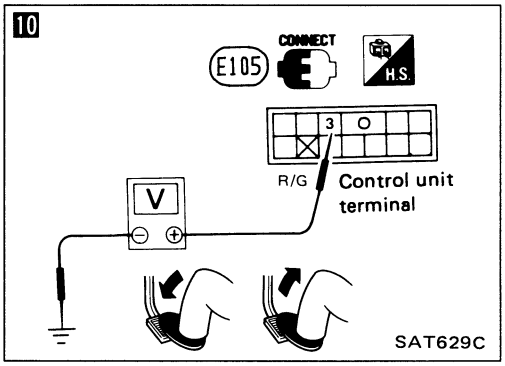
N.G. → Check detention switch–shift. (Refer to "COMPONENT CHECK".)

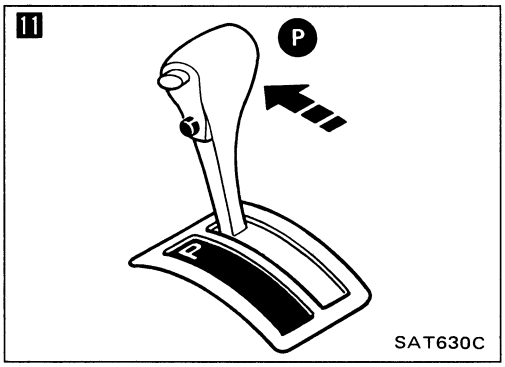
O.K. ↓

Ⓑ

A/T Shift Lock System (Cont'd)



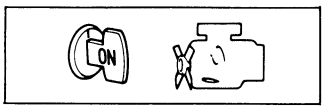




Ⓑ

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.

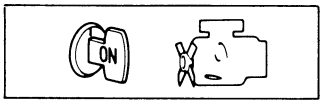
9 3. Check voltage between control unit harness terminal ⑤ and ground with selector lever set in any position except "P".
When selector lever cannot be moved from "P" position with brake pedal depressed, push shift lock release knob.
Battery voltage should exist.

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. ↓

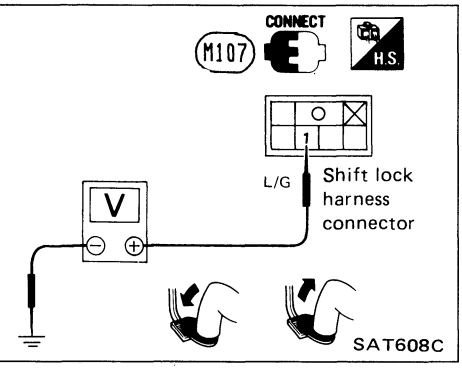
11

Set selector lever in "P" position.

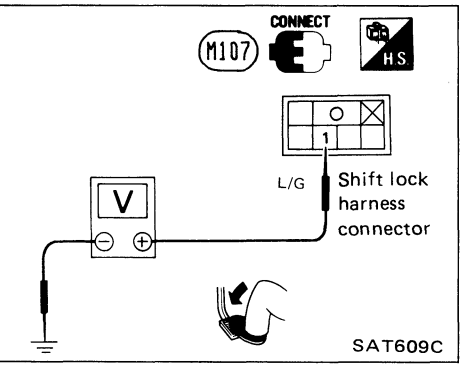
Ⓒ

A/T Shift Lock System (Cont'd)

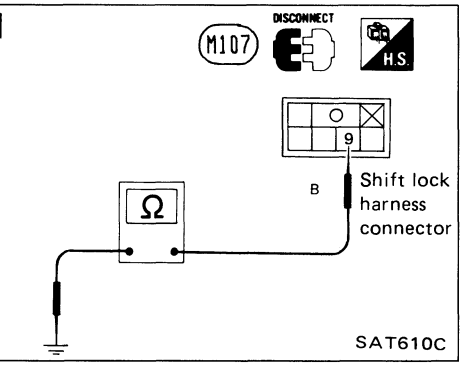
12



13



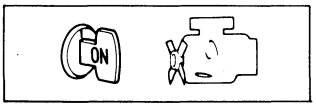
14



Ⓒ

CHECK OUTPUT SIGNAL (SHIFT LOCK SOLENOID).

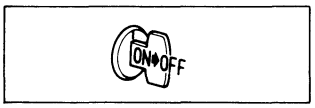
1.



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.

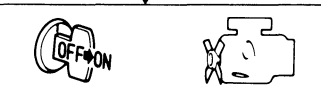
O.K. ↓

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. ↓

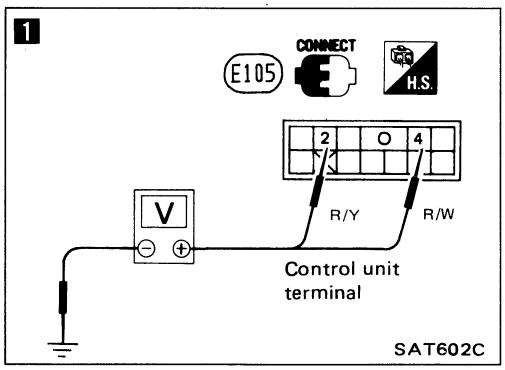
INSPECTION END

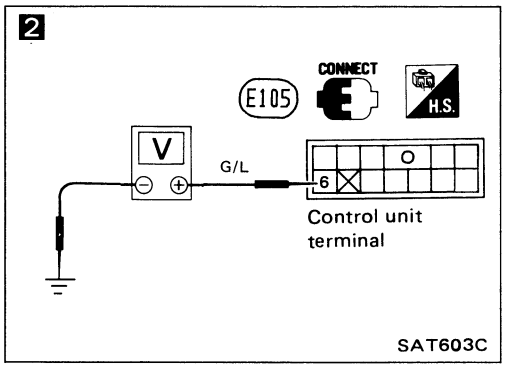
A/T Shift Lock System (Cont'd)

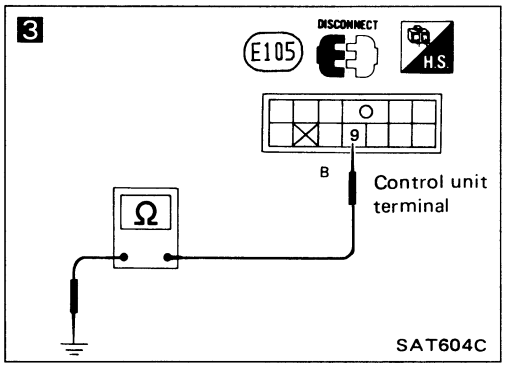
DIAGNOSTIC PROCEDURE 2

SYMPTOM:

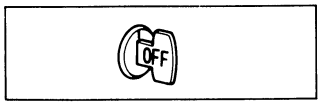
Ignition key cannot be removed when selector lever is set to "P" position or can be removed when selector lever is set to any position except "P".







1 **CHECK POWER SOURCE.**

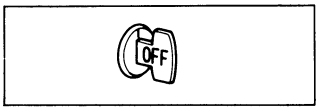
1. 

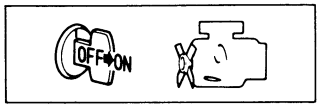
2. Check voltage between control unit harness terminals ②, ④ and ground.
   Battery voltage should exist.

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. 

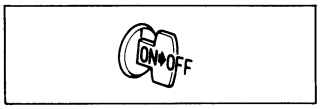
2. Check voltage between control unit harness terminal ⑥ and ground.
   0V
3. 

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.

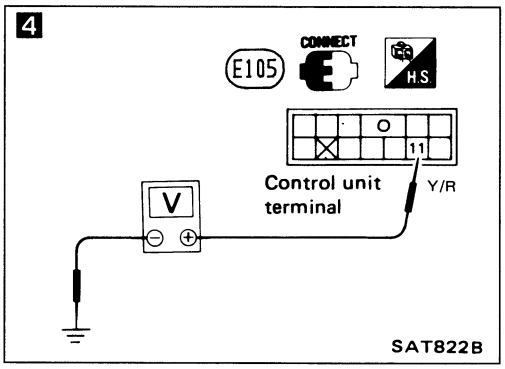
N.G. → Repair harness or connector.

O.K. ↓

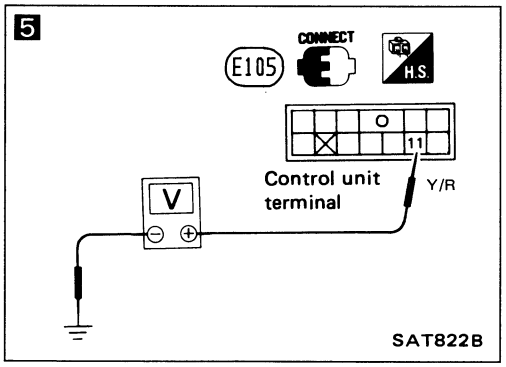
Ⓐ

A/T Shift Lock System (Cont'd)

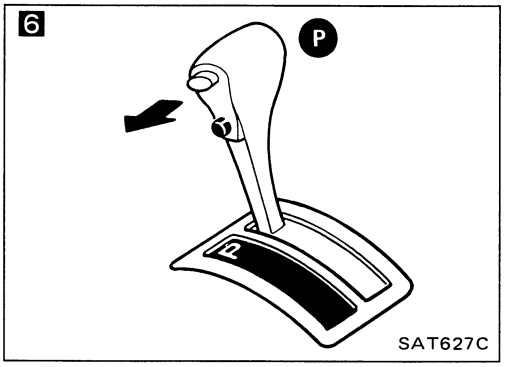
4



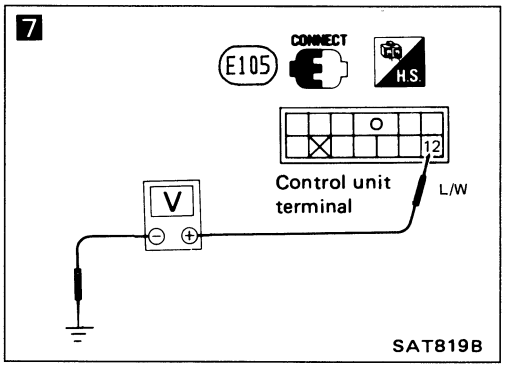
5



6

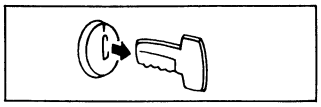


7



Ⓐ

4 **CHECK INPUT SIGNAL (KEY SWITCH).**

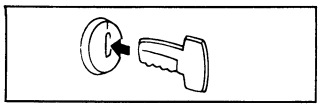
1. Reconnect control unit harness connector.
2. 

   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. ↓

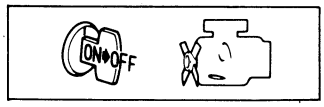
5

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.

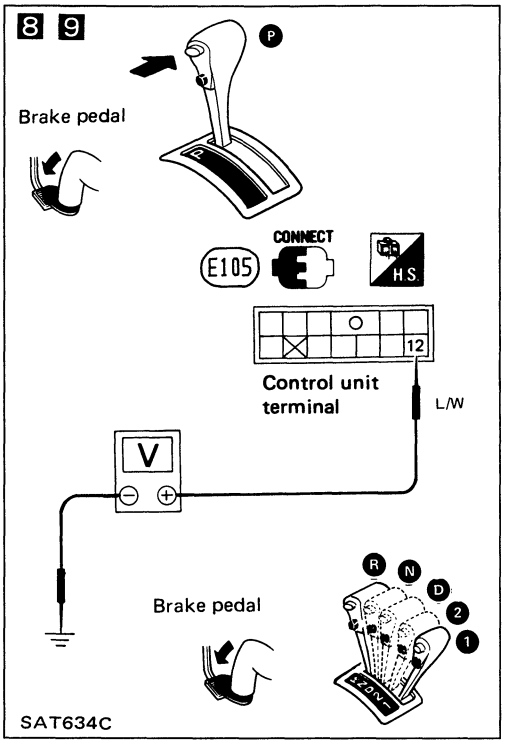
7 3. Check voltage between control unit harness terminal ⑫ and ground.
0V

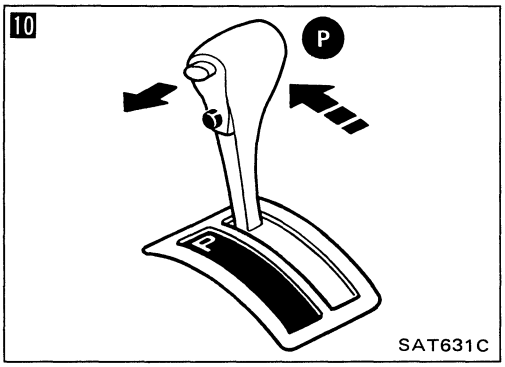
N.G. → Check detention switch–key. (Refer to "COMPONENT CHECK".)

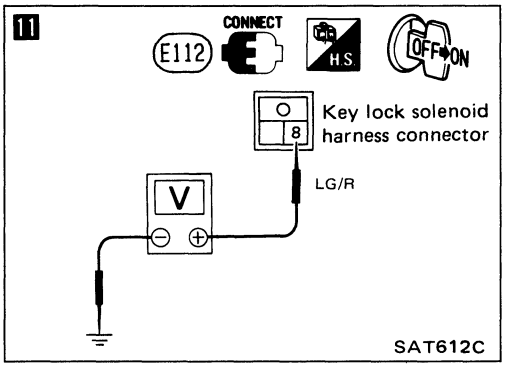
O.K. ↓

Ⓑ

A/T Shift Lock System (Cont'd)

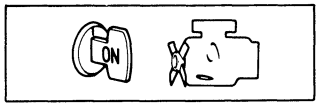






Ⓑ

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.,

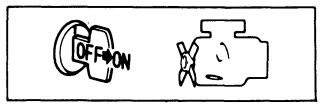
9 2. Check voltage between control unit harness terminal ⑫ and ground with selector lever set in any position except "P".
Battery voltage should exist.

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.

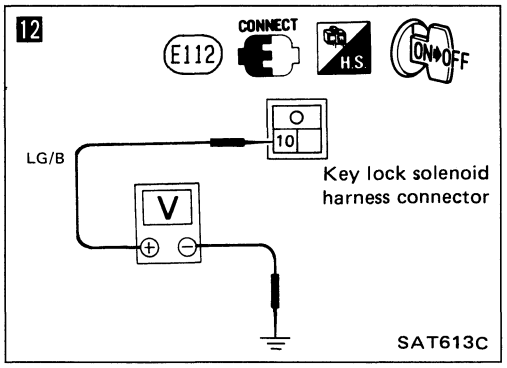
O.K. ↓ / N.G. →
Repair harness or connector.

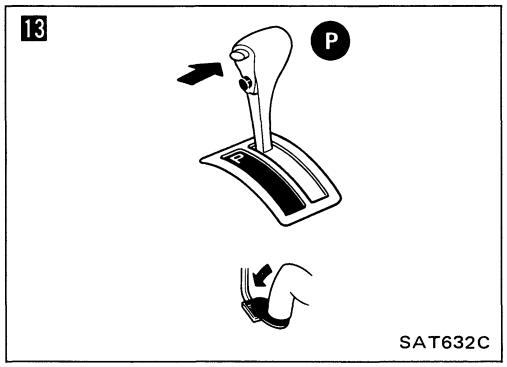
Replace control unit.

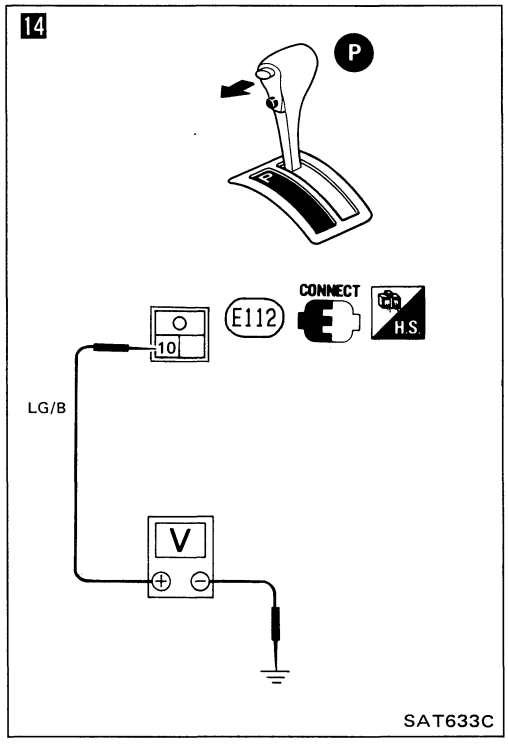
O.K. ↓

Ⓒ

A/T Shift Lock System (Cont'd)



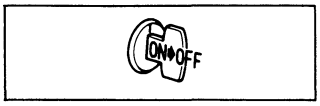




Ⓒ

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.

→ Check harness continuity between shift lock solenoid harness terminal ⑩ and control unit harness terminal ⑩.

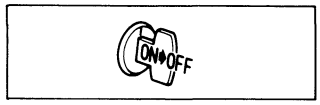
O.K. / N.G.

N.G. → Repair harness or connector.

O.K. → Replace control unit.

O.K.

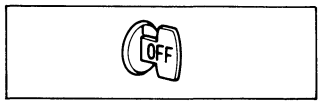
13

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.

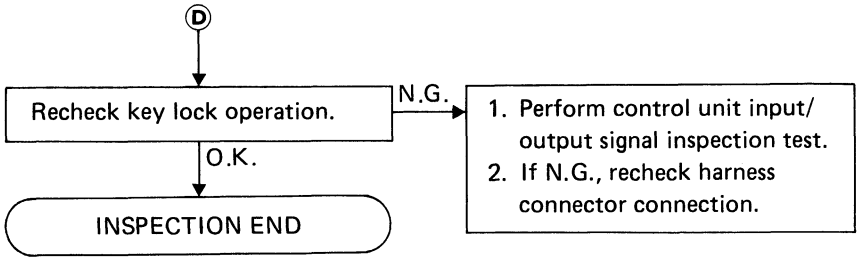
Check key lock solenoid. (Refer to "COMPONENT CHECK".)

N.G. → Replace key lock solenoid.

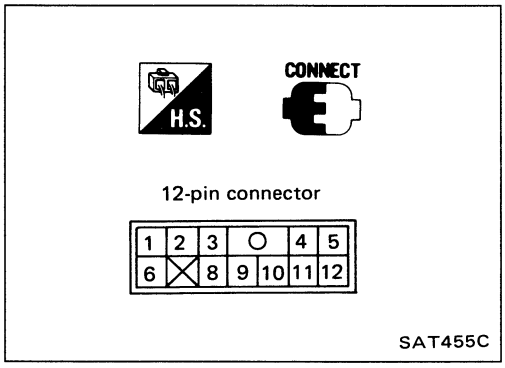
O.K.

Ⓓ

A/T Shift Lock System (Cont'd)



A/T Shift Lock System (Cont'd)



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.)

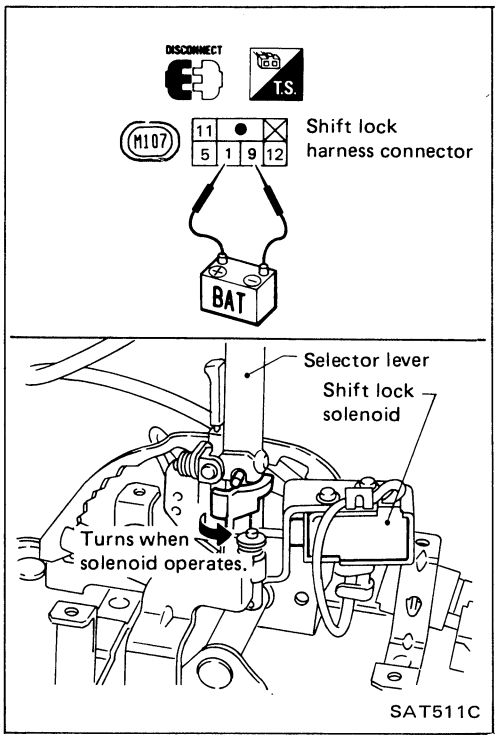
Terminal No. ⊕	Terminal No. ⊖	Item	Condition	Judgement standard
1	9	Shift lock signal	 When selector lever is set in "P" position and brake pedal is depressed	Battery voltage
			Except above	0V
2		Power source		Battery voltage
3		Stop lamp switch	When depressing brake pedal	Battery voltage
			When brake pedal is released	0V
4		Power source		Battery voltage
5		Detention switch (Shift)	When key is inserted into key cylinder and selector lever is set in "P" position pushed with selector lever button or selector lever is set in any position except "P"	Battery voltage
			Except above	0V
6		Ignition signal		Battery voltage
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		Key unlock signal	When ignition key is turned from ON to LOCK, OFF or ACC with selector lever button released. When selector lever button is released with selector lever set in "P" position.	Battery voltage (Approximately 0.1 seconds)
			Except above	0V
11	10	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 release button pushed or selector is set in any position except "P".	Battery voltage
			Except above	0V

A/T Shift Lock System (Cont'd)

COMPONENT CHECK

Shift lock solenoid

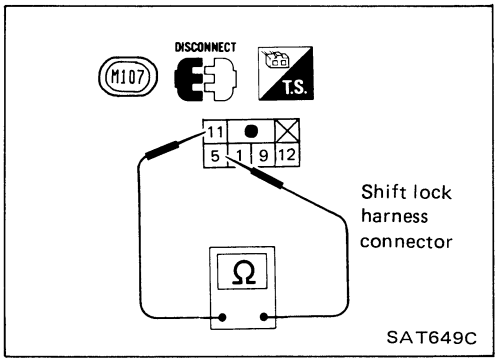
- Check operation by applying battery voltage to shift lock harness connector.



Detention switch

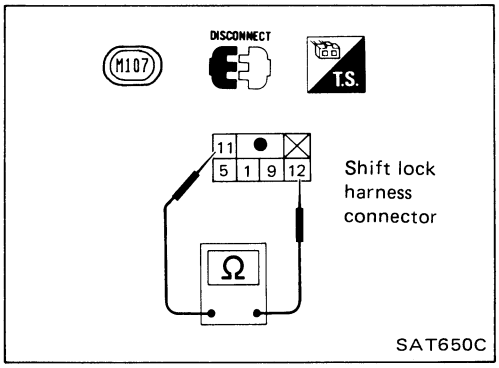
- Check continuity between terminal ⑤ and ⑪ of shift lock harness connector.

Condition	Continuity
When selector lever is set in "P" position with selector lever button pushed or selector lever is set in any position except "P".	Yes
Except the above	No



- Check continuity between terminals ⑪ and ⑫ of shift lock harness connector.

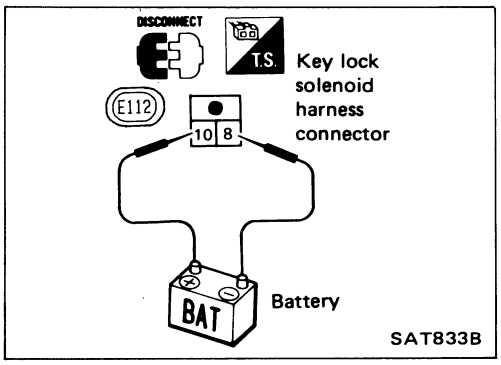
Condition	Continuity
When selector lever is set in "P" position with selector lever button pushed or selector lever is set in any position except "P".	Yes
Except the above	No



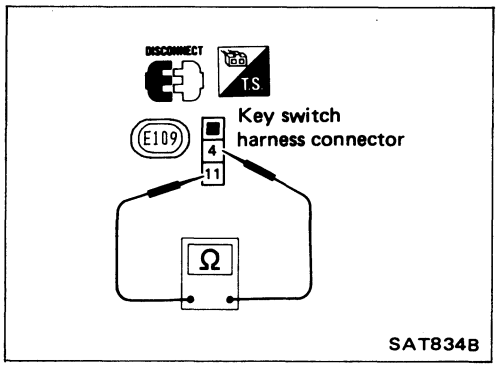
Key lock solenoid

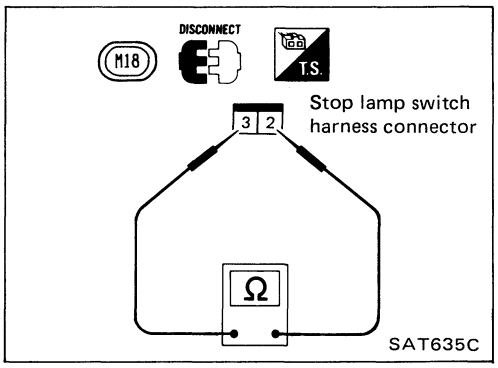
- Check operation by applying battery voltage to key lock solenoid harness connector.

Operating sound must be emitted.



A/T Shift Lock System (Cont'd)





Key switch

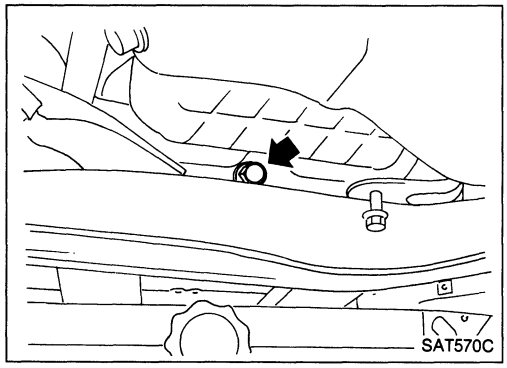
- Check continuity between terminals ④ and ⑪ of key switch harness connector.

- Stop lamp switch

Condition	Continuity
When key is inserted into key cylinder	Yes
When key is removed from key cylinder	No

Check stop lamp switch after adjusting brake pedal — refer to section BR.

Condition	Continuity
When depressing brake pedal	Yes
When releasing brake pedal is released	No


SAT570C

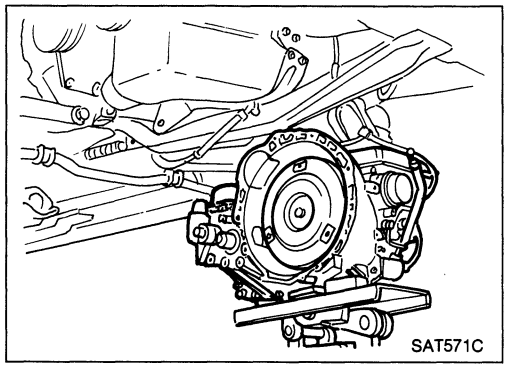
Removal

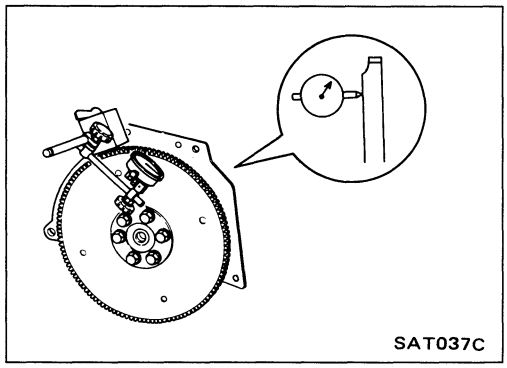
- Disconnect drive shafts. Refer to Drive Shaft (section FA) for removal.
- Support transaxle with transmission jack.
- Place wooden blocks between engine and center member to support engine.
- Remove bolts securing rear mounting to transaxle.
- Remove drive plate cover.
- Remove bolts securing torque 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.


SAT571C


SAT037C

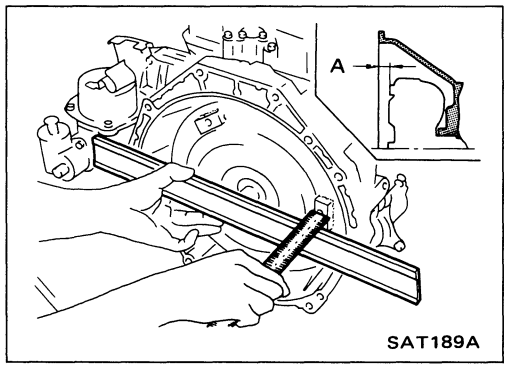
Installation

- 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

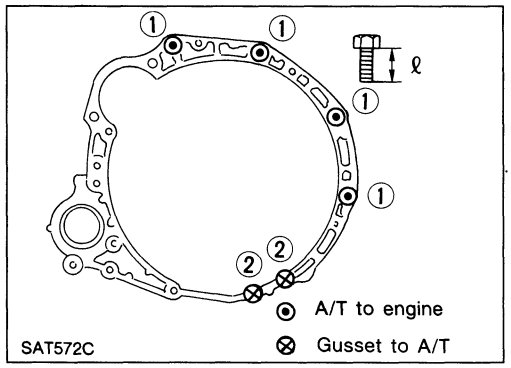
- When connecting torque converter to transaxle, measure distance "A" to be certain that they are correctly assembled.

  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)

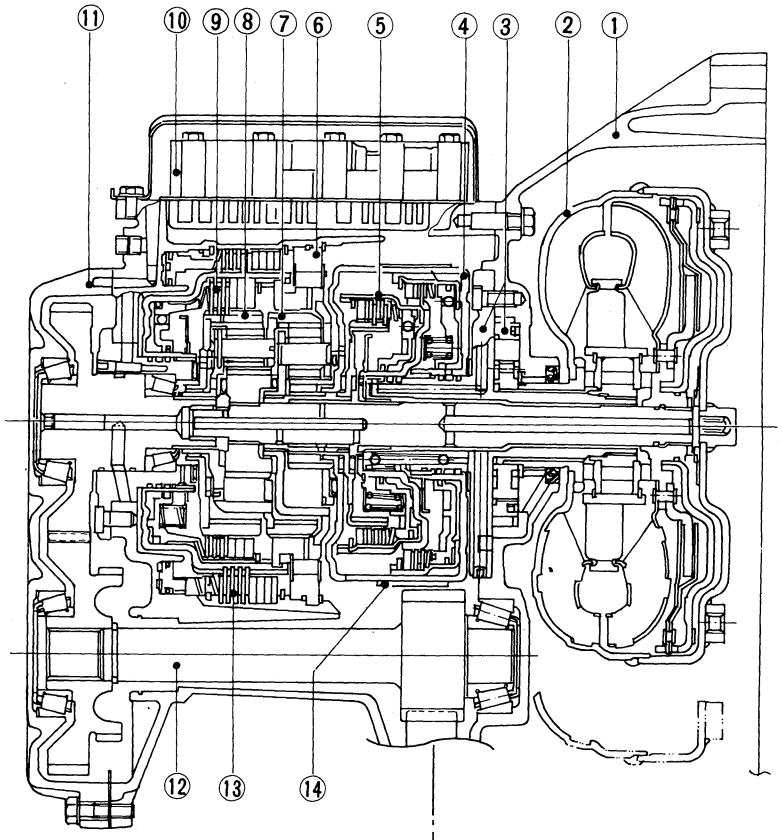
- Reinstall any part removed.

Installation (Cont'd)

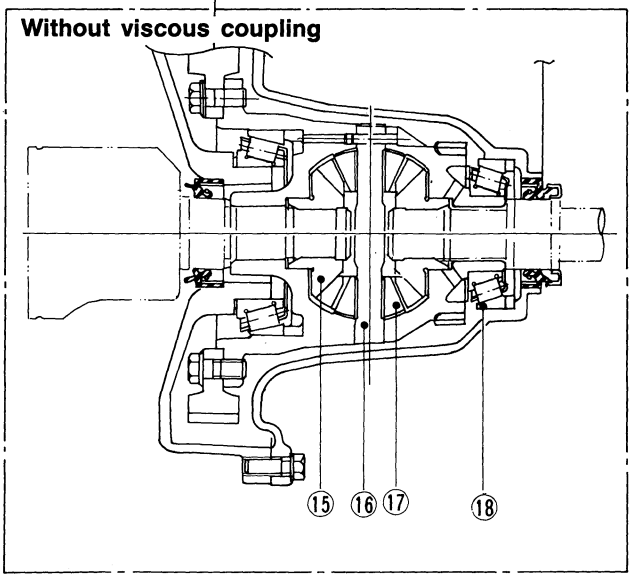

SAT638A

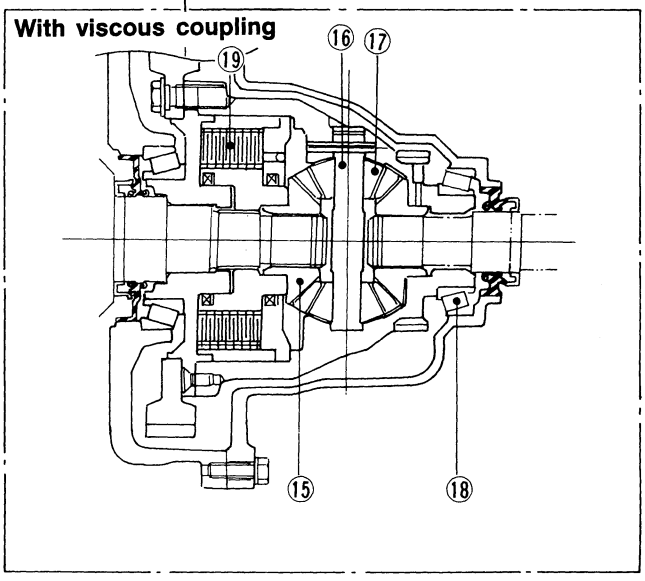
- Check fluid level in transaxle.
- Move selector lever through all positions to be sure that transaxle operates correctly.
  With parking brake applied, rotate engine at idling. Move selector lever through "N" to "D", to "2", to "1" and to "R". A slight shock should be felt by hand gripping selector each time transaxle is shifted.
- Perform road test — Refer to "Road Testing".

NOTE

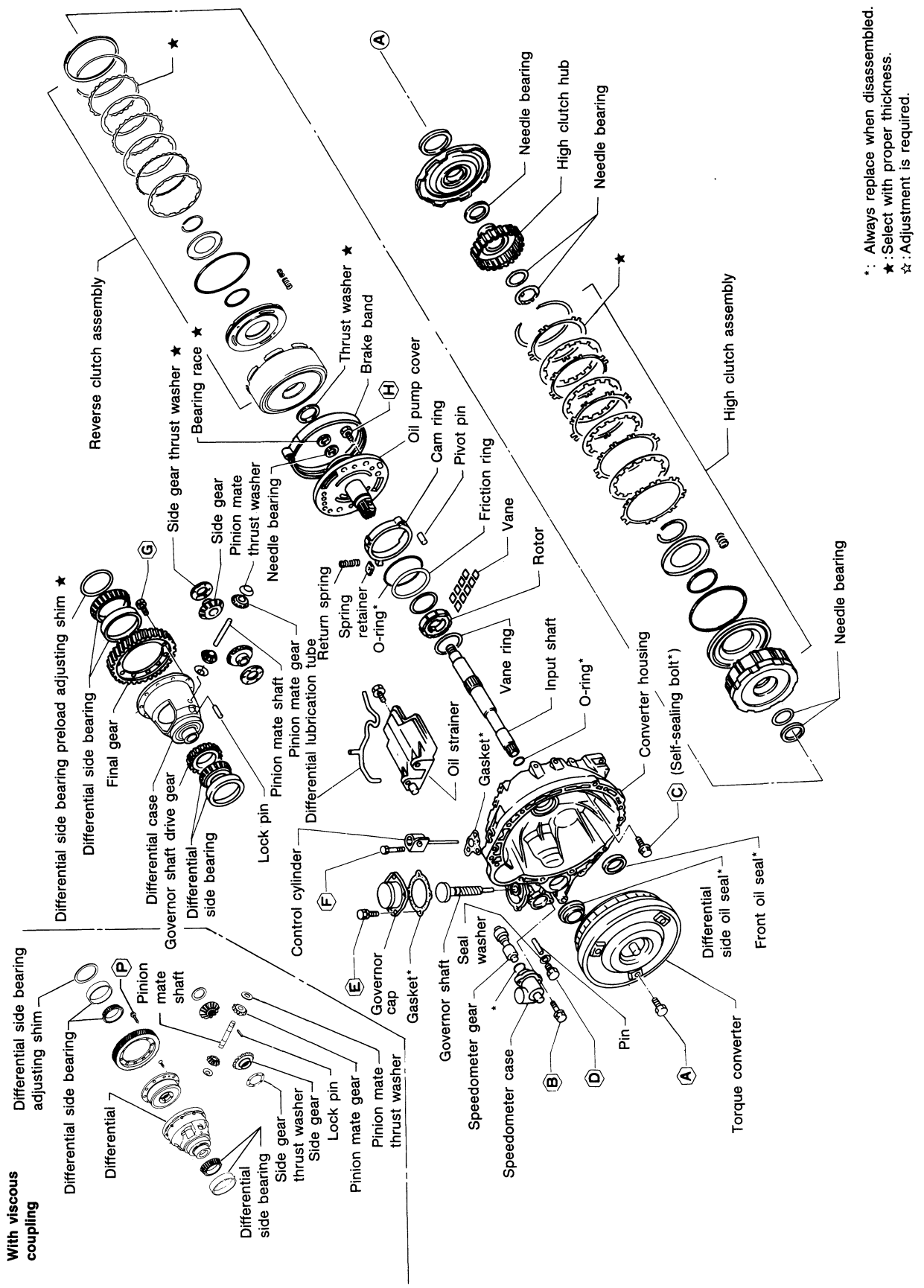


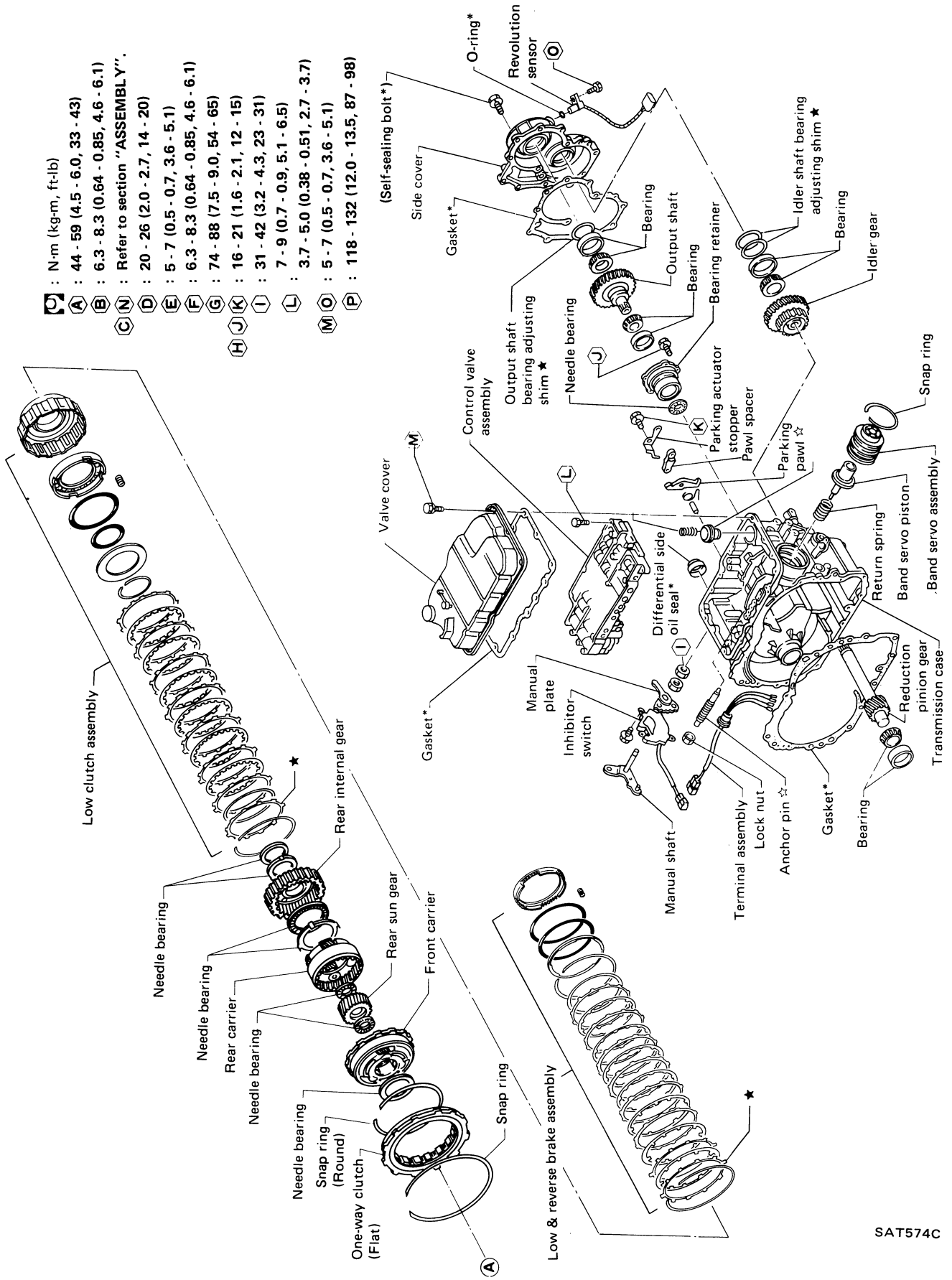
1 Converter housing
2 Torque converter
3 Oil pump
4 Reverse clutch
5 High clutch
6 One-way clutch
7 Front planetary gear
8 Rear planetary gear
9 Low clutch
10 Control valve
11 Side cover
12 Reduction gear
13 Low reverse brake
14 Band brake
15 Side gear
16 Pinion mate shaft
17 Pinion mate gear
18 Differential side bearing
19 Viscous coupling





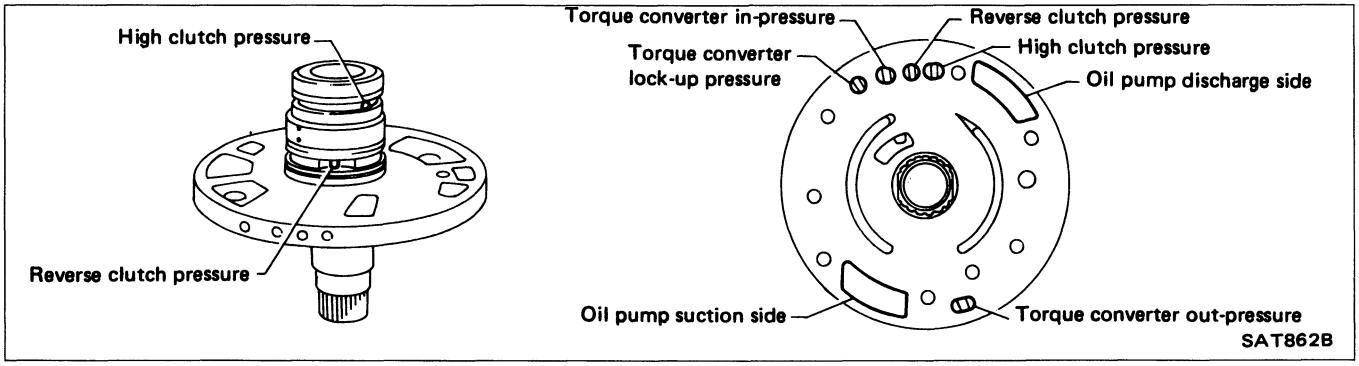
SAT573C


*: Always replace when disassembled.
★: Select with proper thickness.
☆: Adjustment is required.
With viscous coupling
Differential side bearing adjusting shim
Differential side bearing
Differential
Pinion mate shaft
Pinion mate gear
Pinion mate thrust washer
Side gear
Lock pin
Differential side bearing
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
Return spring
Spring retainer
O-ring*
Bearing race ★
Reverse clutch assembly
Thrust washer ★
Brake band
Oil pump cover
Cam ring
Pivot pin
Friction ring
Vane
Rotor
Vane ring
Input shaft
O-ring*
Oil strainer
Gasket*
Control cylinder
Governor cap
Gasket*
Governor shaft
Seal washer
Speedometer gear
Speedometer case
Converter housing
(Self-sealing bolt*)
Pin
Differential side oil seal*
Front oil seal*
Torque converter
Needle bearing
High clutch hub
Needle bearing
High clutch assembly
Needle bearing

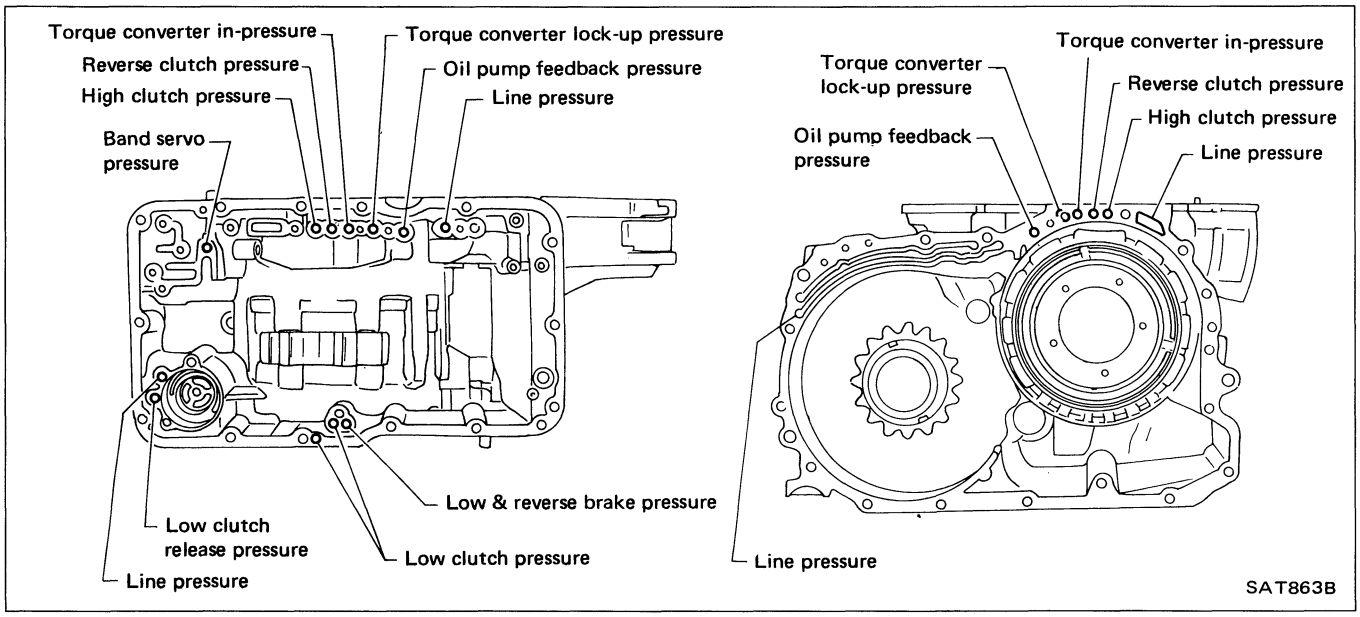

: N·m (kg-m, ft-lb)
Ⓐ : 44 - 59 (4.5 - 6.0, 33 - 43)
Ⓑ : 6.3 - 8.3 (0.64 - 0.85, 4.6 - 6.1)
Ⓒ Ⓝ : Refer to section "ASSEMBLY".
Ⓓ : 20 - 26 (2.0 - 2.7, 14 - 20)
Ⓔ : 5 - 7 (0.5 - 0.7, 3.6 - 5.1)
Ⓕ : 6.3 - 8.3 (0.64 - 0.85, 4.6 - 6.1)
Ⓖ : 74 - 88 (7.5 - 9.0, 54 - 65)
Ⓗ Ⓚ : 16 - 21 (1.6 - 2.1, 12 - 15)
Ⓘ : 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)
Low clutch assembly
Needle bearing
Rear internal gear
Needle bearing
Rear carrier
Needle bearing
Rear sun gear
Front carrier
Needle bearing
Snap ring (Round)
One-way clutch (Flat)
Snap ring
Low & reverse brake assembly
Valve cover
Gasket*
Manual plate
Inhibitor switch
Manual shaft
Terminal assembly
Lock nut
Anchor pin ☆
Gasket*
Bearing
Reduction pinion gear
Transmission case
Differential side oil seal*
Control valve assembly
Output shaft bearing adjusting shim ★
Needle bearing
Parking actuator
Parking stopper
Pawl spacer
Parking pawl ☆
Return spring
Band servo piston
Band servo assembly
Snap ring
(Self-sealing bolt*)
Side cover
Gasket*
O-ring*
Revolution sensor
Bearing
Output shaft
Bearing
Bearing retainer
Idler shaft bearing adjusting shim ★
Bearing
Idler gear
SAT574C

Oil Channel

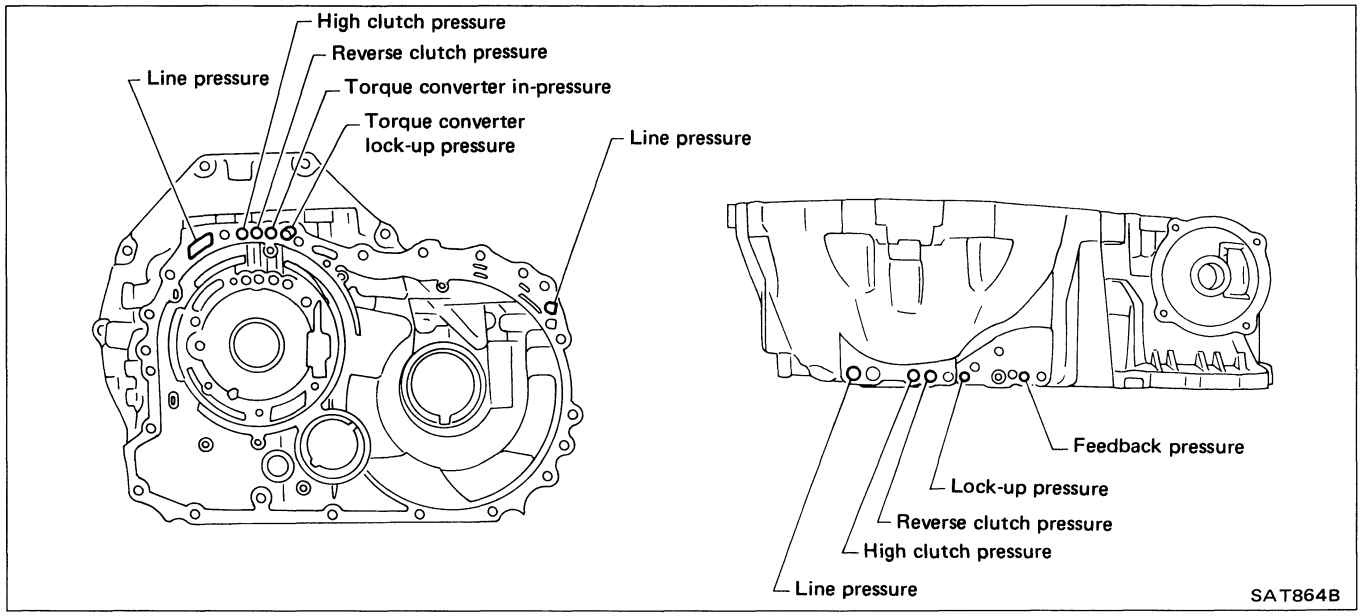
OIL CHANNELS IN OIL PUMP COVER

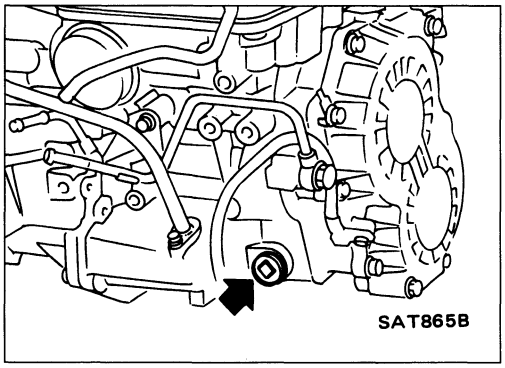


OIL CHANNELS IN TRANSMISSION CASE

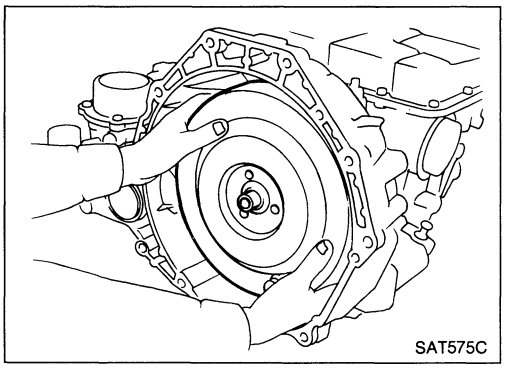


OIL CHANNELS IN CONVERTER HOUSING

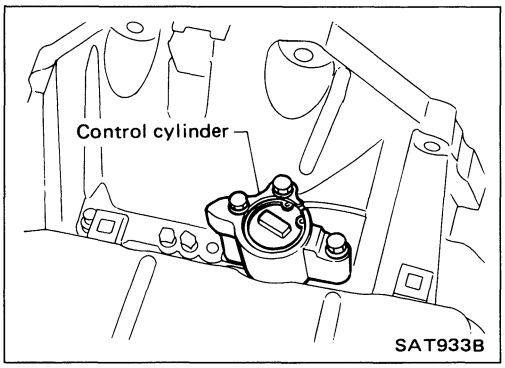



SAT865B

1. Drain A.T.F. through drain hole.

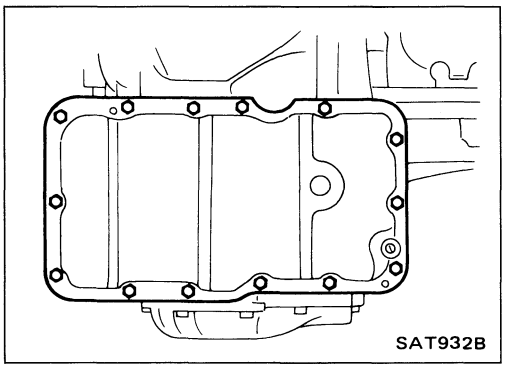

SAT575C

2. Remove torque converter.

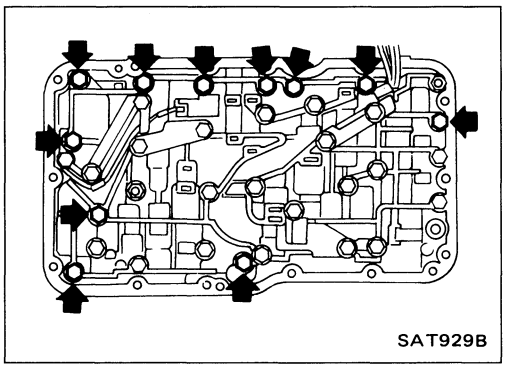


SAT933B

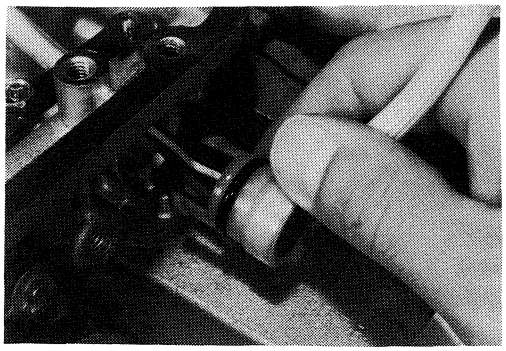
3. Remove control cylinder.


SAT932B

4. Remove control valve cover.

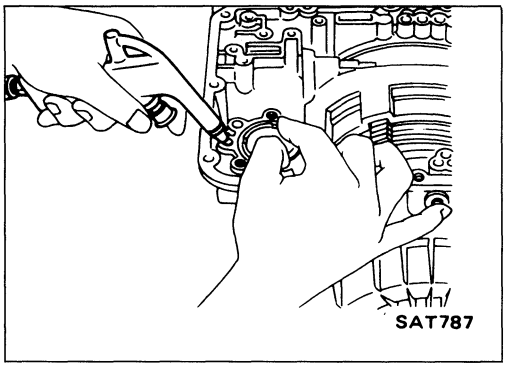

SAT929B

5. Disconnect harness connectors on control valve and remove control valve assembly.

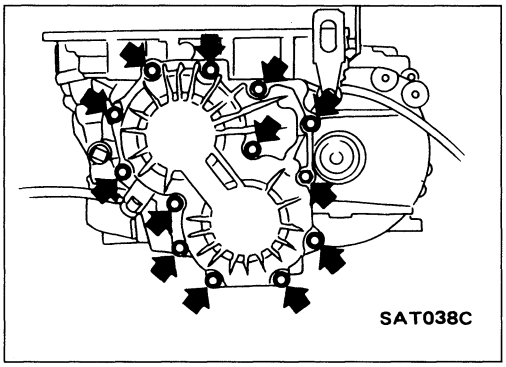


6. Remove terminal assembly.

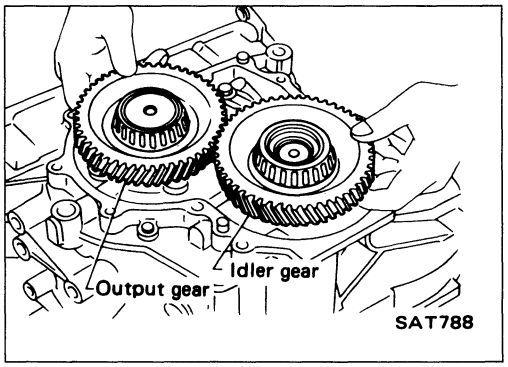
The terminal retrieving hooks will break if they are forced inward too far. Bend them gently inward while pulling carefully outward on the terminal. Do not pull on the wires.



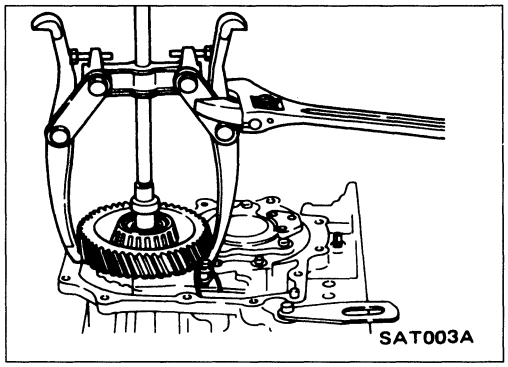
7. Remove accumulator.



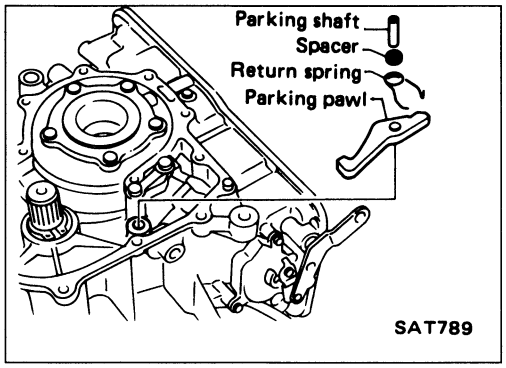
8. Remove side cover.



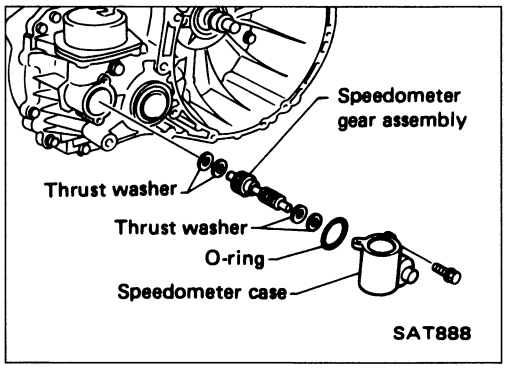
9. Remove output gear.



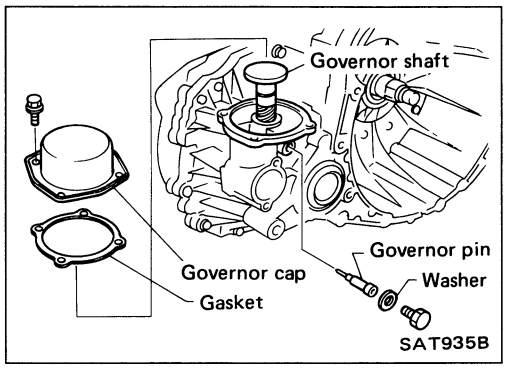
10. Draw out idler gear.



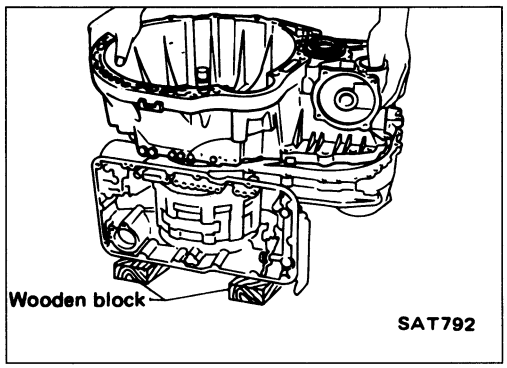
11. Remove parking pawl, return spring, parking shaft and spacer.



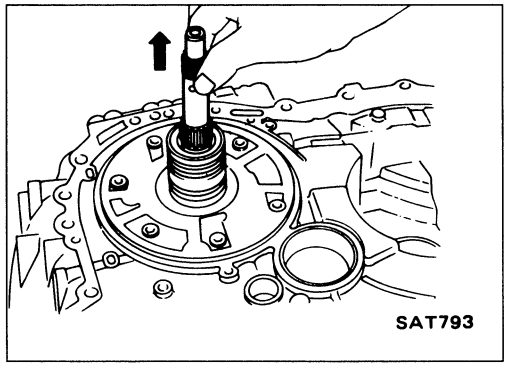
12. Remove speedometer and speedometer gear.



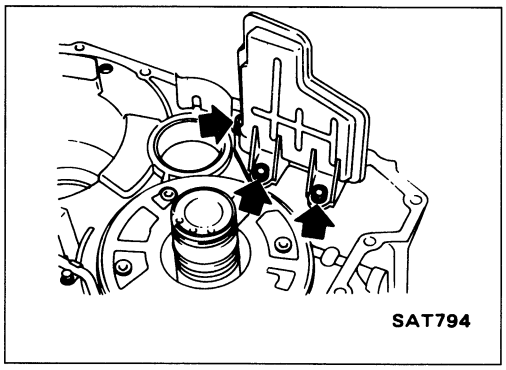
13. Remove governor shaft.



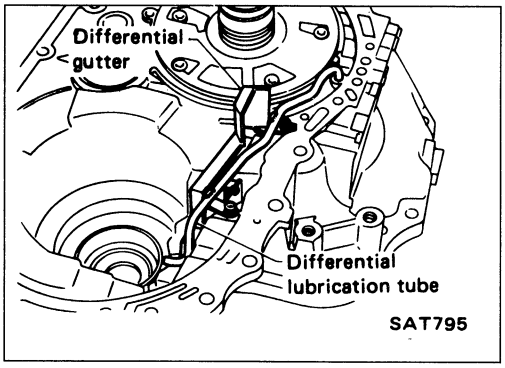
14. Put transaxle assembly on wooden block and remove converter housing.



15. Remove final drive assembly and reduction pinion gear.
16. After removing O-ring from input shaft, extract input shaft from converter housing.

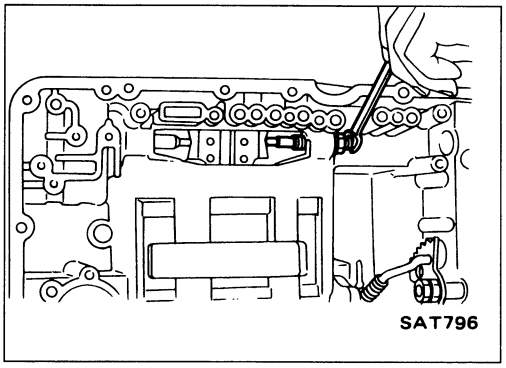

SAT794

17. Remove oil strainer.

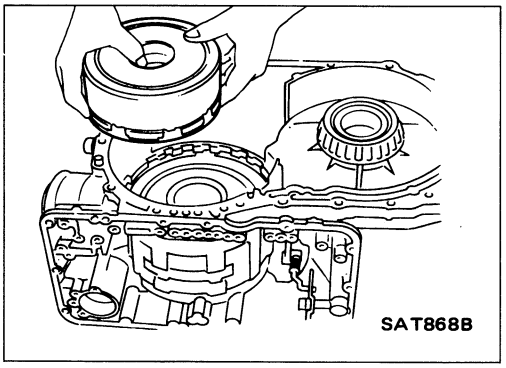


SAT795

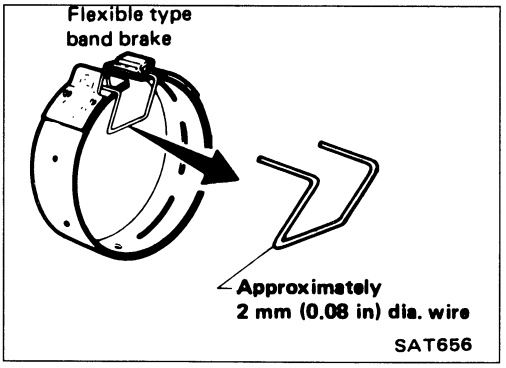
18. Remove differential lubrication tube and gutter.


SAT796

19. Loosen band brake stem lock nut, then back off piston stem.

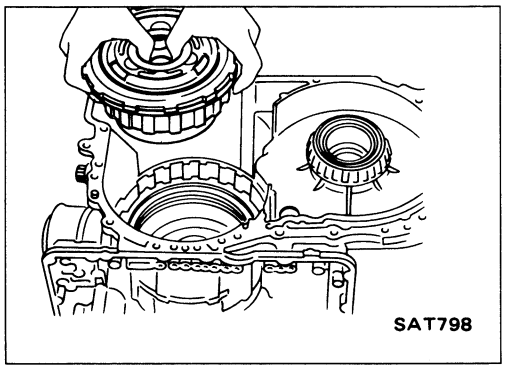

SAT868B

20. Remove brake band and high clutch & reverse clutch pack.

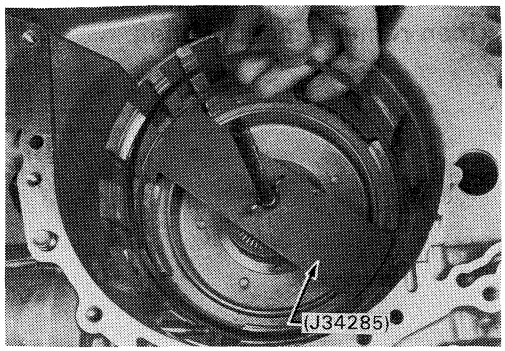


SAT656

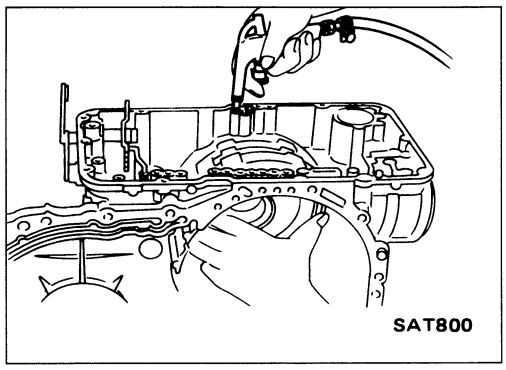
- **To prevent brake linings from cracking or peeling, do not stretch the flexible band unnecessarily. Before removing the brake band, always secure it with a clip as shown in the figure at left.**
  Leave the clip in position after removing the brake band.


SAT798

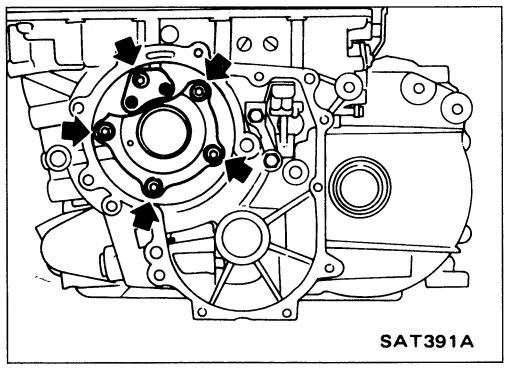
21. Remove one-way clutch, front carrier, rear carrier and low clutch as a set.



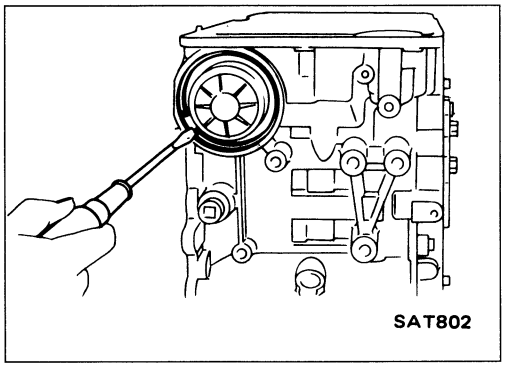
22. Remove low & reverse brake clutches, and detach low & reverse brake retainer snap ring pushing retainer.


SAT800

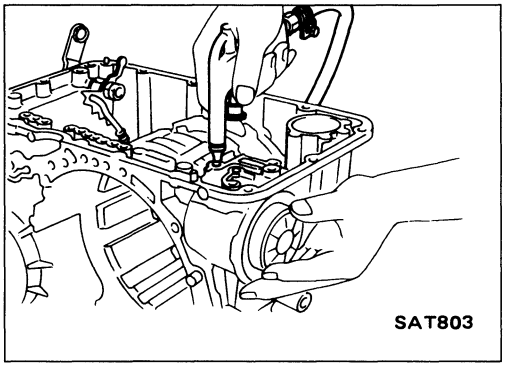
23. Remove low and reverse brake piston with compressed air.


SAT391A

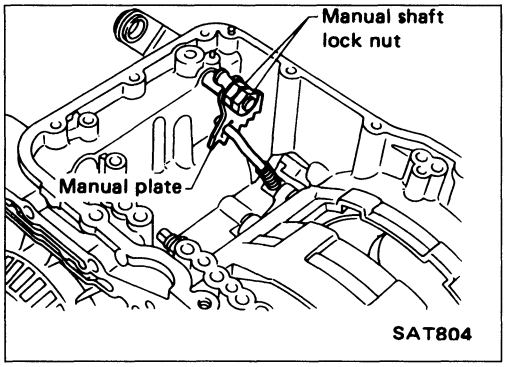
24. Remove bearing retainer assembly.


SAT802

25. Remove band servo snap ring.


SAT803

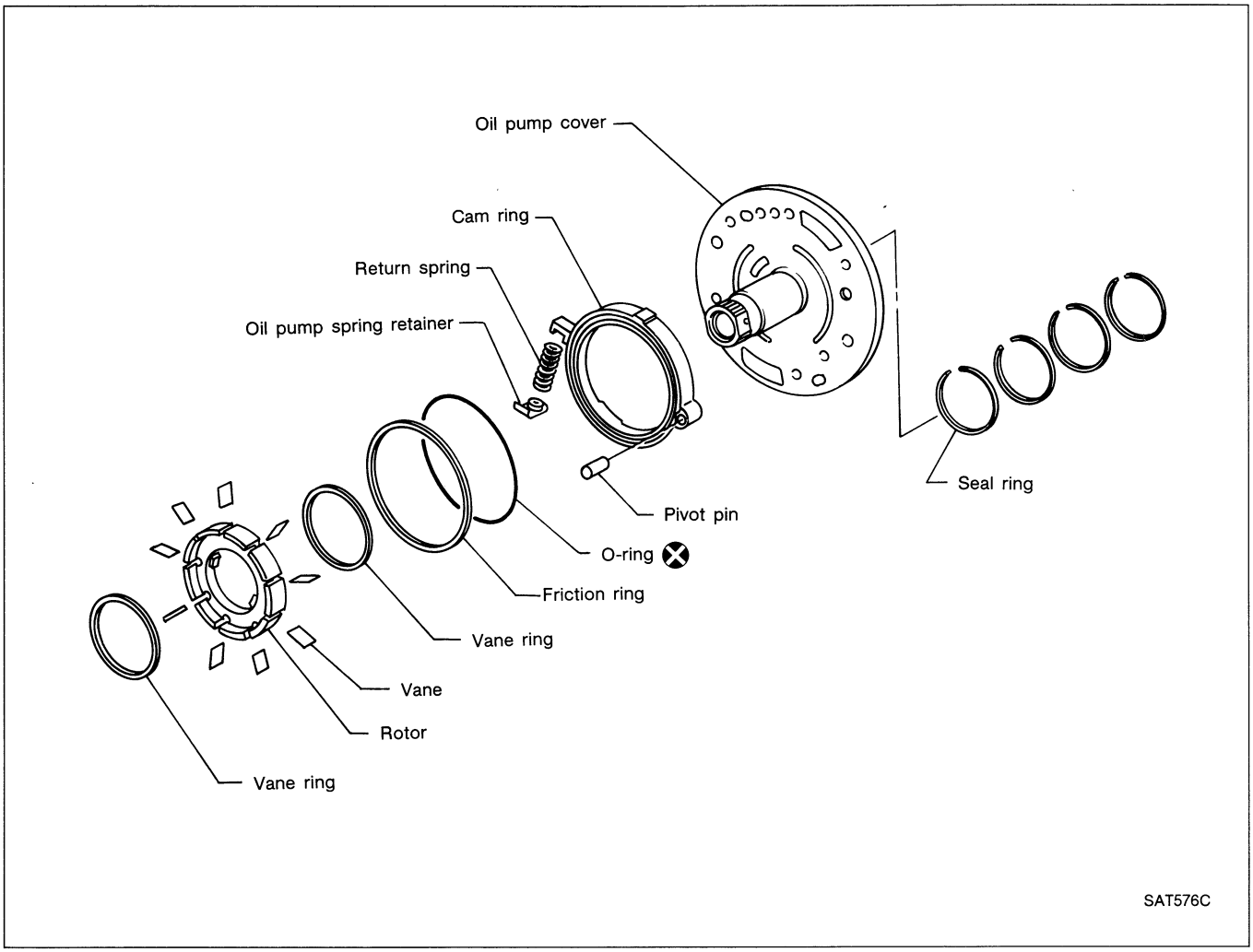
26. Remove band brake servo, retainer and return spring.

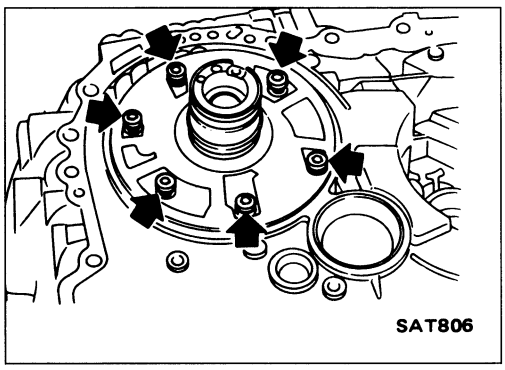


SAT804

27. Loosen manual shaft lock nuts and remove manual plate.
28. Pull out retaining pin, then remove manual shaft.

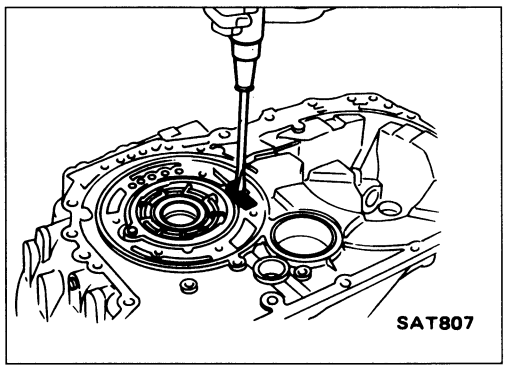
Oil Pump





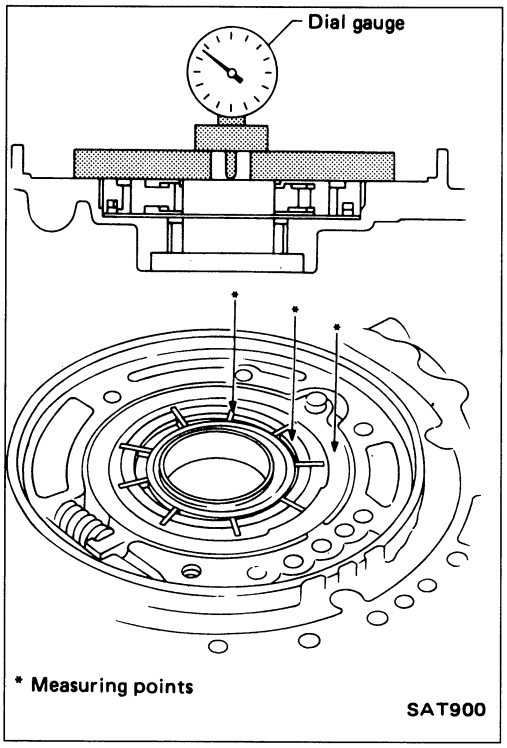
DISASSEMBLY

1. Remove oil pump cover.



2. Remove return spring taking care not to damage converter housing.

Oil Pump (Cont'd)



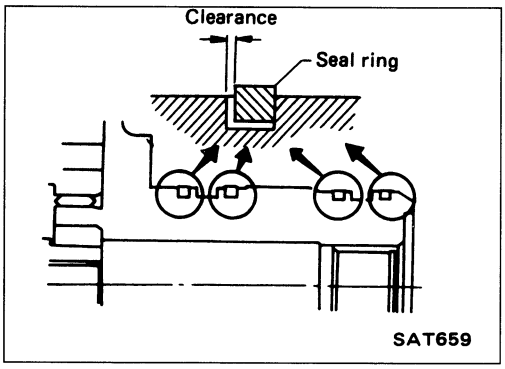
INSPECTION

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.

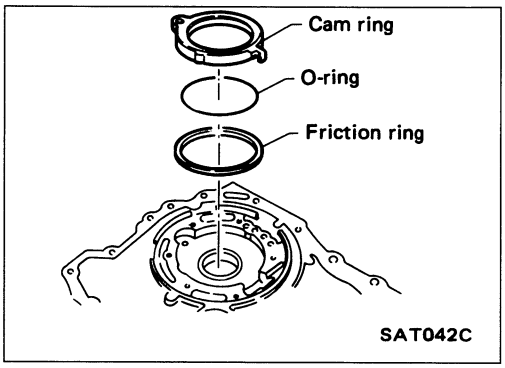
- **Be sure to remove friction ring and vane ring when measuring clearance.**

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.

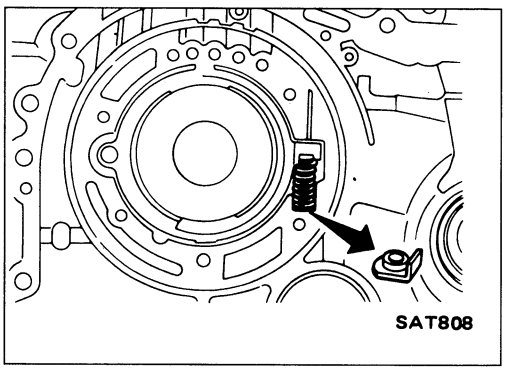


3. Measure clearance between seal ring and ring groove.
Standard clearance:
0.10 - 0.25 mm (0.0039 - 0.0098 in)
Wear limit:
0.25 mm (0.0098 in)



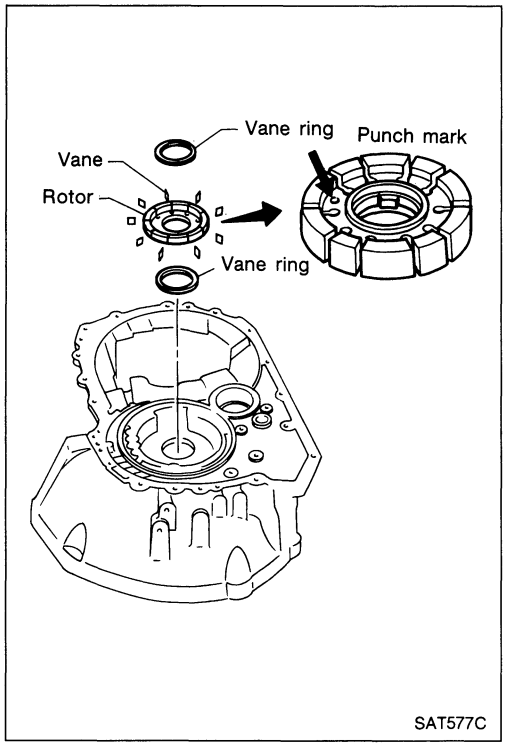
ASSEMBLY

1. Install cam ring, O-ring and friction ring.

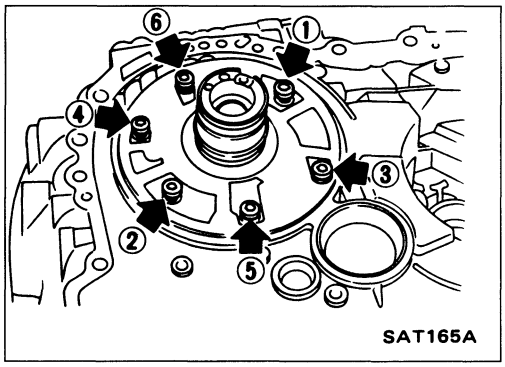


2. Install return spring and spring retainer.

Oil Pump (Cont'd)

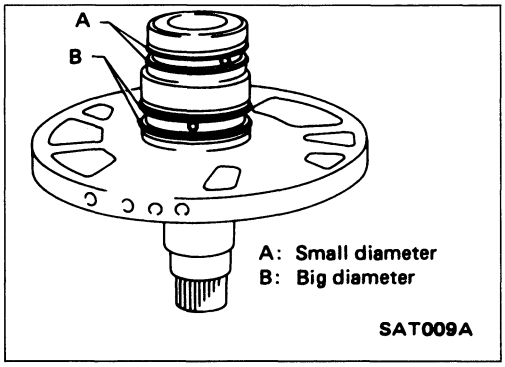


3. Assemble rotor, vanes and vane rings. Pay attention to direction of rotor.



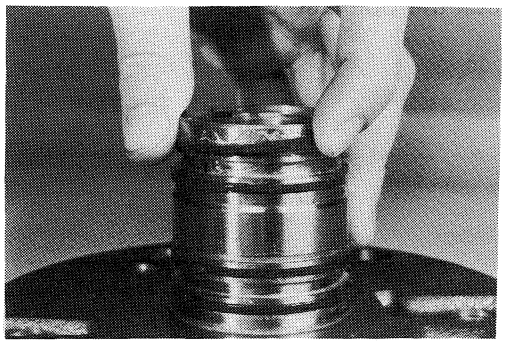
4. Install oil pump cover.

Tighten down cover evenly in a criss-cross type pattern.



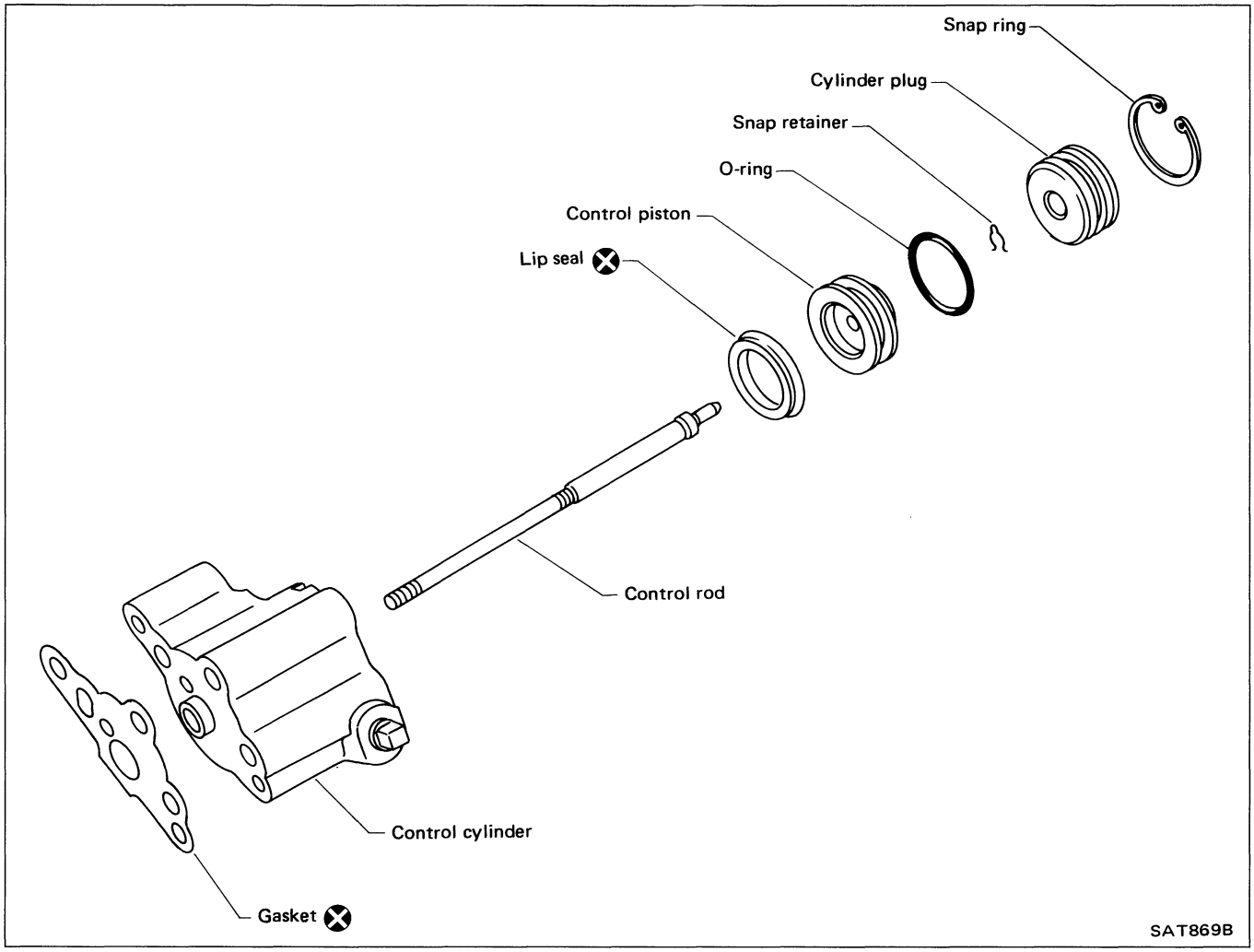
5. Rotate the pump when it has been assembled to ensure that all parts have been correctly assembled.
6. Install seal rings.

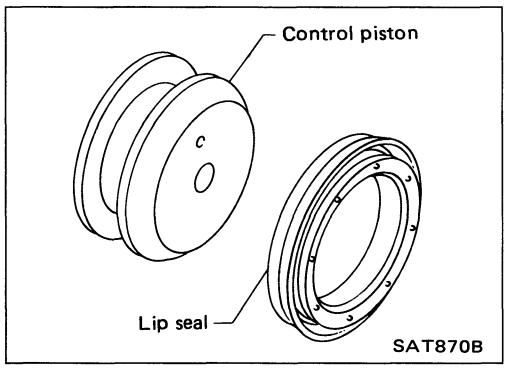
Refer to the figure at left for proper locations of the two different types of seal rings.



- **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.**

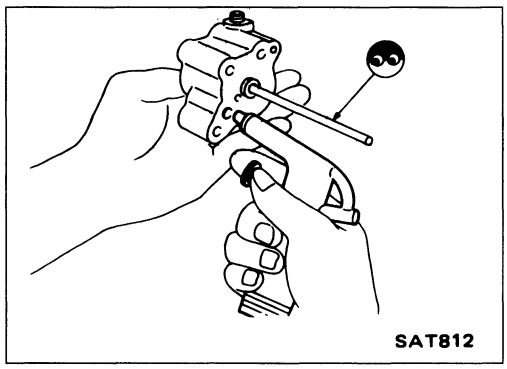
Control Cylinder





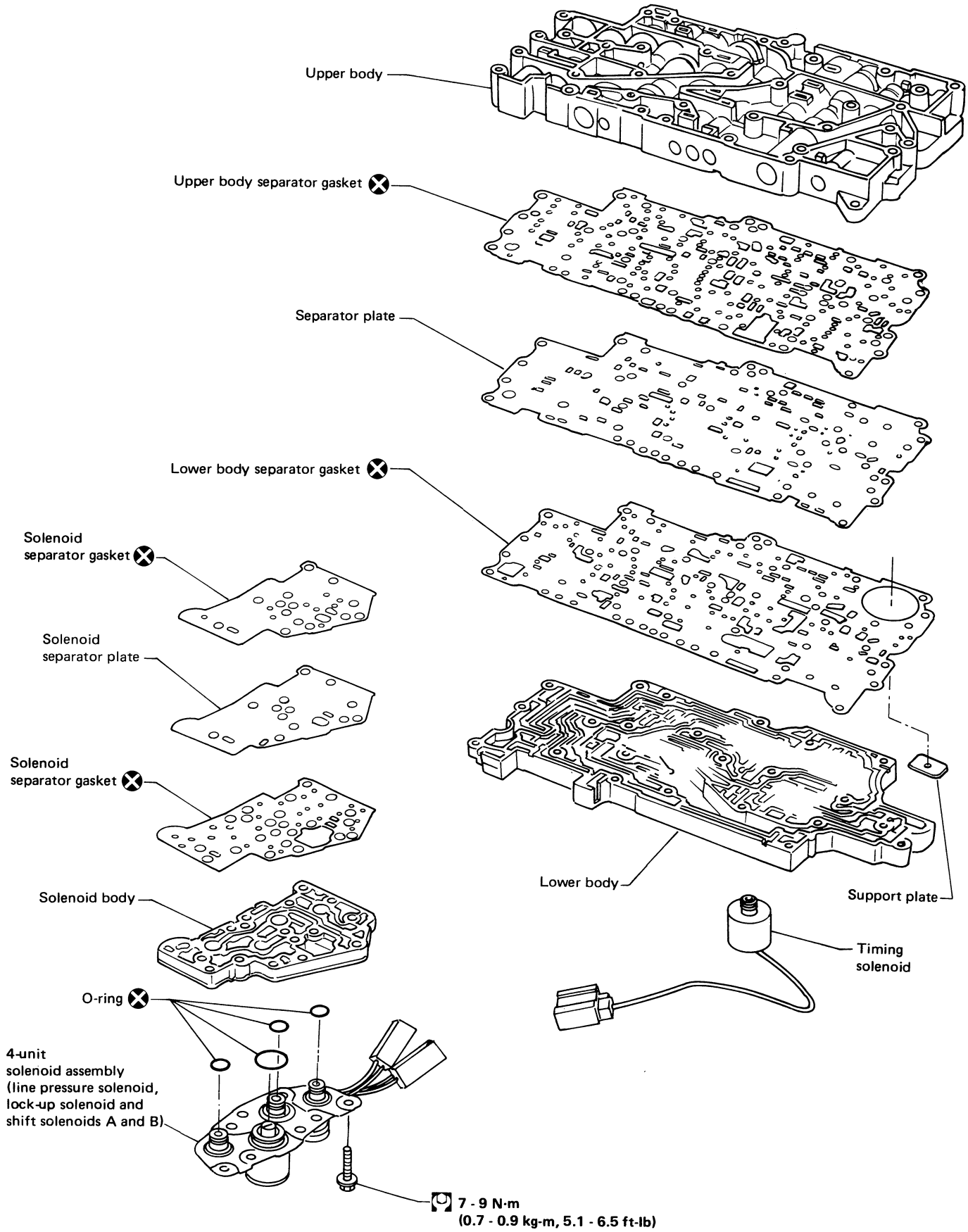
INSPECTION AND ASSEMBLY

- 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.

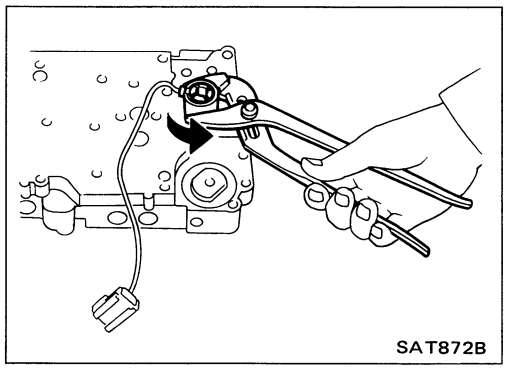
Control Valve Assembly



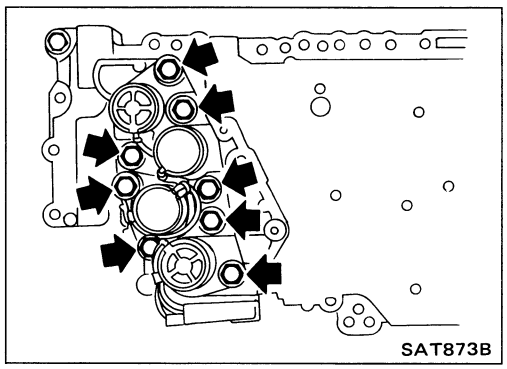
SAT871B

Control Valve Assembly (Cont'd)

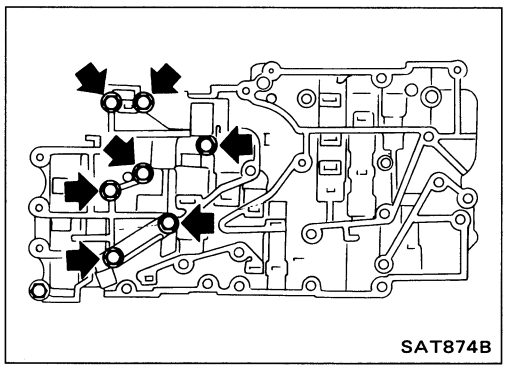
DISASSEMBLY


SAT872B

1. Remove solenoids.
a. Remove timing solenoid.
b. Remove O-ring from solenoid.

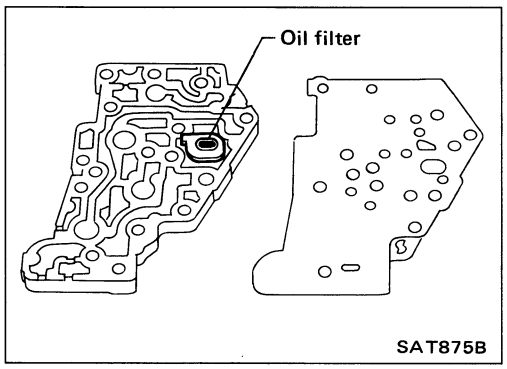

SAT873B

c. Remove shift solenoid A, shift solenoid B, line pressure solenoid and lock-up solenoid.
d. Remove O-rings from solenoids.


SAT874B

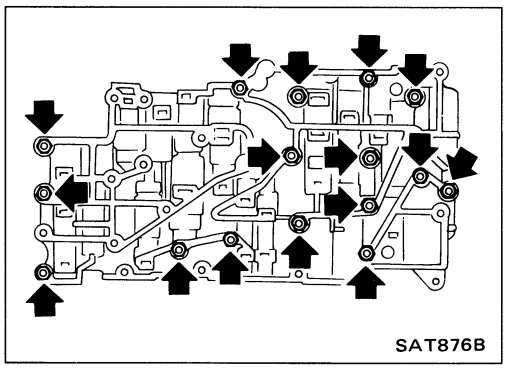
2. Remove solenoid body.
a. Place lower body facedown and remove bolts.

Be careful not to drop solenoid body.



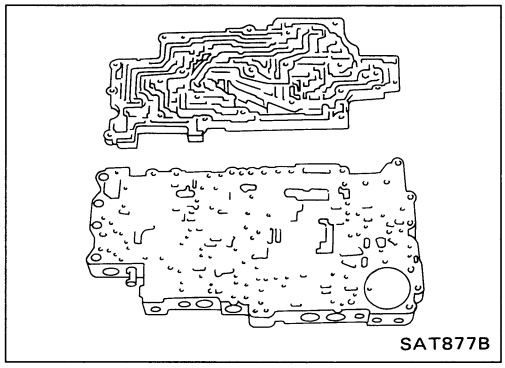
SAT875B

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.

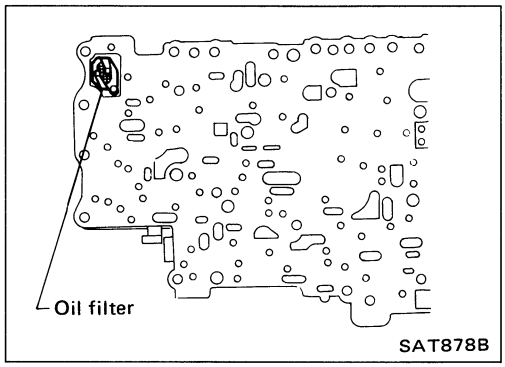

SAT876B

3. Disassemble upper and lower bodies.
a. Place lower body facedown, and remove bolts, reamer bolts and support plate.

Control Valve Assembly (Cont'd)

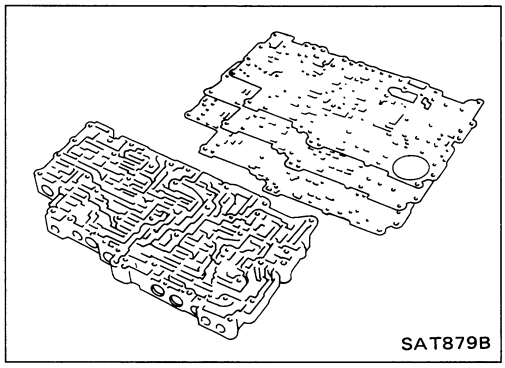

SAT877B

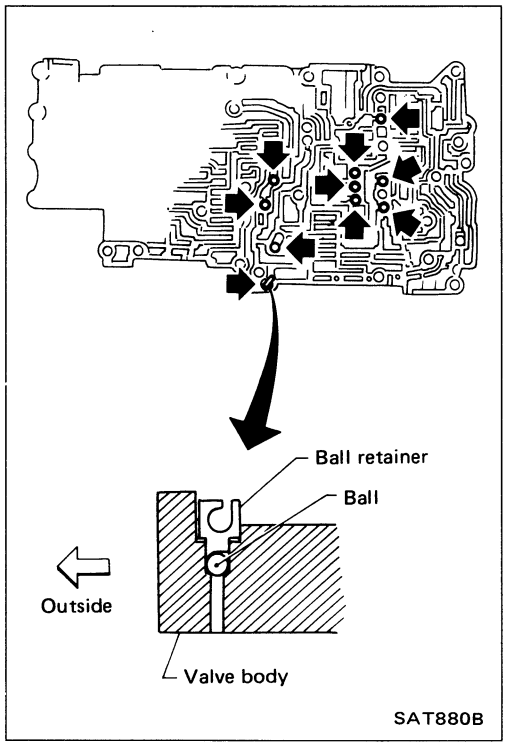
b. Position upper body downward. Remove lower body with separator plate and separator gasket attached to upper body.



SAT878B

c. Remove oil filter, separator gaskets and separator plate from upper body.

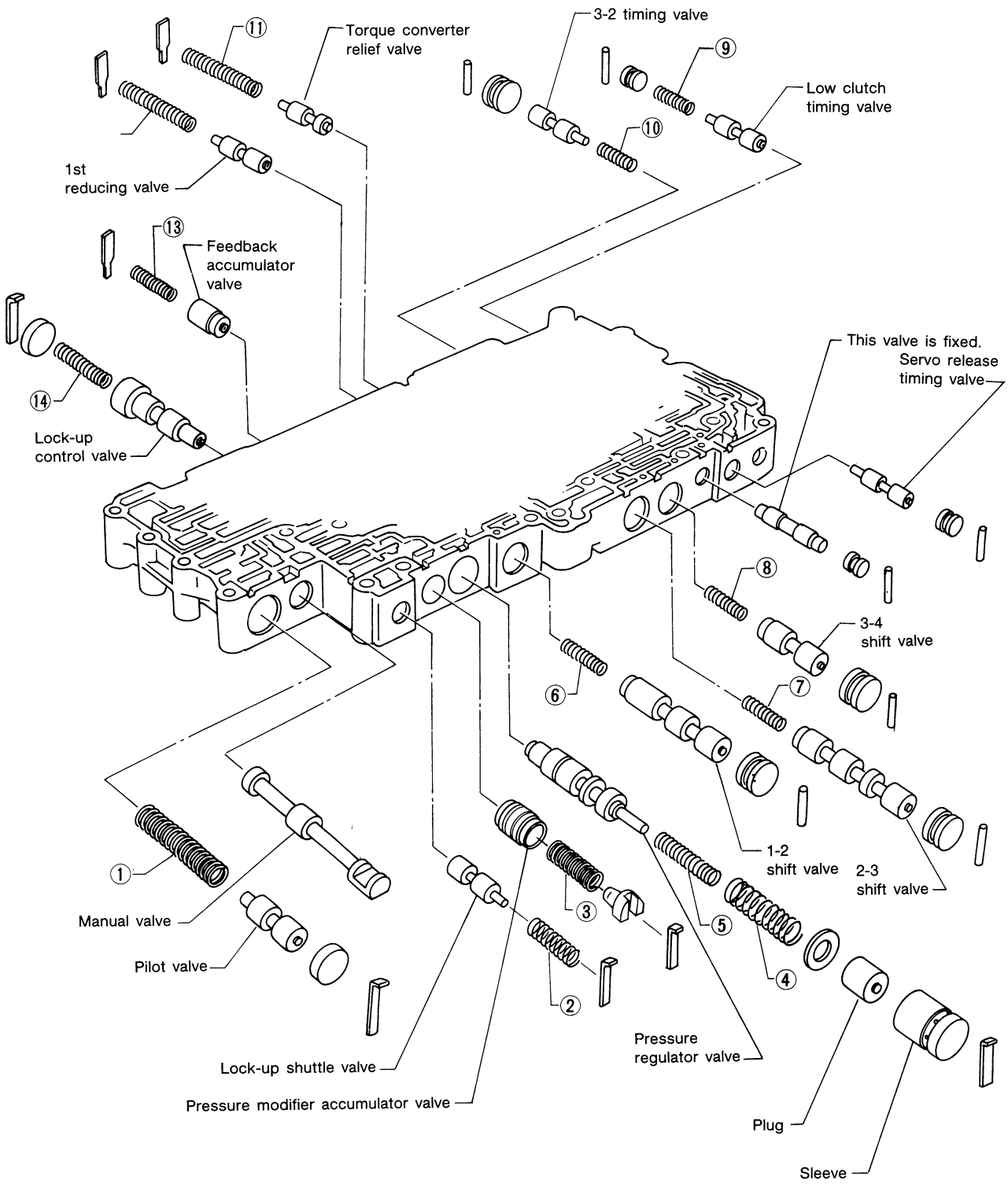

SAT879B



SAT880B

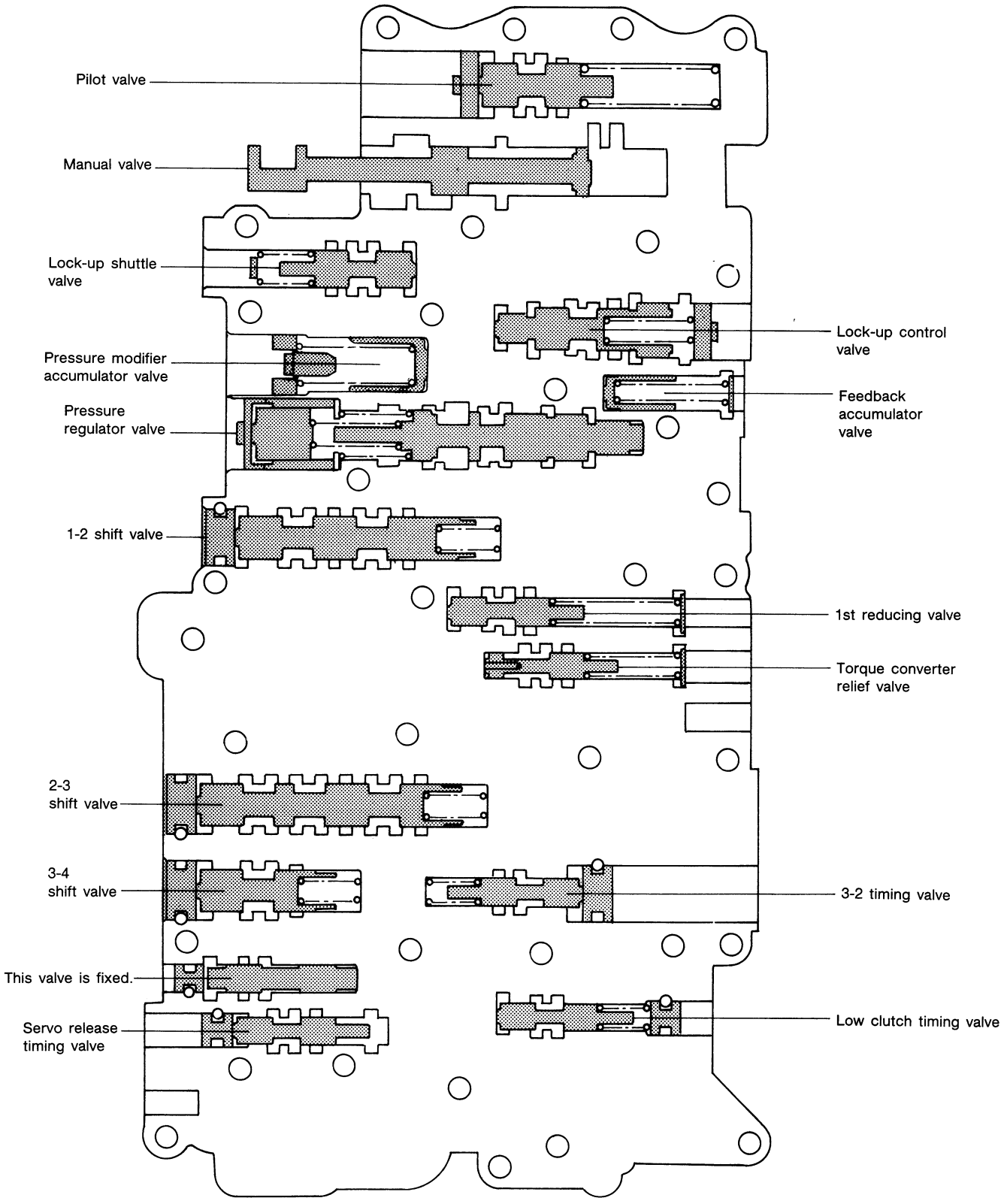
d. Check to see that steel balls are properly positioned in upper body and then remove them from upper body.

Control Valve Upper Body



SAT597C

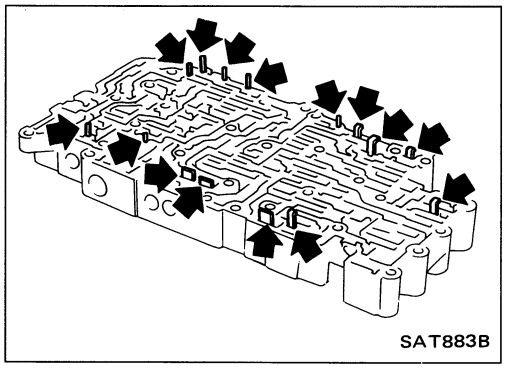
Control Valve Upper Body (Cont'd)



SAT598C

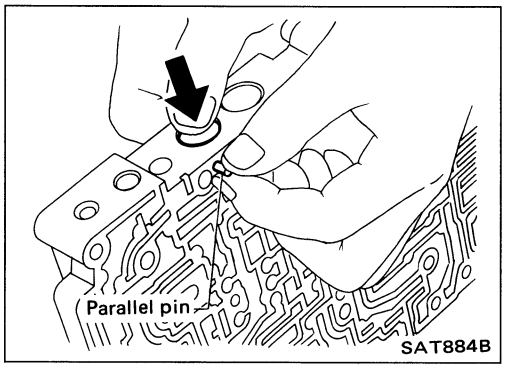
Control Valve Upper Body (Cont'd)

DISASSEMBLY


SAT883B

1. Remove valves at parallel pins.

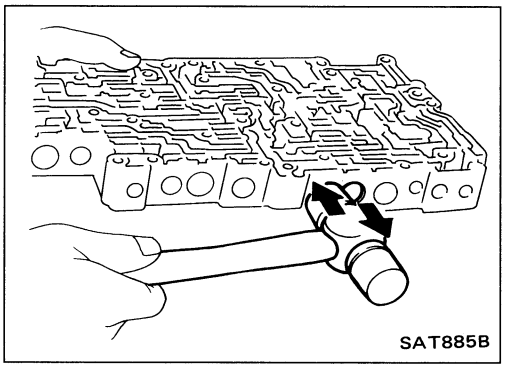
Do not use a magnetic hand.



SAT884B

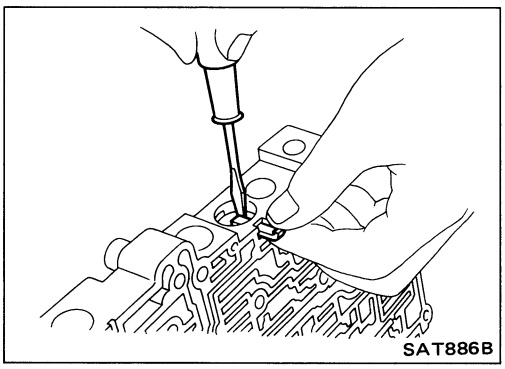
a. Remove parallel pins while pressing their corresponding plugs and sleeves.

Remove plug slowly to prevent internal parts from jumping out.


SAT885B

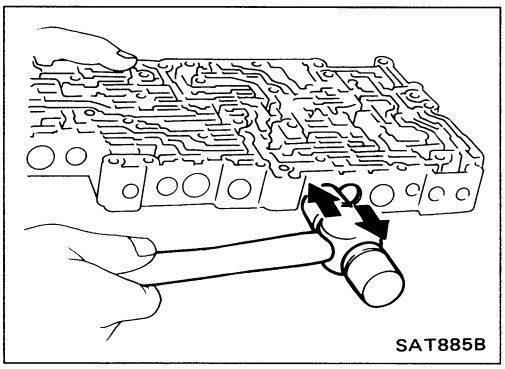
b. Place mating surface of valve facedown, and remove internal parts.

- **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.

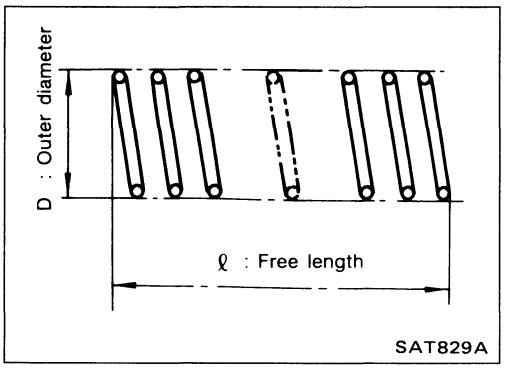

SAT885B

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.**

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-128.

Inspection standard

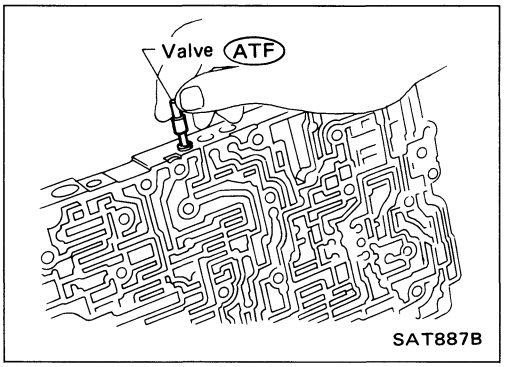
Unit: mm (in)

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.

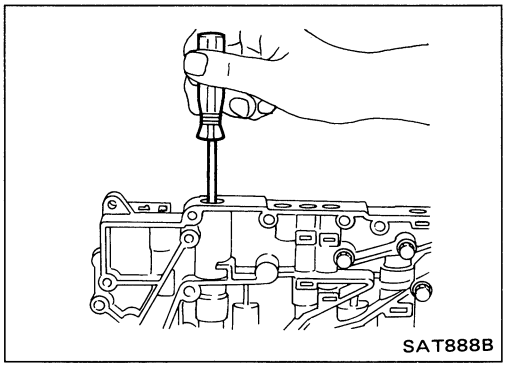


ASSEMBLY

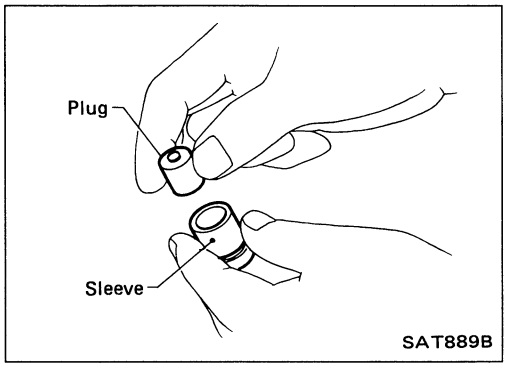
1. Lubricate the control valve body and all valves with A.T.F. Install control valves by sliding them carefully into their bores.

Be careful not to scratch or damage valve body.

Control Valve Upper Body (Cont'd)


SAT888B

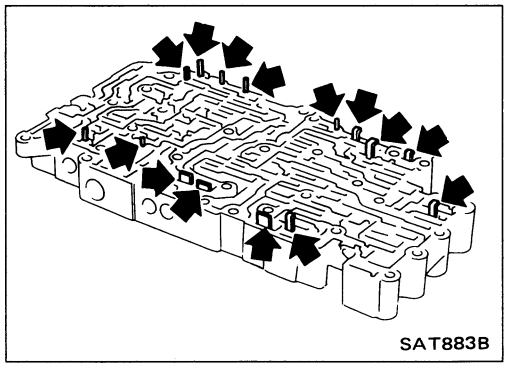
- Wrap a small screwdriver with vinyl tape and use it to insert the valves into proper position.



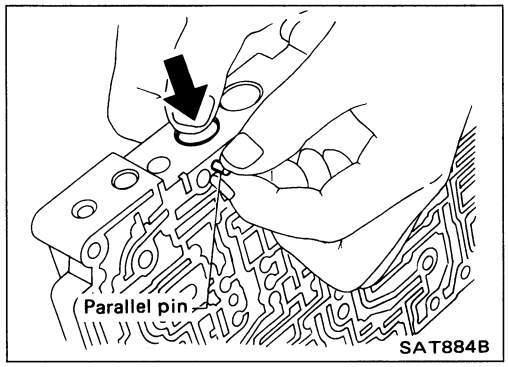
SAT889B

— Pressure regulator valve —

Position plug in sleeve and install pressure regulator valve on upper body.

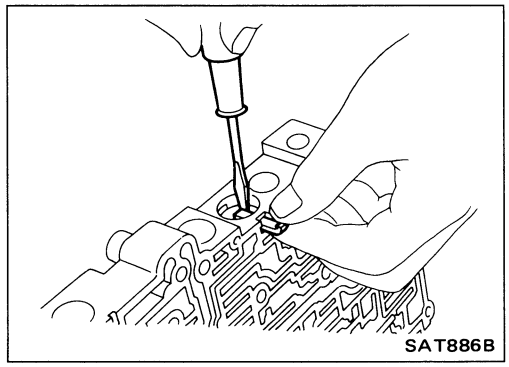

SAT883B

2. Install parallel pins and retainer plates.

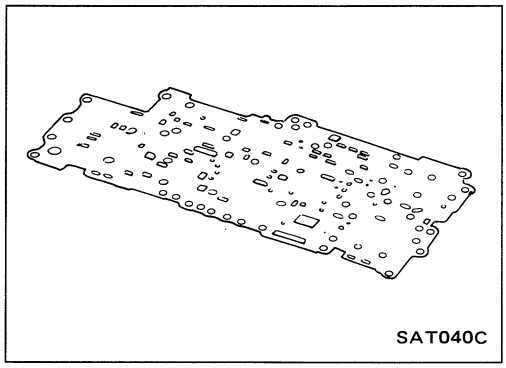


SAT884B

- **While pushing plug, install parallel pin.**


SAT886B

- Insert retainer plate while pressing their corresponding plugs, sleeves or springs.

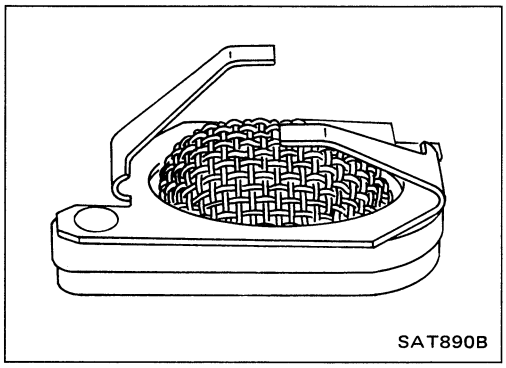

SAT040C

Control Valve Assembly

INSPECTION

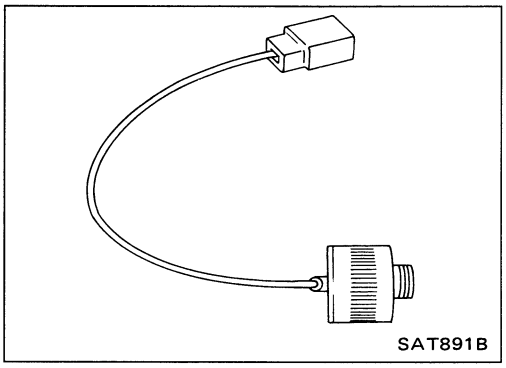
Separator plates

Check to make sure that separator plate is free of damage and not deformed and oil holes are clean.


SAT890B

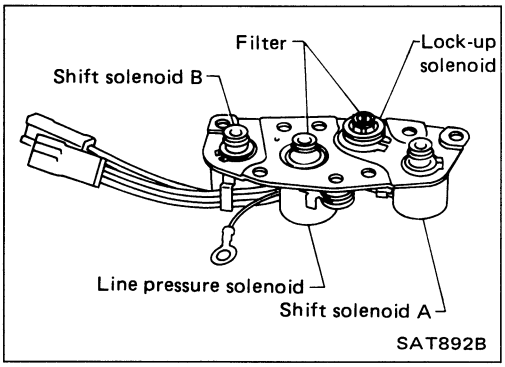
Oil filter

Check to make sure that filter is not clogged or damaged.


SAT891B

Timing solenoid

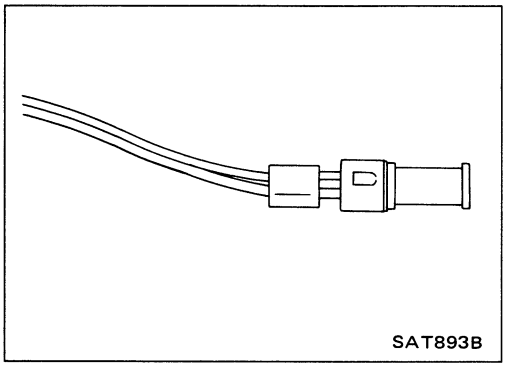
Measure resistance — Refer to "Electrical Components Inspection".



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

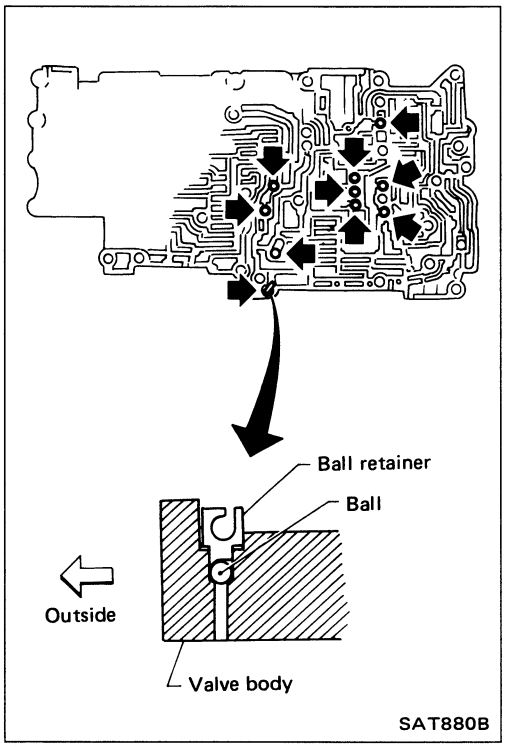
Measure resistance — Refer to "Electrical Components Inspection".

Control Valve Assembly (Cont'd)

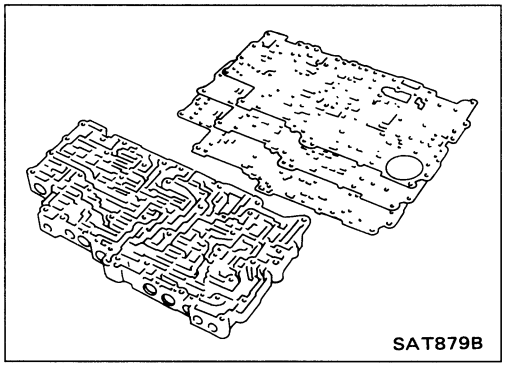
ASSEMBLY

1. Assemble upper and lower bodies.

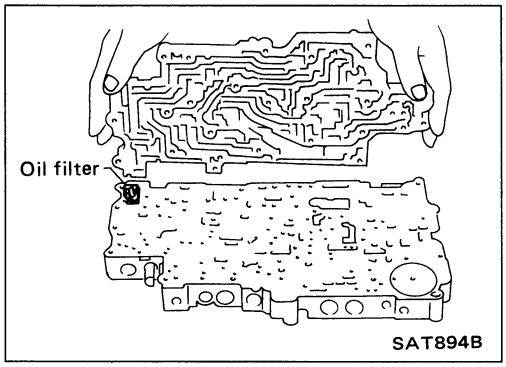
a. Place oil circuit of upper body face up. Install steel balls in their proper positions.



b. Install upper body separator gasket, separator plate and lower body separator gasket on upper body.

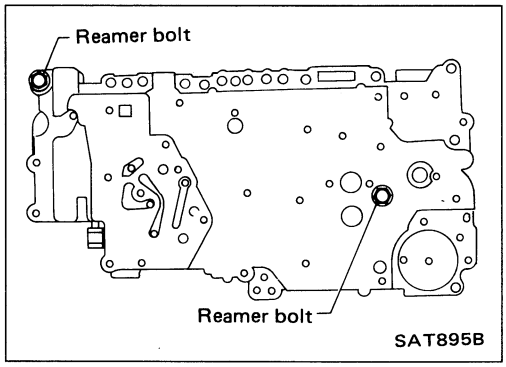


c. Fit oil filter and install lower body on upper body.

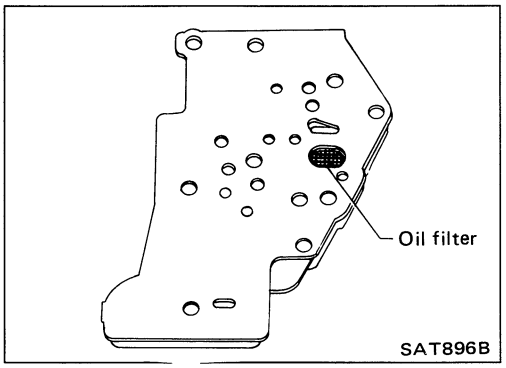


d. Temporarily assemble lower and upper bodies, using reamer bolt as a guide.

Be careful not to dislocate or drop steel balls and oil filter.

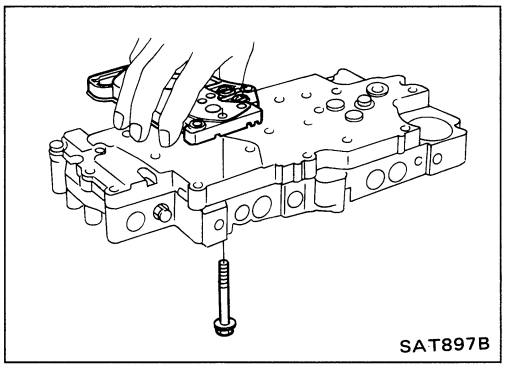


Control Valve Assembly (Cont'd)

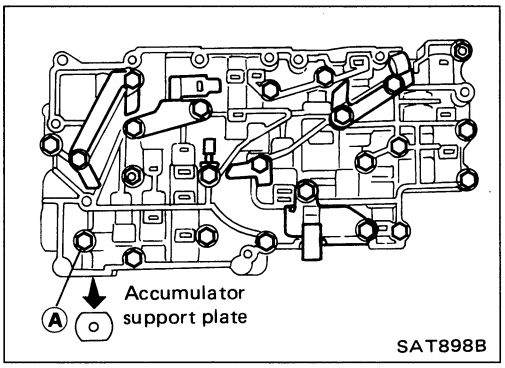


2. Install solenoid body on control valve body.

a. Fit oil filter and install solenoid body separator gaskets and separator plate on solenoid body.

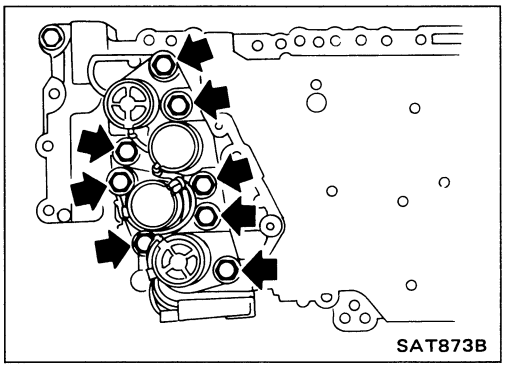


b. Install solenoid body on control valve body and temporarily tighten bolts.



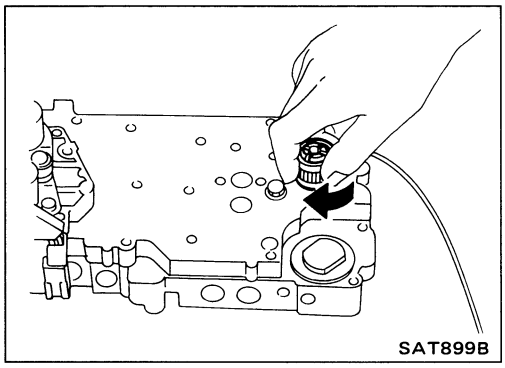
c. Install accumulator support plate and harness clips in their proper locations, and tighten all bolts.

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)



3. Install solenoids.

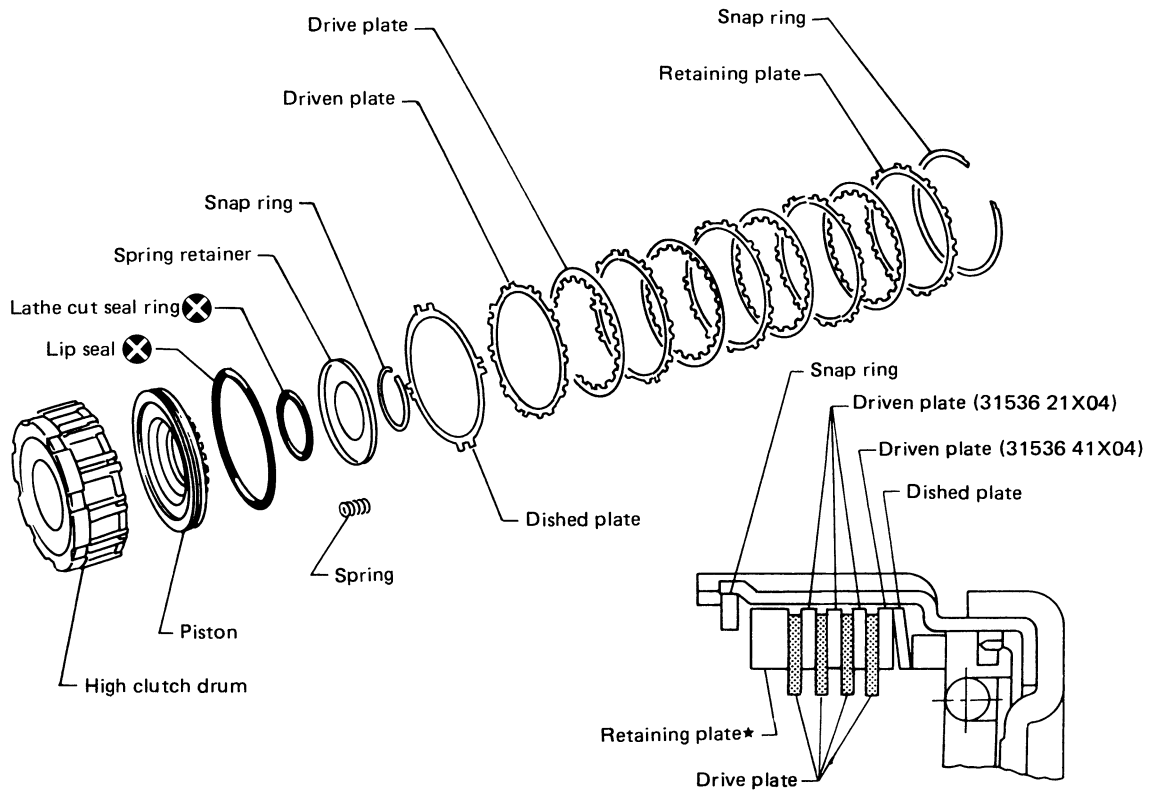
a. Attach O-ring and install 4-unit solenoid assembly on solenoid body.
: 7 - 9 N·m (0.7 - 0.9 kg-m, 5.1 - 6.5 ft-lb)



b. Attach O-ring, and install and tighten timing solenoid firmly.

High Clutch

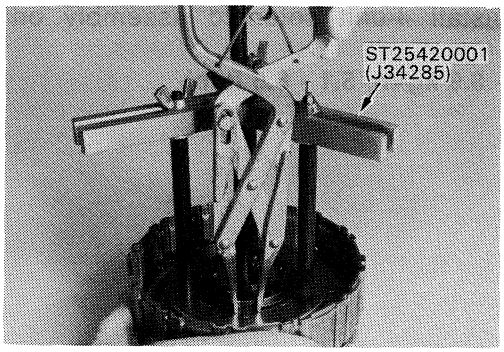
For the number of clutch sheets (drive plate and driven plate), refer to the below cross-section.



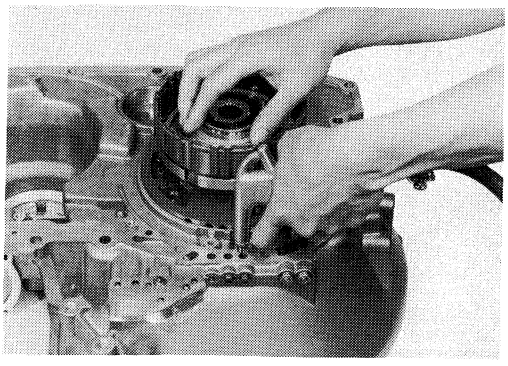
★: Select with proper thickness.

SAT211C

DISASSEMBLY



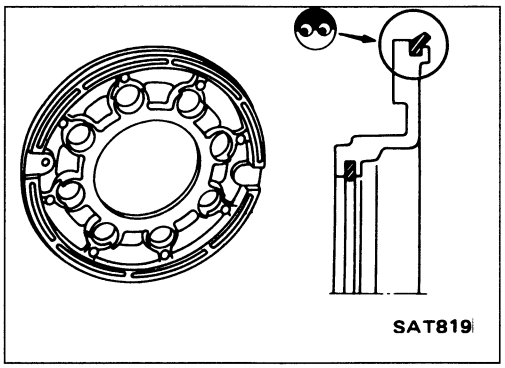
- Compress clutch springs and remove snap ring from spring retainer.



- Place clutch drum onto oil pump, and withdraw clutch piston with compressed air.

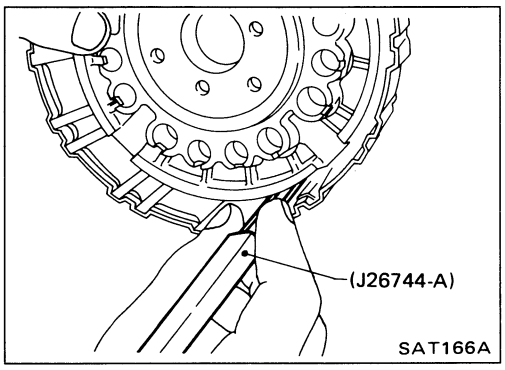
High Clutch (Cont'd)

INSPECTION AND ASSEMBLY


SAT819

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.

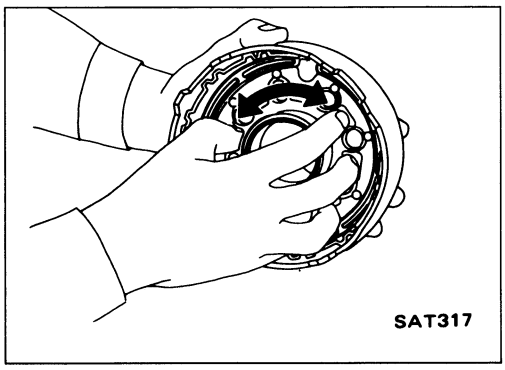
- Never assemble clutch dry; always lubricate its components thoroughly.
- Always install piston seal in direction shown in figure at left.



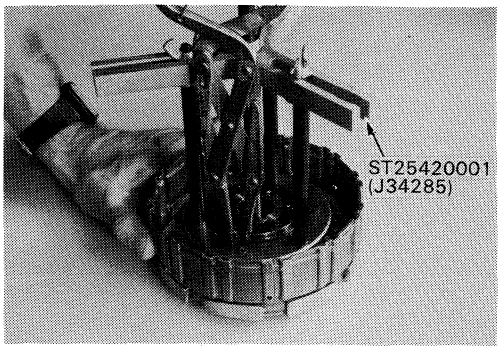
SAT166A

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.

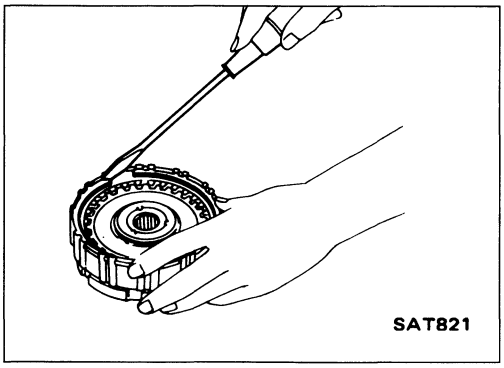

SAT317

- After installing piston, turn piston by hand to ensure that there is no binding.

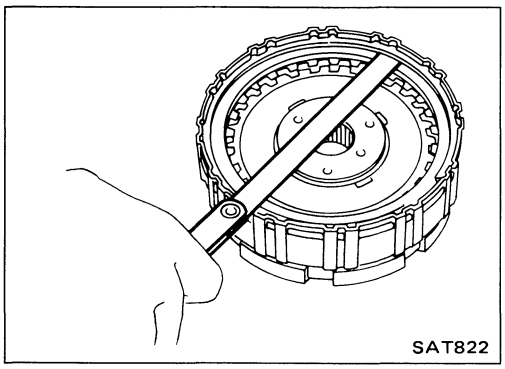


5. Install clutch springs.
6. Reinstall snap ring. Be sure snap ring is properly seated.

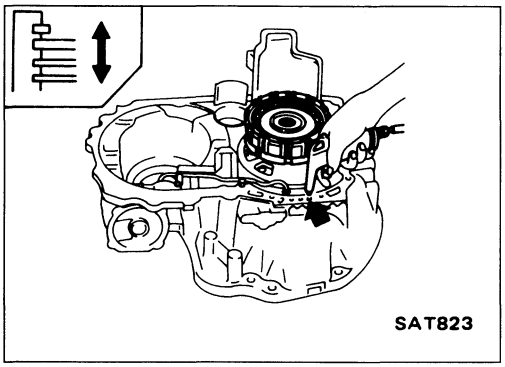
High Clutch (Cont'd)


SAT821

7. Install driven plates, drive plates, and secure with snap ring.


SAT822

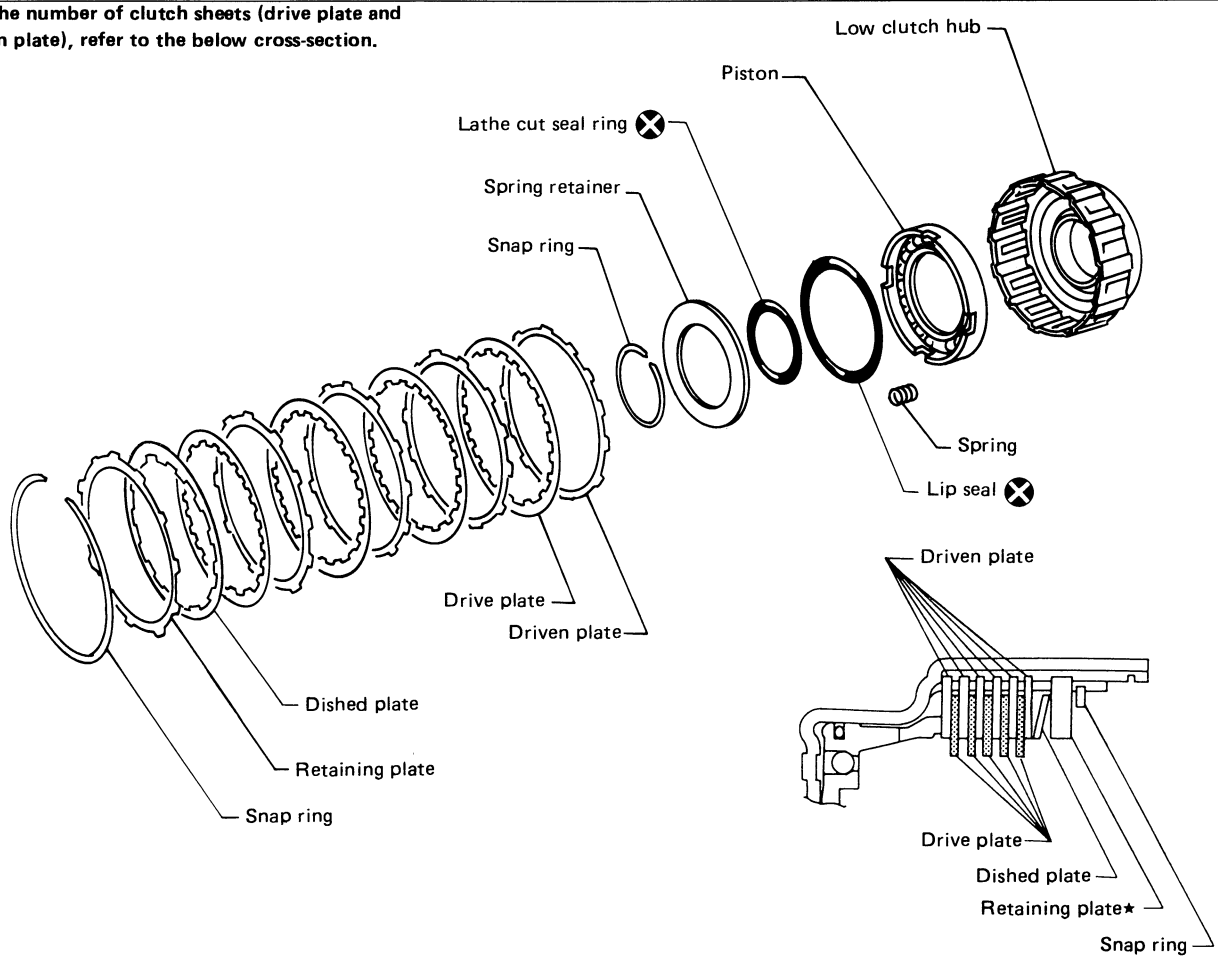
8. Measure clearance between retaining plate and snap ring. Always measure the existing minimum clearance, since snap ring is a wave type.
   Specified clearance:
   Standard
   1.4 - 1.8 mm (0.055 - 0.071 in)
   Allowable limit
   2.6 mm (0.102 in)
   Available retaining plates:
   Refer to S.D.S.


SAT823

9. Check high clutch operation using compressed air.

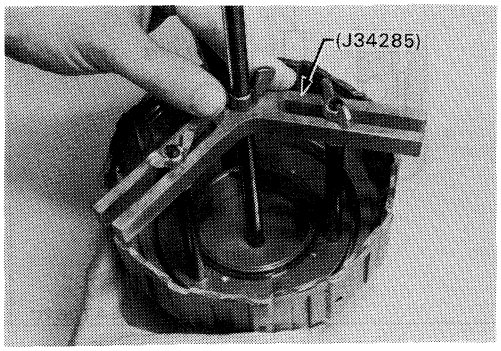
Low Clutch

For the number of clutch sheets (drive plate and driven plate), refer to the below cross-section.

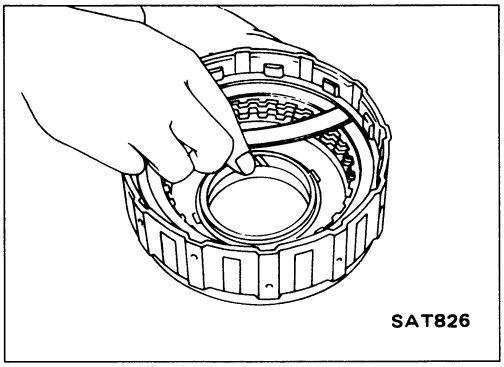


★: Select with proper thickness.

SAT212C



- Use Tool to remove the clutch spring snap ring.



- 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)

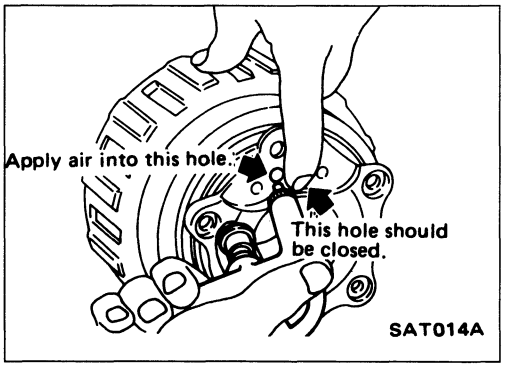
Allowable limit

1.8 mm (0.071 in)

Available retaining plates:

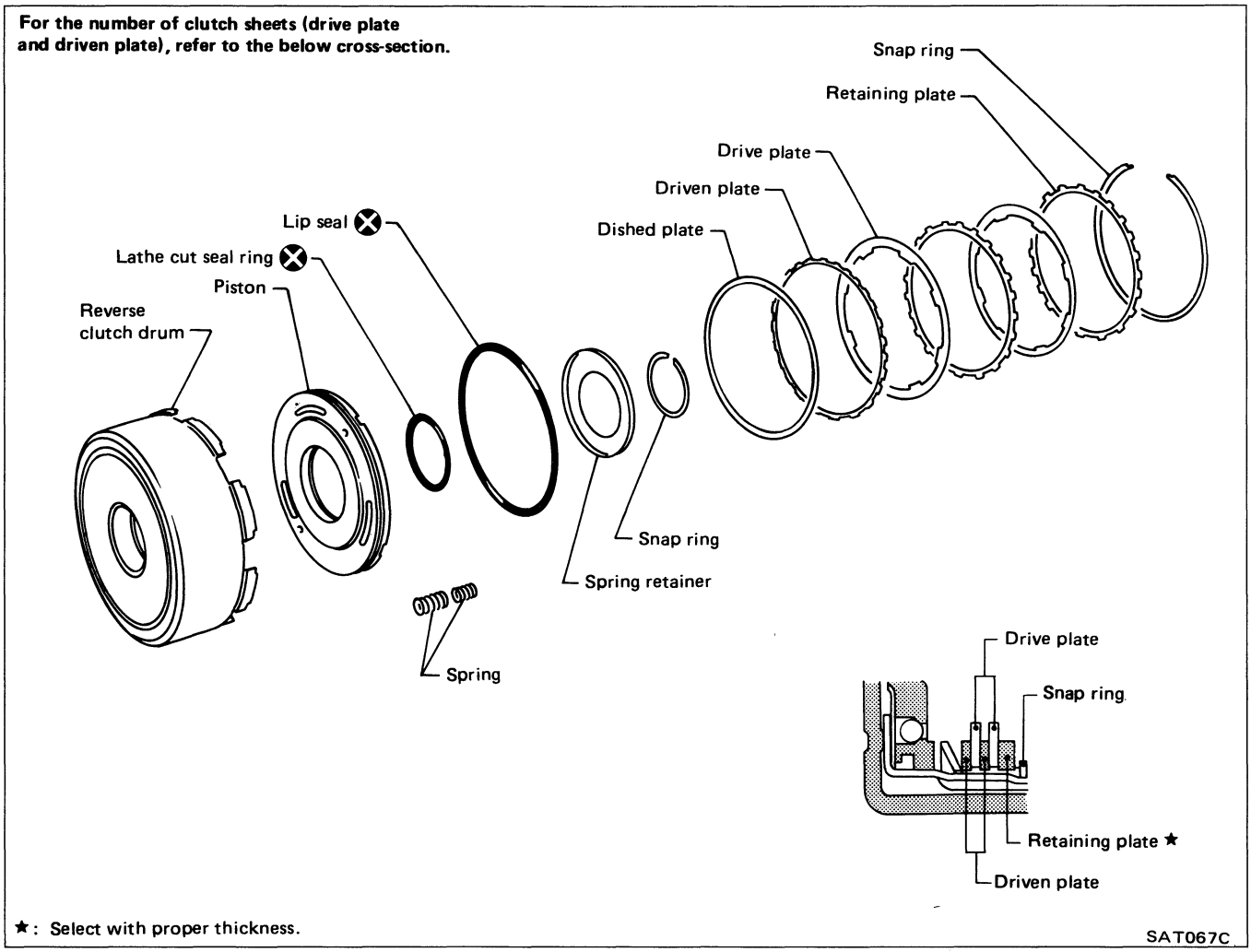
Refer to S.D.S.

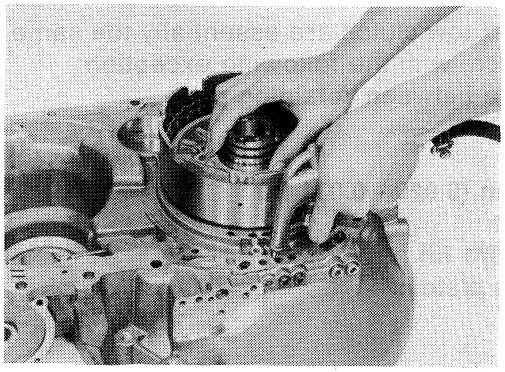
Low Clutch (Cont'd)



- After assembly, check the operation of clutch.

Reverse Clutch

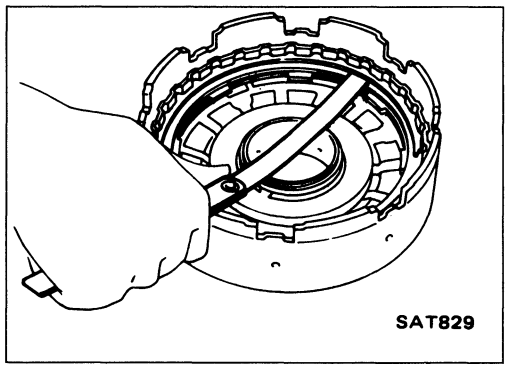




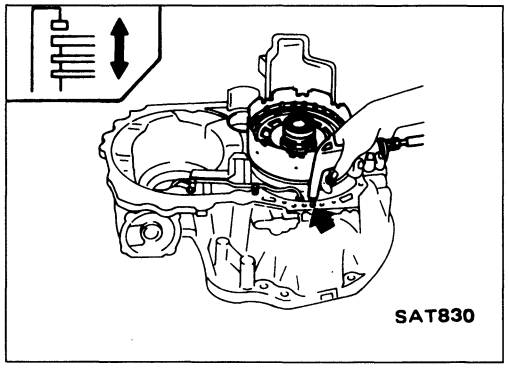
Service procedures for reverse clutch are essentially the same as those for high clutch, with the following exception:

- Remove reverse clutch piston.

Reverse Clutch (Cont'd)


SAT829

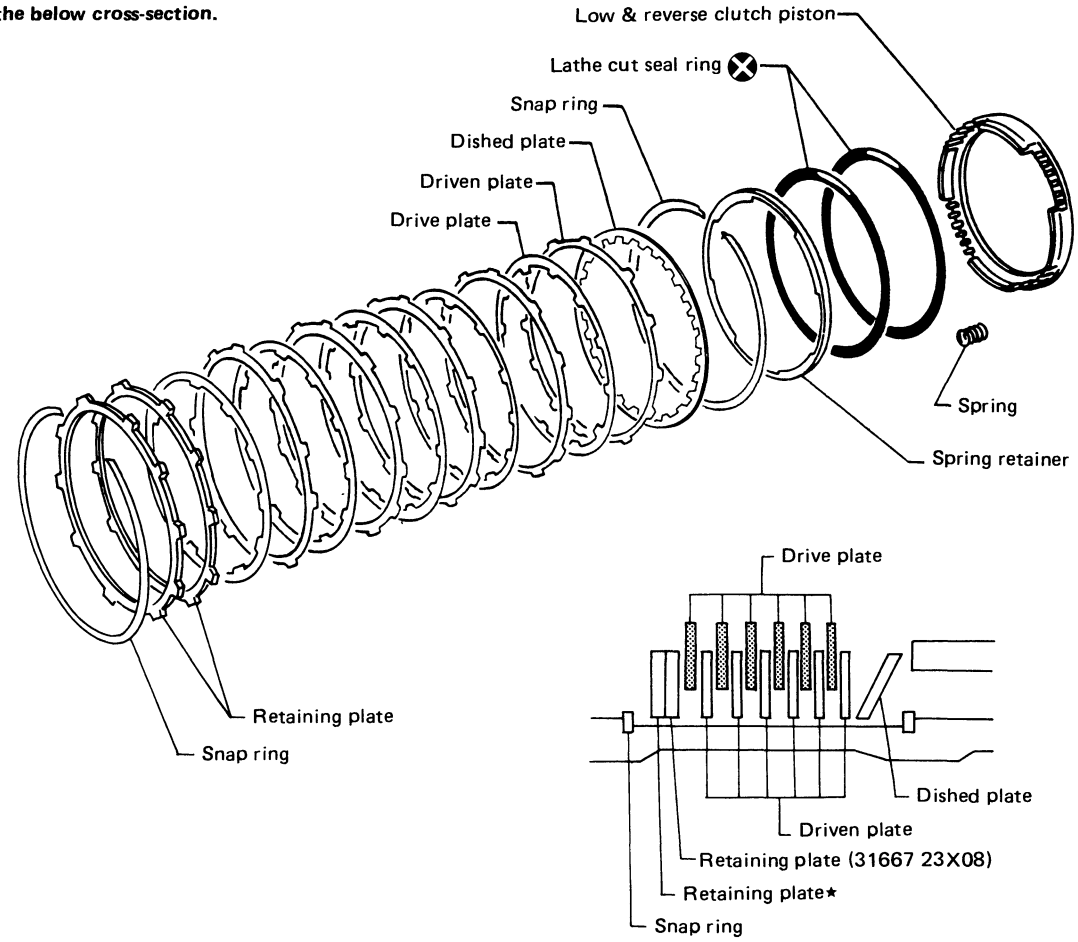
Specified clearance between retaining plate and snap ring:
Standard
0.5 - 0.8 mm (0.020 - 0.031 in)
Allowable limit
1.2 mm (0.047 in)
Available retaining plates:
Refer to S.D.S.


SAT830

- After assembly, check the operation of clutch.

Low & Reverse Brake

For the number of clutch sheets (drive plate and driven plate), refer to the below cross-section.



★: Select with proper thickness.

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)

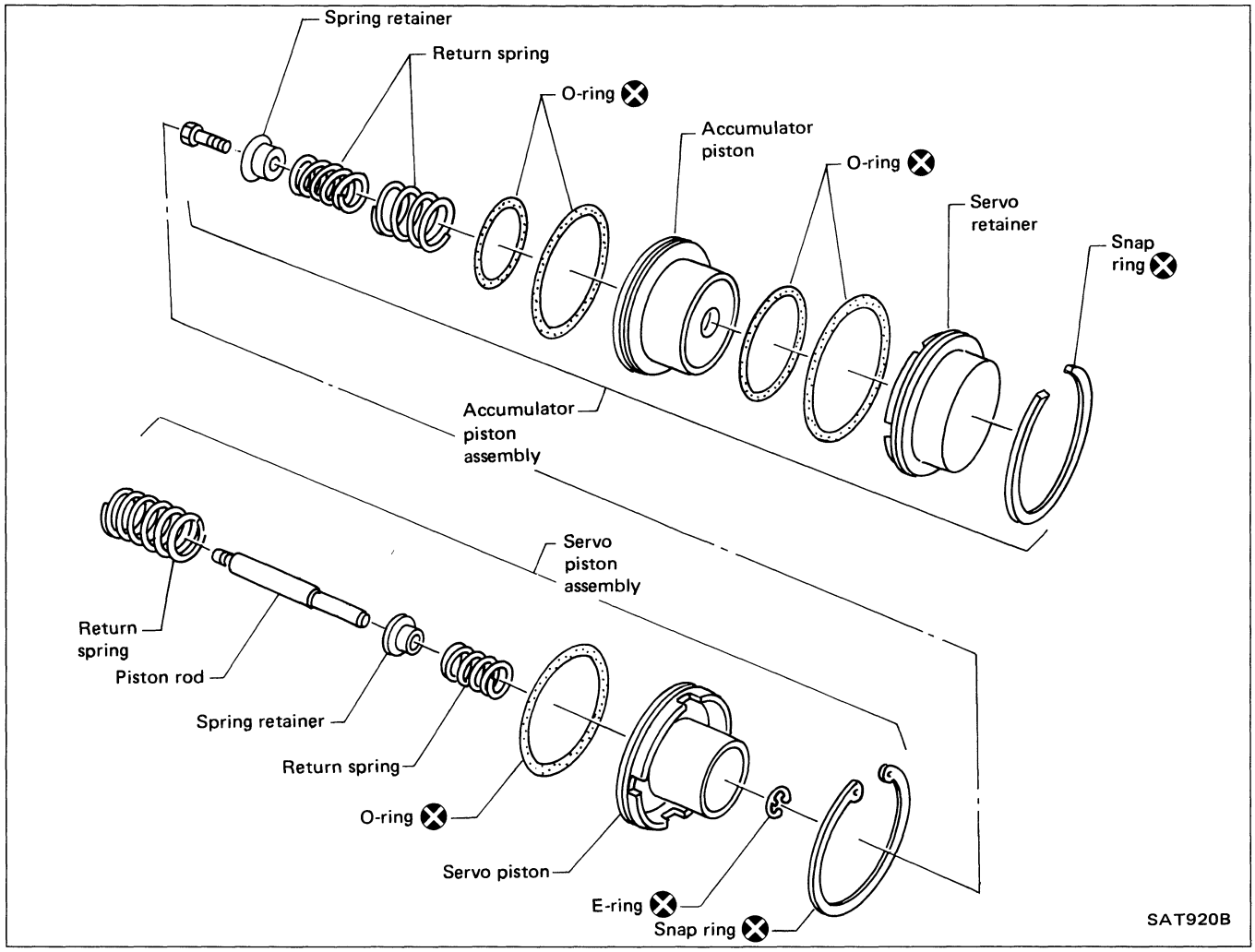
Allowable limit

2.8 mm (0.110 in)

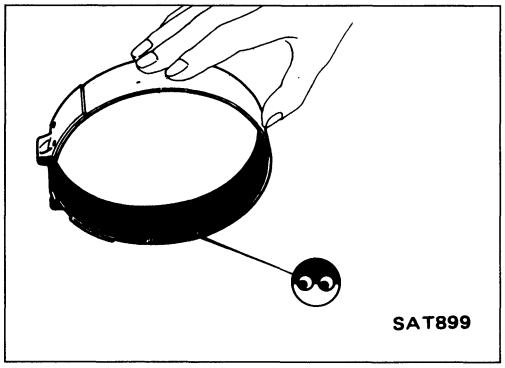
Available retaining plates:

Refer to S.D.S.

Brake Band and Band Servo

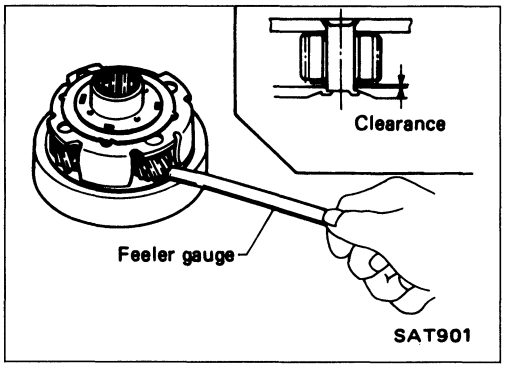


Brake Band and Band Servo (Cont'd)



INSPECTION

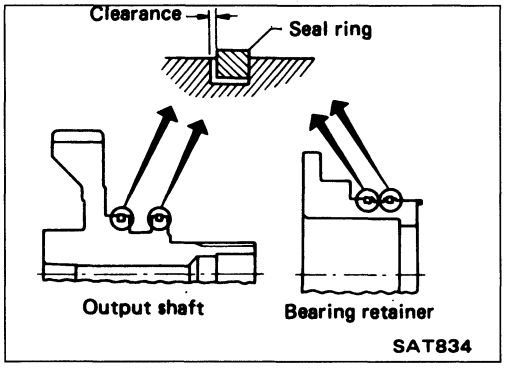
- Inspect band friction material for wear. If cracked, chipped or burnt spots are apparent, replace the band.
- Check band servo components for wear and scoring.



Planetary Carrier

INSPECTION

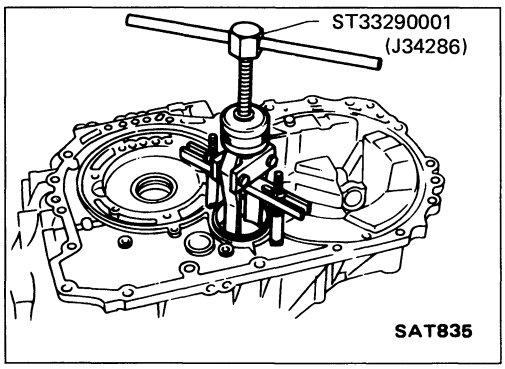
- Check clearance between pinion washer and planetary carrier with a feeler gauge.
  Standard clearance:
  Front carrier
  0.15 - 0.70 mm (0.0059 - 0.0276 in)
  Rear carrier
  0.20 - 0.70 mm (0.0079 - 0.0276 in)
  Replace if the clearance exceeds 0.80 mm (0.0315 in).
- Check planetary gear sets and bearings for damaged or worn gears.



Bearing Retainer and Output Shaft

INSPECTION

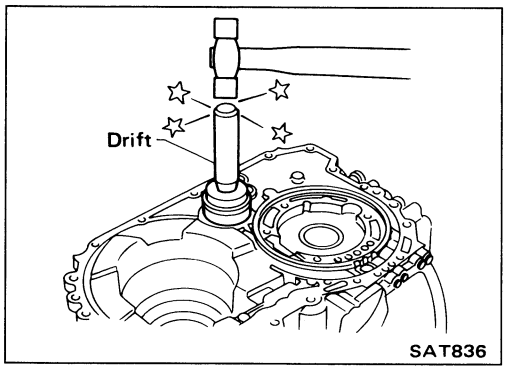
Measure clearance between seal ring and ring groove.
Standard clearance:
0.10 - 0.25 mm (0.0039 - 0.0098 in)
Wear limit:
0.25 mm (0.0098 in)

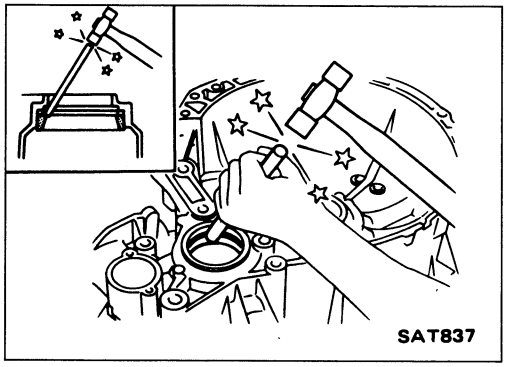


Converter Housing and Transmission Case

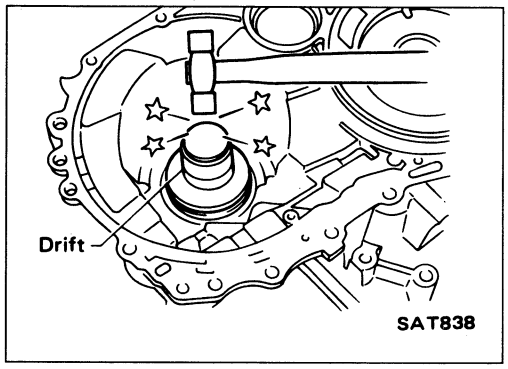
BEARING OUTER RACE

- Reduction pinion gear front bearing outer race.

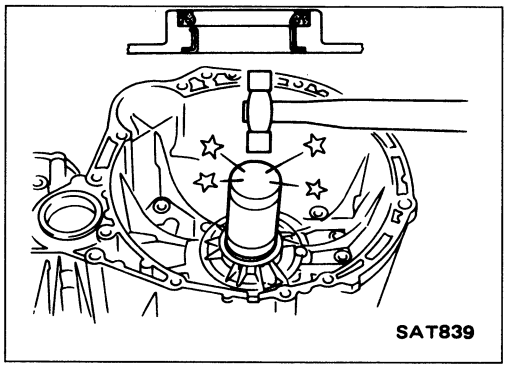




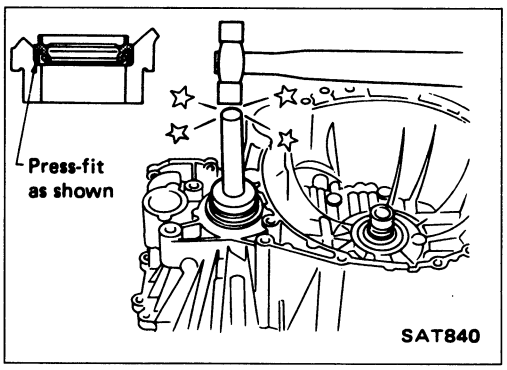
- Differential side bearing outer race



OIL SEAL

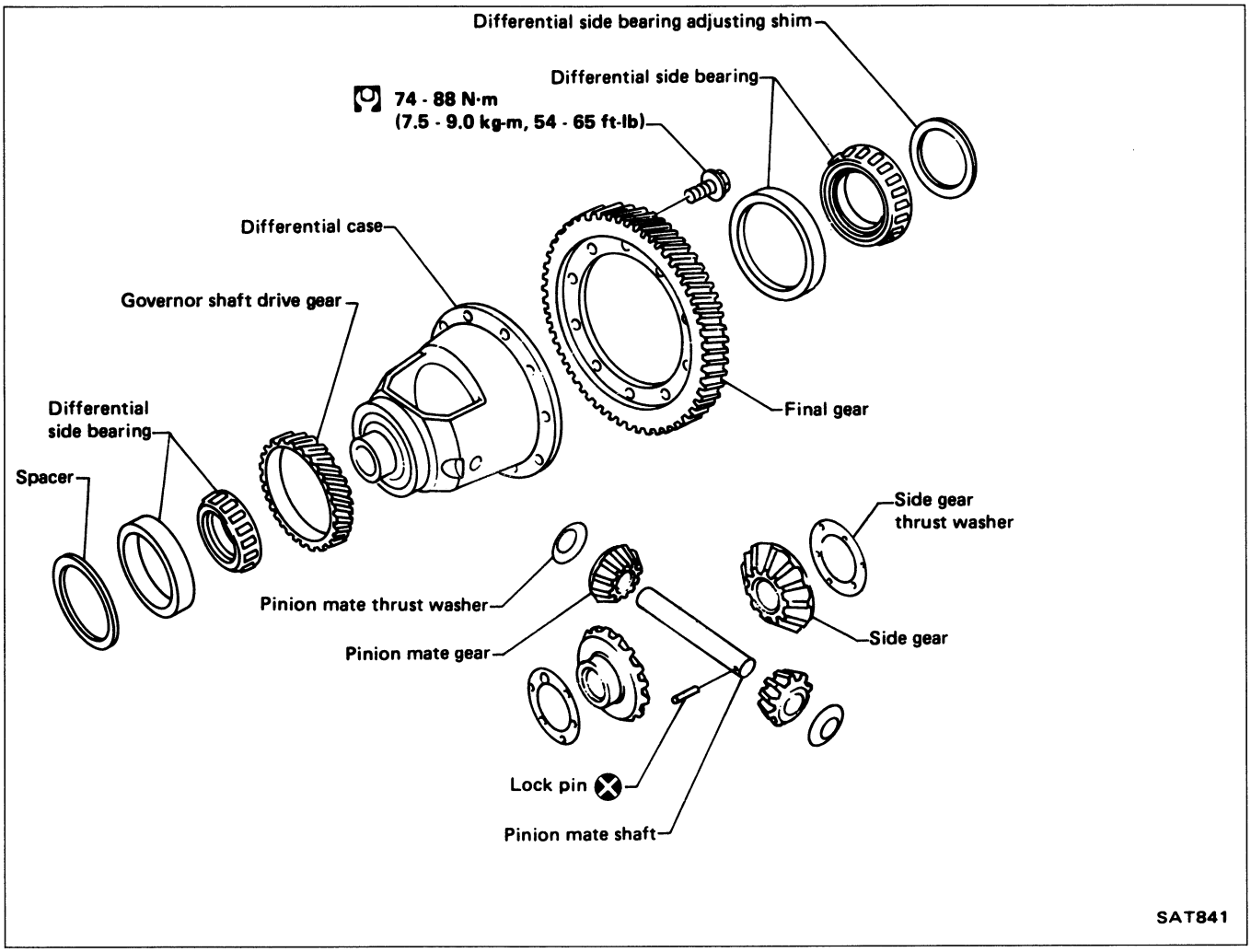


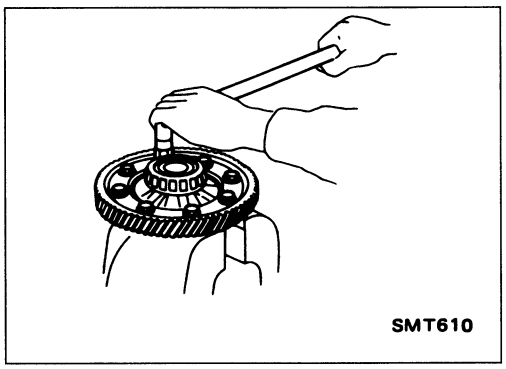
- Torque converter oil seal



- Differential side oil seal

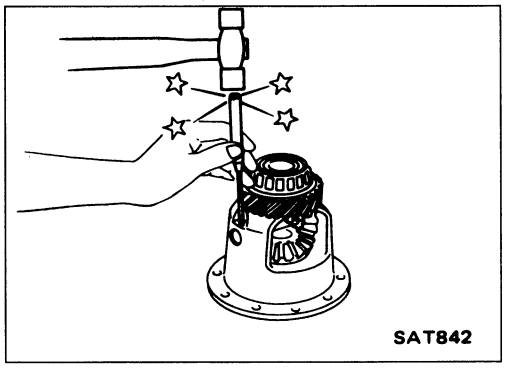
Final Drive (Without viscous coupling)





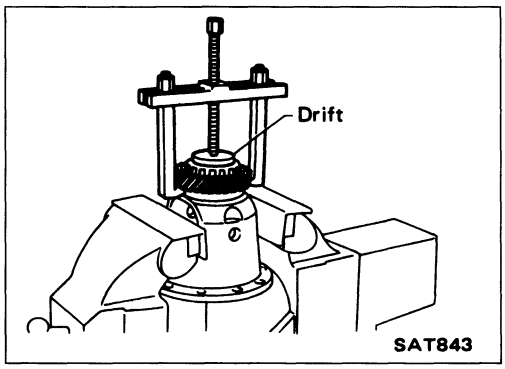
DISASSEMBLY

1. Remove final gear.

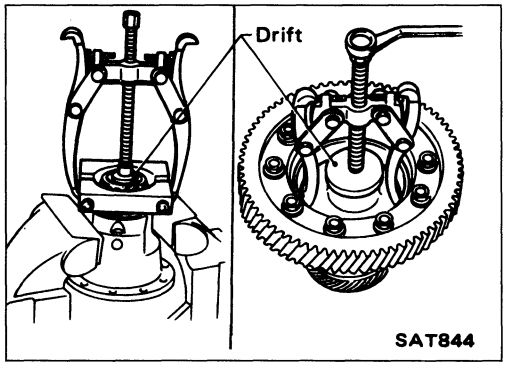


2. Drive out pinion mate shaft lock pin and draw out pinion mate shaft.

Final Drive (Without viscous coupling) (Cont'd)

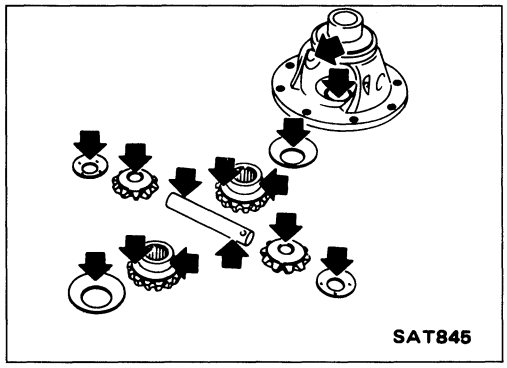


3. Remove governor shaft drive gear.

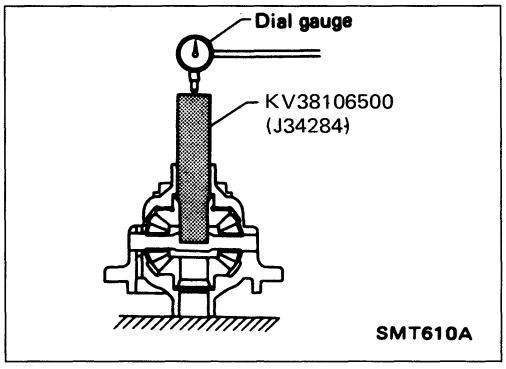


4. Drive out differential side bearing outer race and inner cone.

INSPECTION

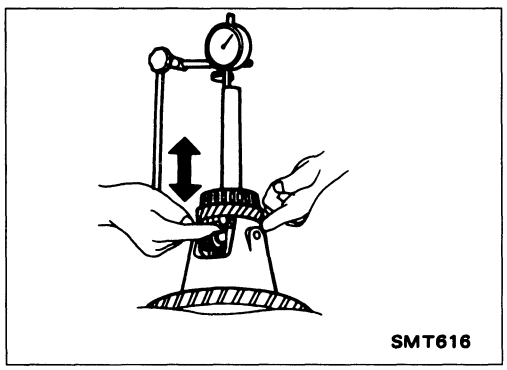


1. Check mating surface of differential case, side gears and pinion mate gears. Replace as required.



2. Check clearance between side gear and differential case with washer following the procedure below.

a. Set Tool and dial gauge on side gear.



b. Move side gear up and down to measure dial gauge deflection. Always measure gauge deflection on both side gears.

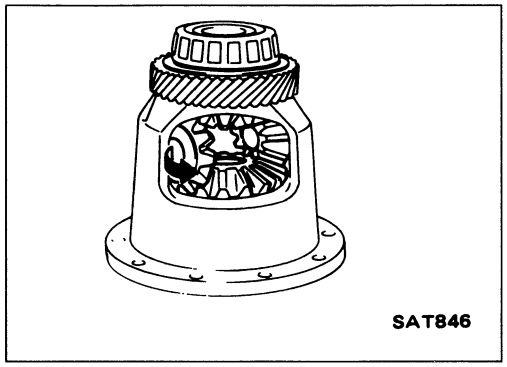
Clearance between side gear and differential case with washer:
0.1 - 0.2 mm (0.004 - 0.008 in)

c. If clearance exceeds the specified value, check for wear and replace necessary parts.

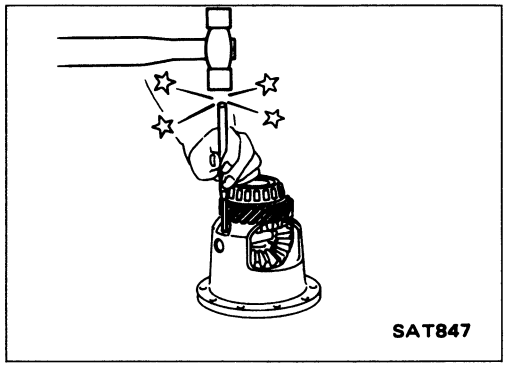
3. Check tapered roller bearings for wear, scratches, pitching or flaking.

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.

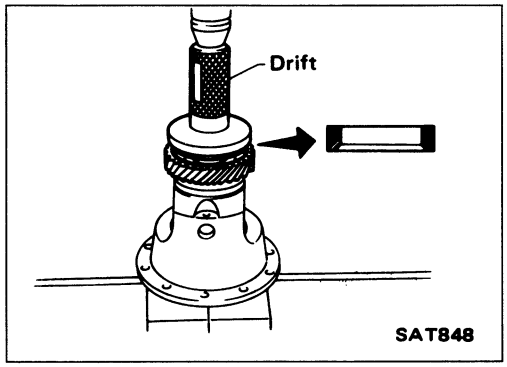
When inserting, be careful not to damage pinion mate washers.

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.

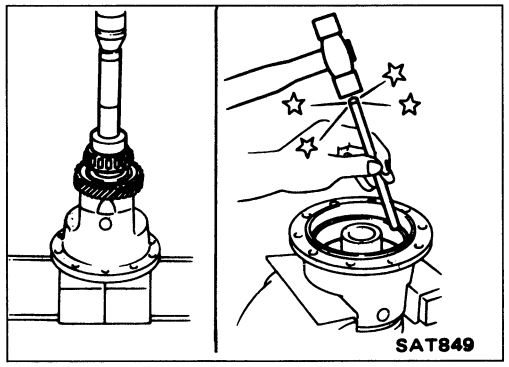
5. Install pinion mate shaft lock pin using a punch.

Make sure that lock pin is flush with case.



