DATSUN

710

Service Manual

1975



NISSAN MOTOR CO.,LTD. Tokyo Japan

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DATSUN 710

SERVICE MANUAL

MODEL 710 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

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FOREWORD

This service manual has been prepared for the purpose of assisting service personnel of authorized NISSAN/DATSUN dealers in providing effective service and maintenance of the 1975 Datsun 710.

Since proper maintenance and service are absolutely essential in satisfying the Datsun owners, this manual should be kept in a handy place for ready reference and should be carefully studied.

This manual includes procedures for maintenance adjustments, minor service operations, removal and installation, and for disassembly and assembly of components.

Some of these service operations require the use of Special Tools especially designed for effective performance of service operations.
The special tools are presented in the "SE" section.

As you read through the maintenance procedures in this service manual, you will occasionally come across paragraphs headed NOTE or CAUTION. A NOTE is supplemental information that is important to a particular procedure. CAUTION warns of steps that must be followed to prevent personal injury and/or damage to some part of your DATSUN.

The Quick Reference Index on the first page enables the user to quickly locate the desired section. At the beginning of each individual section is a table of contents, which gives the page number on which each major subject begins. An index is placed at the beginning of each major subject within the section.

All information, illustrations and specifications contained in this manual are based on the latest product information available at the time of publication approval. If your DATSUN model differs from the specifications contained in this manual, consult your NISSAN/ DATSUN dealer for information.

Rights for alternation at any time of specifications and methods are reserved.

Liability for any personal injury or property damage occasioned by the use of this service manual in effecting maintenance or repair of your Datsun is in no way assumed by Nissan Motor Co., Ltd.
Accordingly, anyone using a service procedure or tool which 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.
TOKYO, JAPAN

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SERVICE MANUAL

DATSUN 710
MODEL 710 SERIES

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NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION GI

GI

GENERAL INFORMATION

GENERAL INFORMATION ..... GI- 3

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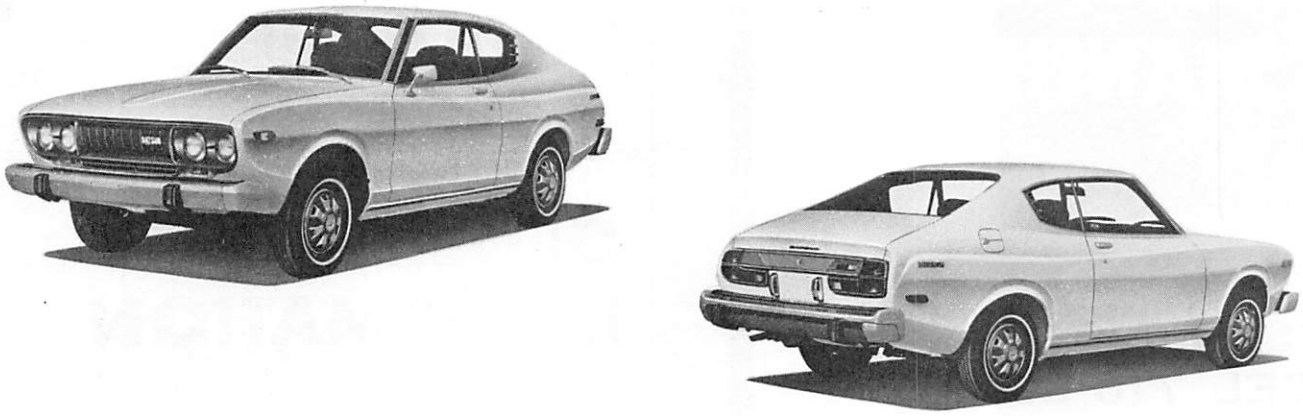


Fig. GI-1 Hardtop

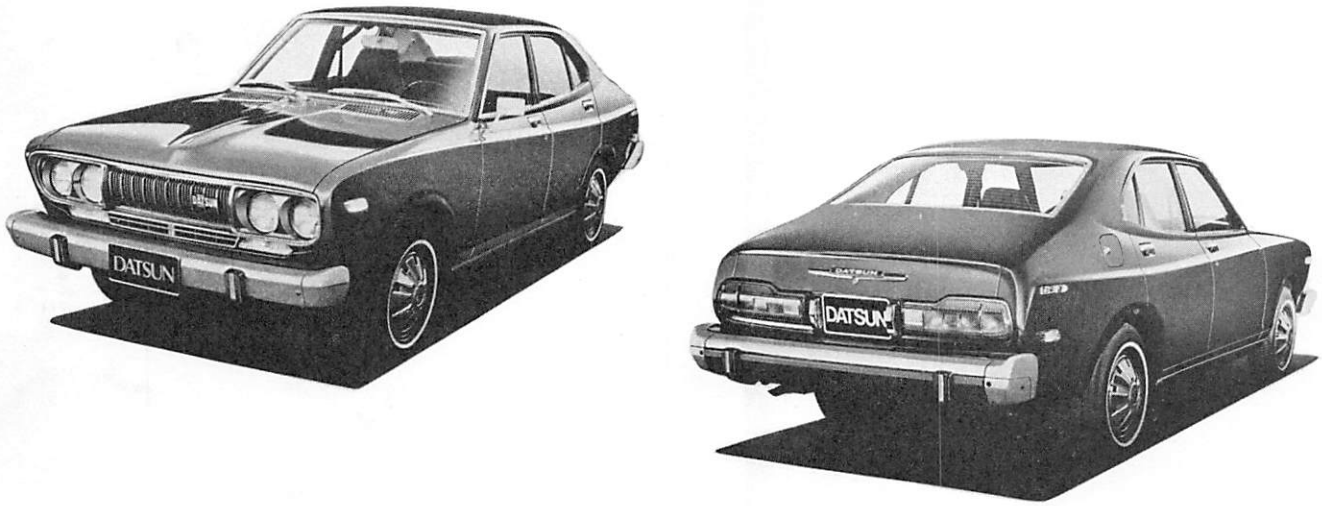


Fig. GI-2 4-door Sedan

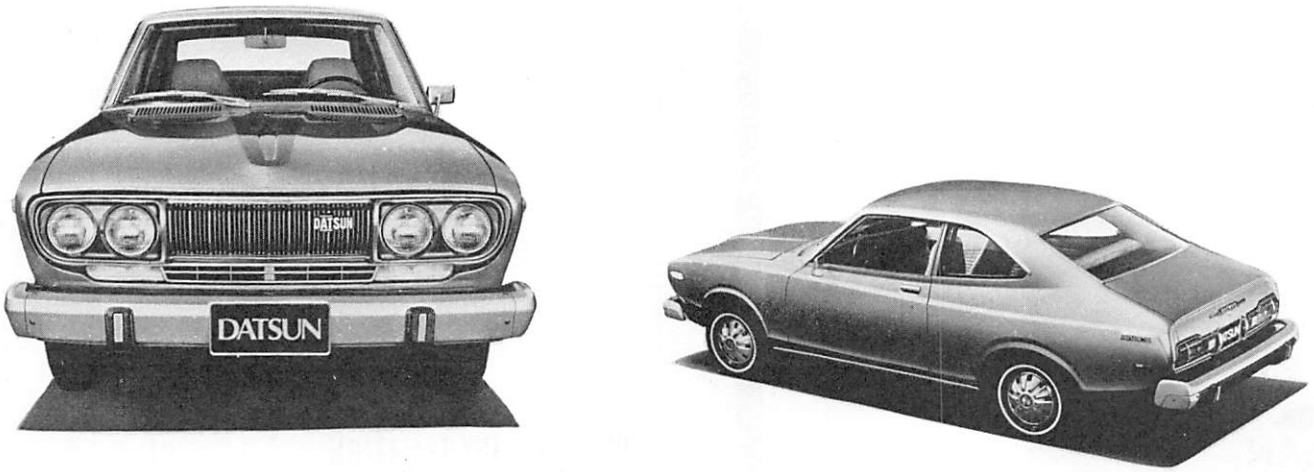


Fig. GI-3 2-door Sedan

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Fig. GI-4 4-door Station Wagon

GENERAL INFORMATION

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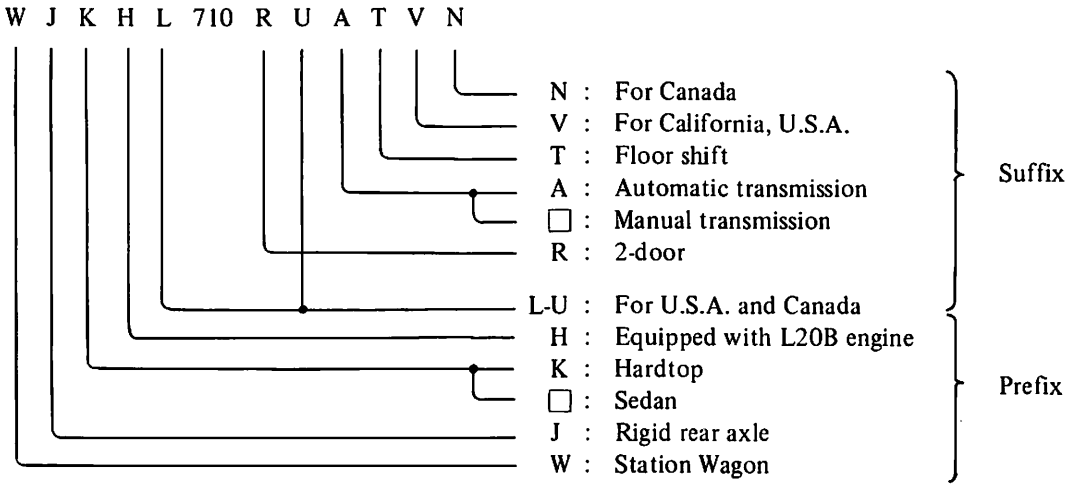
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MODEL VARIATION

Destination		Class		Model	Engine	Transmission model	Transmission control	Differential gear carrier	
								Model	Gear ratio
U.S.A.	Except California	Hardtop		JKHL710UT	L20B	F4W63L	Floor	H165B	3.700
				JKHL710UAT		3N71B			
		Sedan	4-door	JHL710UT		F4W63L			
				JHL710UAT		3N71B			
			2-door	JHL710RUT		F4W63L			
				JHL710RUAT		3N71B			
		Station Wagon		WJHL710UT		F4W63L			
				WJHL710UAT		3N71B			
	California	Hardtop		JKHL710UTV		F4W63L			
				JKHL710UATV		3N71B			
		Sedan	4-door	JHL710UTV		F4W63L			
				JHL710UATV		3N71B			
			2-door	JHL710RUTV		F4W63L			
				JHL710RUATV		3N71B			
		Station Wagon		WJHL710UTV		F4W63L			
				WJHL710UATV		3N71B			
Canada		Hardtop		JKHL710UTN		F4W63L			
				JKHL710UATN		3N71B			
		Sedan	4-door	JHL710UTN		F4W63L			
				JHL710UATN		3N71B			
			2-door	JHL710RUTN		F4W63L			
				JHL710RUATN		3N71B			
		Station Wagon		WJHL710UTN		F4W63L			
				WJHL710UATN		3N71B			

The meaning of prefix and suffix



Note: □ means no indication.

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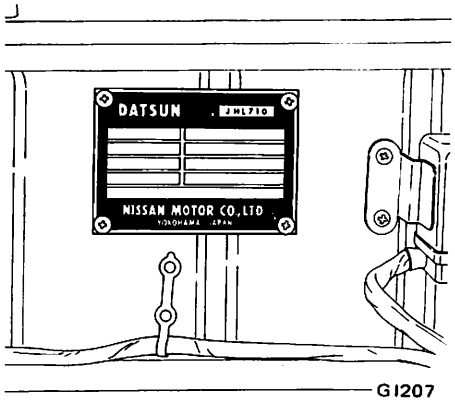
IDENTIFICATION NUMBERS

The unit and car numbers are stamped and registered at the factory.

The engine and vehicle identification numbers are used on legal documents. These numbers are used for factory communications such as Technical Reports, Warranty Claims, Service Journals and other information.

Car identification plate

The car identification plate is located on the center of the cowl top in the engine compartment. The plate contains the car type, engine capacity, max. horsepower, wheelbase and engine and car serial numbers.



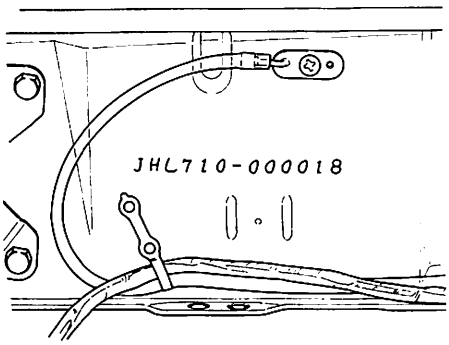
G1207

Fig. GI-5 Car identification plate location

Car serial number

The car serial number is stamped on the right side of the cowl top in the engine compartment and is broken down as shown in the following figure.

JHL710-XXXXXX



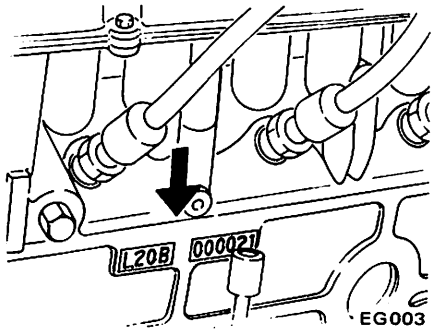
G1208

Fig. GI-6 Car serial number location

Engine serial number

The engine serial number is stamped on the right-hand side of the cylinder block. The number is broken down as shown in Figure GI-7.

Engine model	Engine number
L20B	L20B-XXXXXX

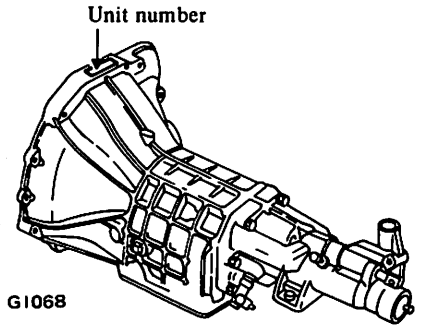


EG003

Fig. GI-7 Engine serial number location

The manual transmission number is stamped on the front upper face of the clutch housing.

The number consists of the date of manufacture of the transmission and serial number.

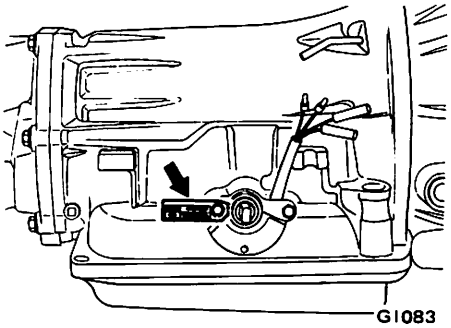


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Fig. GI-8 Manual transmission number location

Automatic transmission number

The plate is attached to the right side of the transmission case as shown in Figure GI-9.

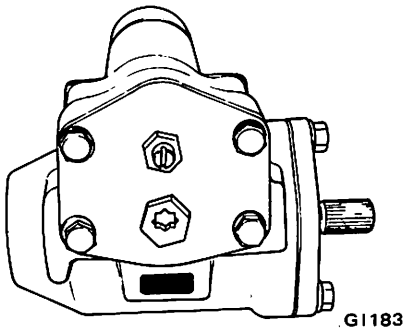


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Fig. GI-9 Automatic transmission number location

Steering gear number

The steering gear number is stamped on the top of the gear box. See Figure GI-10.



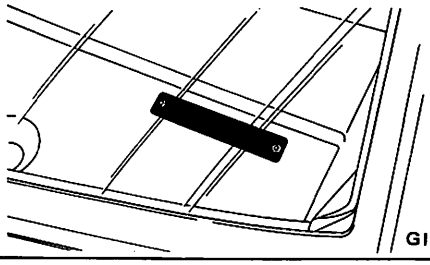
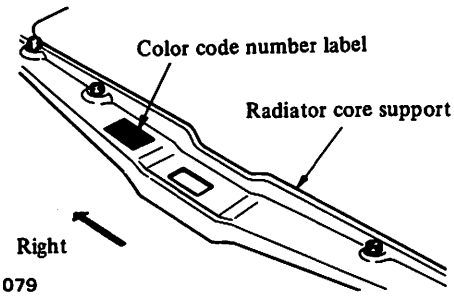
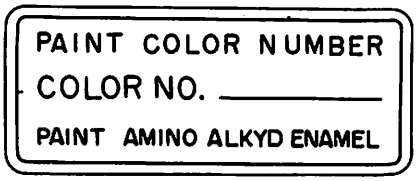
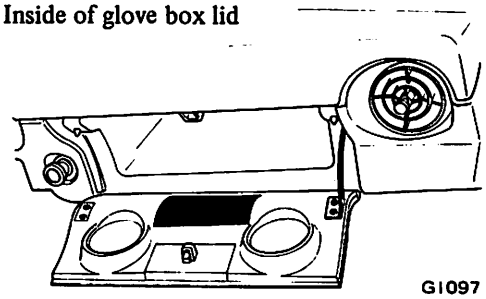
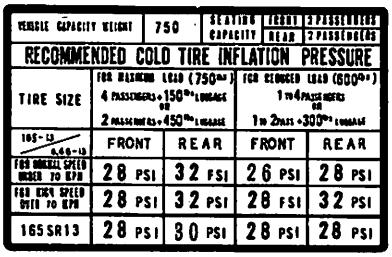
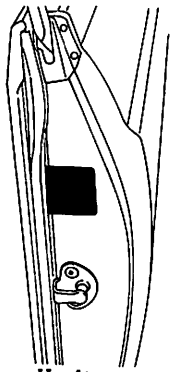
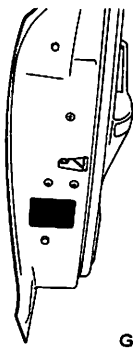
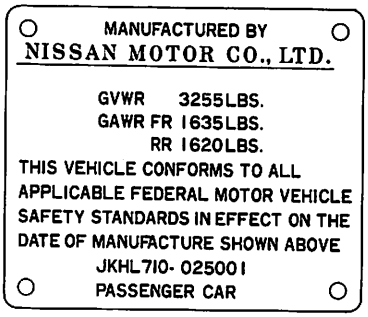
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Fig. GI-10 Steering gear number location

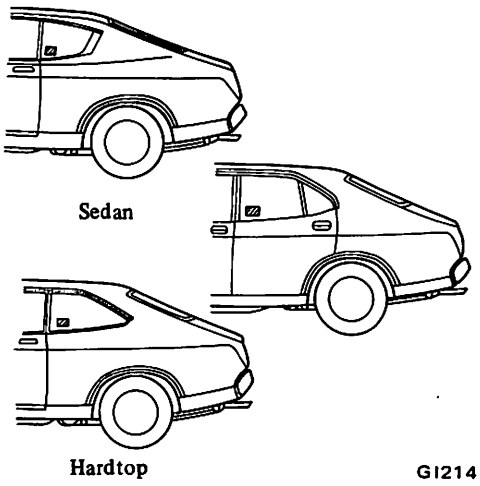
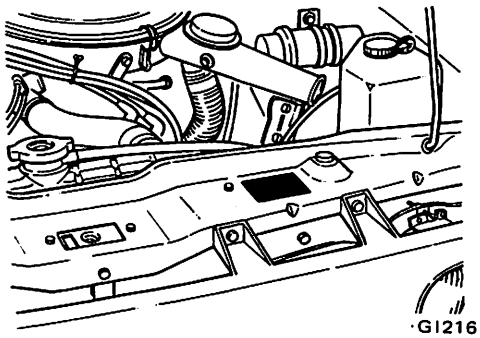
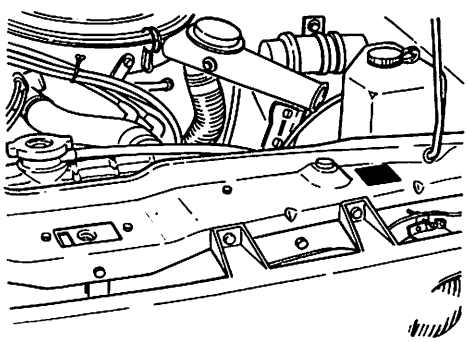
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LABELS

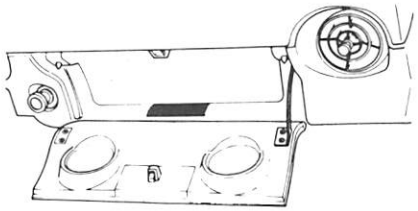
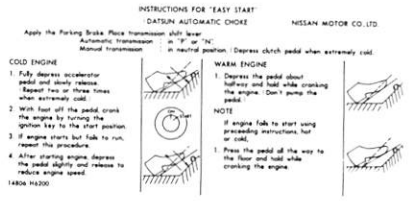
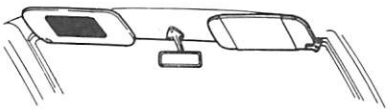
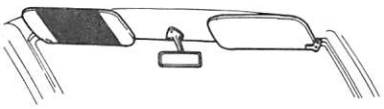
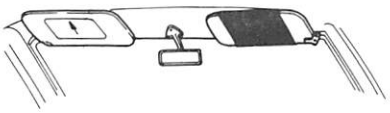
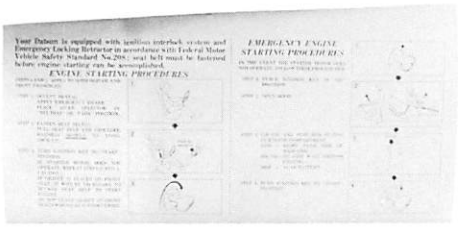
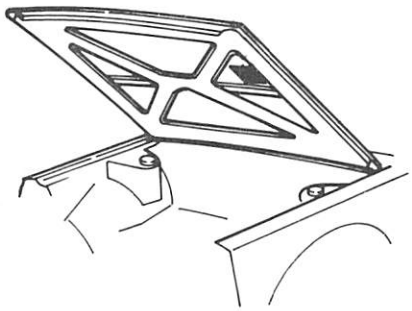
Many labels are attached to the car as shown in the following table.

Label name	Location	Sample
Car identification plate	Center of cowl top	See Figure GI-5.
Identification number plate	Left, upper side of instrument panel  GI209	 GI210
Color code number label	Right, upper side of radiator core support  GI079	 GI096
Tire inflation pressure label	Inside of glove box lid  GI097	 GI098
M.V.S.S. certificate label	 Hardtop  GI212 Sedan and Station Wagon	 GI213

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Label name	Location	Sample
Exhaust emission label (California only)	Right side of rear windshield glass  G1214	VEHICLE EXHAUST EMISSION Engine : Model L20–B, 119.1 This vehicle has been tested under and conforms to California Assembly-Line Test Requirements. HC CO NOx 1975 California Standards(gms/mi) 0.9 9.0 2.0 This Model (gms/mi) NISSAN MOTOR CO., LTD. U6800
Emission control system label	Left, upper side of radiator core support  G1216	Non-California VEHICLE EMISSION CONTROL INFORMATION THIS VEHICLE CONFORMS TO U.S. ENVIRONMENTAL PROTECTION AGENCY AND CALIFORNIA REGULATIONS APPLICABLE TO 1975 MODEL YEAR NEW MOTOR VEHICLES. • ENGINE ..... FAMILY : N-091, 119.1 C.ID • EXHAUST EMISSION CONTROL TYPE ..... A.I.S.+E.G.R. • ENGINE TUNE-UP SPECIFICATIONS AND ADJUSTMENT (LIGHTS AND ACCESSORIES OFF) • IDLE SPEED ..... 750 R.P.M. IN NEUTRAL • IGNITION TIMING ..... 12 B.T.D.C. • IDLE MIXTURE SETTING ..... CO 2.0% WITHOUT AIR INJECTION TIMING MARK INERTIA WEIGHT (FOR EMISSION TEST) ..... 2750 LBS 14805 U6700 NISSAN MOTOR CO., LTD. L20B MT California VEHICLE EMISSION CONTROL INFORMATION THIS VEHICLE CONFORMS TO U.S. ENVIRONMENTAL PROTECTION AGENCY AND CALIFORNIA REGULATIONS APPLICABLE TO 1975 MODEL YEAR NEW MOTOR VEHICLES. • ENGINE ..... FAMILY : N-092, 119.1 C.ID • EXHAUST EMISSION CONTROL TYPE ... A.I.S.+E.G.R.+CATALYZER • ENGINE TUNE-UP SPECIFICATIONS AND ADJUSTMENT (LIGHTS AND ACCESSORIES OFF) • IDLE SPEED ..... 750 R.P.M. IN NEUTRAL • IGNITION TIMING ..... 12 B.T.D.C. • IDLE MIXTURE SETTING ..... CO 2.0% WITHOUT AIR INJECTION TIMING MARK INERTIA WEIGHT (FOR EMISSION TEST) ..... 2750 LBS 14805 U6800 NISSAN MOTOR CO., LTD. L20B MT
Inertia label		Non-California THE INERTIA WHEEL WEIGHT FOR EMISSION TEST ON THIS VEHICLE SHOULD BE 2750 lbs 1975 YEAR MODEL ENGINE FAMILY; N-091 14805 U6700 NISSAN MOTOR CO., LTD. L20BMT California THE INERTIA WHEEL WEIGHT FOR EMISSION TEST ON THIS VEHICLE SHOULD BE 2750 lbs 1975 YEAR MODEL ENGINE FAMILY; N-092 14805 U6800 NISSAN MOTOR CO., LTD. L20BMT

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Label name	Location	Sample
Automatic choke label	Inside of glove box 	
Drive caution label (California only)	Drive side sun visor 	**A CATALYTIC CONVERTER IS USED IN THIS MODEL FOR CLEANER AIR. THE FOLLOWING INSTRUCTIONS SHOULD BE OBSERVED.** * 30 seconds after starting, reduce the idle speed by slightly depressing the accelerator pedal and immediately releasing it. * Do not race the engine for longer than one minute at high speed revolutions. * Do not park the car over dry grass, waste paper, rags and the like that may come in contact with the exhaust pipe and do not place such materials directly behind the exhaust tail pipe. (Refer to your owner's manual for further detail.)
Interlock instruction label	Drive side sun visor  Assist side sun visor (California only) 	
Air conditioner label	Inside of hood 	DATSUN AIR CONDITIONER 1.TYPE OF REFRIGERANT...R12 AMOUNT OF REFRIGERANT...30oz TYPE OF OIL...SUNISO 5GS TOTAL AMOUNT OF OIL...9oz 2.SERVICE PROCEDURES: (1)Set up manifold gauge as following schematic figure. (3)EVACUATING SYSTEM Allow vacuum pump to run for 30minutes at a vacuum of 28 "Hg(MIN.). (3)CHARGING SYSTEM Charge the system from suction side. 3.CAUTION (1)Do not steam clean on any of refrigerant lines or components. (2)Before starting compressor under the following conditions, engage and disengage clutch (3sec. on-3sec. off) several times at low engine speed. ☆After suspension for one week or more. ☆Ambient temperature below 60°F.

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APPROXIMATE REFILL CAPACITY

		U.S. measure	Imper. measure	Liter
Fuel tank	Sedan, Hardtop	13 ¼ gal	11 gal	50
	Station Wagon	11 ⅞ gal	9 ⅞ gal	45
	Station Wagon (California)	13 ¼ gal	11 gal	50
Engine cooling system *1		7 ¼ qt	6 ⅛ qt	6.9
Engine crankcase *2		4 ½ qt	3 ¾ qt	4.3
Manual transmission		4 ¼ pt	3 ½ pt	2.0
Automatic transmission *3		5 ⅞ qt	4 ⅞ qt	5.5
Differential carrier		2 ¾ pt	2 ¼ pt	1.3
Steering gear box		⅝ pt	½ pt	0.27

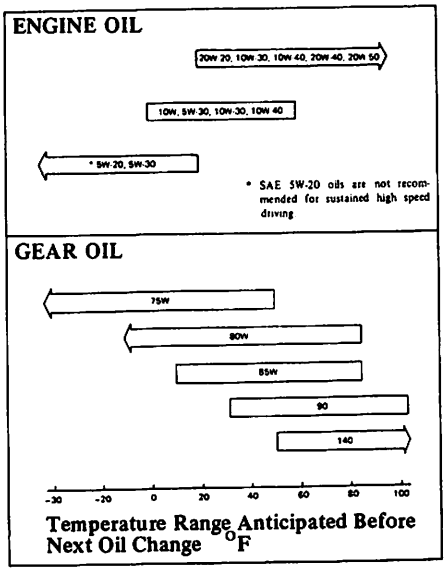
*1: Include ⅛ U.S. gal. (⅛ Imper. gal., 0.5 liter) for heater.
*2: Include ½ U.S. qt. (½ Imper. qt., 0.5 liter) for oil filter.
*3: Include 4 ¼ U.S. qt. (3 ½ Imper. qt., 4.0 liters) for torque converter.

RECOMMENDED FUEL

Use an unleaded or low-lead gasoline with a minimum octane rating of 91 RON (Research Octane Number). For cars which meet the California regulations (California models), use only unleaded gasoline to protect the catalytic converter from contamination.

RECOMMENDED LUBRICANTS

RECOMMENDED SAE VISCOSITY NUMBER



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LUBRICANT SPECIFICATIONS

Item		Specifications	Remarks
Gasoline engine oil		SAE Classification SD or SE	Furthermore refer to SAE recommended viscosity table.
Gear oil	Transmission and steering	API GL-4	————
	Differential	API GL-5	————
Automatic T/M fluid		Type DEXRON	————
Multipurpose grease		NLGI 2	Lithium soap base
Brake and clutch fluid		DOT 3	————
Antifreeze		————	Permanent anti-freeze (Ethylene glycol base)

LIFTING POINTS AND TOWING

PANTOGRAPH JACK

Apply the pantograph jack furnished with the car to the position indicated below in a safe manner See Figures GI-11 and GI-12.

Notes:

a. **Never get under the car while it is supported only by the jack. Always use safety stands to support frame when you have to get under the car.**

b. **Block the wheels diagonally by wheel chocks.**

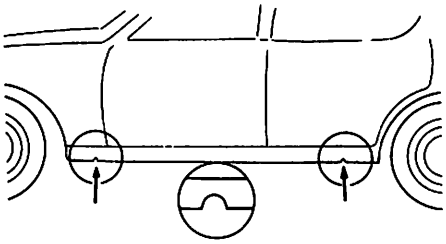


Fig. GI-11 Jack up points

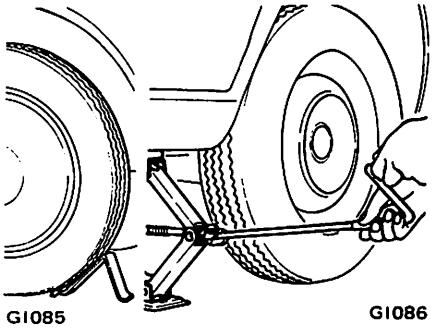


Fig. GI-12 Wheel chocks and jack

GARAGE JACK

Note: **When carrying out operations with the garage jack, be sure to support the car with safety stands.**

Front side

1. When jacking up the front of the vehicle, place the chocks behind the rear wheels to hold them.
2. Apply the garage jack under the front suspension member. Be sure not to lift up the engine oil pan located just behind the suspension member. See Figure GI-13.

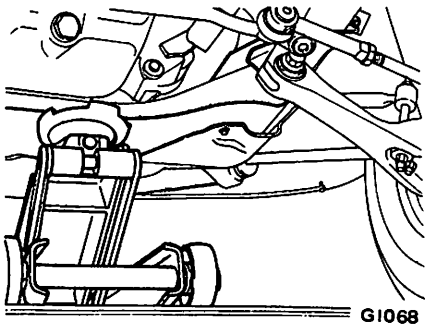


Fig. GI-13 Front jack up point

3. Jack up the vehicle gently just high enough to place the safety stands under both the side members. Place the stands at the position indicated in Figure GI-14.

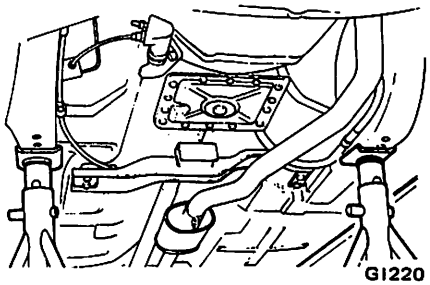


Fig. GI-14 Front supportable points

4. Release the jack slowly.

Rear side

1. When jacking up the rear of the car, place the chocks at the front side of the front wheels to hold them.
2. Apply the garage jack under the differential carrier.

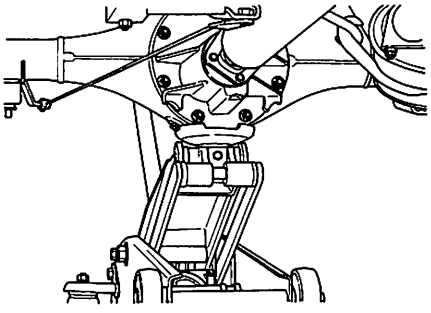
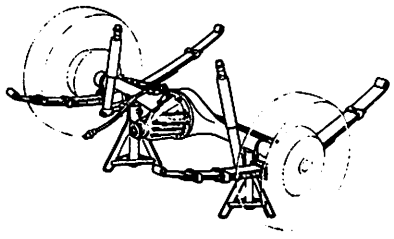


Fig. GI-15 Rear jack up points

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3. Jack up the car gently just high enough to place the safety stands under the rear axle case.

Place the stands at the positions indicated below.



GI072

Fig. GI-16 Rear supportable point

4. Release the jack slowly.

TOWING

It is necessary to use proper towing equipment, to avoid possible damage to the car during a towing operation.

Towing is in accordance with Towing Procedure Manual at dealer side.

All applicable State or Provincial (in Canada) laws and local laws regarding the towing operation must be obeyed.

Before towing the car, make certain that the parking brake is released and the transmission is in neutral. If the transmission and rear axle are in good working order, the car may be towed with all the wheels on the road. If the transmission and/or rear axle are inoperative, the car must be towed from the rear with the rear wheels raised.

Notes:

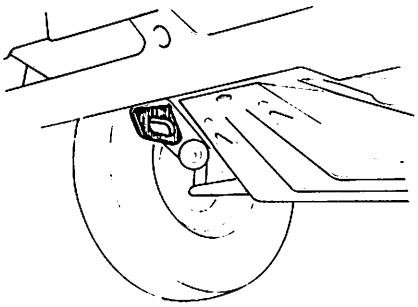
a. The ignition key must be turned to the OFF position and remain in the ignition. Do not remove the key during the towing operation, as this will lock the steering column and damage the lock mechanism.

b. If the car equipped with the automatic transmission is towed with rear wheels on the road, speed should not exceed 20 MPH and the towing distance should not exceed 6 miles. If this is not possible, tow the car with the rear wheels raised.

Warning: The car is equipped with a front towing hook as illustrated. However, this hook should be used only in an emergency situation, e.g., to pull the car out of a ditch, a snowbank or mud.

When towing, do not take up slack in the rope too quickly.

It is illegal to tow a car on the highways with a rope.

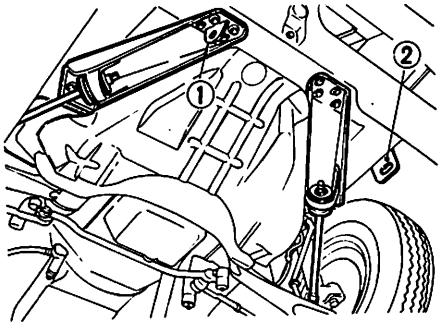


WH144

Fig. GI-17

TIE DOWN

The front tie-down hook is located on both the front bumper stay.



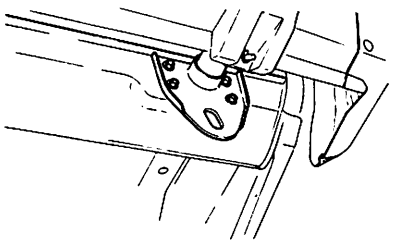
GI191

1 Towing hook
2 Tie-down hook

Fig. GI-18 Tie-down hook (front)

There are two rear tie-down hooks. Each hook is part of the rear bumper shock absorber, and is secured with five bolts, one on the side member and four on the rear lower panel.

Note: Do not use the rear hooks as a towing hook.



GI192

Fig. GI-19 Tie-down hook (rear)

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SERVICE MANUAL

DATSUN 710
MODEL 710 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION ET

ET

ENGINE TUNE-UP

ENGINE TUNE-UP ..... ET- 2
BASIC MECHANICAL SYSTEM ..... ET- 6
IGNITION AND FUEL SYSTEM ..... ET- 8
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SERVICE DATA AND SPECIFICATIONS ET-28
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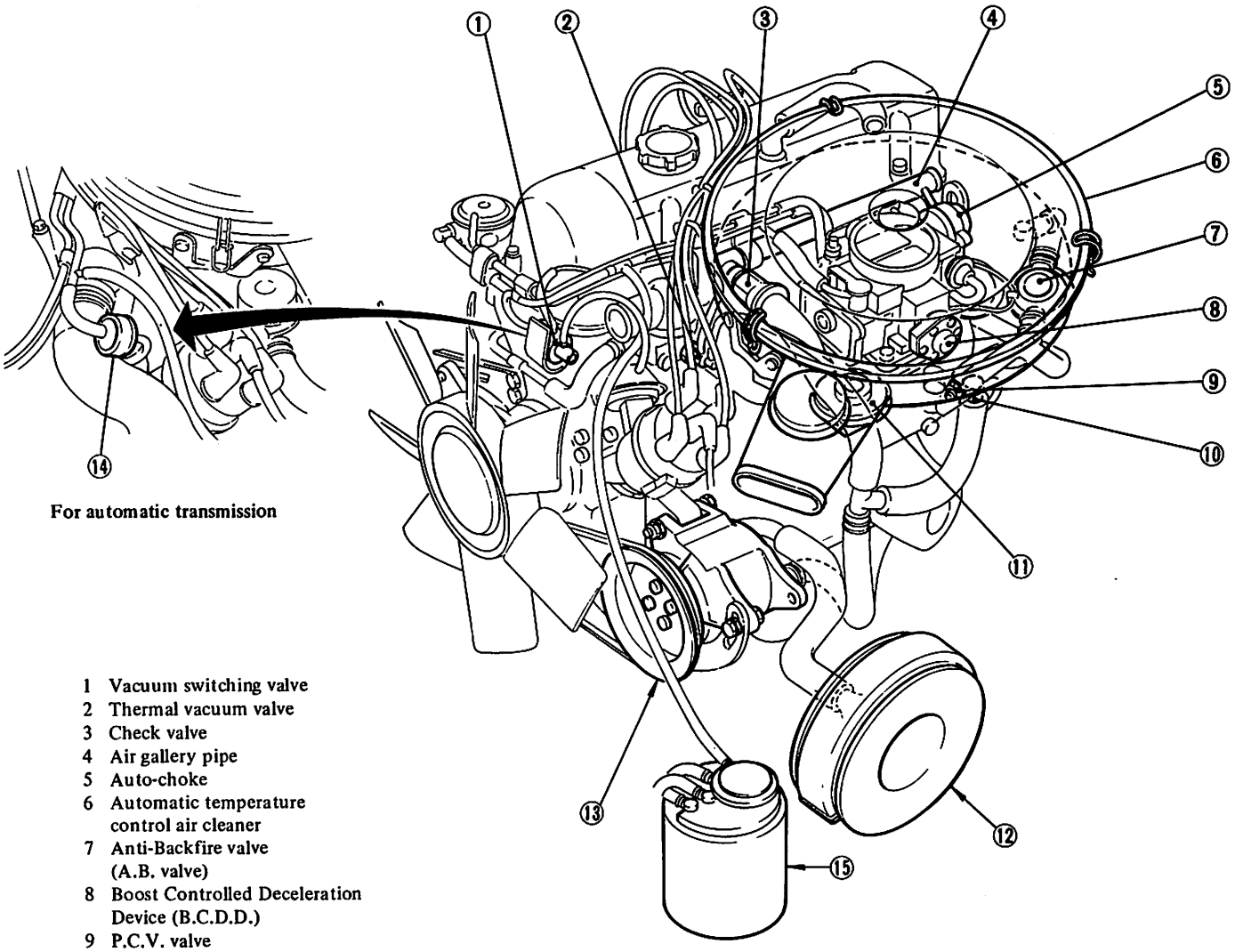
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ENGINE TUNE-UP

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LOCATION OF EMISSION CONTROL SYSTEM COMPONENTS (except California) ET-2
LOCATION OF EMISSION CONTROL SYSTEM COMPONENTS (for California) ET-3
EMISSION CONTROL SYSTEM PIPING (except California) ET-4
EMISSION CONTROL SYSTEM PIPING (for California) ET-5
EMISSION CONTROL DEVICES ET-6

LOCATION OF EMISSION CONTROL SYSTEM COMPONENTS (Except California)



1 Vacuum switching valve
2 Thermal vacuum valve
3 Check valve
4 Air gallery pipe
5 Auto-choke
6 Automatic temperature control air cleaner
7 Anti-Backfire valve (A.B. valve)
8 Boost Controlled Deceleration Device (B.C.D.D.)
9 P.C.V. valve
10 Air relief valve
11 E.G.R. control valve
12 Air pump air cleaner
13 Air pump
14 Spark delay valve
15 Carbon canister

Fig. ET-1 Location of emission control system components (except California)

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LOCATION OF EMISSION CONTROL SYSTEM COMPONENTS (For California)

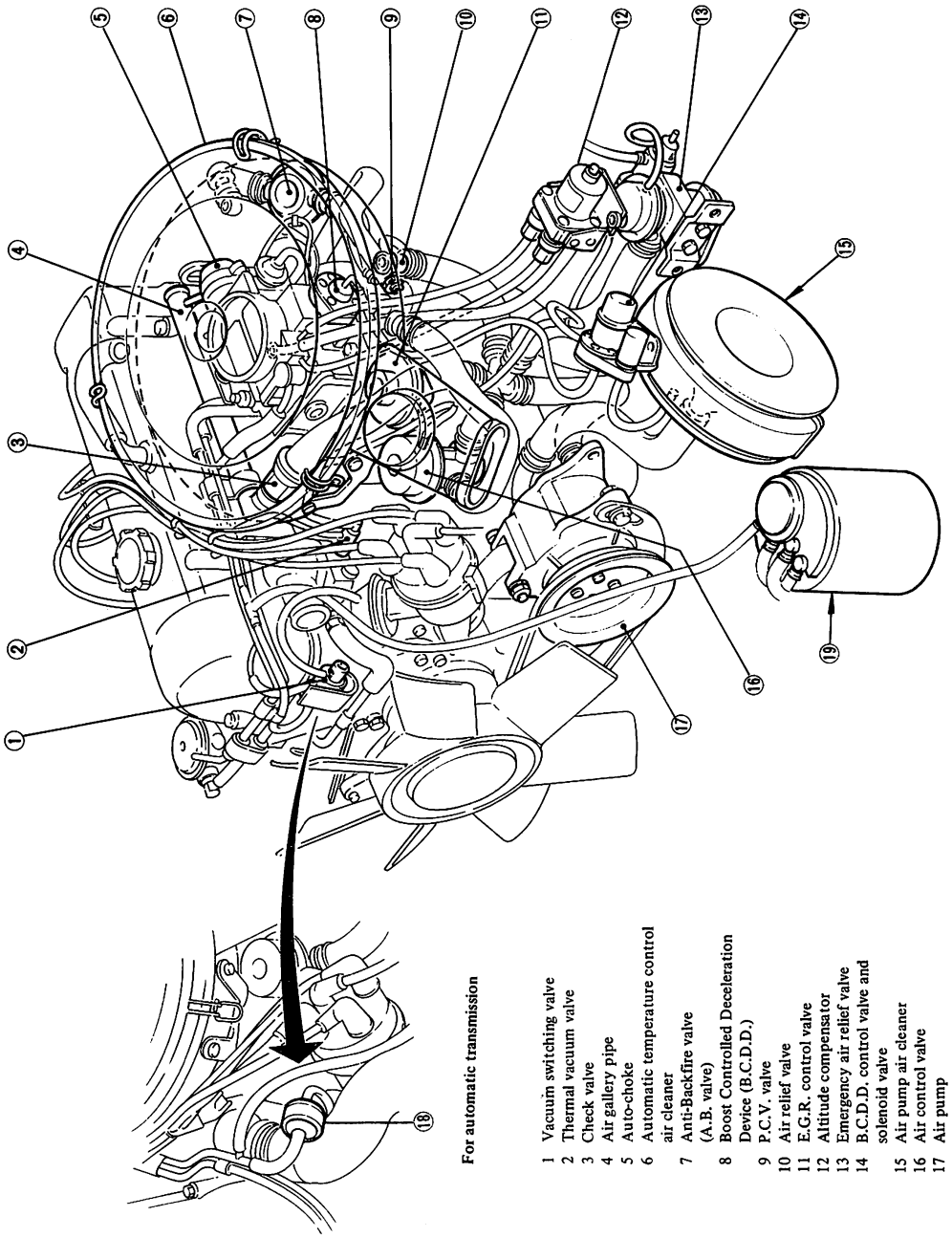


Fig. ET-2 Location of emission control system components (for California)

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EMISSION CONTROL SYSTEM PIPING (Except California)

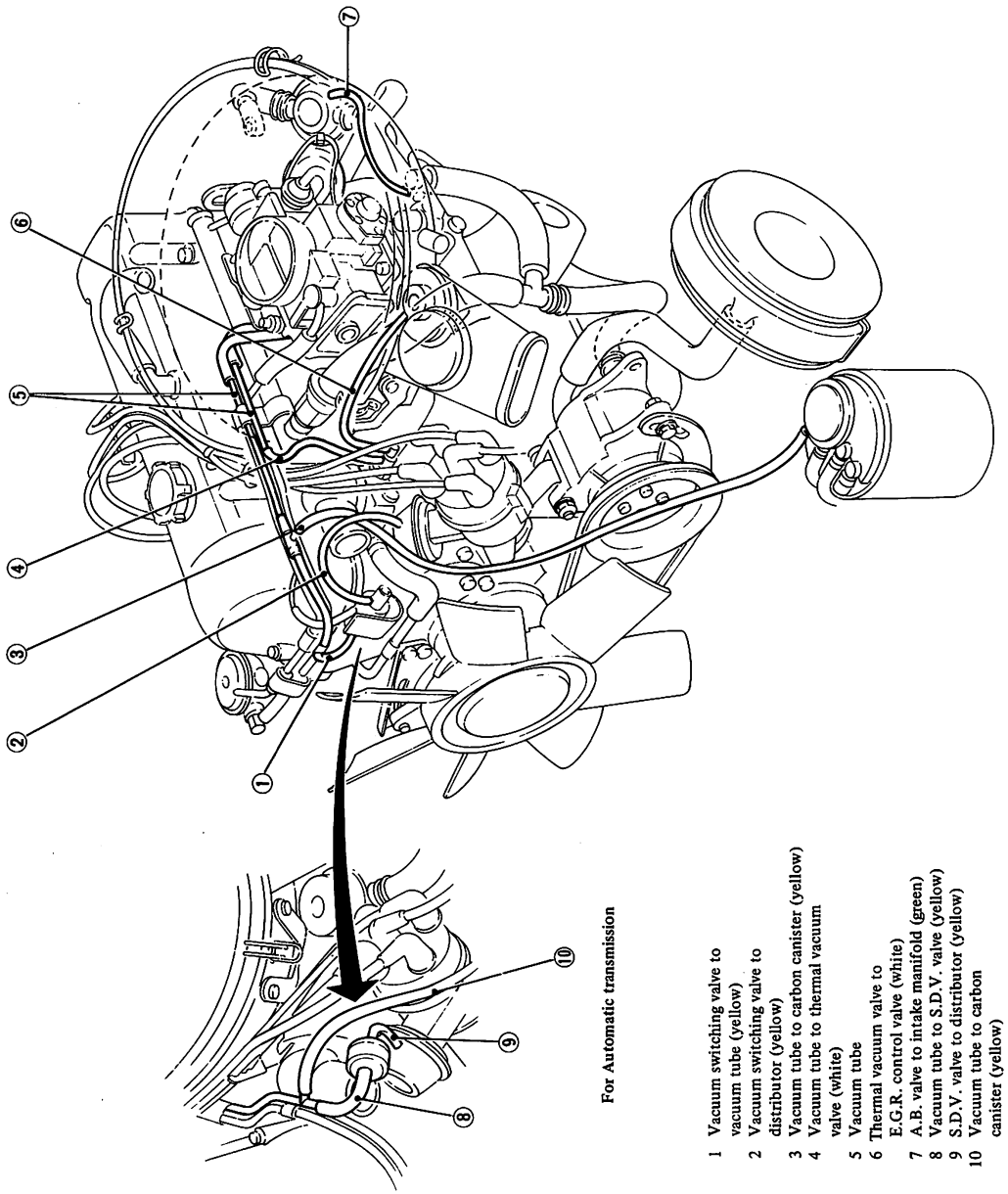
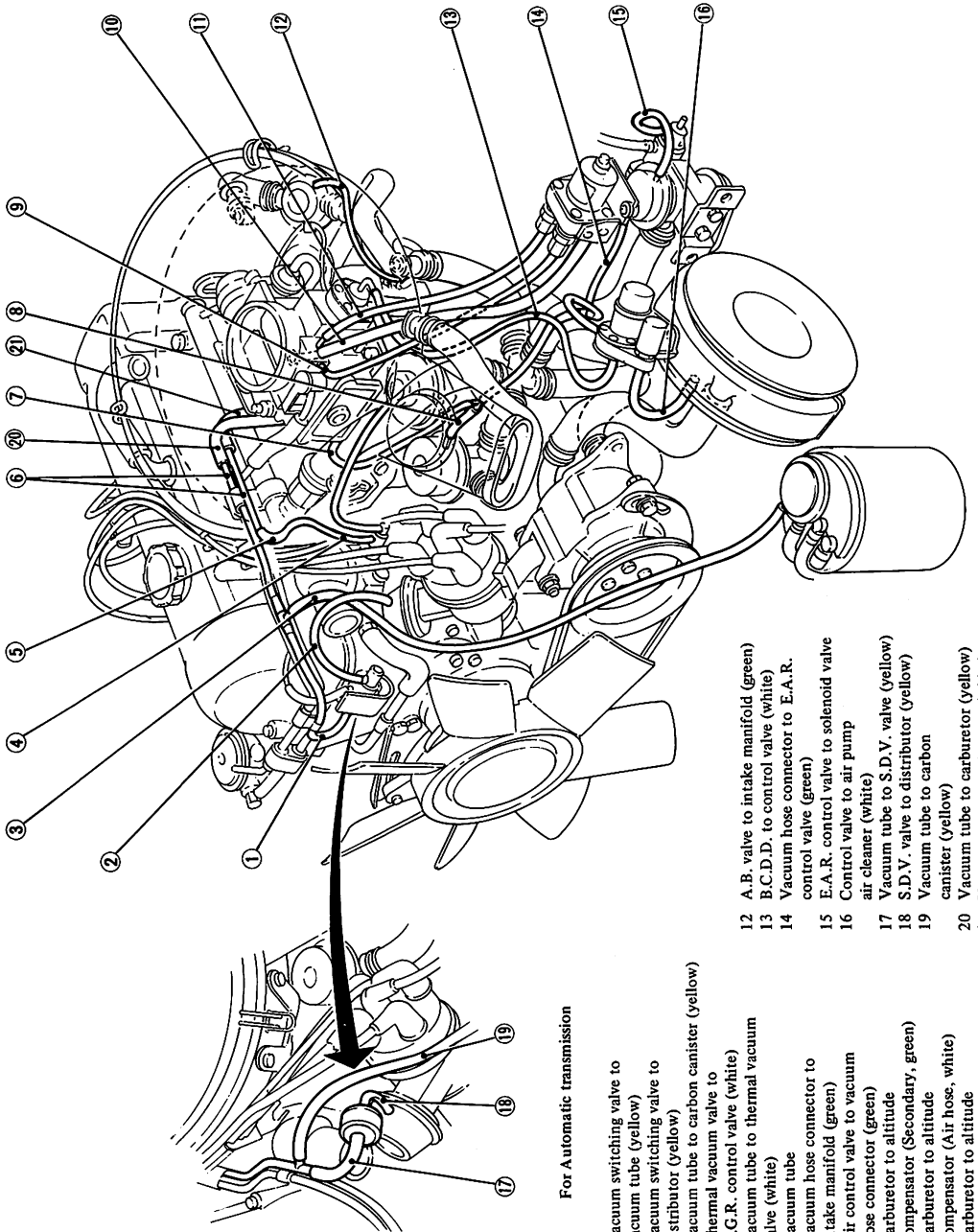


Fig. ET-3 Emission control system piping (except California)

EMISSION CONTROL SYSTEM PIPING (For California)



For Automatic transmission

1 Vacuum switching valve to vacuum tube (yellow)
2 Vacuum switching valve to distributor (yellow)
3 Vacuum tube to carbon canister (yellow)
4 Thermal vacuum valve to E.G.R. control valve (white)
5 Vacuum tube to thermal vacuum valve (white)
6 Vacuum tube
7 Vacuum hose connector to intake manifold (green)
8 Air control valve to vacuum hose connector (green)
9 Carburetor to altitude compensator (Secondary, green)
10 Carburetor to altitude compensator (Air hose, white)
11 Carburetor to altitude compensator (Primary, red)
12 A.B. valve to intake manifold (green)
13 B.C.D.D. to control valve (white)
14 Vacuum hose connector to E.A.R. control valve (green)
15 E.A.R. control valve to solenoid valve
16 Control valve to air pump air cleaner (white)
17 Vacuum tube to S.D.V. valve (yellow)
18 S.D.V. valve to distributor (yellow)
19 Vacuum tube to carbon canister (yellow)
20 Vacuum tube to carburetor (yellow)
21 Vacuum tube to carburetor (white)

Fig. ET-4 Emission control system piping (for California)

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EMISSION CONTROL DEVICE

System name	Part name \ Engine model	A14				L20B																			
	Car model	HLB210, KHLB210				HL610, KHL610				WHL610				HL710, KHL710				WHL710				HL620, HLG620			
	Destination	non-Calif.		For Calif.		non-Calif.		For Calif.		non-Calif.		For Calif.		non-Calif.		For Calif.		non-Calif.		For Calif.		non-Calif.		For Calif.	
	Transmission	M/T	A/T	M/T	A/T	M/T	A/T	M/T	A/T	M/T	A/T	M/T	A/T	M/T	A/T	M/T	A/T	M/T	A/T	M/T	A/T	M/T	A/T	M/T	A/T
Air cleaner	A.T.C. air cleaner (with air pump relief valve)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Idle compensator (dual type)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Early fuel evaporative system	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	P.T.C. auto-choke	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Carburetor	B.C.D.D. (with control valve)	–	–	–	–	X	X	–	–	X	X	–	–	X	X	–	–	X	X	–	–	X	X	X	X
	B.C.D.D. (without control valve)	–	–	–	–	–	–	X	X	–	–	X	X	–	–	X	X	–	–	X	X	–	–	–	–
	Control valve (for B.C.D.D.)	–	–	–	–	–	–	X	X	–	–	X	X	–	–	X	X	–	–	X	X	–	–	–	–
	Throttle opener	X	X	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	Control valve (for throttle opener)	X	X	X	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	Altitude compensator	–	–	X	X	–	–	X	X	–	–	X	X	–	–	X	X	–	–	X	X	–	–	–	–
Ignition system	Ignition transistor unit, distributor (one pick-up)	–	–	X	X	–	–	X	X	–	–	X	X	–	–	X	X	–	–	X	X	–	–	–	–
	T.C.S.	–	–	X	–	X	–	X	–	X	–	X	–	X	–	–	–	X	–	X	–	–	–	–	–
	S.D.V.	–	X	–	X	–	X	–	X	–	X	–	X	–	X	–	–	–	X	–	X	–	–	–	–
	T.C.S. + T.C.E.	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
A.I.S.	Air pump, air pump air cleaner, check valve, A.B. valve	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Control valve (secondary air)	–	–	X	X	–	–	X	X	–	–	X	X	–	–	X	X	–	–	X	X	–	–	–	–
	E.A.R. valve	–	–	X	X	–	–	X	X	–	–	X	X	–	–	X	X	–	–	X	X	–	–	–	–
E.G.R. system	E.G.R. control valve	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Thermal vacuum valve	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Warning device (every 12,500 mile maintenance)	X	X	–	–	X	X	–	–	X	X	–	–	X	X	–	–	X	X	–	–	X	X	X	X
	Top gear, neutral gear switch	X	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Catalytic converter	Catalytic converter	–	–	X	X	–	–	X	X	–	–	X	X	–	–	X	X	–	–	X	X	–	–	–	–
	Warning device (with switching module catalytic converter temperature sensor)	–	–	X	X	–	–	X	X	–	–	X	X	–	–	X	X	–	–	X	X	–	–	–	–
	Floor temperature warning system (with floor sensor)	–	–	X	X	–	–	X	X	–	–	X	X	–	–	X	X	–	–	X	X	–	–	–	–

Remarks: X ... Available
– ... Not available

M/T: Manual transmission
A/T: Automatic transmission
A.T.C.: Automatic temperature control
P.T.C.: Positive temperature coefficient
B.C.D.D.: Boost controlled deceleration device
T.C.S.: Transmission controlled vacuum advance system
S.D.V.: Spark delay valve
T.C.E. Transmission controlled exhaust gas recirculation system
A.I.S.: Air injection system
A.B. valve: Anti-backfire valve
E.A.R. valve: Emergency air relief valve
E.G.R.: Exhaust gas recirculation

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BASIC MECHANICAL SYSTEM

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ADJUSTING INTAKE AND EXHAUST VALVE CLEARANCE ET-7
VALVE CLEARANCE ET-7
CHECKING AND ADJUSTING DRIVE BELT ET-7
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ADJUSTING INTAKE AND EXHAUST VALVE CLEARANCE

Valve clearance adjustment is impossible when the engine is in operation:

1. Loosen pivot locking nut and turn pivot screw until the specified clearance is obtained while cold.

Using service tool, tighten pivot locking nut securely after adjustment, and recheck the clearance.

2. Warm up engine for at least several minutes and stop it. Measure valve clearance while hot. If out of specifications, adjust.

VALVE CLEARANCE

Unit: mm (in)

Cold	Intake	0.20 (0.0079)
	Exhaust	0.25 (0.0098)
Warm	Intake	0.25 (0.0098)
	Exhaust	0.30 (0.0118)

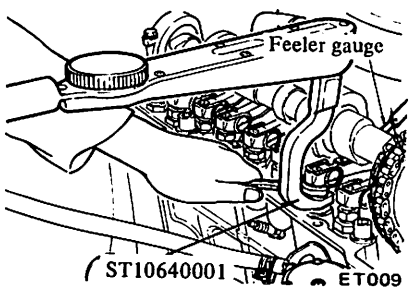


Fig. ET-5 Adjusting valve clearance

CHECKING AND ADJUSTING DRIVE BELT

1. Check for cracks or damage. Replace if necessary.

2. Normal drive belt deflection is shown in figure below, when moderate thumb pressure is applied midway between pulley.

Thumb pressure: 10 kg (22 lb)

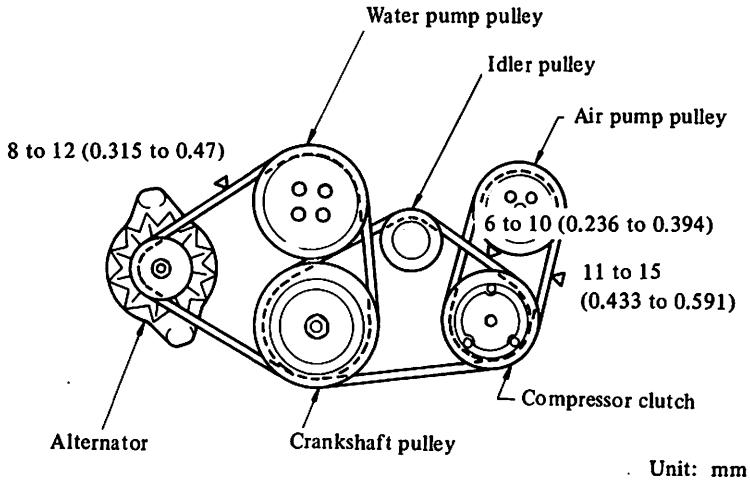


Fig. ET-6 Drive belt tension

RETIGHTENING CYLINDER HEAD BOLTS, MANIFOLD NUTS AND CARBURETOR SECURING NUTS

Refer to the following tightening torque specifications.

Tightening torque:
Cylinder head bolts
1st turn
4.0 kg-m (29 ft-lb)
2nd turn
6.0 kg-m (43 ft-lb)
3rd turn
6.5 to 8.5 kg-m
(47 to 61 ft-lb)

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Manifold nuts
1.2 to 1.6 kg-m
(8.7 to 11.6 ft-lb)
Carburetor nuts
0.5 to 1.0 kg-m
(3.6 to 7.2 ft-lb)

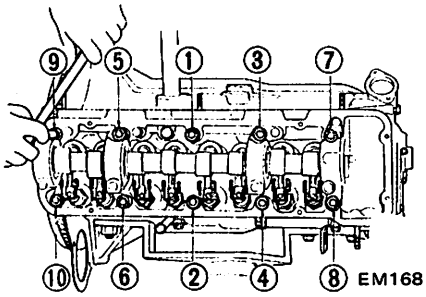


Fig. ET-7 Tightening sequence

CHECKING ENGINE OIL

1. Check if oil is diluted with water or gasoline. Drain and refill oil if necessary.

Notes:
a. **A milky oil indicates the presence of cooling water. Isolate the cause and take corrective measure.**
b. **An oil with extremely low viscosity indicates dilution with gasoline.**

2. Check oil level. If below the specified level, raise it up to the H level.

Engine oil capacity
(including oil filter)
Maximum (H level)
4.3 liters
(4 ½ US qt, 3 ¾ Imp qt)
Minimum (L level)
3.3 liters
(3 ½ US qt, 2 ⅛ Imp qt)

REPLACING OIL FILTER

The oil filter is a cartridge type and can be removed using Oil Filter Wrench ST19320000.

1. Check for oil leaks past gasketed flange. If leakage is found, retighten just enough to stop leakage. If retightening is no longer effective, replace filter as an assembly.
2. When installing oil filter, tighten by hand.

Note: Do not overtighten oil filter, lest leakage should occur.

CHANGING ENGINE COOLANT

PERMANENT ANTI-FREEZE COOLANT

Permanent anti-freeze coolant is an ethylene glycol base product containing chemical inhibitors to protect the cooling system against corrosion.

The anti-freeze does not contain any glycerine, ethyl or methyl alcohol. It will not evaporate or boil away and can be used with either high or low temperature thermostat.

It flows freely, transfers heat efficiently, and will not clog passages in the cooling system.

The anti-freeze must not be mixed with other products.

This coolant can be used throughout the seasons of the year.

Whenever coolant is changed, the cooling system should be flushed and refilled with a new coolant.

Check the level. See the instructions furnished by the manufacturer for the mixture ratio of anti-freeze to water.

CHECKING COOLING SYSTEM HOSES AND CONNECTIONS

Check hoses and fittings for loose connections or deterioration. Retighten or replace if necessary.

INSPECTION OF RADIATOR CAP

Apply reference pressure [0.9 kg/cm² (13 psi)] to radiator cap by means of a cap tester to see if it is satisfactory. Replace cap assembly if necessary.

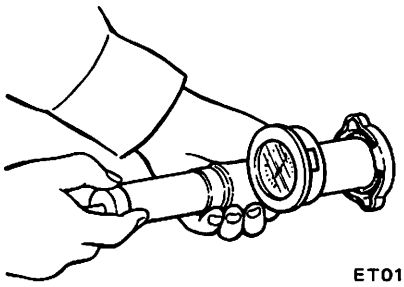


Fig. ET-8 Testing radiator cap

COOLNG SYSTEM PRESSURE TEST

With radiator cap removed, apply reference pressure [1.6 kg/cm² (23 psi)] to the cooling system by means of a tester to detecte any leakage.

Water capacity

Without heater:
6.4 liters
(6 ¾ US qt, 5 ⅝ Imp qt)
With heater:
6.9 liters
(7 ¼ US qt, 6 ⅛ Imp qt)

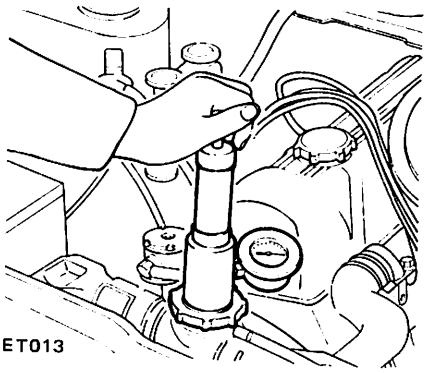


Fig. ET-9 Cooling system pressure test

CHECKING VACUUM FITTINGS, HOSES, AND CONNECTIONS

Check the condition of fittings and hoses. Retighten or replace if necessary.

All vacuum hoses can be identified by colors.

White Line

- Vacuum gallery to carburetor (E.G.R. Tube)

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- Vacuum gallery to thermal vacuum valve
- Thermal vacuum valve to E.G.R. control valve

Yellow Line

- Spark delay valve to distributor
- Spark delay valve to vacuum gallery
- Distributor to vacuum gallery
- Vacuum switch valve to distributor
- Vacuum switch valve to vacuum gallery
- Vacuum gallery to carburetor

Green Line

- Anti-backfire valve to intake manifold
- Air control valve to emergency air relief valve
- Intake manifold to emergency air relief valve
- Intake manifold to canister

CHECKING ENGINE COMPRESSION

COMPRESSION PRESSURE TEST

1. Warm up engine suffiently.
2. Disconnect all spark plugs.
3. Disconnect anti-dieseling solenoid valve connector.
4. Properly attach a compression tester to spark plug hole in cylinder being tested.

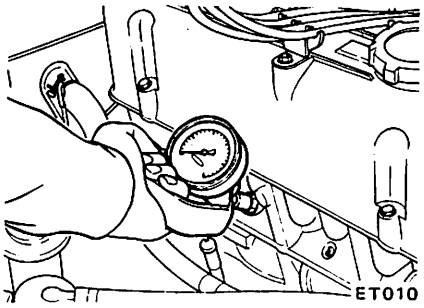


Fig. ET-10 Testing compression pressure

5. Depress accelerator pedal to open throttle and choke valves.

Note: Do not "pump" pedal.

6. Start engine as quickly as possible.
7. Compression pressure

	kg/cm² (psi)/at rpm
Standard	12.0/350
Minimum	9.0/350

8. Cylinder compression in cylinder should not be less than 80% of highest reading. Different compression in two or more cylinders usually indicates an improperly seated valve or broken piston ring.
9. Low compression in cylinders can result from worn piston rings. This condition may usually be accompanied by excessive fuel consumption.

TEST RESULT

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

1. If adding oil increases the compression pressure, the chances are that rings are faulty.
2. If pressure stays low, probable cause is that valve is sticking or seating improperly.
3. If cylinder compression in any two adjacent cylinders is low, and if adding oil does not help the compression, there is leakage past the gasket surface.

Oil and water in combustion chambers can result from leakage.

IGNITION AND FUEL SYSTEM

CONTENTS

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ADJUSTING IGNITION TIMING ET-10
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CHECKING BATTERY

Check electrolyte level in each battery cell.

1. Unscrew each filler cap and inspect fluid level. If the fluid is low, add distilled water to bring the level up approximately 10 to 20 mm (0.39 to 0.79 in) above the plates. Do not overfill.
2. Measure the specific gravity of battery electrolyte.

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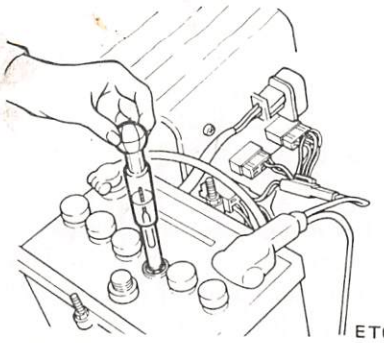

ET002

Fig. ET-11 Checking specific gravity of battery electrolyte

Clean top of battery and terminals with a solution of baking soda and water. Rinse off and dry with compressed air. Top of battery must be clean to prevent current leakage between terminals and from positive terminal to hold-down clamp.

In addition to current leakage, prolonged accumulation of acid and dirt on top of battery may cause blistering of the material covering connector straps and corrosion of straps. After tightening terminals, coat them with petrolatum (vaseline) to protect them from corrosion.

	Permissible value	Full charge value [at 20°C (68°F)]
Frigid climates	Over 1.22	1.28
Tropical climates	Over 1.18	1.23
Other climates	Over 1.20	1.26

CHECKING AND ADJUSTING IGNITION TIMING

ADJUSTING IGNITION TIMING

1. Check spark plugs and distributor breaker points for condition.
2. Thoroughly remove dirt and dust from timing mark on crank pulley and timing indicator on front cover.
3. Warm up engine sufficiently.
4. Install a timing light on No. 1 cylinder spark plug wire, and install a tachometer.
5. Set idling speed to approximately 750 rpm.
6. Check ignition timing if it is 12°B.T.D.C. (Before Top of Dead Center) with a timing light.

If necessary, adjust it as follows:

(1) Loosen set screw until distributor can be moved by hand.
(2) Adjust ignition timing to 12° B.T.D.C.
(3) Lock distributor setscrew, and make sure that timing is correct.

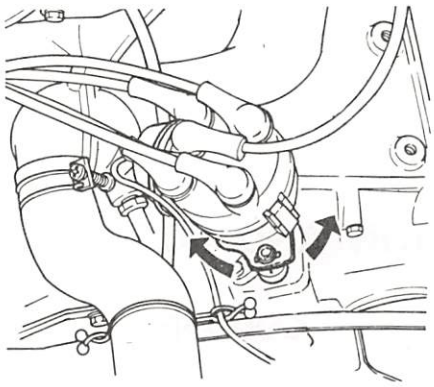
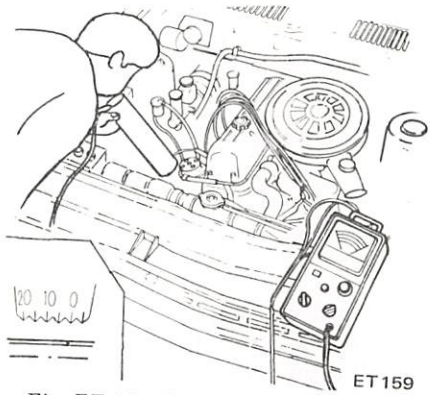

EC352

Fig. ET-12 Adjusting ignition timing



ET159

Fig. ET-13 Checking ignition timing

Ignition timing:
Manual transmission
12°/750 rpm
Automatic transmission
12°/650 rpm (in "D" range)

CHECKING AND REPLACING SPARK PLUG

1. Remove and clean plugs in a sand blast cleaner.
2. Inspect insulator for cracks or chips.
3. Check both center and ground electrodes.

If they are excessively worn, replace with new spark plugs.

4. Spark plug gap:
0.8 to 0.9 mm
(0.032 to 0.036 in)
Tightening torque:
1.5 to 2.5 kg-m
(11 to 18 ft-lb)

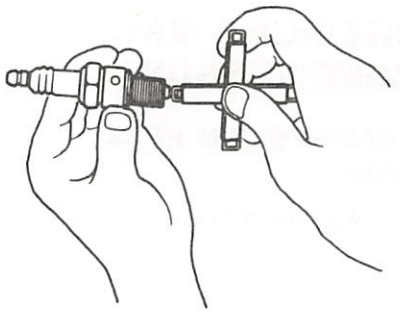

EE080

Fig. ET-14 Checking spark plug point gap

CHECKING DISTRIBUTOR WORKING PARTS AND IGNITION WIRING

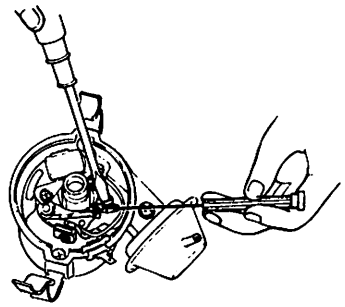
BREAKER PONITS (Non-California models)

Check the distributor breaker points for abnormal pitting and wear. Replace if necessary. Make sure they are properly aligned and that point dwell and gap are correct. Clean and apply distributor grease to the cam and wick.

Note: Do not apply grease excessively.

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Point gap:
0.45 to 0.55 mm
(0.0177 to 0.0217 in)
Dwell angle
49 to 55 degrees



EE322

Fig. ET-15 Checking distributor point gap

AIR GAP (California models)

For inspection procedures and reference data, refer to the topic "Air Gap" in section EE (page EE-29).

DISTRIBUTOR

Check centrifugal advance unit for loose connection or improper operation. If it is not operating properly, the problem may be due to a sticky spring or excessively worn parts. This operation needs a distributor tester.

For inspection procedures and reference data, refer to relative topic under "Distributor" in section EE.

If vacuum advance mechanism does not properly operate, check for the following items and correct the problem as required.

1. Check vacuum inlet for signs of leakage at connection. If necessary, retighten or replace.
2. Check vacuum diaphragm for air leak.

If necessary, replace diaphragm.

3. Inspect breaker plate for smooth movement.

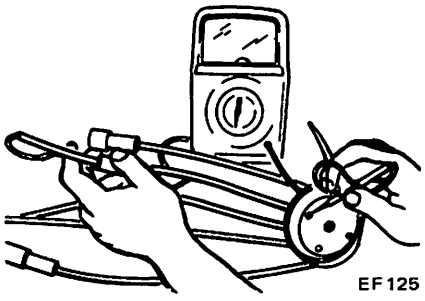
If plate does not move smoothly, this condition could be due to sticky steel balls. If necessary, replace breaker plate assembly.

IGNITION WIRING

Use an ohmmeter to check resistance of secondary cables. Disconnect cables from spark plugs and install a proper adapter between cable and spark plug. Remove distributor cap and secondary cables as an assembly. Do not remove cables from cap.

Check resistance of one cable at a time.

Connect ohmmeter between spark plug adapter and corresponding electrode inside cap. If resistance is more than 30,000 ohms, remove cable from cap and check cable resistance only. If resistance is still more than 30,000 ohms, replace cable assembly.



EF125

Fig. ET-16 Checking high tension cable

CHECKING DISTRIBUTOR CAP, ROTOR AND CONDENSER

Note: This operation is to be performed while checking distributor points. Inspect distributor cap for cracks and flashover.

External surfaces of all parts of secondary system must be cleaned to reduce possibility of voltage loss. All wires should be removed from distributor cap and coil so that terminals can be inspected and cleaned. Burned or corroded terminals indicate that wires are not fully seated, which causes arcing between end of wire and terminal. When replacing wires in terminal, be sure they are fully seated before pushing rubber nipple down over tower. Check distributor rotor for damage, and distributor cap for cracks.

CONDENSER

1. Clean outlet of condenser lead wire, and check for loose set screw. Retighten if necessary.
2. Check condenser with a condenser tester.

Condenser capacity
0.20 to 0.24 μF
(Micro Farad)
Condenser insulation resistance
5MΩ (Mega ohms)

ADJUSTING CARBURETOR IDLE RPM AND MIXTURE RATIO

Cautions:

a. On automatic transmission equipped models, check should be performed in the "D" range.
Be sure to engage parking brake and to lock both front and rear wheels with wheel chocks.
b. Keep your foot down on the brake pedal while depressing the accelerator pedal. Otherwise car will surge forward dangerously.

Notes:

a. Do not attempt to screw the idle adjusting screw down completely. Doing so could cause damage to tip, which in turn will tend to cause malfunctions.
b. After idle adjustment has been made, shift the lever to the "N" or "P" range (for automatic transmission).
c. Remove wheel chocks.

Idle mixture adjustment requires the use of a CO-meter (especially for California standard models). When preparing to adjust idle mixture, it is essential to have the meter thoroughly warmed up and calibrated.

1. Remove air hose between 3-way connector and air check valve as shown in Figure ET-17. Plug the disconnected hose to prevent dust from entering.

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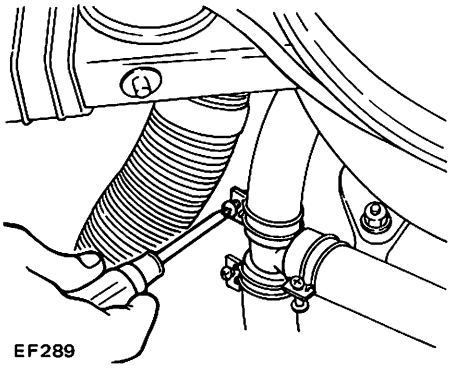


Fig. ET-17 Disconnect air hose from air check valve

2. Check carburetor pipes for proper connection.
3. Warm up engine sufficiently.
4. Continue engine operation for one minute at idling speed.
5. Adjust throttle adjusting screw until engine is at specified speed.

Engine speed:
Manual transmission
750 rpm
Automatic transmission
(in "D" position)
650 rpm

6. Check ignition timing. If necessary, adjust it to specifications.

This operation need not be carried out at 1,600 km (1,000 miles) service.

Ignition timing:
Manual transmission
12°/750 rpm
Automatic transmission
(in "D" position)
12°/650 rpm

7. Adjust idle adjusting screw so that CO percentage is at specified level.

CO percentage:
Manual transmission
2% at 750 rpm
Automatic transmission
(in "D" position)
2% at 650 rpm

8. Repeat the adjustment process as described in steps 5 to 7 above so that CO percentage is at specified level.
9. Remove cap and connect air hose to air check valve.

If engine speed increases, readjust it to the specified speed with throttle adjusting screw.

If CO-meter is not available, the following procedures may be used.

1. Remove air hose between 3-way connector and air check valve as shown in Figure ET-17. Plug the disconnected hose to prevent dust from entering.
2. Check carburetor pipes for proper connection.
3. Warm up engine sufficiently.
4. Continue engine operation for one minute at idling speed.
5. Adjust throttle adjusting screw so that engine speeds are as indicated below.

Engine speed:
Manual transmission
815 rpm
Automatic transmission
(in "D" position)
670 rpm

6. Check ignition timing, if necessary adjust it to 10° required by specifications. This operation need not be carried out at 1,600 km (1,000 miles) service.
7. Adjust idle mixture screw until maximum rpm is obtained.
8. Repeat the procedures as described in items 5 and 7 above until engine speed, at best idle mixture, is 815 rpm for cars with manual transmissions and 670 rpm for automatic transmission models (in "D" position).
9. Turn the idle adjusting screw clockwise until engine speed drops off below specified rpm.

Engine speed drops off:
Manual transmission
60 to 70 rpm
Automatic transmission
(in "D" range)
15 to 25 rpm

Note: If idle limiter cap obstructs proper adjustment, remove it.
To install idle limiter cap, refer to "Idle limiter cap".

10. Remove cap, and connect air hose to air check valve.

If engine speed increases, readjust it to the specified speed with throttle adjusting screw.

IDLE LIMITER CAP

Do not remove this idle limiter cap unless necessary. If this unit is removed, it is necessary to re-adjust it at the time of installation. To adjust proceed as follows.

1. After adjusting throttle or idle speed adjusting screws, check to be sure that the amount of "CO" contained in exhaust gases meets the established standard.
2. Install idle limiter cap in position, making sure that the adjusting screw further turn 1/8 rotation in the "CO-RICH" direction.

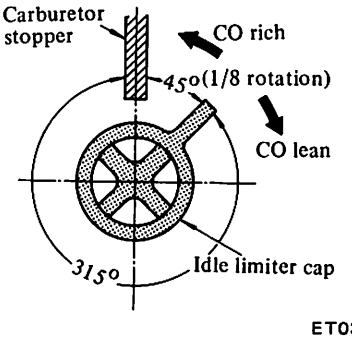


Fig. ET-18 Setting idle limiter cap

CHECKING CARBURETOR RETURN SPRING

Check throttle return spring for cracks, squareness or deformation, if necessary, replace with a new one.

CHECKING CHOKE MECHANISM (Choke plate and linkage)

1. Check choke valve and mechanism for free operation, and clean or replace if necessary. A binding can result from petroleum gum formation on choke shaft or from damage.
2. Check bimetal cover setting. Index mark on bimetal cover is usually set at center of scale.

Note: Always align the index mark on bi-metal cover with the center index mark on choke housing.

3. Every day, before starting engine, depress the accelerator pedal to see if choke valve is closed automatically.

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If it fails to be closed, the chances are that link movement is unsmooth, or that bimetal is out of order. Refer to Carburetor in Section EF.

CHECKING FUEL LINES (Hoses, pipings, connections, etc.)

Check fuel lines for loose connections, cracks and deterioration. Retighten loose connections and replace any damaged or deformed parts.

REPLACING FUEL FILTER

Check for a contaminated element, and water deposit.

All engines use a replaceable cartridge type fuel strainer as an assembly.

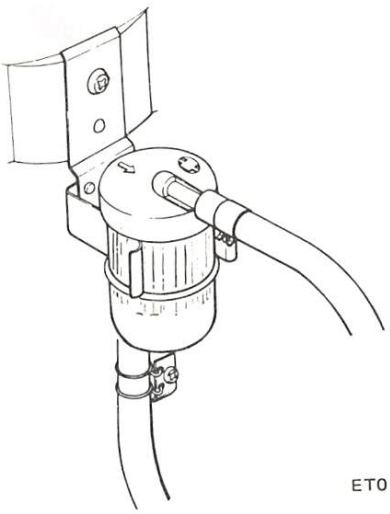


Fig. ET-19 Fuel strainer

EMISSION CONTROL SYSTEM

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CHECKING CRANKCASE EMISSION CONTROL SYSTEM

REPLACING P.C.V. VALVE AND FILTER

Check P.C.V. valve in accordance with the following method.

With engine running at idle, remove ventilator hose from P.C.V. valve. If the valve is properly working, a hissing noise will be heard as air passes through the valve and a strong vacuum should be felt immediately when a finger is placed over valve inlet.

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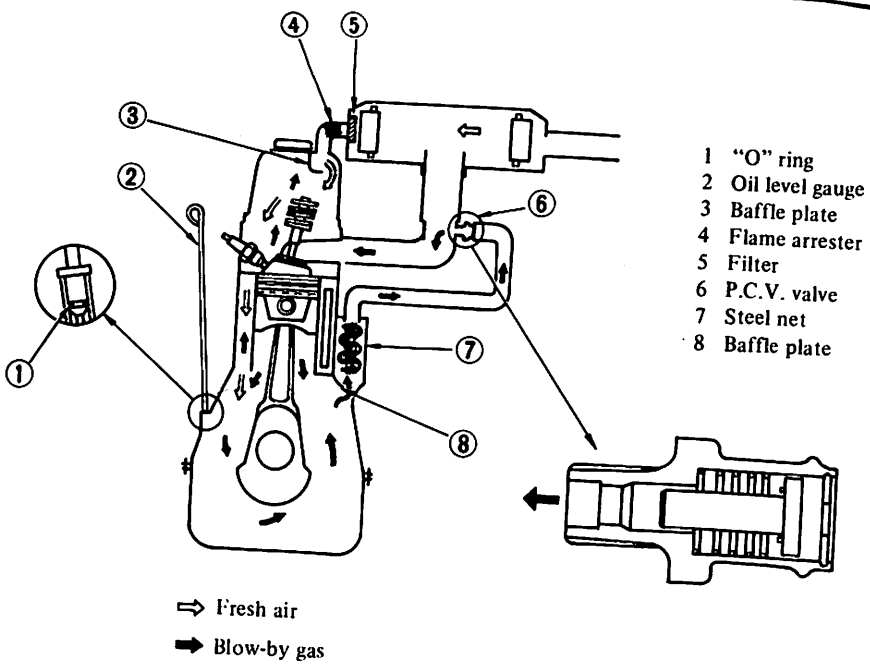


Fig. ET-20 Crankcase emission control system

CHECKING VENTILATION HOSES

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and blow them out with compressed air.

If any hose cannot be free of obstructions, replace.

Insure that flame arrester is surely inserted in the hose, between air cleaner and rocker cover.

CHECKING EXHAUST MANIFOLD HEAT CONTROL VALVE

1. Run engine and visually check counterweight to see if it operates properly.

(1) For some time after starting engine in cold weather, counterweight turns counterclockwise until it comes into contact with stopper pin installed to exhaust manifold.

Counterweight gradually moves down clockwise as engine warms up and ambient temperature goes higher around exhaust manifold.

(2) When engine speed is increased, discharge pressure of exhaust gases causes counterweight to move down-

(3) When heat control valve is in the full open position, counterweight moves further clockwise exceeding the position described in 1-(1) above, and stops again coming into contact with stopper pin.

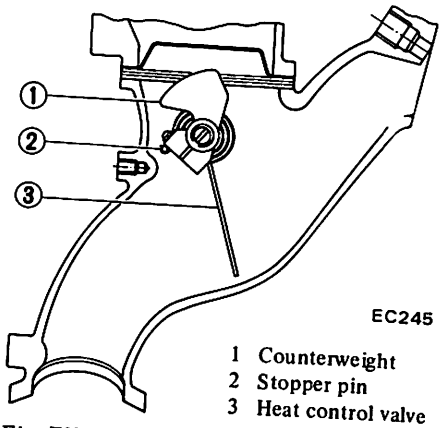


Fig. ET-21 Operation of counterweight

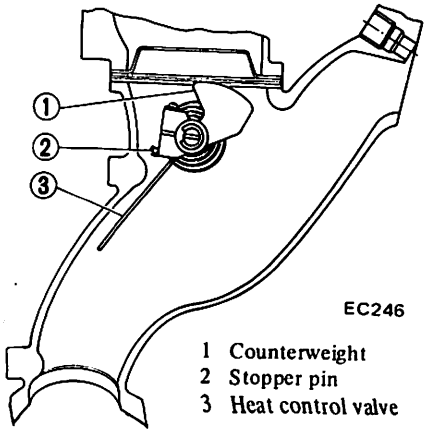


Fig. ET-22 Operation of counterweight

2. With engine stopped, visually check E.F.E. system for the following items.

(1) Thermostat spring for dismounting

(2) Stopper pin for bend, and counter weight stop position for dislocation

(3) Check heat control valve for malfunction due to break of key that locates counterweight to valve shaft.

(4) Check axial clearance between heat control valve and exhaust manifold. Correct clearance is 0.7 to 1.5 mm (0.028 to 0.059 in).

(5) Check welded portion of heat control valve and valve shaft for any indication of crack or flaking.

(6) Rotate heat control valve shaft by a finger, and check for binding between shaft and bushing in closing and opening operation of heat control valve. If any binding is felt in rotating operation, move valve shaft in the rotation direction several times. If this operation does not correct binding condition, it is due to seizure between shaft and bushing, and exhaust manifold should be replaced as an assembly.

CHECKING SPARK TIMING CONTROL SYSTEM

This system is not used on Sedan and Hardtop models desthined for California.

TRANSMISSION CONTROLLED VACUUM ADVANCE SYSTEM (Manual transmission models only)

1. Ensure that wiring connectors are tight in place.
2. Ensure that vacuum hoses are properly connected to their positions. See Figure ET-23.
3. Ensure that distributor vacuum controller properly functions.
4. Set timing light.
5. Run engine and keep it at approximately 1,800 rpm.
6. Disengage clutch. Shift gears in top, 3rd, then neutral positions. Read spark timing in respective shift positions.

The system is properly functioning if spark timing in both top and neutral positions is approximately 5° greater than that in 3rd position.

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7. If correct spark timing is not obtained in step 6 above, replace top detecting switch or neutral detecting switch as required.

Notes:

a. Engage the parking brake while the above check is being made. To protect against accidental forward surge, depress brake pedal while clutch pedal is being depressed.

b. When installing switches, apply lock agent to threads.

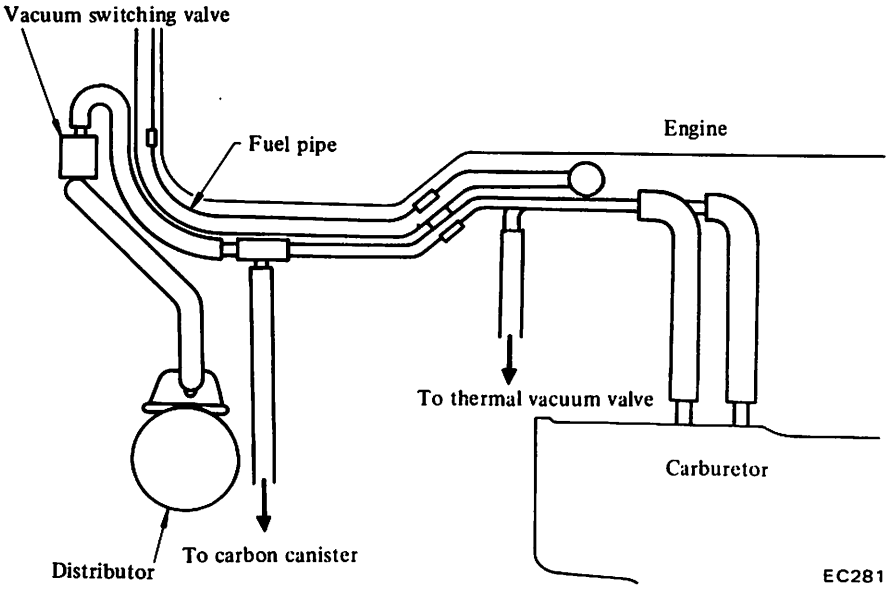
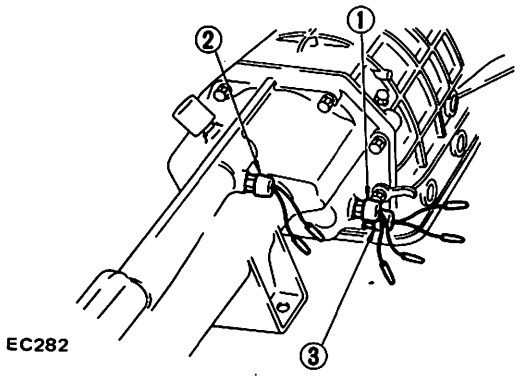


Fig. ET-23 Vacuum piping



1 Top detecting switch
2 Neutral detecting switch
3 Reverse lamp switch

Fig. ET-24 Neutral and top detecting switches

8. If spark timing does all in test described in st proceed as follows:

(1) Disconnect vacuum valve green wire connector.

(2) Set timing light.

(3) Run engine and keep proximately 1,800 rpm. Re timing.

(4) Connect vacuum switch green wire connector directly tery (+) terminal and rea timing.

(5) Vacuum switching valv mal if spark timing advance when connector does not cont tery (+) terminal. Replace neu top detecting switches. If spark does not vary at all in test ab place vacuum switching valve.

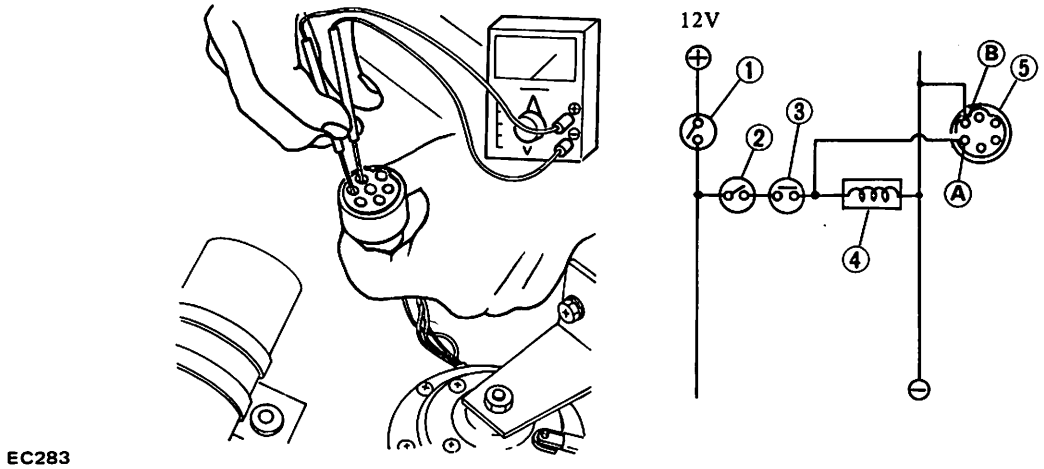
9. Check for continuity in ele wiring with a function test conn

Turn ignition switch on, b not run engine. Check for v across terminals A and B as sho Figure ET-25.

Gear position	Voltmeter indication
Neutral	0V
3rd	12V
4th (Top)	0V

Electrical wiring circuit is normal if voltmeter readings are as shown in chart above.

If readings are not shown, check for loose harness and burned fuse.



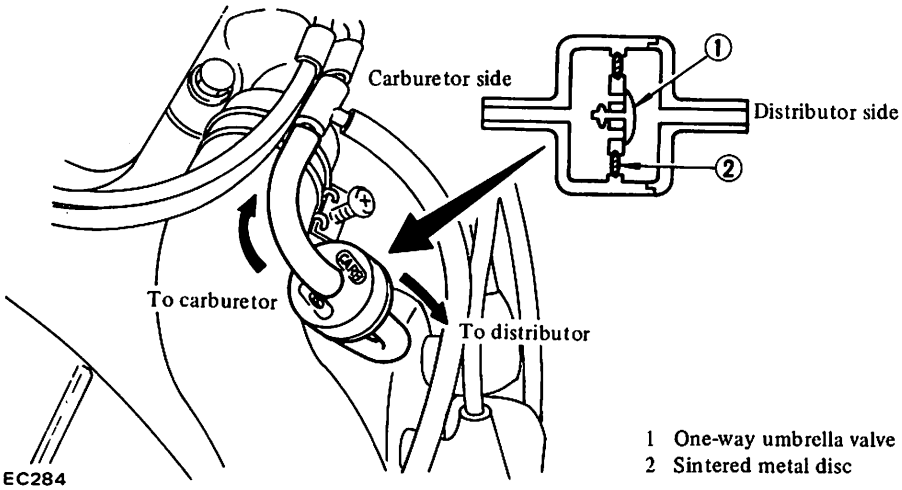
1 Ignition switch
2 Neutral detecting switch
3 Top detecting switch
4 Vacuum switching valve
5 Function test connector

Fig. ET-25 Checking for continuity in electrical wiring with function test connector

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SPARK DELAY VALVE (Automatic transmission models only)

This valve delays vacuum spark advance during rapid acceleration; it also cuts off the vacuum spark advance immediately upon deceleration. The valve is designed for one-way operation and consists of a one-way umbrella valve and sintered steel fluidic restrictor.



1 One-way umbrella valve
2 Sintered metal disc

Fig. ET-26 Spark delay valve

When installing this valve, ensure that it properly oriented. This valve should be replaced periodically. Refer to "Maintenance Schedule".

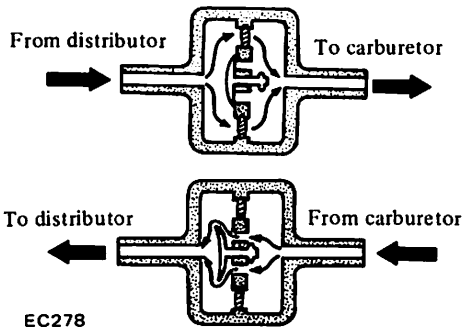
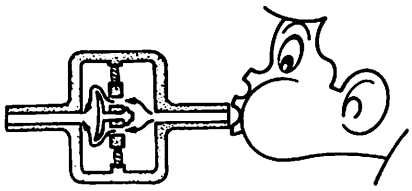


Fig. ET-27 Operation of spark delay valve

1. Remove spark delay valve.
2. Blow air through port on carburetor side, then through the other port (on distributor side). Spark delay valve is in good condition if, when finger is placed over port on distributor side, air flow resistance is greater than that on the other side.



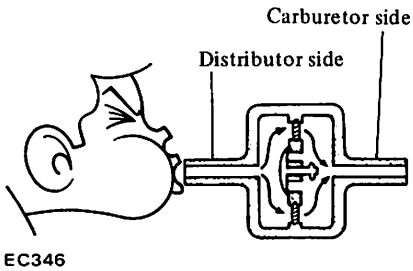


Fig. ET-28 Checking spark delay valve

3. If a considerable air flow resistance is felt at port on distributor side in step 2 above and if the condition of spark delay valve is questionable, dip port (on carburetor side) into a cup filled with water. Blow air through the other port. Small air bubbles should appear.

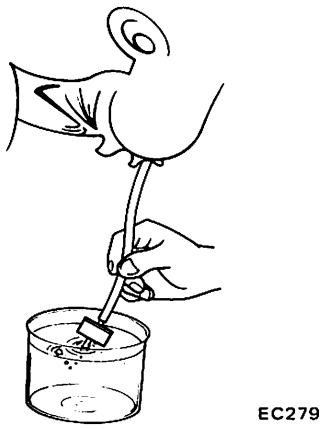


Fig. ET-29 Checking spark delay valve

Note: Be careful to avoid entry of oil or dirt into valve.

CHECKING AUTOMATIC TEMPERATURE CONTROL AIR CLEANER

1. Air cleaner element

Viscous paper type air cleaner element does not require any cleaning operation until it is replaced periodically. Brushing or blasting operation will cause clogging and result in enrichment of carburetor mixture, and should never be conducted. For replacement interval of air cleaner element, refer to "Maintenance Schedule".

2. Hot air control system

In warm weather, it is difficult to find out malfunction of hot air control system. In cold weather, however, malfunction of air control valve due to disconnection or deterioration of vacuum hose between intake manifold and vacuum motor and insufficient durability of air control valve will cause insufficient automatic control operation for intake air, and result in engine disorder including:

1) Stall or hesitation of engine operation
2) Increase in fuel consumption
3) Lack of power

These phenomena reveal malfunction of hot air control system. If these phenomena should occur, check hot air control system as described in the following before carrying out inspection of carburetor.

2-1 Vacuum hoses

(Intake manifold to 3-way connector, 3-way connector to temperature sensor, 3-way connector to idle compensator, temperature sensor to vacuum motor)

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1. Check that vacuum hoses are securely connected in correct position.
2. Check each hose for cracks or distortion, hose clip for condition.

Note: Vacuum hose position: L.H. side of "Nissan" mark on the top of sensor is for intake manifold; R.H. side of the mark is for vacuum motor.

2-2 Vacuum motor

1. With engine stopped, disconnect fresh air duct.

Place a mirror at the end of air cleaner inlet pipe as shown, and check to see if air control valve is in correct position.

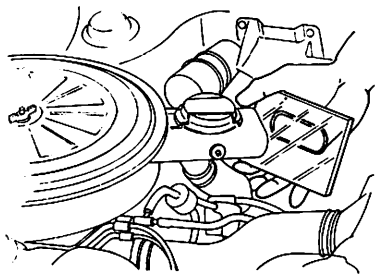


Fig. ET-30 Inspecting valve position

Air control valve is in correct position if its under hood air inlet is open and hot air inlet is closed. Check air control valve linkage for condition.

2. Disconnect vacuum motor inlet vacuum hose, and connect another hose to the inlet to apply vacuum to vacuum motor. Vacuum can be applied by breathing in the hose end as shown.

Place a mirror at the end of air cleaner inlet pipe, and check to see if air control valve is in correct position.

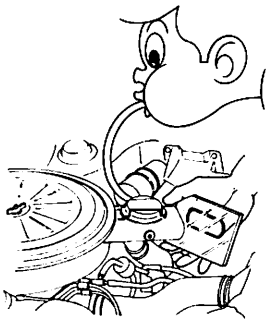


Fig. ET-31 Inspecting valve position

Correct position of air control valve is the reverse of paragraph 1 above. Air control valve is in correct position if under hood air inlet is closed, and hot air inlet is open.

3. With hot air inlet is open position, as described in paragraph 2 above, pinch vacuum hose with fingers and cut off air from vacuum hose. In this condition, check that air control valve maintains the condition described in step 2 for more than 30 seconds, and that hot air inlet is open. If diaphragm spring actuates the air control valve by its spring force to open under hood air inlet within 30 seconds, replace vacuum motor as an assembly since this may be resulted from air leak at vacuum motor diaphragm.

2-3 Temperature sensor

Check temperature sensor for function by proceeding as follows. Be sure to keep engine cold before starting test.

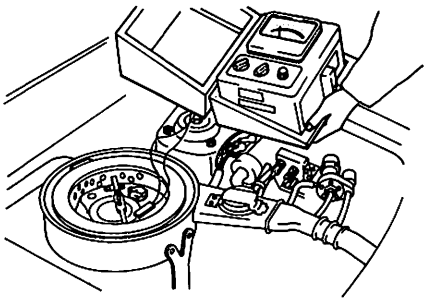
1. With engine off, check air control valve for condition. In this case, under hood air inlet is open. Use a mirror for inspection as 2-2-1 above.
2. Start engine and keep idling.

Immediately after engine starting, check air control valve for correct position as described above. In this case, correct position of air control valve is the reverse of 2-2-1; under hood air inlet is closed, and hot air inlet is open.

3. Check that air control valve gradually opens to under hood air inlet side as engine warms up. When environmental temperature around temperature sensor is low, spend more time for engine warming up operation to facilitate smooth operation of air control valve.

If the above test reveals any trouble in the operation of air control valve, carry out the following test.

4. Remove air cleaner cover. Set temperature sensing element of thermister or thermometer to a position where temperature around sensor can be measured. In this case, fix wiring of thermister or thermometer on the bottom surface of air cleaner with adhesive tape in such a manner that the set position of temperature sensing element will not be affected by air flow. Then install air cleaner cover.



EF219

Fig. ET-32 Checking temperature sensor

5. Carry out test as described in steps 1, 2 and 3 above. When air control valve begins to open to under hood air inlet side several minutes after engine starting, read the indication of thermister or thermometer. If reading falls within the working temperature range of temperature sensor, the sensor is normal. If reading exceeds the range, replace the sensor with new one.

Note: Before replacing temperature sensor, check idle compensator as described in section EF (Page EF-7).

OPERATING PRESSURE OF BOOST CONTROLLED DECELERATION DEVICE (B.C.D.D.) ADJUSTMENT

CHECKING B.C.D.D. CIRCUIT WITH FUNCTION TEST CONNECTOR

Manual transmission models

1. Check for continuity between Ⓐ and Ⓑ when car is brought to a complete stop. Refer to Figure ET-33.

B.C.D.D. circuit is functioning properly if continuity exists and voltmeter reading is 0 volt (d-c) in step 2 below.

If continuity does not exist, check for disconnected connector and/or faulty amplifier, speed detecting switch or B.C.D.D. solenoid valve.

2. Check for presence of voltage across Ⓐ and Ⓑ [at a speed of more than 16 km/h* (10 MPH)]. Refer to Figure ET-33.

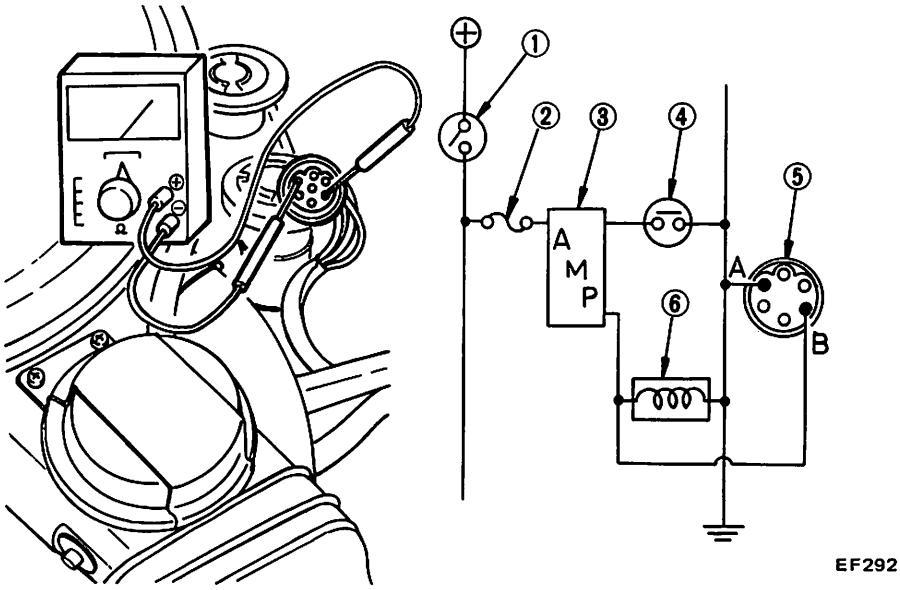
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* Conduct this test by one of the following two methods.

1) Raising up rear axle housing with stand.
2) Chassis dynamometer test

- If voltmeter reading is 0 volt at a speed of more than 16 km/h (10 MPH), circuit is functioning properly.
- If voltmeter reading is not 0 volt, check for disconnected connector, burned fuse, faulty amplifier, B.C.D.D. solenoid valve or speed detecting switch.

3. If, by above checks, faulty part or unit is located, it should be removed and tested again. If necessary, replace. See Figure ET-33.



1 Ignition key
2 Fuse
3 Amplifier
4 Speed detecting switch
Above 10 mph : OFF
Below 10 mph : ON
5 Function test connector
6 B.C.D.D. solenoid valve

Fig. ET-33 B.C.D.D. circuit with function test connector (Manual transmission models)

Automatic transmission models

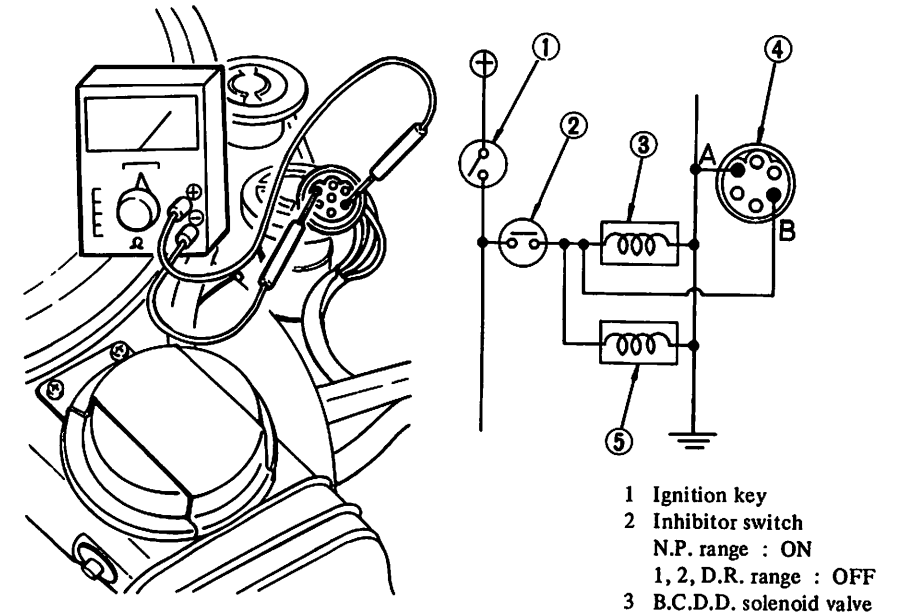
1. With inhibitor switch "ON" ("N" or "P" range), check for presence of voltage across Ⓐ and Ⓑ Refer to Figure ET-34.

- If voltmeter reading is 12 volts (d-c), B.C.D.D. circuit is functioning properly.
- If voltmeter reading is zero, check for disconnected connector, faulty solenoid valve or inhibitor switch.

2. With inhibitor switch "OFF" ("1", "2", "D" or "R" range), check for resistance between Ⓐ and Ⓑ Refer to Figure ET-34.

- If ohmmeter reading is 25 ohms or below, circuit is functioning properly.
- If ohmmeter reading is 32 ohms or above, check for poor connection of connector, faulty B.C.D.D. solenoid valve or inhibitor relay.

3. If, by above checks, faulty part or unit is located, it should be removed and tested again. If necessary, replace. See Figure ET-34.



1 Ignition key
2 Inhibitor switch
N.P. range : ON
1, 2, D.R. range : OFF
3 B.C.D.D. solenoid valve
4 Function test connector
5 Inhibitor relay

Fig. ET-34 Checking B.C.D.D. circuit with function test connector

ADJUSTMENT OF SET PRESSURE OF BOOST CONTROLLED DECELERATION DEVICE (B.C.D.D.)

Generally, it is unnecessary to adjust the B.C.D.D., however, if it should become necessary to adjust it, the procedure is as follows:

Prepare the following tools

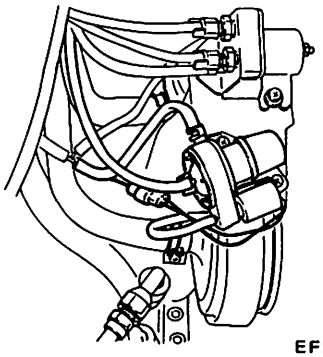
1. Tachometer to measure the engine speed while idling, and a screwdriver.
2. A vacuum gauge connecting pipe.

Note: A quick-response type boost gauge such as Bourdon's type is recommended; a mercury-type manometer should not be used.

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properly set the B.C.D.D. set pressure, proceed as follows:

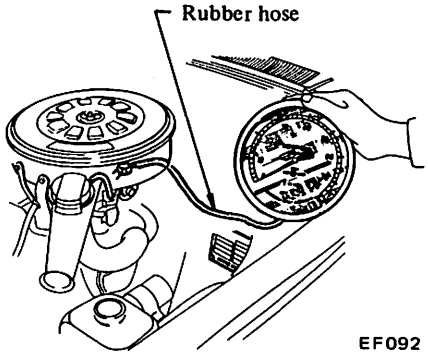
1. Remove the harness of solenoid valve.



EF294

Fig. ET-35 Removing harness of solenoid valve

2. Connect rubber hose between vacuum gauge and intake manifold as shown.



EF092

Fig. ET-36 Connecting vacuum gauge

3. Warm up the engine until it is heated to operating temperature.

Then adjust the engine at normal idling setting. (Refer to the item "Idling Adjustment" in page ET-11).

Idling engine speed
Manual transmission
750 rpm
Automatic transmission
(in "D" position)
650 rpm

4. Run the engine under no load. Increase engine speed to 3,000 to 3,500 rpm, then quickly close throttle valve.

5. At the time, the manifold vacuum pressure increases abruptly to –600 mmHg (–23.62 inHg) or above and then gradually decreases to the level set at idling.

6. Check that the B.C.D.D. set pressure is within the specified pressure.

Specified pressure (0 m, sea level and 760 mmHg (30 inHg), atmospheric pressure)

Manual transmission
–525 to –535 mmHg
(–20.7 to –21.0 inHg)
Automatic transmission
–505 to –515 mmHg
(–19.9 to –20.3 inHg)

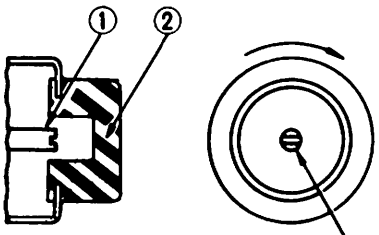
Notes:

a. **When atmospheric pressure is known, operating pressure will be found by tracing the arrow line "A". See Figure EF-39. When altitude is known, operating pressure will be found by tracing the arrow line "B". See Figure EF-39.**

b. **When checking the set pressure of B.C.D.D., find the specified set pressure in Figure ET-39 from the atmospheric pressure and altitude of the given location.**
For example, if an automatic transmission model car is located at an altitude of 1,000 m (3,280 ft), the specified set pressure for B.C.D.D. is 452 mmHg (17.8 inHg).

7. If it is higher than the set level, turn the adjusting screw counterclockwise until correct adjustment is made.

Note: Figure ET-39 shows method of adjusting set pressure on B.C.D.D. equipped with altitude compensator. B.C.D.D. without altitude compensator can be similarly adjusted.



1 Adjusting screw "S"
2 Cover "C"

ET037

Fig. ET-37 Adjusting set pressure

8. Race the engine and check for adjustment.

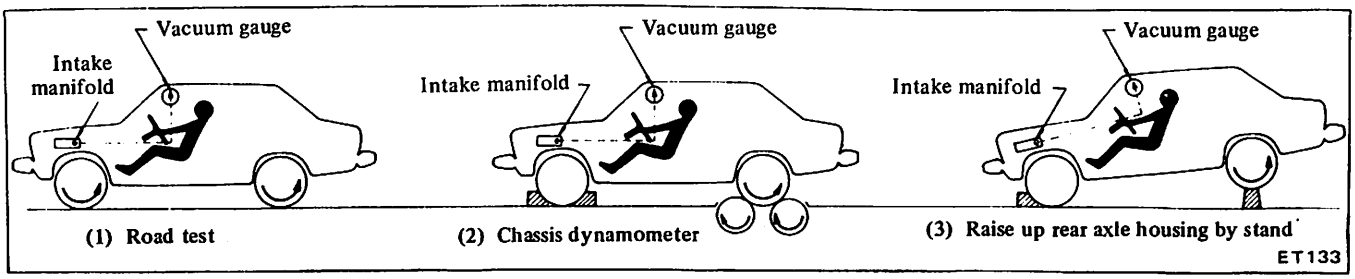
9. If it is lower than the set level, turn the adjusting screw clockwise until correct adjustment is made.

10. Race the engine and check for adjustment.

If engine speed cannot be decreased to idling when checking B.C.D.D. set pressure, proceed as follows:

When the engine speed does not fall to idling speed, it is necessary to reduce the negative idling pressure of the manifold to lower than the set pressure of the B.C.D.D. (The engine speed will not drop to idling speed when the negative idling pressure is higher than the set pressure of the B.C.D.D.).

In this case, the engine must be labored by ① road test or ② chassis dynamometer or ③ by raising up rear suspension member on a stand, accelerating the car to 64 to 80 km/h (40 to 50 MPH) in top gear (manual transmission) or in "D" range (automatic transmission), and then releasing the accelerator pedal and letting the car decelerate. After doing this, check whether the B.C.D.D. set pressure is at the predetermined value or not.



ET133

Fig. ET-38 Testing set pressure of the B.C.D.D.

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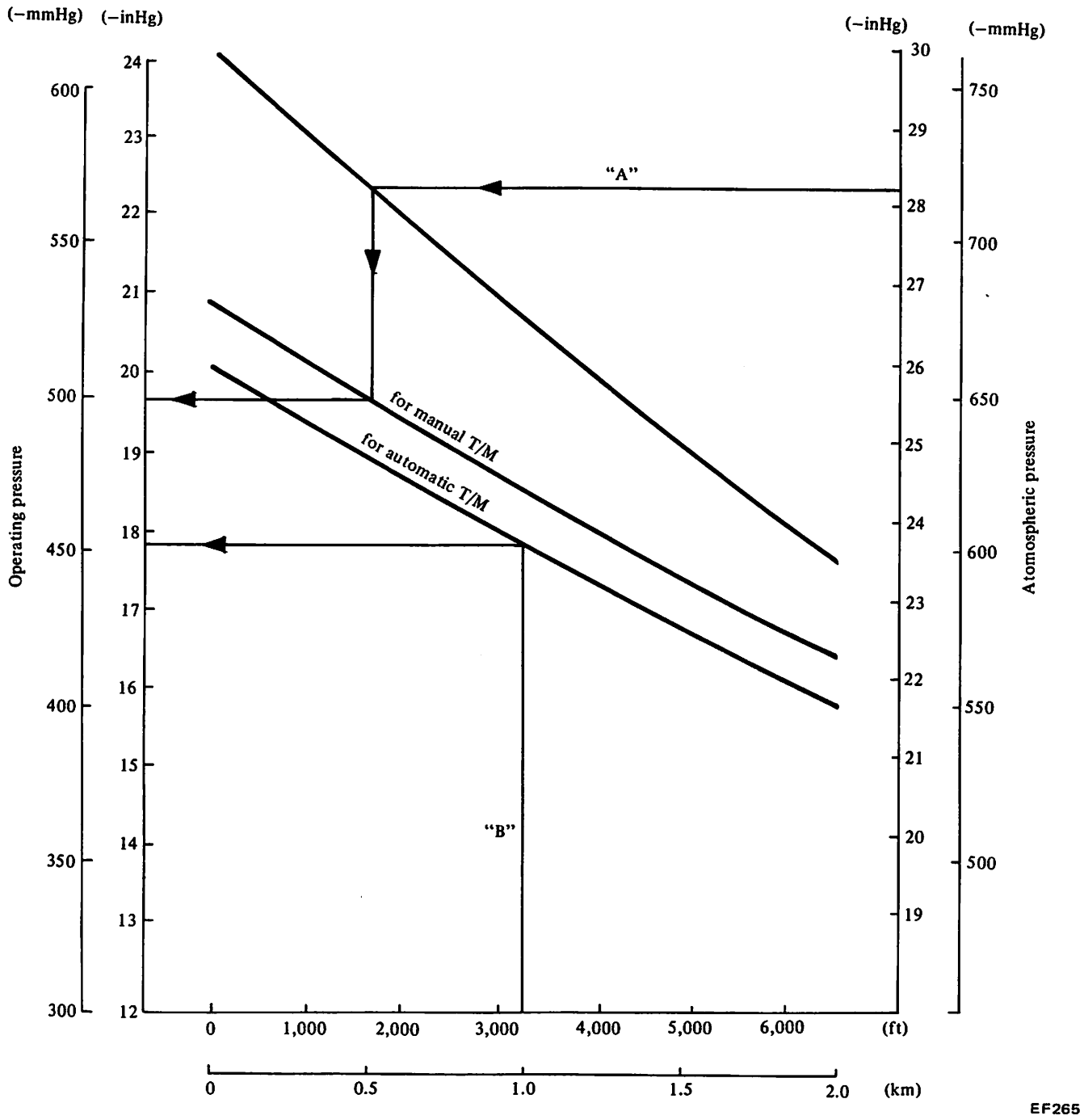


Fig. ET-39 Changes in set pressure versus changes in atmospheric pressure and altitude

CHECK B.C.D.D. SOLENOID VALVE

1. Turn on engine key. (Do not start engine.)
2. Ensure that solenoid valve clicks when intermittently electrified as shown in Figure ET-40.

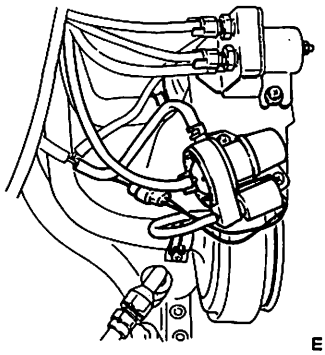


Fig. ET-40 Checking solenoid valve

3. If a click is heard, solenoid valve is normal.
4. If a click is not heard at all, check for continuity with a circuit tester. If discontinuity is detected, replace solenoid valve.

CHECK AMPLIFIER (Manual transmission models)

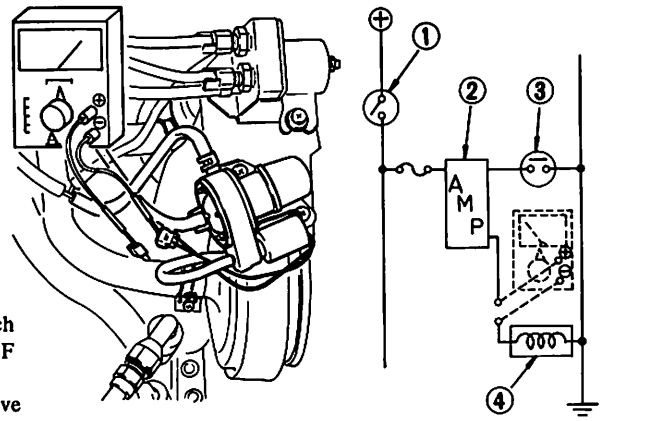
The amplifier is installed at the rear

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of the speedometer. To check, proceed as follows:

1. Set circuit tester in d-c ampere range (1A min, full scale), connect test probes of tester as shown in Figure ET-41.

Do not confuse positive line with negative line.



1 Ignition key
2 Amplifire
3 Speed detecting switch
Above 10 mph : OFF
Below 10 mph : ON
4 B.C.D.D. solenoid valve

Fig. ET-41 Checking amplifier

2. Turn ignition key to "ON" position.
3. Ensure that tester pointer deflects when ignition key is turned on.
4. If tester pointer does not deflect when solenoid valve and speed detecting switch circuits are functioning properly, amplifier is faulty.

CHECKING AIR INJECTION SYSTEM

Air injection system hoses

Check air system hoses for loose connections, cracks, or deterioration. Retighten or replace if necessary.

Air system manifold

Check air gallery pipe and injection nozzles for loose connections and cracks. Retighten or replace if necessary.

Air pump

1. Operate engine until it reaches normal operating temperature.
2. Inspect all hose, hose connections, and air gallery for leaks and correct, if necessary, before checking air injection pump.
3. Check air injection pump belt tension and adjust to specifications if necessary.
4. Disconnect air supply hose at check valve.
5. Disconnect vacuum hose from the air control valve (California only).
6. Insert open pipe end of Air Pump Test Gauge Adapter ST19870000 in air supply hose. Clamp hose securely to adapter to prevent it from blowing out. Position adapter and test gauge so that air blast emitted through drilled pipe plug will be harmlessly dissipated.
7. Install a tachometer on engine. With engine speed at 2,600 rpm observe pressure produced at test gauge.

Air pressure should be 100 mmHg (3.94 inHg) or more.

8. If air pressure does not meet above specifications, proceed as follows:

(1) Repeat 2 and 3 above.
(2) Disconnect air supply hose at anti-backfire valve. Plug air hose opening, and screw with a clamp. Repeat pressure test.
(3) With engine speed at 1,500 rpm close hole of test gauge by finger. If a leaking sound is heard or leaking air is felt by finger at relief valve, relief valve is malfunctioning. Relief valve should be replaced or repaired.
(4) If air injection pump does not meet minimum requirement of pressure test, it should be replaced.

Control valve

The following procedures are recommended for checking and/or ascertaining that the various components of the exhaust emission control system are operating properly.

The engine and all components must be at normal operating temperatures when the tests are performed. Prior to performing any extensive diagnosis of the exhaust control system, it must be determined that the engine as a unit is functioning properly.

Check valve

1. Warm up engine thoroughly.
2. Disconnect hose leading to check valve from air hose connector.
3. Check hose for any indication of exhaust gas leaks. If leaks are detected, replace the hose.
4. Race the engine lightly (at about 2,000 rpm) and then return it to idling. Visually check the hose for any indication of exhaust gas leaks before the engine returns to idling speed. If leaks are detected, replace check valve.

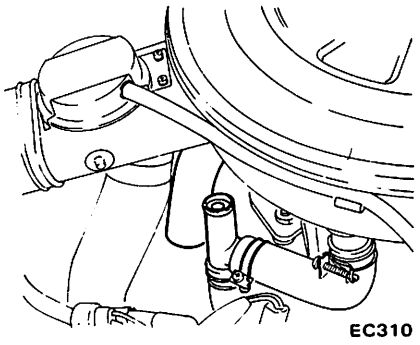


Fig. ET-42 Checking check valve

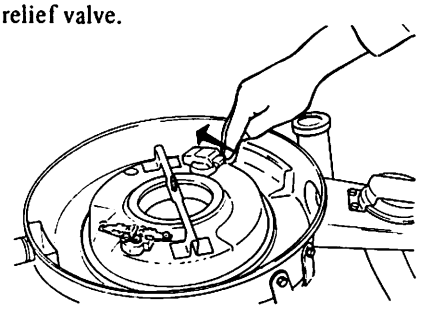
Air pump relief valve

After completing inspection of air pump, check air pump relief valve in the following steps:

1. Disconnect hoses leading to check valve and air control valve from air hose connector, and install blind cap to the connector.

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2. With engine running at about 3,000 rpm under no load, place your hand on the air outlet of air pump relief valve to check for discharged air. If no air is felt, replace the air pump relief valve.



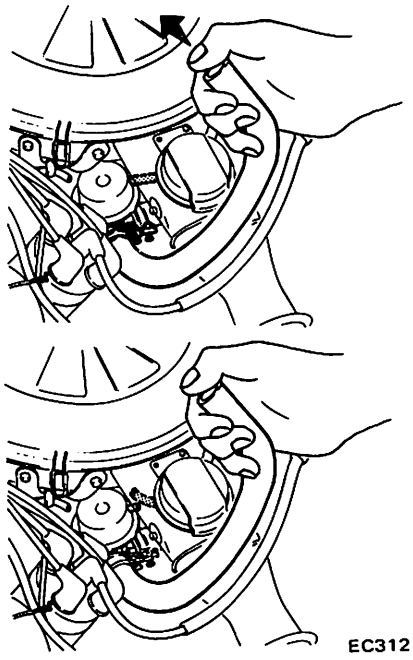
EC311

Fig. ET-43 Checking air pump relief valve

Air control valve

1. Warm up engine thoroughly.
2. Before checking air control valve, check all hoses for loose connection, leaks, etc., and repair or correct if necessary.
3. With engine idling, disconnect the outlet side hose of the air control valve, and place your hand on the air hose outlet to check for air. If no air is felt, replace the air control valve.
4. Pull vacuum hose off from air control valve. If discharge of air from air hose stops, the air control valve is normal. If discharge is still felt, replace the valve.

Plug up the removed vacuum hose, preventing dust from entering.



EC312

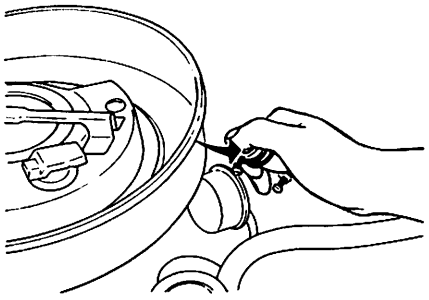
Fig. ET-44 Checking air control valve

Emergency air relief valve

See the section "Catalytic Converter" for checking procedure.

Anti-backfire valve (A.B. valve)

1. Warm up engine thoroughly.
2. Disconnect hose from air cleaner, and place a finger near the outlet.
3. Run engine at about 3,000 rpm under no load, then quickly return it to idling. If you feel a pull or suction force on your finger, the anti-backfire valve is functioning normally. If no suction is felt, replace the anti-backfire valve.

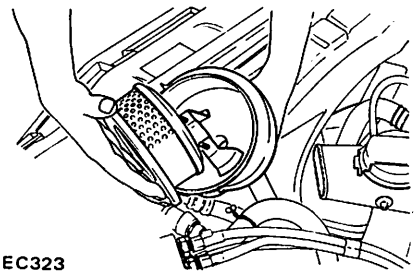


EC313

Fig. ET-45 Checking anti-backfire valve

REPLACING AIR PUMP AIR CLEANER ELEMENT

Remove air hose, then detach air cleaner from hoodledge. Air cleaner element and air cleaner lower body are built into a unit construction. Replace air cleaner element and lower body as an assembly.



EC323

Fig. ET-46 Replacing air cleaner element

CHECKING EXHAUST GAS RECIRCULATION (E.G.R.) CONTROL SYSTEM

Checking E.G.R. control system in its mounted condition

1. Make a thorough visual check of E.G.R. control system. If necessary, wipe away oil to facilitate inspection. If hoses are cracked or broken, replace.

2. With engine running, check E.G.R. warning system for proper function. Make sure that E.G.R. warning lamp lights when ignition switch is turned to START-position (starter motor runs). If E.G.R. warning lamp does not light, inspect harnesses and connectors or replace warning lamp. Then turn ignition switch to ON position, and check the following items:

(1) If odometer of detector drive counter has not reached 50,000 counts, make sure that E.G.R. warning lamp does not light.
(2) If odometer of detector drive counter has attained 50,000 counts, make sure that E.G.R. warning lamp lights.

If warning lamp does not light, check harnesses, connectors, and detector drive counter; replace warning lamp or detector drive counter if necessary.

Notes:

a. Operation of E.G.R. warning lamp is as follows:

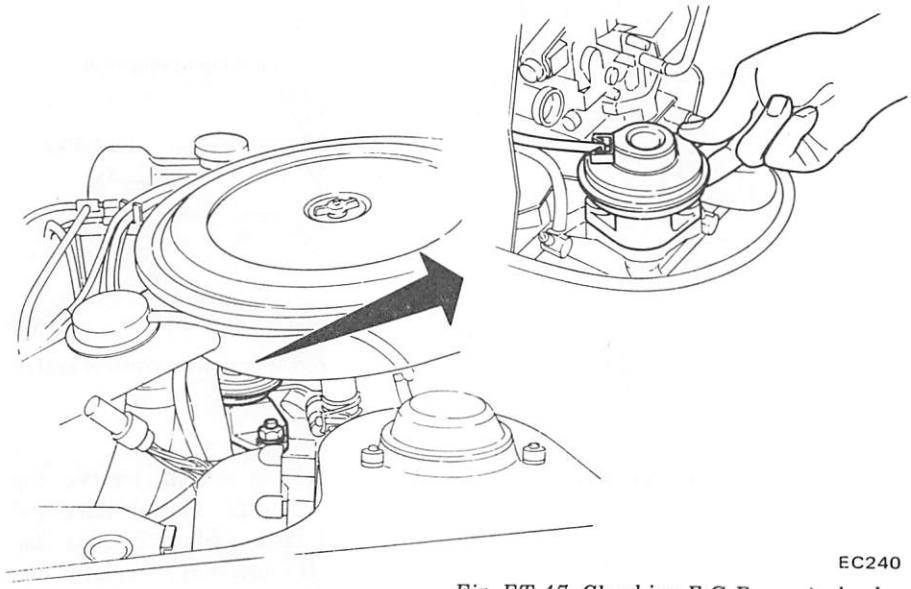
Ignition Switch Position	START	ON	
Detector Drive Counter	–	Below 50,000 counts	Above 50,000 counts
E.G.R. Warning Lamp	ON	OFF	ON

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b. **After completing inspection of E.G.R. control system, be sure to reset odometer of detector drive counter to zero.**

c. **This item applies to all 710 car except those bound for California and Canada.**

3. With engine stopped, inspect E.G.R. control valve for any indication of binding or sticking by moving diaphragm of control valve upwards with a finger.



EC240

Fig. ET-47 Checking E.G.R. control valve

4. With engine running, inspect E.G.R. control valve and thermal vacuum valve for normal operation.

(1) When engine coolant temperature is low:

Make sure that E.G.R. control valve does not operate when engine speed is increased from idling to 3,000 to 3,500 rpm.

Place a finger on the diaphragm of E.G.R. control valve to check for valve operation.

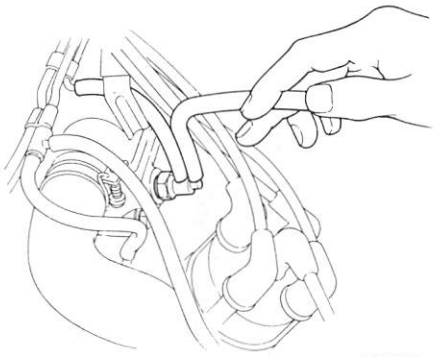
(2) When engine coolant temperature is high:

1) Make sure that E.G.R. control valve operates when engine speed is increased from idling to 3,000 to 3,500 rpm. Place a finger on the diaphragm of E.G.R. control valve to check for valve operation.

2) If E.G.R. control valve does not operate, check as follows:

- Disconnect one end (E.G.R. control valve side) of vacuum hose connecting thermal vacuum valve to E.G.R. control valve.
- Increase engine speed from idling to 3,000 to 3,500 rpm.
- Make sure that thermal vacuum valve is open, and that carburetor vacuum is present at the end (E.G.R. control valve side) of vacuum hose.

If vacuum is weak or not present at all, replace thermal vacuum valve. If vacuum is present, replace E.G.R. control valve.



EC254

Fig. ET-48 Checking thermal vacuum valve

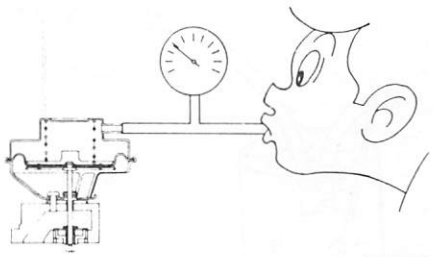
If any difficulty is encountered in judging the condition of any component during above inspection, check the questionable component independently as follows:

E.G.R. control valve

Dismount E.G.R. control valve from engine.

1. Apply vacuum to E.G.R. control valve, referring to the following figure. If the valve moves to full position, it is normal.

E.G.R. control valve will remain open for more than 30 seconds after vacuum has cut off.

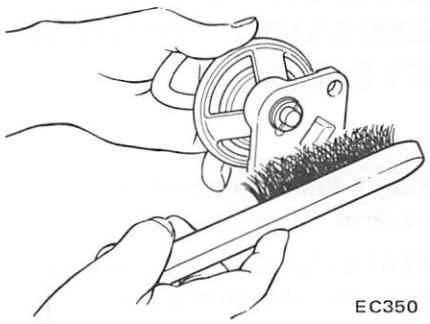


ET152

Fig. ET-49 Checking E.G.R. control valve

2. Visually check E.G.R. control valve for damage, wrinkle or deformation.

3. Clean the seating surface of E.G.R. control valve with a brush and compressed air, and remove foreign matter from around the valve and port.



EC350

Fig. ET-50 Cleaning E.G.R. control valve

Thermal vacuum valve

Dismount thermal vacuum valve from engine.

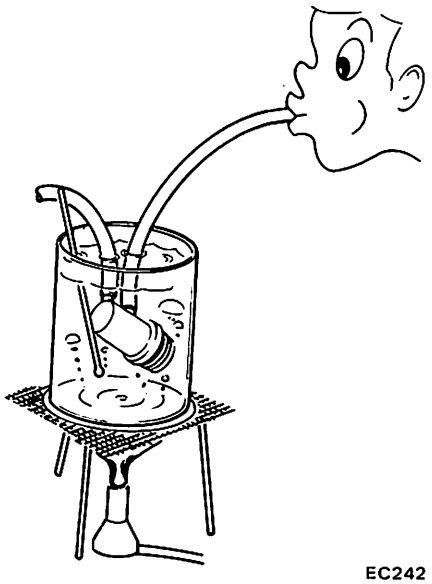
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Note: Before dismounting, drain engine coolant from engine.

Apply vacuum to thermal vacuum valve and check to be sure that thermal vacuum valve opens or closes in response to engine coolant temperature as specified.

Thermal vacuum valve should open at a temperature of 57 to 63°C (134 to 145°F) completing the vacuum passage. .

Note: Do not allow water to get inside the thermal vacuum valve.



EC242

Fig. ET-51 Checking thermal vacuum valve

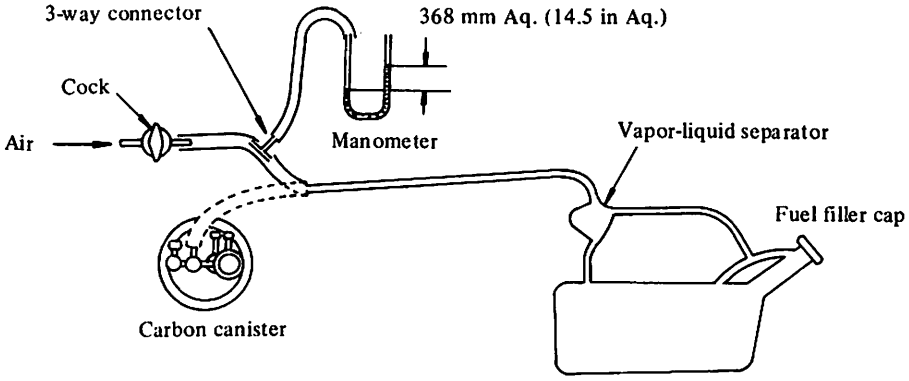
CHECKING EVAPORATIVE EMISSION CONTROL SYSTEM

Vapor lines and fuel vapor control valve

Checking fuel tank, vapor liquid separator and vapor vent line

1. Check all hoses and fuel tank filler cap.
2. Disconnect the vapor vent line connecting carbon canister to vapor-liquid separator.
3. Connect a 3-way connector, a manometer and a cock (or an equivalent 3-way charge cock) to the end of the vent line.
4. Supply fresh air into the vapor vent line through the cock little by little until pressure becomes 368 mmAq (14.5 inAq).
5. Shut the cock completely and leave it unattended.
6. After 2.5 minutes, measure the height of the liquid in the manometer.
7. Variation of height should remain with 25 mmAq (1.10 inAq).
8. When filler cap does not close completely, the hieght should drop to zero in a short time.
9. If the height does not drop to zero in a short time when filler cap is removed, it is the cause of a stuffy hose.

Note: In case the vent line is stuffy, the breathing in fuel tank is not thoroughly made, thus causing insufficient delivery of fuel to engine or vapor lock. It must, therefore, be repaired or replaced.



EF198

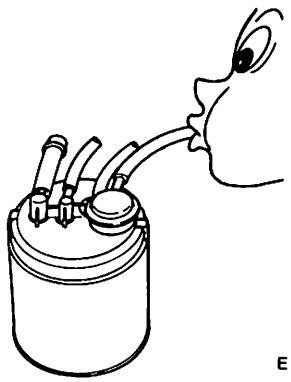
Fig. ET-52 Checking evaporative emission control system

Checking carbon canister purge control valve

Check for fuel vapor leakage, in the distributor VC line, at diaphragm of carbon canister purge control valve.

To check for leakage, proceed as follows:

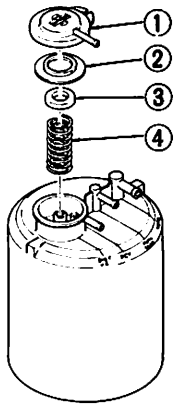
1. Disconnect rubber hose, in the line, between T-connector and carbon canister at T-connector.
2. Inhale air into the opening of rubber hose running to vacuum hole in carbon canister and ensure that there is no leak.



EF199

Fig. ET-53 Checking carbon canister purge control valve

3. If there is a leak, remove top cover from purge control valve and check for dislocated or cracked diaphragm. If necessary, replace diaphragm kit (which is made up of a retainer, diaphragm and spring).



1 Cover
2 Diaphragm
3 Retainer
4 Diaphragm spring

EF200

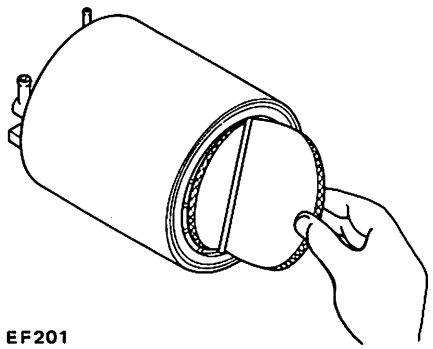
Fig. ET-54 Carbon canister purge control valve

Carbon canister filter

Check for a contaminated element.

Element can be removed at the bottom of canister installed on car body.

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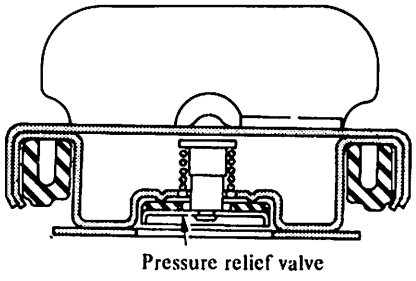
EF201

Fig. ET-55 Replacing carbon canister filter

Fuel tank vacuum relief valve operation

Remove fuel filler cap and see it functions properly.

1. Wipe clean valve housing and have it in your mouth.
2. Inhale air. A slight resistance accompanied by valve indicates that valve is in good mechanical condition. Note also that, by further inhaling air, the resistance should be disappeared with valve clicks.
3. If valve is clogged, or if no resistance is felt, replace cap as an assembled unit.



EF271

Fig. ET-56 Fuel filler cap

CHECKING CATALYTIC CONVERTER

INSPECTION

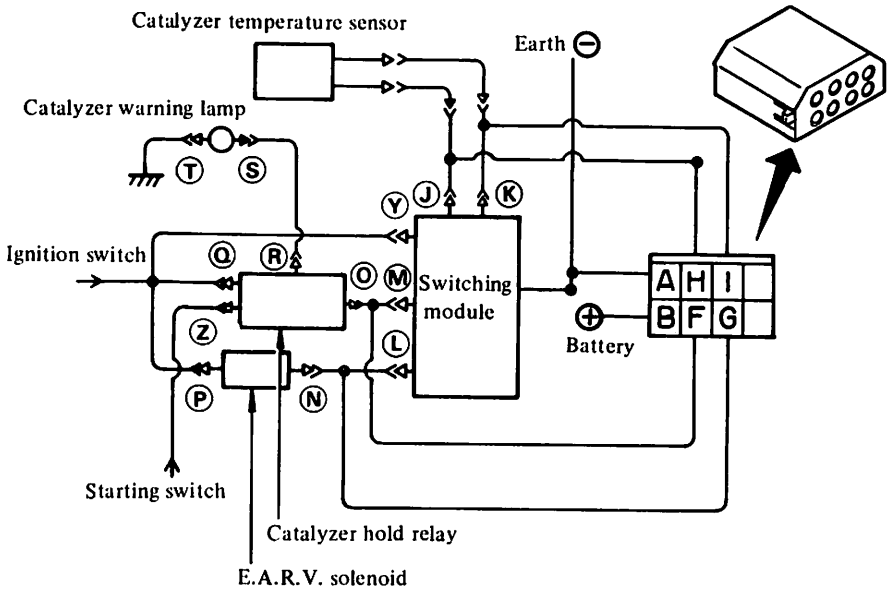
Preliminary inspection

Visually check condition of all component parts including hoses, tubes, and wires, replace if necessary.

catalyzer protector and catalyzer warning device

1. Apply parking brake and place wheel lock under each tire.
2. Make sure that shift lever is in NEUTRAL position on manual transmission models, or in "P" position on automatic transmission models.
3. Run engine at idling speed.
4. Make sure that catalyzer warning lamp is not lit. If catalyzer warning lamp is lit up, see the item "Inspection when catalyzer warning lamp lights".
5. Place hand on E.A.R.V. air cleaner and check that air is not being discharged from it. If air is felt on hand, disconnect the catalyzer temperature sensor and carry out inspection as described under "Inspection of E.A.R.V. (with solenoid valve)". If no abnormality is found in these inspections, replace switch module.
6. Using connector terminal (Refer to Figure ET-57.) provided for factory function test, check each connector for proper connection.

Make a thorough check of switching module, E.A.R.V. (with solenoid valve), catalyzer hold relay and catalyzer warning lamp, proceeding as follows:



EC226

Fig. ET-57 Circuit diagram of catalyzer protector and warning device

(1) Using a circuit tester, check continuity between terminal Ⓨ and ignition switch, between terminal Ⓩ and starting switch, and between terminals Ⓡ and Ⓣ. If continuity does not exist, repair. After repair reconnect connectors to their original positions.

(2) Using a circuit tester, measure voltage across terminals Ⓕ and Ⓐ when terminals Ⓗ and Ⓘ in Figure ET-57 are open. If circuit tester indicates 12V, the points Ⓞ and Ⓠ are normal. If it indicates 0V, reconnect points Ⓞ and Ⓠ. If circuit tester still indicates 0V, check wires for discontinuity, and repair if necessary.

(3) Using a circuit tester, measure voltage across terminals Ⓖ and Ⓐ when terminals Ⓗ and Ⓘ in Figure ET-57 are open. If circuit tester indicates 12V, points Ⓝ and Ⓟ are normal. If circuit tester indicates roughly 0V, reconnect points Ⓝ and Ⓟ. If circuit tester still indicates roughly 0V, check wires for discontinuity, and repair if necessary.

(4) Using a wire, shortcircuit terminals Ⓗ and Ⓘ in Figure ET-57. If circuit tester indicates roughly 0V across terminals Ⓕ and Ⓐ, points Ⓚ, Ⓙ, and Ⓜ are normal. If circuit tester indicates 12V, reconnect points Ⓚ, Ⓙ and Ⓜ. If circuit tester still indicates 12V, check wires for discontinuity, and repair if necessary.

(5) Using a wire, shortcircuit terminals Ⓗ and Ⓘ in Figure ET-57. If circuit tester indicates roughly 0V across terminals Ⓖ and Ⓐ, points Ⓚ, Ⓙ, and Ⓛ are normal. If circuit tester

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indicates 12V, reconnect terminals Ⓚ, Ⓙ, and Ⓛ. If circuit tester still indicates 12V, check wires for discontinuity, and repair if necessary.

(6) Connect a wire between terminals Ⓗ and ① in Figure ET-57. Place hand on E.A.R.V. air cleaner, and check for air discharge. If air is felt on hand, the unit is normal. If air is not felt at all, check condition of E.A.R.V. (with solenoid valve). If E.A.R.V. (with solenoid) is normal, replace switching module.

(7) Connect a wire between terminals Ⓗ and ① in Figure ET-57.

If catalyzer warning lamp lights, the unit is normal. If warning lamp does not light, check condition of warning lamp (Refer to "Inspection of catalyzer warning lamp".) and catalyzer hold relay (Refer to "Inspection of catalyzer hold relay".). If catalyzer warning lamp and hold relay are normal, replace switching module.

The catalyzer temperature sensor

Before checking, ensure that catalytic converter is inspected as outlined and that secondary air is present at exhaust manifold.

1. Apply parking brake.
2. Shift transmission into Neutral (for manual transmission) and Park or Neutral (for automatic transmission models).
3. Connect a tachometer to the engine.
4. Thoroughly warm up the engine.
5. Stop the engine after warm-up.
6. Disconnect high tension cord (to No. 1 cylinder) at distributor.
7. Ensure that catalyzer temperature sensor connector located under driver seat is tight in place.
8. Disconnect 2-pin catalyzer temperature sensor connector (green) on the dash side.
9. Turn circuit tester knob to 100kΩ range and adjust zero point.
10. Attach test leads of circuit tester to the sensor side of connector that has been disconnected in step 8 above, and take a tester reading.
11. Tester reading should be more than 50kΩ. If below this value, replace sensor.
12. Accelerate the engine and observe tachometer to ensure that engine speed is set at 2,500 rpm.

Note: Do not run the engine at more than 3,000 rpm.

13. Keep the engine running at 2,500 rpm for two minutes.
14. Observe tester reading during the operation in step 13 above. Resistance on tester scale should decrease. If not, replace sensor.
15. Reduce engine speed and stop the engine.

Notes:

a. Do not run the engine continuously for more than two minutes.

b. After the above test has been made, connect high tension cord (to No. 1 cylinder) to its original position in distributor.

Checking catalytic warning lamp

If catalytic warning lamp does not go on when starter switch is turned on, check for a faulty lamp. If lamp is not faulty, check for discontinuity in the line between starter switch and warning lamp. Also check wires from the start switch to the warning lamp. Repair or replace as necessary.

Inspection of catalyzer hold relay

1. Disconnect connectors of hold relay.
2. Attach tester positive lead to terminal ③ and negative lead to terminal ④. Continuity should exist.
3. Attach tester positive lead to terminal ④ and negative lead to terminal ③. Discontinuity should exist.
4. Make sure that continuity exists between terminals ① and ②.
5. Make sure that discontinuity exists between terminals ① and ③.
6. Apply a voltage of 12V to terminal ①, and make sure that continuity exists between terminals ① and ③.
7. Reset catalyzer hold relay. To reset, remove reset hole cover of catalyzer hold relay, and insert a bar of 5 mm (0.197 in) dia. into reset hole.

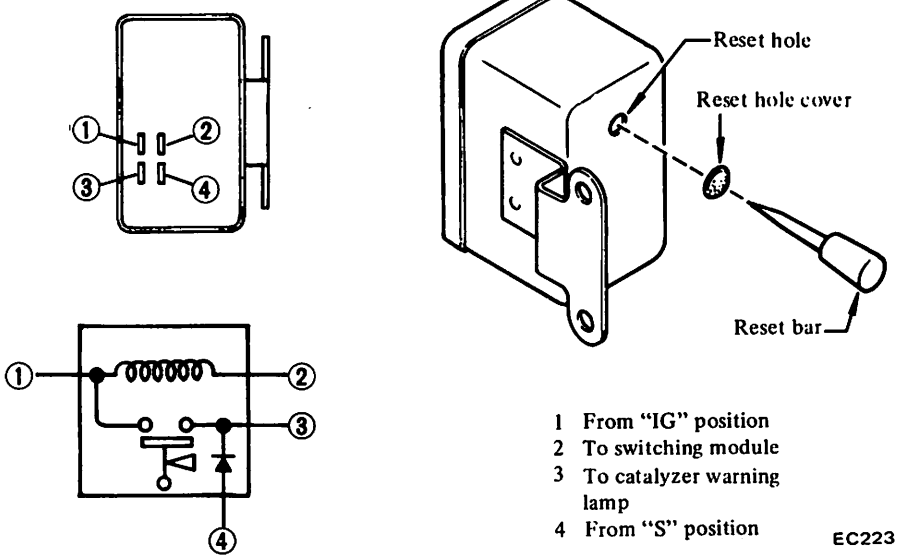


Fig. ET-58 Checking method of catalytic hold relay

E.A.R.V. (With solenoid valve)

1. Apply parking brake and place wheel lock under each tire.
2. Make sure that shift lever is in NEUTRAL position on manual transmission models, or in PARK position on automatic transmission models.
3. Run engine at idling speed.
4. Disconnect hose ⑤. After making sure that air is being discharged from the hose, reconnect it.

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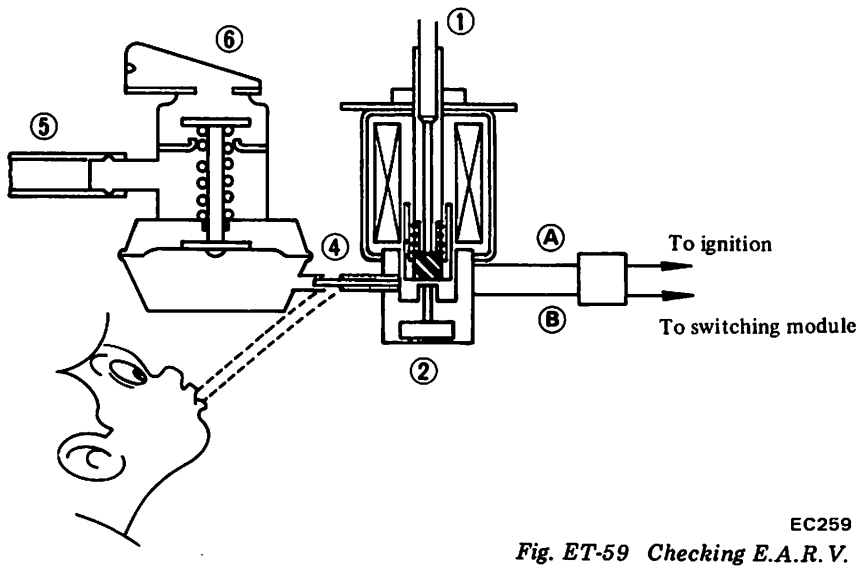


Fig. ET-59 Checking E.A.R.V.

5. Disconnect connectors Ⓐ and Ⓑ, and make sure that air is not being discharged from air cleaner ⑥. If air discharge is felt on hand, follow procedure outlined in step 7.
6. Connect terminals Ⓐ and Ⓑ to 12V battery. Make sure that air is being discharged from air cleaner ⑥. If air is not felt on hand, follow procedure outlined in step 7.
7. If any trouble is encountered in step 5 or 6 above, proceed as follows:
(1) Stop the engine and disconnect tubes ① and ④. Then connect terminals Ⓐ and Ⓑ to 12V battery. Blow through tube ④, and make sure that air comes out of position ② and no air comes out of tube ①.
(2) Disconnect terminals Ⓐ and Ⓑ from battery. Blow through tube ④, and make sure that air comes out of tube ① and no air comes out of position ②.

If the above conditions are confirmed, replace the E.A.R.V. unit. If not, replace solenoid valve.

Catalytic converter

After carrying out idle CO adjustment (Refer to "Idle CO Adjustment".), connect the check valve hose, and charge the secondary air to the check valve. Run engine at idling speed, and measure CO content at the end of exhaust tail pipe. If CO content is less than 0.3%, catalytic converter is normal. If CO content is above 0.3%, replace catalytic converter.

When catalyzer warning lamp lights

If catalyzer warning lamp lights, carry out inspection, proceeding as follows:

1. Inspection of wire harness for shortcircuit
(1) With cold catalytic converter, disconnect connectors of catalyzer temperature sensor, and measure resistance of catalyzer temperature sensor with a circuit tester. If resistance is more than 50kΩ, the unit is normal. If resistance is less than 50kΩ replace catalyzer temperature sensor.
(2) Check catalyzer protector device. (Refer to "Inspection of Catalyzer Protector".)
2. Check fuel system with regard to the following items: (Refer to "Inspection of Fuel System".)
1) Float level
2) Choke
3) Normal fuel supply system (Primary and secondary)
4) Accelerator pump
5) Power valve
6) B.C.D.D.
7) Fuel strainer
8) Air cleaner

3. Check ignition system with regard to the following items: (Refer to "Inspection of Ignition System".)
1) Ignition AMP.
2) Distributor
3) Ignition coil
4) High tension code
5) Spark plug

4. Check idle CO adjustment. (Refer to "Inspection of Idle CO Adjustment")
5. Check catalytic converter. (Refer to "Inspection of Catalytic Converter".)

6. Check catalyzer temperature sensor. (Refer to "Inspection of Catalyzer Temperature Sensor".)

CHECKING FLOOR TEMPERATURE WARNING SYSTEM

INSPECTION

Floor warning temperature system

Apply parking brake. Shift gears into Neutral (for manual transmission) and Neutral or Park (for automatic transmission).

1. Ensure that floor temperature warning lamp lights when ignition switch is turned to the "S" position.
If not, check lamp for burned bulbs.
Replace bulb if bulb is burned out.
If bulb is not burned, trace wire(s) back to ignition switch. Repair or replace if necessary.
2. Be sure that floor temperature is cool [below 176°F (80°C)] before carrying out the following procedure.
(1) Remove rear seat.
(2) Ignition switch is turned to the "IG" position.
(3) Ensure that floor temperature warning lamp goes out.
(4) Heat surrounding areas of floor temperature sensing switch with a proper heater to ensure that floor temperature warning lamp glows when floor is heated to the specifications as shown in the table below.

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Temperature sensing switch	Temperature warning lamp	Floor temperature		
		610	710	W610, W710
Contact close	Off	Below 239°F (115°C)		
Contact open	On	Above 239°F (115°C)		

Note: Avoid heating floor temperature sensing switch directly.

If lamp does not glow, check floor temperature sensing switch connector for continuity with a circuit tester.

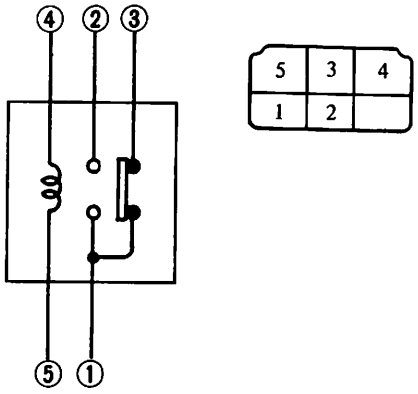
If continuity should exist after heated surrounding areas of floor temperature sensing switch, replace temperature sensing switch.

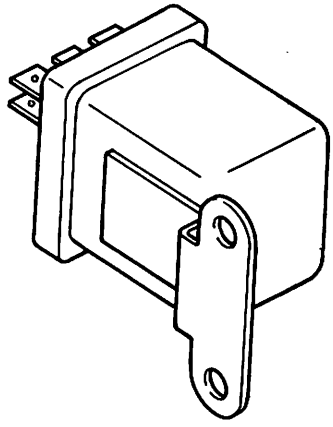
If continuity does not exist, trace the wiring back to relay or check the following step 3. Repair or replace wire(s) if necessary.

Note: The floor temperature sensing switch may be heated through the floor by a proper heater.

3. Turn ignition switch to the "IG" position, and disconnect floor temperature sensing connector. The lamp should remain on. If not, check floor temperature relay for continuity with a circuit tester.

Referring to the following floor temperature relay, if relay is normal, trace wire(s) back to ignition switch. Repair faulty wiring.





1 To floor temperature warning lamp
2 From "S" position
3 From "IG" position
4 From ignition switch
5 To floor temperature sensing switch

EC343

Fig. ET-60 Checking floor temperature relay

Floor temperature relay

To check floor temperature relay, remove it and proceed as follows:

1. Check for continuity between ④ and ⑤. Continuity should exist.

Check for continuity between ① and ③. Continuity should exist.

Check for continuity between ① and ②. Continuity should not exist.

2. Apply a 12-volt d-c across ④ and ⑤ to ensure that continuity exists between ① and ② and that continuity does not between ① and ③ If test results do not satisfy the above, replace the floor temperature relay.

When floor temperature warning lamp lights

Check floor temperature warning lamp for the following items.

1. Open or short circuit in wiring harness.
2. Condition of fuel system. Refer to "Catalytic Converter Warning Lamp" in the "Emission Control" section. Repair or replace faulty part(s) as necessary.
3. Condition of ignition system. Refer to "Catalytic Converter Warning Lamp" in the "Emission Control" section. Repair or replace faulty part(s) as necessary.

Note: Even if there is nothing wrong with engine, the warning lamp may come on if the car is being driven on a steep slope continuously in lower gears at high engine speeds.

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SERVICE DATA AND SPECIFICATIONS

Ignition timing and idling			
Manual transmission		degree/rpm	12°B.T.D.C./750
Automatic transmission (in "D" range)		degree/rpm	12°B.T.D.C./650
Valve clearance			
Cold	Intake	mm (in)	0.20 (0.0079)
	Exhaust	mm (in)	0.25 (0.0098)
Hot	Intake	mm (in)	0.25 (0.0098)
	Exhaust	mm (in)	0.30 (0.0118)
Belt tension			
Fan		mm (in)	8 to 12 (0.315 to 0.472)
Air pump		mm (in)	11 to 15 (0.433 to 0.591)
Air con. compressor		mm (in)	6 to 10 (0.236 to 0.394)
Pressure		kg (lb)	10 (22) is applied
Compression pressure at 350 rpm			
Standard		kg/cm^2 (psi)	12.0 (171)
Minimum		kg/cm^2 (psi)	9.0 (128)
Radiator cap relief pressure		kg/cm^2 (psi)	0.9 (13)
Cooling system			
Leakage testing pressure		kg/cm^2 (psi)	1.6 (23)
Battery specific gravity at 20°C (68°F)			1.26
Distributor			
Point gap		mm (in)	0.45 to 0.55 (0.0177 to 0.0217)
Air gap		mm (in)	0.2 to 0.4 (0.008 to 0.016)
Dwell angle		degree	49° to 55°
Condenser capacity		μF	0.20 to 0.24
Condenser insulation resistance		MΩ	5
Spark plug			
Gap		mm (in)	0.8 to 0.9 (0.032 to 0.036)
Checking "CO" percent at idle speed (No air)			
Manual transmission model		%/rpm	2.0/750
Automatic transmission model		%/rpm	2.0/650
Adjustment of operating pressure of B.C.D.D.			
B.C.D.D. set pressure			
Manual transmission		mmHg (in Hg)	−525 to −535 (−20.7 to −21.0)
Automatic transmission		mmHg (in Hg)	−505 to −515 (−19.9 to −20.3)
A.T.C. air cleaner			
Operating temperature		°C (°F)	30 to 54 (86 to 130)

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Tightening torque

Cylinder head bolts		
1st turn	kg-m (ft-lb)	4.0 (29)
2nd turn	kg-m (ft-lb)	6.0 (43)
3rd turn	kg-m (ft-lb)	6.5 to 8.5 (47 to 61)
Manifold nuts	kg-m (ft-lb)	1.2 to 1.6 (8.7 to 11.6)
Carburetor nuts	kg-m (ft-lb)	0.5 to 1.0 (3.6 to 7.2)
Spark plugs	kg-m (ft-lb)	1.5 to 2.5 (11 to 18)

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TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
CANNOT CRANK ENGINE OR SLOW CRANKING	Improper grade oil.	Replace with proper grade oil.
	Discharged battery.	Charge battery.
	Faulty battery.	Replace.
	Loose fan belt.	Adjust.
	Malfunction in charge system.	Inspect.
	Wiring connection loose in starting circuit.	Correct.
	Faulty ignition switch.	Repair or replace.
	Faulty starter motor.	Repair or replace.

(Trouble-shooting procedure on starting circuit)
Switch on the starting motor with light "ON".

When light goes off or dims considerably,

a. Check battery.
b. Check connection and cable.
c. Check starter motor.

When light stays bright,

a. Check wiring connection between battery and starter motor.
b Check ignition switch.
c. Check starter motor.

ENGINE WILL CRANK NORMALLY BUT WILL NOT START

In this case, the following trouble causes may exist, but in many cases ignition system or fuel system is in trouble.

Ignition system in trouble
Fuel system in trouble
Valve mechanism does not work properly
Low compression

(Trouble-shooting procedure)

Check spark plug firstly by following procedure.
Disconnect high tension cable from one spark plug and hold it about 10 mm (0.39 in) from the engine metal part and crank the engine.

Good spark occurs.

a. Check spark plug.
b. Check ignition timing.
c. Check fuel system.
d. Check cylinder compression.

No spark occurs.

Check the current flow in primary circuit.

Very high current. — Inspect primary circuit for short.
Check breaker point operation (except transistor ignition system).

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Condition	Probable cause	Corrective action
	Low or no current.	Check for loose terminal or disconnection in primary circuit. Check for burned points *
Ignition system out of order	Burned distributor point.	Repair or replace. *
	Improper point gap.	Adjust. *
	Faulty condenser.	Replace. *
	Leak at rotor cap and rotor.	Clean or replace.
	Faulty spark plug.	Clean, adjust plug gap or replace.
	Improper ignition timing.	Adjust.
	Faulty ignition coil.	Replace.
	Disconnection of high tension cable.	Replace.
	Loose connection or disconnection in primary circuit.	Repair or replace.
Fuel system out of order	Lack of fuel.	Supply.
	Dirty fuel strainer.	Replace.
	Dirty or clogged fuel pipe.	Clean.
	Fuel pump will not work properly.	Repair or replace.
	Carburetor choke will not work properly.	Check and adjust.
	Improper adjustment of float level.	Correct.
	Improper idling.	Adjust.
	Dirty or clogged carburetor.	Disassemble and clean.
	Clogged breather pipe of fuel tank.	Repair and clean.
	Malfunctioning anti-dieseling solenoid valve.	Check for loose terminal or wire harness.
Low compression	Incorrect spark plug tightening or faulty gasket.	Tighten to normal torque or replace gasket.
	Improper grade engine oil or low viscosity.	Replace with proper grade oil.
	Incorrect valve clearance.	Adjust.
	Compression leak from valve seat.	Remove cylinder head and lap valves.
	Sticky valve stem.	Correct or replace valve and valve guide.
	Weak or damaged valve springs.	Replace valve springs.
	Compression leak at cylinder head gasket.	Replace gasket.
	Sticking or damaged piston ring.	Replace piston rings.
	Worn piston ring or cylinder.	Overhaul engine.
	(Trouble shooting procedure) Pour the engine oil from plug hole, and then measure cylinder compression.	
	Compression increases.	Malfunctiong cylinder or piston ring.
	Compression does not change.	Compression leaks from valve, cylinder head or head gasket.

* Except transistor ignition system

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Condition	Probable cause	Corrective action
IMPROPER ENGINE IDLING		
Fuel system out of order	Clogged or damaged carburetor jets.	Clean or replace.
	Incorrect idle adjustment.	Adjust.
	Clogged air cleaner filter.	Replace element.
	Damaged manifold gaskets or carburetor insulator.	Replace gasket or insulator.
	Improper float level adjustment.	Adjust.
	Loose air hoses or air-fuel mixture hoses of carburetor.	Check for loose connections.
	Malfunctioning carburetor choke.	Check and adjust.
	Malfunctioning anti-backfire valve.	Check for loose connection of vacuum hose.
	Malfunctioning automatic temperature control air cleaner.	Check A.T.C. air cleaner.
	Inoperative idle compensator.	Check for connection of idle compensator hose or replace idle compensator.
	Carbon canister purge line hose damaged or disconnected.	Connect or replace.
	Stick E.F.E. valve shaft.	Repair.
Low compression		Previously mentioned.
Others	Incorrect valve clearance.	Adjust.
	Extremely low revolution.	Adjust.
	Faulty malfunction of the ignition system (spark plug, high tension cable, breaker point, ignition coil, etc.).	Replace.
	Incorrect basic ignition timing.	Adjust.
	Malfunction of choke valve or linkage.	Adjust.
	Malfunction of vacuum motor, sensor or hoses of air cleaner.	Check for loose hoses. Replace system components if necessary.
	Incorrect idle adjustment.	Adjust idle speed.
	Clogged air cleaner filter.	Replace air cleaner filter.
	Malfunction of idle compensator of air cleaner.	Replace.
	Malfunction of E.G.R. control valve.	Clean or replace.
	Loose manifold and cylinder head bolts.	Retighten bolts.
High engine idle speed.	Dragged accelerator linkage.	Check and correct accelerator linkage.
	Incorrect idle adjustment.	Adjust idle speed.
	Malfunction of B.C.D.D. system.	Check for loose vacuum hose and harness connections. Adjust or replace if necessary.
	Malfunction of speed switch and harness.	Check for loose connections. Repair or replace if necessary.

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Condition	Probable cause	Corrective action
ENGINE POWER NOT UP TO NORMAL		
Low compression		Previously mentioned.
Ignition system out of order	Incorrect ignition timing.	Adjust.
	Damaged spark plugs.	Clean, adjust or replace plugs.
	Worn distributor points. *	Dress, or replace points. Also check condenser.
	Malfunction of T.C.S.	Check and correct.
	Malfunction of S.D.V.	Check and replace.
Fuel system out of order	Malfunction of choke system.	Adjust.
	Clogged fuel pipe or floating valve.	Clean.
	Dirty or clogged fuel strainer.	Replace.
	Fuel pump will not work properly.	Repair or replace.
	Clogged carburetor jets.	Disassemble and clean.
	Malfunction of altitude compensator.	Check and replace.
Air intake system out of order	Clogged air cleaner.	Replace element.
	Air inhaling from manifold gasket or carburetor gasket.	Replace gasket.
Emission control	Malfunction of E.G.R. valve.	Check and replace.
	Stick E.F.E. valve shaft.	Repair.
Overheating	Insufficient coolant.	Replenish.
	Loose fan belt.	Adjust fan belt.
	Worn or oiled fan belt.	Replace.
	Inoperative thermostat.	Replace.
	Worn water pump.	Replace.
	Clogged or leaky radiator.	Flush, repair or replace.
	Worn radiator filler cap.	Replace.
	Air in cooling system.	Retighten each part of cooling system.
	Improper engine oil grade	Replace with proper grade oil.
	Incorrect ignition timing.	Adjust.
	Clogged carburetor (lean mixture).	Overhaul carburetor.
	Disconnected altitude compensator hose.	Connect.
Overcooling	Inoperative thermostat.	Replace.
Others	Improper octane fuel.	Replace with specified octane fuel.
	Improper tire pressure.	Inflate to specified pressure.
	Dragging brake.	Adjust.
	Clutch slipping.	Adjust.

* Except transistor ignition system

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Condition	Probable cause	Corrective action
NOISY ENGINE		
Car knocking	Overloaded engine.	Use right gear in driving.
	Carbon knocking.	Disassemble cylinder head and remove carbon.
	Timing knocking.	Adjust ignition timing.
	Fuel knocking.	Use specified octane fuel.
	Preignition (misusing of spark plug).	Use specified spark plug.
Mechanical knocking		
Crankshaft bearing knocking.	This strong dull noise increases when engine is accelerated. To locate the place, cause a misfire on each cylinder. If the noise stops by the misfire, this cylinder generates the noise.	This is caused by worn or damaged bearings, or unevenly worn crankshaft. Renew bearings and adjust or change crankshaft. Check lubrication system.
Connecting rod bearing knocking.	This is a little higher-pitched noise than the crankshaft knocking, and also increases when engine is accelerated. Cause a misfire on each cylinder and if the noise deminishes almost completely, this crankshaft bearing generates the noise.	Same as the case of crankshaft bearings.
Piston and cylinder noise.	When you hear an overlapping metalic noise which increases its magnitude with the revolution of engine and which decreases as engine is warmed up, this noise is caused by piston and cylinder. To locate the place, cause a misfire on each cylinder.	This may cause an abnormal wearing of cylinder and lower compression which in turn will cause a lower out-put power and excessive consumption of oil. Overhaul engine.
Piston pin noise.	This noise is heared at each highest and lowest dead end of piston. To locate the place, cause a misfire on each cylinder.	This may cause a wear on piston pin, or piston pin hole. Renew piston and piston pin assembly.
Water pump noise.	This noise may be caused by worn or damaged bearings, or by the uneven surface of sliding parts.	Replace water pump with a new one.
Air pump noise	Damaged air pump.	Repair or replace.
Others.	An improper adjustment of valve clearance.	Adjust.
	Noise of timing chain.	Adjust the tension of chain.
	An excessive end-play on crankshaft.	Disassemble engine and renew main bearing.
	Noisy E.F.E. valve shaft.	Repair.
	Note: This noise will be heard when clutch is disengaged.	
	Wear on clutch pilot bushing.	Renew bush and adjust drive shaft.
	Note: This noise will be heared when clutch is disengaged.	

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Condition	Probable cause	Corrective action
ABNORMAL COMBUSTION (back fire, after fire run-on etc.)		
Improper ignition timing	Improper ignition timing.	Adjust ignition timing.
	Improper heat range of spark plugs.	Use specified spark plugs.
Fuel system out of order	Damaged carburetor or manifold gasket. (back fire, after fire)	Replace them with new parts.
	Clogged carburetor jet.	Disassemble carburetor and check it.
	Improper function of the float.	Adjust the level, and check needle valve.
	Uneven idling. (Run on)	Adjust.
	Improperly adjusted B.C.D.D. set pressure.	Adjust.
	Malfunction of anti-dieseling solenoid valve.	Check or replace.
	Malfunction of auto-choke.	Adjust.
Faulty cylinder head, etc.	Improperly adjusted valve clearance.	Adjust.
	Excess carbon in combustion chamber.	Remove head and get rid of carbon.
	Damaged valve spring (backfire, afterfire).	Replace it with a new one.
Others	Malfunction of A.T.C. air cleaner.	Check for loose vacuum hoses. Replace if necessary.
	Inoperative anti-backfire valve.	Replace.
EXCESSIVE OIL CONSUMPTION		
Oil leakage	Loose oil drain plug.	Tighten it.
	Loose or damaged oil pan gasket.	Renew gasket or tighten it.
	Loose or damaged chain cover gasket.	Renew gasket or tighten it.
	Worn oil seal in front and rear of crankshaft.	Renew oil seal.
	Loose or damaged locker cover gasket.	Renew gasket or tighten it (but not too much).
	Improper tightening of oil filter.	Renew gasket and tighten it with the proper torque.
	Loose or damaged oil pressure switch.	Renew oil pressure switch or tighten it.
Excessive oil consumption	Cylinder and piston wear.	Overhaul cylinder and renew piston.
	Improper location of piston ring gap or reversely assembled piston ring.	Remount piston rings.
	Damage piston rings.	Renew rings.
		Repair or renew piston and cylinder.
	Worn piston ring groove and ring.	Renew piston and piston ring.
	Fatigue of valve oil seal lip.	Replace seal lip with a new one.
	Worn valve stem.	Renew valve or guide.
Others	Inadequate quality of engine oil.	Use the designated oil.
	Engine overheat.	Previously mentioned.

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Condition	Probable cause	Corrective action
POOR FUEL ECONOMY		
See the explanation of the power decrease		
Others	Exceeding idling revolution.	Adjust it to the designated rpm.
	Inoperative acceleration recovery.	Adjust it.
	Fuel leakage.	Repair or tighten the connection of fuel pipes.
	Malfunction of B.C.D.D.	Adjust.
	Malfunction of A.T.C. air cleaner.	Check and replace.
PROBLEM IN OTHER FUNCTIONS		
Decreased oil pressure	Inadequate oil quality.	Use the designated oil.
	Overheat.	Previously mentioned.
	Worn oil pump regulator valve.	Disassemble oil pump and repair or renew it.
	Functional deterioration of oil pump.	Repair or replace it with a new one.
	Blocked oil filter.	Renew it.
	Increased clearance in various sliding parts.	Disassemble and replace the worn parts with new ones.
	Blocked oil strainer.	Clean it.
	Inoperative oil gauge pressure switch.	Replace it with a new one.
Excessive wear on the sliding parts	Oil pressure decreases.	Previously mentioned.
	Improper quality or contamination of oil.	Exchange the oil with proper one and change element.
	Damaged air cleaner.	Change element.
	Overheat or overcool.	Previously mentioned.
	Improper fuel mixture.	Check the fuel system.
Scuffing of sliding parts	Decrease of oil pressure.	Previously mentioned.
	Insufficient clearances.	Readjust to the designated clearances.
	Overheat.	Previously mentioned.
	Improper fuel mixture.	Check the fuel system.
Overheating of catalytic converter (California only)	Malfunction of catalyzer protector.	Check and replace.
	Problem in fuel system (Refer to "Inspection of Fuel System".).	Check and repair.
	Problem in ignition system (Refer to "Inspection of Ignition System".).	Check and repair.
	Malfunction of catalytic converter.	Check and replace.
Floor temperature too high (California only)	Malfunction of catalyzer protector.	Check and replace.
	Problem in fuel system (Refer to "Inspection of Fuel System".) .	Check and repair.
	Problem in ignition system (Refer to "Inspection of Ignition System".).	Check and repair.

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SERVICE MANUAL

DATSUN 710
MODEL 710 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION EM

EM

ENGINE MECHANICAL

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TROUBLE DIAGNOSES AND CORRECTIONS EM-32
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GENERAL DESCRIPTION

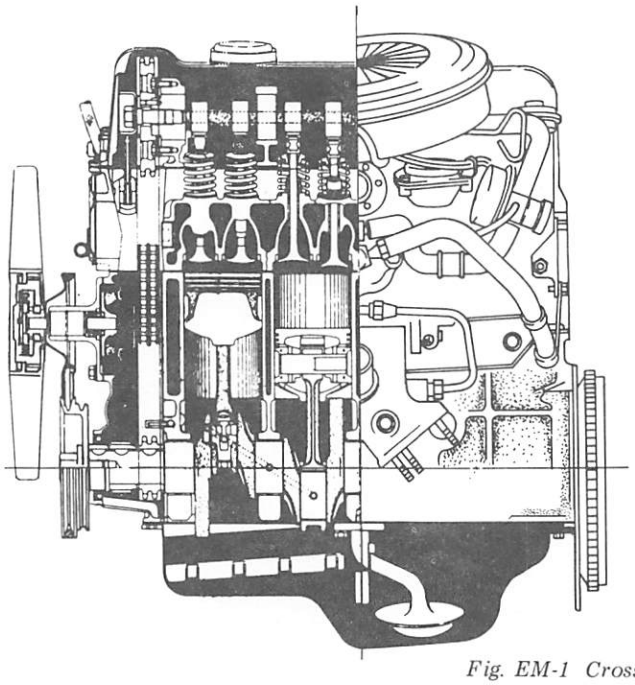
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MODEL L20B ENGINE

The L20B engine features O.H.C. valves, wedge-shaped combustion chamber, aluminum head and a fully balanced 5-bearing crankshaft to turn out smooth, dependable power.

The cylinder block is cast as a single unit, and features deep skirting. This engine is equipped with a single, 2-barrel downdraft carburetor that incorporates a special device to control emissions.



EM535

Fig. EM-1 Cross sectional view

Main specifications

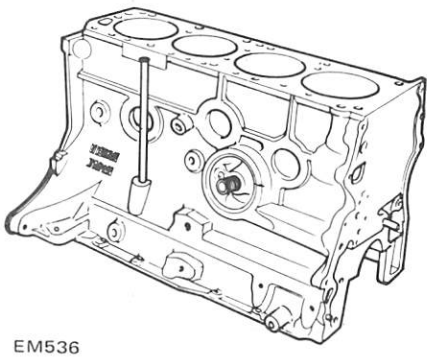
		L20B
Displacement	cc (cu in)	1,952 (119.1)
Bore x stroke	mm (in)	85 x 86 (3.35 x 3.39)
Compression ratio		8.5
Ignition timing for M/T B.T.D.C. (for A/T)		12°/750 rpm (12°/650 rpm in "D" range)

M/T: Manual Transmission A/T: Automatic Transmission

CYLINDER BLOCK

The cylinder block, a monoblock special casting structure, employs a five-bearing-support system for quietness and higher durability.

The cylinder bores are surrounded by cooling jackets and machined directly in the block. The oil ways in the block are arranged so that the full-flow oil filter is directly attached to the right hand side of the block.



EM536

Fig. EM-2 Cylinder block

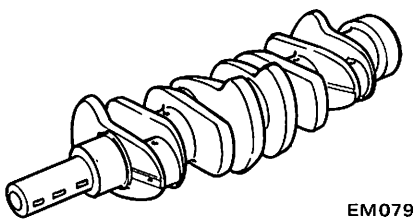
CRANKSHAFT

The crankshaft is a special steel forging. Fully balanced, it turns out smooth, dependable power at high speed.

The L20B engine uses eight balance weights.

Main bearings are lubricated by oil pumped through the main oil gallery and the oil holes which run in parallel with cylinder bores. There are oilways drilled in the crankshaft for the lubricating oil. The center main bearing is equipped with thrust washers to take up end thrust of the crankshaft.

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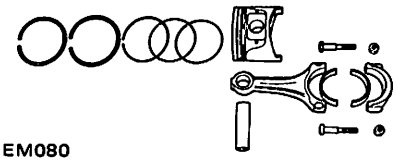
EM079

Fig. EM-3 Crankshaft

PISTON AND CONNECTING ROD

The pistons are of a special aluminum casting and have struts to control thermal expansion, two compression rings and one combined oil ring. The piston heads are slightly dished. The piston pins are a special hollow steel shaft. They are full-floating fit to the piston and press fit to the connecting rods.

The connecting rods are of a special forged steel. Oil is sprayed to the connecting rod small ends through drilled passages in the large ends of rod. Oil holes in the connecting rods are located so as to insure optimum lubrication under heavy load.

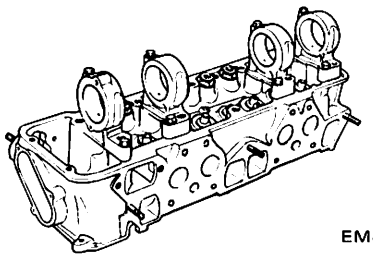


EM080

Fig. EM-4 Piston and connecting rod

CYLINDER HEAD

The cylinder head is made of a light, strong aluminum alloy with good cooling efficiency; it contains wedge type combustion chambers. A special aluminum bronze valve seat is used on the intake valve, while a heat resistant steel valve seat is installed on the exhaust valve. These parts are all hot press-fitted.



EM407

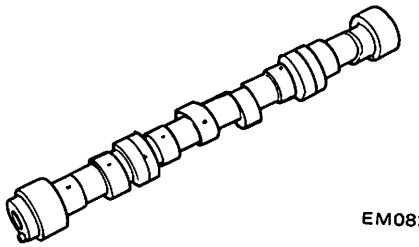
Fig. EM-5 Cylinder head

CAMSHAFT

The camshaft is made of a special cast iron and is located inside the rocker cover. Four aluminum alloy brackets support it. Camshaft bearings are lubricated from oil holes which lead to the main oil gallery of the cylinder head.

Concentric passages are drilled in the front and rear parts of the camshaft.

Oil to each cam lobe is supplied through an oil hole drilled in the base circle of each lobe. Lubricant is supplied to the front oil gallery from the 2nd camshaft bearing and to the rear oil gallery from the 3rd camshaft bearing. These holes on the base circle of the lobe supply lubricant to the cam pad surface of the rocker arm and to the valve tip end. The cams feature a long-overlap profile to reduce NOx emission.



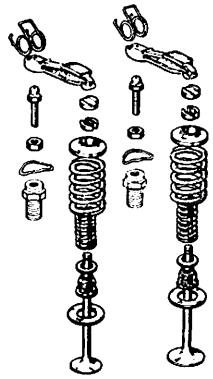
EM082

Fig. EM-6 Camshaft

VALVE MECHANISM

The valve system has the pivot type rocker arms that are activated directly by the cam mechanism; this has made its moving parts considerably lighter and provides ideal high speed performance.

Dual type valve springs are installed.

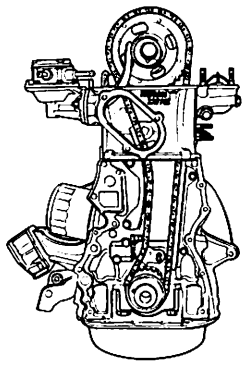


Exhaust Intake EM084

Fig. EM-7 Valve mechanism

CAMSHAFT DRIVE

The camshaft is driven by a double row roller chain driven by the crankshaft. The tension of the chain is controlled by a chain tensioner which is operated by spring and oil pressure. The rubber shoe type tensioner damps vibration of the chain and controls its tension.



EM537

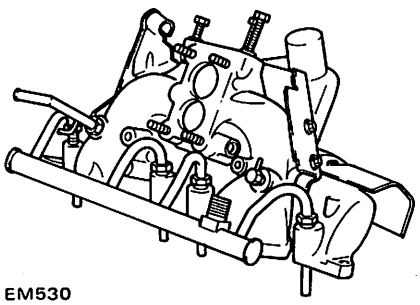
Fig. EM-8 Chain driving system

MANIFOLDS

The intake manifold is of an aluminum cast alloy.

The exhaust manifold is of a dual design and incorporates a heat control valve in it. The heat control valve is used to warm the intake manifold.

A plate is installed on the outer face of the manifold to draw hot intake air out through it. The exhaust pipe is connected to the flanged surface of the exhaust manifold.



EM530

Fig. EM-9 Intake and exhaust manifolds

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ENGINE DISASSEMBLY

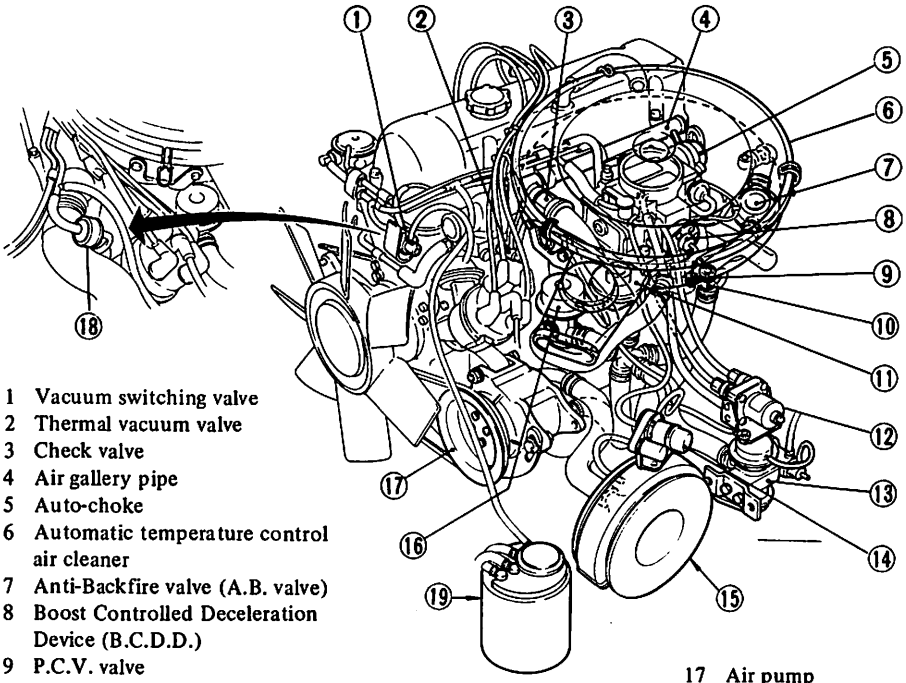
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DISASSEMBLY EM-4
PISTONS AND CONNECTING RODS EM-7
CYLINDER HEAD EM-7

PRELIMINARY CLEANING AND INSPECTION

Before disassembling engine, note the following:

1. Fuel, oil or water may leak past cylinder head and block. Prior to disassembling, check cylinder head, front chain cover, oil pan and oil filter gaskets and crankshaft and water pump seals for signs of leakage past their gasketed surfaces.
2. Check carburetor and fuel pump for condition; fuel hoses for deterioration, cracks or leakage of fuel past their jointed or connected surfaces.



1 Vacuum switching valve
2 Thermal vacuum valve
3 Check valve
4 Air gallery pipe
5 Auto-choke
6 Automatic temperature control air cleaner
7 Anti-Backfire valve (A.B. valve)
8 Boost Controlled Deceleration Device (B.C.D.D.)
9 P.C.V. valve
10 Air relief valve
11 E.G.R. control valve
12 Altitude compensator
13 Emergency air relief valve
14 B.C.D.D. control valve and solenoid valve
15 Air pump air cleaner
16 Air control valve
17 Air pump
18 Spark delay valve (for automatic transmission)
19 Carbon canister

Fig. EM-10 Emission control devices (for California)

3. Remove carburetor air cleaner.
(1) Disconnect hot air duct from air cleaner.
(2) Disconnect air cleaner-to-air pump hose at air cleaner.
(3) Disconnect air cleaner-to-rocker cover hose at rocker cover.
(4) Disconnect air cleaner-to-air control valve hose at air cleaner (for California).
(5) Disconnect air cleaner-to-A.B. valve hose at air cleaner.
(6) Disconnect air cleaner-to-related part vacuum hoses at air cleaner.
(7) Loosen air cleaner band bolt and remove carburetor air cleaner assembly from carburetor.

4. Plug up carburetor air-horn to prevent entry of foreign matter.
5. Remove alternator drive belt, alternator and alternator bracket.
6. Remove air pump drive belt, cooler compressor and idler pulley (if so equipped).
7. Remove starter motor from transmission.
8. Visually inspect cylinder head, cylinder block, rocker cover, front chain cover, oil pan and all other outer parts for oil, water and fuel leaks, breakage or missing parts such as bolts and nuts.
9. Check piping and electrical circuits for deterioration, breakage, fittings, discontinuity or insulation.

DISASSEMBLY

To remove engine from car, refer to the instructions under the "Engine Removal and Installation" (ER) section.

1. Remove transmission from engine.
2. Remove clutch assembly from flywheel.
3. Thoroughly drain engine oil and coolant by removing drain plugs.

Store engine oil and coolant, if they are to be used again.

4. Place engine assembly on engine stand.

(1) Remove cooling fan.
(2) Remove right engine mounting bracket.
(3) Remove oil filter with Oil Filter Wrench ST19320000.
(4) Remove oil pressure switch.
(5) Install engine attachment to cylinder block utilizing bolt holes in alternator bracket and water drain hole.
(6) Set engine on stand.

"Engine Attachment
ST05260001"
"Engine Stand
ST0501S000"

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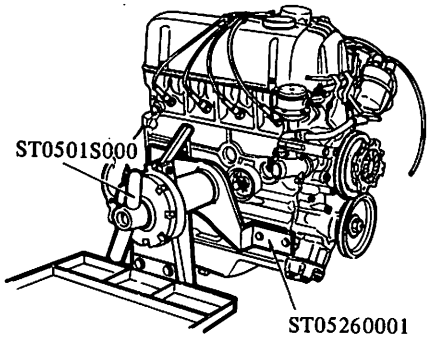


Fig. EM-11 Engine on engine stand

5. Remove oil level gauge.
6. Remove carburetor from intake manifold.
(1) Disconnect cylinder block-to-P.C.V. valve hose at P.C.V. valve.
(2) Disconnect A.B. valve-to-E.G.R. passage hose at E.G.R. passage.
(3) Disconnect vacuum tube-to-carburetor hoses (white and yellow) at vacuum tube.
(4) Disconnect fuel hose from carburetor.
(5) Remove dash pot bracket from intake manifold (if so equipped).
(6) Remove carburetor attaching bolts and remove carburetor assembly and gasket.

7. Disconnect distributor high tension cables from spark plugs.
8. Disconnect vacuum hose from distributor and remove distributor assembly.
9. Disconnect fuel hose from fuel pump and remove fuel and vacuum hoses (combined) from cylinder head.
10. Remove fuel pump assembly from cylinder head.

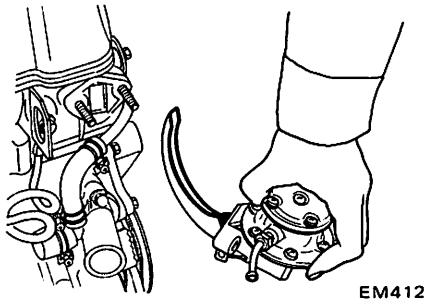


Fig. EM-12 Removing fuel pump

11. Remove intake and exhaust manifold assembly from cylinder head.

(1) Disconnect vacuum hose from air control valve and remove air control valve (for California) and air hoses as an assembly.

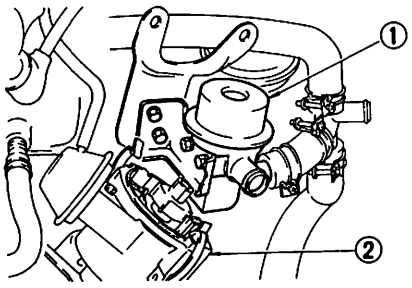


Fig. EM-13 Removing air control valve (for California)

(2) Remove carburetor air cleaner bracket.
(3) Disconnect vacuum hose from E.G.R. valve.
(4) Remove check valve from air gallery pipe.
(5) Disconnect E.G.R. tube from E.G.R. passage and exhaust manifold.
(6) Remove E.G.R. passage and E.G.R. valve from intake manifold.

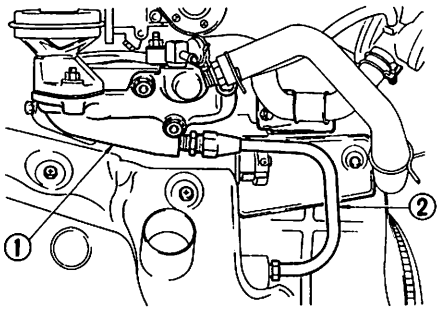


Fig. EM-14 Removing E.G.R. tube and passage

(7) Remove F.I.C.D. bracket from cylinder head (if so equipped).
(8) Disconnect vacuum hoses from thermal vacuum valve and remove thermostat housing and gasket from cylinder head.

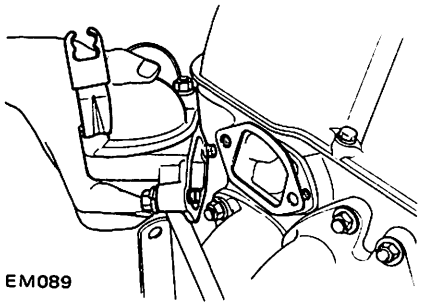


Fig. EM-15 Removing thermostat housing

(9) Remove cylinder block-to-P.C.V. valve hose (blow-by gas hose) from cylinder block.

(10) Remove manifold attaching bolts and remove intake and exhaust manifold assembly and gasket from cylinder head.

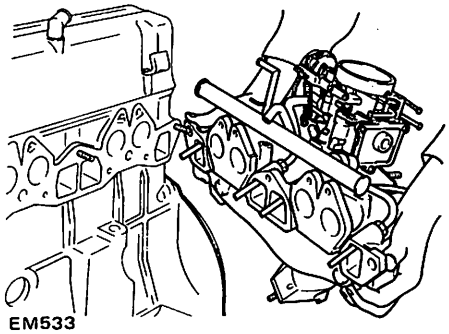


Fig. EM-16 Removing intake and exhaust manifold assembly

(11) Remove intake and exhaust manifold attaching bolts and separate intake manifold from exhaust manifold.
(12) Remove air gallery pipes from exhaust manifold.

12. Remove left engine mounting bracket from cylinder block.
13. Remove air pump and cooler compressor bracket.
14. Remove crankshaft pulley installing bolt and washer and then remove pulley with a two-jaw puller.
15. Remove water pump assembly.
16. Remove rocker cover.
17. Remove spark plugs.
18. Remove fuel pump drive cam.
19. Remove camshaft sprocket.

Refer to the following note during operation when removing camshaft sprocket from engine installed on car.

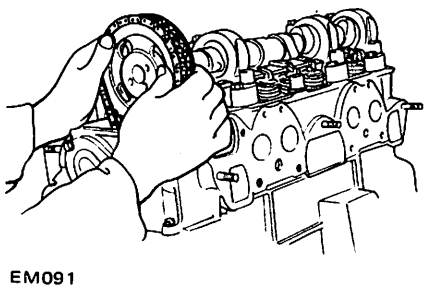


Fig. EM-17 Removing camshaft sprocket

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28. Remove cylinder head assembly. Use Cylinder Head Bolt Wrench ST10120000 to remove cylinder head bolts. Loosen bolts from ① to ⑩ as shown in Figure EM-18.

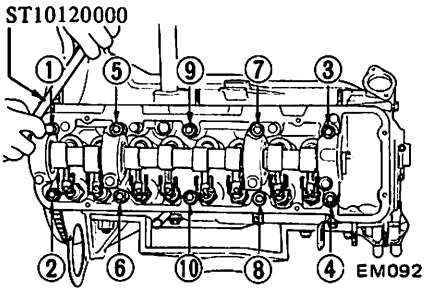


Fig. EM-18 Cylinder head bolt loosening sequence

Notes: When removing cylinder head from engine installed on car, follow the instructions below.

a. Turn crankshaft until No. 1 piston is at T.D.C. on its compression stroke.
b. Remove rocker cover and fuel pump.
c. To facilitate assembling operation, scribe a mark on timing chain and camshaft sprocket with paint before removal.
d. Loosen camshaft bolt and remove fuel pump drive cam.
e. Support timing chain by utilizing Chain Stopper ST17420001 between timing chains as shown in Figure EM-19.
This operation eliminates the problem of realigning timing marks on timing chain and crankshaft sprocket.

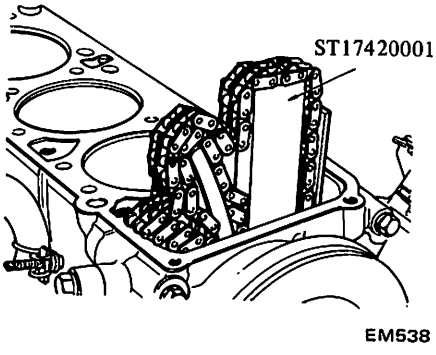


Fig. EM-19 Supporting timing chain

f. Remove camshaft sprocket.
g. Loosen cylinder head bolts and remove cylinder head.

29. Invert engine.
30. Remove oil pan and oil strainer.

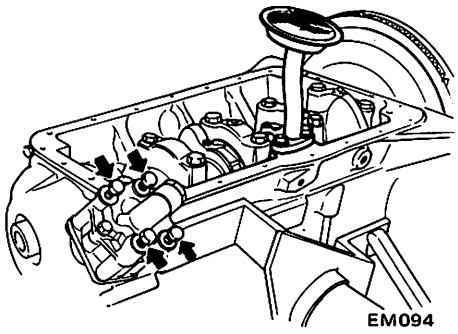


Fig. EM-20 Removing oil strainer and oil pump

31. Remove oil pump and its drive spindle. See Figure EM-20.
32. Remove front cover.
33. Remove chain tensioner and chain slack side guide.

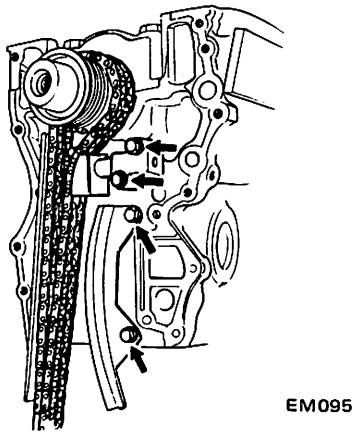


Fig. EM-21 Removing chain tensioner and timing chain

34. Remove timing chain. See Figure EM-21.
35. Remove oil thrower, crankshaft worm gear and chain drive sprocket.

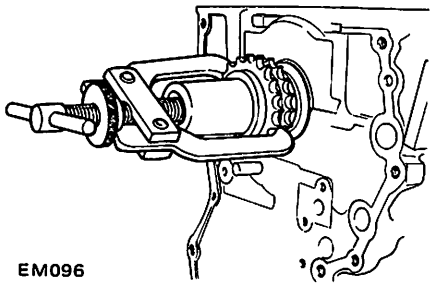


Fig. EM-22 Removing chain drive sprocket

36. Remove piston and connecting rod assembly. Extract connecting rod bearings, keeping them in order.

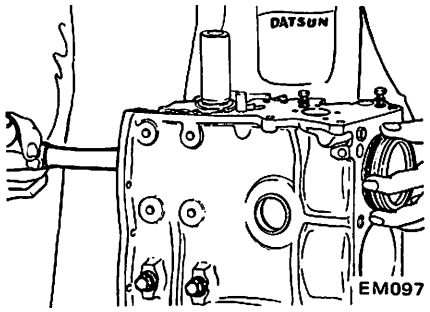


Fig. EM-23 Removing piston and connecting rod assembly

37. Remove flywheel and rear plate. Be careful not to drop them.

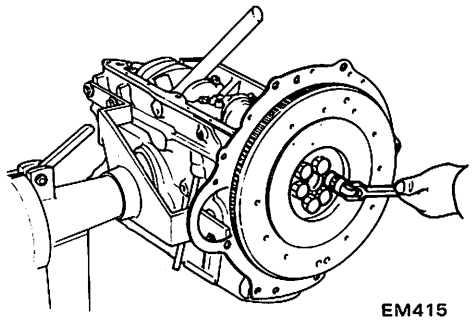


Fig. EM-24 Removing flywheel

38. Remove main bearing caps.
Use Crankshaft Main Bearing Cap Puller ST1651S000 to remove center and rear main bearing caps. Keep them in order.

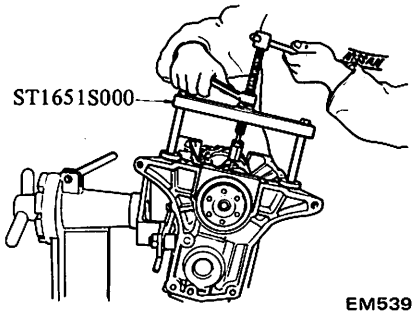


Fig. EM-25 Removing rear main bearing cap

39. Remove two side seals from rear main bearing cap.
40. Remove rear oil seal.

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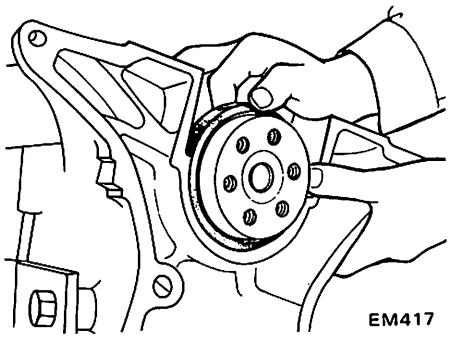


Fig. EM-26 Removing rear oil seal

41. Remove crankshaft.
42. Remove baffle plate and cylinder block net.

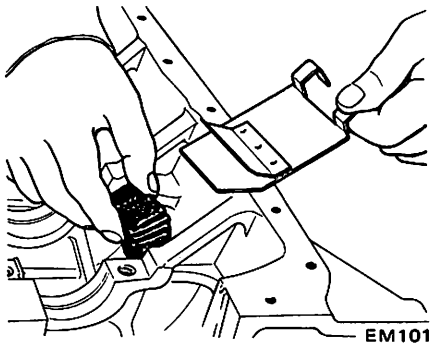


Fig. EM-27 Removing baffle plate and net

PISTONS AND CONNECTING RODS

1. Remove piston rings with a ring remover.

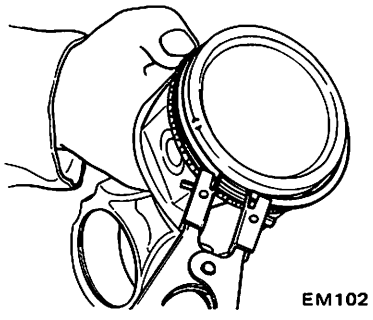


Fig. EM-28 Removing piston rings

2. Press piston pin out with Piston Pin Press Stand ST13030001.

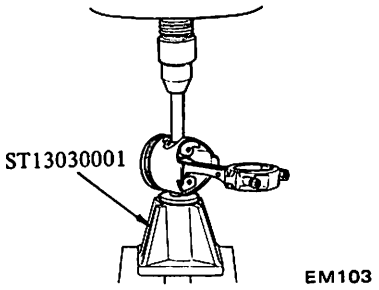


Fig. EM-29 Removing piston pin

3. Keep disassembled parts in order.

CYLINDER HEAD

1. Remove valve rocker springs. Loosen valve rocker pivot lock nut and remove rocker arm by pressing valve spring down.

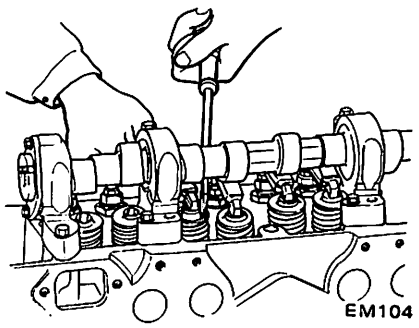


Fig. EM-30 Removing rocker arms

2. Remove locate plate, and remove camshaft.

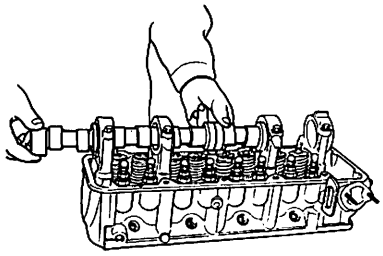


Fig. EM-31 Removing camshaft

Note: Be careful not to damage camshaft bearings and cam lobes.

3. Remove valves using Valve Lifter ST12070000.

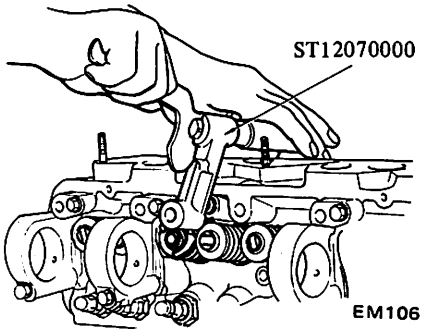


Fig. EM-32 Removing valves

Notes:

a. **Take care not to lose valve spring seat, oil seal, valve collet, and valve rocker guide.**
b. **Be sure to keep camshaft bearings intact, or the bearing center is liable to come out of alignment.**

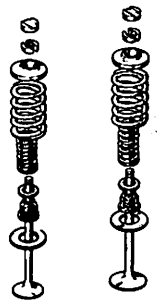


Fig. EM-33 Valve components

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INSPECTION AND REPAIR

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PREPARATION FOR INSPECTION

1. Before cleaning, check for signs of water and oil leaks in cylinder block and head.
2. Clean oil, carbon deposits and sealant from all parts. Remove gasket.
3. Clean all oil holes with solvent and dry with compressed air. Make sure that they are not restricted.

CYLINDER HEAD AND VALVE

Checking cylinder head mating face

Note: Never remove camshaft bearings unless you have a suitable machine for boring camshaft bearing in line. If you once remove camshaft bearings, bearing centers will come out of alignment; reconditioning is very difficult without center borings.

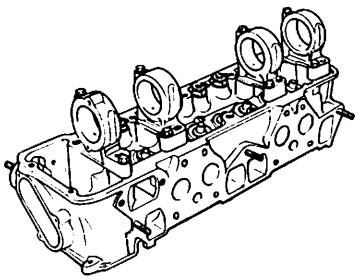
1. Make a visual check for cracks and flaws.
2. Measure the surface of cylinder head (on cylinder block side) for warpage. If it is found to be beyond the limit designated below, regrind the affected surface with a surface grinder.

Head surface flatness

Standard	Maximum
less than 0.05 mm (0.0020 in)	0.1 mm (0.0039 in)

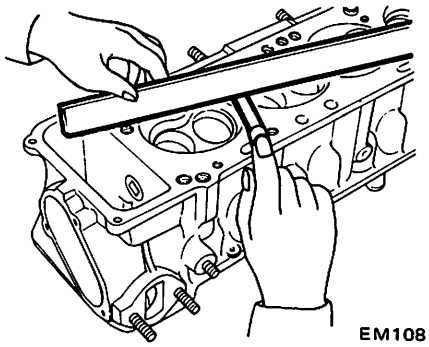
Valve assembly

1. Check each intake and exhaust valve for worn, damaged or deformed valve caps or stems. Correct or replace any valve that is faulty.
2. Valve face or valve stem end surface should be refaced with a valve grinder.



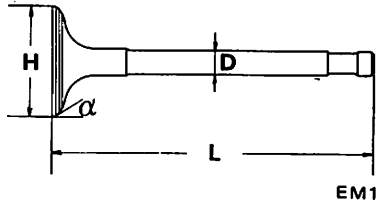
EM407

Fig. EM-34 Cylinder head



EM108

Fig. EM-35 Checking cylinder head surface



EM109

Fig. EM-36 Intake and exhaust valve dimensions

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H	Valve head diameter mm (in)	In.	42.0 to 42.2 (1.654 to 1.661)
		Ex.	35.0 to 35.2 (1.378 to 1.386)
L	Valve length mm (in)	In.	114.9 to 115.2 (4.524 to 4.535)
		Ex.	115.7 to 116.0 (4.555 to 4.567)
D	Valve stem diameter mm (in)	In.	7.965 to 7.980 (0.3136 to 0.3142)
		Ex.	7.945 to 7.960 (0.3128 to 0.3134)
α	Valve seat angle Intake and Exhaust	In.	45°30′
		Ex.	45°30′



Fig. EM-37 Checking valve stem diameter

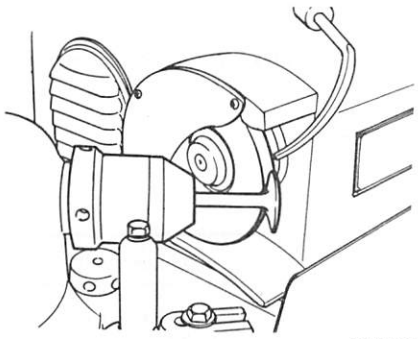


Fig. EM-38 Regrinding valve face

Note: When valve head has been worn down to 0.5 mm (0.0197 in) in thickness, replace the valve.
Grinding allowance for valve stem end surface is 0.5 mm (0.0197 in) or less.

Valve spring

1. Check valve spring for squareness using a steel square and surface plate. If spring is out of square more than 1.6 mm (0.063 in), replace.
2. Measure the free length and tension of each spring. If the measured value exceeds specified limit, replace spring.

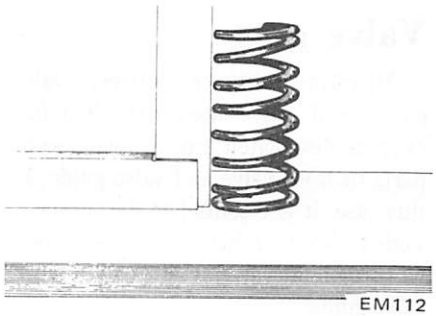


Fig. EM-39 Measuring spring squareness

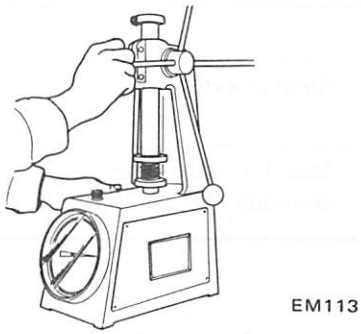


Fig. EM-40 Measuring spring tension

Spring specifications

Valve spring free length		mm (in)	
Intake	Outer	.....	49.98 (1.9677)
	Inner	.....	44.85 (1.7657)
Exhaust	Outer	.....	49.98 (1.9677)
	Inner	.....	44.85 (1.7657)
Valve spring pressured length (valve open)		mm/kg (in/lb)	
Intake	Outer	.....	29.5/49.0 (1.161/108)
	Inner	.....	24.5/25.5 (0.965/56.2)
Exhaust	Outer	.....	29.5/49.0 (1.161/108)
	Inner	.....	24.5/25.5 (0.965/56.2)
Valve spring assembled height (valve close)		mm/kg (in/lb)	
Intake	Outer	.....	40.0/21.3 (1.575/47.0)
	Inner	.....	35.0/12.3 (1.378/27.1)
Exhaust	Outer	.....	40.0/21.3 (1.575/47.0)
	Inner	.....	35.0/12.3 (1.378/27.1)

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Rocker arm and valve rocker pivot

Check pivot head and cam contact and pivot contact surfaces of rocker arm for damage or wear. If damage is found, replace them. A faulty pivot must be replaced together with its corresponding rocker arm.

Valve guide

Measure clearance between valve guide and valve stem. If clearance exceeds designated limit, replace worn parts or both valve and valve guide. In this case, it is essential to determine if such a clearance has been caused by a worn or bent valve stem or by a worn valve guide.

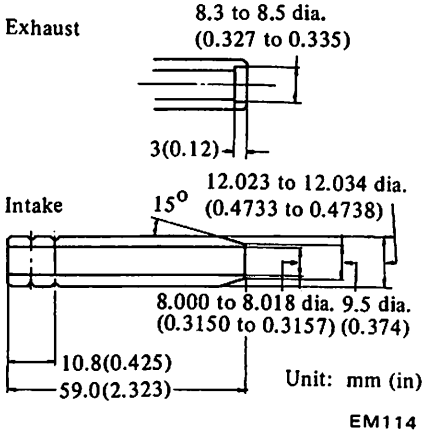


Fig. EM-41 Standard valve guide

	Intake valve	Exhaust valve
Stem to guide clearance mm (in)	0.020 to 0.053 (0.0008 to 0.0021)	0.040 to 0.073 (0.0016 to 0.0029)
Max. tolerance of above clearance mm (in)	0.1 (0.0039)	

As an emergency expedient, a valve can be pushed into valve guide and moved to the right and left. If its tip deflects about 0.2 mm (0.0079 in) or more, it indicates that the clearance between stem and guide exceeds the maximum limit of 0.1 mm (0.0039 in).

Note: Valve should be moved in parallel with rocker arm. (Generally, a large amount of wear occurs in this direction.

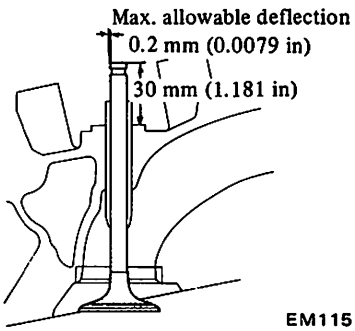


Fig. EM-42 Measuring clearance between valve stem and valve guide

Replacement of valve guide

1. To remove old guides, use a drift and a press (under a 2-ton pressure) or a hammer.

Drive them out from combustion chamber side toward rocker cover. Heated cylinder head will facilitate the operation.

2. Ream cylinder head side guide hole at room temperature.

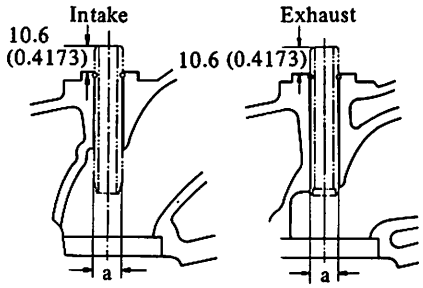


Fig. EM-43 Valve guide hole

Guide hole inner diameter "a" mm (in)	For standard valve guide	11.985 to 11.996 (0.4718 to 0.4723)
	For service valve guide	12.185 to 12.196 (0.4797 to 0.4802)

3. Carefully press new valve guide into valve so that it will fit smoothly after heating cylinder head to 150 to 200°C (302 to 392°F).

Valve guide of 0.2 mm (0.0079 in) oversize diameter is available for service.

Interference fit of valve guide to guide hole:
0.027 to 0.049 mm
(0.0011 to 0.0019 in)

4. Ream bore with valve guide pressed in, using Valve Guide Reamer Set ST1103S000.

Reaming bore:
8.000 to 8.018 mm
(0.3150 to 0.3157 in)

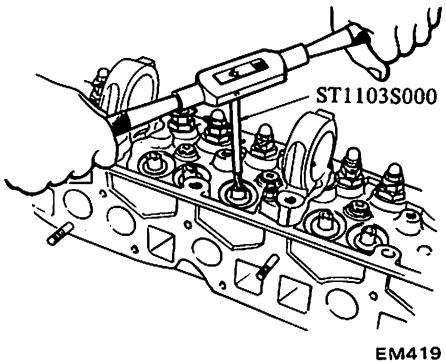


Fig. EM-44 Reaming valve guide

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5. Correct valve seat surface with new valve guide as the axis.

Valve seat inserts

Check valve seat inserts for any evidence of pitting at valve contact surface. and reseat or replace if worn excessively.

Valve seat insert of 0.5 mm (0.0197 in) oversize is available for service.

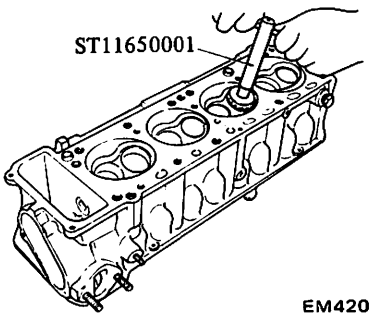


Fig. EM-45 Correcting valve seat

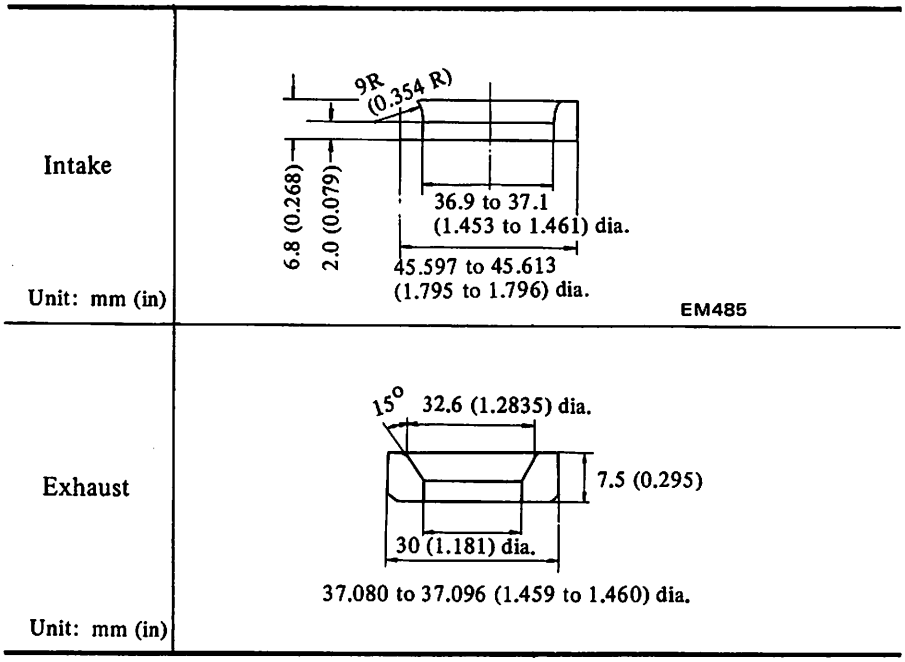


Fig. EM-46 Standard valve seat dimensions

Cylinder head recess diameter

Unit: mm (in)

Intake	For factory standard insert	45.000 to 45.016 (1.7717 to 1.7723)
	For service insert	45.500 to 45.516 (1.7913 to 1.7920)
Exhaust	For factory standard insert	37.000 to 37.016 (1.4567 to 1.4573)
	For service insert	37.500 to 37.516 (1.4764 to 1.4770)

Interference fit mm (in)	Intake	0.081 to 0.113 (0.0032 to 0.0044)
	Exhaust	0.064 to 0.096 (0.0025 to 0.0038)

Replacing valve seat insert

1. Old insert can be removed by boring it out until it collapses. The machine depth stop should be set so that boring cannot continue beyond the bottom face of the insert recess in cylinder head.
2. Select a suitable valve seat insert and check its outside diameter.
3. Machine cylinder head recess to the concentric circles in valve guide center so that insert will have the correct fit.
4. Heat cylinder head to a temperature of 150 to 200°C (302 to 392°F).
5. Fit insert ensuring that it beds on the bottom face of its recess, and caulk more than 4 points.
6. Newly fitted valve seats should be cut or ground at the specified dimensions as shown in Figure EM-47.
7. Apply small amount of fine grinding compound to valve contacting face and put valve into guide. Lap valve against its seat until proper valve seating is obtained. Remove valve and then clean valve and valve seat.

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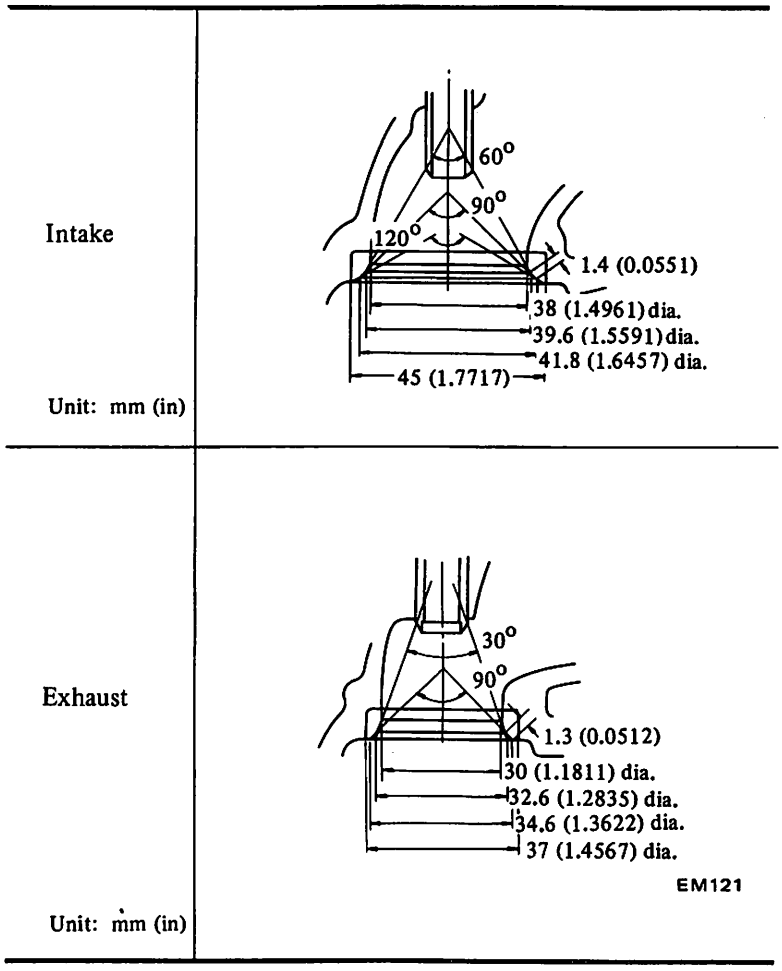
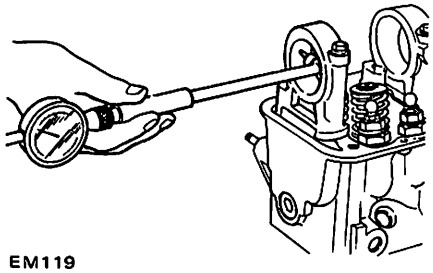


Fig. EM-47 Valve seat dimensions

CAMSHAFT AND CAMSHAFT BEARING

Camshaft bearing clearance

Measure inside diameter of camshaft bearing with an inside dial gauge and outside diameter of camshaft journal with a micrometer. If wear is found inside of bracket, replace cylinder head assembly.



EM119

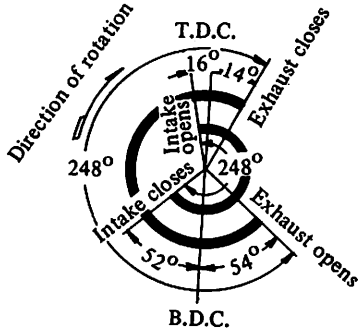
Fig. EM-48 Checking camshaft bearing

Camshaft journal to bearing clearance

	Standard	Wear limit
Oil clearance mm (in)	0.038 to 0.067 (0.0015 to 0.0026)	0.1 (0.0039)
Inner diameter of cam shaft bearing mm (in)	48.000 to 48.016 (1.8898 to 1.8904)	—

Valve timing

This diagram applies to all cylinders. If any valve is found out of specifications, one possibility is that cam lobe is worn or damaged. This calls for replacement of camshaft.



EM421

Fig. EM-49 Valve timing diagram

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	Standard	Bend limit
Camshaft bend mm (in)	0.02 (0.0008)	0.05 (0.0020)

Camshaft alignment

1. Check camshaft, camshaft journal and cam surface for bend, wear or damage. If damage is beyond limits, replace affected parts.
2. A bend value is one-half of the reading obtained when camshaft is turned one full revolution with a dial gauge applied to 2nd and 3rd journals.

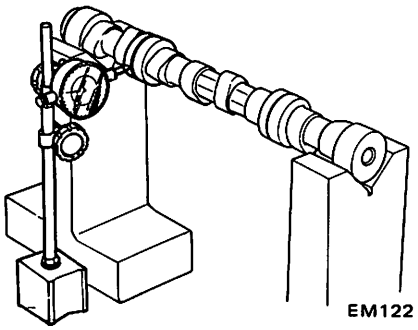


Fig. EM-50 Checking camshaft bend

Standard height of cam mm (in)	Intake	40.30 to 40.35 (1.5866 to 1.5886)
	Exhaust	
Wear limit of cam height mm (in)		0.25 (0.0098)
Allowable difference in diameter between max. worn and min. worn parts of camshaft journal mm (in)		0.05 (0.0020)
Maximum tolerance in journal diameter mm (in)		0.1 (0.0039)
Camshaft end play mm (in)		0.08 to 0.38 (0.0031 to 0.0150)

	Standard	Maximum tolerance
Surface flatness mm (in)	less than 0.05 (0.0020)	0.10 (0.0039)

CYLINDER BLOCK

1. Visually check cylinder block for cracks or flaws.
2. Measure top of cylinder block (cylinder head mating face) for warpage. If warpage exceeds limits, correct it.

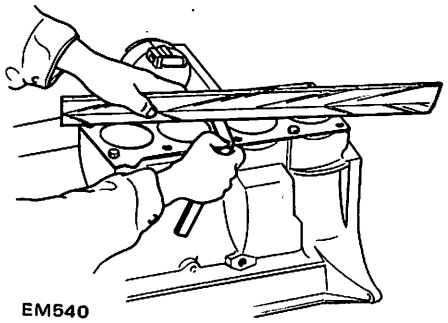


Fig. EM-51 Checking cylinder block surface

3. Using a bore gauge, measure cylinder bore for out-of-round or taper. If out-of-round or taper is excessive, rebore cylinder walls with a boring machine. Measurement should be taken along bores for taper and around bores for out-of-round. See Figure EM-52.

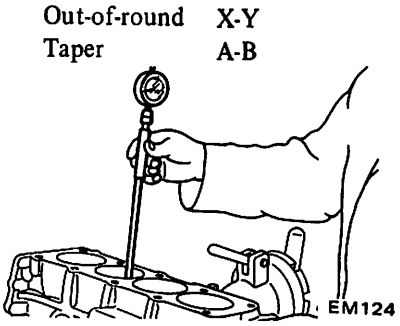


Fig. EM-52 Measuring cylinder bore diameter

4. When wear, taper or out-of-round is minor and within limits, remove step at topmost portion of cylinder using a ridge reamer or other similar tool.

How to measure cylinder bore

A bore gauge is used. Measure cylinder bore at top, middle and bottom positions toward A and B directions as shown in Figure EM-53 and record the measured values.

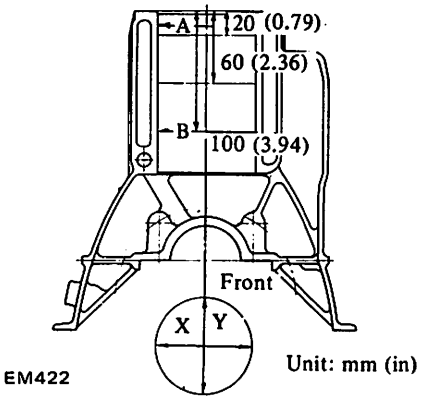


Fig. EM-53 Cylinder bore measuring positions

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		Standard	Wear limit
Cylinder bore mm (in)	Inner diameter	85.000 to 85.050 (3.3465 to 3.3484)	0.2 (0.0079)
	Out-of-round	0.015 (0.0006)	
	Taper	0.015 (0.0006)	
Difference in cylinder bore mm (in)		0.05 (0.0020)	0.2 (0.0079)

Cylinder boring

1. When any cylinder needs boring, all other cylinders must also be bored at the same time.

2. Determine piston oversize according to amount of wear of cylinder.

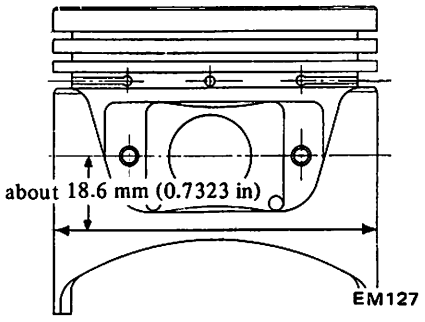


Fig. EM-55 Measuring piston skirt diameter

Oversize pistons specifications

Piston diameter mm (in)	
Standard	84.965 to 85.015 (3.3451 to 3.3470)
0.50 (0.0197) Oversize	85.465 to 85.515 (3.3648 to 3.3667)
1.00 (0.0394) oversize	86.965 to 86.015 (3.4238 to 3.3864)

Rebored size calculation

D = A + B – C = A + [0.005 to 0.025 mm (0.0002 to 0.0010 in)]

where,

D: Honed diameter
A: Skirt diameter as measured
B: Piston-to-wall clearance
C: Machining allowance (0.02 mm) (0.0008 in)

3. The size to which cylinders must be honed is determined by adding piston-to-cylinder clearance to the largest piston diameter (at piston skirt in thrust direction).

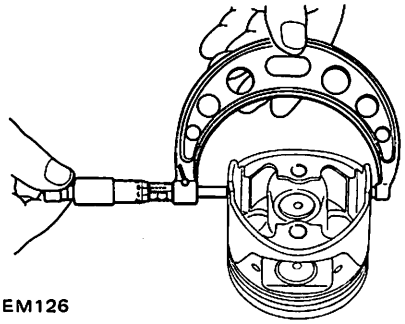


Fig. EM-54 Measuring piston diameter

Standard clearance	mm (in)	0.025 to 0.045 (0.0010 to 0.0018)
Feeler gauge	mm (in)	0.04 (0.0016)
Extracting force	kg (lb)	0.2 to 1.5 (0.44 to 3.31)

Note: To prevent strain due to cutting heat, bore the cylinders in the order of 2-4-1-3.

4. Do not cut too much out of cylinder bore at a time. Cut only 0.05 mm (0.0020 in) or so at a time.
5. Measurement of a just machined cylinder bore requires utmost care since it is expanded by cutting heat.
6. As a final step, cylinders should be honed to size.
7. Measure the finished cylinder bore for out-of-round or tapered part.
8. Measure piston-to-cylinder clearance.

This clearance can be checked easily by using a feeler gauge and a spring balance hooked on feeler gauge, measuring the amount of force required to pull gauge out from between piston and cylinder.

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Notes:
a. When measuring clearance, slowly pull feeler gauge straight upward.
b. It is recommended that piston and cylinder be heated to 20°C (68°F).

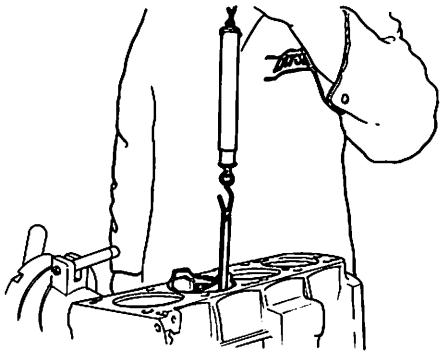

EM541

Fig. EM-56 Measuring piston fit in cylinder

PISTONS, PISTON PINS AND PISTON RINGS

1. Remove carbon from piston and ring grooves with a carbon scraper and a curved steel wire. Clean out oil slots in bottom land of oil ring groove.
2. Check for damage, scratches and wear. Replace if necessary.
3. Measure side clearance of rings in ring grooves as each ring is installed. Side clearance should be as follows.

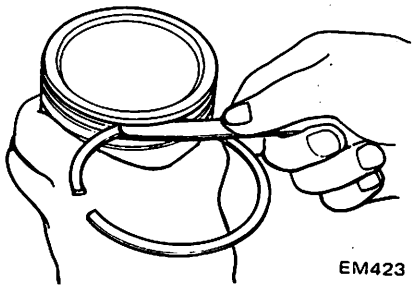

EM423

Fig. EM-57 Measuring piston ring side clearance

Side clearance

Unit: mm (in)

	Standard	Wear limit
Top ring	0.073 to 0.040 (0.0016 to 0.0029)	0.1 (0.0039)
Second ring	0.030 to 0.070 (0.0012 to 0.0028)	
Oil ring	–	–

4. Push ring into cylinder with piston so as to place it squarely in cylinder; measure ring gap with a feeler gauge.

Ring should be placed to diameter at upper or lower limit of ring travel.

Ring gap

Unit: mm (in)

	Standard	Wear limit
Top ring	0.25 to 0.40 (0.0098 to 0.0157)	1.0 (0.0394)
Second ring	0.30 to 0.50 (0.0118 to 0.0197)	
Oil ring	0.30 to 0.90 (0.0118 to 0.0315)	

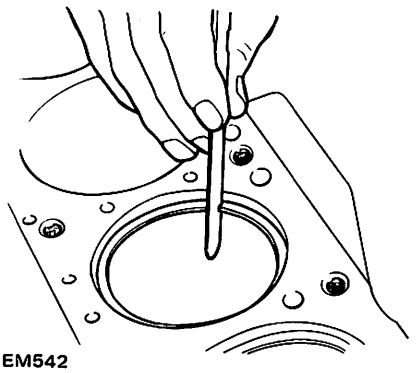

EM542

Fig. EM-58 Measuring ring gap

Notes:
a. When piston ring only is to be replaced, without cylinder bore being corrected, measure gap at bottom of cylinder where wear is minor.
b. Oversize piston rings are available for service.

Oversize:
0.5 mm (0.0197 in) and
1.0 mm (0.0394 in)

5. Measure piston pin hole in relation to outer diameter of pin. If wear exceeds limit, replace each piston pin together with the piston on which it is installed.
6. Determine the fitting of piston pin into piston pin hole to such an extent that it can be finger pressed at room temperature. This piston pin must be a tight press fit into connecting rod.