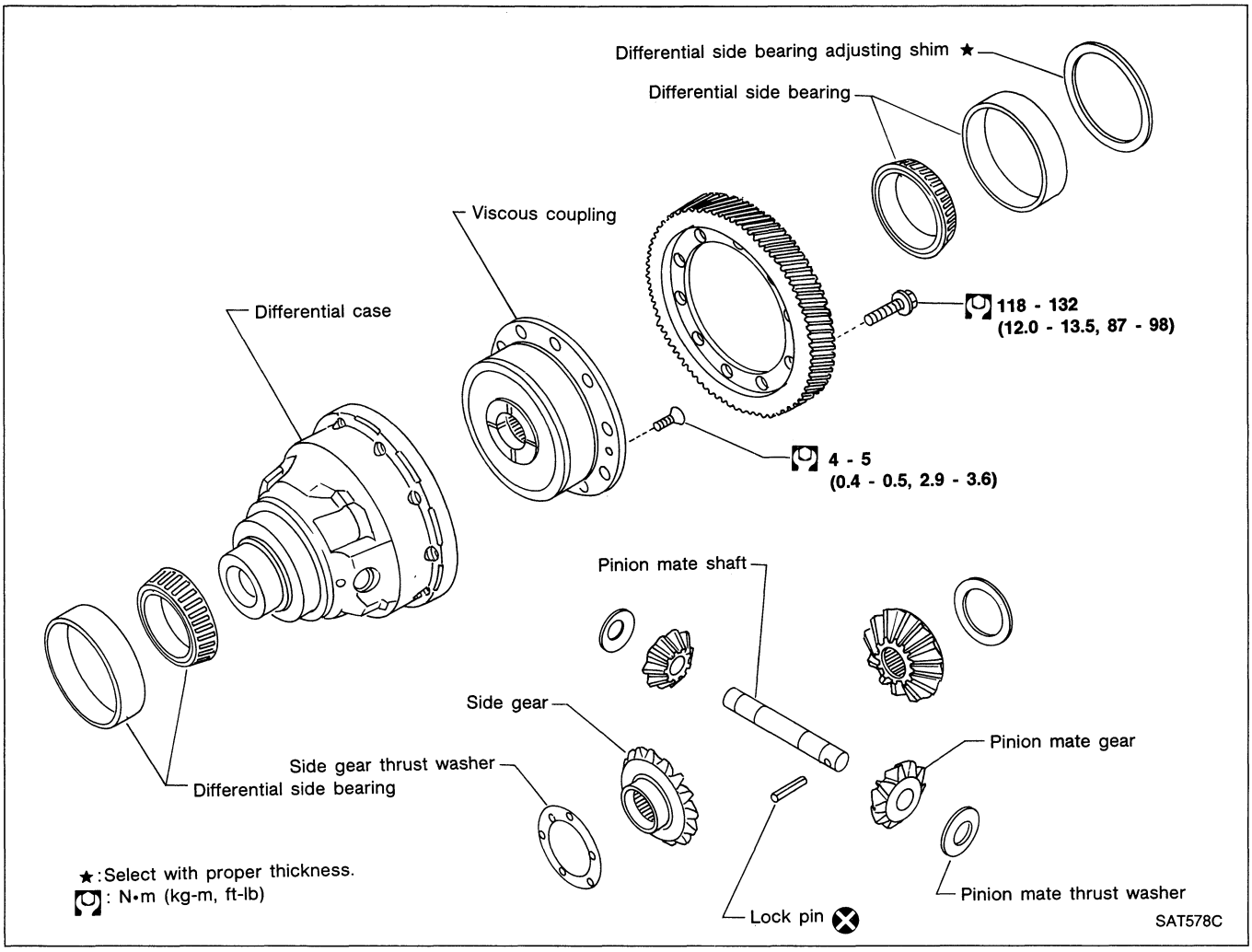
SAT848

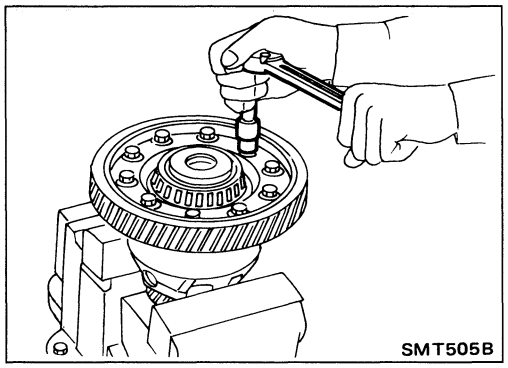
6. Install governor shaft drive gear.


SAT849

7. Press on differential side bearing inner cone and outer race.
8. Install final gear.

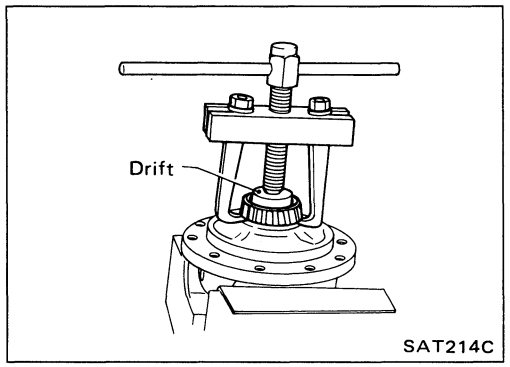
Final Drive (With viscous coupling)





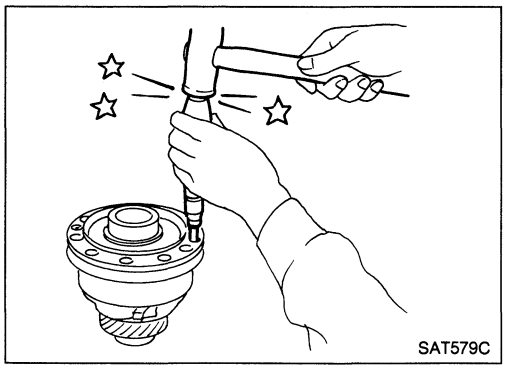
DISASSEMBLY

1. Remove final gear.

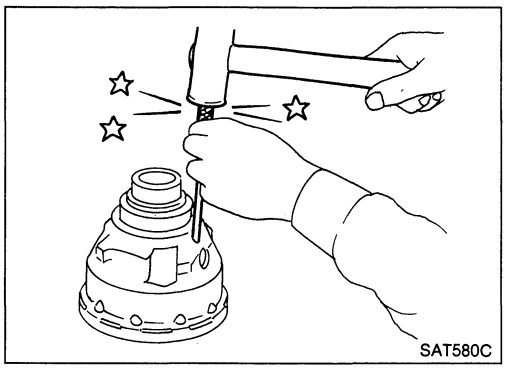


2. Remove differential side bearings.

Final Drive (With viscous coupling) (Cont'd)

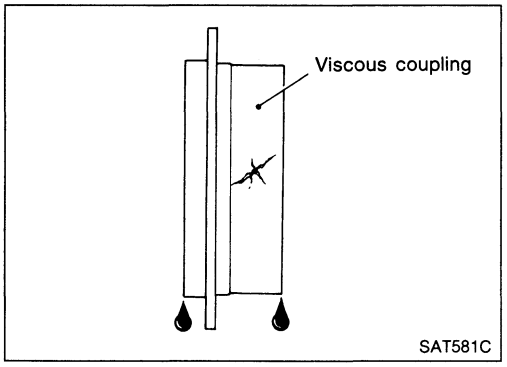

SAT579C

3. Remove viscous coupling.


SAT580C

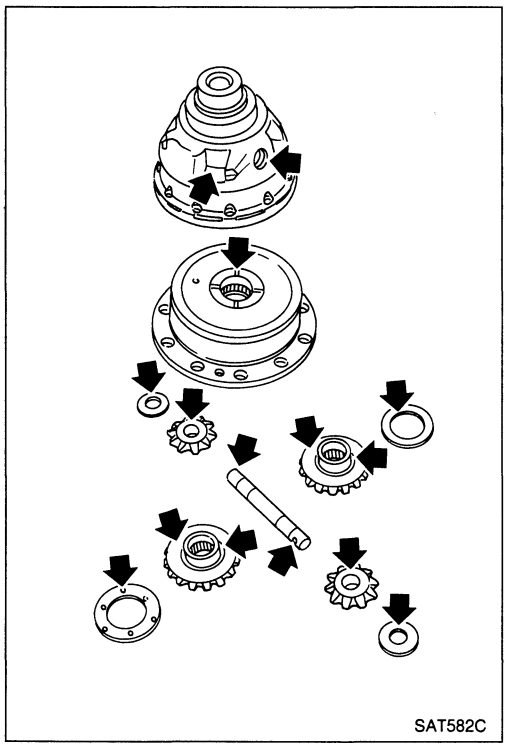
4. Drive out pinion mate shaft lock pin and draw out pinion mate shaft.

INSPECTION



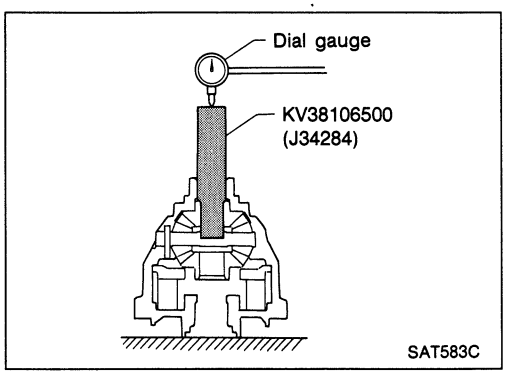
SAT581C

1. Check viscous coupling case for cracks and silicone oil leakage.


SAT582C

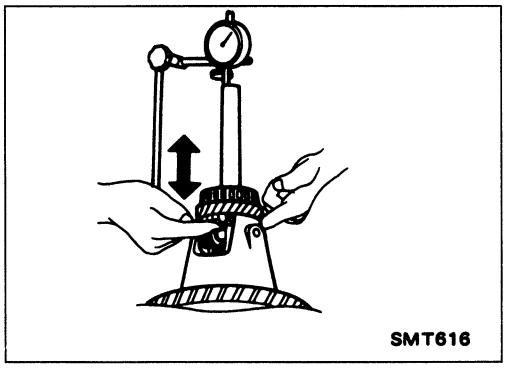
2. Check mating surface of differential case, side gears and pinion mate gears. Replace as required.

Final Drive (With viscous coupling) (Cont'd)



3. Check clearance between side gear and differential case with washer following the procedure below.

a. Set Tool and dial gauge on side gear.



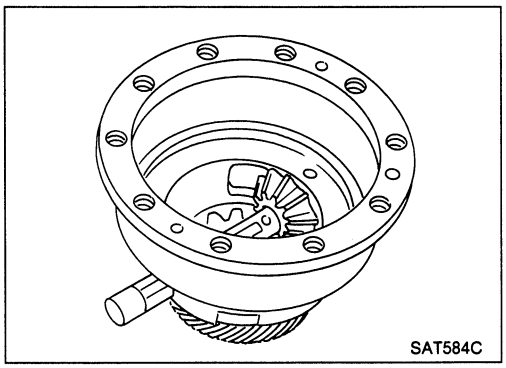
b. Move side gear up and down to measure dial gauge deflection. Always measure gauge deflection on both side gears.

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.

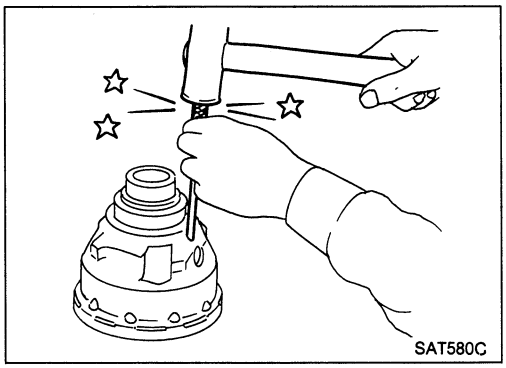
4. Check tapered roller bearings for wear, scratches, pitching or flaking.

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.

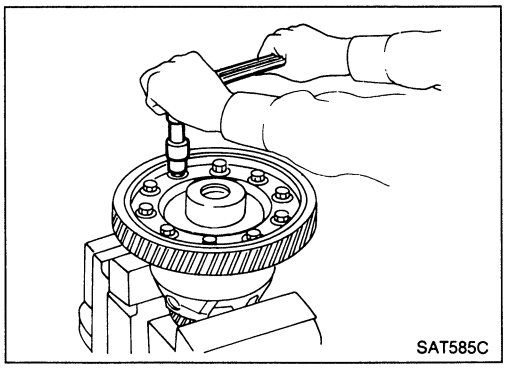


4. Measure clearance between side gear and pinion mate gear, referring to "Inspection". If necessary, adjust.

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.

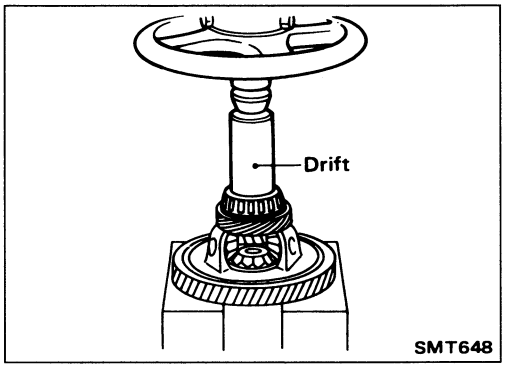
5. Install pinion mate shaft lock pin using a punch.

Make sure that lock pin is flush with case.

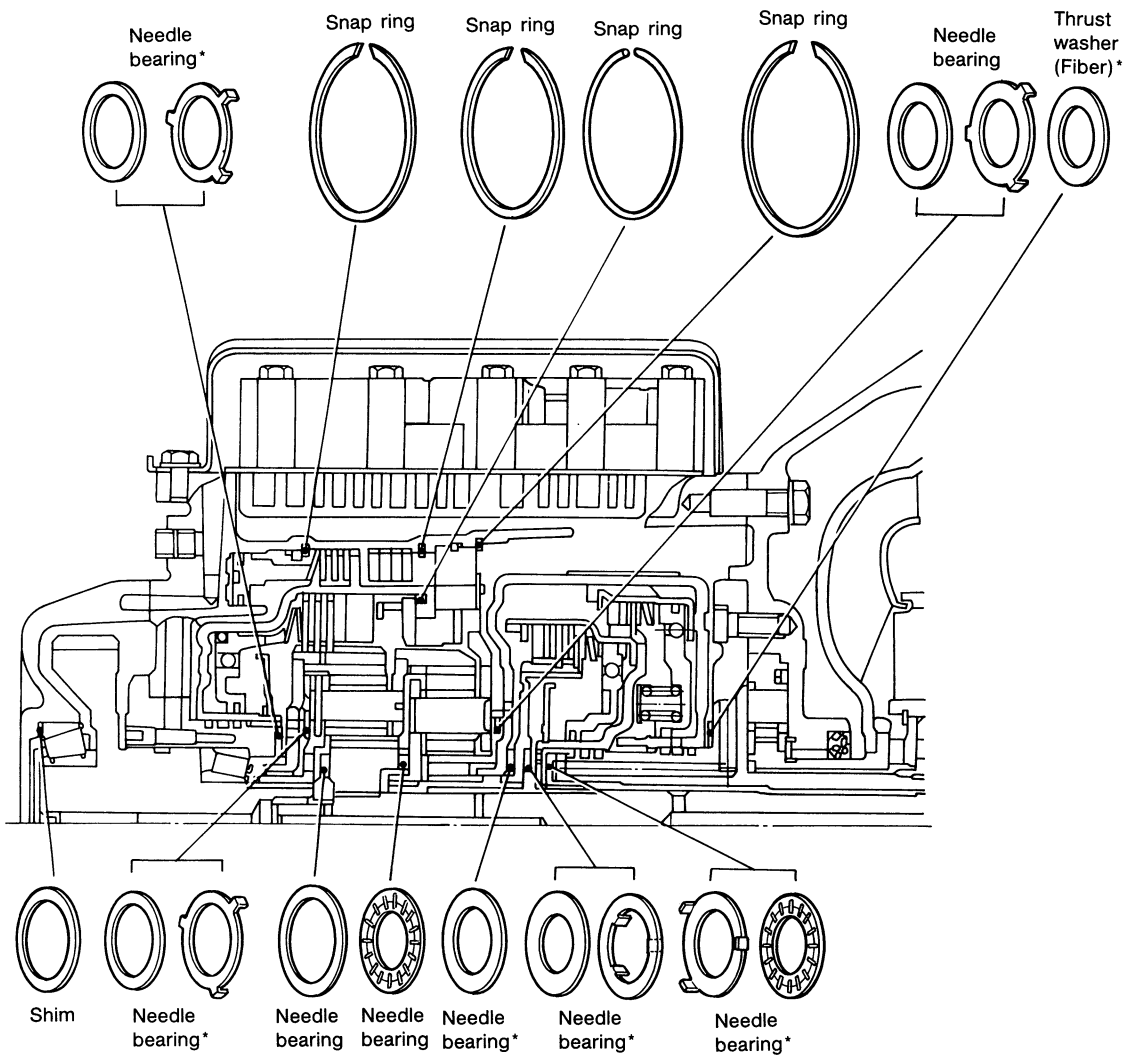


6. Install viscous coupling and final gear.

Final Drive (With viscous coupling) (Cont'd)

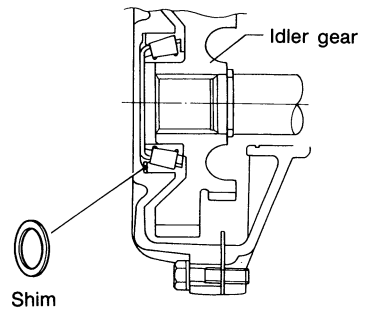


7. Press on differential side bearings.

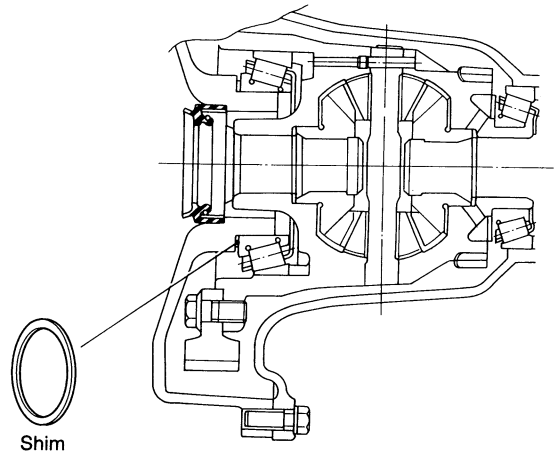


When installing, apply vaseline to parts with "*" so that they will not drop off.

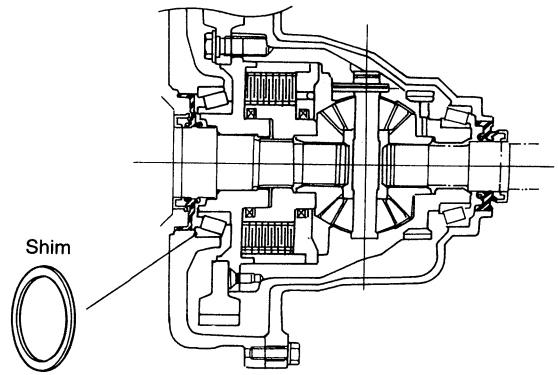
SAT586C

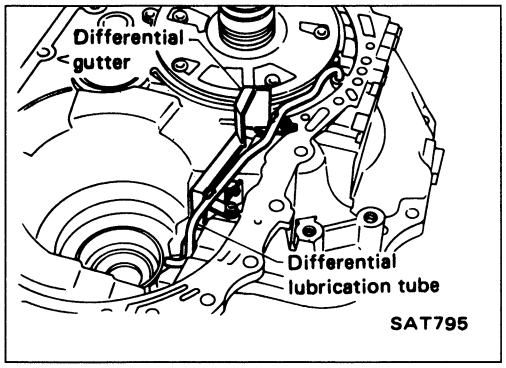


Without viscous coupling

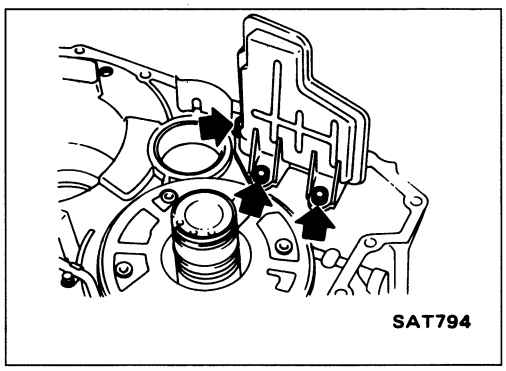


With viscous coupling

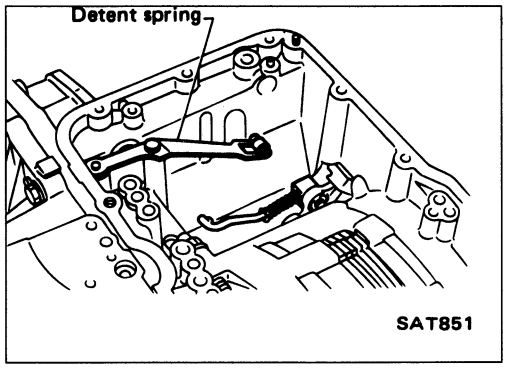




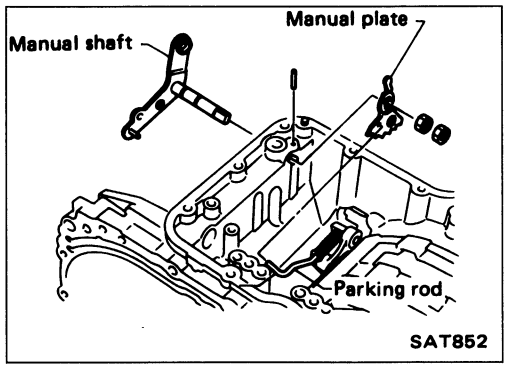
1. Install differential lubrication tube and differential gutter to converter housing.



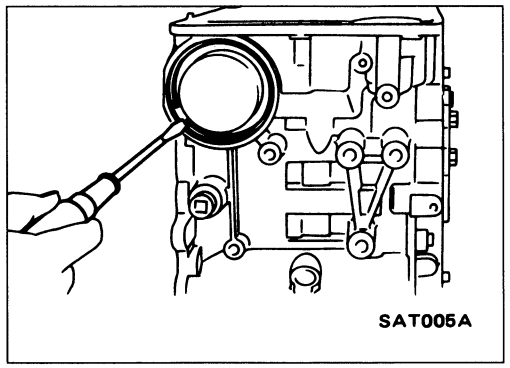
2. Install oil strainer.



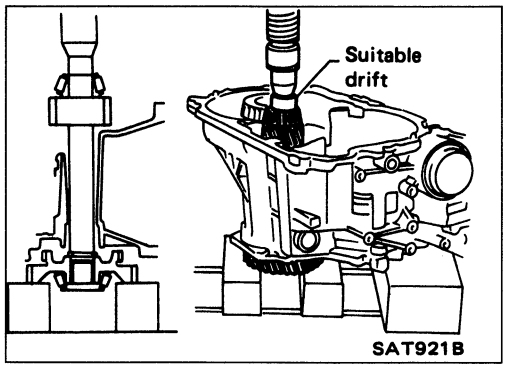
3. Install detent spring assembly.



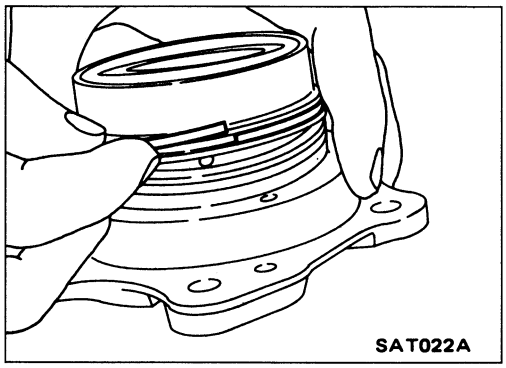
4. Pass parking rod into the hole in the manual plate and then install manual plate on manual shaft.



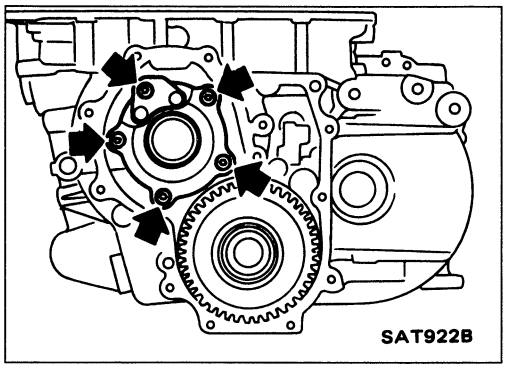
5. Install band brake servo, retainer and return spring and secure with snap ring.



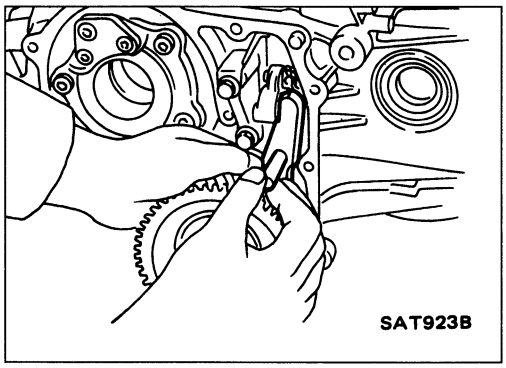
6. Install reduction gear.
a. Position reduction gear in transmission case so that it meshes with idler gear.
b. Press reduction gear into place using a drift, and install idler gear.



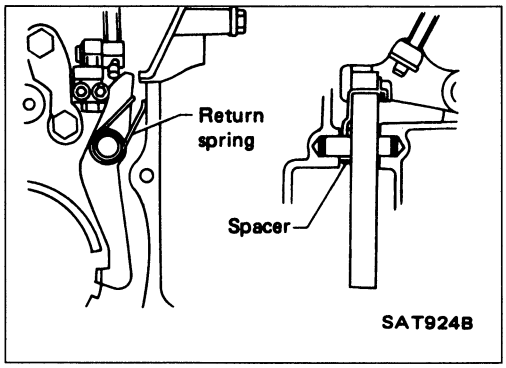
7. Install bearing retainer assembly.
a. Install seal rings onto bearing retainer with great care. Clean the grooves and liberally apply petroleum jelly to hold the rings in place. Otherwise, they could be cut or deformed when the low clutch and carrier assembly are installed.



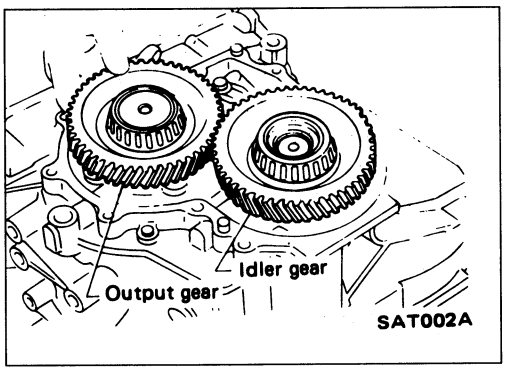
b. Install bearing retainer assembly.



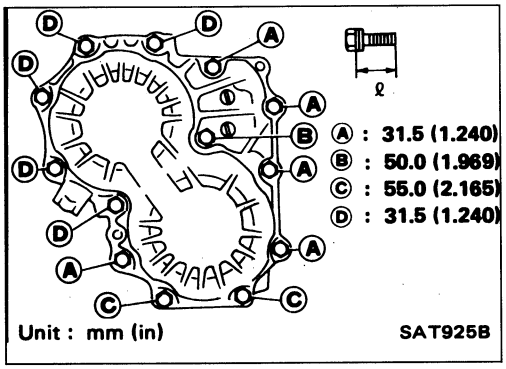
8. Install parking pawl and parking shaft.



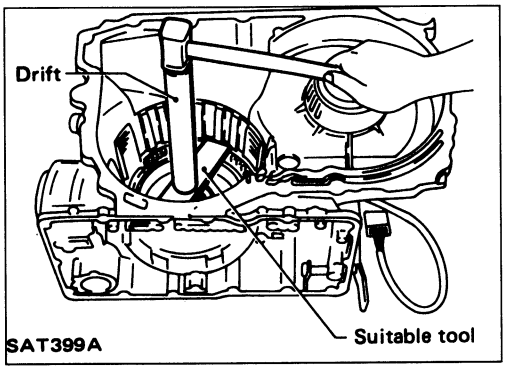
9. Install spacer and return spring.



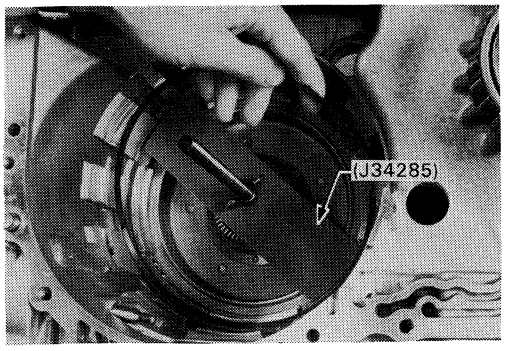
10. Install output gear.



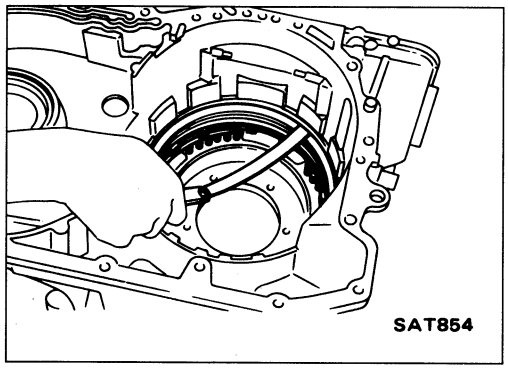
11. Temporarily install side cover and gasket.



12. Lubricate low and reverse brake piston seal, then install piston by tapping it evenly with Tool.

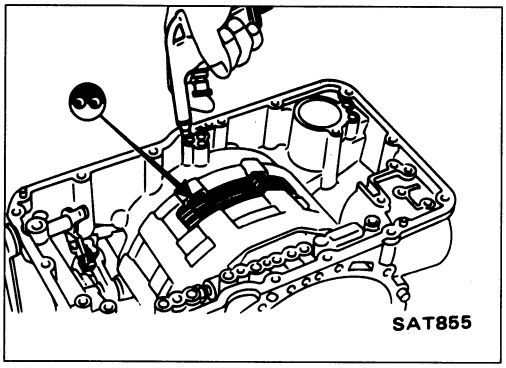


13. Install low and reverse brake retainer, and secure with snap ring.
14. Install low and reverse brake driven & drive plates and retaining plate, then secure with snap ring.

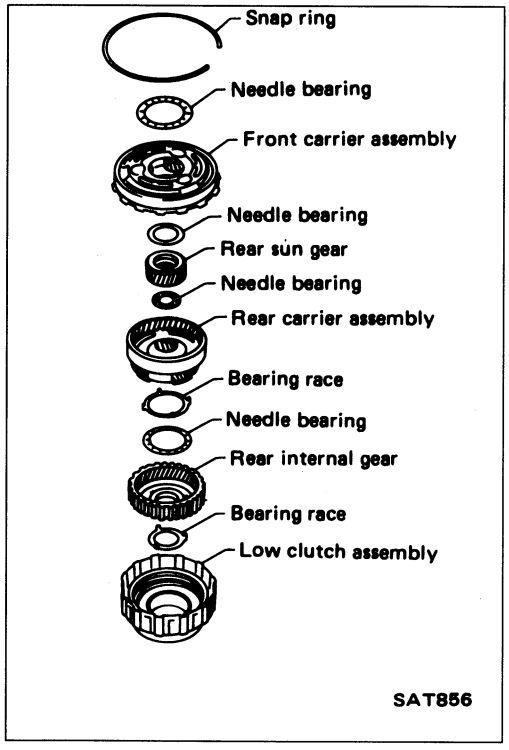

SAT854

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.

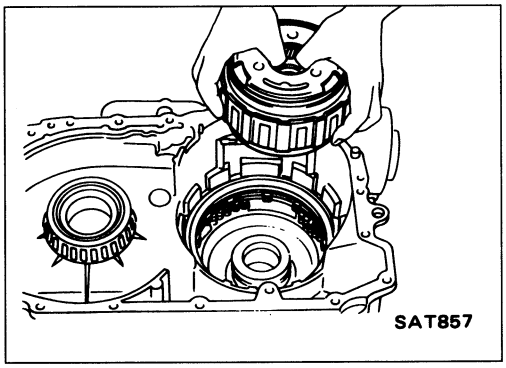

SAT855

- **Check low & reverse brake operation using air.**

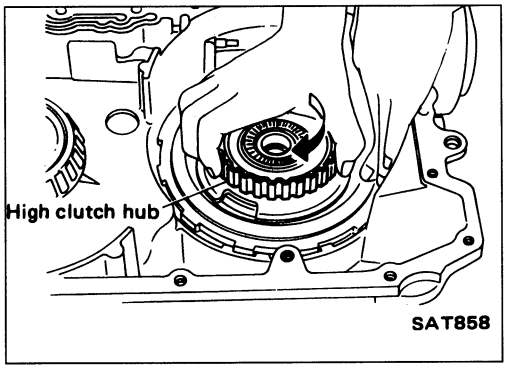


SAT856

16. Assemble front carrier, rear carrier and low clutch.

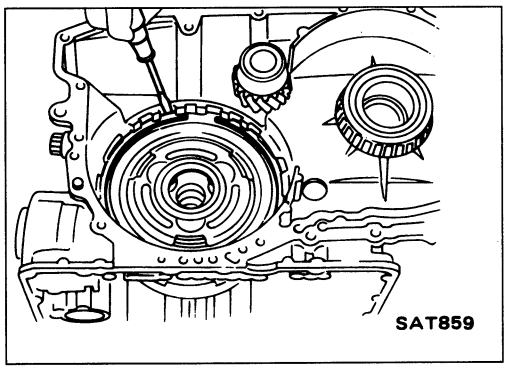

SAT857

17. Install carrier set.

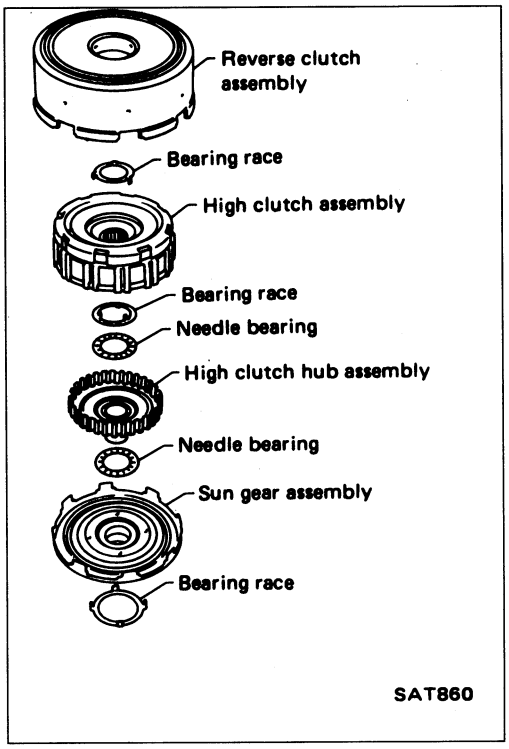


SAT858

18. Install one-way clutch assembly while rotating front carrier with high clutch hub.

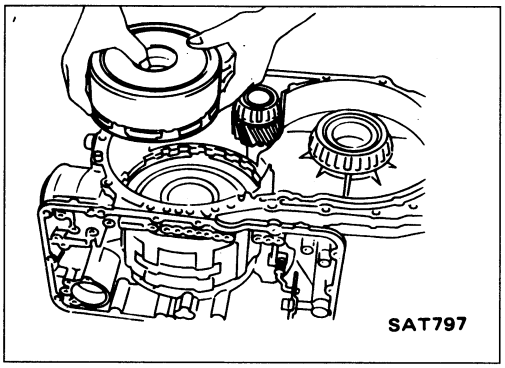

SAT859

19. Remove high clutch hub, and install clutch snap ring.

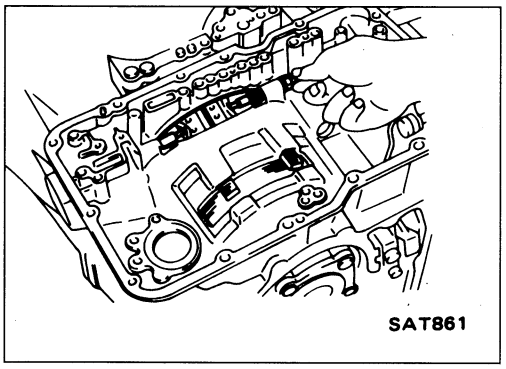


SAT860

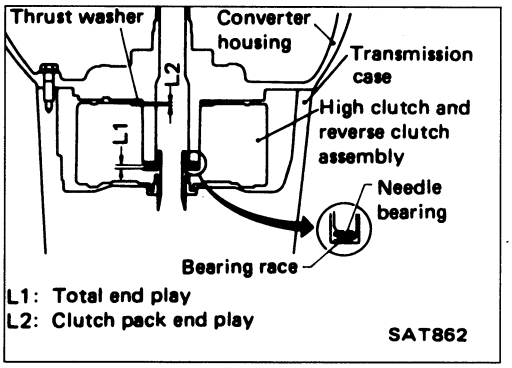
20. Assemble reverse clutch and high clutch.


SAT797

21. Install reverse and high clutch as a pack.


SAT861

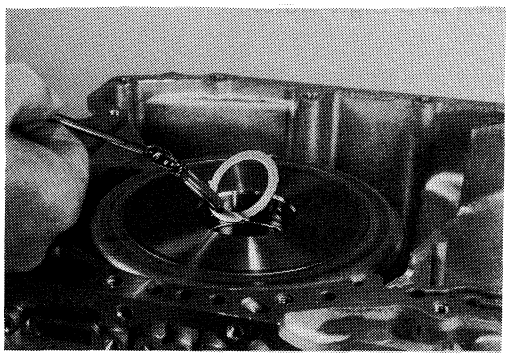
22. Install brake band and anchor pin. Temporarily tighten anchor bolt by hand.



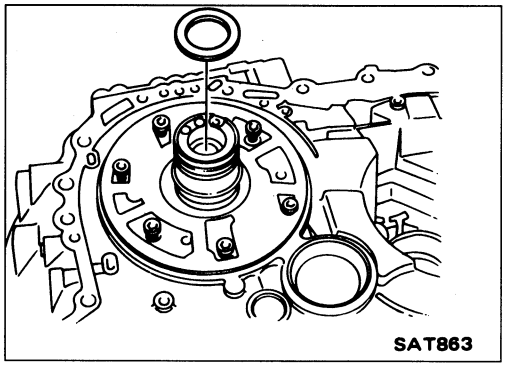
SAT862

23. Adjust total end play and clutch pack end play as follows:

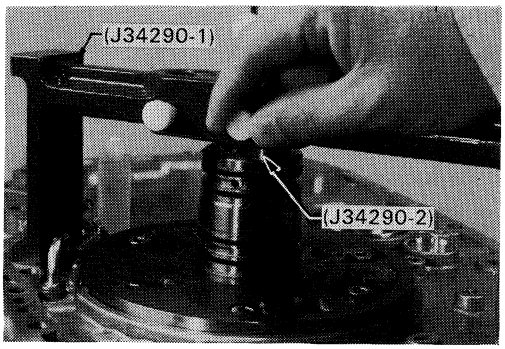
— Total end play —



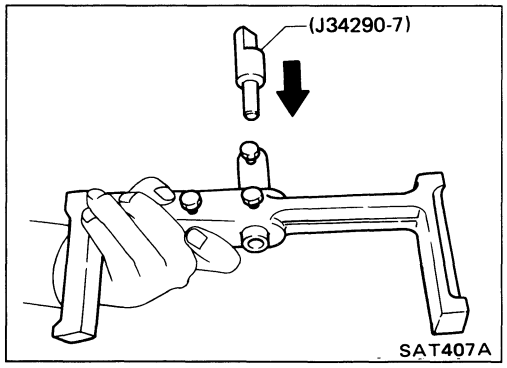
a. Remove thrust bearing race from high clutch drum.


SAT863

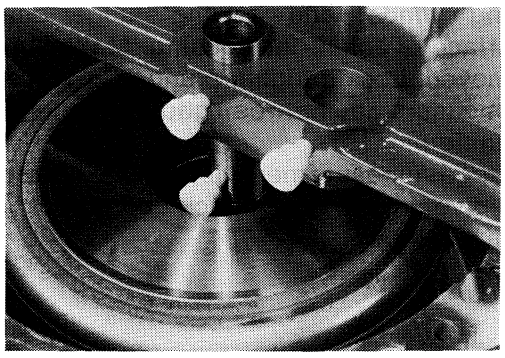
b. Install needle bearing on top of oil pump cover.



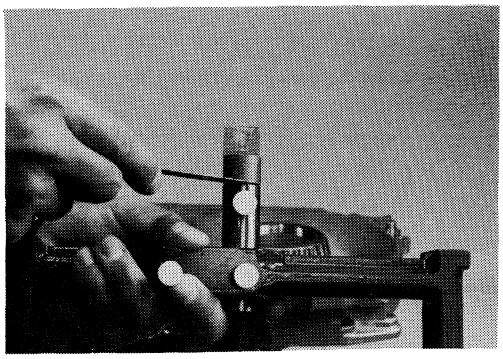
c. Place Tools (bridge and gauging cylinder) on machined gasket surface of converter housing. Allow gauging cylinder to rest on needle bearing and lock it in place with thumbscrew.



d. Insert Tool (total end play gauging plunger) into gauging cylinder.

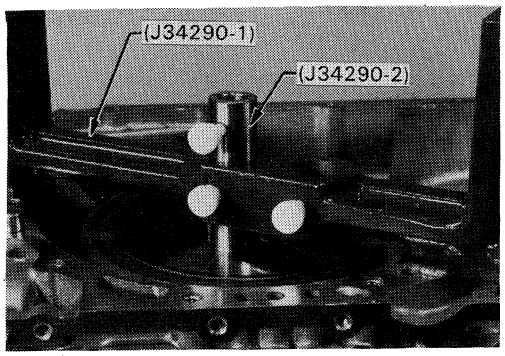


e. Place bridge, legs up, onto machined gasket surface of transaxle case, allowing gauging plunger to rest on surface where bearing race was removed. Lock plunger in place.



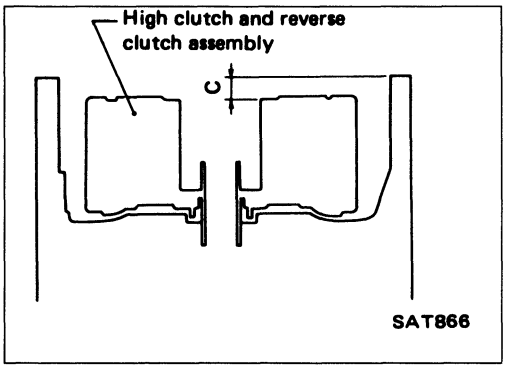
f. Remove bridge and use feeler gauge to measure gap between gauging cylinder and shoulder of gauging plunger.
g. Use your feeler gauge reading to select appropriate bearing race thickness.

Oil pump housing bearing races:
Refer to S.D.S.

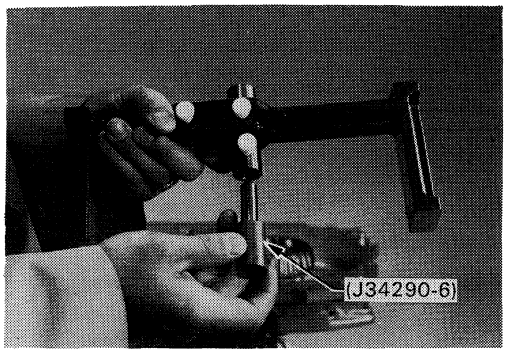


— Clutch pack end play —

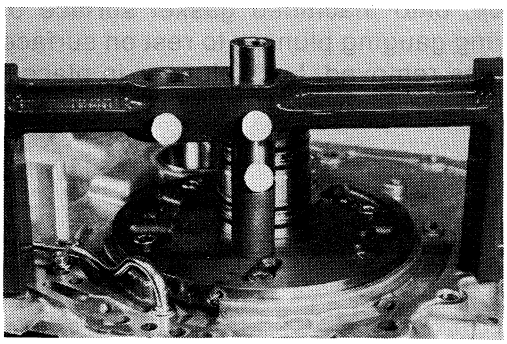
a. Place Tools (bridge and gauging cylinder) onto machined gasket surface of transaxle case and allow cylinder to rest on high clutch drum. Lock cylinder into place.

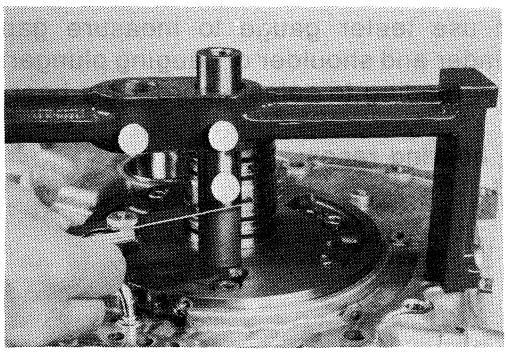


- You are now measuring dimension "C".



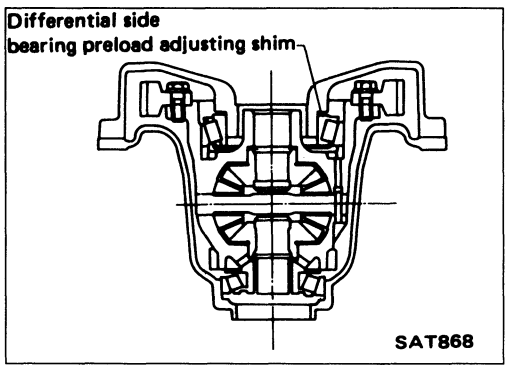
b. Now, insert Tool (clutch pack gauging plunger) into gauging cylinder.



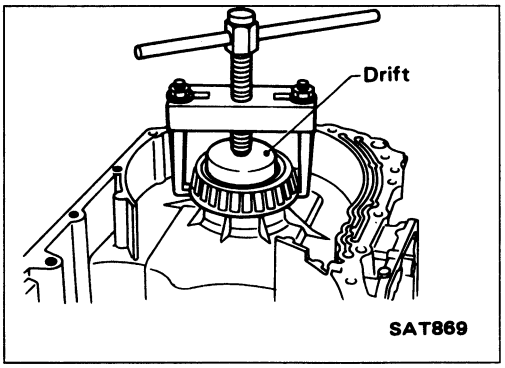


c. Place bridge, gauging cylinder, and gauging plunger onto machined gasket surface of converter housing. Make sure thrust washer is removed. Lock gauging plunger in place.
d. Use feeler gauge to measure gap between gauging cylinder and shoulder of gauging plunger.
e. Use your feeler gauge measurement to select correct washer thickness to give proper clutch pack end play.

Clutch pack thrust washers:
Refer to S.D.S.

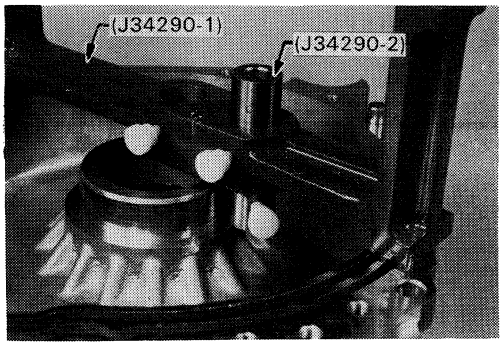


24. Adjust differential side bearing preload as follows:

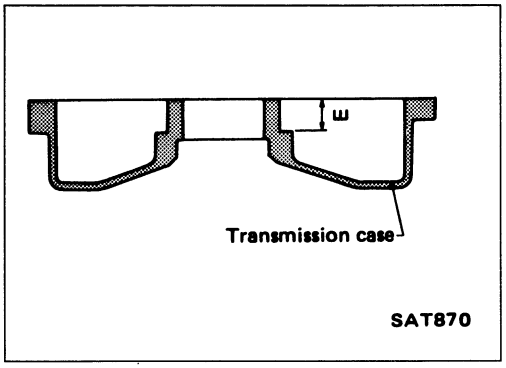


— Without viscous coupling —

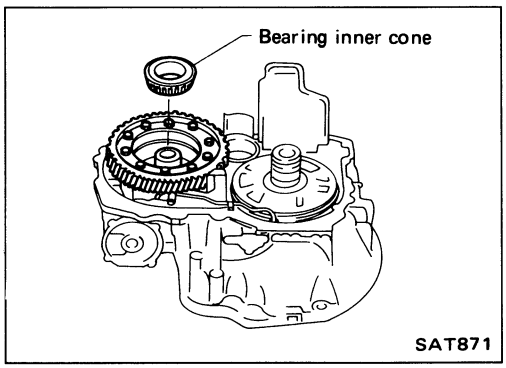
a. Remove left side bearing inner cone from transmission case.



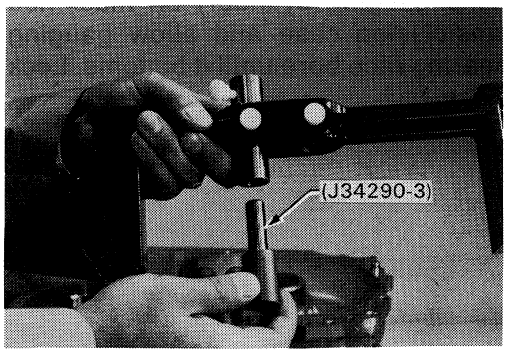
b. Place Tools (bridge and gauging cylinder) on machined gasket surface of transmission case and allow gauging cylinder to rest on bearing mating surface. Lock gauging cylinder in place.



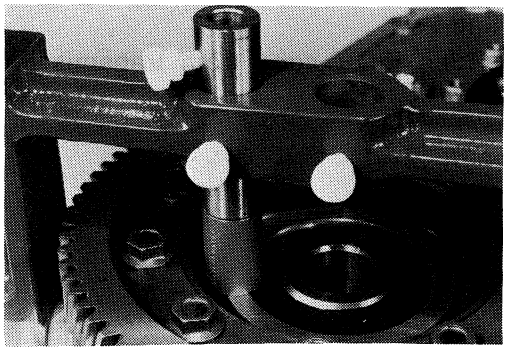
- You are now measuring dimension "E".



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.

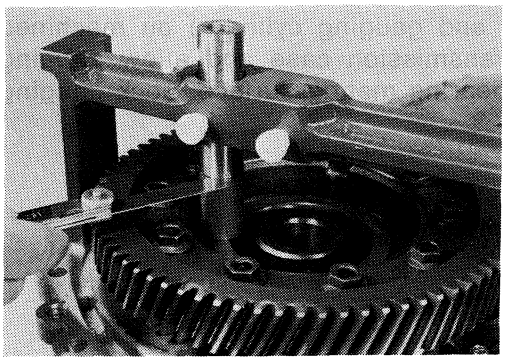


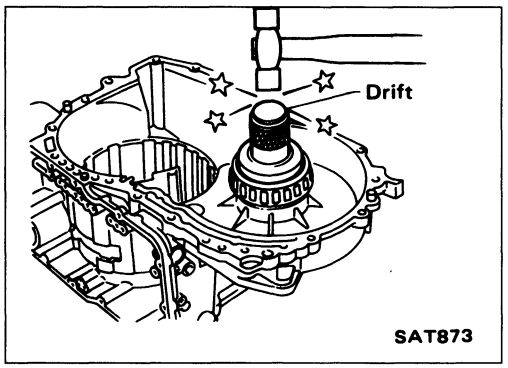
e. Insert Tool (differential side bearing gauging plunger) into gauging cylinder.



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).

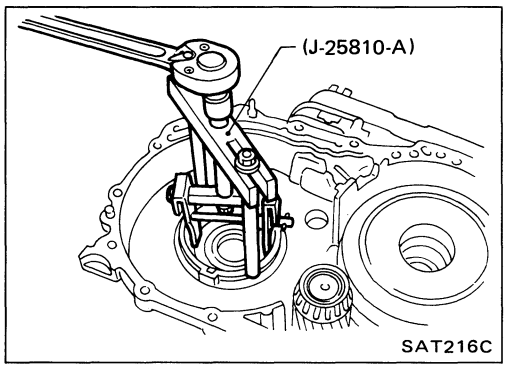
Differential side bearing adjusting shims:
Refer to S.D.S.



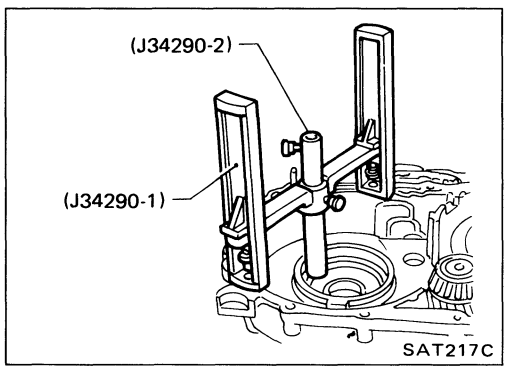


i. Install selected shims and left side bearing inner cone.

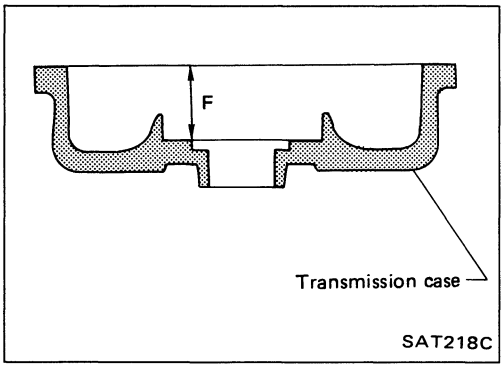
— With viscous coupling —



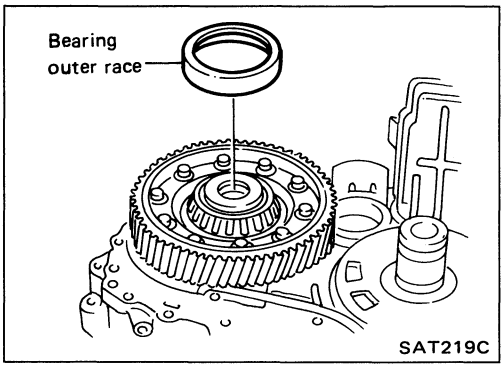
a. Remove left side bearing outer race and preload adjusting shims from transmission case.



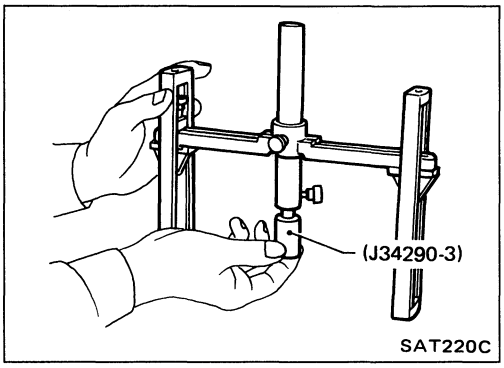
b. Place Tools (bridge and gauging cylinder) on machined gasket surface of transmission case and allow gauging cylinder to drop into bearing race bore until it bottoms. Lock gauging cylinder in place.



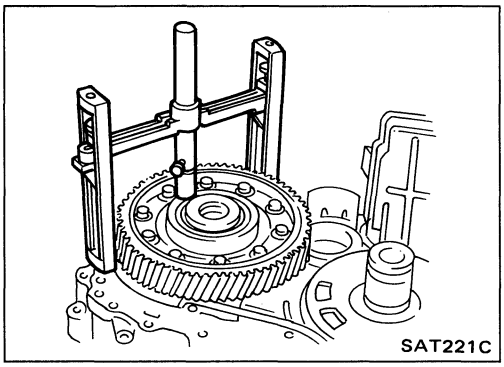
- You are now measuring dimension "F".



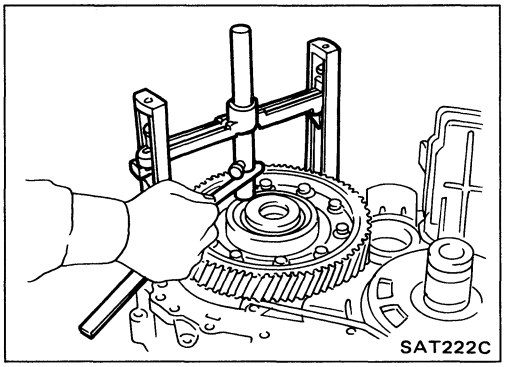
c. Put final drive assembly into converter housing, then put side bearing outer race on differential side bearing.
d. Turn outer race to seat bearing.



e. Insert Tool (differential side bearing gauging plunger) into gauging cylinder.

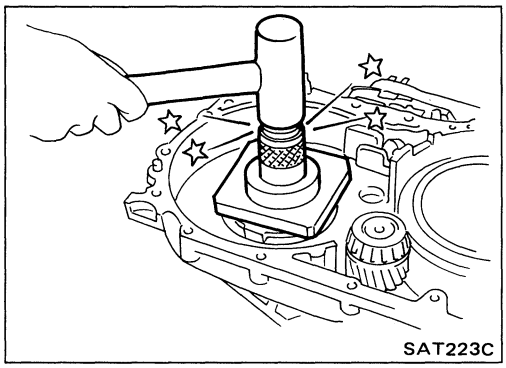


f. Place bridge, gauging cylinder, and gauging plunger onto machined gasket surface of converter housing and allow gauging plunger to drop onto rear surface of side bearing outer race. Lock plunger in place.

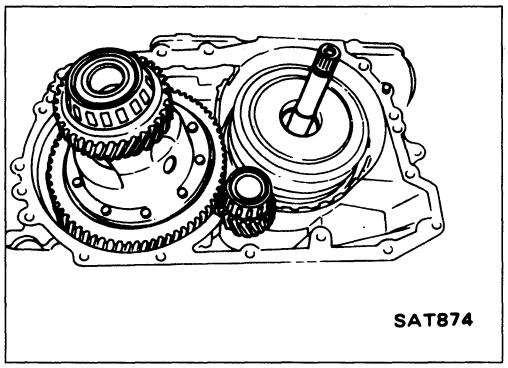


g. Use feeler gauge to measure clearance between gauging cylinder and shoulder of the gauging plunger.
h. Use your feeler gauge reading to select appropriate side bearing preload shim(s).

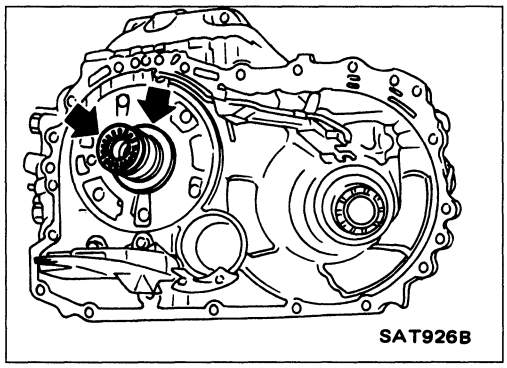
Available differential side bearing adjusting shims:
Refer to S.D.S.


SAT223C

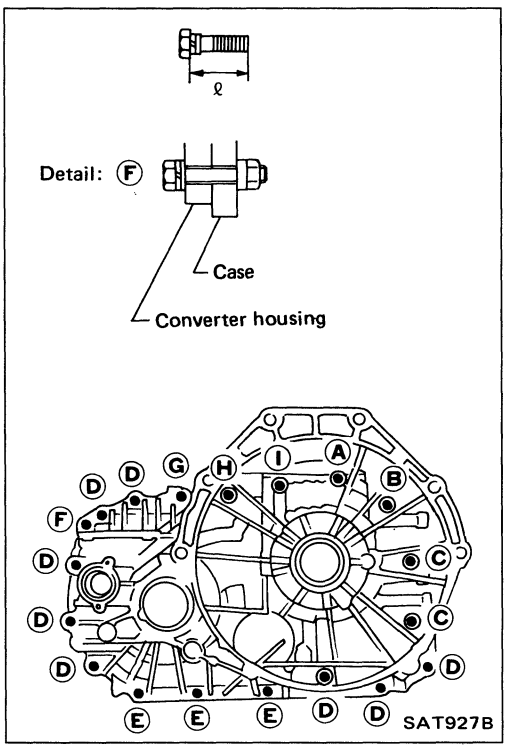
i. Install selected shims and left side bearing outer race.


SAT874

25. Install input shaft.


SAT926B

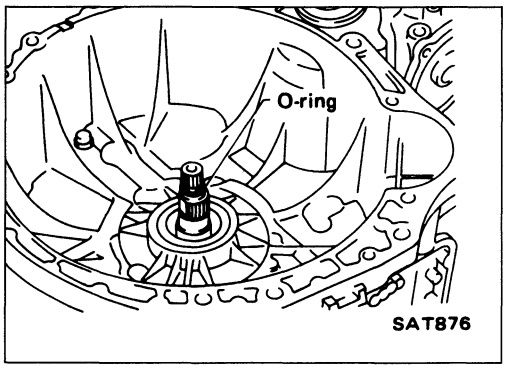
26. Install selected thrust washer and bearing on oil pump cover.



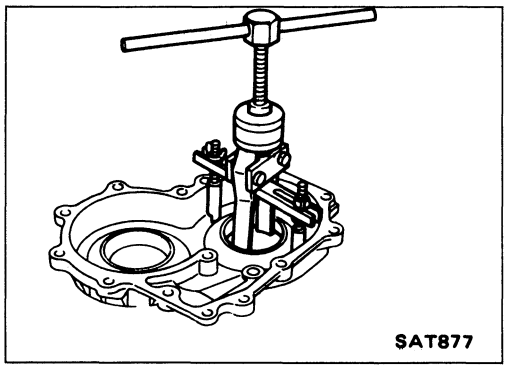
27. Place gasket on transmission case and install converter housing.

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)

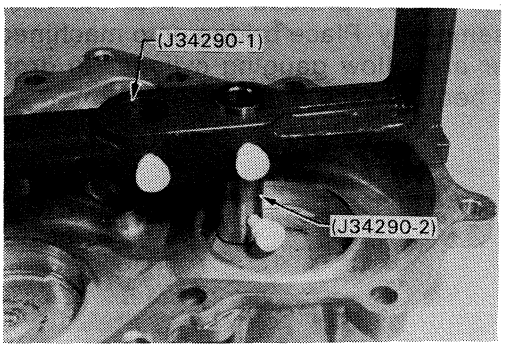
Always use new bolts at portions Ⓐ, Ⓑ, Ⓗ and Ⓘ as they are self-sealing bolts. Apply A.T.F. to thread of other bolts by that fix converter housing to transmission case when installing them.



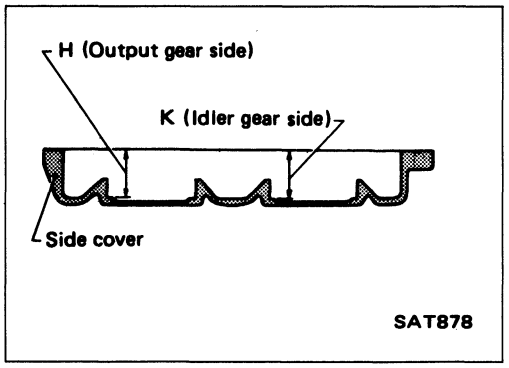
28. Install O-ring onto input shaft.



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.)

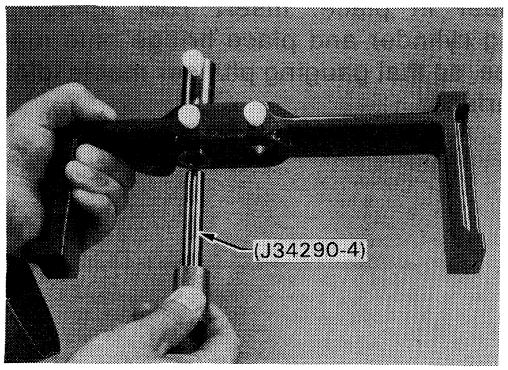


c. Place Tools (bridge and gauging cylinder) onto machined gasket surface of side cover. Allow gauging cylinder to drop into output gear bearing race bore until it bottoms. Lock cylinder in place with the thumbscrew.

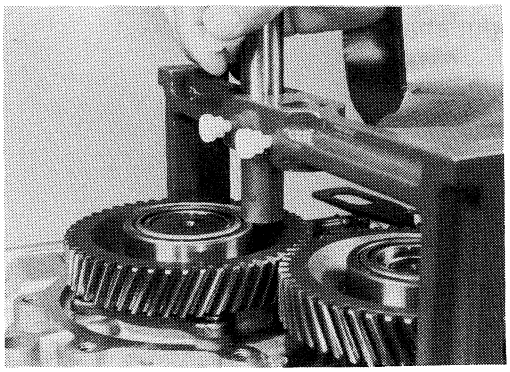


- You are now measuring dimension "H".

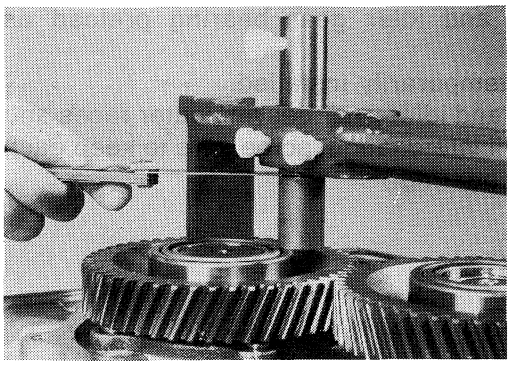
d. Put correct bearing races on the output gear and idler gear bearings, and turn races to seat bearings.



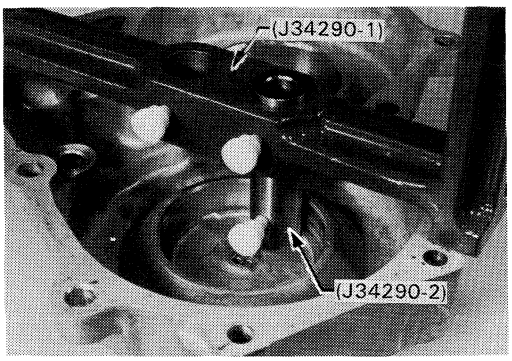
e. Place Tool (output gauging plunger) into the gauging cylinder.



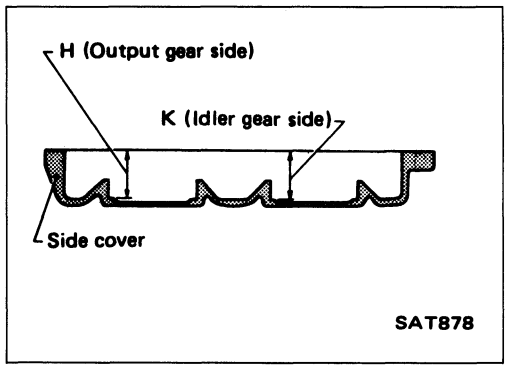
f. Now, place bridge onto machined gasket surface of transmission case and allow gauging plunger to drop onto rear surface of output gear bearing race.



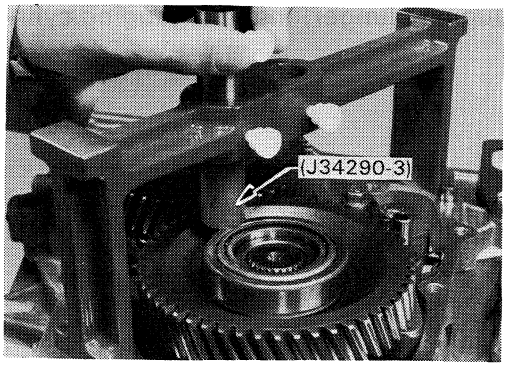
g. Lock gauging plunger in place with thumbscrew. Use feeler gauge to measure gap between gauging cylinder and shoulder of gauging plunger.
h. Use feeler gauge reading to select the correct shim(s).
Output shaft bearing adjusting shims:
Refer to S.D.S.



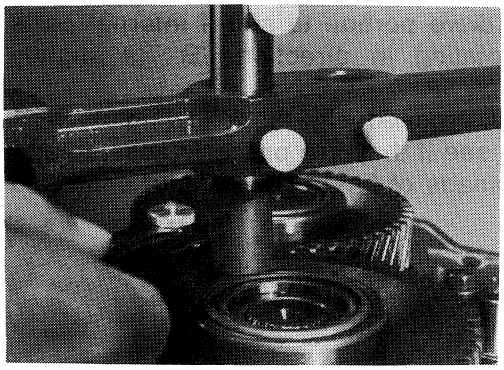
i. Now, measure for the correct preload shims at the idler gear bearing in the same way. Place bridge onto machined surface of side cover and allow gauging cylinder to drop until it contacts idler bearing race mating surface.



- You are now measuring dimension "K".

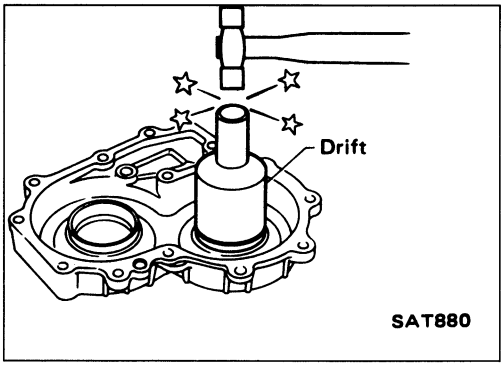


j. Lock gauging cylinder in place. Insert Tool (gauging plunger) into gauging cylinder and place bridge onto machined surface of case, so that gauging plunger meets idler bearing race rear surface.

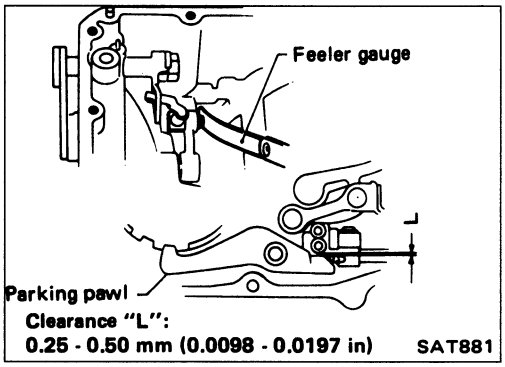


k. Lock gauging plunger in place and use feeler gauge to measure gap between gauging cylinder and gauging plunger.
l. Use your measured distance to select correct shim(s) for idler gear bearing preload.

Idler gear bearing adjusting shims:
Refer to S.D.S.



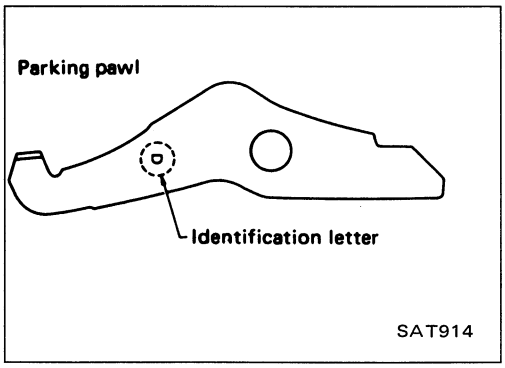
m. Install selected shim(s) and bearing outer races.



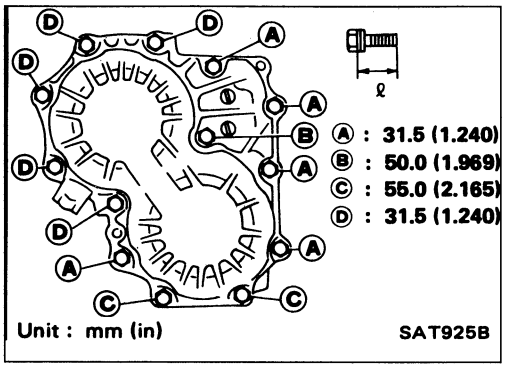
30. Move manual lever until parking pawl engages idler gear. Measure clearance between parking pawl and parking actuator.

If clearance is outside specifications, replace parking pawl.

Part number	Identification letter
31989-21X00	D
31989-21X01	E
31989-21X02	F



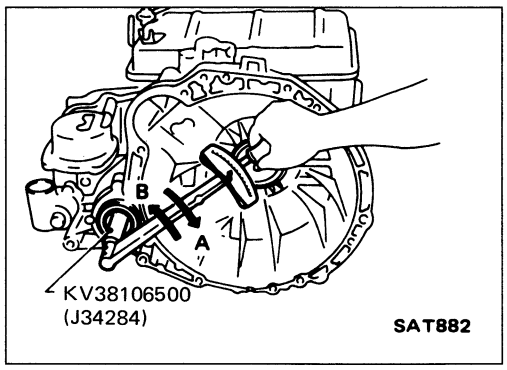
Example:
When parking pawl with identification letter "E" is used:
Clearance "L" is larger.
→Replace with parking pawl with identification letter "D".
Clearance "L" is smaller.
→Replace with parking pawl with identification letter "F".



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.

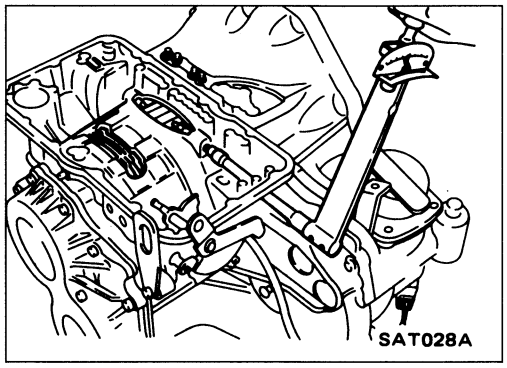
Bolts Ⓐ and Ⓒ:
: 19 - 23 N·m (1.9 - 2.3 kg-m, 14 - 17 ft-lb)
Bolts Ⓑ and Ⓓ:
: 21 - 23 N·m (2.1 - 2.3 kg-m, 15 - 17 ft-lb)



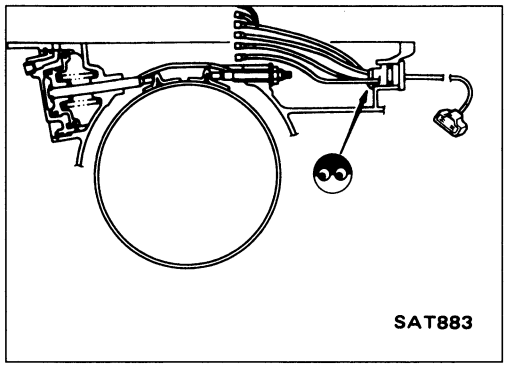
32. Insert Tool into final drive portion to see if internal parts rotates smoothly. Rotating in direction "B" is slightly harder than in direction "A".

If abnormalities are noted, proceed with the following:

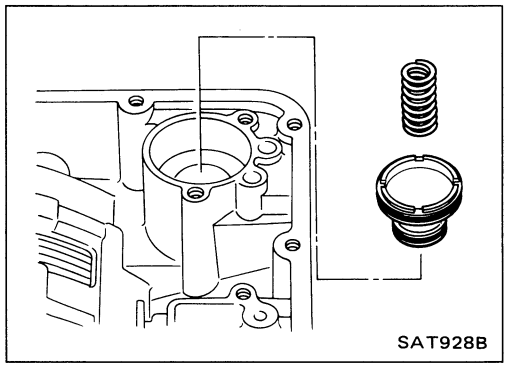
- Disassemble parts to see if they are properly assembled.
- Readjust bearing preloads of final drive, output shaft and idler gear.



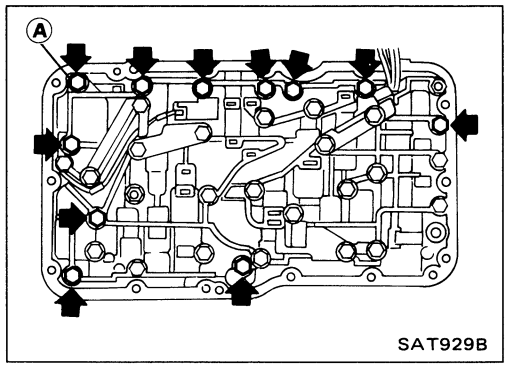
33. Adjust brake band.
1) First tighten anchor end pin.
2) Back off anchor end pin 5-1/4 turns.
3) Tighten lock nut while holding anchor end pin stationary.



34. Install terminal assembly, paying attention to the direction of its hook.

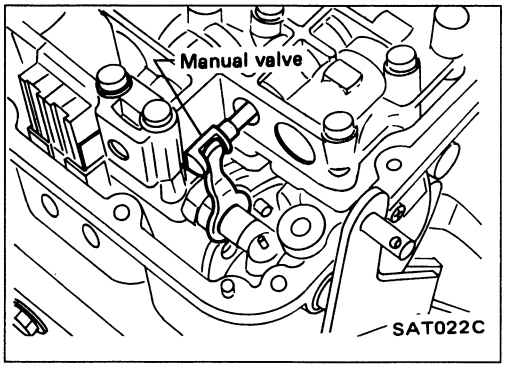


35. Install accumulator and spring.

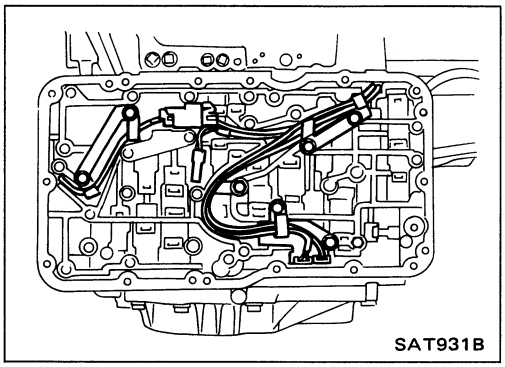


36. Insert manual valve to control valve body, then assemble them to transmission case.

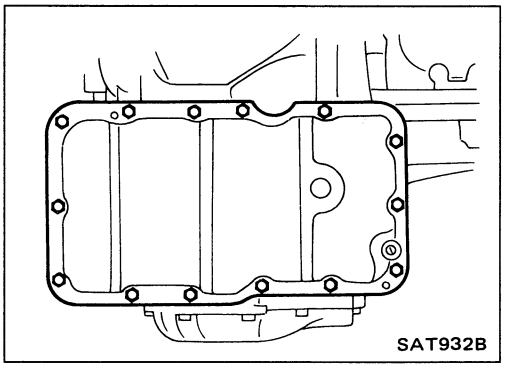
Bolt Ⓐ :
: 3.7 - 5.0 N·m (0.38 - 0.51 kg-m, 2.7 - 3.7 ft-lb)
Other bolts:
: 7 - 9 N·m (0.7 - 0.9 kg-m, 5.1 - 6.5 ft-lb)



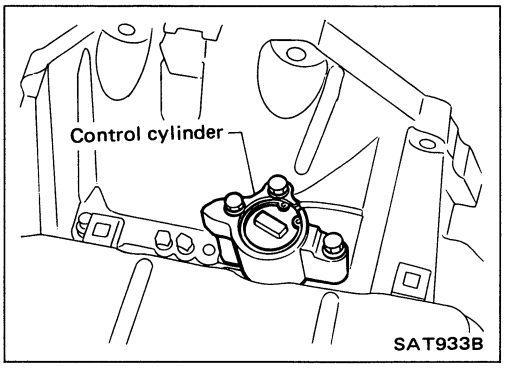
- **Pay attention to the direction of manual valve groove.**



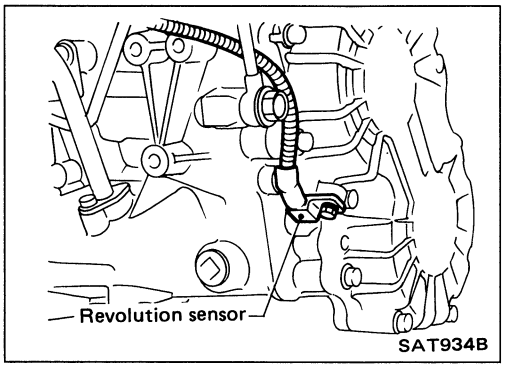
37. Connect harness connectors between terminal assembly and solenoids.



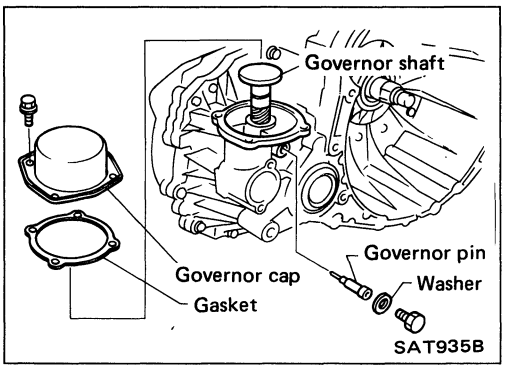
38. Put gasket on transmission case and install valve cover.
Always use new bolts as they are self-sealing bolts.



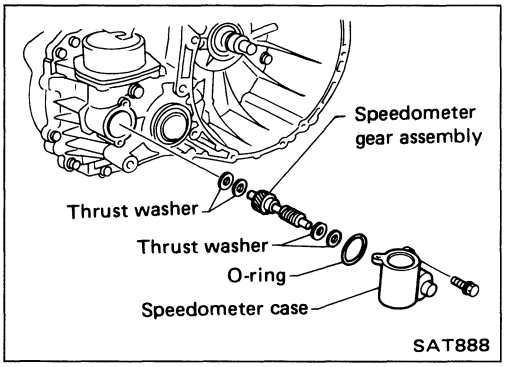
39. Install control cylinder.



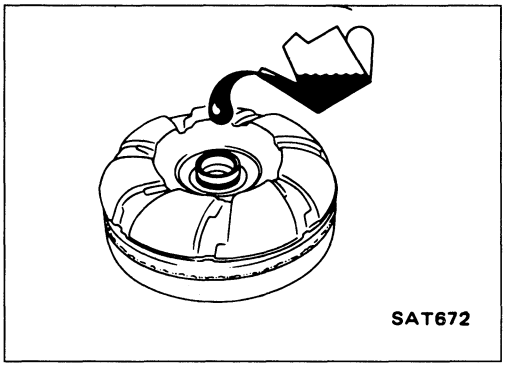
40. Install revolution sensor.



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

Engine model	KA24E	
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
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

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 & 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
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)	

Specifications and Adjustment (Cont'd)

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)	

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

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

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

Specifications and Adjustment (Cont'd)

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

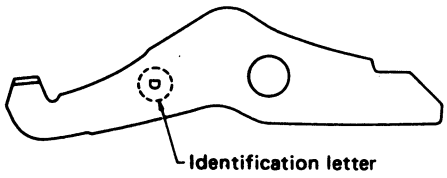
Idler gear preload adjusting shim

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

Specifications and Adjustment (Cont'd)

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)

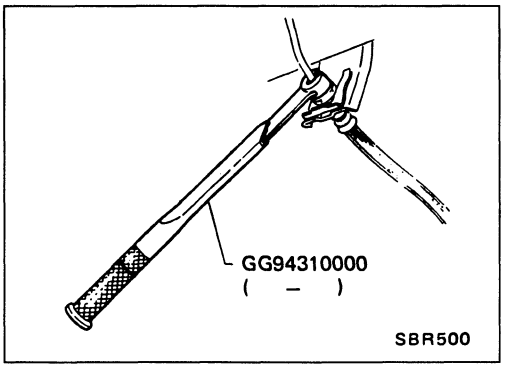
NOTE

NOTE

FRONT AXLE & FRONT SUSPENSION

SECTION FA

CONTENTS

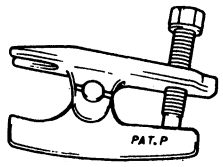
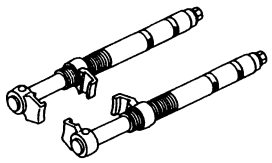
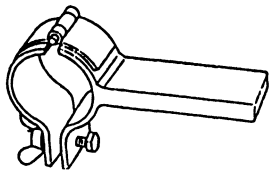
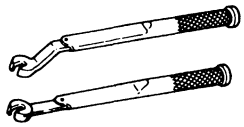
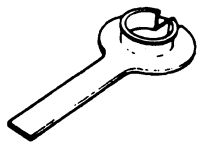


Precautions

- **When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.**
  ***: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.**
- **When removing each suspension part, check wheel alignment and adjust if necessary.**
- **Use Tool when removing or installing brake tubes.**

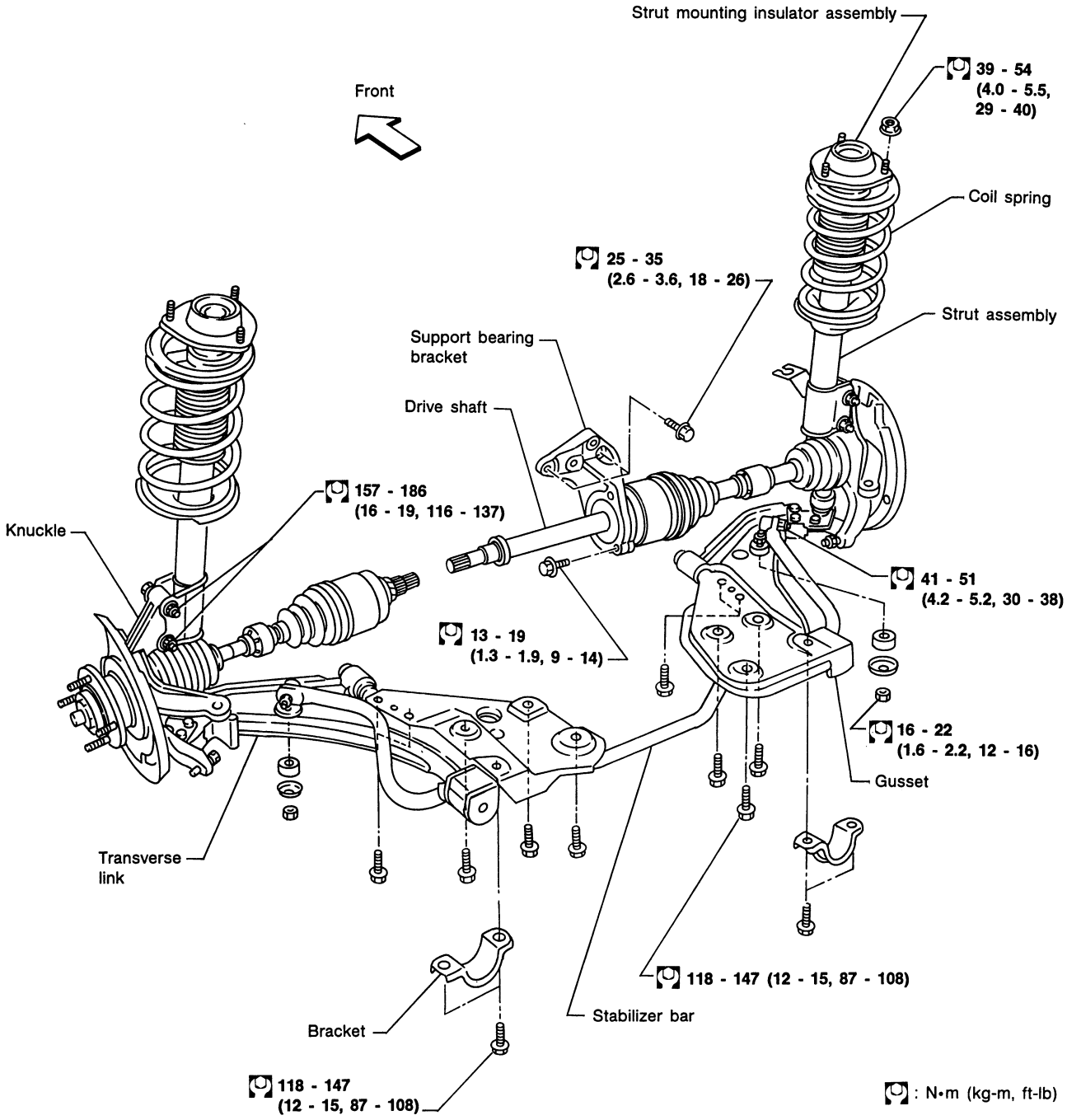
Preparation

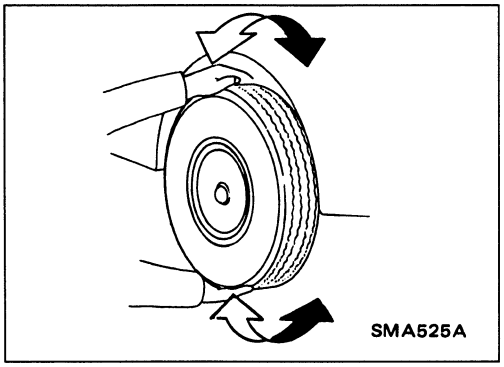
SPECIAL SERVICE TOOLS

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 installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.

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

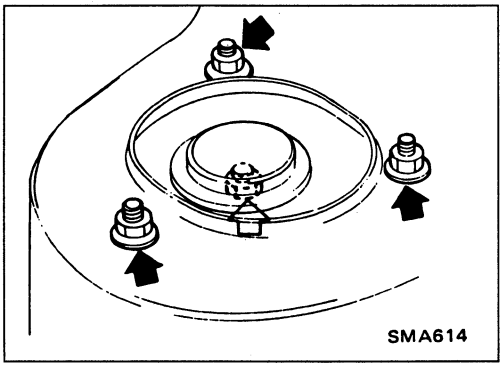



SMA525A

Front Axle and Front Suspension Parts

Check front axle and front suspension parts for looseness, cracks, wear or other damage.

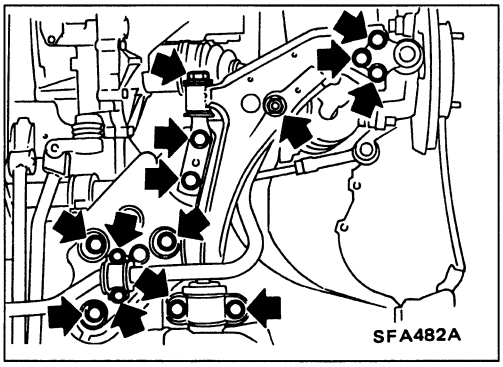
- Shake each front wheel to check for excessive play.

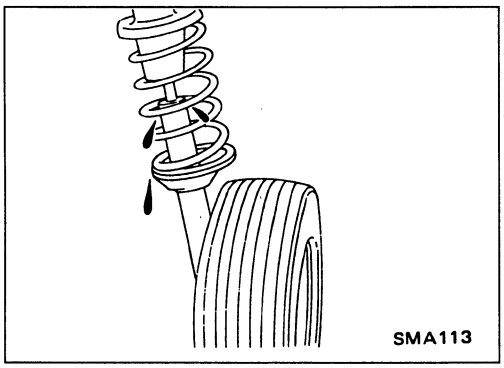

SMA614

- Make sure that cotter pin is inserted.
- Retighten all nuts and bolts to the specified torque.

  Tightening torque:

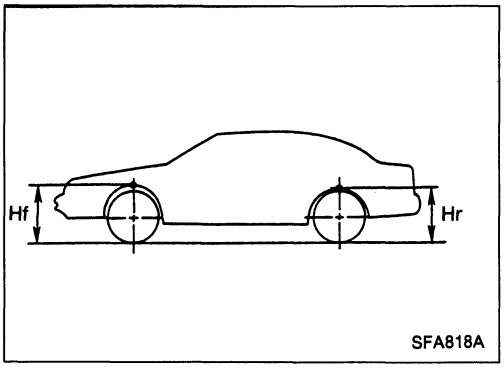
  Refer to FRONT SUSPENSION.


SFA482A


SMA113

- Check strut (shock absorber) for oil leakage or other damage.

Front Axle and Front Suspension Parts (Cont'd)



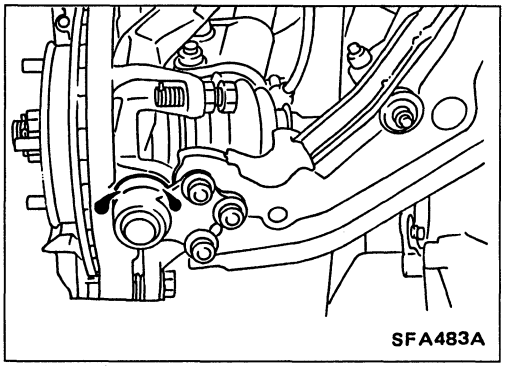
- Check spring height from the top of the wheelarch to the ground.

(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.

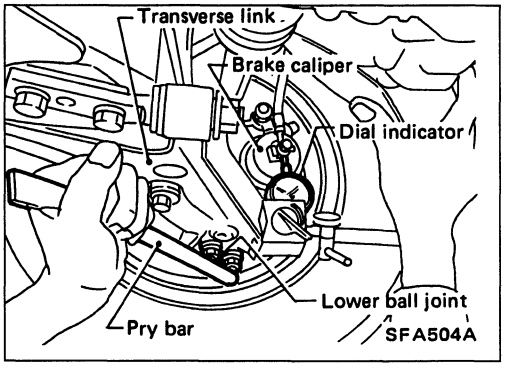
(2) Bounce the vehicle up and down several times before measuring.

Wheelarch 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.



- Check suspension ball joint for grease leakage and ball joint dust cover for cracks or other damage.

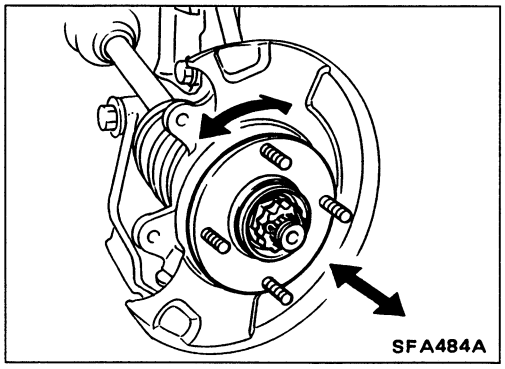


- Check suspension ball joint end play.

(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.

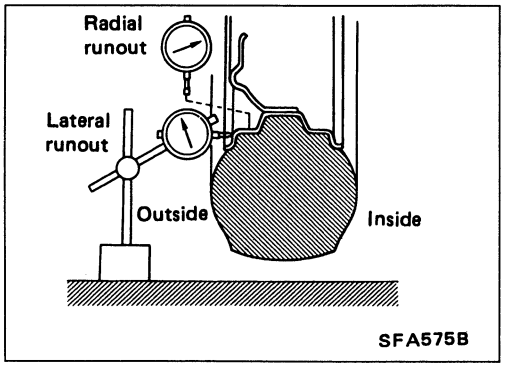

SFA484A

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*).

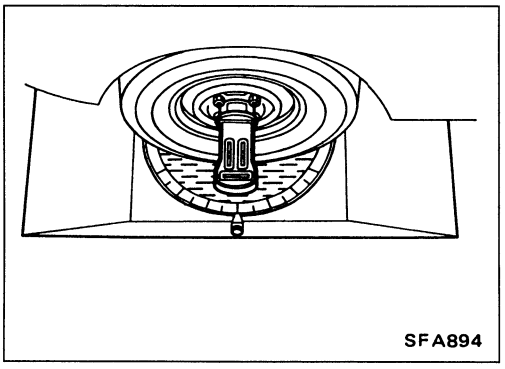
*: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

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:

   -30' to 1°00'

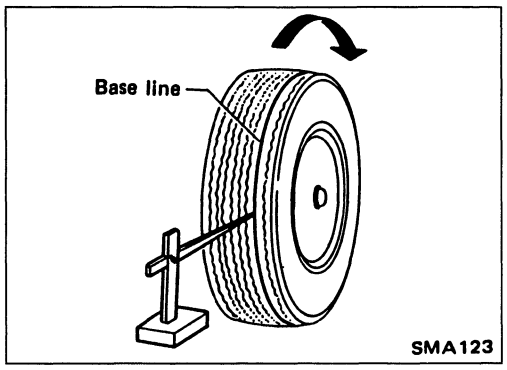
   Caster:

   35' - 2°05'

   Kingpin inclination:

   13°45' - 15°15'
2. If camber, caster and kingpin inclination are not within specification, inspect and replace any damaged or worn front suspension parts.

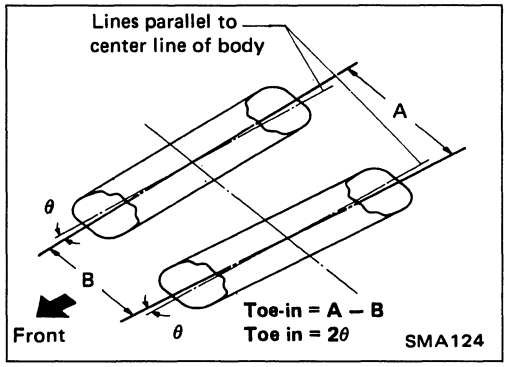
Front Wheel Alignment (Cont'd)



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.



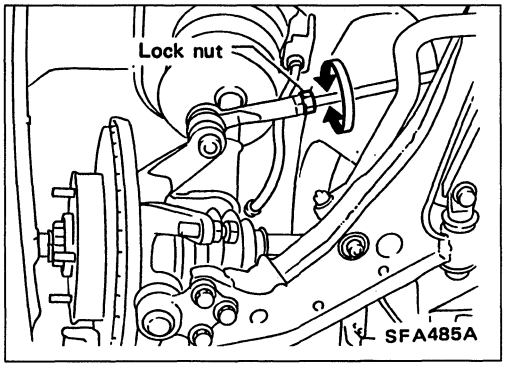
2. Measure toe-in.

- Measure distance "A" and "B" at the same height as hub center.

Toe-in (Unladen):

A - B: 1 - 3 mm (0.04 - 0.12 in)

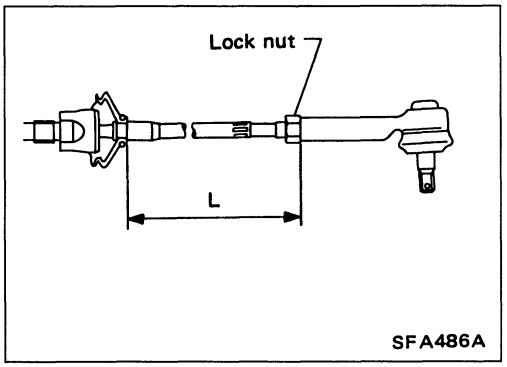
2θ: 6' - 18'



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.



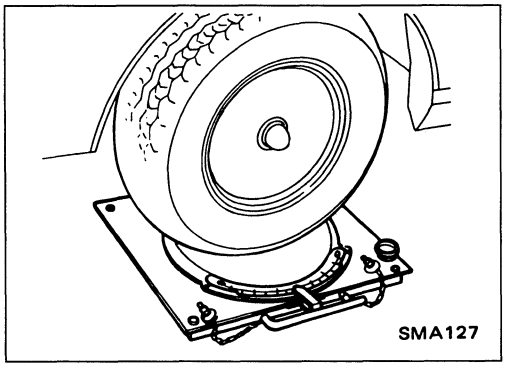
Standard length "L":

Refer to ST section.

(3) Tighten lock nuts to specified torque.

Lock nut tightening torque:

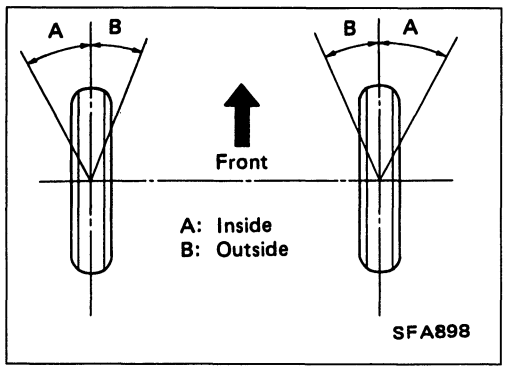
Refer to ST section.



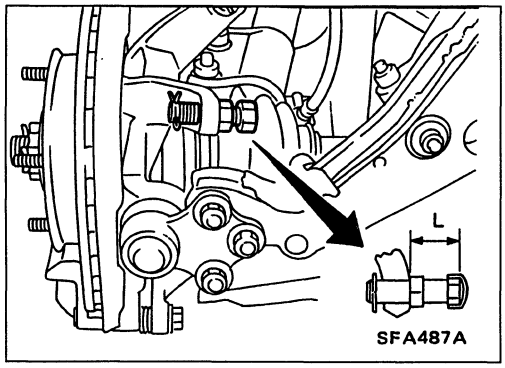
FRONT WHEEL TURNING ANGLE

1. Set wheels in straight-ahead position and then move vehicle forward until front wheels rest on turning radius gauge properly.

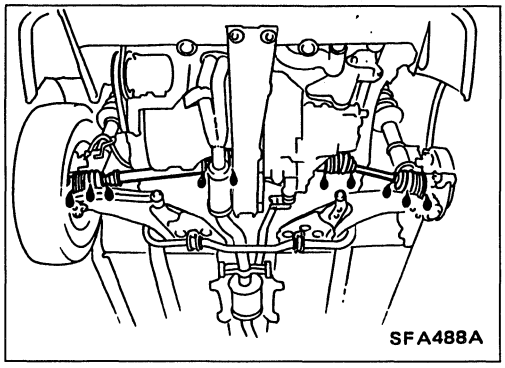
Front Wheel Alignment (Cont'd)



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°

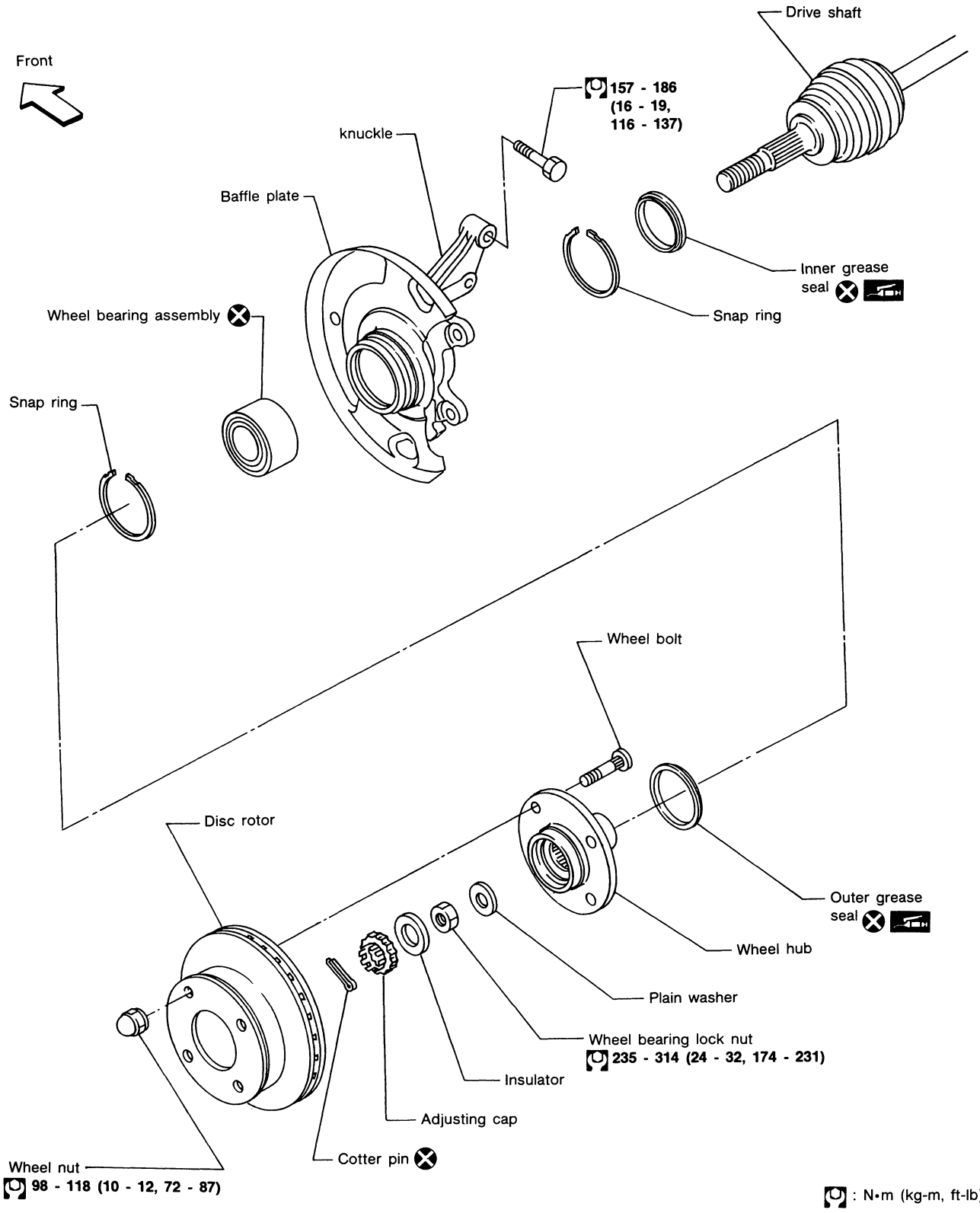


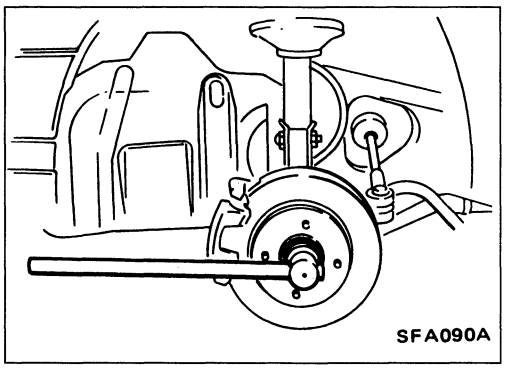
3. Adjust with stopper bolt if necessary.
   Stopper bolt lock nut tightening torque:
   54 - 72 N·m (5.5 - 7.3 kg-m, 40 - 53 ft-lb)



Drive Shaft

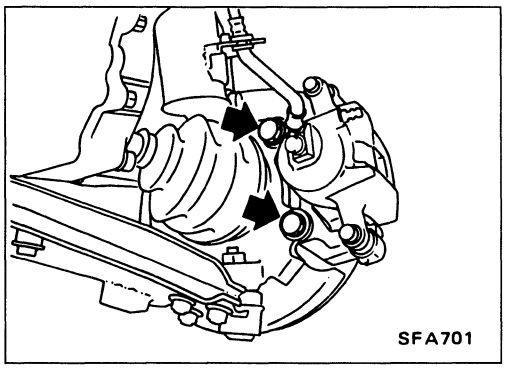
Check for grease leakage or other damage.


Front
Drive shaft
157 - 186 (16 - 19, 116 - 137)
knuckle
Baffle plate
Inner grease seal
Snap ring
Wheel bearing assembly
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



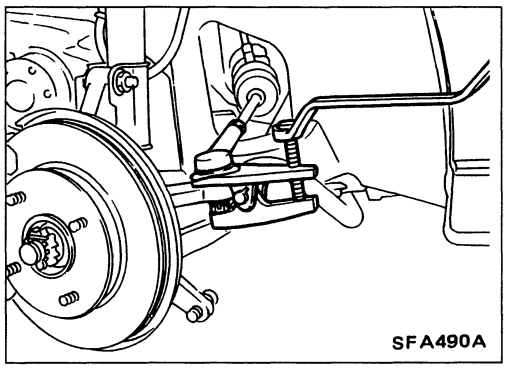
Removal

- Remove wheel bearing lock nut.



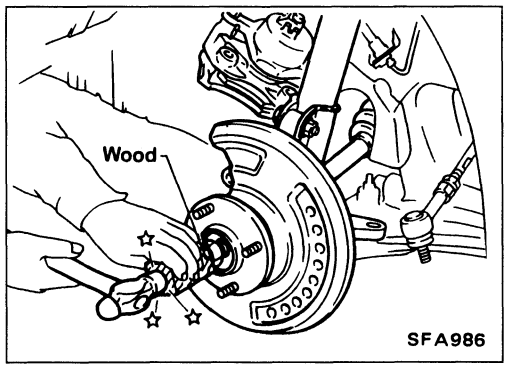
- Remove brake caliper assembly.

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.



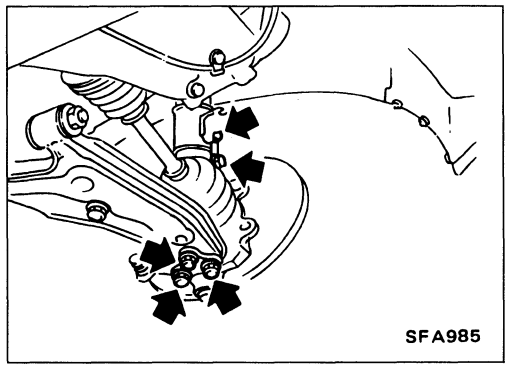
- Separate tie-rod from knuckle with Tool.

Install stud nut conversely on stud bolt to prevent damage to stud bolt.

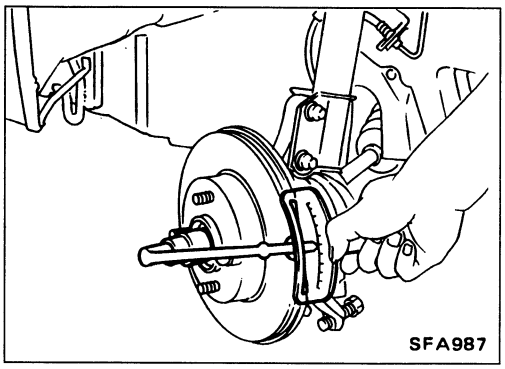


- Separate drive shaft from knuckle with Tool.

When removing drive shaft, cover boots with waste cloth to prevent damage to them.

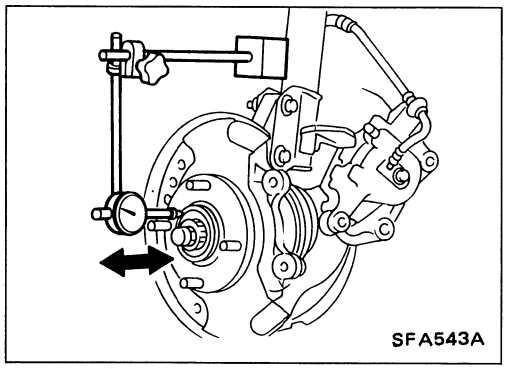


- Remove bolts and nuts as shown at left.

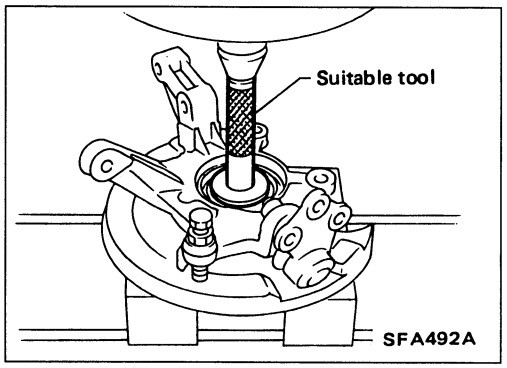


Installation

- Install knuckle with wheel hub.
- Tighten wheel bearing lock nut.
  [O]: 235 - 314 N·m
  (24 - 32 kg-m, 174 - 231 ft-lb)



- Check wheel bearing axial end play.
  Axial end play:
  0.05 mm (0.0020 in) or less.

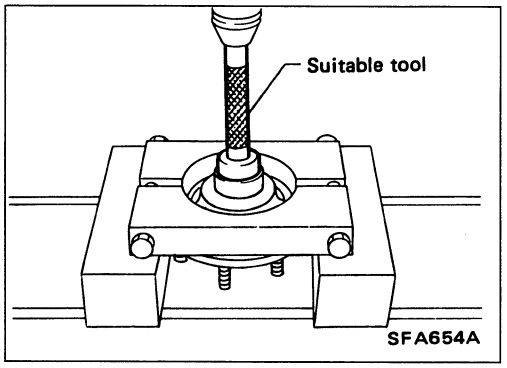


Disassembly

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

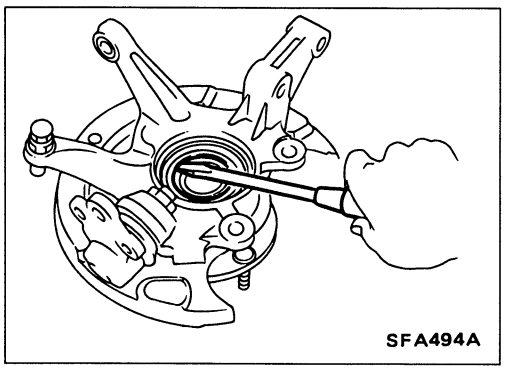
Drive out hub with inner race (outside) from knuckle with a suitable tool.



WHEEL BEARING

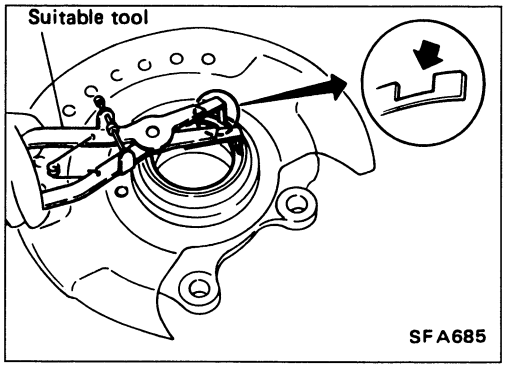
When replacing wheel bearing, replace wheel bearing assembly (inner races and outer race).

- Remove bearing inner race (outside), then remove outer grease seal.

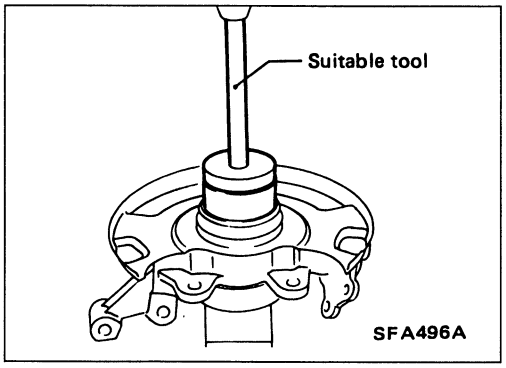


- Remove inner grease seal from knuckle.

Disassembly (Cont'd)



- Remove inner and outer snap rings.



- Press out bearing outer race.

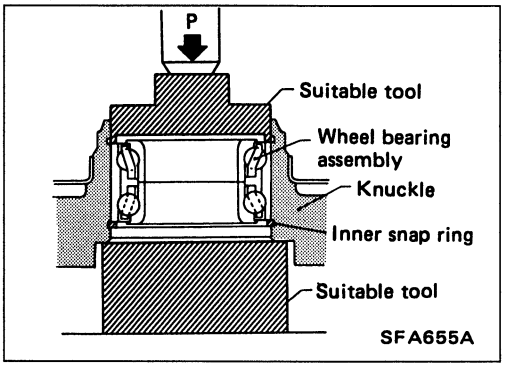
Inspection

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.



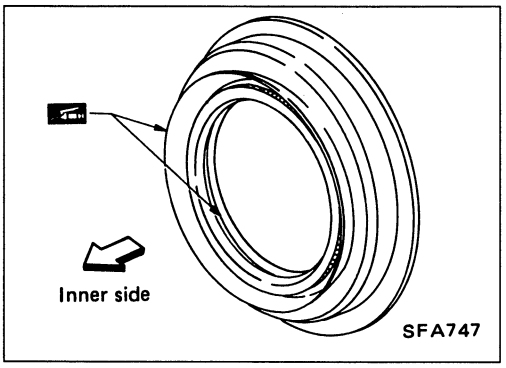
Assembly

1. Install inner snap ring into groove of knuckle.
2. Press new wheel bearing assembly into knuckle.
   Maximum load P:
   29 kN (3 t, 3.3 US ton, 3.0 Imp ton)

CAUTION:

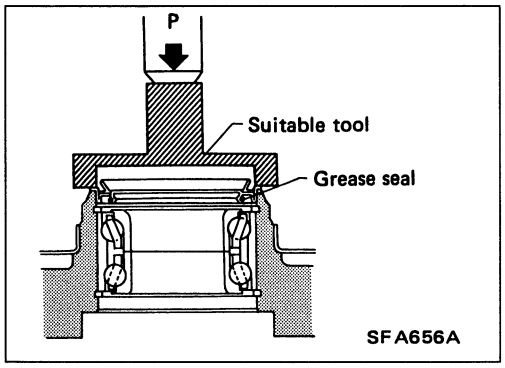
- **Do not press inner race of wheel bearing assembly.**
- **Do not apply oil or grease to mating surfaces of wheel bearing outer race and knuckle.**

3. Install outer snap ring into groove of knuckle.

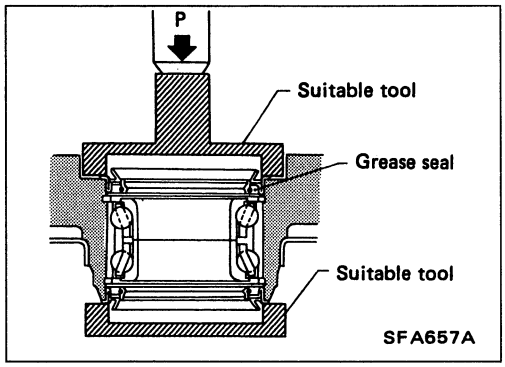


4. Pack grease seal lip with multi-purpose grease.

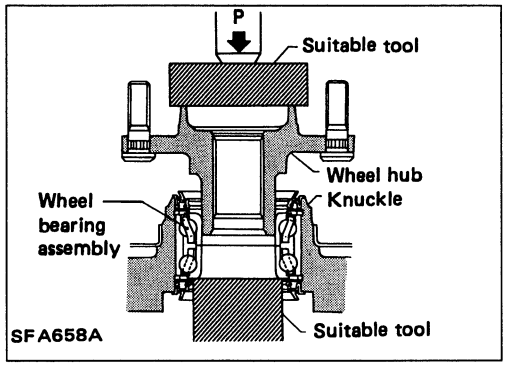
Assembly (Cont'd)



5. Install outer grease seal.

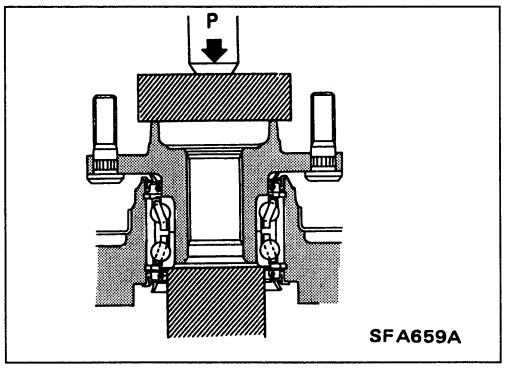


6. Install inner grease seal.

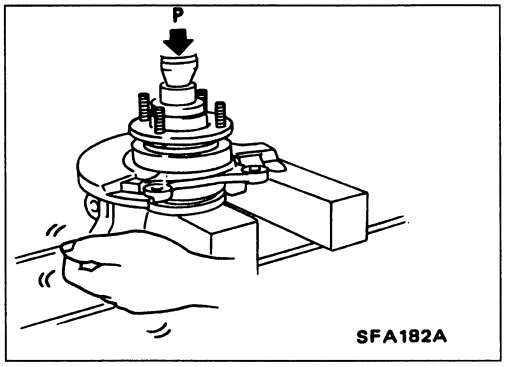


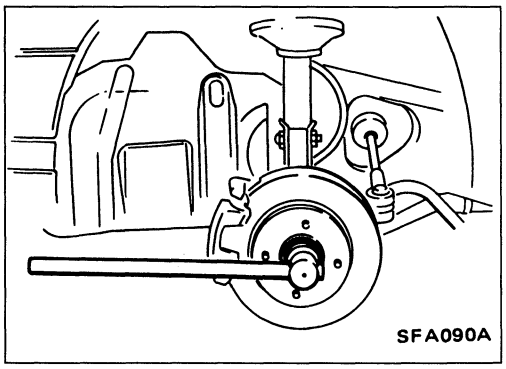
7. Press wheel hub into knuckle.
   Maximum load P:
   29 kN (3 ton, 3.3 US ton, 3.0 Imp ton)

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.

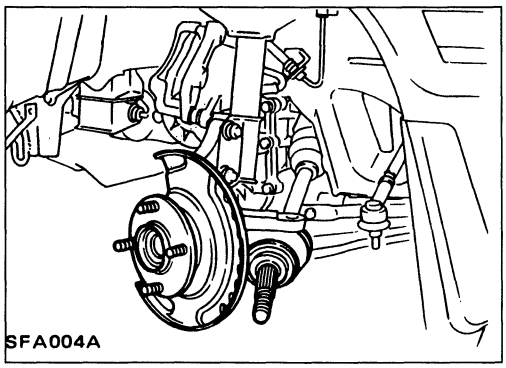




Removal

- Remove wheel bearing lock nut.
- Remove brake caliper assembly.

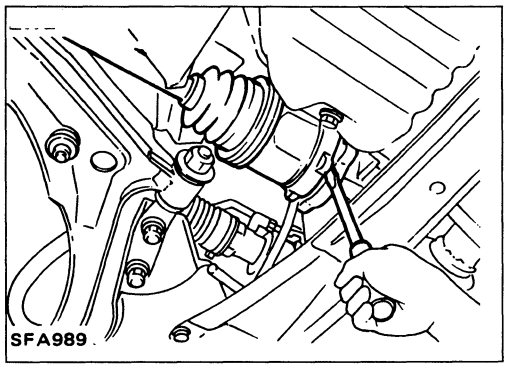
Brake hose need not be disconnected from brake caliper.
Be careful not to depress brake pedal, or piston will pop out.
Make sure brake hose is not twisted.



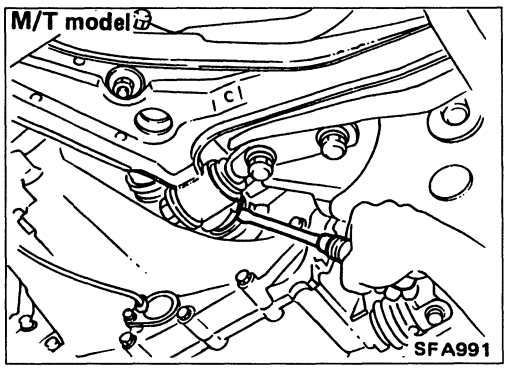
- Remove tie-rod ball joint.
- Separate drive shaft from knuckle by slightly tapping it.

When removing drive shaft, cover boots with waste cloth to prevent damage to them.

Refer to FRONT AXLE — Wheel Hub and Knuckle.



1. Remove right drive shaft from transaxle.

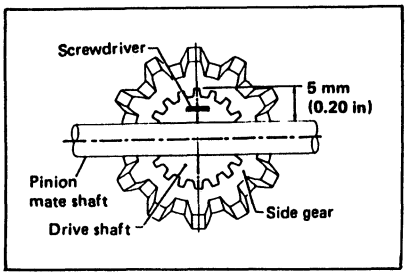


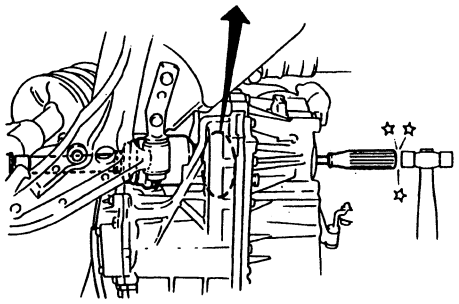
2. Remove left drive shaft from transaxle.

— FOR M/T MODELS —

Removal (Cont'd)

A/T model





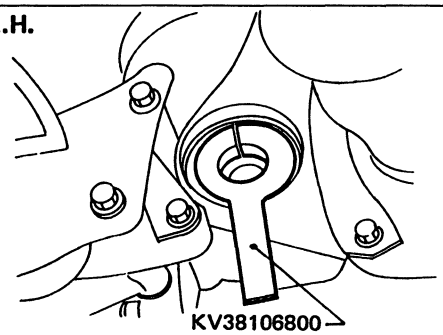
SFA730

— FOR A/T MODELS —

- Remove left drive shaft with a suitable tool.

Be careful not to damage pinion mate shaft and side gear.

R.H.



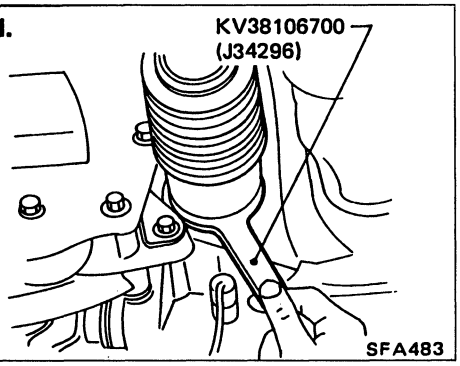
SFA482

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).

L.H.



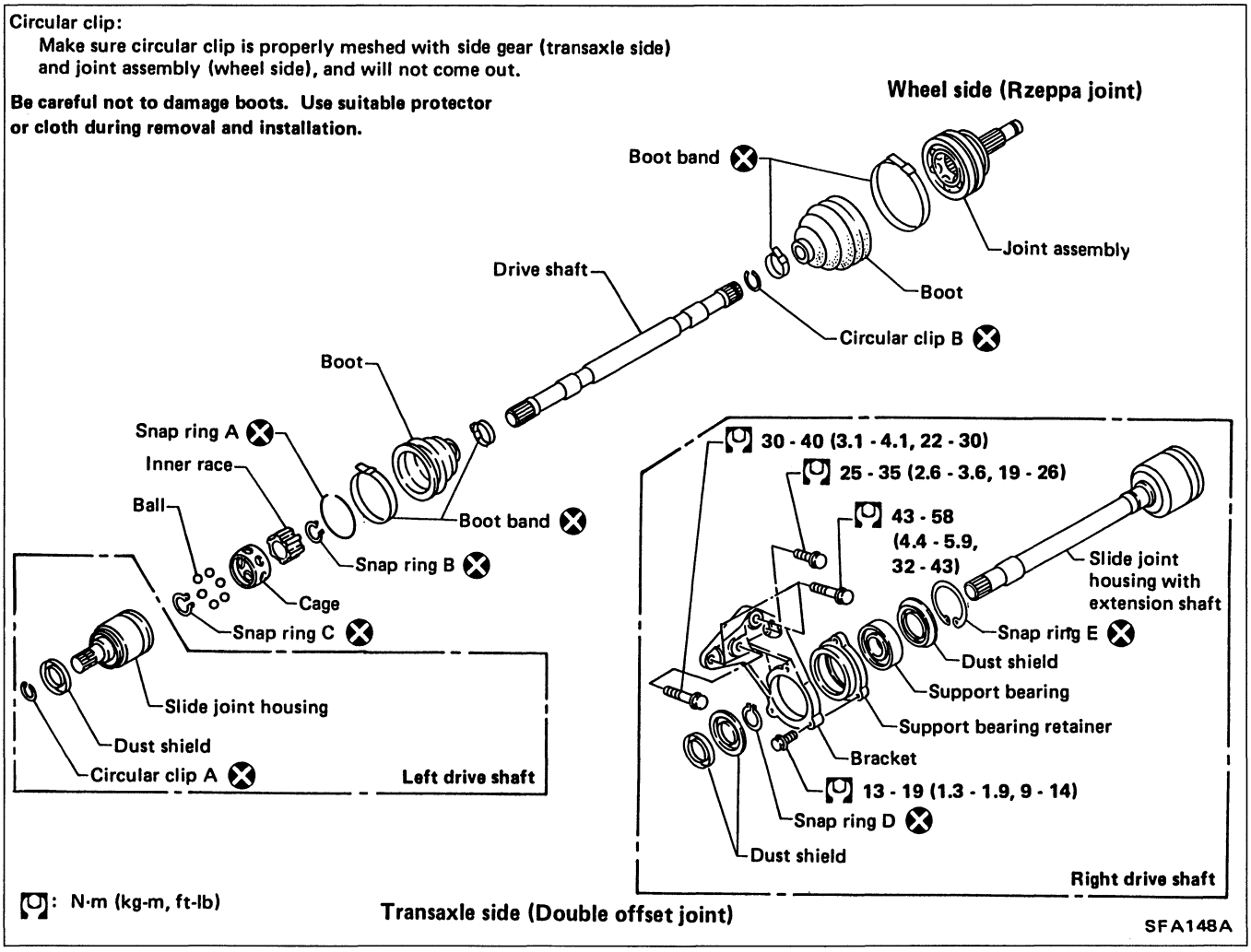
SFA483

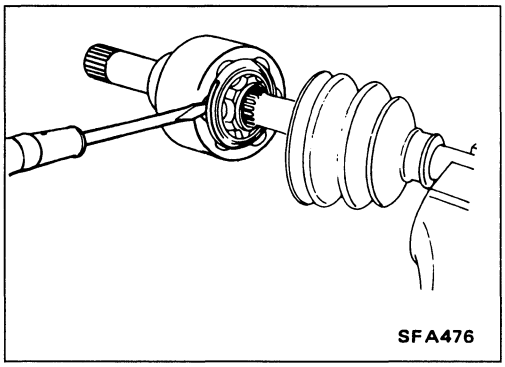
3. Insert drive shaft into transaxle. Be sure to properly align the serrations and then withdraw Tool.
4. Push drive shaft, then press-fit circular clip on the drive shaft into circular clip groove of side gear.
5. After its insertion, try to pull the flange out of the slide joint by hand. If it pulls 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

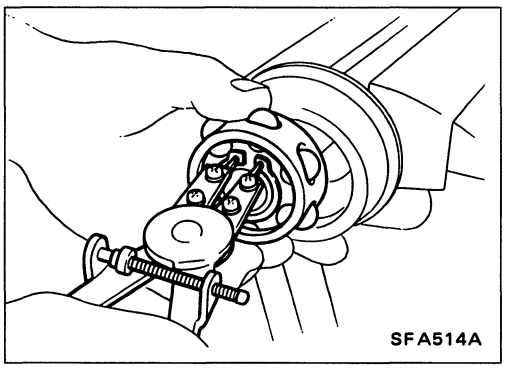




Disassembly

TRANSAXLE SIDE

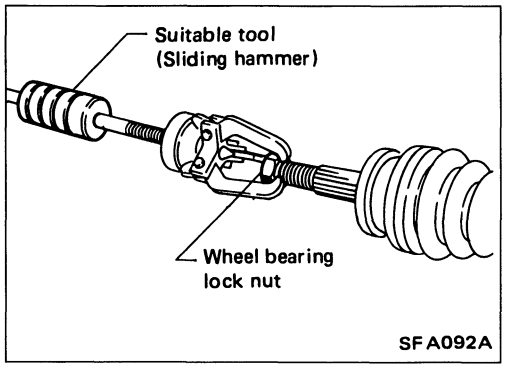
1. Remove boot bands.
2. Put matching marks on slide joint housing and inner race, before separating joint assembly.
3. Pry off snap ring "A" with a screwdriver, and pull out slide joint housing.



4. Put matching marks on inner race and drive shaft.
5. Pry off snap ring "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)



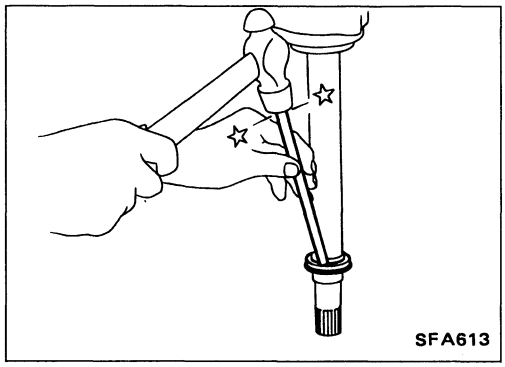
WHEEL SIDE

CAUTION:
The joint on the wheel side cannot be disassembled.

- Before separating joint assembly, put matching marks on drive shaft and joint assembly.
- Separate joint assembly with a suitable tool.

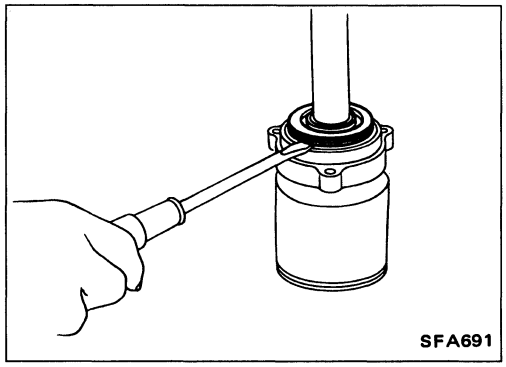
Be careful not to damage threads on drive shaft.

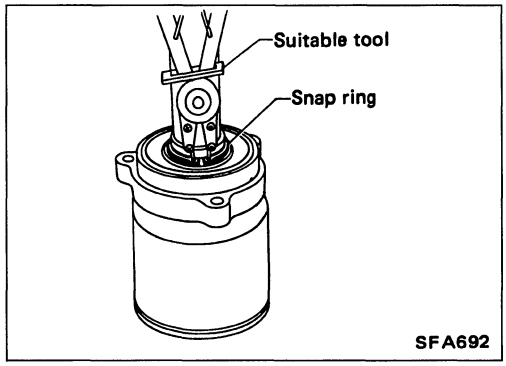
- Remove boot bands.



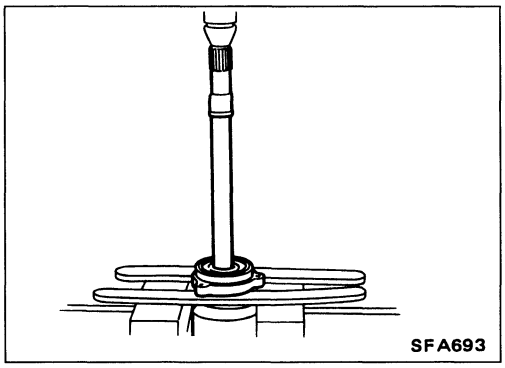
SUPPORT BEARING

- Remove dust shield.



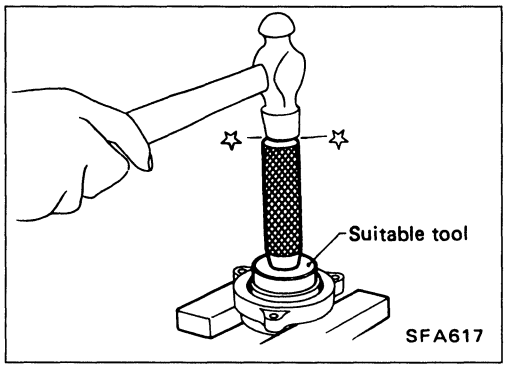


- Pry off snap ring.



- 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

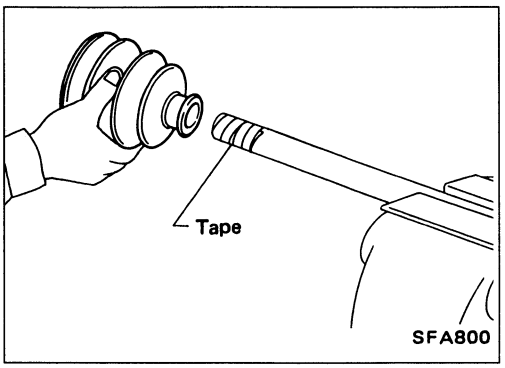
Check support bearing bracket for cracks with a magnetic exploration or dyeing test.

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.**

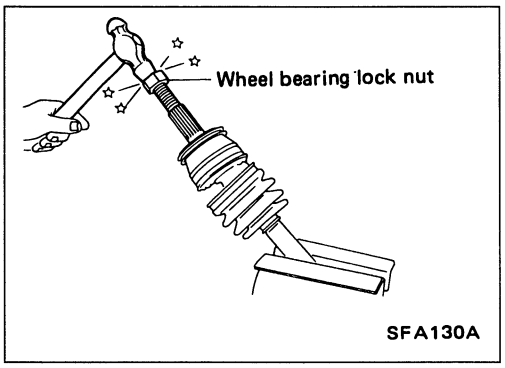
Assembly (Cont'd)

WHEEL SIDE

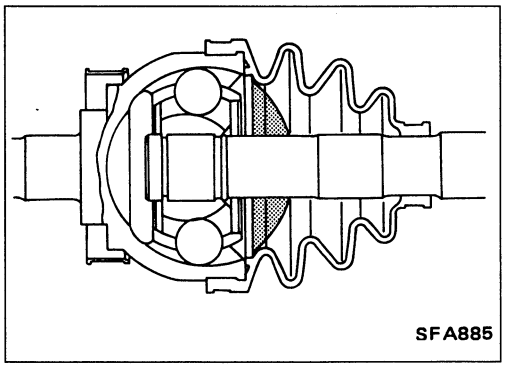


1. Install boot and new small boot band on drive shaft.

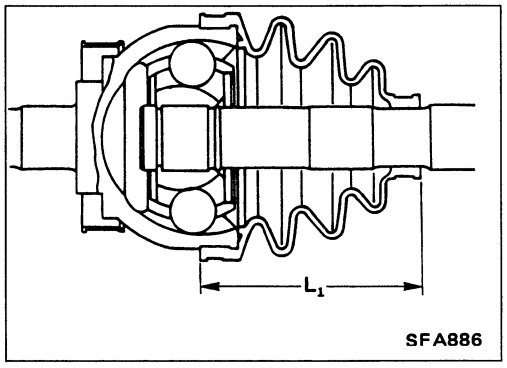
Cover drive shaft serration with tape so as not to damage boot during installation.



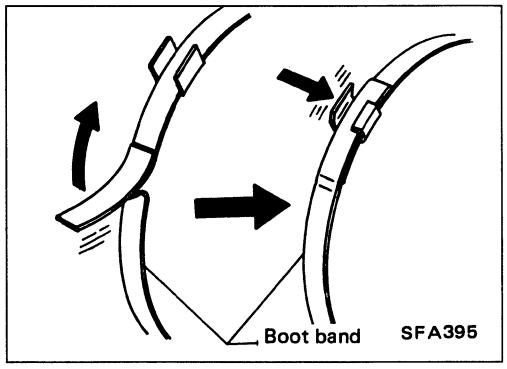
2. Set joint assembly onto drive shaft by lightly tapping it. Install joint assembly securely, ensuring marks which were made during disassembly are properly aligned.



3. Pack drive shaft with specified amount of grease.
   Specified amount of grease:
   205 - 225 g (7.23 - 7.94 oz)

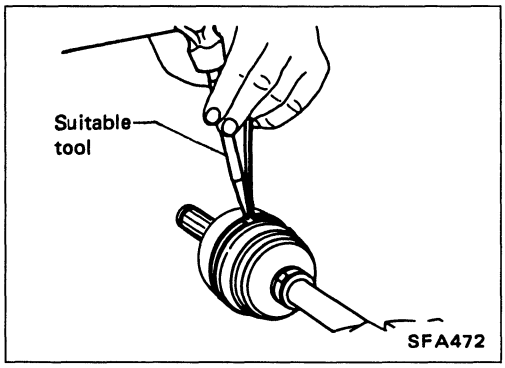


4. Make sure that boot is properly installed on the drive shaft groove.
   Set boot so that it does not swell and deform when its length is "L_1".
   Length "L_1":
   96 - 98 mm (3.78 - 3.86 in)



5. Lock new larger and smaller boot bands securely with a suitable tool.

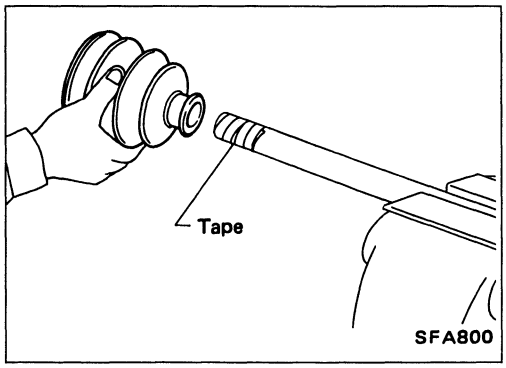
Assembly (Cont'd)

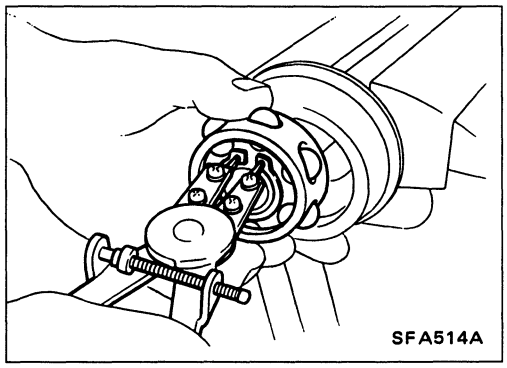


TRANSAXLE SIDE

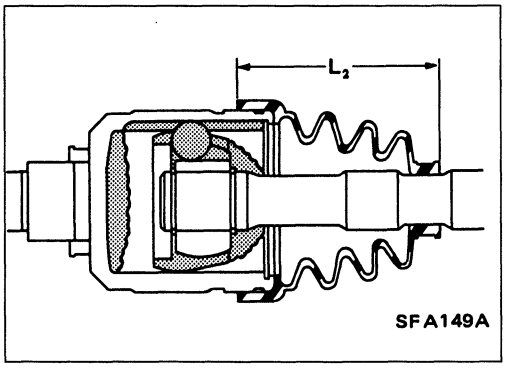
1. Install boot and new small boot band on drive shaft.

Cover drive shaft serration with tape so as not to damage boot during installation.

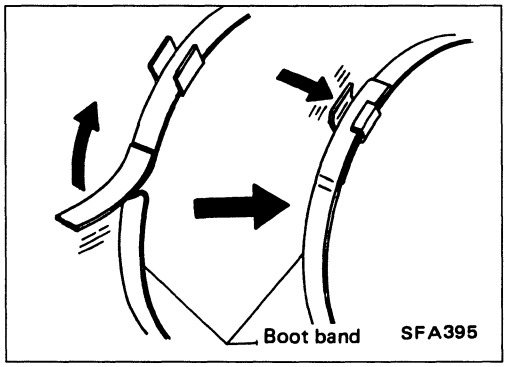




2. Install new snap ring "B", then securely install ball cage, inner race and balls as a unit, making sure the marks which were made during disassembly are properly aligned.
3. Install new snap ring "C".



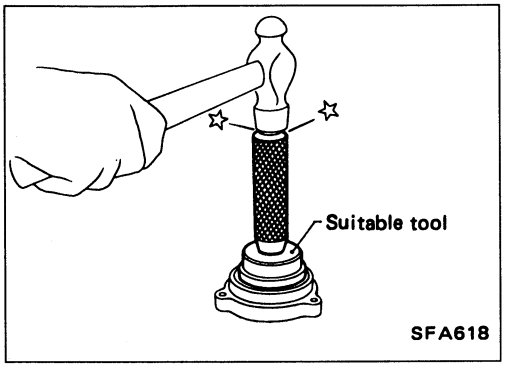
4. Pack drive shaft with specified amount of grease.
   Specified amount of grease:
   160 - 180 g (5.64 - 6.35 oz)
5. Install slide joint housing, then install new snap ring "A".
6. Make sure that boot is properly installed on the drive shaft groove.
   Set boot so that it does not swell and deform when its length is "L_2".
   Length "L_2":
   97 - 99 mm (3.82 - 3.90 in)



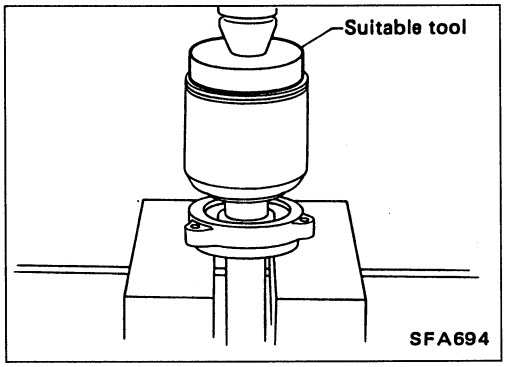
7. Lock new larger and smaller boot bands securely with a suitable tool.

Assembly (Cont'd)

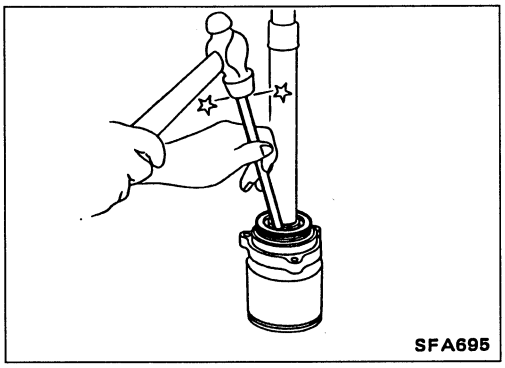
SUPPORT BEARING



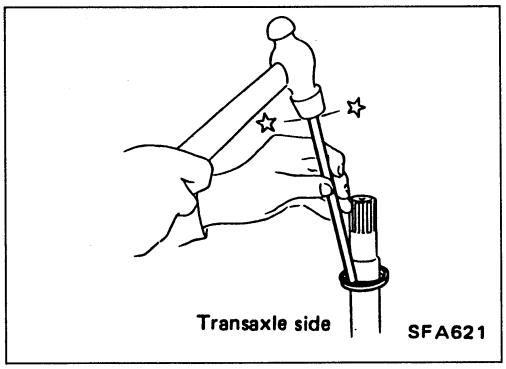
- Press bearing into retainer.



- Press drive shaft into bearing.

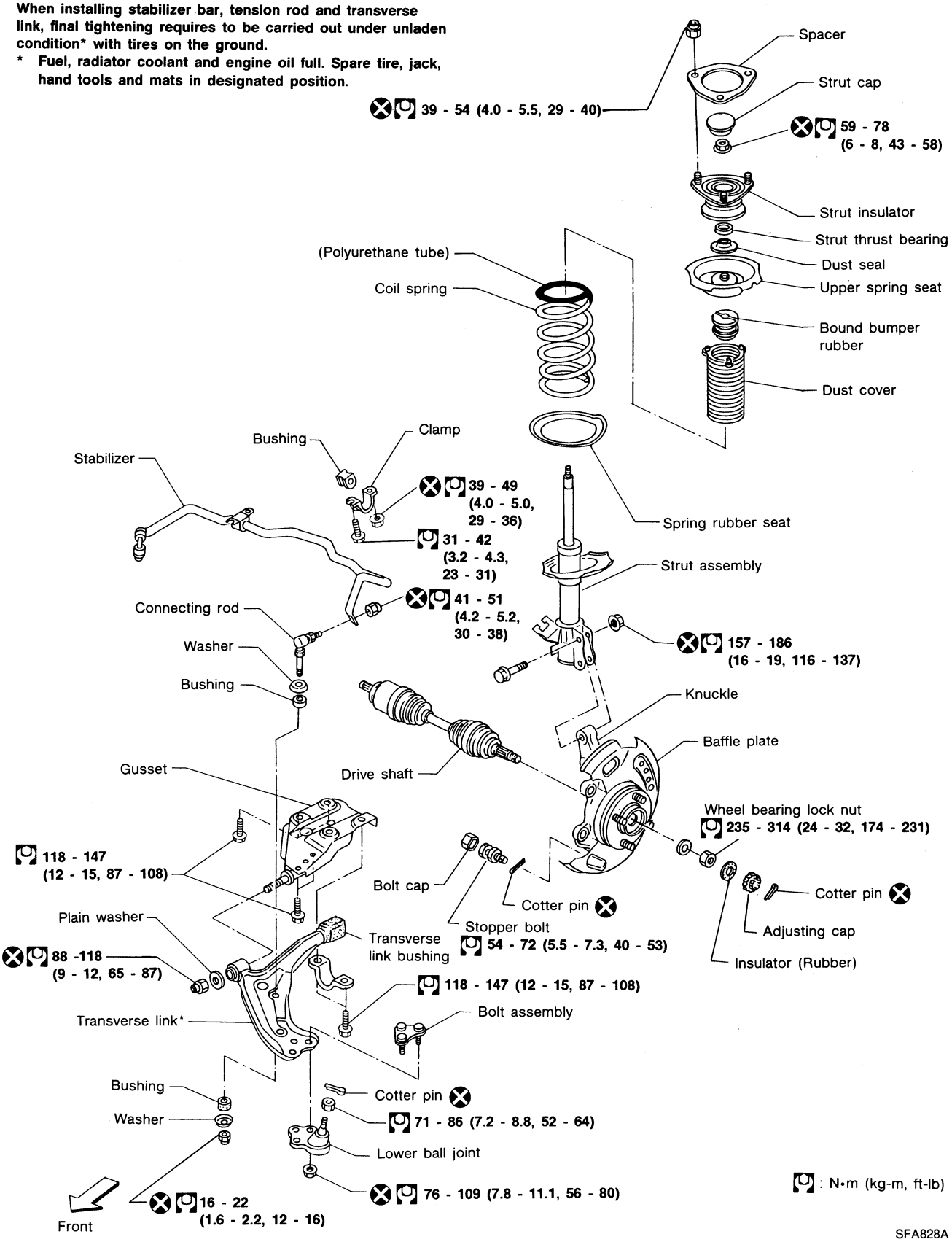


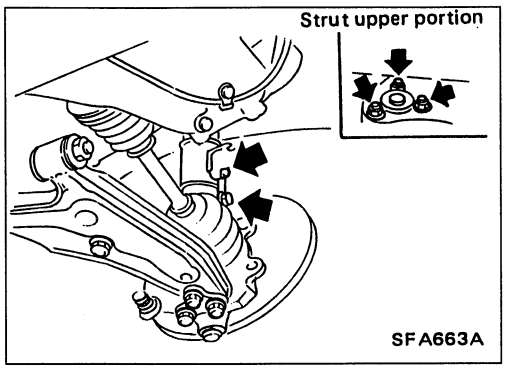
- Install snap ring.
- Install new dust shield.



When installing stabilizer bar, tension rod and transverse link, final tightening requires to be carried out under unladen condition* with tires on the ground.

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

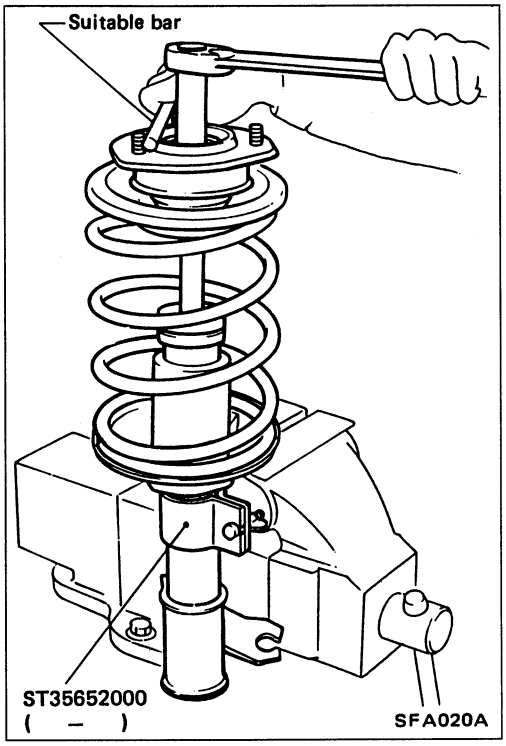




Removal and Installation

- Remove strut assembly fixing bolts and nuts (to hoodledge).

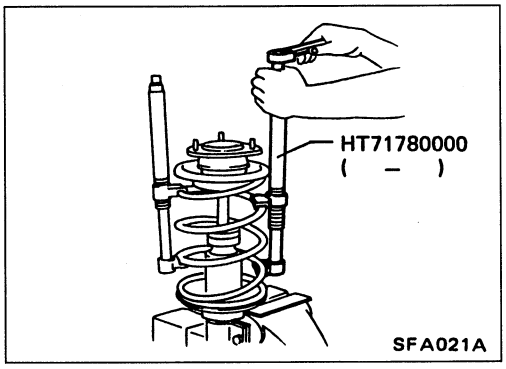
Do not remove piston rod lock nut on vehicle.



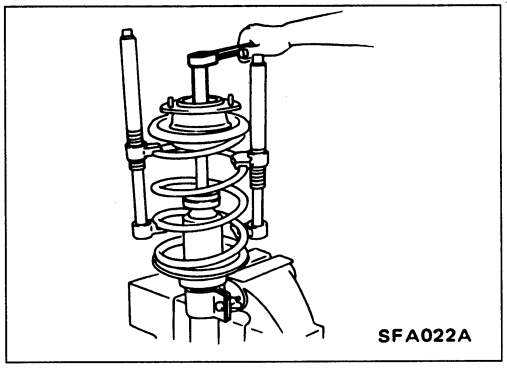
Disassembly

1. Set strut assembly on vise with Tool, 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.

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

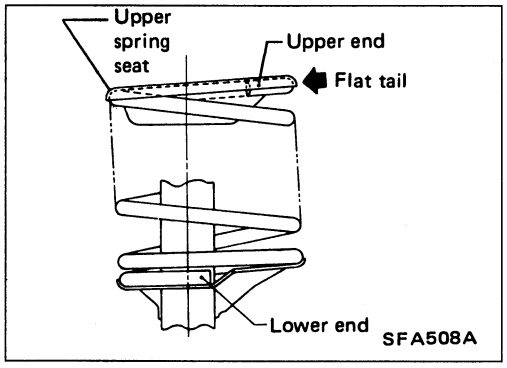
- Check cemented rubber-to-metal portion for separation or cracks.
- Check rubber parts for deterioration.

THRUST BEARING

- Check thrust bearing parts for abnormal noise or excessive rattle in axial direction.
- Replace if necessary.

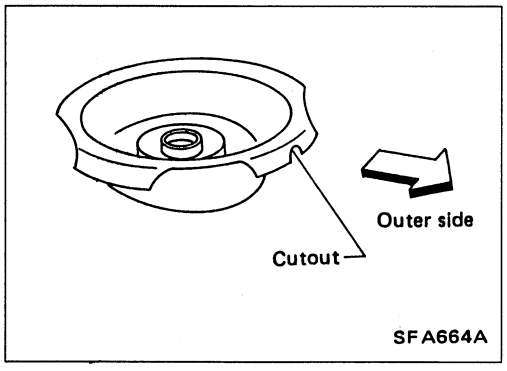
COIL SPRING

Check for cracks, deformation or other damage. Replace if necessary.

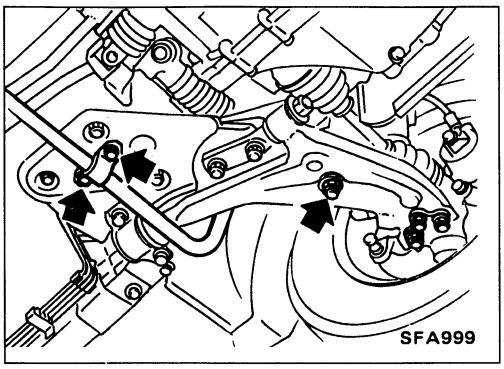


Assembly

- When installing coil spring on strut, it must be positioned as shown in the figure at left.

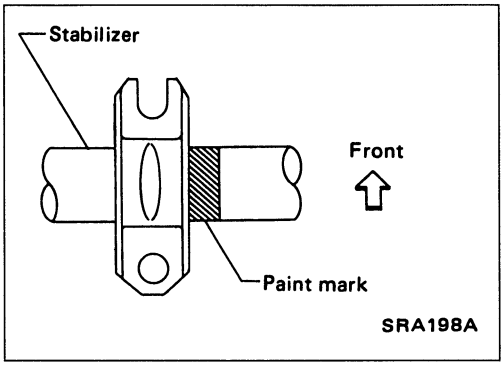


- Install upper spring seat with its cutout facing the outer side of vehicle.

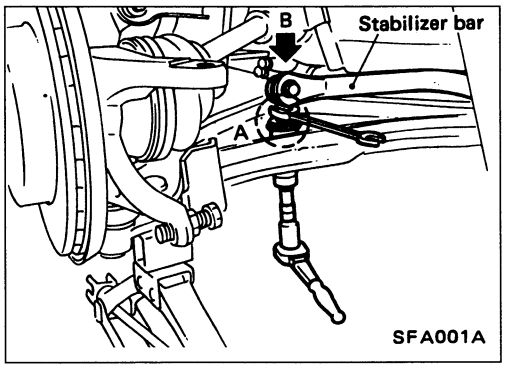


Removal and Installation

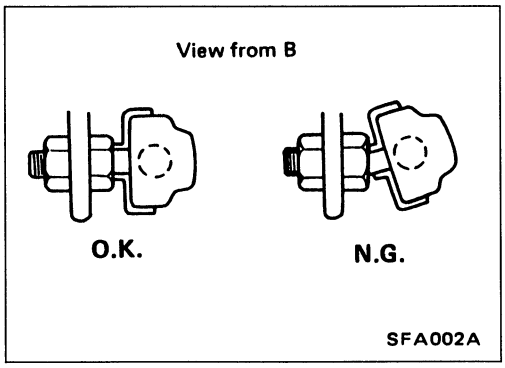
- Remove stabilizer bar.



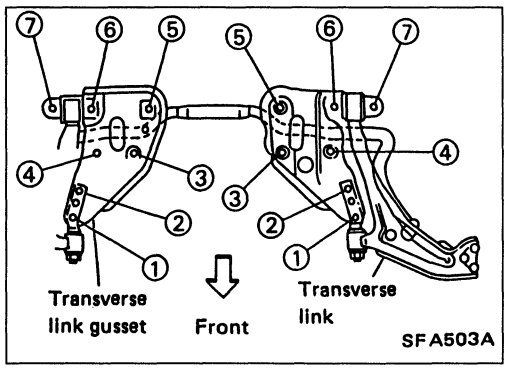
- When installing stabilizer, make sure that paint mark and clamp face in their correct directions.



- When removing and installing stabilizer bar, fix portion A.



- Install stabilizer bar with ball joint socket properly placed.

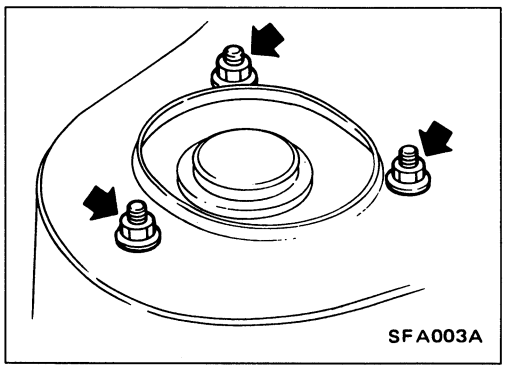


Removal and Installation

- 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 CHECK AND ADJUSTMENT.

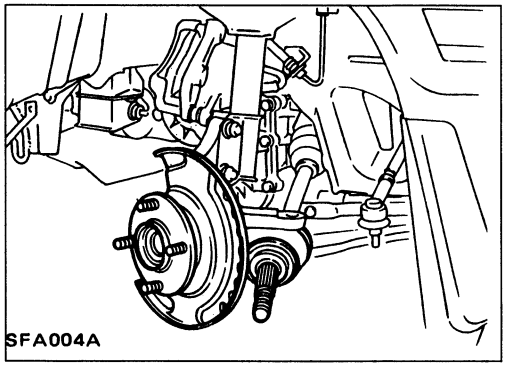
Inspection

- 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.


SFA003A

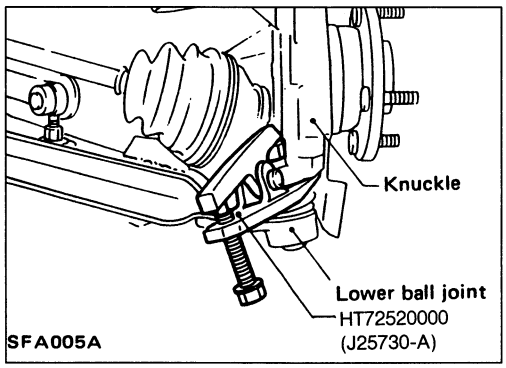
Removal and Installation

1. Remove wheel bearing lock nut.
2. Remove tie-rod ball joint.
3. Loosen (do not remove) strut mounting nuts.


SFA004A

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 waste cloth so as not to damage them when removing drive shaft.

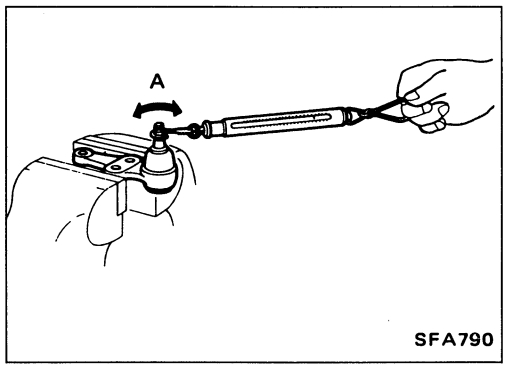


SFA005A

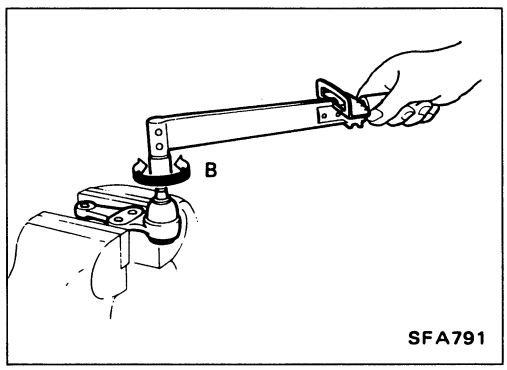
6. Remove lower ball joint from knuckle with Tool.

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.



SFA790



SFA791

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

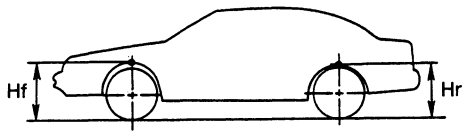
STRUT

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

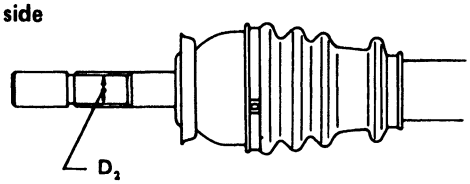
Applied model		All
Front (Hf)	mm (in)	676 (26.61)
Rear (Hr)	mm (in)	645 (25.39)

*: Tankful of fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools, mats in designated position.

DRIVE SHAFT

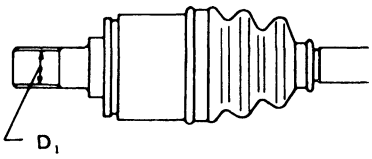
Applied model	All
Joint type	
Transaxle side	DS90
Wheel side	ZF100
Diameter mm (in)	
Transaxle side D_1	28 (1.10)
Wheel side D_2	28 (1.10)
Grease	Nissan genuine grease or equivalent
Capacity g (oz)	
Transaxle side	160 - 180 (5.64 - 6.35)
Wheel side	205 - 225 (7.23 - 7.94)

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		mm (in)	1 - 3 (0.04 - 0.12)
	Total toe-in	degree	6' - 18'
Front wheel turning angle	Full turn*2	Inside	34° - 38°
		Outside	27° - 31°

*1: Tankful of fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools, mats in designated position.

*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

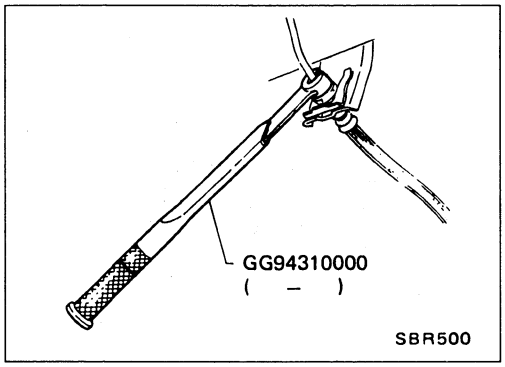
Unit: mm (in)

Wheel type	Aluminum wheel	Steel wheel
Maximum radial runout limit	0.3 (0.012)	0.5 (0.020)
Maximum lateral runout limit	0.3 (0.012)	0.8 (0.031)

REAR AXLE & REAR SUSPENSION

SECTION RA

CONTENTS

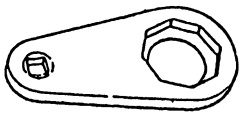
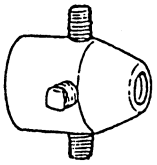
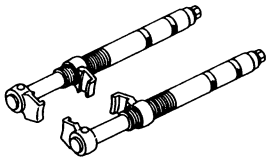
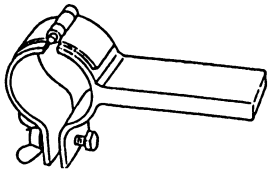
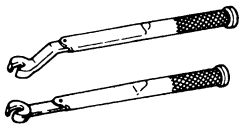


Precautions

- **When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.**
  ***: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools, and mats in designated positions.**
- **Use Tool when removing or installing brake tubes.**
- **When removing each suspension part, check wheel alignment and adjust if necessary.**
- **Do not jack up at the parallel links.**

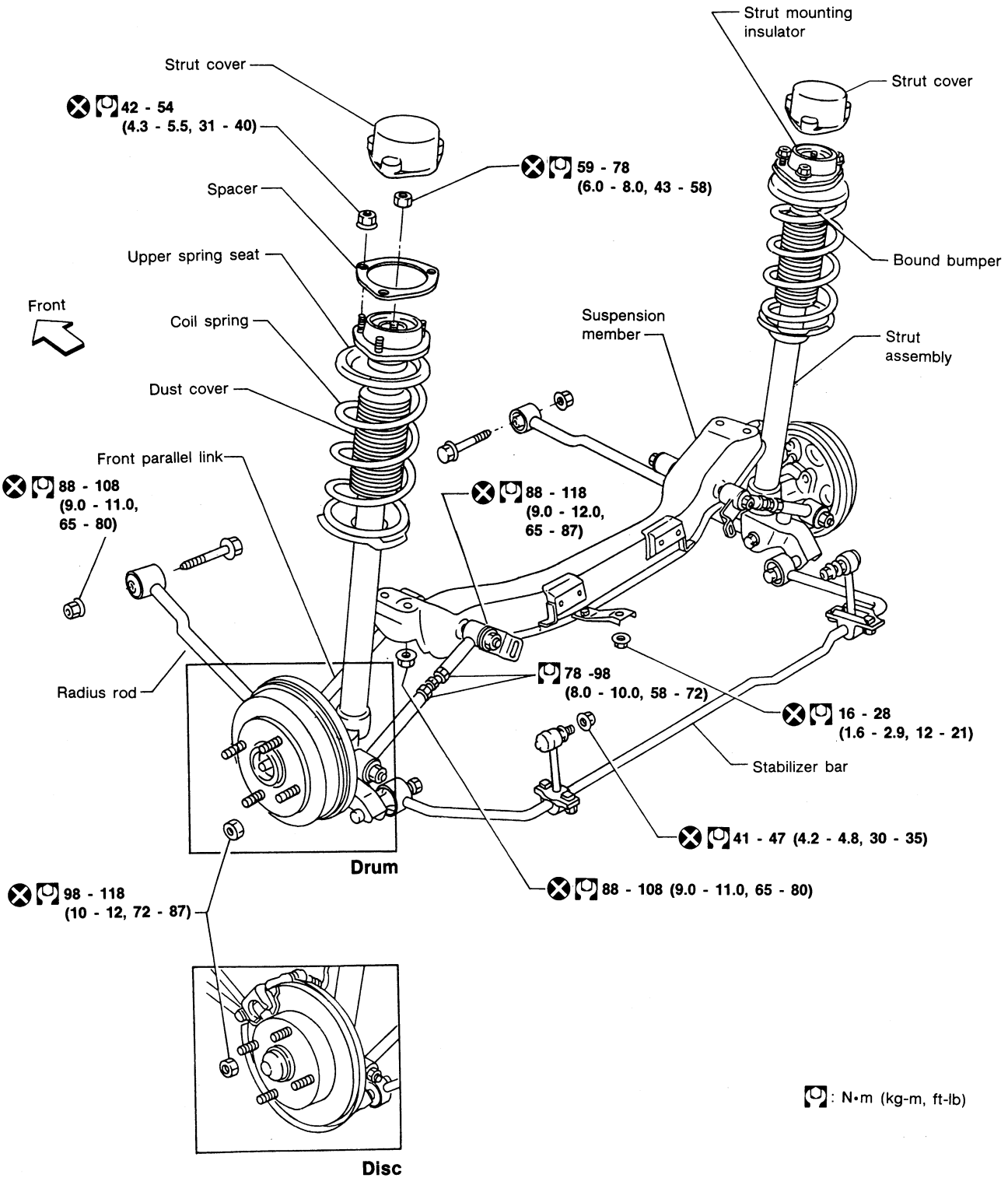
Preparation

SPECIAL SERVICE TOOLS

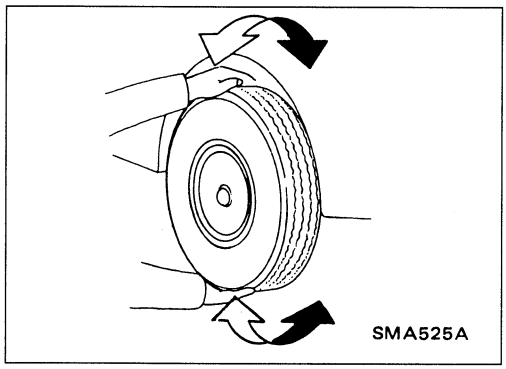
Tool number (Kent-Moore No.) Tool name	Description	
ST35490000 (J26083) Gland packing wrench		Removing and installing gland packing
KV401021S0 (—) Bearing race drift		Installing wheel bearing outer race
HT71780000 (—) Spring compressor		Removing and installing coil spring
ST35652000 (—) Strut attachment		Fixing strut assembly
GG94310000 (—) Flare nut torque wrench		Removing and installing brake piping

When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.

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



SRA265A

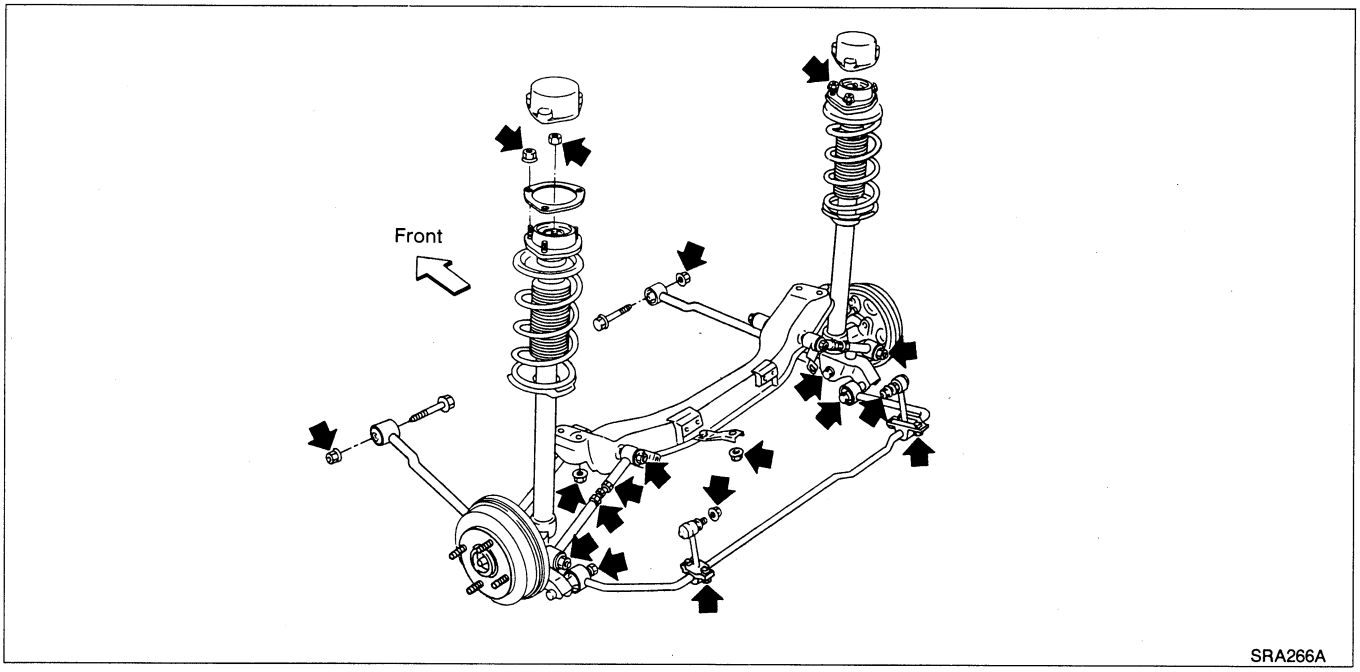

SMA525A

Rear Axle and Rear Suspension Parts

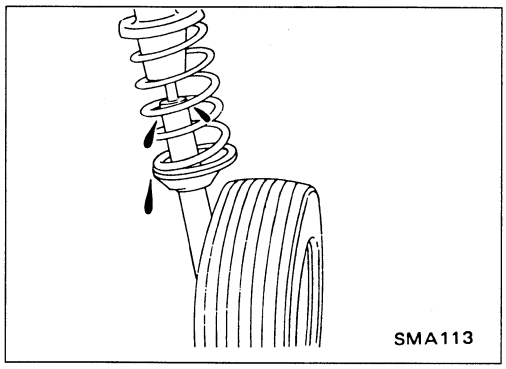
Check axle and suspension parts for looseness, wear or damage.

- Shake each rear wheel to see excessive play.

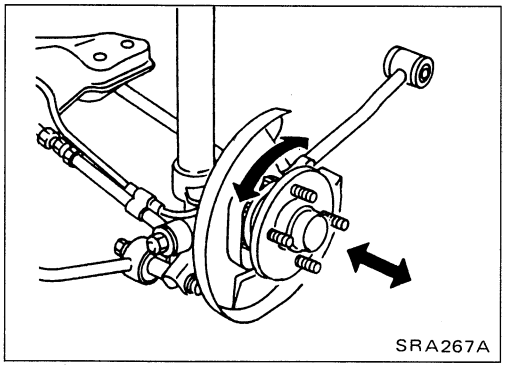
- Retighten all nuts and bolts to the specified torque.
  Tightening torque: Refer to pages RA-3 and RA-9.



SRA266A

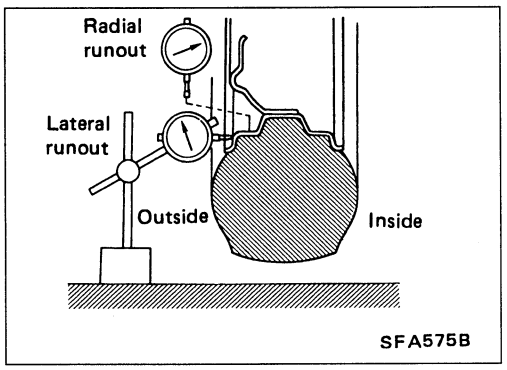

SMA113

- Check strut (shock absorber) for oil leakage or other damage.
- Check wheelarch height. Refer to 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.

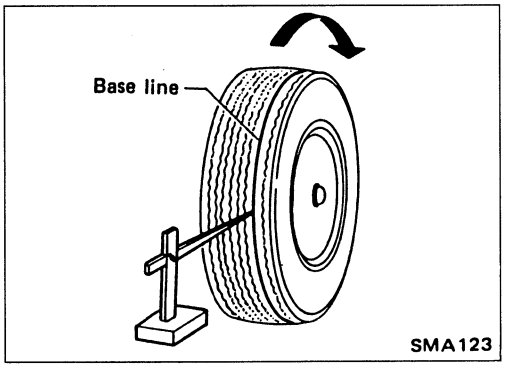
- Check tires for wear and for improper inflation.
- Check rear wheel bearings for looseness.
- Check wheel runout.
  Wheel runout: Refer to S.D.S. in FA section.
- Check that rear strut (shock absorber) works properly.
- Check rear axle and rear suspension parts for looseness.
- Check vehicle posture (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.

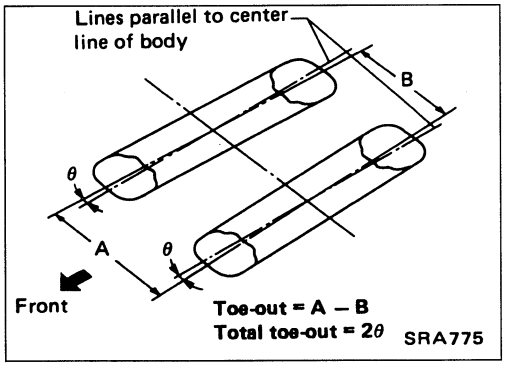
Camber:
-1°20' to 0°10'

- If the camber is not within specification, inspect and replace any damaged or worn rear suspension parts.



TOE-OUT

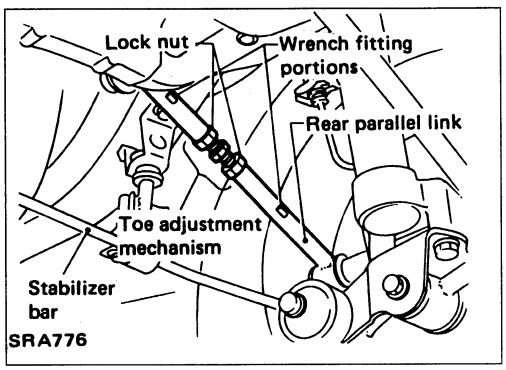
1. Draw a base line across the tread.
- After lowering rear of vehicle, move it up and down to eliminate friction.