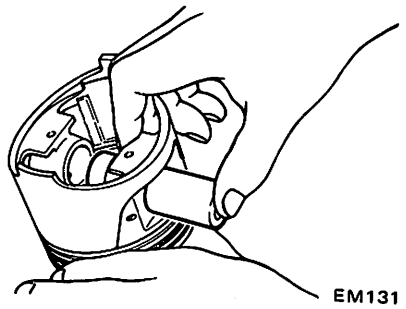

EM131

Fig. EM-59 Piston pin fitting

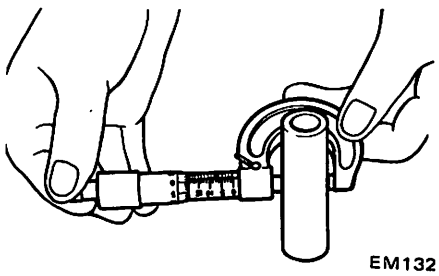

EM132

Fig. EM-60 Measuring piston pin diameter

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Unit: mm (in)

Piston pin outside diameter	20.993 to 20.998 (0.8265 to 0.8267)
Piston pin hole diameter	21.001 to 21.008 (0.8268 to 0.8271)
Piston pin to piston clearance	0.003 to 0.015 (0.0001 to 0.0006)
Interference fit of piston pin to connecting rod	0.015 to 0.033 (0.0006 to 0.0013)

CONNECTING ROD

1. If a connecting rod has any flaw on either side of the thrust face or the large end, correct or replace it.

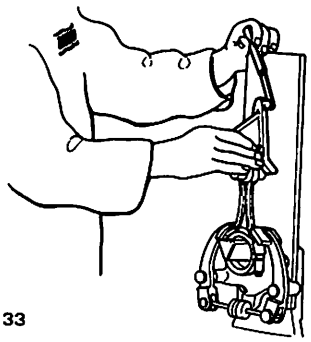


Fig. EM-61 Checking rod alignment

2. Check connecting rod for bend or torsion using a connecting rod aligner. If bend or torsion exceeds the limit, correct or replace.

	Standard	Maximum
Connecting rod bend or torsion (per 100 mm or 3.94 in length) mm (in)	0.03 (0.0012)	0.05 (0.0020)

3. When replacing connecting rod, select rod so that weight difference between new and old ones is within 7 gr (0.25 oz).
4. Install connecting rods with bearings on to corresponding crank pins and measure thrust clearance. If measured value exceeds limit, replace.

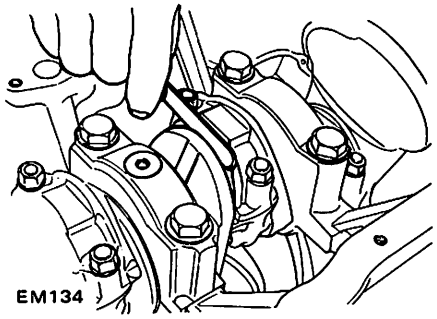


Fig. EM-62 Checking big end play

	Standard	Maximum
Big end play mm (in)	0.2 to 0.3 (0.0079 to 0.0118)	0.6 (0.0236)

CRANKSHAFT

1. Whenever crankshaft is removed from engine, it should be cleaned thoroughly in a suitable solvent. After cleaning, check crankshaft journal and crank pin for score, bias wear or cracks. Repair or replace as required. If damage is minor, dress with fine crocus cloth.
2. Check journals and crank pins for taper and out-of-round with a micrometer. Measurement should be taken along journals for taper and around journals for out-of-round. See Figure EM-63 for detailed information.

If journals or crank pins are tapered or out-of-round beyond limits, replace with a new shaft.

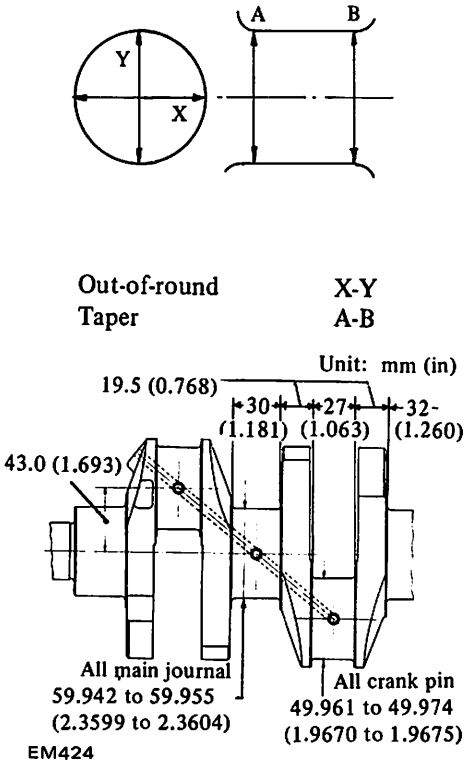


Fig. EM-63 Crankshaft and journal dimensions

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	Standard	Maximum
Taper and out-of-round of journal and crank pin mm (in)	less than 0.01 (0.0004)	0.025 (0.0010)

3. Crankshaft bend can be checked by placing it on V-blocks and using a dial gauge with its indicating finger resting on center journal.

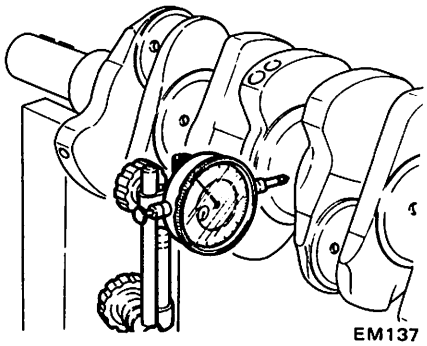


Fig. EM-64 Checking crankshaft bend

	Standard	Maximum
Crankshaft bend mm (in)	less than 0.05 (0.0020)	0.10 (0.0039)

Note: When measuring bend, use a dial gauge. Bend value is half of the reading obtained when crankshaft is turned one full revolution with a dial gauge attached to its center journal.

4. After regrinding crankshaft, finish it to the necessary size indicated on page EM-18 by using an adequate undersize bearing according to the extent of required repair.
5. Install crankshaft in cylinder block and measure crankshaft free end play.

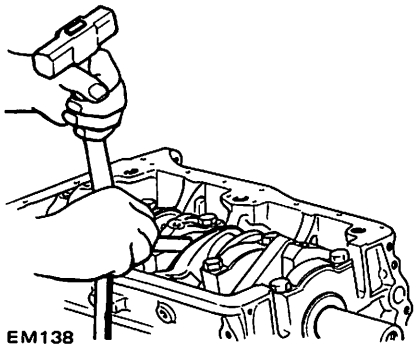


Fig. EM-65 Checking crankshaft end play

	Standard	Wear limit
Crankshaft free end play mm (in)	0.05 to 0.18 (0.0020 to 0.0071)	0.3 (0.0118)

6. At the rear end of crankshaft, check crankshaft pilot bushing for wear or damage. Replace it if any fault is detected.

To replace crankshaft rear pilot bushing, proceed as follows:
(1) Pull out bushing using Pilot Bushing Puller ST16610001.

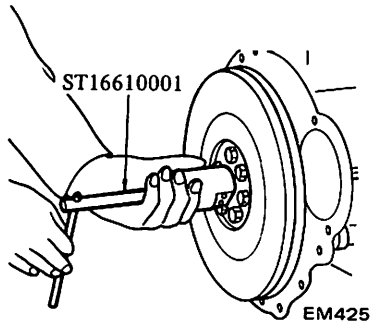


Fig. EM-66 Pulling out pilot bushing

(2) Before installing a new bushing, thoroughly clean bushing hole. Press fit bushing so that its height above flange end is 4.5 to 5.0 mm (0.177 to 0.197 in). Do not oil bushing.

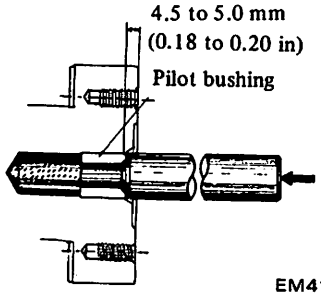


Fig. EM-67 Press-fitting new pilot bushing

BUSHING AND BEARING

Measurement of main bearing clearance

1. Thoroughly clean all bearings and check for scratches, melting score or wear.

Replace bearings if any fault is detected.

2. Crankshaft journals and bearings should be clean and free from dust and dirt before oil clearance is measured.
3. Set main bearing on cap block.
4. Cut a plastigage to width of bearing and place it in parallel with crank pin, getting clear of the oil hole. Install cap on the assembly and tighten them together to the specified torque.

Tightening torque:
4.5 to 5.5 kg-m (33 to 40 ft-lb)

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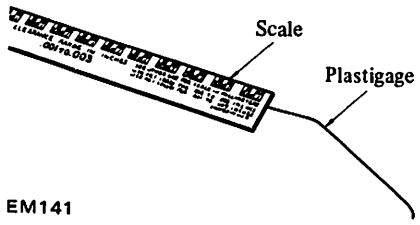


Fig. EM-68 Plastigage

Note: Do not turn crankshaft while plastigage is being inserted.

5. Remove cap, and compare width of the plastigage at its widest part with the scale printed in plastigage envelope.

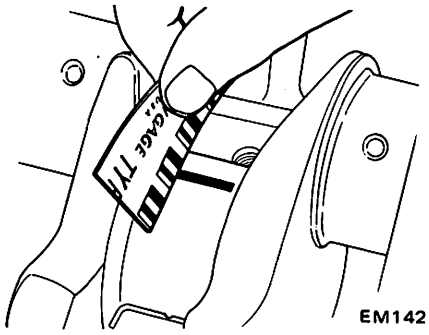


Fig. EM-69 Measuring bearing clearance

Measurement of connecting rod bearing clearance

1. Measure connecting rod bearing clearance in the same manner as above.

Tightening torque:
4.5 to 5.5 kg-m (33 to 40 ft-lb)

Bearing oil clearance

	Standard	Wear limit
Main bearing clearance mm (in)	0.020 to 0.062 (0.0008 to 0.0024)	0.12 (0.0047)
Connecting rod bearing clearance mm (in)	0.025 to 0.055 (0.0010 to 0.0022)	0.12 (0.0047)

2. If clearance exceeds specified value, replace bearing with an undersize bearing and grind crankshaft journal adequately.

Fitting bearings

Bearings are manufactured with crush to make bearing snug down into its bore. To measure this, proceed as follows:

1. Set main bearing in main bearing cap recess or cylinder block bearing recess correctly.
2. Lock one side of bearing and press other side until bearing back surface touches the recess.
3. Then, measure bearing crush "H" with a feeler gauge. See Figure EM-70. The standard bearing crush value is listed below.

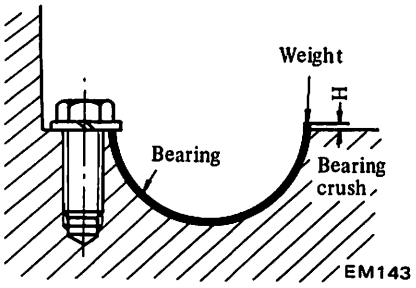


Fig. EM-70 Checking bearing crush

Bearing crush

All main bearings	mm (in)	0 to 0.03 (0 to 0.0012)
All connecting rod bearings	mm (in)	0.015 to 0.045 (0.0006 to 0.0018)

4. Handle connecting rod bearing in the same manner as above.

Main bearing undersize

Unit: mm (in)

	Bearing top thickness	Crank journal diameter
STD	1.827 to 1.835 (0.0719 to 0.0722)	59.942 to 59.955 (2.3599 to 2.3604)
0.25 (0.0098) Undersize	1.952 to 1.960 (0.0769 to 0.0772)	59.692 to 59.705 (2.3501 to 2.3506)
0.50 (0.0197) Undersize	2.077 to 2.085 (0.0818 to 0.0821)	59.442 to 59.455 (2.3402 to 2.3407)
0.75 (0.0295) Undersize	2.202 to 2.210 (0.0867 to 0.0870)	59.192 to 59.205 (2.3304 to 2.3309)
1.00 (0.0394) Undersize	2.327 to 2.335 (0.0916 to 0.0919)	58.942 to 58.955 (2.3205 to 2.3211)

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Connecting rod bearing undersize

Unit: mm (in)

	Bearing top thickness	Crank pin diameter
STD	1.493 to 1.506 (0.0588 to 0.0593)	49.961 to 49.974 (1.9670 to 1.9675)
0.06 (0.0024) Undersize	1.523 to 1.536 (0.0600 to 0.0605)	49.901 to 49.914 (1.9646 to 1.9651)
0.12 (0.0047) Undersize	1.553 to 1.566 (0.0611 to 0.0617)	49.841 to 49.854 (1.9622 to 1.9628)
0.25 (0.0098) Undersize	1.618 to 1.631 (0.0637 to 0.0642)	49.711 to 49.724 (1.9571 to 1.9576)
0.50 (0.0197) Undersize	1.743 to 1.756 (0.0686 to 0.0691)	49.461 to 49.474 (1.9473 to 1.9478)
0.75 (0.0295) Unsersize	1.868 to 1.881 (0.0735 to 0.0741)	49.211 to 49.224 (1.9374 to 1.9379)
1.00 (0.0394) Undersize	1.993 to 2.006 (0.0785 to 0.0790)	48.961 to 48.974 (1.9276 to 1.9281)

MISCELLANEOUS COMPONENTS

Crankshaft sprocket, camshaft sprocket

1. Check tooth surface for flaws or wear. Replace sprocket if fault is found.
2. Install camshaft sprocket in position and check for rounout. If it exceeds 0.1 mm (0.0039 in) total indicator reading, replace camshaft sprocket. Also check for end play.

Camshaft end play:
0.08 to 0.38 mm
(0.0031 to 0.0150 in)

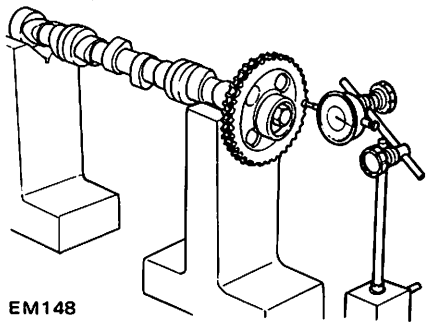


Fig. EM-71 Checking camshaft sprocket runout

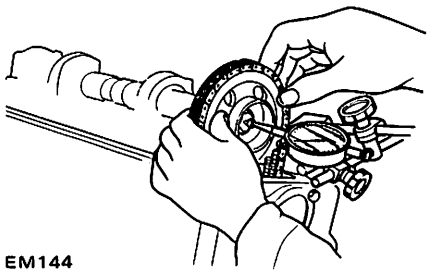


Fig. EM-72 Checking camshaft end play

3. Check chain for damage, excessive wear or stretch at roller links. Replace if faulty.
4. To properly adjust chain tension (or valve timing), camshaft sprocket has a cam locating plate and three location holes (Nos. 1, 2 and 3).

Camshaft sprocket is preset at No. 1 hole at the factory. If chain becomes loose, adjust it by setting camshaft sprocket at No. 2 hole. If chain is too loose, adjust it by setting camshaft sprocket at No. 3 hole.

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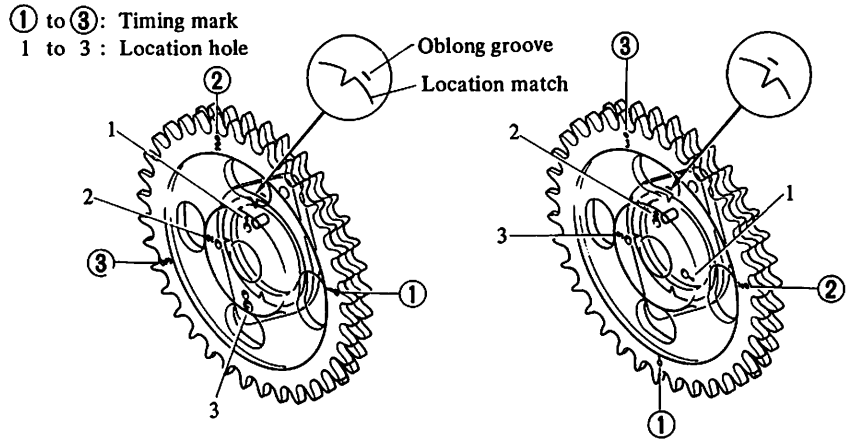


Fig. EM-73 Adjusting camshaft sprocket location

(1) Turn engine until No. 1 piston is at T.D.C. on its compression stroke. Determine whether camshaft sprocket location notch comes off the left end of the oblong groove on camshaft locating plate. (If the location notch is off the left end of the oblong groove, chain stretch is beyond limits.)

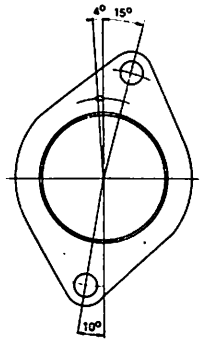


Fig. EM-74 Camshaft locating plate

(2) Turn engine until No. 1 piston is at T.D.C. on its compression stroke, setting camshaft on No. 2 location hole in camshaft sprocket. This No. 2 notch should then be on the right end of the oblong groove. When No. 2 hole is used, No. 2 timing mark must also be used. The amount of the modification is a 4° rotation of crankshaft.

(3) When modification becomes impossible even by transferring camshaft location hole, replace chain assembly.

Chain tensioner and chain guide

Check for wear and breakage. Replace if necessary.

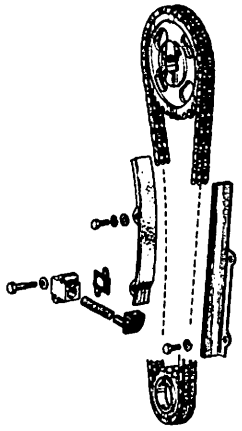


Fig. EM-75 Camshaft drive mechanism

Flywheel

1. Check clutch disc contact surface with flywheel for damage or wear. Repair or replace if necessary.
2. Measure runout of clutch disc contact surface with a dial gauge. If it exceeds 0.15 mm (0.0059 in) total indicator reading, replace it.

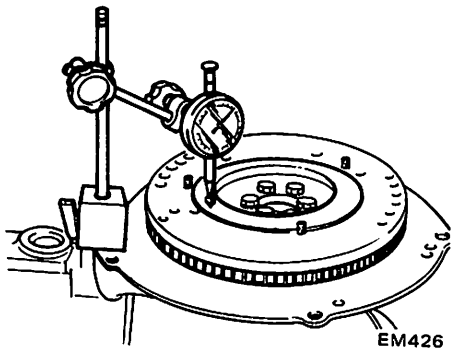


Fig. EM-76 Checking flywheel deviation

3. Check tooth surfaces of ring gear for flaws or wear.
   Replace if necessary.

Note: Replace ring gear at about 180 to 220°C (356 to 428°F).

Front cover and rear oil seal

First check front cover and rear oil seal for worn or folded over sealing lip or oil leakage. If necessary, install a new seal. When installing a new seal, pay attention to mounting direction.

Note: It is good practice to replace oil seal whenever engine is overhauled.

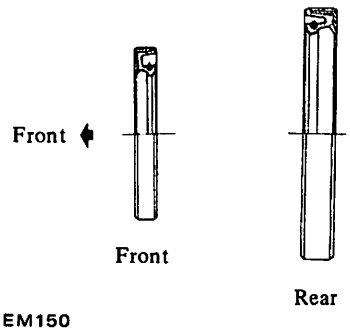


Fig. EM-77 Oil seals of crankshaft

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ENGINE ASSEMBLY

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ENGINE ASSEMBLY EM-22

PRECAUTIONS

1. Use thoroughly cleaned parts. Especially, make sure that oil holes are clear of foreign matter.
2. When installing sliding parts such as bearings, be sure to apply engine oil to them.
3. Use new packings and oil seals.
4. Do not reuse lock washers.
5. Keep tools and work benches clean.
6. Keep necessary parts and tools near at hand.
7. Be sure to follow specified tightening torque and order.
8. Applying sealant

Use sealant to eliminate water and oil leaks. Parts requiring sealant are:

(1) Front cover and corners of cylinder block: See Figure EM-78.

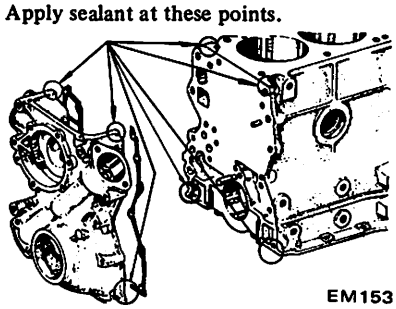


Fig. EM-78 Applying sealant (Front cover and cylinder block)

(2) Main bearing cap and cylinder block: Each side of rear main bearing cap and each corner of cylinder block. See Figure EM-79.

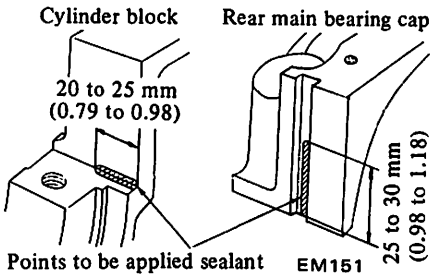


Fig. EM-79 Applying sealant (Main bearing cap and cylinder block)

(3) Cylinder block: Step portions at four mating surfaces (cylinder block to front chain cover and cylinder block to rear main bearing cap). See Figure EM-80.

Note: Do not apply too much sealant.

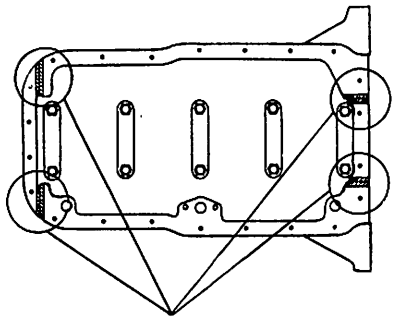


Fig. EM-80 Applying sealant (Cylinder block)

CYLINDER HEAD

1. Valve assembly and valve spring

Using Valve Lifter ST12070000, set valve spring seat in position, and fit valve guide with oil seal.

Assemble valve in the order shown below: valve, inner and outer valve springs, spring retainer, valve collet and valve rocker guide.

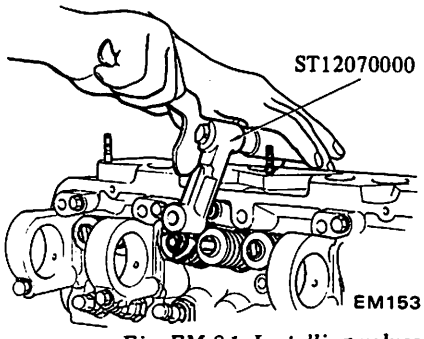


Fig. EM-81 Installing valves

Notes:

a. Ensure that valve face is free from foreign matter.

b. The L20B engine uses double type valve springs.

2. Valve rocker pivot assembly

Screw valve rocker pivots joined with lock nuts into pivot bushing.

3. Camshaft assembly

Set locating plate and carefully install camshaft in cylinder head. Do not damage the bearing inside. Oblong groove of locating plate must be directed toward front side of engine.

Camshaft bracket tightening torque:

1.8 to 2.0 kg-m (13 to 15 ft-lb)

4. Install camshaft sprocket on camshaft and tighten it together with fuel pump drive cam to specified torque.

Tightening torque:

12 to16 kg-m (87 to 116 ft-lb)

At this time, check camshaft end play.

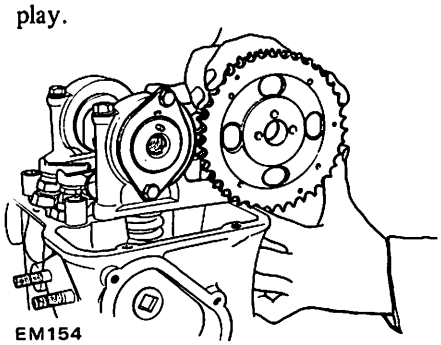
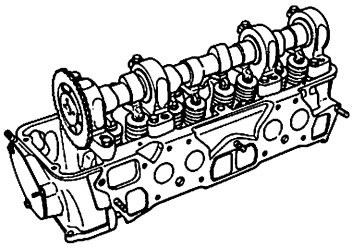


Fig. EM-82 Installing camshaft sprocket

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5. Install rocker arms by pressing valve springs down with a screwdriver.
6. Install valve rocker springs.
7. After assembling cylinder head, turn camshaft until No. 1 piston is at T.D.C. on its compression stroke.

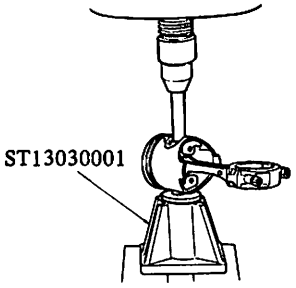


EM155

Fig. EM-83 Assembling cylinder head

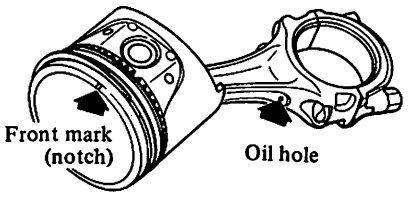
PISTON AND CONNECTING ROD

1. Assemble pistons, piston pins and connecting rods on the designated cylinder.



EM156

Fig. EM-84 Installing piston pin



EM157

Fig. EM-85 Assembling piston and connecting rod

Notes:

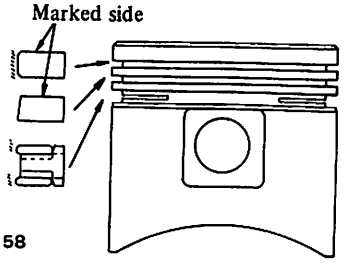
a. Piston is pressed into connecting rod, with fitting force of 0.5 to 1.5 tons; aid of Piston Pin Press Stand ST13030001 is necessary.
When pressing piston pin into connecting rod, apply engine oil to pin and small end of connecting rod.
b. Arrange so that oil jet of connecting rod big end is directed toward right side of cylinder block.
c. Be sure to install piston in cylinders with notch mark of piston head toward front of engine.

2. Install piston rings

Install top and second rings in right position, with marked side up.

Notes:

a. Top ring is chromium-plated on liner contacting face.
b. Second ring has larger taper surface than top ring.
c. In the combined oil ring, upper rail is the same as lower one.



EM158

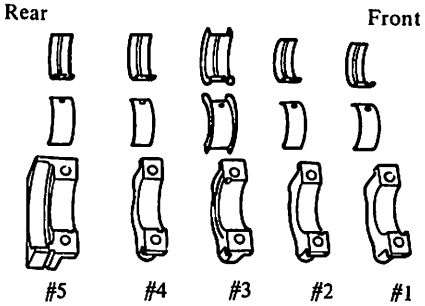
Fig. EM-86 Installing piston rings

3. Fix bearings on connecting rod and connecting rod cap.

Note: Clean back side of bearing carefully.

ENGINE ASSEMBLY

1. The first step in engine assembly is to bolt Engine Attachment ST05260001 to right hand side of cylinder block. Next, install block on another Engine Stand ST0501S000 with engine bottom up.
2. Set main bearings at the proper portion of cylinder block.



EM159

Fig. EM-87 Main bearings

3. Install baffle plate including cylinder block net.

Notes:

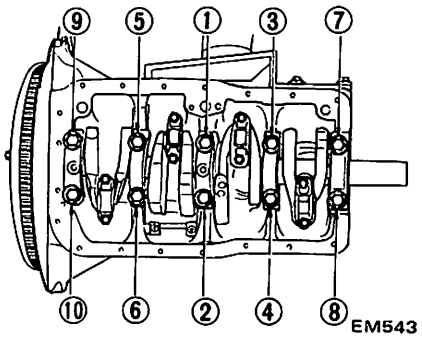
a. Only center bearing (No. 3) is a flanged type.
b. All inter-bearings (No. 2 and No. 4) are the same type.
c. Front bearing (No. 1) is also the same type as rear bearing (No. 5). The difference is that an oil hole is provided in the front bearing.
d. All upper and lower bearings are interchangeable.

4. Apply engine oil to main bearing surfaces on both sides of cylinder block and cap and then install crankshaft.
5. Install main bearing cap and tighten bolts to specified torque.

Tightening torque:
4.5 to 5.5 kg-m (33 to 40 ft-lb)

Notes:

a. Apply sealant to each side of rear main bearing cap and each corner of cylinder block as shown in Figure EM-79.
b. Arrange parts so arrow mark on bearing cap faces toward front of engine.
c. Prior to tightening bearing cap bolts, place bearing cap in proper position by shifting crankshaft in the axial direction.
d. Tighten bearing cap bolts gradually, in two to three stages outwardly from center bearing in the sequence as shown in Figure EM-88.
e. After securing bearing cap bolts, ascertain that crankshaft turns smoothly.



EM543

Fig. EM-88 Torque sequence of cap bolts

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6. Make sure that crankshaft has proper end play.

Crankshaft end play:
0.05 to 0.18 mm
(0.0020 to 0.0071 in)

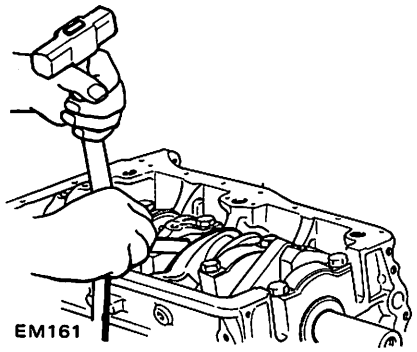


Fig. EM-89 Checking crankshaft end play

7. Install side oil seals into rear main bearing cap. Prior to installing, apply sealant to seals.

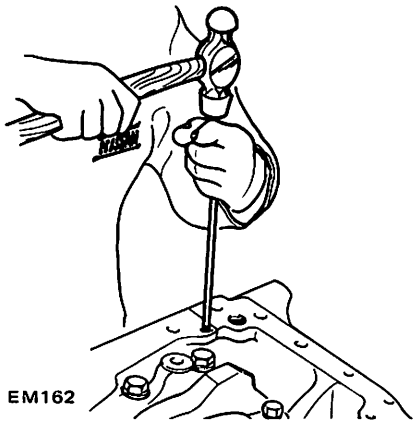


Fig. EM-90 Driving side oil seal

8. Install rear oil seal using Crankshaft Rear Oil Seal Drift ST15310000.

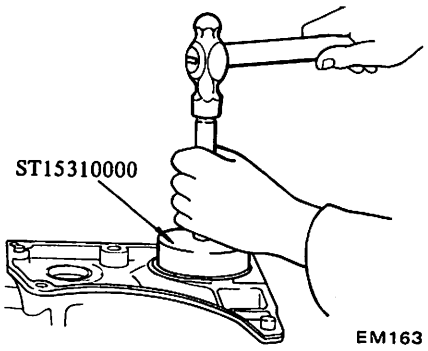


Fig. EM-91 Installing rear oil seal

Note: When installing oil seal, give coating of engine oil to mating shaft to prevent scratches and folded lip. Also give coating of oil to periphery of oil seal.

9. Install rear end plate.

10. Install flywheel securely, and tighten bolts to specified torque.

Tightening torque:
14 to 16 kg-m
(101 to 161 ft-lb)

11. Insert pistons in corresponding cylinder using Piston Ring Compressor EM03470000.

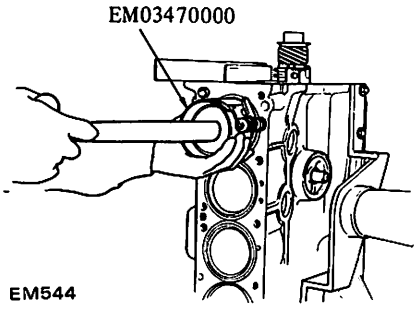


Fig. EM-92 Installing piston-rod assembly

Notes:
a. **Apply engine oil to sliding parts.**
b. **Arrange so that notch mark on piston head faces to front of engine.**
c. **Install piston rings at 180° to each other, avoiding their fit in the thrust and piston pin directions.**

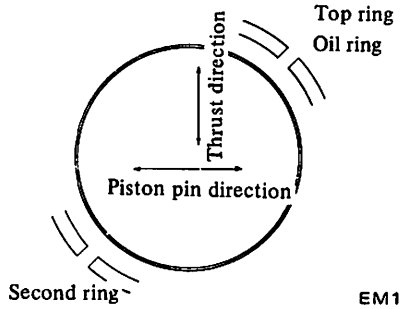


Fig. EM-93 Piston ring direction

12. Install connecting rod caps.

Tightening torque:
4.5 to 5.5 kg-m (33 to 40 ft-lb)

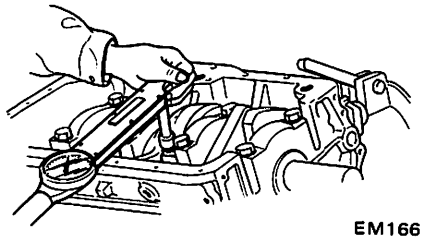


Fig. EM-94 Installing connecting rod cap

Note: Install connecting rods and connecting rod caps so that their assigned numbers are positioned on the same side and in the same direction with respect to cylinders.

13. Make sure that connecting rod big end has proper end play.

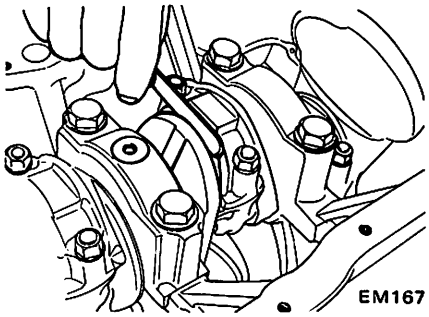


Fig. EM-95 Checking big end play

Big end play:
0.2 to 0.3 mm
(0.008 to 0.012 in)

14. Install cylinder head assembly.

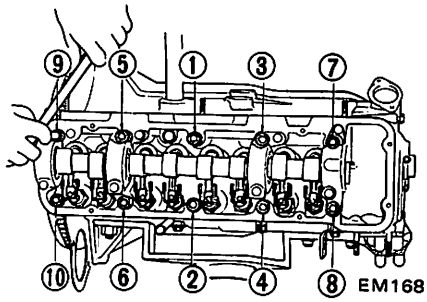


Fig. EM-96 Tightening sequence of cylinder head bolts

(1) Thoroughly clean cylinder block and head surface.

Do not apply sealant to any other part of cylinder block and head surface.

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(2) Turn crankshaft until No. 1 piston is at T.D.C. on its compression stroke.
(3) Make sure that camshaft sprocket location notch and plate oblong groove are aligned at their correct positions.
(4) When installing cylinder head, make sure that all valves are apart from heads of pistons.
(5) Do not rotate crankshaft and camshaft separately, or valves will hit heads of pistons.
(6) Temporarily tighten two bolts ①, ② shown in Figure EM-96.

Tightening torque:
2 kg-m (14 ft-lb)

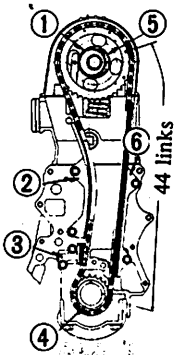
15. Install crankshaft sprocket and oil pump drive gear, and fit oil thrower.

Note: Make sure that mating marks of crankshaft sprocket face to front.

16. Install timing chain.

Notes:

a. Make sure that crankshaft and camshaft keys point upwards.



1 Fuel pump drive cam
2 Chain guide
3 Chain tensioner
4 Crank sprocket
5 Cam sprocket
6 Chain guide

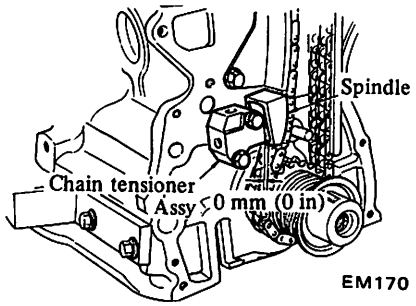
EM439

Fig. EM-97 Installing timing chain

b. Set timing chain by aligning its mating marks with those of crankshaft sprocket and camshaft sprocket at the right hand side. There are forty-four chain links between two mating marks of timing chain.
c. No. 2 hole is factory adjusted. When chain stretches excessively, adjust camshaft sprocket at No. 3 hole.
d. Use a set of timing marks and location hole numbers.

17. Install chain slack side guide to cylinder block.
18. Install chain tensioner.

Note: Adjust protrusion of chain tensioner spindle to 0 mm (0 in).



EM170

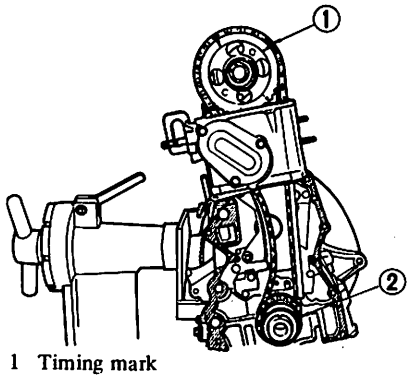
Fig. EM-98 Installing chain tensioner

19. Press new oil seal in front cover.

Notes:

a. Front cover oil seal should be replaced when front cover is disassembled.
b. Before pressing oil seal into front cover, give coating of engine oil to periphery of oil seal.
c. This oil seal is a threaded seal type which has improved sealing characteristics. Do not apply grease to sealing lip.

20. Install front cover with gasket in place.



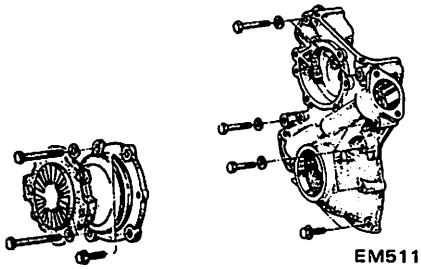
1 Timing mark
2 Timing mark

EM545

Fig. EM-99 Installing front cover

Notes:

a. Apply sealant to front cover and corners of upper section of cylinder block as shown in Figure EM-78.
b. Install front cover with head gasket in place.
c. Check height difference between cylinder block upper face and front cover upper face. Difference must be less than 0.15 mm (0.0059 in).
d. Note that different types of bolts are used.
e. Before installing front cover on cylinder block, apply coating of engine oil to sealing lip of oil seal.



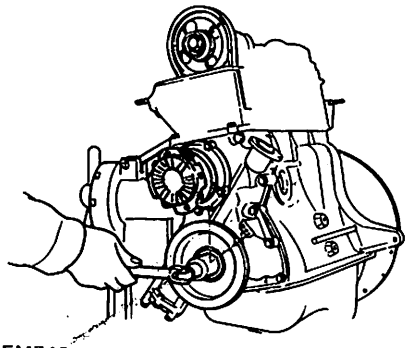
EM511

Fig. EM-100 Front cover bolts

Tightening torque:
Size M8 (0.315 in)
1.0 to 1.3 kg-m (7.2 to 9.4 ft-lb)
Size M6 (0.236 in)
0.4 to 0.6 kg-m (2.9 to 4.3 ft-lb)

21. Install crankshaft pulley and water pump assembly, then set No. 1 piston at T.D.C. on its compression stroke.

Crankshaft pulley nut tightening torque:
12 to 16 kg-m (87 to 116 ft-lb)



EM546

Fig. EM-101 Installing crankshaft pulley and water pump

22. Finally, tighten head bolts to the specified torque in three steps according to the tightening sequence shown in Figure EM-96.

Note that two types of bolts are used.

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Special tool Cylinder Head Bolt Wrench ST10120000

Tightening torque:
1st turn
4.0 kg-m (29 ft-lb)
2nd turn
6.0 kg-m (43 ft-lb)
3rd turn
6.5 to 8.5 kg-m
(47 to 61 ft-lb)

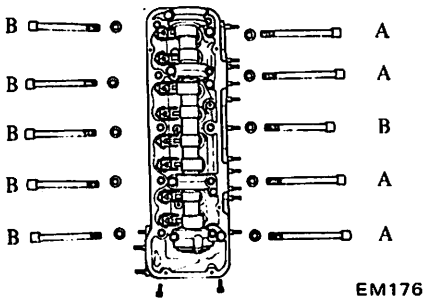


Fig. EM-102 Cylinder head bolts

Notes:
a. **Be sure to tighten two small bolts.**
b. **After engine has been operated for several minutes retighten if necessary.**

23. Install oil pump and distributor driving spindle in front cover.

Tightening torque:
1.1 to 1.5 kg-m
(8.0 to 10.8 ft-lb)

Notes:
a. **Assemble oil pump and drive spindle, aligning driving spindle face with oil pump hole.**
b. **Install oil pump together with drive spindle so that the projection on its top is located at the 11:25 a.m. position. At this point, the smaller bow-shape will be facing toward the front.**
c. **Do not forget to install gasket.**

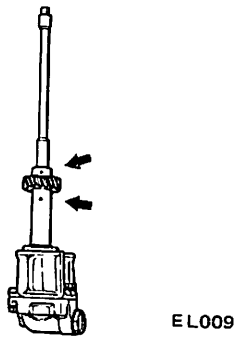


Fig. EM-103 Setting distributor driving spindle

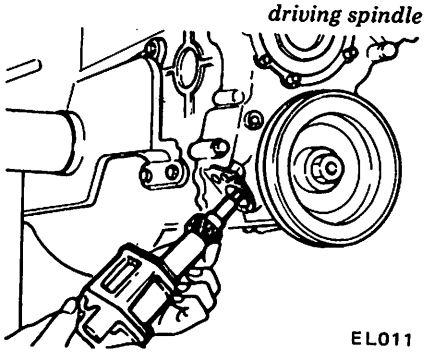


Fig. EM-104 Installing oil pump

24. Install fuel pump, water inlet elbow and front engine slinger in their positions.

Fuel pump tightening torque:
1.2 to 1.8 kg-m
(8.7 to 13.0 ft-lb)

Note: Do not forget to install fuel pump spacer and packing between spacer and block, spacer and fuel pump.

25. Install oil strainer, oil pan gasket and oil pan.

Tightening torque:
Oil strainer bolts
0.8 to 1.1 kg-m (5.8 to 8.0 ft-lb)
Oil pan bolts
0.6 to 0.9 kg-m (4.3 to 6.5 ft-lb)

Notes:
a. **Apply sealant to the step portions at four mating surfaces as shown in Figure EM-80.**
b. **Oil pan should be tightened in criss-cross pattern to a final torque of 0.6 to 0.9 kg-m (4.3 to 6.5 ft-lb).**

26. Adjust valve clearance to the specified dimensions.

Special tool
Pivot Adjuster ST10640001

Tightening torque:
5.0 to 6.0 kg-m (36 to 43 ft-lb)

Notes:
a. **First set clearance to the cold specifications.**

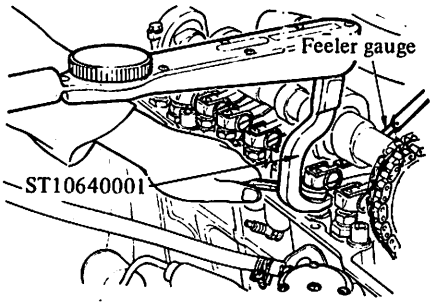


Fig. EM-105 Adjusting valve clearance

b. **After engine has been assembled, run it for at least several minutes, and finally adjust clearance to the warm specifications.**

Valve clearance mm (in)	Cold	Intake	0.20 (0.0078)
		Exhaust	0.25 (0.0098)
	Warm	Intake	0.25 (0.0098)
		Exhaust	0.30 (0.0118)

27. Install rocker cover to cylinder head.
28. Install air pump bracket and cooler compressor to cylinder block.
29. Install intake manifold to exhaust manifold. The intake manifold face which comes into contact with gasket should be even with that of exhaust manifold. Note that two different sizes of attaching bolts are used.

Tightening torque:
2.5 kg-m (18.0 ft-lb)

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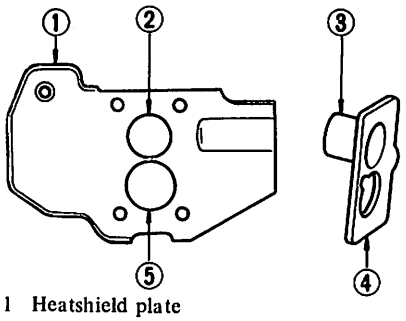
30. Install heatshield plate on manifold assembly.
31. Install air gallery pipe on exhaust manifold.
32. Install manifold gasket and manifold assembly on cylinder head.

Tightening torque:
1.2 to 1.6 kg-m
(8.7 to 11.6 ft-lb)

33. Install blow-by gas pipe on cylinder block and tighten with rear engine slinger.
34. Install thermostat housing gasket, thermostat housing and thermostat.
35. Install thermal vacuum valve on thermostat housing. Before installing, apply a liquid packing slightly to the threads.
36. Install F.I.C.D. bracket on cylinder head.
37. Install E.G.R. passage and E.G.R. valve on intake manifold.
38. Connect E.G.R. tube to E.G.R. tube and exhaust manifold.
39. Install check valve on air gallery pipe.
40. Install air cleaner bracket on intake manifold.
41. Install air control valve on air cleaner bracket (for California).
42. Install vacuum and fuel tubes (combined) on cylinder head.
43. Install distributor assembly.
44. Install heatshield plate, joint seat and carburetor.

Carburetor tightening torque:
0.5 to 1.0 kg-m (3.6 to 7.2 ft-lb)

Note: When installing joint seat, be sure to put the duct into primary hole in intake manifold.



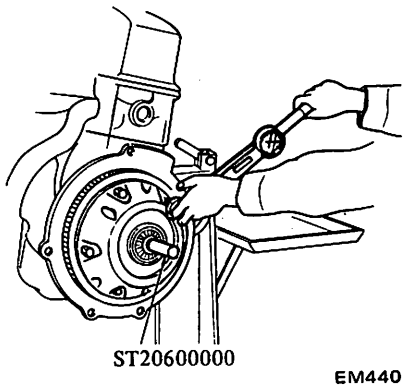
1 Heatshield plate
2 Primary hole
3 Duct
4 Joint seat
5 Secondary hole

EM534

Fig. EM-106 Installing carburetor joint seat

45. Install dash pot bracket and dash pot to intake manifold.
46. Connect all air, vacuum and fuel hoses and then secure with clamps.
(1) Cylinder block-to-P.C.V. valve hose
(2) A.B. valve-to-E.G.R. passage vacuum hose
(3) A.B. valve-to-E.G.R. passage air hose
(4) Vacuum tube-to-carburetor vacuum hoses
(5) Fuel tube-to-carburetor fuel hose
(6) Fuel tube-to-fuel pump fuel hose
(7) Distributor-to-vacuum switch (or spark delay valve) vacuum hose
(8) Air control valve vacuum hose
(9) Check valve-to-air control valve hose
(10) Thermal vacuum valve-to-E.G.R. valve vacuum hose
(11) Thermal vacuum valve-to-vacuum tube hose
47. Install carburetor air cleaner on carburetor and then connect air and vacuum hoses as follows:
(1) Air cleaner-to-exhaust manifold hot air duct
(2) Air cleaner-to-air pump hose
(3) Air cleaner-to-rocker cover hose
(4) Air cleaner-to-air control valve hose
(5) Air cleaner-to-A.B. valve hose
(6) Other vacuum hoses
48. Install spark plugs in place.
49. Connect all distributor high tension cables to spark plugs.
50. Install air pump, drive belt, cooler compressor and idler pulley.
51. Install left engine mounting bracket.
52. Install clutch assembly on flywheel with Clutch Aligning Bar ST20600000.

Tightening torque:
1.2 to 2.2 kg-m
(8.7 to 15.9 ft-lb).



EM440

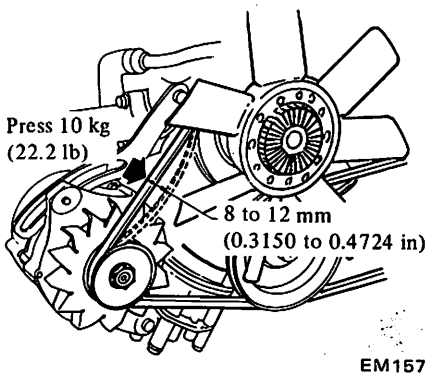
Fig. EM-107 Installing clutch assembly

53. Using an overhead hoist and lifting cable, hoist engine away from engine stand and then down onto engine carrier.
54. Install right engine mounting bracket, oil filter, oil pressure switch, oil level gauge and water drain plug. When installing oil filter, fasten it to cylinder block by hand.

Note: Do not overtighten filter, or oil leakage may occur.

55. Install alternator bracket adjusting bar, alternator, cooling fan and belt.
56. Adjust the deflection of drive belts when thumb pressure is applied midway between pulleys [A pressed force is above 10 kg (22.0 lb).]

Deflection of drive belts
8 to 12 mm
(0.315 to 0.472 in)



EM157

Fig. EM-108 Fan belt tension

57. Fill engine oil up to specified level.

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SERVICE DATA AND SPECIFICATIONS

GENERAL SPECIFICATIONS

Engine model		L20B
Cylinder arrangement		4, in-line
Displacement	cc (cu in)	1,952 (119.1)
Bore and stroke	mm (in)	85 x 86 (3.35 x 3.39)
Valve arrangement		O.H.C.
Firing order		1-3-4-2
Engine idle	rpm	
Manual transmission		750
Automatic transmission (in "D" range)		650
Compression ratio		8.5
Oil pressure (Warm at 2,000 rpm)		
	kg/cm² (psi)	3.5 to 4.0 (50 to 57)

SPECIFICATIONS

a) Valve mechanism

Valve clearance (Warm)		mm (in)	
	Intake		0.25 (0.0098)
	Exhaust		0.30 (0.0118)
Valve clearance (Cold)		mm (in)	
	Intake		0.20 (0.0079)
	Exhaust		0.25 (0.0098)
Valve head diameter		mm (in)	
	Intake		41.9 to 42.1 (1.650 to 1.657)
	Exhaust		35.0 to 35.2 (1.378 to 1.386)
Valve stem diameter		mm (in)	
	Intake		7.965 to 7.980 (0.3136 to 0.3142)
	Exhaust		7.945 to 7.960 (0.3128 to 0.3134)
Valve length		mm (in)	
	Intake		114.9 to 115.2 (4.524 to 4.535)
	Exhaust		115.7 to 116.0 (4.555 to 4.567)
Valve lift		mm (in)	
	Intake		10.5 (0.413)
	Exhaust		10.5 (0.413)
Valve spring out-of-square		mm (in)	less than 1.6 (0.063)
Valve spring free length		mm (in)	
Intake	Outer		49.98 (1.968)
	Inner		44.85 (1.766)
Exhaust	Outer		49.98 (1.968)
	Inner		44.85 (1.766)

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Valve spring pressured length (Valve open)		mm/kg (in/lb)	
Intake	Outer		29.5/49.0 (1.1 61/108)
	Inner		24.5/25.5 (0.965/56.2)
Exhaust	Outer		29.5/49.0 (1.161/108)
	Inner		24.5/25.5 (0.965/56.2)
Valve spring assembled height (Valve close)		mm/kg (in/lb)	
Intake	Outer		40.0/21.3 (1.575/47.0)
	Inner		35.0/12.3 (1.378/27.1)
Exhaust	Outer		40.0/21.3 (1.575/47.0)
	Inner		35.0/12.3 (1.378/27.1)

Valve guide length	mm (in)	
Intake		59.0 (2.323)
Exhaust		59.0 (2.323)
Valve guide height from head surface	mm (in)	10.6 (0.417)
Valve guide inner diameter	mm (in)	
Intake		8.000 to 8.018 (0.3150 to 0.3154)
Exhaust		8.000 to 8.018 (0.3150 to 0.3154)
Valve guide outer diameter	mm (in)	
Intake		12.023 to 12.034 (0.4733 to 0.4738)
Exhaust		12.023 to 12.034 (0.4733 to 0.4738)
Valve guide to stem clearance	mm (in)	
Intake		0.020 to 0.053 (0.0008 to 0.0021)
Exhaust		0.0040 to 0.0073 (0.0016 to 0.0029)
Valve seat width	mm (in)	
Intake		1.4 to 1.6 (0.0551 to 0.0630)
Exhaust		1.8 to 2.2 (0.0709 to 0.0866)
Valve seat angle		
Intake		45°30′
Exhaust		45°30′
Valve seat interference fit	mm (in)	
Intake		0.081 to 0.113 (0.0032 to 0.0044)
Exhaust		0.064 to 0.096 (0.025 to 0.038)
Valve guide interference fit	mm (in)	0.027 to 0.049 (0.0011 to 0.0019)

b) Camshaft and timing chain

Camshaft end play	mm (in)	0.08 to 0.38 (0.0031 to 0.0150)
Camshaft lobe lift	mm (in)	
Intake		7.0 (0.276)
Exhaust		7.0 (0.276)

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Camshaft journal diameter	mm (in)	
1st		47.949 to 47.962 (1.8877 to 1.8883)
2nd		47.949 to 47.962 (1.8877 to 1.8883)
3rd		47.949 to 47.962 (1.8877 to 1.8883)
4th		47.949 to 47.962 (1.8877 to 1.8883)
Camshaft bend	mm (in)	0.02 (0.0007)
Camshaft journal to bearing clearance	mm (in)	0.038 to 0.067 (0.0015 to 0.0026)
Camshaft bearing inner diameter	mm (in)	
1st		48.000 to 48.016 (1.8898 to 1.8904)
2nd		48.000 to 48.016 (1.8898 to 1.8904)
3rd		48.000 to 48.016 (1.8898 to 1.8904)
4th		48.000 to 48.016 (1.8898 to 1.8904)

c) Connecting rod

Center distance	mm (in)	146 (5.748)
Bearing thickness (Standard)	mm (in)	1.493 to 1.506 (0.0588 to 0.0593)
Big end play	mm (in)	0.20 to 0.30 (0.0079 to 0.0118)
Connecting rod bearing clearance	mm (in)	0.025 to 0.055 (0.0010 to 0.0022)
Connecting rod bend or torsion (per 100 mm or 2.937 in)	mm (in)	less than 0.03 (0.012)

d) Crankshaft and main bearing

Journal diameter	mm (in)	59.942 to 59.955 (2.633 to 2.360)
Journal taper & out-of-round	mm (in)	less than 0.01 (0.0004)
Crankshaft free end play	mm (in)	0.05 to 0.18 (0.0020 to 0.0071)
Wear limit of dittoed play	mm (in)	0.3 (0.0118)
Crank pin diameter	mm (in)	49.961 to 49.974 (1.966 to 1.967)
Crank pin taper & out-of-round	mm (in)	less than 0.01 (0.0004)
Main bearing thickness (Standard)	mm (in)	1.827 to 1.835 (0.0719 to 0.0722)
Main bearing clearance	mm (in)	0.020 to 0.062 (0.0008 to 0.0024)
Wear limit of dittoed clearance	mm (in)	0.12 (0.0047)
Crankshaft bend	mm (in)	0.05 (0.0019)
Flywheel runout at clutch disc contact face	mm (in)	less than 0.15 (0.0059)

e) Piston

Piston diameter (Standard)		mm (in)	84.965 to 85.015 (3.3451 to 3.3470)
0.50 (0.0197)	Oversize	mm (in)	85.465 to 85.515 (3.3648 to 3.3667)

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1.00 (0.0394) Oversize	mm (in)	.....	85.965 to 86.015 (3.3844 to 3.3864)
Ring groove width	mm (in)		
Top		.....	2.030 to 2.050 (0.0780 to 0.0807)
Second		.....	2.020 to 2.040 (0.0795 to 0.0803)
Oil		.....	4.015 to 4.040 (0.1581 to 0.1591)
Piston to bore clearance	mm (in)	.....	0.025 to 0.045 (0.0010 to 0.0018)
Piston pin hole off-set	mm (in)	.....	0.95 to 1.05 (0.0374 to 0.0413)
Piston pin hole diameter	mm (in)	.....	21.001 to 21.008 (0.8268 to 0.8271)

f) Piston pin

Pin diameter	mm (in)	.....	20.993 to 20.998 (0.8265 to 0.8266)
Pin length	mm (in)	.....	72.25 to 73.00 (2.8445 to 2.8740)
Piston pin to piston clearance	mm (in)	.....	0.003 to 0.015 (0.0001 to 0.0006)
Interference fit of piston pin to connecting rod bushing	mm (in)	.....	0.015 to 0.033 (0.0006 to 0.0013)

g) Piston ring

Ring height	mm (in)		
Top		.....	1.977 to 1.990 (0.0778 to 0.0783)
Second		.....	1.970 to 1.990 (0.0776 to 0.0783)
Side clearance	mm (in)		
Top		.....	0.040 to 0.073 (0.0016 to 0.0029)
Second		.....	0.030 to 0.070 (0.0012 to 0.0028)
Ring gap	mm (in)		
Top		.....	0.25 to 0.40 (0.0098 to 0.0157)
Second		.....	0.30 to 0.50 (0.0118 to 0.0197)
Oil		.....	0.30 to 0.90 (0.0118 to 0.0217)

h) Cylinder block

Cylinder bore inner diameter	mm (in)	.....	85.000 to 85.050 (3.3465 to 3.3484)
Wear limit of dittoed inner diameter	mm (in)	.....	0.2 (0.0079)
Cylinder bore taper and out-of-round	mm (in)	.....	0.015 (0.0006)
Difference in cylinder bore	mm (in)	.....	0.05 (0.0020)
Surface flatness	mm (in)	.....	less than 0.05 (0.0020)

i) Cylinder head

Surface flatness	mm (in)	.....	less than 0.05 (0.0020)

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TIGHTENING TORQUE

Cylinder head bolts	kg-m (ft-lb)		3rd Turn 6.5 to 8.5 (47 to 61)
Connecting rod big end nuts	kg-m (ft-lb)		4.5 to 5.5 (33 to 40)
Flywheel fixing bolts	kg-m (ft-lb)		14 to 16 (101 to 116)
Main bearing cap bolts	kg-m (ft-lb)		4.5 to 5.5 (33 to 40)
Camshaft bracket bolts	kg-m (ft-lb)		1.8 to 2.0 (13 to 15)
Camshaft sprocket bolt	kg-m (ft-lb)		12 to 16 (87 to 116)
Oil pan bolts	kg-m (ft-lb)		0.6 to 0.9 (4.3 to 6.5)
Oil pump bolts	kg-m (ft-lb)		1.1 to 1.5 (8.0 to 10.8)
Oil strainer bolts	kg-m (ft-lb)		0.8 to 1.1 (5.8 to 8.0)
Oil pan drain plug	kg-m (ft-lb)		2.0 to 3.0 (14 to 22)
Rocker pivot lock nuts	kg-m (ft-lb)		5.0 to 6.0 (36 to 43)
Camshaft locating plate bolts	kg-m (ft-lb)		0.6 to 0.9 (4.3 to 6.5)
Carburetor nuts	kg-m (ft-lb)		0.5 to 1.0 (3.6 to 7.2)
Manifold bolts	kg-m (ft-lb)		1.2 to 1.6 (8.7 to 11.6)
Fuel pump nuts	kg-m (ft-lb)		1.2 to 1.8 (8.7 to 13.0)
Crank pulley bolt	kg-m (ft-lb)		12 to 16 (87 to 116)
Water pump bolts	kg-m (ft-lb)		0.4 to 0.5 (2.9 to 3.6)
Front cover bolts	kg-m (ft-lb)	8 mm (0.315 in) dia. 6 mm (0.236 in) dia.	1.0 to 1.6 (7.2 to 11) 0.4 to 0.8 (2.9 to 5.8)

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TROUBLE DIAGNOSES AND CORRECTIONS

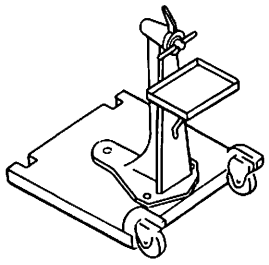
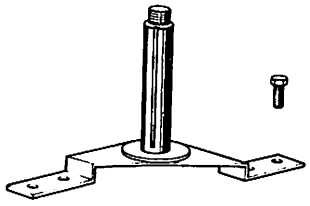
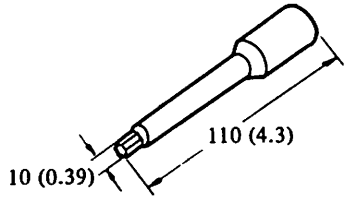
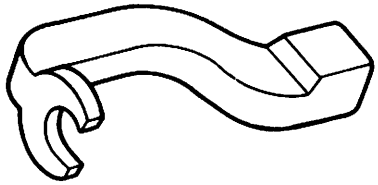
Condition	Probable cause	Corrective action
I. Noisy engine		
Knocking of crankshaft and bearing	Loose main bearing.	Replace.
	Seized bearing.	Replace.
	Bent crankshaft.	Repair or replace.
	Uneven wear of journal.	Correct.
	Excessive crankshaft end play.	Replace center bearing.
Knocking of piston and connecting rod	Loose bearing.	Replace.
	Seized bearing.	Replace.
	Loose piston pin.	Replace pin or bushing.
	Loose piston in cylinder.	Recondition cylinder.
	Broken piston ring.	Replace.
	Improper connecting rod alignment.	Realign.
Camshaft knocking	Loose bearing.	Replace.
	Excessive axial play.	Replace bearing thrust plate.
	Rough gear teeth.	Repair.
	Broken cam gear.	Replace.
Timing chain noise	Improper chain tension.	Adjust.
	Worn and/or damaged chain.	Replace.
	Worn sprocket.	Replace.
	Worn and/or broken tension adjusting mechanism.	Replace.
	Excessive camshaft and bearing clearance.	Replace.
Camshaft and valve mechanism knocking	Improper valve clearance.	Adjust.
	Worn adjusting screw.	Replace.
	Worn rocker face.	Replace.
	Loose valve stem in guide.	Replace guide.
	Weakened valve spring.	Replace.
	Seized valve.	Repair or replace.
Water pump knocking	Improper shaft end play.	Replace.
	Broken impeller.	Replace.
II. Other mechanical troubles		
Stuck valve	Improper valve clearance.	Adjust.
	Insufficient clearance between valve stem and guide.	Clean stem or ream guide.
	Weakened or broken valve spring.	Replace.
	Biting or damage of valve stem.	Replace or clean.
	Poor quality of fuel.	Use good fuel.

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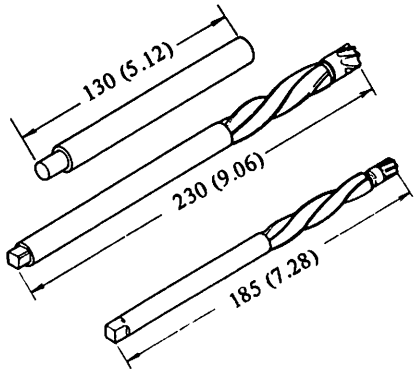
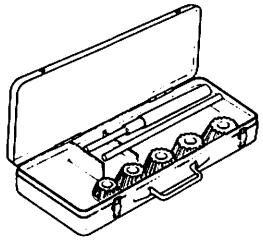
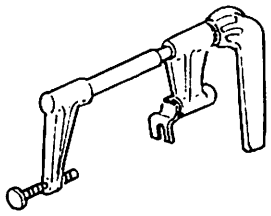
Condition	Probable cause	Corrective action
Seized valve seat	Improper valve clearance.	Adjust.
	Weakened valve spring.	Replace.
	Thin valve head edge.	Replace valve.
	Narrow valve seat.	Reface.
	Overheating.	Repair or replace.
	Over speeding.	Drive at proper speeds.
	Stuck valve guide.	Repair.
Excessively worn cylinder and piston	Shortage of engine oil.	Add or replace oil.
	Dirty engine oil.	Clean crankcase, replace oil and oil filter element.
	Poor quality of oil.	Use right oil.
	Overheating.	Repair or replace.
	Wrong assembly of piston with connecting rod.	Repair or replace.
	Improper piston ring clearance.	Adjust.
	Broken piston ring.	Replace.
	Dirty air cleaner.	Clean.
	Mixture too rich.	Adjust.
	Engine over run.	Drive at proper speeds.
	Stuck choke valve.	Clean and adjust.
	Overchoking.	Start correct way.
Faulty connecting rod	Shortage of engine oil.	Add oil.
	Low oil pressure.	Correct.
	Poor quality of engine oil.	Use proper oil.
	Rough surface of crankshaft.	Grind and replace bearing.
	Clogged oil passage.	Clean.
	Bearing worn or eccentric.	Replace.
	Bearing improperly assembled.	Correct.
	Loose bearing.	Replace.
	Connecting rod alignment incorrect.	Repair or replace.
Faulty crankshaft bearing	Shortage of engine oil.	Add or replace.
	Low oil pressure.	Correct.
	Poor quality of engine oil.	Use proper oil.
	Crankshaft journal worn or out-of-round.	Repair.
	Clogged oil passage in crankshaft.	Clean.
	Bearing worn or eccentric.	Replace.
	Bearing improperly assembled.	Correct.
	Eccentric crankshaft or bearing.	Replace.

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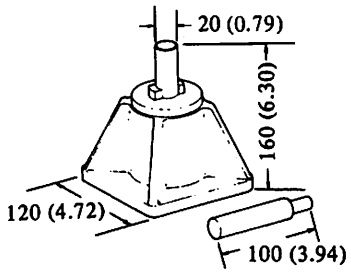
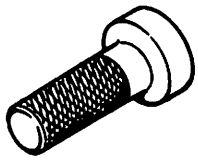
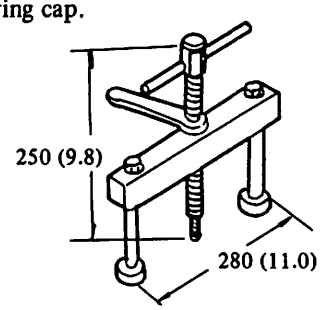
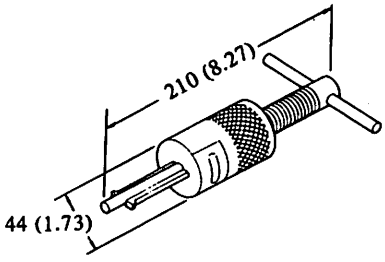
SPECIAL SERVICE TOOLS

No.	Tool number & tool name	Description Unit: mm (in)	For use on	Reference page or figure No.
1.	ST0501S000 Engine stand assembly ├ST05011000 Engine stand └ST05012000 Base	This engine stand assembly is used for disassembling or assembling engine block or differential carrier throughout 360° in all directions.  SE184	All models	Fig. EM-11 Page EM-22
2.	ST05260001 Engine attachment	This engine attachment is installed to engine stand ST0501S000 in disassembling or assembling engine.  SE185	L16 L18 L20B	Fig. EM-11 Page EM-22
3.	ST10120000 Cylinder head bolt wrench	Special hollow set bolts are used in tightening cylinder heads in L-series engines. This wrench is used to torque cylinder head bolts and its head can be inserted into the torque wrench.  SE186	All L-series	Fig. EM-18 Page EM-25
4.	ST10640001 Pivot adjuster	This tool is used together with a torque wrench in tightening pivot lock nut for valve clearance adjustment.  SE187	All L-series	Fig. EM-105

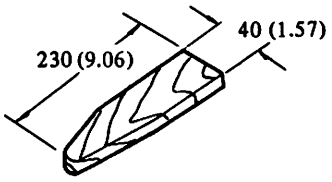
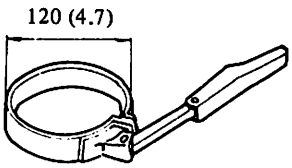
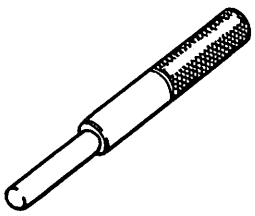
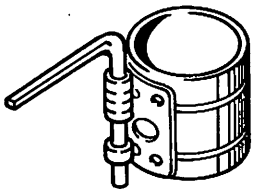
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No.	Tool number & tool name	Description Unit: mm (in)	For use on	Reference page or Figure No.
5.	ST1103S000 Valve guide reamer set — ST11031000 Reamer (12.2 mm dia.) — ST11032000 Reamer (8.0 mm dia.) — ST11033000 Drift	This guide is used for: o Pressing used guide out of place. o Driving a new guide into place. o Finishing the bore of new guide.  SE192	All L-series	Fig. EM-44
6.	ST11650001 Valve seat cutter set	This valve seat cutter set is used to or refinish a valve seat.  SE193	All L-series	Fig. EM-45
7.	ST12070000 Valve lifter	This tool is used to compress valve spring by the combined action of its cam and lever, thereby facilitating the removal or installation of valve collet (for general use).  SE194	All models	Fig. EM-32 Fig. EM-81

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No.	Tool number & tool name	Description Unit: mm (in)	For use on	Reference page or figure No.
8.	ST13030001 Piston pin press stand	This tool is used with a press to drive pin into, or out of, connecting rod.  SE188	All L-series	Fig. EM-29 Fig. EM-84
9.	ST15310000 Crankshaft rear oil seal drift	This tool is used to push a lip type rear oil seal for L-series engine into place by giving hammer blows.  SE189	All L-series	Fig. EM-91
10.	ST1651S000 Crankshaft main bearing cap puller ST16511000 Body ST16512001 Adapter	This tool is used to remove the cap from main bearing. When using this tool, turn its adapter into the threaded hole in main bearing cap.  SE190	All L-series	Fig. EM-25
11.	ST16610001 Pilot bushing puller	This tool is used to pull pilot bushing out of place.  SE191	L16 L18 L20B	Fig. EM-66

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No.	Tool number & tool name	Description Unit: mm (in)	For use on	Reference page or figure No.
12.	ST17420001 Chain stopper	This tool is used to prevent chains from falling out of place in removing cylinder heads or cam gears and shafts.  SE195	All L-series	Fig. EM-19
13.	ST19320000 Oil filter wrench	This tool is used to take oil filter out of place. In tightening the filter, do not use this tool, to prevent excess tightening.  SE197	All models	Page EM-4
14.	ST20600000 Clutch aligning bar	This tool is used to install clutch assembly to engine.  SE001	L20B	Fig. EM-107
15.	EM03470000 Piston ring compressor	This tool is used to compress piston rings while piston is being inserted into cylinder.  SE199	All models	Fig. EM-91

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SERVICE MANUAL

DATSUN 710
MODEL 710 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION EL

ENGINE LUBRICATION SYSTEM

EL

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TROUBLE DIAGNOSES AND CORRECTIONS ..... EL- 5

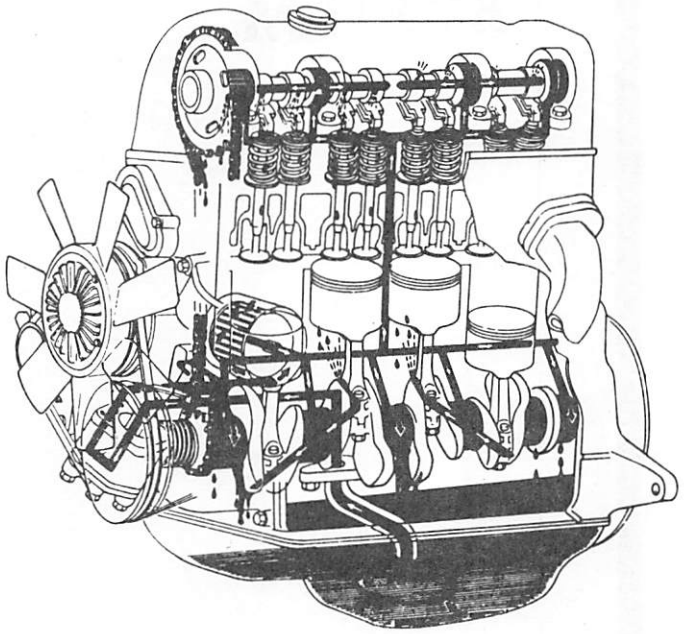
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ENGINE LUBRICATION SYSTEM

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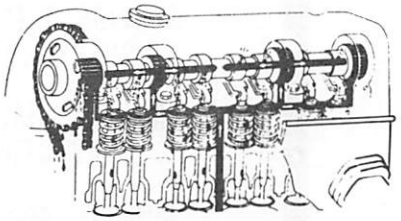


EL049

Fig. EL-1 Lubricating circuit

LUBRICATION CIRCUIT

The pressure lubrication of the engine is accomplished by a trochoid-type oil pump. This pump draws the oil through the oil strainer into pump housing and then forces it through the full flow type oil filter into the main oil gallery. Part of the oil is supplied to all crankshaft bearings, chain tensioner and timing chain. Oil supplied to crankshaft bearings is fed to connecting rod bearings through the drilled passages in the crankshaft. Oil injected from jet holes on connecting rods lubricates the cylinder walls and piston pins. The other part of the oil is brought to the oil gallery in the cylinder head to provide lubrication of the valve mechanism and timing chain as shown in Figure EL-2.



EL050

Fig. EL-2 Lubricating valve mechanism

From this gallery, oil holes go directly to all camshaft bearings through cam brackets.

Oil supplied through the No. 2 and No. 3 camshaft bearings is then fed to the rocker arm, valve and cam lobe through the oil gallery in the camshaft and the small channel at the base circle portion of each cam.

OIL PUMP

The oil pump is secured on the bottom of the front cover with four bolts and driven by the oil pump drive spindle assembly which is driven by the helical gear on the crankshaft.

The oil pump assembly consists of an oil pressure regulator valve and outer and inner rotors.

The spring-loaded oil pressure regulator valve limits the oil pressure to a maximum of 5.6 kg/cm² (80 psi).

Removal

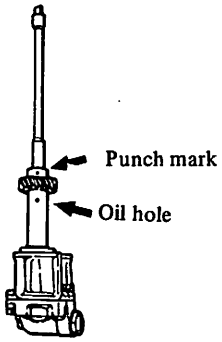
1. Remove distributor.
2. Drain engine oil, if necessary.
3. Remove oil pump body with drive spindle assembly.

Installation

1. Before installing oil pump on engine, turn crankshaft so that No. 1 piston is at T.D.C.

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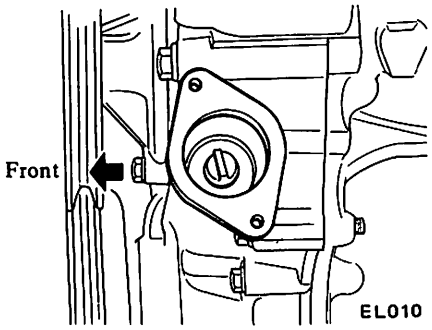
2. Fill pump housing with engine oil, then align punch mark of spindle with hole in oil pump as shown in Figure EL-3.



EL009

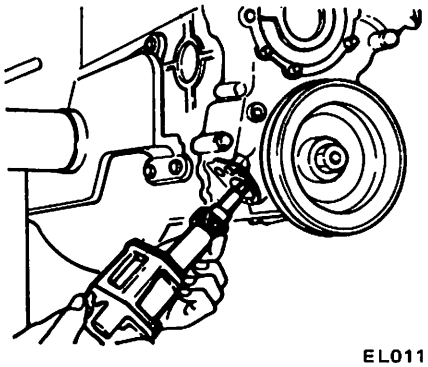
Fig. EL-3 Aligning punch mark and oil hole

3. Using a new gasket, install oil pump and drive spindle assembly so that the projection on its top is located in 11 : 25 a.m. position, at this time, the smaller bow-shape will be placed toward the front as shown in Figure EL-4.



EL010

Fig. EL-4 Setting drive spindle



EL011

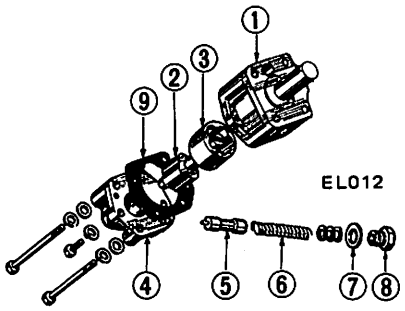
Fig. EL-5 Installing oil pump

Ascertain whether or not the engagement is in order by checking the top of spindle through distributor fitting hole.

4. Tighten bolts securing oil pump to front cover.

Disassembly and assembly

1. Remove pump cover attaching bolts, pump cover and cover gasket, and slide out pump rotors.
2. Remove regulator cap, regulator valve and spring.
3. Install pressure regulator valve and related parts.
4. Install outer rotor, inner rotor and shaft in pump body and do not turn cover gasket up.



EL012

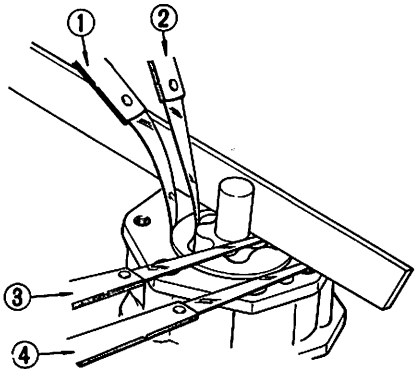
1 Oil pump body
2 Inner rotor and shaft
3 Outer rotor
4 Oil pump cover
5 Regulator valve
6 Regulator spring
7 Washer
8 Regulator cap
9 Cover gasket

Fig. EL-6 Oil pump

Inspection

Wash all parts in cleaning solvent and dry with compressed air.

1. Inspect pump body and cover for cracks or excessive wear.
2. Inspect pump rotors for excessive wear.
3. Check inner rotor shaft for looseness in pump body.
4. Inspect regulator valve for wear or scoring.
5. Check regulator spring to see that it is not worn on its side or collapsed.
6. Using a feeler gauge, check tip clearance and outer rotor-to-body clearances shown in Figure EL-7.



1 Outer rotor to body clearance
2 Tip clearance
3 Side clearance
4 Rotor to body clearance

EL040

Fig. EL-7 Checking rotor clearances

7. Place a straight edge across the face of pump as shown in Figure EL-7. Check side clearance (outer to inner rotor) and gap between body and straight edge.

The gap should be –0.03 to 0.06 mm (–0.0012 to 0.0024 in), then rotor to bottom cover clearance with gasket should satisfy the specifications.

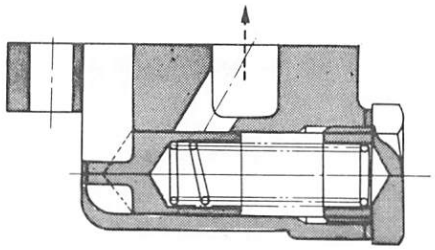
		Standard	Wear limit
Rotor side clearance (outer to inner rotor)	mm (in)	0.04 to 0.08 (0.0016 to 0.0031)	0.20 (0.0079)
Rotor tip clearance	mm (in)	Less than 0.12 (0.0047)	0.20 (0.0079)
Outer rotor to body clearance	mm (in)	0.15 to 0.21 (0.0059 to 0.0083)	0.5 (0.0197)
Rotor to bottom cover clearance	mm (in)	0.03 to 0.13 (0.0012 to 0.0051)	0.20 (0.0079)

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Note: Pump rotors and body are not serviced separately. If pump rotors or body are damaged or worn, replacement of the entire oil pump assembly is necessary.

OIL PRESSURE REGULATOR VALVE

The oil pressure regulator valve is not adjustable. At the released position, the valve permits the oil to by-pass through the passage in the pump cover to the inlet side of the pump. Check regulator valve spring to ensure that spring tension is correct.



EL014

Fig. EL-8 Regulator valve

Tightening torque		
Oil pump mounting bolts	kg-m (ft-lb)	1.1 to 1.5 (8.0 to 11)
Oil pump cover bolts	kg-m (ft-lb)	0.7 to 1.0 (5.1 to 7.2)
Regulator valve cap nut	kg-m (ft-lb)	4 to 5 (29 to 36)
Specifications		
Oil pressure at idling	kg/cm^2 (psi)	0.8 to 2.8 (11 to 40)
Regulator valve spring		
Free length	mm (in)	52.5 (2.067)
Pressured length	mm (in)	34.8 (1.370)
Regulator valve opening pressure	kg/cm^2 (psi)	3.5 to 5.0 (50 to 71)

OIL FILTER

The oil filter is a cartridge type. The oil filter element should be replaced periodically, with the use of Oil Filter Wrench ST19320000.

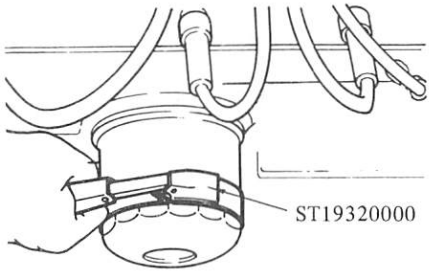
When installing an oil filter, fasten it to cylinder block by hand.

Note: Do not overtighten filter, or oil leakage may occur.

RELIEF VALVE

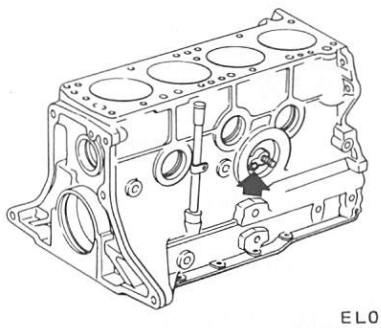
The relief valve located at the center portion securing oil filter to the cylinder block by-passes the oil into the main gallery when the oil filter element is excessively clogged.

With oil filter removed, check valve unit for operation. Inspect for a cracked or broken valve. If replacement is necessary, remove valve by prying it out with a screwdriver. Install a new valve in place by tapping it.



EL015

Fig. EL-9 Removing oil filter



EL016

Fig. EL-10 Relief valve

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SERVICE DATA AND SPECIFICATIONS

Oil pump

		Standard	Wear limit
Rotor side clearance (outer to inner rotor)	mm (in)	0.04 to 0.08 (0.0016 to 0.0031)	0.20 (0.0079)
Rotor tip clearance	mm (in)	less than 0.12 (0.0047)	0.20 (0.0079)
Outer rotor to body clearance	mm (in)	0.15 to 0.21 (0.0059 to 0.0083)	0.5 (0.0197)
Rotor to bottom cover clearance	mm (in)	0.03 to 0.13 (0.0012 to 0.0051)	0.20 (0.0079)

Oil pressure regulator valve

Oil pressure at idling	kg/cm^2 (psi)	0.8 to 2.8 (11 to 40)
Regulator valve spring:		
Free length	mm (in)	52.5 (2.067)
Pressured length	mm (in)	34.8 (1.370)
Regulator valve opening pressure	kg/cm^2 (psi)	3.5 to 5.0 (50 to 71)

Tightening torque:

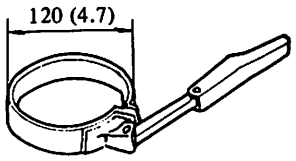
Oil pump bolt	kg-m (ft-lb)	1.1 to 1.5 (8.0 to 10.8)
Oil pump cover bolt	kg-m (ft-lb)	0.7 to 1.0 (5.1 to 7.2)
Regulator valve cap nut	kg-m (ft-lb)	4 to 5 (29 to 36)

TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable causes	Corrective actions
Oil leakage	Damaged or cracked body cover.	Replace.
	Oil leakage from gasket.	Replace.
	Oil leakage from regulator valve.	Tighten or replace.
	Oil leakage from blind plug.	Replace.
Decreased oil pressure	Leak of oil in engine oil pan.	Correct.
	Dirty oil strainer.	Clean or replace.
	Damaged or worn pump rotors.	Replace.
	Faulty regulator.	Replace.
	Use of poor quality engine oil.	Replace.
Warning light remains "on"- engine running	Decreased oil pressure.	Previously mentioned.
	Oil pressure switch unserviceable.	Replace.
	Electrical fault.	Check circuit.
Noise	Excessive backlash in pump rotors.	Replace.

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SPECIAL SERVICE TOOL

No.	Tool number & tool name	Description Unit: mm (in)	For use on	Reference page or figure No.
1.	ST19320000 Oil filter wrench	This tool is used to take oil filter out of place. In tightening the filter, do not use this tool, to prevent excess tightening.  SE197	All models	Fig. EL-9

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SERVICE MANUAL

DATSUN 710
MODEL 710 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION CO

COOLING SYSTEM

CO

COOLING SYSTEM ..... CO- 2
SERVICE DATA AND SPECIFICATIONS ..... CO- 5
TROUBLE DIAGNOSES AND CORRECTIONS ..... CO- 6

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COOLING SYSTEM

CONTENTS

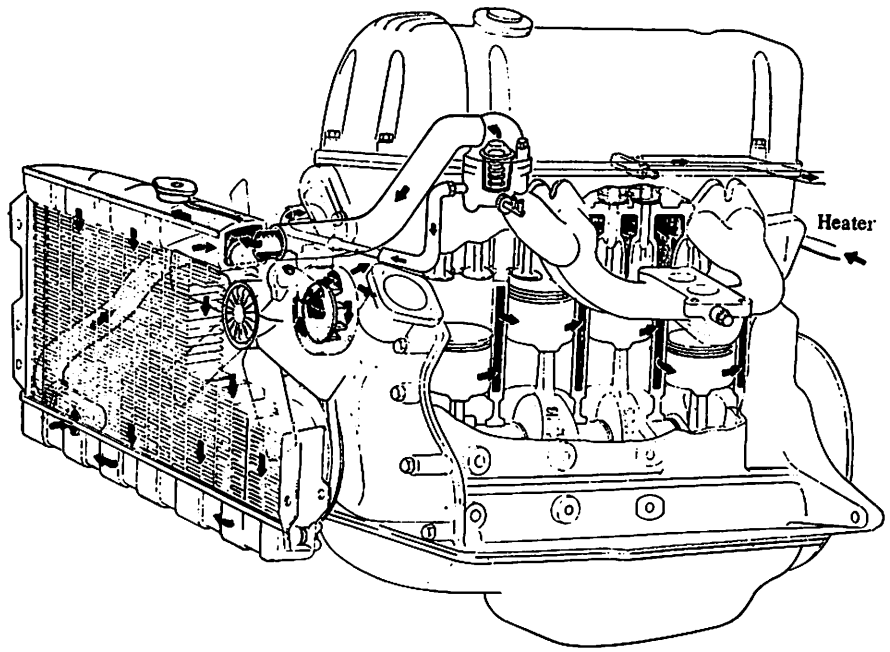
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RADIATOR CO-4
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Inspection CO-4

DESCRIPTION

The cooling system is a conventional pressure type. A centrifugal pump built in the front cover circulates the coolant.

The pressure type radiator filler cap installed on the radiator controls the cooling system at higher than atmospheric pressure. The higher pressure raises the boiling point of the coolant and increases the cooling efficiency of the radiator.

When the thermostat is closed, the coolant remains in the cylinder head and block for quick warm up of the engine. After reaching normal operating temperature, the coolant circulates through the radiator.



CO055

Fig. CO-1 Cooling system

Coolant level

The radiator coolant level should be checked and maintained 30 mm (1.18 in) below the bottom of the filler neck, when the engine is cold.

The expansion of the coolant will cause the level to drop due to overflow.

CAUTION:

To avoid serious personal injury, never remove radiator cap quickly when the engine is hot. Sudden release of cooling system pressure is very dangerous.

If it is necessary to remove the radiator cap when the radiator is hot, turn cap slowly counterclockwise to first stop. After all pressure in cooling system is released, turn cap past the stop and remove it.

Draining and flushing the cooling system

To drain the cooling system remove radiator cap, release drain cock at the bottom of radiator and drain plug on right side of cylinder block. If the heater system is installed, set heater temperature control valve at open position

After the coolant is drained completely, close drain cock and plug and refill system with clean water.

WATER PUMP, TORQUE COUPLING AND COOLING FAN

The water pump, cooling fan pulley and torque coupling are built into a unit construction. The water pump assembly is a centrifugal type and is

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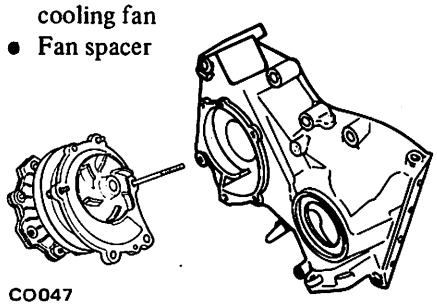
mounted on the engine front cover.

The fan is bolted at the torque coupling. The torque coupling keeps the fan speed at 2,500 rpm (rated) or below to conserve horsepower at high engine speed. It also helps reduce fan noise to a minimum during high speed operation. This unit is filled with a special silicone oil used as a fluid coupling which controls the fan speed. (Silicone oil can not be replenished.)

The pump shaft is supported by a double row ball bearing pressed into an aluminum die cast pump body. The bearing is permanently lubricated and sealed to prevent loss of lubricant and entry of dirt. The pulley hub is pressed onto the front end of the pump shaft. The torque coupling disc is pressed onto the pump shaft through the ball bearing and is securely staked at the front end face of the bearing. The torque coupling wheel is spline-fitted to the pump shaft and is securely staked at the front end face. The torque coupling disc and its wheel can not be disassembled. The fan pulley is welded to the pulley hub. The pump incorporates the impeller and volute chamber in it. The impeller rotates together with the torque coupling wheel. The volute chamber is provided in the front cover assembly. The inlet of the pump is connected to the radiator lower tank by a hose.

When installing cooler or air conditioner, replace torque coupling and cooling fan assembly with following parts.

- Torque coupling for air conditioning.
- 380 mm (14.96 in) dia. 8-blade cooling fan
- Fan spacer

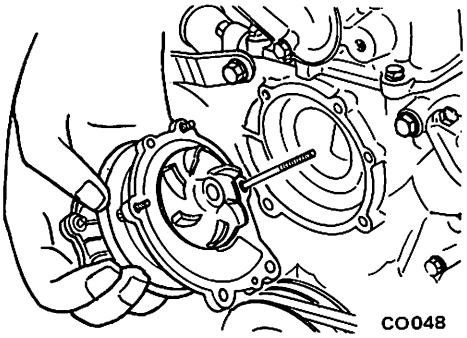


CO047

Fig. CO-2 Water pump and front cover

Removal

1. Drain coolant into a clean container.
2. Loosen four bolts securing fan shroud to radiator and remove shroud.
3. Loosen four bolts securing fan blade to torque coupling, and remove fan blade.
4. To loosen fan belt, loosen bolt securing alternator to bracket.
5. Remove five bolts securing water pump assembly to engine front cover, and detach water pump assembly and gasket from engine front cover. See Figure CO-3.



CO048

Fig. CO-3 Removing water pump

Disassembly

The water pump is so designed that it can not be disassembled.

Inspection

Inspect water pump assembly for the following. Replace pump assembly, if necessary.

1. Badly rusted or corroded body assembly and vane.
2. Excessive end play or rough operation of bearings.
3. Reduced cooling efficiency due to deteriorated silicone oil.
4. Oil leakage in torque coupling.

Installation

1. Make sure to clean gasket surfaces on pump and front cover. Always use new gasket when installing pump assembly. Be sure to tighten bolts uniformly.
2. Fill cooling system and check for leaks at pump.
3. Install fan blade, and tighten fixing bolts securely.

Install belt and adjust for proper tension. Refer to page CO-3, for Fan Belt Adjustment.

Fan belt adjustment

The fan belt should be properly adjusted at all times. A tight belt causes wear of alternator and water pump bearings. A loose belt causes improper cooling fan, water pump and alternator operation.

Check belt slack between alternator and fan pulley by pressing a force of 10 kg (22 lb).

Slackness of fan belt:
8 to 12 mm
(0.31 to 0.47 in)

If adjustment is necessary, loosen bolt retaining alternator adjusting bar to alternator. Move alternator toward or away from engine until correct tension is obtained.

THERMOSTAT

A wax pellet type thermostat is mounted in the thermostat housing at the cylinder head water outlet adjacent to the inlet manifold. The function of the thermostat is to control the flow of coolant, facilitating fast engine warm up and regulating coolant temperature. The thermostats are designed to open and close at predetermined temperatures and if not operating properly should be removed and tested.

Removal and installation

1. Partially drain coolant.
2. Disconnect upper radiator hose at water outlet.
3. Loosen two securing nuts and remove water outlet, gasket, and thermostat from thermostat housing.
4. After checking thermostat, reinstall, replacing with a new housing gasket.
5. Reinstall water outlet and tighten securing nuts.
6. Replenish coolant and check for leaks.

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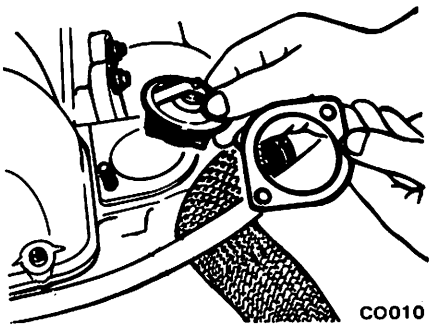


Fig. CO-4 Removing thermostat

Inspection

A sticking thermostat will prevent the cooling system from functioning properly. If thermostat sticks in the open position, engine will warm up very slowly. If thermostat sticks in the closed position, overheating will result. Therefore, the thermostat should be inspected to make sure it is in good condition.

1. Submerge thermostat in hot water 5°C (41°F) below temperature stamped on the frame.
2. Measure lift height of valve by inserting a screwdriver marked at point about 8 mm (0.315 in) from its tip.
3. Remove thermostat and place in water 5°C (41°F) above the temperature specified in following table.
4. Under above condition, valve should be closed completely.

Agitate water to maintain an even temperature throughout the container.

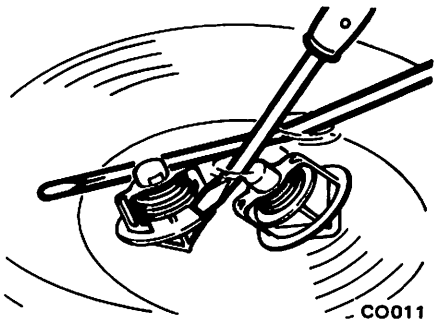


Fig. CO-5 Inspecting thermostat

If thermostat does not operate at above specified temperatures, it must be replaced because it can not be repaired.

	U.S.A.	Canada	Puerto Rico, Guam and U.N.T.T.
Valve opening temp.	82°C (180°F)	88°C (190°F)	76.5°C (170°F)
Max. valve lift	Above 8 mm at 95°C (0.315 in at 203°F)	Above 8 mm at 100°C (0.315 in at 212°F)	Above 8 mm at 90°C (0.315 in at 194°F)

Note: It is necessary to check a new thermostat before installing it in engine.

RADIATOR

The radiator is a conventional down flow type with top and bottom tanks to distribute coolant flow uniformly through the vertical tube of the radiator core.

The radiator filler cap is designed to maintain a pre-set pressure (0.9 kg/cm² (13 psi) above atmospheric pressure. The relief valve consisting of a blow-off valve and a vacuum valve, helps to prevent coolant loss from boiling by raising the pressure on the coolant. On the contrary, when pressure is reduced below atmospheric pressure the vacuum valve allows air to re-enter the radiator, preventing the formation of vacuum in the cooling system.

The bottom tank on cars equipped with the automatic transmission incorporates an oil cooler for the transmission fluid.

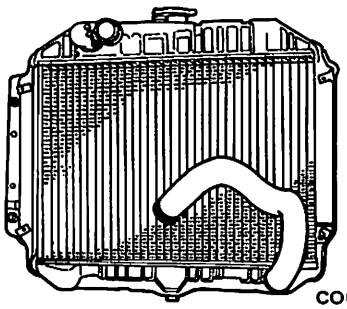


Fig. CO-6 Radiator for manual transmission

Removal and installation

1. Drain coolant into a clean container.
2. Remove front grille.
3. Disconnect radiator upper and lower hoses. On car with automatic transmission, disconnect cooler inlet and outlet lines from radiator.
4. Remove four bolts securing radiator shroud to radiator, and detach radiator shroud from radiator.
5. Remove four bolts securing radiator to radiator side supports. Remove radiator from car after pulling two hooks out through holes in radiator upper support. These hooks are installed on the front top face of radiator.

Inspection

Radiator cap should be pressure checked at regular tune up intervals. First, after cleaning, check rubber seal on cap for tears, cracks or deterioration. Then, install radiator cap on a tester. If cap does not hold pressure or will not release at proper pressure, replace cap.

Also, inspect radiator for water leakage using cap tester applying a pressure of 1.2 kg/cm² (17 psi). If malfunction is detected, repair or replace radiator.

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SERVICE DATA AND SPECIFICATIONS

Thermostat

	U.S.A.	Canada	Puerto Rico, Guam and U.N.T.T.
Valve opening temp.	82°C (180°F)	88°C (190°F)	76.5°C (170°F)
Max. valve lift	Above 8 mm at 95°C (0.315 in at 203°F)	Above 8 mm at 100°C (0.315 in at 212°F)	Above 8 mm at 90°C (0.315 in at 194°F)

Radiator

Transmission type	Manual	Automatic
Type	Corrugated fin type	Corrugated fin type (Equipped with oil cooler)
Cap relief pressure kg/cm² (psi)	0.9 (13)	0.9 (13)
Cooling system		
Leakage testing pressure	1.6 kg/cm² (22.761 psi)	1.6 kg/cm² (22.761 psi)
Capacity		
With heater	6.9 liters (7 ¼ US qt, 6 ⅛ Imp qt)	6.9 liters (7 ¼ US qt, 6 ⅛ Imp qt)
Without heater	6.4 liters (6 ¾ US qt, 5 ⅝ Imp qt)	6.4 liters (6 ¾ US qt, 5 ⅝ Imp qt)
Fan		
Number of blades x outer diameter		
With air conditioning	8 x 380 mm (14.96 in)	8 x 380 mm (14.96 in)
Without air conditioning	7 x 380 mm (14.96 in)	7 x 380 mm (14.96 in)

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TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Loss of water	Radiator coolant overfilled.	Do not fill up coolant to top of filler neck while cold.
	Damaged radiator seams.	Repair.
	Excessive wear in water pump.	Replace.
	Leak at heater connections or plugs.	Repair.
	Leak at water temperature gauge.	Tighten.
	Loose joints.	Tighten.
	Damaged cylinder head gasket.	Replace.
		Check engine oil for contamination and refill as necessary.
	Cracked cylinder block.	Replace.
		Pull engine oil level gauge to check for water in crankcase.
	Cracked cylinder head.	Replace.
	Loose cylinder head bolts.	Tighten.
Poor circulation	Restriction in system.	Check hoses for crimps, reverse flush radiator, and clear the system of rust and sludge.
	Insufficient coolant.	Replenish.
	Inoperative water pump.	Replace.
	Loose fan belt.	Adjust.
	Inoperative thermostat.	Replace.
Corrosion	Excessive impurity in water.	Use soft and clean water (Rain water is satisfactory.).
	Infrequent flushing and draining of system.	Cooling system should be drained and flushed thoroughly periodically. [Nissan Long Life Coolant (L.L.C.) is also available.]
Overheating	Malfunctioning thermostat.	Replace.
	Radiator fins choked with mud, chaff, etc.	Clean out air passage thoroughly from engine side of radiator using compressed air.
	Incorrect ignition and valve timing.	Adjust.
	Dirty oil and sludge in engine.	Refill.
	Inoperative water pump.	Replace.
	Loose fan belt.	Adjust.
	Restricted radiator.	Flush radiator.
	Inaccurate temperature gauge.	Replace.
	Impurity in water.	Use soft, clean water.
Over cooling	Malfunctioning thermostat.	Replace.
	Inaccurate temperature gauge.	Replace.

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SERVICE MANUAL

DATSUN 710
MODEL 710 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION EF

FUEL SYSTEM

EF

AUTOMATIC TEMPERATURE-CONTROL (A.T.C.) AIR CLEANER ..... EF- 2
IDLE COMPENSATOR ..... EF- 7
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CARBURETOR EF-11

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AUTOMATIC TEMPERATURE CONTROL (A.T.C.) AIR CLEANER

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AIR CLEANER EF-5
INSPECTION EF-5
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DESCRIPTION

The air cleaner removes dust and dirt from the air before it enters the carburetor and engine. It also muffles noise resulting from the intake of air into the engine.

The air cleaner especially designed for improved exhaust emission control is referred to as "Automatic Temperature Control Air Cleaner". In order to reduce HC emission, when the under hood temperature is below 30°C (86°F), the automatic temperature control system maintains the temperature of air to be sucked in the carburetor at 30 to 54°C (86 to 130°F), thereby enabling lean setting for carburetor calibration. In addition to this, the automatic temperature control system is effective to improve warm-up characteristics of the engine and to remove carburetor icing.

The A.T.C. air cleaner system consists of the following devices:

1. Air cleaner element

The air cleaner element employed is a viscous paper type. It requires only periodical replacement and should not be cleaned.

2. Automatic temperature control air cleaner

In the A.T.C. air cleaner, the air cleaner valve is actuated by intake manifold vacuum to control the intake air flow circuit. The temperature sensor detects the intake air temperature, and opens or closes the vacuum passage.

3. Hot air duct

The hot air duct is mounted on the exhaust manifold. The air warmed up between the exhaust manifold and hot air duct is led to the air cleaner through the hose.

4. Blow-by gas filter

The blow-by gas filter removes dirt and oil from the blow-by gas sucked in the air cleaner from the engine rocker cover.

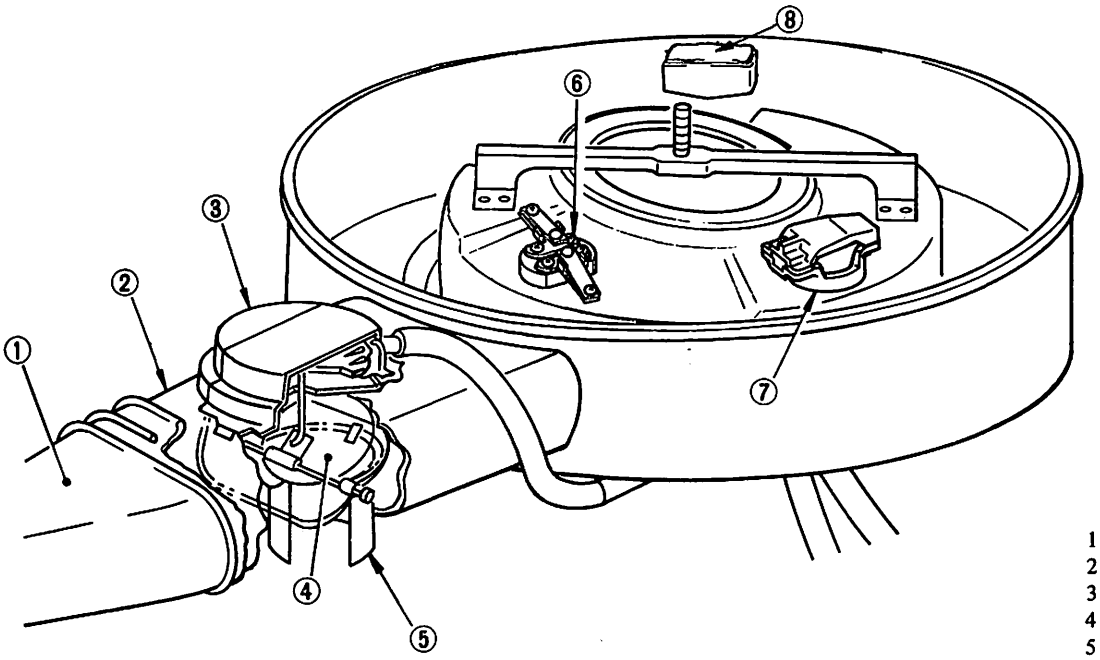
5. Fresh air duct

The fresh air duct leads the outside fresh air directly to the air cleaner.

6. Idle compensator

See paragraph "Idle compensator" (Page EF-7).

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EF203

1 Fresh air duct
2 Air inlet pipe
3 Vacuum motor assembly
4 Air control valve
5 Hot air pipe
6 Idle compensator
7 Temperature sensor assembly
8 Blow by gas filter

Fig. EF-1 Automatic temperature control air cleaner

OPERATION

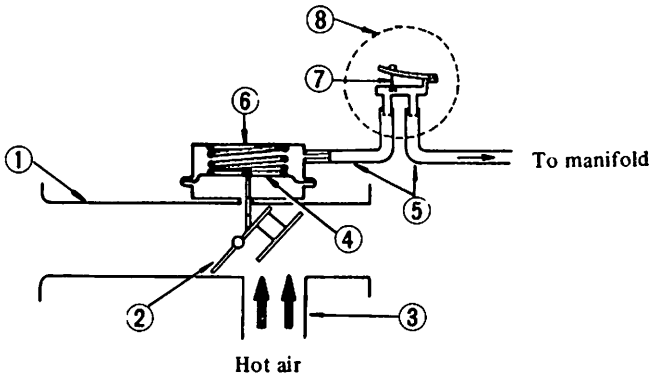
The automatic temperature control system of the air cleaner is controlled by the inlet air temperature and the load condition of the engine. The inlet air temperature is detected by the sensor, and the vacuum motor is actuated by the engine intake vacuum.

Under hood air temperature	Sensor vacuum at vacuum motor side	Air control valve operation	Sensor operation
Below 30°C (86°F)	Below 60 mmHg (2.36 inHg)	Open (cold air)	Close
	Above 210 mmHg (8.27 inHg)	Close (hot air)	
30 to 54°C (86 to 130°F)	———	Half-open (cold air + hot air)	Open
Above 55°C (131°F)	———	Open (cold air)	Open

A.T.C. AIR CLEANER HOT AIR OPERATION

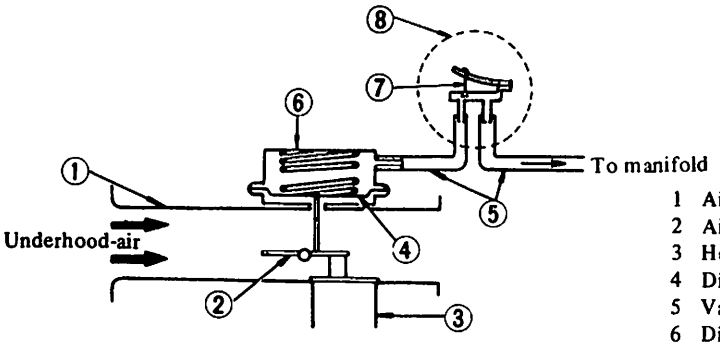
When the under hood air temperature is low, the sensor air bleed valve remains in the closed position, and establishes vacuum passage between the intake manifold and vacuum motor. With this condition, the vacuum at the intake manifold side actuates the air control valve attached to the vacuum motor diagram to introduce hot air into the air cleaner through the hot air duct on the exhaust manifold.

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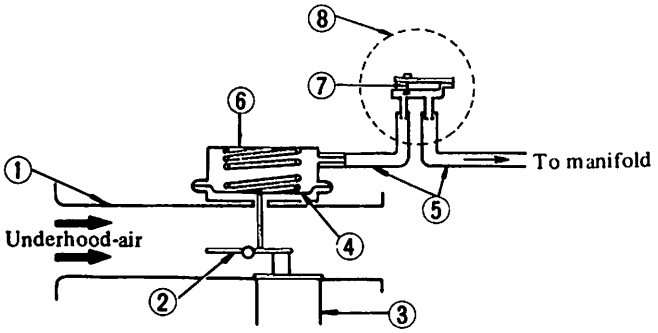
1 Air inlet pipe
2 Air control valve
3 Hot air pipe
4 Diaphragm
5 Vacuum hose
6 Diaphragm spring
7 Air bleed valve (closed)
8 Temperature sensor assembly EC007

Fig. EF-2 Hot air delivery mode (During cold engine operation)



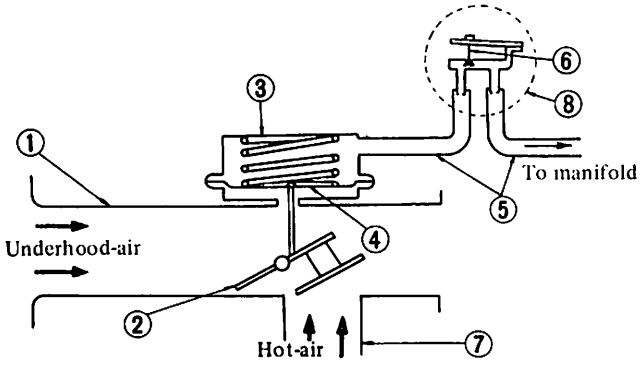
1 Air inlet pipe
2 Air control valve
3 Hot air pipe
4 Diaphragm
5 Vacuum hoses
6 Diaphragm spring
7 Air bleed valve (closed)
8 Temperature sensor assembly EF205

Fig. EF-3 Cold air delivery mode (During cold engine operation)



1 Air inlet pipe
2 Air control valve
3 Hot air pipe
4 Diaphragm
5 Vacuum hoses
6 Diaphragm spring
7 Air bleed valve (fully open)
8 Temperature sensor assembly EC008

Fig. EF-4 Under hood air delivery mode (During hot engine operation)



1 Air inlet pipe
2 Air control valve
3 Diaphragm spring
4 Diaphragm
5 Vacuum hose
6 Air bleed valve (partially opened)
7 Hot air pipe
8 Temperature sensor assembly EC009

Fig. EF-5 Regulating air delivery mode

A.T.C. AIR CLEANER COLD AIR OPERATION

1. When under hood air temperature is low:

Similarly to paragraph 1 above, the sensor air bleed valve remains in the closed position, and vacuum passage is established between the intake manifold and the vacuum motor, and the intake manifold vacuum is applied to the vacuum motor diaphragm. When the vacuum is small, or when the engine is operating under heavy load, the air control valve opens widely, irrespective of the temperature around the sensor, to introduce the under hood air (cold air) for increased power of the engine.

2. When under hood air temperature is high:

The sensor air bleed valve opens fully to shut off the vacuum passage between the intake manifold and the vacuum motor. Due to the force of the vacuum motor diaphragm spring, the air control valve closes the hot air pipe of the air cleaner, and introduces the under hood air (cold air).

A.T.C. AIR CLEANER COLD AND HOT AIR OPERATION

When the sensor air bleed valve is partially opened, opening of the air control valve varies with the vacuum of the intake manifold. With the air control valve half-open, the cold air and hot air are sucked together and mixed for controlling of the air temperature of the air to be introduced to the air cleaner.

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TEMPERATURE SENSOR

The temperature sensor is attached to the inside of the air cleaner. The bimetal built-in the sensor detects the under hood air temperature and opens or closes the vacuum passage in the sensor.

The construction of the temperature sensor is shown in the following.

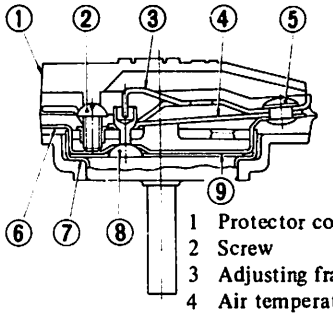


Fig. EF-6 Temperature sensor

VACUUM MOTOR AND AIR CONTROL VALVE

The vacuum pressure which varies with opening of the carburetor throttle acts upon the vacuum motor diaphragm. The valve shaft attached to the diaphragm is then moved up or down in response to the vacuum on the diaphragm. This movement of the valve shaft actuates the air control valve to control the temperature of the air to be introduced into the air cleaner.

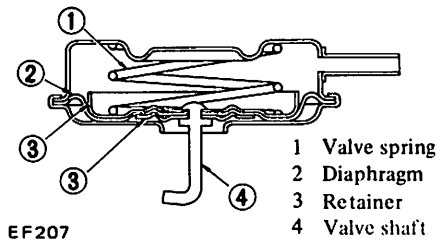


Fig. EF-7 Vacuum motor

REMOVAL AND INSTALLATION

TEMPERATURE SENSOR

Removal

1. Using pliers, flatten clip connecting vacuum hose to sensor vacuum tube.

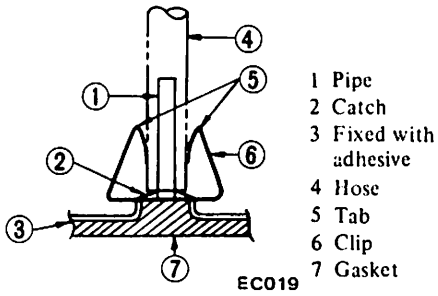


Fig. EF-8 Removal of sensor

2. Disconnect hose from sensor.
3. Take off clip from sensor vacuum tube, and dismount sensor body from air cleaner.

Note: The gasket between sensor and air cleaner is bonded to the air cleaner side, and should not be removed.

Installation

1. Mount sensor on the specified position.

For mounting position of sensor, see the following.

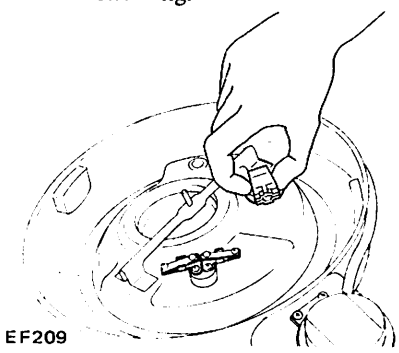


Fig. EF-9 Installing sensor

2. Insert clip into vacuum tube of sensor. After installing each vacuum hose, secure hose with the clip.

Note: Be sure to install vacuum hose correctly. Correct position is: L.H. side to "Nissan" mark at the top face of sensor for intake manifold; R.H. side for vacuum motor.

VACUUM MOTOR

1. Remove screws securing vacuum motor to air cleaner.
2. Disconnect valve shaft attached to vacuum motor diaphragm from air control valve, and remove vacuum motor assembly from air cleaner.
3. To install, reverse the removal procedure.

AIR CLEANER

1. Loosen bolts securing air cleaner to air cleaner bracket.
2. Loosen air cleaner lock bolt and remove air cleaner from carburetor. Disconnect the following hoses when dismounting air cleaner.

1) Under hood air inlet hose
2) Hot air inlet hose
3) Vacuum hose (Sensor to intake manifold)
4) Vacuum hose (Sensor to vacuum motor)
5) Vacuum hose (Idle compensator to intake manifold)
6) Hose (Air pump to air cleaner)
7) Hose (AB valve to air cleaner)
8) Hose (Carburetor to air cleaner)
9) Blow-by hose (Air cleaner to rocker cover)

3. To install, reverse the removal procedure.

INSPECTION

1 AIR CLEANER ELEMENT

Viscous paper type air cleaner element does not require any cleaning operation until it is replaced periodically. Brushing or blasting operation will cause clogging and result in enrichment of carburetor mixture, and should never be conducted. For replacement interval of air cleaner element, refer to "Maintenance Schedule".

2 HOT AIR CONTROL SYSTEM

In warm weather, it is difficult to find out malfunction of hot air control system. In cold weather, however,

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malfunction of air control valve due to disconnection or deterioration of vacuum hose between intake manifold and vacuum motor and insufficient durability of air control valve will cause insufficient automatic control operation for intake air, and result in engine disorder including:

1. Stall or hesitation of engine operation
2. Increase in fuel consumption
3. Lack of power

These phenomena reveal malfunction of hot air control system. If these phenomena should occur, check hot air control system as described in the following before carrying out inspection of carburetor.

2-1 Vacuum hoses

(Intake manifold to 3-way connector, 3-way connector to temperature sensor, 3-way connector to idle compensator, temperature sensor to vacuum motor)

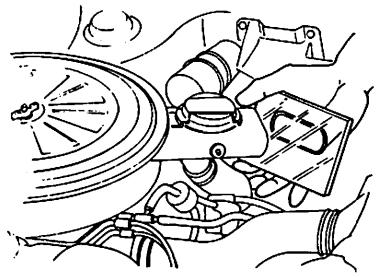
1. Check that vacuum hoses are securely connected in correct position.
2. Check each hose for cracks or distortion, hose clip for condition.

Note: Vacuum hose position: L.H. side of "Nissan" mark on the top of sensor is for intake manifold; R.H. side of the mark is for vacuum motor.

2-2 Vacuum motor

1. With engine stopped, disconnect fresh air duct.

Place a mirror at the end of air cleaner inlet pipe as shown, and check to see if air control valve is in correct position.



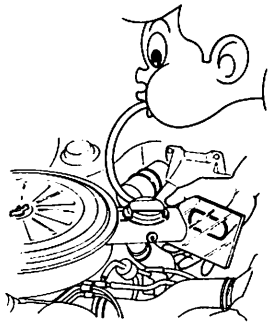
EF211

Fig. EF-10 Inspecting valve position

Air control valve is in correct position if its under hood air inlet is open and hot air inlet is closed. Check air control valve linkage for condition.

2. Disconnect vacuum motor inlet vacuum hose, and connect another hose to the inlet to apply vacuum to vacuum motor. Vacuum can be applied by breathing in the hose end as shown.

Place a mirror at the end of air cleaner inlet pipe, and check to see if air control valve is in correct position.



EF215

Fig. EF-11 Inspecting valve position

Correct position of air control valve is the reverse of paragraph 1 above. Air control valve is in correct position if under hood air inlet is closed, and hot air inlet is open.

3. With hot air inlet is open position, as described in paragraph 2 above, pinch vacuum hose with fingers and cut off air from vacuum hose. In this condition, check that air control valve maintains the condition described in step 2 for more than 30 seconds, and that hot air inlet is open. If diaphragm spring actuates the air control valve by its spring force to open under hood air inlet within 30 seconds, replace vacuum motor as an assembly since this may be resulted from air leak at vacuum motor diaphragm.

2-3 Temperature sensor

Check temperature sensor for function by proceeding as follows. Be sure to keep engine cold before starting test.

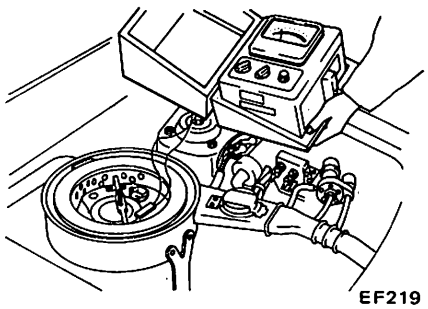
1. With engine off, check air control valve for condition. In this case, under hood air inlet is open. Use a mirror for inspection as 2-2-1 above.
2. Start engine and keep idling.

Immediately after engine starting, check air control valve for correct position as described above. In this case, correct position of air control valve is the reverse of 2-2-1; under hood air inlet is closed, and hot air inlet is open.

3. Check that air control valve gradually opens to under hood air inlet side as engine warms up. When environmental temperature around temperature sensor is low, spend more time for engine warming up operation to facilitate smooth operation of air control valve.

If the above test reveals any trouble in the operation of air control valve, carry out the following test.

4. Remove air cleaner cover. Set temperature sensing element of thermister or thermometer to a position where temperature around sensor can be measured. In this case, fix wiring of thermister or thermometer on the bottom surface of air cleaner with adhesive tape in such a manner that the set position of temperature sensing element will not be affected by air flow. Then install air cleaner cover.



EF219

Fig. EF-12 Checking temperature sensor

5. Carry out test as described in steps 1, 2 and 3 above. When air control valve begins to open to under hood air inlet side several minutes after engine starting, read the indication of thermister or thermometer. If reading falls within the working temperature range of temperature sensor, the sensor is normal. If reading exceeds the range, replace the sensor with new one.

Note: Before replacing temperature sensor, check idle compensator as described in "Idle compensator".

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IDLE COMPENSATOR

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DESCRIPTION

The idle compensator is basically a thermostatic valve which functions to introduce the air directly from the air cleaner to the intake manifold to compensate for abnormal enrichment of mixture in high idle temperature.

The bi-metal attached to the idle compensator detects the temperature of intake air, and opens or closes the valve. Two idle compensators having different temperature characteristics are installed; one opens at an intake air temperature of 60 to 70°C (140 to 158°F), and the other at 70 to 90°C (158 to 194°F).

OPERATION

The construction of the idle compensator is shown in the following.

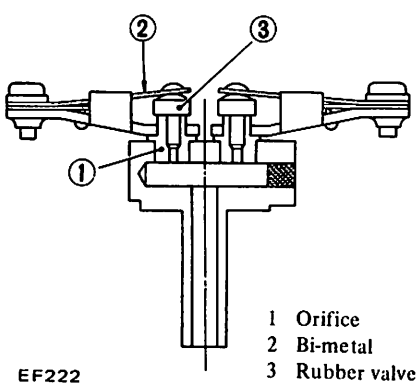


Fig. EF-13 Structure of idle compensator

The idle compensator operates in response to the under hood air temperature as shown below:

Bi-metal	Intake air temperature	Idle compensator operation
No. 1	Below 60°C (140°F)	Fully closed
	60 to 70°C (140 to 158°F)	Close to open
	Above 70°C (158°F)	Fully open
No. 2	Below 70°C (158°F)	Fully closed
	70 to 90°C (158 to 194°F)	Close to open
	Above 90°C (194°F)	Fully open

REMOVAL AND INSTALLATION

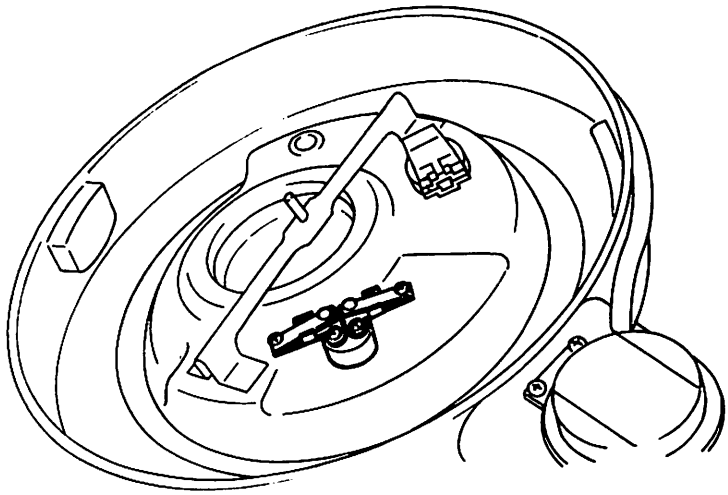


Fig. EF-14 Location of idle compensator

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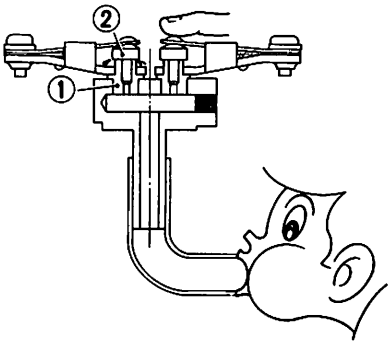
1. Remove air cleaner cover.
2. Remove hose connecting idle compensator and 3-way connector.
3. Loosen screws securing idle compensator to air cleaner, then remove idle compensator.

Notes:
a. **When removing idle compensator, remove gasket and plate.**
b. **When removing screw securing idle compensator to air cleaner, be careful not to miss the screw.**

4. To install, reverse the removal procedure.

INSPECTION

1. Check that valve is in closed position when bi-metal temperature is lower than operating temperature. To check, breathe air into tube or suck air. If excessive air leakage is found at the valve, replace idle compensator as an assembly. Note that two idle compensators are mounted to air cleaner, and that it is necessary to plug the valve of one of these idle compensators so as to prevent air leak while checking the other one.

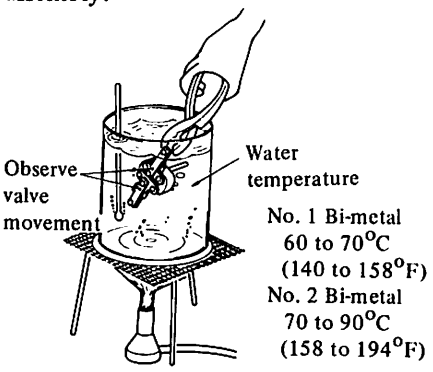


EF225

Fig. EF-15 Checking idle compensator

Note: When checking idle compensator on car, disconnect hose leading to idle compensator, and connect other hose, then carry out check as described above.

2. When bi-metal temperature is above the specified operating temperature, visually check to see if the valve is in open position. If valve is not open, replace idle compensator as an assembly.



EF226

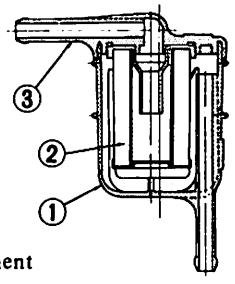
Fig. EF-16 Checking idle compensator

3. Others
1) Check hoses for correct installation, distortion, or cracks.
2) Check rubber valve seat of idle compensator for sticking or any other faulty conditions.

FUEL STRAINER

DESCRIPTION

The fuel strainer is a cartridge type. It uses a paper element which can be checked for condition from the outside.



1 Body
2 Paper element
3 Cover

EF005

Fig. EF-17 Sectional view of cartridge type fuel strainer

REMOVAL

Disconnect inlet and outlet fuel lines from fuel strainer, and remove fuel strainer.

Note: Before disconnecting fuel lines, use a container to receive the fuel remaining in lines.

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FUEL PUMP

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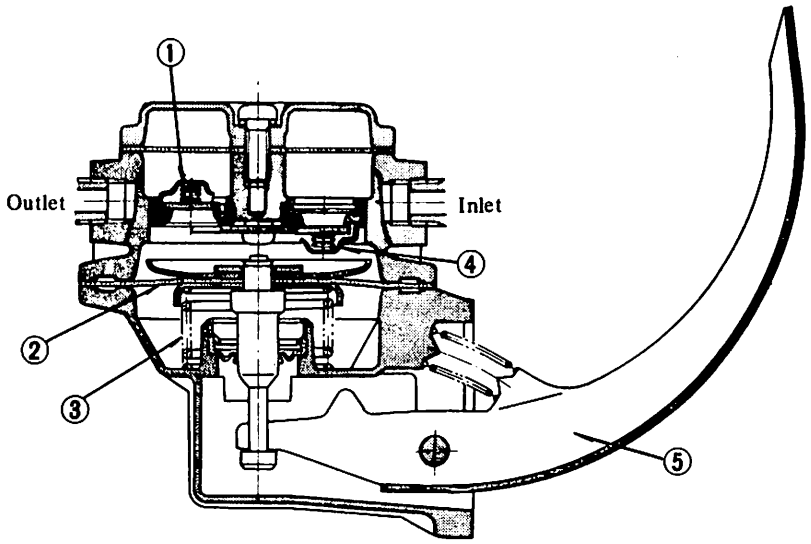
DESCRIPTION

The fuel pump transfers fuel from the tank to the carburetor in sufficient quantity to meet the engine requirements at any speed or load.

The fuel pump is a pulsating type designed for easy maintenance. It consists of a body, rocker arm assembly, fuel diaphragm, fuel diaphragm spring, seal inlet- and outlet-valves. Figure EF-18 shows a cross-sectional view of the pump.

The fuel diaphragm consists of specially treated rubber, which is not affected by gasoline and held in place by two metal discs and a pull rod.

This type of fuel pump is also used in the L24 (1973 Model) engine.



1 Outlet-valve
2 Diaphragm
3 Diaphragm spring
4 Inlet-valve
5 Rocker arm

EF006

Fig. EF-18 Schematic view of fuel pump

FUEL PUMP TESTING

A fuel pump is operating properly when its pressure is within specifications and its capacity is equal to the engine's requirements at all speeds. Pressure and capacity must be determined by two tests, while the pump is still mounted on the engine. Be sure there is fuel in the tank when carrying out the tests.

STATIC PRESSURE TEST

The static pressure test should be made as follows:

1. Disconnect fuel line between carburetor and fuel pump.
2. Connect a rubber hose to each open end of a T-connector, and connect this connector-hose assembly between carburetor and fuel pump.

Note: Locate this T-connector as close to carburetor as possible.

3. Connect a suitable pressure gauge to the opening of T-connector, and fasten hose between carburetor and T-connector with a clip securely.

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4. Run the engine at varying speeds.
5. The pressure gauge indicates static fuel pressure in the line. The gauge reading should be within the following range.

0.21 to 0.27 kg/cm² (3.0 to 3.8 psi)

Note: If the fuel in carburetor float chamber has run out and engine has stopped, remove clip and pour fuel into carburetor. Fasten clip securely and repeat static pressure test.

Pressure below the lower limit indicates extreme wear on one part or a small amount of wear on each working part. It also indicates ruptured diaphragm; worn, warped, dirty or gumming valves and seats, or a weak diaphragm return spring. Pressure above the upper limit indicates an excessively strong tension of diaphragm return spring or a diaphragm that is too tight. Both of these conditions require the removal of pump assembly for replacement or repair.

CAPACITY TEST

The capacity test is made only when static pressure is within the specifications. To make this test, proceed as follows:

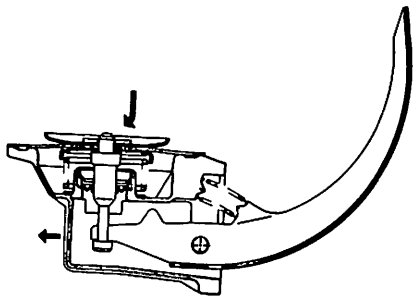
1. Disconnect pressure gauge from T-connector and, in its vacant place, install a suitable container as a fuel sump.
2. Run engine at 1,000 rpm.
3. The pump should deliver 1,000 cc (2.11 US pt) of fuel in one minute or less.

If little or no fuel flows from the open end of pipe, it is an indication that fuel line is clogged or pump is malfunctioning.

REMOVAL AND DISASSEMBLY

Remove fuel pump assembly by unscrewing two mounting nuts and disassemble in the following order.

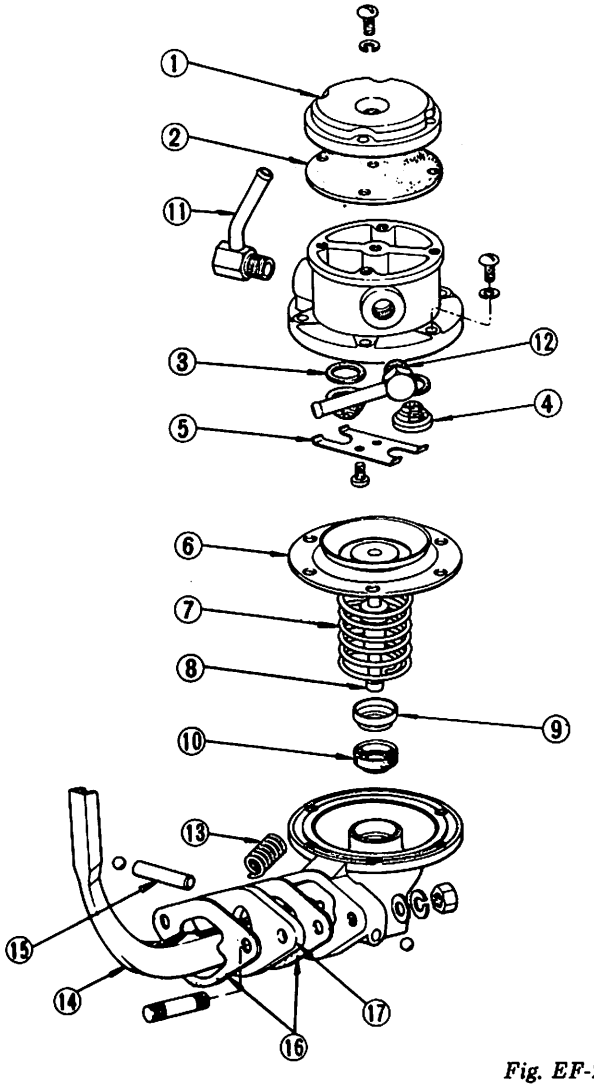
1. Separate upper body and lower body by unscrewing body set screws.
2. Take off cap and cap gasket by removing cap screws.
3. Unscrew elbow and connector.
4. Take off valve retainer by unscrewing two retainer screws and remove two valves.
5. To remove diaphragm, press down its center against spring force. With diaphragm pressed down, tilt it until the end of pull rod touches the inner wall of body. Then, release diaphragm to unhook push rod. Be careful during this operation not to damage diaphragm or oil seal.



EF007

Fig. EF-19 Removing pull rod

6. Drive rocker arm pin out with a press or hammer.



1 Fuel pump cap
2 Cap gasket
3 Valve packing assembly
4 Fuel pump valve assembly
5 Valve retainer
6 Diaphragm assembly
7 Diaphragm spring
8 Pull rod
9 Lower body seal washer
10 Lower body seal
11 Inlet connector
12 Outlet connector
13 Rocker arm spring
14 Rocker arm
15 Rocker arm side pin
16 Fuel pump packing
17 Spacer-fuel pump to cylinder block

EF008

Fig. EF-20 Structure of fuel pump

INSPECTION

1. Check upper body and lower body for cracks.
2. Check valve assembly for wear on valve and valve spring. Blow valve assembly with breath to examine its

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function.
3. Check diaphragm for small holes, cracks or wear.
4. Check rocker arm for wear at the mating portion with camshaft.
5. Check rocker arm pin for wear. A worn pin may cause oil leakage.
6. Check all other components for any abnormalities and replace if necessary.

ASSEMBLY

Reverse the order of disassembly. Closely observe the following instructions.
1. Use new gaskets.
2. Lubricate rocker arm, rocker arm link and rocker arm pin before installation.
3. To test the function, proceed as follows:

Position fuel pump assembly about 1 meter (3.3 ft) above fuel level of fuel strainer and connect a pipe from strainer to fuel pump.

Operate rocker arm by hand. If fuel is drawn up soon after rocker arm is released, fuel pump is functioning properly.

CARBURETOR

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DESCRIPTION

The carburetors are of down-draft two-barrel types which produce the optimum air-fuel mixture under all operating conditions.

They present several distinct features of importance to the car owners.

A summary of the features is as follows:

1. A slow economizer to make a smooth connection with acceleration or deceleration during light load running.

It also assures stable low speed performance.

2. An idle limiter to reduce harmful exhaust emissions to a minimum.
3. A B.C.D.D. device for reducing hydrocarbon (H.C.) emissions.
4. An electric automatic choke to facilitate cold starting and to reduce exhaust emissions.
5. An anti-dieseling solenoid to eliminate dieseling (run-on).
6. A power valve, or vacuum actuated booster, to ensure smooth high-speed operation.
7. The carburetor comes equipped with dash pot, which ensures smooth deceleration, without engine stall under all operating conditions.
8. An altitude compensator for California standard model

It automatically controls air-fuel ratio corresponding to the atmospheric pressure.

STRUCTURE AND OPERATION

These carburetors consist of a primary system for normal running and a secondary system for full load running.

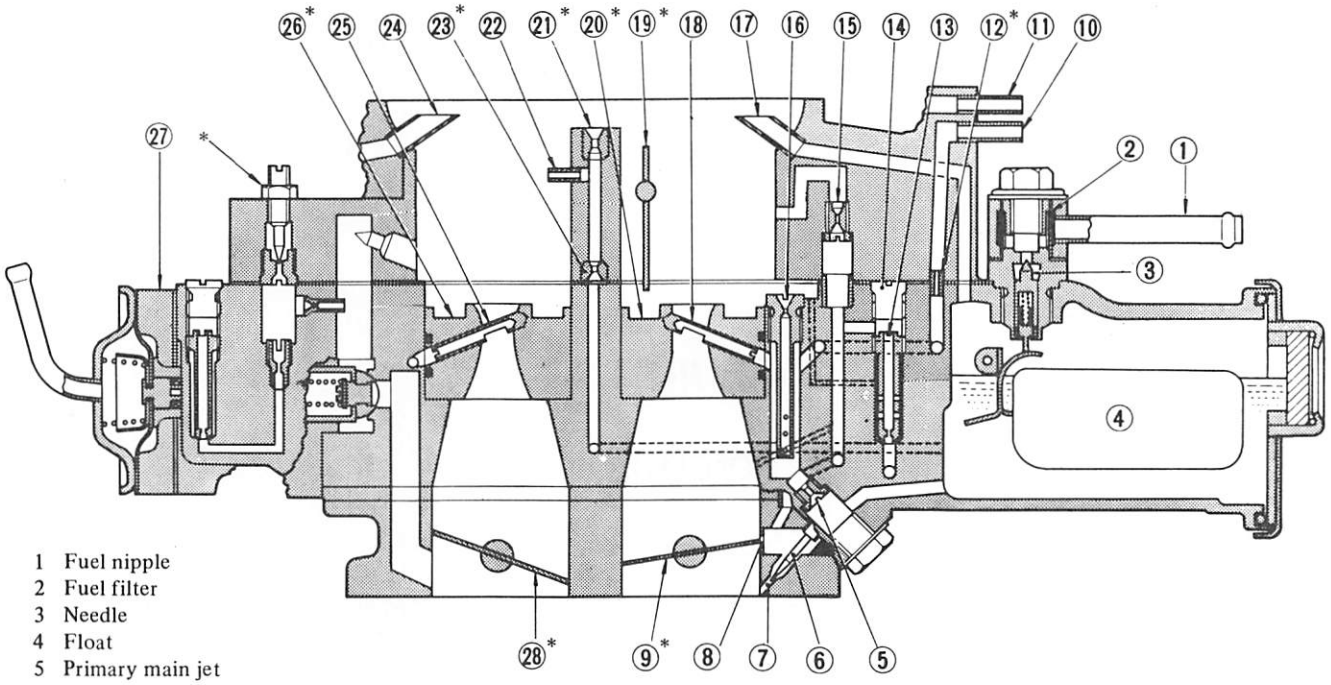
A float system common to both primary and secondary systems, a sec-

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ondary switch-over mechanism, an accelerating mechanism, etc. are also attached.

An anti-dieseling solenoid valve and a power valve mechanism are also installed.

The California standard model is equipped with the altitude compensator which controls air-fuel ratio automatically corresponding to the atmospheric pressure.



1 Fuel nipple
2 Fuel filter
3 Needle
4 Float
5 Primary main jet
6 Idle adjust screw
7 Idle hole
8 Primary bypass hole
9* Primary throttle valve
10 Primary altitude compensator pipe (for California)
11 Secondary altitude compensator pipe (for California)
12* Safe orifice
13 Primary slow jet
14 Plug
15 Primary slow air bleed
16 Primary main air bleed
17 Primary air vent pipe
18 Primary main nozzle
19* Choke valve
20* Primary small venturi
21* High-speed enricher air bleed
22 Richer nozzle
23* Richer jet
24 Secondary air vent pipe
25 Secondary main nozzle
26* Secondary small venturi
27 B.C.D.D. assembly
28* Secondary throttle valve

EF229

Note: Do not remove the parts marked with an asterisk "*."

Fig. EF-21 Sectional view of carburetor

PRIMARY SYSTEM

Primary main system

The primary main system is a Stromburg type. Fuel flows as shown in Figure EF-21 through the main jet, mixing with air which comes in from the main air bleed and passes through the emulsion tube, and is pulled out into the venturi through the main nozzle.

Idling and slow system

During low engine speed, as shown in Figure EF-21, fuel flows through the slow jet located on rear right side of main nozzle, mixing with air coming from the 1st slow air bleed, again mixing with air coming from the 2nd slow air bleed and then is pulled out into the engine through the idle hole and bypass hole.

Adoption of the submerged type of slow jet eliminates such hesitation as occurs on sudden deceleration of the car.

Slow economizer system obtains smooth deceleration at high speeds.

Small opening of the throttle valve at idling or partial load creates a large vacuum pressure in the intake manifold.

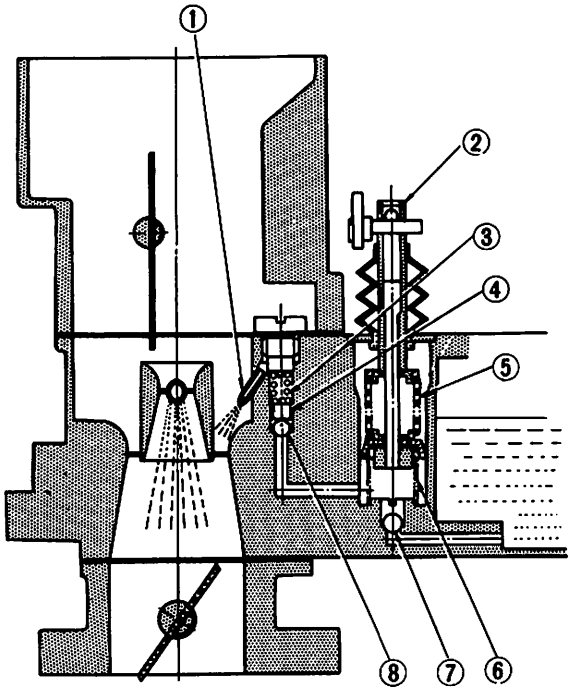
By this vacuum pressure, fuel is measured through the slow jet located behind the main jet. And air coming from the 1st slow air bleed is mixed with fuel in the emulsion hole.

This mixture is further mixed and atomized with air coming from the 2nd slow air bleed. The atomized mixture is supplied to the engine from the idle hole and bypass hole via the slow system passage.

Accelerating mechanism

The carburetor is equipped with the piston type accelerating mechanism linked to the throttle valve. When the primary throttle valve, shown in Figure EF-22, is closed, the piston goes up, and fuel flows from the float chamber through the inlet valve into the space under the piston. When the throttle valve is opened, the piston goes down, opening the outlet valve, and fuel is forced out through the injector.

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1 Pump injector
2 Piston
3 Weight
4 Spring
5 Damper spring
6 Piston return spring
7 Inlet valve
8 Outlet valve

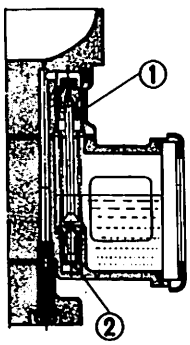
ET023

Fig. EF-22 Acceleration mechanism

Power valve mechanism

The power valve mechanism, so-called vacuum piston type, utilizes the vacuum below the throttle valve.

When the throttle valve is slightly opened during light load running, high vacuum is created in the intake manifold. This vacuum pulls the vacuum piston upward against the spring, leaving the power valve closed. When the vacuum below the throttle valve is lowered during full load or accelerating running, the spring pushes the vacuum piston downward, opening the power valve to furnish fuel.



1 Vacuum piston
2 Power valve ET024

Fig. EF-23 Sectional view of power valve

SECONDARY SYSTEM

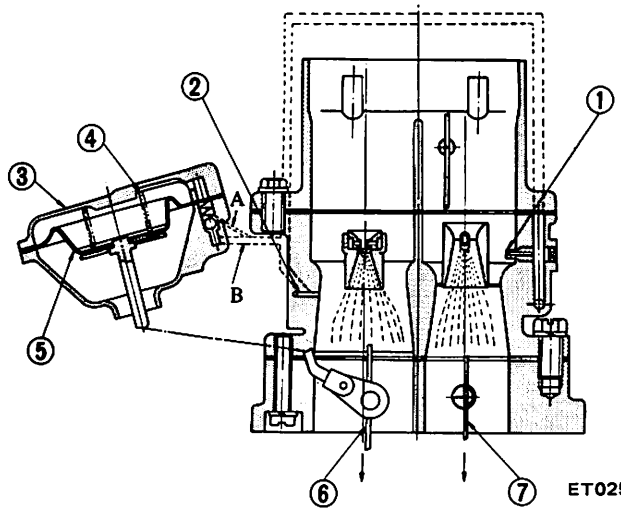
Secondary main system

The secondary main system is a Stromburg type.

Fuel-air mixture produced by the functions of the main jet, main air bleed and emulsion tube, in the same manner as in the primary system, is pulled out through the main nozzle into the small venturi.

Due to the double venturi of the secondary system, the higher velocity air current passing through the main nozzle promotes the fuel atomization.

The structure is almost the same as the primary side.



1 Primary vacuum port
2 Secondary vacuum port
3 Diaphragm chamber cover
4 Diaphragm spring
5 Diaphragm
6 Secondary throttle valve
7 Primary throttle valve

ET025

Fig. EF-24 Full throttle at high speed

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Step system

The construction of this system may correspond to the idling and slow system of the primary system.

This system aims at the proper filling up of the gap when fuel supply is transferred from the primary system to the secondary one. The step port is located near the secondary throttle valve edge in its fully closed state.

Secondary switchover mechanism

The secondary throttle valve is linked to the diaphragm which is actuated by the vacuum created in the venturi. A vacuum jet is provided at each of the primary and secondary venturies, and the composite vacuum of these jets actuates the diaphragm.

As the linkage causes the secondary throttle valve to close until the primary throttle valve opening reaches approximately 50°, fuel consumption during normal operation is not excessive.

During high speed running, as shown in Figure EF-24, as the vacuum at the venturi is increased, the diaphragm is pulled against the diaphragm spring force, and then secondary throttle valve is opened.

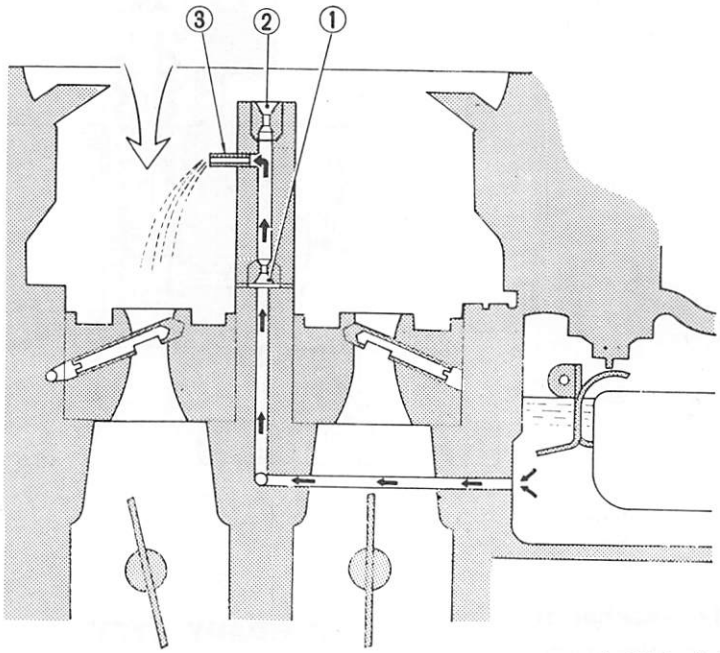
The other side, during low speed running (as the primary throttle valve opening does not reach 50°), the secondary throttle valve is locked to close completely by the locking arm which is interlocked with primary throttle arm by linkage.

When the primary throttle valve opening reaches wider position than 50°, the secondary throttle valve is ready to open, because the locking arm revolves and leaves from the secondary throttle arm.

High speed circuit

The high speed circuit improves high engine output performance during high speed driving.

This circuit operates only when driving at high speed. It consists of a richer jet, high speed enricher air bleed, and richer nozzle. When the velocity of suction air flowing through the carburetor secondary bore increases, additional fuel is drawn out of the richer nozzle.



EF234

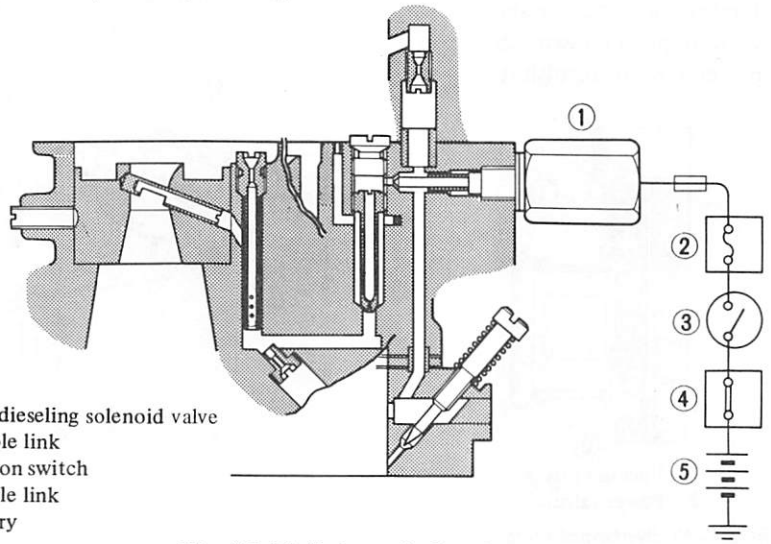
1 Richer jet
2 High speed enricher air bleed
3 Richer nozzle

Fig. EF-25 High speed circuit

ANTI-DIESELING SYSTEM

The carburetor is equipped with an anti-dieseling solenoid valve. As the ignition switch is turned off, the valve is brought into operation, shutting off the supply of fuel to the slow circuit.

The following figure shows a sectional view of this control.



EF230

1 Anti-dieseling solenoid valve
2 Fusible link
3 Ignition switch
4 Fusible link
5 Battery

Fig. EF-26 Schematic druwing of anti-dieseling system

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FLOAT SYSTEM

There is only one float chamber, while two carburetor systems, primary and secondary, are provided.

Fuel fed from the fuel pump flows through the filter and needle valve into the float chamber. A constant fuel level is maintained by the float and needle valve.

Because of the inner air vent type of the float chamber ventilation, the fuel consumption will not be influenced by some dirt accumulated in the air cleaner.

The needle valve includes special hard steel ball and will not wear for all its considerably long use. Besides, the insertion of a spring will prevent the flooding at rough road running.

BOOST CONTROLLED DECELERATION DEVICE (B. C. D. D.)

A boost controlled deceleration device (B.C.D.D.) serves to reduce the hydrocarbons (H.C.) emitted from engine during coasting.

The high manifold vacuum during coasting prevents the mixture from complete combustion because of the reduced amount of mixture per cylinder per rotation of engine, with the result that a large amount of hydrocarbons is emitted into the atmosphere.

The B.C.D.D. has been designed to correct this problem.

It operates as follows: when the manifold vacuum exceeds a predetermined value, the B.C.D.D. introduces an additional mixture of optimum mixture ratio and quantity into the manifold by opening a separate mixture passage in the carburetor. Complete combustion of fuel is assisted by this additional mixture, and the amount of H.C. contained in exhaust gases is dramatically reduced.

During the transition period from coasting to idling, the transmission produces a signal which in turn energizes the vacuum control solenoid valve. As this takes place, the valve is lifted off its seat, opening the vacuum chamber to the atmosphere. The mixture control valve is then closed, returning the engine to the predetermined idling speed.

On manual transmission models, this system consists of B.C.D.D., vacuum control solenoid valve, speed detecting switch and amplifier.

On automatic transmission models, it consists of B.C.D.D., vacuum control solenoid valve and inhibitor switch.

Cars conforming to the California standards are equipped with the altitude compensator on both manual and automatic transmission models. The altitude compensator automatically controls the operating pressure of B.C.D.D. in accord with the atmospheric pressure.

B.C.D.D. operation

Diaphragm I ⑪ monitors the manifold vacuum and, when the vacuum exceeds a pre-determined value, acts so as to open the vacuum control valve ⑩. This causes the manifold vacuum to be introduced into the second vacuum chamber and actuates diaphragm II②.

When diaphragm II operates, the mixture control valve ③ opens the passage and introduces the additional mixture into the manifold.

The amount of the mixture is controlled by the servo-action of the mixture control valve ③ and vacuum control valve ⑩ so that the manifold vacuum may be kept at the predetermined value.

The amount of mixture depends mainly upon the coasting air bleed II④, while the mixture ratio is determined by the coasting jet ⑬ and coasting air bleed ⑭. See Figure EF-27.

Vacuum control solenoid valve operation

Manual transmission models:

The vacuum control solenoid valve is controlled by a speed detecting switch that is actuated by the speedometer needle.

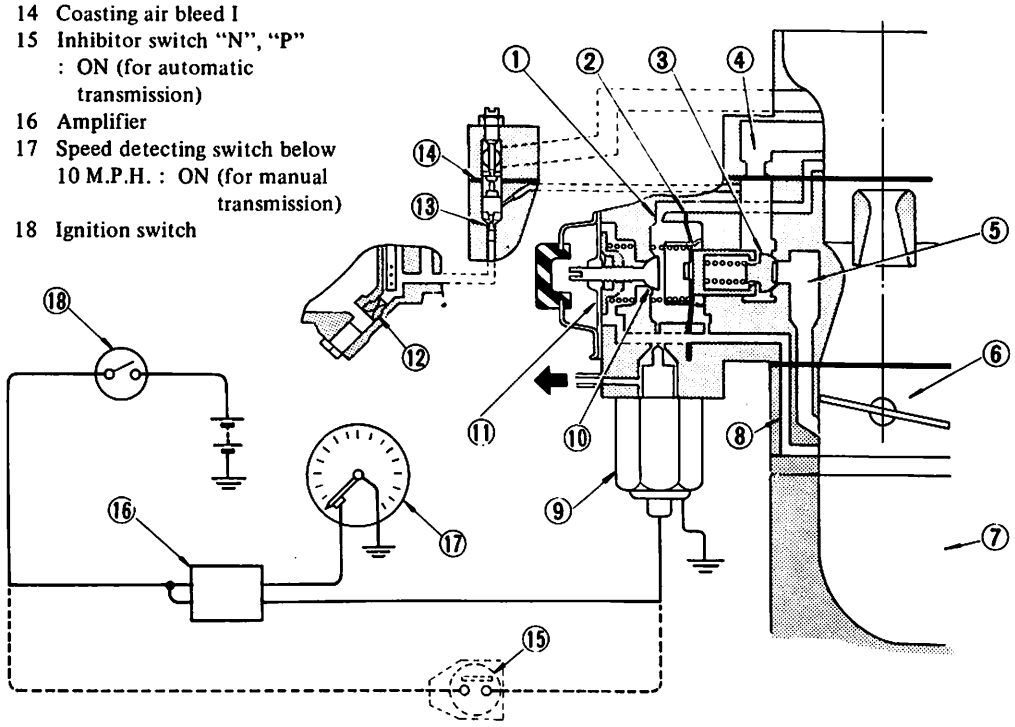
As the car speed falls below 10 MPH, this switch is activated, producing a signal. This signal actuates the amplifier to open the vacuum control solenoid valve.

Automatic transmission models:

When the shift lever is in "N" or "P" range, the inhibitor switch mounted on the transmission turns on to open the vacuum control solenoid valve.

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1 Air jet
2 Diaphragm II
3 Mixture control valve
4 Coasting air bleed II
5 Mixture air passage
6 Secondary barrel
7 Intake manifold
8 Boost passage
9 Vacuum control solenoid valve
10 Vacuum control valve
11 Diaphragm I
12 Secondary main jet
13 Coasting jet
14 Coasting air bleed I
15 Inhibitor switch "N", "P" : ON (for automatic transmission)
16 Amplifier
17 Speed detecting switch below 10 M.P.H. : ON (for manual transmission)
18 Ignition switch

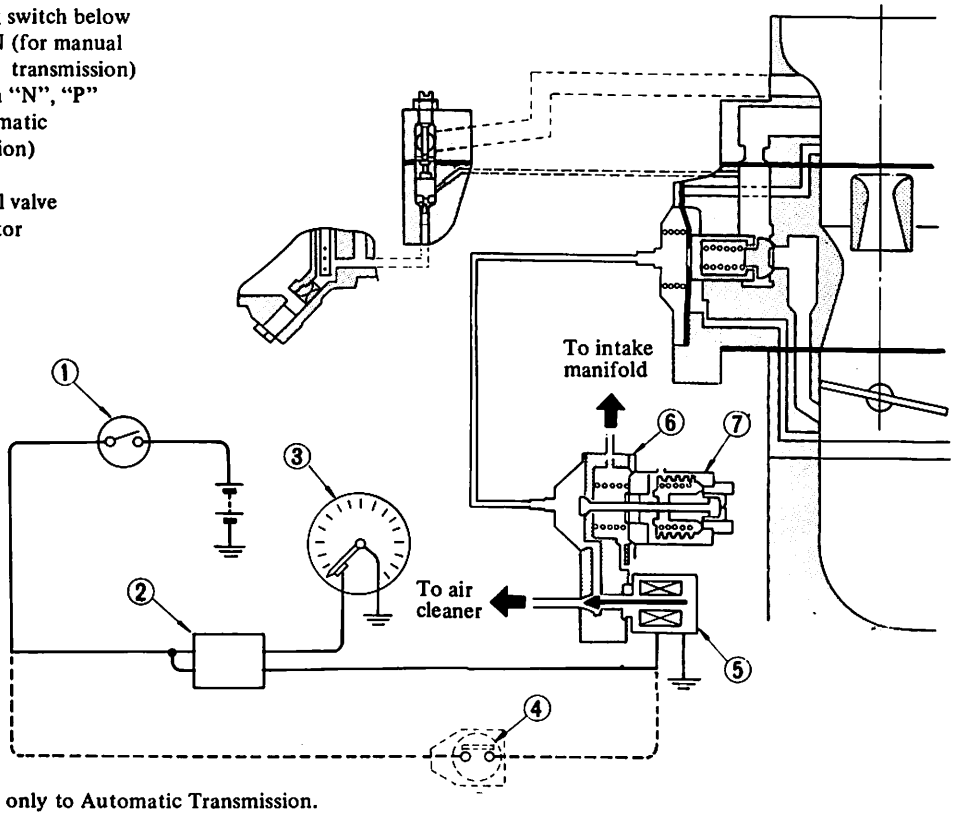


Note: Broken line applies only to Automatic Transmission.

EF231

Fig. EF-27 Schematic drawing of B.C.D.D. (except California)

1 Ignition switch
2 Amplifier
3 Speed detecting switch below 10 M.P.H. : ON (for manual transmission)
4 Inhibitor switch "N", "P" : ON (for automatic transmission)
5 Solenoid valve
6 Vacuum control valve
7 Altitude corrector



Note: Broken line applies only to Automatic Transmission.

EF235

Fig. EF-28 Schematic drawing of B.C.D.D. (for California)

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ELECTRIC AUTOMATIC CHOKE

An electric heater warms a bi-metal interconnected to the choke valve, and controls the position of choke valve and throttle valve in accordance with the time elapsed, the warm-up condition of the engine, and the outside ambient temperature.

When outside ambient temperature is above operating temperature, the automatic choke control serves to further reduce exhaust gas emission during warm-up by automatically selecting one of the two choke operation modes, fast-acting or slow-acting.

Slow-acting choke operation

When ambient temperature is low, electric current flows through the automatic choke relay to the P.T.C. heater A, and gradually warms the bi-metal. This causes the choke valve to open slowly.

Fast-acting choke operation

When ambient temperature is high, the bi-metal switch is in on. This causes electric current to flow through the automatic choke relay to the P.T.C. heater A and heater B, resulting in quick opening of the choke valve.

The construction and function of each part of this carburetor are as follows:

1. Bi-metal and heater in choke cover

Electric current flows through the heater as the engine starts, and warms the bi-metal. The deflection of the bi-metal is transmitted to the choke valve through the choke valve lever.

2. Fast idle cam

The fast idle cam determines the opening of the throttle valve so that the proper amount of mixture corresponding to the opening of the choke valve will be obtained. The opening of the choke valve is dependent upon the warm-up condition of the engine.

3. Fast idle adjusting screw

This screw adjusts the opening of the throttle valve of the fast idle cam.

4. Unloader

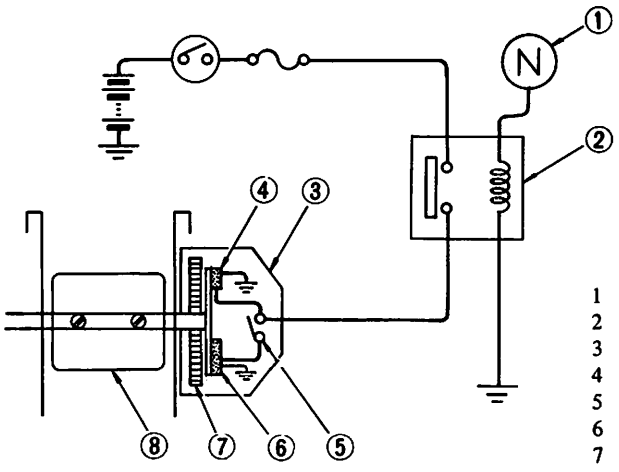
When accelerating the engine during the warm-up period, that is, before the choke valve opens sufficiently, this unloader forces the choke valve open a little so as to obtain an adequate air-fuel mixture.

5. Vacuum diaphragm

After the engine has been started by cranking, this diaphragm forces the choke valve open to the predetermined extent so as to provide the proper air-fuel ratio.

6. Bi-metal case index mark

The bi-metal case index mark is used for setting the moment of the bi-metal which controls the air-fuel mixture ratio required for starting.



1 Alternator
2 Automatic-choke relay
3 Automatic-choke cover
4 P.T.C. heater (A)
5 Bi-metal switch
6 P.T.C. heater (B)
7 Bi-metal
8 Choke valve

Fig. EF-29 Schematic drawing of electric automatic choke heater

DASH POT SYSTEM

These carburetors are equipped with a dash pot interlocked with the primary throttle valve through a link mechanism. The dash pot is intended to prevent engine stall resulting from quick application of the brake, or from the quick release of the accelerator pedal after treading it slightly.

In such a situation, a throttle lever strikes against the dash pot stem and makes the primary throttle valve close gradually, thus keeping the engine running.

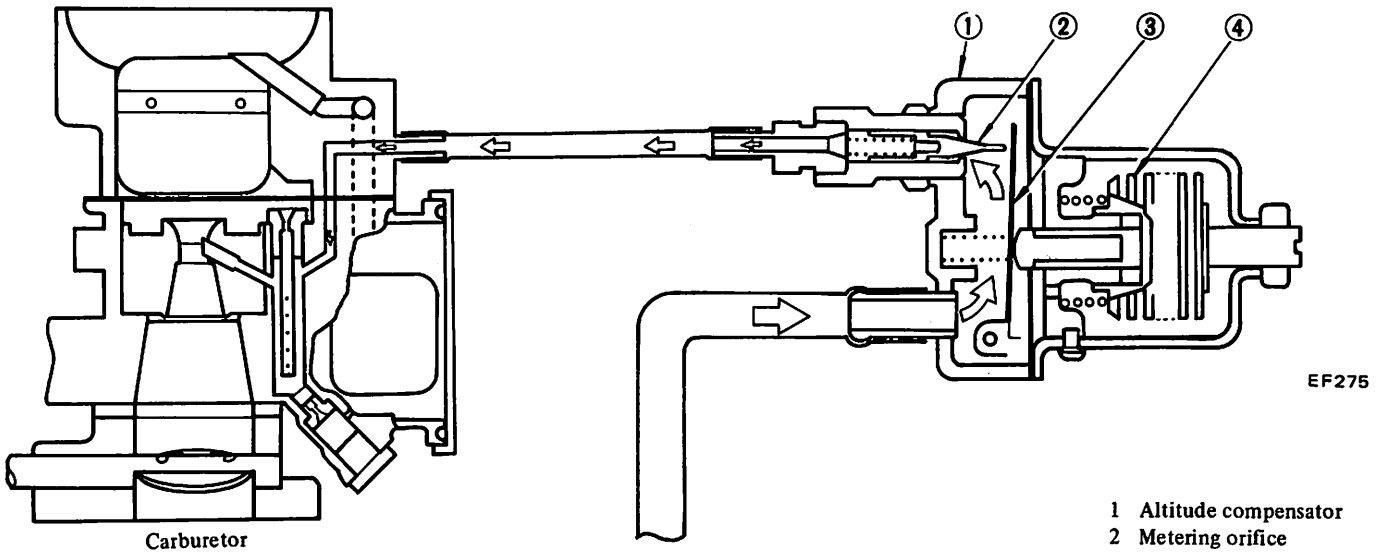
ALTITUDE COMPENSATOR (FOR CALIFORNIA)

The higher the altitude is, the thinner the density of air becomes. At a higher altitude, therefore, the carburetor produces too rich air-fuel mixture.

The altitude compensator automatically corrects air-fuel mixture to an optimum ratio. It operates in the following sequence when altitude is high.

1. The bellows in the altitude compensator extends.
2. The lever attached to the bellows then pushes up the needle.
3. When the needle is pushed up, the air passage becomes wider, allowing larger amount of air to flow from altitude compensator to the carburetor. As a result, the fuel becomes thinner.
4. With this additional air in the carburetor, air-fuel mixture becomes thin to a proper ratio.

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1 Altitude compensator
2 Metering orifice
3 Bellows lever
4 Bellows

Fig. EF-30 Sectional view of altitude compensator

ADJUSTMENT AND INSPECTION

CARBURETOR IDLE-R.P.M. AND MIXTURE RATIO

Precautions:

a. On automatic transmission equipped models, check should be performed in the "D" range.
Be sure to engage parking brake and to lock both front and rear wheels with wheel chocks.

b. Keep your foot down on the brake pedal while depressing the accelerator pedal. Otherwise car will surge forward dangerously.

Notes:

a. Do not attempt to screw the idle adjusting screw down completely. Doing so could cause damage to tip, which in turn will tend to cause malfunctions.

b. After idle adjustment has been made, shift the lever to the "N" or "P" range (for automatic transmission).

c. Remove wheel chocks.

Idle adjustment with Co-meter

Idle mixture adjustment requires the use of a CO-meter. When preparing to adjust idle mixture, it is essential to have the meter thoroughly warmed up and calibrated.

1. Remove air hose between 3-way connector and air check valve as shown in Figure EF-31. Plug the disconnected hose to prevent dust from entering.

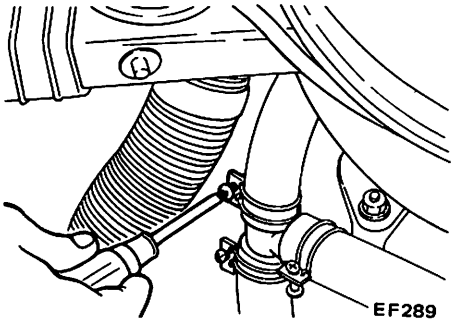


Fig. EF-31 Disconnecting air hose from air check valve

2. Check carburetor pipes for proper connection.
3. Warm up engine sufficiently.
4. Continue engine operation for one minute at idling speed.
5. Adjust throttle adjusting screw until engine is at specified speed.

Engine speed
Manual transmission
750 rpm
Automatic transmission
(in "D" position)
650 rpm

6. Check ignition timing, if necessary adjust it to specifications.

This operation need not be carried out at 1,600 km (1,000 miles) service.

Ignition timing
Manual transmission
12°/750 rpm
Automatic transmission
(in "D" position)
12°/650 rpm

7. Adjust idle adjusting screw so that CO percentage is at specified level.

CO percentage
Manual transmission
2% at 750 rpm
Automatic transmission
(in "D" position)
2% at 650 rpm

8. Repeat the adjustment process as described in steps 5 to 7 above so that CO percentage is at specified level.
9. Remove cap and connect air hose to air check valve.

If engine speed increases, readjust it to the specified speed with throttle adjusting screw.

Idle adjustment without Co-meter

If a CO-meter is not available, the following procedures may be used.

1. Remove air hose between 3-way connector and air check valve as shown in Figure EF-32. Plug the disconnected hose to prevent dust from entering.

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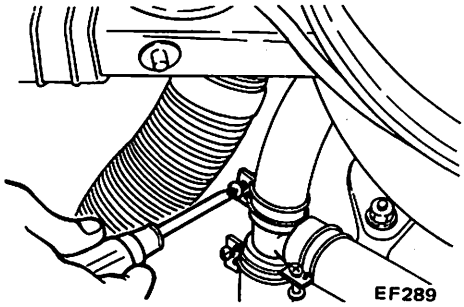


Fig. EF-32 Disconnect air hose from air check valve

2. Check carburetor pipes for proper connection.
3. Warm up engine sufficiently.
4. Continue engine operation for one minute at idling speed.
5. Adjust throttle adjusting screw so that engine speeds are as indicated below.

Engine speed
Manual transmission
815 rpm
Automatic transmission
(in "D" position)
670 rpm

6. Check ignition timing, if necessary adjusut it to 12° of specifications. This operation need not be carried out at 1,600 km (1,000 miles) service.
7. Adjust idle mixture screw until maximum rpm is obtained.
8. Repeat the procedures as described in items 5 and 7 above until engine speed, at best idle mixture, is 815 rpm for cars with manual transmissions and 670 rpm for automatic transmission models (in "D" position).
9. Turn the idle adjusting screw clockwise until engine speed drops off below specified rpm.

Engine speed drops off
Manual transmission
60 to 70 rpm
Automatic transmission
(in "D" range)
15 to 25 rpm

Note: If idle limiter cap obstructs proper adjustment, remove it.
To install idle limiter cap, refer to "Idle Limiter Cap".

10. Remove cap, and connect air hose to air check valve.

If engine speed rises, readjust it to the specified speed with throttle adjusting screw.

Idle limiter cap

Do not remove this idle limiter cap unless necessary. If this unit is removed, it must be readjusted at time of installation. To adjust proceed as follows:

1. After adjusting throttle or idle speed adjusting screw, check to be sure that the amount of "CO" contained in exhaust gases meets the established standard.
2. Install idle limiter cap in position, making sure that the adjusting screw can rotate another 1/8 turn in the "CO-RICH" direction.

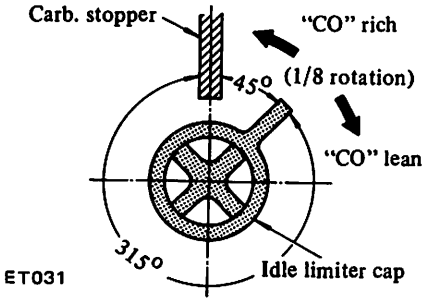


Fig. EF-33 Setting idle limiter cap

FUEL LEVEL

1. Turn down float chamber to allow float to come into contact with needle valve, and measure "H" shown in Figure EF-34.

When "H" is approximately 7.2 mm (0.283 in), top float position is correct.

The top float position can be adjusted by bending float seat.

Upon completion of the adjustment, check fuel level with attached level gauge.

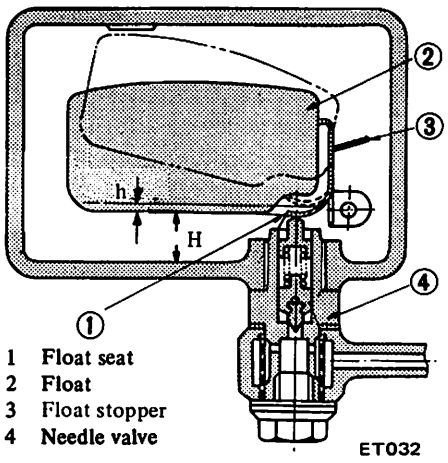
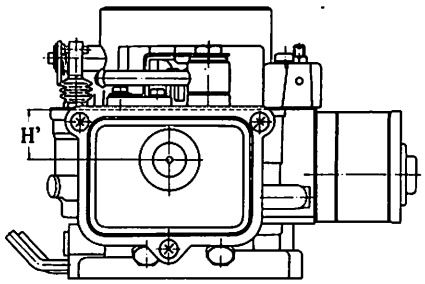


Fig. EF-34 Adjusting float level

2. Adjust bottom float position so that clearance "h" between float seat and needle valve stem is 1.3 to 1.7 mm (0.051 to 0.067 in) when float is fully raised. Bend float stopper as required.
3. After adjustments in steps 1 and 2 above have been made, make sure that when fuel is delivered to the float chamber, the fuel level is maintained within the range of 23 mm (0.91 in) as shown in Figure EF-35.



H' = 23 mm (0.91 in)

Fig. EF-35 Checking fuel level

FAST IDLE

The choke valve at fully closed position automatically opens throttle valve at an optimum angle for starting engine through a link mechanism.

Normal tune-up

In moderate climates, adjust manual transmission fast idle rpm to specification by turning fast idling screw in or out as necessary.

Carburetor removed

If a new or reconditioned carburetor is being installed, tune as follows:

1. With carburetor assembly removed from engine, measure throttle valve clearance ("A" in Figure EF-36) with a wire gauge, placing the upper side of fast idling screw on the second step of the fast idling cam.
2. Install carburetor on engine.

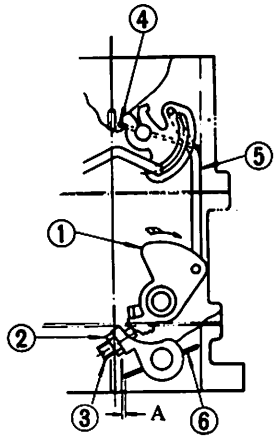
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3. Start engine and measure speed. It should be the specified engine speed.

Specified engine speed (rpm)
Automatic transmission:
2,300 to 2,500
Manual transmission:
1,900 to 2,100

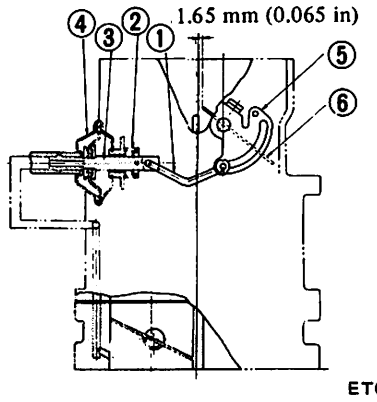
4. To adjust fast idle rpm turn fast idling screw counterclockwise to increase rpm, or clockwise to decrease.

	Clearance "A" mm (in)	Engine speed rpm
Automatic transmission	1.23 to 1.33 (0.048 to 0.052)	2,300 to 2,500
Manual transmission	1.01 to 1.21 (0.040 to 0.048)	1,900 to 2,100



1 Fast idle cam 4 Choke valve
2 Nut 5 Choke connecting rod
3 Fast idle screw 6 Throttle valve

Fig. EF-36 Adjusting fast idle opening



1 Choke piston rod 4 Diaphragm cover
2 Choke spring 5 Choke piston lever
3 Choke piston 6 Choke valve

Fig. EF-37 Adjusting vacuum break

VACUUM BREAK

1. Close choke valve completely.
2. Hold choke valve by stretching a rubber band between choke piston lever and stationary part of carburetor.
3. Grip vacuum break rod with pliers, and pull straight out.
4. Under this condition, adjust the gap between choke valve and carburetor body to 1.65 mm (0.065 in) by bending vacuum brake rod. See Figure EF-37.

CHOKE UNLOADER

1. Close choke valve completely.
2. Hold choke valve by stretching a rubber band between choke piston lever and stationary part of carburetor.
3. Pull throttle lever until full open.

Under this condition, adjust clearance between choke valve and carburetor body to 2.45 mm (0.096 in) by bending unloader tongue.

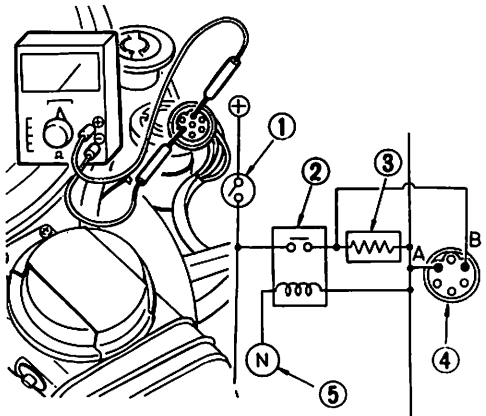
Note: Make sure that throttle valve opens when carburetor is mounted on the car.
If throttle valve fails to open, unloader becomes inoperative, resulting in poor acceleration after engine is started.

ELECTRIC AUTOMATIC CHOKE

Checking automatic choke heater circuit with function test connector

Caution: Do not attach test leads of a circuit tester to those other than designated. Refer to Figure EF-38.

1. With engine not running, check for continuity between A and B as shown in Figure EF-38.
   - If continuity exists, heater is functioning properly.
   - If continuity does not exist, check for disconnected connector or open P.T.C. heater circuit.
2. With engine running at idle, check for presence of voltage across A and B as shown in Figure EF-38.
   - If voltmeter reading is 12 volts (d-c), heater circuit is functioning properly.
   - If voltmeter reading is zero, check for disconnected connector, open circuit, or faulty automatic choke relay.
3. If, by above checks, faulty part or unit is located, it should be removed and tested again. Replace if necessary.



1 Ignition key
2 Automatic choke relay
Engine stop: OFF
Engine start: ON
3 Automatic choke heater
4 Function test connector
5 Alternator

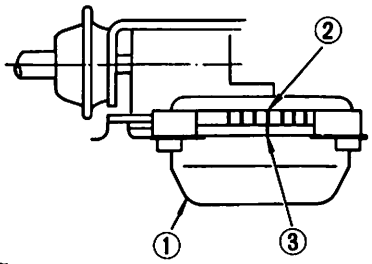
Fig. EF-38 Checking automatic choke heater circuit with function test connector

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Automatic choke

1. Before starting engine, fully depress accelerator pedal to ensure that choke valve closes properly.
2. Push choke valve with a finger, and check for binding.
3. Check to be sure that bi-metal cover index mark is set at the center of choke housing index mark as shown in Figure EF-39.

Note: Do not set bi-metal cover index mark at any position except the center of choke housing index mark.



1 Thermostat cover (Bimetal chamber)
2 Thermostat housing
3 Groove

Fig. EF-39 Bi-metal setting

4. Check automatic choke heater source wiring for proper connection, then start engine.
5. After warming up the engine, see that choke valve is fully open.
6. If automatic choke heater source wiring is normal and choke valve does not operate after warm-up, replace bi-metal cover.

Automatic choke relay

1. Remove automatic choke relay. Refer to Figure EF-40.

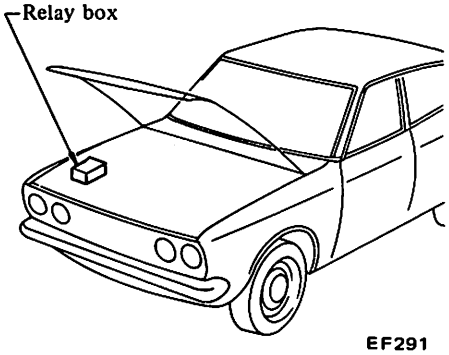


Fig. EF-40 Location of automatic choke relay

2. Make an operational check of automatic choke relay as shown in Figure EF-41.

Apply 12 volts (d-c) across terminals "1" and "3" to ensure that continuity exists between terminals "2" and "4".

Check that continuity does not exist between terminals "2" and "4" when no voltage is applied across them. If results satisfies the above, automatic choke relay is functioning properly; if not, replace choke relay.

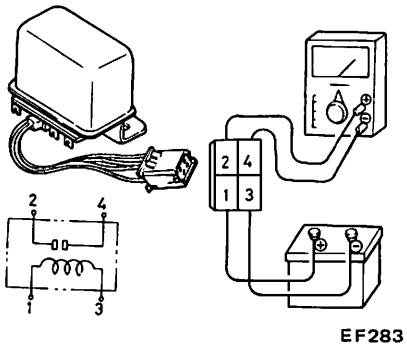


Fig. EF-41 Checking automatic choke relay

Automatic choke heater

1. Measure resistance of choke heater as shown in Figure EF-42.

Specified resistance is 3.7 to 8.9 ohms.

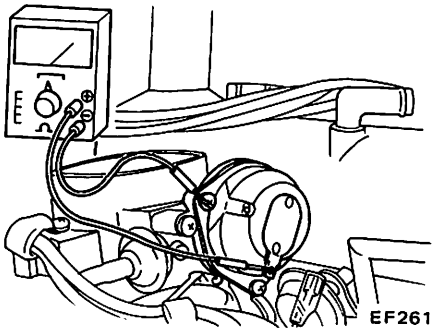


Fig. EF-42 Automatic choke heater check

2. If measured value is not within the specification, replace bi-metal cover.

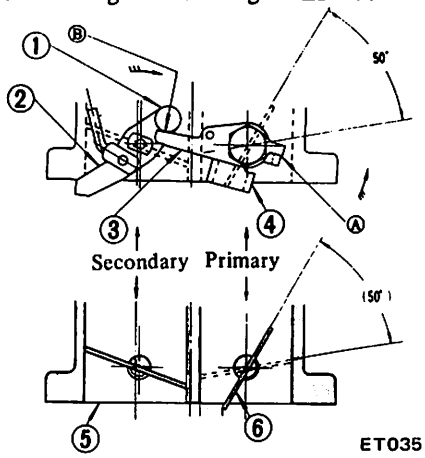
INTERLOCK OPENING OF PRIMARY AND SECONDARY THROTTLE VALVE

Figure EF-43 shows primary throttle valve opened 50°. When primary throttle valve is opened 50° the adjust plate integrated with throttle valve is in contact with return plate at A.

When throttle valve is opened further, locking arm is detached from secondary throttle arm, permitting secondary system to start operation.

Linkage between primary and secondary throttles will function properly if distance between throttle valve and inner wall of throttle chamber is 7.4 mm (0.291 in).

Adjustment is made by bending connecting link. See Figure EF-43.



1 Roller
2 Connecting lever
3 Return plate
4 Adjust plate
5 Throttle chamber
6 Throttle valve

Fig. EF-43 Adjusting interlock opening

DASH POT

1. Idling speed of engine and mixture must be well tuned up and engine sufficiently warm.
2. Turn throttle valve by hand, and read engine speed when dash pot just touches stopper lever.
3. Adjust position of dash pot by turning nut until engine speed is in the specified range.

Specified engine speed
Manual transmission
1,900 to 2,100 rpm
Automatic transmission
1,650 to 1,850 rpm

4. Tighten lock nuts.
5. Make sure that engine speed drops smoothly from 2,000 to 1,000 rpm in about three seconds.

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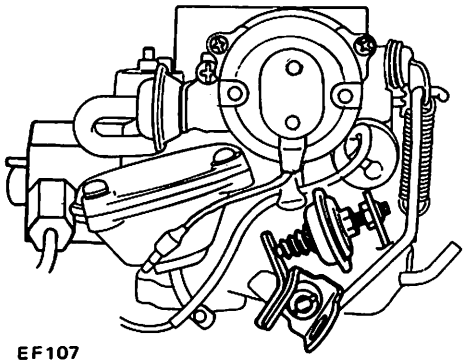

EF107

Fig. EF-44 Adjusting dash pot

ACCELERATING PUMP

1. Visually inspect accelerating pump cover for any sign of fuel leaks.
2. If fuel leaks are found, check gasket, and replace if necessary.

ANTI-DIESELING SOLENOID VALVE

If engine does not stop when ignition switch is turned off, this indicates that a striking (closed) solenoid valve is shutting off supply of fuel to engine.

If harness is in good condition, replace solenoid valve as a unit.

Notes:

a. Tightening torque is 1.8 to 3.5 kg-m (13 to 25 ft-lb).

b. After replacement, start engine and check to be sure that fuel is not leaking, and that anti-dieseling solenoid is in good condition.

BOOST CONTROLLED DECELERATION DEVICE

Caution: Do not attach test leads of a circuit tester to those other than designated. Refer to Figure EF-45.

Manual transmission models

1. Check for continuity between A and B when car is brought to a complete stop. Refer to Figure EF-45.

B.C.D.D. circuit is functioning properly if continuity exists and voltmeter reading is 0 volt (d-c) in step 2 below.

If continuity does not exist, check for disconnected connector and/or faulty amplifier, speed detecting switch or B.C.D.D. solenoid valve.

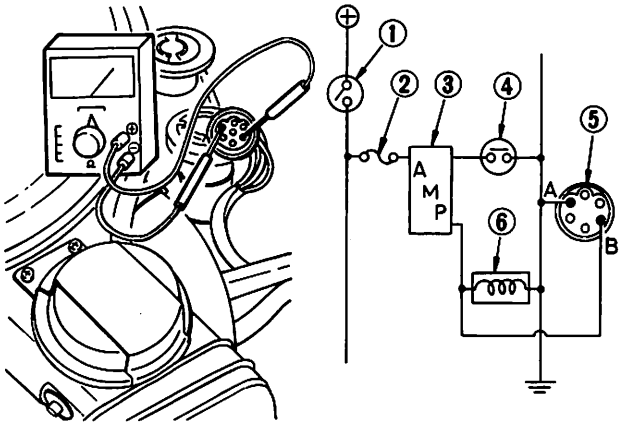
2. Check for presence of voltage across A and B [at a speed of more than 16 km/h* (10 MPH)]. Refer to Figure EF-45.

* Conduct this test by one of the following two methods.

1) Raising up rear axle housing with stand.
2) Chassis dynamometer test

- If voltmeter reading is 0 volt at a speed of more than 16 km/h (10 MPH), circuit is functioning properly.
- If voltmeter reading is not 0 volt, check for disconnected connector, burned fuse, faulty amplifier, B.C.D.D. solenoid valve or speed detecting switch.

3. If, by above checks, faulty part or unit is located, it should be removed and tested again. If necessary, replace.



1 Ignition key
2 Fuse
3 Amplifire
4 Speed detecting switch
Above 10 mph : OFF
Below 10 mph : ON
5 Function test connector
6 B.C.D.D. solenoid valve

EF292

Fig. EF-45 Checking B.C.D.D. circuit with function test connector (for manual transmission)

Automatic transmission models

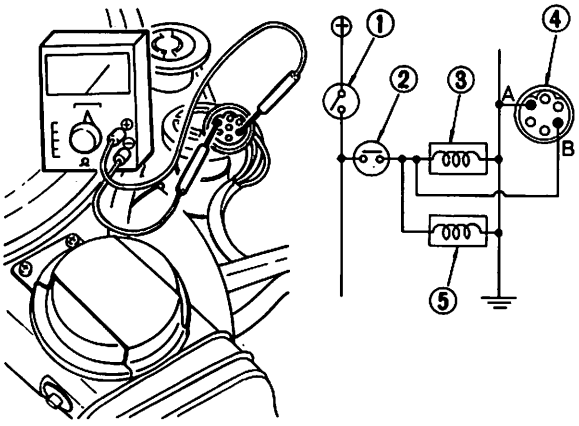
1. With inhibitor switch "ON" ("N" or "P" range), check for presence of voltage across A and B. Refer to Figure EF-46.

- If voltmeter reading is 12 volts (d-c), B.C.D.D. circuit is functioning properly.
- If voltmeter reading is zero, check for disconnected connector, faulty solenoid valve or inhibitor switch.

2. With inhibitor switch "OFF" ("1", "2", "D" or "R" range), check for resistance between A and B. Refer to Figure EF-46.

- If ohmmeter reading is 25 ohms or below, circuit is functioning properly.
- If ohmmeter reading is 32 ohms or above, check for poor connection of connector, faulty B.C.D.D. solenoid valve or inhibitor relay.

3. If, by above checks, faulty part or unit is located, it should be removed and tested again. If necessary, replace.



1 Ignition key
2 Inhibitor switch
N.P. range : ON
1, 2, D.R. range : OFF
3 B.C.D.D. solenoid valve
4 Function test connector
5 Inhibitor relay

EF293

Fig. EF-46 Checking B.C.D.D. circuit with function test connector

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Set pressure of Boost Controlled Deceleration Device (B.C.D.D.)

Generally, it is unnecessary to adjust the B.C.D.D., however, if it should become necessary to adjust it, the procedure is as follows:

Prepare the following tools

1. Tachometer to measure the engine speed while idling, and a screwdriver.
2. A vacuum gauge and connecting pipe.

Note: A quick-response type boost gauge such as Bourdon's type is recommended; a mercury-type manometer should not be used.

To properly set the B.C.D.D. set pressure, proceed as follows:

1. Remove the harness of solenoid valve.

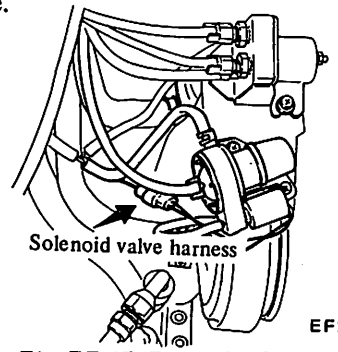


Fig. EF-47 Removing harness of solenoid valve

2. Connect rubber hose between vacuum gauge and intake manifold as shown.

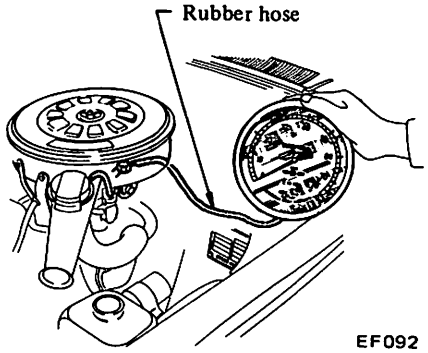


Fig. EF-48 Connecting vacuum gauge

3. Warm up the engine until it is heated to operating temperature.
   Then adjust the engine at normal idling setting. (Refer to the item "Idling Adjustment" in page EF-18.)

   Idling engine speed
   Manual transmission
   750 rpm
   Automatic transmission
   (in "D" position)
   650 rpm

4. Run the engine under no load. Increase engine speed to 3,000 to 3,500 rpm, then quickly close throttle valve.
5. At the time, the manifold vacuum pressure increases abruptly to –600 mmHg (–23.62 inHg) or above and then gradually decreases to the level set at idling.
6. Check that the B.C.D.D. set pressure is within the specified pressure.

   Specified pressure (0 m, sea level and 760 mmHg (30 inHg), atmospheric pressure)

   Manual transmission
   –525 to –535 mmHg
   (–20.7 to –21.0 inHg)
   Automatic transmission
   –505 to –515 mmHg
   (–19.9 to –20.3 inHg)

Notes:

a. **When atmospheric pressure is known, operating pressure will be found by tracing the arrow line "A". See Figure EF-51. When altitude is known, operating pressure will be found by tracing the arrow line "B". See Figure EF-51.**
b. **When checking the set pressure of B.C.D.D., find the specified set pressure in Figure EF-51 from the atmospheric pressure and altitude of the given location.**
   For example, if an automatic transmission model car is located at an altitude of 1,000 m (3,280 ft), the specified set pressure for B.C.D.D. is –452 mmHg (–17.8 inHg).

7. If it is higher than the set level, turn the adjusting screw counterclockwise until correct adjustment is made.

Note: Figure EF-49 shows method of adjusting set pressure on B.C.D.D. equipped with altitude corrector B.C.D.D. without altitude corrector can be similarly adjusted.

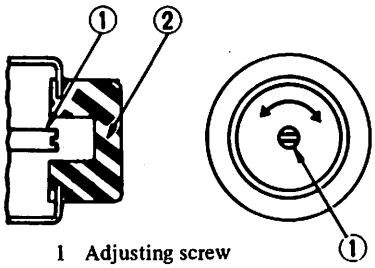


Fig. EF-49 Adjusting set pressure

8. Race the engine and check for adjustment.
9. If it is lower than the set level, turn the adjusting screw clockwise until correct adjustment is made.
10. Race the engine and check for adjustment.

If engine speed cannot be decreased to idling when checking B.C.D.D. set pressure, proceed as follows:

When the engine speed does not fall to idling speed, it is necessary to reduce the negative idling pressure of the manifold to lower than the set pressure of the B.C.D.D. (The engine speed will not drop to idling speed when the negative idling pressure is higher than the set pressure of the B.C.D.D.).

In this case, the engine must be labored by (1) road test or (2) chassis dynamometer or (3) by raising up rear suspension member on a stand, accelerating the car to 64 to 80 km/h (40 to 50 MPH) in top gear (manual transmission) or in "D" range (automatic transmission), and then releasing the accelerator pedal and letting the car decelerate. After doing this, check whether the B.C.D.D. set pressure is at the predetermined value or not.

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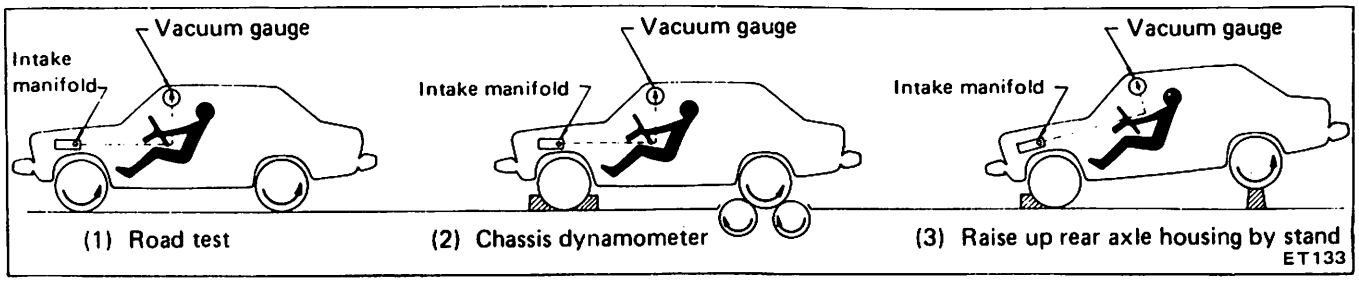


Fig. EF-50 Testing set pressure of the B.C.D.D.

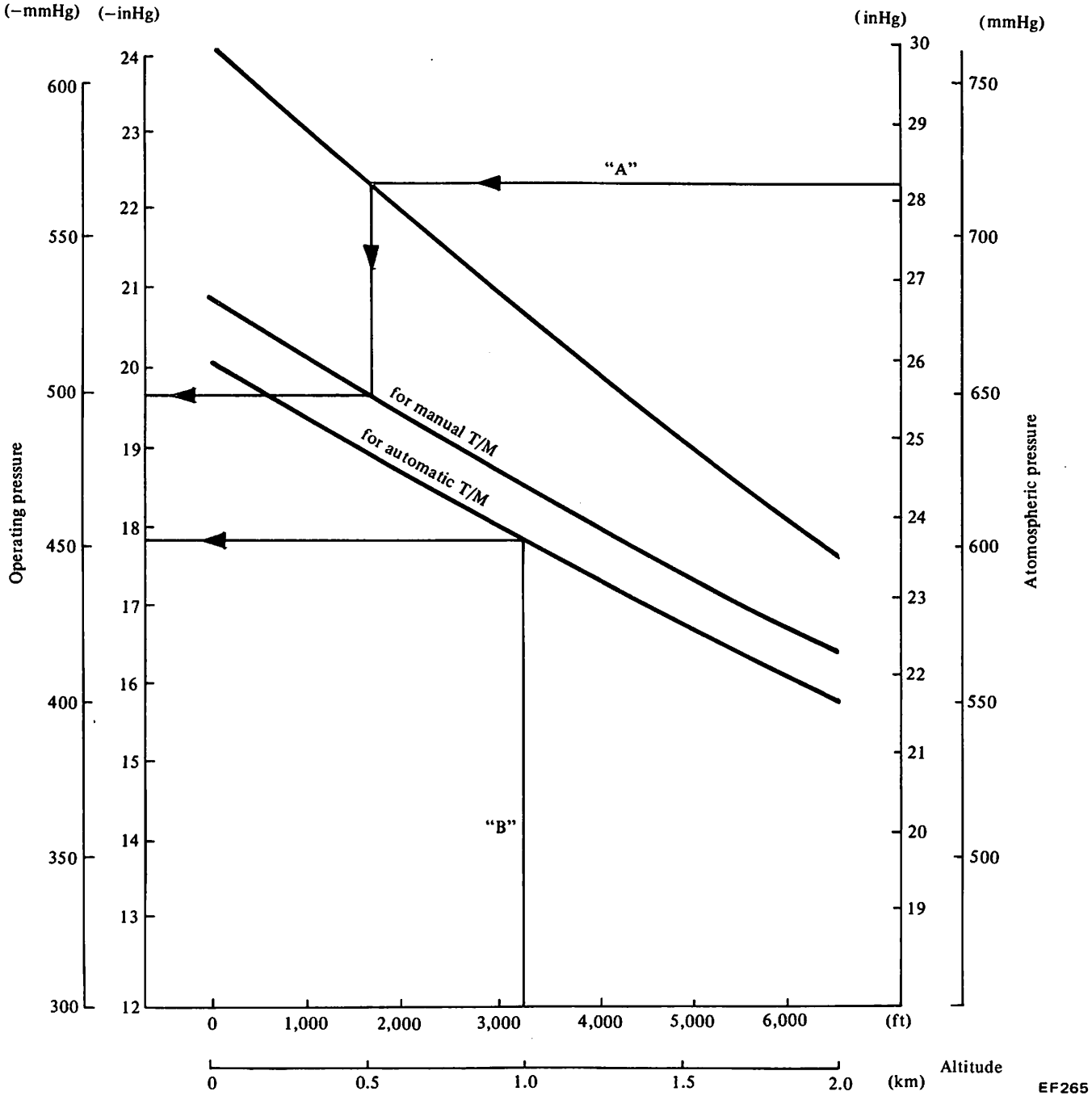
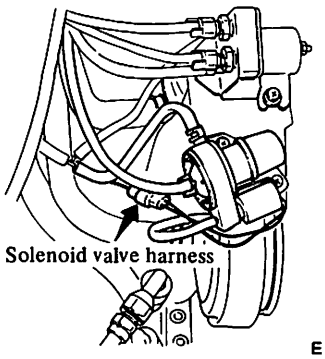


Fig. EF-51 Changes in set pressure versus changes in atmospheric pressure and altitude

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B.C.D.D. solenoid valve

1. Turn on engine key. (Do not start engine.)
2. Ensure that solenoid valve clicks when intermittently electrified as shown in Figure EF-52.



EF294

Fig. EF-52 Checking solenoid valve

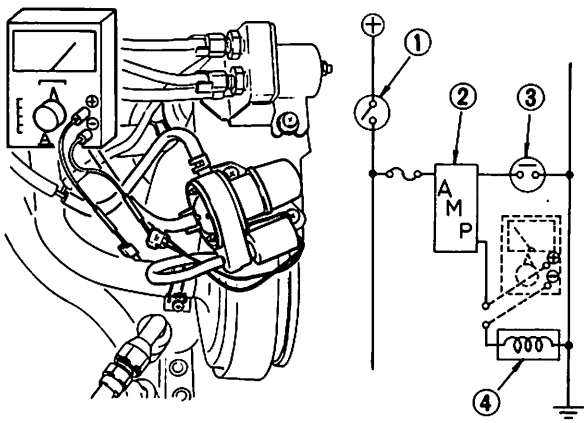
3. If a click is heard, solenoid valve is normal.
4. If a click is not heard at all, check for continuity with a circuit tester. If discontinuity is detected, replace solenoid valve.

Amplifier (Manual transmission models)

The amplifier is installed at the rear of the speedometer. To check, proceed as follows:

1. Set circuit tester in d-c ampere range (1A min, full scale), connect test probes of tester as shown in Figure EF-53.

Do not confuse positive line with negative line.



1 Ignition key
2 Amplifire
3 Speed detecting switch
Above 10 mph : OFF
Below 10 mph : ON
4 B.C.D.D. solenoid valve

EF296

Fig. EF-53 Checking amplifier

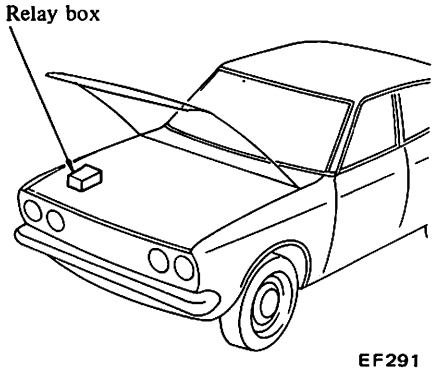
2. Turn ignition key to "ON" position.
3. Ensure that tester pointer deflects when ignition key is turned on.
4. If tester pointer does not deflect when solenoid valve and speed detecting switch circuits are functioning properly, amplifier is faulty.

Inhibitor switch (Automatic transmission models)

Refer to the TM section.

Inhibitor relay (Automatic transmission models)

1. Remove inhibitor relay. Refer to Figure EF-54.



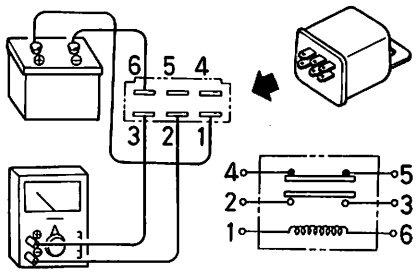
EF291

Fig. EF-54 Location of inhibitor relay

2. Make an inhibitor relay check as shown in Figure EF-55.

Apply 12 volts (d-c) across terminals 1 and 6 to ensure that continuity exists between terminals 2 and 3 and that it does not exist between terminals 4 and 5.

If results satisfied the above, inhibitor relay is functioning properly; if not, replace inhibitor relay.



EF301

Fig. EF-55 Checking inhibitor relay

ALTITUDE COMPENSATOR (for California)

Notes:

a. The altitude compensator is set to operate above an altitude of approximately 600 m (1,968 ft). It should be carefully checked.
b. When making this check, ensure that all other parts are working properly.
c. The altitude compensator cannot be adjusted; if it is found to be functioning unsatisfactorily, it must be replaced as an assembly.
d. The hoses are color-coded. When connecting them, be sure to align them with the proper color marks on the unit.

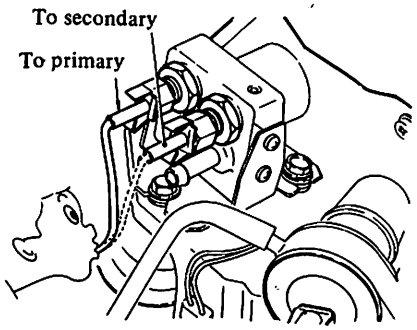
Compensator at low altitudes

If the compensator should be operating at low altitudes, any of the following four symptoms may result:

1. Hesitation (a) and stumble (b) when engine is started.
2. Surge (c) when crusing at approximately 80 km/h (50 MPH).
3. Stumble (b) when accelerating in the 80 to 112 km/h (50 to 70 MPH) range.
4. Poor acceleration at full throttle (it takes too long to attain full acceleration.).

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When the compensator is malfunctioning, check it by sucking or blowing air through the inlet and outlet hoses. If air flows through smoothly, replace the unit as an assembly. Refer to Figure EF-56.



EF298

Fig. EF-56 Altitude compensator check

Compensator at high altitudes

If the compensator should not be operating at high altitudes, any of the following four symptoms may result:

1. Engine speed does not increase in proper response to accelerator depression under no-load condition.
2. Hesitation (a) and stumble (b) when engine is started.
3. Poor acceleration at full throttle (it takes too long to attain full acceleration.).
4. Smooth running at partial throttle begins to depend upon altitude.

When the compensator is malfunctioning, check it by sucking or blowing air through the inlet and outlet hoses. If air does not flow through smoothly, replace the unit as an assembly.

Notes:

a. **Hesitation:**
   A temporary lack of initial response in acceleration rate.
b. **Stumble:**
   A short, sharp reduction in acceleration rate.
c. **Surge:**
   A continued condition of short, sharp fluctuations in power. These may be cyclic or random, and can occur at any speed and/or load. Surge is usually caused by excessively lean carburetor mixtures.

MAJOR SERVICE OPERATION

The perfectly adjusted carburetor delivers the proper fuel and air ratios at all speeds for the particular engine for which it was designed. By completely disassembling which will allow cleaning of all parts and passages, the carburetor can be maintained its original condition and will continue to deliver the proper ratios.

To maintain accurate carburetion of passages and discharge holes, extreme care must be taken in cleaning.

Use only carburetor solvent and compressed air to clean all passages and discharge holes. Never use wire or other pointed instrument to clean or carburetor calibration will be affected.

REMOVAL

Remove carburetor from engine, taking sufficient care to the following:

Precautions:

a. **When disconnecting fuel lines, do not spill fuel from fuel pipe.**
b. **When removing carburetor, do not drop any nut or bolt into intake manifold.**
c. **Be careful not to bend or scratch any part.**

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DISASSEMBLY AND ASSEMBLY

A Choke chamber
B Center body
C Throttle chamber

1 Lock lever
2 Filter set screw
3 Fuel filter
4 Fuel nipple
5 Needle valve body
6 Needle valve
7 Fuel chamber parts
8 Accelerating pump parts
9 Altitude compensator pipe (for California)
10* Coasting air bleed adjusting screw
11* High speed enricher air bleed
12* Choke valve
13 Accelerating pump lever
14 Throttle return spring
15 Accelerating pump rod
16 Automatic choke cover
17* Automatic choke body and diaphragm chamber
18* Richer jet
19* Coasting air bleed I
20 Primary main jet
21 Secondary main jet
22 Secondary slow air bleed
23 Secondary slow jet
24 Plug
25* Safe orifice
26 Coasting jet
27 Secondary main air bleed
28 Power valve
29 Primary main air bleed
30 Plug
31 Primary slow jet
32 No. 2 primary slow air bleed
33* Primary and secondary small venturi
34* Venturi stopper screw
35 Choke connecting rod
36 Anti-dieseling solenoid valve
37 Fast idle cam
38 Diaphragm chamber parts
39 Idle limiter cap
40 Idle adjust screw
41 Idle adjust screw spring
42 Throttle adjust screw
43 Throttle adjust screw spring
44* Primary and secondary throttle valve
45 B.C.D.D. (for California)
46 Vacuum control solenoid valve
47 B.C.D.D. (except California)

Note: Do not remove the parts marked with an asterisk "*."

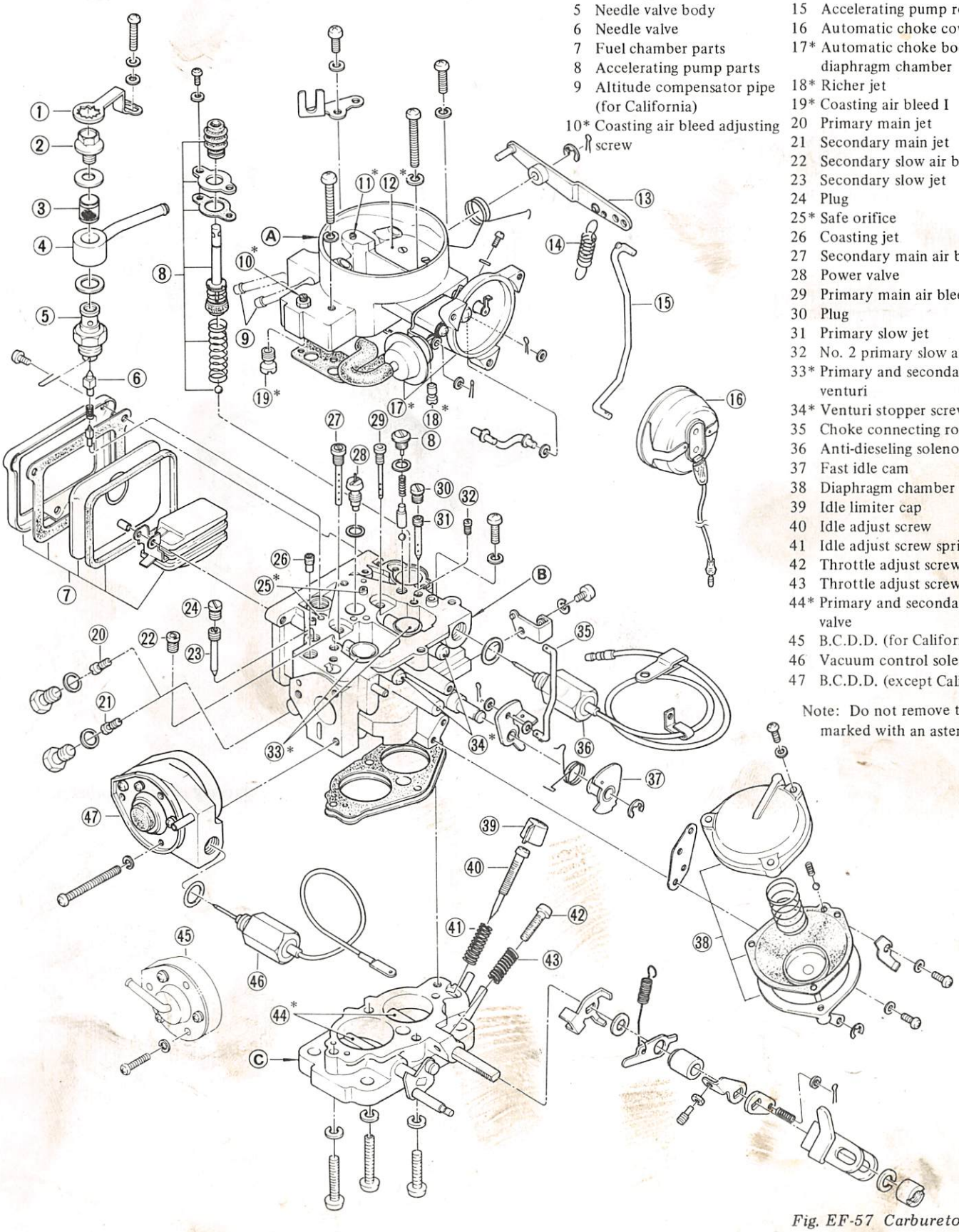


Fig. EF-57 Carburetor parts

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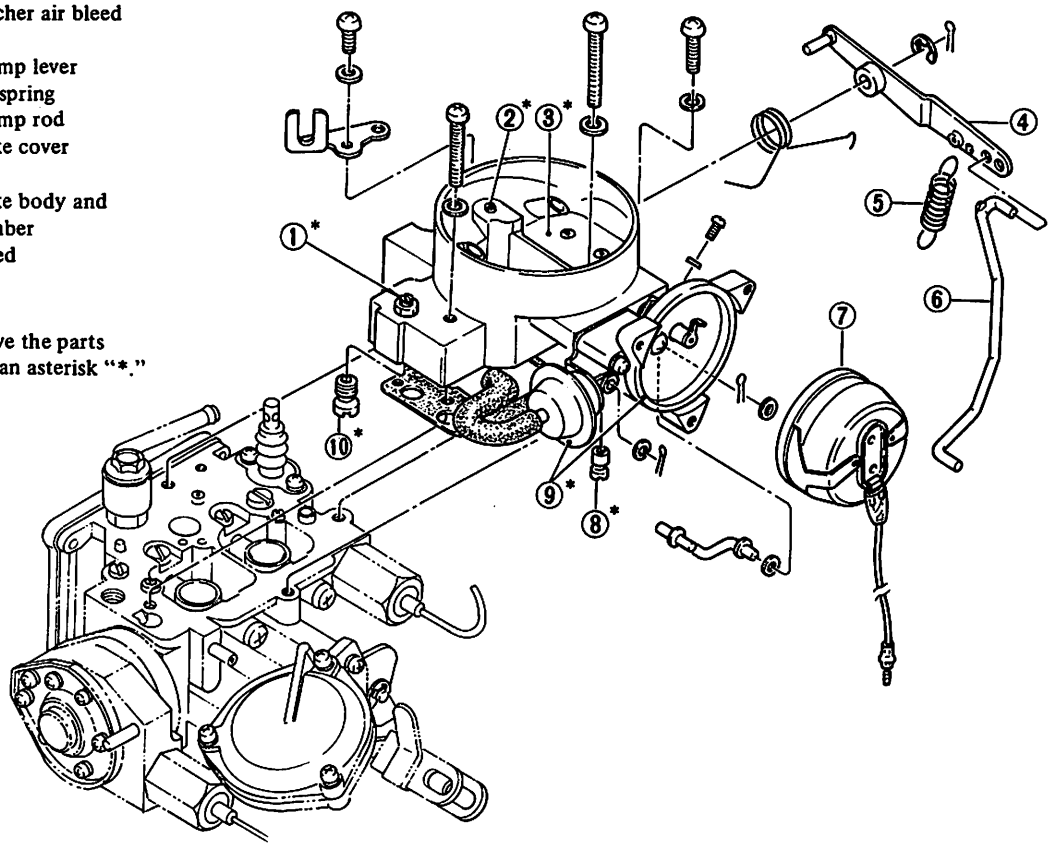
Disassembly

1. Properly fitting wrenches and screwdrivers must be used on the nozzles and jets as well as on the screws and nuts, and care must be exercised not to damage any parts.
2. Clean the carburetor thoroughly before disassembly.
3. Do not attempt to remove any parts marked with an asterisk (*) in Figure EF-58.

Choke chamber parts

1* Coasting air bleed adjusting screw
2* High speed enricher air bleed
3* Choke valve
4 Accelerating pump lever
5 Throttle return spring
6 Accelerating pump rod
7 Automatic choke cover
8* Richer jet
9* Automatic choke body and diaphragm chamber
10* Coasting air bleed

Note: Do not remove the parts marked with an asterisk "*."

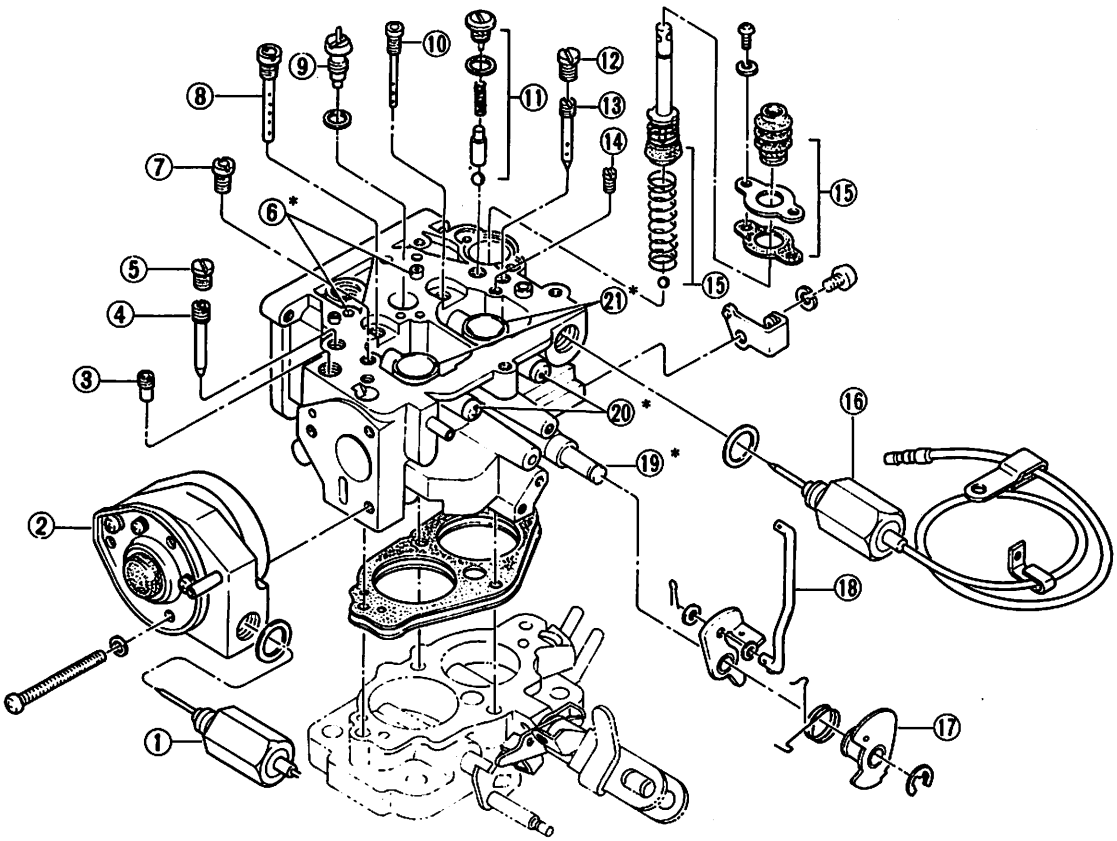


EF225

Fig. EF-58 Removing choke chamber parts

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Center body parts



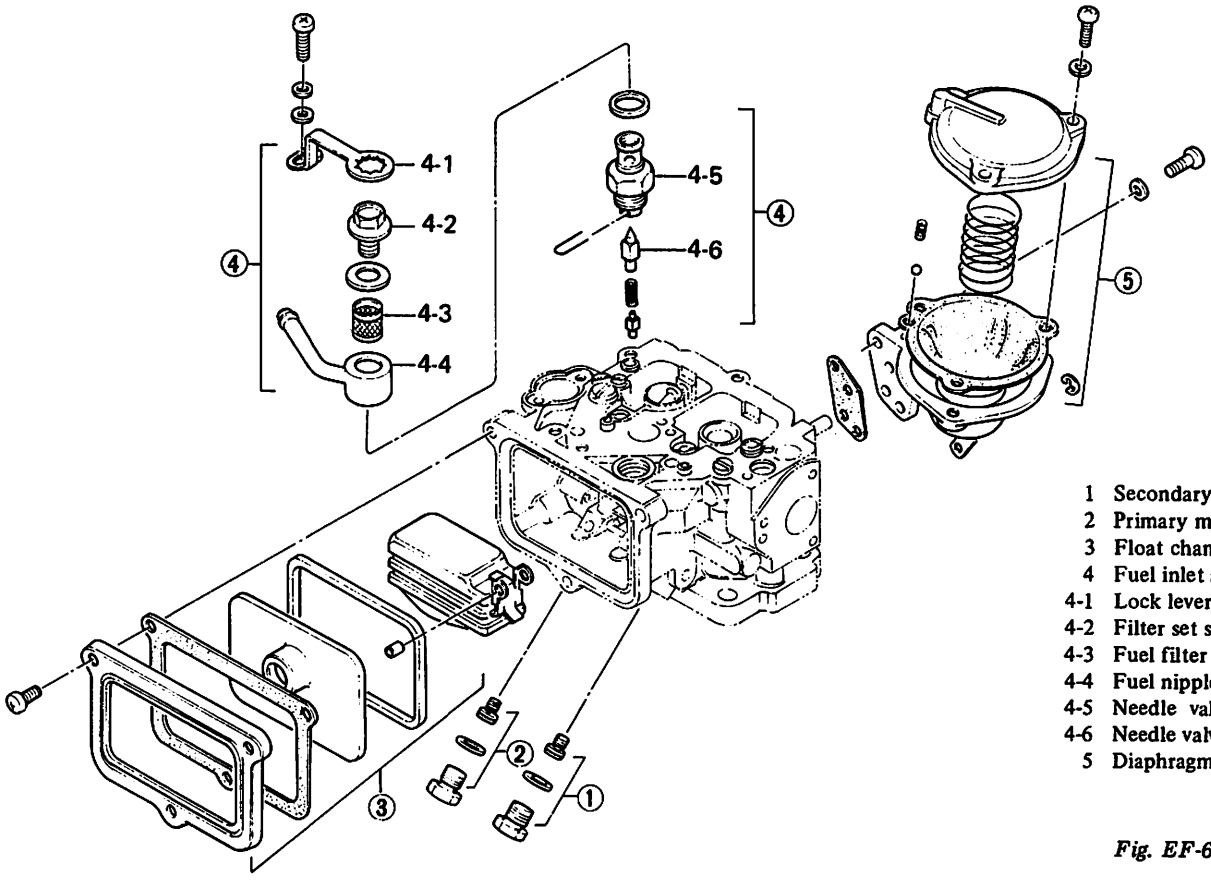
1 Vacuum control solenoid valve
2 B.C.D.D.
3 Coasting jet
4 Secondary slow jet
5 Plug
6* Safe orifice
7 Secondary slow air bleed
8 Secondary main air bleed
9 Power valve
10 Primary main air bleed
11 Weight and outlet valve
12 Plug
13 Primary slow jet
14 Primary slow air bleed
15 Accelerator pump assembly
16 Anti-dieseling solenoid valve
17 Fast idle cam
18 Choke connecting rod
19* Fast idle camshaft
20* Venturi stopper screw
21* Primary and secondary small venturi

Note: Do not remove the parts marked with an asterisk "*."

EF226

Fig. EF-59 Removing jets

Float



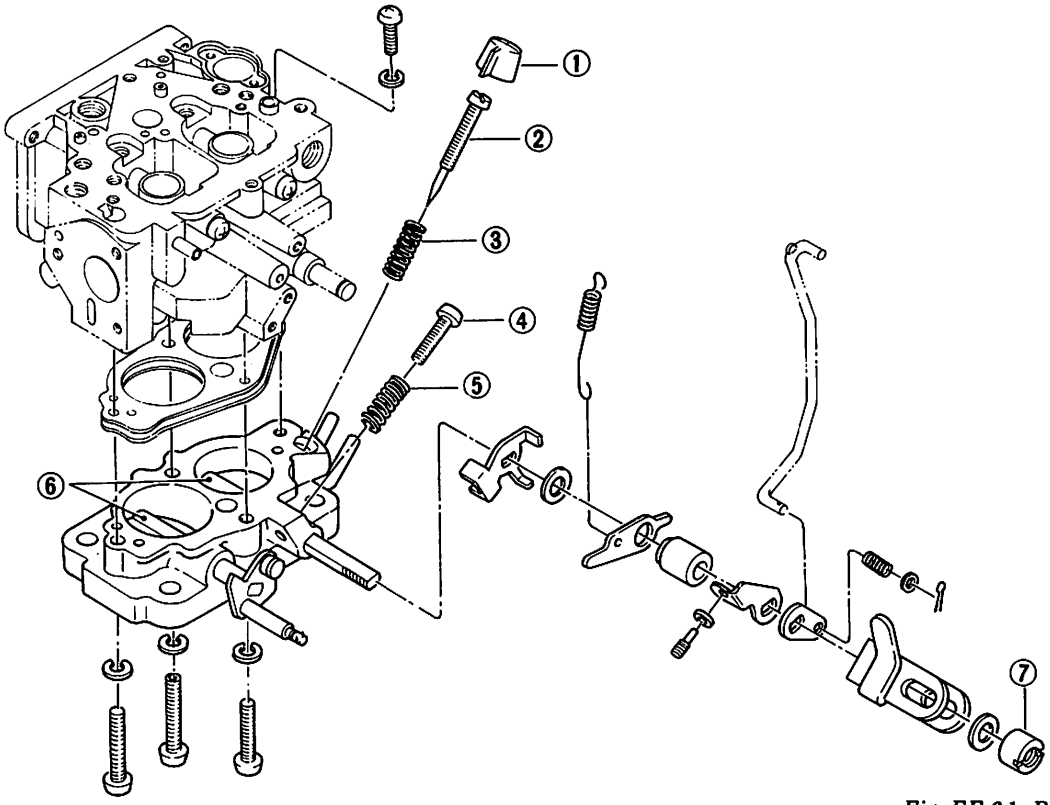
1 Secondary main jet
2 Primary main jet
3 Float chamber parts
4 Fuel inlet assembly
4-1 Lock lever
4-2 Filter set screw
4-3 Fuel filter
4-4 Fuel nipple
4-5 Needle valve body
4-6 Needle valve
5 Diaphragm chamber assembly

EF227

Fig. EF-60 Removing float

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Throttle chamber parts



1 Idle limiter cap
2 Idle adjust screw
3 Idle adjust screw spring
4 Throttle adjust screw
5 Throttle adjust screw spring
6* Primary and secondary throttle valves
7 Nut

Note: Do not remove the parts marked with an asterisk "*."

EF228

Fig. EF-61 Removing throttle chamber parts

Assembly

To assemble, reverse the disassembly procedure, taking care to the following:

1. Thoroughly wash all the parts before assembling.
2. Inspect gaskets to see if they appear hard or brittle or if edges are torn or distorted.

If any of such undesirable conditions is noted, they must be replaced.

3. Install jet and air bleed having the same size number as that of original one.
4. After reassembling carburetor, check each rotating portion or sliding portion for smooth operation.

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CLEANING AND INSPECTION

Dirt, gum, water or carbon contamination in or on exterior moving parts of a carburetor are often responsible for unsatisfactory performance. For this reason, efficient carburetion depends upon careful cleaning and inspection while servicing.

1. Blow all passages and castings with compressed air and blow off all parts until dry.

Note: Do not pass drills or wires through calibrated jets or passages as this may enlarge orifice and seriously affect carburetor calibration.

2. Check all parts for wear. If wear is noted, damaged parts must be replaced. Note especially the following:

(1) Check float needle and seat for wear. If wear is noted, assembly must be replaced.

(2) Check throttle and choke shaft bores in throttle chamber and choke chamber for wear or out-of-roundness.

(3) Inspect idle adjusting needle for burrs or ridges. Such a condition requires replacement.

3. Inspect gaskets to see if they appear hard or brittle or if edges are torn or distorted. If any such condition is noted, they must be replaced.

4. Check filter screen for dirt or lint. Clean, and if screen is distorted or remains plugged, replace.

5. Check linkage for operating condition.

6. Inspect operation of accelerating pump. Pour fuel into float chamber and make throttle lever operate. Check condition of fuel injection from the accelerating nozzle.

7. Push connecting rod of diaphragm chamber and block passage of vacuum by finger. When connecting rod becomes free, check for leakage of air or damage to diaphragm.

Jets

Carburetor performance depends on jets and air bleeds. That is why these components must be fabricated with utmost care. To clean them, use cleaning solvent and blow air on them. Larger inner numbers stamped on the jets indicate larger diameters. Accordingly, main and slow jets with larger numbers provide richer mixture; the smaller the numbers the leaner the mixture. Conversely, the main and slow air bleeds, through which air to passes through, make the fuel leaner if they bear larger numbers; the smaller the numbers the richer the fuel.

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SERVICE DATA AND SPECIFICATIONS

		Non-California models		California models	
		Manual transmission	Automatic transmission	Manual transmission	Automatic transmission
Air cleaner					
Air control valve partially opens	°C (°F)	30 to 54 (86 to 130)		30 to 54 (86 to 130)	
Air control valve fully opens	°C (°F)	above 55 (131)		above 55 (131)	
Idle compensator partially opens	°C (°F)				
Bi-metal No. 1		60 to 70 (140 to 158)		60 to 70 (140 to 158)	
Bi-metal No. 2		70 to 90 (158 to 194)		70 to 90 (158 to 194)	
Idle compensator fully opens	°C (°F)				
Bi-metal No. 1		above 70 (158)		above 70 (158)	
Bi-metal No. 2		above 90 (196)		above 90 (196)	
Fuel system					
Fuel pressure	kg/cm² (psi)	0.21 to 0.27 (2.99 to 3.84)		0.21 to 0.27 (2.99 to 3.84)	
Fuel pump capacity	cc (US pt)/min at rpm	1,000 (2 1/8)/1,000		1,000 (2 1/8)/1,000	
Carburetor					
Carburetor type		Stromburg type		Stromburg type	
Carburetor model		DCH340-43	DCH340-44	DCH340-41	DCH340-42
		Primary / Secondary	Primary / Secondary	Primary / Secondary	Primary / Secondary
Outlet diameter	mm (in)	30 (1.181) / 34 (1.341)	30 (1.181) / 34 (1.341)	30 (1.181) / 34 (1.341)	30 (1.181) / 34 (1.341)
Venturi diameter	mm (in)	24 (0.945) / 31 (1.220)	24 (0.945) / 31 (1.220)	24 (0.945) / 31 (1.220)	24 (0.945) / 31 (1.220)
Main jet		#97 / #160	#97 / #160	#99 / #160	#99 / #160
Main air bleed		#70 / #60	#70 / #60	#70 / #60	#70 / #60
Slow jet		#48 / #100	#48 / #100	#48 / #80	#48 / #80
Power valve		#48	#48	#43	#43
Float level (H')	mm (in)	23 (0.906)	23 (0.906)	23 (0.906)	23 (0.906)
Fuel pressure	kg/cm² (psi)	0.17 (2.418)	0.17 (2.418)	0.17 (2.418)	0.17 (2.418)
Adjustment					
Engine idling (Ignition timing/Idle speed/ CO % at air off)		12°/750 rpm, CO 2%	12°/650 rpm at "D" range, CO 2%	12°/750 rpm, CO 2%	12°/650 rpm at "D" range, CO 2%
Fuel level adjustment					
Gap between valve stem and float seat H	mm (in)	7.2 (0.283)	7.2 (0.283)	7.2 (0.283)	7.2 (0.283)
H'		23 (0.906)	23 (0.906)	23 (0.906)	23 (0.906)
h		1.3 to 1.7 (0.051 to 0.067)	1.3 to 1.7 (0.051 to 0.067)	1.3 to 1.7 (0.051 to 0.067)	1.3 to 1.7 (0.051 to 0.067)
Fast idle adjustment (Fast idle cam, second step)					
Gap between throttle valve and carburetor body	mm (in)	1.01 to 1.21 (0.040 to 0.048)	1.23 to 1.33 (0.049 to 0.052)	1.01 to 1.21 (0.040 to 0.048)	1.23 to 1.33 (0.049 to 0.052)
Vacuum break adjustment					
Gap between choke valve and carburetor body	mm (in)	1.65 (0.065)	1.65 (0.065)	1.65 (0.065)	1.65 (0.065)
Choke unloader adjustment					
Gap between choke valve and carburetor body	mm (in)	2.45 (0.096)	2.45 (0.096)	2.45 (0.096)	2.45 (0.096)
Bi-metal setting					
Bi-metal resistance [at 21°C (70°F)]	Ω	3.7 to 8.9	3.7 to 8.9	3.7 to 8.9	3.7 to 8.9
Bi-metal setting		Center of the index mark		Center of the index mark	
Interlock opening of primary and secondary throttle valve	mm (in)	7.38 (0.291)	7.38 (0.291)	7.38 (0.291)	7.38 (0.291)
Dash pot adjustment (without loading)		1,900 to 2,100	1,650 to 1,850	1,900 to 2,100	1,650 to 1,850
Anti-dieseling solenoid valve tightening torque	kg-cm (in-lb)	180 to 350 (156 to 304)	180 to 350 (156 to 304)	180 to 350 (156 to 304)	180 to 350 (156 to 304)
B.C.D.D. set pressure [0 m, sea level and 760 mmHg, (30 inHg), atmospheric pressure]		−525 to −535 (−0.21 to −0.211)	−505 to −515 (−0.20 to −0.206)	−525 to −535 (−0.21 to −0.211)	−505 to −515 (−0.20 to −0.206)
B.C.D.D. tightening torque	kg-cm (in-lb)	20 to 40 (17.4 to 34.7)	20 to 40 (17.4 to 34.7)	20 to 40 (17.4 to 34.7)	20 to 40 (17.4 to 34.7)

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TROUBLE DIAGNOSES AND CORRECTIONS

In the following table, the symptoms and causes of carburetor troubles and remedies for them are listed to facilitate quick repairs.

There are various causes of engine malfunctions. It sometimes happens that a carburetor which has no fault appears to have some problems, when actually the electric system is at fault. Therefore, whenever the engine is malfunctioning, the electrical system should be checked first, before adjusting carburetor.

Condition	Probable cause	Corrective action
Overflow	Dirt accumulated on needle valve.	Clean needle valve.
	Fuel pump pressure too high.	Repair pump.
	Needle valve improperly seated.	Replace.
Excessive fuel consumption	Fuel overflow.	See condition "overflow".
	Slow jet too large on each main jet.	Replace.
	Main air bleed clogged.	Clean.
	Choke valve does not open fully.	Adjust.
	Outlet valve seat of accelerator pump improper.	Lap.
	Linked opening of secondary throttle valve opens too early.	Adjust.
Power shortage	Main jets clogged.	Clean.
	Every throttle valve does not open fully.	Adjust.
	Idling adjustment incorrect.	Adjust.
	Fuel strainer clogged.	Repair.
	Vacuum jet clogged.	Clean.
	Air cleaner clogged.	Clean.
	Diaphragm damaged.	Replace.
	Power valve operating improperly.	Adjust.
Improper idling	Slow jet clogged.	Clean.
	Every throttle valve does not close.	Adjust.
	Secondary throttle valve operating improperly.	Overhaul and clean.
	Throttle valve shafts worn.	Replace.
	Packing between manifold/carburetor faulty.	Replace packing.
	Manifold/carburetor tightening improper.	Correct tightening.
	Fuel overflow.	See condition "overflow".
	B.C.D.D. adjustment incorrect.	Adjust.
	Vacuum control solenoid damaged.	Replace.
	Stuck anti-stall dash pot.	Replace.

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Condition	Probable cause	Corrective action
Engine hesitation	Main jet or slow jet clogged.	Clean.
	By pass hole, idle passage clogged.	Clean tube.
	Emulsion tube clogged.	Clean.
	Idling adjustment incorrect.	Adjust.
	Secondary throttle valve operating improperly.	Overhaul and clean.
Engine does not start.	Fuel overflows.	See condition "overflow".
	No fuel.	Check pump, fuel pipe and needle valve.
	Idling adjustment incorrect.	Adjust.
	Fast idle adjustment incorrect.	Adjust.
	Damaged anti-dieseling solenoid.	Replace.

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SERVICE MANUAL

DATSUN 710
MODEL 710 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION EC

EMISSION CONTROL SYSTEM

EC

GENERAL DESCRIPTION ..... EC- 2
CRANKCASE EMISSION CONTROL SYSTEM ..... EC- 2
EXHAUST EMISSION CONTROL SYSTEM ..... EC- 3
EVAPORATIVE EMISSION CONTROL SYSTEM EC-37
SPECIAL SERVICE TOOLS EC-41

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GENERAL DESCRIPTION

There are three types of control system. These are:

1. Closed type crankcase emission control system
2. Exhaust emission control system
3. Evaporative emission control system

Periodic inspection and required servicing of these systems should be carried out to reduce harmful emissions to a minimum.

CRANKCASE EMISSION CONTROL SYSTEM

DESCRIPTION

This system returns blow-by gas to both the intake manifold and carburetor 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 dust side of the carburetor air cleaner, through the tube connecting carburetor 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 tube connection in the reverse direction.

On cars with an excessively high blow-by, some of the flow will go through the tube connection to carburetor air cleaner under all conditions.

INSPECTION

P.C.V. VALVE AND FILTER

Checking P.C.V. valve in accordance with the following method.

With engine running at idle, remove the ventilator hose from P.C.V. valve, if the valve is working, a hissing noise will be heard as air passes through the valve and a strong vacuum should be felt immediately when a finger is placed over valve inlet.