2. Measure toe-out.
- Measure distance "A" and "B" at the same height as hub center.

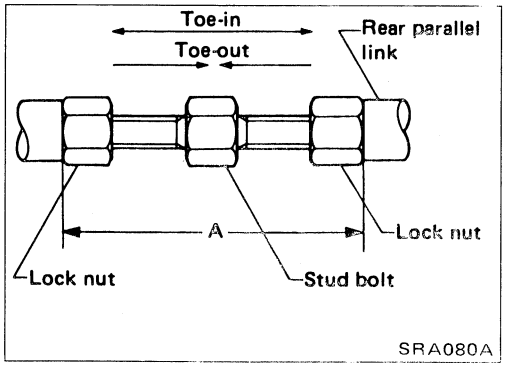
Toe-out:

A - B	**0 - 4 mm (0 - 0.16 in)**
2θ	**0' - 23'**



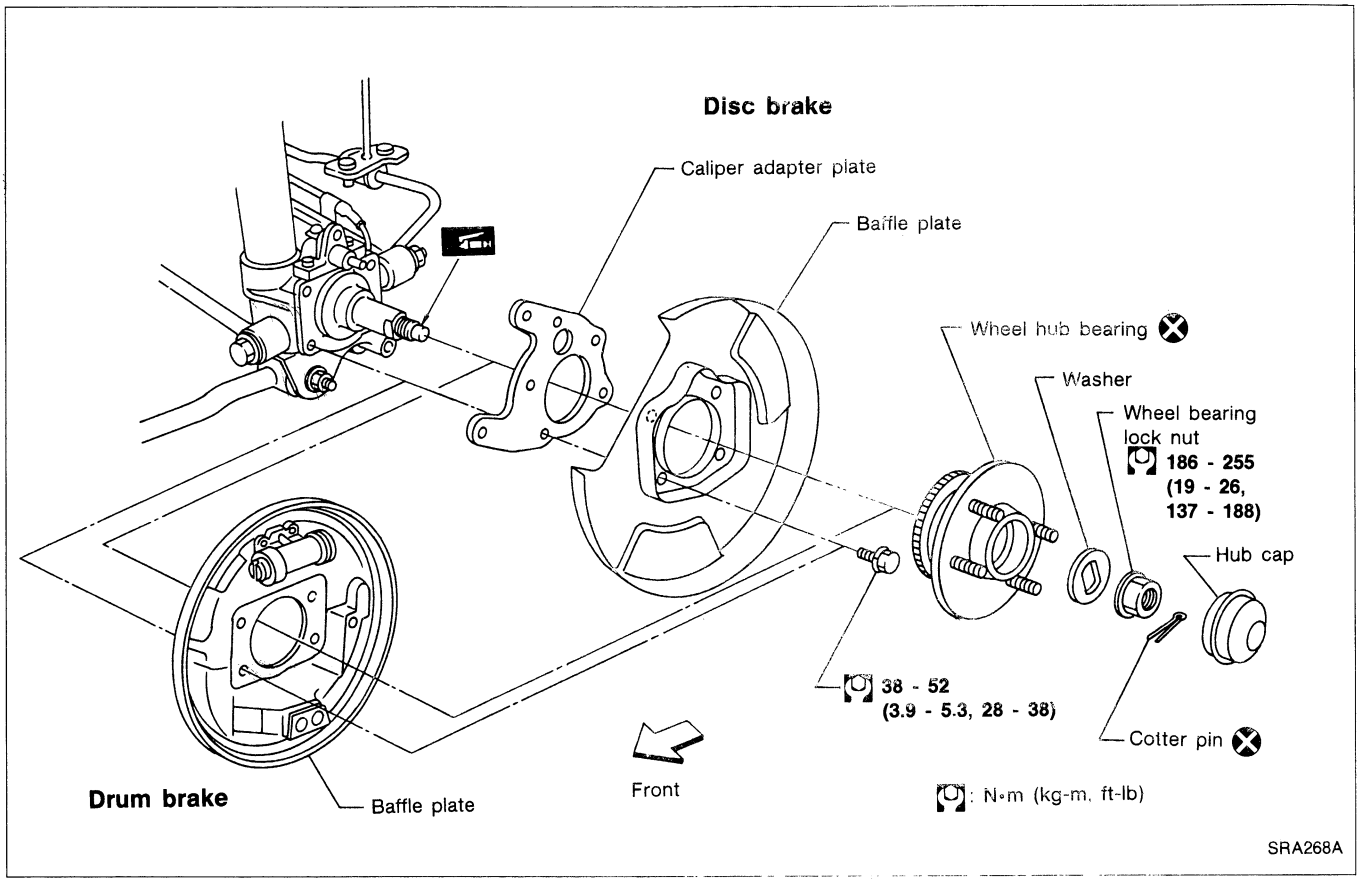
3. Adjust toe-out by varying the lengths of rear parallel links.

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)

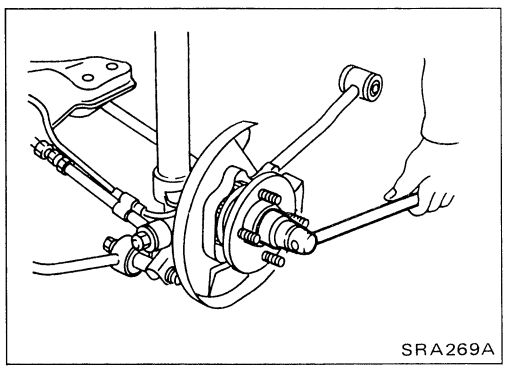


Removal

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.

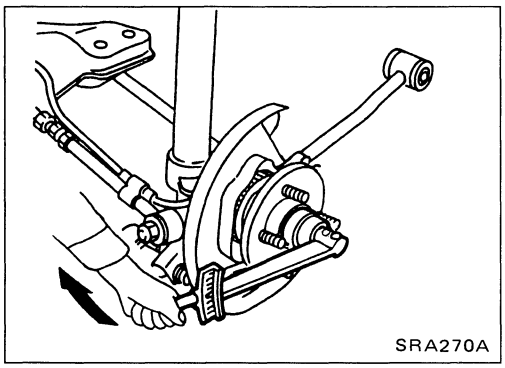


1) Remove brake caliper assembly.
2) Remove wheel bearing lock nut.

Brake hose does not need to be disconnected from brake caliper.

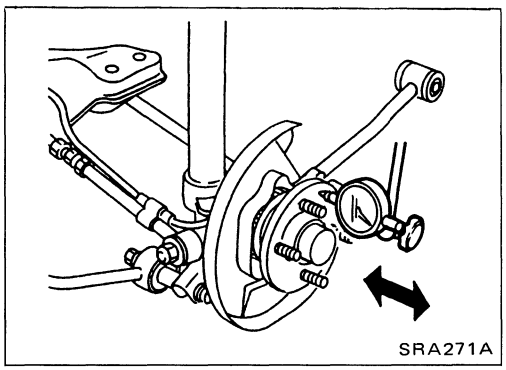
Be careful not to depress brake pedal, or piston will pop out.

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

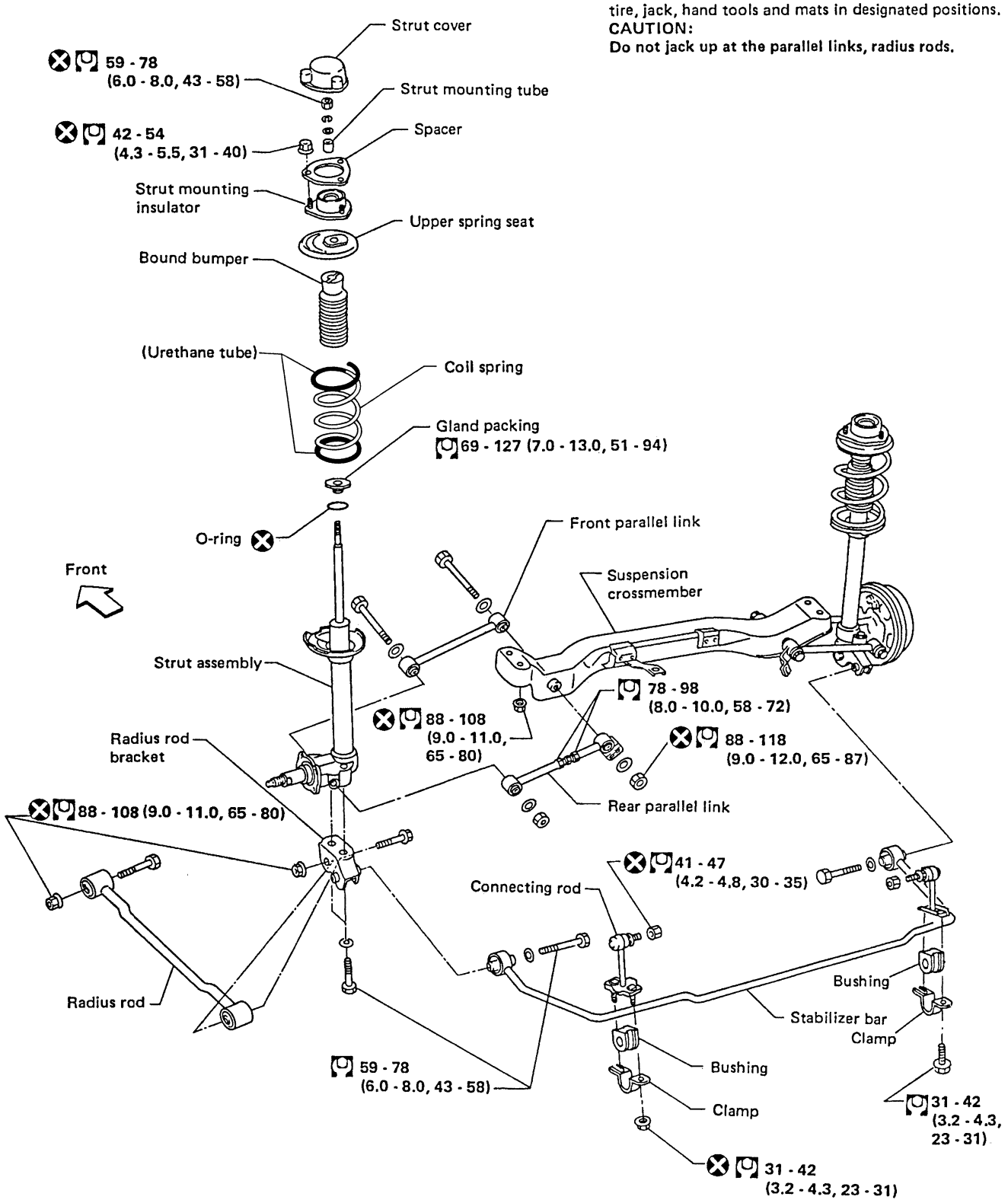
- Check wheel bearing axial end play.
  Axial end play:
  0.05 mm (0.0020 in) or less

When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.

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

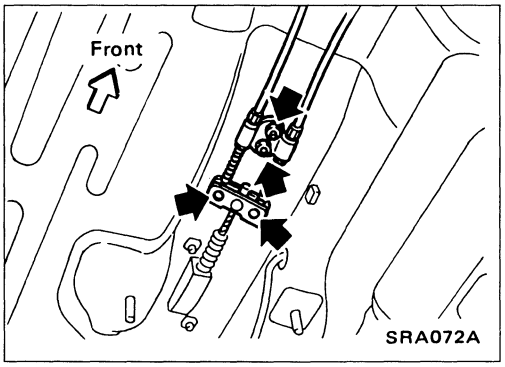
CAUTION:

Do not jack up at the parallel links, radius rods.



: N·m (kg-m, ft-lb)

SRA263A

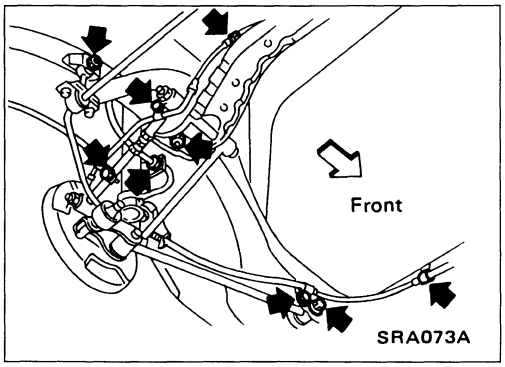


Removal and Installation

CAUTION:

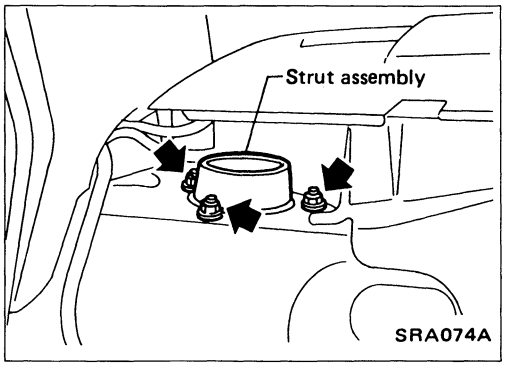
Do not jack up at the parallel links or radius rods.

- Disconnect brake hydraulic line and parking brake cable at equalizer.

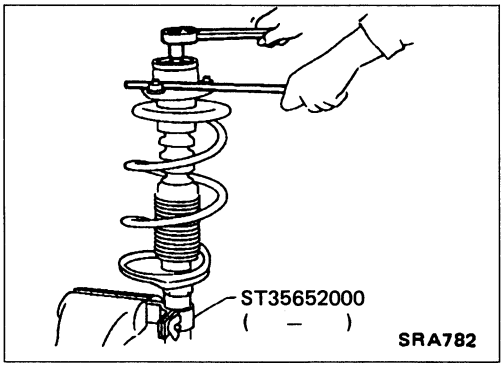


- Remove suspension assembly.

1) Remove parallel link fixing bolt, radius rod fixing bolt, stabilizer fixing bolt, stabilizer connecting rod brackets and parking brake cable fixing bolts.



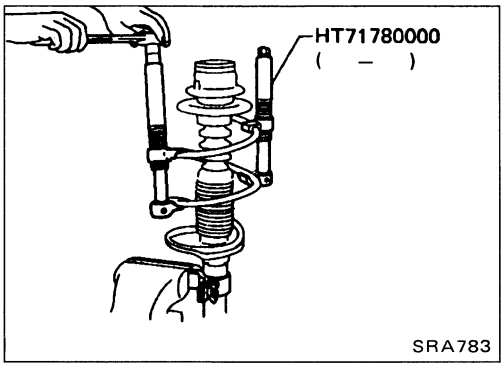
2) Remove rear seat and parcel shelf. Refer to section BF.
3) Remove strut securing nuts (Upper side). Then pull out strut assembly.



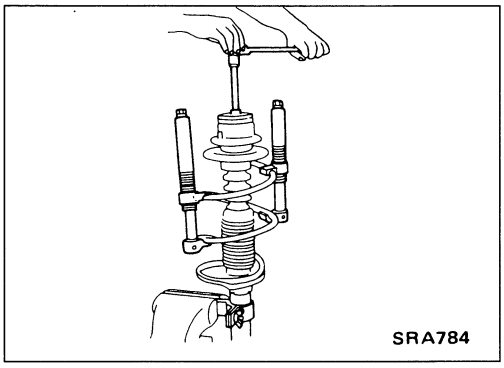
Disassembly

1. Set strut assembly on vise with attachment, then loosen piston rod lock nut.

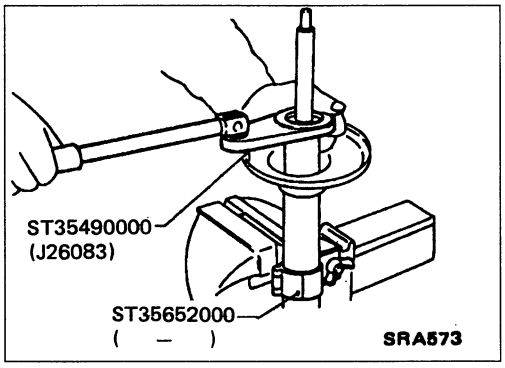
Do not remove piston rod lock nut.



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

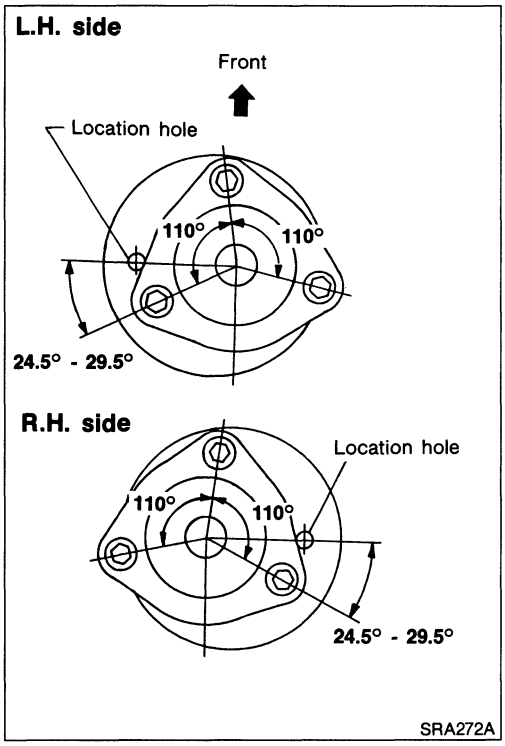
Check rubber parts for deterioration or cracks.
Replace if necessary.

STRUT MOUNTING INSULATOR

- Check cemented rubber-to-metal portion for melting or cracks.
- Check rubber parts for deterioration.

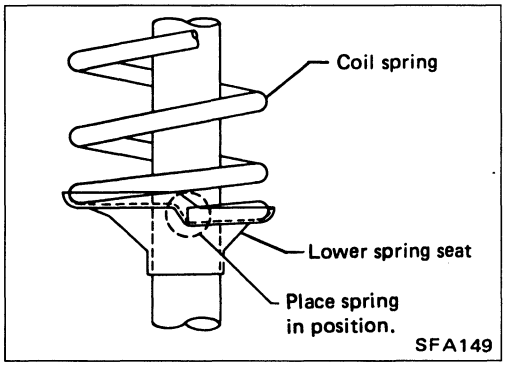
COIL SPRING

Check for cracks, deformation or other damage.
Replace if necessary.

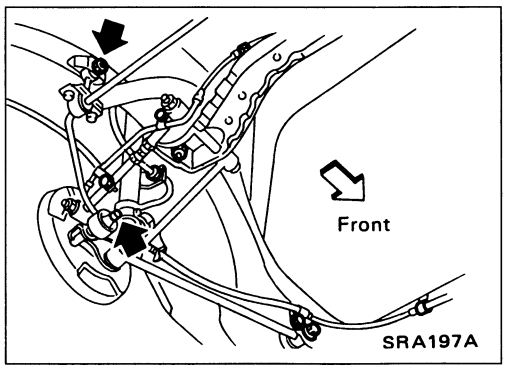


Assembly

1. Locate upper spring seat as shown.

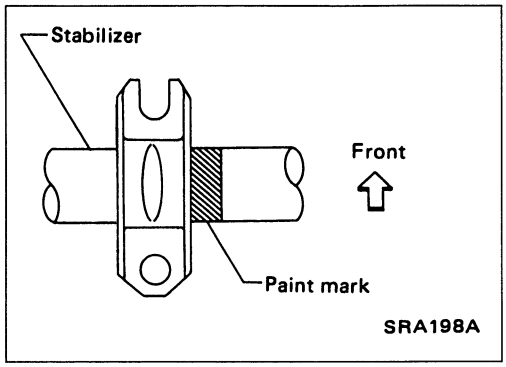


2. After placing coil spring in position on lower spring seat, release spring compressor gradually.

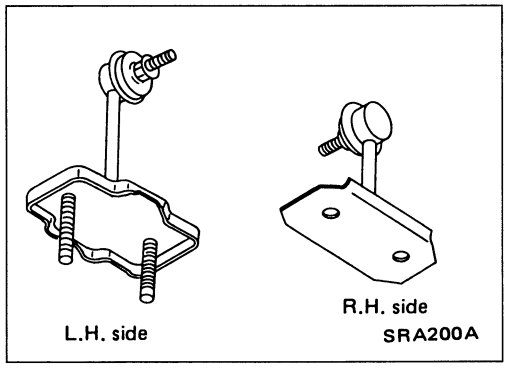


Removal and Installation

- 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, lb/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-out	mm (in)	0 - 4 (0 - 0.16)
(Total toe-out)	degree	0' - 23'

* Tankful of fuel, radiator coolant and engine oil full.
Spare tire, jack, hand tools, 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)

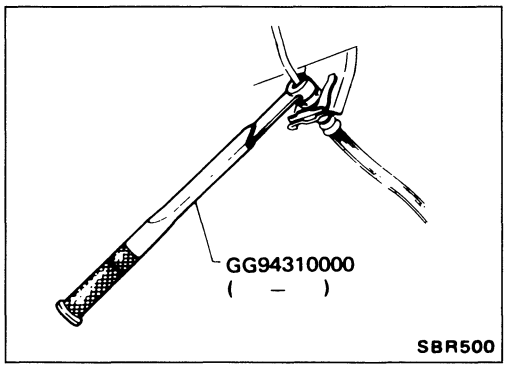
BRAKE SYSTEM

SECTION BR

CONTENTS

Precautions

- **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.**



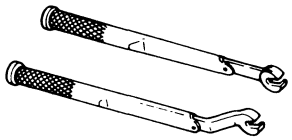
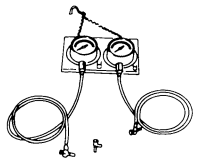
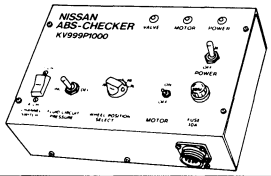
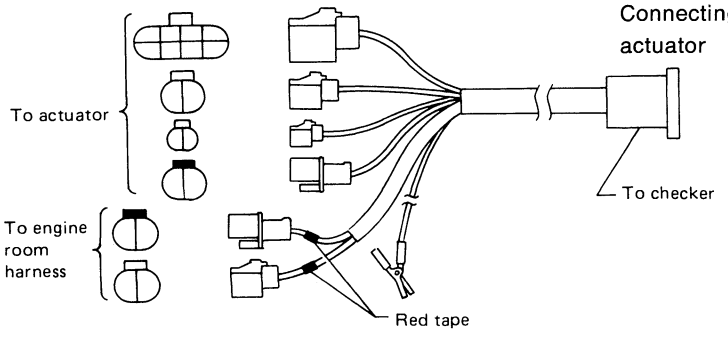
- **Use Tool when removing and installing brake tube.**

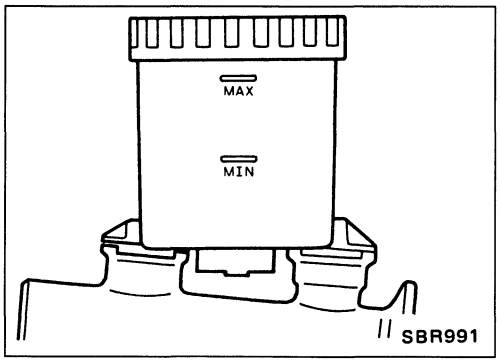
WARNING:

- **Clean brake pads and shoes with a waste cloth, then wipe with a dust collector.**

Preparation

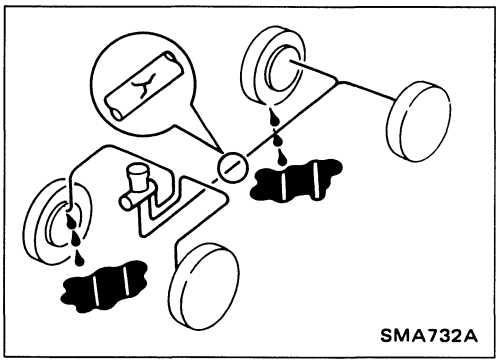
SPECIAL SERVICE TOOL

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 (—) A.B.S. checker		Checking A.B.S. actuator operation
KV999P1010 (—) A.B.S. checker adapter harness		Connecting A.B.S. checker with actuator



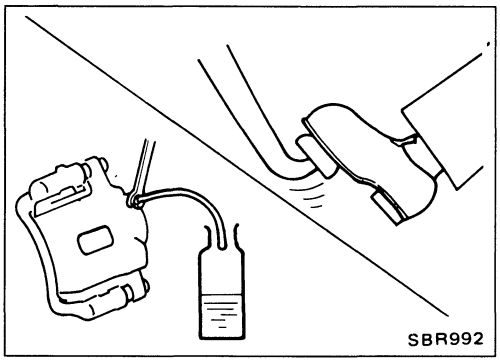
Checking Brake Fluid Level

- 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.

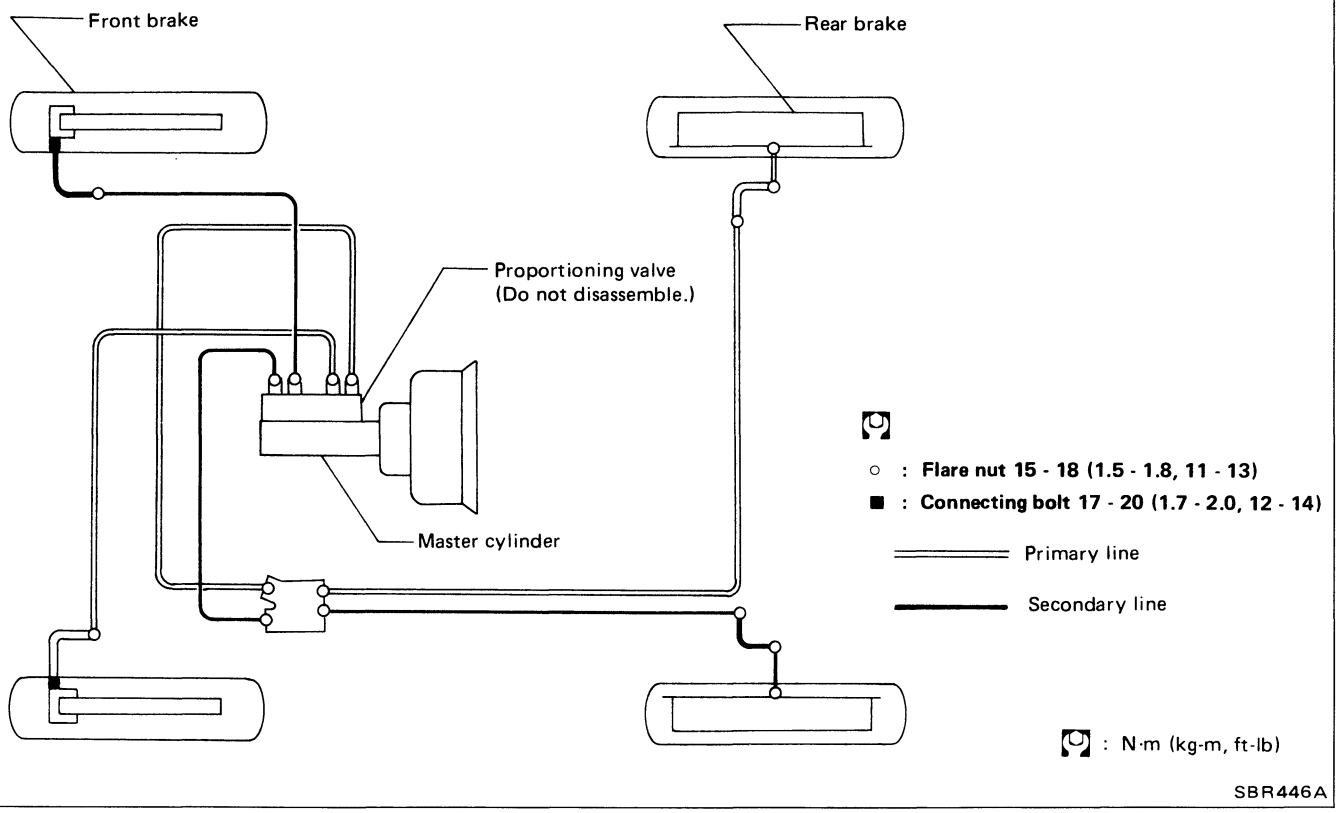


Changing Brake Fluid

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.

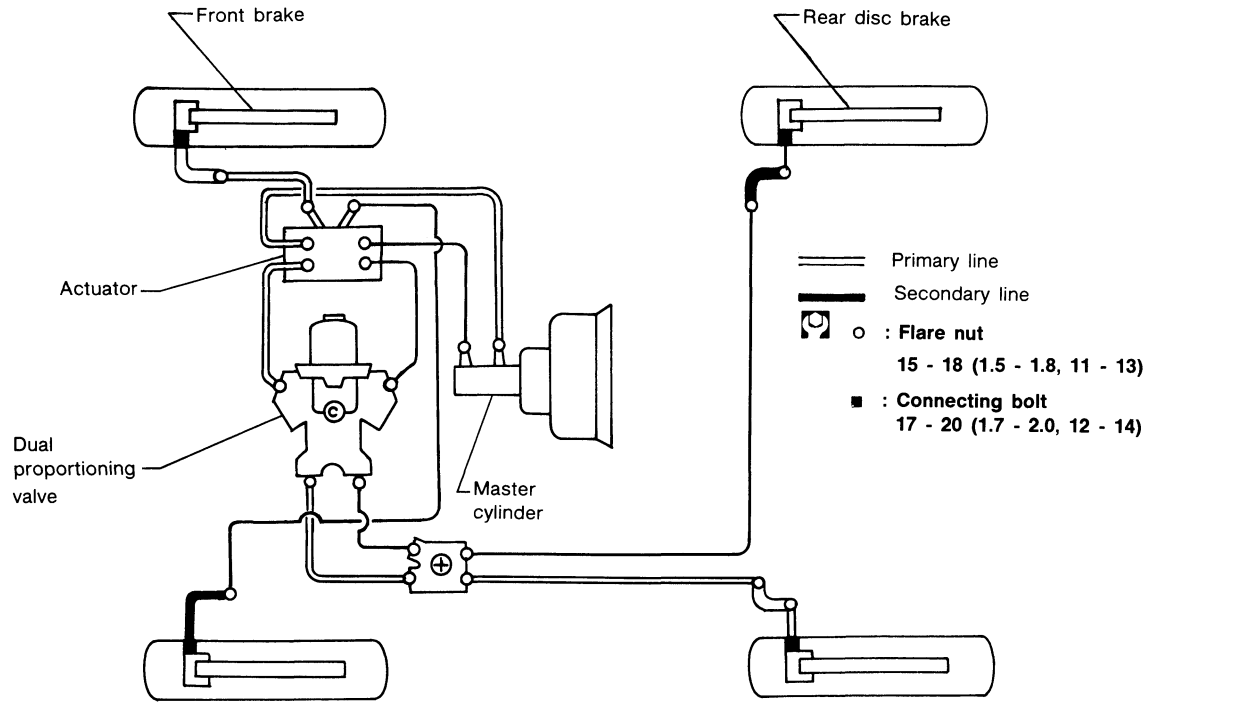
- **Refill with recommended brake fluid "DOT 3".**
- **Never reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas.**

Without anti-lock braking system

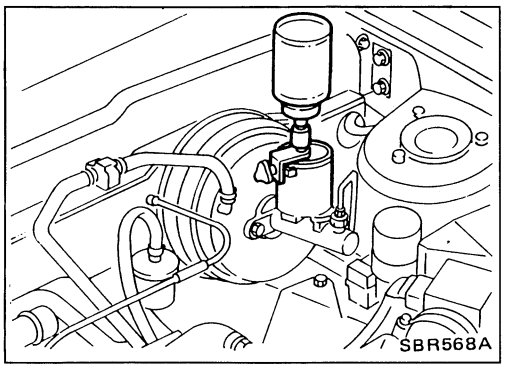


SBR446A

With anti-lock braking system



SBR894A

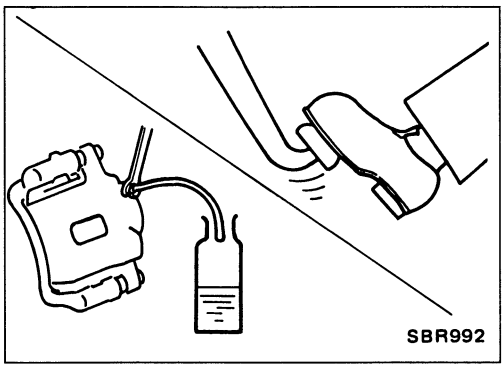


Bleeding Procedure

CAUTION:

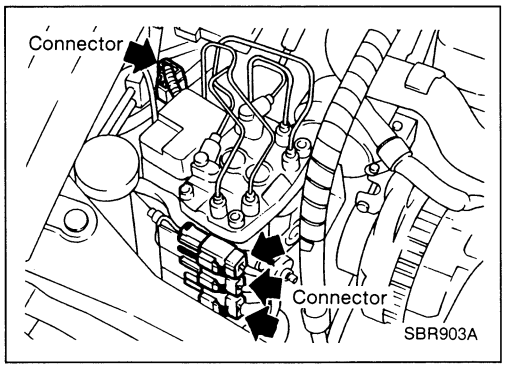
- **Carefully monitor brake fluid level at master cylinder during bleeding operation.**
- **Fill reservoir with recommended brake fluid. Make sure it is full at all times while bleeding air out of system.**
- **Place a container beneath master cylinder to avoid spillage of brake fluid.**

- 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 A.B.S. 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.

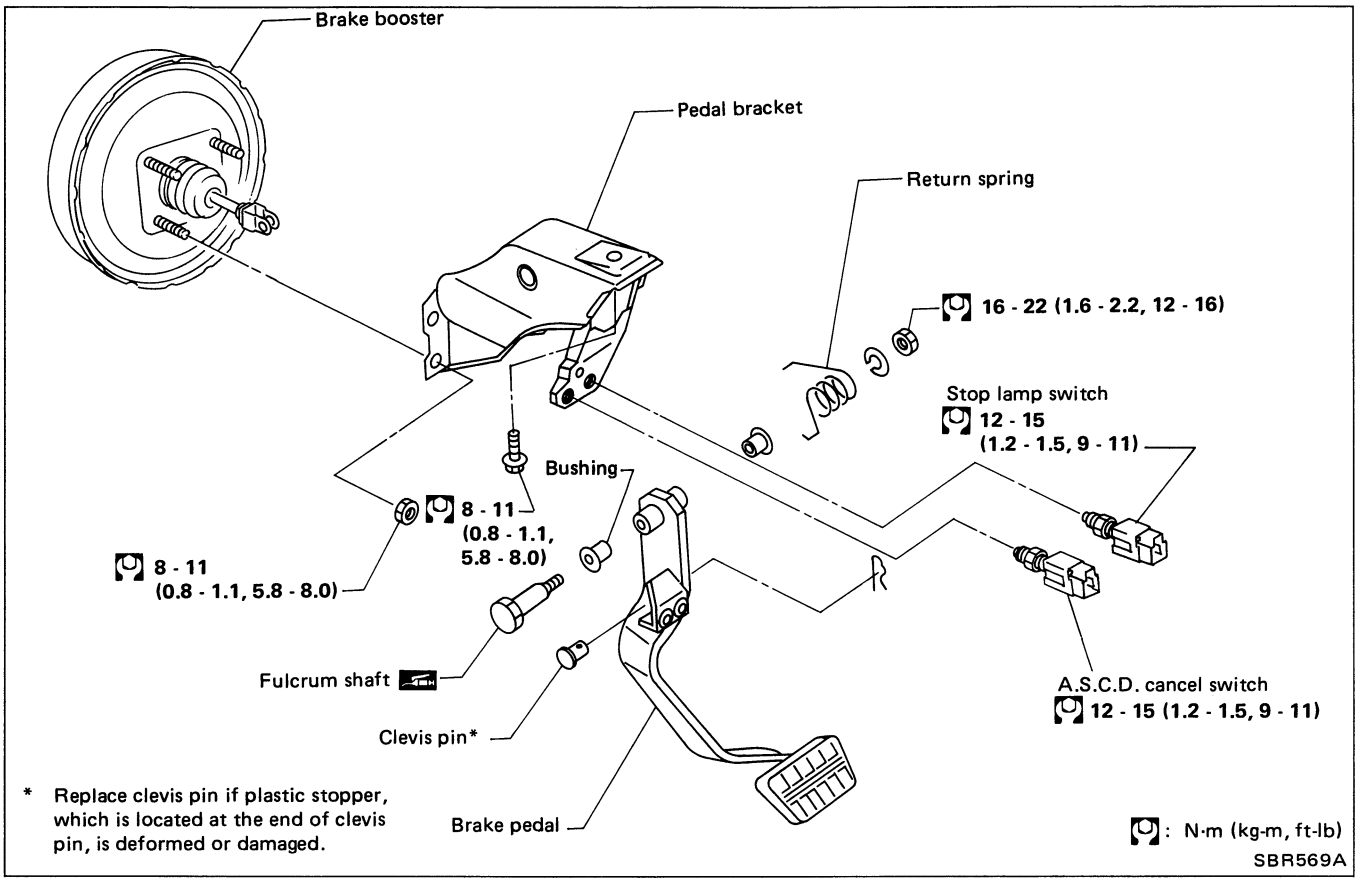
Removal and Installation

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.

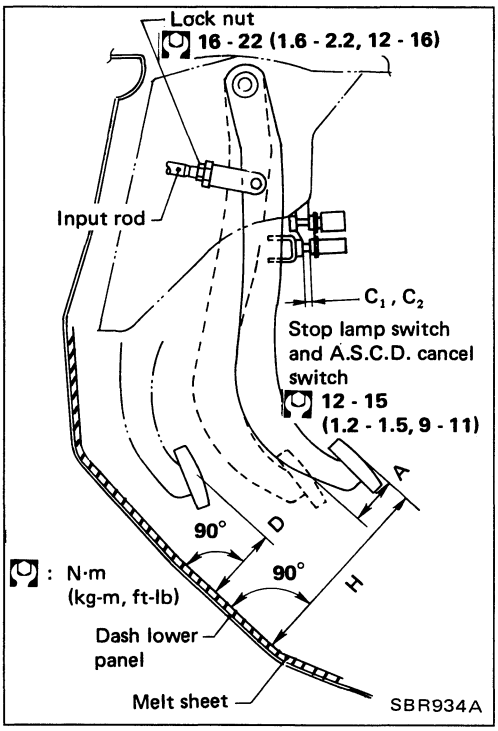
Removal and Installation



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.

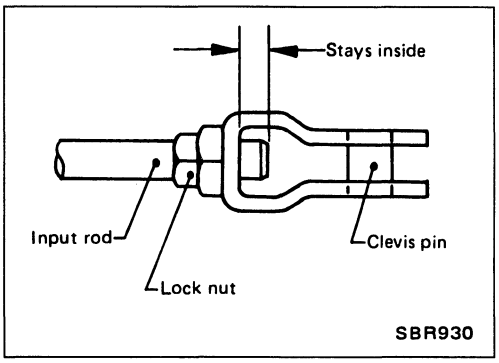
H: Free height
Refer to S.D.S.

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.

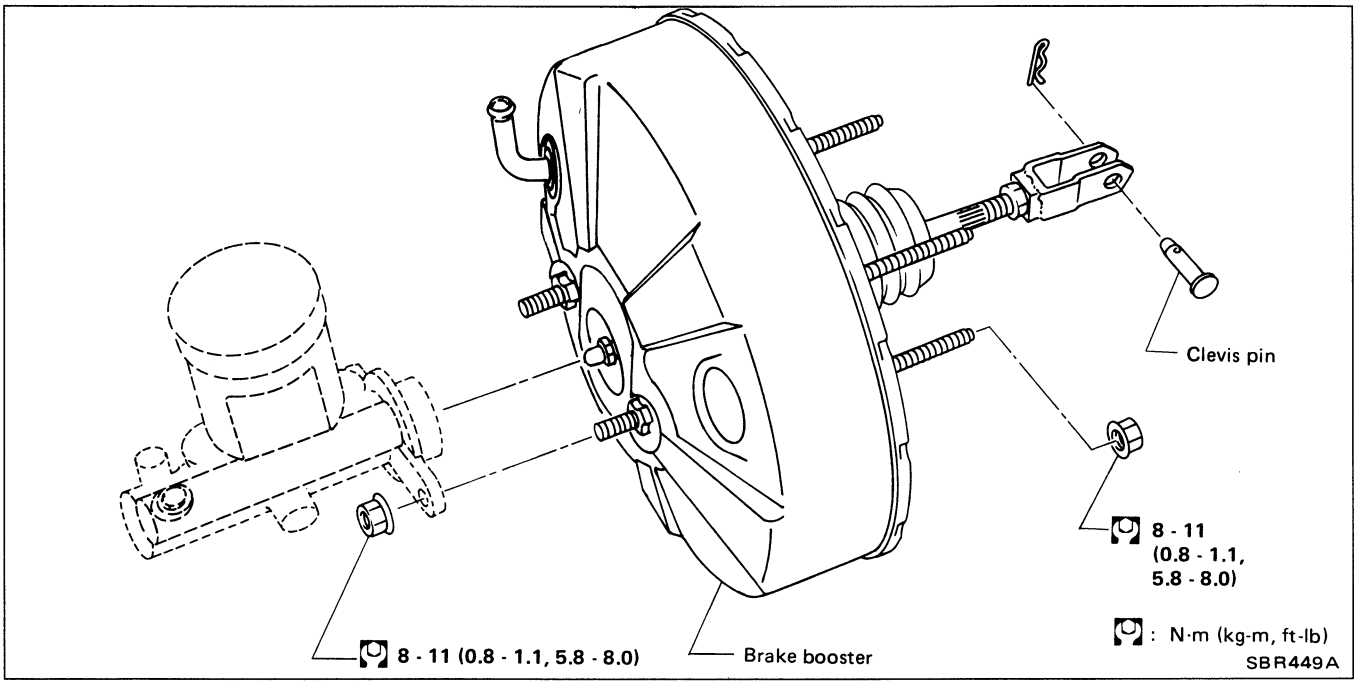
Make sure that tip of input rod stays inside.

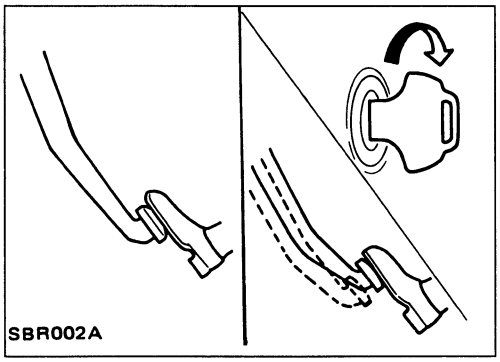
2. Adjust clearance "C_1" and "C_2" with stop lamp switch and A.S.C.D. cancel switch respectively. Then tighten lock nuts.
3. Check pedal free play.

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

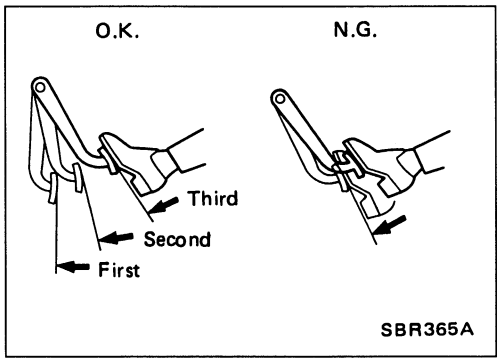




Inspection

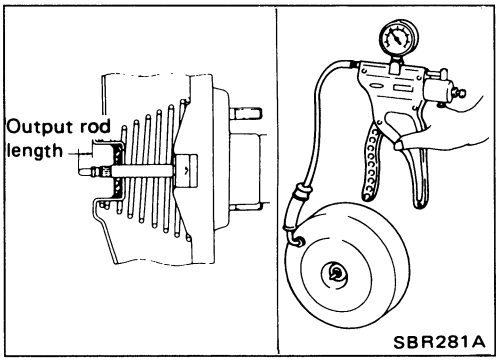
OPERATING CHECK

- 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

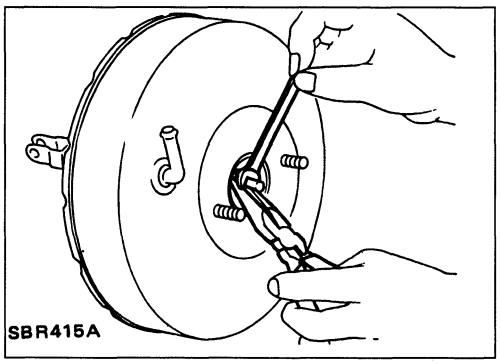
- Start engine, and stop it after one or two minutes. Depress brake pedal several times slowly. If pedal goes further down the first time and gradually rises after second or third time, booster is airtight.
- Depress brake pedal while engine is running, and stop engine with pedal depressed. If there is no change in pedal stroke after holding pedal down **30 seconds**, brake booster is airtight.



OUTPUT ROD LENGTH CHECK

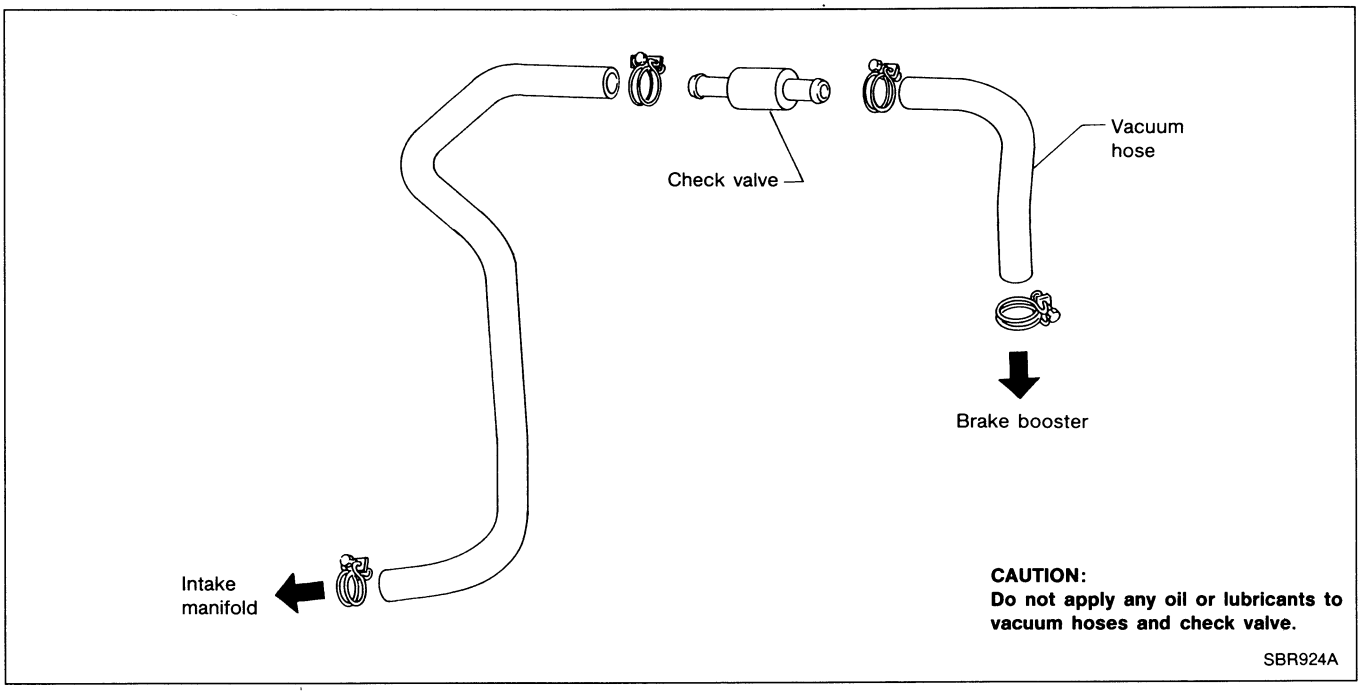
1. Supply brake booster with vacuum of –66.7 kPa (–500 mmHg, –19.69 inHg) using a handy vacuum pump.
2. Check output rod length.
   Specified length:
   10.275 - 10.525 mm (0.4045 - 0.4144 in)

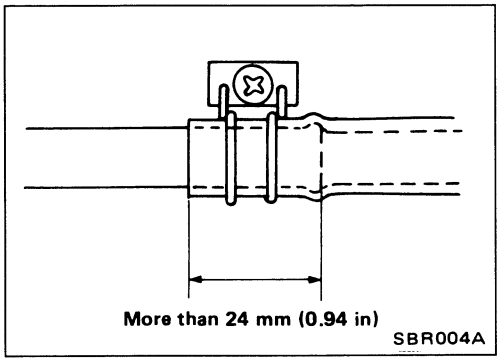
Inspection (Cont'd)



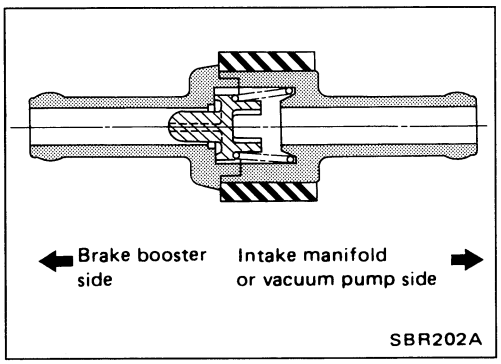
3. Adjust rod length if necessary.
4. If rod length is without specification, replace brake booster.

Removal and Installation

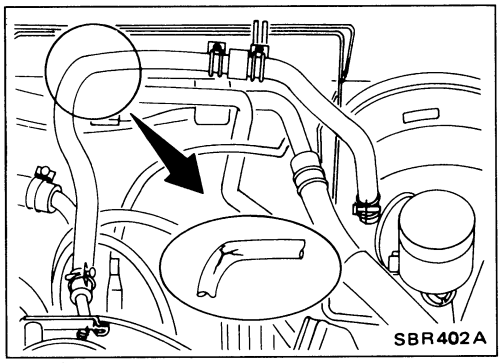




- Insert vacuum tube into vacuum hose more than 24 mm (0.94 in).



- Install check valve, paying attention to its direction.



Inspection

HOSES AND CONNECTORS

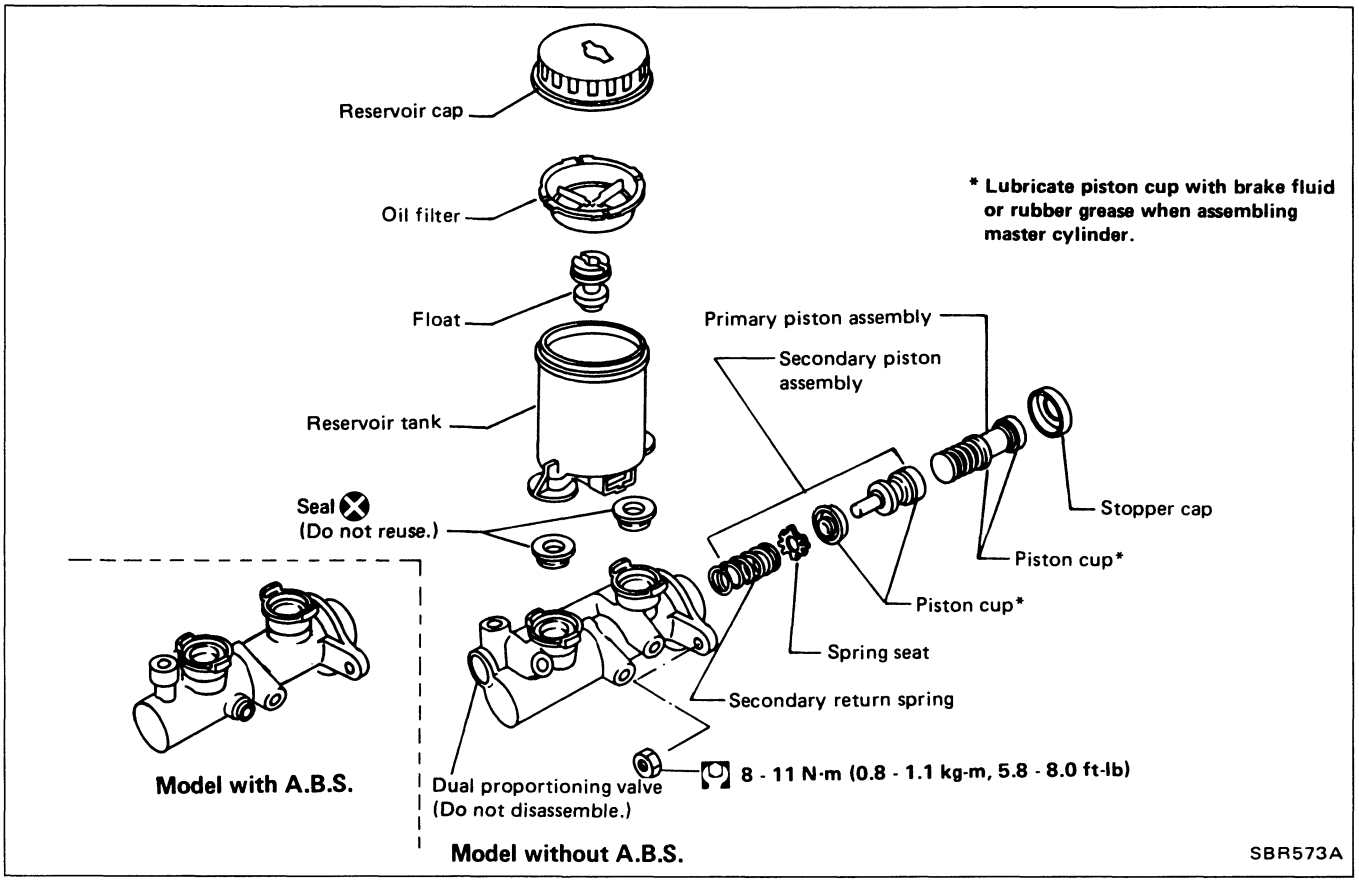
- Check vacuum lines, connections and check valve for airtightness, chafing and deterioration.

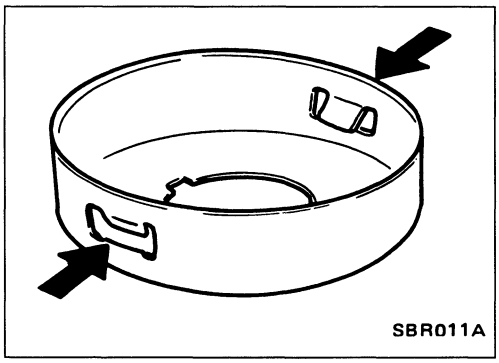
Inspection (Cont'd)

CHECK VALVE

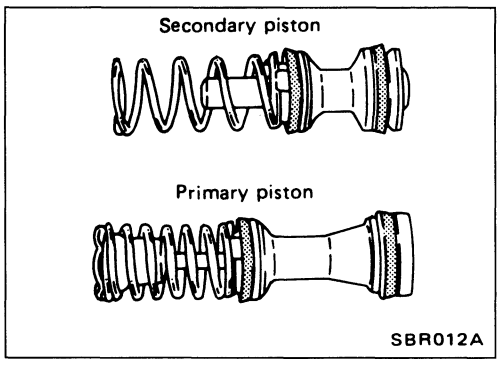
- When pressure is applied to brake booster side of check valve and valve does not open, replace check valve with a new one.

Removal and Installation

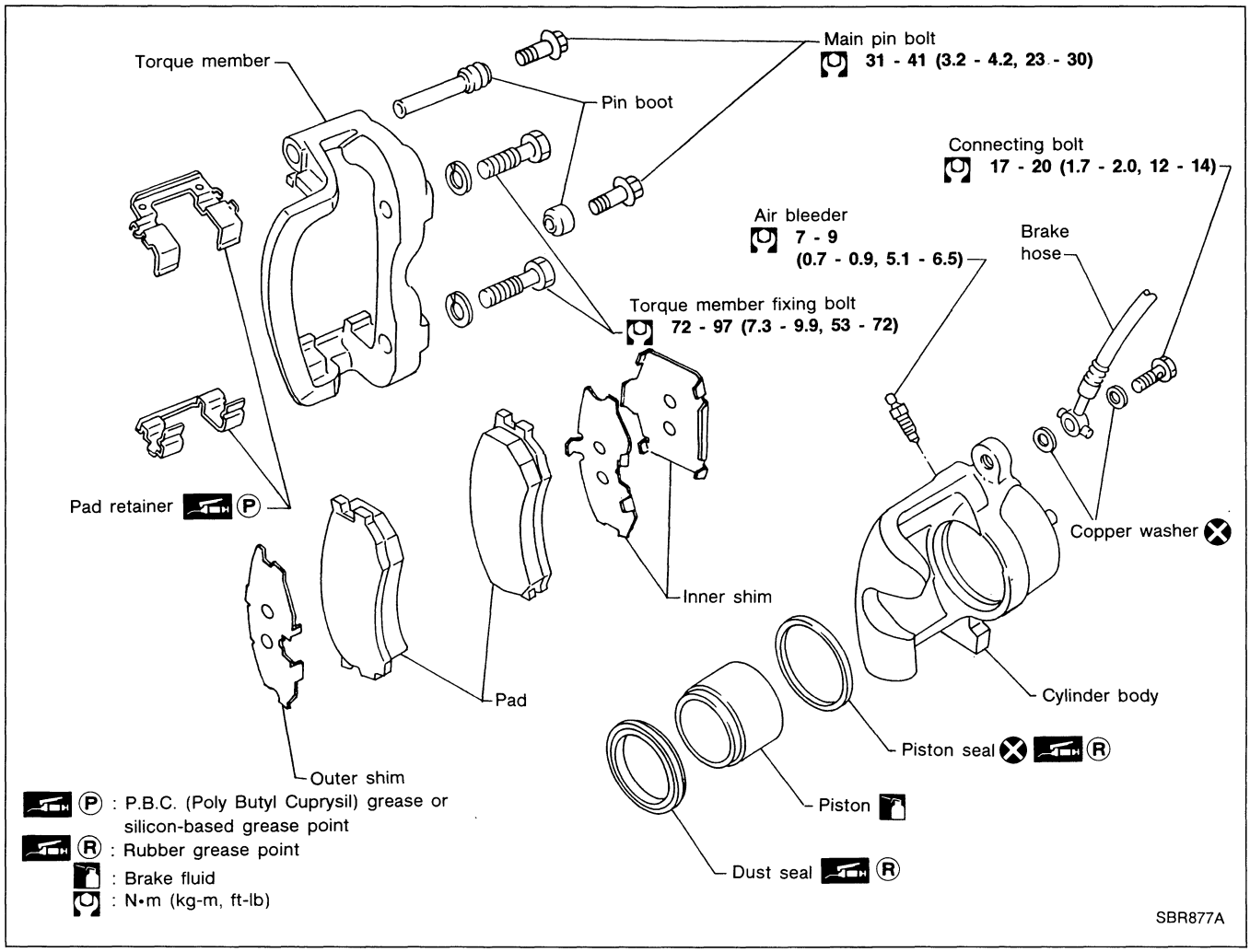


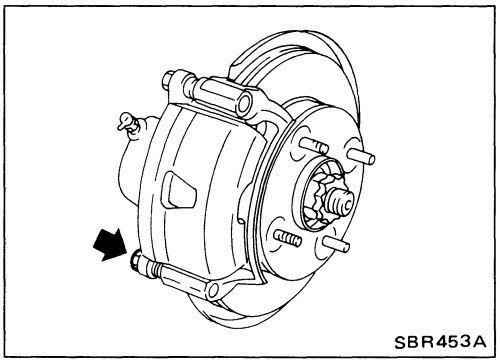


- Replace stopper cap if claw is damaged or deformed.
- Bend claws inward when installing stopper cap.



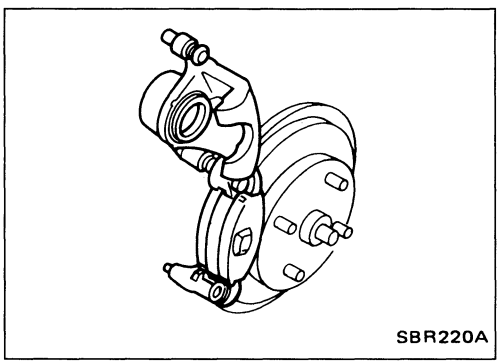
- Pay attention to direction of piston cups in figure at left.
- Check parts for wear or damage. Replace if necessary.





Pad Replacement

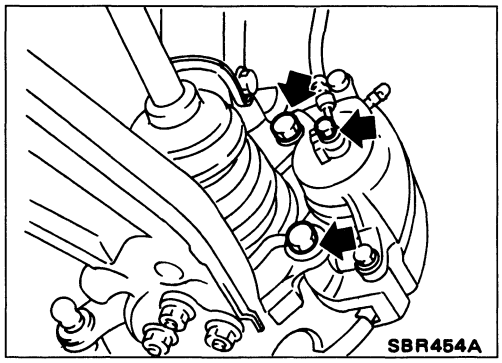
1. Remove pin bolt.



2. Swing cylinder body upward. Then remove pad retainer, and inner and outer shims.

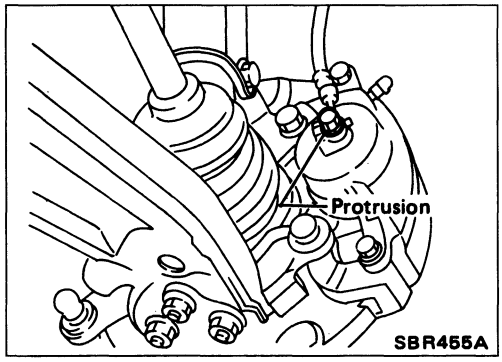
CAUTION:

- **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.**


SBR454A

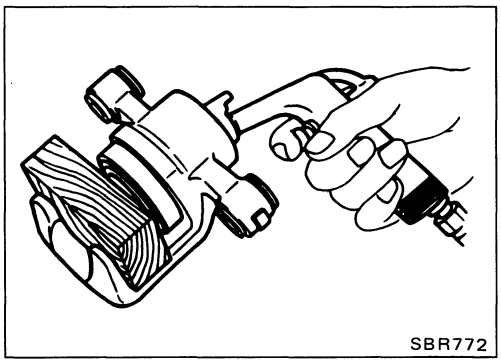
Removal and Installation

- Remove torque member fixing bolts and connecting bolt.



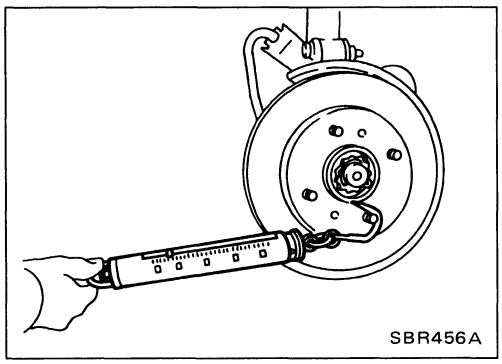
SBR455A

- Install brake hose to caliper at protrusions securely.


SBR772

Disassembly

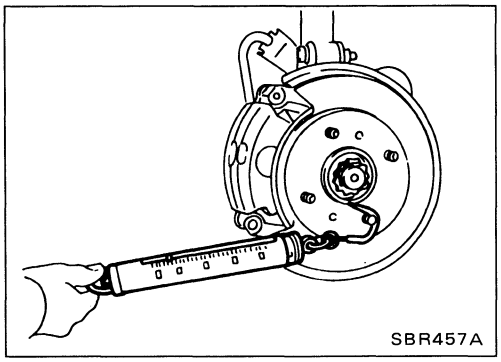
- Push out piston with dust seal using compressed air.


SBR456A

Inspection

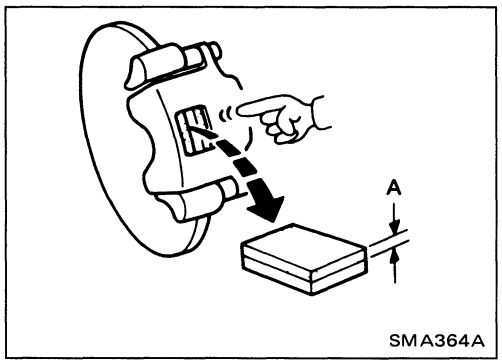
INSPECTION OF BRAKE DRAG FORCE

1. Swing cylinder body upward.
2. Make sure that wheel bearing is adjusted properly. Refer to section FA.
3. Measure rotating force (F_1).


SBR457A

4. Install caliper with pads to the original position.
5. Depress brake pedal for 5 seconds.
6. Release brake pedal and rotate disc rotor 10 revolutions.
7. Measure rotating force (F_2).
8. Calculate brake drag force by subtracting F_1 from F_2.
   Maximum brake drag force ($F_2 - F_1$):
   114.7 N (11.7 kg, 25.8 lb)
   If it is not within specification, check main pins and retainer boots in caliper.

Inspection (Cont'd)



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.

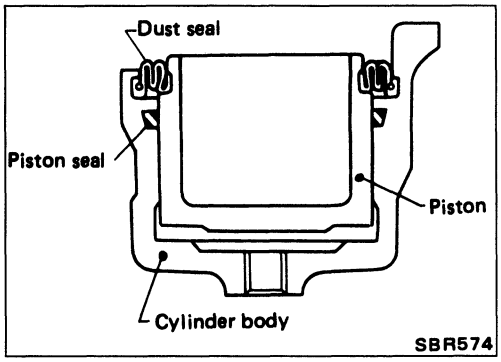
PISTON

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.



Assembly

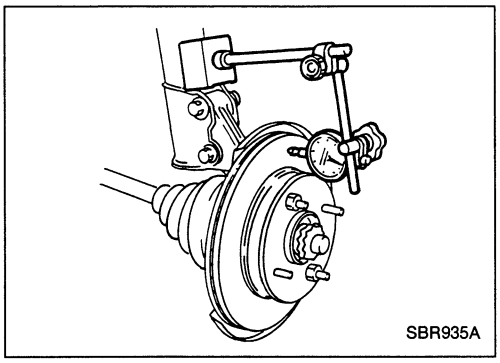
- Insert piston seal into groove on cylinder body.
- With dust seal fitted to piston, install piston into cylinder body.

CAUTION:
- **Secure dust seal properly.**

Inspection

RUBBING SURFACE

Check rotor for roughness, cracks or chips.

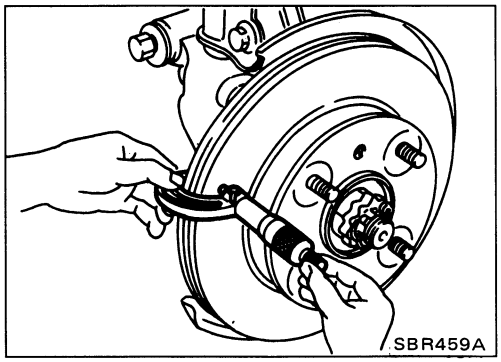

SBR935A

RUNOUT

Adjust wheel bearing preload. Check runout using a dial indicator.

Rotor repair limit:

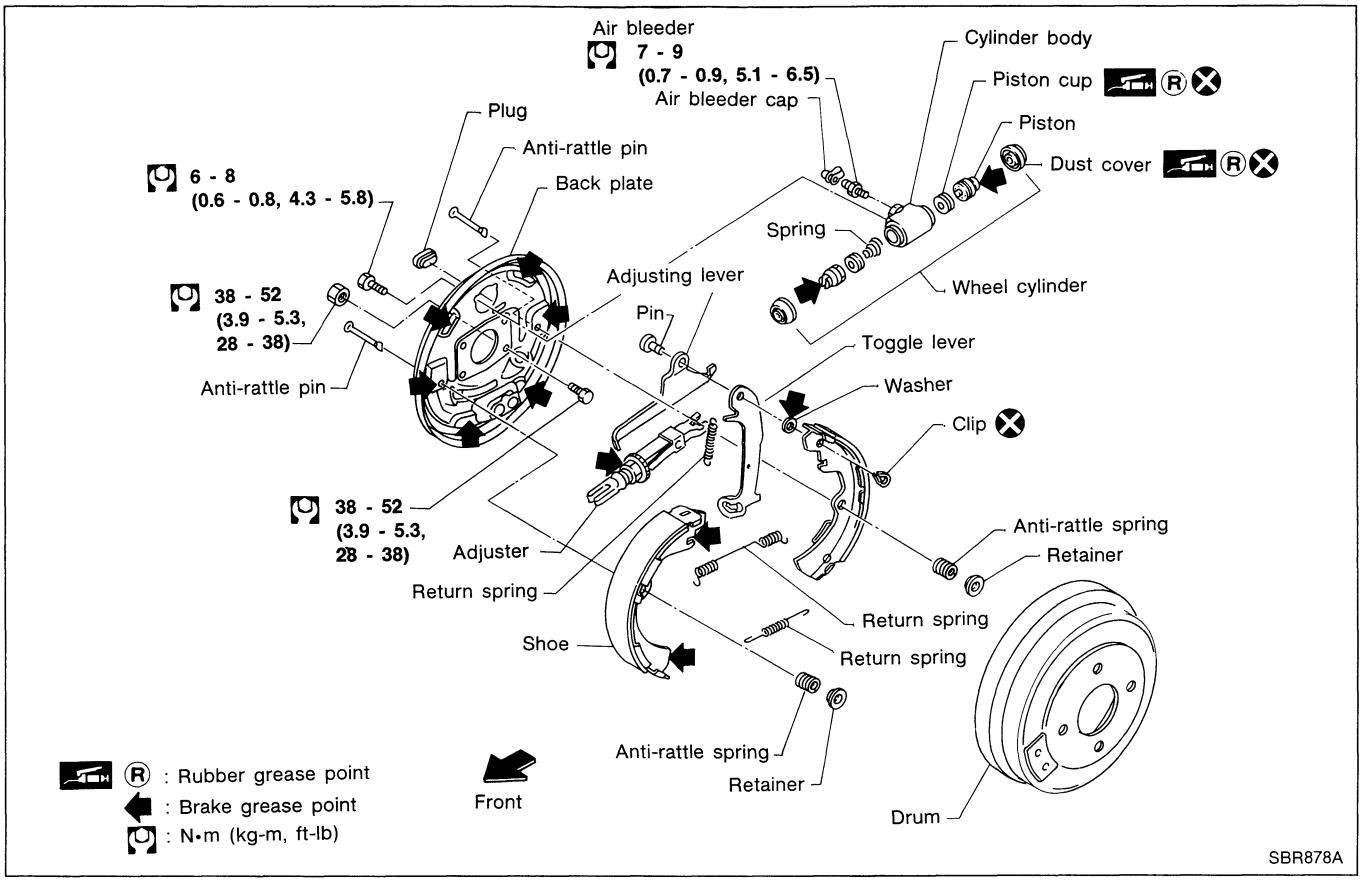
Maximum runout
(Total indicator reading at center of rotor pad contact surface)
0.07 mm (0.0028 in)

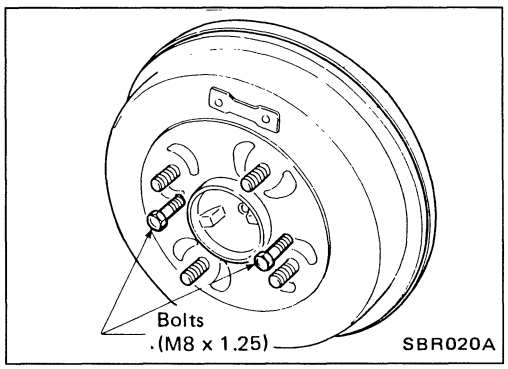

SBR459A

THICKNESS

- Measure thickness of brake disc at least four points to determine maximum worn area.

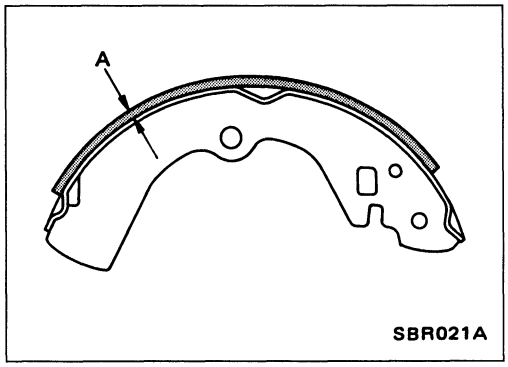
Standard thickness:
22.0 mm (0.866 in)
Minimum thickness:
20.0 mm (0.787 in)





Brake Drum Removal

- Release parking brake control lever fully.
- Tighten two bolts gradually if brake drum is hard to remove.



Shoe Replacement

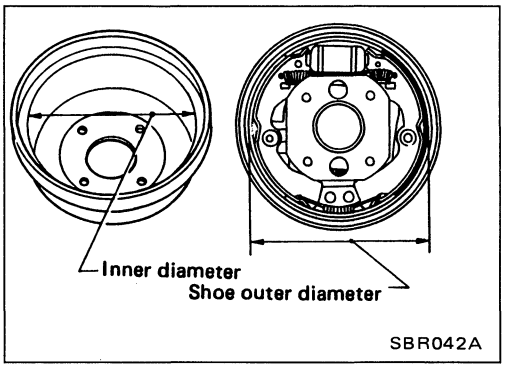
- Measure lining thickness.

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.

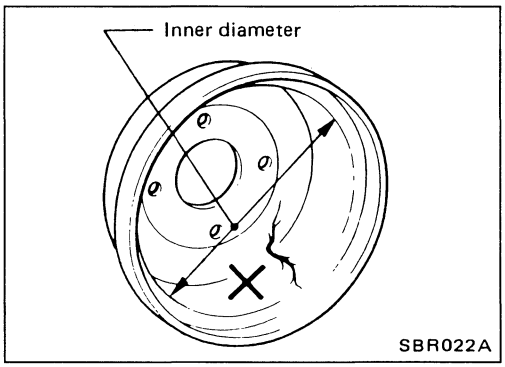


Removal and Installation

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)

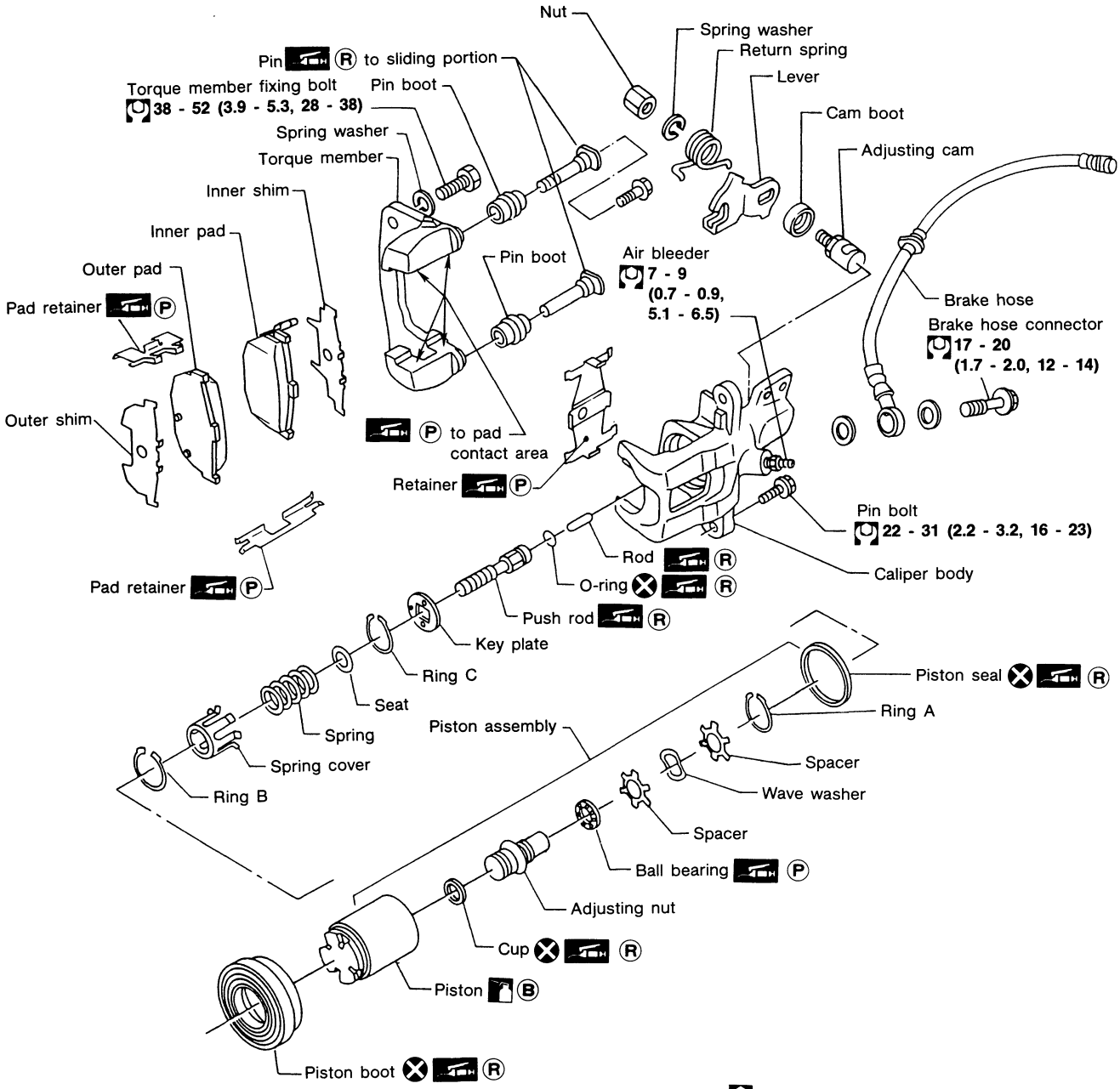
If necessary, adjust by rotating adjuster.



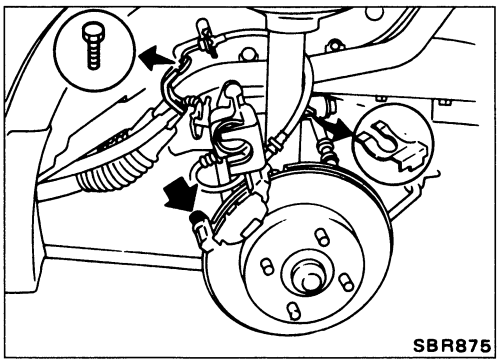
Drum Inspection

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
Radial runout (Total indicator reading):
0.05 mm (0.0020 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)
Pin bolt
22 - 31 (2.2 - 3.2, 16 - 23)
Rod (R)
Caliper body
Pad retainer (P)
O-ring (R)
Push rod (R)
Key plate
Ring C
Seat
Spring
Spring cover
Ring B
Piston seal (R)
Ring A
Piston assembly
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

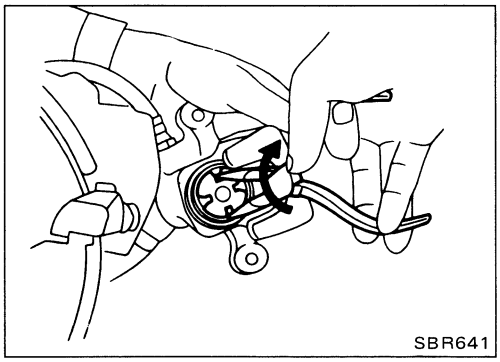
SBR895A


SBR875

Pad Replacement

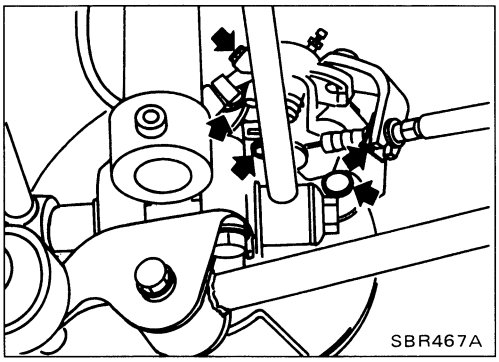
1. Remove parking cable stay fixing bolt, pin bolt and lock spring. Then remove pad retainers, pads and shims.

CAUTION:
When cylinder body is swung up, do not depress brake pedal because piston will pop out.


SBR641

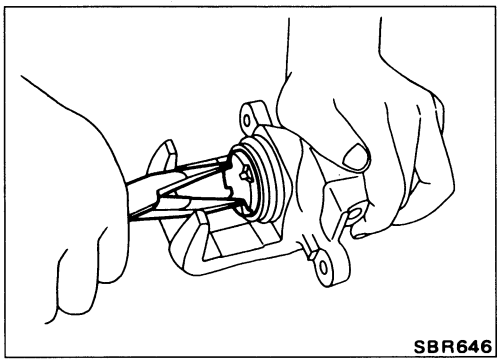
2. When installing pads, retract piston into cylinder body by turning piston clockwise.

CAUTION:
Be careful not to damage piston boot or get oil on rotor.
Always replace shims when replacing pads.


SBR467A

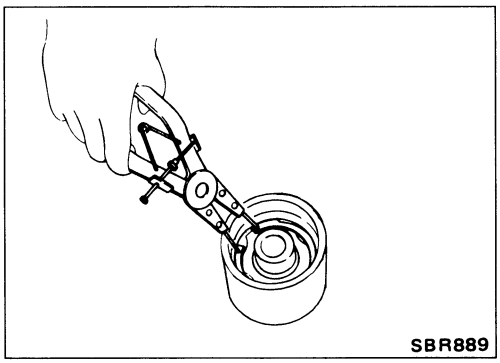
Removal and Installation

Disconnect parking brake cable and brake hose, then remove caliper assembly.


SBR646

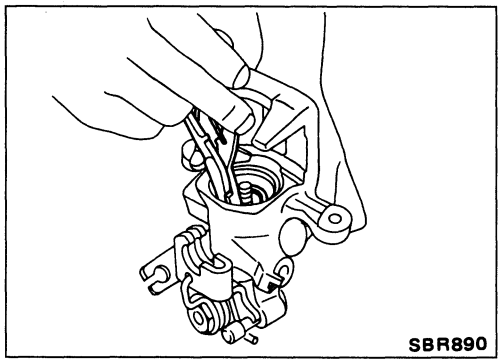
Disassembly

1. Remove piston by turning it counterclockwise with suitable long nose pliers.

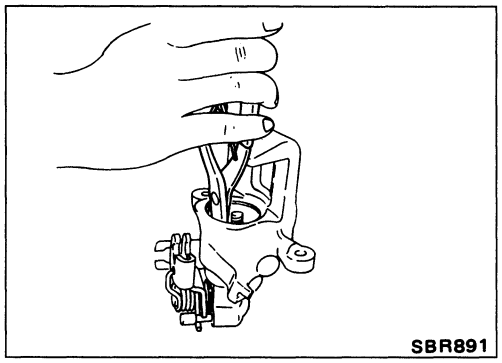

SBR889

2. Pry off ring A from piston with suitable pliers and remove adjusting nut.

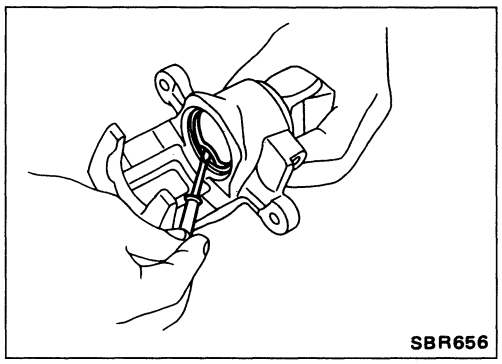
Disassembly (Cont'd)


SBR890

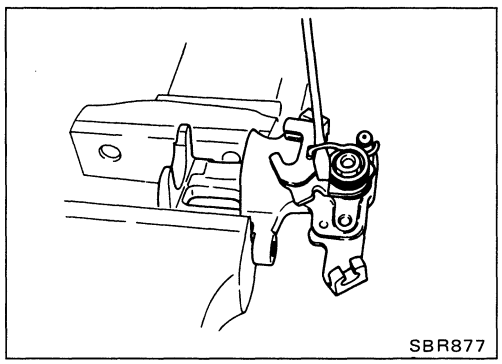
3. Disassemble cylinder body.
(1) Pry off ring B with suitable pliers, then remove spring cover, spring and seat.


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.

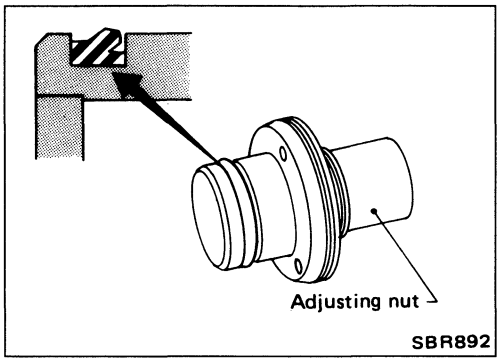
PISTON

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.

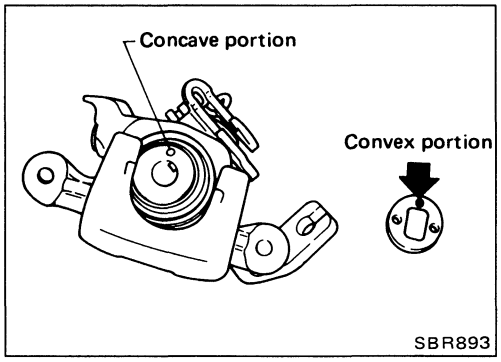
PIN AND PIN BOOT

Check for wear, cracks or other damage.
Replace if any of the above conditions are observed.

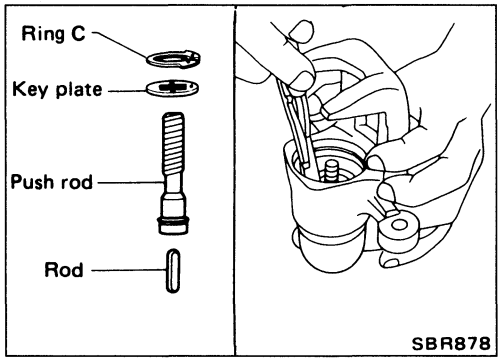


Assembly

1. Install cup in the specified direction.

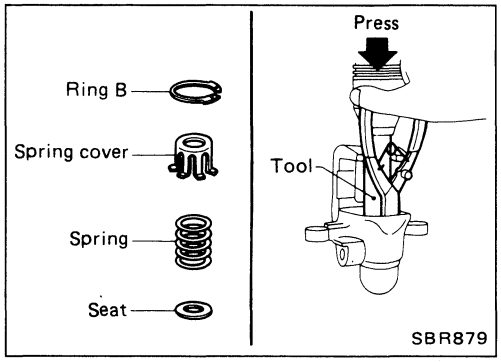


2. Fit push rod into square hole in key plate. Also match convex portion of key plate with concave portion of cylinder.



3. Install ring C with a suitable tool.

Assembly (Cont'd)

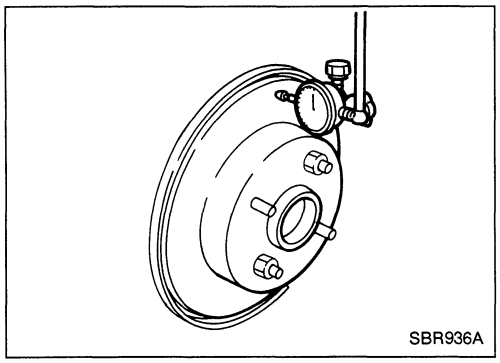


4. Install seat, spring, spring cover and ring B with suitable press and drift.

Inspection

RUBBING SURFACE

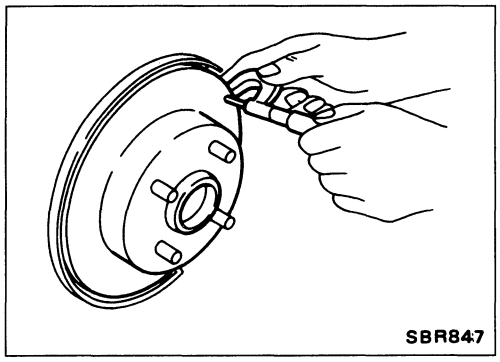
Check rotor for roughness, cracks or chips.


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.

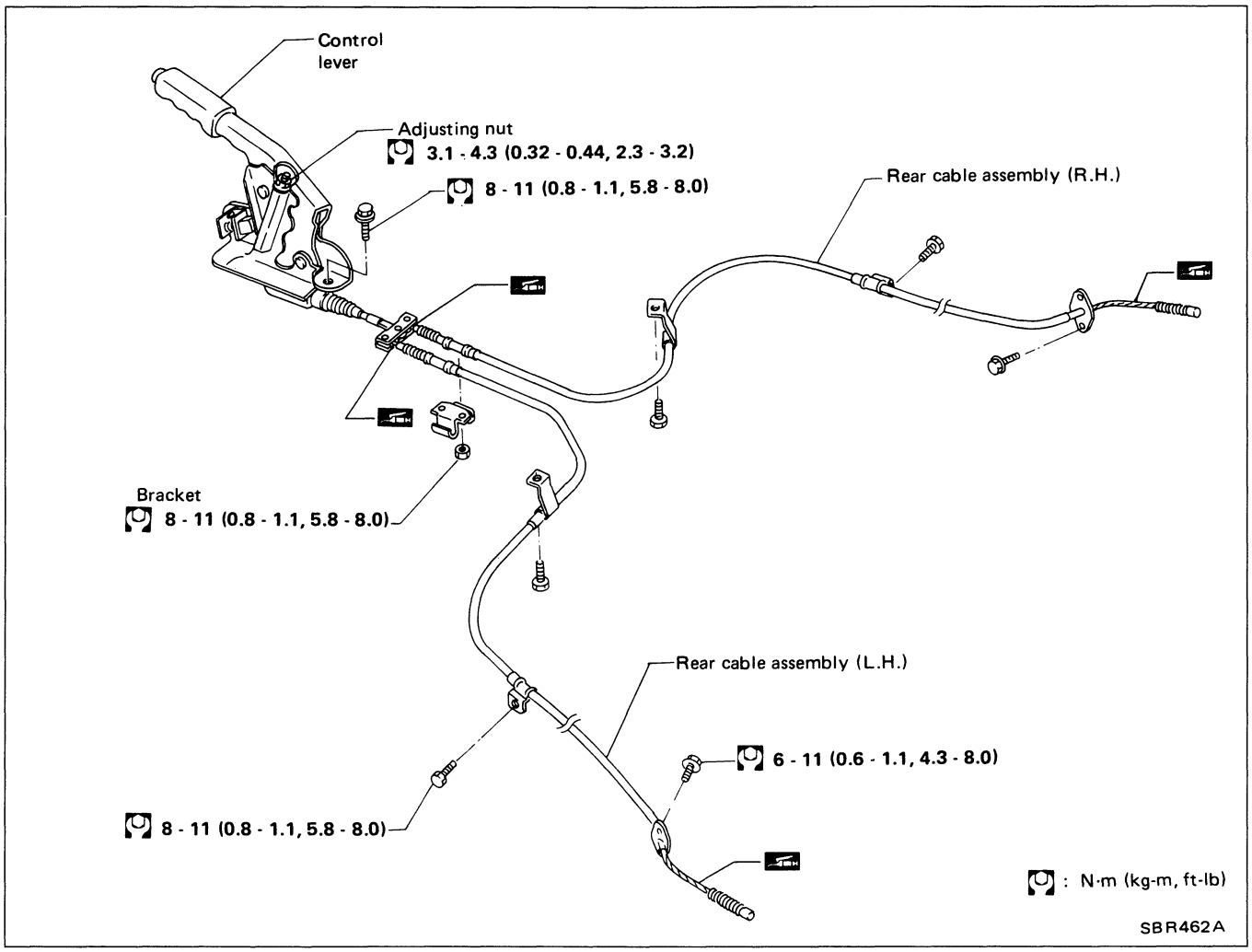
Rotor repair limit:
Maximum runout
(Total indicator reading at center of rotor pad contact surface)
0.07 mm (0.0028 in)


SBR847

THICKNESS

Rotor repair limit:
Minimum thickness
9.0 mm (0.354 in)

Removal and Installation



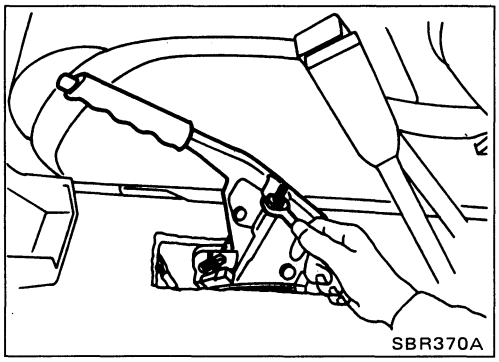
- Before removing parking brake control assembly, remove console box.
- Make sure there is no free play after installing.

Inspection

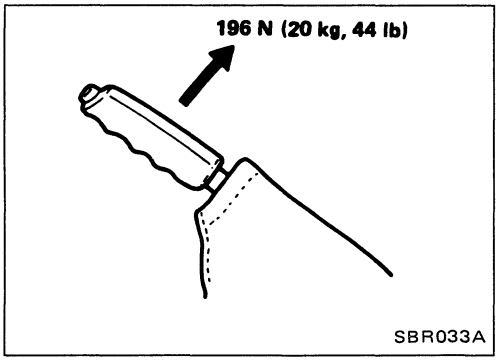
1. Check control lever for wear or other damage. Replace if necessary.
2. Check parking brake cables and lamp switch. Replace if necessary.
3. Check parts at each connecting portion for deformation or damage, and if found, replace.

Adjustment

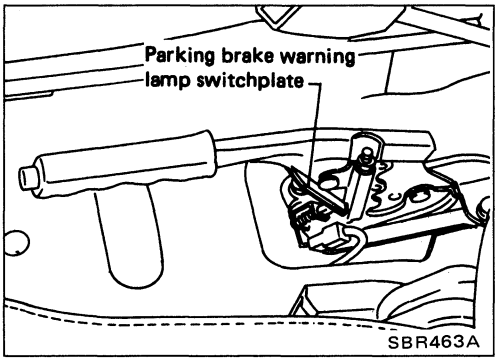
Adjust control lever stroke as follows:



1. Adjust control lever by turning adjusting nut.

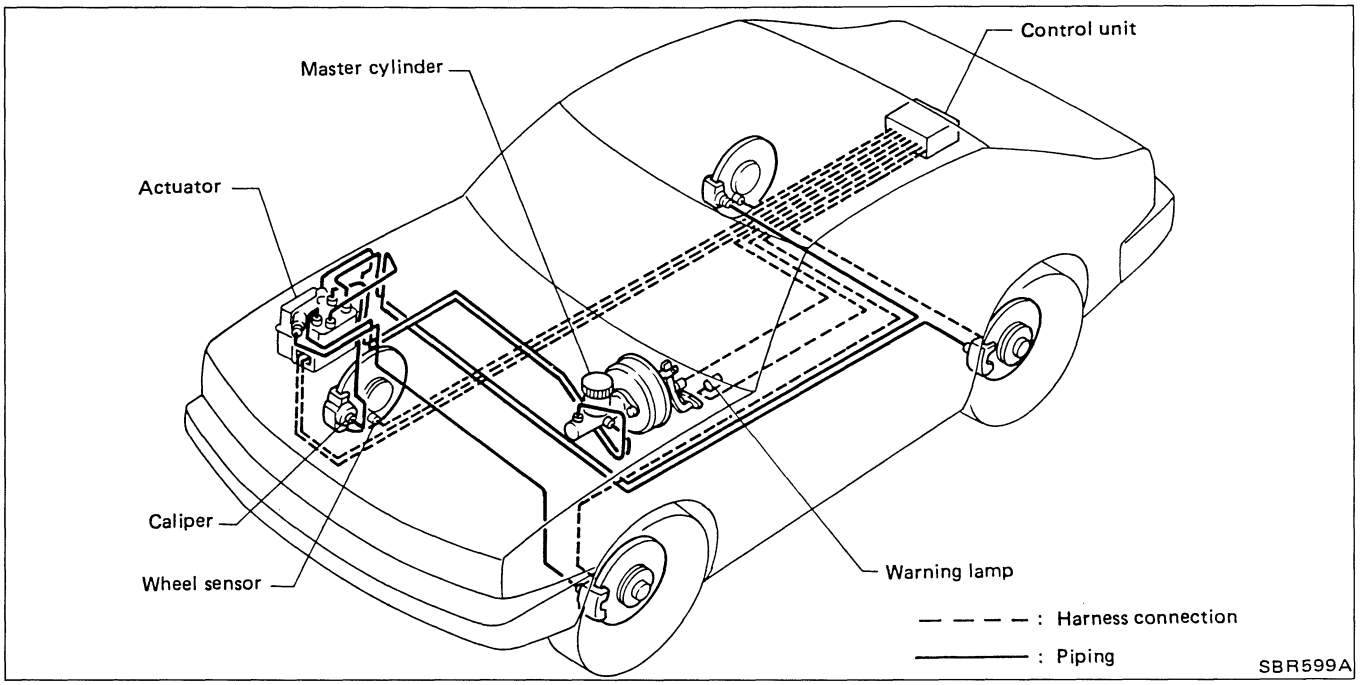


2. Pull control lever with specified amount of force. Check lever stroke and ensure smooth operation.
   Number of notches
   Center lever type: 9 - 11

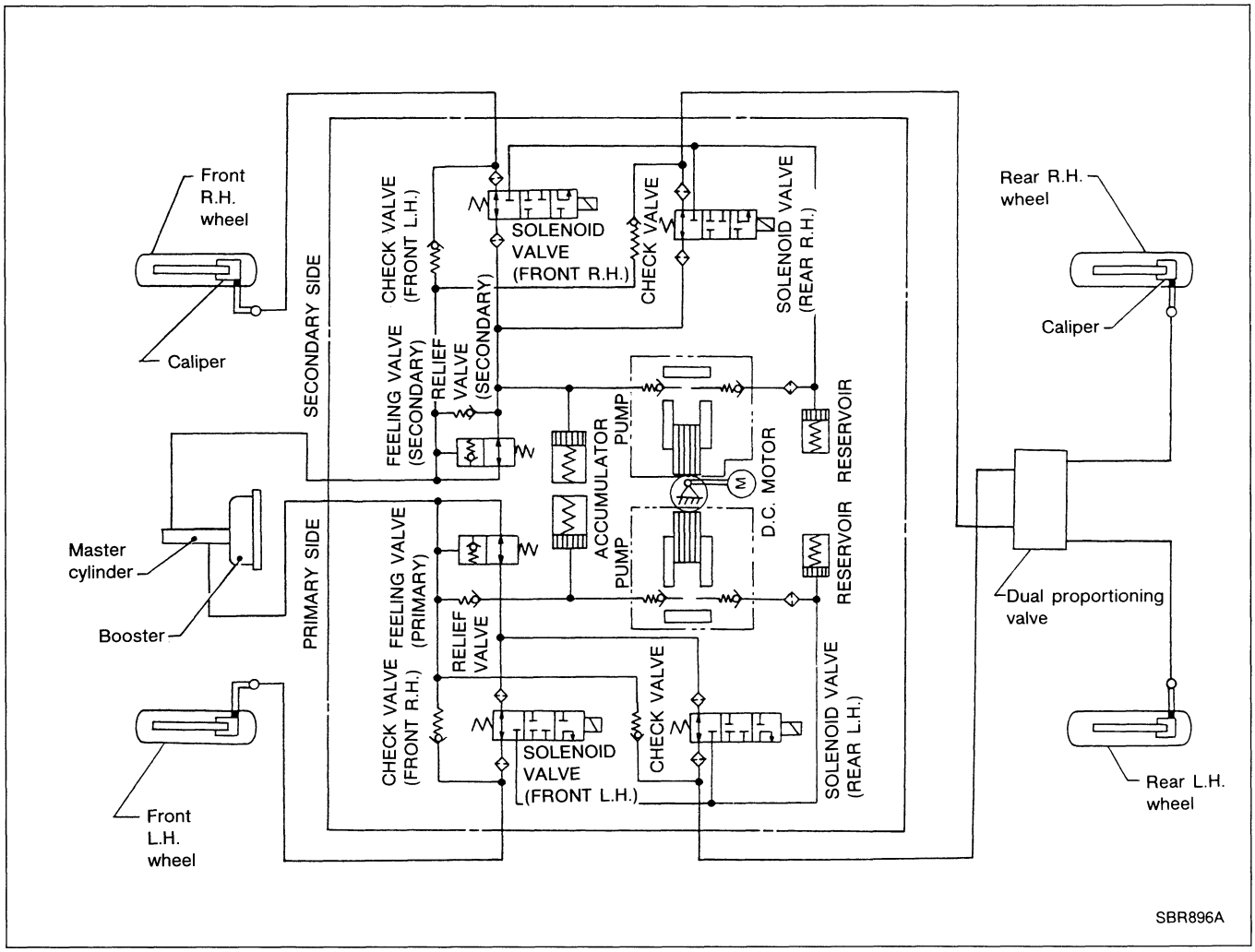


3. Bend parking brake warning lamp switchplate so that brake warning lamp comes on when ratchet at parking brake lever is pulled "A" notches and goes out when fully released.
   Number of "A" notches : 1 - 2

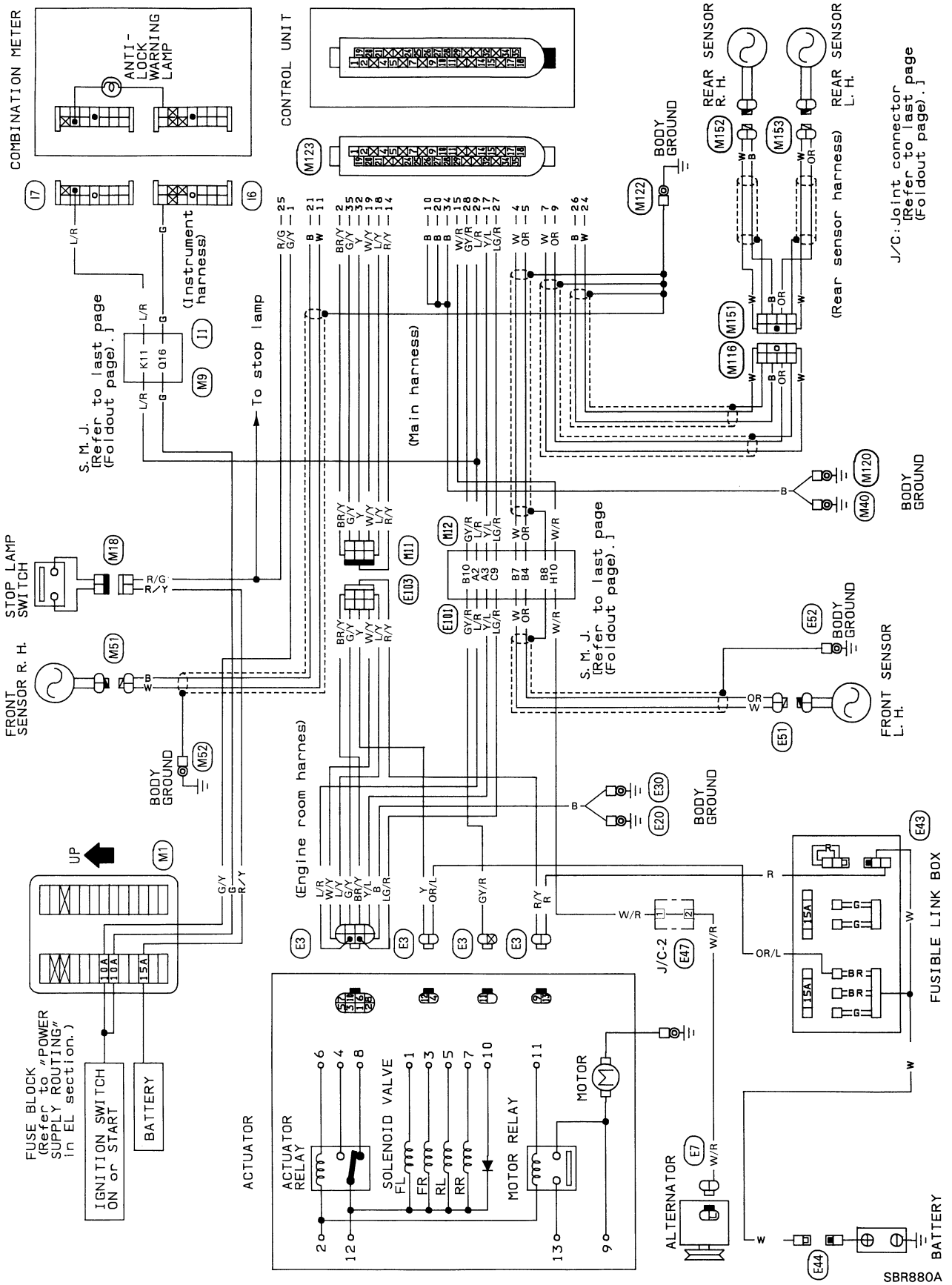
System Components



Hydraulic Circuit



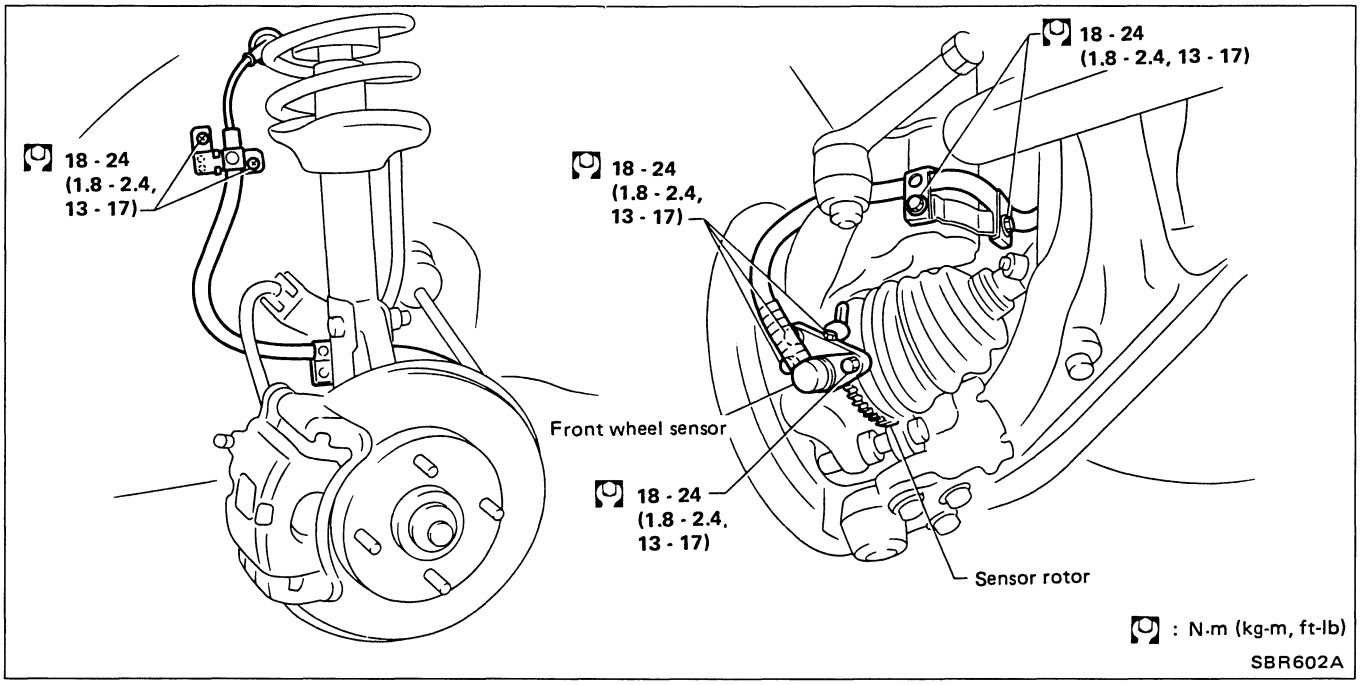
Wiring Diagram



Removal and Installation

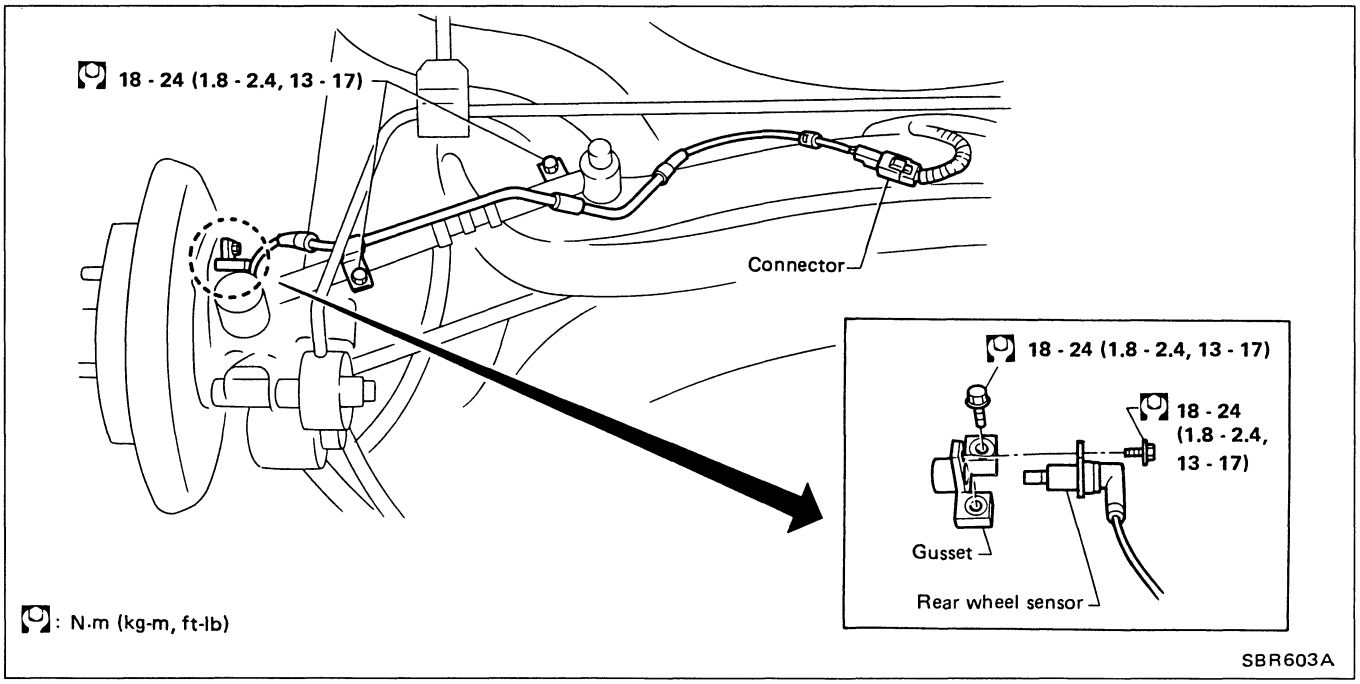
CAUTION:
Be careful not to damage sensor edge and sensor rotor teeth.

FRONT WHEEL SENSOR



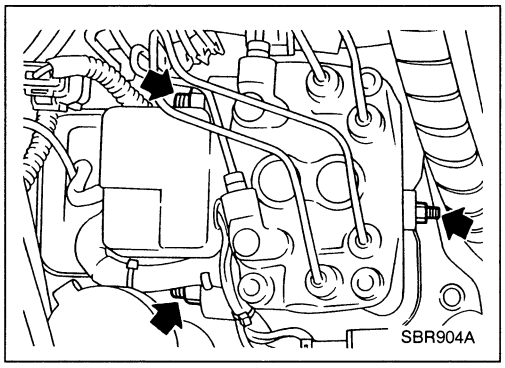
- Remove sensor rotor with front wheel hub, referring to FA section.

REAR WHEEL SENSOR



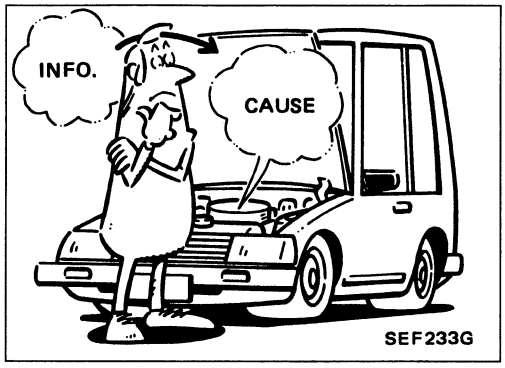
Removal and Installation (Cont'd)

ACTUATOR

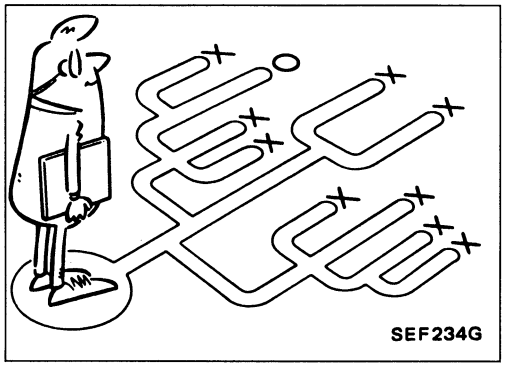


- Disconnect 4 connectors and brake tubes.
- Remove 3 nuts fixing actuator to bracket.

Contents



SEF233G


SEF234G

How to Perform Trouble Diagnoses for Quick and Accurate Repair

INTRODUCTION

The A.B.S. system has an electronic control unit to control major functions. The control unit accepts input signals from sensors and instantly drives actuators. It is essential that both kinds of signals are proper and stable. At the same time, it is important that there are no conventional problems such as air leaks in the booster or lines, lack of brake fluid, or other problems with brake system.

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

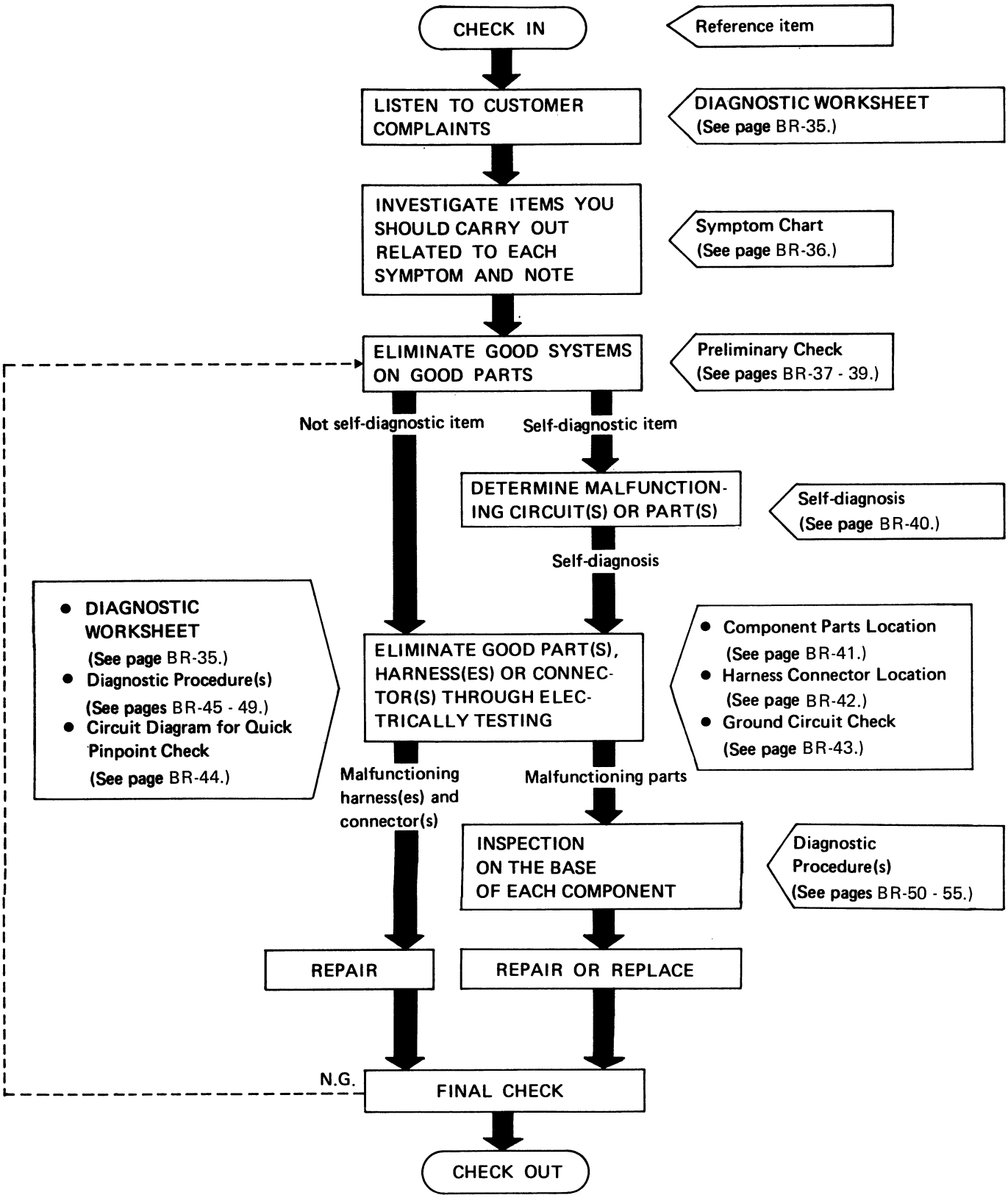
A visual check only may not find the cause of the problems, so a road test should be performed.

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

Start your diagnosis by looking for "conventional" problems first. This is one of the best ways to troubleshoot brake problems on an A.B.S. controlled vehicle.

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

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.

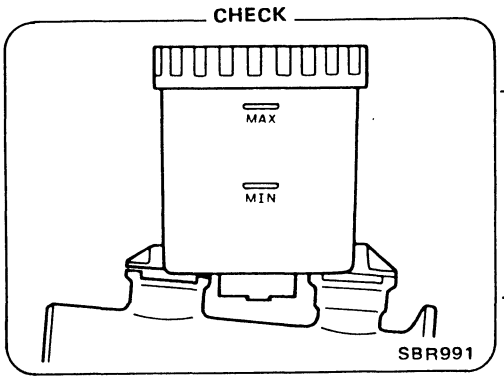
Worksheet sample

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	☐ A.B.S. doesn't work	☐ A.B.S. works but warning activates	☐ A.B.S. 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	A.B.S. doesn't work	A.B.S. works but warning activates	A.B.S. works frequently
Electrical Components Inspection	BR-56	Actuator inspection					○		
Ground Circuit Check	BR-43	Motor ground					○		
	BR-43	Sensor shield	○						○
Diagnostic Procedure (Select inspection with L.E.D. flashing No.)	BR-55	L.E.D. is off	○	○	○	○	○	○	
	BR-54	L.E.D. flashing 16	○	○	○	○	○	○	
	BR-53	L.E.D. flashing 10	○	○	○	○	○	○	
	BR-52	L.E.D. flashing 9	○	○	○	○	○	○	
	BR-51	L.E.D. flashing 5 - 8	○	○	○	○	○	○	
	BR-50	L.E.D. flashing 1 - 4	○	○	○	○	○	○	
Diagnostic Procedure	BR-49	Diagnostic Procedure 6							○
	BR-48	Diagnostic Procedure 5						○	
	BR-48	Diagnostic Procedure 4					○		
	BR-47	Diagnostic Procedure 3				○			
	BR-47	Diagnostic Procedure 2			○				
	BR-45	Diagnostic Procedure 1	○						
Preliminary Check	BR-39	Preliminary Check 4	○	○	○	○	○	○	
	BR-39	Preliminary Check 3	○	○					
	BR-38	Preliminary Check 2		○			○		○
	BR-37	Preliminary Check 1			○	○			○

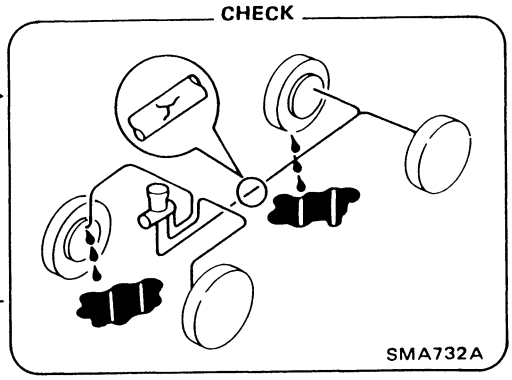
Preliminary Check 1



Check brake fluid level in reservoir tank.

N.G. → Fill up brake fluid.

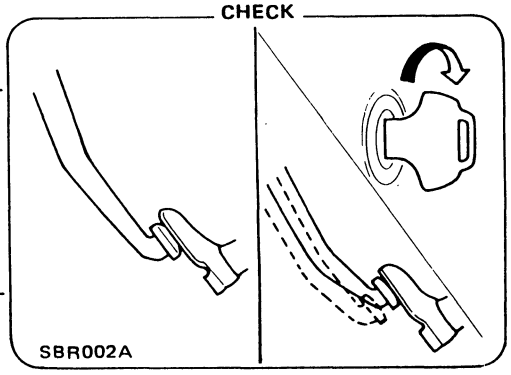
O.K. →



Check brake system.
Refer to CHECK AND ADJUSTMENT.

N.G. ← Repair brake system.

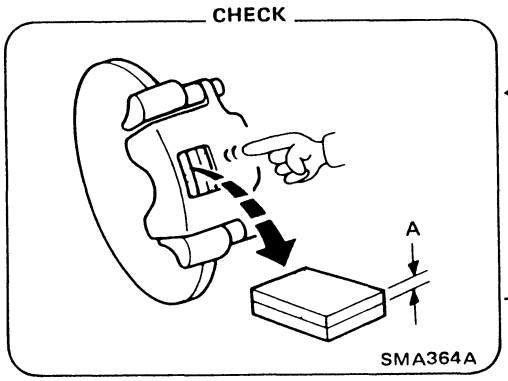
O.K. ↓



Check brake booster operation and airtightness.
Refer to "Inspection" of BRAKE BOOSTER.

N.G. ← Repair or replace booster system.

O.K. ←

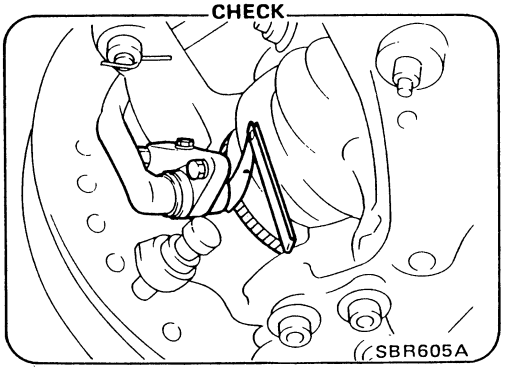


Check brake pads and rotor.
Refer to "Inspection" of FRONT and REAR DISC BRAKE.

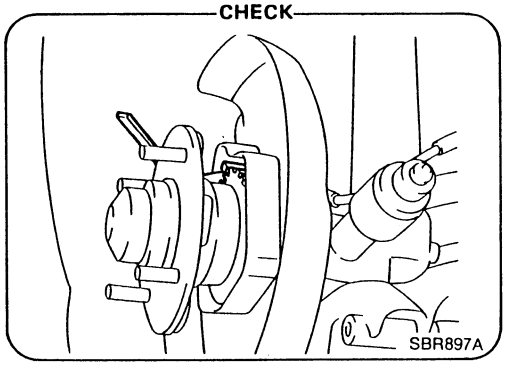
N.G. → Replace malfunctioning parts.

Preliminary Check 2

CHECK



CHECK



Check sensor clearance.

Clearance:

0.2 - 1.0 mm

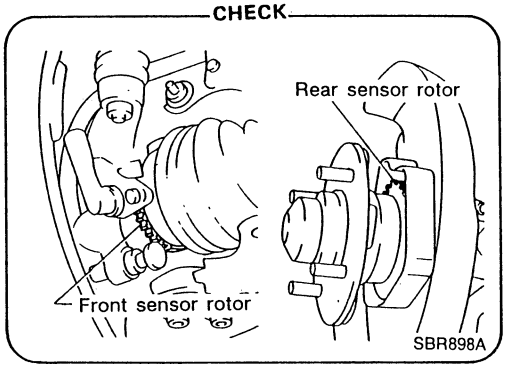
(0.008 - 0.039 in)

N.G. → Check sensor for the following items:

- Dust, foreign materials, etc., at fastening portion
- Improper installation
- Breakage

O.K. → CHECK

N.G. → Repair or replace malfunctioning sensor.



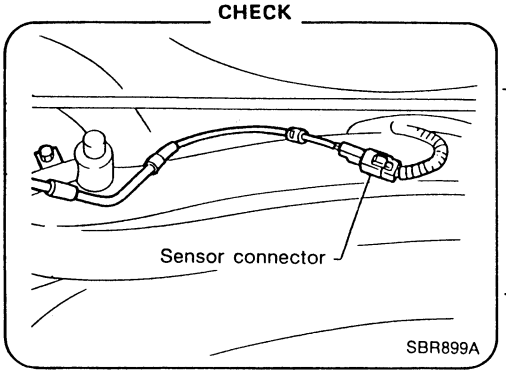
Check sensor rotor for teeth damage.

N.G. → Replace sensor rotor with wheel hub or companion flange as a set..

Preliminary Check 3, 4

Preliminary Check 3

CHECK



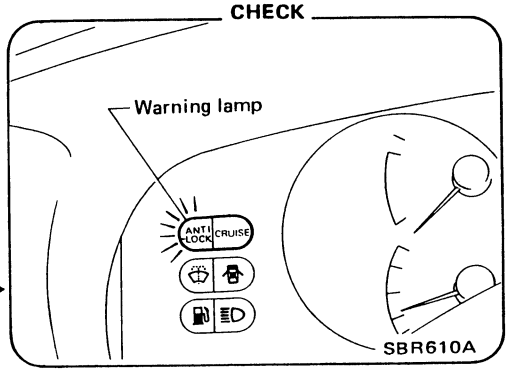
N.G. → Replace.

O.K.

Measure each sensor resistance.
0.8 - 1.2 kΩ

Preliminary Check 4

CHECK



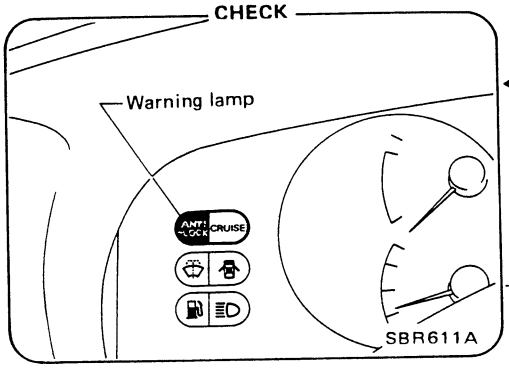
Check warning lamp activation.
When ignition switch is turned on, warning lamp turns on.

O.K.

N.G.

Check fuse.
Check bulb condition and remedy.

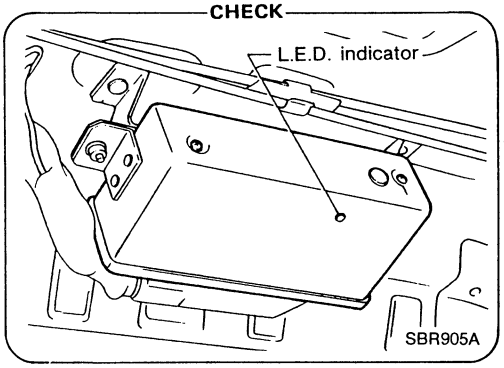
CHECK



Check warning lamp for deactivation.
When engine starts, warning lamp deactivates.

N.G.

CHECK

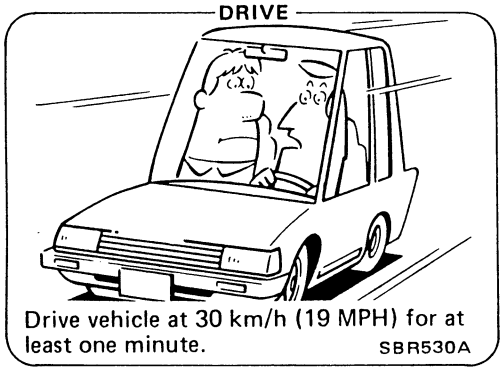


- Keep engine on and running.
- Count the number of L.E.D. flashes during 5 to 10 second "OFF" period.

Go to Self-diagnosis.
(See page BR-40.)

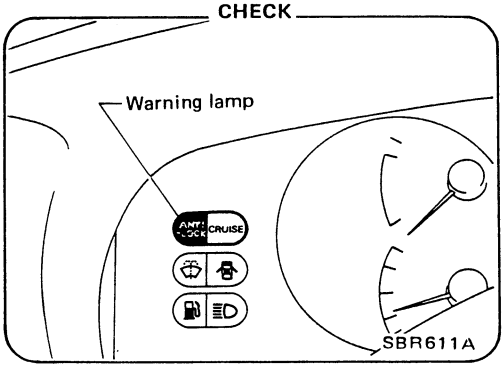
O.K.

DRIVE



Drive vehicle at 30 km/h (19 MPH) for at least one minute.

CHECK



N.G.

O.K. → If Preliminary Check 2 is not performed and there is abnormal A.B.S. operation, perform Preliminary Check 2.

Ensure warning lamp remains off while driving.

Self-diagnosis

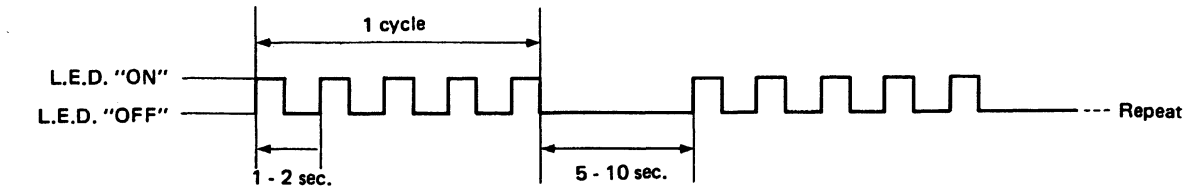
CHECKING THE NUMBER OF L.E.D. FLASHES

When a problem occurs in the A.B.S., the warning light on the instrument panel comes on. As shown in the Table, the control unit performs self-diagnosis.
To obtain satisfactory self-diagnosing results, the vehicle must be driven above 30 km/h (19 MPH) for at least one minute before the self-diagnosis is performed. After the vehicle is stopped, the number of L.E.D. flashes is counted while the engine is running.
The L.E.D. is located on the control unit, identifying a malfunctioning part or unit by the number of flashes. Both the warning light and the L.E.D. persistently activate, even after a malfunctioning part or unit has been repaired, unless the ignition switch is turned "OFF". After repairs, turn the ignition switch "OFF". Then start the engine and drive the vehicle over 30 km/h (19 MPH) for at least one minute to ensure that the malfunctioning part or unit has been repaired properly.
If more than two circuits malfunction at the same time, the L.E.D. will flash to indicate one of the malfunctioning circuits. After the circuit has been repaired, the L.E.D. will then flash to indicate that the other circuit is malfunctioning.

No. of L.E.D. flashes	Malfunctioning part or unit
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

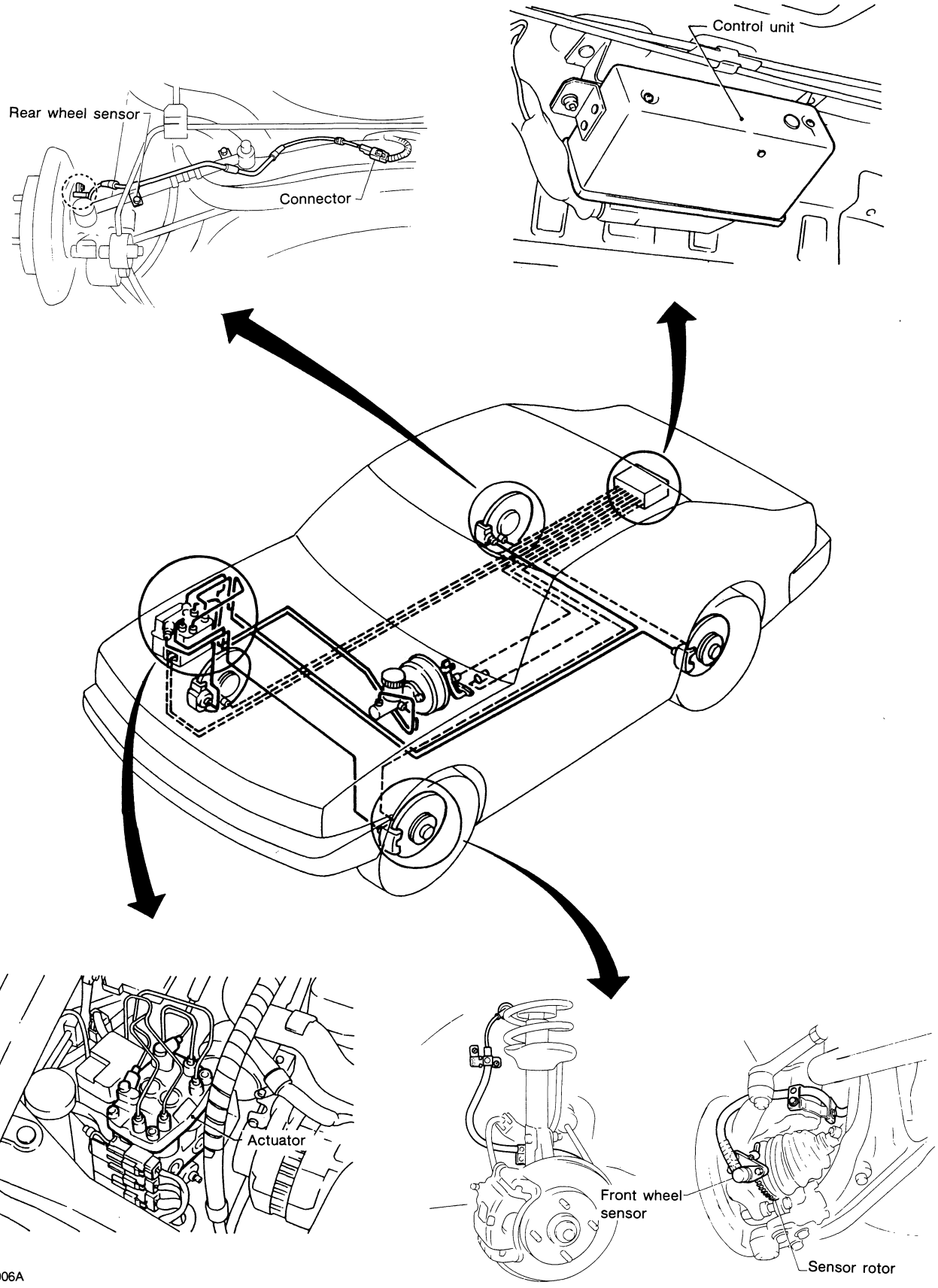
Improper operation of left front rotor sensor circuit



SBR531A

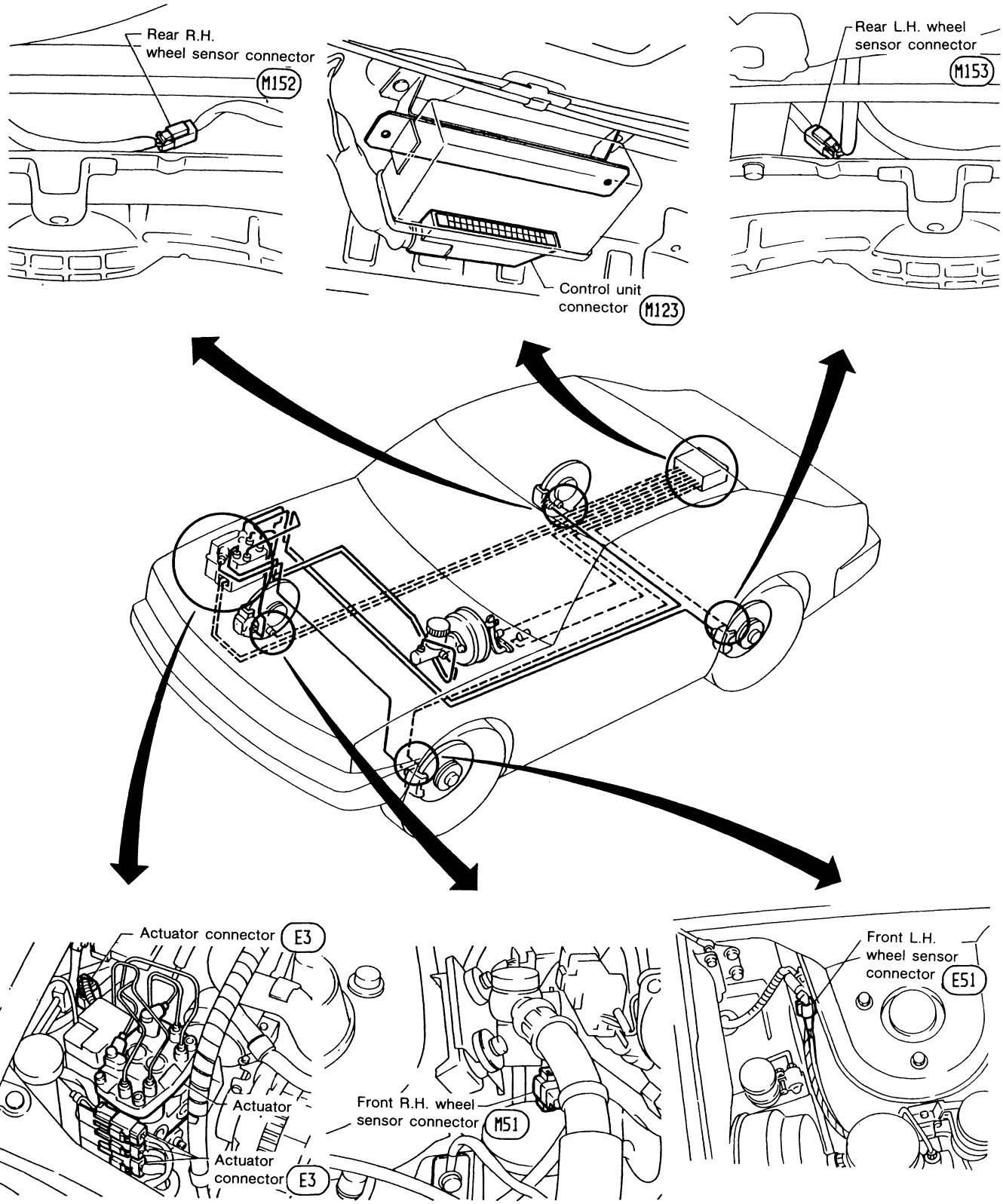
Go to Diagnostic Procedures 7-12, where malfunction portion is concerned.

Component Parts Location

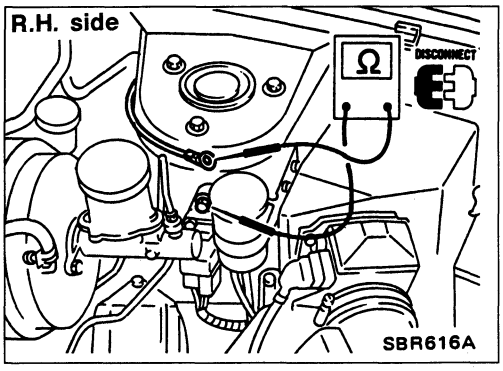


SBR906A

Harness Connector Location



SBR907A



Ground Circuit Check

FRONT WHEEL SENSOR SHIELDED WIRE GROUND

1. Remove ground terminals (on both L.H. and R.H. sides).
2. Check resistance between ground terminals and ground.

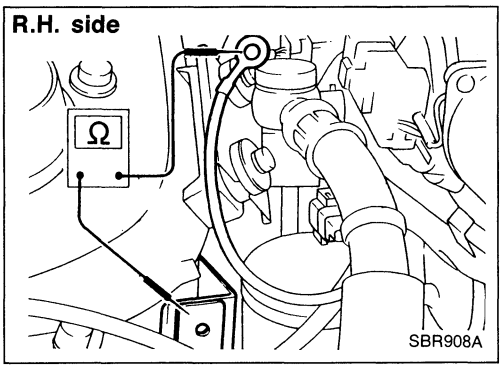
Resistance:

L.H. side

0Ω

R.H. side

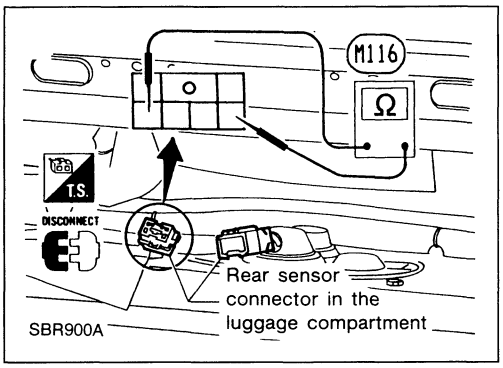
0Ω



REAR WHEEL SENSORS SHIELDED WIRE GROUND

- Check resistance between both terminals.

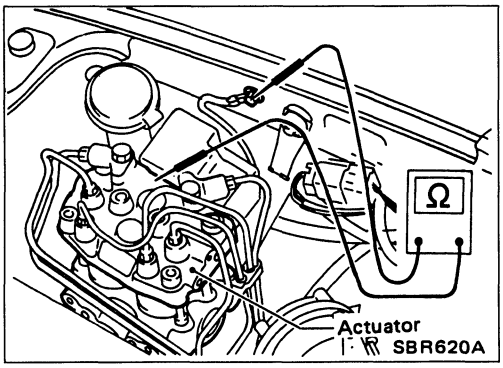
Resistance: 0Ω



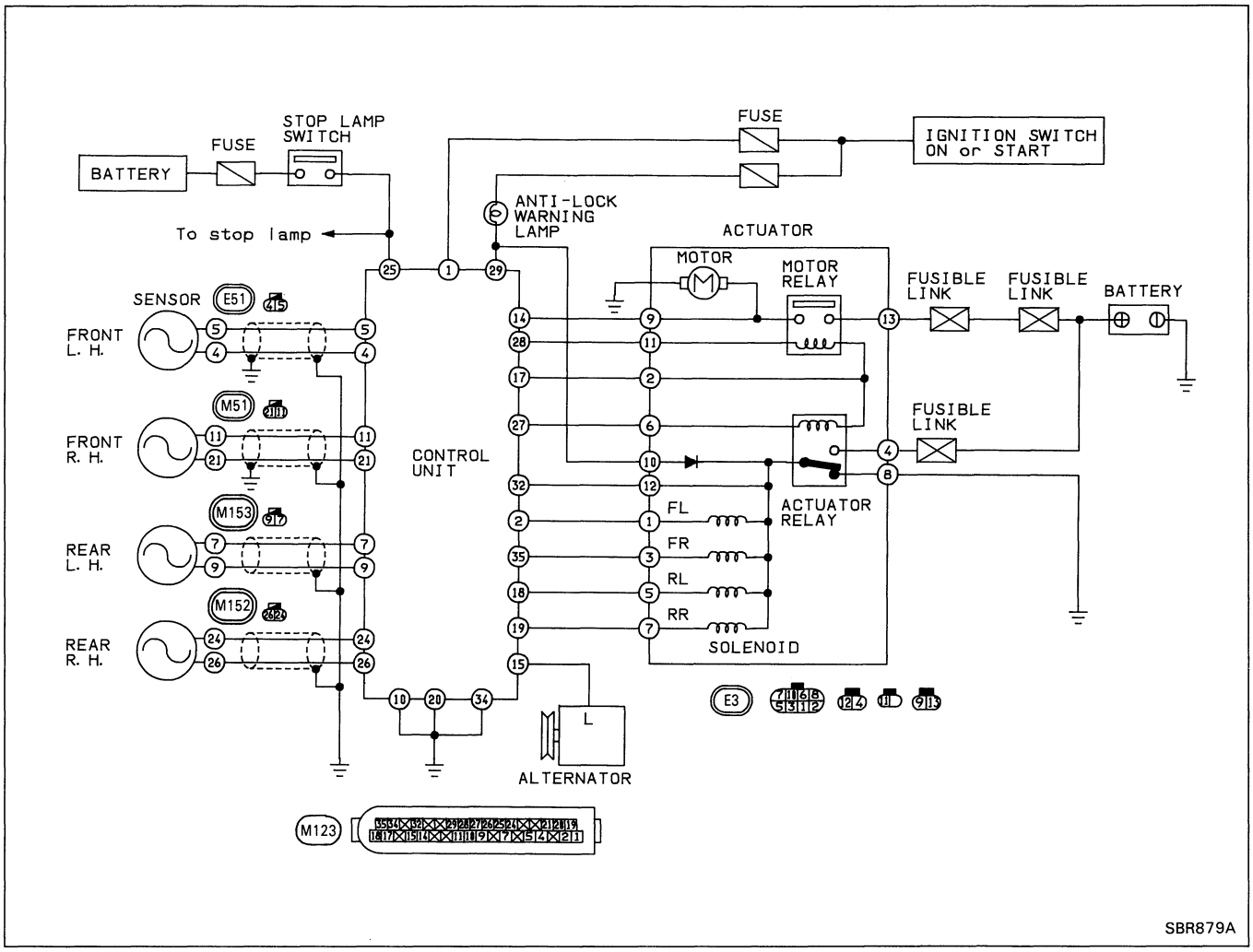
ACTUATOR MOTOR GROUND

- Check resistance between both terminals.

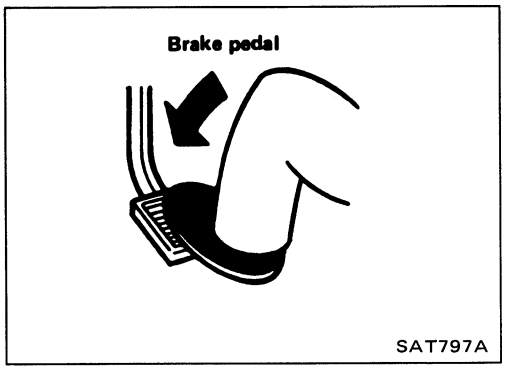
Resistance: 0Ω



Circuit Diagram for Quick Pinpoint Check



SBR879A



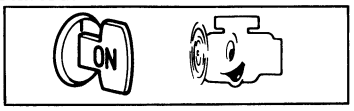
Diagnostic Procedure 1

SYMPTOM: Pedal vibration and noise

Refer to worksheet result.

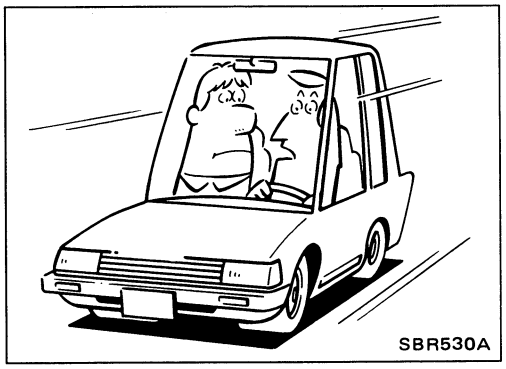
Check whether the symptom appears only when brake is applied suddenly.
- Yes → When brake is normally applied, A.B.S. works and produces pedal vibration or noise.
- No ↓

Check whether the symptom appears only when engine is started.

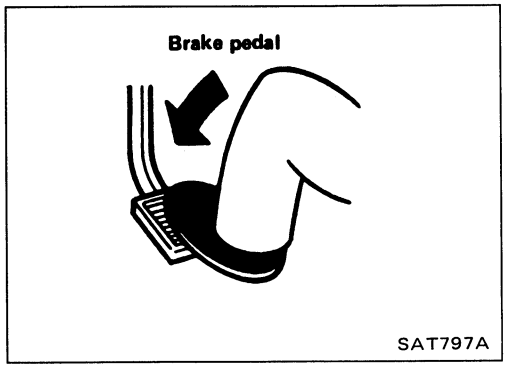


- Yes → Refer to Preliminary Check 4 result.
- No ↓

Check whether the symptom appears onlywhen the vehicle speed is within 10 km/h (6 MPH) after starting engine.
- Yes → Check whether the symptom disappears within 5 seconds.
  - No → Ⓐ
  - Yes → A.B.S. may sometimes operate when load is high and voltage is low due to insufficient alternator output.
- No ↓



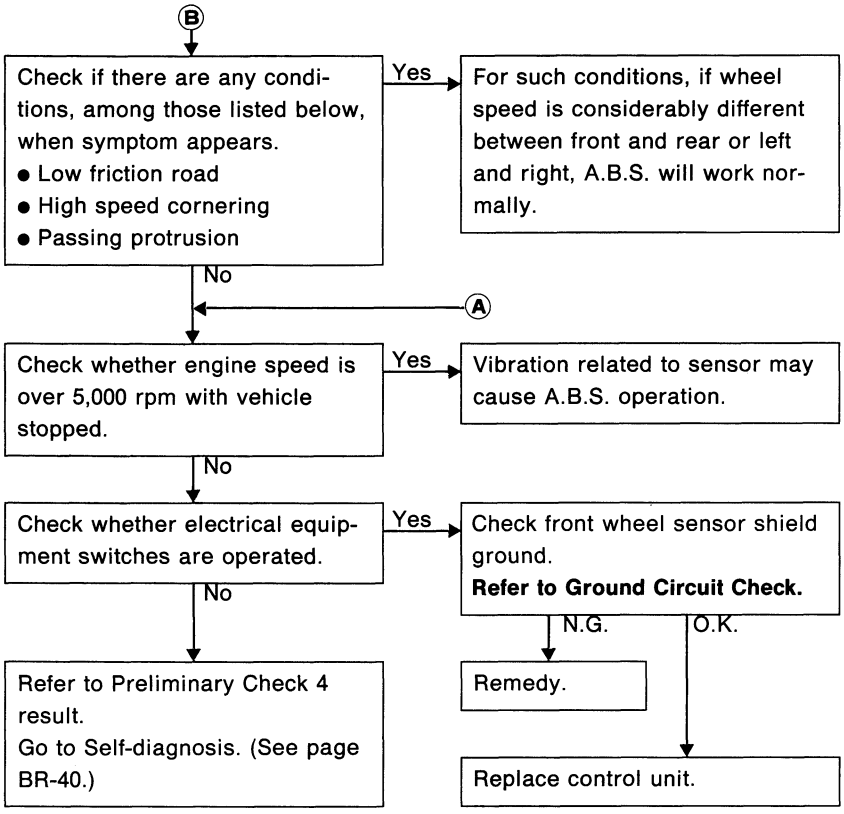
Check whether the symptom appears while the vehicle is being driven.
- No → Ⓐ
- Yes ↓

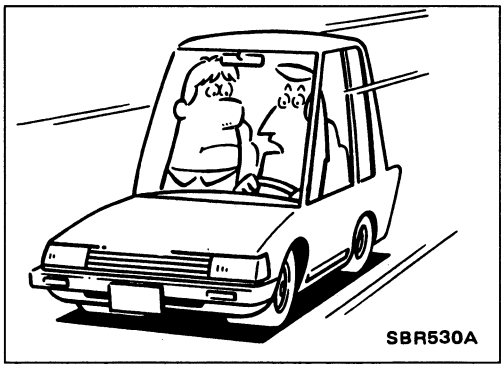


Check whether the symptom appears when brake is applied gradually.
- No (Appears when brake is not applied.) → Check if there are any conditions, among those listed below, when symptom appears.
  - ● Shifting
  - ● Operating clutch
  - ● Passing protrusion
  - No → Ⓑ
  - Yes → Under these conditions individual wheel speed can change suddenly. This may sometimes cause the A.B.C. to operate.
- Yes ↓

Ⓑ

Diagnostic Procedure 1 (Cont'd)




SBR530A

Diagnostic Procedure 2

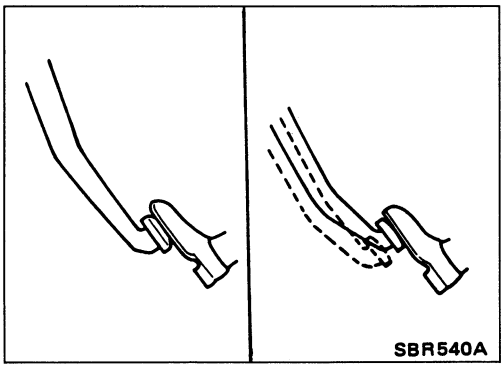
SYMPTOM: Long stopping distance

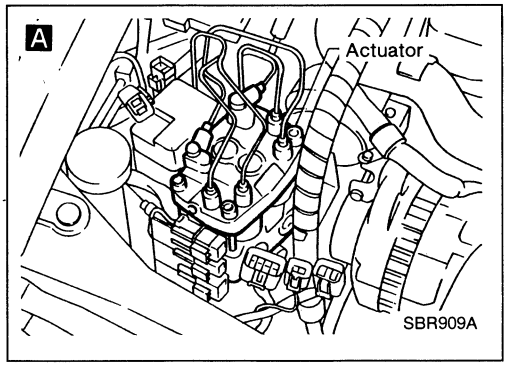
Refer to worksheet results.

Check if road condition is slippery with snow or gravel.
- Yes → Stopping distance may be longer than vehicles which are not equipped with A.B.S.
- No ↓

Disconnect actuator connector and check whether stopping distance is still long.
- Yes → Refer to Preliminary Check 4 result. Go to Self-diagnosis. (See page BR-40.)
- No ↓

Perform Preliminary Check 1 and air bleeding.


SBR540A



Diagnostic Procedure 3

SYMPTOM: Abnormal pedal action

Refer to worksheet results.

Check whether brake pedal stroke is abnormally large.
- Yes → Vehicle equipped with A.B.S. 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

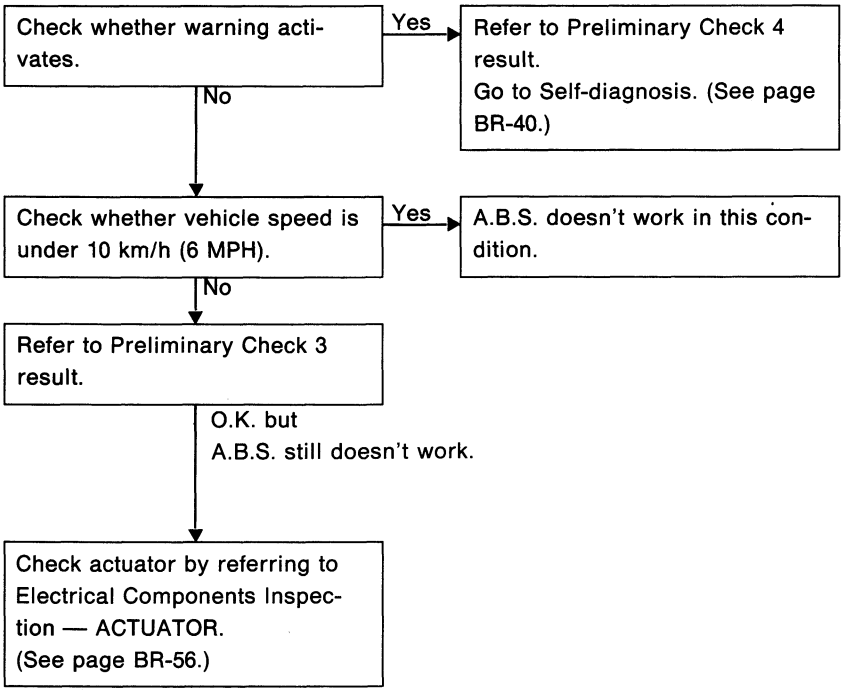
Disconnect actuator connector and check whether brake is effective.
- Yes → Refer to Preliminary Check 4 result. Go to Self-diagnosis. (See page BR-40.)
- No ↓

Perform Preliminary Check 1.

Diagnostic Procedure 4

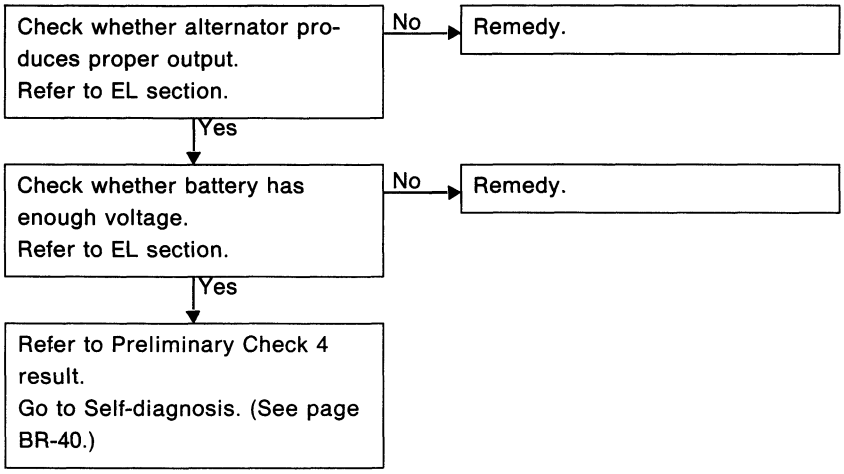
SYMPTOM: A.B.S. doesn't work.

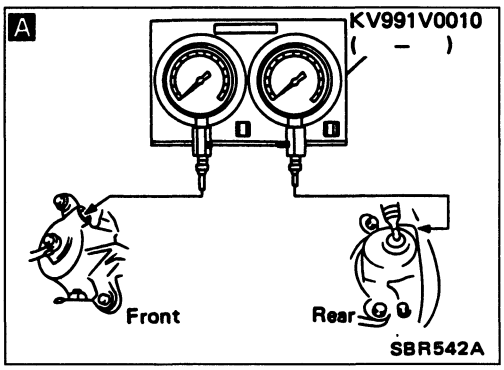
Refer to worksheet results.

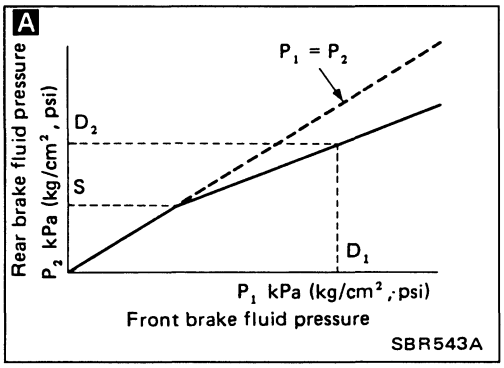


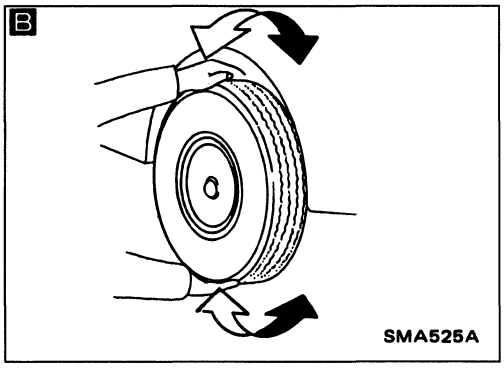
Diagnostic Procedure 5

SYMPTOM: A.B.S. works but warning activates.









Diagnostic Procedure 6

SYMPTOM: A.B.S. works frequently.

A

CHECK BRAKE FLUID PRESSURE.
Check whether brake fluid pressure distribution is normal.
D_2/D_1: 52 - 66/100

No → Perform Preliminary Check 1.

Yes ↓

B

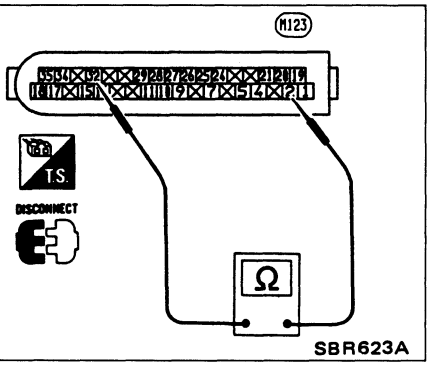
Check whether front axles have excessive looseness.

Yes → Remedy.

No ↓

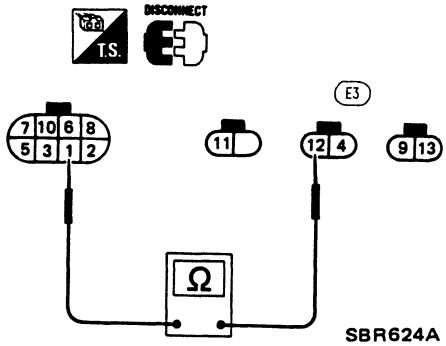
Perform Preliminary Check 2 and Ground Circuit Check.

A



SBR623A

B



SBR624A

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 (18)
Flashing number 4:
Terminals (32) and (19)
Resistance: 0.7 - 1.6Ω

O.K. → Replace control unit.

N.G.

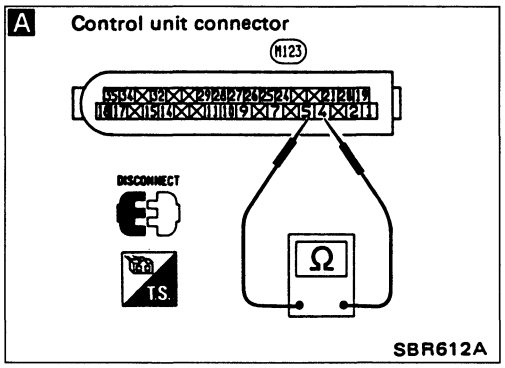
B

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.

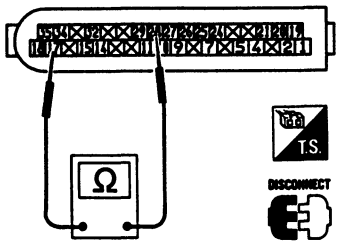
Refer to Preliminary Check 3 result. Check whether sensor has 0.8 to 1.2 kΩ resistance.

N.G. → Replace sensor.

O.K.

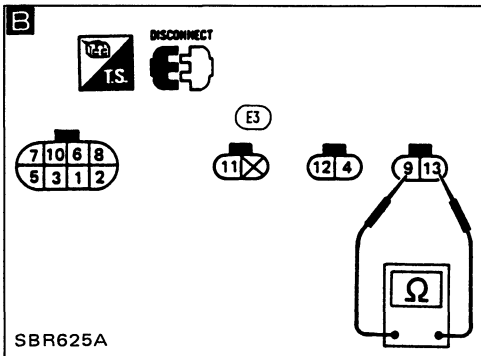
Repair harness between sensor connector and control unit connector.

A Control unit connector



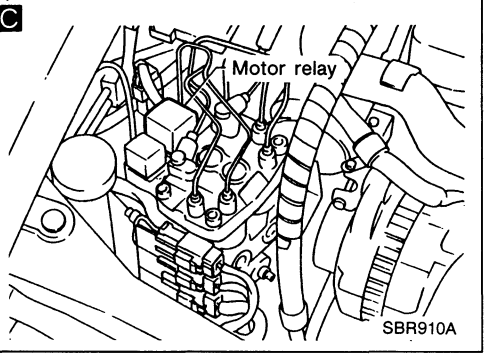
SBR667A

B



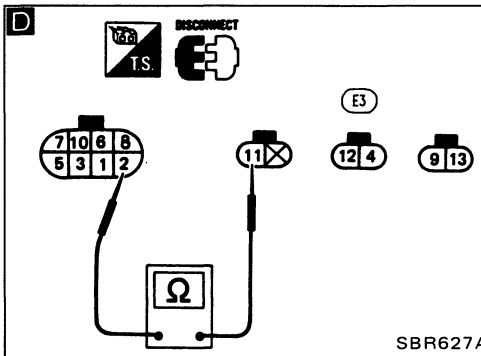
SBR625A

C



SBR910A

D



SBR627A

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

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

O.K. ↓

B

CHECK MOTOR RELAY DEACTIVATION.
Check continuity between actuator connector (actuator side) terminals ⑬ and ⑨.

Yes → C

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-56.)

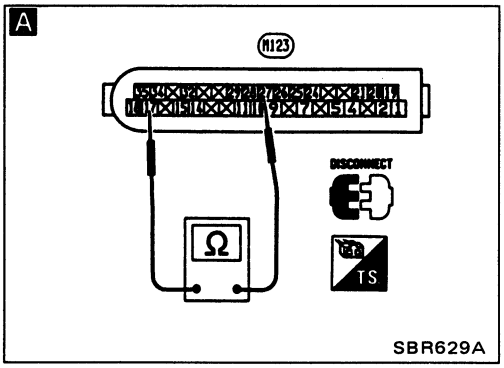
N.G. → Replace actuator.

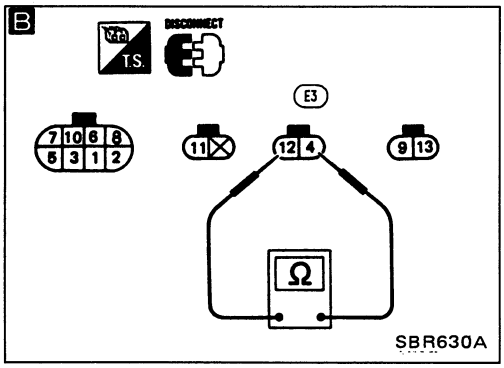
O.K. ↓

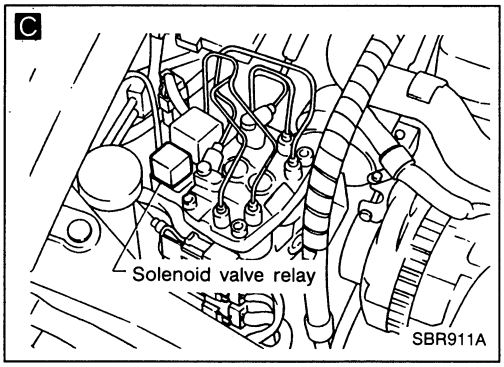
Replace control unit.

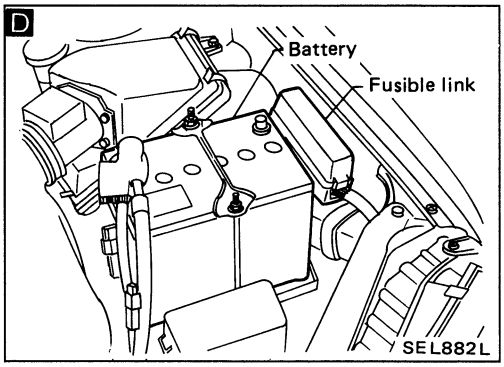
Diagnostic Procedure 10

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

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 herness between terminal ④ and fusible link box. Then replace 30A fusible link.

No →

Perform Electrical Components Inspection — ACTUATOR.
(See page BR-56.)

N.G. → Replace actuator.

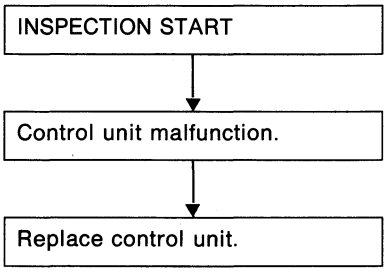
O.K. →

Replace control unit.

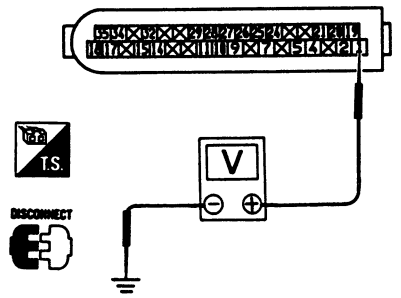
C → Replace solenoid valve relay.

Diagnostic Procedure 11

CONTROL UNIT (L.E.D. flashing number 16 or continuous)

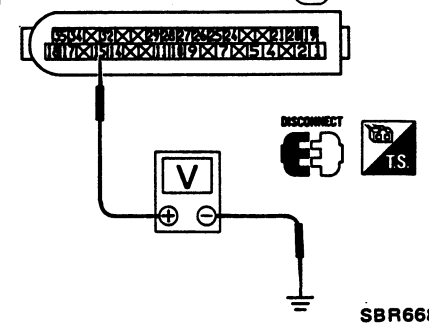


A Control unit connector (M123)



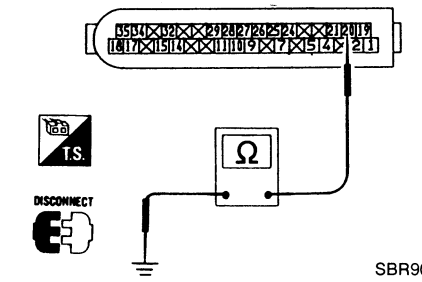
SBR669A

B Control unit connector (M123)



SBR668A

C Control unit connector (M123)



SBR901A

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

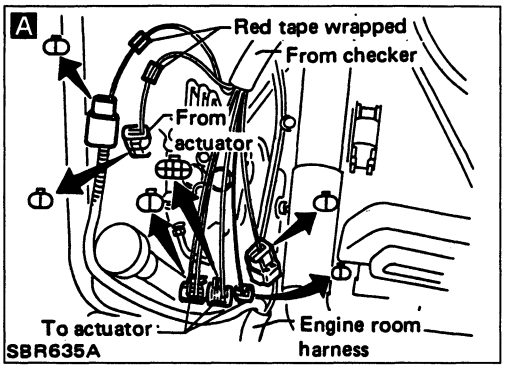
Check continuity between control unit connector (vehicle side) terminal ⑳ and body ground with ignition switch "OFF".

N.G. → Repair ground harness.

O.K. ↓

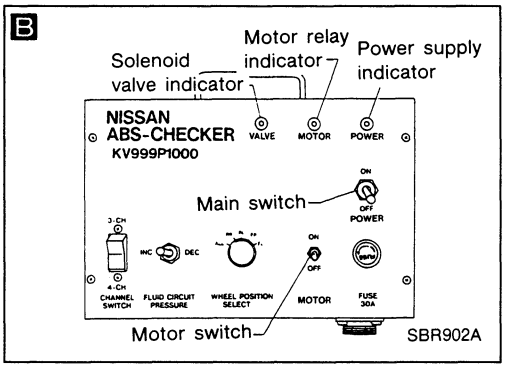
Replace control unit

A

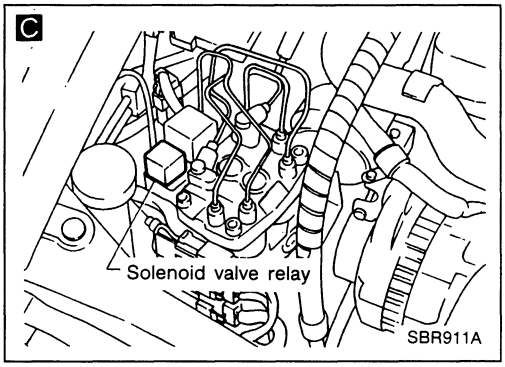


SBR635A

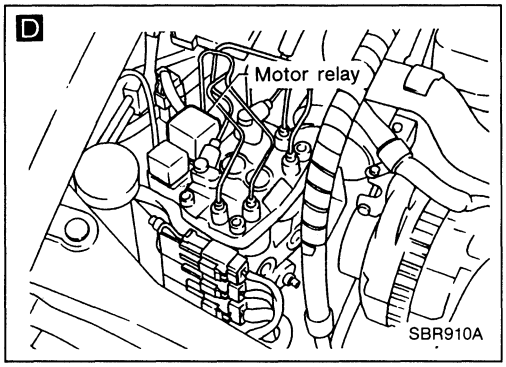
B



C



D



Electrical Components Inspection

ACTUATOR (Not self-diagnostic item)

INSPECTION START

A

Connect A.B.S. checker to actuator connector and vehicle harness with battery terminal connected and all checker switch turning 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

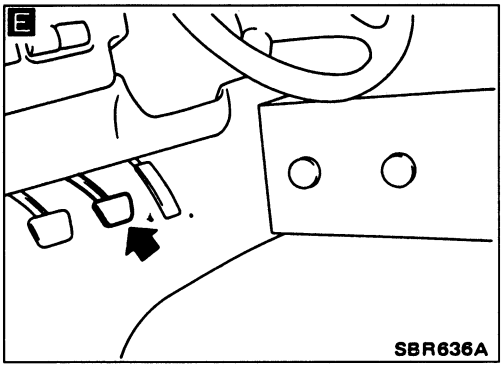
Check motor for operational sound beside the actuator in a quiet place.

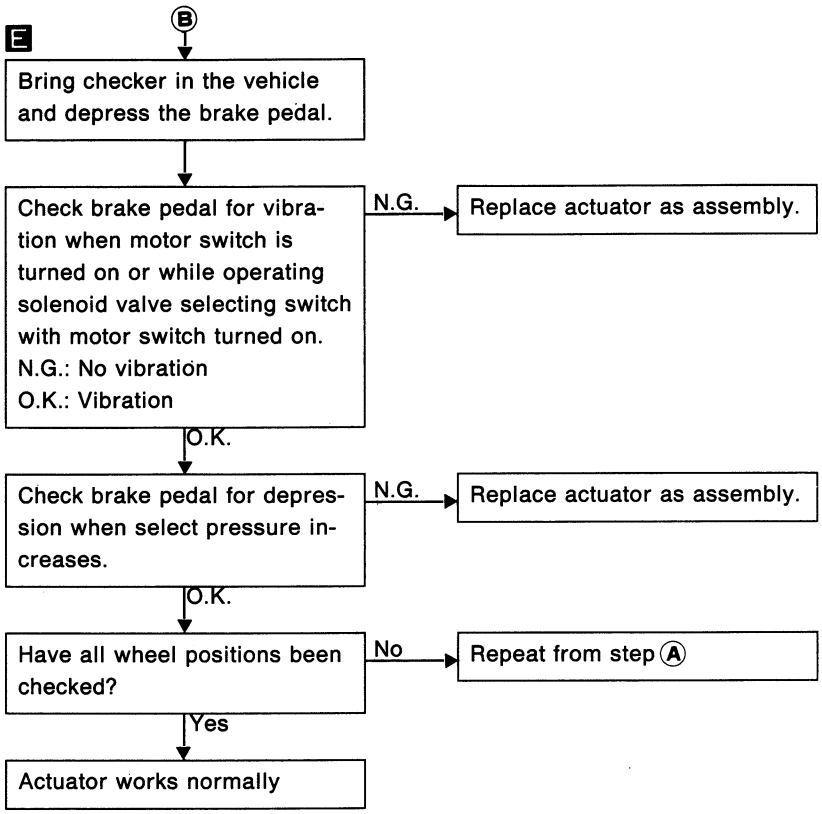
No → Replace actuator as assembly, if Diagnostic Procedures 7 - 12 are already performed and checker connection is correct.

Yes

Ⓑ

Electrical Components Inspection (Cont'd)





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 A.B.S.	With A.B.S.
Front brake		
Brake model	CL25VA disc brake	
Cylinder bore diameter mm (in)	57.2 (2.252)	
Pad mm (in)		
Length x width x thickness	134.1 x 45.3 x 11.0 (5.28 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 8 (2.95 x 1.575 x 0.31)
Drum inner diameter or rotor outer diameter x thickness mm (in)	228.6 (9)	258 x 10 (10.16 x 0.39)
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	M205T
Diaphragm diameter mm (in)	Primary: 208 (8.19) Secondary: 180 (7.09)	Primary: 230 (9.06) Secondary: 208 (8.19)
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 - 2

STEERING SYSTEM

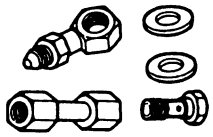
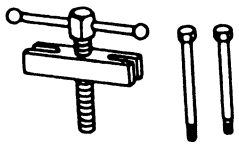
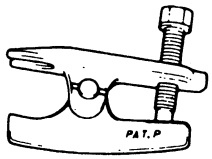
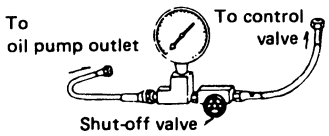
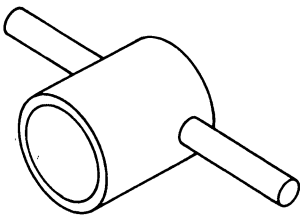
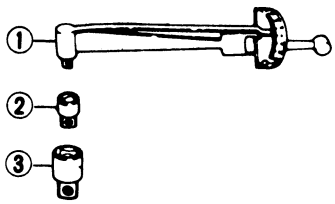
SECTION ST

CONTENTS

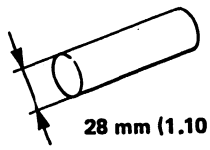
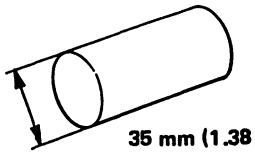
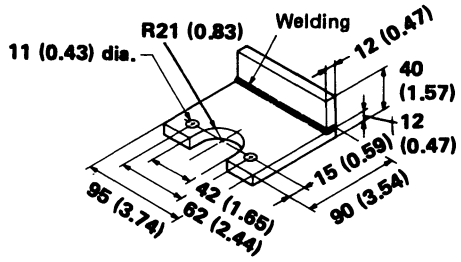
- Before disassembly, thoroughly clean the outside of the unit.
- Disassembly should be done in a clean work area. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
- When disassembling parts, be sure to place them in order on a part rack so they 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.