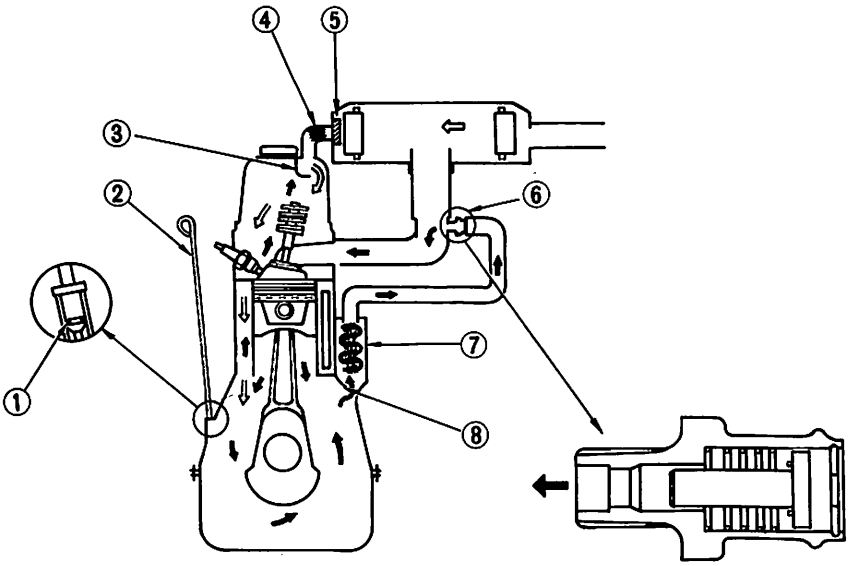
Replace P.C.V. valve and filter in accordance with the maintenance schedule.

VENTILATION HOSE

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air.

If any hose cannot be free of obstructions, replace.

Ensure that flame arrester is surely inserted in hose between air cleaner and rocker cover.



Fresh air
Blow-by gas

1 O-ring
2 Oil level gauge
3 Baffle plate
4 Flame arrester
5 Filter
6 P.C.V. valve
7 Steel net
8 Baffle plate

EF266

Fig. EC-1 Crankcase emission control system

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EXHAUST EMISSION CONTROL SYSTEM

CONTENTS

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- REMOVAL AND INSTALLATION ..... EC- 7
- INSPECTION ..... EC- 7

SPARK TIMING CONTROL SYSTEM ..... EC- 7
- DESCRIPTION ..... EC- 7
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- REMOVAL AND INSPECTION EC-30
- INSTALLATION EC-34

FLOOR TEMPERATURE WARNING SYSTEM EC-34
- DESCRIPTION EC-34
- OPERATION EC-35
- REMOVAL EC-35
- INSTALLATION EC-36
- INSPECTION EC-36

DESCRIPTION

The exhaust emission control system is made up of the following:

1) Early fuel evaporative system
2) Spark timing control system
3) Air injection system (A.I.S.)
4) Exhaust gas recirculation (E.G.R.) control system
5) Catalytic converter (California only)
6) Boost control deceleration device (B.C.D.D.)
7) High altitude temperature compensator (California only)

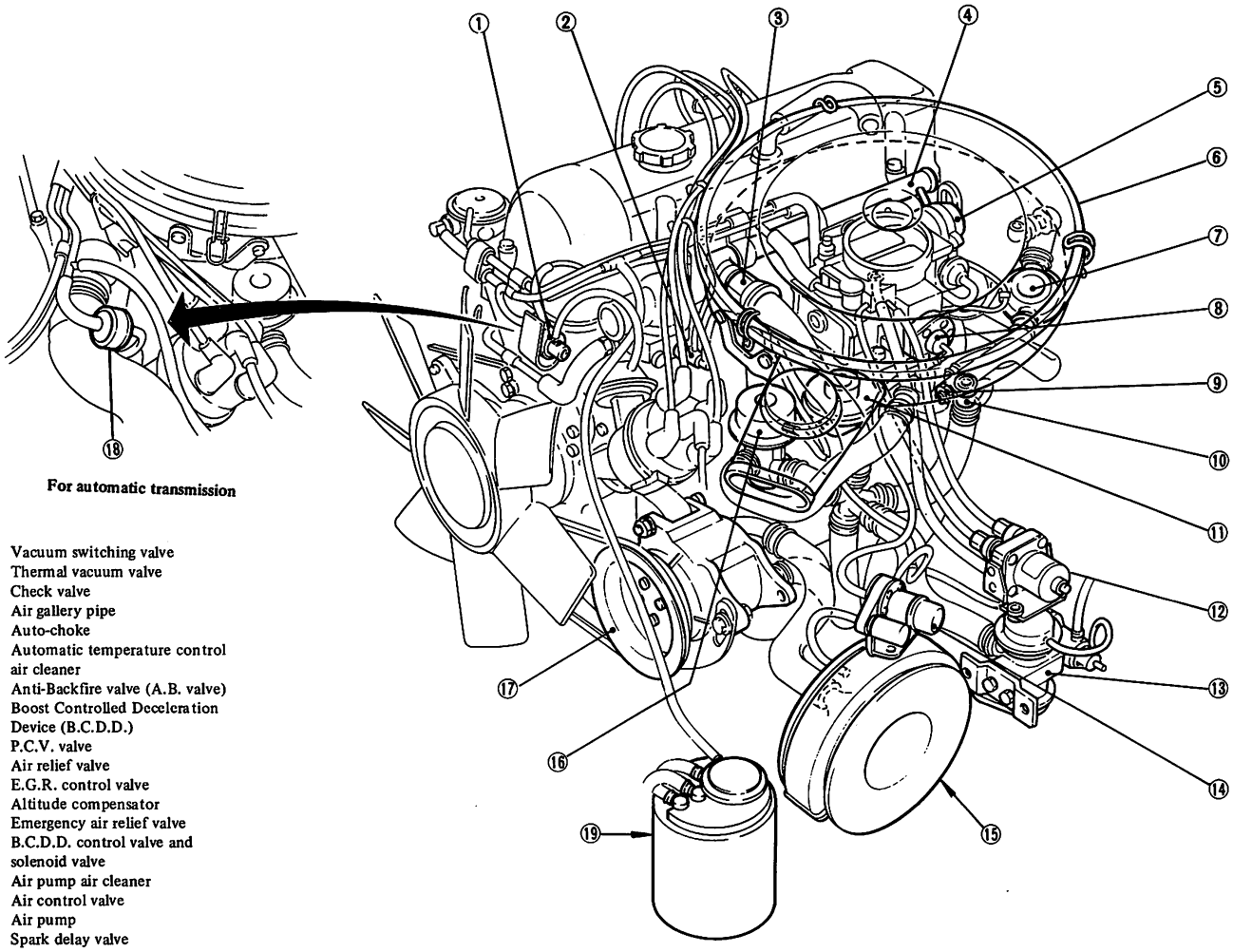
As regards the last two units, refer to the Engine Fuel section.

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1 Vacuum switching valve
2 Thermal vacuum valve
3 Check valve
4 Air gallery pipe
5 Auto-choke
6 Automatic temperature control air cleaner
7 Anti-Backfire valve (A.B. valve)
8 Boost Controlled Deceleration Device (B.C.D.D.)
9 P.C.V. valve
10 Air relief valve
11 E.G.R. control valve
12 Air pump air cleaner
13 Air pump
14 Spark delay valve
15 Carbon canister

Fig. EC-2 Exhaust emission control system (except California)

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For automatic transmission

1 Vacuum switching valve
2 Thermal vacuum valve
3 Check valve
4 Air gallery pipe
5 Auto-choke
6 Automatic temperature control air cleaner
7 Anti-Backfire valve (A.B. valve)
8 Boost Controlled Deceleration Device (B.C.D.D.)
9 P.C.V. valve
10 Air relief valve
11 E.G.R. control valve
12 Altitude compensator
13 Emergency air relief valve
14 B.C.D.D. control valve and solenoid valve
15 Air pump air cleaner
16 Air control valve
17 Air pump
18 Spark delay valve
19 Carbon canister

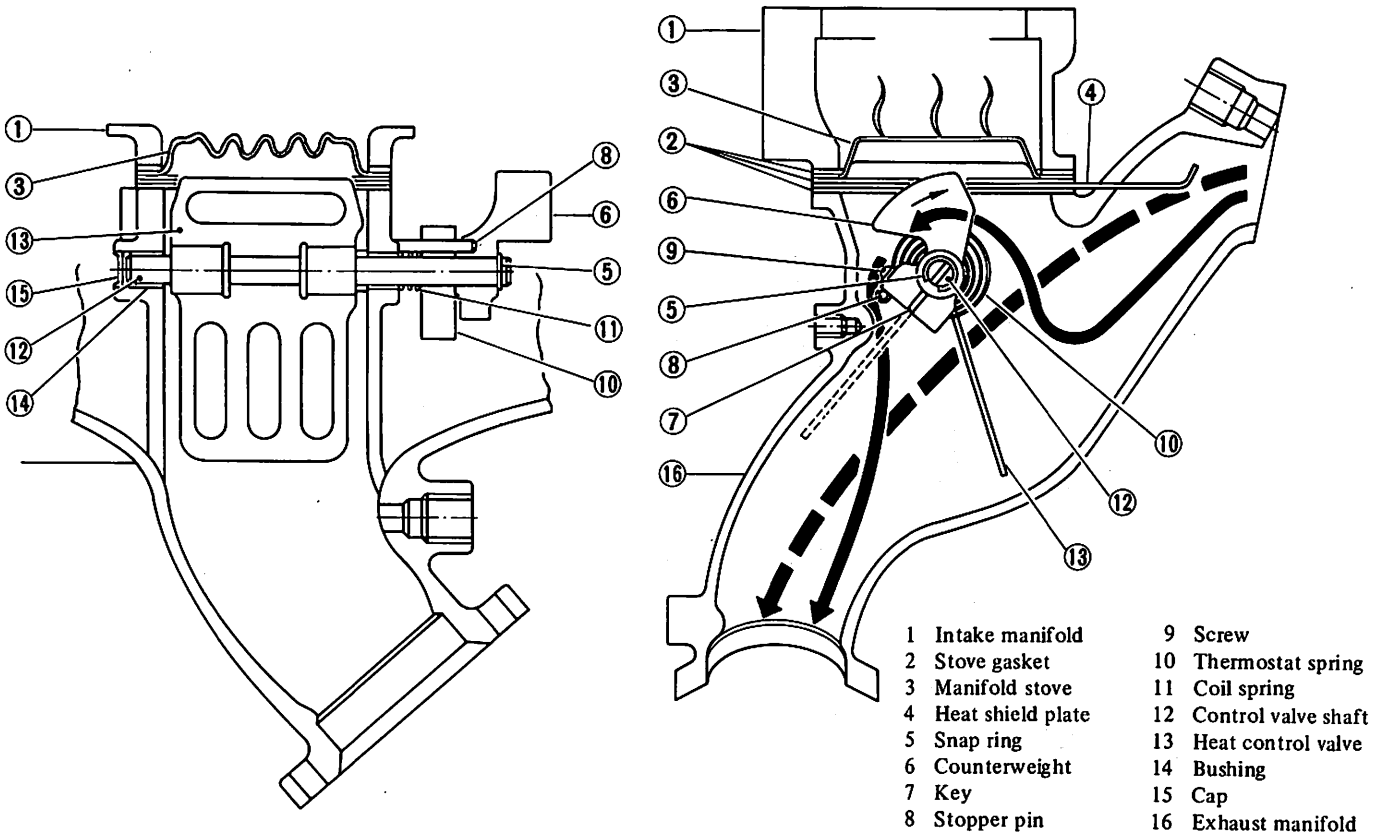
Fig. EC-3 Exhaust emission control system (for California)

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EARLY FUEL EVAPORATIVE SYSTEM (E.F.E.)

DESCRIPTION

Construction of the early fuel evaporative system is shown in Figure EC-4. A control valve welded to the valve shaft is installed on the exhaust manifold through bushing. This control valve is called "Heat control valve". The heat control valve is actuated by the coil spring, thermostat spring and counterweight which are assembled on the valve shaft projecting to the rear outside of the exhaust manifold. The counterweight is secured to the valve shaft with key, bolt and snap ring.



1 Intake manifold
2 Stove gasket
3 Manifold stove
4 Heat shield plate
5 Snap ring
6 Counterweight
7 Key
8 Stopper pin
9 Screw
10 Thermostat spring
11 Coil spring
12 Control valve shaft
13 Heat control valve
14 Bushing
15 Cap
16 Exhaust manifold

EC243

Fig. EC-4 Early Fuel Evaporative system (E.F.E.)

The early fuel evaporative system is provided with a chamber above a manifold stove mounted between the intake and exhaust manifolds. During engine warming-up, air-fuel mixture in the carburetor is heated in the chamber by exhaust gases. This results in improved evaporation of atomized fuel droplets in the mixture and in smaller content of hydrocarbons (HC) in the exhaust gas especially in cold weather operation.

The exhaust gas flow from the engine is obstructed by the heat control valve in the exhaust manifold, and is changed in direction as shown by the solid lines in Figure EC-4. The exhaust gas heats the manifold stove.

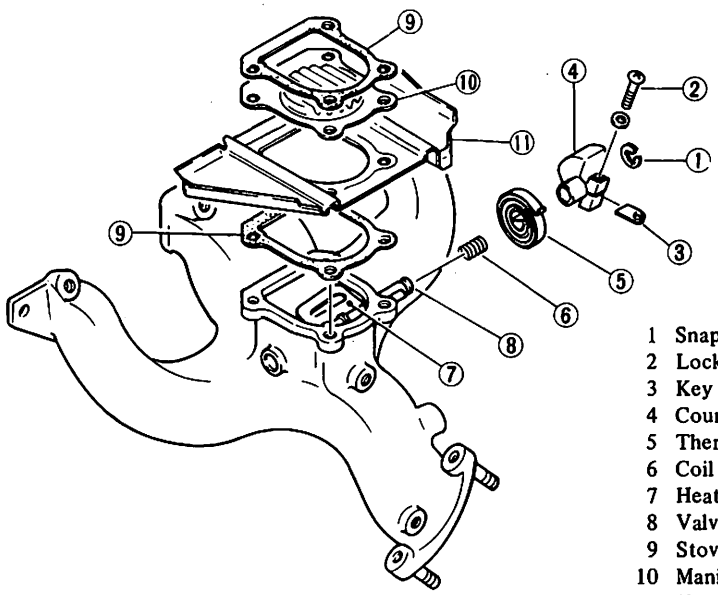
Open-close operation of the heat control valve is controlled by the counterweight and thermostat spring which is sensitive to the ambient temperature around the exhaust manifold.

OPERATION

The counterweight rotates counterclockwise and stops at the stopper pin mounted on the exhaust manifold while the engine temperature is low. With this condition, the heat control valve is in the fully closed position, obstructing the flow of exhaust gas. As engine temperature goes up and the ambient temperature becomes high enough to actuate the thermostat spring, the counterweight begins to rotate clockwise, and again comes into contact with the stopper pin. With this condition, the heat control valve is in the full open position, and exhaust gas passes through the exhaust manifold as shown by the dotted lines in Figure EC-4 without heating the manifold stove.

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REMOVAL AND INSTALLATION



1 Snap ring
2 Lock bolt
3 Key
4 Counterweight
5 Thermostat spring
6 Coil spring
7 Heat control valve
8 Valve shaft
9 Stove gasket
10 Manifold stove
11 Heat shield plate

Fig. EC-5 Exploded view of E.F.E. system

Remove snap ring ① and lock bolt ②, and the following parts can be detached from heat control valve shaft.

- Key ③
- Counterweight ④
- Thermostat spring ⑤
- Coil spring ⑥

Note: As previously described, heat control valve ⑦ is welded to valve shaft ⑧ at exhaust manifold, and cannot be disassembled.

To install, reverse the removal procedure.

INSPECTION

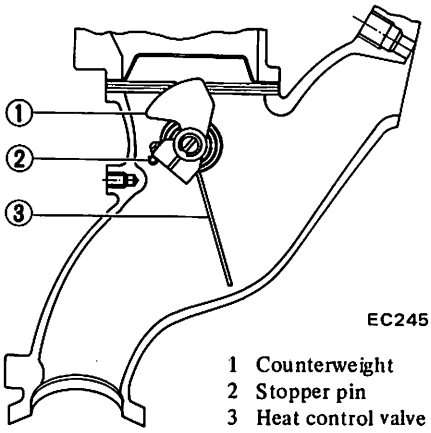
1. Run engine and visually check counterweight to see if it operates properly.

(1) For some time after starting engine in cold weather, counterweight turns counterclockwise until it comes into contact with stopper pin installed to exhaust manifold.

Counterweight gradually moves down clockwise as engine warms up and ambient temperature goes higher around exhaust manifold.

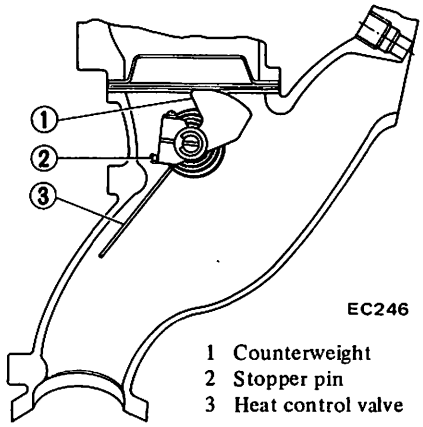
(2) When engine speed is increased, discharge pressure of exhaust gases causes counterweight to move downward clockwise.

(3) When heat control valve is in the full- open position, counterweight moves further clockwise exceeding the position described in 1-(1) above, and stops again coming into contact with stopper pin.



1 Counterweight
2 Stopper pin
3 Heat control valve

Fig. EC-6 Operation of counterweight



1 Counterweight
2 Stopper pin
3 Heat control valve

Fig. EC-7 Operation of counterweight

2. With engine stopped, visually check E.F.E. system for the following items.

(1) Thermostat spring for dismounting

(2) Stopper pin for bend, and counter weight stop position for dislocation

(3) Check heat control valve for malfunction due to break of key that locates counterweight to valve shaft.

(4) Check axial clearance between heat control valve and exhaust manifold. Correct clearance is 0.7 to 1.5 mm (0.028 to 0.059 in).

(5) Check welded portion of heat control valve and valve shaft for any indication of crack or flaking.

(6) Rotate heat control valve shaft by a finger, and check for binding between shaft and bushing in closing and opening operation of heat control valve. If any binding is felt in rotating operation, move valve shaft in the rotation direction several times. If this operation does not correct binding condition, it is due to seizure between shaft and bushing, and exhaust manifold should be replaced as an assembly.

SPARK TIMING CONTROL SYSTEM

DESCRIPTION

The spark timing control system serves to control the distributor vacuum advance under varying travelling conditions so as to reduce HC and NOx emissions. This system differs for the manual and automatic transmission models and is not used on 710 Sedan and Hardtop models destined for California.

TRANSMISSION CONTROLLED VACUUM ADVANCE SYSTEM (Manual transmission models only)

This system provides vacuum advance when the gear is in the top (4th) and neutral position and retarded spark timing at the other positions.

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When electric current flows through the vacuum switching valve, the valve opens and introduces air into the vacuum controller of the distributor through a vacuum hose, and vacuum advance is eliminated. When the vacuum switching valve is deenergized, the valve closes and vacuum created by the carburetor is introduced into the vacuum controller of the distributor to provide usual vacuum advance.

The top detecting switch and neutral detecting switch, located on the transmission case, operate so as to interrupt the flow of electric current when the gear is placed into "TOP" and "NEUTRAL", but allows it to flow in the other gear positions.

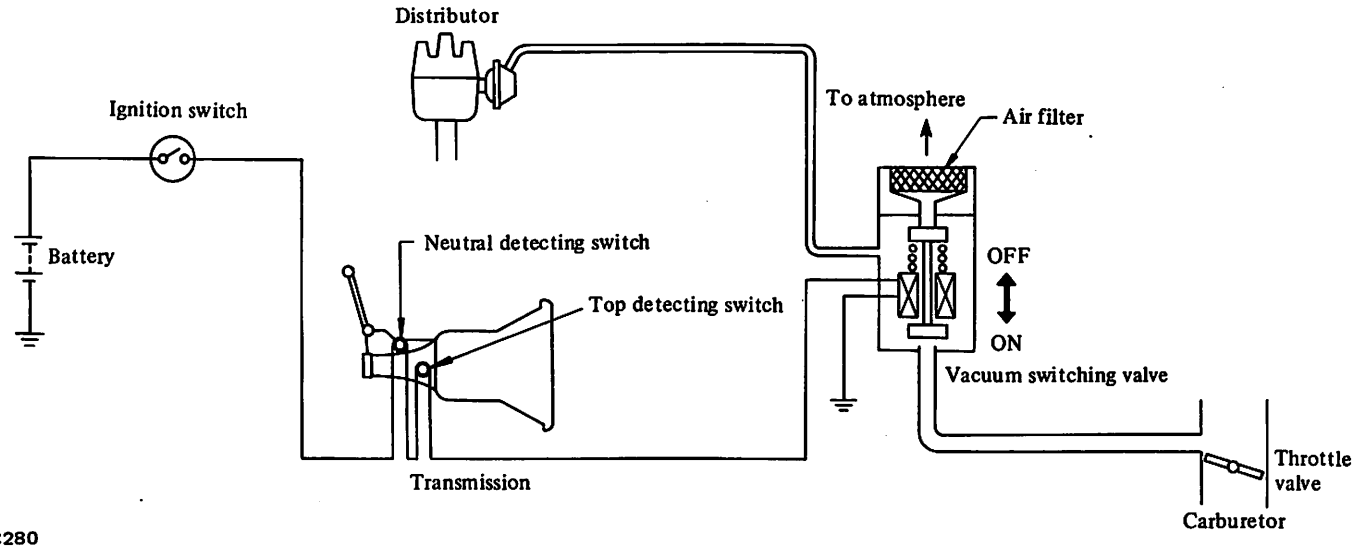


Fig. EC-8 Schematic drawing of transmission controlled vacuum advance system

Gear position	Neutral detecting switch	Top detecting switch	Vacuum switching valve	Spark timing
Neutral	OFF	ON	OFF	Advanced
Reverse	ON	ON	ON	Retarded
1st	ON	ON	ON	Retarded
2nd	ON	ON	ON	Retarded
3rd	ON	ON	ON	Retarded
4th (Top)	ON	OFF	OFF	Advanced

Inspection

1. Ensure that wiring connectors are tight in place.
2. Ensure that vacuum hoses are properly connected to their positions. See Figure EC-9.
3. Ensure that distributor vacuum controller properly functions.

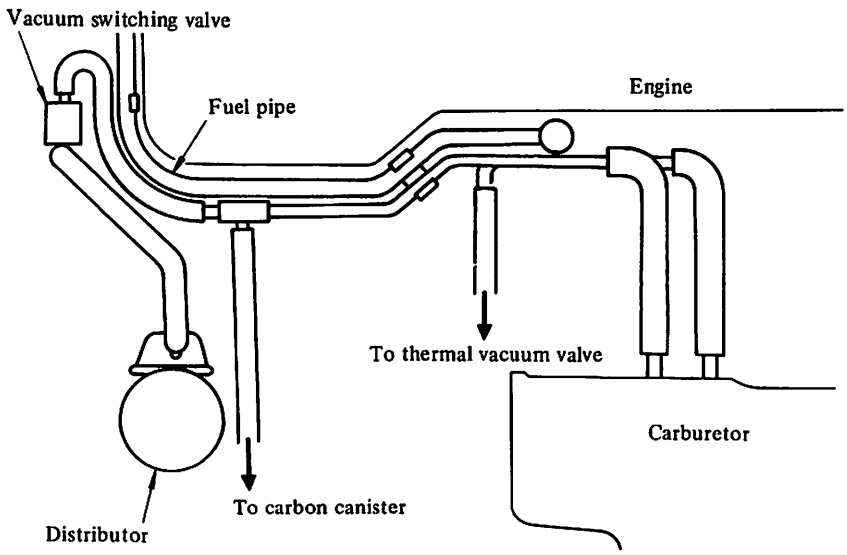


Fig. EC-9 Vacuum piping

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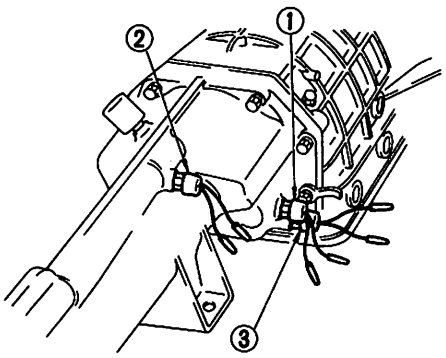
4. Set timing light.
5. Run engine and keep it at approximately 1,800 rpm.
6. Disengage clutch. Shift gears in top, 3rd, then neutral positions. Read spark timing in respective shift positions.

The system is properly functioning if spark timing in both top and neutral positions is approximately 5° greater than that in 3rd position.

7. If correct spark timing is not obtained in step 6 above, replace top detecting switch or neutral detecting switch as required.

Notes:

a. **Engage the parking brake while the above check is being made. To protect against accidental forward surge, depress brake pedal while clutch pedal is being depressed.**
b. **When installing switches, apply lock agent to threads.**



1 Top detecting switch
2 Neutral detecting switch
3 Reverse lamp switch

EC282

Fig. EC-10 Neutral and top detecting switches

8. If spark timing does not vary at all in test described in step 6 above, proceed as follows:
(1) Disconnect vacuum switching valve green wire connector.
(2) Set timing light.
(3) Run engine and keep it at approximately 1,800 rpm. Read spark timing.
(4) Connect vacuum switching valve green wire connector directly to battery (+) terminal and read spark timing.
(5) Vacuum switching valve is normal if spark timing advances by 5° when connector does not contact battery (+) terminal. Replace neutral and top detecting switches. If spark timing does not vary at all in test above replace vacuum switching valve.

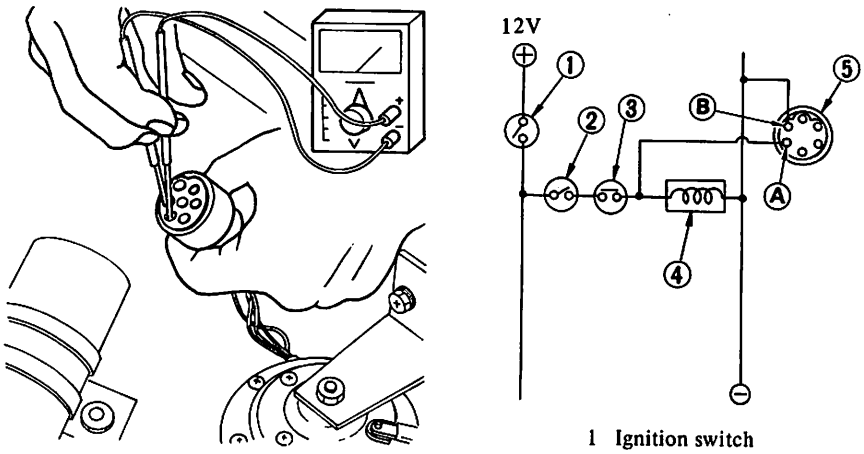
9. Check for continuity in electrical wiring with a function test connector.

Turn ignition switch on, but do not run engine. Check for voltage across terminals A and B as shown in Figure EC-11.

Gear position	Voltmeter indication
Neutral	0V
3rd	12V
4th (Top)	0V

Electrical wiring circuit is normal if voltmeter readings are as shown in chart above.

If readings are not shown, check for loose harness and burned fuse.



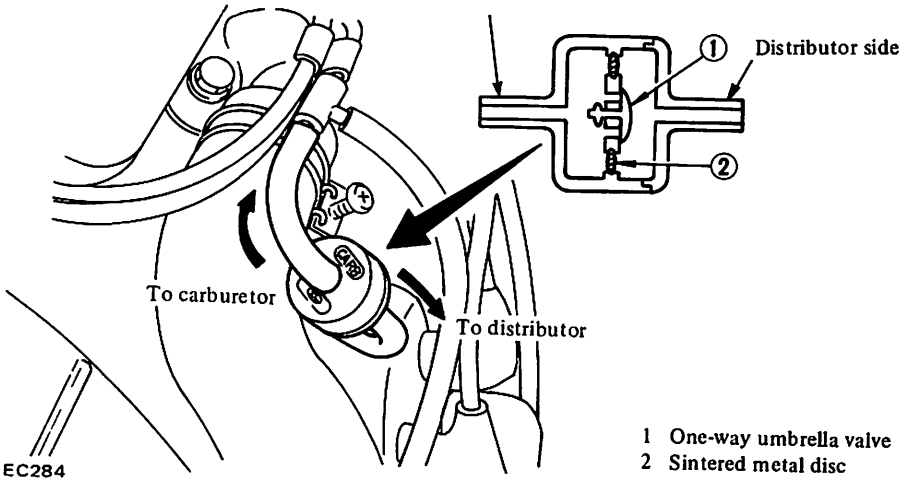
EC283

1 Ignition switch
2 Neutral detecting switch
3 Top detecting switch
4 Vacuum switching valve
5 Function test connector

Fig. EC-11 Checking for continuity in electrical wiring with function test connector

SPARK DELAY VALVE (Automatic transmission models only)

This valve delays vacuum spark advance during rapid acceleration; it also cuts off the vacuum spark advance immediately upon deceleration. The valve is designed for one-way operation and consists of a one-way umbrella valve and sintered steel fluidic restrictor.



EC284

1 One-way umbrella valve
2 Sintered metal disc

Fig. EC-12 Spark delay valve

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When installing this valve, ensure that it properly oriented. This valve should be replaced periodically. Refer to "Maintenance Schedule".

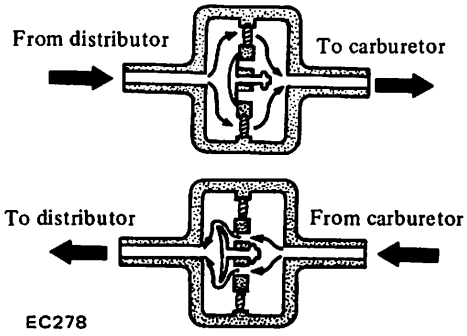
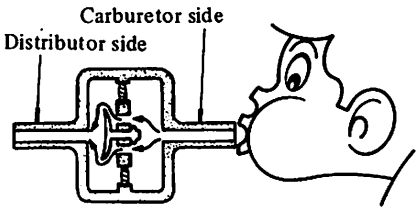


Fig. EC-13 Operation of spark delay valve

Inspection

1. Remove spark delay valve.
2. Blow air through port on carburetor side, then through the other port (on distributor side). Spark delay valve is in good condition if, when finger is placed over port on distributor side, air flow resistance is greater than that on the other side.



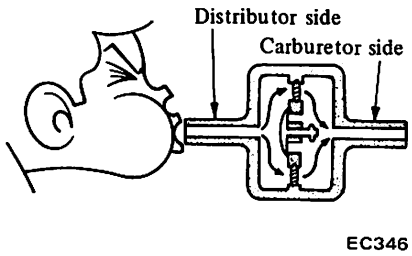


Fig. EC-14 Checking spark delay valve

3. If a considerable air flow resistance is felt at port on distributor side in step 2 above and if the condition of spark delay valve is questionable, dip port (on carburetor side) into a cup filled with water. Blow air through the other port. Small air bubbles should appear.

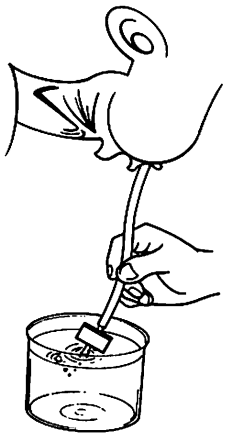


Fig. EC-15 Checking spark delay valve

Note: Be careful to avoid entry of oil or dirt into valve.

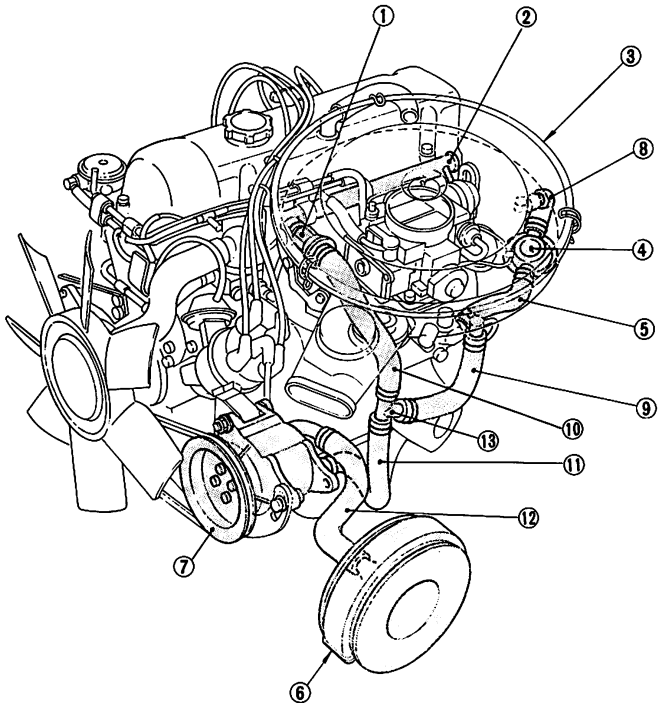
AIR INJECTION SYSTEM

DESCRIPTION

The Air Injection System (A.I.S.) is designed to inject compressed air (secondary air) coming from the air pump into the exhaust manifold to reduce hydrocarbons and carbon monoxide in exhaust gas through re-combustion. There are two types of A.I.S.: One type is mounted on California models and the other is on non-California models. The non-California type consists of an air pump air cleaner, air pump, relief valve, check valve, anti-backfire valve, air gallery and hoses. The California type has, in addition to the components of the non-California type, an air control valve and an emergency air relief valve. These valves prevent abnormal temperature rise of the catalytic converter.

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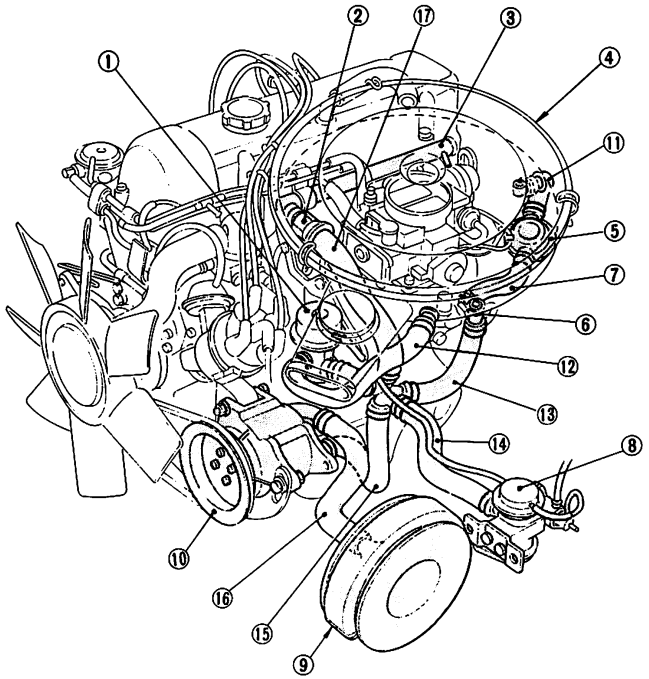
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1 Check valve
2 Air gallery pipe
3 Automatic temperature control air cleaner
4 Anti-backfire valve (A.B. valve)
5 Air hose (A.B. valve to intake manifold)
6 Air pump air cleaner
7 Air pump
8 Air hose (carburetor air cleaner to A.B. valve)
9 Air hose (carburetor air cleaner to air hose connector)
10 Air hose (check valve to air hose connector)
11 Air hose (air hose connector to air pump)
12 Air hose (air pump to air pump air cleaner)
13 3-way connector

EC287

Fig. EC-16 Non-California type A.I.S.



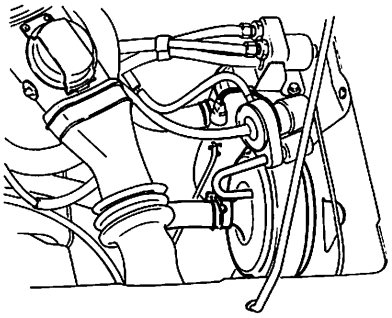
1 Air control valve
2 Check valve
3 Air gallery pipe
4 Automatic temperature control air cleaner
5 Anti-backfire valve (A.B. valve)
6 Air relief valve
7 Air hose (A.B. valve to intake manifold)
8 Emergency air relief valve
9 Air pump air cleaner
10 Air pump
11 Air hose (carburetor air cleaner to A.B. valve)
12 Air hose (carburetor air cleaner to air control valve)
13 Air hose (air relief valve)
14 Air hose (air hose connector to A.B. valve)
15 Air hose (air hose connector to air pump)
16 Air hose (air pump to air pump air cleaner)
17 Air hose (check valve to air hose connector)

EC288

Fig. EC-17 California type A.I.S.

Air pump air cleaner

The air cleaner element is a viscous paper type, and requires periodic replacement. The air pump air cleaner is bolted to the left front of the hood-ledge.



EC314

Fig. EC-18 Air pump air cleaner

Air pump

The air pump is a two-vane type. It has two positive displacement vanes which requires no lubricating service.

The die-cast aluminum air pump assembly attached to the front of the engine is driven by an air pump drive belt. A rotor shaft, drive hub, inlet and outlet tubes are visible on the pump exterior. A rotor, vanes, carbon shoes, and shoe springs make up the rotating unit of the pump. The rotor located in the center of the pump is belt-driven. The vanes rotate freely around the off-center pivot pin, and follow the circular-shaped pump bore. In the two-vane type, the vanes form two chambers in the housing. Each vane completes a pumping cycle in every revolution of the rotor. Air is drawn into the inlet cavity through a tube connected to the air pump air cleaner. Air is sealed between the vanes and moved into a smaller cavity (the compression area).

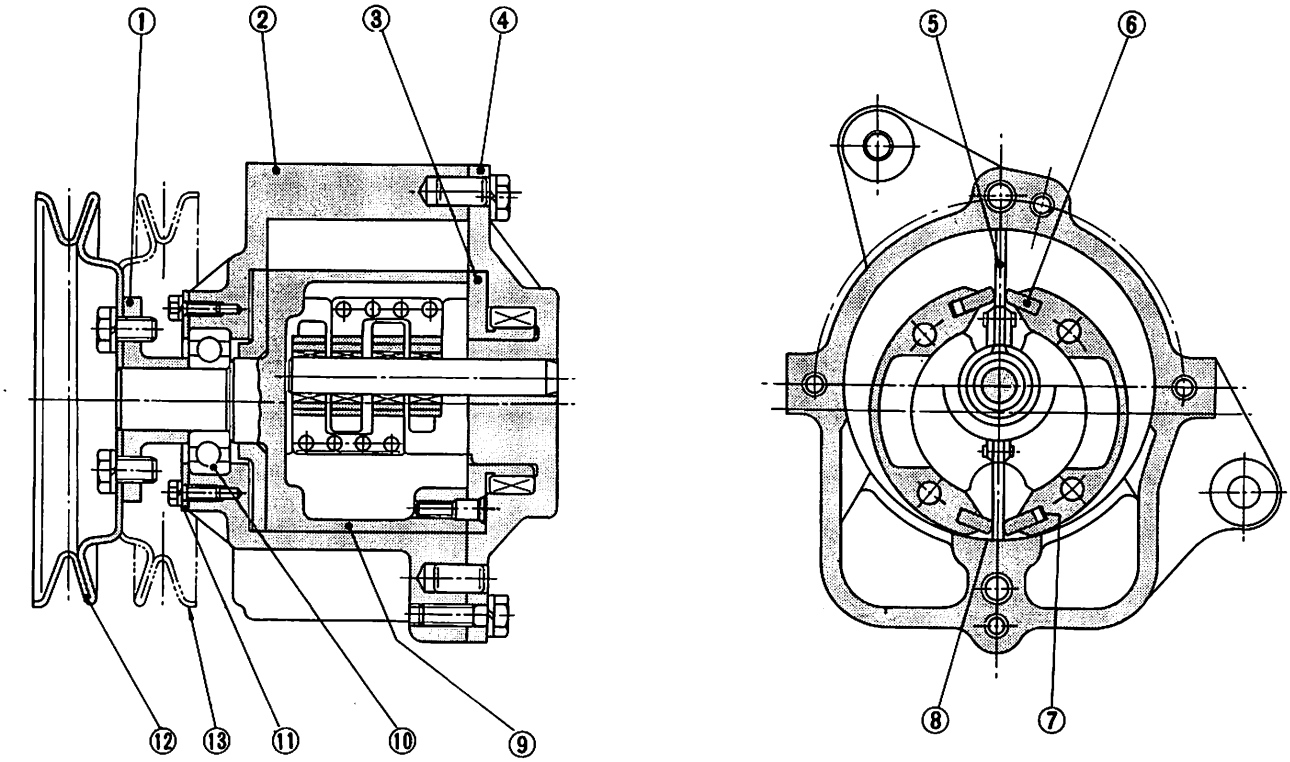
After compression, a vane passes the outlet cavity. Subsequently it passes the stripper and a section of the housing that separates the outlet and inlet cavities and again reaches the inlet cavity to repeat the pumping cycle.

Carbon shoes (in the slots of the rotor) support the vanes. They are designed to permit sliding of the vanes and to seal the rotor interior from the air cavities. Leaf springs which are behind the leading-side of the shoes compensate for shoe abrasion.

The rotor ring is a steel bolted to the rotor end. It positions the rotor and holds the carbon shoes.

The vane uses needle bearings. All bearings have been greased.

There are two types of bearing which support the rotor. Ball bearing is used for the front one and the needle bearing is used for the rear.



1 Air pump drive hub
2 Housing
3 Rotor ring
4 End cover (with needle bearing)
5 Vane
6 Carbon shoe
7 Shoe spring
8 Stripper
9 Rotor shaft
10 Ball bearing
11 Front bearing cover
12 Pulley
13 Pulley (for air conditioner)

EC321

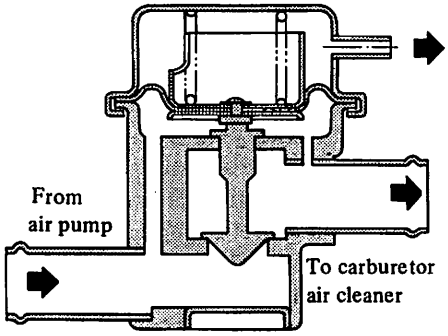
Fig. EC-19 Sectional view of air pump (two-vane type)

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Air control valve (For California)

The air control valve controls the quantity of secondary air fed from the air pump according to engine speed and load condition, and prevents excessive temperature rise of the catalytic converter.

The construction is as shown in Figure EC-20. The intake manifold vacuum and air pump discharge pressure applied to the diaphragm chamber actuate the valve which is coupled to the diaphragm and control the quantity of secondary air to be fed into the exhaust manifold in response to the engine condition.



EC291

Fig. EC-20 Air control valve

Anti-backfire valve

This valve is controlled by intake manifold vacuum to prevent backfire in the exhaust system at the initial period of deceleration.

At this period, the mixture in the intake manifold becomes too rich to ignite and burn in the combustion chamber and burns easily in the exhaust system with injected air in the exhaust manifold.

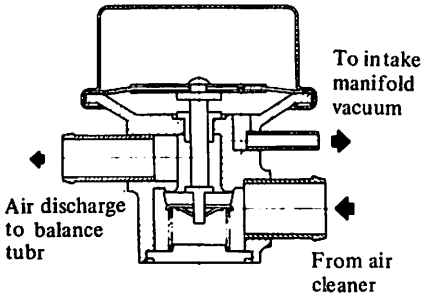
The anti-backfire valve provides air to the intake manifold to make the air-fuel mixture leaner and prevents backfire.

A schematic drawing of the anti-backfire valve is shown in Figure EC-21.

The anti-backfire valve inlet is connected to the air cleaner and the outlet to the intake manifold.

The correct function of this valve reduces hydrocarbon emission during deceleration.

If the valve does not work properly, unburned mixture will be emitted from the combustion chambers and burns with the aid of high-temperature and injected air which causes backfire.



EC069

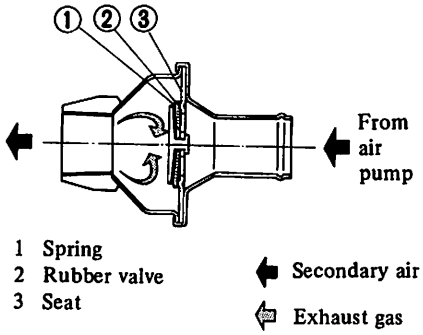
Fig. EC-21 Anti-backfire valve

Check valve

A check valve is located in the air pump discharge lines. The valve prevents the backflow of exhaust gas which occurs in one of the following cases.

1. When the air pump drive belt fails.
2. When relief valve spring fails.

Construction is shown in Figure EC-22.

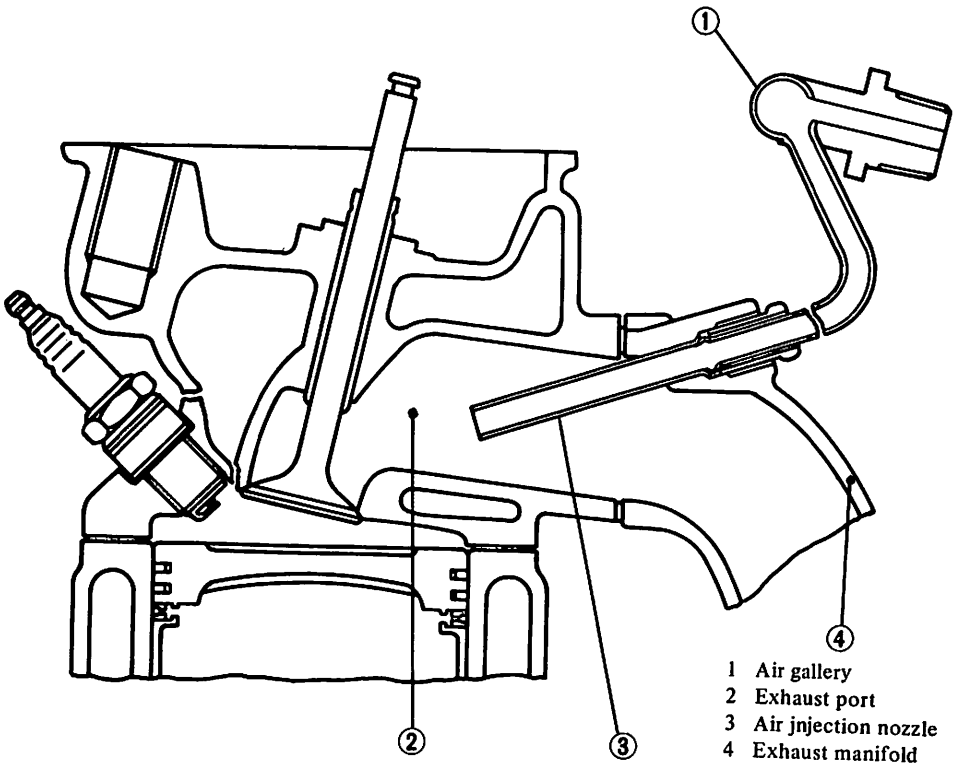


EC292

Fig. EC-22 Check valve

Air injection into exhaust port

The secondary air fed from the air pump goes through the check valve to the air gallery where it is distributed to each exhaust port. The secondary air is then injected from the air injection nozzle into the exhaust port near the exhaust valve.



EC293

Fig. EC-23 Air injection into exhaust port

Air pump relief valve

The air pump relief valve controls the injection of the secondary air into the exhaust system when the engine is running at high speed under a heavily loaded condition. It accomplishes the following functions without affecting the effectiveness of the exhaust emission control system.

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1. Minimizes exhaust gas temperature rise.
2. Minimizes horsepower losses resulting from air injection into the exhaust system.
3. Protects pump from excessive back pressure.

The air pump relief valve is installed as shown in Figure EC-24.

The secondary air is discharged from the air pump relief valve to the dust side of the carburetor air cleaner.

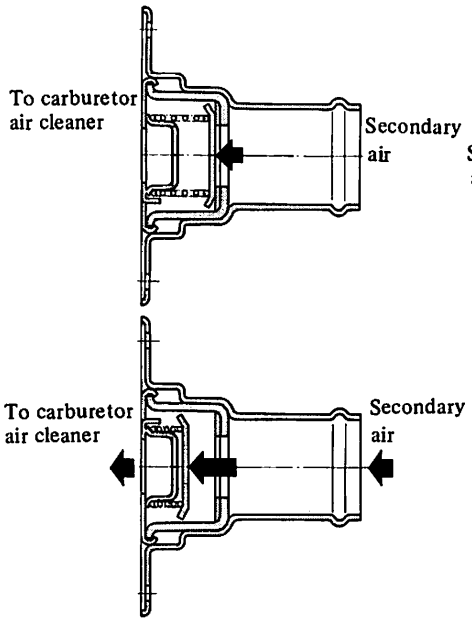
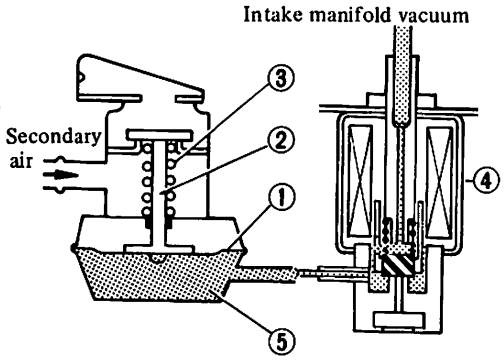


Fig. EC-24 Air pump relief valve

Emergency air relief valve (For California)

The emergency air relief valve opens when the internal temperature of the catalytic converter rises above the limit as a result of abnormal engine operation; it discharges the secondary air into the atmosphere to prevent overheating of the catalytic converter.

The emergency air relief valve consists of a diaphragm, a valve which is coupled to the diaphragm, and a spring and solenoid valve. The solenoid valve functions when the temperature of the catalytic converter rises above the limit. For a description of operation, see the Catalytic Converter item.



1 Diaphragm
2 Valve
3 Spring
4 Solenoid valve
5 Diaphragm chamber

Fig. EC-25 Emergency air relief valve

OPERATION

As mentioned previously, there are two types of Air Injection Systems (A.I.S.): a non-California type and a California type. The California standard type includes a system which controls injection of secondary air so as to assure proper function of the catalytic converter, and a system which controls the supply of secondary air to prevent abnormal temperature rise in the catalytic converter.

The A.I.S. consists of the following systems:

1. A system which allows injection of secondary air into the exhaust port.
2. A system which bypasses secondary air from the air pump relief valve to the carburetor air cleaner during high speed engine operation.
3. A system which supplies air from the carburetor air cleaner to the intake manifold by means of the anti-backfire valve so as to prevent after-fire during deceleration.
4. A system which controls injection of the secondary air by means of the air control valve so as to maintain the catalytic converter at an optimum temperature level under lightly loaded conditions.
   (California type only)
5. A system which controls the supply of secondary air through the emergency air relief valve to prevent abnormal temperature rise of the catalytic converter.
   (California type only)

A.I.S. operation is as follows:

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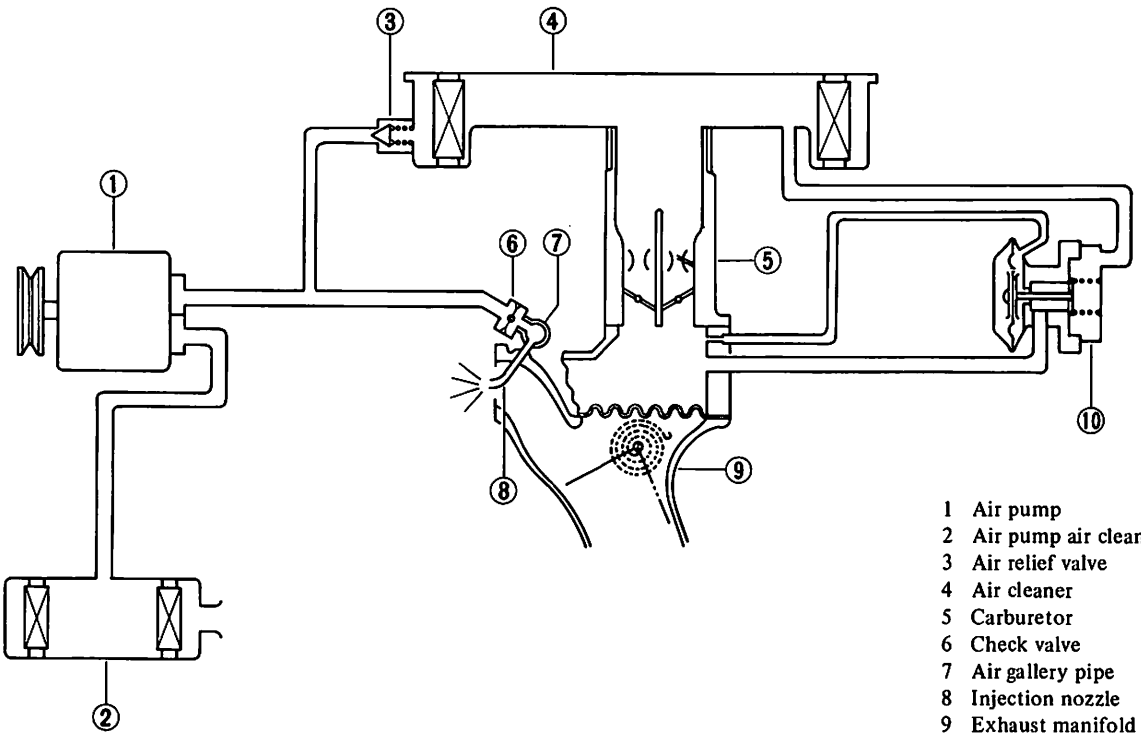


Fig. EC-26 Non-California type A.I.S.

The non-California type operates as follows: secondary air is sucked through the air pump air cleaner into the air pump driven by the crank pulley. It is then discharged through the check valve to the air gallery where it is distributed to each exhaust port. The secondary air is then injected from the injection nozzle into the exhaust port near the exhaust valve.

The air relief valve opens only when the discharge pressure of the air pump surpasses the spring force of the air relief valve during high speed operation. When the air relief valve opens, the secondary air is discharged into the carburetor air cleaner.

The anti-backfire valve opens when the intake manifold vacuum reaches a predetermined value during deceleration and permits fresh air to flow into the intake manifold from the air cleaner.

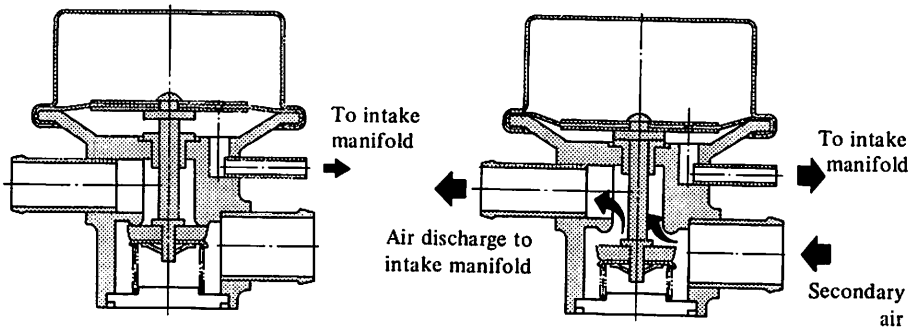


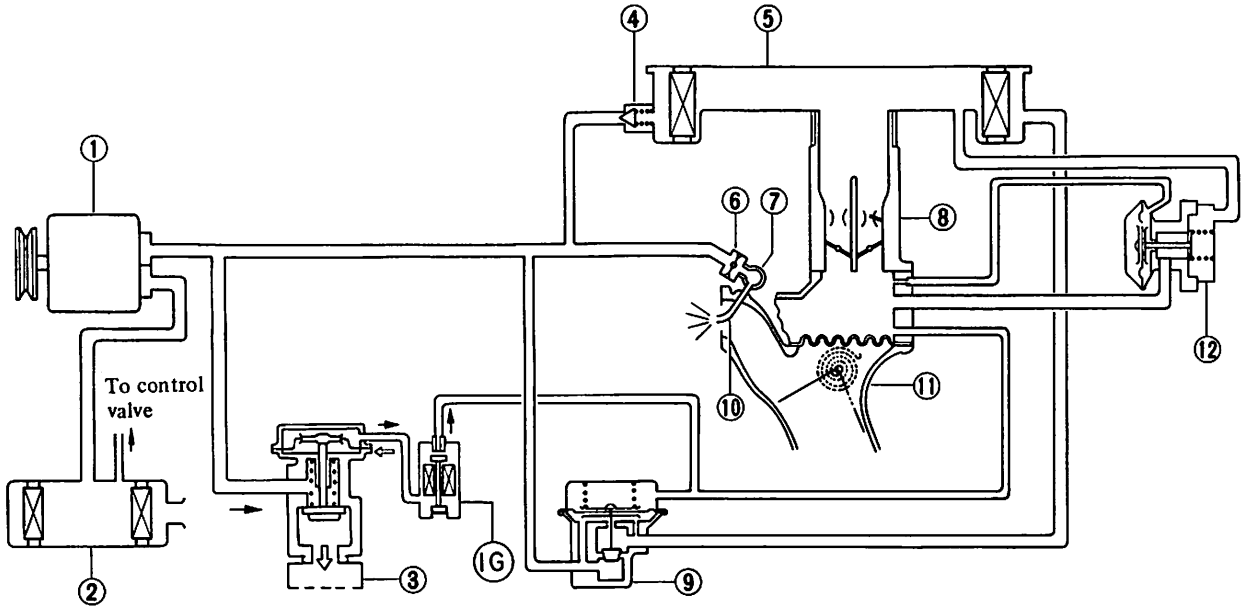
Fig. EC-27 Operation of A.B. valve

The California type includes, in addition to the components of the non-California type, an air control valve and an emergency air relief valve.

The air control valve opens when the sum of the air pump discharge pressure and the intake manifold vacuum applied to the diaphragm reaches a predetermined level, and discharges the secondary air into the air cleaner. When the pressure becomes low, the valve closes with the spring force of the air control valve, and stops discharging the secondary air (Figure EC-29).

E.A.R. valve operation will be covered under the topic "Catalytic Converter".

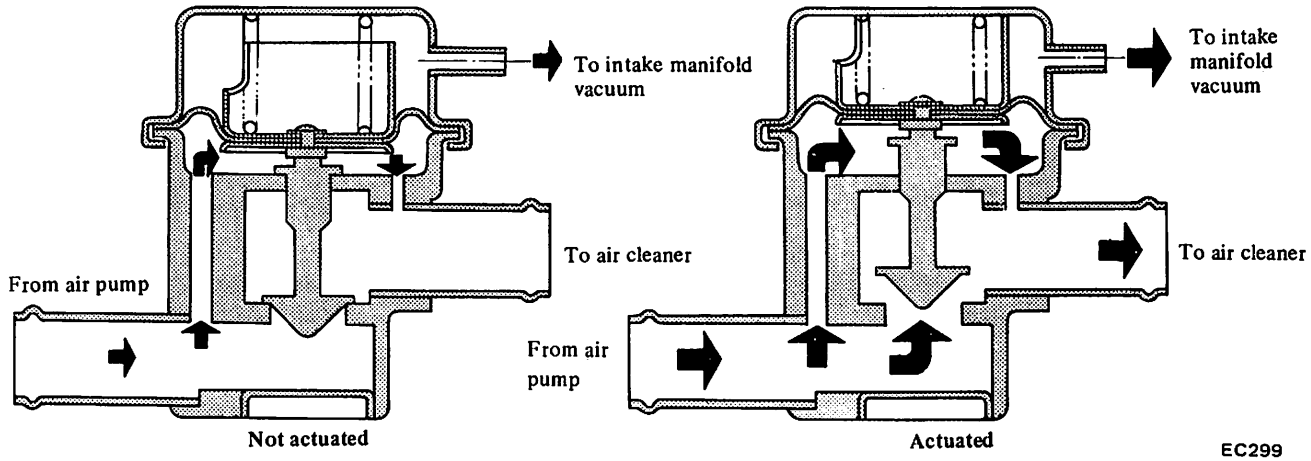
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1 Air pump
2 Air pump air cleaner
3 Emergency air relief valve
4 Air relief valve
5 Air cleaner
6 Check valve
7 Air gallery pipe
8 Carburetor
9 Air control valve
10 Injection nozzle
11 Exhaust manifold
12 Anti-backfire valve

EC298

Fig. EC-28 California type A.I.S.



EC299

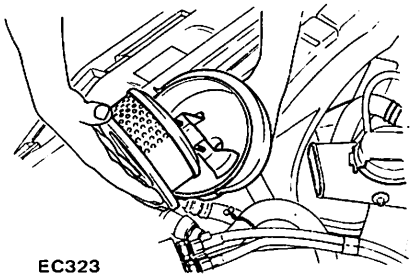
Fig. EC-29 Operation of air control valve

To intake manifold

REMOVAL AND INSTALLATION

Air pump air cleaner

Remove air hose, then detach air cleaner from hoodledge. Air cleaner element and air cleaner lower body are built into a unit construction. Replace air cleaner element and lower body as an assembly.



EC323

Fig. EC-30 Replacing air cleaner element

Air pump

1. Remove air hoses from air pump.
2. Loosen air pump adjusting bar mounting bolts and air pump mounting bolts, then remove air pump drive belt.
3. Remove air pump pulley.
4. Remove air pump from bracket.

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Air control valve

1. Disconnect air hoses and a vacuum hose from air control valve.
2. Remove air control valve from bracket.

Anti-backfire valve

Disconnect air hose and vacuum hose from anti-backfire valve.

Check valve

Disconnect hose and remove check valve from air gallery pipe.

Air gallery pipe and injection nozzles

It is very difficult to remove the air gallery from the exhaust manifold without bending the pipe, which could result in fractures or leakage. Therefore, removal of the air gallery pipe and injection nozzles should be undertaken only when they are damaged.

1. Lubricate around the connecting portion of air injection nozzle and air gallery with engine oil.
2. Hold air injection nozzle hexagon head with a wrench and unfasten flare screw connecting air gallery to injection nozzle. Remove air gallery.

Notes:

a. **Apply engine oil to screws several times during above work.**
b. **Be careful not to damage other parts.**

3. Unfasten air injection nozzle from cylinder head applying engine oil to screwed portion several times.
4. Check air gallery and nozzle for fractures or leakage. Clean air injection nozzle with a wire brush.
5. At time of installation, hold air injection nozzle hexagon head with a wrench and tighten air gallery flange screw to a torque of 5.0 to 5.9 kg-m (36 to 43 ft-lb).
6. Check cylinder head, air injection nozzle and air gallery for leaks with engine running.

Air pump relief valve

Loosen carburetor air cleaner mounting screws, and remove air pump relief valve.

Installation

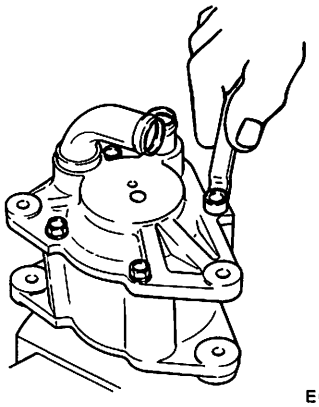
Install in the reverse order of removal.

DISASSEMBLY AND ASSEMBLY

Disassembly of air pump

1. Remove four pulley drive bolts and remove pulley from hub.
2. Secure air pump drive hub in a vise, as shown in Figure EC-31 and remove four end cover bolts.

Note: **Never clamp on the aluminum housing.**



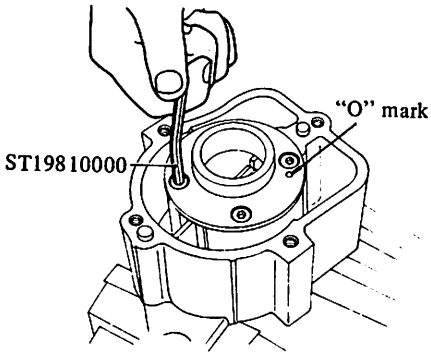
EC302

Fig. EC-31 Removing cover

3. Remove end cover by carefully tapping around dowel pin with a plastic mallet and lift up straight.
4. Put match marks "O" on rotor ring and side of rotor to ensure correct reassembly and remove four screws that retain rotor ring to rotor, using a Hexagonal Wrench ST19810000.

Notes:

a. **Generally, match marks are indicated on both rotor ring and rotor by the manufacturer.**

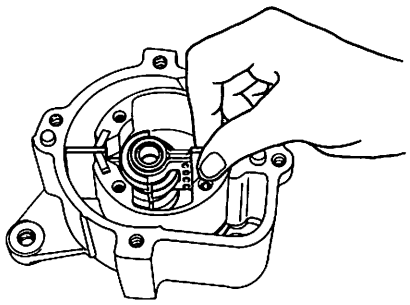


EC111

Fig. EC-32 Removing rotor ring

b. **Discard screws which were removed. Always use new ones when installing.**

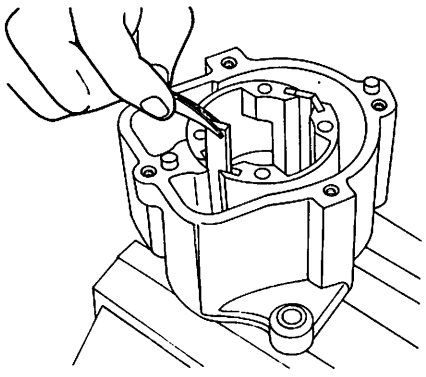
5. Remove vane from rotor.



EC112

Fig. EC-33 Removing vanes

6. Remove four carbon shoes and two shoe springs from rotor using needle nose pliers or tweezers.



EC113

Fig. EC-34 Removing shoe springs

If replacement of front bearing is necessary, proceed as follows:

7. Remove air pump drive hub with standard puller.

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8. Remove four screws securing front bearing cover in place, and detach bearing cover.
9. Support the rear end face of air pump housing with Rotor Stand ST19890000. Drive rotor out by pushing rotor shaft with Bearing Pressing Tool ST19940000.

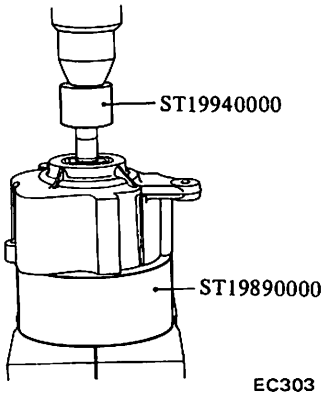


Fig. EC-35 Removing rotor shaft

10. Support the front end face of housing with Bearing Stand ST19930000. Attach Bearing Driver ST19910000 to front bearing on the inside of air pump housing, and press out.

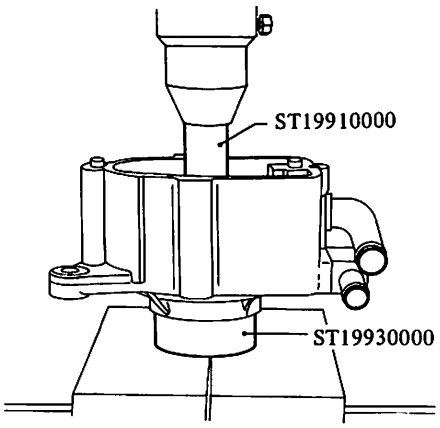


Fig. EC-36 Removing ball bearing

11. Keep disassembled parts in order.

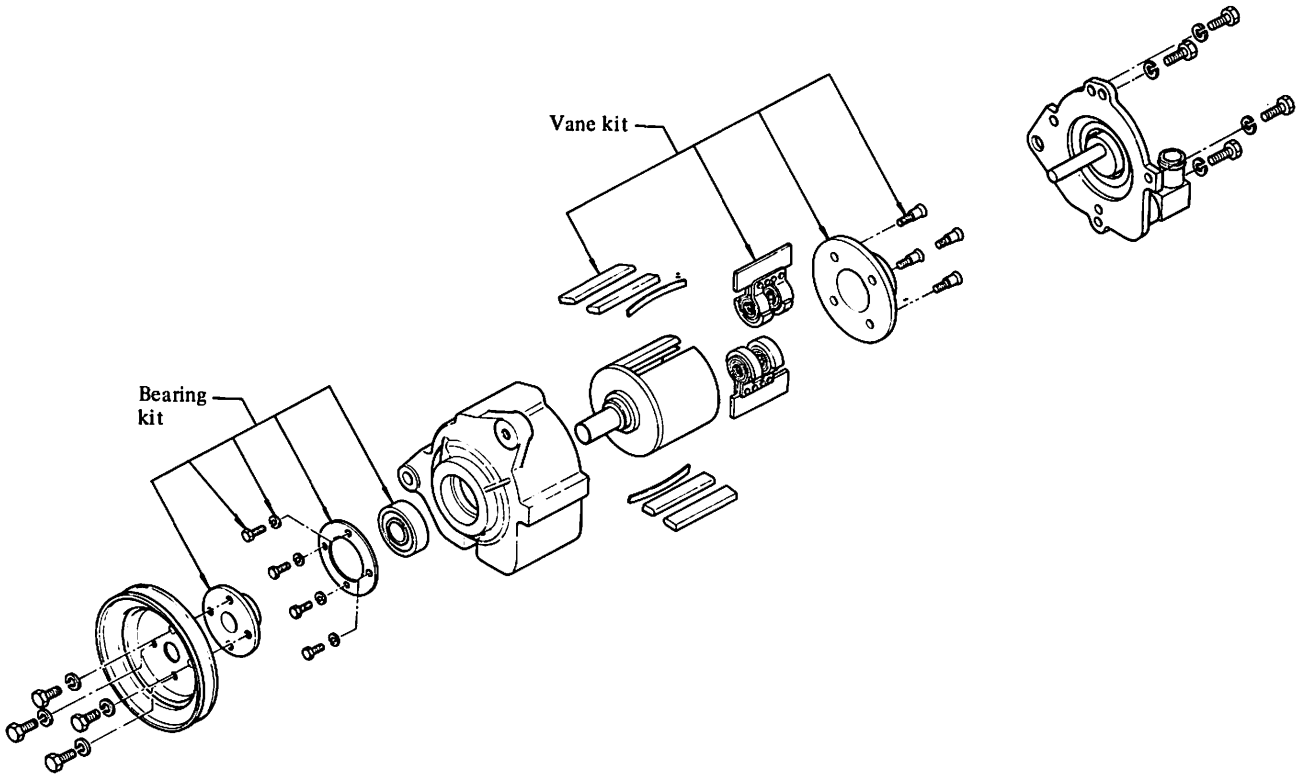


Fig. EC-37 Components of two-vane type

Assembly of air pump

1. Front bearing
Support the rear end face of air pump housing with Rotor Stand ST19890000. Press front bearing into place with a press and Bearing Pressing Tool ST19940000.

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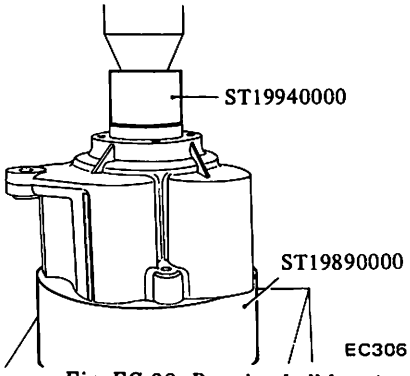


Fig. EC-38 Pressing ball bearing

2. Bearing cover

Torque four bearing cover securing bolts to 0.1 to 0.2 kg-m (0.7 to 1.4 ft-lb).

3. Rotor shaft

Support the inward bottom of rotor with Rotor Support ST19920000.

Press rotor into place with a press and Bearing Driver ST19910000 until the stepped portion of rotor shaft touches front bearing inner race.

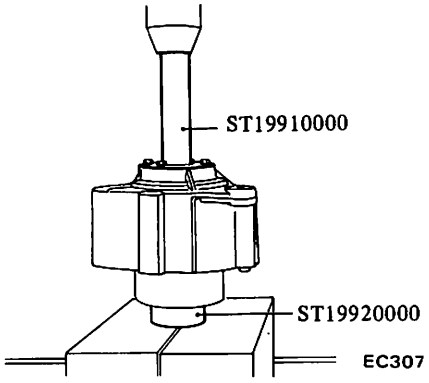


Fig. EC-39 Pressing rotor shaft

Notes:

a. Be sure to drive front bearing inner race in.

b. After rotor is installed in place, ensure that the rotor end is positioned below the end face of air pump housing.

Position of rotor end below air pump housing:
0.050 to 0.150 mm
(0.0020 to 0.0059 in)

4. Air pump drive hub

Support the inward bottom of rotor with Rotor Support ST19920000.

Press drive hub into place with a press and Bearing Driver ST19910000 until the end face of drive hub touches front bearing inner race.

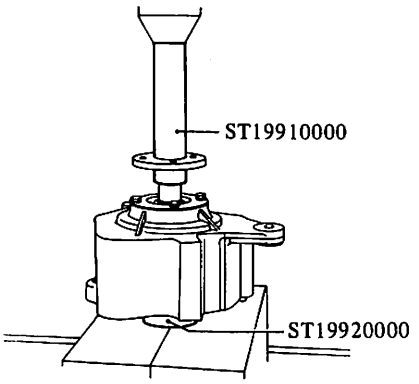


Fig. EC-40 Pressing air pump drive hub

5. Carbon shoe

(1) Place air pump drive hub in a vise.

(2) Clean carbon, dust, etc. from shoe grooves.

(3) Align rotor with housing properly. Refer to Figure EC-41. Then insert carbon shoes into place, noting their directions.

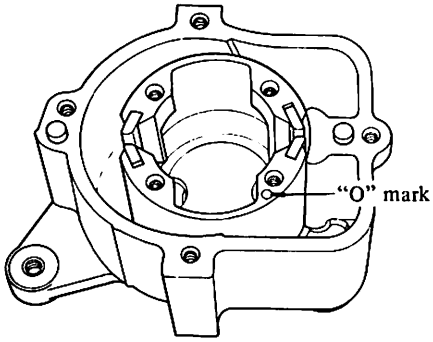


Fig. EC-41 Install carbon shoe

Note: If carbon shoes are exposed beyond the rotor end face, remove carbon shoes and clean shoe grooves.
Reassemble carbon shoes.

6. Vane

(1) Pack vane bearing with high melting-point grease (MIL-G-3545 A, Esso ANDOK260 or equivalent), and insert dummy shaft into the vane bearing.

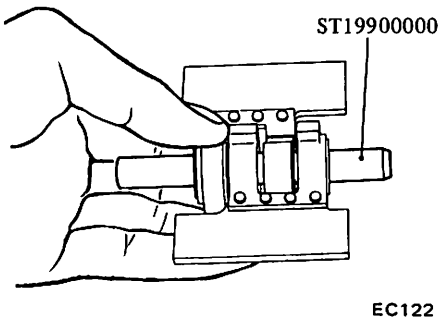


Fig. EC-42 Vane assembly

(2) Install vane in place on rotor, using dummy shaft ST19900000 as a guide.

Note: The vanes may require 6 to 16 km (4 to 10 miles) wear-in running time. In the event a slight squeaking still remains, drive the car about 64 to 80 km/h (40 to 50 MPH). In most cases 6 to 16 km (4 to 10 miles) will be sufficient for wear-in.

7. Shoe spring

Place shoe springs in deeper groove of shoe.

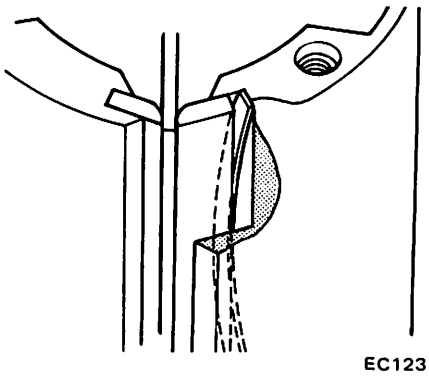


Fig. EC-43 Installing shoe spring

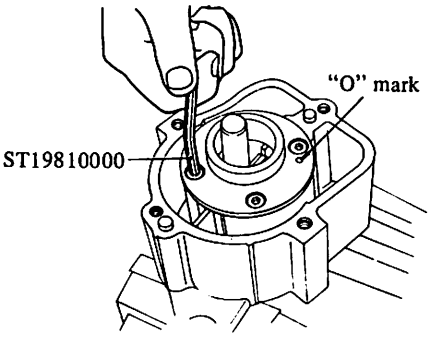
Note: When installing a shoe spring, make sure that the outward bending side faces in shoe and that both ends of spring face in the wall of shoe groove.
Be sure to push spring in so that spring end face is flush with rotor.

8. Rotor ring

Install rotor ring by correctly aligning the rear end face of rotor with the "O" mark in rotor ring, and tighten four screws to the specified torque with Hexagonal Wrench ST19810000.

Tightening torque:
0.5 to 0.7 kg-m
(3.6 to 5.1 ft-lb)

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EC124

Fig. EC-44 Installing rotor ring

9. Removal of dummy shaft

Carefully withdraw dummy shaft from vane.

10. Vane shaft

Pack rear bearing with high melting-point grease (MIL-G-3545 A, Esso ANDOK 260 or equivalent). Apply thin coating of grease to vane shaft and rotor ring, and insert vane shaft into its bearing.

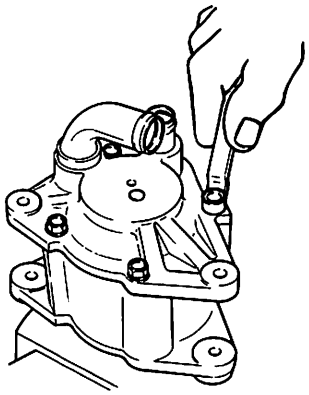
Notes:

a. **Do not apply an undue stress to vane shaft when inserting.**
b. **If two vanes are dislocated when inserting vane shaft, correctly align vanes by inserting dummy shaft. Then, draw out dummy shaft and insert vane shaft.**
c. **When wear occurs on vane shaft or when replacement of rear bearing is necessary, replace rear cover assembly.**

11. End cover

Position end cover in place. Snugly tighten the bolt close to the dowel. Then tighten four bolts to the specified torque.

Tightening torque:
0.7 to 0.9 kg-m
(5.1 to 6.5 ft-lb)



EC302

Fig. EC-45 Installing end cover

12. Pulley

Tighten four pulley securing bolts to the specified torque.

Tightening torque:
0.7 to 0.9 kg-m
(5.1 to 6.5 ft-lb)

INSPECTION

Air injection system hoses

Check air system hoses for loose connections, cracks, or deterioration. Retighten or replace if necessary.

Air system manifold

Check air gallery pipe and injection nozzles for loose connections and cracks. Retighten or replace if necessary.

Air pump

1. Operate engine until it reaches normal operating temperature.
2. Inspect all hose, hose connections, and air gallery for leaks and correct, if necessary, before checking air injection pump.
3. Check air injection pump belt tension and adjust to specifications if necessary.
4. Disconnect air supply hose at check valve.
5. Disconnect vacuum hose from the air control valve (California type only).
6. Insert open pipe end of Air Pump Test Gauge Adapter ST19870000 in air supply hose. Clamp hose securely to adapter to prevent it from blowing out. Position adapter and test gauge so that air blast emitted through drilled pipe plug will be harmlessly dissipated.
7. Install a tachometer on engine. With engine speed at 2,600 rpm observe pressure produced at test gauge.

Air pressure should be 100 mmHg (3.94 inHg) or more.

8. If air pressure does not meet above specifications, proceed as follows:

(1) Repeat 2 and 3 above.
(2) Disconnect air supply hose at anti-backfire valve. Plug air hose opening, and screw with a clamp. Repeat pressure test.
(3) With engine speed at 1,500 rpm close hole of test gauge by finger. If a leaking sound is heard or leaking air is felt by finger at relief valve, relief valve is malfunctioning. Relief valve should be replaced or repaired.
(4) If air injection pump does not meet minimum requirement of pressure test, it should be replaced.

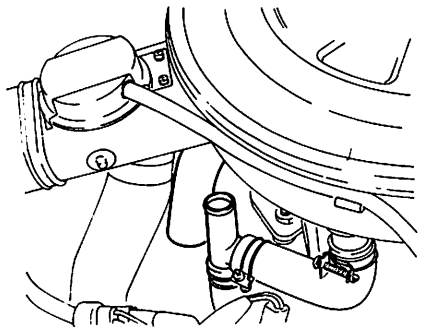
Control valve

The following procedures are recommended for checking and/or ascertaining that the various components of the exhaust emission control system are operating properly.

The engine and all components must be at normal operating temperatures when the tests are performed. Prior to performing any extensive diagnosis of the exhaust control system, it must be determined that the engine as a unit is functioning properly.

Check valve

1. Warm up engine thoroughly.
2. Disconnect hose leading to check valve from air hose connector.
3. Check hose opening for any indication of exhaust gas leaks. If leaks are detected, replace check valve.
4. Race the engine lightly (at about 2,000 rpm) and then return it to idling. Visually check the hose for any indication of exhaust gas leaks before the engine returns to idling speed. If leaks are detected, replace check valve.



EC310

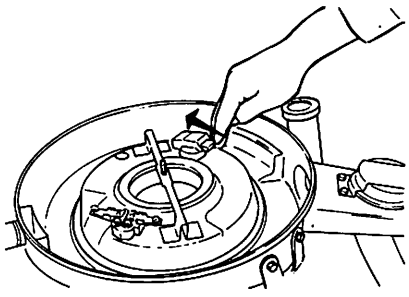
Fig. EC-46 Checking check valve

Air pump relief valve

After completing inspection of air pump, check air pump relief valve in the following steps:

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1. Disconnect hoses leading to check valve and air control valve from air hose connector, and install blind cap to the connector.
2. With engine running at about 3,000 rpm under no load, place your hand on the air outlet of air pump relief valve to check for discharged air. If no air is felt, replace the air pump relief valve.



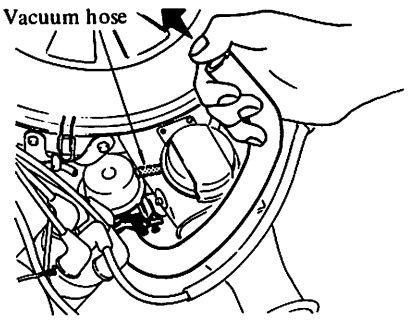
EC311

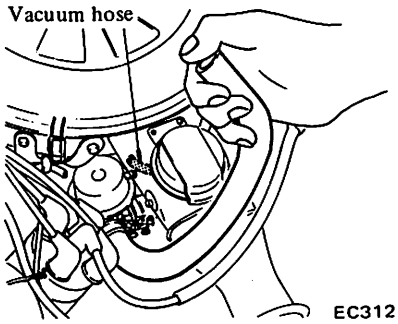
Fig. EC-47 Checking air pump relief valve

Air control valve

1. Warm up engine thoroughly.
2. Before checking air control valve, check all hoses for loose connection, leaks, etc., and repair or correct if necessary.
3. With engine idling, disconnect the outlet side hose of the air control valve, and place your hand on the air hose outlet to check for air. If no air is felt, replace the air control valve.
4. Pull vacuum hose off from air control valve. If discharge of air from air hose stops, the air control valve is normal. If discharge is still felt, replace the valve.

Plug up the removed vacuum hose to stabilize engine running.





EC312

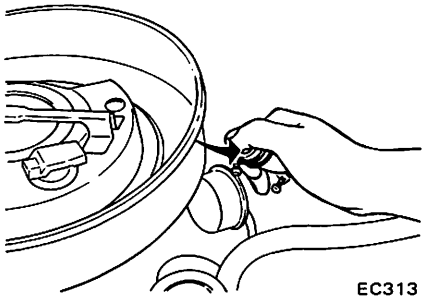
Fig. EC-48 Checking air control valve

Emergency air relief valve

See the section "Catalytic Converter" for checking procedure.

Anti-backfire valve (A.B. valve)

1. Warm up engine thoroughly.
2. Disconnect hose from air cleaner, and place a finger near the outlet.
3. Run engine at about 3,000 rpm under no load, then quickly return it to idling. If you feel a pull or suction force on your finger, the anti-backfire valve is functioning normally. If no suction is felt, replace the anti-backfire valve.



EC313

Fig. EC-49 Checking anti-backfire valve

EXHAUST GAS RECIRCULATION CONTROL SYSTEM (E.G.R.)

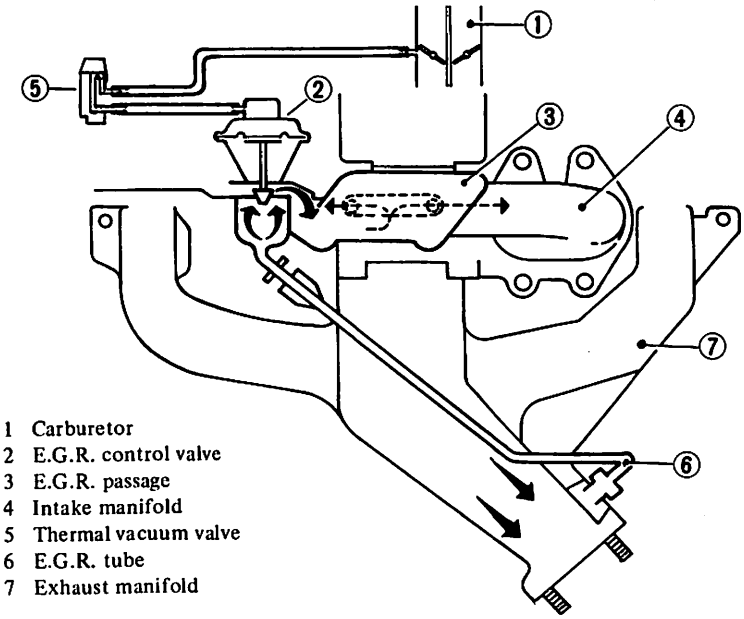
DESCRIPTION

In the exhaust gas recirculation system, a part of the exhaust gas is returned to the combustion chamber to lower the spark flame temperature during combustion. This results in a reduction of the nitrogen oxide content in the exhaust gas.

The exhaust gas recirculation system consists of an E.G.R. passage, E.G.R. control valve, thermal vacuum valve, E.G.R. tube and hose. A warning system which indicates when the E.G.R. control system must be inspected is also installed in all 710 cars except those destined for California and Canada.

When the E.G.R. control valve is open, some of the exhaust gas is led from the exhaust manifold to the E.G.R. chamber through the E.G.R. passage. The exhaust gas is then controlled in quantity by the E.G.R. valve, and is introduced into the intake manifold.

Open-close operation of the E.G.R. control valve is controlled by the thermal vacuum valve which operates on carburetor vacuum and engine coolant temperature.



1 Carburetor
2 E.G.R. control valve
3 E.G.R. passage
4 Intake manifold
5 Thermal vacuum valve
6 E.G.R. tube
7 Exhaust manifold

EC349

Fig. EC-50 Exhaust Gas Recirculation system (E.G.R.)

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OPERATION

Operation of E.G.R. system is as shown below:

E.G.R.	E.G.R. system operating water temperature °C (°F)	Thermal vacuum valve	Intake manifold vacuum		E.G.R. control valve	Remarks
Not actuated	Below 57°C (134°F)	Close	–		Close	–
	Above 57 to 63°C (134 to 145°F)	Open	Above	California model: −50 mmHg (−1.96 inHg) Non-California model: −70 mmHg (−2.76 inHg)	Close	Idling
			Below			Full throttle
Actuated	Above 57 to 63°C (134 to 145°F)	Open	Above		Open	–

E.G.R. "OFF" operation

1. When engine coolant temperature is low, recirculated exhaust gas causes irregular engine operation. To prevent this, recirculation of exhaust gas must be cut off for a few minutes after engine has started. The thermal vacuum valve is provided for this purpose. It remains closed while engine coolant temperature is low and keeps the E.G.R. control valve closed, thereby cutting off the E.G.R. circuit.

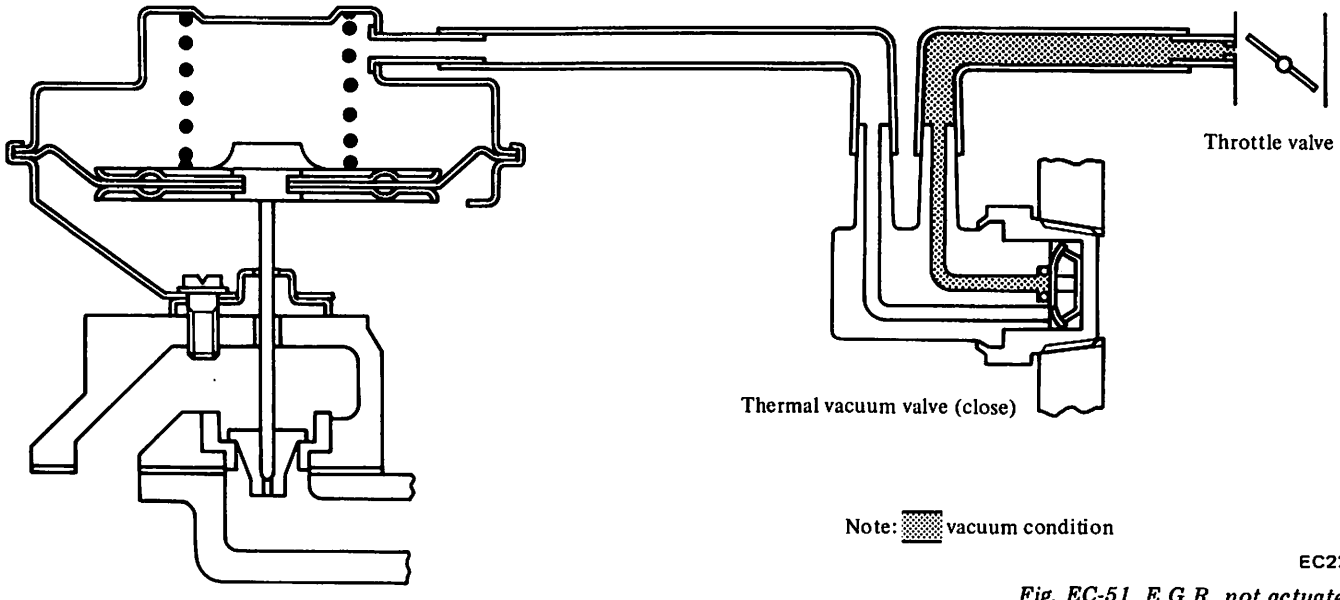
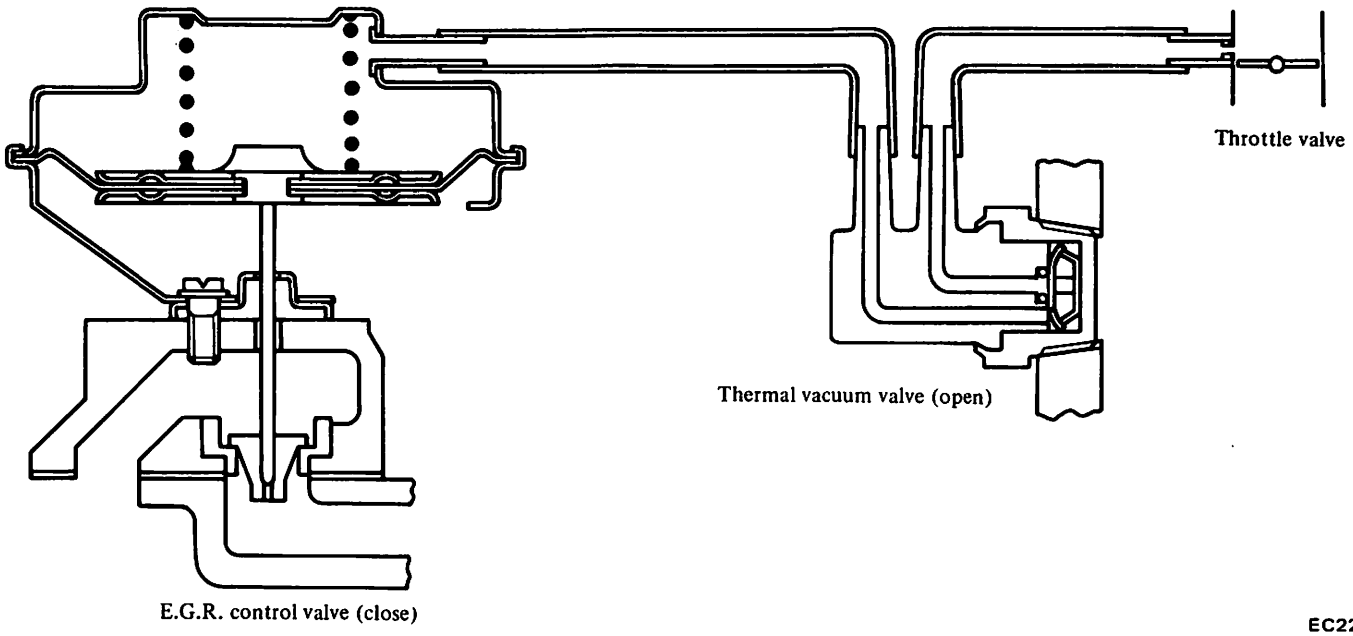


Fig. EC-51 E.G.R. not actuated

2. When engine coolant temperature is above the working temperature of the thermal vacuum valve:
(1) The valve port comes to the top of the throttle valve during engine idling for improved idling operation.
At this point, vacuum does not actuate the E.G.R. control valve though intake manifold vacuum is high, and E.G.R. control valve remains closed.

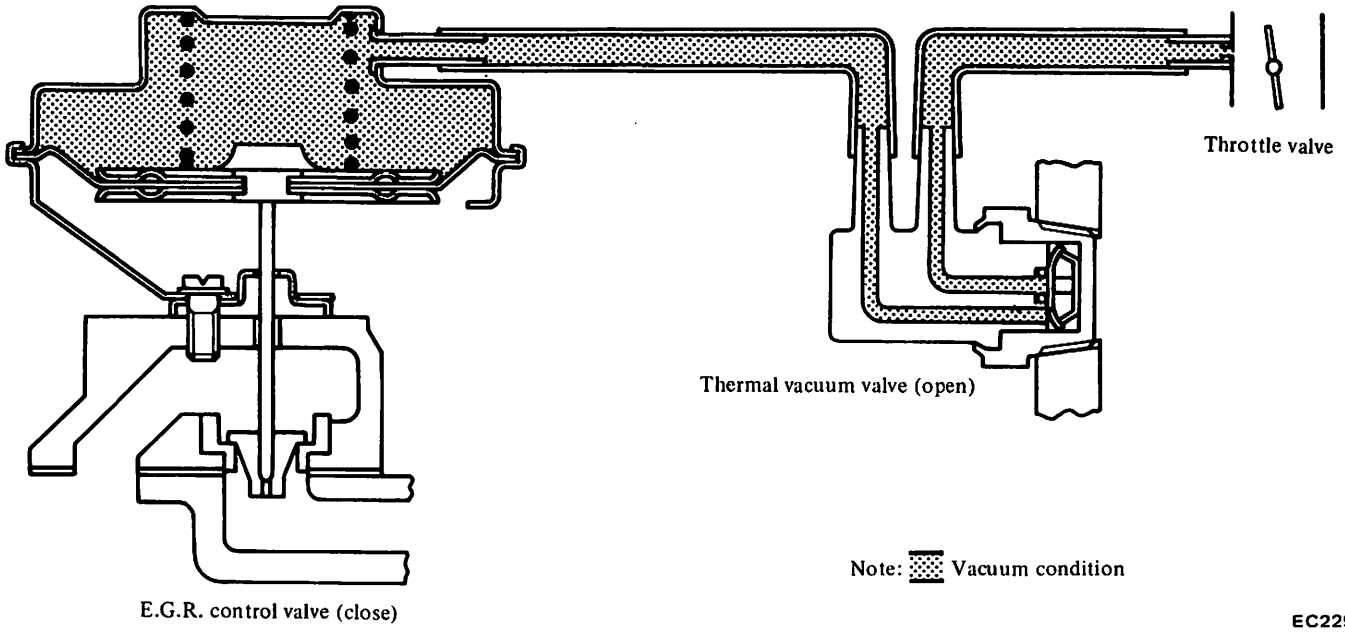
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EC228

Fig. EC-52 E.G.R. not actuated

(2) In the full throttle driving position, the suction vacuum on the vacuum passage does not surpass the vacuum required to actuate the E.G.R. control valve.



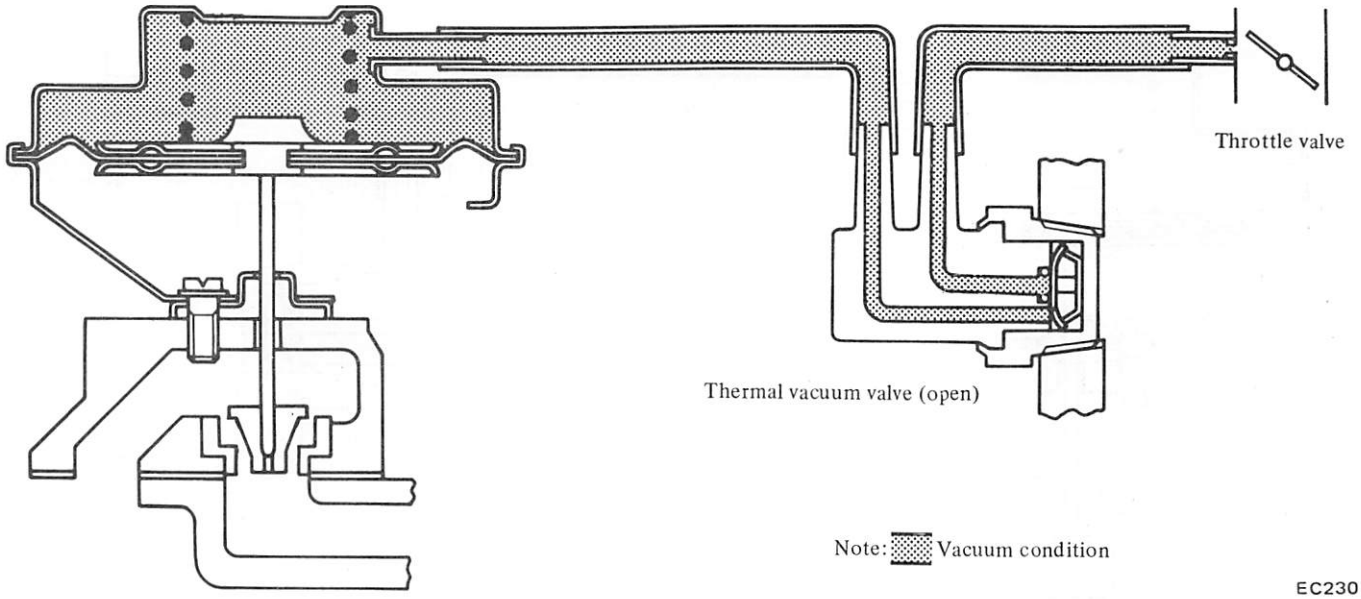
EC229

Fig. EC-53 E.G.R. not actuated

E.G.R. "ON" operation

The E.G.R. circuit is completed only when engine coolant temperature is above the working temperature of the thermal vacuum valve and carburetor suction vacuum is large enough to open the E.G.R. control valve.

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E.G.R. control valve (open)

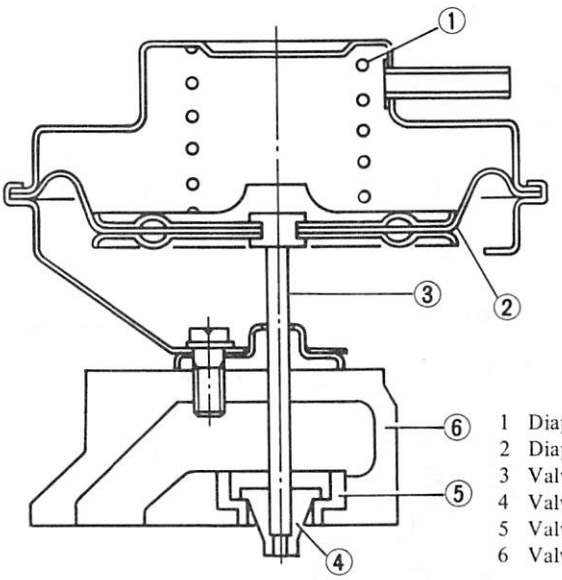
Fig. EC-54 E.G.R. actuated

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 carburetor throttle valve. The E.G.R. control valve is installed on the E.G.R. passage through a gasket.

E.G.R. control valve construction and type vary with transmission type and car destination. For identification purposes, the part number is stamped on the recessed portion at the top of the valve.

The construction of the E.G.R. control valve is shown below.



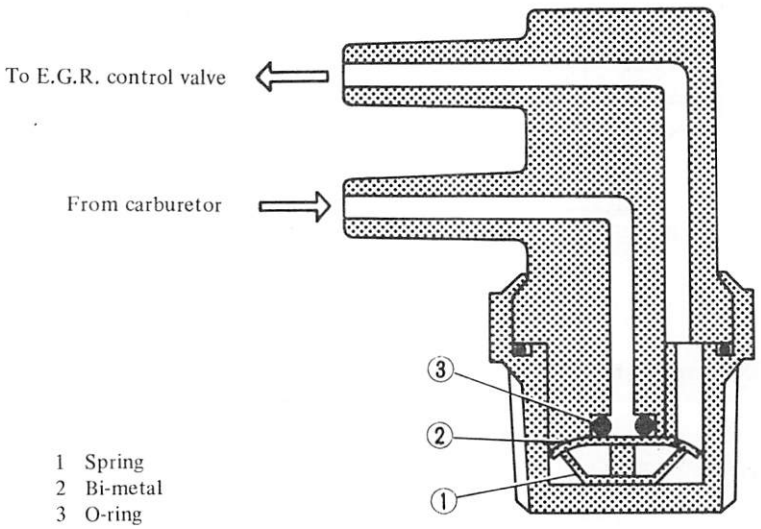
1 Diaphragm spring
2 Diaphragm
3 Valve shaft
4 Valve
5 Valve Seat
6 Valve chamber

Fig. EC-55 E.G.R. control valve

Thermal vacuum valve

The thermal vacuum valve is mounted in the engine thermostat housing. It detects engine coolant temperature by means of a built-in bi-metal, and opens or closes the vacuum passage in the thermal vacuum valve. When the vacuum passage is open, the carburetor suction vacuum is applied to the diaphragm of the E.G.R. control valve to actuate the taper valve connected to the diaphragm.

The construction of the thermal vacuum valve is shown below.



1 Spring
2 Bi-metal
3 O-ring

Fig. EC-56 Thermal vacuum valve

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E.G.R. warning system

The E.G.R. warning system, installed independently of the E.G.R. control system, monitors the distance the car has travelled and indicates when the E.G.R. control system must be checked.

The E.G.R. warning system consists of an odometer switch, detector drive counter E.G.R. warning lamp and harnesses. When the cam in the odometer switch connected to the speedometer turns once for each 0.4 km (¼ mile), the contact point of the electrical circuit closes, allowing electric current to flow through the magnet coil of the detector drive counter. Thus energized, the magnet coil actuates the latchet to turn the counter wheel by one pitch. When the number of counts reaches 50,000, the latchet drops in a groove provided on the periphery of the counter wheel to activate the detector drive counter switch.

Then the E.G.R. warning lamp comes on, indicating that the E.G.R. control system should be checked.

The detector drive counter is equipped with an odometer which can tell when to service the E.G.R. control system.

After completing periodic check, reset the odometer to zero by hand, proceeding as follows:

1. Remove grommet installed on the side surface of detector drive counter unit.
2. Insert a bar or a screwdriver tip into the hole from which grommet has been removed, and press down knob provided in the detector drive counter for resetting.

The E.G.R. warning lamp comes on under the following circumstances:

(1) When the number of counts has reached 50,000. In this case, the lamp indicates that E.G.R. control system must be checked.
(2) When operating starter motor.

Notes:

a. **It is an indication of problem in the E.G.R. warning lamp, or problems in the point or in the harnesses if the lamp does not light at 50,000 counts.**
b. **The E.G.R. warning system is mounted on all 710 cars except those bound for California and Canada.**

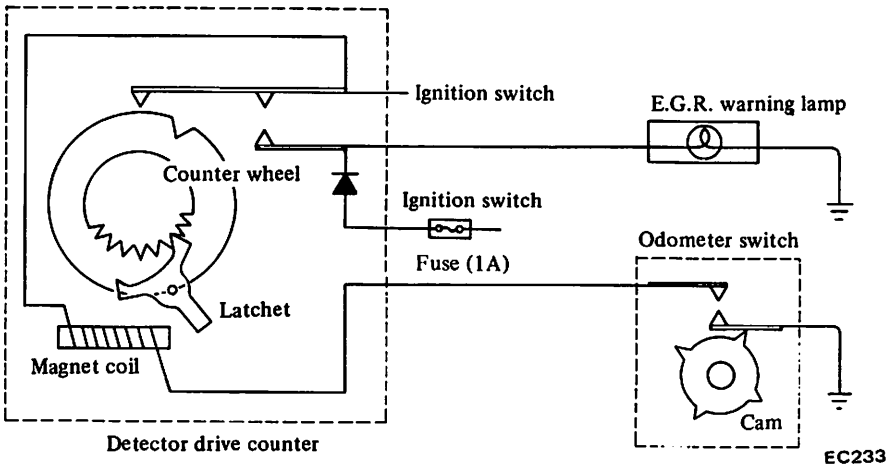


Fig. EC-57 E.G.R. warning circuit

REMOVAL AND INSTALLATION

Remove air cleaner before removing E.G.R. control system. For removal and installation of air cleaner, refer to "Air Cleaner" section (Page EF-5).

Removal

1. E.G.R. control valve

After removing the following parts the E.G.R. control valve can be dismounted.

- Vacuum hose (thermal vacuum valve to E.G.R. control valve)
- E.G.R. control valve mounting nut

Note: To remove vacuum hose, flatten clip connecting vacuum hose to E.G.R. control valve and pull the hose off with hand.

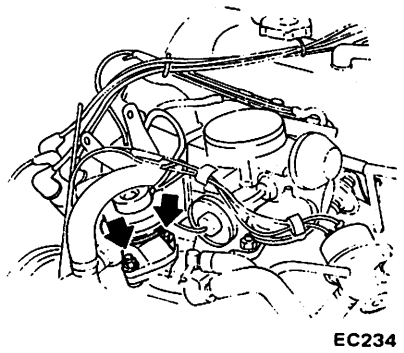


Fig. EC-58 Removing E.G.R. control valve

2. E.G.R. passage

After removing the following parts the E.G.R. passage can be dismounted.

- Exhaust gas return tube (exhaust manifold to E.G.R. passage)
- Blow-by hose (cylinder block to P.C.V. valve)
- Vacuum hose (AB valve to E.G.R. passage)
- E.G.R. passage mounting bolt

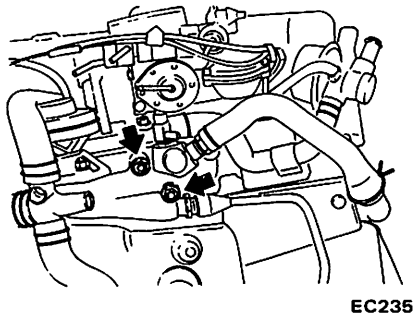


Fig. EC-59 Removing E.G.R. passage

3. Thermal vacuum valve

After removing the following parts the thermal vacuum valve can be dismounted.

- Vacuum hose (carburetor to thermal vacuum valve)
- Vacuum hose (thermal vacuum valve to E.G.R. control valve)

Note: Drain engine coolant before dismounting thermal vacuum valve.

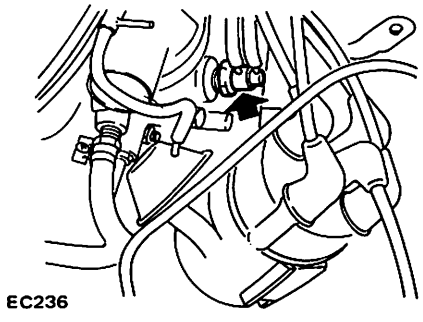
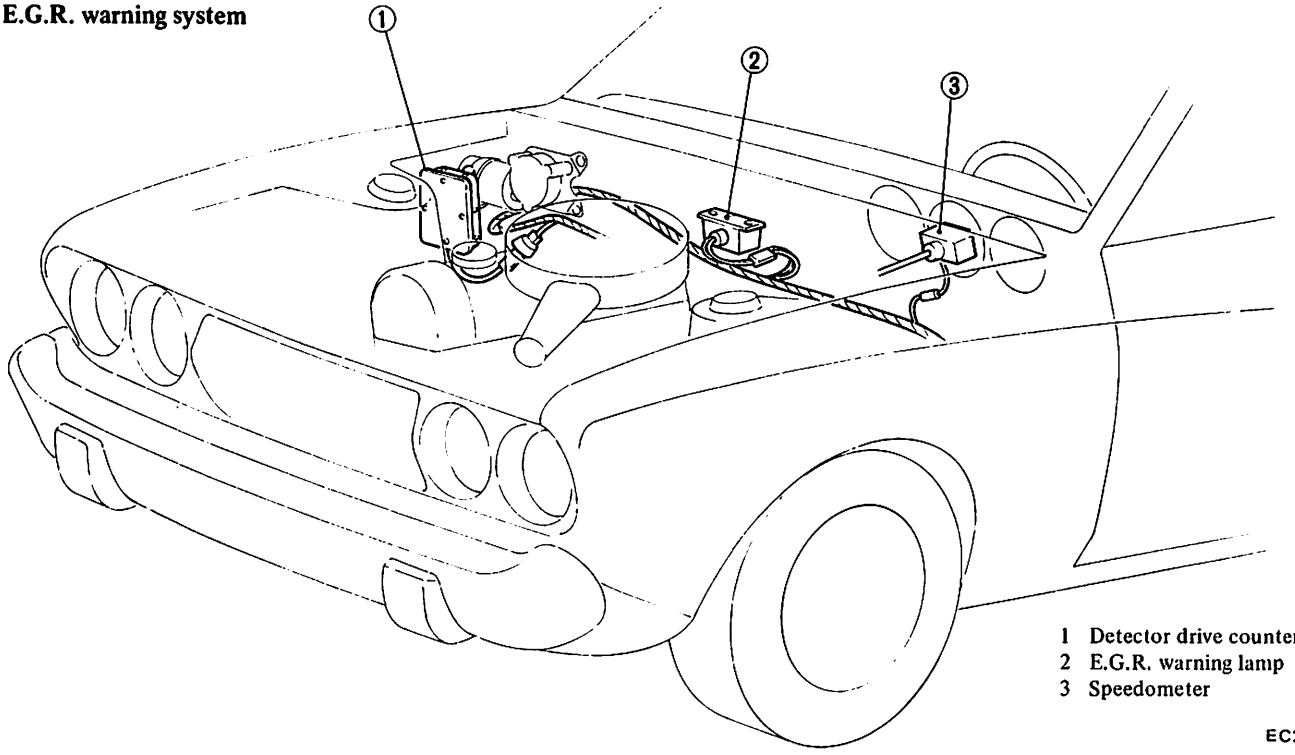


Fig. EC-60 Removing thermal vacuum valve

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4. E.G.R. warning system



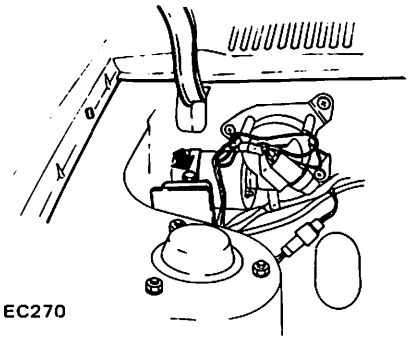
1 Detector drive counter
2 E.G.R. warning lamp
3 Speedometer

EC271

Fig. EC-61 E.G.R. warning system

1. Detector drive counter

Detector drive counter is secured to wiper motor with a band. To remove detector drive counter, disconnect wire connector and back off bolts securing detector drive counter to wiper motor through bracket.



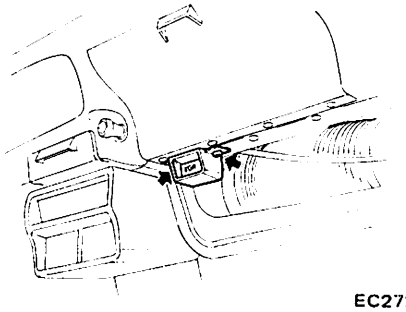
EC270

Fig. EC-62 Removing detector drive counter

2. E.G.R. warning lamp

E.G.R. warning lamp is installed under glove box.

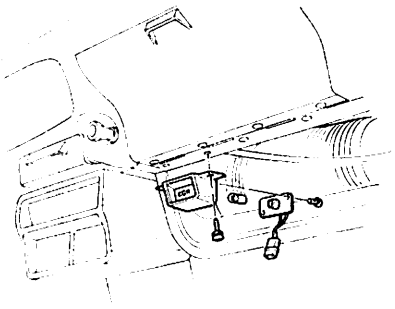
To remove E.G.R. warning lamp as an assembly, disconnect wire connector and remove two screws.



EC272

Fig. EC-63 Removing E.G.R. warning lamp

Loosen screws attaching E.G.R. lamp lower plate to lamp housing and remove E.G.R. warning lamp.



EC273

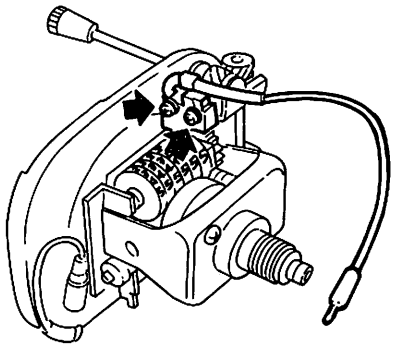
Fig. EC-64 Removing E.G.R. warning lamp

3. Odometer switch

Odometer switch is mounted on the back side of speedometer; the cam in the odometer switch is rotated by the speedometer.

To dismount odometer switch, remove cluster lid, combination meter and speedometer.

Odometer switch can be easily dismounted by removing two bolts attaching odometer switch to the back side of speedometer.



EC239

Fig. EC-65 Removing odometer switch

Installation

To install, reverse the removal procedure.

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INSPECTION

Checking E.G.R. control system in its mounted condition

1. Make a thorough visual check of E.G.R. control system. If necessary, wipe away oil to facilitate inspection. If any hoses are cracked or broken, replace.
2. With engine running, check E.G.R. warning system for proper function. Make sure that E.G.R. warning lamp lights when ignition switch is turned to START-position (starter motor runs). If E.G.R. warning lamp does not light, inspect harnesses and connectors or replace warning lamp. Then turn ignition switch to ON position, and check the following items:

(1) If odometer of detector drive counter has not reached 50,000 counts, make sure that E.G.R. warning lamp does not light.
(2) If odometer of detector drive counter has attained 50,000 counts, make sure that E.G.R. warning lamp lights.

If warning lamp does not light, check harnesses, connectors, and detector drive counter; replace warning lamp or detector drive counter if necessary.

Notes:

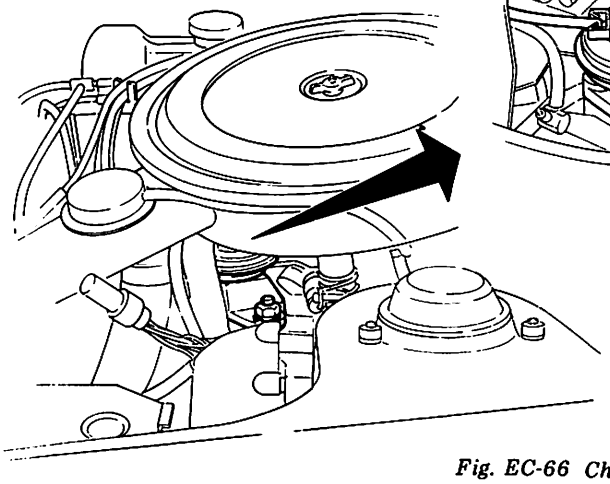
a. Operation of E.G.R. warning lamp is as follows:

Ignition Switch Position	START	ON	
Detector Drive Counter	–	Below 50,000 counts	Above 50,000 counts
E.G.R. Warning Lamp	ON	OFF	ON

b. After completing inspection of E.G.R. control system, be sure to reset odometer of detector drive counter to zero.

c. This item applies to all 710 cars except those bound for California and Canada.

3. With engine stopped, inspect E.G.R. control valve for any indication of binding or sticking by moving diaphragm of control valve upwards with a finger.



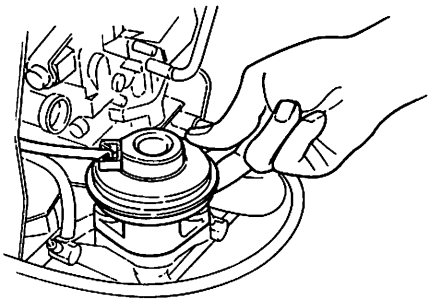
EC240

Fig. EC-66 Checking E.G.R. control valve

4. With engine running, inspect E.G.R. control valve and thermal vacuum valve for normal operation.
(1) When engine coolant temperature is low:

Make sure that E.G.R. control valve does not operate when engine speed is increased from idling to 3,000 to 3,500 rpm.

Place a finger on the diaphragm of E.G.R. control valve to check for valve operation.

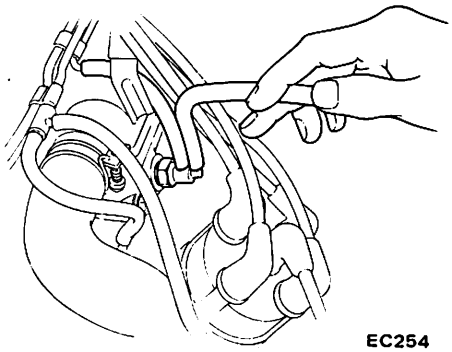


(2) When engine coolant temperature is high:

1) Make sure that E.G.R. control valve operates when engine speed is increased from idling to 3,000 to 3,500 rpm. Place a finger on the diaphragm of E.G.R. control valve to check for valve operation.
2) If E.G.R. control valve does not operate, check as follows:

- Disconnect one end (E.G.R. control valve side) of vacuum hose connecting thermal vacuum valve to E.G.R. control valve.
- Increase engine speed from idling to 3,000 to 3,500 rpm.
- Make sure that thermal vacuum valve is open, and that carburetor vacuum is present at the end (E.G.R. control valve side) of vacuum hose.

  If vacuum is weak or not present at all, replace thermal vacuum valve. If vacuum is present, replace E.G.R. control valve.



EC254

Fig. EC-67 Checking thermal vacuum valve

If any difficulty is encountered in judging the condition of any component during above inspection, check the questionable component independently as follows:

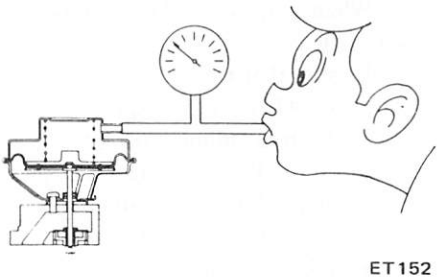
E.G.R. control valve

Dismount E.G.R. control valve from engine.

1. Apply vacuum to E.G.R. control valve, referring to the following figure. If the valve moves to full position, it is normal.

E.G.R. control valve will remain open for more than 30 seconds after vacuum has cut off.

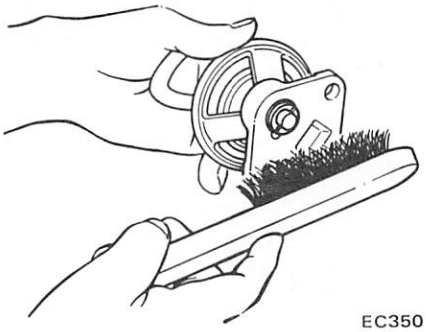
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ET152

Fig. EC-68 Checking E.G.R. control valve

2. Visually check E.G.R. control valve for damage, wrinkle or deformation.
3. Clean the seating surface of E.G.R. control valve with a brush and compressed air, and remove foreign matter from around the valve and port.



EC350

Fig. EC-69 Cleaning E.G.R. control valve

Thermal vacuum valve

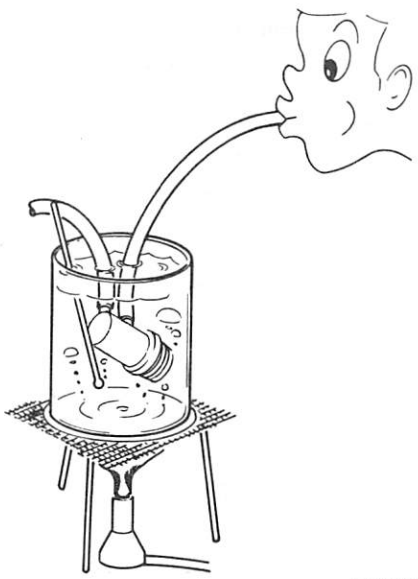
Dismount thermal vacuum valve from engine.

Note: Before dismounting, drain engine coolant from engine.

Apply vacuum to thermal vacuum valve and check to be sure that thermal vacuum valve opens or closes in response to engine coolant temperature as specified.

Thermal vacuum valve should open at a temperature of 57 to 63°C (134 to 145°F) completing the vacuum passage. .

Note: Do not allow water to get inside the thermal vacuum valve.



EC242

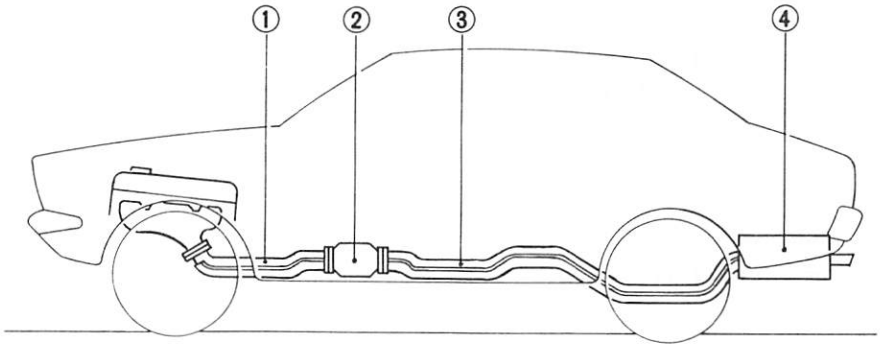
Fig. EC-70 Checking thermal vacuum valve

CATALYTIC CONVERTER

DESCRIPTION

The catalytic converter accelerates the chemical reaction of hydrocarbons (HC) and carbon monoxide (CO) in the exhaust gas, and changes them into non-harmful carbon dioxide (CO_2) and water (H_2O). This chemical reaction process requires the proper amount of air, which is supplied by the air pump (Refer to the item "A.I.S.".). This air is called "secondary air".

The catalytic converter is provided with a catalyzer protector which prevents abnormal temperature rise in the unit, and a catalyzer warning device whose catalyzer warning lamp located on the instrument panel lights if the temperature rises abnormally. The catalytic converter is mounted on the vehicles destined for California. Refer to Figure EC-71.



1 Front tube
2 Catalytic converter
3 Center tube
4 Main muffler

EC215

Fig. EC-71 Location of catalytic converter (610)

The catalyzer protector and catalyzer warning devices consist of a catalyzer temperature sensor, switching module, emergency air relief valve (E.A.R.V.), solenoid valve for E.A.R.V., catalyzer hold relay, and catalyzer warning lamp. Refer to Figure EC-72.

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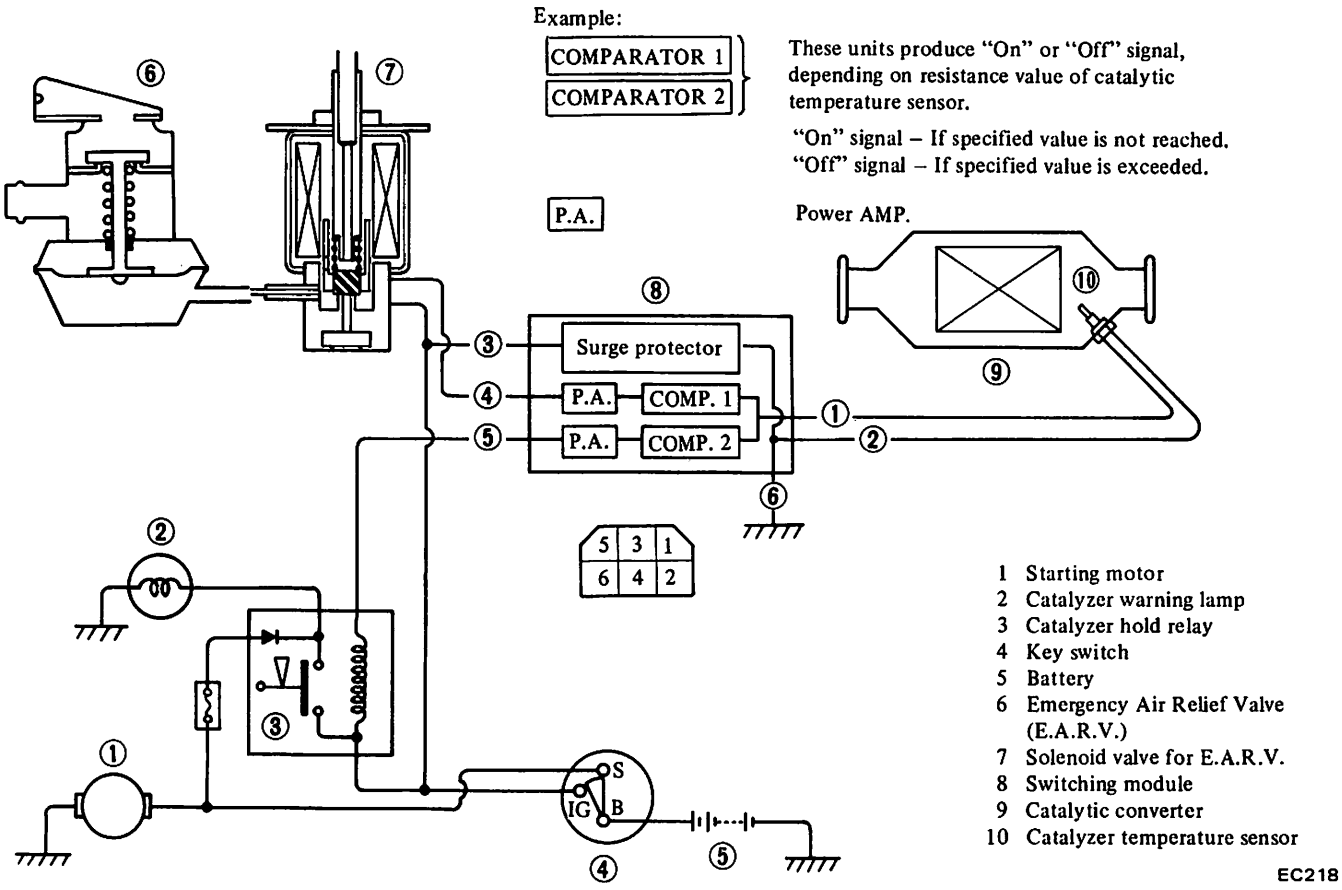


Fig. EC-72 Catalyzer protector and catalyzer warning device

OPERATION

Catalytic converter

Exhaust gas emitted from the engine contains some harmful substances due to incomplete combustion in the combustion chamber. The air injection system is designed to reduce the content of such substances in the exhaust gas. In this system, the secondary air is led from the check valve and injected into the exhaust manifold. With this injection of the secondary air, hydrocarbons (HC) and carbon monoxide (CO) in the exhaust gas are gradually oxidized with oxygen (O_2) in the secondary air and converted into non-harmful carbon dioxide (CO_2) and water (H_2O).

The catalytic converter further cleans engine exhaust gas. Through catalytic action, it changes residual hydrocarbons and carbon monoxide contained in exhaust gas into carbon dioxide and water before exhaust gas is discharged to the atmosphere.

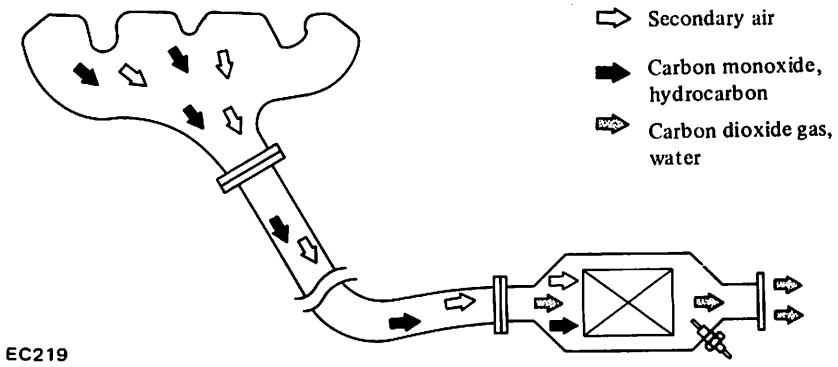


Fig. EC-73 Operation of catalytic converter

Catalyzer protector

The emergency air relief valve (E.A.R.V.) is employed as a catalyzer protector. The E.A.R.V. operates under the conditions shown below.

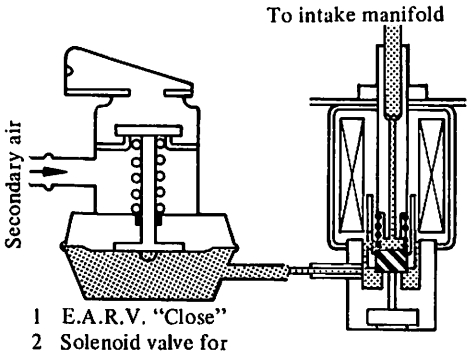
Operation of E.A.R.V.	Catalytic converter temperature		Vacuum pressure	Solenoid valve for E.A.R.V.
Not actuated	850°C (1,562°F)	Below	High	Off
Actuated		Below	Low	Off
		Above	Low to High	On

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When the temperature of the catalytic converter goes above the specified temperature level, the temperature sensor issues a signal to actuate the switching module for operating the E.A.R.V..

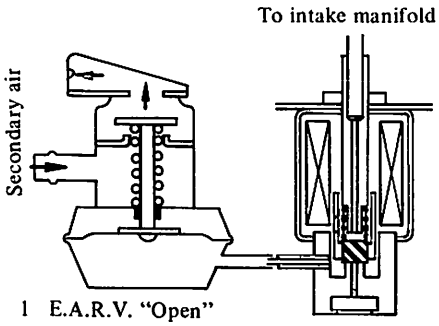
If vacuum pressure is low when the temperature of catalytic converter is below the specified level, the E.A.R.V. is actuated.

The E.A.R.V. is then actuated to release secondary air to the atmosphere, stopping air injection into the exhaust manifold. This lowers the temperature of the catalytic converter.

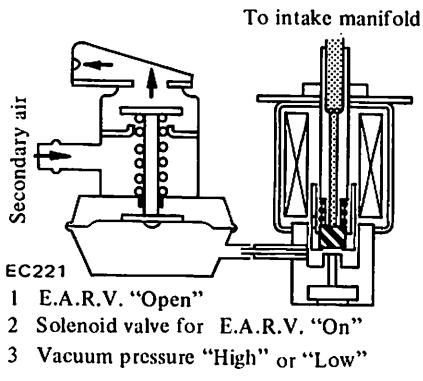


Note: ▨ Vacuum condition actuated

Fig. EC-74 E.A.R.V. not actuated



Note: ▭ Vacuum condition not actuated



Note: ▨ Vacuum condition actuated

Fig. EC-75 E.A.R.V. actuated

Catalyzer warning device

If the temperature of the catalyzer goes up abnormally, exceeding 2,012°F, the catalyzer warning lamp lights to indicate an abnormal condition in the engine. The warning lamp also lights during operation of the starter motor, permitting inspection of the lamp's condition. The lamp goes out after the engine starts.

The operation of the catalyzer warning device is controlled by the temperature sensor. When the temperature of the catalytic converter exceeds the specified temperature level, the temperature sensor attached to the catalytic converter issues a signal to actuate the switching module, and causes the catalyzer warning lamp to light through operation of the catalyzer hold relay. This catalyzer warning lamp, once lit up, remains lit as long as the ignition switch is turned on.

To turn off the lamp after inspection, the reset switch of the catalyzer hold relay should be depressed.

The catalyzer warning lamp remains lit while the starter motor is in operation because the starter circuit is directly connected to the catalyzer warning lamp through the hold relay. The hold relay self-contains a diode which serves to prevent the starter from rotating while current flows through the ignition switch and the hold relay is in operation.

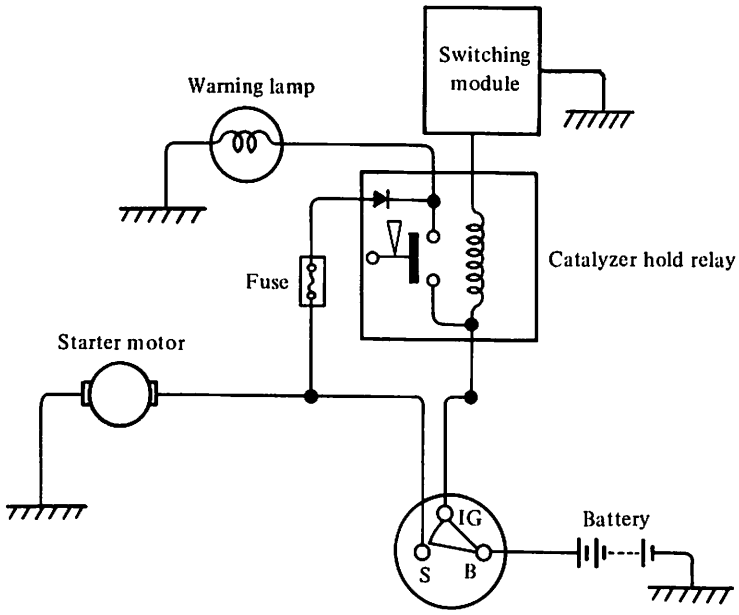


Fig. EC-76 Catalyzer hold relay circuit

REMOVAL AND INSPECTION

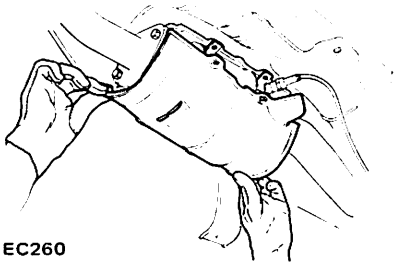
Removal and inspection can be done as follows:

Removal

Catalytic converter

1. Apply parking brake.
2. Disconnect connectors of temperature sensor and pull connector terminals to the outside of floor.
3. Place wheel lock under each tire.
4. Jack up the car.
5. Remove temperature sensor protector.
6. Remove lower shelter of catalytic converter.
7. Dismount catalytic converter.

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EC260

Fig. EC-77 Removing catalytic converter

Temperature sensor

1. Apply parking brake.
2. Disconnect connectors of temperature sensor and pull connector terminal to the outside of floor.
3. Place wheel lock under each tire.
4. Jack up the car.
5. Remove temperature sensor protector.
6. Remove lower shelter of catalytic converter.
7. Dismount temperature sensor. See Figure EC-78.

Switching module and catalyzer hold relay

Switching module and catalyzer hold relay are located as shown in Figure EC-79.

To remove switching module and catalyzer hold relay, refer to Figure EC-79 for location.

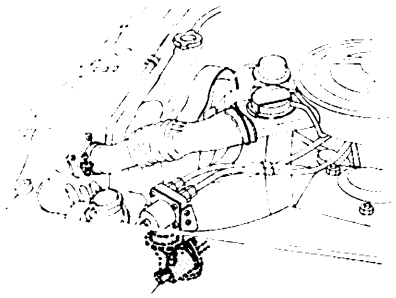
E.A.R.V. solenoid valve

Remove vacuum pipe and dismount solenoid valve from E.A.R.V.

To remove E.A.R.V. solenoid valve, refer to Figure EC-80 for location.

E.A.R.V. (with solenoid valve)

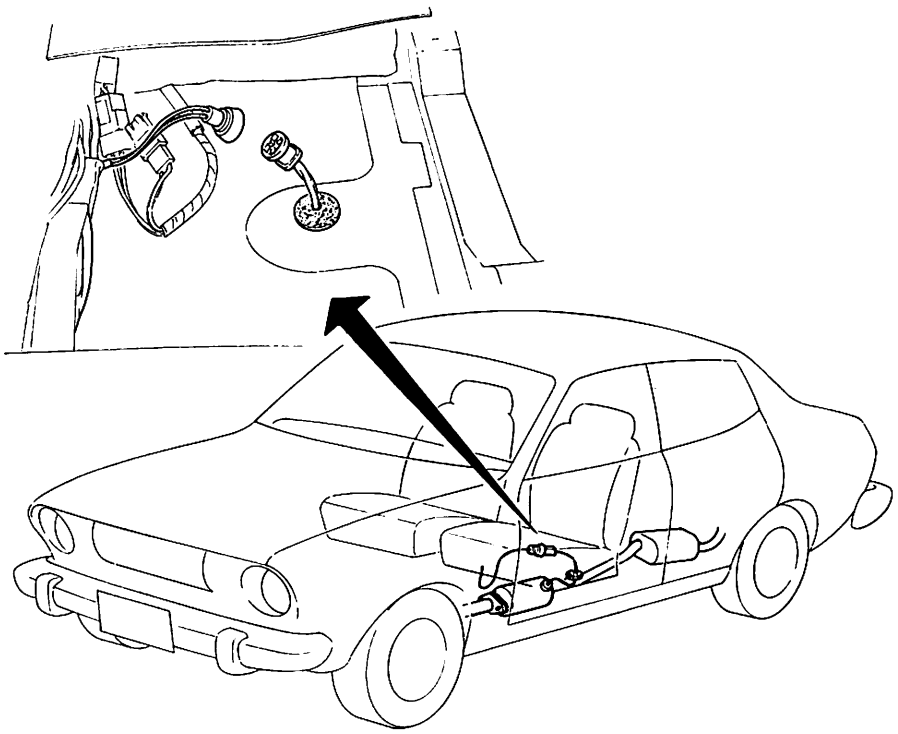
Remove vacuum pipe and air hose, and dismount E.A.R.V.



Emergency air relief valve

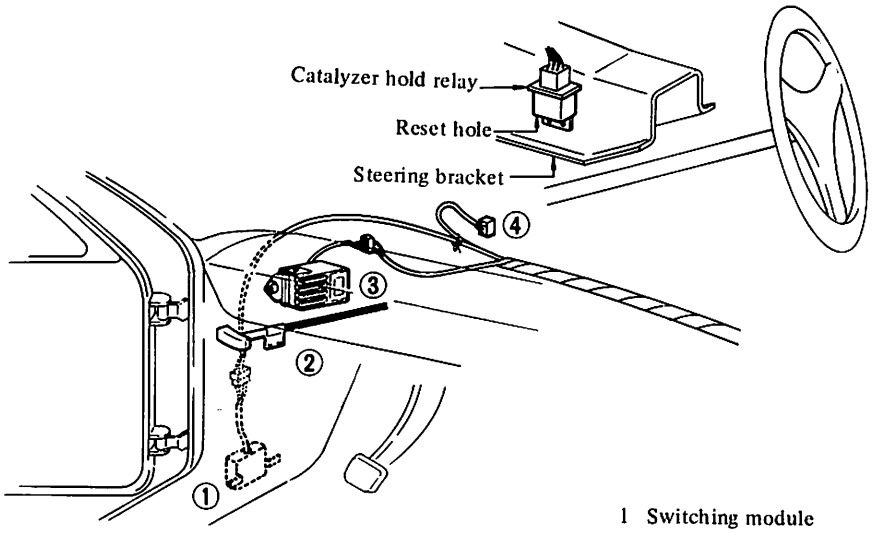
EC255

Fig. EC-80 Location of E.A.R.V.



EC286

Fig. EC-78 Location of catalyzer temperature sensor connector



1 Switching module
2 Hood lock control
3 Transistor ignition unit
4 Connector terminal for factory function test

EC225

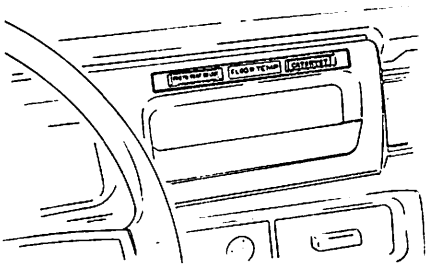
Fig. EC-79 Location of switching module and catalyzer hold relay

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Catalyzer warning lamp

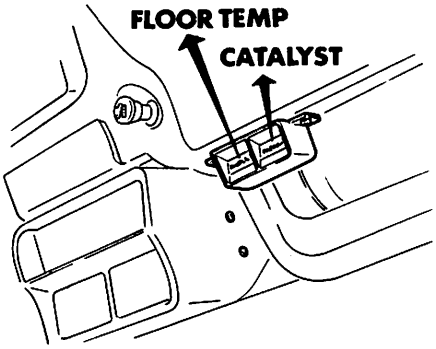
Catalyzer warning lamp is located as shown in Figure EC-81.

The location of the catalyzer warning lamp (610) is the same as that of the E.G.R. warning lamp on the cars except California.



EC257

Fig. EC-81 Location of catalytic warning lamp (610)



EC258

Fig. EC-82 Location of catalytic warning lamp (710)

Inspection

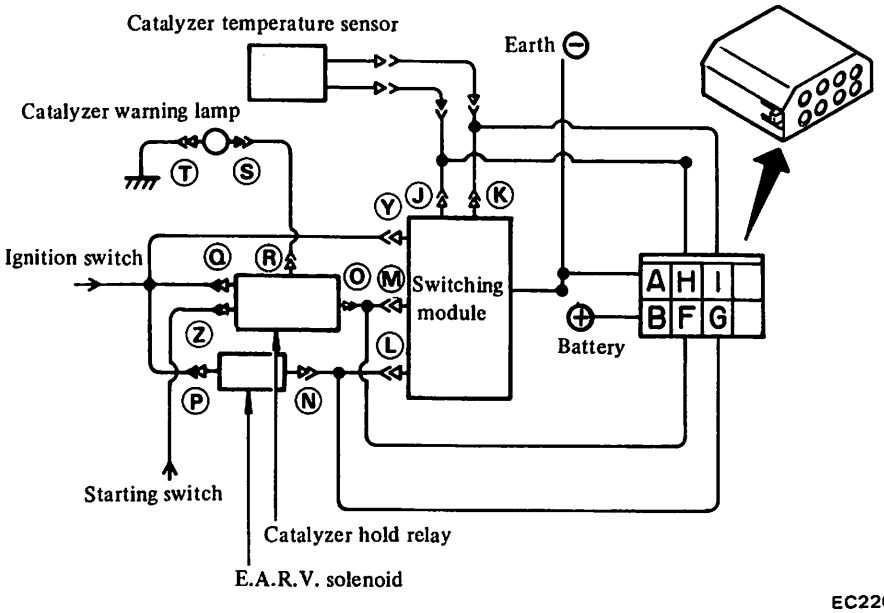
Preliminary inspection

Visually check condition of all component parts including hoses, tubes, and wires, replace if necessary.

Catalyzer protector and catalyzer warning devices

1. Apply parking brake and place wheel lock under each tire.
2. Make sure that shift lever is in NEUTRAL position on manual transmission models, or in "P" position on automatic transmission models.
3. Run engine at idling speed.
4. Make sure that catalyzer warning lamp is not lit. If catalyzer warning lamp is lit up, see the item "Inspection when catalyzer warning lamp lights".
5. Place hand on E.A.R.V. air cleaner and check that air is not being discharged from it. If air is felt on hand, disconnect the catalyzer temperature sensor and carry out inspection as described under "Inspection of E.A.R.V. (with solenoid valve)". If no abnormality is found in these inspections, replace switching module.
6. Using connector terminal (Refer to Figure EC-79.) provided for factory function test, check each connector for proper connection.

Make a thorough check of switching module, E.A.R.V. (with solenoid valve), catalyzer hold relay and catalyzer warning lamp, proceeding as follows:



EC226

Fig. EC-83 Circuit diagram of catalyzer protector and warning device

(1) Using a circuit tester, check continuity between terminal Ⓨ and ignition switch, between terminal Ⓩ and starting switch, and between terminals Ⓡ and Ⓣ. If continuity does not exist, repair. After repair reconnect connectors to their original positions.

(2) Using a circuit tester, measure voltage across terminals Ⓕ and Ⓐ when terminals Ⓗ and Ⓘ in Figure EC-83 are open. If circuit tester indicates 12V, the points Ⓞ and Ⓠ are normal. If it indicates 0V, reconnect points Ⓞ and Ⓠ. If circuit tester still indicates 0V, check wires for discontinuity, and repair if necessary.

(3) Using a circuit tester, measure voltage across terminals Ⓖ and Ⓐ when terminals Ⓗ and Ⓘ in Figure EC-83 are open. If circuit tester indicates 12V, points Ⓝ and Ⓟ are normal. If circuit tester indicates roughly 0V, reconnect points Ⓝ and Ⓟ. If circuit tester still indicates roughly 0V, check wires for discontinuity, and repair if necessary.

(4) Using a wire, shortcircuit terminals Ⓗ and Ⓘ in Figure EC-83. If circuit tester indicates roughly 0V across terminals Ⓕ and Ⓐ, points Ⓚ, Ⓙ, and Ⓜ are normal. If circuit tester indicates 12V, reconnect points Ⓚ, Ⓙ and Ⓜ. If circuit tester still indicates 12V, check wires for discontinuity, and repair if necessary.

(5) Using a wire, shortcircuit terminals Ⓗ and Ⓘ in Figure EC-83. If circuit tester indicates roughly 0V across terminals Ⓖ and Ⓐ, points Ⓚ, Ⓙ, and Ⓛ are normal. If circuit tester indicates 12V, reconnect terminals Ⓚ, Ⓙ, and Ⓛ. If circuit tester still indicates 12V, check wires for discontinuity, and repair if necessary.

(6) Connect a wire between terminals Ⓗ and Ⓘ in Figure EC-83. Place hand on E.A.R.V. air cleaner, and check for air discharge. If air is felt on hand, the unit is normal. If air is not felt at all, check condition of E.A.R.V. (with solenoid valve). If E.A.R.V. (with solenoid) is normal, replace switching module.

(7) Connect a wire between terminals Ⓗ and Ⓘ in Figure EC-83.

If catalyzer warning lamp lights, the unit is normal. If warning lamp does not light, check condition of warning lamp (Refer to "Inspection of catalyzer warning lamp".) and catalyzer

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hold relay (Refer to "Inspection of catalyzer hold relay".). If catalyzer warning lamp and hold relay are normal, replace switching module.

The catalyzer temperature sensor

Before checking, ensure that catalytic converter is inspected as outlined and that secondary air is present at exhaust manifold.

1. Apply parking brake.
2. Shift transmission into Neutral (for manual transmission) and Park or Neutral (for automatic transmission models).
3. Connect a tachometer to the engine.
4. Thoroughly warm up the engine.
5. Stop the engine after warm-up.
6. Disconnect high tension cord (to No. 1 cylinder) at distributor.
7. Ensure that catalyzer temperature sensor connector located under driver seat is tight in place.
8. Disconnect 2-pin catalyzer temperature sensor connector (green) on the dash side.
9. Turn circuit tester knob to 100kΩ range and zero adjust.
10. Attach test leads of circuit tester to the sensor side of connector that has been disconnected in step 8 above, and take a tester reading.
11. Tester reading should be more than 50kΩ. If below this value, replace sensor.
12. Accelerate the engine and observe tachometer to ensure that engine speed is set at 2,500 rpm.

Note: Do not run the engine at more than 3,000 rpm.

13. Keep the engine running at 2,500 rpm for two minutes.
14. Observe tester reading during the operation in step 13 above. Resistance on tester scale should decrease. If not, replace sensor.
15. Reduce engine speed and stop the engine.

Notes:

a. Do not run the engine continuously for more than two minutes.

b. After the above test has been made, connect high tension cord (to No. 1 cylinder) to its original position in distributor.

Catalyzer warning lamp

If catalyzer warning lamp does not go on when starter switch is turned on, check for a faulty lamp. If lamp is not faulty, check for discontinuity in the line between starter switch and warning lamp. Also check wires from the starter switch to the warning lamp. Repair or replace as necessary.

Catalyzer hold relay

1. Disconnect connectors of hold relay.
2. Attach tester positive lead to terminal ③ and negative lead to terminal ④. Continuity should exist.
3. Attach tester positive lead to terminal ④ and negative lead to terminal ③. Discontinuity should exist.
4. Make sure that continuity exists between terminals ① and ②.
5. Make sure that discontinuity exists between terminals ① and ③.
6. Apply a voltage of 12V to terminal ①, and make sure that continuity exists between terminals ① and ③.
7. Reset catalyzer hold relay. To reset, remove reset hole cover of catalyzer hold relay, and insert a bar of 5 mm (0.197 in) dia. into reset hole.

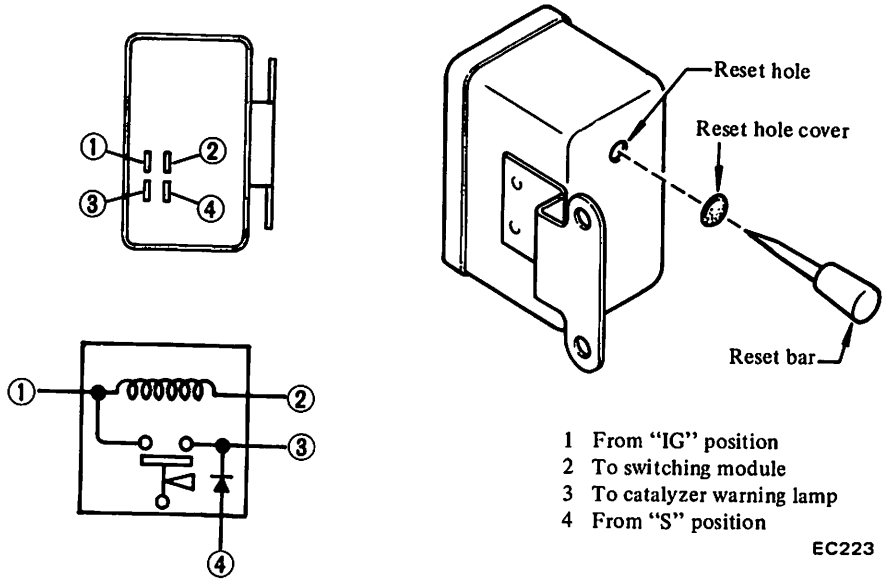


Fig. EC-84 Checking method of catalytic hold relay

E.A.R.V. (with solenoid valve)

1. Apply parking brake and place wheel lock under each tire.
2. Make sure that shift lever is in NEUTRAL position on manual transmission models, or in PARK position on automatic transmission models.
3. Run engine at idling speed.
4. Disconnect hose ⑤. After making sure that air is being discharged from the hose, reconnect it.

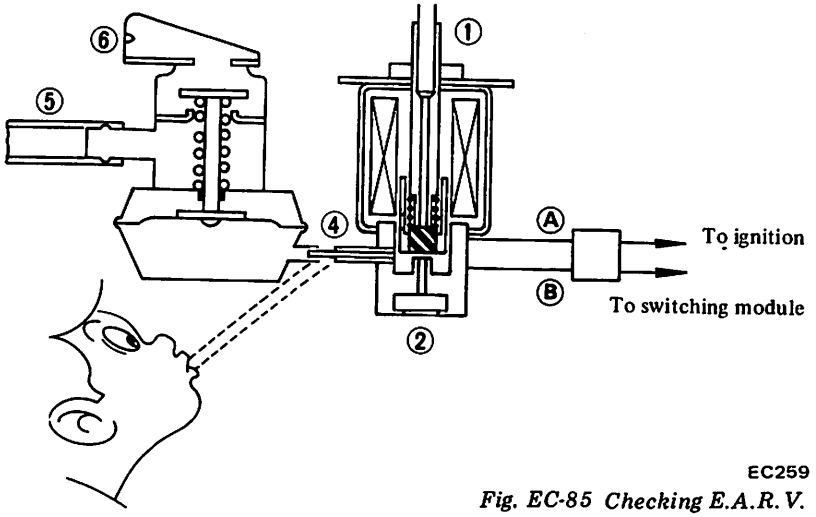


Fig. EC-85 Checking E.A.R.V.

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5. Disconnect connectors Ⓐ and Ⓑ, and make sure that air is not being discharged from air cleaner ⑥. If air discharge is felt on hand, follow procedure outlined in step 7.
6. Connect terminals Ⓐ and Ⓑ to 12V battery. Make sure that air is being discharged from air cleaner ⑥. If air is not felt on hand, follow procedure outlined in step 7.
7. If any trouble is encountered in step 5 or 6 above, proceed as follows:
(1) Stop the engine and disconnect tubes ① and ④. Then connect terminals Ⓐ and Ⓑ to 12V battery. Blow through tube ④, and make sure that air comes out of position ② and no air comes out of tube ①.
(2) Disconnect terminals Ⓐ and (B) from battery. Blow through tube ④, and make sure that air comes out of tube ① and no air comes out of position ②.

If the above conditions are confirmed, replace the E.A.R.V. unit. If not, replace solenoid valve.

Catalytic converter

After carrying out idle CO adjustment (Refer to "Idle CO Adjustment".), connect the check valve hose, and charge the secondary air to the check valve. Run engine at idling speed, and measure CO content at the end of exhaust tail pipe. If CO content is less than 0.3%, catalytic converter is normal. If CO content is above 0.3%, replace catalytic converter.

When catalyzer warning lamp lights

If catalyzer warning lamp lights, carry out inspection, proceeding as follows:

1. Inspection of wire harness for shortcircuit
(1) With cold catalytic converter, disconnect connectors of catalyzer temperature sensor, and measure resistance of catalyzer temperature sensor with a circuit tester. If resistance is more than 50kΩ, the unit is normal. If resistance is less than 50kΩ replace catalyzer temperature sensor.
(2) Check catalyzer protector device. (Refer to "Inspection of Catalyzer Protector".)
2. Check fuel system with regard to the following items: (Refer to "Inspection of Fuel System".)
1) Float level
2) Choke
3) Normal fuel supply system (Primary and secondary)
4) Accelerator pump
5) Power valve
6) B.C.D.D.
7) Fuel strainer
8) Air cleaner

3. Check ignition system with regard to the following items: (Refer to "Inspection of Ignition System".)
1) Ignition AMP.
2) Distributor
3) Ignition coil
4) High tension code
5) Spark plug

4. Check idle CO adjustment. (Refer to "Inspection of Idle CO Adjustment")
5. Check catalytic converter. (Refer to "Inspection of Catalytic Converter".)
6. Check catalyzer temperature sensor. (Refer to "Inspection of Catalyzer Temperature Sensor".)

INSTALLATION

To install, reverse the removal procedure.

Bolt tightening torque specifications:

Tightening torque:
Catalytic converter
2.6 to 3.4 kg-m
(19 to 24 ft-lb)
Temperature sensor:
2.5 to 3.5 kg-m
(18 to 25 ft-lb)

Note: Use care when handling catalyzer temperature sensor, as its tip is quite delicate.

Cautions:
a. After installing catalyzer temperature sensor in place, clip sensor cord at mark.
b. When installing catalyzer temperature sensor, be careful not to allow rubber cover sticking in between intermediate protector and car body.

FLOOR TEMPERATURE WARNING SYSTEM

DESCRIPTION

The floor temperature warning system consists of a floor temperature sensing switch installed on the car's floor, floor temperature relay and a warning lamp on the instrument panel and wires that connect these parts.

When the floor temperature rises to an abnormal level, the warning lamp will light to call the attention of the driver. The wiring diagram of this system, and location of the floor temperature sensing switch are illustrated in Figures EC-86 and EC-87.

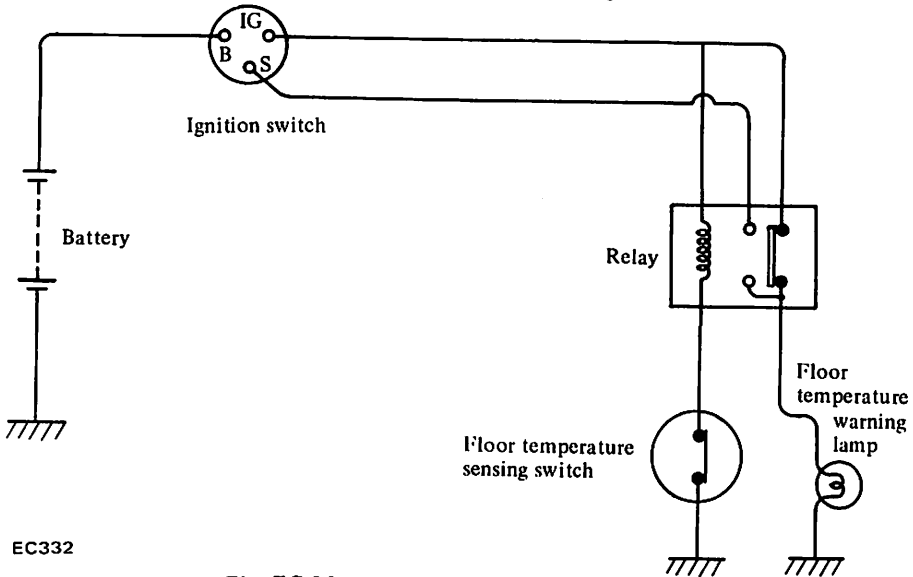


Fig. EC-86 Wiring diagram of floor temperature warning system

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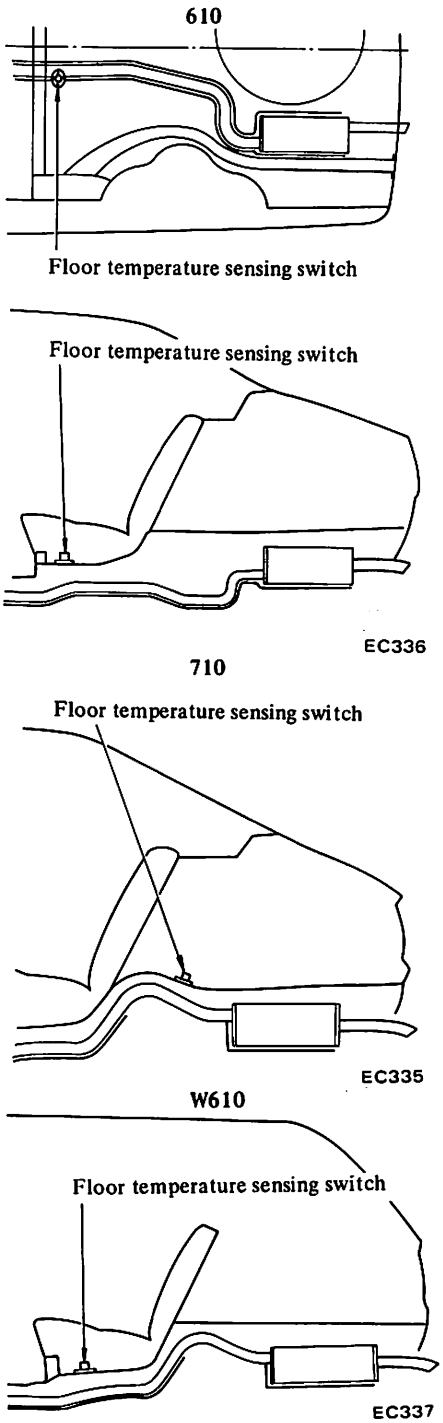


Fig. EC-87 Location of floor temperature sensing switch

OPERATION

Floor temperature will exceed normal level when temperature rise in the exhaust system succeeding the catalytic converter is caused by either an engine trouble or severe driving conditions. Under this condition the floor temperature sensing switch turns off, causing the starting switch line of the floor temperature relay to turn off and the ignition switch line to turn on, as a result, the floor temperature warning lamp comes on.

When the floor temperature is lower than the specific temperature, the floor temperature sensing switch turns on. The ignition line of the floor temperature relay turns off, while the starting switch side is in on. The floor temperature warning lamp goes out.

The lamp is functioning satisfactorily, if it is remains on while the starting motor is in operation. The lamp goes out when the ignition switch is in "IG" position.

The following chart furnishes the information on the relationship between floor temperatures, warning lamp and sensing switch.

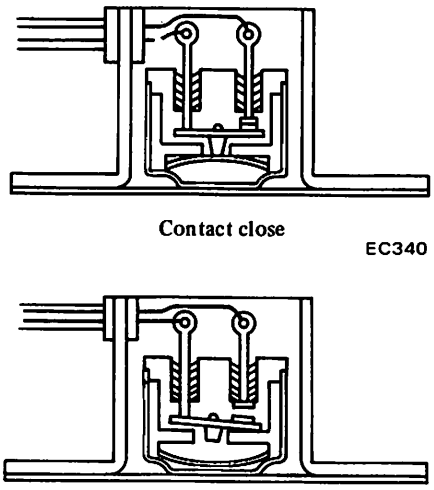


Fig. EC-88 Operation of floor temperature sensing switch

REMOVAL

Floor temperature sensing switch

610, W610 and W710

1. Remove rear seat as outlined in the "Rear Seat" section of "Chassis and Body" service manual.
2. Remove floor temperature sensing switch.

710

1. Remove rear seat as outlined in the "Rear Seat" section of "Chassis and Body" manual.
2. Remove parts necessary for accessibility of fuel tank. For removal procedures, refer to the instructions under "Fuel Tank" in the "Engine Control Fuel and Exhaust Piping" section.
3. Remove floor temperature sensing switch.

Floor temperature relay

610

Remove glove box to gain access to this part. Refer to Figure EC-89.

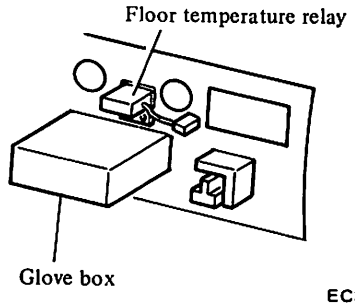


Fig. EC-89 Location of floor temperature relay

710

From under instrument panel, remove this part. Refer to Figure EC-90.

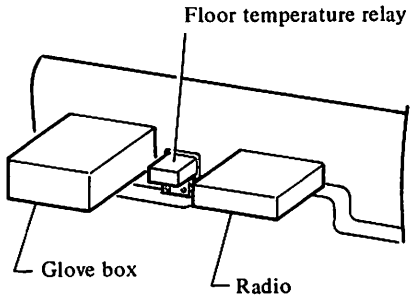


Fig. EC-90 Location of floor temperature relay

Floor temperature warning lamp

610

Refer to Figure EC-91 for the location of this part.

Remove warning lamp in the same manner as that for the E.G.R. warning lamp.

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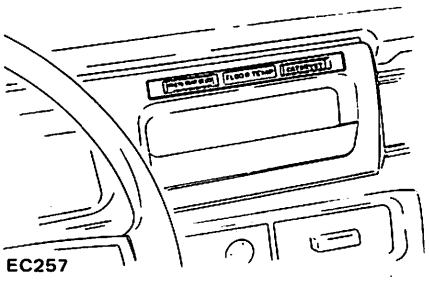
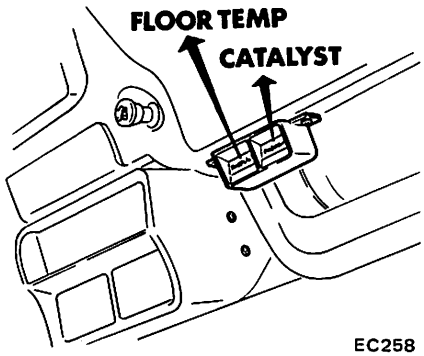

EC257

Fig. EC-91 Location of floor temperature warning lamp

710

Refer to Figure EC-92 for the location of this part.



EC258

Fig. EC-92 Location of floor temperature warning lamp

INSTALLATION

To install, reverse the order of removal.

INSPECTION

Floor warning temperature system

Apply parking brake. Shift gears into Neutral (for manual transmission) and Neutral or Park (for automatic transmission).

1. Ensure that floor temperature warning lamp lights when ignition switch is turned to the "S" position.

If not, check lamp for burned bulbs.

Replace bulb if bulb is burned out.

If bulb is not burned, trace wire(s) back to ignition switch. Repair or replace if necessary.

2. Be sure that floor temperature is cool (below 176°F) before carrying out the following procedure.

(1) Remove rear seat.
(2) Ignition switch is turned to the "IG" position.
(3) Ensure that floor temperature warning lamp goes out.
(4) Heat surrounding areas of floor temperature sensing switch with a proper heater to ensure that floor temperature warning lamp glows when floor is heated to the specifications as shown in the table below.

Temperature sensing switch	Temperature warning lamp	Floor temperature		
		610	710	W610, W710
Contact close	Off	Below 239°F		
Contact open	On	Above 239°F		

Note: Avoid heating floor temperature sensing switch directly.

If lamp does not glow, check floor temperature sensing switch connector for continuity with a circuit tester.

If continuity should exist after heated surrounding areas of floor temperature sensing switch, replace temperature sensing switch.

If continuity does not exist, trace the wiring back to relay or check the following step 3. Repair or replace wire(s) if necessary.

Note: The floor temperature sensing switch may be heated through the floor by a proper heater.

3. Turn ignition switch to the "IG" position, and disconnect floor temperature sensing connector. The lamp should remain on. If not, check floor temperature relay for continuity with a circuit tester.

Referring to the following floor temperature relay, if relay is normal, trace wire(s) back to ignition switch. Repair faulty wiring.

Floor temperature relay

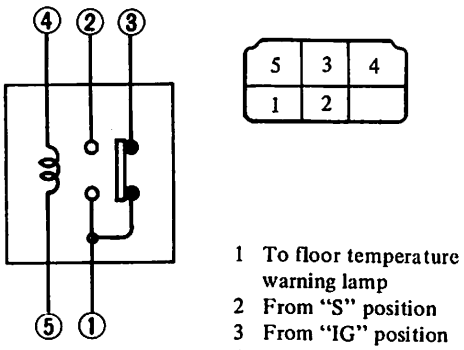
When checking floor temperature relay for unit, remove it and proceed as follows:

1. Check for continuity between ④ and ⑤. Continuity should exist.

Check for continuity between ① and ③. Continuity should exist.

Check for continuity between ① and ②. Continuity should not exist.

2. Apply a 12-volt d-c across ④ and ⑤ to ensure that continuity exists between ① and ② and that continuity does not between ① and ③. If test results do not satisfy the above, replace the floor temperature relay.



1 To floor temperature warning lamp
2 From "S" position
3 From "IG" position
4 From ignition switch
5 To floor temperature sensing switch

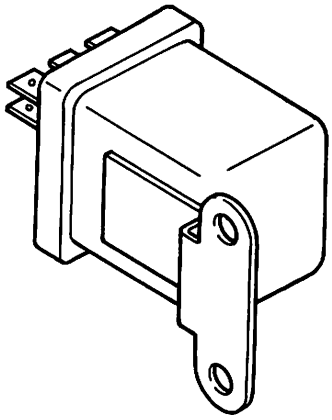

EC344

Fig. EC-93 Checking floor temperature relay

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When floor temperature warning lamp lights

Check floor temperature warning lamp for the following items.

1. Open or short circuit in wiring harness.
2. Condition of fuel system. Refer to "Catalytic Converter Warning Lamp" in the "Emission Control" section. Repair or replace faulty part(s) as necessary.
3. Condition of ignition system. Refer to "Catalytic Converter Warning Lamp" in the "Emission Control" section. Repair or replace faulty part(s) as necessary.

Note: Even if there is nothing wrong with engine, the warning lamp may come on if the car is being driven on a steep slope continuously in lower gears at high engine speeds.

EVAPORATIVE EMISSION CONTROL SYSTEM

CONTENTS

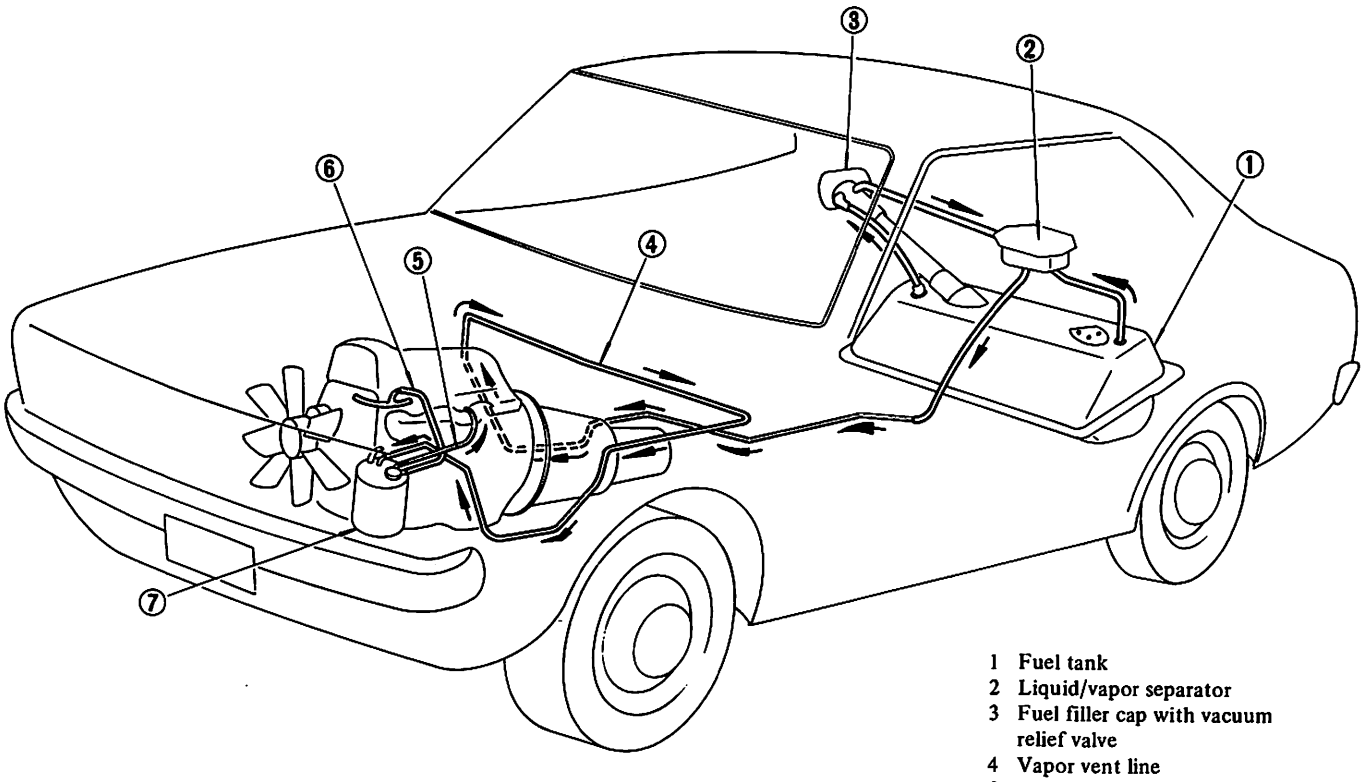
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CARBON CANISTER PURGE CONTROL VALVE EC-39
CARBON CANISTER FILTER EC-40
FUEL TANK VACUUM RELIEF VALVE ... EC-40

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.

This system is made up to the following:

1. Fuel tank with positive sealing filler cap
2. Vapor-liquid separator
3. Vapor vent line
4. Carbon canister
5. Vacuum signal line
6. Canister purge line

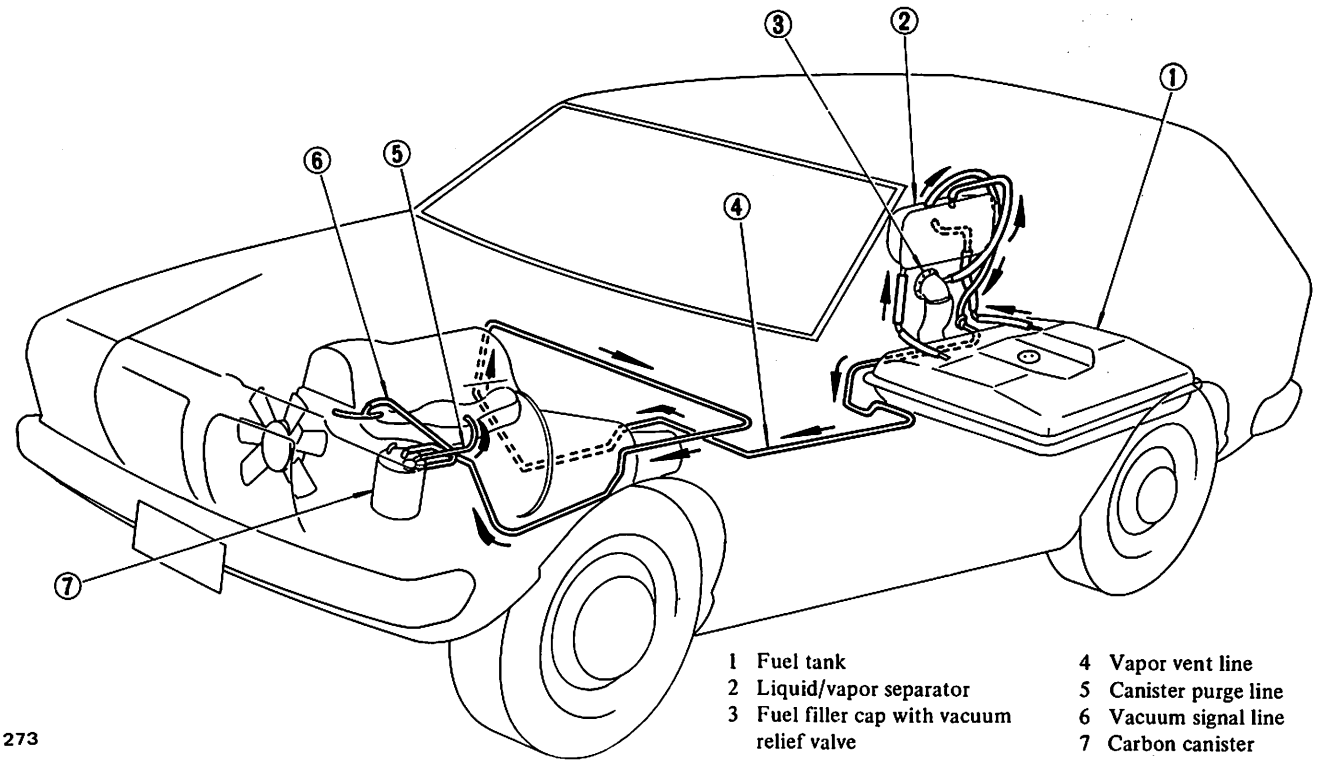


1 Fuel tank
2 Liquid/vapor separator
3 Fuel filler cap with vacuum relief valve
4 Vapor vent line
5 Canister purge line
6 Vacuum signal line
7 Carbon canister

EF272

Fig. EC-94 Schematic drawing of evaporative emission control system

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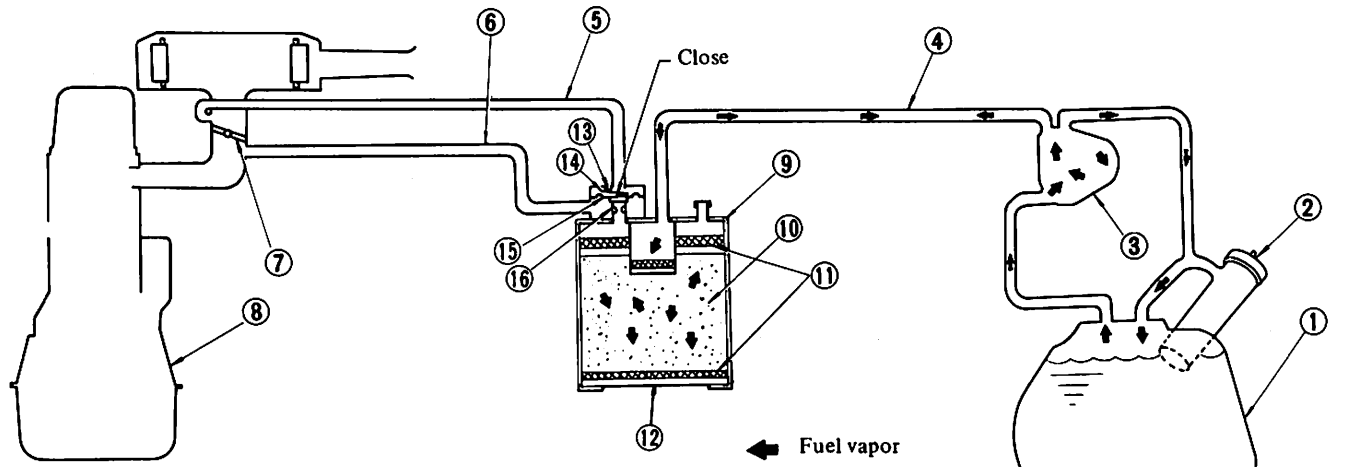


1 Fuel tank
2 Liquid/vapor separator
3 Fuel filler cap with vacuum relief valve
4 Vapor vent line
5 Canister purge line
6 Vacuum signal line
7 Carbon canister

Fig. EC-95 Schematic drawing of evaporative emission control system for Station Wagon

OPERATION

Fuel vapors from the sealed fuel tank are led into the carbon canister. The canister is filled with activated charcoals to absorb the fuel vapors when the engine is at rest or at idling. See Figure EC-96.



1 Fuel tank
2 Fuel filler cap with vacuum relief valve
3 Liquid/vapor separator
4 Vapor vent line
5 Vacuum signal line
6 Canister purge line
7 Throttle valve
8 Engine
9 Carbon canister
10 Activated carbon
11 Screen
12 Filter
13 Purge control valve
14 Diaphragm spring
15 Diaphragm
16 Fixed orifice

Fig. EC-96 Evaporative emission control system (Fuel vapor flow when engine is at rest or at idle.)

As the throttle valve opens and car speed increases, vacuum pressure in the vacuum signal line forces the purge control valve to open, and admits an orifice to intake manifold and fuel vapor is then drawn into the intake manifold through the canister purge line. See Figure EC-97.

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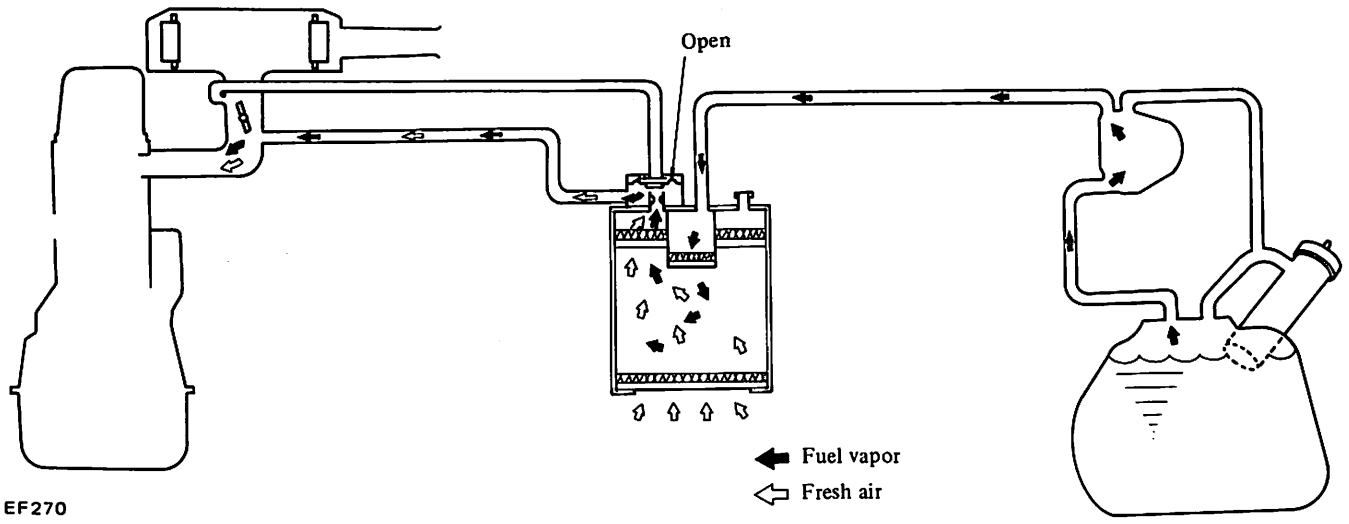


Fig. EC-97 Evaporative emission control system (Fuel vapor flow when engine is running.)

INSPECTION

FUEL TANK, VAPOR LIQUID SEPARATOR AND VAPOR VENT LINE

1. Check all hoses and fuel tank filler cap.
2. Disconnect the vapor vent line connecting carbon canister to vapor-liquid separator.
3. Connect a 3-way connector, a manometer and a cock (or an equivalent 3-way charge cock) to the end of the vent line.
4. Supply fresh air into the vapor vent line through the cock little by little until pressure becomes 368 mmAq (14.5 inAq).
5. Shut the cock completely and leave it unattended.
6. After 2.5 minutes, measure the height of the liquid in the manometer.
7. Variation of height should remain with 25 mmAq (1.10 inAq.).
8. When filler cap does not close completely, the height should drop to zero in a short time.
9. If the height does not drop to zero in a short time when filler cap is removed, it is the cause of a stuffy hose.

Note: In case the vent line is stuffy, the breathing in fuel tank is not thoroughly made, thus causing insufficient delivery of fuel to engine or vapor lock. It must, therefore, be repaired or replaced.

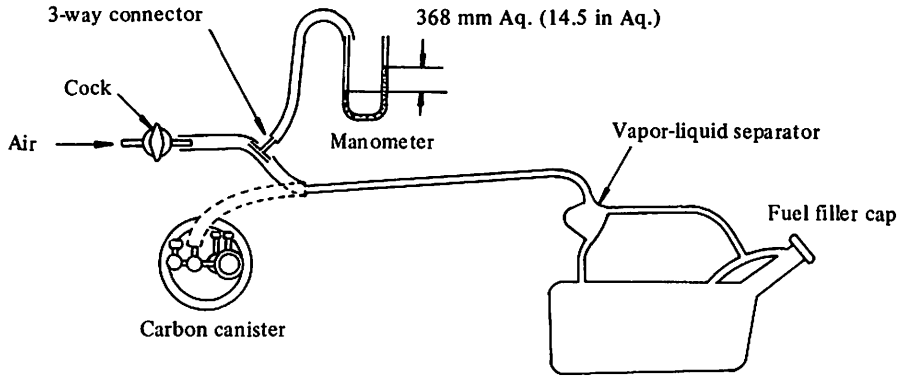


Fig. EC-98 Checking evaporative emission control system

CARBON CANISTER PURGE CONTROL VALVE

Check for fuel vapor leakage, in the distributor vacuum line, at diaphragm of carbon canister purge control valve.

To check for leakage, proceed as follows:

1. Disconnect rubber hose, in the line, between T-connector and carbon canister at T-connector.
2. Inhale air into the opening of rubber hose running to vacuum hole in carbon canister and ensure that there is no leak.

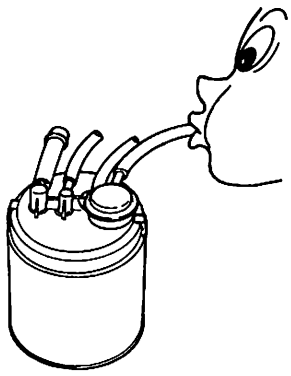
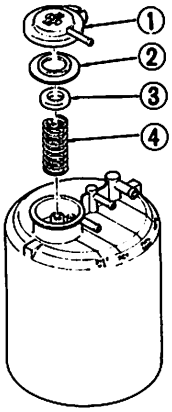


Fig. EC-99 Checking carbon canister purge control valve

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3. If there is a leak, remove top cover from purge control valve and check for dislocated or cracked diaphragm. If necessary, replace diaphragm kit (which is made up of a retainer, diaphragm and spring).



1 Cover
2 Diaphragm
3 Retainer
4 Diaphragm spring

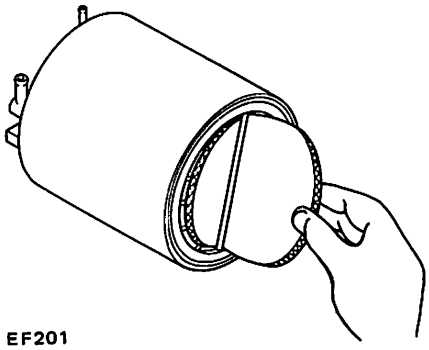
EF200

Fig. EC-100 Carbon canister purge control valve

CARBON CANISTER FILTER

Check for a contaminated element.

Element can be removed at the bottom of canister installed on car body.



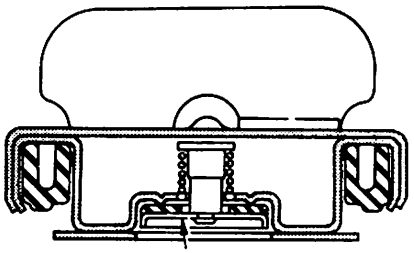
EF201

Fig. EC-101 Replacing carbon canister filter

FUEL TANK VACUUM RELIEF VALVE

Remove fuel filler cap and see it functions properly.

1. Wipe clean valve housing and have it in your mouth.
2. Inhale air. A slight resistance accompanied by valve indicates that valve is in good mechanical condition. Note also that, by further inhaling air, the resistance should be disappeared with valve clicks.
3. If valve is clogged, or if no resistance is felt, replace cap as an assembled unit.



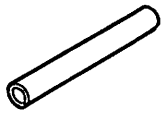
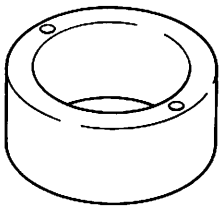
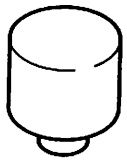
Pressure relief valve

EF271

Fig. EC-102 Fuel filler cap

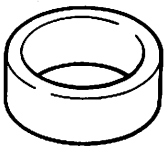
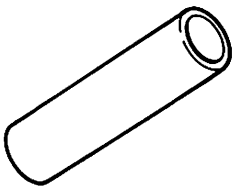
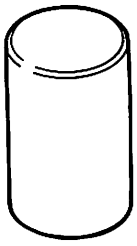
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SPECIAL SERVICE TOOLS

No.	Tool number & tool name	Description	For use on	Reference page or Figure No.
1.	*ST19810000 Hexagon wrench	For removing and installing the rotor ring assembly.  SE279	L20B A14	Fig. EC-23 Page EC-19 Fig. EC-44
2.	ST19900000 Dummy shaft	For assembling the vanes.  SE284	L20B A14	Fig. EC-19
3.	ST19890000 Rotor adapter	Used as a mount when rotor is removed and when bearing is installed.  SE347	L20B A14	Fig. EC-35 Page EC-18 Fig. EC-38
4.	ST19940000 Bearing Pressing tool	Used when rotor is removed and when front bearing installed.  SE348	L20B A14	Fig. EC-35 Page EC-18 Fig. EC-38

* This service tool is designed for use in disassembly and assembly of the air pump.

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No.	Tool number & tool name	Description	For use on	Reference page or Figure No.
5.	ST19930000 Bearing adapter	Used as a mount when front bearing is removed.  SE349	L20B A14	Fig. EC-36
6.	ST19910000 Bearing driver	Used as a drift when front bearing is installed. Also used as a support when rotor is installed.  SE350	L20B A14	Fig. EC-36 Fig. EC-39 Fig. EC-40
7.	ST19920000 Rotor stand	Used as a drift when rotor is installed.  SE351	L20B A14	Fig. EC-39 Fig. EC-40 Fig. EC-20

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SERVICE MANUAL

DATSUN 710
MODEL 710 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION EE

ENGINE ELECTRICAL SYSTEM

EE

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DISTRIBUTOR (California models) EE-28
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BATTERY

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CHECKING ELECTROLYTE LEVEL EE-2
CHECKING SPECIFIC GRAVITY EE-2
BATTERY FREEZING EE-3
CHARGING EE-3
INSTALLATION EE-3

REMOVAL

1. Disconnect negative and positive cables.
2. Remove nuts from battery clamps; take off clamps.
3. Remove battery.

CHECKING ELECTROLYTE LEVEL

Remove six vent plugs and check for electrolyte level in each cell.

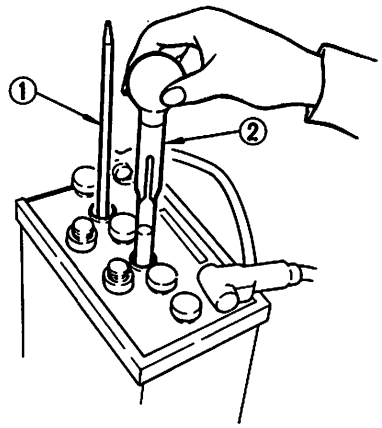
If necessary, pour distilled water.

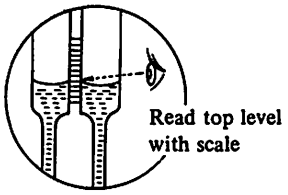
CHECKING SPECIFIC GRAVITY

Specific gravity of battery electrolyte is tested by a hydrometer. If the state of charge of battery is 60% or specific gravity reading is below 1.20 [as corrected at 20°C (68°F)], battery must be recharged or battery-electrolyte concentration adjusted.

Add or subtract gravity points according to whether the electrolyte temperature is above or below 20°C (68°F) standard.

The gravity of electrolyte changes 0.0007 for every 1°C (1.8°F) temperature. A correction can then be made by using the following formula:





1 Thermal gauge
2 Hydrometer

EE001

Fig. EE-1 Checking specific gravity

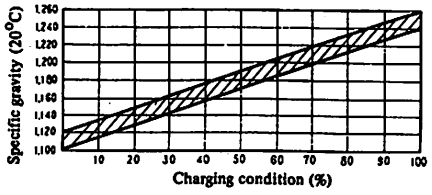
$$S_{20} = St + 0.0007 (t - 20)$$

Where

- St: Specific gravity of electrolyte at t°C
- S_{20}: Specific gravity of electrolyte corrected at 20°C (68°F)
- t: Electrolyte temperature

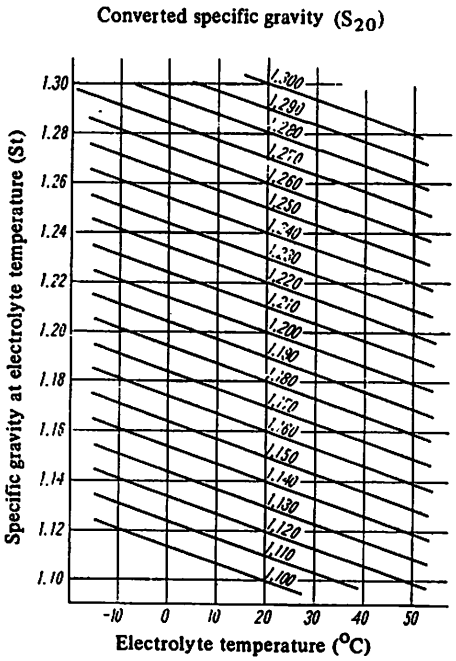
For example: A hydrometer reading of 1.260 at 30°C (86°F) would be 1.267 corrected to 20°C (68°F), indicating fully charged battery. On the other hand, a hydrometer reading of 1.220 at −10°C (14°F) would be 1.199 corrected to 20°C (68°F), indicating a partially charged battery.

The state of charge of battery can be determined by the following table if the specific gravity of electrolyte is known. Before checking, be sure that cells are filled to correct level.



EE002

Fig. EE-2 Charging condition



EE003

Fig. EE-3 Specific gravity at electrolyte temperature

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BATTERY FREEZING

Battery electrolyte freezing point varies with acid concentration or its specific gravity. A battery with an insufficient charge will freeze at lower temperatures. If specific gravity of a battery falls below 1.1, this is an indication that battery is completely discharged and will freeze readily when temperatures fall below freezing.

Note: Use extreme caution to avoid freezing battery since freezing will generally ruin the battery.

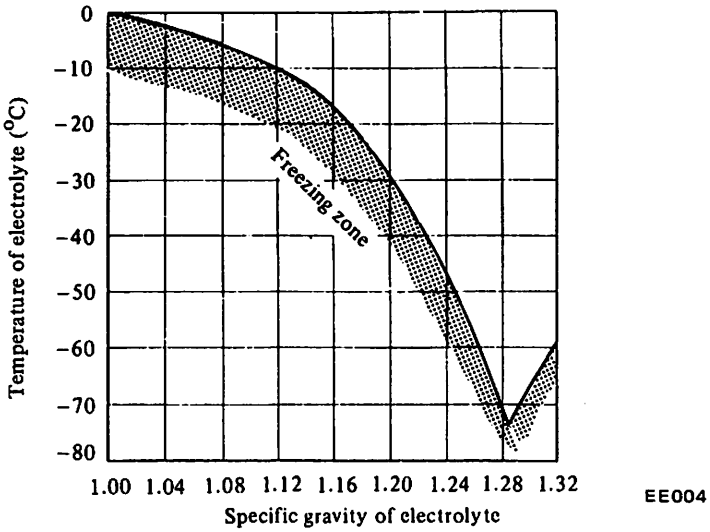


Fig. EE-4 Freezing point of electrolyte

CHARGING

If electrolyte level is satisfactory, battery must be charged when electrolyte-gravity reading falls below 1.20. If battery on car is quick-charged to bring it up to full charge, the operation should be carried out with negative cable removed.

Prior to charging, corroded terminals should be cleaned with a brush and common baking-soda solution. In addition, the following items should be observed while battery is being charged.

1. Be sure that electrolyte level is above top of each plate.
2. Keep removed plugs in a safe place.
3. Do not allow electrolyte temperature to go over 45°C (113°F).
4. After charging, check to be certain that specific gravity does not exceed 1.260 [at 20°C (68°F)]. Correction can be made by adding distilled water into cells as necessary.
5. Keep battery away from open flame while it is being charged.
6. After all vent plugs have been tightened, clean all sprayed electrolyte off upper face of battery.

INSTALLATION

1. Install and tighten clamps securely.
2. After clamps have been tightened, clean battery cable terminals and apply grease to retard formation of corrosion.

STARTING MOTOR

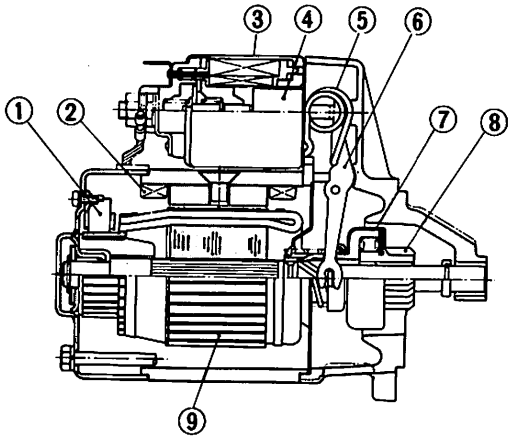
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DESCRIPTION

The function of the starting system which consists of the battery, ignition switch, starting motor and solenoid, is to crank the engine. The electrical energy is supplied from the battery, the solenoid completes the circuit to operate the starting motor, and then the motor carries out the actual cranking of the engine.

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1 Brush
2 Field coil
3 Magnetic switch
4 Plunger
5 Torsion spring
6 Shift lever
7 Overrunning clutch
8 Pinion
9 Armature

Fig. EE-5 Sectional view of starting motor (S114-180)

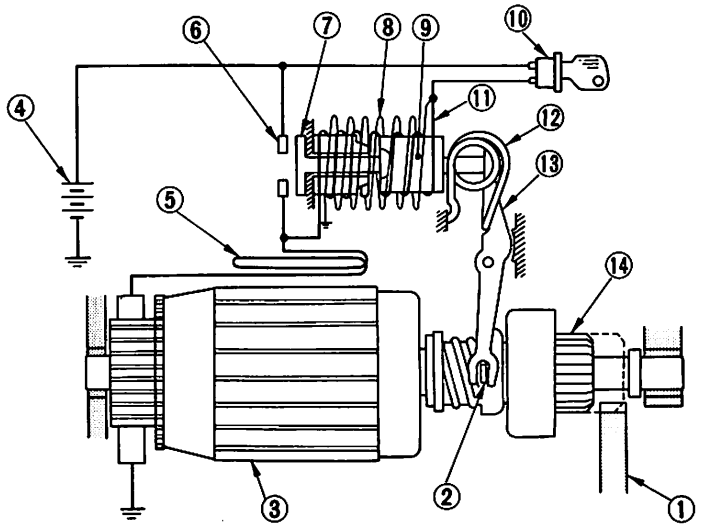
OPERATION

When the ignition switch is turned fully clockwise to the START position, battery current flows through "series" and "shunt" coils of the solenoid, magnetizing the solenoid. The plunger is pulled into the solenoid so that it operates the shift lever to move the drive pinion into the flywheel ring gear. Then the solenoid switch contacts close after the drive pinion is partially engaged with the ring gear.

Closing of the solenoid switch contacts causes the motor to crank the engine and also cut out the "series" coil of the solenoid, the magnetic pull of the "shunt" coil being sufficient to hold the pinion in mesh after the shifting has been performed.

After the engine starts running, the driver releases the ignition key and it automatically returns to the ON position.

The torsion spring then actuates the shift lever to pull the pinion, which allows the solenoid switch contacts to open. Consequently, the starting motor stops.



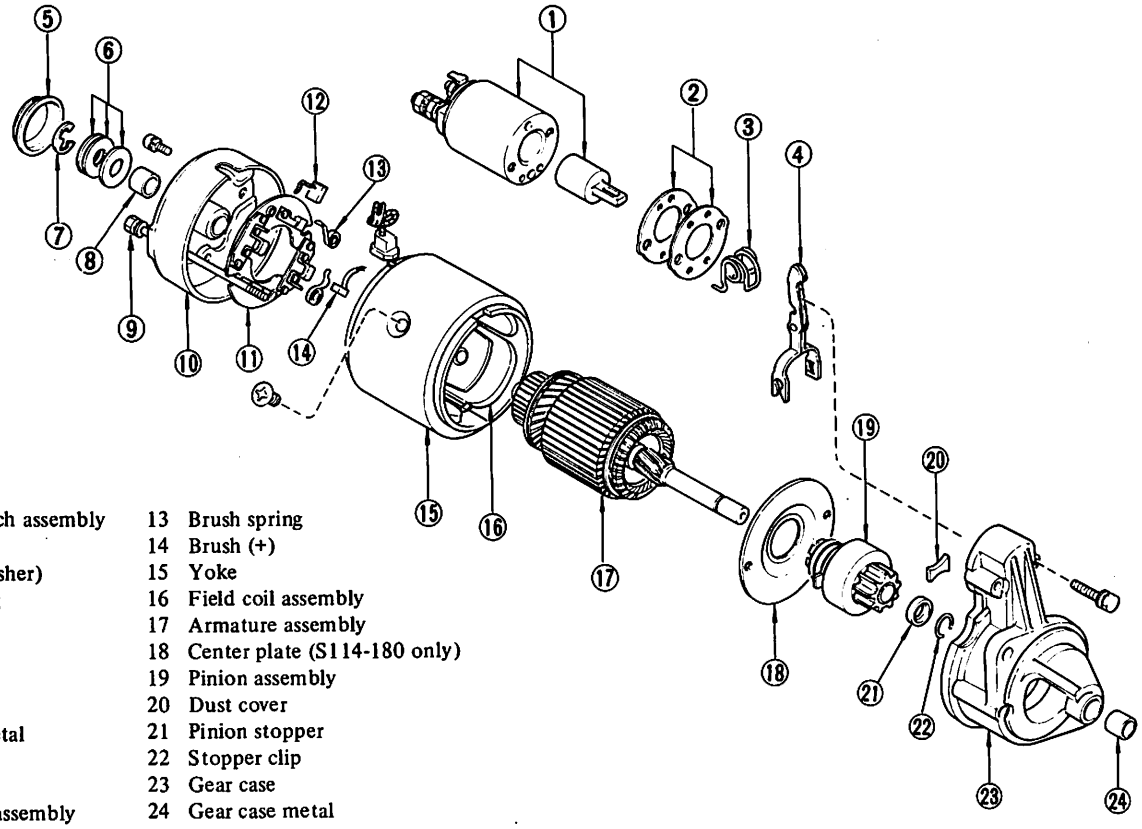
1 Ring gear
2 Shift lever guide
3 Armature
4 Battery
5 Field coil
6 Stationary contact
7 Movable contactor
8 Shunt coil
9 Plunger
10 Ignition switch
11 Series coil
12 Torsion spring
13 Shift lever
14 Pinion

Fig. EE-6 Starting motor circuit

More positive meshing and demeshing of the pinion and the ring gear teeth are secured by means of the overrunning clutch. The overrunning clutch employs a shift lever to slide the pinion along the armature shaft, into or out of mesh with the ring gear teeth. The overrunning clutch is designed to transmit driving torque from the motor armature to the ring gear, but prevent the armature from overrunning after the engine has started.

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CONSTRUCTION



1 Magnetic switch assembly
2 Dust cover (Adjusting washer)
3 Torsion spring
4 Shift lever
5 Dust cover
6 Thrust washer
7 E-ring
8 Rear cover metal
9 Through bolt
10 Rear cover
11 Brush holder assembly
12 Brush (–)
13 Brush spring
14 Brush (+)
15 Yoke
16 Field coil assembly
17 Armature assembly
18 Center plate (S114-180 only)
19 Pinion assembly
20 Dust cover
21 Pinion stopper
22 Stopper clip
23 Gear case
24 Gear case metal

EE316

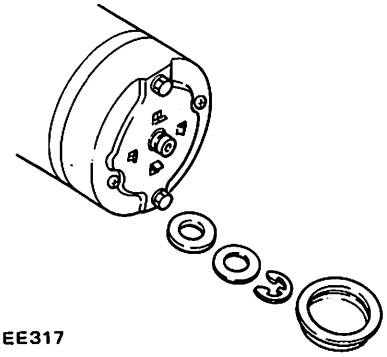
Fig. EE-7 Exploded view of starting motor

REMOVAL

1. Disconnect battery ground cable.
Disconnect black wire with yellow stripe from magnetic switch terminal, and black battery cable from battery terminal of magnetic switch.
2. Remove two bolts securing starting motor to transmission case. Pull starter assembly forward and remove starting motor.

DISASSEMBLY

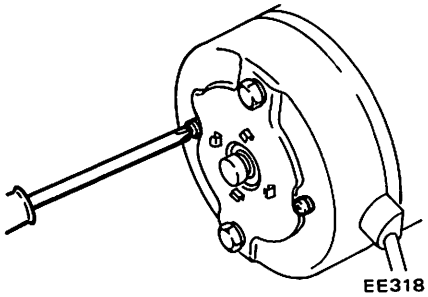
1. Disconnect connecting plate from "M" terminal of magnetic switch. Remove two screws securing magnetic switch and remove magnetic switch assembly.
2. Remove dust cover, E-ring and thrust washer(s).



EE317

Fig. EE-8 Removing dust cover, E-ring and thrust washer(s)

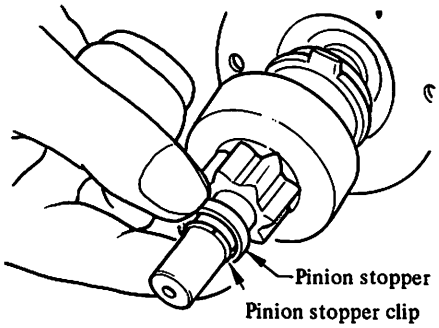
3. Remove two screws securing brush holder assembly.



EE318

Fig. EE-9 Removing brush holder setscrews

4. Remove two through bolts and rear cover.
5. Remove brushes from their holder by moving each brush spring away from brush with a hook.
Remove brush holder.
6. Remove yoke assembly and withdraw armature assembly and shift lever.
7. Remove pinion stopper located at the end of armature shaft. To remove stopper, first move stopper toward pinion and after removing stopper clip, remove stopper with overrunning clutch assembly from armature shaft.



EE277

Fig. EE-10 Removing pinion stopper

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CLEANING AND INSPECTION

Clean all disassembled parts, but do not use grease dissolving solvents for cleaning overrunning clutch, armature assembly, magnetic switch assembly and field coils since such a solvent would dissolve grease packed in clutch mechanism and would damage coils or other insulators.

Check them for excessive damage or wear, and replace if necessary.

TERMINAL

Check terminal for damage and wear, and replace magnetic switch assembly if necessary.

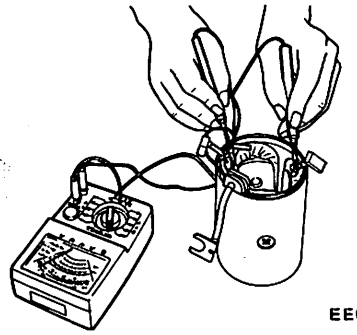
FIELD COIL

Check field coil for insulation. If the insulation of coil is damaged or worn it should be replaced.

Testing field coil for continuity:

Connect the probe of a circuit tester or an ohmmeter to field coil positive terminal and positive brush holder.

If tester shows no continuity, field circuit or coil is open.



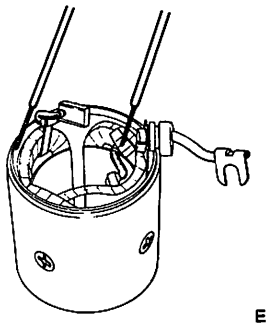
EE016

Fig. EE-11 Testing field coil for continuity

Testing field coil for ground:

Place one probe of circuit tester onto yoke and the other onto field coil lead (positive terminal).

If very little resistance is read, field coil is grounded.



EE017

Fig. EE-12 Testing field coil for ground

BRUSHES AND BRUSH LEAD WIRE

Check the surface condition of brush contact and wear of brush. If a loose contact is found it should be replaced.

If brush is worn so that its length is less than 12 mm (0.472 in), replace.

Check the connection of lead clip and lead wire.

Check brush holders and spring clip to see if they are not deformed or bent, and will properly hold brushes against the commutator.

If brushes or brush holders are dirty, they should be cleaned.

BRUSH SPRING TENSION

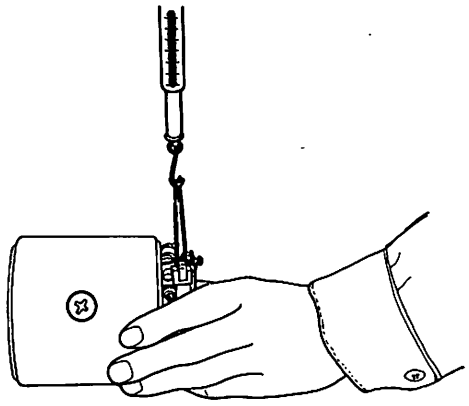
Check brush spring tension by a spring scale as shown in Figure EE-13. The reading should be 1.6 kg (3.5 lb). Replace spring if tension is lower than 1.4 kg (3.1 lb).

ARMATURE ASSEMBLY

Check external appearance of armature and commutator.

1. Inspect commutator. If the surface of commutator is rough, it must be sanded lightly with a No. 500 emery cloth. If the depth of insulating mica is less than 0.2 mm (0.0079 in) from commutator surface, insulating mica should also be undercut so that its depth is 0.5 to 0.8 mm (0.0197 to 0.0315 in).

The wear limit of commutator diameter is 2 mm (0.0787 in). If the diameter of commutator is less than 31 mm (1.221 in), replace armature assembly.



EE018

Fig. EE-13 Inspecting brush spring tension

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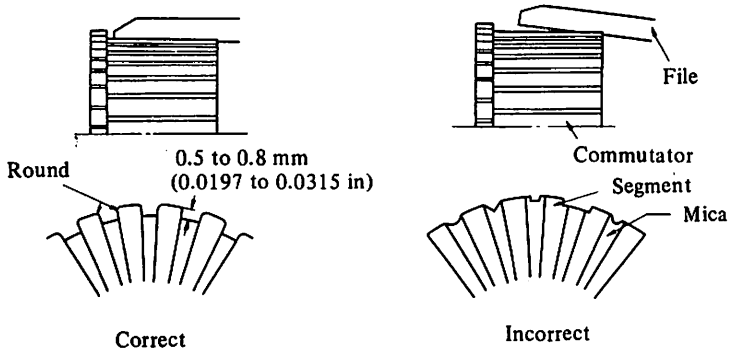


Fig. EE-14 Undercutting insulating mica

2. Inspect soldered connection of armature lead and commutator. If loose connection is found, solder it using resin flux.
3. Armature test for ground

Using a circuit tester, place one test probe onto armature shaft and other onto each commutator bar.

If tester shows continuity, armature is grounded and must be replaced.

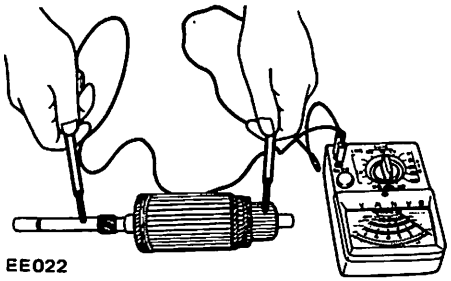


Fig. EE-15 Testing armature for ground

4. Check armature for short by placing it on armature tester (growler) with a piece of iron over armature core, rotating armature. If the plate vibrates, armature is shorted.

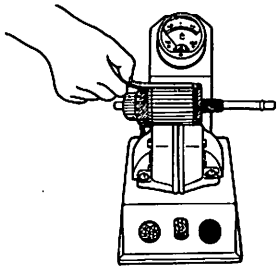


Fig. EE-16 Testing armature for short

5. Check armature for continuity by placing probes of tester on two segments side by side. If tester shows no continuity, the circuit is open.

OVERRUNNING CLUTCH ASSEMBLY

Inspect pinion assembly and screw sleeve. Screw sleeve must slide freely along armature shaft splines. If damage is found or resistance is felt when sliding, it must be repaired. Inspect pinion teeth. If excessive rubbing is found on teeth, replace. Flywheel ring gear also must be inspected.

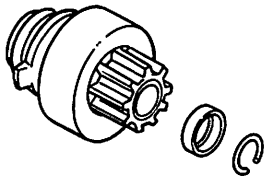


Fig. EE-17 Overrunning clutch assembly

BRUSH HOLDER TEST FOR GROUND

Using a circuit tester, place one test probe onto negative side of brush holder and another onto positive side. If tester shows continuity, brush holder is shorted to ground. Replace brush holder.

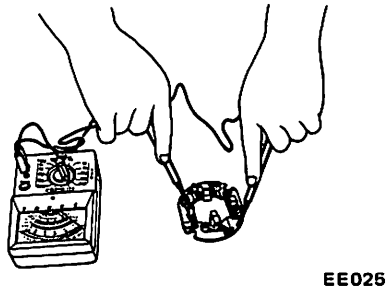


Fig. EE-18 Testing brush for ground

BEARING METAL

Inspect bearing metal for wear or side play. If the clearance between bearing metal and armature shaft is more than 0.2 mm (0.0079 in), replace metal.

MAGNETIC SWITCH ASSEMBLY

1. Using a circuit tester, check continuity between "S" terminal of magnetic switch and switch body metal. If continuity does not exist, shunt coil is opened.

Replace switch assembly.

2. In the same manner as above, check continuity between terminals "S" and "M". If continuity does not exist, series coil is opened.

Replace switch assembly.

ASSEMBLY

Reassemble starting motor in reverse sequence of disassembly.

When assembling, be sure to apply grease to gear case and rear cover bearing metal, and apply oil lightly to pinion.

TEST

PERFORMANCE TEST

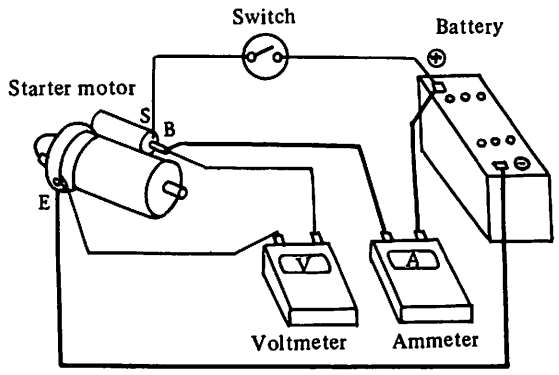
Starter motor should be subjected to a "no-load" test whenever it has been overhauled to ensure that its performance will be satisfactory when installed on engine. Starter motor should also be subjected to the test when the cause of abnormal operation is to be determined. A brief outline of the test is given below.

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No-load test

Connect starting motor in series with specified (12 volts) battery and an ammeter capable of indicating 1,000 amperes.

Specified current draw and revolution in these test are shown in "Specifications".



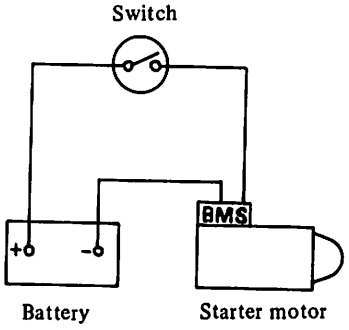
EE026

Fig. EE-19 No-load testing

Diagnoses of test

1. Low speed with no-load and high current draw may result from the following :
(1) Tight, dirty or worn bearings.
(2) Bent armature shaft or loosened field probe.
(3) Shorted armature;
Check armature further.
(4) A grounded armature or field;
a. Remove input terminal.
b. Raise two negative side brushes from commutator.
c. Using a circuit tester, place one probe onto input terminal and the other onto yoke.
d. If tester indicates continuity, raise the other two brushes and check field and armature separately to determine whether field or armature is grounded.
2. Failure to operate with high current draw may be caused by the following:
(1) A grounded or open field coil:
Inspect the connection and trace circuit with a circuit tester.
(2) Armature coil does not operate:
Inspect commutator for excessive burning. In this case, arc may occur on damaged commutator when motor is operated with no-load.
(3) Burned out commutator bar:
Weak brush spring tension, broken brush spring, rubber bush, thrust out of mica in commutator or a loose contact between brush and commutator would cause commutator bar to burn.
3. Low current draw and low no-load speed would cause high internal resistance due to loose connections, damaged leads, dirty commutator and causes listed on item 2-(3).

MAGNETIC SWITCH ASSEMBLY TEST

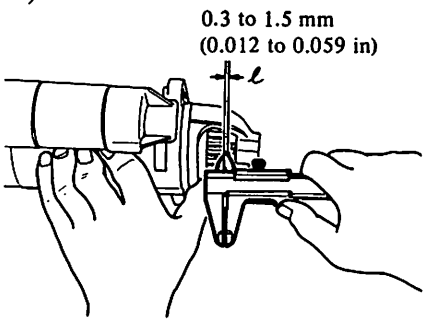


EE351

Fig. EE-20 Circuit of magnetic switch assembly test

If the starting motor check is "OK", check magnetic switch assembly. Connect cables between "negative" battery terminal and starting motor "M" terminal, "positive" battery terminal and starting motor "S" terminal connecting a switch in series as shown in Figure EE-20.

With the switch on, push pinion back to remove all slack and measure the clearance "ℓ" between pinion front edge and pinion stopper. The clearance should be held within 0.3 to 1.5 mm (0.012 to 0.059 in). If necessary, adjust it by changing or adding adjusting washer(s). Adjusting washers are available into two different sizes, 0.5 mm (0.020 in) and 0.8 mm (0.032 in).



EE028

Fig. EE-21 Measuring clearance "ℓ"

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SERVICE DATA AND SPECIFICATIONS

		Manual transmission	Automatic transmission
Type		S114-170	S114-180
System voltage	V	12	
No load			
Terminal voltage	V	12	
Current	A	Less than 60	
Revolution	rpm	More than 7,000	More than 6,000
Outer diameter of commutator	mm (in)	More than 31 (1.22)	
Brush length	mm (in)	More than 12 (0.47)	
Brush spring tension	kg (lb)	1.4 to 1.8 (3.1 to 4.0)	
Clearance between bearing metal and armature shaft	mm (in)	Less than 0.2 (0.008)	
Clearance "ℓ" between pinion front edge and pinion stopper	mm (in)	0.3 to 1.5 (0.012 to 0.059)	

TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Starting motor will not operate.	Discharged battery.	Charge or replace battery.
	Damaged solenoid switch.	Repair or replace solenoid switch.
	Loose connections of terminal.	Clean and tighten terminal.
	Damaged brushes.	Replace brushes.
	Starting motor inoperative.	Remove starting motor and make test.
Noisy starting motor.	Loose securing bolt.	Tighten.
	Worn pinion gear.	Replace.
	Poor lubrication.	Add oil.
	Worn commutator.	Replace.
	Worn brushes.	Replace.
Starting motor cranks slowly.	Discharged battery.	Charge.
	Loose connection of terminal.	Clean and tighten.
	Worn brushes.	Replace.
	Locked brushes.	Inspect brush spring tension or repair brush holder.

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Condition	Probable cause	Corrective action
Starting motor cranks slowly.	Dirty or worn commutator. Armature rubs field coil. Damaged solenoid switch.	Clean and repair. Replace assembly. Repair or replace.
Starting motor operates but does not crank engine.	Worn pinion. Locked pinion guide. Worn ring gear.	Replace. Repair. Replace.
Starting motor will not disengage even if ignition switch is turned off.	Damaged solenoid switch. Damaged gear teeth.	Repair or replace. Replace damaged gear.

CHARGING CIRCUIT

The charging circuit consists of the battery, alternator, regulator and necessary wiring to connect these parts. The purpose of this system is to convert mechanical energy from the engine into electrical energy which is used to operate all electrically operated units and to keep the battery fully charged.

When the ignition switch is set to "ON", current flows from the battery to ground through the ignition switch, voltage regulator IG terminal, primary side contact point "P1," movable contact point "P2", voltage regulator "F" terminal, alternator "F" terminal, rotor (field) coil and alternator "E" terminal, as shown in Figure EE-22 by full line arrow marks. Then the rotor in the alternator is excited. On the other hand, current flows from the battery to ground through the ignition switch, warning lamp, voltage regulator "L" terminal, lamp side contact point "P4", movable contact point "P5", and voltage regulator "E" terminal, as shown by dotted line arrow marks. Then, the warning lamp lights.

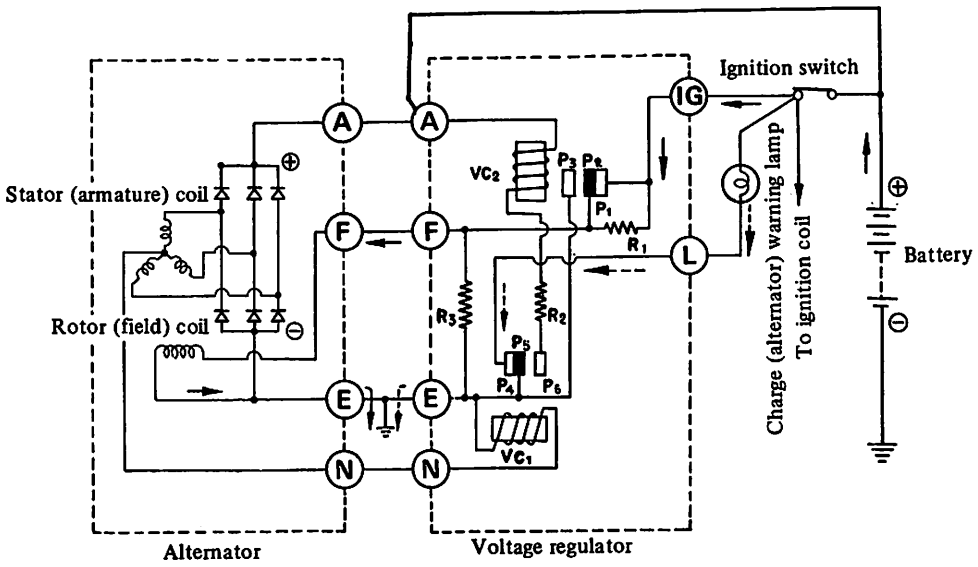
When the alternator begins to operate, three-phase alternating current is induced in the stator (armature) coil. This alternating current is rectified by the positive and negative silicon diodes. The rectified direct current output reaches the alternator "A" and "E" terminals.

On the other hand, the neutral point voltage reaches "N" and "E" terminals (nearly a half of the output voltage), and current flows from voltage regulator "N" terminal to "E" terminal or ground through the coil "VC1" as shown in Figure EE-23 by the dotted line arrow marks. Then, the coil "VC1" is excited, and the movable contact point "P5" comes into contact with voltage winding side contact point "P6". This action causes to turn off the warning lamp and complete the voltage winding circuit, as shown by the full line arrow marks.

When the alternator speed is increased or the voltage starts to rise excessively, the movable contact point "P2" is separated from the primary side contact "P1" by the magnetic force of coil "VC2". Therefore, registor "R1" is applied into the rotor circuit and output voltage is decreased. As the output voltage is decreased, the movable contact point "P2", and primary side contact "P1" comes into contact once again, and the alternator voltage increases. Thus, the rapid vibration of the movable contact point "P2", maintains an alternator output voltage constant.

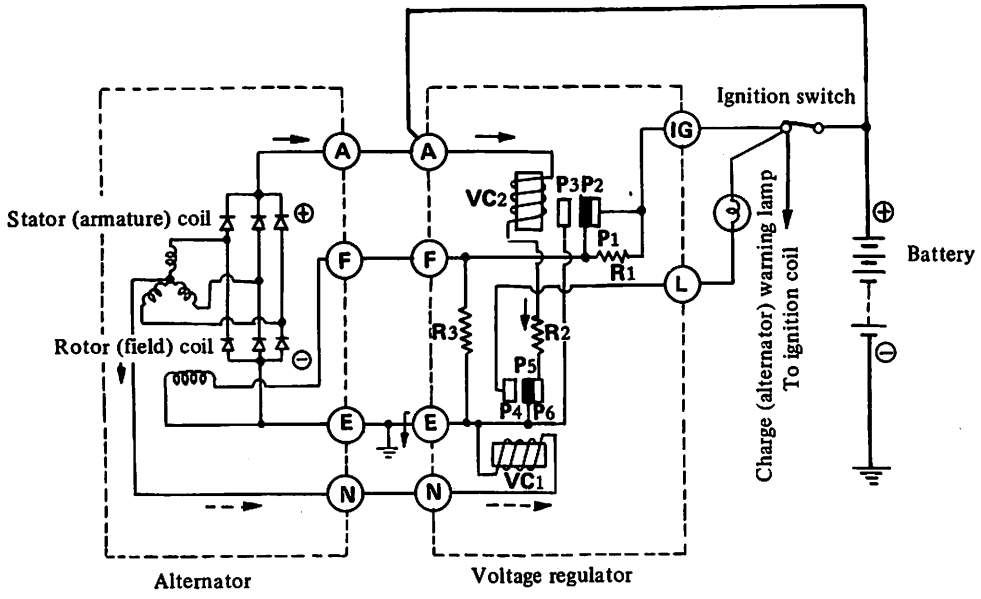
When the alternator speed is further increased or the voltage starts to rise excessively, the movable contact point "P2" comes into contact with secondary side contact point "P3". Then, the rotor current is shut off and alternator output voltage is decreased immediately. This action causes movable contact "P2" to separate from secondary contact "P3". Thus, the rapid vibration of the movable contact point "P2", or breaking and completing the rotor circuit, maintains an alternator output voltage constant.

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EE029

Fig. EE-22 Charging circuit (I)



EE030

Fig. EE-23 Charging circuit (II)

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ALTERNATOR

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INSPECTION OF DIODE EE-14
INSPECTION OF BRUSH EE-15
SPRING PRESSURE TEST EE-15
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DESCRIPTION

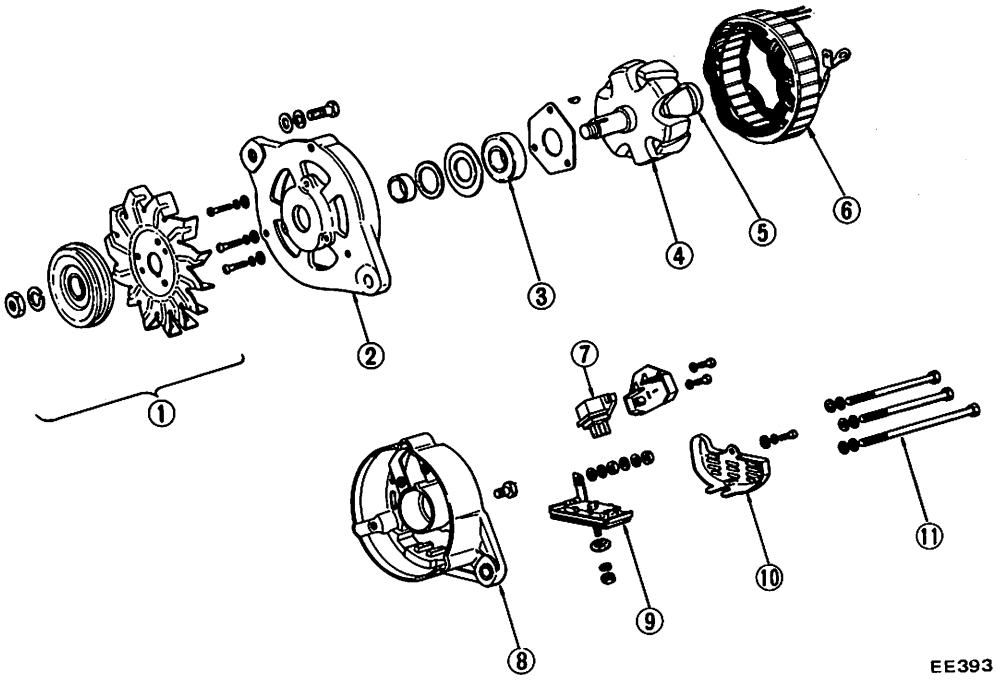
In the alternator, a magnetic field is produced by the rotor which consists of alternator shaft, field coil, pole pieces, and slip rings. The slip rings pressed in the shaft conduct only a small field current. Output current is generated in the armature coils located in the stator. The stator has three windings and generates three-phase alternating current. Silicon diodes act like a one-way valve for electricity so that charging current passes easily but reverse current is shut out.

In this alternator, pack type silicon diodes are used.

Six diodes (three negative and three positive), are installed in positive and negative plates as an assembly.

These diodes are direct-soldered at their tips, and constructed with positive and negative conjunction.

They are mounted on the two plates which combine the function of heat-dissipating plate and positive/negative terminals and are light in weight and easy to service.



1 Pulley assembly
2 Front cover
3 Front bearing
4 Rotor
5 Rear bearing
6 Stator
7 Brush assembly
8 Rear cover
9 Diode (set plate) assembly
10 Diode cover
11 Through bolts

Fig. EE-24 Exploded view of alternator

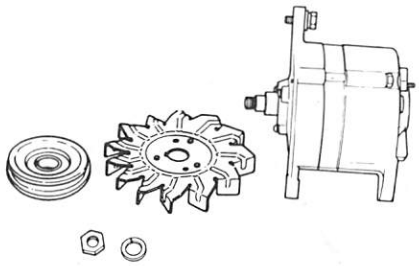
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REMOVAL

1. Disconnect battery negative cable.
2. Disconnect two lead wires and connector from alternator.
3. Loosen adjusting bolt.
4. Remove alternator drive belt.
5. Remove parts associated with alternator from engine.
6. Remove alternator from car.

DISASSEMBLY

1. Remove pulley nut and pulley assembly.

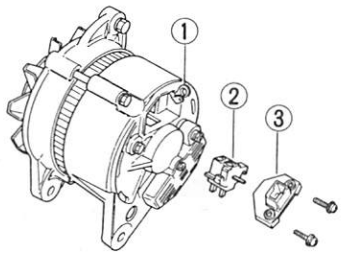


EE362

Fig. EE-25 Removing pulley and fan

2. Remove brush holder fixing screws, and remove brush holder cover. Pull brush holder forward, and remove brushes together with brush holder.

Note: Do not disconnect N terminal from stator coil lead wire.

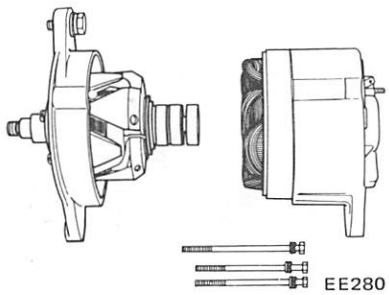


EE209

1 "N" terminal
2 Brush holder
3 Brush holder cover

Fig. EE-26 Removing brush

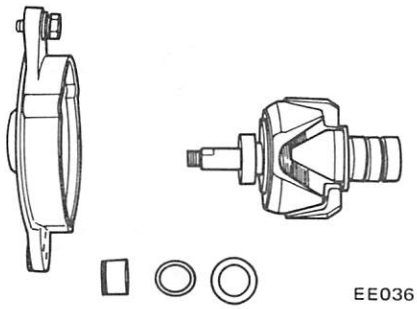
3. Remove through bolts. Separate front cover with rotor from rear cover with stator by lightly tapping front bracket with a wooden mallet.



EE280

Fig. EE-27 Separating front cover with rotor from rear cover

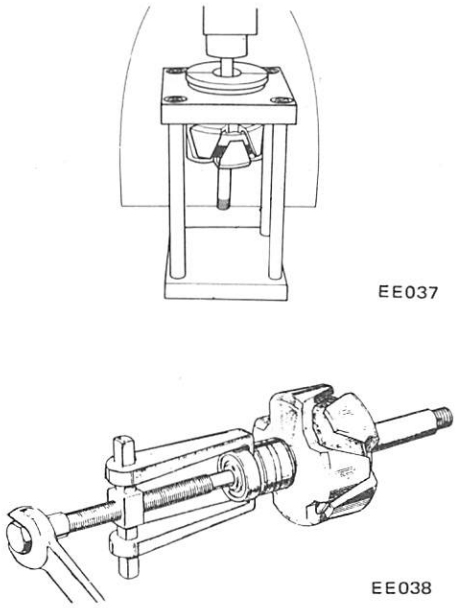
4. Remove three set screws from bearing retainer, and separate rotor from front cover.



EE036

Fig. EE-28 Removing rotor

5. Pull rear bearing out from rotor assembly with a press or bearing puller.

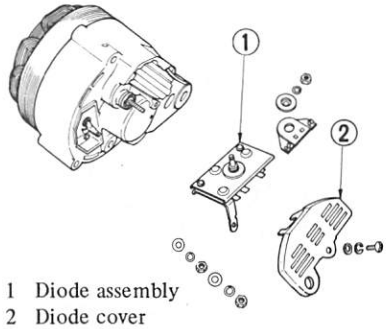


EE037

EE038

Fig. EE-29 Pulling out of rear bearing

6. Remove diode cover fixing screw, and remove diode cover. Disconnect three stator coil lead wires from diode terminal with a soldering iron.
7. Remove A terminal nut and diode installation nut, and remove diode assembly.



1 Diode assembly
2 Diode cover

EE394

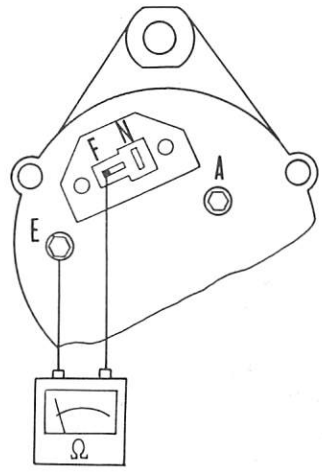
Fig. EE-30 Removing diode assembly

Note: Use care in handling diode assembly to prevent an undue stress on it.