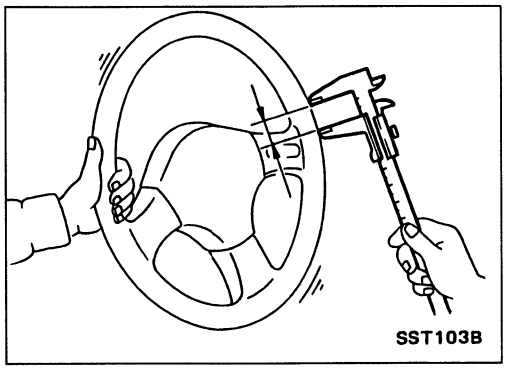
  *: Automatic transmission fluid

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
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

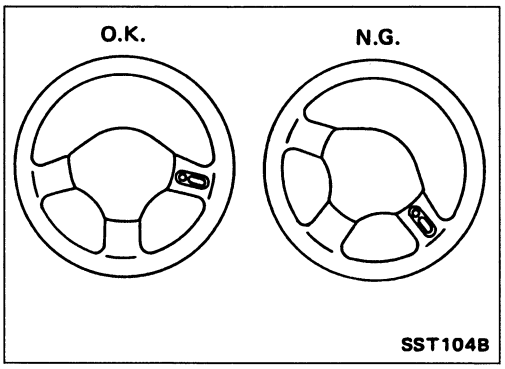
COMMERCIAL SERVICE TOOLS

Tool name	Description	
Rear oil seal drift		Installing rear oil seal
Pinion oil seal drift		Installing pinion oil seal
Oil pump attachment	 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.



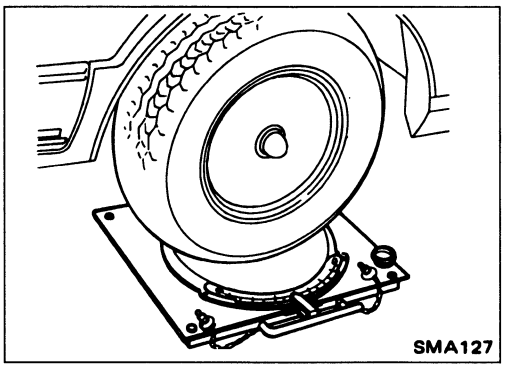
Checking Neutral Position on Steering Wheel

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.

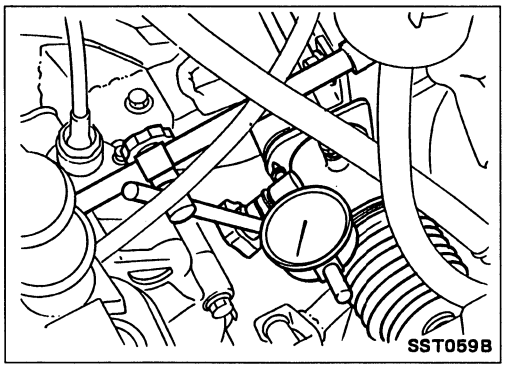
Checking

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.

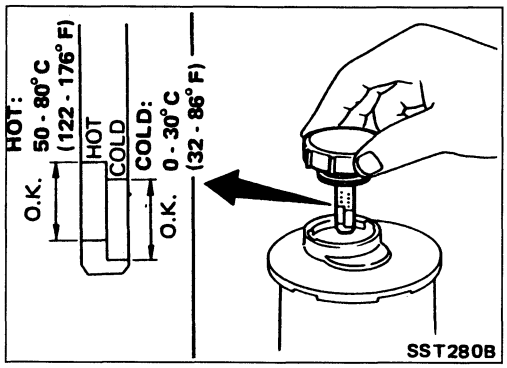


Checking Gear Housing Movement

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:
  ±2 mm (±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.



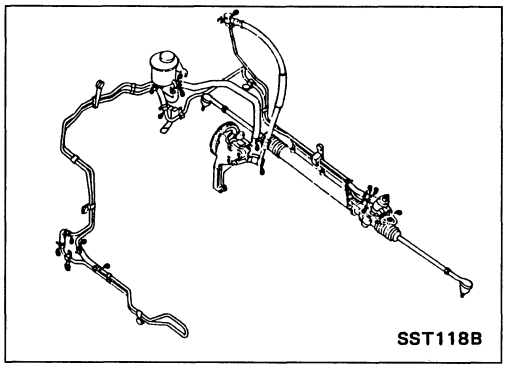
Checking Fluid Level

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.**



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

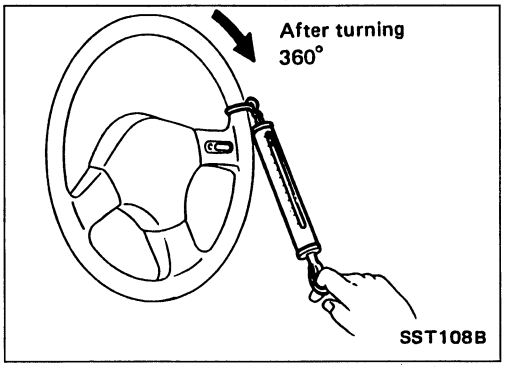
1. Raise front end of vehicle until wheels are clear of the ground.
2. Add fluid into oil tank to specified level. Meanwhile quickly turn steering wheel fully to right and left and lightly touch steering stoppers.
   Repeat steering wheel operation until fluid level no longer decreases.
3. Start engine.
   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.



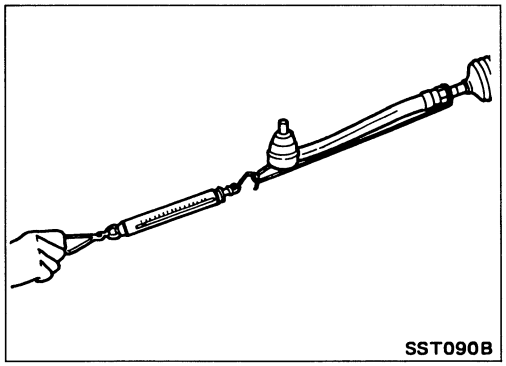
Checking Steering Wheel Turning Force

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.

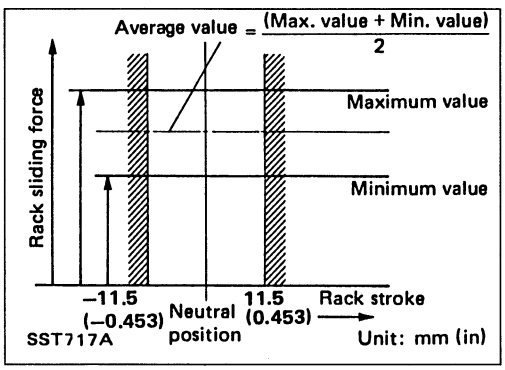
4. Check steering wheel turning force when steering wheel has been turned 360° from neutral position.

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.

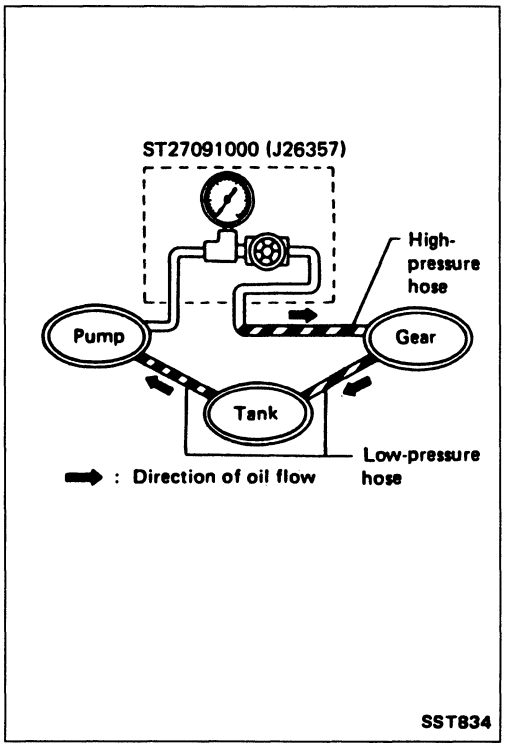


Average rack sliding force:
284 N (29 kg, 64 lb)

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.



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:
7,355 - 8,336 kPa (75 - 85 kg/cm^2, 1,067 - 1,209 psi)

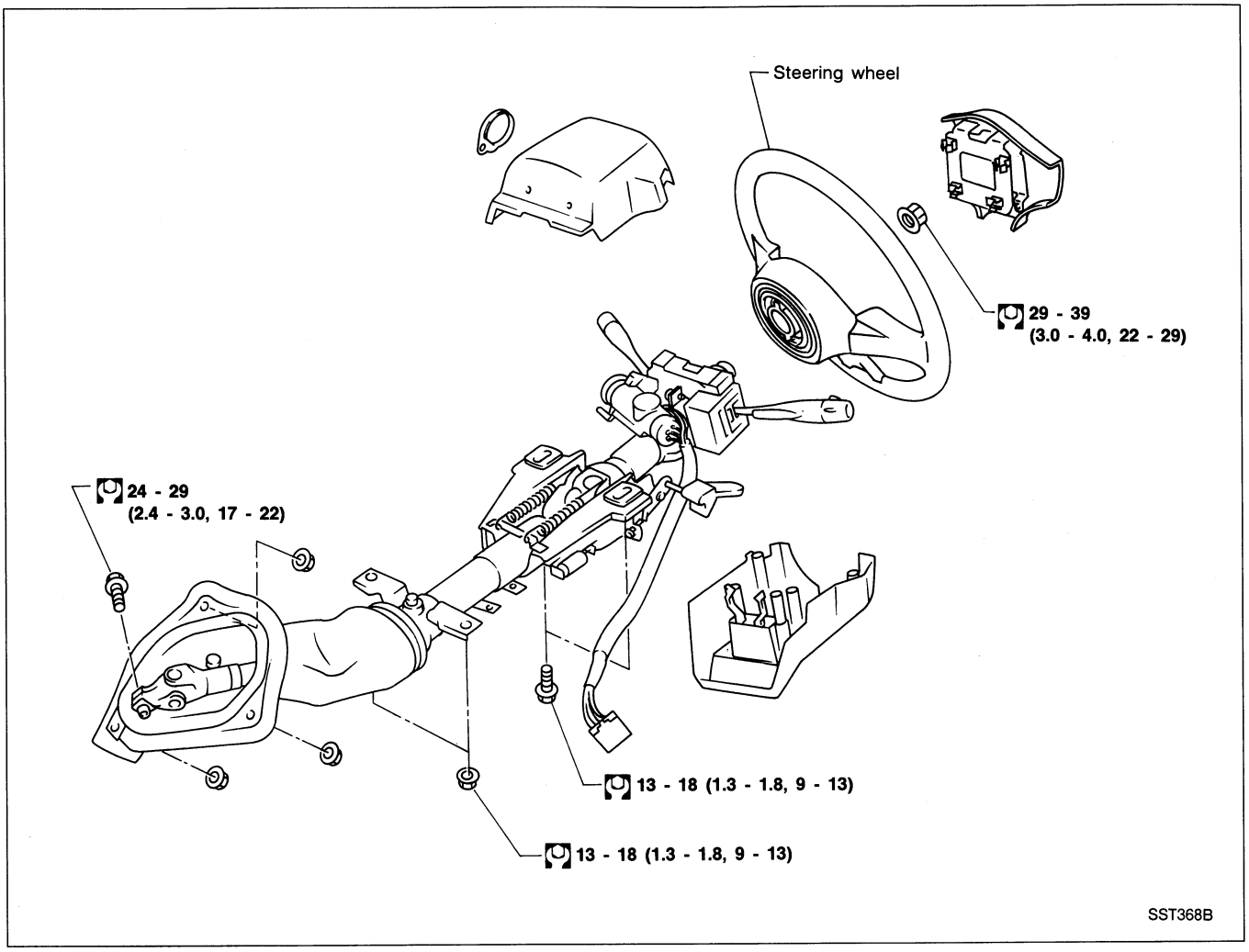
4. If oil pressure is below the standard pressure, slowly close shut-off valve and check pressure.

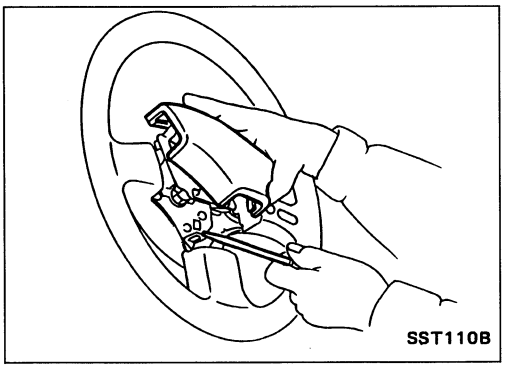
- When pressure reaches standard pressure, gear is damaged.
- When pressure remains below standard pressure, pump is damaged.

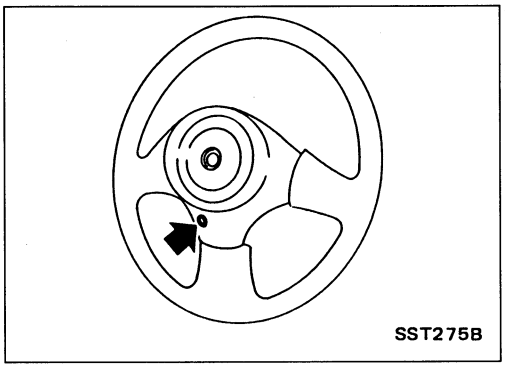
CAUTION:

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.







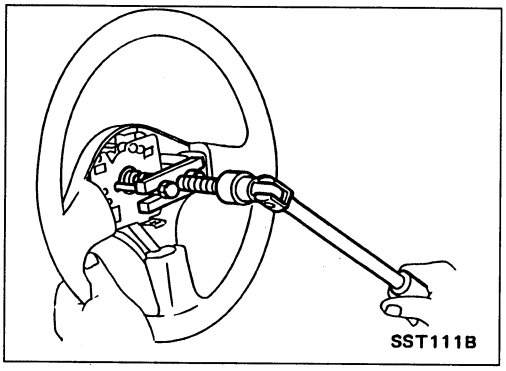
Removal

STEERING WHEEL

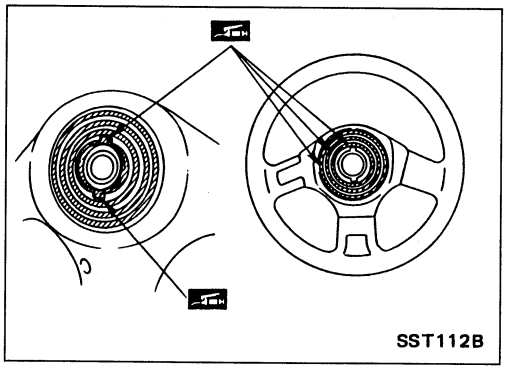
1. Pull out horn pad.

- If it is hard to pull out horn pad, temporarily loosen fixing screw of horn pad retaining spring.

Removal (Cont'd)



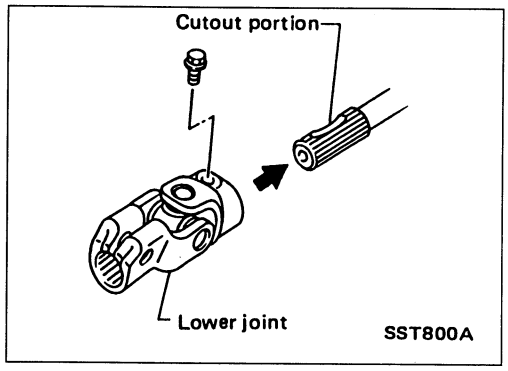
2. Remove steering wheel with Tool.



Installation

STEERING WHEEL

When installing steering wheel, apply multi-purpose grease to entire surface of turn signal cancel pin (both portions) and also to horn contact slip ring.



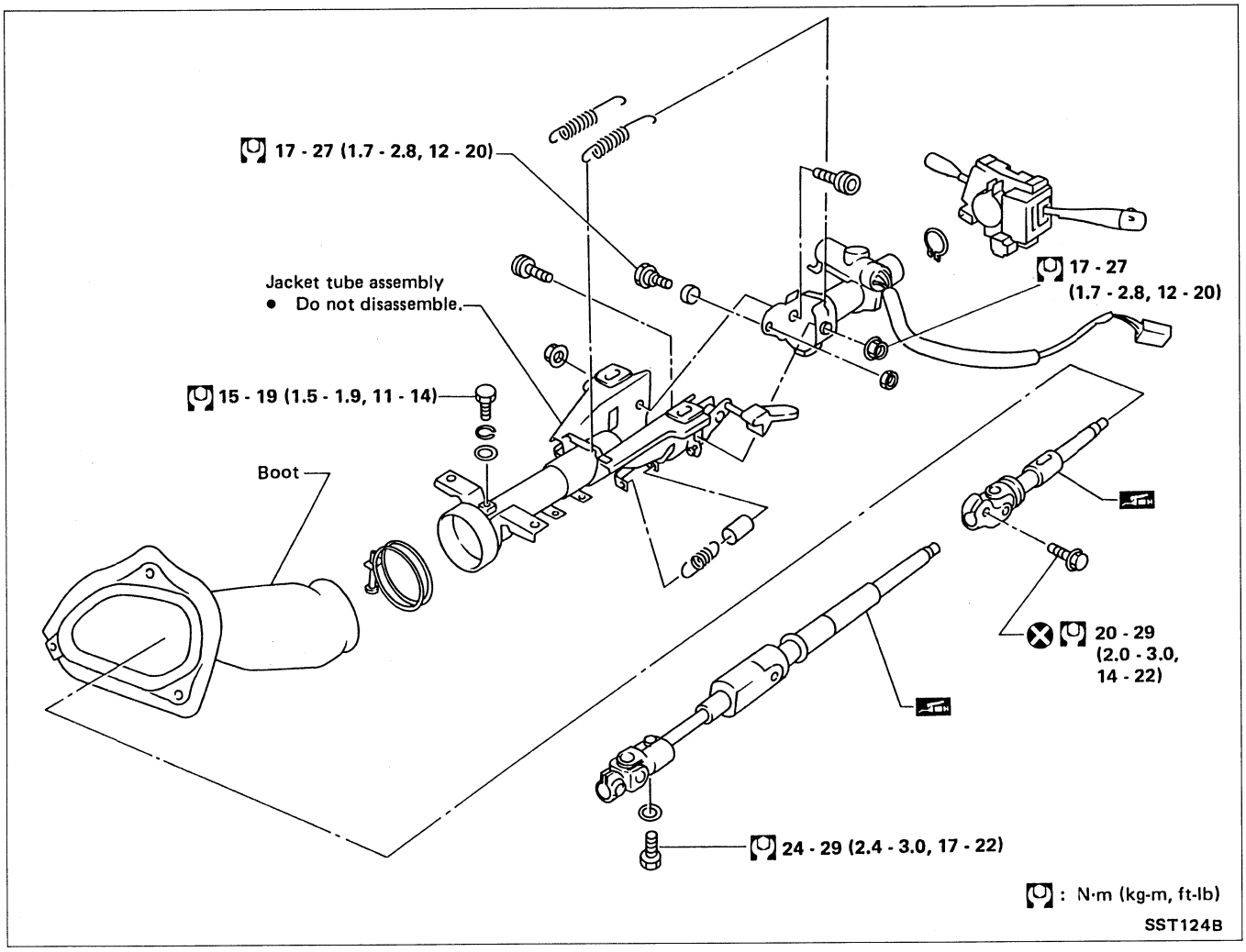
STEERING COLUMN

- 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.

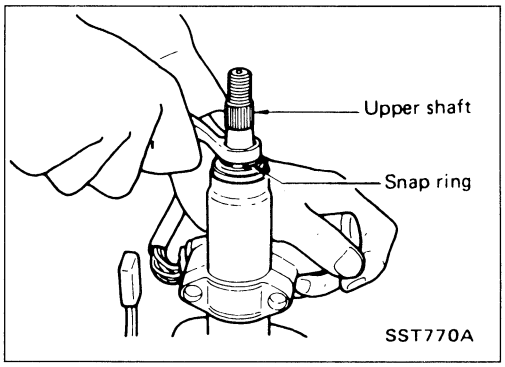
CAUTION:

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

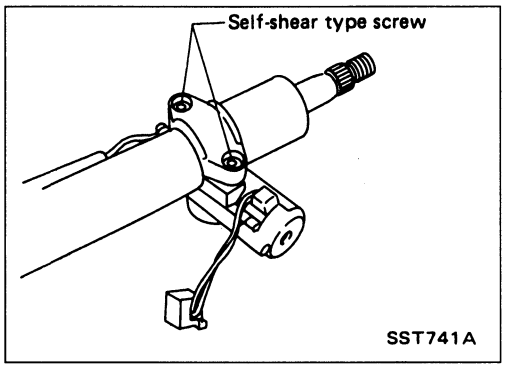


- When disassembling and assembling, unlock steering lock with key.
- Ensure that rounded surface of snap ring faces toward bearing when snap ring is installed.



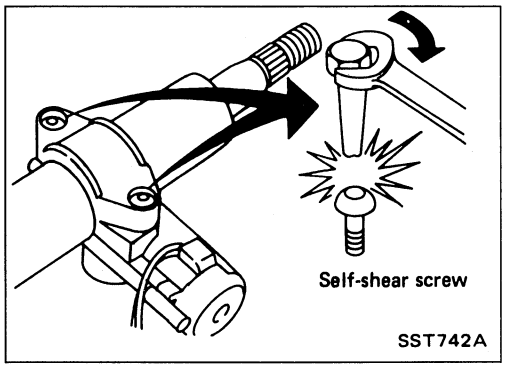
- Install snap ring on upper shaft with a suitable tool.

Disassembly and Assembly (Cont'd)

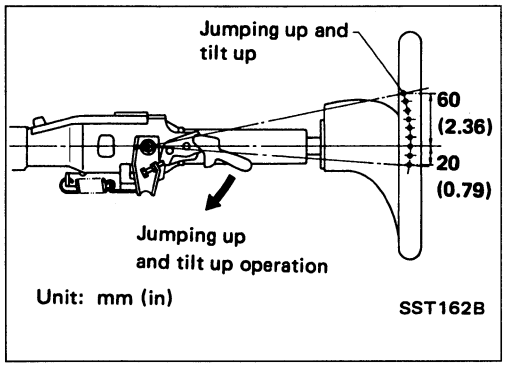


- Steering lock

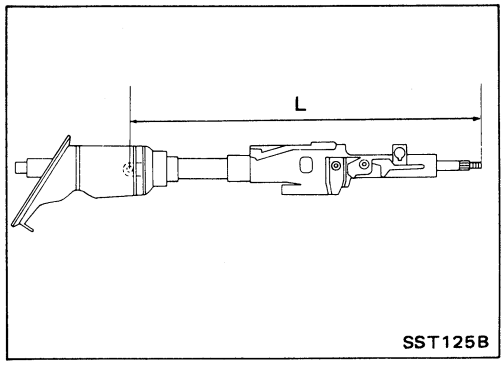
a. Break self-shear type screws with a drill or other appropriate tool.



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.

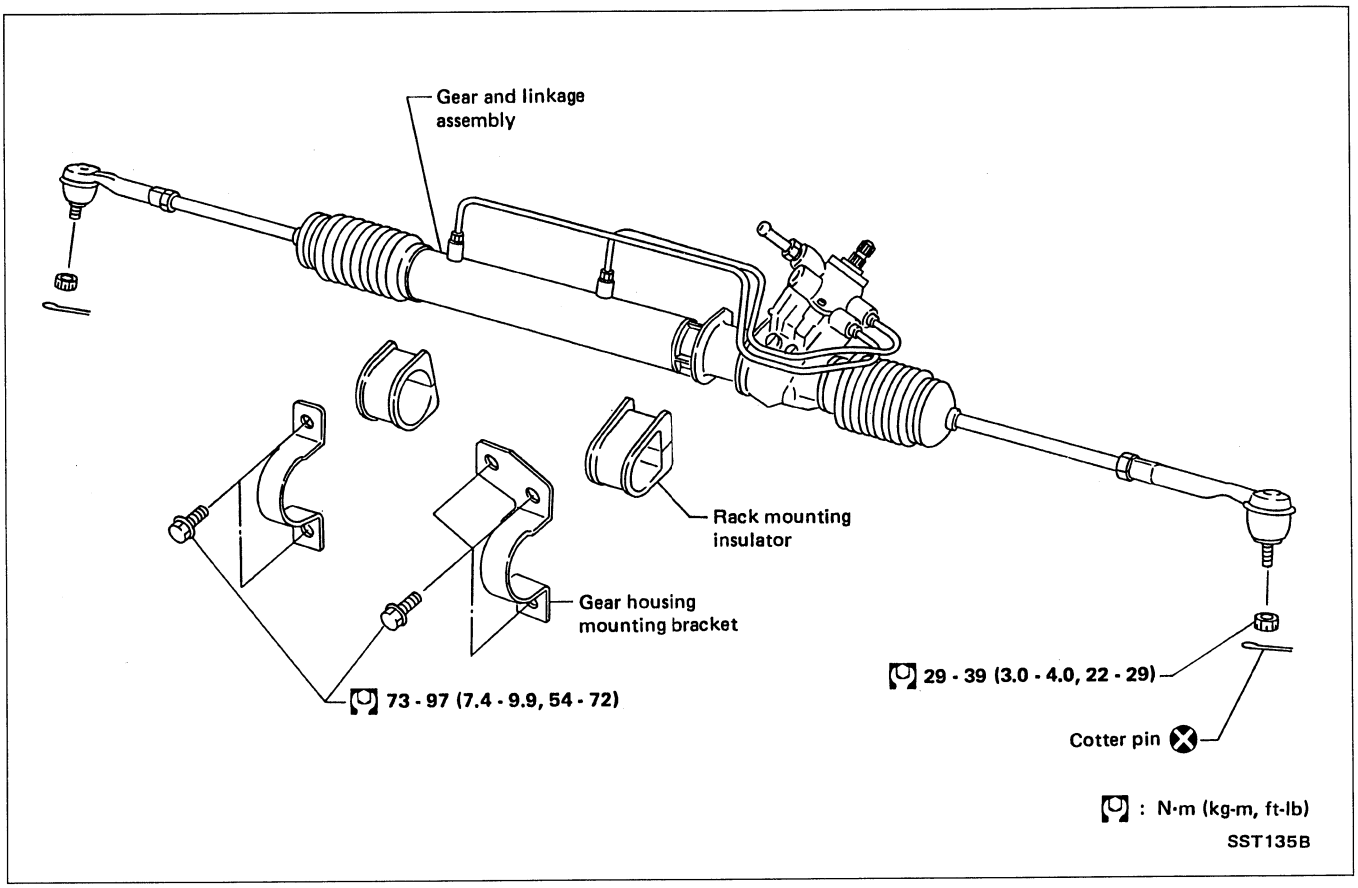
b. Check jacket tube for deformation or breakage. Replace if necessary.

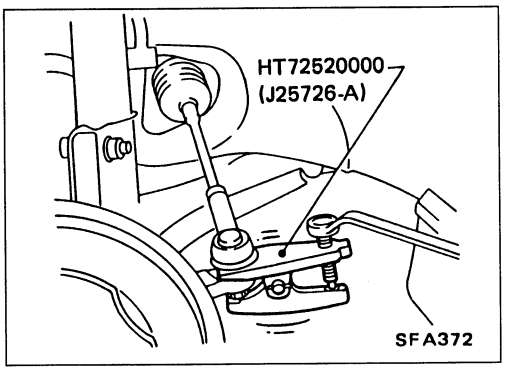
- When the vehicle is involved in a light collision, check column length "L". If it is not within specifications, replace steering column as an assembly.

Column length "L":

581.2 - 582.8 mm (22.88 - 22.94 in)

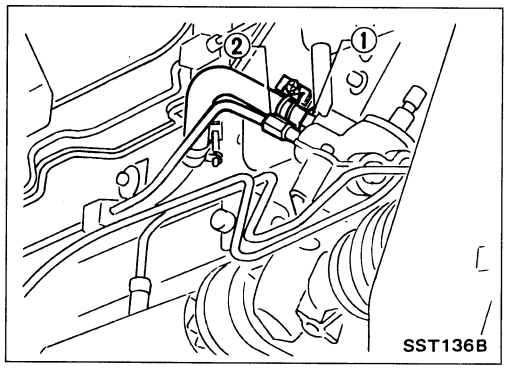
Removal and Installation





- 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.

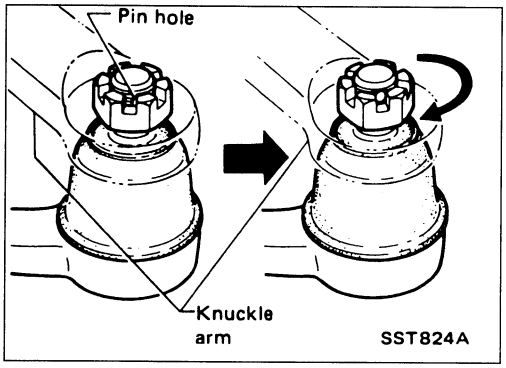
Connector tightening torque:

Low-pressure side "1"

27 - 39 N·m (2.8 - 4.0 kg-m, 20 - 29 ft-lb)

High-pressure side "2"

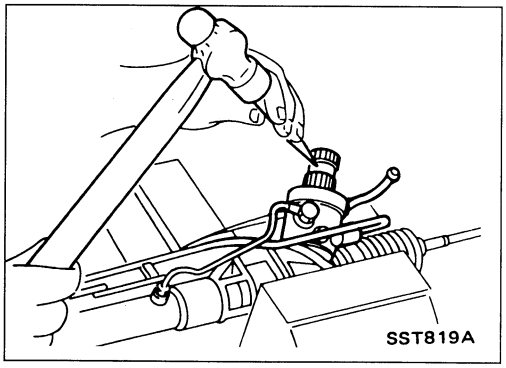
15 - 25 N·m (1.5 - 2.5 kg-m, 11 - 18 ft-lb)



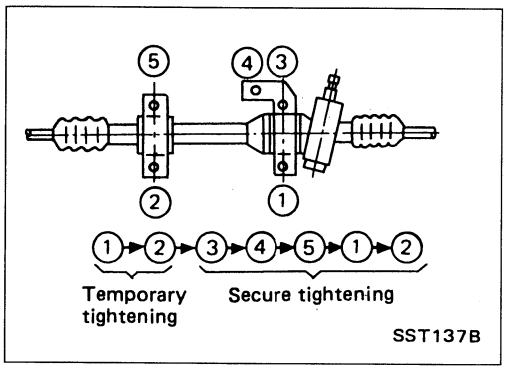
- Initially, tighten nut on tie-rod outer socket and knuckle arm to 29 to 39 N·m (3 to 4 kg-m, 22 to 29 ft-lb). Then tighten further to align nut groove with first pin hole so that cotter pin can be installed.

CAUTION:

Tightening torque must not exceed 49 N·m (5 kg-m, 36 ft-lb).

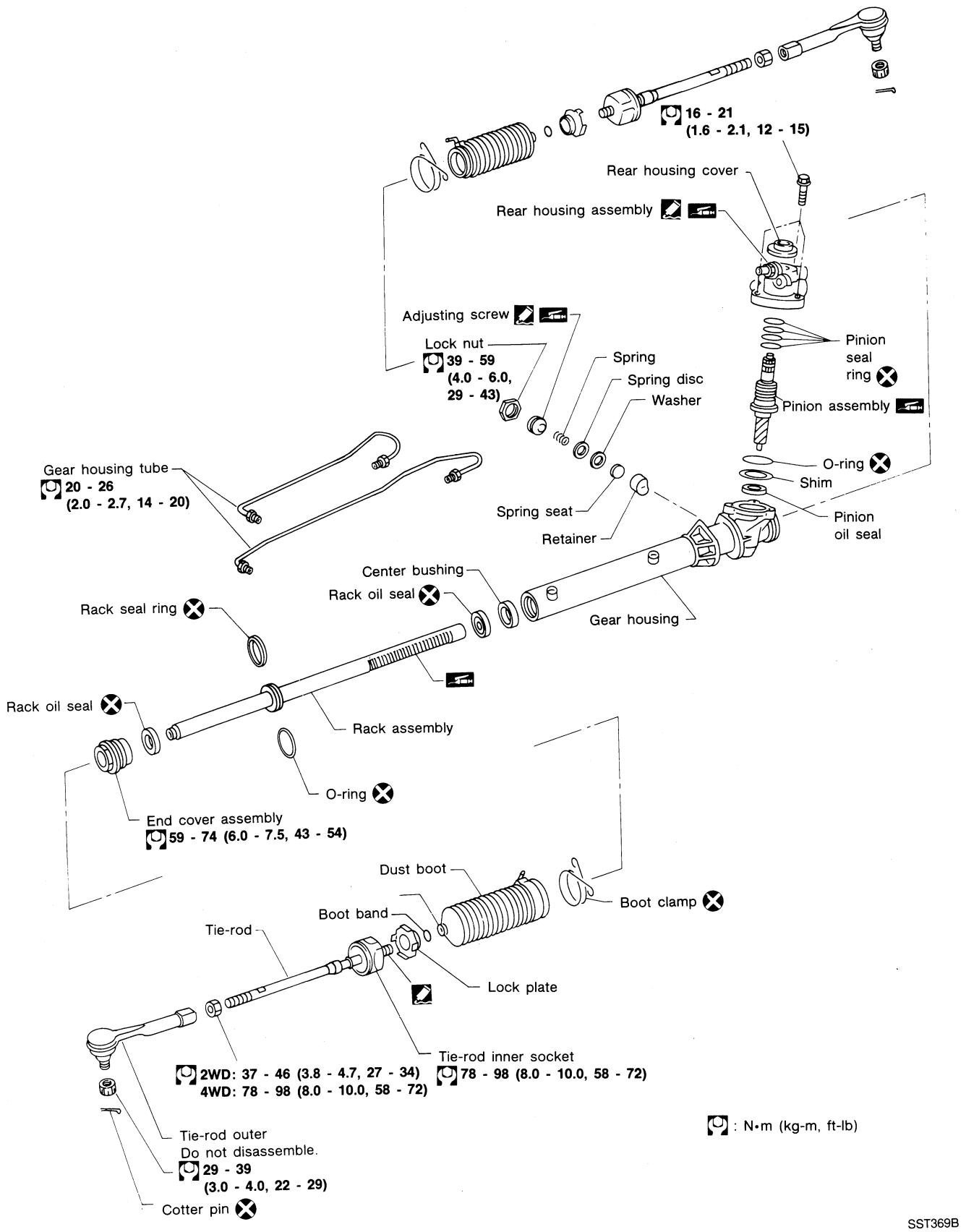


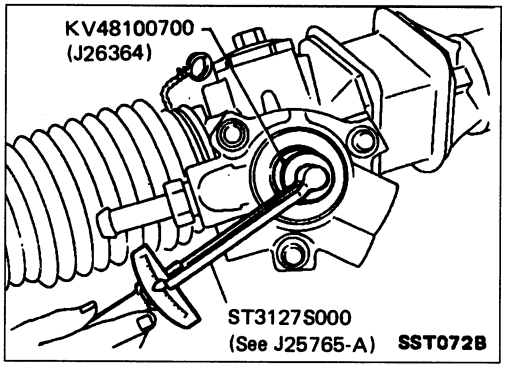
- Before removing lower joint from gear, set gear in neutral (wheels in straight-ahead position). After removing lower joint, put matching mark on pinion shaft and pinion housing to record neutral position of gear.
- To install, set left and right dust boots to equal deflection, and attach lower joint by aligning matching marks of pinion shaft and pinion housing.



- Tighten gear housing mounting bracket bolts in the order shown.

POWER STEERING GEAR AND LINKAGE (Model PR26SC)





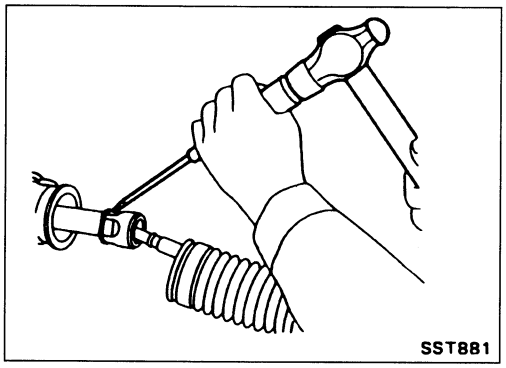
Disassembly

1. Prior to disassembling, measure pinion rotating torque. Record the pinion rotating torque as a reference.

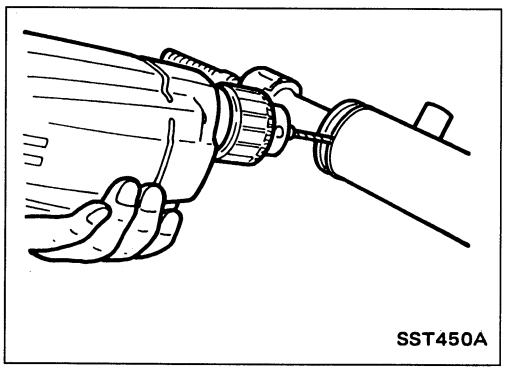
- **Before measuring, disconnect gear housing tube and drain fluid.**
- **Use soft jaws when holding steering gear housing. Handle gear housing carefully, as it is made of aluminum. Do not grip cylinder in a vise.**

2. Remove pinion gear.

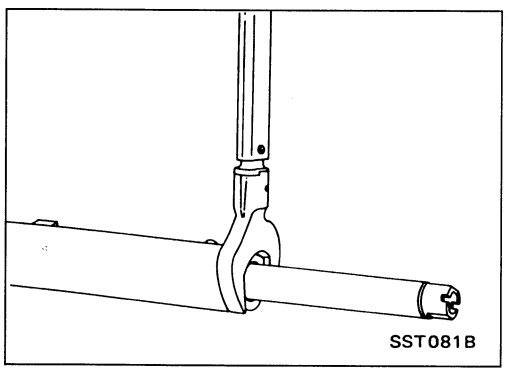
Be careful not to damage pinion gear when removing pinion seal ring.



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.

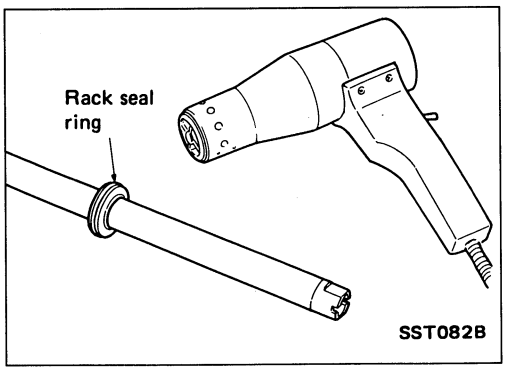


7. Drill staked portion of gear housing end with drill of 2 to 2.5 mm (0.079 to 0.098 in) diameter, until the staking is eliminated.



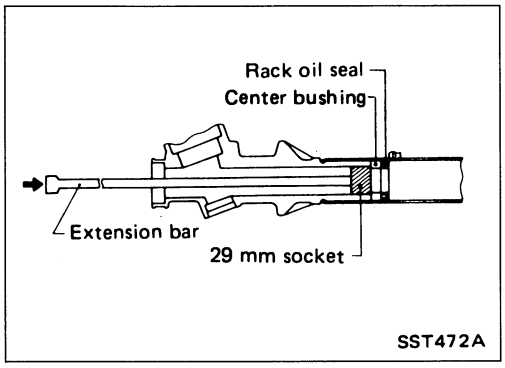
8. Remove end cover assembly with a suitable tool.
9. Draw out rack assembly.

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

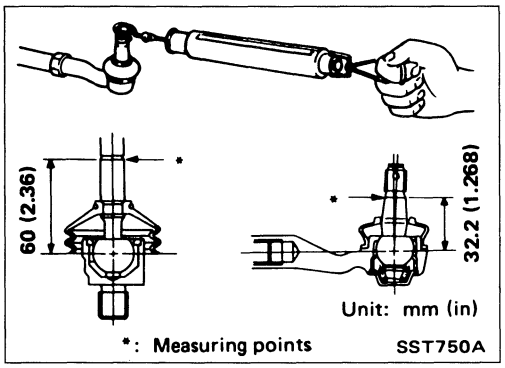
- Thoroughly examine pinion gear. If pinion gear is damaged, cracked or worn, replace it.
- Inspect bearings to see that they roll freely and are free from cracked, pitted, or worn balls, rollers and races. Replace if necessary.

GEAR HOUSING CYLINDER

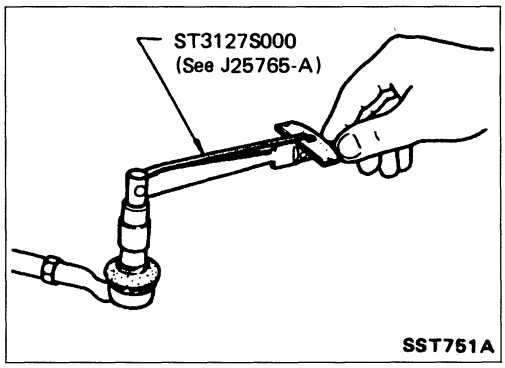
Check gear housing cylinder bore for scratches or other damage. Replace if necessary.

Inspection (Cont'd)

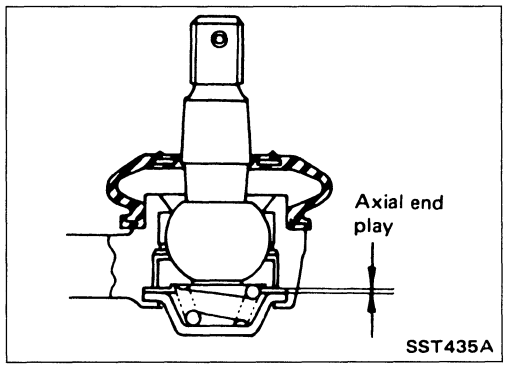
TIE-ROD OUTER AND INNER SOCKET



- 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)

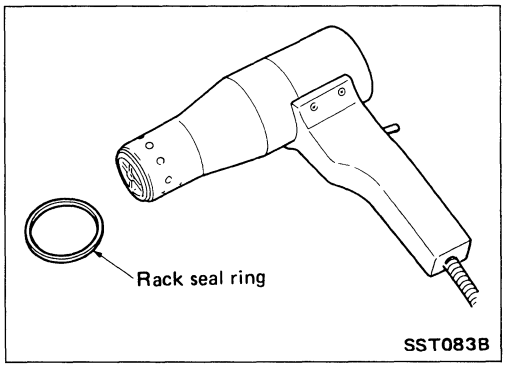


- Check ball joint for rotating torque.
  Tie-rod outer ball joint:
  0.3 - 2.9 N·m
  (3 - 30 kg-cm, 2.6 - 26.0 in-lb)

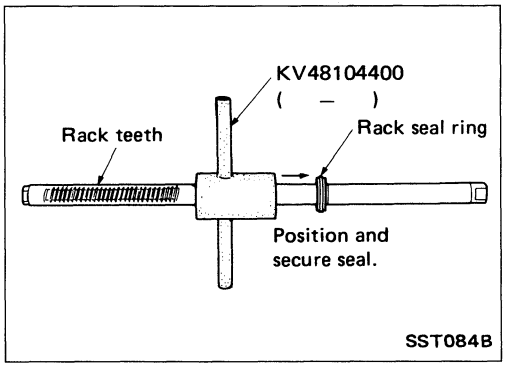


- Check ball joint for axial end play.
  Tie-rod outer ball joint:
  0.5 mm (0.020 in) or less
  Tie-rod inner ball joint:
  0 mm (0 in)
- Check condition of dust cover. If cracked excessively, replace it.

Assembly



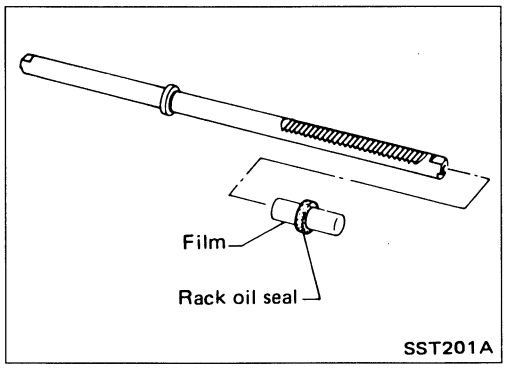
1. Using a heat gun, heat new rack seal ring (made of Teflon) to approximately 40°C (104°F) and install it onto rack with your hand.



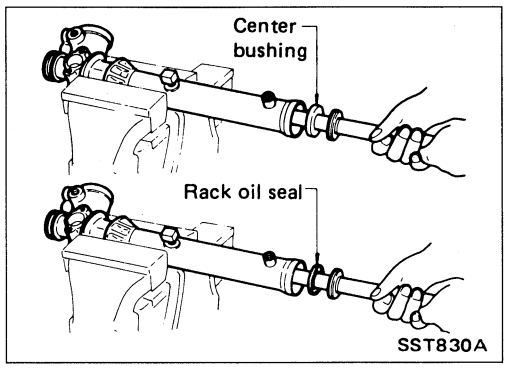
2. Using Tool, compress periphery of rack seal ring to position and secure it on rack.

Always insert Tool from the rack gear side.

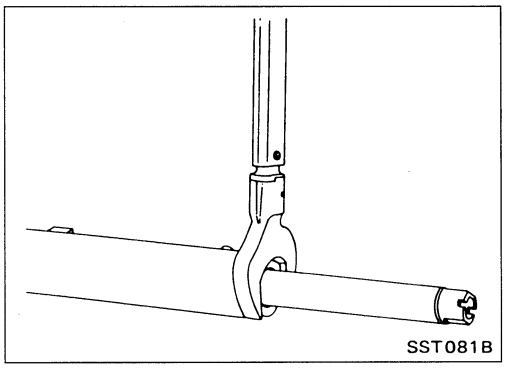
Assembly (Cont'd)



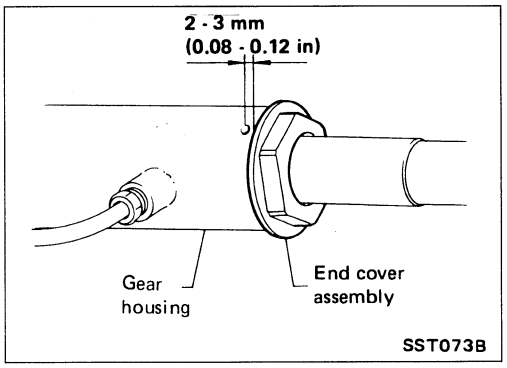
3. Insert new rack oil seal.
- **Place plastic film into rack oil seal to prevent damage by rack teeth.**
- **Do not forget to remove plastic film after rack oil seal is positioned properly.**
- **Make sure lips of rack oil seal face each other.**



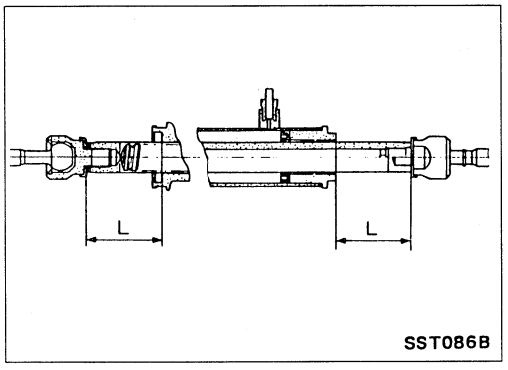
4. Install center bushing and rack oil seal with rack assembly.



5. Tighten end cover assembly with a suitable tool.

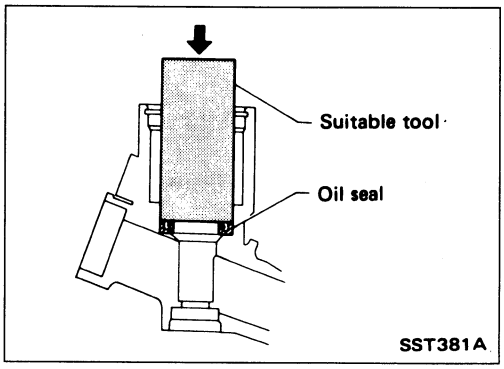


6. Fasten end cover assembly to gear housing by staking.



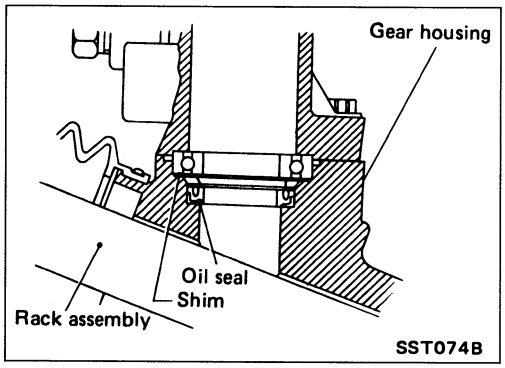
7. Set rack gear in neutral position.
   Rack stroke "L":
   Refer to S.D.S.

Assembly (Cont'd)

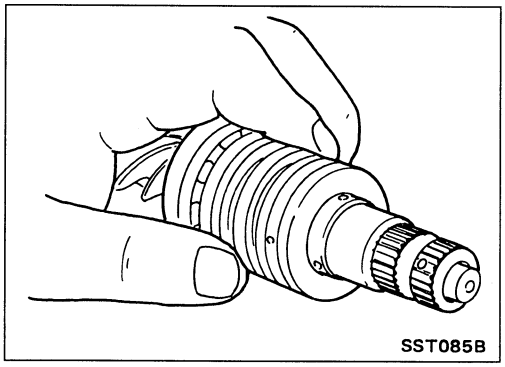


8. Coat seal lip of new pinion oil seal with multi-purpose grease and install it to pinion housing of gear housing with a suitable tool.

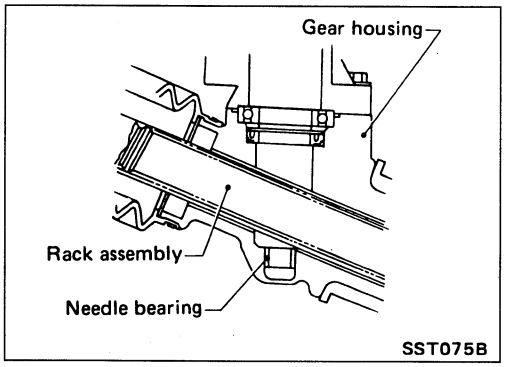
Make sure lip of oil seal faces up when installed.



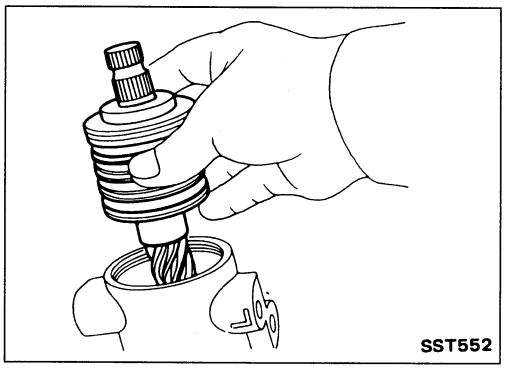
9. Install pinion bearing adjusting shim(s).
- Whenever pinion assembly, gear housing and rear housing are disassembled, replace shim(s) with new ones. Always use the same number of shim(s) when replacing.



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.



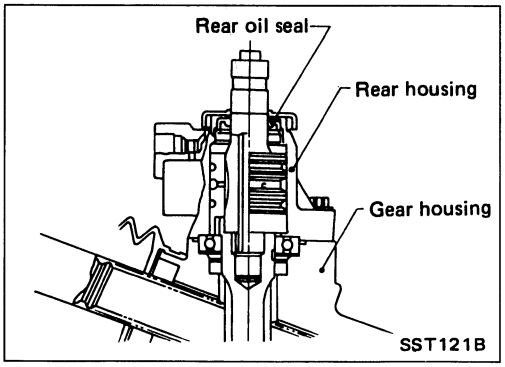
11. Apply a coat of multi-purpose grease to needle bearing roller and oil seal lip before installing pinion assembly in gear housing.



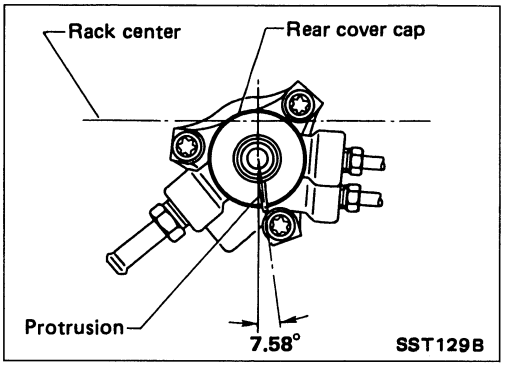
12. Install pinion assembly to pinion housing.

Be careful not to damage pinion oil seal.

Assembly (Cont'd)

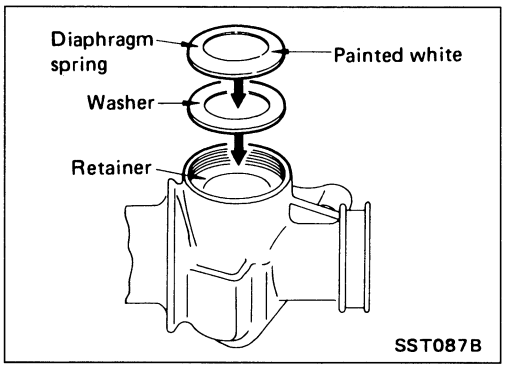


13. Apply a coat of multi-purpose grease to new rear oil seal lip before installing rear housing.



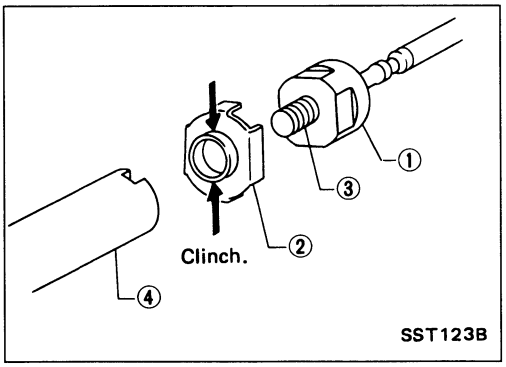
14. Install rear cover cap so that protrusion of rear housing cover is positioned as shown in figure at left.

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.

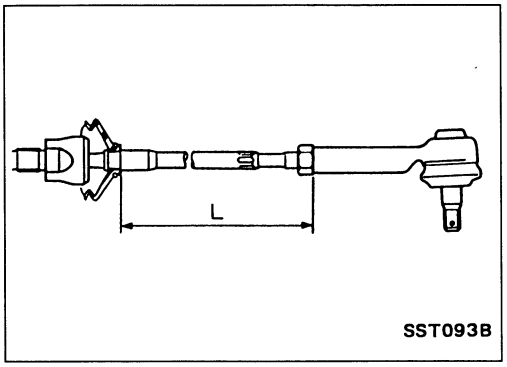
16. Install retainer spring and adjusting screw temporarily.



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:

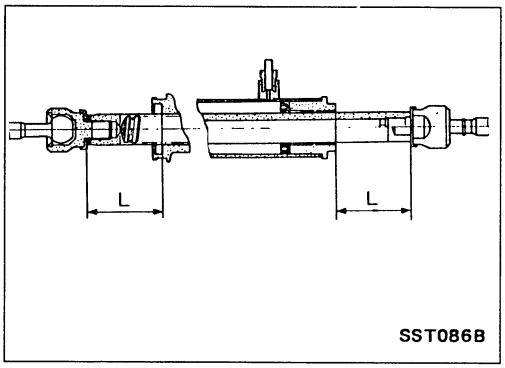
To prevent scratching the boot, remove burrs from lock plate.



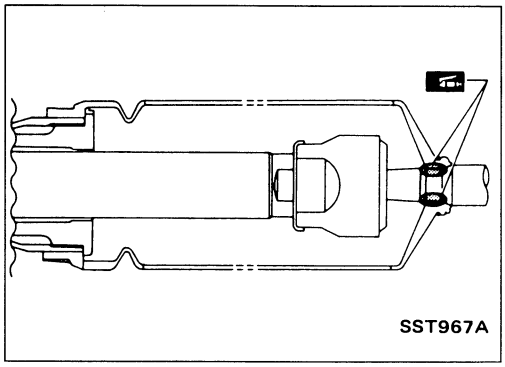
18. Tighten outer socket lock nut.

Tie-rod length "L":
Refer to S.D.S.

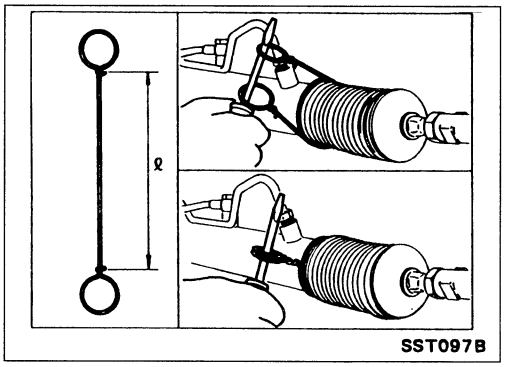
Assembly (Cont'd)



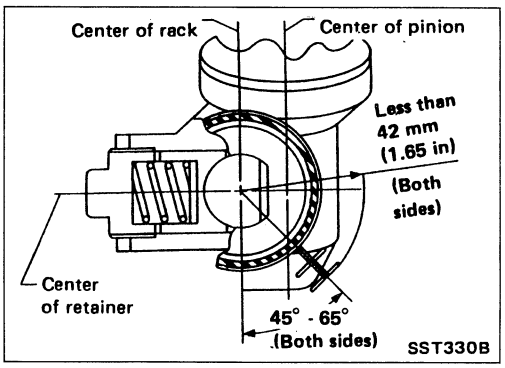
19. Measure rack stroke.
    Rack stroke "L":
    Refer to S.D.S.



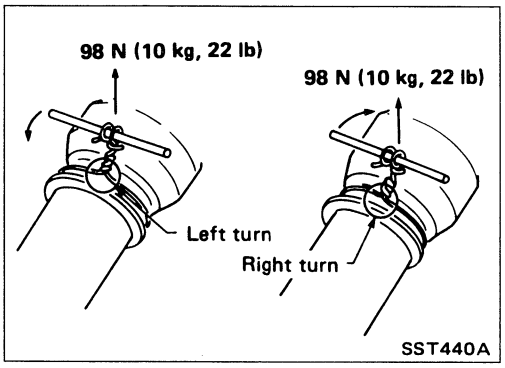
20. Before installing boot, coat the contact surfaces between boot and tie-rod with grease.



21. Install boot clamps.
- To install, wrap boot clamp around boot groove twice. Tighten clamp by twisting rings at both ends 4 to 4-1/2 turns with screwdriver while pulling with a force of approx. 98 N (10 kg, 22 lb).

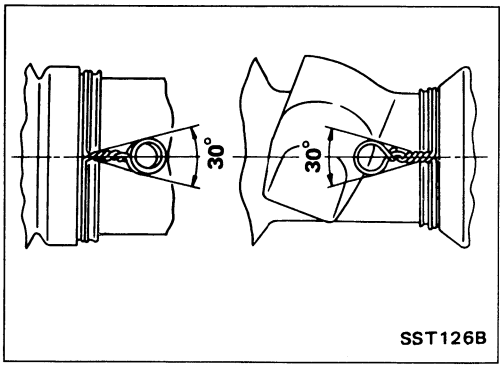


- Install boot clamp so that it is to the rear of the vehicle when gear housing is attached to the body. (This will prevent interference with other parts.)

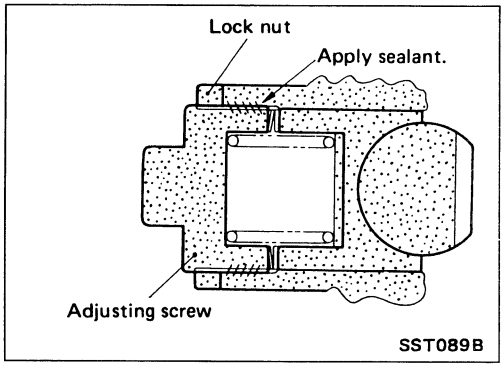


- Twist boot clamp in the direction shown in figure at left.

Assembly (Cont'd)



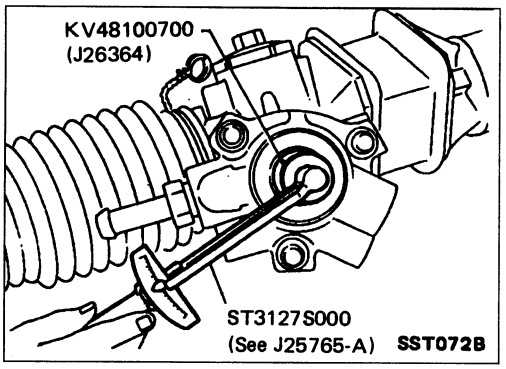
- After twisting boot clamp, bend twisted and diagonally so it does not contact boot.



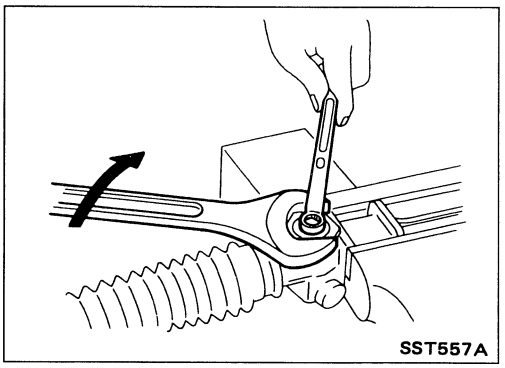
Adjustment

Adjust pinion rotating torque as follows:

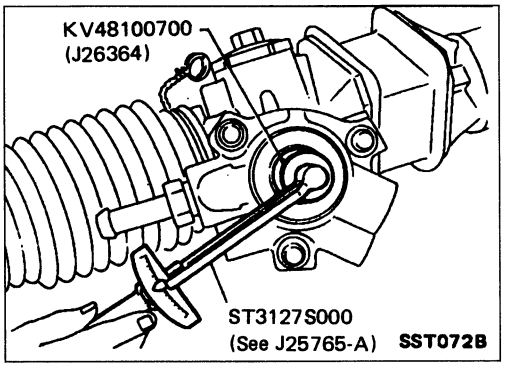
1. Set rack to the neutral position without fluid in the gear.
2. Coat the adjusting screw with locking sealant and screw it in.
3. Lightly tighten lock nut.
4. Tighten adjusting screw to a torque of 4.9 to 5.9 N·m (50 to 60 kg-cm, 43 to 52 in-lb).
5. Loosen adjusting screw, then retighten it to 0.2 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°.



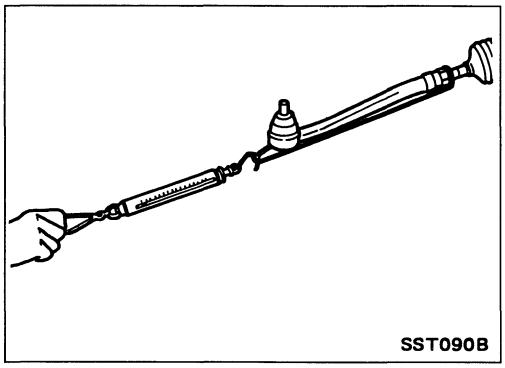
10. Prevent adjusting screw from turning, and tighten lock nut to specified torque.

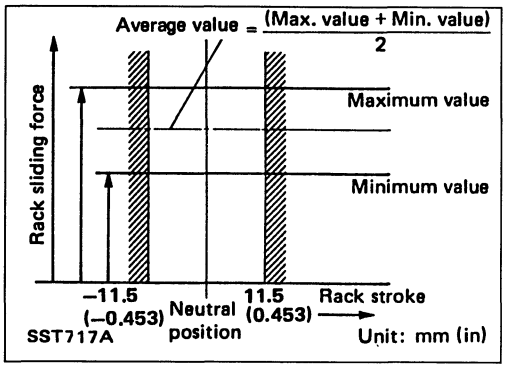


11. Measure pinion rotating torque.
    Within ±100° from the neutral position:
    Average rotating torque
    0.8 - 1.3 N·m (8 - 13 kg-cm, 6.9 - 11.3 in-lb)
    Maximum torque deviation
    0.4 N·m (4 kg-cm, 3.5 in-lb)
    Except for above measuring range:
    Maximum rotating torque
    1.9 N·m (19 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 steerng 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.

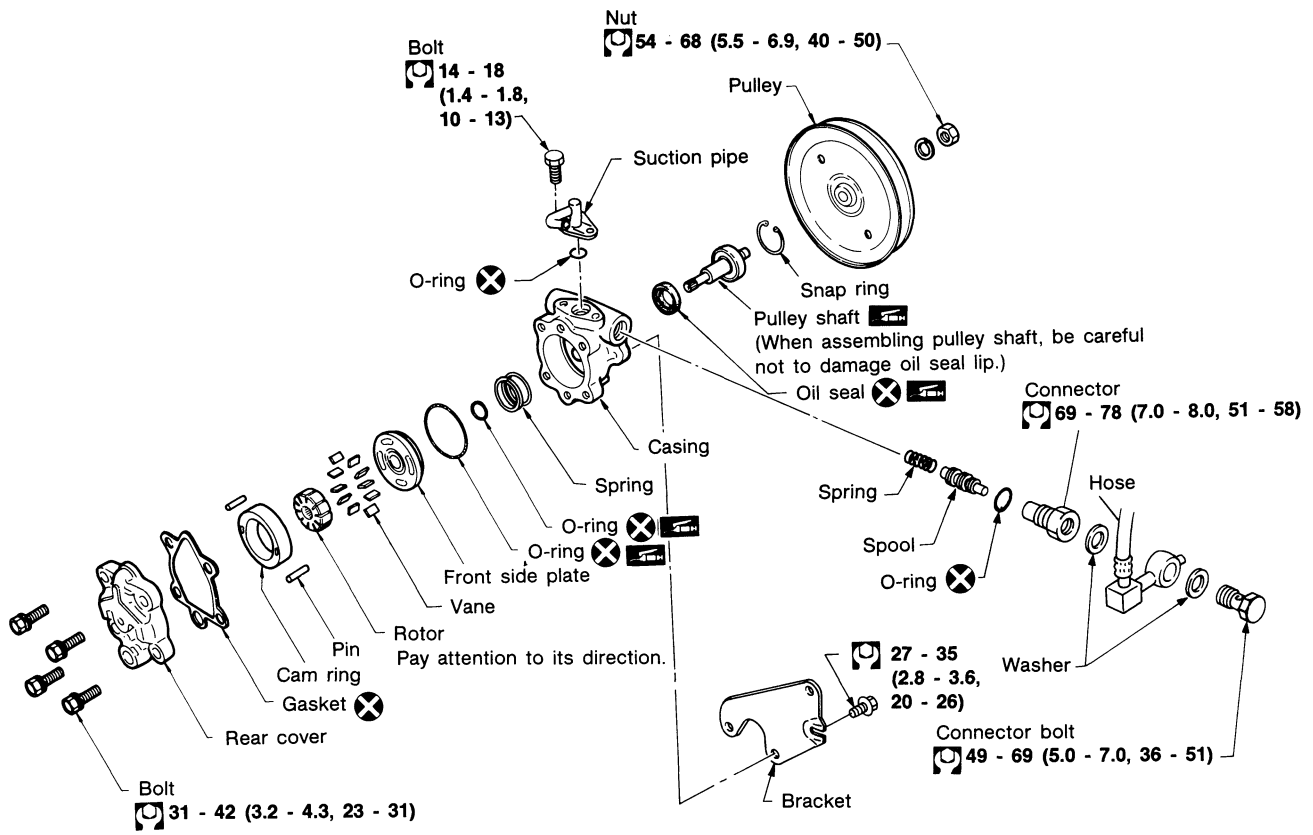
Average rack sliding force:
284 N (29 kg, 64 lb)

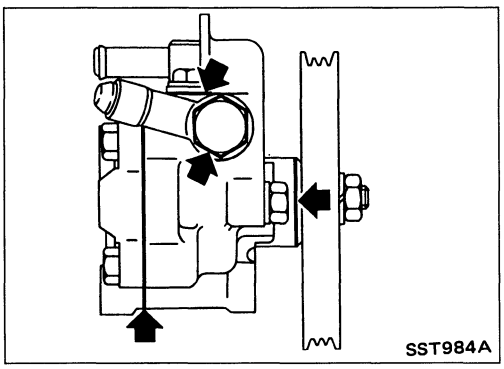
g. Check sliding force outside above range.

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

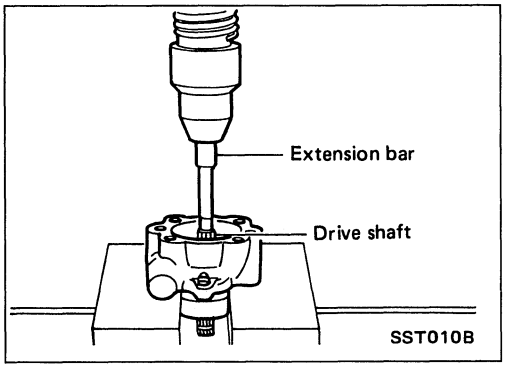
Disassemble the power steering oil pump only if the following items are found.

- Oil leak from any point shown in the figure.
- Deformed or damaged pulley.
- Poor performance.

Disassembly

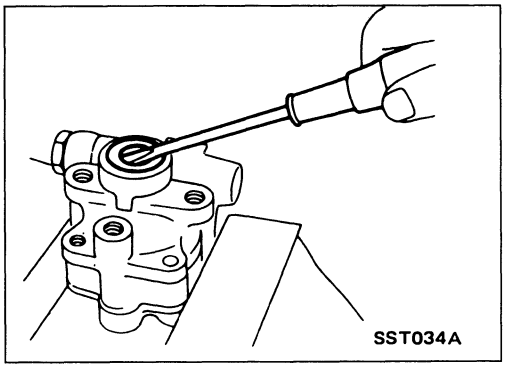
CAUTION:

- **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.**



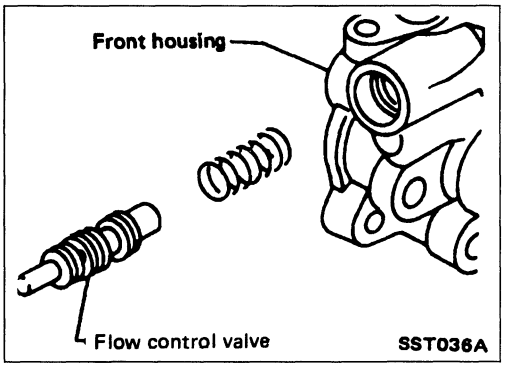
- Remove snap ring, then draw pulley shaft out.

Be careful not to drop pulley shaft.



- Remove oil seal.

Be careful not to damage front housing.

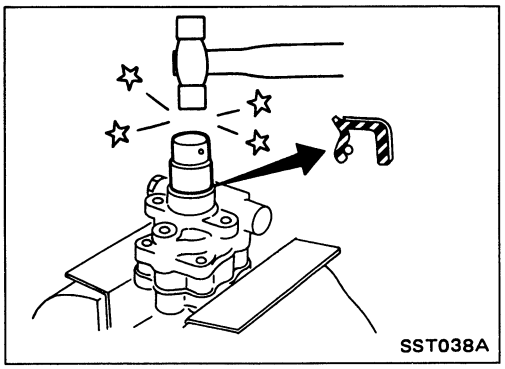


- Remove connector.

Be careful not to drop flow control valve.

Inspection

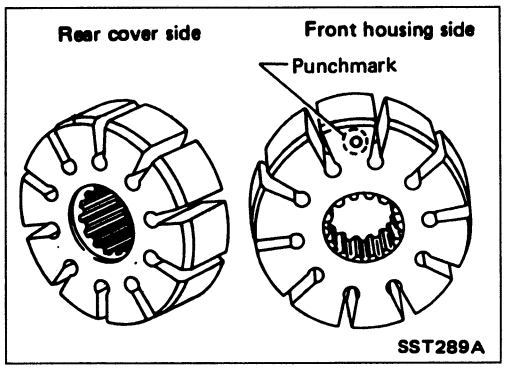
Inspect each component part for wear, deformation, scratches, and cracks. If damage is found, replace the part.


SST038A

Assembly

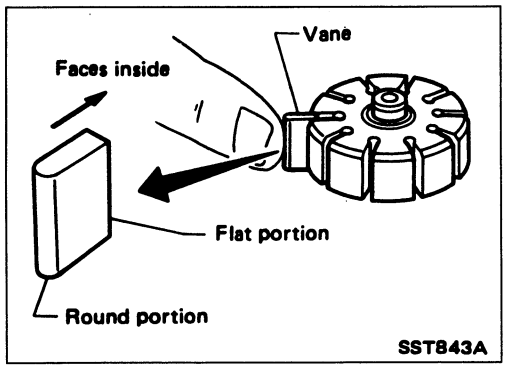
Assemble oil pump, noting the following instructions.

- 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.



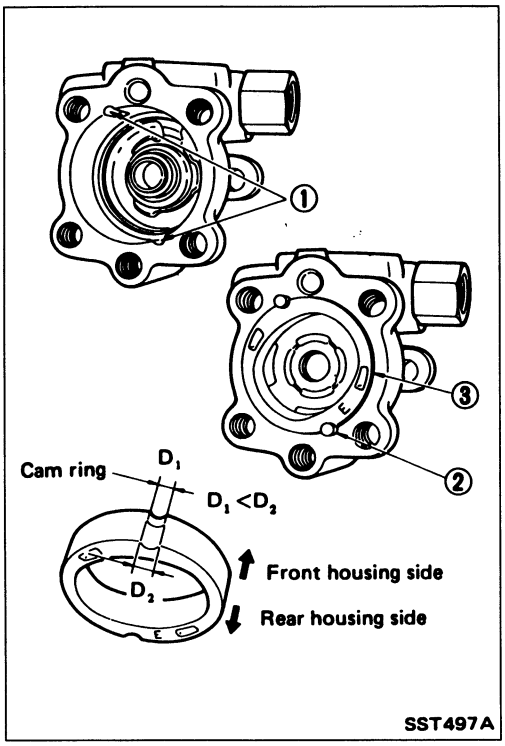
SST289A

- Pay attention to the direction of rotor.



SST843A

- When assembling vanes to rotor, rounded surfaces of vanes must face cam ring side.



SST497A

- 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	16.8
Turns of steering wheel (Lock to lock)	3.01
Steering column type	Collapsible, tilt

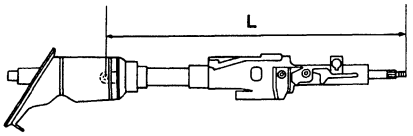
Inspection and Adjustment

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)

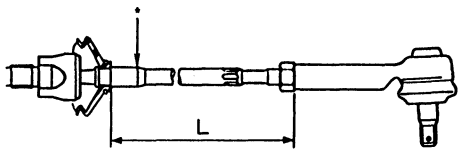


SST125B

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

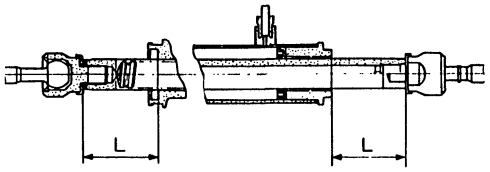


SST371B

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/cm^2, psi)	7,355 - 8,336 (75 - 85, 1,067 - 1,209)

SECTION BF

CONTENTS

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

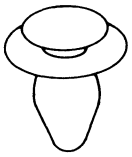
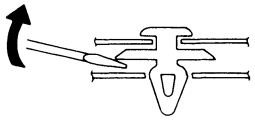
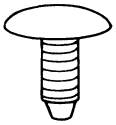
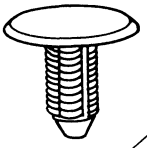
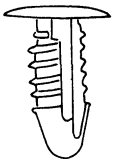
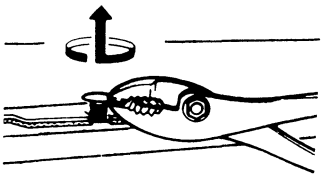
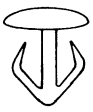
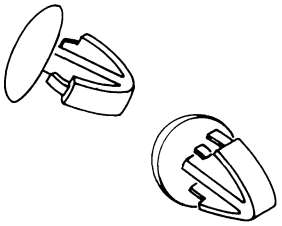
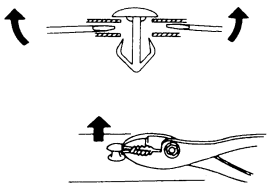
*** For seat belt, refer to MA section.**

Precautions

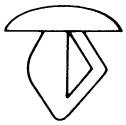
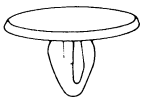
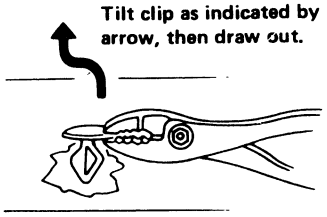
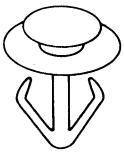
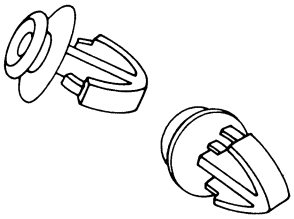
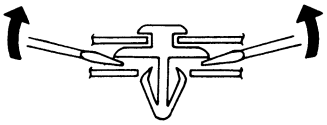
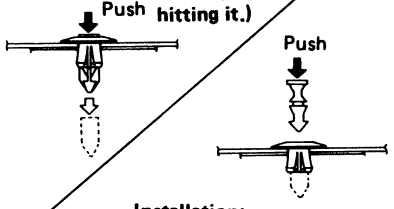
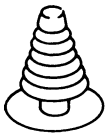
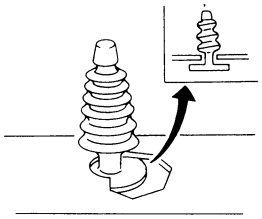
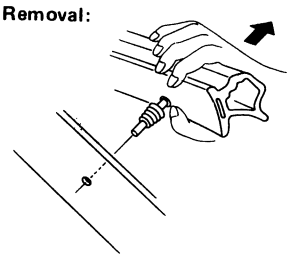
- When removing or installing various parts, place a cloth or padding onto the vehicle body to prevent scratches.
- Handle trim, molding, instruments, grille, etc. carefully during removing or installation. Be careful not to soil or damage them.
- Apply sealing compound where necessary when installing 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.

Clip and Fastener

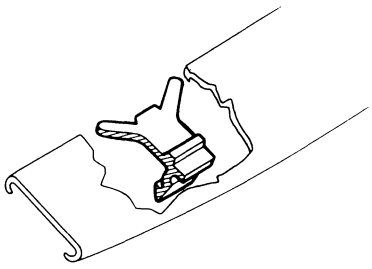
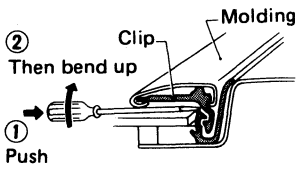
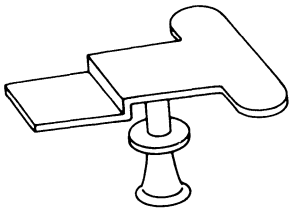
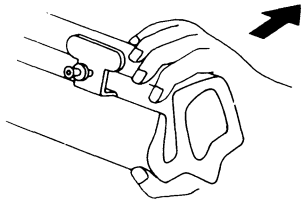
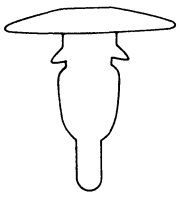
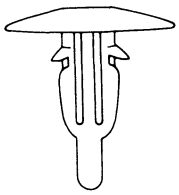
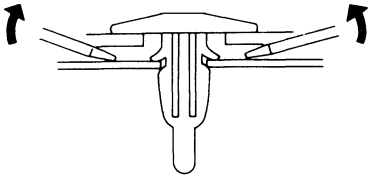
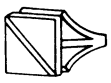
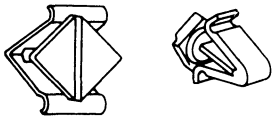
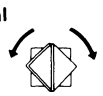
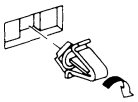
- Clips and fasteners in BF section correspond to the following numbers and symbols.
- Replace any clips and/or fasteners which are damaged during removal or installation.

No.	Symbol	Shape	Removal & Installation
C101	 SBF092B	 SBF109B	**Removal:** **Remove by bending up with a flat-bladed screwdriver.**  SBF094B
C102	 SBF113B	 SBF114B  SBF137B	 **Removal:** **Pull up by rotating.** SBF115B
C103	 SBF110B	 SBF111B	**Removal:** **Remove with flat-bladed screwdrivers or pliers.**  SBF112B

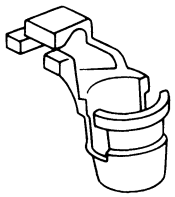
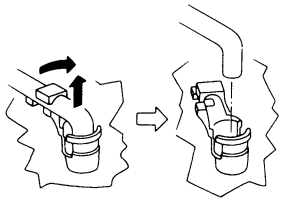
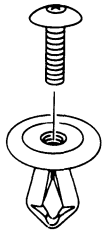
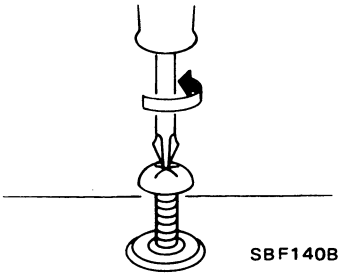
Clip and Fastener (Cont'd)

No.	Symbol	Shape	Removal & Installation
C105	 SBF141B	 SBF142B	Removal: Tilt clip as indicated by arrow, then draw out.  SBF143B
C107	 SBF365B	 SBF366B	Removal: Remove by bending up with flat-bladed screwdrivers.  SBF367B
C203	 SBF318C	 SBF319C	Push center pin to catching position. (Do not remove center pin by hitting it.) Push Push Installation:  SBF320C
CE103	 SBF103B	 SBF104B	Removal:  SBF147B

Clip and Fastener (Cont'd)

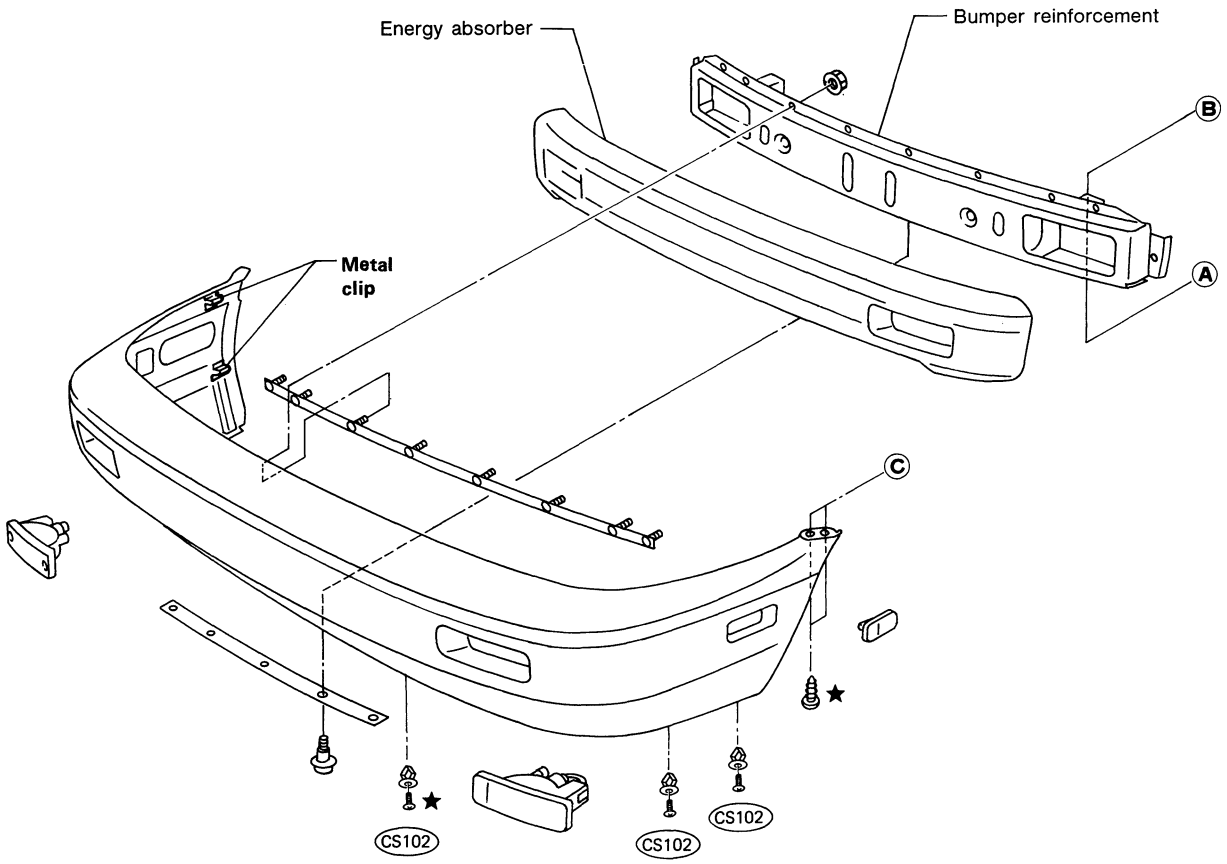
No.	Symbol	Shape	Removal & Installation
CE106	 SBF653B		**Removal:**  SBF654B
CE112	 SBF028C		**Removal:**  SBF029C
CE117	 SBF173D	 SBF174D	**Removal:** **Remove with flat-bladed screwdrivers or pliers.**  SBF175D
CG101	 SBF144B	 SBF145B	**Removal** **Installation**  **Rotate 45° to remove.**   **Removal** SBF085B

Clip and Fastener (Cont'd)

No.	Symbol	Shape	Removal & Installation
CR103		 SBF768B	**Removal:** **Holder portion of clip must be spread out to remove rod.**  SBF770B
CS102	 SBF138B	 SBF139B	**Removal:** **Screw out with a Phillips screwdriver.**  SBF140B

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.



★ : Bumper assembly mounting bolts, screws, clips and pins
: N•m (kg-m, ft-lb)

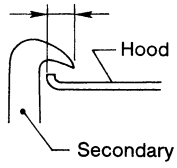
Body Front End (Cont'd)

Hood lock adjustment

- Adjust hood so that hood primary lock meshes at position 1 to 1.5 mm (0.039 to 0.059 in) lower than fender.
- After hood lock adjustment, adjust bumper rubber.
- When securing hood lock, ensure it does not tilt. Striker must be positioned at the center of hood primary lock.
- After adjustment, ensure that hood primary and secondary lock operate properly.

Hood lock secondary latch hooking length

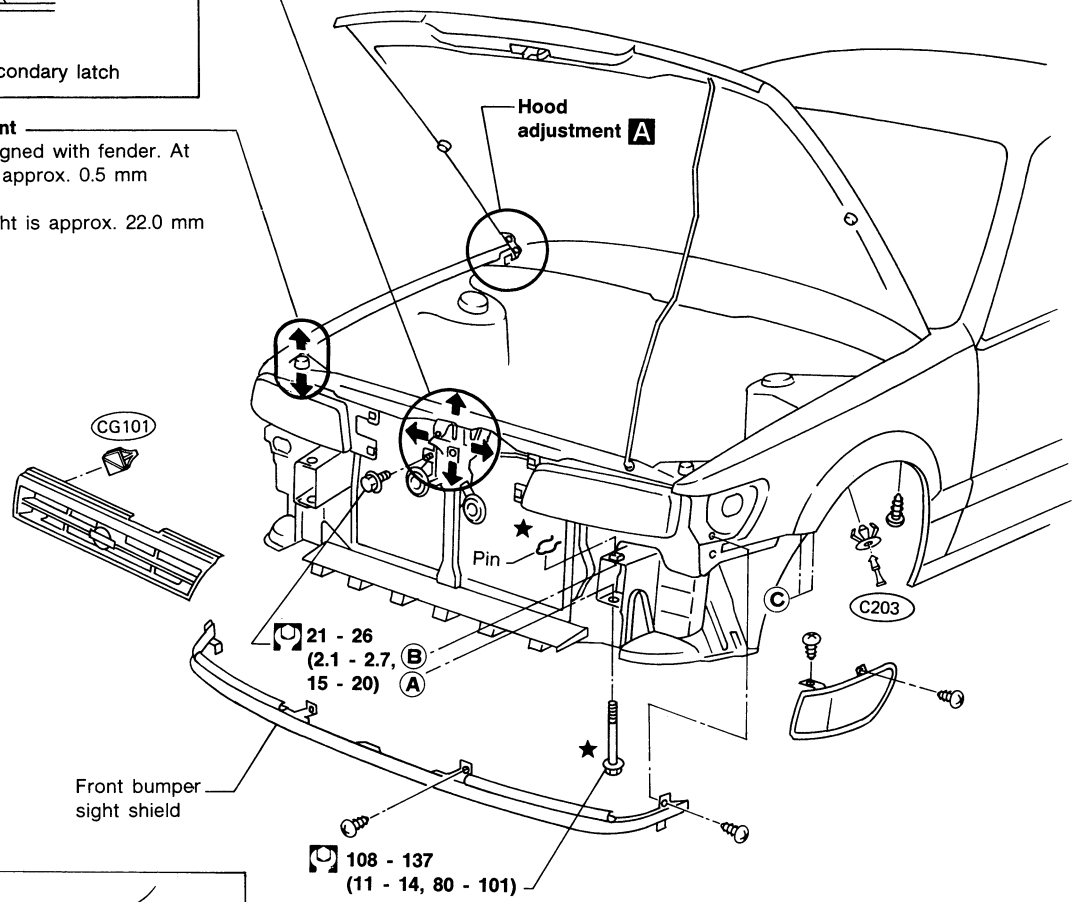
More than 5.0 mm (0.197 in)

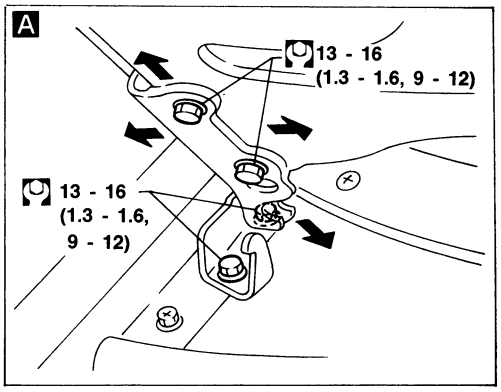


Bumper rubber adjustment

- Adjust that hood is aligned with fender. At that time deflection is approx. 0.5 mm (0.020 in).

[Bumper rubber free height is approx. 22.0 mm (0.866 in)]

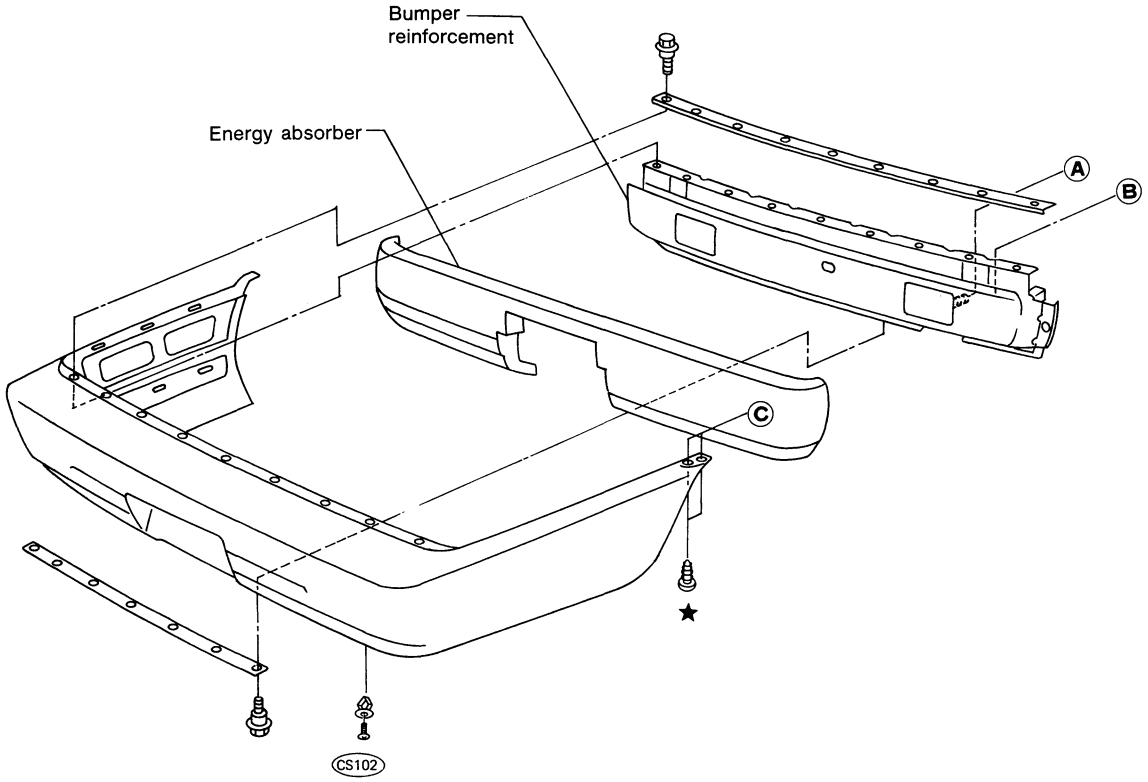


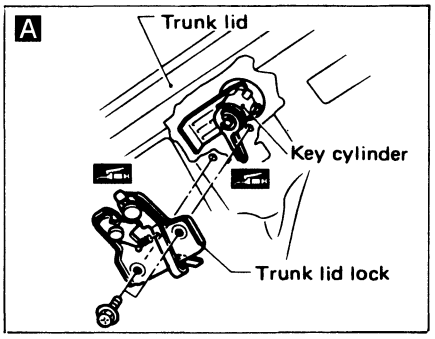


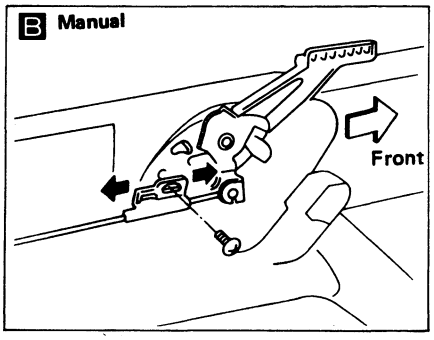
SBF084F

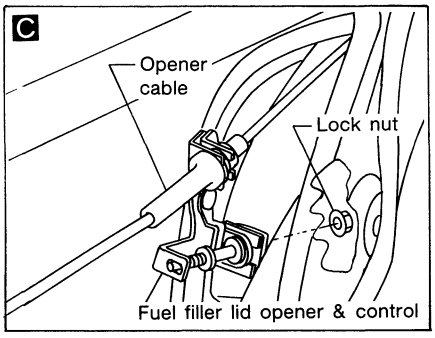
Body Rear End and Opener

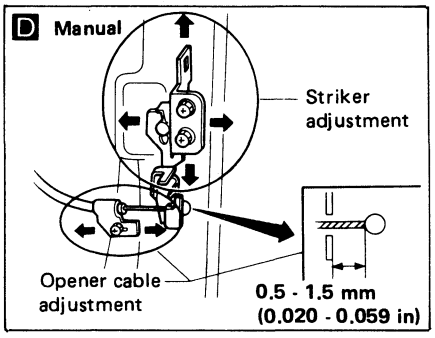
- Trunk lid adjustment: Adjust at hinge-trunk lid portion for proper trunk lid fit.
- Trunk lid lock system adjustment: Adjust striker so that it is in the center of the lock. After adjustment, check trunk lid lock operation.
- Opener cable: Do not attempt to bend cable using excessive force.
- After installation, make sure that trunk lid and fuel filler lid open smoothly.

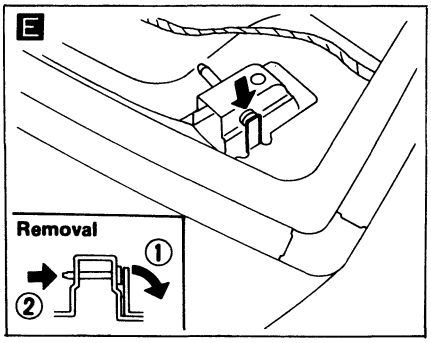




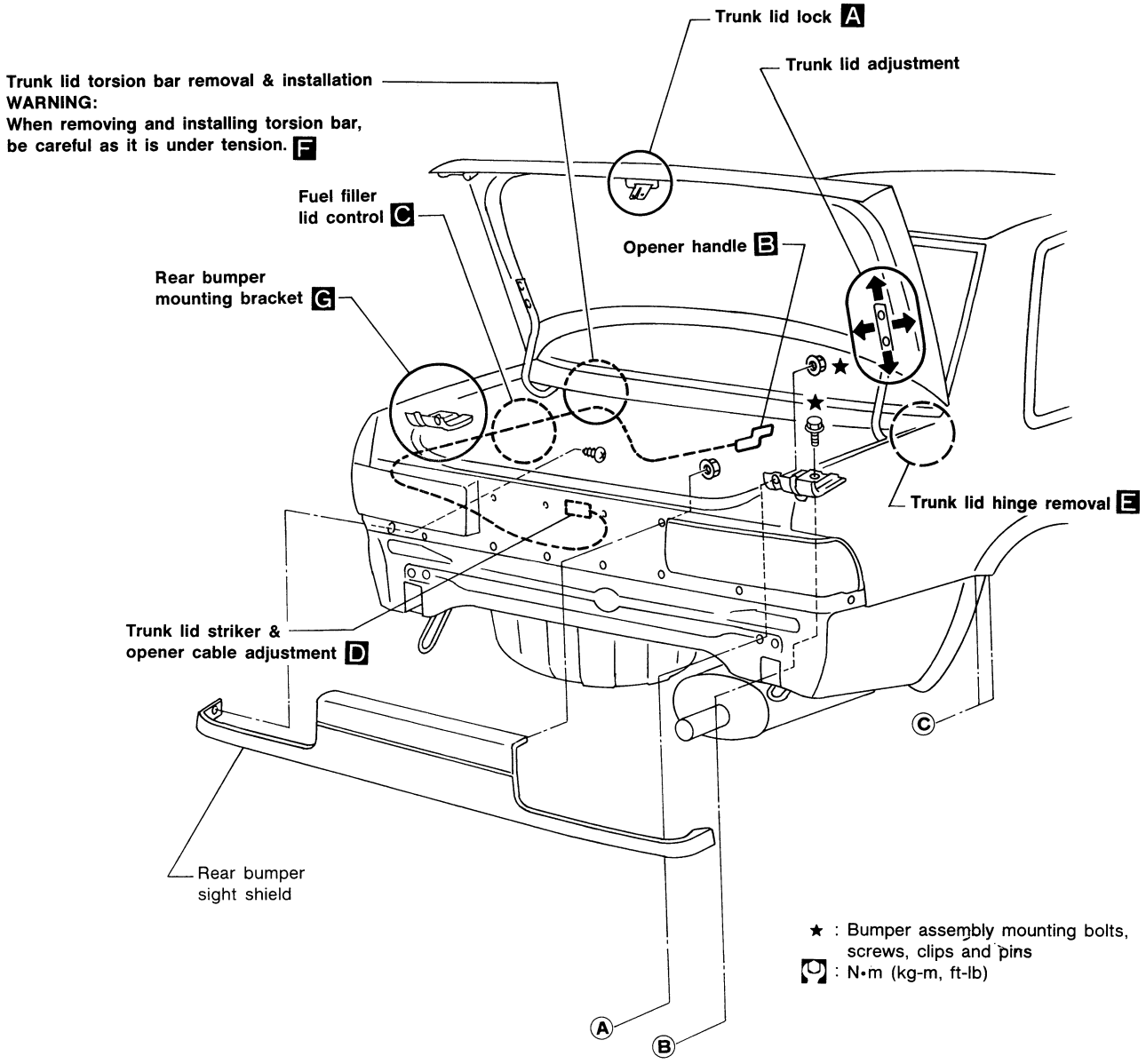


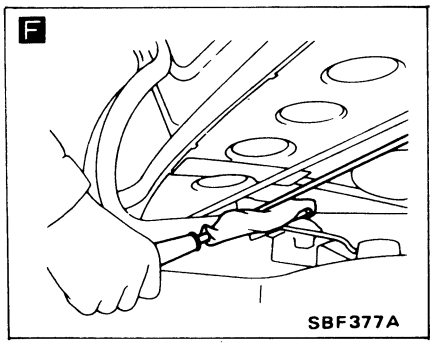


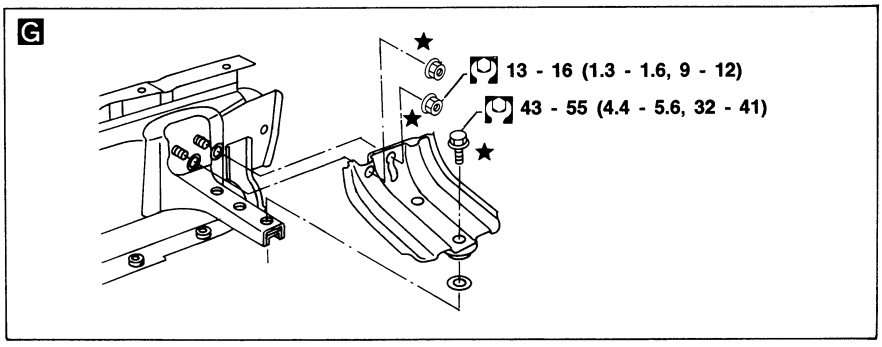




Body Rear End and Opener (Cont'd)

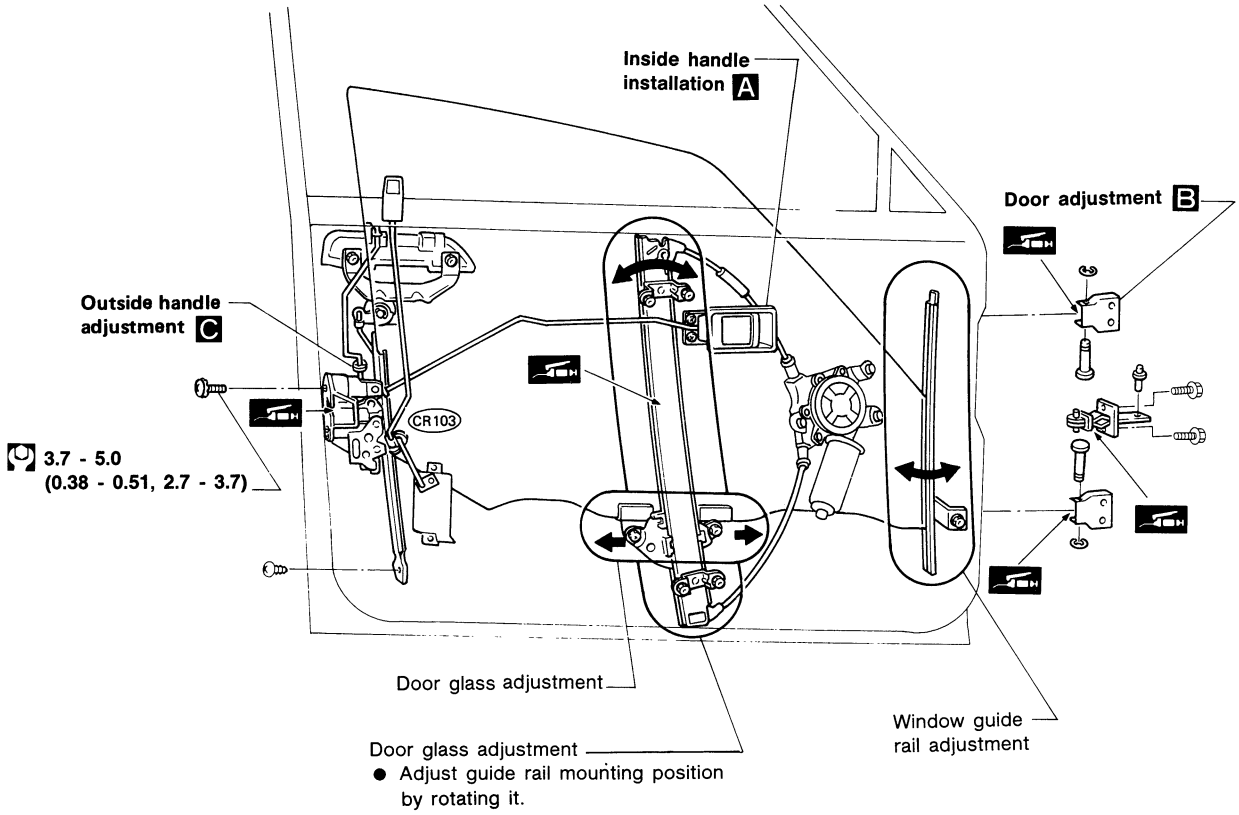


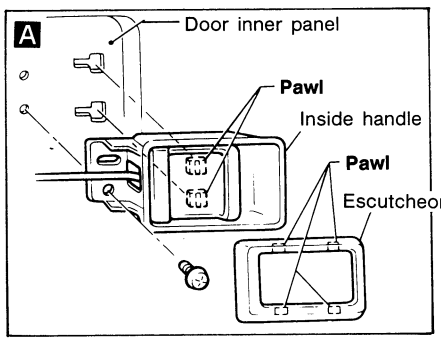


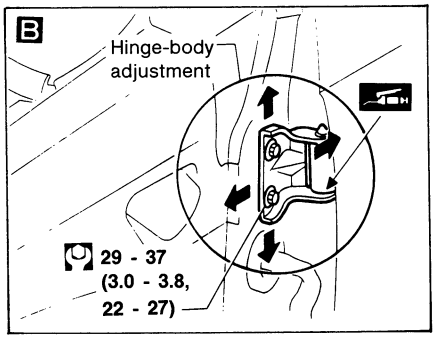


SBF085F

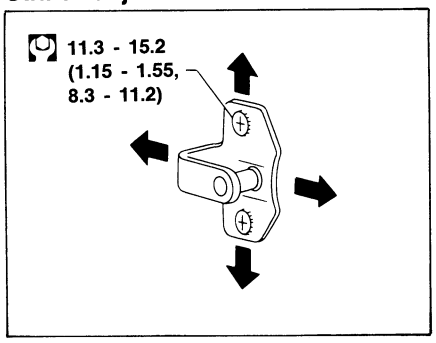
Front Door

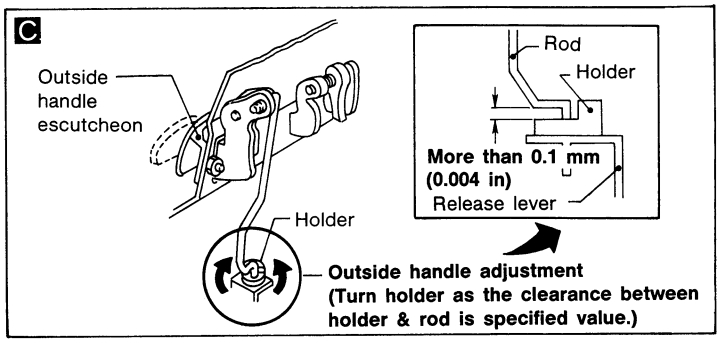






Striker adjustment

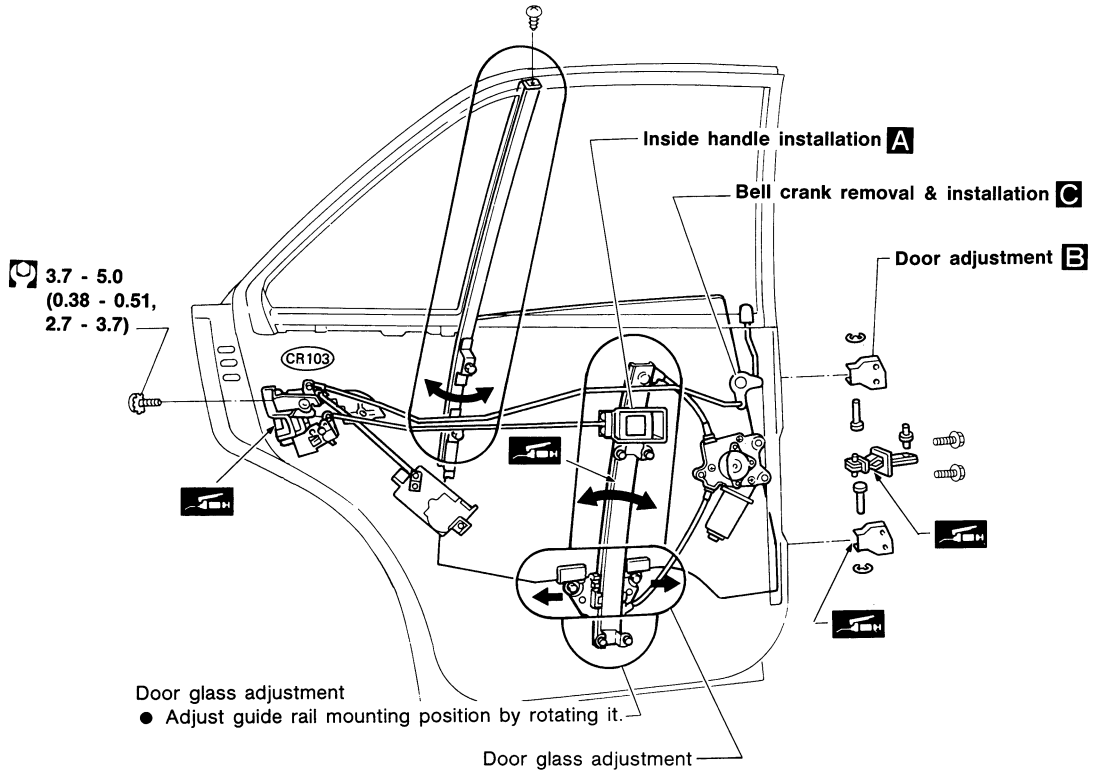


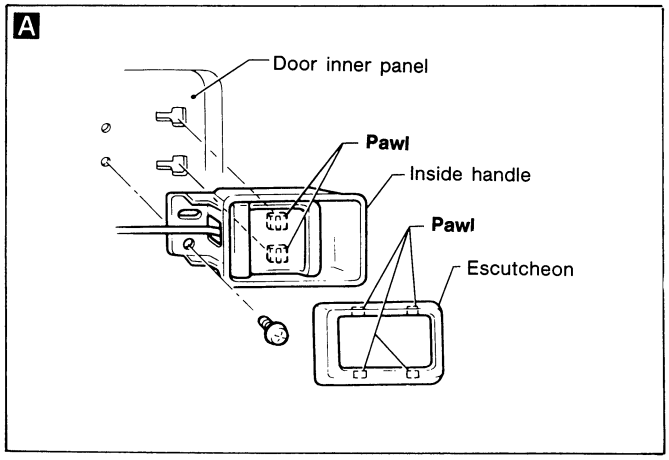


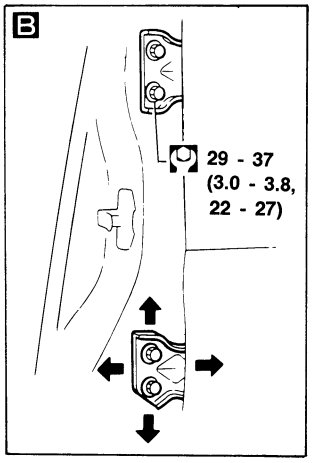
: N•m (kg-m, ft-lb)

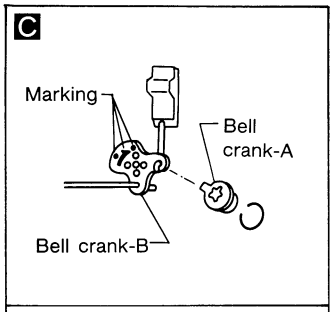
SBF086F

Rear Door

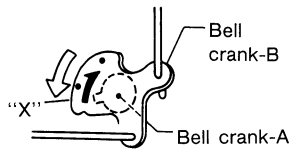






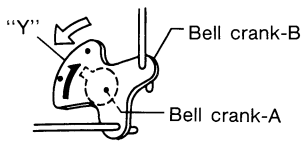


Removal:



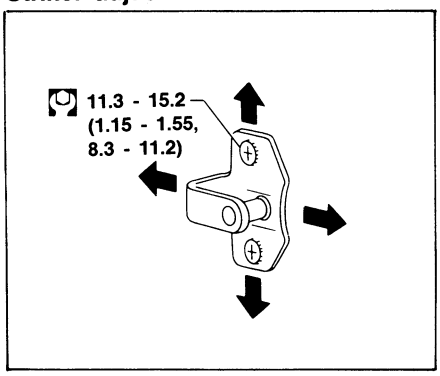
Turn bell crank-A counter-clockwise (as white arrow) to the position "X".

Installation:



Turn bell crank-A counter-clockwise to the position "Y".

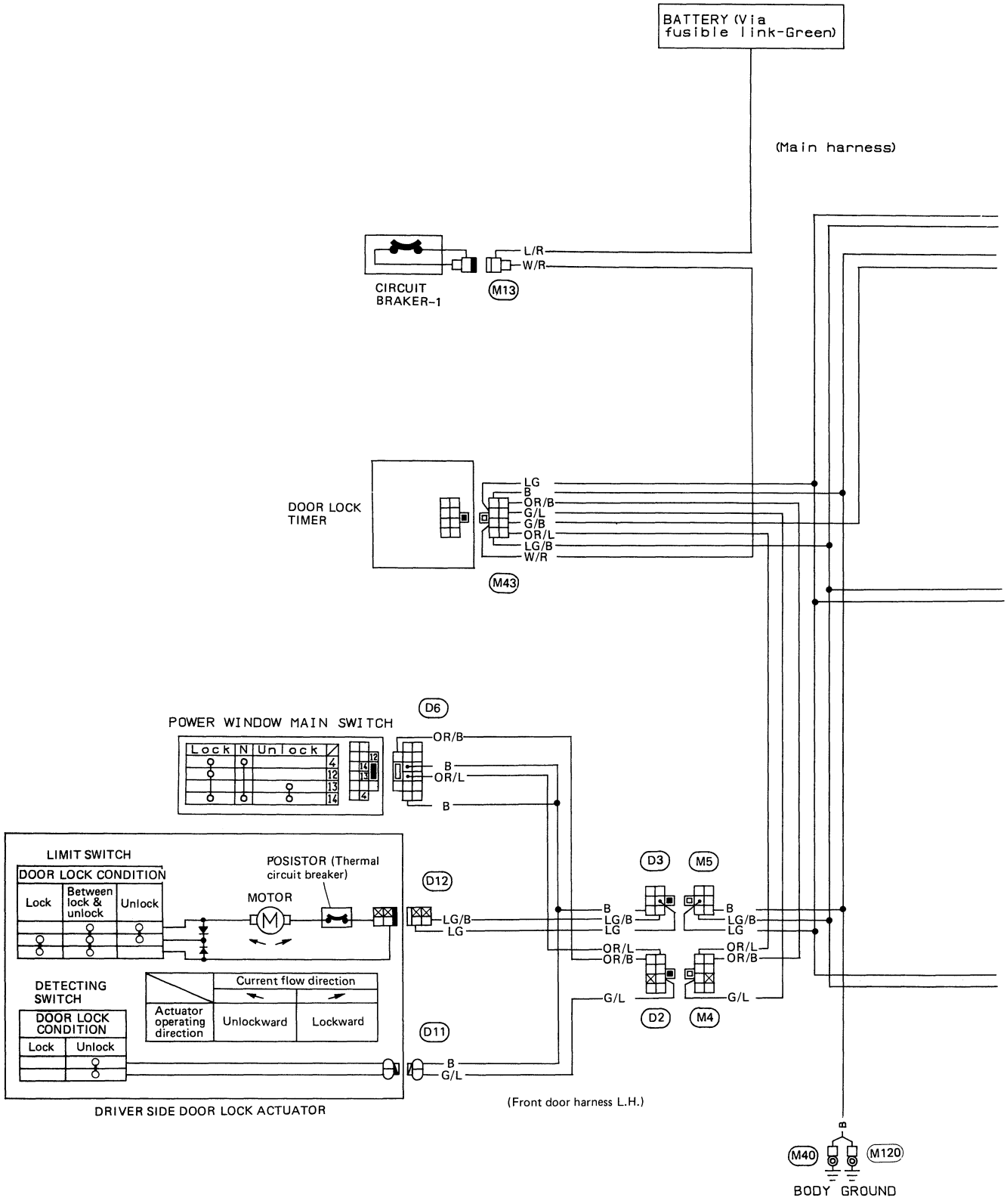
Striker adjustment



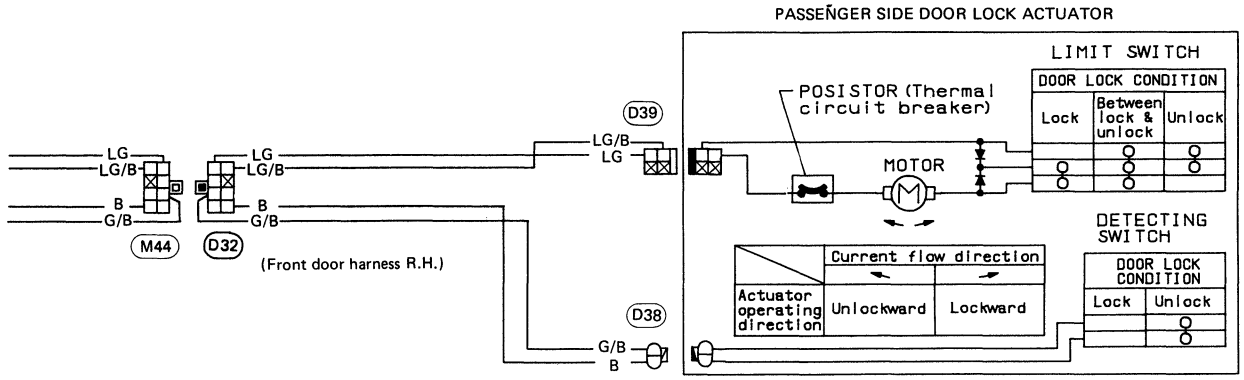
SBF087F

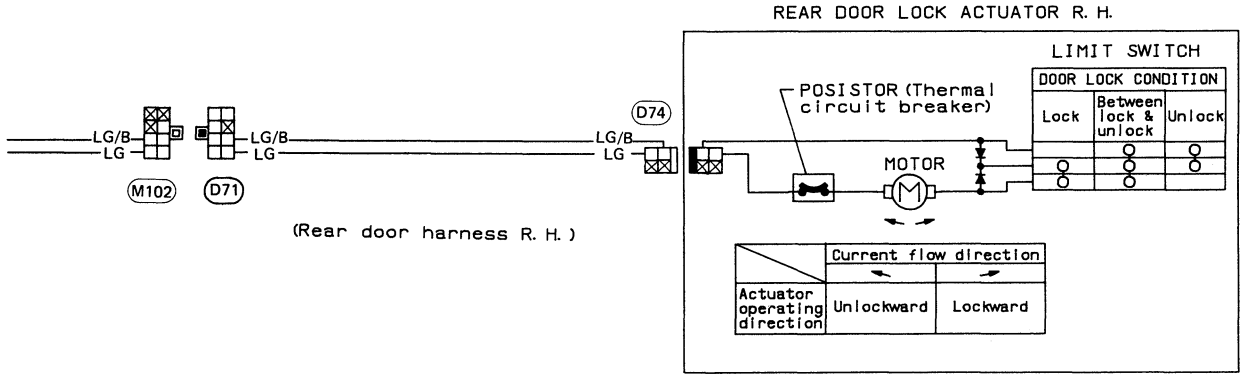
Power Door Lock

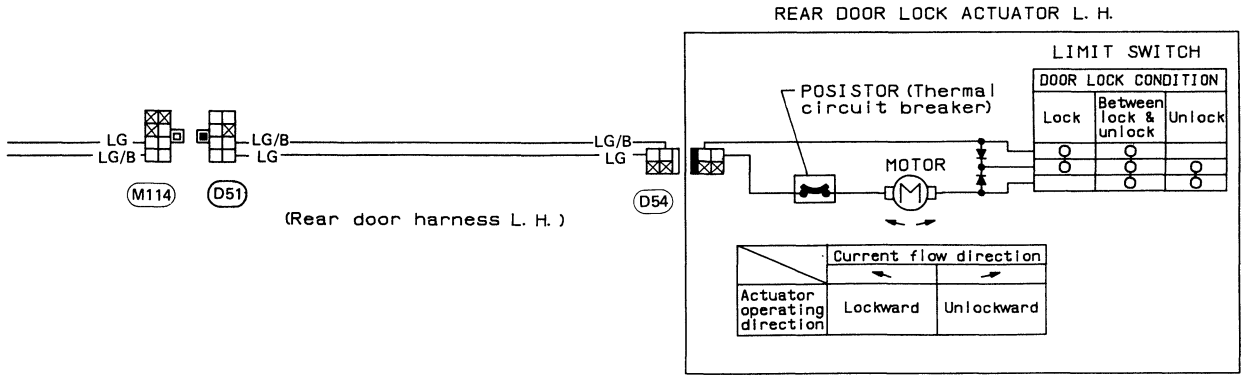
WIRING DIAGRAM



Power Door Lock (Cont'd)







SBF145F

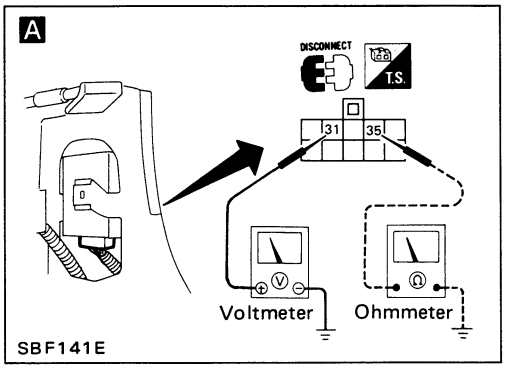
Power Door Lock Trouble-shooting

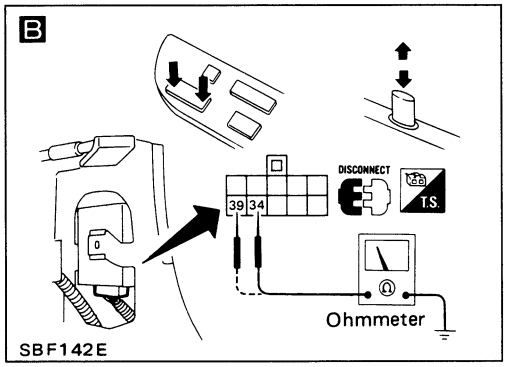
PRIORITY	SYMPTOM	"HOW TO REPAIR"
1	All doors do not operate.	Go to TROUBLE-SHOOTING PROCEDURE 1.
2	Either one or two doors do not operate.	Go to TROUBLE-SHOOTING PROCEDURE 2.
3	Vehicle speed sensor system does not operate.	Go to TROUBLE-SHOOTING PROCEDURE 3.

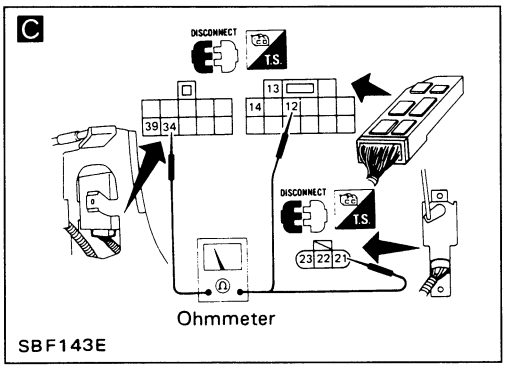
This trouble-shooting must be applied according to priority. Driver's door lock does not operate by this system.

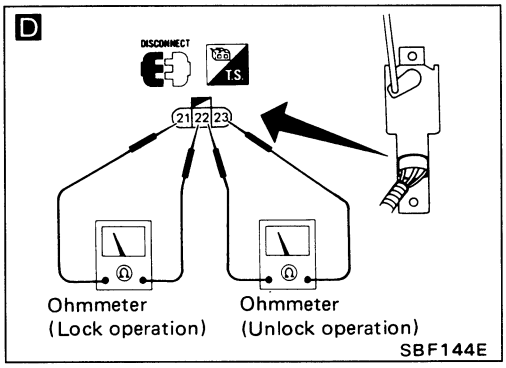
Power Door Lock Trouble-shooting (Cont'd)

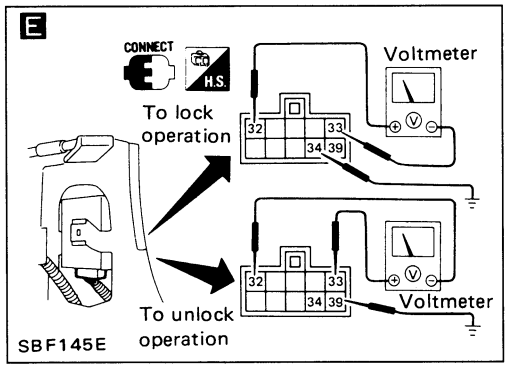
TROUBLE-SHOOTING PROCEDURE 1











A

Disconnect door lock timer connector.

↓

A

Check voltage between terminal ㉛ and body ground.
㉛ - **Body ground: 12V**

N.G. → Repair harness between terminal ㉛ and battery.

↓ O.K.

B

Check continuity between terminal ㉟ and body ground.
㉟ - **Body ground: 0Ω**

N.G. → Repair harness between terminal ㉟ and body ground (5M and 59M).

↓ O.K.

Check continuity between terminal ㉞ and body ground (Lock), and ㊴ and body ground (Unlock).
For power window main switch, continuity should exist when pushing switch to lock/unlock.
For auto door lock switch, continuity should exist once when pushing (to lock)/pulling (to unlock) lock knob.

N.G. → Disconnect power window main and/or auto door lock switch.

↓

C

Check continuity between terminals ⑫, ⑬, ⑭, ㉑, ㉒ or ㉓ and ㉞, ㊴ or body ground.

O.K. ↓ / N.G. → Repair harness.

↓ O.K.

Connect door lock timer connector.

↓

D

Check auto door lock switch.
Continuity exists once when operating to unlock or to lock.
In other cases, continuity should not exist.

O.K. ↓ Replace power window main switch.
N.G. → Replace auto door lock switch.

E

Check door lock timer.
Battery voltage should exist once for 1 second only when grounding.
⊕ and ⊖ terminals are reversed for lock and unlock operations.

N.G. → Replace door lock timer.

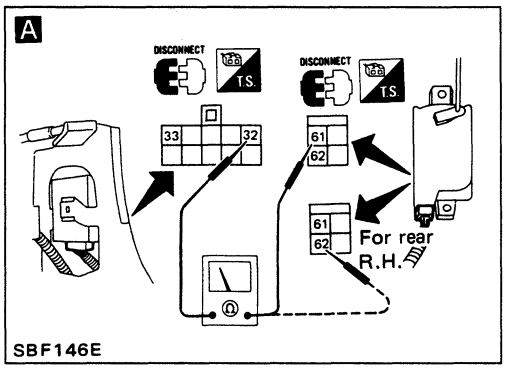
↓ O.K.

Disconnect actuator connectors and timer connector.

→ Go to Ⓐ of TROUBLE-SHOOTING PROCEDURE 2.

Power Door Lock Trouble-shooting (Cont'd)

TROUBLE-SHOOTING PROCEDURE 2



Disconnect door lock timer and actuator connectors.

A

Check continuity between terminals 32 and 61 (*62), and 33 and 62 (*61).

***: For rear R.H. actuator only.**

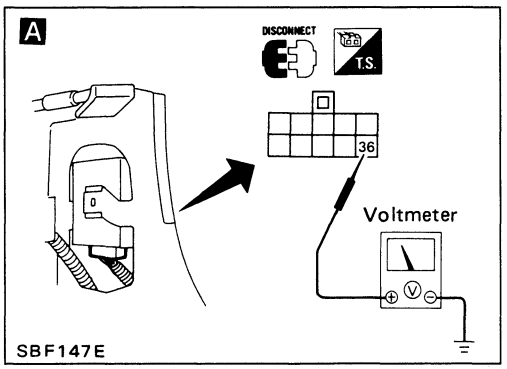
N.G. → Repair harness.

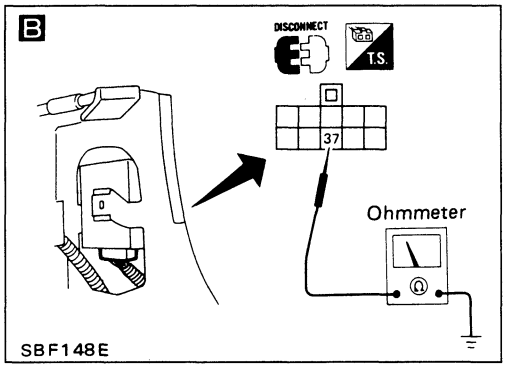
O.K.

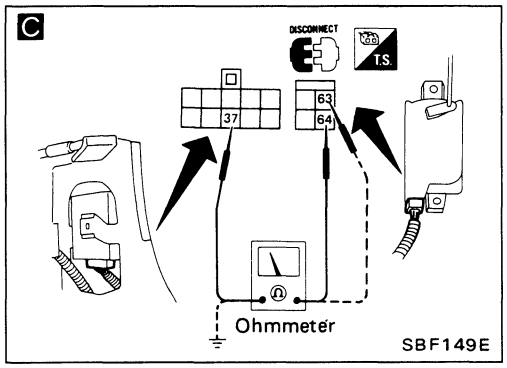
Replace door lock actuator.

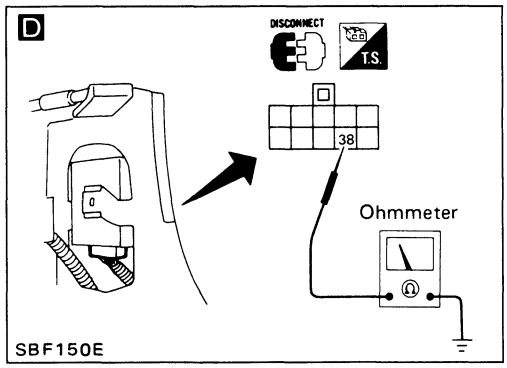
Power Door Lock Trouble-shooting (Cont'd)

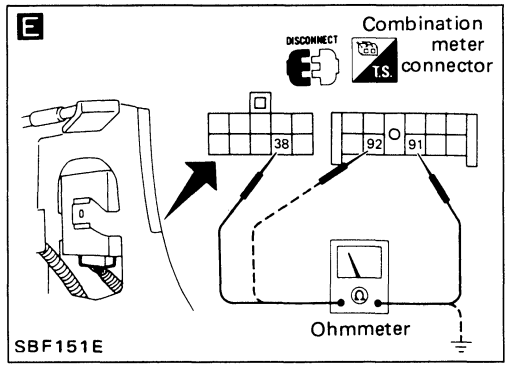
TROUBLE-SHOOTING PROCEDURE 3











Disconnect door lock timer connector.

A

Check voltage between terminal ㊱ and body ground with ignition switch ON.
㊱ - **Body ground: 12V**

N.G. → Check fuse.
- O.K. → Repair harness between terminal ㊱ and battery.
- Blown → Replace fuse.

O.K. ↓

B

Check continuity between terminal ㊲ and body ground.

Condition	Continuity
All doors except driver's are locked.	Does not exist.
For all doors except driver's, when even one of them is unlocked.	Exists.

N.G. → Disconnect door lock actuator connector.

C

Check continuity between terminals ㊲ and ㊹, and ㊸ and body ground.
- O.K. → Replace actuator.
- N.G. → Repair harness.

O.K. ↓

D

Check continuity variation between terminal ㊳ and body ground while running vehicle over 1 m (3 ft) at very low speed.
Continuity should come and go.

O.K. → Replace door lock timer.

N.G. ↓

Disconnect meter connector.

E

Check continuity between terminals ㊳ and ㊶, and ㊷ and body ground.

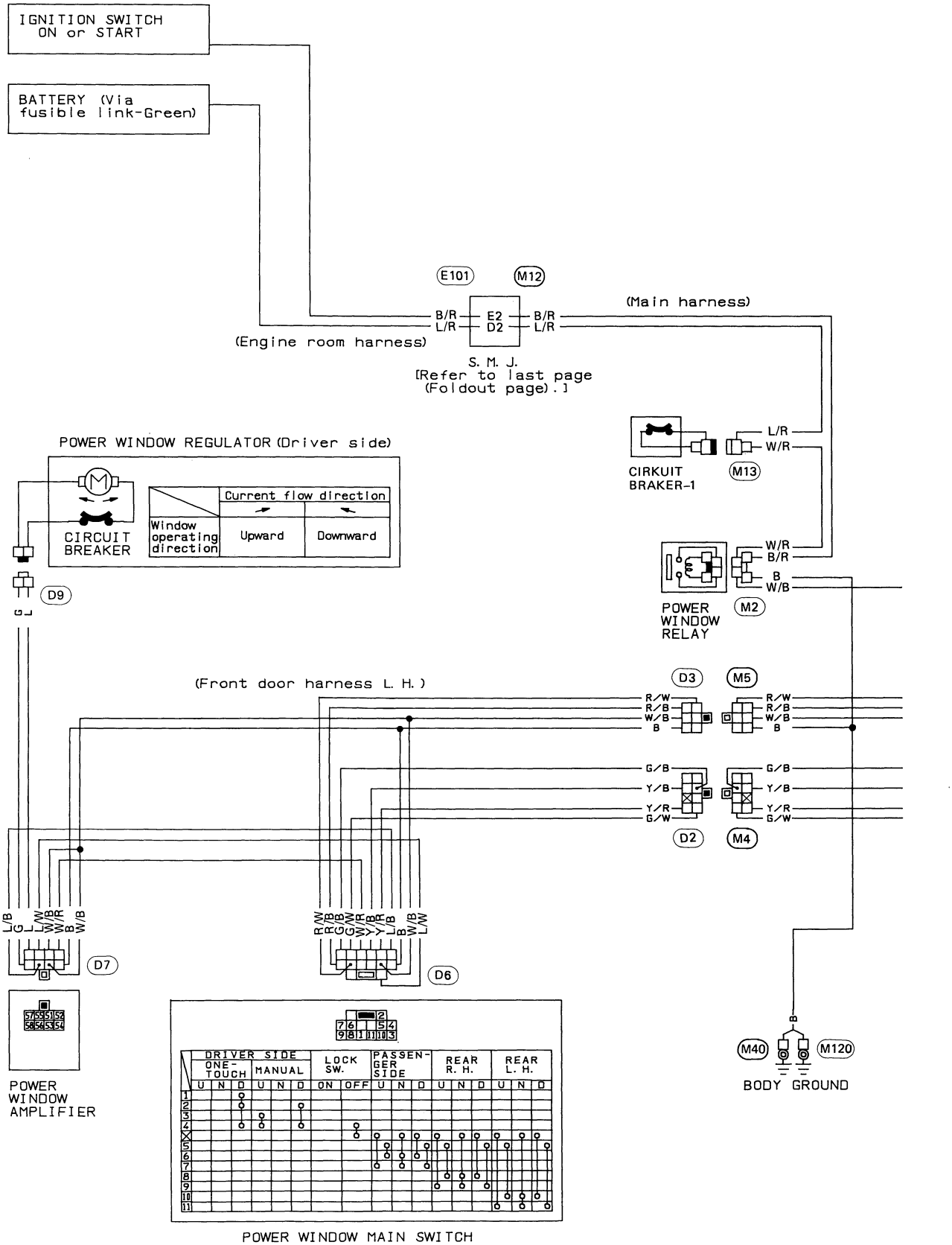
N.G. → Repair harness.

O.K. ↓

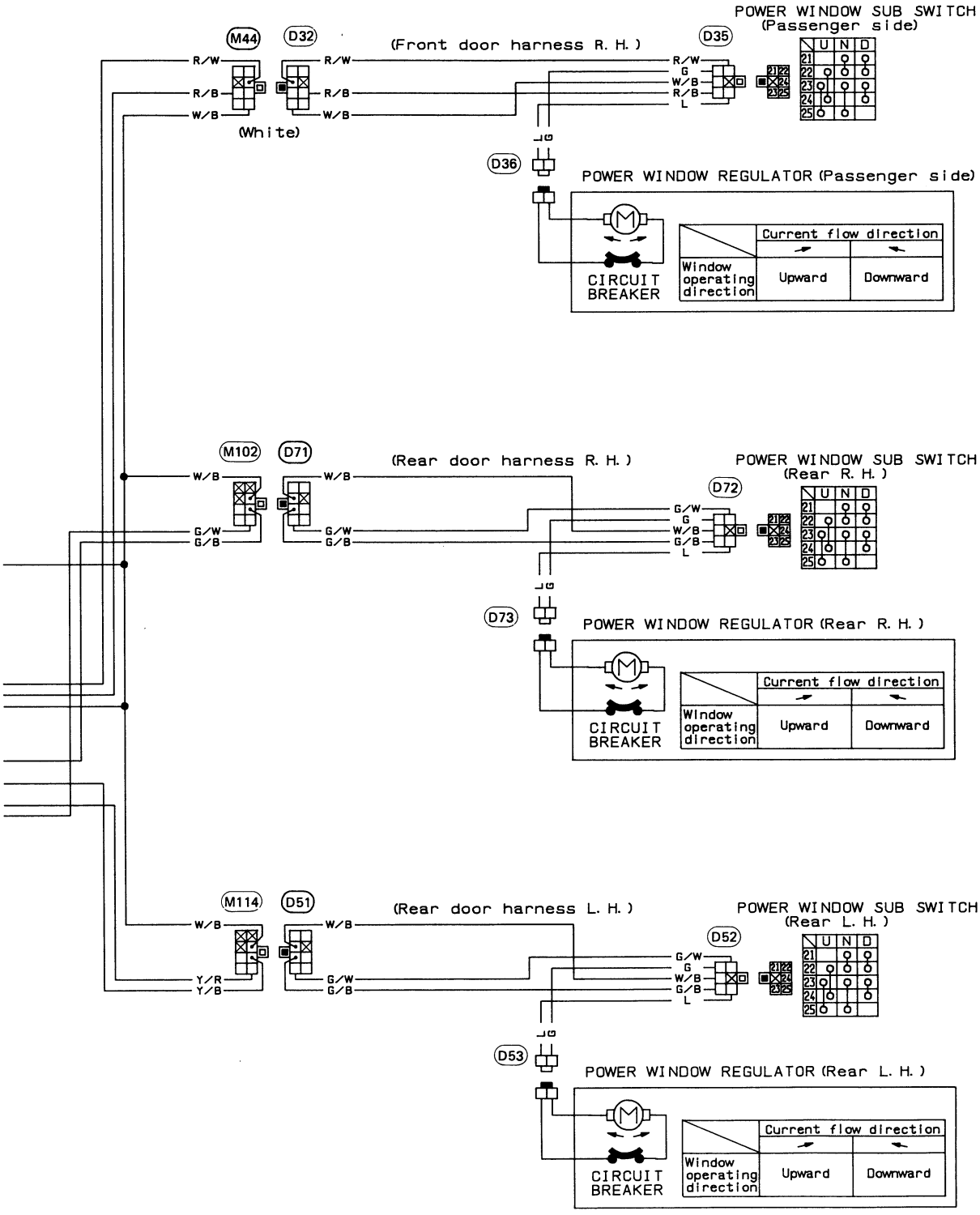
Replace speedometer.

Power Window

WIRING DIAGRAM



Power Window (Cont'd)

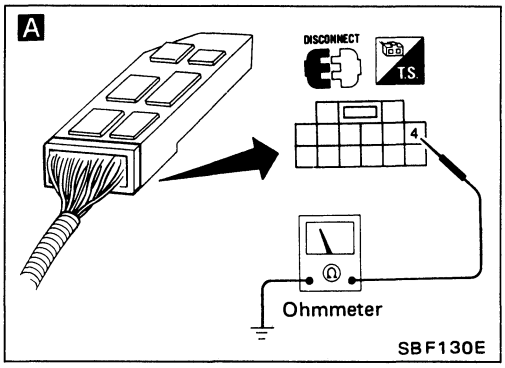


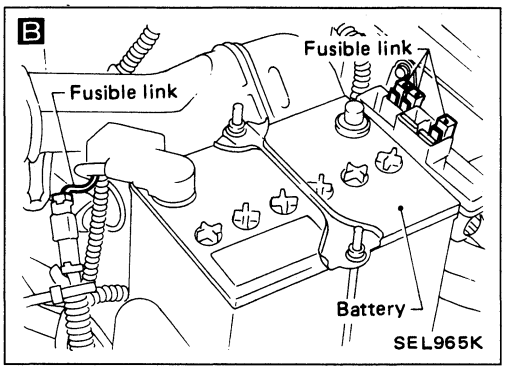
SBF144F

Power Window Trouble-shooting

SYMPTOM	"HOW TO REPAIR"
All windows do not operate.	Go to TROUBLE-SHOOTING PROCEDURE 1.
Driver's window does not operate.	Go to TROUBLE-SHOOTING PROCEDURE 2.
Windows except driver's do not operate by sub* switches.	Go to TROUBLE-SHOOTING PROCEDURE 3.
Windows except driver's do not operate by main** and sub* switches.	Go to TROUBLE-SHOOTING PROCEDURE 4.

*: Sub switches mean switches except driver's switch.
**: Main switch means driver's switch.





TROUBLE-SHOOTING PROCEDURE 1

Disconnect main switch harness connector.

A

Check harness continuity between terminal ④ and body ground.
④ - **Body ground: 0Ω**

N.G. → Repair harness between terminal ④ and body ground (5M and 59M).

O.K.

B

Check fusible link — Green.

Melted → ● Check harness and eliminate cause of problem due to critical short circuit.
● Replace fusible link.

Not melted

Check power window relay.
Refer to STANDARDIZED RELAY in EL section.

N.G. → Replace power window relay.

O.K.

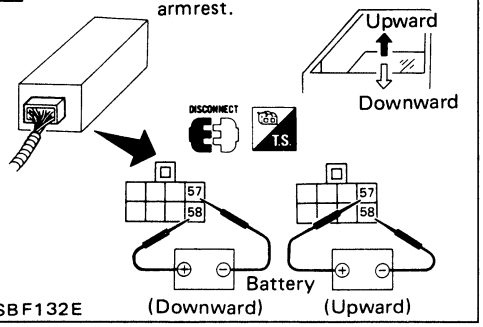
Repair harness between terminal ⑤ and battery.

END

Power Window Trouble-shooting (Cont'd)

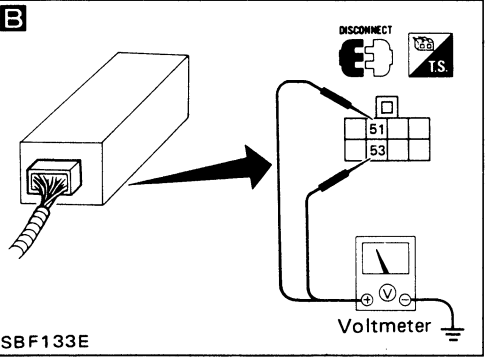
TROUBLE-SHOOTING PROCEDURE 2

A Power window amp. is located in driver's armrest.



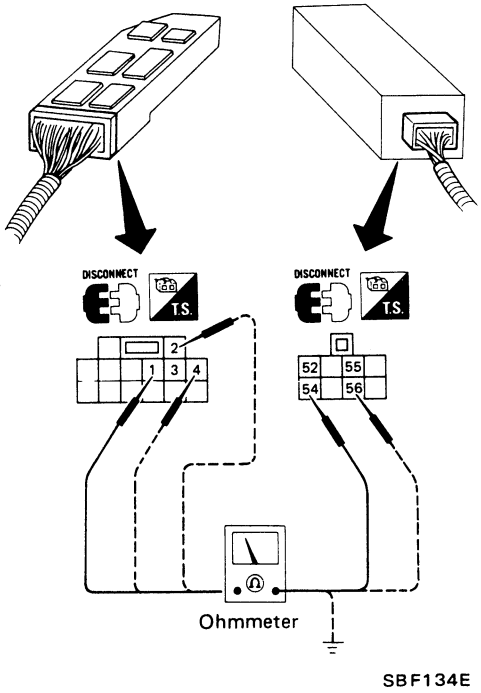
SBF132E

B



SBF133E

C



SBF134E

Disconnect power window amp. connector.

A

Check power window motor applying battery voltage to the terminals.

Terminal ⊕	Terminal ⊖	Operation
57	58	Upward
58	57	Downward

N.G. → Check harness for continuity.
- O.K. → Replace motor.
- N.G. → Repair harness between terminal 57 or 58 and motor.

O.K.

B

Check voltage between terminal 51 or 53 and body ground with ignition switch ON.
- 51 - **Body ground: 12V**
- 53 - **Body ground: 12V**

N.G. → Check fuse.
- O.K. → Repair harness between terminal 51 or 53 and battery.
- Blown → Replace fuse.

O.K.

Disconnect main switch connector.

C

Check continuity between terminals.

Terminal	Resistance
1 and 54	0Ω
2 and 56	0Ω
3 and 55	0Ω
4 and body ground	0Ω
52 and body ground	0Ω

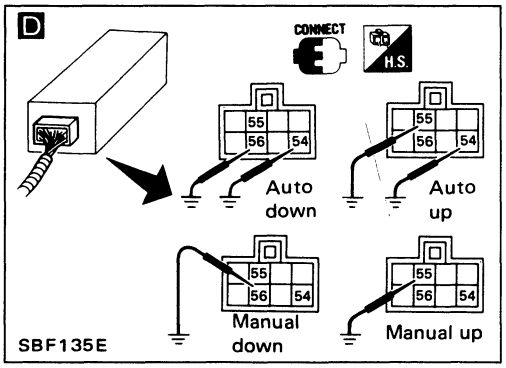
N.G. → Repair harness between terminals 1, 2, 3, 4 or 52 and 54, 56, 55 or body ground (5M and 59M).

O.K.

Connect power window amp. connector.

Ⓐ

Power Window Trouble-shooting (Cont'd)



Ⓐ

D

Check power window amp.

N.G. → Replace power window amp.

Auto. operation

Jumper cable connection		Operation
From	To	
⑭ and ⑯	Ground	Downward
⑭ and ⑮	Ground	Upward

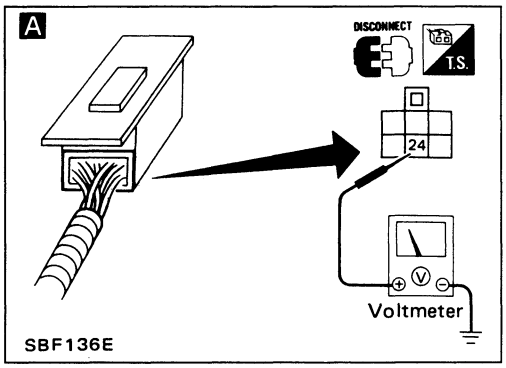
Manual operation

Jumper cable connection		Operation
From	To	
⑯	Ground	Downward
⑮	Ground	Upward

O.K.

Replace power window main switch.

END



TROUBLE-SHOOTING PROCEDURE 3

Disconnect inoperative window sub switch connector.

A

Check voltage terminal ㉔ and body ground with ignition switch ON.

㉔ - **Body ground: 12V**

N.G. → Repair harness between terminal ㉔ and battery.

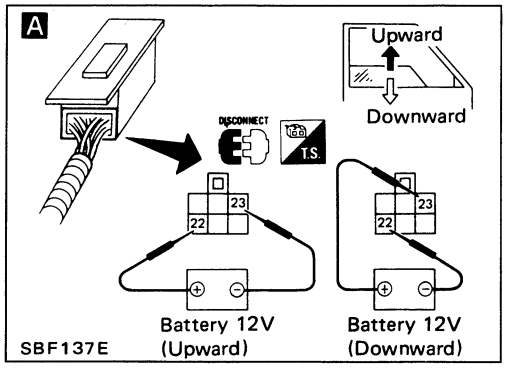
O.K.

Replace switch.

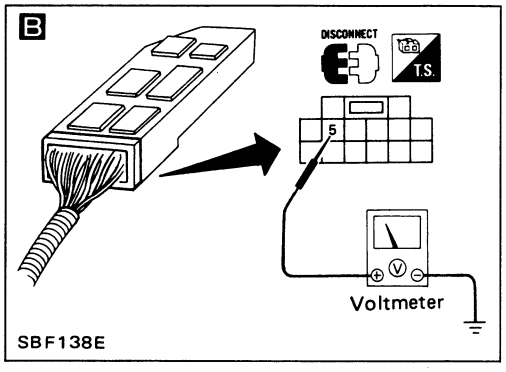
END

Power Window Trouble-shooting (Cont'd)

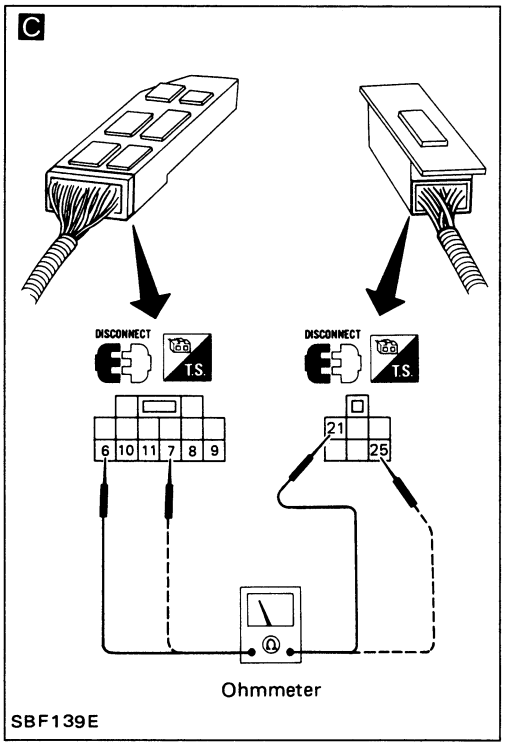
TROUBLE-SHOOTING PROCEDURE 4



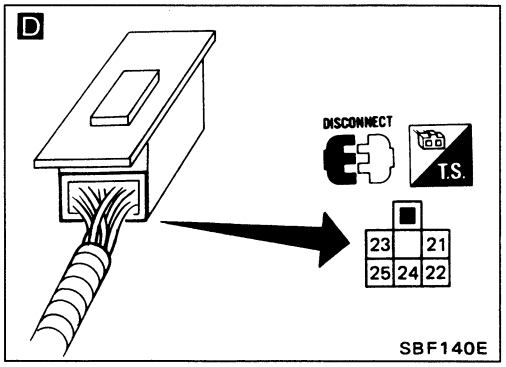
SBF137E



SBF138E



SBF139E



SBF140E

Disconnect inoperative window sub switch connector.

A

Check power window motor applying battery voltage to the connector.

Terminal		Operation
⊕	⊖	
㉒	㉓	Upward
㉓	㉒	Downward

N.G. → Check herness for continuity.
- O.K. → Replace motor.
- N.G. → Repair harness between terminal ㉒ or ㉓ and motor.

O.K.

Disconnect main switch connector.

B

Check voltage between terminal ⑤ and body ground with ignition switch ON.
⑤ - **Body ground: 12V**

N.G. → Repair harness between terminal ⑤ and battery.

O.K.

C

Check herness between main and sub switches for continuity.

Window	Terminal	Resistance
Passenger	⑥ and ㉑	0Ω
	⑦ and ㉕	0Ω
Rear R.H.	⑧ and ㉑	0Ω
	⑨ and ㉕	0Ω
Rear L.H.	⑩ and ㉑	0Ω
	⑪ and ㉕	0Ω

N.G. → Repair harness between terminals ⑥, ⑦, ⑧, ⑨, ⑩ or ⑪ and ㉑ or ㉕.

O.K.

D

Check sub switch for continuity.

Terminal	Continuity		
	U	N	D
㉑		○	○
㉒	○	○	○
㉓	○	○	○
㉔	○		○
㉕	○	○	

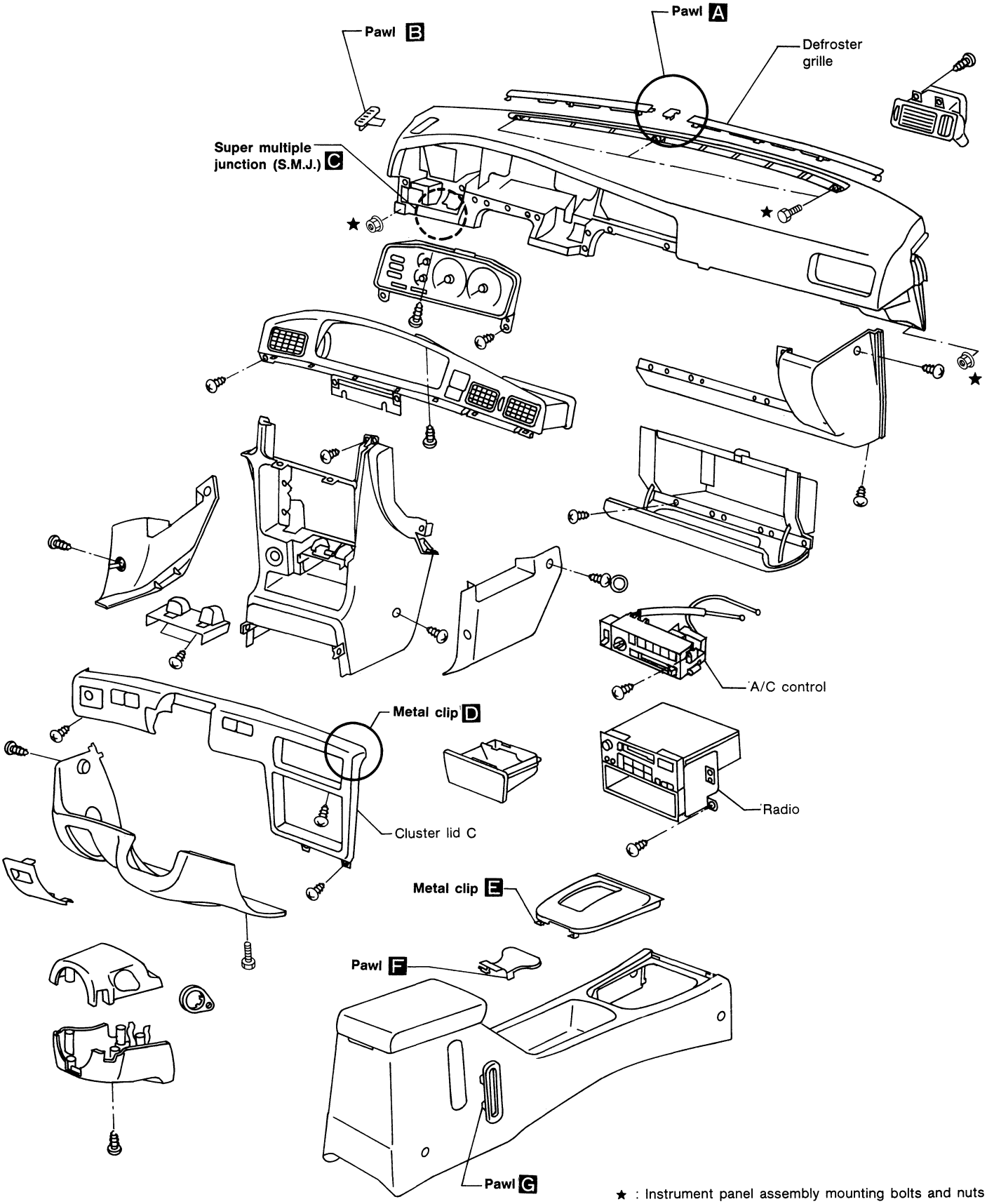
N.G. → Replace sub switch.

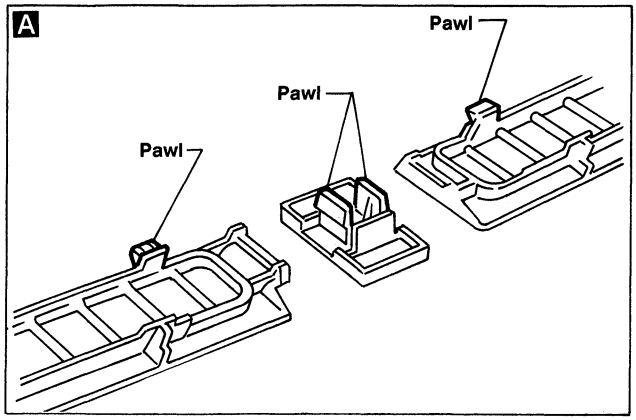
O.K.

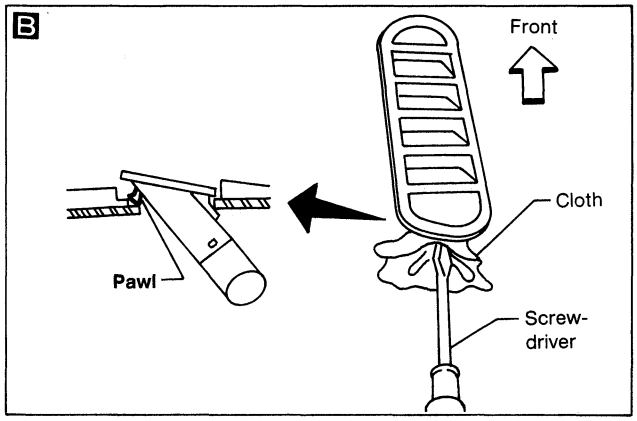
Replace main switch.

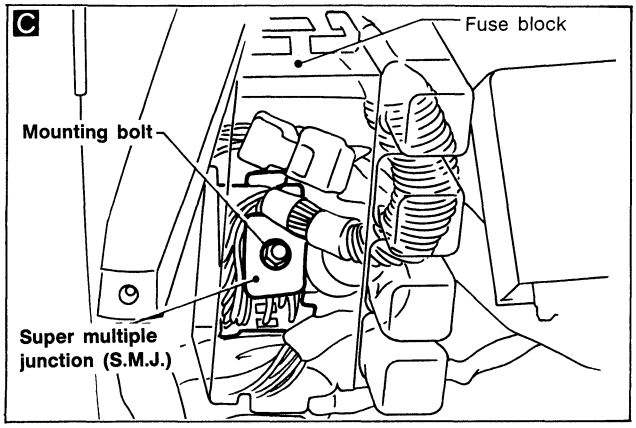
END

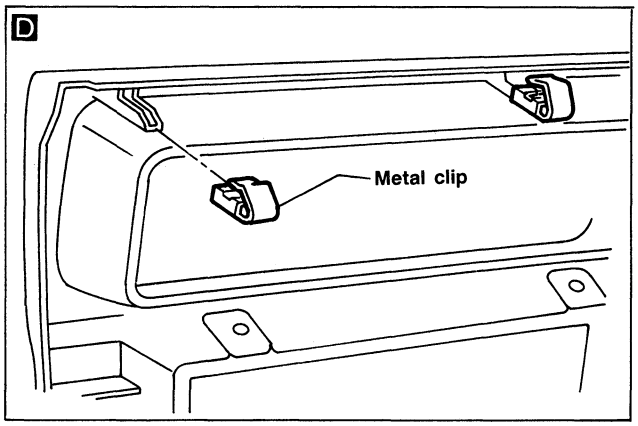
- When removing instrument panel assembly, remove defroster grille, combination meter, A/C or heater control, cluster lid C and S.M.J. first.




A
Pawl
Pawl
Pawl


B
Front
Cloth
Pawl
Screw-
driver


C
Fuse block
Mounting bolt
Super multiple
junction (S.M.J.)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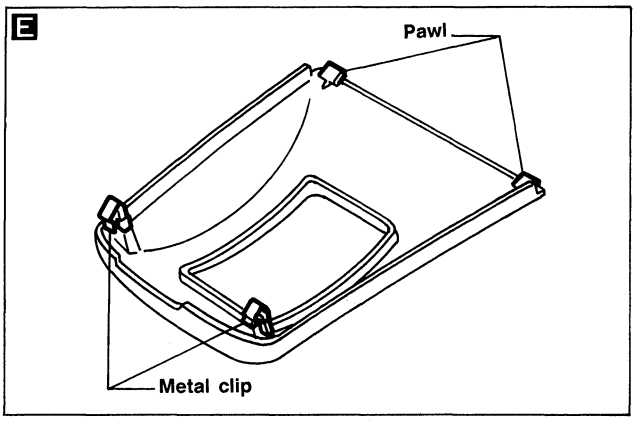
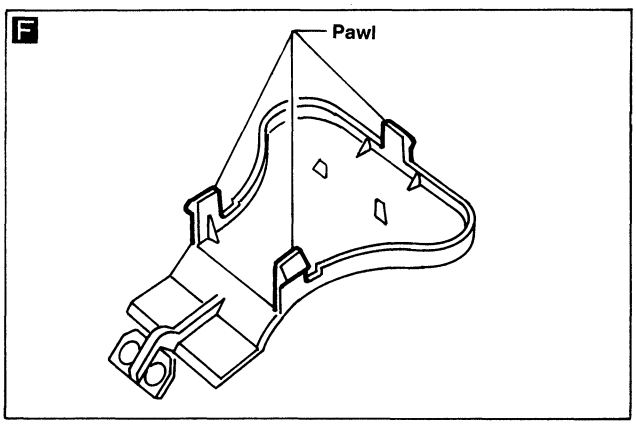
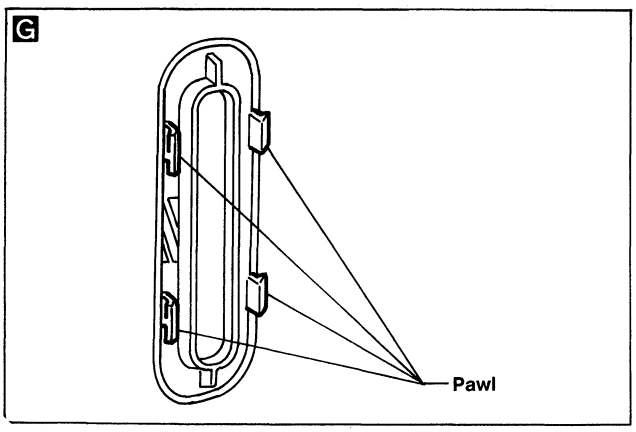
Metal clip


E
Pawl
Metal clip

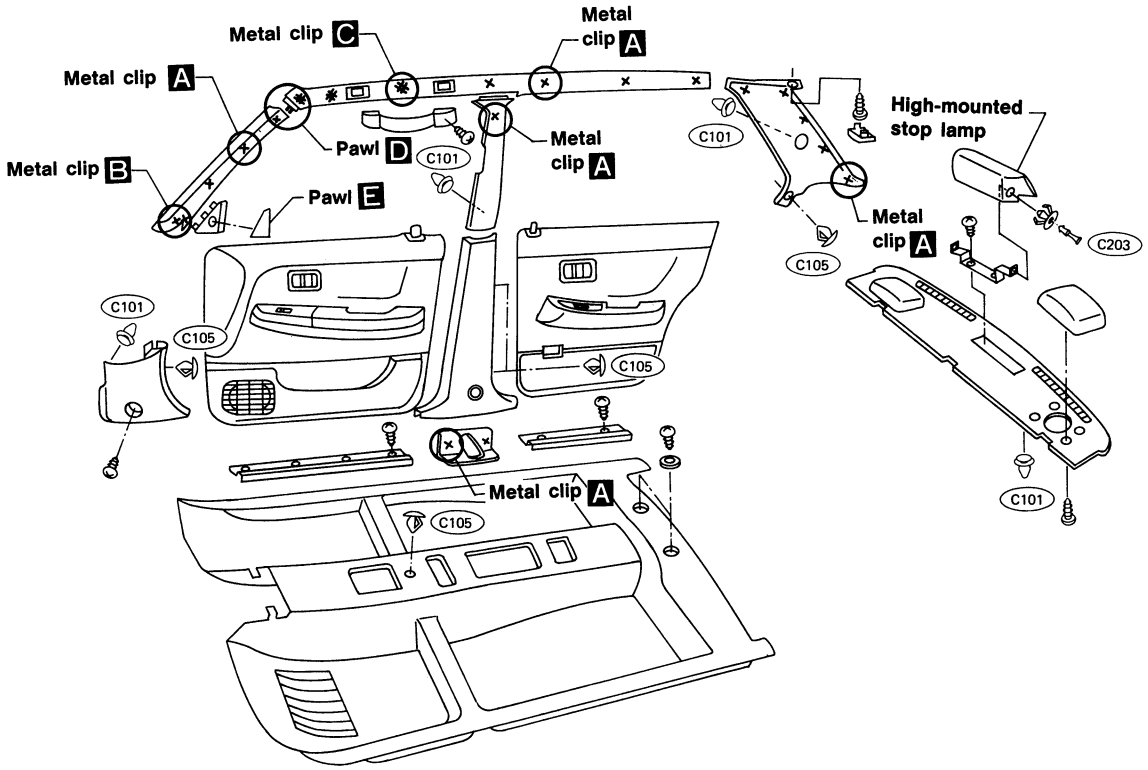

F
Pawl

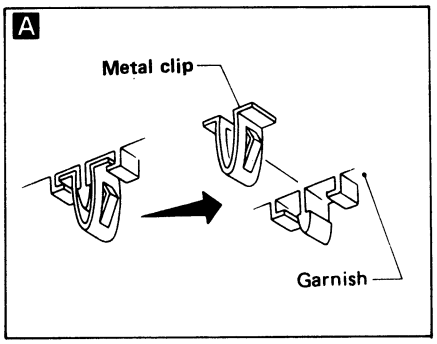

G
Pawl

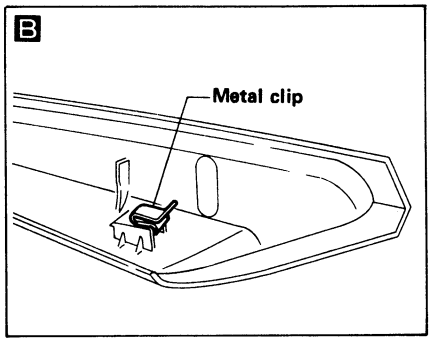
SBF088F

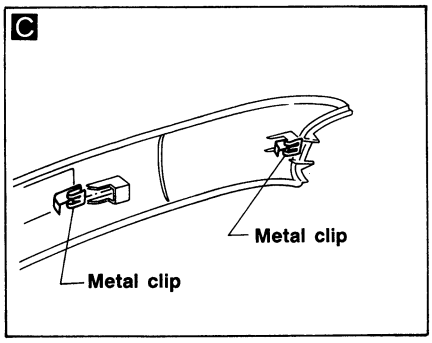
Interior

SIDE AND FLOOR TRIM — Passenger room



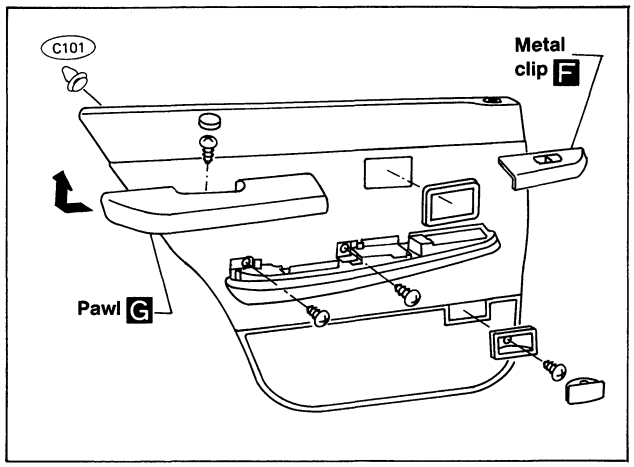




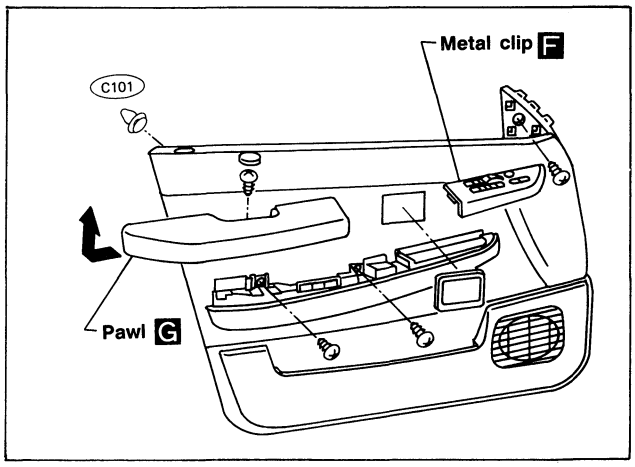


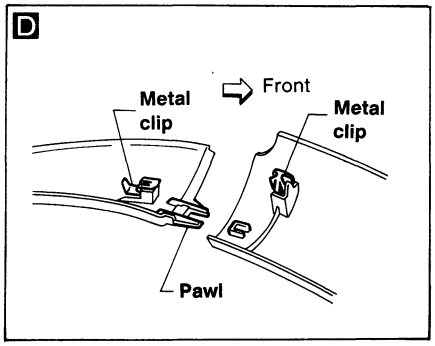
Interior (Cont'd)

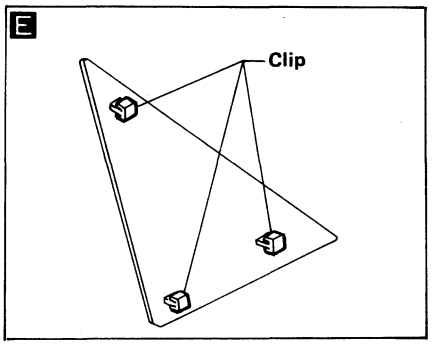
Rear door

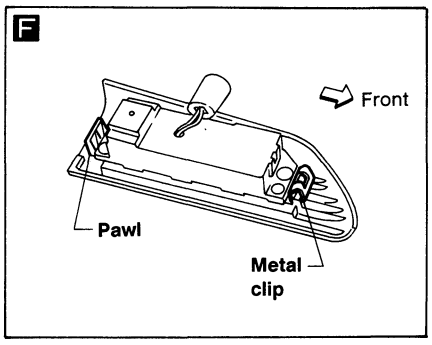


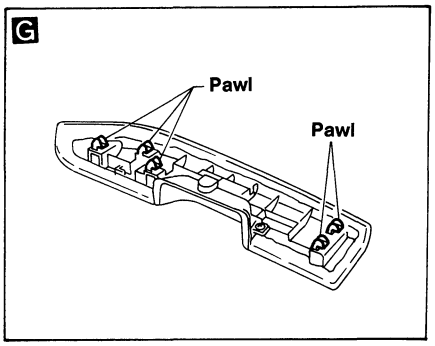
Front door







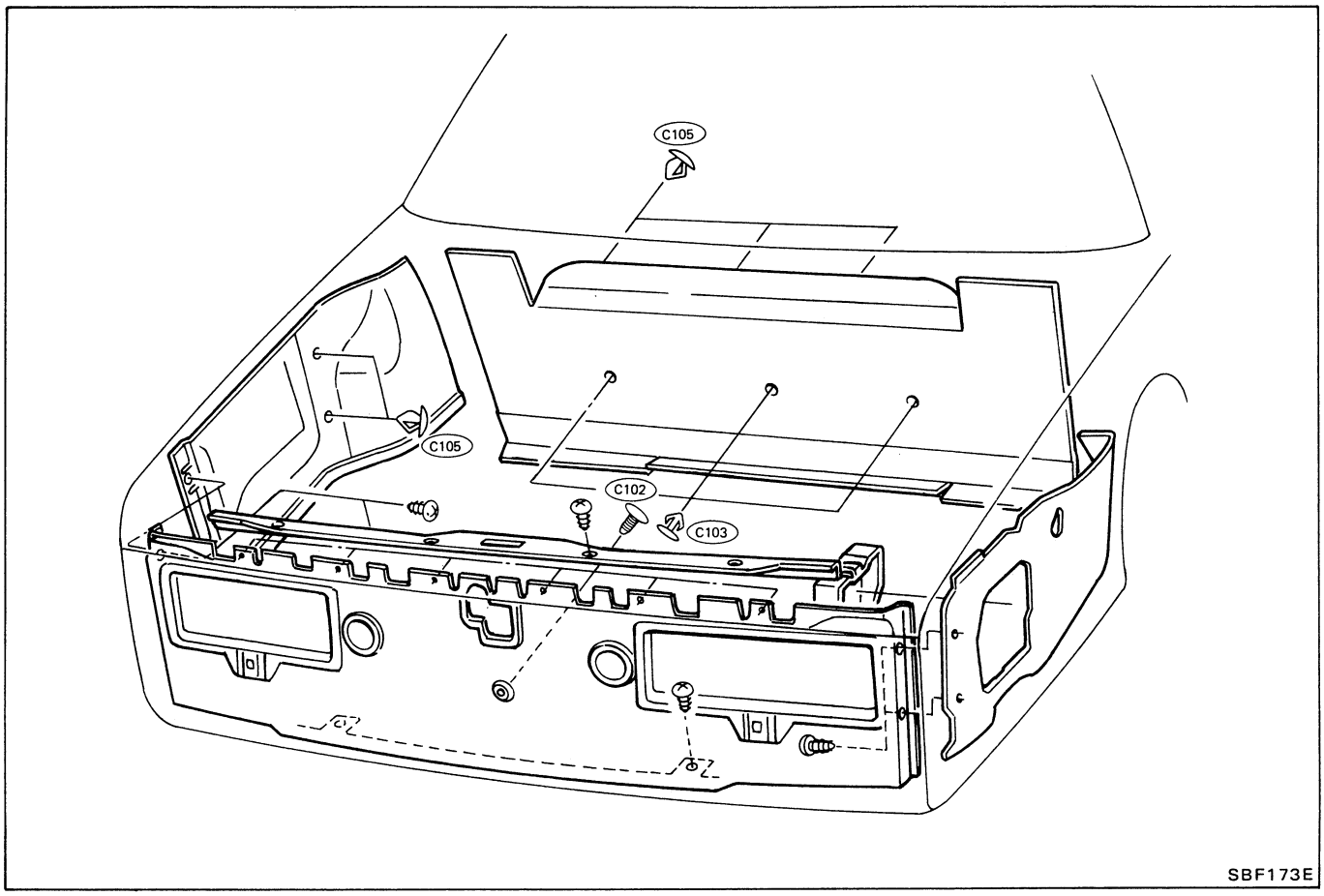




SBF089F

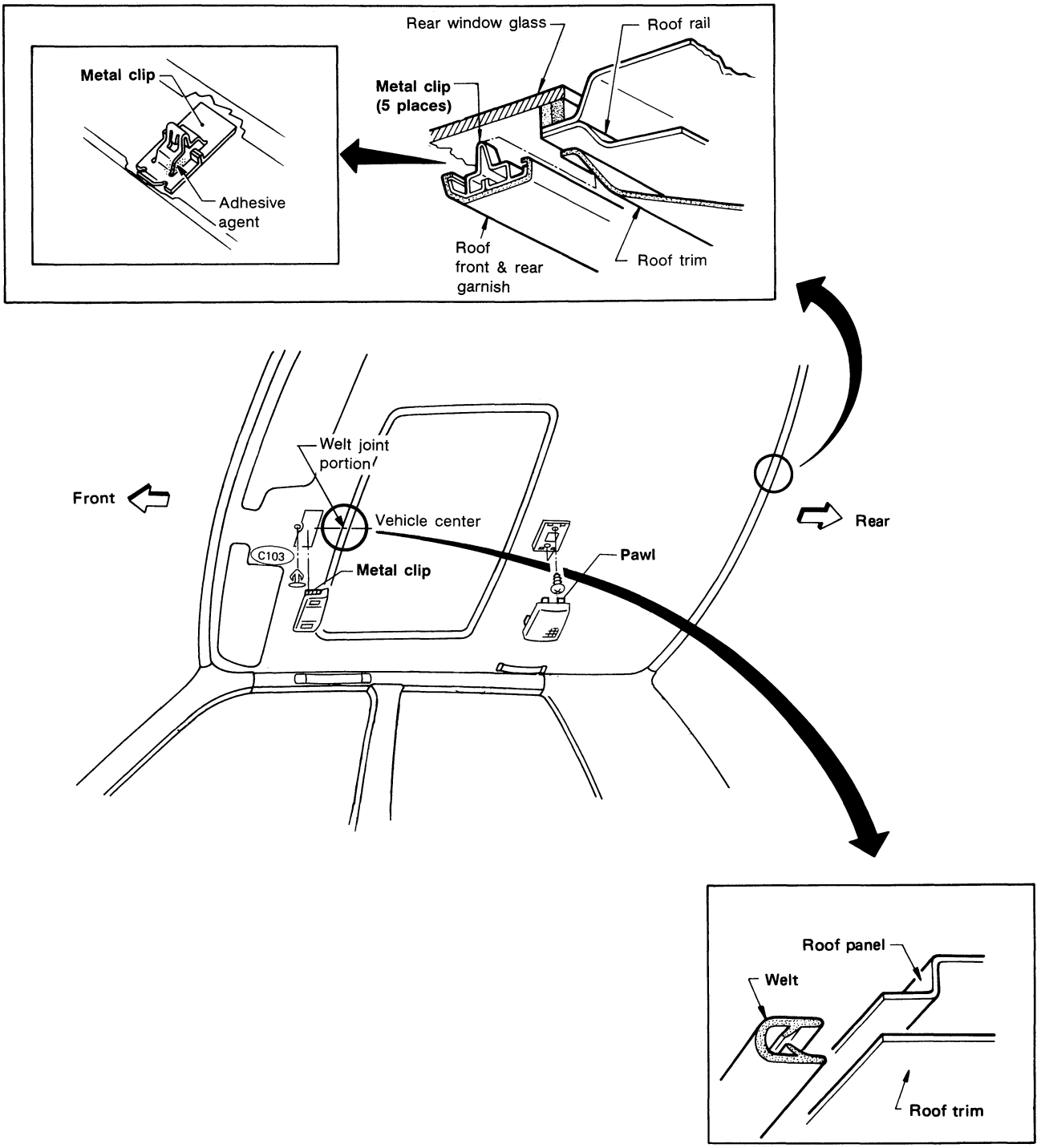
Interior (Cont'd)

LUGGAGE ROOM TRIM — Trunk space



Interior (Cont'd)

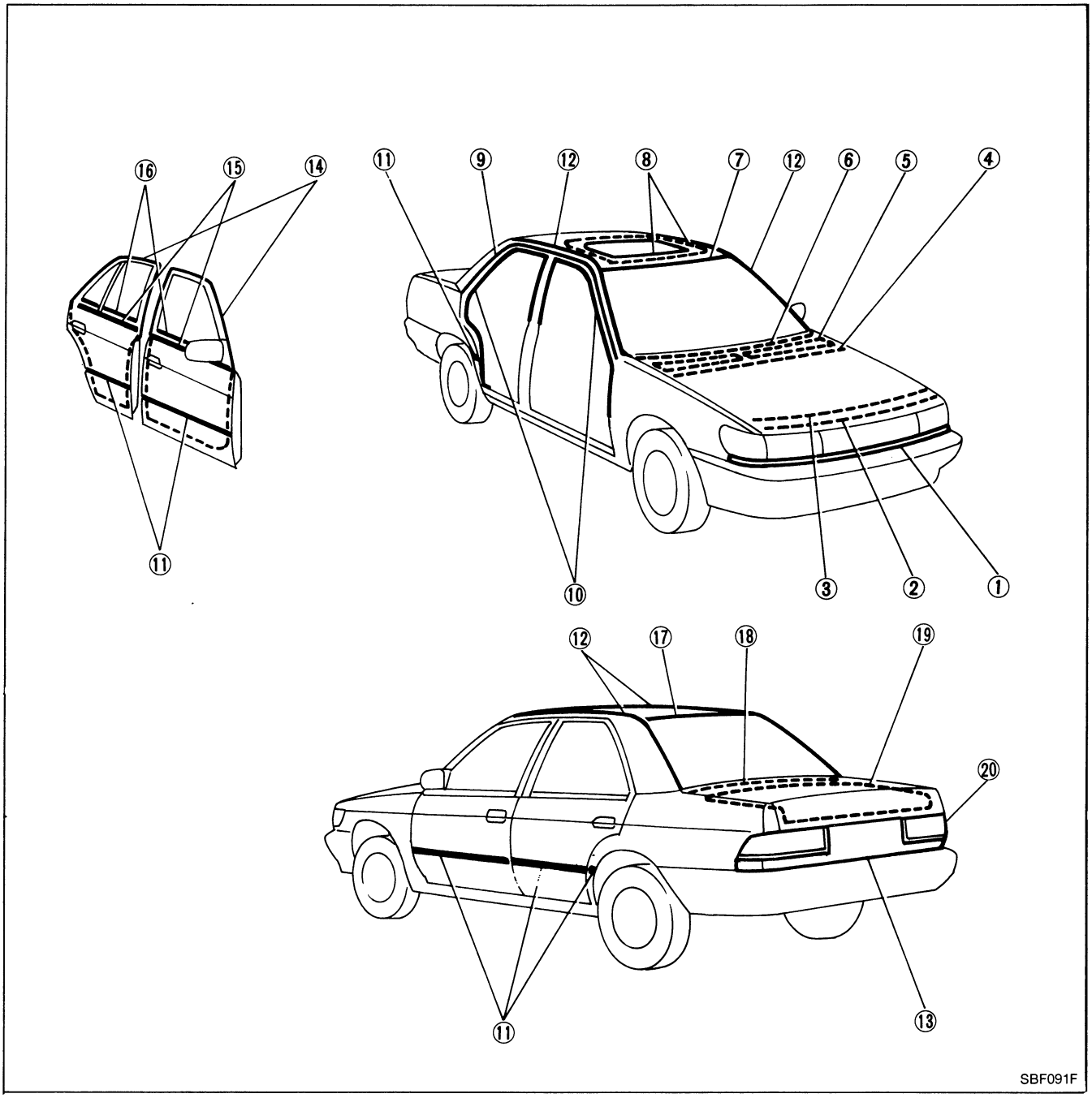
ROOF TRIM



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.