INSPECTION AND REPAIR

Remove alternator from car and connect a circuit tester between F terminal and E terminal.

When the resistance is approximately 5Ω, the condition of brush and field coil is satisfactory. When no continuity exists in brush or field coil, or when resistance differs significantly between those parts, disassemble and inspect.



EE282

Fig. EE-31 Inspecting alternator

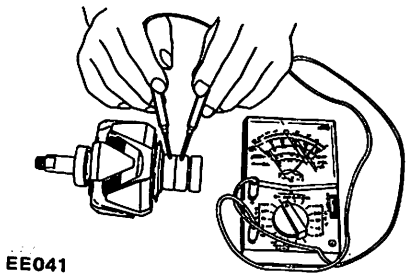
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ROTOR INSPECTION

1. Continuity test of rotor coil

Apply tester between slip rings of rotor as shown in Figure EE-32. If there is no continuity field coil is open.

Replace rotor assembly.

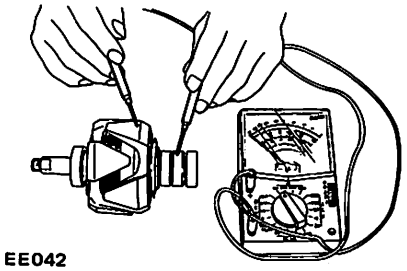


EE041

Fig. EE-32 Continuity test of rotor coil

2. Ground test of rotor coil

Check continuity between slip ring and rotor core. If continuity exists, replace rotor assembly, because rotor coil or slip ring may be grounded.



EE042

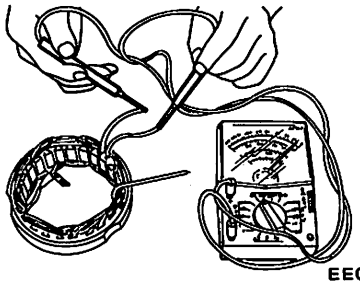
Fig. EE-33 Testing rotor coil for ground

INSPECTION OF STATOR

1. Continuity test

Stator is normal when there is continuity between individual stator coil terminals. When there is no continuity between individual terminals, cable is broken.

Replace stator assembly.

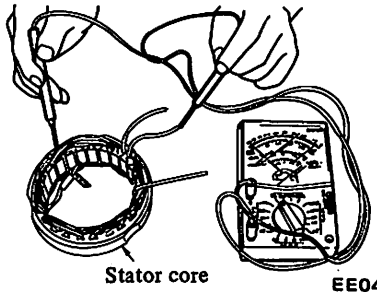


EE043

Fig. EE-34 Testing stator for continuity

2. Ground test

If each lead wire of stator coil (including neutral wire) is not conductive with stator core, condition is satisfactory. If there is continuity, stator coil is grounded.

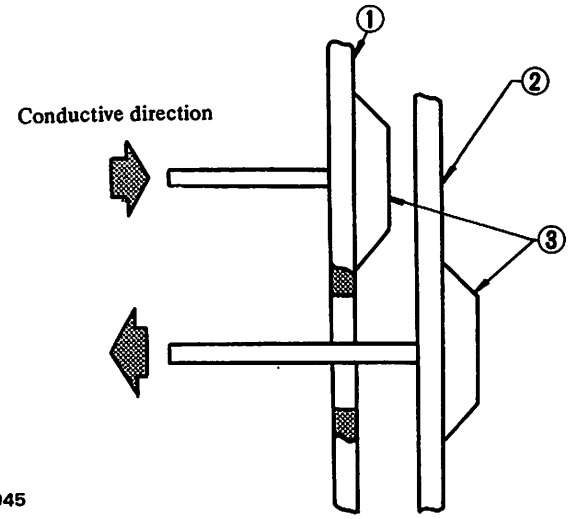


EE044

Fig. EE-35 Testing stator for ground

INSPECTION OF DIODE

Perform a continuity test on diodes in both directions, using an ohmmeter. A total of six diodes are used; three are mounted on the positive ⊕ plate, and other three are on the negative ⊖ plate. The continuity test should be performed on each diode, between the terminal and plate.

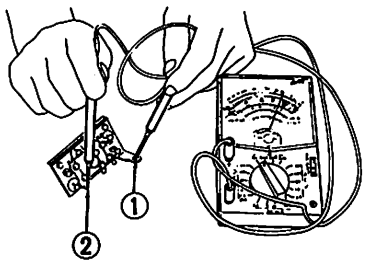


EE045

1 (+) plate
2 (−) plate
3 Diode

Fig. EE-36 Conductive direction of diode

Diode installed on ⊕ plate is a positive diode which allows current flowing from terminal to ⊕ plate only. In other words, current does not flow from ⊕ plate to terminal.

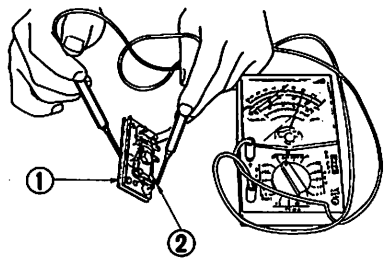


1 (+) plate
2 Terminal

EE046

Fig. EE-37 Inspecting positive diode

Diode installed on ⊖ plate is a negative diode which allows current flowing from ⊖ plate to terminal only. In other words, current does not flow from terminal to ⊖ plate.



1 (−) plate
2 Terminal

EE047

Fig. EE-38 Inspecting negative diode

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If current flows in both positive and negative directions, diode is short-circuited. If current flows in one direction only, diode is in good condition.

If there is a faulty diode, replace all diodes (six diodes) as an assembly. (See table below.) These diodes are unserviceable.

Test probe of a circuit tester		Conduction
⊖	⊕	
terminal	⊕ plate	O
⊕ plate	terminal	–
terminal	⊖ plate	–
⊖ plate	terminal	O
⊖ plate	⊕ plate	O
⊕ plate	⊖ plate	–

INSPECTION OF BRUSH

Check movement of brush and if movement is not smooth, check brush holder and clean if necessary.

Check brush for wear. If it is worn down to less than the specified limit, replace brush assembly.

Check brush pig tail and, if damaged, replace.

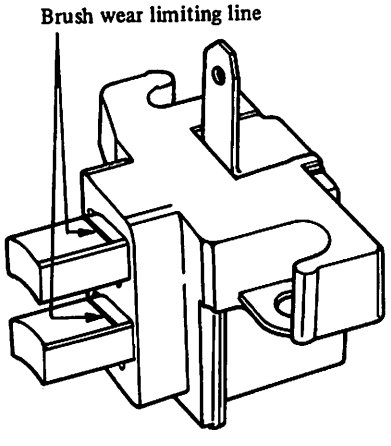


Fig. EE-39 Brush wear limit

SPRING PRESSURE TEST

With brush projected approximately 2 mm (0.079 in) from brush holder, measure brush spring pressure by the use of a spring balance. Normally, the rated pressure of a new brush spring is 255to 345 gr (9.0 to 12.2 oz).

Moreover, when brush is worn, pressure decreases approximately 20 g (0.7 oz) per 1 mm (0.0394 in) wear.

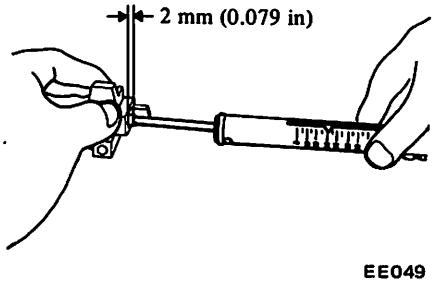
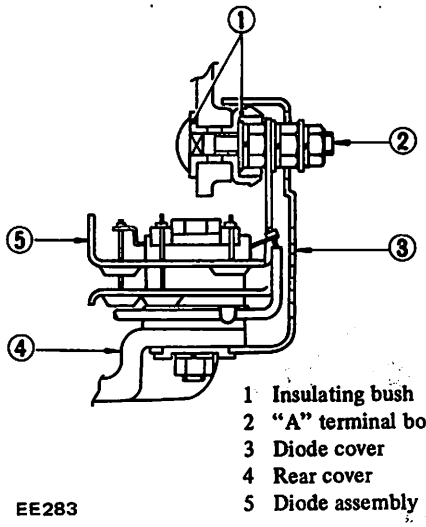


Fig. EE-40 Measuring spring pressure

ASSEMBLY

Reassemble alternator in the reverse sequence of disassembly noting the following:

1. When soldering each stator coil lead wire to diode assembly terminal, carry out the operation as fast as possible.
2. When installing diode A terminal, install insulating bush correctly.



1 Insulating bush
2 "A" terminal bolt
3 Diode cover
4 Rear cover
5 Diode assembly

Fig. EE-41 Sectional view of diode and A terminal

3. Tighten pulley nut with tightening torque of 3.5 to 4.0 kg-m (25.3 to 29.0 ft-lb). When pulley is tightened, make sure that deflection of V-groove is less than 0.3 mm (0.0118 in).

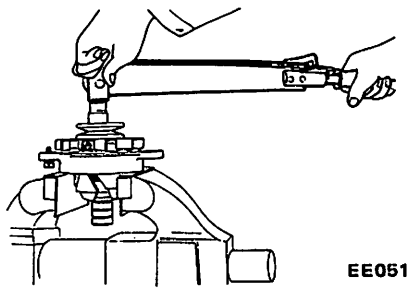


Fig. EE-42 Tightening pulley nut

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ALTERNATOR TEST

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.

Set up a test circuit as shown in Figure EE-43 and test alternator in the manner indicated in the flow chart below:

1. Disconnect connectors at alternator.
2. Connect "A" terminal to "F" terminal.
3. Connect one test probe from voltmeter positive terminal to "A" terminal. Connect the other test probe to ground. Make sure that voltmeter registers battery voltage.
4. Turn on headlights and switch to High Beam.
5. Start engine.
6. Increase engine speed gradually until it is approximately 1,100 rpm, and take the voltmeter reading.

Measured value: Below 12.5 Volts
Alternator is in trouble. remove and check it for condition.

Measured value: Over 12.5 Volts
Alternator is in good condition.

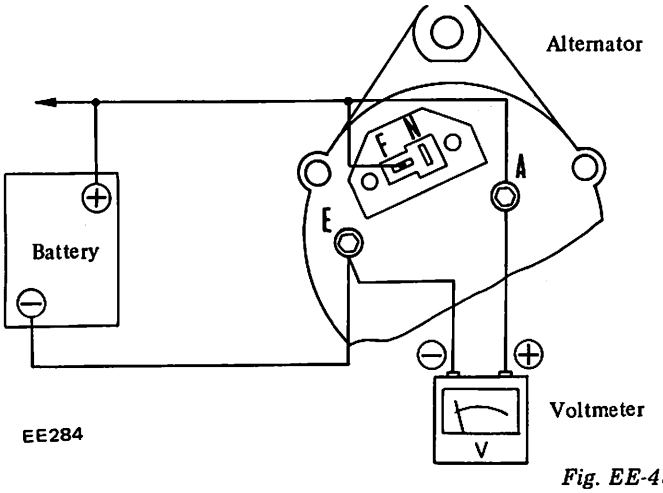


Fig. EE-43 Testing alternator

Notes:

a. **Do not run engine at the speed of more than 1,100 rpm while test is being conducted on alternator.**

b. **Do not race engine.**

SERVICE DATA AND SPECIFICATIONS

Type		LT150-13	LT160-24
Applicable to		For U.S.A.	For Canada
Nominal rating	V-A	12-50	12-60
Ground poloarity		Negative	Negative
Minimum revolution under no load (When 14 volt is applied)	rpm	Less than 1,000	Less than 1,000
Hot output current	A/rpm	37.5/2,500	45/2,500
		50/5,000	60/5,000
Pulley ratio		2.25	2.09
Brush			
Length	mm (in)	More than 7.5 (0.31)	More than 7.5 (0.31)
Spring pressure	gr (oz)	255 to 345 (9.0 to 12.2)	255 to 345 (9.0 to 12.2)
Slip ring outer diameter	mm (in)	More than 30 (1.18)	More than 30 (1.18)

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REGULATOR

CONTENTS

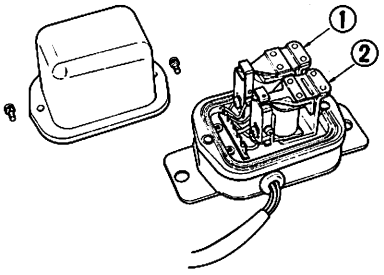
DESCRIPTION EE-17
MEASUREMENT OF REGULATOR VOLTAGE EE-18
ADJUSTMENT EE-20
VOLTAGE REGULATOR EE-20
CHARGING RELAY EE-20
SERVICE DATA AND SPECIFICATIONS EE-21
TROUBLE DIAGNOSES AND CORRECTIONS (Including alternator) EE-22

DESCRIPTION

The regulator consists basically of a voltage regulator and a charge relay. The voltage regulator has two sets of contact points, a lower set and an upper set, to control alternator voltage. An armature plate placed between the two sets of contacts moves upward or downward or vibrates. The lower contacts, when closed, complete the field circuit direct to ground; and the upper contacts, when closed, complete the field circuit to ground through a resistance (field coil), and produce alternator output.

The charge relay is similar in construction to the voltage regulator.

When the upper contacts are closed, charge warning lamp goes on.

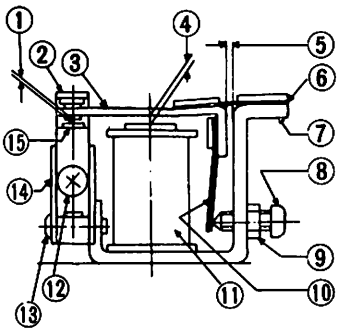


1 Charge relay
2 Voltage regulator

EE285

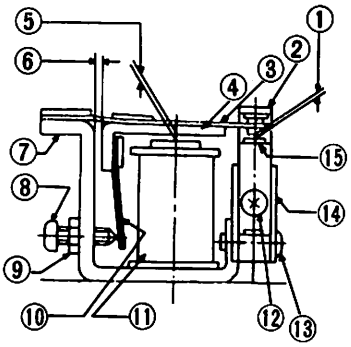
Fig. EE-44 View of removing cover

As regards the construction, the voltage regulator is very similar to the charge relay as shown in Figure EE-45.



1 Point gap
2 Low speed contact
3 Armature
4 Core gap
5 Yoke gap
6 Connecting spring
7 Yoke
8 Adjusting screw
9 Lock nut
10 Adjust spring
11 Coil
12 3 mm (0.118 in) dia. screw
13 4 mm (0.157 in) dia. screw
14 Contact set
15 High speed contact

(a) Construction of voltage regulator



EE353

1 Point gap
2 Charge relay contact
3 Connecting spring
4 Armature
5 Core gap
6 Yoke gap
7 Yoke
8 Adjusting screw
9 Lock nut
10 Adjust spring
11 Coil
12 3 mm (0.118 in) dia. screw
13 4 mm (0.157 in) dia. screw
14 Contact set
15 Voltage regulator contact

(b) Construction of charge relay

Fig. EE-45 Structural view

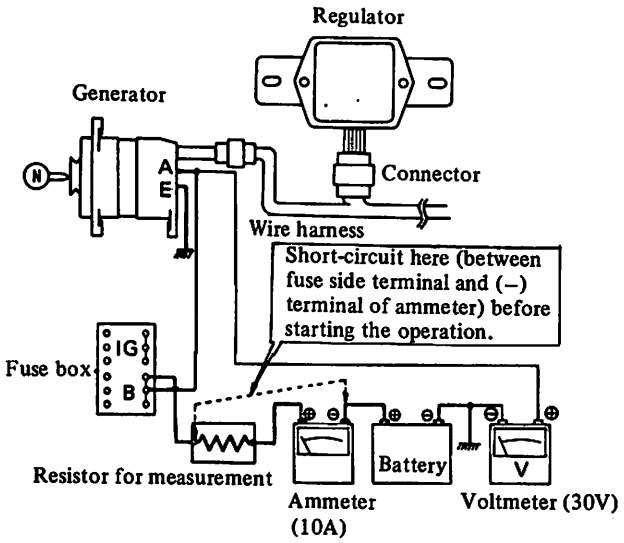
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MEASUREMENT OF REGULATOR VOLTAGE

Regulator voltage is measured with regulator assembled with alternator. When measuring voltage with regulator mounted on car, it is necessary to rotate engine at high speed.

Connect DC voltmeter (15-30V), DC ammeter (15-30A), battery and a 0.25Ω resistor (rated at 25W) with cables as shown.

1. Check to be sure that all electrical loads such as lamps, air conditioner, radio etc. are turned off.
2. Before starting engine, be sure to make short circuit with a cable between fuse side terminal of resistor (0.25Ω) and negative side terminal of ammeter. Failure to follow this precaution will cause needle of ammeter to swing violently, resulting in a damaged ammeter.

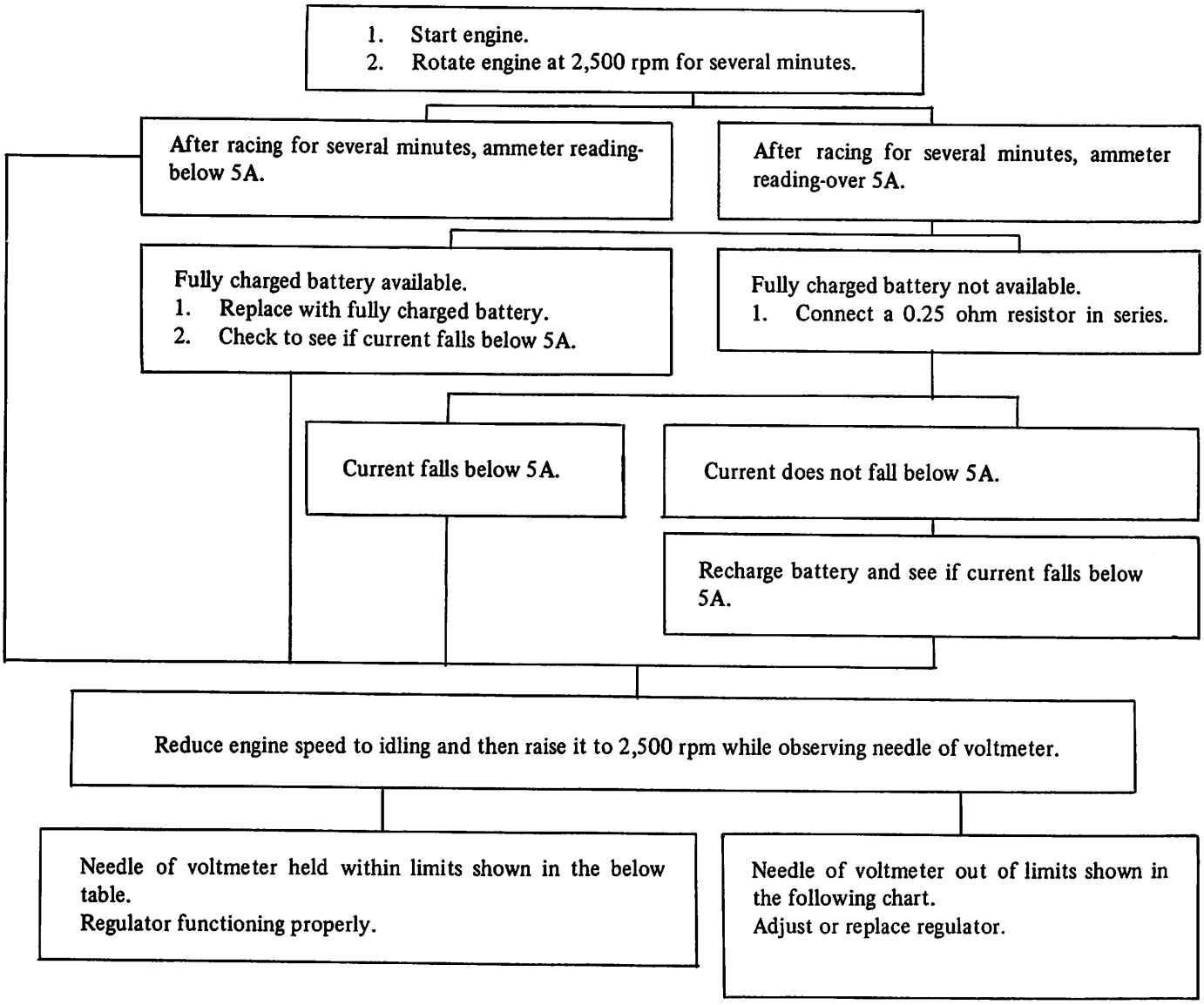


EE055

Fig. EE-46 Measuring regulator voltage with regulator on vehicle

3. Refer to the following chart to determine if regulator and relative parts are in good condition:

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Regulator type TL1Z-82

Temperature °C (°F)	Voltage V
−10 (14)	14.75 to 15.75
0 (32)	14.60 to 15.60
10 (50)	14.45 to 15.45
20 (68)	14.30 to 15.30
30 (86)	14.15 to 15.15
40 (104)	14.00 to 15.00

Notes:

a. Do not measure voltage immediately after driving. Do this while regulator is cold.

b. To measure voltage, raise engine speed gradually from idling to rated speed.

c. Voltage may be approximately 0.3 V higher than rated for two to three minutes after engine is started, or more specifically, when regulator becomes self-heated. Measurements should then be made within one minute after starting engine, or when regulator is cold.

d. The regulator is of a temperature-compensating type. Before measuring voltage, be sure to measure surrounding temperature and correct measurements according to the table at left.

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ADJUSTMENT

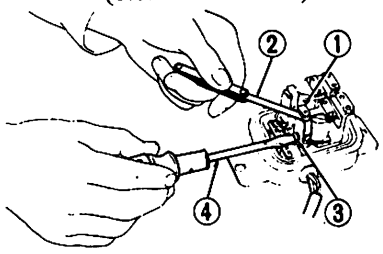
VOLTAGE REGULATOR

When regulating voltage, as measured above, deviates from rated value, adjust regulator in accordance with the following instructions.

1. Inspect contact surface, and if rough, lightly polish with fine emery paper (#500 or 600).
2. Measure each gap, and adjust if necessary. Adjust core gap and point gap in that order. No adjustment is required for yoke gap.
3. Adjusting core gap.

Loosen screw [4 mm (0.157 in) diameter] which is used to secure contact set on yoke, and move contact upward or downward properly. (See Figure EE-47.)

Core gap:
0.6 to 1.0 mm
(0.024 to 0.039 in)



EE242

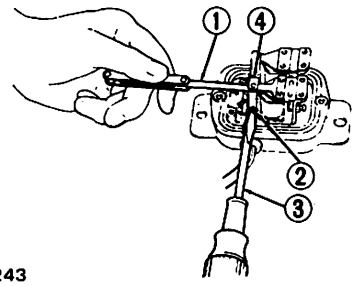
1 Contact set
2 Thickness gauge
3 4 mm (0.157 in) dia. screw
4 Crosshead screwdriver

Fig. EE-47 Adjusting core gap

4. Adjusting point gap

Loosen screw [3 mm (0.118 in) diameter] used to secure upper contact, and move upper contact upward or downward as necessary. (See Figure EE-48.)

Point gap:
0.3 to 0.4 mm
(0.012 to 0.016 in)



EE243

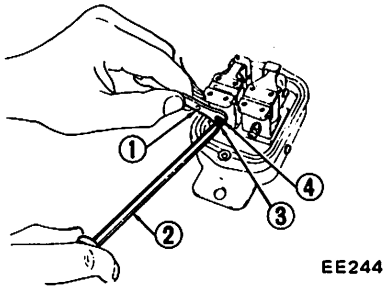
1 Thickness gauge
2 3 mm (0.118 in) dia. screw
3 Crosshead screwdriver
4 Upper contact

Fig. EE-48 Adjusting point gap

5. Adjusting voltage

Adjust regulating voltage as follows:

Loosen lock nut securing adjusting screw. Turn this screw clockwise to increase, or counterclockwise to decrease, regulating voltage. (See Figure EE-49.)



EE244

1 Wrench
2 Crosshead screwdriver
3 Adjusting screw
4 Lock nut

Fig. EE-49 Adjusting regulating voltage

CHARG RELAY

Normal relay operating voltage is 8 to 10V as measured at alternator "A" terminal. Relay itself, however, operates at 4 to 5 V.

Use a DC voltmeter, and set up a circuit as shown in Figure EE-50.

Adjust charge relay in the same manner as that for voltage regulator.

1. Connect positive terminal of voltmeter to regulator lead connector "N" terminal with negative terminal grounded.
2. Start engine and keep it idle.
3. Take voltmeter reading.

0 Volt

1. Check for continuity between "N" terminals of regulator and alternator.
2. Alternator circuit inoperative if continuity exists.

Below 5.2 Volts

(Charge warning lamp on.)
1. Check fan belt tension.
2. If correct, remove regulator and adjust as necessary.

Over 5.2 Volts

(Charge warning lamp on.)
Charge relay coil or contact points out of order.
Replace regulator.

Over 5.2 Volts

(Charge warning lamp off.)
Charge relay assembly is in good condition.

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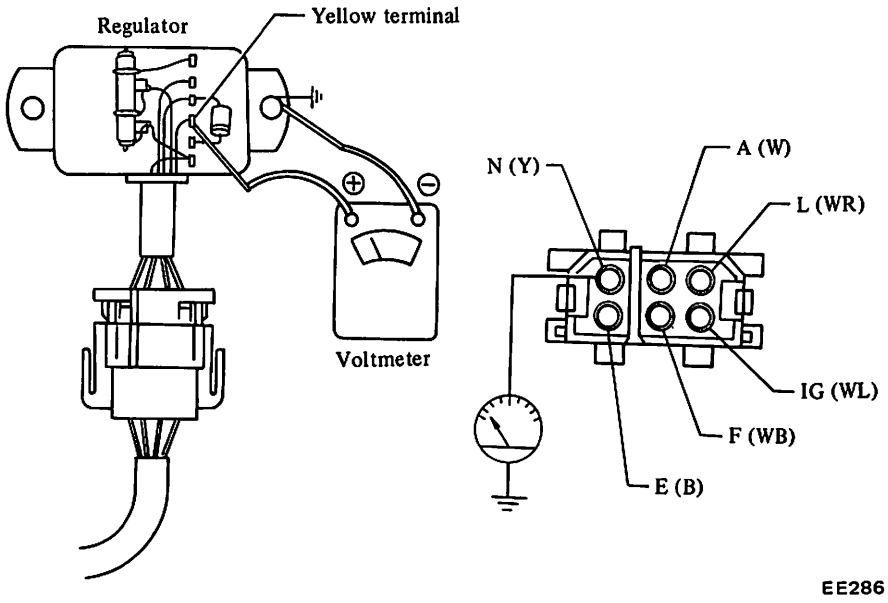


Fig. EE-50 Testing charging relay

SERVICE DATA AND SPECIFICATIONS

Voltage regulator

Type		TL1Z-82
Regulating voltage (with fully charged battery)	V	*14.3 to 15.3 [at 20°C (68°F)]
Voltage coil resistance	Ω	10.5 [at 20°C (68°F)]
Rotor coil inserting resistance	Ω	10
Voltage coil series resistance	Ω	31
Smoothing resistance	Ω	40
Core gap	mm (in)	0.6 to 1.0 (0.024 to 0.039)
Point gap	mm (in)	0.3 to 0.4 (0.012 to 0.016)

Charge relay

Release voltage	V	4.2 to 5.2 at "N" terminal
Voltage coil resistance	Ω	37.8 [at 20°C (68°F)]
Core gap	mm (in)	0.8 to 1.0 (0.031 to 0.039)
Point gap	mm (in)	0.4 to 0.6 (0.016 to 0.024)

*Standard temperature gradient: –0.015V/°C

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TROUBLE DIAGNOSES AND CORRECTIONS (Including alternator)

Condition	Probable cause	Corrective action
No output	Sticking brushes.	Correct or replace brushes and brush springs.
	Dirty brushes and slip rings.	Clean.
	Loose connections or broken leads.	Retighten or solder connections. Replace leads if necessary.
	Open stator winding.	Repair or replace stator.
	Open rotor winding.	Replace rotor.
	Open diodes.	Replace.
	Shorted rotor.	Replace rotor.
	Shorted stator.	Repair or replace.
	Ground "A" terminal.	Replace insulator.
	Broken fan belt.	Replace.
Excessive output	Broken neutral wire (color of wire is yellow.)	Replace.
	Voltage regulator breakdown.	Check regulator operation and repair or replace as required.
	Poor grounding of alternator and voltage regulator "E" terminal.	Retighten terminal connection.
	Broken ground wire (color of wire is black.)	Replace.
Low output	Loose or worn fan belt.	Retighten or replace.
	Sticking brushes.	Correct or replace brushes and springs if necessary.
	Low brush spring tension.	Replace brush springs.
	Voltage regulator breakdown.	Check regulator operation and repair or replace as required.
	Dirty slip rings.	Clean.
	Partial short, ground, or open in stator winding.	Replace stator.
	Partially shorted or grounded rotor winding.	Replace rotor.
	Open or damaged diode.	Replace diode.
Noisy alternator	Loose mounting.	Retighten bolts.
	Loose drive pulley.	Retighten.
	Broken ball bearing.	Replace.
	Improperly seated brushes.	Seat correctly.

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IGNITION CIRCUIT

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NON-CALIFORNIA MODELS

The ignition circuit consists of the ignition switch, coil, distributor, wiring, spark plugs and battery.

The circuit is equipped with a resistor. During cranking, electrical current bypasses the resistor, thereby connecting the ignition coil directly to battery. This provides full battery voltage available at coil and keeps ignition voltage as high as possible.

The low voltage current is supplied by the battery or alternator and flows through the primary circuit. It consists of the ignition switch, resistor, primary winding of the ignition coil, distributor contact points, condenser and all connecting low tension wiring.

The high voltage current is produced by the ignition coil and flows through the secondary circuit, resulting in high voltage spark between the electrodes of the spark plugs in engine cylinders. This circuit contains the secondary winding of the ignition coil, high tension wiring, distributor rotor and cap.

When the ignition switch is turned on and the distributor contact points are closed, the primary current flows through the primary winding of the coil and through the contact points to ground.

When the contact points are opened by the revolving distributor cam, the magnetic field built up in the primary winding of the coil moves through the secondary winding of the coil inducing high voltage. The high voltage is produced every time the contact points open. The high voltage current flows through the high tension wire to the distributor cap. Then the rotor distributes the current to one of the spark plug terminals in the distributor cap.

Then the spark obtains while the high voltage current jumps the gap between the insulated electrode and the ground side electrode of the spark plug. This process is repeated for each power stroke of the engine.

The distributor contact point and spark plugs should be inspected, cleaned and regapped at tune up. They should also be replaced periodically as specified in the "Maintenance Schedule". In addition, apply grease (NLGI consistency No. 1 containing MoS_2 or equivalent) to distributor shaft and grease (MIL-G-10924B containing MoS_2 or equivalent) to cam as required.

The remainder of the ignition component parts should be inspected for only their operation, tightness of electrical terminals, and wiring condition.

The ignition circuit is shown below:

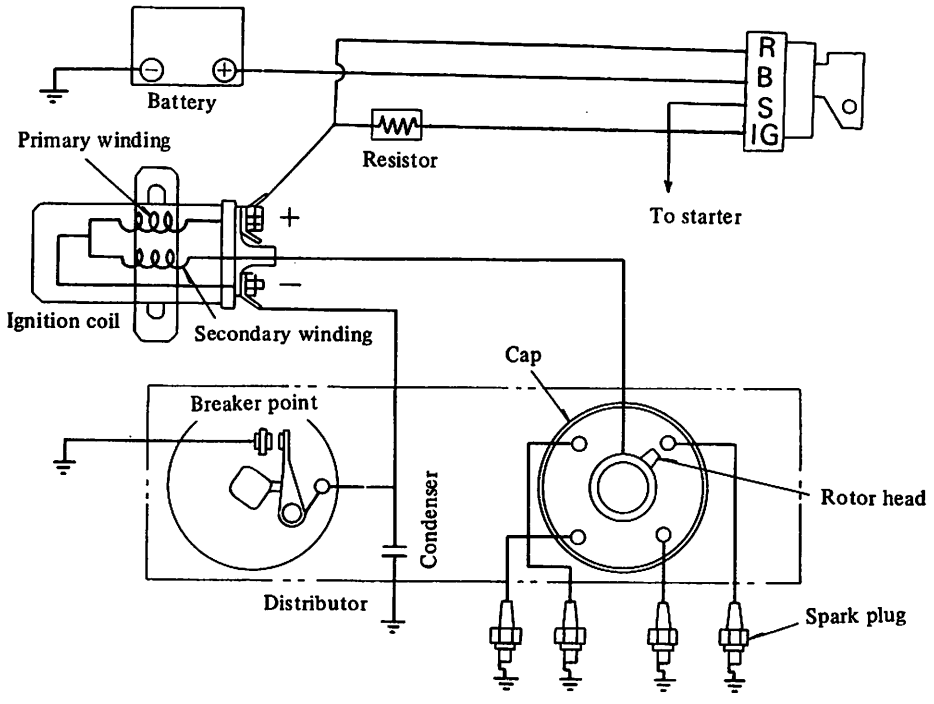


Fig. EE-51 Ignition system circuit diagram

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CALIFORNIA MODELS

The ignition circuit consists of ignition switch, transistor ignition unit, distributor, wiring, spark plugs and battery.

The distributor is of the contactless type and is equipped with a pick-up coil which electrically detects the ignition timing signal in place of the circuit breaker of the conventional distributor. The transistor ignition unit is a new addition, which generates the signal required for the make and break of the primary electric current for the ignition coil.

The circuit is equipped with a resistor. During cranking, electrical current bypasses the secondary resistor, thereby connecting the ignition coil through the primary resistor. This makes battery voltage available at efficiently and keeps ignition voltage as high as possible.

The primary resistor serves to protect transistor ignition circuit.

The low voltage current is supplied by the battery or alternator and flows through the primary circuit.

It consists of the ignition switch, resistor, primary winding of the ignition coil, transistor ignition unit and all connecting low tension wiring.

The high voltage current is produced by the ignition coil and flows through the secondary circuit, resulting in high voltage spark between the electrodes of the spark plugs in engine cylinders.

This circuit contains the secondary winding of the ignition coil, distributor high tension wires to coil and spark plugs, distributor rotor and cap.

When the ignition switch is turned on and the distributor reluctor rotates, the primary current flows through the primary winding of the coil and through transistor ignition unit to ground.

When the primary circuit is opened by circuit of transistor ignition unit, the magnetic field built up in the primary winding of the coil moves through the secondary winding of the coil, inducing high voltage. This high voltage is produced every time the primary circuit opens.

The high voltage current flows through the high tension wire to the distributor cap, then the rotor distributor cap, then the rotor distributes the current to one of the spark plug terminals in the distributor cap.

Then the spark occurs while the high voltage current jumps the gap between the insulated electrode and the ground side electrode of the spark plug. This process is repeated for each power stroke of the engine.

The spark plug should be inspected, cleaned and regapped at tune up. Spark plugs should also be replaced periodically as specified in the "Maintenance Schedule".

The remainder of the ignition component parts should be inspected for only their operation, air gap of distributor, tightness of electrical terminals, and wiring condition.

Apply grease (NLGI consistency No. 1 containing MoS_2 or equivalent) to distributor rotor shaft as required.

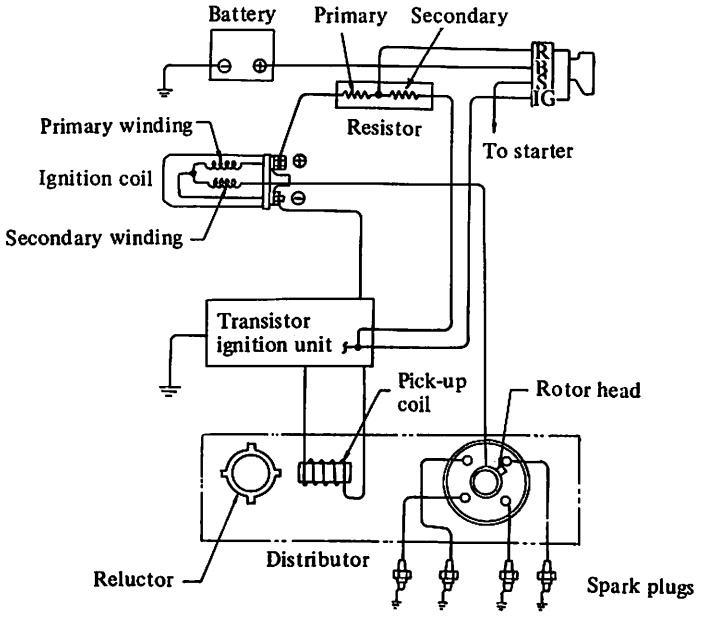


Fig. EE-52 Ignition system circuit diagram

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DISTRIBUTOR (Non-California models)

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DISASSEMBLY EE-27
ASSEMBLY EE-27
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CONSTRUCTION

The distributor consists of breaker plate with contact points, centrifugal advance mechanism, vacuum controller, distributor shaft and rotor.

1 Cap assembly
2 Rotor head assembly
3 Condenser assembly
4 Ground wire assembly
5 Lead wire assembly
6 Contact set
7 Breaker plate assembly
8 Packing
9 Cam assembly
10 Governor spring
11 Governor weight
12 Shaft assembly
13 Vacuum controller
14 Terminal assembly
15 Housing
16 Fixing plate
17 O-ring
18 Collar

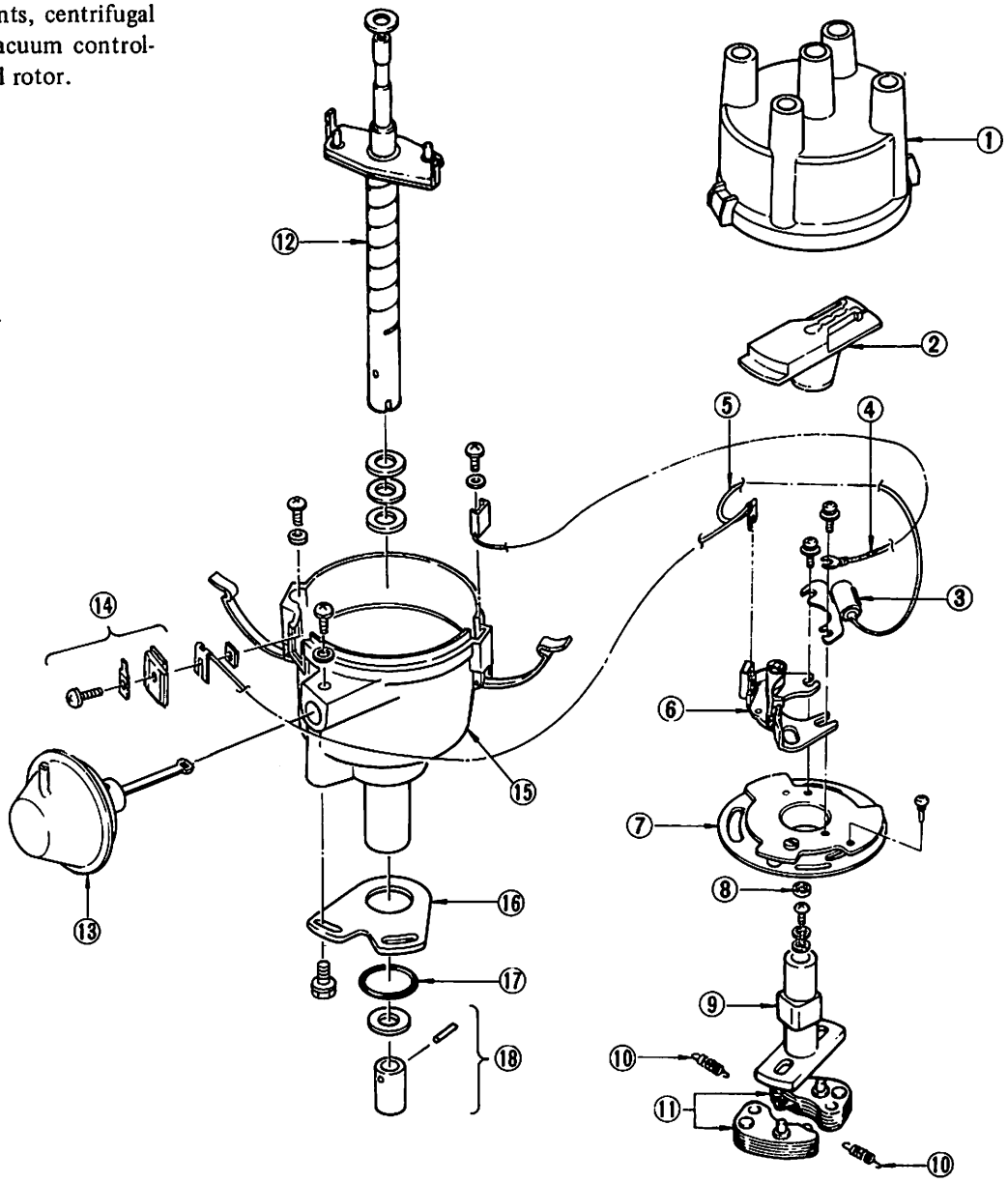


Fig. EE-53 Components of distributor

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CHECKING AND ADJUSTMENT

CAP AND ROTOR HEAD

Cap and rotor head should be inspected periodically as specified in the "Maintenance Schedule". Remove cap and clean all dust and carbon deposits from cap and rotor. If cap is cracked or is leaking, replace with a new one.

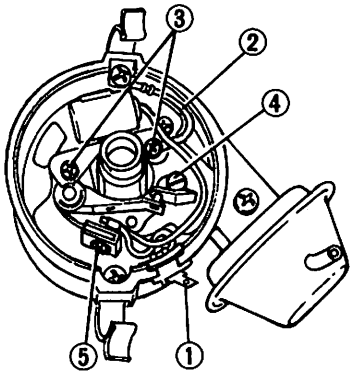
CONTACT POINT

Contact point should be replaced in accordance with the "Maintenance Schedule".

Standard point gap is 0.45 to 0.55 mm (0.0177 to 0.0217 in). In case size is off the standard, adjustment is made by loosening point screws. Gap gauge is required for adjustment.

When point surface is rough, take off any irregularities with fine sand paper of No. 500 or 600 or with oil stone.

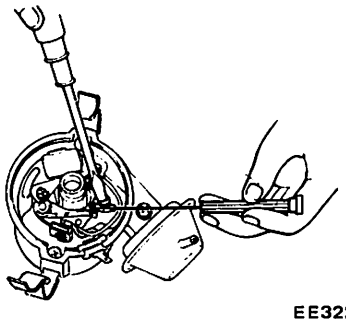
When wear on contact points is noticeable, replace points together with contact arm. To replace, proceed as follows:



1 Primary lead terminal
2 Ground lead wire
3 Set screw
4 Adjuster
5 Screw

EE321

Fig. EE-54 Breaker



EE322

Fig. EE-55 Adjusting point gap

First turn out set screws 1 to 1.5 turns at contact arm and primary lead wire connection just for enough to pull out primary lead terminal.

Referring to Figure EE-54, unscrew two contact set fixing screws and remove lead wire.

While holding contact arm by fingers, pull out contact set toward you by raising it slightly. Contact point and arm can then be removed together.

Install new contact point and arm assembly in reverse sequence of removal. Coat cam with a light coating of grease.

CONDENSER

Satisfactory performance of condenser depends on capacity and degree of insulation, requiring attention to be sure that terminals are clean and set screws are tight.

Checking of condenser is made by a condenser tester.

ADVANCE MECHANISMS

≪Specifications≫

Item \ Type	D4A4-04	D4A4-06
Transmission	Manual	Automatic
Vacuum advance [Distributor degrees/ distributor mmHg (inHg)]	0°/150 (5.91) 5°/250 (9.84)	0°/150 (5.91) 3°/250 (9.84)
Centrifugal advance [Distributor degrees/ distributor rpm]	0°/600 11°/1,950	0°/550 11°/2,300

≪Vacuum advance mechanism mechanical parts≫

If vacuum advance mechanism fails to operate properly, check for the following items and correct the malfunction as required.

1. Check vacuum inlet for signs of leakage at its connection. If necessary, retighten or replace with a new one.
2. Check vacuum diaphragm for air leak.

If leak is found, replace vacuum controller assembly.

3. Inspect breaker plate for smooth moving.

If plate does not move smoothly, this condition could be due to sticky steel balls or pivot. Apply grease to steel balls or, if necessary, replace breaker plate as an assembly.

≪Centrifugal advance mechanical parts≫

When cause of engine malfunction is traced to centrifugal advance mechanical part, use distributor tester to check its characteristic.

See the specifications above.

When nothing is wrong with its characteristic, conceivable causes are break-down abnormal wearing-out of driving part or others. So do not disassemble it.

In case of improper characteristic, take off contact breaker assembly and check closely cam assembly, governor weight, shaft and governor spring, etc.

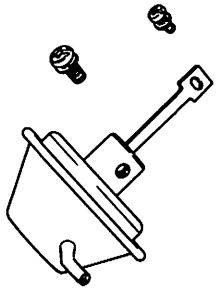
In case centrifugal advance mechanical part is reassembled, be sure to check advance characteristic by distributor tester.

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DISASSEMBLY

To disassemble, follow the below procedure.

1. Take off cap and disconnect rotor head.
2. Remove vacuum controller.

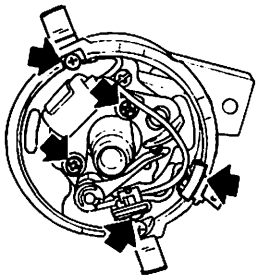


EE291

Fig. EE-56 Removing vacuum controller

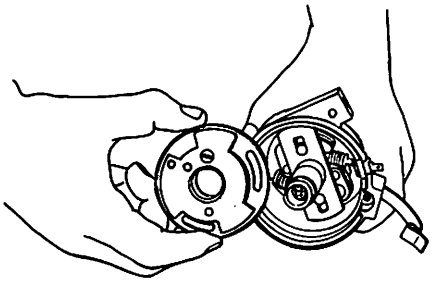
3. Remove contact set.

Refer to Page EE-26, when contact set is removed.



EE323

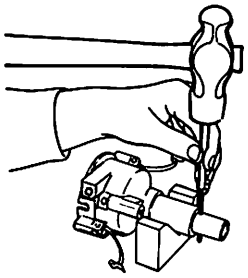
Fig. EE-57 Removing contact set



EE324

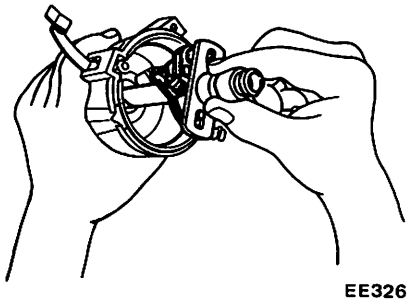
Fig. EE-58 Removing breaker plate

4. When breaker plate is removed, be careful not to lose steel balls between breaker spring and breaker plate.
5. Pull knock pin out and disconnect collar to remove the entire rotating parts.



EE325

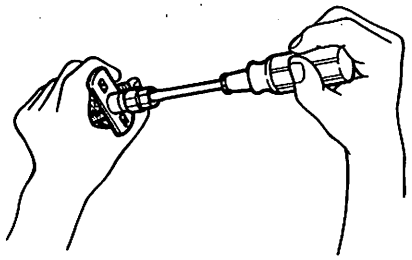
Fig. EE-59 Removing knock pin



EE326

Fig. EE-60 Removing rotation parts

6. Remove packing from top of cam assembly and unscrew rotor shaft setscrew. Put match mark across cam and shaft so that original combination can be restored at assembly.



EE075

Fig. EE-61 Removing cam

7. When governor weight and spring are disconnected, be careful not to stretch or deform governor spring.

After disassembling, apply grease to governor weights.

ASSEMBLY

To assemble, reverse the order of disassembly. Carefully observe the following instructions.

1. Align match marks so that parts are assembled to their original positions.
2. Apply grease to the top of cam assembly as required.
3. Check the operation of governor before installing distributor on engine.
4. Adjust ignition timing after distributor is installed on engine.

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SERVICE DATA AND SPECIFICATIONS

		Manual transmission	Automatic transmission
Type		D4A4-04	D4A4-06
Firing order		1-3-4-2	1-3-4-2
Rotating direction		Counterclockwise	Counterclockwise
Dwell angle	degree	49° to 55°	49° to 55°
Point gap	mm (in)	0.45 to 0.55 (0.018 to 0.022)	0.45 to 0.55 (0.018 to 0.022)
Point pressure	kg (lb)	0.50 to 0.65 (1.10 to 1.43)	0.50 to 0.65 (1.10 to 1.43)
Condenser capacity	μF	0.20 to 0.24	0.20 to 0.24
Condenser insulation resistance	MΩ	More than 5	More than 5
Cap insulation resistance	MΩ	More than 50	More than 50
Rotor head insulation resistance	MΩ	More than 50	More than 50
Cap carbon point length	mm (in)	10 (0.39)	10 (0.39)

DISTRIBUTOR (California models)

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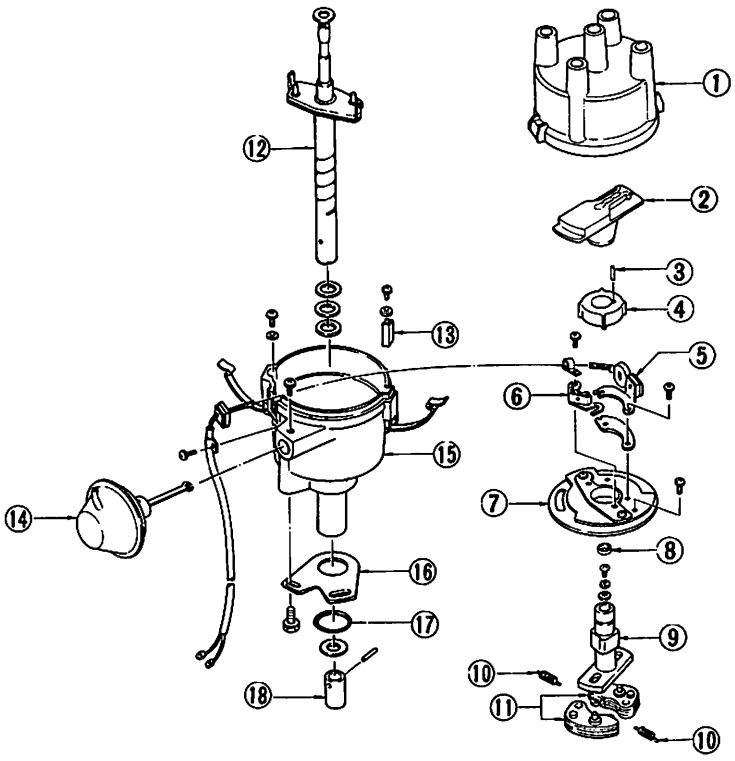
CONSTRUCTION

In the conventional distributor the ignition timing is detected by the cam and breaker arm, while in this transistor ignition unit it is detected by the reluctor on the shaft and the pick-up coil provided in place of the breaker. The pick-up coil consists of a magnet, coil, etc. The amount of magnetic flux passing through the pole piece in the coil is changed at the moment the pole piece faces the protrusion of the reluctor, and then the electrical signal is generated in the pick-up coil.

This electric signal is conducted into the transistor ignition unit, which in turn breaks the primary coil current running through the ignition coil and generates high voltage in the secondary winding. Also, this transistor ignition unit utilizes this electric signal to restore the primary coil to the original state after cutting off the primary current for a fixed time.

The centrifugal and vacuum advance mechanisms employ the conventional mechanical type. The contactor is used to eliminate vacuum and centrifugal advance hysteresis.

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1 Cap assembly
2 Rotor head assembly
3 Roll pin
4 Reluctor
5 Pick-up coil
6 Contactor
7 Breaker plate assembly
8 Packing
9 Rotor shaft
10 Governor spring
11 Governor weight
12 Shaft assembly
13 Cap setter
14 Vacuum controller
15 Housing
16 Fixing plate
17 O-ring
18 Collar

EE327

Fig. EE-62 Exploded view of distributor

CHECKING AND ADJUSTMENT

CAP AND ROTOR HEAD

Cap and rotor head must be inspected periodically as specified in the "Maintenance Schedule". Remove cap and clean all dust and carbon deposits from cap and rotor from time to time. If cap is cracked or is leaking, replace with a new one.

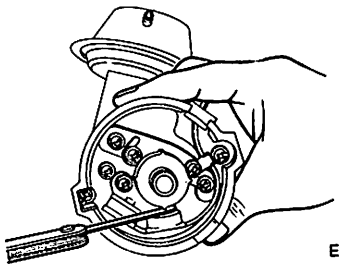
AIR GAP

Standard air gap is 0.2 to 0.4 mm (0.008 to 0.016 in).

If the gap is off the standard, adjustment should be made by loosening pick-up coil screws.

Gap gauge is required for adjustment. Air gaps must be checked from time to time.

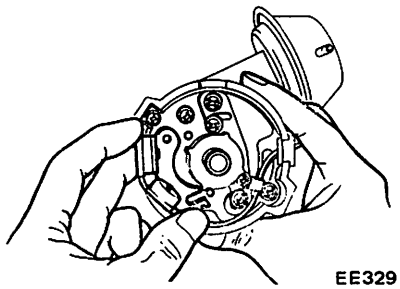
Air gap: 0.2 to 0.4 mm
(0.008 to 0.016 in)



EE328

Fig. EE-63 Checking air gap

To remove pick-up coil, disconnect distributor harness at terminal block and remove screw securing pick-up coil assembly and distributor harness to their positions.



EE329

Fig. EE-64 Removing pick-up coil

ADVANCE MECHANISMS

≪ Specifications ≫

Item \ Type	D4F4-03
Vacuum advance [Distributor degrees/ Distributor mmHg (inHg)]	0°/150 (5.91) 3°/250 (9.84)
Centrifugal advance [Distributor degrees/ Distributor rpm]	0°/600 11°/1,950

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≪ Vacuum advance mechanism mechanical parts ≫

If vacuum advance mechanism fails to operate properly, check for the following items and correct the problem as required.

1. Check vacuum inlet for signs of leakage at its connection. If necessary, retighten or replace with a new one.
2. Check vacuum diaphragm for air leak.

If leak is found, replace vacuum controller assembly.

3. Inspect breaker plate for smooth moving.

If plate does not move smoothly, this condition could be due to sticky steel balls or pivot. Apply grease to steel balls or, if necessary, replace distributor assembly.

≪ Centrifugal advance mechanical parts ≫

When cause of engine malfunction is traced to centrifugal advance mechanical parts, use distributor tester to check its characteristics. See to the specifications above.

If nothing is wrong with its characteristics, conceivable causes are faulty or abnormal wear of driving part or others. So do not disassemble it.

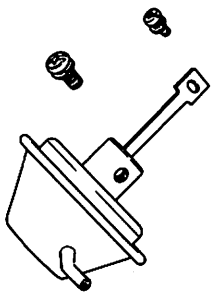
In the event of improper characteristics, check closely rotor shaft assembly, governor weight and shaft.

If any of above parts are malfunctioning, replace distributor assembly.

DISASSEMBLY

To disassemble, follow the procedure below.

1. Take off cap and remove rotor head.
2. Remove two screws shown in Figure EE-65 and detach vacuum controller.



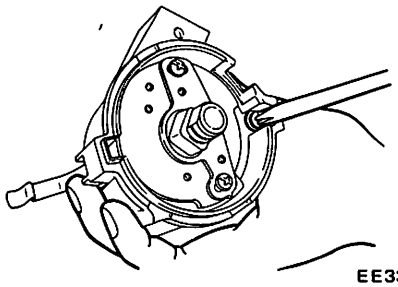
EE291

Fig. EE-65 Removing vacuum controller

3. Remove pick-up coil assembly.
4. Using two pry bars, pry reluctor from shaft. Be careful not to distort or damage the teeth of reluctor.

Remove roll pin.

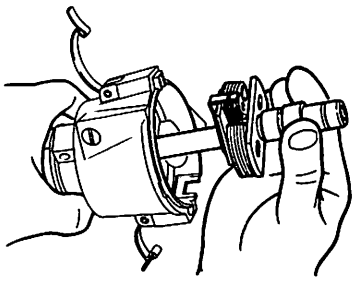
5. Remove breaker plate setscrews and remove breaker plate assembly.



EE330

Fig. EE-66 Removing breaker plate setscrews

6. Pull roll pin out and remove collar.
7. Remove rotor shaft and drive shaft assembly.

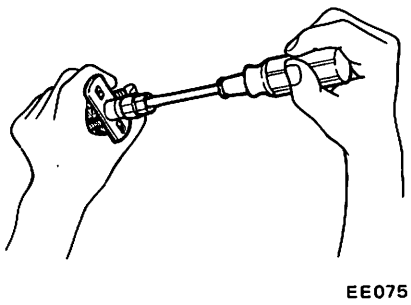


EE331

Fig. EE-67 Removing rotor shaft and drive shaft assembly

8. Mark rotor shaft and drive shaft.

Remove packing from the top of rotor shaft and unscrew rotor shaft setscrew.



EE075

Fig. EE-68 Removing rotor shaft

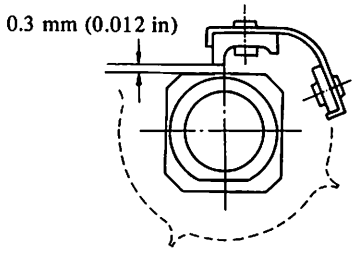
9. Mark one of the governor springs and its bracket. Also mark one of the governor weights and its pivot pins.
10. Carefully unhook and remove governor springs.
11. Remove governor weights.

Apply grease to governor weights after disassembling.

ASSEMBLY

To assemble, reverse the order of disassembly. Carefully observe the following instructions.

1. Align match marks so that parts are assembled to their original positions.
2. If, for any reason, contactor is removed from breaker plate, adjust cam-to-contactor clearance to 0.3 mm (0.012 in) as shown in Figure EE-69 after installation.



EE298

Fig. EE-69 Cam-to-contactor clearance

3. Ensure that reluctor is properly oriented when installing on shaft.

Always drive in roll pin with its slit toward the outer end of shaft. See Figure EE-70. Be sure to use a new roll pin.

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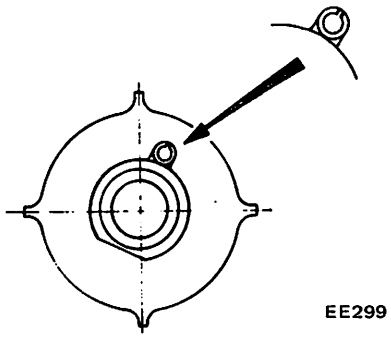


Fig. EE-70 Driving in roll pin

4. Apply grease to the top of rotor shaft as required.
5. Check the operation of governor before installing distributor on engine.
6. Adjust ignition timing after distributor is installed on engine.

SERVICE DATA AND SPECIFICATIONS

Type		D4F4-03
Firing order		1-3-4-2
Rotating direction		Counterclockwise
Duty		70%
Air gap	mm (in)	0.2 to 0.4 (0.008 to 0.016)
Cap insulation resistance	MΩ	More than 50
Rotor head insulation resistance	MΩ	More than 50
Cap carbon point length	mm (in)	10 (0.39)

TRANSISTOR IGNITION UNIT (For California)

CONTENTS

DESCRIPTION EE-31
TRANSISTOR IGNITION UNIT EE-31
REMOVAL AND INSTALLATION EE-32
INSPECTION EE-32
1. POWER SUPPLY WIRING AND BATTERY CHECK EE-32
2. CONTINUITY CHECK OF PRIMARY CIRCUIT EE-33
3. PICK-UP COIL CONTINUITY CHECK EE-33
4. PICK-UP COIL POWER SIGNAL PULSE CHECK EE-33
5. TRANSISTOR IGNITION UNIT CHECK .. EE-34

DESCRIPTION

TRANSISTOR IGNITION UNIT

The transistor ignition unit provides the following functions:

1. It makes and breaks the electric current in the primary circuit of the ignition coil.
2. The duty control circuit sets the rate of make and break within one cycle, i.e., this maintains good ignition characteristics of engine from low speed to high speed and is equal to the dwell angle in the conventional breaker type distributor.
3. A preventive circuit against locking is provided. This cuts off the primary electric current in the ignition coil after a fixed (within 10 seconds) even when the ignition switch is turned on with the engine not running.

Each component part of this unit is highly reliable, however, should any part be found faulty, the entire assembly must be replaced.

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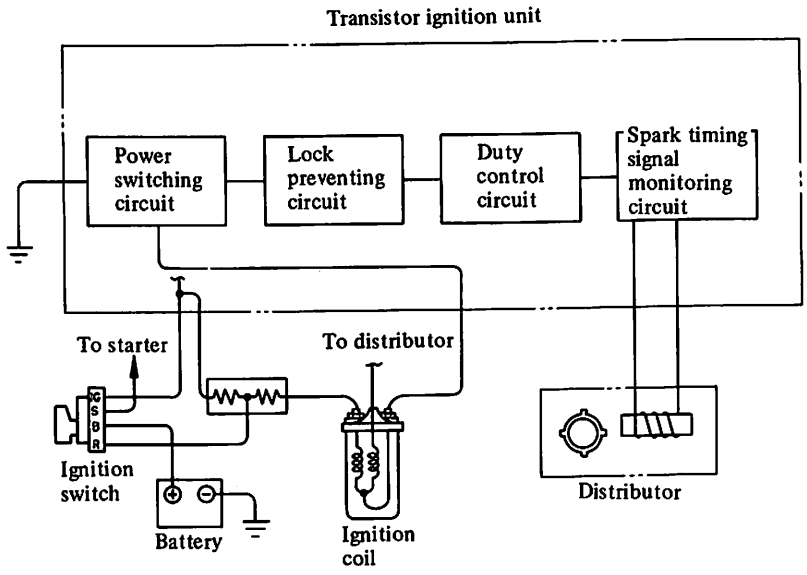


Fig. EE-71 Transistor ignition unit circuit diagram

REMOVAL AND INSTALLATION

Transistor ignition unit is located on the left-hand dash side panel in passenger compartment.

1. Disconnect battery negative cable.
2. Disconnect wiring harness from unit.
3. Remove two setscrews and remove unit.
4. To install, reverse the order of removal.

Note: Be sure to connect wiring harnesses to their proper positions. Failure to do so will damage the unit.

Refer to Figure EE-72.

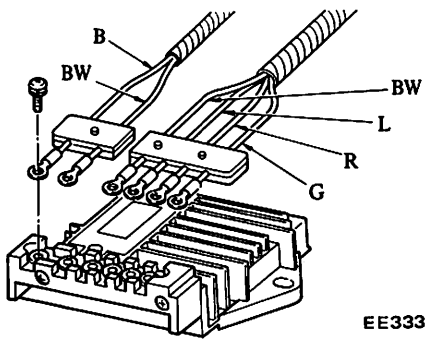


Fig. EE-72 External view of ignition unit

INSPECTION

If the engine does not run due to faulty ignition system, check the ignition system as follows:

Check for a cracked distributor rotor or cap and corroded terminals. Visually inspect high tension wires for condition and, if necessary, use an ignition oscilloscope or a circuit tester to make performance checks. Check spark plugs and adjust gaps as necessary.

Replace a spark plug which is not suitable for further use. If the above checks cannot correct the problem, check the entire ignition system with an oscilloscope or a circuit tester.

CHECKING WITH AN OSCILLOSCOPE

An oscilloscope can be used for checking almost all the items in a transistor ignition system.

CHECKING WITH A CIRCUIT TESTER

A circuit tester can not be used for the duty control circuit and power transistor performance tests. Both methods (use of an oscilloscope and a circuit tester) are described in this section.

The items are classified by numerals in accordance with the objective of checks to be performed. Several wiring diagrams are found on pages EE-36 to EE-40. The thick lines indicate the objective of each individual item check.

When checking a circuit with an oscilloscope or a circuit tester, be careful not to confuse the polarity of the lead wires if a potential difference exists between the check points at which the lead wires are to be contacted. Also, do not attempt to connect the lead wires to any points in the circuit other than those designated. Careless handling of the lead wires will result in damage to the transistor ignition unit as well as to the oscilloscope or ciruit tester.

The connection of a tachometer or a timing light in parallel with an oscilloscope or a circuit tester is allowable, provided that such a connection is made with due consideration to wiring connections.

1. POWER SUPPLY WIRING AND BATTERY CHECK (See wiring diagram in Figure EE-84)

Procedure:

1. Turn on ignition switch.
2. Connect a circuit tester or an oscilloscope as shown in the figure below.

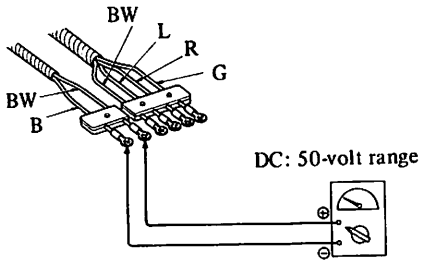


Fig. EE-73 Checking power supply wiring and battery

Criterion:

When power source (battery) voltage is indicated ..... OK
Lower or no indication ..... N.G.

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If the result is "N.G." – Take the following measures:

1. Check "BW" and "B" color wire harness respectively, for proper conductance.
2. Check battery terminals for proper connection.
3. Check charge condition of battery if an excessively low voltage is indicated.

2. CONTINUITY CHECK OF PRIMARY CIRCUIT

2-1. Checking primary circuit (See wiring diagram in Fig. EE-85)

Procedure:

1. Disconnect "L" color wire from ignition unit.
2. Turn on ignition switch.
3. Connect a circuit tester or an oscilloscope as shown in Figure EE-74.

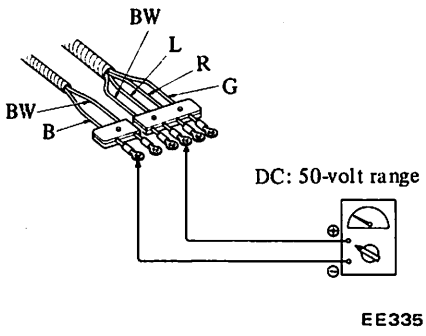


Fig. EE-74 Checking primary circuit

Criterion:

When normal power source (battery) voltage is indicated . OK
Lower or no indication ..... N.G.

If the result is "N.G." – Take the following measures:

1. Check "BW" and "L" color wire harness respectively for proper conductance.
2. Check resistor and ignition coil terminals for loose contact.
3. Check resistor and ignition coil for discontinuity.
4. Check "WB" color wire harness of ignition coil assembly for proper continuity.

2-2. Checking ignition coil assembly (See wiring diagram in Fig. EE-86)

Procedure:

1. Disconnect ignition coil and distributor harness from ignition coil external resistor.
2. Connect a circuit tester as shown in the figure below.

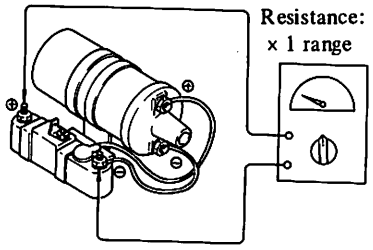


Fig. EE-75 Checking ignition coil assembly

Criterion:

When approximately 0 ohm is indicated ..... OK
More than 1.8 ohm ..... N.G.

If the result is "N.G." – Replace ignition coil assembly.

3. PICK-UP COIL CONTINUITY CHECK (See wiring diagram in Figure EE-87)

Procedure:

1. Disconnect "R" and "G" color wires from ignition unit.
2. Connect a circuit tester as shown in the figure below:

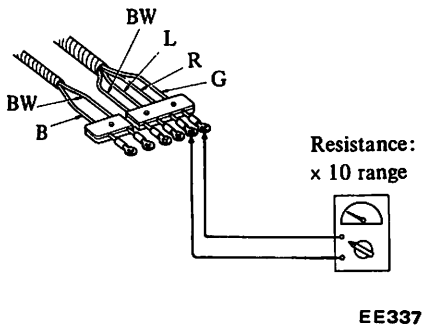


Fig. EE-76 Checking pick-up coil

Criterion:

When approximately 720 ohm is indicated ..... OK
Far less than or more than 720 ohm ..... N.G.

If the result is "N.G." – Replace pick-up coil assembly.

4. PICK-UP COIL POWER SIGNAL PULSE CHECK

Procedure:

1. Disconnect anti-dieseling solenoid valve connector.
2. Connect a circuit tester as shown in the figure below.
3. Rotate starter motor.
4. Read the tester indication.

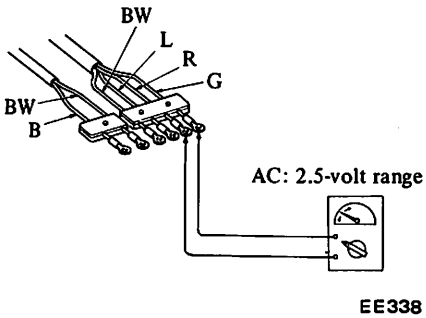


Fig. EE-77 Checking pick-up coil power signal pulse

Criterion:

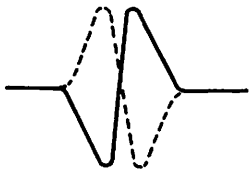
When pointer deflects slightly ..... OK
When pointer does not deflect at all ..... N.G.

If the result is "N.G." – Replace pick-up coil assembly.

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Procedure: (with an oscilloscope)

1. Disconnect anti-dieseling solenoid valve connector.
2. Connect a positive lead of an oscilloscope to "R" color wire and a negative lead (of an oscilloscope) to "G" color wire.
3. Set a "SLOPE" select switch of an oscilloscope to the positive side. (If so equipped.)
4. Rotate starter motor.
5. Check the wave form as shown in the figure below.



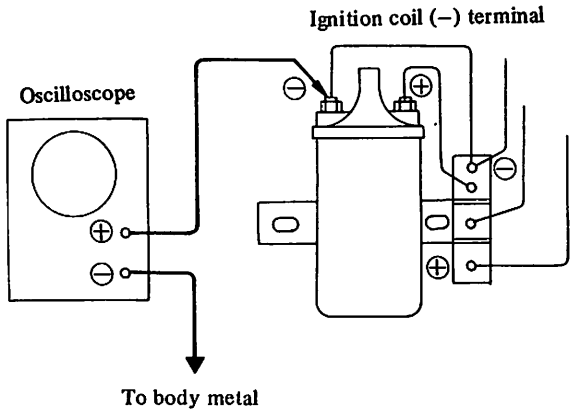
EE268

Fig. EE-78 Wave form of pick-up coil

Criterion:

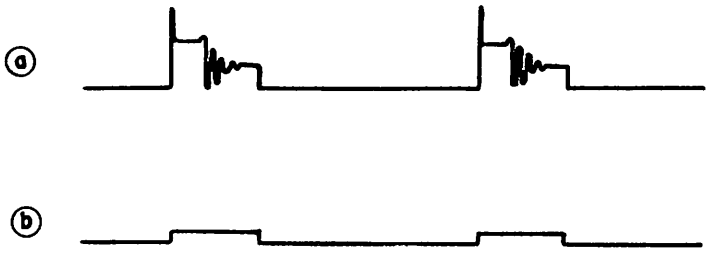
When the wave form takes the shape of a full line ..... OK
When the wave form takes the shape of a dashed line or when there is no wave form ..... N.G.

If the result is "N.G." – Replace pick-up coil assembly.



EE307

Fig. EE-79 Checking operation of transistor ignition unit



EE256

Fig. EE-80 Wave form of pulse

5. TRANSISTOR IGNITION UNIT CHECK (See wiring diagram in Figure EE-88)

Check items 5-1 and 5-2 with an oscilloscope.

Where an oscilloscope is not available, check to make sure that all previous tests are satisfactory and that no spark is issuing from the secondary high-tension wire.

If everything else is satisfactory, then the transistor ignition unit is faulty or there is discontinuity in the secondary high-tension wire. Replace the faulty part. After replacement check the sparks from the secondary cord.

5-1. Checking operation of transistor ignition unit

Procedure:

1. Connect ignition coil and distributor harness to ignition coil external resistor.
2. Connect wiring harness to the ignition unit.
3. Disconnect anti-dieseling solenoid valve connector.
4. Connect oscilloscope as shown in Figure EE-79, rotate the starter motor and observe the wave form on the oscilloscope.

Criterion:

See Figure EE-80.
When a wave form similar to (a) is observed ..... OK
When a wave form similar to (b) is observed or when no wave form is observed ..... N.G.

If the result is "N.G.", the fault lies either in the transistor unit or in the secondary high-tension wire.

Replace these parts.

– If an oscilloscope is not available –

Procedure:

1. Connect ignition coil and distributor harness to ignition coil external resistor.
2. Connect wiring harness to ignition unit.
3. Disconnect anti-dieseling solenoid valve connector.
4. Keep the secondary high-tension wire end 4 to 5 mm (0.16 to 0.20 in) away from engine block, rotate the starter motor, and check whether sparks fly across the clearance.

Criterion:

Where sparks issue ..... OK
Where no spark issues ..... N.G.

If the result is "N.G.", the fault lies either in the transistor unit or in the secondary high-tension wire.

Replace these parts.

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5-2. Checking operation of duty

Procedure:

1. Connect anti-dieseling solenoid valve connector.
2. While the engine is idling, observe the wave form on the oscilloscope in the same way as stated in item 5-1, Figure EE-79. Determine the ratio t/T as shown in Figure EE-81.

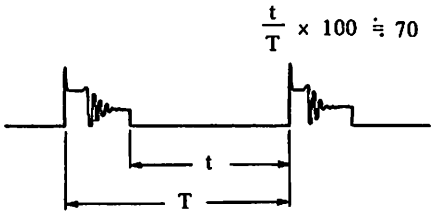


Fig. EE-81 Wave form of duty pulse

Criterion:

When standard ratio of about 70% is obtained ..... OK
When the ratio obtained is far less than, or more than 70% ..... N.G.

If the result is "N.G." – Replace transistor ignition unit.

5-3. Checking lock preventive circuit

– If a circuit tester is used –

Procedure:

1. Connect a circuit tester as shown in Figure EE-79 or EE-82; positive terminal of tester is connected to "L" color wire and negative terminal of tester is grounded.
2. Turn on ignition switch. Check to see whether the tester indicates the voltage of power source (battery) within 10 seconds after ignition switch is turned on.

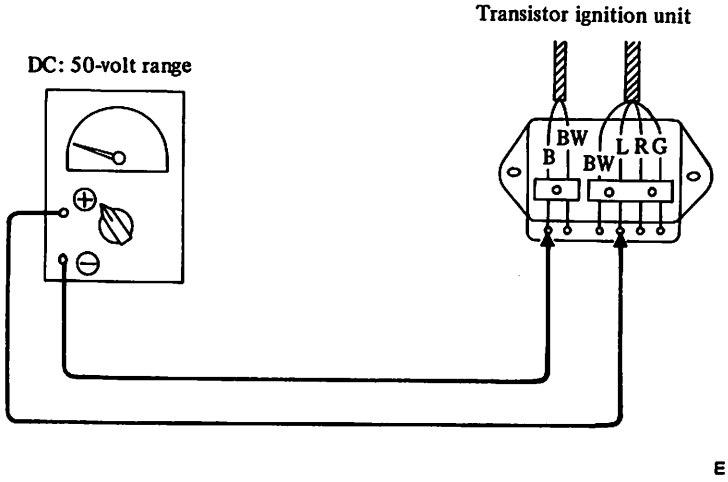


Fig. EE-82 Checking lock preventive circuit

Criterion:

When power source voltage is indicated ..... OK
When approximately zero-voltage is indicated ..... N.G.

If the result is "N.G." – Take the following measures:

Replace transistor ignition unit.

– If an oscilloscope is used –

Procedure:

1. When using an oscilloscope instead of a tester, arrange the connection in the same way as shown in Figure EE-79 or Figure EE-82. Turn on ignition switch.

Check to see whether the wave form on the oscilloscope rises up to the power source voltage within about 10 seconds after ignition switch is turned on.

Criterion:

The same as described before for use of a tester.

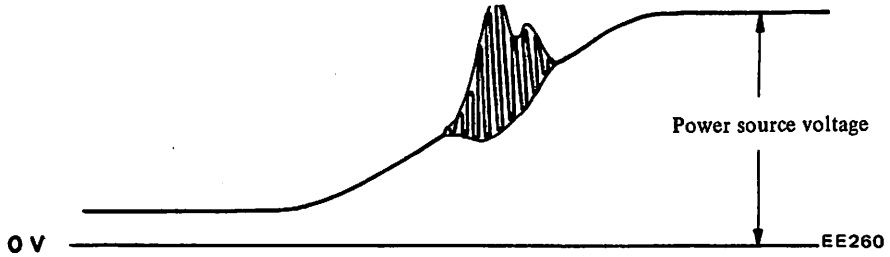


Fig. EE-83 Wave form of lock preventive circuit

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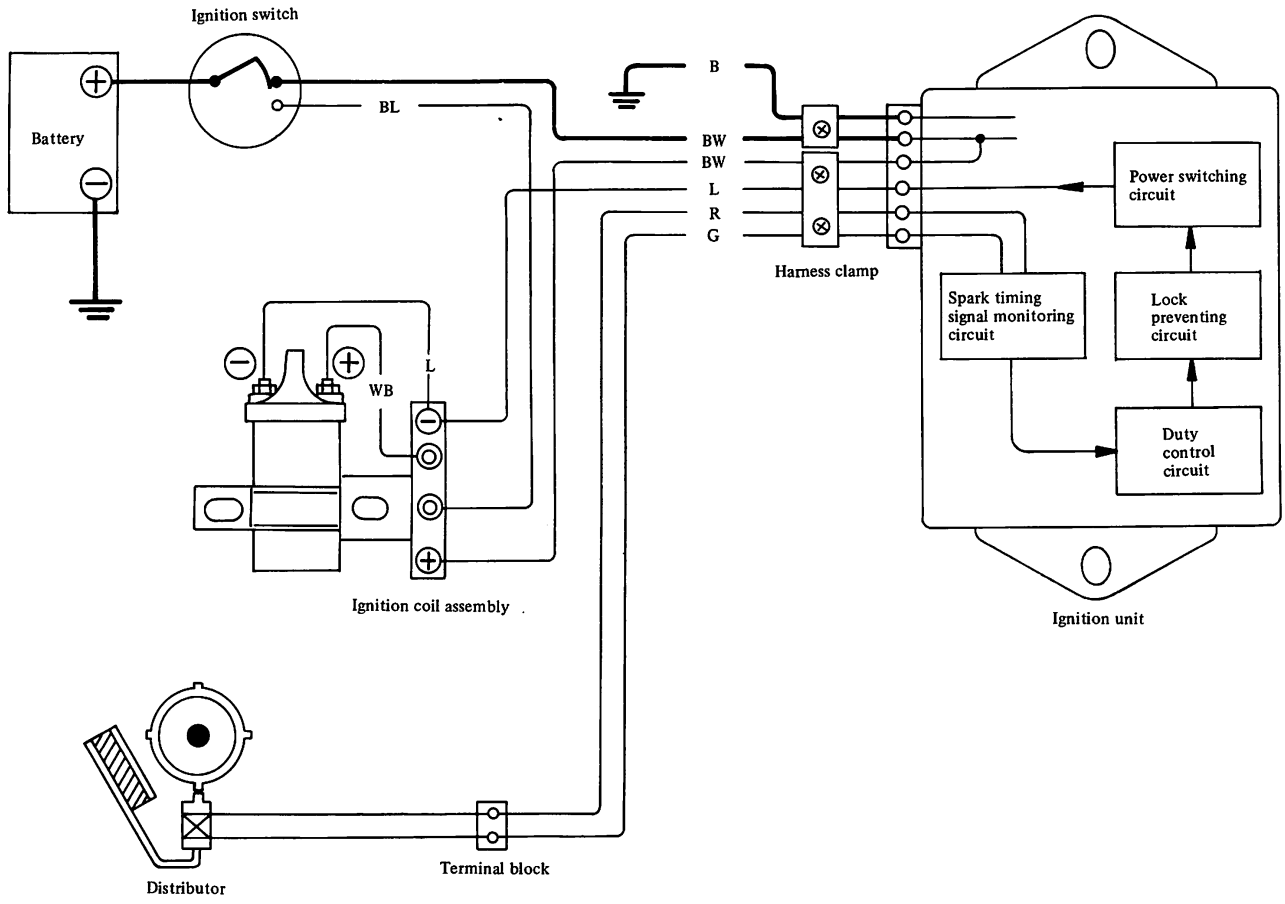


Fig. EE-84 Wiring diagram for item (1) (Power supply wiring and battery check)

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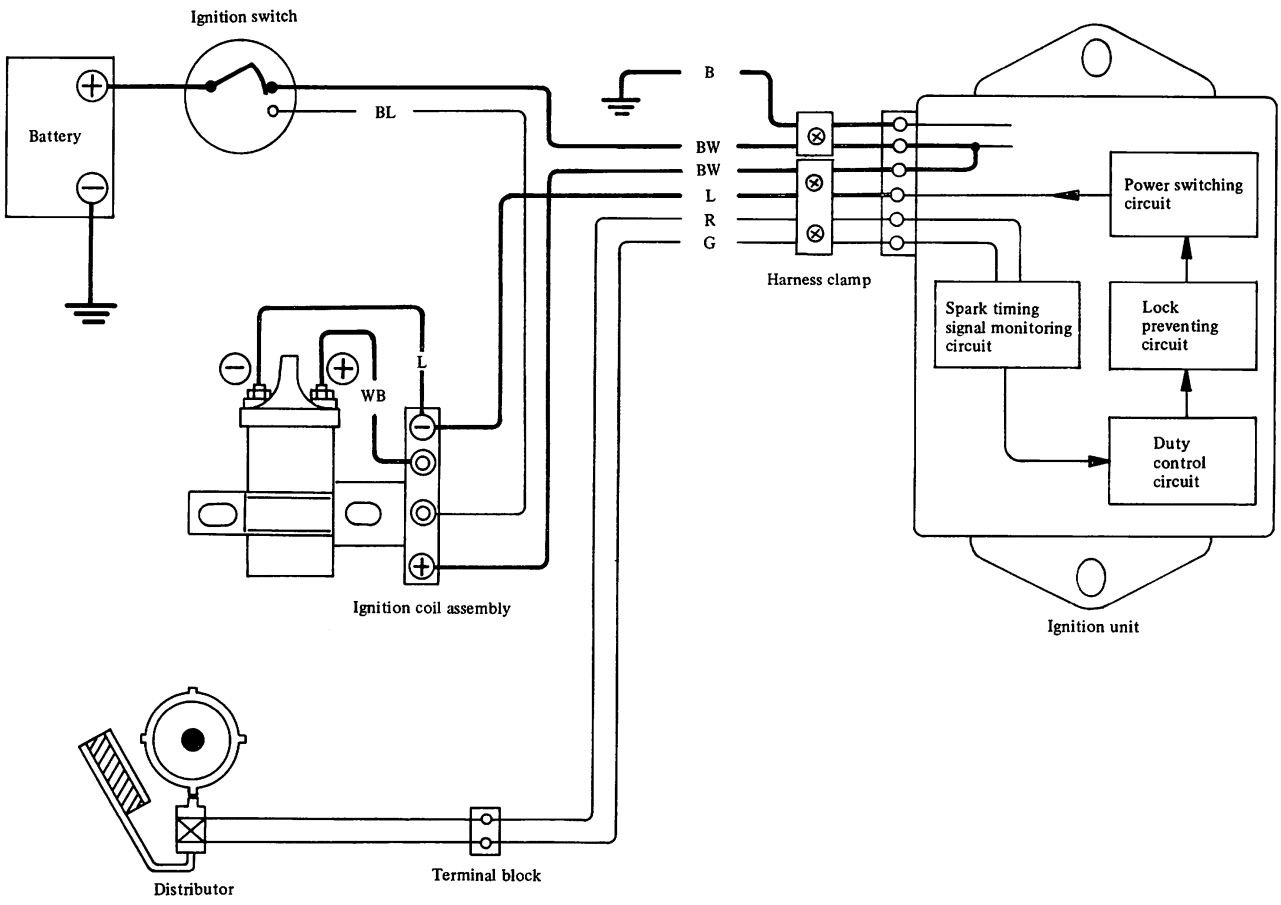
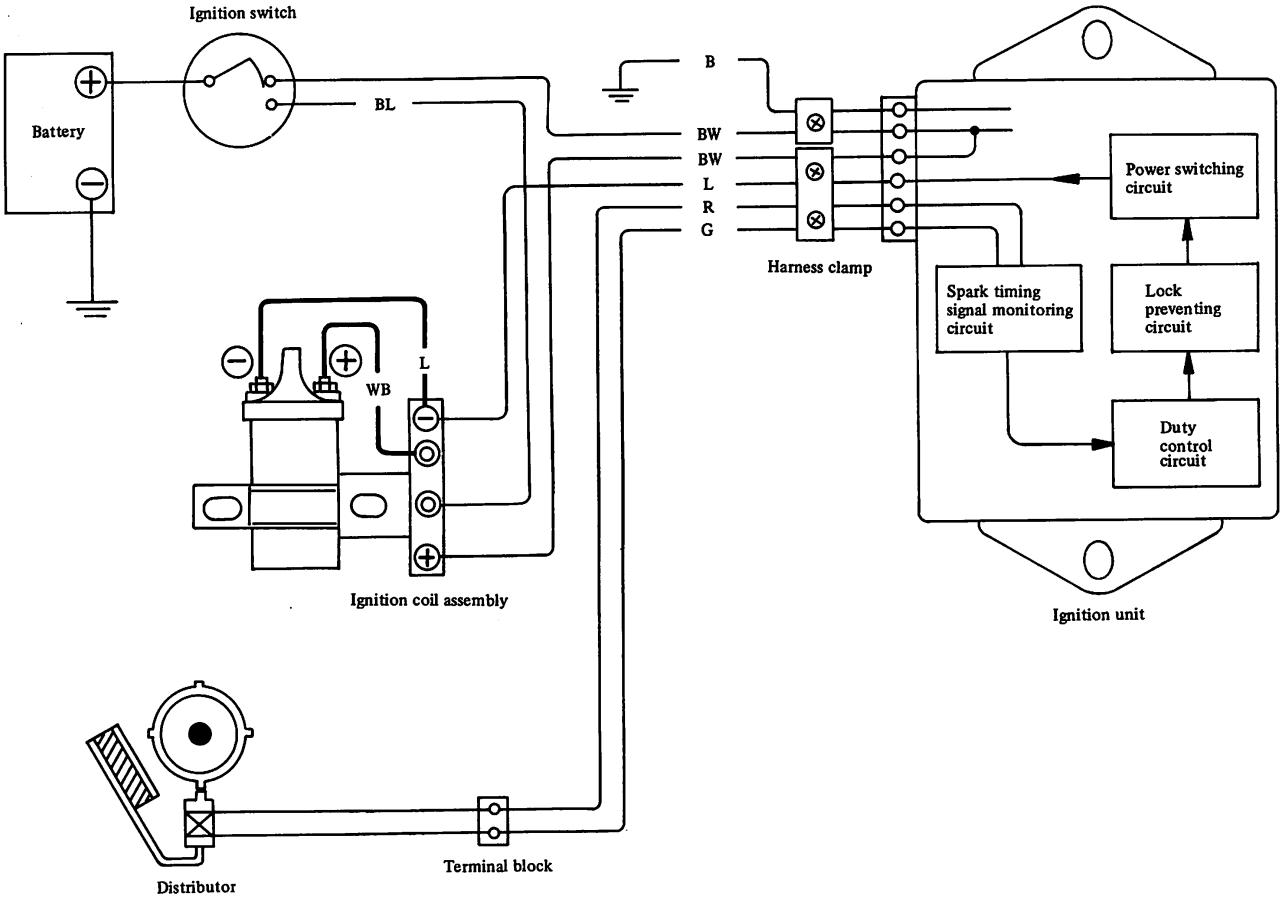


Fig. EE-85 Wiring diagram for item (2)-1 (Checking primary circuit)

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EE341

Fig. EE-86 Wiring diagram for item (2)-2 (Checking ignition coil assembly)

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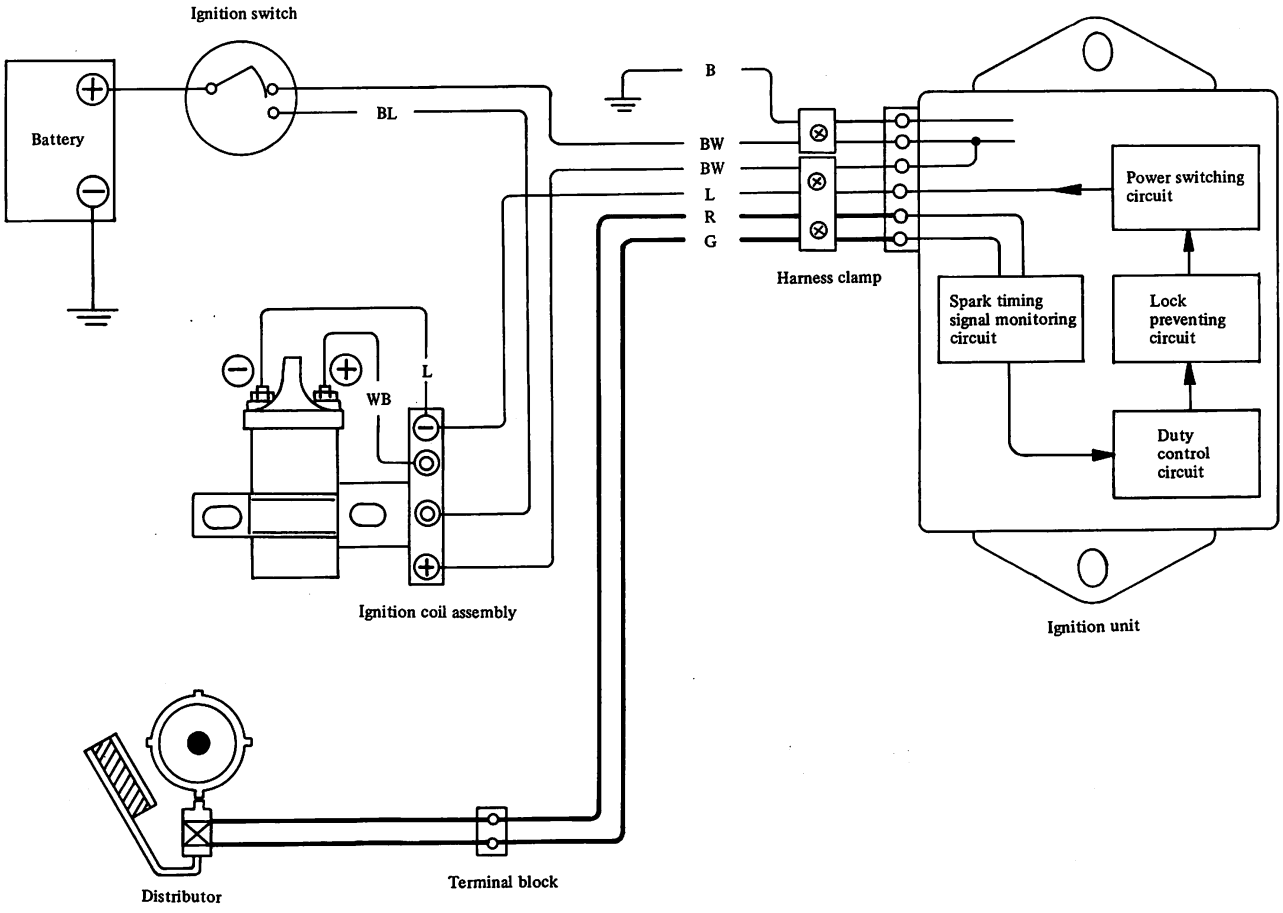
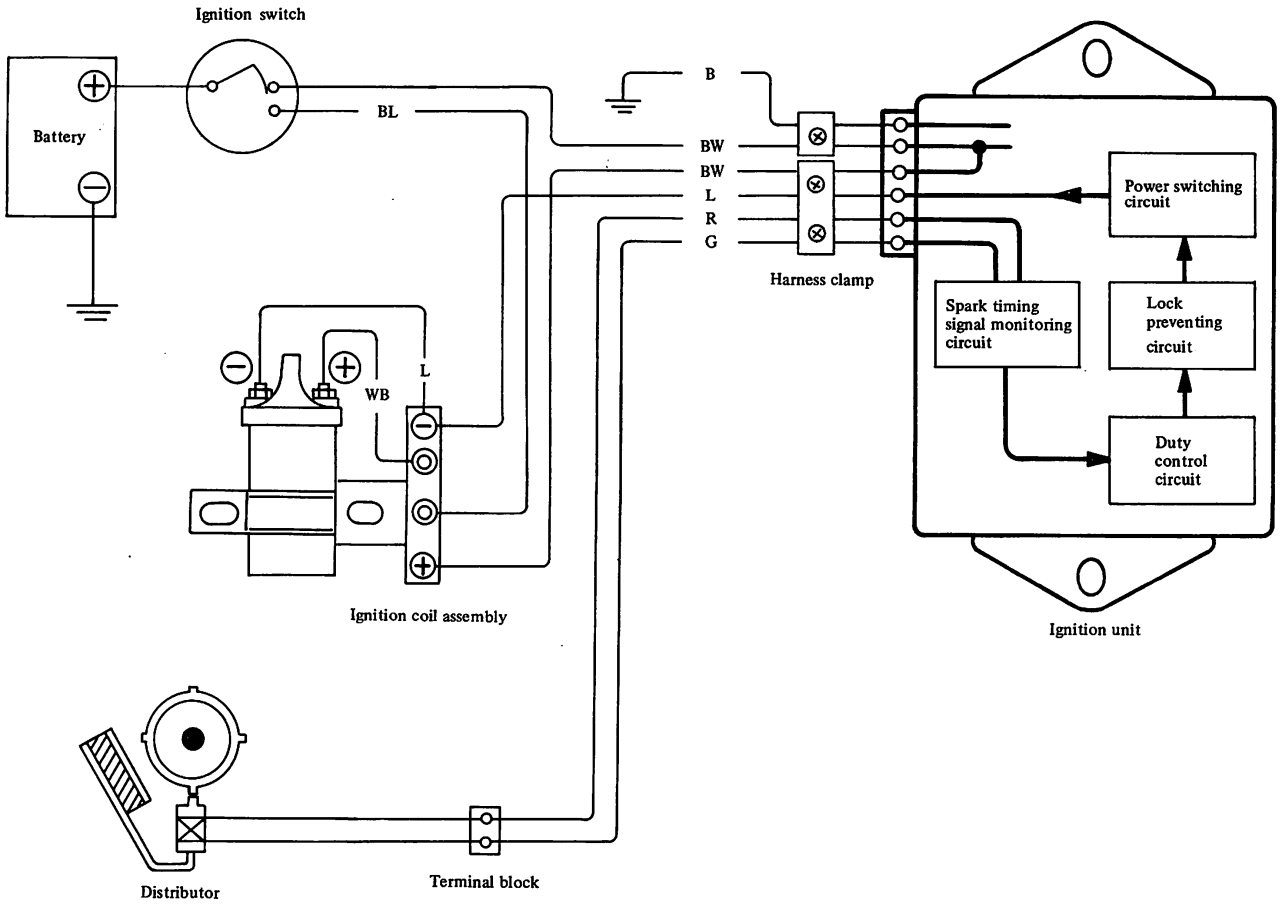


Fig. EE-87 Wiring diagram for item (3) (Pick-up coil continuity check)

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EE343

Fig. EE-88 Wiring diagram for item (5) (Transistor ignition unit check)

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IGNITION COIL

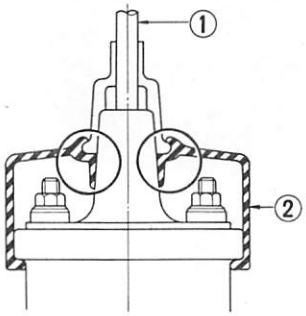
The ignition coil is of an oil-filled type. The ignition coil case is filled with oil which has good insulating and heat-radiating characteristics.

The ignition coil has a greater ratio between the primary and secondary windings to step up the battery voltage to the high voltage to cause stronger sparks to jump the spark plug gap.

The cap is made of alkyd resin which offers high resistance to electric arc and increased insulation.

The ignition coil and external resistor should be handled as a matched set.

When high tension wire is installed to ignition coil, there should be no clearance between their caps.

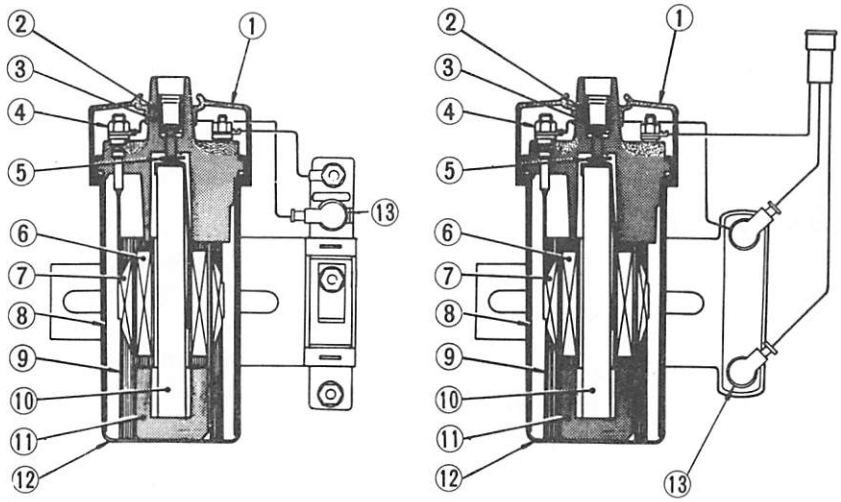


1 High tension wire
2 Rubber cap

Fig. EE-90 Correct installation of high tension wire

California models

Non-California models



1 Rubber cap for ignition coil
2 Secondary terminal
3 Cap
4 Primary terminal
5 Spring
6 Secondary winding
7 Primary winding
8 Side core
9 Insulator coil
10 Center core
11 Segment
12 Case
13 Rubber cap for terminal

Fig. EE-89 Construction

Note: Do not disconnect high tension wires from spark plugs during engine running. (California models only)

SPECIFICATIONS

Item \ Application		Non-California models	California models
Type		C6R-607, H5-15-10	C1T-17, STC-10
Primary voltage	V	12	12
Spark gap	mm (in)	More than 7 (0.28)	More than 7 (0.28)
Primary resistance at 20°C (68°F)	Ω	1.17 to 1.43	0.45 to 0.55
Secondary resistance at 20°C (68°F)	KΩ	11.2 to 16.8	8.5 to 12.7
External resistor at 20°C (68°F)	Ω	1.5	1.3 (0.4 + 0.9)

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SPARK PLUG

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DESCRIPTION EE-42
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CLEANING AND REGAP EE-42
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DESCRIPTION

The spark plugs are of the conventional type, having 14 mm (0.551 in) threads and a gap of 0.8 to 0.9 mm (0.032 to 0.035 in). The inspection and cleaning should be made every suitable maintenance period. If necessary, replace.

Note: All spark plugs installed on an engine must be of the same brand and the same number of heat range.

INSPECTION

1. Remove spark plug wire by pulling on boot, not on wire itself.
2. Remove spark plugs.
3. Check electrodes and inner and outer porcelains of plugs, noting the type of deposits and the degree of electrode erosion. Refer to Figure EE-91.

Normal: Brown to grayish-tan deposits and slight electrode wear indicate correct spark plug heat range.

Carbon fouled: Dry fluffy carbon deposits on the insulator and electrode are usually caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.
It is advisable to replace with plugs having hotter heat range.

Oil fouled: Wet black deposits indicate excessive oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems. If the same condition remains after repair, use a hotter plug.

Overheating: White or light gray insulator with black or gray brown spots and bluish burnt electrodes indicate engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, low fuel pump pressure, wrong selection of fuel, a hotter plug, etc.
It is advisable to replace with plugs having colder heat range.

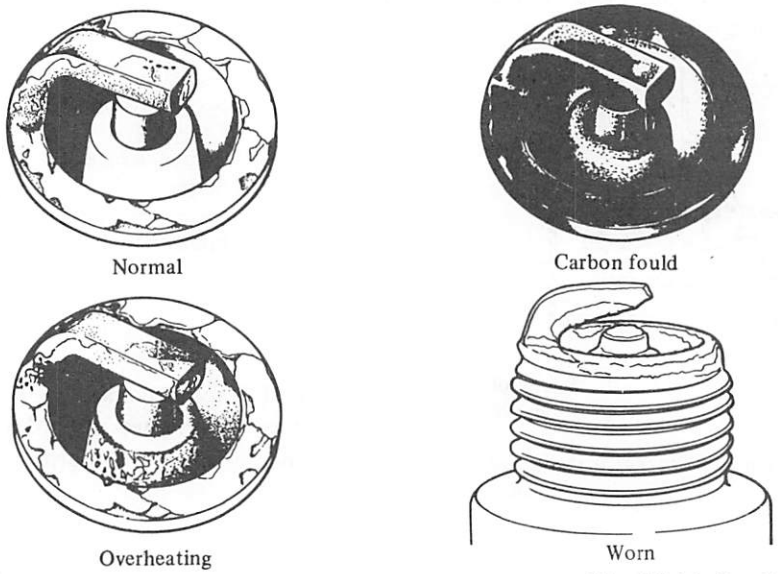


Fig. EE-91 Spark plug

4. After cleaning, dress electrodes with a small fine file to flatten the surfaces of both center and side electrodes in parallel. Set spark plug gap to specification.
5. Install spark plugs and torque each plug to 1.5 to 2.0 kg-m (11 to 15 ft-lb).
6. Connect spark plug wires.

CLEANING AND REGAP

Clean spark plugs in a sand blast type cleaner. Avoid excessive blasting. Clean and remove carbon or oxide deposits, but do not wear away porcelain. If deposits are too stubborn, discard plugs.

After cleaning spark plugs, renew firing surface of electrodes with file mentioned above. Then gap spark plugs to 0.8 to 0.9 mm (0.032 to 0.035 in) using a round wire feeler gauge. All spark plugs new or used should have the gap checked and reset by bending ground electrode.

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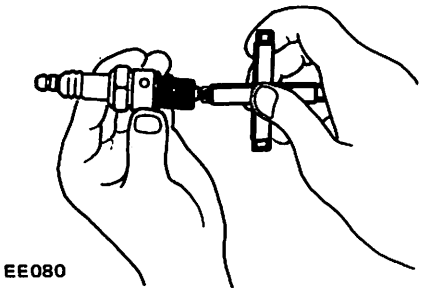


Fig. EE-92 Setting spark plug gap

SERVICE DATA AND SPECIFICATIONS

Item	Type	BP6ES, L45-PW
Applied engine		L20B
Size (screw dia. x reach)	mm (in)	14 x 19 (0.55 x 0.75)
Plug gap	mm (in)	0.8 to 0.9 (0.031 to 0.035)
Tightening torque	kg-m (ft-lb)	1.5 to 2.0 (11 to 14)

TROUBLE DIAGNOSES AND CORRECTIONS

1. When engine does not start

If there is no problem in fuel system, ignition system should be checked. This can be easily done by detaching a high tension wire from spark plug, starting engine and observing condition of spark that occurs between high tension wire and spark plug terminal. After checking this, repair as necessary.

Note: On California models, disconnect anti-dieseling solenoid valve connector to cut off supply of fuel to engine and then observe the condition of sparks while starter motor is in operation.

Condition	Location	Probable cause	Corrective action
No spark at all	Distributor	Faulty insulation of condenser (Non-California models).	Replace.
		Breakage of lead-wire on low tension side.	Repair.
		Poor insulation of cap and rotor head.	Replace.
		Seized points (Non-California models).	Repair.
		Open pick-up coil (California models).	Replace.
		Air gap wider than specification (California models).	Adjust.
	Ignition coil	Wire breakage or short circuit of coil.	Replace with new one.
	High tension wire	Wire coming off.	Repair.
		Faulty insulation.	Replace.
	Transistor ignition unit (California models)	Faulty transistor ignition unit.	Replace.
Spark length 1 to 2 mm (0.039 to 0.079 in) or irregular.	Distributor	Point gap too wide (Non-California models).	Correct.
		Oil on point (Non-California models).	Clean.
		Burned points (Non-California models).	Replace.
More than 6 mm (0.236 in)	Spark plugs	Spark plug gap too wide.	Correct or replace.
		Too much carbon.	Clean or replace.
		Broken neck of insulator.	Replace.
		Expiration of plug life.	Replace.
	Distributor	Air gap too wide (California models).	Correct.
	Transistor ignition unit (California models)	Faulty transistor ignition unit.	Replace.

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2. Engine rotates but does not run smoothly.

This may be caused by the ignition system or other engine conditions not related to ignition. Therefore, first a complete inspection of ignition system should be carried out.

Condition	Location	Probable cause	Corrective action
Engine misses.	Distributor	Dirty point (Non-California models).	Clean.
		Foreign matter on pick-up coil (California models).	Clean.
		Improper point gap (Non-California models).	Correct.
		Improper air gap (California models).	Correct.
		Leak of electricity at cap and rotor head.	Repair or replace.
		Damaged insulation of condenser (Non-California models).	Replace.
		Malfunctioning contact arm (Non-California models).	Oil shaft.
		Faulty contact arm spring (Non-California models).	Replace.
		Breakage of lead wire (Non-California models).	Replace.
		Breakage of pick-up coil lead wire (California models).	Replace.
		Worn or shaky breaker plate.	Replace assembly.
		Worn or shaky distributor driving shaft.	Replace assembly.
	Ignition coil	Layer short circuit or inferior quality coil.	Replace with good one.
	High tension wire	Deterioration of insulation with consequent leak of electricity.	Replace.
	Spark plugs	Fouled.	Clean.
		Leak of electricity at upper porcelain insulator.	Repair or replace.
	Transistor ignition unit (California models)	Faulty transistor ignition unit.	Replace.
Engine causes knocking very often.	Distributor	Improper ignition timing (too advanced).	Correct.
		Coming off or breakage of governor spring.	Correct or replace.
		Worn pin or hole of governor.	Replace.
	Spark plugs	Burnt too much.	Replace.
Engine does not deliver enough power.	Distributor	Improper ignition timing (too retarded).	Correct.
		Improper functioning governor.	Replace assembly.
		Point gap too narrow (Non-California models).	Correct.
		Foreign particles stuck in air gap (California models).	Clean.
	Spark plugs	Fouled.	Clean.

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SERVICE MANUAL

DATSUN 710
MODEL 710 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION ER

ENGINE REMOVAL AND INSTALLATION

ER

ENGINE REMOVAL AND INSTALLATION ..... ER- 2

SERVICE DATA AND SPECIFICATIONS ..... ER- 6

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ENGINE REMOVAL AND INSTALLATION

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FRONT INSULATORS ER-6
REAR INSULATOR ER-6

REMOVAL

It is much easier to remove engine and transmission as a single unit than to remove only engine from the engine compartment. After removal, the engine can be separated from the transmission assembly.

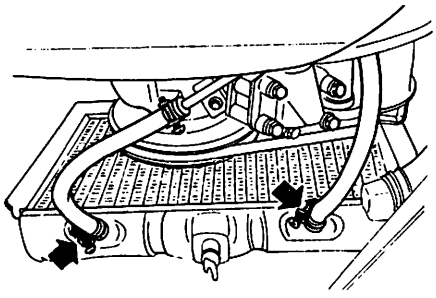
Notes:

a. **Be sure to hoist engine and jack up transmission in a safe manner.**
b. **Fender covers should be used to prevent damage to car body.**
c. **Place wheel chocks in front of front wheels and in rear of rear wheels.**

1. Disconnect negative battery cable at battery.
2. Drain engine coolant by loosening radiator drain plug.
3. Drain engine oil by removing drain plug.

On automatic transmission models:

(1) Remove splash board.
(2) Disconnect oil cooler hoses at oil cooler installed at the lower end of radiator and drain automatic transmission fluid at connectors. See Figure ER-1.

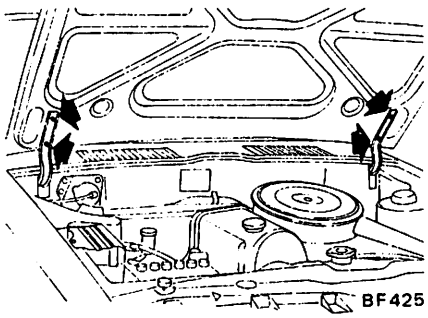


ER121

Fig. ER-1 Removing oil cooler hoses

4. Remove engine hood as follows:

(1) Mark hood hinge locations on hood to facilitate proper reinstallation.
(2) Support hood with hand and remove bolts securing it to hood hinge, taking care not to let hood slip when bolts are removed. See Figure ER-2.



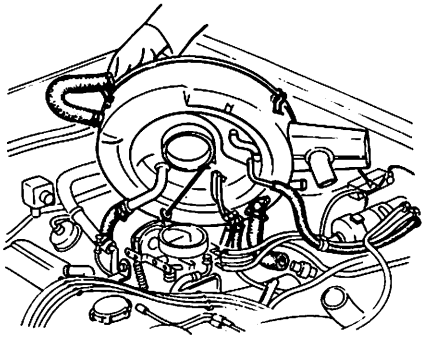
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Fig. ER-2 Removing hood securing bolts

(3) Remove hood from hood hinge with the help of an assistant.

5. Remove carburetor air cleaner as follows:

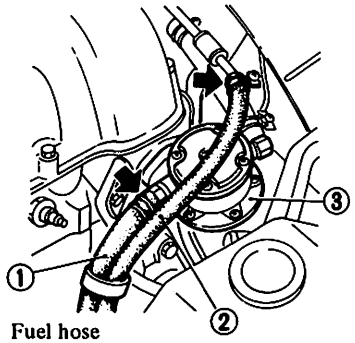
(1) Remove fresh air duct from air cleaner.
(2) Remove hot air duct from air cleaner.
(3) Loosen air cleaner band bolt.
(4) Disconnect air cleaner-to-air pump hose at air cleaner.
(5) Disconnect air cleaner-to-rocker cover hose at rocker cover.
(6) Disconnect air cleaner-to-air control valve hose at air cleaner (California model).
(7) Disconnect air cleaner-to-A.B. valve hose at air cleaner.
(8) Disconnect air cleaner-to-related part vacuum hoses at air cleaner.



ER227

Fig. ER-3 Removing carburetor air cleaner

6. Plug up carburetor air-horn to prevent entry of foreign matter.
7. Disconnect fuel pump-to-fuel strainer hose at fuel pump and disconnect return hose on engine side.

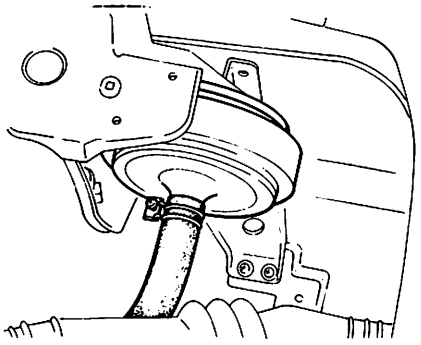


1 Fuel hose
2 Fuel return hose
3 Fuel pump

ER228

Fig. ER-4 Removing fuel hoses

8. Disconnect carbon canister hose on engine side.
9. Disconnect air pump air cleaner-to-air pump hose at air cleaner.



ER229

Fig. ER-5 Removing air pump air cleaner hose

10. Disconnect the following electrical leads:

(1) Distributor terminal wires at the top of radiator.
(2) High tension cable between distributor and ignition coil at distributor.
(3) Negative battery cable at engine slinger.
(4) Starting motor "E" terminal wire.

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(5) The following two mold type connectors.

One of them is positioned above front right engine mounting bracket. See Figure ER-6.

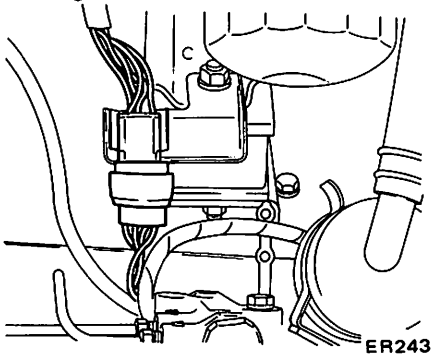


Fig. ER-6 Disconnecting mold type connector

The other is under ignition coil. See Figure ER-7.

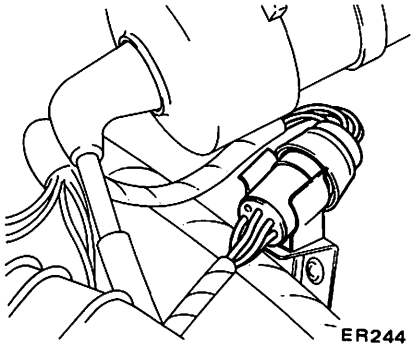
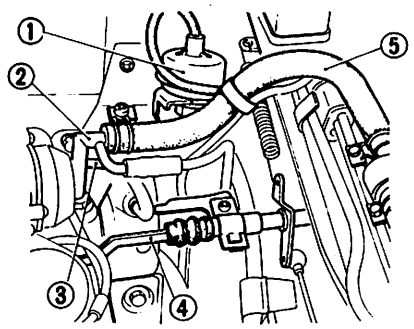


Fig. ER-7 Disconnecting mold type connector

11. Disconnect brake Master-Vac-to-intake manifold connector vacuum hose at intake manifold. See Figure ER-8.

12. Disconnect vacuum hose of air conditioner from connector of intake manifold. See Figure ER-8. (Air conditioner equipped models)



1 F.I.C.D. actuator
2 Vacuum hose connector
3 Vacuum hose of air conditioner
4 Torsion shaft
5 Master-Vac vacuum hose

Fig. ER-8 Removing vacuum hoses

13. Remove F.I.C.D. actuator from bracket. (Air conditioner equipped models)

14. Remove torsion shaft of accelerator linkage from carburetor. See Figure ER-8.

15. Disconnect heater inlet and outlet hoses. (Air conditioner equipped models)

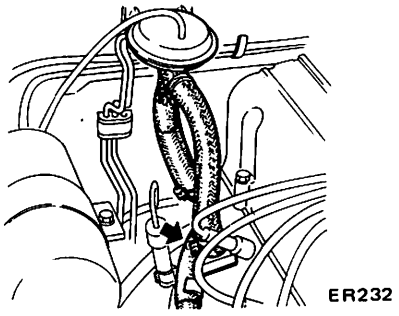


Fig. ER-9 Disconnecting heater hoses

16. Disconnect flexible hoses at air conditioning compressor. Plug up their hose openings as well as the inlet and outlet openings of the compressor to prevent entrance of dirt and moisture. (Air conditioner equipped models)

17. Remove upper and lower radiator hoses.

18. Remove radiator shrouds from radiator.

19. Remove radiator grille.

20. Remove radiator assembly from radiator support.

21. Remove transmission control linkage as follows:

(1) Manual transmission models

Detach rubber boot. Remove nut from shift lever and detach shift lever.

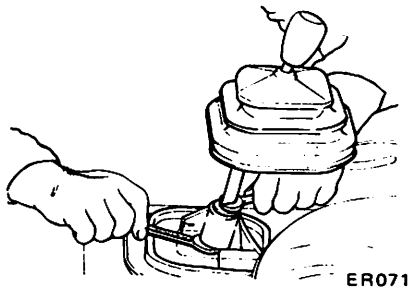
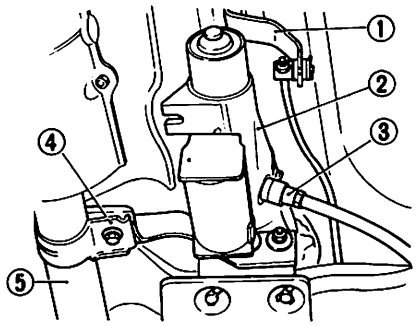


Fig. ER-10 Removing shift lever

(2) Automatic transmission models

Disconnect joint between control lever and selector rod.



1 Control lever
2 Rear extension
3 Speedometer cable
4 Front exhaust tube mounting
5 Front exhaust tube

Fig. ER-11 Disconnecting control lever

22. Disconnect speedometer cable from transmission rear extension. See Figure ER-11.

23. Remove clutch operating cylinder attaching bolts and remove operating cylinder from clutch housing. (Manual transmission models)

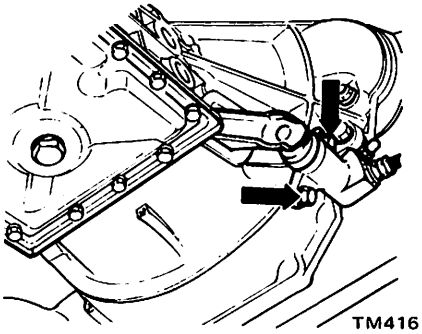


Fig. ER-12 Removing clutch operating cylinder

24. Remove heatshield insulators of front exhaust tube and catalytic converter (California model).

25. On California models, separate front exhaust tube from catalytic converter.

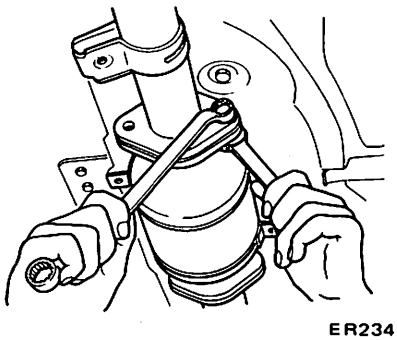
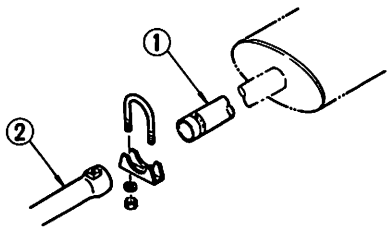


Fig. ER-13 Separating front exhaust tube from catalytic converter

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26. For non-California models, separate front exhaust tube from rear tube by loosening rear tube connector.

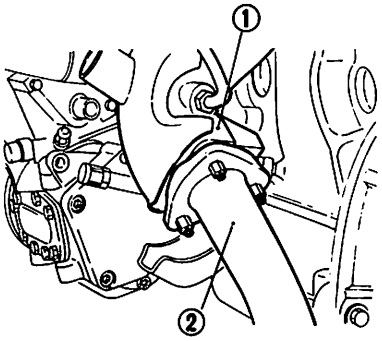


1 Front tube
2 Rear tube

ER180

Fig. ER-14 Separating front exhaust tube from rear tube

27. Remove front exhaust tube mounting. See Figure ER-11.
28. Remove front exhaust tube from exhaust manifold.



1 Exhaust manifold
2 Front exhaust tube

ER235

Fig. ER-15 Removing front exhaust tube from exhaust manifold

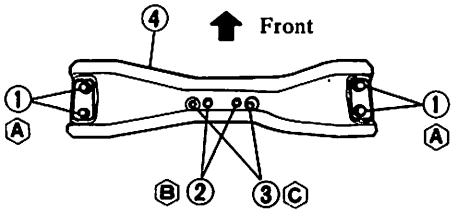
29. Supporting propeller shaft by hand, remove propeller shaft at companion flange of gear carrier; also remove center bearing mounting bracket for three-joint propeller shaft.
30. Withdraw sleeve yoke of propeller shaft from rear extension housing.

It is good practice to release parking brake lever to facilitate removal of propeller shaft. Plug up rear end of rear extension housing to prevent oil leakage.

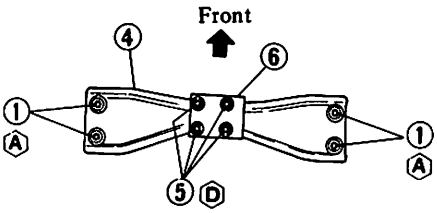
31. Support transmission with a jack.
32. Remove damper attaching bolts and remove damper from rear engine mounting support (California models). See Figure ER-16.
33. Remove rear engine mounting insulator-to-rear engine mounting support attaching bolts.
34. Remove rear engine mounting support-to-body attaching bolts and remove mounting support. See Figure ER-16.
35. Connect suitable wires to engine slingers and raise engine with a hoist to take weight off front mounting insulators.
36. Remove front engine mounting bracket-to-mounting insulator attaching bolts. See Figure ER-17.
37. Raise engine and transmission and remove from car as a single unit.

Note: Be careful not to allow the unit to hit any adjacent parts.

Non-California models



California models

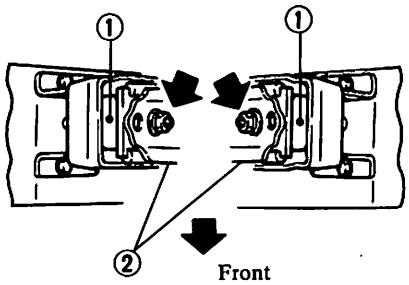


1 Rear engine mounting support-to-body attaching bolts
2 Mounting insulator-to-mounting support attaching bolts
3 Mounting insulator-to-rear extension attaching bolts
4 Rear engine mounting support
5 Damper-to-mounting support attaching bolts
6 Damper

Tightening torque kg-m (ft-lb)
Ⓐ 1.9 to 2.6 (14 to 19)
Ⓑ 0.9 to 1.2 (6.5 to 8.7)
Ⓒ 1.4 to 1.8 (10.1 to 13)
Ⓓ 0.9 to 1.2 (6.5 to 8.7)

ER236

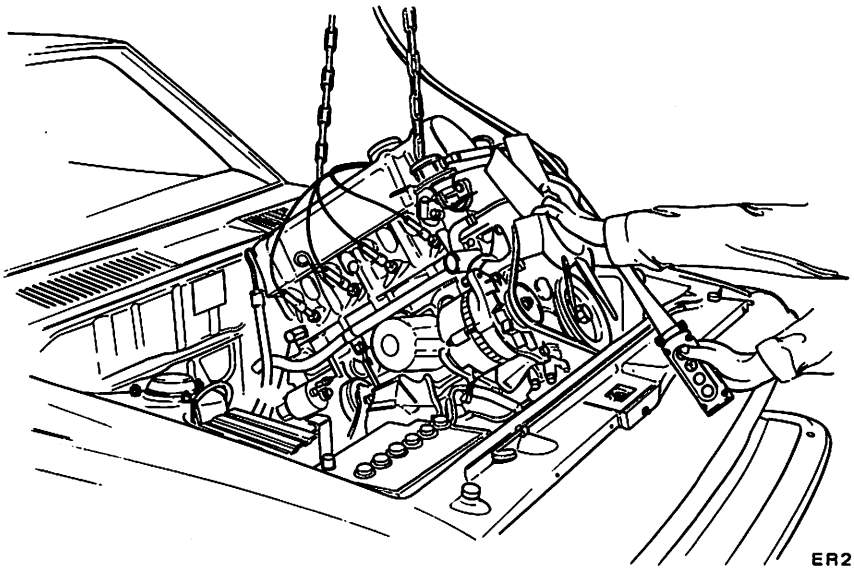
Fig. ER-16 Removing rear engine mounting support



1 Front engine mounting insulator
2 Front engine mounting bracket

ER238

Fig. ER-17 Removing front mounting bolts



ER216

Fig. ER-18 Lifting engine and transmission

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38. Place engine and transmission on engine stand.

INSTALLATION

Install engine and transmission in reverse order of removal, observing the following:

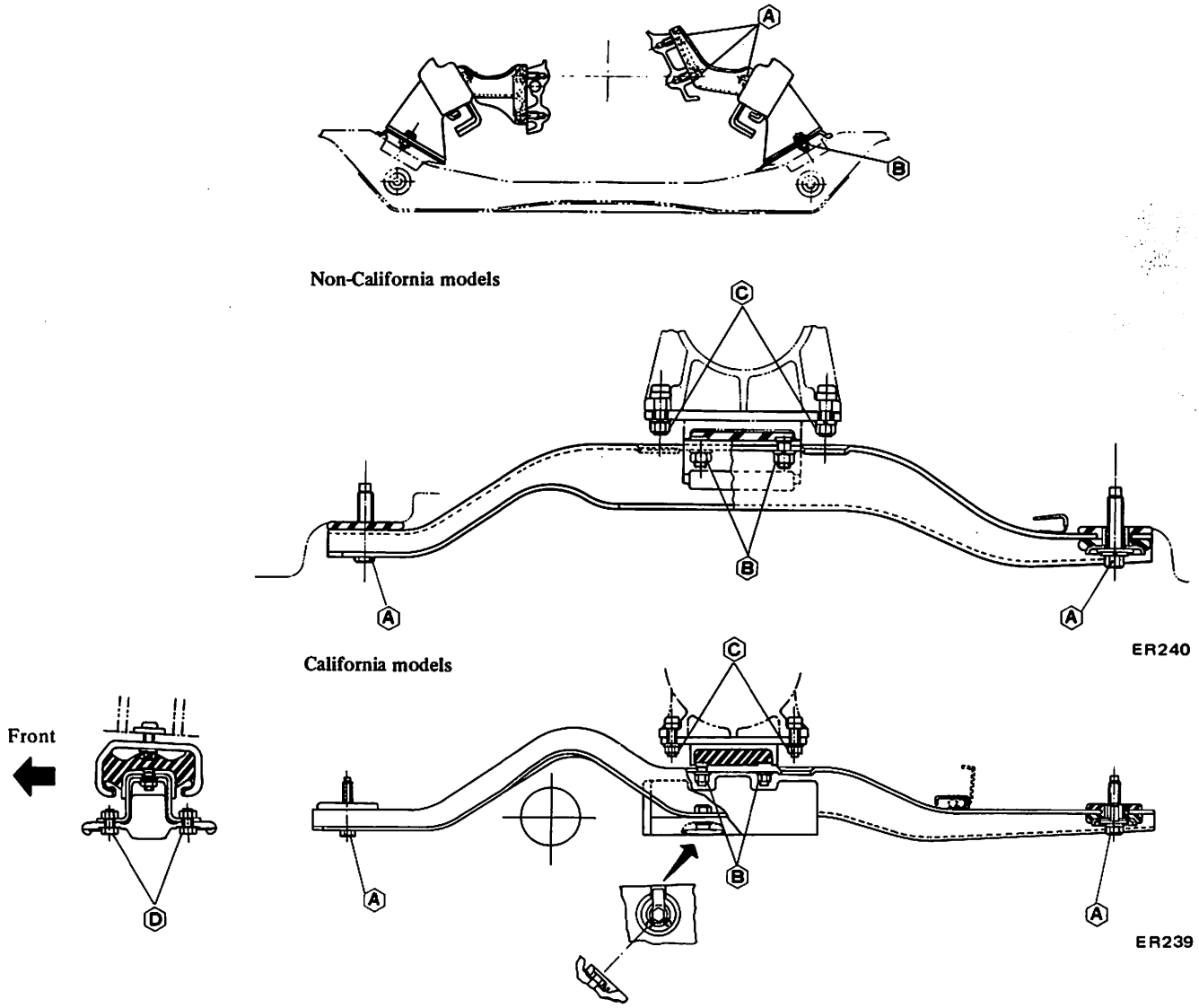
1. When installing, first secure rear engine mounting support to body.
2. Refer to applicable section when installing and adjusting any parts.
3. When installing engine hood, be sure that it is properly aligned and that hood lock operates securely. Refer to Section BF for "Adjustment".

ENGINE MOUNTING INSULATORS

Three insulators are used to mount the engine and transmission; two are located at the left and right front ends of the cylinder block and one at the transmission rear extension housing.

Replace insulator if it shows signs of separation or deterioration.

Be sure to keep insulator free from oil or grease.



Tightening torque kg-m (ft-lb)

Ⓐ 1.9 to 2.6 (14 to 19)
Ⓑ 0.9 to 1.2 (6.5 to 8.7)
Ⓒ 1.4 to 1.8 (10.1 to 13)
Ⓓ 0.9 to 1.2 (6.5 to 8.7)

Fig. ER-19 Structure view of engine mounting

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FRONT INSULATORS

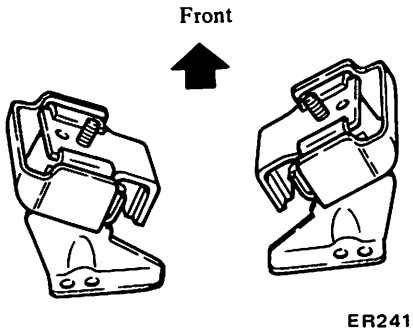


Fig. ER-20 Front insulators

Removal

1. Support engine with a jack or a hoist.
2. Remove front engine mounting insulator-to-front suspension member attaching bolts.
3. Remove engine mounting insulator-to-engine mounting bracket attaching bolts.
4. Raise engine slightly and remove insulators with heatshield plate.

Inspection

If there is damage, deterioration or separation of bounded surface, replace.

Installation

Install front insulator in the reverse order of removal, observing the following instructions.

Front insulator can be adjusted sideways. After mounting the engine on front insulators, make sure that the engine is properly aligned.

Note: When connecting front insulator to engine mounting bracket, align the projection on front insulator with the notch in engine mounting bracket.

REAR INSULATOR

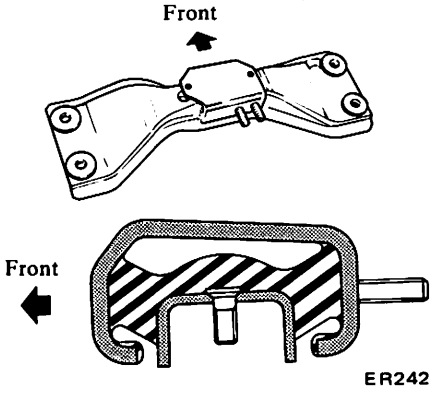


Fig. ER-21 Rear insulator

Removal

1. Support transmission with a jack.
2. Remove damper attaching bolts and remove damper from rear engine mounting support (California models).
3. Remove rear engine mounting insulator-to-mounting support attaching bolts.
4. Remove rear engine mounting insulator-to-rear extension housing attaching bolts.
5. Raise transmission slightly, and remove insulator.

Inspection

If there is damage, deterioration or separation of bounded surface, replace.

Installation

Install rear engine mounting insulator in the reverse order of removal, observing the following instructions:

1. Install insulator in place with the direction of mounted insulator as the same as that in Figure ER-21.
2. Install damper to mounting support and bend lock washers securely. Make sure that the end of lock washer is in the recess of damper (California models).

SERVICE DATA AND SPECIFICATIONS

Tightening torque	kg-m (ft-lb)
Front insulator-to-front suspension member	0.9 to 1.2 (6.5 to 8.7)
Front insulator-to-engine mounting bracket	1.9 to 2.6 (14 to 19)
Engine-to-engine mounting bracket	1.9 to 2.6 (14 to 19)
Rear mounting support-to-body	1.9 to 2.6 (14 to 19)
Rear insulator-to-rear mounting support	0.9 to 1.2 (6.5 to 8.7)
Transmission-to-rear insulator	1.4 to 1.8 (10.1 to 13.0)
Cylinder block gusset-to-automatic transmission	2.7 to 3.3 (20 to 24)
Damper-to-rear mounting support	0.9 to 1.2 (6.5 to 8.7)

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SERVICE MANUAL

DATSUN 710
MODEL 710 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION CL

CLUTCH

CL

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TROUBLE DIAGNOSES AND CORRECTIONS CL-11
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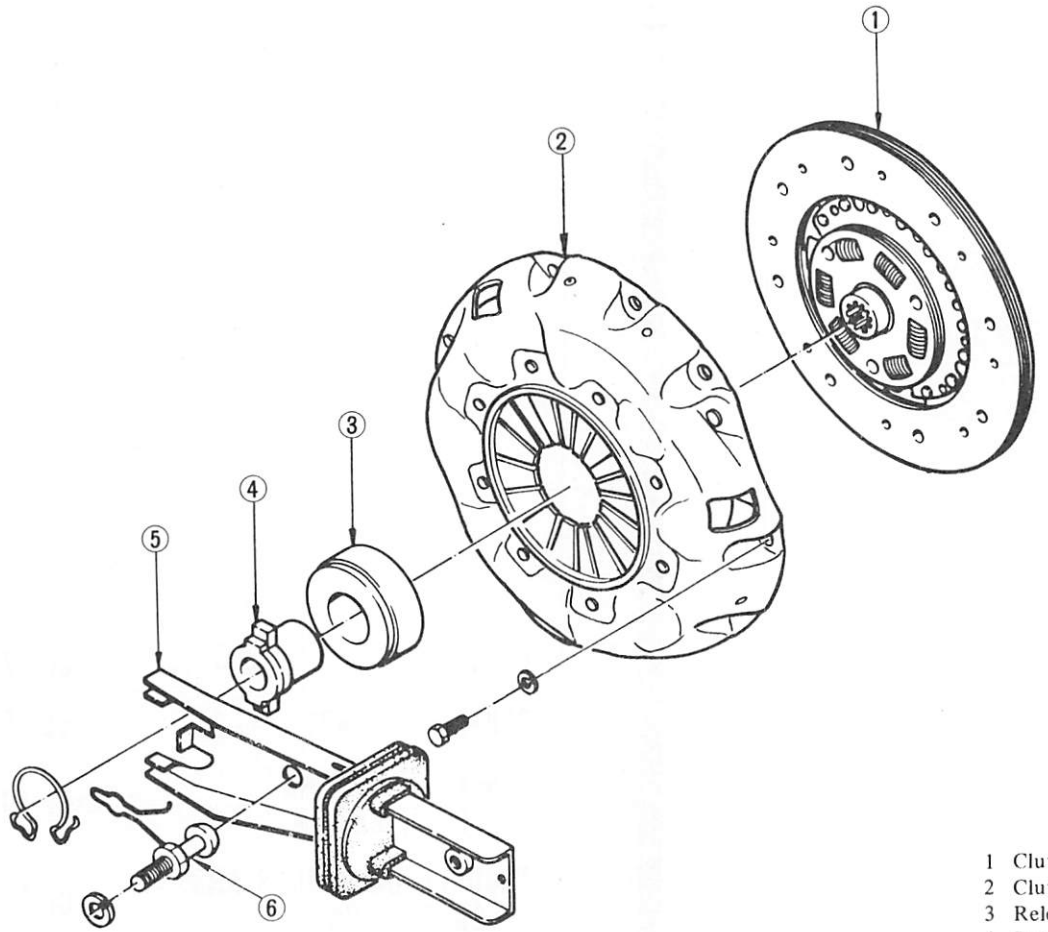
CLUTCH

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DESCRIPTION

The clutch is a single dry disc type using a diaphragm spring. It consists of a clutch disc, pressure plate, diaphragm spring, thrust rings, clutch cover and clutch release bearing.



1 Clutch disc assembly
2 Clutch cover assembly
3 Release bearing
4 Release sleeve
5 Withdrawal lever
6 Withdrawal lever ball pin

CL149

Fig. CL-1 Exploded view of clutch assembly

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CLUTCH DISC AND COVER

REMOVAL

1. Remove transmission from engine. For details of transmission removal, refer to Section TM (Page TM-3, TM-11 or TM-19) for Removal.
2. Insert Clutch Aligning Bar ST20630000 into clutch disc hub until it will no longer go. It is important to support weight of clutch disc in the steps that follow. See Figure CL-2.

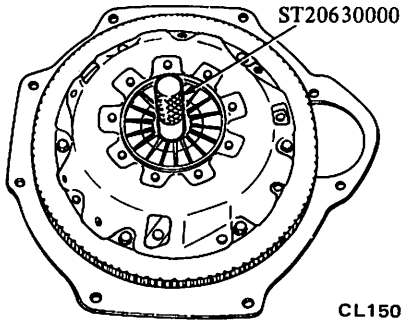


Fig. CL-2 Supporting clutch

3. Loosen bolts attaching clutch cover to flywheel, one turn each at a time, until spring pressure is released. Be sure to turn them out in a crisscross fashion.
4. Remove clutch disc and cover assembly.

INSPECTION

Wash all the disassembled parts except disc assembly in suitable cleaning solvent to remove dirt and grease before making inspection and adjustment.

Flywheel and pressure plate

Check friction surface of flywheel and pressure plate for scoring or roughness. Slight roughness may be smoothed by using fine emery cloth. If surface is deeply scored or grooved, the part should be replaced.

Clutch disc assembly

Inspect clutch disc for worn or oily facings, loose rivets and broken or loose torsional springs.

1. If facings are oily, the disc should be replaced. In this case, inspect transmission front cover oil seal, pilot bushing, engine rear oil seal and other points for oil leakage.
2. The disc should also be replaced when facings are worn locally or worn down to less than 0.3 mm (0.012 in) at rivet. See Figure CL-3.

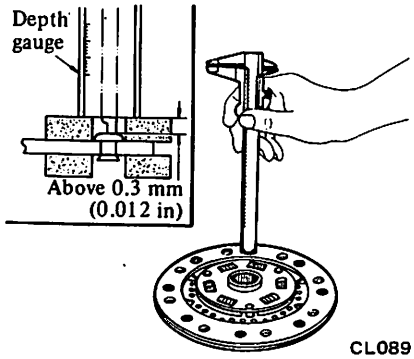


Fig. CL-3 Measuring clutch facing

3. Check disc plate for runout whenever the old disc or a new one is installed.
4. Check the fit of disc hub on transmission main drive gear splines for smooth sliding. If splines are worn, clutch disc or main drive gear should be replaced; that is, backlash exceeds 0.4 mm (0.016 in) at the outer edge of clutch disc.

Clutch cover assembly

1. Check the end surface of diaphragm spring for wear. If excessive wear is found, replace clutch cover assembly.
2. Measure the height of diaphragm spring as outlined below:

(1) Place Distance Piece ST20050100 on Base Plate ST20050010 and then tighten clutch cover assembly on the base plate by using Set Bolts ST20050051. See Figure CL-4.

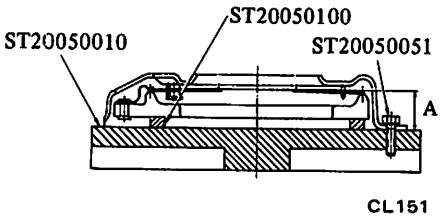


Fig. CL-4 Measuring the height of diaphragm spring

(2) Measure the height "A" at several points with a vernier caliper depth gauge. See Figure CL-3. If the height "A" of spring end is beyond the specified value, adjust the spring height with Diaphragm Spring Adjusting Wrench ST20050240 as shown in Figure CL-5.

Engine equipped models
A: 31.0 to 33.0 mm
(1.220 to 1.299 in)
Inner diameter of diaphragm spring

If necessary, replace clutch cover assembly. Also, unevenness of diaphragm spring toe height should be less than 0.5 mm (0.020 in).

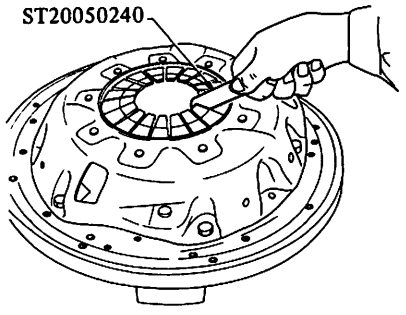


Fig. CL-5 Adjusting spring height

3. Inspect thrust rings for wear or damage. As these parts are invisible from outside, shake cover assembly up and down to listen for chattering noise, or lightly hammer on rivets for a slightly cracked noise. Any of these noises indicates need of replacement as a complete assembly.

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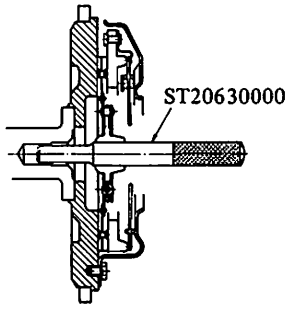
INSTALLATION

1. Apply a light coat of grease (including Disulphide Molybdenum) to transmission main drive gear splines. Slide clutch disc on main drive gear several times. Remove clutch disc and wipe off excess lubricant pushed off by disc hub.

Note: Take special care to prevent grease or oil from getting on clutch facing.

2. Reinstall clutch disc and clutch cover assembly. Support clutch disc and cover assemblies with Clutch Aligning Bar ST20630000. See Figure CL-6.

Note: Be sure to keep disc facings, flywheel and pressure plate clean and dry.



CL153

Fig. CL-6 Installing clutch cover assembly (Diaphragm spring type)

3. Install bolts to tighten clutch cover assembly to flywheel squarely. Each bolt should be tightened one turn at a time in a crisscross fashion to the specified torque, 1.6 to 2.1 kg-m (12 to 15 ft-lb).

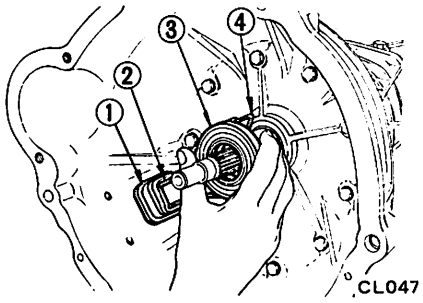
Note: Dowels are used to locate clutch cover on flywheel properly.

4. Remove Clutch Aligning Bar.
5. After installing clutch assembly (coil spring type), remove three release lever stoppers from clutch cover.
6. Reinstall transmission as described in Section TM (Page TM-9, TM-17 or TM-30) for Installation.

RELEASE BEARING

REMOVAL

1. Remove transmission from engine. For details of transmission removal, refer to Section TM (Page TM-3).
2. Remove holder spring from bearing sleeve; disconnect clutch withdrawal lever from bearing sleeve.
3. Remove release bearing and sleeve as an assembly from mainshaft. See Figure CL-12.

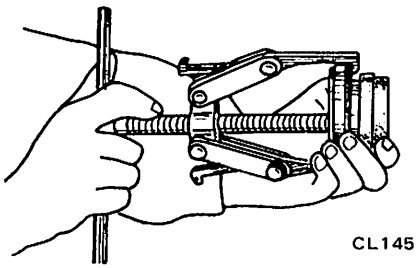


CL047

1 Dust cover
2 Withdrawal lever
3 Release bearing
4 Holder spring

Fig. CL-7 Removing clutch release mechanism

4. Take out clutch release bearing from bearing sleeve, using a universal puller and a suitable adapter. See Figure CL-13.



CL145

Fig. CL-8 Disassembling release bearing

INSPECTION

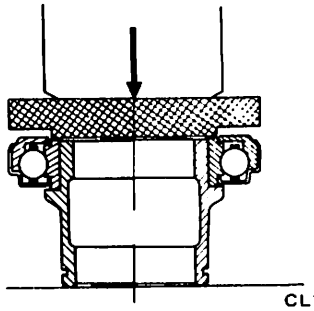
Check for abnormal wear on contact surface of withdrawal lever, ball pin and bearing sleeve.

Hold bearing inner race and rotate outer race while applying pressure to it. If the bearing rotation is rough or noisy, replace bearing.

INSTALLATION

1. Assemble release bearing on sleeve, using a press. See Figure CL-9.

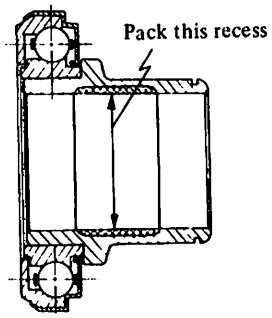
Note: Do not depress outer race.



CL117

Fig. CL-9 Installing release bearing

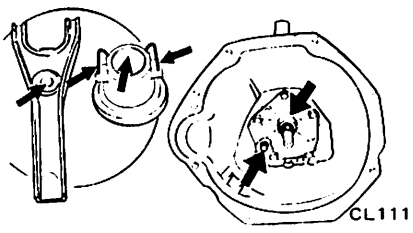
2. Before or during assembling, lubricate the following points with a light coat of multi-purpose grease.
(1) Inner groove of release bearing sleeve.



CL093

Fig. CL-10 Lubricating recess of bearing sleeve

(2) Contact surfaces of withdrawal lever, lever ball pin and bearing sleeve.
(3) Contact surfaces of transmission front cover. See Figure CL-11.



CL111

Fig. CL-11 Lubricating points of withdrawal lever and front cover

(4) Contact surfaces of transmission main drive gear splines [grease (including Disulphide Molybdenum)].

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Note: Very small amount of grease should be coated to the above points. If too much lubricant is applied, it will run out on the friction plates when hot, resulting in damaged clutch disc facings.

3. After lubricating, install withdrawal lever, release bearing and bearing sleeve on clutch housing. After connecting them with holder spring, install dust cover on clutch housing.
4. Reinstall transmission as described in Section TM (Page TM-9).

PILOT BUSHING

REMOVAL

1. Remove transmission from engine. For details of transmission removal, refer to Section TM (Page TM-3, TM-11 or TM-19) for Removal.
2. Remove clutch disc and cover assembly. Refer to the page CL-3 for Removal.
3. Remove pilot bushing in crankshaft by Pilot Bush Puller ST16610001. See Figure CL-12.

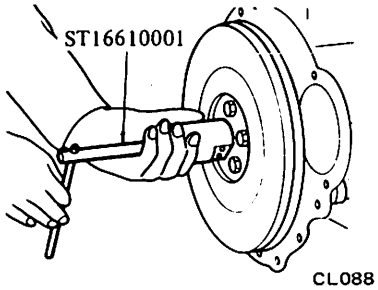


Fig. CL-12 Removing pilot bushing

INSPECTION

Check the fit of pilot bushing in the bore of crankshaft.

Check pilot bushing in crankshaft for wear, roughness or bell-mounted condition. If necessary, replace it. When bushing is damaged, be sure to check transmission main drive gear at the same time.

INSTALLATION

1. Before installing a new bushing, thoroughly clean bushing hole. Install bushing in crankshaft using a soft hammer. Bushing need not be oiled. See Figure CL-13.

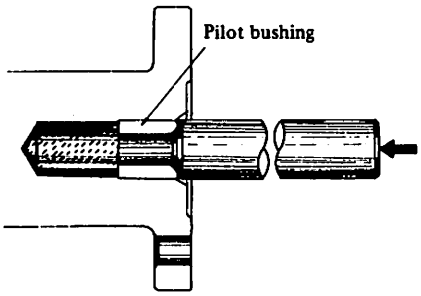


Fig. CL-13 Installing pilot bushing

2. Install clutch disc and clutch cover assembly. Refer to Section CL (Page CL-5) for Installation.
3. Install transmission as described in Section TM (Page TM-9, TM-17 or TM-30) for Installation.

CLUTCH CONTROL

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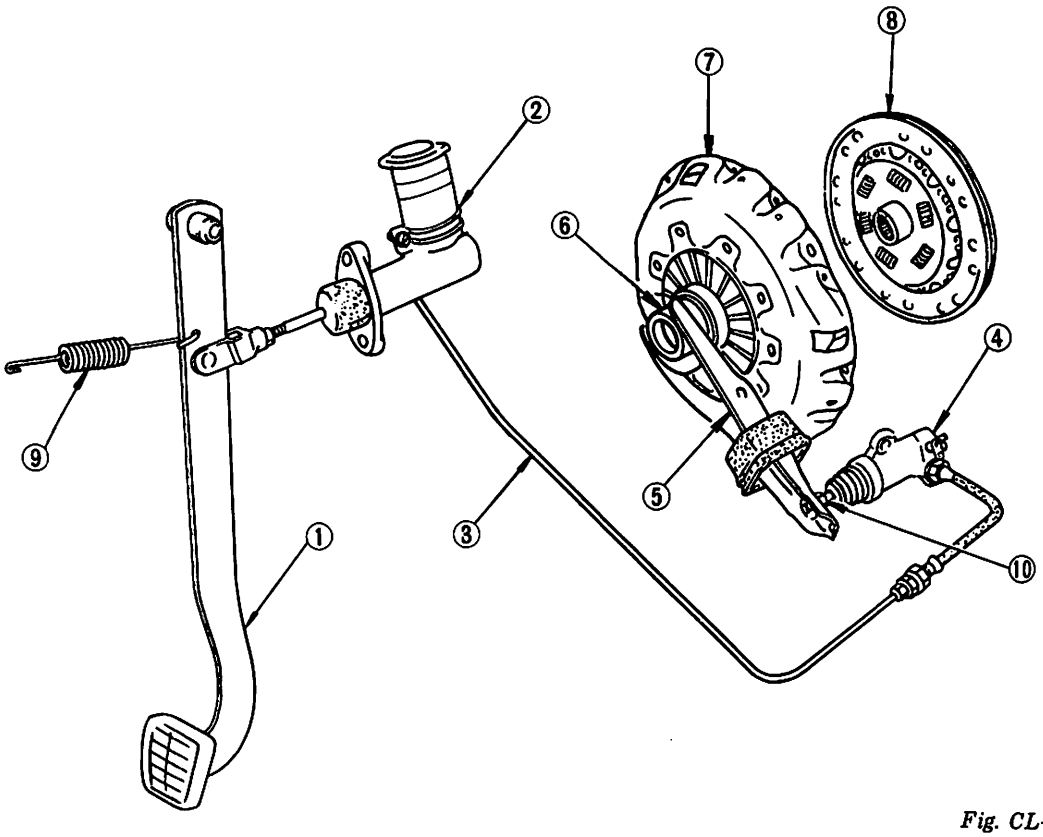
DESCRIPTION

The hydraulic clutch control consists of a pendent pedal, master cylinder, operating cylinder and withdrawal lever.

When the clutch pedal is depressed, the piston of the master cylinder forwards brake fluid to the operating cylinder via a pipe line. The movement of the operating cylinder piston is transmitted to the withdrawal lever through the push rod, thus disengaging the clutch.

The operating cylinder is a non-adjustable type that uses no return spring. In this unit, the withdrawal-to-push rod play adjustment is not necessary since the "S" shown in Figure CL-16 serves to automatically compensate for wear on clutch disc.

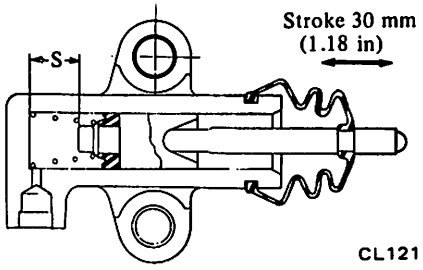
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1 Clutch pedal
2 Clutch master cylinder
3 Clutch piping
4 Operating cylinder
5 Withdrawal lever
6 Release bearing
7 Clutch cover
8 Clutch disc
9 Return spring
10 Push rod

CL155

Fig. CL-14 Clutch operating system



CL121

Fig. CL-15 Non-adjustable operating cylinder

BLEEDING CLUTCH SYSTEM

To bleed clutch system, use the same procedures as described in Section BR (Page BR-9) for Bleeding Hydraulic System.

1. Fill oil reservoir of operating cylinder with brake fluid.
2. Detach cap from bleeder screw on operating cylinder and, in its place, connect a vinyl tube.
3. Pour a small amount of brake fluid into a clean container and insert the open end of the vinyl tube into it.
4. Have a co-worker depress clutch pedal two or three times. With clutch pedal depressed fully, loosen bleeder screw to bleed air out of clutch system.
5. Tighten bleeder screw and release the pedal.
6. Repeat above steps until no air bubbles appear in vinyl tube.

Notes:

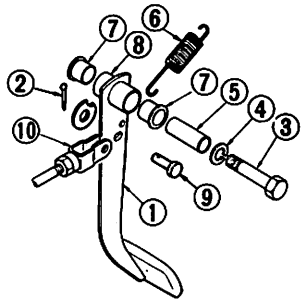
a. **Always keep brake fluid in oil reservoir so that it flows into the line continuously.**
b. **Use care not to allow brake fluid coming into contact with painted surfaces.**
c. **Make sure that no leak occurs at connections.**
d. **Pour brake fluid into oil reservoir up to the specified level.**

CLUTCH PEDAL

REMOVAL

See Figure CL-16.

1. Unhook return spring ⑥.
2. Take out clevis pin ⑨ by taking off cotter pin ② and disconnect push rod ⑩ from pedal assembly ①.
3. Remove fulcrum bolt ③ and drop down pedal assembly ①.



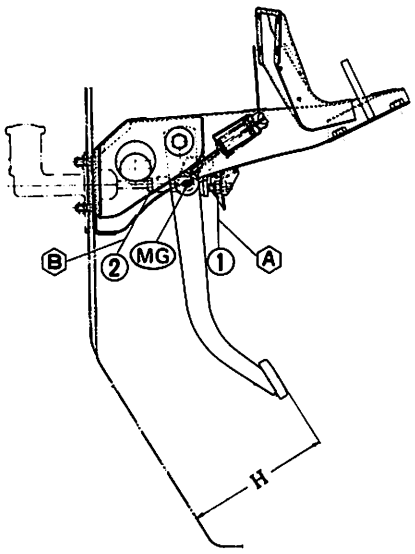
CL226

1 Pedal assembly
2 Cotter pin
3 Fulcrum bolt
4 Lock washer
5 Sleeve
6 Return spring
7 Bushing
8 Pedal boss
9 Clevis pin
10 Push rod

Fig. CL-16 Exploded view of clutch pedal

Note: Before removing clutch pedal, note toe board clearance.

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1 Lock nut A
2 Lock nut B
MG Multi-purpose grease
H Pedal height
180 mm (7.087 in)

Tightening torque (T) of
nuts kg-m (ft-lb)
A T : 0.8 to 1.1 (5.8 to 8.0)
B T : 0.8 to 1.1 (5.8 to 8.0)

CL227

Fig. CL-17 Adjusting pedal height

INSPECTION

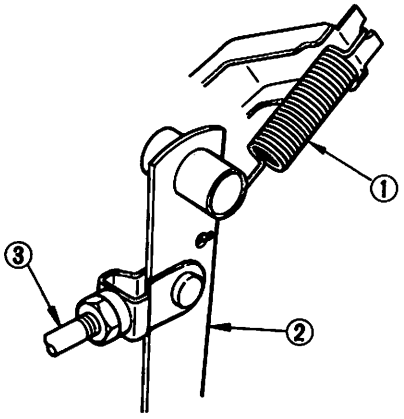
Clean the following parts in cleaning solvent and check for wear, damage or any other abnormal condition. Replace the parts which are not good for further use.

1. Return spring
2. Pedal boss
3. Bushing
4. Fulcrum bolt, etc.

INSTALLATION AND ADJUSTMENT

Install clutch pedal in the reverse procedures of removal. Apply multi-purpose grease to the friction surface of clevis pin. See Figure CL-17.

Note: Refer to Figure CL-19 for the correct direction of return spring.



1 Return spring
2 Pedal assembly
3 Push rod

CL228

Fig. CL-18 Hooking return spring

After installing clutch pedal, adjust the clutch pedal height as follows:

1. Adjust the clutch pedal height to 180 mm (7.087 in) by turning in or out pedal stopper bolt. Then tighten lock nut "A" (1) to the specified torque 0.8 to 1.1 kg-m (5.8 to 8.0 ft-lb). See Figure CL-17.
2. Adjust the play of clutch pedal appeared due to the clearance between clevis pin and clutch pedal to 1 to 5 mm (0.039 to 0.197 in) measured on the top face of pedal pad by turning in or out push rod. Then tighten lock nut "B" (2) to the specified torque of 0.8 to 1.1 kg-m (5.8 to 8.0 ft-lb). See Figure CL-17.

Note: Depress and release clutch pedal over its entire stroke to ensure that the clutch linkage operates smoothly without squeak noise, interference and binding.

CLUTCH MASTER CYLINDER

REMOVAL

1. Pry off snap ring on clevis pin.
2. Remove clevis pin at push rod.
3. Disconnect clutch tube from master cylinder and drain brake fluid.
4. Remove nuts securing master cylinder to dash panel and disconnect master cylinder.

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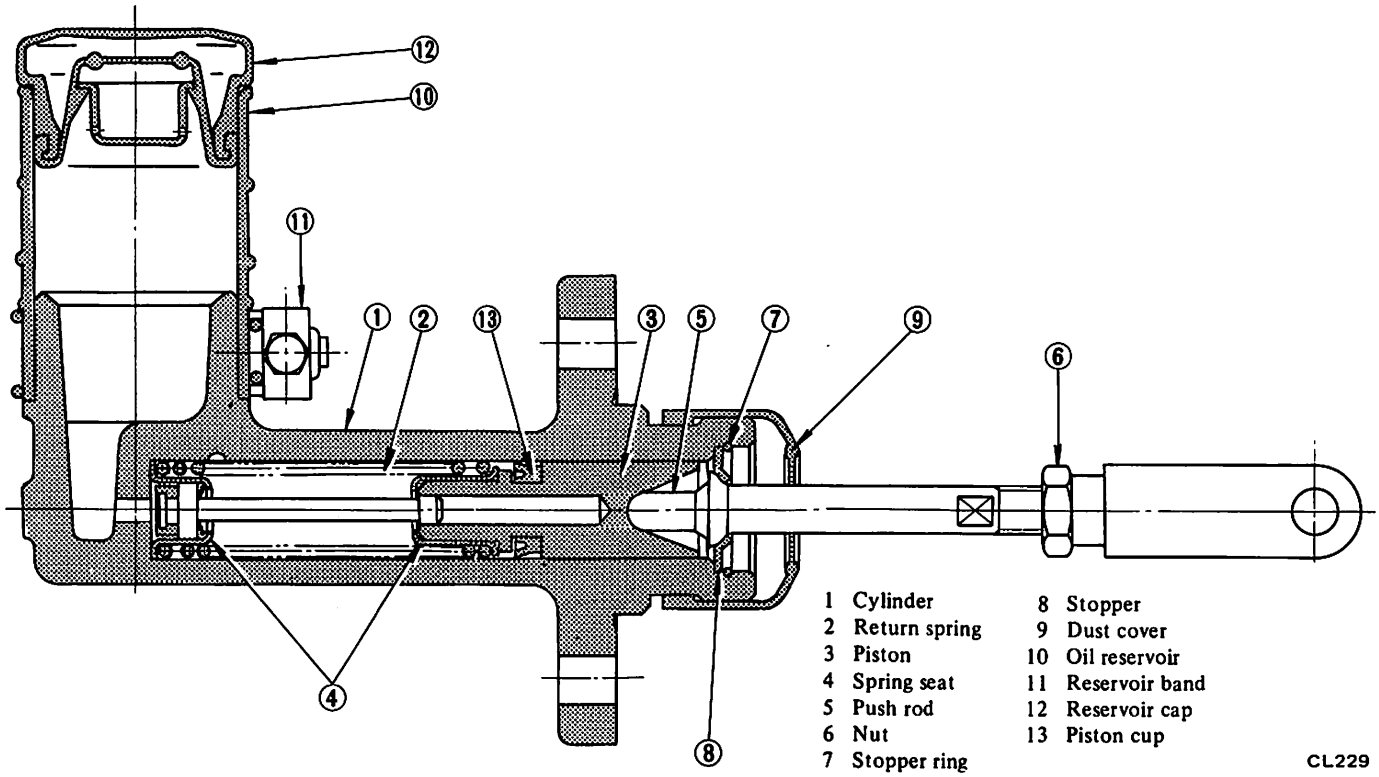
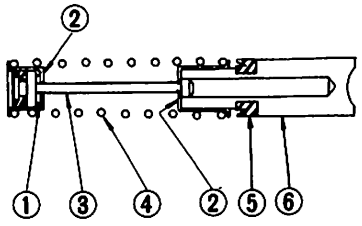


Fig. CL-19 Clutch master cylinder

DISASSEMBLY

1. Remove dust cover and take off stopper ring from body.
2. Remove push rod and piston assembly.
3. Remove spring seat from piston and take off piston cup, if necessary. See Figure CL-20.

Note: Discard piston cup if it is removed from piston assembly.



1 Valve spring
2 Spring seat
3 Valve assembly
4 Return spring
5 Piston cup
6 Piston
CL105

Fig. CL-20 Piston assembly

INSPECTION

Note: To clean or wash all parts of master cylinder, clean brake fluid must be used. Never use mineral oils such as gasoline and kerosene. It will ruin the rubber parts of the hydraulic system.

1. Check cylinder and piston for uneven wear or damage, and replace if necessary.
2. Renew piston cup when disassembled. It must also be replaced when wear or deformation due to fatigue or damage is found.
3. Damaged dust cover, oil reservoir or cap, should be replaced. Return spring and valve spring must also be replaced when they are broken or weak.

ASSEMBLY

Assemble clutch master cylinder in the reverse procedures of disassembly, observing closely the following instructions.

1. Dip piston cup in brake fluid before installing. Make sure that it is correctly faced in position. See Figure CL-14.
2. Apply a coating of brake fluid to cylinder and piston when assembling.

INSTALLATION

Install clutch master cylinder in the reverse procedures of removal, observing closely the following instructions.

1. Adjust the pedal height by changing the length of push rod, referring to the page CL-6 for Installation and Adjustment.
2. Bleed air out of hydraulic system, referring to the page **CL-6** for Bleeding Clutch System:

Tightening torque:
Master cylinder to dash panel
Clutch tube connector:
1.5 to 1.8 kg-m
(11 to 13 ft-lb)

OPERATING CYLINDER

REMOVAL

1. Disconnect clutch tube from clutch hose.

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2. Detach clutch hose from operating cylinder.
3. Remove two bolts securing operating cylinder to clutch housing.

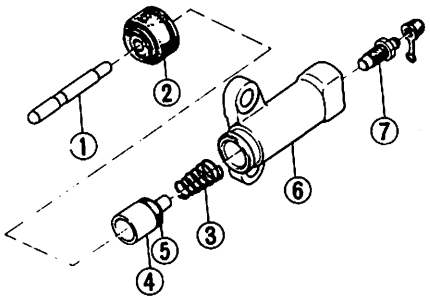
DISASSEMBLY

See Figure CL-21.

1. Remove push rod and dust cover.
2. Remove piston and piston spring.

Note: Discard piston cup if it is removed from piston assembly.

3. Remove bleeder screw.



1 Push rod
2 Dust cover
3 Piston spring
4 Piston
5 Piston cup
6 Operating cylinder
7 Bleeder screw

CL118

Fig. CL-21 Exploded view of operating cylinder

INSPECTION

Visually inspect all disassembled parts, replacing those found worn or damaged too badly beyond specifications.

Note: To clean or wash all parts of operating cylinder, clean brake fluid must be used.
Never use mineral oils such as gasoline or kerosene. It will ruin the rubber parts of the hydraulic system.

1. Check cylinder and piston for uneven wear or damage, and replace if necessary.
2. Renew piston cup when disassembled. It must also be replaced when wear or deformation due to fatigue or damage is found.
3. Damaged dust cover should be replaced. Return spring must also be replaced when it is broken or weak.

ASSEMBLY

Assemble operating cylinder in the reverse procedures of disassembly, observing closely the following instructions.

1. Prior to assembly, dip a new piston cup in clean brake fluid. In installing piston cup, pay particular attention to its direction.
2. Dip cylinder and piston in clean brake fluid before assembly.

Note: Be sure to install piston assembly with piston spring in place.

INSTALLATION

Install operating cylinder in the reverse procedures of removal.

Note: Bleed air thoroughly from clutch hydraulic system, referring to the page CL-8 for Bleeding Clutch System.

Tightening torque:

Operating cylinder to clutch housing securing bolts:
3.1 to 4.1 kg-m
(22 to 30 ft-lb)
Clutch hose connector:
1.7 to 2.1 kg-m
(12 to 15 ft-lb)

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SERVICE DATA AND SPECIFICATIONS

Clutch cover		
Diaphragm spring-to-flywheel distance	mm (in)	31.0 to 33.0 (1.220 to 1.299)
Unevenness of diaphragm spring height	mm (in)	less than 0.5 (0.020)
Full load	kg (lb)	450 (992)
Out of flatness of pressure plate	mm (in)	0.1 (0.004)
Allowable refacing limit	mm (in)	1.0 (0.039)
Clutch disc		
Facing size Outer dia. x inner dia. x thickness	mm (in)	200 x 130 x 3.5 (7.87 x 5.12 x 0.138)
Allowable minimum depth of rivet head from surface	mm (in)	0.3 (0.012)
Allowable backlash of spline (at the outer edge of disc)	mm (in)	0.4 (0.016)
Clutch pedal		
Pedal height	mm (in)	180 (7.087)
Play at pedal pad	mm (in)	1 to 5 (0.039 to 0.197)
Clutch master cylinder		
Diameter of master cylinder	mm (in)	15.87 (5/8)
Clutch operating cylinder		
Diameter of operating cylinder	mm (in)	19.05 (3/4)

Tightening torque

Clutch assembly to flywheel securing bolt	kg-m (ft-lb)	1.6 to 2.1 (12 to 15)
Push rod lock nut	kg-m (ft-lb)	0.8 to 1.1 (5.8 to 8.0)
Pedal stopper lock nut	kg-m (ft-lb)	0.8 to 1.1 (5.8 to 8.0)
Clutch tube connector (Flare nut)	kg-m (ft-lb)	1.5 to 1.8 (11 to 13)
Operating cylinder to clutch housing securing bolt	kg-m (ft-lb)	3.1 to 4.1 (22 to 30)
Clutch hose connector	kg-m (ft-lb)	1.7 to 2.1 (12 to 15)
Flywheel fixing bolts	kg-m (ft-lb)	14 to 16 (101 to 116)

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TROUBLE DIAGNOSES AND CORRECTIONS

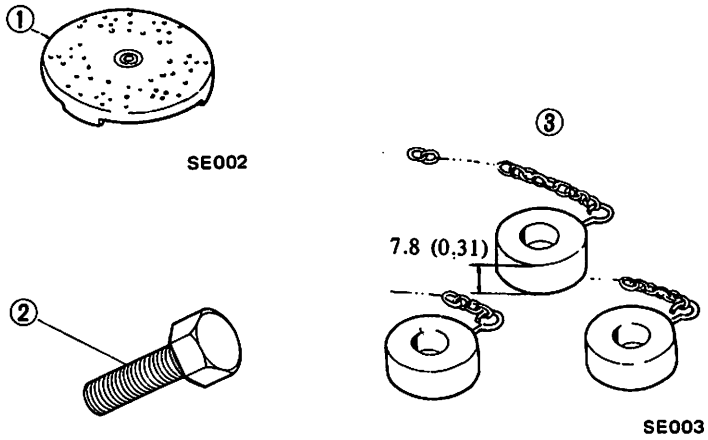
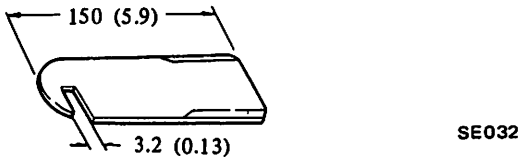
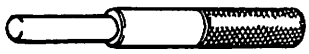
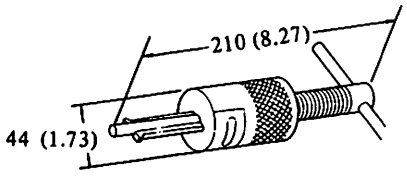
Condition	Probable cause and testing	Corrective action
Clutch slips	Slipping of clutch may be noticeable when any of the following symptoms is encountered during operation. (1) Car will not respond to engine speed during acceleration. (2) Insufficient car speed. (3) Lack of power during uphill driving. Some of the above conditions may also be attributable to engine problem. First determine whether engine or clutch is causing the problem. If slipping clutch is left unheeded, wear and/or overheating will occur on clutch facing to such an extent that it is no longer serviceable. TO TEST FOR SLIPPING CLUTCH, proceed as follows: During upgrade travelling, run engine at about 40 to 50 km/h (25 to 31 MPH) with gear shift lever in 3rd-speed position, shift into highest gear and at the same time rev up engine. If clutch is slipping, car will not readily respond to depression of accelerator pedal.	
	• Clutch facing worn excessively.	Replace.
	• Oil or grease on clutch facing.	Replace.
	• Warped clutch cover or pressure plate.	Repair or replace.
Clutch drags	Dragging clutch is particularly noticeable when shifting gears, especially into low gear. TO TEST FOR DRAGGING CLUTCH, proceed as follows: (1) Start engine. Disengage clutch. Shift into reverse gear, and then into Neutral. Gradually increase engine speed, and again shift into reverse gear. If clutch is dragging, gear "grating" is heard when shifting gears from Neutral into Reverse. (2) Stop engine and shift gears. (Conduct this test at each gear position.) (3) Each gear is smoothly shifted in step (2) above, but grates when shifted to 1st speed position at idling. a. If dragging is encountered at the end of shifting, check condition of synchro-mechanism in transmission. b. If dragging is encountered at the beginning of shifting, proceed to step (4) below. (4) Push change lever toward Reverse side, depress pedal to check for free travel of pedal. a. If pedal can be depressed further, check clutch for condition. b. If pedal cannot be depressed further, proceed to step (5) below. (5) Check clutch control. (pedal height, free pedal play, free travel withdrawal lever play, etc.) If any abnormal condition does not exist and if pedal cannot be depressed further, check clutch for condition.	
	• Clutch disc runout or warped.	Replace.
	• Wear or rust on hub splines in clutch disc.	Clean and lubricate with grease, or replace.
	• Diaphragm spring toe height out of adjustment or toe tip worn.	Adjust or replace.
	• Worn or improperly installed parts.	Repair or replace.

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Condition	Probable cause and testing	Corrective action
Clutch chatters	Clutch chattering is usually noticeable when car is just rolled off with clutch partially engaged.	
	• Weak or broken clutch disc torsion spring.	Replace.
	• Oil or grease on clutch facing.	Replace.
	• Clutch facing out of proper contact or clutch disc runout.	Replace.
	• Loose rivets.	Replace.
	• Warped pressure plate or clutch cover surface.	Repair or replace.
	• Unevenness of diaphragm spring toe height.	Adjust or replace.
	• Loose engine mounting or deteriorated rubber.	Retighten or replace.
Noisy clutch	A noise is heard after clutch is disengaged.	
	• Damaged release bearing.	Replace.
	A noise is heard when clutch is disengaged.	
	• Insufficient grease on the sliding surface of bearing sleeve.	Apply grease.
	• Clutch cover and bearing are not installed correctly.	Adjust.
	A noise is heard when car is suddenly rolled off with clutch partially engaged.	
	• Damaged pilot bushing.	Replace.
Clutch grabs	When grabbing of clutch occurs, car will not roll off smoothly from a standing start or clutch will be engaged before clutch pedal is fully depressed.	
	• Oil or grease on clutch facing.	Replace.
	• Clutch facing worn or loose rivets.	Replace.
	• Wear or rust on splines in drive shaft and clutch disc.	Clean or replace.
	• Warped flywheel or pressure plate.	Repair or replace.
	• Loose mountings for engine or power train units.	Retighten.

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SPECIAL SERVICE TOOLS

No.	Tool number & tool name	Description Unit: mm (in)	For use on	Reference page or figure No.
1. 2. 3.	ST20050010 Base plate ST20050051 Set bolt ST20050100 Distance piece 7.8 mm (0.31 in)		710 610	Fig. CL-4 Page CL-3
4.	ST20050240 Diaphragm spring adjusting wrench		710 610	Fig. CL-5 Page CL-3
5.	ST20630000 Clutch aligning bar	This tool is used to conduct disc centering by inserting the tool into pilot bush in flywheel, when installing clutch assembly to flywheel. 		Fig. CL-2 Fig. CL-6 Page CL-3 Page CL-4
6.	ST16610001 Pilot bush puller		L26 L24 L18 L16 L14	Fig. CL-12 Page CL-5

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SERVICE MANUAL

DATSUN 710
MODEL 710 SERIES

SECTION TM

TRANSMISSION

TM

4-SPEED TRANSMISSION (TYPE : F4W63L) ..... TM- 2

SERVICE DATA AND SPECIFICATIONS TM-10

TROUBLE DIAGNOSES AND CORRECTIONS TM-12

SPECIAL SERVICE TOOLS TM-13

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

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4-SPEED TRANSMISSION (TYPE: F4W63L)

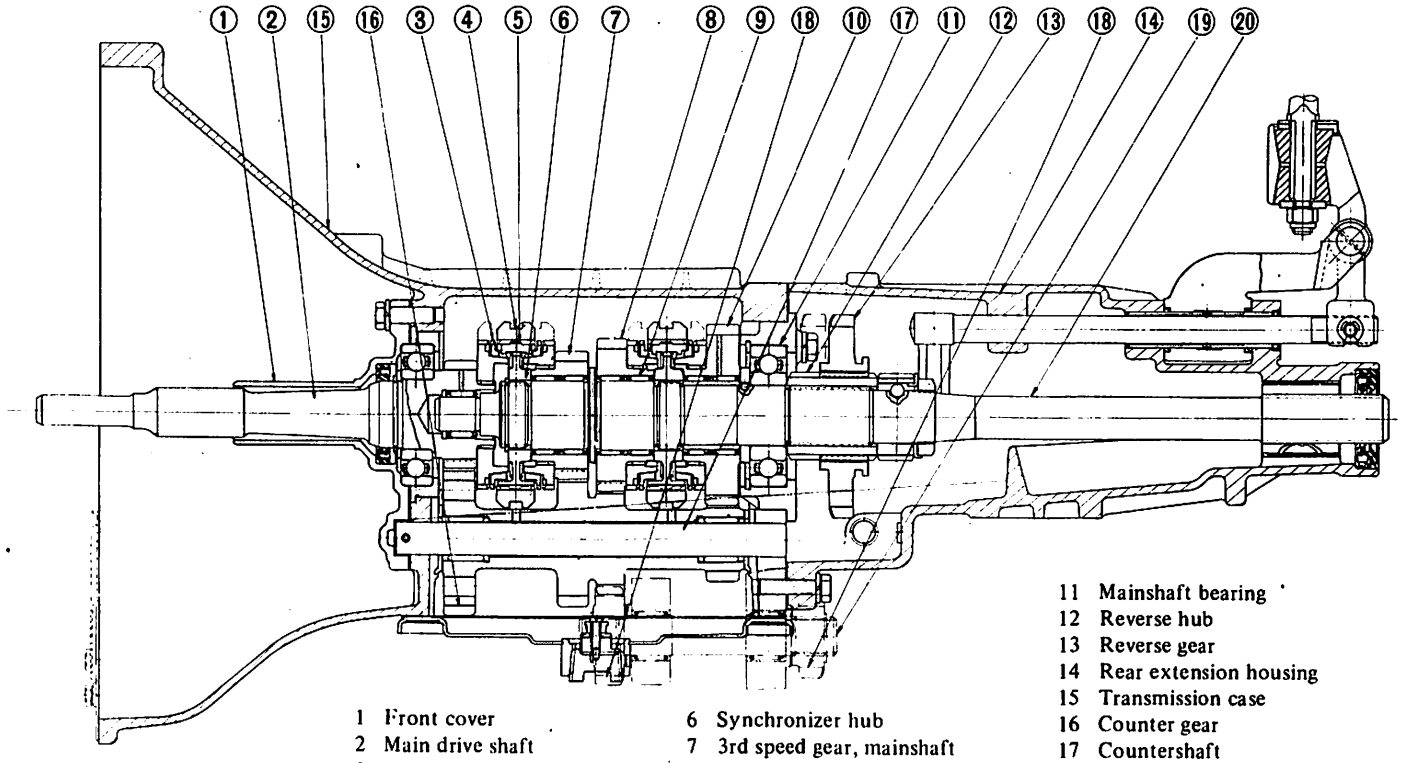
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DESCRIPTION

The transmission is a fully synchronized 4-speed type that uses helical gears. The reverse gear is a sliding mesh type using spur gears. In construction, the main drive gear is meshed with the counter drive gear. The forward speed gears provided on the countershaft are in constant mesh with the main gears. Each of the main gears rides on the mainshaft through the needle roller bearing, thus rotating freely on the mainshaft. When the transmission is shifted, the action causes the coupling sleeve to slide on the synchronizer hub. This engages its inner teeth with the outer teeth formed on the mainshaft gear.

The synchronizer hub is fitted to the mainshaft by spline so they turn together as a unit as the mainshaft is rotated. The transmission is of a Warner type. On Warner type, the baulk rings synchronize the coupling sleeve with the mainshaft gear. Placing the speed control lever in the reverse position throws the mainshaft reverse gear into engagement with the reverse idler gear; the transmission is reversed. The transmission consists of two major elements; complete transmission case and rear extension. The case contains all gears and gear shafts.



1 Front cover
2 Main drive shaft
3 Baulk ring
4 Coupling sleeve
5 Shifting insert
6 Synchronizer hub
7 3rd speed gear, mainshaft
8 2nd speed gear, mainshaft
9 Needle bearing
10 1st speed gear, mainshaft
11 Mainshaft bearing
12 Reverse hub
13 Reverse gear
14 Rear extension housing
15 Transmission case
16 Counter gear
17 Countershaft
18 Reverse idler gear
19 Reverse idler shaft
20 Mainshaft

Fig. TM-1 Sectional view of F4W63L transmission

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REMOVAL

To dismount transmission from car, proceed as follows:

1. Disconnect battery ground cable from terminal.
2. On California models, disconnect catalyzer sensor harness and remove harness protector.
3. Jack up car and support its weight on safety stands. A hydraulic hoist or an open pit should be utilized, if available.

Ensure that safety precautions are observed.

4. Loosen off control lever securing nut and remove lever. See Figure TM-2.

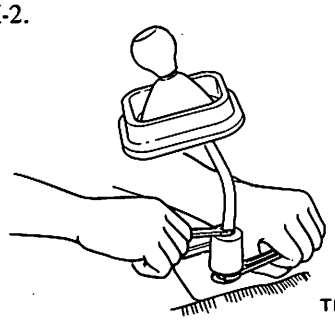

TM775

Fig. TM-2 Removing control lever

5. On California models, remove lower catalytic converter shelter, and disconnect front exhaust tube from catalytic converter after loosening exhaust bracket bolt.

On non-California models, disconnect front exhaust tube from exhaust manifold and rear exhaust tube.

6. Disconnect wires from reverse lamp switch (back-up lamp switch), top switch and neutral switch at connectors.
7. Remove clutch operating cylinder from transmission case. See Figure TM-3.

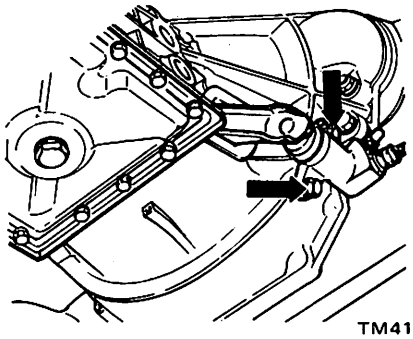

TM416

Fig. TM-3 Removing clutch operating cylinder

8. Disconnect speedometer cable. On California models, disconnect speedometer cable from speedometer cable adapter on rear extension housing. See Figure TM-4.

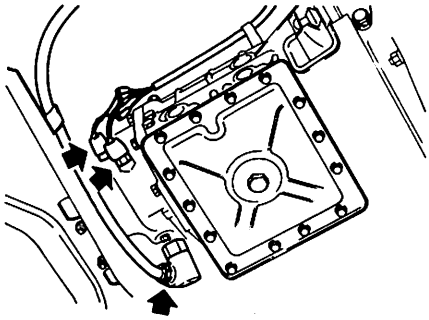

TM818

Fig. TM-4 Disconnecting wires and cables

9. Disengage propeller shaft. Refer to the Section "Propeller Shaft".

Note: Plug up the opening in rear extension housing to prevent oil from flowing out.

10. Support the engine by locating a jack under oil pan with a wooden block used between oil pan and jack.
11. Support the transmission by means of a jack.
12. Remove four crossmember mounting bolts, and remove two bolts securing transmission to rear engine mounting insulator. See Figure TM-5.

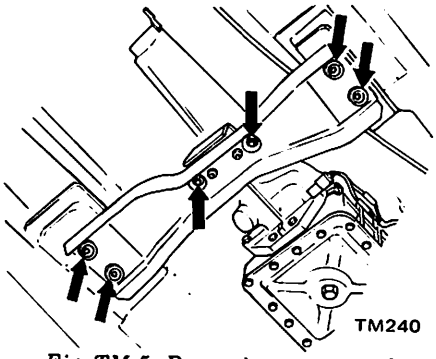

TM240

Fig. TM-5 Removing crossmember

Note: On California models, it is unnecessary to remove damper.

13. Lower jack so that transmission can be dismounted from the vehicle easily.
14. Remove starter motor from transmission case.
15. Remove four bolts securing engine to gussets.

Remove three bolts securing gussets to engine rear plate and transmission case, and separate gussets from engine block and transmission case. See Figure TM-6.

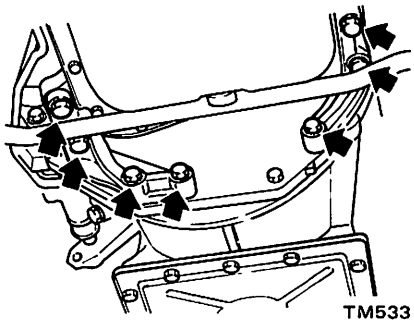

TM533

Fig. TM-6 Removing gusset

16. Remove bolts securing transmission to engine, and move transmission backward and away from the car.

Note: Take care in dismounting the transmission not to strike any adjacent parts and main drive shaft.

DISASSEMBLY

1. Thoroughly wipe clean dirt and grease from each component parts of transmission. Drain out oil in transmission case. Place the transmission on the suitable stand securely.
2. Remove speedometer cable adapter. Detach dust cover from transmission case. Remove withdrawal lever and release bearing. Remove five bolts securing front cover to transmission case, and detach front cover. See Figure TM-7.

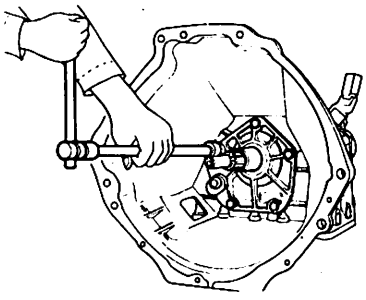

TM241

Fig. TM-7 Removing front cover

3. Detach bottom cover from transmission case.
4. Remove reverse lamp switch neutral switch, top switch and speedometer pinion with speedometer sleeve.
5. Move gear to Neutral position.
6. Pull out striking rod pin ①. See Figure TM-8.

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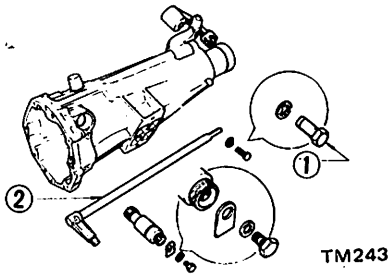


Fig. TM-8 Disassembling rear extension

7. Remove six bolts securing rear extension to transmission case. Detach rear extension housing by lightly tapping it with a soft hammer as shown in Figure TM-9.

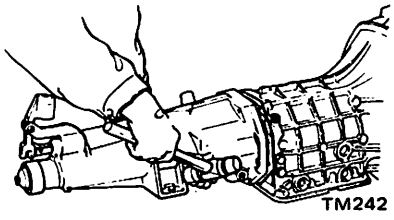


Fig. TM-9 Removing rear extension housing

8. Draw out striking rod ②. See Figure TM-8.

GEAR DISASSEMBLY

1. Back off check ball plugs, and remove three locking springs and check balls. Take care not to lose these parts. See Figure TM-10.

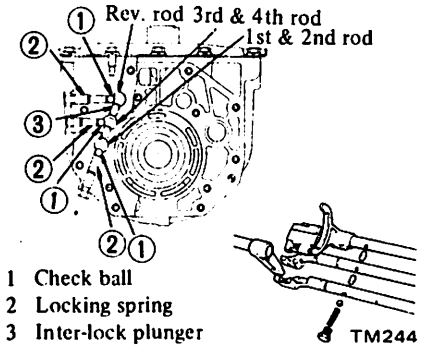


Fig. TM-10 Layout of check balls and interlock plungers

2. Using Fork Rod Pin Punch ST23540000, drive out retaining pins from fork rod. See Figure TM-11. Take care not to lose two plungers when drawing out fork rods.

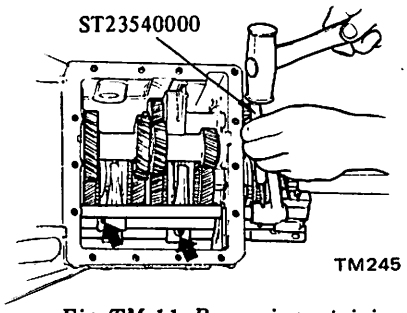


Fig. TM-11 Removing retaining pins

3. Mesh gears at two places. Straighten lock washer and loosen nut on mainshaft.

4. Using Countershaft Guide ST23100000, push out countershaft from the transmission case as shown in Figure TM-12. Take care not to drop needle bearings into case.

Remove counter gear together with needle bearings and washers from transmission case.

Note: Make sure that washers used between counter gear and transmission case are removed.

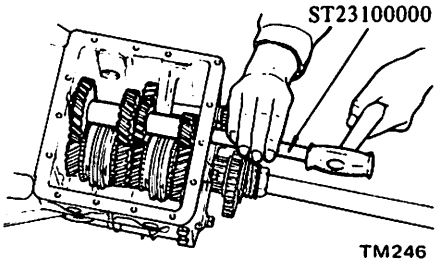


Fig. TM-12 Pushing out countershaft

5. Pry off snap ring retaining reverse idler gear in place. Withdraw idler gear shaft from the rear of transmission case. See Figure TM-13.

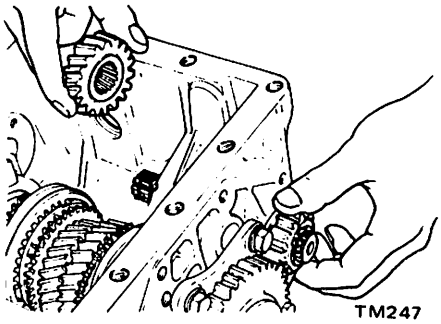


Fig. TM-13 Removing reverse idler shaft

6. Remove bolts securing mainshaft bearing retainer, and withdraw mainshaft assembly from the rear of transmission case. See Figure TM-14.

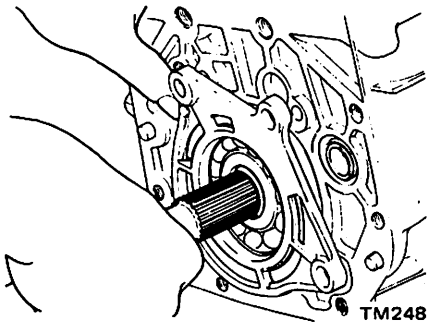


Fig. TM-14 Removing mainshaft assembly

7. Take out pilot bearing located between mainshaft and main drive gear.

8. Drive out main drive gear as shown using the wooden handle of a hammer. See Figure TM-15.

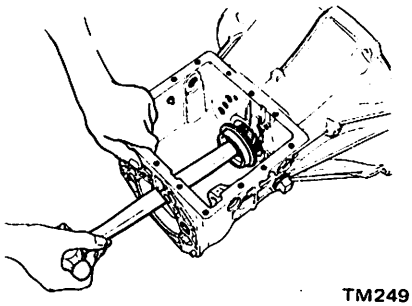


Fig. TM-15 Removing main drive gear assembly

MAINSHAFT DISASSEMBLY

1. Pry off snap ring on the front end of mainshaft, and remove 3rd & 4th synchromesh assembly and 3rd gear. See Figure TM-16.

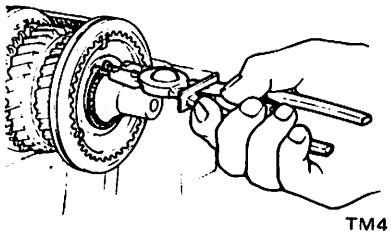


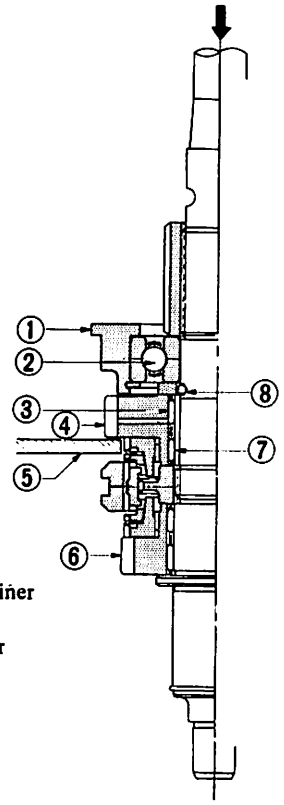
Fig. TM-16 Removing snap ring

2. Remove lock nut from mainshaft, and take out reverse gear, reverse gear hub and speedometer drive gear. Take care not to lose steel ball retaining speedometer drive gear.

3. Attach a suitable tool to the front side of 1st gear, and press out 1st gear together with ball bearing and retainer. See Figure TM-17.

Note: Do not attach this tool to 2nd gear. This may damage 1st gear mainshaft bushing.

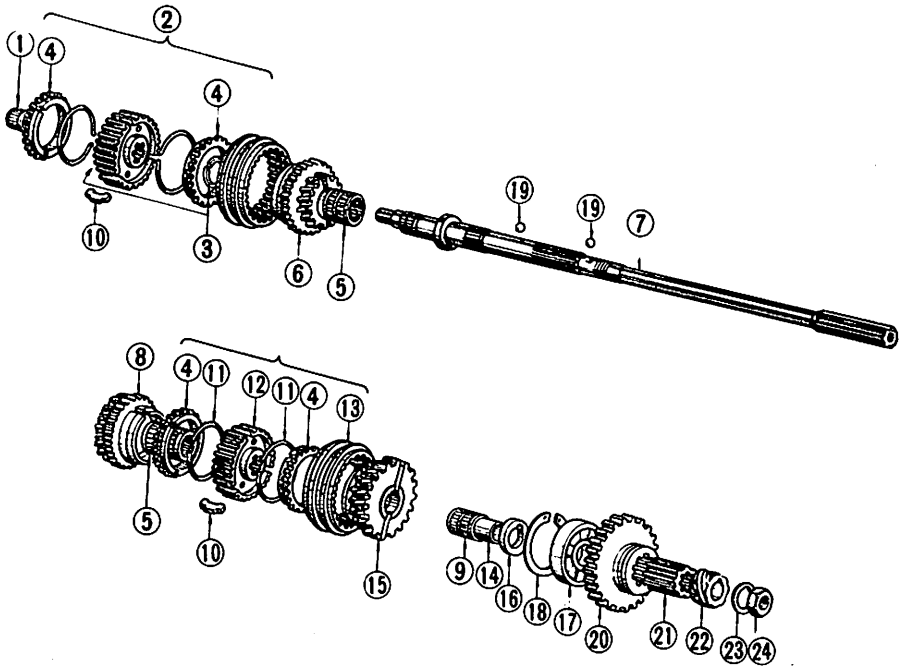
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1 Bearing retainer
2 Bearing
3 Needle roller bearing
4 1st gear
5 Puller stand
6 2nd gear
7 Bushing
8 Steel ball

Fig. TM-17 Drawing out mainshaft bearing

4. Then attach a proper puller stand to the front side of 2nd gear in the same manner as step 3, and press out 1st gear bushing together with 1st & 2nd synchromesh assembly and 2nd gear.

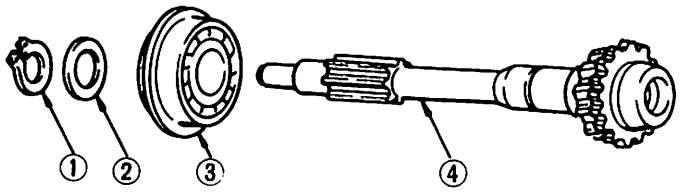


1 Pilot bearing
2 3rd & 4th synchromesh assembly
3 Snap ring
4 Baulk ring
5 Needle bearing
6 3rd speed gear, mainshaft
7 Mainshaft
8 2nd speed gear, mainshaft
9 1st & 2nd synchromesh assembly
10 Shifting insert
11 Spread spring
12 Synchronizer hub
13 Coupling sleeve
14 Bush, 1st gear
15 1st speed gear, mainshaft
16 Thrust washer, mainshaft
17 Mainshaft bearing
18 Snap ring, mainshaft bearing
19 Steel ball
20 Reverse gear
21 Reverse hub
22 Speedometer drive gear
23 Lock plate
24 Nut

Fig. TM-18 Exploded view of mainshaft assembly (F4W63L transmission)

MAIN DRIVE SHAFT DISASSEMBLY

1. Pry off snap ring and remove spacer. See Figure TM-19.

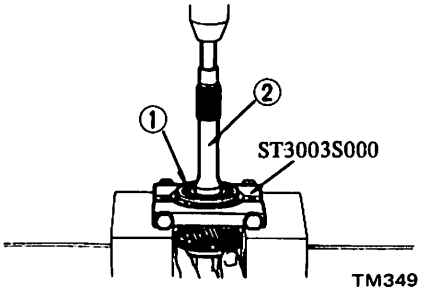


1 Snap ring
2 Spacer
3 Main drive bearing with snap ring
4 Main drive gear

Fig. TM-19 Exploded view of main drive shaft

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2. Press out main drive shaft bearing with the use of an ordinary bearing puller and a suitable press. See Figure TM-20.

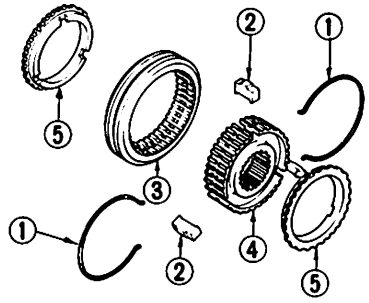


1 Main drive bearing
2 Main drive gear

Fig. TM-20 Driving out main drive shaft bearing

SYNCHROMESH DISASSEMBLY

1. Remove spread springs ①, and take out shifting inserts ②.
2. Separate coupling sleeve ③ from synchro hub ④. See Figure TM-21.



1 Spread spring
2 Shifting insert
3 Coupling sleeve
4 Synchro hub
5 Baulk ring

Fig. TM-21 Exploded view of synchromesh assembly

INSPECTION

Wash clean all parts in an approved solvent, and check for wear or damage.

TRANSMISSION CASE AND REAR EXTENSION HOUSING

Wash clean with an approved solvent and check for any crack which may be the cause of oil leak.

If rear extension bush is worn or cracked, replace it as an assembly of bush and rear extension housing.

BEARINGS

1. Wipe clean oil or grease on bearings and dry these parts with compressed air.
2. Check balls, outer race and inner race for wear, burr or damage. Also check for smooth operation. If necessary, replace. See Figure TM-22.

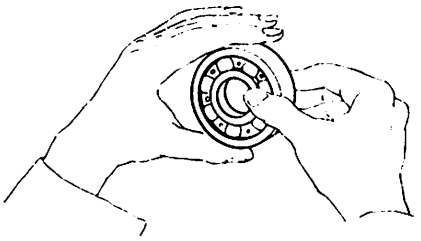


Fig. TM-22 Checking ball bearing

GEARS AND SHAFTS

1. Check gears for wear, crack or damage and, if necessary, replace.
2. Check shafts for wear, crack or bending. If necessary, replace.
3. Check gears for end play. See Figure TM-23.

Standard end play:

1st gear:
0.32 to 0.42 mm
(0.0126 to 0.0165 in)

2nd gear:
0.22 to 0.32 mm
(0.0087 to 0.0126 in)

3rd gear:
0.05 to 0.15 mm
(0.0020 to 0.0059 in)

Reverse idler gear:
0.10 to 0.30 mm
(0.0039 to 0.0118 in)

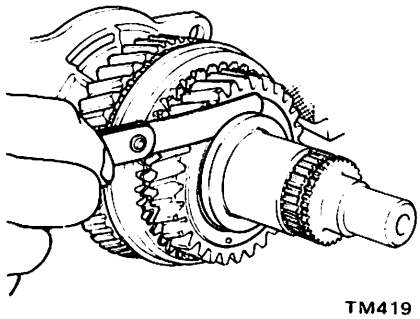


Fig. TM-23 Measuring gear end play

4. Measure backlash in gears.

Standard backlash:
0.05 to 0.20 mm
(0.0020 to 0.0079 in)

If the backlash exceeds the specified value, replace drive and driven gears as a set. See Figure TM-24.

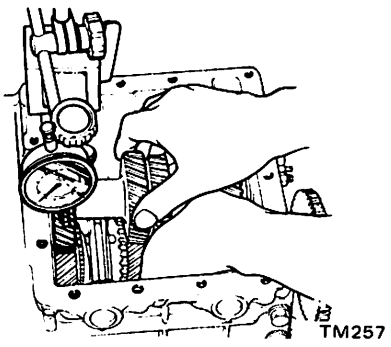


Fig. TM-24 Measuring gear backlash

BAULK RINGS

1. Replace any baulk ring which is deformed or cracked.
2. Position baulk ring in place on gear cone, and measure the baulk ring-to-gear clearance with baulk ring pushed toward gear. See Figure TM-25.

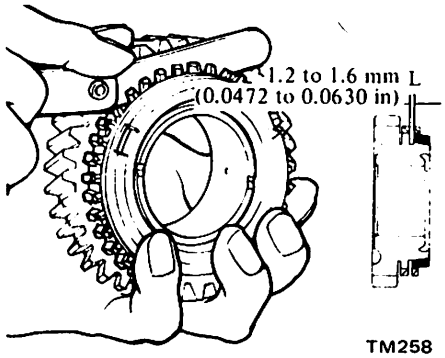


Fig. TM-25 Baulk ring to cone gap

OIL SEAL

It is advisable not to reuse oil seals that have been removed. Always install new oil seals.

Replace oil seal if sealing lip is deformed or cracked. Also discard oil seal if spring is out of position. Check the oil seal lip contacting face on shaft; if necessary replace the seal and the shaft as a set.

ASSEMBLY

To assemble, reverse the order of disassembly.

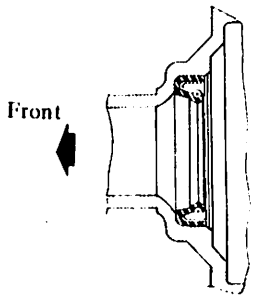
FRONT COVER

1. Make sure that seal mating surface is clean.

Using a press, drive new seal into place on front cover.

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2. Lubricate seal lip and main drive shaft with gear oil when installing oil seal. See Figure TM-26.

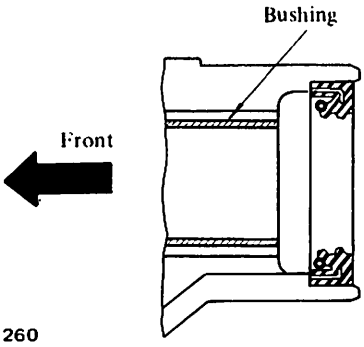


TM354

Fig. TM-26 Location of front cover oil seal

REAR EXTENSION HOUSING

1. Clean rear extension housing and press oil seal into position. Apply a coating of gear oil to sealing lip when installing oil seal. See Figure TM-27.



TM260

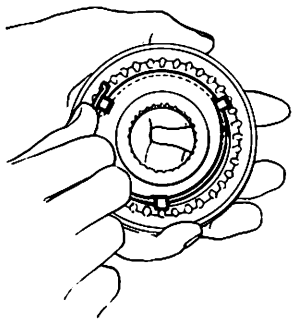
Fig. TM-27 Location of rear extension housing oil seal

2. Install striking rod in place on rear extension housing.

GEAR ASSEMBLY

1. Wash clean all parts and dry with compressed air.
2. Assemble synchromesh assembly.
(1) Place synchro-hub into coupling sleeve.
(2) Fit shifting inserts in three grooves in synchronizer hub.
(3) Locate one spread spring on the lower side of shifting inserts to secure them to the inner side of coupling sleeve.

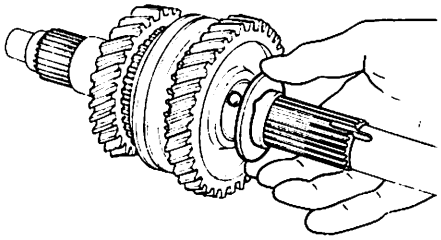
Install the other spring on the opposite side of coupling sleeve properly. Make sure that they are installed opposite to each other. See Figure TM-28.



TM077

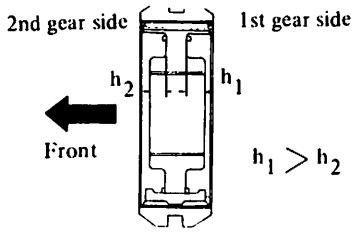
Fig. TM-28 Installing spread spring

3. Install the following parts to mainshaft in the order listed: 2nd gear needle roller bearing, 2nd gear, 2nd gear baulk ring, 1st & 2nd speed synchromesh assembly. Then fit 1st gear bushing onto mainshaft by using a proper brass drift. And install 1st gear baulk ring, needle bearing 1st gear, steel ball and thrust washer. See Figures TM-29 and TM-30.



TM078

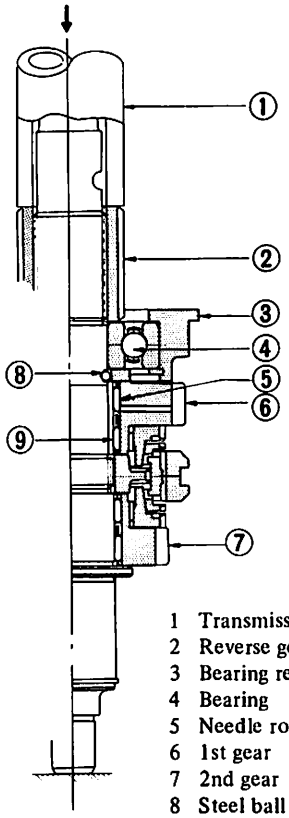
Fig. TM-29 Installing thrust washer



TM262

Fig. TM-30 Installing synchro hub

4. Using Transmission Adapter ST23800000 as shown in Figure TM-31, install mainshaft bearing together with reverse hub to mainshaft.



1 Transmission adapter
2 Reverse gear hub
3 Bearing retainer
4 Bearing
5 Needle roller bearing
6 1st gear
7 2nd gear
8 Steel ball
9 Bushing

TM534

Fig. TM-31 Installing mainshaft bearing

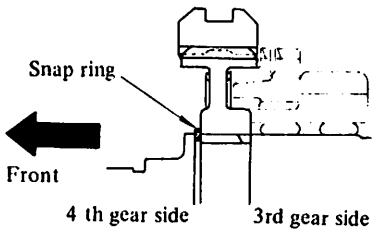
5. Install 3rd gear needle roller bearing, 3rd baulk ring, 3rd & 4th speed synchromesh assembly to mainshaft.
6. Fit a suitable snap ring in place so that there exists a minimum clearance between the end face of hub and ring groove. See Figure TM-32.

Refer to the following chart as a guide in selecting a suitable snap ring.

Available synchro hub snap ring

No.	Thickness mm (in)	
1	1.40 to 1.45	(0.0551 to 0.0571)
2	1.45 to 1.50	(0.0571 to 0.0591)
3	1.50 to 1.55	(0.0591 to 0.0610)
4	1.55 to 1.60	(0.0610 to 0.0630)
5	1.60 to 1.65	(0.0630 to 0.0650)

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TM264

Fig. TM-32 Installing synchro hub snap ring

7. Install reverse gear, steel ball, speedometer drive gear, lock plate and mainshaft nut to mainshaft.

Insert mainshaft assembly into position from the rear side of transmission case, and secure to transmission case with mainshaft bearing retainer mounting bolts.

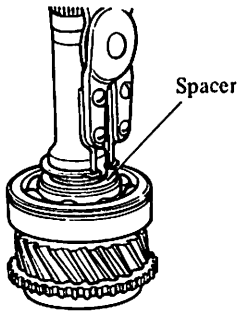
Mainshaft bearing retainer
Tightening torque:
0.8 to 1.0 kg-m
(5.8 to 7.2 ft-lb)

MAIN DRIVE GEAR ASSEMBLY

1. Using an ordinary bearing puller, press main drive bearing on to main drive shaft.
2. Install a set of suitable spacer and snap ring into groove so that there exists a minimum clearance between the groove and end face of spacer. See Figure TM-33. Be sure to install pilot bearing in place when istalling main drive gear assembly to transmission case.

Chart-Snap ring thickness

No.	Thickness mm (in)
1	1.49 to 1.55 (0.0587 to 0.0610)
2	1.56 to 1.62 (0.0614 to 0.0638)
3	1.62 to 1.68 (0.0638 to 0.0661)
4	1.68 to 1.74 (0.0661 to 0.0685)
5	1.74 to 1.80 (0.0685 to 0.0709)
6	1.80 to 1.86 (0.0709 to 0.0732)
7	1.86 to 1.92 (0.0732 to 0.0756)

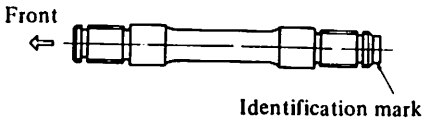


TM085

Fig. TM-33 Installing snap ring

REVERSE IDLER GEAR ASSEMBLY

1. Insert reverse idler shaft ① into place in transmission case from rear with identification mark facing toward rear. See Figure TM-34.



TM249

Fig. TM-34 Installing reverse idler shaft

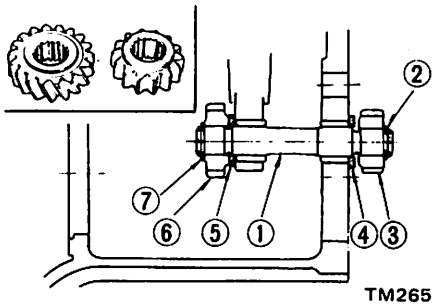
2. Referring to Figure TM-35, assemble thrust washer ⑤ and reverse idler gear ⑥ (herical gear). Seat snap ring ⑦ in groove in top of reverse idler shaft.
3. Insert a 0.1 mm (0.0039 in) thickness gauge between herical gear ⑥ and thrust washer ⑤.

With shaft ① pushed fully toward rear, install thrust washer ④ and spur gear ③; then, fit snap ring ② of proper thickness so that specified end play is obtained for reverse idler gear.

Standard reverse idler gear end play:
0.10 to 0.30 mm
(0.0039 to 0.0118 in)

Available snap ring

No.	Thickness mm (in)
1	1.15 to 1.25 (0.0453 to 0.0492)
2	1.35 to 1.45 (0.0531 to 0.0571)
3	1.25 to 1.35 (0.0492 to 0.0531)
4	1.45 to 1.55 (0.0571 to 0.0610)
5	1.05 to 1.15 (0.0413 to 0.0453)



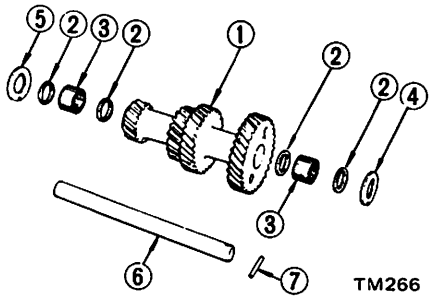
TM265

Fig. TM-35 Assembling reverse idler gear assembly

Note: Install thrust washers ④ and ⑤ so that grooved sides are facing toward gears.

COUNTER GEAR ASSEMBLY

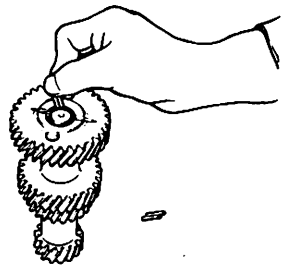
1. To install needle roller bearing ③ in its position, insert Counter Shaft Guide ST23100000 in counter gear ①, and then install washer ②, bearing ③ and washer in place. See Figure TM-36 and TM-37.



TM266

Fig. TM-36 Exploded view of counter gear assembly

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TM267

Fig. TM-37 Installing needle roller bearing

2. Install these parts together with washers ④ and ⑤ to transmission case, and insert countershaft ⑥ into counter gear through the hole of case, and retaining pin ⑦ into its hole on the front side of countershaft.
3. Select and install rear thrust washer ⑤ of the suitable thickness until proper counter gear end play is obtained.

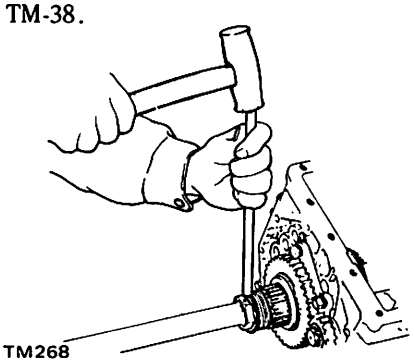
Standard counter gear end play:
0.05 to 0.15 mm
(0.0020 to 0.0059 in)

Rear thrust washer

No.	Thickness mm (in)
1	2.35 to 2.40 (0.0925 to 0.0945)
2	2.40 to 2.45 (0.0945 to 0.0965)
3	2.45 to 2.50 (0.0965 to 0.0984)
4	2.50 to 2.55 (0.0984 to 0.1004)
5	2.55 to 2.60 (0.1004 to 0.1024)

TRANSMISSION ASSEMBLY

1. With gears meshed at two positions, tighten mainshaft nut to a torque of 9.0 to 11.0 kg-m (65 to 80 ft-lb), and bend lock plate to secure mainshaft nut tightening. See Figure TM-38.



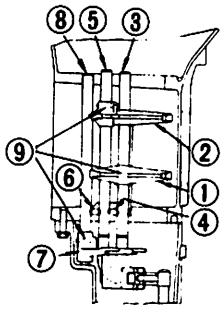
TM268

Fig. TM-38 Bending lock plate

2. Align 1st & 2nd shift fork ① and 3rd & 4th shift fork ② with the grooves on coupling sleeves respectively.

Insert 1st & 2nd shift rod ③ and drive in pin ⑨ securely.

With 1st & 2nd shift rod in Neutral position, install interlock plunger ④ and insert 3rd & 4th shift rod ⑤ into position, and drive in pin ⑨ securely.
3. Place 3rd & 4th shift rod ⑤ into Neutral position, and install interlock plunger ⑥. Install reverse shift rod ⑧ into reverse shift fork ⑦, and secure with retaining pin ⑨. See Figure TM-39.



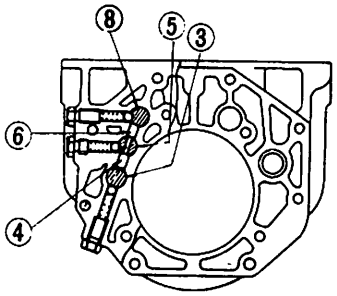
TM420

Fig. TM-39 Installing shift rod & shift fork

4. Install check balls and locking springs at three places in the transmission case, and tighten with plugs. Before tightening these plugs, apply sealant to plugs.

Plug tightening torque:
1.7 to 2.1 kg-m
(12 to 15 ft-lb)

See Figure TM-40.

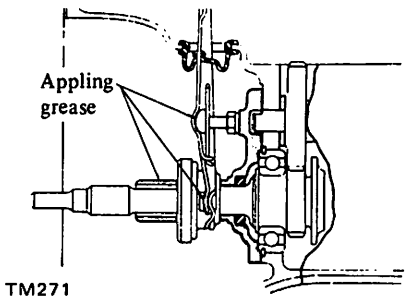


TM421

Fig. TM-40 Interlock mechanism

5. Apply gear oil to all sliding parts, and make sure that gears are meshed smoothly in their positions.
6. Make sure that gears are placed into Neutral positions, and install extension housing to transmission case by properly aligning striking lever with shift rod brackets.
7. Install front cover on transmission case.

Install release bearing, withdrawal lever and dust cover in their positions. Then apply grease (including disulphide molybdenum) as shown in Figure TM-41.



TM271

Fig. TM-41 Applying grease

8. Install bottom cover to transmission case.
9. Make sure that main drive shaft rotates smoothly at a force of 120 kg-cm (104 in-lb) with transmission in Neutral.

INSTALLATION

To install, reverse the order of removal.

Remove filler plug at the inspection hole, and fill the transmission case with gear oil to the level of the filler hole. [Approximately 2.0 liters (4¼ U.S. gal., 3½ Imp. gal.)].

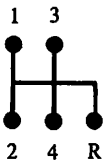
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SERVICE DATA AND SPECIFICATIONS

CONTENTS

GENERAL SPECIFICATIONS TM-10
TIGHTENING TORQUE TM-11
SPECIFICATIONS TM-11

GENERAL SPECIFICATIONS

Transmission type	F4W63L
No. of speeds	4
Synchromesh type	Warner
Control system	Floor shift
Shift pattern	

Gear ratio

1st	3.382
2nd	2.013
3rd	1.312
4th	1.000
Reverse	3.365
Speedometer gear ratio	16/5
Final gear ratio	3.700

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TIGHTENING TORQUE

Engine to transmission installation bolt	kg-m (ft-lb)	4.0 to 4.8 (29 to 35)
Transmission to engine rear plate (gusset) installation bolt	kg-m (ft-lb)	0.32 to 0.44 (2.3 to 3.2)
Clutch operating cylinder installation bolt	kg-m (ft-lb)	2.5 to 3.0 (18 to 22)
Transmission shift lever installation nut	kg-m (ft-lb)	1.9 to 2.2 (14 to 16)
Speedometer cable adapter installation nut	kg-m (ft-lb)	3.0 to 4.5 (22 to 33)
Speedometer cable installation companion nut	kg-m (ft-lb)	0.5 to 1.0 (3.6 to 7.2)
Rear mounting insulator to transmission installation bolt	kg-m (ft-lb)	0.9 to 1.2 (6.5 to 8.7)
Crossmember mounting bolt	kg-m (ft-lb)	1.9 to 2.6 (14 to 19)
Mainshaft retainer to transmission case	kg-m (ft-lb)	0.8 to 1.0 (5.8 to 7.2)
Mainshaft nut	kg-m (ft-lb)	9.0 to 11.0 (65 to 80)
Check ball plug	kg-m (ft-lb)	1.7 to 2.1 (12 to 15)
Rear extension installation bolt	kg-m (ft-lb)	1.4 to 1.8 (10 to 13)
Front cover installation bolt	kg-m (ft-lb)	0.8 to 1.0 (5.8 to 7.2)
Bottom cover installation bolt	kg-m (ft-lb)	0.8 to 1.0 (5.8 to 7.2)
Speedometer sleeve locking plate nut	kg-m (ft-lb)	0.3 to 0.4 (2.2 to 2.9)
Reverse lamp switch	kg-m (ft-lb)	2.0 to 3.0 (14 to 22)
Neutral switch	kg-m (ft-lb)	2.0 to 3.0 (14 to 22)
Top switch	kg-m (ft-lb)	2.0 to 3.0 (14 to 22)
Gear oil filler plug	kg-m (ft-lb)	2.5 to 3.5 (18 to 25)
Gear oil drain plug	kg-m (ft-lb)	2.5 to 3.5 (18 to 25)
Withdrawal lever ball pin	kg-m (ft-lb)	3.3 to 5.0 (24 to 36)

SPECIFICATIONS

Oil capacity		Liters (U.S. pt., Imp. pt.)	2.0 (4¼, 3½)
Gear backlash	1st	mm (in)	0.05 to 0.20 (0.0020 to 0.0079)
	2nd	mm (in)	0.05 to 0.20 (0.0020 to 0.0079)
	3rd	mm (in)	0.05 to 0.20 (0.0020 to 0.0079)
	Reverse	mm (in)	0.05 to 0.20 (0.0020 to 0.0079)
	Drive	mm (in)	0.05 to 0.02 (0.0020 to 0.0079)
Gear end play	1st	mm (in)	0.32 to 0.42 (0.0126 to 0.0165)
	2nd	mm (in)	0.22 to 0.32 (0.0087 to 0.0126)
	3rd	mm (in)	0.05 to 0.15 (0.0020 to 0.0059)
	Reverse Idler	mm (in)	0.10 to 0.30 (0.0039 to 0.0118)
	Counter gear	mm (in)	0.05 to 0.15 (0.0020 to 0.0059)
Clearance between baulk ring and gear		mm (in)	1.2 to 1.6 (0.047 to 0.063)

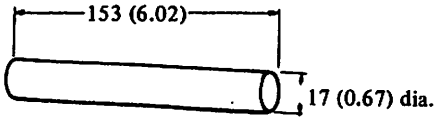
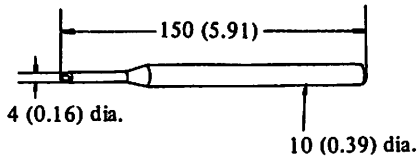
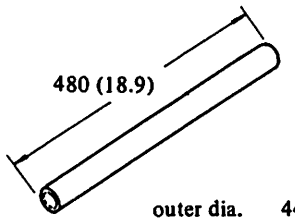
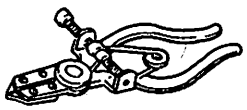
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TROUBLE DIAGNOSES AND CORRECTIONS

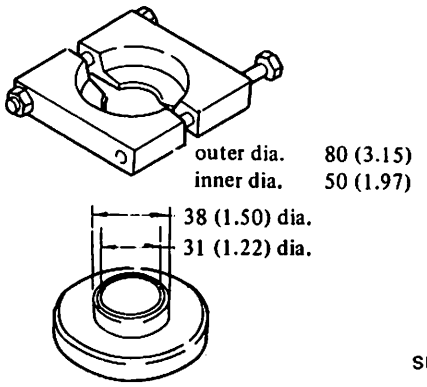
Condition	Probable cause	Corrective action
Difficult to intermesh gears Causes for difficult gear shifting are classified to troubles concerning control system and transmission. When gear shift lever is heavy and it is difficult to shift gears, clutch disengagement may also be unsmooth. First, make sure that clutch operates correctly, and inspect transmission.	Worn gears, shaft, and/or bearing. Insufficient operating stroke due to worn or loose sliding part. Defective or damaged synchronizer.	Replace. Repair or replace. Replace.
Gear slips out of mesh. In most cases, this trouble occurs, when interlock ball, check ball, and/or spring is worn or weakened, or when control system is defective. In this case, the trouble cannot be corrected by replacing gears, and therefore, trouble shooting must be carried out carefully. It should also be noted that gear slips out of mesh due to vibration generated by weakened front and rear engine mounts.	Worn interlock plunger. Worn check ball and/or weakened or broken spring. Worn fork rod ball groove. Worn or damaged bearing. Worn or damaged gear.	Replace. Replace. Replace. Replace. Replace.
Noise When noise occurs with engine idling and ceases when clutch is disengaged, or when noise occurs while shifting gears, it is an indication that the noise is from transmission. (Transmission may rattle during engine idling. Check air-fuel mixture and ignition timing. After above procedure, readjust engine idling.)	Insufficient or improper lubricant. Oil leaking due to defective oil seal or sealant, clogged breather, etc. Worn bearing (High humming occurs at a high speed.). Damaged bearing (Cyclic knocking sound occurs also at a low speed.). Worn spline. Worn bushing.	Add oil or replace with designated oil. Clean or replace. Replace. Replace. Replace. Replace, as a rear extension housing assembly.

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SPECIAL SERVICE TOOLS

No.	Tool number & tool name	Description Unit: mm (in)	For use on	Reference page or Figure No.
1.	ST23100000 Countershaft guide	For prevention of needle bearing from falling off when countershaft is removed from, or inserted into, the transmission case. 	63LT/M	Fig. TM-12 Fig. TM-36
2.	ST23540000 Fork rod pin punch	For removal and assembly of fork rod retaining pin.  SE082	63A, 63L & 71BT/M	Fig. TM-11 Page TM-4
3.	ST23800000 Transmission adapter	For assembly of main bearing.  SE037	S30 620	Page TM-7 Fig. TM-31
4.	ST23840000 Expander	For removal and assembly of snap ring.  SE099	All models	Fig. TM-16

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No.	Tool number & tool name	Description Unit: mm (in)	For use on	Reference page or Figure No.
5.	ST3003S000 Drive pinion rear bearing inner race replacer (Bearing puller) ST30031000 Puller ST30032000 Base	For replacing bearing.  	63A, 65L, 63L & 71B T/M	Fig. TM-20

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SERVICE MANUAL

DATSUN 710
MODEL 710 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION AT

AUTOMATIC TRANSMISSION

AT

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DESCRIPTION

The model 3N71B automatic transmission is a fully automatic unit consisting primarily of 3-element hydraulic torque converter and two planetary gear sets. Two multiple-disc clutches, a multiple-disc brake, a band brake and a one way sprag clutch provide the friction elements required to obtain the desired function of the two planetary gear sets.

The two planetary gear sets give three forward ratios and one reverse. Changing of the gear ratios is fully automatic in relation to vehicle speed and engine torque input. Vehicle speed and engine manifold vacuum signals are constantly fed to the transmission to provide the proper gear ratio for maximum efficiency and performance at all throttle openings.

The model 3N71B has six selector positions: P, R, N, D, 2, 1.

"P" – Park position positively locks the output shaft to the transmission case by means of a locking pawl to prevent the vehicle from rolling in either direction.

This position should be selected whenever the driver leaves the vehicle.

The engine may be started in Park position.

"R" – Reverse range enables the vehicle to be operated in a reverse direction.

"N" – Neutral position enables the engine to be started and run without driving the vehicle.

"D" – Drive range is used for all normal driving conditions.

Drive range has three gear ratios, from the starting ratio to direct drive.

"2" – "2" range provides performance for driving on slippery surfaces. "2" range can also be used for engine braking.

"2" range can be selected at any vehicle speed, and prevents the transmission from shifting out of second gear.

"1" – "1" range can be selected at any vehicle speed and the transmission will shift to second gear and remain in second until vehicle speed is reduced to approximately 40 to 50 km/h (25 to 31 MPH).

"1" range position prevents the transmission from shifting out of low gear. This is particularly beneficial for maintaining maximum engine braking when continuous low gear operation is desirable.

The torque converter assembly is of welded construction and can not be disassembled for service.

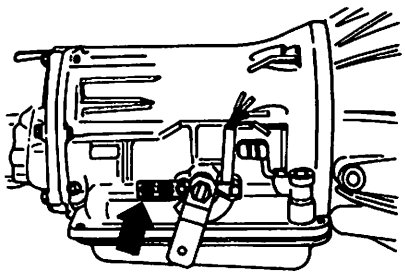
FLUID RECOMMENDATION

Use automatic transmission fluid having "DEXRON" identifications only in the 3N71B automatic transmission.

IDENTIFICATION NUMBER

Stamped position:

The plate is attached to the right hand side of transmission case as shown in Figure AT-1.



AT057

Fig. AT-1 Identification number

Identification of number Arrangements:

See below.

Model code

JAPAN AUTOMATIC TRANSMISSION CO., LTD.

MODEL	X2402
NO.	4912345

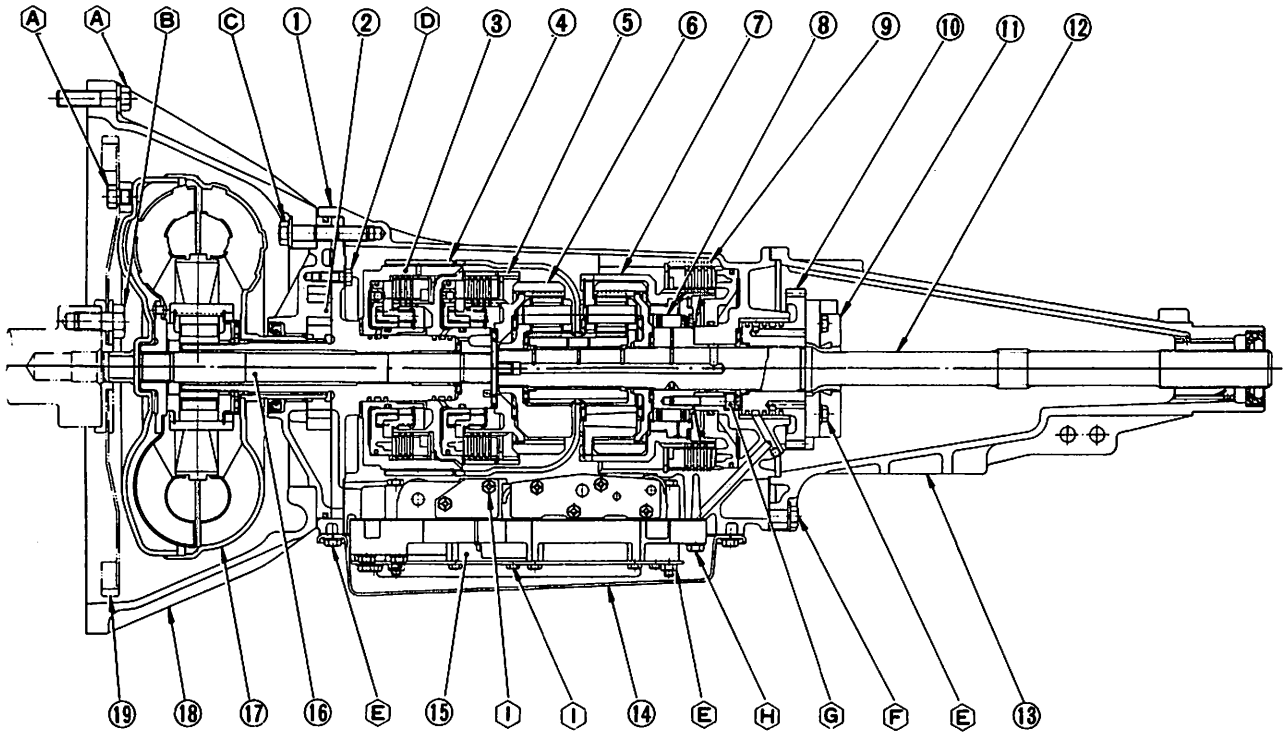
Unit number

Number designation

4 9 1 2 3 4 5

- 5 – Last figure denoting the year (A.D.)
- 4 – Month of production (X: Oct., Y: Nov., Z: Dec.)
- 3 2 1 – Serial production number for the month

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AT286

1 Transmission case
2 Oil pump
3 Front clutch
4 Band brake
5 Rear clutch
6 Front planetary gear
7 Rear planetary gear
8 One way clutch
9 Low & Reverse brake
10 Oil distributor
11 Governor
12 Output shaft
13 Rear extension
14 Oil pan
15 Control valve
16 Input shaft
17 Torque converter
18 Converter housing
19 Drive plate

Tightening torque (T) of bolts and nuts kg-m (ft-lb)

Ⓐ T : 4 to 5 (29 to 36)
Ⓑ T : 14 to 16 (101 to 116)
Ⓒ T : 4.5 to 5.5 (33 to 40)
Ⓓ T : 0.6 to 0.8 (4.3 to 5.8)
Ⓔ T : 0.5 to 0.7 (3.6 to 5.1)
Ⓕ T : 2.0 to 2.5 (14 to 18)
Ⓖ T : 1.3 to 1.8 (9.4 to 13)
Ⓗ T : 0.55 to 0.75 (4.0 to 5.4)
Ⓘ T : 0.25 to 0.35 (1.8 to 2.5)

Fig. AT-2 Cross-sectional view of 3N71B automatic transmission

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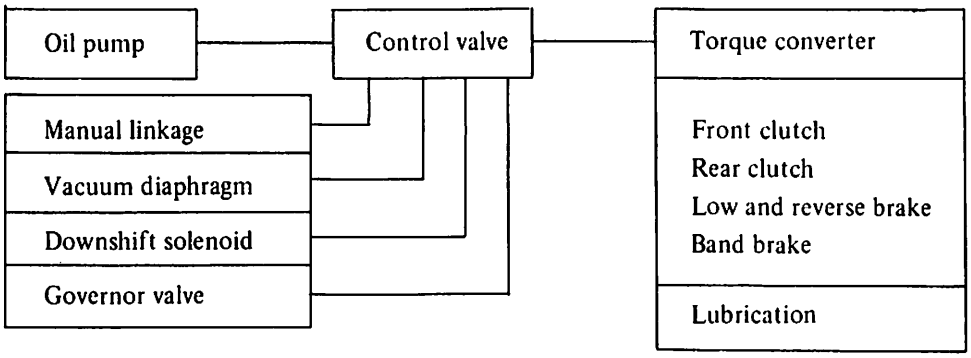
HYDRAULIC CONTROL SYSTEM

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FUNCTIONS OF HYDRAULIC CONTROL UNIT AND VALVES

The hydraulic control system contains an oil pump for packing up oil from the oil pan through the oil strainer. A shift control is provided by two centrifugally operated hydraulic governors on the output shaft, vacuum control diaphragm and downshift solenoid. These parts work in conjunction with valves in the valve body assembly located in the base of the transmission. The valves regulate oil pressure and direct it to appropriate transmission components.



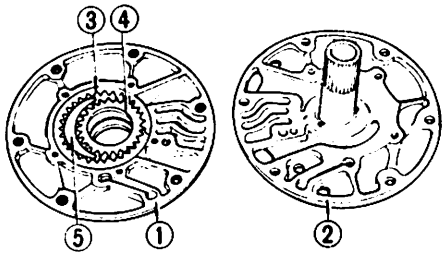
OIL PUMP

The oil pump is the source of control medium (i.e., oil) for the control system.

The oil pump is of an internal, involute gear type. The drive sleeve is a part of the torque converter pump impeller and serves to drive the pump inner gear with the drive sleeve directly coupled with the engine operation.

The oil flows through the following route:

Oil pan – Oil strainer (bottom of the control valve) – Control valve lower body suction port – Transmission case suction port – Pump housing suction port – Pump gear space – Pump housing delivery port – Transmission case delivery port – Lower body delivery port – Control valve line pressure circuit.



AT071

1 Housing
2 Cover
3 Outer gear
4 Inner gear
5 Crescent

Fig. AT-3 Oil pump

MANUAL LINKAGE

The hand lever motion (the hand lever is located in the driver's compartment), mechanically transmitted from the remote control linkage, is further transmitted to the inner manual lever in the transmission case from the range selector lever in the right center portion of the transmission case through the manual shaft. The inner manual lever is thereby turned.

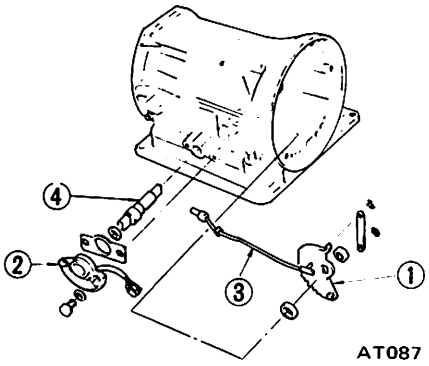
A pin installed on the bottom of the inner manual lever slides the manual valve spool of the control valve thus positioning the spool opposite the appropriate select position.

The parking rod pin is held in the groove on the top of the inner manual

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plate. The parking rod pin operates the rod at "P" range, and operates the mechanical lock system.

The above described manual shaft is further equipped with an inhibitor switch. A rotor inside the inhibitor switch rotates in response to each range. When the range is selected at "P" or "N", the rotor closes the starter magnet circuit so that the engine can be started. When the range is selected at "R", the rotor closes the back-up lamp circuit, and the back-up lamp lights.



1 Manual plate
2 Inhibitor switch
3 Parking rod
4 Manual shaft

Fig. AT-4 Manual linkage

vacuum reaction increases since the flow velocity of mixture inside the intake manifold is slow. Contrarily, when the engine speed increases and the flow velocity of the mixture increases or when the carburetor is closed, the manifold negative pressure increases (i.e., tends towards vacuum) and the vacuum reaction is reduced.

Thus, a signal to generate hydraulic pressure perfectly suited to the engine loading at the control valve is transmitted from the vacuum diaphragm, and the most suitable timing for speed change and line pressure is obtained so that the most proper torque capacity is obtained against the transmitting torque.