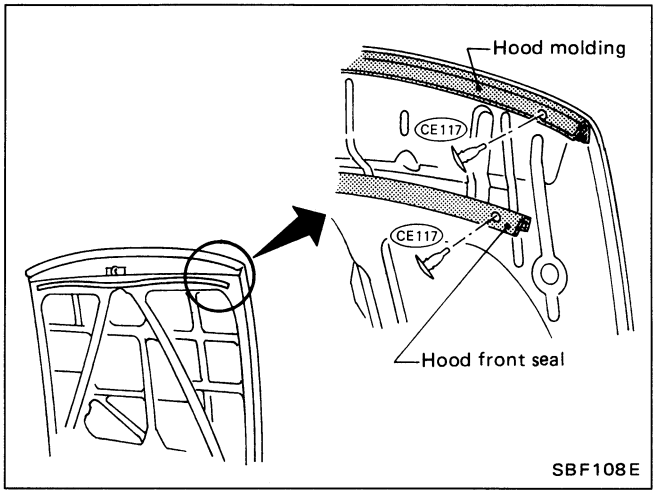


Exterior (Cont'd)

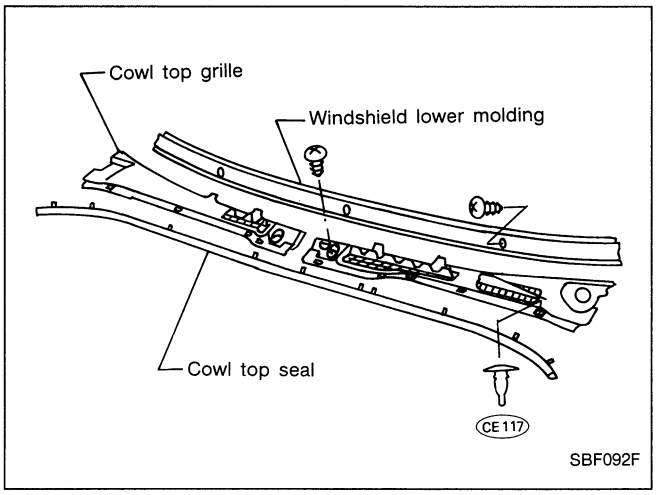
① Front bumper sight shield

Refer to "Body Front End".

② ③ Hood molding and hood front seal



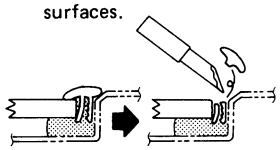
④ ⑤ ⑥ Cowl top seal, cowl top grille and windshield lower molding



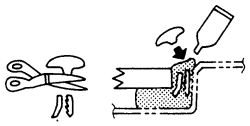
⑦ Windshield upper molding

Method 1

Cut off top portion of molding and clean glass and panel surfaces.



Apply sealant to top portion of molding.

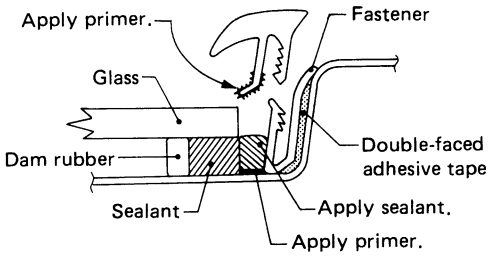


Cut off lower portion of new molding.

Finish well to give it a good appearance.

Method 2

1. Cut off sealant at glass end.
2. Clean the side on which panel was mounted.
3. Set molding fastener and apply sealant to body panel, and apply primer to molding and body.

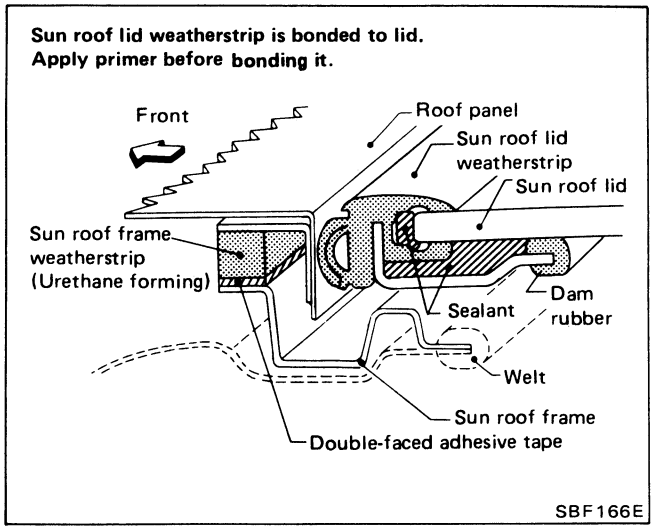


4. Install molding by aligning the molding mark located on center with vehicle center.
   Be sure to install tightly so that there is no gap around the corner.

SBF161E

Exterior (Cont'd)

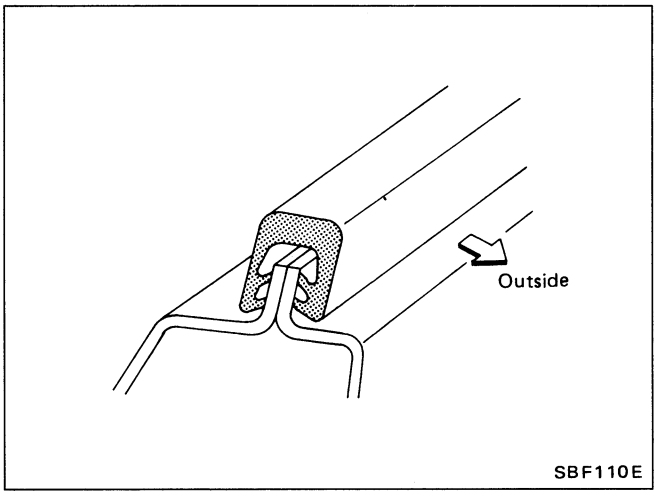
⑧ Sun roof frame weatherstrip and sun roof lid weatherstrip



⑨ Drip molding

It is mounted with screws.

⑩ Body side welt

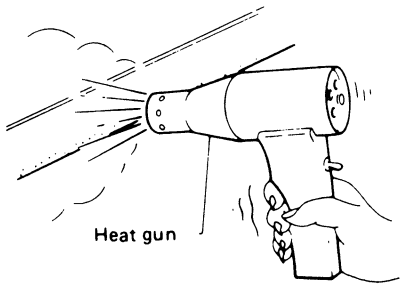


⑪ Side guard molding

- 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.



2. Raise end of molding and, while cutting off bonding agent, detach molding.

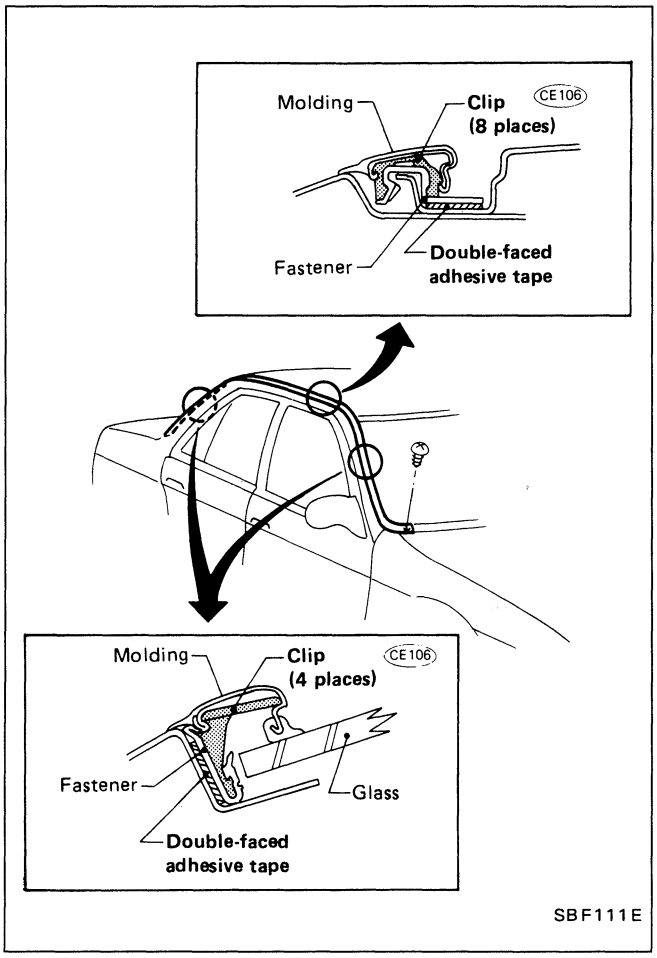
- **Installation:**

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

Exterior (Cont'd)

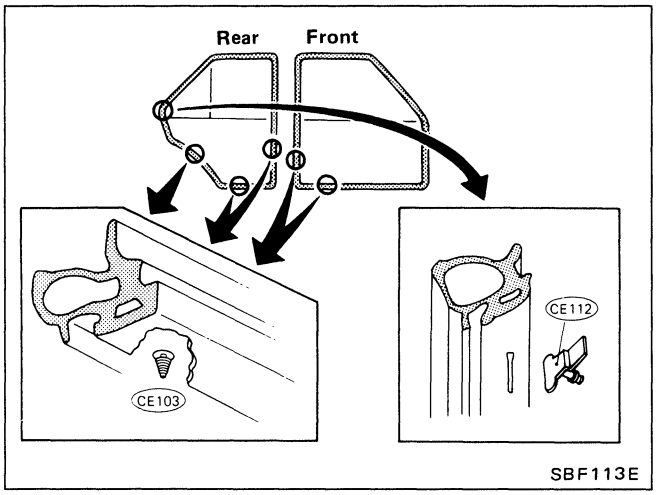
⑫ Roof side molding



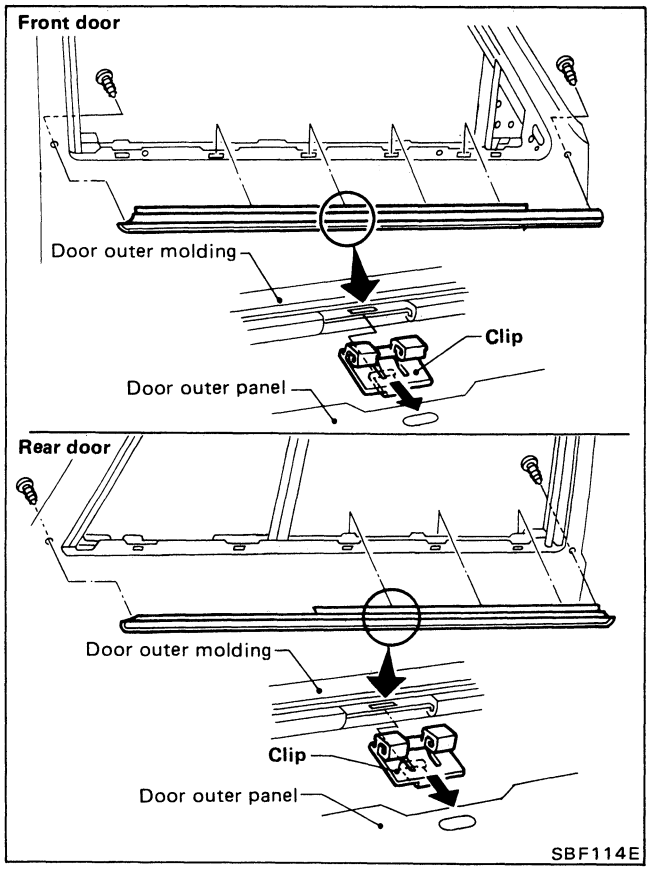
⑬ Rear bumper sight shield

Refer to "Body Rear End".

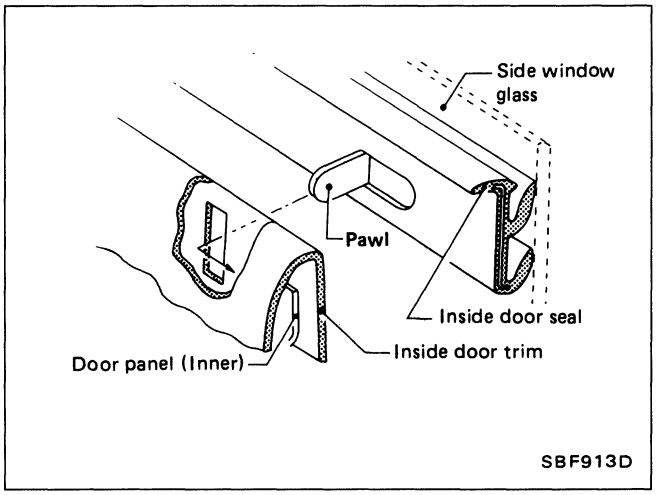
⑭ Door weatherstrip



⑮ Door outside molding



⑯ Door inside seal



Exterior (Cont'd)

⑰ Rear window upper molding

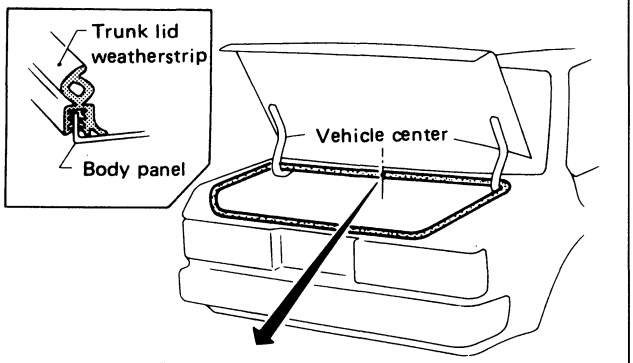
Basically the same as windshield upper molding.

Refer to ⑦ Windshield upper molding.

⑱ Rear window lower molding

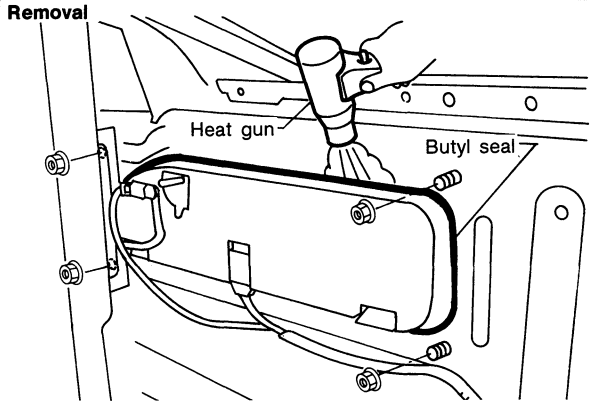
It is mounted with screws.

⑲ Trunk lid weatherstrip



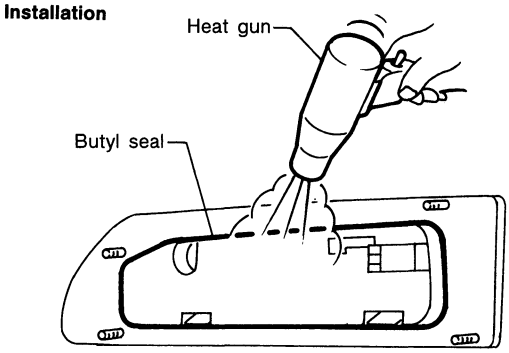
⑳ Rear combination lamp

Removal



- **Warm up lamp assembly area to a temperature of a little below 60°C (140°F).**

Installation

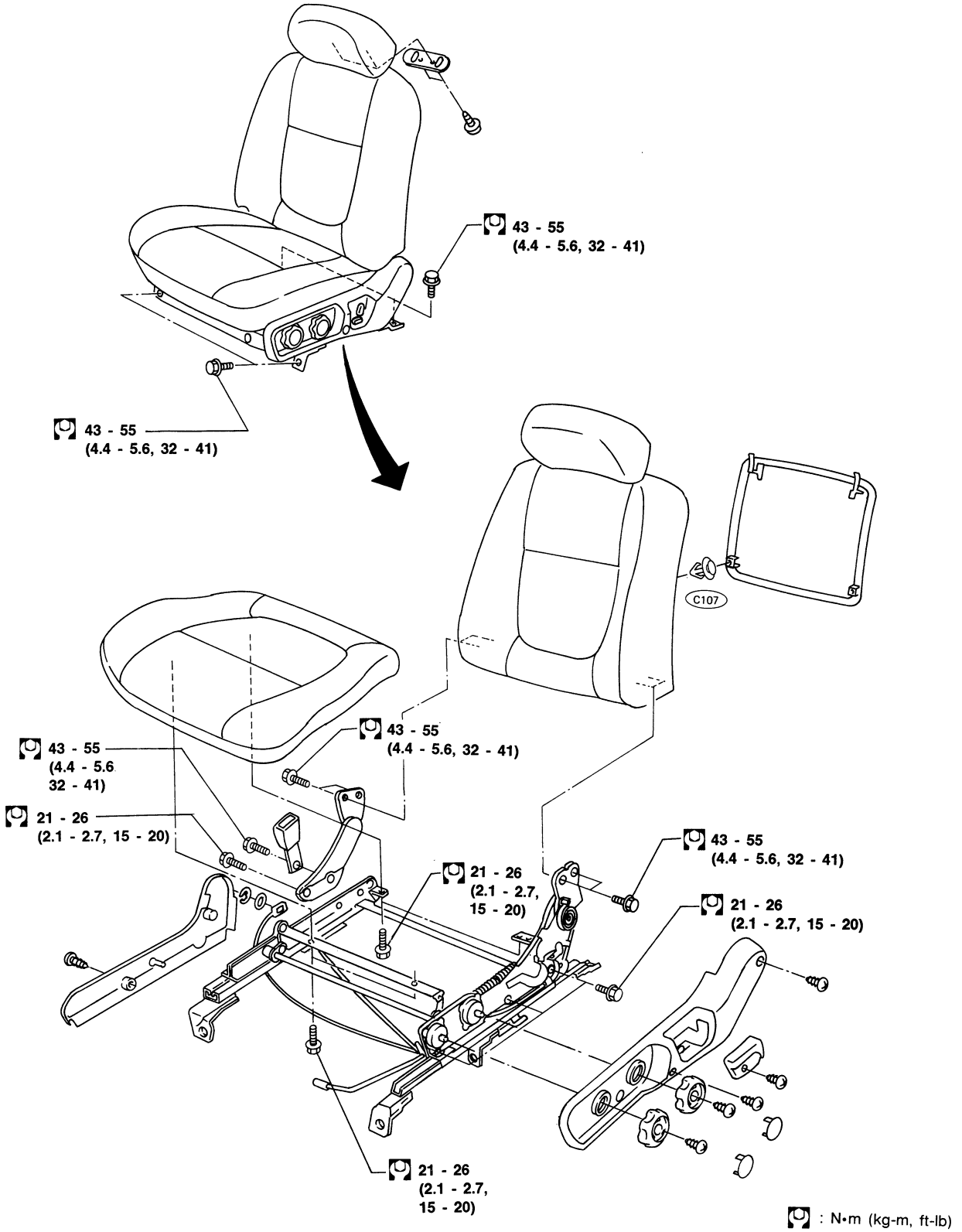


- **Apply butyl seal evenly as it tends to become thin in the corners.**
- **Warm up lamp assembly area to a temperature of a little below 60°C (140°F).**

SBF093F

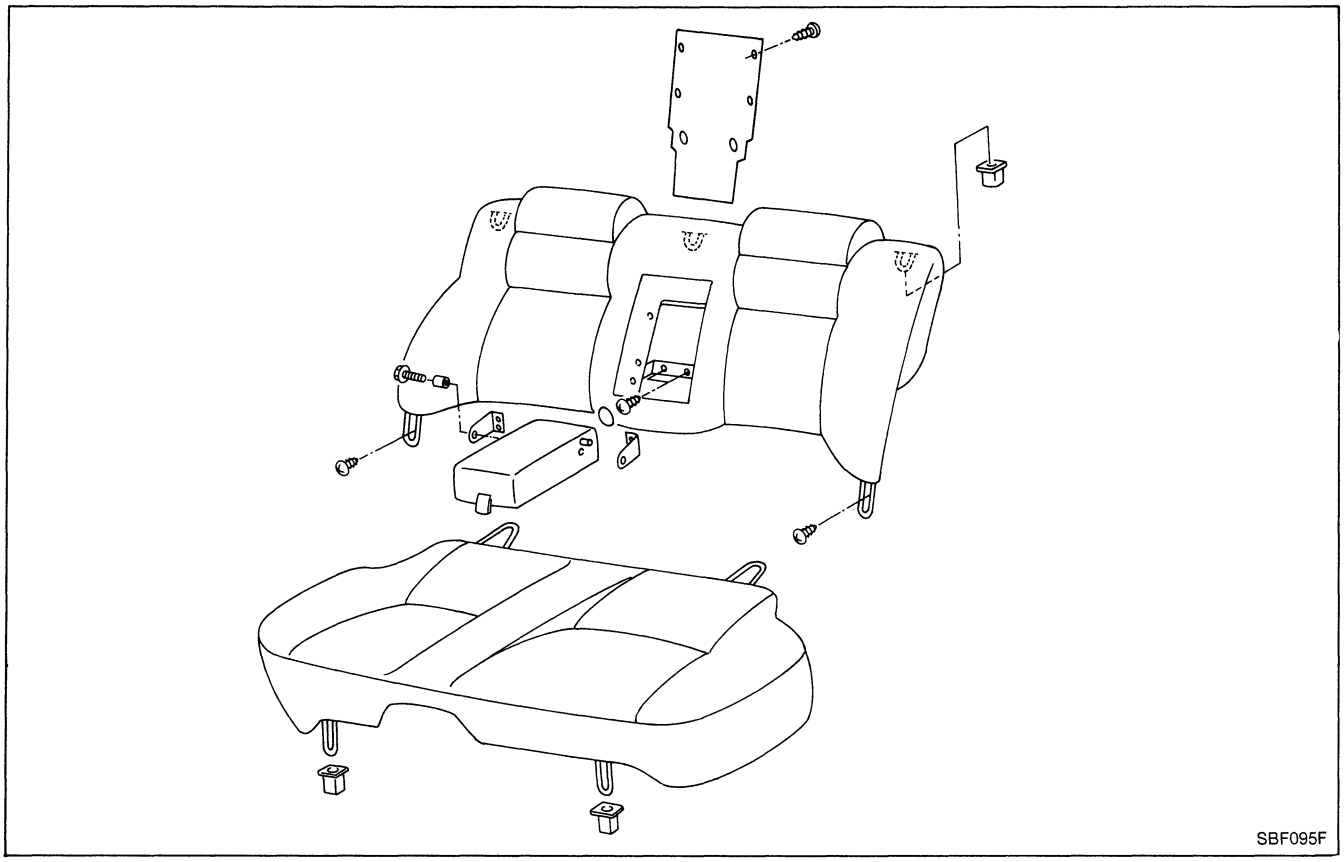
- When removing or installing the seat trim, carefully handle it to keep dirt out and avoid damage.

Front Seat



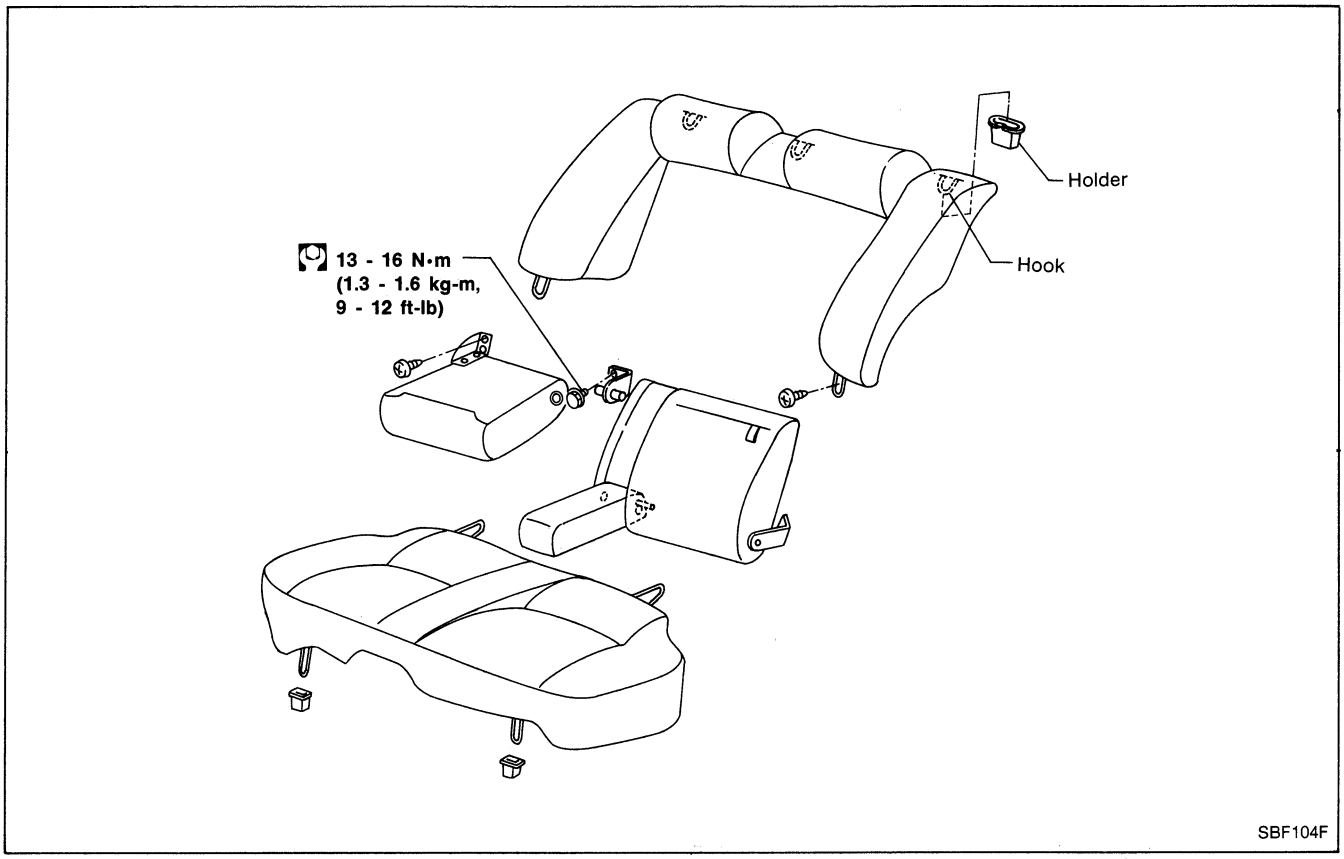
Rear Seat

Type 1

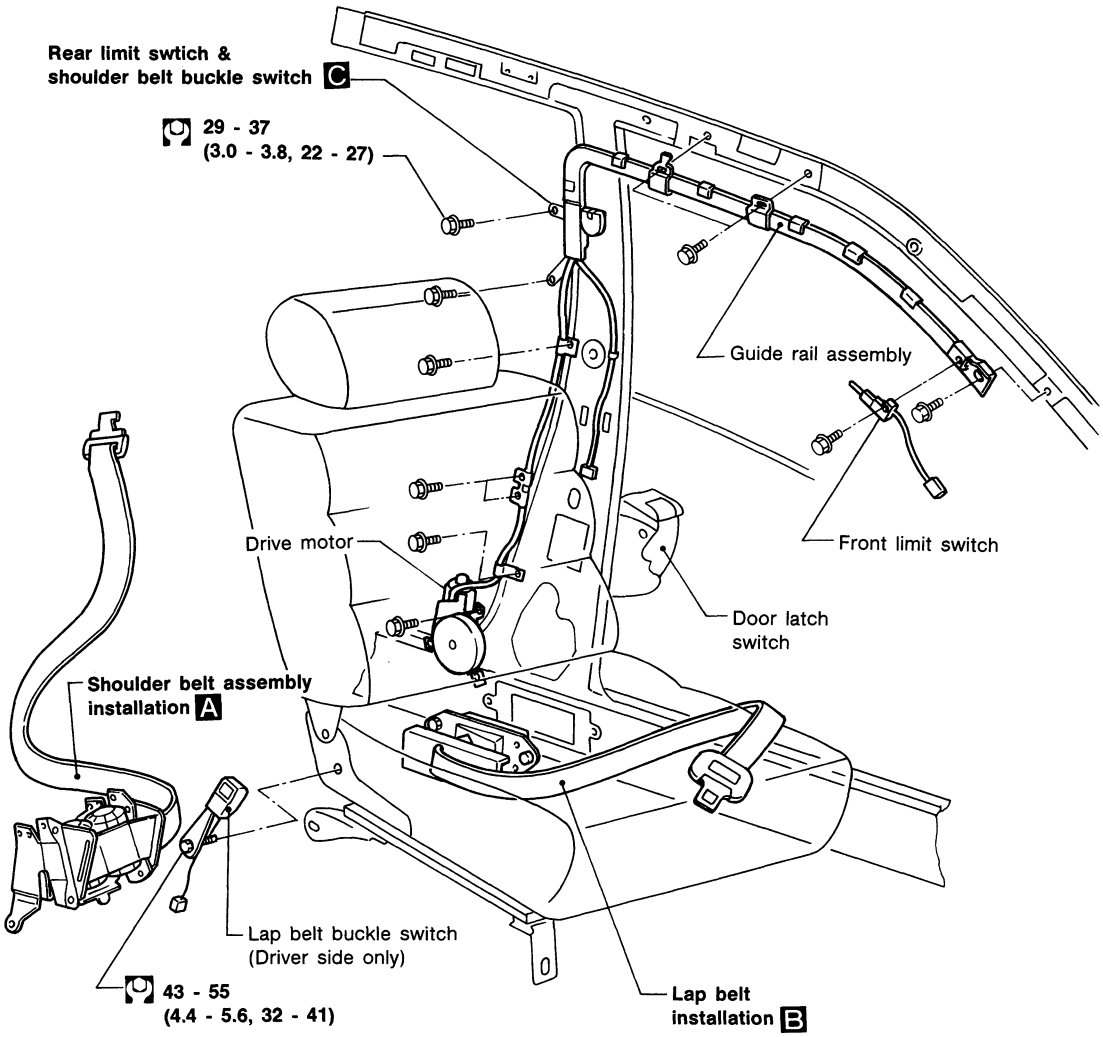


Rear Seat (Cont'd)

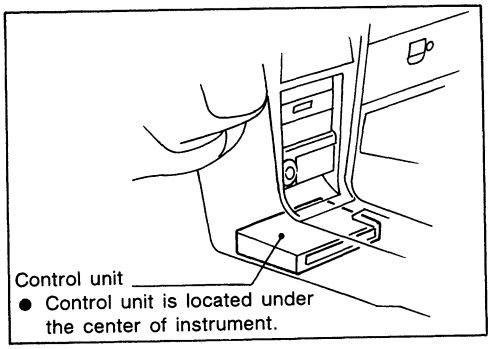
Type 2



Unit Location

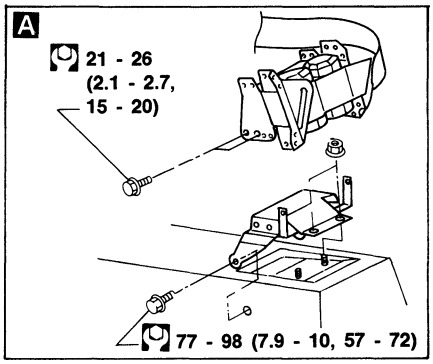


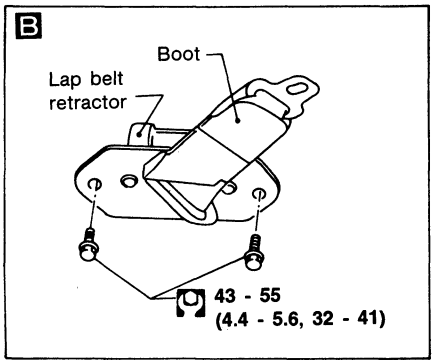
Control unit

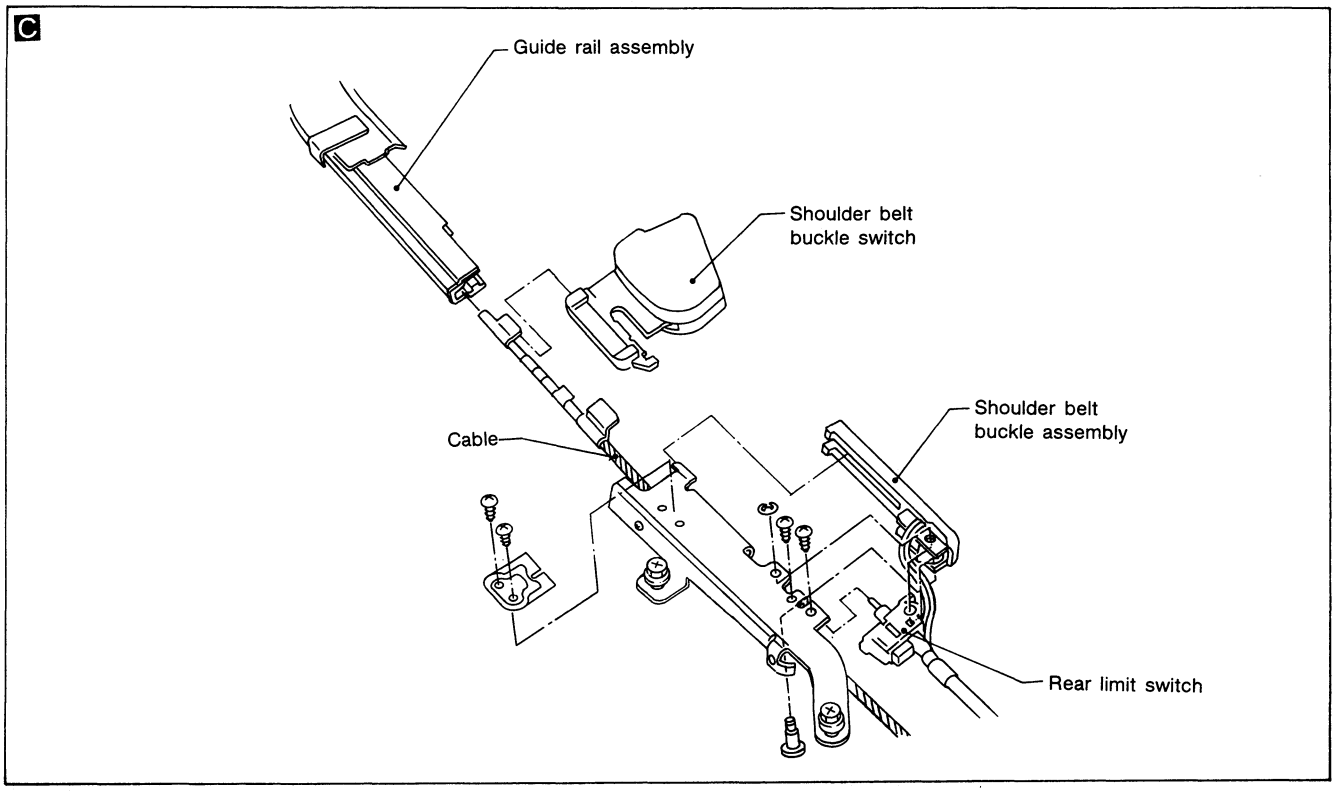


: N•m (kg-m, ft-lb)

Unit Location (Cont'd)

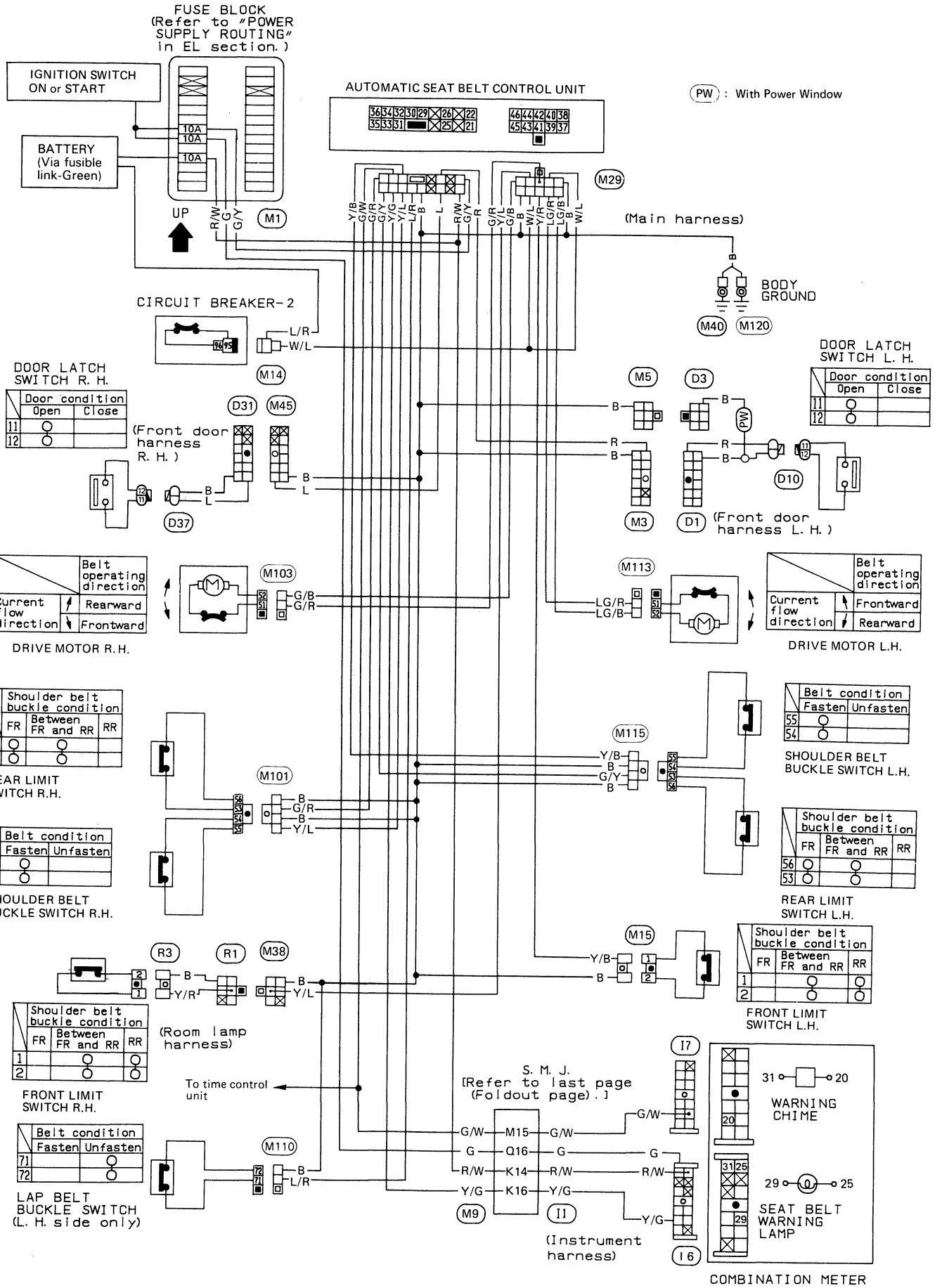






SBF096F

Wiring Diagram



SBF147F

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")

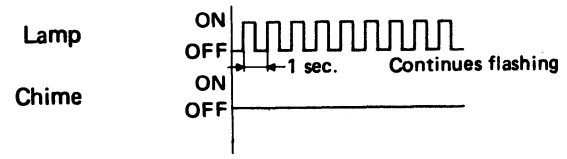
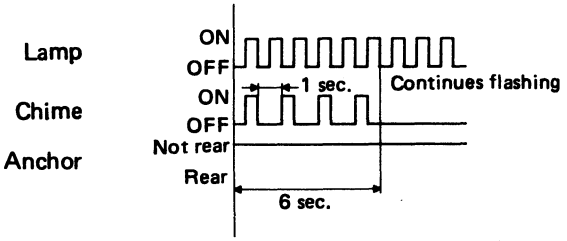
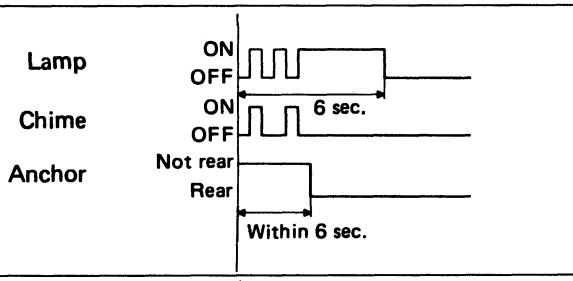
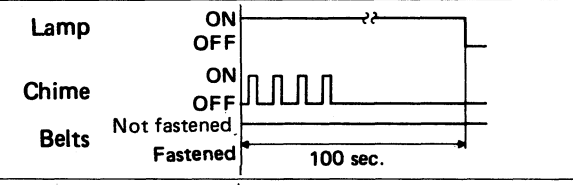
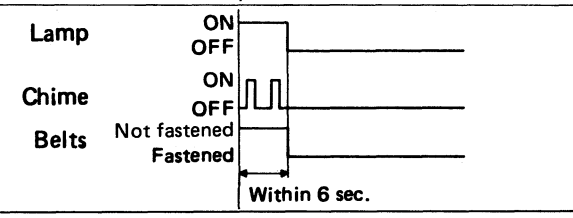
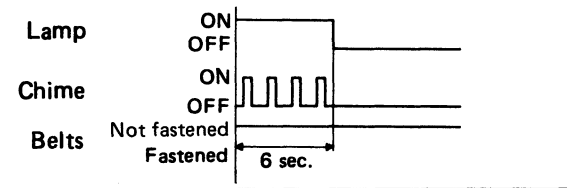
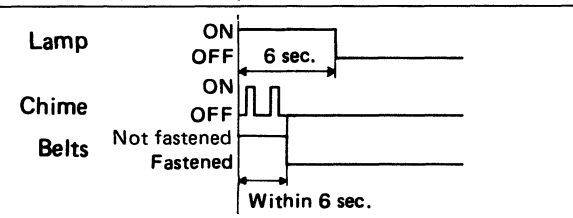
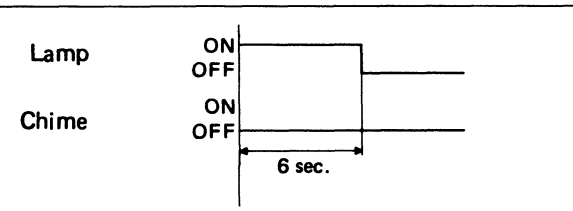
If front limit switch is not turned "OFF" after accomplishing frontward operation (when door is opened), control unit will stop supplying power 15 seconds later and warning lamp will flash and chime will operate rapidly for approximately 6 seconds.

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

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

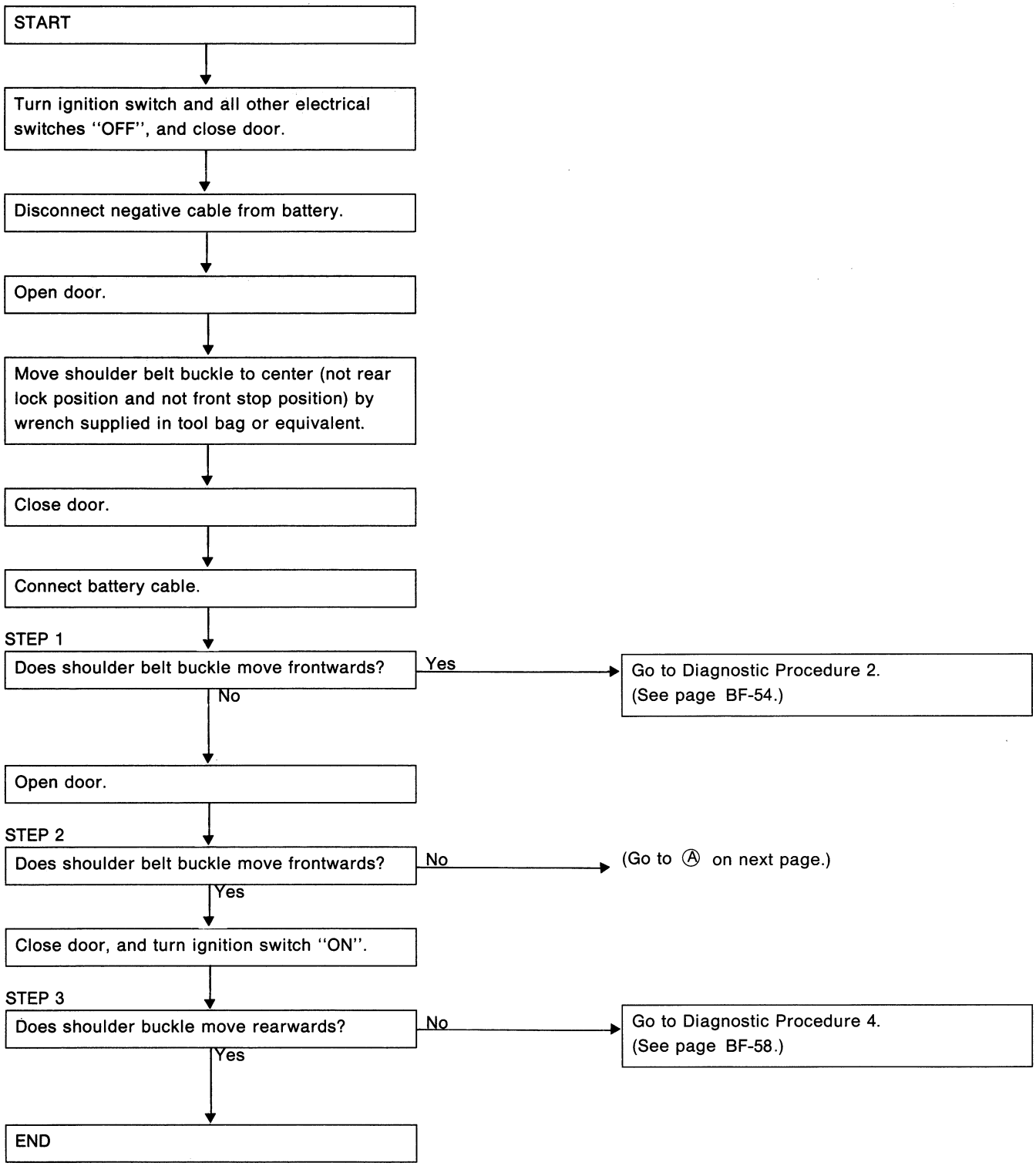
Refer to EL section.

Symptom Chart

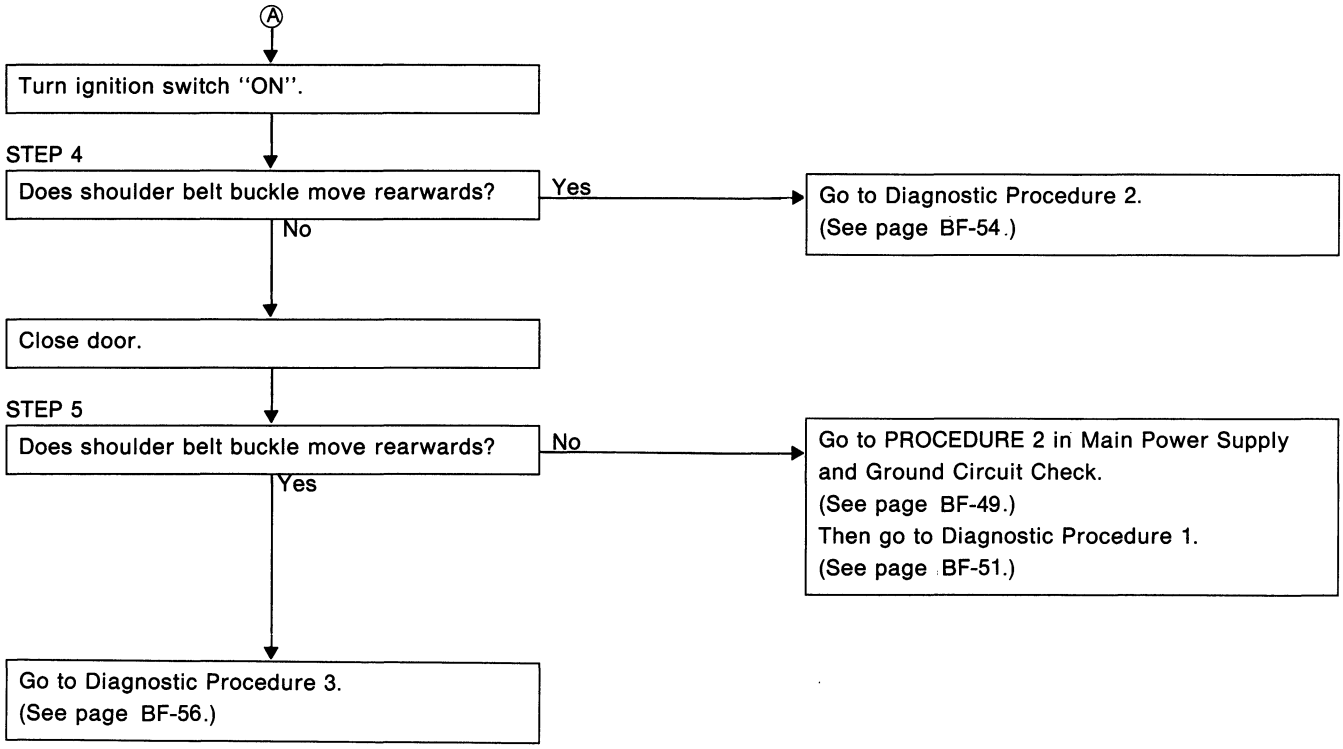
Procedure	Reference page		SYMPTOM	No operation has made. (No warning indicated and no buckles movement performed)	Shoulder belt buckle in L.H. or R.H. side does not move.	Shoulder belt buckle moves frontwards only. (not rearwards)	Shoulder belt buckle moves rearwards only. (not frontwards)	Warnings indicate incorrectly or do not function.	Quick warning operates.
Electrical Components Inspection	BF-66	R.H. side	Motor	○	○				
	BF-66		Shoulder belt buckle switch	○				○	
	BF-66		Door latch switch	○		○	○		
	BF-66		Rear limit switch	○	○	○		○	
	BF-66		Front limit switch	○	○		○		○
	BF-67	L.H. side	Lap belt switch	○				○	
	BF-66		Motor	○	○				
	BF-66		Shoulder belt buckle switch	○				○	
	BF-66		Door latch switch	○		○	○		
	BF-66		Rear limit switch	○	○	○		○	
	BF-66		Front limit switch	○	○		○		○
	—		Warning chime	○				○	
	—		Warning lamp	○				○	
Diagnostic Procedure	BF-65		Procedure 8					○	
	BF-64		Procedure 7					○	
	BF-62		Procedure 6					○	
	BF-60		Procedure 5					○	
	BF-58		Procedure 4	○	○	○		○	
	BF-56		Procedure 3	○	○		○		○
	BF-54		Procedure 2			○	○		
	BF-51		Procedure 1	○	○				
Main Power Supply and Ground Circuit Check	BF-49		Procedure 2		○				
	BF-49		Procedure 1	○					
Preliminary Check	BF-47		Procedure 2					○	
	BF-45		Procedure 1		○	○	○		

Preliminary Check

PROCEDURE 1

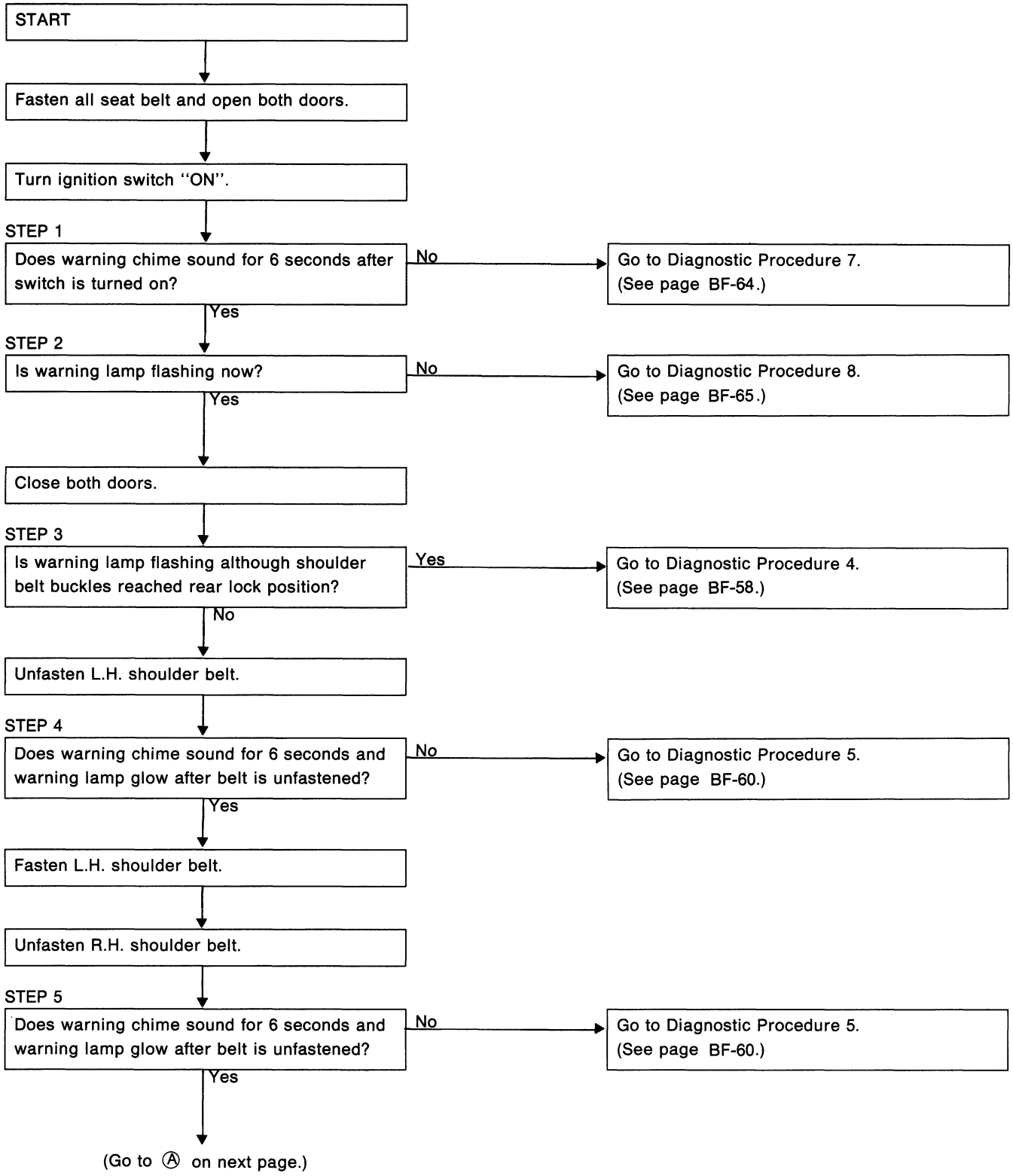


Preliminary Check (Cont'd)

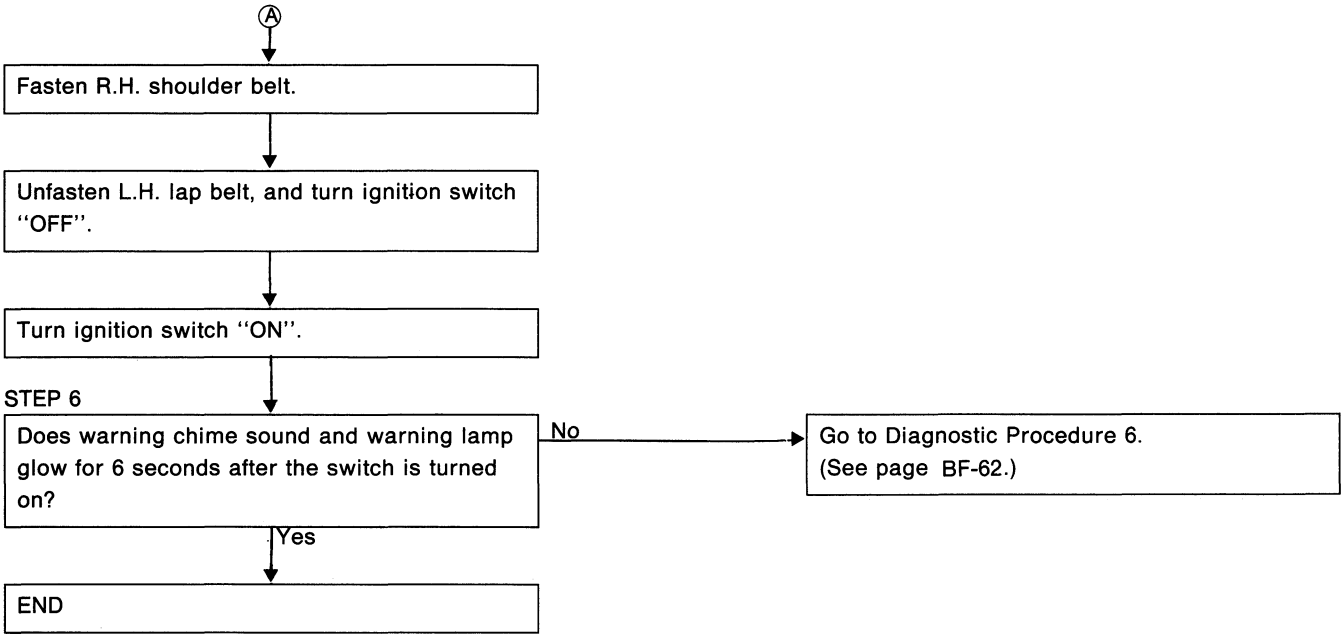


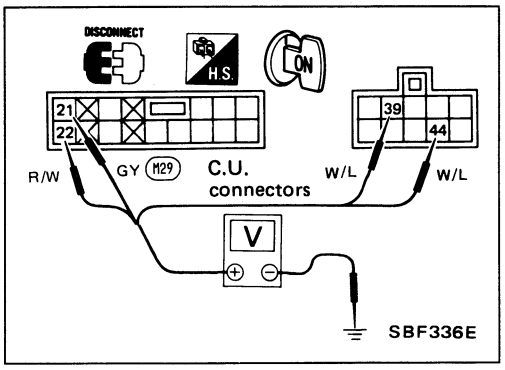
Preliminary Check (Cont'd)

PROCEDURE 2



Preliminary Check (Cont'd)



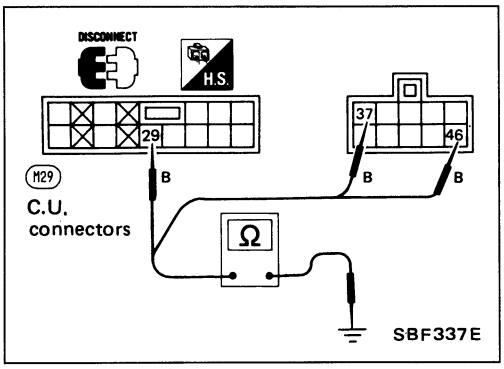


Main Power Supply and Ground Circuit Check

PROCEDURE 1

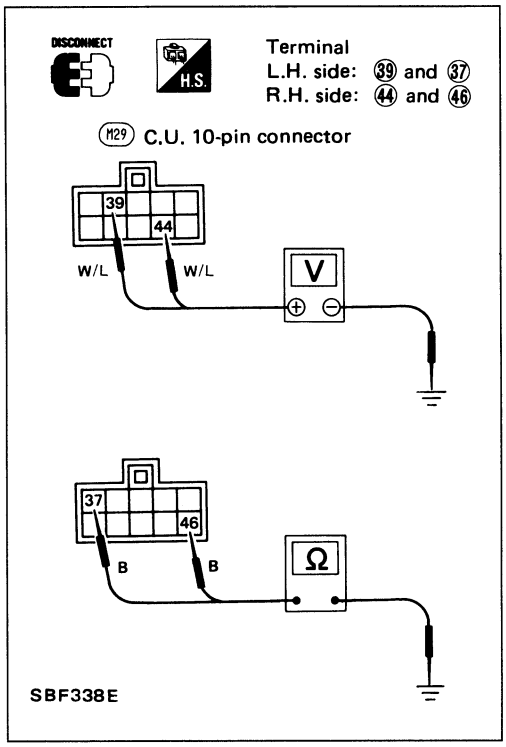
Main power supply

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

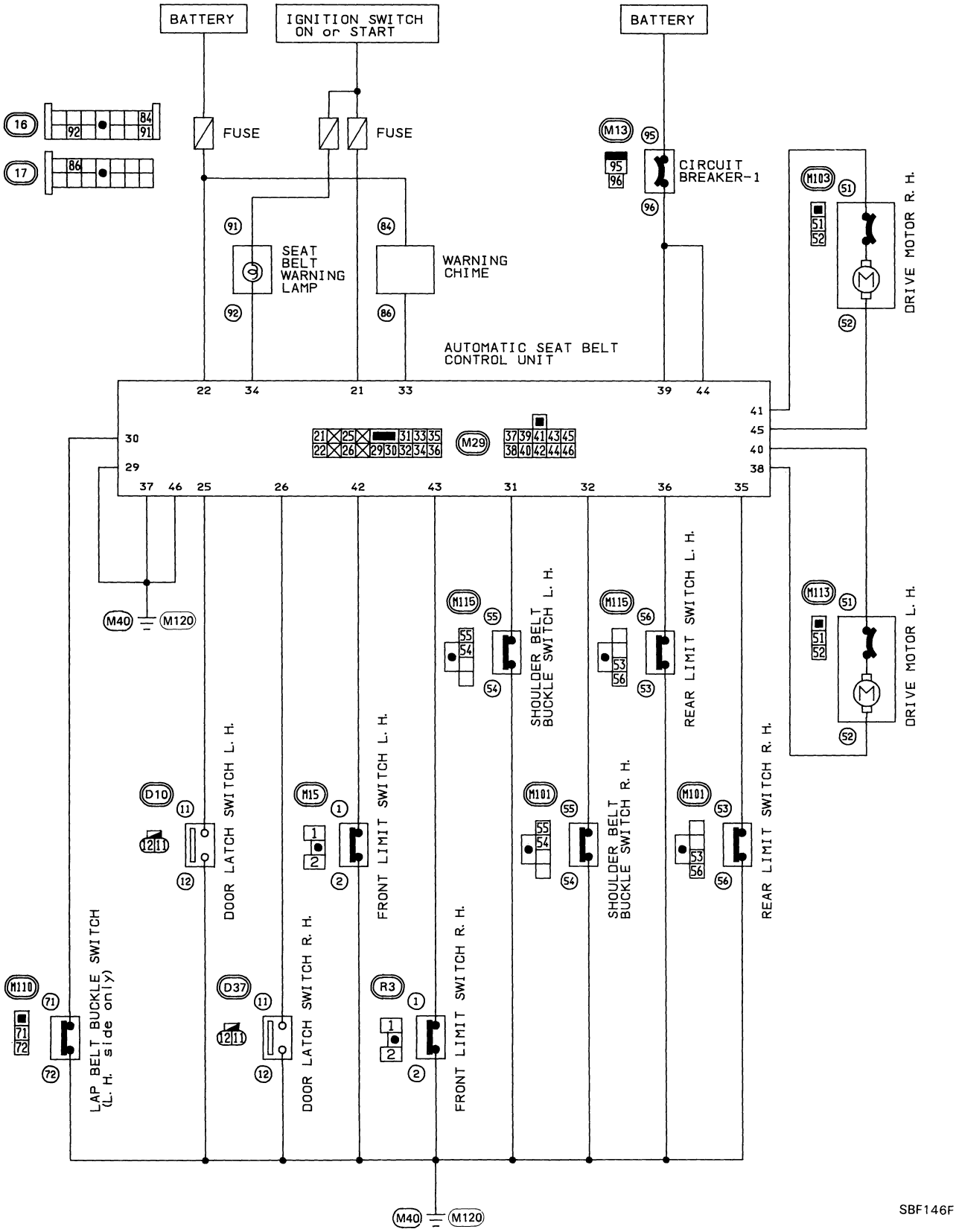
Power supply for motor drive

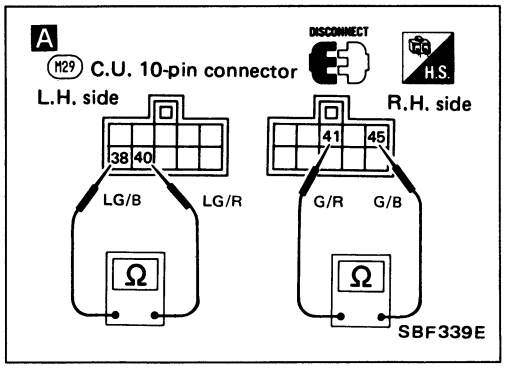
	Terminals	Battery voltage existence
L.H. side	㊴ - Ground	Yes
R.H. side	㊹ - Ground	Yes

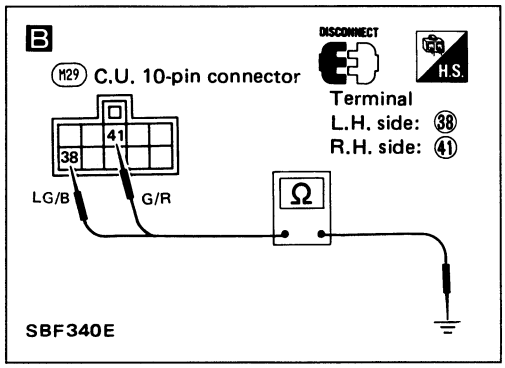
Ground circuit for motor drive

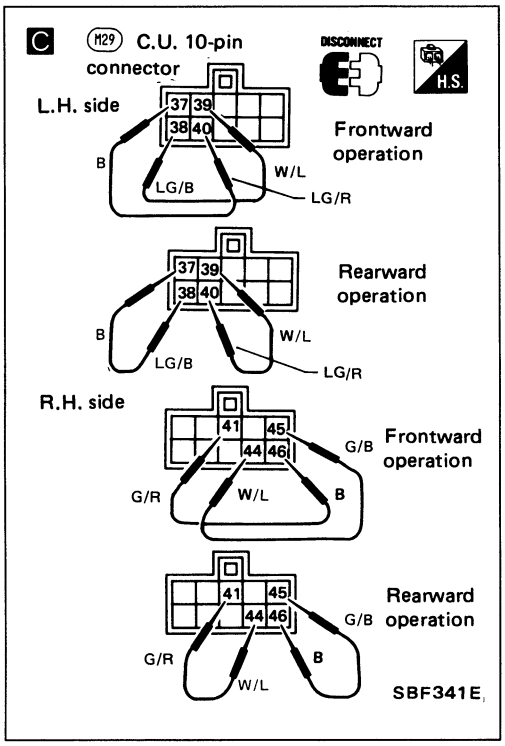
	Terminals	Continuity
L.H. side	㊲ - Ground	Yes
R.H. side	㊻ - Ground	Yes

Circuit Diagram for Quick Pinpoint Check









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-53.)

N.G.

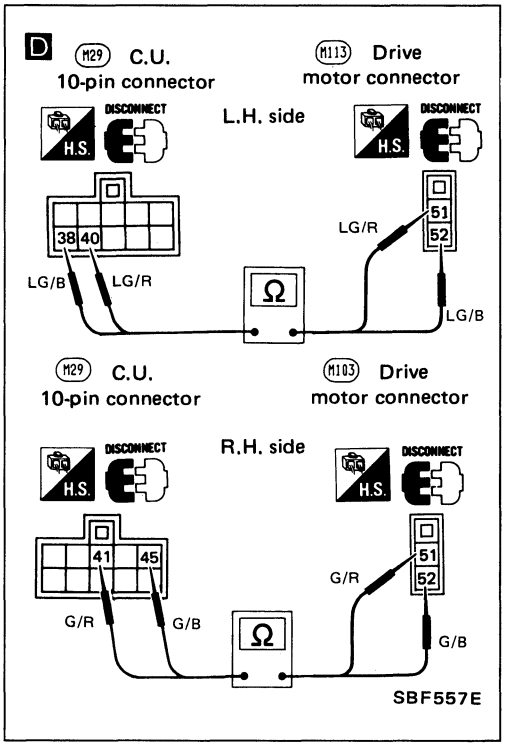
Go to DRIVE MOTOR ASSEMBLY in Electrical Components Inspection. (See page BF-66.)

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 - ㊷
	㊵ - ㊶
R.H. side	㊶ - ㊶
	㊺ - ㊷

Continuity should exist.

N.G. → Repair harness.

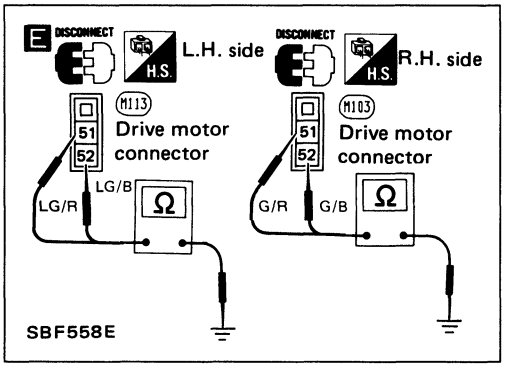
O.K. ↓

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	㊶ - Ground
	㊷ - Ground
R.H. side	㊶ - Ground
	㊷ - Ground

Yes → Repair harness.
There will be incorrect grounding.

No ↓

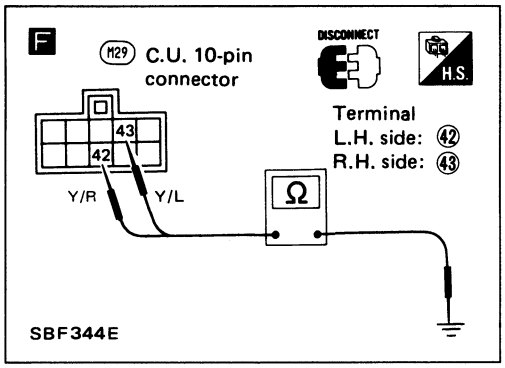
Check drive motor harness for incorrect grounding.

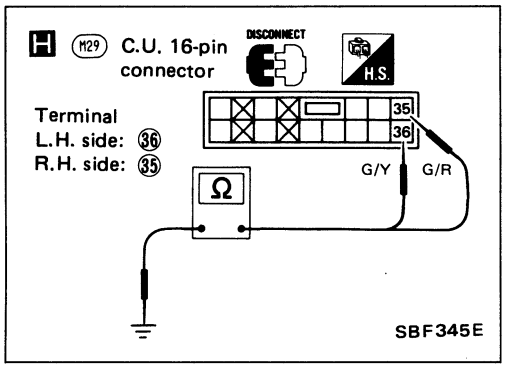
N.G. → Repair drive motor harness.

O.K. ↓

Replace drive motor assembly.

Diagnostic Procedure 1 (Cont'd)





Ⓒ

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-51) to move shoulder belt buckle.

N.G. → Go to Diagnostic Procedure 3 (See page BF-56.) 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-58.) and return to next step.

O.K.

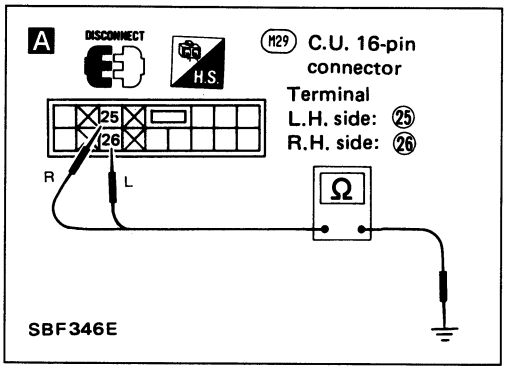
Is this the second time?

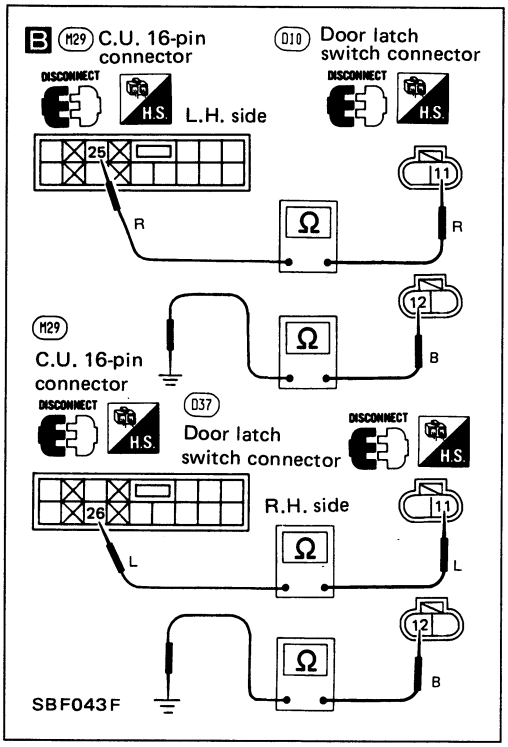
Yes → Replace control unit.

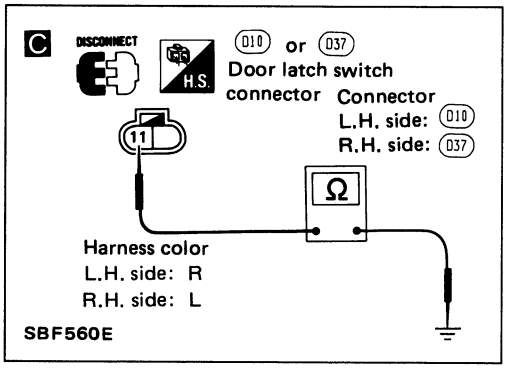
No

Reinstall any part removed.

Go to PROCEDURE 1 (START) in Preliminary Check.
(See page BF-45.)







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. → (Go to Ⓐ on next page.)

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 and 11 or 26 and 11.

No

Go to DOOR LATCH SWITCH in Electrical Components Inspection. (See page BF-66.)

O.K. → Reinstall any part removed.

→ Go to PROCEDURE 1 (START) in Preliminary Check. (See page BF-45.)

N.G.

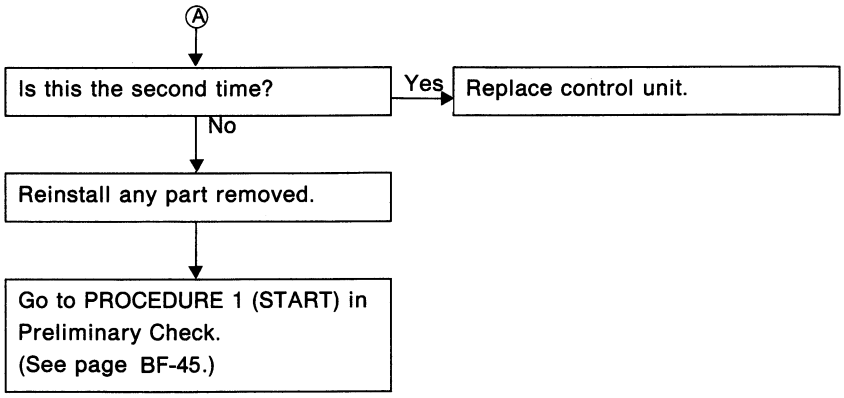
Check door latch switch harness for open and short circuit.

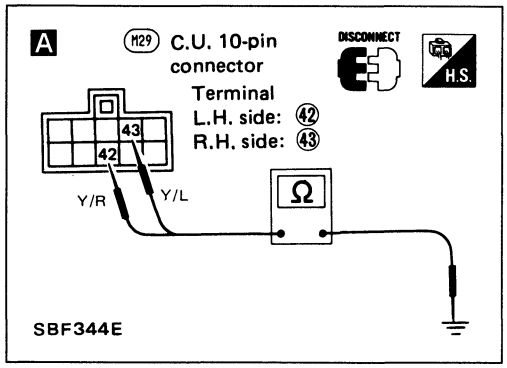
N.G. → Repair door latch switch harness.

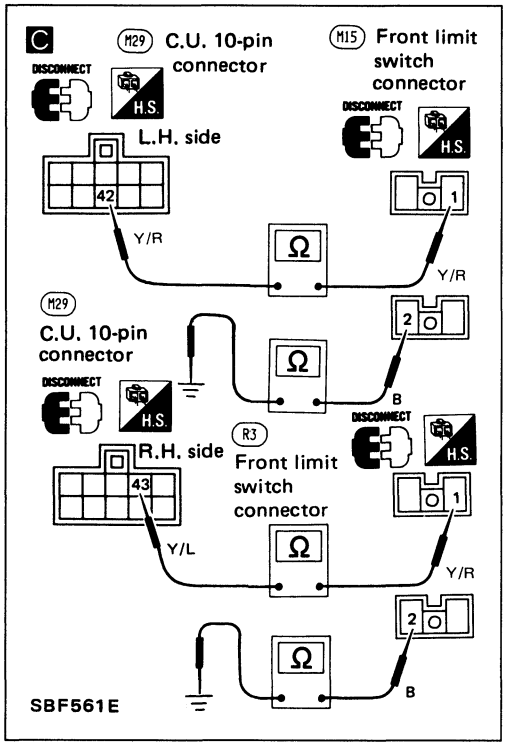
O.K.

Replace door lock assembly.

Diagnostic Procedure 2 (Cont'd)







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-51) to move shoulder belt buckle.

O.K. → (Go to Ⓑ on next page.)

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)

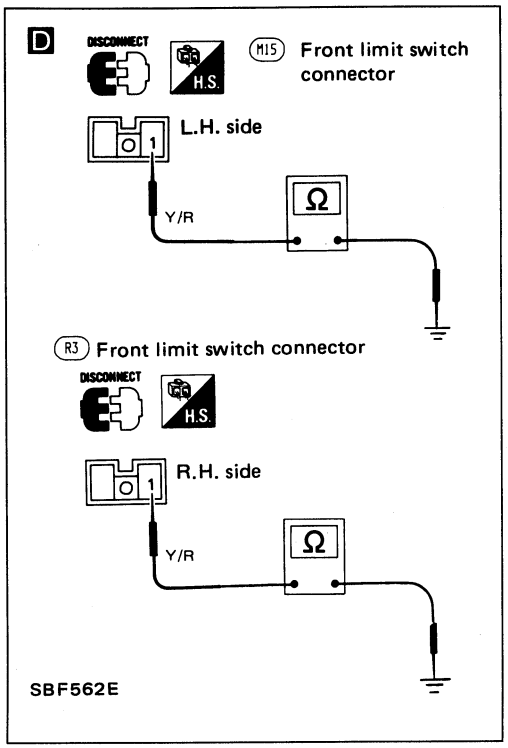
Continuity should exist.

N.G. → Repair harness.

O.K.

(Go to Ⓐ on next page.)

Diagnostic Procedure 3 (Cont'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-66.)

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.

Ⓑ

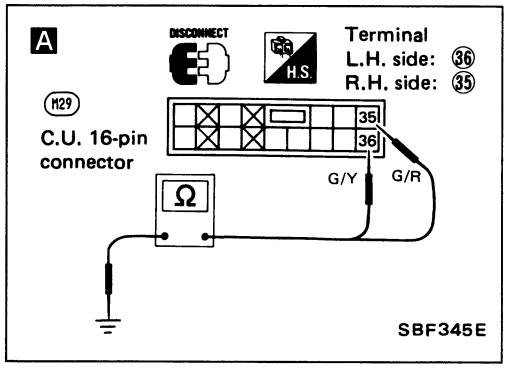
Is this the second time?

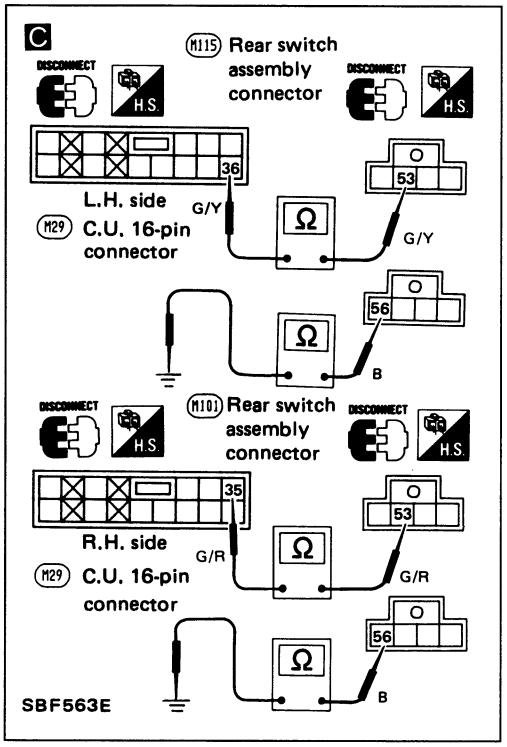
Yes → Replace control unit.

No

Reinstall any part removed.

Go to PROCEDURE 1 (START) in Preliminary Check.
(See page BF-45.)





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-51) to move shoulder belt buckle.

O.K. → (Go to Ⓑ on next page.)

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)

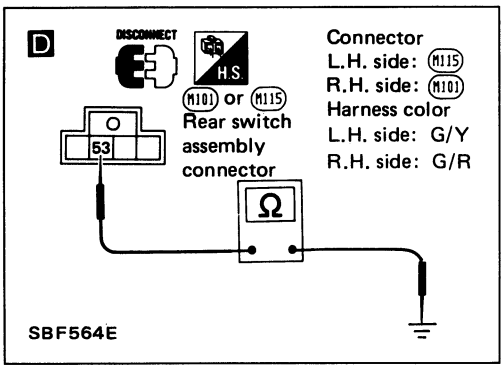
Continuity should exist.

N.G. → Repair harness.

O.K.

(Go to Ⓐ on next page.)

Diagnostic Procedure 4 (Cont'd)



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-66.)

O.K. → (Go to Ⓑ below.)

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.

Ⓑ

Is this the second time?

Yes → Replace control unit.

No

Reinstall any part removed.

Go to PROCEDURE 1 (STEP 3) (See page BF-45.) or PROCEDURE 2 (STEP 3) (See page BF-47.) in Preliminary Check.

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. → (Go to Ⓑ on next page.)

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).

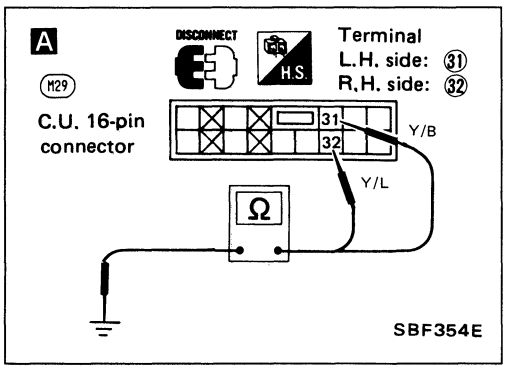
No

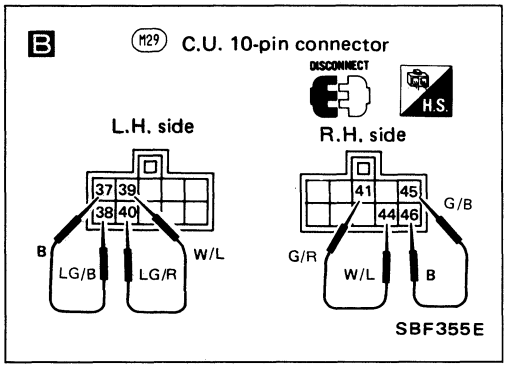
Go to SHOULDER BELT BUCKLE SWITCH in Electrical Components Inspection.
(See page BF-66.)

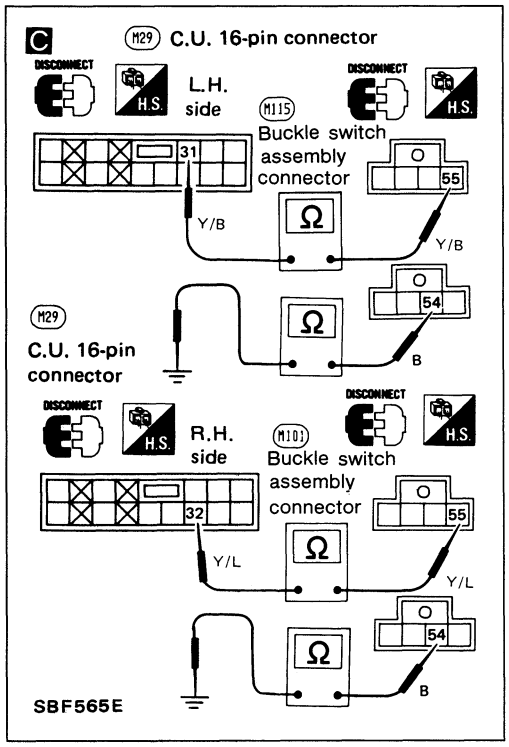
O.K. → (Go to Ⓑ on next page.)

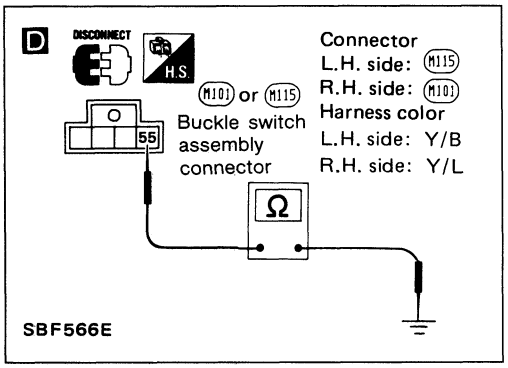
N.G.

(Go to Ⓐ on next page.)

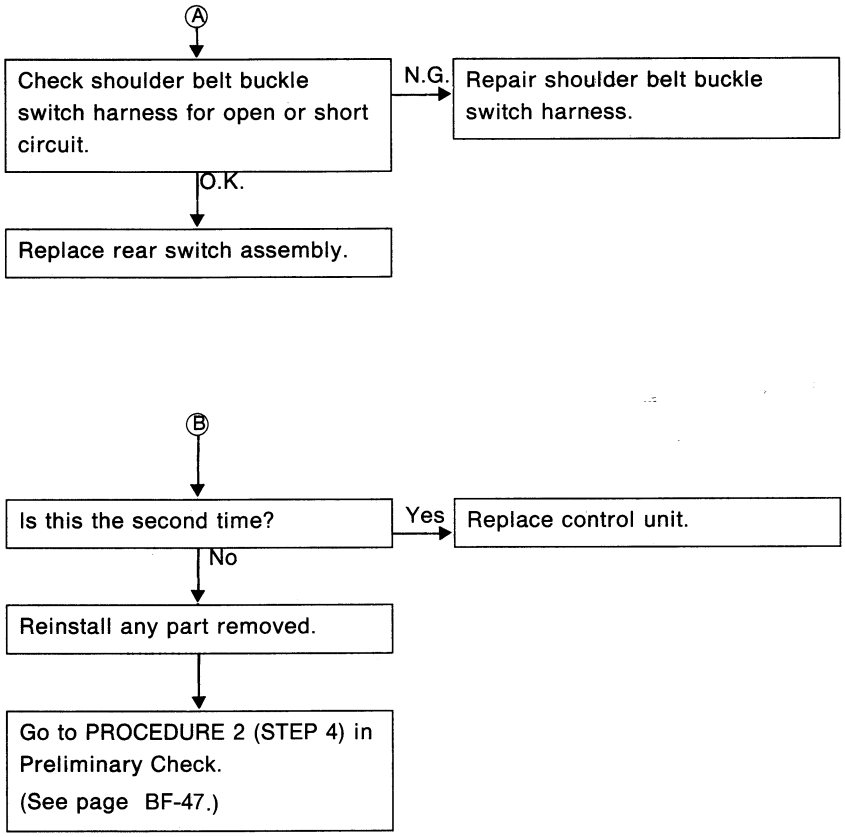




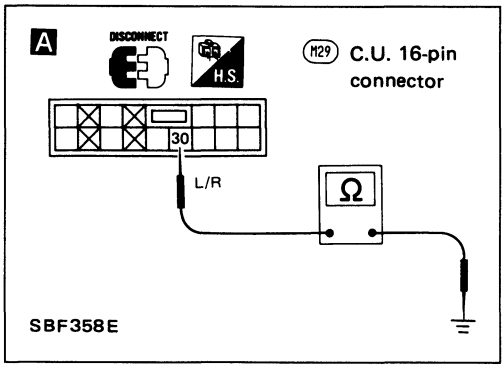


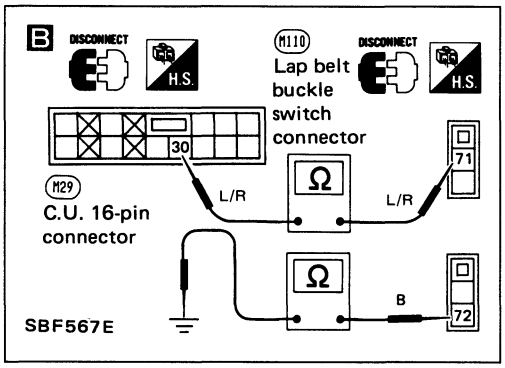


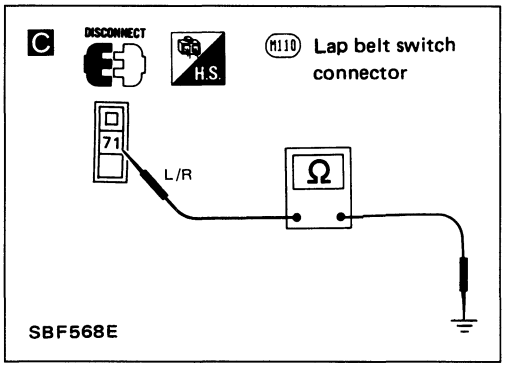
Diagnostic Procedure 5 (Cont'd)



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. → (Go to Ⓐ on next page.)

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-67.)

O.K. → (Go to Ⓐ on next page.)

N.G.

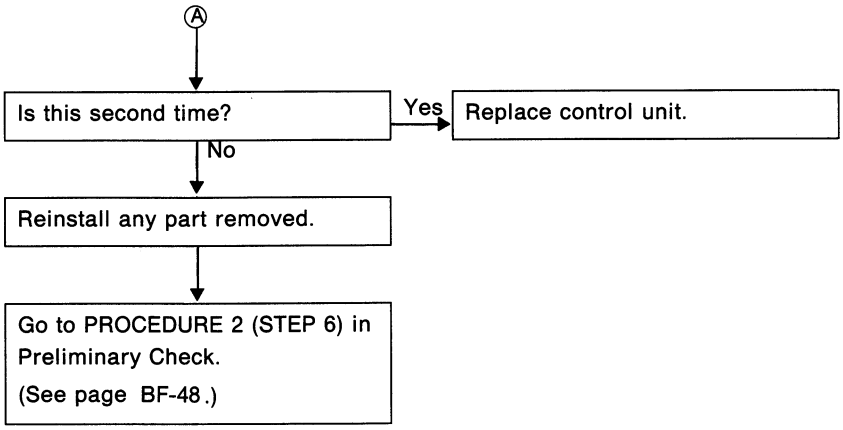
Check lap belt buckle switch harness for open and short circuit.

N.G. → Repair lap belt buckle switch harness.

O.K.

Replace shoulder belt buckle assembly.

Diagnostic Procedure 6 (Cont'd)



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 intermittently.	Sound

O.K. → (Go to Ⓐ below.)

N.G.

B

1) Disconnect connector(s) from combination meter.
2) Check continuity.

Terminals
㉝ - ㊱

Continuity should exist.

N.G. → Repair harness.

O.K.

C

Does continuity exist?

Terminals
㊱ - Ground

Yes → Repair harness. There will be incorrect grounding.

No

D

Check battery voltage existence.

Terminals
㉞ - 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

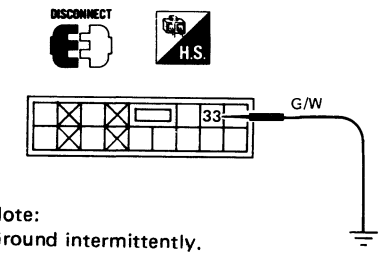
Is this the second time? Yes → Ⓐ Replace control unit.

No

Reinstall any part removed.

Go to PROCEDURE 2 (START) in Preliminary Check.
(See page BF-47.)

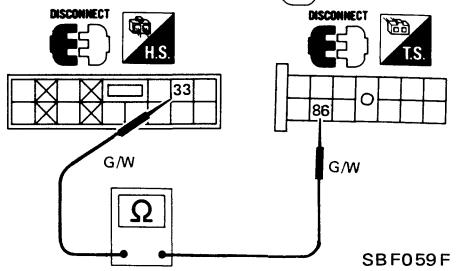
A



Note:
Ground intermittently.

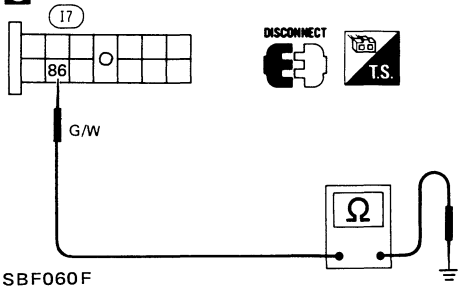
SBF361E

B



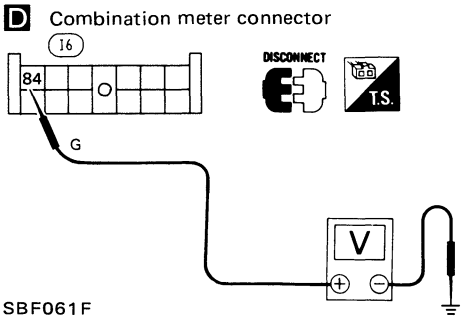
SBF059F

C



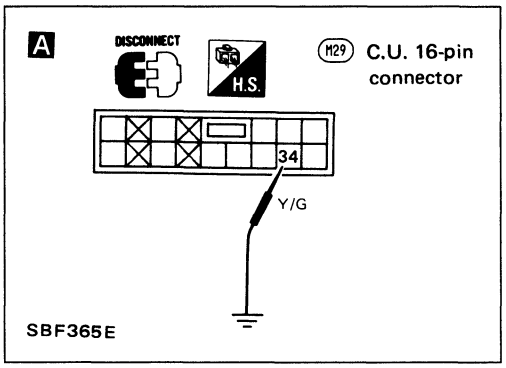
SBF060F

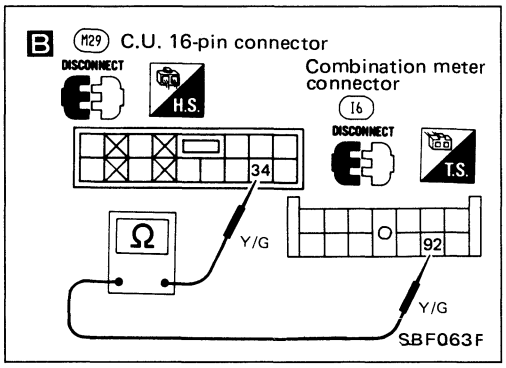
D

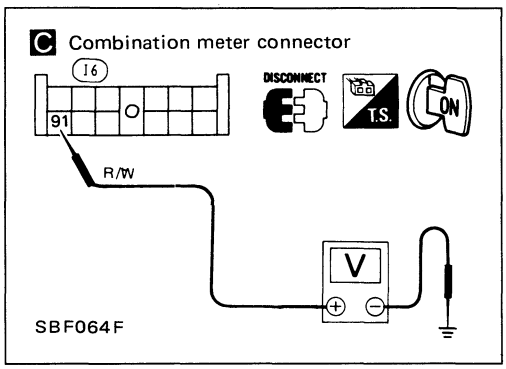


SBF061F

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. → (Go to Ⓐ below.)

N.G.

B

1) Disconnect connector from combination meter.
2) Check continuity.

Terminals
㉞ - ㉜

Continuity should exist.

N.G. → Repair harness

O.K.

B

Does continuity exist?

Terminals
㉜ - Ground

Yes → Repair harness. There will be incorrect grounding.

No

C

Check battery voltage existence.

Terminals
㉛ - 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

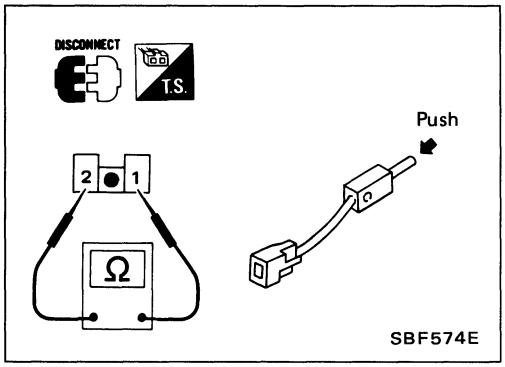
Ⓐ

Is this the second time? Yes → Replace control unit.

No

Reinstall any part removed.

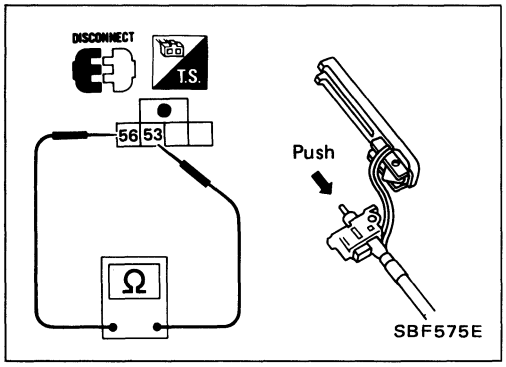
Go to PROCEDURE 2 (START) in Preliminary Check.
(See page BF-47.)



Electrical Components Inspection

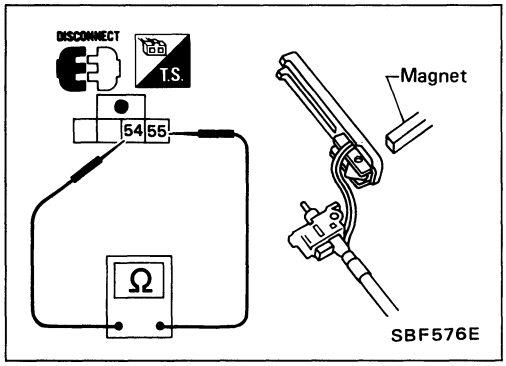
FRONT LIMIT SWITCH

Condition	Continuity
Pushed	No
Released	Yes



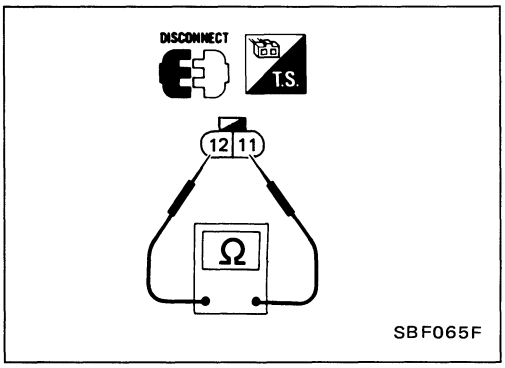
REAR LIMIT SWITCH

Condition	Continuity
Pushed	No
Released	Yes



SHOULDER BELT BUCKLE SWITCH

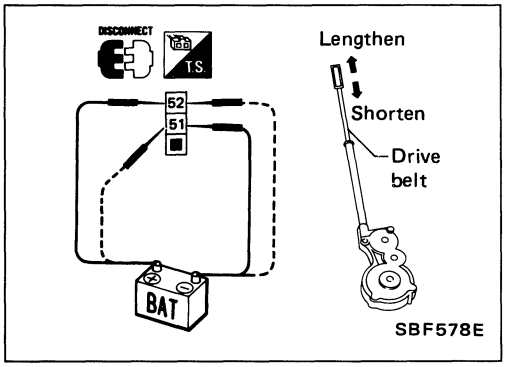
Condition	Continuity
Move magnet toward buckle switch.	Yes
Move magnet away from buckle switch.	No



DOOR LATCH SWITCH

(Built-in door lock assembly)

Door condition	Continuity
Open	Yes
Closed	No



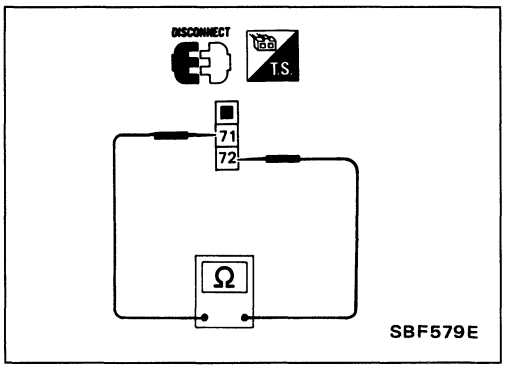
DRIVE MOTOR ASSEMBLY

Terminals		Drive belt operation
⊕	⊖	
52	51	Lengthen
51	52	Shorten

Electrical Components Inspection (Cont'd)

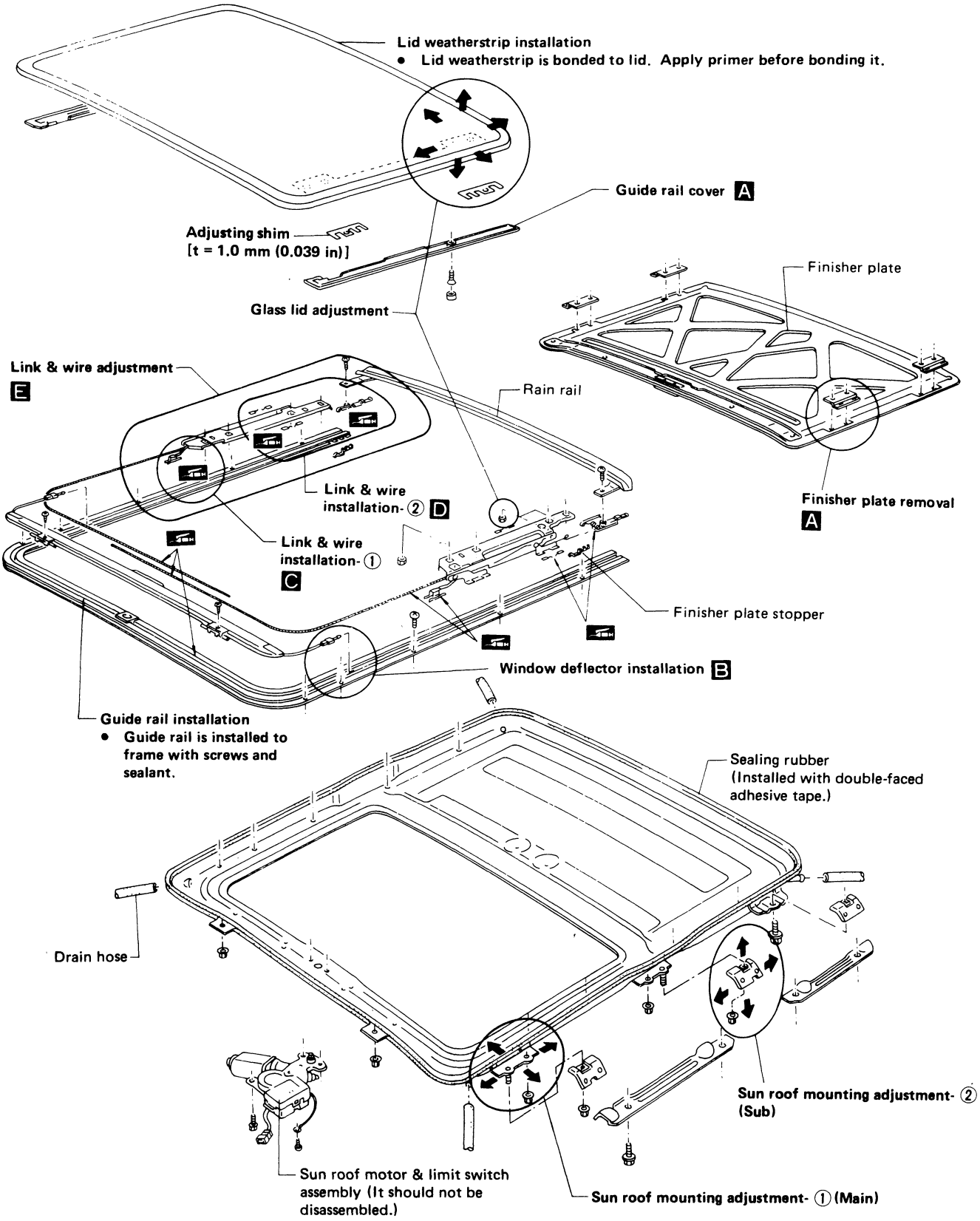
LAP BELT BUCKLE SWITCH

(L.H. side only)



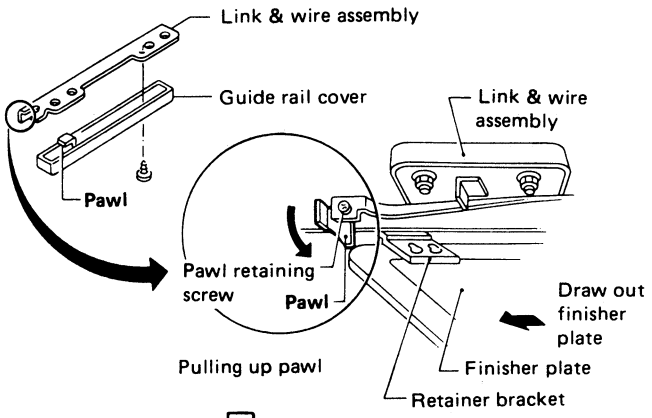
Condition	Continuity
Fastened	No
Unfastened	Yes

- 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 fcr easy installation to mark each point before removal.

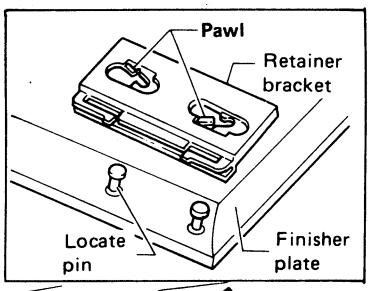


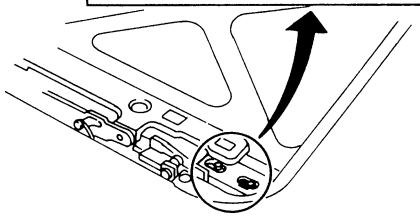
Finisher plate removal A

Remove guide rail cover and pull up pawl by loosening retaining screw, then draw out finisher plate with sun roof lid open.

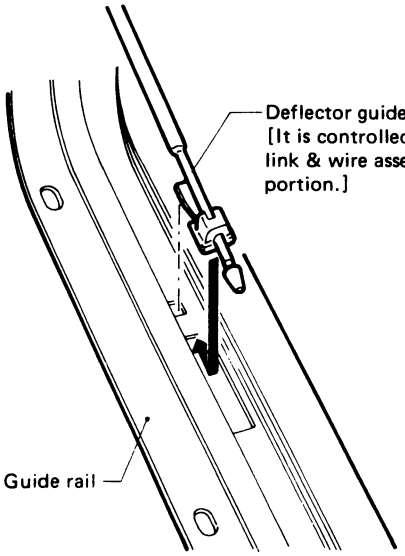


Removal:
Raise pawl of retainer bracket, shift finisher plate and remove locate pins from retainer bracket. Then remove finisher plate.

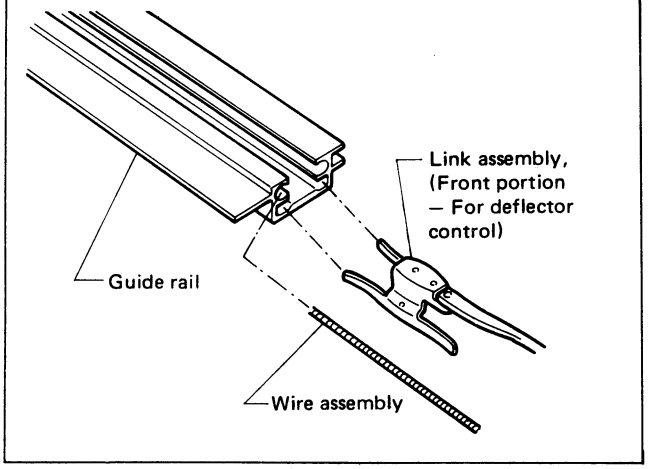




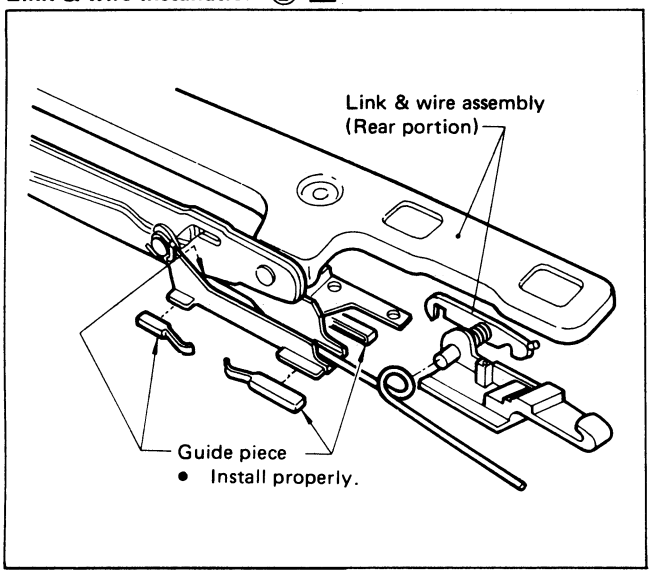
Wind deflector installation B



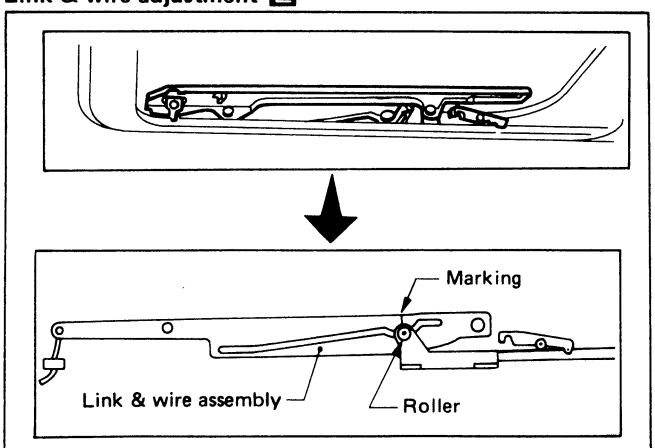
Link & wire installation-① C



Link & wire installation-② D



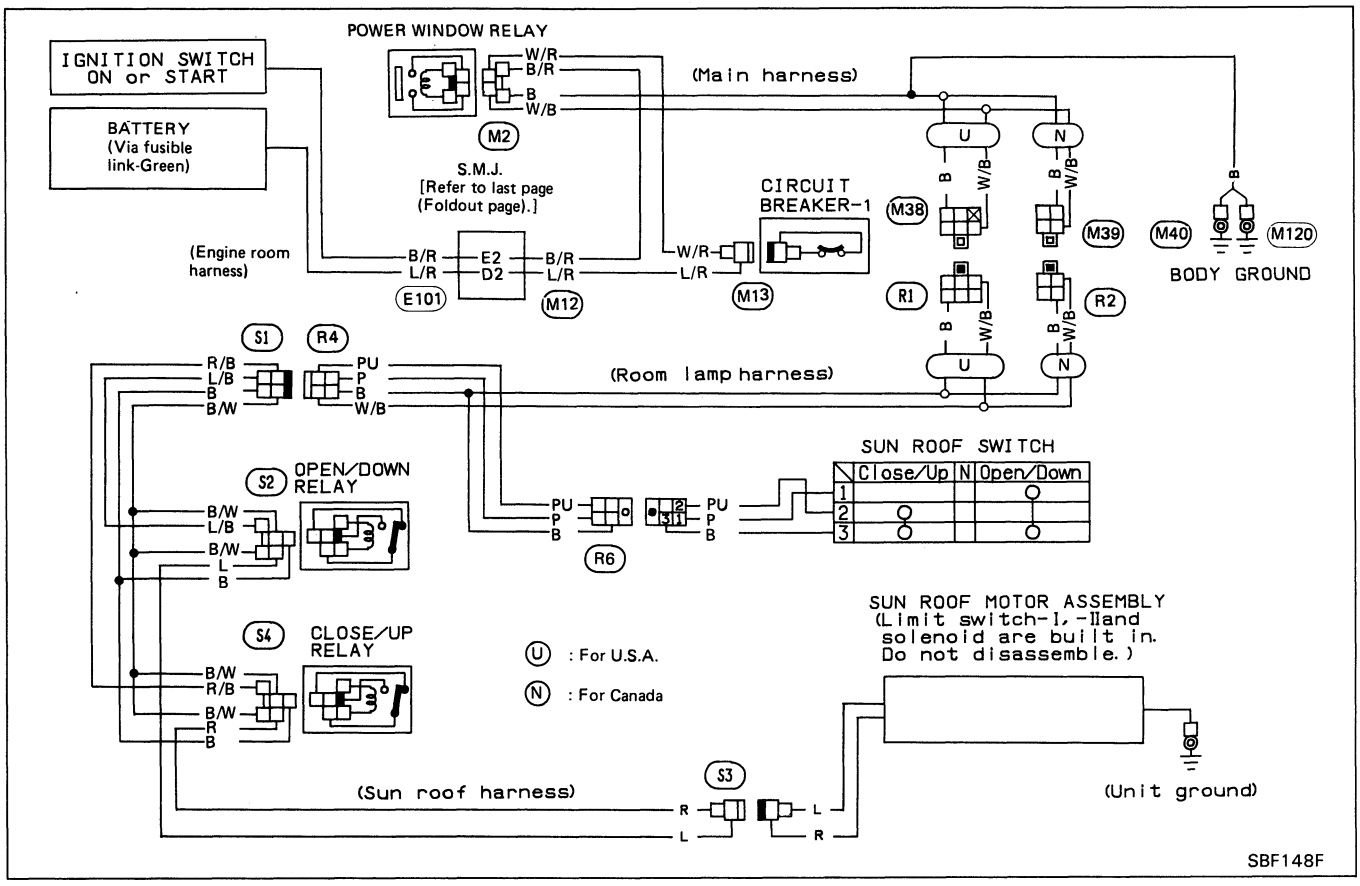
Link & wire adjustment E



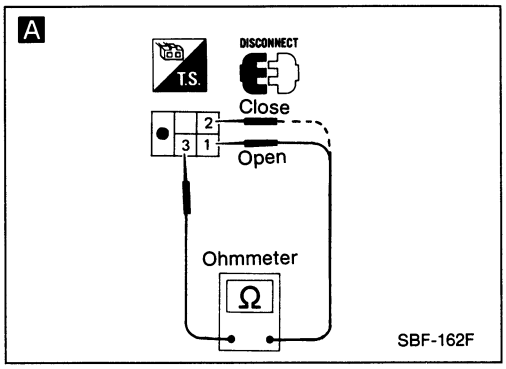
When installing motor & limit switch assembly, set motor & limit switch assembly to fully closed condition using the vehicle's harness and switch first. And adjust link & wire assembly's position as the roller line up at the marking. Then install the motor & limit switch assembly.

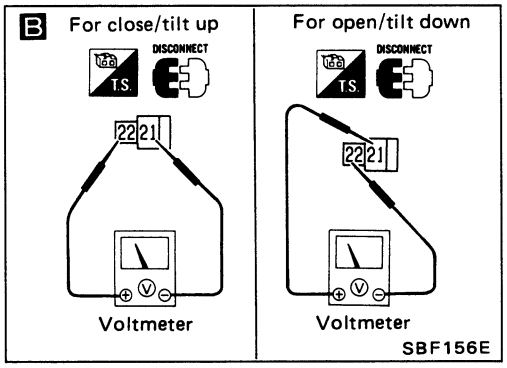
SBF617C

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.
- N.G. → Replace sun roof switch.

Operation	Continuity
Close/tilt up	③ - ②
Open/tilt down	③ - ①

O.K. ↓

Connect sun roof switch connector and disconnect sun roof motor connector.

B

Does battery voltage exist?
- No → Disconnect close/up relay and open/down relay connectors. → Ⓐ
- Yes ↓

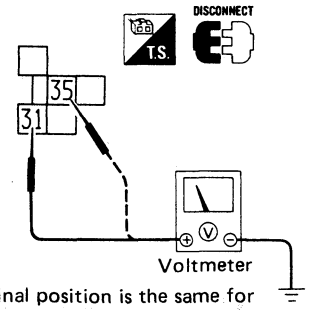
Operation	Terminals	
	⊕	⊖
Close/tilt up	㉒	㉑
Open/tilt down	㉑	㉒

Replace sun roof motor assembly.

END

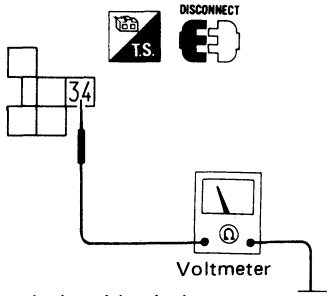
Sun Roof Trouble-shooting (Cont'd)

A



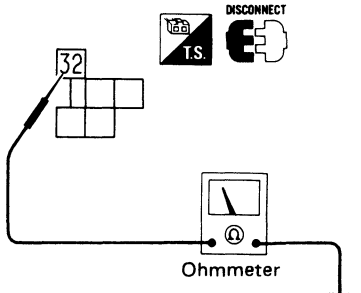
Terminal position is the same for both close and open relays. SBF157E

B



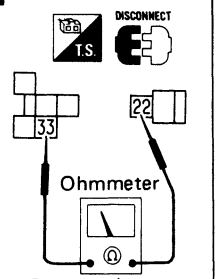
Terminal position is the same for both close and open relays. SEF158E

C

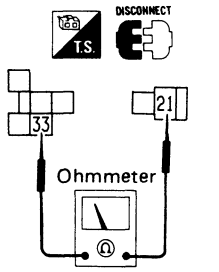


Terminal position is the same for both close and open relays. SEF159E

D



For close/tilt up relay



For open/tilt down relay SEF160E

Ⓐ

A

Does battery voltage exist? — No → Repair harness between terminals ㉛, ㉟ and ㊶ (power window relay output side).

Relay	Terminals ⊕	Terminals ⊖
Close/tilt up	㉛	Ground
	㉟	Ground
Open/tilt down	㉛	Ground
	㉟	Ground

Yes ↓

B

Check continuity. — N.G → Repair harness between terminal ㉞ and body ground (M40 and M120).

Relay	Terminals	
Close/tilt up	㉞	Ground
Open/tilt down	㉞	Ground

O.K. ↓

C

Check continuity between terminal ㉜ and body ground under switch operation. — N.G. → Repair harness between terminal ㉜ and body ground (M40 and M120).

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

O.K. ↓

D

Check continuity. — N.G. → Repair harness between terminals ㉝ and ㉒ or ㉑.

Terminals
㉝ for close/tilt up relay - ㉒
㉝ for open/tilt down relay - ㉑

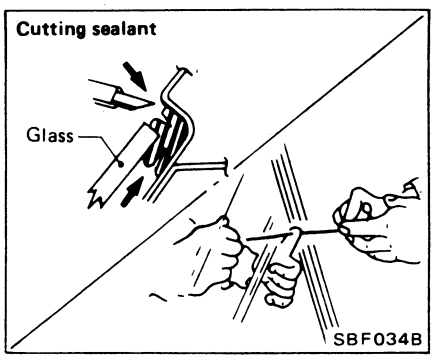
O.K. ↓

Replace relay.

Windshield and Rear Window

REMOVAL

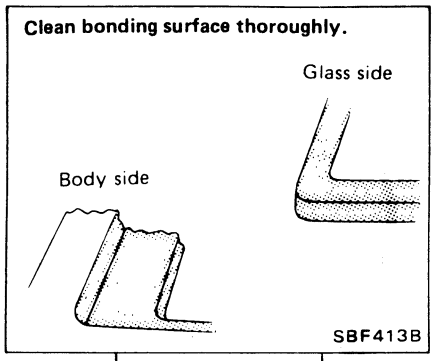
After removing moldings, remove glass.



CAUTION:
Be careful not to scratch glass when removing.

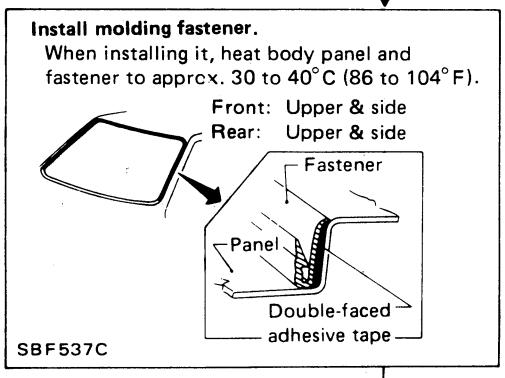
INSTALLATION

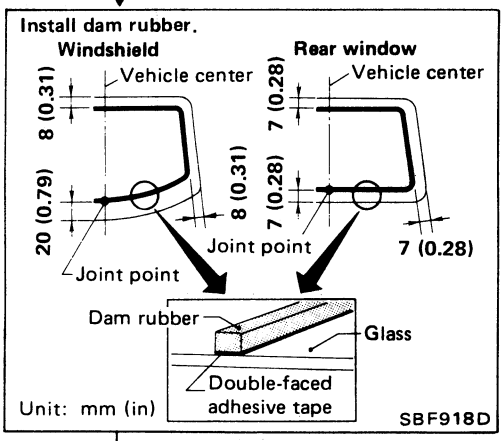
- **Use genuine Nissan Sealant kit or equivalent. Follow instructions furnished with it.**
- **After installation, the vehicle should remain stationary for about 24 hours.**
- **Do not use sealant which is more than 12 months past its production date.**
- **Do not leave cartridge unattended with its cap open.**
- **Keep primers and sealant in a cool, dry place. Ideally, they should be stored in a refrigerator.**

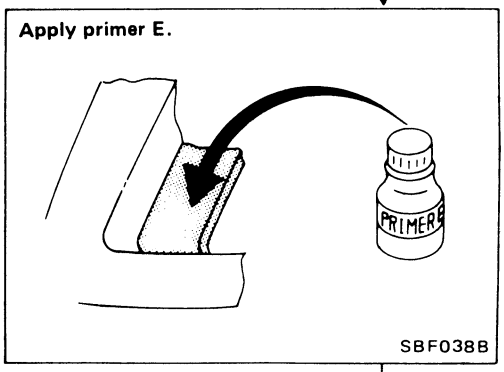


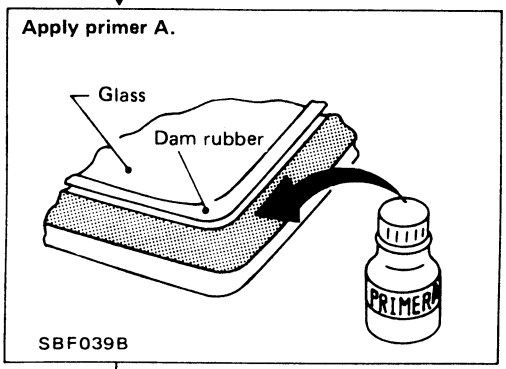
WARNING:
Keep heat or open flames away as primers are flammable.

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.

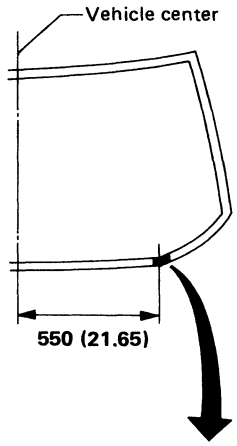
Ⓐ Ⓑ

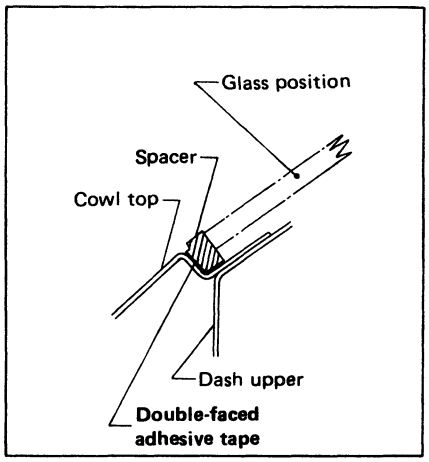
Windshield and Rear Window (Cont'd)

Ⓐ

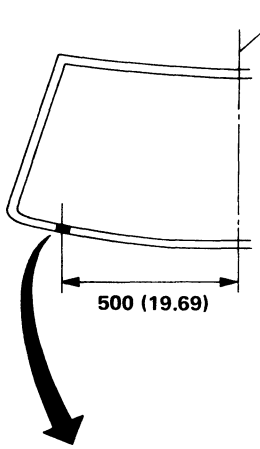
Install spacers with double-faced adhesive tape.

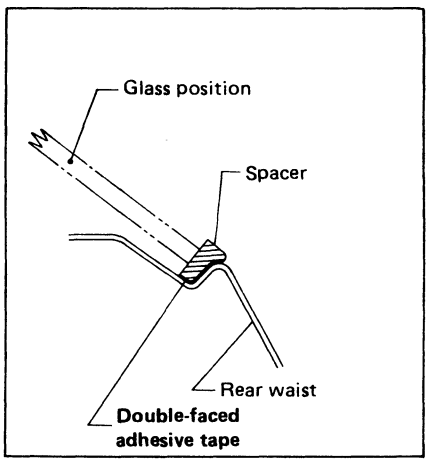
Windshield





Rear window





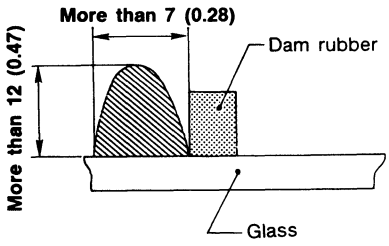
Unit: mm (in)

SBF117E

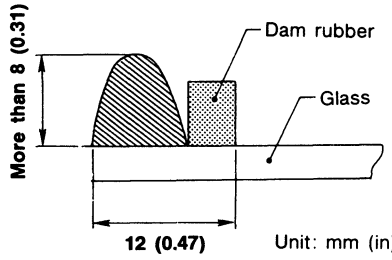
Ⓑ

Apply sealant evenly.

Windshield



Rear window



Unit: mm (in)

SBF097F

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

Relative humidity / Temperature °C (°F)	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

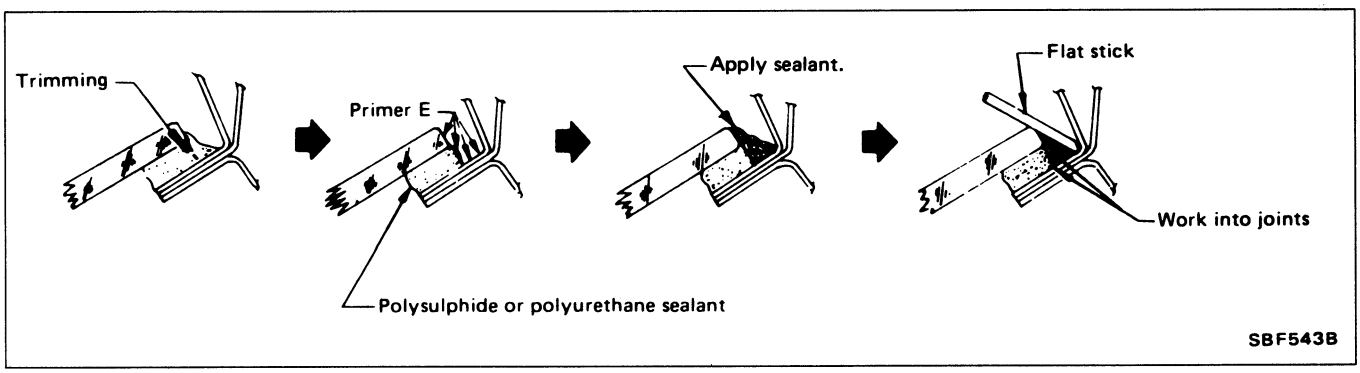
CAUTION:
Advise the user of the fact that vehicle should not be driven on rough roads or surfaces until sealant has properly vulcanized.

Repairing Water Leaks for Windshield and Rear Window

Leaks can be repaired without removing and reinstalling glass.

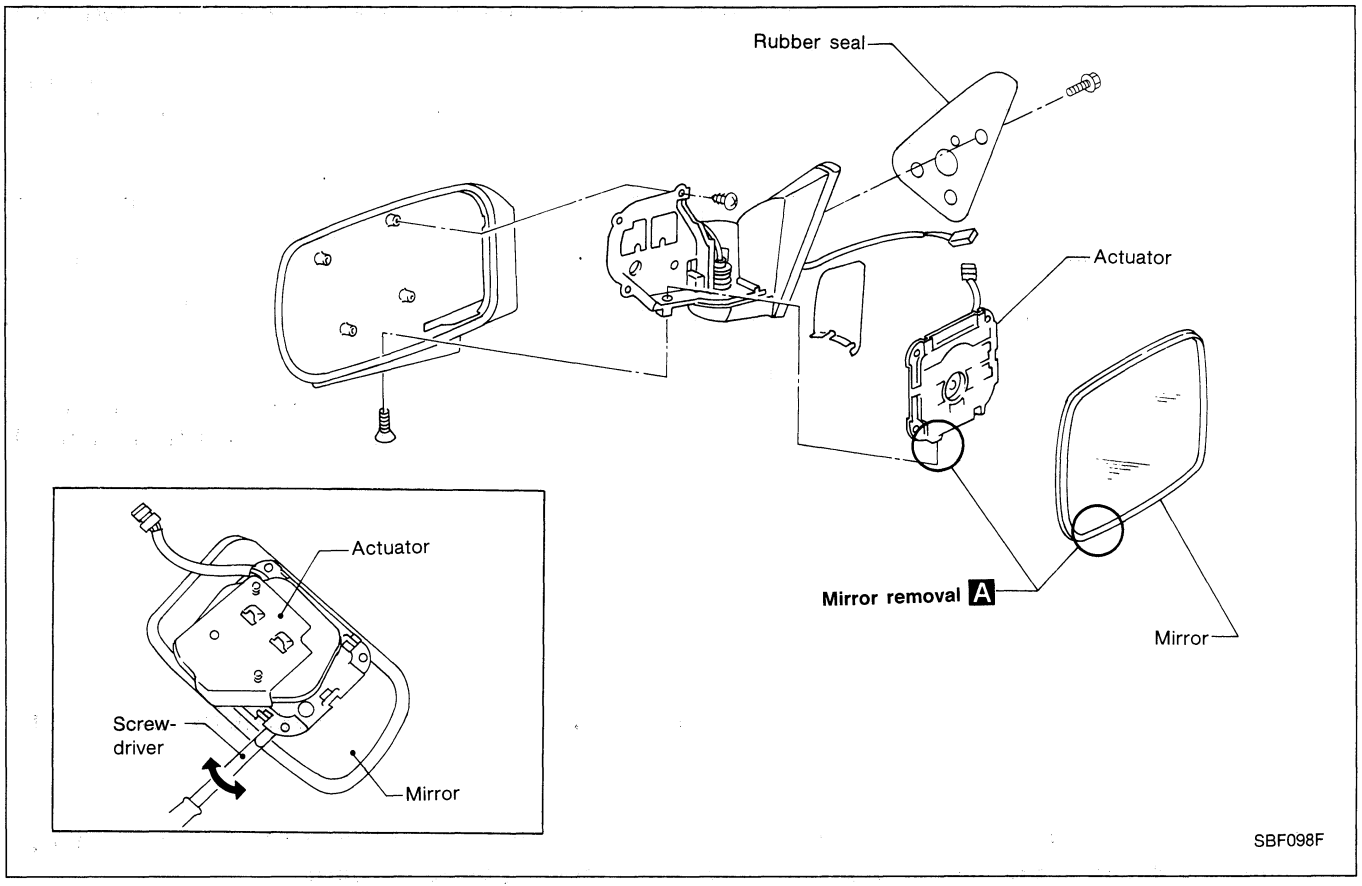
If water is leaking between caulking material and body or between glass and caulking material, determine the extent of the leak by applying water while pushing glass outward.

To stop the leak, apply primer and then sealant to the leak point.

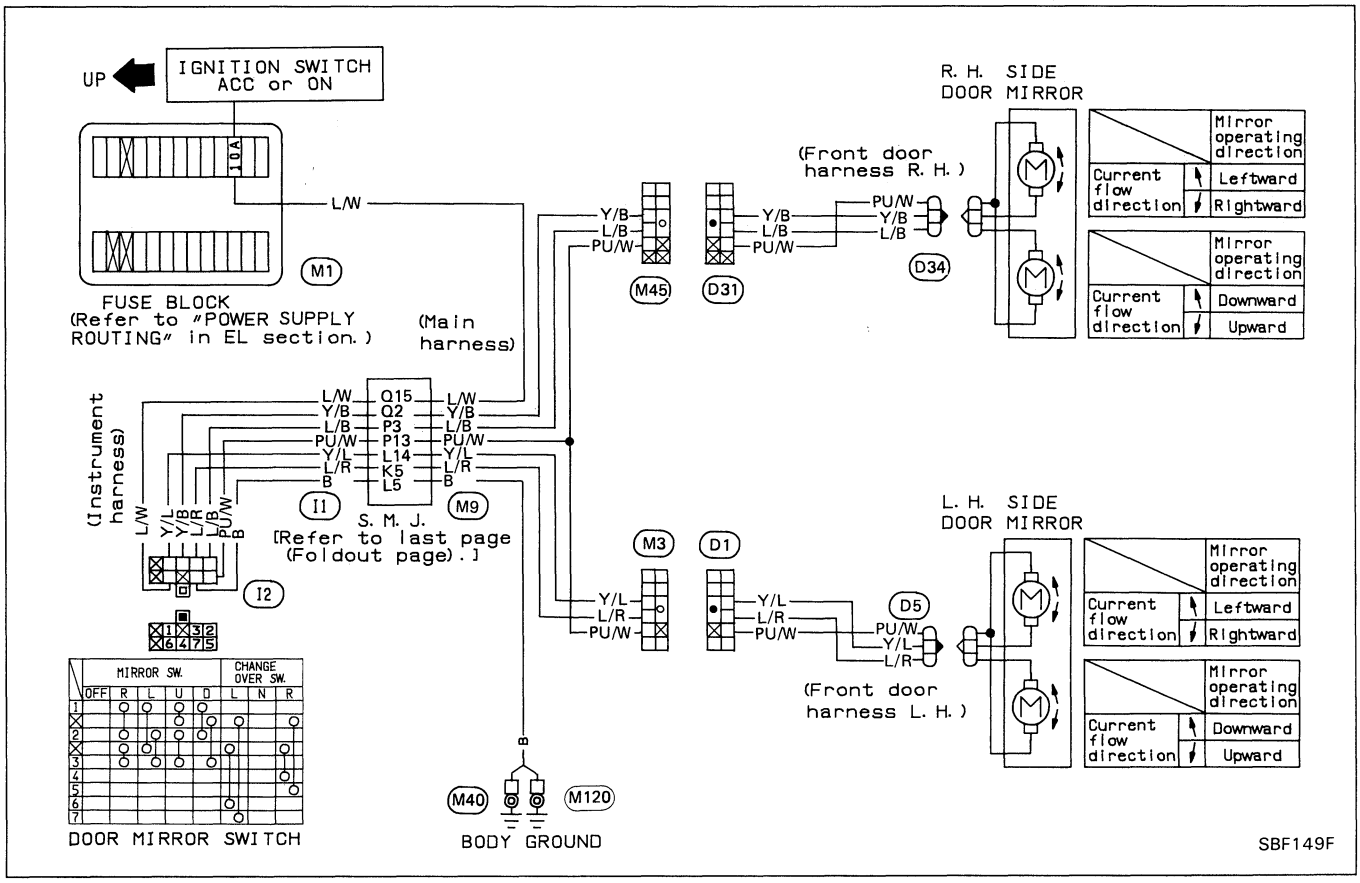


Afterwards, install molding securely.

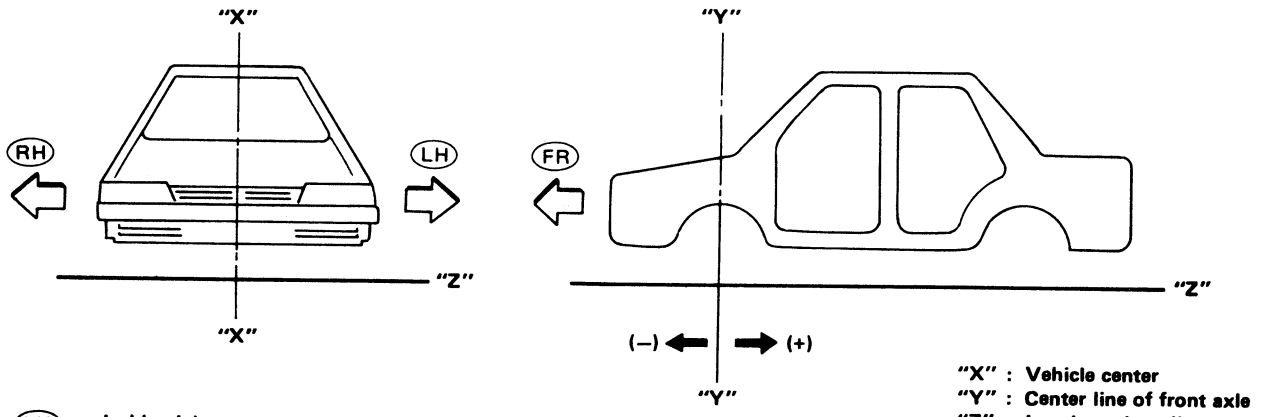
Door Mirror



WIRING DIAGRAM



- 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".

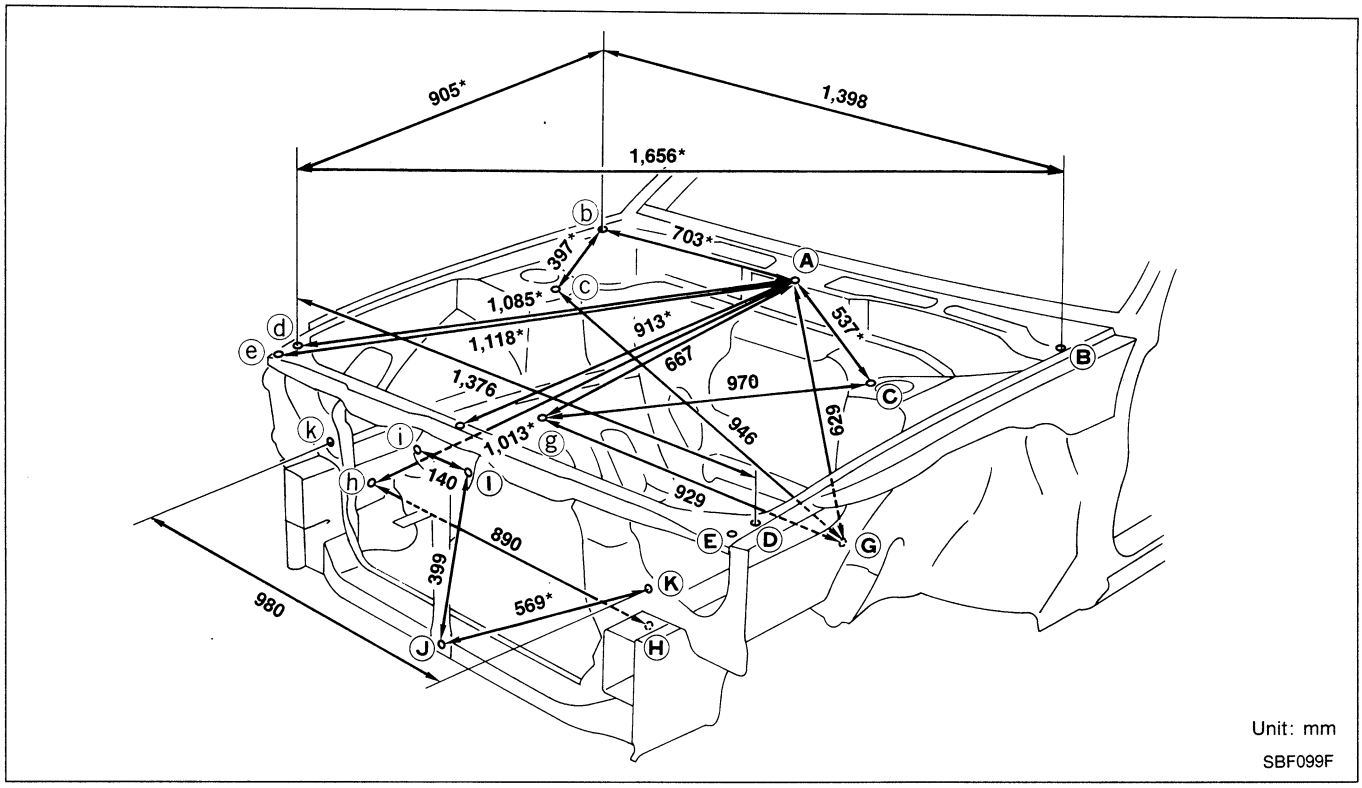


(LH) : L.H. side
(RH) : R.H. side

"X" : Vehicle center
"Y" : Center line of front axle
"Z" : Imaginary base line [200 mm below datum line ("OZ" at design plan)]

Engine Compartment

MEASUREMENT

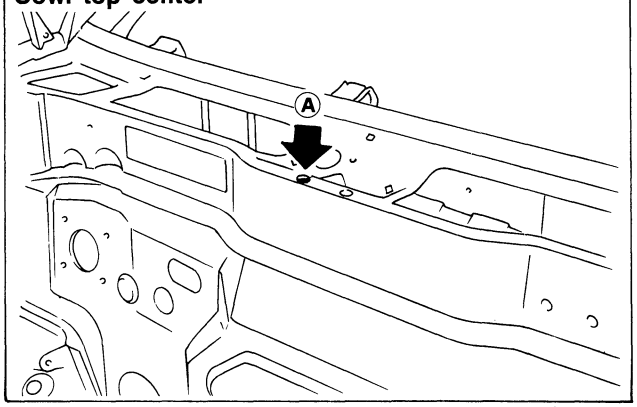


Engine Compartment (Cont'd)

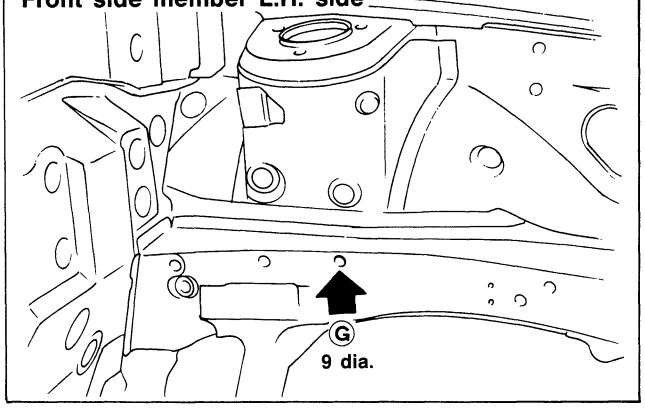
MEASUREMENT POINTS

Unit: mm

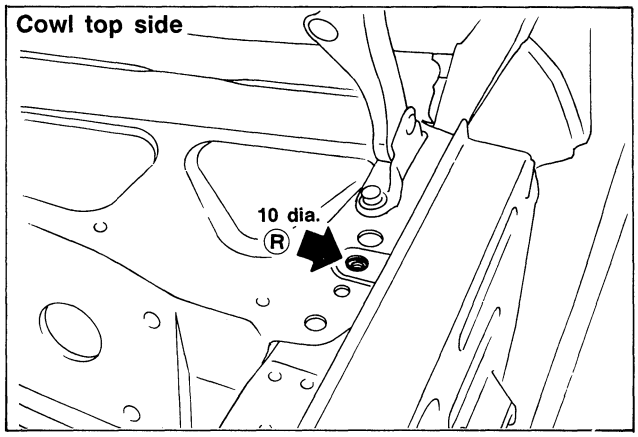
Cowl top center



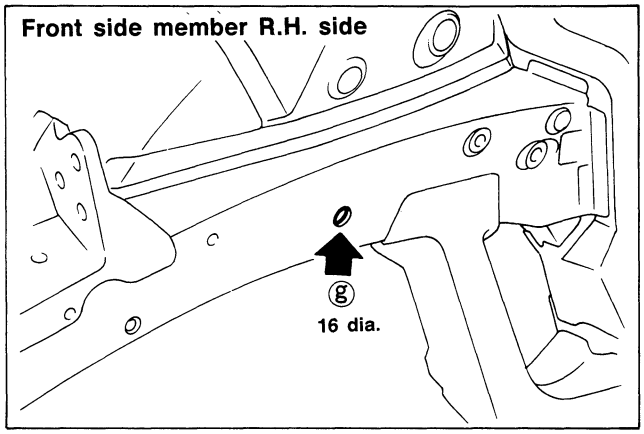
Front side member L.H. side



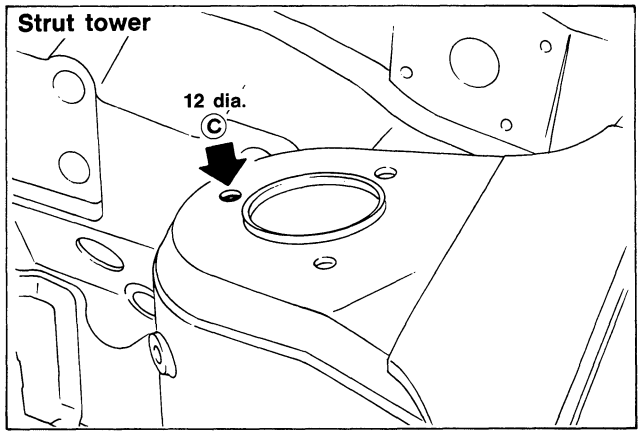
Cowl top side



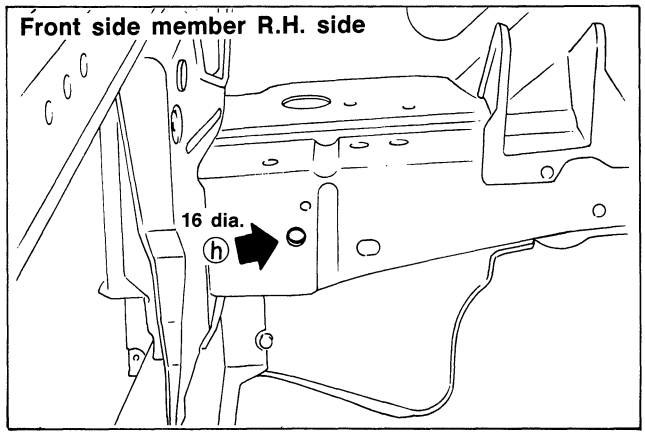
Front side member R.H. side



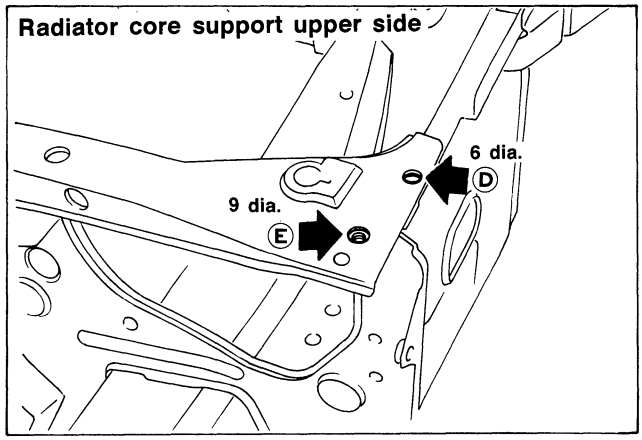
Strut tower



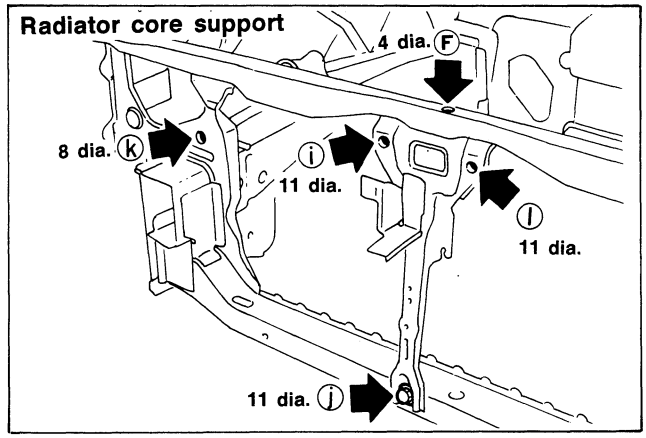
Front side member R.H. side



Radiator core support upper side



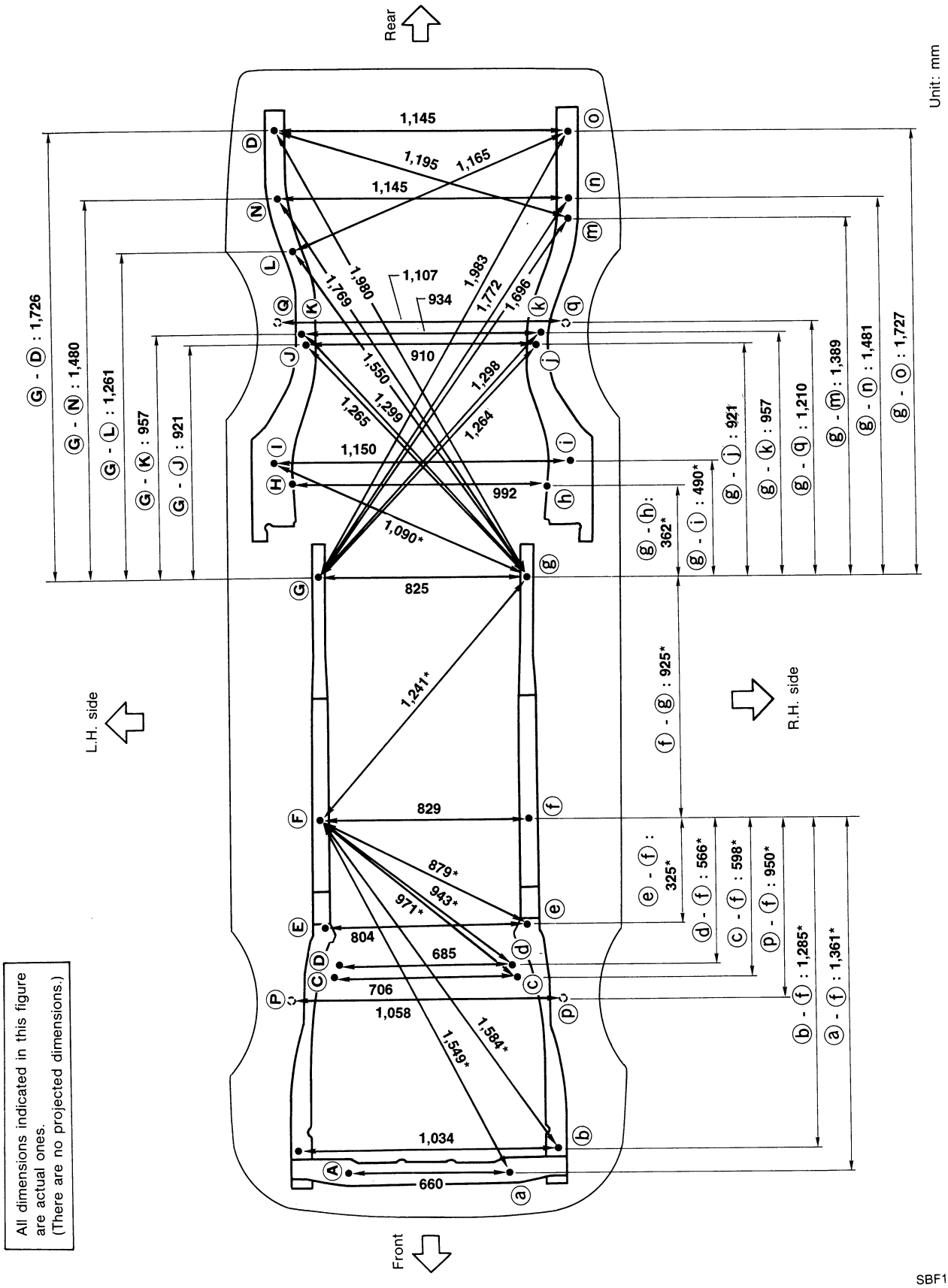
Radiator core support



SBF100F

Underbody

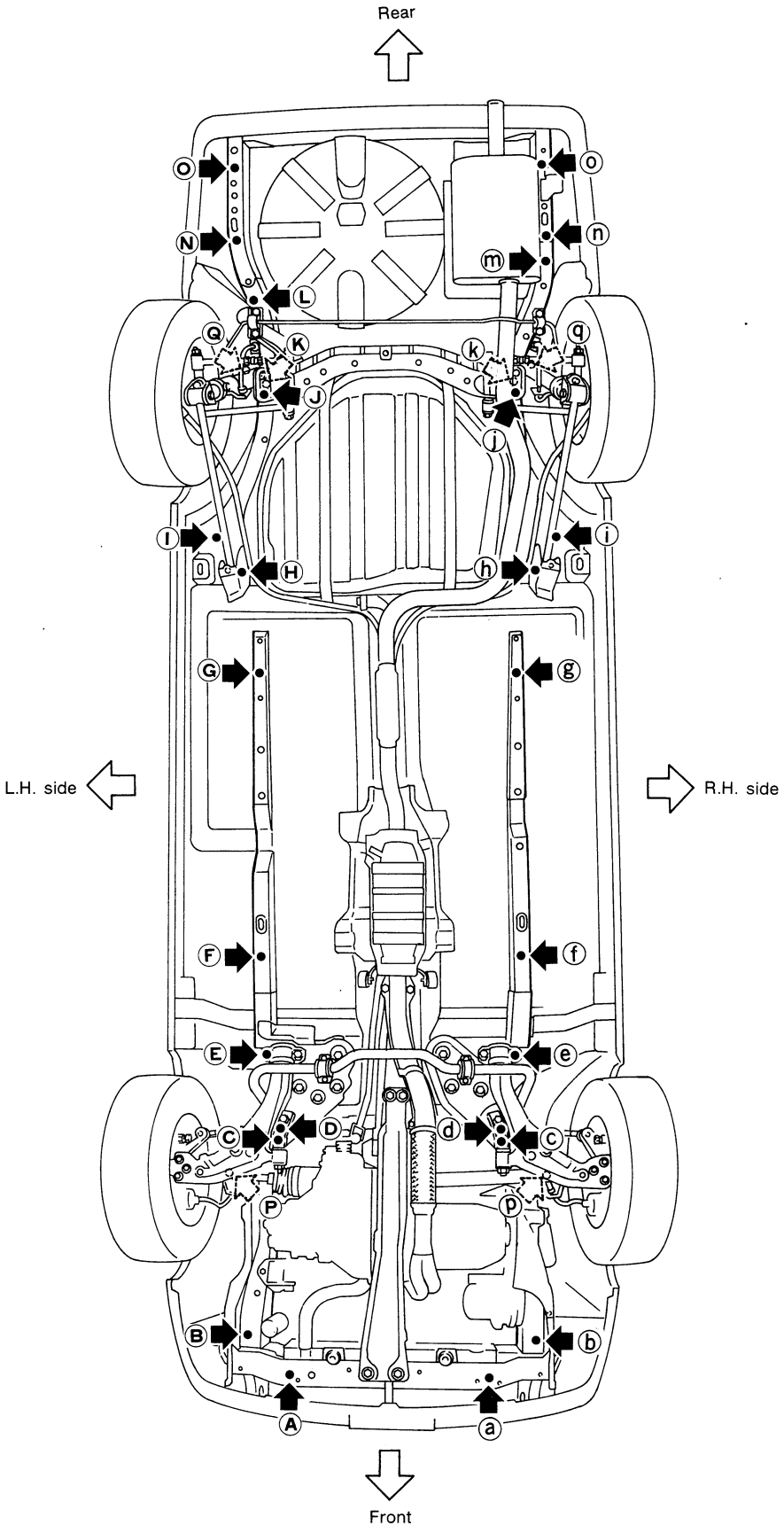
MEASUREMENT



SBF101F

Underbody (Cont'd)

MEASUREMENT POINTS



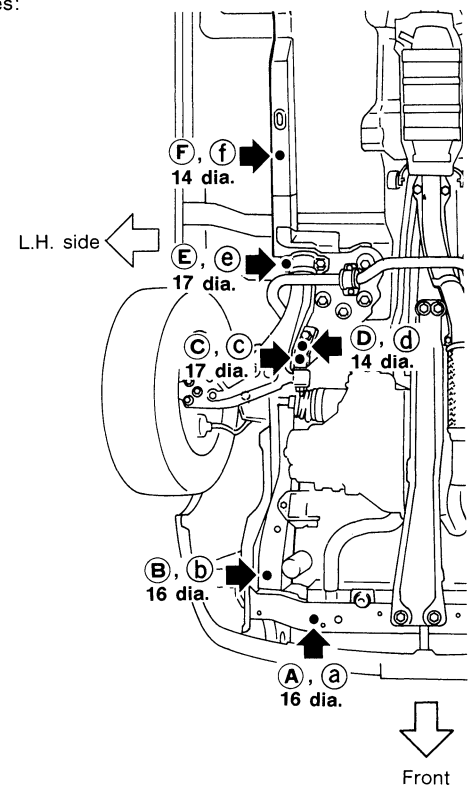
SBF102F

Underbody (Cont'd)

Unit: mm

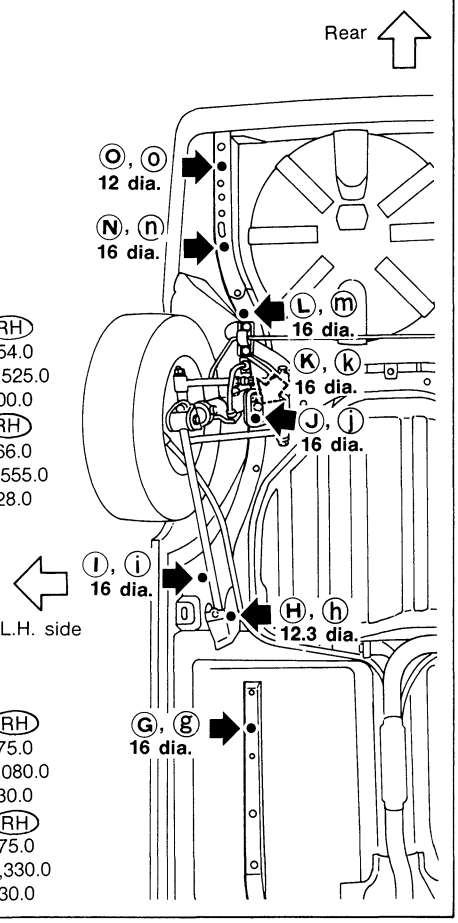
Radiator core lower support, front side member, front side member extension, front suspension mounting lower member and dash lower cross-member

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



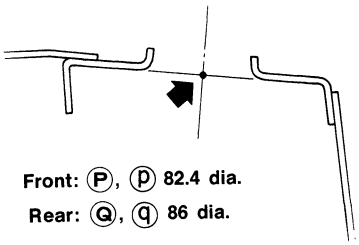
Front side member rear extension, rear side member, rear suspension radius rod bracket and rear suspension mounting bolt top

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



Front: Ⓟ, ⓟ 82.4 dia.
Rear: Ⓠ, ⓠ 86 dia.

SBF103F

HEATER & AIR CONDITIONER

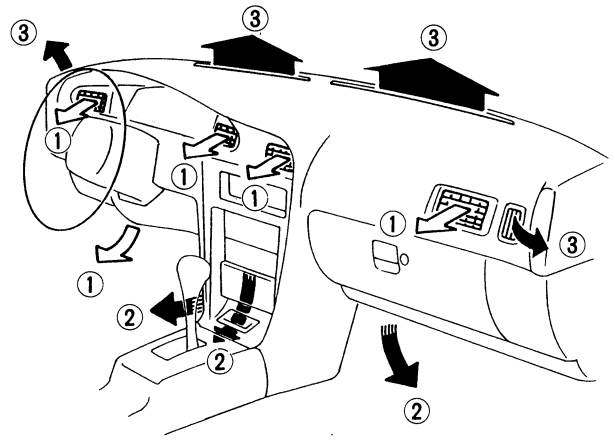
SECTION HA

CONTENTS

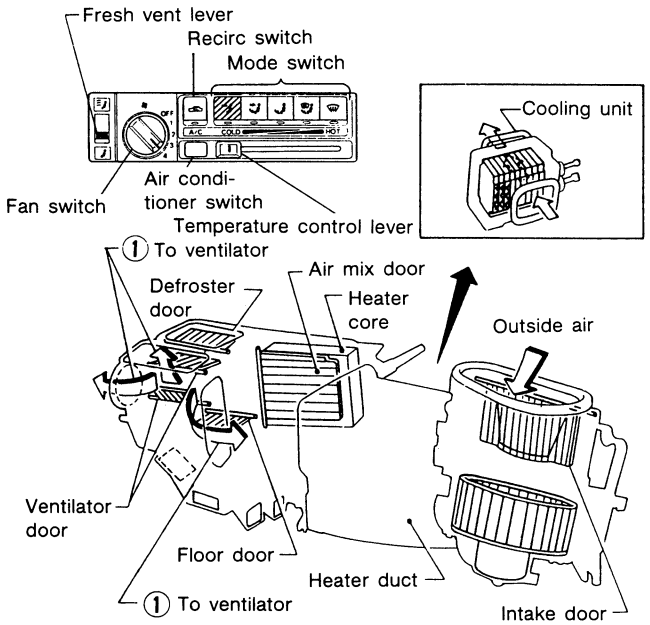
When you read wiring diagrams:
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

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

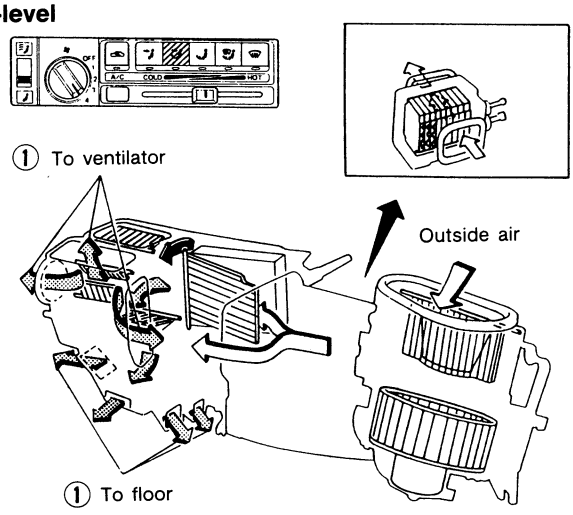
Air Flow



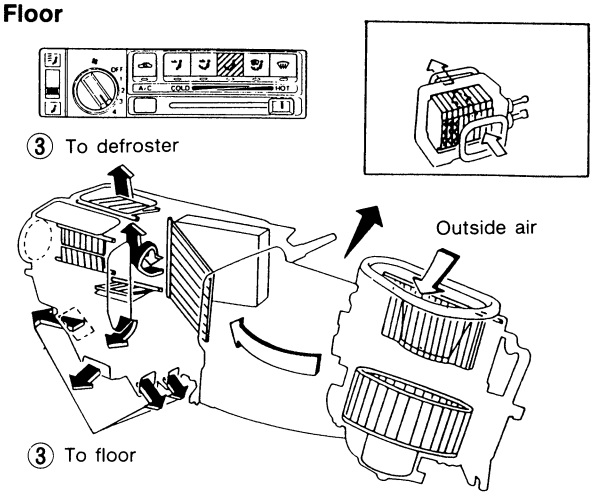
Ventilation



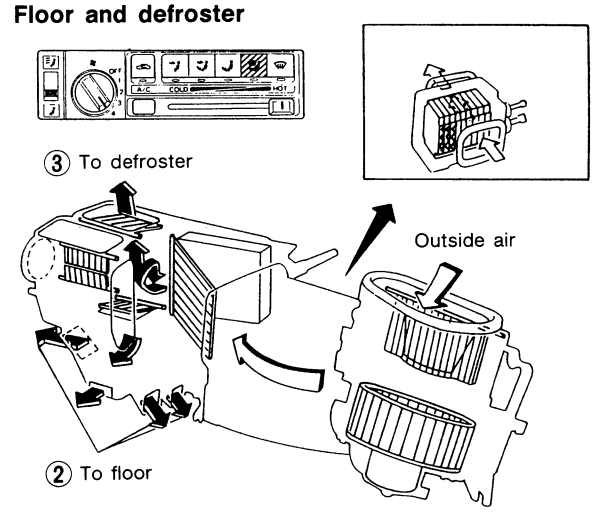
Bi-level



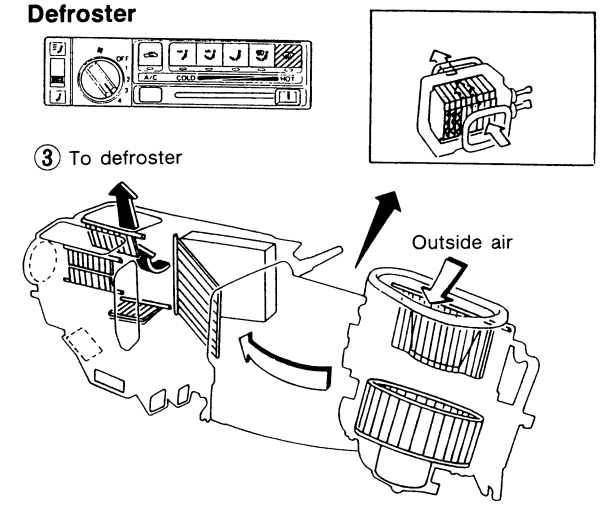
Floor



Floor and defroster



Defroster



: Air passed through heater core

: Mixed air (+)

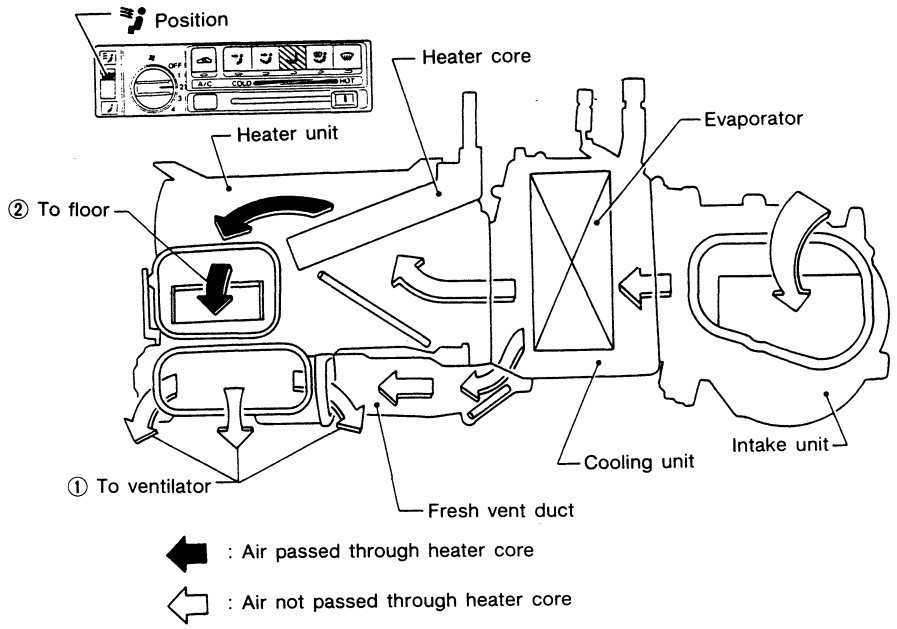
: Air not passed through heater core

RHA150B

Air Flow (Cont'd)

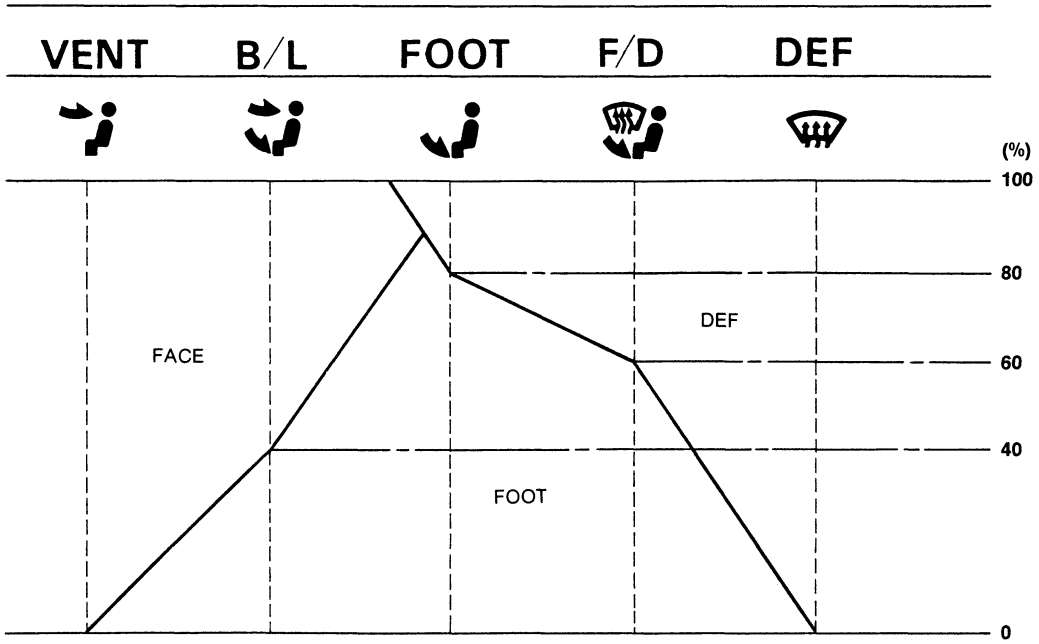
FRESH VENT SYSTEM

In order to prevent unpleasant hot air on face in heater mode, or especially in FOOT, FOOT/DEF or DEF modes, this system can prepare cold air flow to ventilator ducts directly (without passing through heater core) by means of a fresh air vent lever beside push control unit.



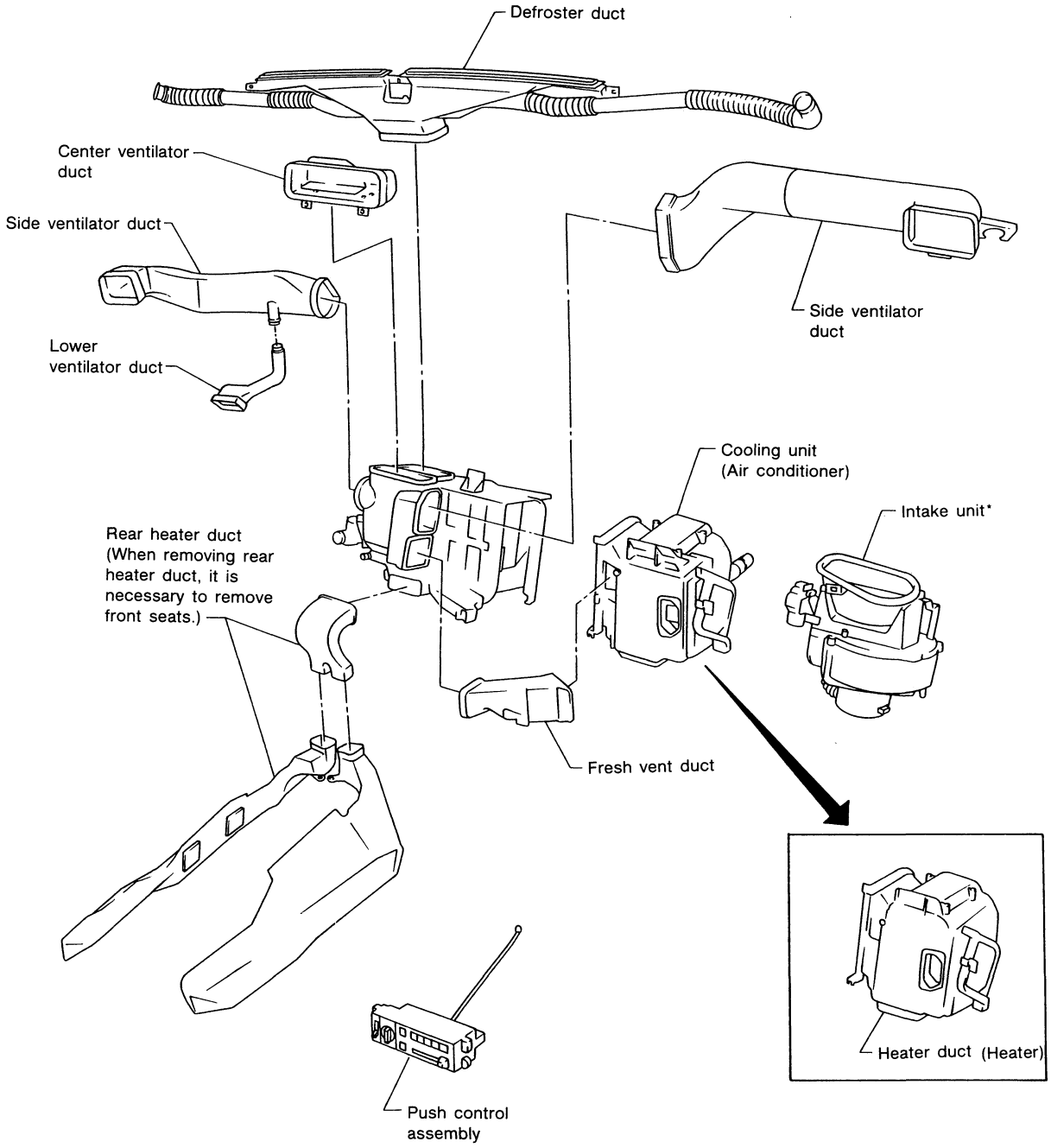
RHA151B

AIR DISTRIBUTION RATIOS



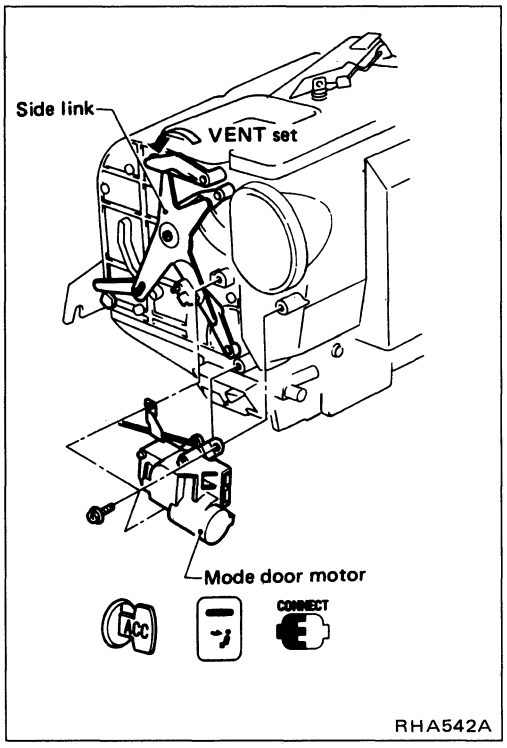
RHA152B

Component Layout



*: For removal, it is necessary to remove instrument assembly

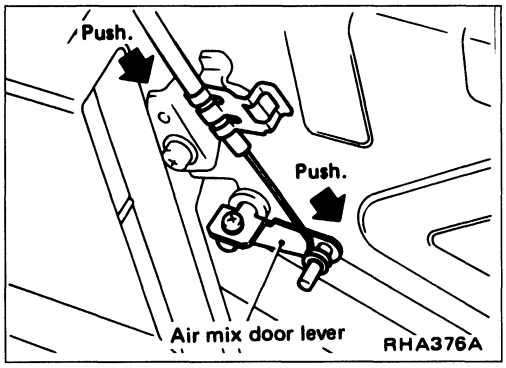
RHA153B



Control Cable and Rod Adjustment

MODE DOOR

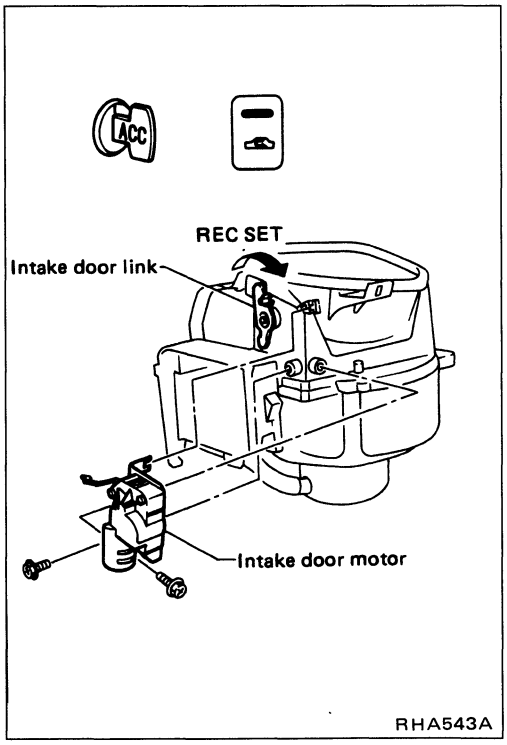
1. Move side link with hand and hold mode door in VENT mode.
2. Install mode door motor on heater unit and connect it to body harness.
3. Turn ignition switch to ACC.
4. Turn VENT switch ON.
5. Attach mode door motor rod to side link rod holder.
6. Turn DEF switch ON. Check that side link operates at the fully-open position. Also turn VENT switch ON to check that side link operates at the fully-open position.



TEMPERATURE CONTROL CABLE

- Clamp the cable while pushing cable outer and air mix door lever in direction of arrow.

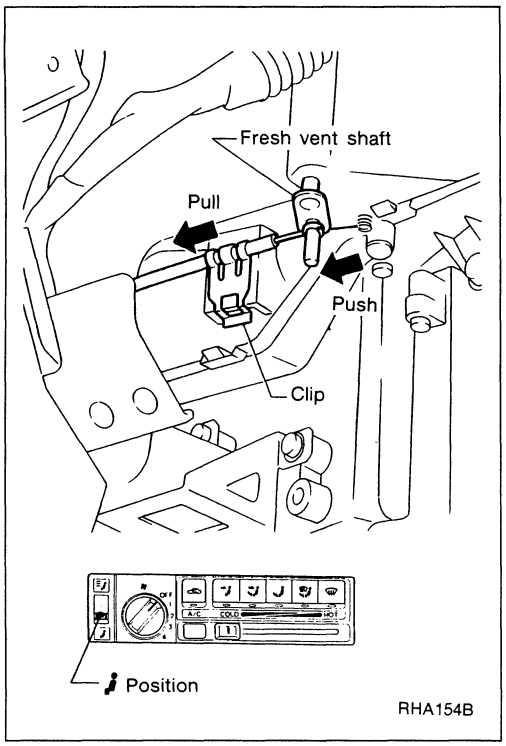
After positioning control cable, check it operates properly.



INTAKE DOOR

1. Connect the intake door motor harness connector before installing to the intake door motor.
2. Turn ignition switch to ACC.
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 Cable and Rod Adjustment (Cont'd)

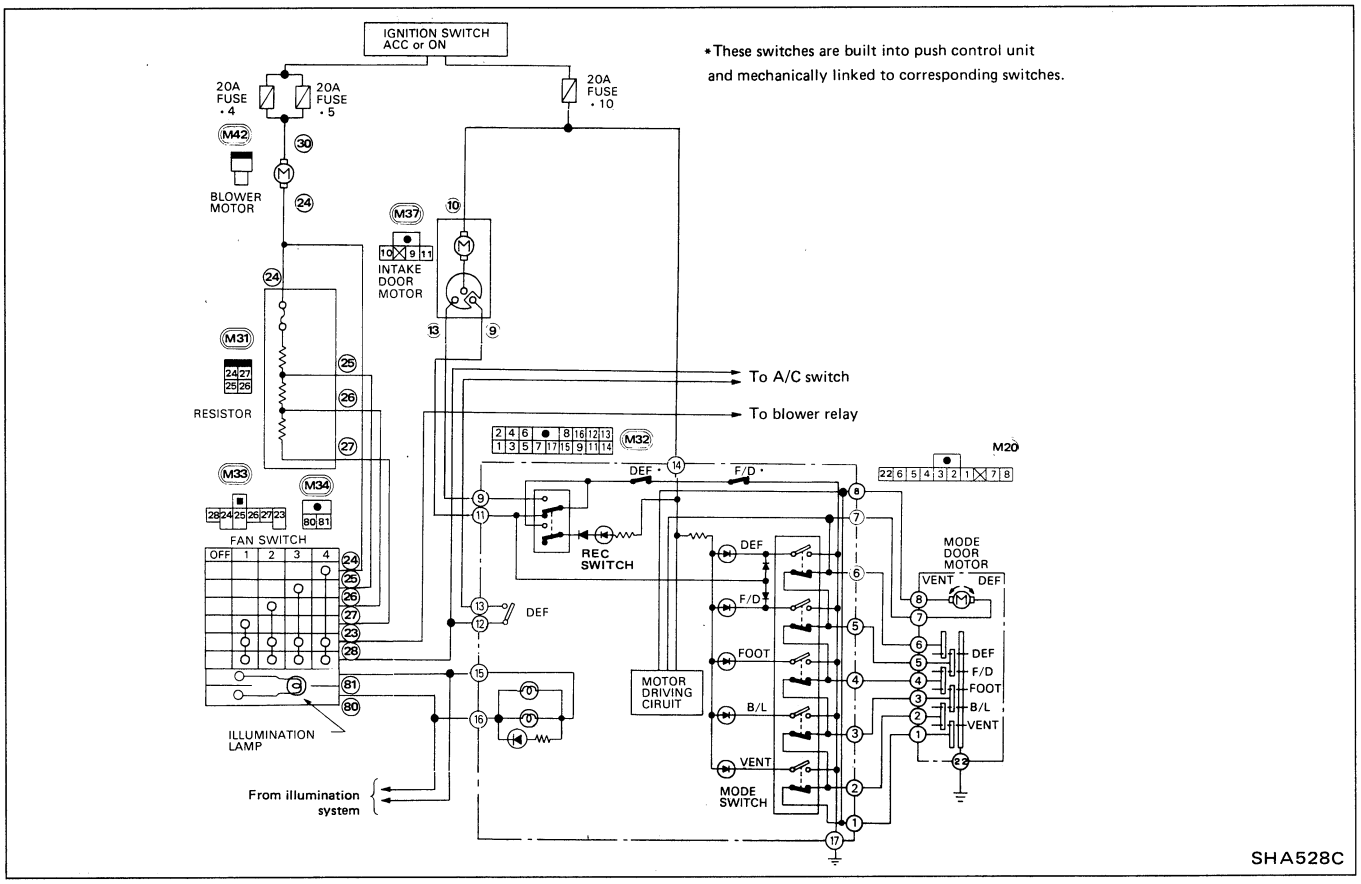


FRESH VENT DOOR

- Clamp the cable while pushing cable outer and fresh vent shaft in direction of arrow.

After positioning control cable, check it operates properly.

Push Control System

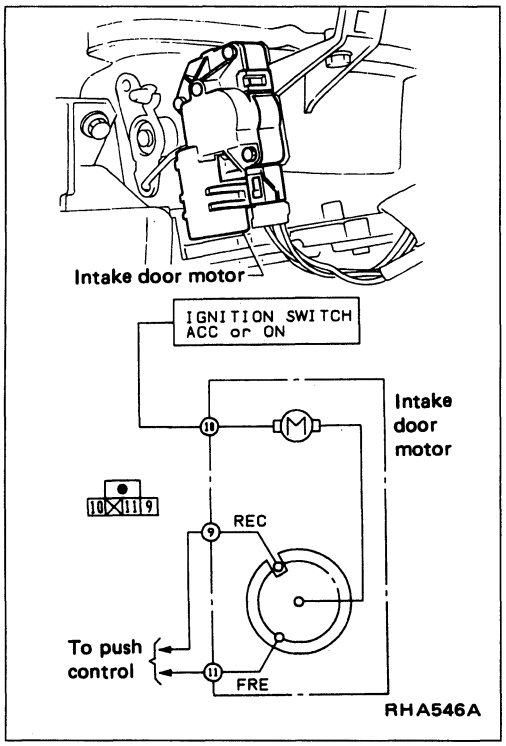


This push control system operates the intake and mode door motors to activate their corresponding doors.

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	

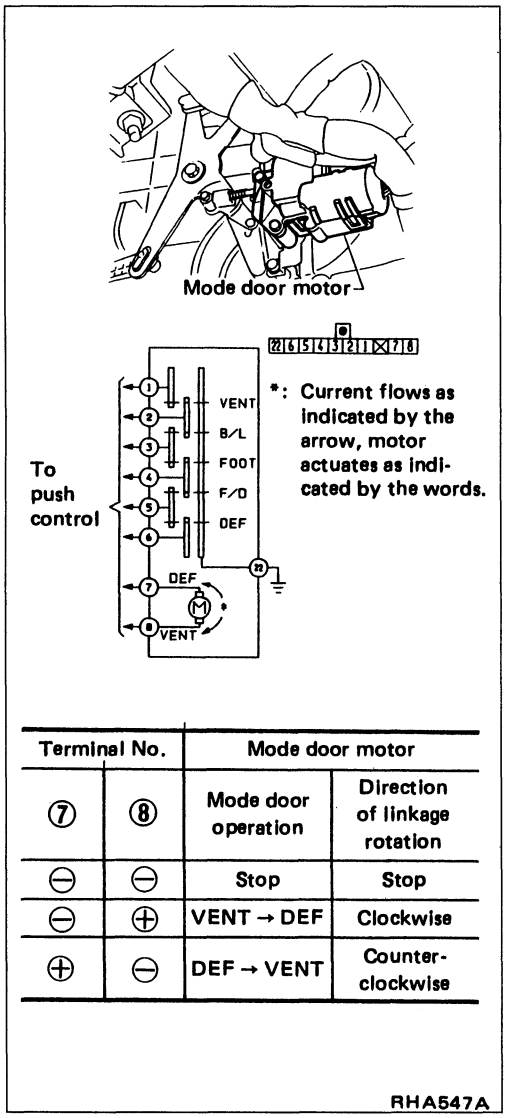
*1: Compressor is operated by thermo control amp.
*2: Depending on mode switch position



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.



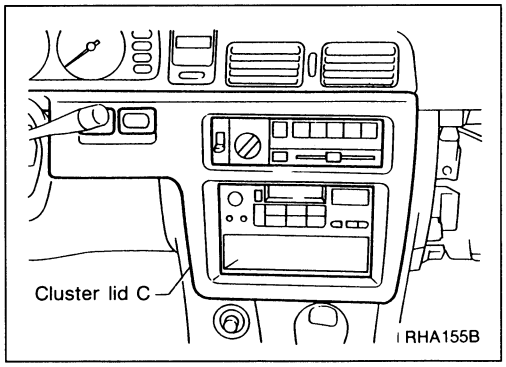
Terminal No.		Mode door motor	
⑦	⑧	Mode door operation	Direction of linkage rotation
⊖	⊖	Stop	Stop
⊖	⊕	VENT → DEF	Clockwise
⊕	⊖	DEF → VENT	Counter-clockwise

RHA547A

Mode Door Motor

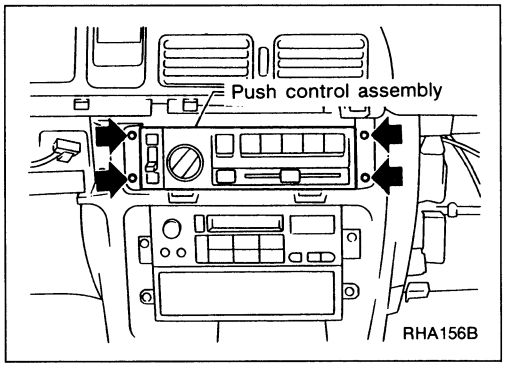
The mode door motor is located on the left side of the heater unit. Through the side link it opens and closes the vent, foot and defroster door.

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

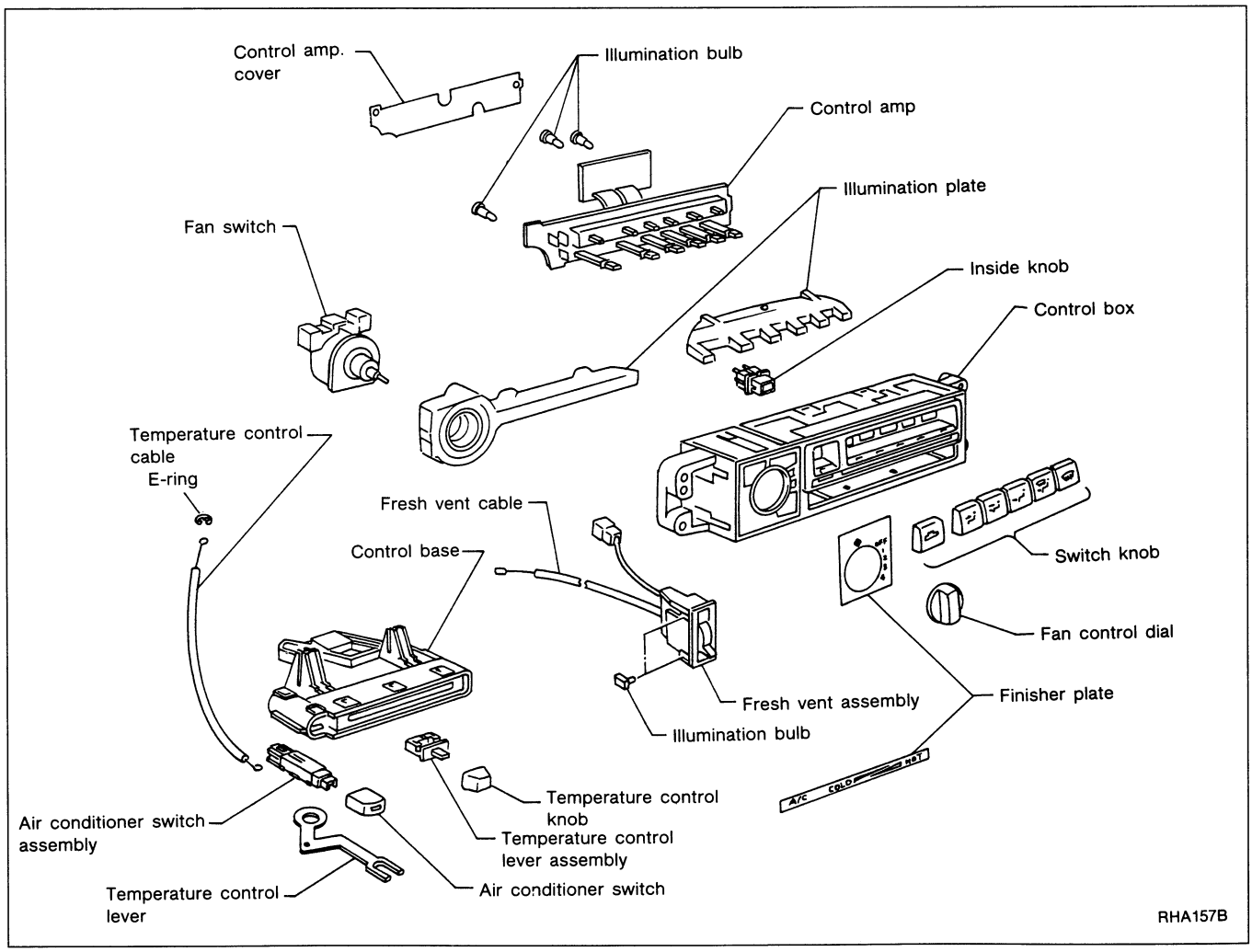
1. Remove cluster lid C.



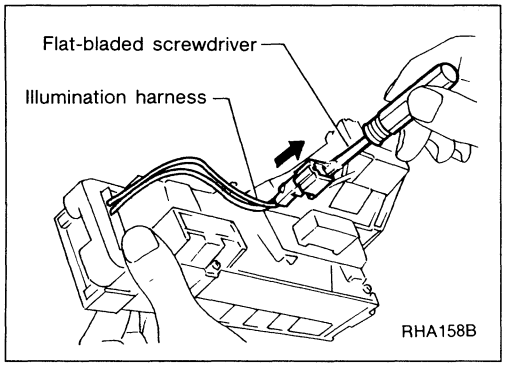
2. Remove audio (radio).
3. Remove four screws of push control unit.
4. Remove temperature control cable.
5. Remove fresh vent door cable.
6. Disconnect push control unit harness connectors.
7. Remove push control unit.
8. Installation is in the reverse order of removal.

Refer to "Control Cable and Rod Adjustment" for temperature control cable.

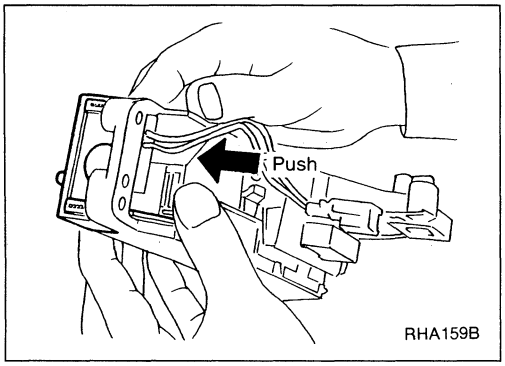
Overhaul — Push control unit assembly



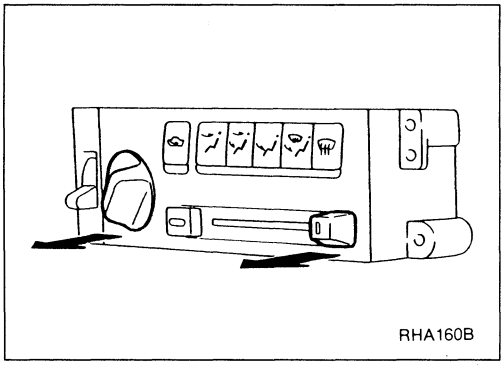
Overhaul — Push control unit assembly (Cont'd)



1. Disconnect illumination harness connector.

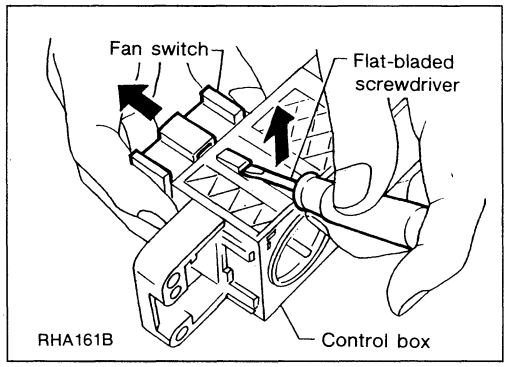


2. Remove fresh vent assembly.

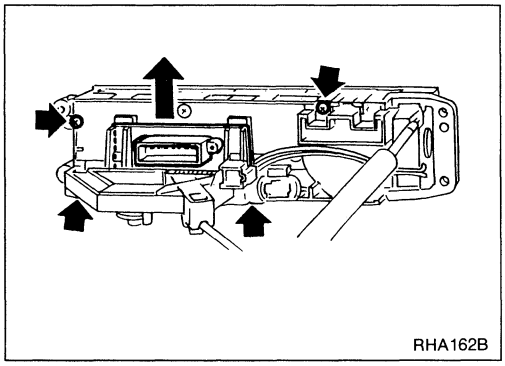


3. Remove temperature control knob & fan control dial.

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.

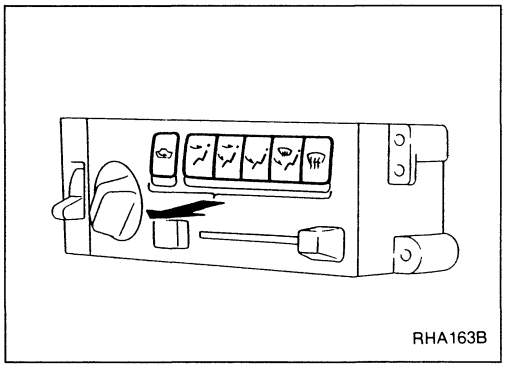


4. Remove fan switch.



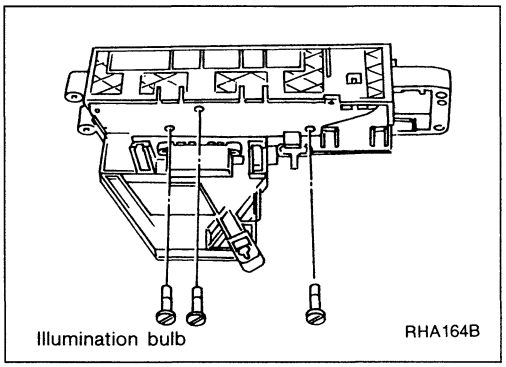
5. Remove control base & control amp. cover.

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.



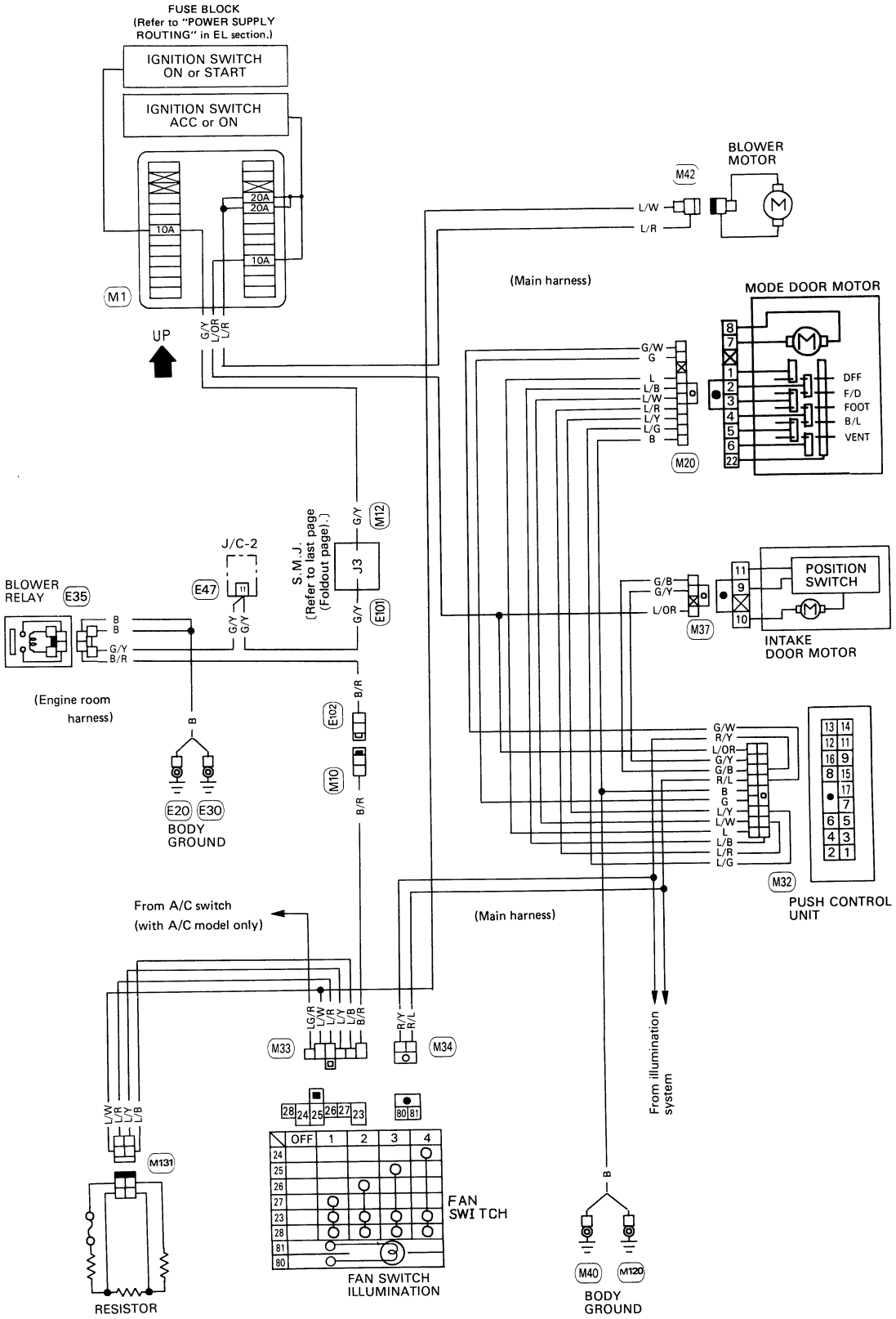
7. Remove illumination bulbs.

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.

Wiring Diagram



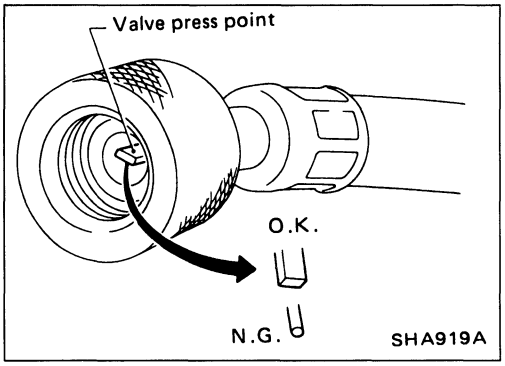
SHA531C

WARNING:

- **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 can with an open flame. There is a danger that can will explode.**

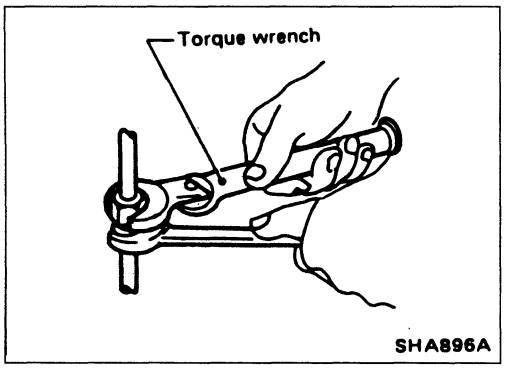
CAUTION:

- **Do not use steam to clean surface of condenser or evaporator. Be sure to use cold water or compressed air.**
- **Compressed air must never be used to clean a dirty line. Clean with refrigerant gas.**



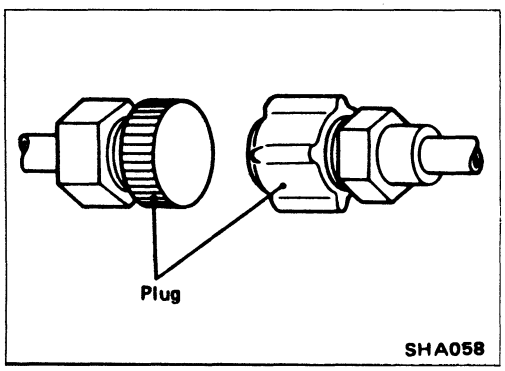
- Do not use manifold gauge whose press point shape is different from that shown. Otherwise, insufficient evacuating may occur.

- Do not over-tighten service valve cap.
- Do not allow refrigerant to rush out. Otherwise, compressor oil will be discharged along with refrigerant.

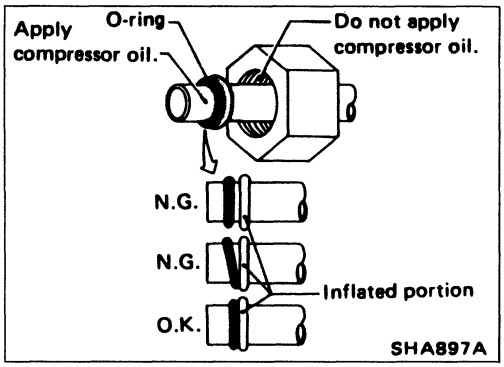


WARNING:
Gradually loosen discharge side hose fitting, and remove it after remaining pressure has been released.
CAUTION:
When replacing or cleaning refrigerant cycle components, observe the following.

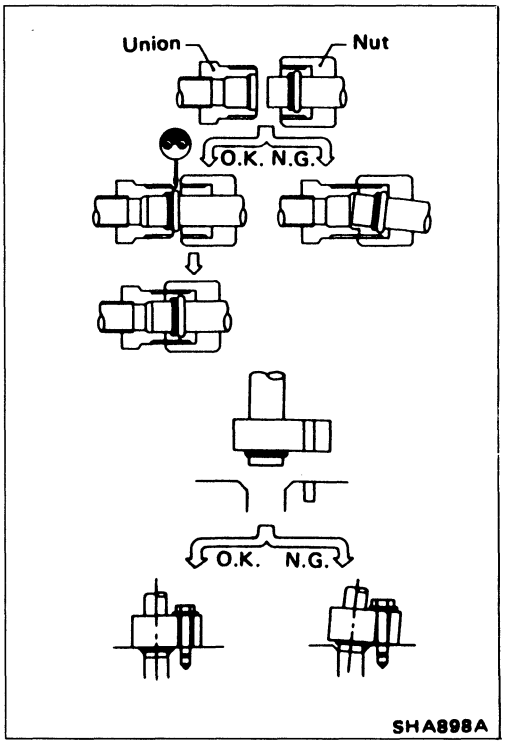
- **Do not leave compressor on its side or upside down for more than 10 minutes, as compressor oil will enter low pressure chamber.**
- **When connecting tubes, always use a torque wrench.**



- After disconnecting tubes, plug all openings immediately to prevent entrance of dirt and moisture.

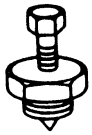
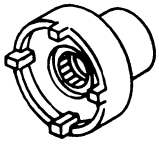


- Always replace used O-rings.
- When connecting tube, apply compressor oil to portions shown in illustration. Be careful not to apply oil to threaded portion.
- O-ring must be closely attached to inflated portion of tube.

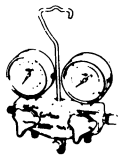
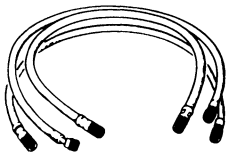
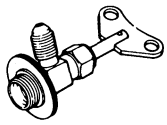
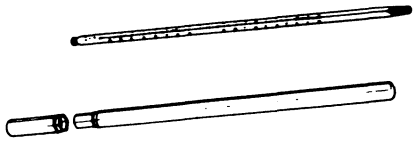
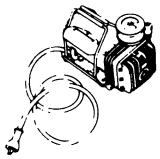
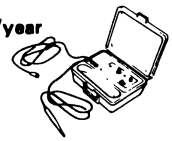


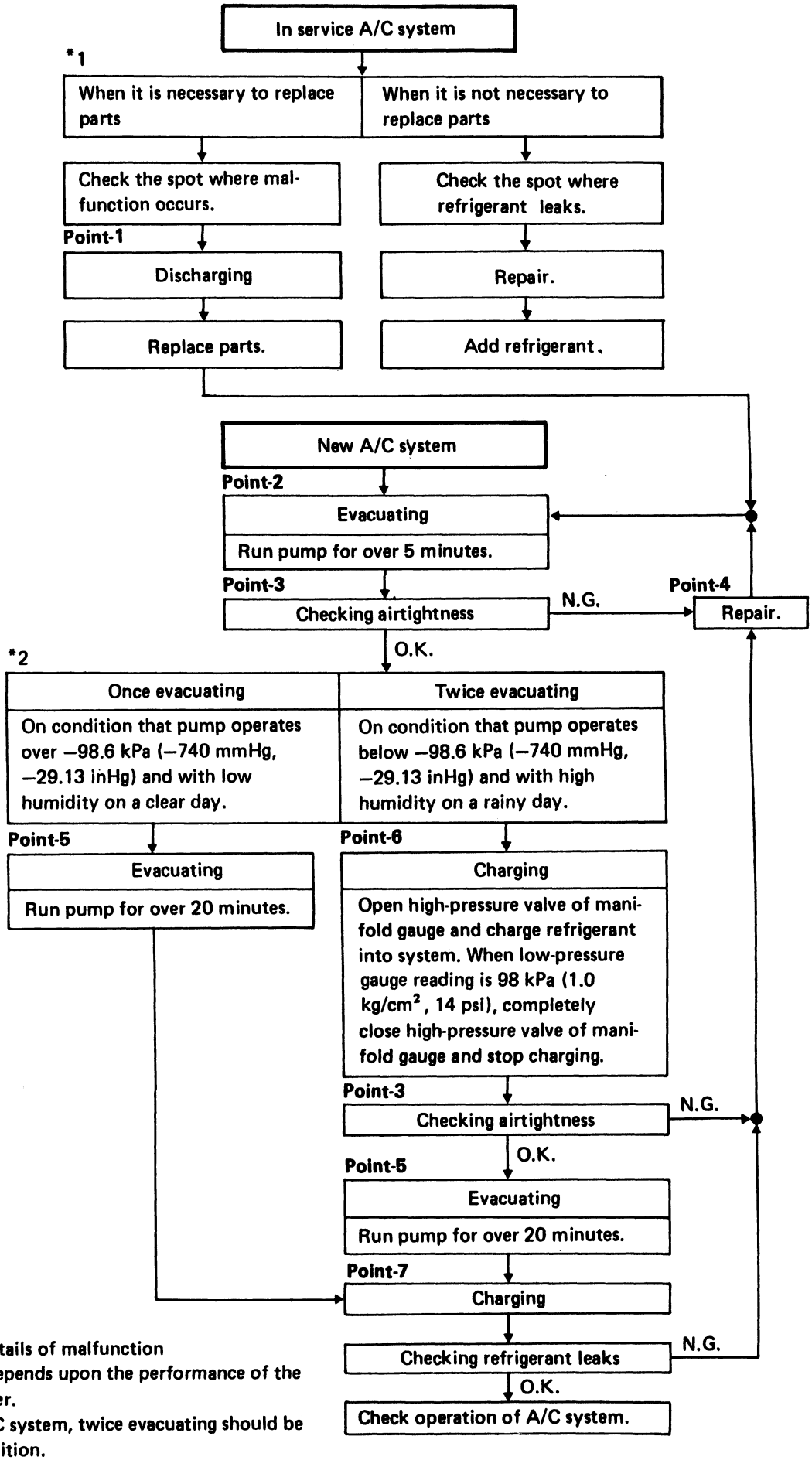
- After inserting tube into union until O-ring is no longer visible, tighten nut to specified torque.
- After connecting line, conduct leak test and make sure that there is no leakage from connections. When the gas leaking point is found, disconnect that line and replace the O-ring. Then tighten connections of seal seat to the specified torque.

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

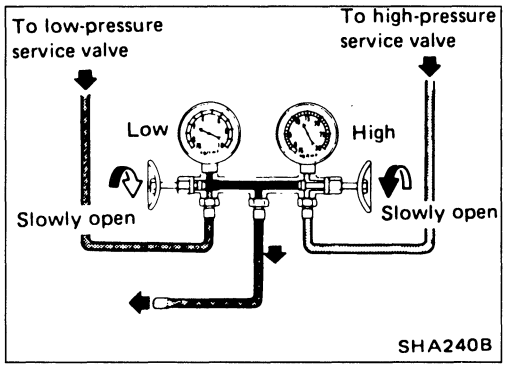
SERVICE TOOLS

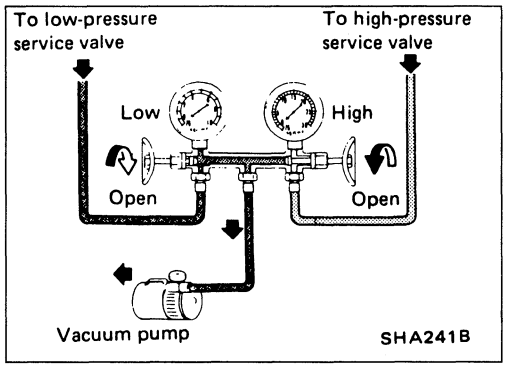
Tool name	Description	
Manifold gauge		Discharging and charging refrigerant
Charging hose		Discharging, evacuating and checking refrigerant
Charge valve		Discharging and charging refrigerant
Thermometer		Checking temperature
Vacuum pump		Evacuating refrigerant
Electric leak detector	**Nominal sensitivity:** **15 - 25 g (0.53 - 0.88 oz)/year** 	Checking refrigerant leaks



*1: Depending on the details of malfunction

*2: Working operation depends upon the performance of the pump and the weather.
In case of service A/C system, twice evacuating should be done under any condition.





Elevation m (ft)	Vacuum of system* kPa (mmHg, inHg)
0 (0)	101.3 (760, 29.92)
300 (1,000)	98.0 (735, 28.94)
600 (2,000)	94.6 (710, 27.95)
900 (3,000)	91.3 (685, 26.97)

*: Values show reading of the low-pressure gauge.

Point-1
Discharging

Slowly open the valves to discharge only refrigerant. If they are opened quickly, compressor oil will also be discharged.

Point-2
Evacuating the System

1. Start pump, then open both valves and run pump for over 5 minutes.
2. When low gauge has reached approx. 98.6 to 101.3 kPa (740 to 760 mmHg, 29.13 to 29.92 inHg), completely close both valves of gauge and stop vacuum pump.

a. The low-pressure gauge reads lower by 3.3 kPa (25 mmHg, 0.98 inHg) per 300 m (1,000 ft) elevation. Perform evacuation according to the following table.

b. The rate ascension of the low-pressure gauge should be less than 3.3 kPa (25 mmHg, 0.98 inHg) in 5 minutes.

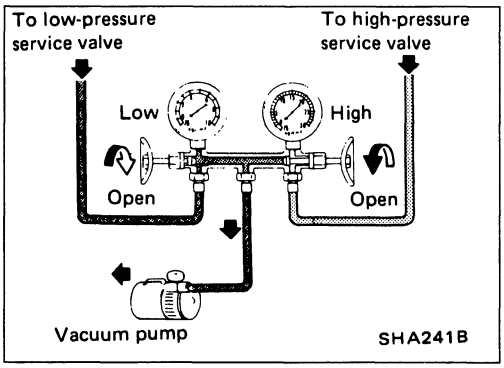
Point-3
Checking Airtightness

1. Close both low and high-pressure valves and leave them unattended for approx. 5 to 10 minutes.
2. Make sure the pointer of the low-pressure gauge does not deflect toward the "0" direction.
3. If the pointer deflects, gas leakage is present. Repair as outlined under Point-4.

Point-4
Repair

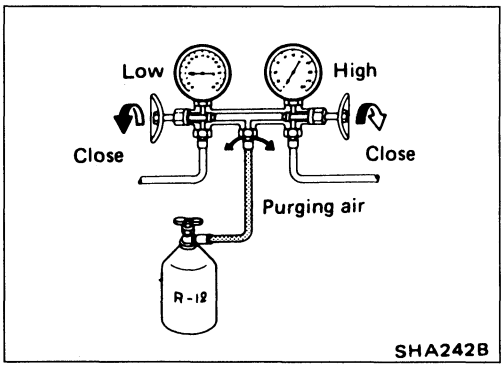
If a malfunction is noticed under Point-3 above, locate and repair the leaking point using the following table as a guide.

Leak at/around pipe connection	Leak at/around gauge manifold
• O-ring fouled, damaged or deformed • Oil not applied to pipe connections during installation • Pipe connections not properly tightened (too tight or too loose)	• Malfunctioning charging hose • Gauge improperly installed • Malfunctioning valve • Malfunctioning packing, etc.



Point-5
Evacuating the System

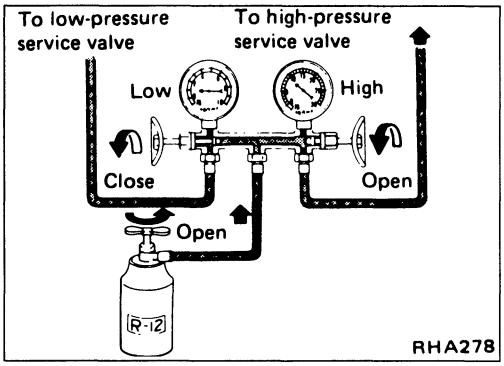
1. Close manifold gauge valve securely and disconnect charging hose from refrigerant can.
2. Connect center charging hose to vacuum pump.
3. Start pump, then open both valves and run pump for over 20 minutes.



Point-6
Charging

1. Close manifold gauge valves securely and disconnect charging hose from vacuum pump.
2. Purge air from center charging hose.

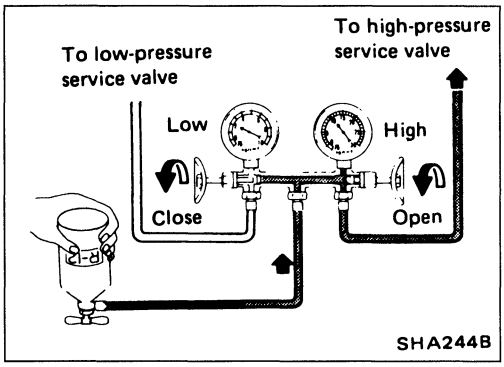
1) Connect center charging hose to refrigerant can through charge valve.
2) Break seal of refrigerant can and purge air.



3. Charge refrigerant into system.

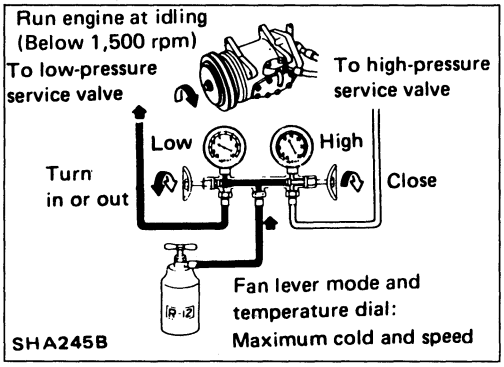
WARNING:
Ensure that engine is off.

1) Open high-pressure valve of manifold gauge and charge refrigerant into system.



CAUTION:
If charging liquefied refrigerant into the system with the can turned upside down to reduce charging time, charge it only through high-pressure (discharge) service valve. After charging, the compressor should always be turned several times manually.

2) When low-pressure gauge reading is 98 kPa (1.0 kg/cm^2, 14 psi), completely close high-pressure valve of manifold gauge and stop charging.



Point-7

Charging

1. Open manifold gauge low-pressure valve and charge refrigerant into system.

WARNING:
Ensure that engine is off.

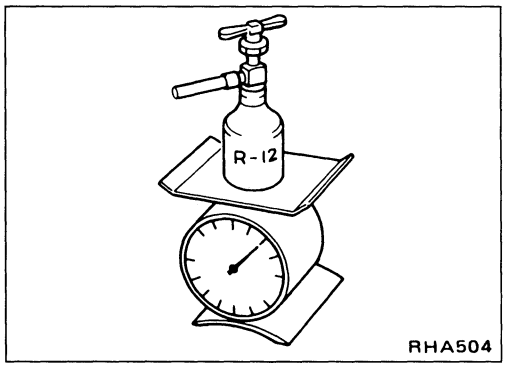
2. When refrigerant charging speed slows down, start engine — Air conditioning system ON, maximum cold temperature set, maximum blower speed with can in upright position. Monitor sight glass. Charge is complete when sight glass is clear.

Cycling clutch systems will produce bubbles in sight glass when clutch engages. Therefore, allow 5 seconds after clutch engages to determine if bubbles continue, and, if so, add refrigerant to clear sight glass.

WARNING:
Never charge refrigerant through high-pressure side (discharge side) of system since this will force refrigerant back into refrigerant can and it may explode.

3. Charge refrigerant while controlling low-pressure gauge reading at 275 kPa (2.8 kg/cm^2, 40 psi) or less by turning in or out low-pressure valve of manifold gauge.

- **Be sure to purge air from charging hose when replacing can with a new one.**



4. Charge the specified amount of refrigerant into system by weighing charged refrigerant with scale. Overcharging will cause discharge pressure to rise.

Refrigerant amount:
0.8 - 0.9 kg (1.8 - 2.0 lb)

Point-7

Charging (Cont'd)

The state of the bubbles in sight glass can only be used for checking whether the amount of charged refrigerant is small or not. The amount of charged refrigerant should be correctly judged by means of discharge pressure.

5. After charging, be sure to install valve cap on service valve.
6. Confirm that there are no leaks in system by checking with a leak detector.

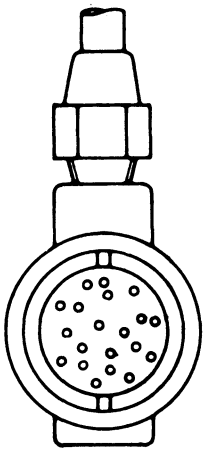
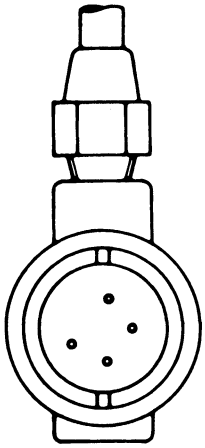
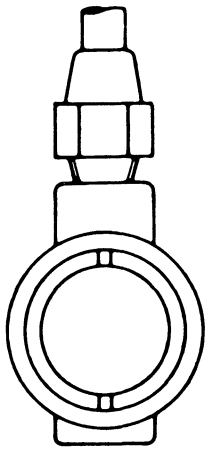
- When refrigerant charging is performed with a charging cylinder, charging station, or automatic charging equipment, engine off, charge only through high side, after specified refrigerant amount has entered the system, close high-pressure valve on gauge set. Start engine return to idle speed, operate A/C at maximum temperature setting, high blower. Observe sight glass to confirm complete charge.

Overcharging will result in increased high pressures, and reduced performance.

Checking Refrigerant Level

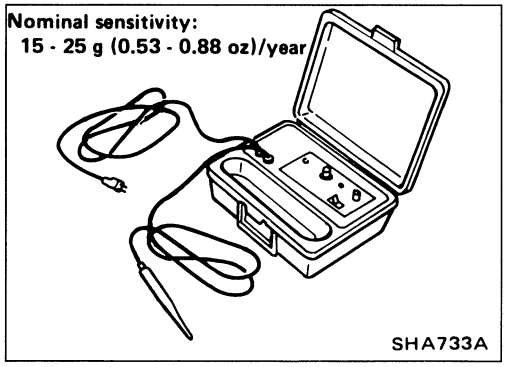
CONDITION

- Door window: Open
- A/C switch: ON
- TEMP. setting: Max. COLD
- FAN speed: 4
- Check sight glass after a lapse of about five minutes.

Amount of refrigerant / Check item	Almost no refrigerant	Insufficient	Suitable	Too much refrigerant
Temperature of high-pressure and low-pressure lines.	Almost no difference between high-pressure and low-pressure side temperature.	High-pressure side is warm and low-pressure side is fairly cold.	High-pressure side is hot and low-pressure side is cold.	High-pressure side is abnormally hot.
State in sight glass.	Bubbles flow continuously. Bubbles will disappear and something like mist will flow when refrigerant is nearly gone.  AC256	The bubbles are seen at intervals of 1 - 2 seconds.  AC257	Almost transparent. Bubbles may appear when engine speed is raised and lowered. No clear difference exists between these two conditions.  AC258	No bubbles can be seen.
Pressure of system.	High-pressure side is abnormally low.	Both pressures on high and low-pressure sides are slightly low.	Both pressures on high and low-pressure sides are normal.	Both pressures on high and low-pressure sides are abnormally high.
Repair.	Stop compressor immediately and conduct an overall check.	Check for gas leakage, repair as required, replenish and charge system.		Discharge refrigerant from service valve of low-pressure side.

a. The bubbles seen through the sight glass are influenced by the ambient temperature. Since the bubbles are hard to show up in comparatively low temperatures below 20°C (68°F), it is possible that a slightly larger amount of refrigerant would be filled, if supplied according to the sight glass. Recheck the amount when it exceeds 20°C (68°F). In higher temperature the bubbles are easy to show up.

b. When the screen in the receiver drier is clogged, the bubbles will appear even if the amount or refrigerant is normal. In this case, the outlet side pipe of the receiver drier becomes considerably cold.

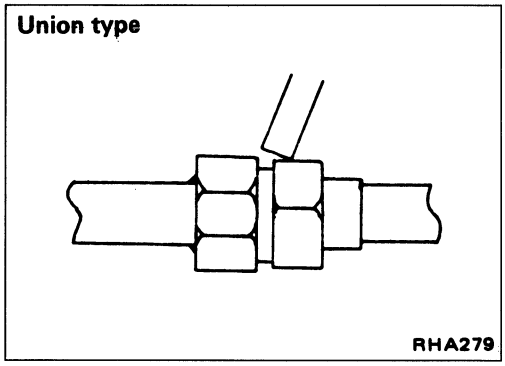


Checking Refrigerant Leaks

ELECTRIC LEAK DETECTOR

The leak detector is a delicate device that detects small amounts of halogen.

To use the device properly, read the manufacturer's manuals. Also perform the specified maintenance and inspections.

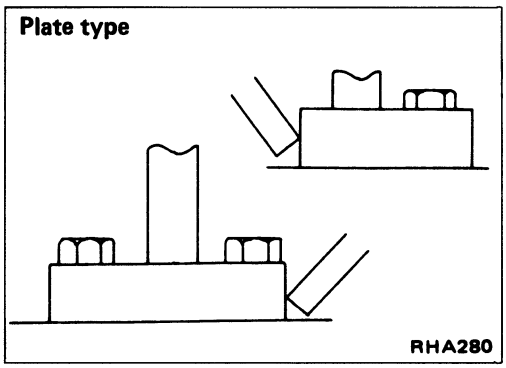


GENERAL PRECAUTIONS FOR HANDLING LEAK DETECTOR

Place the probe on connection fitting and wait for 5 seconds or more.

To check cooling unit, wait for 10 seconds or more.

If a leak is detected, keep the probe as still as possible for one more minute.



When testing single-bolt flange, place the probe on the opposite side of the fitting.

MEASUREMENT STANDARD

If any leak is noted with a detector having a nominal sensitivity of 15 to 25 g (0.53 to 0.88 oz)/year, that leak must be repaired.

- The nominal sensitivity of the detector is determined under the assumption that all the leaking gas is collected by the detector. Accordingly, the quantity of gas actually leaking can amount to five to ten times the indicated value. Generally speaking, leakage of 150 to 200 g (5.29 to 7.05 oz) of refrigerant can cause insufficient cooling.
- Oil deposited during assembling must be wiped off before inspection. Refrigerant easily dissolves in oil, and the presence of oil can cause an error in measurement.
  This precaution is important when checking a used car for refrigerant leakage.
- If oil is noted at or around connections, it indicates that refrigerant is leaking.

Acceleration Cut System

This system is controlled by the E.C.C.S. control unit.
When the engine is heavily overloaded, the compressor is turned off for several seconds to reduce overloading.

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

The compressor cycles on and off to maintain the evaporator temperature within a specified range. When the evaporator coil temperature falls below a specified point, the thermo control amplifier interrupts the compressor operation. When the evaporator coil temperature rises above the specification, the thermo control amplifier allows compressor operation.

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.

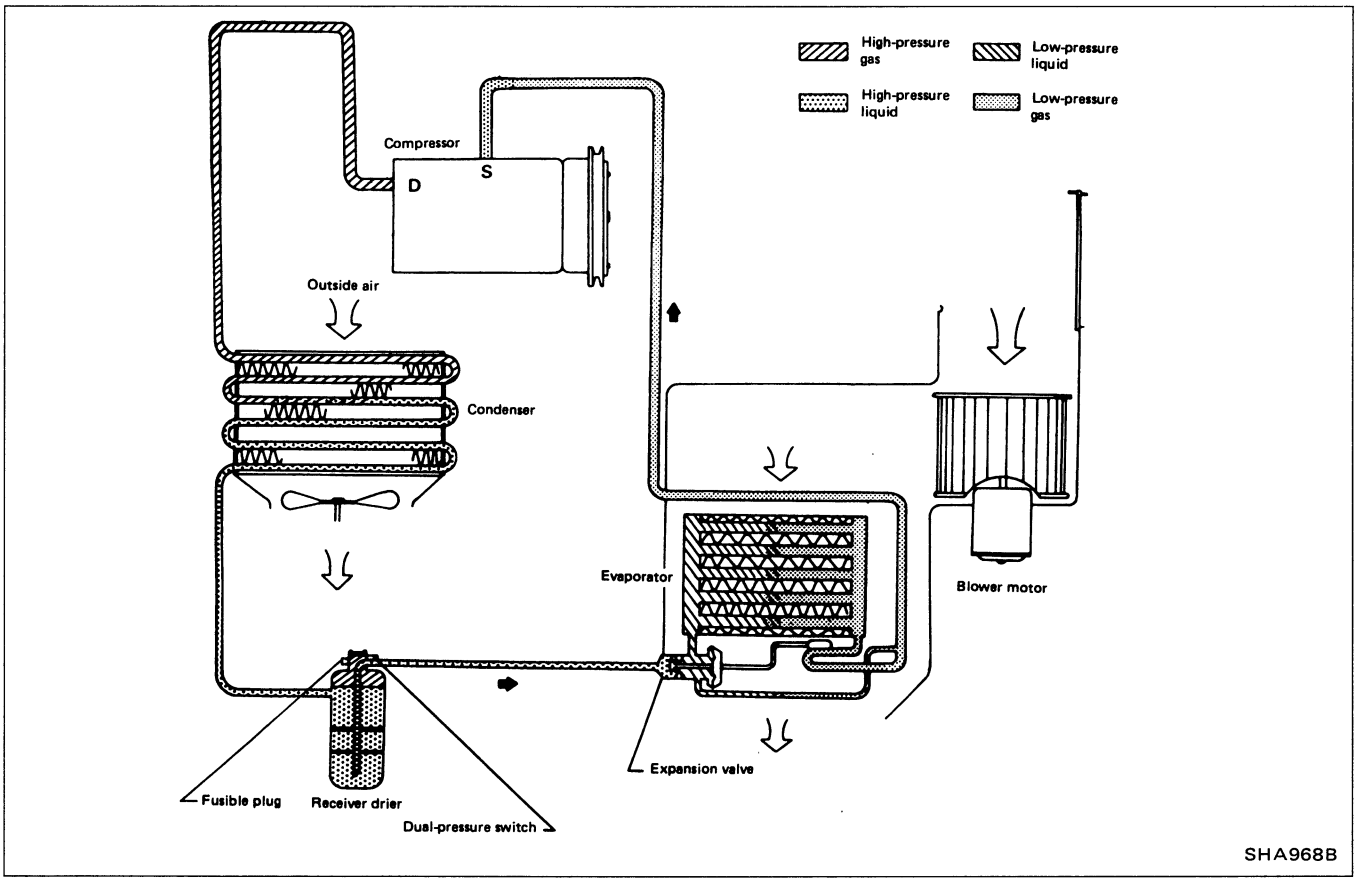
Fusible plug

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.

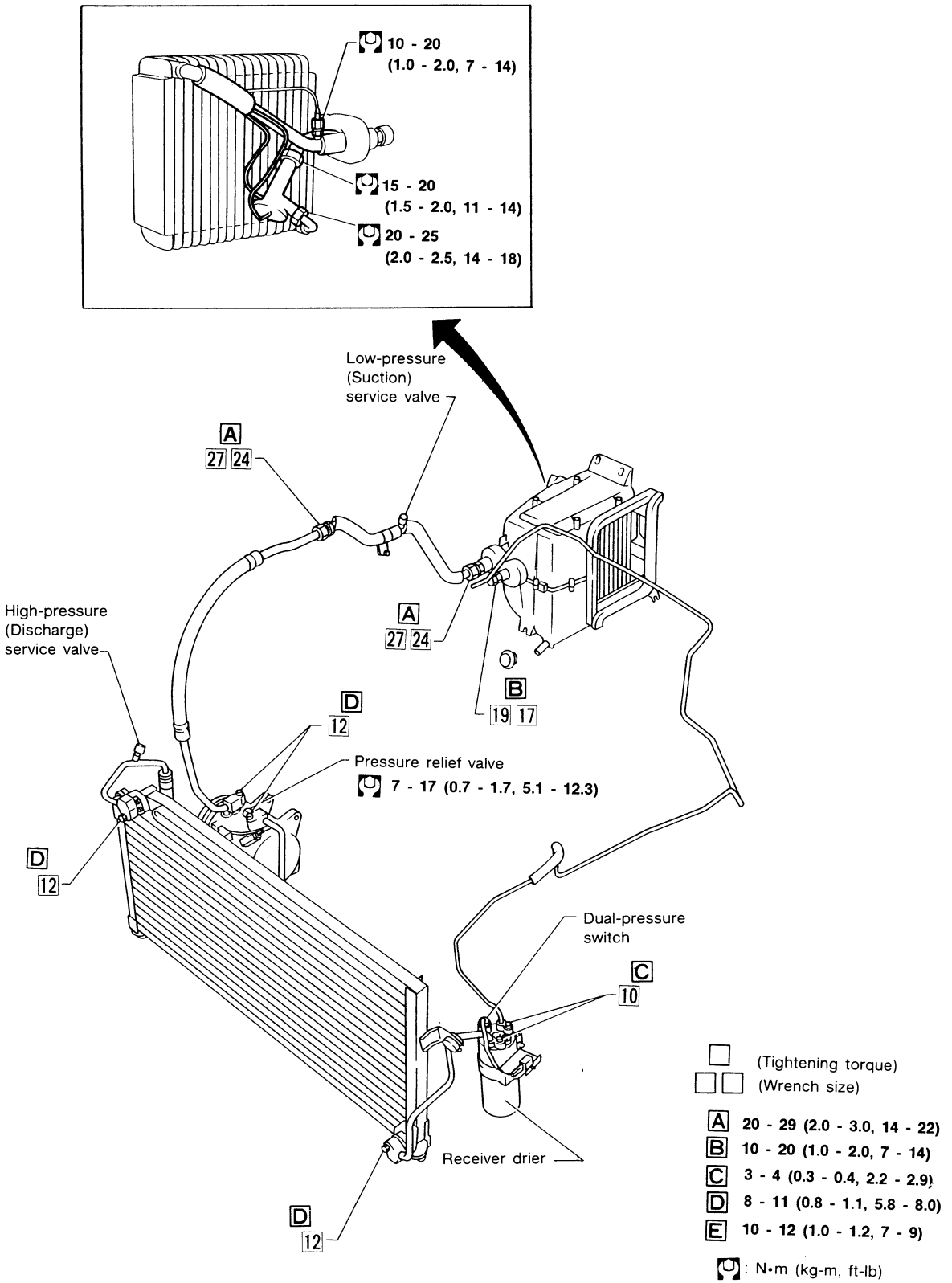
Pressure relief valve

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.

Refrigeration Cycle (Cont'd)



Refrigerant Lines



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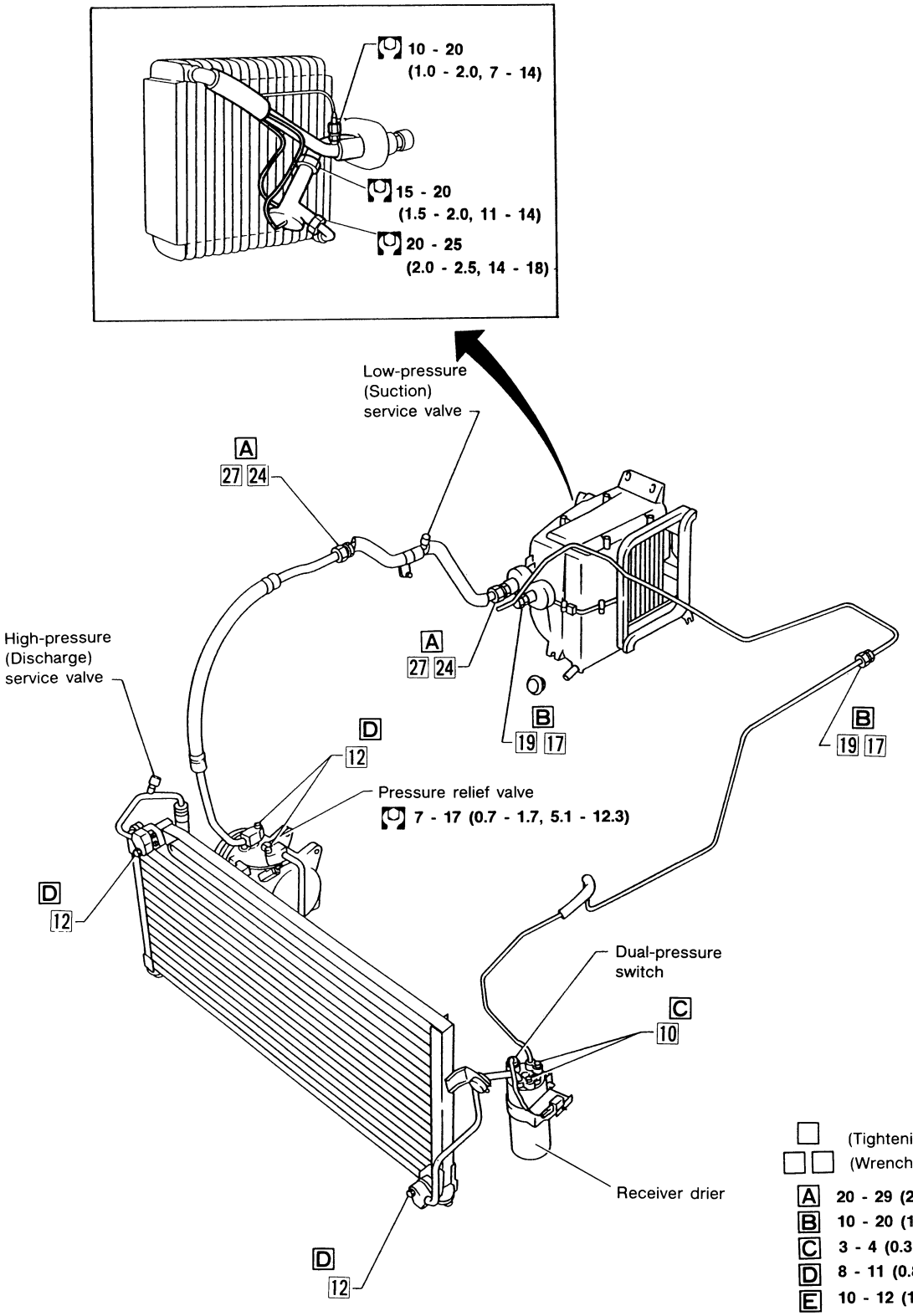
Refrigerant Lines (Cont'd)



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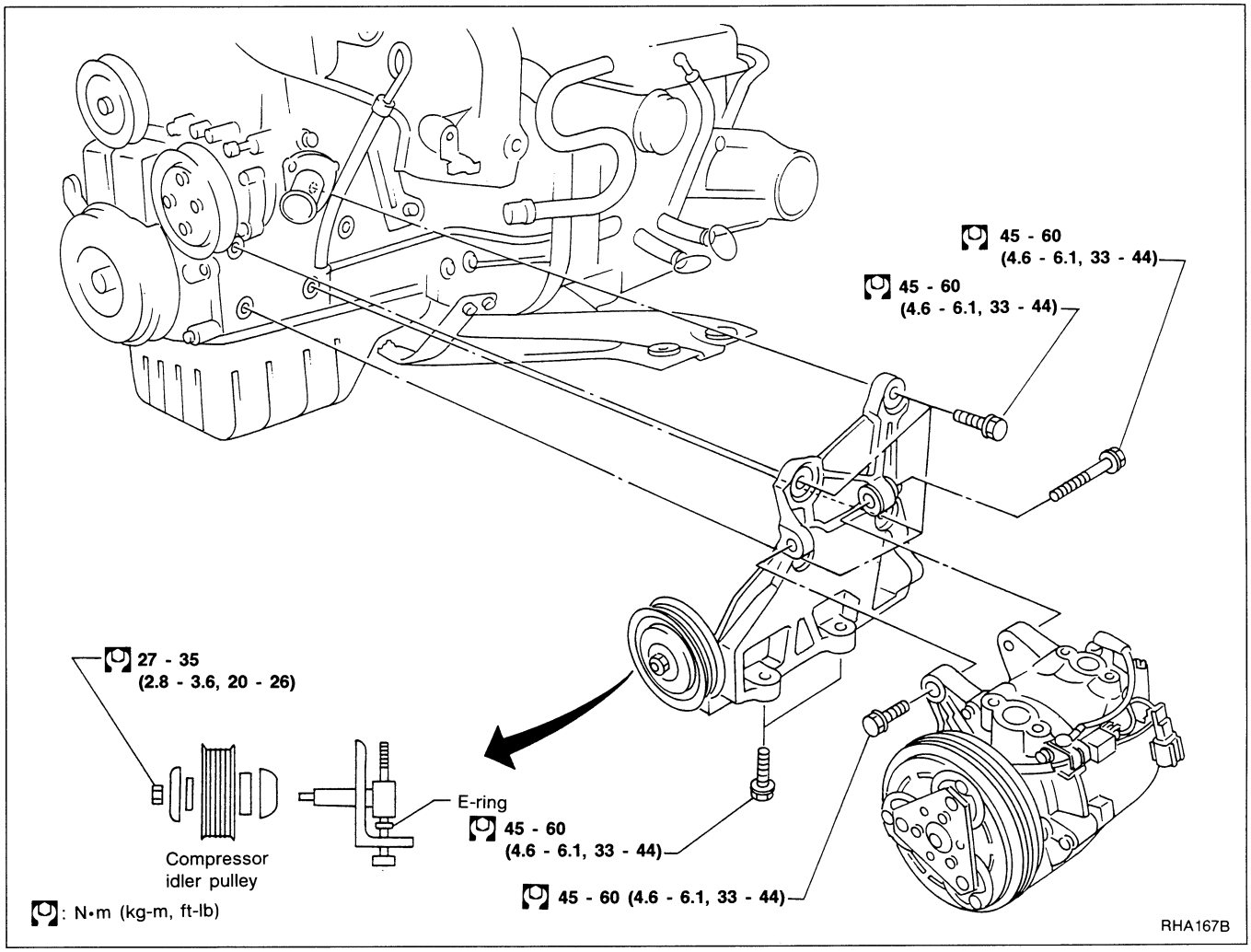
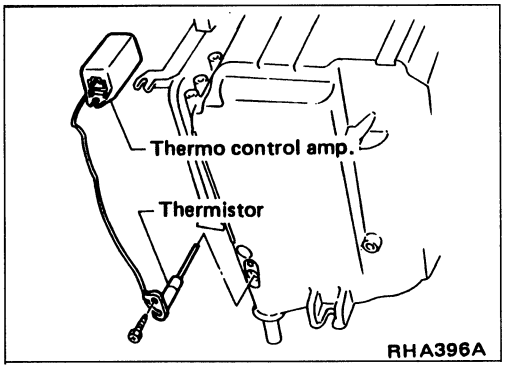
Compressor Mounting





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.**

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
Air control lever position: (Ventilation)
INTAKE lever position: (Recirculation)
FAN lever position: Max. position
Engine speed: 1,500 rpm
Time required before starting testing after air conditioner starts operating: More than 10 minutes

TEST READING

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)

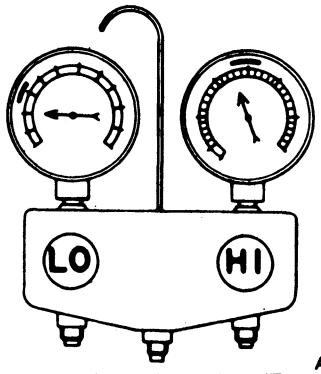
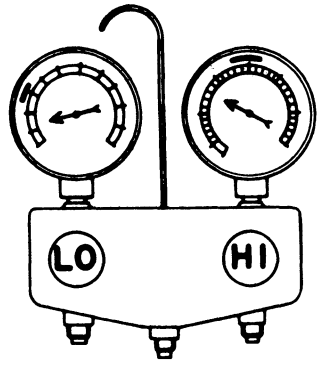
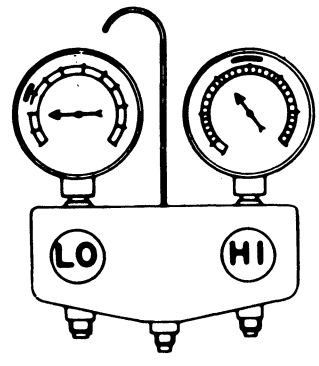
Ambient air temperature-to-compressor pressure table

Ambient air		High-pressure (Discharge side) kPa (kg/cm^2, psi)	Low-pressure (Suction side) kPa (kg/cm^2, 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)

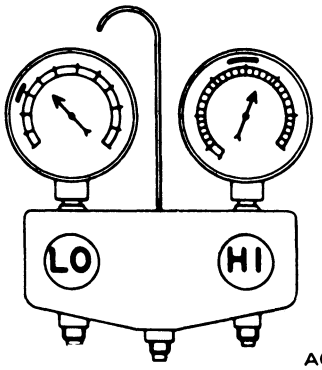
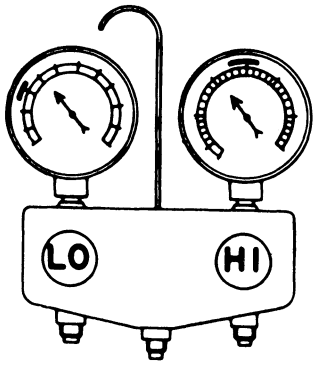
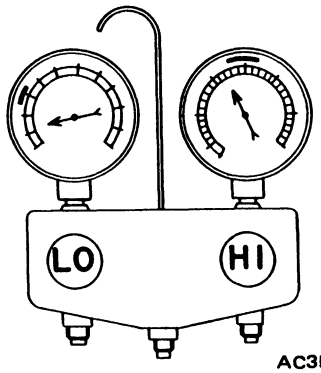
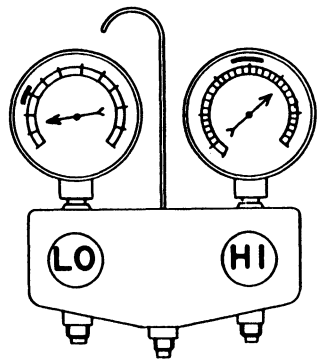
Performance Test Diagnoses

Characteristics revealed by the manifold gauge readings for the air conditioning system are shown in the following.
For how to do the performance test, refer to the item "Performance Chart".

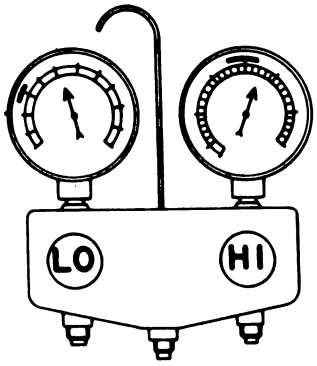
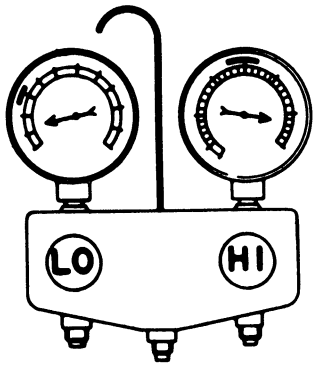
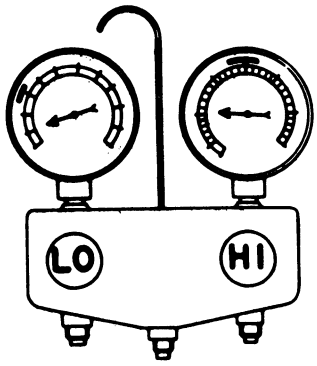
In the following table, the portion smeared with ink on each gauge scale indicates the range showing that the air conditioning system is in good order. This range is described in Performance Chart.

Condition		Probable cause	Corrective action
INSUFFICIENT REFRIGERANT CHARGE			
 AC352A	Insufficient cooling. Bubbles appear in sight glass.	Refrigerant is low, or leaking slightly.	1. Leak test. 2. Repair leak. 3. Charge system. **Evacuate, as necessary, and recharge system.**
ALMOST NO REFRIGERANT			
 AC353A	No cooling action. A lot of bubbles or something like mist appears in sight glass.	Serious refrigerant leak.	Stop compressor immediately. 1. Leak test. 2. Discharge system. 3. Repair leak(s). 4. Replace receiver drier if necessary. 5. Check oil level. 6. Evacuate and recharge system.
MALFUNCTIONING EXPANSION VALVE			
 AC354A	Slight cooling. Sweat or frosting on expansion valve inlet.	Expansion valve restricts refrigerant flow. ● Expansion valve is clogged. ● Expansion valve is inoperative. Valve stuck closed. Thermal bulb has lost charge.	If valve inlet reveals sweat or frost: 1. Discharge system. 2. Remove valve and clean it. Replace it if necessary. 3. Evacuate system. 4. Charge system. If valve does not operate: 1. Discharge system. 2. Replace valve. 3. Evacuate and charge system.

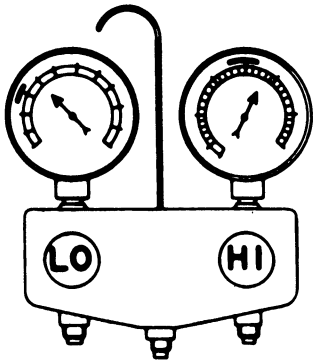
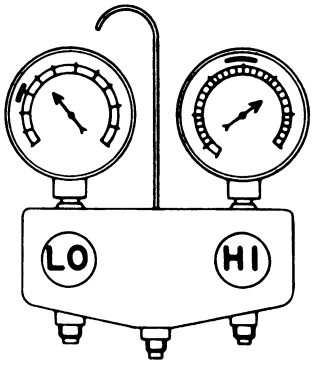
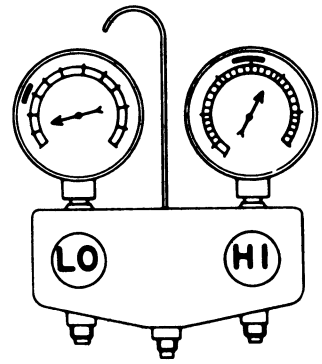
Performance Test Diagnoses (Cont'd)

Condition		Probable cause	Corrective action
 AC355A	Insufficient cooling. Sweat on suction line.	Expansion valve allows too much refrigerant through evaporator.	Check valve for operation. If suction side does not show a pressure decrease, replace valve.
 AC356A	No cooling. Sweat or frosting on suction line.	Malfunctioning expansion valve.	1. Discharge system. 2. Replace valve. 3. Evacuate and charge system.
MALFUNCTIONING SUCTION THROTTLE VALVE			
 AC357A	Insufficient cooling. Frosted evaporator.	Suction throttle valve is inoperative.	1. Discharge system. 2. Replace valve. 3. Evacuate and charge system.
 AC358A	Insufficient cooling.	Suction throttle valve restricts refrigerant flow.	1. Discharge system. 2. Replace valve. 3. Evacuate and charge system.

Performance Test Diagnoses (Cont'd)

Condition		Probable cause	Corrective action
MALFUNCTIONING CONDENSER			
 AC361A	No cooling action: engine may overheat. Bubbles appear in sight glass of drier. Suction line is very hot.	Ususally a malfunctioning condenser.	• Check fan belt and fluid coupling • Check radiator fan motor. • Check condenser for dirt accumulation. • Check engine cooling system for overheating. • Check for refrigerant overcharging. If pressure remains high in spite of all above actions taken, remove and inspect the condenser for possible oil clogging.
HIGH-PRESSURE LINE BLOCKED			
 AC362A	Insufficient cooling. Frosted high-pressure liquid line.	Drier clogged, or restriction in high-pressure line.	1. Discharge system. 2. Remove receiver drier or strainer and replace it. 3. Evacuate and charge system.
MALFUNCTIONING COMPRESSOR			
 AC363A	Insufficient cooling.	Internal problem in compressor, or damaged gasket and valve.	1. Discharge system. 2. Remove and check compressor. 3. Repair or replace compressor. 4. Check oil level. 5. Replace receiver drier. 6. Evacuate and charge system.

Performance Test Diagnoses (Cont'd)

Condition		Probable cause	Corrective action
TOO MUCH OIL IN SYSTEM (Excessive)			
 AC364A	Insufficient cooling.	Too much oil circulates with refrigerant, causing the cooling capacity of the system to be reduced.	Refer to COMPRESSOR OIL for correcting oil level.
AIR IN SYSTEM			
 AC359A	Insufficient cooling. Sight glass shows occasional bubbles.	Air mixed with refrigerant in system.	1. Discharge system. 2. Replace receiver drier 3. Evacuate and charge system.
MOISTURE IN SYSTEM			
 AC360A	After short operation, suction side may show vacuum pressure reading. During this condition, discharge air will be warm. As warning of this, reading vibrates around 39 kPa (0.4 kg/cm^2, 6 psi).	Drier is saturated with moisture. Moisture has frozen in expansion valve. Refrigerant flow is restricted.	1. Discharge system. 2. Replace receiver drier (twice if necessary). 3. Evacuate system completely. (Repeat 30-minutes evacuating three times.) 4. Recharge system.

Checking and Adjusting

The oil used to lubricate the compressor is circulating with the refrigerant.
Whenever replacing any component of the system or a large amount of gas leakage occurs, add oil to maintain the original amount of oil.

OIL CAPACITY

Unit: m ℓ (US fl oz, Imp fl oz)

Applied model	All models
Capacity	
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)

*: All oil cannot be drained from system.

OIL RETURN OPERATION

Before checking and adjusting oil level, operate compressor at engine idling speed, with controls set for maximum cooling and high blower speed, for 20 to 30 minutes in order to return oil to compressor.

CHECKING AND ADJUSTING FOR USED COMPRESSOR

1. After oil return operation, stop the engine and discharge refrigerant and then remove compressor from the vehicle.
2. Drain compressor oil from compressor discharge port and measure the amount.

Oil is sometimes hard to extract when compressor is cooled. Remove oil while compressor is warm [maintained to 40 to 50°C (104 to 122°F)].

3. If the amount is less than 90 m ℓ (3.0 US fl oz, 3.2 Imp fl oz), some refrigerant may have leaked out. Conduct leak tests on connections of each system, and if necessary, repair or replace malfunctioning parts.
4. Check the purity of the oil and then adjust oil level following the procedure below.

(a) When oil is clean;

Unit: m ℓ (US fl oz, Imp fl oz)

Amount of oil drained	Adjusting procedure
Above 90 (3.0, 3.2)*	Oil level is right. Pour in same amount of oil as was drained out.
Below 90 (3.0, 3.2)	Oil level may be low. Pour in 90 m ℓ (3.0 US fl oz, 3.2 Imp fl oz) of oil.

*: If amount of oil drained is much greater than under normal circumstances, flush air conditioner system with refrigerant. Then pour in 200 m ℓ (6.8 US fl oz, 7.0 Imp fl oz) of oil into air conditioner system.

(b) When oil contains chips or other foreign material;
After air conditioner system has been flushed with refrigerant, replace receiver drier. Then pour in 200 m ℓ (6.8 US fl oz, 7.0 Imp fl oz) of oil into air conditioner system.

CHECKING AND ADJUSTING FOR COMPRESSOR REPLACEMENT

200 m ℓ (6.8 US fl oz, 7.0 Imp fl oz) of oil is charged in compressor (service parts). So it is necessary to drain the proper amount of oil from new compressor. Follow the procedure below.

1. After oil return operation, drain compressor oil from used compressor and measure the amount.
   (It is the same procedure as CHECKING AND ADJUSTING FOR USED COMPRESSOR.)
2. Check the purity of the oil and then adjust oil level following the procedure below.

(a) When oil is clean;

Unit: m ℓ (US fl oz, Imp fl oz)

Amount of oil drained from used compressor	Draining amount of oil from new compressor
Above 90 (3.0, 3.2)*	200 (6.8, 7.0) – [Amount of oil drained + 20 (0.7, 0.7)]
Below 90 (3.0, 3.2)	90 (3.0, 3.2)

*: If amount of oil drained is greater than under normal circumstances, flush air conditioner system with refrigerant.
Then install new compressor [200 m ℓ (6.8 US fl oz, 7.0 Imp fl oz) of oil is charged compressor service parts.].

Checking and Adjusting (Cont'd)

Example:

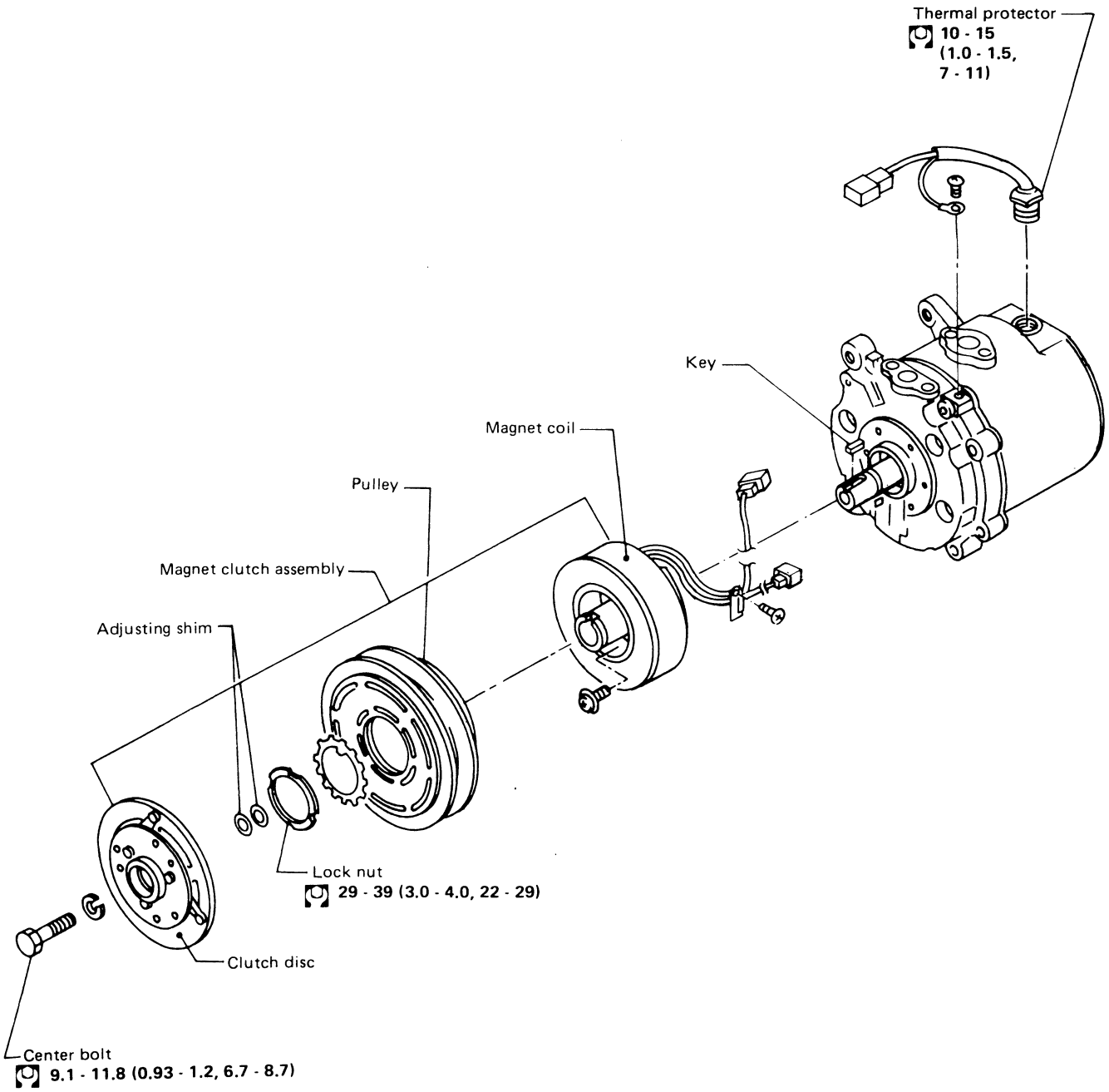
Unit: mℓ (US fl oz, Imp fl oz)

Amount of oil drained from used compressor	Draining amount of oil from new compressor
110 (3.7, 3.9)	70 (2.4, 2.5)
70 (2.4, 2.5)	90 (3.0, 3.2)

(b) When oil contains chips or foreign material;
After air conditioner system has been flushed with refrigerant, replace receiver drier. Then install new compressor [200 mℓ (6.8 US fl oz, 7.0 Imp fl oz) of oil is charged in compressor service parts.].

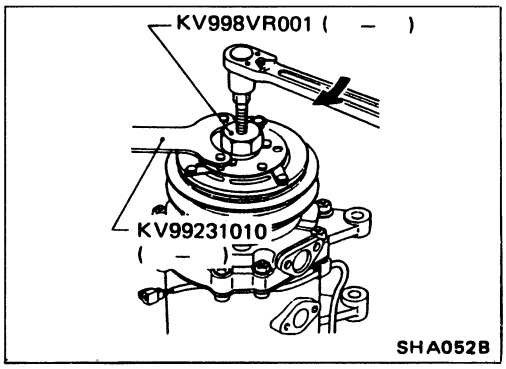
Precautions

- Plug all openings to prevent moisture and foreign matter from entering.
- Do not leave compressor on its side or upside down for more than 10 minutes.
- When replacing or repairing compressor, check compressor oil level in system.
- When replacing with a new compressor, drain specified oil from new compressor. Refer to COMPRESSOR OIL.
- Be sure there is no oil or dirt on frictional surface of clutch disc and pulley.
- When replacing compressor clutch, be careful not to scratch shaft or bend pulley.
- When replacing compressor clutch assembly, do not forget BREAK-IN OPERATION.
- When storing a compressor, be sure to fill it with refrigerant to prevent rust formation. Add refrigerant at the low-pressure side and purge air at the high-pressure side, while rotating shaft by hand.

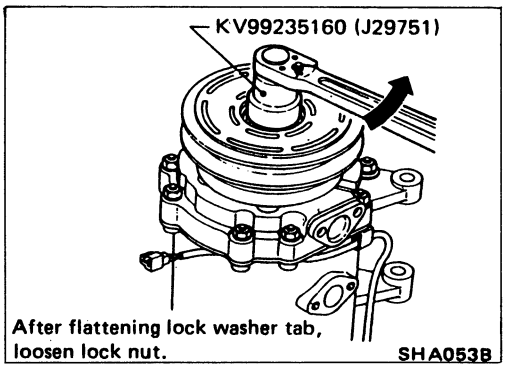


: N·m (kg-m, ft-lb)

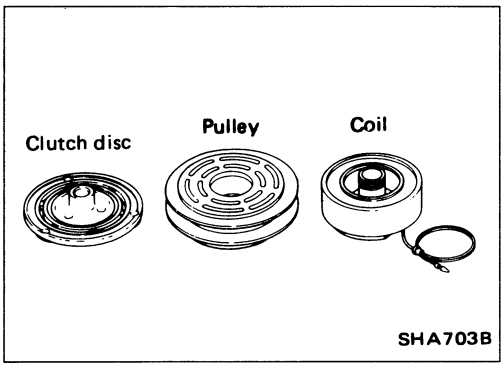
RHA283



SHA052B



SHA053B



SHA703B

Compressor Clutch

REPLACEMENT

- When removing center bolt, hold clutch disc with clutch disc wrench.
- Using clutch disc puller, clutch disc can be removed.

- Bend down pawl of lock washer.
- When removing pulley, remove lock nut with nut wrench.

INSPECTION

Clutch disc

If the contact surface shows signs of damage due to excessive heat, the drive plate and pulley should be replaced.

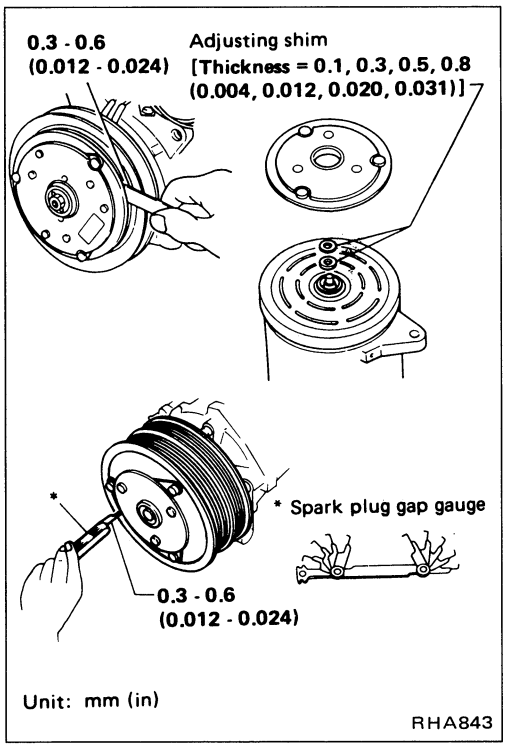
Pulley

Check the appearance of the pulley assembly. If the contact surface of the pulley shows signs of excessive grooving due to slippage, both the pulley and drive plate should be replaced. The contact surfaces of the pulley assembly should be cleaned with a suitable solvent before reinstallation.

Coil

Check coil for loose connection or cracked insulation.

Compressor Clutch (Cont'd)

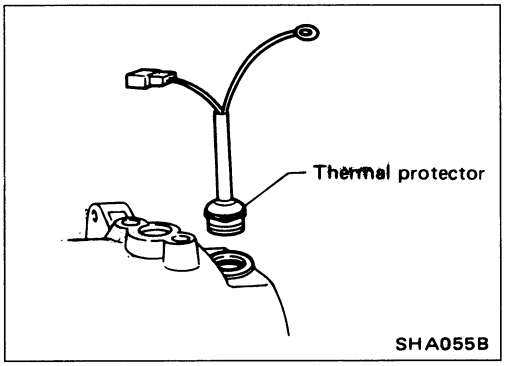


ADJUSTMENT

- When assembling clutch disc, adjust disc-to-pulley clearance with shims.

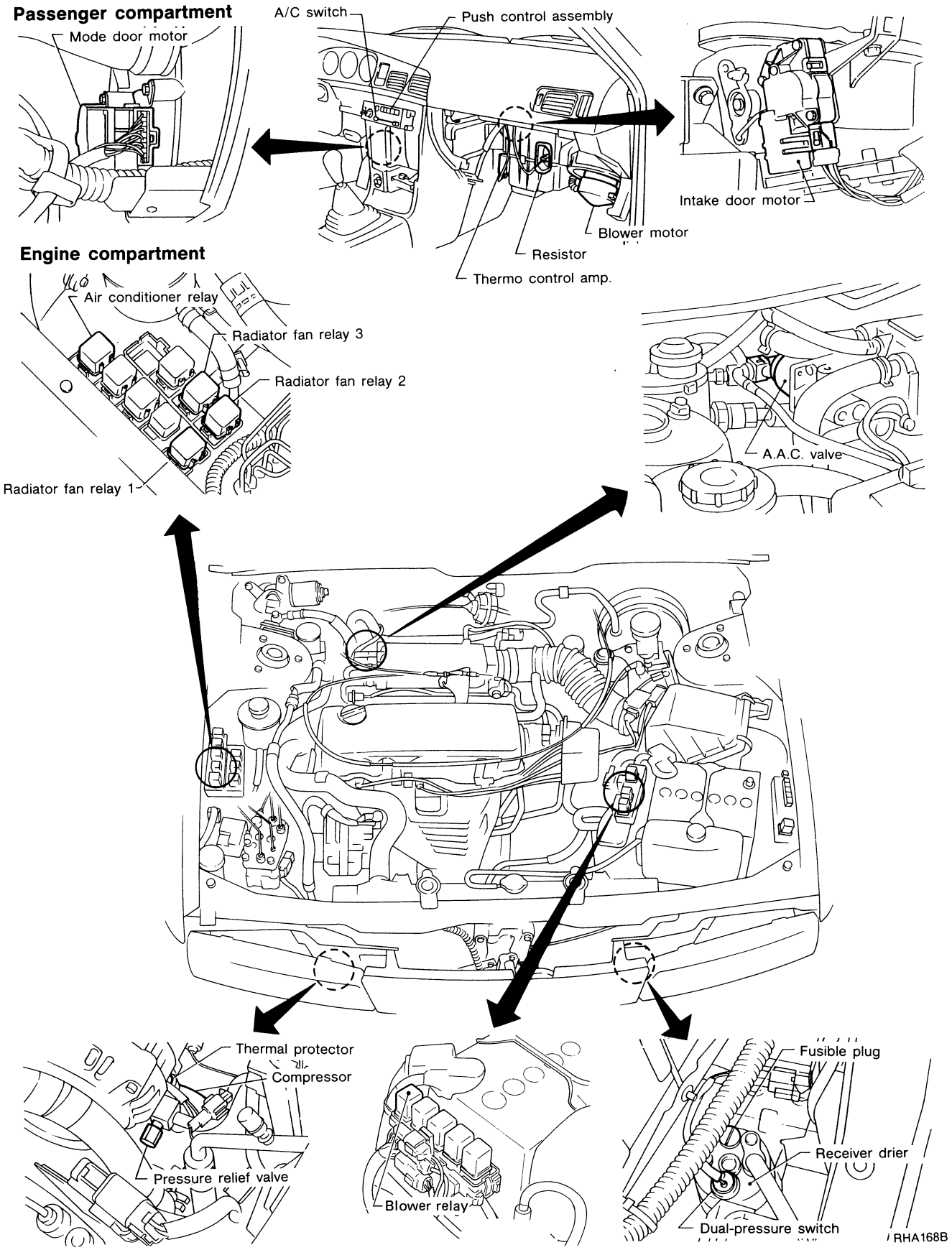
BREAK-IN OPERATION

When replacing compressor clutch assembly, do not forget break-in operation, accomplished by engaging and disengaging the clutch about thirty times.
Break-in operation raises the level of transmitted torque.

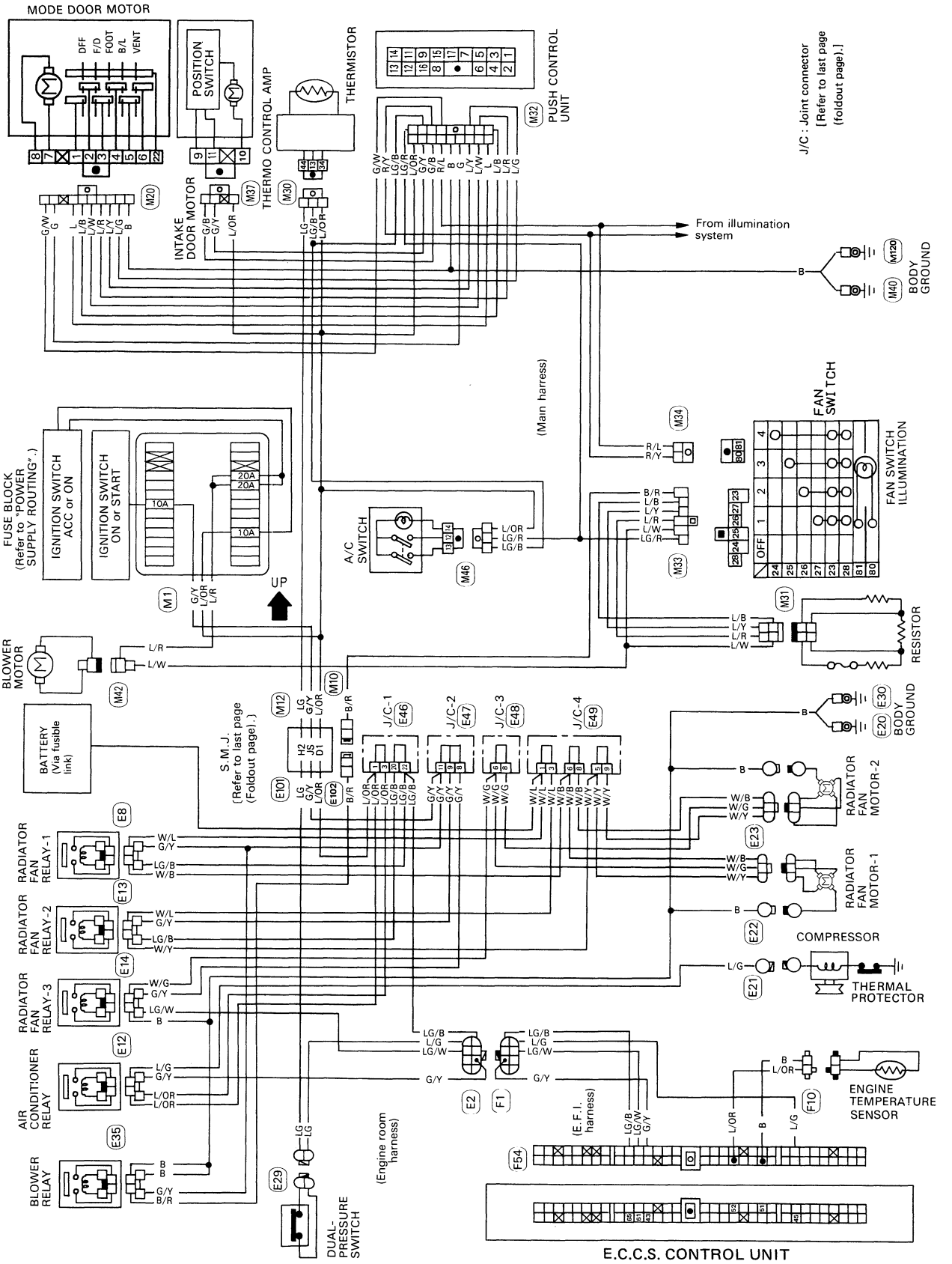


Thermal Protector

- When servicing, do not allow foreign matter to get into compressor.
- Check continuity between two terminals.


Passenger compartment
Mode door motor
A/C switch
Push control assembly
Intake door motor
Blower motor
Resistor
Thermo control amp.
Engine compartment
Air conditioner relay
Radiator fan relay 3
Radiator fan relay 2
Radiator fan relay 1
A.A.C. valve
Thermal protector
Compressor
Pressure relief valve
Blower relay
Fusible plug
Receiver drier
Dual-pressure switch
RHA168B

Wiring Diagram

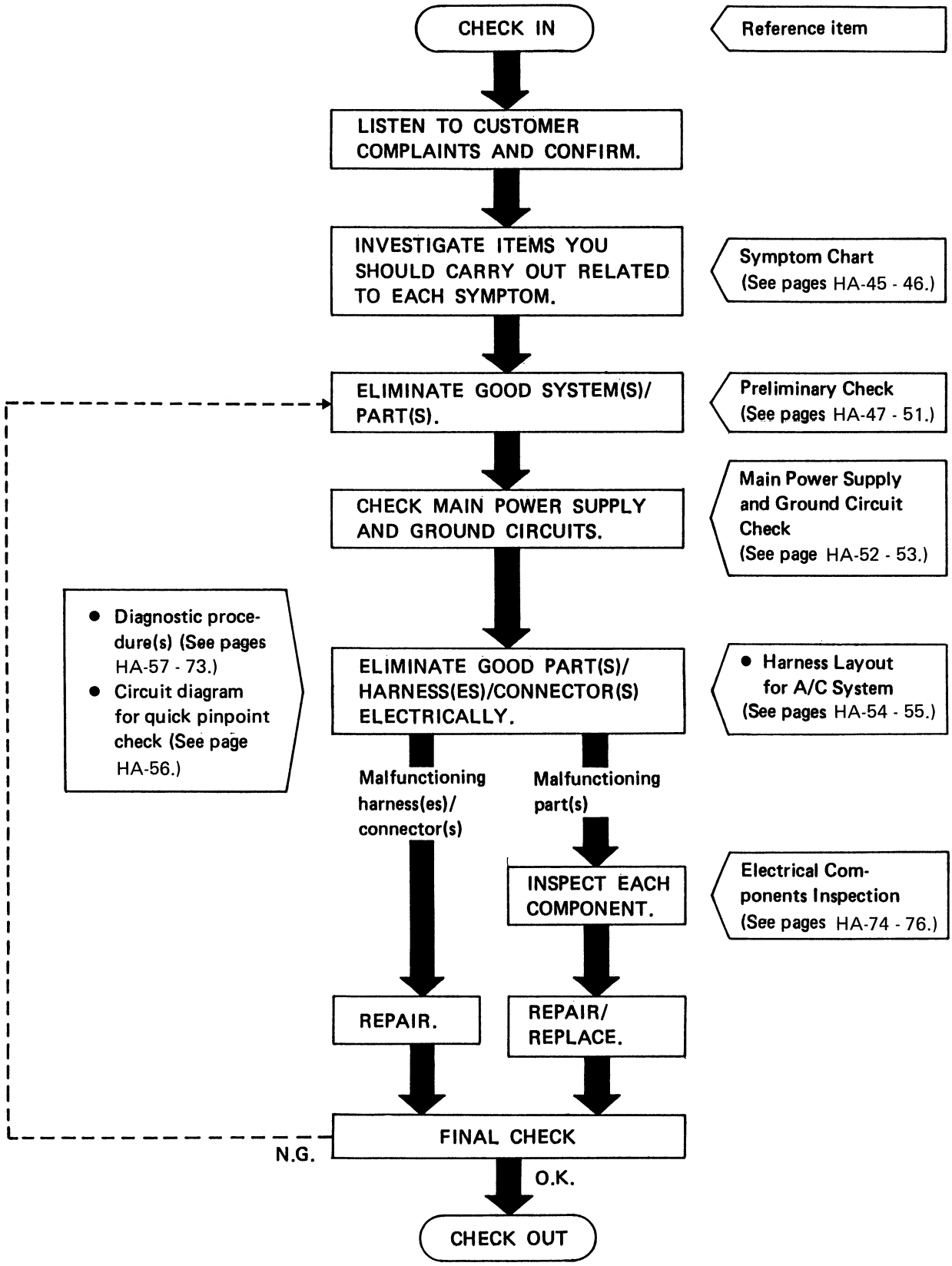


SHA529C

Contents

How to Perform Trouble Diagnoses for Quick and Accurate Repair

WORK FLOW



Symptom Chart

DIAGNOSTIC TABLE

PROCEDURE	Preliminary Check					Diagnostic Procedure					Main Power Supply and Ground Circuit Check			
REFERENCE PAGE	HA-47	HA-48	HA-49	HA-50	HA-51	HA-57 - 60	HA-61 - 62	HA-63	HA-64 - 68	HA-69 - 73	—	—	HA-52	HA-52
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.)

Symptom Chart (Cont'd)

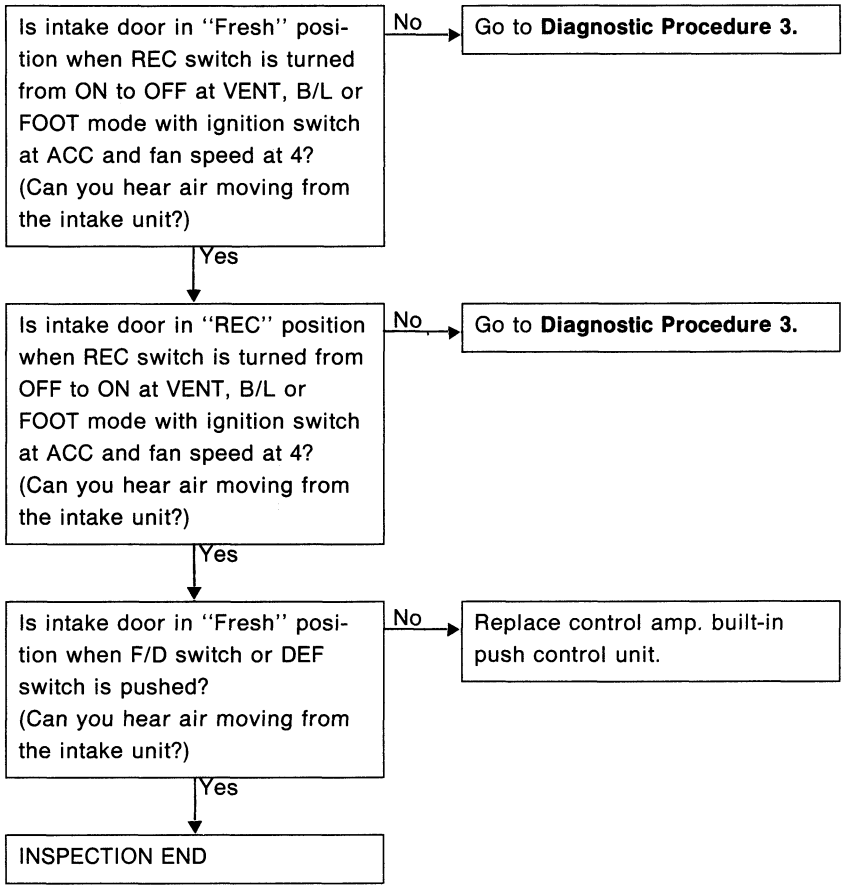
Electrical Components Inspection

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
○	○	○	○							○			○	○	○	○	○	○			○
○	○	○								○											○
					○	○	○	○	○		○										○
				○								○									○
○			○							○			○	○	○	○	○	○			○
○									○	○			○	○	○	○	○	○			○
			○	○	○	○	○	○	○	○					○				○	○	○

Preliminary Check

PRELIMINARY CHECK 1

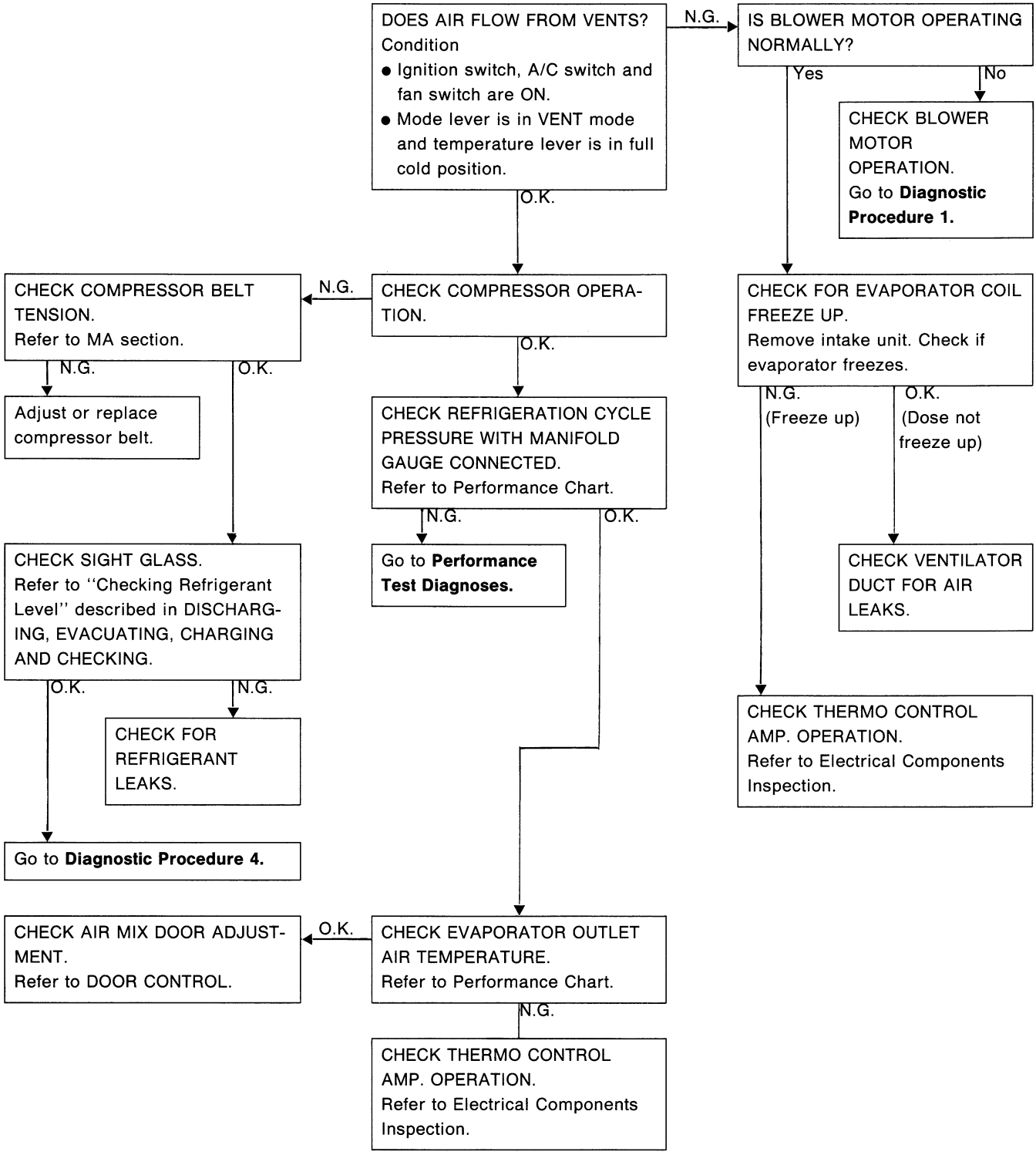
Intake door is set at "FRESH" in DEF or F/D mode.



Preliminary Check (Cont'd)

PRELIMINARY CHECK 2

A/C does not blow cold air.

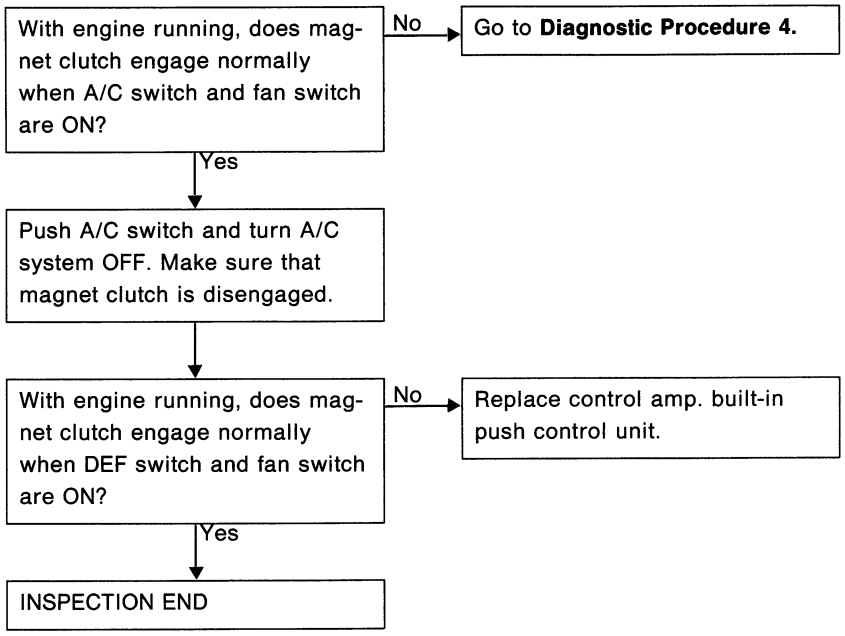


Preliminary Check (Cont'd)

PRELIMINARY CHECK 3

Magnet clutch does not engage in DEF mode.

- **Perform PRELIMINARY CHECK 2 before referring to the following flow chart.**



Preliminary Check (Cont'd)

PRELIMINARY CHECK 4

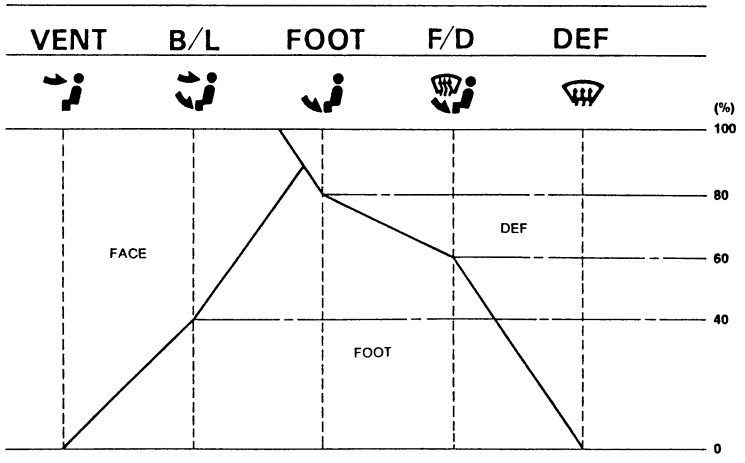
Air outlet does not change.

DOES AIR COME OUT FROM EACH DUCT NORMALLY WHEN EACH MODE SWITCH IS PUSHED WITH IGNITION SWITCH AT ACC?

No → Go to **Diagnostic Procedure 2.**

Switch / Mode	Indicator illuminates					Air outlet
	○					VENT
		○				FOOT & VENT
			○			FOOT & DEF
				○		FOOT & DEF
					○	DEF

Air distribution ratios



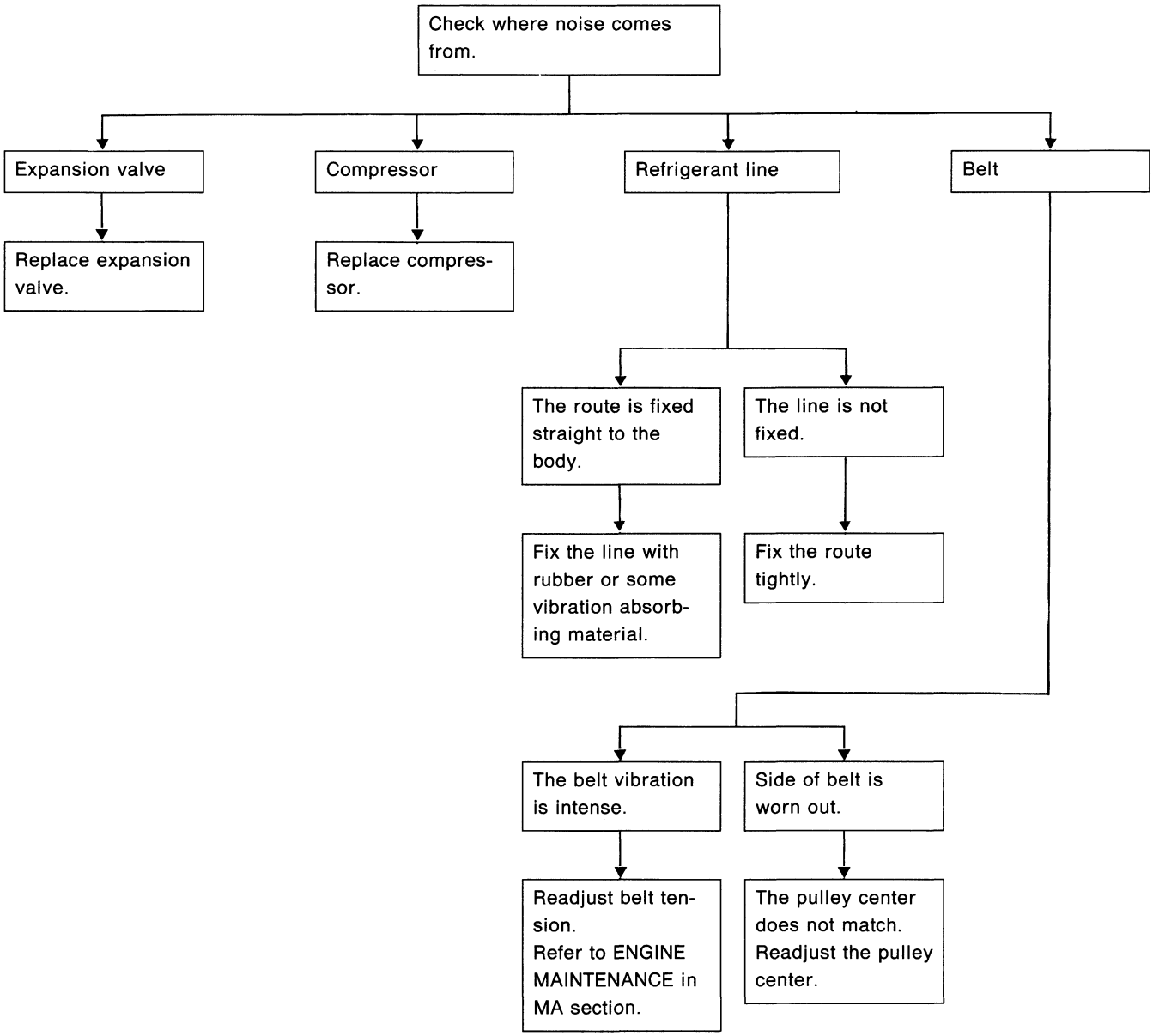
Yes

INSPECTION END

Preliminary Check (Cont'd)

PRELIMINARY CHECK 5

Noise

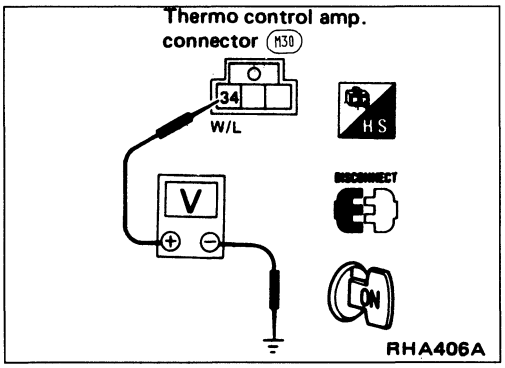


Main Power Supply and Ground Circuit Check

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.

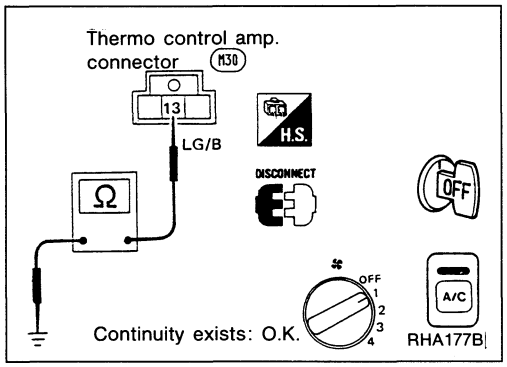


THERMO CONTROL AMP. CHECK

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.

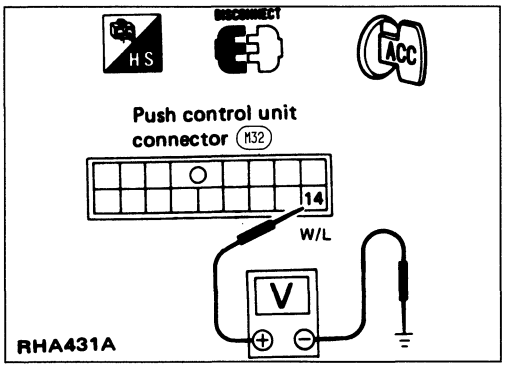
Voltmeter terminal		Voltage
⊕	⊖	
㉞	Body ground	Approx. 12V



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



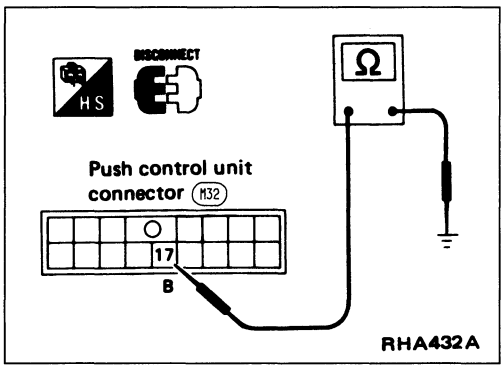
PUSH CONTROL UNIT CHECK

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

Main Power Supply and Ground Circuit Check (Cont'd)

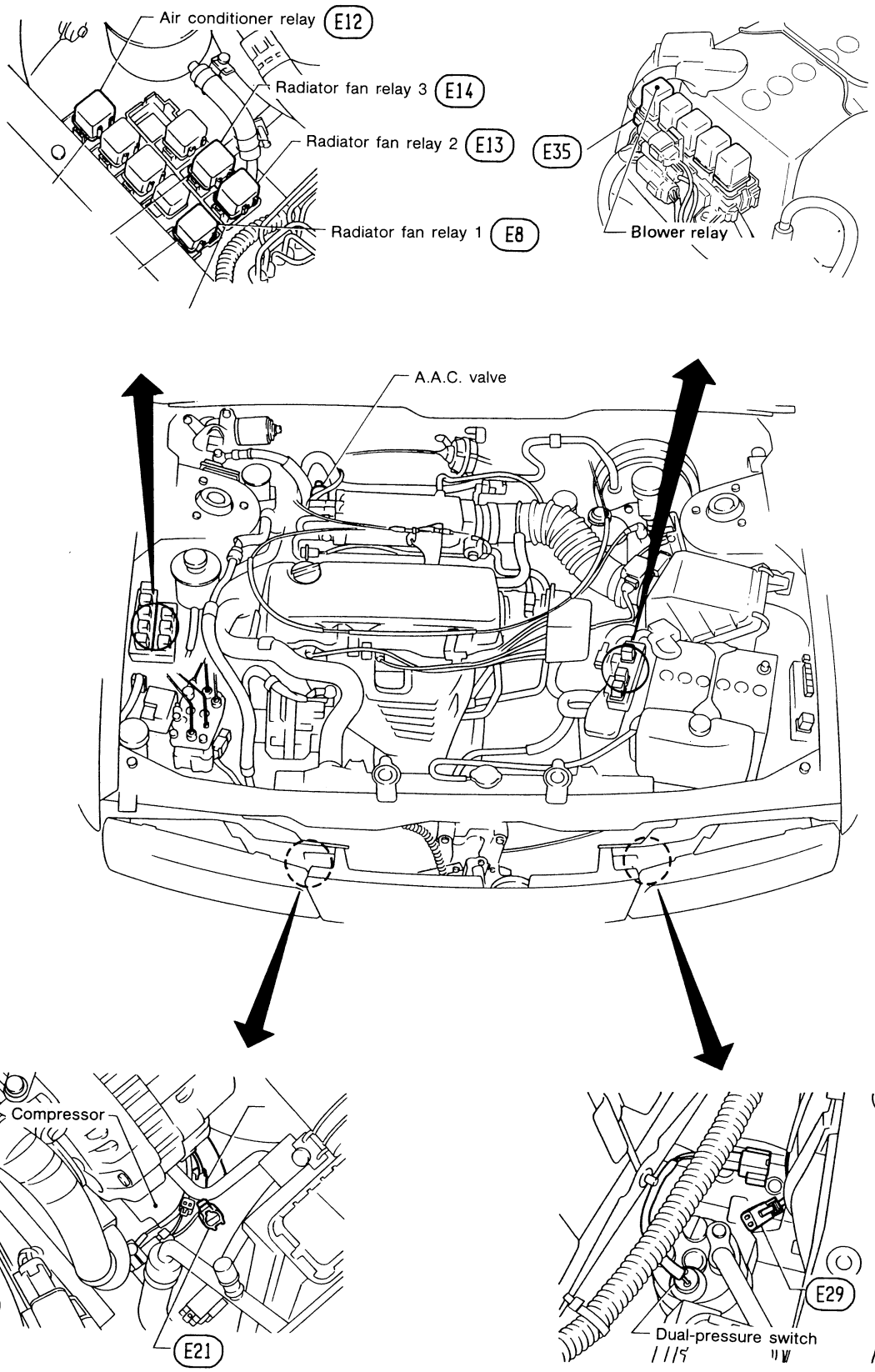


Check body ground circuit for push control unit with ignition switch OFF.

1. Disconnect push control unit harness connector.
2. Connect ohmmeter from harness side.
3. Check for continuity between terminal No. ⑰ and body ground.

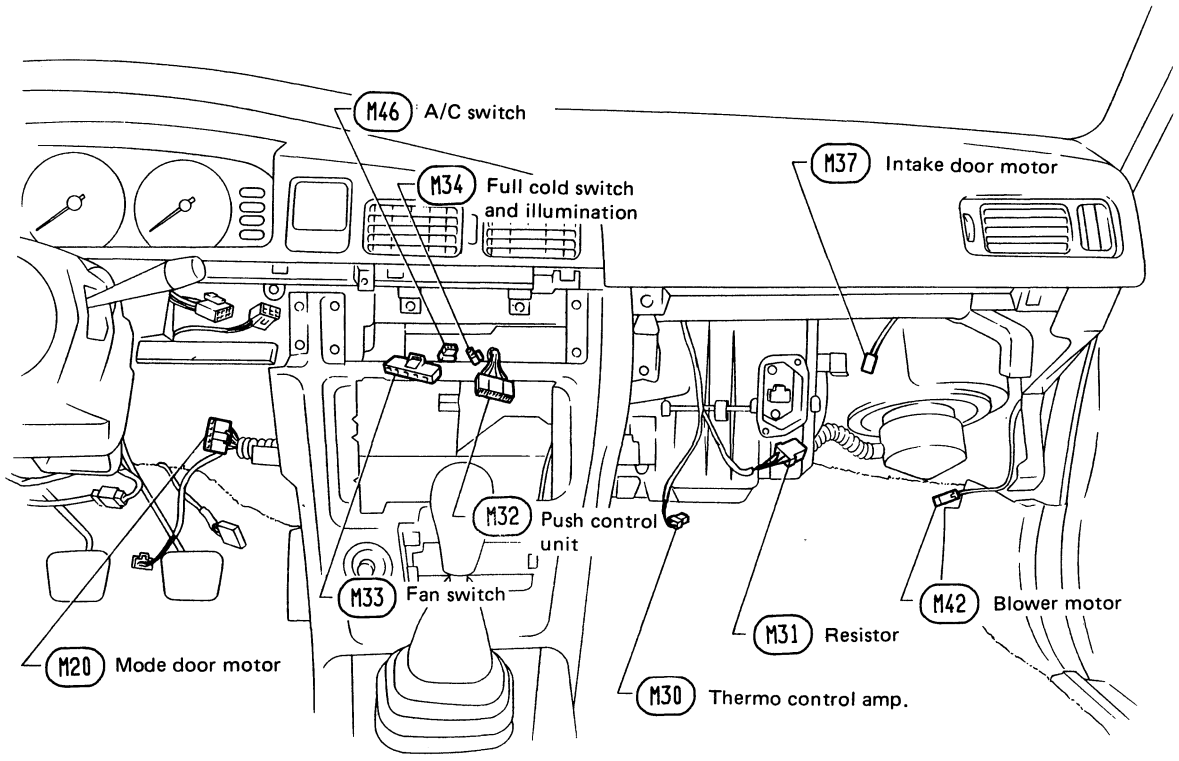
Harness Layout for A/C System

Engine compartment

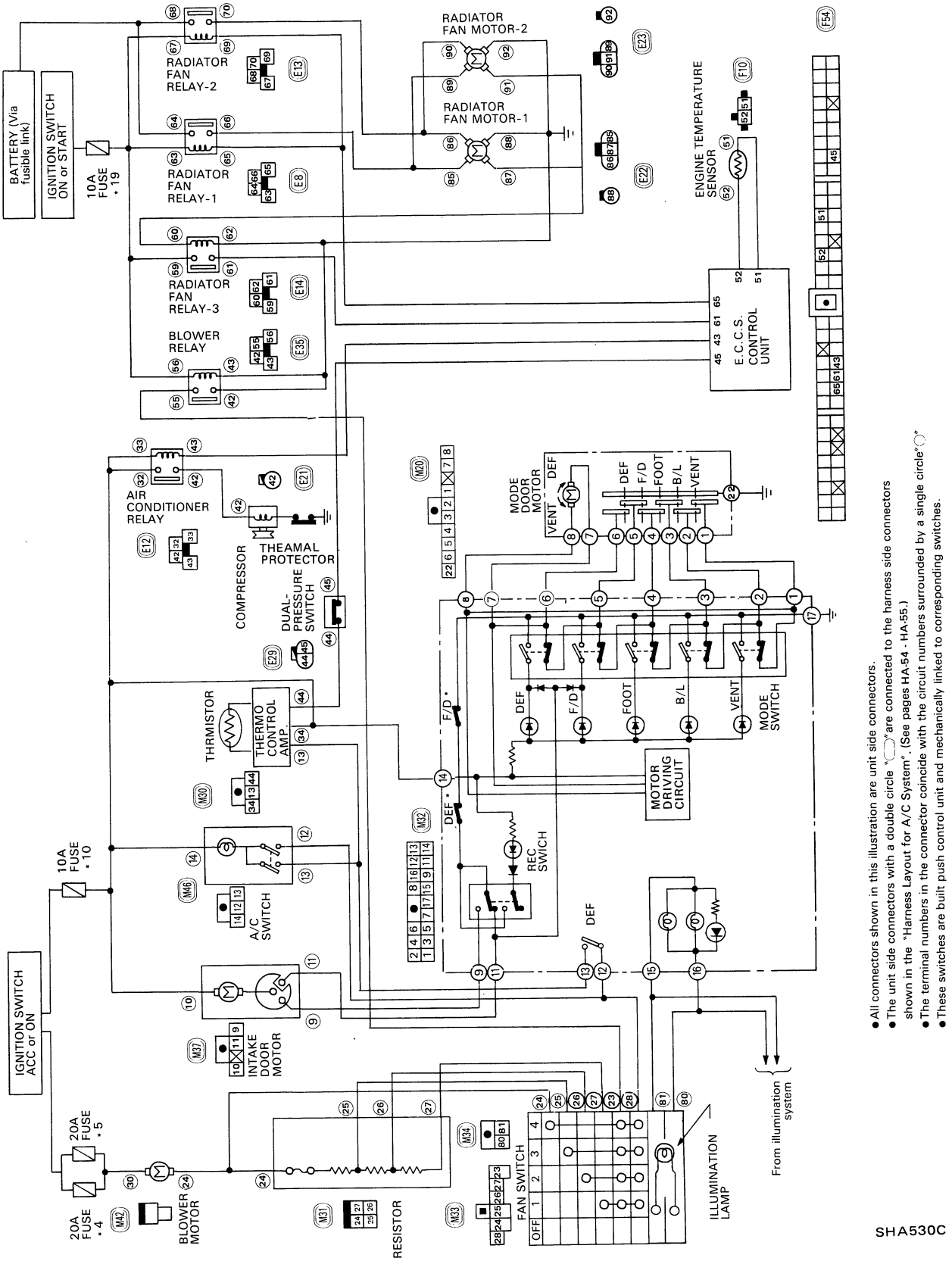


RHA169B

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-54 - HA-55.)
- The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle "◯"
- These switches are built push control unit and mechanically linked to corresponding switches.

SHA530C

	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 → A

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.

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
Check circuit continuity between blower motor harness terminal No. 24 and resistor harness terminal No. 24.

Note

O.K. ↓

Ⓐ

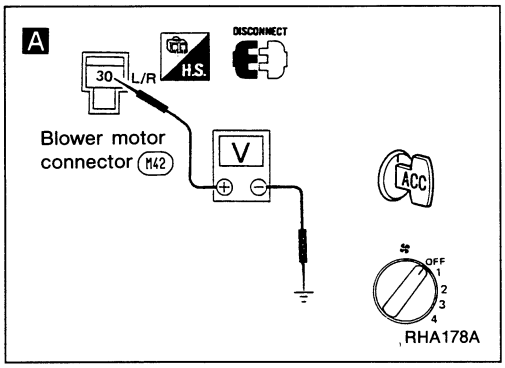
(Go to next page.)

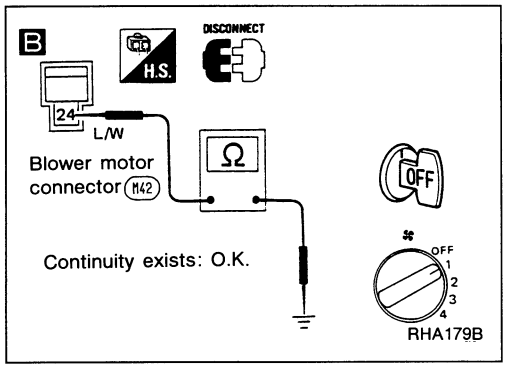
2 3 → Ⓑ Ⓒ

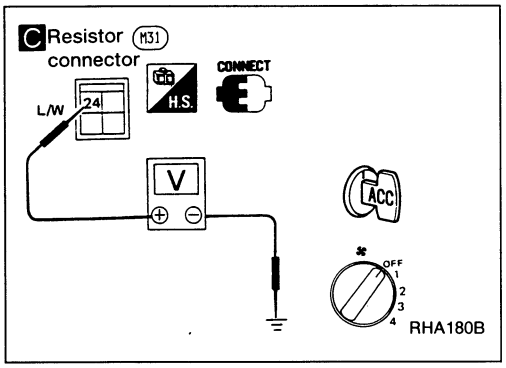
4 5 → Ⓓ Ⓔ

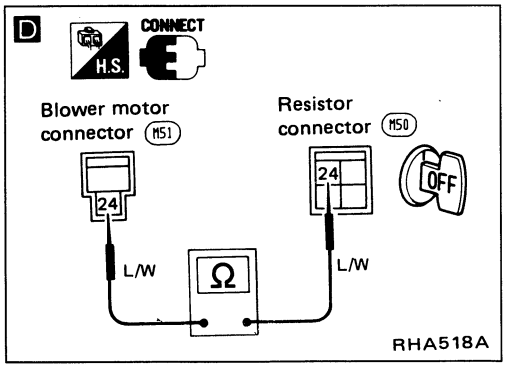
(Go to next page.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.



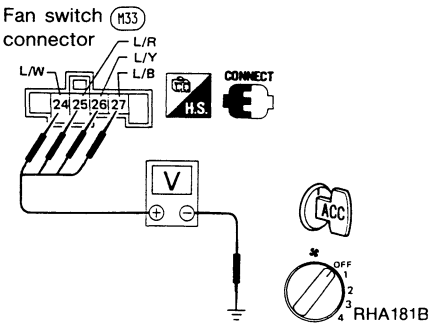




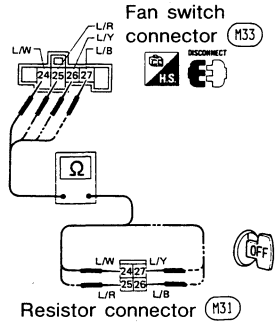


Diagnostic Procedure 1 (Cont'd)

E Fan switch connector (M33)



F Fan switch connector (M33)



Ⓐ 1 — CHECK RESISTOR AFTER DISCONNECTING IT. (Refer to Electrical Components Inspection.)

Ⓑ 2 Ⓒ 3 Ⓓ 4 Ⓔ 5

O.K. / N.G.

N.G. → Replace resistor.

O.K. → Reconnect resistor harness connector.

1 / E 2 3 4 5 → 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. (Refer to Electrical Components Inspection.)

N.G. → F Note: Check circuit continuity between fan switch and resistor.

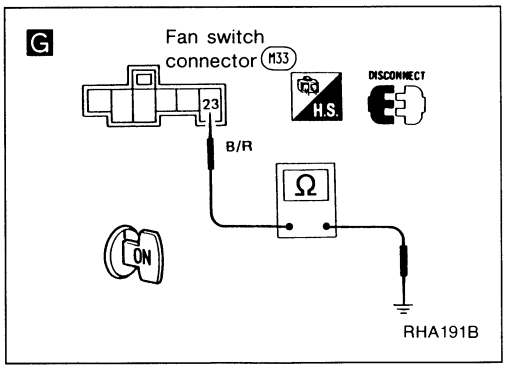
CHECK FAN SWITCH AFTER DISCONNECTING IT. — N.G. → Replace fan switch.

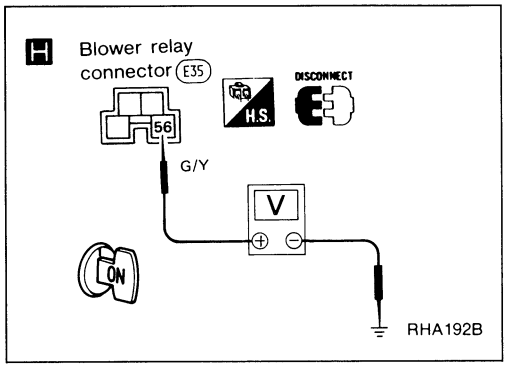
O.K. → Ⓕ

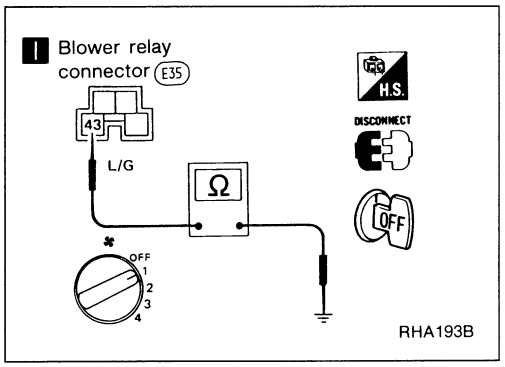
(Go to next page.)

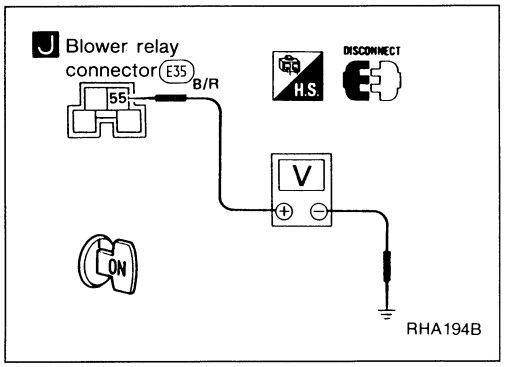
Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

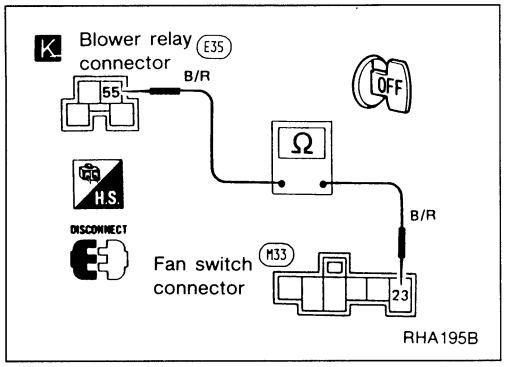
Diagnostic Procedure 1 (Cont'd)











(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. → Replace fan switch.

N.G. → Check 15A fuses at fuse block. (Refer to Electrical Components Inspection.)

O.K. → **I**

Note

Check circuit continuity between blower relay harness terminal No. 43 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.

→ **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**

Note

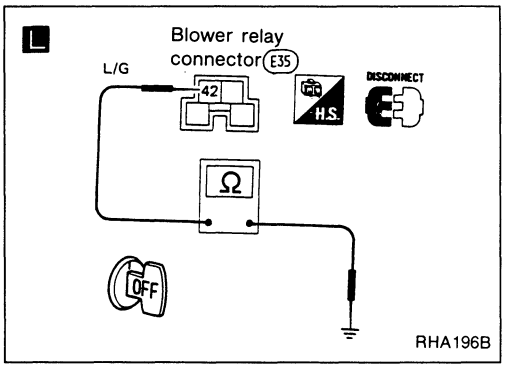
Check circuit continuity between fan switch harness terminal No. 23 and blower relay harness terminal No. 55.

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)

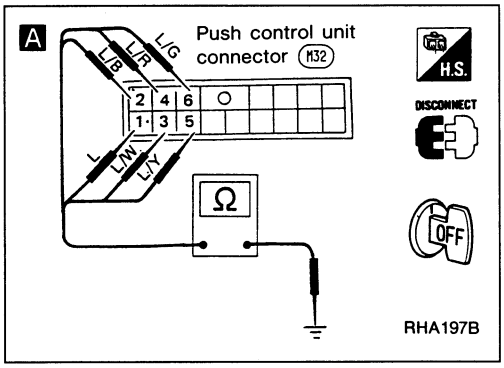


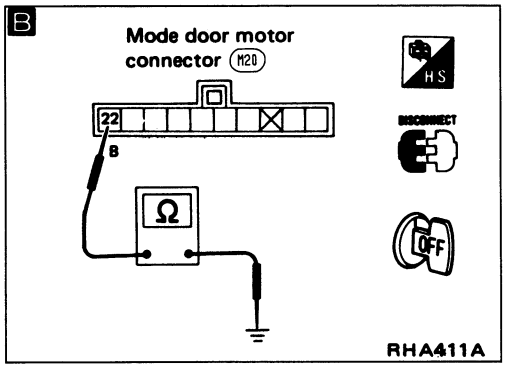
Ⓖ

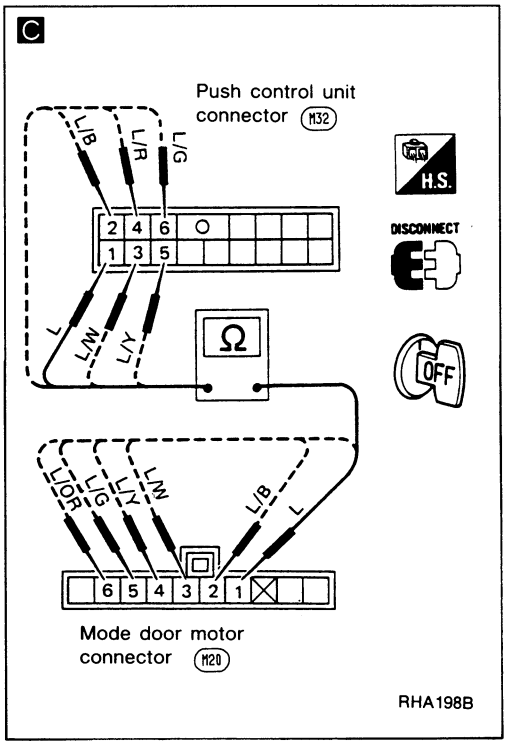
Note

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 ACC position.
2. Turn ignition switch OFF. 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		

N.G. → Disconnect mode door motor harness connector.

O.K. ↓

CHECK SIDE LINK.
Refer to DOOR CONTROL.

B

Note

CHECK BODY GROUND CIRCUIT FOR MODE DOOR MOTOR.
Does continuity exist between mode door motor harness terminal No. ㉒ and body ground?

O.K. ↓

C

Note

Check circuit continuity between each terminal on push control unit and on mode door motor.

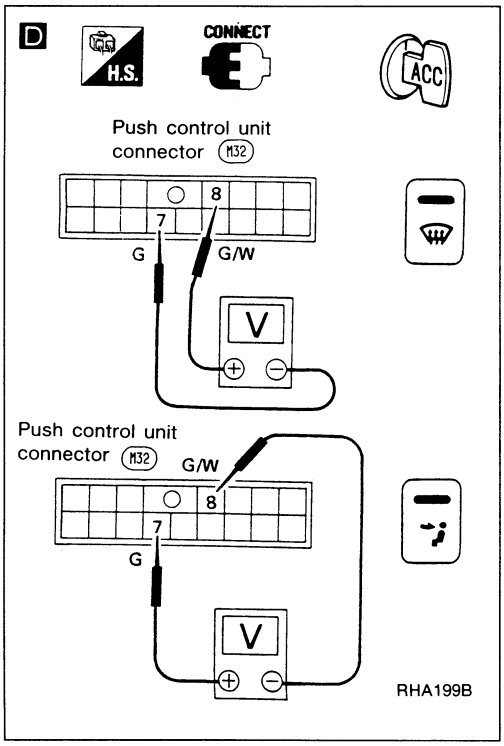
Terminal No. ⊕ (Push control unit)	Terminal No. ⊖ (Mode door motor)	Continuity
①	①	Yes
②	②	
③	③	
④	④	
⑤	⑤	
⑥	⑥	

Ⓐ

(Go to next page.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 2 (Cont'd)



Ⓐ

Reconnect push control unit and mode door motor harness connectors.

D

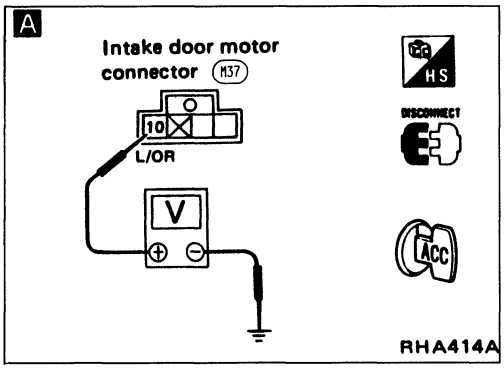
CHECK FOR OUTPUT OF PUSH CONTROL UNIT.
Do approx. 12 volts exist between push control unit harness terminal No. ⑦ and ⑧ when mode is switched from "VENT" to "DEF" or when mode is switched from "DEF" to "VENT"?

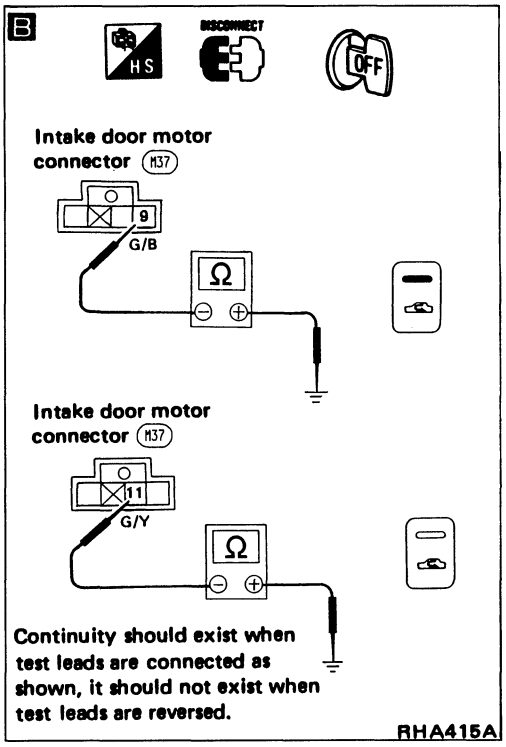
N.G. → Replace control amp. built-in push control unit.

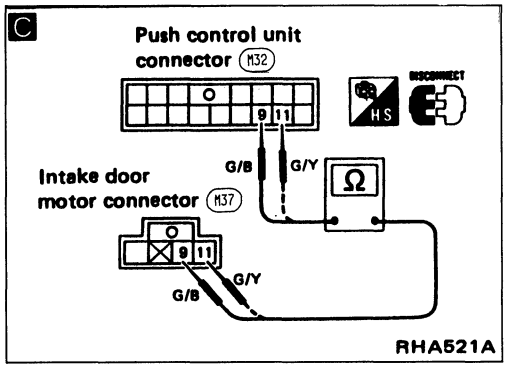
Terminal No.		Mode door motor	
⑦	⑧	Mode door operation	Direction of linkage rotation
⊖	⊖	Stop	Stop
⊖	⊕	VENT → DEF	Clock-wise
⊕	⊖	DEF → VENT	Counter-clock-wise

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.

C

Note

Check circuit continuity between push control unit harness terminal No. ⑨ (⑪) and intake door motor harness terminal No. ⑨ (⑪)?

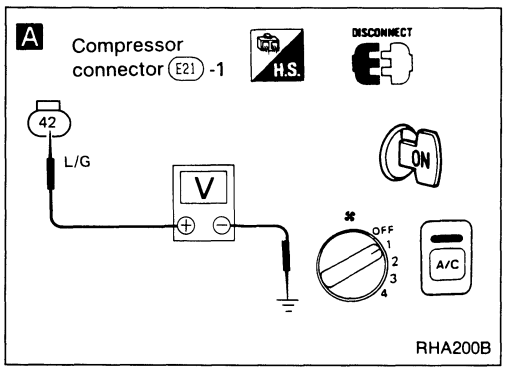
O.K. ↓

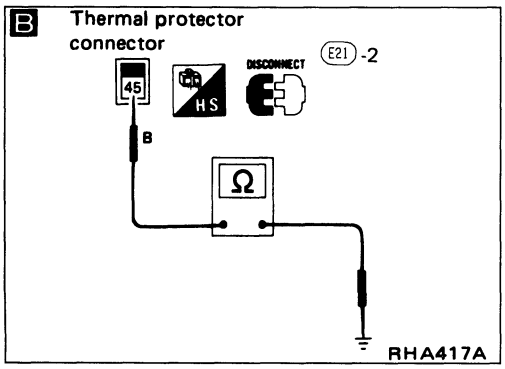
Replace control amp. built-in push control unit.

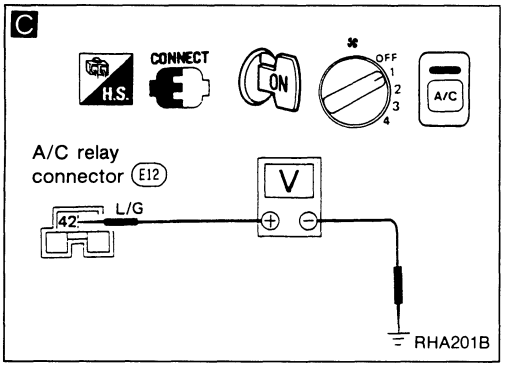
O.K. ↓

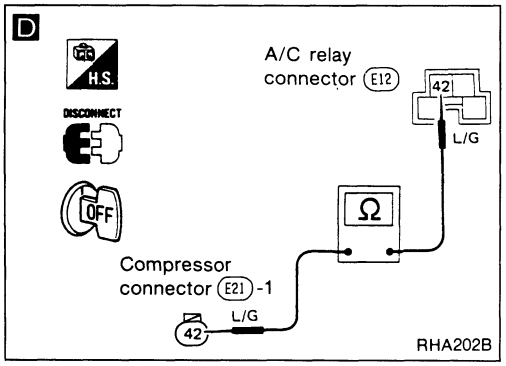
Replace intake door motor.

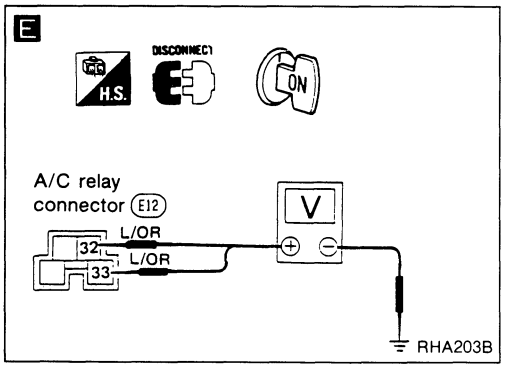
Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.











Diagnostic Procedure 4

SYMPTOM: Magnet clutch does not engage with A/C switch and fan switch are ON.

- **Perform PRELIMINARY CHECK 2 before referring to the following flow chart.**

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. → Ⓐ

O.K. ↓

B

CHECK THERMAL PROTECTOR.
Disconnect thermal protector harness connector.
Does continuity exist between thermal protector harness terminal No. 45 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).

Ⓐ ↓

C

CHECK A/C RELAY OPERATION.
Do approx. 12 volts exist between A/C relay harness terminal No. 42 and body ground?

N.G. → E

O.K. ↓

Disconnect A/C relay harness connector.

D

Check circuit continuity between A/C relay harness terminal No. 42 and compressor harness terminal No. 42.

Note

E

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. → Ⓑ

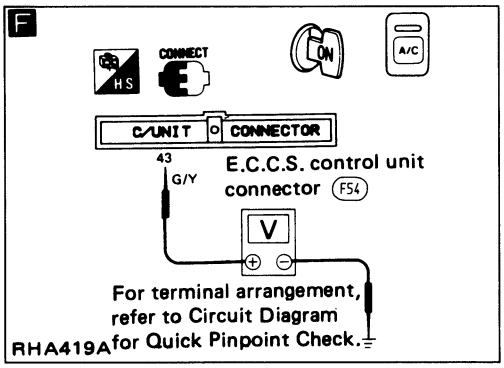
N.G. → Check 10A fuse at fuse block. (Refer to "POWER SUPPLY ROUTING" in EL section and A/C ELECTRICAL CIRCUIT.)

(Go to next page.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 4 (Cont'd)

F



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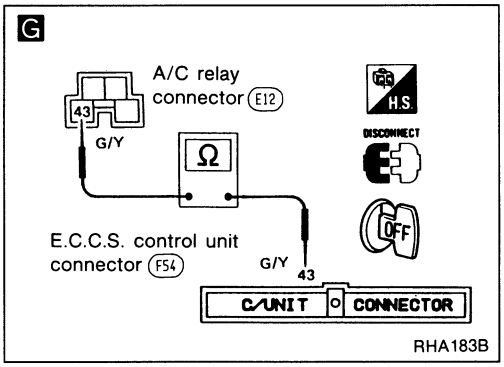

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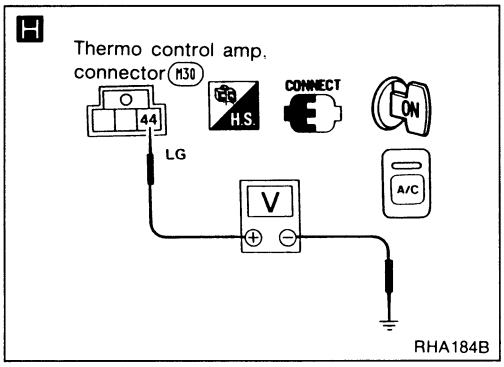

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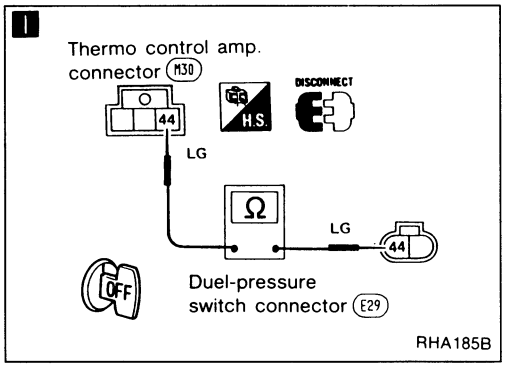

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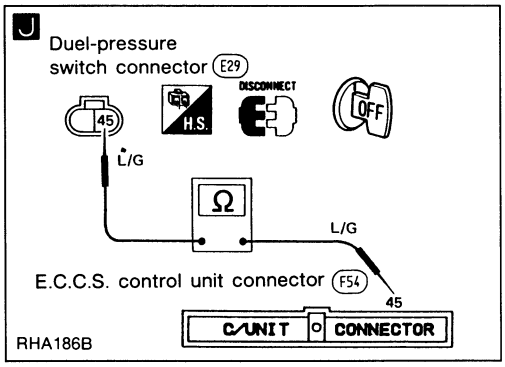


Ⓑ

CHECK A/C RELAY AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection.)

N.G. → Replace A/C relay.

O.K. ↓

Reconnect A/C relay.

F

CHECK COIL SIDE CIRCUIT OF A/C RELAY.
Do approx. 12 volts exist between E.C.C.S. control unit harness terminal No. ㊸ and body ground?

N.G. → G Note: Check circuit continuity between A/C relay harness terminal No. ㊸ and E.C.C.S. control unit harness terminal No. ㊸.

O.K. ↓

H

CHECK VOLTAGE FOR THERMO CONTROL AMP.
Do approx. 8 to 9 volts exist between thermo control amp. harness terminal No. ㊹ and body ground?

N.G. → I Note: Check circuit continuity between thermo control amp. harness terminal No. ㊹ and dual-pressure switch terminal No. ㊹.

O.K. ↓

Ⓒ
(Go to next page.)

O.K. ↓

CHECK DUAL-PRESSURE SWITCH.
(Refer to Electrical Components Inspection.)

O.K. ↓

J Note: Check circuit continuity between E.C.C.S. control unit harness terminal No. ㊺ and dual-pressure switch harness terminal No. ㊺.

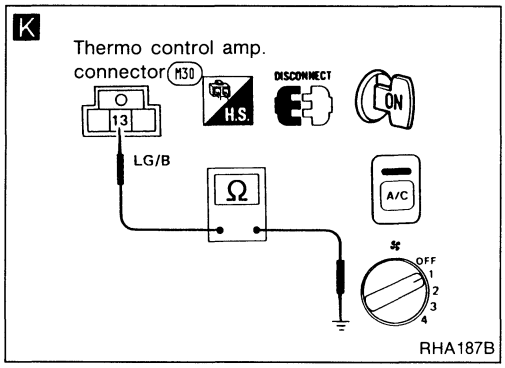
N.G. → Replace dual-pressure switch.

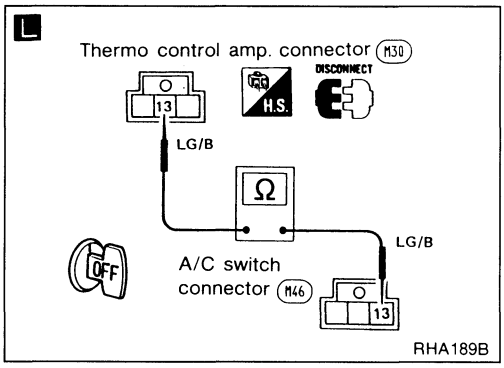
O.K. ↓

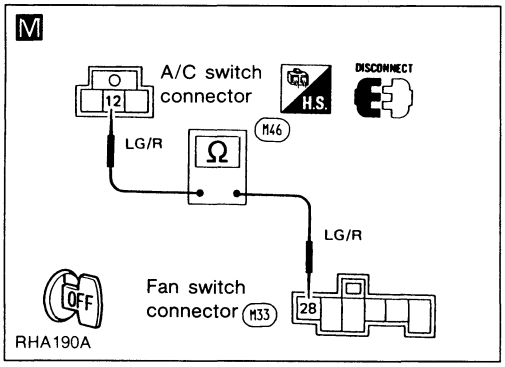
CHECK E.C.C.S. CONTROL UNIT.
(Refer to EF & EC section.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 4 (Cont'd)







Ⓒ

CHECK POWER SUPPLY FOR THERMO CONTROL AMP.
Go to Main Power Supply and Ground Circuit Check.

O.K.

K

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?

N.G. → Disconnect A/C switch harness connector.

L — Note

Check circuit continuity between thermo control amp. harness terminal No. ⑬ and A/C switch harness terminal No. ⑬ .

O.K.

O.K.

Replace thermo control amp.

CHECK A/C SWITCH.
(Refer to Electrical Components Inspection.)

N.G. → Replace A/C switch.

O.K.

Disconnect fan switch harness connector.

M — Note

Check circuit continuity between A/C switch harness terminal No. ⑫ and fan switch harness terminal No. ㉘ .

O.K.

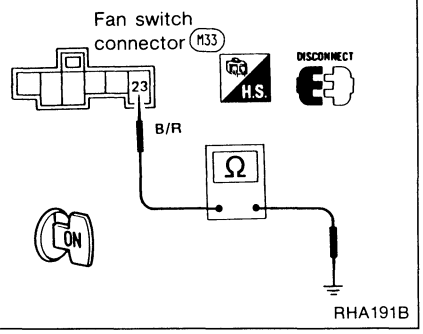
Ⓓ

(Go to next page.)

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

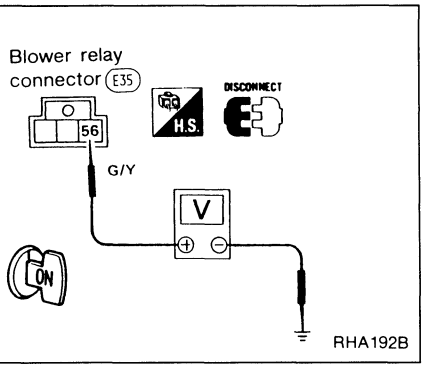
Diagnostic Procedure 4 (Cont'd)

N



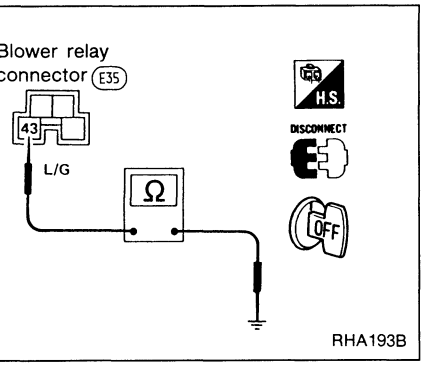
RHA191B

O



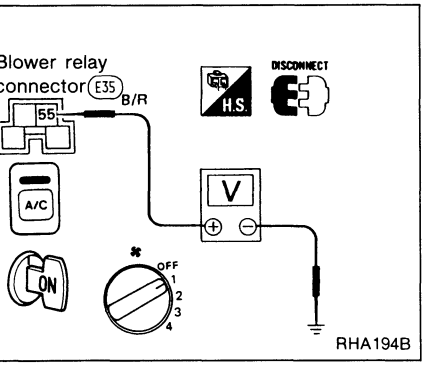
RHA192B

P



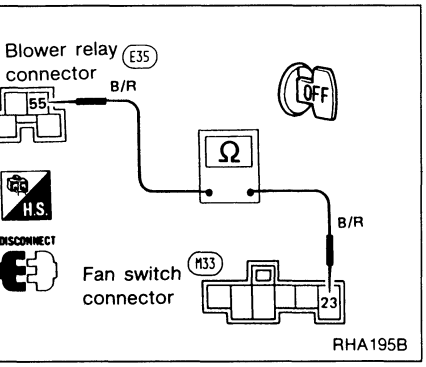
RHA193B

Q



RHA194B

R



RHA195B

(D)

N — Note

CHECK BODY GROUND CIRCUIT FOR FAN SWITCH.
Does continuity exist between fan switch harness terminal No. 23 and body ground?

N.G. → O

O.K. ↓

CHECK FAN SWITCH.
(Refer to Electrical Components Inspection.)

↓

Replace fan switch.

O

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. → P

N.G. → Check 10A fuses at fuse block. (Refer to Electrical Components Inspection.)

P — Note

Check circuit continuity between blower relay harness terminal No. 43 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.

↓

Q

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.

↓

R — Note

Check circuit continuity between fan switch harness terminal No. 23 and blower relay harness terminal No. 55 .

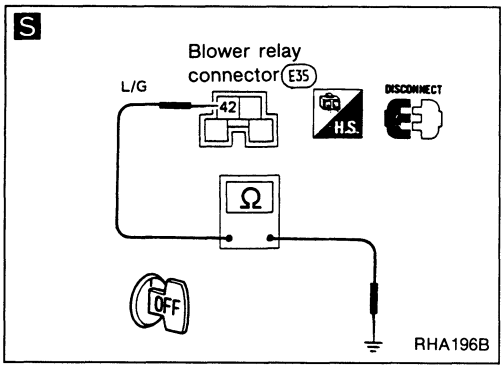
O.K. ↓

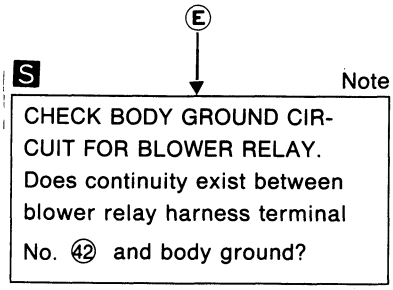
(E)

(Go to next page.)

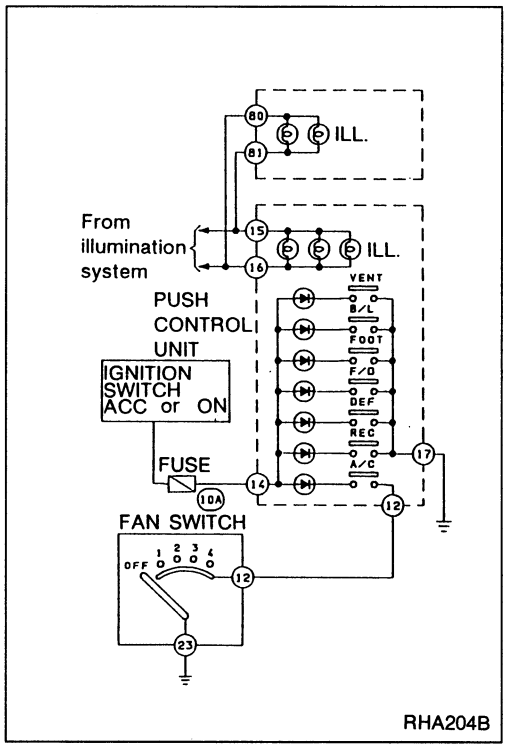
Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 4 (Cont'd)





Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.



RHA204B

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:

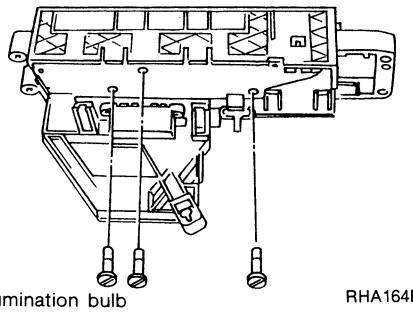
INCIDENTS									"How to repair"
ILL.		VENT	B/L	FOOT	F/D	DEF	REC	A/C	
Push control unit	Fresh vent								
X	O	O	O	O	O	O	O		Go to DIAGNOSTIC PROCEDURE 5-1.
O	X	O	O	O	O	O	O		Go to DIAGNOSTIC PROCEDURE 5-2.
		O	O	O	O	O	O	X	Go to DIAGNOSTIC PROCEDURE 5-3.
O		X	X	X	X	X	X		Go to DIAGNOSTIC PROCEDURE 5-4.
		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)

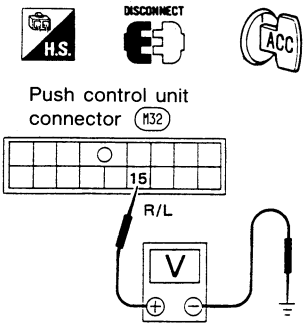
DIAGNOSTIC PROCEDURE 5-1

A



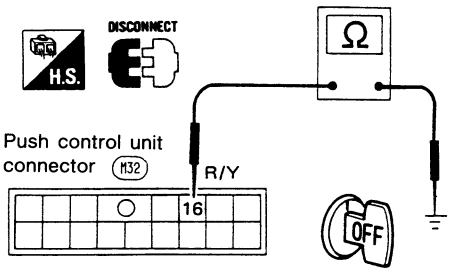
Illumination bulb RHA164B

B



RHA205B

C



RHA206B

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

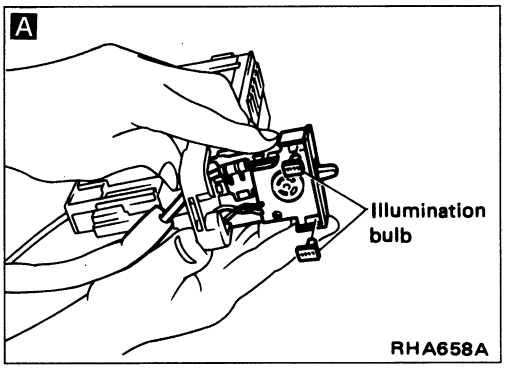
CHECK BODY GROUND CIRCUIT FOR ILLUMINATION.
Does continuity exist between push control unit harness terminal No. ⑯ and body ground?

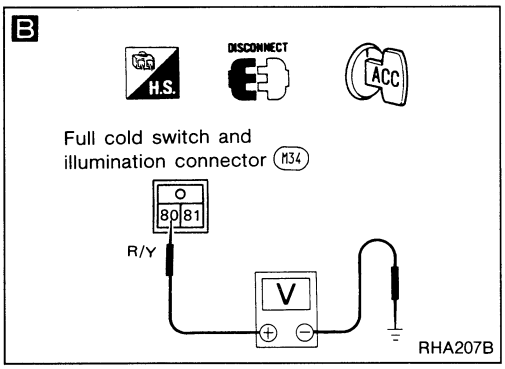
O.K. ↓

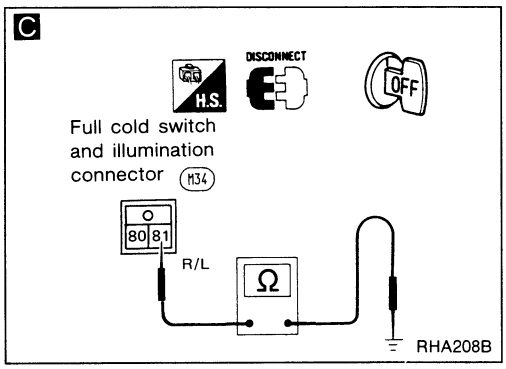
Replace control amp. built-in push control unit.

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. ↓

A

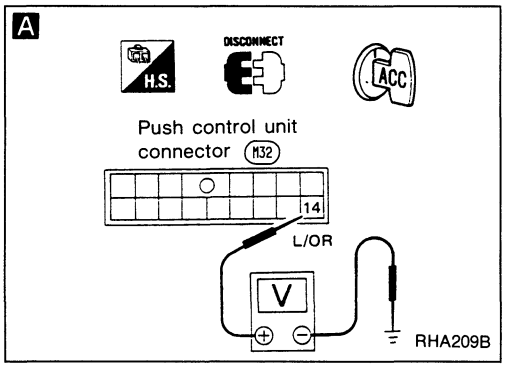
Check Bulb.

N.G. ↓

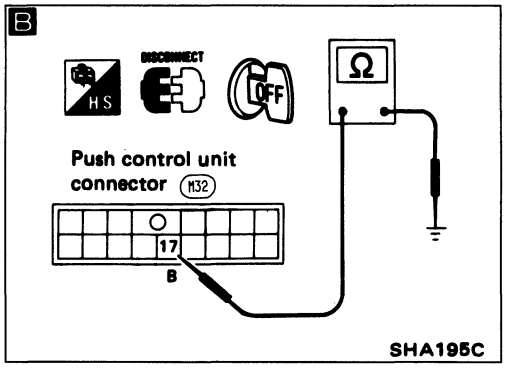
Replace Bulb.

DIAGNOSTIC PROCEDURE 5-4

A



B



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?

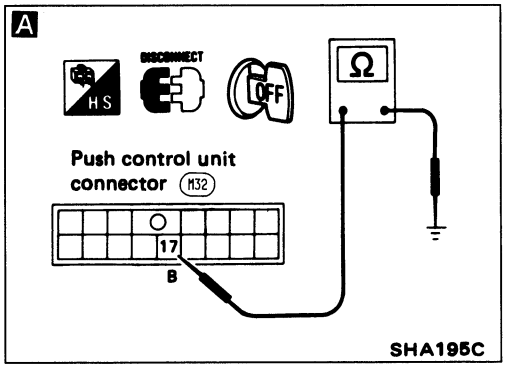
O.K. ↓

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)

DIAGNOSTIC PROCEDURE 5-5



Turn ignition switch and lighting switch OFF.

↓

Disconnect push control unit harness connector.