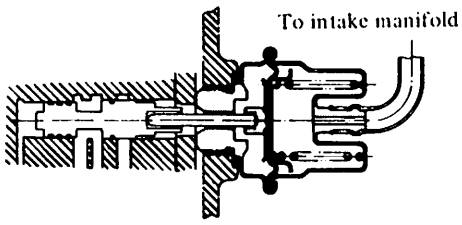


Fig. AT-5 Vacuum diaphragm

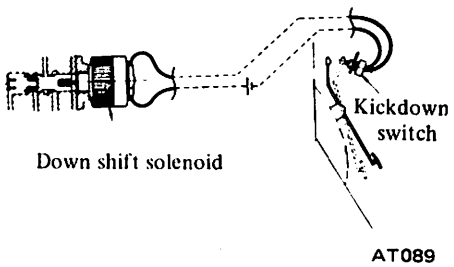


Fig. AT-6 Downshift solenoid

GOVERNER VALVE

The primary and secondary governor valves are installed separately on the back of the oil distributor on the transmission output shaft. They operate at the same speed as that of the output shaft. (that is, they operate at a speed in proportion to the vehicle speed.) The line pressure is applied to those valves as the input from the control valve, through the transmission case, rear flange and oil distributor. The governor pressure [in proportion to the output shaft speed (vehicle speed)] is led to the shift valve of the control valve through the opposite route of the output. In this manner speed change and line pressure are controlled.

VACUUM DIAPHRAGM

The vacuum diaphragm is installed on the left center portion of the transmission case. The internal construction of the vacuum diaphragm is as follows:

A rubber diaphragm forms a partition in the center. The engine intake manifold negative pressure is led through a vacuum tube and spring force is applied to the front surface of the rubber diaphragm while atmospheric pressure is applied to the back surface. The difference between pressure applied to the front and back surfaces causes a vacuum reaction, which activates the throttle valve of the control valve inside the transmission case.

When accelerator pedal is fully depressed and the carburetor is fully opened but the engine speed is not sufficiently increased, the manifold negative pressure lowers (i.e., tends towards atmospheric pressure) and the

DOWNSHIFT SOLENOID

The downshift solenoid is of a magnetic type installed on the left rear portion of the transmission case. When a driver requires accelerating power and depresses the accelerator pedal down to the stopper, a kickdown switch located in the middle of the accelerator link is depressed by a push rod, the kickdown switch closes, current flows to the solenoid, the solenoid push rod is depressed, the downshift valve of the control valve inside the transmission case is depressed, and the speed is changed forcedly from "3rd" to "2nd" within a certain vehicle speed limit.

Note: Since the kickdown switch closes when the accelerator pedal is depressed from 7/8 to 15/16 of the whole stroke, the accelerator pedal should be correctly adjusted so as to afford a complete stroke.
The arrangement of the switch varies according to model.

Operation of secondary governor valve

The secondary valve is a control valve which receives line pressure (1) and controls the governor pressure.

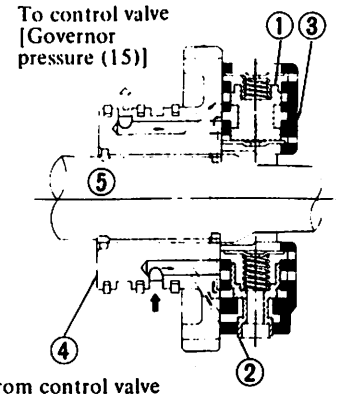
When the manual valve is selected at "D", "2" or "1" range, line pressure is applied to the ring shaped area of this valve from circuit (1), and this valve is depressed toward the center. Movement of this valve to a certain position closes the circuit from (1) to (15) while simultaneously making a space from (15) to the center drain port, and pressure in the circuit (15) is lowered.

When the vehicle is stopped and the centrifugal force of this valve is zero, the valve is balanced. At this point, a governor pressure which is balanced with the spring force occurs on (15).

When the vehicle is started and the centrifugal force increases, this valve moves slightly to the outside, and as

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the space from (1) to (15) increases, space from (15) to the drain port simultaneously decreases. As a result, governor pressure of (15) increases, and the governor pressure is balanced with the sum of centrifugal force and spring force. The governor pressure thus changes in response to the vehicle speed change (centrifugal force).



1 Primary governor
2 Secondary governor
3 Governor valve body
4 Oil distributor
5 Output shaft

Fig. AT-7 Cross-sectional view of governor

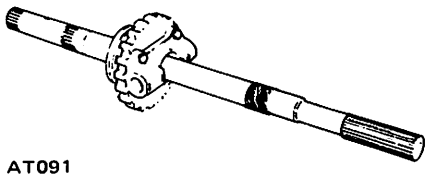
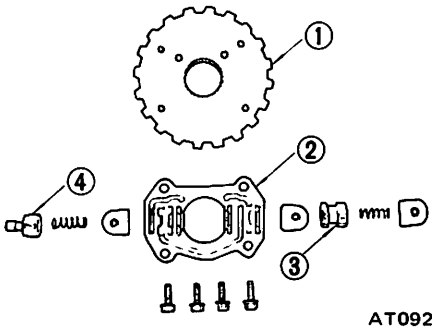


Fig. AT-8 Output shaft with oil distributor and governor



1 Oil distributor
2 Governor valve body
3 Primary governor valve
4 Secondary governor valve

Fig. AT-9 Exploded view of governor

Operation of primary governor valve

The valve is an ON-OFF valve which closes the governor pressure (15) regulated by the secondary governor valve when the vehicle reaches the minimum speed, and when the vehicle speed exceeds a certain level, the governor opens and forwards the governor pressure (15) to the control valve.

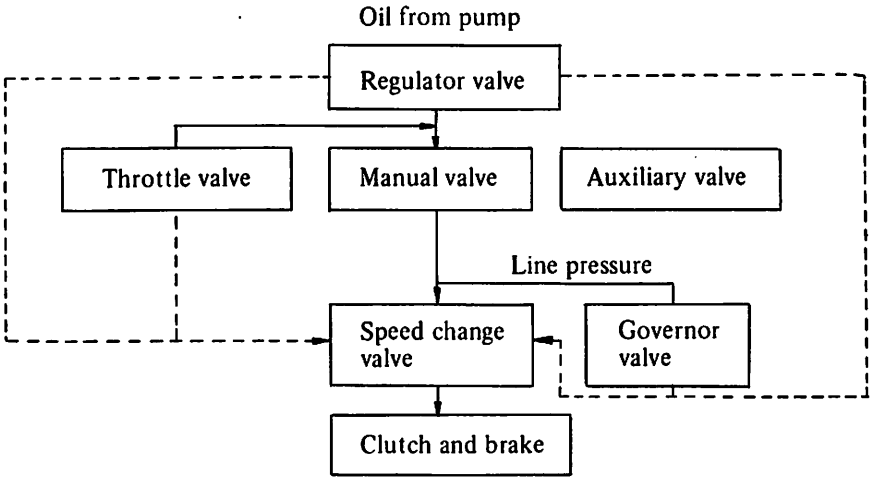
When the vehicle is stopped, the governor pressure is zero. However, when the vehicle is running slowly, this valve is depressed to the center and the groove to (15) is closed since the governor pressure applied to the ring shaped area is higher than the centrifugal force of this valve. When the governor speed exceeds a certain revolution, the governor pressure in the circuit (15) also increases. However, as the centrifugal force increases and exceeds the governor pressure, this valve moves toward the outside, and the governor pressure is transmitted to the circuit (15).

Two different valves are employed in the governor so that it will independently control the speed at high and low speeds. That is, within the low speed range, the governor pressure is not generated because of the primary valve; whereas at the high speed range above the breaking point, governor pressure is regulated by the secondary valve.

* The breaking point is the point at which the function of one of the governor is transferred to the other as the speed changes from the low-speed to the high-speed range.

CONTROL VALVE ASSEMBLY

Flow chart of control valve system



The control valve assembly receives oil from the pump and individual signals from the vacuum diaphragm, and transmits the individual line pressures to the transmission friction element, torque converter circuit, and lubricating system circuit as outputs. More specifically, the oil from the oil pump is regulated by the regulator valve as line pressure build up. The line pressure is fed out from the control valve assembly through various direction changeover valves (including ON-OFF valve) and regulator valves, are newly reformed to a throttle system oil pressure and operate other valves. Finally, the line pressure is transmitted to the required clutch or brake servo piston unit in response to the individual running conditions after receiving signals from the vacuum diaphragm, downshift solenoid, governor valve, and/or manual linkage.

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The control valve assembly consists of the following valves (See Figure AT-20):

1. Pressure regulator valve (PRV)
2. Manual valve (MNV)
3. 1st-2nd shift valve (FSV)
4. 2nd-3rd shift valve (SSV)
5. Pressure modifier valve (PMV)
6. Vacuum throttle valve (VTV)
7. Throttle back-up valve (TBV)
8. Solenoid downshift valve (SDV)
9. Second lock valve (SLV)
10. 2nd-3rd timing valve (TMV)

Pressure regulator valve (PRV)

The pressure regulator valve receives valve spring force, force from the plug created by the throttle pressure (16) and line pressure (7), and force of the throttle pressure (18). With the interaction of those forces, the PRV regulates the line pressure (7) to that most suitable for individual driving conditions.

The oil from the oil pump is applied to the ring-shaped area through orifice (20). As a result, the PRV is depressed downward, and moves from port (7) up to such extent that the space to the next drain port (marked with "X" in Figure AT-10) opens slightly. Thus, the line pressure (7) is balanced with the spring force, thereby balancing the PRV. In this operation, the space from port (7) to the subsequent converter oil pressure (14) circuit has also been opened. As a result, the converter is filled with pressurized oil in circuit (14), and this oil is further used for lubrication of the rear unit. Moreover, part of the oil is branched and used for lubrication of the front unit for the front and rear clutches.

When the accelerator pedal is depressed, the throttle pressure (16) increases as described in the preceding paragraph, oil pressure is applied to the plug through orifice (21), and this pressure is added to the spring force. As a result, the PRV is contrarily forced upward, space to the drain port is reduced, and the line pressure (7) increases.

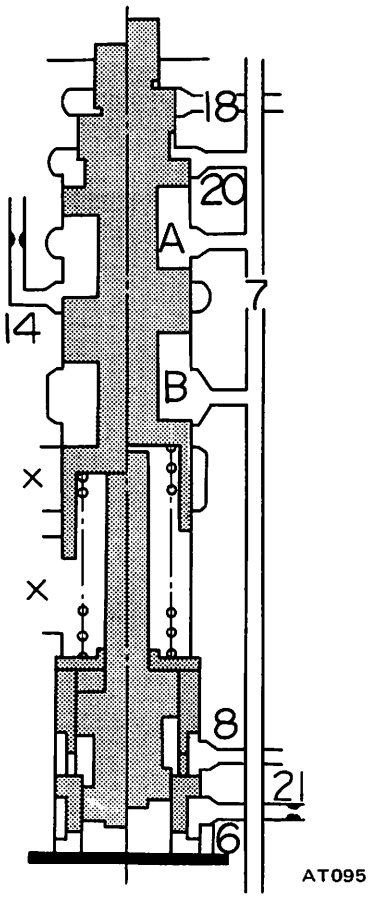


Fig. AT-10 Pressure regulator valve

When the range is selected at "R" (Reverse), the line pressure (6) is applied to the plug in a manner identical to the throttle pressure (16) and is added to the spring force. Consequently, the line pressure (7) further increases.

When vehicle speed increases and the governor pressure rises, the throttle pressure (18) is applied to the port on the top of the PRV, and pressure is applied contrarily against the spring force. As a result, the line pressure (7) decreases. Moreover, at individual conditions, the line pressure (7) is equal to the line pressure (6) and the throttle pressure (16) is equal to (18).

Manual valve (MNV)

The manual lever turning motion is converted to reciprocating motion of the manual valve through a pin, and the MNV is positioned so that the line pressure (7) is distributed to the individual line pressure circuits at each "P", "R", "N", "D", "2" or "1" range as shown below.

"P" range:
(7) – (4) – SDV and TBV
(5) – FSV (12) – TBV and Low & reverse brake

"R" range:
(7) – (4) – same as above
(5) – same as above
(6) – PRV and SSV – (F.C.) and band release

"N" range: (7) – None

"D" range:
(7) – (1) – Governor valve, FSV, and rear clutch
(2) – SLV
(3) – SLV and SSV

"2" range:
(7) – (1) – Same as above
(2) – SLV – (9) Band applied
(4) – SDV and TBV

"1" range:
(7) – (1) – Same as above
(4) – Same as above
(5) – FSV

Moreover, (1), (2), (3), (4), (5), and (6) are always drained at a position where the line pressure is not distributed from (7).

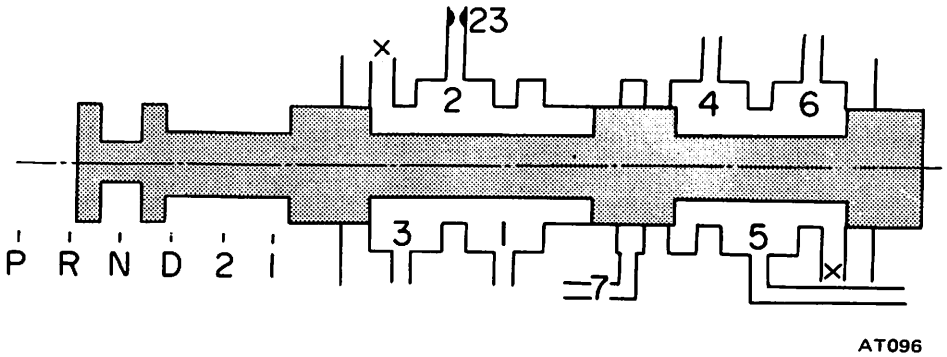


Fig. AT-11 Manual valve

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1st-2nd shift valve (FSV)

The FSV is a transfer valve which shifts gears from low to second. When the vehicle is stopped, the FSV is depressed to the right side by force of a spring located on the left side, putting the FSV is in the "Low" position.

When vehicle speed increases, the governor pressure (15) is applied to the right side of the FSV, and the FSV is forced toward the left. Contrarily, the line pressure (1) together with the spring force, force the FSV toward the right opposing the governor pressure (15).

When the vehicle speed exceeds a certain level, the governor pressure (15) exceeds the sum of the throttle pressure and the spring force, and the FSV is forced toward the left.

When the FSV is depressed to a certain position, the line pressure (1) is closed, and only the spring depresses the FSV toward the right, and it is depressed to the end for a moment. As a result, the line pressure (1) is forwarded to (8), the band servo is engaged through the SLV, and the speed is shifted to "2nd" With the accelerator pedal depressed, the FSV remains in the "Low" position unless the governor pressure (15) increases to a high level corresponding to the line pressure (1) since the line pressure (1) increase when the accelerator pedal is depressed.

Contrarily, when vehicle speed decreases, the governor pressure (15) decreases. However, the gear is not shifted to "Low" unless the governor pressure (15) becomes zero, since the force depressing the FSV toward the right is being delivered only by the spring.

"Low" in range "1" is led to the low and reverse clutch from line pressure (5) through line pressure (12), and is simultaneously, led to the left end spring unit. Consequently, although the governor pressure increases, the valve is still forced toward the right, and the SFV is fixed in the "Low" position. When kicked down to the "2nd" speed, the SDV operates, and the line pressure (13) forces the FSV toward the right. Although the governor pressure (15) is considerably high, the valve is forced completely toward the right, and the FSV is returned to the "Low" position. (This operation is called "Kickdown shift".)

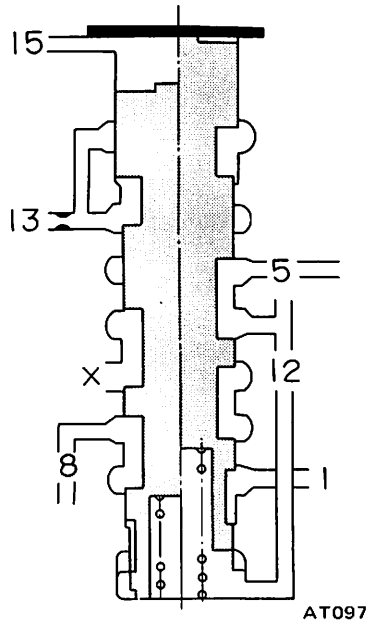


Fig. AT-12 "1st-2nd" shift valve

2nd-3rd shift valve (SSV)

The SSV is a transfer valve which shifts gears from "2nd" to "3rd". When the vehicle is stopped, the SSV is forced toward the right by the spring, and is in the "2nd" position. It is so designed, however, that the FSV can decide to shift either to "Low" or "2nd".

When the vehicle is running, the governor pressure (15) is applied to the right end surface, and the SSV is forced toward the left. Contrarily, the spring force, line pressure (3), and throttle pressure (19) force the SSV toward the right.

When vehicle speed exceeds a certain level, the governor pressure surpasses the sum of the spring force, line pressure, and throttle pressure, and the valve is forced toward the left. The line pressure (3) is then closed. Consequently, the forces being rapidly unbalanced, the force depressing the SSV toward the right decreases, and thus the SSV is depressed to the left end for a moment. With the SSV depressed toward the left end, the line pressure (3) is connected with the line pressure (10), the band servo is released, the front clutch is engaged, and speed is shifted to "3rd".

When the accelerator pedal is depressed, both the line pressure (3) and the throttle pressure (19) are high, and the SSV is thus retained in "2nd" unless the governor pressure (15) exceeds the line pressure (3) and the throttle pressure (19).

In the "3rd" position, force depressing the SSV toward the right is retained only by the throttle pressure (16), and the throttle pressure (16) is slightly lower than that toward the right which is applied while shifting from "2nd" to "3rd".

Consequently, the SSV is returned to the "2nd" position at a slightly lower speed. (Shifting from "3rd" to "2nd" occurs at a speed slightly lower than that for "2nd" to "3rd" shifting.)

When kicked down at "3rd", line pressure (13) is led from the SDV, and the SSV is forced toward the right. Although the governor pressure is considerably high, the valve is forced completely toward the right, and the SSV is thus returned to "2nd" position. (This operation is called "Kickdown shift".)

When the shift lever is shifted to "2" or "1" range at the "3rd" speed, the line pressure (3) is drained at the MNV. Consequently, the front clutch and band servo releasing oils are drained. As a result, the transmission is shifted to "2nd" or "low" speed although the SSV is in the "3rd" position.

When the speed is shifted to the "3rd", a one-way orifice (24) on the top of the SSV relieves oil transmitting velocity from the line pressure (3) to the line pressure (10), and reduces the shock generated from the shifting. Contrarily, when the lever is shifted from "3rd" to "2" or "1" range and the speed is shifted to the "2nd", the orifice checking valve spring (24) is depressed, the throttle becomes ineffective, the line pressure (10) is drained quickly, and delay in shifting speeds is thus eliminated.

The throttle of line pressure (6) transmits the oil transmitting velocity from line pressure (6) to line pressure (10) when the lever is shifted to the "R" range, and transmits drain velocity from line pressure (10) to line

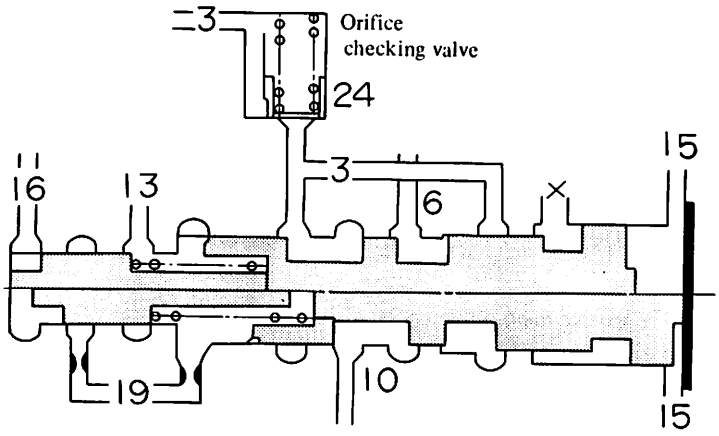
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pressure (6) when shifting from "3rd" to "2nd" at "D" range. Thus, the throttle of line pressure (6) reduces the shock generated from shifting.

A plug in the SSV left end readjust the throttle pressure (16) which varies depending on the engine throttle condition, to a throttle pressure (19) suited to the speed change control. Moreover, the plug is a valve which applies line pressure (13), in lieu of the throttle pressure, to the SSV and the FSV when kickdown is performed.

When the throttle pressure (16) is applied to the left side of this plug, and the plug is depressed toward the right, a slight space is formed from the throttle pressure (16) to (19). A throttle pressure (19) which is lower by the pressure loss equivalent to this space is generated, the pressure loss is added to the spring force, and the plug is thus forced back from the right to the left. When this pressure (19) increases excessively, the plug is further depressed toward the left, space from the throttle pressure (19) to the drain circuit (13) increases, and the throttle pressure (19) decreases. Thus, the plug is balanced, and the throttle pressure (19) is reduced to a certain value against the throttle pressure (16).

When performing kickdown, the SDV moves, a high line pressure is led to the circuit (19) from the line pressure circuit (13) (which had been drained), the plug is forced toward the left, and circuit (19) becomes equal to the line pressure (13).



AT098

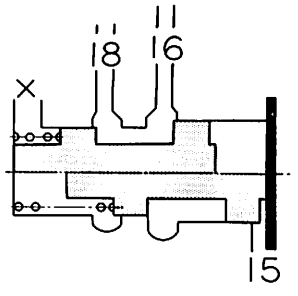
Fig. AT-13 "2nd-3rd" shift valve

Pressure modifier valve (PMV)

Compared to the operating pressure required in starting the vehicle, the power transmitting capacity of the clutch (that is, required operating pressure) may be lower when the vehicle is once started. When the line pressure is retained at a high level up to a high vehicle speed, shock generated from the shifting increases, and the oil pump loss also increases. In order to prevent this, the throttle pressure must be changed over with the operation of the governor pressure (15) to reduce the line pressure. The PMV is used for this purpose.

When the governor pressure (15) which is applied to the right side of the PMV is low, the valve is forced toward the right by the throttle pressure (16) (applied to the area difference of the value) and the spring force, and the circuit from circuit (16) to circuit (18) is closed. However, when vehicle speed increases and the governor pressure (15) exceeds a certain level, the governor pressure toward the left (which is applied to the right side) exceeds the spring force and the throttle pressure (16) toward the right, the valve is depressed toward the left, and the throttle pressure is led from circuit (16) to circuit (18). This throttle pressure (18) is applied to the top of the PRV, and the force of the line pressure source (7) is reduced. Contrarily, when the vehicle speed decreases and the governor pressure (15) decreases, the force toward the right exceeds the governor pressure, the valve is forced back toward the right, and the throttle pressure (18) is drained to the spring unit.

This valve is switched when the throttle pressure and the governor pressure are high or when they are both low.



AT099

Fig. AT-14 Pressure modifier valve

Vacuum throttle valve (VTV)

The vacuum throttle valve is a regulator valve which uses the line pressure (7) for the pressure source and regulates the throttle pressure (16) which is proportioned to the force of the vacuum diaphragm. [The vacuum diaphragm varies depending on the engine throttle condition (negative pressure in the intake line)].

When the line pressure (7) is applied to the bottom through the valve hole and the valve is forced upward, space from the line pressure (7) to the throttle pressure (16) is closed, and the space from the throttle pressure (16) to the drain circuit (17) is about to open. In this operation, the throttle pressure (16) becomes lower than the line pressure (7) by the pressure equivalent of the loss of space, and the force depressing the rod of the vacuum diaphragm is balanced with the throttle pressure (16) applied upward to the bottom.

When the engine torque is high, the negative pressure in the intake line rises (tending toward atmospheric pressure), and the force of the rod to depress the valve increases. As a result, the valve is depressed downward, the

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space from the throttle pressure (16) to the drain (17) decreases, and the space from the line pressure (7) to the throttle pressure (16) increases.

Consequently, the throttle pressure (16) increases, and the valve is balanced. Contrarily, when the engine torque lowers and the negative pressure in the intake line lowers (tending toward vacuum), the force of the rod depressing the valve decreases, and the throttle pressure (16) also decreases. When pressure regulated by the throttle back-up valve (described in the subsequent paragraph) is led to circuit (17), a high pressure is applied through the space from the circuit (17) to the throttle pressure (16). Consequently, the VTV is unbalanced, the throttle pressure (16) becomes equal to the back-up pressure (17), and the valve is locked upward.

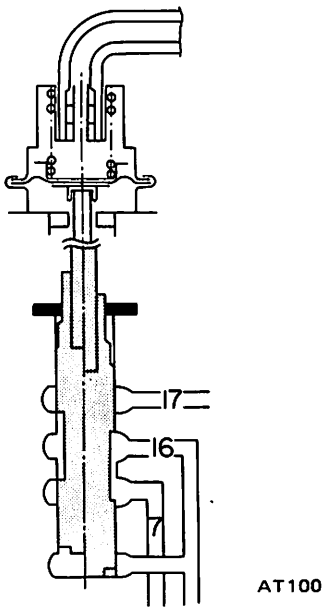


Fig. AT-15 Vacuum throttle valve

Throttle back-up valve (TBV)

Usually, this valve is depressed downward by the spring force, and circuit (17) is drained upward.

As soon as the lever is shifted either to "2" or "1" range, line pressure is led from circuit (4), the line pressure is applied to the area difference of the valve, the valve is forced upward, the space from circuit (4) to circuit (17) is closed, and with the space from circuit (17) to the upper drain about to open, the back-up pressure (17) which is lower than the line pressure (4) by the pressure loss due to the space from circuit (4) to circuit (17) is balanced with the spring force.

Further, when gear is shifted from "2nd" to "Low" at the range "1", line pressure is led from circuit (12), and the line pressure is applied upward to the bottom of the valve through the valve hole. Consequently, the valve is forced upward, and locked. As a result, the space from the line pressure (4) to the back-up pressure (17) is closed completely, and the back-up pressure (17) is drained upward.

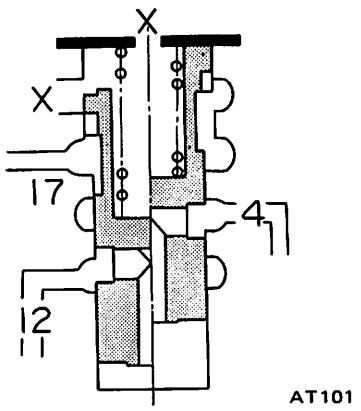


Fig. AT-16 Throttle back-up valve

Solenoid downshift valve (SDV)

This valve is a transfer valve which leads the line pressure (7) to (13) and transmits the same to the FSV and SSV when a kickdown signal is received from the downshift solenoid. Usually, the solenoid push rod and valve are locked upward by the spring in the lower end, and the circuit from line pressure (4) to line pressure (13) is opened.

When kickdown is performed, the push rod operates, the valve is depressed downward, and the circuit from line pressure (7) to line pressure (13) opens. Line pressure (13) opposes the governor pressure (15) at the SSV and FSV, thus accomplishing the downshift operation.

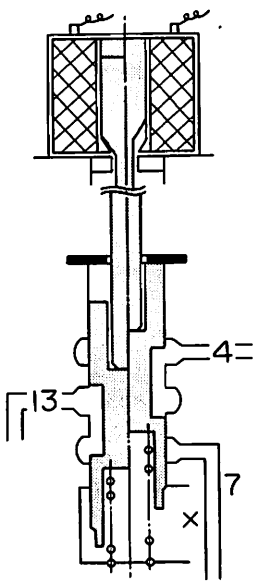


Fig. AT-17 Solenoid downshift valve

Second lock valve (SLV)

This valve is a transfer valve which assists the shift valve in determining the fixed "2nd" speed at the "2" range.

In the "D" range, the sum of the spring force and line pressure (3) applied upward exceeds the line pressure (2) which is applied to the valve area difference as a downward force. As a result, the valve is locked upward, and the circuit from line pressure (8) to line pressure (9) is opened.

Consequently, the FSV becomes the "2nd" speed condition, and line pressure is led to the band servo engaging circuit (9) only when line pressure (1) is released to line pressure (8).

In the "2" range, the upward force is retained only on the spring, and the downward line pressure (2) exceeds the upward force.

As a result, the valve is locked downward, line pressure (2) is released to (9) regardless of the operating condition of the FSV, and the band servo is engaged.

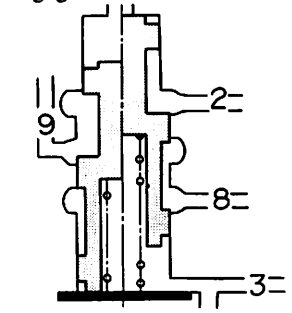


Fig. AT-18 Second lock valve

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2nd-3rd timing valve (TMV)

This valve is a transfer valve which switches the by-pass circuit of the orifice (22) in the front clutch pressure circuit (11) in response to vehicle speed and throttle condition. A force created when the governor pressure (15) is applied to the bottom of the TMV constitutes the upward force, and a force created when the spring force and the throttle pressure are applied to the top of the TMV constitutes the downward force.

When the throttle pressure (16) is lower than the governor pressure (15), the upward force exceeds the downward force, the valve is locked upward, and passage from circuit (10) ("2nd" from the "Top") to circuit (11) is closed. Consequently, the line pressure (10) is led to the front clutch circuit (11) through the orifice (22), and the oil pressure is thus transmitted slowly. However, under normal shifting, the throttle pressure (16) has a pressure exceeding a certain level, and the downward force exceeds the upward force. As a result, the valve is locked downward, the passage from circuit (10) to circuit (11) is opened, and the orifice (22) is bypassed.

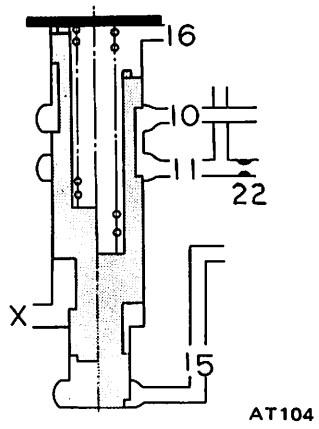
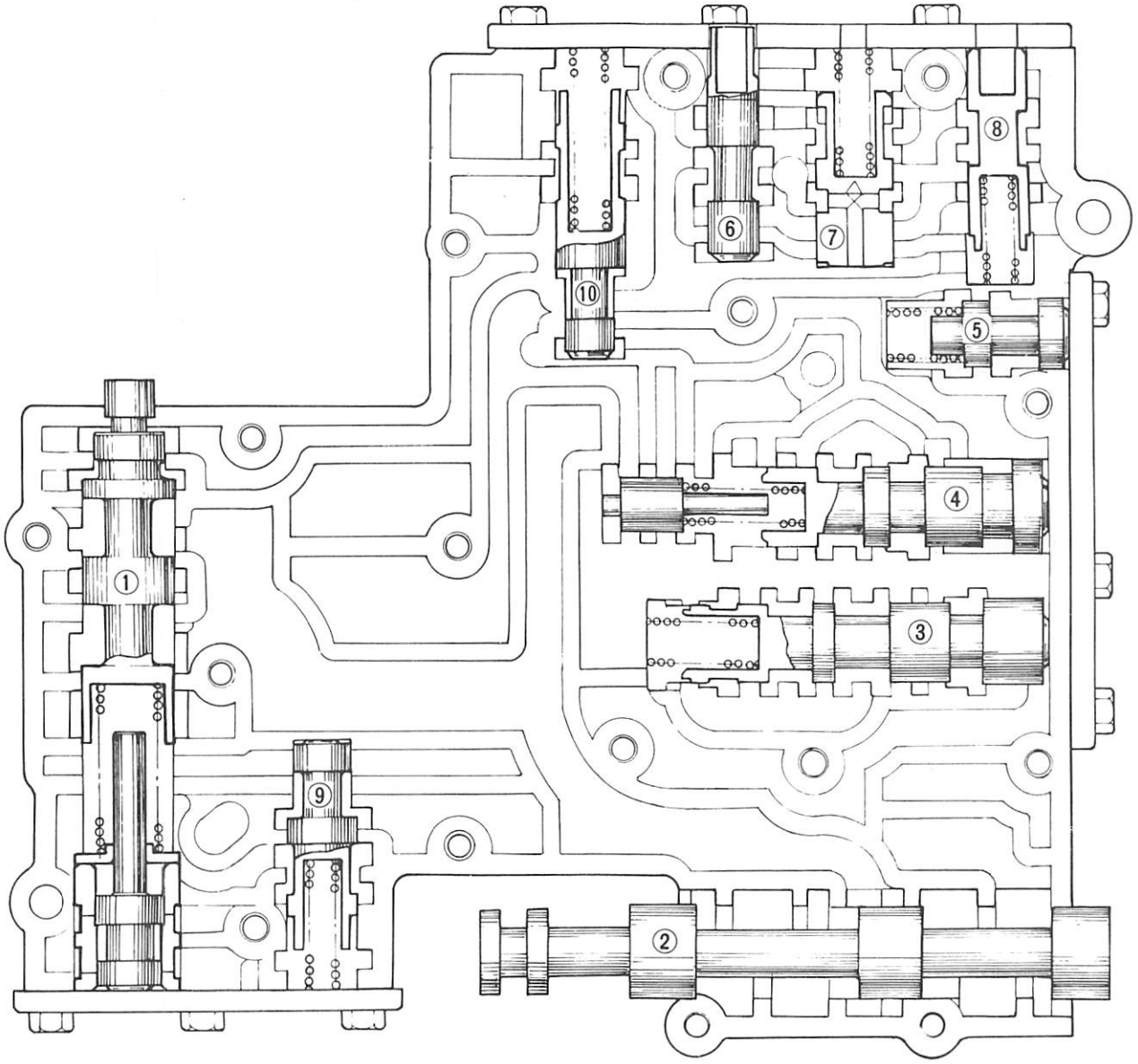


Fig. AT-19 "2nd-3rd" timing valve

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AT094

1 Pressure regulating valve (PRV)
2 Manual valve (MNV)
3 1st-2nd shift valve (FSV)
4 2nd-3rd shift valve (SSV)
5 Pressure modifier valve (PMV)
6 Vacuum throttle valve (VTV)
7 Throttle back-up valve (TBV)
8 Solenoid down shift valve (SDV)
9 Second lock valve (SLV)
10 2 - 3 timing valve (TMV)

Fig. AT-20 Control valve

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HYDRAULIC SYSTEM AND MECHANICAL OPERATION

The operating system of oil pressure in each range is described below:

The oil pressure in each circuit shown in the illustration is classified as follows according to the function: (The numerals show the circuit numbers.)

Pressure source of the line: 7

Operating line pressure for friction elements:
1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12.

Auxiliary line pressure: 13

Throttle system pressure:
16, 17, 18, 19.

Others: 14, 15

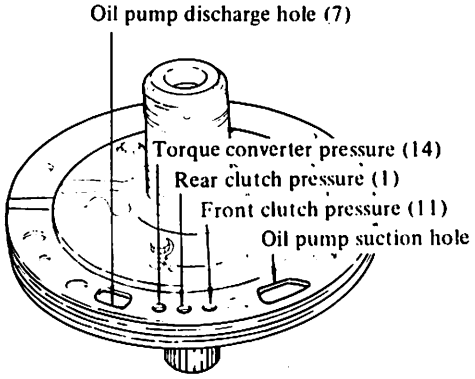


Fig. AT-21 Identification of oil channels in oil pump

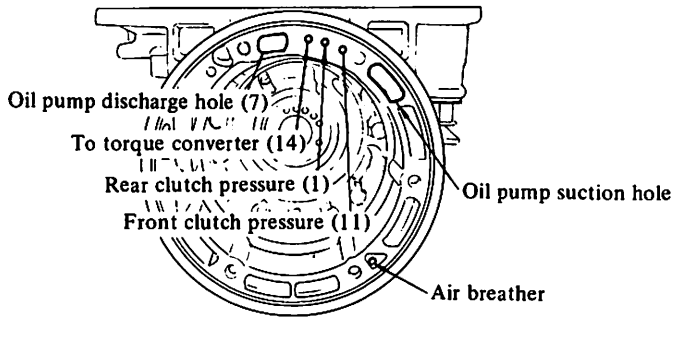


Fig. AT-22 Identification of oil channels in case front face

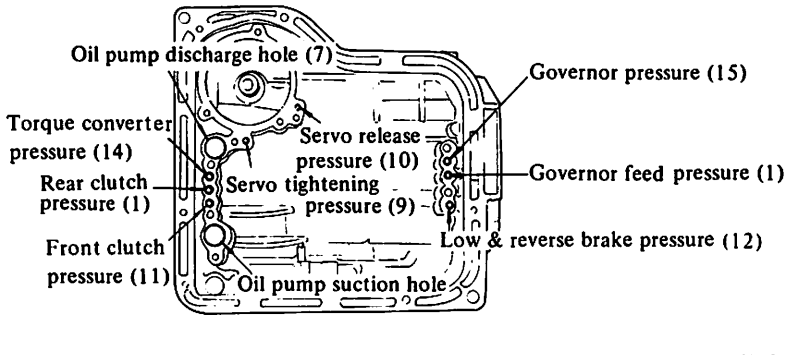


Fig. AT-23 Identification of oil channels in case face

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"P" RANGE (PARK)

The operation of clutches and band are functionally the same as in "Neutral".

In parking, however, when the parking pawl meshes in a gear which is splined to the output shaft, the output shaft is mechanically locked from rotating.

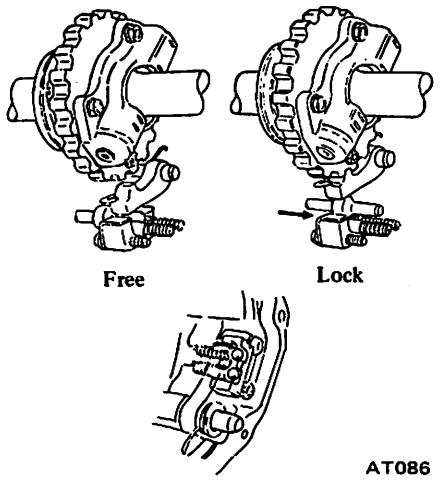


Fig. AT-24 Parking mechanism

The oil discharged from the oil pump is fed to each part in a similar manner to that of the "N" range. The oil having the line pressure (7) which has been introduced into the manual valve ② reaches the "1st-2nd" shift valve ③ through the line pressure circuit (5). As the "1st-2nd" shift valve is forced to the right-hand side by the spring, the line pressure (5) and (12) actuates the low and reverse brake through the groove. Also, the parking pawl engages with the outer teeth of the oil distributor by means of the manual lever, mechanically locking the output shaft.

Range			Gear ratio	Clutch		Low & reverse brake	Band servo		One way clutch	Parking pawl
				Front	Rear		Operation	Release		
Park						on				on
Reverse			2.182	on		on		on		
Neutral										
Drive	D1	Low	2.458		on				on	
	D2	Second	1.458		on		on			
	D3	Top	1.000	on	on		(on)	on		
2		Second	1.458		on		on			
1	1_2	Second	1.458		on		on			
	1_1	Low	2.458		on	on				

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"P" range (Park)

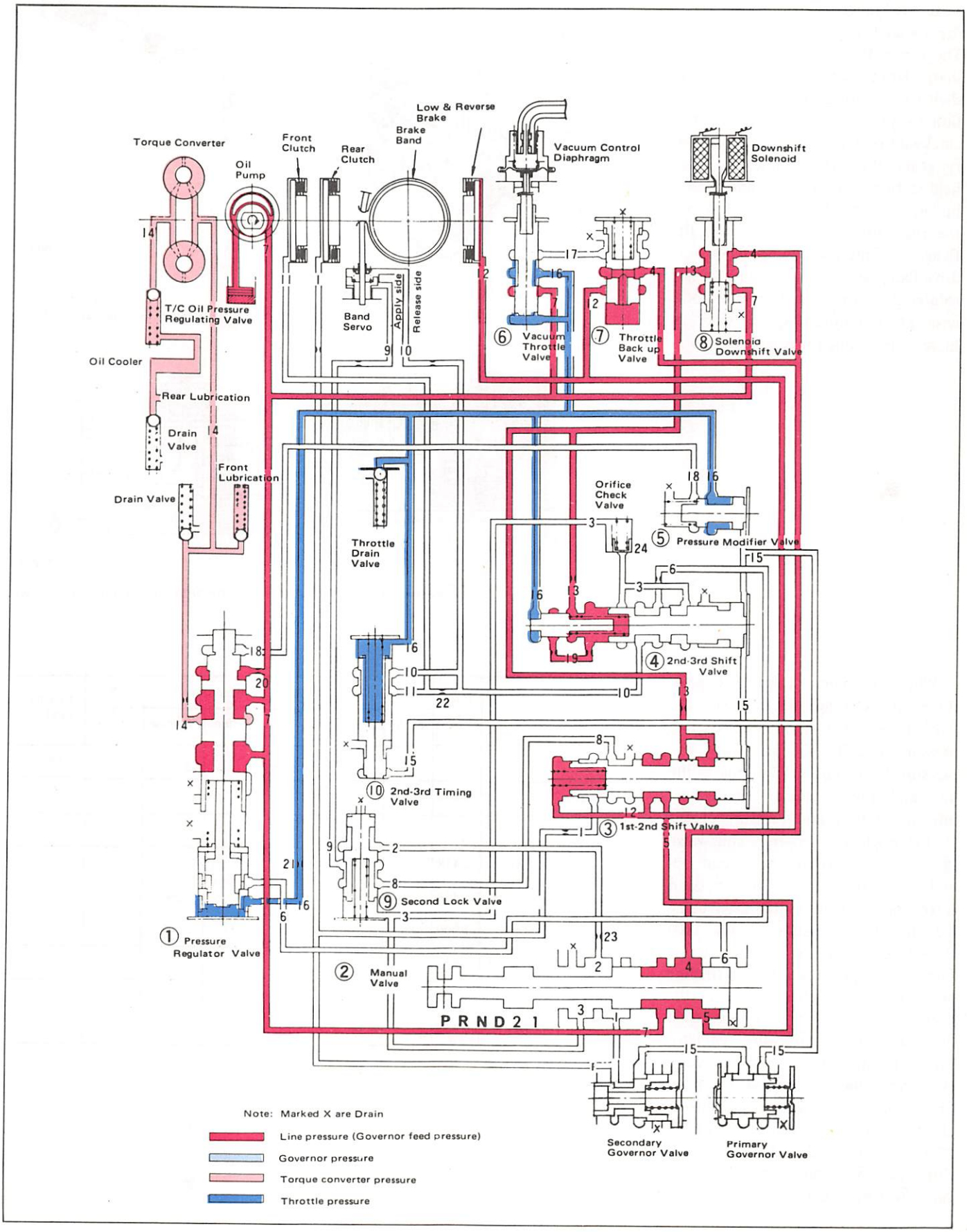


Fig. AT-25 Oil pressure circuit diagram — "P" range (Park)

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"R" RANGE (REVERSE)

In "R" range, the front clutch and the low and reverse brake are applied. The power flow is through the input shaft, front clutch, and connecting shell to the sun gear. Clockwise rotation of the sun gear causes counterclockwise rotation of the rear planetary gears. With the connecting drum held stationary by the low and reverse brake, the rear planetary gears rotate the rear internal gear and drive the flange counterclockwise. The rear drive flange splined to the output shaft rotates the output shaft counterclockwise at a reduced speed with an increase in torque for reverse gear.

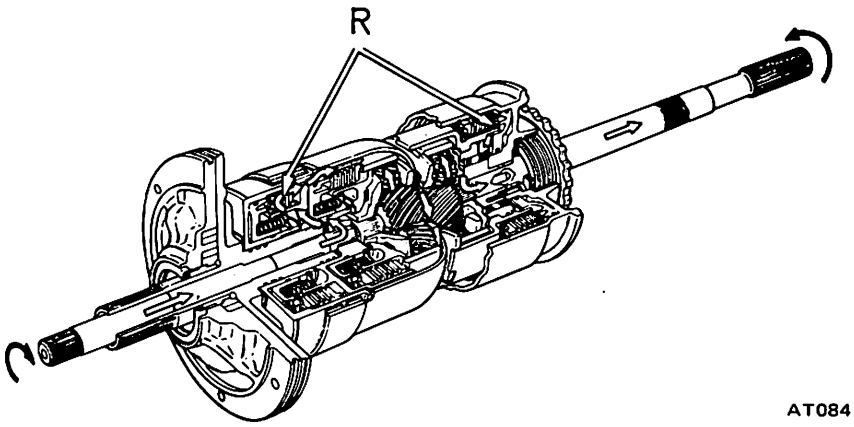


Fig. AT-26 Power transmission during "R" range

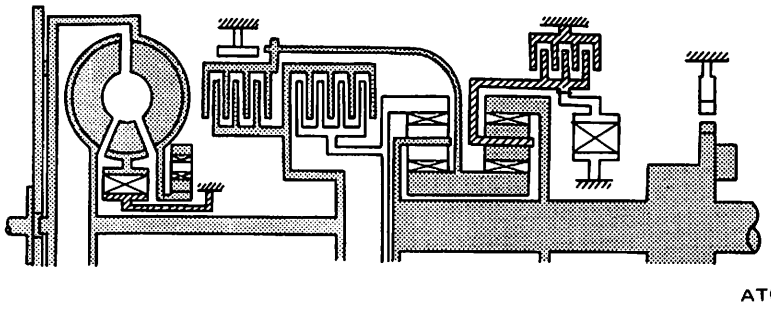


Fig. AT-27 Operation of each mechanism during "R" range

When the manual valve ② is positioned at "R" range, the oil having the line pressure (7) is directed to line pressure circuits (5) and (6). The pressure in the circuit (5) actuates the low and reverse brake after being introduced into line pressure circuit (12) through the "1st-2nd" shift valve ③. The pressure in the circuit operates the release side of the band servo and the front clutch after being led to line pressure circuit (10) through the "2nd-3rd" shift valve ④. The throttle pressure (16) and the line pressure (6) which vary with the degree of accelerator pedal depression both act on the pressure regulator valve ① and press against its valve ①, increasing line pressure (7). In "R" range, the governor pressure is absent, making all such valves as the "1st-2nd" shift valve ③, "2nd-3rd" shift valve ④, and pressure modifier valve ⑥ inoperative.

Range			Gear ratio	Clutch		Low & reverse brake	Band servo		One way clutch	Parking pawl
				Front	Rear		Operation	Release		
Park						on				on
Reverse			2.182	on		on		on		
Neutral										
Drive	D1	Low	2.458		on				on	
	D2	Second	1.458		on		on			
	D3	Top	1.000	on	on		(on)	on		
2		Second	1.458		on		on			
1	1_2	Second	1.458		on		on			
	1_1	Low	2.458		on	on				

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"R" range (Reverse)

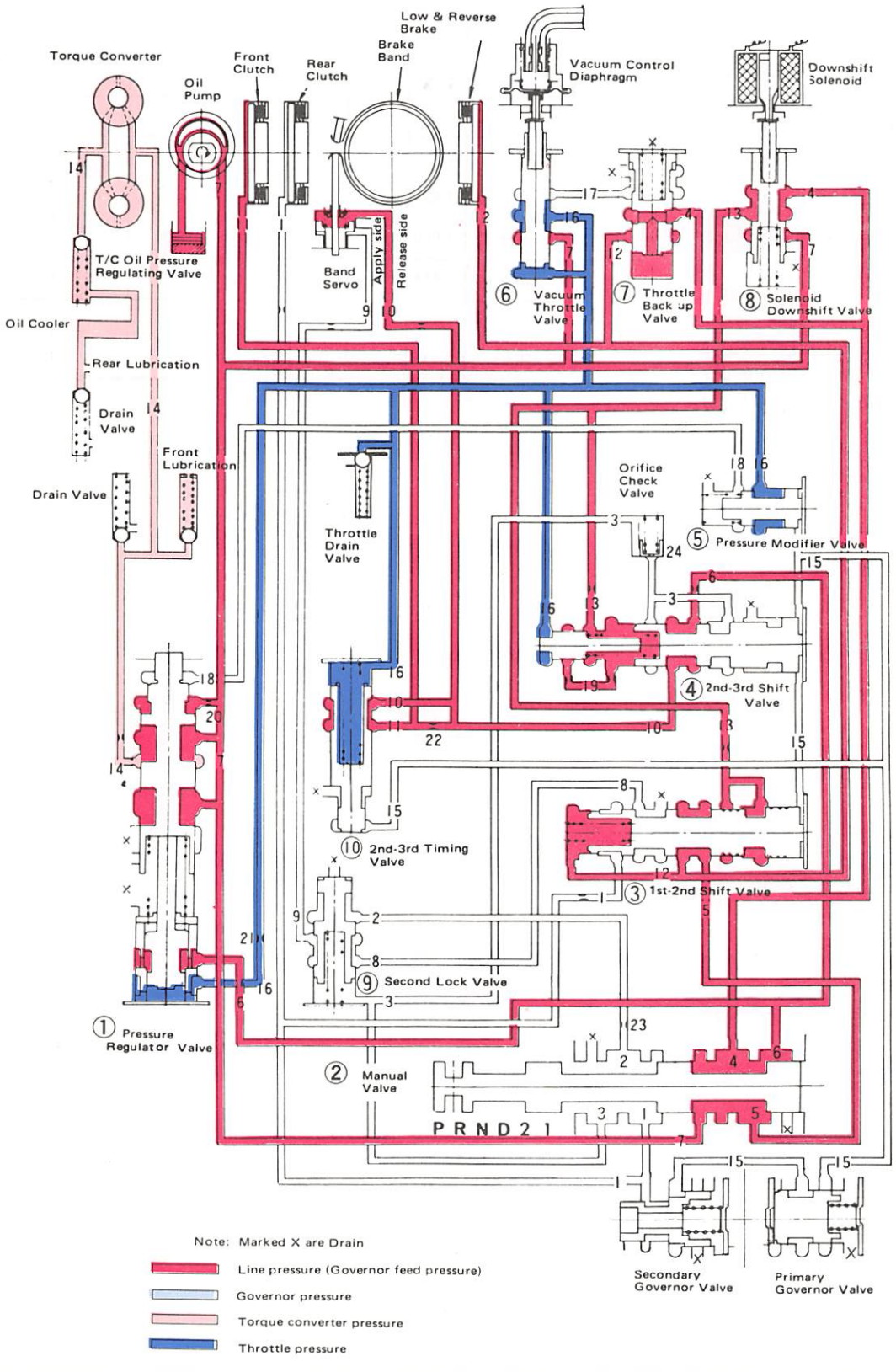


Fig. AT-28 Oil pressure circuit diagram — "R" range (Reverse)

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"N" RANGE (NEUTRAL)

In "N" range none of the clutches and band are applied, thus no power is transmitted to the output shaft.

The pressure of oil discharged from the oil pump is regulated by the pressure regulator valve ① to maintain the line pressure (7), and the oil is led to the manual valve ②, vacuum throttle valve ⑥, and solenoid down shift valve ⑧. The oil is further introduced into the torque converter at its operating pressure (14), and a portion of this oil is distributed to each part as the front lubricant. The oil which has been discharged from the torque converter is also distributed to each part as the rear lubricant.

As the oil pump rotates at the same speed as the engine, the oil pump discharge increases with engine speed. But the surplus oil is returned to the oil pan by the pressure regulator valve ①.

Range			Gear ratio	Clutch		Low & reverse brake	Band servo		One way clutch	Parking pawl
				Front	Rear		Operation	Release		
Park						on				on
Reverse			2.182	on		on		on		
Neutral										
Drive	D1	Low	2.458		on				on	
	D2	Second	1.458		on		on			
	D3	Top	1.000	on	on		(on)	on		
2		Second	1.458		on		on			
1	1_2	Second	1.458		on		on			
	1_1	Low	2.458		on	on				

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"N" range (Neutral)

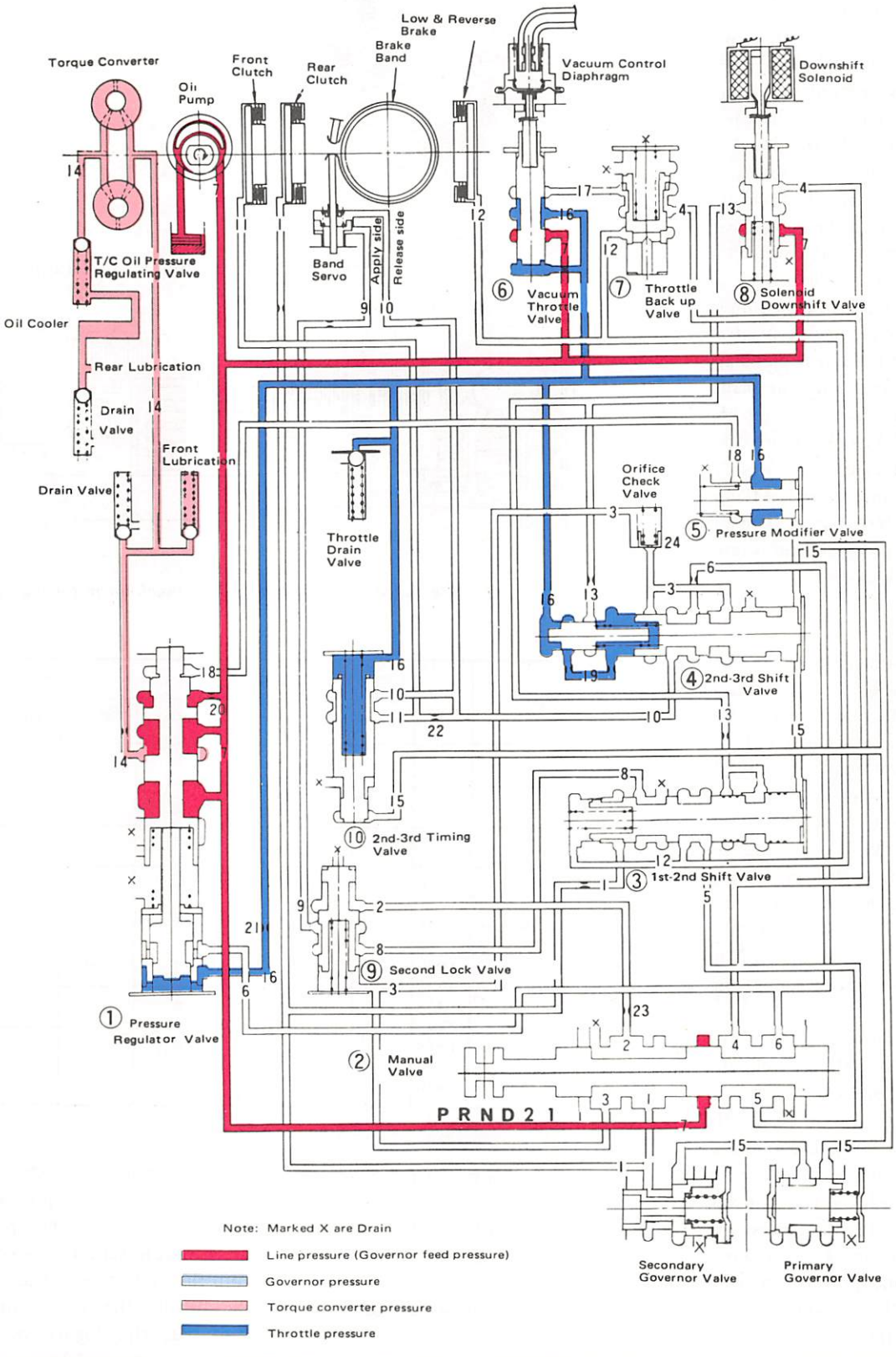


Fig. AT-29 Oil pressure circuit diagram — "N" range (Neutral)

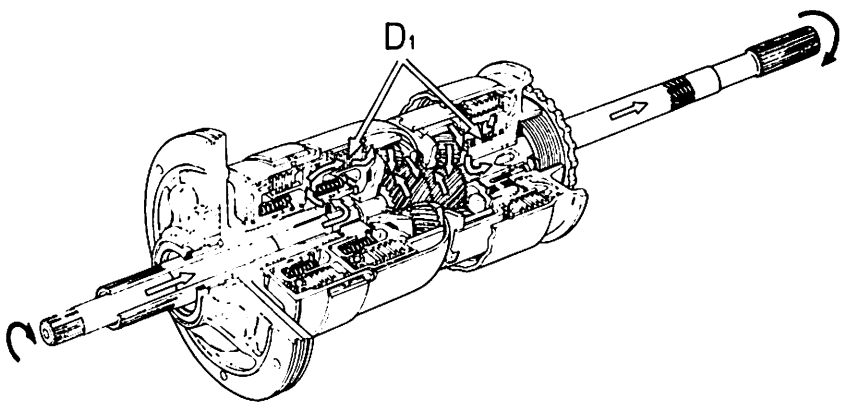
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"D_1" RANGE (LOW GEAR)

The low gear in "D" range is somewhat different from that in "1_1" range.

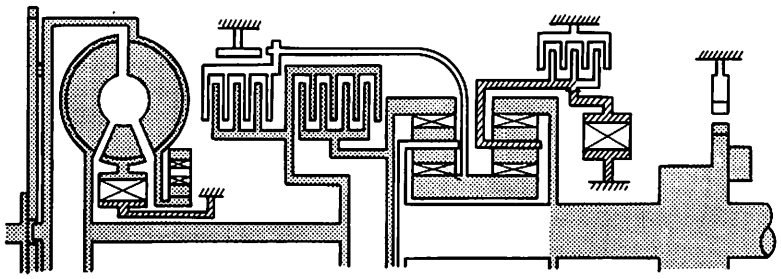
The rear clutch is applied as in "1_1" range, but the one-way clutch holds the connecting drum. The power flow is the same as in "1_1" range. That is, the power flow takes place through the input shaft and into the rear clutch. The input shaft is splined to the rear clutch drum and drives it. Rotation of the rear clutch drives the rear clutch hub and front internal gear.

The front internal gear rotates the front planetary gears clockwise to cause the sun gear to rotate counterclockwise. Counterclockwise rotation of the sun gear turns the rear planetary gears clockwise. With the rear planetary carrier held stationary by the one-way clutch, the clockwise rotation of the rear planetary gears rotates the rear internal gear and drives the flange clockwise. The internal drive flange is splined to the output shaft and rotates the output shaft clockwise.



AT080

Fig. AT-30 Power transmission during "D_1" range



AT081

Fig. AT-31 Operation of each mechanism during "D_1" range

When the manual valve is positioned at "D", the line pressure (7) introduced into the manual valve is led to the line pressure circuits (1), (2) and (3). The pressure in the circuit (1) actuates the rear clutch and the governor, and at the same time, operates the "1st-2nd" shift valve ③ to change the speed. The circuit (2) leads to the second lock valve ⑨. The circuit (3) actuates the "2nd-3rd" shift valve ④ for the "2nd-3rd" speed change, and at the same time, locks the second lock valve ⑨.

The throttle pressure (16) which changes with the degree of accelerator pedal depression, presses the pressure regulator valve ① and increases the line pressure (7). When the speed of the vehicle has increased, the governor pressure (15) introduced from the line pressure circuit (1) actuates the "1st-2nd" shift valve ③, "2nd-3rd" shift valve ④, and pressure modifier valve ⑤. When the governor pressure is high, the pressure modifier valve ⑤ acts in such a direction as to compress the spring, and the throttle pressure is led to the throttle pressure (18). This pressure acts against the force of the spring of the pressure regulator valve ① and also against the throttle pressure (16), thus lowering the line pressure (7).

The governor pressure also increases with the speed of the vehicle, exerting a pressure on one side of the "1st-2nd" shift valve, and counter acts the throttle pressure (19), line pressure (1), and the spring which are exerting against the governor pressure. Therefore, when the governor pressure exceeds this pressure, the speed is shifted from the "1st" gear to the "2nd" gear. The further the accelerator pedal is depressed, the higher becomes the throttle pressure (19), increasing the governor pressure and shifting the speed change point to the higher side.

Range			Gear ratio	Clutch		Low & reverse brake	Band servo		One way clutch	Parking pawl
				Front	Rear		Operation	Release		
Park						on				on
Reverse			2.182	on		on		on		
Neutral										
Drive	D1	Low	2.458		on				on	
	D2	Second	1.458		on		on			
	D3	Top	1.000	on	on		(on)	on		
2		Second	1.458		on		on			
1	1_2	Second	1.458		on		on			
	1_1	Low	2.458		on	on				

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"D_1" range (Low gear)

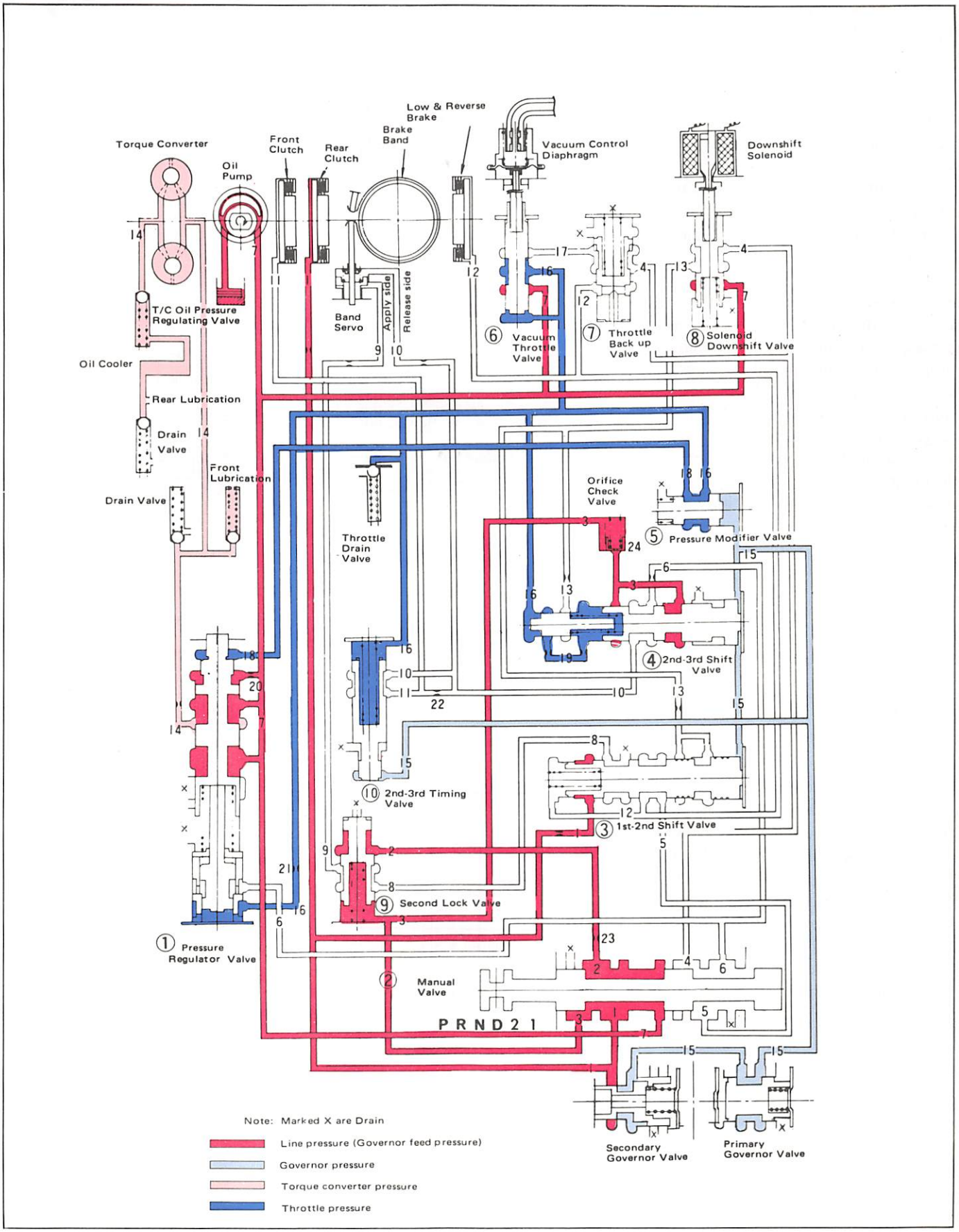


Fig. AT-32 Oil pressure circuit diagram — "D_1" range (Low gear)

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"D_2" RANGE (2ND GEAR)

In this case, the rear clutch is applied and the band brake holds the front clutch drum, the connecting shell and the sun gear from rotating.

The power flow takes place through the input shaft into the rear clutch and the front internal gear. With the sun gear held stationary, the front planetary gears rotate around the sun gear, carrying the front planet carrier with them. The front planet carrier, being splined to the output shaft, causes clockwise rotation of the output shaft at a reduced speed compared with the speed of the input shaft, with an increase in torque. As the low and reverse brake is not applied, the clockwise rotation of the output shaft causes clockwise rotation of rear internal gear and the rear planet carrier also rotates around the sun gear in a clockwise direction. The one-way clutch will act to allow the clockwise rotation of connecting drum.

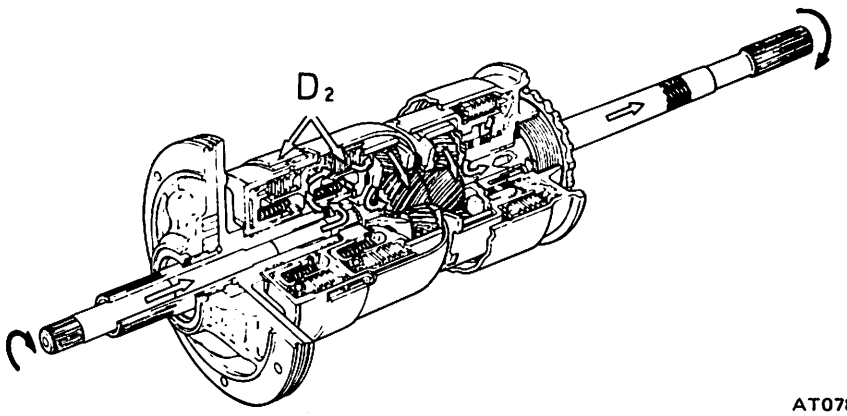


Fig. AT-33 Power transmission during "D_2" range

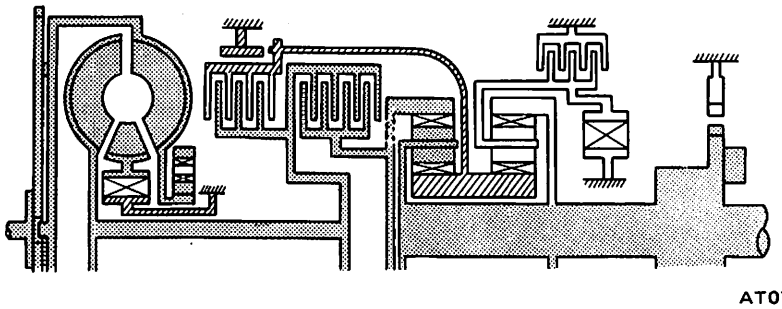


Fig. AT-34 Operation of each mechanism during "D_2" range

When the car speed increases while running at "D_1" range (1st gear), the "1st-2nd" shift valve ③ moves allowing the line pressure (1) to be introduced into the line pressure (8) through itself. The line pressure (8) is further led to the line pressure (9) through the second lock valve ⑨, and by locking the band servo, obtains the "2nd" gear condition.

Range			Gear ratio	Clutch		Low & reverse brake	Band servo		One way clutch	Parking pawl
				Front	Rear		Operation	Release		
Park						on				on
Reverse			2.182	on		on		on		
Neutral										
Drive	D1	Low	2.458		on				on	
	D2	Second	1.458		on		on			
	D3	Top	1.000	on	on		(on)	on		
2		Second	1.458		on		on			
1	1_2	Second	1.458		on		on			
	1_1	Low	2.458		on	on				

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"D_2" range (2nd gear)

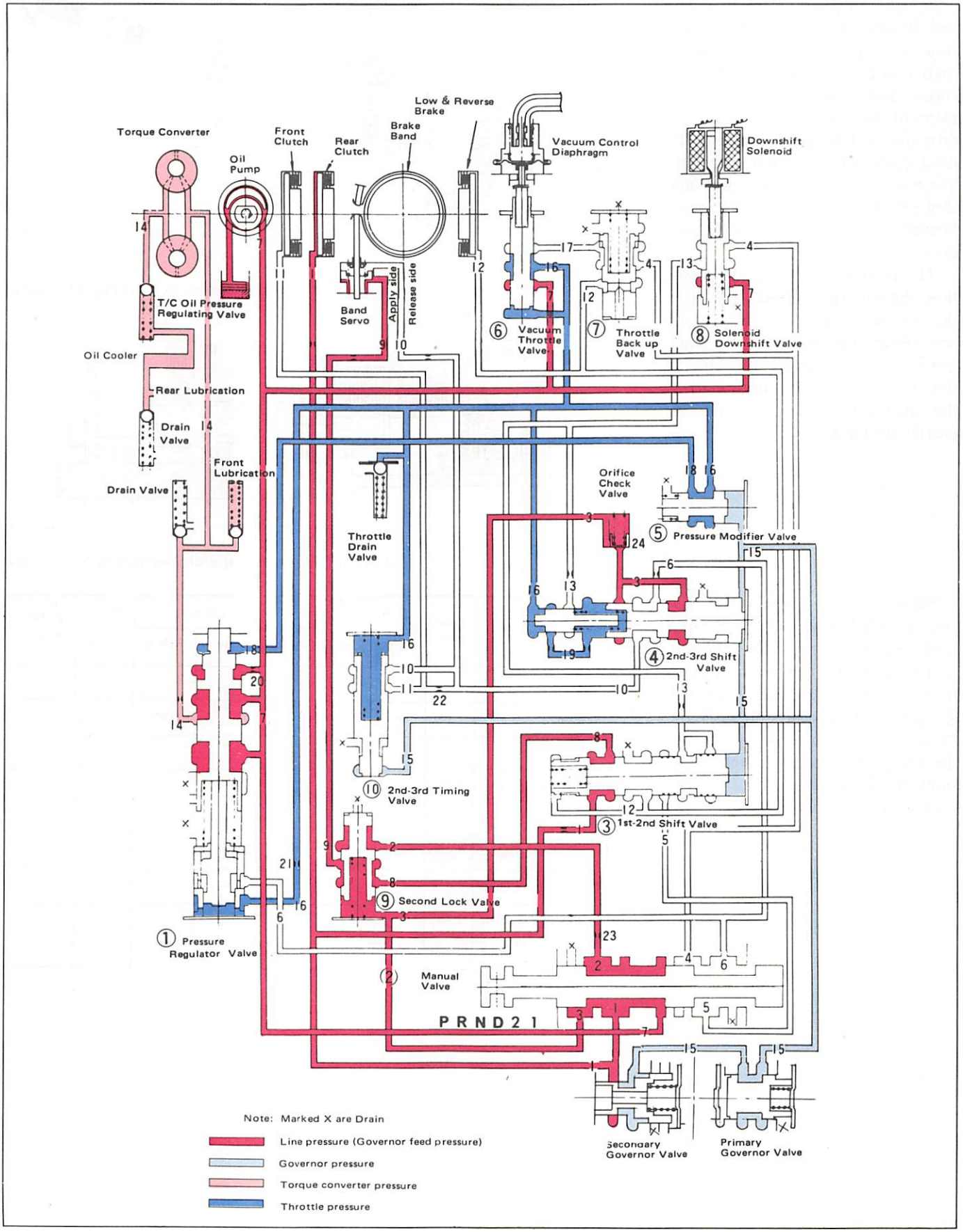


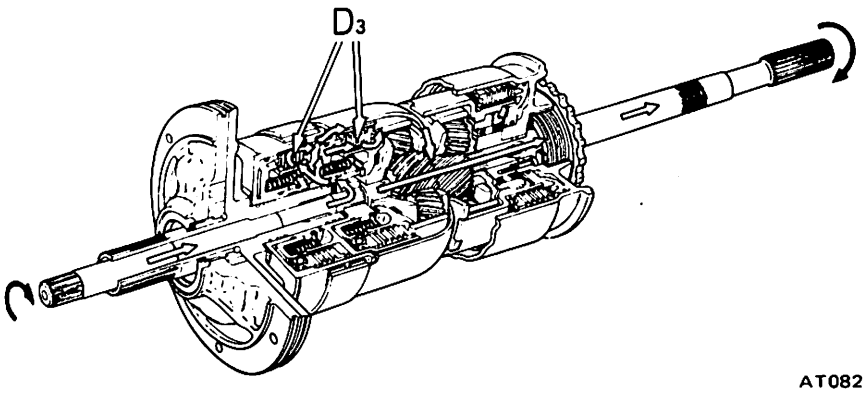
Fig. AT-35 Oil pressure circuit diagram — "D_2" range (2nd gear)

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"D_3" RANGE (TOP GEAR)

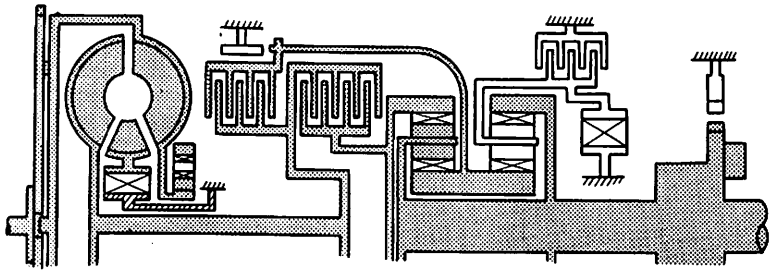
In 3rd gear position, the front and rear clutches are engaged. The power flow takes place through the input shaft into rear clutch drum. The rear clutch drum rotates the steel drive plates of the rear clutch and the lined drive plates of the rear clutch and the lined drive plates of the front clutch. The rear clutch directs the power flow through the rear clutch hub and front internal gear to the front planet carrier.

The front clutch directs the power flow through the connecting shell to the sun gear. With the sun gear and the rear clutch hub driven at the same speed, the front planet assembly is forced to rotate the output shaft at the same speed in the direction to provide the top gear.



AT082

Fig. AT-36 Power transmission during "D_3" range



AT083

Fig. AT-37 Operation of each mechanism "D_3" range

When the car speed further increases while running at "D_2" range (2nd gear) and the governor pressure (15) exceeds the combined force of the spring of the "2nd-3rd" shift valve ④ and the throttle pressure (19), the "2nd-3rd" shift valve ④ moves, and the line pressure (8) acts to release the front clutch and band servo through the line pressure (10).

Range			Gear ratio	Clutch		Low & reverse brake	Band servo		One way clutch	Parking pawl
				Front	Rear		Operation	Release		
Park						on				on
Reverse			2.182	on		on		on		
Neutral										
Drive	D1	Low	2.458		on				on	
	D2	Second	1.458		on		on			
	D3	Top	1.000	on	on		(on)	on		
2		Second	1.458		on		on			
1	1_2	Second	1.458		on		on			
	1_1	Low	2.458		on	on				

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"D_3" range (Top gear)

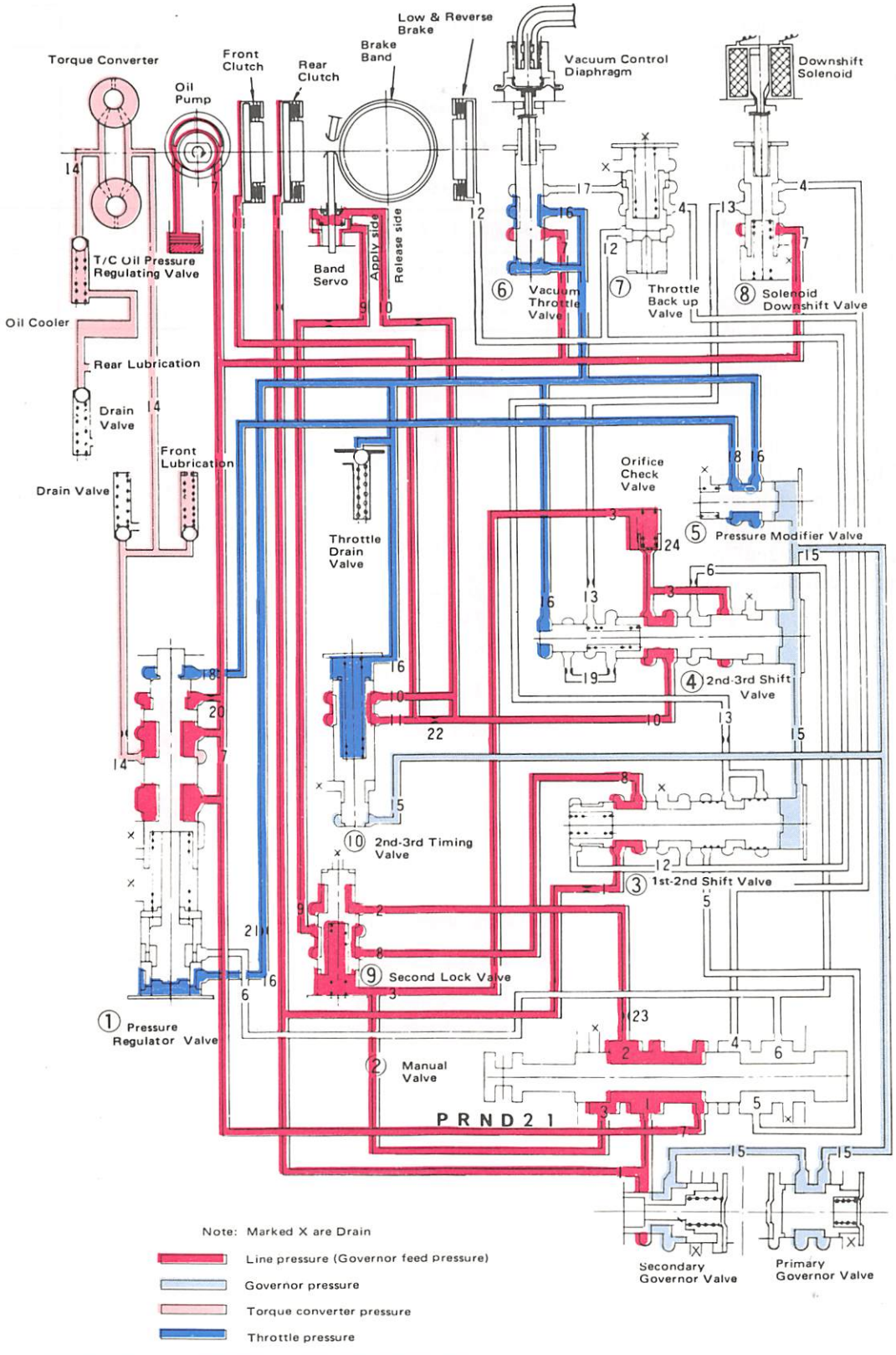


Fig. AT-38 Oil pressure circuit diagram — "D_3" range (Top gear)

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"D" RANGE KICKDOWN

While operating at speeds below approximately 80 to 90 km/h (50 to 56 MPH), a kick "3rd-2nd" downshift can be accomplished by fully depressing the accelerator.

A kick "3rd-1st" or "2nd-1st" downshift can also be accomplished below approximately 40 to 50 km/h (25 to 31 MPH).

When kickdown is performed, the push rod operates by the solenoid, the valve is depressed downward, and the circuit from the line pressure (7) to the line pressure (13) opens. The line pressure (13), (3) plus the force of the "2nd-3rd" shift valve spring oppose the governor pressure (15) at the "2nd-3rd" shift valve ④, and thus, performs "3rd-2nd" downshift operation.

Moreover, the line pressure (13) plus the force of the "1st-2nd" shift valve spring oppose the governor pressure (15) at the "1st-2nd" shift valve ③, and thus, perform "3rd-2nd" or "2nd-1st" downshift operation.

Range			Gear ratio	Clutch		Low & reverse brake	Band servo		One way clutch	Parking pawl
				Front	Rear		Operation	Release		
Park						on				on
Reverse			2.182	on		on		on		
Neutral										
Drive	D1	Low	2.458		on				on	
	D2	Second	1.458		on		on			
	D3	Top	1.000	on	on		(on)	on		
2		Second	1.458		on		on			
1	1_2	Second	1.458		on		on			
	1_1	Low	2.458		on	on				

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"D" range kickdown (Shift valves in 2nd gear position)

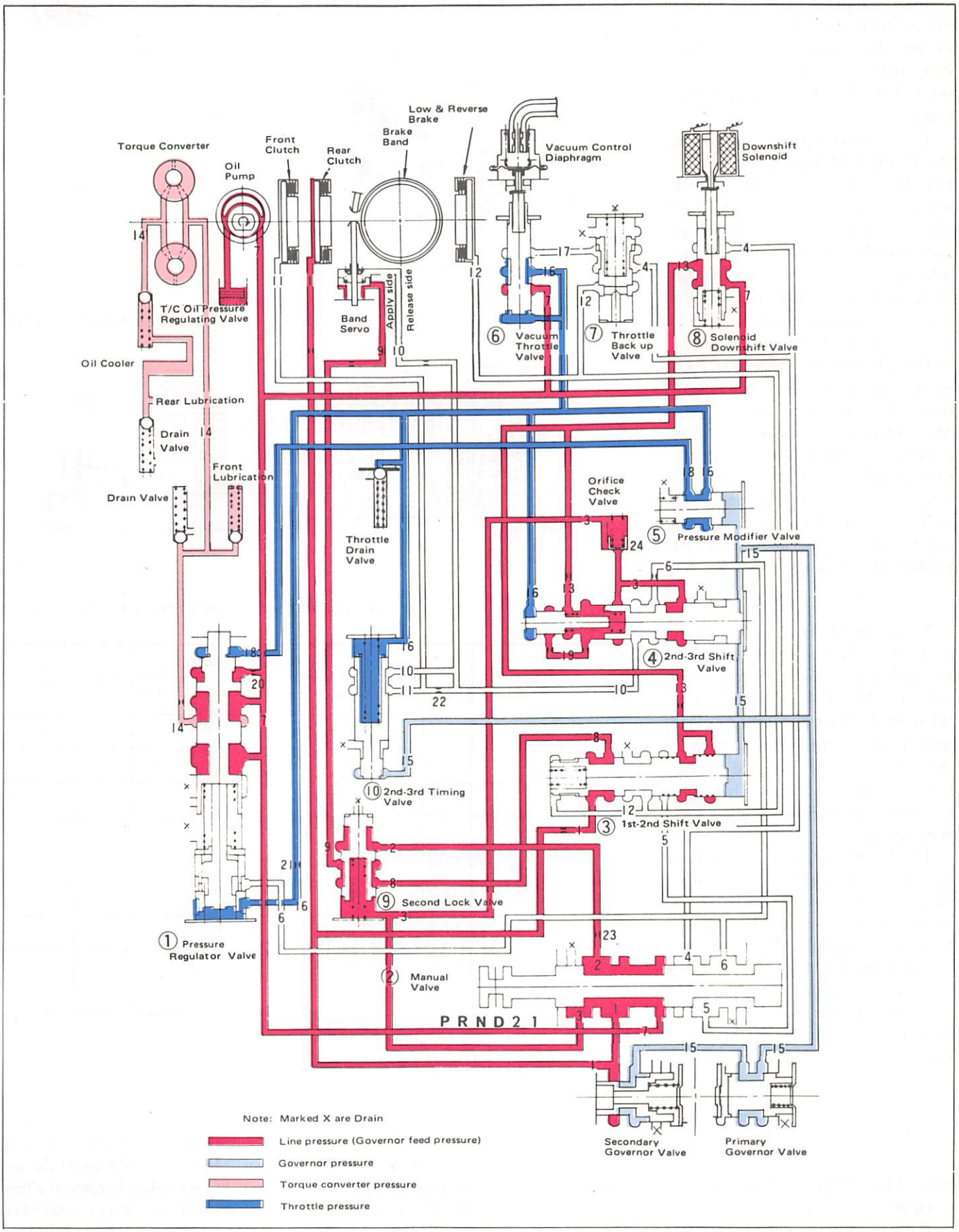


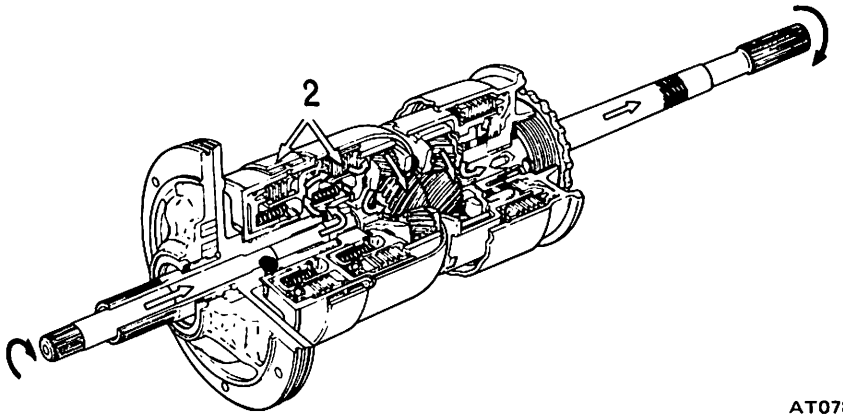
Fig. AT-39 Oil pressure circuit diagram — "D" range kickdown (shift valves in 2nd gear position)

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"2" RANGE (2ND GEAR)

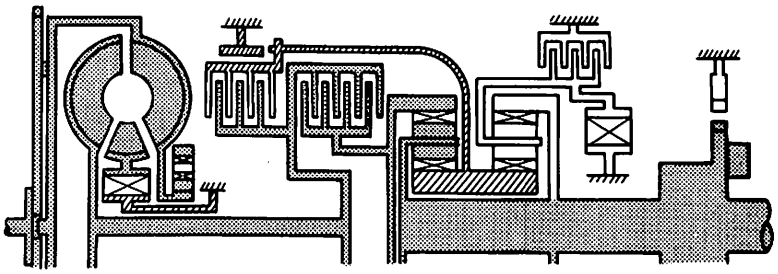
In "2" range the gear ratio is locked in the 2nd forward speed. In this case, the rear clutch is engaged and the band brake holds the front clutch drum, the connecting shell and sun gear from rotating.

The power flow takes place through the input shaft into the rear clutch and the front internal gear. With the sun gear held stationary, the front planetary gears rotate around the sun gear, carrying the front planet carrier with them. The front planet carrier, being splined to the output shaft, causes clockwise rotation of the output shaft at a reduced speed compared to the speed of the input shaft, with an increase in torque. As the low and reverse brake is not engaged, the clockwise rotation of the output shaft causes clockwise rotation of rear internal gear and the rear planet carrier also rotates around the sun gear in a clockwise direction. The one-way clutch will act to allow clockwise rotation of connecting drum.



AT078

Fig. AT-40 Power transmission during "2" range



AT079

Fig. AT-41 Operation of each mechanism during "2" range

When the manual valve ② is positioned at "2", the line pressure (7) is introduced into the line pressure circuits (1), (2) and (4). The line pressure (1) is led to the governor, rear clutch and "1st-2nd" shift valve ③ as in the case of "D" range. The line pressure (2) locks the second lock valve ⑨ and is led to the tightening side of the band servo.

The "2nd" gear is therefore fixed regardless of vehicle speed. When "D_3" range (3rd gear) is shifted to "2" range, the line pressure (4) enters the throttle back-up valve ⑦ and produces a high pressure in the circuit (17), increasing the throttle pressure (16). The line pressure (7) is, therefore, increased and quickly tightens the band.

Range			Gear ratio	Clutch		Low & reverse brake	Band servo		One way clutch	Parking pawl
				Front	Rear		Operation	Release		
Park						on				on
Reverse			2.182	on		on		on		
Neutral										
Drive	D1	Low	2.458		on				on	
	D2	Second	1.458		on		on			
	D3	Top	1.000	on	on		(on)	on		
2		Second	1.458		on		on			
1	1_2	Second	1.458		on		on			
	1_1	Low	2.458		on	on				

Note: "D_3" range (3rd gear) to "2" range:
If "D_3" range (3rd gear) is shifted to "2" range during operation, the manual valve ② is also shifted to "2" position, causing the line pressure circuit (3) to be drained. Therefore, the line pressure circuit (10) which is situated at the release side of the front clutch and servo is also drained through the "2nd-3rd" shift valve ④, forcing the speed to decrease from "3rd gear" to "2nd gear." In this case the speed change quickly takes place because the line pressure (7) and other pressure are heightened by the action of the line pressure (4), in the same manner as described under "2" range.

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"2" range (2nd gear)

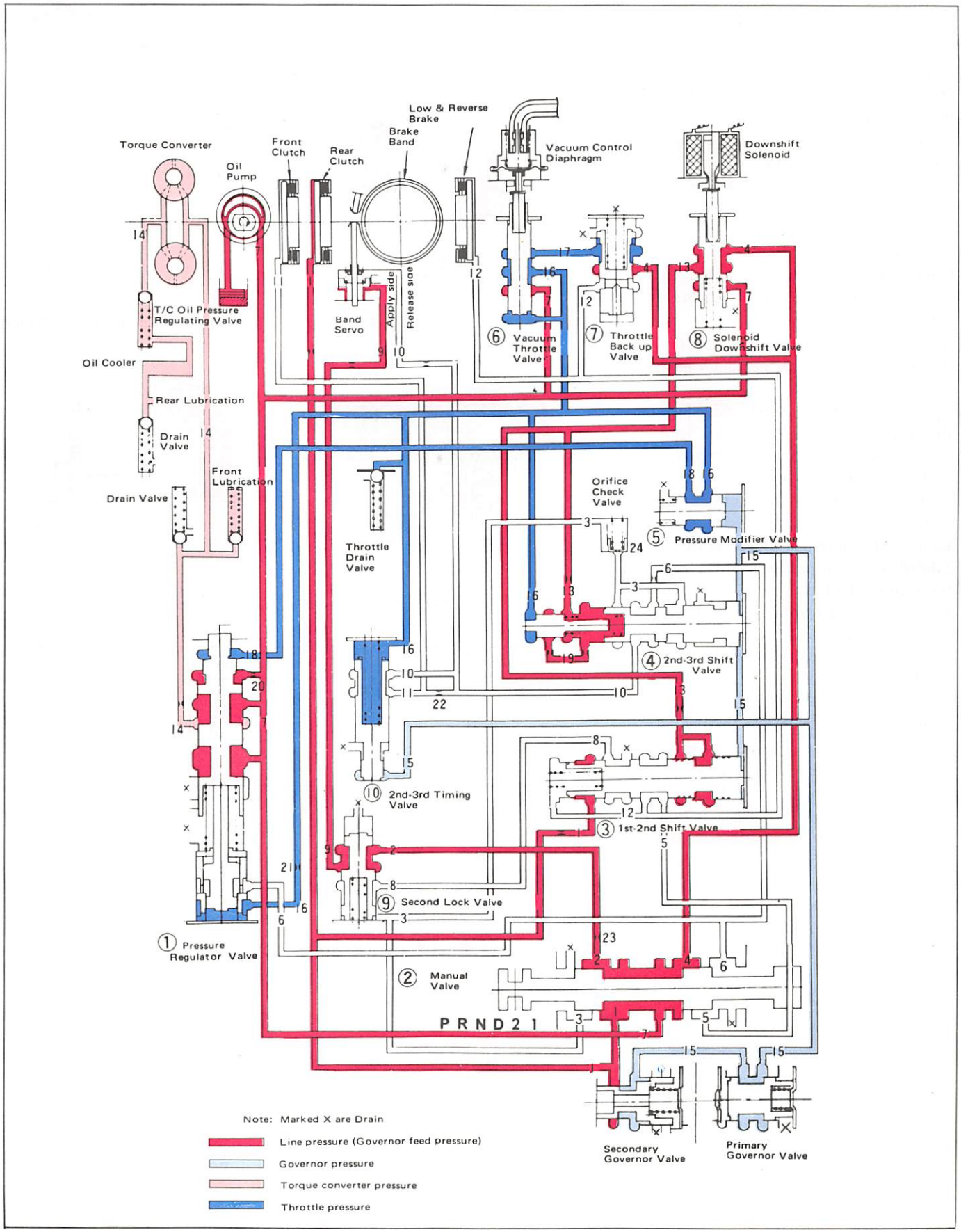


Fig. AT-42 Oil pressure circuit diagram — "2" range (2nd gear)

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"1_1" RANGE (LOW GEAR)

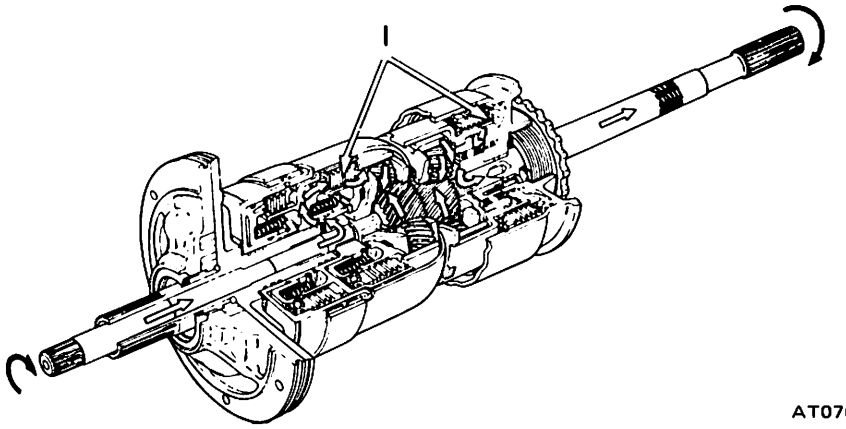
When starting in "1" range, the driving gear is locked to the low gear ratio.

In "1" range, the rear clutch is engaged and the low and reverse brake holds the connecting drum and rear planet carrier from rotating. The power flow takes place through the input shaft and into the rear clutch. Rotation of the rear clutch drives the rear clutch hub and front internal gear. The front internal gear rotates the front planetary gears clockwise to cause the sun gear to rotate counterclockwise.

Counterclockwise rotation of the sun gear turns the rear planetary gear clockwise.

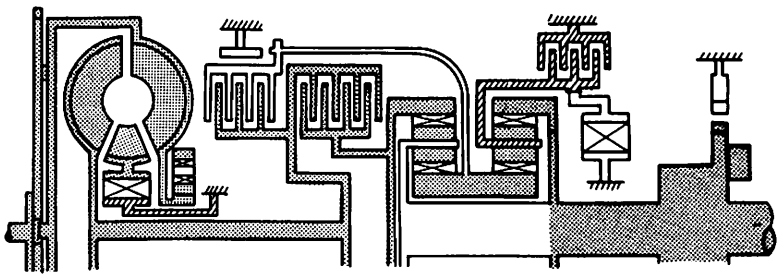
The rear planet carrier splined to the connecting drum is held from rotating by the low and reverse brake.

The clockwise rotation of the rear planetary gears therefore rotates the rear internal gear and internal drive flange. The internal drive flange is splined to the output shaft and rotates the output shaft clockwise. However, the output shaft rotates at a lower speed compared to that of the input shaft. This is caused by the fact that the front planet carrier rotates at the same speed as the output shaft in the same direction since the carrier is splined to the output shaft. The front internal gear and planetary gear assembly are rotating in the same direction, but the planet carrier is rotating at a speed slower than the ring gear. So the gear ratio of this speed range is a combination of the ratios provided by the front and rear planetary gear assemblies.



AT076

Fig. AT-43 Power transmission during "1_1" range



AT077

Fig. AT-44 Operation of each mechanism during "1_1" range

Range			Gear ratio	Clutch		Low & reverse brake	Band servo		One way clutch	Parking pawl
				Front	Rear		Operation	Release		
Park						on				on
Reverse			2.182	on		on		on		
Neutral										
Drive	D1	Low	2.458		on				on	
	D2	Second	1.458		on		on			
	D3	Top	1.000	on	on		(on)	on		
2		Second	1.458		on		on			
1	1_2	Second	1.458		on		on			
	1_1	Low	2.458		on	on				

When the manual valve ② is positioned at "1", the line pressure (7) is applied into the line pressure circuits (1), (4) and (5). The oil pressure in (5) actuates the low and reverse brake after being introduced into the circuit (12) through the "1st-2nd" shift valve ③, and the line pressure (1) acts on the rear clutch and governor. The line pressure (4) acts in the same manner as in "2" range.

Similar to that of the "D" range, the line pressure increases with the degree of accelerator pedal depression, and the line pressure decreases with the increase of car speed. The governor pressure (15) which acts on the "1st-2nd" shift valve does not increase until it overcomes the combined force of the line pressure (12) and the spring, causing no "1st-2nd" speed change.

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"1_1" range (Low gear)

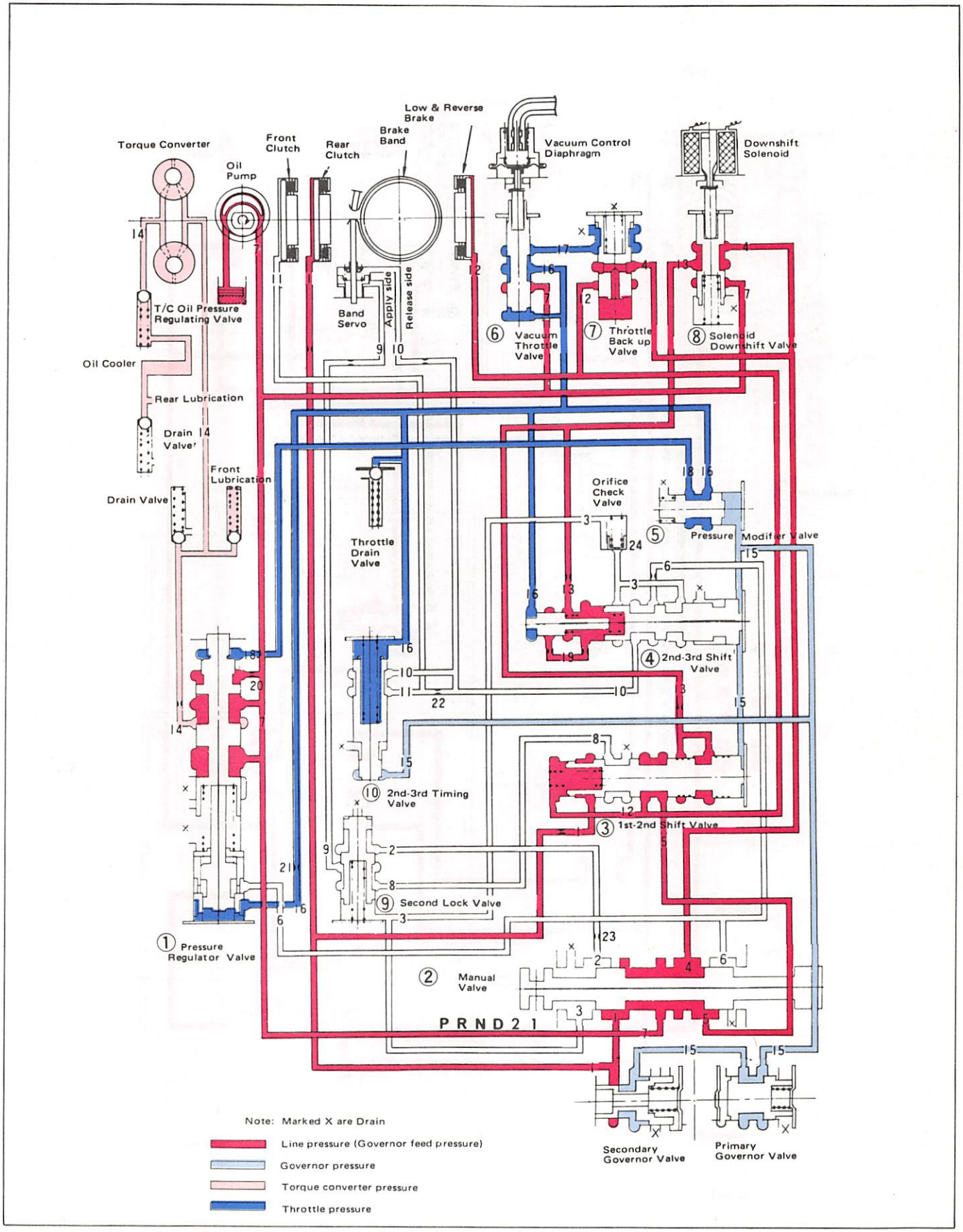


Fig. AT-45 Oil pressure circuit diagram — "1_1" range (Low gear)

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"1_2" range (2nd gear)

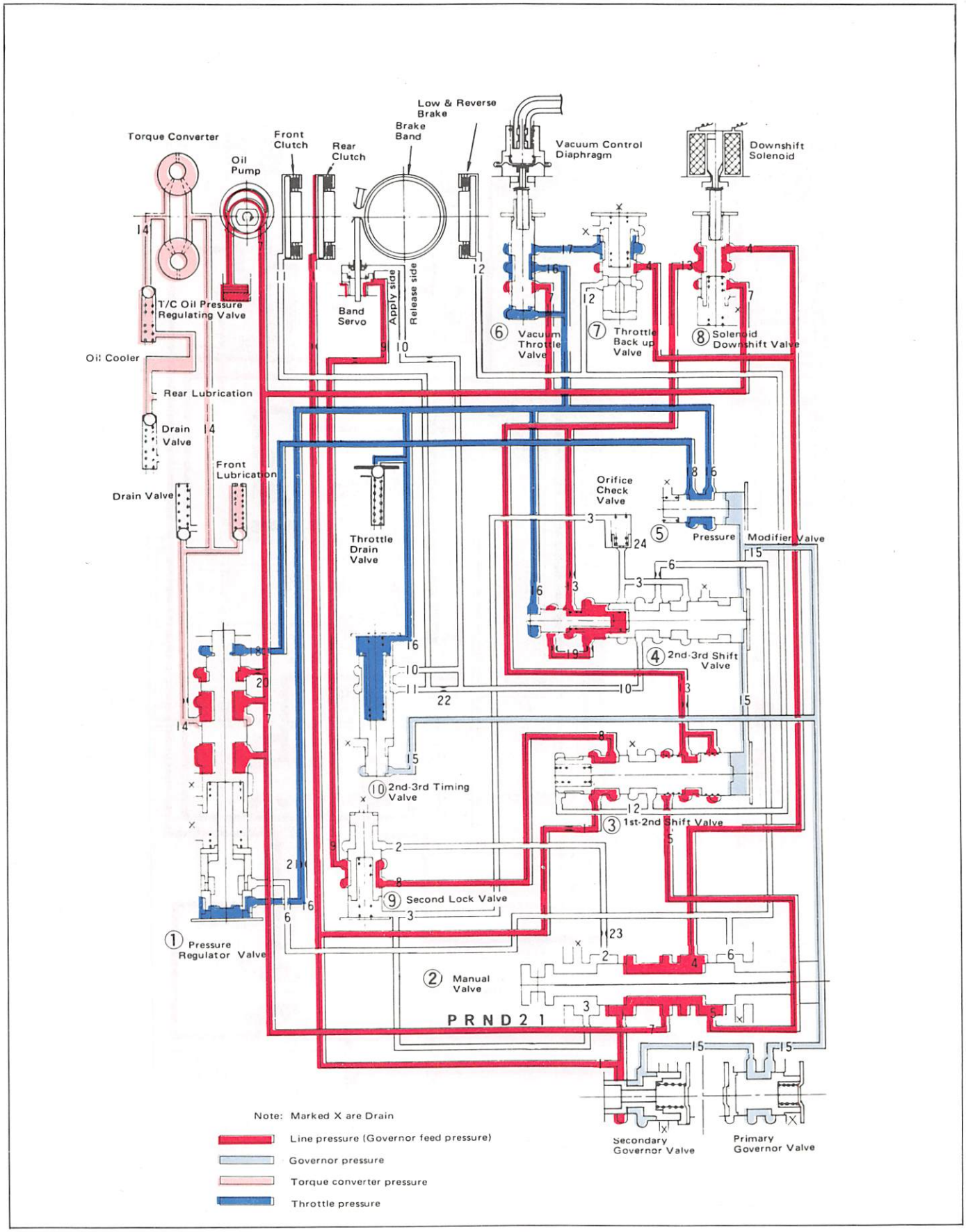


Fig. AT-46 Oil pressure circuit diagram — "1_2" range (2nd gear)

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REMOVAL AND INSTALLATION

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TRANSMISSION ASSEMBLY AT-33
REMOVAL AT-33
INSTALLATION AT-33
TRANSMISSION CONTROL LINKAGE AT-35
REMOVAL AND INSTALLATION AT-35
ADJUSTMENT AT-35

TRANSMISSION ASSEMBLY

When removing the automatic transmission from a vehicle, pay attention to the following points:

1. Before removing the transmission, inspect it with the aid of the "Trouble Shooting Chart," and remove only when considered to be absolutely necessary.
2. Remove the transmission with utmost care; and when mounting, observe the tightening torque tables. Do not exert excessive force.

REMOVAL

In removing automatic transmission from car, proceed as follows:

1. Disconnect battery ground cable from terminal.
2. Disengage torsion shaft from accelerator linkage.
3. On California models, disconnect catalyzer sensor harness and remove harness protector.
4. Jack up car and support its weight on safety stands. A hydraulic hoist or an open pit should be utilized, if available.

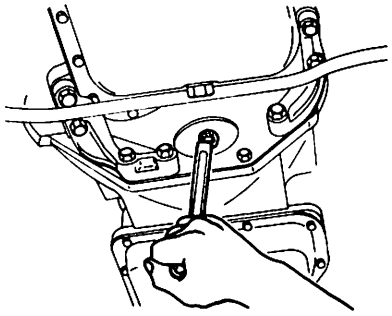
   Ensure that safety precautions are observed.
5. On California models, remove lower catalytic converter shelter, and disconnect front exhaust tube from catalytic converter after loosening exhaust bracket bolt.

   On other models, disconnect front exhaust tube from exhaust manifold and rear exhaust tube.
6. Remove propeller shaft.

Note: Plug up the opening in the rear extension to prevent oil from leaking out.

7. Disconnect selector range lever from manual shaft.
8. Disconnect wire connections at inhibitor switch.
9. Disconnect vacuum tube from vacuum diaphragm, and wire connections at downshift solenoid.
10. Disconnect speedometer cable from rear extension.
11. Disconnect oil charging pipe.
12. Disconnect oil cooler inlet and outlet tubes at transmission case.
13. Support engine by placing a jack under oil pan, with a wooden block between oil pan and jack.

    Support transmission by means of a transmission jack.
14. Detach engine rear plate rubber plug. Remove bolts securing torque converter to drive plate. See Figure AT-47.



AT287

Fig. AT-47 Removing torque converter attaching bolts

Note: Before removing torque converter, scribe match marks on two parts so that they may be replaced in their original positions.

15. Remove rear engine mount securing bolts and crossmember mounting bolts.
16. Remove starter motor.
17. Remove bolts securing transmission to engine. After removing these bolts, support engine and transmission with jack, and lower the jack gradually until transmission can be removed from under the car.

Note: Plug up any openings such as oil charging pipe, oil cooler tubes, etc.

INSTALLATION

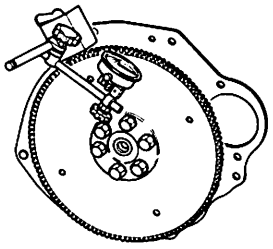
For installation of automatic transmission, reverse the order of removal. However, observe the following installation notes:

1. Drive plate runout

   Turn crankshaft one full turn and measure drive plate runout with indicating finger of a dial gauge resting against plate. See Figure AT-48.

   [Replace drive plate if in excess of 0.5 mm (0.020 in).]

- Maximum allowable runout:
  0.3 mm (0.012 in)
  Total indicator reading

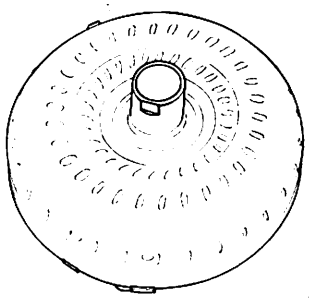


AT288

Fig. AT-48 Measuring drive plate runout

2. Installation of torque converter

   Line up notch in torque converter with that in oil pump. Be extremely careful not to cause undue stresses in parts while installing torque converter. See Figure AT-49.



AT116

Fig. AT-49 Torque converter aligning cut

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3. When connecting torque converter to transmission, measure distance "A" to ensure that they are correctly assembled. See Figure AT-50.

Distance "A":
More than 21.5 mm (0.846 in)

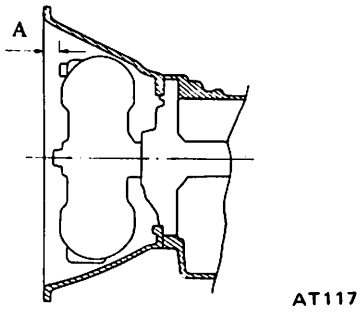


Fig. AT-50 Installing torque converter

4. Bolt converter to drive plate.

Note: Align chalk marks painted across both parts during disassembly process.

5. After converter is installed, rotate crankshaft several turns and check to be sure that transmission rotates freely without binding.
6. Pour recommended automatic transmission fluid up to correct level through oil charge pipe.
7. Connect selector range lever to manual shaft. Operation should be carried out with manual and selector levers in "N".
8. Connect inhibitor switch wires.

Notes:
a. **Refer to page AT-49 for Checking and Adjusting Inhibitor Switch.**
b. **Inspect and adjust switch as detailed above whenever it has to be removed for service.**

9. Check inhibitor switch for operation:

Starter should be brought into operation only when selector lever is in "P" and "N" positions (it should not be started when lever is in "D", "2", "1" and "R" positions).

Back-up lamp should also light when selector lever is placed in "R" position.

10. Check level of oil in transmission. For detailed procedure, see page AT-48 for Checking Oil Level.
11. Move selector lever through all positions to be sure that transmission operates correctly.

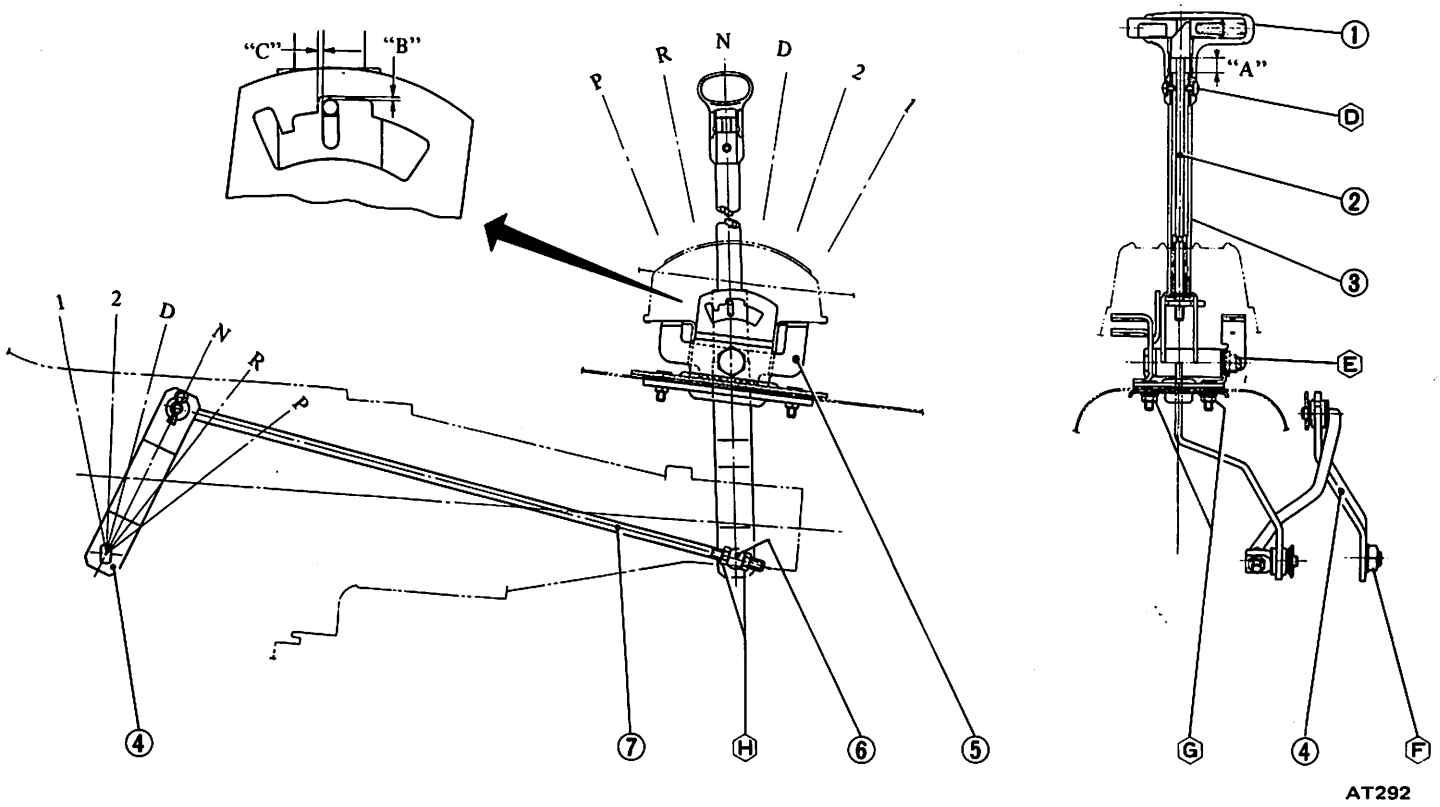
With hand brake engaged, rotate engine at idling speed. Without disturbing the above setting, move selector lever through "N" to "D", to "2", to "1" and to "R". A slight shock should be felt each time transmission is shifted.

Note: See page AT-49 for Checking Engine Idling.

12. Check to ensure that line pressure is correct. To do this, refer to page AT-52 for Testing Line Pressure.
13. Perform stall test as described in page AT-50 for Stall Test.

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TRANSMISSION CONTROL LINKAGE



1	Control lever knob	Tightening torque (T) of nuts and screws kg-m (ft-lb)	
2	Pusher		
3	Control lever assembly	Ⓓ	T : 0.07 to 0.13 (0.51 to 0.94)
4	Selector range lever	Ⓔ	T : 1.6 to 2.2 (12 to 16)
5	Control lever bracket	Ⓕ	T : 3 to 4 (22 to 29)
6	Joint trunnion	Ⓖ	T : 0.35 to 0.45 (2.5 to 3.3)
7	Selector rod	Ⓗ	T : 0.8 to 1.1 (5.8 to 8.0)

Fig. AT-51 Control linkage system

REMOVAL AND INSTALLATION

1. Disconnect control knob from control lever by removing two (2) screws.
2. Remove console box.
3. Remove selector rod, selector range lever and control lever assembly with bracket.

To install, reverse the order of removal.

ADJUSTMENT

The adjustment of linkage is as important as "Inspection of oil level" for the automatic transmission.

Therefore, great care should be exercised because defective adjustment will result in the breakdown of the transmission.

1. Prior to installing control knob, set the dimension "A" to 11 to 12 mm (0.433 to 0.472 in).
2. Install control knob on lever. At the same time, check the dimension "B" and adjust it to 0.1 to 1.1 mm (0.0039 to 0.4331 in) by turning pusher ②. See Figure AT-51.
3. Loosen adjust nuts (H). Set control lever ③ and selector lever ④ at "N" position, moreover, set the clearance "C" to 1 mm (0.039 in) by turning in or out adjusting nuts at trunnion ⑥ with connects selector rod ⑦.

After adjusting, make sure that control lever can be set in any position correctly and that selector lever operates properly without any binding.

If levers do not operate satisfactorily, readjust or replace parts as necessary.

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MAJOR REPAIR OPERATION

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SERVICE NOTICE FOR DISASSEMBLY AND ASSEMBLY

1. It is advisable that repair operations be carried out in a dust-proof room.
2. Due to the differences of the engine capacities, the specifications of component parts for each model's transmission may be different. They do, however, have common adjustment and repair procedures as well as cleaning and inspection procedures, outlined hereinafter.
3. During repair operations, refer to "Service Data and Specifications" section for the correct parts for each model.
4. Before removing any of subassemblies, thoroughly clean the outside of the transmission to prevent dirt from entering the mechanical parts.
5. Do not use a waste rag. Use a nylon or paper cloth.
6. After disassembling, wash all disassembled parts, and examine them to see if there are any worn, damaged or defective parts, and how they are affected. Refer to "Service Data" for the extent of damage that justifies replacement.
7. As a rule, packings, seals and similar parts once disassembled should be replaced with new ones.

TORQUE CONVERTER

The torque converter is a welded construction and can not be disassembled.

INSPECTION

1. Check torque converter for any sign of damage, bending, oil leak or deformation. If necessary, replace.
2. Remove rust from pilots and bosses completely.

If torque converter oil is fouled or contaminated due to burnt clutch, flush the torque converter as follows:

(1) Drain oil in torque converter.
(2) Pour non lead gasoline or kerosene into torque converter [approximately 0.5 liter (1 ⅛ U.S.pt., ⅞ Imp. pt.)].
(3) Blow air into torque converter and flush and drain out gasoline.
(4) Fill torque converter with torque converter oil [approximately 0.5 liter (1 ⅛ U.S.pt., ⅞ Imp.pt.)].
(5) Again blow air into torque converter, and drain torque converter oil.

TRANSMISSION

DISASSEMBLY

1. Drain oil from the end of rear extension. Mount transmission on Transmission Case Stand ST07870000 or ST07860000. Remove oil pan. See Figure AT-52.

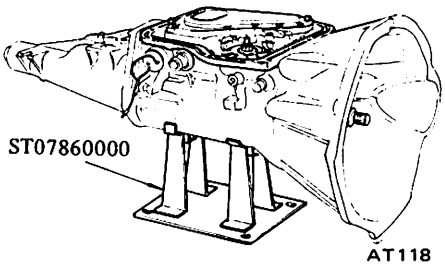


Fig. AT-52 Removing oil pan

2. Remove bolts securing converter housing to transmission case. Remove torque converter.
3. Remove speedometer pinion sleeve bolt. Withdraw pinion.
4. Remove downshift solenoid and vacuum diaphragm. Do not leave diaphragm rod at this stage of disassembly. Rod is assembled in top of vacuum diaphragm. See Figure AT-53.

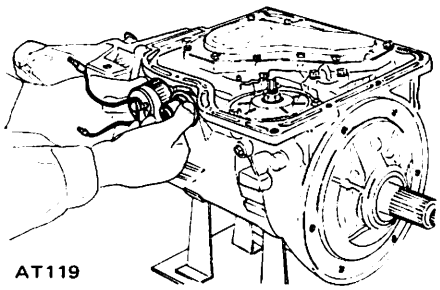


Fig. AT-53 Downshift solenoid and vacuum diaphragm

5. Remove bolts which hold valve body to transmission case. See Figure AT-54.

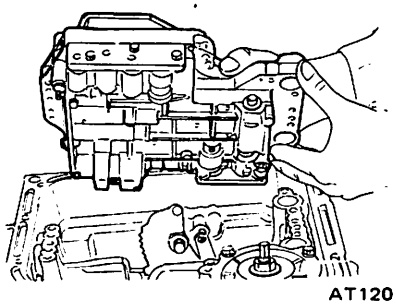


Fig. AT-54 Removing valve body

6. Loosen lock nut ② on piston stem ① as shown in Figure AT-55. Then tighten piston stem in order to prevent front clutch drum from falling when oil pump is withdrawn.

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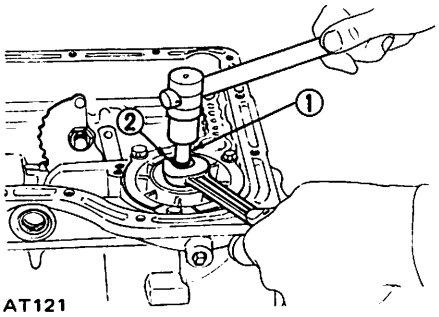


Fig. AT-55 Loosening band servo

7. Pull out input shaft.
8. Withdraw oil pump using Sliding Hammer ST25850000. Do not allow front clutch to come out of position and drop onto floor. See Figure AT-56.

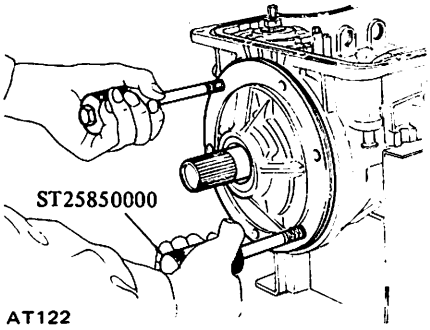


Fig. AT-56 Removing oil pump

9. Remove band strut. This can be done by loosening piston stem further. See Figure AT-57.

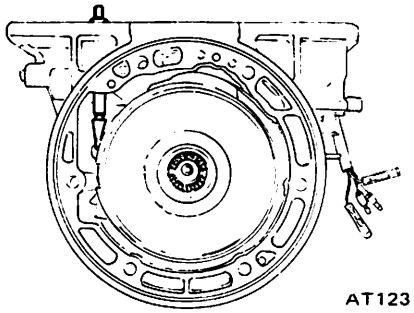


Fig. AT-57 Removing band strut

10. Remove brake band, front clutch and rear clutch as an assembled unit.
11. Remove connecting shell, rear clutch hub and front planetary carrier as a unit. See Figure AT-58.

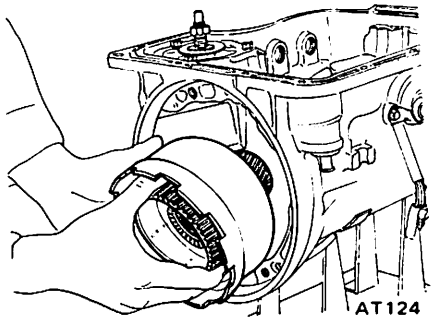


Fig. AT-58 Removing connecting shell

12. With the aid of Snap Ring Remover HT69860000, pry snap ring off output shaft. See Figure AT-59.

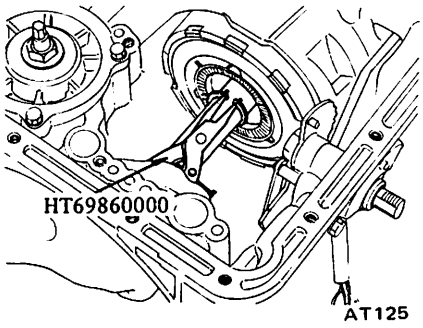


Fig. AT-59 Removing snap ring

13. Remove connecting drum and inner gear of rear planetary carrier as an assembly. See Figure AT-60.

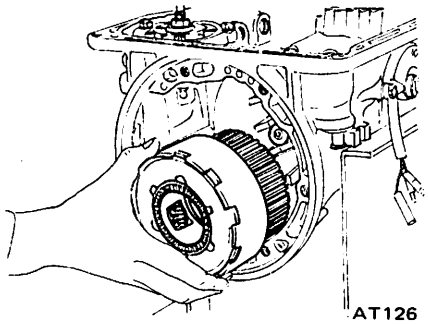


Fig. AT-60 Removing connecting drum

14. Remove snap rings and then remove rear planetary carrier, internal gear, connecting drum, one-way clutch outer race and one-way clutch in that order.
15. Remove rear extension by loosening securing bolts. See Figure AT-61.

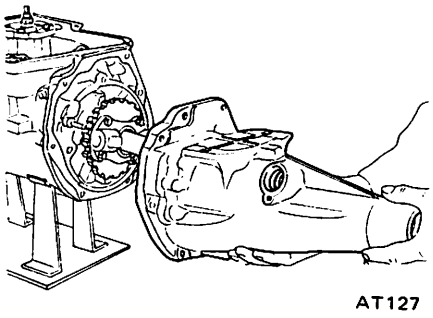


Fig. AT-61 Removing rear extension

16. Pull out output shaft; remove oil distributor ② together with governor valve ①. See Figure AT-62.

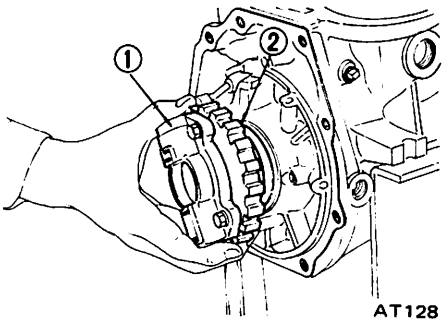


Fig. AT-62 Removing governor and oil distributor

17. Pry off snap ring using a pair of pliers. Remove retaining plate, drive plate, driven plate and dish plate in that order. See Figure AT-63.

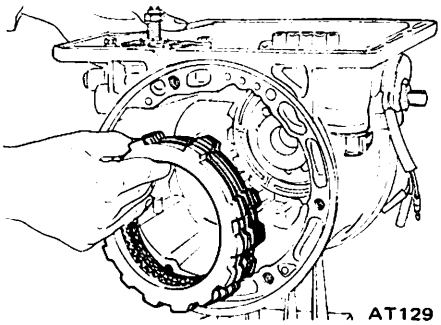


Fig. AT-63 Removing drive and driven plates

18. Reaching through back side of transmission case, remove hex-head slotted bolts as shown in Figure AT-64. To do this, use Hex-head Extension ST25570001 (ST25570000). One-way clutch inner race, thrust washer, piston return spring and thrust spring ring can now be removed.

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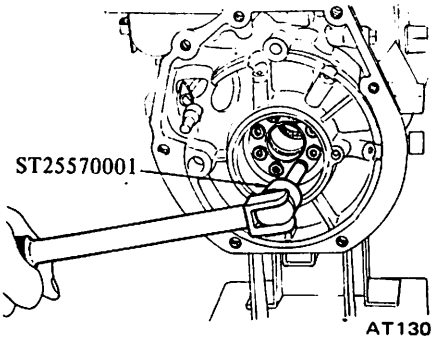


Fig. AT-64 Removing hex-head slotted bolt

19. Blow out low and reverse brake piston by directing a jet of air into hole in cylinder. See Figure AT-65.

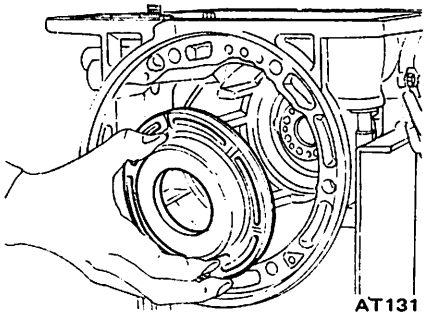


Fig. AT-65 Removing piston

20. Remove band servo loosening attaching bolts.

Note: If difficulty is encountered in removing retainer, direct a jet of air toward release side as shown in Figure AT-66.

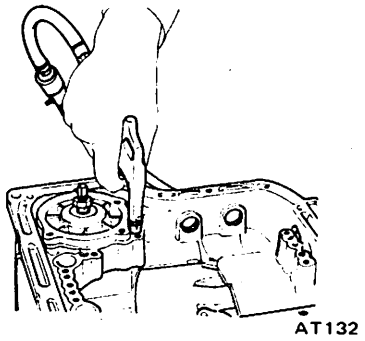


Fig. AT-66 Removing band servo

21. Pry snap rings ① from both ends of parking brake lever ② and remove the lever. Back off manual shaft lock nut ③ and remove manual plate ④ and parking rod ⑤. See Figure AT-67.

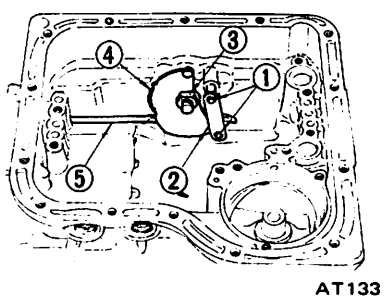


Fig. AT-67 Removing manual plate

22. Remove inhibitor switch and manual shaft by loosening two securing bolts.

INSPECTION

Torque converter housing, transmission case and rear extension

1. Check for damage or cracking; if necessary, replace.
2. Check for dents or score marks on mating surfaces. Repair as necessary.
3. Check for score marks or signs of burning on extension bushing; if necessary, replace.

Gaskets and O-ring

1. Always use new gaskets when the units are to be disassembled.
2. Check O-rings for burrs or cracking. If necessary, replace with new rings.

Oil distributor

1. Check for signs of wear on seal ring and ring groove, replacing with new ones if found worn beyond use.
2. Check that clearance between seal ring and ring groove is correct. If out of specification, replace whichever is worn beyond limits. Correct clearance is from 0.04 to 0.16 mm (0.0016 to 0.0063 in). See Figure AT-68.

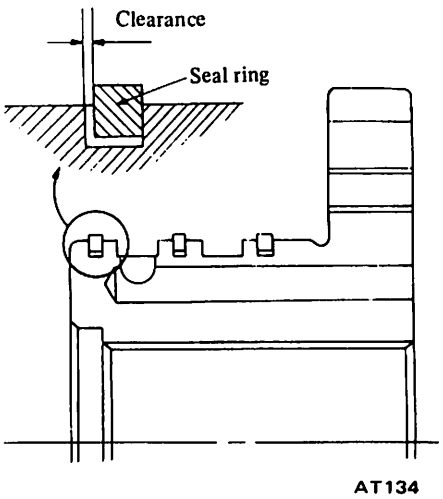


Fig. AT-68 Measuring seal ring to ring groove clearance

ASSEMBLY

Assembly is in reverse order of disassembly. However, observe the following assembly notes.

1. After installing piston of low and reverse brake, assemble thrust spring ring, return spring, thrust washer and one-way clutch inner race. Torque hex-head slotted bolt to 1.3 to 1.8 kg-m (9.4 to 13 ft-lb), using Hex-head Extension ST25570001 (ST25570000), Torque Wrench GG93010000 and Socket Extension ST25490000 (ST25512001). See Figure AT-69.

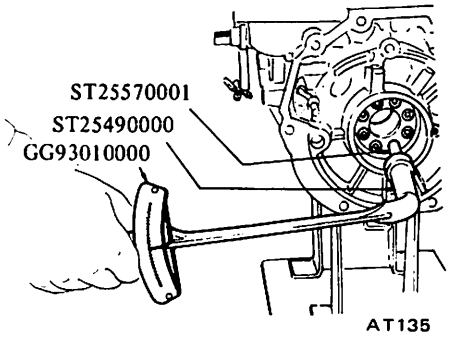


Fig. AT-69 Installing one-way clutch inner race

2. After low and reverse brake has been assembled, measure the clearance between snap ring ① and retaining plate ②. Select proper thickness of retaining plate to give correct ring to plate clearance. See Figure AT-70.

- Low and reverse brake clearance:
  0.8 to 1.05 mm
  (0.031 to 0.041 in)

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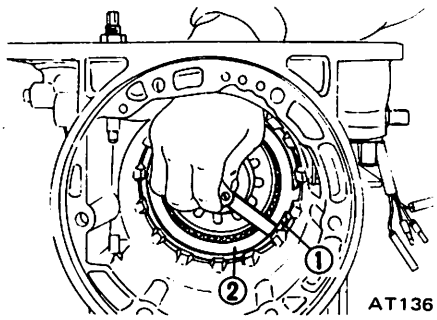


Fig. AT-70 Measuring ring to plate clearance

Available retaining plate

Thickness mm (in)
11.8 (0.465)
12.0 (0.472)
12.2 (0.480)
12.4 (0.488)
12.6 (0.496)
12.8 (0.504)

For inspection procedure for low and reverse brake, see page AT-42 for Assembly.

3. Install one-way clutch so that the arrow mark "→" is toward front of vehicle. It should be free to rotate only in clockwise direction. See Figure AT-71.

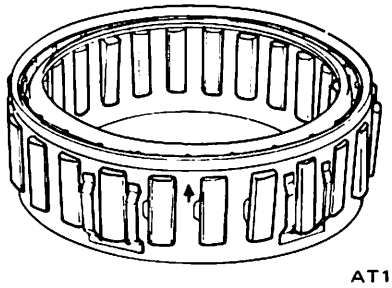


Fig. AT-71 One-way clutch

4. After installing rear extension, torque attaching bolts to 2.0 to 2.5 kg-m (14 to 18 ft-lb). Place manual lever in "P" range and check to be sure that rear output shaft is securely blocked.

5. Tighten servo retainer temporarily at this stage of assembly.

6. Place rear clutch assembly with needle bearing on front assembly.

7. Install rear clutch hub and front planetary carrier as shown in Figure AT-72.

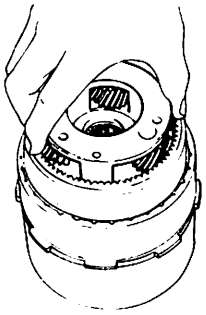


Fig. AT-72 Installing planetary carrier

8. Assemble connecting shell and other parts up to front clutch in reverse order of disassembly.

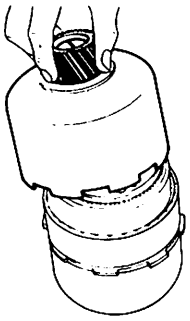
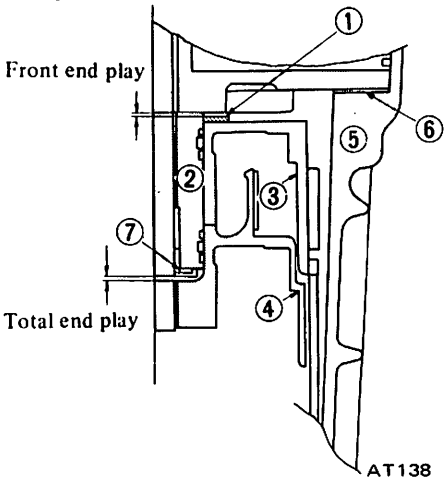


Fig. AT-73 Installing connecting shell

9. Adjust total end play and front end play as follows:



1 Front clutch thrust washer
2 Oil pump cover
3 Front clutch
4 Rear clutch
5 Transmission case
6 Oil pump gasket
7 Oil pump cover bearing race

Fig. AT-74 End play

(1) Measure the distance "A" and "C" by vernier calipers as shown in Figure AT-75.

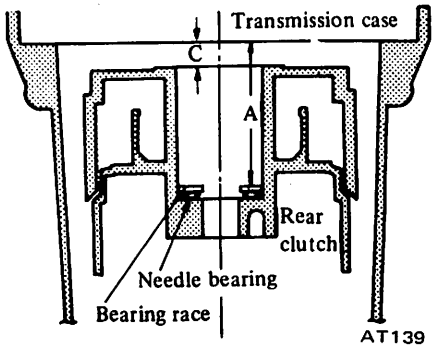


Fig. AT-75 Measuring the distance "A" and "C"

(2) Measure the distance "B" and "D" of oil pump cover as shown in Figure AT-76.

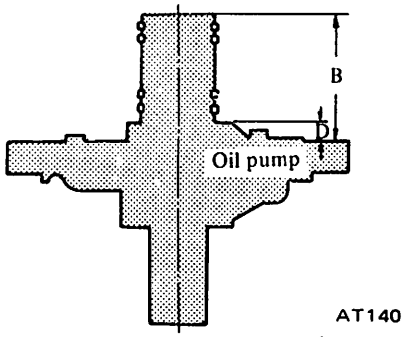


Fig. AT-76 Measuring the distance "B" and "D"

Adjustment of total end play

Select oil pump cover bearing race by calculating the following formula:

$$T_T = A - B + W$$

where,

T_T : Required thickness of oil pump cover bearing race mm (in)
A : Measured distance A mm (in)
B : Measured distance B mm (in)
W : Thickness of bearing race temporarily inserted mm (in)

Available oil pump cover bearing race

Thickness mm (in)
1.2 (0.047)
1.4 (0.055)
1.6 (0.063)
1.8 (0.071)
2.0 (0.079)
2.2 (0.087)

Specified total end play:
0.25 to 0.50 mm
(0.010 to 0.020 in)

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Adjustment of front end play

Select front clutch thrust washer by calculating the following formula:

$$T_F = C - D - 0.2 \text{ (mm)}$$

where,

T_F : Required thickness of front clutch thrust washer mm (in)
C : Measured distance C mm (in)
D : Measured distance D mm (in)

Available front clutch thrust washer

Thickness mm (in)
1.5 (0.059)
1.7 (0.067)
1.9 (0.075)
2.1 (0.083)
2.3 (0.091)
2.5 (0.098)
2.7 (0.106)

Specified front end play:
0.5 to 0.8 mm
(0.020 to 0.031 in)

Notes:

a. **Correct thickness of bearing race and thrust washer is always the one which is nearest the calculated one.**
b. **Installed thickness of oil pump gasket is 0.4 mm (0.016 in).**

10. Check to be sure that brake servo piston moves freely. For detailed procedure, refer to page AT-42 for Servo Piston. Use care to prevent piston from coming out of place during testing since servo retainer is not tightened at this point of assembly.

11. Make sure that brake band strut is correctly installed. Torque piston stem to 1.2 to 1.5 kg-m (8.7 to 11 ft-lb): Back off two full turns and secure with lock nut. Lock nut tightening torque is 1.5 to 4.0 kg-m (11 to 29 ft-lb).

12. After inhibitor switch is installed, check to be sure that it operates properly in each range. For detailed procedure, refer to page AT-49 for Checking and Adjusting Inhibitor Switch.

13. Check the length "L" between case end to rod end of vacuum throttle valve fully pushed in. Then select adequate diaphragm rod of corresponding measured length. See Figure AT-77.

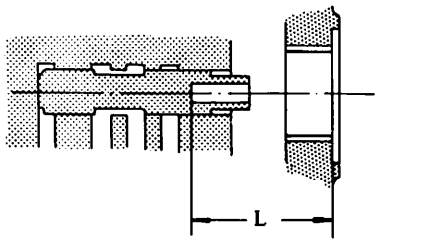


Fig. AT-77 Measuring the distance "L"

Available diaphragm rod

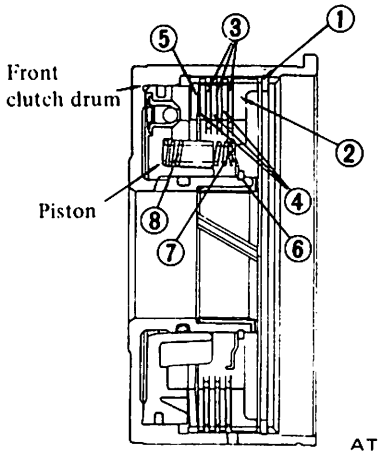
Distance measured "L" mm (in)	Diaphragm rod length mm (in)
Under 25.55 (1.006)	29.0 (1.142)
25.65 to 26.05 (1.010 to 1.026)	29.5 (1.161)
26.15 to 26.55 (1.030 to 1.045)	30.0 (1.181)
26.65 to 27.05 (1.049 to 1.065)	30.5 (1.201)
Over 27.15 (1.069)	31.0 (1.220)

COMPONENT PARTS

The transmission consists of many small parts that are quite alike in construction yet machined to very close tolerances. When disassembling parts, be sure to place them in order in part rack so they can be restored in the unit in their proper positions. It is also very important to perform functional test whenever it is designated.

FRONT CLUTCH

Disassembly



1 Snap ring
2 Retaining plate
3 Drive plate
4 Driven plate
5 Dished plate
6 Snap ring
7 Spring retainer
8 Coil spring

Fig. AT-78 Sectional view of front clutch

1. Pry off snap ring ① with a suitable screwdriver or a pair of pliers. Remove a retaining plate ②, drive plate ③, driven plate ④ and dished plate ⑤ in the order listed, as shown in Figure AT-78.

2. Compress clutch springs, using Clutch Spring Compressor ST25420001 (or ST25420000). Remove snap ring ⑥ from spring retainer, using Snap Ring Remover ST25320001. See Figure AT-79.

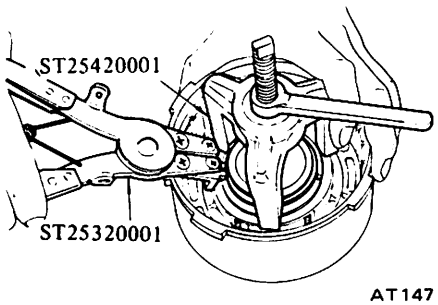


Fig. AT-79 Removing snap ring

Note: When Clutch Spring Compressor ST25420000 is to be used, cut the toe-tips of three legs by a grinding wheel. See Figure AT-80.

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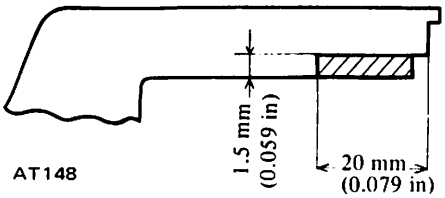


Fig. AT-80 Modifying coil spring compressor

3. Take out spring retainer ⑦ and spring ⑧. See Figure AT-78.
4. Blow out piston by directing a jet of air into hole in clutch drum. See Figure AT-81.

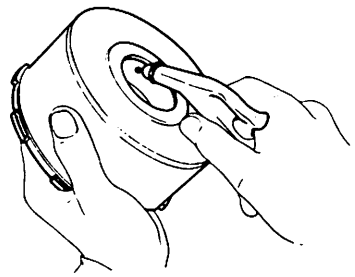


Fig. AT-81 Blowing out piston

Inspection

1. Check for signs of wear or damage to clutch drive plate facing. If found worn or damaged excessively, discard. See "Service Data" for limits.
2. Check for wear on snap ring and for weakened or broken coil spring.

If necessary, replace with new ones.

Spring retainer should also be inspected for warpage.

Assembly

1. Assembly is in reverse the order of disassembly. Dip all parts in clean automatic transmission fluid before installing.
2. Line up driven plates so that stripped arcs are properly aligned, paying particular attention to the location of oil holes in clutch drum. See Figure AT-82.

Note: The number of drive and driven plates varies with the type of vehicle. For detailed information, see "Service Data & Specifications."

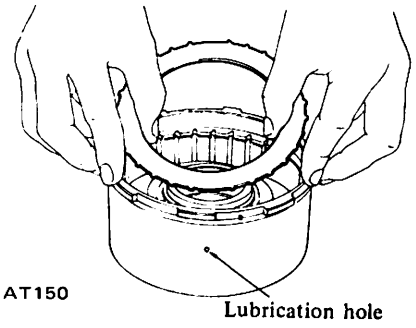


Fig. AT-82 Inserting clutch plate

3. After clutch is assembled, make sure that clearance between snap ring ① and retaining plate ② is held within specified limits. If necessary, try with other plates having different thickness until correct clearance is obtained. See Figure AT-83.

Specified clearance:
1.6 to 1.8 mm
(0.063 to 0.071 in)

Available retaining plate

Thickness mm (in)
10.6 (0.417)
10.8 (0.425)
11.0 (0.433)
11.2 (0.441)
11.4 (0.449)
11.6 (0.457)

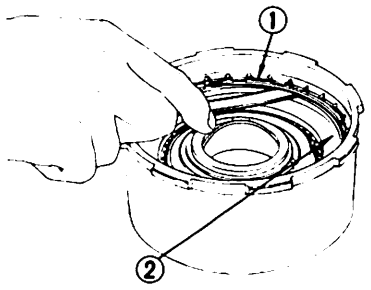


Fig. AT-83 Measuring ring to plate clearance

4. Testing front clutch

With front clutch assembled on oil pump cover, direct a jet of air into hole in clutch drum. See Figure AT-84.

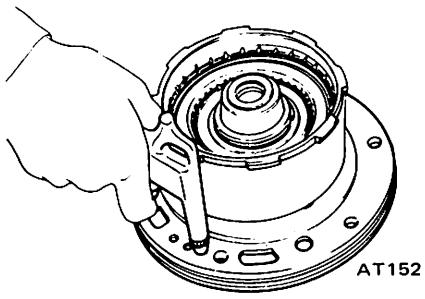
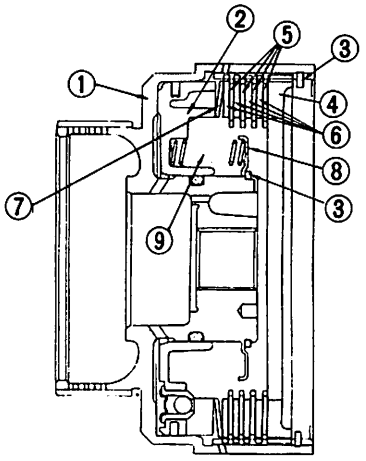


Fig. AT-84 Testing front clutch

REAR CLUTCH

Disassembly



1 Rear clutch drum
2 Front clutch piston
3 Snap ring
4 Retaining plate
5 Drive plate
6 Driven plate
7 Dished plate
8 Spring retainer
9 Coil spring

Fig. AT-85 Sectional view of rear clutch

1. Take out snap ring ③, retaining plate ④, drive plate ⑤, driven plate ⑥ and dished plate ⑦. Same technique can be applied as in disassembling front clutch. See Figure AT-85.
2. Remove snap ring from coil spring retainer. See Figure AT-86.

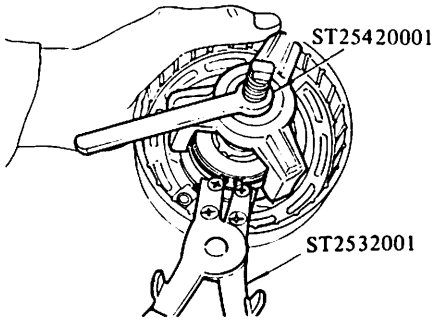


Fig. AT-86 Removing snap ring

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3. Blow out piston by directing a jet of air into hole in clutch drum. See Figure AT-87.

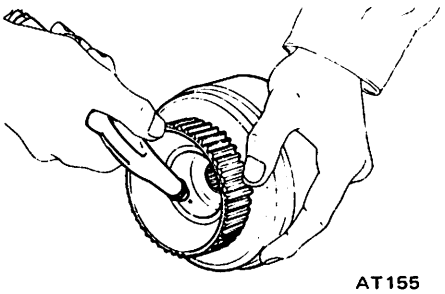


Fig. AT-87 Blowing out piston

Inspection

Refer to page AT-41 for Inspection of Front Clutch.

Assembly

Assemble in reverse the order of disassembly. Dip all parts in clean automatic transmission fluid before assembling. Note that the number of drive and driven plates varies with type of vehicle. For details, refer to "Service Data & Specifications".

1. After rear clutch is assembled, check to be sure that clearance between snap ring ① and retaining plate ② is held within prescribed tolerances. See Figure AT-88.

Specified clearance:
1.0 to 1.5 mm
(0.039 to 0.059 in)

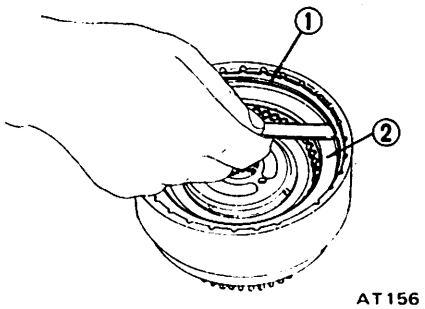


Fig. AT-88 Measuring ring to plate clearance

2. Testing rear clutch

Install rear clutch on oil pump cover.

Blow compressed air into oil hole to test for definite clutch operation as shown in Figure AT-89.

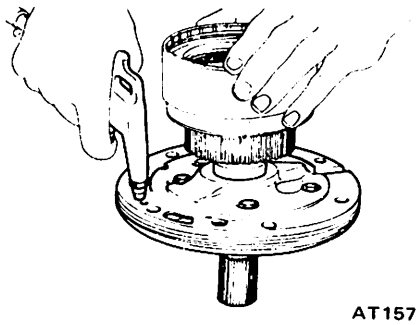


Fig. AT-89 Testing rear clutch

LOW & REVERSE BRAKE

Disassembly

1. Follow steps as described in page AT-36 for Transmission Disassembly.
2. Blow out piston by directing a jet of air into oil hole in clutch piston.

Inspection

1. Check drive plate facing for wear or damage; if necessary, replace. Refer to "Service Data & Specifications" for tolerances.
2. Test piston return spring for weakness. Discard if weakened beyond use.
3. Replace faulty parts with new ones.

Assembly

1. After low & reverse piston is installed, assemble thrust spring ring, return spring, thrust washer and one-way clutch inner race. Using Hex-head Extension ST25570001 (ST25570000), torque hex-head slotted bolt 1.3 to 1.8 kg-m (9.4 to 13 ft-lb).
2. Insert dished plate, driven plate, drive plate and retaining plate into transmission case in that order. Install snap ring to secure the installation.

Note: The number of drive and driven plates varies with type of vehicle. For detailed information, refer to "Service Data & Specifications".

3. Without disturbing the above setting, check to be sure that clearance between snap ring and retaining plate is within specified limits. If necessary, use other plates of different thickness until correct clearance is obtained.

Specified clearance:
0.80 to 1.05 mm
(0.031 to 0.041 in)

4. Blow compressed air into oil hole in low & reverse brake to test for definite brake operation as shown in Figure AT-90.

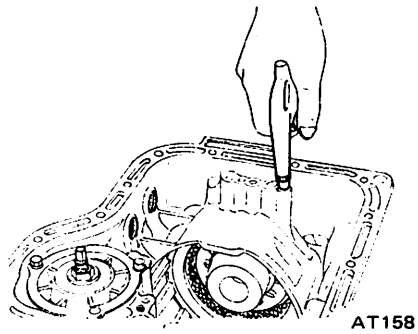


Fig. AT-90 Testing low & reverse brake

SERVO PISTON

Disassembly

1. Blow out piston by directing a jet of air into hole in release-side of piston.
2. Remove servo piston return spring.

Inspection

Check piston for wear, damage or other faults which might interfere with proper brake operation.

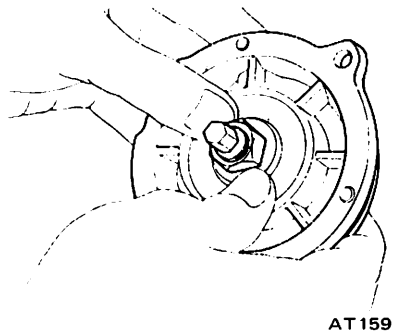
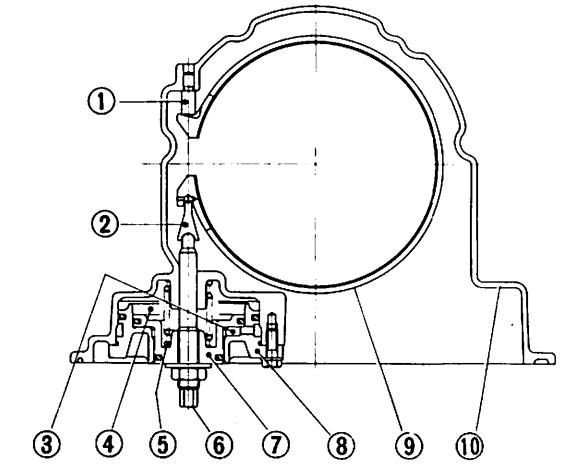


Fig. AT-91 Removing piston

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1 Anchor end pin
2 Band strut
3 Apply
4 Release
5 Return spring
6 Band servo piston stem
7 Band servo piston
8 Servo retainer
9 Brake band assembly
10 Transmission case

Fig. AT-92 Sectional view of servo piston

Assembly

1. Prior to assembly, dip all parts in clean automatic transmission fluid.

Reverse disassembly procedure to assemble brake.

2. Use extreme care to avoid damaging rubber ring when installing seal lace.
3. Blow compressed air from apply-side of piston to test for definite piston operation as shown in Figure AT-93.

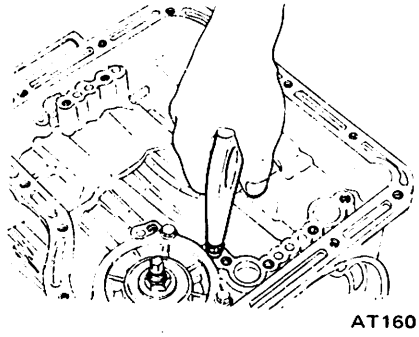


Fig. AT-93 Testing piston (Apply side)

4. With apply-side of piston plugged with thumb, blow compressed air into cylinder from release-side as shown in Figure AT-94. If retainer is raised a little, it is an indication that attaching bolts are loose, calling for retightening.

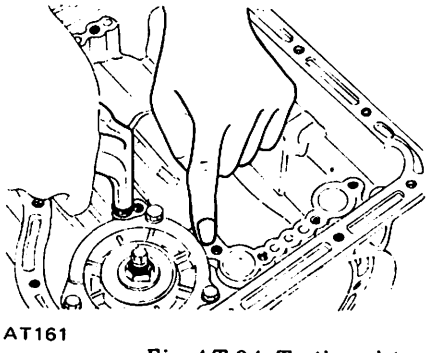
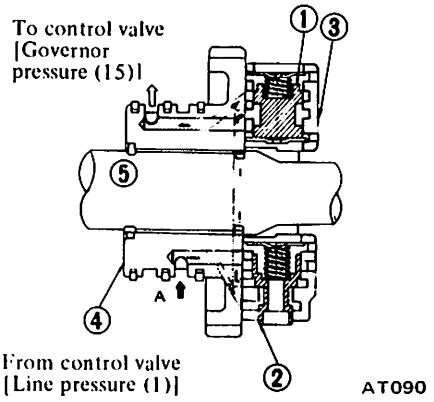


Fig. AT-94 Testing piston (Release side)

GOVERNOR

Disassembly

1. Separate governor from oil distributor by unscrewing attaching bolts.
2. To disassemble secondary governor, remove spring seat, spring and secondary governor valve from valve body in that order as shown in Figure AT-95.



1 Primary governor
2 Secondary governor
3 Governor valve body
4 Oil distributor
5 Output shaft

Fig. AT-95 Testing secondary governor

3. If primary governor is to be disassembled for any purpose, remove spring seat, primary governor valve, spring and spring seat.

Inspection

1. Check valve for faulty condition. Replace spring if found weakened beyond use. Faulty piston should also be replaced with a new one.
2. Examine to see if primary governor slides freely without binding.
3. To determine if secondary governor is in good condition, blow air under light pressure into hole at "A" and listen for noise like that of a model plane.

Assembly

Reverse disassembly procedure to assemble governor.

Note: Do not confuse primary governor with secondary governor. After installation, check that spring is not deflected.

OIL PUMP

Disassembly

1. Free pump cover from pump housing by removing attaching bolts.
2. Take out inner and outer gears from pump housing.

Inspection

1. Inspect for wear or damage to gear teeth. Replace rubber ring if found damaged beyond use.
2. Using a straight edge and feelers, measure pump and gear clearances as follows:

- Clearance between inner (or outer) gear and pump cover. See Figure AT-96.

Standard clearance:
0.02 to 0.04 mm
(0.0008 to 0.0016 in)

[Replace if over 0.08 mm (0.0031 in).]

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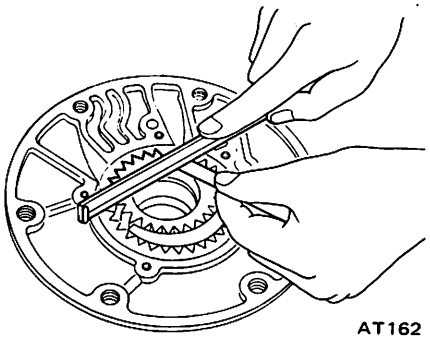


Fig. AT-96 Measuring clearance

- Clearance between seal ring and ring groove. See Figure AT-97.

  Standard clearance:
  0.04 to 0.16 mm
  (0.0016 to 0.0063 in)

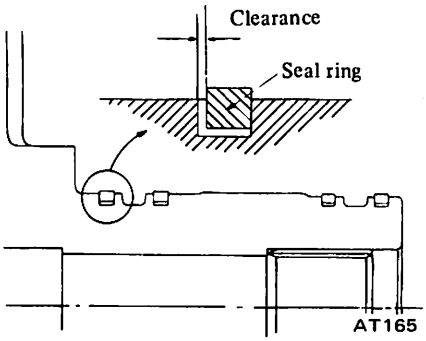


Fig. AT-97 Measuring clearance

Assembly

1. Set up pump housing with inner and outer pump gears on it.
2. Using Oil Pump Assembling Gauge ST25580000, install pump cover to pump housing as shown in Figure AT-98.

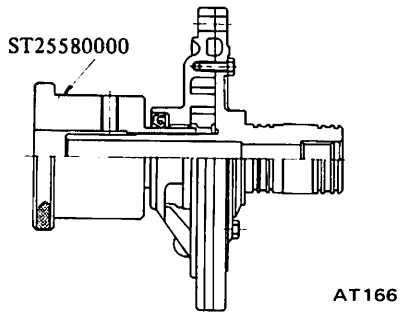


Fig. AT-98 Centering oil pump

3. Temporarily tighten pump securing bolts.
4. Set the runout of oil pump cover within 0.07 mm (0.0028 in) total indicator reading. See Figure AT-99.

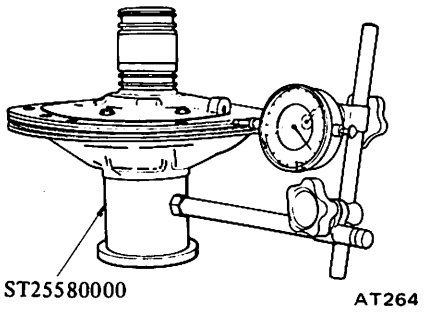


Fig. AT-99 Measuring runout

5. Tighten pump securing bolts to specified torque 0.6 to 0.8 kg-m (4.3 to 5.8 ft-lb).

Note: Be sure to align converter housing securing bolt holes.

6. Again, check the runout of oil pump cover.

Note: When former Oil Pump Assembling Gauge is to be used, make a screw hole in side of it.

PLANETARY CARRIER

The planetary carrier cannot be divided into its individual components.

If any part of component is faulty, replace the carrier as a unit.

Inspection

Check clearance between pinion washer and planetary carrier with a feeler. See Figure AT-100.

- Standard clearance:
  0.20 to 0.70 mm
  (0.008 to 0.028 in)

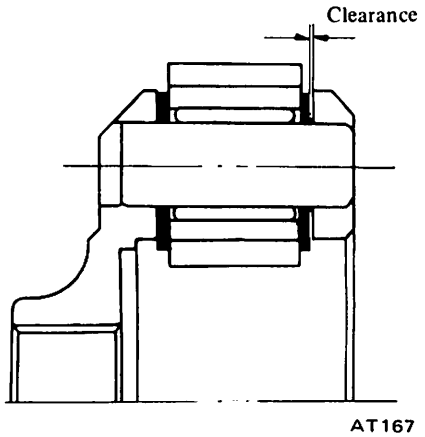


Fig. AT-100 Measuring pinion washer to carrier clearance

[Replace if over 0.80 mm (0.031 in).]

CONTROL VALVE

The control valve assembly consists of many precision parts and requires extreme care when it has to be removed and serviced. It is good practice to place parts in a part rack so that they can be reassembled in valve body in their proper positions. Added care should also be exercised to prevent springs and other small parts from being scattered and lost.

Before assembly, dip all parts in clean automatic transmission fluid and check to be certain that they are free of lint and other minute particles. If clutch or band is burnt or if oil becomes fouled, the control valve assembly should be disassembled and flushed.

Disassembly

1. Remove bolts and nuts which retain oil strainer. Bolts may be removed with a screwdriver, but it is recommended that Hexagon Wrench HT61000800 and Spinner Handle HT62350000 be used. See Figure AT-101.

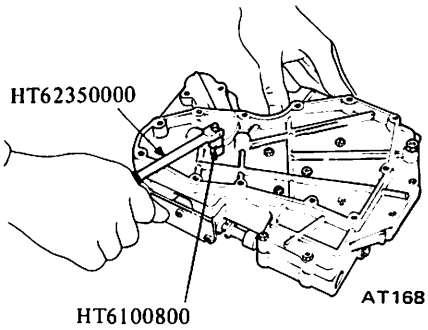


Fig. AT-101 Disassembling valve body

2. Remove attaching bolts. With bolts removed, lower valve body, separate plate, and upper valve body are free for removal. See Figure AT-102.

Note: Do not allow orifice check valve and valve spring in lower valve body to be scattered and lost when removing separate plate.

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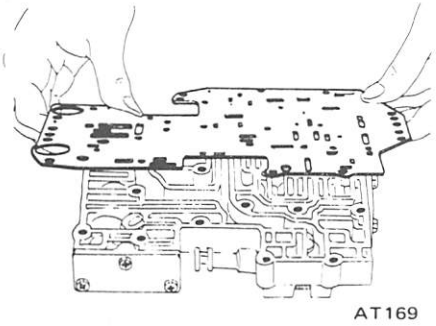


Fig. AT-102 Removing separate plate

3. Pull out manual valve as shown in Figure AT-103.
4. Remove side plate. Take out "1st-2nd" shift valve, "2nd-3rd" shift valve, pressure modifier valve and three valve springs. See Figure AT-104.

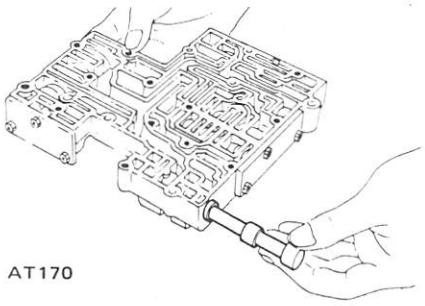


Fig. AT-103 Removing manual valve

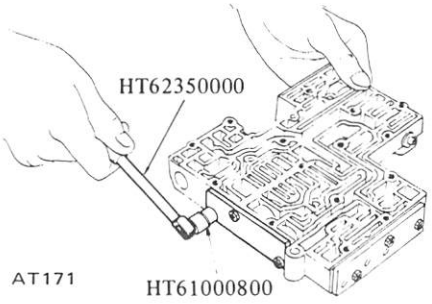


Fig. AT-104 Removing side plate

Note: Do not work it off with screwdrivers. To avoid damaging machine screws do not work it off with screwdriver.

5. Remove side plate; pull out pressure regulator valve, second lock valve, pressure regulator plug and two valve springs.
6. Remove side plate. With side plate removed, solenoid downshift valve; throttle back-up valve, vacuum throttle valve, "2nd-3rd" timing valve and three valve springs are free for removal.

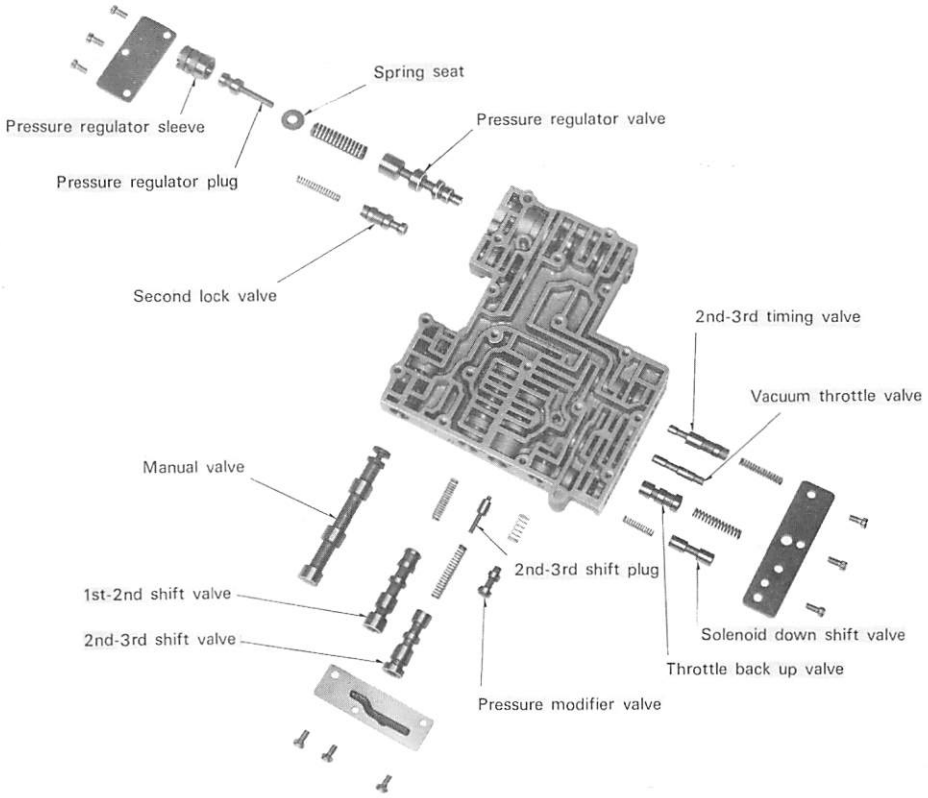


Fig. AT-105 Components parts of control valve

Inspection

1. Check valves for sign of burning and, if necessary, replace.
2. Check to be certain that oil strainer is in good condition. If found damaged in any manner, discard.
3. Test valve springs for weakened tension; if necessary replace.
4. Examine for any sign of damage or score marks on separate plate. If left unheeded, oil will bypass correct oil passages causing many types of abnormalities in the system.
5. Check oil passages in valve body for sign of damage and other conditions which might interfere with proper valve operation.
6. Check bolts for stripped threads. Replace as required.

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Valve spring chart

Valve spring	Wire dia. mm (in)	Mean coil dia. mm (in)	No. of active coil	Free length mm (in)	Installed	
					Length mm (in)	Load kg (lb)
Manual detent	1.3 (0.0512)	6.0 (0.2362)	15.0	32.4 (1.276)	26.5 (1.043)	5.5 (12)
Pressure regulator	1.2 (0.0472)	10.5 (0.4134)	13.0	43.0 (1.693)	23.5 (0.925)	2.8 (6.2)
Pressure modifier	0.4 (0.0157)	8.0 (0.3150)	5.0	18.5 (0.728)	9.0 (0.3543)	0.1 (0.2)
1st - 2nd shift	0.6 (0.0236)	6.0 (0.2362)	16.0	32.0 (1.260)	16.0 (0.630)	0.625 (1.4)
2nd - 3rd shift	0.7 (0.0276)	6.2 (0.2441)	18.0	41.0 (1.614)	17.0 (0.669)	1.40 (3.1)
2nd - 3rd timing	0.7 (0.0276)	5.5 (0.2165)	15.0	32.5 (1.280)	27.0 (1.063)	0.55 (1.2)
Throttle back-up	0.8 (0.0315)	6.5 (0.2559)	14.0	36.0 (1.417)	18.8 (0.740)	1.92 (4.2)
Solenoid downshift	0.55 (0.0217)	5.0 (0.1969)	12.0	22.0 (0.866)	12.5 (0.492)	0.60 (1.3)
Second lock	0.55 (0.0217)	5.0 (0.1969)	16.0	33.5 (1.319)	21.0 (0.827)	0.60 (1.3)
Throttle relief	0.9 (0.0354)	5.6 (0.2205)	14.0	26.8 (1.055)	19.0 (0.748)	2.19 (4.8)
Orifice check	0.23 (0.0091)	4.77 (0.1878)	12.0	15.5 (0.610)	11.5 (0.453)	0.01 (0.02)
Primary governor	0.45 (0.0177)	8.3 (0.3268)	5.0	21.8 (0.858)	7.5 (0.2953)	0.215 (0.5)
Secondary governor	0.7 (0.0276)	8.5 (0.3346)	5.5	25.1 (0.988)	10.5 (0.413)	1.10 (2.4)

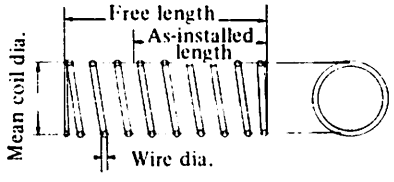


Fig. AT-106 Valve spring

Assembly

Assemble in reverse order of disassembly. However, observe the following assembly notes. Refer to "Valve Spring Chart" and illustration in assembling valve springs. Dip all parts in clean automatic transmission fluid before assembly. Tighten parts to specifications when designated.

1. Slide valve into valve body and be particularly careful that they are not forced in any way.
2. Install side plates using Torque Driver ST25160000 and Hexagon Wrench HT61000800. See Figure AT-107.

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Tightening torque:
0.25 to 0.35 kg-m
(1.9 to 2.5 ft-lb)

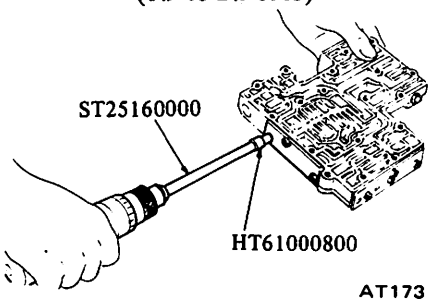


Fig. AT-107 Installing side plate

3. Install orifice check valve, valve spring, throttle relief valve spring and steel ball in valve body.

Note: Install check valve and relief spring so that they are properly positioned in valve body.

4. Install upper and lower valves. See Figure AT-108.

Tightening torque:
0.25 to 0.35 kg-m
(1.8 to 2.5 ft-lb)

Reamer bolt tightening torque:
0.5 to 0.7 kg-m
(3.6 to 5.1 ft-lb)

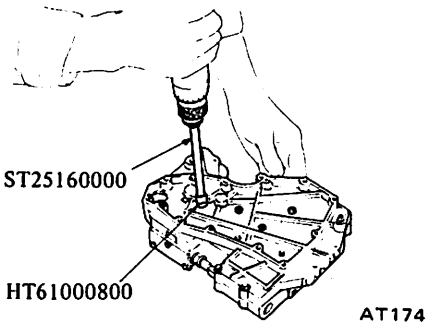


Fig. AT-108 Installing valve body

5. Install oil strainer.

Tightening torque:
0.25 to 0.35 kg-m
(1.8 to 2.5 ft-lb)

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TROUBLE DIAGNOSIS AND ADJUSTMENT

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Since most automatic transmission troubles can be repaired by simple adjustment, do not disassemble immediately.

Firstly inspect and adjust the automatic transmission in place utilizing the "Trouble Shooting Chart".

If the trouble can not be solved by this procedure, remove and disassemble the automatic transmission. It is advisable to check, overhaul and repair each part in the order listed in the "Trouble Shooting Chart".

1. In the "Trouble Shooting Chart" the diagnosis items are arranged according to difficulty from easy to difficult, therefore please follow these items. The transmission should not be removed, unless necessary.
2. Tests and adjustments should be made on the basis of standard values and the data should be recorded.

INSPECTION AND ADJUSTMENT BEFORE TROUBLE DIAGNOSIS

TESTING INSTRUMENT FOR INSPECTION

1. Engine tachometer
2. Vacuum gauge
3. Oil pressure gauge

It is convenient to install these instruments in a way that allows measurements to be made from the driver's seat.

CHECKING OIL LEVEL

In checking the automatic transmission the oil level and the condition of oil around the oil level gauge should be examined. This is an easy and effective trouble shooting procedure since some changes in oil condition are often linked with developed troubles.

For instance:

Lack of oil causes faulty operation by making the clutches and brakes slip, resulting in severe wear.

This is because the oil pump sucks air causing oil foaming, thus rapidly deteriorating the oil quality and producing sludge and varnish.

Excessive oil is also bad because of oil foaming caused by the gears stirring up the oil. During high speed driving excessive oil in the transmission often blows out from the breather.

Measuring oil level

To check the fluid level, start the engine and run it until normal operating temperatures [oil temperature: 50 to 80°C (122 to 176°F). Approximately ten-minute of operation will raise the temperature to this range.] and engine idling conditions are stabilized. Then, apply the brakes and move the transmission shift lever through all drive positions and place it in park "P" position. In this inspection, the car must be placed on a level surface.

The amount of the oil varies with the temperature. As a rule the oil level must be measured after its temperature becomes sufficiently high.

1. Fill the oil to the line "H". The difference of capacities between both "H" and "L" is approximately 0.4 liter (⅛ U.S.pt., ¾ Imp.pt.) and, therefore, do not to fill beyond the line "H".
2. When topping-up and changing oil, care should be taken to prevent mixing the oil with dust and water.

Inspecting oil condition

The condition of oil sticking to the level gauge indicates whether to overhaul and repair the transmission or look for the faulty part.

If the oil has deteriorated to a varnish-like quality, it causes the control valve to stick. Blackened oil indicates a burned clutch, brake band, etc.

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In these cases, the transmission must be replaced.

Notes:

a. **In checking oil level, use special paper cloth to handle the level gauge and be careful not to let the scraps of paper and cloth stick to the gauge.**
b. **Insert the gauge fully and take it out quickly before splashing oil adheres to the gauge. Then observe the level.**
c. **Use automatic transmission fluid having "DEXRON" identifications only in the 3N71B automatic transmission.**
d. **Pay attention because the oil to be used differs from that used in the Nissan Full Automatic Transmission 3N71A. Never mix the oils.**

INSPECTION AND REPAIR OF OIL LEAKAGE

When oil leakage takes place, the portion near the leakage is covered with oil, presenting difficulty in detecting the spot. Therefore, the places where oil seals and gaskets are equipped are enumerated below:

1. Converter housing
- Rubber ring of oil pump housing.
- Oil seal of oil pump housing.
- Oil seal of engine crankshaft.
- Bolts of converter housing to case.

2. Transmission and rear extension
- Junction of transmission and rear extension.
- Oil cooler tube connectors.
- Oil pan.
- Oil-pressure inspection holes (Refer to Figure AT-112.).
- Mounting portion of vacuum diaphragm and downshift solenoid.
- Breather and oil charging pipe.
- Speedometer pinion sleeve.
- Oil seal of rear extension.

To exactly locate the place of oil leakage, proceed as follows:

- Place the vehicle in a pit, and by sampling the leaked oil, determine if it is the torque converter oil. The torque converter oil has a color like red wine, so it is easily distinguished from engine oil or gear oil.
- Wipe off the leaking oil and dust and detect the spot of oil leakage. Use nonflammable organic solvent such as carbon tetrachloride for wiping.
- Raise the oil temperature by operating the engine and shift the lever to "D" to increase the oil pressure. The spot of oil leakage will then be found more easily.

Note: **As oil leakage from the breather does not take place except when running at high speed, it is impossible to locate this leakage with vehicle stationary.**

CHECKING ENGINE IDLING REVOLUTION

The engine idling revolution should be properly adjusted.

If the engine revolution is too low, the engine does not operate smoothly, and if too high, a strong shock or creep develops when changing over from "N" to "D" or "R".

CHECKING AND ADJUSTING KICKDOWN SWITCH AND DOWNSHIFT SOLENOID

When the kickdown operation is not made properly or the speed changing point is too high, check the kickdown switch, downshift solenoid, and wiring between them. When the ignition key is positioned at the 1st stage and the accelerator pedal is depressed deeply, the switch contact should be closed and the solenoid should click. If it does not click, it indicates a defect. Then check each part with the testing instruments. See Figure AT-109.

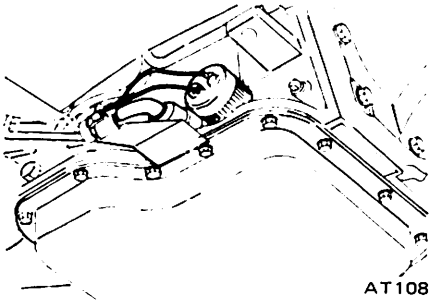


Fig. AT-109 Downshift solenoid

Note: **Watch for oil leakage from transmission case.**

INSPECTION AND ADJUSTMENT OF MANUAL LINKAGE

The adjustment of manual linkage is equally important as "Inspection of Oil Level" for the automatic transmission. Therefore, great care should be exercised because incorrect adjustment will result in the breakdown of the transmission.

Inspection

Pull the selector lever toward you and turn it as far as "P" to "1" range, where clicks will be felt by the hand. This is the detent of manual valve in the valve body, and indicates the correct position of the lever.

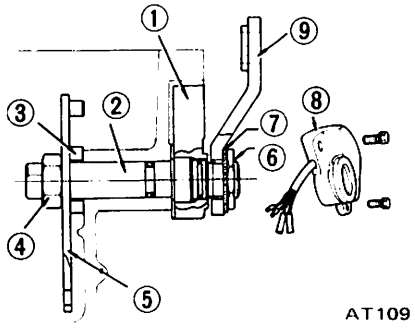
Inspect whether the pointer of selector dial corresponds to this point, and also whether the lever comes in alignment with the stepping of position plate when it is released.

Adjustment

This procedure can be accomplished by referring to page AT-35 for Removal and Installation.

CHECKING AND ADJUSTING INHIBITOR SWITCH

The inhibitor switch lights the reverse lamp in the range "R" of the transmission operation and also rotates the starter motor in the ranges "N" and "P".



1 Inhibitor switch
2 Manual shaft
3 Washer
4 Nut
5 Manual plate
6 Nut
7 Washer
8 Inhibitor switch
9 Range select lever

Fig. AT-110 Construction of inhibitor switch

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Check whether the reverse lamp and the starter motor operate normally in these ranges. If there is any trouble, first check the linkage. If no faulty is found in thy linkage, check the inhibitor switch.

Separate the manual lever from the remote control selector rod and turn the range select lever to "N".

Note: In the position "N" the slot of the manual shaft is vertical.

Using the tester, check the two black-yellow (BY) wires from the inhibitor switch in the ranges "N" and "P" and the two red-black (RB) wires in the range "R" for continuity. Turn range select lever in both directions from each lever set position and check each continuity range. It is normal if the electricity is on while the lever is within an angle of about 3° on both sides from each lever set line. However, if its continuity range is obviously unequal on both sides, adjustment is required.

If any malfunction is found, unscrew the fastening nut of the range selector lever and two fastening bolts of the switch body and then remove the machine screw under the switch body. Adjust the manual shaft correctly to the position "N" by means of the selector lever. (When the slot of the shaft becomes vertical, the detent works to position the shaft correctly with a clicking sound.)

Move the switch slightly aside so that the screw hole will be aligned with the pin hole of the internal rotor combined with the manual shaft and check their alignment by inserting a 1.5 mm (0.0591 in) diameter pin into the holes. If the alignment is correct, fasten the switch body with the bolts, pull out the pin, tighten up the screw in the hole, and fasten the selector lever as before. Check the continuity again with the tester. If the malfunction still remains, replace the inhibitor switch.

STALL TEST

The purpose of this test is to check the transmission and engine for trouble by measuring the maximum numbers of revolutions of the engine while vehicle is held in a stalled condition. The carburetor is in full throttle operation with the selector lever in ranges "D", "2" and "1" respectively. Compare the measured results with the standard values.

Components to be tested and test items

1. Clutches, brake and band in transmission for slipping
2. Torque converter for proper functioning
3. Engine for overall properly

STALL TEST PROCEDURES

Before testing, check the engine oil and torque converter oil; warm up the engine cooling water to suitable temperature by running at 1,200 rpm with the selector lever in the range "P" for several minutes. Warm up the torque converter oil to suitable temperature [60 to 100°C (140 to 212°F)].

1. Mount the engine tachometer at a location that allows good visibility from the driver's seat and put a mark on specified revolutions on the meter.
2. Secure the front and rear wheels with chocks and apply the hand brake. Be sure to depress the brake pedal firmly with the left foot before depressing the accelerator pedal.
3. Throw the selector lever into the range "D".
4. Slowly depress the accelerator pedal until the throttle valve is fully opened. Quickly read and record the engine revolution when the engine begins to rotate steadily and then release the accelerator pedal.
5. Shift the selector lever to "N" and operate the engine at approximately 1,200 rpm for more than one minute to cool down the torque converter oil and coolant.
6. Make similar stall tests in ranges "2", "1" and "R".

Note: The stall test operation as specified in item (4) should be made within five seconds. If it takes too long, the oil deteriorates and the clutches. brake and band are adversely affected. Sufficient cooling time should be given between each test for the four ranges "D", "2", "1" and "R".

JUDGEMENT

1. High stall revolution more than standard revolution

If the engine revolution in stall condition is higher than the standard values, it indicates that one or more clutches in the transmission are slipping and, therefore, no further test is required.

For the following abnormalities, the respective causes are presumed.

- High rpm in all ranges . . . Low line pressure
- High rpm in "D", "2" and "1" and normal rpm in "R" . . . Rear clutch slipping
- High rpm in "D" and "2" and normal rpm in "1" . . . One-way clutch slipping
- High rpm in "R" only . . . Front clutch or low and reverse brake slipping

To determine which is slipping, front clutch or low and reverse brake, a road test is needed.

If, while coasting, after starting with the lever in "1" range, engine braking does not work properly, the low and reverse brake is slipping. Otherwise, the front clutch is slipping.

Slipping of the band brake is difficult to ascertain. However, if it occurs with the lever in "2" range, engine revolution increases up to the same level as in "1st" range. It is impossible to check it in the stall test.

2. Standard stall revolution

If the engine revolution in stall condition is within the standard values, the control elements are normally operating in the ranges "D", "2", "1" and "R".

Also, the engine and one-way clutch of the torque converter are normal in performance and operation.

The one-way clutch of the torque converter, however, sometimes sticks. This is determined in the road test.

3. Lower stall revolution than standard revolution

If the engine revolution in stall condition is lower than the standard

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values, it indicates that the engine is in abnormal condition or the torque converter's one-way clutch is slipping.

4. Others

(1) If the accelerating performance is poor until vehicle speed of approximately 50 km/h (30 MPH) is attained and then normal beyond that speed, it can be judged that the torque converter's one-way clutch is slipping.

(2) If the torque converter's one-way clutch sticks, vehicle speed can not exceed approximately 80 km/h (50 MPH) in the road test. In such a case, the torque converter oil temperature rises abnormally and so special care is required.

(3) If the transmission does not operate properly at all vehicle speeds, it indicates poor engine performance.

ROAD TEST

An accurate knowledge of the automatic transmission is required for an exact diagnosis.

It is recommended that a diagnosis guide chart with the standard vehicle speeds for each stage of the up- and down-shiftings be prepared. Measured vehicle speeds are to be filled in the adjoining column after each testing.

Also it is advisable to mount a stopper for positioning the throttle opening.

CAR SPEED AT GEAR SHIFT

Throttle opening (−mmHg)	Gearshift	Car speed** km/h (MPH)	Propeller shaft rpm
Kickdown (0)	$D_1 \rightarrow D_2$	53 to 68 (33 to 42)	1,840 to 2,340
	$D_2 \rightarrow D_3$	97 to 111 (60 to 69)	3,340 to 3,840
	$D_3 \rightarrow D_2$	100 to 86 (62 to 53)	3,460 to 2,960
	$D_2 \rightarrow D_1$	52 to 37 (32 to 23)	1,790 to 1,290
Half throttle (200)	$D_2 \rightarrow D_2$	10 to 24 (6 to 15)	330 to 830
	$D_2 \rightarrow D_3$	50 to 64 (31 to 40)	1,720 to 2,220
	$D_3 \rightarrow D_2$ or $D_3 \rightarrow D_1$	39 to 25 (24 to 16)	1,350 to 850
	$D_2 \rightarrow D_1$	20 (12)	700 Max.
Full throttle (0)	$1_2 \rightarrow 1_1$*	54 to 39 (34 to 24)	1,860 to 1,360
Minimum throttle (450)	$1_2 \rightarrow 1_1$*	54 to 39 (34 to 24)	1,860 to 1,360

*: Reduce the speed by shifting to "1" range from "D" range (output shaft 2,000 rpm).

Note: Car speed can be calculated by the following formula;

$$V = \frac{2 \times \pi \times r \times N_p \times 60}{R_f \times 1{,}000}$$

where, V = Car speed (km/h)
N_p = Propeller shaft revolution (rpm)
R_f = Final gear ratio
r = Tire effective radius (m)
π = The ratio of circumference of a circle to its diameter: 3.14

**: R_f = 3.700
r = 0.285 m [165-13/6.45-13 or 165 SR-13]

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CHECKING SPEED CHANGING CONDITION

The driver's feeling during gear changes should also be checked attentively.

1. A sharp shock or unsmoothness is felt during a gear change.
2. A gear change is made with a long and dragging feeling.

These indicate that the throttle pressure is too low or some valve connected to the throttle is faulty.

CHECKING ITEMS DURING SPEED CHANGE

1. In "D" range, gear changes, $D_1 \longrightarrow D_2 \longrightarrow D_3$ are effected. In "R" range, the speed does not increase.
2. The kickdown operates properly.
3. By moving the lever from "D" to "1", gear changes $D_3 \longrightarrow 2(1_2) \longrightarrow 1_1$ are effected. In the ranges "1_2" and "1_1", the engine braking works properly.
4. In "1", the speed does not increase.
5. Should be quickly fixed at "2" range.
6. In "P", vehicle can be parked properly.

If any malfunction occurs in second gear during the road test, that is, if vehicle shakes, drags or slings while shifting up from "D_1", directly to "D_3" or in shifting up from "D_1" to "D_2", the brake band should be adjusted. If these troubles remain after the brake band is adjusted, check the servo piston seal for oil leakage.

SHIFT SCHEDULE

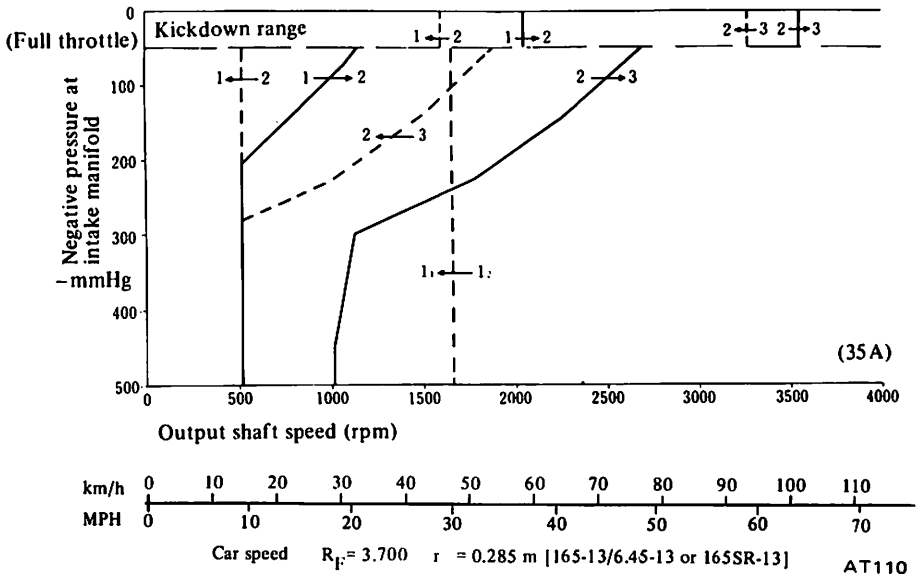


Fig. AT-111 Shift schedule

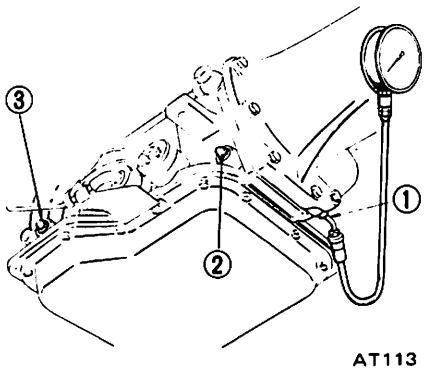
LINE PRESSURE TEST

When any slipping occurs in clutch or brake, or the feeling during a speed change is not correct, the line pressure must be checked.

Measuring line pressure is done by a pressure gauge attached to two pressure measuring holes after removing blind plugs located at transmission case. See Figure AT-112.

The line pressure measurement is begun at idling and taken step by step by enlarging the throttle opening.

1. A sharp shock in up-shifting or too high changing speeds are caused mostly by too high throttle pressure.
2. Slipping or incapability of operation is mostly due to oil pressure leakage within the gear trains or spool valve.



1 Line pressure
2 Governor feed
3 Servo release pressure

Fig. AT-112 Measuring line pressure

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LINE PRESSURE (GOVERNOR FEED PRESSURE)

Range	Throttle opening Unit: –mmHg		At cut back point [under approximately 15 km/h (9 MPH)] Unit: kg/cm² (psi)	After cut back [over approximately 35 km/h (22 MPH)] Unit: kg/cm² (psi)
"D"	Full throttle	0	9.4 to 11.0 (134 to 156)	5.5 to 6.5 (78 to 92)
	Minimum throttle	450	3.0 to 4.0 (43 to 57)	3.0 to 4.0 (43 to 57)
"2"	Full throttle	0	10.0 to 12.0 (142 to 171)	5.5 to 7.0 (78 to 100)
	Minimum throttle	450	6.0 to 12.0 (85 to 171)	5.5 to 7.0 (78 to 100)
"R"	Full throttle	0	14.0 to 16.0 (199 to 228)	14.0 to 16.0 (199 to 228)
	Minimum throttle	450	3.0 to 5.5 (43 to 78)	3.0 to 5.5 (43 to 78)

Notes: **a. The line pressure during idling corresponds to the oil pressure before cut down at minimum throttle.**
b. The oil pressure "After cut back" means that after the pressure modifier valve has operated.

JUDGEMENT IN MEASURING LINE PRESSURE

1. Low idling line pressure in the ranges "D", "2", "1", "R" and "P".

This can be attributed to trouble in the pressure supply system or too low output of power caused by:

(1) A worn oil pump
(2) An oil pressure leak in the oil pump, valve body or case
(3) A sticking regulator valve

2. Low idling, line pressure in certain ranges only

This is presumably caused by an oil leak in the devices or circuits connected to the relevant ranges.

(1) When there is an oil leak in the rear clutch and governor, the line pressure in "D", "2" and "1" are low but the pressure is normal in "R".
(2) When an oil leak occurs in the low and reverse brake circuit, the line pressure in "R" and "P" are low but the pressure is normal in "D", "2" and "1".

3. High idling line pressure

This is presumably caused by an increased vacuum throttle pressure owing to a leak in the vacuum tube or diaphragm or by an increased line pressure due to a sticking regulator valve.

Vacuum leakage is checked by directly measuring the negative pressure after removing the vacuum pipe.

A puncture of the vacuum diaphragm can be easily ascertained because the torque converter oil is absorbed into the engine and the exhaust pipe emits white smoke.

4. Items to be checked when the line pressure is increasing

In this check, the line pressure should be measured with vacuums of 450 mmHg and 0 mmHg in accordance with the stall test procedure.
(1) If the line pressure do not increase despite the vacuum decrease, check whether the vacuum rod is incorporated.
(2) If the line pressure do not meet the standard, it is caused mostly by a sticking pressure regulating valve, pressure regulating valve plug, or amplifier.

TROUBLE-SHOOTING CHART

INSPECTING ITEMS

1. Inspection with automatic transmission on vehicle.

A Oil level
B Range select linkage
C Inhibitor switch and wiring
D Vacuum diaphragm and piping
E Downshift solenoid, kickdown switch and wiring
F Engine idling rpm
G Oil pressure (throttle)
H Engine stall rpm
I Rear lubrication
J Control valve (manual)
K Governor valve
L Band servo
M Transmission air check
N Oil quantity
O Ignition switch and starter motor
P Engine adjustment and brake inspection

2. Inspection after inspecting automatic transmission on vehicle.

m Rear clutch
n Front clutch
q Band brake
r Low and reverse brake
s Oil pump
t Leakage of oil passage
u One-way clutch of troque converter
v One-way clutch of transmission
w Front clutch check ball
x Parking linkage
y Planetary gear

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TROUBLE-SHOOTING CHART FOR 3N71B AUTOMATIC TRANSMISSION

(The number shown below indicates the sequence in which the checks should be taken up.)

Trouble	A B C D	E F G H	I J K L	M N O P	m n q r	s t u v	w x y
Engine does not start in "N", "P" ranges.	. 2 3 .	. . . .	. . . .	. . 1 .	. . . .	. . . .	. . .
Engine starts in other range than "N" and "P".	. 1 2 .	. . . .	. . . .	. . . .	. . . .	. . . .	. . .
Sharp shock in shifting from "N" to "D" range.	. . . 2	. 1 3 .	. 4 . .	. . . .	⑤. . .	. . . .	. . .
Vehicle will not run in "D" range (but runs in "2", "1" and "R" ranges).	. 1 . .	. . 2 .	. 3 . .	. . . .	. . . .	. . . ④	. . .
Vehicle will not run in "D", "1", "2" ranges (but runs in "R" range). Clutch slips. Very poor acceleration.	1 2 . .	. . 4 .	. 5 . .	6 3 . 7	⑧. . .	. ⑨. .	. . .
Vehicle will not run in "R" range (but runs in "D", "2" and "1" ranges.) Clutch slips. Very poor acceleration.	1 2 . .	. . 3 .	. 5 . .	6 4 . .	⑨⑧. ⑦	. ⑩. .	⑪. .
Vehicle will not run in any range.	1 2 . .	. . 3 .	. 5 . .	6 4 . .	. . . .	⑦⑧. .	. ⑨.
Clutches or brakes slip somewhat in starting.	1 2 . 6	. . 3 .	. 5 . .	7 4 . .	. . . .	⑧⑨. .	. . .
Vehicle runs in "N" range.	. 1 . .	. . . .	. 3 . .	. 2 . .	④. . .	. . . .	
Maximum speed not attained. Acceleration poor.	1 2 . .	. . 4 5	. 7 . 6	. 3 . 8	⑪⑫⑨⑩	⑬. . .	. . .
Vehicle braked by throwing lever into "R" range.	. . . .	. . . .	. . . 3	2 1 . .	④. ⑤.	. . . .	. ⑥.
Excessive creep.	. . . .	. 1 . .	. . . .	. . . .	. . . .	. . . .	. . .
No creep at all.	1 2 . .	. 3 . .	. 5 . .	. 4 . .	⑧⑨. .	⑥⑦. .	. . .
Failure to change gear from "2nd" to "3rd".	. 1 . 2	3 . . .	. 5 6 8	7 4 . .	. . ⑨.	. ⑩. .	. . .
Failure to change gear from "1st" to "2nd",	. 1 . 2	3 . . .	. 5 6 8	7 4 . .	. ⑨. .	. ⑩. .	⑪. .
Too high a gear change point from "1st" to "2nd", from "2nd" to "3rd".	. . . 1	2 . 3 .	. 5 6 .	. 4 . .	. . . .	. ⑦. .	. . .
Gear change directly from "1st" to "3rd" occurs.	. . . .	. . . .	. 2 4 .	3 1 . .	. . ⑤.	. ⑥. .	. . .

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Trouble	A B C D	E F G H	I J K L	M N O P	m n q r	s t u v	w x y
Too sharp a shock in change from "1st" to "2nd".	. . . 1	. . . 2	. 4 . 5	. 3 . .	. . ⑥ .	. . . .	. . .
Too sharp a shock in change from "2nd" to "3rd".	. . . 1	2 . 3 .	. 3 . 5	4 . . .	. ⑥ . .	. . . .	. . .
Almost no shock or clutches slipping in change from "1st" to "2nd".	1 2 . 3	. . 4 .	. 6 . 8	7 5 . .	. . ⑨ .	. ⑩ . .	. . .
Almost no shock or slipping in change from "2nd" to "3rd". Engine races extremely.	1 2 . 3	. . 4 .	. 6 . 8	7 5 . .	. ⑨ . .	. ⑩ . .	⑪ . .
Vehicle braked by gear change from "1st" to "2nd".	. . . .	. . . .	. 2 . .	. 1 . .	. ④ . ③	. . . ⑤	. . .
Vehicle braked by gear change from "2nd" to "3rd".	. . . .	. . . .	. 3 . 2	. 1 . .	. . ④ .	. . . .	. . .
Failure to change gear from "3rd" to "2nd".	. . . 1	. . . .	. 3 4 6	5 2 . .	. ⑦⑧ .	. ⑨ . .	. . .
Failure to change gear from "2nd" to "1st" or from "3rd" to "1st".	. . . 1	. . . .	. 3 4 6	5 2 . .	. . ⑦ .	. . . ⑧	. . .
Gear change shock felt during deceleration by releasing accelerator pedal.	. 1 . 2	3 . 4 .	. 5 6 .	. . . .	. . . .	. ⑦ . .	. . .
Too high a change point from "3rd" to "2nd", from "2nd" to "1st".	. 1 . 2	3 . 4 .	. 5 6 .	. . . .	. . . .	. ⑦ . .	. . .
Kickdown does not operate when depressing pedal in "3rd" within kickdown vehicle speed.	. . . 2	1 . . .	. 4 5 .	. 3 . .	. . ⑥ .	. ⑦ . .	. . .
Kickdown operates or engine over-runs when depressing pedal in "3rd" beyond kickdown vehicle speed limit.	. 1 . 2	. . 3 .	. 5 6 .	7 4 . .	. ⑧ . .	. ⑨ . .	. . .
Races extremely or slips in changing from "3rd" to "2nd" when depressing pedal.	. . . 1	. . 2 .	. 4 . 6	5 3 . .	. ⑦⑧ .	. ⑨ . .	⑩ . .
Failure to change from "3rd" to "2nd" when changing lever into "2" range.	. 1 . .	. . 2 .	. 4 . 5	. 3 . .	. . ⑥ .	. ⑦ . .	. . .
Gear change from "2nd" to "1st" or from "2nd" to "3rd" in "2" range.	. 1 . .	. . 2 .	. 3 . .	. . . .	. . . .	. . . .	. . .

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Trouble	A B C D	E F G H	I J K L	M N O P	m n q r	s t u v	w x y
No shock at change from "1" to "2" range or engine races extremely.	1 2 . 3	. 4 . 1	. 6 . .	7 5 . .	. . ⑨ .	⑩ . . .	. . .
Failure to change from "3rd" to "2nd" when shifting lever into "1" range.	. 1 . .	. . 2 .	. 4 5 7	6 3 . .	. ⑧⑨ .	. ⑩ . .	. . .
Engine brake does not operate in "1" range.	. 1 . .	. . 2 .	. 4 . .	5 3 . .	. . . ⑥	. ⑦ . .	. . .
Gear change from "1st" to "2nd" or from "2nd" to "3rd" in "1" range.	. 1 . .	. . . .	. 2 . .	. . . .	. . . .	. ③ . .	. . .
Does not change from "2nd" to "1st" in "1" range.	1 2 . .	. . . .	. 4 5 6	7 3 . .	. . . ⑧	. ⑨ . .	. . .
Large shock changing from "2nd" to "1st" in "1" range.	. . . 1	. . . 2	. 4 . .	. 3 . .	. . . ⑤	. . . .	. . .
Vehicle moves when changing into "P" range or parking gear does not disengage when shifted out of "P" range.	. 1 . .	. . . .	. . . .	. . . .	. . . .	. . . .	. ② .
Transmission overheats.	1 . . .	. . 3 4	2 6 . 8	7 5 . .	. ⑨⑩⑪	⑫⑬⑭ .	. . ⑮
Oil shoots out during operation. White smoke emitted from exhaust pipe during operation.	1 . . 3	. . 5 6	2 7 . .	8 4 . .	. ⑨⑩⑪	⑫⑬⑭ .	. . ⑮
Offensive smell at oil charging pipe.	1 . . .	. . . .	. . . .	. 2 . .	③④⑤⑥	⑦⑧⑨ .	. . ⑩
Transmission noise in "P" and "N" ranges.	1 . . .	. . 2 .	. . . .	. . . .	. . . .	③ . . .	. . .
Transmission noise in "D", "2", "1" and "R" ranges.	1 . . .	. . 2 .	. . . .	. . . .	③ . . .	④ . . ⑤	. . ⑥

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TROUBLE-SHOOTING GUIDE FOR 3N71B AUTOMATIC TRANSMISSION

Order	Test item	Procedure
Checking	1. Oil level gauge	Check gauge for oil level and leakage before and after each test.
	2. Downshift solenoid	Check for sound of operating solenoid when depressing accelerator pedal fully with ignition key "ON".
	3. Manual linkage	Check by shifting into "P", "R", "N", "D", "2" and "1" ranges with selector lever.
	4. Inhibitor switch	Check whether starter operates in "N" and "P" ranges only and whether reverse lamp operates in "R" range only.
	5. Engine idling rpm.	Check whether idling rpm meet standard.
	6. Vacuum pressure of vacuum pipe.	Check whether vacuum pressure is more than 450 mmHg in idling and whether it decreases with increasing rpm.
	7. Operation in each range.	Check whether transmission engages positively by shifting "N"→"D", "N"→"2", "N"→"1" and "N"→"R" range while idling with brake applied.
	8. Creep of vehicle.	Check whether there is any creep in "D", "2", "1" and "R" ranges.
Stall test	1. Oil pressure before testing.	Measure line pressures in "D", "2", "1" and "R" range while idling.
	2. Stall test.	Measure engine rpm and line pressure in "D", "2", "1" and "R" ranges during full throttle operation. Notes: **a. Temperature of torque converter oil used in test should be from 60° to 100°C (140° to 212°F) i.e., sufficiently warmed up but not overheated.** **b. To cool oil between each stall test for "D", "2", "1" and "R" ranges, idle engine, i.e., rpm at about 1,200 rpm for more than 1 minute in "P" range. Measurement time must not be more than 5 seconds.**
	3. Oil pressure after testing	Same as item 1.
Road test	1. Slow acceleration, 1st→2nd 2nd→3rd	Check vehicle speeds and engine rpm in shifting up 1st→2nd range and 2nd→3rd range while running with lever in "D" range and engine vacuum pressure of about 200 mmHg.
	2. Quick acceleration, 1st→2nd 2nd→3rd	Same as item 1 above except with engine vacuum pressure of 0 mmHg (i.e., in position just before kickdown.).
	3. Kick-down operation, 3rd→2nd or 2nd→1st	Check whether the kickdown operates and measure the time delays while running at 30, 40, 50, 60, 70 km/h (19, 25, 31, 38, 44 MPH) in "D_3" range.

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Order	Test item	Procedure
	4. Shift down, $D_3 \rightarrow D_2 \rightarrow D_1$	Check vehicle speeds and engine rpm in shifting down from 3rd → 2nd → 1st (sequentially) while coasting with accelerater pedal released in "D_3" range and engine vacuum pressure of about 450 mmHg.
	5. Shift down, $D_3 \rightarrow 1_2 \rightarrow 1_1$	Check for shifting down $D_3 \rightarrow 1_2$ and engine braking, and further for shifting down $1_2 \rightarrow 1_1$ and engine braking, after shifting the lever into "1" range with the accelerator pedal released and the engine vacuum pressure of 0 mmHg while driving at about 50 km/h (31 MPH) in "D_3" range.
	6. Shift down, $D_3 \rightarrow 2$	Check for quick shifting down $D_3 \rightarrow 2$ and engine braking, after shifting the lever into "2" range while driving at about 50 km/h (31 MPH) in "D_3" range. Further, check for locking of the transmission in 2nd gear ratio regardless of vehicle speed.
	7. Shift up, $1_1 \rightarrow 1_2$	Check for failure of the transmission to shift up during acceleration, when starting in "1" range.
	8. Shift up or down when starting in "2" range.	Check the transmission for not shifting up or down during acceleration or deceleration, when starting in "2" range.
	9. Parking.	Confirm that vehicle will not move on grade when shifting to "P" range.
Others	Abnormal shock, oil leakage.	Enter into record conditions observed during these tests such as gear noise, abnormal clutch noise and acceleration performance.

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SERVICE DATA AND SPECIFICATIONS

General specifications

Torque converter		
Type		Symmetrical 3-element 1-stage 2-phase torque converter
Stall torque ratio		2.0 : 1
Transmission		
Type		3-speed forward and one-speed reverse with planetary gear train
Control elements:	Multiple-disc clutch	2
	Band brake	1
	Multiple-disc brake	1
	One-way clutch	1
Gear ratio:	1st	2.458
	2nd	1.458
	3rd	1.000
	Reverse	2.182
Selector positions:	P (Park)	Transmission is placed in neutral. Output shaft is fixed. Engine can be started.
	R (Reverse)	Backward running
	N (Neutral)	Transmission is in neutral. Engine can be started.
	D (Drive)	Up- or downshifts automatically to and from 1st, 2nd, and top
	2 (2nd lock)	Fixed at 2nd
	1 (Lock up)	Fixed at low or downshifts from 2nd
Oil pump		
Type		Internally intermeshing involute gear pump
Number of pump		1
Oil		Automatic transmission fluid "DEXRON" type
Capacity		5.5 liters (5 ⅞ U.S.qt., 4 ⅞ Imp.qt.) Approximately 2.7 liters (2 ⅞ U.S.qt., 2 ⅜ Imp.qt.) in torque converter
Hydraulic control system		Controlled by measuring the negative pressure of intake manifold and the revolution of output shaft.
Lubrication system		Forced lubrication by an oil pump
Cooling system		Water-cooled by a circulation-type auxiliary cooler (located at the radiator).

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Specifications and adjustment

Automatic transmission assembly		
Model code number		X2402
Torque converter assembly		
Stamped mark on the T/C		16-B
Front clutch		
Number of drive plates		3
Number of driven plates		3
Clearance	mm (in)	1.6 to 1.8 (0.063 to 0.071)
Thickness of retaining plate	mm (in)	10.6 (0.417) 10.8 (0.425) 11.0 (0.433) 11.2 (0.441) 11.4 (0.449) 11.6 (0.457)
Rear clutch		
Number of drive plates		4
Number of driven plates		4
Clearance	mm (in)	1.0 to 1.5 (0.039 to 0.059)
Thickness of retaining plate	mm (in)	4.8 (0.189)
Low & reverse brake		
Number of drive plates		4
Number of driven plates		4
Clearance	mm (in)	0.80 to 1.05 (0.0315 to 0.0413)
Thickness of retaining plate	mm (in)	11.8 (0.465) 12.0 (0.472) 12.2 (0.480) 12.4 (0.488) 12.6 (0.496) 12.8 (0.504)
Brake band		
Piston size	mm (in)	
Big dia.		64 (2.52)
Small dia.		40 (1.57)
Control valve assembly		
Stamped mark on strainer		E
Governor assembly		
Stamped mark on governor body		35

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Engine idling and stall revolution

Idling revolution	rpm	650 at "D" position (800 with air conditioner equipped models)
Stall revolution	rpm	2,000 to 2,200

Tightening torque

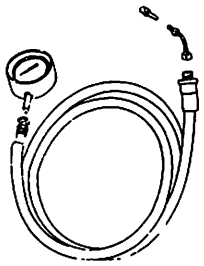
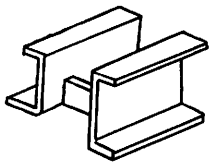
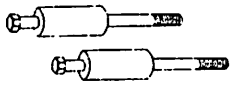
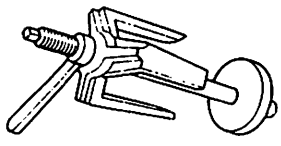
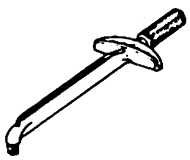
kg-m(ft-lb)

Drive plate to crankshaft	14.0 to 16.0	(101 to 116)
Drive plate to torque converter	4.0 to 5.0	(29 to 36)
Converter housing to engine	4.0 to 5.0	(29 to 36)
Transmission case to converter housing	4.5 to 5.5	(33 to 40)
Transmission case to rear extension	2.0 to 2.5	(14 to 18)
Oil pan to transmission case	0.5 to 0.7	(3.6 to 5.1)
Servo piston retainer to transmission case	0.5 to 0.7	(3.6 to 5.1)
Piston stem (when adjuting band brake)	*1.2 to 1.5	(8.7 to 10.8)
Piston stem lock nut	1.5 to 4.0	(11 to 29)
One way clutch inner race to transmission case	1.3 to 1.8	(9.4 to 13)
Control valve body to transmission case	0.55 to 0.75	(4.0 to 5.4)
Lower valve body to upper valve body	0.25 to 0.35	(1.8 to 2.5)
Side plate to control valve body	0.25 to 0.35	(1.8 to 2.5)
Nut for control valve reamer bolt	0.5 to 0.7	(3.6 to 5.1)
Oil strainer to lower valve body	0.25 to 0.35	(1.8 to 2.5)
Governor valve body to oil distributor	0.5 to 0.7	(3.6 to 5.1)
Oil pump housing to oil pump cover	0.6 to 0.8	(4.3 to 5.8)
Inhibitor switch to transmission case	0.5 to 0.7	(3.6 to 5.1)
Manual shaft lock nut	3.0 to 4.0	(22 to 29)
Oil cooler pipe to transmission case	3.0 to 5.0	(22 to 36)
Test plug (oil pressure inspection hole)	1.4 to 2.1	(10 to 15)
Support actuator (parking rod inserting position) to rear extension	0.8 to 1.1	(5.8 to 8.0)
Oil charging pipe to case	0.55 to 0.75	(4.0 to 5.4)
Selector range lever to manual shaft	3.0 to 4.0	(22 to 29)
Selector rod lock nut	1.6 to 2.2	(12 to 16)
Converter housing to gusset	2.7 to 3.3	(20 to 24)

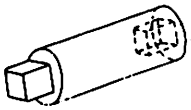
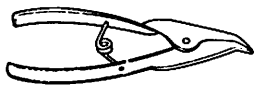
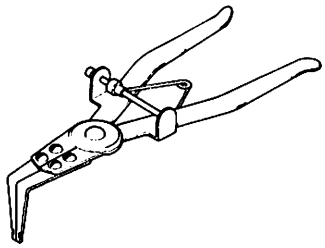
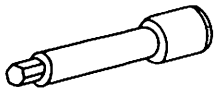
* Turn back two turns after tightening.

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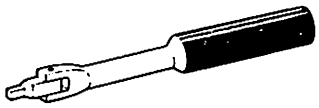
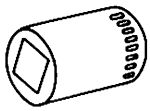
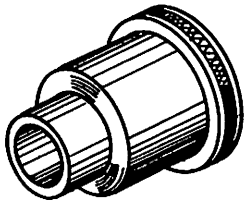
SPECIAL SERVICE TOOLS

No.	Tool number & tool name	Description	For use on	Reference page or figure No.
1.	ST2505S001 (ST25050001) Oil pressure gauge set	Use for checking hydraulic pressure  SE119	3N71B and 3N71A A/T	Fig. AT-112
2.	ST07870000 Transmission case stand	Use for setting transmission  SE120	3N71B A/T	Page AT-36
3.	ST25850000 Sliding hammers	Use for removing oil pump  SE121	3N71B and 3N71A A/T	Fig. AT-56
4.	ST25420001 (ST25420000) Clutch spring compressor	Use for assembling or disassembling front and rear clutch  SE122	3N71B and 3N71A A/T	Fig. AT-79 Fig. AT-86
5.	GG93010000 Torque wrench	Use for tightening correct torque Max. torque: 4.6 kg-m (0.33 ft-lb) Drive angle 3/8" square  SE123	3N71B and 3N71A A/T	Fig. AT-69

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No.	Tool number & tool name	Description	For use on	Reference page or figure No.
6.	ST25490000 (ST25512001) Socket extension	Socket extension to connect torque wrench (GG93010000) with ½" square socket wrench  SE124	3N71B A/T	Fig. AT-69
7.	ST25160000 Torque driver	Use for tightening correct torque Max. torque: 1.04 kg-m (90 ft-lb)  SE125	3N71B A/T and 3N71A	Fig. AT-107 Fig. AT-108
8.	HT69860000 Snap ring remover	Use for removing and replacing snap ring  SE126	3N71B and 3N71A A/T	Fig. AT-59
9.	ST25320001 Snap ring remover	Use for removing and replacing snap ring  SE305	3N71B and 3N71A A/T	Fig. AT-79 Fig. AT-86
10.	ST25570001 (ST25570000) Hex-head extension	Use for removing and installing one-way clutch inner race with torque wrench. Drive angle ½" square and 6 mm (across flat width)  SE128	3N71B A/T	Fig. AT-64 Fig. AT-69 Page AT-42

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No.	Tool number & tool name	Description	For use on	Reference page or figure No.
11.	HT62350000 Spinner handle	Use for disassemlbing and assembling control valve  SE129	3N71B and 3N71A A/T	Fig. AT-101 Fig. AT-104
12.	HT61000800 Hexagon wrench	Use for disassembling and assembling control valve  SE130	3N71B and 3N71A A/T	Fig. AT-101 Fig. AT-104 Fig. AT-107 Fig. AT-108
13.	ST25580000 Oil pump assemlbing gauge	Use for centering oil pump  SE131	3N71B and 3N71A A/T	Fig. AT-98 Fig. AT-99

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SERVICE MANUAL

DATSUN 710
MODEL 710 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION PD

PROPELLER SHAFT AND DIFFERENTIAL CARRIER

PD

PROPELLER SHAFT AND CENTER BEARING ..... PD- 2

DIFFERENTIAL CARRIER (TYPE H165B) ..... PD- 5

SERVICE DATA AND SPECIFICATIONS PD-14

TROUBLE DIAGNOSES AND CORRECTIONS PD-16

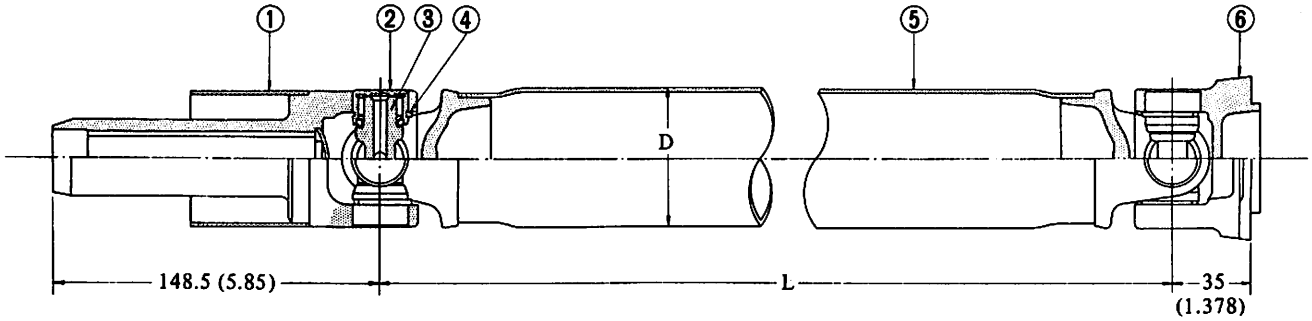
SPECIAL SERVICE TOOLS PD-18

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PROPELLER SHAFT AND CENTER BEARING

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REMOVAL PD-2
DISASSEMBLY PD-2
INSPECTION PD-3
ASSEMBLY PD-3
INSTALLATION PD-3
SERVICE DATA PD-3
TROUBLE DIAGNOSES AND CORRECTIONS PD-4



1 Sleeve yoke assembly
2 Bearing race assembly
3 Journal assembly
4 Snap ring
5 Propeller shaft tube assembly
6 Flange yoke

PD169

Unit: mm (in)

Item	L	D
Manual transmission	1,242 (48.90)	75.0 (2.953)
Automatic transmission	1,110 (43.70)	75.0 (2.953)

Fig. PD-1 Cross-sectional view of propeller shaft

DESCRIPTION

The propeller shaft is used to transfer the engine power, through the transmission, to the differential and the rear axle, which transmits it to the rear wheels. The propeller shaft has two universal joints and a sleeve yoke. The splines in the sleeve yoke and on the transmission mainshaft (output shaft) permit the propeller shaft to move forward and rearward when the axle moves up and down.

The propeller shaft and universal joint assembly is carefully balanced during original assembly; that is, the dynamic unbalance is under 35 gr-cm (0.49 in-oz) at 5,800 rpm for automatic transmission models or 35 gr-cm (0.49 in-oz) at 4,000 rpm for manual transmission models.

If the propeller shaft has to be disassembled, it must be made carefully so that the above limit is not exceeded. Therefore, when the car is to be undercoated, cover the propeller shaft and universal joints to prevent application of the undercoating material.

REMOVAL

1. Raise car on hoist. Put match marks both on propeller shaft and companion flange so that shaft can be reinstalled in the original position.
2. Remove bolts connecting shaft to companion flange.
3. Draw out propeller shaft sleeve yoke from transmission by moving shaft rearward, passing it under rear axle.

Plug up rear end of rear extension housing to prevent oil leakage.

Note: Remove propeller shaft carefully so as not to damage the spline, sleeve yoke and rear oil seal.

DISASSEMBLY

Primarily, do not disassemble propeller shaft because it is balanced as an assembly. Check movement of propeller shaft with journal, and if journal does not move smoothly, disassemble.

1. Mark propeller shaft and journal so that the original combination can be restored at assembly.
2. Remove snap ring with a standard screwdriver.
3. Lightly tap base of yoke with a hammer, and withdraw bearing race. See Figure PD-2.

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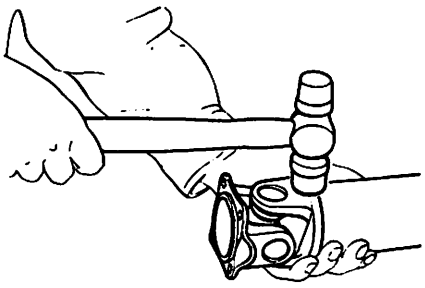


Fig. PD-2 Removing bearing

Note: When removing journal from yoke, be careful not to damage journal and yoke hole.

INSPECTION

1. Check journal pin for dent or brinell marks, and yoke hole for sign of wear or damage.

Snap ring, bearing and seal ring should also be inspected to see if these are damaged, worn or deformed. Replace if necessary.

2. Check propeller shaft tube surface for dent or crack. Chenge if necessary.

ASSEMBLY

To assemble, reverse the foregoing procedure using reference marks prescribed on page PD-3 for Removal and Disassembly.

Fill joint with recommended multipurpose grease whenever propeller shaft is overhauled.

Two opposite snap rings should be equal in thickness. Be sure that play is below 0.02 mm (0.0008 in).

Available snap ring

Thickness mm (in)	Color identification
2.00 (0.0787)	White
2.02 (0.0795)	Yellow
2.04 (0.0803)	Red
2.06 (0.0811)	Green
2.08 (0.0819)	Blue
2.10 (0.0827)	Light brown
2.12 (0.0835)	Unpainted
2.14 (0.0843)	Pink

Install and assemble components correctly so that joint moves under friction resistance of less than 15 kg-cm (13 in-lb).

When the above steps are complete, place the shaft in a balancing machine and adjust unbalance less than 35 gr-cm (0.49 in-oz) at 5,800 rpm for automatic transmission cars, or less than 35 gr-cm (0.49 in-oz) at 4,000 rpm for manual transmission cars.

INSTALLATION

To install, reverse the foregoing removal procedure.

Align propeller shaft with companion flange using reference marks prescribed in "Removal" procedure and tighten them with bolts.

Tightening torque:
2.5 to 3.2 kg-m
(18 to 23 ft-lb)

SERVICE DATA

Item \ Transmission type		Manual	Automatic
Permissible dynamic unbalance	gr-cm (in-oz)	35 (0.49) at 4,000 rpm	35 (0.49) at 5,800 rpm
Axial play of spider journal	mm (in)	Less than 0.02 (0.0008)	
Journal swinging torque	kg-cm (in-lb)	Less than 15 (13.0)	
Propeller shaft (front and rear) out-of-round	mm (in)	Less than 0.6 (0.024)	
Tightening torque Shaft to companion flange (gear carrier) bolts	kg-m (ft-lb)	2.5 to 3.2 (18 to 23)	

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TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Vibration during at medium or high speed.	Worn or damaged universal joint needle bearing.	Replace.
	Unbalance due to bent or dented propeller shaft.	Replace.
	Loose propeller shaft installation.	Retighten.
	Worn transmission rear extension bushing.	Replace.
	Undercoating or mud on the shaft causing unbalance.	Clean up shaft.
	Tire unbalance.	Balance wheel and tire assembly.
	Balance weights missing.	Replace.
Knocking sound during starting or noise during coasting on propeller shaft.	Worn damaged universal joint.	Replace.
	Worn sleeve yoke and main shaft spline.	Replace.
	Loose propeller shaft installation.	Retighten.
	Loose joint installation.	Adjust snap ring.
Scraping noise.	Dust cover on sleeve yoke rubbing on transmission rear extension. Dust cover on companion flange rubbing on differential carrier.	Straighten out dust cover to remove interference.

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DIFFERENTIAL CARRIER (TYPE H165B)

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ADJUSTMENT OF DRIVE PINION PRELOAD PD-10
ADJUSTMENT OF SIDE BEARING SHIMS PD-10
INSTALLATION PD-12
REPLACEMENT OF FRONT OIL SEAL PD-13

DESCRIPTION

The differential gear carrier assembly has a hypoid type drive pinion and ring gear set with single gear ratio, as indicated in the following table.

The drive pinion is mounted in two tapered roller bearings which are preloaded by pinion bearing adjusting spacer and washer during assembly.

The drive pinion is positioned by a washer located between a shoulder of the drive pinion and the rear bearing.

The differential case is supported in the carrier by two tapered roller side bearings. These are preloaded by inserting shims between the bearings and the differential case. The differential case assembly is positioned for proper ring gear-to-drive pinion backlash by varying these shims. The ring gear is bolted to the differential case. The case houses two side gears in mesh with two pinions mounted on a pinion shaft. The pinion shaft anchored in the case by lock pin. The pinions and side gears are backed by thrust washers.

The carrier is of malleable cast iron.

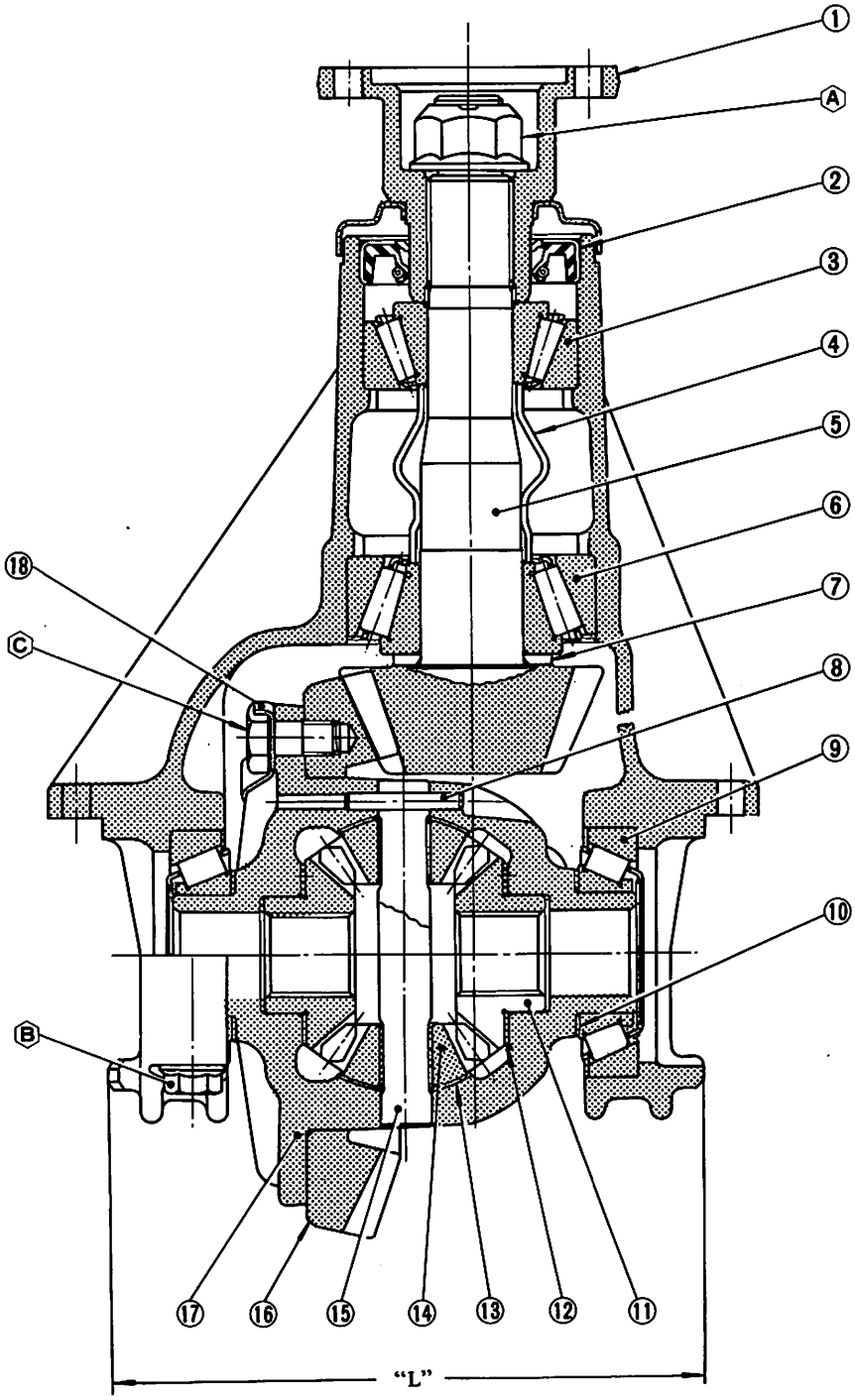
The maintenance interval should be referred to Section GI.

Note: Replacement of front oil seal with differential gear carrier assembly installed on the car must not be allowed due to used collapsible spacer on its model.

Applied model		Gear ratio
Engine	Transmission	
L20B	Automatic	3.700
	Manual	

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(TYPE H165B)



1 Companion flange
2 Oil seal
Supply grease to oil seal lip when assembling.
3 Pinion front bearing
4 Collapsible spacer
Adjust pinion bearing preload by this spacer. Procedure can be accomplished by referring to "Adjustment of drive pinion preload".
5 Drive pinion
6 Pinion rear bearing
7 Pinion height adjusting washer
8 Lock pin
9 Side bearing
10 Side bearing adjusting shim
Adjust side bearing preload and ring gear-to-drive pinion backlash by selecting ⑩.
11 Side gear
12 Thrust washer
Adjust pinion mate-to-side gear backlash (or the clearance between the rear face of side gear and thrust washer) 0.1 to 0.2 mm (0.0039 to 0.0079 in) by ⑫.
13 Thrust washer
14 Pinion mate
15 Differential pinion shaft
16 Ring gear
Ring gear-to-drive pinion backlash: 0.10 to 0.15 mm (0.0039 to 0.0059 in)
17 Differential gear case
18 Lock strap

Tightening torque (T) of bolts and nut kg-m (ft-lb)

Ⓐ T : More than 14 (101)

This nut should tightened by referring to "Adjustment of drive pinion preload".

Ⓑ T : 5 to 6 (36 to 43)
Ⓒ T : 7 to 8 (51 to 58)

L : 173.23 to 173.29 mm (6.8201 to 6.8224 in)

PD316

Fig. PD-72 Sectional view of differential carrier for Station Wagon equipped with automatic transmission

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REMOVAL

1. Jack up rear of vehicle and support it by placing safety stands under rear axle case. Drain gear oil.
2. Remove propeller shaft and rear axle shafts. These works can be done as described in Section RA (page RA-4) for Removal.
3. Loosen off bolts securing differential carrier to rear axle case, and take out differential gear carrier assembly.

PRE-DISASSEMBLY INSPECTION

Differential case or carrier should be inspected before any parts are removed from it.

These inspections are helpful in finding the cause of the trouble and in determining the corrections needed.

1. Mount carrier on Gear Carrier Attachment ST06360001. See Figure PD-4.

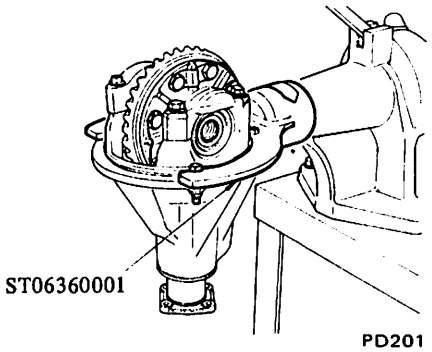


Fig. PD-4 Holding differential carrier

2. Visually inspect parts for wear or damage.
3. Rotate gears to see that there is any roughness which would indicate damaged bearings or chipped gears. Check the gear teeth for scoring or signs of abnormal wear. Measure preload of drive pinion.
4. Set up a dial indicator and check the backlash at several points around ring gear. Backlash should be 0.10 to 0.15 mm (0.0039 to 0.0059 in).
5. Check the gear tooth contact with a mixture of powdered red lead and oil applied lightly to all ring gear teeth.

For the tooth contact pattern, see page PD-12 for Contact Pattern.

DISASSEMBLY

1. Put match marks on side bearing caps and carrier, and remove side bearing caps and take out differential case assembly. See Figure PD-5.

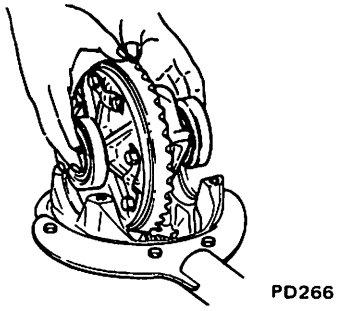


Fig. PD-5 Removing differential case assembly

Note: Care should be taken not to confuse the left and right hand bearing caps and bearing outer races so that reassembly will be easily carried out with the same parts in the original position.

2. Remove drive pinion nut using Drive Pinion Flange Wrench ST31530000, and pull off companion flange using a suitable puller. See Figure PD-6.

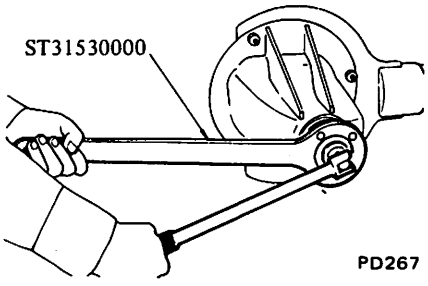


Fig. PD-6 Removing drive pinion nut

3. Extract drive pinion assembly to the rearwards by tapping the front end with a soft hammer. Drive pinion can be taken out together with rear bearing inner race, bearing spacer and washer.
4. Remove oil seal and take out front bearing inner race.

Note: Oil seal must not be reused.

5. Hold rear bearing inner race with Drive Pinion Rear Bearing Inner Race Puller ST30031000 and extract from drive pinion with a press. See Figure PD-7.

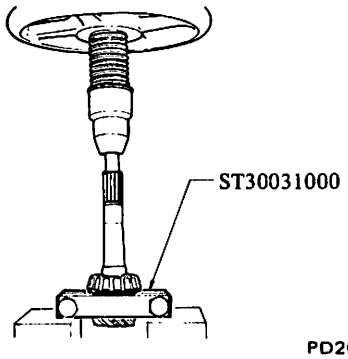


Fig. PD-7 Removing pinion rear bearing inner race

6. To remove outer races of both front and rear bearing, apply a brass drift to race side surface, and withdraw them by lightly tapping the top of drift with a hammer. See Figure PD-8.

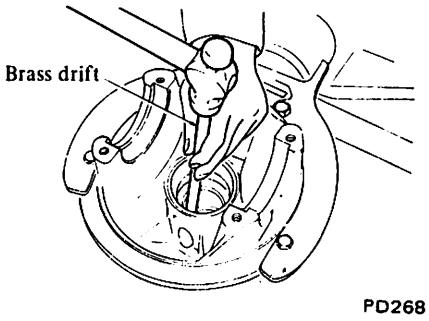


Fig. PD-8 Removing pinion front and rear bearing outer races

DISASSEMBLY OF DIFFERENTIAL CASE

1. When replacing side bearing, use Gear Carrier Side Bearing Puller ST3305S001 (set of ST33051001 and ST33052000). See Figure PD-9.

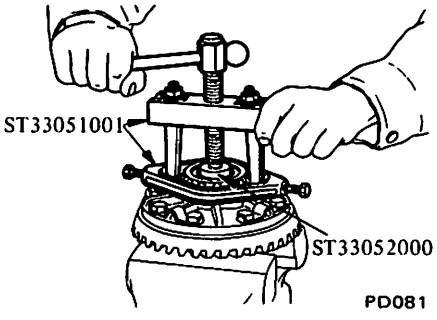


Fig. PD-9 Removing side bearing

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Notes:
a. **Puller should be handled with care in catching the edge of bearing inner race.**
b. **Be careful not to confuse left and right hand parts.**

2. Remove ring gear by spreading out lock strap and loosening ring gear bolts in diagonally.
3. Punch off pinion mate shaft lock pin from ring gear side using Solid Punch ST23510000. See Figure PD-10.

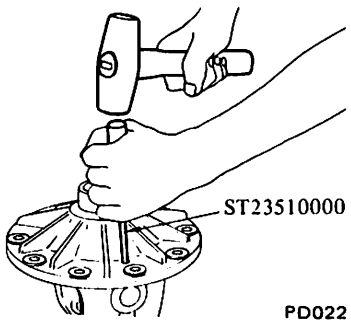


Fig. PD-10 Removing lock pin

Note: Lock pin is caulked at pin hole mouth on differential case. Do not punch it off forcibly without checking how it is caulked.

4. Draw out pinion mate shaft and remove pinion mate gears, side gears and thrust washers.

Note: Put marks on gear and thrust washer so that they can be re-installed in their original positions from which they were removed.