↓

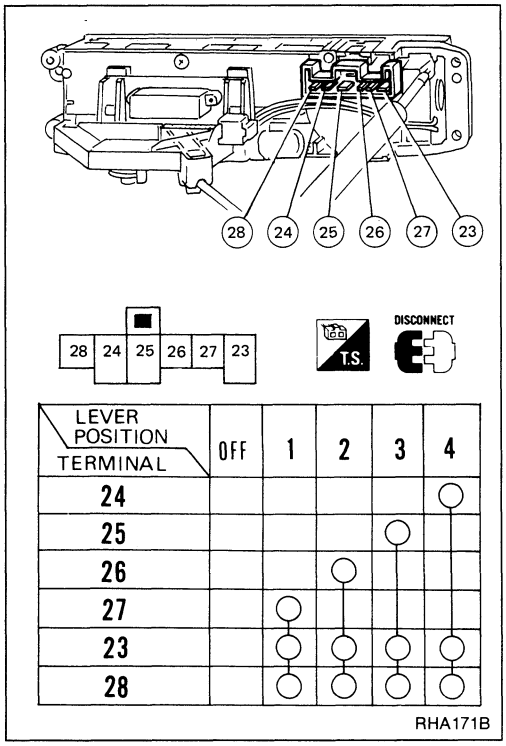
A Note

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.



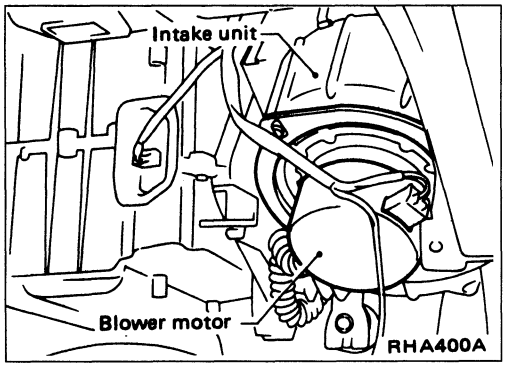
LEVER POSITION / TERMINAL	OFF	1	2	3	4
24					○
25				○	
26			○		
27		○			
23		○	○	○	○
28		○	○	○	○

RHA171B

Electrical Components Inspection

FAN SWITCH

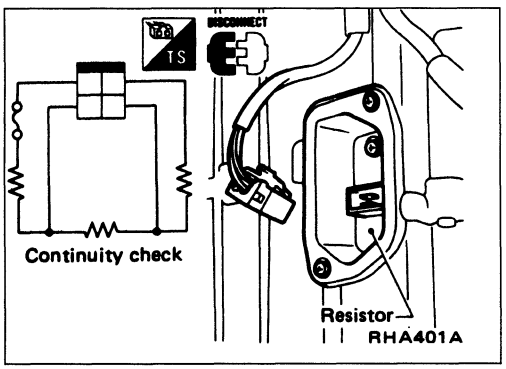
Check continuity between terminals at each switch position.



BLOWER MOTOR

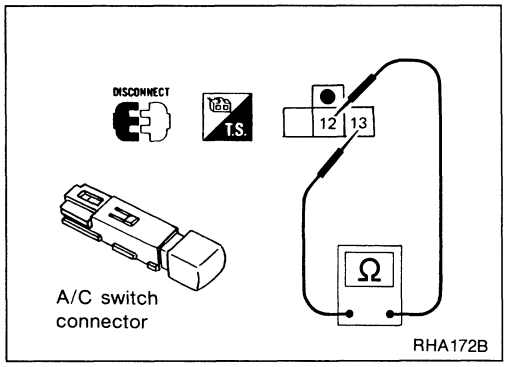
Confirm smooth rotation of the blower motor.

- Ensure that there are no foreign particles inside the intake unit.



BLOWER RESISTOR

Check continuity between terminals.



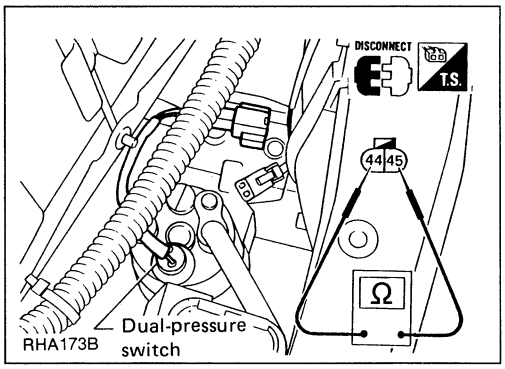
A/C SWITCH

Check continuity between terminals at each switch position.

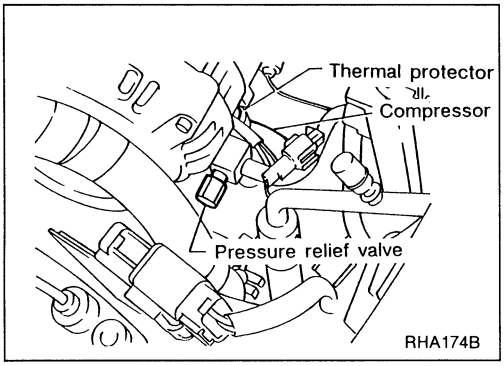
Switch condition		Terminal No.		Continuity
A/C	DEF	⊕	⊖	
ON	ON	⑬	⑫	Yes
ON	OFF			
OFF	ON			

Electrical Components Inspection (Cont'd)

DUAL-PRESSURE SWITCH

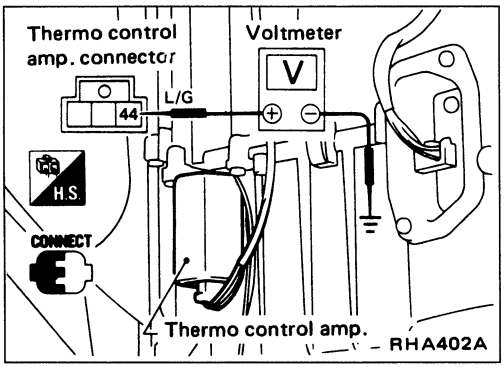


High-pressure side line pressure kPa (kg/cm^2, psi)	Operation	Continuity
Decreasing to 177 - 216 (1.8 - 2.2, 26 - 31) Increasing to 2,452 - 2,844 (25 - 29, 356 - 412)	Turn OFF	Does not exist
Increasing to 177 - 235 (1.8 - 2.4, 34) Decreasing to 1,863 - 2,354 (19 - 24, 270 - 341)	Turn ON	Exists



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.

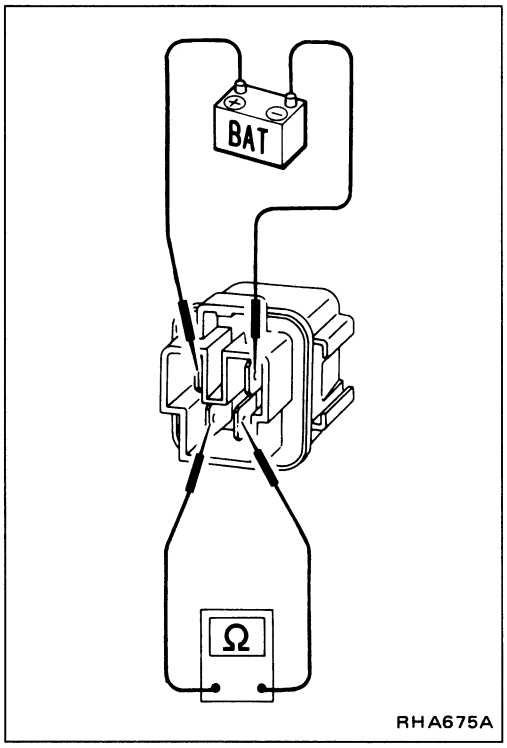
1. Run engine, and operate A/C system.
2. Connect the voltmeter from harness side.
3. Check thermo control amp. operation shown in the table.

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

Electrical Components Inspection (Cont'd)

RELAYS

Check circuit continuity between terminals by supplying 12 volts to coil side terminal of A/C relay.



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
Capacity m ℓ (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)	0.8 - 0.9 (1.8 - 2.0)

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

CONTENTS

EL

WIRING DIAGRAM REFERENCE CHART

Description

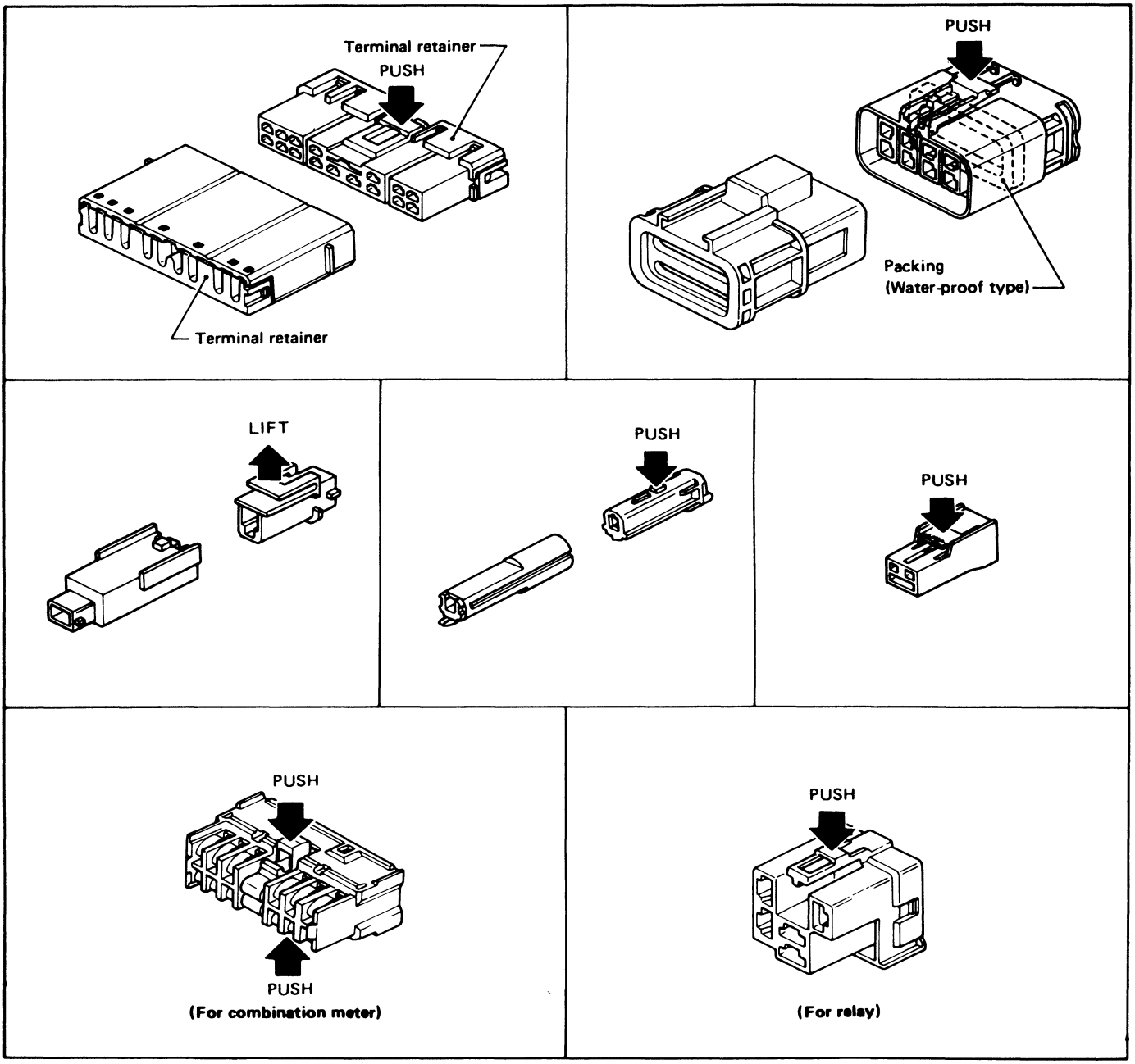
HARNESS CONNECTOR

- 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]

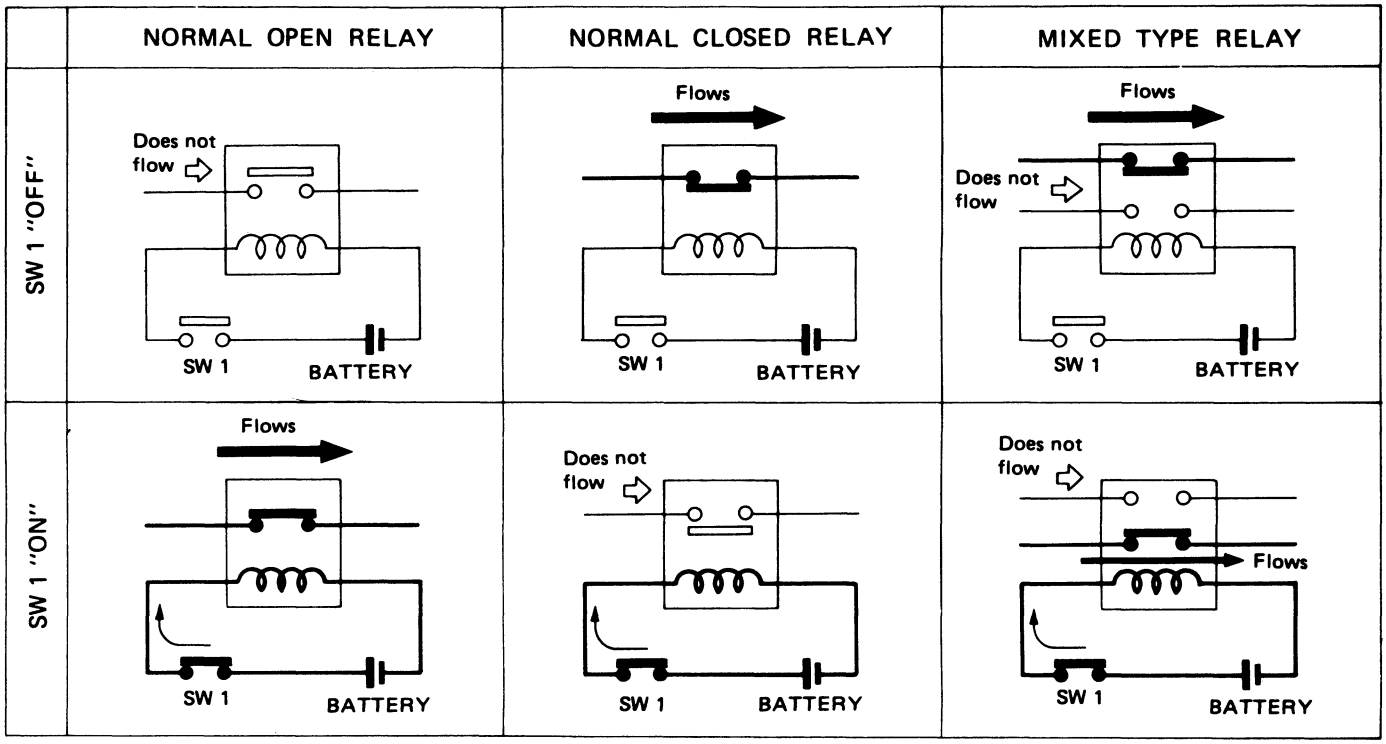


SEL769D

Description

NORMAL OPEN, NORMAL CLOSED AND MIXED TYPE RELAYS

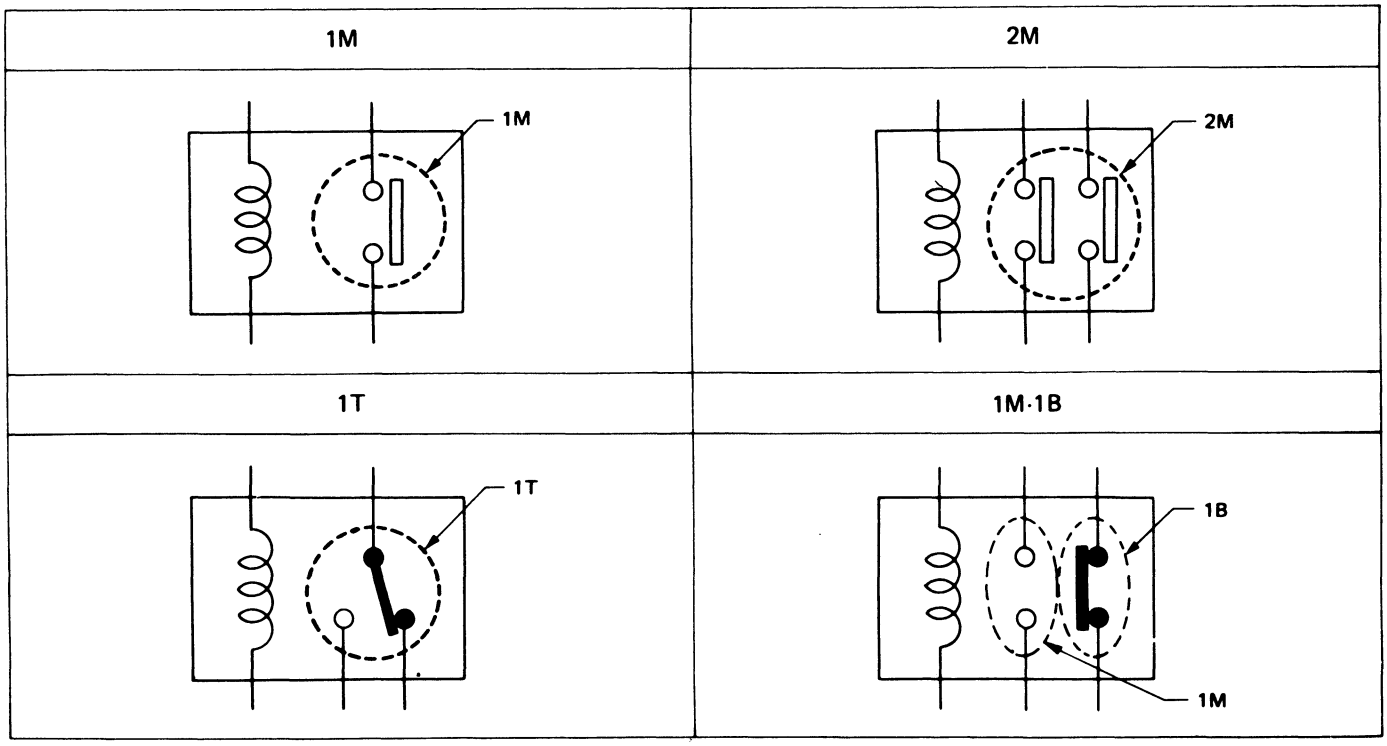
Relays can mainly be divided into three types: normal open, normal closed and mixed type relays.



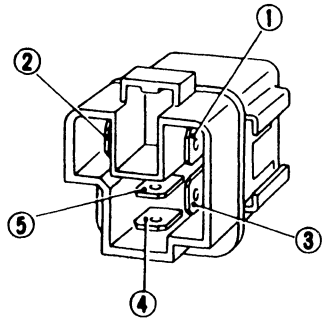
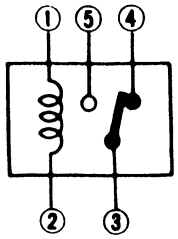
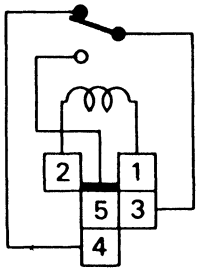
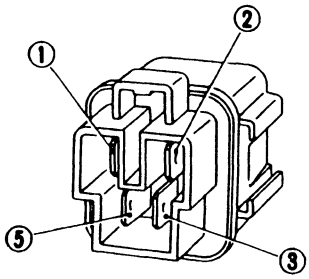
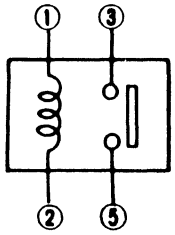
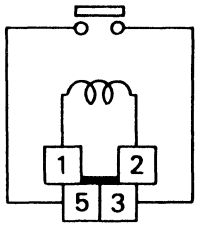
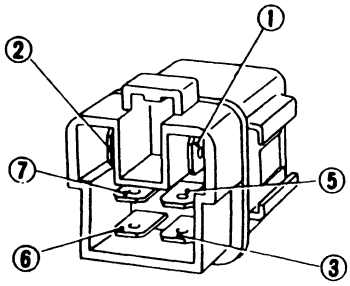
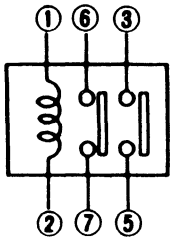
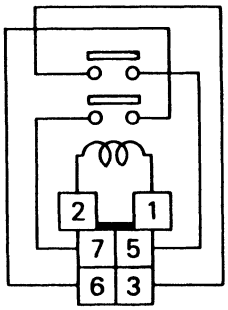
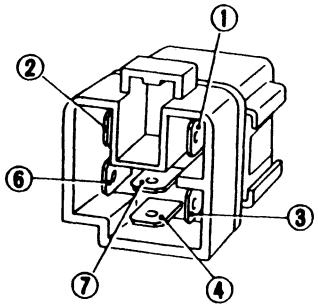
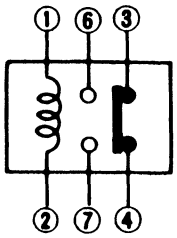
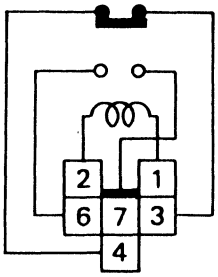
SEL881H

TYPE OF STANDARDIZED RELAYS

1M	.....	1 Make	2M	.....	2 Make
1T	.....	1 Transfer	1M·1B	.....	1 Make 1 Break

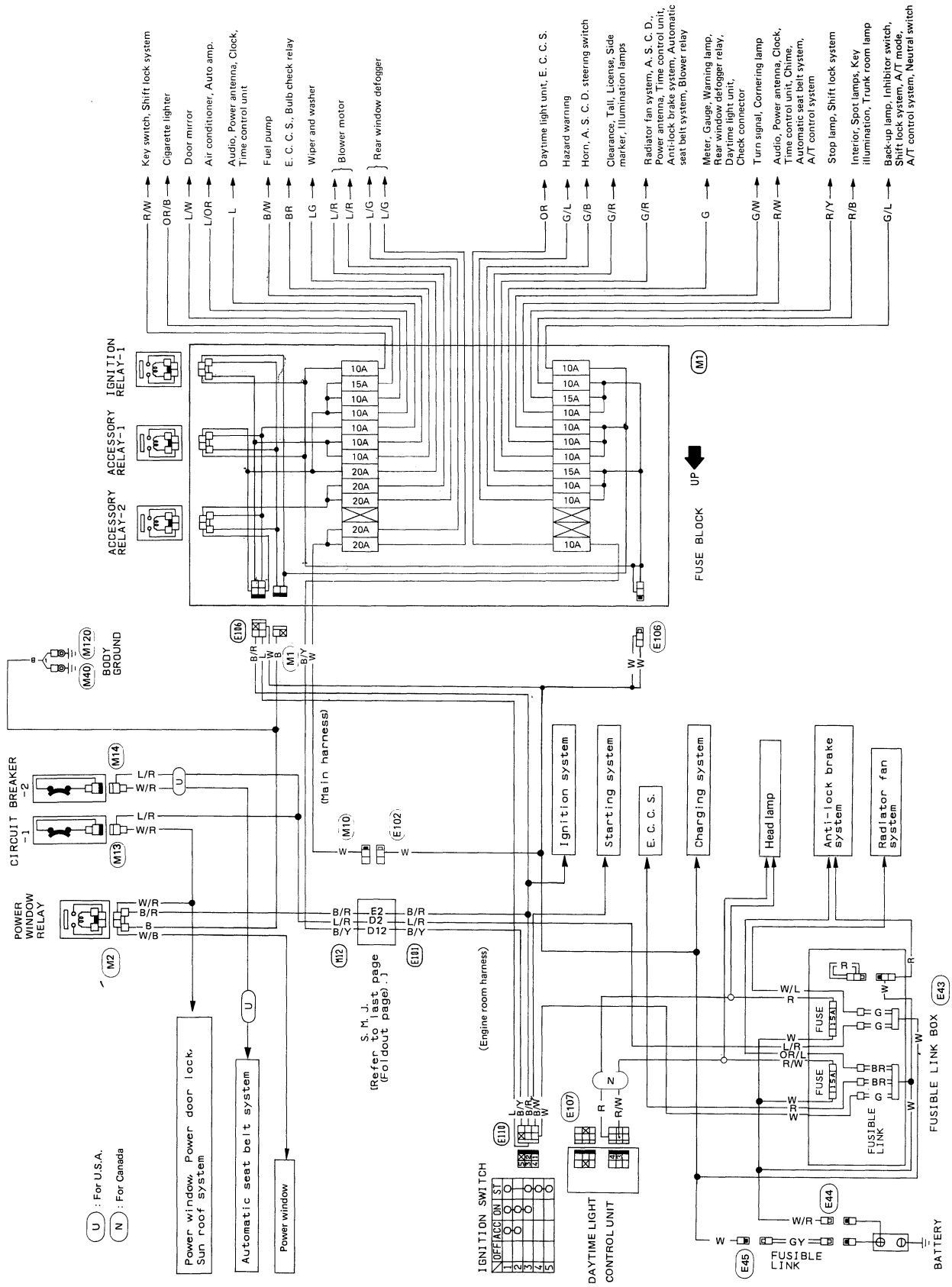


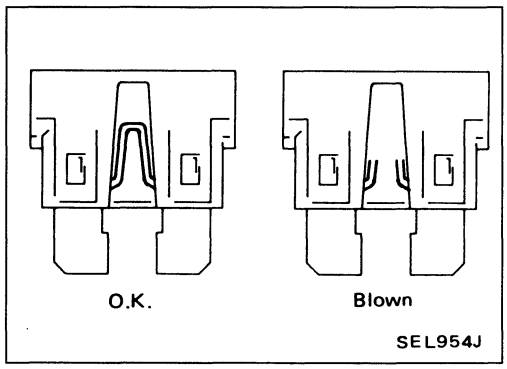
SEL882H

Type	Outer view	Circuit	Connector symbol and connection	Case color
1T				BLACK
1M				BLUE or GREEN
2M				BROWN
1M·1B				GRAY

SEL883H

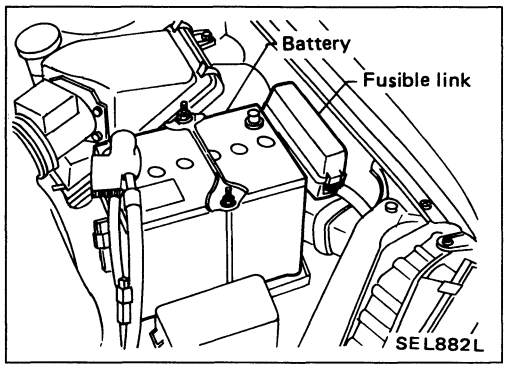
Wiring Diagram





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.

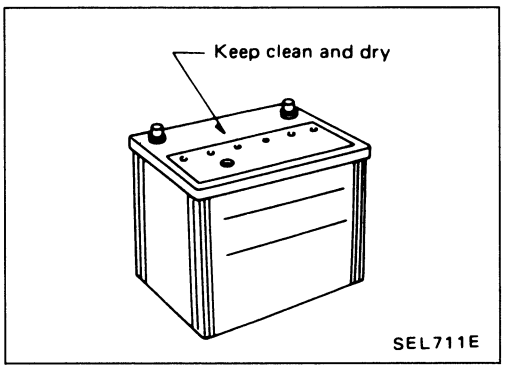
FUSIBLE LINK (WIRE TYPE) VARIATION

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.**

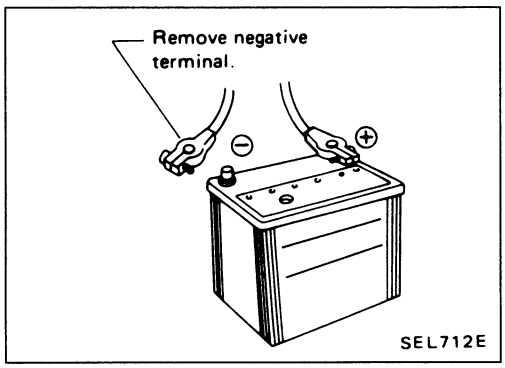


How to Handle Battery

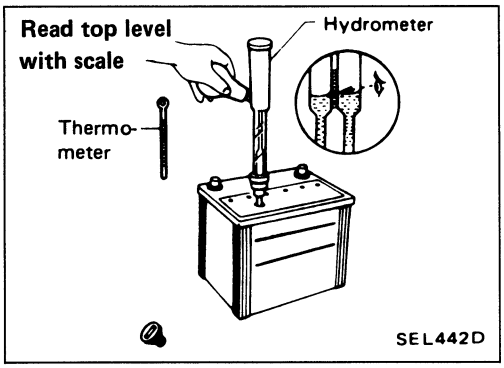
METHODS OF PREVENTING OVER-DISCHARGE

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.

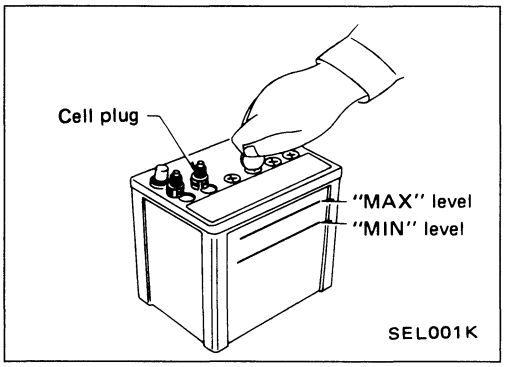
How to Handle Battery (Cont'd)

CHECKING ELECTROLYTE LEVEL

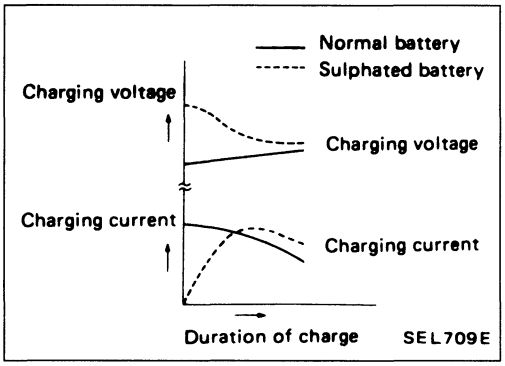
WARNING:

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.



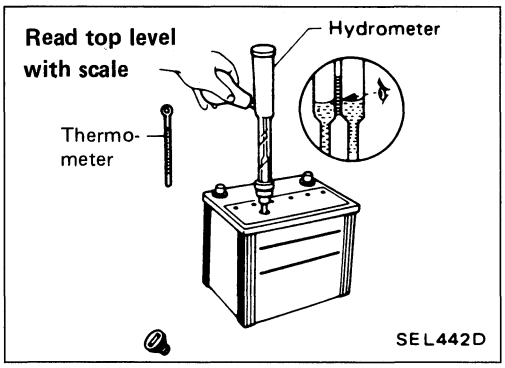
- Remove the cell plug using a suitable tool.
- Add distilled water up to the MAX level.



SULPHATION

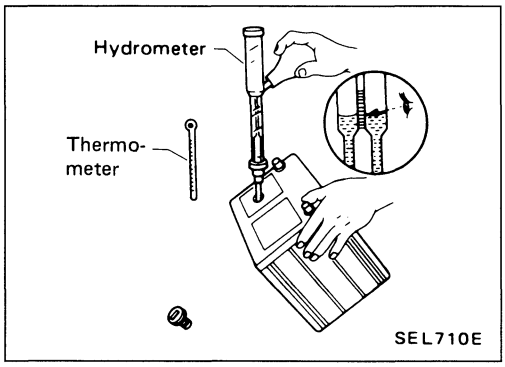
When a battery has been left unattended for a long period of time and has a specific gravity of less than 1.100, it will be completely discharged, resulting in sulphation on the cell plates.

Compared with a battery discharged under normal conditions, the current flow in a "sulphated" battery is not as smooth although its voltage is high during the initial stage of charging, as shown in the figure at the left.



SPECIFIC GRAVITY CHECK

1. Read hydrometer and thermometer indications at eye level.



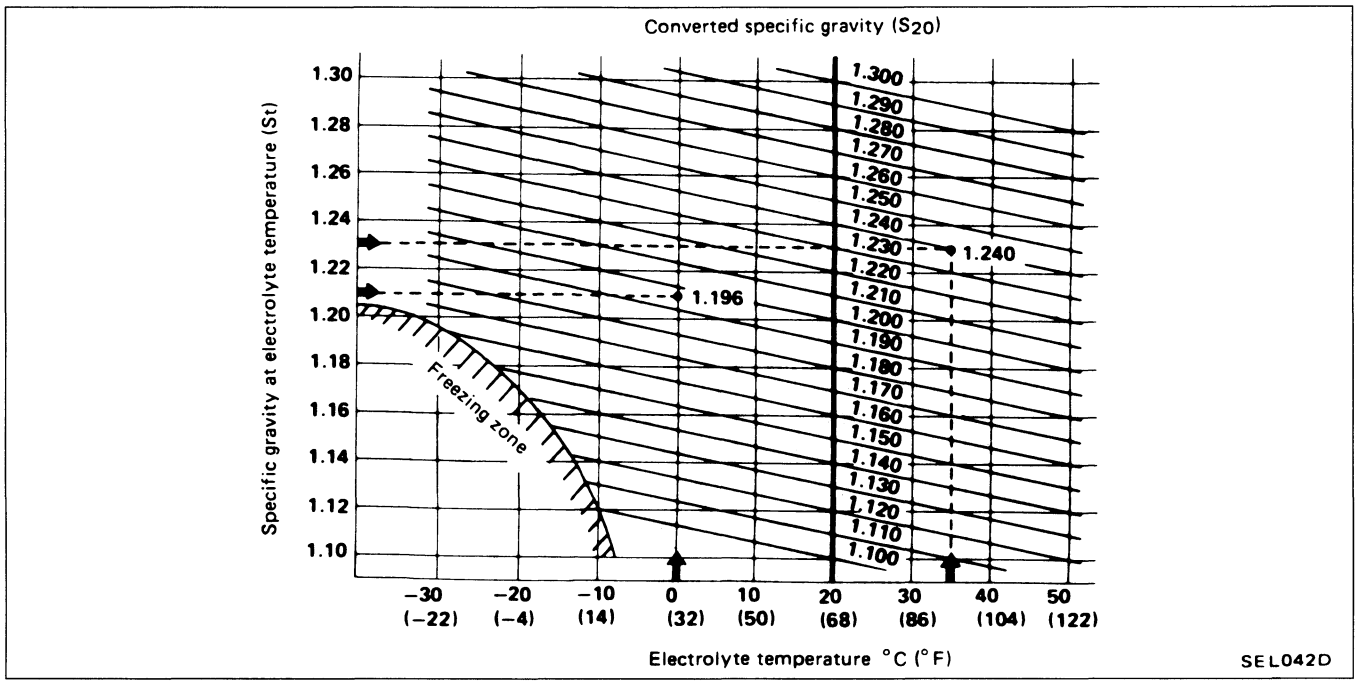
- When electrolyte level is too low, tilt battery case to raise it for easy measurement.

How to Handle Battery (Cont'd)

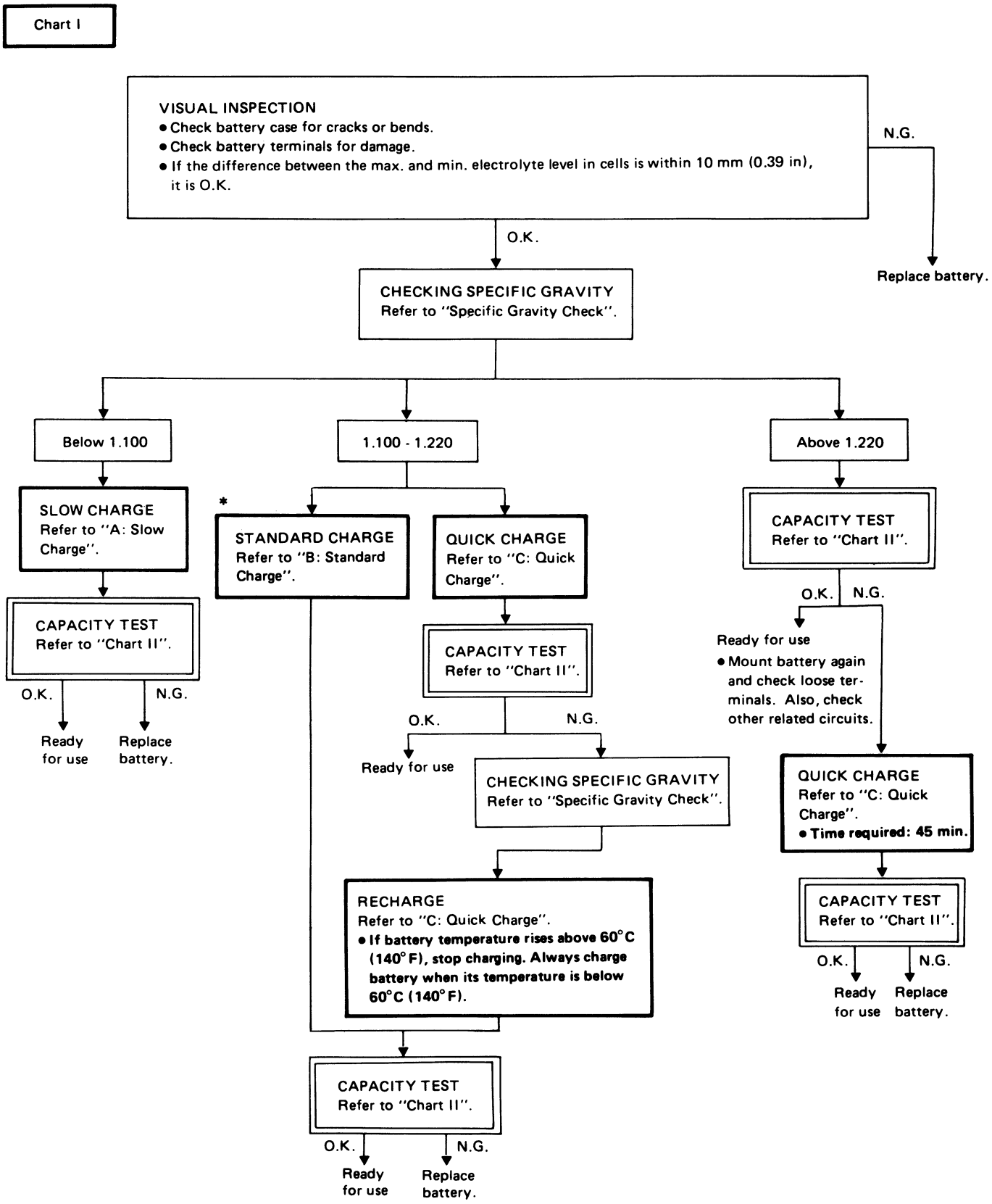
2. Convert into specific gravity at 20°C (68°F).

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.



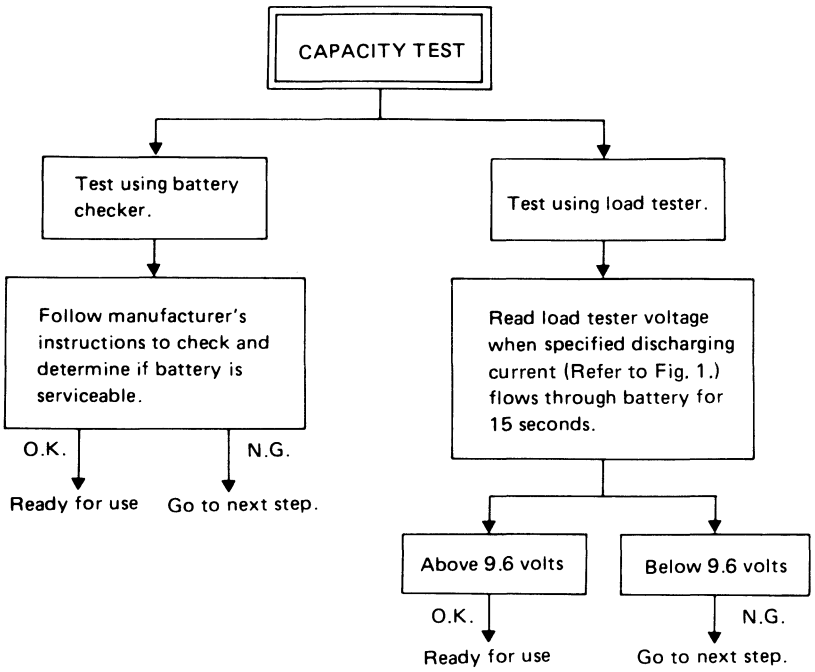
Battery Test and Charging Chart



* "STANDARD CHARGE" is recommended in case that the vehicle is in storage after charging.

Battery Test and Charging Chart (Cont'd)

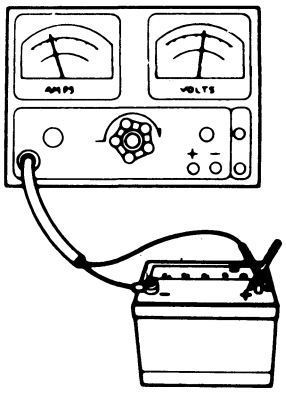
Chart II



- Check battery type and determine the specified current using the following table.

Fig. 1 DISCHARGING CURRENT (Load tester)

Type	Current (A)
28B19R(L)	90
34B19R(L)	99
46B24R(L)	135
55B24R(L)	135
50D23R(L)	150
55D23R(L)	180
65D26R(L)	195
80D26R(L)	195
75D31R(L)	210
95D31R(L)	240
95E41R(L)	300
130E41R(L)	330



SEL697B

Battery Test and Charging Chart (Cont'd)

A: SLOW CHARGE

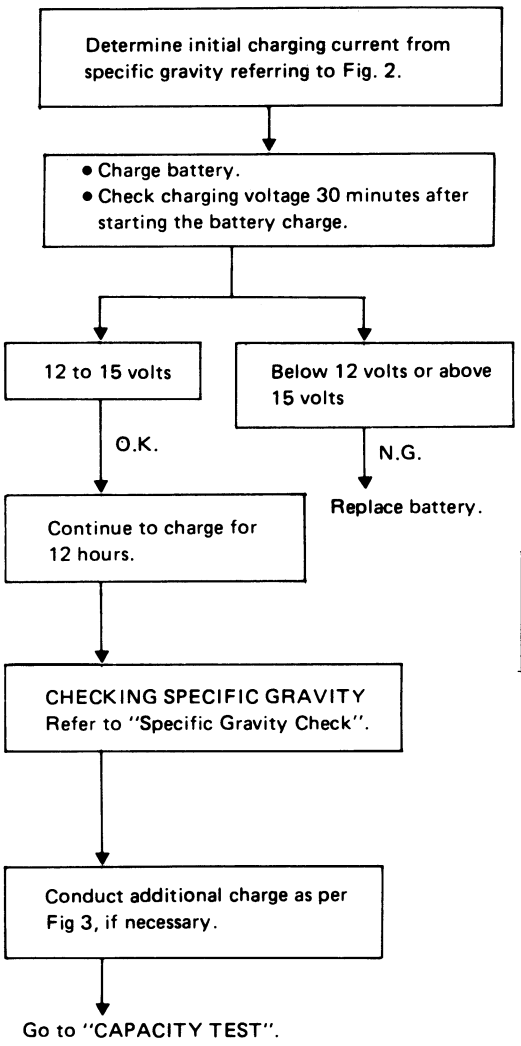
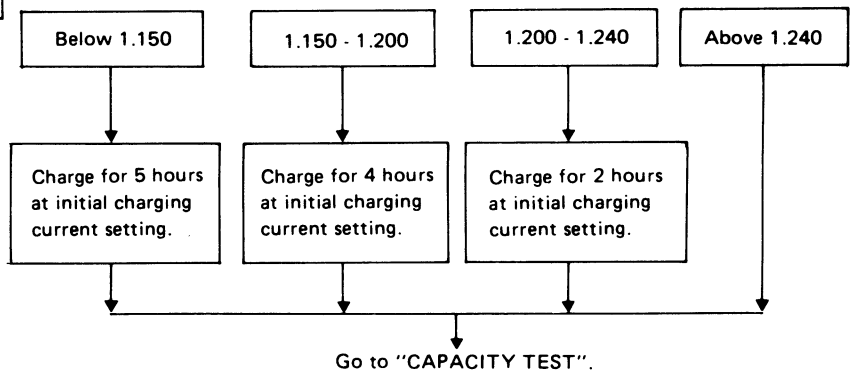


Fig. 2 INITIAL CHARGING CURRENT SETTING (Slow charge)

BATTERY TYPE / CONVERTED SPECIFIC GRAVITY	28B19R(L) 34B19R(L)	46B24R(L) 55B24R(L)	50D23R(L) 55D23R(L)	65D26R(L) 80D26R(L)	75D31R(L)	95D31R(L) 95E41R(L)	130E41R(L)
Below 1.100	4.0 (A)	5.0 (A)	7.0 (A)	8.0 (A)	9.0 (A)	10.0 (A)	14.0 (A)

- Check battery type and determine the specified current using the table shown above.
- After starting charging, adjustment of charging current is not necessary.

Fig. 3 ADDITIONAL CHARGE (Slow charge)



CAUTION:

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

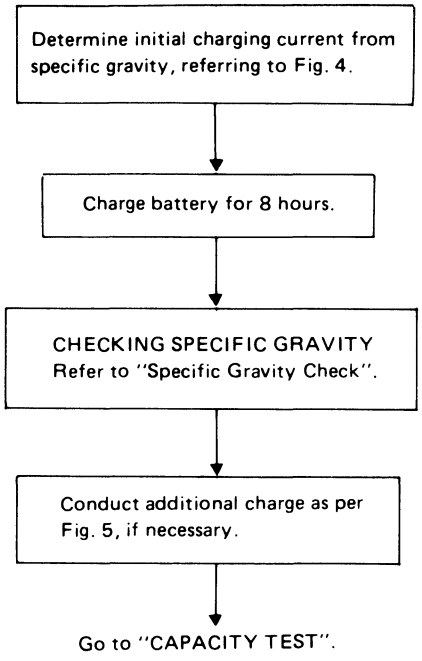
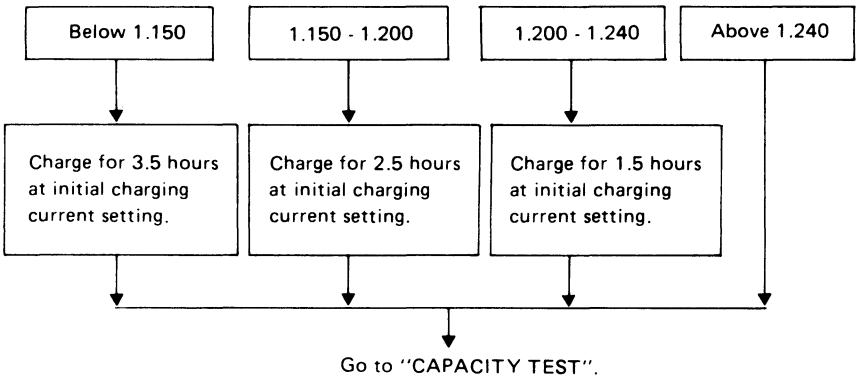


Fig. 4 INITIAL CHARGING CURRENT SETTING
(Standard charge)

BATTERY TYPE / CONVERTED SPECIFIC GRAVITY	28B19R(L) 34B19R(L)	46B24R(L) 55B24R(L)	50D23R(L) 55D23R(L)	65D26R(L) 80D26R(L)	75D31R(L)	95D31R(L) 95E41R(L)	130E41R(L)
1.100 - 1.130	4.0 (A)	5.0 (A)	6.0 (A)	7.0 (A)	8.0 (A)	9.0 (A)	13.0 (A)
1.130 - 1.160	3.0 (A)	4.0 (A)	5.0 (A)	6.0 (A)	7.0 (A)	8.0 (A)	11.0 (A)
1.160 - 1.190	2.0 (A)	3.0 (A)	4.0 (A)	5.0 (A)	6.0 (A)	7.0 (A)	9.0 (A)
1.190 - 1.220	2.0 (A)	2.0 (A)	3.0 (A)	4.0 (A)	5.0 (A)	5.0 (A)	7.0 (A)

- Check battery type and determine the specified current using the table shown above.
- After starting charging, adjustment of charging current is not necessary.

Fig. 5 ADDITIONAL CHARGE (Standard charge)



CAUTION:

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

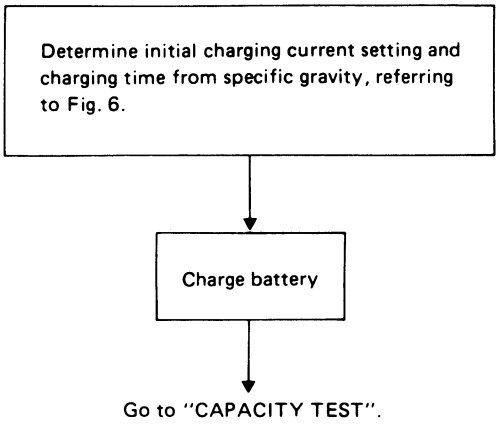


Fig. 6 INITIAL CHARGING CURRENT SETTING AND CHARGING TIME (Quick charge)

BATTERY TYPE / CURRENT [A] / CONVERTED SPECIFIC GRAVITY	28B19R(L) 34B19R(L)	46B24R(L) 55B24R(L) 50D23R(L)	55D23R(L) 65D26R(L) 80D26R(L)	75D31R(L) 95D31R(L) 95E41R(L)	130E41R(L)
	10 (A)	15 (A)	20 (A)	30 (A)	40 (A)
1.100 - 1.130	2.5 hours				
1.130 - 1.160	2.0 hours				
1.160 - 1.190	1.5 hours				
1.190 - 1.220	1.0 hours				
Above 1.220	0.75 hours (45 min.)				

- Check battery type and determine the specified current using the table shown above.
- After starting charging, adjustment of charging current is not necessary.

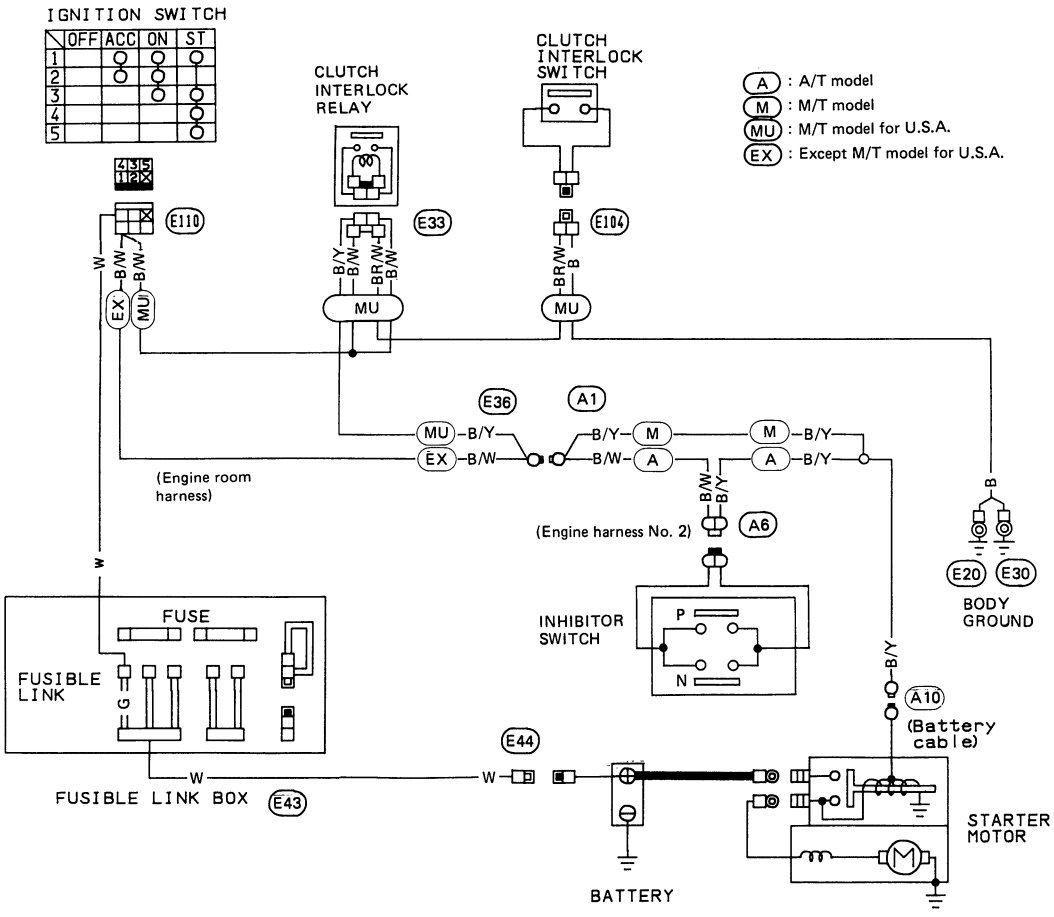
CAUTION:

a. Do not use quick charge method on a battery whose specific gravity is less than 1.100.
b. Set initial charging current to value specified in Fig. 6. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.
c. Keep battery away from open flame while it is being charged.
d. When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.
e. Be careful of a rise in battery temperature because a large current flow is required during quick-charge operation.
   If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).
f. Do not exceed the charging time specified in Fig. 6, because charging battery over the charging time can cause deterioration of the battery.

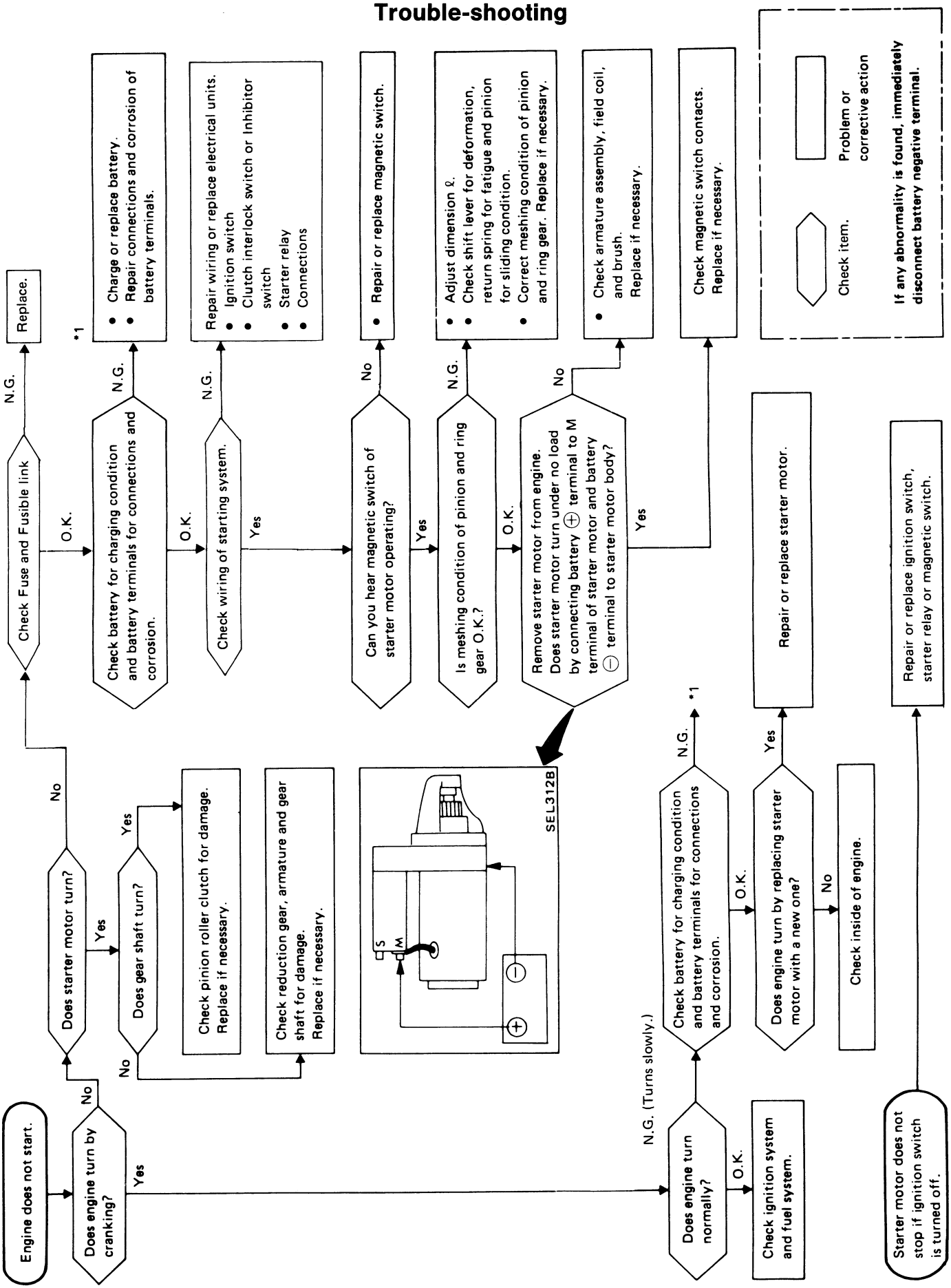
Service Data and Specifications (S.D.S.)

Applied model		For U.S.A.	For Canada
Type		55D23L	65D26L
Capacity	V-AH	12-60	12-65

Wiring Diagram

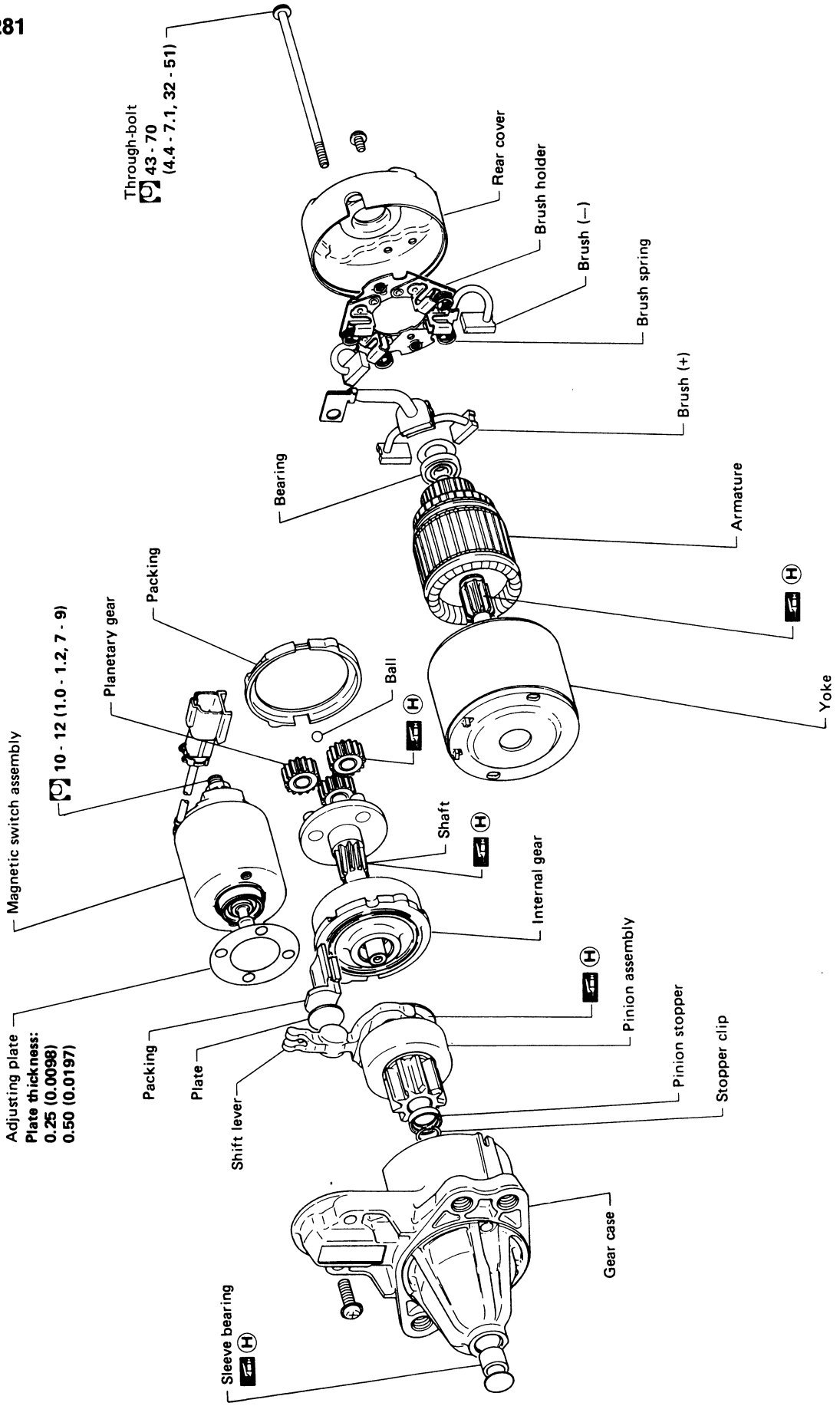


Trouble-shooting



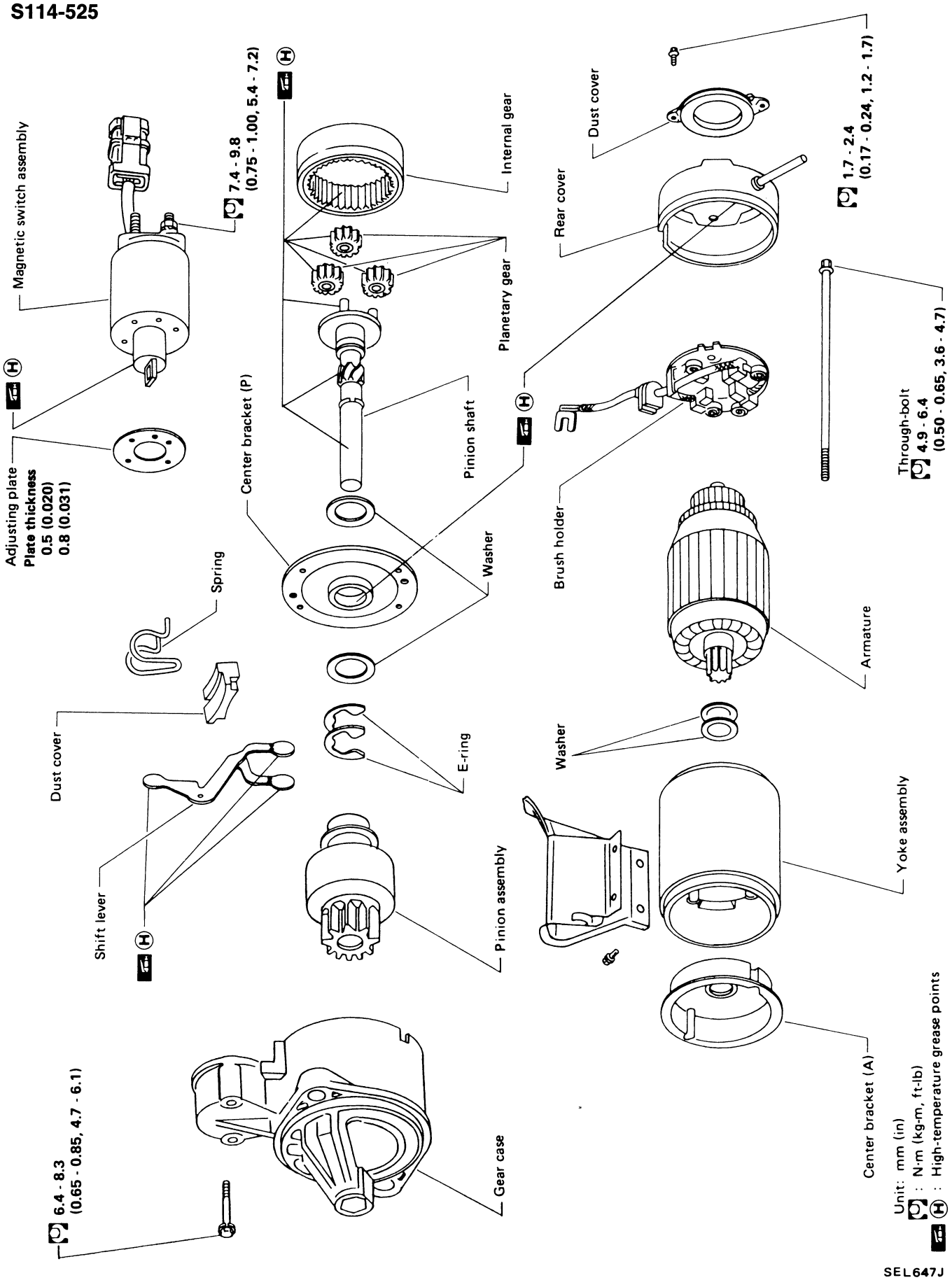
Construction

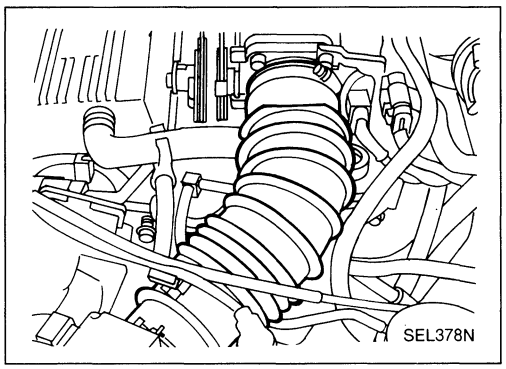
M1T72281



Construction (Cont'd)

S114-525

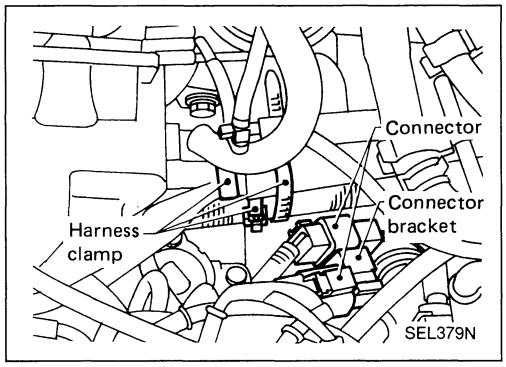




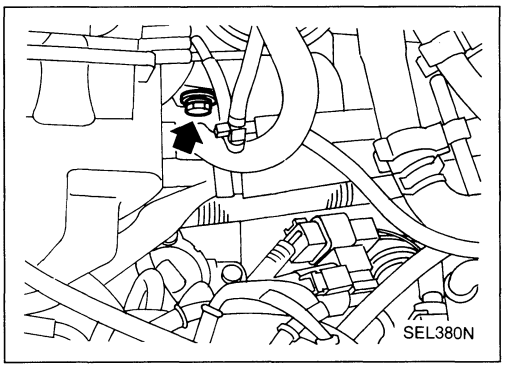
Removal and Installation

REMOVAL

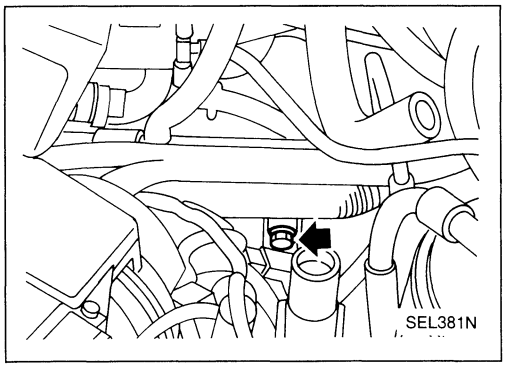
1. Remove air duct.



2. Remove harness clamps. For A/T model, remove harness connectors from harness connector bracket.
3. Remove starter cable from starter.



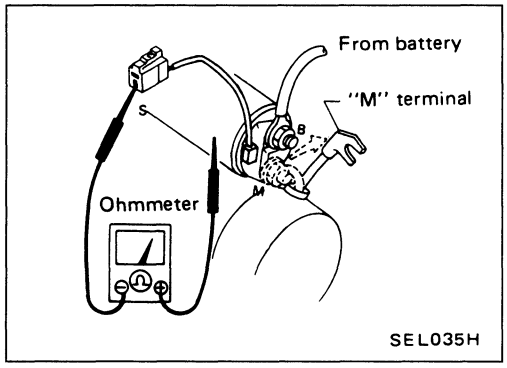
4. Remove starter fixing bolts.



INSTALLATION

- Installation is in reverse order of removal.

Starter upper fixing bolt is shorter than lower bolt.

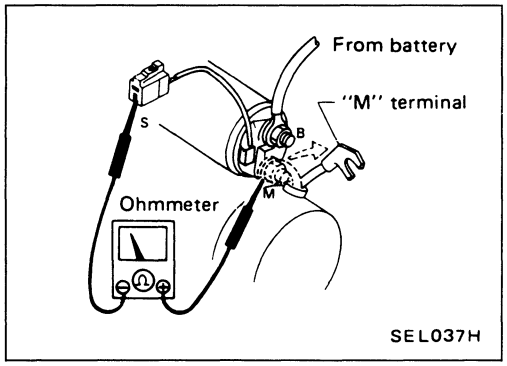


Magnetic Switch Check

- Before starting to check, disconnect battery ground cable.
- Disconnect "M" terminal of starter motor.

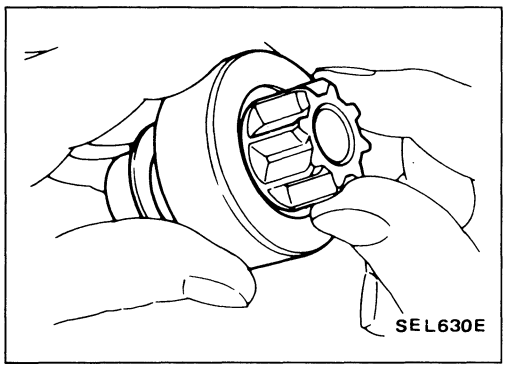
1. Continuity test (between "S" terminal and switch body).

- No continuity ... Replace.



2. Continuity test (between "S" terminal and "M" terminal).

- No continuity ... Replace.



Pinion/Clutch Check

1. Inspect pinion teeth.

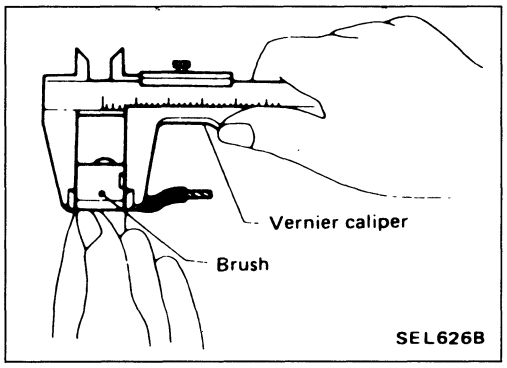
- Replace pinion if teeth are worn or damaged. (Also check condition of ring gear teeth.)

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.)



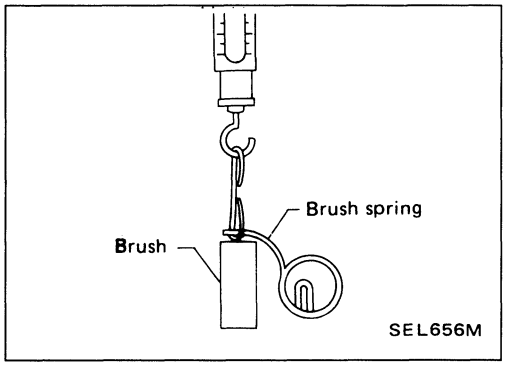
Brush Check

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.

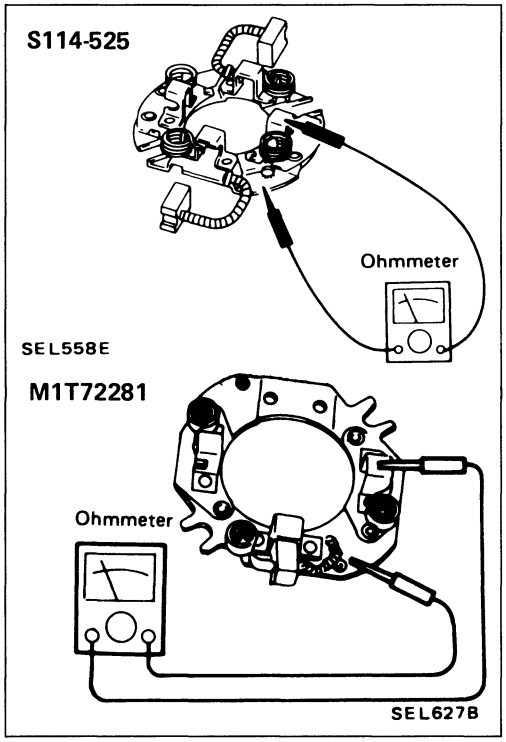
Spring pressure (with new brush):
Refer to S.D.S.

- Not within the specified values ... Replace.

Brush Check (Cont'd)

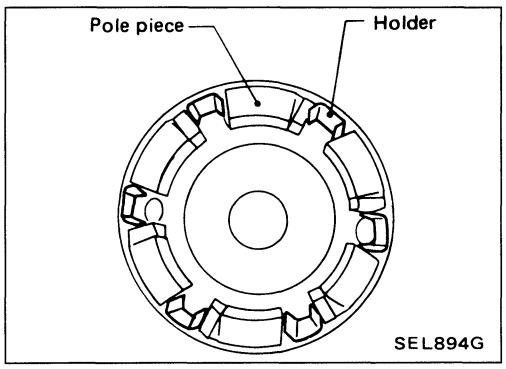
BRUSH HOLDER

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.



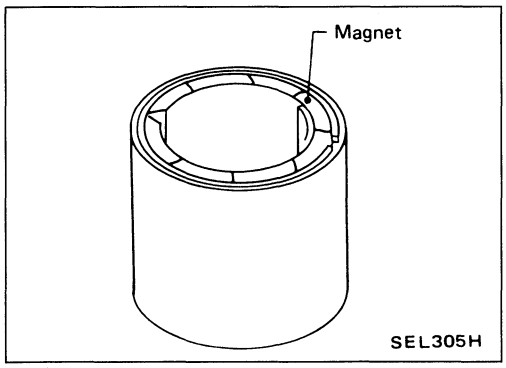
Pole Piece Check (M1T72281)

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.



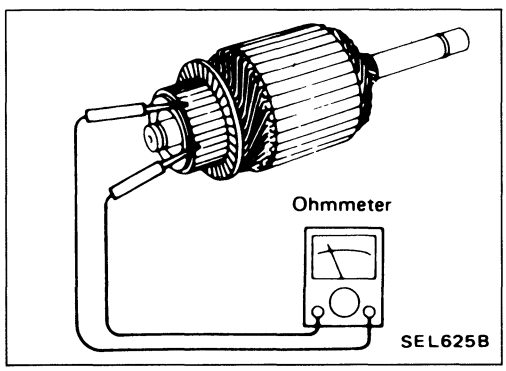
Yoke Assembly Check (S114-525)

Check magnet for cracks. If there is any crack, replace malfunctioning parts as an assembly.

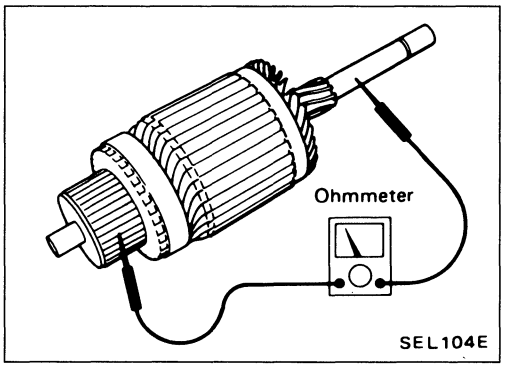


Armature Check

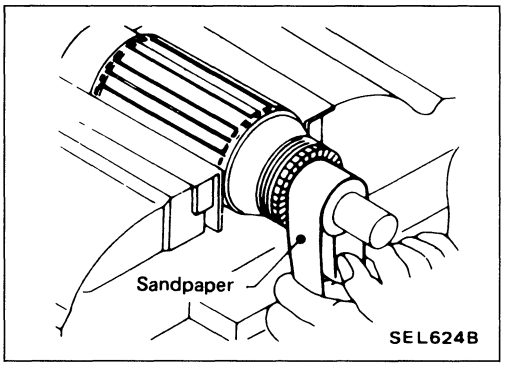
1. Continuity test (between two segments side by side).
- No continuity ... Replace.



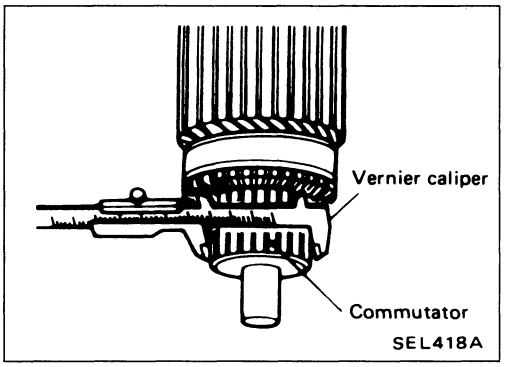
Armature Check (Cont'd)



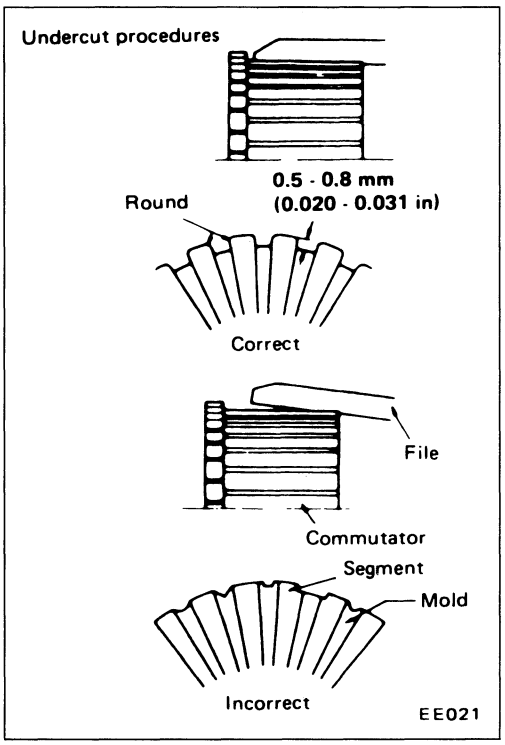
2. Insulation test (between each commutator bar and shaft).
- Continuity exists. ... Replace.



3. Check commutator surface.
- Rough ... Sand lightly with No. 500 - 600 sandpaper.



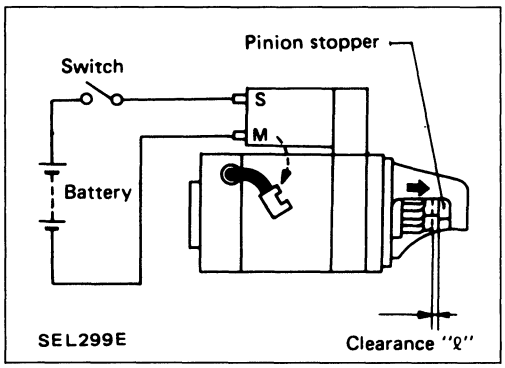
4. Check diameter of commutator.
   Commutator minimum diameter:
   Refer to S.D.S.
- Less than specified value ... Replace.



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.

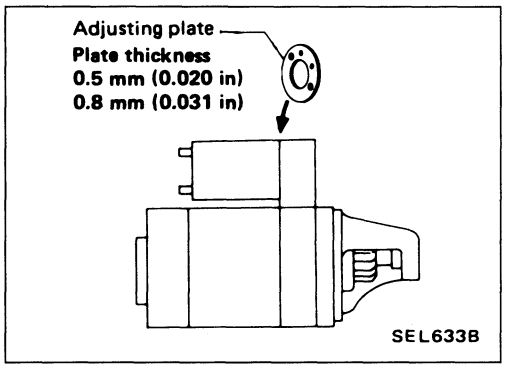


PINION PROTRUSION LENGTH ADJUSTMENT

M1T72281

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.

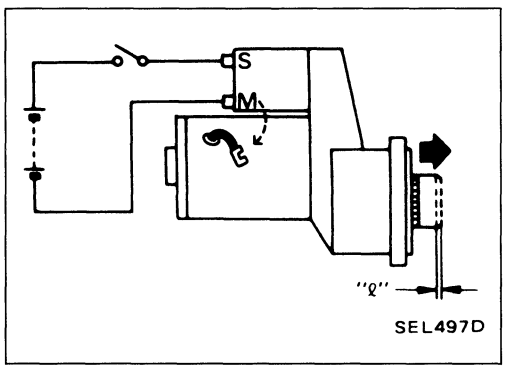


- Not in the specified value ... Adjust with adjusting plate.

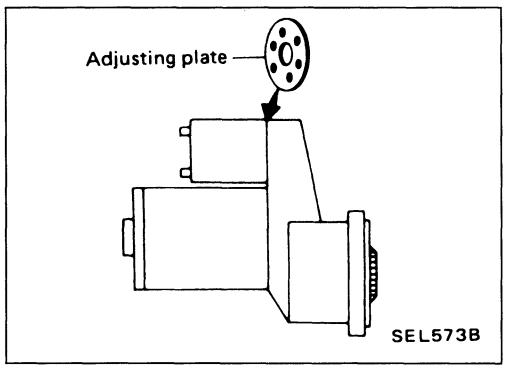
S114-525

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.



- Not in the specified value ... Adjust by adjusting plate.

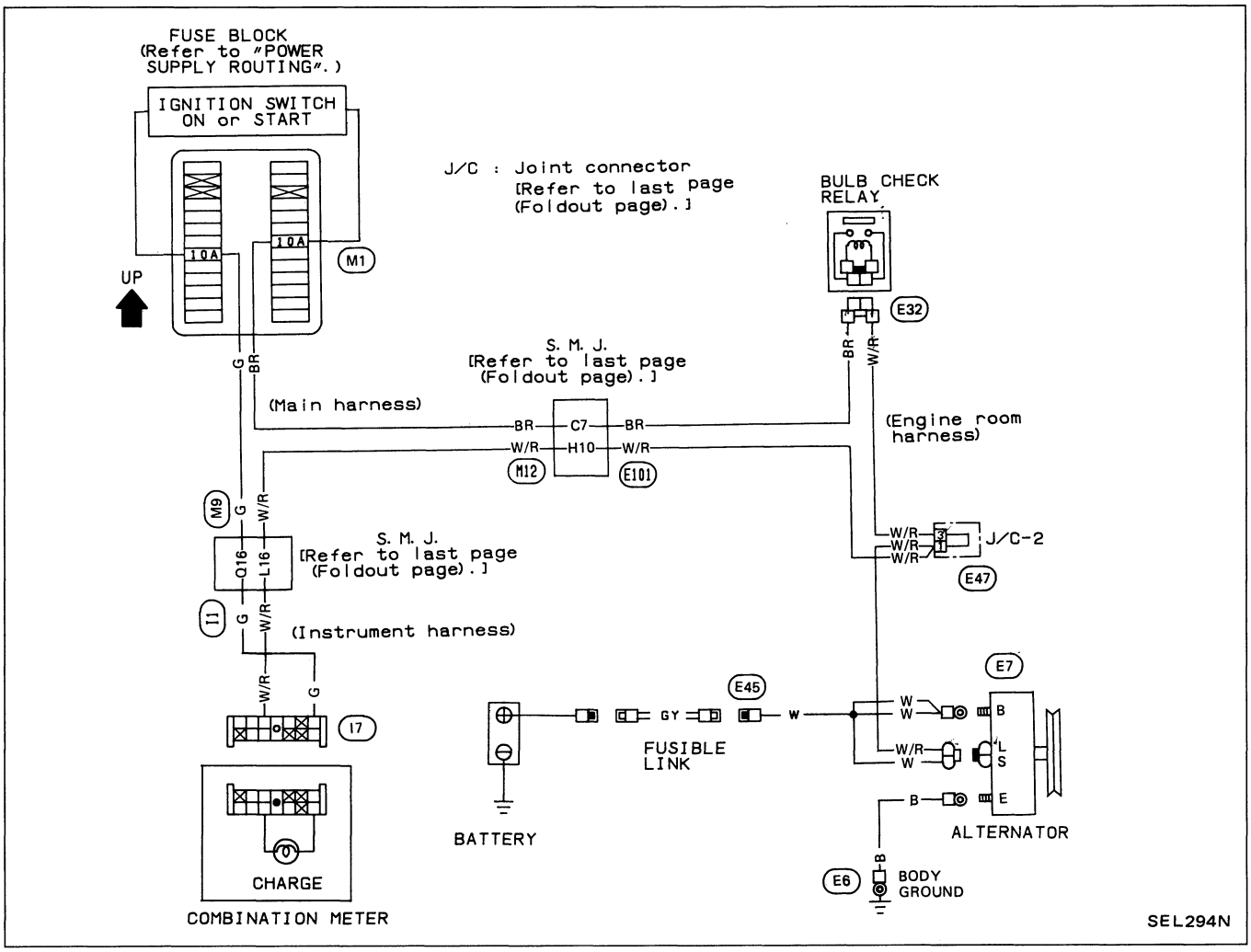


Service Data and Specifications (S.D.S.)

STARTER

Type			MIT72281	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

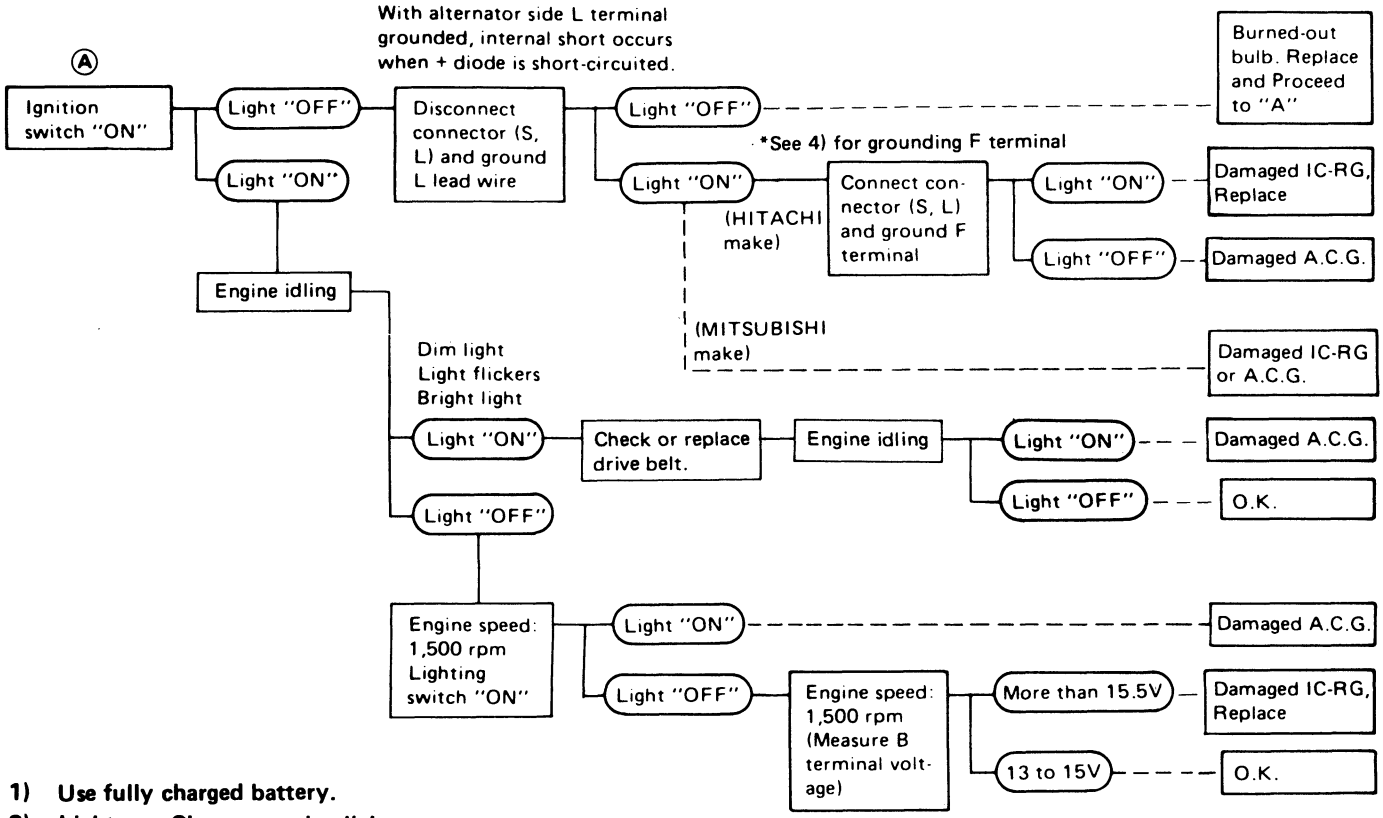


Trouble-shooting

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.

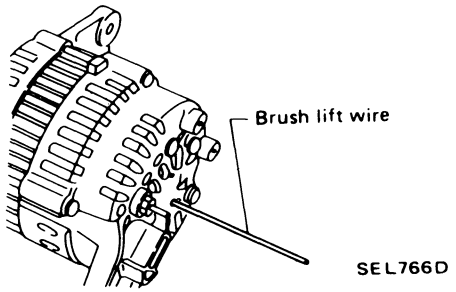
Before starting trouble-shooting, inspect the fusible link.

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)**

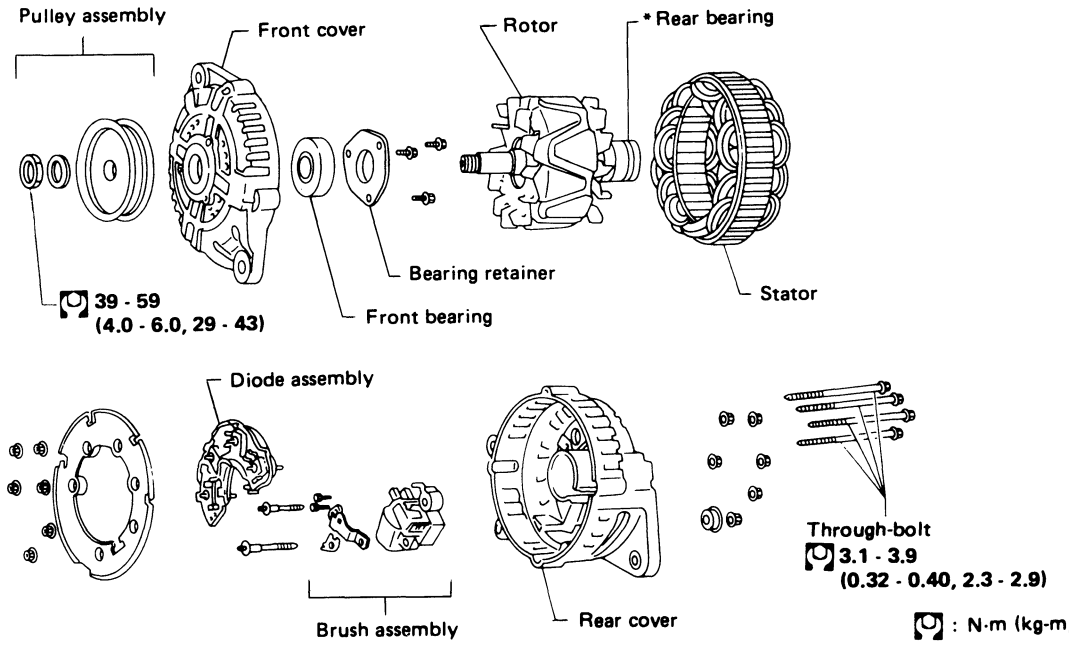
   Contact tip of wire with brush and attach wire to alternator body.



5) **Terminals "S", "L", "B" and "E" are marked on rear cover of alternator.**

Construction

LR180-719

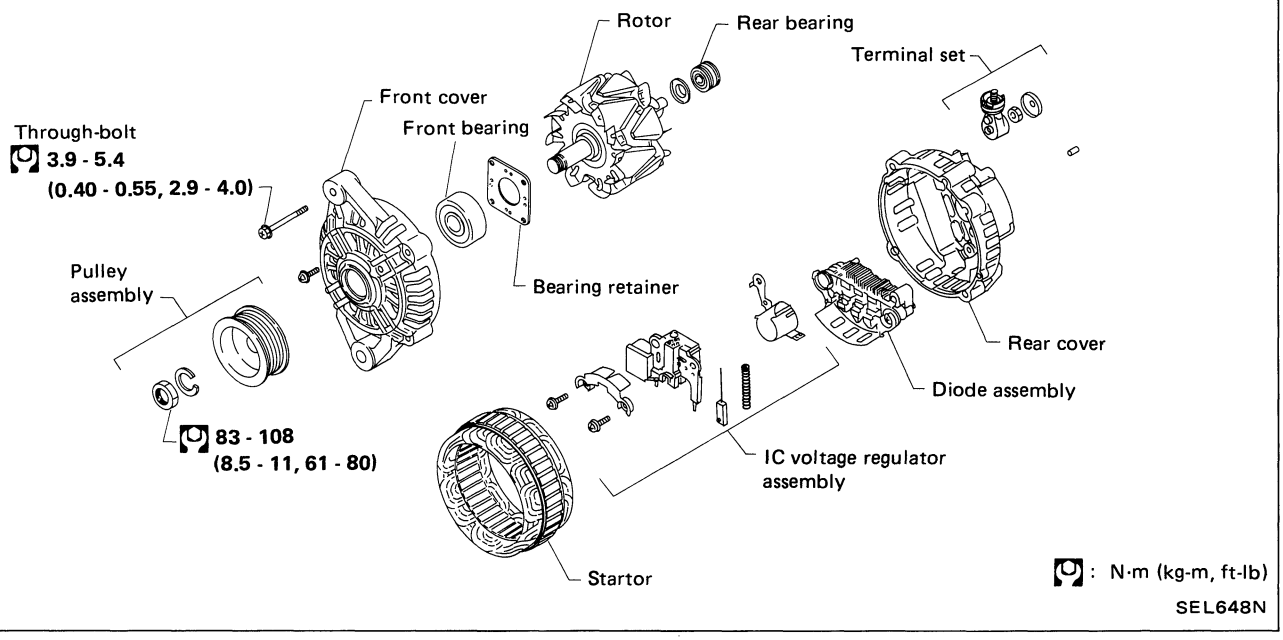


*** Rear bearing**

CAUTION:

Rear cover may be hard to remove because a ring is used to lock outer race of rear bearing. Be careful not to lose this ring during removal.

A2T18792



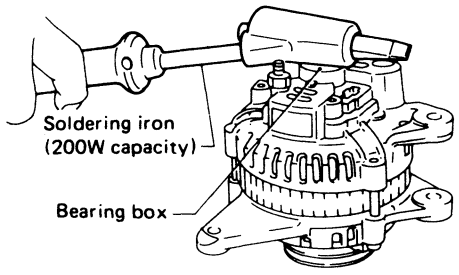
REAR BEARING

CAUTION:

Do not reuse bearing or oil seal after removal. Replace with a new one.

Do not lubricate rear bearing outer race.

[HITACHI make]



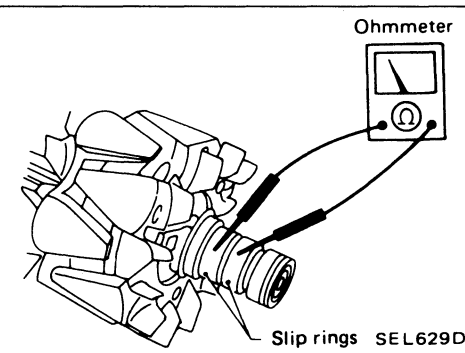
SEL628D

Disassembly

REAR COVER REMOVAL [LR180 - 719]

CAUTION:

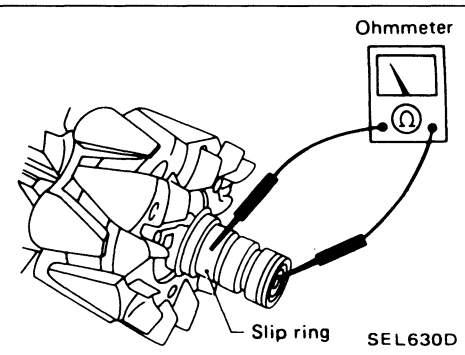
Rear cover may be hard to remove because a ring is used to lock outer race of rear bearing. To facilitate removal of rear cover, heat just bearing box section with a 200W soldering iron. Do not use a heat gun, as it can damage diode assembly.



SEL629D

Rotor Slip Ring Check

1. Continuity test
- No continuity ... Replace rotor.

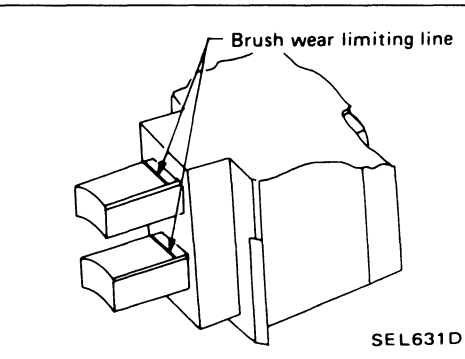


SEL630D

2. Insulator test
- Continuity exists. ... Replace rotor.

3. Check slip ring for wear.

Slip ring minimum outer diameter:
Refer to S.D.S.

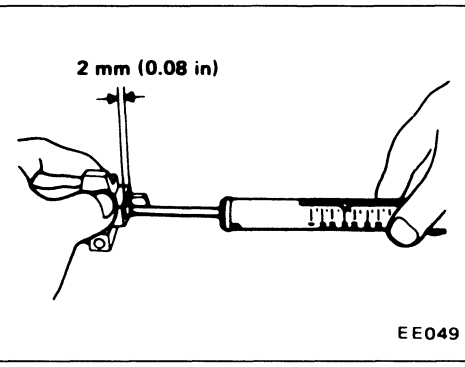


SEL631D

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.



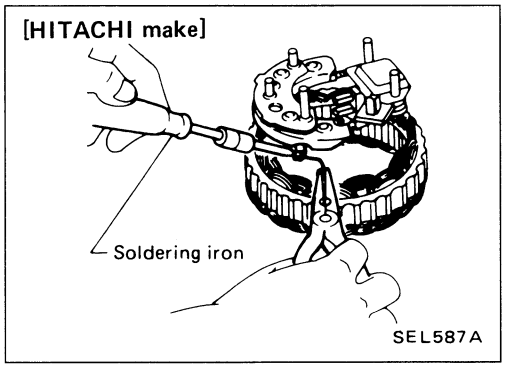
EE049

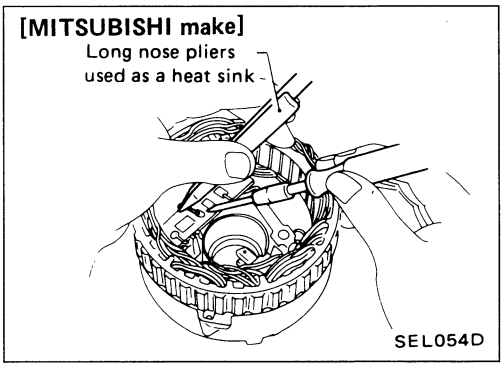
3. Check brush lead wire for damage.
- Damaged ... Replace.

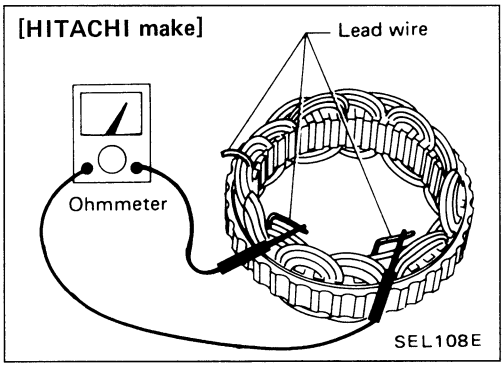
4. Check brush spring pressure.
Measure brush spring pressure with brush projected approximately 2 mm (0.08 in) from brush holder.

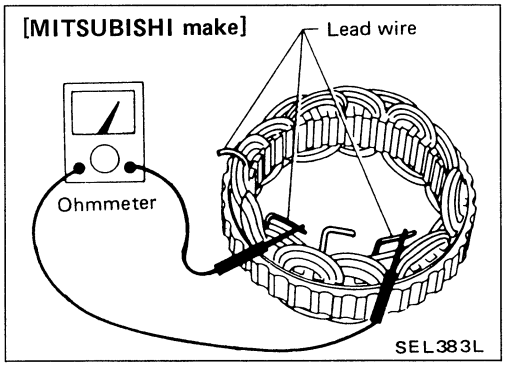
Spring pressure:
Refer to S.D.S.

- Not within the specified values ... Replace.









Stator Check

To test the stator or diode, separate them by unsoldering the connecting wires.

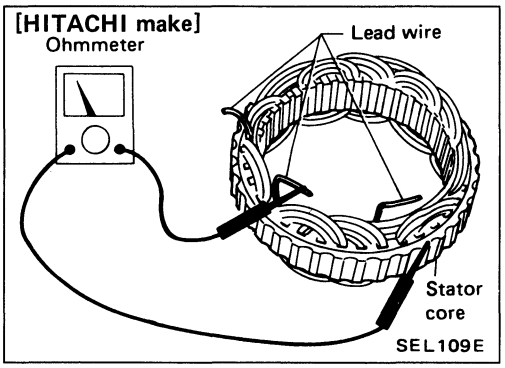
CAUTION:

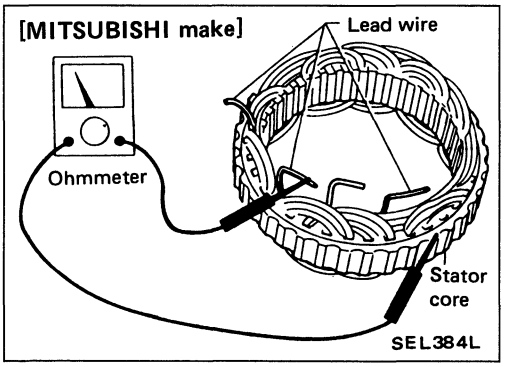
Use only as much heat as required to melt solder. Otherwise, diodes will be damaged by excessive heat.

1. Continuity test

- No continuity ... Replace stator.

Stator Check (Cont'd)





2. Ground test

- Continuity exists. ... Replace stator.

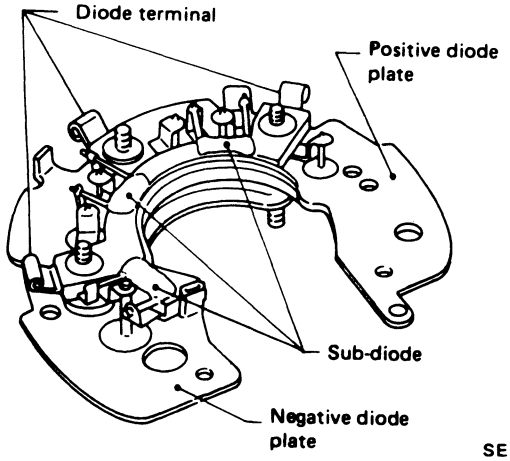
Diode Check

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.

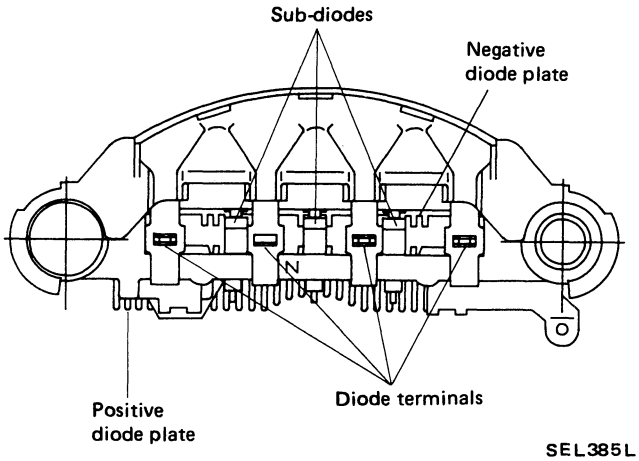
	Ohmmeter probes		Continuity
	Positive ⊕	Negative ⊖	
Diodes check (Positive side)	Positive diode plate	Diode terminals	Yes
	Diode terminals	Positive diode plate	No
Diodes check (Negative side)	Negative diode plate	Diode terminals	No
	Diode terminals	Negative diode plate	Yes

[HITACHI make]



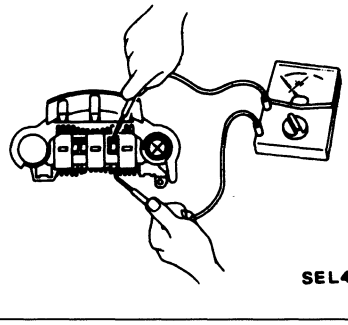
SEL768D

[MITSUBISHI make]

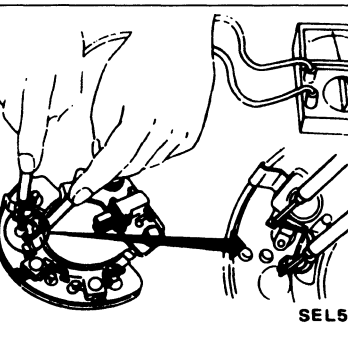


SEL385L

[MITSUBISHI make]



SEL494H



SEL593A

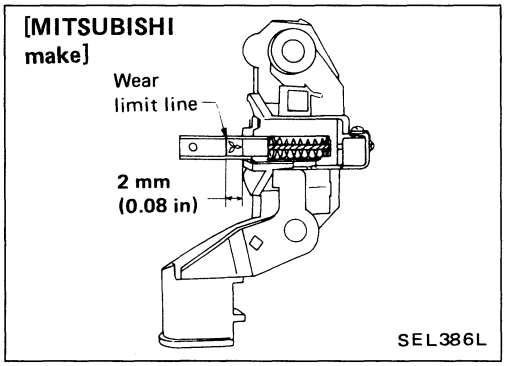
SUB-DIODES

- 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.

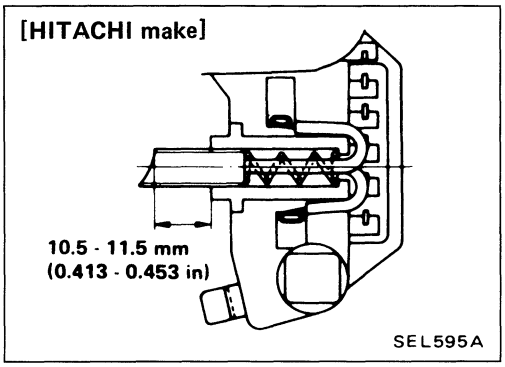
- When soldering each stator coil lead wire to diode assembly terminal, carry out the operation as fast as possible.



WHEN SOLDERING BRUSH LEAD WIRE

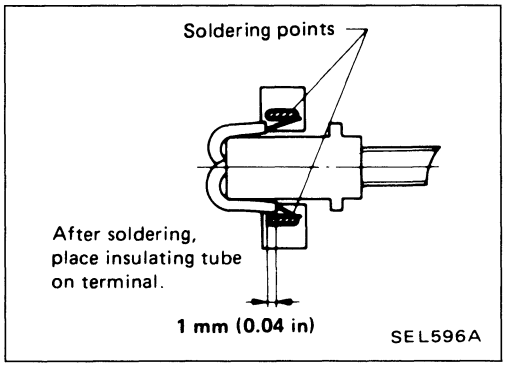
[MITSUBISHI make]

- Position brush so that its wear limit line protrudes 2 mm (0.08 in) beyond end face of brush holder.



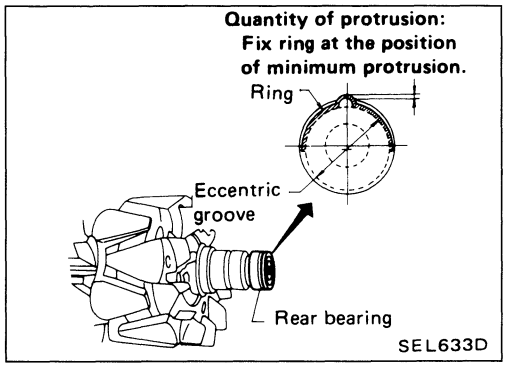
[HITACHI make]

(1) Position brush so that it extends 10.5 to 11.5 mm (0.413 to 0.453 in) from brush holder.



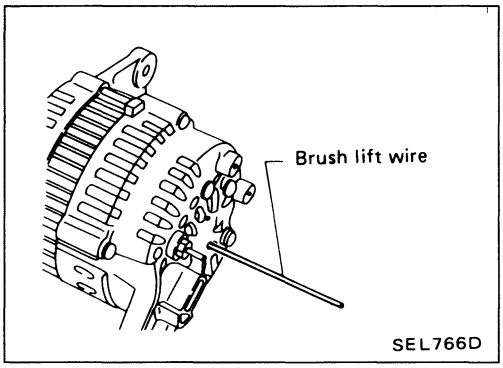
(2) Coil lead wire 1.5 times around terminal groove. Solder outside of terminal.

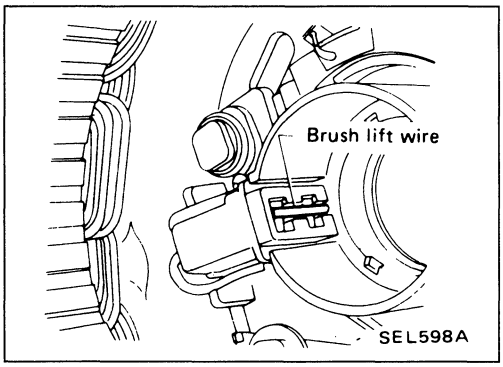
When soldering, be careful not to let solder adhere to insulating tube as it will weaken the tube and cause it to break.



RING FITTING IN REAR BEARING

- Fix ring into groove in rear bearing so that it is as close to the adjacent area as possible.





Assembly (Cont'd)

REAR COVER INSTALLATION

(1) Before installing front cover with pulley and rotor with rear cover, push brush up with fingers and retain brush by inserting brush lift wire into brush lift hole from outside.
(2) After installing front and rear sides of alternator, pull brush lift wire by pushing toward the center.

[HITACHI make]

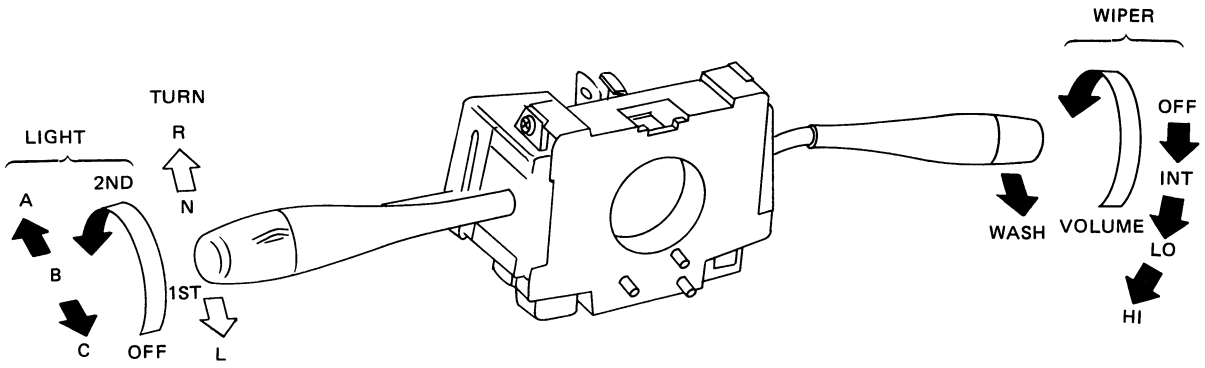
Do not pull brush lift wire by pushing toward outside of rear cover as it will damage slip ring sliding surface.

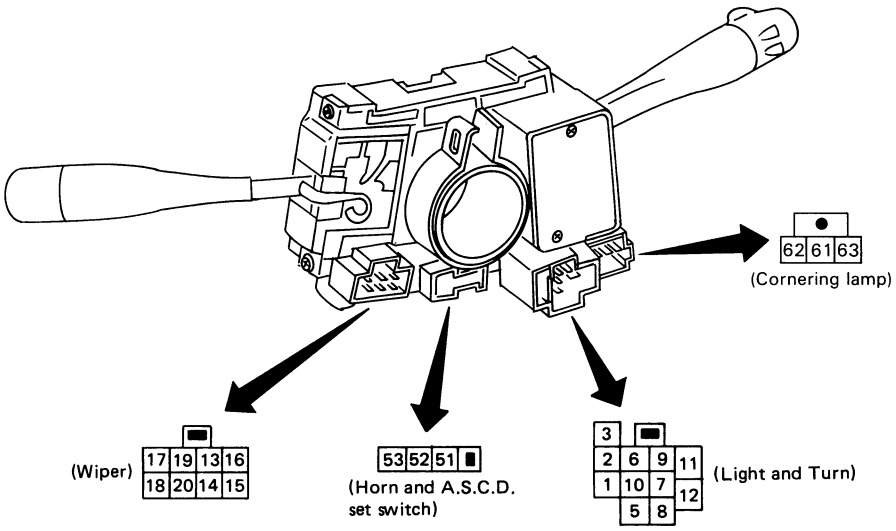
Service Data and Specifications (S.D.S.)

ALTERNATOR

Type		LR180-719	A2T18792
		HITACHI	MITSUBISHI
Nominal rating	V-A	12 - 70	12 - 80
Ground polarity		Negative	
Minimum revolution under no-load (When 13.5 volts is applied)	rpm	Less than 950	1,100
Hot output current	A/rpm	More than 50/2,500 More than 67/5,000	More than 21/1,300 More than 60/2,500
Regulated output voltage	V	14.1 - 14.7	
Minimum length of brush	mm (in)	7 (0.28)	8 (0.31)
Brush spring pressure	N (g, oz)	2.746 - 3.923 (280 - 400, 9.88 - 14.11)	3.138 - 4.315 (320 - 440, 11.29 - 15.52)
Slip ring minimum outer diameter	mm (in)	30.6 (1.205)	22.1 (0.870)

Check





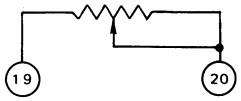
LIGHTING SWITCH

	OFF			1ST			2ND		
	A	B	C	A	B	C	A	B	C
5			○			○	○	○	○
6			○			○	○		○
7								○	
8			○			○	○	○	○
9			○			○	○		○
10								○	
11				○	○	○	○	○	○
12				○	○	○	○	○	○

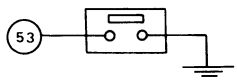
WIPER SWITCH

	OFF	INT	LO	HI	WASH
13	○	○			
14	○	○	○		
15		○			
16				○	
17		○	○	○	○
18					○

INTERMITTENT WIPER VOLUME



HORN SWITCH



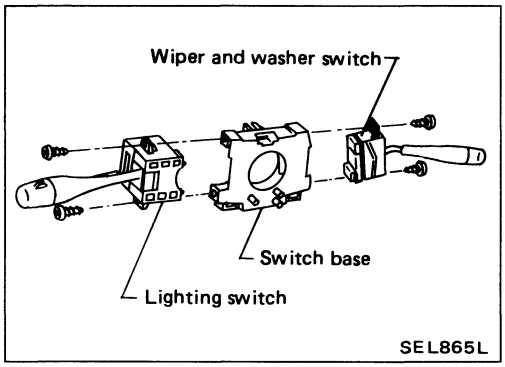
TURN SIGNAL SWITCH

	R	N	L
1	○		○
2	○		
3			○

CORNERING LAMP SWITCH

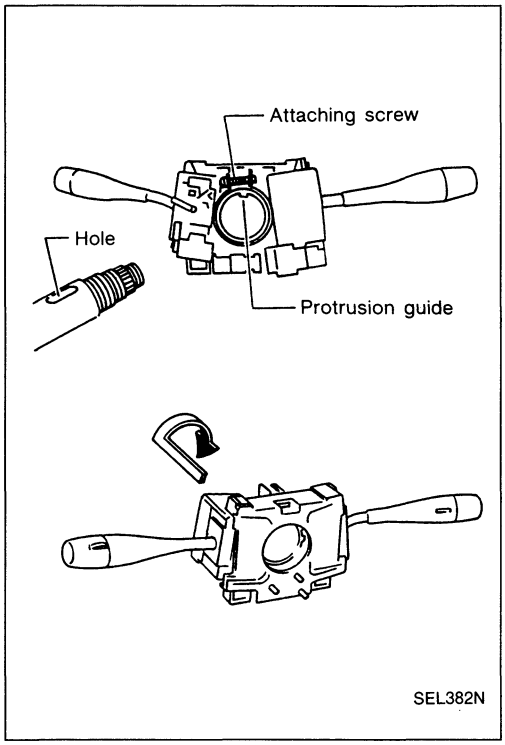
	R	N	L
61	○		○
62	○		
63			○

SEL295N



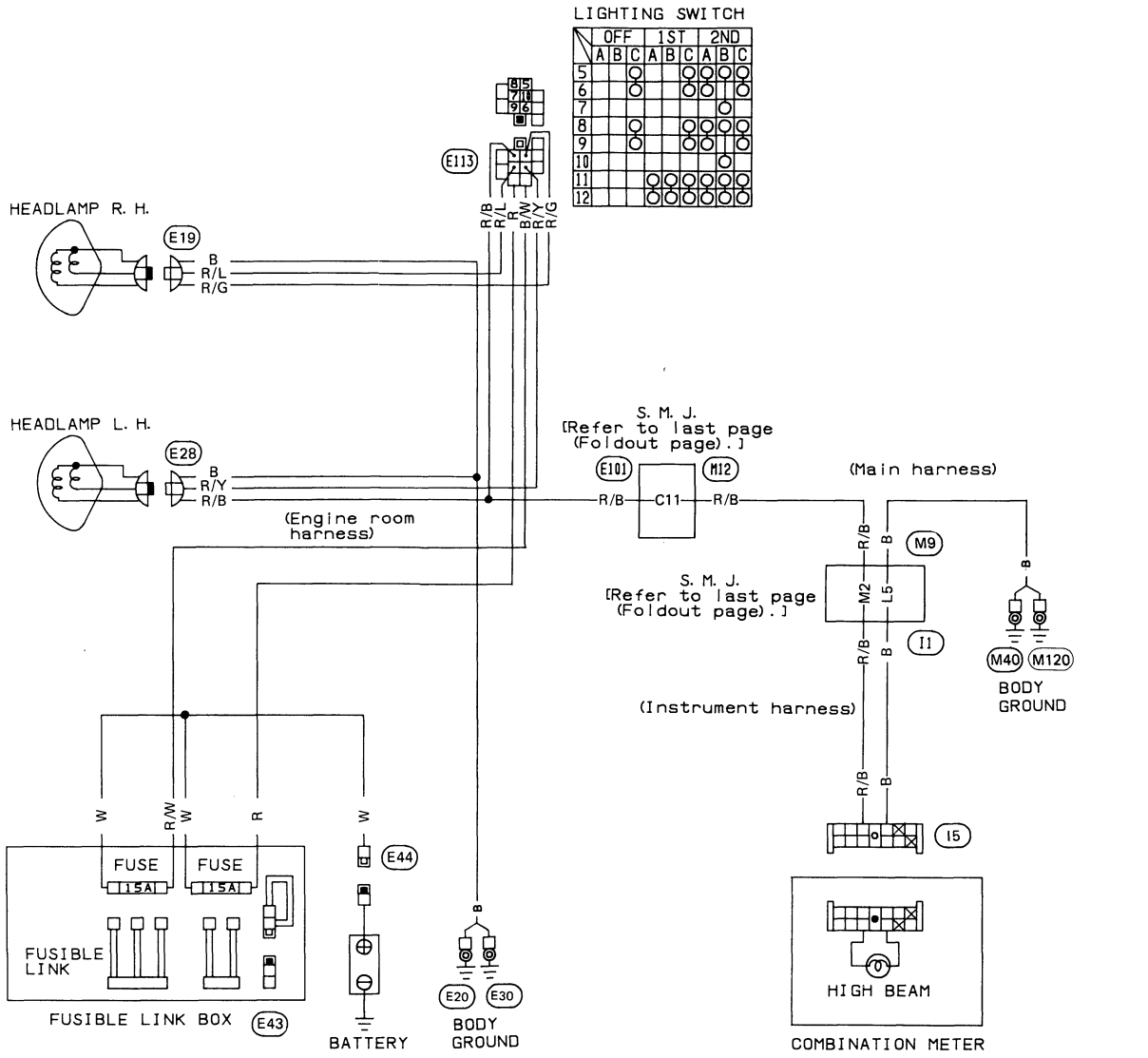
Replacement

- Each switch can be replaced without removing combination switch base.



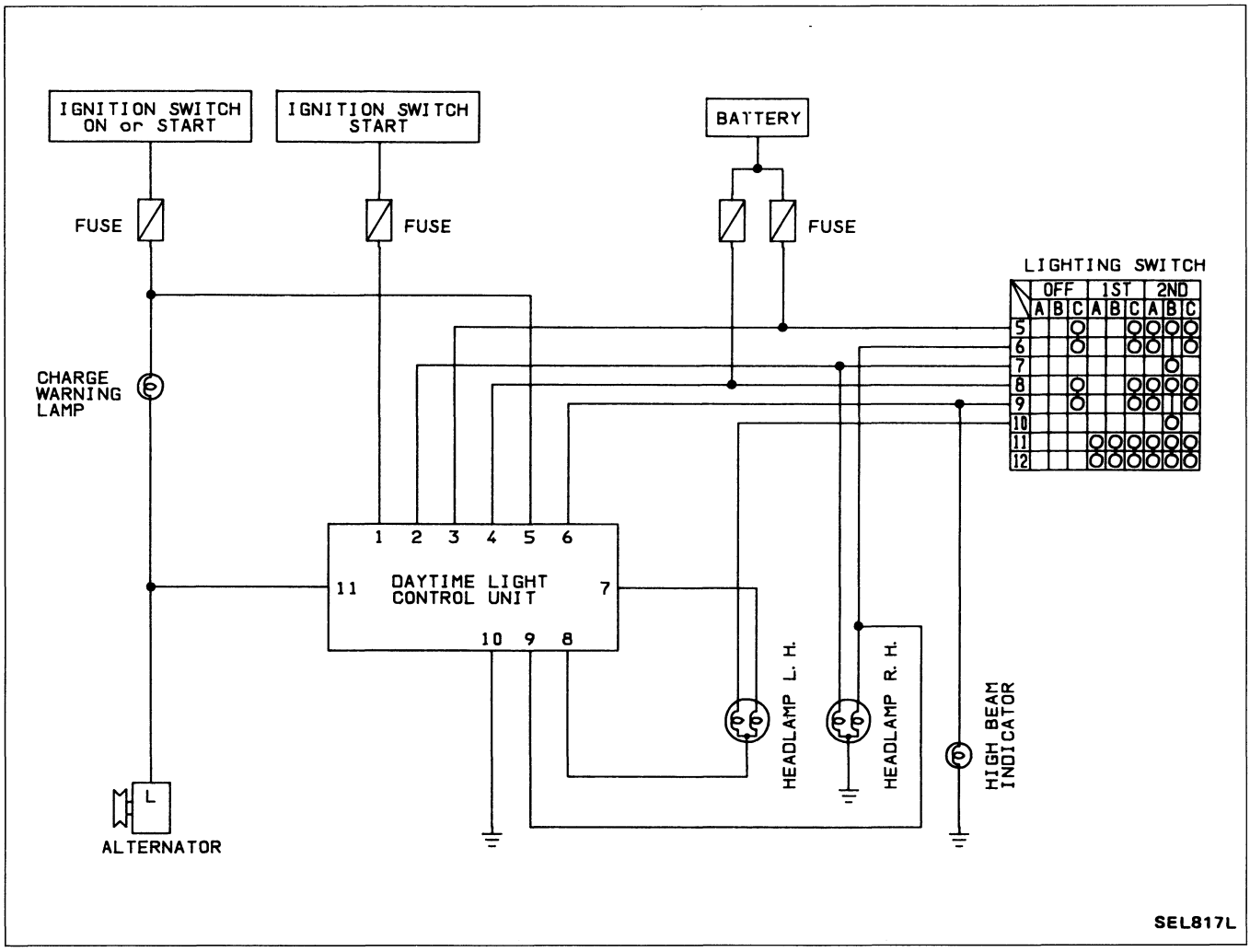
- To remove combination switch base, remove base attaching screw and turn after pushing on it.

Wiring Diagram (For U.S.A.)



SEL296N

Schematic (For Canada)



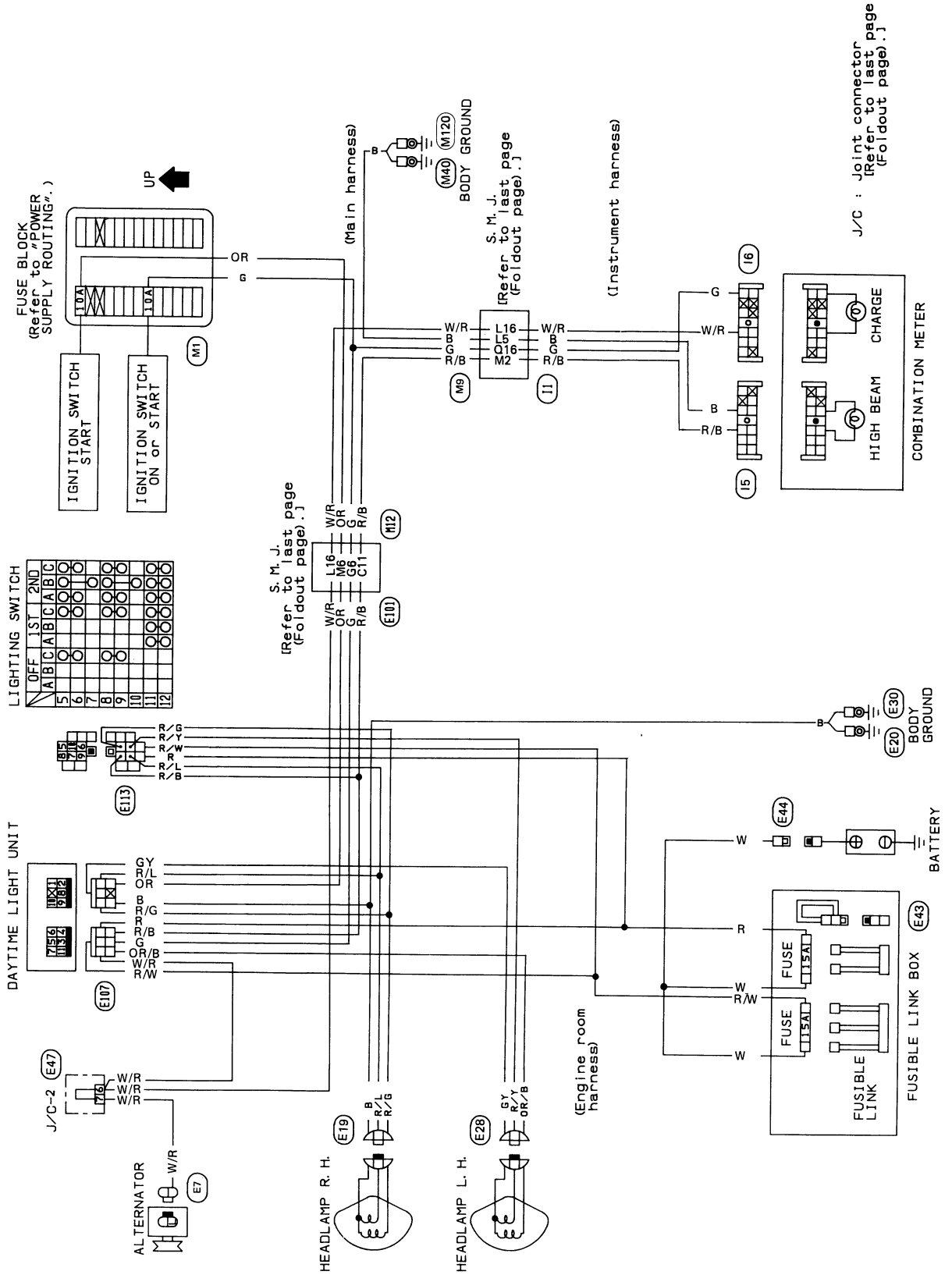
Operation (Daytime light system equipped model)

After starting the engine with the lighting switch in the "OFF" position, the headlamp low beam and clearance, tail, license and instrument illumination lamps automatically turn on. Lighting switch operations other than the above are the same as conventional light systems.

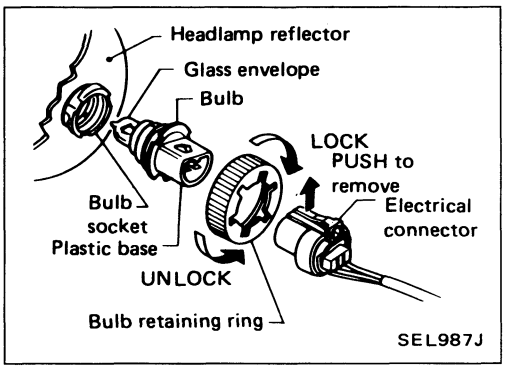
Engine		With engine stopped									With engine running								
Lighting switch		OFF			1ST			2ND			OFF			1ST			2ND		
		A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Headlamp	High beam	X	X	O	X	X	O	O	X	O	X	X	O	X	X	O	O	X	O
	Low beam	X	X	X	X	X	X	X	O	X	O	O	O	X	X	X	X	O	X
Clearance and tail lamp		X	X	X	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
License and instrument illumination lamp		X	X	X	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

O: Lamp "ON"
X: Lamp "OFF"
□: Added functions

Wiring Diagram (For Canada)



SEL297N



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.**

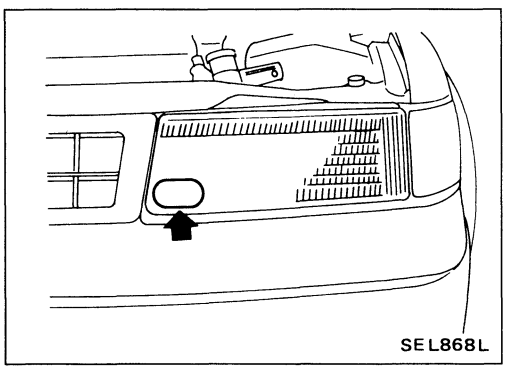
Aiming Adjustment

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

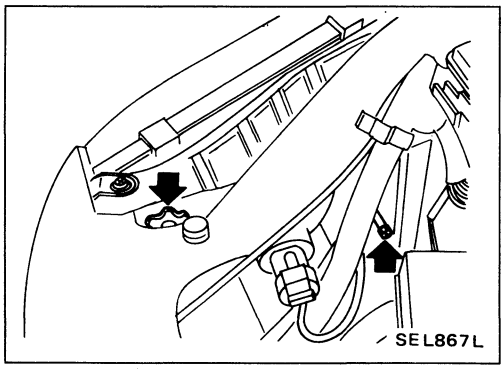
When using a mechanical aimer, adjust adapter legs to the data marked on the headlamps.

Example:

4H2V

Horizontal side: 4
Vertical side: 2

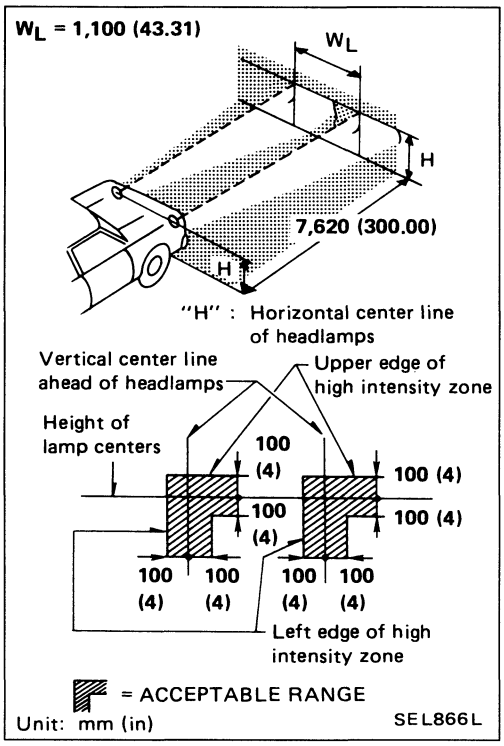
Aiming Adjustment (Cont'd)



LOW BEAM

1. Turn headlamp low beam on.
2. Use adjusting screws to perform aiming adjustment.

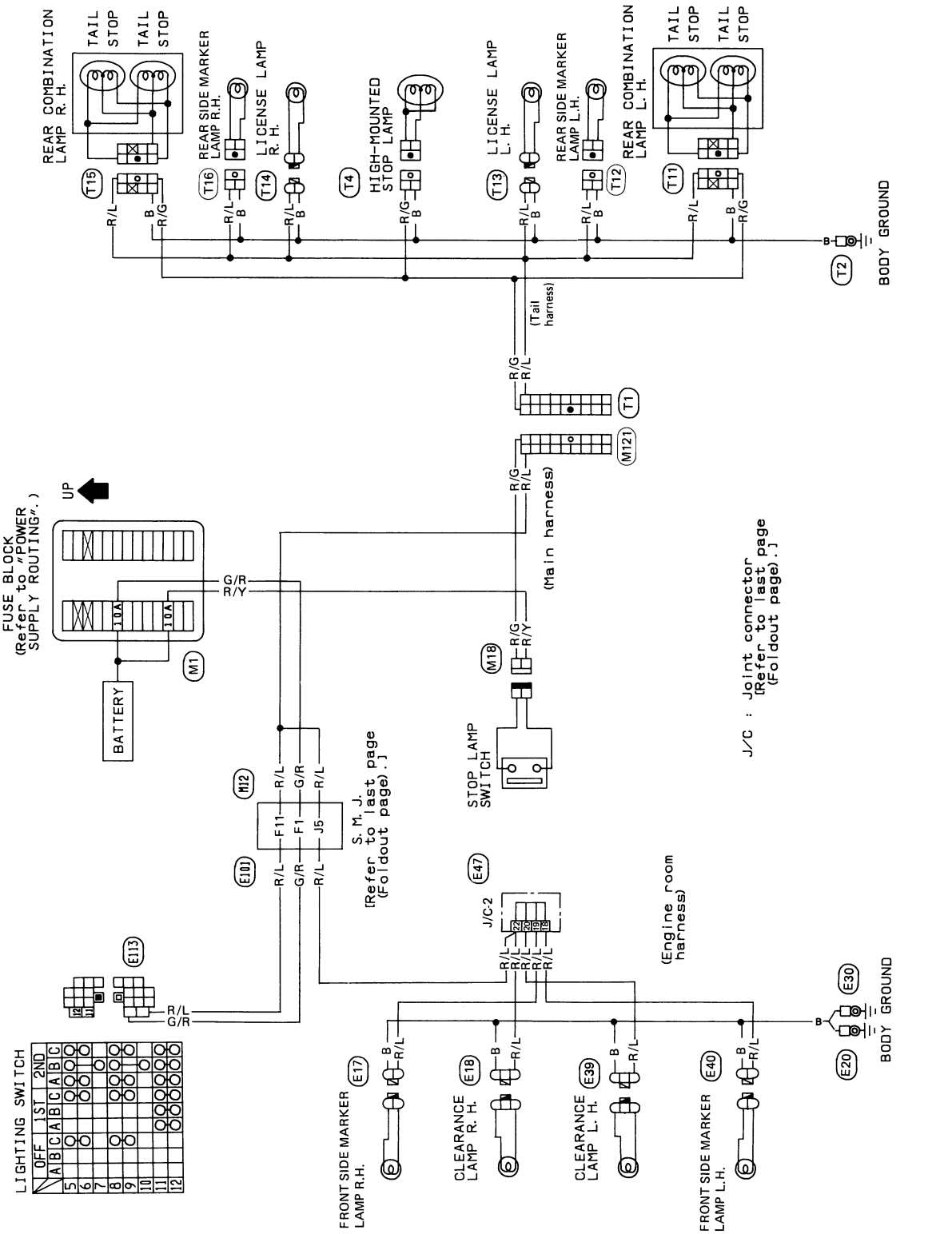
- **First tighten the adjusting screw all the way and then make adjustment by loosening the screw.**



- **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.**

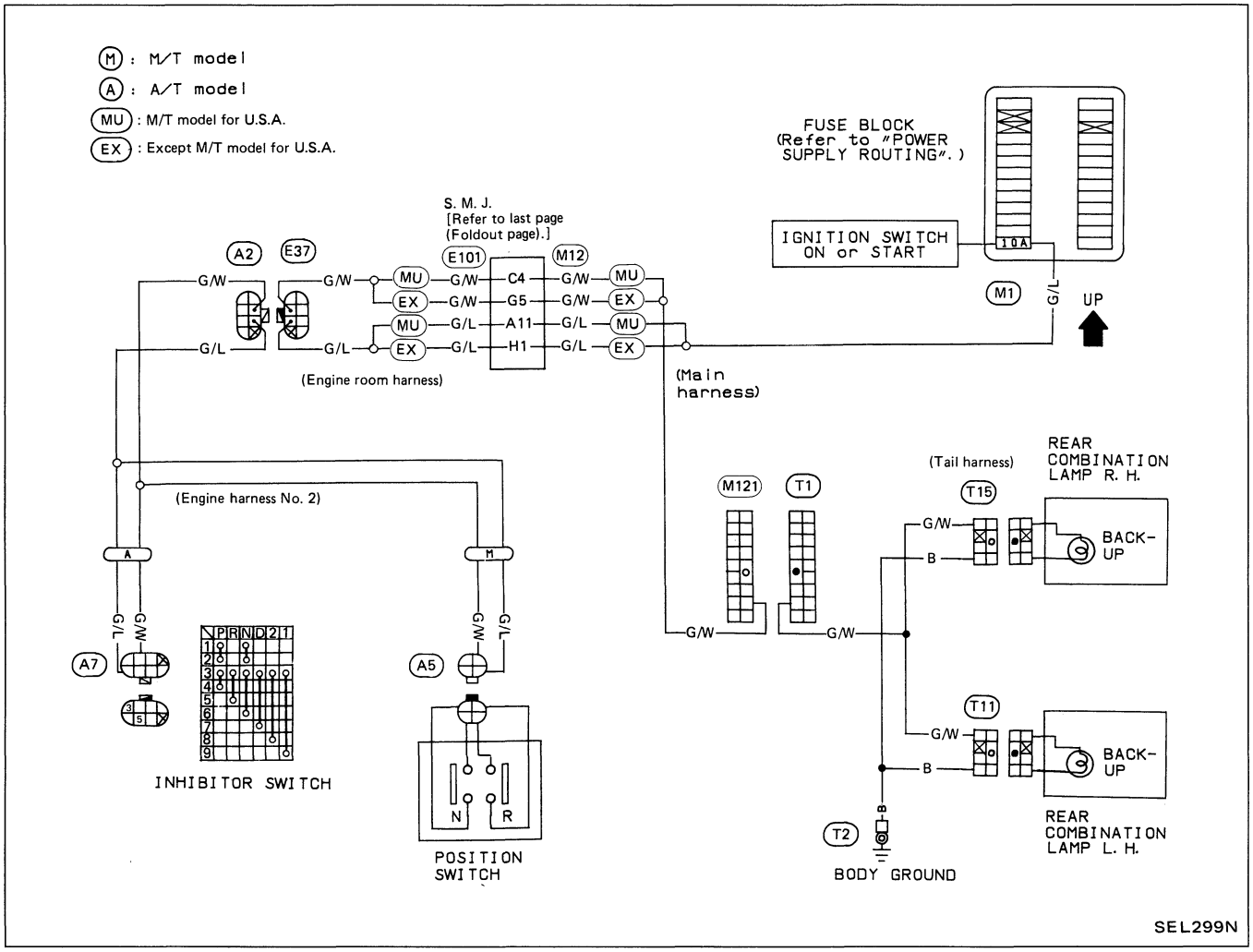
"H": Horizontal center line of headlamps
"WL": Distance between each headlamp center

Clearance, License, Tail and Stop Lamps/Wiring Diagram

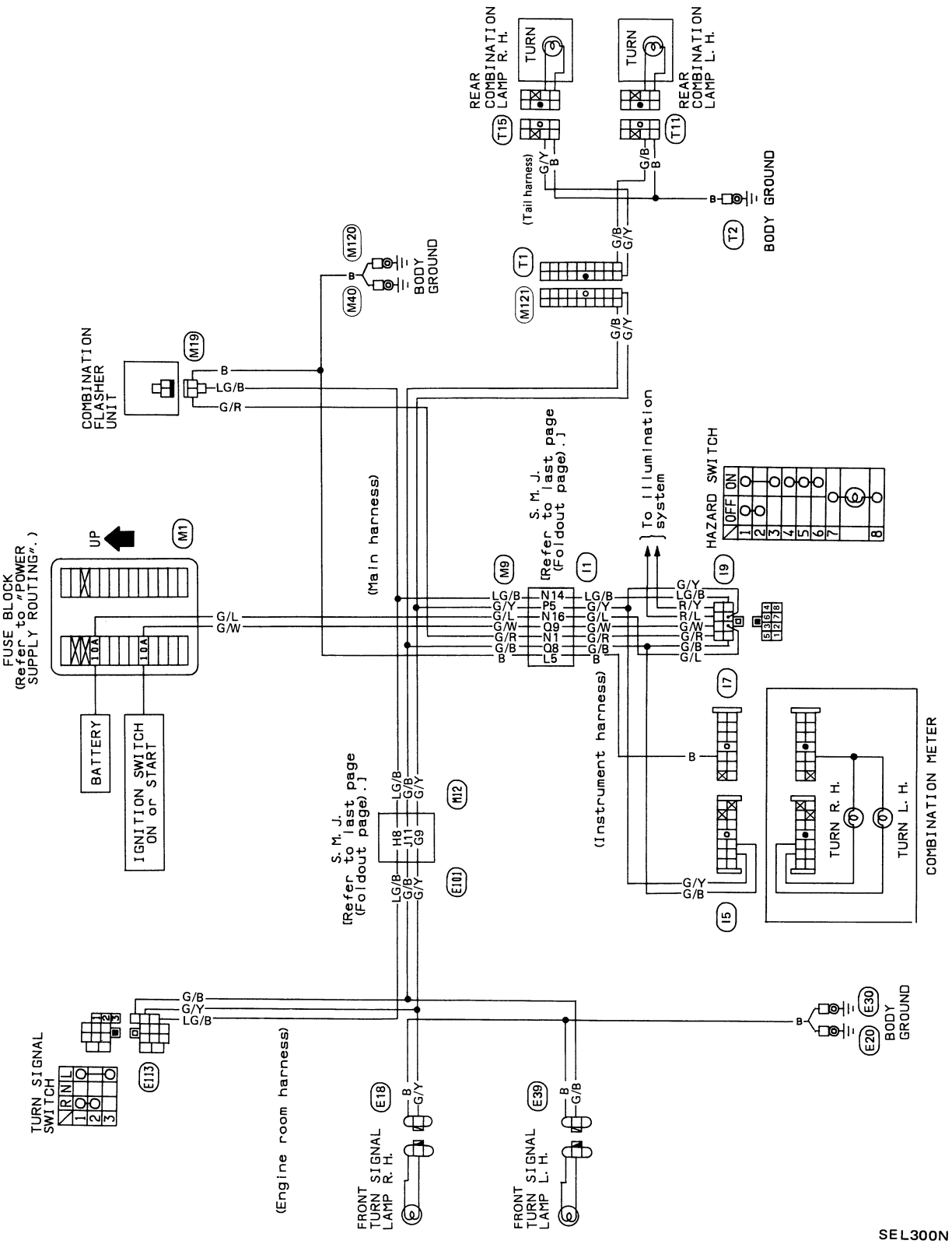


SEL298N

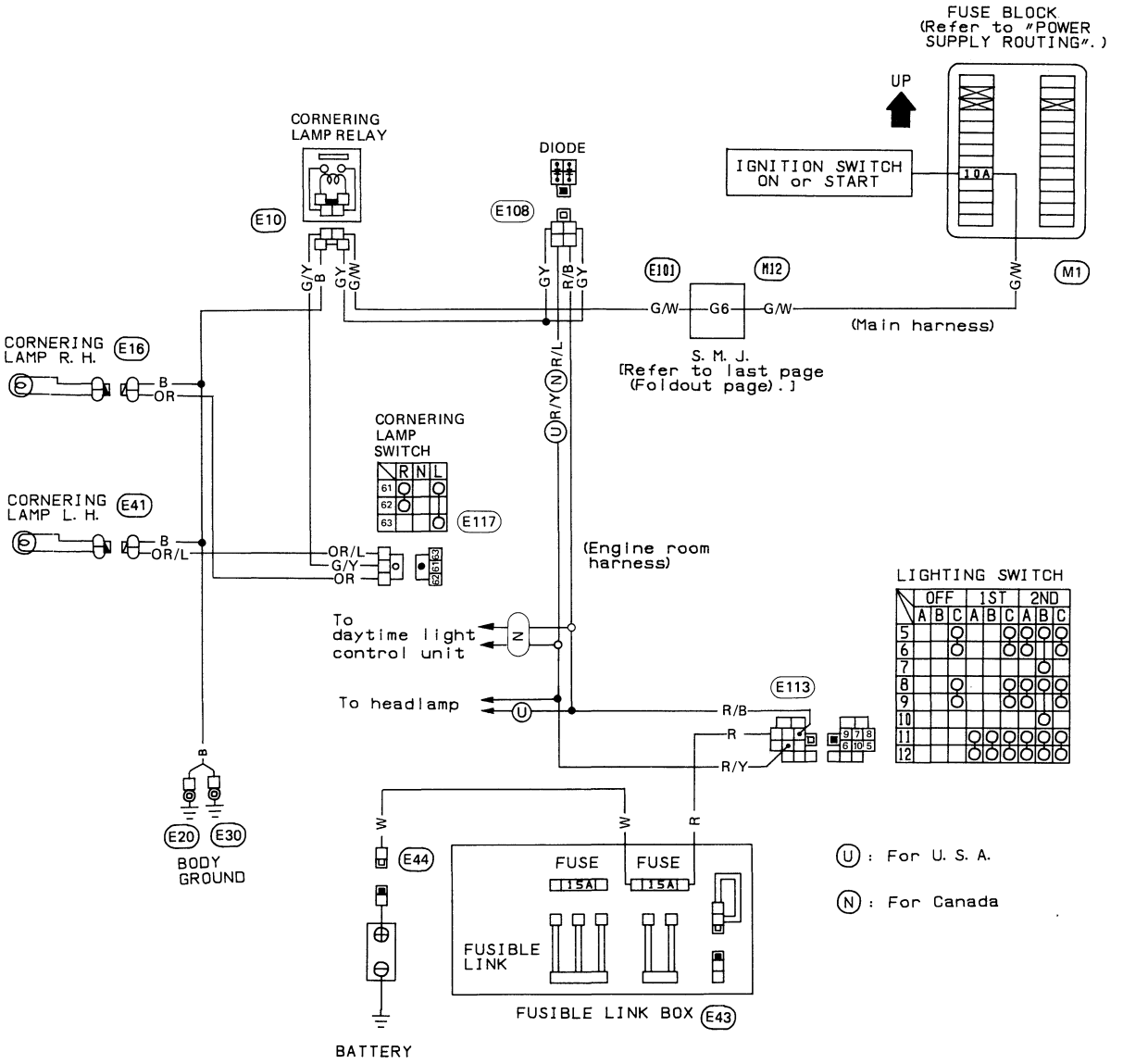
Back-up Lamp/Wiring Diagram



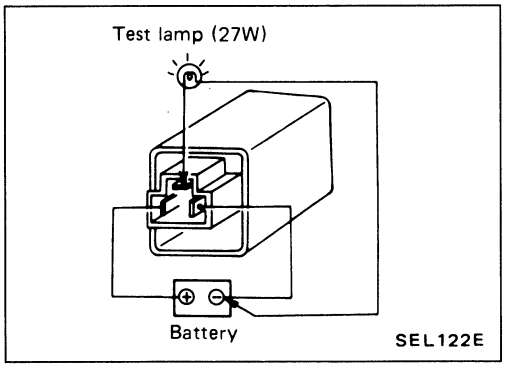
Turn Signal and Hazard Warning Lamps/Wiring Diagram



Cornering Lamp/Wiring Diagram



SEL301N



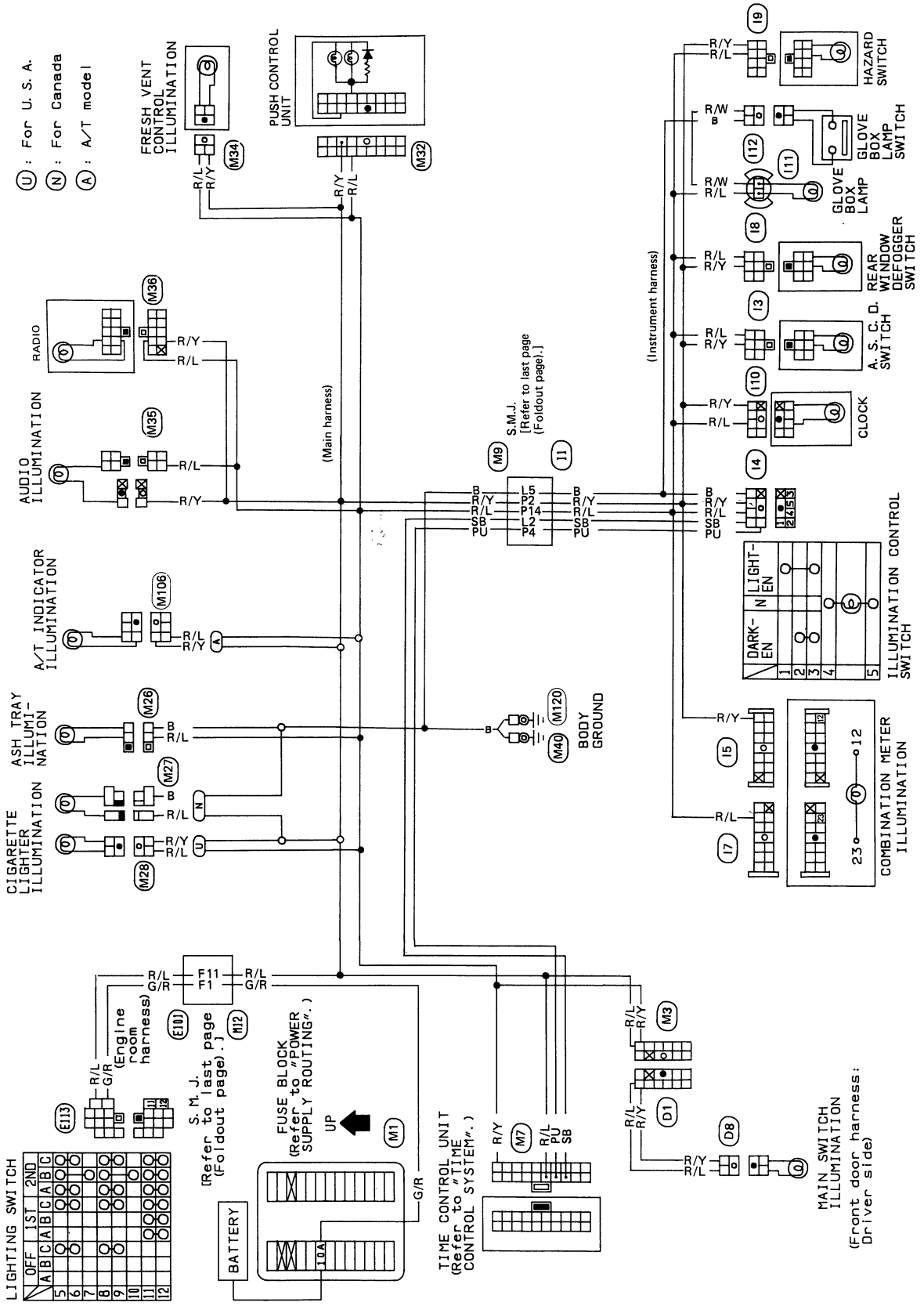
Combination Flasher Unit Check

- 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

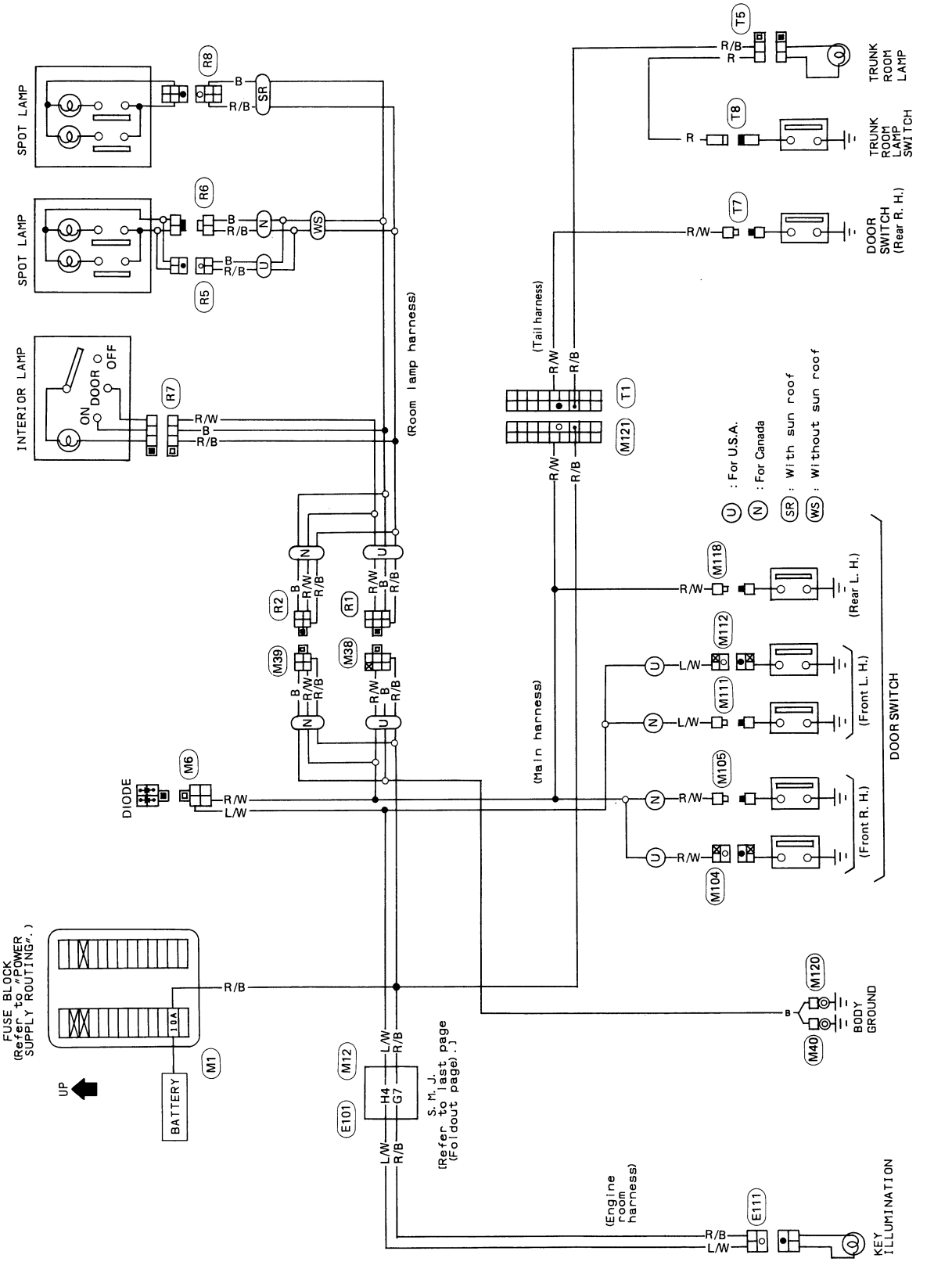
	Wattage (12 volt)
Headlamp (Semi-sealed beam)	
High/Low	65/45
Front turn signal lamp	27
Cornering lamp/Front clearance lamp	27/8
Front side marker lamp	3.8
Rear combination lamp	
Turn signal	27
Stop/Tail	27/8
Back-up	27
Rear side marker lamp	3.8
License plate lamp	5
High-mounted stop lamp	18
Interior lamp	10
Spot lamp	8
Trunk room lamp	3.4

Illumination/Wiring Diagram



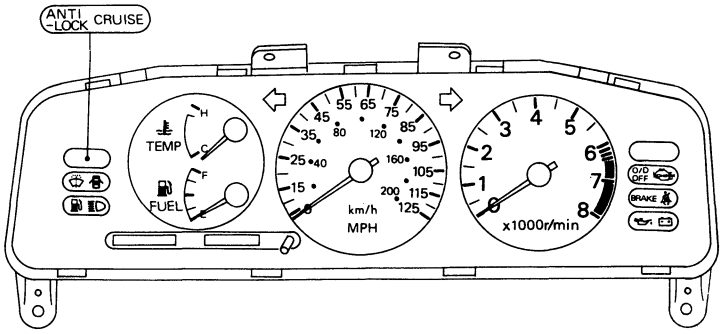
SEL302N

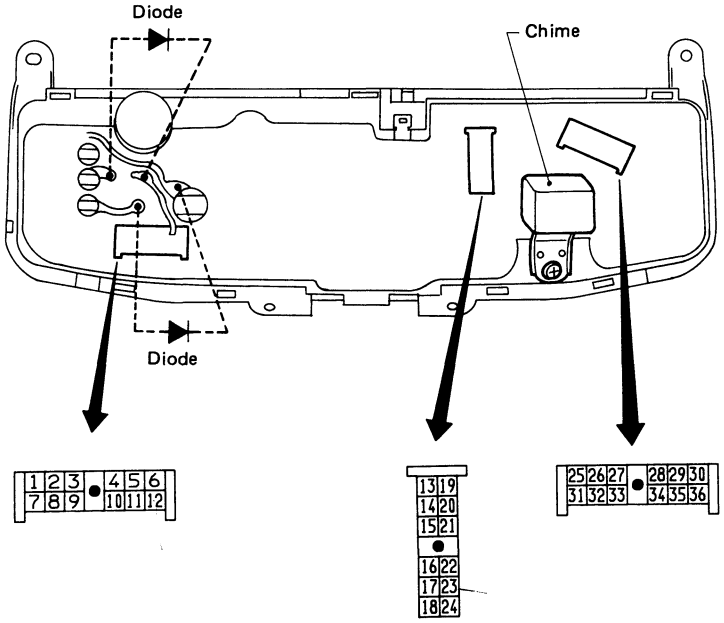
Interior, Spot and Trunk Room Lamps/Wiring Diagram

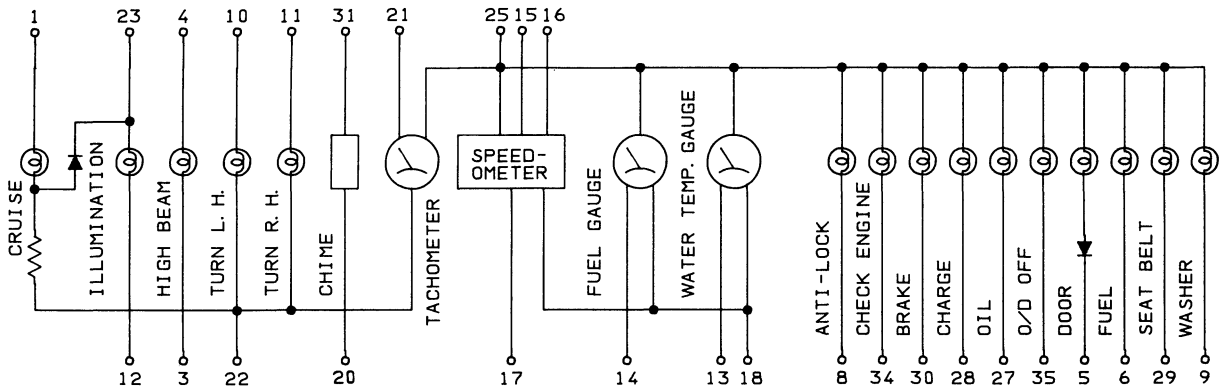


SEL303N

Combination Meter

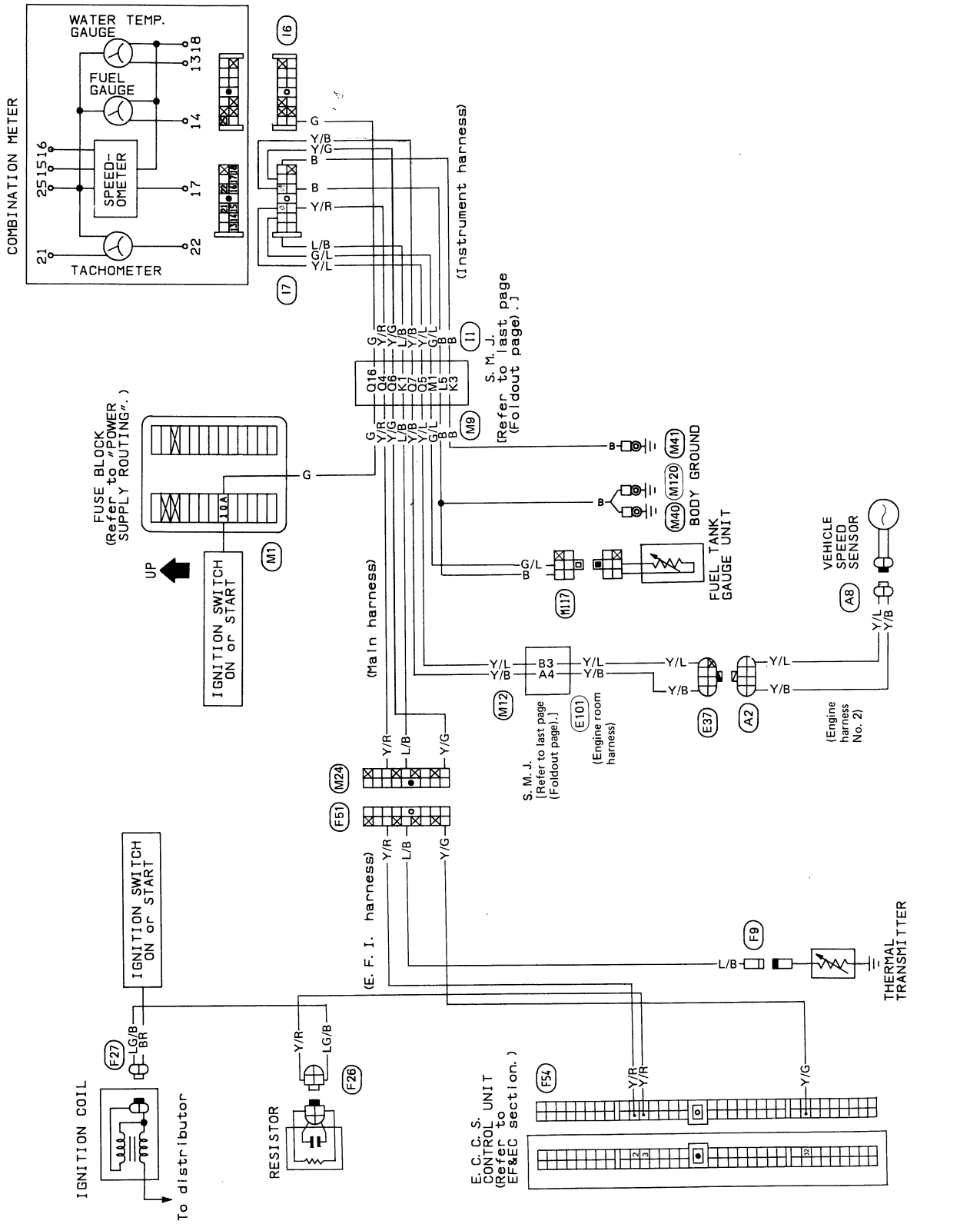




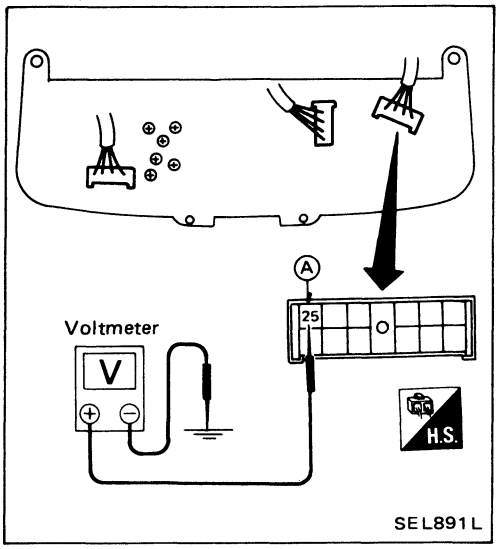


SEL304N

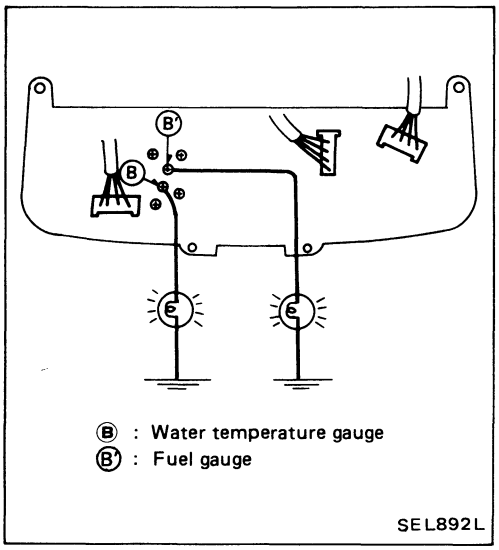
Speedometer, Tachometer, Temp., and Fuel Gauges/Wiring Diagram



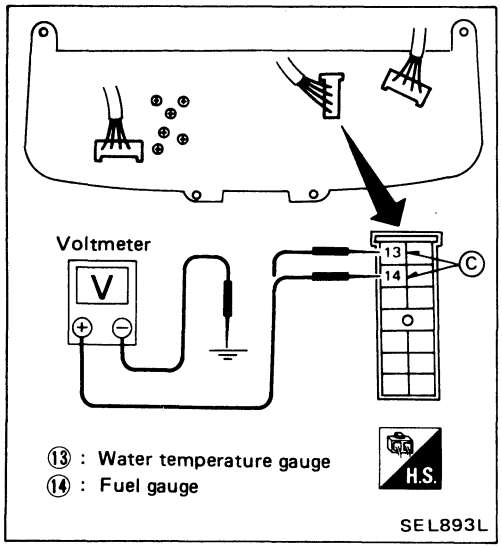
SEL305N



SEL891L



Ⓑ : Water temperature gauge
Ⓑ' : Fuel gauge
SEL892L



⑬ : Water temperature gauge
⑭ : Fuel gauge
SEL893L

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 terminal Ⓑ 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.

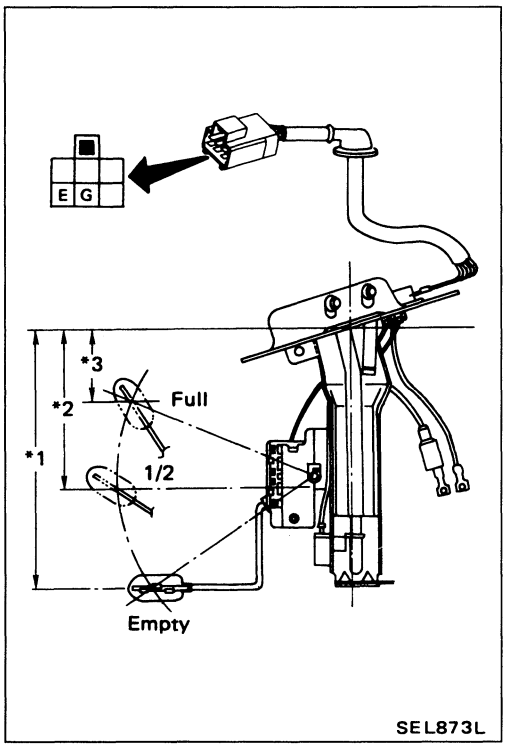
CHECK COMPONENT
Check gauge units and harness.
Refer to "Fuel Tank Gauge Unit Check", "Thermal Transmitter Check".

N.G. → Repair or replace.
Refer to FE section. (Fuel tank gauge unit)

O.K.

Reinstall any part removed.

INSPECTION END

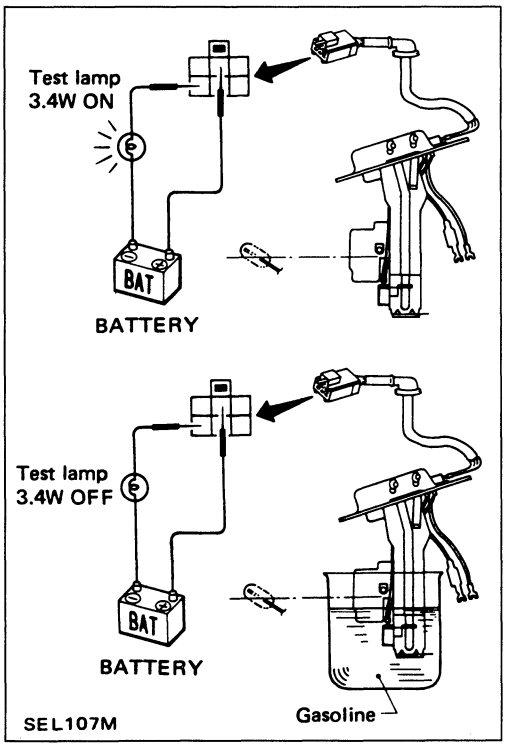


Fuel Tank Gauge Unit Check

Ohmmeter (+)	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

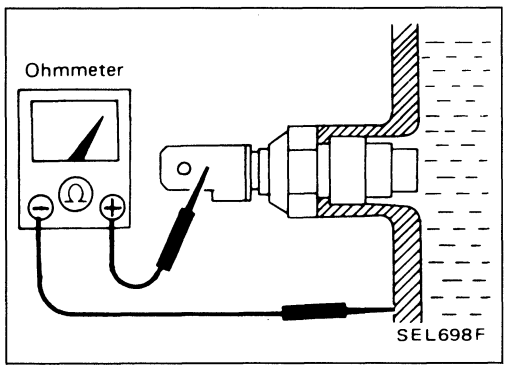
- For removal, refer to FE section.

Check the resistance between terminals Ⓖ and Ⓔ.



Fuel Warning Lamp Sensor Check

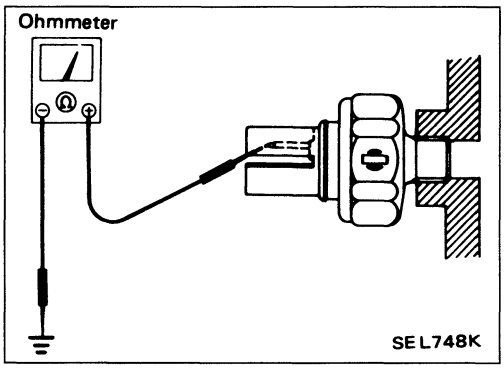
- It will take a short time for the bulb to light.



Thermal Transmitter Check

Check the resistance between the terminals of thermal transmitter and body ground.

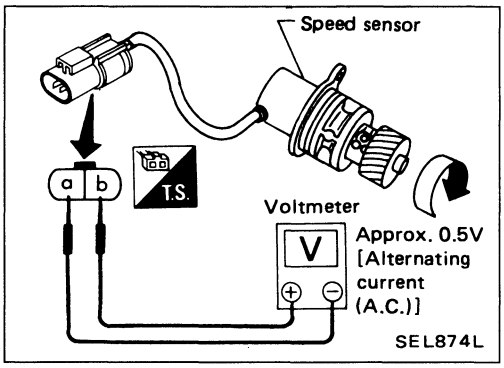
Water temperature	Resistance
60°C (140°F)	Approx. 70 - 90Ω
100°C (212°F)	Approx. 21 - 24Ω



Oil Pressure Switch Check

	Oil pressure kPa (kg/cm^2, 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

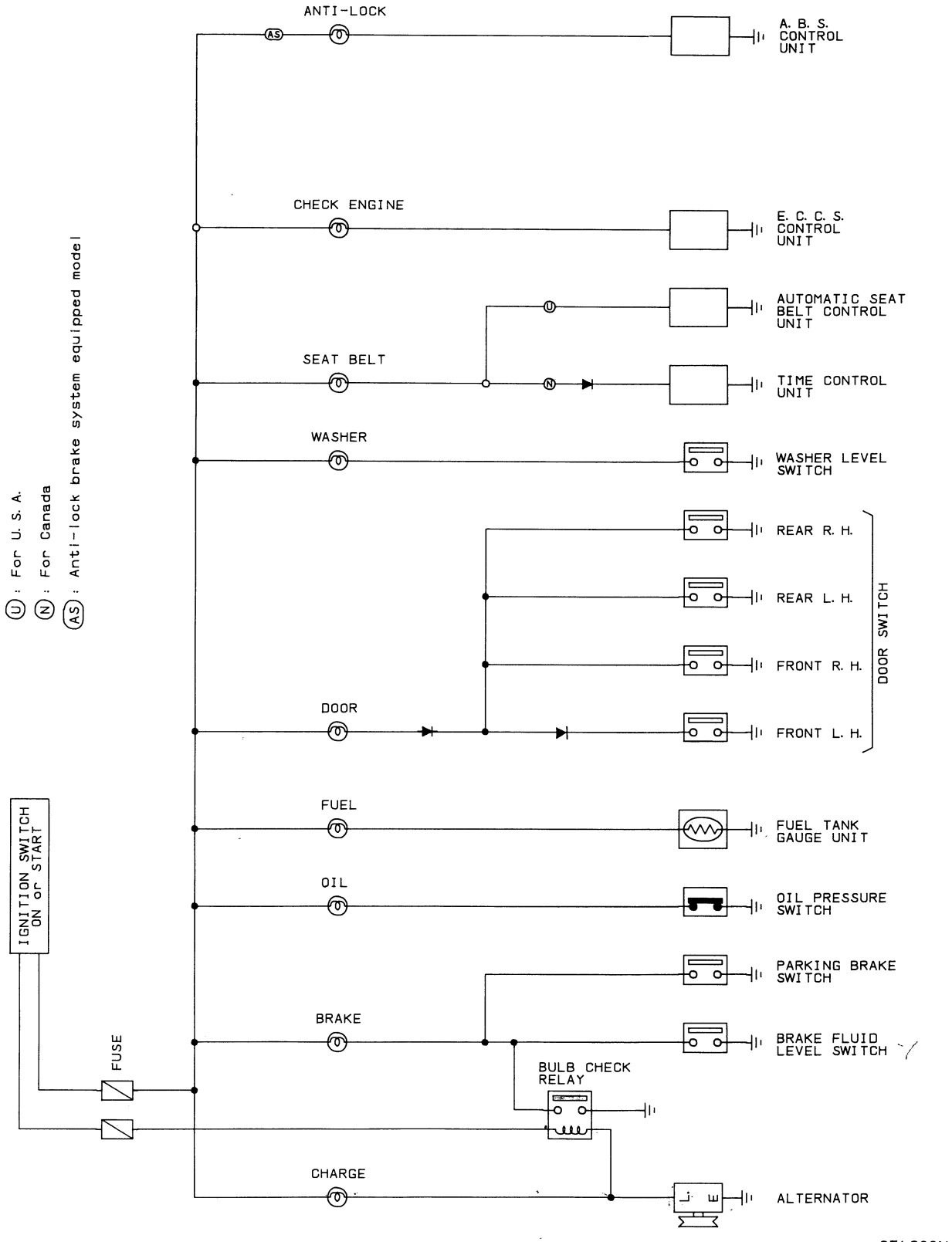
Check the continuity between the terminals of oil pressure switch and body ground.



Speed Sensor Signal Check

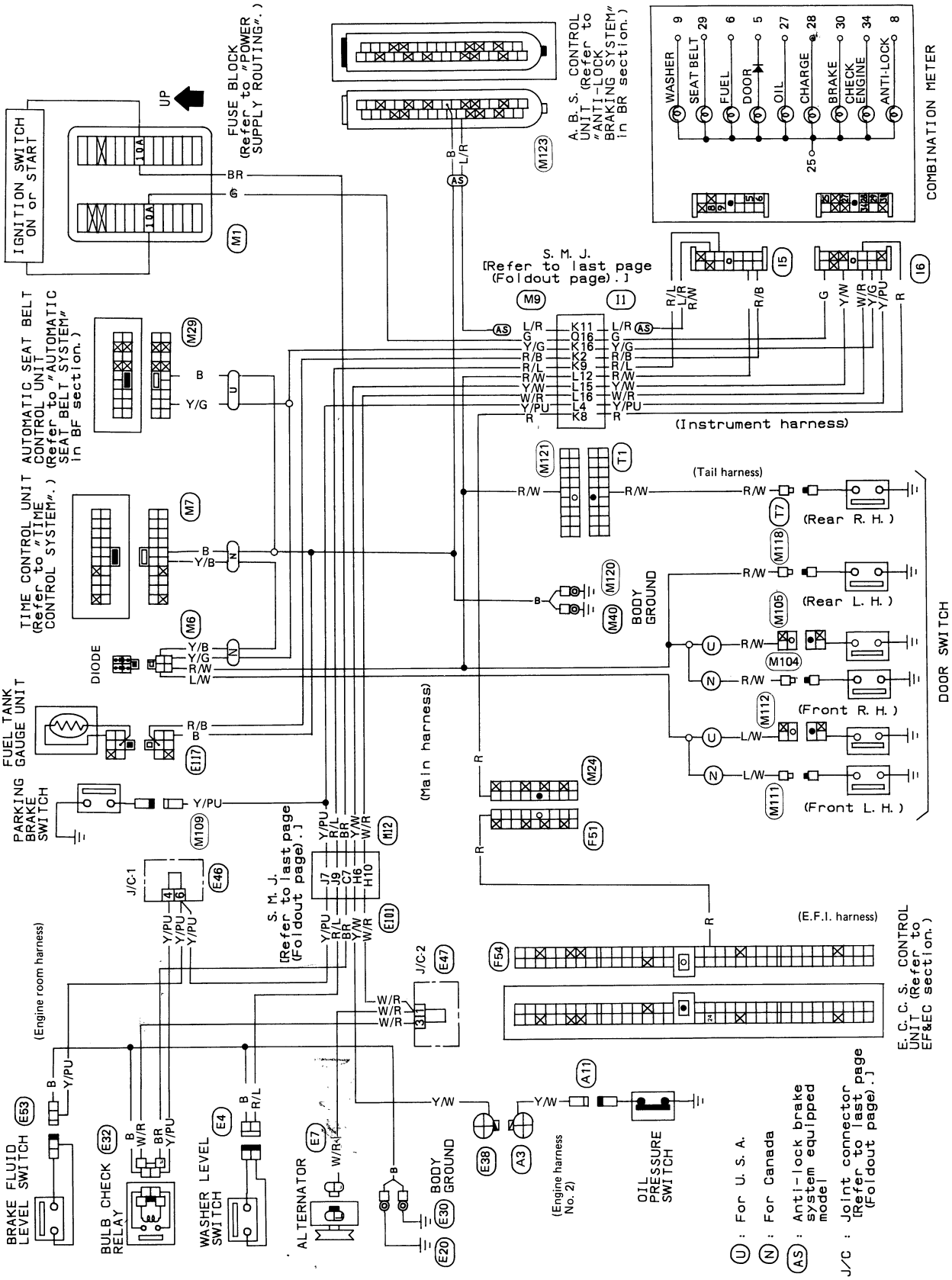
1. Remove speed sensor from transmission.
   Location: Refer to "Location of Electrical Units"
2. Turn speedometer pinion quickly and measure voltage across ⓐ and ⓑ.

Warning Lamps/Schematic



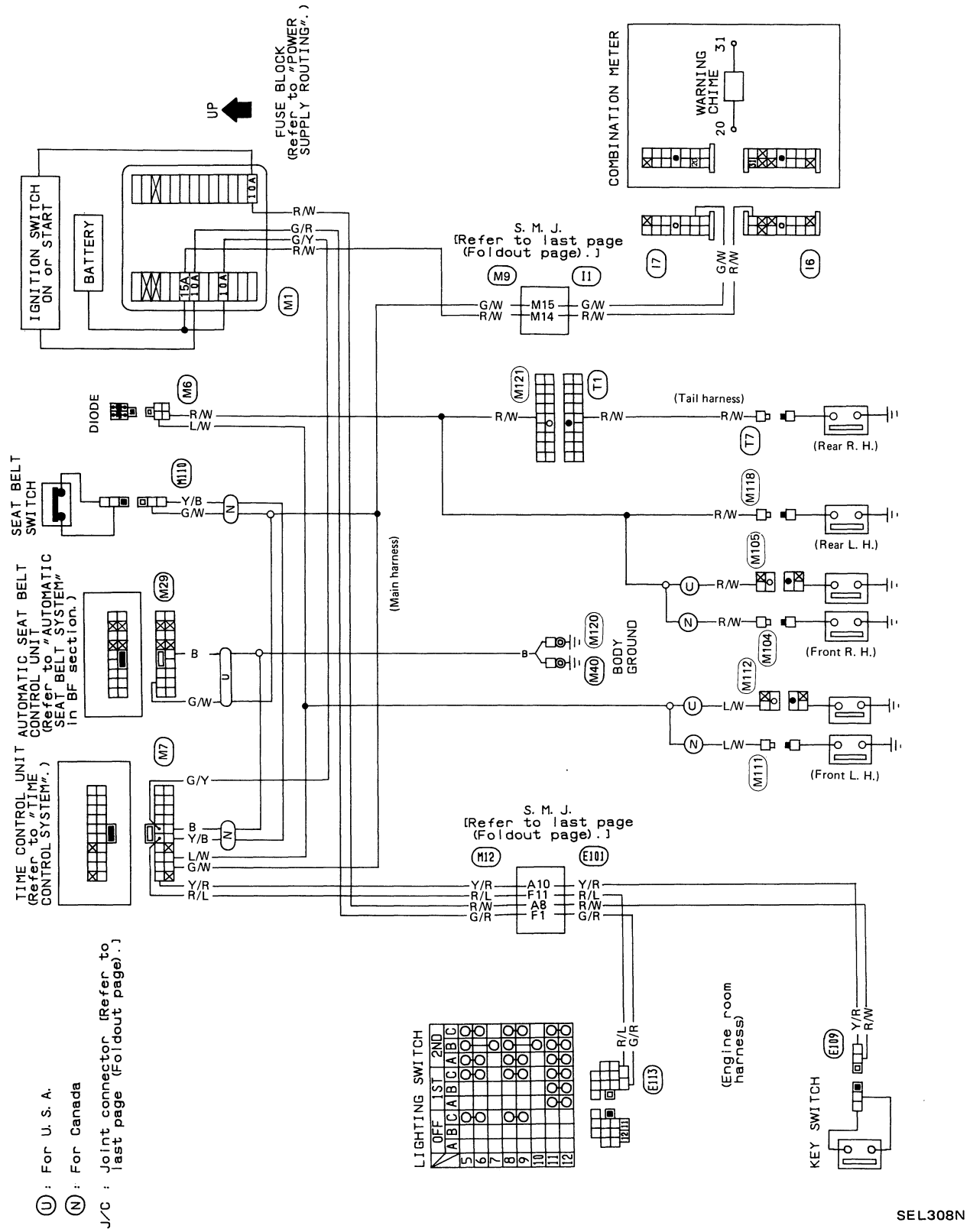
SEL306N

Warning Lamps/Wiring Diagram

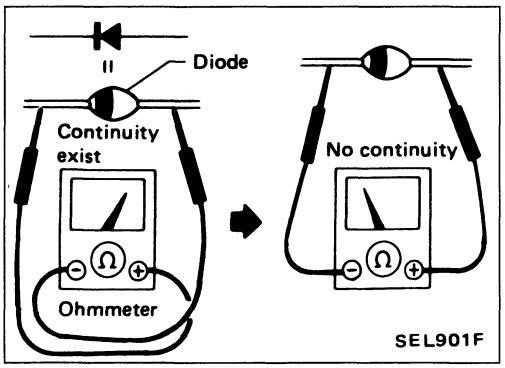


SEL307N

Warning Chime/Wiring Diagram

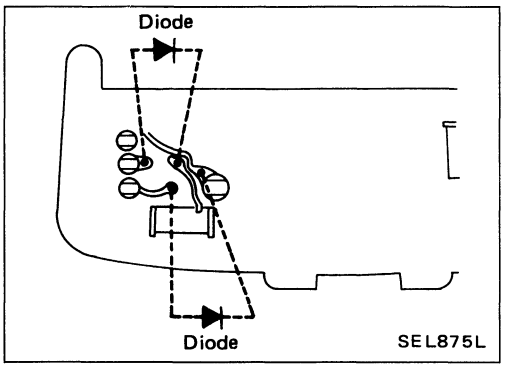


SEL308N



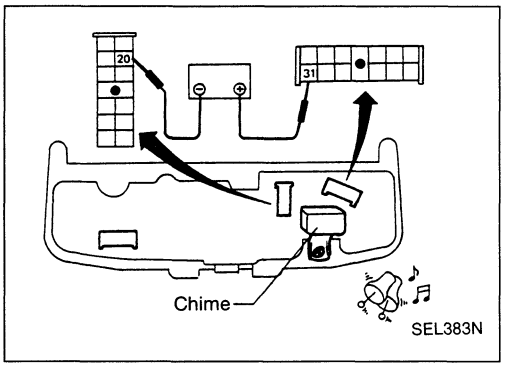
Diode Check

- Check continuity using an ohmmeter.
- Diode is functioning properly if test results are as shown in the figure at left.



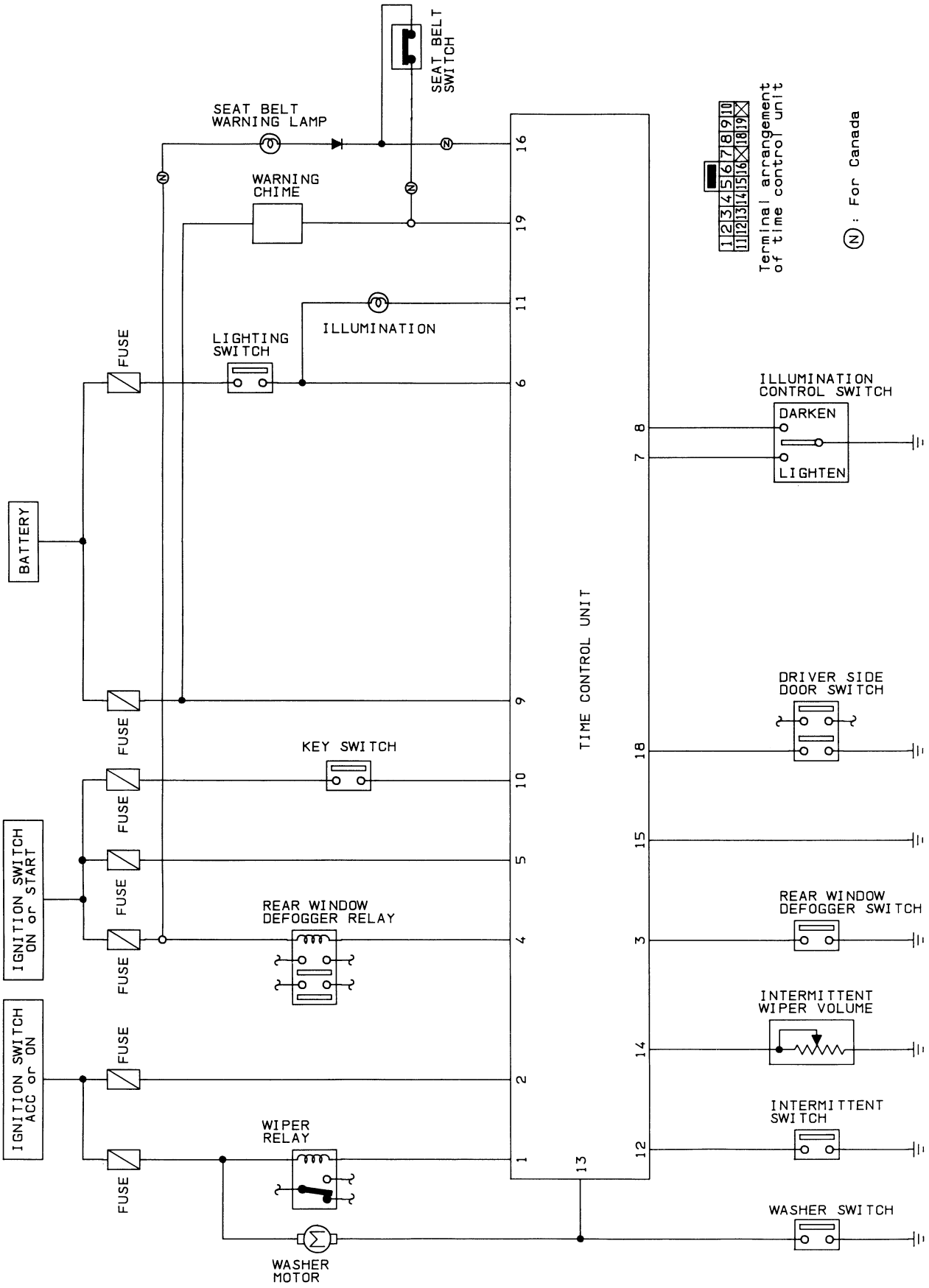
- Diodes for warning lamps are built into the combination meter printed circuit.

Refer to "Combination Meter".



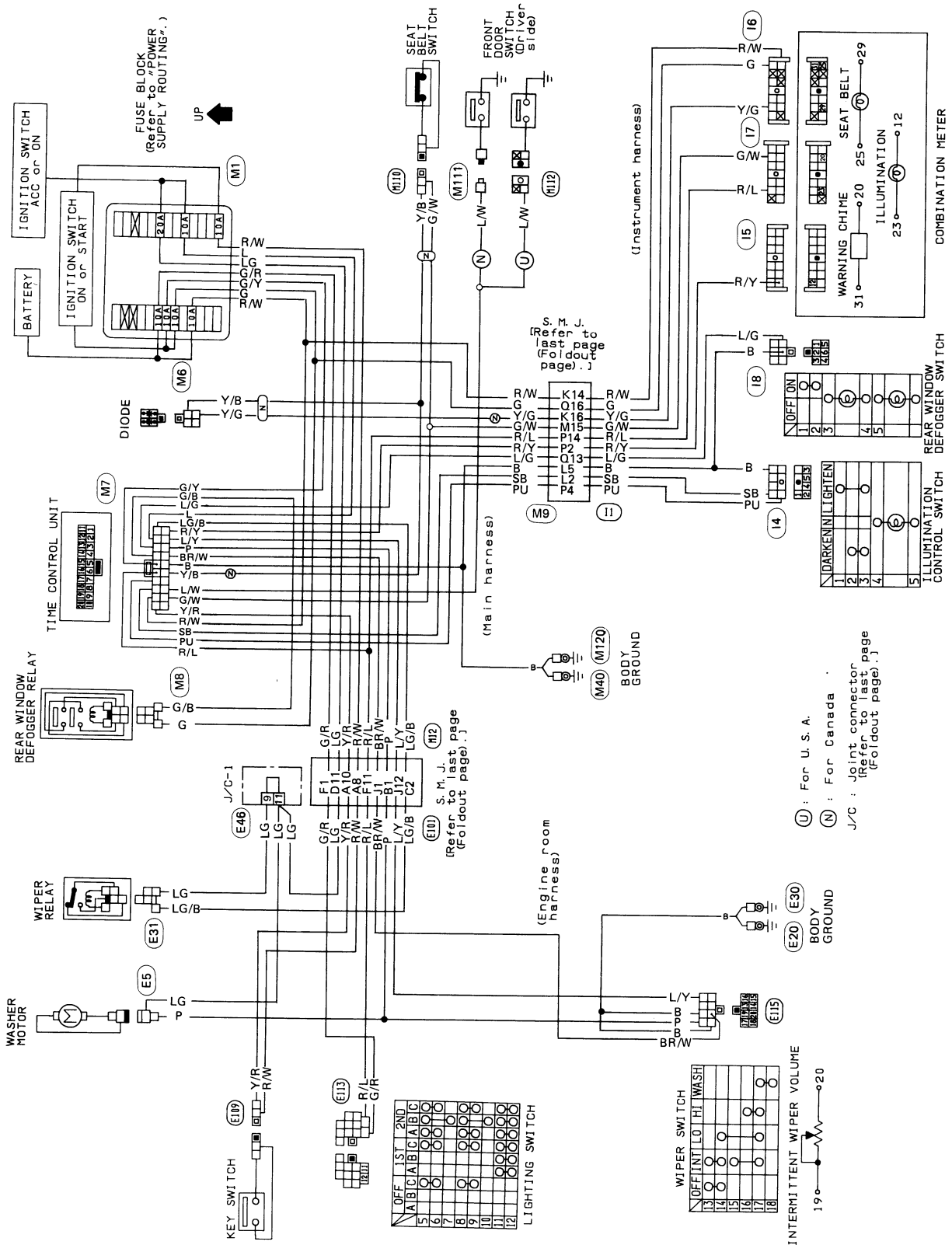
Warning Chime Check

Schematic



SEL309N

Wiring Diagram



SEL310N

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

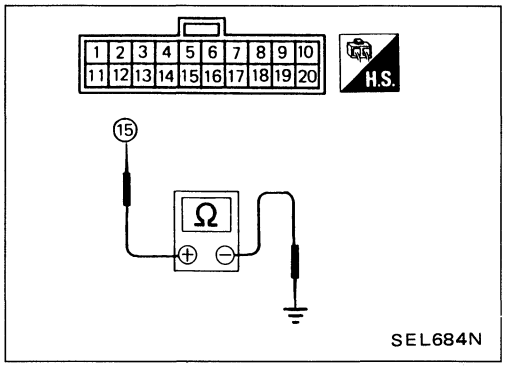
Input signal / Input terminal / Output terminal / Item		Power source from battery	Ignition switch	Light switch	Wiper switch "INT"	Washer switch	Driver's side door switch *1	Seat belt switch *2	Illumination control switch
		⑨	② or ⑤	⑥	⑫	⑬	⑱	⑯	⑦ or ⑧
Intermittent wiper control	①	ON	ACC or ON		ON				
Washer 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	

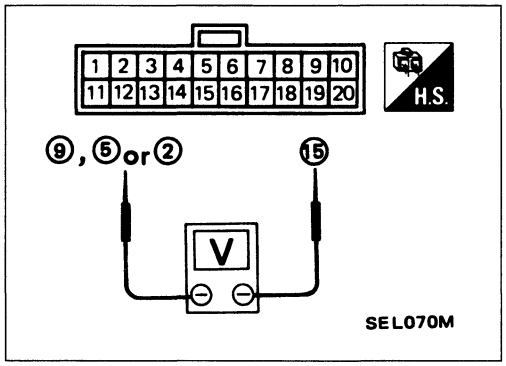
*1: Door switch is turned "ON" when door is opened.

*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





PREPARATION FOR TROUBLE-DIAGNOSIS

1. Remove lower trim.
2. Remove time control unit with harness connected.

POWER SUPPLY CIRCUIT CHECK

1. Connect ohmmeter from harness side.
2. Check continuity between terminal ⑮ and body ground.

Ohmmeter terminals		Continuity
(+)	(-)	
⑮	Body ground	Yes

3. Connect voltmeter from harness side.
4. Measure voltage across terminal ⑮ and terminals ②, ⑤ or ⑨.

Voltmeter terminals		Ignition switch position		
(+)	(-)	OFF	ACC	ON
⑨	⑮	Approx. 12V	Approx. 12V	Approx. 12V
⑤	⑮	0V	0V	Approx. 12V
②	⑮	0V	Approx. 12V	Approx. 12V

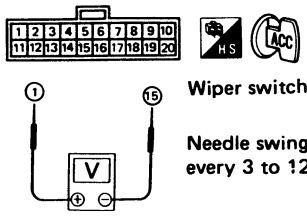
Trouble-diagnosis (Cont'd)

DIAGNOSTIC PROCEDURE-1

Intermittent wiper does not operate.

A **T.C.U. OUTPUT FOR WIPER RELAY CIRCUIT CHECK**

Measure voltage across ① and ⑮.



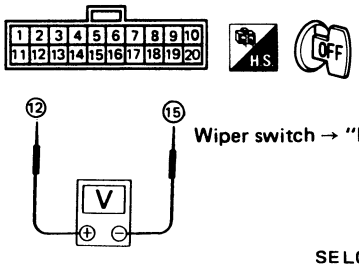
Wiper switch → "INT"

Needle swings from 0 to 12V every 3 to 12 seconds.

SEL071M

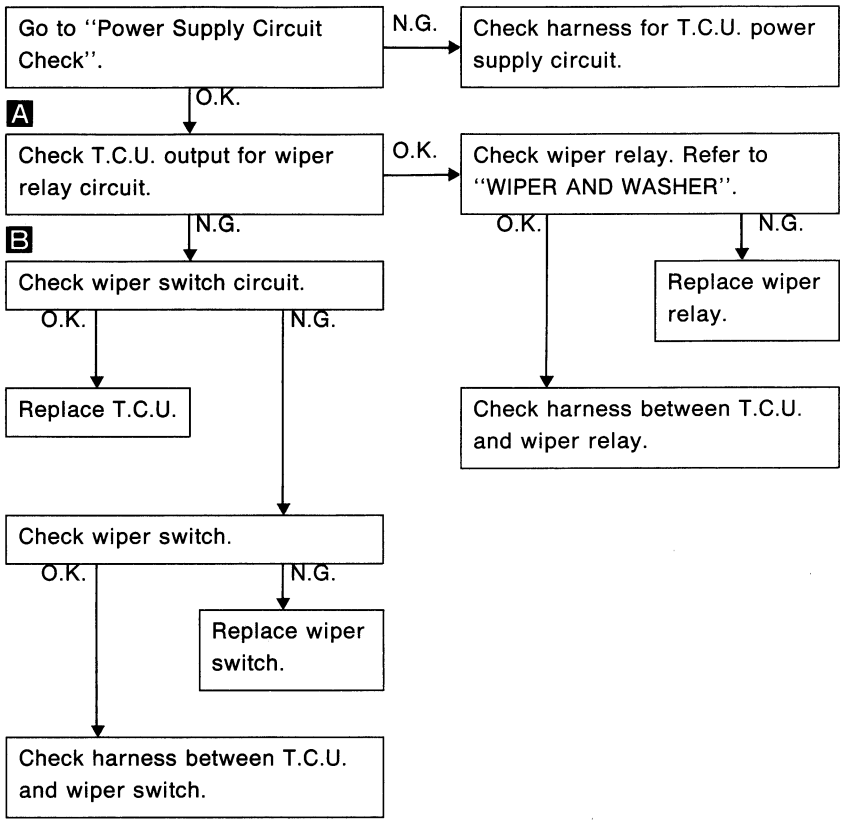
B **WIPER SWITCH CIRCUIT CHECK**

Check continuity between ⑫ and ⑮.



Wiper switch → "INT"

SEL072M

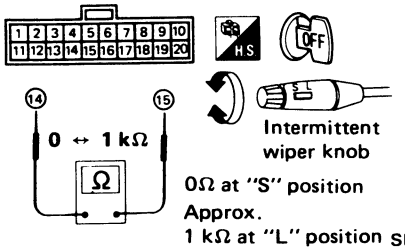


DIAGNOSTIC PROCEDURE-2

Intermittent time of wiper cannot be adjusted.

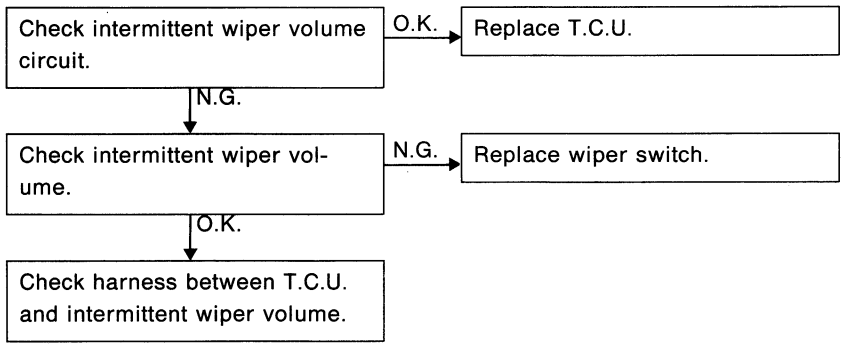
A **INTERMITTENT WIPER VOLUME CIRCUIT CHECK**

Measure resistance between ⑭ and ⑮ while turning intermittent wiper volume.



0Ω at "S" position

Approx. 1 kΩ at "L" position SEL073M



Trouble-diagnosis (Cont'd)

DIAGNOSTIC PROCEDURE-3

Wiper and washer activate individually but not in combination.

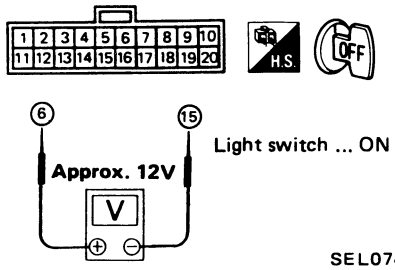
Check washer switch circuit. → O.K. → Check harness between T.C.U.and wiper switch.

Check washer switch circuit. → N.G. → Check T.C.U. output for wiper motor.

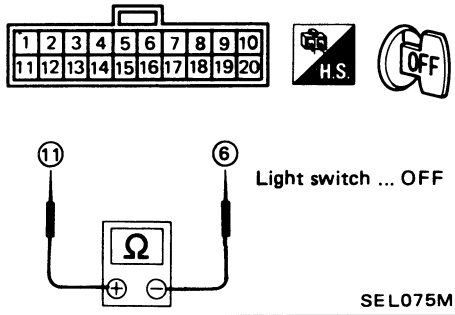
Check T.C.U. output for wiper motor. → N.G. → Replace T.C.U.

Check T.C.U. output for wiper motor. → O.K. → Replace wiper relay.

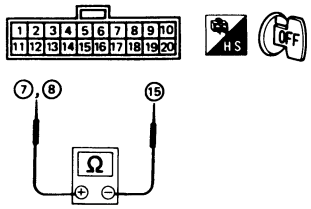
A T.C.U. OUTPUT FOR LIGHT SWITCH CIRCUIT CHECK



B ILLUMINATION CIRCUIT CHECK



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.

Check T.C.U. output for light switch circuit. → O.K. →

B

Check illumination circuit. → N.G. → Check for loose harness connector.

Check illumination circuit. → O.K. →

C

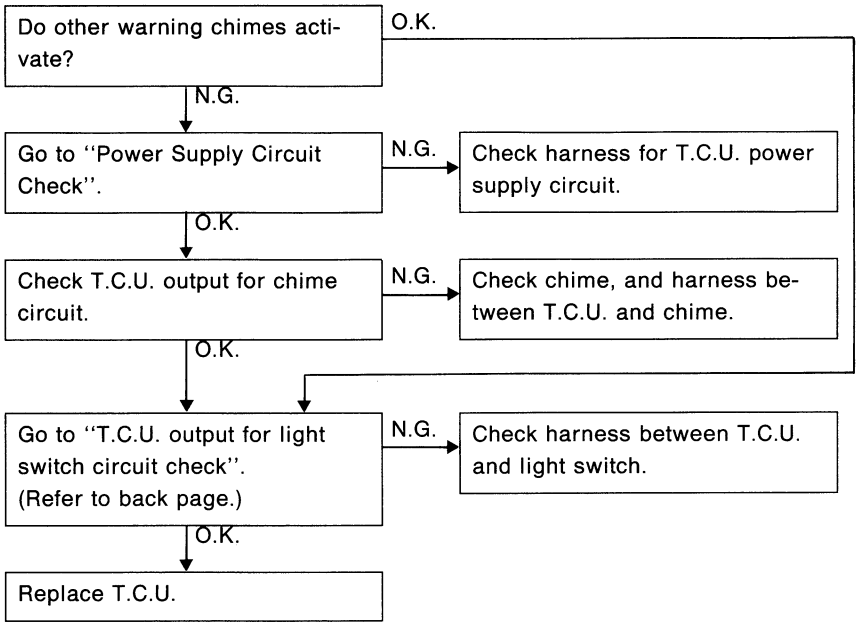
Check illumination control circuit. → N.G. → Check illumination control switch.

Check illumination control circuit. → O.K. → Replace T.C.U.

Trouble-diagnosis (Cont'd)

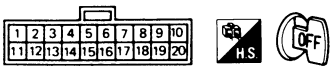
DIAGNOSTIC PROCEDURE-5

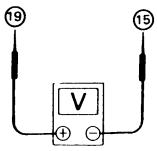
Light warning chime does not activate.



A T.C.U. OUTPUT FOR CHIME CIRCUIT CHECK

Measure voltage across ⑲ and ⑮ when driver side door is opened and close.



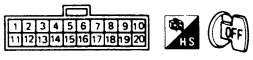


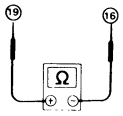
Light switch ... 1ST
- Approx. 12V when driver side door is closed.
- Voltmeter needle swings (0 – 12V) when driver side door is opened.

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.

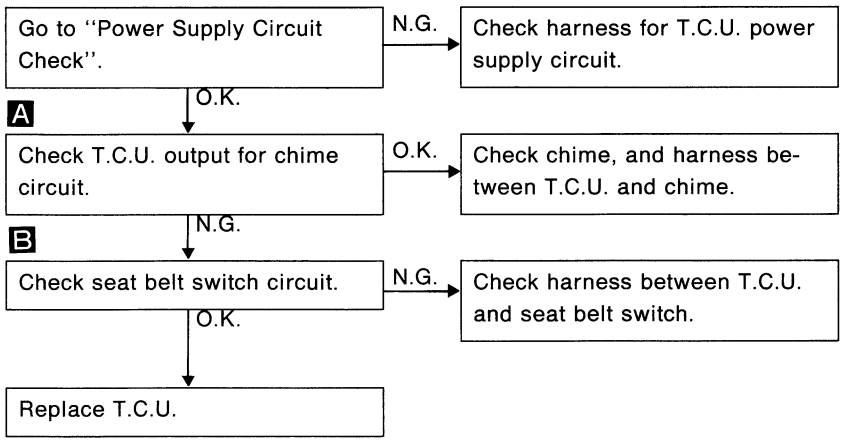




SEL078M

DIAGNOSTIC PROCEDURE-6

Seat belt warning chime does not activate.



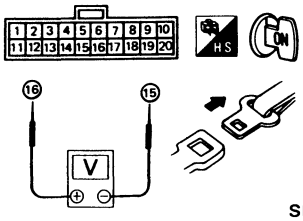
Trouble-diagnosis (Cont'd)

DIAGNOSTIC PROCEDURE-7

Seat belt warning lamp does not go off nor comes on.

A T.C.U. OUTPUT FOR BELT WARNING LAMP CIRCUIT CHECK

Measure voltage across ⑯ and ⑮ when ignition switch is "ON".



SEL079M

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. → N.G. → Replace T.C.U.

Voltmeter needle keeps swinging (approx. 0 ←→ 12V) for about 7 seconds after ignition switch is turned "ON".

↓ 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. ↓

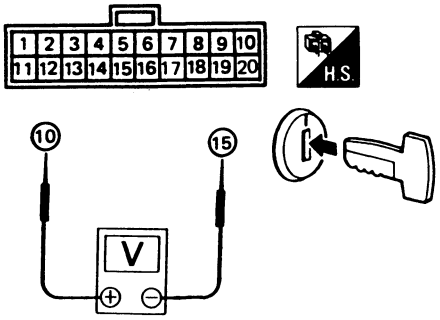
C Check driver's door switch circuit. — N.G. → Check harness between T.C.U. and driver's door switch.

O.K. ↓

Replace T.C.U.

A KEY SWITCH CIRCUIT CHECK

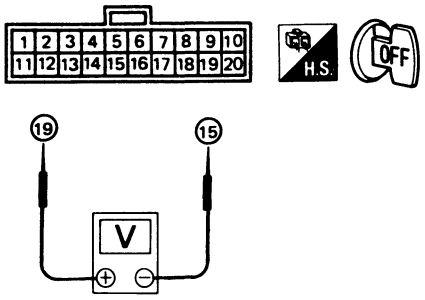
Measure voltage across ⑩ and ⑮.



SEL082M

B T.C.U. OUTPUT FOR CHIME CIRCUIT CHECK

Measure voltage across ⑲ and ⑮ when driver side door is opened and closed.

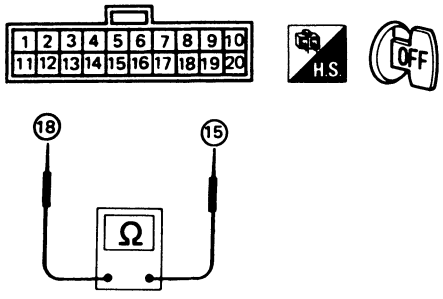


- Approx. 12V when driver side door is opened.

SEL080M

C DRIVER'S DOOR SWITCH CIRCUIT CHECK

Check continuity between ⑱ and ⑮.



Driver side door ... Open

SEL081M

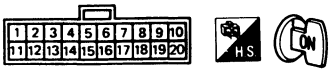
Trouble-diagnosis (Cont'd)

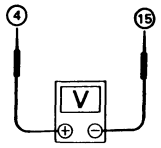
DIAGNOSTIC PROCEDURE-9

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.



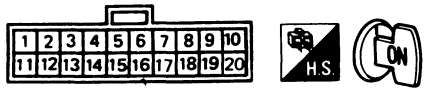


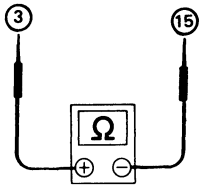
Rear defogger switch → ON

- Rear defogger switch "OFF": Approx. 12V
- Rear defogger switch "ON": Approx. 0V

SEL083M

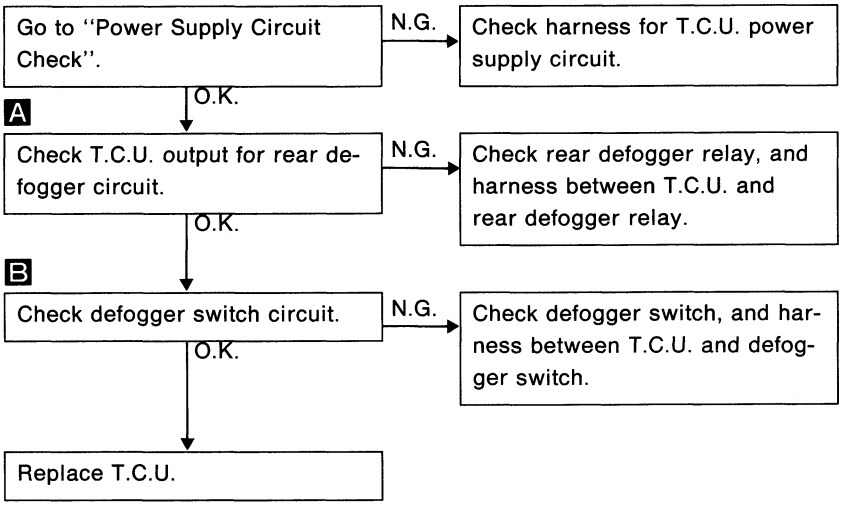
B DEFOGGER SWITCH CIRCUIT CHECK



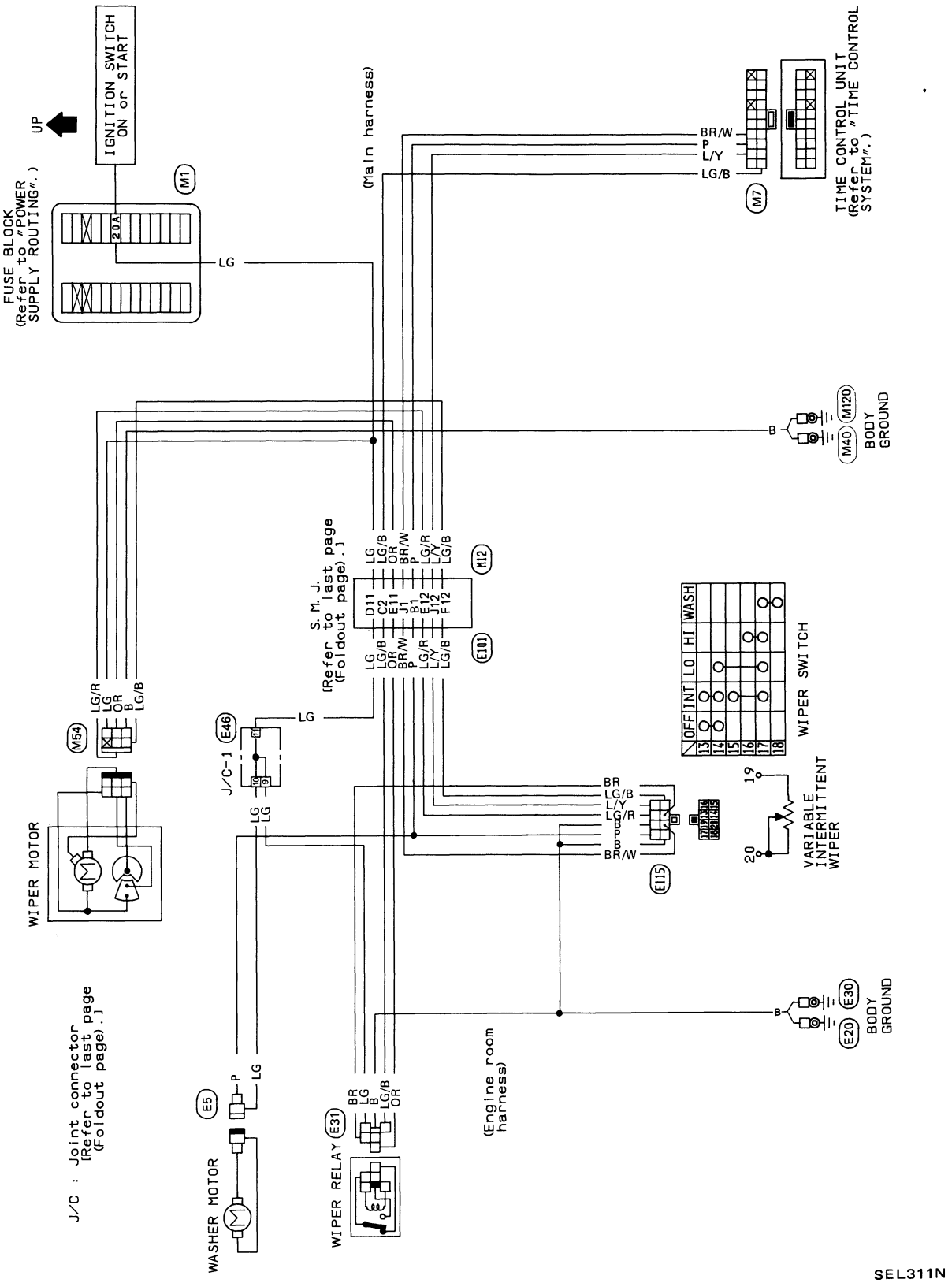


- Rear defogger switch "OFF": Except 0Ω
- Rear defogger switch "ON": 0Ω

SEL084M

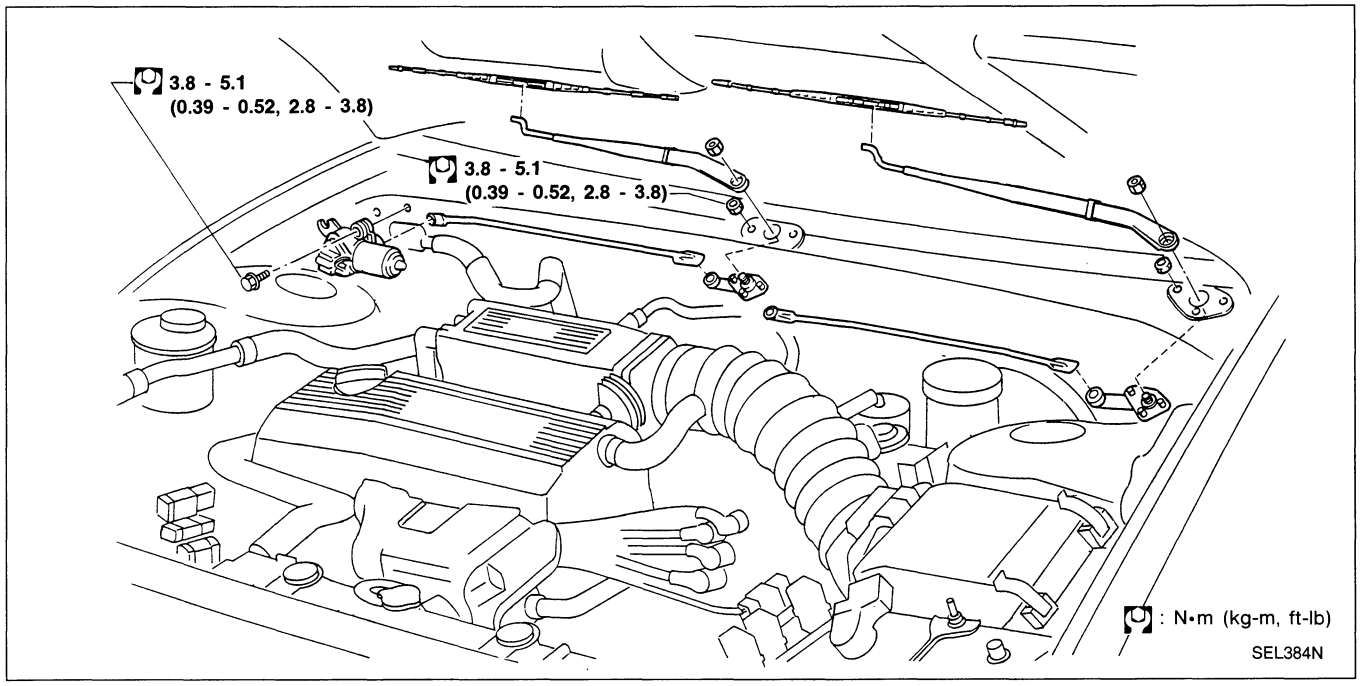


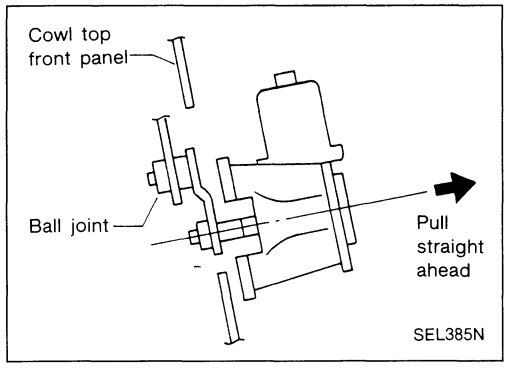
Front Wiper and Washer/Wiring Diagram



SEL311N

Wiper Removal and Installation

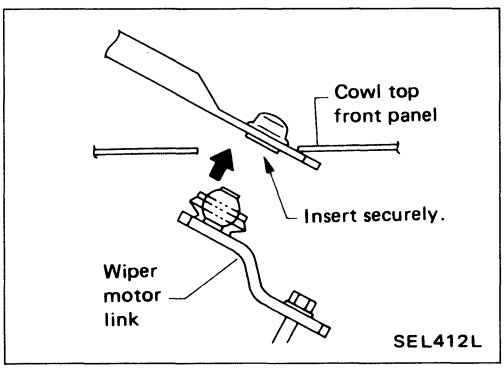




FRONT WIPER REMOVAL

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.

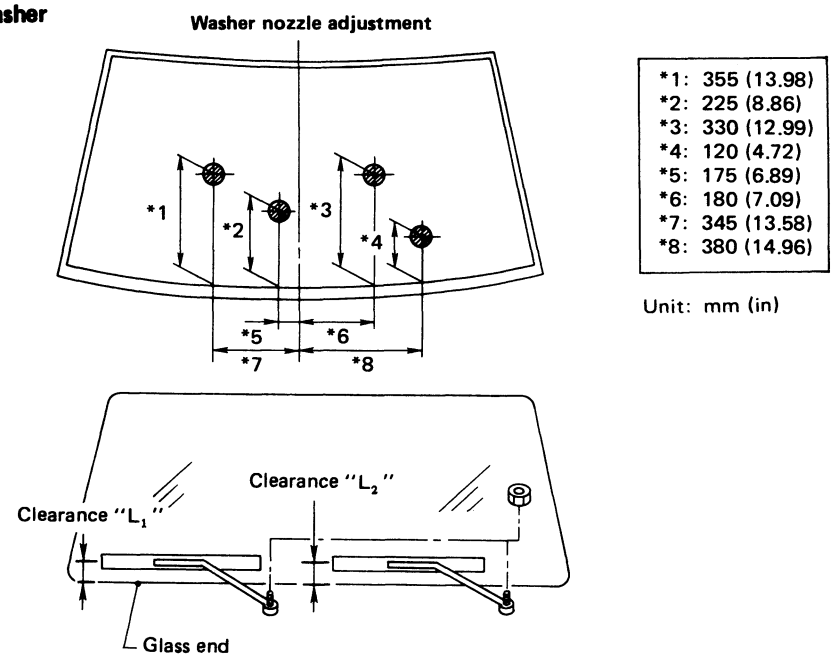
- Apply a small amount of grease to ball joints before installation.

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)

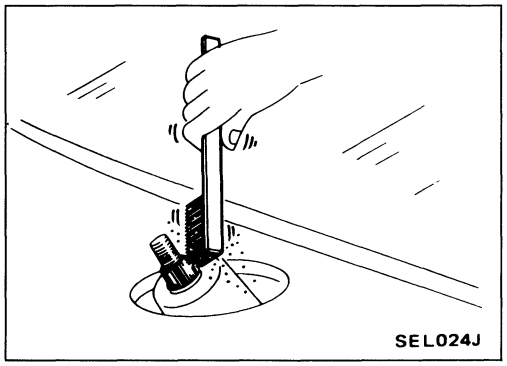
Windshield wiper and washer



*1:	355 (13.98)
*2:	225 (8.86)
*3:	330 (12.99)
*4:	120 (4.72)
*5:	175 (6.89)
*6:	180 (7.09)
*7:	345 (13.58)
*8:	380 (14.96)

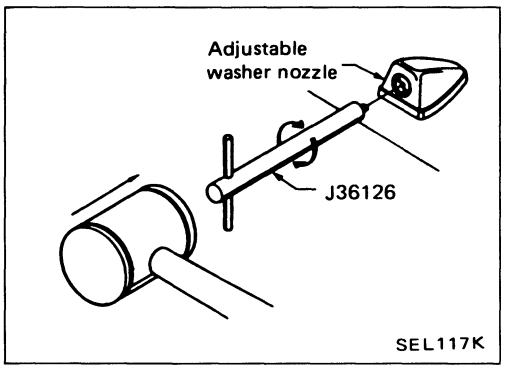
Unit: mm (in)

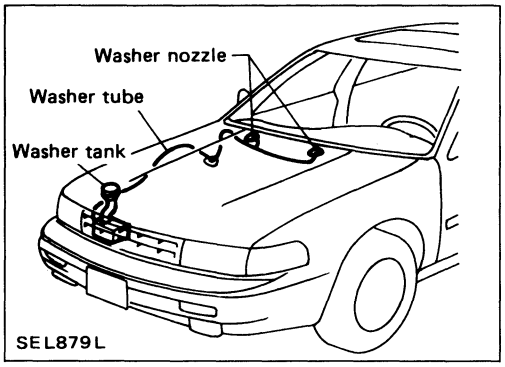
SEL877L



SEL024J

- **Before reinstalling wiper arm, clean up the pivot area as illustrated. This will reduce possibility of wiper arm looseness.**



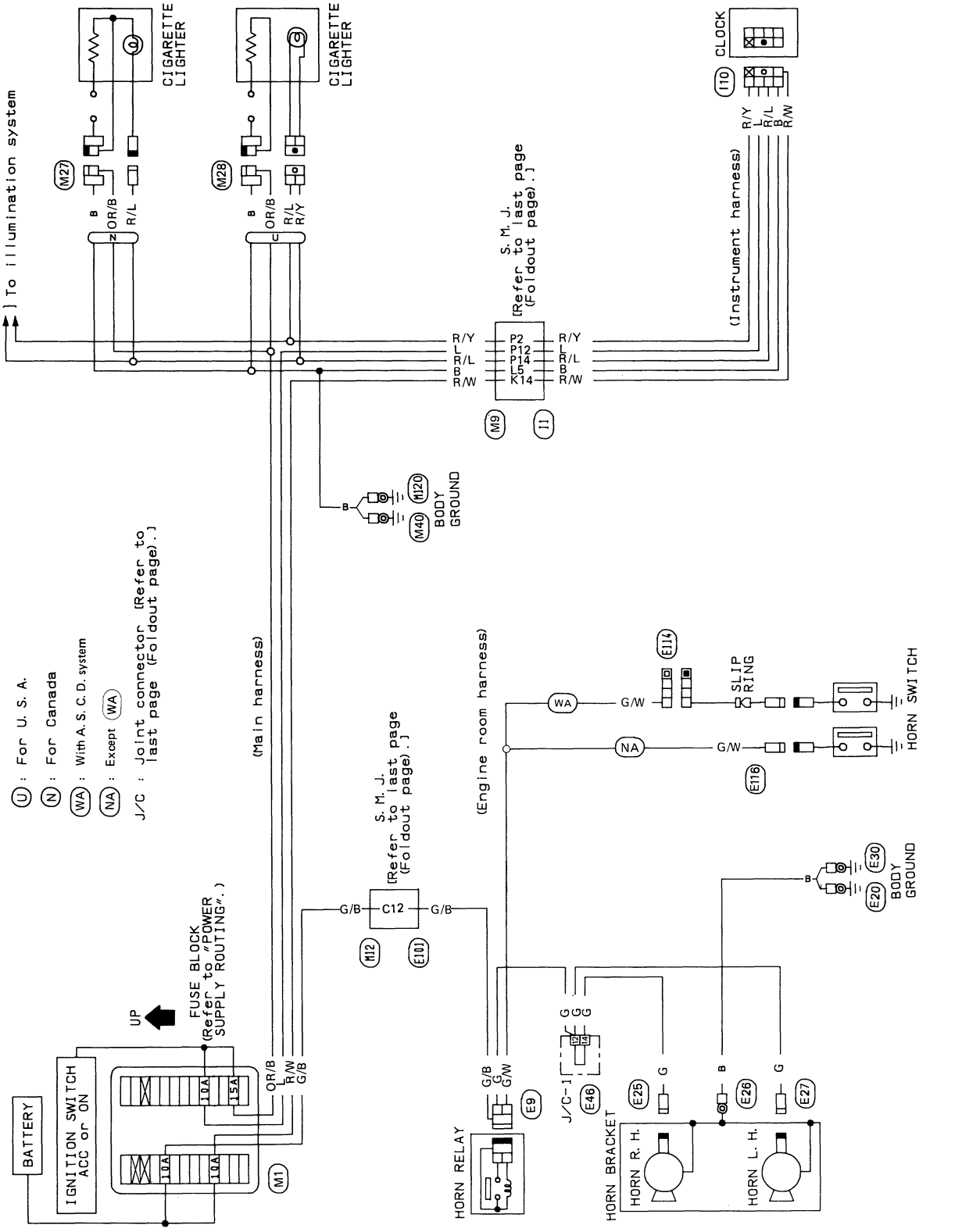


Washer Nozzle Adjustment

- Using Tool J36126, adjust windshield washer nozzle to correct its spray pattern.

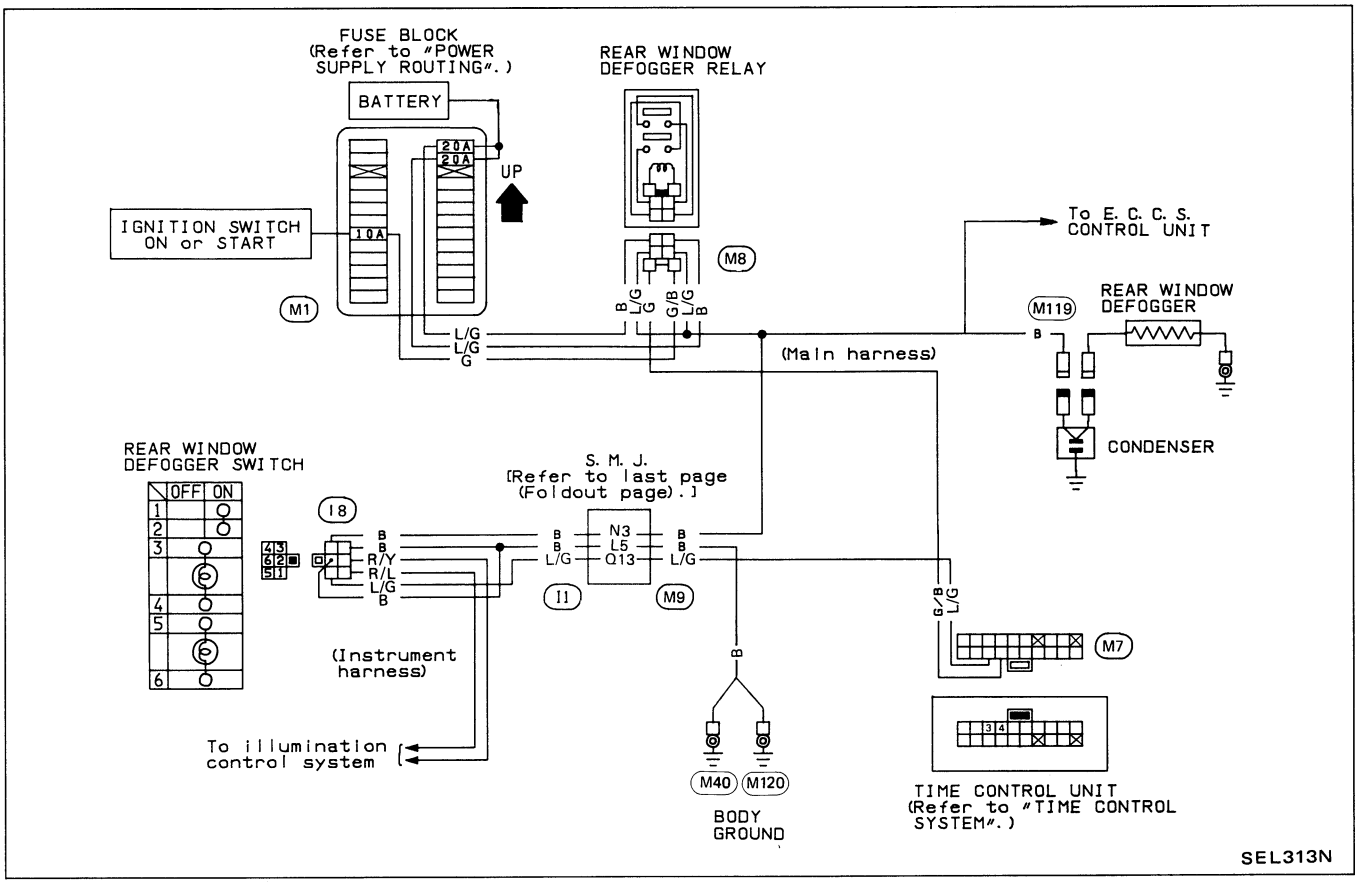
Before attempting to turn the nozzle, gently tap the end of the tool to free the nozzle.
This will prevent "rounding out" the small female square in the center of the nozzle.

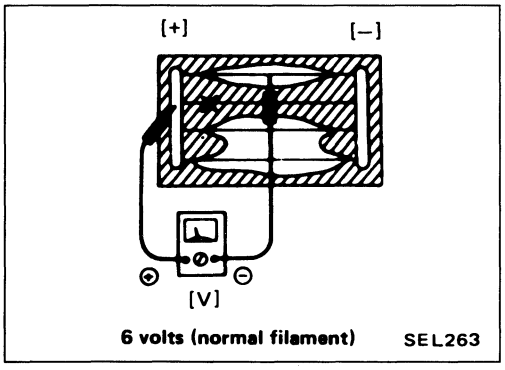
Wiring Diagram



SEL312N

Wiring Diagram

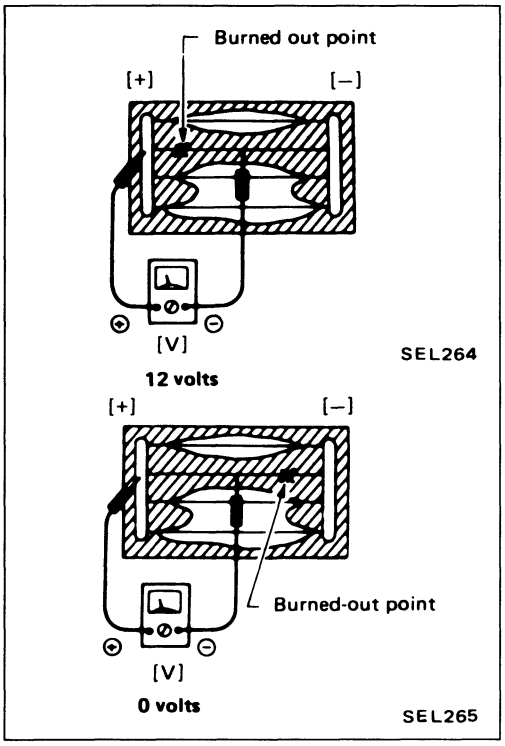




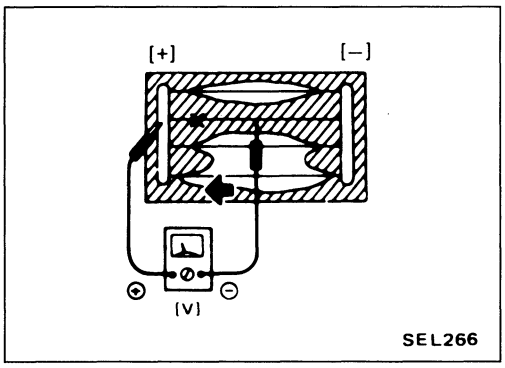
6 volts (normal filament) SEL263

Filament Check

1. Attach probe circuit tester (in volt range) to middle portion of each filament.



2. If a filament is burned out, circuit tester registers 0 or 12 volts.



3. To locate burned out point, move probe to left and right along filament to determine point where tester needle swings abruptly.

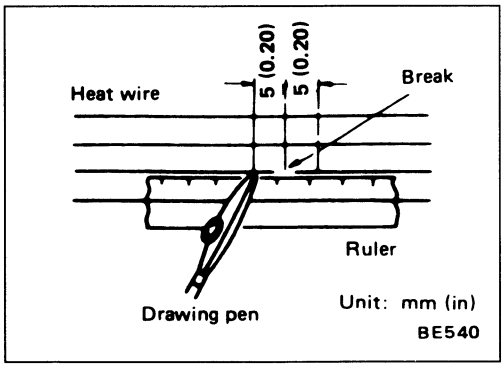
Filament Repair

REPAIR EQUIPMENT

1. Conductive silver composition (Dupont No. 4817 or equivalent)
2. Ruler 30 cm (11.8 in) long
3. Drawing pen
4. Heat gun
5. Alcohol
6. Cloth

Filament Repair (Cont'd)

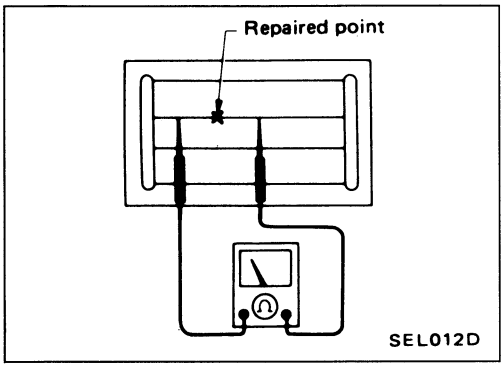
REPAIRING PROCEDURE



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.

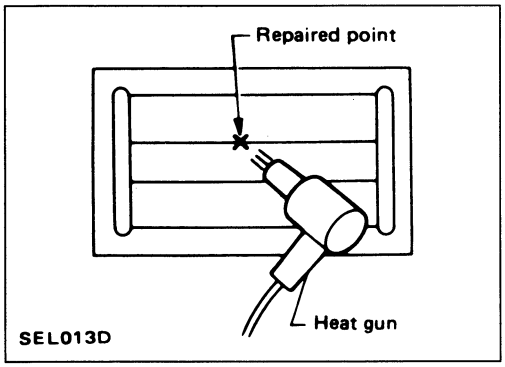
Shake silver composition container before use.

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.



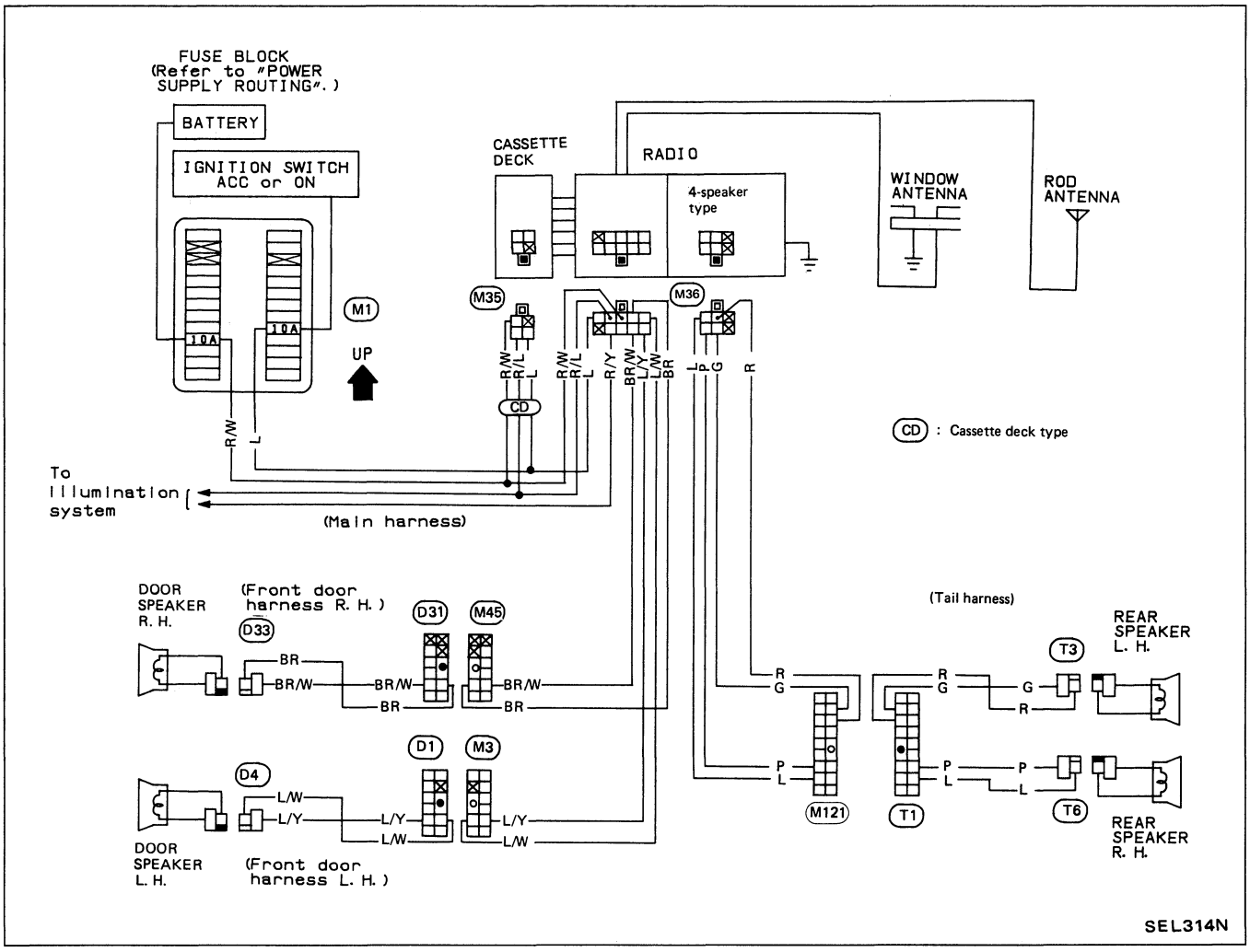
4. After repair has been completed, check repaired wire for continuity. This check should be conducted 10 minutes after silver composition is deposited.

Do not touch repaired area while test is being conducted.

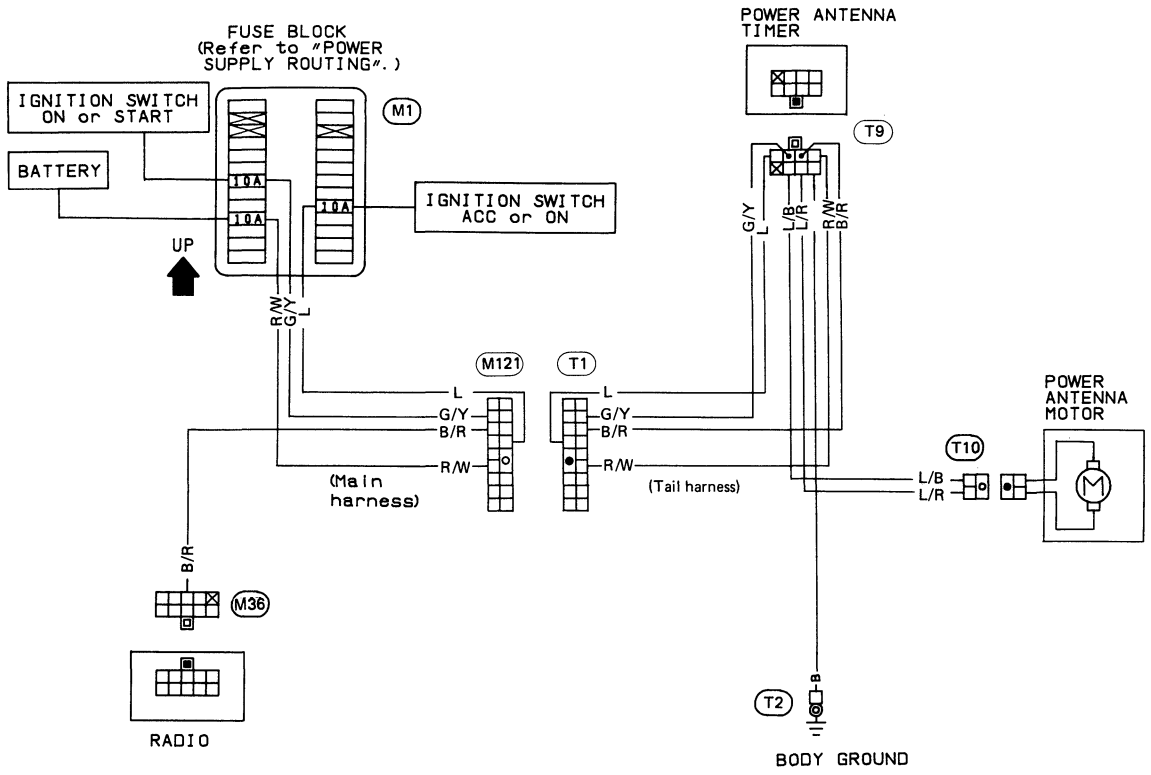


5. Apply a constant stream of hot air directly to the repaired area for approximately 20 minutes with a heat gun. A minimum distance of 3 cm (1.2 in) should be kept between repaired area and hot air outlet. If a heat gun is not available, let the repaired area dry for 24 hours.

Audio/Wiring Diagram

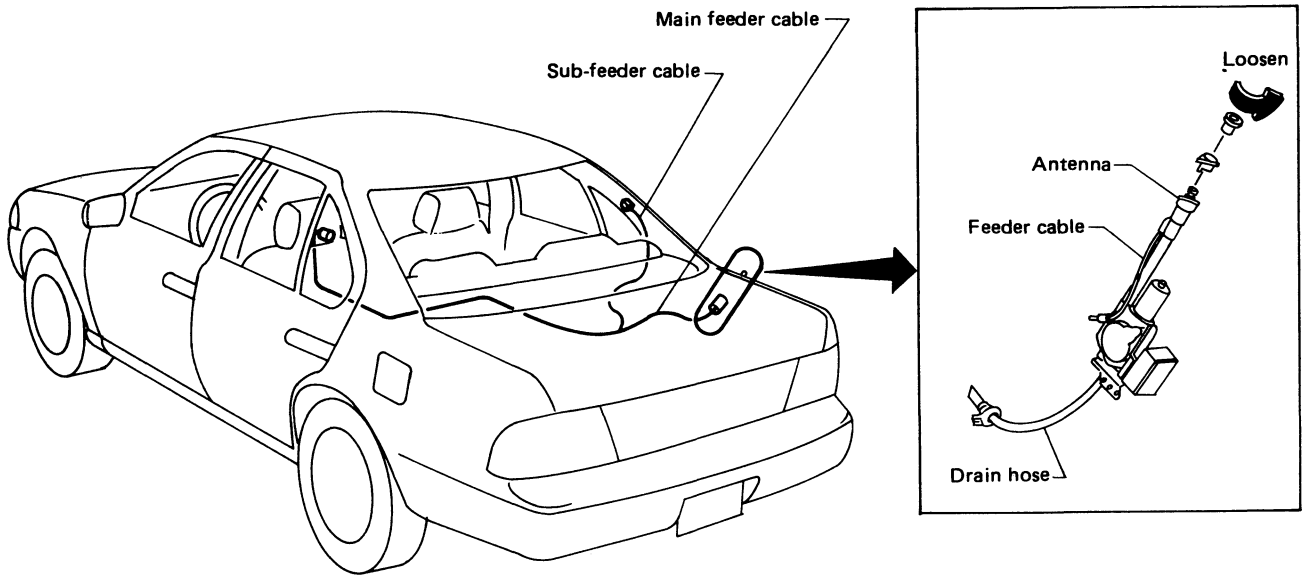


Power Antenna/Wiring Diagram

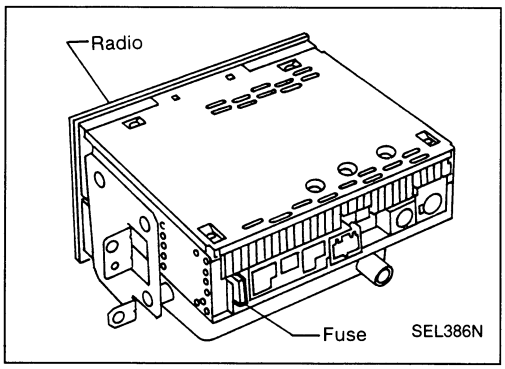


SEL315N

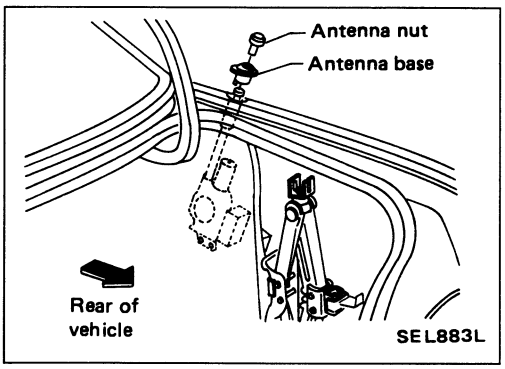
Location of Antenna



SEL880L



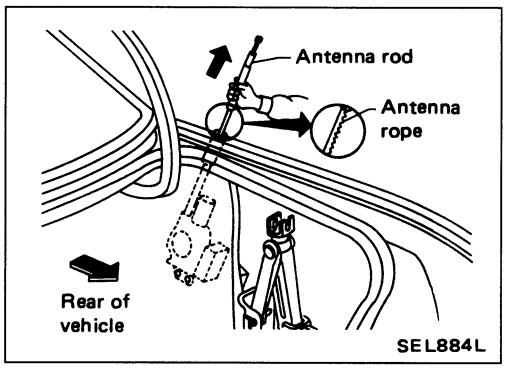
Radio Fuse Check



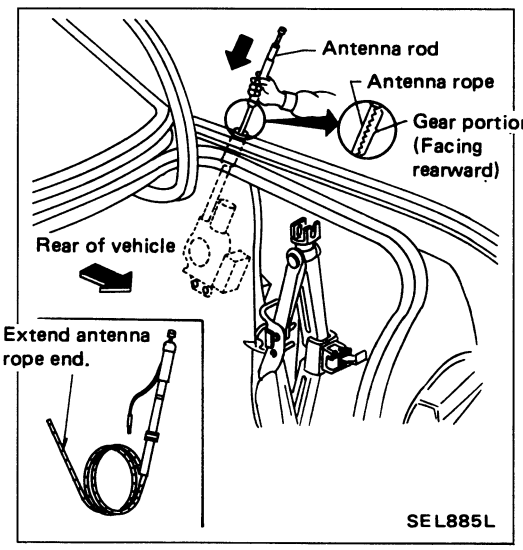
Antenna Rod Replacement

REMOVAL

1. Remove antenna nut and antenna base.

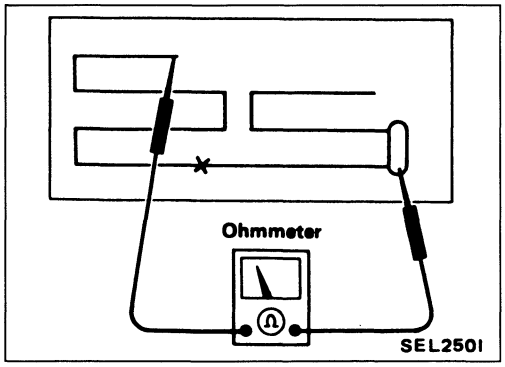


2. Withdraw antenna rod while raising it by operating antenna motor.



INSTALLATION

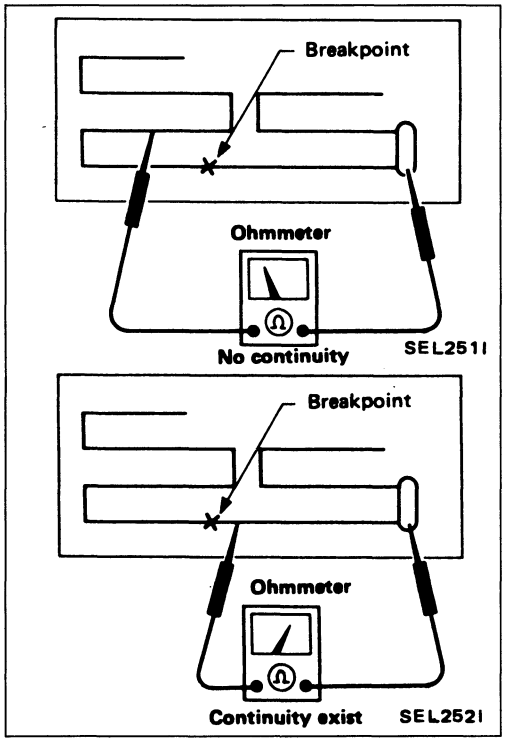
1. Lower antenna rod by operating antenna motor.
2. Insert gear section of antenna rope into place with it facing toward antenna motor.
3. As soon as antenna rope is wound on antenna motor, stop antenna motor. Insert antenna rod lower end into antenna motor pipe.
4. Retract antenna rod completely by operating antenna motor.
5. Install antenna nut and base.



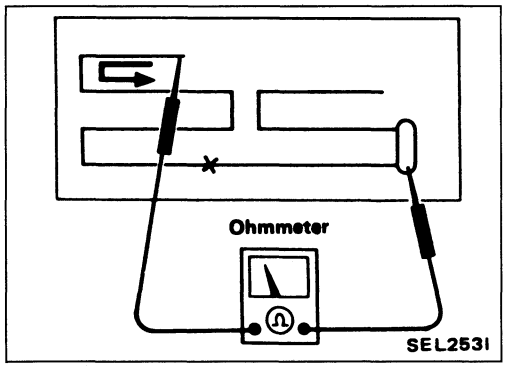
Window Antenna Repair

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.

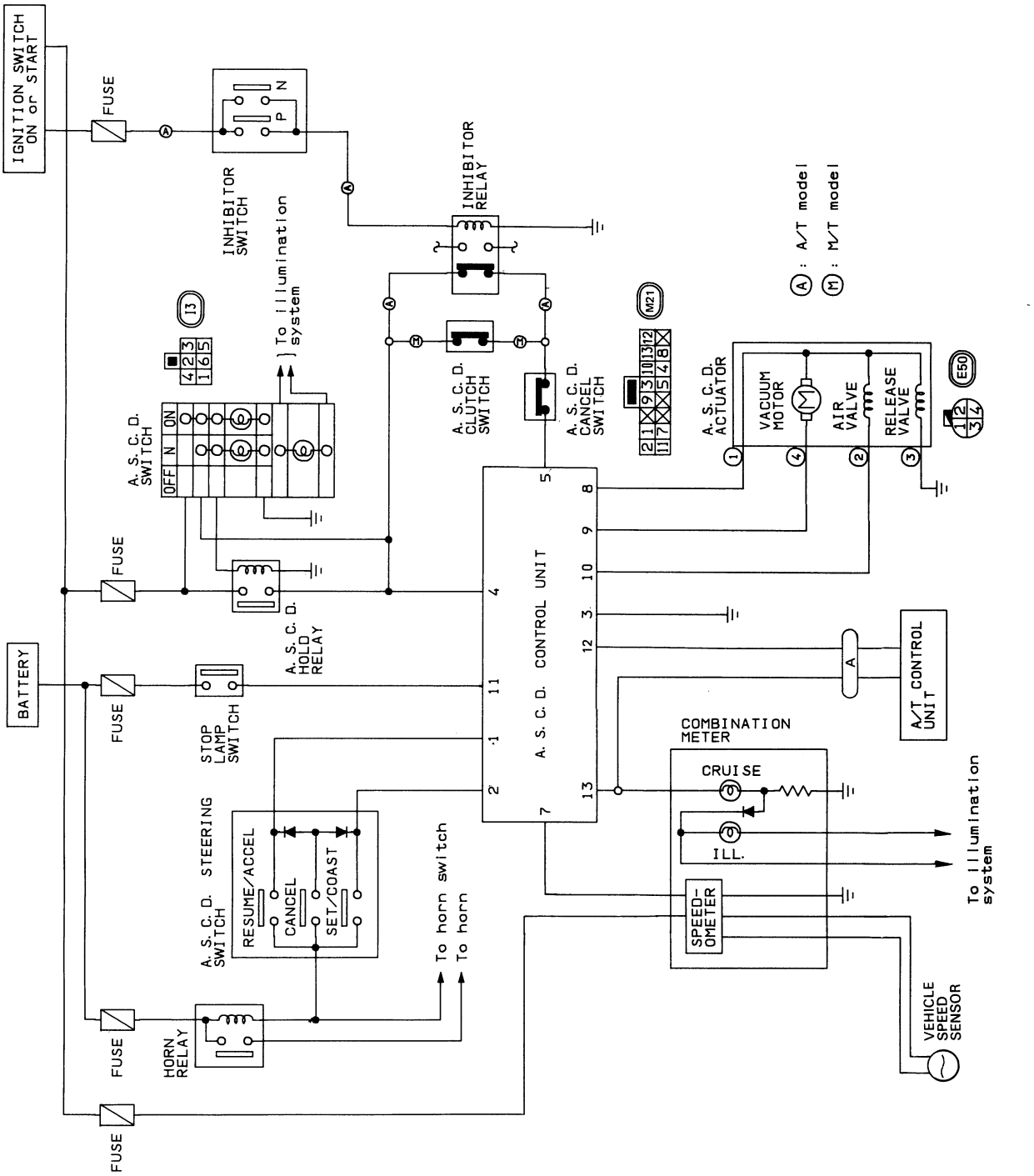


3. To locate broken point, move probe to left and right along element to determine point where tester needle swings abruptly.

ELEMENT REPAIR

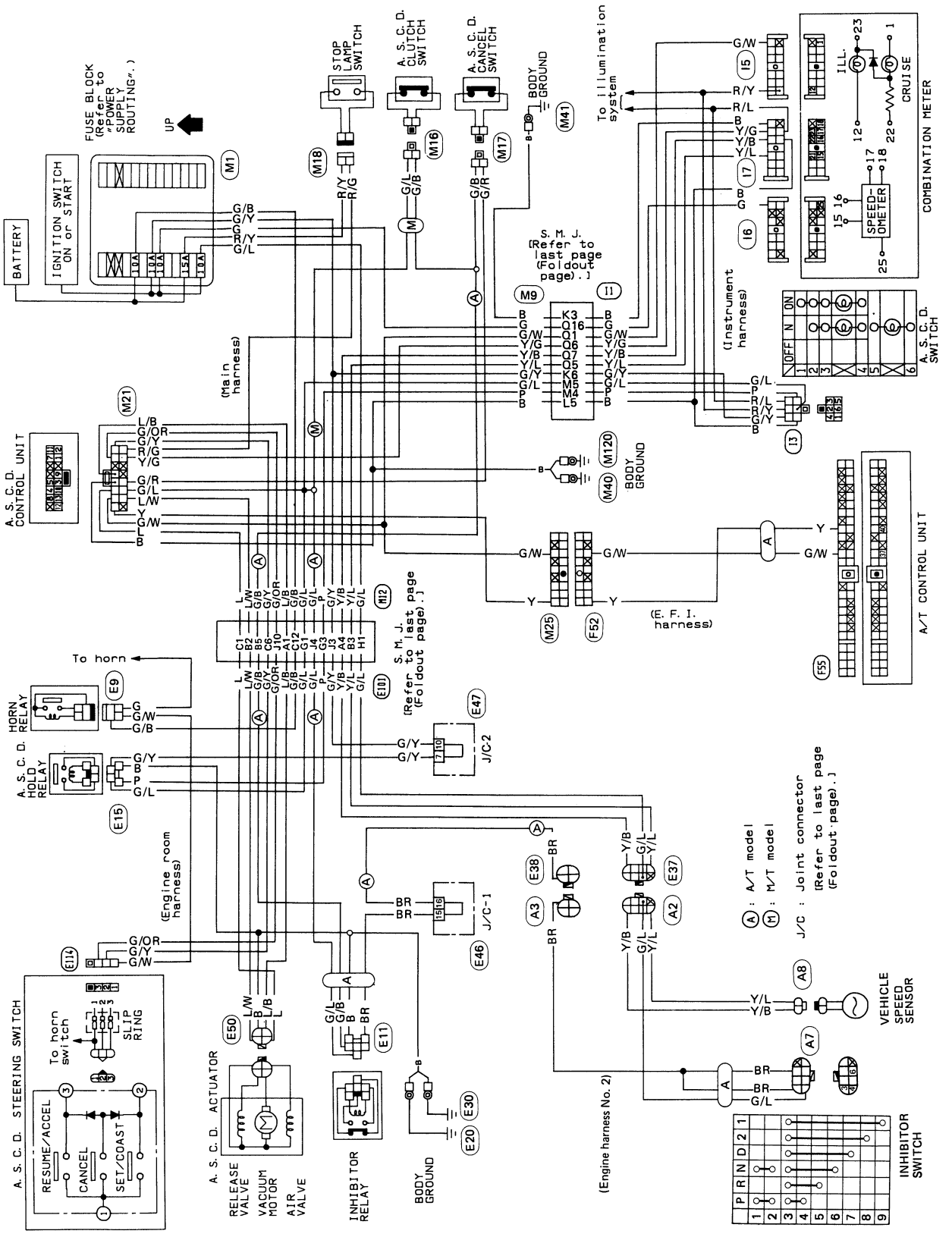
Refer to REAR WINDOW DEFOGGER "Filament Repair".

Schematic



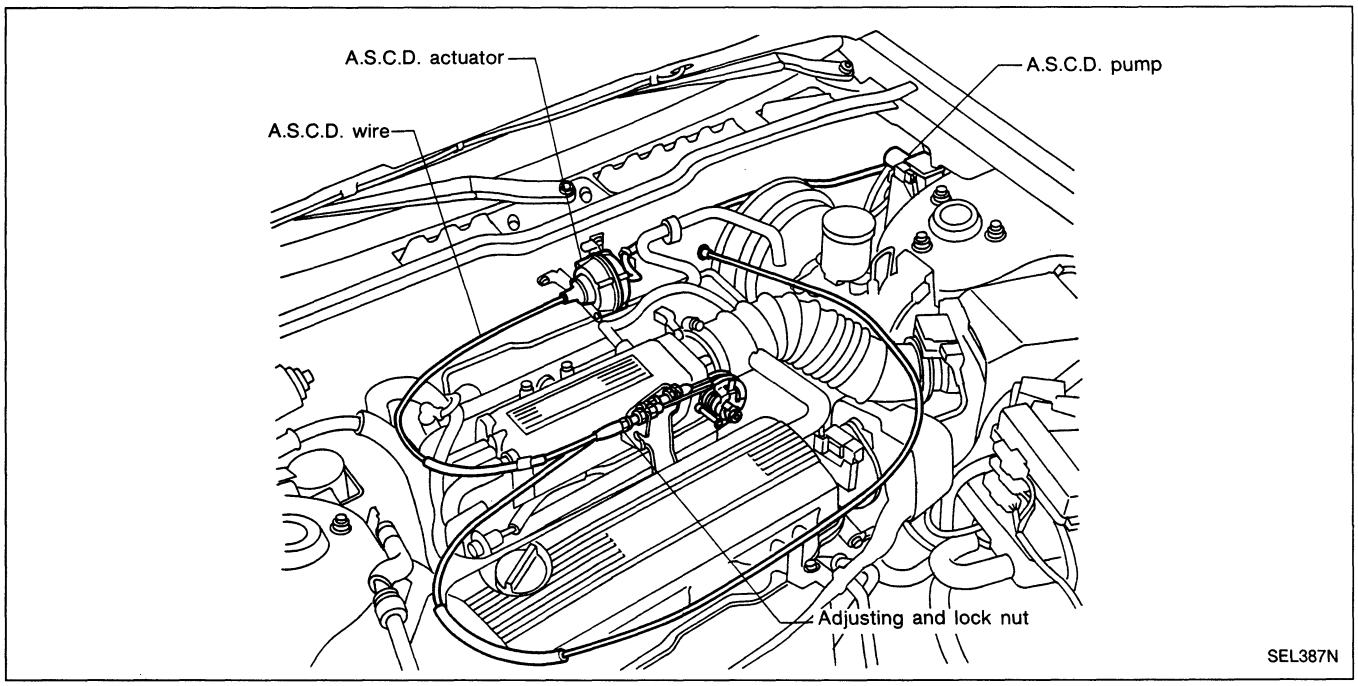
SEL316N

Wiring Diagram



SEL317N

A.S.C.D. Wire Adjustment



CAUTION:

- **Be careful not to twist A.S.C.D. wire when removing it.**
- **Do not tense A.S.C.D. wire excessively during adjustment.**

After confirming that accelerator wire is properly adjusted, adjust the tension of A.S.C.D. wire in the following manner.

(1) After adjusting the length of the accelerator wire, turn a securing nut by 1/2 to 1 turn from throttle open starting position to the wire loosening direction to fix. (Must be securing carried out to prevent response delay of operation of the A.S.C.D.)

(2) Securely tighten lock nut to hold adjusting nut in place.

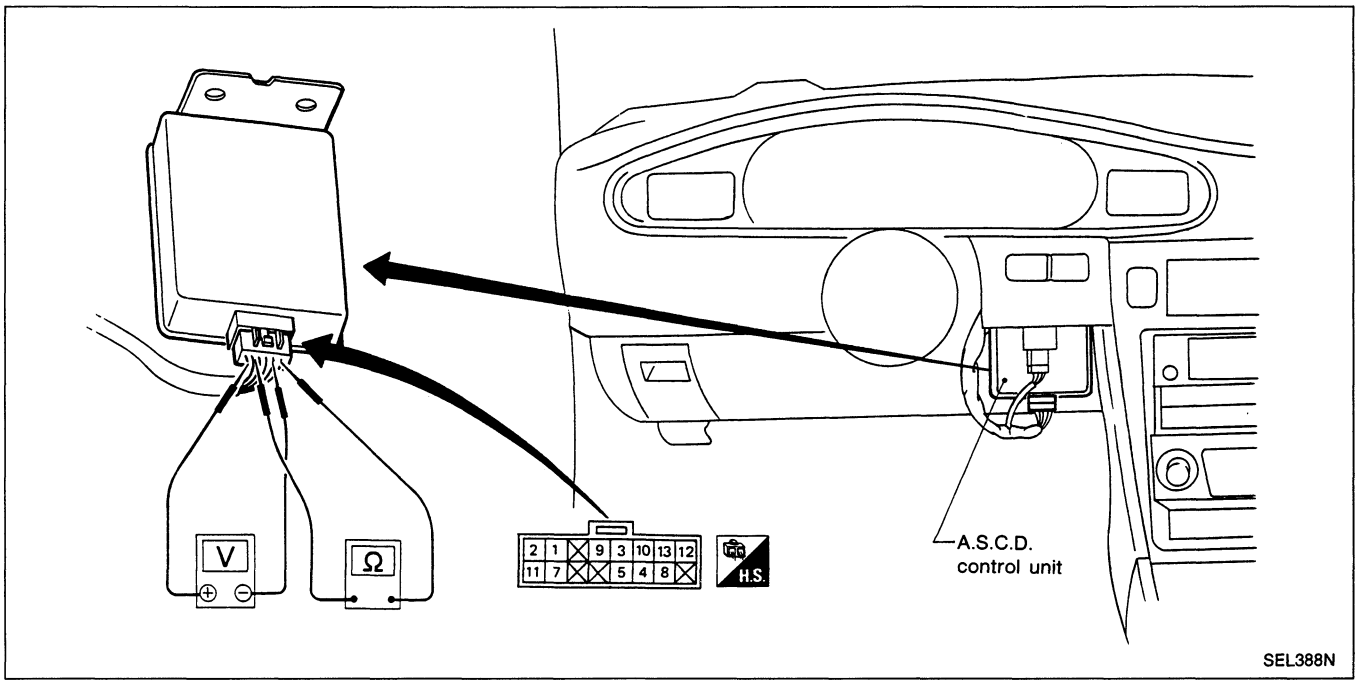
- For A.S.C.D. stop switch and clutch switch adjustment, refer to BR and CL sections.

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.

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. ↓

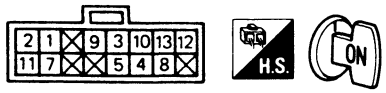
Check speed sensor circuit.
- N.G. → Check speed sensor and harness between A.S.C.D. control unit and speed sensor signal output terminal of combination meter.
- O.K. ↓

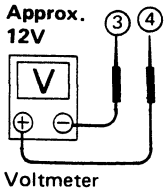
Check actuator. Refer to "Actuator Check".
- N.G. → Replace actuator.
- O.K. ↓

Replace A.S.C.D. control unit.

POWER SUPPLY CIRCUIT CHECK

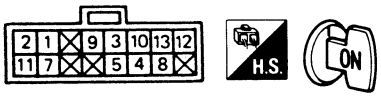
1. Turn A.S.C.D. main switch to "ON".
2. Check voltage between ④ and ③.

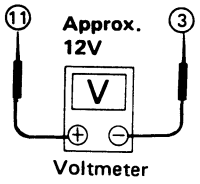




CUT-OFF CIRCUIT CHECK

1. Step on brake pedal.
2. Turn A.S.C.D. main switch to "ON".
3. Check voltage between ⑪ and ③.



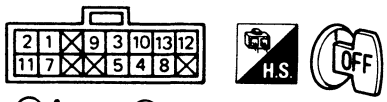


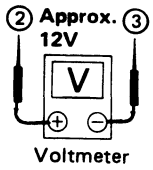
Brake pedal → Step on.

SEL685N

SET SWITCH CIRCUIT CHECK

1. Push A.S.C.D. set switch.
2. Check voltage between ② and ③.

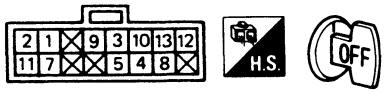


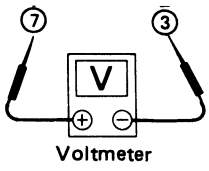


SPEED SENSOR CIRCUIT CHECK

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.**



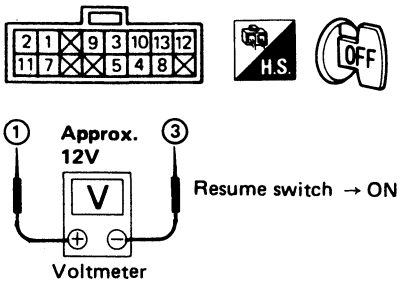


SEL630L

Trouble Diagnoses (Cont'd)

PRESUME SWITCH CIRCUIT CHECK

1. Turn resume switch to "ON".
2. Check voltage between ① and ③.



SEL636L

DIAGNOSTIC PROCEDURE-2

Resume switch will not operate.

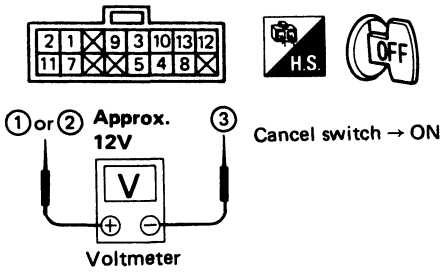
Check resume switch circuit. → N.G. → Check resume switch.

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.



SEL637L

DIAGNOSTIC PROCEDURE-3

Cancel switch will not operate.

Check cancel switch circuit. → N.G. → Check cancel switch.

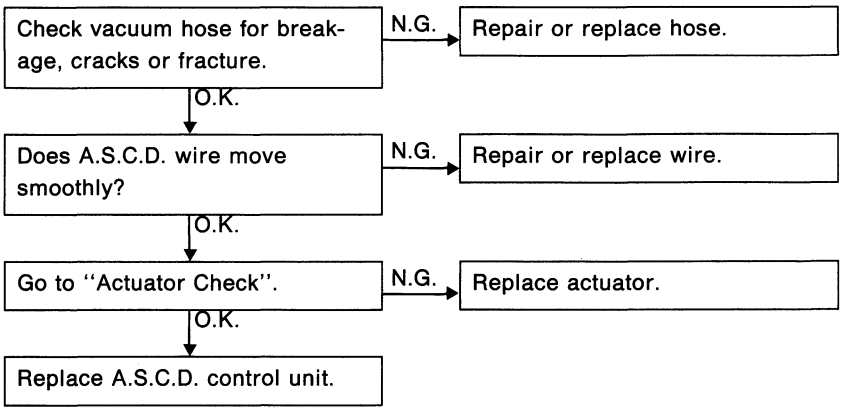
O.K. ↓

Replace A.S.C.D. control unit.

Trouble Diagnoses (Cont'd)

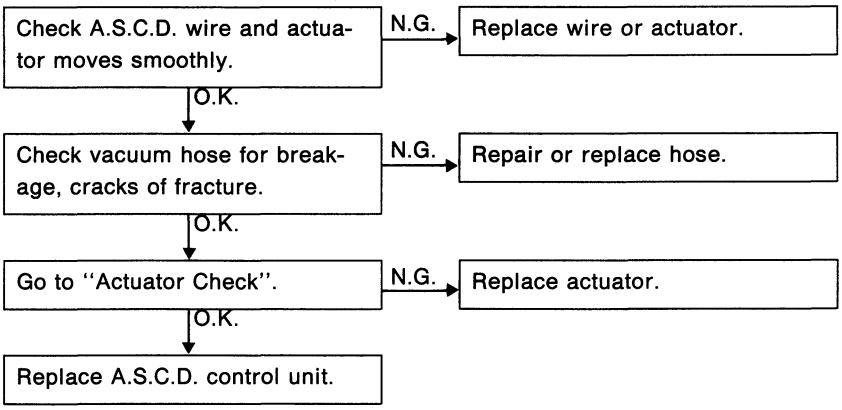
DIAGNOSTIC PROCEDURE-4

Engine hunts.



DIAGNOSTIC PROCEDURE-5

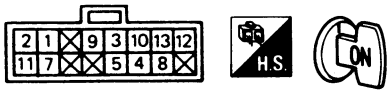
Large difference between set vehicle speed and actual speed.

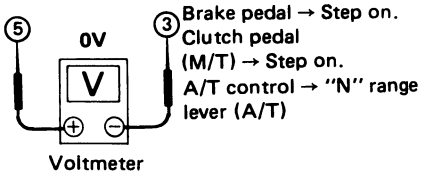


Trouble Diagnoses (Cont'd)

CUT-OFF CIRCUIT CHECK

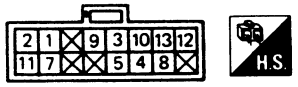
1. Turn A.S.C.D. main switch to "ON".
2. Turn A.S.C.D. main switch to "ON" again.
3. Step on brake pedal.
4. Step on clutch pedal (M/T) or shift in "N" range (A/T).
5. Check voltage between ⑤ and ③.

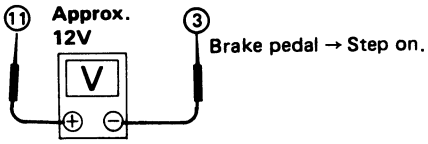




STOP LAMP CIRCUIT CHECK

1. Step on brake pedal.
2. Check voltage between ⑪ and ③.

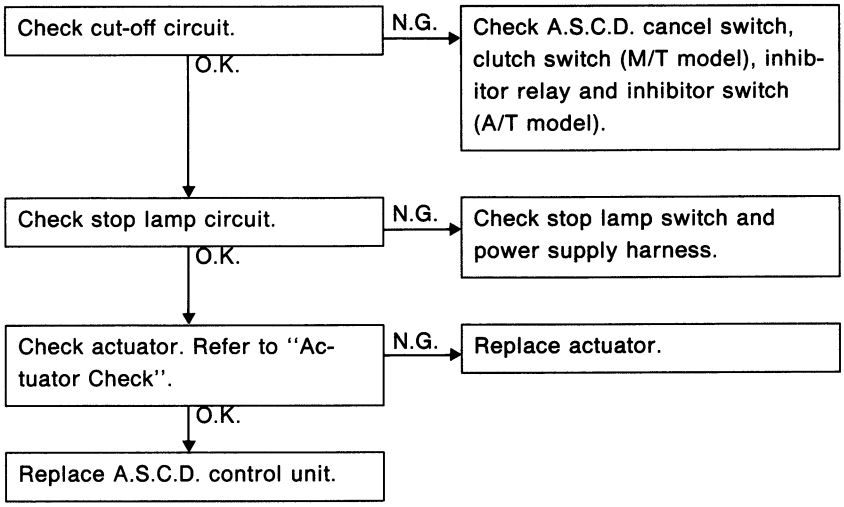




SEL631L

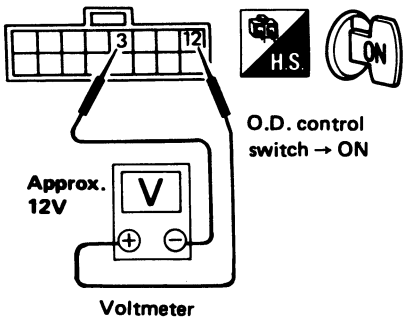
DIAGNOSTIC PROCEDURE-6

Set speed cannot be canceled.



O.D. CANCEL CIRCUIT CHECK FOR A.S.C.D. CONTROL UNIT

1. Turn O.D. control switch to "ON"
2. Measure voltage across ⑫ and ③.

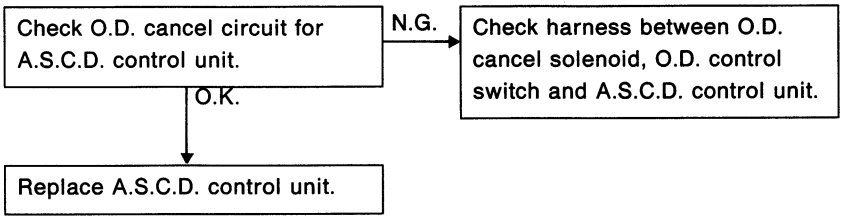


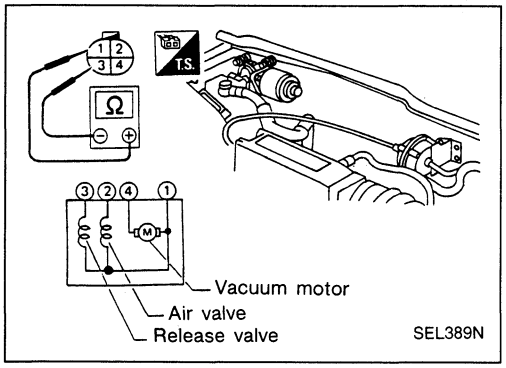
SEL640M

DIAGNOSTIC PROCEDURE-7

A/T model only:

- **When A.S.C.D. is set while vehicle is operating in "O.D." range, O.D. will be canceled and shifting to O.D. cannot be made thereafter.**
- **O.D. will not be canceled even if actual vehicle speed is 6 km/h (4 MPH) lower than set speed. (Set speed cannot be maintained.)**
- **O.D. will not be canceled even if accelerator switch is turned "ON".**





Actuator Check

1. Disconnect connector of actuator from main harness.
2. Check actuator operations as shown.

Check actuator.

O.K.

A

Check to see if motor starts when 12V D.C. is applied across ① and ④.

N.G. → Replace actuator.

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. → Replace 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 actuator.

O.K. (Wire does not return.)

D

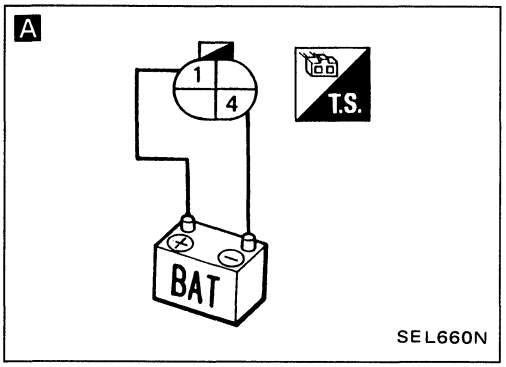
Disconnect lead from ① to see if A.S.C.D. wire returns immediately.

N.G. → Replace actuator.

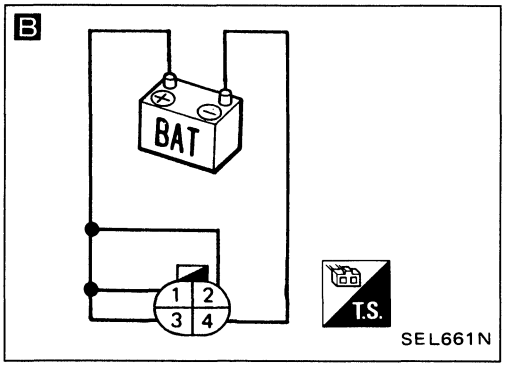
O.K. (Wire returns.)

Actuator is O.K.

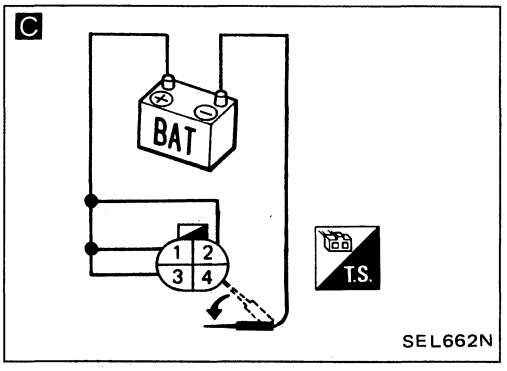
A



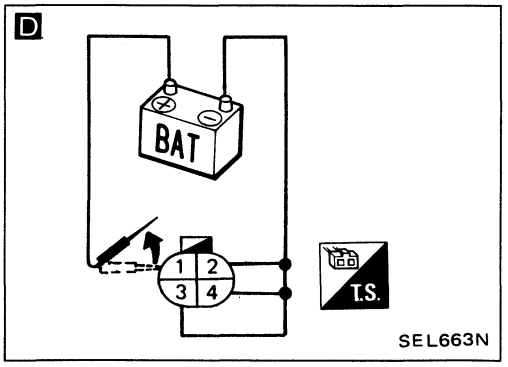
B



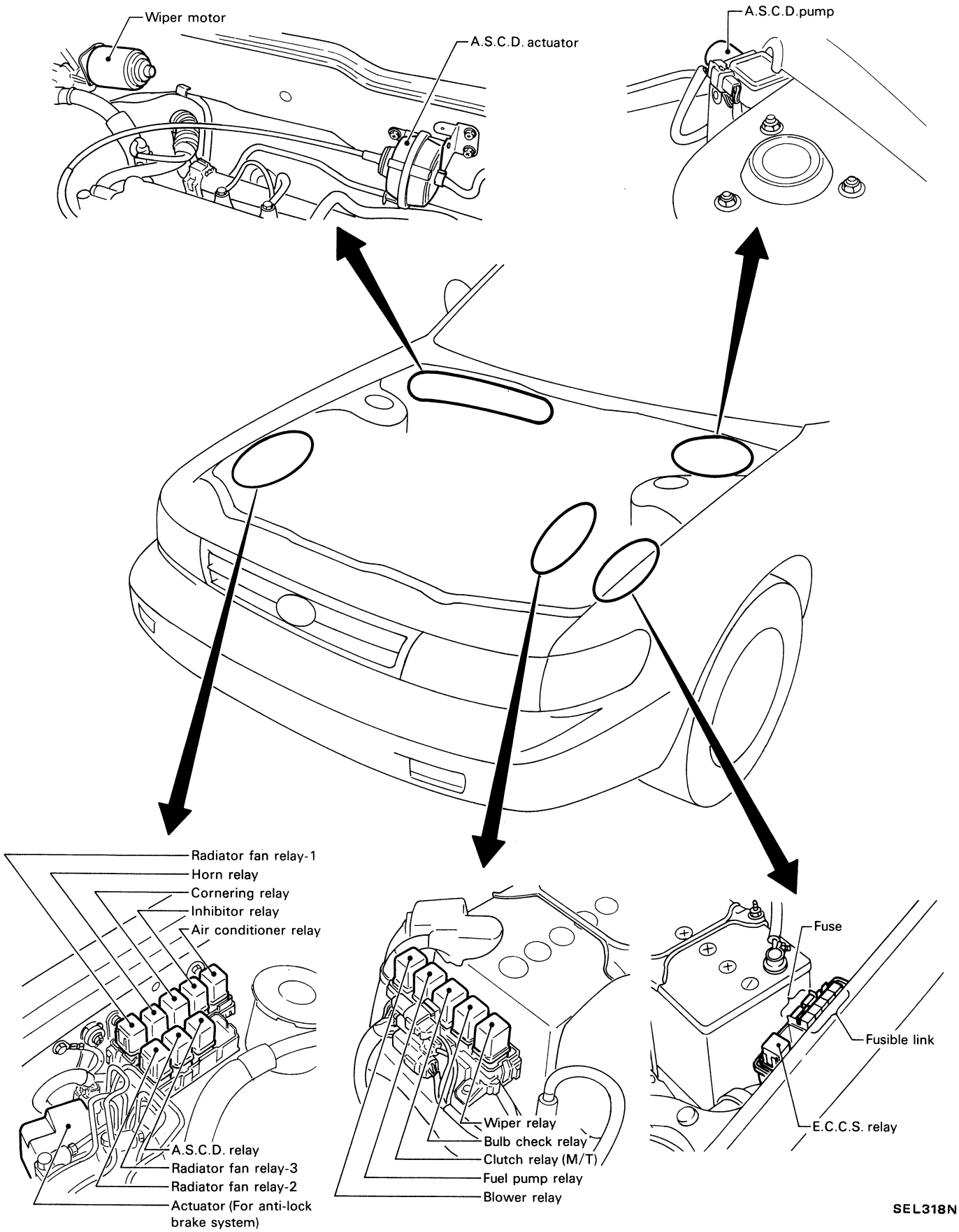
C



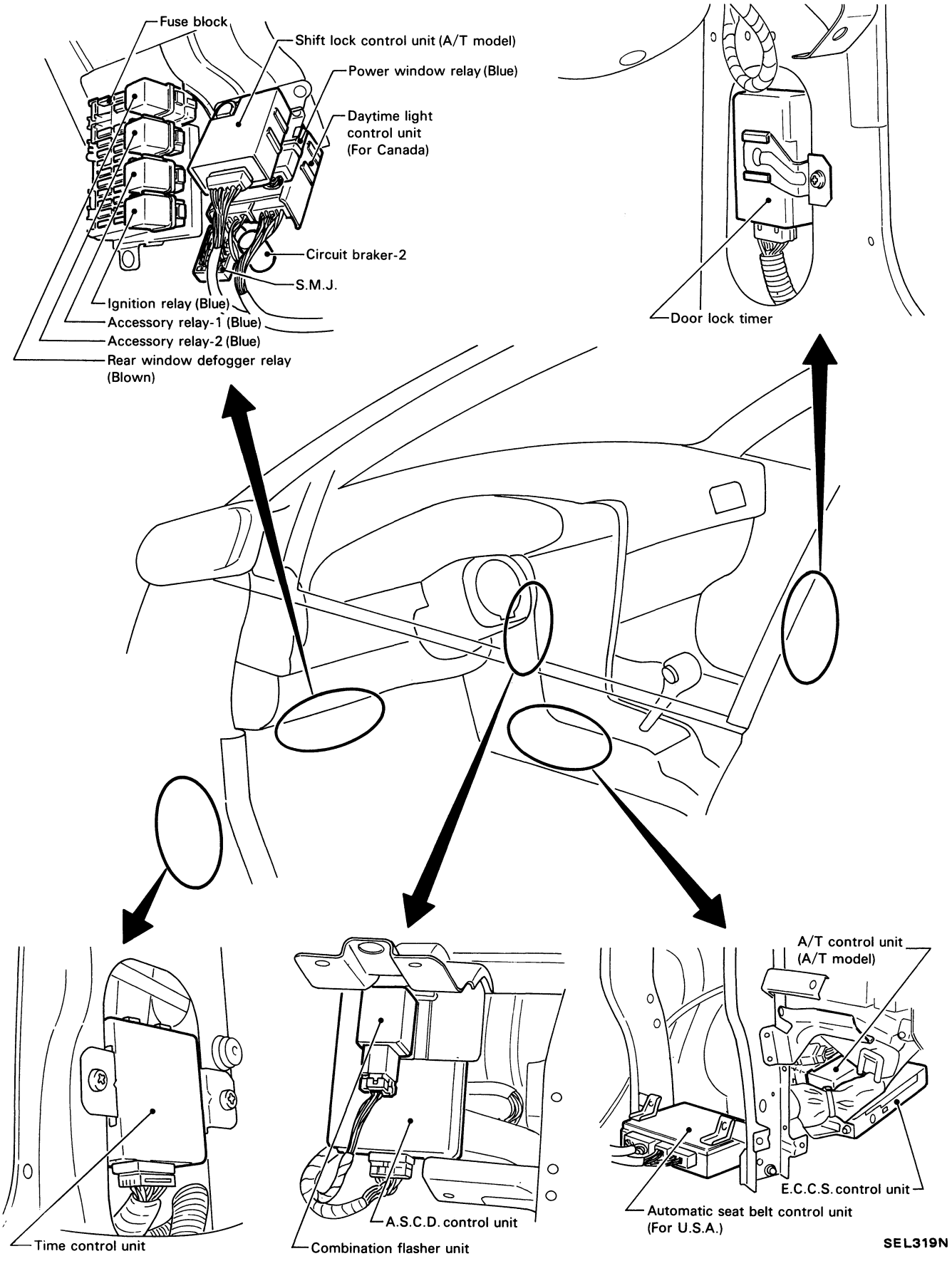
D



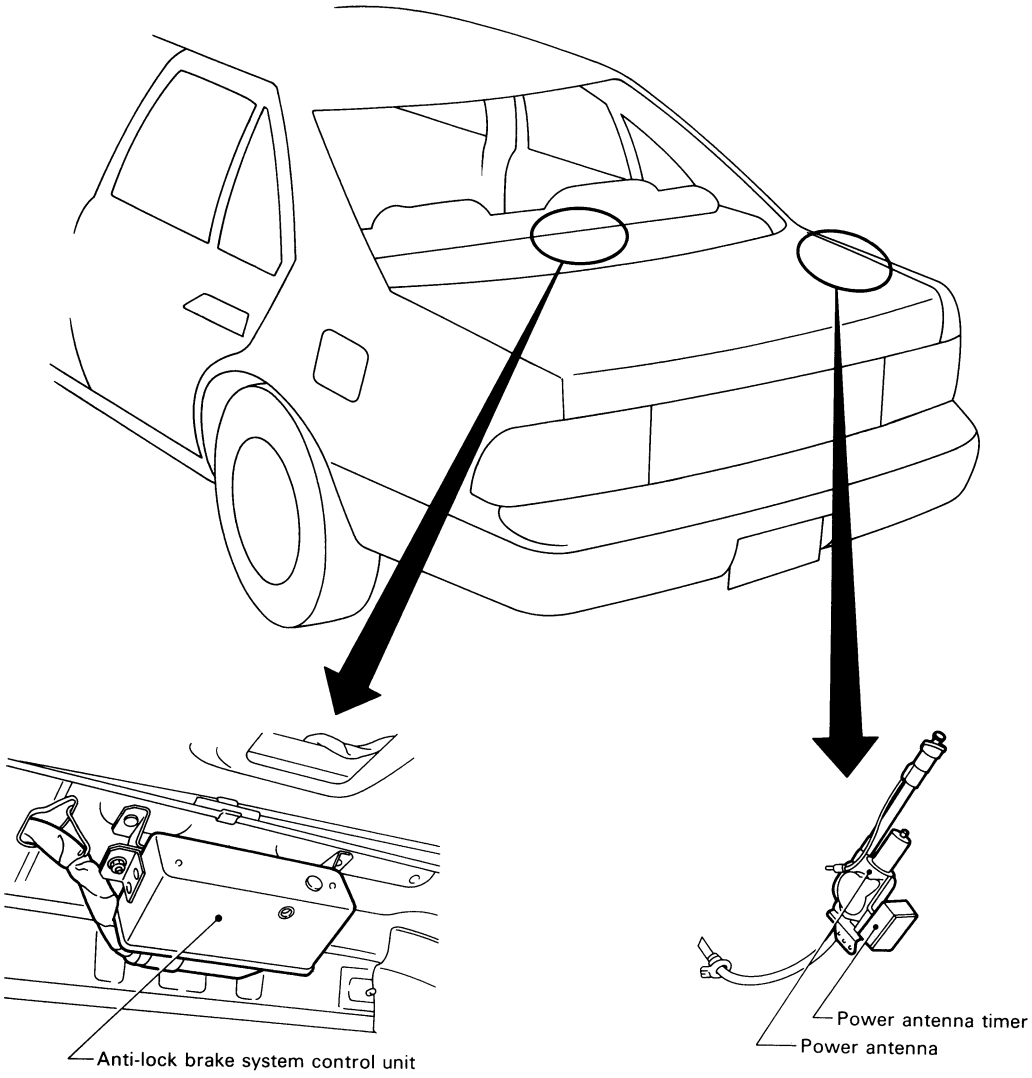
Engine Compartment



Passenger Compartment



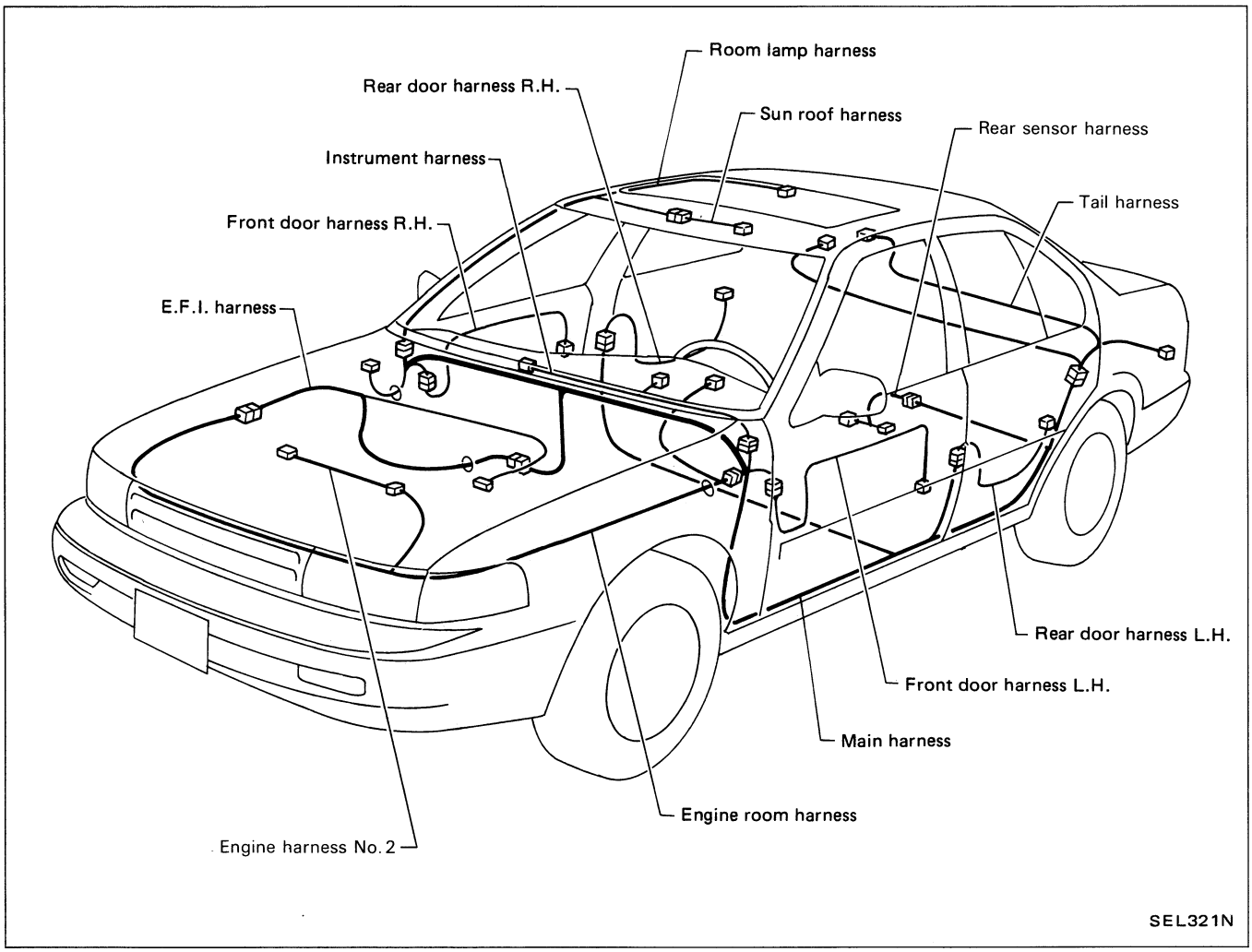
Luggage Compartment



SEL320N

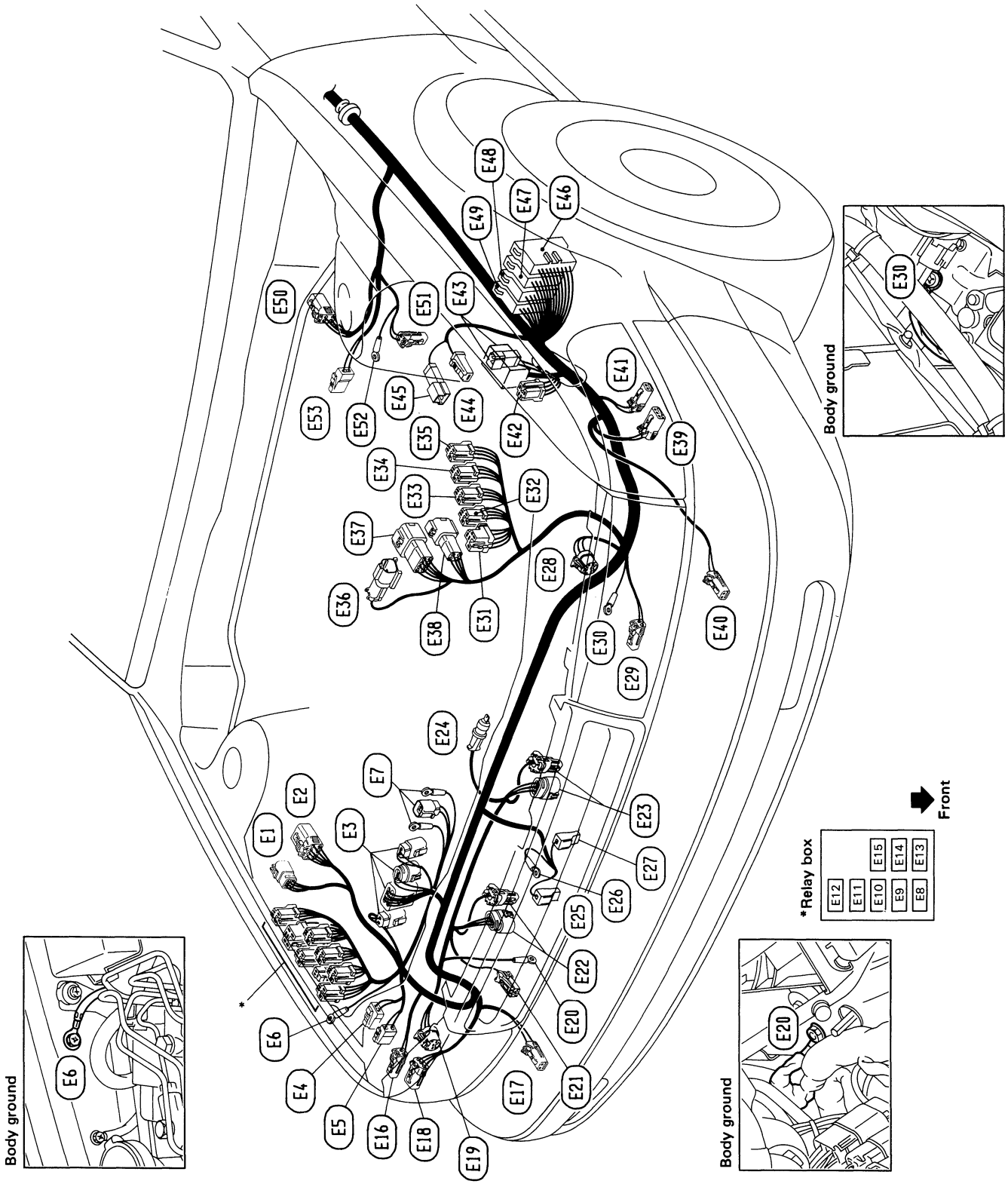
NOTE

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

ENGINE COMPARTMENT



Engine Room Harness (Cont'd)

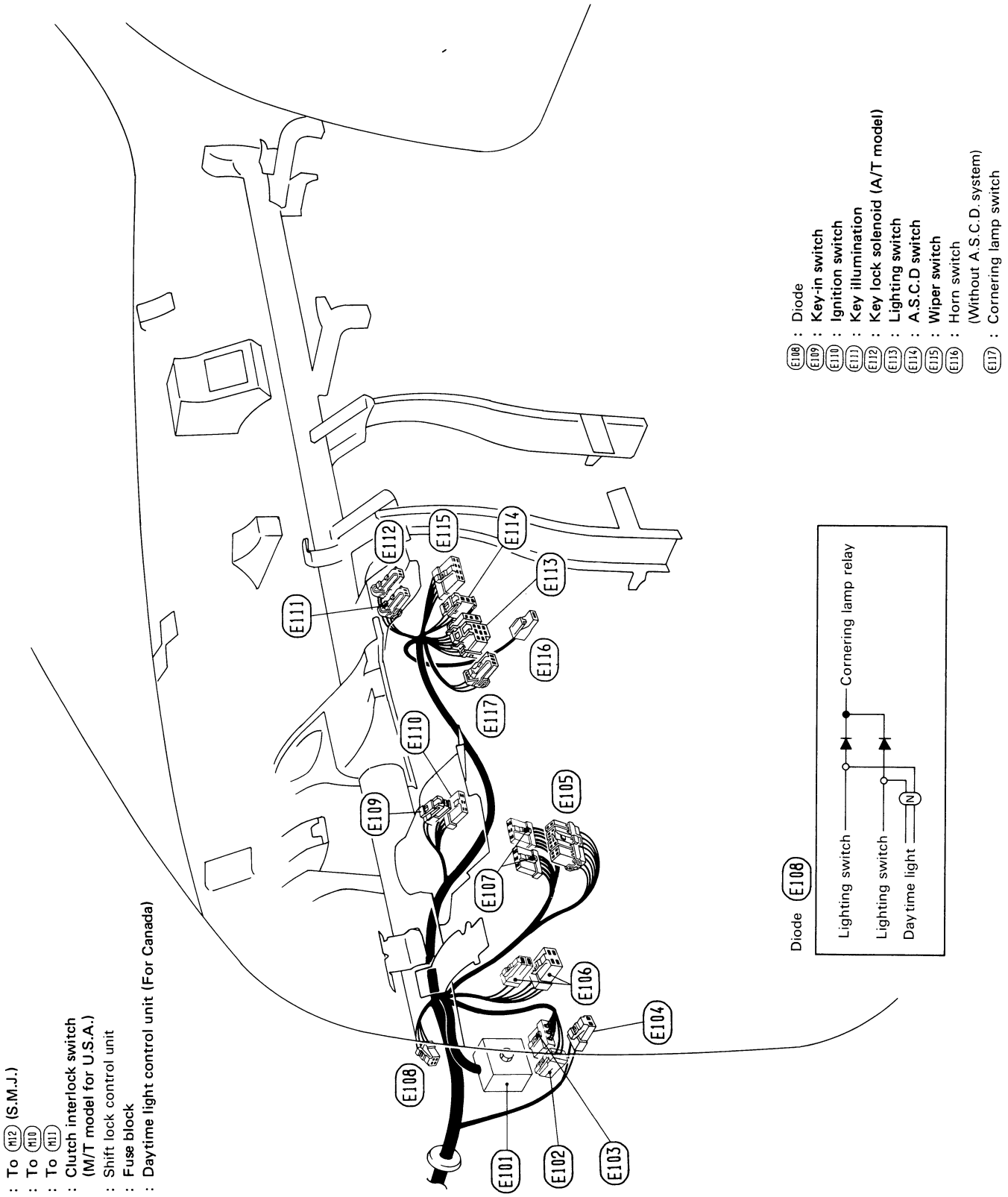
(E1) : To (F1)
(E2) : To (F2)
(E3) : Actuator (For anti-lock brake system)
(E4) : Washer sensor
(E5) : Washer motor
(E6) : Body ground
(E7) : Alternator
(E8) : Radiator fan relay-1
(E9) : Horn relay
(E10) : Cornering lamp relay
(E11) : Inhibitor relay (A/T model)
(E12) : Air conditioner relay
(E13) : 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. actuator
(E51) : Front sensor L.H.
(For anti-lock brake system)
(E52) : Body ground (For anti-lock brake system)
(E53) : Brake fluid level switch

SEL322N

Engine Room Harness (Cont'd)

PASSENGER COMPARTMENT



SEL323N

NOTE

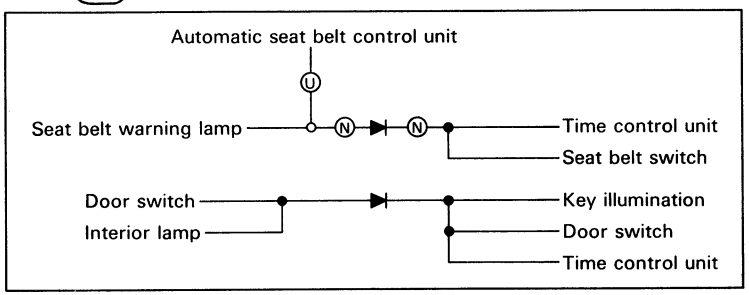
Main Harness

(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 (T1) (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

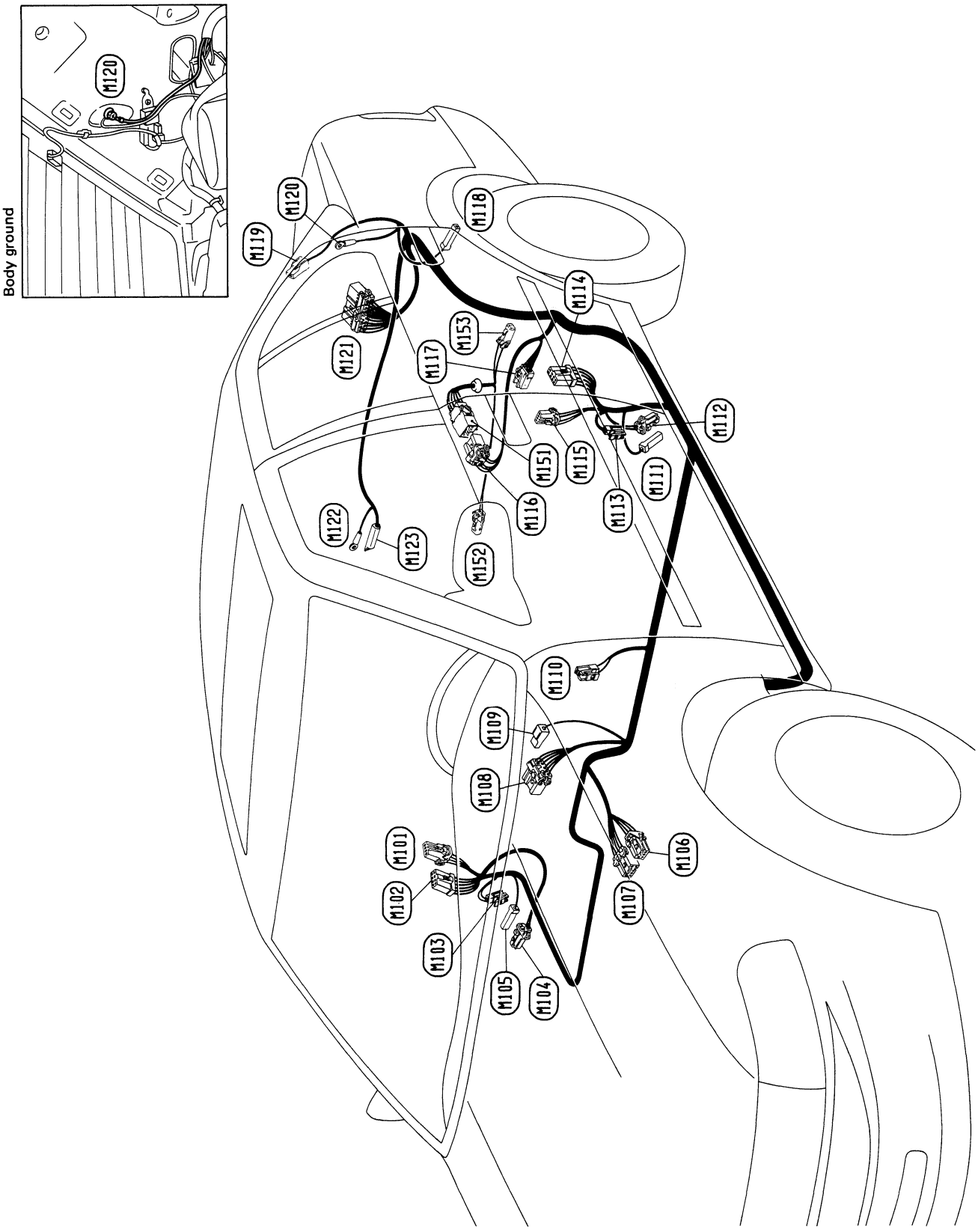
(M51) : Front sensor R.H. (For anti-lock brake system)
(M52) : Body ground (For anti-lock brake system)
(M53) : Power stearing oil pressure switch
(M54) : Wiper motor

Diode (M6)



SEL324N

Main Harness (Cont'd)



Main Harness (Cont'd)

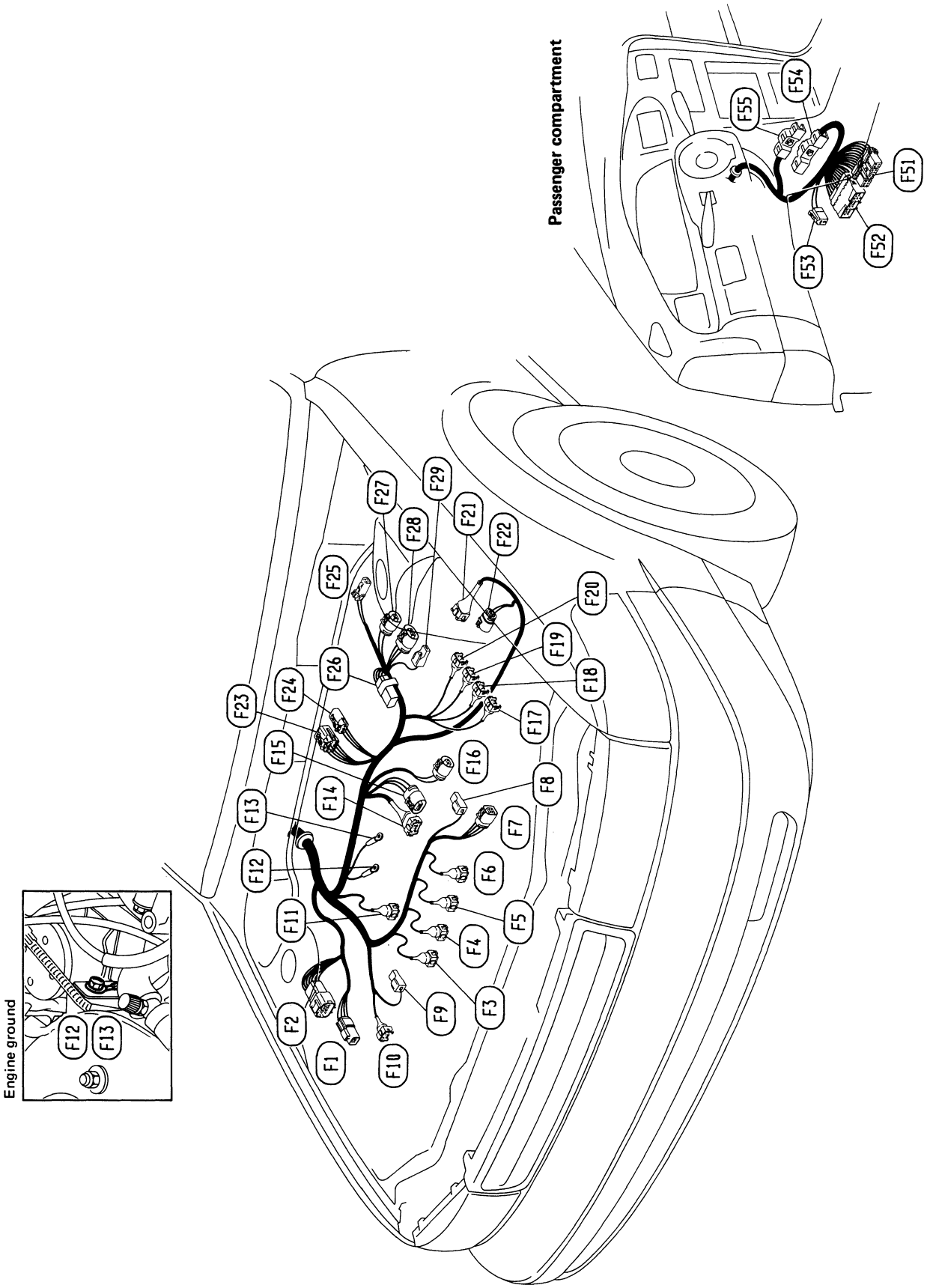
(M101) : Rear limit switch and shoulder belt buckle switch R.H. (For U.S.A.)
(M102) : To (D71)
(M103) : Drive motor R.H. (For U.S.A)
(M104) : Front door switch R.H. (For U.S.A)
(M105) : Front door switch R.H. (For Canada)
(M106) : Overdrive switch and A/T indicator illumination (A/T model)
(M107) : Shift 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 (M15) (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

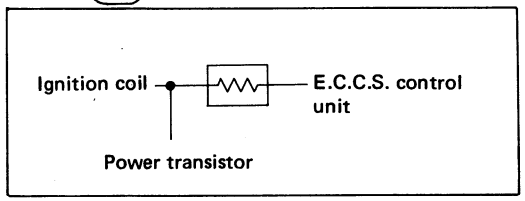
E.F.I. Harness


Passenger compartment
F54
F55
F51
F52
F53
F27
F29
F28
F21
F22
F25
F20
F19
F26
F18
F24
F23
F17
F15
F16
F14
F8
F13
F7
F12
F6
F11
F5
F4
F2
F9
F3
F1
F10
Engine ground
F12
F13

(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

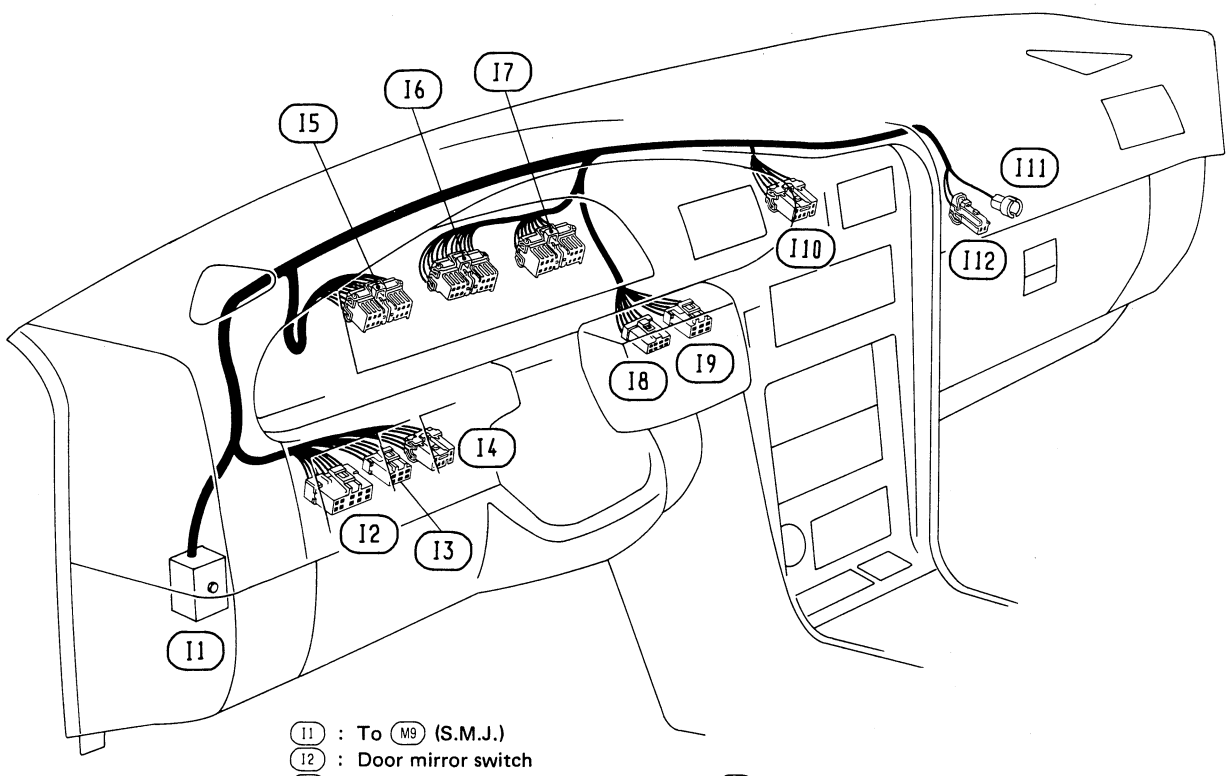
Passenger compartment
(F51) : To (M24)
(F52) : To (M25)
(F53) : To (M23)
(F54) : E.C.C.S. control unit
(F55) : A/T control unit (A/T model)

Resistor (F26)



SEL326N

Instrument Harness

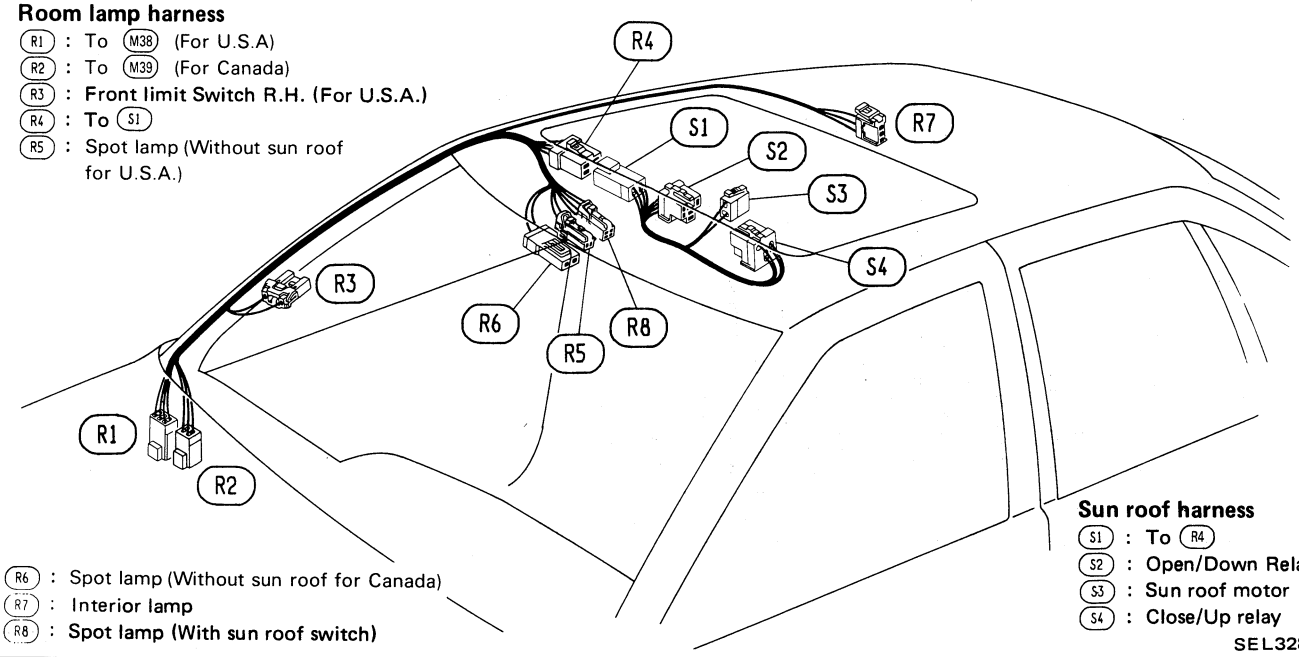


(I1) : To (M9) (S.M.J.)
(I2) : Door mirror switch
(I3) : A.S.C.D. main switch
(I4) : Illumination control switch
(I5) : Combination meter
(I6) : Combination meter
(I7) : Combination meter
(I8) : Rear window defogger switch
(I9) : Hazard switch
(I10) : Clock
(I11) : Glove box lamp
(I12) : Glove box lamp 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.)



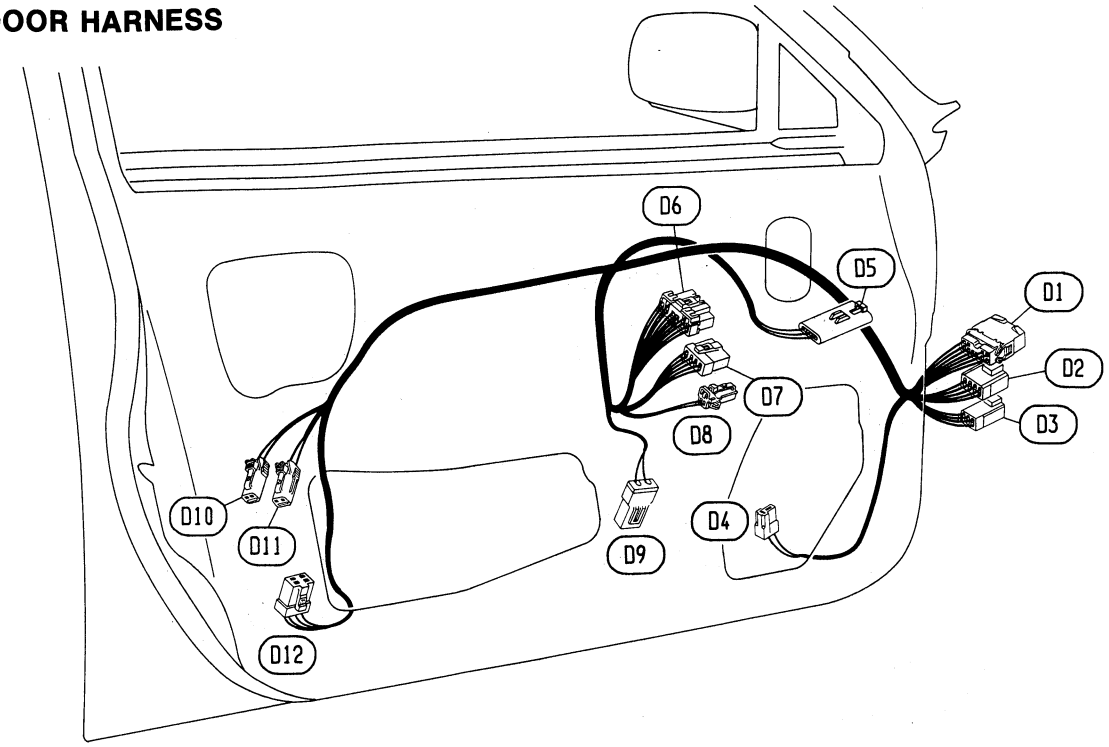
(R6) : Spot lamp (Without sun roof for Canada)
(R7) : Interior lamp
(R8) : Spot lamp (With sun roof switch)

Sun roof harness
(S1) : To (R4)
(S2) : Open/Down Relay
(S3) : Sun roof motor
(S4) : Close/Up relay

SEL328N

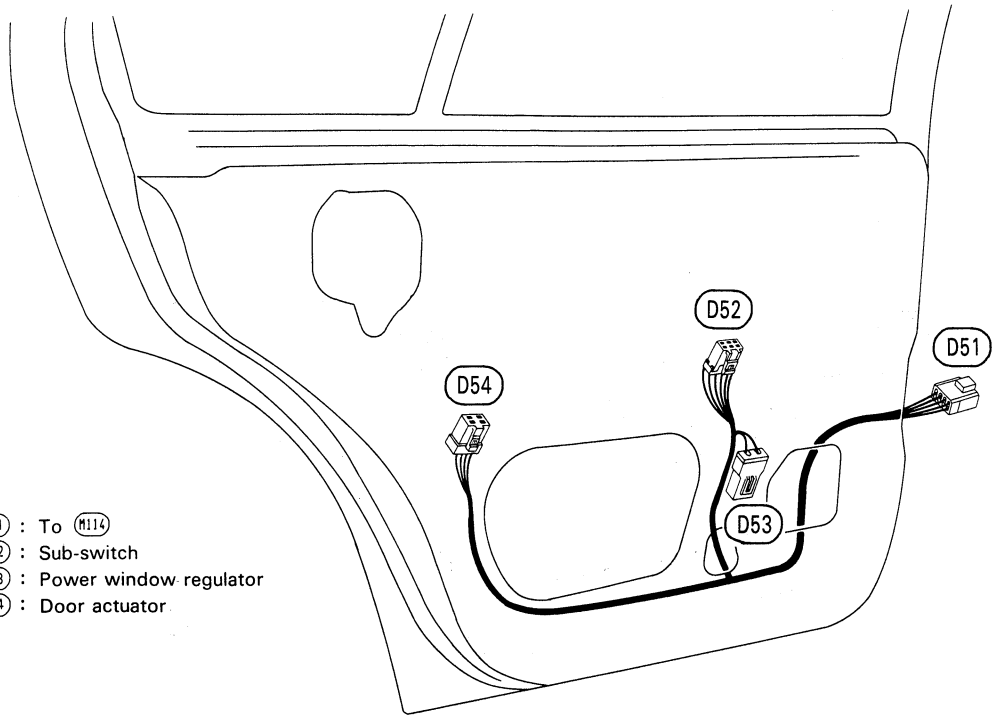
Door Harness (L.H. side)

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

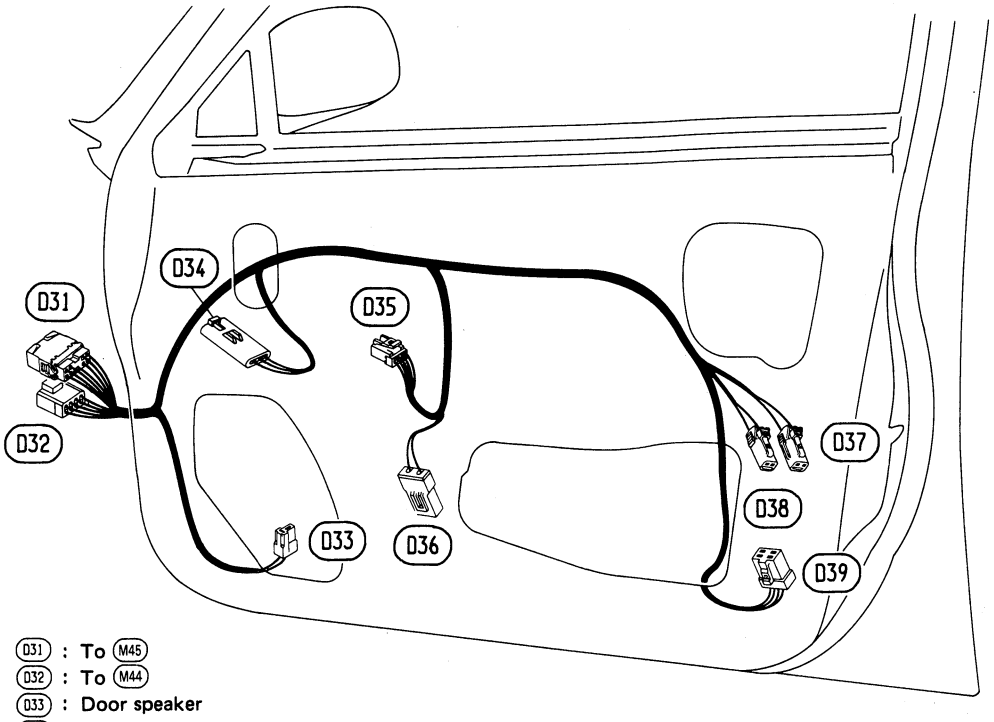


(D51) : To (M114)
(D52) : Sub-switch
(D53) : Power window regulator
(D54) : Door actuator

SEL329N

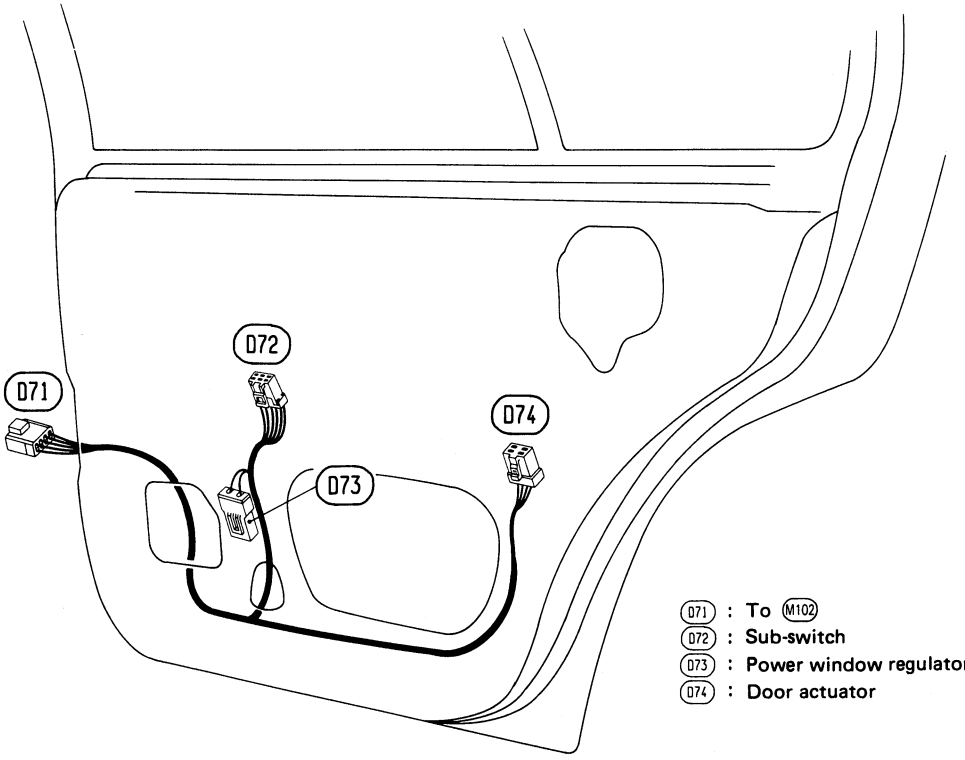
Door Harness (R.H. side)

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.)
D38 : Door lock knob switch
D39 : Door actuator

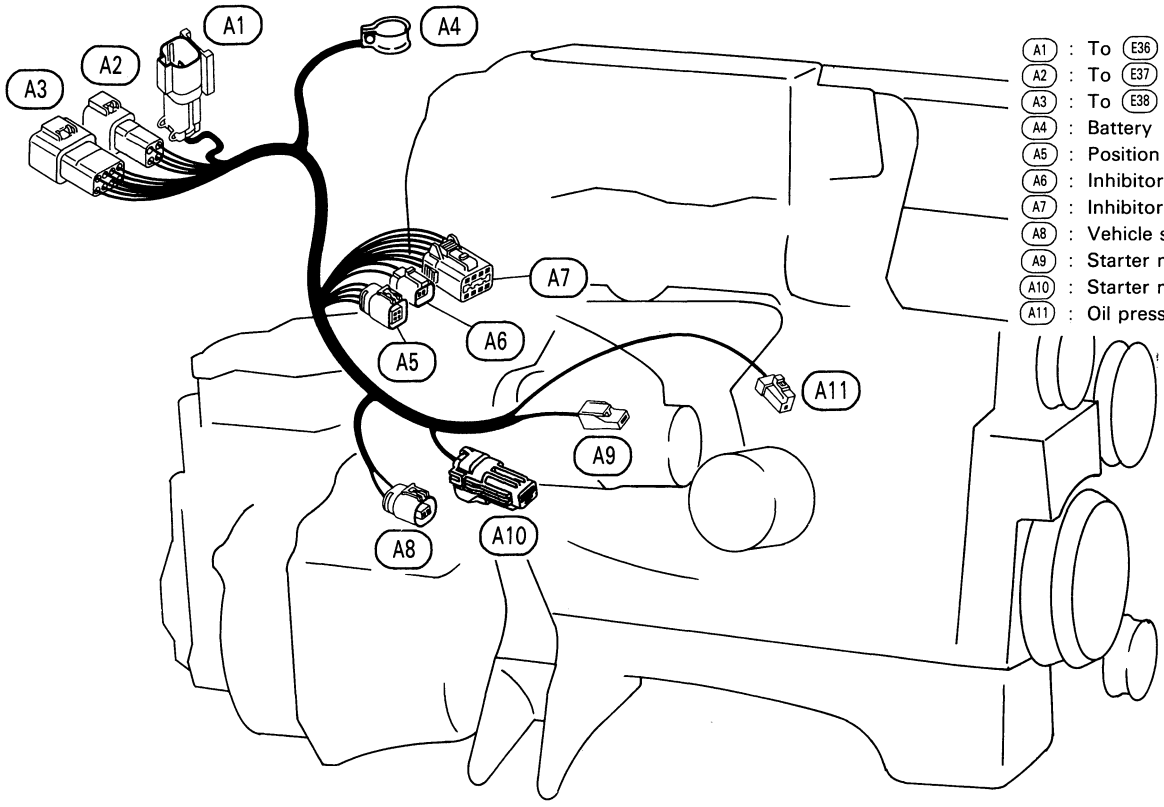
REAR DOOR HARNESS



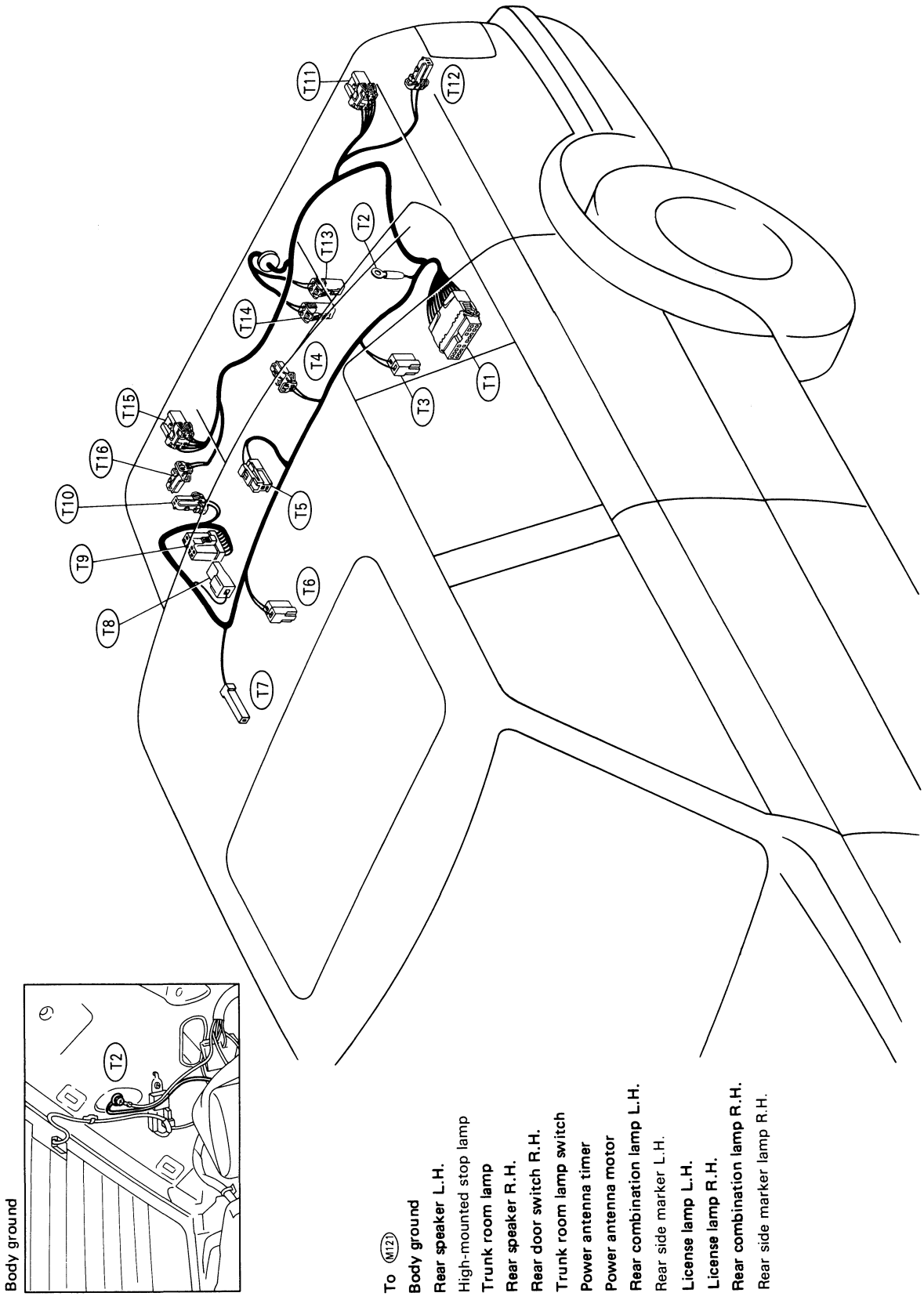
D71 : To M102
D72 : Sub-switch
D73 : Power window regulator
D74 : Door actuator

SEL330N

Engine Harness No. 2

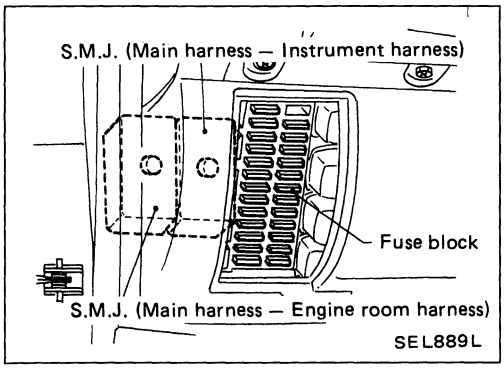


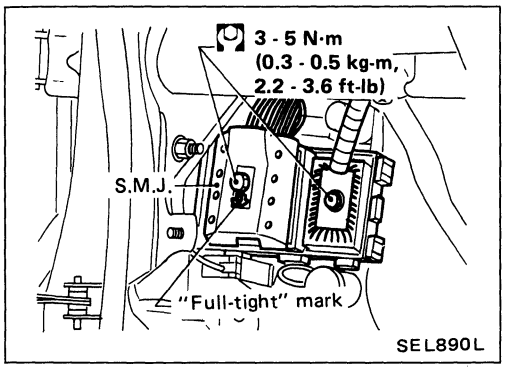
Tail Harness



(T1) : To (M12)
(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





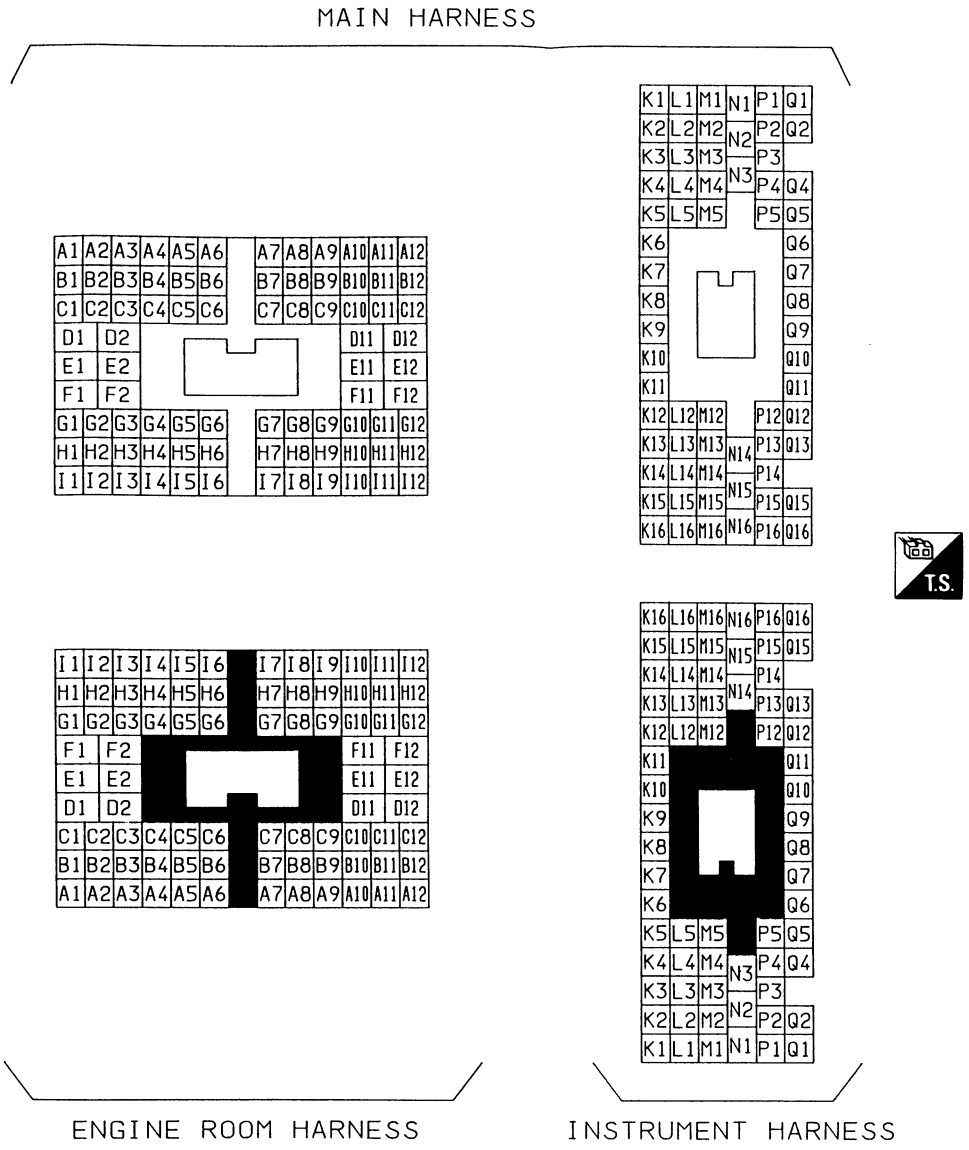
INSTALLATION

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)

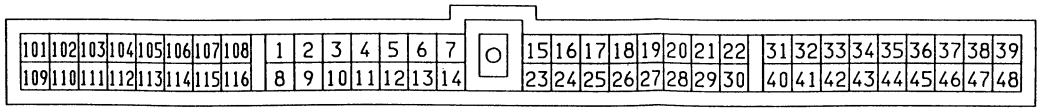
CAUTION:
Do not overtighten bolts, otherwise, they may be damaged.

Terminal Arrangement



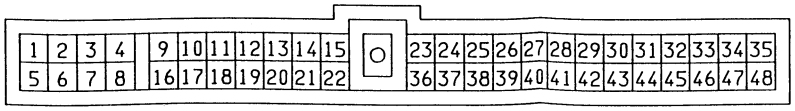
E. C. C. S. CONTROL UNIT

H.S.



View from harness side

A/T CONTROL UNIT

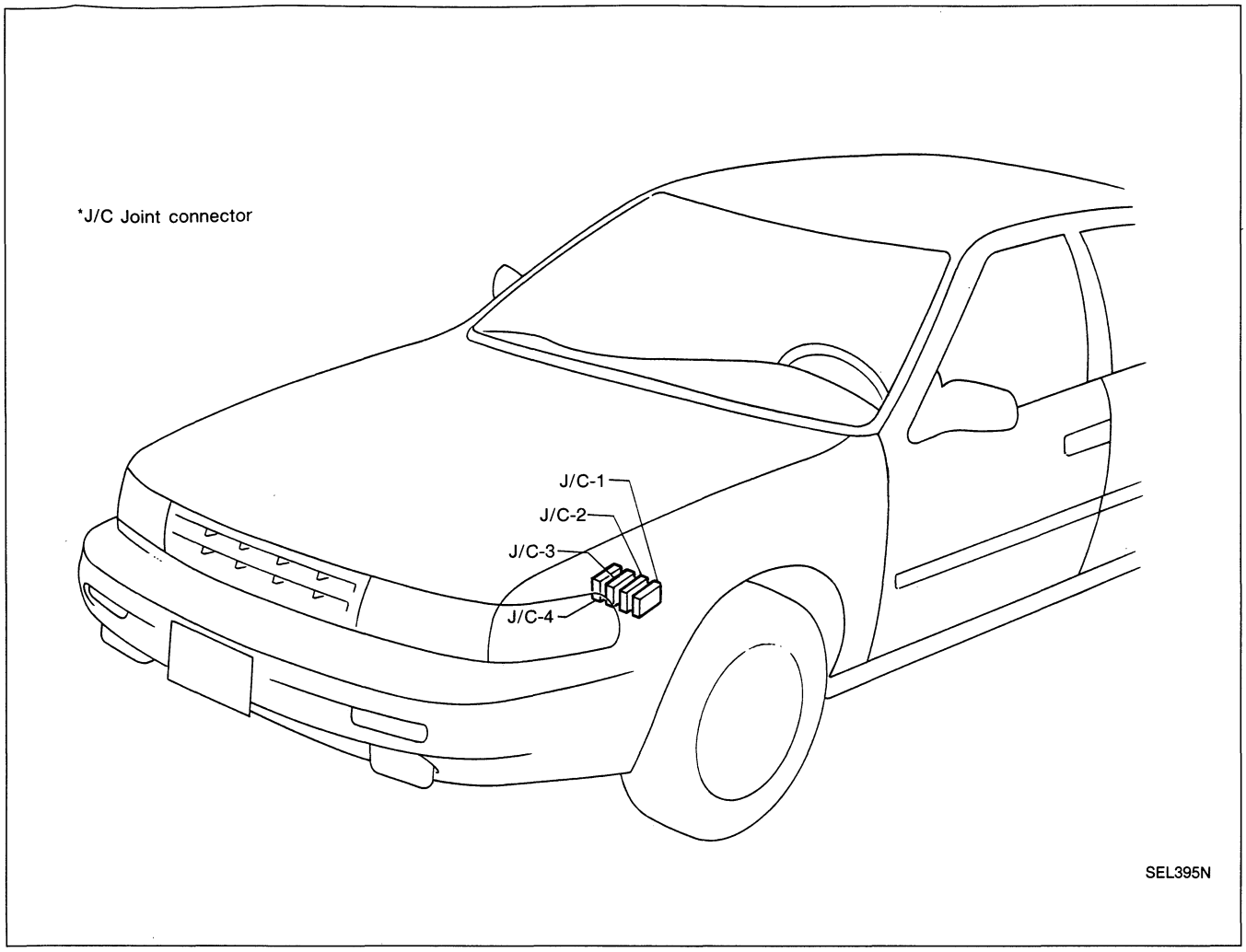


H.S.

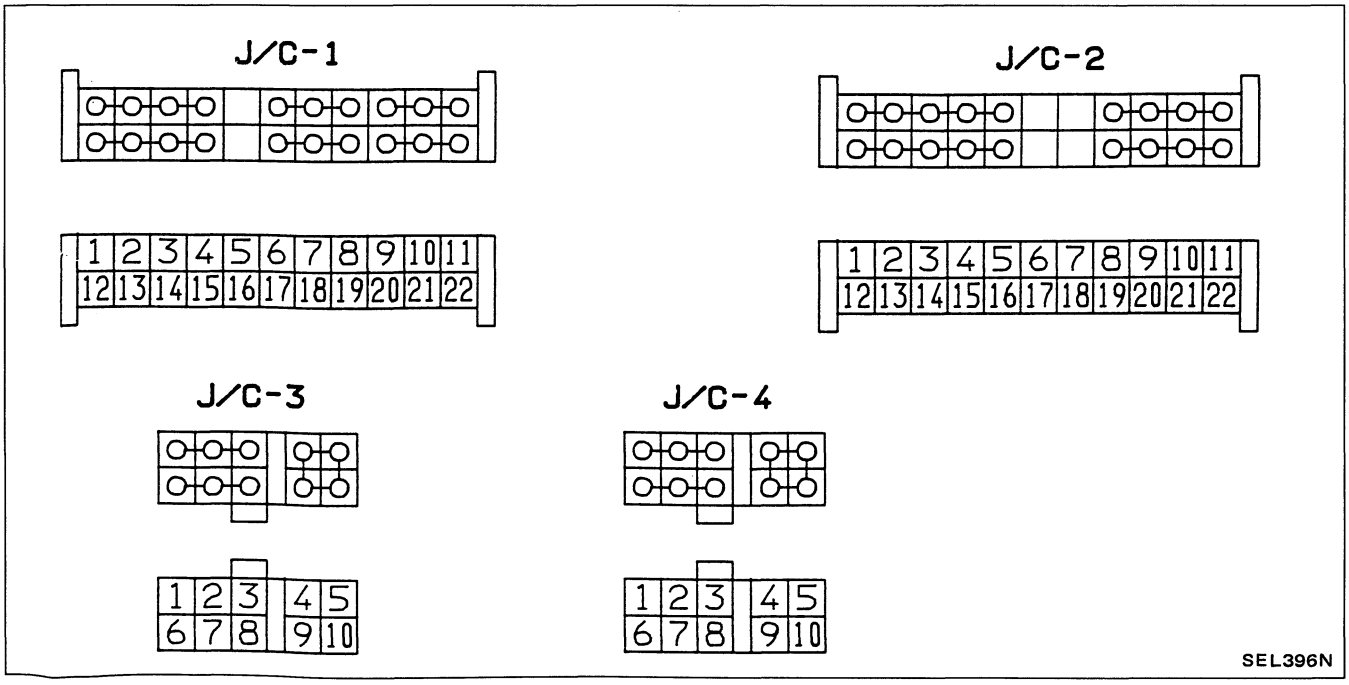
View from harness side

SEL394N

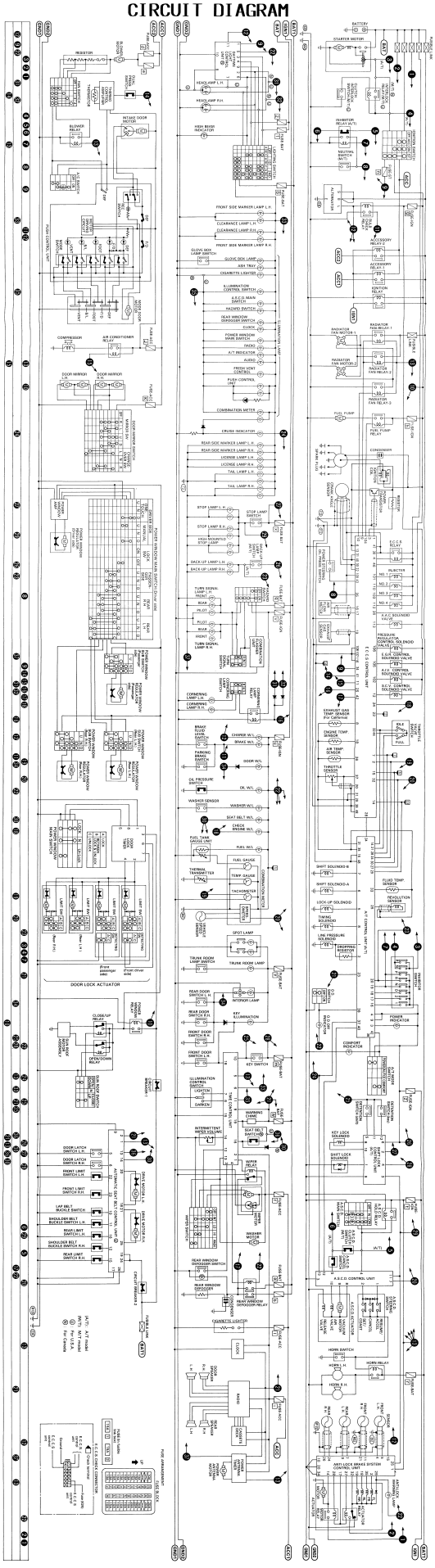
Location



Terminal Arrangement



1990 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 [ ] 1990

ENGINE TUNE-UP DATA

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.		
Valve clearance (Hot) mm (in)		Non-adjustable		
High tension cable resistance kΩ/m (kΩ/ft)		Less than 30 (9.14)		
Spark plug				
Type	Standard	ZFR5E-11		
	Hot	ZFR4E-11		
	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		
	mm (in)	1 - 3 (0.04 - 0.12)
Total toe-in	degree	6′ - 18′
Turning angle		
Inside		34° - 38°
Outside		27° - 31°

* Tankful of fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools, mats in designated positions.

REAR WHEEL ALIGNMENT (Unladen*)

Camber	degree	−1°20′ to 0°10′
Toe-out	mm (in)	0 - 4 (0 - 0.16)
Total toe-out	degree	0′ - 23′

* Tankful of fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools, mats in designated positions.

BRAKE

Unit: mm (in)

Disc brake	
Pad minimum thickness	2.0 (0.079)
Rotor repair limit	
Runout	0.07 (0.0028) or less
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	7.4	7-7/8 qt
Power steering system		0.9	1 qt
Air conditioning system	Compressor oil	0.2	6.8 fl oz
	Refrigerant	0.8 - 0.9 kg	1.8 - 2.0 lb

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