INSPECTION

Thoroughly clean all disassembled parts, and examine them to see that they are worn, damaged or otherwise defective, and how they are affected. Repair or replace all defective parts, whichever is necessary.

1. Check gear teeth for scoring, cracking or chipping, and make sure that tooth contact pattern indicates correct meshing depth. If any defect is evident, replace parts as required.

Note: Drive pinion and ring gear are supplied for replacement as a set, therefore, should either part be damaged, replace as a set.

2. Check pinion gear shaft, and pinion gear for scores and signs of wear, and replace as required.

Follow the same procedure for side gear and their seats on differential case.

3. Inspect all bearing races and rollers for scoring, chipping or evidence of excessive wear. They should be in tiptop condition such as not worn and with mirror-like surfaces. Replace if there is a shadow of doubt on their efficiency, as an incorrect bearing operation may result in noises and gear seizure. If you need the information on "Visual Serviceability Standard for Taper Roller Bearing", refer to Section FA (page FA-8) for Inspection.
4. Inspect thrust washer faces. Small defects can be corrected with sand paper. If pinion mate-to-side gear backlash (or the clearance between side gear and thrust washer) exceeds limits 0.1 to 0.2 mm (0.0039 to 0.0079 in), replace thrust washers.
5. Inspect carrier and differential case for cracks or distortion. If either condition is evident, replace defective parts.
6. As a general rule, oil seal should be replaced at each disassembly.

ASSEMBLY AND ADJUSTMENT

Assembly can be done in the reverse order of disassembly. The following directions for adjustment and usage of special tools enable to obtain a perfect differential operation.

PRECAUTIONS IN REASSEMBLY

1. Arrange shims, washers and the like to install them correctly.
2. Thoroughly clean the surfaces on which shims, washers, bearings and bearing caps are installed.
3. Apply gear oil when installing bearings.
4. Pack recommended multi-purpose grease cavity between lips when fitting oil seal.

ASSEMBLY OF DIFFERENTIAL GEAR CASE

1. Assemble pinion mates, side gears and thrust washers in differential case.
2. Fit pinion shaft to differential case so that it meets lock pin holes.
3. Adjust pinion mate-to-side gear backlash (or the clearance between the rear face of side gear and thrust washer) to 0.1 to 0.2 mm (0.0039 to 0.0079 in) by selecting side gear thrust washer.

Side gear thrust washer

Thickness mm (in)
0.785 (0.0309)
0.835 (0.0329)
0.885 (0.0348)
1.035 (0.0407)
1.185 (0.0467)

4. Lock pinion shaft lock pin using a punch after it is secured into place.
5. Apply oil to gear tooth surfaces and thrust surfaces and check if they turn properly.
6. Place ring gear on differential case and install bolts and lock washers. Torque bolts to specification, and bend up lock washers.

Tightening torque:
7 to 8 kg-m
(51 to 58 ft-lb)

Notes:
a. **Use only genuine drive gear bolts and new lock washers.**
b. **Tighten bolts in criss-cross fashion lightly tapping around bolt heads with a hammer.**

7. When replacing side bearing, measure bearing width using a standard gauge [18.50 mm (0.7283 in) thickness] and a weight block 2.5 kg (5.5 lb) prior to installation. See Figure PD-16.

Normal bearing width:
18.50 mm (0.7283 in)

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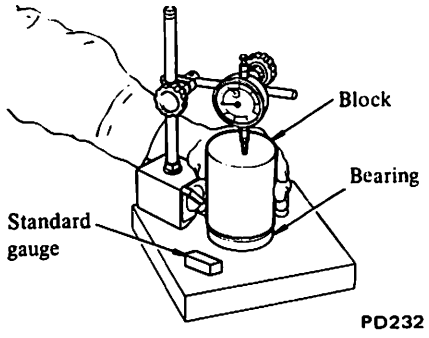


Fig. PD-11 Measuring bearing width

8. Press fit side bearing cone into differential case using Gear Carrier Side Bearing Drift ST33210000 and Adapter ST33052000. See Figure PD-12.

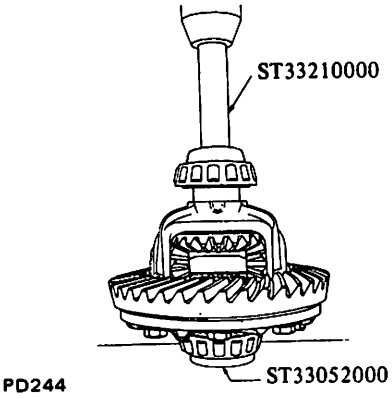


Fig. PD-12 Installing side bearing cone

ADJUSTMENT OF DRIVE PINION HEIGHT

Adjust the pinion height with washer provided between rear bearing inner race and the back of pinion gear.

1. Press fit front and rear bearing outer races into gear carrier using Drive Pinion Outer Race Drift Set ST30611000, ST30612000 and ST30613000.

Front: ST30611000 and ST30612000

Rear: ST30611000 and ST30613000

2. Fit rear bearing on carrier, and install Dummy Shaft on rear bearing, and place Height Gauge on carrier. See Figure PD-13.

ST31141000: Height gauge
ST31942000: Dummy shaft

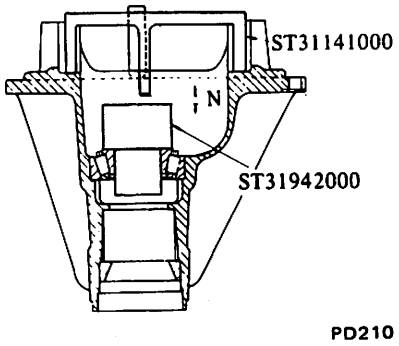


Fig. PD-13 Adjusting pinion height

3. Measure the clearance (N) between the tip end of height gauge and the end surface of dummy shaft, using a thickness gauge. See Figure PD-14.

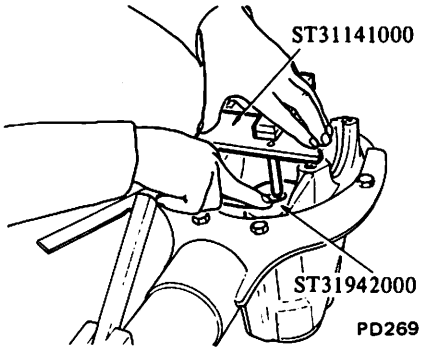


Fig. PD-14 Measuring clearance

4. The thickness of drive pinion height adjusting washer can be obtained from the following formula:

$$T = N - [(H - D' - S) \times 0.01] + 2.98$$

Where,

T : Required thickness of rear bearing adjusting washer (mm).
N : Measured value with thickness gauge (mm).
H : Figure marked on the drive pinion head. See Figure PD-20.
D' : Figure marked on the dummy shaft.
S : Figure marked on the height gauge.

Figures for H, D' and S are dimensional variations in a unit of 1/100 mm against each standard measurement.

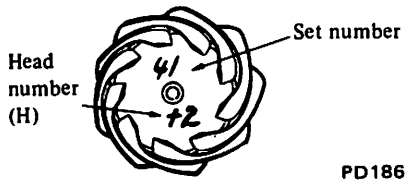


Fig. PD-15 Variation number on drive pinion

Examples of calculation

Ex. 1 ---

N = 0.42 mm, H = +2, D' = –1
S = +1

$$T = N - [(H - D' - S) \times 0.01] + 2.98$$
$$= 0.42 - [((+2) - (-1) - (+1)) \times 0.01] + 2.98$$
$$= 0.42 - [(2 + 1 - 1) \times 0.01] + 2.98$$
$$= 0.42 - [2 \times 0.01] + 2.98$$
$$= 0.42 - 0.02 + 2.98$$
$$= 3.38 \text{ mm}$$

The correct washer is 3.39 mm thick.

Ex. 2 ---

N = 0.35 mm, H = –3, D' = +1
S = –2

$$T = N - [(H - D' - S) \times 0.01] + 2.98$$
$$= 0.35 - [((-3) - (+1) - (-2)) \times 0.01] + 2.98$$
$$= 0.35 - [(-3 - 1 + 2) \times 0.01] + 2.98$$
$$= 0.35 - [-2 \times 0.01] + 2.98$$
$$= 0.35 + 0.02 + 2.98$$
$$= 3.35 \text{ mm}$$

The correct washer is 3.36 mm thick.

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Ex. 3 ---

N = 0.51 mm, H = 0, D′ = 0
S = 0

T = N – [(H – D′ – S) x 0.01] + 2.98
= 0.51 – [(0 – 0 – 0) x 0.01] + 2.98
= 0.51 – [0 x 0.01] + 2.98
= 0.51 – 0 + 2.98
= 0.51 + 2.98
= 3.49 mm

The correct washer is 3.48 mm thick.

Note: If values signifying H, D′ and S are not given, regard them as zero and compute. After assembly, check to see that tooth contact is correct. If not, readjust.
For the tooth contact pattern, see page PD-34 for Contact Pattern.

Pinion height adjusting washer

Thickness mm (in)
3.09 (0.1217)
3.12 (0.1228)
3.15 (0.1240)
3.18 (0.1252)
3.21 (0.1264)
3.24 (0.1276)
3.27 (0.1287)
3.30 (0.1299)
3.33 (0.1311)
3.36 (0.1323)
3.39 (0.1335)
3.42 (0.1346)
3.45 (0.1358)
3.48 (0.1370)
3.51 (0.1382)
3.54 (0.1394)
3.57 (0.1406)
3.60 (0.1417)
3.63 (0.1429)
3.66 (0.1441)

5. Fit determined pinion height adjusting washer in drive pinion, and press fit rear bearing inner race in it, using Base ST30032000.

ADJUSTMENT OF DRIVE PINION PRELOAD

Adjust the preload of drive pinion with collapsible spacer.

This procedure has nothing to do with thickness of pinion height adjusting washer.

Note: Reuse of a collapsible spacer must not be allowed.

1. After adjusting pinion height, lubricate front bearing with gear oil and place it in carrier.
2. Install a new oil seal in carrier. Lubricate cavity between seal lips with recommended multi-purpose grease when installing.
3. Place a new collapsible spacer on drive pinion and lubricate pinion rear bearing with gear oil.
4. Insert companion flange into oil seal and hold it firmly against pinion front bearing cone. From the rear of the carrier, insert drive pinion into companion flange.
5. Ascertain that threaded portion of drive pinion and a new pinion nut are free from oil or grease.
6. Holding companion flange with Drive Pinion Flange Wrench ST31530000, tighten nut and then drive pinion is pulled into front bearing cone and into flange.

As drive pinion is pulled into front bearing cone, drive pinion end play is reduced. While there is still end play in drive pinion, companion flange and cone will be felt to bottom. This indicates that bearing cone and companion flange have bottomed on collapsible spacer.

From this point, a much greater torque must be applied to turn pinion nut since spacer must be collapsed. From this point, nut should also be tightened very slowly and drive pinion end play checked often so that pinion bearing preload does not exceed the limits.

When the drive pinion end play is eliminated, the specified preload is being approached. Replace collapsible spacer if this specification is exceeded.

Note: Do not decrease preload by loosening pinion nut. This will remove compression between pinion front and rear bearing cones and collapsible spacer and may permit front bearing cone to turn on drive pinion, moreover, nut becomes loose.

7. Turn drive pinion in both directions several times to set bearing rollers. And adjust bearing preload to specifications using Preload Gauge ST3127S000. See Figure PD-16.

Tightening torque of pinion nut:
More than 14 kg-m (101 ft-lb)

Preload (with oil seal):
7 to 10 kg-cm
(6.1 to 8.7 in-lb)

At companion flange bolt hole:
2.0 to 2.9 kg
(4.4 to 6.4 lb)

Note: Preload of used bearing is the same value as that of a new bearing.

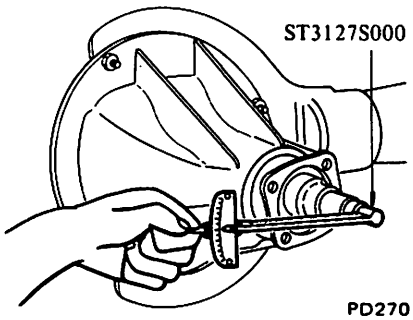


Fig. PD-16 Measuring pinion preload

ADJUSTMENT OF SIDE BEARING SHIMS

1. If hypoid gear set, carrier, differential case or side bearing have been replaced with new ones, adjust the side bearing preload with adjusting shim.

The required thickness of adjusting shim can be calculated by the following formulas.

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$T_1 = (A - C + D - H') \times 0.01 + 0.200 + E$

$T_2 = (B - D + H') \times 0.01 + 0.090 + F$

Where,

T_1 : Required thickness of left side bearing adjusting shim (mm).

T_2 : Required thickness of right side bearing adjusting shim (mm).

A : Figure marked on the left side bearing housing of gear carrier.

B : Figure marked on the right side bearing of gear carrier.

C & D : Figure marked on the differential case.

E & F : These are differences in width of left or right side bearing against the standard width (18.50 mm).

If bearing width is 18.39, the difference will be as follows:

$18.50 - 18.39 = 0.11$

H' : Figure marked on the ring gear. See Figures PD-22 and PD-23.

Figures for A, B, C, D and H' are dimensional variations in a unit of 1/100 mm against each standard measurement.

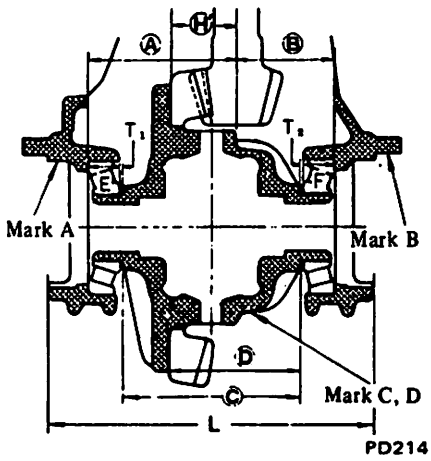


Fig. PD-17 Thickness of shim on left and right sides

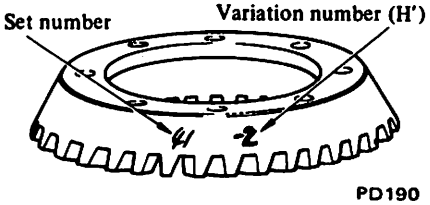


Fig. PD-18 Variation number on ring gear

Examples of calculation

Ex. 1 ---

A = 1, B = 2, C = 2, D = 3
E = 0.11 mm, F = 0.15 mm
H' = –2

Left side:

$T_1 = (A - C + D - H') \times 0.01 + 0.200 + E$
$= (1 - 2 + 3 - (-2)) \times 0.01 + 0.200 + 0.11$
$= (1 - 2 + 3 + 2) \times 0.01 + 0.200 + 0.11$
$= 4 \times 0.01 + 0.200 + 0.11$
$= 0.04 + 0.200 + 0.11$
$= 0.35$ mm

The correct shims are 0.05 plus 0.10 plus 0.20 mm thick.

Right side:

$T_2 = (B - D + H') \times 0.01 + 0.090 + F$
$= (2 - 3 + (-2)) \times 0.01 + 0.090 + 0.15$
$= (2 - 3 - 2) \times 0.01 + 0.090 + 0.15$
$= -3 \times 0.01 + 0.090 + 0.15$
$= -0.03 + 0.090 + 0.15$
$= 0.21$ mm

The correct shims are three pieces of 0.07 mm thick.

Ex. 2 ---

A = 0, B = 3, C = 1, D = 0
E = 0.20 mm, F = 0.17 mm
H' = 2

Left side:

$T_1 = (A - C + D - H') \times 0.01 + 0.200 + E$
$= (0 - 1 + 0 - (+2)) \times 0.01 + 0.200 + 0.20$
$= (0 - 1 + 0 - 2) \times 0.01 + 0.200 + 0.20$
$= -3 \times 0.01 + 0.200 + 0.20$
$= -0.03 + 0.200 + 0.20$
$= 0.37$ mm

The correct shims are 0.07 plus 0.10 plus 0.20 mm thick.

Right side:

$T_2 = (B - D + H') \times 0.01 + 0.090 + F$
$= (3 - 0 + (+2)) \times 0.01 + 0.090 + 0.17$
$= (3 - 0 + 2) \times 0.01 + 0.090 + 0.17$
$= 5 \times 0.01 + 0.090 + 0.17$
$= 0.05 + 0.090 + 0.17$
$= 0.31$ mm

The correct shims are as follows:

Thickness		Quantity	
0.07	x	3	= 0.21
0.10	x	1	= 0.10
Total thickness			= 0.31 mm

Note: If values signifying A, B, C, D and H' are not given, regard them as zero and compute.
After assembly, check to see that preload and backlash are correct. If not, readjust.

Side bearing adjusting shim

Thickness mm (in)
0.05 (0.0020)
0.07 (0.0028)
0.10 (0.0039)
0.20 (0.0079)
0.50 (0.0197)

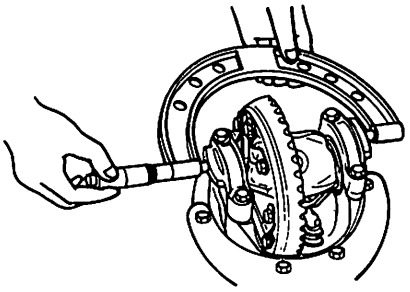
2. Fit determined side bearing adjusting shim on differential case, and press fit left and right side bearing inner races on it, using Side Bearing Drift ST33210000 and Adapter ST33052000. See Figure PD-12.
3. Install differential case assembly into gear carrier, tapping with a soft hammer.
4. Align mark on bearing cap with that on gear carrier, and install bearing cap on carrier. And tighten bolts to specified torque.

Tightening torque:
5 to 6 kg-m
(36 to 43 ft-lb)

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5. Measure "L" dimension (between left and right bearing cap edges) by a micrometer. See Figures PD-3 and PD-19.

"L" dimension:
173.23 to 173.29 mm
(6.8201 to 6.8224 in)



PD271

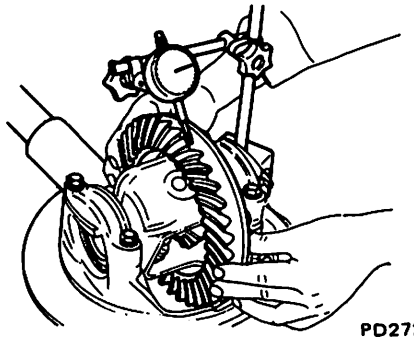
Fig. PD-19 Measuring "L" dimension

6. Measure ring gear-to-drive pinion backlash. See Figure PD-20.

If backlash is too small, decrease thickness of left shim and increase thickness of right shim by the same amount.

If backlash is too great, reverse the above procedure.

Backlash:
0.10 to 0.15 mm
(0.0039 to 0.0059 in)



PD272

Fig. PD-20 Measuring backlash

7. At the same time, check side bearing preload. Bearing preload should read 9 to 17 kg-cm (7.8 to 14.8 in-lb) of rotating torque, [2.6 to 4.9 kg (5.7 to 10.8 lb) at companion flange bolt hole].

If preload does not accord with this specification, adjust it with side bearing shims.

8. Check and adjust the tooth contact pattern of ring gear and drive pinion.

(1) Thoroughly clean ring and drive pinion gear teeth.

(2) Paint ring gear teeth lightly and evenly with a mixture of powdered red lead and oil of a suitable consistency to produce a contact pattern.

(3) Rotate pinion through several revolutions in the forward and reverse direction until a definite contact pattern is developed on ring gear.

(4) When contact pattern is in correct, readjust thickness of adjust shim.

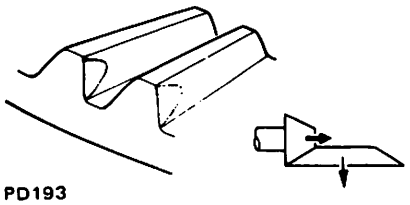
Be sure to wipe off red lead completely upon completion of adjustment.

(5) Incorrect contact pattern of teeth can be adjusted in the following manner.

Contact pattern

a. Heel contact

To correct, increase thickness of pinion height adjusting washer in order to bring drive pinion close to ring gear. See Figure PD-21.

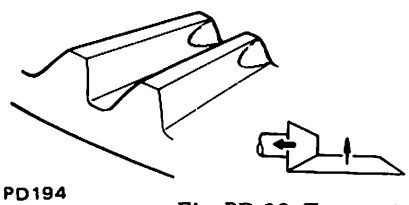


PD193

Fig. PD-21 Heel contact

b. Toe contact

To correct, reduce thickness of pinion height adjusting washer in order to make drive pinion go away from ring gear. See Figure PD-22.

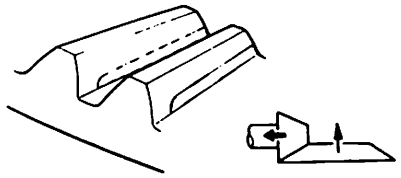


PD194

Fig. PD-22 Toe contact

c. Flank contact

Adjust in the same manner as in b. See Figure PD-23.

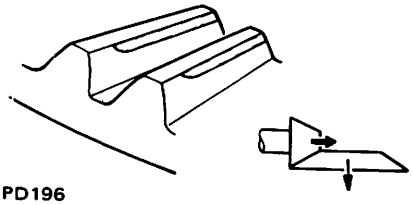


PD195

Fig. PD-23 Flank contact

d. Face contact

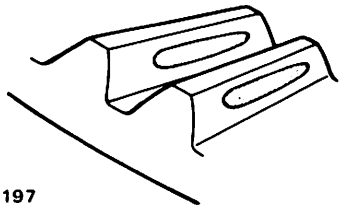
Adjust in the same manner as in a. See Figure PD-24.



PD196

Fig. PD-24 Face contact

e. Correct tooth contact



PD197

Fig. PD-25 Correct contact

Note: Change in thickness of adjusting washer is accompanied by change in backlash. Check it when installing gear.

INSTALLATION

Installing can be done in the reverse order of removal.

Tightening torque:
Gear carrier to rear axle case:
2.0 to 2.5 kg-m
(14 to 18 ft-lb)
Drain and filler plug:
4.2 to 6.9 kg-m
(30 to 50 ft-lb)

Gear oil quantity:
1.3 liters
(1 3/8 U.S.qt., 1 1/8 Imp.qt.)

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REPLACEMENT OF FRONT OIL SEAL

When replacing front oil seal, do as follows:

1. Remove differential gear carrier assembly and mount it on Gear Carrier Attachment ST06360001.

This work can be done by referring to "Removal" procedure.

2. Remove side bearing caps and take out differential case assembly. Remove drive pinion nut and extract drive pinion assembly. Remove oil seal using Gear Carrier Oil Seal Puller ST33290001. See Figure PD-26.

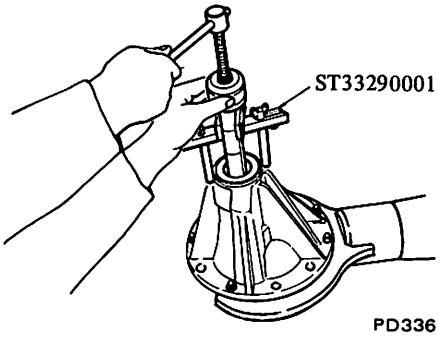


Fig. PD-26 Removing oil seal

These works can be done by referring to "Disassembly" procedure.

3. Install a new oil seal in carrier. Lubricate cavity between seal lips with recommended multi-purpose grease when installing.

4. Place a new collapsible spacer on drive pinion and lubricate pinion rear bearing with gear oil.

5. Insert companion flange into oil seal. Insert drive pinion into companion flange from the rear of the carrier and secure them in position by tightening nut to the given torque confirming specified preload.

These works can be done by referring to "Adjustment of Drive Pinion Preload" procedure.

6. Install differential case assembly into gear carrier. Measure "L" dimension, backlash with specification, adjust them with side bearing shims.

These works can be done by referring to "Adjustmen of Side Bearing Shims" procedure.

7. Reinstall differential gear carrier assembly, rear axle shafts and propeller shaft. Fill up differential carrier with correct gear oil.

Notes:

a. **Replacement of front oil seal with differential gear carrier assembly installed on the car must not be allowed due to used collapsible spacer on its model.**

b. **Whenever front oil seal is replaced, collapsible spacer must be replaced.**

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SERVICE DATA AND SPECIFICATIONS

Nominal diameter of ring gear		165B
Gear carrier material		Malleable cast-iron
Gear ratio (number of teeth)		Automatic transmission: 3.700 (37/10) Manual transmission: 3.700 (37/10)
Drive pinion preload adjusted by		Shim

Drive pinion

Preload	kg-cm (in-lb)	
(with oil seal)		7 to 10 (6.1 to 8.7)
At companion flange bolt hole	kg (lb)	
(with oil seal)		2.0 to 2.9 (4.4 to 6.4)
Thickness of pinion height adjusting washer	mm (in)	3.09 (0.1217) 3.12 (0.1228) 3.15 (0.1240) 3.18 (0.1252) 3.21 (0.1264) 3.24 (0.1276) 3.27 (0.1287) 3.30 (0.1299) 3.33 (0.1311) 3.36 (0.1323) 3.39 (0.1335) 3.42 (0.1346) 3.45 (0.1358) 3.48 (0.1370) 3.51 (0.1382) 3.54 (0.1394) 3.57 (0.1406) 3.60 (0.1417) 3.63 (0.1429) 3.66 (0.1441)
Length of pinion bearing adjusting spacer	mm (in)	Non adjustable collapsible spacer
Thickness of pinion bearing adjusting washer	mm (in)	Non adjustable collapsible spacer

Side gear and pinion mate

Thickness of side gear thrust washer	mm (in)	0.785 (0.0309) 0.835 (0.0329) 0.885 (0.0348) 1.035 (0.0407) 1.185 (0.0467)
Pinion mate-to-side gear backlash (or clearance between side gear and thrust washer)	mm (in)	0.1 to 0.2 (0.0039 to 0.0079)

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Ring gear		
Ring gear-to-drive pinion backlash	mm (in)	0.10 to 0.15 (0.0039 to 0.0059)
Runout of back side of ring gear	mm (in)	Less than 0.05 (0.0020)
Thickness of side bearing adjusting shim	mm (in)	0.05 (0.0020)
		0.07 (0.0028)
		0.10 (0.0039)
		0.20 (0.0079)
		0.50 (0.0197)
Side bearing standard with	mm (in)	18.5 (0.7283)
"L" dimension	mm (in)	173.23 to 173.29 (6.8201 to 6.8224)

Tightening torque	**kg-m (ft-lb)**	
Drive pinion nut		14 to 17 (101 to 123)
Ring gear bolt		7 to 8 (51 to 58)
Side bearing cap bolt		5 to 6 (36 to 43)
Differential carrier to axle case fit bolt		2.0 to 2.5 (14 to 18)
Companion flange to propeller shaft fix bolt		2.4 to 3.3 (17 to 24)
Oil drain and filler plug		4.2 to 6.9 (30 to 50)
Oil capacity (about)	liters	1.3 (1⅜ U.S. qt., 1⅛ Imp. qt.)

Adjusting methods	
Variable numbers expressed by	mm (x 0.01)
Dummy shaft	Use
Drive pinion adjusting formula	$T = N - [(H - D' - S) \times 0.01] + 2.98$
Side bearing adjusting formula	$T_1 = (A - C + D - H') \times 0.01 + 0.20 + E$
	$T_2 = (B - D + H') \times 0.01 + 0.09 + F$

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TROUBLE DIAGNOSES AND CORRECTIONS

When a gear carrier is suspected of being noisy, it is advisable to make a thorough test to determine whether the noise originates in the tires, road surface, exhaust, universal joint, propeller shaft, wheel bearings, engine, transmission, or gear carrier. Noise which originates in these places cannot be corrected by adjustment or replacement of parts in the rear axle assembly.

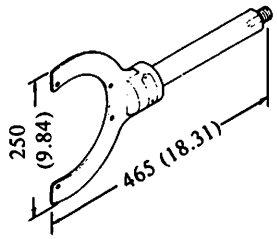
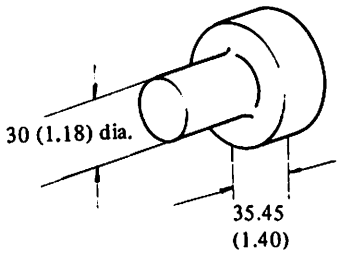
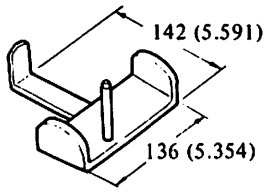
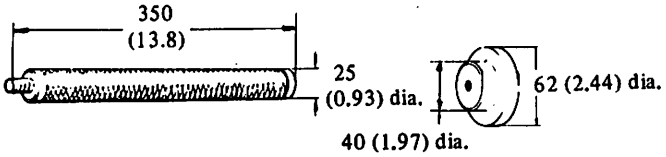
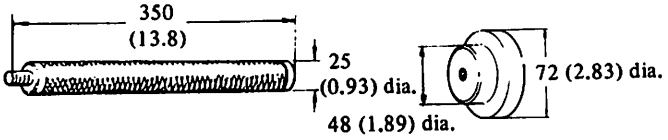
Condition	Probable cause	Corrective action
Noise on drive, coast and float.	Shortage of oil.	Supply gear oil. Rebuild gear carrier if necessary.
	Incorrect tooth contact between ring gear and drive pinion.	Adjust tooth contact or replace the hypoid gear set.
	Incorrect ring gear-to-drive pinion backlash.	Adjust backlash or replace the hypoid gear set if necessary.
	Seized or damaged ring gear and drive pinion.	Replace the hypoid gear set.
	Seized, damaged or broken drive pinion bearing.	Replace the pinion bearing and defective parts.
	Seized, damaged or broken side bearing.	Replace the side bearing and defective parts.
	Loose clamp bolts or nuts holding ring gear, side retainers, bearing cap, etc.	Clamp them to specified torque, and replace defective parts.
Noise on turn.	Seized, damaged or broken side and pinion gear.	Replace defective parts.
	Seized, damaged or broken side gear and pinion thrust washer.	Replace defective parts.
	Pinion gears too tight on their shaft.	Replace defective parts.
Knocking sound during starting or gear shifting.	Excessive backlash.	
	Incorrect backlash ring gear-to-drive pinion, or side-to-pinion gear.	Adjust backlash.
	Worn gears or case.	Replace worn parts.
	Worn side flange (or rear axle shaft) and side gear spline.	Replace worn parts.
	Pinion bearing under preload.	Adjust preload.
	Loose drive pinion nut.	Repair or replace.
	Loose clamp bolts or nuts holding ring gear, side retainers, bearing cap, etc.	Clamp them or replace if necessary.

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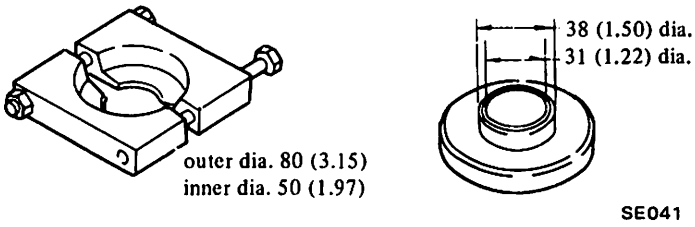
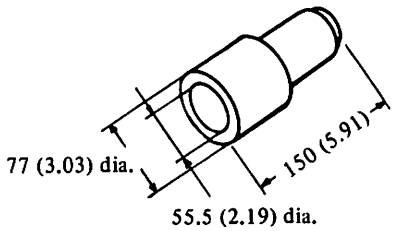
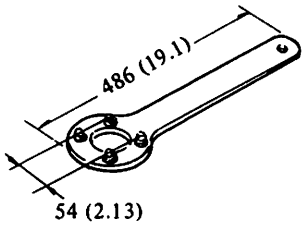
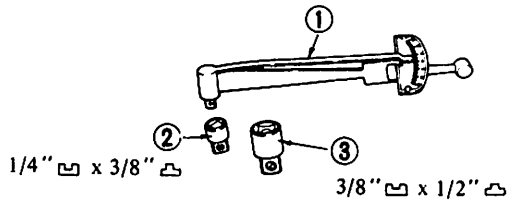
Condition	Probable cause	Corrective action
Seizure of breakage.	Shortage of oil or use of unsuitable oil.	Replace defective parts.
	Excessively small backlash.	Adjust backlash and replace as required.
	Incorrect adjustment of bearings or gears.	Replace defective parts.
	Severe service due to an excessive loading, improper use of clutch.	Replace defective parts.
	Loose bolts and nuts, such as ring gear clamp bolts.	Replace defective parts.
Oil leakage.	Worn-out, damaged or improperly driven front oil seal, or bruised, dented or abnormally worn slide face of companion flange.	Replace the defective oil seal. Repair the affected flange with sandpaper or replace if necessary.
	Worn, damaged or improperly driven side flange oil seal, or bruised, dented or abnormally worn slide face of side flange.	Treat as above.
	Loose bolts such as side flange, side retainer or gear carrier.	Tighten the bolts to specified torque.
	Defective gasket or O-ring.	Replace defective parts with new ones.
	Loose filler or drain plug.	Tighten the plug.
	Clogged or damaged breather.	Repair or replace.

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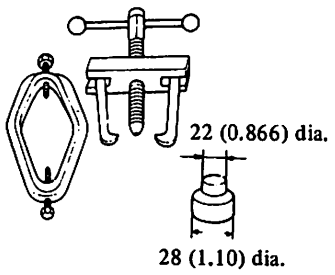
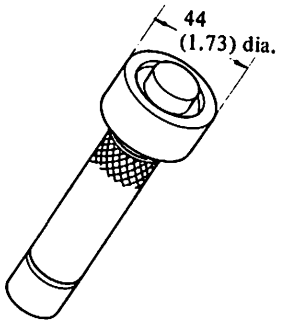
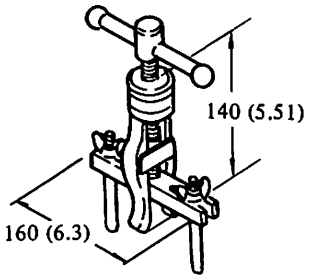
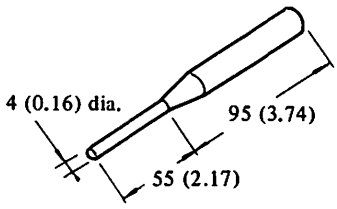
SPECIAL SERVICE TOOLS

No.	Tool number & tool name	Description Unit: mm (in)	For use on	Reference page or Figure No.
1.	ST06360001 Diff. attachment (H165)	This tool is used for attaching gear carrier to ease disassembly or assembly (ST0501S000).  SE206	710 W610	Fig. PD-4 Page PD-13
2.	ST3114S000 Drive pinion setting gauge assembly (H165) ST31942000 Dummy shaft ST31141000 Height gauge	These tools are used to adjust the pinion height.  SE209  SE210	710 W610	Fig. PD-13 Fig. PD-14
3.	Drive pinion outer race drift ST30611000 Bar ST30612000 Adapter	 	(Front) 710 610 W610 V610 S30 620	Page PD-9
	ST30611000 Bar ST30613000 Adapter	 	(Rear) 710 610 W610 620	

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No.	Tool number & tool name	Description Unit: mm (in)	For use on	Reference page or Figure No.
4.	ST3003S000 Drive pinion rear inner bearing puller assembly ST30031000 Puller ST30032000 Base	This assembly clamps rear bearing inner race and pulls it out by a hydraulic press. Before insertion, place another drift facing inner race, and then press fit. 	710 610 W610 620	Page PD-7 Fig. PD-7 Page PD-10
5.	ST30720000 Gear carrier front oil seal drift	This tool is used to drive in front oil seal without damaging it. 	710 610 W610 S30 620	
6.	ST31530000 Drive pinion flange wrench	This tool is used to hold the flange to ease the operation of tightening and loosening drive pinion nut. 	710 610 W610 S30 620	Page PD-10 Fig. PD-6 Page PD-7
7.	ST3127S000 Preload gauge 1 GG91030000 Torque wrench 2 HT62940000 Socket adapter 3 HT62900000 Socket adapter	This tool is used to measure the preload of pinion bearing. 	All models	Fig. PD-16

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No.	Tool number & tool name	Description Unit: mm (in)	For use on	Reference page or Figure No.
8.	ST3305S001 Diff. side bearing puller ST33051001 Body ST33052000 Adapter	This tool is used to pull out side bearing.  	710 W610 B210	Page PD-7 Fig. PD-9 Fig. PD-12 Page PD-11
9.	ST33210000 Diff. side bearing drift	Use of this tool makes it possible to drive in bearing without damaging it.  	710 W610	Page PD-9 Fig. PD-12 Page PD-11
10.	ST33290001 Gear carrier oil seal puller	This tool is used to pull out oil seal from gear carrier. This tool also enables to remove side bearing outer race from retainer without damaging.  	All models	Fig. PD-26
11.	ST23510000 Solid punch	This tool is used to drive out lock pin of pinion mate shaft.  	710 610 W610 V610 C110 GC110 VC110 230 S30 C130 KC130 620	Page PD-8 Fig. PD-10

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SERVICE MANUAL

DATSUN 710
MODEL 710 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION FA

FRONT AXLE AND FRONT SUSPENSION

FA

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INSPECTION AND ADJUSTMENT ..... FA- 3
FRONT AXLE ..... FA- 5
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DESCRIPTION

All models employ a strut type front suspension in which the shock absorber and spindle are assembled into a single unit. It is supported by a coil spring at the top and by the transverse link at the bottom.

The spindle and outer casing are of an integral design. The ball joint, located at the outer end of the transverse link, serves as a pivot for the movement of the spindle.

These are assembled on the suspension member through a rubber bushing to avoid metal to metal contact.

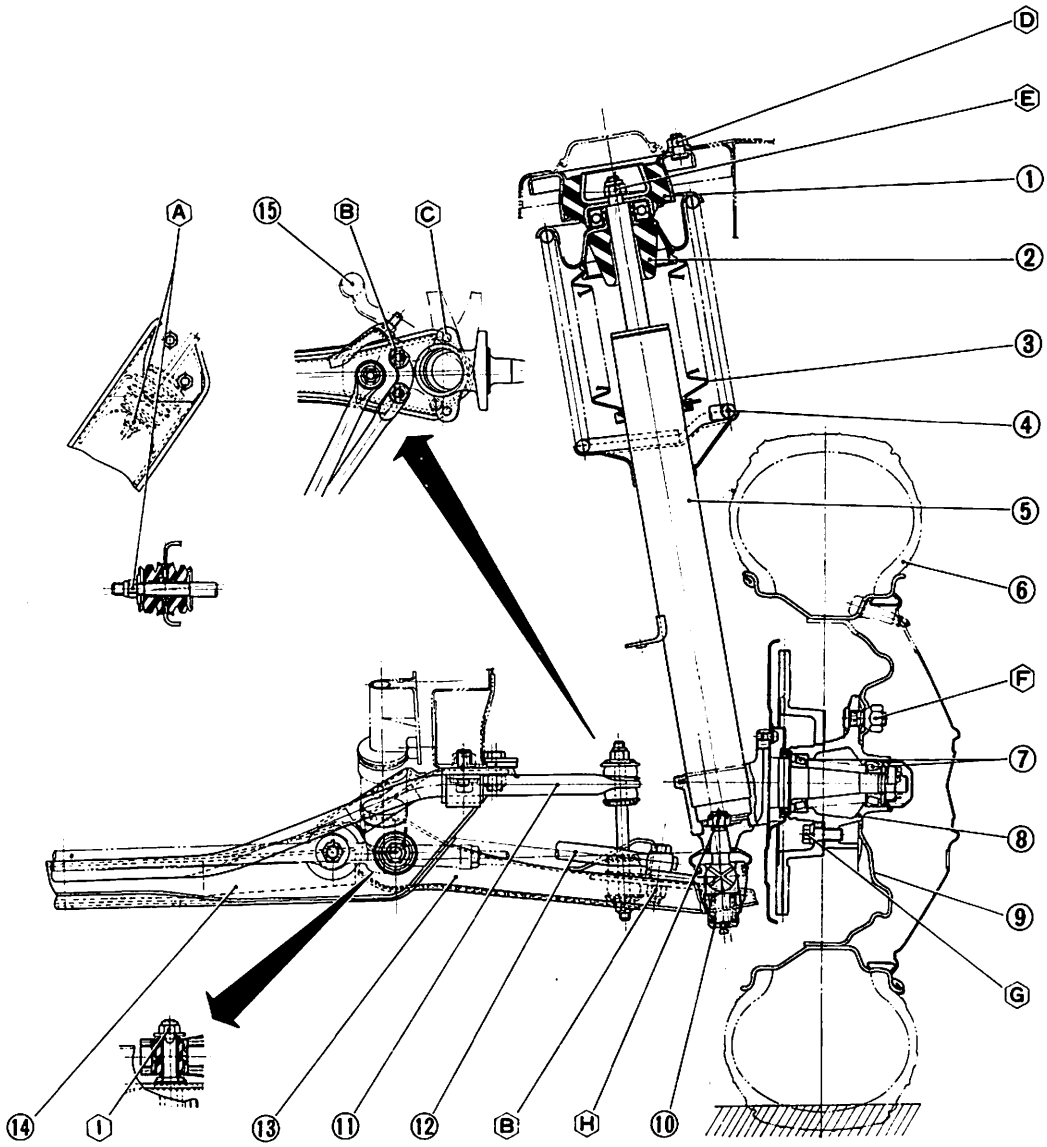
The shock absorber is basically a double-acting hydraulic ram consisting mainly of an outer casing, an inner casing, a piston and a piston rod.

The gland packing and piston guide keep the rod in place as well as prevent leakage.

The coil spring is placed on the piston rod with its seat on the bottom.

The seat is welded to the outer casing. These are mounted on the chassis frame through the thrust bearing at the top. The transverse link, tension rod and rubber bushing take thrusts from front and rear.

The stabilizer uses a torsion bar; it takes thrusts from either side of the car. Thus, the entire suspension handles thrusts from any angle: i.e. those from front and rear by the tension rod, those in a vertical direction with the strut, and those from either side of the car by means of the transverse link.



1 Strut mounting insulator
2 Bound bumper rubber
3 Dust cover
4 Coil spring
5 Strut assembly
6 Tire
7 Wheel bearing
8 Wheel hub
9 Road wheel
10 Suspention ball joint
11 Stabilizer bar
12 Tension rod
13 Transverse link
14 Side member

Tightening torque (T) of bolts and nuts kg-m (ft-lb)
Ⓐ T : 5 to 5.5 (36 to 40)
Ⓑ T : 4.9 to 6.3 (35 to 46)
Ⓒ T : 1.9 to 2.5 (14 to 18)
Ⓓ T : 2.5 to 3.5 (18 to 25)
Ⓔ T : 6.0 to 7.5 (43 to 54)
Ⓕ T : 8 to 9 (58 to 65)
Ⓖ T : 3.9 to 5.3 (28 to 38)
Ⓗ T : 5.5 to 7.6 (40 to 55)
Ⓘ T : 9.0 to 10.0 (65 to 72)

FA450

Fig. FA-1 Front axle and suspension assembly

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INSPECTION AND ADJUSTMENT

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INSPECTION FA-3
SUSPENSION PARTS FA-3
ADJUSTMENT FA-3
WHEEL BEARING FA-3
WHEEL ALIGNMENT FA-4
CAR LEVEL FA-4

INSPECTION

Periodically inspect in accordance with a regular maintenance schedule.

SUSPENSION PARTS

1. Jack up the front of car until front wheels clear the floor.
2. Shaking each front wheel by grasping the upper and lower surfaces of the tire, check suspension parts for looseness, wear, or damage. Tighten all loose bolts and nuts to the specified torque. Replace all worn parts as described under "Front Suspension".
3. Check wheel bearings. If any axial end-play is present, adjust bearings to specifications. Replace worn or damaged bearings as described under "Front Axle".
4. Check the shock absorbers assembled into strut. If these are not in good condition, car posture and wheel alignment may be affected.

ADJUSTMENT

WHEEL BEARING

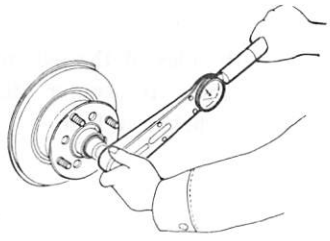
Improper adjustment of wheel bearings causes abnormal wear and score on the bearings and knuckle spindle.

To obtain proper preload on wheel bearings, proceed as follows:

Note: **In order to assure correct bearing preload and to extend service life of wheel bearings, be sure to prevent dirt and foreign particles from getting in bearings, grease seal and spindle nut.**

1. Jack up and support car on the stands at the side member in a safe manner, and remove wheel, hub cap, cotter pin and brake pads. Refer to Section BR for "Pad Replacement".
2. Tighten spindle nut to specifications, using a suitable torque wrench.

Tightening torque:
2.5 to 3.0 kg-m (18 to 22 ft-lb)



FA263

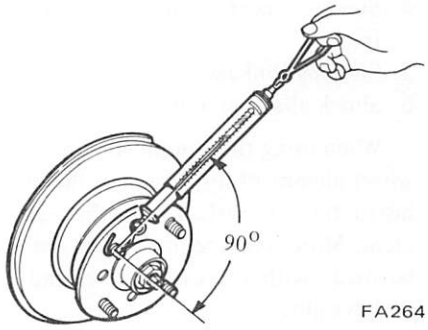
Fig. FA-2 Tightening spindle nut

3. Rotate wheel hub a few turns in both directions to seat wheel bearing correctly. Then, retighten spindle nut to the above torque.
4. Loosen spindle nut 60 degrees.

Install adjusting cap and tighten within 15 degrees until grooves are aligned with hole in spindle.

5. Again spin wheel hub several turns in both directions to see if it rotates freely. Then, measure bearing preload using a spring balance as follows:

Rotation starting torque
of wheel bearing:
New parts
8.5 kg-cm (118 in-oz) or less
As measured at wheel hub bolt
1.49 kg (3.3 lb) or less
Adjustment with old parts
4.5 kg-cm (63 in-oz)
As measured at wheel hub bolt
0.79 kg (1.7 lb)



FA264

Fig. FA-3 Measuring bearing preload

Repeat above procedures until correct preload is obtained.

Notes:

a. **To measure bearing preload, attach a spring balance to hub bolt and pull it at right angle to a line drawn through center of bearing and hub bolt to which it is attached.**
b. **The slightest shaft play cannot be tolerated here.**

6. Insert a new cotter pin with the legs through adjusting cap and spindle, spread legs away from each other against sides of adjusting cap to secure the installation. See Figure FA-4.



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Fig. FA-4 Installing cotter pin

7. Install hub cap.

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WHEEL ALIGNMENT

Correct front wheel alignment assures proper vehicle handling characteristics and minimum steering effort with the least amount of tire wear.

Before adjusting front wheel alignment, be-sure to carry out a preliminary inspection of the front end parts as follows:

1. Tire pressure
2. Wheel bearings and spindle nuts
3 Steering gear play
4. Steering gear housing (loose at frame.)
5. Steering linkage and connections
6. Shock absorber action

When using the equipment for front wheel alignment inspection, follow the instructions furnished with the equipment. Moreover, the inspection should be made with the car set level and at curb weight.

Camber and caster

Camber and caster are preset at factory and cannot be adjusted.

Car requires only toe-in and leveling adjustments.

Toe-in

Measure toe-in and adjust if necessary. For adjustment, proceed as follows:

1. Turn steering wheel so that front wheels are pointed straight ahead. Then, check that steering gear is in straight ahead position.
2. The length of side adjusting rod (marked with an arrow) should be adjusted to specification by turning both side adjusting rods. See Figure FA-5.

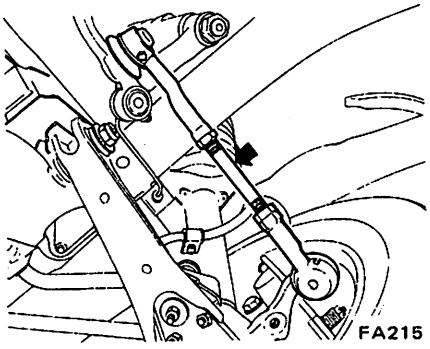


Fig. FA-5 Adjusting toe-in

Note: Both sides of the side rod ball joint center to center distances should be balanced first.

Steering angle

Check steering angle using the following procedures if necessary.

1. Place front wheels on turn table.
2. Turn adjusting bolts (indicated by arrow) in or out as required until correct turning angle is obtained. See Figure FA-6.
3. Put nylon cap on adjusting bolt.

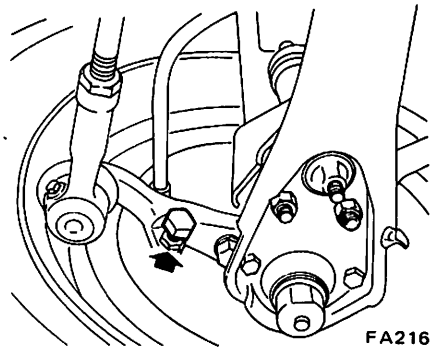


Fig. FA-6 Adjusting steering angle

Steering angle

Inner wheel	32° to 33°
Outer wheel	29°30′ to 31°30′

CAR LEVEL

Adjustment can be made by selecting spring which will keep car in a normal, level position.

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FRONT AXLE

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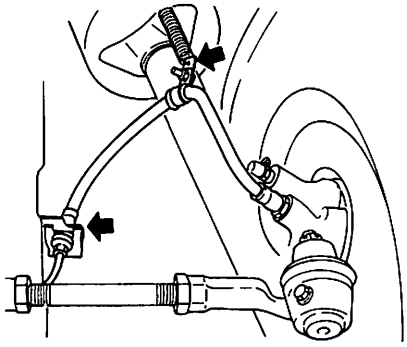
FRONT AXLE FA-5
REMOVAL FA-5
INSPECTION FA-5
INSTALLATION FA-8

FRONT AXLE

REMOVAL

1. Jack up car until wheel drops to full down position; remove wheel.
2. Remove flare nut connecting brake hose to brake tube on car frame; take out brake hose lock spring, and remove hanger spring from bracket attached to brake hose.

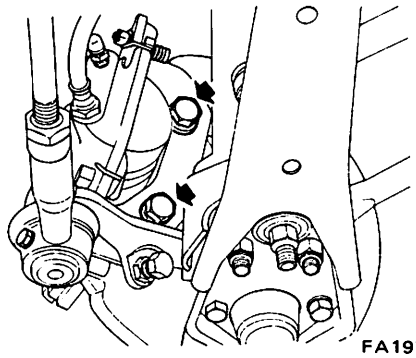
Take out brake hose in the order listed. See Figure FA-7.



FA335

Fig. FA-7 Removing brake hose

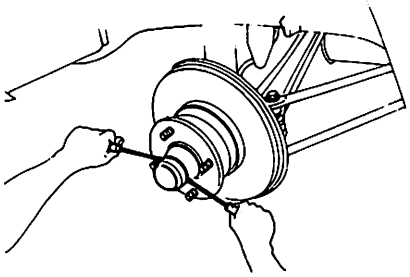
3. Remove bolts retaining brake caliper and take out caliper assembly. See Figure FA-8.



FA197

Fig. FA-8 Removing brake caliper installation bolts

4. Work off hub cap from end of spindle using two screwdrivers or any other suitable tool as shown in Figure FA-9. If necessary, tap around it with a soft hammer while removing cap.

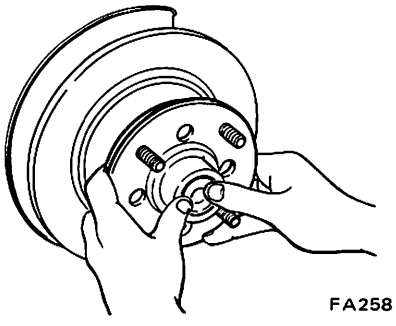


FA038

Fig. FA-9 Removing hub cap

Note: During this operation, use caution to avoid damaging O-ring.

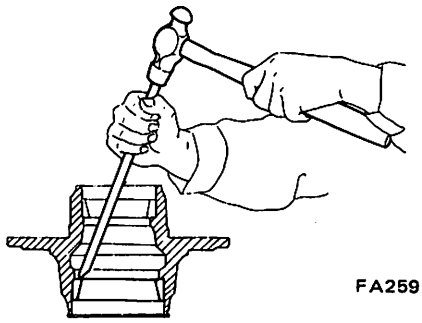
5. Pry off cotter pin; take out adjusting cap and wheel bearing lock nut.
6. Remove wheel hub from spindle with bearing installed.
7. Wheel hub may be removed together with disc rotor.



FA258

Fig. FA-10 Removing wheel hub

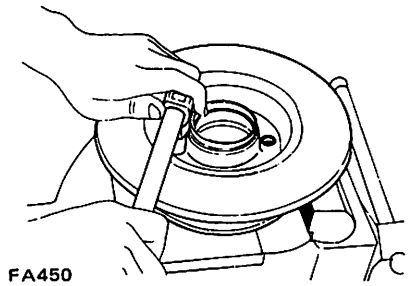
8. Utilizing two grooves inside hub, drive out wheel bearing outer race from hub with a brass drift.



FA259

Fig. FA-11 Removing wheel bearing outer race

9. Loosen four bolts securing brake disc in position; remove disc brake rotor from wheel hub assembly.



FA450

Fig. FA-12 Removing disc brake rotor

10. Loosen screws securing baffle plate in position; take out baffle plate.

INSPECTION

Wheel hub

Check hub for cracks by means of a magnetic exploration or dyeing test, and replace if cracked.

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Grease seal

If grease leakage is detected during removal, replace seal.

Replace grease seal every disassembly even if it appears good.

Wheel bearing

Thoroughly clean grease and dirt from wheel bearing with cleaning solvent, and dry with compressed air free of moisture. Check wheel bearing to see that it rolls freely and is free from noise, crack, pitting, or wear. Also, check condition of outer race. Removal of outer race from hub is not necessary.

Note below chart: "Visual Serviceability Standard for Wheel Bearing".

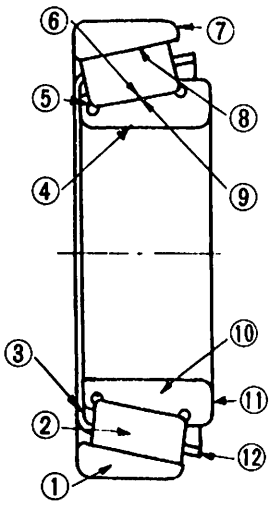


Fig. FA-13 Wheel bearing

Judgement	X : Unserviceable △ : May be used when minor * : Rust should be removed with # 0 emery paper			
Components	Race and roller		Retainer	Cause
	Rolling surface	Fitted surface		
Flaking (Fig. FA-14.a,b)	X			Shortened service life due to rolling fatigue. Occurring before normal end of service life, probable causes are: • Abnormal load (overload). • Improper handling or installing.
Crack (Fig. FA-14.c,d)	X	X	X	• Excessive tightening. • Excessive gap coupled with substantial external shock. • Rapid heat generation on the race due to creep. • Bitten supporter with seized rollers. • Abnormal thrust load. • Tapped with a hammer while being removed.
Seizure	X	X	X	In the most cases, seizure occurs as a result of progressive discoloring or flaking.
Scratch	△	△	△	• Shock resulting from careless installation. • Foreign matter.
Recess or wear made by pressing or striking (Fig. FA-14.e,f,g)	△	△	△	• Careless installation, removal, or other rough handling (scar due to striking). • Recess made by foreign matter.

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Judgement	X : Unserviceable △ : May be used when minor * : Rust should be removed with # 0 emery paper			
Components	Race and roller		Retainer	Cause
	Rolling surface	Fitted surface		
Wear	△	△	△	• Poor lubricant quality or deteriorated lubricant. • Intrusion of dust. Fitted surface worn excessively. • Wear due to excessive preliminary pressure.
Bite	△	△	△	• Excessive preliminary pressure or faulty lubrication.
Fretting	△ *	△ *	△ *	• The fitted part is discolored to brown or black. • Fretting corrosion (rust on fitted part) means fine relative slip on metal contact surface.
Rust (Fig. FA-14.h)	△ *	△ *	△ *	• Temperature increased during operation decreases when the bearing stops, moisture inside the bearing is condensed, becoming fine drops, and the grease is moistened. • The bearing has been placed in highly moistened place for a long period of time. • Intrusion of moisture, chemicals, etc., or the bearing is touched with bare hand and no rustproof action has been taken.
Discoloring	The wheel bearing is serviceable if discoloring can be removed with solvent or by polishing.			• Slight discoloring may look like oxidized oil stain due to grease. • In the most cases, this occurs when preliminary pressure is too high.

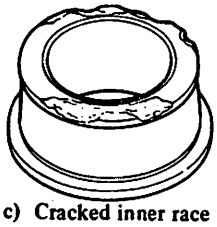
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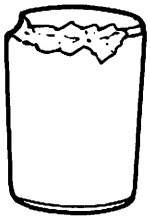
a) Inner race flaking



b) Roller flaking



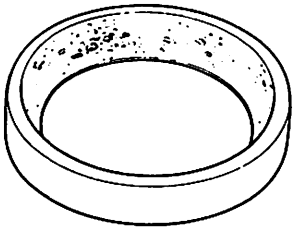
c) Cracked inner race



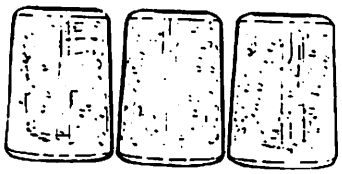
d) Cracked roller



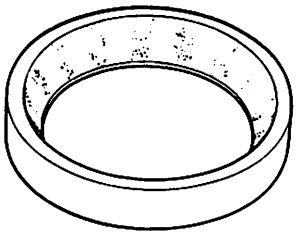
e) Recess on inner race



f) Recess on outer race



g) Recess on roller



h) Rust on outer race

FA267

Fig. FA-14 Bearing's appearance

INSTALLATION

Install front axle in the reverse order of removal, noting the following:

1. Install baffle plate to knuckle spindle, tighten screws to 3.9 to 5.3 kg-m (28 to 38 ft-lb).
2. Install disc brake rotor to wheel hub, tighten to 3.9 to 5.3 kg-m (28 to 38 ft-lb).
3. Install bearing outer race by tapping its outer periphery with a mallet, or using Front Wheel Bearing Drift ST35300000, until it is bottomed in hub.
4. Pack the inside of hub and hub cap with recommended multi-purpose grease to the described level. See Figure FA-15.

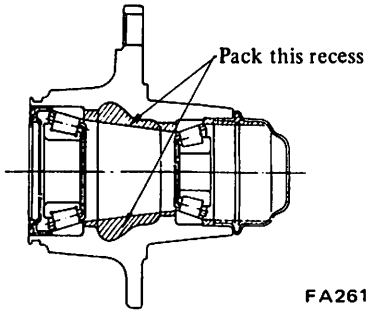


Fig. FA-15 Lubricating points of wheel hub

5. Pack cavities of each bearing cone with grease.



Fig. FA-16 Filling bearing cone with grease

6. Put inner bearing cone in hub and install a new grease seal. Be sure to lubricate sealing lips of the grease seal before installation.
7. Put hub assembly on spindle and then install outer bearing cone.
8. Apply sparingly grease to washer and threaded parts of spindle and spindle nut. Then, install washer and spindle nut. Adjust the installation as outlined under "Wheel Bearing Adjustment".

Note: In order to assure correct bearing preload and to extend service life of wheel bearings, be sure to avoid dirt and foreign particles getting in bearings, grease seal, washer and spindle nut.

9. After lowering car to the ground, tighten wheel nut, bleed brake.

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FRONT SUSPENSION

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SPRING AND STRUT ASSEMBLY

DESCRIPTION

The front suspension employs struts right and left. Each strut consists of an outer casing, a piston, a piston rod and an inner cylinder.

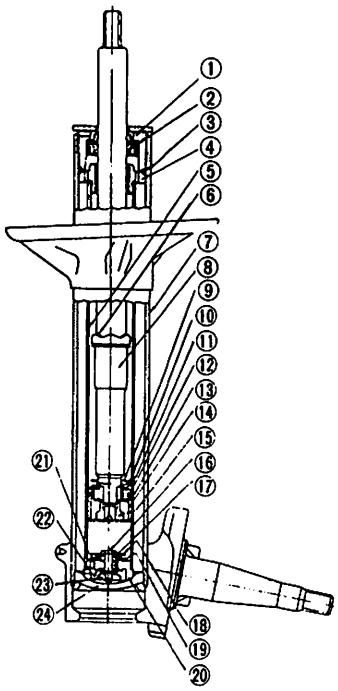
The cylinder incorporates a piston rod guide at the top and a check valve at the bottom.

The piston rod, piston rod guide, cylinder and bottom valve should be handled as a matched set.

If any of these parts becomes defective, all the parts must be replaced as a unit.

The spring comes in seven types with individual markings.

When a spring requires replacement, use the one having the same color identification. If this is not done, the car may not settle in a normal level posture.



1 Gland packing assembly
2 Oil seal
3 O-ring
4 Piston rod guide assembly
5 Cylinder
6 Rebound stopper
7 Strut-outer casing
8 Piston rod
9 Check valve spring retainer
10 Check valve spring
11 Check valve plate
12 Piston ring
13 Valve plate
14 Piston body
15 Nut
16 Bolt
17 Distance collar
18 Spring retainer
19 Check valve spring
20 Bottom valve body
21 Check valve plate
22 Valve plate
23 Nut
24 Bottom plate

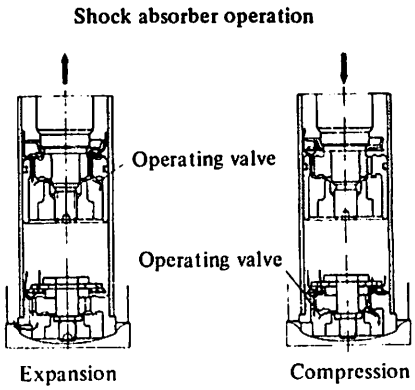


Fig. FA-17 Sectional view of strut assembly

REMOVAL

1. Jack up car and support it with safety stands. Remove wheel.
2. Loosen flare nut connecting brake hose to brake tube on car frame. See Figure FA-7. Take out brake hose locking spring and plate. Separate brake hose from brake tube.

Remove hanger spring from bracket attached brake hose.

3. Loosen flare nut securing brake tube to cylinder and then separate from brake cylinder.
4. Loosen bolts retaining caliper in place; take out caliper as an assembled unit.
5. Remove bolts connecting strut to knuckle arm. See Figure FA-18.

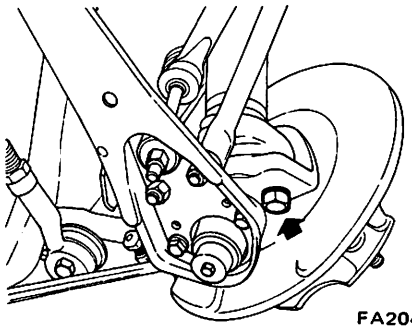
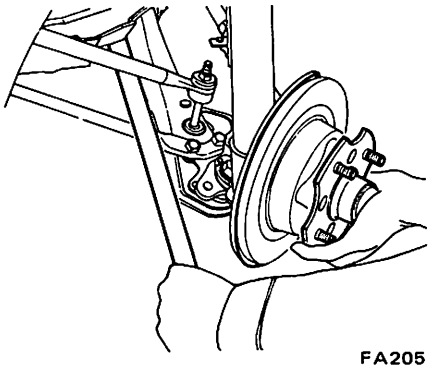


Fig. FA-18 Removing bolts connecting knuckle arm

6. Detach knuckle arm from bottom of strut. This can be done by forcing transverse link down with a suitable bar as shown in Figure FA-19.

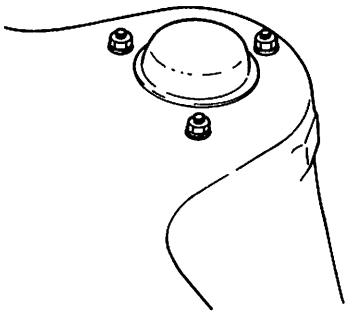
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FA205

Fig. FA-19 Removing knuckle arm

7. Place jack under strut to receive its weight when nuts are removed.
8. Lift engine hood to gain access to nuts holding strut in place on car body. See Figure FA-20.



FA451

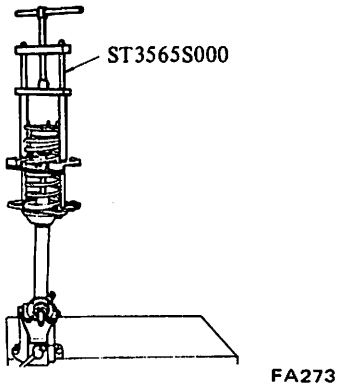
Fig. FA-20 Removing strut holding nuts

9. With springs attached, lower jack slowly while holding strut by hand; take out strut.

DISASSEMBLY

When disassembling a strut, caution should be exercised to prevent dirt and dust from getting inside strut. This dirt and dust is extremely abrasive and, if permitted to enter strut, causes internal leaks and premature wear of moving parts.

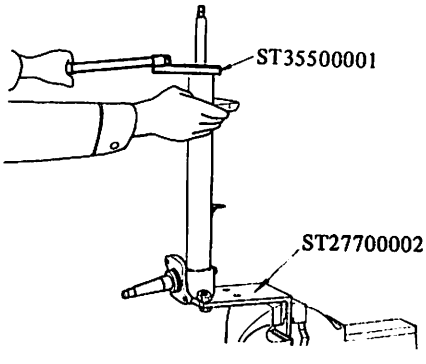
1. Install Strut & Steering Gear Housing Attachment ST27700002 on bottom of strut; secure above assembly in jaws of a suitable vise. See Figure FA-22.
2. Pry snap ring off dust cover.
3. Set up Spring Compressor ST3565S000 on spring. Compress spring just far enough to permit turning of strut insulator by hand. Remove self-locking nut. See Figure FA-21.



FA273

Fig. FA-21 Installing strut in vise

4. Take out strut insulator, strut bearing, oil seal, upper spring seat and bound bumper rubber in the order listed.
5. Remove spring from strut with Spring Compressor ST3565S000 left on spring.
6. Retract piston rod by pushing it down until it bottoms. Without disturbing the above setting, remove gland packing with Gland Packing Wrench ST35500001. See Figure FA-22.

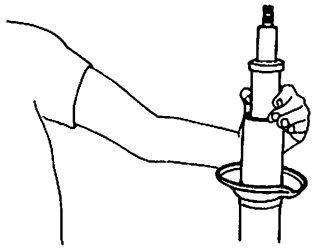


FA274

Fig. FA-22 Removing gland packing

Note: Clean gland packing of mud and other accumulated foreign particles.

7. Remove O-ring from top of piston rod guide.
8. Lift out piston rod together with cylinder. See Figure FA-23.



FA275

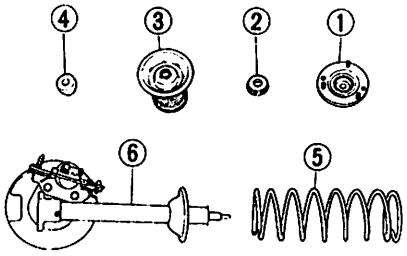
Fig. FA-23 Removing piston rod and cylinder

Note: Under no circumstances should piston and piston rod guide be removed from cylinder since these are adjusted to each other to provide precision mating surfaces and should be handled as a matched set.

9. Drain fluid thoroughly from inner cylinder. Use a suitable container to receive fluid drained.
10. Wash all metallic parts in cleaning solvent.
11. Drain fluid which collects inside outer casing thoroughly.

Note: This operation is very important since performance of strut varies with amount of fluid initially filled.

INSPECTION



1 Strut mounting insulator
2 Bearing
3 Spring upper seat and dust cover
4 Damper rubber
5 Coil spring
6 Strut assembly

FA337

Fig. FA-24 Exploded view of spring and strut assembly

1. Replace gland packing, O-ring and fluid with new ones or fresh oil whenever strut is disassembled.
2. Wash all parts, except for nonmetalic parts, with solvent and dry with compressed air.
3. Blow dirt and dust off of nonmetalic parts using compressed air.

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(1) Outer casing

Check outer casing for evidence of deformation, cracking or other damage. If necessary, replace.

(2) Spindle

Check spindle for hair cracks on base and damaged threads. Replace strut if any of above conditions exceed limits.

(3) Strut mounting insulator

Replace if rubber and metal joints are melted or cracked. Rubber parts should be replaced if deteriorated.

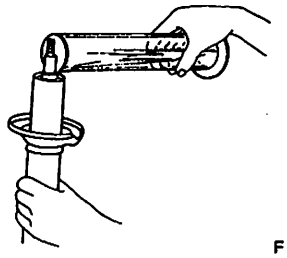
(4) Strut mounting bearing

Replace if inspection reveals abnormal noise or excessive rattle in axial direction.

ASSEMBLY

When assembling strut, be careful not to drop or scratch parts since they are precisely machined to very close tolerances. Before assembly, clean away all dirt to prevent any possible entry of dirt into strut.

1. Set Steering Gear Housing Attachment ST27710002 in place on bottom of strut and place attachment in jaws of a suitable vise.
2. Install piston rod and cylinder into place in outer casing.
3. Pour correct amount of fluid into outer casing. See Figure FA-25.



FA330

Fig. FA-25 Filling outer casing with fluid

Note: It is important that correct amount of fluid be poured into strut to assure correct damping force of shock absorber.

Amount of oil:
325 cc (19.83 cu in) for AMPCO (ATSUGI) make
332 cc (20.26 cu in) for K.Y.B. (KAYABA) make

4. Place rod guide on top of piston rod guide.

Lubricate sealing lip, asterisked in Figure FA-26, with recommended multi-purpose grease.

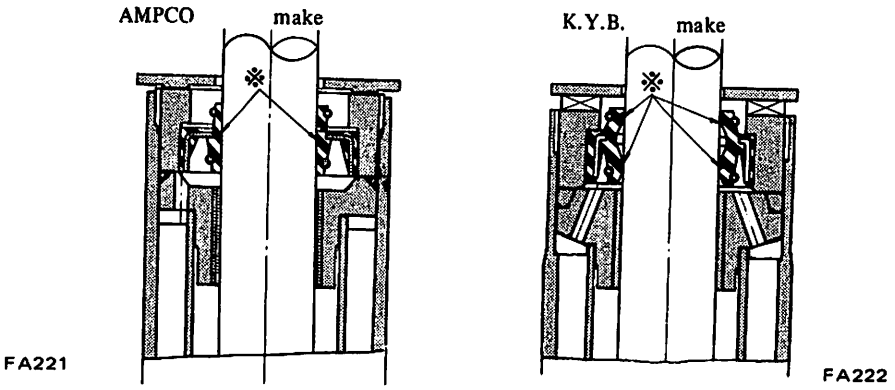


Fig. FA-26 Sectional view of gland packing

5. Tighten gland packing to 7 to 13 kg-m (51 to 94 ft-lb) torque. See Figure FA-27.

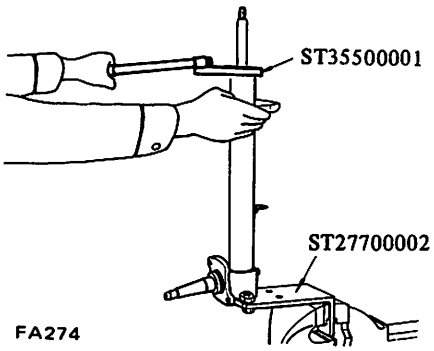


Fig. FA-27 Tightening gland packing

Notes:

a. **When tightening gland packing, it is important that piston rod be extended approximately 120 mm (4.724 in) from end of outer casing to expel most of air out of strut.**

b. **Gland packing should be tightened to 7.0 to 13.0 kg-m (51 to 94 ft-lb) torque with the aid of Gland Packing Wrench ST35500001. When doing so, the amount of torque to be read beneath wrench needle should be modified according to the following formula:**

$$C\ \text{kg-m} = 7 \times \left(\frac{\ell}{\ell + 0.1}\right) \text{ or}$$

$$C\ \text{ft-lb} = 51 \times \left(\frac{\ell}{\ell + 0.33}\right)$$

Where,
C ..Value read on the torque wrench [kg-m (ft-lb)]
ℓ..Effective length of torque wrench [m (ft)]

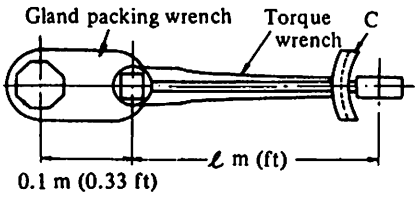


Fig. FA-28 Gland packing wrench

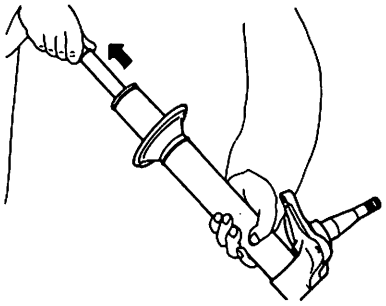
6. After the above steps have been completed, air should be removed from shock absorber system in the following manner.

(1) Hold strut by hand with its spindle end facing down; without disturbing the above setting, pull out piston rod completely. Then, turn strut upside down so that spindle end is now facing up. Under this condition, retract piston rod all the way. See Figure FA-29.

(2) Repeat the above procedure several times so that air will be completely bled from strut.

(3) If, during the above step, an equal pressure is felt through the hand gripping piston rod on both strokes, it is an indication that air has been completely expelled from strut.

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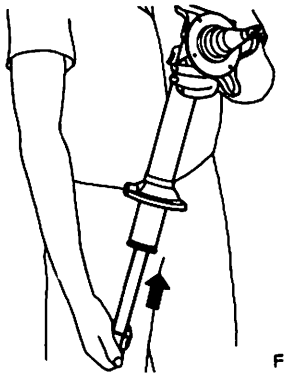


Fig. FA-29 Bleeding air from strut

7. Place Strut & Steering Gear Housing Attachment ST27710002 in jaws of a vise.
8. Before proceeding any further, pull piston rod all the way out to the limit of its stroke; install bound bumper rubber to prevent piston rod from falling by its own weight.
9. Place front spring on lower spring seat and compress spring with Spring Compressor ST3565S000.

Install dust cover, upper spring seat, mounting bearing and insulator in the order listed.

10. Lubricate parts, indicated by arrow in Figure FA-30, with recommended multi-purpose grease.

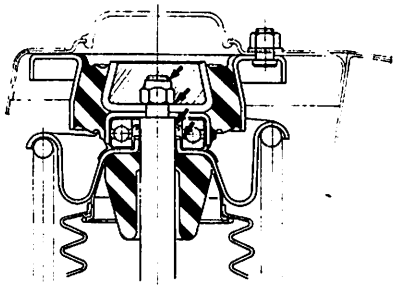


Fig. FA-30 Greasing mounting bearing and oil seal

Notes:

a. **Use care to avoid damaging piston rod during disassembly and assembly. Do not use pliers or the like to extract piston rod.**
b. **Install mounting bearing so that it points in correct direction. See Figure FA-30.**

11. Tighten piston rod self-locking nut to 6 to 7.5 kg-m (43 to 54 ft-lb) torque.
12. After placing spring in position (Figure FA-31) between upper and lower spring seats, release compressor gradually.

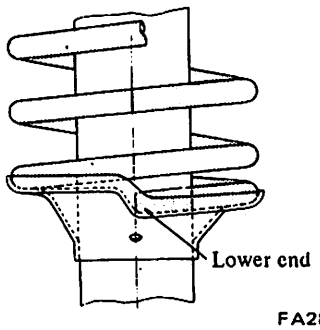


Fig. FA-31 Installing front spring

13. Raise bound bumper rubber to upper spring seat.

INSTALLATION

Install the strut and spring assembly in the reverse order of removal, noting the following:

Tightening torque:

Strut to body nuts
2.5 to 3.5 kg-m (18 to 25 ft-lb)

Steering knuckle arm to strut
7.3 to 9.9 kg-m (53 to 72 ft-lb)

Notes:

a. **Replace self-locking nuts whenever strut is disassembled.**
b. **Make sure brake hose is secure and not twisted.**
c. **When installing steering knuckle arm to the bottom of strut assembly, apply the suitable sealing material to the portion indicated in Figure FA-32 so as to prevent ball stud from rust.**

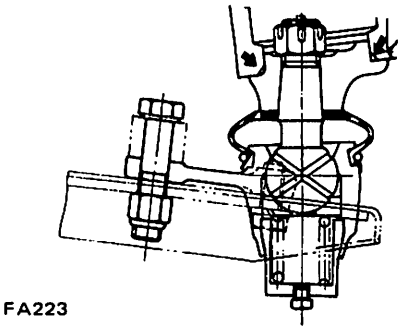


Fig. FA-32 Applying sealing material

TENSION ROD AND STABILIZER BAR

REMOVAL

1. Jack up car and support it with safety stands; remove wheel.
2. Remove splash board.
3. Back off nut ① securing tension rod to bracket, and remove bolts ② which secure tension rod to transverse link. Tension rod can then be taken out.
4. Remove nut ③ connecting stabilizer connecting rod to transverse link.
5. Take out bolts ④ securing stabilizer bracket in position. Loosen four tension rod brackets ⑤ in advance. Remove stabilizer from car frame. See Figure FA-33.

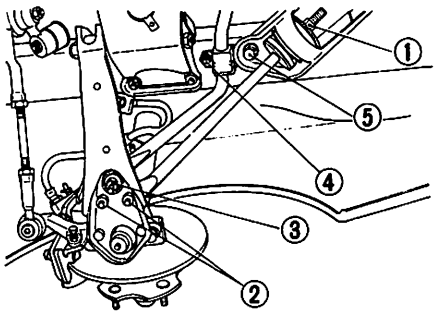


Fig. FA-33 Removing stabilizer and tension rod

INSPECTION

1. Check tension rod and stabilizer for evidence of deformation and cracking; if necessary, replace.
2. Check rubber parts such as tension rod and stabilizer bushings to be sure they are not deteriorated or cracked.

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INSTALLATION

Install tension rod and stabilizer bar in the reverse order of removal, noting the following:

1. Ensure that stabilizer is correctly installed to the portion of the left and right sides.
2. Check to be sure that tension rod bushing is properly centered in its seat.
3. Examine if clearance between tension rod and stabilizer bar is equal on both sides. See Figure FA-34.

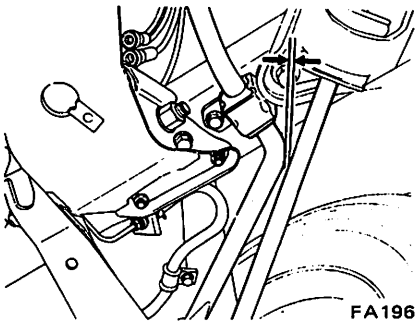


Fig. FA-34 Adjusting clearance between tension rod and stabilizer bar

4. Be sure that bolt attaching tension bracket is correctly tightened.
5. Do not tighten transverse link side bolt of tension rod without first tightening bolt securing tension rod to tension rod bracket.

Tightening torque:

Stabilizer connecting rod nut
1.2 to 1.7 kg-m
(8.7 to 12 ft-lb)
Tension rod bracket bolt
5.1 to 6.9 kg-m
(37 to 50 ft-lb)
Tension rod installation nut
4.5 to 5.5 kg-m
(33 to 40 ft-lb)
Tension rod to transverse link bolt
4.9 to 6.3 kg-m
(35 to 46 ft-lb)

TRANSVERSE LINK AND LOWER BALL JOINT

The transverse link is connected to the suspension member through a rubber bushing and to the strut through a ball joint.

The lower ball joint is assembled at the factory and cannot be disassembled. Lubricate ball joints with recommended multi-purpose grease every recommended maintenance interval.

REMOVAL

1. Jack up car and support it with safety stands; remove wheel.
2. Remove splash board.
3. Pry cotter pin off side rod socket ball joint. Remove castle nut and separate side rod socket from knuckle arm.
4. Loosen bolts holding knuckle arm in place. Separate knuckle arm from bottom end of strut. For details, refer to "Spring and Strut Assembly".
5. Remove tension rod and stabilizer bar.

For detail, refer to "Spring and Strut Assembly".

6. Remove pin assembly connecting transverse link to suspension cross-member after loosening front and rear nuts.

Remove transverse link with suspension ball joint and knuckle arm.

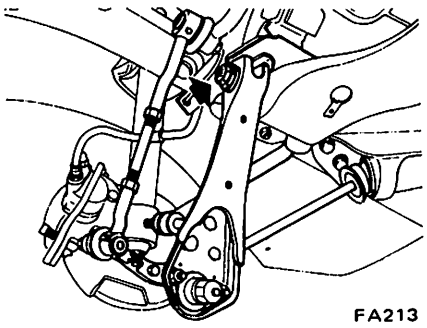


Fig. FA-35 Removing transverse link

7. Place transverse link in a vise, loosen bolt securing ball joint to transverse link and remove ball joint from transverse link.
8. Withdraw transverse link bushing from transverse link using Front Transverse Link Bushing Replacer Set ST36700000 and a press.

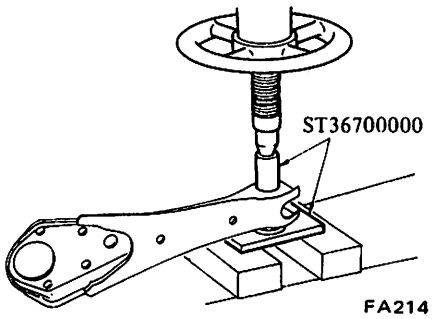


Fig. FA-36 Removing transverse link bushing

INSPECTION

Transverse link

1. Check for signs of cracks, distortion or other damage. Replace if any of above conditions are beyond repair.
2. If rubber bushing shows evidence of cracking, replace with a new one.

Ball joint

1. Ball joint is assembled at factory and cannot be disassembled. Measure end play and force required to keep joint turning. If found to be more or less specifications, discard.

Standard end play:
0.1 mm (0.0039 in)
Shaking torque:
40 kg-cm (35 in-lb)
At cotter pin hole:
11.3 kg (24.9 lb)

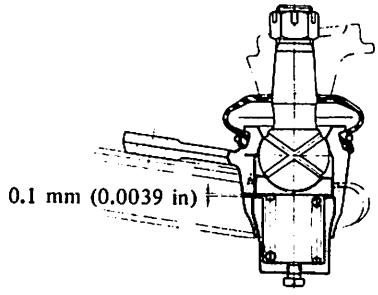


Fig. FA-37 Sectional view of lower ball joint

2. Check conditional dust cover. If found to be cracked excessively beyond use, replace ball joint with a new one.

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3. Every recommended maintenance interval, lubricate ball joint with recommended multi-purpose grease.

To lubricate, remove plug and install grease nipple in its place.

Pump grease slowly until old grease is completely forced out. After greasing, reinstall plug.

Note: When a high-pressure grease gun is used, operate the grease gun carefully so that grease is injected slowly and new grease does not come out from the clamp portion.

INSTALLATION

Install transverse link and lower ball joint in reverse order of removal. In rebushing link, use Front Transverse Link Replacer Set ST36700000.

Rebushing should also be in the manner that outer end of bushing is flush with end of link.

To install, first tighten transverse link mounting bolts temporarily. Final tightening should be carried out with vehicle under normal load.

Tightening torque:

Ball joint bolt
Socket bolt
1.9 to 2.5 kg-m
(14 to 18 ft-lb)
Tension rod fastening bolt
4.9 to 6.3 kg-m
(35 to 46 ft-lb)

Ball joint castle nut
5.5 to 7.6 kg-m
(40 to 55 ft-lb)

Transverse link mounting bolts
4.9 to 6.3 kg-m
(35 to 46 ft-lb)

SUSPENSION CROSSMEMBER

REMOVAL

1. Jack up car and support it with safety stands: remove wheels.
2. Remove splash board.
3. Remove transverse link. For details, refer to "Transverse Link and Lower Ball Joint".
4. With an overhead hoist and lifting cable, support weight of engine to remove load from mountings.
5. Remove engine mounting bolts and nuts indicated by arrows in the sketch below. Separete suspension crossmember from engine.

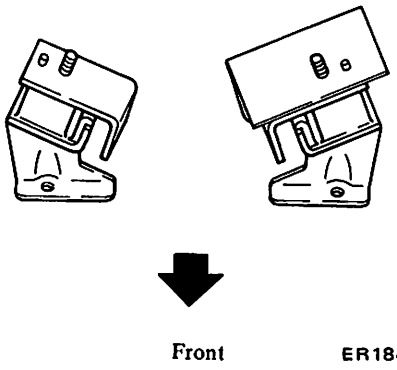


Fig. FA-38 Front mounting insulator

6. Using floor jack beneath center of suspension crossmember, raise car until wheel falls to full down position. Remove bolt, indicated by arrow, and separate suspension crossmember from car body.

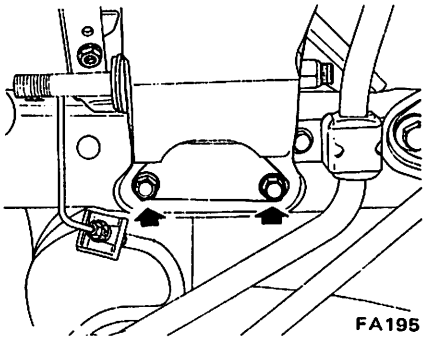


Fig. FA-39 Removing suspension crossmember

INSPECTION

1. Check suspension crossmember for evidence of deformation and cracking; if necessary, replace.

INSTALLATION

Install strut and spring assembly in the reverse order of removal, noting the following.

Tightening torque:
Suspension member to frame
4.0 to 5.0 kg-m
(29 to 36 ft-lb)

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SERVICE DATA AND SPECIFICATIONS

Wheel alignment

Applied model		Condition	Camber	Caster	Kingpin inclination	Toe-in mm (in)
Rigid axle	Standard	unladen	1°25′ to 2°55′	1°10′ to 2°40′	6°25′	8 to 11 (0.315 to 0.433)

Steering angle

Inner wheel	32° to 33°
Outer wheel	29°30′ to 31°30′

Coil spring

Wire diameter	mm (in)	12.5 (0.492)
Coil diameter	mm (in)	130 (5.12)
Coil turns		8.0
Coil effective turns		6.5
Free length	mm (in)	406.5 (16.0)

Strut assembly

Strut outer diameter	mm (in)	50.8 (2.000)
Piston rod diameter	mm (in)	20 (0.787)
Piston diameter	mm (in)	30 (1.181)
Damping force at piston of speed 0.3 m/sec.		
Expansion	kg (lb)	35 (77)
Compression	kg (lb)	20 (44)

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Wheel bearing

Rotation starting torque:

Adjustment with old parts	kg-cm (in-oz)	45 (63) or less
At wheel hub bolt	kg (lb)	0.79 (1.7) or less
New parts	kg-m (in-oz)	8.5 (118) or less
At wheel hub bolt	kg (lb)	1.49 (3.3) or less

Lower ball joint

Shaking torque	kg-cm (in-oz)	more than 40 (556)
Standard end play	mm (in)	0.1 (0.0039)

Tightening torque

	kg-m (ft-lb)
Stabilizer bar	
Frame bracket fixing bolt	1.4 to 1.8 (10 to 13)
Tension rod	
Tension rod fixing nut	4.5 to 5.5 (33 to 40)
Tension rod to transverse link	4.9 to 6.3 (35 to 46)
Tension rod bracket fixing bolt	5.1 to 6.9 (37 to 50)
Transverse link	
Transverse link to body frame	9 to 10 (65 to 72)
Ball joint	
Ball joint to transverse link	1.9 to 2.5 (14 to 18)
Ball joint to transverse link with tension rod	4.9 to 6.3 (35 to 46)
Ball joint to knuckle arm	5.5 to 7.6 (40 to 55)

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TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Vibration, shock and shimmying of steering wheel.	Improper tire pressure.	Adjust.
	Imbalance and deformation of roadwheel.	Correct the imbalance or replace.
Vibration: Loose connection of the serration parts and wear of each part of linkage cause vibration of front wheels, which in turn is transmitted to the steering wheel. This is very noticeable when travelling over rough roads.	Unevenly worn tire or insufficient lightening.	Replace or tighten.
	Improperly adjusted or worn front wheel bearing.	Adjust or tighten.
	Faulty wheel alignment.	Adjust.
	Worn fitting transverse link bushings.	Replace.
	Insufficiently tightened steering gear housing.	Retighten
Shock: When the front wheels are travelling over bumpy roads, the play of the steering linkage is transmitted to the steering wheel. This is especially noticeable when travelling on rough roads.	Wear of steering linkage.	Replace defective parts.
	Worn suspension ball-joint.	Replace.
	Excessive backlash due to improper adjustment of the retainer parts.	Adjust correctly.
Shimmying: Abnormal vibration of the front suspension group and the whole steering linkage, which occur when a specific speed is attained.	Damaged idler arm.	Replace.
	Worn column bearing, weakened column bearing spring, or loose clamp.	Replace or retighten.
	Malfunction of shock absorber (inside the strut) or loose installation bolts.	Replace or retighten.
	Imbalance of vehicle level.	Correct the imbalance.
Vehicle pulls to right or left When driving with hands off the steering wheel over a flat road, the car gently swerves to right or left.	Improper tire pressure or insufficient tightening of wheel nuts.	Adjust or tighten.
	Difference in height of right and left tire treads.	Replace tires.
	Incorrect adjustment or abrasion of front wheel bearing.	Adjust or replace.
Note: **A defective rear suspension may also be the cause of this trouble, therefore, see also the chapter dealing with the rear suspension.**	Collapsed or twisted front spring.	Replace.
	Incorrect wheel alignment.	Adjust.
	Incorrect brake adjustment (binding).	Adjust.
	Worn rubber bushings for transverse link and tension rod.	Replace.
	Deformed steering linkage and suspension link.	Replace.
	Imbalance of car level.	Correct the imbalance.
Instability of car	Improper tire pressure.	Adjust.
	Worn rubber bushings for transverse link and tension rod.	Replace.
	Incorrect wheel alignment.	Adjust.

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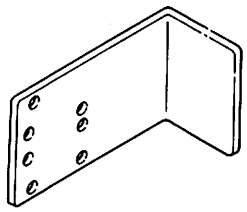
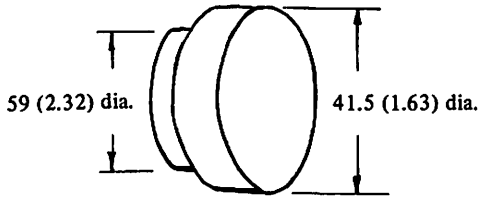
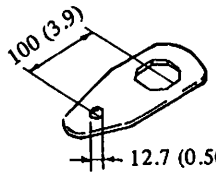
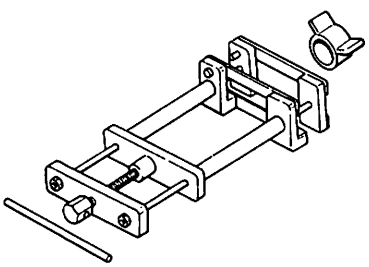
Condition	Probable cause	Corrective action
Instability of car	Worn or deformed steering linkage and suspension link.	Replace.
	Incorrect adjustment of steering gear.	Adjust.
	Deformed or imbalanced wheel.	Correct or replace.
Stiff steering wheel (check-up procedure) Jack up front wheels, detach the steering gear and operate the steering wheel, and; If it is light, check steering linkage, and suspension groups. If it is heavy, check steering gear and steering column groups.	Improper tire pressure.	Adjust.
	Insufficient lubricants or mixing impurities in steering linkage or excessively worn steering linkage.	Replenish grease or replace the part.
	Stiff or damaged suspension ball-joint, or lack of grease.	Replace.
	Worn or incorrectly adjusted wheel bearing.	Replace or adjust.
	Worn damaged steering gear and bearing.	Replace.
	Incorrectly adjusted steering gear.	Adjust.
	Deformed steering linkage.	Replace.
	Incorrect wheel alignment.	Adjust.
	Damaged strut upper end bearing.	Replace.
	Damaged or stiff piston or shock absorber rod (in the strut).	Replace.
	Interference of steering column with turn signal switch.	Adjust.
Excessive steering wheel play	Incorrectly adjusted steering gear housing.	Adjust.
	Worn steering linkage.	Replace.
	Improperly fitted gear box.	Retighten.
	Incorrectly adjusted wheel bearing.	Adjust.
	Worn transverse link and tension rod fitting bushings.	Replace.
Noises	Improper tire pressure.	Adjust.
	Insufficient lubricating oil and grease for suspension ball joint and steering linkage, or their breakage.	Replenish lubricating oil and grease, or replace.
	Loose steering gear bolts, linkage and suspension groups.	Retighten.
	Damaged shock absorber (inside the strut).	Replace.
	Damaged wheel bearing.	Replace.
	Worn steering linkage and steering gear.	Replace.
	Worn transverse link and tension rod fitting bushings.	Replace.
	Broken or collapsed coil spring.	Replace.
	Loose strut mounting insulator tightening nuts.	Retighten.
	Loose stabilizer bolt.	Retighten.

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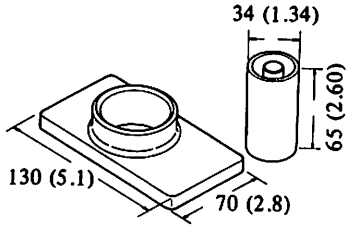
Condition	Probable cause	Corrective action
Grating tire noise	Improper tire pressure.	Adjust.
	Incorrect wheel alignment.	Adjust.
	Deformed knuckle spindle and suspension linkage.	Replace.
Jumping of disc wheel	Improper tire pressure.	Adjust.
	Imbalance wheels.	Adjust.
	Damaged shock absorber.	Replace.
	Damaged tire.	Replace.
	Deformed wheel rim.	Replace.
Excessively or partially worn tire.	Improper tire pressure.	Adjust.
	Incorrect wheel alignment.	Adjust.
	Worn wheel bearing.	Replace.
	Incorrect brake adjustment.	Adjust.
	Improper tire shifting (rotation).	Adjust.
	Rough and improper driving manner.	Drive more gently.

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SPECIAL SERVICE TOOLS

No.	Tool number & tool name	Description Unit: mm (in)	For use on	Reference page or Figure No.
1.	ST27700002 Strut and steering gear housing attachment	This tool is used as an attachment to strut or steering gear box when work is performed in a vise. S mark indicates hole for strut. G mark indicates hole for steering gear box. L mark indicates hole for L.H. steering gear box.  SE342	710 610 B210	Page FA-11 Fig. FA-22 Fig. FA-27
2.	ST3530000 Front wheel bearing drift	This tool is used to attach outer race for front wheel bearing.  	710 610 S30	Page FA-8
3.	ST35500001 Gland packing wrench	This tool is used to remove or install gland packing at the top end of strut.  width across flats; 55 (12.7) SE220	710 610 S30	Fig. FA-22 Fig. FA-27
4.	ST3565S000 Coil spring compressor ST35651001 Body ST35652000 Clamp	This tool is used to compress coil spring in disassembling or assembling strut assembly.  SE221	710 610 S30 B210	Fig. FA-21 Fig. FA-22 Page FA-12

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No.	Tool number & tool name	Description Unit: mm (in)	For use on	Reference page or Figure No.
5.	ST36700000 Transverse link bushing replacer	This tool is used to replace transverse link bushing. In its application, align the tool with the bushing center by using a press.  SE222	710 610	Fig. FA-35 Page FA-13 Page FA-14

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SERVICE MANUAL

DATSUN 710
MODEL 710 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION RA

REAR AXLE AND REAR SUSPENSION

RA

REAR AXLE AND SUSPENSION-RIGID AXLE ..... RA- 2
SERVICE DATA AND SPECIFICATIONS ..... RA- 9
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REAR AXLE AND SUSPENSION – RIGID AXLE

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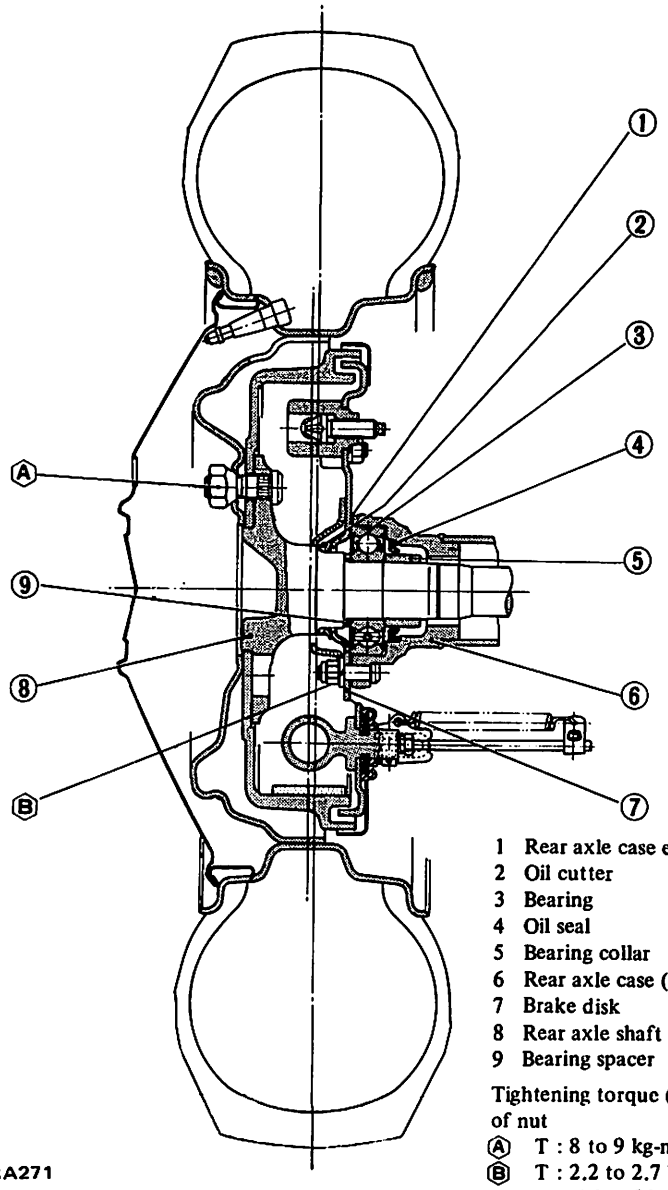


Fig. RA-1 Cross-sectional view of rear axle

DESCRIPTION

The rear suspension is integrated with the rear axle assembly.

The rear axle assembly is of the semi-floating type in which the car weight is carried on the axle shafts through the bearings in the outer end of the rear axle case. The axle case is a "Banjo" type.

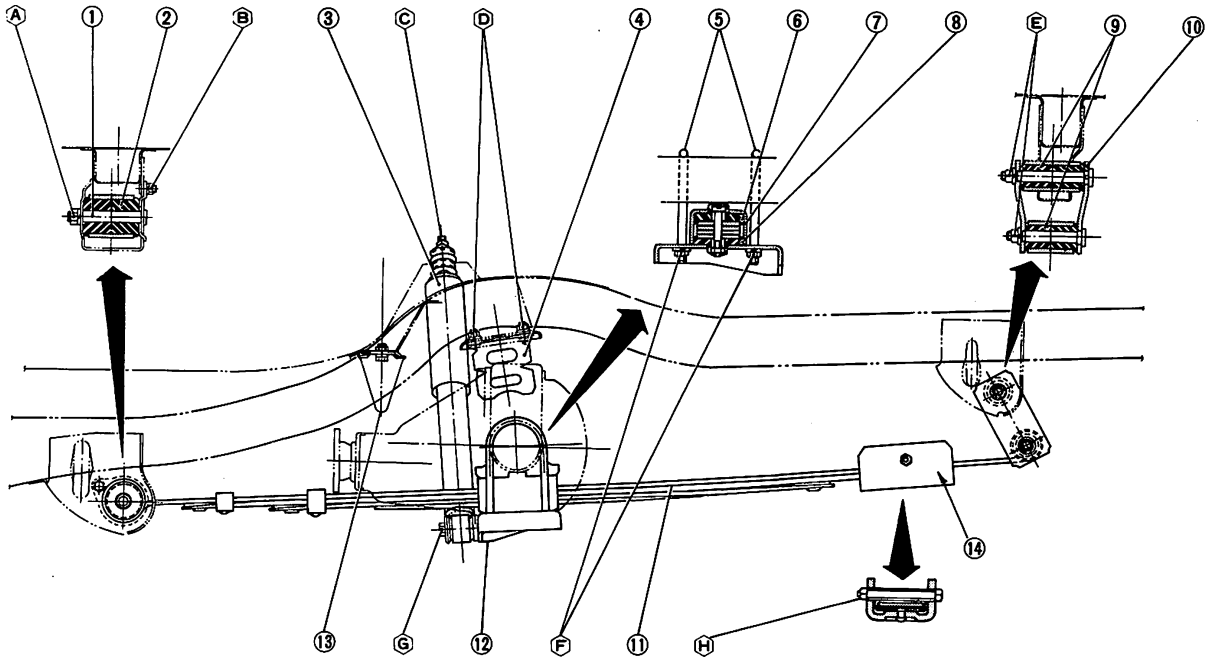
The rear axle assembly is attached to the frame through semi-elliptic leaf springs and shock absorbers.

Rubber bushings at each end of the leaf springs and shock absorbers, spring pad at spring seats and mass dumper attached to leaf spring (except automatic transmission equipped models), singly, or in combination, effectively absorb vibration and noise.

The rear axle shafts are floating fitted to the differential side gears through splines. The outer ends are supported at the ends of rear axle case by a single set of sealed ball bearings.

The bearings are lubricated with recommended multi-purpose grease. The axle shaft oil seals are located inboard of the bearings. The bearings are secured against shaft shoulders by means of collars.

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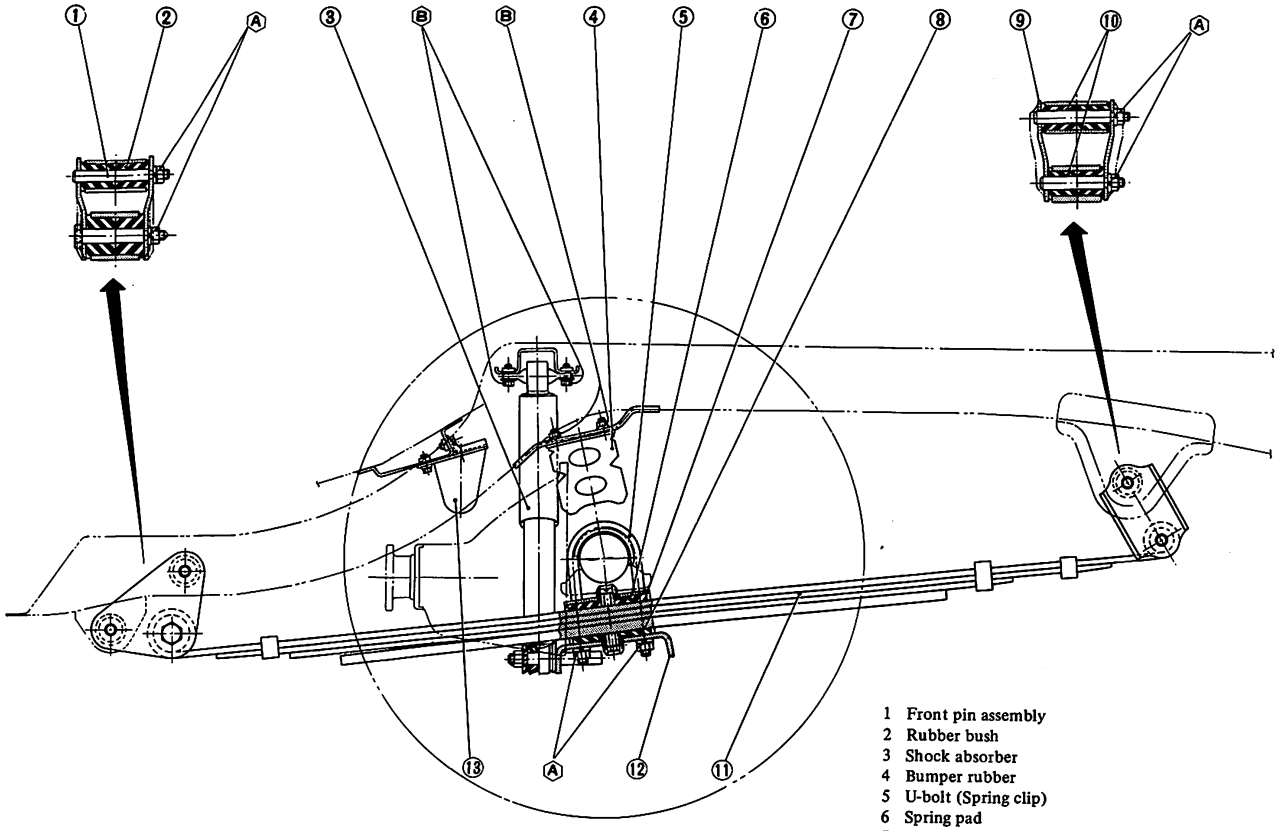
RA186

1 Front pin assembly
2 Rubber bush
3 Shock absorber
4 Bumper rubber
5 U-bolt (Spring clip)
6 Spring pad
7 Spring location plate
8 Spring seat pad
9 Rubber bush
10 Shackle assembly
11 Leaf spring
12 Spring seat
13 Torque arrester
14 Mass dumper (except automatic transmission equipped models)

Tightening torque (T) of bolts and nuts kg-m (ft-lb)
Ⓐ T : 5.1 to 6.9 (37 to 50)
Ⓑ T : 0.8 to 1.0 (5.8 to 7.2)
Ⓒ T : Tighten under side nut of double nuts until threads go in.
Ⓓ T : 0.7 to 1.0 (5.1 to 7.2)
Ⓔ T : 5.1 to 6.9 (37 to 50)
Ⓕ T : 3.5 to 4.8 (25 to 35)
Ⓖ T : 1.6 to 2.2 (12 to 16)
Ⓗ T : 0.8 to 1.1 (5.8 to 8.0)

Fig. RA-2 Rear suspension system (Sedan and Hardtop)

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1 Front pin assembly
2 Rubber bush
3 Shock absorber
4 Bumper rubber
5 U-bolt (Spring clip)
6 Spring pad
7 Spring location plate
8 Spring seat pad
9 Shackle assembly
10 Rubber bush
11 Leaf spring
12 Spring seat
13 Torque arrester

Tightening torque (T) of bolts and nuts kg-m (ft-lb)

Ⓐ T : 6.0 to 6.5 (43 to 47)
Ⓑ T : 0.9 to 1.2 (6.5 to 8.7)

RA310

Fig. RA-3 Rear suspension system (Station Wagon)

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REAR AXLE ASSEMBLY

REMOVAL

It is not necessary to remove the rear axle assembly for minor repairs.

However, if the axle case is damaged, the rear axle assembly may be removed as follows.

1. Raise rear of car high enough to permit working under it. Place a jack under the center of axle case so it just starts to raise rear axle assembly.

Place stands under body member on both sides. Remove rear wheels.

2. Mark propeller shaft flange and companion flange of differential carrier so that the original combination can be restored at assembly.

3. Withdraw propeller shaft sleeve yoke from transmission by moving the shaft rearward, passing it under rear axle. Watch for oil leakage from transmission end.

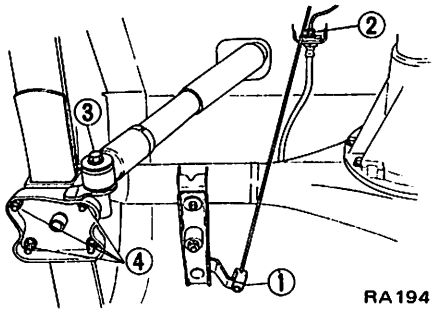
Note: Remove propeller shaft carefully so as not to damage spline, sleeve yoke and rear oil seal.

4. Disconnect hand brake cable by removing clevis pin ①. See Figure RA-4.

5. Disconnect rear brake hose at body side ②. Cover brake hose and pipe openings to prevent entrance of dirt. See Figure RA-4.

6. Disconnect shock absorbers at lower end ③ and push shock absorbers up out of the way. See Figure RA-4.

7. Lower jack under axle case. Remove U-bolts (spring clips) ④ to separate axle case from spring. See Figure RA-4.



RA194

Fig. RA-4 Under view

8. Place a jack under the center of axle case. Pass axle case through space above spring, and take it out to the side. See Figure RA-5.

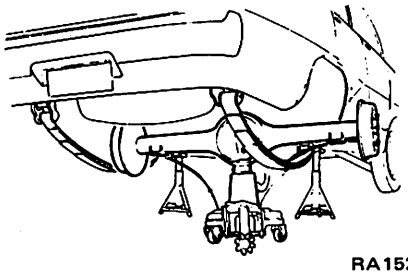

RA152

Fig. RA-5 Removing rear axle assembly

INSTALLATION

Install the axle case assembly in the reverse order of removal, noting the following instructions.

Tightening torque:

U-bolt (Spring clip):
Sedan and Hardtop
3.5 to 4.8 kg-m
(25 to 35 ft-lb)
Station Wagon
6.0 to 6.5 kg-m
(43 to 47 ft-lb)

Shock absorber lower end bolt:
Sedan and Hardtop
1.6 to 2.2 kg-m
(12 to 16 ft-lb)
Station Wagon
3.6 to 4.8 kg-m
(26 to 35 ft-lb)

Propeller shaft-to-companion flange connecting bolt:
2.5 to 3.2 kg-m
(18 to 23 ft-lb)

REAR AXLE SHAFT AND WHEEL BEARING

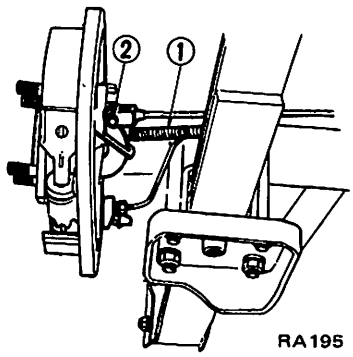
REMOVAL

1. Raise rear of car and place stands under axle case on both sides. Remove rear wheels.

2. Pull-off spring ① and disconnect cross rod from lever by removing clevis pin ②. See Figure RA-6.

3. Disconnect brake tube at rear brake disc. See Figure RA-6.

Cover brake hose and pipe openings to prevent entrance of dirt.



RA195

Fig. RA-6 Removing brake parts

4. Remove brake drum.

5. Remove four nuts retaining brake disc to axle case. See Figure RA-7.

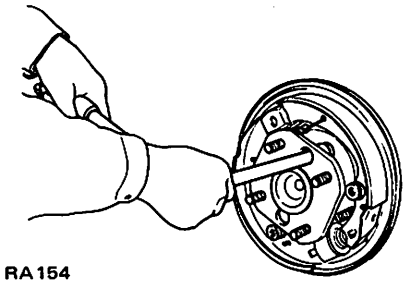
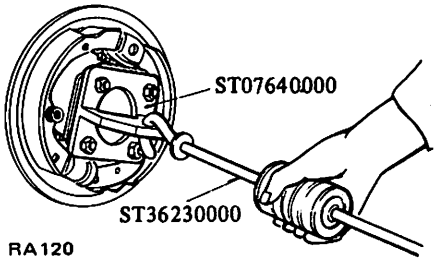

RA154

Fig. RA-7 Removing nuts

6. Pull out axle shaft assembly together with brake disc using Rear Axle Stand ST07640000 and Sliding Hammer ST36230000. See Figure RA-8.



RA120

Fig. RA-8 Removing rear axle shaft assembly

7. Remove oil seal in axle case if necessary and install new seal. Insure against damaging the seal lip.

8. Cut bearing collar with cold chisel. See Figure RA-9.

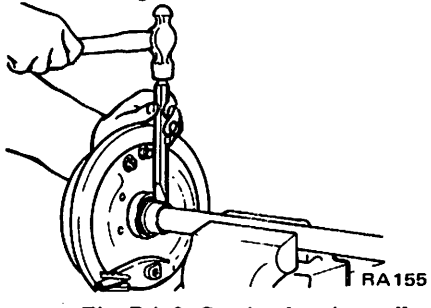

RA155

Fig. RA-9 Cutting bearing collar

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Note: Take care not to damage axle shaft with cold chisel during operation.

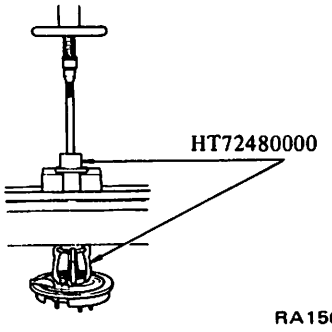


Fig. RA-10 Removing wheel bearing

9. Remove wheel bearing and collar using Rear Axle Shaft Bearing Puller HT72480000. Then take out brake disc. See Figure RA-10.

INSPECTION

Inspect the following parts for defects and replace as necessary.

1. Check axle shaft for bending, cracks, damage, wear and distortion.
2. Check the lip of oil seal for damage, deformation and wear.
3. Check bearing for wear and damage.

INSTALLATION

Install in the reverse order of removal.

1. Install bearing spacer, bearing and new bearing collar onto axle shaft, and press bearing collar by specified load more than 3 tons using Rear Axle Shaft Lock Collar Inserter ST38210000. See Figure RA-11.

Notes:

a. **A new collar must be used. Before installing, clean collar and axle shaft.**
b. **Clean bearing, and pack with recommended multi-purpose grease.**
c. **Insert wheel bearing with seal side toward wheel.**

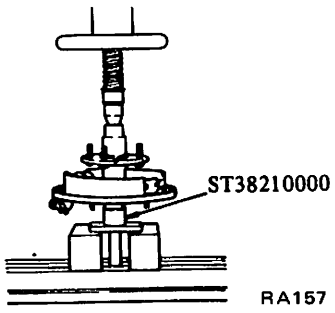


Fig. RA-11 Installing wheel bearing

2. Install oil seal using Oil Seal Drift ST37820000.
3. Pack cavity between seal lips with recommended multi-purpose grease when installing.
4. Use care not to damage oil seal when installing.
5. When inserting axle shaft into axle case, use Rear Axle Shaft Guide ST37840000 not to damage the sealing lips of oil seal.

To insert axle shaft into axle case, proceed as follows:

Install Rear Axle Shaft Guide ST37840000 on axle case.

Remove the guide when the distance "A" between the axle flange and bearing is 70 to 90 mm (2.756 to 3.543 in). See Figure RA-12.

Note: Apply multi-purpose grease to the outer periphery of the rear axle shaft bearing collar.

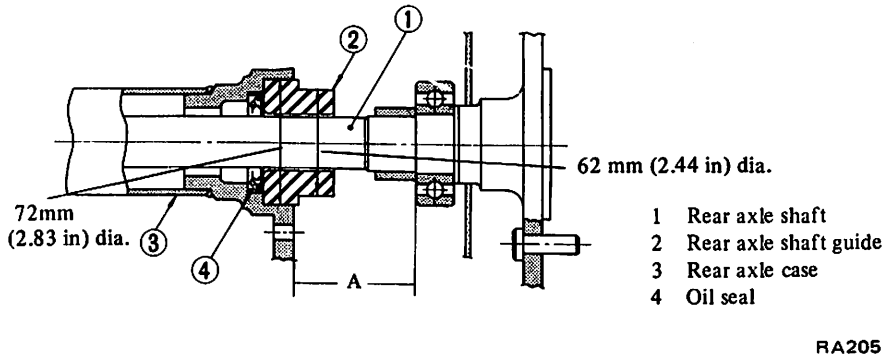


Fig. RA-12 Installing rear axle shaft

6. Adjust the gap "C" between wheel bearing and brake disc to within 0.1 mm (0.0039 in) by use of shim. See Figure RA-13.

Rear axle case end shim thickness:
0.1 mm (0.0039 in)

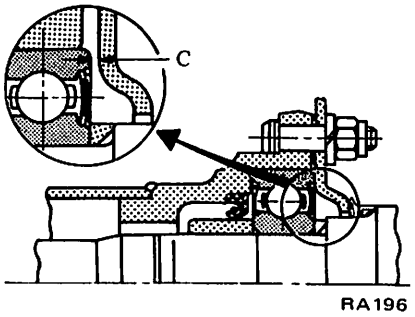


Fig. RA-13 Gap "C"

7. Measure axial end play of axle shaft with dial indicator. It should be within 0.45 mm (0.0177 in). See Figure RA-14.

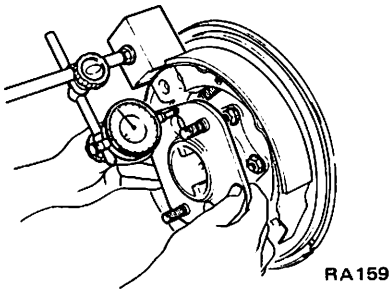


Fig. RA-14 Measuring end play

Tightening torque:

Brake disc fixing nut:
2.2 to 2.7 kg-m
(16 to 20 ft-lb)
Brake tube:
1.5 to 1.8 kg-m
(11 to 13 ft-lb)
Wheel nut:
8 to 9 kg-m
(58 to 65 ft-lb)

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REAR AXLE CASE

REMOVAL

Rear axle case is removed and installed as follows:

1. Raise rear of car and place stands under body member on both sides.
2. Remove rear axle assembly (Refer to page RA-5 for Removal of Rear Axle Assembly).
3. Remove rear axle shaft on both sides (Refer to page RA-5 for Removal of Rear Axle Shaft and Wheel Bearing).
4. Remove differential gear carrier assembly.

An alternate procedure can be followed as listed below:

1. Raise rear of car and place stands under body member on both sides.
2. Remove rear axle shaft on both sides.
3. Remove differential gear carrier assembly.
4. Remove rear axle case.

INSPECTION

Check axle case for deformation or cracks and replace if necessary.

INSTALLATION

Installation can be accomplished following the reverse order of removal.

Tightening torque:
Differential carrier to axle case fix nut:
2.0 to 2.5 kg-m
(14 to 18 ft-lb)
Oil drain and filler plug:
4.2 to 6.9 kg-m
(30 to 50 ft-lb)

REAR SPRING

REMOVAL

1. Raise rear of car and place stands under body member on both sides.
2. Disconnect shock absorber at lower end ① and remove U-bolts (Spring clips) ② . See Figure RA-14.

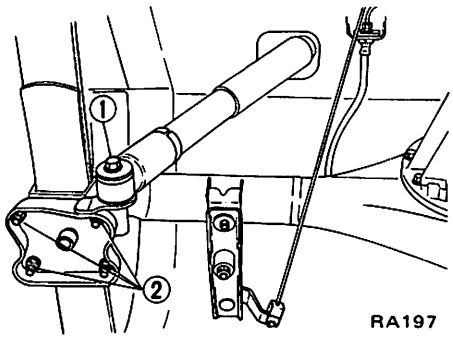


Fig. RA-14 Removing shock absorber lower end and U-bolts

3. Position jack under rear axle case. Raise jack and float axle case from spring.
4. Disconnect rear spring shackle by removing nuts. See Figure RA16.

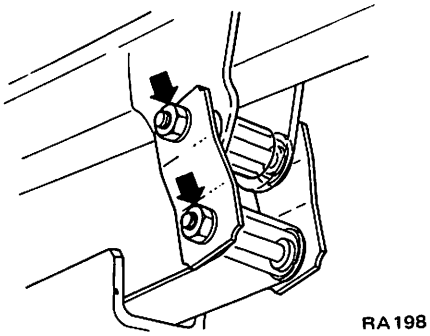


Fig. RA-15 Removing spring shackle

5. On Sedan and Hardtop models, disconnect spring front pin by removing nuts ① and ② . Disconnect spring from body. See Figure RA-17.

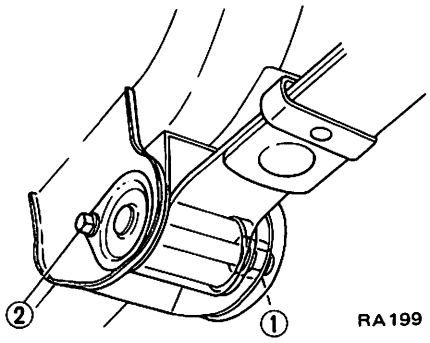


Fig. RA-17 Removing spring pin (Sedan and Hardtop)

6. On Station Wagon model, disconnect spring front pin by removing nuts. Disconnecting spring from body. See Figure RA-18.

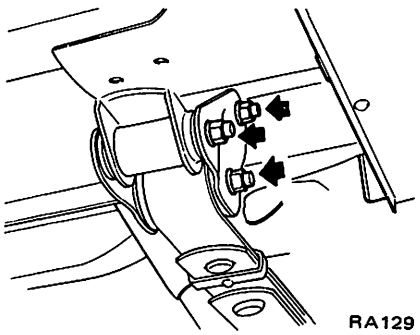


Fig. RA-18 Removing spring pin (Station Wagon)

7. Remove rubber bush in spring if necessary and install new bush.

INSPECTION

Clean all rust and dirt from spring leaves, using a wire brush if necessary.

1. Examine spring leaves for fractures or cracks.
2. Check front bracket and pin, shackle, U-bolts and spring seat for wear, cracks, bending and damaged threads. If defective parts are found, replace with new ones.
3. Inspect all rubber parts for wear, damage, separation and deformation. Replace them if necessary.

INSTALLATION

Use the following procedure when tightening U-bolts (spring clips).

1. Apply soapy water to each side of spring pad.
2. Torque U-bolts to the specified setting, exercising care not to tilt U-bolts sideways.

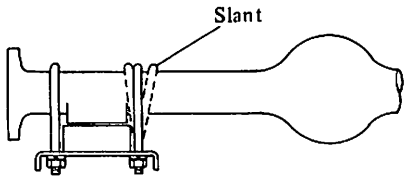


Fig. RA-19 Installing U-bolt

3. Install four nuts in place by making them snug tight evenly (until the same number of threads is engaged), before tightening with a box wrench securely.

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4. When tightening nuts with a box wrench, alternately turn them one full rotation at a time until the projection of each bolt head is within 3 mm (0.1181 in) above the nut. Check again that the four nuts are torqued evenly.

Notes:

a. **Close adherence to the above instructions will add much to increased service life of U-bolts.**
b. **After installation, make sure that location plate and spring seat closely come into contact with each other.**

Closely observe the following instructions.

c. **Do not remove any particular U-bolt alone. Be sure to remove adjacent U-bolts too.**
d. **Two types of location plate are available. One type is for use on the five leaf spring suspension and the other for the four leaf spring suspension.**
Never use one type for the other.

To install the part other than U-bolts, reverse the order of removal, closely observing the following.

Coat rubber bushes with soapy water, prior to assembly.

Car weight must be on rear wheels when tightening front pin, shackle and shock absorber lower end bolt in order to clamp rubber bushes in an unloaded position.

Tightening torque:

Spring front pin nut:
(Sedan and Hardtop)
Nut (1): 5.1 to 6.9 kg-m
(37 to 50 ft-lb)
Nut (2): 0.8 to 1.0 kg-m
(5.8 to 7.2 ft-lb)
(Station Wagon)
Nut: 6.0 to 6.5 kg-m
(43 to 47 ft-lb)

Spring shackle nut:
(Sedan and Hardtop)
Nut: 5.1 to 6.9 kg-m
(37 to 50 ft-lb)
(Station Wagon)
Nut: 6.0 to 6.5 kg-m
(43 to 47 ft-lb)

U-bolt:
(Sedan and Hardtop)
Nut: 4.0 to 4.8 kg-m
(29 to 35 ft-lb)
(Station Wagon)
Nut: 6.0 to 6.5 kg-m
(43 to 47 ft-lb)

Shock absorber lower end:
(Sedan and Hardtop)
Bolt: 1.6 to 2.2 kg-m
(12 to 16 ft-lb)
(Station Wagon)
Bolt: 3.6 to 4.8 kg-m
(26 to 35 ft-lb)

SHOCK ABSORBER

REMOVAL

1. Raise rear of car and place stands under axle case on both sides.
Use a hoist or open pit if available.
2. Disconnect lower end of shock absorber by removing bolt ① or nut ① at spring seat. See Figure RA-20 or RA-21.
3. Disconnect upper end of shock absorber by removing nut ② or bolts ② at frame. See Figure RA-20 or RA-21.

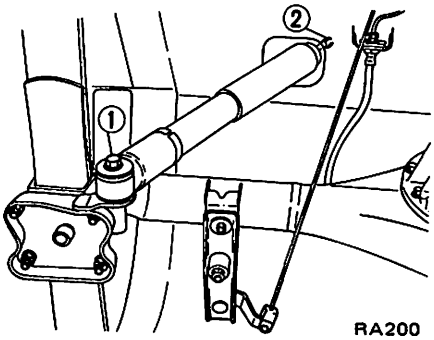


Fig. RA-20 Removing shock absorber (Sedan and Hardtop)

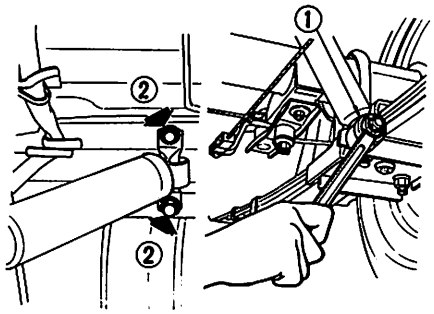


Fig. RA-21 Removing shock absorber (Station Wagon)

INSPECTION

1. Test shock absorber and compare with specifications given in "Service Data and Specifications." Replace if necessary.
2. Check for oil leakage and cracks. Also, check shaft for bending.
3. Inspect rubber bushings for damage, cracks and deformation. Replace parts if necessary.

INSTALLATION

Install shock absorber in the reverse order of removal, noting the following.

Note: Car weight must be on rear wheels when tightening shock absorber upper and lower ends in order to clamp rubber bushings in an unloaded position.

Shock absorber upper end nut (Sedan and Hardtop)
Securely tighten under side nut of double nuts until they will no longer go.

Upper end bolt
(Station Wagon)
0.9 to 1.2 kg-m
(6.5 to 8.8 ft-lb)

Shock absorber lower end bolt (Sedan and Hardtop)
1.6 to 2.2 kg-m
(12 to 16 ft-lb)

Lower end nut (Station Wagon)
3.6 to 4.8 kg-m
(26 to 35 ft-lb)

Caution: Do not open or heat gas filled type shock absorbers which are equipped on some models.

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SERVICE DATA AND SPECIFICATIONS

Rear leaf spring

Dimension

Length x Width x Thickness - Number of leaves — mm (in)

Sedan and Hardtop	1,200 x 60 x $\frac{6 - 4}{5 - 1}$
	(47.2 x 2.36 x $\frac{0.236 - 4}{0.197 - 1}$)
Station Wagon	1,200 x 60 x 6 - 5
	(47.2 x 2.36 x 0.236 - 5)

Free camber — mm (in)

Sedan and Hardtop	118 (4.65)
Station Wagon	148 (5.83)

Rear shock absorber

Stroke x Max. length — mm (in)

Sedan and Hardtop	200 x 530 (7.87 x 20.87)
Station Wagon	205 x 518 (8.07 x 20.39)

Damping force at 0.3 m/sec

Sedan and Hardtop		
Expansion	kg (lb)	70 to 76 (154 to 168)
Compression	kg (lb)	43 to 49 (95 to 108)
Station Wagon		
Expansion	kg (lb)	71 to 97 (157 to 214)
Compression	kg (lb)	36 to 52 (79 to 115)

Rear axle shaft

End play	mm (in)	Within 0.45 (0.0177)
Thickness of rear axle case end shim	mm (in)	0.075 (0.0030)

Tightening torque	**kg-m (ft-lb)**
Shock absorber upper end nut (Sedan and Hardtop)	Securely tighten under side nut of double nuts until they will no longer go.
Shock absorber upper end bolt (Station Wagon)	0.9 to 1.2 (6.5 to 8.7)
Shock absorber lower end bolt (Sedan and Hardtop)	1.6 to 2.2 (12 to 16)
Shock absorber lower end nut (Station Wagon)	3.6 to 4.8 (26 to 35)
Rear spring U-bolt (clip)	
Sedan and Hardtop	3.5 to 4.8 (25 to 35)
Station Wagon	6.0 to 6.5 (43 to 47)
Spring front pin	
Sedan and Hardtop	5.1 to 6.9 (37 to 50)
Pin to body nut	0.8 to 1.0 (5.8 to 7.2)
Station Wagon	6.0 to 6.5 (43 to 47)

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Spring shackle (two bolts)	
Sedan and Hardtop	5.1 to 6.9 (37 to 50)
Station Wagon	6.0 to 6.5 (43 to 47)
Mass damper nut	0.8 to 1.1 (5.8 to 8.0)
Brake disc (back plate) fix nut	2.2 to 2.7 (16 to 20)
Differential gear carrier-to-axle case nut	2.0 to 2.5 (14 to 18)
Propeller shaft flange bolt	2.5 to 3.2 (18 to 23)
Bumper rubber fix nut	0.8 to 1.0 (5.8 to 7.2)
Drain and filler plug	4.2 to 6.9 (30 to 50)
Wheel nut	8 to 9 (58 to 65)

TROUBLE DIAGNOSES AND CORRECTIONS

When rear axle and suspension are suspected of being noisy, it is advisable to make thorough test to determine whether the noise originates in the tires, road surface, exhaust, propeller shaft, engine, transmission, universal joint, wheel bearings or suspension.

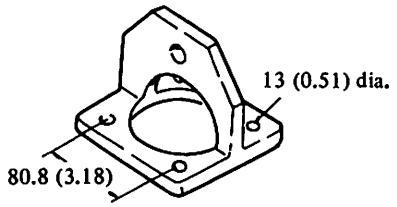
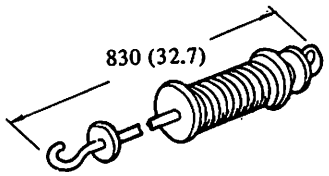
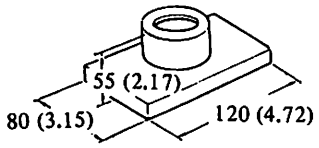
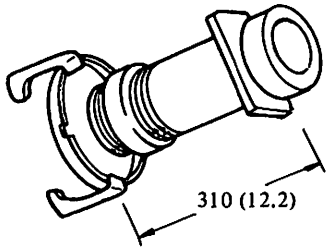
Noise which originates in other places cannot be corrected by adjustment or replacement of parts in the rear axle and rear suspension.

In case of oil leak, first check to see if there is any damage or restriction in breather.

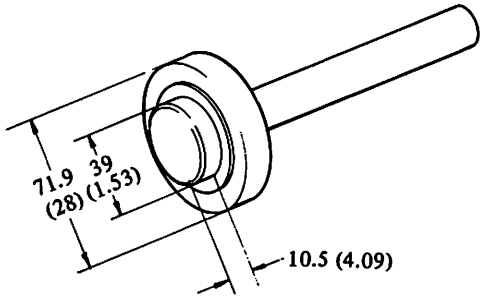
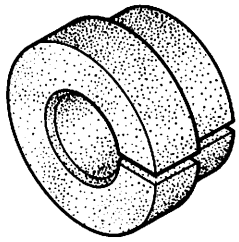
Condition	Probable cause	Corrective action
Noise	Loose wheel nuts.	Tighten wheel nuts.
	Loose securing bolts.	Tighten to the specified torque.
	Lack of lubricating oil or grease.	Lubricate as required.
	Broken shock absorber.	Replace.
	Incorrect adjustment of rear axle shaft end play.	Adjust.
	Damaged or worn wheel bearing.	Replace.
	Worn spline portion of rear axle shaft.	Replace if necessary.
	Broken leaf spring.	Replace.
	Loose journal, connections or so on.	Tighten to the given torque.
	Imbalance of wheel and tire.	Balance wheel and tire.
	Damaged to rubber parts such as leaf spring bush, shock absorber mounting bush.	Replace parts as required.
Instability in driving	Loose wheel nuts.	Tighten to the given torque.
	Damaged rear suspension arm rubber bushes.	Replace the rubber bushes.
	Worn shock absorber.	Replace defective shock absorber.
	Faulty wheel alignment.	
	1) Spring wear.	Replace spring.
	2) Worn-out spline portion of drive shaft ball spline.	Replace drive shaft assembly.
Oil leakage	Damaged or restricted air breather.	Clean or replace air breather.
	Damaged oil seal on rear axle shaft.	Replace the defective oil seal.
	Oil leakage from the differential carrier.	Replace as required.
	Damaged dust cover of drive shaft.	Replace dust cover.
	Damaged grease seal of rear axle shaft.	Replace grease seal.

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SPECIAL SERVICE TOOLS

No.	Tool number & tool name	Description Unit: mm (in)	For use model	Reference page or Figure No.
1.	ST07640000 Rear axle stand	This stand is used together with the sliding hammer (ST36230000) in taking rear axle shaft out of place. The stand is also used to hold the removed rear axle shaft assembly with the vise in taking bearing out of the assembly.  SE063	B210 710 610 W610 V610 S30	Fig. RA-8
2.	ST36230000 Sliding hammer	This hammer is used together with rear axle stand in driving axle shaft out of place.  SE059	All models	Fig. RA-8
3.	ST38210000 Rear axle shaft lock collar inserter	This tool is used together with a hydraulic press in driving bearing collar (new) into place.  SE226	710 610	Fig. RA-11
4.	HT72480000 Rear axle shaft bearing puller	This puller is designed so as to drive out rear axle shaft bearing.  SE265	All rigid axle models	Page RA-6 Fig. RA-10

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No.	Tool number & tool name	Description Unit: mm (in)	For use model	Reference page or Figure No.
5.	ST37820000 Rear axle shaft oil seal drift	This tool is used to set oil seal in its position without marring seal.  SE265	610 710	Page RA-6
6.	ST37840000 Rear axle shaft guide	This tool is used when installing rear axle shaft (rigid axle models) not to damage rear axle shaft oil seal. 	All rigid axle models	Page RA-6 Fig. RA-12

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SERVICE MANUAL

DATSUN 710
MODEL 710 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION BR

BRAKE SYSTEM

BR

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BRAKE

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DESCRIPTION

The 710 series cars are equipped with hydraulically operated brakes on all four wheels, and mechanically operated hand brakes on rear wheels.

Front brake is of SC type disc brakes, rear brake is of leading-trailing drum brake type, with hand brake installed in a body.

Mechanical hand brake is controlled by center lever located between the front seats.

The brake warning lamp on the instrument panel indicates that hand brake is engaged.

Master-Vac is installed to increase braking force, and tandem master cylinders are standard equipment on all models for increased safety.

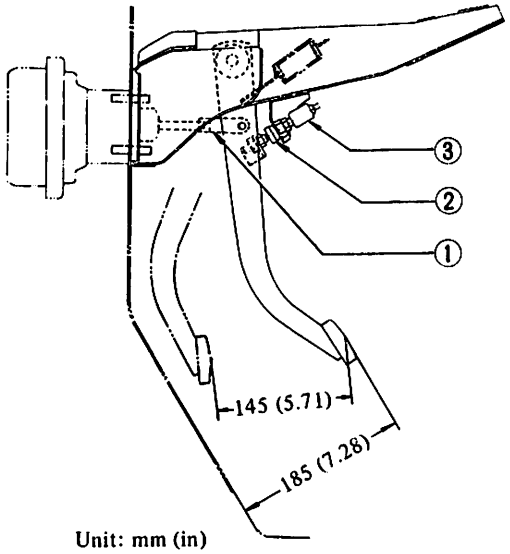
The NP (Nissan Proportioning) valve is standard equipment to ensure greater safety and reliability.

A brake indicator switch is available as an option to worn the driver when a pressure difference exists between the front and rear brake system.

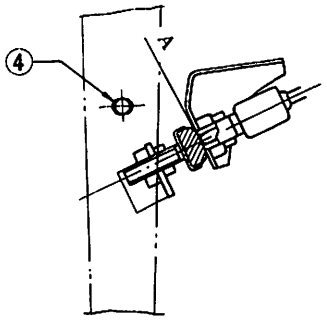
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ADJUSTMENT

BRAKE PEDAL



Unit: mm (in)



1 Push rod adjusting screw
2 Pedal stopper
3 Brake lamp switch
4 Clevis pin

Fig. BR-1 Adjusting brake pedal

1. Adjust brake lamp switch bolt until its end face is flush with the front face (shown by "A" in Figure BR-1) of lock nut. Then, tighten lock nut securely.

Tightening torque:
1.6 to 2.2 kg-m
(12 to 16 ft-lb)

2. Adjust pedal stopper until pedal pad is positioned 185 mm (7.283 in) above the floor. Then, lock pedal stopper with lock nut.

Tightening torque:
0.8 to 1.1 kg-m
(5.8 to 8.0 ft-lb)

3. Adjust the length of push rod until a pedal free play of 1 to 5 mm (0.039 to 0.197 in) is obtained at the pedal pad. Then, tighten lock nut securely.

Tightening torque:
1.6 to 2.2 kg-m
(12 to 16 ft-lb)

Note: Use care not to allow the push rod getting into master cylinder.

4. After adjustment is made, depress and release brake pedal several times to insure that it travels over its entire stroke [145 mm (5.71 in)] smoothly without showing squeak noise, twisting or interference.

FRONT DISC BRAKE

Front disc brake does not require adjustment under normal conditions since pad to rotor clearance is automatically adjusted by elasticity of piston seal.

REAR BRAKE

1. Make sure that each wheel cylinder lever of hand brake is properly returned to its original position.
2. Depress brake pedal several times so that brake shoes are settled in normal position.
3. Raise car until rear wheels are clear of ground.
4. Rotate adjusting cam in the same rotational direction as car is driven forward until shoes drag against brake drum. See Figure BR-2.
5. Turn out cam a little at a time until brake shoes are not in contact with brake drum.

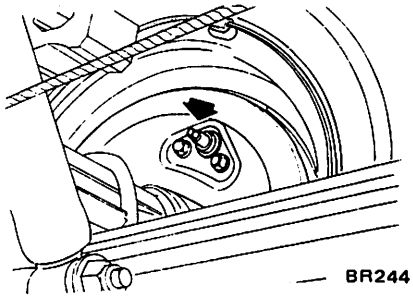


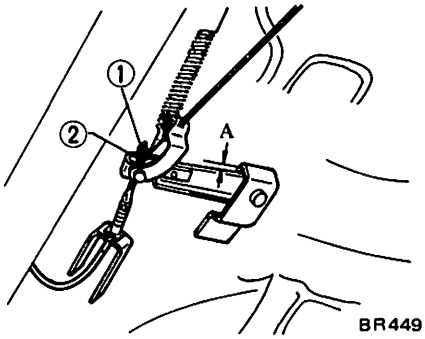
Fig. BR-2 Rear brake shoe adjusting cam

HAND BRAKE

1. Prior to hand brake adjustment, adjust brake shoe-to-drum clearance.
2. Make sure there exists a stroke of 80 to 95 mm (3.15 to 3.74 in) (6th or 7th notch) when control stem is pulled by a force of 20 kg (44 lb). If the proper stroke is not obtained, adjust it at front cable adjuster.

On Sedan and Hardtop models, when hand brake control stem is returned to original position, the space "A" shown in Figure BR-3 should be about 5 mm (0.197 in).

Then tighten lock nut securely. See Figure BR-3.



1 Front cable lock nut
2 Front cable adjusting nut

Fig. BR-3 Adjusting hand brake (Sedan and Hardtop)

3. Ascertain that each wheel cylinder lever (shown by an arrow in Figure BR-4) returns to its original position when hand brake control stem is returned to its original position.

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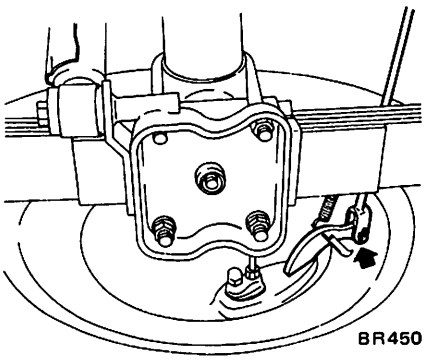


Fig. BR-4 Wheel cylinder lever pin

4. Replace front or rear cables if adjustment is no longer effective on its threaded end.

BLEEDING HYDRAULIC SYSTEM

Hydraulic brake system must be bled whenever any line has been disconnected or air has entered into system.

When pedal action has a "spongy" feel, it is an indication that air has entered the system.

Bleeding the hydraulic system is an essential part of regular brake service.

1. Clean all dirt around master cylinder reservoir, remove cap and top up reservoir with recommended brake fluid.
2. Thoroughly clean mud and dust from bleeder valve so that outlet hole is free from any foreign material. Install a bleeder hose on bleeder valve.

Place the other end of hose in a container filled with brake fluid.

3. Depress brake pedal two or three times, then keep pedal fully depressed.
4. With brake pedal fully depressed, open bleeder valve to expel air.

Notes:

a. Pay attention to brake fluid level in master cylinder reservoir during bleeding operation.
b. Do not reuse brake fluid drained during bleeding operation.
c. Bleed air as follows;
Rear wheels → Front wheels
d. Exercise care not to splash brake fluid on exterior finish as it will damage the paint.

5. Close bleeder valve quickly as brake pedal is on down stroke.
6. Allow brake pedal to return slowly with bleeder screw closed.
7. Repeat bleeding operations until no air bubbles show in hose.

Notes:

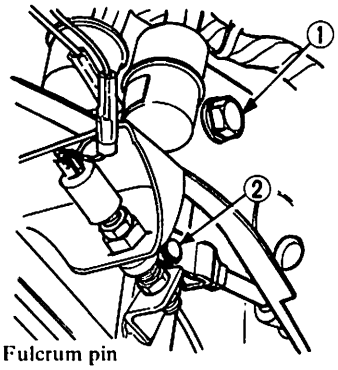
a. Brake fluid containing air is white and has visible air bubbles.
b. Brake fluid containing no air runs out of bleeder valve in a solid stream free of air bubbles.

8. Repeat above steps on the remaining brake lines to expel all air.

BRAKE PEDAL

REMOVAL

1. Remove pedal return spring.
2. Remove cotter pin from clevis, and separate brake push rod from brake pedal.
3. Remove fulcrum pin and pull out to the right. The brake pedal can then be taken out.



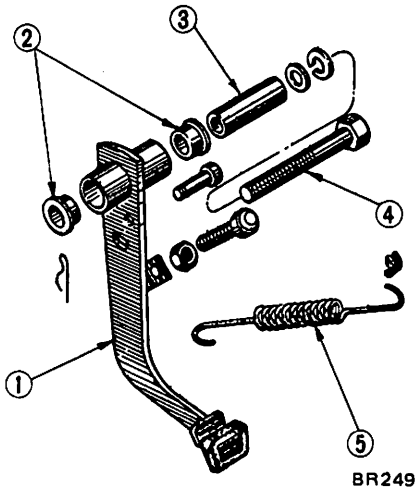
1 Fulcrum pin
2 Cotter pin

Fig. BR-5 Brake pedal mounting

Note: Turn fulcrum pin clockwise to loosen it. When removing clutch pedal, turn it counterclockwise to loosen.

INSPECTION

Check brake pedal for the following items, servicing as necessary:



1 Brake pedal
2 Pedal bush
3 Pedal shaft sleeve
4 Fulcrum pin
5 Return spring

Fig. BR-6 Brake pedal

1. Check brake pedal for bend.
2. Check return spring for fatigue.
3. Check pedal bushing for wear, deformation or damage.
4. Check pedal shaft sleeve for wear or roughness.

INSTALLATION

Install brake pedal in the reverse sequence of removal, paying attention to the following instructions.

1. Install fulcrum pin from the right side.
2. Install clevis pin from the right side.
3. Install return spring with the longer hook toward pedal arm.
4. Apply a coating of recommended multi-purpose grease to the inner and outer faces of pedal bushing, clevis pin, and hooks of return spring. Charge the clearances in bushings with grease.

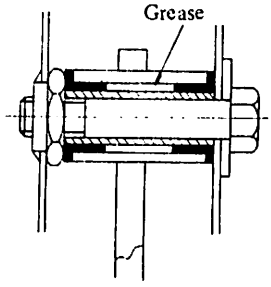
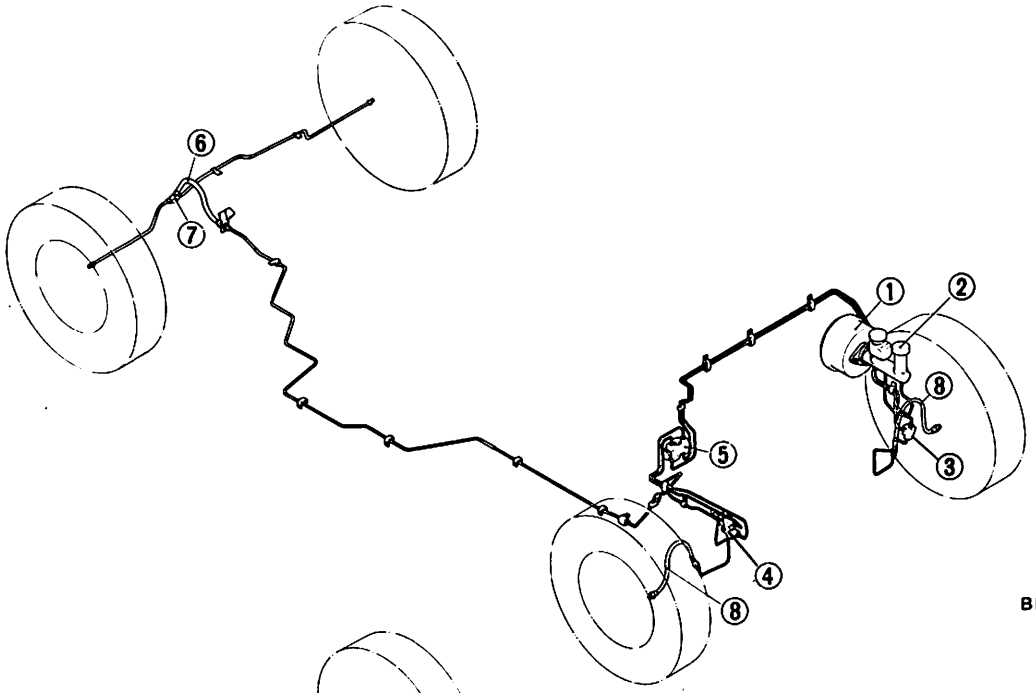


Fig. BR-7 Greasing place

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Sedan and Hardtop

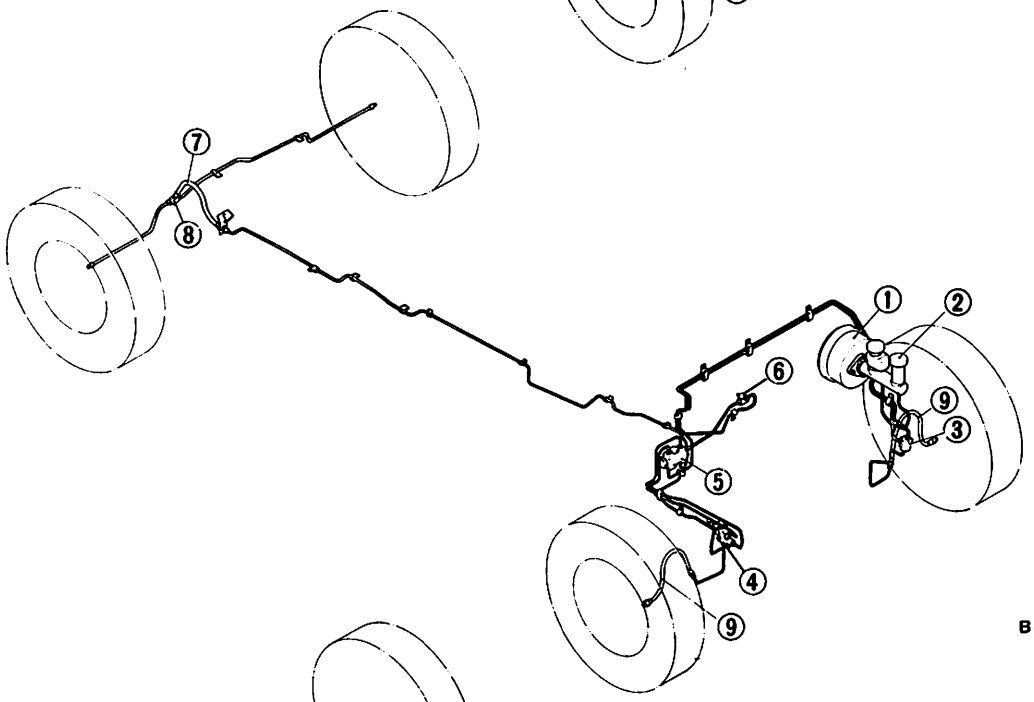
California models



1 Master-Vac
2 Master cylinder
3 3-way connector
4 NP-valve
5 Brake indicator switch
6 Brake hose
7 3-way connector
8 Front brake hose

BR666

Non-California models

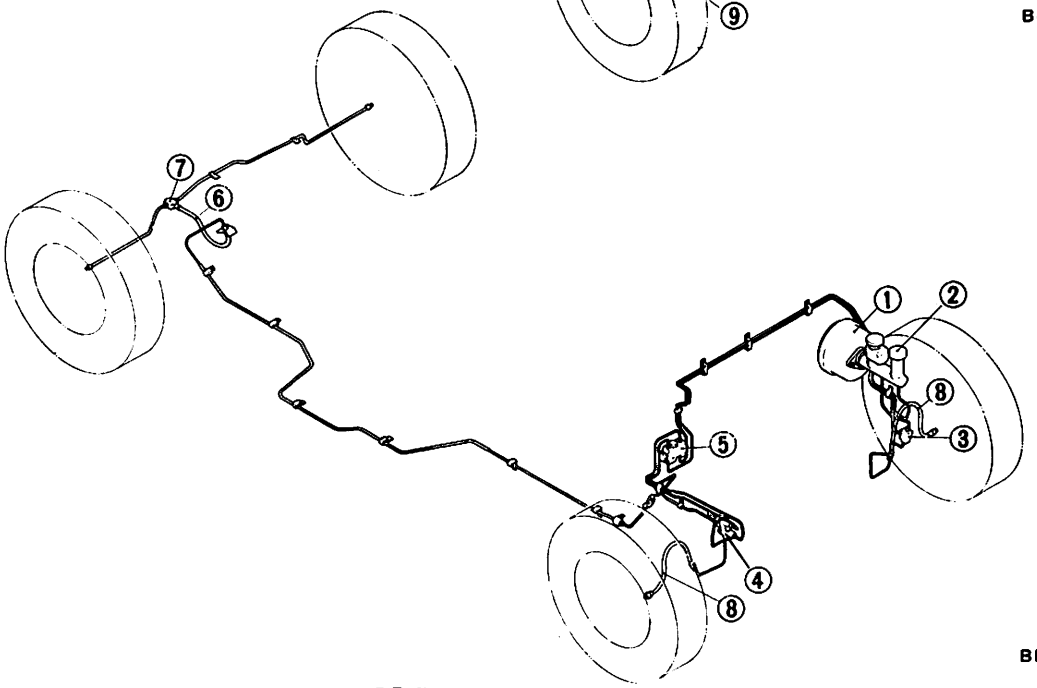


1 Master-Vac
2 Master cylinder
3 3-way connector
4 NP-valve
5 Brake indicator switch
6 2-way connector
7 Brake hose
8 3-way connector
9 Front brake hose

BR667

Station Wagon

California models



1 Master-Vac
2 Master cylinder
3 3-way connector
4 NP-valve
5 Brake indicator switch
6 Brake hose
7 3-way connector
8 Front brake hose

BR668

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Non-California models

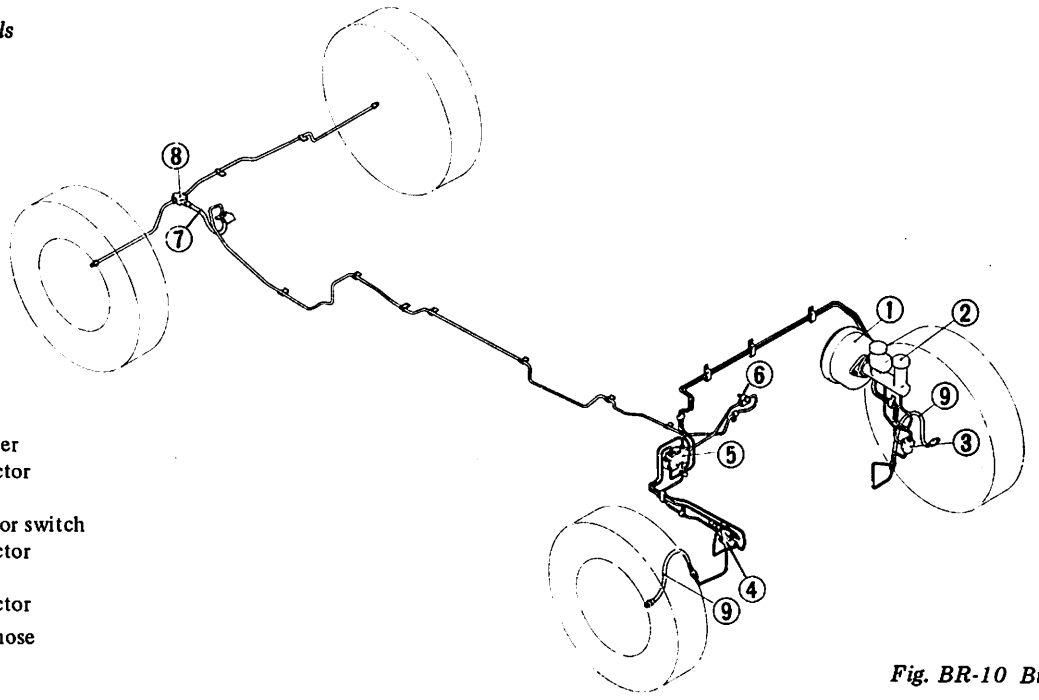


Fig. BR-10 Brake lines

REMOVAL

1. Removing flare nuts on both ends and clips effects the removal of brake tube and brake hose.
2. Rear brake hose can be removed by disconnecting the tube and then turning round hose.

Note: When removing brake tubes and hoses, use suitable tube wrench. Never use open end or adjustable wrench.

INSPECTION

Check brake lines (tubes and hoses) for evidence of cracks, deterioration or other damage. Replace defective parts.

If leakage occurs at or around joints, retighten and, if necessary, replace defective parts.

INSTALLATION

Install brake hoses and pipes following the reverse procedure of removal, paying particular attention to the following items:

1. Keep sufficient space between brake lines and adjacent parts so that vibration during driving does not influence brake lines.
2. Exercise care not to warp or twist brake hoses. Be extremely careful that they are kept away from tires and suspension system components.
3. Using Brake Pipe Torque Wrench GG94310000, tighten each connector to the specified torque. See Figure BR-11.
4. Bleed all brakes as described in Bleeding Hydraulic System.

Notes:

a. Install new copper gasket at the end of brake hose whenever reinstalling.

b. Installation must be carried out with normal weight on wheels and front wheels set straight ahead.

Tightening torque:

Brake hose to brake caliper assembly (front brake):
1.7 to 2.0 kg-m
(12 to 14 ft-lb)

Brake hose to three way connector (rear brake):
1.7 to 2.0 kg-m
(12 to 14 ft-lb)

Connector mounting bolt:

6 mm (0.236 in) diameter bolt:
0.5 to 0.7 kg-m
(3.6 to 5.1 ft-lb)

8 mm (0.315 in) diameter bolt:
0.8 to 1.1 kg-m
(5.8 to 8.0 ft-lb)

Flare nut
(both end of brake tube):
1.5 to 1.8 kg-m
(11 to 13 ft-lb)

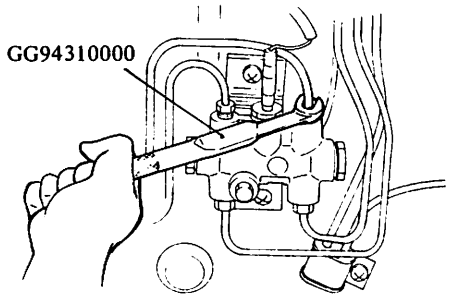


Fig. BR-11 Tightening brake tube

Front brake hose

Installing the front brake hose requires the following special cares:

1. Keep the car in straight ahead position and raise the right and left front wheel from ground by placing a jack under crossmember.
2. Screw hose in caliper.

Tightening torque:
1.7 to 2.0 kg-m
(12 to 14 ft-lb)

3. Install hose to bracket on the body side as shown in Figure BR-12, and secure with lock spring. Do not twist hose when installing.
4. Hook hanger spring on hose clamp at the lower end and on the spring lower seat of strut at the upper end. Make sure that hose clamp faces in the pulling direction of hanger spring. See Figure BR-12.

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5. Adjust the brake pedal after installation (Refer to page BR-3 for Adjustment).

Tightening torque:
Fulcrum pin
3.1 to 4.2 kg-m
(22 to 30 ft-lb)
Pedal stopper lock nut
0.8 to 1.1 kg-m
(5.8 to 8.0 ft-lb)

MASTER CYLINDER

The master cylinder is of a tandem type, which acts on the front and rear brake lines independently.

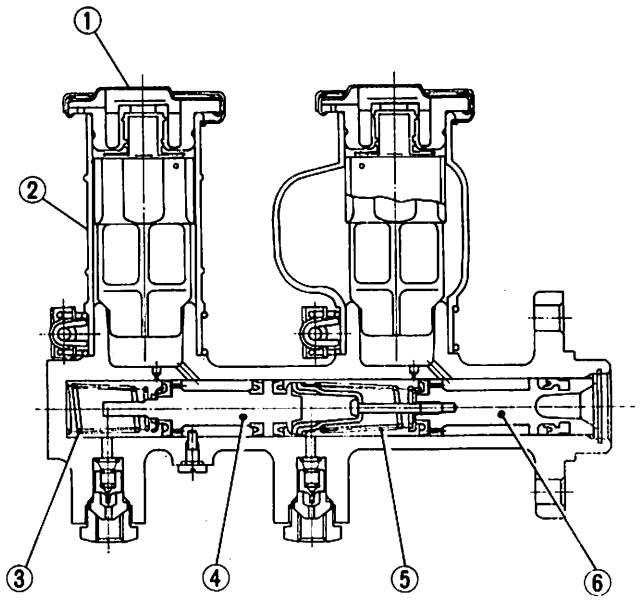
The braking force is constantly maintained even when failure occurs in either the front brake system or the rear brake system. Failure in the front brake system will leave the rear brake system still operative. Conversely, failure in the rear brake system will leave the front brake system still operative.

The reservoir is equipped with a retention cap. To remove this cap, proceed as follows:

1. Turn retention ring fully in the REMOVE direction.
2. Pull out retention cap.

To install it, proceed as follows:

(1) Turn retention ring (used in the retention cap) fully in the REMOVE direction.
(2) Align the projection in retention ring with the slit in the reservoir tank and push retention cap in the tank.
3. Turn retention ring fully in the TIGHTEN direction.



BR453

1 Reservoir cap
2 Reservoir tank
3 Secondary piston return spring
4 Secondary piston
5 Primary piston return spring
6 Primary piston

Fig. BR-8 Cross-sectional view of disc brake master cylinder

REMOVAL AND INSTALLATION

Removal

1. Disconnect front and rear brake tubes from master cylinder.

Notes:
a. When removing brake tubes, use suitable tube wrench.
Never use open end or adjustable wrench.
b. When disconnecting brake tubes, be sure to use a container to receive draining brake fluid. Use of rags is also suggested to keep adjacent parts and area clean.

2. Remove master cylinder securing nut. Master cylinder can then be taken out.

Installation

Install master cylinder following the reverse procedure of removal.

Bleed air out of master cylinder by loosening bleeder screw after it is installed in its original position.

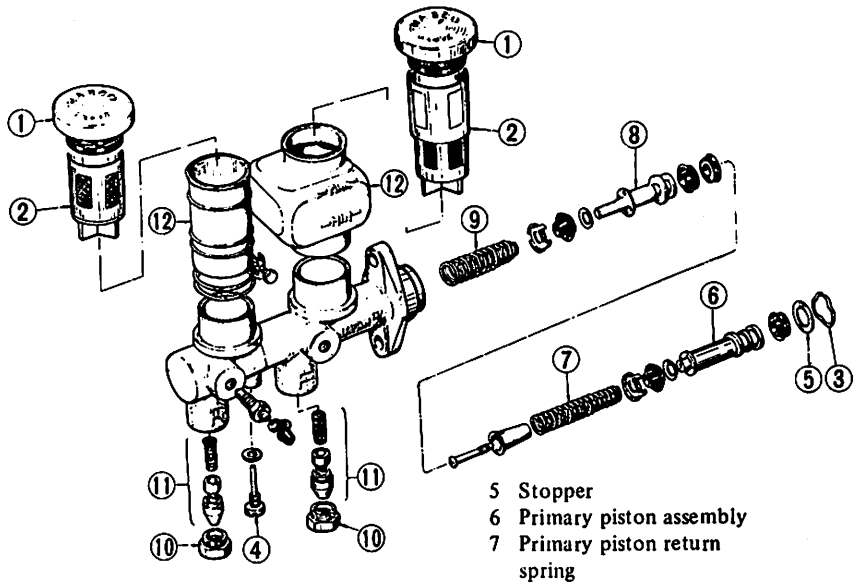
Tightening torque:
Brake master cylinder securing nut:
0.8 to 1.1 kg-m
(5.8 to 8.0 ft-lb)
Brake tube connector:
1.5 to 1.8 kg-m
(11 to 13 ft-lb)

Note: When installing brake tubes, use Pipe Torque Wrench GG94310000.

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DISASSEMBLY AND ASSEMBLY

Disassembly



1 Reservoir cap
2 Filter
3 Stopper ring
4 Stopper screw
5 Stopper
6 Primary piston assembly
7 Primary piston return spring
8 Secondary piston assembly
9 Secondary piston return spring
10 Plug
11 Check valve
12 Reservoir

Fig. BR-9 Master cylinder

1. Remove reservoir caps and filters and drain out brake fluid.
2. Pry off stopper ring, using a screwdriver. See Figure BR-9.
3. Remove stopper screw and take out stopper, primary piston assembly, spring, and secondary piston assembly, in the order shown. See Figure BR-9.

Note: Discard caps if they are removed from piston assemblies and replace with new ones.

4. Unscrew plugs to gain access to check valve for disassembling. See Figure BR-9.

Note: Never detach reservoir tanks. If they are removed for any reason, discard them and install new ones.

Assembly

Assemble master cylinder following the reverse procedure of disassembly, paying particular attention to the following notes.

Notes:

a. **Replace gaskets and packing with new ones.**
b. **Apply brake fluid or grease to sliding contact surfaces of parts to facilitate assembly of master cylinder.**

INSPECTION

Thoroughly clean all parts in a suitable solvent and check them for wear or damage. Replace any part that is defective.

Note: Do not clean rubber parts with mineral oil, since this will deteriorate parts.
Use brake fluid or alcohol. When alcohol is used for cleaning these parts, do not immerse them in it any longer than 30 seconds. After parts are cleaned, dry with compressed air.

1. Check cylinder and pistons for evidence of abnormal wear or damage.
2. Check springs for weakness, fatigue or damage. Replace if necessary.
3. When master cylinder is disassembled, be sure to discard caps and valves. Replace any other parts which show evidence of deformation, wear or other damage.
4. Replace damaged oil reservoirs and caps.

BRAKE LINE

There are four kinds of the hydraulic brake line as shown in Figure BR-10.

They are;

1. Sedan and Hardtop
   - California models
   - Non-California models
2. Station Wagon
   - California models
   - Non-California models

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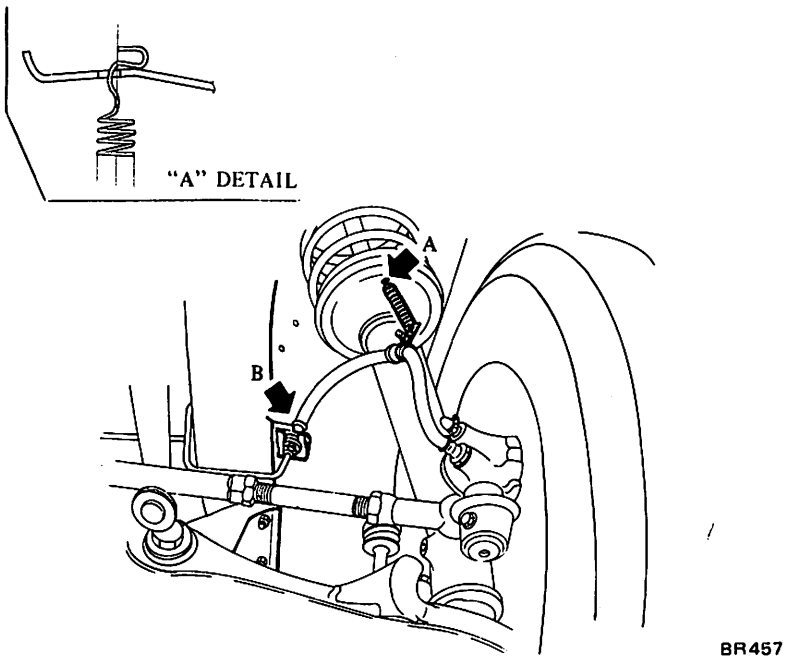


Fig. BR-12 Front brake hose for disc brake

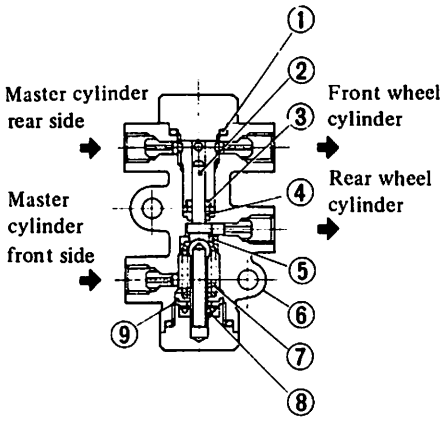
Note: When replacing hose, always renew copper gasket and hanger spring.
Do not allow dirt and water to get into caliper and brake tube.

5. The standard clearance after assembly are as follows:
Body-to-hose clearance
(Full bound at max. turn of steering handle):
Approx. 25 mm (0.98 in)
With hanger spring unhooked,
side rail flange-to-hose clearance
(Full bound at max. turn of steering handle):
Approx. 10 to 30 mm
(0.39 to 1.18 in)

NP-VALVE

DESCRIPTION

The NP-valve completely separates the front and rear brake lines, allowing them to function independently, and preventing the rear brakes from locking before the front brakes. Consequently, even in emergency braking, the brakes operate safely and effectively. Trouble, such as brake line leakage, in either the front or rear brake system will not affect the normal operation of the unaffected system.



1 O-ring
2 Plunger
3 Back-up ring
4 Y seal
5 Lip seal
6 Valve body
7 Spring
8 Cup seal
9 Spring retainer

Fig. BR-13 Cross-sectional view of NP-valve

OPERATING TEST

Conduct the following periodic test.

Drive the car with only driver laden, on dry concrete road and apply brake suddenly at 50 km/h (31 MPH).

1. NP-valve is functioning normally if rear wheels lock simultaneously with front wheels or front wheels lock ahead of rear wheels.
2. If the rear wheels lock first, it may be attributable to malfunctioning of NP-valve. Replace NP-valve with a new one as an assembly.

Caution: When conducting this test, take care with other cars.

BRAKE INDICATOR SWITCH

A warning lamp is located on the instrument panel to warn the driver when a pressure difference of 13 to 17 kg/cm² (185 to 242 psi) exists between the front and rear brake systems.

A hydraulically actuated brake indicator switch is located in the engine compartment. Both front and rear brake systems are connected to this switch assembly.

When a pressure difference of 13 to 17 kg-cm² (185 to 242 psi) occurs between the front and rear brake systems, the valves will shuttle toward the side with the low pressure. The valve contacts with the switch terminal, ground circuit for the warning lamp is completed, and thus the warning lamp glows.

In this case, correct the hydraulic brake problem and bleed the brakes.

Check brake indicator switch assembly for a proper operation. Check the switch assembly for fluid leakage.

Note: Do not attempt to repair switch. Replace switch assembly as a unit.

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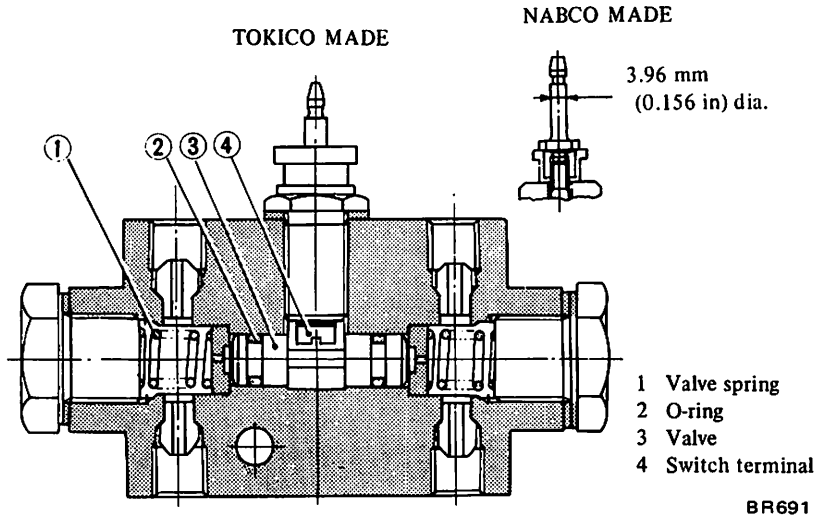


Fig. BR-14 Cross-sectional view of brake indicator switch

HAND BRAKE

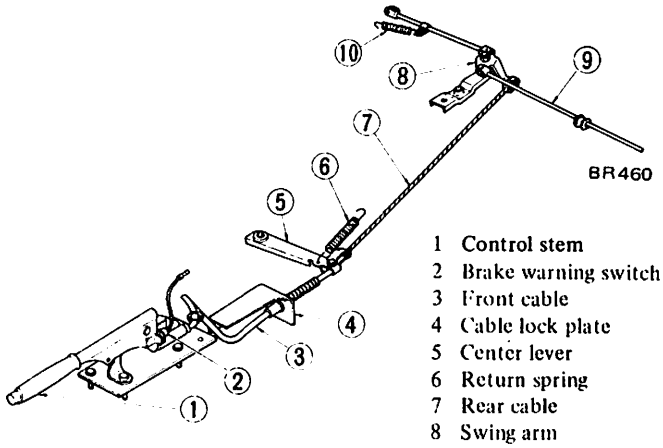


Fig. BR-15 Hand brake linkage (Sedan and Hardtop)

REMOVAL

Control stem and front cable

1. Disconnect terminal from hand brake warning switch.
2. Remove four bolts securing hand brake stem assembly to floor.

Note: **If console box is equipped it must be removed before carrying out steps 1 and 2.**

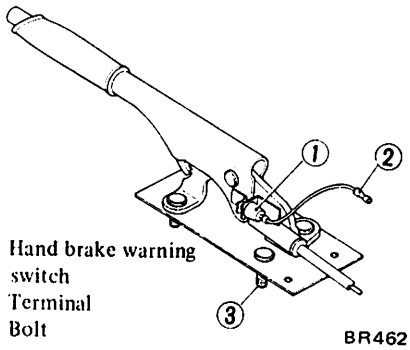


Fig. BR-16 Hand brake stem

3. Disconnect the front brake cable at center lever. The control stem and front cable can then be taken out.

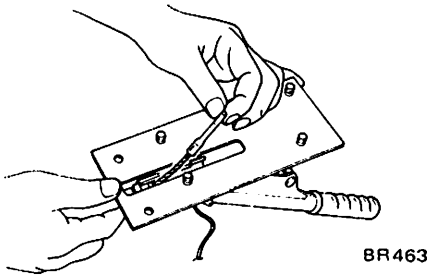


Fig. BR-17 Removing front cable

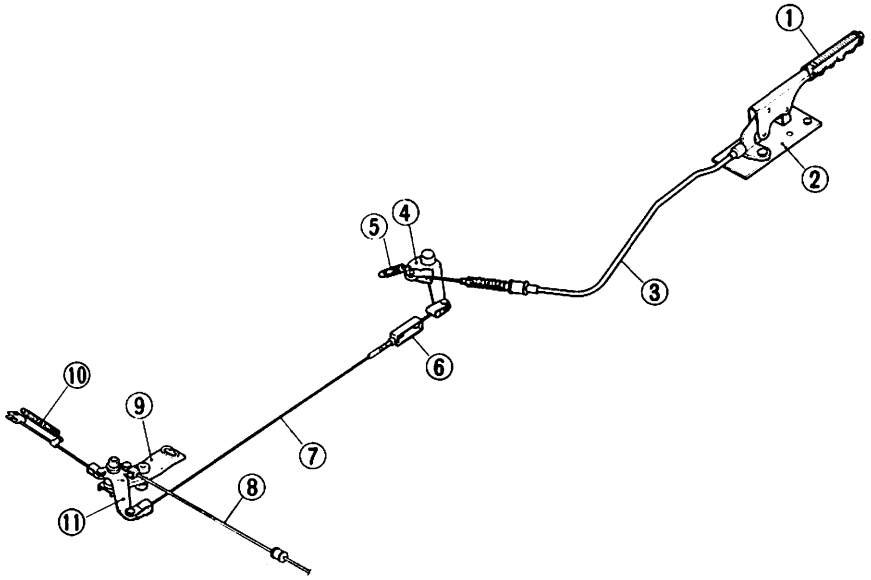


Fig. BR-18 Hand brake linkage (Station Wagon)

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Rear cable

1. Unhook return spring at center lever and unhook return spring at cross rod.
2. Remove three clevis pins from balance lever and clevis pins from each side of wheels.

Two cross rods and rear brake cable can now be taken out.

3. Remove two nuts on balance lever arm. Balance lever with balance lever arm can then be taken out from rear axle housing.

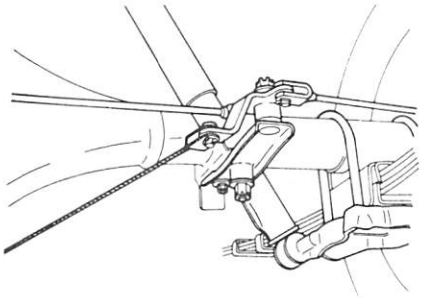


Fig. BR-19 Balance lever

INSPECTION

1. Check control stem for wear or other damage. Replace if necessary.
2. Replace worn or fatigued springs.
3. Check wires for discontinuity or deterioration. Replace if necessary.
4. Replace malfunctioning warning lamp or switch.
5. Check parts at each connection and, if found deformed or damaged, replace.

INSTALLATION

Install hand brake assembly following the reverse procedure of removal. Closely observing the following items.

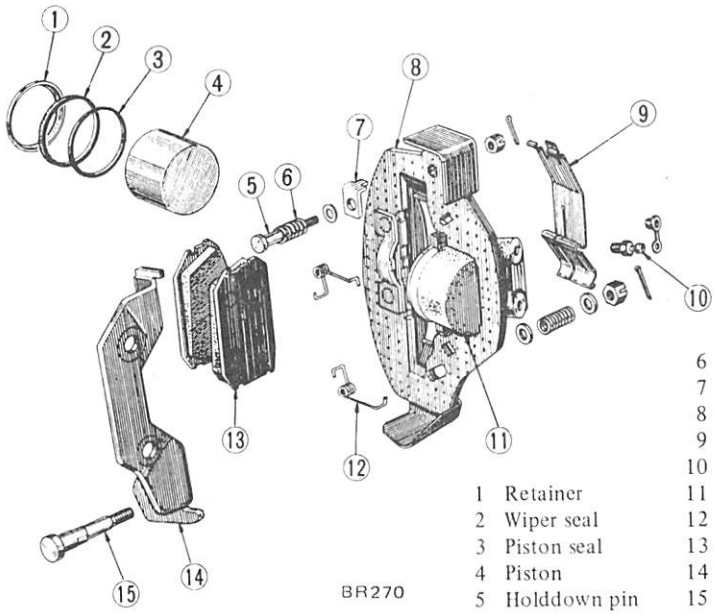
1. When installing, apply a coating of grease to sliding contact surfaces. Make sure that each sliding part functions smoothly without bind.
2. Upon completion of installation of hand brake assembly, adjust the entire system as described in Adjustment of Hand Brake.
3. Make sure that adjacent parts do not interfere with cables.

Do not apply an undue stress to cables.

FRONT DISC BRAKE

The type SC caliper satisfies sufficiently general characteristics. Due to its high rigidity and sturdy construction, the type SC caliper is a powerful braking system.

The brake pedal feeling of type SC disc brakes is adequate, and pad dragging is minimized. The pad is returned by elasticity of piston seal. When pad is worn, the piston operating stroke increases, slippage occurs on the piston seal surface, and thus, clearance is adjusted automatically.



1 Retainer
2 Wiper seal
3 Piston seal
4 Piston
5 Holddown pin
6 Spring
7 Support bracket
8 Caliper plate
9 Clip
10 Bleeder screw
11 Cylinder
12 Torsion spring
13 Pad
14 Mounting bracket
15 Pivot pin

Fig. BR-20 Front disc brake

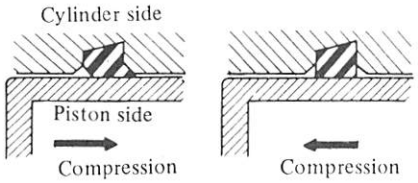


Fig. BR-21 Piston seal automatic adjusting operation

Figure BR-22 shows the relation of force's working. As brake pedal is depressed, hydraulic pressure from the master cylinder forces the piston of wheel cylinder out of the caliper bore and thrusts inner pad forward until it contacts disc, and simultaneously pushes outer pad by reaction force F2. These forces cause rotating moment, which increases reaction force F2.

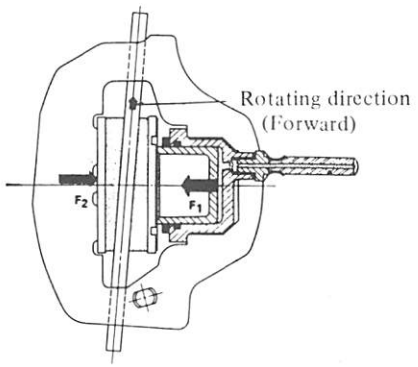


Fig. BR-22 Cross-sectional view of disc brake

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PAD REPLACEMENT

Removal

To remove brake pads, proceed as follows:

1. Jack up the front of car and remove wheels.
2. Push the upper portion of clip to release clip. See Figure BR-23.

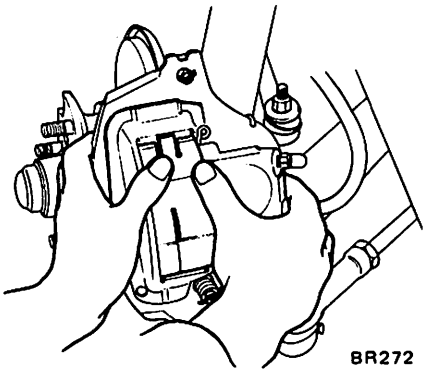


Fig. BR-23 Removing clip

3. Insert a screwdriver into the back of pad on the opposite side of piston, and move caliper plate to the extreme outer end.
4. Remove pads.

Inspection

1. Clean pads with suitable cleaning solvent.
2. When pads are heavily soiled with oil or grease or when pads are deteriorated or deformed, replace with new ones.
3. When thickness of friction material is less than 1.0 mm (0.039 in), replace all four pads.

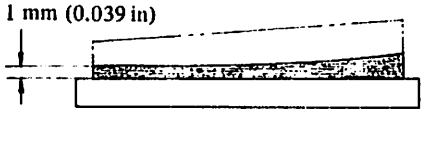


Fig. BR-24 Pad wear limit

Note: Replace pads as full set of four. Replacement of pad at only one position may cause uneven brake effect. Rotate pads periodically.

Installation

To install brake pads proceed as follows:

1. Clean calipers and pad parts.

Note: Be careful not to get oil on rotor and pads.

2. Depress pistons into cylinders so that new pads can be installed.

Note: When worn out pads are replaced with new ones, brake fluid may overflow from reservoir. While replacing pads keep loosening bleeder to release brake fluid.

3. Install pads' shim and clips.
4. After installing pads, depress brake pedal several times so as to settle down pads in proper positions.

PISTON SEAL REPLACEMENT

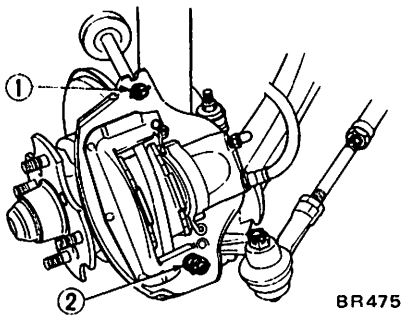
If brake fluid leaks from piston unit or pads does not return properly, replace piston seal with a new one in the manner described below. Keep component parts clean while disassembling.

Removal

1. Remove pads and disconnect brake hose.

Note: When removing the brake hose, use suitable tube wrench. Never use open end wrench or adjustable wrench.

2. Pull out cotter pin from holddown pin and pivot pin and remove nuts. See Figure BR-25.



1 Holddown pin
2 Pivot pin

Fig. BR-25 Removing caliper plate

3. Disengage caliper plate from its mounting bracket.

Disassembly

1. Remove mud and dust from caliper assembly before disassembly.
2. Remove torsion spring, and take out cylinder from caliper plate. See Figure BR-26.

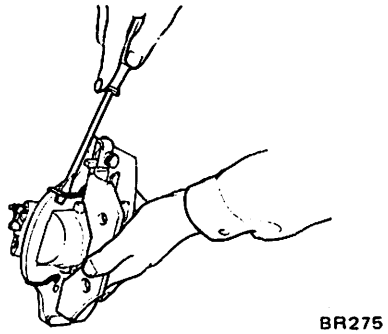


Fig. BR-26 Removing springs

3. Hold piston with finger, feed air at brake line joint, and remove piston.
4. Remove wiper seal and piston seal retainer.

Inspection

Thoroughly clean all parts, and check them for the following items.

Note: When cleaning rubber parts, use alcohol or brake fluid. Never use mineral oil. Failure to follow this rule may cause deterioration of rubber parts.

1. Caliper

Replace cylinder that is worn or damaged. If cylinder wall is rusted, carefully polish with fine emery paper. Replace cylinder if roughness or rust is excessive.

2. Pad

Refer to the paragraph of Pad Replacement.

3. Piston

Replace, if unevenly worn, damaged, or rusted.

Note: Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign matter is sticked on sliding surface.

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4. Seals

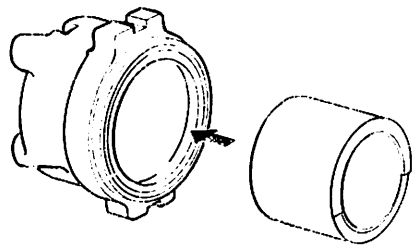
Replace piston and dust seals whenever they are removed.

Note: Piston seal affects not only leaking but also piston return. For this reason, replace even when damage is minor.

Assembly

1. Fit seal into groove in cylinder.
2. Evenly apply a thin coating of grease to the inner face of seal and contact surface of piston.

Note: In case when piston is removed from cylinder, apply grease to the surface of piston before installing.



BR276

Fig. BR-27 Piston and cylinder

Installation

1. To install, reverse the sequence of removal.

Notes:

a. **Tighten pivot pin and hold-down pin with cotter pin in place until nut is no longer turned.**
b. **After caliper plate is installed to mount bracket, make sure that caliper plate moves smoothly.**

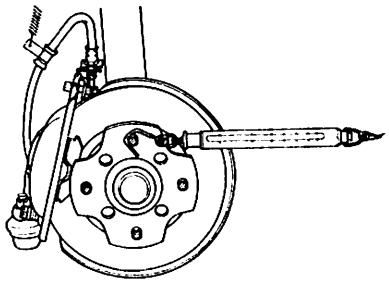
2. Bleed air from brake line.

Note: When installing brake tube, use Pipe Torque Wrench GG94310000.

3. After repair or replacement of parts is done, see if there is no leak by depressing brake pedal several times.
4. Using a spring scale, measure rotor turning resistance.

Rotor turning resistance:
New bearing
51.5 kg-cm (715 in-oz)
Reused bearing
47.5 kg-cm (660 in-oz)
Use hub bolt:
New bearing
8.29 kg (18.3 lb)
Reused bearing
7.59 kg (16.7 lb)

Note: If specified value is exceeded, reassemble seal.



BR476

Fig. BR-28 Measuring rotating resistance

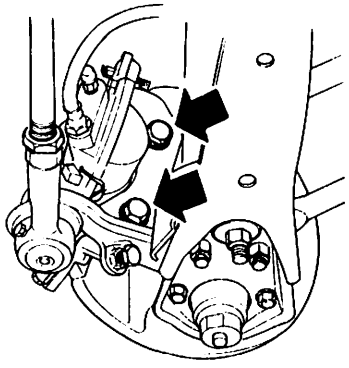
CALIPER ASSEMBLY REPLACEMENT

Removal

1. Disconnect brake hose from tube.

Note: When removing brake hose, use suitable tube wrench. Never use open end wrench or adjustable wrench.

2. Remove pads. Disengage caliper assembly from knuckle spindle by removing bolts attaching to bracket. See Figure BR-29.



BR278

Fig. BR-29 Detaching caliper assembly

Disassembly and assembly

1. To disassemble, refer to the paragraph of Removal of Pad Replacement and Disassembly of Piston Seal Replacement in this chapter.
2. To assemble, reverse the sequence of disassembly.

Caliper mounting bolts tightening torque:
7.3 to 9.9 kg-m
(53 to 72 ft-lb)

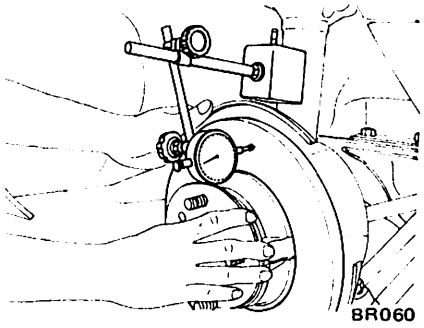
ROTOR INSPECTION

Remove caliper assembly. Check rotor for runout or damage and, if necessary, replace.

1. Runout

Adjust wheel bearing correctly. Using a dial gauge, measure runout at the center of rotor pad contact surface.

Runout limit:
0.06 mm (0.0024 in)
Total indicator reading



BR060

Fig. BR-30 Measuring runout

2. Parallelism

Measure thickness toward the entire periphery of rotor, using a micrometer.

Parallelism (when new)
0.03 mm (0.0012 in)
maximum
Service limit:
0.07 mm (0.0028 in)

Note: As this value increases (wear occurs progressively), vibration corresponding to revolution of tire may often be transmitted to interior of car.

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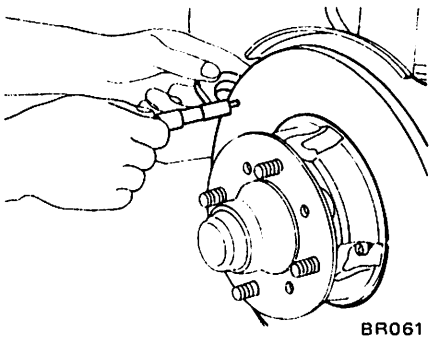


Fig. BR-31 Measuring parallelism

3. Thickness

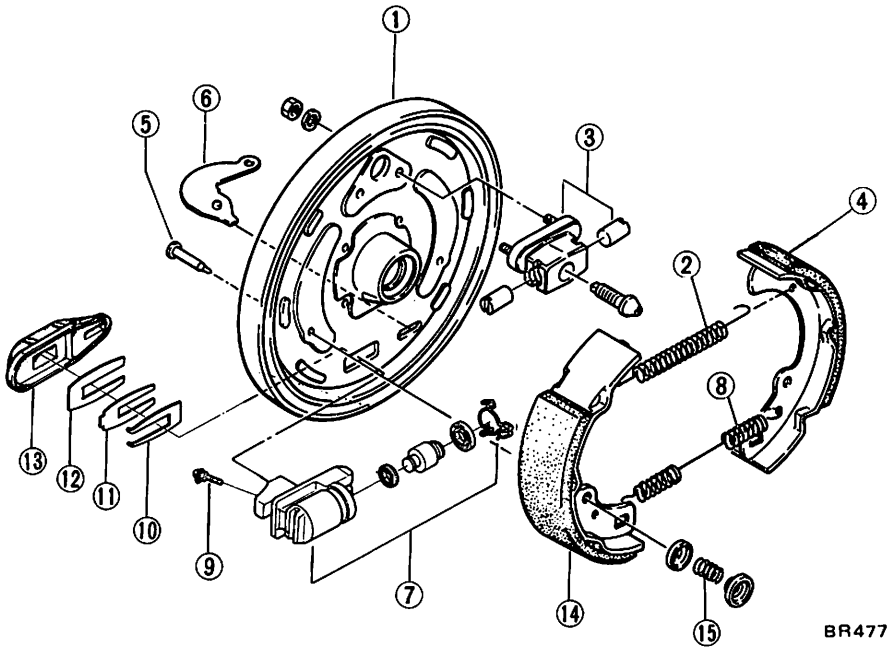
If rotor thickness is beyond wear limit, replace rotor. When correcting thickness, be sure that the thickness after correction does not exceed the limit.

Standard thickness:
10.0 mm (0.394 in)
Wear limit:
8.4 mm (0.331 in)

REAR BRAKE

DESCRIPTION

The rear brake is a leading-trailing type. Brake shoe clearance can be adjusted by turning the end of the adjuster wedge.



1 Brake disc
2 Return spring adjuster side
3 Brake shoe adjuster
4 Brake shoe assembly-fore
5 Anti-rattle pin
6 Wheel cylinder lever
7 Wheel cylinder
8 Return spring cylinder side
9 Bleeder
10 Lock plate A
11 Lock plate B
12 Lock plate C and D
13 Dust cover
14 Brake shoe assembly-after
15 Anti-rattle spring

Fig. BR-32 Rear brake

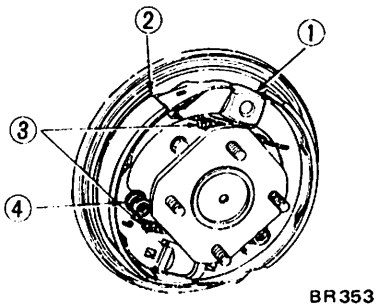
REMOVAL AND INSTALLATION

Removal

To remove rear brake, use the following procedure.

1. Jack up rear axle case or suspension member of car and remove tire and brake drum. If brake drum is hard to remove, use bolts [8 mm (0.3150 in) diameter, 1.25 mm (0.0492 in) pitch] to drive it out.
2. Turn anti-rattle pin 90° and remove anti-rattle springs. See Figure BR-32.
3. Remove return springs ②, ⑧ and brake shoes ④, ⑭. See Figure BR-32.
4. Remove adjuster securing nuts and detach adjuster ③. See Figure BR-32.
5. Disconnect brake tube.

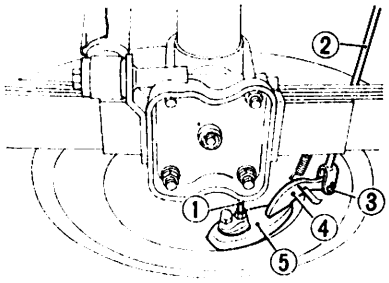
Note: When removing brake tube use suitable tube wrench. Never use open end or adjustable wrench.



1 Brake shoe adjuster
2 Brake shoe assembly
3 Return spring
4 Anti-rattle pin

Fig. BR-33 Removing shoe assembly

6. Pull out clevis pin to separate cross rod from wheel cylinder lever.
7. Remove dust cover, adjusting shims and lock plates, and wheel cylinder can be removed easily.



1 Brake tube
2 Cross rod
3 Clevis pin
4 Wheel cylinder lever
5 Dust cover

Fig. BR-34 Removing wheel cylinder

8. Remove nuts securing back plate to rear axle case. Withdraw rear axle shaft with brake back plate. For details, refer to Section "RA".

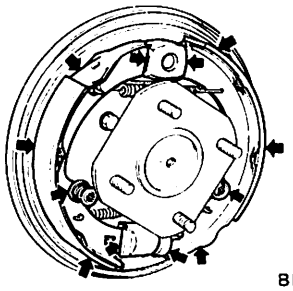
Installation

To install, follow the reverse procedure of removal, observing the following items.

1. Apply a coating of grease to shoe-to-disc sliding surfaces (6 places), exercising care not to wet lining with grease. See Figure BR-35.

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Note: When installing brake tube, use Pipe Torque Wrench GG94310000.

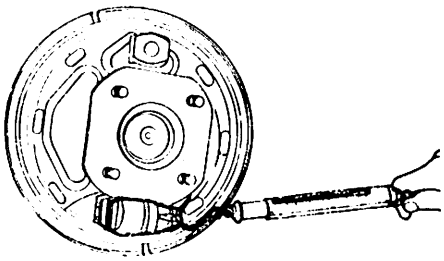


BR356

Fig. BR-35 Points requiring grease

2. Measure wheel cylinder sliding resistance, using a spring balance. See Figure BR-36.

Standard:
2.0 to 7.0 kg (4.4 to 15.4 lb)
Adjuster mounting nut tightening torque:
1.4 to 1.8 kg-m
(10 to 13 ft-lb)

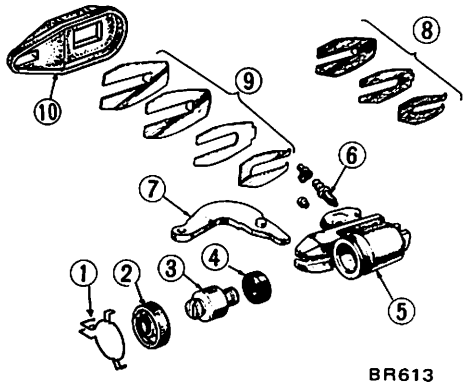


BR357

Fig. BR-36 Measuring wheel cylinder sliding resistance

DISASSEMBLY AND ASSEMBLY OF WHEEL CYLINDER

Disassembly



BR613

1 Snap ring
2 Dust cover
3 Piston
4 Piston cup
5 Cylinder
6 Bleeder
7 Wheel cylinder lever
8 Lock plates (Tokico made)
9 Lock plates (Nabco made)
10 Dust cover

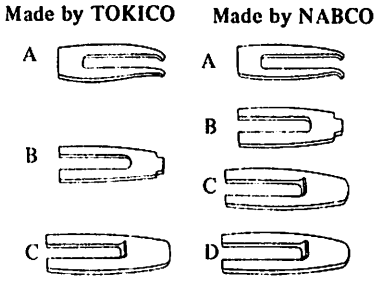
Fig. BR-37 Wheel cylinder

1. The wheel cylinder can be disassembled in its mounted condition. Do not remove it unless replacement of entire master assembly is necessary.
2. To disassemble, remove snap ring, dust cover, piston and piston cup, in the order enumerated. See Figure BR-37.

Note: Exercise care not to scratch sliding contact surfaces of cylinder and piston. Discard old piston cup.

Assembly

1. To assemble, reverse the disassembly procedure.
2. Apply rubber grease to rubber parts to facilitate the assembly operation.
3. To install wheel cylinder, insert wheel cylinder lever into disc and fit wheel cylinder in position. Then drive in the parts A, B, C and D, in the order shown, using a hammer.



BR283

Fig. BR-38 Lock plates

INSPECTION

Brake drum

1. Replace brake drum whose diameter is beyond the limit of 1.4 mm (0.055 in) with respect to the standard inner diameter of 228.6 mm (9.000 in).
2. The maximum allowable "out-of-round" of brake drum is 0.02 mm (0.0008 in). Recondition or replace brake drum if specified limit is exceeded.
3. Measure brake drum for taper.
If specified limit of 0.02 mm (0.0008 in) is exceeded as measured at a position where the distance of 40 mm (1.575 in) is kept away from inlet, recondition or replace brake drum.
4. Drum surface with which linings come into contact should be finished by grinding with a No. 120 to 150 sandpaper.
5. Using a drum racer, finish brake drum by machining if it shows any sign of score marks, partial or stepped wear on its contact surface.

Note: After brake drum is completely reconditioned or replaced, check drum and shoe for proper contact pattern.

Brake assembly

1. Replace linings which are cracked, worn or oil-stained.
2. Replace linings if they are worn down to less than 1.5 mm (0.059 in).
3. Replace shoe return springs which are broken or fatigued.
4. Replace fatigued anti-rattle springs, damaged pins and/or retainers.

Standard dimensions of shoe springs

	Free length mm (in)	Installed length/load mm/kg (in/lb)
Cylinder side	120.7 (4.752)	131.5/7.0 to 8.0 (5.177/15 to 18)
Adjuster side	120.4 (4.740)	132.4/13.5 to 16.5 (5.213/30 to 36)
Anti-rattler	20.5 (0.807)	14.9/7.0 to 8.0 (0.587/15 to 18)

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Wheel cylinder

1. Replace any cylinder or piston which is scratched, scored or worn on its sliding contact surface.
2. Replace piston cup with a new one.

Note: It is difficult to find a damaged or worn piston cup. Always replace it with a new one at each disassembly.

3. Replace cylinder if contacting face of cylinder is worn locally or in step.
4. Replace cylinder or/and piston if piston-to-cylinder clearance is beyond 0.15 mm (0.0059 in).
5. Replace damaged dust cover, fatigued piston spring or defective threaded parts.
6. Replace tube connector which is worn on its threaded portion.

MASTER-VAC

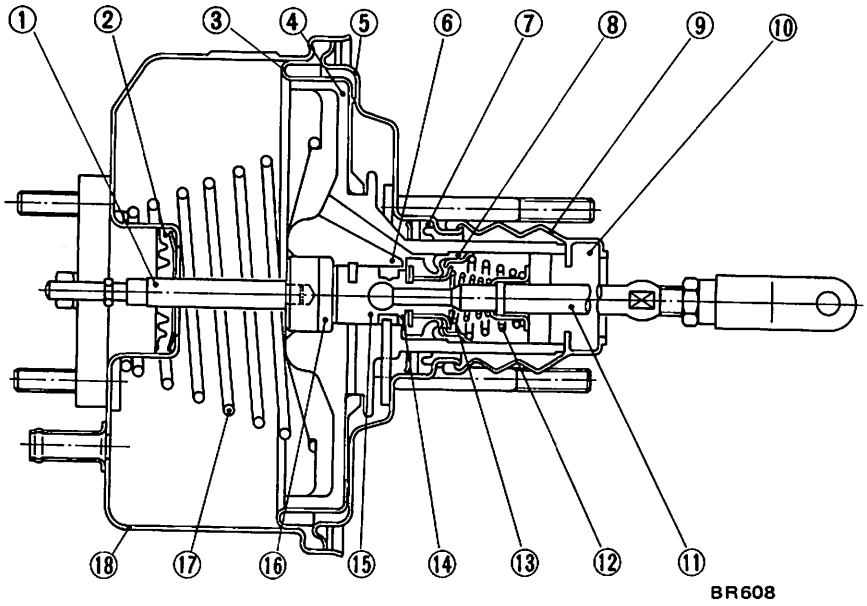
DESCRIPTION

A Master-Vac which decreases the pedal operating force and effectively and certainly brakes all wheels is installed between the brake pedal and the master cylinder. As the brake pedal is depressed, fluid is forced under high pressure through the brake pipes to the wheel cylinders to retard or stop the car.

The Master-Vac contains a spring loaded on diaphragm 152 mm (6.0 in) in diameter.

It operates on the negative pressure produced in the engine intake manifold.

The tandem master cylinder is capable of producing high pressure even if the Master-Vac is defective.



1 Push rod
2 Plate and seal
3 Diaphragm
4 Diaphragm plate
5 Rear shell
6 Vacuum valve
7 Seal
8 Poppet assembly
9 Valve body guard
10 Air silencer filter
11 Valve operating rod
12 Valve return spring
13 Poppet return spring
14 Exhaust valve
15 Valve plunger
16 Reaction disc
17 Diaphragm return spring
18 Front shell

Fig. BR-39 Sectional view of Master-Vac

INSPECTION OF OPERATION

Check valve

1. Loosen clip screw on check valve and disconnect hose.

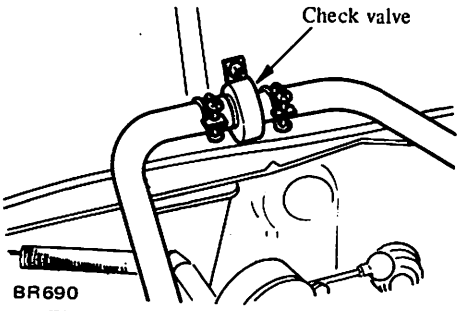
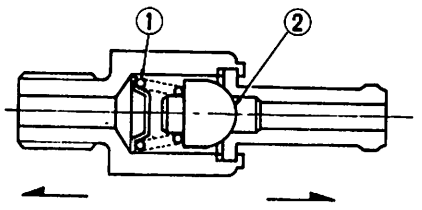


Fig. BF-40 Location of check valve

2. Install a vacuum gauge on check valve. Then start the engine, and increase engine speed. Stop engine when vacuum gauge indicates 500 mm Hg (19.7 in Hg).
3. For fifteen seconds after engine is stopped, observe air pressure rise on vacuum gauge indicator. Even if a slight pressure rise is observed, the check valve is inoperative. Replace check valve with a new one.



1 Spring 2 Valve

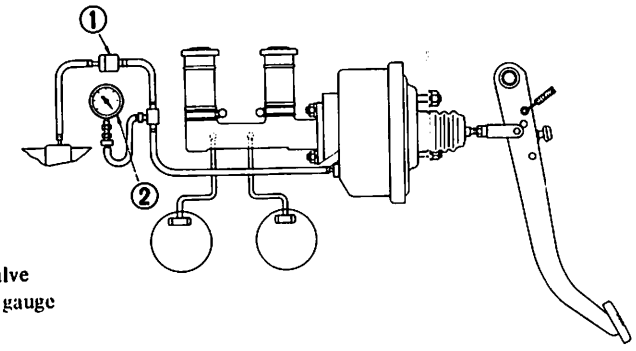
Fig. BR-41 Cross-sectional view of check valve

Air tight test (No load)

1. Connect a vacuum gauge to the line between check valve and Master-Vac as shown in Figure BR-42.

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2. Start engine and increase engine speed. Stop engine when vacuum gauge indicates 500 mm Hg (19.7 in Hg).



1 Check valve
2 Vacuum gauge

BR169

Fig. BR-42 Air-tight test set-up

3. For fifteen seconds after engine is stopped, observe the air pressure rise on vacuum gauge indicator. Even if a slight pressure rise is found, the following items may be the cause of failure. Therefore, the Master-Vac may require disassembly.

Note: Whenever the Master-Vac is to be disassembled, a rubber part must be replaced with a new one.

Probable cause	Corrective action
1. Leakage from connection or piping.	Repair or replace.
2. Leakage from either shell. (Bolt weld part, shells mating part)	Replace.
3. Leakage from seal between valve body and rear shell.	Repair or replace faulty part(s).
4. Leakage from valve of poppet assembly.	Replace poppet assembly.
5. Leakage from seal of push rod.	Replace plate and seal assembly.

Air tight test (Under load)

1. Connect a vacuum gauge and start engine as previously described.
2. Keep engine running, then depress the brake pedal as far as it goes. When the vacuum gauge indicates 500 mm Hg (19.7 in Hg), stop the engine while keeping the brake pedal depressed.
3. For fifteen seconds after engine is stopped, observe air pressure rise on vacuum gauge indicator keeping brake pedal depressed. Even if a slight pressure rise is found, the following items may be the cause of failure. Therefore, the Master-Vac may require disassembly.

Note: Whenever the Master-Vac is to be disassembled, a rubber part must be replace with a new one.

Probable cause	Corrective action
1. Damaged diaphragm.	Replace.
2. Damaged reaction disc.	Replace.
3. Leakage from valve of poppet assembly.	Replace poppet assembly

Operating test

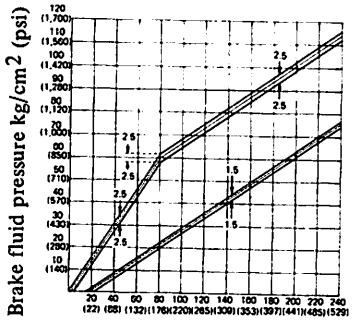
1. Connect an oil pressure gauge to brake line at connection on master cylinder.
2. Start engine and increase engine speed until vacuum pressure gauge indicates 500 mm Hg (19.7 in Hg).
3. With a vacuum pressure of 500 mm Hg (19.7 in Hg) held, measure oil pressure at each pedal operating force.

Note: Pedal operating force can be measured by spring balance of compression type.

4. Relationship between brake fluid pressure and pedal operating force is illustrated in Figure BR-43. If test results are not as specified. Check Master-Vac for condition as previously described "Inspection", before removal of this unit.

Also check brake line for evidence of fluid leakage.

Note: Check and determine whether trouble occurs in Master-Vac or in check valve. Always inspect check valve first.



BR609

Fig. BR-43 Performance curve of Master-Vac

REMOVAL AND INSTALLATION

Removal

Referring to Figure BR-44, remove the parts in order enumerated.

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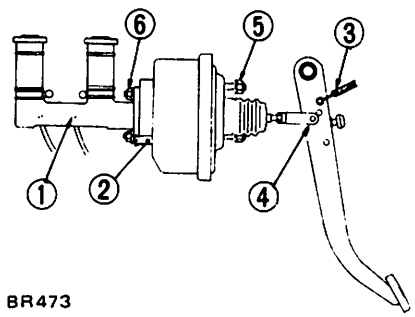


Fig. BR-44 Removal method of Master-Vac

Installation

Install following the reverse procedure of removal.

Note: **After Master-Vac is properly installed in car, conduct an air-tight test and operating test as previously described in this chapter.**

DISASSEMBLY AND ASSEMBLY

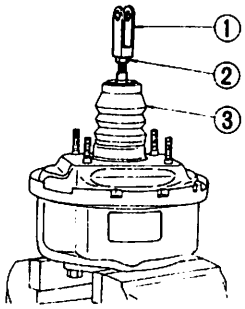
Disassembly

When disassembling Master-Vac, observe the following items.

a) Thoroughly clean mud and dust from Master-Vac.
b) Extreme care should be taken not to allow dirt, water or any other foreign substances to get into any component parts.
Be sure to select a clean place for disassembling and assembling.
c) Mark mating joints so that they may be installed exactly in their original positions.
d) Keep all disassembled parts arranged properly so that they may be readily assembled.
e) Clean synthetic resin parts in alcohol.
f) After all disassembled parts are cleaned in an approved solvent, place them on a clean work bench. Use care not to allow dirt and dust to come into contact with these parts.

1. Place Master-Vac in a vise as shown in Figure BR-45.

Note: **Never remove flange on front shell and use soft jaws not to damage stud bolts on front shell.**



1 Clevis
2 Lock nut
3 Valve body guard

Fig. BR-45 Removing rear shell

2. Mark mating marks on both front and rear shells so that they may be reassembled in their original positions. Then remove clevis and lock nut on valve operating rod and valve body guard on rear shell.
3. Using Master-Vac Wrench ST08080000, remove rear shell from front shell. Then diaphragm plate and valve body, diaphragm spring and push rod can be taken out. See Figure BR-46.

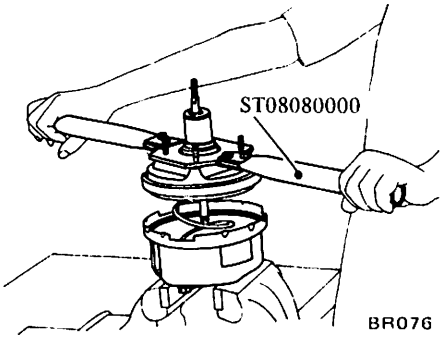


Fig. BR-46 Removing rear shell

Disassembly of rear shell

Pry off retainer with a screwdriver as shown and detach bearing and valve body seal. See Figure BR-47.

Notes:
a. **Use care not to damage bearing and retainer.**
b. **Be sure to install new seal at each reassembly.**

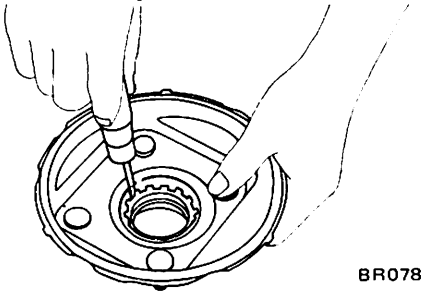


Fig. BR-47 Removing retainer

Disassembly of diaphragm plate and valve body

1. Place diaphragm plate assembly on a clean work bench. Detach diaphragm from groove in plate as shown in Figure BR-48.

Note: **Be sure to install new diaphragm at each reassembly.**

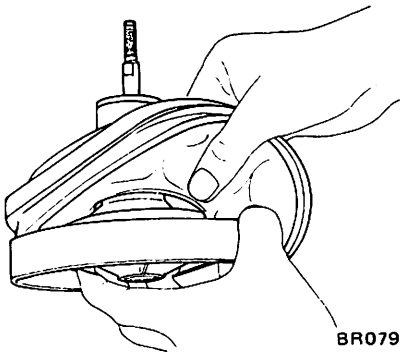


Fig. BR-48 Separating diaphragm

2. Using a screwdriver, evenly pry air silencer retainer until it is detached from diaphragm plate assembly.

Note: **To avoid damage, never tap the driver with a hammer to remove this retainer.**

3. Take out silencer filter and silencer.

Note: **Be sure to install new silencer filter, silencer and silencer retainer at each reassembly.**

4. Pull out valve plunger stop key and withdraw plunger assembly. See Figures BR-49 and BR-50.

Notes:
a. **To remove valve plunger stop key properly, proceed as follows.**
With key hole facing down, lightly push valve operating rod simultaneously while applying vibration to it.
b. **In reassembling, be sure to install new plunger assembly.**

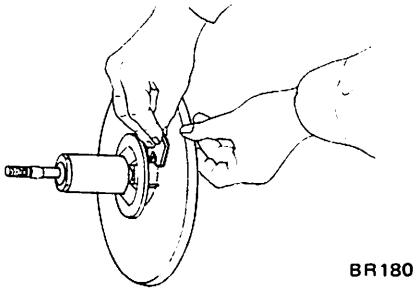


Fig. BR-49 Pulling out stop key

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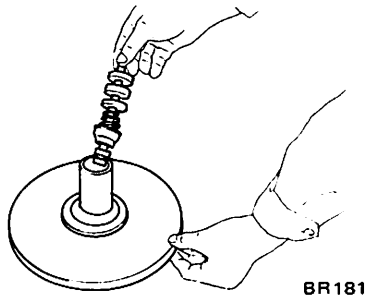


Fig. BR-50 Removing valve operating rod assembly

5. Remove reaction disc. See Figure BR-51.

Note: Be sure to install new reaction disc at each reassembly.

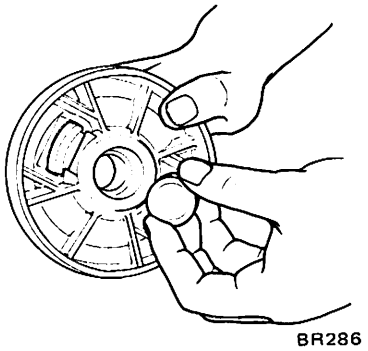


Fig. BR-51 Removing reaction disc

Disassembly of front shell

1. Detach flange from front shell assembly. See Figure BR-52.

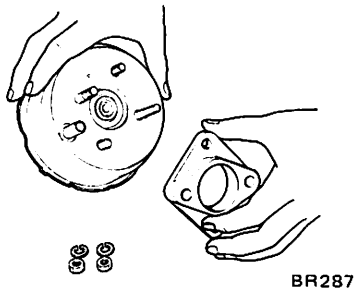


Fig. BR-52 Removing flange

2. Withdraw plate and seal assembly.

Note: Be sure to install new plate and seal assembly at each reassembly.

Assembly of rear shell

1. Apply a coating of Master-Vac grease to the sliding surface and lip of valve body seal.

2. Install valve body seal, bearing and retainer in this order with Oil Seal Retainer Drift ST08060000. See Figure BR-53.

Notes:

a. A new valve body seal must be installed at each reassembly.

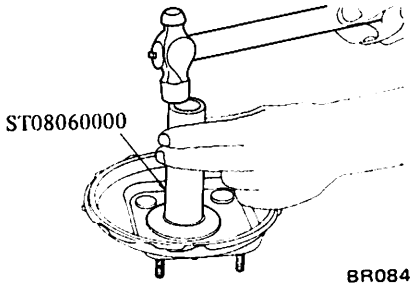


Fig. BR-53 Installing oil seal

b. Referring to Figure BR-54, install seal in place by properly aligning the pawl of special tool with seal hole. Installation is correct when specified length of "A" is obtained.

Length "A"
6.7 to 7.0 mm
(0.264 to 0.276 in)

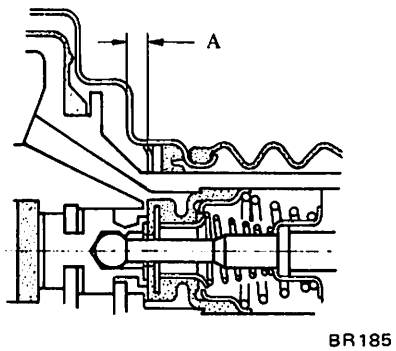


Fig. BR-54 Length of "A"

Assembly of diaphragm plate and valve body

1. Apply a thin coating of grease to the sliding contact portion on the poppet assembly of new plunger assembly. See Figure BR-55.

Note: New plunger assembly must be installed at each reassembly.

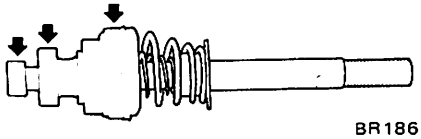


Fig. BR-55 Place of requiring grease

Note: Diaphragm plate is made of bakelite. Exercise care in installing plunger assembly so as not to damage diaphragm plate.

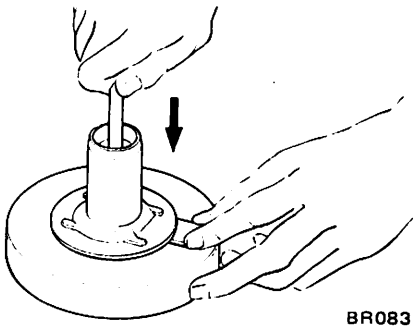


Fig. BR-56 Inserting stop key

2. Install new silencer, silencer filter and silencer retainer in this order.

Note: New silencer, silencer filter and silencer retainer must be installed at each reassembly.

3. Apply a thin coating of mica-powder to new diaphragm except to outer face and sealing portion with which shell comes into contact.

Then, install diaphragm on diaphragm plate and valve body.

Note: A new diaphragm must be installed at each reassembly.

4. Before installing reaction disc on diaphragm plate, apply a thin coating of Master-Vac grease.

Notes:

a. The reaction disc must be a new one.

b. Take care not to fall reaction disc when assembling rear shell on front shell.

Assembly of front shell

Before installing plate and seal assembly on front shell, apply a coating of Master-Vac grease to the inner wall of seal and front shell with which seal comes into contact.

Final assembly

1. Apply a thin coating of Master-Vac grease to the outer edges of diaphragm with which rear and front

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shells come into contact, before installing diaphragm in position.
2. Before installing push rod assembly in place, apply a coating of Master-Vac grease to the sliding contact surface of diaphragm plate.
3. Align marks scribed on the rear and front shell. Carefully turn Master-Vac Wrench ST08080000 clockwise until it reaches notch in shell retainer. See Figure BR-57.

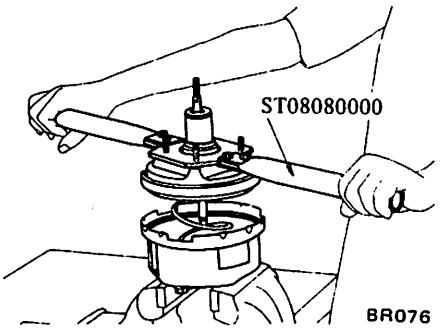


Fig. BR-57 Tightening rear shell

4. After assembly, adjust the length of push rod to the value indicated below. Length adjustment of push rod is made at the tip of push rod. See Figures BR-58 and BR-59.

Length "B":
9.75 to 10.00 mm
(0.384 to 0.394 in)

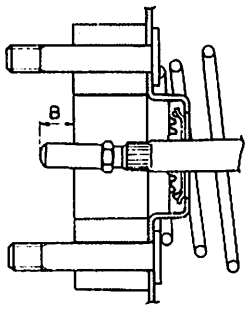


Fig. BR-58 Length "B"

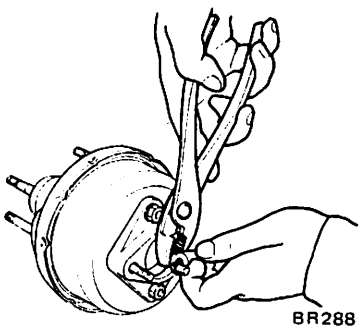


Fig. BR-59 Adjusting push rod length

5. After completion of assembly, inspect the operation of Master-Vac by referring to Inspection of Operation.

INSPECTION

All the rubber parts and some other parts should be discarded and renewed at each disassembly. Therefore, only these parts as described below are necessary to inspect and replace if necessary.

Front and rear shell

Check front and rear shells for condition. If they are worn or damaged, replace with new ones.
1. Check the mating surface of front and rear shells.

If the clearance C is not less than 7.0 mm (0.276 in), replace with new ones.

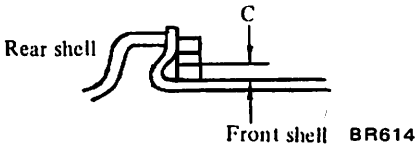


Fig. BR-60 Clearance of mating surface

2. Check threads of stud bolt.

If nut can not be screwed in all the way due to damaged threads, replace shell with a new one.

If threads are damaged slightly, repair with die.
3. Check the welded part of stud bolts for crack.

If a crack is found, replace the shell with a new one.
4. Check the surface of D as sketched below. No rust must be found on both front or rear shells.

If rust is found on these parts, repair with emery paper.

If rust is heavy, replace the shell with a new one.

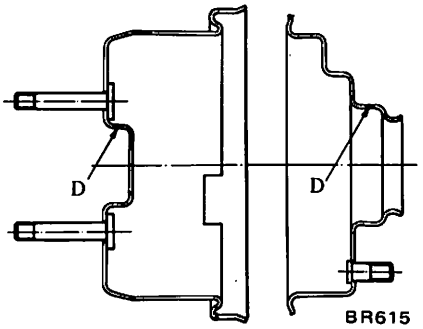


Fig. BR-61 Checking point of D

5. Check the outside of shells for damage.

If paint is torn off, touch up the part.

If dents on the shell are more than 2 mm (0.0787 in) in depth or disturb normal operation, replace shell.

Diaphragm plate and valve body

1. Check outer surface E of valve body for damage. See Figure BR-62.

If damage or score is found, even if they are slight, replace diaphragm plate and valve body with new ones.

2. Check the friction of bearing on the valve body.

If bearing does not move smoothly, replace bearing with a new one.
3. Check the whole diaphragm plate and valve body for cracks.

If a crack is found, even if it is slight, replace it with a new one.

Pay keen attention to the part F. See Figure BR-62.

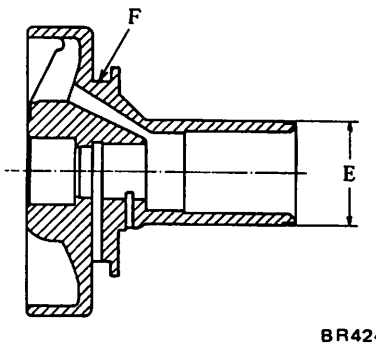


Fig. BR-62 Checking points of diaphragm plate and valve body

Flange

Check the flange for crack and rust.

Replace damaged flange with a new one.

Diaphragm return spring

Check the spring for rust and deterioration.

Replace rusted or weak spring with a new one.

Push rod

1. Check sliding part of push rod for score.

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If a score is found on the sliding part of push rod, replace with a new one.

2. Check the whole push rod for rust.

If push rod is rusty, rub rust off with emery paper.

If push rod is rusted too much, replace it with a new one.

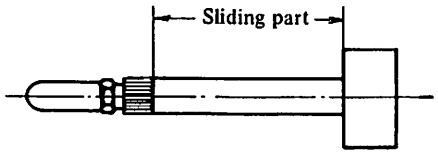


Fig. BR-63 Push rod

Clevis

Check the clevis for wear or deformation and, if necessary, replace with a new one.

Key

Check the key for deformation and, if necessary, replace with a new one.

SERVICE DATA AND SPECIFICATIONS

Brake pedal			
Pedal height	mm (in)	.....	185 (7.283)
Free play at pedal pad	mm (in)	.....	1 to 5 (0.039 to 0.197)
Full stroke of pedal head	mm (in)	.....	145 (5.709)
Master cylinder			
Inner diameter	mm (in)	.....	19.05 (3/4)
Hand brake			
Type		.....	Mechanically-operated on rear wheels
Normal stroke	mm (in)	.....	80 to 95 (3.150 to 3.740)
Front service brake			
Type		.....	SC
Wheel cylinder inner dia.	mm (in)	.....	50.80 (2)
Brake rotor outer dia.	mm (in)	.....	232 (9.134)
Rotor runout	mm (in)	.....	0.06 (0.0024) max.
Repair limit of rotor (thickness)	mm (in)	.....	8.4 (0.331)
Pads (Width x thickness x length)	mm (in)	.....	39.7 x 9 x 86 (1.563 x 0.354 x 3.386)
Wear limit (thickness)	mm (in)	.....	1.0 (0.039)
Rear service brake			
Type		.....	Leading trailing drum brake
Wheel cylinder inner dia.	mm (in)	.....	20.64 (13/16)
Brake drum inner dia.	mm (in)	.....	228.6 (9.000)
Drum inside out-of-round	mm (in)	.....	0.02 (0.0008) max.
Repair limit of drum dia.	mm (in)	.....	230 (9.055)
Lining (Width x thickness x length)	mm (in)	.....	40 x 4.5 x 219.5 (1.575 x 0.177 x 8.642)
Wear limit (thickness)	mm (in)	.....	1.5 (0.059)

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Tightening torque

		kg-m (ft-lb)
Brake pedal		
Fulcrum pin		3.1 to 4.2 (22 to 30)
Pedal stopper lock nut		0.8 to 1.1 (5.8 to 8.0)
Master cylinder		
Brake master cylinder attaching nut		0.8 to 1.1 (5.8 to 8.0)
Brake line		
Flare nut (both end of brake tube)		1.5 to 1.8 (11 to 13)
Brake hose to brake caliper assembly		1.7 to 2.0 (12 to 14)
Brake hose to three-way connector		1.7 to 2.0 (12 to 14)
Connector mounting bolt	6 mm (0.236 in) dia. bolt	0.5 to 0.7 (3.6 to 5.1)
	8 mm (0.315 in) dia. bolt	0.8 to 1.1 (5.8 to 8.0)
Front and rear brake		
Caliper fixing bolt		7.3 to 9.9 (53 to 72)
Rotor fixing bolt		3.9 to 5.3 (28 to 38)
Adjuster mounting nut (Rear)		1.4 to 1.8 (10 to 13)
Baffle plate		0.3 to 0.4 (2.2 to 2.9)
Rear brake back plate		2.2 to 2.7 (16 to 20)
Air bleeder		0.7 to 0.9 (5.1 to 6.5)

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TROUBLE DIAGNOSES AND CORRECTIONS

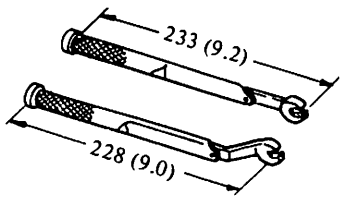
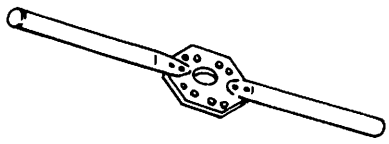
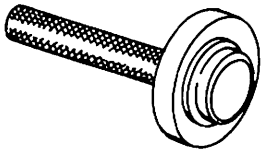
Condition	Probable cause	Corrective action
Poor braking force.	Fluid leakage in brake lines.	Check master cylinder, piping and wheel cylinder for leaks, and repair.
	Insufficient fluid in master cylinder.	Fill with specified brake fluid and bleed system.
	Air in brake lines.	Bleed system.
	Excessive shoe-to-drum clearance.	Adjust.
	Grease, oil, mud or water on linings or pads.	Clean brake mechanism and check cause of trouble. Replace linings or pads.
	Deterioration of linings or pads.	Replace.
	Local fit of linings or pads.	Rub or replace.
	Excessive wear of linings or pads.	Replace.
	Poor condition of master cylinder or wheel cylinders.	Repair or replace.
	Poor condition of check valve or Master-Vac.	Check and repair or replace.
Unbalanced brakes.	Improper tire inflation.	Inflate to correct pressure.
	Improper adjustment of shoe-to-drum clearance.	Adjust.
	Grease, oil, mud or water on linings or pads.	Clean brake mechanism and check cause of trouble. Replace linings or pads.
	Mud in brake drum.	Clean.
	Deterioration of linings or pads.	Replace.
	Excessive wear of linings or pads.	Replace.
	Deformation of brake shoes.	Replace.
	Excessive wear or score of drum or rotor.	Reface drums and install new linings or replace. Reface rotor or replace.
	Poor condition of wheel cylinder.	Repair or replace.
	Poor sliding condition of brake shoe.	Adjust.
	Looseness of cylinder body or back plate securing bolts.	Fasten or replace.
	Deformation of back plate.	Replace.
	Incorrect adjustment of wheel bearings.	Adjust or replace.
	Incorrect adjustment of wheel alignment.	Adjust.
	Looseness of leaf spring securing U-bolts.	Tighten or replace.
	Clogged brake lines.	Check and clean.
All brakes drag.	Improper shoe-to-drum clearance.	Adjust.
	Weak shoe return springs.	Replace.
	No free travel in brake shoe return.	Adjust pedal height.

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Condition	Probable cause	Corrective action
All brakes drag.	Seized master cylinder piston.	Disassemble master cylinder and replace piston. Bleed system.
	No free play in pedal.	Adjust.
	Poor shoe condition.	Clean and repair.
	Poor condition of wheel cylinder.	Repair or replace.
	Deformation of piston cups.	Replace.
	Poor condition of piston because of defective piston seals.	Replace piston seals.
	Excessive run out of rotor.	Turn rotor on lathe or replace.
	Hand brake will not return.	Check and repair.
	Clogged master cylinder return port.	Clean.
	Clogged brake lines.	Check and clean.
	Incorrect adjustment of wheel bearings.	Adjust or repair.
Spongy pedal.	Air in brake lines.	Bleed system.
	Swollen hose due to deterioration or use of poor quality hose.	Replace hose and bleed system.
	Use of a brake fluid with too low boiling point.	Replace with specified brake fluid and bleed system.
	Reservoir filler cap vent hole clogged. (This promotes a vacuum in master cylinder that sucks air through rear seal.)	Clean and bleed system.
Pedal yields under slight pressure.	Deteriorated check valve.	Replace check valve and bleed system.
	External leaks.	Check master cylinder, piping and wheel cylinder for leaks and repair.
	Leakage in master cylinder.	Overhaul master cylinder.
Excessive pedal travel.	Air in system.	Bleed system.
	Shoe out of adjustment.	Adjust shoe-to-drum clearance.
	Insufficient fluid in master cylinder.	Fill with specified brake fluid and bleed system.
	Thermal expansion of drums because of overheating.	Allow drums to cool off. Check brake shoe linings and drums. Replace damaged parts.
Excessive pedal pressure required, poor brakes.	Grease, oil, mud or water on brake shoe linings.	Remove drums and clean and dry linings or replace.
	Full area of linings not contacting drums.	Replace shoes.
	Scored brake drums.	Reface drums and install new linings.
Brake chatters, squeaks or squeals.	Dust on drums or oil-stained linings.	Remove and clean drums.
	Weak shoe return springs.	Check and if necessary, replace springs.
	Drum out-of-round.	Turn drums on lathe.
	Worn linings or pads.	Replace.

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SPECIAL SERVICE TOOLS

No.	Tool number & tool name	Description Unit: mm (in)	For use on	Reference page or figure No.
1.	GG94310000 Brake pipe torque wrench	This tools is used to tighten and loosen brake tube flare nut. A built-in torque limiting wrench is provided to assure torque accuracy.  SE227	All models	Page BR-5 Page BR-12 Page BR-14 Fig. BR-11
2.	ST08080000 Master-Vac wrench	This tool is used to remove rear shell after aligning rear shell stud bolt with the opening in this tool.  SE073	710 610 S30	Fig. BR-46 Fig. BR-57
3.	ST08060000 Master-Vac oil seal retainer drift	This tool is used when rear shell seal is driven into position. **Note: Make sure that this tool is pushed in until rear guide of this tool touches rear shell.**  SE115	710 610 S30	Fig. BR-53

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SERVICE MANUAL

DATSUN 710
MODEL 710 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION WT

WHEEL AND TIRE

WT

WHEEL AND TIRE ..... WT- 2
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WHEEL AND TIRE

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DESCRIPTION

The 710 series models use 4½J-13 with a 30 mm (1.181 in) offset wheels.

The tire and wheel usage chart is shown below. The bias pry tubeless tire is standard for the 710 series. Radial tires are also available as optional parts.

All radial tires are tubed tires.

TIRE USAGE

Applied model	Wheel size	Tire size	Remarks
Sedan Hardtop Station Wagon	4½J-13	165-13/6.45-13-4PR	Bias pry, tubeless tire
		165SR-13	Radial tubed tire

RECOMMENDED INFLATION PRESSURE

VEHICLE CAPACITY WEIGHT	750	SEATING CAPACITY	FRONT	2 PASSENGERS
			REAR	2 PASSENGERS

RECOMMENDED COLD TIRE INFLATION PRESSURE

TIRE SIZE	FOR MAXIMUM LOAD (750 lbs) 4 PASSENGERS + 150 lbs LUGGAGE OR 2 PASSENGERS + 450 lbs LUGGAGE		FOR REDUCED LOAD (600 lbs) 1 TO 4 PASSENGERS OR 1 TO 2 PASS + 300 lbs LUGGAGE	
165 - 13 / 6.45 - 13	FRONT	REAR	FRONT	REAR
FOR NORMAL SPEED UNDER 70 MPH	28 PSI	32 PSI	26 PSI	28 PSI
FOR HIGH SPEED OVER 70 MPH	28 PSI	32 PSI	28 FSI	32 PSI
165 SR13	28 PSI	30 PSI	28 PSI	28 PSI

Notes: a. For continuous high speed operation [over 100 km/h (63 MPH)], increase tire inflation pressure by 0.3 kg/cm² (4 psi) higher than the recommended pressure except radial tire.

b. The tire inflation pressure should be measured when the tire is cold.

c. Tube for radial tire is used exclusively from tube for bias pry tire.

MAINTENANCE AND SERVICE

TIRE INFLATION

Correct tire pressure is very important to ease of steering and riding comfort. This also reduces driving sound to a minimum, resulting in longer tire life; that is, overinflation or underinflation promotes wear at center tread or shoulder of tire.

If all tires are inspected frequently and maintained correct tire pressure, it is possible to detect sharp material in the tread. Also, the above check avoids abnormal wear which invites serious trouble. If tires indicate abnormal or uneven wear, the cause of trouble should be detected and eliminated.

After inflating tires, leakage in valve should be checked. Without valve caps, leakage will occur due to dirt and water, resulting in underinflation. Accordingly, whenever tire pressure is checked, be sure to tighten valve caps firmly by hand.

TIRE REPAIR

Tubeless tire

In order to inspect a leak, apply soapy solution to tire or submerge tire and wheel in the water after inflating tire to specified pressure. Special inspection for leaks should be carried out around the valve, wheel rim and along the tread. Exercise care to bead and rim where leakage occurs. Wipe out water from area which leaks air bubbles and then mark the place with chalk.

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After removing the materials which caused puncture, seal the point. When repairing the puncture, use the tire repair kits which are furnished from tire dealers, following the instructions provided with the kits. In case that a puncture becomes large or there is any other damage on the tire fabric, repair must be carried out by authorized tire dealers.

Tubed tire

In order to inspect a leak, apply soapy solution to tire tube or submerge tire tube in the water after inflating tire tube. Special inspection for leaks should be carried out around the valve. Wipe out water from area where air bubbles exist and then mark the place with chalk.

After removing the materials which caused puncture, seal the point. When repair kits furnished from tire dealers, following the instructions provided with the kits. When a puncture becomes large or there is any other damage on the tire fabric, repair must be carried out by an authorized tire dealer.

Wheel repair

Inspect wheel rim flange for a bend or dent. If any of the above deterioration is detected, repair should be made to secure complete sealing. The flange should be cleaned by a wire brush when rust is found on the flange. Furthermore, if excessive pitting occurs on the rim, eliminate it with a file.

WEAR

Misalignment

When the front wheels align in excessive toe-in or toe-out condition, tires scrape the tread rubber off. The wear of tread appears feathered edge.

Center

This wear is caused by overinflation of the tire. The inflation pressure must be kept at the specified value.

Shoulder

The wear may be caused by underinflation, incorrect wheel camber, or continuous high speed driving on curves. In general, the former two causes are common. Underinflation wear occurs on both sides of treads, and on the other hand, camber causes wear only on one side of treads. For cornering tread wear, the driver must operate car slowing down on curves.

Uneven

Uneven wear is caused by incorrect camber or caster, malfunctioning suspension, unbalanced wheel, out-of-round brake drum, or other mechanical conditions. To repair this abnormal wear, correct the above defective parts.

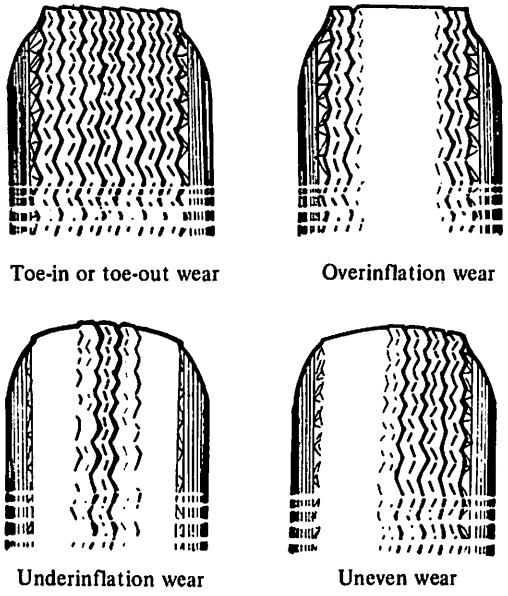


Fig. WT-1 Abnormal tire wear

RADIAL TIRE

Tires of radial ply construction will revolve with less camber thrust force and with greater cornering power on turns. This tends to cause local or rapid wear on the treads with excessive toe-in. Exercise special care for front wheel alignment during the life of tires.

Notes:

a. Radial ply tires should not be mixed with ordianry tires since their characteristics differ from those of ordinary tires.
b. The same brand radial ply tires should be installed on all wheels.
c. The tubes designed for radial tire should be used exclusively.
d. Snow chain should not be fitted because it damages side wall.

TIRE ROTATION

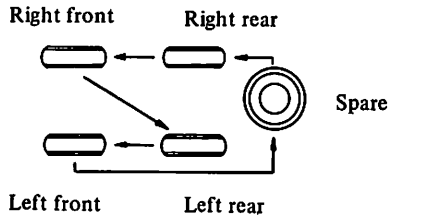
Tires wear unevenly and become unbalanced according to running distance. Uneven tire wear often results in tire noise which is attributed to rear axle gears, bearing, etc. Meanwhile, the front tires tend to wear unevenly because of improperly aligned front wheel.

Accordingly, to equalize tire wear, it is necessary to rotate tires periodically as recommended in the "Periodical Maintenance". See Figure WT-2.

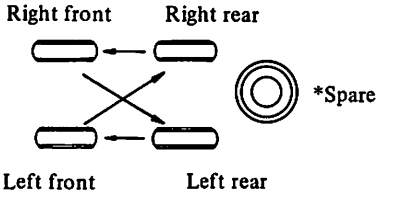
Bias and Bias belted tires

1. All the tires including the spare tire are of the same type.

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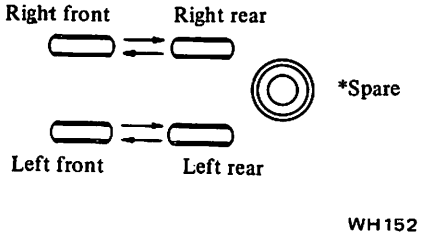


2. The spare tire has a different brand from 4 tires on the ground.



* The spare tire should be used in an emergency only.

Radial ply tires



* Regardless of tire brand the spare tire should be used in an emergency only.

Fig. WT-2 Tire rotation

The tires are provided with "tread wear indicator" at six places around tire circumference, indicating 1.6 mm ($\frac{1}{16}$ in) tread depth. When the tires wear and then the marks appear, replace them with new ones. See Figure WT-3.

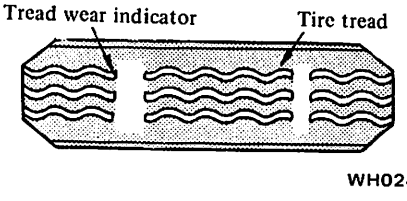


Fig. WT-3 Tread wear indicator

To change tire with wheel using a jack in the safe manner, observe the following procedures:

1. Apply parking brake and block front wheels when rear wheel is being changed.
2. Remove wheel cover and loosen wheel nuts.
3. Place jack at jacking point as described in Section GI for jack up and raise car until wheel clears ground.
4. Remove wheel nuts and wheel from drum.
5. To install wheel, reverse the above steps. Tighten wheel nuts in criss-cross fashion to 8.0 to 9.0 kg-m (58 to 65 ft-lb).

Note: Never get under the car while it is supported only by the jack. Always use safety stands to support the side member of body construction when you must get beneath the car.

INSPECTION

WHEEL BALANCE

The wheel and tire assembly should be kept balanced statically and dynamically.

Proper tire balance is necessary when driving the car at high speeds. Consequently, the wheel and tire assembly should be properly rebalanced whenever puncture is repaired.

The wheel and tire assembly becomes out of balance according to uneven tire wear. Severe acceleration and braking, or fast cornering is the cause of wear on tire, resulting in unbalance of tire and wheel assembly.

The symptom of unbalance appears as tramp, car shake and steering trouble.

To correct unbalance, use proper wheel balancer.

Maximum allowable unbalance:
177 gr-cm (2.5 in-oz)
Balance weight:
10 to 60 gr (0.35 to 2.12 oz)
at 10 gr (0.35 oz) interval

Note: Be sure to place the correct balance weights on the inner edge of rim as shown in Figure WT-4.
Do not put more than two weights on each side.

WHEEL AND TIRE

In order to ensure satisfactory steering condition as well as maximum tire life, proceed as follows:

1. Check wheel rim, especially, rim flange and bead seat for rust, distortion, cracks or other defects which might cause air leaks. Function of tubeless tire depends on a good seal between tire bead and wheel rim. Thoroughly remove rust, dust, oxidized rubber or sand from wheel rim with wire brush, emery cloth or paper. Use dial gauge to examine wheel rim for lateral and diametral runout. See Figure WT-4.

Lateral runout limit:
Less than 1.0 mm (0.039 in) total indicator reading

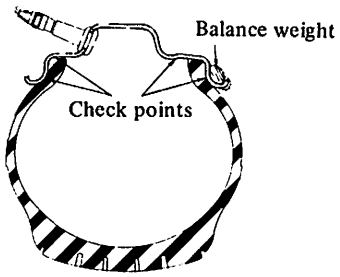


Fig. WT-4 Wheel rim run-out check points

Note: In replacing tire, take extra care not to damage tire bead, rim-flange and bead seat.
Do not use tire irons to force beads away from wheel rim-flange; that is, always use tire replacement device whenever tire is removed.

2. Discard when any of the following trouble occurs:

(1) Broken or damaged bead wire.
(2) Ply or tread separation.
(3) Worn fabric damage on tubeless tire.
(4) Cracked or damaged side wall, etc.

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TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Wheel wobbles.	Improper tire pressure.	Measure and adjust.
	Damaged tire or distorted wheel rim.	Repair or replace.
	Unbalanced wheel.	Balance.
	Loose wheel nuts.	Tighten.
	Worn or damaged wheel bearing, or excessive play of wheel bearing.	Correct play or replace wheel bearing.
	Improper front wheel alignment.	Align.
	Worn or damaged ball joint.	Replace.
	Excessive steering linkage play or worn steering linkage.	Adjust or replace.
	Loose steering linkage connection.	Tighten nuts to rated torque, or replace worn parts if any.
	Broken suspension spring.	Replace.
	Defective shock absorber.	Replace.
Unevenly or excessively worn tire.	Improper tire rotation.	Conduct tire rotation periodically.
	Improper tire pressure.	Measure and adjust.
	Unbalanced wheel.	Balance or replace.
	Improperly adjusted brake.	Adjust.
	Improper wheel alignment.	Align.
	Excessively distorted or improperly installed suspension link.	Repair, replace or, if necessary, reinstall.
	High speed on curves.	Reduce speed.
	Sudden start and improper speed due to rapid acceleration or improper brake application.	Follow correct and proper driving manner.
Tire squeals.	Improper tire pressure.	Measure and adjust.
	Improper front wheel alignment.	Align.
	Distorted knuckle or suspension link.	Repair or replace.

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SERVICE MANUAL

DATSUN 710
MODEL 710 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION ST

STEERING SYSTEM

ST

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STEERING SYSTEM

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INSTALLATION ST-11

DESCRIPTION

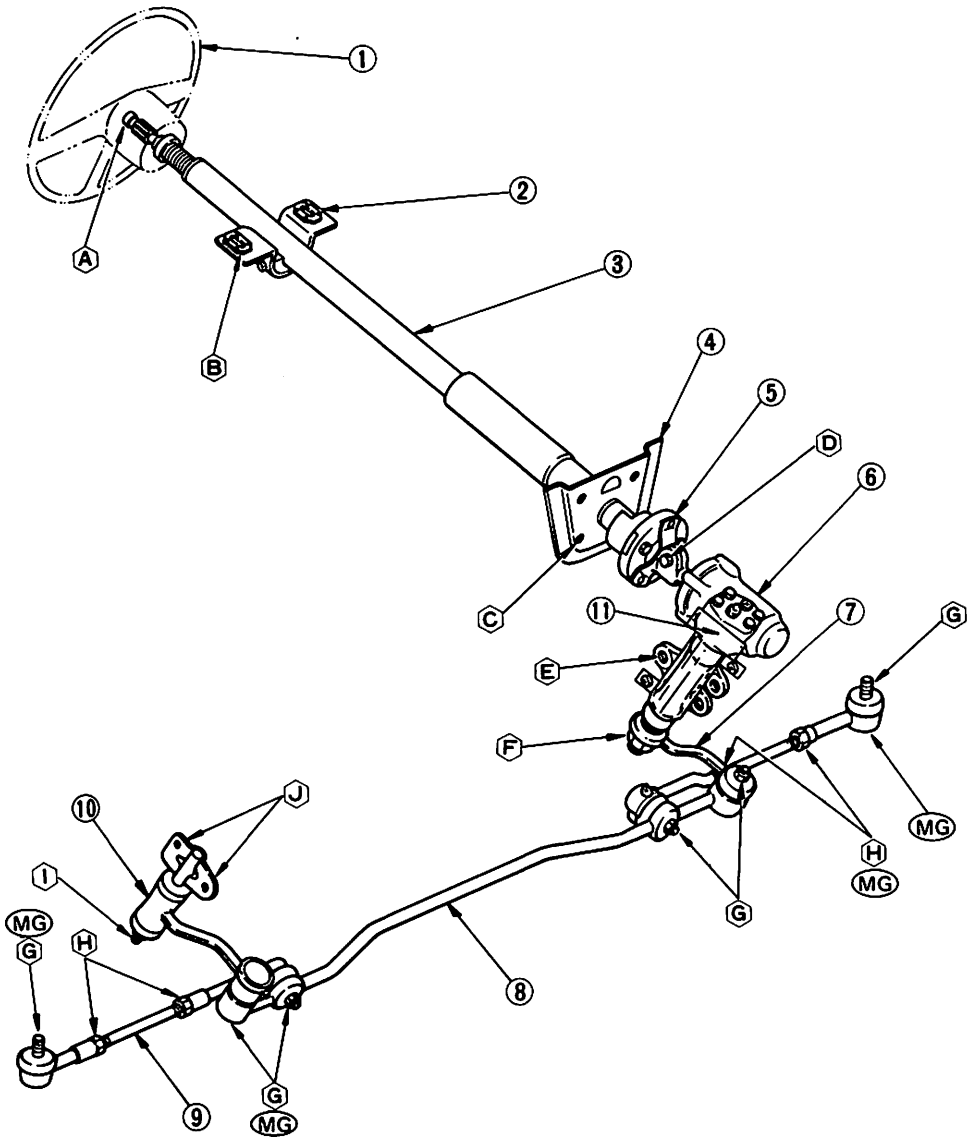
The steering gear is of a recirculating type designed especially for easy operation and high durability. The steering linkage is of a relay design. The gear arm is connected to one end of the cross rod. The other end of the cross rod is linked to the idler arm connecting with the side member located on the opposite side of the steering gear.

The adjustable side rods connect the cross rod to the steering knuckle arms. The rubber coupling, located between the steering column and the steering gear box, prevents road shocks and linkage vibrations from imparting to the steering wheel during operation.

The collapsible steering column is used as a standard equipment. This collapsible steering column is of a steel ball type, and collapses upon impact. Thus, if the car should become involved in a head-on collision that throws the driver forward, the steering column will absorb the energy of his forward movement and greatly reduce the possibility of his being injured.

The oil level in the gear housing should be checked and corrected at the intervals recommended in the Maintenance Schedule. Apply the recommended multi-purpose grease to idler body, idler side joint and ball joints in the steering linkage at the intervals recommended in the Maintenance Schedule.

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1 Steering wheel
2 Column clamp
3 Steering column
4 Jacket tube flange
5 Rubber coupling
6 Steering gear
7 Gear arm
8 Cross rod
9 Side rod
10 Idler arm
11 Heat shield plate

Tightening torque of bolts and nuts kg-m (ft-lb)

Ⓐ 3.8 to 5.2 (27 to 38)
Ⓑ 1.3 to 1.8 (9.40 to 13.0)
Ⓒ 0.35 to 0.45 (2.5 to 3.3)
Ⓓ 4.0 to 5.0 (29 to 36)
Ⓔ 7.0 to 8.0 (51 to 58)
Ⓕ 14.0 (101)
Ⓖ 5.5 to 10.0 (40 to 72)
Ⓗ 5.5 to 7.6 (40 to 55)
Ⓘ 4.0 to 5.0 (29 to 36)
Ⓙ 4.4 to 6.1 (32 to 44)
Ⓜ : Multi-purpose grease

Fig. ST-1 Structural view of steering system

STEERING WHEEL

REMOVAL

1. Disconnect battery ground cable.
2. Disconnect horn wiring.
3. Remove horn pad as follows according to their types.

(1) Two-spoke type horn pad: Sliding horn pad upward, pull it out. See Figure ST-2.

(2) Three-spoke type horn pad: pull out horn pad and remove it from steering wheel.

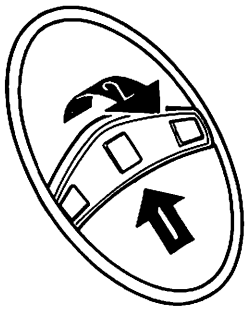


Fig. ST-2 Removing horn pad

4. Remove steering wheel nut.
5. Using Steering Wheel Puller ST27180001, install puller anchor screws in threaded holes in steering wheel. Turn center bolt of the special tool clockwise to remove steering wheel. See Figure ST-3.

Note: Do not strike the end of steering column shaft with a hammer. Striking shaft will damage bearing or collapsible shaft.

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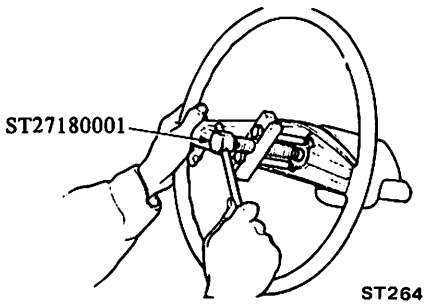


Fig. ST-3 Removing steering wheel

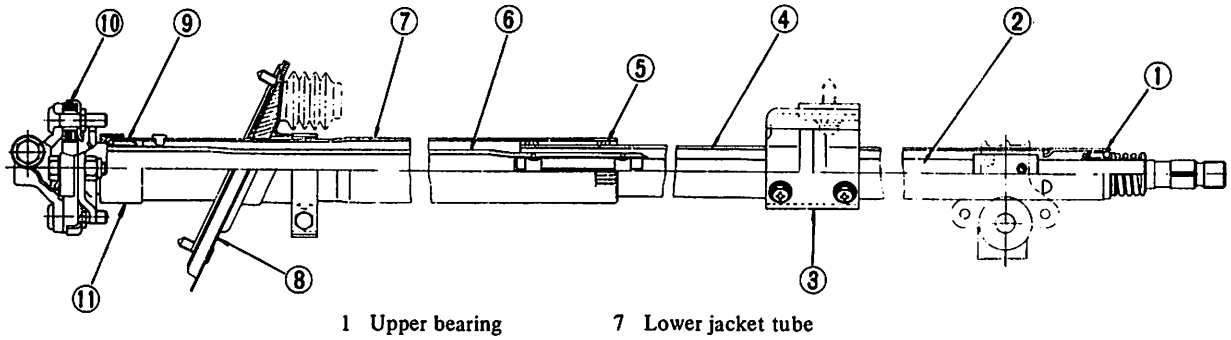
INSTALLATION

Install steering wheel in the reverse order of removal. Observe the following instructions.

1. Apply grease to sliding portions.
2. Install steering wheel on column shaft in a straight ahead position after facing punch mark on the top of upper column shaft in that direction and tighten steering wheel nut to the specified torque.

Tightening torque:
3.8 to 5.2 kg-m
(27 to 38 ft-lb)

STEERING COLUMN (Collapsible type)



1 Upper bearing
2 Upper jacket shaft
3 Steering post clamp
4 Upper jacket tube
5 Steel ball
6 Lower jacket shaft
7 Lower jacket tube
8 Lower jacket tube flange
9 Lower bearing
10 Rubber coupling
11 Column dust cover

ST182

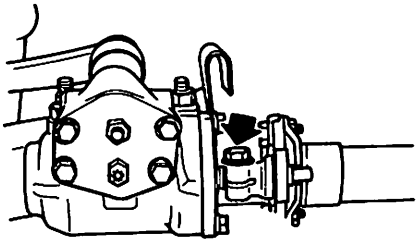
Fig. ST-4 Sectional view of collapsible type steering

Instructions for handling collapsible steering column

1. **Never in any case should an undue stress be applied to steering column in axial direction.**
2. **When installing, do not apply bending force to steering column.**

REMOVAL

1. Remove bolt securing worm shaft and rubber coupling. See Figure ST-5.



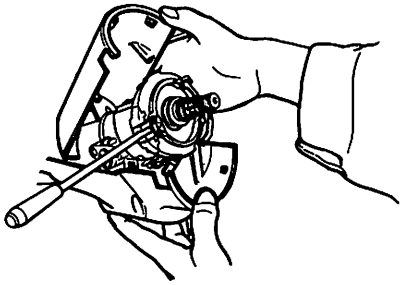
ST474

Fig. ST-5 Removing rubber coupling securing bolt

2. Remove steering wheel.

Refer to page ST-3, step 5 for Removal of Steering Wheel.

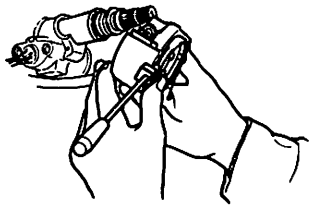
3. Loosen four screws, and remove upper and lower steering column shell covers. See Figure ST-6.



ST494

Fig. ST-6 Removing column shell covers

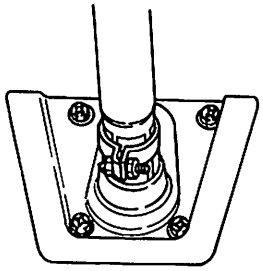
4. Remove turn signal switch assembly by loosening two screws.



ST495

Fig. ST-7 Removing turn signal switch assembly

5. Remove four bolts securing jacket tube flange to dash panel. See Figure ST-8.



ST334

Fig. ST-8 Removing jacket tube flange securing bolts

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6. Remove four bolts securing jacket tube flange to dash panel. See Figure ST-9.

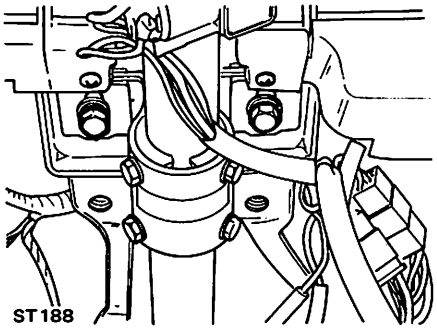


Fig. ST-9 Removing column clamp securing bolts

7. Draw out steering column assembly from the room side. See Figure ST-10.

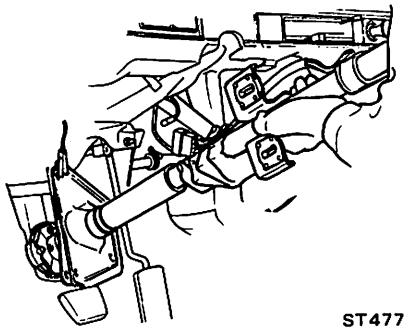


Fig. ST-10 Drawing steering column assembly

Note: When a head-on collision is encountered, inspect steering system as follows:

The steering system is very important unit for driving. The collapsible type steering should not be disassembled, and if necessary, replace it as an assembly.

INSPECTION

1. When steering wheel cannot be rotated smoothly but steering gear, steering linkage and suspension system are normal, check the steering system and replace damaged parts.

(1) Check column bearings for damage or unsmoothness.

If so, lubricate with recommended multi-purpose grease or replace steering column assembly.

(2) Check jacket tube for deformation or breakage, and replace if necessary.

(3) Check column spring, and replace if damaged and weakened.

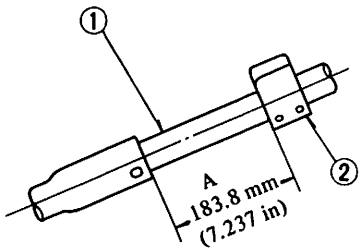
2. When the car equipped with collapsible steering is involved in a light front collision, check the following parts and replace if necessary.

(1) Jacket tube

Measure the dimension A as shown in Figure ST-11.

Standard installed dimension is 183.8 mm (7.236 in).

When jacket tube is crushed, dimension A is reduced.



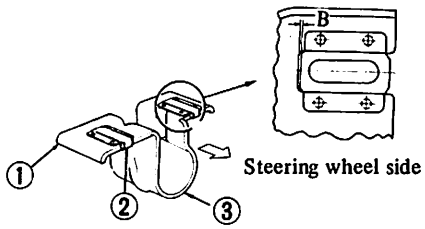
1 Jacket tube
2 Column clamp

Fig. ST-11 Standard dimension between column clamp and the top end of lower jacket tube

(2) Column clamp

Measure dimension B as shown in Figure ST-12.

Standard B dimension is 0 mm (0 in). When jacket tube is crushed, dimension B is increased.



1 Column clamp
2 Block
3 Jacket tube

Fig. ST-12 Standard dimension B

(3) Steering wheel

Check steering wheel for axial play.

When steering jacket shaft is crushed, axial play exists. See Figure ST-13.

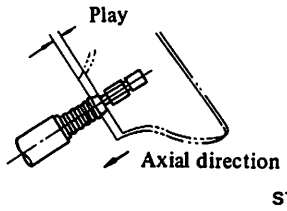


Fig. ST-13 Inspecting steering wheel for axial play

(4) Sector shaft

When collision occurs, abnormal strength is applied to gear arm. As a result of this, serration of sector shaft is apt to be distorted. See Figure ST-14.

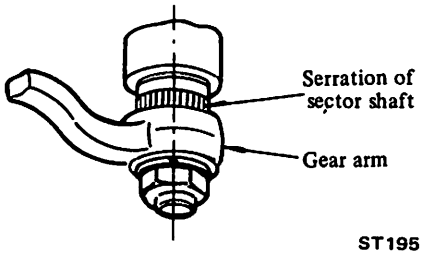


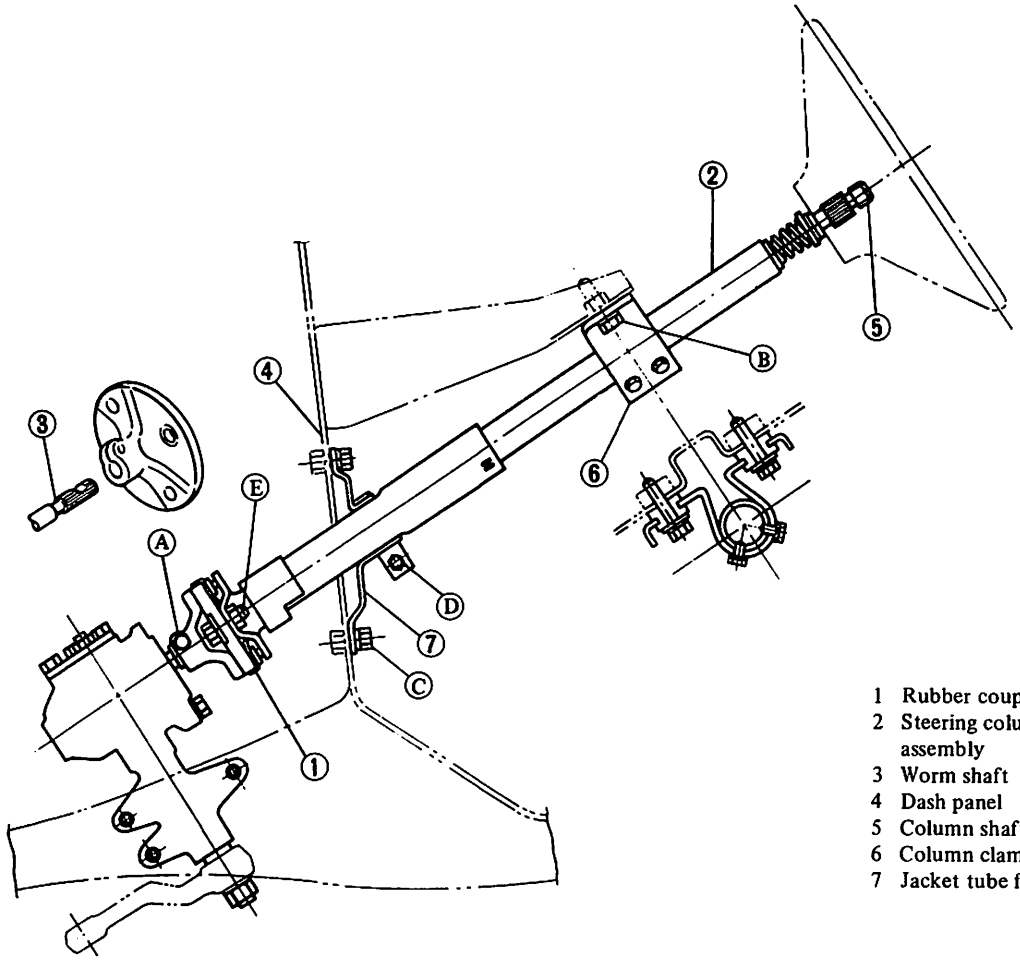
Fig. ST-14 Inspecting the serration of sector shaft for deformation

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INSTALLATION

Install steering column in the reverse order of removal.

Observe the following instructions. See Figure ST-15.



1 Rubber coupling
2 Steering column assembly
3 Worm shaft
4 Dash panel
5 Column shaft
6 Column clamp
7 Jacket tube flange

Fig.ST-15 Installing steering column assembly

1. Set the wheel in a straight ahead position.
2. Fit steering column assembly onto worm shaft serration through dash panel and tighten bolt Ⓐ.

Make sure that punch mark at the top end of column shaft is faced up.

Note: Make sure that any undue stress is not applied to rubber coupling.

3. Install bolts Ⓑ to support the upper side of steering column assembly by means of column clamp.

Tightening torque:
1.3 to 1.8 kg-m
(9.4 to 13.0 ft-lb)

4. Loosen bolt Ⓓ, and after sliding jacket tube flange to dash panel, tighten four nuts Ⓒ, and then tighten bolt Ⓓ.

Tightening torque:
0.35 to 0.45 kg-m
(2.5 to 3.3 ft-lb)

5. After installation, make sure that steering wheel turns smoothly.

STEERING LOCK

To provide tamper-proof, self-shear type screws are used and their heads are sheared off, when installed so that the steering lock cannot be removed easily.

REMOVAL

1. Break two self-shear type screws with a drill or other proper tool.
2. Remove two screws and dismount steering lock from steering jacket tube. See Figure ST-16.

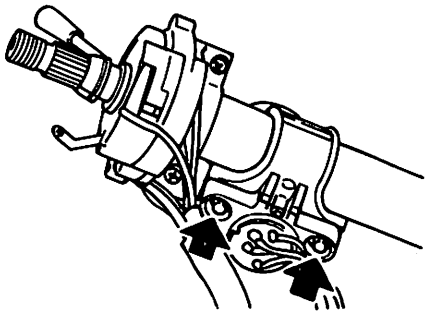


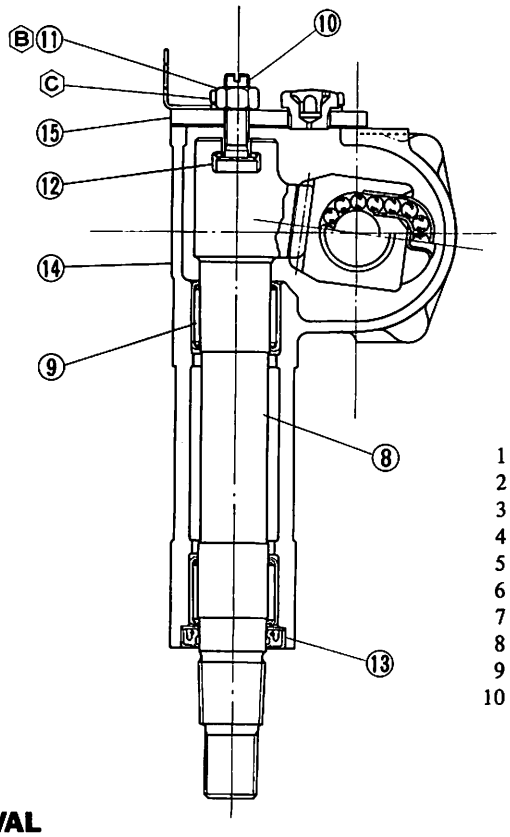
Fig. ST-16 Removing steering lock securing screws

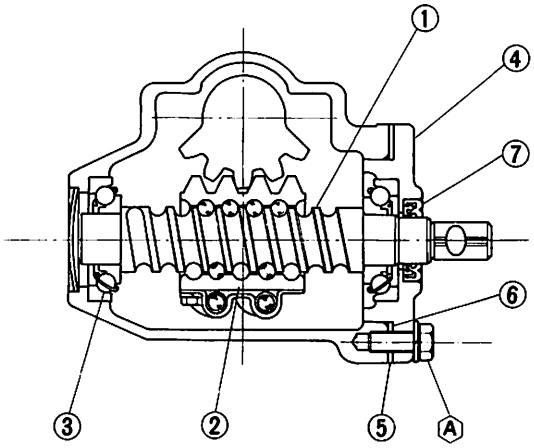
INSTALLATION

1. Align steering lock hole in jacket tube with the mating portion of steering lock.
2. Install self-shear type screws and cut off their heads.

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STEERING GEAR





1 Worm shaft
2 Ball nut
3 Worm bearing
4 Rear cover
5 Bearing shim
6 O-ring
7 Oil seal
8 Sector shaft
9 Sector shaft bearing
10 Adjusting screw
11 Lock nut
12 Adjusting shim
13 Oil seal
14 Steering gear housing
15 Sector shaft cover

Tightening torque of bolts and nuts kg-m (ft-lb)
Ⓐ 1.5 to 2.5 (10.9 to 18.1)
Ⓑ 3.0 to 4.0 (21.7 to 28.9)
Ⓒ 1.5 to 2.5 (10.9 to 18.1)

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Fig. ST-17 Sectional view of steering gear

REMOVAL

1. Remove two screws securing heat shield plate to side member, and detach plate. See Figure ST-18.

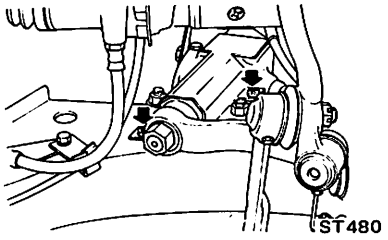


Fig. ST-18 Removing heatshield plate

2. Remove bolt securing worm shaft to rubber coupling. See Figure ST-19.

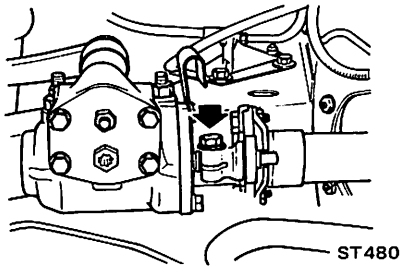


Fig. ST-19 Removing rubber coupling securing bolt

3. Remove nut and lock washer securing gear arm to sector shaft. Using Steering Gear Arm Puller ST27140000, remove steering gear arm from sector shaft. See Figure ST-20.

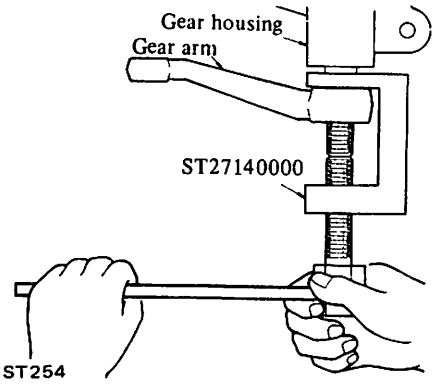


Fig. ST-20 Removing steering gear arm

4. Remove three bolts securing steering gear housing to body side member, and withdraw steering gear housing from engine compartment. See Figure ST-21.

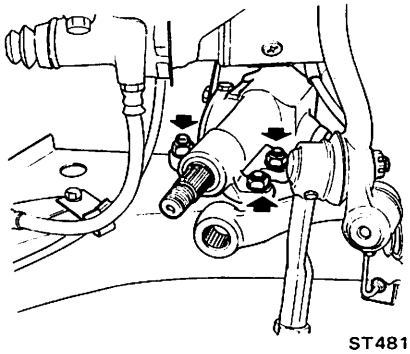


Fig. ST-21 Withdrawing steering gear housing

DISASSEMBLY

1. Thoroughly drain steering gear oil by removing filler plug ① . Place steering gear in a vise with Steering Gear Attachment ST27700001 in place.
2. Loosen lock nut ② and remove four sector shaft cover attaching bolts ③ . After removing sector shaft with cover, remove cover from sector shaft by turning screw clockwise. See Figure ST-22.

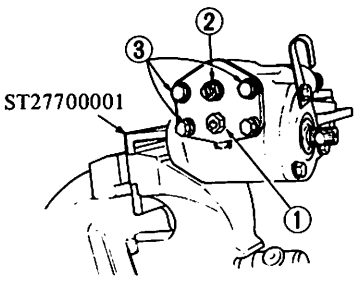


Fig. ST-22 Mounting steering gear in a vise

3. Turn sector shaft adjusting screw a few turns in clockwise direction and then remove cover and sector shaft. See Figure ST-23.

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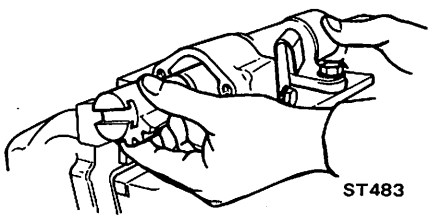


Fig. ST-23 Drawing out sector shaft

4. Remove three rear cover securing bolts and detach rear cover. See Figure ST-24.

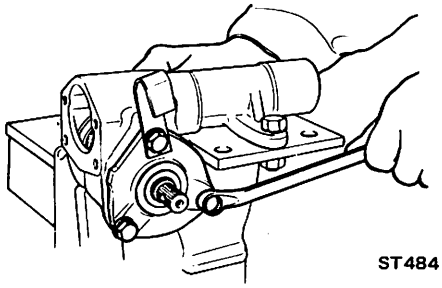


Fig. ST-24 Detaching rear cover

5. Remove bearing adjusting shim(s), and steering worm assembly. See Figure ST-25.

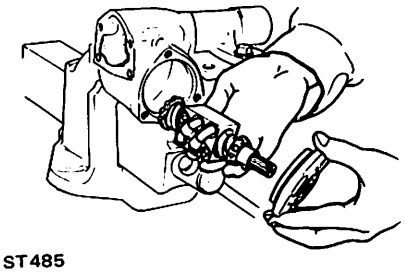


Fig. ST-25 Drawing out steering worm - assembly

Notes:

a. Be careful not to allow ball nut running down to either end of worm. The ends of ball guides will be damaged if nut is rotated until it stops at the end of worm.

b. Do not detach ball nut from worm shaft assembly. If necessary, replace assembly.

c. Do not remove sector shaft needle bearings from steering gear housing. If necessary, replace gear housing assembly.

INSPECTION

Wash clean all the disassembled parts in solvent and check for condition.

Sector shaft

1. Check gear tooth surface for pitting, burrs, cracks or any other damage, and replace if necessary.
2. Check sector shaft for distortion on its serration, and, if necessary, replace. Also check gear housing and steering worm assembly for deformation.

Steering worm assembly

1. Inspect ball nut gear tooth surface, and replace if pitting, burrs, wear or any other damage is found.
2. Ball nut must rotate smoothly on worm gear. If found too tight, assembly should be replaced.

Check rotation of ball nut as follows;

(1) Move ball nut to either end of worm gear, and gradually stand worm shaft and ball nut assembly until ball nut moves downward on worm gear under its own weight.

(2) If ball nut does not move freely over entire stroke, replace assembly.

Note: Be careful not to damage ball nut guide tube while check is being made.

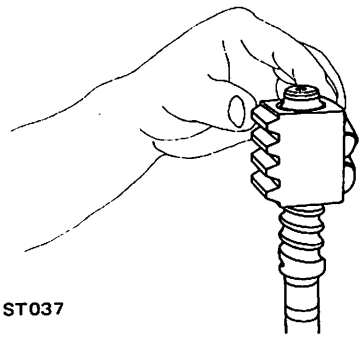


Fig.ST-26 Inspecting worm shaft and ball nut assembly

Bearings

1. Replace worm shaft needle bearing if pitting, wear or any other damage is present.
2. If sector shaft needle bearings are found worn or damaged, replace as an assembly of gear housing and bearings.

Oil seals

Be sure to use new oil seals at each reassembly.

ASSEMBLY AND ADJUSTMENT

Assemble steering gear in the reverse order of disassembly.

Observe the following instructions.

1. Clean all parts.
2. Lubricate worm bearings, sector shaft bearings, and gear tooth with clean gear oil.
3. Fill the space between sealing lips of new oil seal with recommended multi-purpose grease, and fit it to gear housing and rear cover.

Notes:

a. To facilitate installation, coat gear oil to seal contacting face of oil seal.

b. Press oil seal into place with its lettered side towards the outside of gear housing.

Adjustment of worm bearing preload

4. Place steering worm assembly in position in gear housing with worm bearings. Install rear cover on gear housing with O-ring and worm bearing shims.

Tightening torque:
1.5 to 1.8 kg-m
(11 to 13 ft-lb)

Note: Be sure to install thicker shims to gear housing side.

Standard shim thickness:
1.5 mm (0.0591 in)

Available worm bearing shims

No.	Thickness mm (in)
1	0.762 (0.0300)
2	0.254 (0.0100)
3	0.127 (0.0050)
4	0.050 (0.0020)

5. Adjust the worm bearing preload by selecting suitable bearing shims so that the initial turning torque is 4.0 to 8.0 kg-cm (56 to 111 in-oz). See Figure ST-27.

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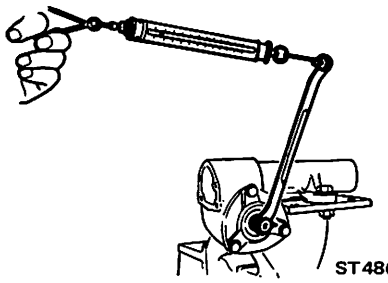


Fig. ST-27 Measuring initial turning torque

Notes:

a. **Rotate worm shaft a few turns in both directions to settle down worm bearing and measure the preload.**
b. **When readjustment is necessary, initial turning torque should be 4.0 to 8.0 kg-cm (56 to 111 in-oz).**
c. **When adjusting worm bearing preload, add or remove shims until correct adjustment is made.**

Adjustment of sector shaft and adjusting screw

6. Insert adjusting screw into T-shaped groove at sector shaft head, and adjust the end play between sector shaft and adjusting screw until it is within 0.01 to 0.03 mm (0.0004 to 0.0012 in) by choosing suitable adjusting shims.

Available sector shaft adjusting shims

No.	Thickness mm (in)
1	1.575 to 1.600 (0.0620 to 0.0630)
2	1.550 to 1.575 (0.0610 to 0.0620)
3	1.525 to 1.550 (0.0600 to 0.0610)
4	1.500 to 1.525 (0.0591 to 0.0600)
5	1.450 to 1.475 (0.0571 to 0.0581)

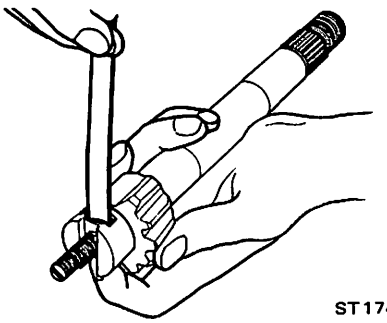


Fig. ST-28 Measuring end play between sector shaft and adjusting screw

7. Rotate worm shaft by hand until ball nut is in the center of travel, then install sector shaft together with adjusting screw in gear housing. Ensure that center gear of sector shaft engages with the center gear of the ball nut. See Figure ST-29.

Note: Be careful not to damage sealing lips of oil seal during operation.

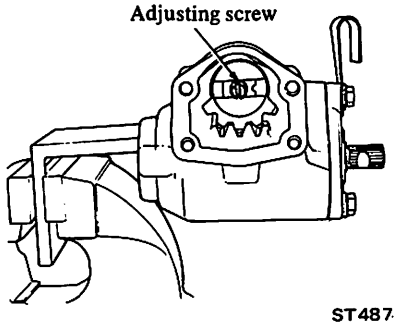


Fig. ST-29 Installing sector shaft

8. Install sector shaft cover on gear housing.

Be sure to apply sealant to each face of sector shaft cover packing when installing cover.

By turning adjusting screw counterclockwise, attach sector shaft cover to gear housing and then temporarily secure it with fixing bolts.

9. Pull sector shaft toward cover approximately 2 to 3 mm (0.079 to 0.118 in) after turning adjusting screw counterclockwise and tighten sector shaft cover fixing bolts to 1.5 to 2.5 kg-m (11 to 18 ft-lb).

10. Push sector shaft against ball nut gear by gradually turning adjusting screw clockwise until sector shaft gear lightly meshes with ball nut gear and then temporarily secure adjusting screw with lock nut.

11. Install gear arm on sector shaft and move sector shaft several times from the side of gear arm to see that it turns smoothly.

12. Adjust the backlash at the neutral position of gear arm by turning adjusting screw in or out so that the movement of the gear arm top end is less than 0.1 mm (0.0039 in). See Figure ST-30.

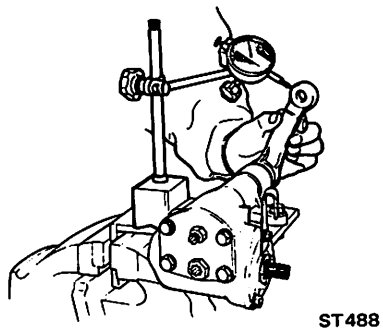


Fig. ST-30 Measuring backlash

13. Turn adjusting screw clockwise approximately 1/8 to 1/6 rotation and then tighten lock nut to 2.0 to 2.5 kg-m (14 to 18 ft-lb) after moving sector shaft several times. See Figure ST-31.

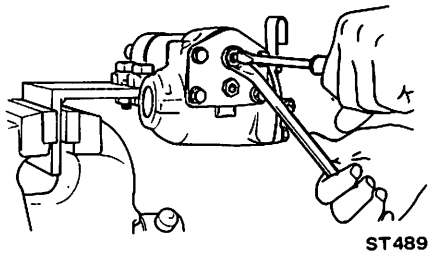


Fig. ST-31 Tightening lock nut

14. Fill gear housing with recommended gear oil of approximately 0.27 liter (⅝ US pt, ½ Imp pt) through filler hole and install filler plug.

INSTALLATION

Install steering gear in the reverse order of removal.

Observe the following instructions.

1. Position steering gear and rubber coupling in place; then install and tighten bolts securing steering gear housing to body side member. Tighten to 7 to 8 kg-m (51 to 58 ft-lb).

Tighten bolt securing rubber coupling to worm shaft to 4 to 5 kg-m (29 to 36 ft-lb).

Notes:

a. **Align the groove in worm shaft with the bolt hole in rubber coupling flange yoke, and press coupling bolt through the undercut section of worm shaft.**
b. **Align four grooves of gear arm serrations with four projections of sector shaft serrations, and install and tighten lock washer and nut to the torque of 14 kg-m (101 ft-lb).**

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STEERING LINKAGE

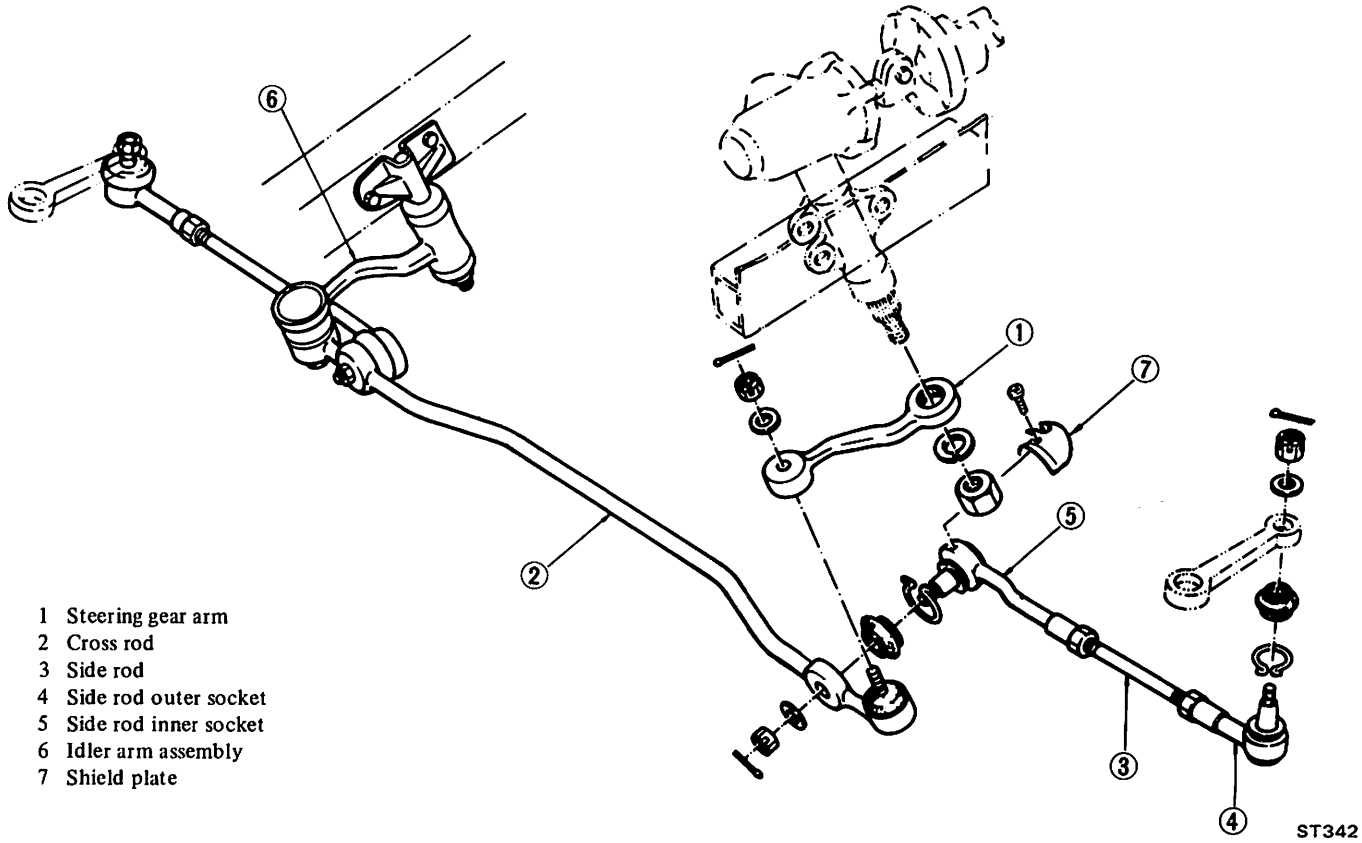


Fig. ST-32 Steering linkage

REMOVAL

1. Jack up the front of car and support it on safety stands.
2. Remove cotter pins and nuts fastening side rod ball studs to knuckle arms.
3. To detach side rod ball studs from knuckle arms, insert Steering Ball Joint Puller ST27850000 between them and strike the top of the tool with a hammer. If this operation must be done without the tool, strike knuckle arm boss with a hammer backing up the opposite side of it with a large hammer and ball stud is free from knuckle arm.

Note: Be careful not to strike the ball stud head, the ball socket of side rod and side rod with a hammer.

4. Remove bolt securing heatshield plate to left side inner side rod socket, and remove heatshield plate.
5. Remove ball stud of cross rod from gear arm, and remove idler arm from cross rod in the same manner as described in step 3 above.
6. Remove idler assembly from side member by taking off two fixing bolts.

DISASSEMBLY

1. Disconnect both side rods from cross rod, following the procedure for removal of side rod ball joints on knuckle arm sides.
2. Remove idler arm nut and disassemble idler assembly.

INSPECTION AND REPAIR

Ball joint

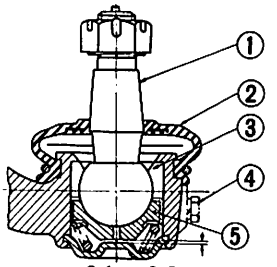
1. When ball stud is worn and axial play is too excessive, replace.

Axial play:
0.1 to 0.5 mm
(0.0039 to 0.0197 in)
Swing torque:
0.5 kg-m (3.62 ft-lb)

2. When dust cover is broken or deformed, replace.

Note: Check and renew grease at the intervals recommended in the "Maintenance Schedule".

To renew grease, replace plug with a grease nipple, and apply recommended multi-purpose grease to ball joints, as shown in Figure ST-33, through grease nipple until grease is forced out through dust cover-to-joint socket clearance.



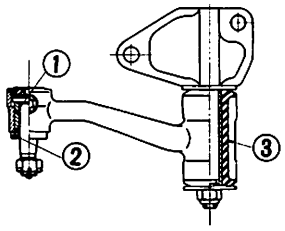
1 Ball joint
2 Dust cover
3 Ball seat
4 Plug
5 Spring seat

Fig. ST-33 Sectional view of ball stud (side rod)

Idler arm assembly

Check nylon bushing of cross rod joint and rubber bushing of idler arm for breakage, wear or play, and if necessary replace.

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1 Nylon bushing 3 Torsion rubber
2 Dust cover

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Fig.ST-34 Sectional view of idler assembly

Cross rod and side rod

Check side rods and cross rod for breakage, bend or crack, and replace if necessary.

ASSEMBLY AND ADJUSTMENT

Assemble steering linkage in the reverse order of disassembly.

Observe the following instructions.

Ball joints

Before installing a new dust cover, be sure to pack with the recommended multi-purpose grease.

Tightening torque:

Ball stud:

5.5 to 10.0 kg-m
(40 to 72 ft-lb)

Notes:

a. When tightening ball stud, be careful not to allow grease getting on its tapered section.

b. Align the cotter pin holes in the tightening directions.

c. Be sure to insert new cotter pin in place and bend it securely.

Idler arm assembly

When assembling idler assembly, observe the following instructions.

1. Apply recommended multi-purpose grease to the sliding portion of idler arm and rubber bushing.
2. Apply soapy water on the outer circumference of bushing.

Carefully press bushing into idler body until it protrudes.

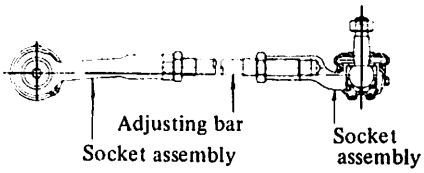
3. Tighten idler nut to 4.4 to 6.1 kg-m (32 to 44 ft-lb).

Cross rod and side rods

1. When side rod sockets and side rod adjusting bar are separated, adjust side rod length correctly. Refer to Section FA for adjustment procedures.
2. Tightening torque:

Side rod adjusting bar lock nut:

8 to 10 kg-m
(58 to 72 ft-lb)



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Fig. ST-35 Side rod

INSTALLATION

Install steering linkage in the reverse order of removal.

Observe the following instructions.

1. Tightening torque:

Ball stud:

5.5 to 10.0 kg-m
(40 to 72 ft-lb)

Idler body-to-frame bolts:

4.4 to 6.1 kg-m
(32 to 44 ft-lb)

Note: Align the cotter pin holes in the tightening directions.

2. Check wheel alignment, and if necessary adjust. See Section FA.

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SERVICE DATA AND SPECIFICATIONS

Steering gear type			Recirculating ball type
Steering gear ratio			16.48 : 1
Steering angle	inner wheel	degree	32° to 33°
	outer wheel	degree	29°30′ to 31°30′
Turns of steering wheel (lock to lock)			3.3
Ball stud	axial play	mm (in)	0.1 to 0.5 (0.0039 to 0.0197)
	swing torque	kg-m (ft-lb)	less than 0.5 (3.62)
Steering wheel play		mm (in)	less than 35 (1.378) at outer circumference of steering wheel
Worm bearing starting torque			
	new bearing	kg-cm (in-oz)	4.0 to 8.0 (56 to 111)
	readjusted bearing	kg-cm (in-oz)	4.0 to 8.0 (56 to 111)

Worm bearing shim

Standard total thickness mm (in) 1.5 (0.0591)

Adjusting shim .....

No.	Thickness mm (in)
1	0.762 (0.0300)
2	0.254 (0.0100)
3	0.127 (0.0050)
4	0.050 (0.0020)

End play between sector shaft and adjusting screw

mm (in) ..... 0.01 to 0.03 (0.0004 to 0.0012)

Adjusting shim .....

No.	Thickness mm (in)
1	1.575 to 1.600 (0.0620 to 0.0630)
2	1.550 to 1.575 (0.0610 to 0.0620)
3	1.525 to 1.550 (0.0600 to 0.0610)
4	1.500 to 1.525 (0.0591 to 0.0600)
5	1.450 to 1.475 (0.0571 to 0.0581)

Gear backlash at gear arm top end mm (in) ..... less than 0.1 (0.0039)

Tightening torque kg-m (ft-lb)

Steering gear

Gear arm nut	14.0 (101)	
Rear cover bolts	1.5 to 2.5	(11 to 18)
Sector shaft cover bolts	1.5 to 2.5	(11 to 18)
Sector shaft adjusting screw lock nut	3.0 to 4.0	(22 to 29)
Steering gear housing-to-body bolts	7.0 to 8.0	(51 to 58)

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Steering linkage

Idler arm-to-frame bolts	4.4 to 6.1	(32 to 44)
Ball stud nuts	5.5 to 10.0	(40 to 72)
Side rod lock nuts	8 to 10	(58 to 72)

Column shaft

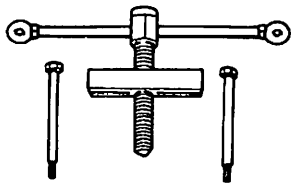
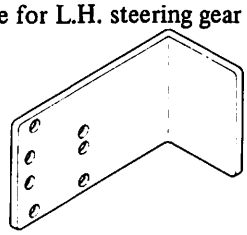
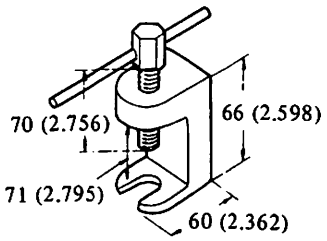
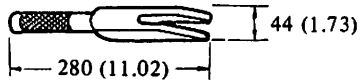
Steering wheel nut	4.0 to 5.0	(29 to 36)
Column clamp bolts	1.3 to 1.8	(9.4 to 13.0)
Rubber coupling-to-worm shaft bolt	4.0 to 5.0	(29 to 36)
Rubber coupling securing bolts	1.5 to 2.2	(11 to 16)

TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Steering wheel moves heavily.	Wheel alignment out of specifications or lower tire inflation pressure.	Re-align or inflate tires to correct pressure.
	Steering linkage out of adjustment.	Re-adjust and see relative topic under Front Suspension.
	Steering column out of alignment.	Repair.
Steering wheel returns but sluggishly.	Wheels out of alignment or lower tire inflation pressure.	Repair or inflate tires to correct air pressure.
	Faulty steering linkage.	Replace and see relative topic under Front Suspension.
Car pulls to one side.	Wheels out of proper alignment.	Re-align.
	Wheel bearing out of adjustment.	Readjust.
	Faulty steering linkage.	Replace and see relative topic under Front Suspension.

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SPECIAL SERVICE TOOLS

No.	Tool number & tool name	Description Unit: mm (in)	For use on	Reference page or figure No.
1.	ST27180001 Steering wheel puller	This tool is used to drive out steering wheel. **Caution: Do not hammer on steering column shaft.**  SE116	710 620 610 B110	Fig. ST-3
2.	ST27700001 Strut & steering gear box attachment	This tool is used as an attachment to strut or steering gear box when work is performed in a vise. S mark indicates hole for strut. G mark indicates hole for steering gear box. L mark indicate hole for L.H. steering gear box.  SE342	710 610	Fig. ST-22
3.	ST27140000 Steering gear arm puller	This tool is used to remove steering gear arm from steering sector shaft. **Note: Strike the side of the gear arm with double hammer to ease removal.**  SE117	710 620 610 B110	Fig. ST-20
4.	ST27850000 Steering ball joint puller	This tool is placed between knuckle arm and steering ball joint to facilitate the disengagement of ball-joint section. **Caution: Do not hammer on bolts.**  SE089	All models	Page ST-10

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SERVICE MANUAL

DATSUN 710
MODEL 710 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION FE

ENGINE CONTROL, FUEL AND EXHAUST SYSTEMS

FE

ENGINE CONTROL SYSTEM ..... FE- 2
FUEL SYSTEM ..... FE- 3
EXHAUST SYSTEM ..... FE- 8

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ENGINE CONTROL SYSTEM

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DESCRIPTION FE-2
REMOVAL AND INSTALLATION FE-2
INSPECTION FE-2
ADJUSTMENT FE-2

ACCELERATOR SYSTEM

DESCRIPTION

The accelerator control system is of a linkage type. To align the control linkage, adjustable rod(s) are used.

Smooth and responsive movement of the linkage is accomplished through the use of nylon ball joints. The ball joint should be lubricated with multi-purpose grease at recommended maintenance intervals.

The torsion shaft is supported by bearing which is made from polyacetal resin. The resin bearing and all metal sliding parts should also be lubricated with multi-purpose grease at recommended maintenance intervals.

REMOVAL AND INSTALLATION

Accelerator pedal & pedal arm

1. Remove two screws and accelerator pedal.
2. Disconnect ball joint at the upper end of pedal arm.
3. Remove snap ring, then remove pedal arm from pedal arm bracket.
4. To install, reverse the order of removal.

Torsion shaft & torsion shaft support

1. Remove return spring.
2. Disconnect connecting rod (ball joint assembly) from torsion shaft.
3. Remove cotter pin and separate torsion shaft from carburetor throttle lever.
4. Remove torsion shaft.
5. Remove two mounting bolts and torsion shaft support.
6. To install, reverse the order of removal.

Bell-crank bracket

1. Remove return spring.
2. Disconnect two connecting rods (two ball joint assemblies) from bell-crank.
3. Remove three mounting nuts, then remove bell-crank bracket assembly from dash panel.
4. To install, reverse the order of removal.

Notes:

a. **Ball jointed sections can be separated from each other by lightly pulling apart.**

b. **When removing any parts of accelerator linkage, do not disturb adjusting screw of ball joint assembly to save control linkage adjustment. In case ball joint assembly should be adjusted, refer to page FE-2 or 3 for Adjustment.**

INSPECTION

1. Check accelerator rods to ensure that they are neither twisted nor bent.
   Also check ball joints for cracks or wear. Repair or, replace if necessary.
2. Check return spring for fatigue or damage. Replace if necessary.

ADJUSTMENT

Accelerator linkage

See Figure FE-1.

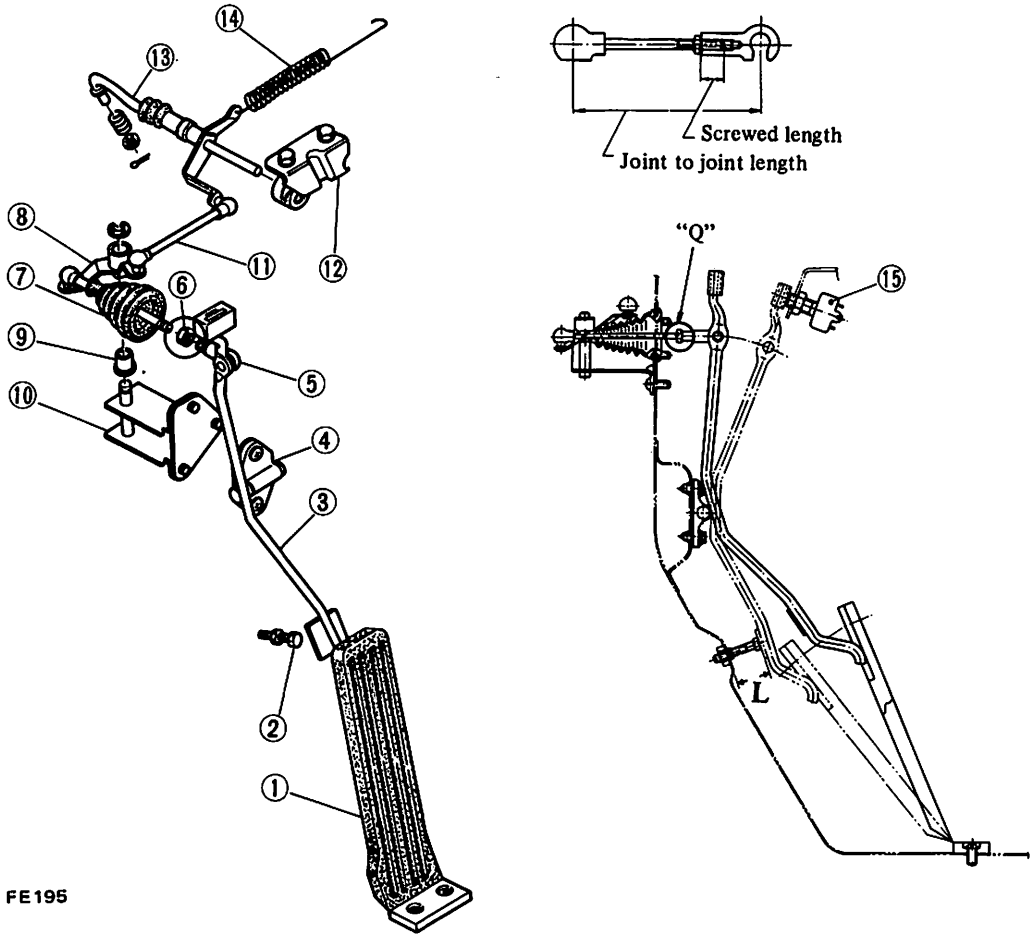
1. To ease the adjustment, first adjust the (ball joint-to-joint) length of ball joint assembly to the specified value.

Unit: mm (in)

	Screwed length	Joint-to-joint length
Ball joint assembly	10 (0.394)	142 (5.59)

2. With carburetor throttle shaft held at full-open position, readjust the length of ball joint assembly at the "Q" section until the "L" dimension is 24.5 mm (0.965 in).
3. Depress accelerator pedal. With carburetor throttle valve opened fully, adjust the height of stopper bolt so that it touches pedal arm closely. From that position, turn in stopper bolt one full turn and secure stopper bolt with lock nut.

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1 Accelerator pedal
2 Stopper bolt
3 Pedal arm
4 Pedal arm bracket
5 Ball joint assembly
6 Lock nut
7 Boot
8 Bell-crank
9 Nylon bush
10 Bell-crank bracket
11 Ball joint
12 Torsion shaft support assembly
13 Torsion shaft
14 Return spring
15 Kickdown switch

Fig. FE-1 Engine control system

Kickdown switch

On the automatic transmission models, it is also necessary to adjust kickdown switch. The kickdown switch adjustment is correct if kickdown switch is actuated by the stopper located on the tip end of pedal arm when accelerator pedal is depressed fully. Always tighten lock nut securely when proper adjustment is obtained. See Figure FE-1

FUEL SYSTEM

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FUEL TANK (Station Wagon) FE-7
FUEL PIPING FE-7
FUEL STRAINER FE-7
INSPECTION FE-7
INSTALLATION FE-7

DESCRIPTION

Fuel tanks are classified into two types. One type is 50 liters (13 ¼ US gal, 11 Imp gal) in capacity and is used on Sedans and Hardtops, as well as Station Wagons destined for California. The other type is 45 liters (11 ⅞ US gal, 9 ⅞ Imp gal) and is used on Station Wagons destined for all areas except California.

Vapor liquid separators are classified into two types. One type is 3.0 liters (3 ⅛ US qt, 2 ⅝ Imp qt) in capacity and is used on Sedans and Hardtops. The other type is 4.7 liters (5 US qt, 4 ⅛ Imp qt) and is used on Station Wagons destined for California.

All the other Station Wagons destined elsewhere is not equipped with a vapor liquid separator.

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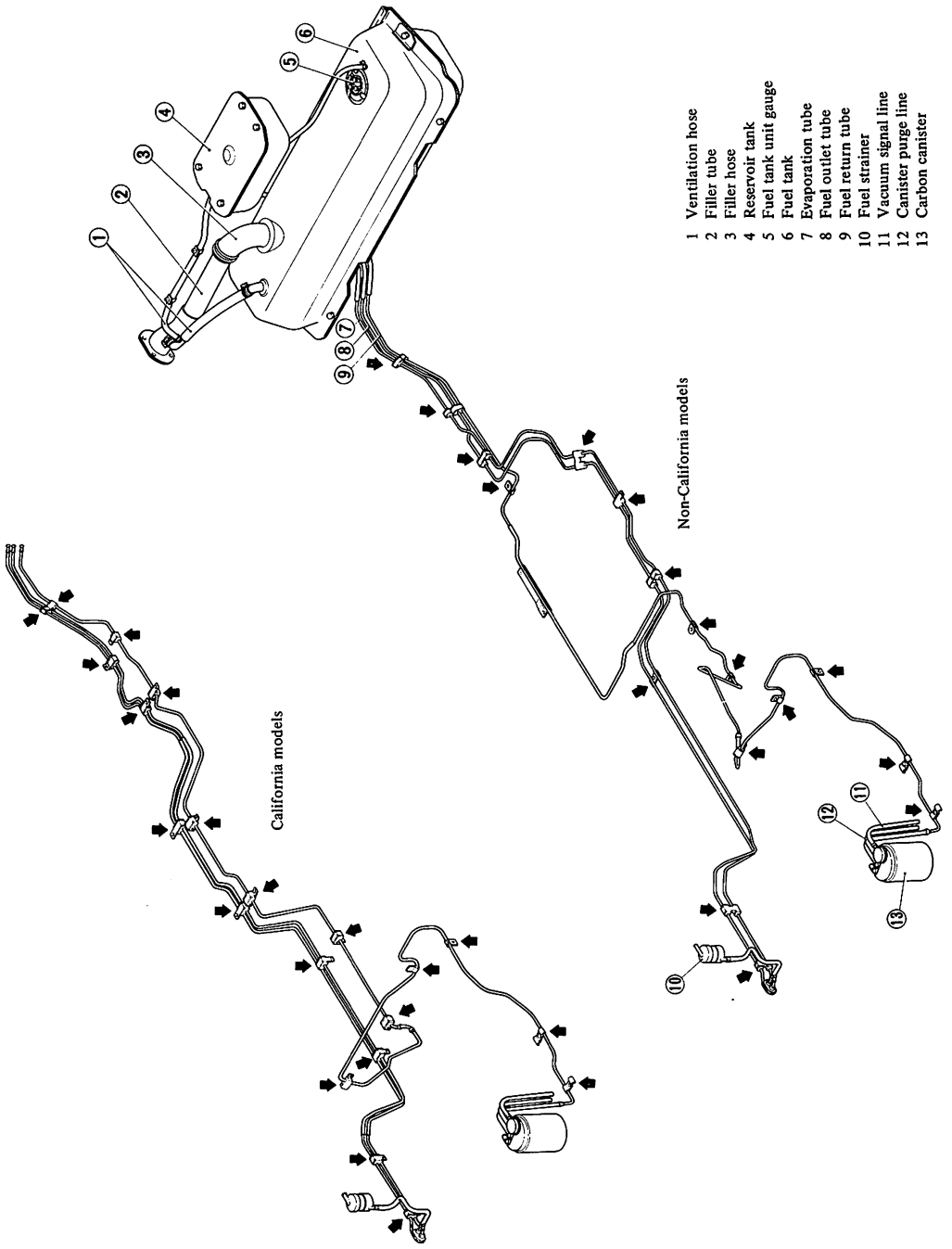


Fig. FE-2 Fuel tank and fuel line (Sedan and Hardtop)

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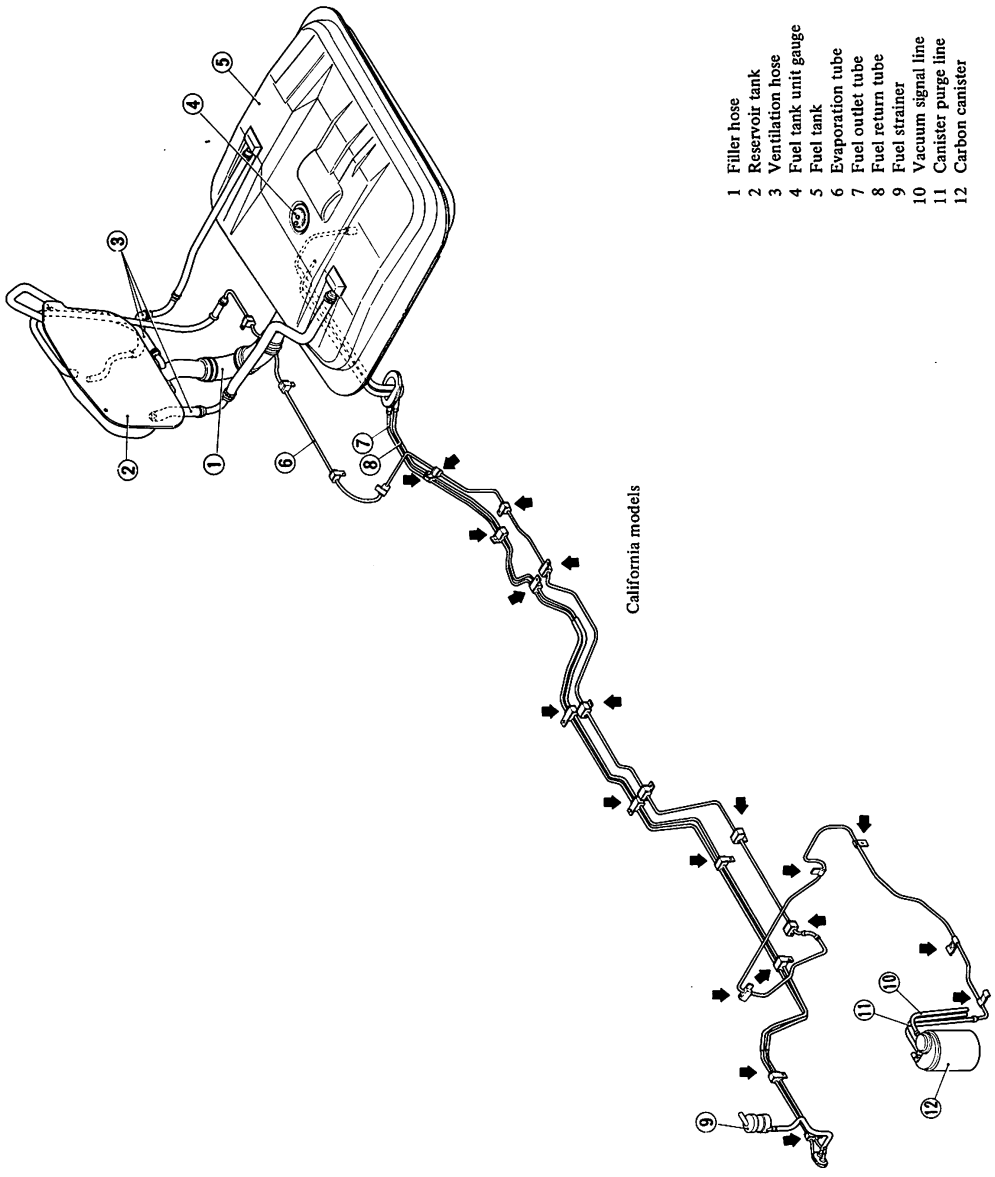
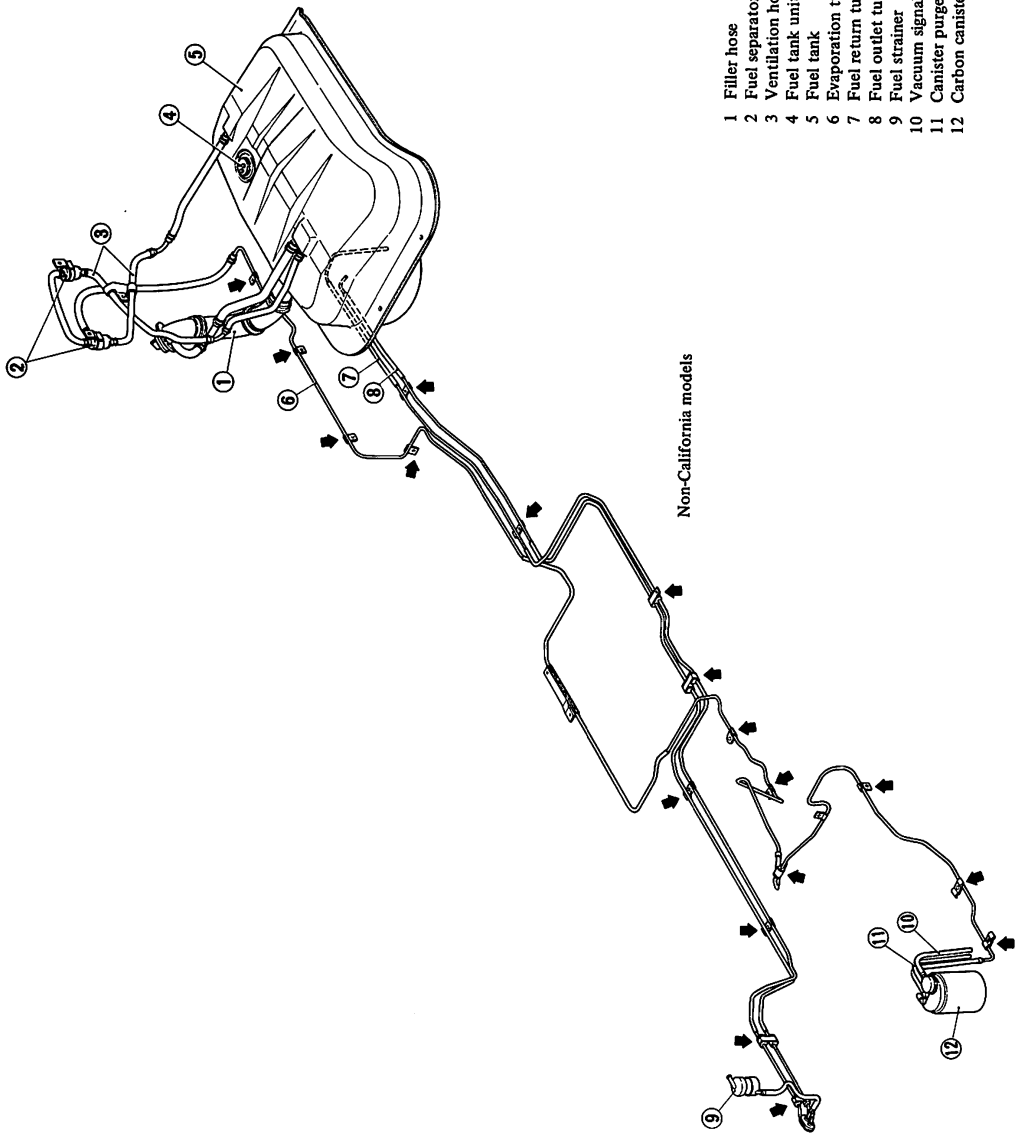


Fig. FE-3 Fuel tank and fuel line [Station Wagon (For California)]

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FE220

Fig. FE-4 Fuel tank and fuel line [Station Wagon (Except California)]

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REMOVAL

FUEL TANK (Sedan and Hardtop)

1. Remove battery ground cable.
2. Remove trunk front finisher.
3. Take out spare tire. Place a suitable container under fuel tank drain plug to receive the remaining fuel in tank. Remove plug and then drain plug to drain fuel into the container.

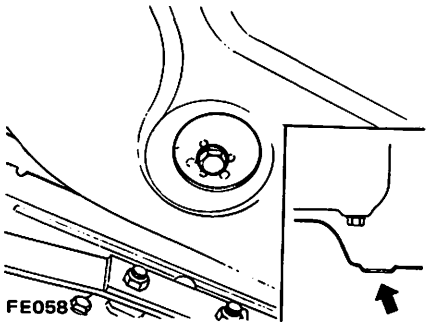


Fig. FE-5 Draining fuel

4. Disconnect filler hose, ventilation hose, breather hose, outlet hose and return hose. (Tank side)
5. Disconnect wires from fuel tank unit gauge.
6. Detach rear seat cushion and seat back. Remove four bolts (two at the front and one on each side) securing fuel tank in place, and take out fuel tank.
7. The unit gauge is of a bayonet type and can be taken out by turning lock plate counterclockwise with a screwdriver.
8. Reservoir tank removal

Unfasten trim clip and detach rear parcel shelf finish. Disconnect three breather tubes.

Loosen four bolts securing reservoir tank, and take out the tank.

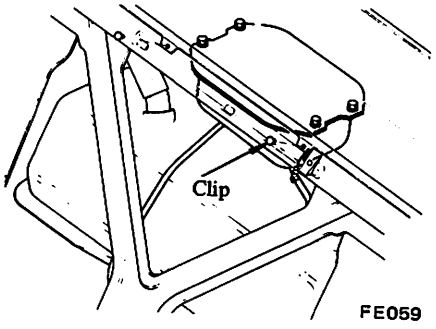


Fig. FE-6 Removing reservoir tank

FUEL TANK (Station Wagon)

1. Remove battery ground cable.
2. Remove inspection cover from rear floor. Disconnect wires from unit gauge.

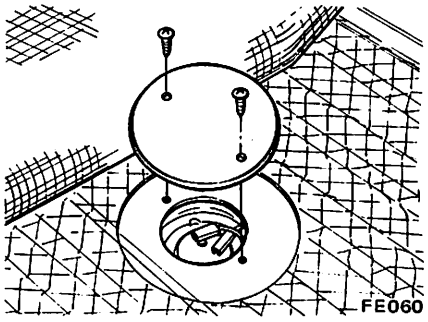


Fig. FE-7 Removing inspection cover

3. Take out spare tire.
4. Loosen drain plug and allow fuel to drain into a suitable container.
5. Disconnect filler hose, ventilation hose and outlet hose. (Tank side)
6. Remove four bolts from fuel tank, and detach fuel tank.
7. Detach bayonet-type unit gauge by turning lock plate counterclockwise with a screwdriver.
8. Reservoir tank removal (California only)

(1) Remove trim board from the right side of rear body.
(2) Unfasten three clamps, and disconnect ventilation hoses.
(3) Remove grommet from vapor hose, and disconnect hose.
(4) Remove two screws on the top face of reservoir tank.
(5) Lift up reservoir tank, and unfasten latches at lower flange section. Slide out reservoir tank.

Notes:

a. Use care not to spill fuel over trunk room floor.
b. Plug filler opening to prevent entry of dust or dirt.

FUEL PIPING

All fuel lines can be easily disconnected by unfastening clamps and clips. Do not disconnect any fuel line unless necessary.

Note: Plug hose and tube opening to prevent entry of dust or dirt.

FUEL STRAINER

1. Disconnect fuel hoses from fuel strainer by removing clamps.
2. Take out fuel strainer and discard it.

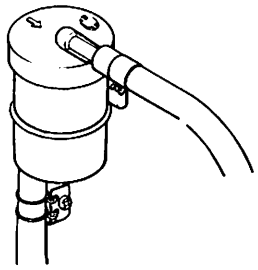


Fig. FE-8 Fuel strainer

INSPECTION

1. Fuel tank

Check fuel tank for cracks or deformation. If necessary, replace.

2. Fuel hose

Inspect all hoses for cracks, fatigue, sweating or deterioration.

Replace any hose that is damaged.

3. Fuel tube

Replace any fuel tube that is cracked, rusted, collapsed or deformed.

4. Fuel strainer

Replace fuel strainer at recommended maintenance intervals or if it becomes clogged or restricted.

Fuel strainer is of a cartridge type and cannot be cleaned. Always replace with a new one.

INSTALLATION

Install any parts of the fuel system in the reverse order of removal. Observe the following notes.

Notes:

a. Install hose clamps securely. Do not tighten excessively to avoid damaging hoses.
b. Fasten clips holding fuel tube on underbody securely. Failure to follow this caution could result in damage to the surface of fuel tube.

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c. Do not kink or twist hose and tube when they are routed.
d. Run the engine and check for leaks at connections.
e. Fuel tank
Install fuel filler hose after fuel tank has been mounted in place. Failure to follow this rule could result in leakage from around hose connections. Do not twist or smash breather hoses when they are routed. Be sure to retain them with clips securely.
f. Fuel gauge tank unit
When installing fuel gauge tank unit, align the projection of gauge tank unit with the notch in fuel tank and tighten it securely. Be sure to install gauge tank unit with O-ring in place.

EXHAUST SYSTEM

CONTENTS

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INSTALLATION FE-10

DESCRIPTION

The exhaust systems differ for the car models (Sedan, Hardtop and Station Wagon) and their specifications (Non-California and California).

Sedan and Hardtop

- Non-California specifications

The exhaust system consists of a front exhaust tube (with pre-muffler assembly), main muffler assembly, hangers, brackets and heat insulators.

- California specifications

The system consists of a front exhaust tube, catalytic converter assembly, center exhaust tube, rear exhaust tube (with main muffler assembly), diffuser, hangers, brackets and heat insulators.

Station Wagon

- Non-California specifications

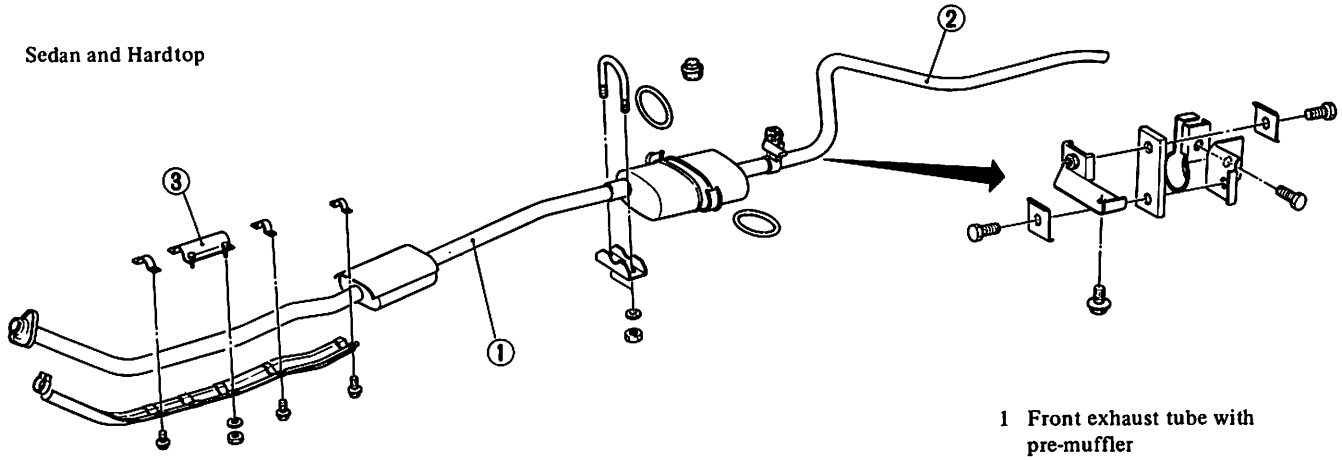
The exhaust system consists of a front exhaust tube (with pre-muffler assembly), rear exhaust tube (with main muffler assembly), brackets, hangers and heat insulators.

- California specifications

The system consists of a front exhaust tube, catalytic converter assembly, center exhaust tube, rear exhaust tube (with main muffler), diffuser, brackets, hangers and heat insulators.

NON-CALIFORNIA MODELS

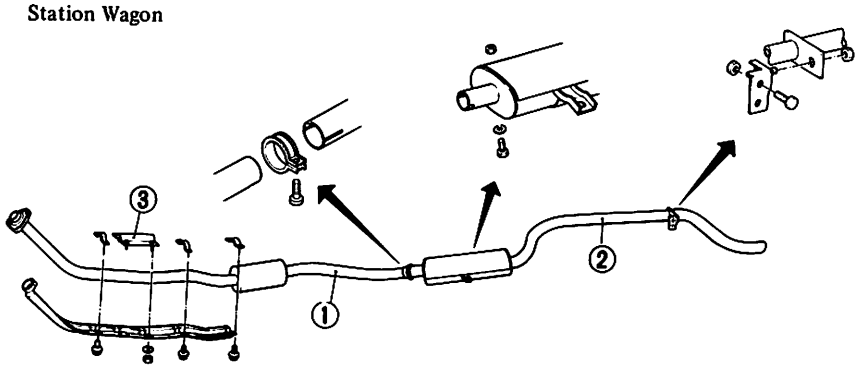
Sedan and Hardtop



1 Front exhaust tube with pre-muffler
2 Rear exhaust tube with main muffler
3 Heat insulator (A/T only)

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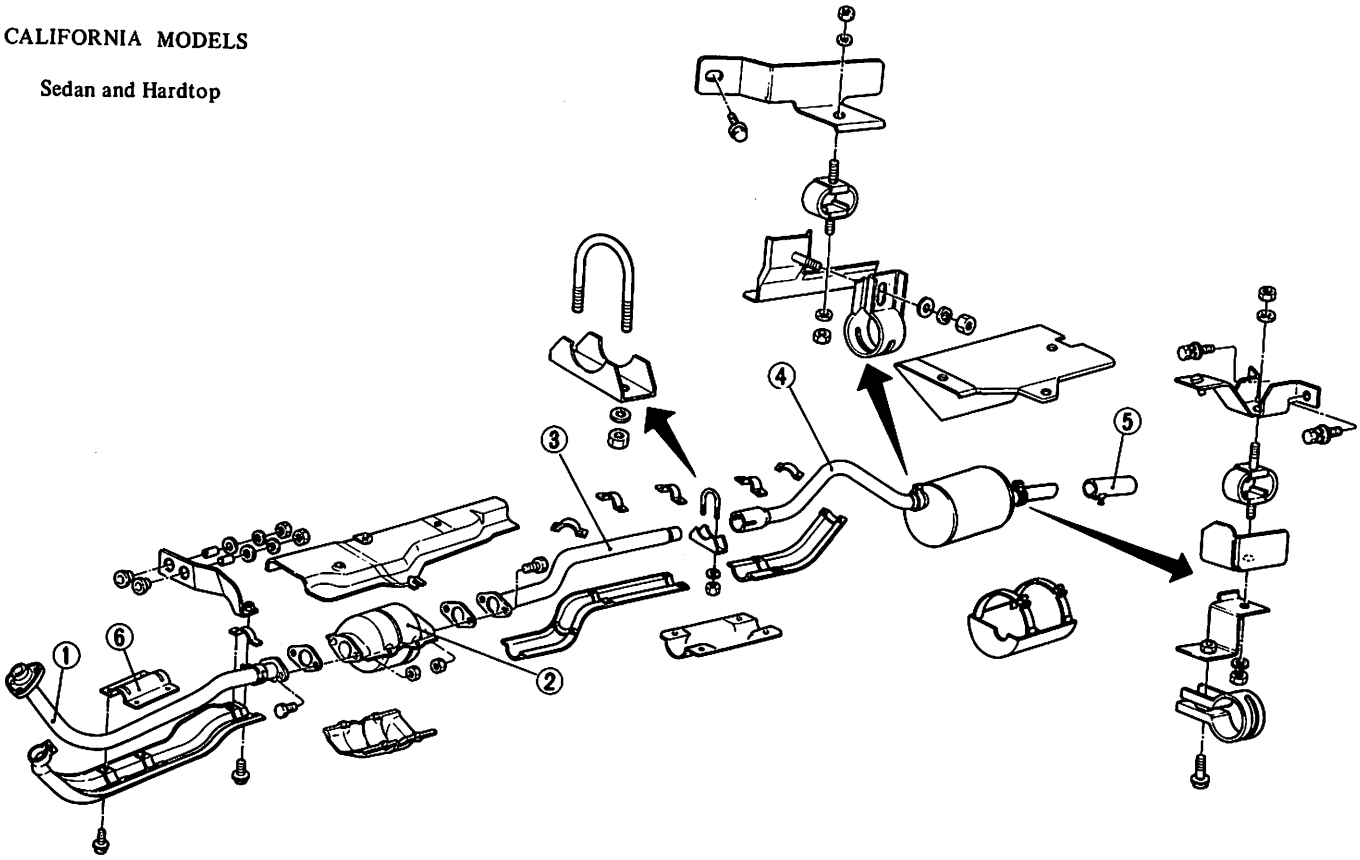
Station Wagon



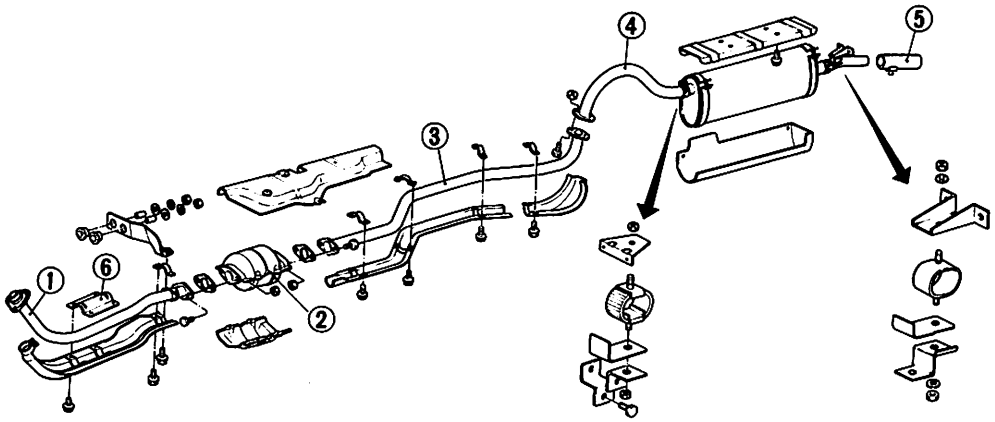
1 Front exhaust tube with pre-muffler
2 Rear exhaust tube with main muffler
3 Heat insulator (A/T only)

CALIFORNIA MODELS

Sedan and Hardtop



Station Wagon



1 Front exhaust tube
2 Catalytic converter
3 Center exhaust tube
4 Main muffler assembly
5 Diffuser
6 Heat insulator

Fig. FE-9 Exhaust system

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REMOVAL

1. Before removing all heat insulators, remove bolts and nuts securing them in place.
2. Remove bolts and nuts from main muffler clamp.
3. Break old sealant off the joint while tapping around with a hammer and twist muffler.

Using a rubber hammer, tap the front end of muffler while pulling muffler toward the rear side. (All except California Station Wagon).

On the California Station Wagon, remove bolts and nuts securing main muffler to center exhaust tube.

The main muffler can then be removed.

4. Non-California models

Remove bolts and nuts from rear exhaust tube clamp.

Utilizing the same procedure as for the main muffler, remove rear exhaust tube from front exhaust tube.

California models

Remove bolts and nuts securing catalytic converter to center exhaust tube, and disengage center exhaust tube.

Remove bolts and nuts securing catalytic converter to front exhaust tube. Remove catalytic sensor from catalytic converter, then remove catalytic converter.

To remove catalytic sensor, turn catalytic converter.

5. Remove nuts securing exhaust manifold to exhaust tube, and remove front exhaust tube from exhaust manifold.

Note: On the California Station Wagon, Sedan and Hardtop models, remove bolts and nuts at the clamp in advance.

INSPECTION

1. Check muffler and tubes for cracks, damage or corrosion.

Replace any parts that is damaged beyond limits.

2. Replace bracket and hanger rubber parts that are cracked, fatigued or sweated.

INSTALLATION

Install the exhaust system which has been removed as an assembly in the reverse order of removal.

Observe the following notes:

Notes:

a. **Replace gasket, located at the connection between exhaust manifold and front exhaust tube, with a new one if necessary.**

b. **After installation, check that mounting brackets and mounting rubbers are free from undue stress. If any of the above parts is not installed properly, excessive noises or vibrations may be transmitted to the car body.**

c. **Check all tube connections for exhaust gas leaks, and entire system for unusual noises, with the engine running.**

d. **Tightening torque:**

Exhaust manifold to front exhaust tube nuts:
2.0 to 2.6 kg-m
(14 to 19 ft-lb)
Catalytic converter to front exhaust tube bolts:
2.6 to 3.4 kg-m
(19 to 25 ft-lb)
3.2 to 4.3 kg-m (23 to 31 ft-lb)
(for Station Wagon)
Catalytic converter to center exhaust tube bolts:
2.6 to 3.4 kg-m
(19 to 25 ft-lb)
3.2 to 4.3 kg-m (23 to 31 ft-lb)
(for Station Wagon)
Heat insulator installation bolts:
0.4 to 0.5 kg-m
(2.9 to 3.6 ft-lb)
Diffuser installation bolts:
0.4 to 0.5 kg-m
(2.9 to 3.6 ft-lb)
All U-bolt securing nuts:
1.8 to 2.3 kg-m
(13 to 17 ft-lb)
Mounting bracket bolts:
1.8 to 2.3 kg-m
(13 to 17 ft-lb)
Mounting rubber bolts:
1.8 to 2.3 kg-m
(13 to 17 ft-lb)

If exhaust tubes are separated at connection to renew muffler assembly, etc., use the Genuine Nissan Sealant "Exhaust Sealant Kit 20720-N2225" (See Figure FE-10) to eliminate gas leakage past the joint. Be sure to observe the following procedures.

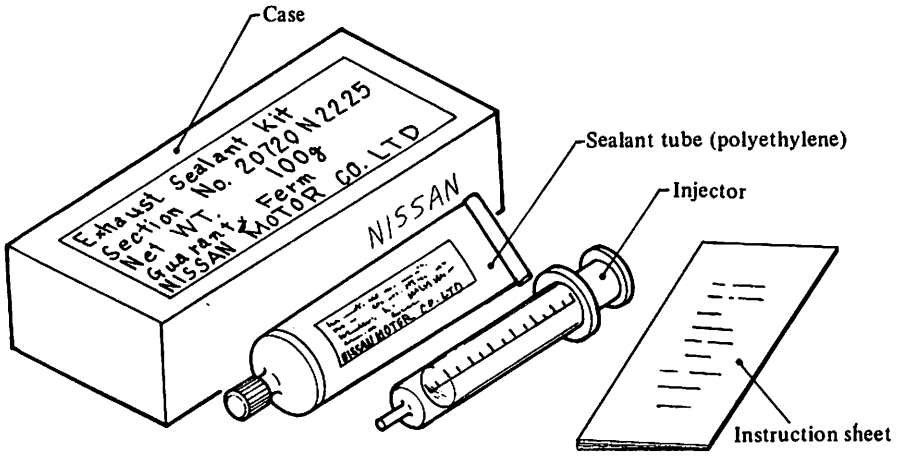


Fig. FE-10 Exhaust sealant kit

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1. Wipe clean all the contact portions of tube joints; allow them to dry thoroughly.
2. Temporarily mount in place muffler assembly (and/or exhaust tube) as an assembled unit on the car.
3. Insert the male tube into the female tube fully until the front end of the female tube touches the stopper on the male tube. See Figure FE-11.

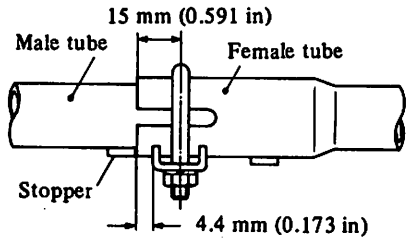


Fig. FE-11 Exhaust tube connections

4. Torque U-bolt securing nuts and exhaust tube mounting bolts to specifications.

Tightening torque:
1.8 to 2.3 kg-m
(13 to 17 ft-lb)

5. Squeeze 5 to 6 cc (0.31 to 0.37 cu in) of sealant into injector from the sealant tube. See Figure FE-12.

Be sure to place the cap back to the sealant tube since sealant will dry.

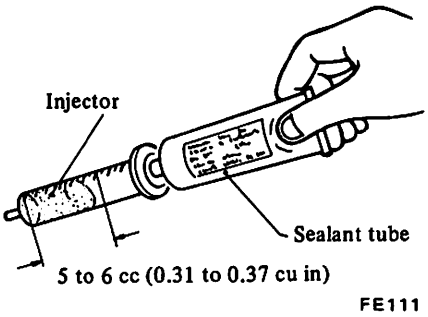


Fig. FE-12 Squeezing sealant to injector

6. Position the nozzle of injector to the guide and press it there firmly. Inject sealant slowly until sealant begins to flow out of the slit of the tube.

This indicates that the bead requires no further sealant. Excessive sealant can cause a clogged tube. See Figure FE-12.

After injecting, wash injector thoroughly in clean water to remove all traces of sealant.

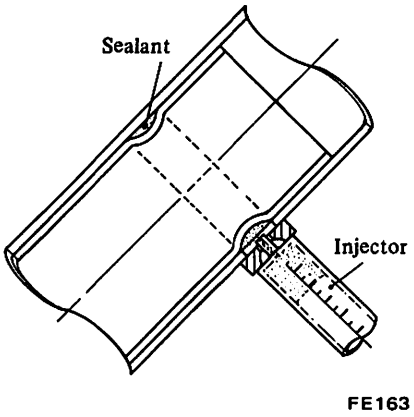


Fig. FE-13 Injecting sealant

7. Start the engine and let it idle slowly for ten minutes (minimum) to harden sealant with the heat of exhaut gas.
8. Check the condition of sealant before driving the car.

It is also essential that the car should not be accelerated sharply for 20 to 30 minutes subsequent to this operation.

Notes:

a. The sealant should be used within guaranty term indicated on the kit case.

b. Exposure of sealant to the skin may cause a rash. Wash sealant off the skin with water.

c. Do not keep the sealant tube in a place where the ambient temperature is 40°C (104°F) or above.
A sealant hardened at 40°C (104°F) or above cannot be used. The most suitable storage temperature is from 15 to 35°C (59 to 95°F). If sealant becomes hardened because of low temperatures, warm the sealant tube with lukewarm water until the sealant is softened. Do not warm the tube at a temperature of over 40°C (104°F) for a long period of time.

d. Thoroughly read the instruction sheet furnished with the kit before using the sealant.

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SERVICE MANUAL

DATSUN 710
MODEL 710 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION BF

BODY

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MOULDING BF-45

BF

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GENERAL DESCRIPTION

On the 710 series models, bodies are basically classified into four types: 4-door Sedan, 2-door Sedan, Hardtop and Station Wagon.

These bodies are further classified into two types according to their floor designs: One type is for California models and the other for Non-California models.

Each body is of the same unitized construction as the 510 model series, and is rugged, lightweight and safe.

The engine compartment is wide enough for easy accessibility, and the trunk has an extra large capacity due to the lowered spare tire compartment.

Insulation of the floor portion from the shock absorber mounting member has greatly reduced the transmission of direct vibrations to the floor panel. Moreover, passenger compartment noise and vibration have been further reduced through the use of asphalt seats, which adhere to the upper surface of the floor.

Under coating has been applied to the lower surface of the floor.

The floor has been provided with water drain holes to facilitate the cleaning and washing of the interior.

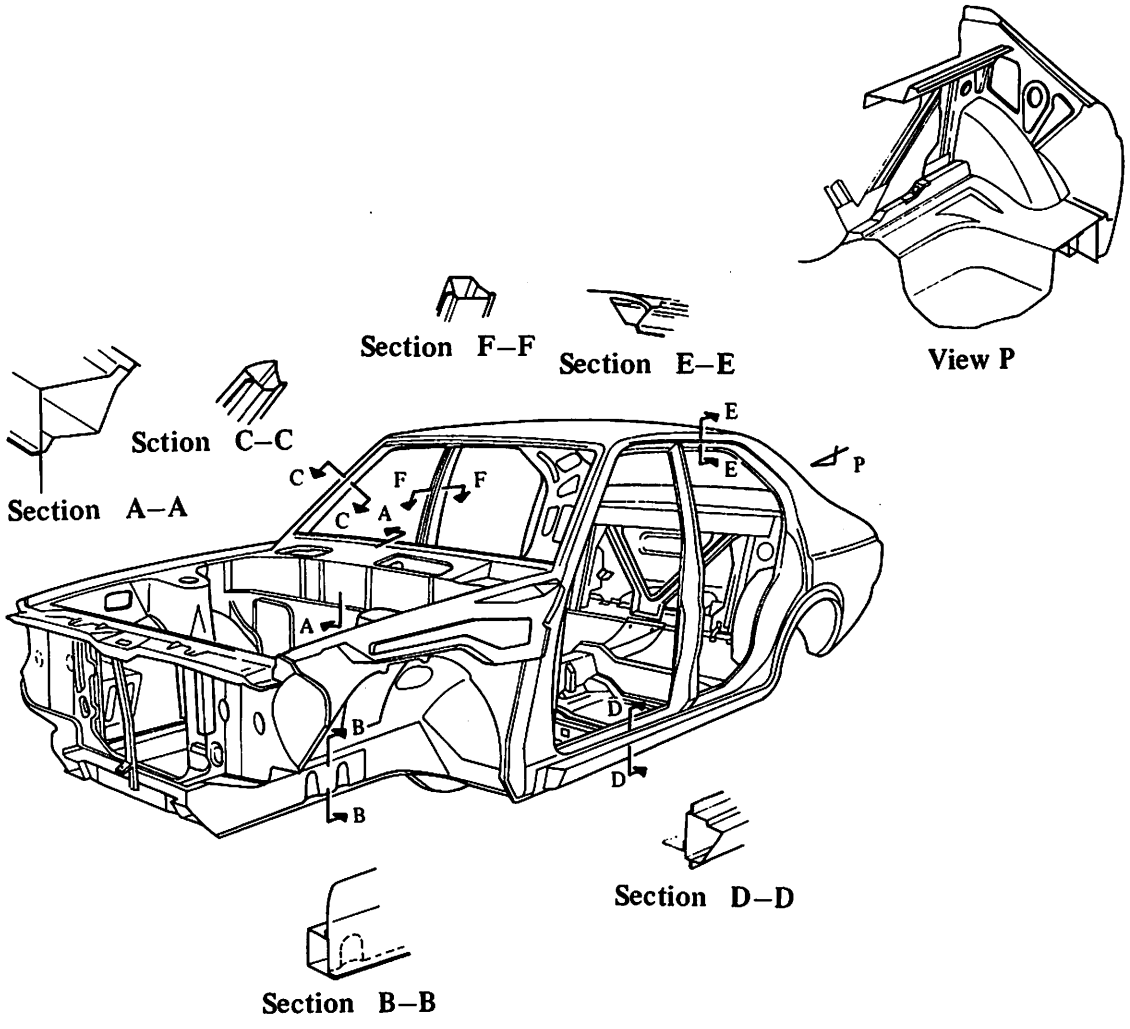
The front and rear ends of the body are so constructed as to absorb impact energy during a collision.

On Hardtop models, the front pillar, door support, side roof rail, and rear quarter have been specially reinforced by means of a wider door dimension.

Body parts for the four models are to a great extent interchangeable.

For example, the hood, front fender, hood ledge, and dash board for the Sedan are exactly the same as for the Hardtop and Station Wagon.

Dust proofness and watertight integrity have been improved in the doors, weatherstripping, and welded panel areas.



BF301A

Fig. BF-1 Body construction of the 4-door Sedan

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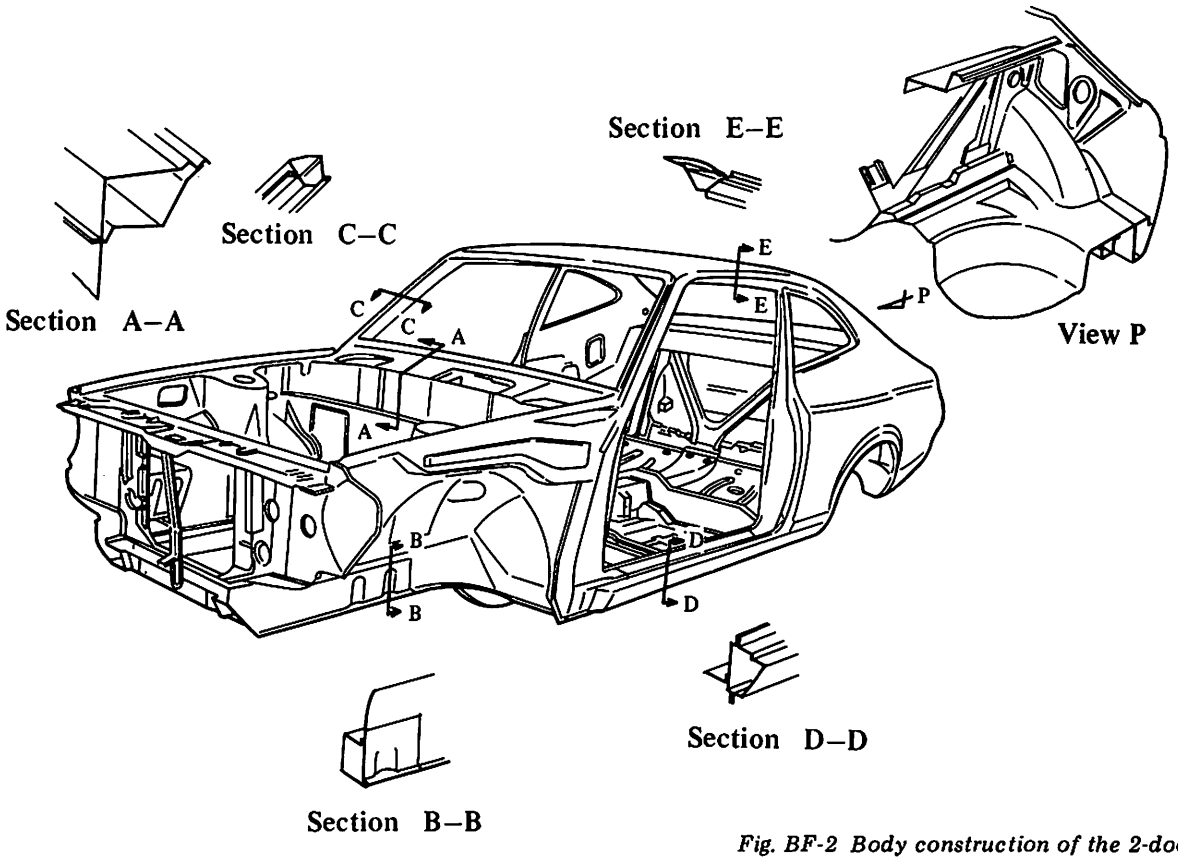
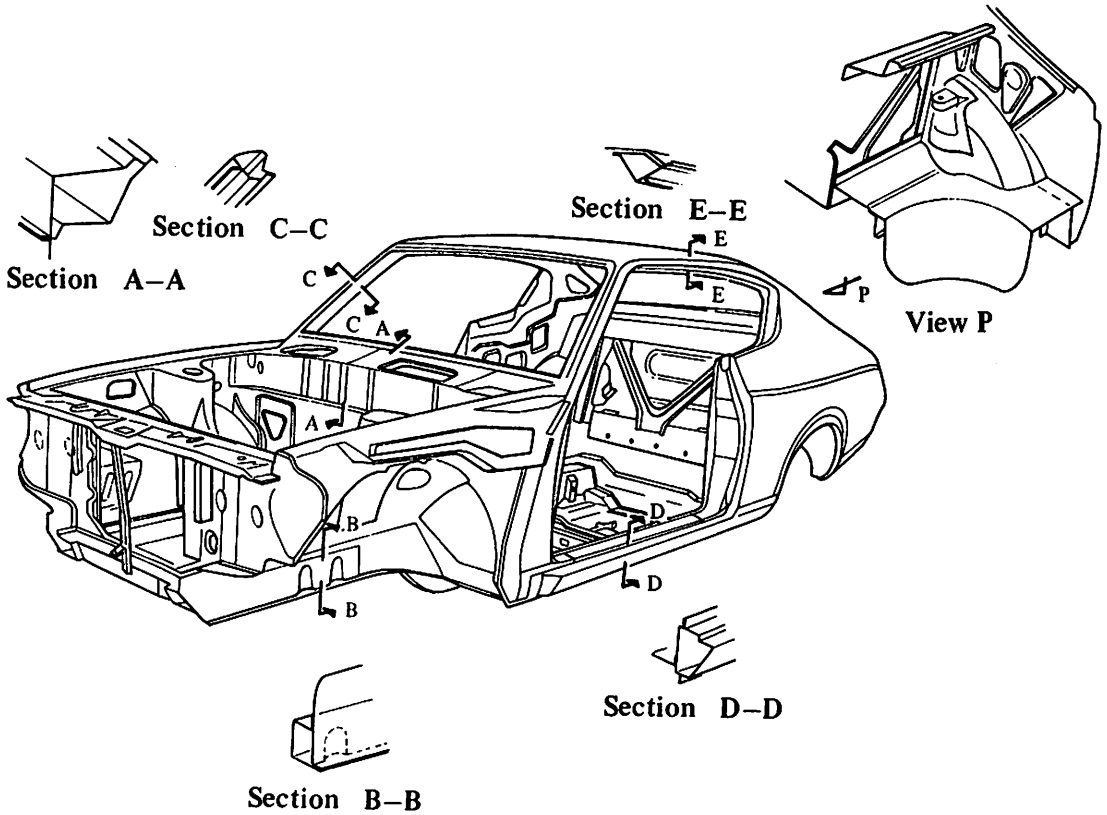


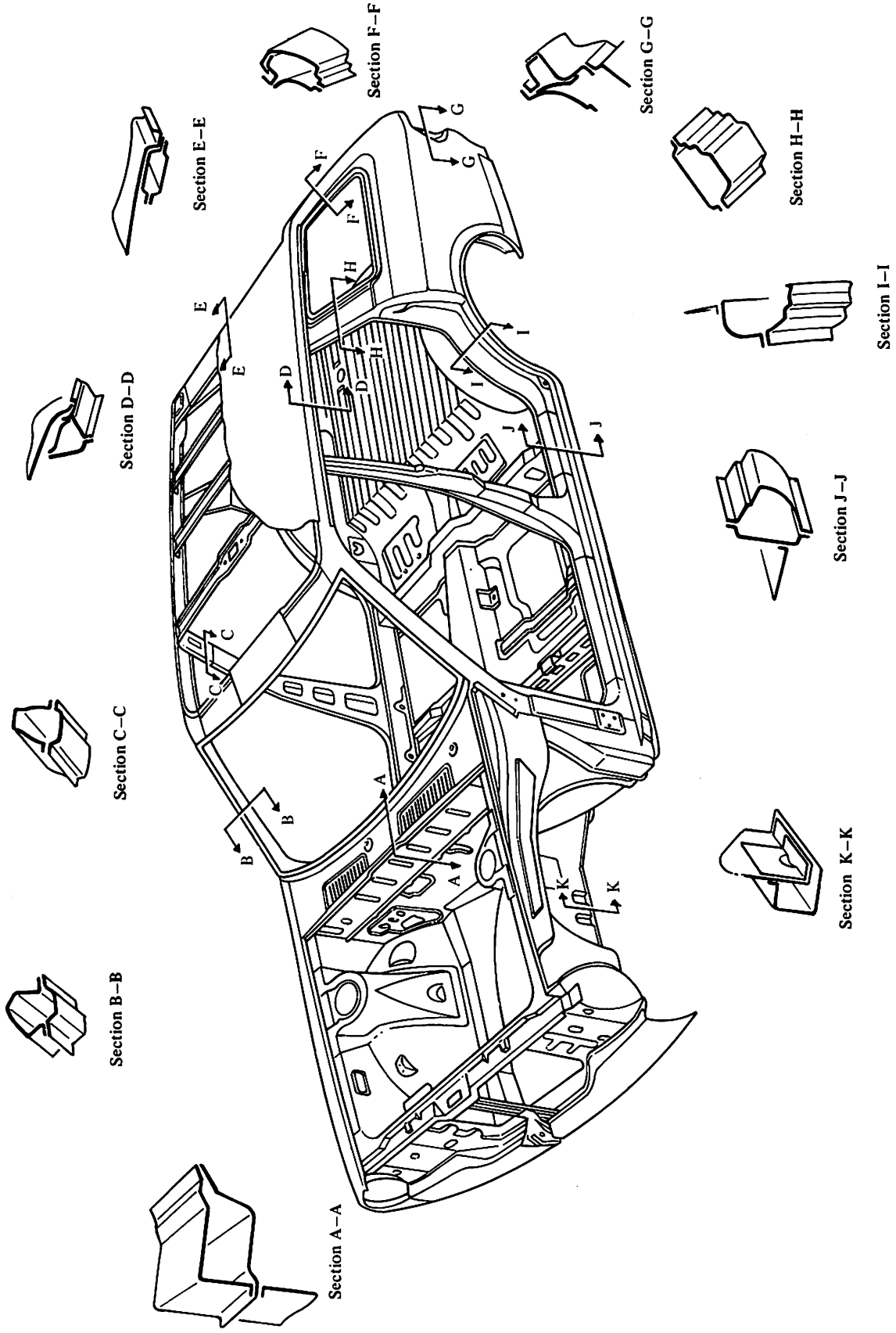
Fig. BF-2 Body construction of the 2-door Sedan



BF886

Fig. BF-3 Body construction of the Hardtop

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BF454A

Fig. BF-4 Body construction of Station Wagon

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UNDERBODY ALIGNMENT

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UNDERBODY GENERAL SERVICE INFORMATION BF-5
ALIGNMENT CHECKING PROCEDURE BF-5
PRINCIPLES OF TRAMMING BF-5
CAR PREPARATION BF-5
TRAMMING SEQUENCE BF-5

UNDERBODY GENERAL SERVICE INFORMATION

Since each underbody component directly affects the overall strength of the body, it is essential that proper welding, sealing and rust-proofing techniques be observed during service operations.

Whenever the body is repaired, be sure to rust-proof the repaired body parts.

In the case of rust-proofing a critical underbody component, it is essential that a good quality type air dry primer such as corrosion resistant zinc chromate be used.

Do not use combination type primer surfacers.

ALIGNMENT CHECKING PROCEDURE

Misalignment in the underbody affects the front fender, door, trunk lid and window alignments. Underbody misalignment particularly affects the suspension system.

Accordingly, in the event of collision damage, it is essential that underbody be thoroughly rechecked, and if necessary, aligned within the specified dimensions given in Figures BF-5, BF-6 and BF-7.

There are many tools that may be employed to correct collision damage such as frame straightening machines, external pulling equipment or other standard body jacks.

To assist in checking alignment of the underbody component, repairing minor underbody damage or locating replacement parts, the following underbody dimensions and alignment checking information are presented.

PRINCIPLES OF TRAMMING

Figures BF-5, BF-6 and BF-7 show reference locations required to determine the extent of misalignment present in underbody structure; the reference locations are symmetrical along the center line of the car.

Tramming underbody correctly calls for two measurements: the vertical dimension from the datum line to the points to be measured, and the horizontal distance between any two points of measurement.

Note that precise measurement can be made only when the tram gauge is parallel to the underbody.

If two points of measurement are on a horizontal plane, the vertical pointer of the tram gauge should be extended equally to bring the gauge parallel to the center of the underbody. If one of the two reference points is included in misaligned area, the parallel plane between the body and tram gauge may not exist, indicating the necessity of underbody repair.

CAR PREPARATION

Preparing the car for the underbody alignment check involves the following:

1. Place car on a level surface.
2. The weight of car should be supported at wheel locations.
3. A visual damage inspection should be made to eliminate unnecessary measuring since obviously damaged or misaligned areas may often be located visually.

TRAMMING SEQUENCE

The tramming sequence will vary depending upon the nature and location of the misaligned area. Prior to performing any tramming operation, the accuracy of reference points to be used must be determined.

A measurement that originates from a reference point included in a damaged area will produce untrue results and confuse the evaluation of the underbody construction.

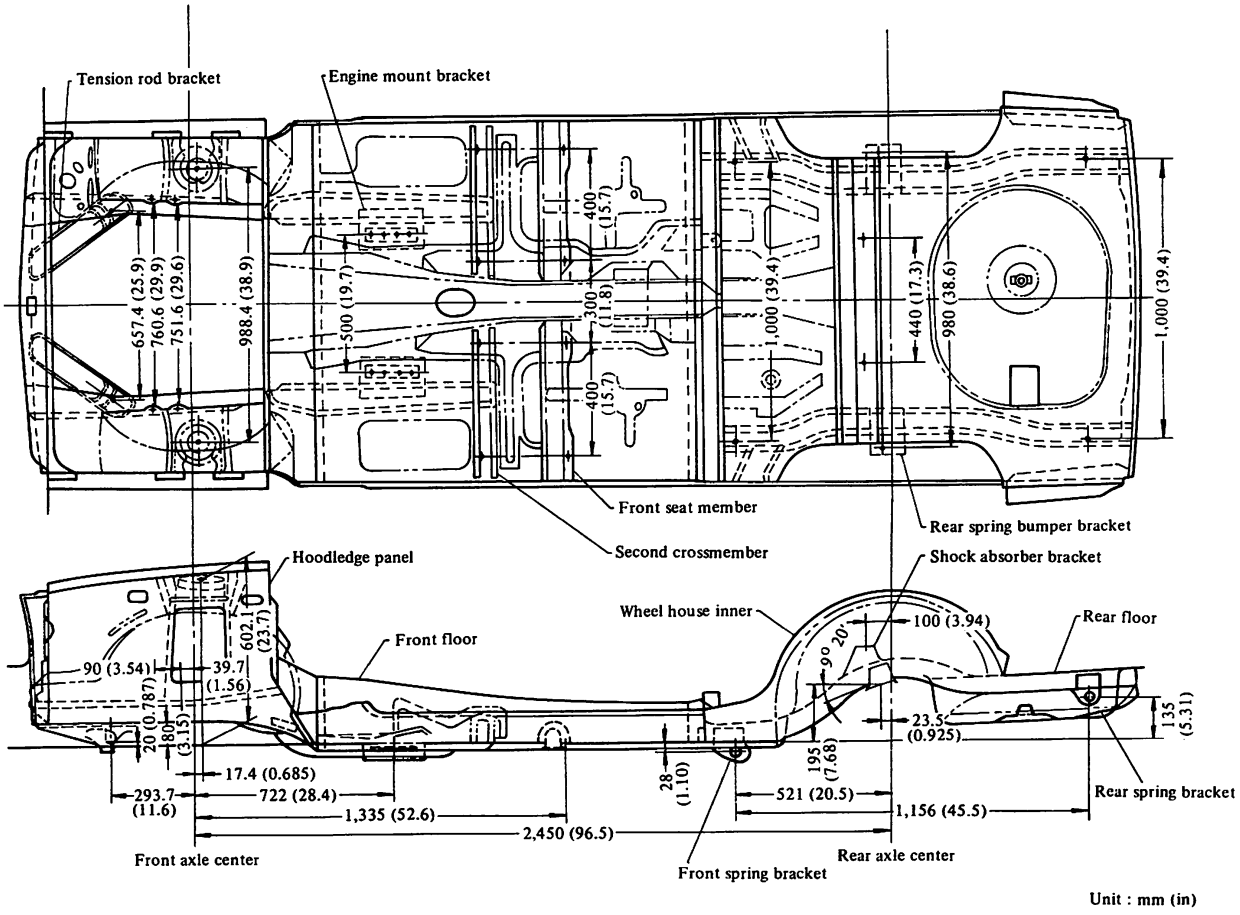
Unlike the conventional type of frame design, the unitized type of body construction seldom develops the condition of "diamond" in the floor pan area as a result of front or rear end collision. Therefore, underbody alignment checking can usually originate from the body floor pan area.

If inspection indicates that these locations have been disturbed and are not suitable for measuring, one of the undamaged suspension locations should be used as an initial reference point.

If all of these locations should be unsuitable as reference points, repair operations should begin with the body floor pan area. All other underbody components should be aligned progressively from this area.

Furthermore, the door and surrounding body should be repaired according to the specifications as shown in Figure BF-7.

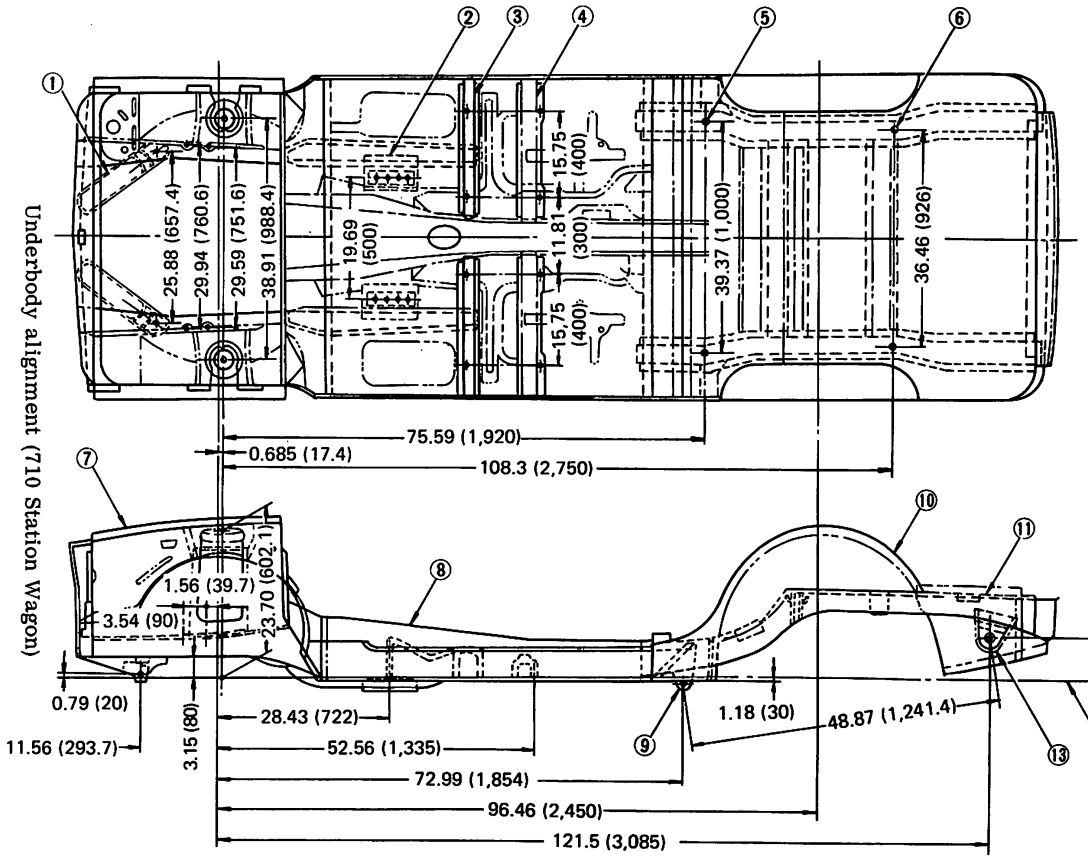
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BF887

Fig. BF-5 Underbody alignment of the Sedan and Hardtop

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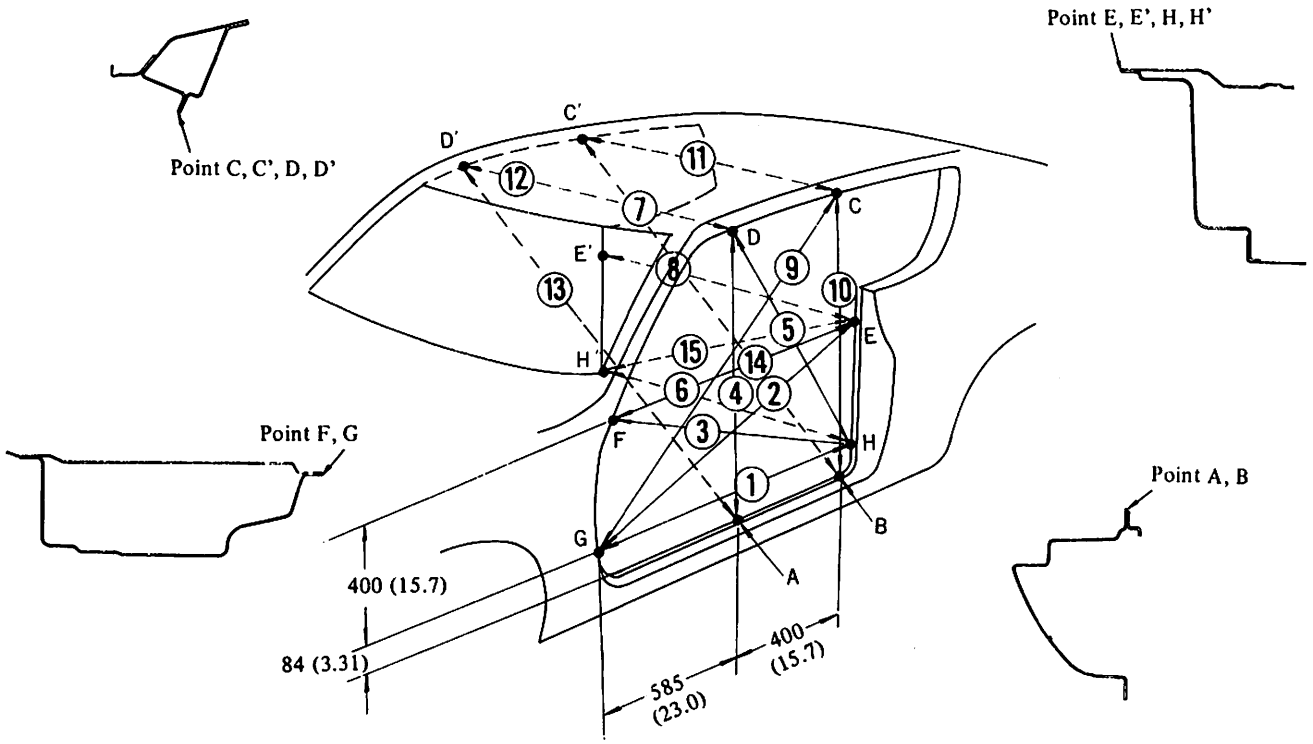


1 Tension rod bracket
2 Rear engine mount bracket
3 Second class member
4 Front seat riser member
5 Side member location hole
6 Side member location hole
7 Food ridge panel
8 Front floor panel
9 Spring front bracket
10 Wheel house inner
11 Rear floor panel
12 Front floor panel (under)
13 Spring rear bracket

Fig. BF-6 Underbody alignment of Station Wagon

BF4455A

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Unit: mm (in)

No.	Measurement position	Length mm (in)
1	G to H	1,035.0 (40.748)
2	G to E	1,127.4 (44.386)
3	F to H	1,032.2 (40.638)
4	A to D	913.7 (35.972)
5	D to H	944.4 (37.181)
6	H to H'	1,311.4 (51.630)
7	B to C'	1,502.2 (59.142)
8	E to E'	1,287.2 (50.677)
9	C to G	1,285.2 (50.598)
10	B to C	909.0 (35.787)
11	C to C'	1,088.6 (42.858)
12	D to D'	1,085.0 (42.716)
13	A to D'	1,503.5 (59.193)
14	E to F	970.5 (38.209)
15	E to H'	1,359.6 (53.527)
16	A to A'	1,314.0 (51.732)
17	B to B'	1,314.0 (51.732)
18	F to F'	1,290.4 (50.803)
19	G to G'	1,311.4 (51.630)

Tolerance error ± 2 mm (0.0787 in)

BF890

Fig. BF-7 Side body alignment of the Hardtop

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BUMPER

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REMOVAL AND INSTALLATION BF-12

DESCRIPTION

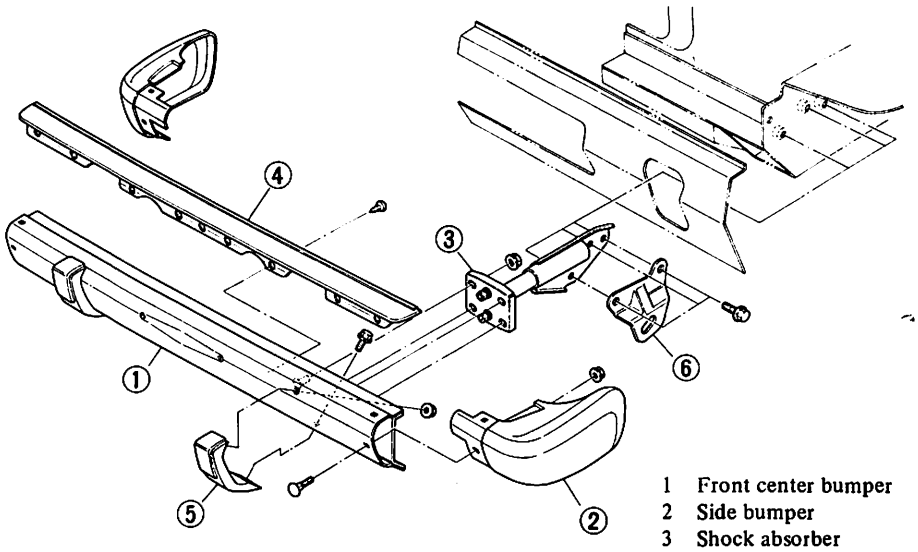
Component parts of the front bumper are the same for all models, and those of the rear bumper differ for the Station Wagon and all other models.

These bumpers consist basically of a center bumper, two side bumpers, two overriders, two shock absorbers and a sight shield.

Each bumper is secured to the car body through the two shock absorbers. These shock absorbers are designed to absorb impact energy in a light collision (5 MPH front and rear impact) and to restore the bumper to the original position after a collision without damage to the car.

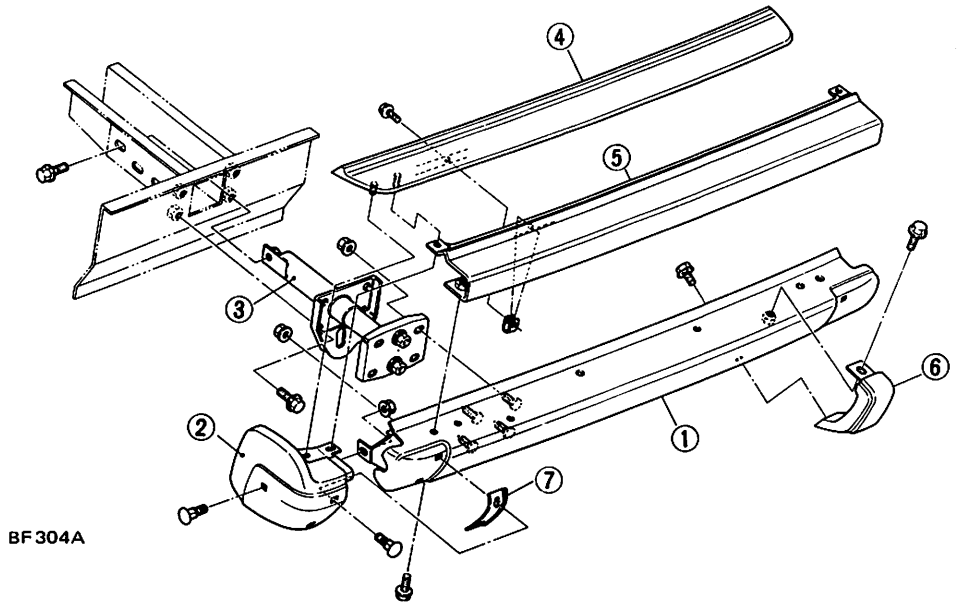
The side bumpers are fabricated from uretane rubber and employ steel inserts in their constructions.

Note: The shock absorber is filled with a high pressure gas and should not be disassembled, drilled or exposed to an open flame.



1 Front center bumper
2 Side bumper
3 Shock absorber
4 Sight shield
5 Over rider
6 Front lashing hook

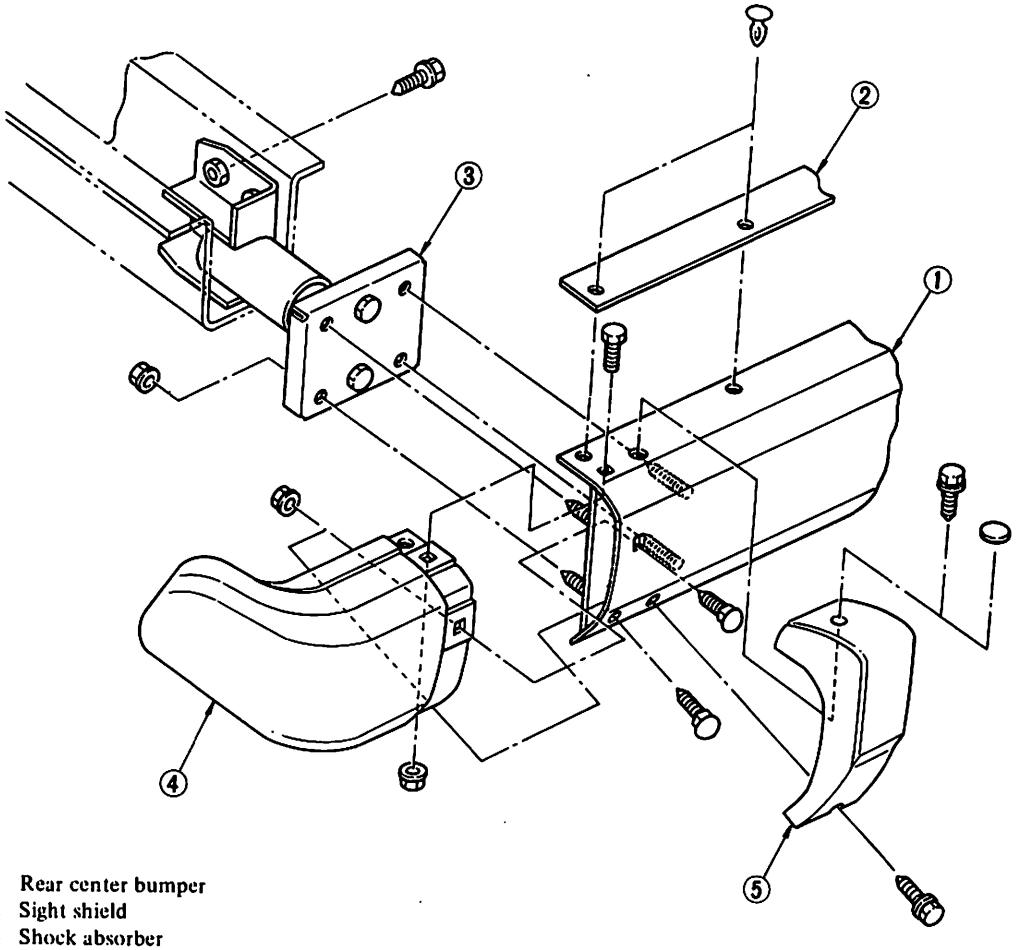
Fig. BF-8 Exploded view of front bumper



1 Rear center bumper
2 Side bumper
3 Shock absorber
4 Sight shield
5 Upper center bumper
6 Over rider
7 Seating rubber

Fig. BF-9 Exploded view of rear bumper for Sedan and Hardtop

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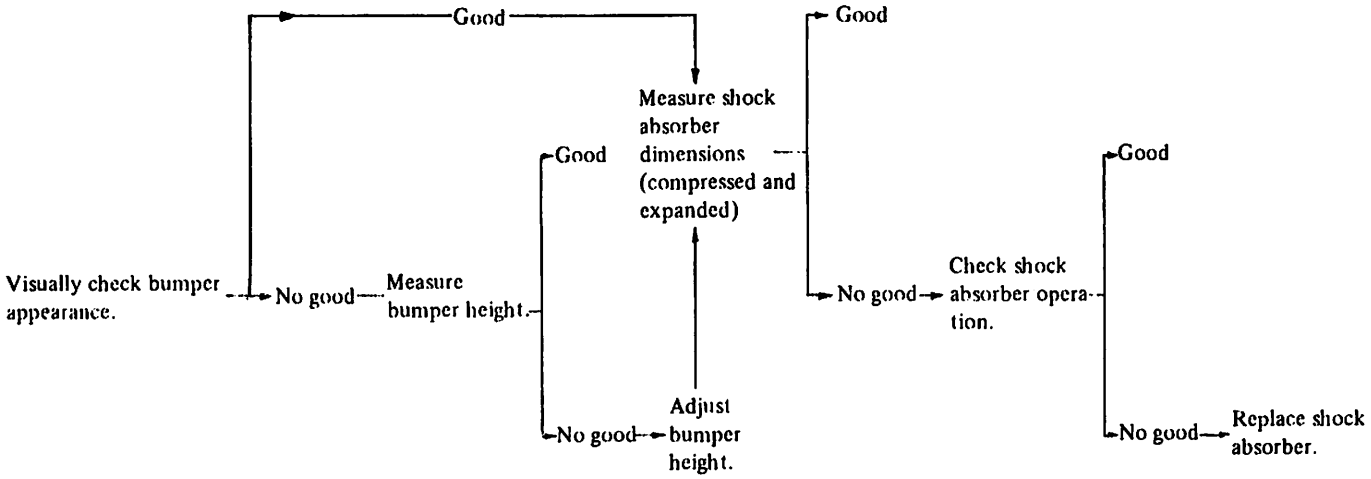
1 Rear center bumper
2 Sight shield
3 Shock absorber
4 Side bumper
5 Over rider

BF456A

Fig. BF-10 Exploded view of rear bumper for Station Wagon

INSPECTION

To inspect bumper and shock absorber for condition, utilize the following chart as a guide and proceed to the indicated order in the chart.



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1. Bumper height

The bumper height for all models should be held within the range shown in Figures BF-11 and BF-12 in accordance with No. 215 of M.V.S.S. This provision does not apply to the Hardtop.

To adjust bumper height properly, utilize the following procedure.

(1) Place car on a flat surface under curb weight condition. Tires must be inflated kept to rated pressure.

(2) Measure the height of bumper above ground at P and P′ points as shown in Figures BF-11 and BF-12.

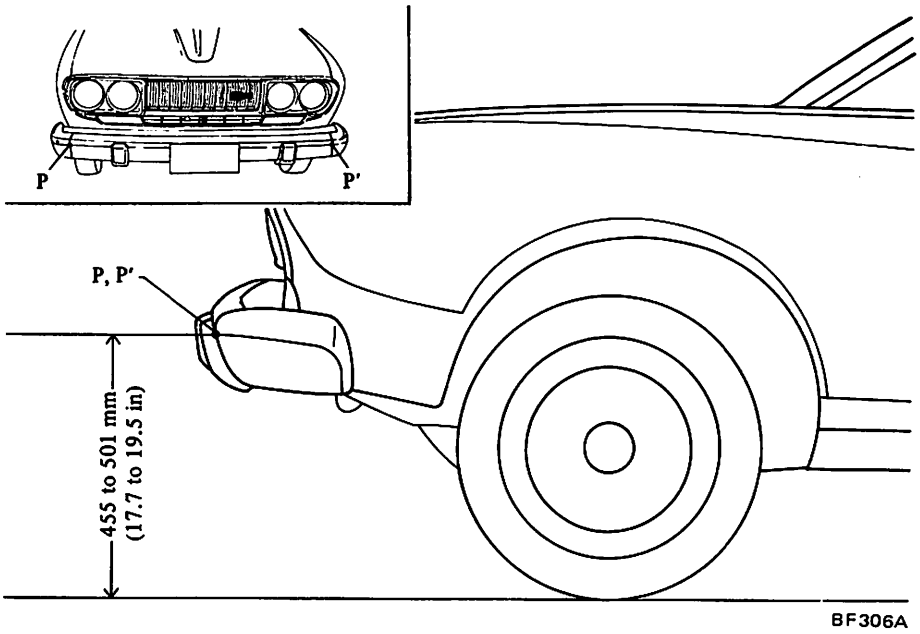


Fig. BF-11 Front bumper height

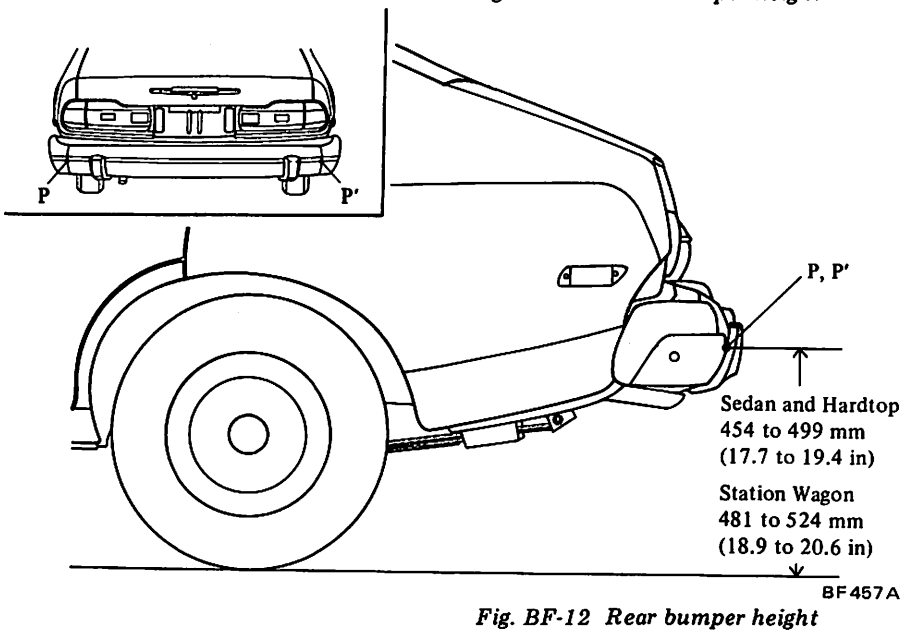


Fig. BF-12 Rear bumper height

(3) If the bumper height is not held within the specification, loosen shock absorber attaching bolts and adjust bumper height. After adjustment, tighten bolts securely.

2. Length of shock absorber

The standard dimension of shock absorbers is shown in the Figure BF-13.

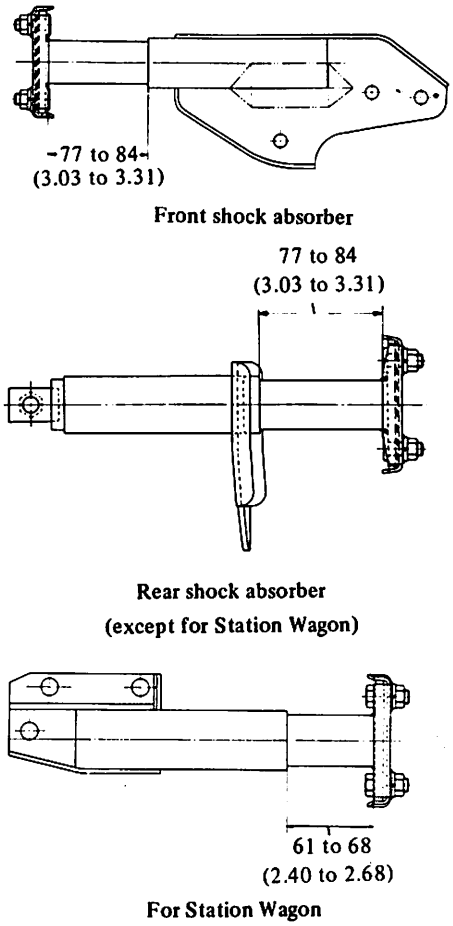


Fig. BF-13 Length of shock absorber

3. Checking the function of shock absorber.

(1) Locate the car in front of a wall. Apply hand brake and place wheel chocks securely.

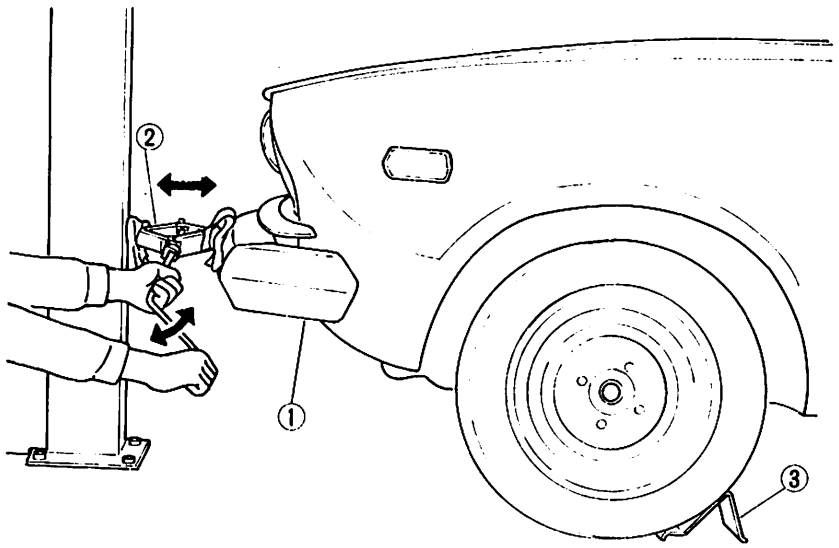
(2) Place a jack between the wall and the center of front bumper. Gradually extend jack approx. 40 mm (1.57 in). [The bumper should move approx. 40 mm (1.57 in) backward through the shock absorber operation.] See Figure BF-13.

Note: Use a jack of more than 400 kg (881 lb) in capacity.

(3) Make sure that bumper returns to its original position when jack is retracted.

(4) On the rear bumper, utilize the same procedures as described for front bumper.

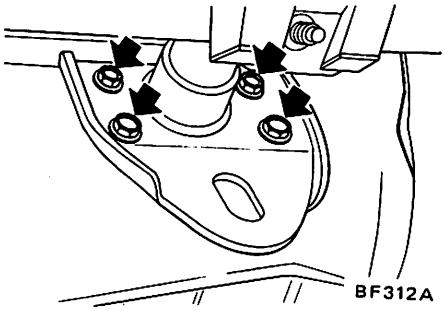
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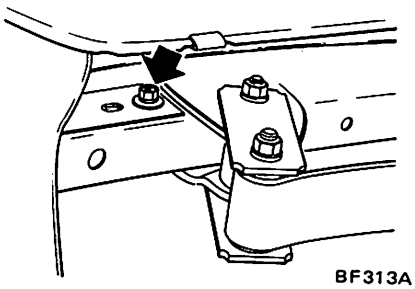
1 Front bumper
2 Jack
3 Wheel chock

BF227A

Fig. BF-14 Checking shock absorber function



BF312A



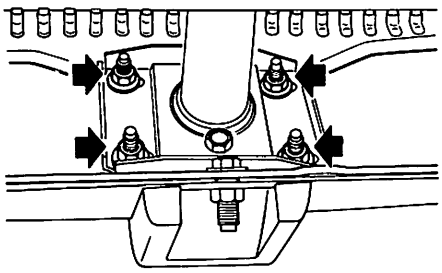
BF313A

Fig. BF-18 Removing rear shock absorber (Sedan and Hardtop)

FRONT BUMPER

REMOVAL AND INSTALLATION

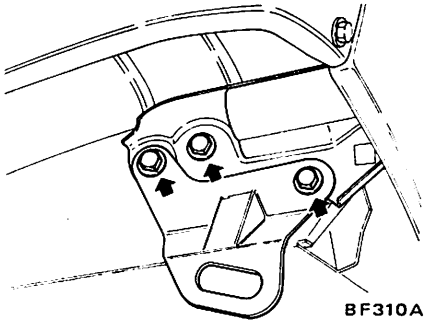
1. Loosen nuts attaching front bumper to shock absorbers and remove bumper. See Figure BF-15.



BF309A

Fig. BF-15 Removing front bumper

2. Loosen bolts attaching shock absorbers to body and remove shock absorbers. See Figure BF-16.



BF310A

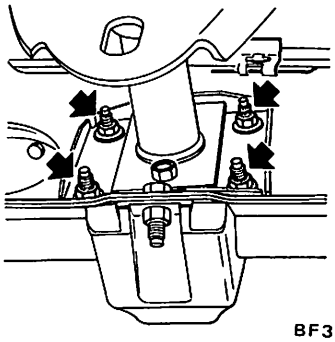
Fig. BF-16 Removing front shock absorber

3. Install shock absorbers and front bumper in the reverse order of removal, and adjust bumper height as shown in Figure BF-11.

REAR BUMPER

REMOVAL AND INSTALLATION

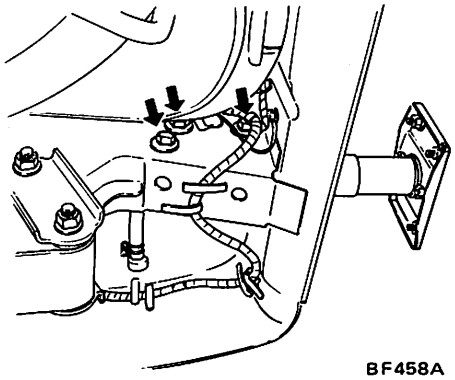
1. Loosen nuts attaching rear bumper to shock absorbers and remove bumper. See Figure BF-17.



BF311A

Fig. BF-17 Removing rear bumper

2. Loosen bolts attaching shock absorber to body and remove shock absorbers. See Figures BF-18 and BF-19.



BF458A

Fig. BF-19 Removing rear shock absorber (Station Wagon)

3. Install rear shock absorbers and rear bumper in the reverse order of removal, and adjust rear bumper height as shown in Figure BF-12.

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RADIATOR GRILLE, FRONT FENDER AND APRON

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RADIATOR GRILLE

REMOVAL AND INSTALLATION

1. Open hood and support it in open position with a stay.
2. Remove six screws attaching radiator grille shown by arrows and lift radiator grille out. See Figure BF-20.
3. Insert radiator grille into radiator grille mounting bases at front apron and tighten attaching screws. See Figure BF-21.

Note: The radiator grille is made of plastic so never use excessive force on it.

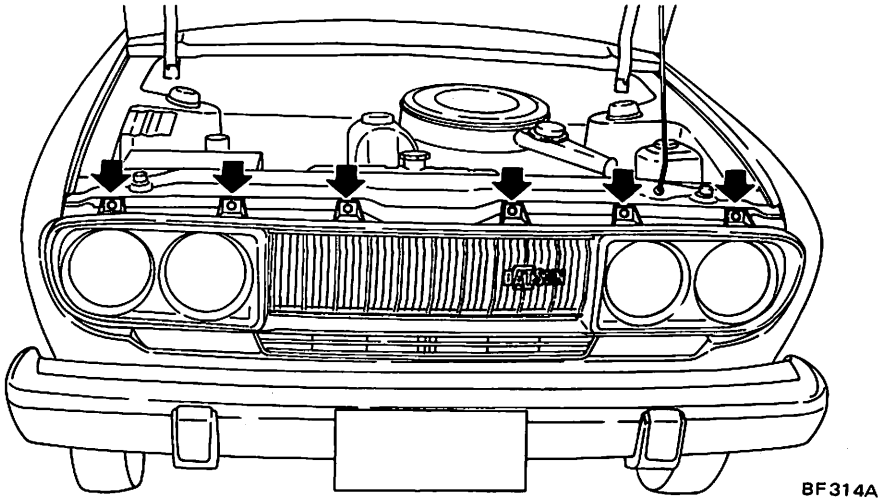


Fig. BF-20 Removing radiator grille

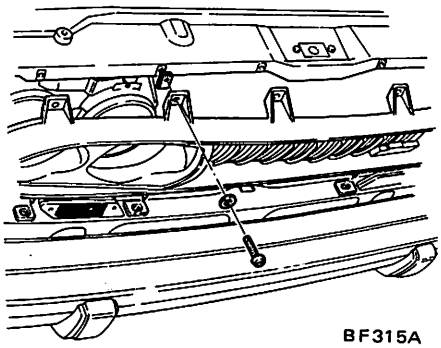


Fig. BF-21 Installing radiator grille

FRONT FENDER AND APRON

REMOVAL AND INSTALLATION

1 Spring nut
2 Front fender
3 Baffle filler
4 Fender rubber
5 Front apron
6 Hood lock stay
7 Fender protector

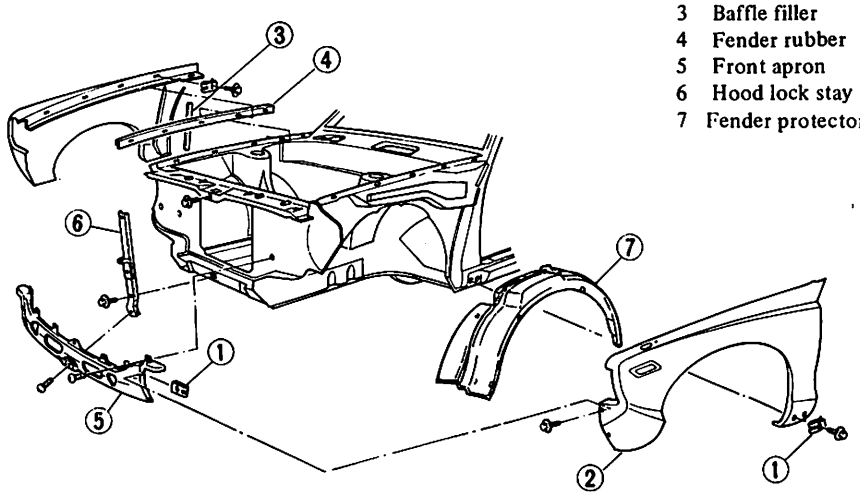


Fig. BF-22 Exploded view of front fenders and apron

1. Open hood and support it in open position with a stay.
2. Remove front bumper with shock absorbers.
3. Remove radiator grille.
4. Remove front combination lamps.
5. Remove screws attaching front apron to front fender. See Figure BF-23.

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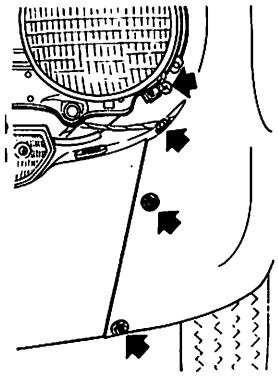

BF317A

Fig. BF-23 Removing screws attaching front apron to fender

6. Remove screws attaching front apron to hood lock stay and remove front apron. See Figure BF-24.

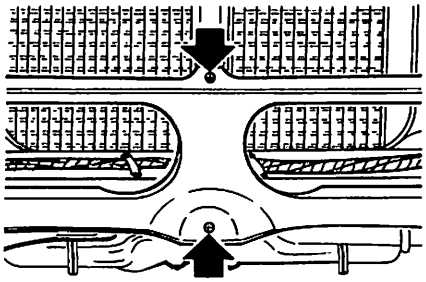

BF318A

Fig. BF-24 Removing screws attaching front apron to hood lock stay

7. Remove windshield wiper blades, cowl top grille and sill moldings in that order.

8. Remove fender protector attaching clips and screws, and remove fender protector.

9. Remove fender attaching screws as shown in the following illustrations:

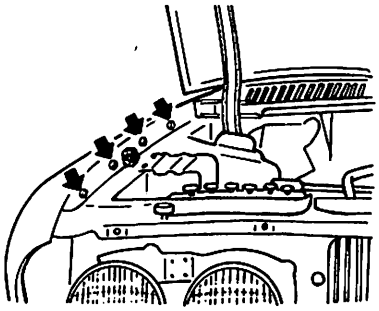

BF898

Fig. BF-25 Removing screws attaching hood ledge to front fender

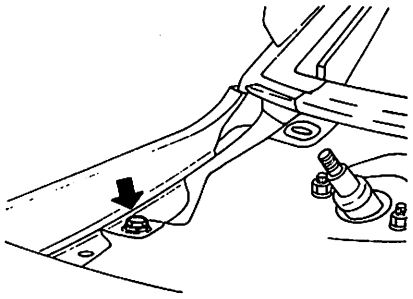
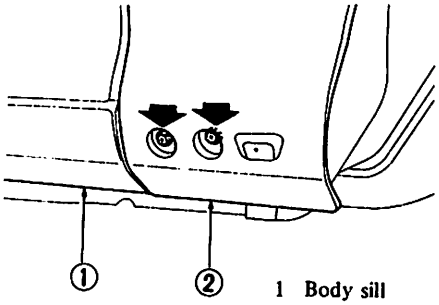

BF899

Fig. BF-26 Removing screw attaching cowl top panel to front fender



1 Body sill
2 Front fender
BF424

Fig. BF-27 Removing screws attaching body sill to front fender

10. Install front fenders and apron in the reverse order of removal.

ENGINE HOOD AND COWL TOP GRILLE

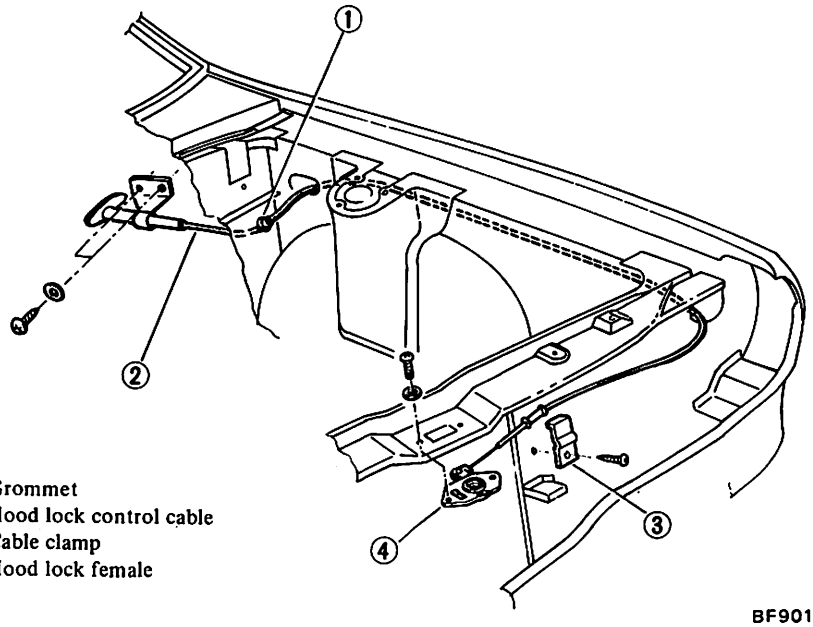
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ENGINE HOOD

ADJUSTMENT



1 Grommet
2 Hood lock control cable
3 Cable clamp
4 Hood lock female

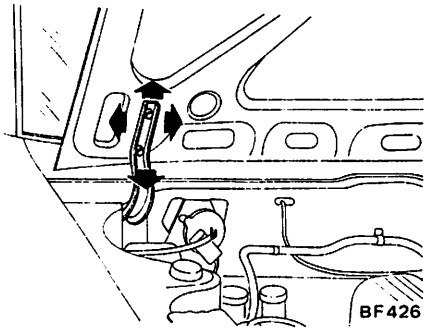
BF901

Fig. BF-28 Exploded view of hood lock control

Hood can be adjusted by bolts attaching hood to hood hinge, hood lock mechanism and hood bumpers. Adjust hood for an even fit between front fenders and for a flush fit with the front of fenders.

Adjust hood according to the following procedures:

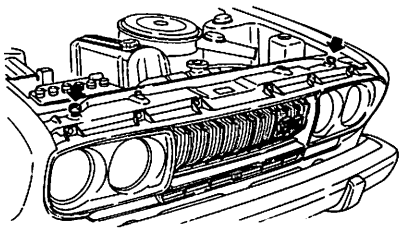
1. Adjust hood fore and aft and from side to side by loosening bolts attaching hood to hinge and repositioning hood. See Figure BF-29.



BF426

Fig. BF-29 Adjusting bolts attaching hood

2. Loosen hood bumper lock nuts and lower bumpers until bumpers do not come into contact with the front of hood when hood is closed. See Figure BF-30.

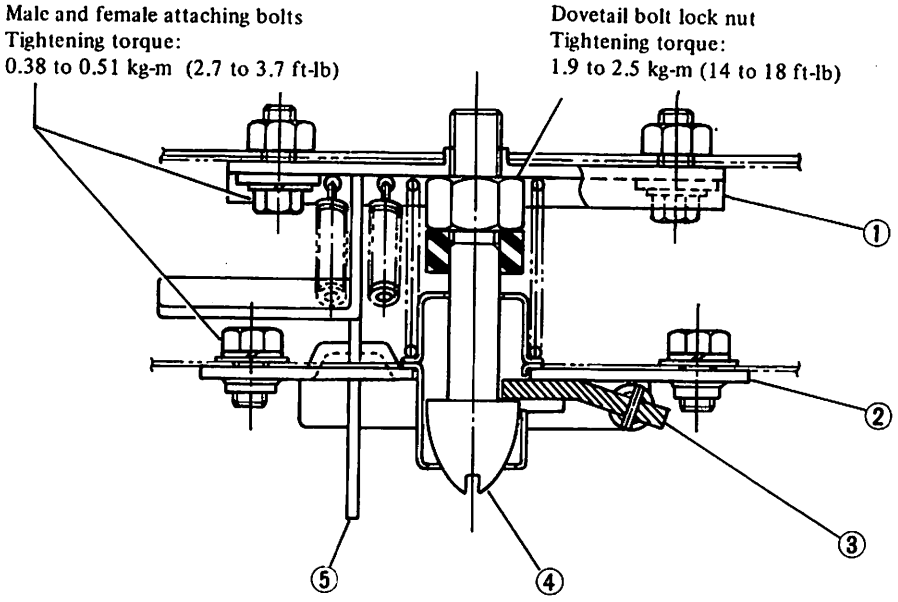


BF319A

Fig. BF-30 Adjusting hood bumper height

3. Adjust hood lock mechanism after hood has been properly aligned. Hood lock male can be moved fore and aft and from side to side to align it with hood lock female by loosening attaching bolts.

Front end of hood can also be moved up and down by adjusting the height of dovetail bolt of hood lock male to obtain a flush fit with fenders.



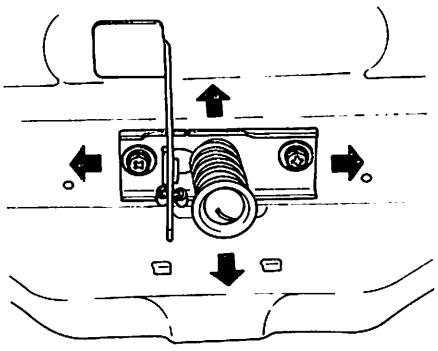
1 Hood lock male body
2 Hood lock female assembly
3 Primary latch
4 Dovetail bolt
5 Secondary latch

BF903

Fig. BF-31 Sectional view of hood lock

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4. Loosen hood lock male attaching bolts until they are just loose enough to move hood lock male.
5. Move hood lock male until it is aligned with hood lock female. See Figure BF-32.



BF902

Fig. BF-32 Adjusting hood lock male

6. After the desired alignment is obtained, tighten hood lock male attaching bolts.

Tightening torque:
Male and female attaching bolts
0.38 to 0.51 kg-m
(2.7 to 3.7 ft-lb)

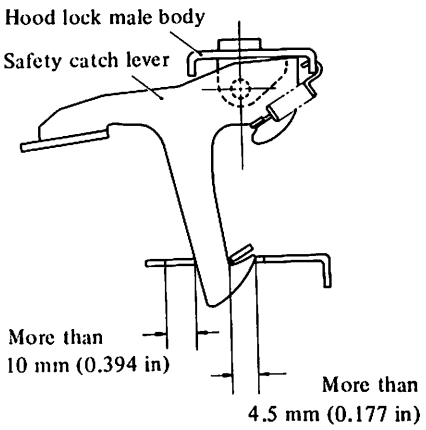
7. Lower hood 1 to 3 mm (0.039 to 0.118 in) from top of front fender by adjusting dovetail bolt.
After the desired alignment is obtained, tighten lock nut of dovetail bolt.

Tightening torque:
Lock nut of dovetail
1.9 to 2.6 kg-m
(14 to 19 ft-lb)

8. Raise two hood bumpers until hood is flush with fenders.
9. Open and close hood several times to check the operation.
Check hood lock male for complete engagement with hood lock female.

Note: Full engagement must be obtained for proper hood lock male adjustment. If complete engagement is not obtained, readjust hood lock male for full engagement of dovetail bolt and hood lock female.

10. Make sure that safety catch lever retains hood properly when hood lock is disengaged. See Figure BF-33.



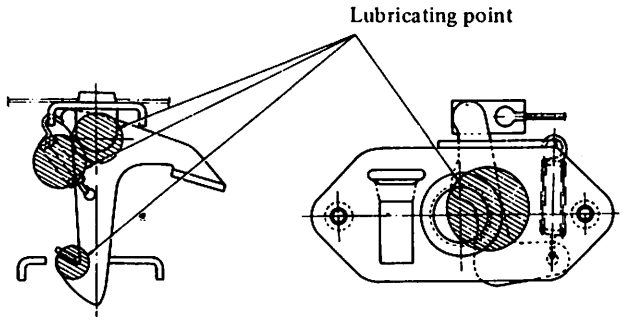
BF460A

Fig. BF-33 Safety catch lever

Notes:
When inspecting the hood lock, observe the following procedures:
a. **Operation of safety catch lever**
Check caulking portion of safety catch lever for wear.
Check spring for weakness and breakdown. If spring is broken, hood may be unlocked and spring open during driving.
b. **Operation of female lever**
Check female lever for smooth and correct operation.
Check spring for weakness and breakdown. If female lever does not move smoothly, engaging stroke will be reduced, and it may be disengaged from the hood lock.

LUBRICATION

When checking or adjusting the hood lock, lubricate the pivot, catcher and return spring of the safety catch lever thoroughly. Also, lubricate the lever of the hood lock female for smooth and correct operation. See Figure BF-34.



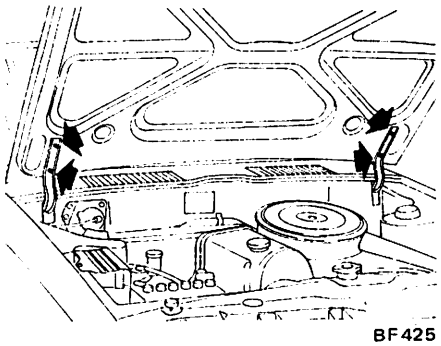
BF889

Fig. BF-34 Lubricating points

REMOVAL AND INSTALLATION

ENGINE HOOD

1. Open engine hood and protect body with covers to prevent scratching the paint.
2. Mark hood hinge locations on hood for proper reinstallation.
3. Support engine hood with hand and remove bolts securing hood hinge to hood, taking care not to let the hood slip when the bolts are removed. See Figure BF-35.



BF425

Fig. BF-35 Removing bolts attaching hood

4. Remove hood from car.
5. Install hood in the reverse order of removal.

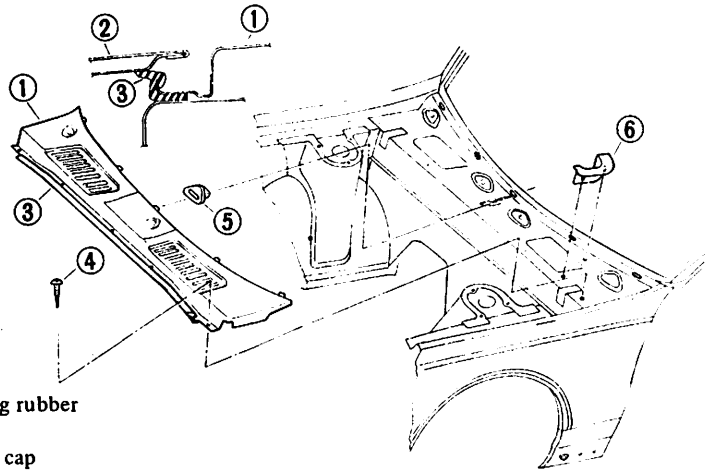
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HOOD LOCK

1. Remove hood lock male attaching bolts and remove hood lock male from hood.
2. Remove hood lock release handle to instrument panel bolts and remove control cable retaining clamps.
3. Disconnect control cable from hood lock female and then remove hood lock control cable.
4. Install hood lock mechanism in the reverse order of removal.

COWL TOP GRILLE AND HOOD HINGE

REMOVAL AND INSTALLATION



1 Cowl top grille
2 Engine hood
3 Cowl top sealing rubber
4 Screw
5 Cowl top panel cap
6 Cowl top baffle plate

BF904

Fig. BF-36 Exploded view of cowl top grille

1. Open engine hood and protect front fenders with covers to prevent scratching the paint.
2. Scribe hood hinge location on hood for proper reinstallation.
3. Remove engine hood from hood hinge.
4. Remove windshield wiper blades.
5. Remove cowl top grille attaching screws.
6. Draw cowl top grille forward.

Cowl top grille can also be removed without removing engine hood.

7. Loosen hood hinge attaching bolts and remove hood hinges.
8. Install cowl top grille and hood hinges in the reverse order of removal.

TRUNK LID

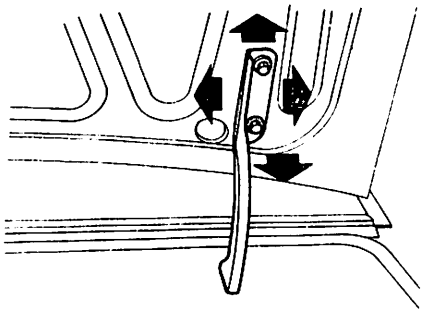
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TRUNK LID

ADJUSTMENT

1. Loosen trunk lid hinge attaching bolts until they are just loose enough to move trunk lid.
2. Move trunk lid fore and aft to obtain a flush fit between trunk lid and rear fender. See Figure BF-37.

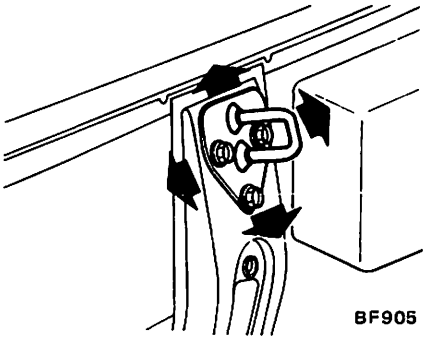


BF433

Fig. BF-37 Adjusting trunk lid

3. To obtain a snug fit between trunk lid and weatherstrip, loosen trunk lid lock striker attaching bolts enough to move lid, working striker up or down and from side to side as required. See Figure BF-38.

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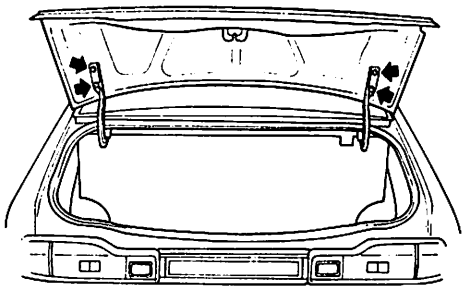
BF905

Fig. BF-38 Adjusting trunk lid lock striker

4. After desired adjustment is obtained, tighten trunk lid lock striker attaching bolts securely.

REMOVAL AND INSTALLATION

1. Open trunk lid and cover rear fenders.
2. Mark trunk lid hinge locations or trunk lid for proper reinstallation.
3. Support trunk lid by hand and remove bolts attaching trunk lid to hinge. Then remove trunk lid. See Figure BF-39.



BF906

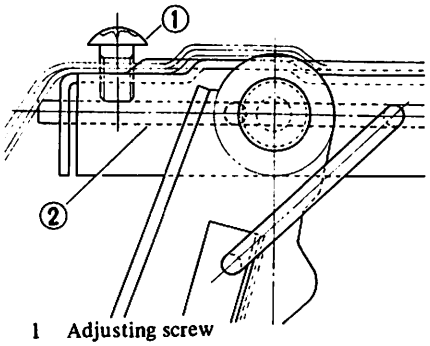
Fig. BF-39 Removing trunk lid

4. Install trunk lid in the reverse order of removal.

TORSION BAR

ADJUSTMENT

1. Open trunk lid and note its pop-up distance.
2. If trunk lid does not pop open, the torsion bar tension should be increased.
3. To increase torsion bar tension, turn adjusting screw on hinge bracket clockwise. See Figure BF-40.



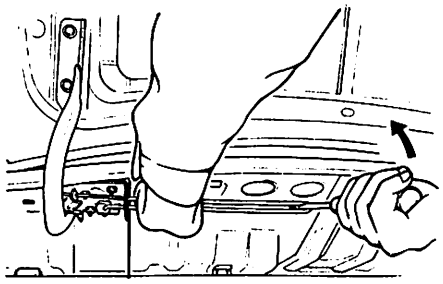
1 Adjusting screw
2 Torsion bar

BF907

Fig. BF-40 Adjusting torsion bar tension

REMOVAL AND INSTALLATION

1. Open trunk lid.
2. Support trunk lid and remove each torsion bar, disengaging end of torsion bar from torsion bar bracket and trunk lid hinge. Use a suitable screwdriver. See Figure BF-41.



BF908

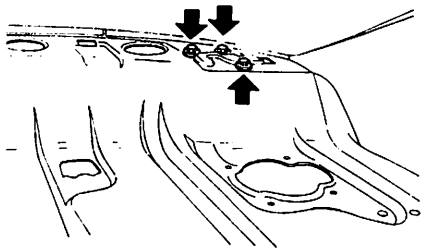
Fig. BF-41 Removing torsion bar

3. Install torsion bars in the reverse order of removal.

TRUNK LID HINGE

REMOVAL AND INSTALLATION

1. Open trunk lid and protect body with covers.
2. Remove trunk lid and torsion bars.
3. Remove rear seat cushion and seat back.
4. Pull up the four clips which retain rear parcel shelf finisher front end and draw rear parcel shelf finisher forward.
5. Remove trunk lid hinge attaching bolts and remove trunk lid hinges. See Figure BF-42.



BF909

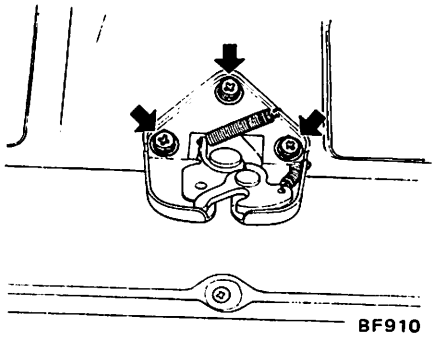
Fig. BF-42 Removing trunk lid hinge

6. Install trunk lid hinges in the reverse order of removal.

TRUNK LID LOCK

REMOVAL AND INSTALLATION

1. Open trunk lid.
2. Remove trunk lid lock attaching bolts and remove trunk lid lock from trunk lid. See Figure BF-43.



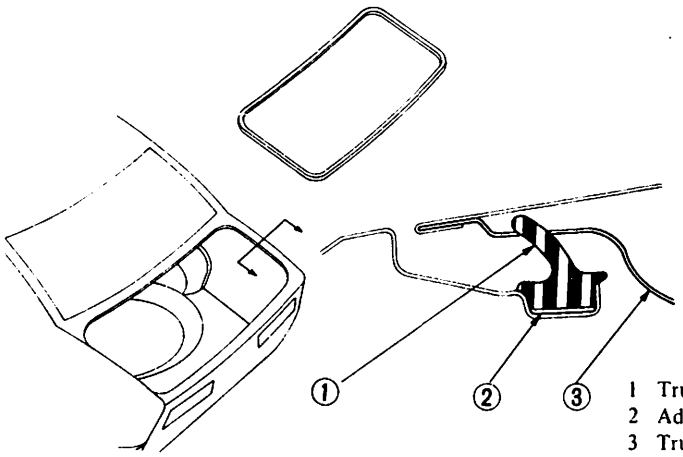
BF910

Fig. BF-43 Removing trunk lid lock

3. To remove lock cylinder, pry off retaining clip on lock cylinder from inside of trunk lid and remove lock cylinder from trunk lid outer panel.
4. Install trunk lid lock and lock cylinder in the reverse order of removal.

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TRUNK LID WEATHERSTRIP



1 Trunk lid weatherstrip
2 Adhesive
3 Trunk lid

Fig. BF-44 Sectional view of trunk lid weatherstrip

REMOVAL AND INSTALLATION

1. Remove weatherstrip from body and wipe the remaining adhesive away from body with suitable cleaning solvent. Then wash the surface with water.
2. Coat adhesive to body side and weatherstrip.
3. After coating adhesive, let it dry. Then install weatherstrip, pressing the corners first, the other parts later.

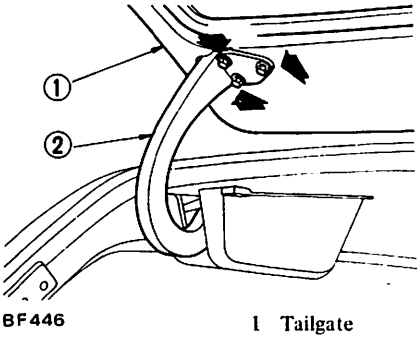
TAILGATE (Station Wagon)

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REMOVAL AND INSTALLATION

1. Open tailgate and support it in open position.
2. Remove bolts attaching tailgate to tailgate hinge and remove tailgate from the hinge.
3. Install tailgate in reverse sequence of removal.



1 Tailgate
2 Tailgate hinge

Fig. BF-45 Removing tailgate

TAILGATE ALIGNMENT

Tailgate can be moved up and down and from side to side by loosening bolts attaching tailgate to tailgate hinge.

Fore and aft adjustment is obtained by loosening bolts attaching tailgate hinge to body.

Tailgate should be adjusted for an even and parallel fit with the tailgate opening.

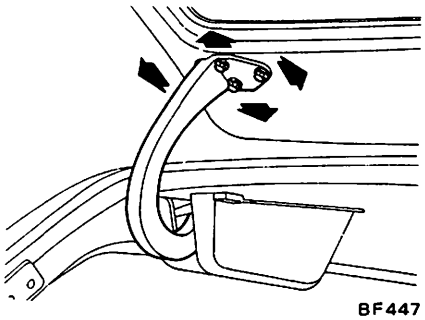


Fig. BF-46 Adjusting tailgate up and down and from side to side

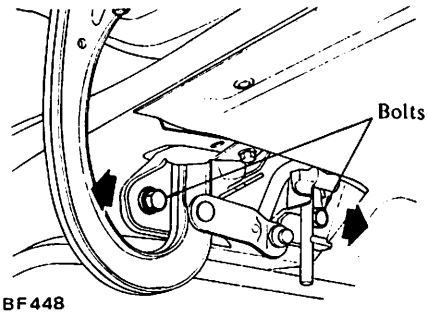


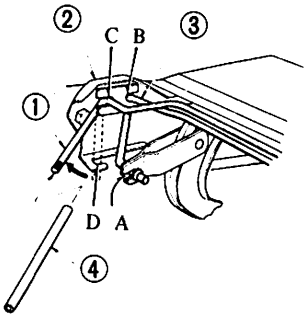
Fig. BF-47 Adjusting tailgate fore and aft

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TAILGATE TORSION BAR

REMOVAL AND INSTALLATION

1. Open tailgate and support it in open position.
2. Loosen screws attaching tailgate hinge cover and remove it.
3. Loosen screws attaching headlining rear end and remove headlining rear portion from tail rail panel.
4. Support tailgate and remove left torsion bar (painted yellow) first from brackets "D" and "C" with a suitable pipe. See Figure BF-48.



BF449

1 Left torsion bar
2 Tailgate hinge
3 Right torsion bar
4 Pipe for removal and installation

Fig. BF-48 Removing torsion bar

5. Remove right torsion bar in the same manner.
6. Install torsion bars in reverse sequence of removal.

Notes:

a. **First install the bar which is not painted yellow.**
b. **If unusual noise are heard when the tailgate is opened and closed, apply a coating of grease to the A section.**

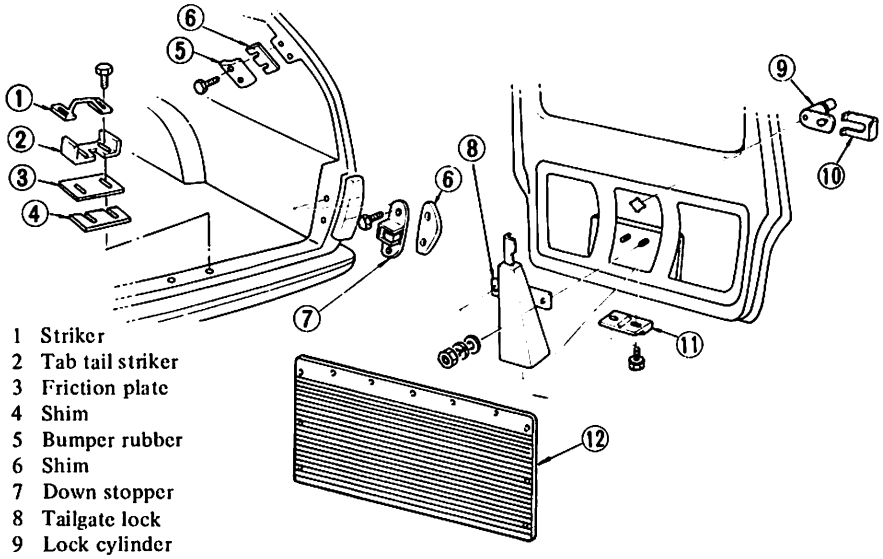
TAILGATE HIMGE

REMOVAL AND INSTALLATION

1. Open tailgate and support it in open position.
2. Remove tailgate from hinge.
3. Remove tailgate hinge cover.
4. Remove headlining rear portion from tail rail panel.
5. Remove torsion bars.
6. Loosen bolts attaching hinge and remove it.
7. Install hinge in reverse sequence of removal.

TAIL GATE LOCK AND STRIKER

REMOVAL AND INSTALLATION

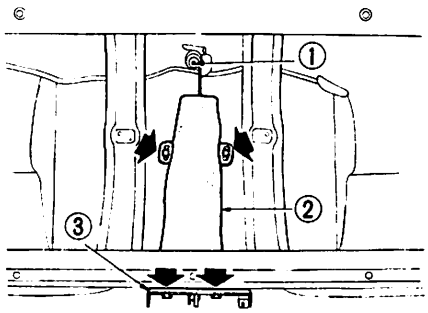


1 Striker
2 Tab tail striker
3 Friction plate
4 Shim
5 Bumper rubber
6 Shim
7 Down stopper
8 Tailgate lock
9 Lock cylinder
10 Clip
11 Tailgate striker catcher
12 Tailgate trim

BF461A

Fig. BF-49 Exploded view of tailgate lock and striker

1. Open tailgate and support it in open position.
2. Remove screws attaching tailgate trim and remove trim and sealing screen from tailgate.
3. Loosen bolts attaching tailgate lock and remove the lock and striker catcher from tailgate.



BF451

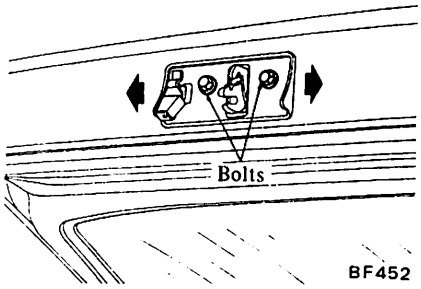
1 Lock cylinder
2 Tailgate lock
3 Striker catcher

Fig. BF-50 Removing tailgate lock

4. Loosen bolts attaching striker and remove it.
5. Install tailgate lock, striker catcher and striker in reverse sequence of removal.

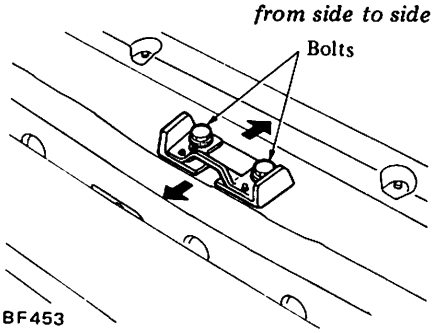
ADJUSTMENT

1. Striker catcher can be adjusted from side to side, and striker can be adjusted fore and aft. Before adjusting tailgate lock, make sure that tailgate is properly aligned.



BF452

Fig. BF-51 Adjusting striker catcher from side to side



BF453

Fig. BF-52 Adjusting striker fore and aft

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2. To adjust contact between striker and catcher, loosen attaching bolts and move them as required.
3. Loosen down stopper attaching bolts and move down stopper up or down to align it with stopper located on both sides of tailgate.

Then, tighten attaching bolts.

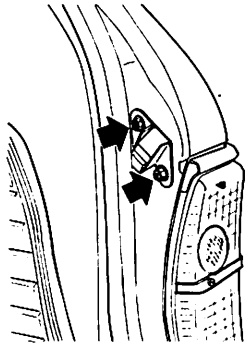


Fig. BF-53 Adjusting down stopper

TAILGATE LOCK CYLINDER

REMOVAL

1. Open tailgate and support it in open position.
2. Remove tailgate trim and sealing screen from tailgate.
3. Pull out spring washer which secures lock cylinder to tailgate outer panel. Then remove lock cylinder from tailgate.

INSTALLATION

Install lock cylinder in reverse sequence of removal.

After installing lock cylinder, make certain that tailgate lock mechanism and lock cylinder operate properly.

DOOR

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DOOR

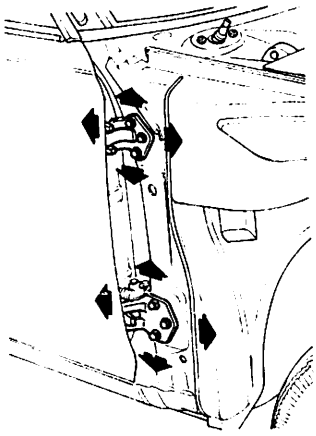
ALIGNMENT

Proper door alignment can be obtained by adjusting door hinge and door lock striker.

Door hinge and striker can be moved up and down and fore and aft in enlarged holes by loosening attaching bolts.

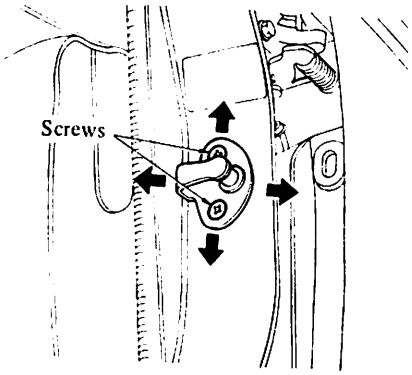
Door should be adjusted for an even and parallel fit with the door opening and surrounding body panels.

Be careful not to distort or mar door and surrounding body panels when adjusting. See Figures BF-54 and BF-55.



BF457

Fig. BF-54 Adjusting door hinge



BF458

Fig. BF-55 Adjusting door lock striker

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Front door hinge can be adjusted without removing front fender by using Door Hinge Wrench ST08730000. See Figure BF-56.

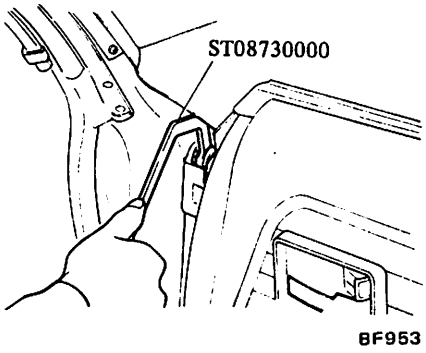


Fig. BF-56 Adjusting door hinge

REMOVAL AND INSTALLATION

Front door

1. Remove front bumper, radiator grille, front apron, windshield wiper blades, cowl top grille and sill molding in that order.
2. Remove front fender.
3. With door in full open position, place a garage jack or stand under door to support its weight.

Place rag between door and jack or stand to protect door from scratches.

4. Loosen bolts attaching door hinge to body and remove front door from the car. See Figure BF-57.

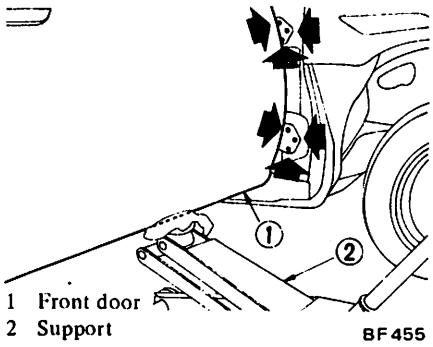


Fig. BF-57 Removing front door

5. Install front door in the reverse order of removal.

Rear door

1. Open front door and keep it open.
2. Open rear door to full open position, and place a support under it. Use rag between door and support to protect it from damage.
3. Loosen bolts attaching rear door hinges to center pillar and remove rear door from body. See Figure BF-58.

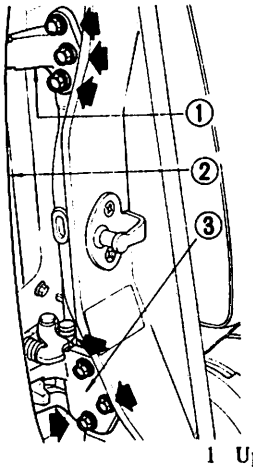


Fig. BF-58 Removing rear door

4. Install rear door in the reverse order of removal.

DOOR TRIM

REMOVAL AND INSTALLATION

1. Open door and keep it open.
2. Loosen screws attaching arm rest and remove arm rest from door.
3. Loosen screw attaching door inside handle escutcheon and remove escutcheon.
4. Loosen screw attaching ash tray and remove it (rear door only).
5. Remove spring retaining regulator handle and remove regulator handle and seating washer.
6. Remove door finisher retaining clips from door with a screwdriver and remove door finisher. See Figure BF-59.

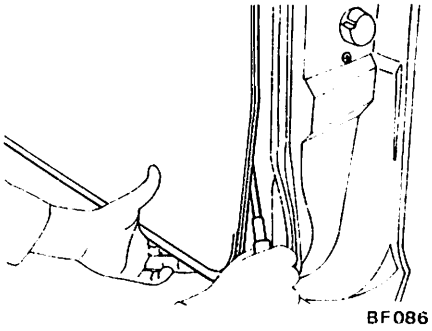


Fig. BF-59 Removing door finisher

7. Remove water seal screen from door.
8. Install water seal screen, door finisher and fittings in the reverse order of removal.

However, observe the following installation notes.

(1) When water seal screen is to be installed, it must be replaced with a new one if broken or suspected of leaking.

(2) With door glass up, set regulator handle at an angle. See Figure BF-60.

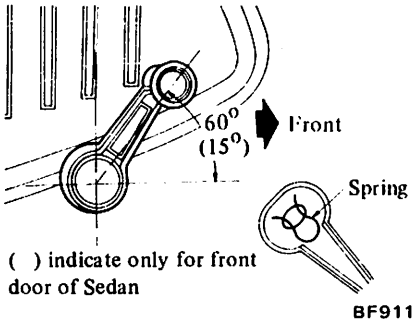


Fig. BF-60 Setting angle of regulator handle

(3) When cleaning the door finisher, use a damp or wet cloth; do not use any solvent harmful to the material.

DOOR LOCK AND STRIKER

ADJUSTMENT

Outside door handle

Outside door handle adjustment can be accomplished by adjusting the clearance between outside door lock lever and adjusting nut (nylon) located on outside door handle rod.

To adjust outside door handle, turn adjusting nut clockwise or counterclockwise to obtain clearance of 0 to 1.0 mm (0 to 0.039 in). See Figure BF-61.

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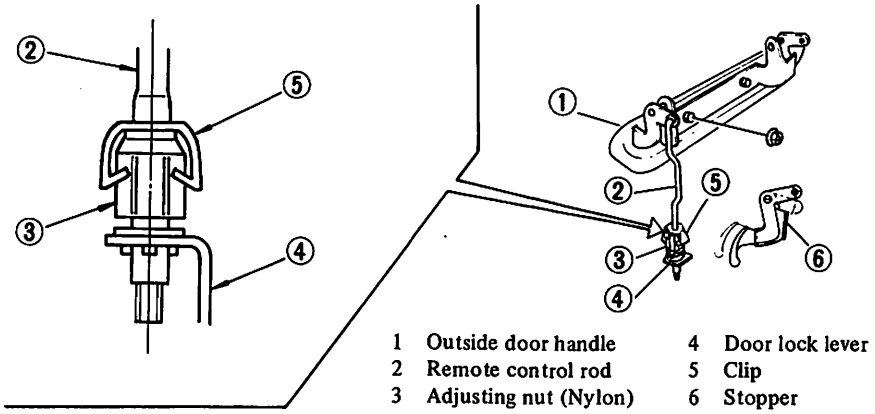


Fig. BF-61 Adjusting handle free play

Inside door handle

1. Partially tighten control rod bell-crank attaching screws and inside door handle attaching screws.
2. With inside door lock knob set on (closed), move bell-crank in elongated holes toward the front of door until bell-crank stops moving. See Figures BF-62 and BF-63.
3. Tighten bell-crank and inside door handle base attaching screws.
4. Check the operation of inside door handle and lock.

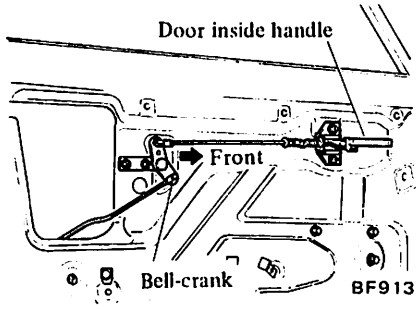


Fig. BF-62 Adjusting inside door handle (Sedan and Station Wagon)

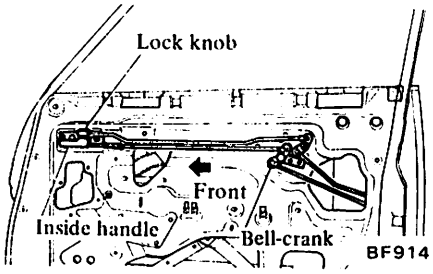


Fig. BF-63 Adjusting inside door handle (Hardtop)

Door lock striker

Door lock striker can be moved from side to side and up and down to align it with door lock latch. Adjust door lock striker after door hinge has been adjusted.

REMOVAL AND INSTALLATION

1. Open door and keep it open.
2. Remove door finisher and water seal screen. Refer to page BF-16 for Removal and Installation of Door Trim.
3. Remove inside door handle and bell-crank attaching screws.
4. Loosen screws attaching remote control and lock knob rod and then remove them.
5. Loosen nuts attaching outside door handle and remove handle. See Figure BF-64.

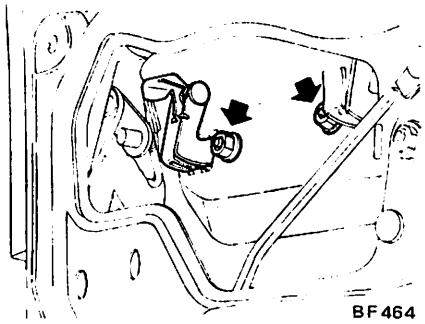


Fig. BF-64 Removing outside door handle

6. Removing remote control rod from door lock cylinder.
7. Loosen door lock attaching screws and remove door lock assembly from door. See Figure BF-65.

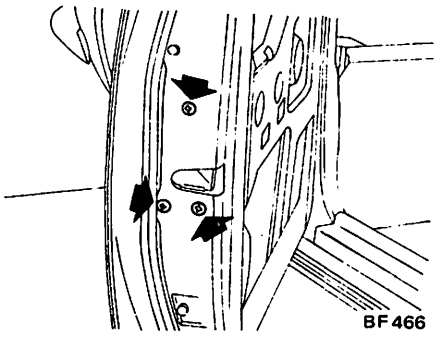


Fig. BF-65 Removing door lock assembly

8. Loosen door lock striker attaching screws and remove door lock from body. See Figure BF-66.

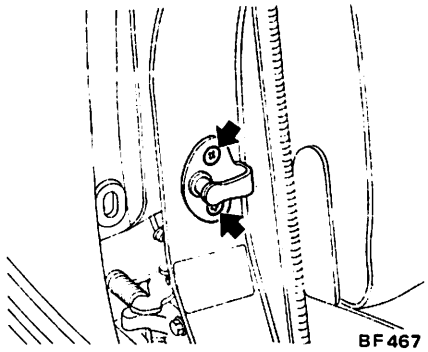


Fig. BF-66 Removing door lock striker

9. Install door lock mechanism in the reverse order of removal and apply small amount of multi-purpose grease to all movable surfaces of door lock assembly to obtain smooth operation.

Notes:

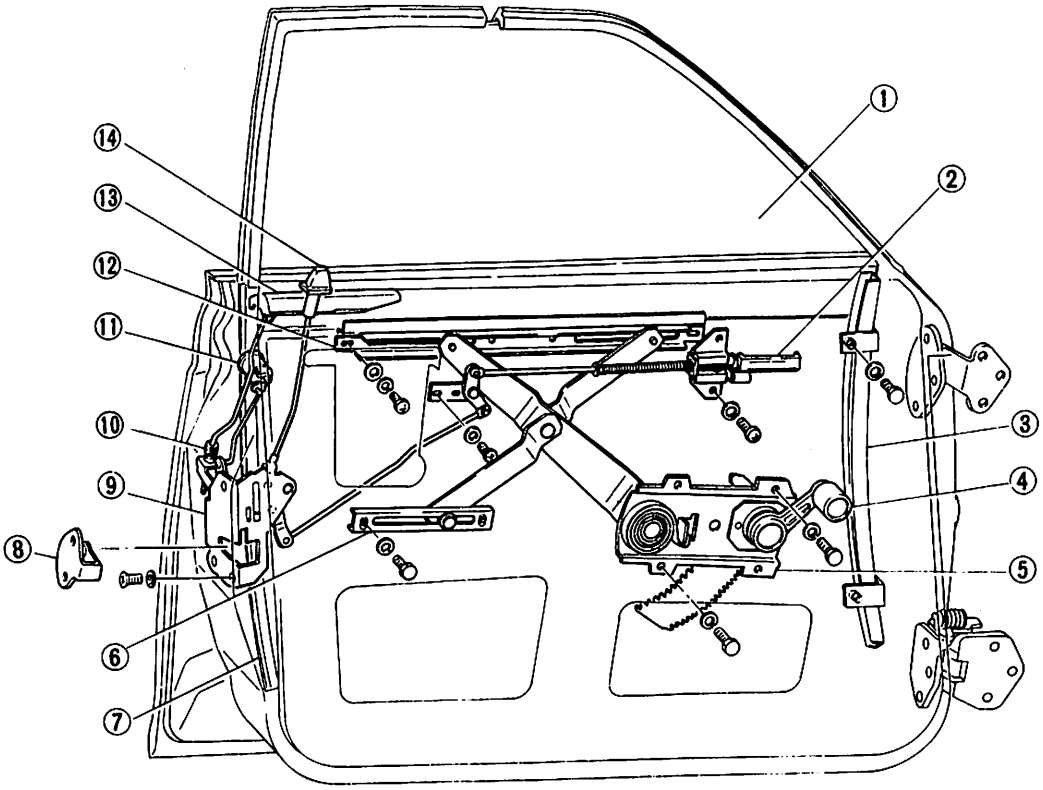
a. **If nylon nut is heated over 80°C (176°F) when repainting door, nylon should be removed to avoid deformation.**

b. **Check return springs, actuating levers and other component parts for deformation, fatigue or rusting. Defective parts must be replaced.**

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DOOR WINDOW GLASS AND REGULATOR

FRONT DOOR (Sedan and Station Wagon)



1 Door glass
2 Inside door handle
3 Front lower sash
4 Regulator handle
5 Regulator assembly
6 Guide channel A
7 Rear lower sash
8 Door lock striker
9 Door lock assembly
10 Adjusting nut
11 Door lock cylinder
12 Guide channel B
13 Outside door handle
14 Inside door lock knob

BF915

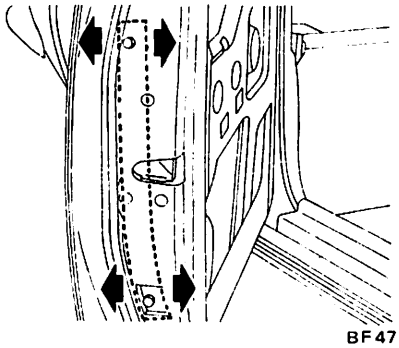
Fig. BF-67 Structural view of front door

Adjustment

Door glass alignment can be accomplished by adjusting front and rear lower sashes and guide channel A.

1. To obtain proper alignment of glass, temporarily tighten front and rear lower sashes.
2. With glass in the up position, adjust rear lower sash from side to side to align with glass and front lower sash.

Raise and lower glass to assure a good fit. See Figure BF-68.

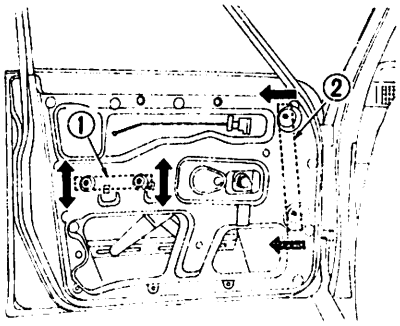


BF477

Fig. BF-68 Adjusting rear lower sash

3. With glass up, adjust glass in parallel with the top rail of door sash by moving guide channel A up and down.

The sideways free play of glass can be adjusted by moving front lower sash fore and aft. See Figure BF-69.



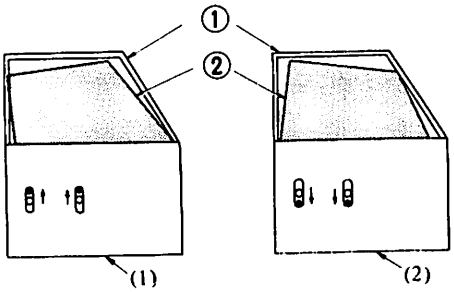
1 Guide channel A
2 Front lower sash

BF478

Fig. BF-69 Adjusting front lower sash and guide channel A

Guide channel A adjustment can be accomplished by the following procedure:

When door glass is as in picture (1) of Figure BF-70, move guide channel A up. Move it down if as in picture (2).



1 Door sash
2 Door glass

BF479

Fig. BF-70 Adjusting guide channel A

Removal and installation

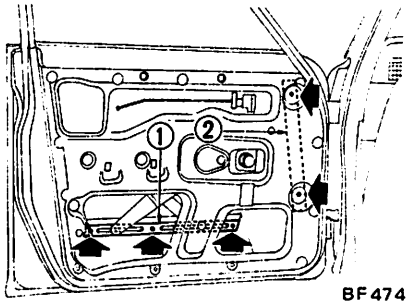
1. Lower door glass.
2. Remove assist grip, regulator handle, inside handle escutcheon, door lock knob, door finisher and water seal screen.

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3. Remove outside door molding and weatherstrip.
4. Loosen screws attaching front lower sash and remove front lower sash from door glass.

It is not necessary to draw front lower sash out of door before removing door glass.

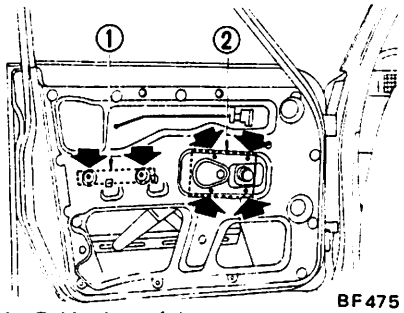
5. Support door glass and remove screws retaining guide channel B to glass back plate. See Figure BF-71.



1 Guide channel B 2 Front lower sash

Fig. BF-71 Removing door glass

6. Draw door glass upwards and remove it from door.
7. Loosen screws attaching guide channel A and regulator base, remove regulator assembly, and draw it through the lower opening of inside door panel. See Figure BF-72.



1 Guide channel A 2 Regulator base

Fig. BF-72 Removing regulator assembly

8. Loosen screws attaching rear lower sash and remove rear lower sash. See Figure BF-73.

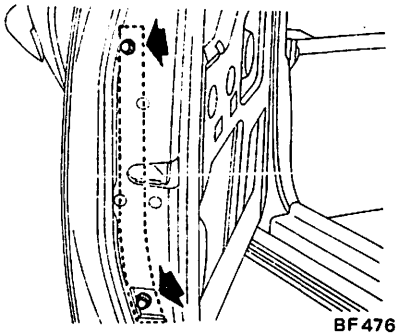
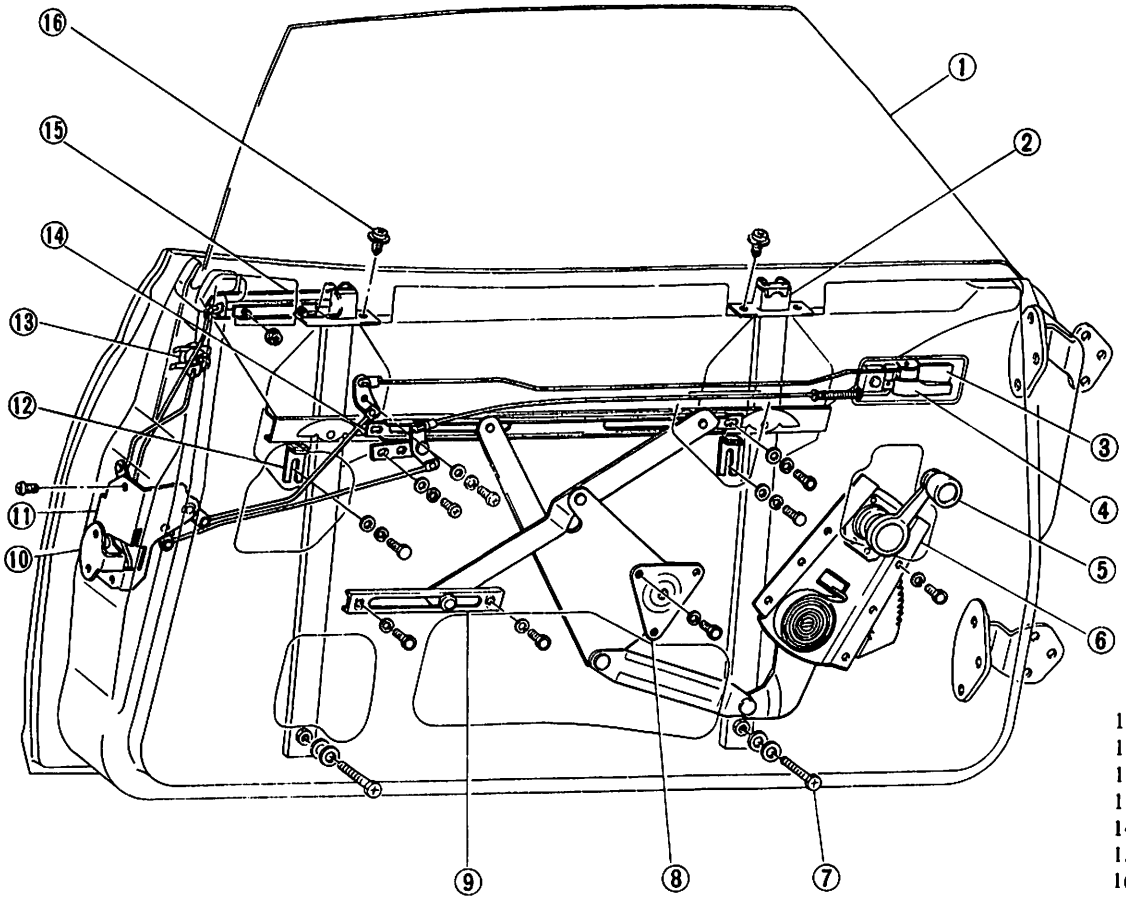


Fig. BF-73 Removing rear lower sash

9. Remove front lower sash.
10. Install door glass and regulator assembly in the reverse order of removal.

FRONT DOOR (Hardtop)



1 Door glass
2 Guide rail
3 Inside door lock knob
4 Inside door handle
5 Regulator handle
6 Regulator assembly
7 Adjusting bolt
8 Regulator arm base
9 Guide channel A
10 Door lock striker
11 Door lock assembly
12 Door glass upper stopper
13 Door lock cylinder
14 Guide channel B
15 Outside door handle
16 Adjusting bolt

BF916

Fig. BF-74 Structural view of front door

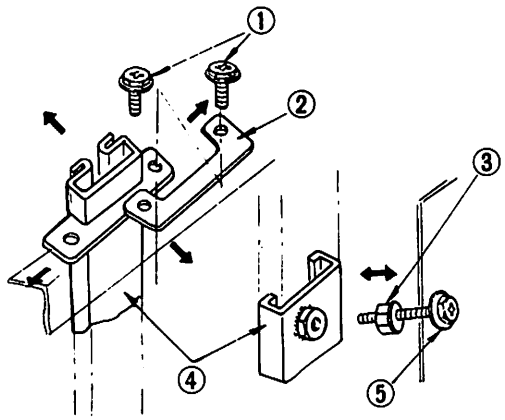
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Adjustment

1. With door glass up, temporarily tighten upper and lower bolts adjusting guide rail in the neutral position.

The neutral position for upper adjusting bolts is the center of the elongated holes.

For lower adjusting bolt, tighten it all the way. Then return four turns and secure lock nut at that position. See Figure BF-75.

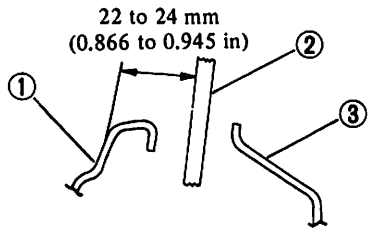


1 Upper adjusting bolts
2 Spacer
3 Lock nut
4 Guide rail
5 Lower adjusting bolt

BF487

Fig. BF-75 Guide rail adjusting mechanism

2. Adjust guide rail upper adjusting bolts so that the clearance between outside door panel and outside glass face is 22 to 24 mm (0.866 to 0.945 in). See Figure BF-76.



1 Outside door panel
2 Glass
3 Inside door panel

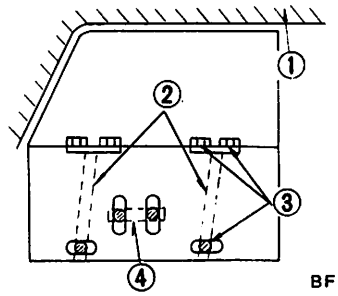
BF917

Fig. BF-76 Proper clearance between outside door panel and glass

3. Install outside door finish in position and make sure that outside door weatherstrip makes proper contact with door glass when door glass is raised and lowered.

4. Raise door glass to its full up position and align door glass with body weatherstrip to obtain a water seal screen.

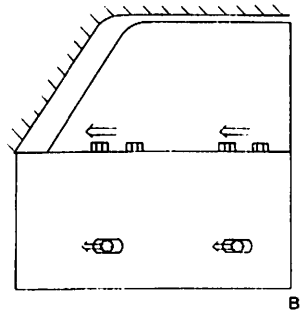
Proper glass alignment can be obtained by adjusting rails and guide channel A as in Figures BF-77 through Figure BF-81.



1 Body side weatherstrip
2 Guide rail
3 Guide rail adjusting bolts
4 Guide channel A

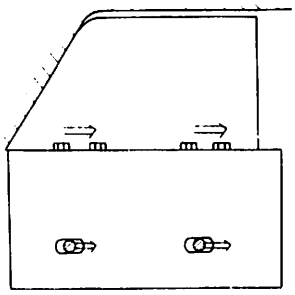
BF490

Fig. BF-77 Proper glass position



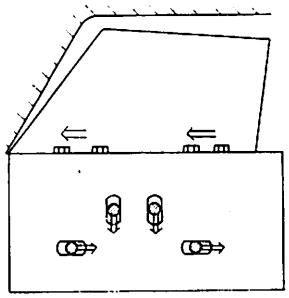
BF491

Fig. BF-78 When moving to front



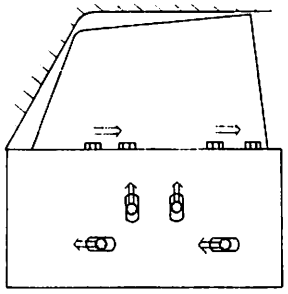
BF492

Fig. BF-79 When moving to rear



BF493

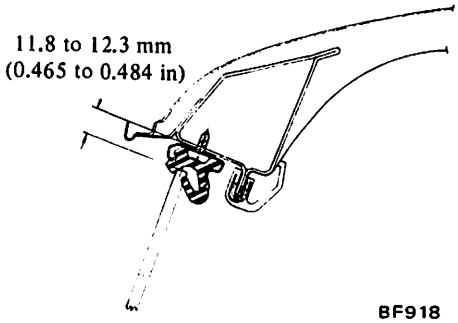
Fig. BF-80 When moving front up



BF494

Fig. BF-81 When moving rear up

5. Raise glass to up position, adjust upper glass stoppers so that the clearance between the top of glass and outer roof rail is 11.8 to 12.3 mm (0.465 to 0.484 in). See Figure BF-82.



BF918

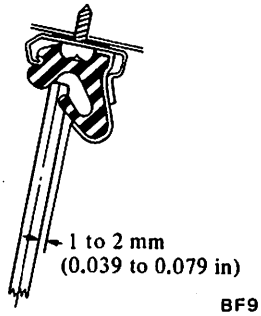
Fig. BF-82 Proper clearance between glass and outer roof rail

6. With glass up, move the top edge of glass to body side weatherstrip. Obtain a tight seal by adjusting guide rail lower adjusting bolts evenly.

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Turn lower adjusting bolts clockwise to release the top edge of glass from body side weatherstrip and counterclockwise to tighten.

7. Make certain that the clearance between the top of glass and the end of glass guide is 1.0 to 2.0 mm (0.039 to 0.079 in) just before door glass makes contact with door side weatherstrip. See Figure BF-83.



BF919

Fig. BF-83 Proper clearance between glass and glass guide

8. Raise and lower door glass to be sure the operation of regulator handle is smooth. The operating force of regulator handle should be less than 3.5 kg (7.7 lb) at the knob of regulator handle.

If proper operating force is still not obtained, adjust regulator mechanism according to the following procedures:

(1) Lubricate guide rollers, guide rails and regulator linkage.

(2) Perform outside and inside door weatherstrip-to-door glass adjustment.

(3) Adjust guide rails in parallel.



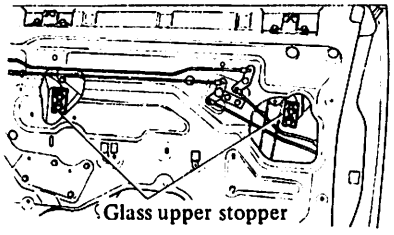
BF498

Fig. BF-84 Side view of improperly aligned guide rails

9. Make certain that the location of upper glass stoppers is aligned properly. If necessary, adjust them.

Removal and installation

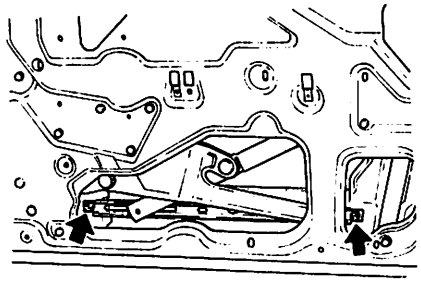
1. Lower door glass.
2. Remove arm rest, regulator handle, inside door handle escutcheon, door finisher and water seal screen.
3. Remove outside door molding.
4. Raise door glass until upper glass stoppers appear in the upper openings of inside door panel and remove upper glass stoppers. See Figure BF-85.



BF920

Fig. BF-85 Removing upper glass stopper

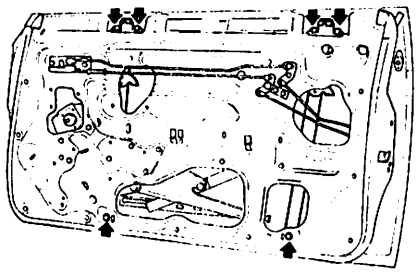
4. With glass in the full down position, support door glass and remove screws attaching glass back plate to guide channel B. See Figure BF-76.



BF921

Fig. BF-86 Removing screws attaching glass back plate to guide channel B

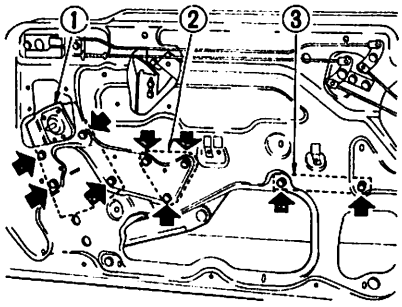
5. Raise door glass and draw it upwards.
6. Loosen bolts adjusting front and rear guide rail and remove guide rails from door. See Figure BF-87.



BF922

Fig. BF-87 Removing guide rail

7. Remove screws attaching guide channel A, regulator arm base and regulator base and then remove them through the lower opening of inside door panel. See Figure BF-88.



BF923

1 Regulator base
2 Regulator arm base
3 Guide channel A

Fig. BF-88 Removing regulator assembly

8. Install regulator assembly, guide rails, and door glass in the reverse order of removal.

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REAR DOOR (Sedan and Station Wagon)

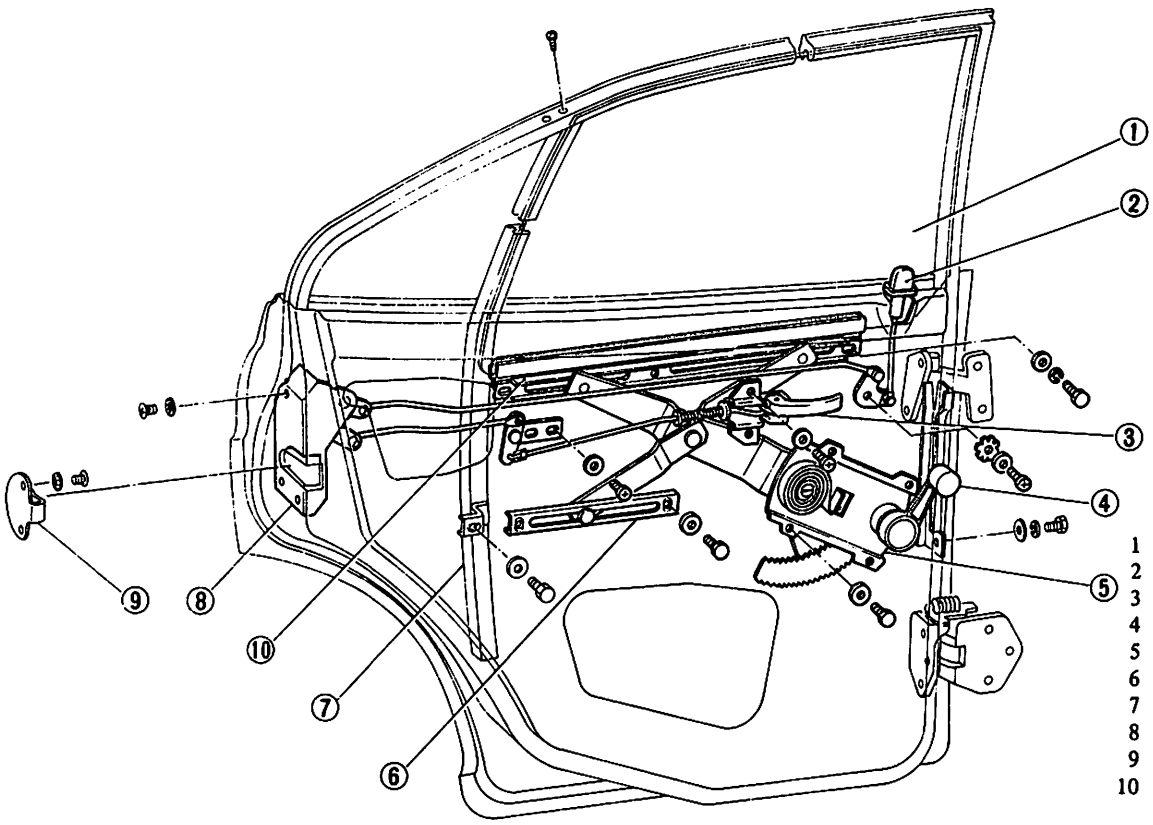


Fig. BF-89 Structural view of rear door

Adjustment

Adjust rear door window in the same manner as front door.

Refer to page BF-24 for Adjustment.

Removal and installation

1. Lower door glass.
2. Remove door lock knob and grommet.
3. Remove assist grip, regulator handle, inside handle escutcheon, ash tray, door finisher and water seal screen from door.
4. Remove outside door weatherstrip and rear sash.
5. Remove screws attaching center sash and guide channel B to glass back plate and draw door glass out of door. See Figure BF-90.

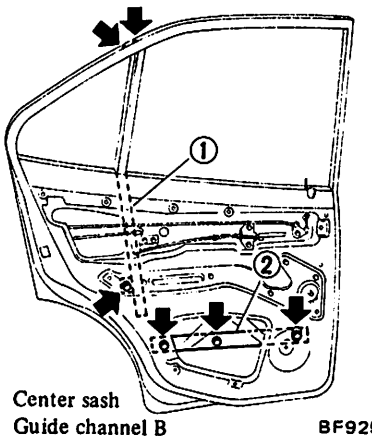


Fig. BF-90 Removing screws attaching center sash and guide channel B

6. Loosen screws attaching guide channel A and regulator base, remove regulator assembly, and draw it through the lower opening of inside door panel. See Figure BF-91.

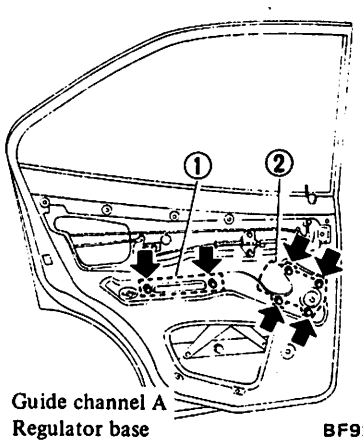
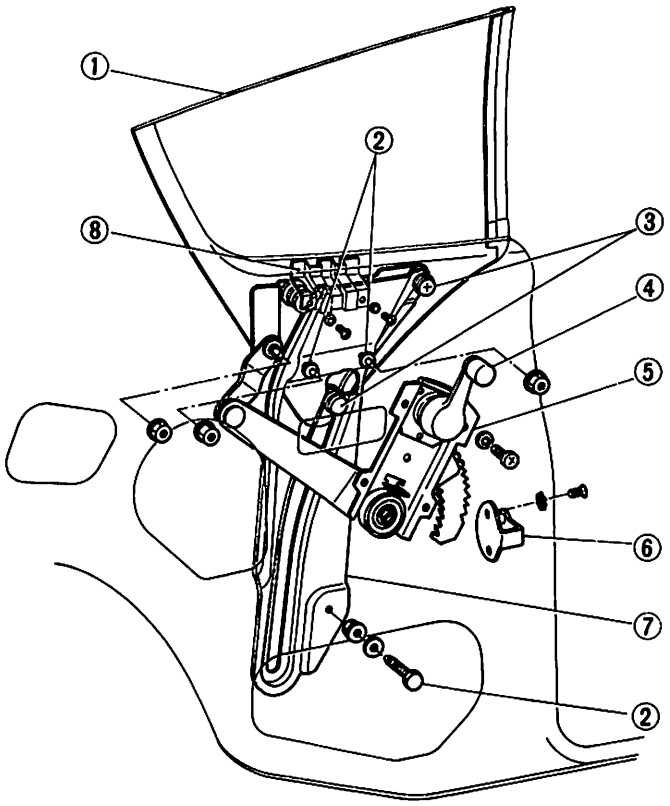


Fig. BF-91 Removing regulator assembly

7. Install door glass and regulator assembly in the reverse order of removal.

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REAR SIDE WINDOW (Hardtop)



1 Door glass
2 Adjusting bolts
3 Guide roller
4 Regulator handle
5 Regulator assembly
6 Door lock striker
7 Guide plate
8 Trim fixing bracket

BF927

Fig. BF-92 Structural view of side window and regulator

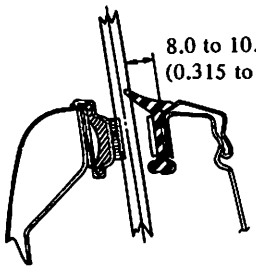
Adjustment

1. With window glass down, temporarily tighten guide plate adjusting bolts in the neutral position.

The neutral position is the center of the elongated holes.

Tighten these adjusting bolts all the way and return two bolts at the upper position five turns and one bolt at the lower position eleven turns. Secure them at that position.

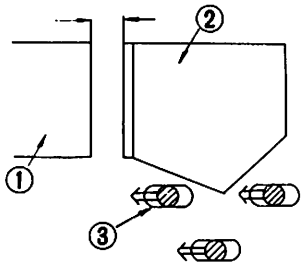
2. Adjust guide plate upper adjusting bolts to obtain 8.0 to 10.0 mm (0.315 to 0.394 in) of the clearance from rear fender to window glass outside face. See Figure BF-93.



BF462A

Fig. BF-93 Proper clearance from rear fender to window glass

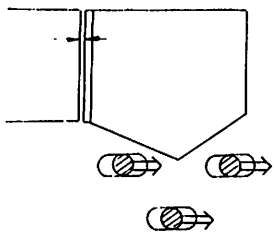
3. Close front door and raise door glass and side window glass.
4. Align side window glass with door glass and body side weatherstrip by adjusting guide plate adjusting bolts according to the procedures in Figures BF-94 through Figure BF-97.



1 Door glass
2 Side window glass
3 Guide plate adjusting bolt

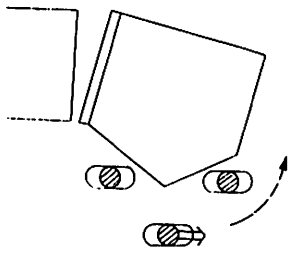
BF507

Fig. BF-94 When moving to front



BF508

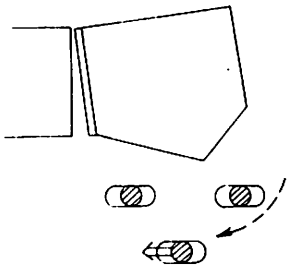
Fig. BF-95 When moving to rear



BF509

Fig. BF-96 When moving rear up

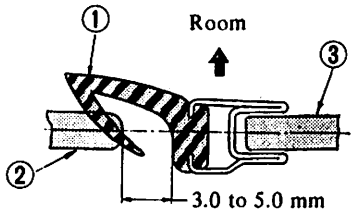
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BF510

Fig. BF-97 When moving rear down

5. With window glass up, adjust guide plate adjusting bolts so that the clearance from window glass to side window weatherstrip is 3.0 to 5.0 mm (0.118 to 0.197 in) as shown in Figure BF-98.

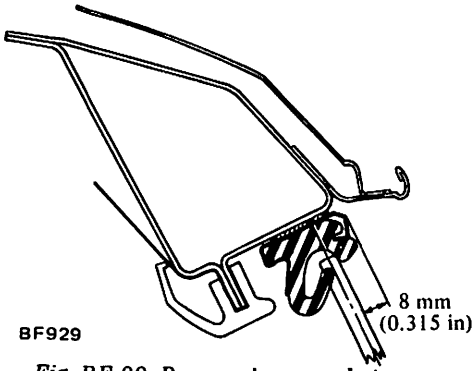


1 Weatherstrip
2 Door glass
3 Side window glass

BF511

Fig. BF-98 Proper clearance from window glass to weatherstrip

6. Align window glass with body side weatherstrip to obtain a tight seal by adjusting guide plate lower adjusting bolt. See Figure BF-99.



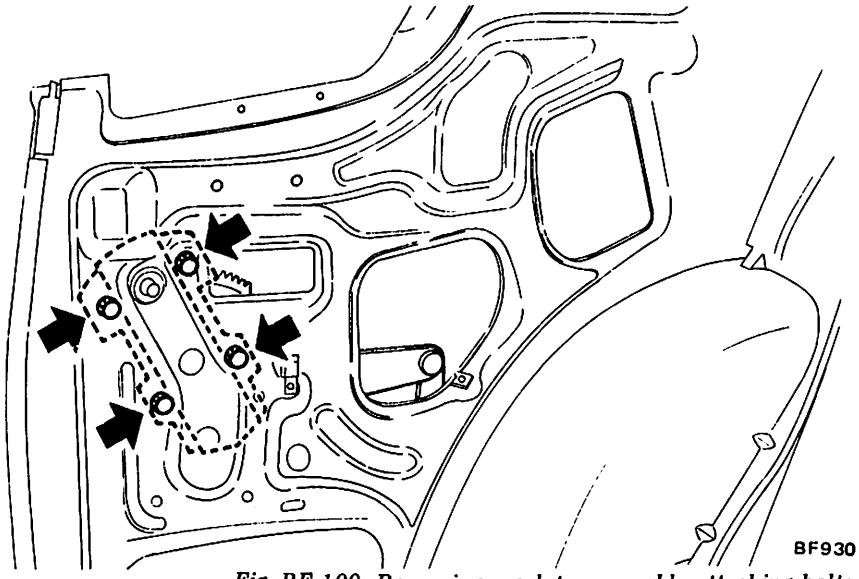
BF929

Fig. BF-99 Proper clearance between weatherstrip retainer to glass

Removal and installation

1. Remove rear seat cushion and rear seat back from body.
2. Remove lap belt (if so equipped) and kicking plate.
3. Remove rear parcel finisher and draughter finisher.
4. Lower side window glass.
5. Remove arm rest and regulator handle.
6. Remove rear side finisher and water seal screen.
7. Raise glass until regulator arm bracket appears in the upper opening of inside panel. Support glass and remove nut attaching regulator arm bracket to side window back plate.
8. Loosen lock nuts of guide plate upper and lower adjusting bolts.

   Remove adjusting bolts from guide plate.
9. Raise window glass with guide panel and remove toward passenger compartment.
10. Remove regulator base attaching screws and draw regulator assembly out through the lower opening of inside panel. See Figure BF-100.



BF930

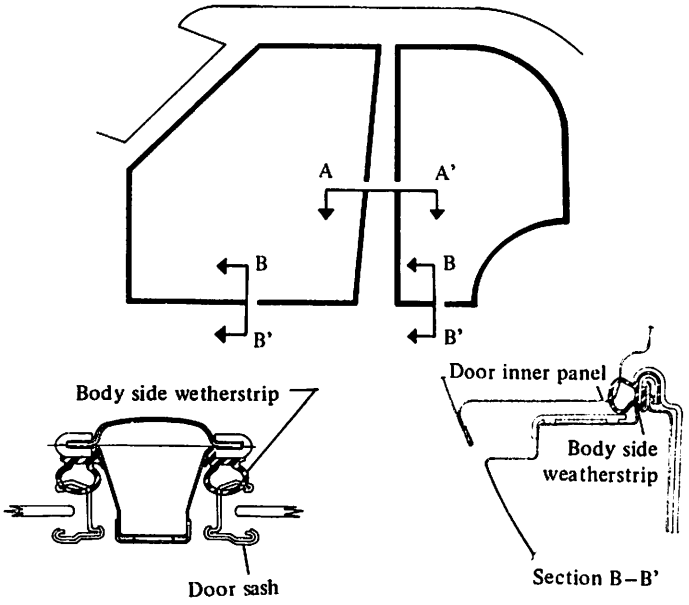
Fig. BF-100 Removing regulator assembly attaching bolts

11. Install door glass and regulator assembly in the reverse order of removal.

BODY SIDE WEATHERSTRIP

4-DOOR SEDAN AND STATION WAGON

Body side weatherstrip is attached at body side flange. See Figures BF-101, BF-102 and BF-103.



BF931

Fig. BF-101 Body side weatherstrip

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2-DOOR SEDAN

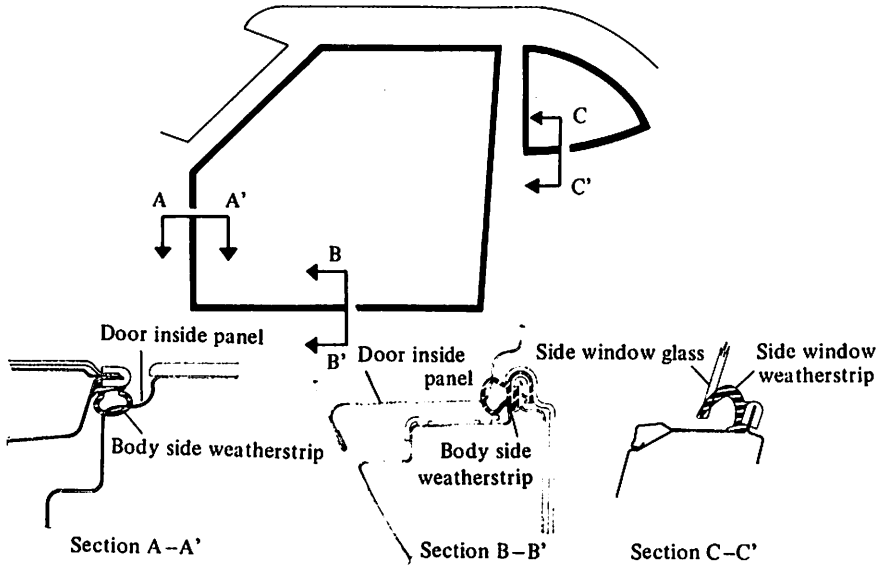


Fig. BF-102 Body side weatherstrip

HARDTOP

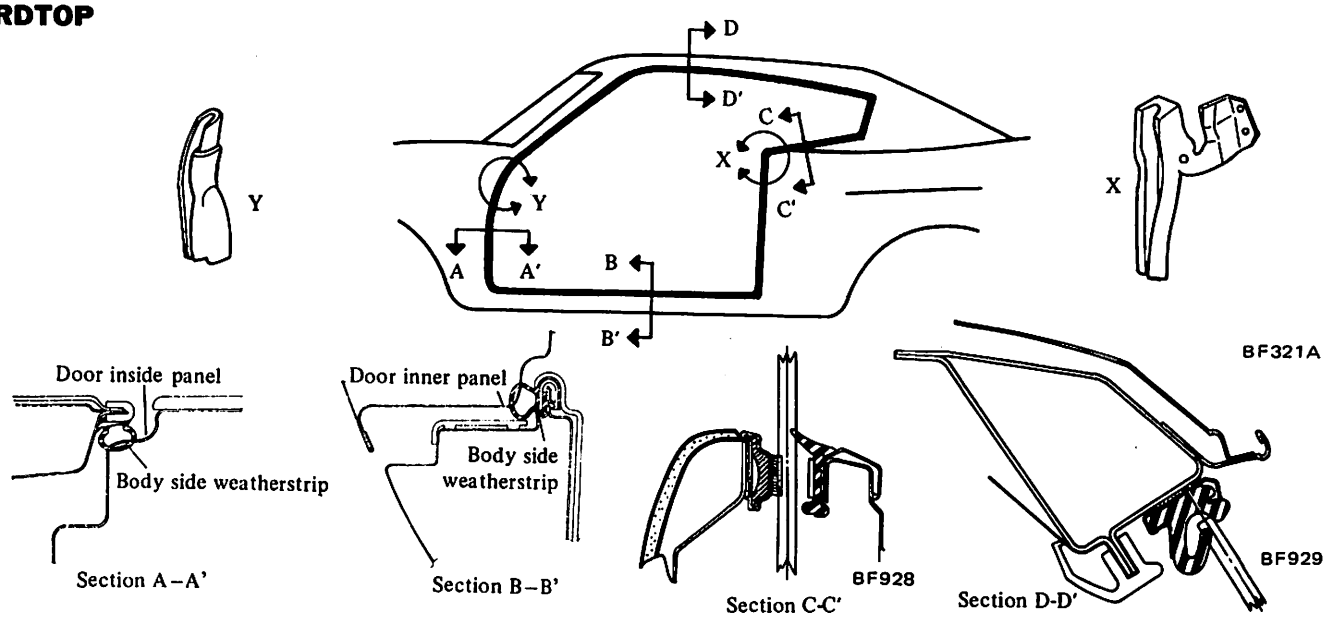


Fig. BF-103 Body side weatherstrip

Removal

1. Remove rivets retaining body side weatherstrip to front pillar and remove weatherstrip. See Figure BF-104.
2. Remove screws installing weatherstrip retainer to roof side rail. See Figure BF-105.
3. Remove weatherstrip retainer and retainer seal.

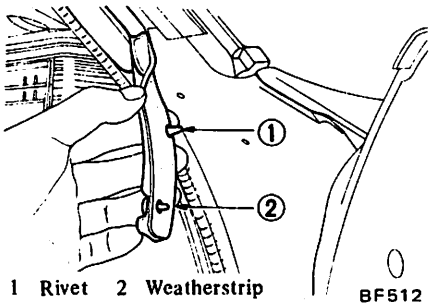


Fig. BF-104 Removing body side weatherstrip retaining rivets

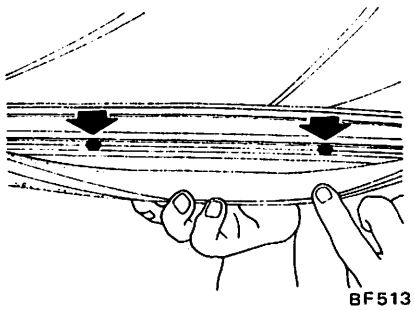


Fig. BF-105 Removing attaching screws of weatherstrip retainer

Installation

1. Temporarily attach weatherstrip retainer seal to weatherstrip retainer with adhesive.
2. Position weatherstrip retainer with retainer seal to body and tighten attaching screws.
3. Install weatherstrip to weatherstrip retainer.

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SEAT

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FRONT SEAT (Sedan and Hardtop) BF-33
REMOVAL AND INSTALLATION BF-33
REAR SEAT (Station Wagon) BF-33
REMOVAL AND INSTALLATION BF-33
REAR SEAT (Station Wagon) BF-33
REMOVAL AND INSTALLATION BF-33
SEAT SWITCH BF-34
INSPECTION BF-34

DESCRIPTION

The front seats are a separate, high back, manually-operated, reclining type.

They can be moved 80 mm (3.15 in) forward and 60 mm (2.36 in) backward, from neutral position.

The rear seat-back is a semi-high-back type. The head rest is available as an option.

On the Hardtop, urethane cushions without springs are utilized for all seats.

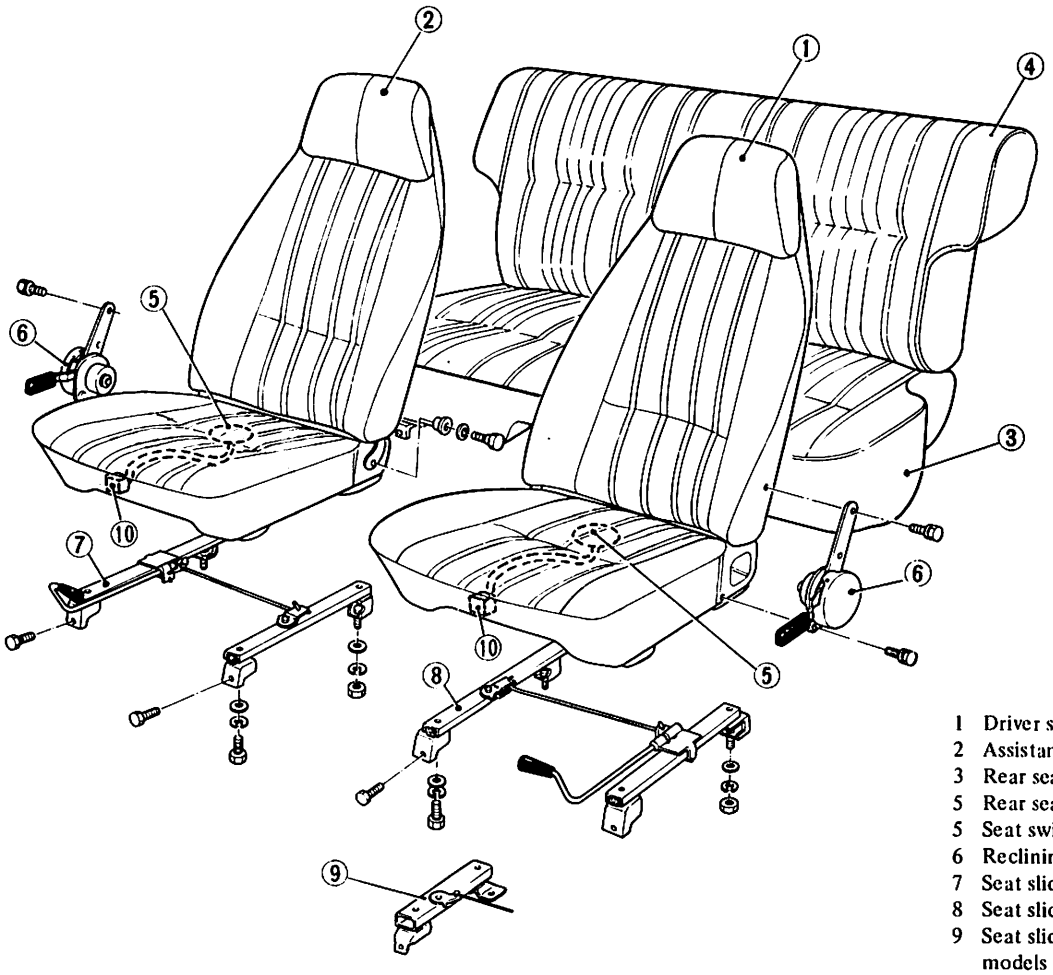
The driver and front passenger seats incorporate seat switches in them.

On the models destined for Canada, the seat switch is incorporated in the front passenger seat only.

CAUTION: In conformity with MVSS No. 302, be sure to remove the thin polyethylene covers from seat cushions, seat backs and head restraints at:

a. Pre-delivery service

b. Parts replacements



1 Driver seat assembly
2 Assistant seat assembly
3 Rear seat cushion
5 Rear seat back
5 Seat switch
6 Reclining device assembly
7 Seat slide assembly R.H.
8 Seat slide assembly L.H.
9 Seat slide for California models
10 Seat switch connector

BF463A

Fig. BF-106 Front and rear seats

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FRONT SEAT

REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Disconnect seat switch wire at connector.
3. Remove bolts attaching the front of seat bracket to floor. See Figure BF-107.

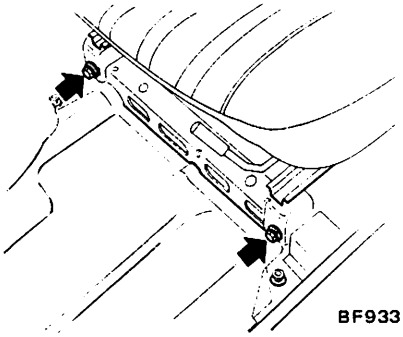


Fig. BF-107 Removing front attaching bolts of front seat bracket

4. Remove nuts attaching the rear of seat bracket to floor. See Figure BF-108.

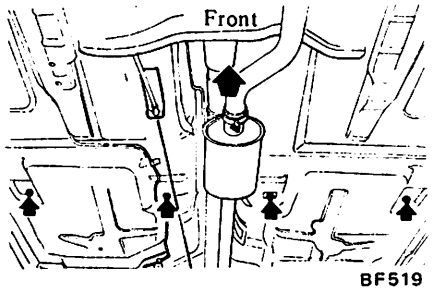


Fig. BF-108 Removing rear attaching nuts of front seat bracket

5. On California models, rear side of driver's seat can be removed from slide by removing bolts on floor.

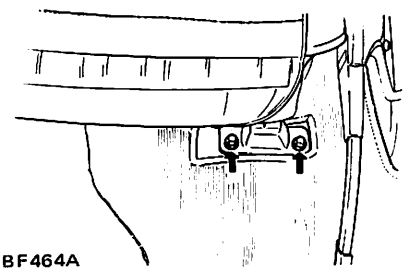


Fig. BF-109 Removing bolts from rear of driver's seat (California models)

6. Then remove front seat assembly from car.
7. Install front seat assembly in the reverse order of removal.

REAR SEAT (Sedan and Hardtop)

REMOVAL AND INSTALLATION

1. Remove screws attaching rear seat front end and remove rear seat cushion. See Figure BF-110.

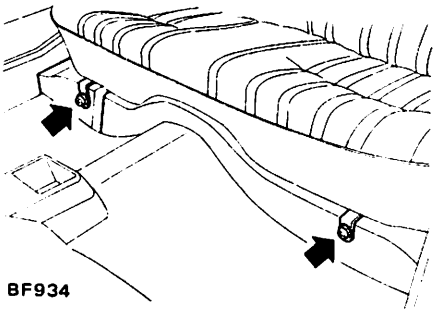


Fig. BF-110 Removing rear seat cushion

2. Remove screws attaching rear seat back and lift it up. Remove it from body. See Figure BF-111.

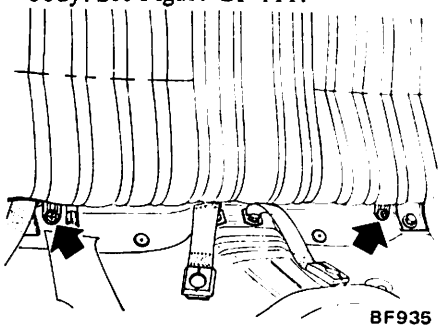


Fig. BF-111 Removing rear seat back

3. Install rear seat cushion and seat back in the reverse order of removal.

REAR SEAT (Station Wagon)

REMOVAL AND INSTALLATION

1. Tilt rear seat cushion forward, remove rear seat hinge attaching bolts, and then remove rear seat cushion.

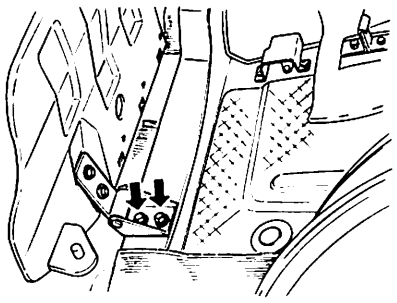


Fig. BF-112 Removing rear seat hinge attaching bolts

2. Remove rear seat back from catcher.
3. Remove rear floor carpet by loosening screws ①. See Figure BF-113.
4. Remove rear seat back by removing hinge attaching bolts ②. See Figure BF-113.

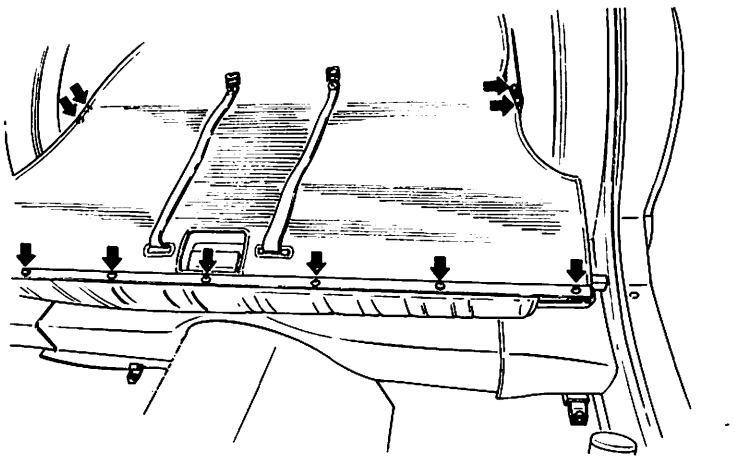


Fig. BF-113 Removing rear seat back

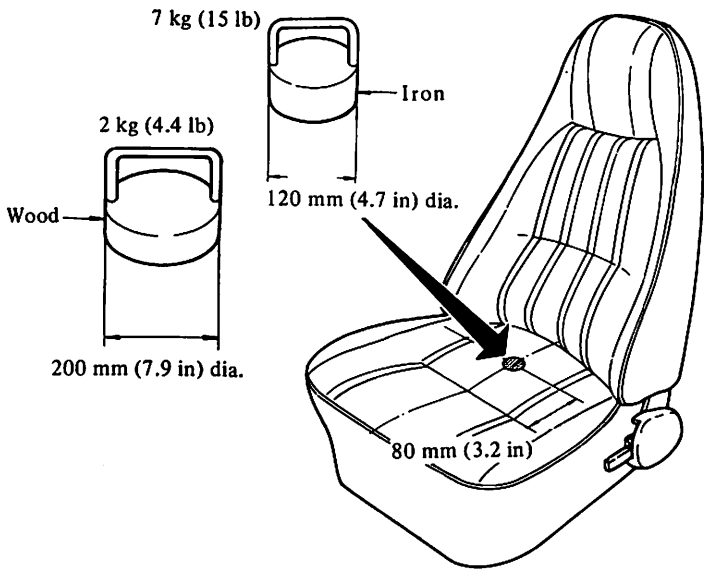
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SEAT SWITCH

INSPECTION

Seat switch should operate accurately.

1. Prior to inspecting seat switch, disconnect seat switch harness.
2. Place standard weight on the hatched position of driver or assistant seat. (Assistant seat only on the model destined for Canada)
3. Using test light to check sensor operation. The light should go on when a weight of over 7 kg (15 lb) is put on seat, and should go out when a 2 kg (4.4 lb) weight is put on.
4. Seat switch is installed on seat cushion spring. See Figure BF-114.
5. Replace seat switch assembly if necessary.



BF323A

Fig. BF-114 Weight position

SEAT BELT

CONTENTS

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INSPECTION OF BUCKLE SWITCH BF-36

DESCRIPTION

The front seat belt assembly is a three-point type and consists essentially of a shoulder belt, through anchor plate (4-door Sedan and Station Wagon), through belt (2-door Sedan and Hardtop), outer and inner lap belts. The shoulder and outer lap belts are a combine unit and can not be separated from each other.

The outer lap belt incorporates a webbing, sensitive, emergency locking retractor in it. This retractor serves to restraint the belt securely in case of emergency, as in a collision or sudden stop of the car, thus protecting the seat occupant against serious injury. Under normal condition, the belt can be freely pulled out.

The inner lap belt is a flexible wire combined with a buckle. The buckle includes a switch which is used as a seat belt warning device.

The rear seat belt is a two-point type and includes an automatic belt locking-retracting device.

Cautions

1. In conformity with MVSS No. 302, be sure to remove the thin polyethylene covers from seat belts at:

(1) Pre-delivery service
(2) Parts replacements

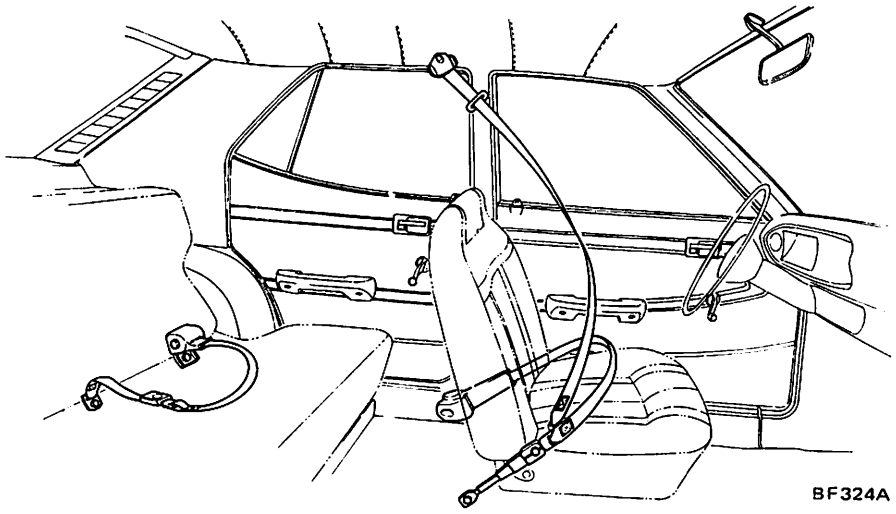
2. If the car is collided or overturned, replace the entire belt assembly, regardless of nature of accident.

3. If the condition of any component of a seat belt is questionable, do not have seat belt repaired, but replaced as a belt assembly.

4. If webbing is cut, frayed, or damaged, replace belt assembly.

5. Do not spill drinks, oil, etc. on inner lap belt buckle. Never oil tongue and buckle.

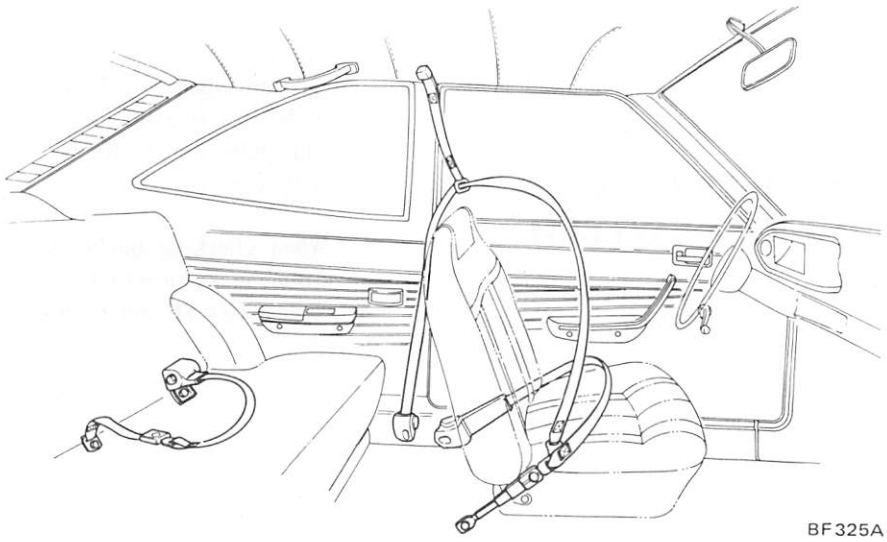
6. Use only a Nissan genuine seat belt assembly.



BF324A

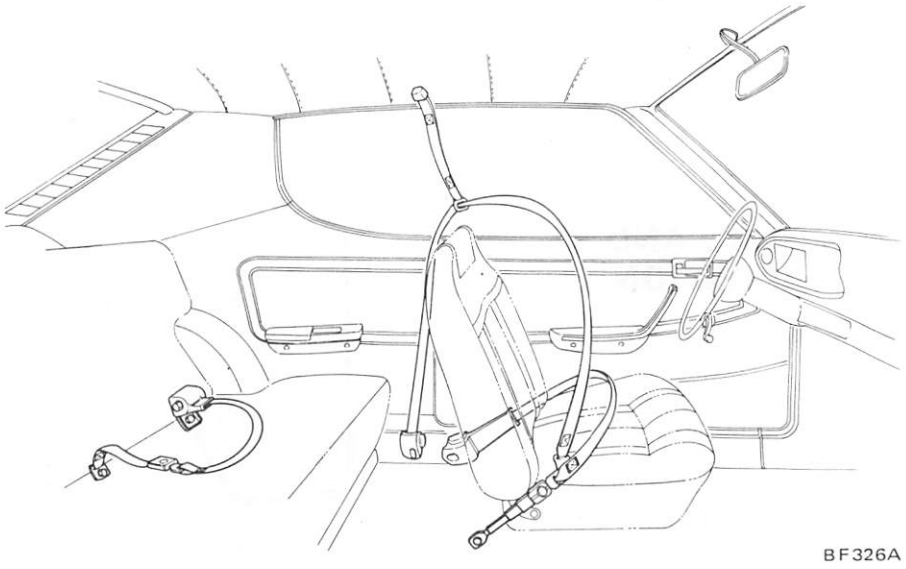
Fig. BF-115 Lap and shoulder belts for 4-door Sedan and Station Wagon

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BF325A

Fig. BF-116 Lap and shoulder belts for 2-door Sedan

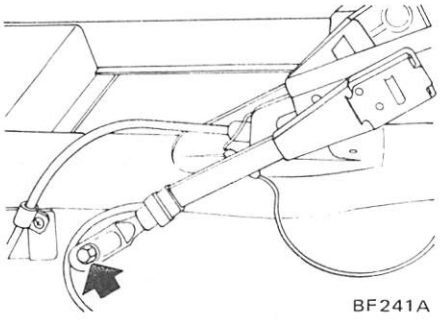


BF326A

Fig. BF-117 Lap and shoulder belts for Hardtop

REMOVAL AND INSTALLATION

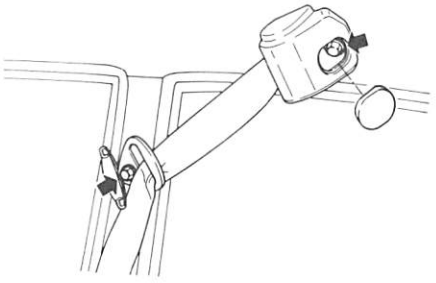
1. Disconnect battery ground cable.
2. Disconnect buckle switch harness at connector under front seat.
3. Loosen bolt attaching inner lap belt and remove lap belt. See Figure BF-118.



BF241A

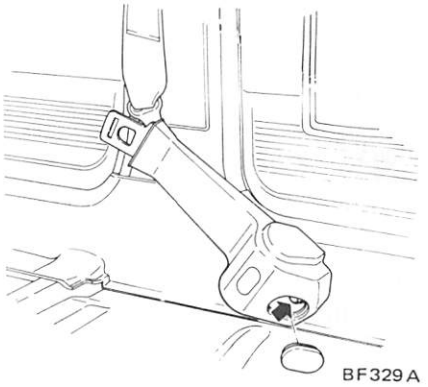
Fig. BF-118 Removing inner lap belt

4. Remove emergency locking retractor cover grommets and loosen bolts attaching shoulder belt or outer lap belt, remove through anchor bolt, and then remove shoulder and outer lap belt assembly. See Figures BF-119 through BF-123.



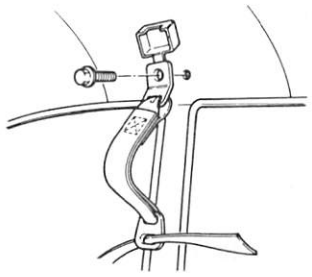
BF328A

Fig. BF-119 Removing shoulder belt for 4-door Sedan



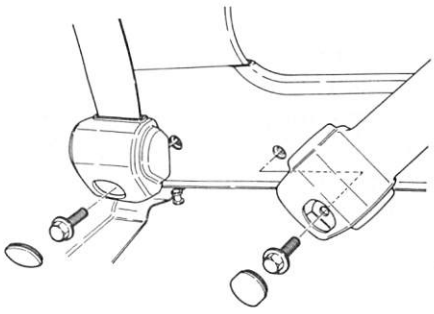
BF329A

Fig. BF-120 Removing outer lap belt for Sedan



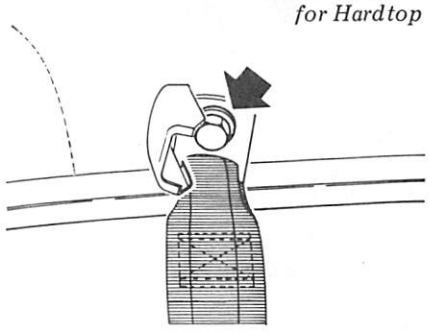
BF330A

Fig. BF-121 Removing shoulder and through belts for 2-door Sedan



BF331A

Fig. BF-122 Removing outer and shoulder lap belts for Hardtop



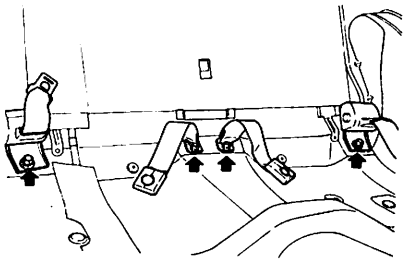
BF332A

Fig. BF-123 Removing through belt for Hardtop

5. Removing rear seat belts.

Remove seat cushion and seat back. Then loosen bolts attaching rear seat belts and remove rear seat belts. See Figure BF-124.

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BF333A

Fig. BF-124 Removing rear seat belt

6. Install front and rear seat belts in the reverse order of removal.

Observe the following:

Note: Install inner lap belt in such a way that it is routed midway between seat cushion and seat back.

INSPECTION OF BUCKLE SWITCH

The contacts of buckle switch is normally closed. When tongue latches buckle, the tip end of tongue pushed push rod to open the switch contacts.

1. Disconnect battery ground cable.
2. Disconnect buckle switch wire harness.
3. Check buckle switch for proper operation, using a test light. The light should go out when tongue of outer lap belt latches buckle, and go on when it unlatches buckle. Replace belt assembly if necessary.

Note: When checking buckle switch operation, make sure that power is held below 16 volts and 13 mA.

WINDSHIELD GLASS

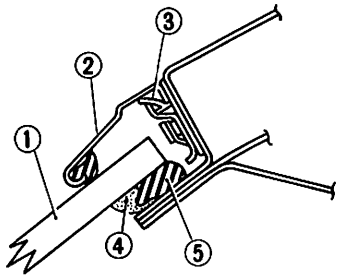
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REMOVAL BF-36
INSTALLATION BF-37
REPAIRING LEAKS BF-39

DESCRIPTION

A pre-mixed, one-part sealant to cement windshield glass to window opening is available.

After using this sealant, it is highly recommended that the car remain stationary for about 24 hours so that the sealant can cure well.



1 Windshield glass
2 Windshield molding
3 Fastener
4 Dam
5 Sealant

BF481A

Fig. BF-125 Sectional view of front adhesive caulked windshield glass

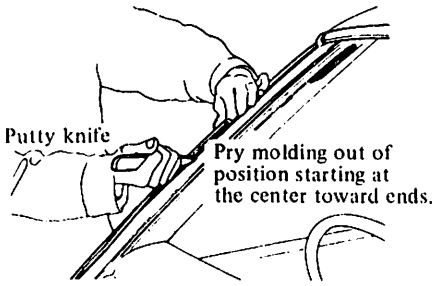
Notes:

a. Do not use sealant if it is more than six-months old.
b. Open cartridge only at the time of use.
c. Keep primer and sealant in a cool, dry place. Ideally, the sealant should be stored in a refrigerator.
d. Keep heat or open flames away as primer is flammable.

REMOVAL AND INSTALLATION

REMOVAL

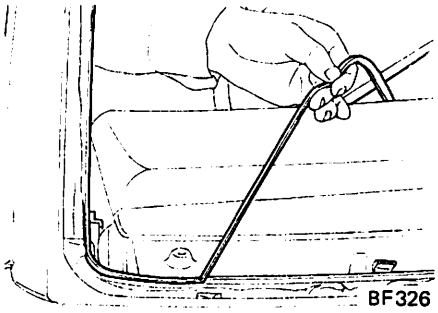
1. Protect hood, front fenders, instrument panel and front seats with covers.
2. Remove windshield wipers, front pillar garnish, instrument garnish and welt (Front windshield glass). Remove rear corner finisher, rear parcel shelf finish and welt (Rear window glass).
3. Using a putty knife or similar tool, pry moldings out of position, starting at center and moving toward the ends. See Figure BF-126.



BF954

Fig. BF-126 Removing molding

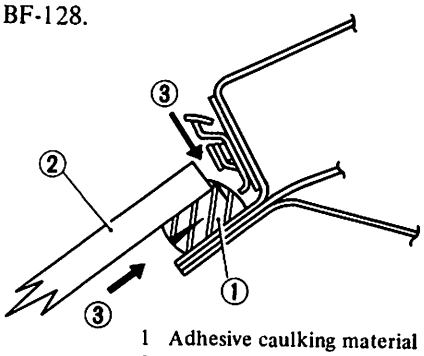
4. Reaching from inside car, strip dam from around window glass. See Figure BF-127.



BF326

Fig. BF-127 Stripping dam

5. With aid of sharp cutting knife, cut off caulking material along edge of entire window opening. See Figure BF-128.



1 Adhesive caulking material
2 Glass
3 Cut by knife

BF467A

Fig. BF-128 Cutting off adhesive caulking

6. The following procedure may also be used in removing rear windshield.
(1) Using a knife, cut through part of caulking material.
(2) Secure one end of steel music

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wire [0.5 mm (0.020 in) diameter] to a piece of wood that can serve as a handle.

Using long nose pliers, insert other end of wire through caulking material at edge of glass; then, secure that end of wire to another wood handle.

(3) With the aid of an assistant, carefully cut (pull wire) through caulking material around entire perimeter of window using a sawing motion. See Figure BF-129.

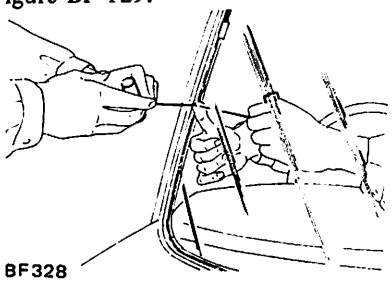


Fig. BF-129 Cutting sealant

7. From inside car, push glass up and out of window opening.

8. Using a razor blade or sharp scraper, remove caulking material along entire edge of window opening, leaving it about 1 to 2 mm (0.039 to 0.079 in) thick.

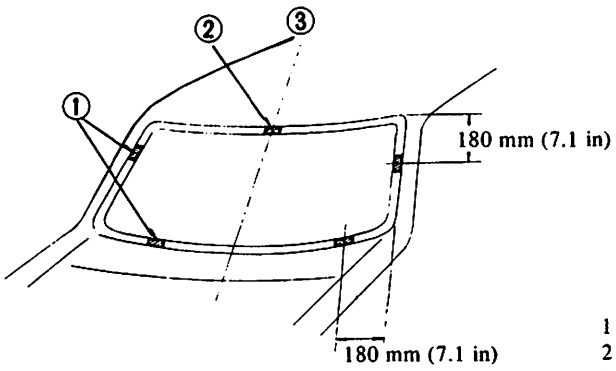
INSTALLATION

1. Check for missing molding retainers.

2. Clean body side contacting face with suitable cleaning solvent.

Note: Do not allow oil, grease or water to get on clean surfaces through dirty hands or fouled tools.

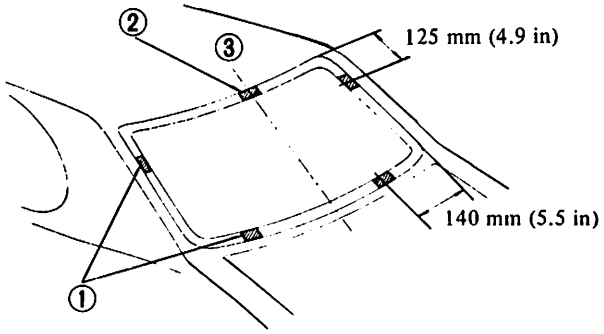
3. Install four spacers on front window opening and four on rear. See Figures BF-130, BF-131 and BF-132.



1 Spacer A
2 Spacer B
3 Body center line

BF528

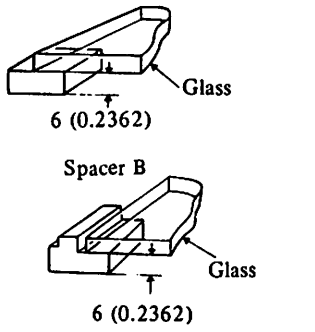
Fig. BF-130 Location of spacers (Front)



1 Spacer A
2 Spacer B
3 Body center line

BF529

Fig. BF-131 Location of spacers (Rear)

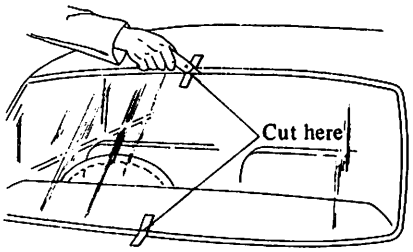


BF530

Fig. BF-132 Installing glass on spacer

4. There are two water drain holes in bottom edge of body opening. In applying caulking material, use care not to plug these two holes.

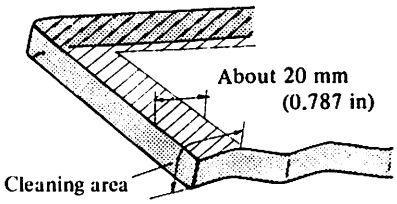
5. To set glass in proper position in window opening, paste two pieces of masking tape at the center top and bottom of glass and panel for alignment. See Figure BF-133.



BF331

Fig. BF-133 Aligning glass in window opening

6. Clean glass surface where the sealant will be applied and dam with non-lead gasoline as shown in Figure BF-134.

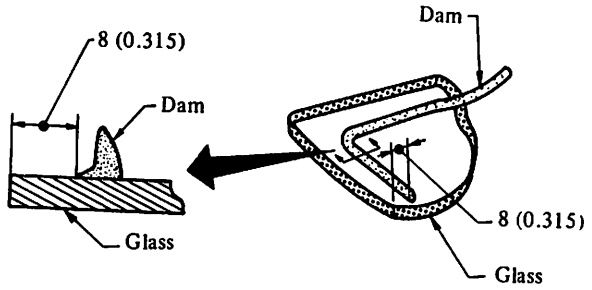


BF531

Fig. BF-134 Cleaning area of glass

7. Install dam to inside of windshield glass 8 mm (0.315 in) inboard from edge of glass and cut off excess amount at its ends. See Figure BF-135.

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Unit: mm (in)

BF955

Fig. BF-135 Installing dam

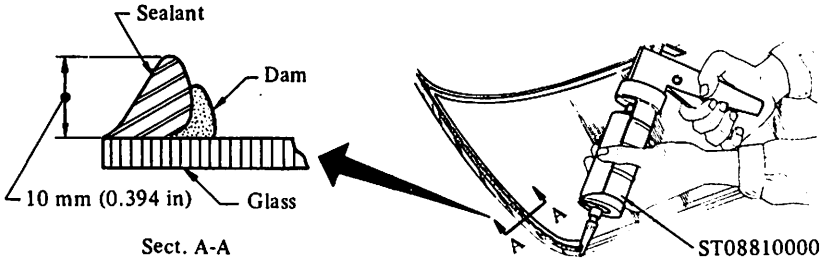
8. With the sponge furnished with the primer, apply a light coat of primer to original caulking material left on window opening flanges.

Notes:

a. It is not necessary to apply primer to old sealant when replacing glass that has at one time been repaired with silicone sealant.
Identification of old adhesive material can be accomplished as follows:
1) Cut a small piece of excess sealant from glass or window opening flanges.
2) Stick small piece of sealant on the end of knife or the like, and hold it over flame from match or lighter until it ignites.
(1) Polysulfide burns with a clear flame with a very small amount of white smoke or no smoke and its odor is very objectionable (heavy sulfur dioxide).
(2) Silicone glows with little or no flame and emits white smoke and very little odor.
Burnt residue is white ash.

b. Allow primer to dry for 10 to 15 minutes before proceeding to the next step.

9. Insert cartridge in Caulking Hand Gun ST08810000 and place smooth, continuous bead on glass 10 mm (0.394 in) above glass surfaces. See Figure BF-136.

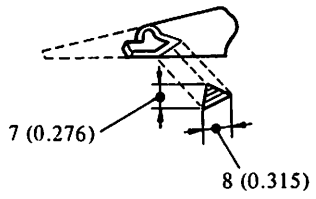


BF956

Fig. BF-136 Applying adhesive caulking

Notes:

a. Cut off nozzle end of cartridge as shown in Figure BF-137.



Unit: mm (in)

BF957

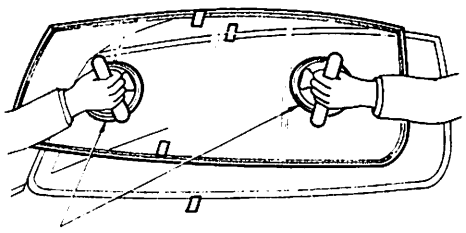
Fig. BF-137 Cutting nozzle of cartridge

Pierce sealing film with needle; install cartridge in hand gun.

b. Sealant starts to harden 15 minutes after it is applied; therefore, window glass should be installed in glass opening in body within 15 minutes of applying sealant.

10. Support windshield glass with Sucker ST08800000.

11. Position windshield glass in opening and align the masking tape previously applied to make sure that glass is properly placed on spacers located at the glass opening flange. See Figure BF-138.



BF334

Fig. BF-138 Installing glass

12. Apply pressure on glass to aid in seating on plate.

13. Wipe excess caulking material off T studs, edges of glass, and body.

14. Remove protective covers.

15. Water test immediately using a cold water spray.

Do not direct stream of water at fresh adhesive material. Allow water to spill over edges of glass. If leaks are encountered, use Caulking Hand Gun to work in additional caulking material at leak point.

16. Install all previously removed parts.

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Notes:

a. After installing, attach caution label to glass surface.



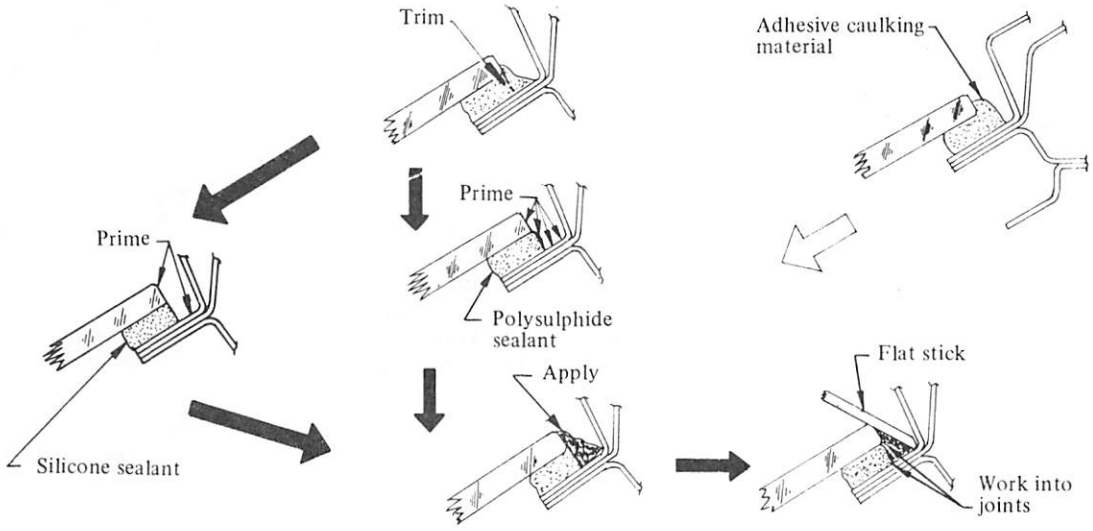
Fig. BF-139 Caution label

Be sure that it does not obstruct visibility. The label, noting the fact that sealing will be impaired if door is opened or closed with window closed before sealant has dried, will be furnished with the kit.

b. Advise the user of the fact that car should not be driven on rough roads or surfaces until sealant has properly vulcanized.

REPAIRING LEAKS

Leaks can be repaired without removing and re-installing glass in the following manner:



BF958

Fig. BF-140 Adhesive caulked glass leak correction

Note: Do not apply primer to old silicone sealant.

1. To stop leaks, first remove moldings in area of leak. It may be necessary to remove garnish molding or finishing lace to isolate the cause of trouble.
2. Mark location of leak.

Note: If water is leaking between caulking material and body or between glass and caulking material, determine the extent of leak by pushing the glass outwards.
Apply water to leak area while pushing on the glass.
Mark the extent of leak point.

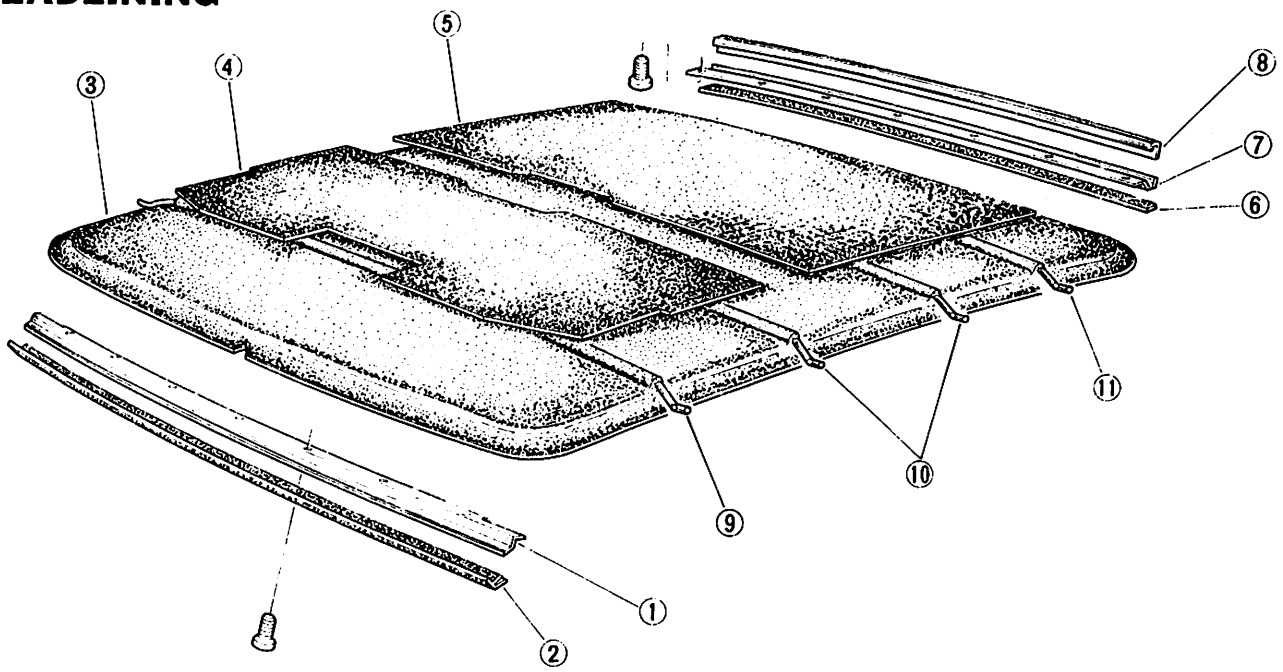
INTERIOR TRIM

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CENTER CONSOLE BF-43
REMOVAL AND INSTALLATION BF-43

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HEADLINING



1	Front welt retainer	7	Rear headlining retainer
2	Welt	8	Rear headlining belt
3	Headlining cloth	9	Listing wire No.1
4	Front roof insulator	10	Listing wire No.2
5	Rear roof insulator	11	Listing wire No.3
6	Rear headlining pad		

BF940

Fig. BF-141 Headlining

REMOVAL

1. Loosen inside back mirror bracket attaching screws and then remove inside back mirror.
2. Loosen sun visor bracket attaching screws and remove sun visor.
3. Remove room lamp lens, remove room lamp base plate attaching screws and then remove room lamp assembly from roof.
4. Pry assist grip caps open, remove assist grip attaching screws and remove assist grip.
5. Remove body side welts from door openings.
6. Remove front pillar garnishes.
7. Remove center pillar garnishes.
8. Remove rear corner garnishes.
9. Remove windshield upper welt from welt retainer.
10. Remove back window upper welt from welt retainer.
11. Remove the ends of headlining cloth from roof rails and front and rear welt retainer.
12. Remove headlining listing wires from roof rails and remove front listing wire from wire hooks.

INSTALLATION

1. Remove headlining listing wires from old headlining and install them in the same relative positions of new headlining.
2. Position headlining in car and retain front listing wire to wire hooks.
3. Starting at front window area, apply trim cement to front retainer and attach headlining ends to these positions.
4. Apply trim cement to roof side rail flanges, back window welt retainer and pillar upper areas.
5. Working from front to rear, stretch and cement headlining to flanges, retainer and pillar upper areas.

Note: Wrinkles can be removed by prying lining area along listing wire.

6. Install the inside fittings in position.

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OTHER INTERIOR TRIM

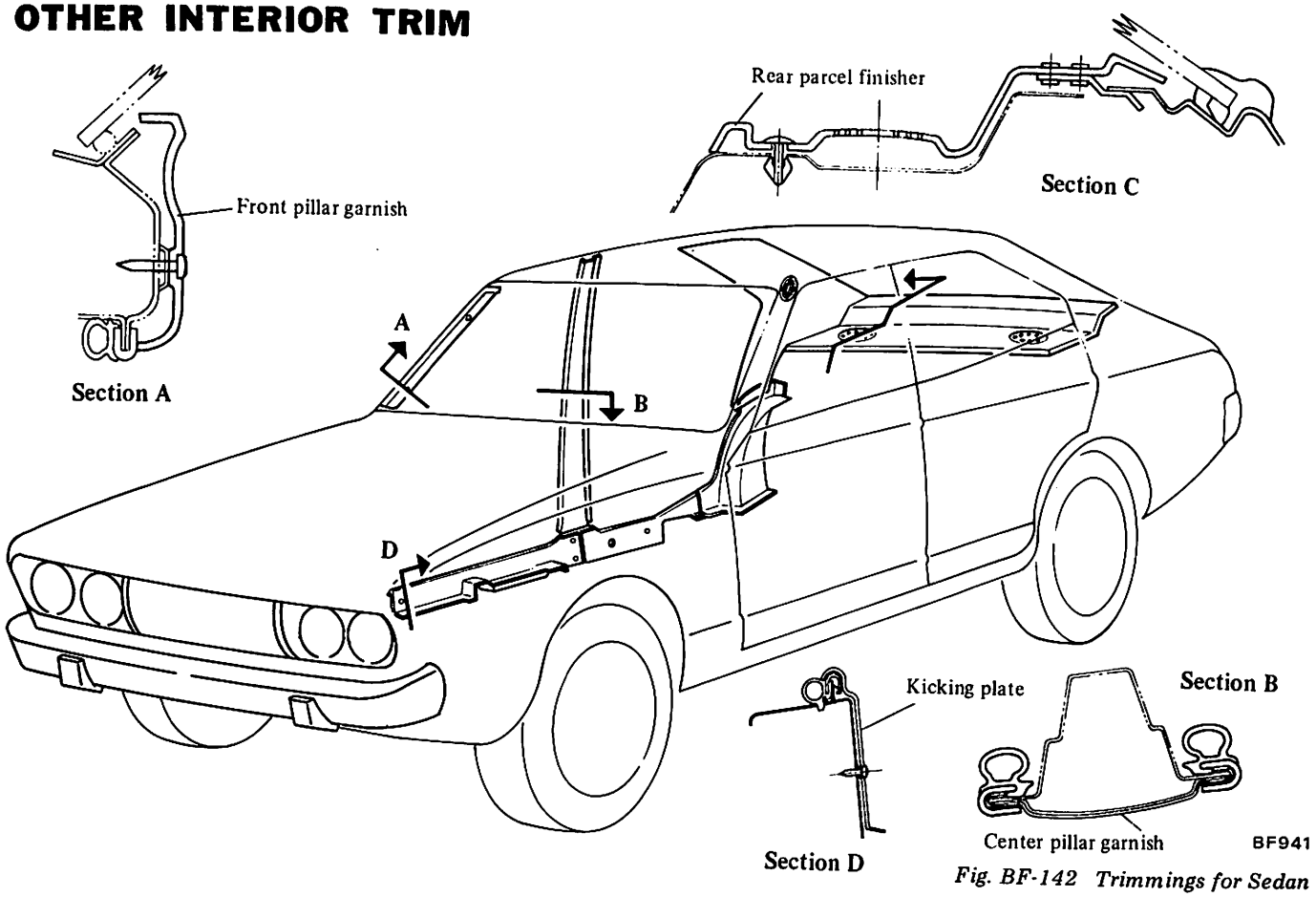


Fig. BF-142 Trimmings for Sedan

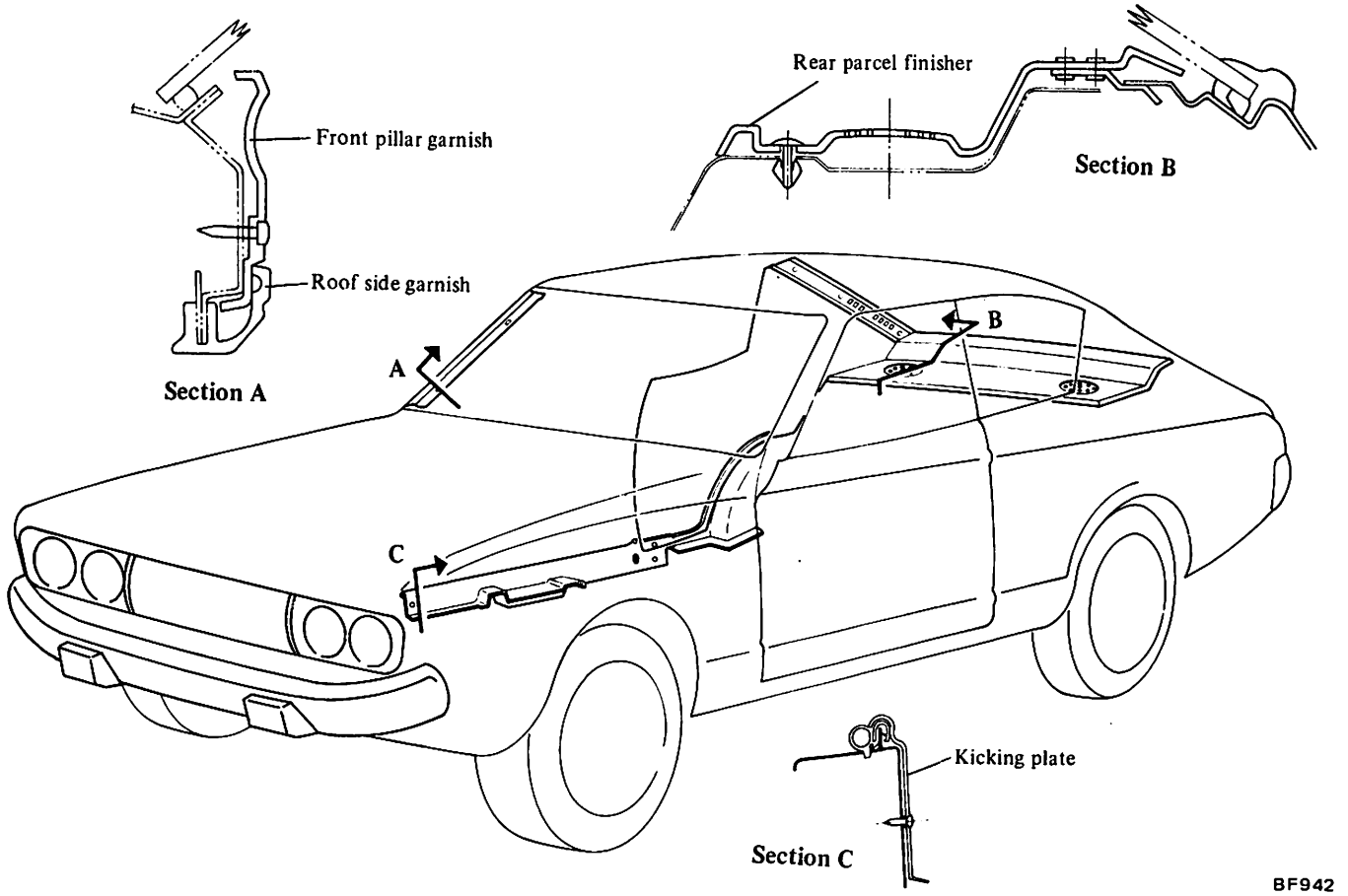
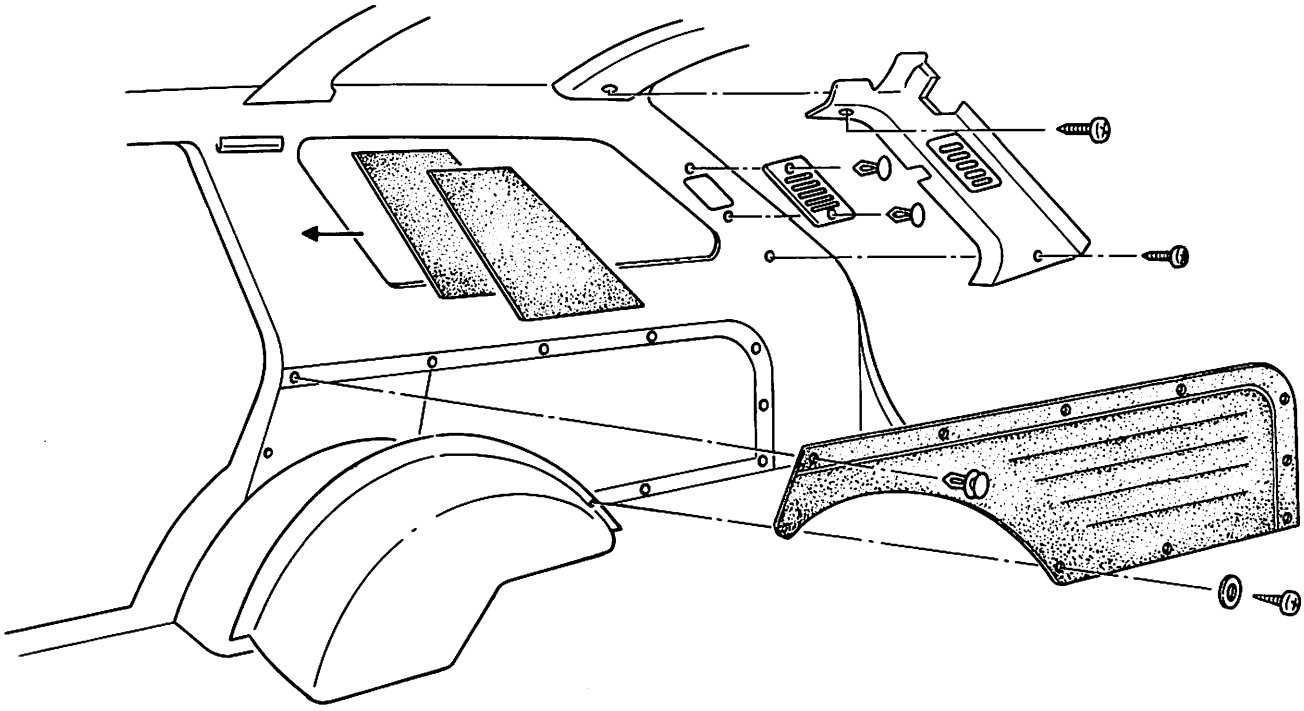


Fig. BF-143 Trimming for Hardtop

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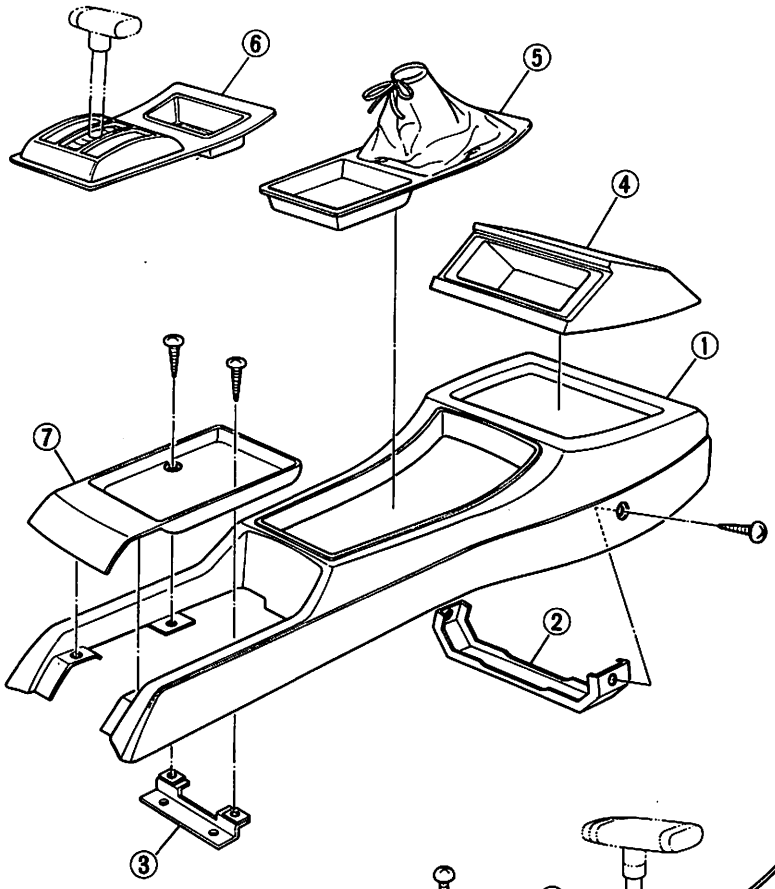


BF468A

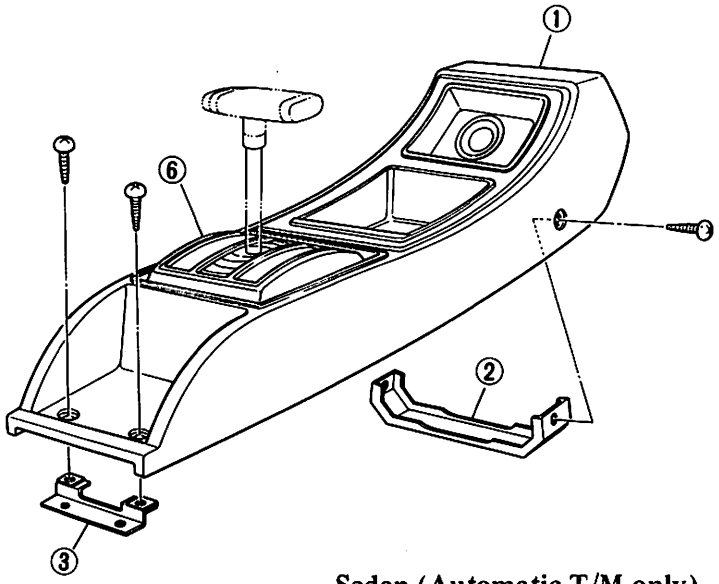
Fig. BF-144 Trimming for Station Wagon rear body

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CENTER CONSOLE



Hardtop



Sedan (Automatic T/M only)

1 Center console box assembly
2 Front bracket
3 Rear bracket
4 Front console box
5 Center finisher (Manual T/M)
6 Center finisher (Automatic T/M)
7 Rear mask

BF334A

Fig. BF-145 Center console

REMOVAL AND INSTALLATION

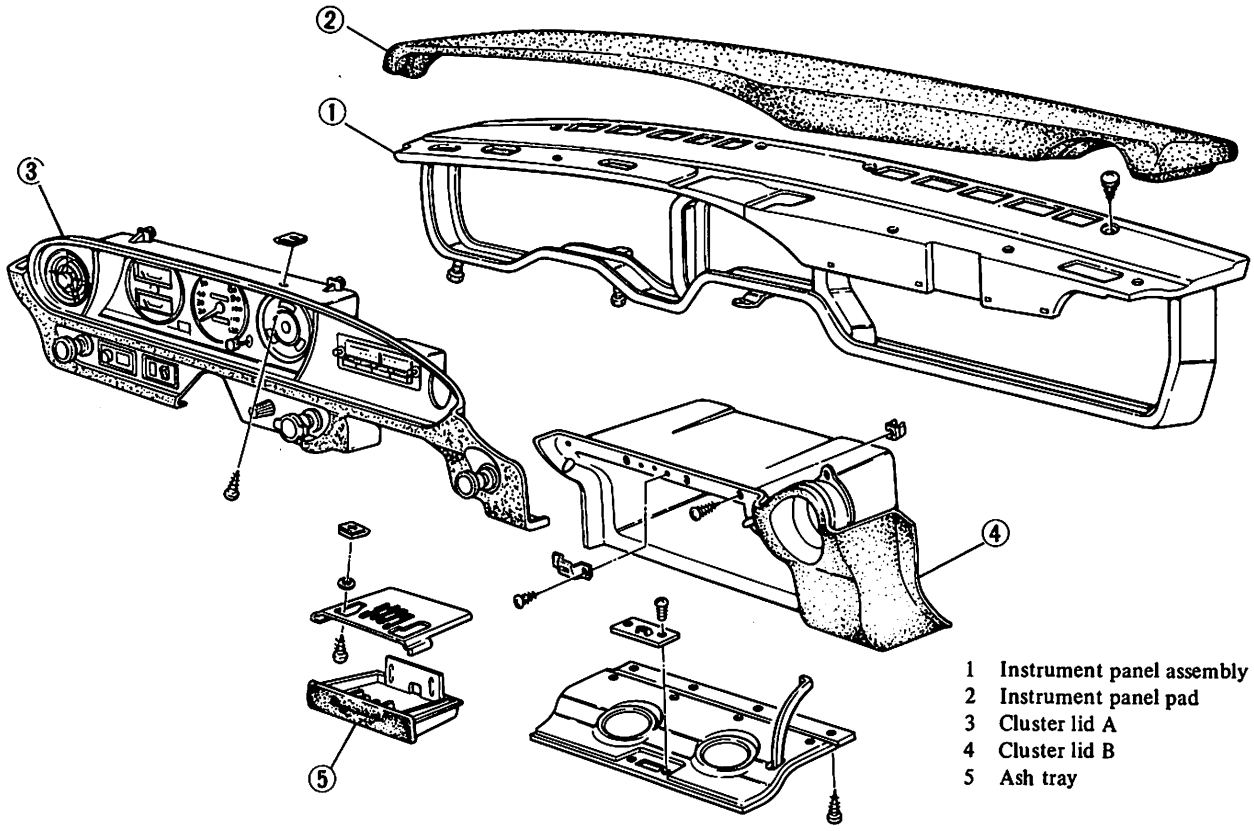
1. Remove center console attaching screws as shown in Figure BF-131.
2. Remove center console from floor.
3. Install center console in the reverse order of removal.

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INSTRUMENT PANEL

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CLUSTER LID B BF-45



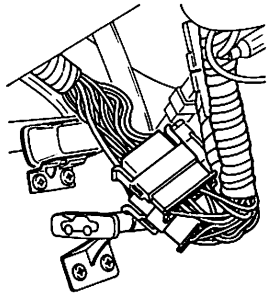
BF335A

Fig. BF-146 Structural view of instrument panel

REMOVAL AND INSTALLATION

INSTRUMENT PANEL ASSEMBLY

1. To remove instrument panel as a unit, disconnect battery ground cable.
2. Remove horn pad, steering wheel and shell covers.
3. Disconnect speedometer cable behind speedometer.
4. Remove radio antenna cable if equipped.
5. Disconnect body and instrument harness at a connector. See Figure BF-133.



BF336A

Fig. BF-147 Disconnect instrument harness connector

6. Loosen instrument panel upper attaching screws with a suitable screwdriver as shown in Figure BF-134.

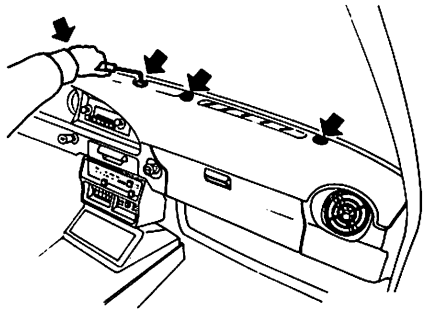
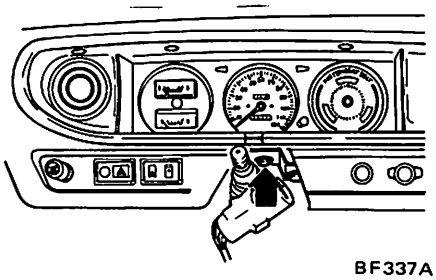


Fig. BF-148 Removing instrument panel upper attaching screws

7. Remove bolts attaching steering column clamp to pedal bracket and bolts attaching steering tube jacket to

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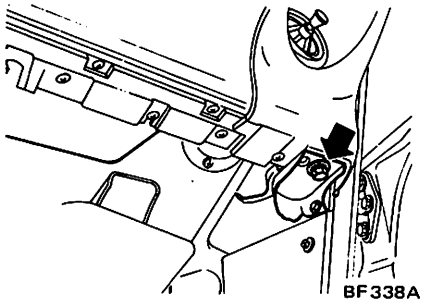
dash panel, and then remove bolt attaching instrument panel to pedal bracket as shown in Figure BF-148.



BF337A

Fig. BF-149 Removing instrument panel center attaching bolt

8. Remove each bolt fastening sides of instrument panel and draw instrument panel assembly out backwards.



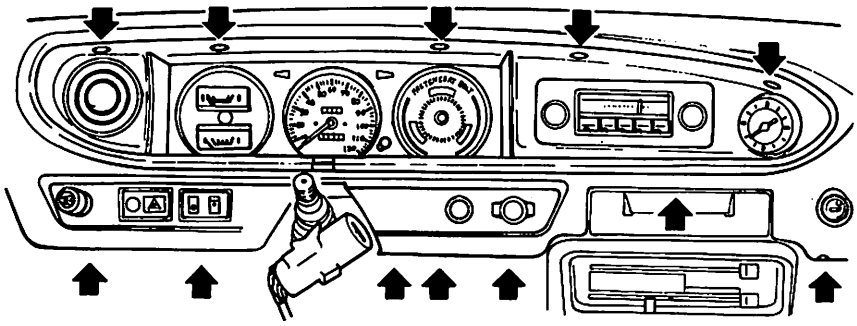
BF338A

Fig. BF-150 Removing instrument panel side attaching bolts

9. Install instrument panel assembly in the reverse order of removal.

CLUSTER LID A

1. Remove horn bar, steering wheel and shell covers.
2. Disconnect speedometer cable behind speedometer.
3. Remove cluster lid C.
4. Loosen screws attaching cluster lid A and draw cluster lid A out backwards. See Figure BF-151.



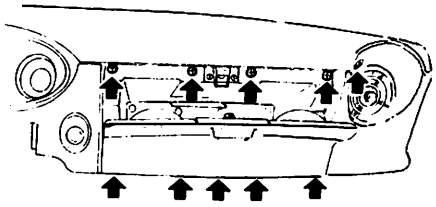
BF339A

Fig. BF-151 Removing cluster lid A attaching screws

5. Disconnect relative wire harness from back side of meter.
6. Install cluster lid A in the reverse order of removal.

CLUSTER LID B

1. Remove package tray.
2. With glove box lid open, loosen screws attaching cluster lid B and remove it. See Figure BF-152.



BF340A

Fig. BF-152 Removing cluster lid B

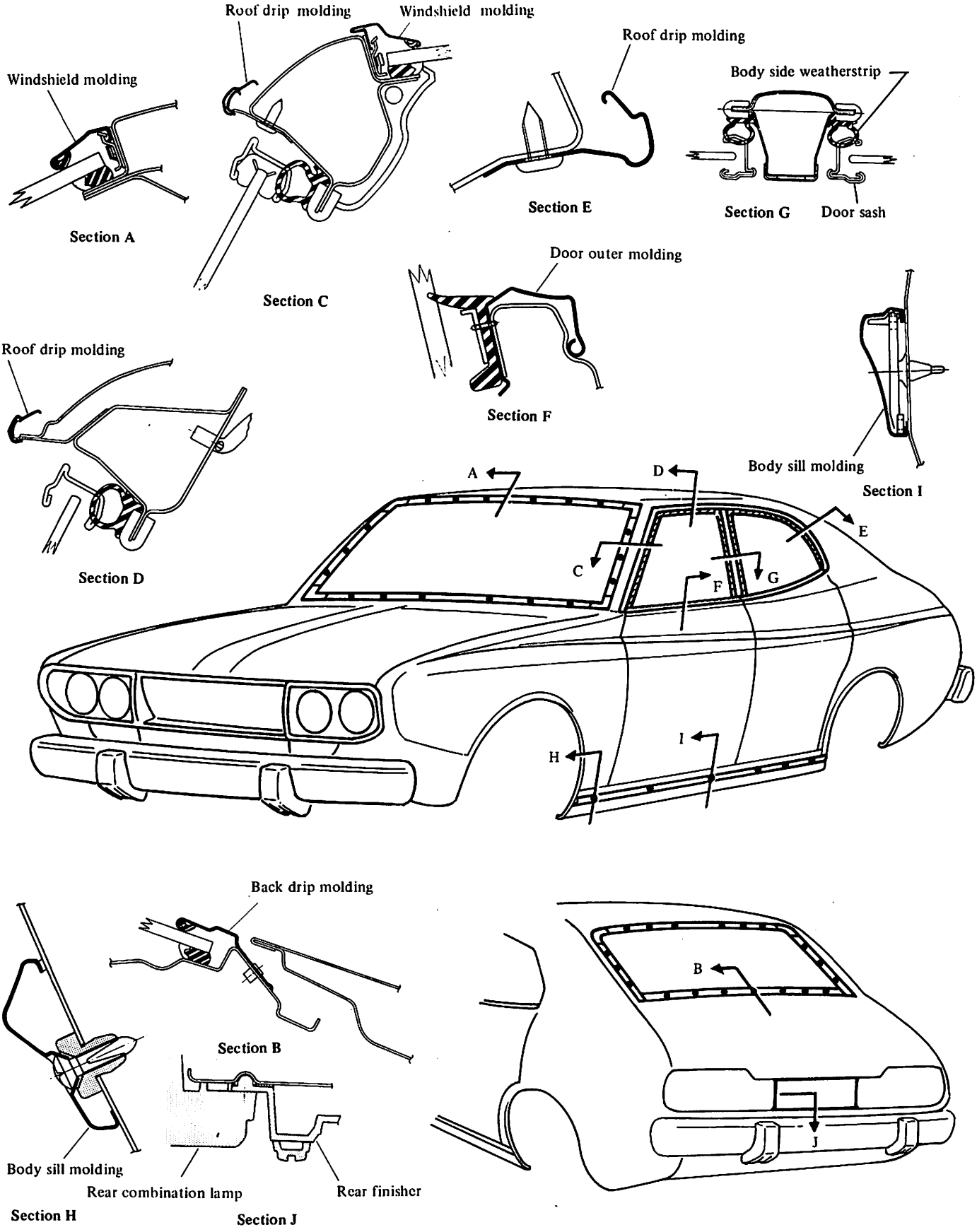
3. Install cluster lid B in the reverse order of removal.

MOLDINGS

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REAR WINDOW MOLDING BF-48
REMOVAL AND INSTALLATION BF-48

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BF469A

Fig. BF-153 Moldings for Sedan

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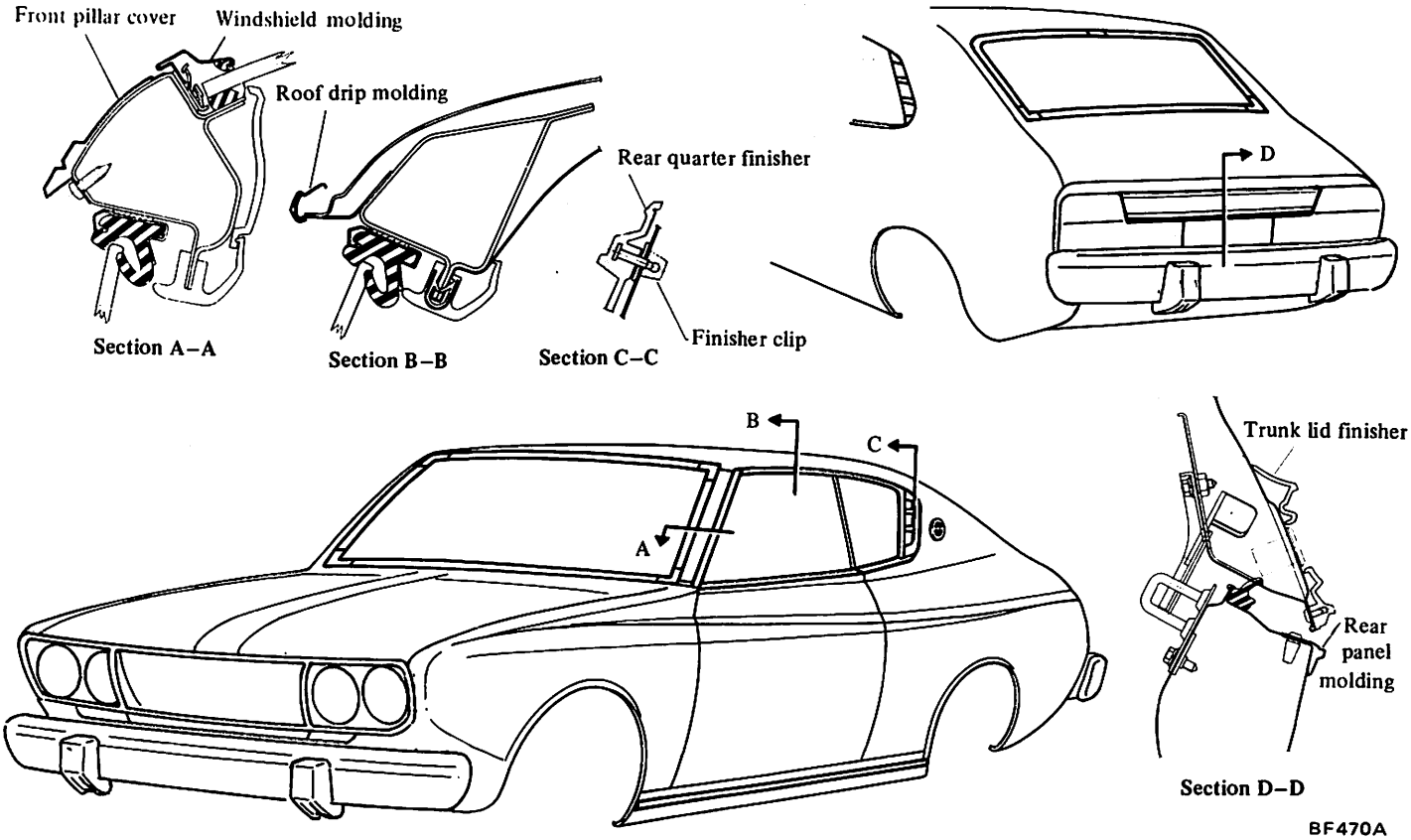


Fig. BF-154 Moldings for Hardtop

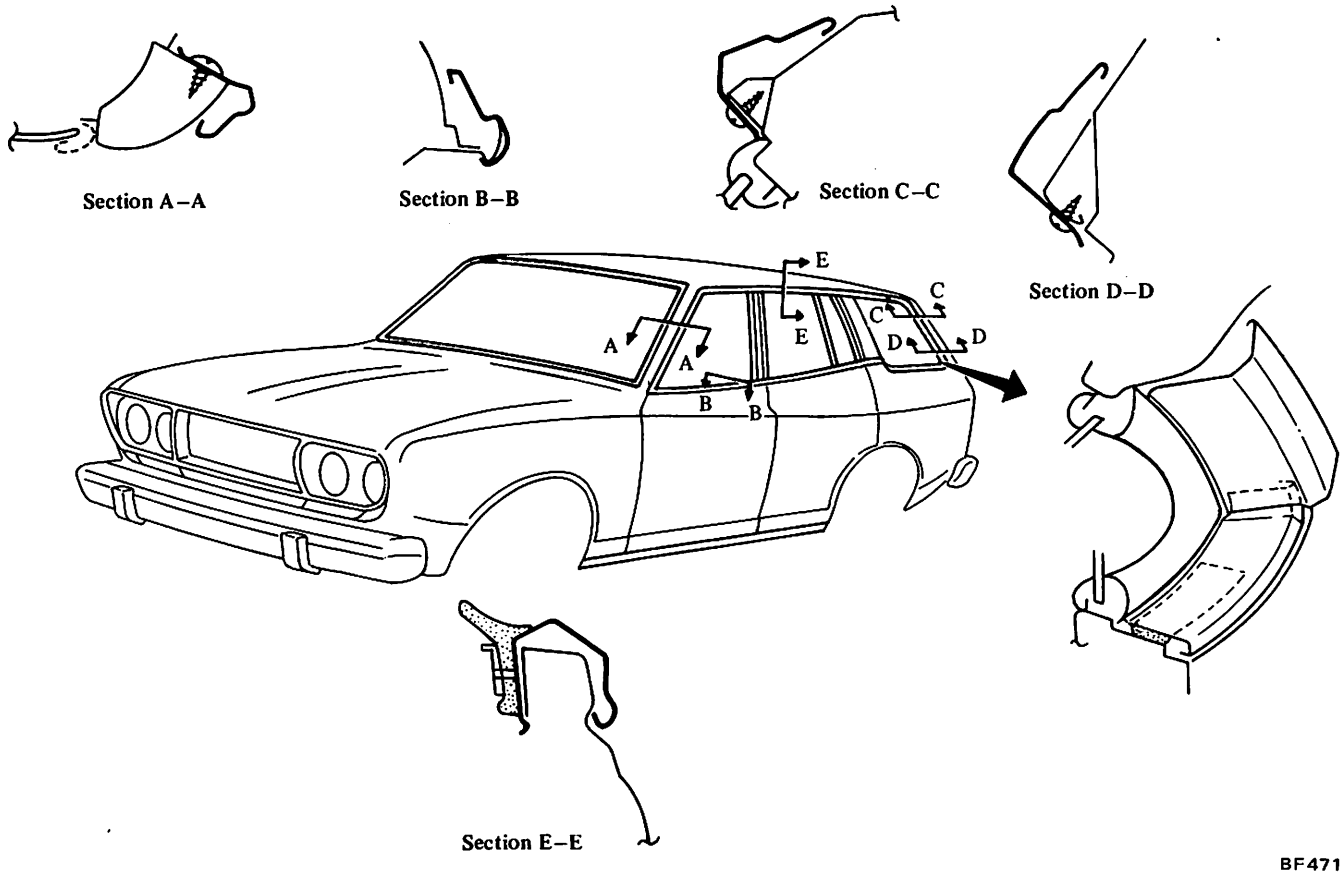


Fig. BF-155 Molding for Station Wagon

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WINDSHIELD MOLDING

REMOVAL AND INSTALLATION

1. Remove windshield moldings from fasteners in glass opening.
2. To install windshield moldings, pop moldings into fasteners with hand pressure.

Note: Take care not to deform windshield moldings in removal and installation.

REAR WINDOW MOLDING

REMOVAL AND INSTALLATION

1. Open trunk lid.
2. Drive out inner pin of lower molding fastener.

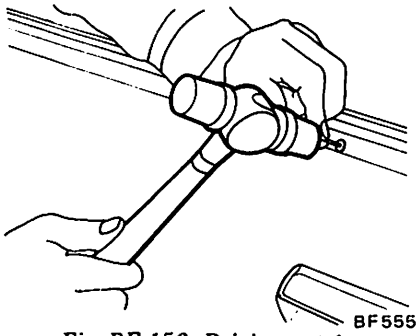


Fig. BF-156 Driving out fastener inner pin

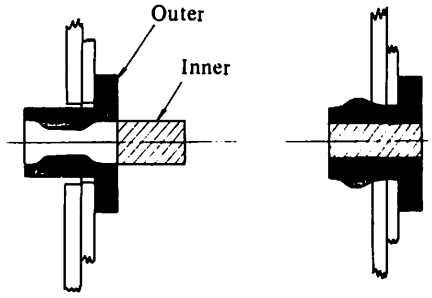
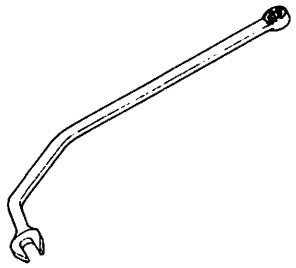
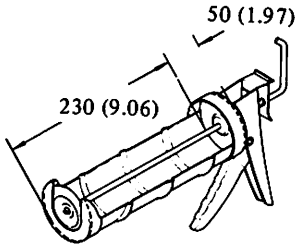
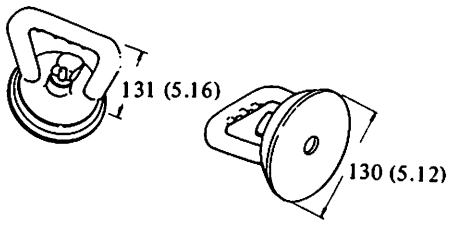


Fig. BF-157 Sectional view of fastener

3. Move side molding down until separated from corner molding. Remove corner molding.
4. Draw side molding upward.
5. Draw upper and lower moldings sideways.
6. Install rear window moldings in the reverse order or removal.

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SPECIAL SERVICE TOOLS

No.	Tool number & tool name	Description Unit: mm (in)	For use model	Reference page or fugure No.
1.	ST08730000 Door hinge wrench	This special wrench is used to make door adjustment without removing fender. 	710	Fig. BF-56
2.	ST08810000 Caulking hand gun	For pushing out the bottom of windshield glass sealer cartridge.  SE231	All models	Fig. BF-136
3.	ST08800000 Sucker	This tool is used to secure and set the windshield glass panel on the spacer. It also serves to facilitate proper adhesion of glass panel to body by insuring uniform pressure after setting.  SE345	All models	Fig. BF-138

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SERVICE MANUAL

DATSUN 710
MODEL 710 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION BE

BODY ELECTRICAL SYSTEM

BODY ELECTRICAL WIRING ..... BE- 2
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BE

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BODY ELECTRICAL WIRING

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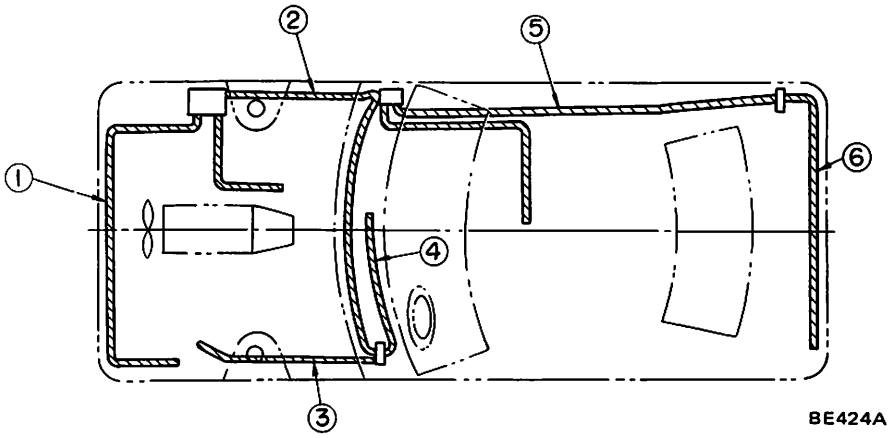
DESCRIPTION

Cables used for body electrical wiring are low tension cables. They are covered with color-coded vinyl for easy identification. Each system (e.g. ignition, lighting, or signal system) has its own distinctive color. This facilitates trouble-shooting. In the wiring diagram, the colors are indicated by one or two alphabetical letters. Basic colors include standard and supplementary colors.

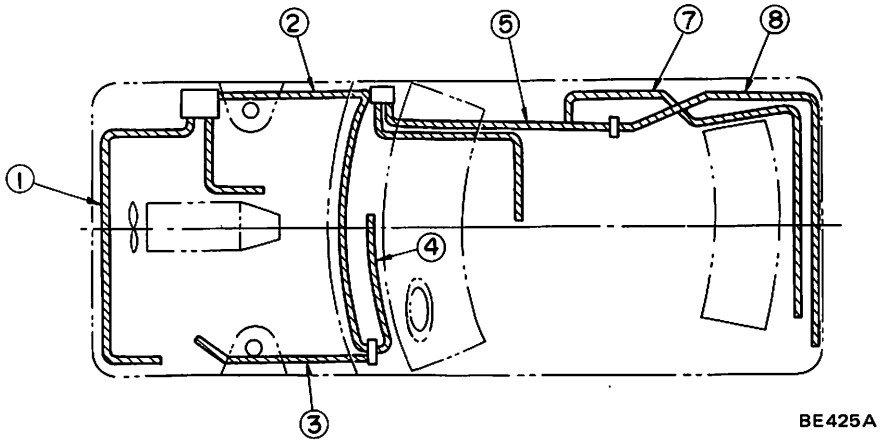
The entire wiring system consists of several harnesses connected one to another by means of connectors; These include the main harness, engine compartment harness, engine harness, instrument harness, body harness, trunk room harness, room lamp harness, battery cables and fusible link harness. It is recommended that the battery be disconnected before performing any electrical service other than bulb or fuse replacement. To protect the electrical devices, fuses are installed in the middle of circuit.

In addition to fuses, a fusible link is installed to protect wiring. Fusible link functions almost the same as fuse, though its characteristics are slightly different from normal fuses.

For engine harness, refer to Section EE.



Sedan and Hardtop



Station Wagon

1 Engine compartment harness
2 Main harness
3 Ignition coil and distributor harness
4 Instrument harness
5 Body harness
6 Trunk room harness (Sedan and Hardtop)
7 Tailgate harness (Station Wagon)
8 Tail harness (Station Wagon)

Fig. BE-1 Wiring harness

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COLORS OF CABLES

The system of colors applied to the covering of cable conductors is as shown in the following table:

Circuit system	Standard color	Supplementary color	Supplementary color Standard color
Starting and ignition system	B (Black)	W, Y, R	
Charging system	W (White)	B, R, L	Y
Lighting system	R (Red)	W, B, G, Y, L	
Signal system	G (Green)	W, B, R, Y, L	W, Br (Brown)
Instrument system	Y (Yellow)	W, B, G, R, L	
Others	L (Blue)	W, R, Y	Y, Br Lg (Light green)
Grounding system	B (Black)		

The main cable of each system is generally coded with a standard or supplementary color. These colors are represented by such letters as G, W, and Br. Minor items of each circuit's terminal are coded with a two-tone color composed of both standard and supplementary colors. These colors are represented by a combination of two letters like RW or GY. The first letter of each combination stands for standard color, and the second for supplementary color.

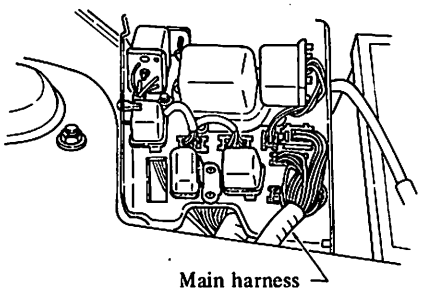
WIRING

Main harness

The main harness is located between relay fixing bracket and passenger compartment along the right side of engine compartment and has several branches on both ends. The harness also has a junction block and fuse block midway in the system. The junction block is located under right side of instrument panel. As for fuse block, refer to page BE-5 for Fuse Block and Fusible Link. At relay bracket, the main harness services to engine compartment harness, fusible link, engine harness, horn relay, voltage regulator, lighting relay, and so on. See Figure BE-2. At passenger compartment, it services junction block, ignition switch, stop lamp switch, turn signal flasher unit, hazard flasher unit, turn signal switch, heater unit, room lamp harness, and wiper motor. The main harness also has connectors for kickdown switch (A/T only), and lead harness of stereo and select indicator lamp of automatic transmission.

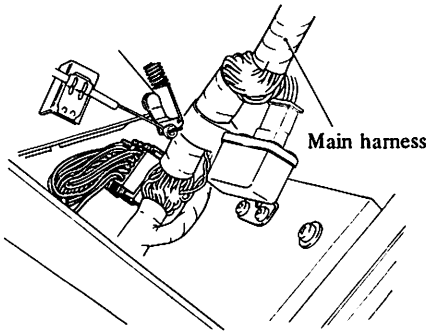
It also traverses behind instrument panel and connected to instrument harness at left side end of instrument panel.

AT RELAY BRACKET



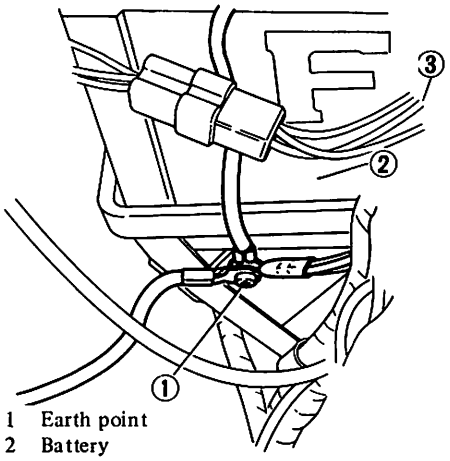
BE426A

AT JUNCTION BLOCK



BE427A

AT BATTERY SUPPORT



1 Earth point
2 Battery
3 Fusible link

BE428A

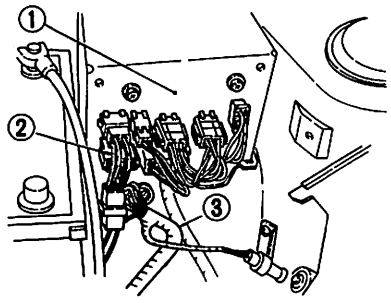
Fig. BE-2 Main harness

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Engine compartment harness

The engine compartment harness is connected to main harness at relay fixing bracket by two connectors and traverses the car along the front end of engine compartment. It services headlamps, front combination lamps, horns, side marker lamps, washer motor and thermal transmitter of engine.

In removing harnesses, remove each connector and clamp on the radiator core support, and then the harness can be easily removed.



BE429A

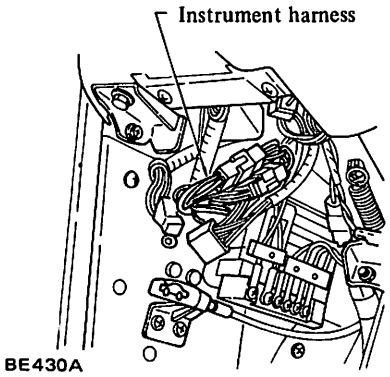
1 Relay bracket
2 Fusible link
3 Engine compartment harness

Fig. BE-3 Engine compartment harness

Instrument harness

The instrument harness is connected to main harness at the left side of instrument panel.

It services wiper switch, lighting switch, hazard warning switch, combination meter, defogger switch, knob illumination lamp, clock, cigarette lighter and radio.



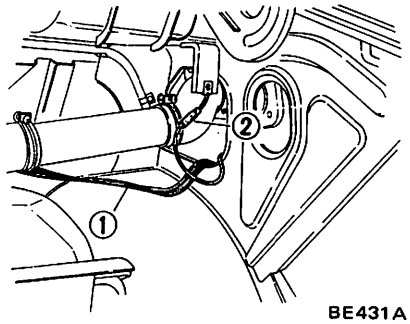
BE430A

Fig. BE-4 Instrument harness

Body harness

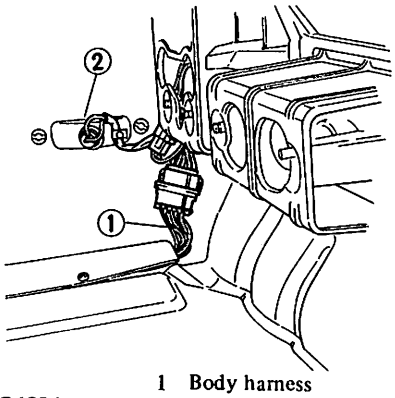
The body harness has two connectors to the junction block and goes to the right side of trunk along the floor board under the insulator.

It services hand brake switch, tank unit, rear window defogger and trunk harness (Sedan and Hardtop) or tail harness (Station Wagon). The harness from main harness to stereo and automatic transmission select lever indicator lamp is installed partially along the body harness.



BE431A

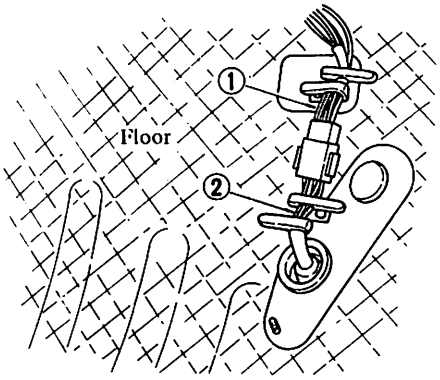
1 Body harness
2 For rear window defogger



BE432A

1 Body harness
2 Rear side marker lamp

Fig. BE-5-1 Body harness (Sedan and Hardtop)



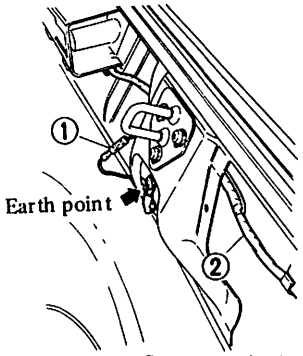
BE433A

1 Body harness
2 Tail harness

Fig. BE-5-2 Body harness (Station Wagon)

Trunk room harness (Sedan and Hardtop)

The trunk room harness is connected to body harness on the right side of trunk room with a connector. This harness goes along rear end of trunk room and services rear combination lamp on either side, license light and body ground.



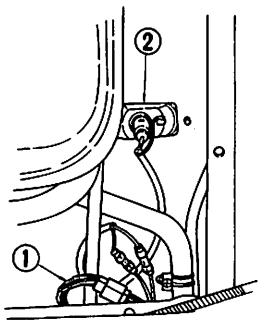
BE434A

1 Connector for license lamp
2 Tail harness

Fig. BE-6 Trunk room harness

Tail harness (Station Wagon)

The tail harness is connected to the body harness on the right side of the luggage compartment with a connector. This harness which runs the rear end of the luggage compartment services rear combination lamp, rear side marker lamp and body ground.



BE435A

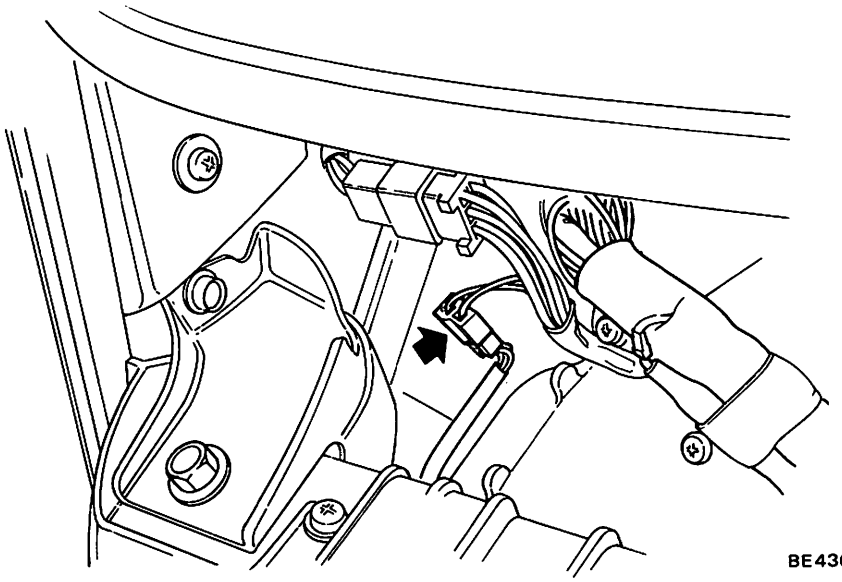
1 Tail harness
2 Rear side marker lamp

Fig. BE-7 Tail harness

Room lamp harness

The room lamp harnesses of Sedan and Hardtop are different from each other. Hardtop models have not only room lamp harness but also a sub-room lamp harness. The room lamp harness is connected to main harness next to the junction block and goes to door switch and room lamp along the right front pillar and right side of roof.

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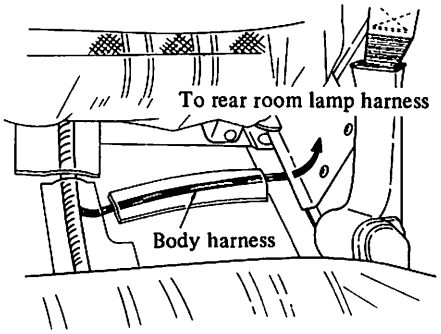


BE436A

Fig. BE-8 Room lamp harness

Rear room lamp harness (Station Wagon)

The rear room lamp is connected to the body harness at the bottom of the right center pillar. This harness goes to the rear room lamp and tail gate switch along the right center pillar and right side of roof.



BE437A

Fig. BE-9 Rear room lamp harness

INSPECTION

Inspect all electrical circuits referring to wiring or circuit diagrams. Circuits should be tested for continuous or short circuit with a conventional test lamp or low reading voltmeter. Before inspection of circuit, insure that:

1. Each electrical component part or cable is securely fastened to its connector or terminal.
2. Each connection is firmly in place and free from rust and dirt.
3. Each cable covering shows no evidence of cracks, deterioration or other damage.
4. Each terminal is kept away from any adjacent metal parts.
5. Each cable is fastened to its proper connector or terminal.
6. Each grounding bolt is planted firmly.
7. Wiring is kept away from any adjacent parts with sharp edges or parts (such as exhaust pipe) having high temperature.
8. Wiring is kept away from any rotating or working parts such as fan pulley and belt.
9. Cables between fixed portions and moving equipment are long enough to withstand shocks and vibratory forces.

MAINTENANCE

Wire harness must be replaced if insulation becomes burned, cracked, or deteriorated. Whenever it is necessary to splice or repair a wire, be sure to use resin flux solder or electrical connections. Use insulating tape to cover all splices or bare wire. In replacing wire, correct size wire must be used. Never replace a wire with smaller one. Each harness and wire must be held securely in place with clips or other holding devices to avoid chafing or wearing away of insulation due to vibration.

Notes:

a. **Before starting to inspect and repair any part of electrical system or other parts which may lead to a short circuit, disconnect cables at battery terminals as follows:**

   Disconnect cable at negative (–) terminal, and then disconnect cable at positive (+) terminal.
   Before connecting cables to battery terminals, be sure to clean terminals with a rag. Fasten cable at positive (+) terminal, and then ground cable at negative (–) terminal. Apply grease to the top of these terminals to prevent rust from developing on them.

b. **Never use a screwdriver or service tool to conduct a continuity test. Use test leads to conduct this check.**

c. **Never ground an open circuit or circuits under no load. Use a test lamp (12V-3W) or circuit tester as a load.**

FUSE BLOCK AND FUSIBLE LINK

DESCRIPTION

The fuse and fusible link are protective devices used in an electrical circuit. When current increases beyond rated amperage, fusible metal melts and the circuit is broken, thus protecting cable and electrical equipment from burning. Whenever fuse is melted for one reason or another, use systematic procedure to check and eliminate cause of problem before installing new fuse.

MAINTENANCE INSTRUCTIONS

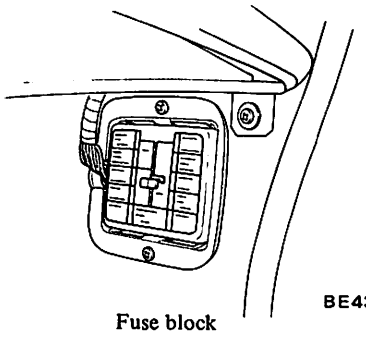
Fuse

In nearly all cases, visual inspection can reveal blown fuse. If condition of fuse is questionable, conduct a continuity test with circuit tester or test lamp.

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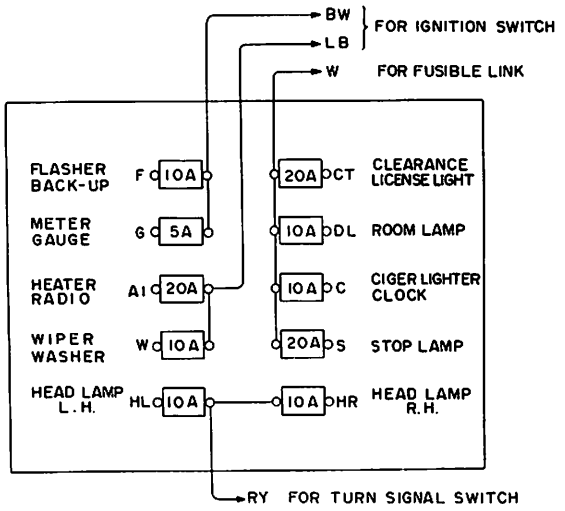
Notes:

a. If fuse is blown, be sure to eliminate the cause before installing new fuse in position.
b. Use fuse of specified rating. Do not use fuse of more than specified rating. See Figure BE-10.
c. Check fuse holders for conditions. If much rust or dirt is found thereon, clean metal parts with fine-grained sandpaper until proper metal-to-metal contact is made. Poor contact of any fuse holder will often lead to voltage drop or heating in the circuit and could result in improper operation of circuit.



BE438A

Fuse block



BE439A

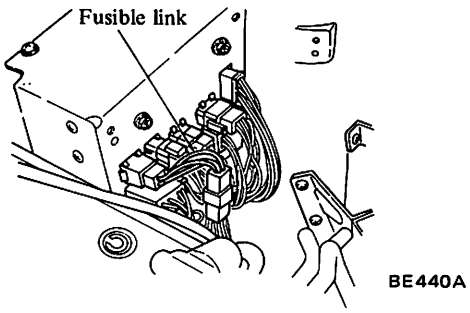
Fig. BE-10 Fuse block

Fusible link

Color	Size mm² (sq in)
Brown	0.3 (0.0005)
Green	0.5 (0.0077)
Red	0.85 (0.0013)

The fusible link holder is mounted on relay bracket located on the front right side of the engine compartment.

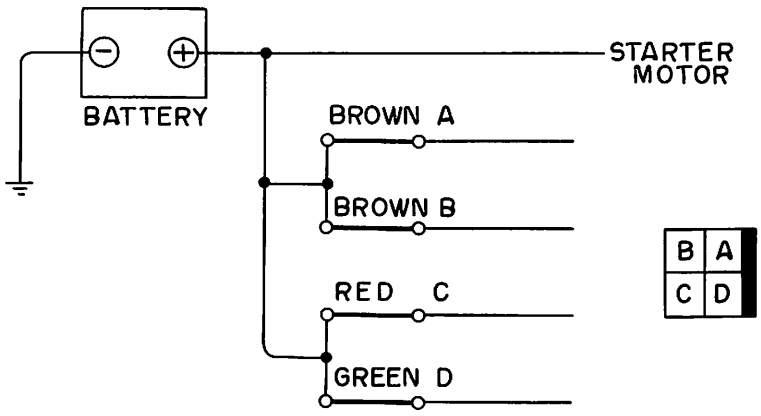
A melted fusible link can be detected by either visual inspection or finger-tip feeling. If its condition is questionable, use circuit tester or test lamp, as required, to conduct continuity test. This continuity test can be performed in the same manner as for any conventional fuse.



BE440A

Notes:

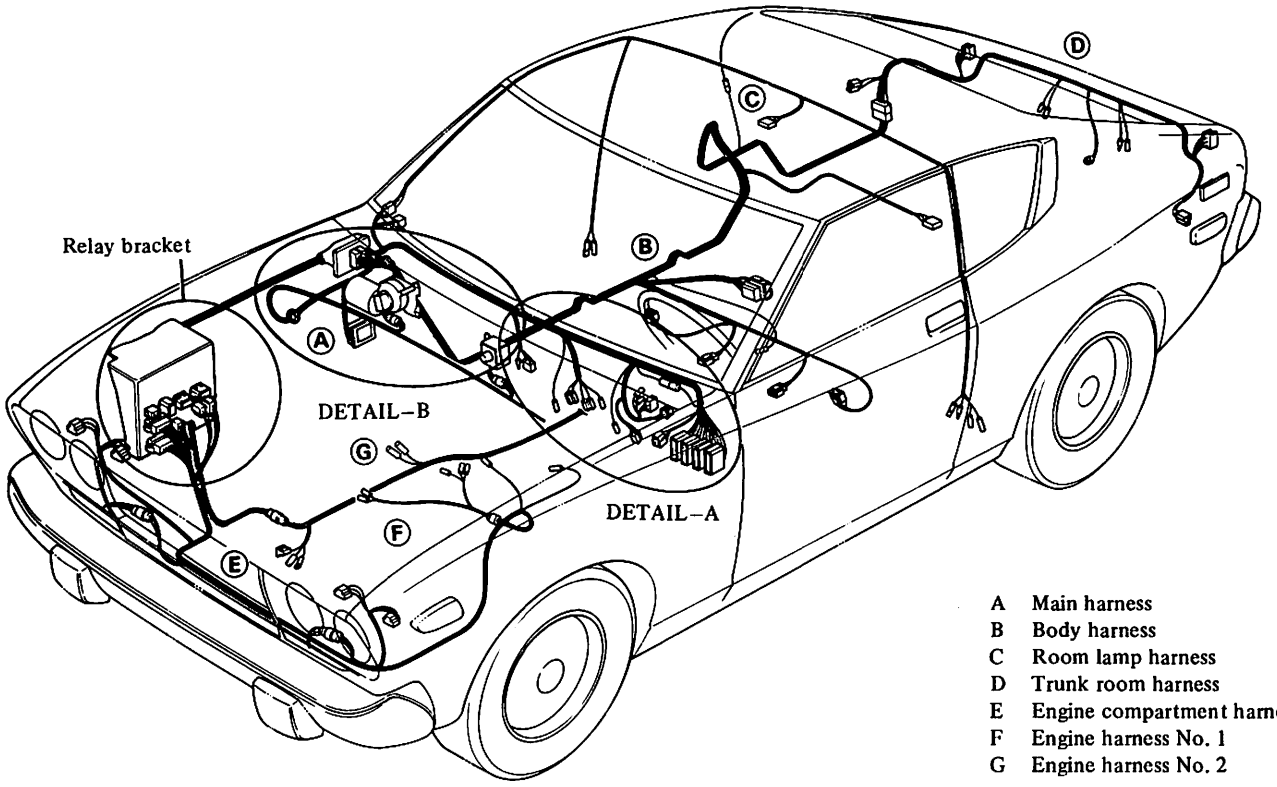
a. Under no circumstances should any larger fusible link than that specified be used.
b. Should melting of fusible link occur, it is possible that critical circuit (power supply or large current carrying circuit) is shorted. In such case, carefully check and eliminate the cause of trouble.
c. Never wrap periphery of fusible link with vinyl tape. Extreme care should be taken with this link so that it does not come into contact with any other wiring harness or vinyl or rubber-parts.



BE441A

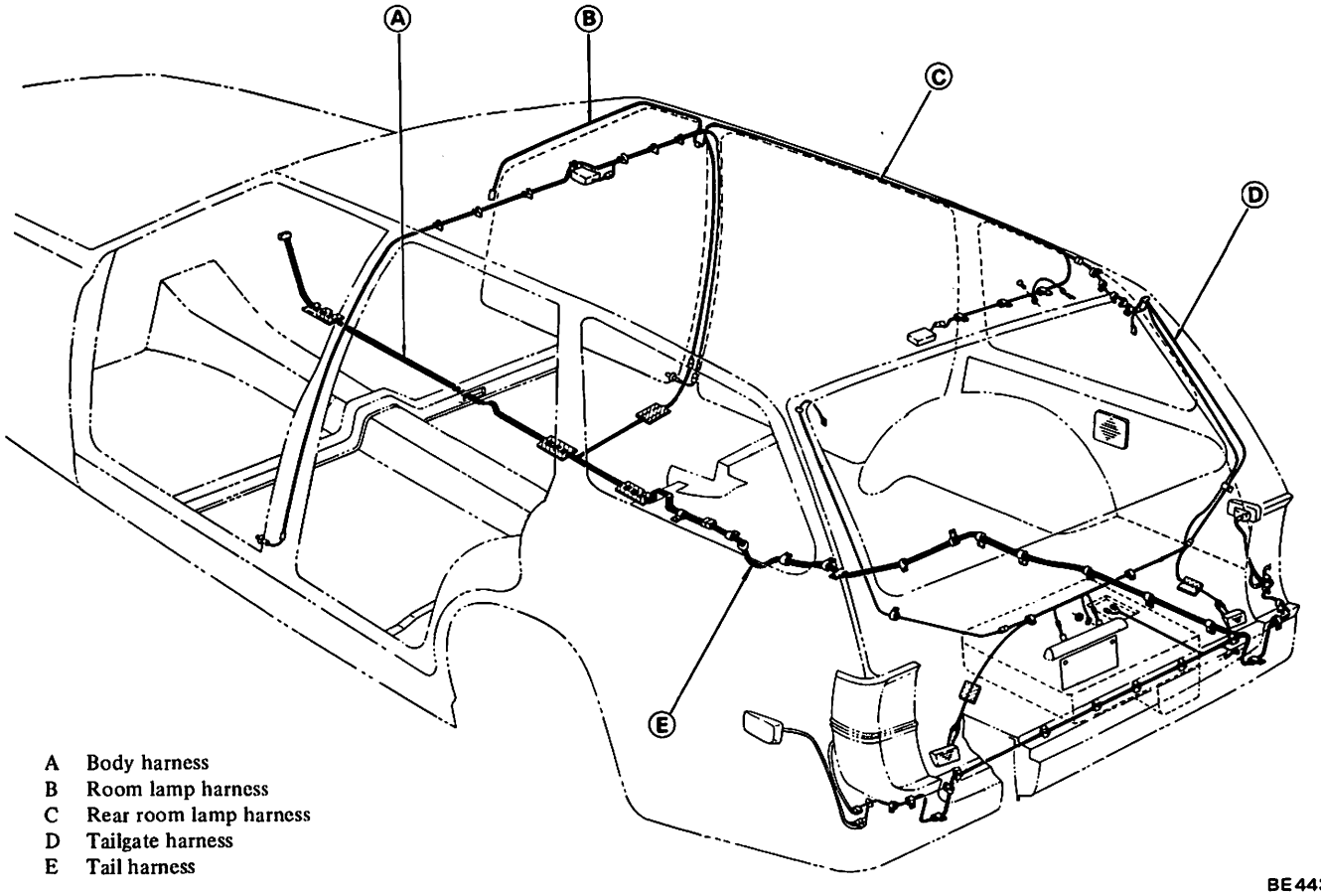
Fig. BE-11 Fusible link

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A Main harness
B Body harness
C Room lamp harness
D Trunk room harness
E Engine compartment harness
F Engine harness No. 1
G Engine harness No. 2

BE442A

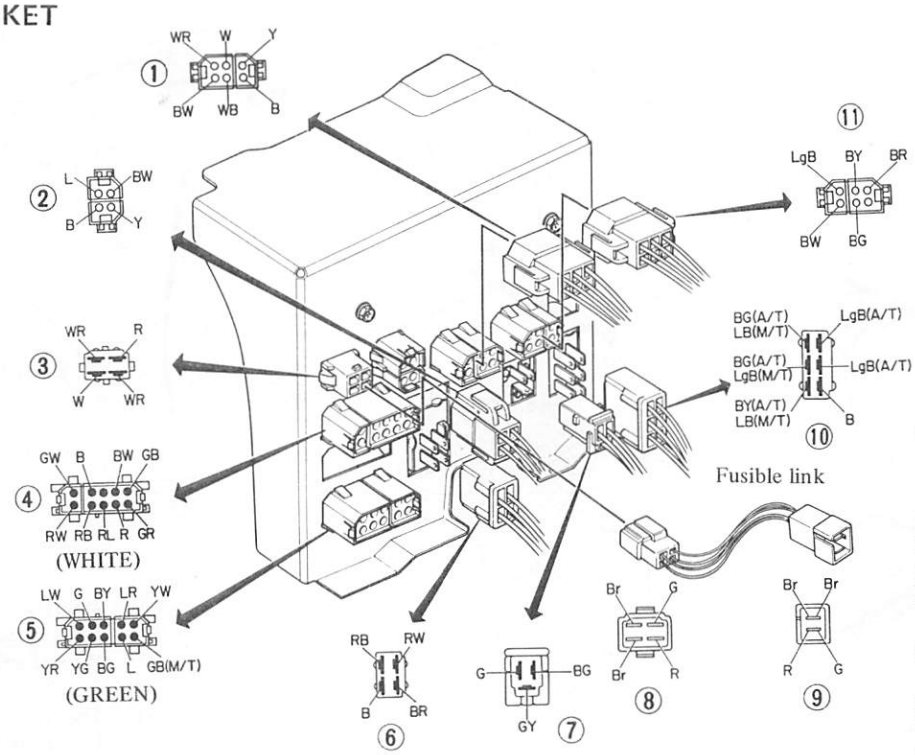


A Body harness
B Room lamp harness
C Rear room lamp harness
D Tailgate harness
E Tail harness

BE443A

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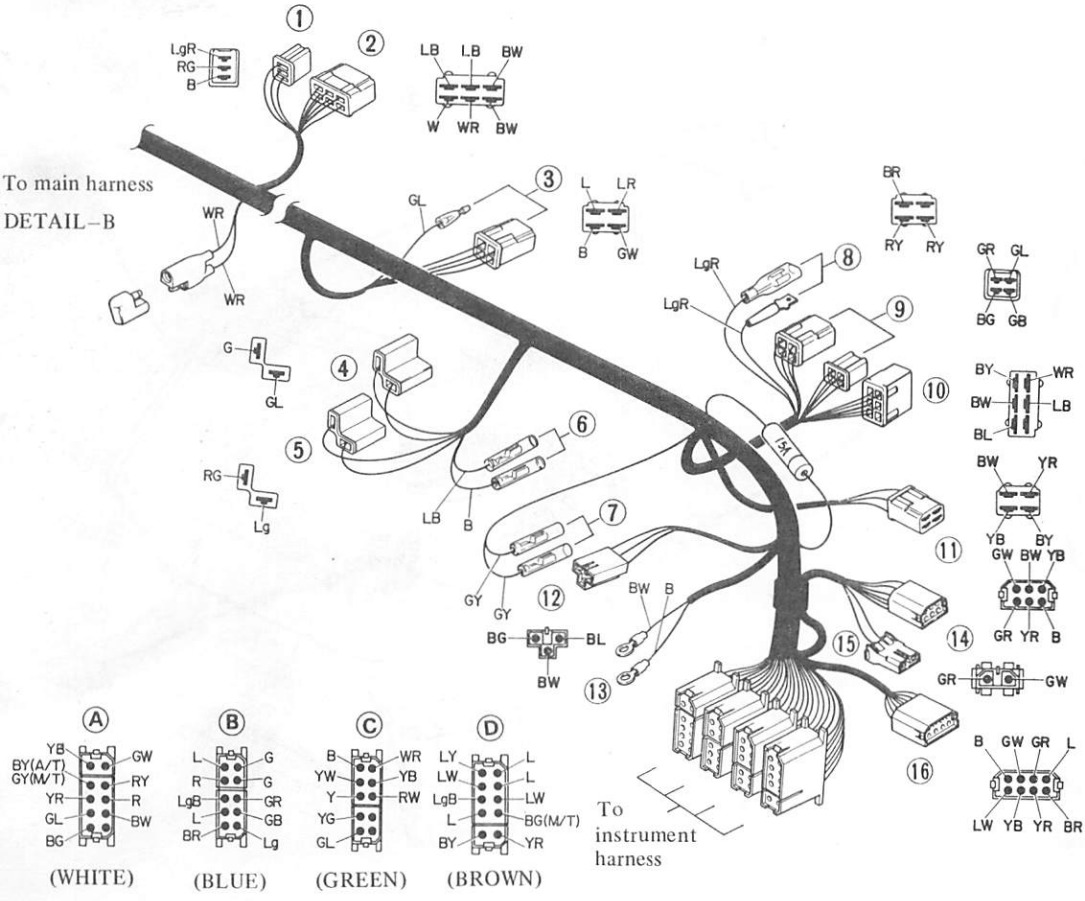
RELAY BRACKET



1 To voltage regulator
2 To auto-choke relay
3 To fusible link
4 To engine compartment harness
5 To engine compartment harness
6 To lighting relay
7 To horn relay
8 To main harness
9 To battery
10 To seat belt warning relay
11 To interlock relay

BE444A

DETAIL–A

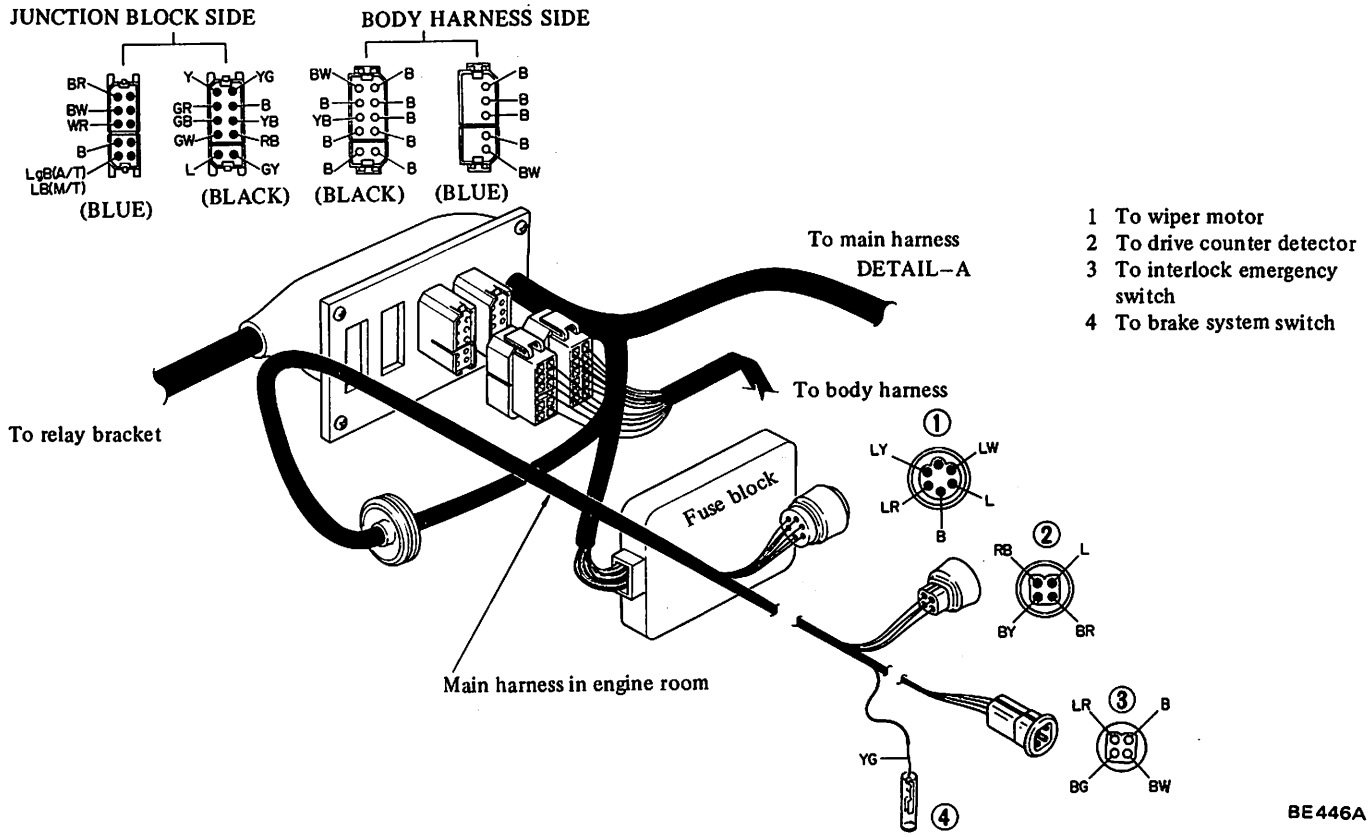


1 To room lamp harness
2 To ignition relay
3 To heater unit
4 To turn signal flasher unit
5 To hazard flasher unit
6 To kickdown switch (A/T only)
7 To stop lamp switch
8 To steering lock switch
9 To turn signal switch
10 To ignition switch
11 To catalyzer hold relay
12 To ignition coil and distributor harness
13 To transistor ignition unit
14 To switching module
15 To catalyzer temperature sensor
16 Connector for factory function test

BE445A

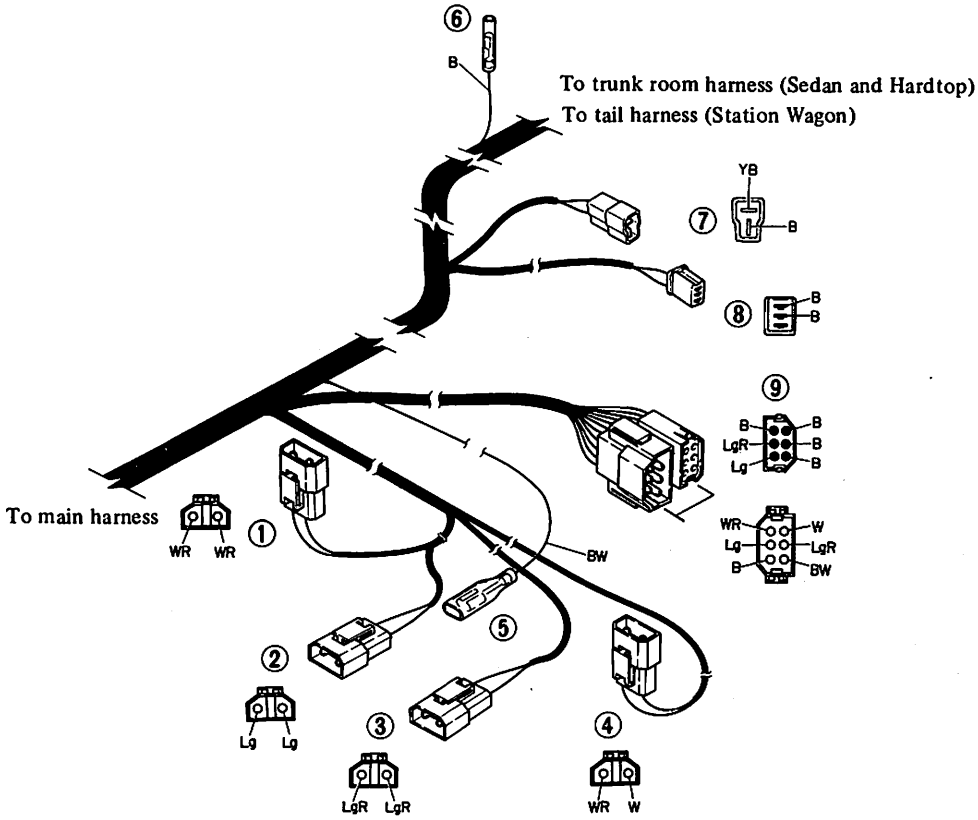
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DETAIL–B



BE446A

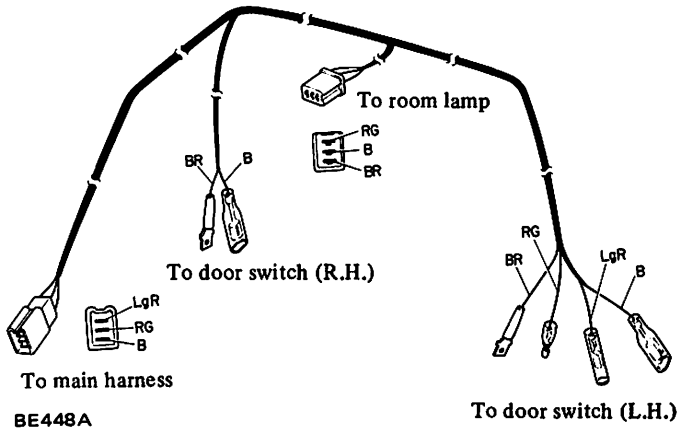
BODY HARNESS



BE447A

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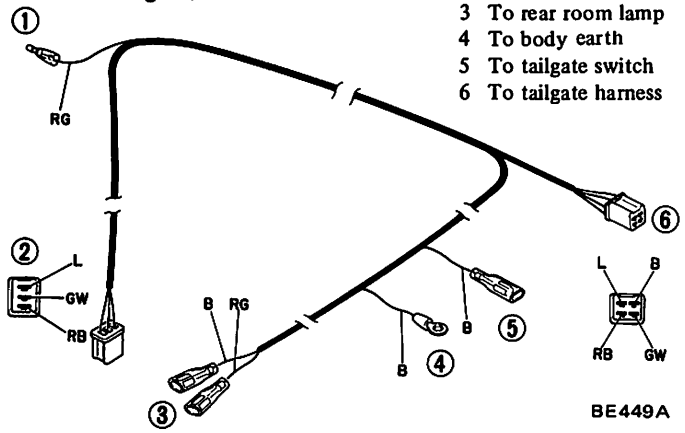
ROOM LAMP HARNESS



BE448A

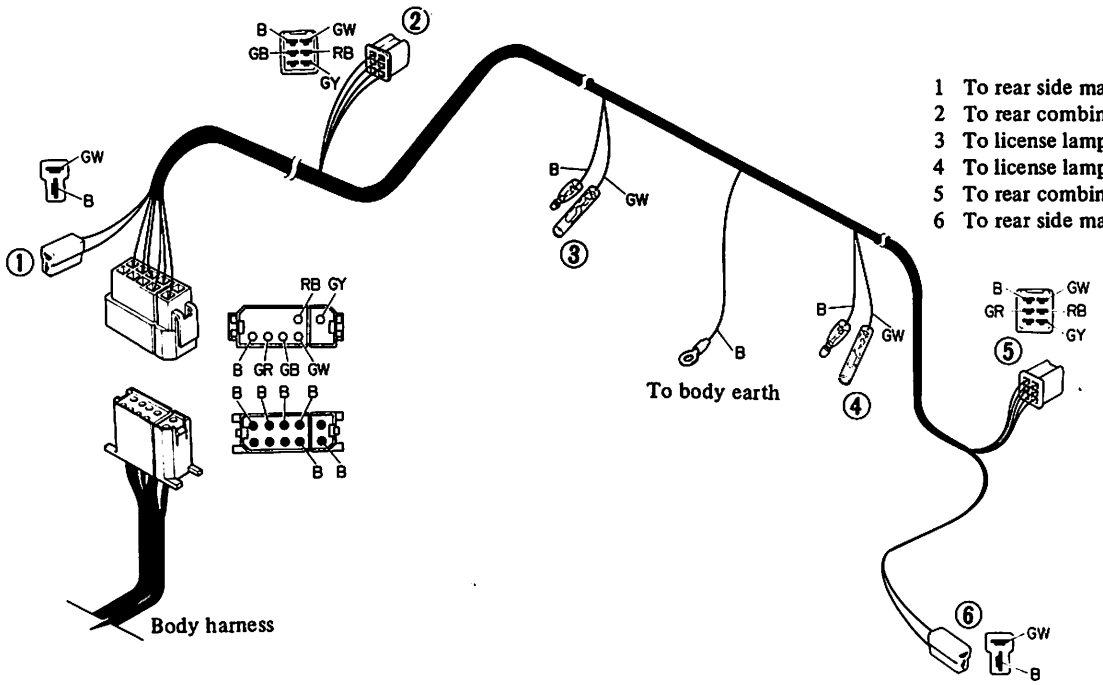
REAR ROOM LAMP HARNESS (Station Wagon)

1 To room harness
2 To body harness
3 To rear room lamp
4 To body earth
5 To tailgate switch
6 To tailgate harness



BE449A

TRUNK ROOM HARNESS (Sedan and Hardtop)

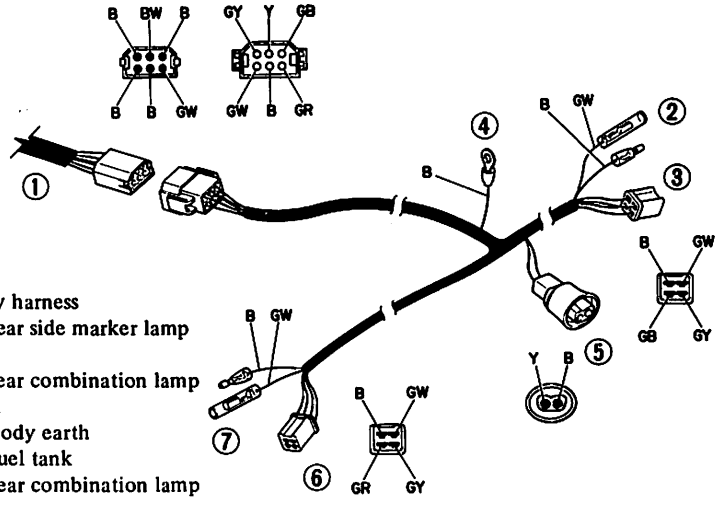


1 To rear side marker lamp (R.H.)
2 To rear combination lamp (R.H.)
3 To license lamp (R.H.)
4 To license lamp (L.H.)
5 To rear combination lamp (L.H.)
6 To rear side marker lamp (L.H.)

Body harness

BE450A

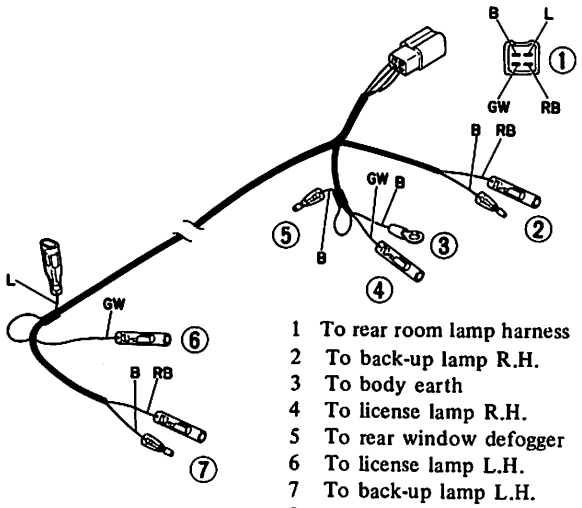
TAIL HARNESS (Station Wagon)



1 Body harness
2 To rear side marker lamp R.H.
3 To rear combination lamp R.H.
4 To body earth
5 To fuel tank
6 To rear combination lamp L.H.
7 To rear side marker lamp L.H.

BE451A

TAILGATE HARNESS (Station Wagon)

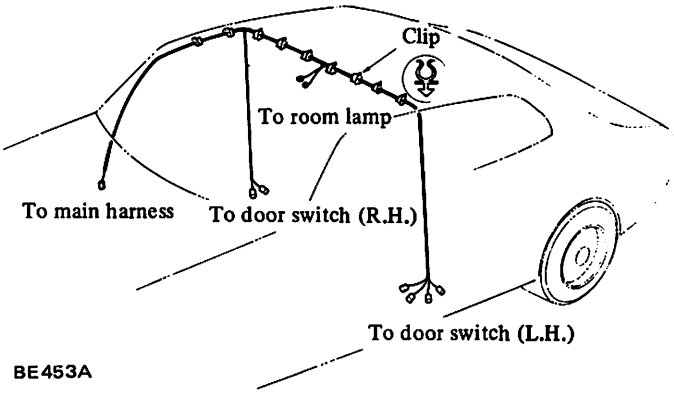


1 To rear room lamp harness
2 To back-up lamp R.H.
3 To body earth
4 To license lamp R.H.
5 To rear window defogger
6 To license lamp L.H.
7 To back-up lamp L.H.
8 To rear window defogger

BE452A

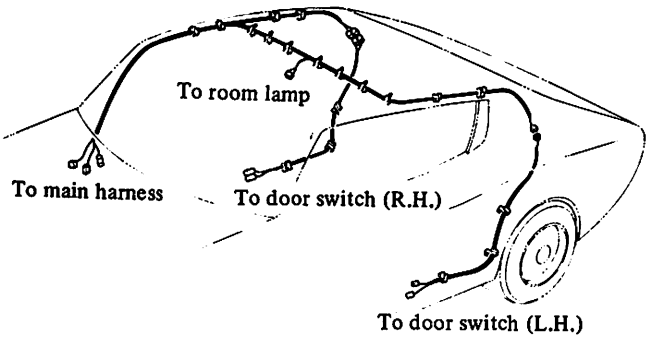
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ROOM LAMP HARNESS (Sedan)



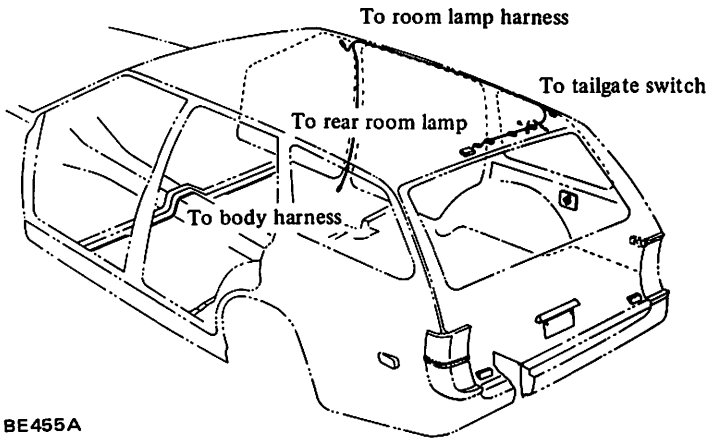
BE453A

ROOM LAMP HARNESS (Hardtop)



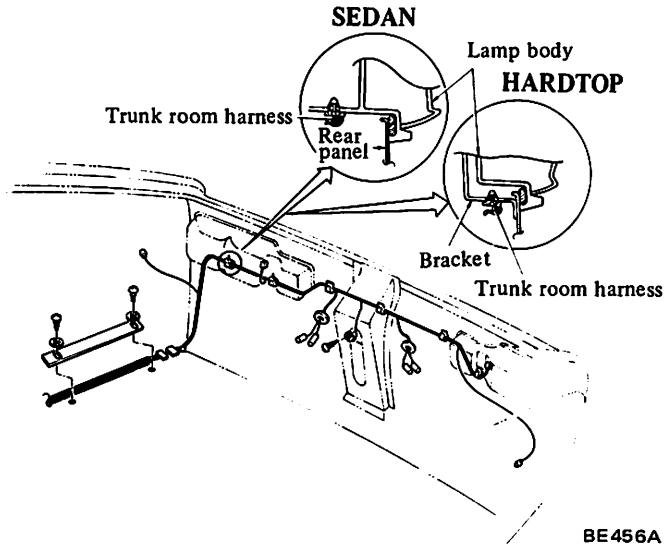
BE454A

REAR ROOM LAMP HARNESS (Station Wagon)



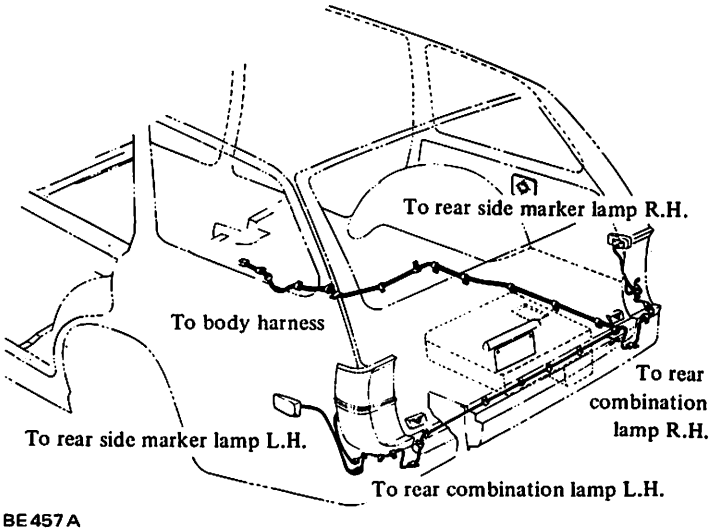
BE455A

TRUNK ROOM HARNESS (Sedan and Hardtop)



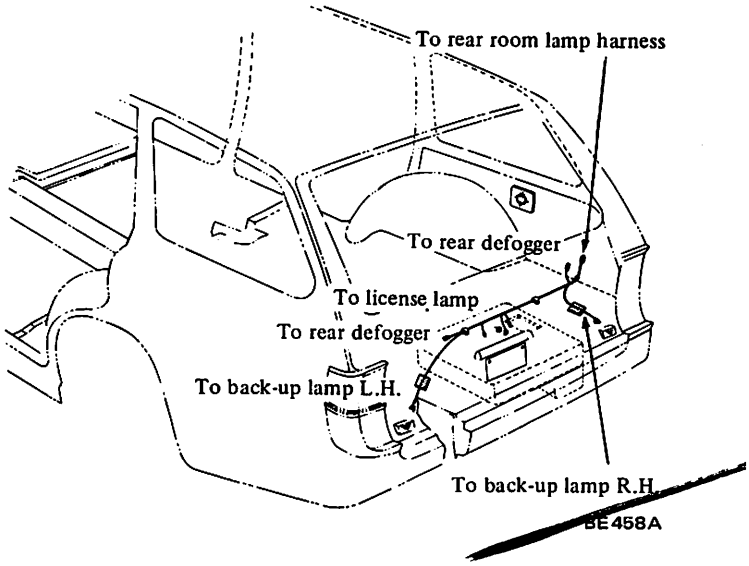
BE456A

TAIL HARNESS (Station Wagon)



BE457A

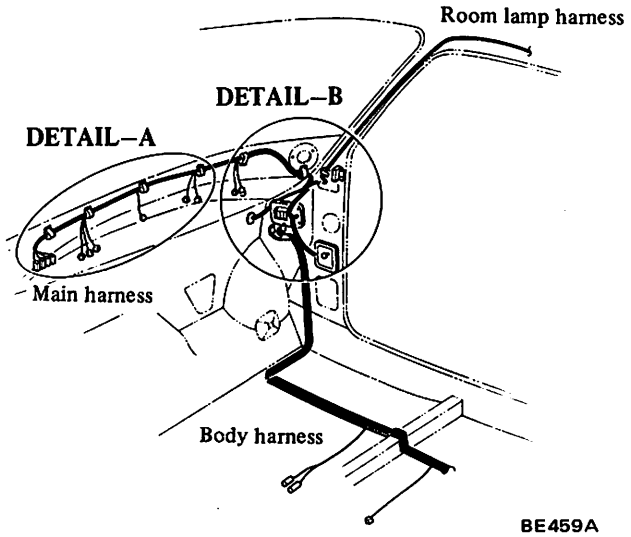
TAILGATE HARNESS (Station Wagon)



BE458A

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MAIN HARNESS (In the passenger room)



ENGINE COMPARTMENT HARNESS

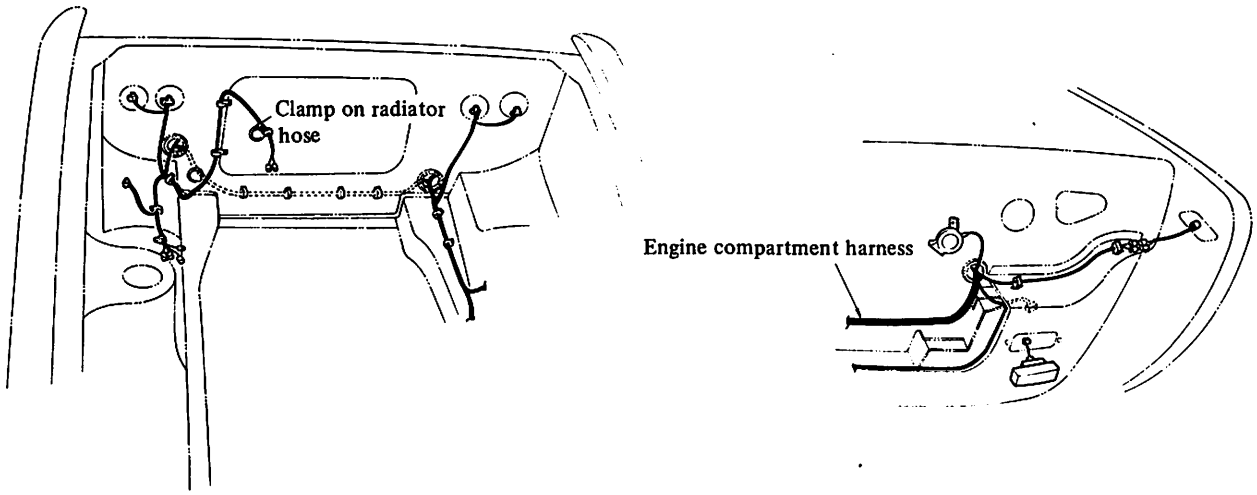


Fig. BE-12 Wiring harness

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LIGHTING AND SIGNAL LAMP SYSTEM

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DESCRIPTION

Lighting and signal lamp system includes headlamps, front combination lamps, side marker lamps, room lamp, rear combination lamps, license lamp, turn signal and lighting switch, lighting switch and hazard warning switch.

Every lighting system is not independent; some lead wires are co-used by several systems. Refer to circuit diagrams for each system.

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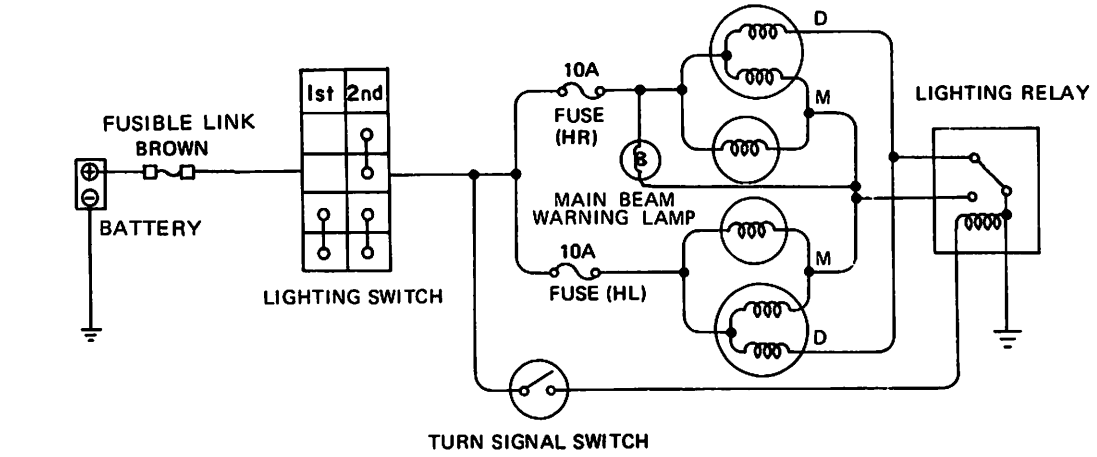
BULB SPECIFICATIONS

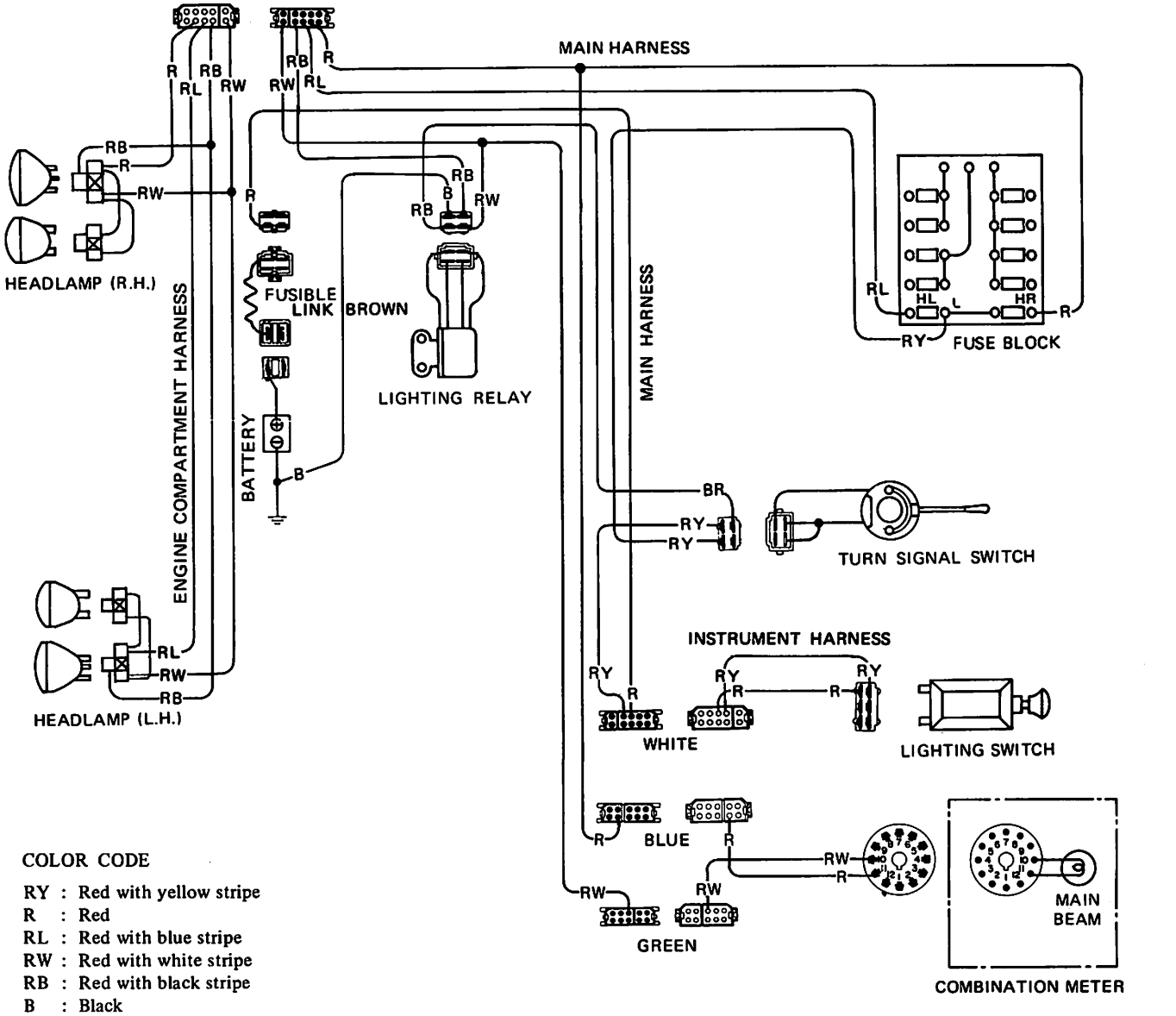
Item	Wattage	SAE trade number	Remarks
Headlamp			
Outer Main/Dim	37.5/50W	4002	Double filament
Inner Main	37.5W	4001	
Front combination lamp			
Turn/Clearance	27/8.3W	1157	Double filament
Side marker lamp	8W	67	
License lamp	7.5W	89	
Rear combination lamp			
Turn	27W	1156	
Back-up	27W	1156	
Stop/Tail	27/8.3W	1157	x 1 ... Hardtop and Station Wagon x 2 ... Sedan
Tail	10W	—	Hardtop
Room lamp	10W	–	
Rear room lamp	10W	–	Station Wagon
Knob illumination lamp	3.4W	158	
Automatic transmission indicator lamp	3.4W	158	A/T model

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CIRCUIT DIAGRAM OF LIGHTING SYSTEM

Headlamp system





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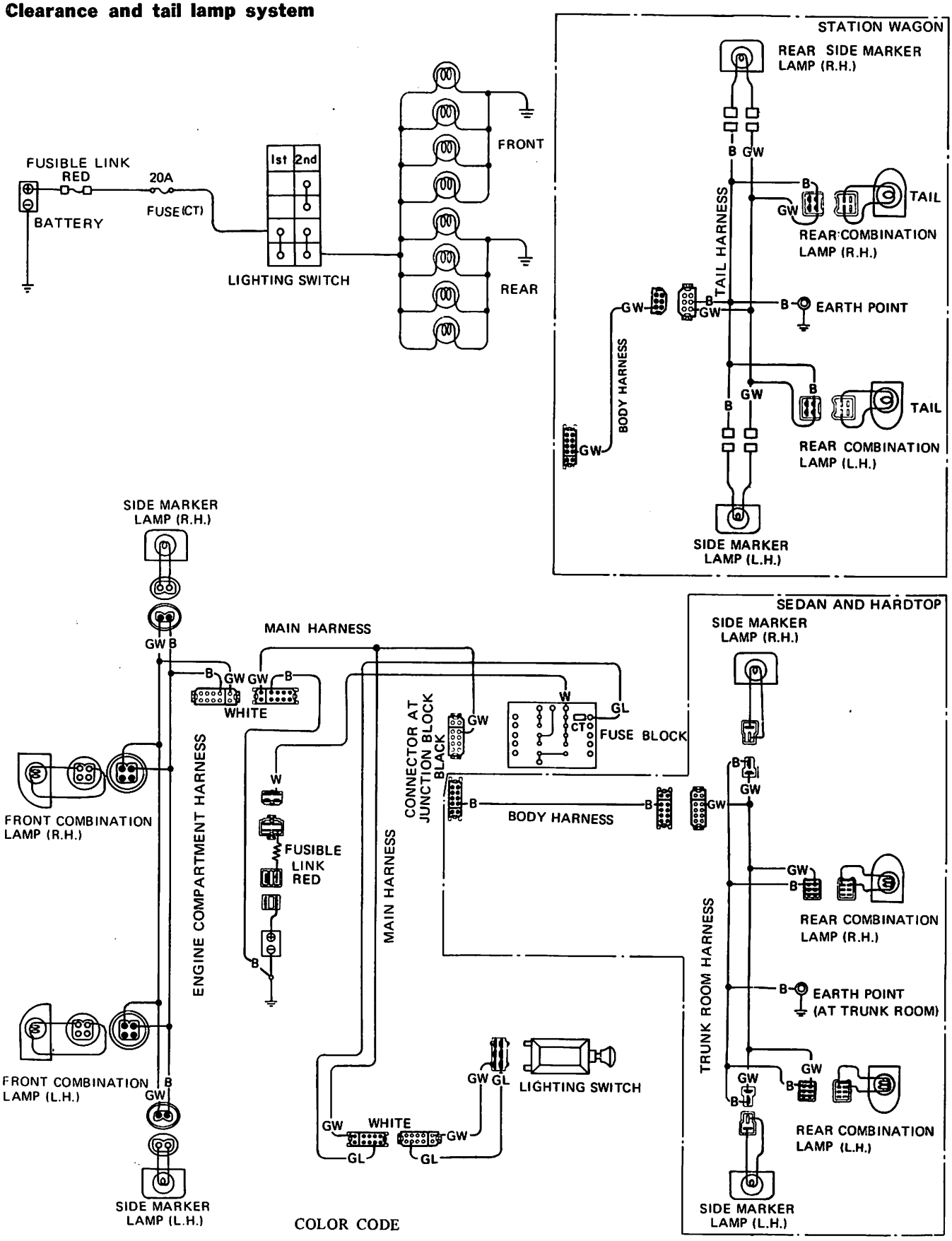
RY : Red with yellow stripe
R : Red
RL : Red with blue stripe
RW : Red with white stripe
RB : Red with black stripe
B : Black
BR : Black with red stripe

BE461A

Fig. BE-13 Circuit diagram of headlamp

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Clearance and tail lamp system



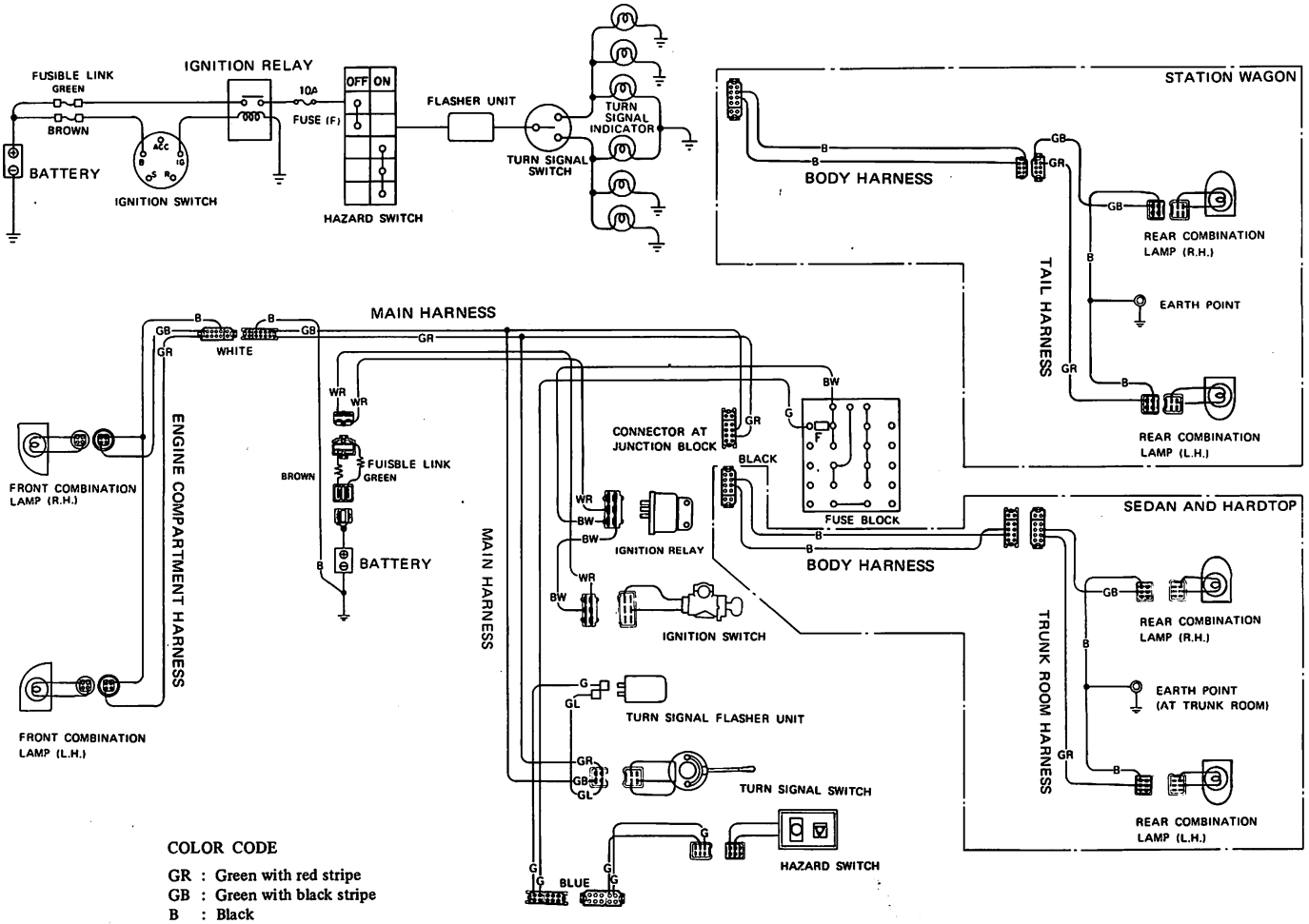
COLOR CODE

GL : Green with blue stripe
GW : Green with white stripe
B : Black
W : White

BE462A

Fig. BE-14 Circuit diagram of clearance and tail lamp

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COLOR CODE

GR : Green with red stripe
GB : Green with black stripe
B : Black
WR : White with red stripe
G : Green
GL : Green with blue stripe
BW : Black with white stripe

BE463A

Fig. BE-15 Circuit diagram of turn signal lamp

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Hazard warning system

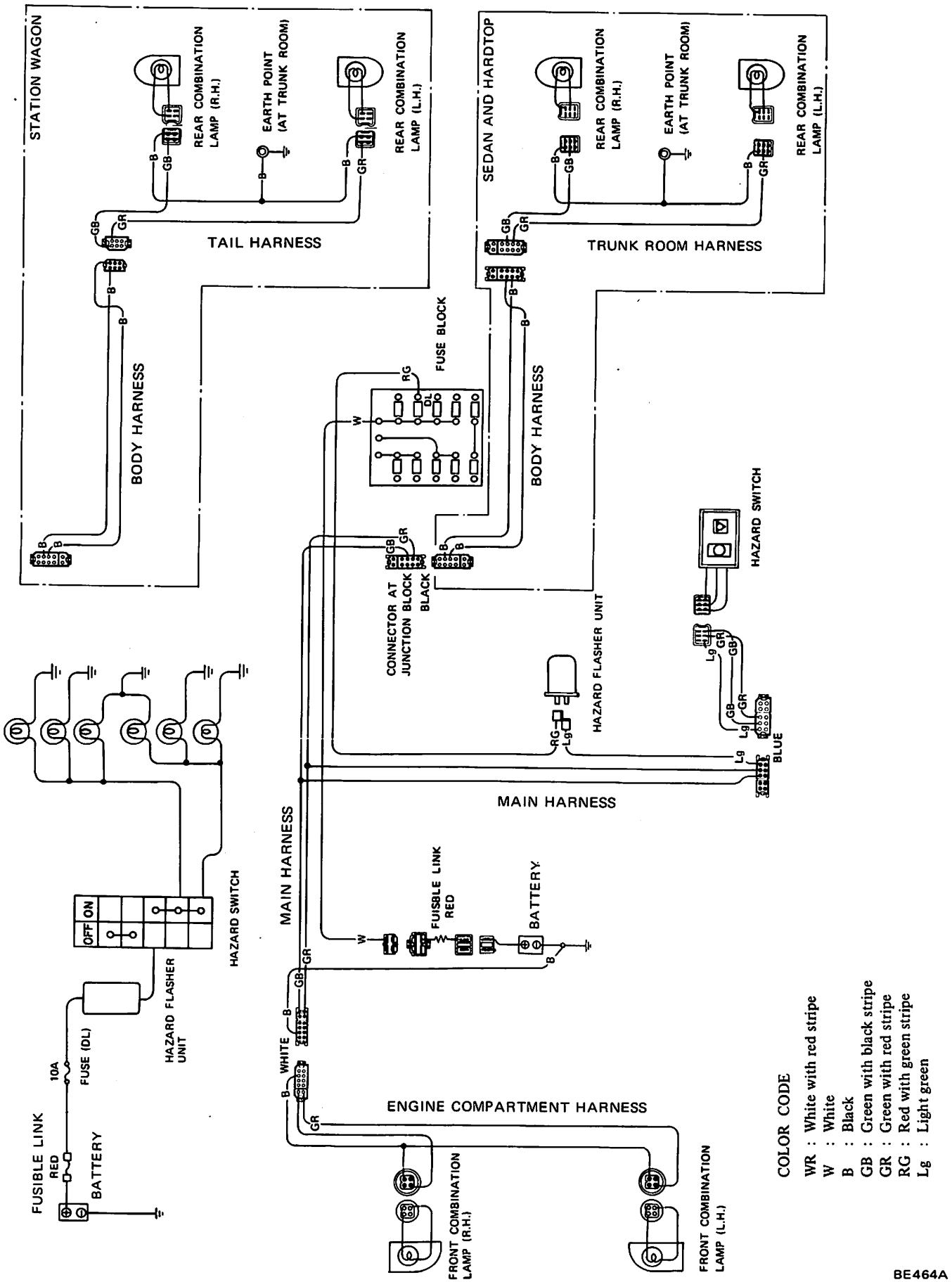
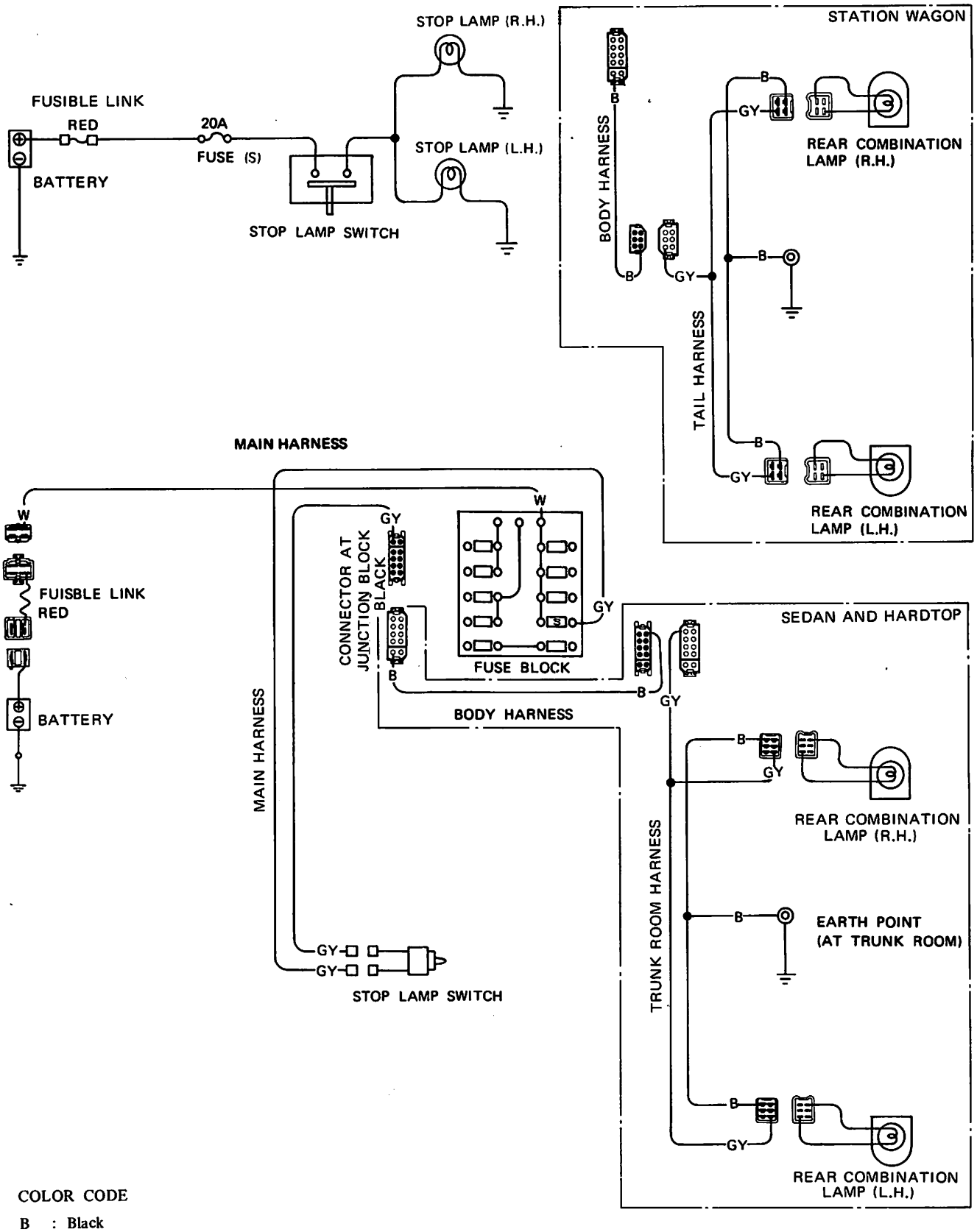


Fig. BE-16 Circuit diagram of hazard switch

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Stop lamp system



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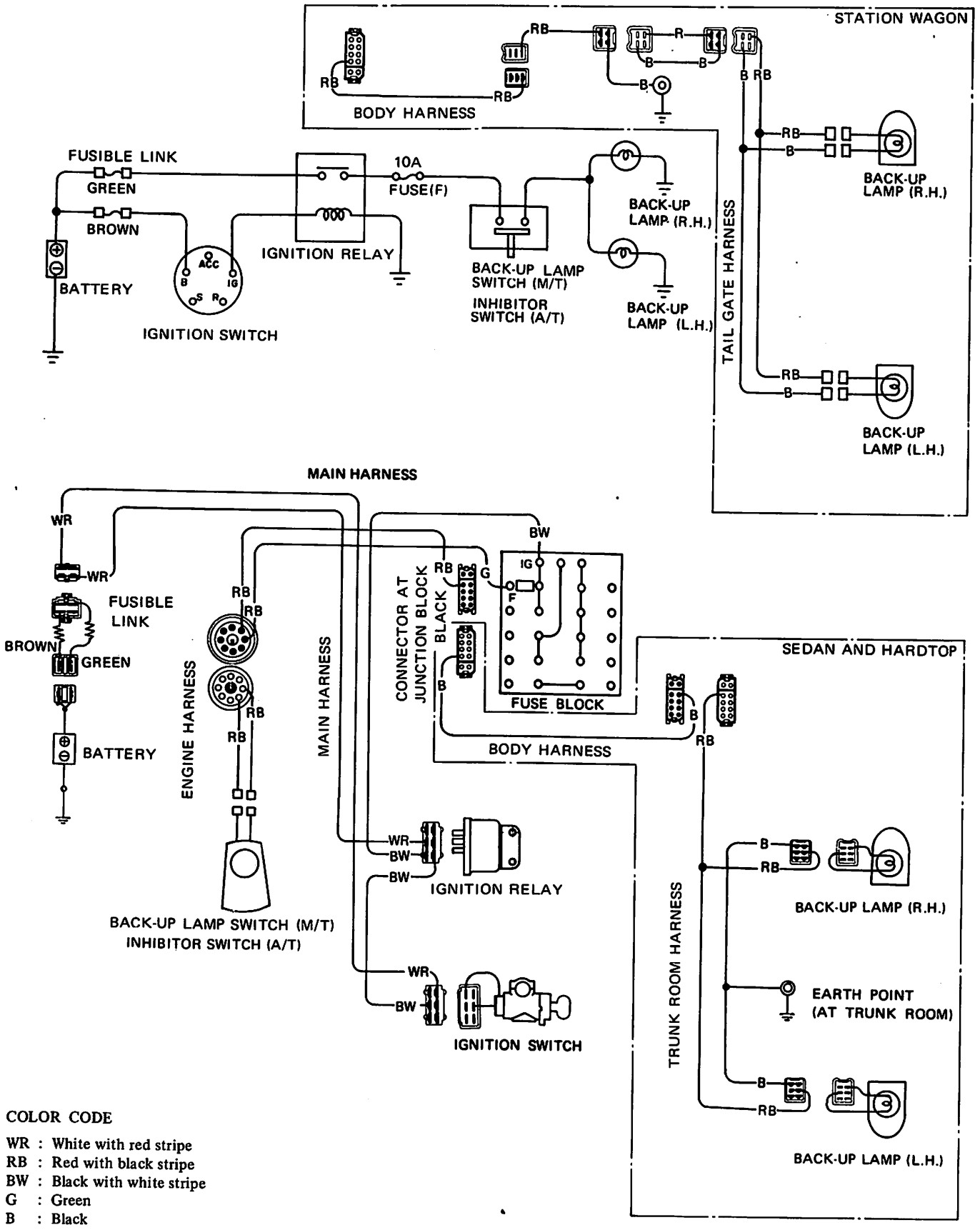
B : Black
W : White
GY : Green with yellow stripe

BE465A

Fig. BE-17 Circuit diagram of stop lamp

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Back-up lamp system



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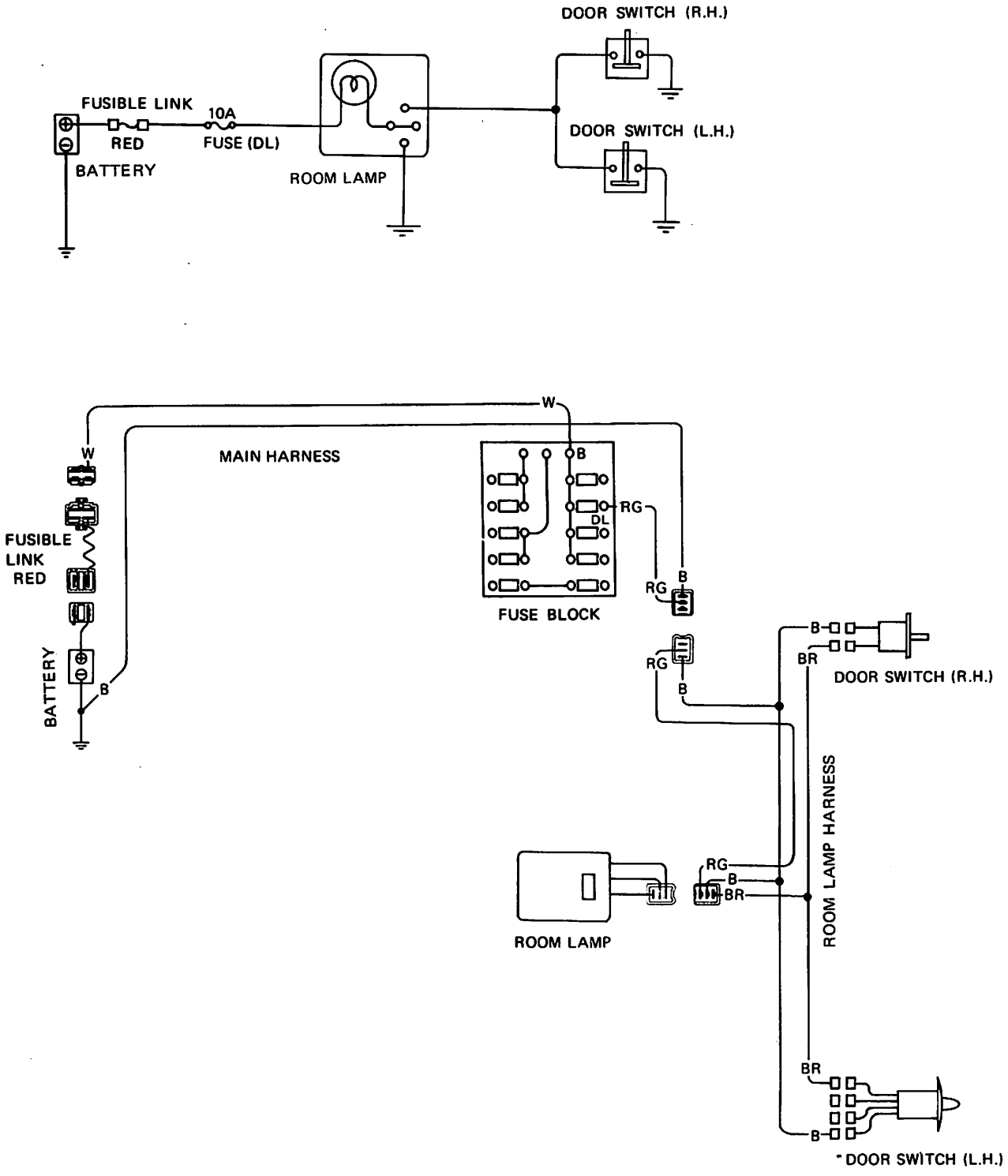
WR : White with red stripe
RB : Red with black stripe
BW : Black with white stripe
G : Green
B : Black

BE466A

Fig. BE-18 Circuit diagram of back-up lamp

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Room lamp



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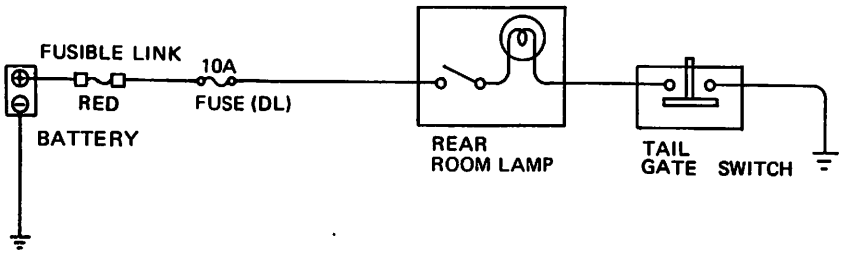
W : White
B : Black
WR : White with red stripe
RG : Red with green stripe
BR : Black with red stripe

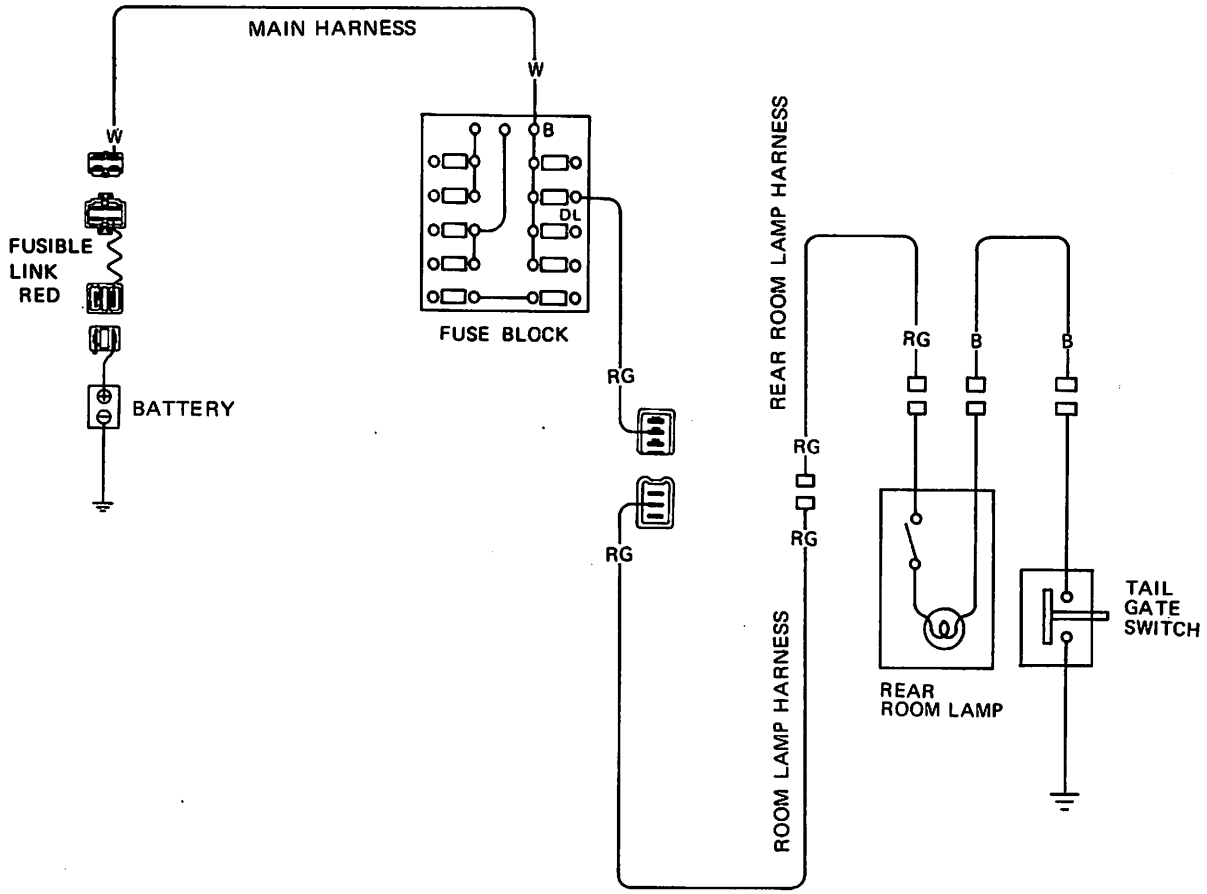
BE467A

Fig. BE-19 Circuit diagram of room lamp

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Rear room lamp (Station Wagon)





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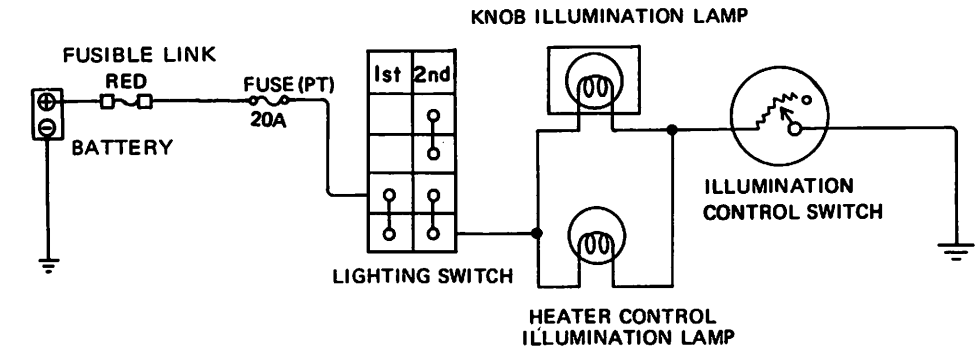
W : White
RG : Red with green stripe
B : Black

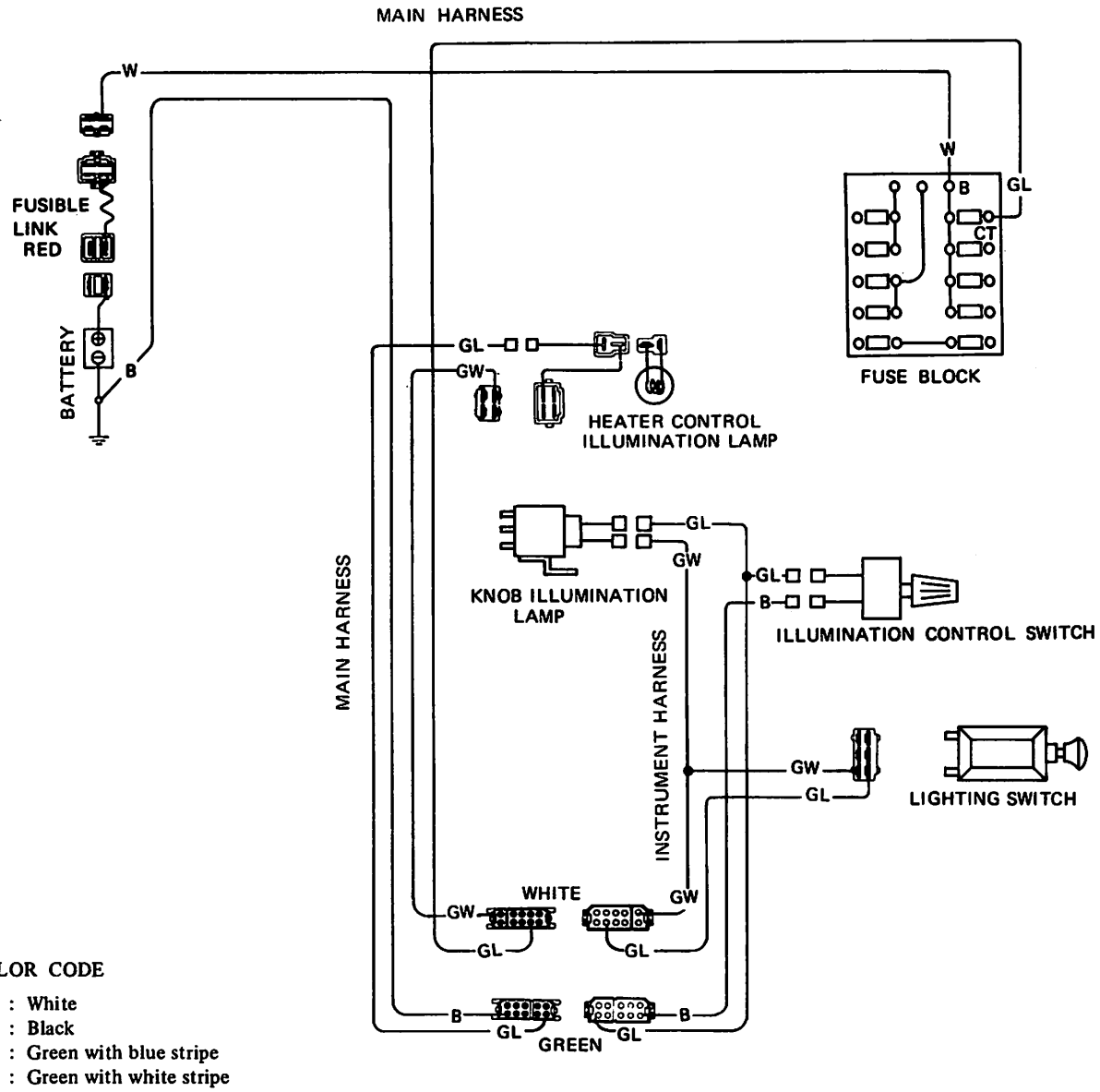
BE468A

Fig. BE-20 Circuit diagram of rear room lamp

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Illumination control system





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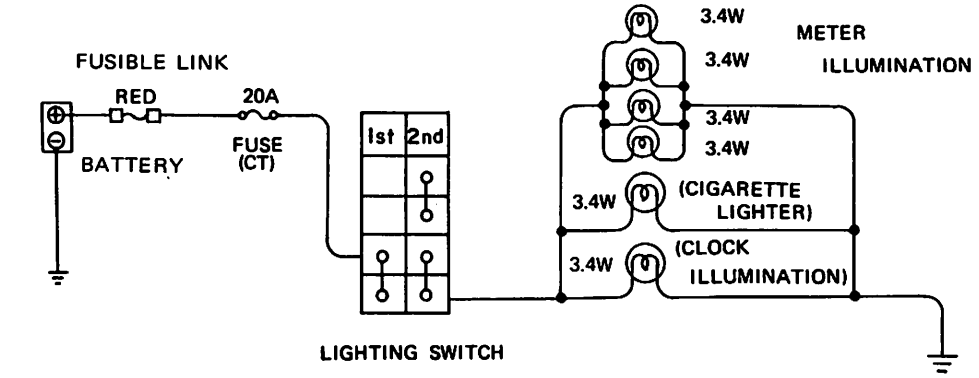
W : White
B : Black
GL : Green with blue stripe
GW : Green with white stripe

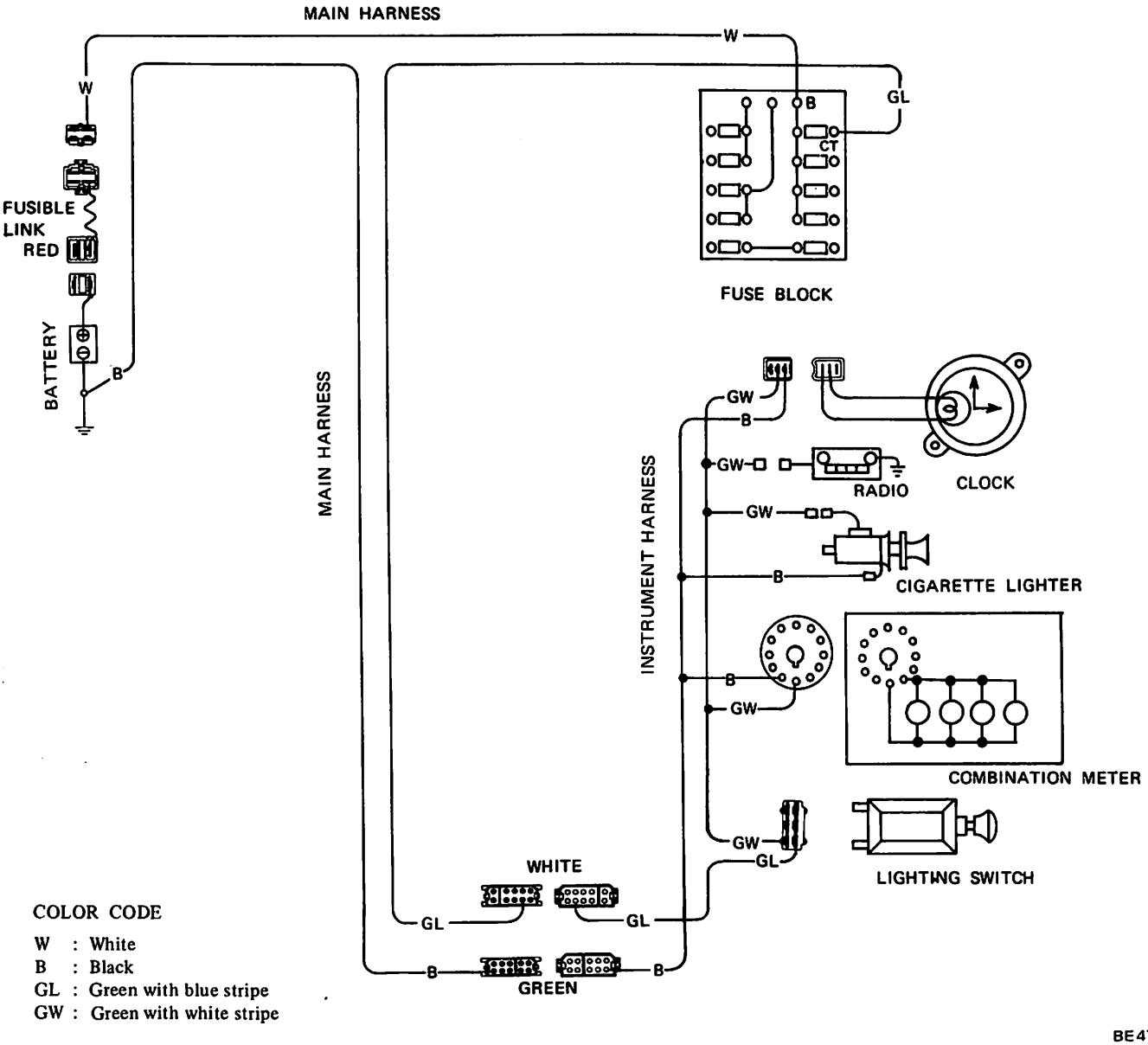
BE469A

Fig. BE-21 Circuit diagram of illumination control system

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Meter and gauge illumination system



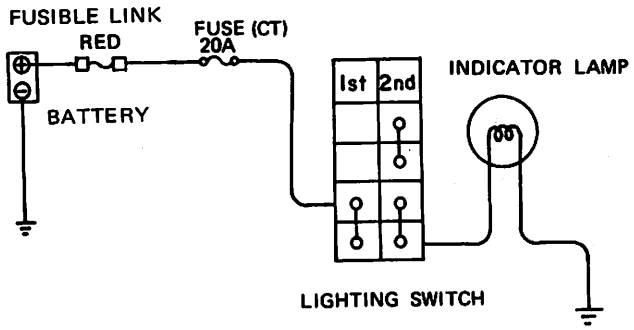


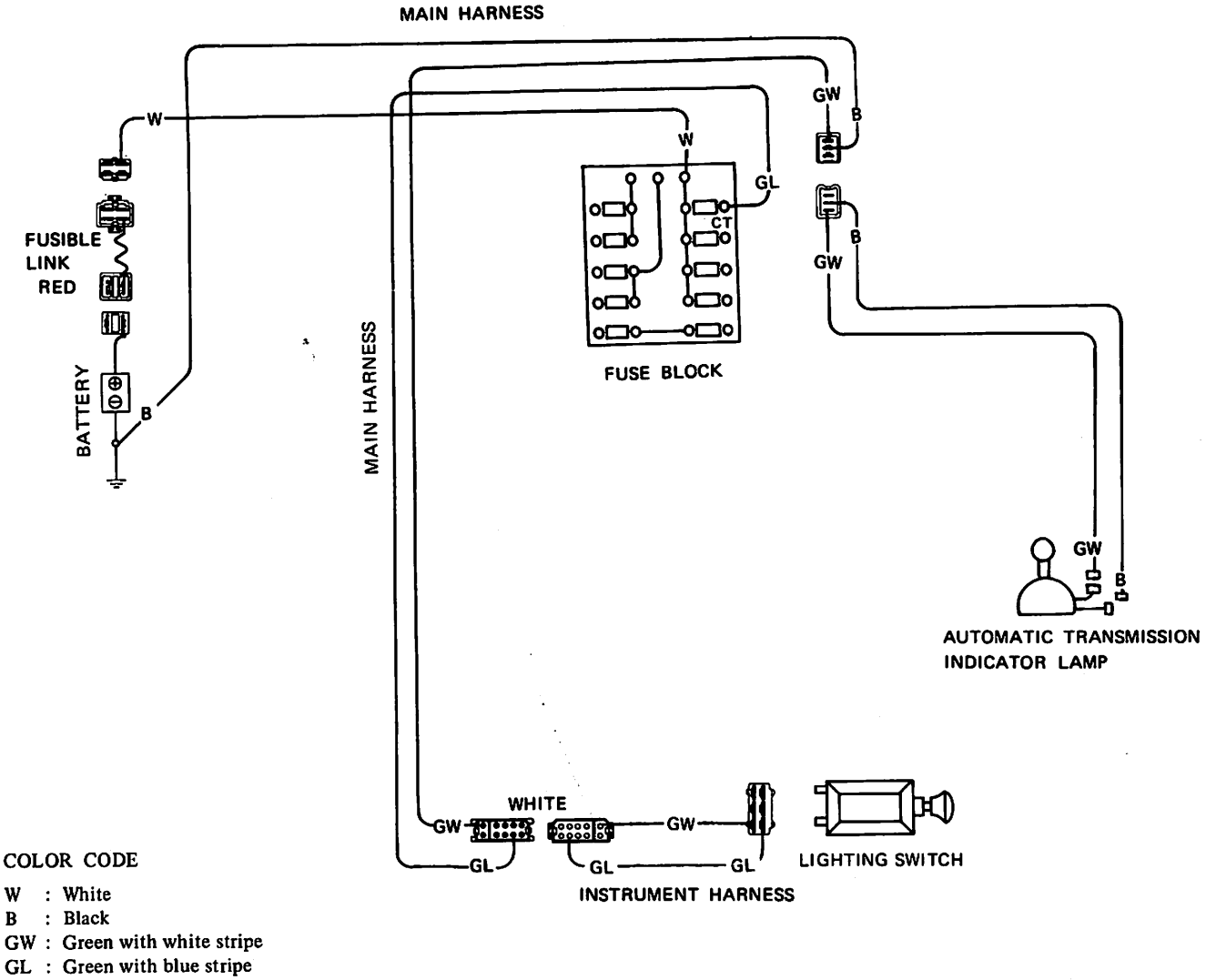
BE470A

Fig. BE-22 Circuit diagram of meter and gauge illumination system

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Automatic transmission indicator lamp (A/T)





BE471A

Fig. BE-23 Circuit diagram of automatic transmission indicator lamp

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HEADLAMP

AIMING ADJUSTMENT

Both vertical and horizontal aiming adjustment can be carried out through the cutting hole of radiator grille.

Adjust the adjusting screw on each upper side of head lamp to adjust vertical aiming and adjust the adjusting screw on each side of head lamp to adjust horizontal aiming as sketched below:

Notes:

Before making head lamp aiming adjustment, observe the following:

a. Keep all tires inflated to correct pressure.

b. Place car and tester on the same flat surface.

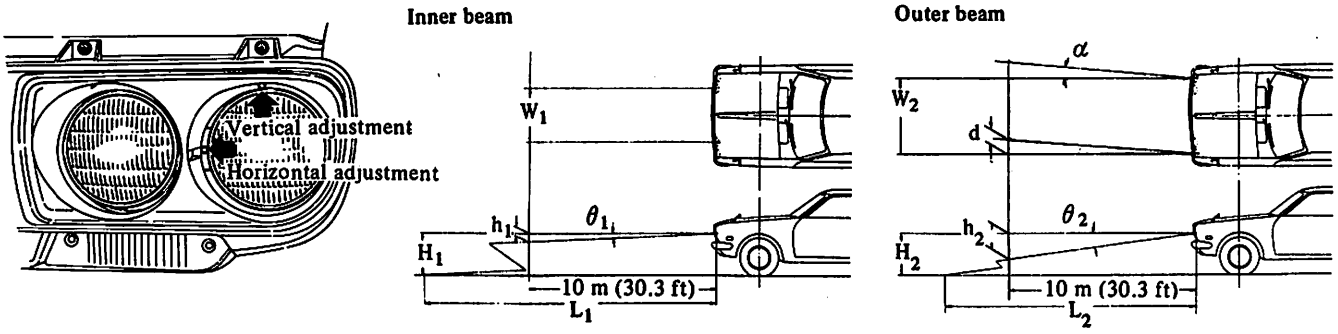
c. See that there is no load in car and that:

1) Gasoline, radiator and engine oil pan are filled up to correct levels.

2) There are no passengers.

When performing head lamp aiming adjustment, use an aiming device, aiming wall screen or head lamp tester. For operating instructions of any aimer, refer to the respective operation manuals supplied with the unit.

Adjust each headlamp beam as shown in Figure BE-24.



Headlight aiming adjustment chart BE514

Model	Item	Inner beam (Type 1)					Outer beam (Type 2)						
		H_1 mm (in)	W_1 mm (in)	θ_1	h_1 mm (in)	L_1 m (ft)	H_2 mm (in)	W_2 mm (in)	θ_2	h_2 mm (in)	L_2 m (ft)	d mm (in)	α
Rigid axle	Sedan and Hardtop	650 (25.6)	810 (31.9)	39′	114 (4.5)	57 (187)	650 (25.6)	1,160 (45.7)	2°09′	375 (14.8)	17 (56)	349 (13.7)	2°
	Station Wagon	663.5 (26.1)	810 (31.9)	28′	81.5 (3.2)	81.5 (267)	663.5 (26.1)	1,160 (45.7)	1°18′	227 (8.9)	29.2 (96)	349 (13.7)	2°

Fig. BE-24 Aiming adjustment

HEADLAMP BEAM REPLACEMENT

1. Remove retaining screws and remove radiator grille.
2. Loosen three head lamp retaining ring screws. It is unnecessary to remove screws. Then, remove retaining ring by rotating it clockwise.

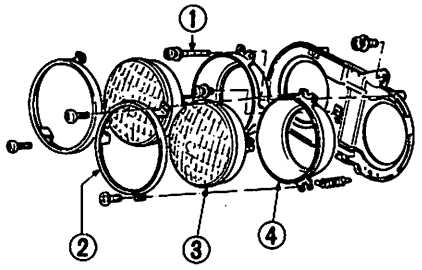
Note: **Be careful not to disturb aiming adjust screws.**

3. After removing headlamp beam from mounting ring, disconnect wiring connector from behind beam.
4. Change headlamp beam and connect wiring connector to new beam.
5. Place headlamp beam in position so that three location tabs behind beam fit in with three hollows on mounting ring. Make sure that the word "Top" on beam lens is on the upper side.
6. Install headlamp retaining ring by rotating clockwise and tighten retaining screws.
7. Place radiator grille in position and tighten retaining screws.

Bulb wattage:

Inner – High beam 37.5W

Outer – Low/High beam 37.5W/50W



1 Aiming adjusting screw
2 Head lamp retaining ring
3 Head lamp beam
4 Head lamp mounting ring

BE244

Fig. BE-25 Headlamp

FRONT COMBINATION LAMP

BULB REPLACEMENT

1. Remove two lens retaining screws and lens.

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2. Push in on bulb, turn it counter-clockwise and remove it from socket.
3. Insert new bulb into socket, press it inward and rotate it clockwise. Make sure that bulb is locked in socket.
4. Place gasket in position and install lens and two retaining screws.

Bulb wattage:
Turn signal/Clearance
..... 27W/8.3W

LAMP ASSEMBLY REPLACEMENT

1. Disconnect lead wires at connector from behind front apron panel.
2. Remove two lens retaining screws on the lens assembly and detach lens assembly.

Lamp assembly can then be taken out.

3. Install new assembly in the reverse sequence of removal.

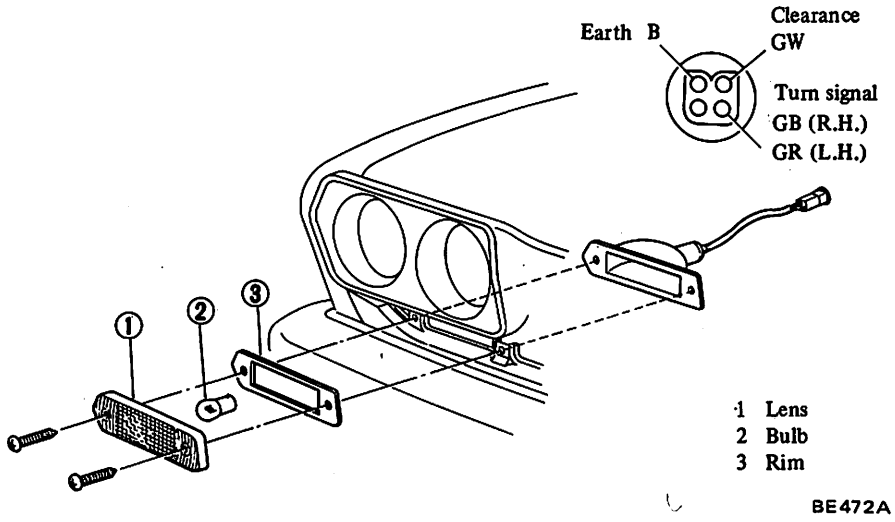


Fig. BE-26 Front combination lamp

SIDE MARKER LAMP

BULB REPLACEMENT

1. Remove two retaining screws and remove lens.
2. Pull bulb out forward from socket.
3. Push new bulb in by pressing it inward.
4. Install packing and lens, then secure two retaining screws.

Bulb wattage:
Side marker lamp
..... 8W

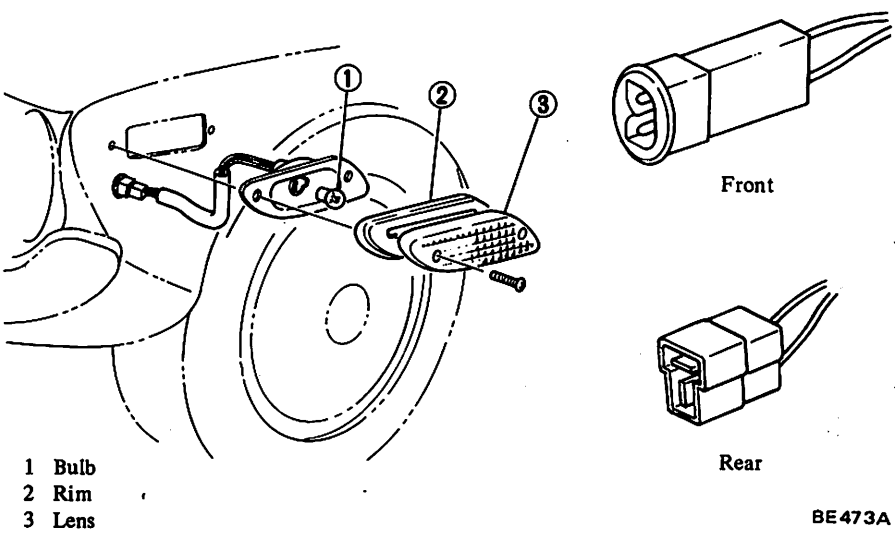


Fig. BE-27 Side marker lamp

LAMP ASSEMBLY REPLACEMENT

To remove lamp body, disconnect two lead wires at connectors behind fender panel. Remove two retaining screws and withdraw lamp body and wire assembly from car

Install new lamp assembly in the reverse sequence of removal.

ROOM LAMP

BULB REPLACEMENT

1. Disconnect battery ground cable.
2. Pull lamp body out of roof.
3. Replace bulb.
4. Install lamp body in the reverse sequence of removal.

LAMP ASSEMBLY REPLACEMENT

1. Disconnect battery ground cable.
2. Pull lamp body out of roof.
3. Disconnect room lamp wires at connector.
4. Install new lamp body in the reverse sequence of removal.

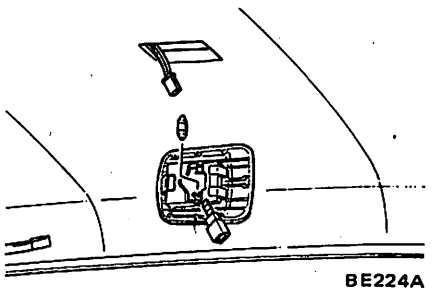


Fig. BE-28 Room lamp

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REAR ROOM LAMP (Station Wagon)

BULB REPLACEMENT

1. Disconnect battery ground cable.
2. Remove lens from lamp housing.
3. Replace bulb.
4. Install lens on lamp housing.
5. Connect battery ground cable.

Bulb wattage:
Rear room lamp 10W

LAMP ASSEMBLY REPLACEMENT

1. Disconnect battery ground cable.
2. Remove lens from lamp housing.
3. Remove two screws and remove lamp body from roof.
4. Disconnect rear room lamp wires at connector.

Rear room lamp body can then be taken out.

5. Install lamp body in the reverse sequence of removal.

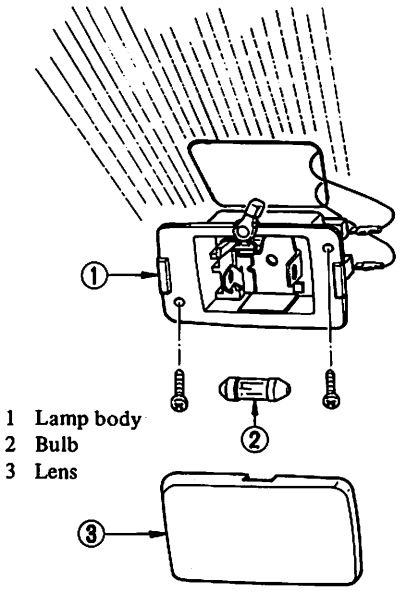


Fig. BE-29 Rear room lamp

REAR COMBINATION LAMP

BULB REPLACEMENT

Sedan and Hardtop models

1. Disconnect battery ground cable.
2. Turn bulb socket counterclockwise in trunk and remove socket with bulb from lamp body.
3. Push in on bulb, turn it counterclockwise and remove it from socket.
4. Insert new bulb into socket, making certain that locking pins in base of bulb are in position. Press bulb inward, rotate it clockwise and lock it in socket.
5. Insert socket into lamp housing with locking tab in proper position. Rotate socket clockwise to lock it in lamp body.

Bulb wattage:
Turn signal lamp 27W
Back-up lamp 27W
Stop/tail lamp
..... 27W/8.3W
Tail .....10W (Hardtop only)

Station Wagon model

1. Remove three retaining screws.
2. Turn bulb socket counterclockwise and remove socket with bulb from trunk.
3. Push in on bulb, turn it counterclockwise and remove it from socket.
4. Insert new bulb into socket, making certain that locking pins in base of bulb are in position. Press bulb inward, rotate it clockwise and lock it in socket.
5. Insert socket into lamp housing with locking tab in proper position. Rotate socket clockwise to lock it in lamp body.
6. Install three retaining screws.

Bulb wattage:
Stop/tail lamp 27/8.3W
Turn signal lamp 27W

LAMP ASSEMBLY REPLACEMENT

Sedan models

1. Disconnect wiring assembly at connector in the trunk.
2. Remove seven tapping screws retaining lamp body on rear panel from the trunk.

Lamp body assembly can then be taken out.

3. Install new lamp assembly in the reverse sequence of removal.

Hardtop models

1. Disconnect wiring assembly at connector of trunk room harness.
2. Remove six flange nuts fastening lamp body to rear panel from inside of trunk.
3. Remove lamp bracket through trunk. Lamp body assembly can then be taken outside.
4. Install new lamp body assembly in the reverse sequence of removal.

Station Wagon model

1. Remove three retaining screws.
2. Turn bulb socket counterclockwise and remove socket with bulb from lamp body.

Then, replace lamp body.

3. Insert socket into lamp housing with locking tab in proper position. Rotate socket clockwise to lock it in new lamp body.
4. Install three retaining screws.

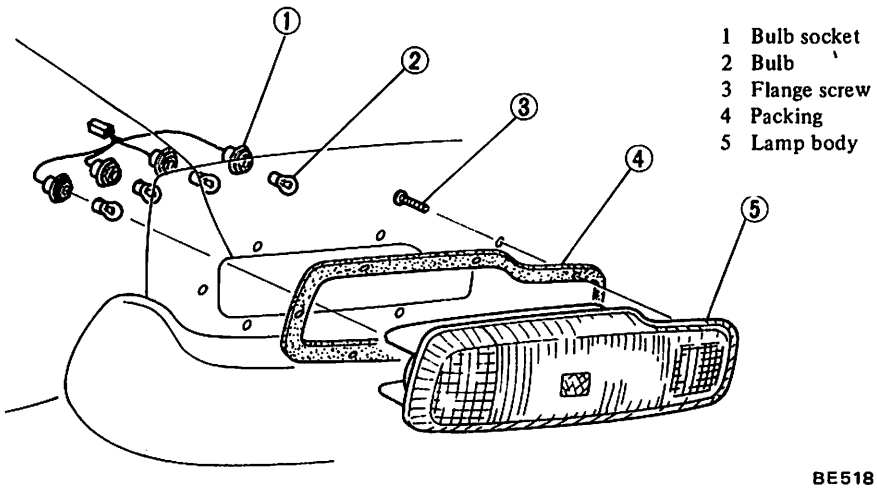


Fig. BE-30 Rear combination lamp (Sedan)

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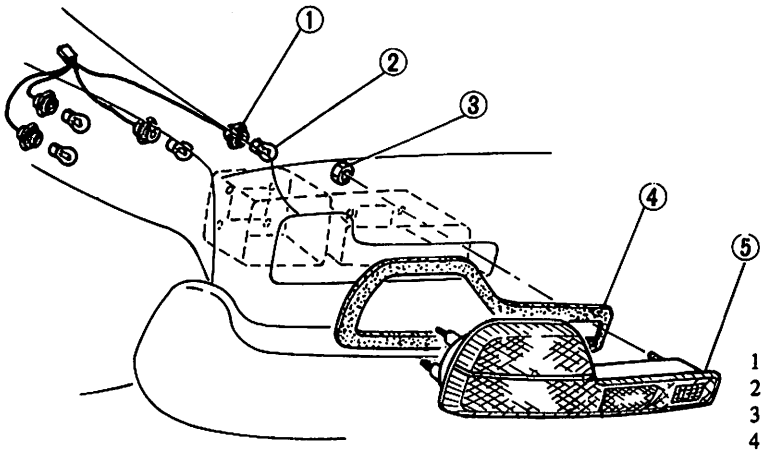


Fig. BE-31 Rear combination lamp (Hardtop)

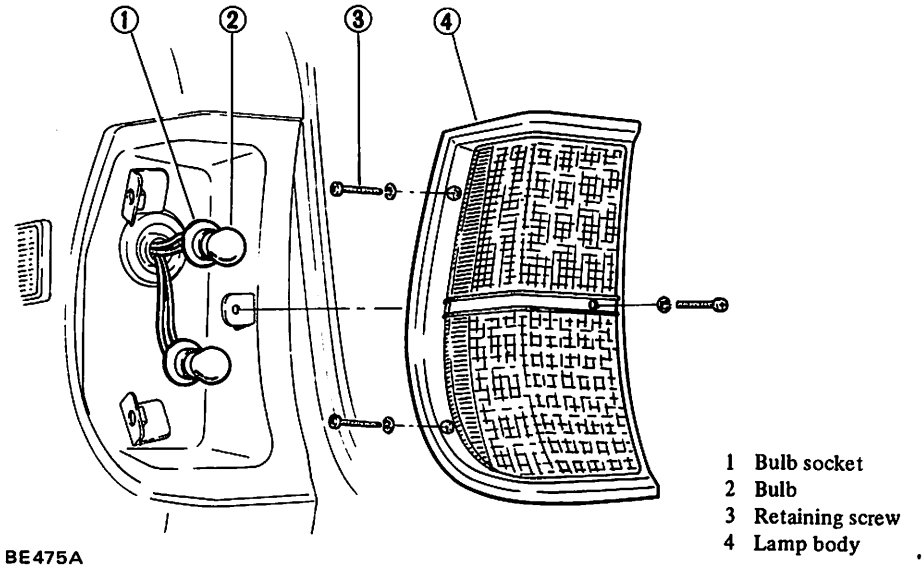


Fig. BE-32 Rear combination lamp (Station Wagon)

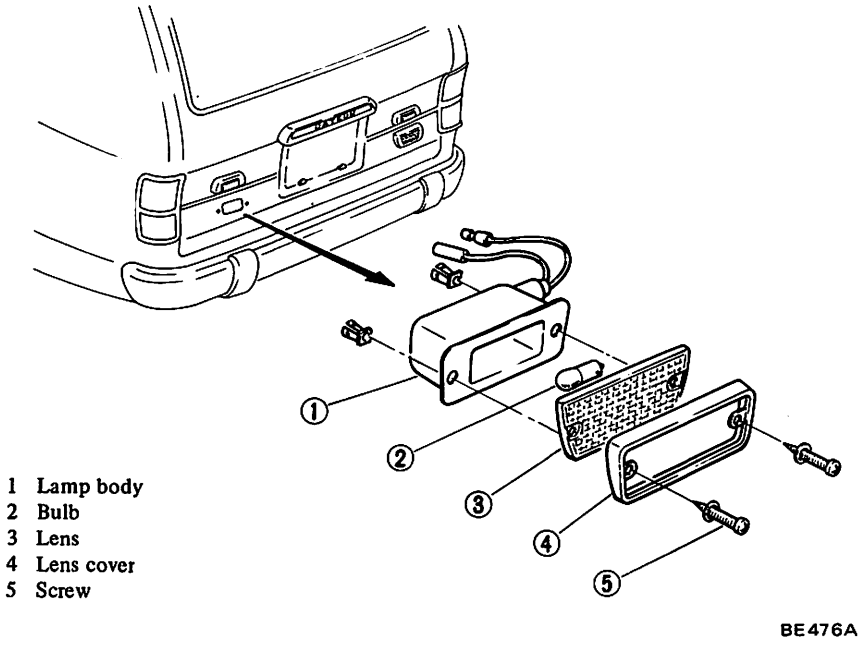


Fig. BE-33 Back-up lamp (Station Wagon)

BACK-UP LAMP (Station Wagon)

BULB REPLACEMENT

1. Remove two lens cover retaining screws.
2. Remove lens cover, lens and packing.
3. Replace bulb.
4. Install packing, lens and lens cover in the reverse sequence of removal.

Bulb wattage:

Back-up lamp 27W

LAMP BODY REPLACEMENT

1. Remove two retaining screws and remove lamp assembly from tail gate panel.
2. Disconnect lead wire at connector.

Lamp body can then be taken out.

3. Install new lamp body in the reverse sequence of removal.

LICENSE LAMP (Sedan and Hardtop)

BULB REPLACEMENT

1. Remove two screws at the top of lamp cover and remove lamp cover.
2. Push in on bulb and turn it counterclockwise. Bulb can then be taken out from socket.
3. Insert new bulb into socket, press it inward and rotate it clockwise. Make sure that bulb is locked in socket.
4. Install lamp cover in the reverse sequence of removal.

Bulb wattage:

License lamp 7.5W

LAMP ASSEMBLY REPLACEMENT

1. Disconnect license lamp lead wires at connector. Connector is located inside trunk room.
2. Remove two nuts retaining license lamp to body from trunk room. License lamp assembly can then be easily taken out.
3. Install license lamp assembly in the reverse sequence of removal.

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LICENSE LAMP (Station Wagon)

BULB REPLACEMENT

1. Remove two screws.
2. Remove lens and packing.
3. Push in on bulb and turn it counterclockwise.

Bulb can then be taken out from socket.

4. Insert new bulb into socket, press it inward and rotate it clockwise. Make sure that bulb is locked in socket.
5. Install packing and lens in the reverse sequence of removal.

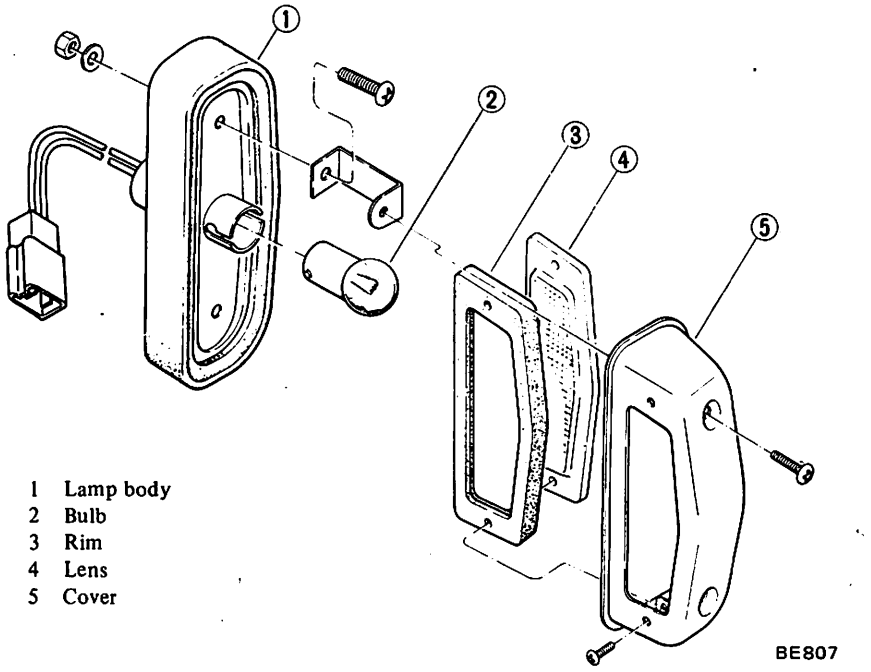
Bulb wattage:
License lamp 7.5W

LAMP ASSEMBLY REPLACEMENT

1. Disconnect battery ground cable.
2. Remove tail gate trim, referring to Section BF.
3. Disconnect license lamp lead wires at connector.
4. Remove two flange nuts retaining license lamp assembly from inside of tail gate.

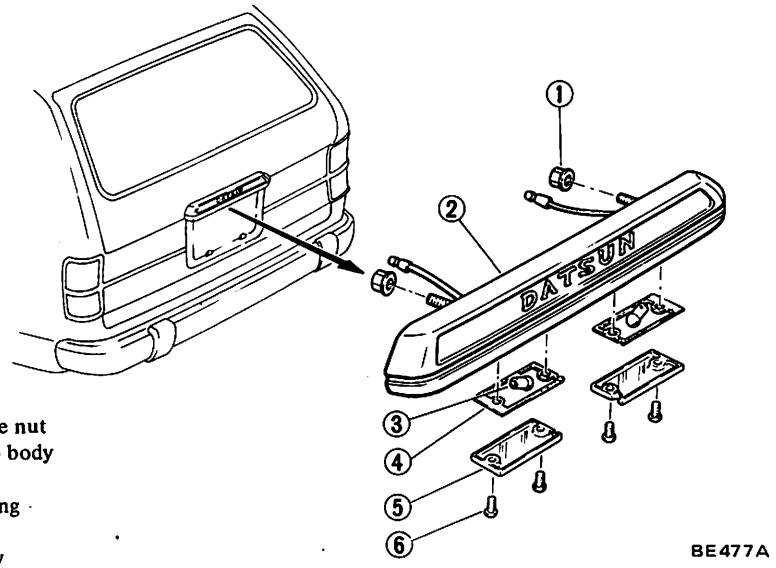
License lamp assembly can then be taken out easily.

5. Install license lamp assembly in the reverse sequence of removal.



1 Lamp body
2 Bulb
3 Rim
4 Lens
5 Cover

Fig. BE-34 License lamp (Sedan and Hardtop)



1 Flange nut
2 Lamp body
3 Bulb
4 Packing
5 Lens
6 Screw

Fig. BE-35 License lamp (Station Wagon)

IGNITION SWITCH

The ignition switch is installed on the bottom of steering lock. For information on engine electrical system, refer to Section EE.

REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Remove screws retaining shell covers to each other.
3. Remove shell covers and disconnect lead wires at connector.
4. Remove small screw retaining switch body to steering lock. Switch assembly can be easily taken out.
5. Install new ignition switch in the reverse sequence of removal.

INSPECTION

Test continuity through ignition switch at each step by using ohmmeter or test lamp. See Figure BE-36.

IGNITION RELAY

The ignition relay is located on the right side trim as shown in Figure BE-37.

REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Remove two relay retaining screws.
3. Disconnect ignition relay connector.

Ignition relay can then be taken out.

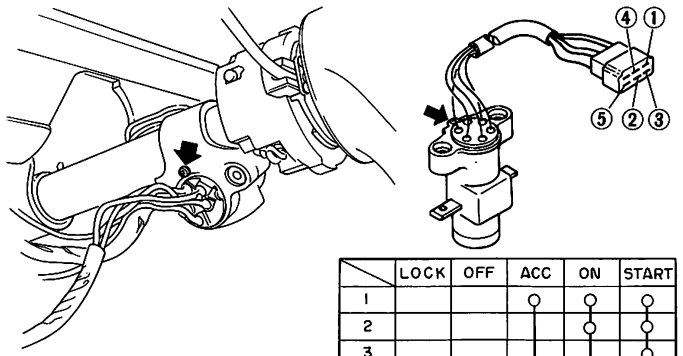
4. Install ignition relay in the reverse sequence of removal.

INSPECTION

Inspect operation of ignition relay, referring to the circuit diagram.

There should exist continuity between ① -Case and ④ -Case. Continuity should exist between ② - ③ when a 12-volt is applied to ① -Case, and also between ⑤ - ⑥ when a 12-volt is applied to ④ -Case.

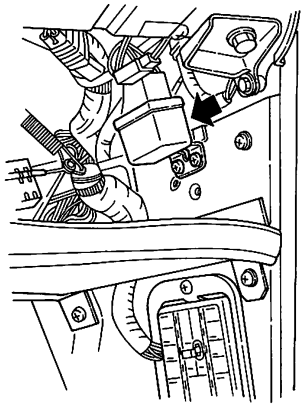
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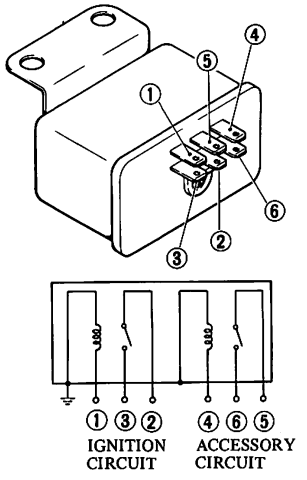


	LOCK	OFF	ACC	ON	START
1			○	○	○
2			○	○	○
3					○
4			○	○	
5					○

BE478A

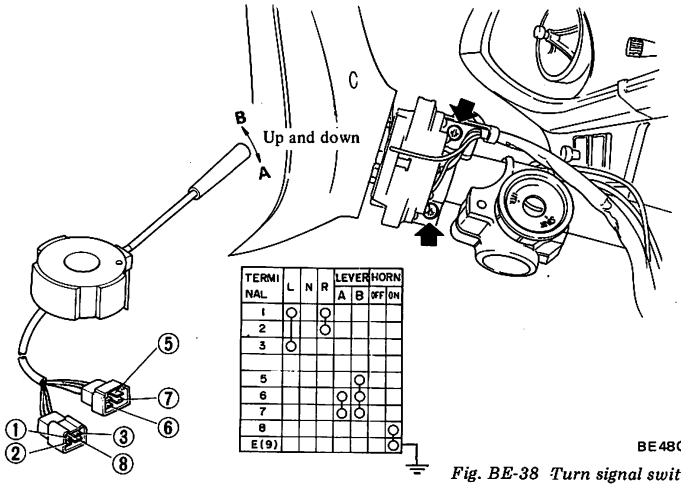
Fig. BE-36 Ignition switch





BE479A

Fig. BE-37 Ignition relay



TERMINAL	L	N	R	LEVER A	LEVER B	HORN OFF	HORN ON
1	○		○				
2			○				
3	○						
5					○		
6			○		○		
7			○		○		
8							○
E(9)							○

BE480A

Fig. BE-38 Turn signal switch

TURN SIGNAL SWITCH

The turn signal switch operates as a lane change device. Position the turn signal switch lever at the first stop position in the left or right direction when changing lanes. The turn signal lamps operate until the lever is released. Move the switch up and down direction to switch headlamp between main and dim.

REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Remove steering wheel. Refer to Section ST for detailed instructions.
3. Remove four screws securing shell covers to each other and take out shell covers.
4. Disconnect turn signal switch wires at two connectors.
5. Loosen two screws holding switch assembly to steering column jacket and remove switch assembly.
6. In installing the turn signal switch, position switch assembly to steering column jacket. Make sure that location tab fits in with hole of steering column jacket. Then tighten two holding screws.
7. Connect turn signal switch wiring assembly at two connectors.
8. Install shell covers.
9. Install steering wheel.
10. Connect battery ground cable.

INSPECTION

Test continuity through turn signal switch by using test lamp or ohmmeter. Refer to continuity diagram of turn signal switch.

LIGHTING SWITCH

REMOVAL AND INSTALLATION

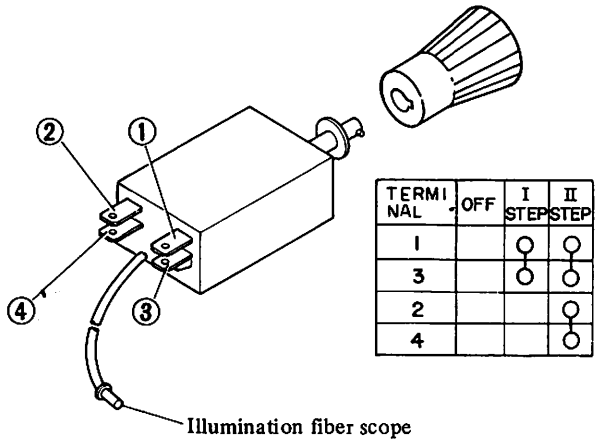
1. Disconnect battery ground cable.
2. Press switch knob in, turn it counterclockwise and pull it out of switch assembly.
3. Unscrew retaining nut.

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4. Reaching up from underneath instrument panel, disconnect lighting switch wiring connector at the back of switch and disconnect knob illumination scope at the cap of illumination lamp. Switch assembly can then be taken out.
5. Install new switch in the reverse sequence of removal.

INSPECTION

Test continuity through lighting switch by using test lamp or ohmmeter. Refer to the continuity diagram of lighting switch.



BE481A

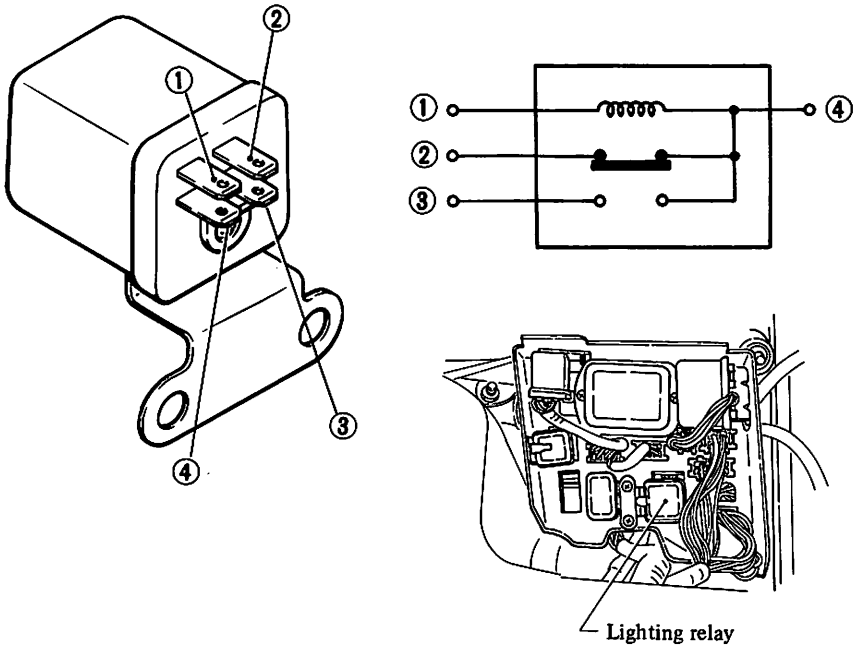
Fig. BE-39 Lighting switch

LIGHTING RELAY

The light relay is a device located on the relay fixing bracket in the engine compartment which changes the electric current for headlight beam from main to dim.

REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Remove two light relay bracket retaining screws on the relay fixing bracket.
3. Disconnect light relay connector. Light relay can then be taken out.
4. Install light relay in the reverse sequence of removal.

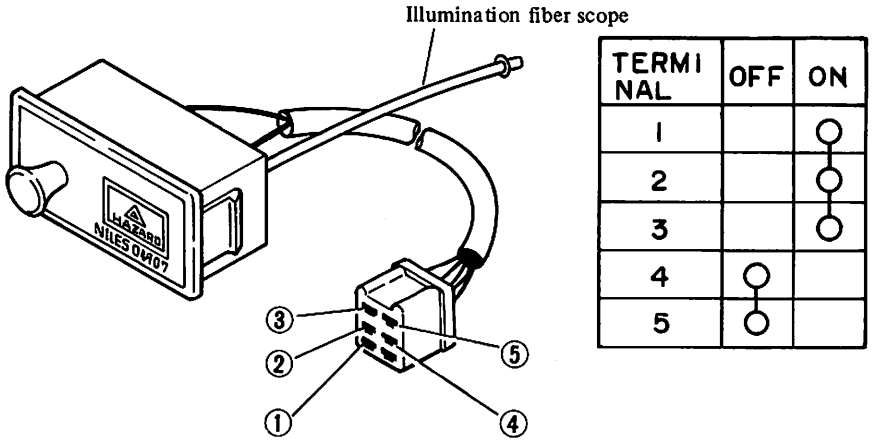


BE482A

Fig. BE-40 Lighting relay

INSPECTION

Inspect the operation of the light relay, referring to the circuit diagram. There exist continuity between ①–④, ④–② ordinarily. But the continuity ④–③ must exist instead of ④–② in giving 12V current to ①–④. Refer to following diagram for lighting relay.



BE483A

Fig. BE-41 Hazard switch

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HAZARD SWITCH

REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Reach up from underneath instrument panel, and disconnect lead wires at connector.
3. Disconnect fiber scope of hazard switch at knob illumination lamp.
4. Remove switch assembly from instrument panel.

Note: The hazard switch body is held by spring pressure against instrument panel.

In case of difficulty in removing, take it out with aid of conventional screwdriver.

5. Install new switch in the reverse sequence of removal.

INSPECTION

Test continuity through hazard switch at each step by using test lamp or ohmmeter. Refer to continuity diagram of hazard switch.

FLASHER UNIT

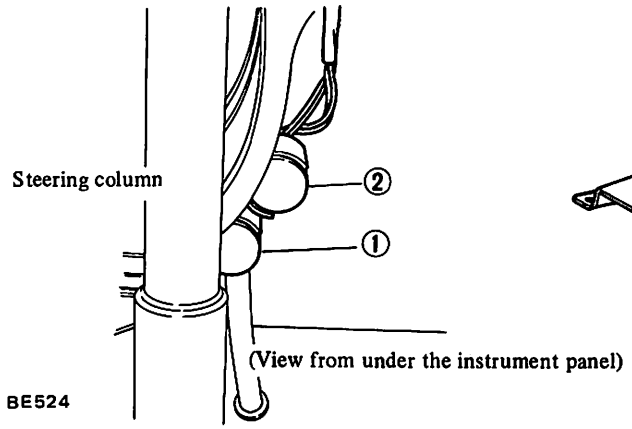
REPLACEMENT

Reach up from underneath instrument panel and remove flasher unit from holder located beside pedal bracket.

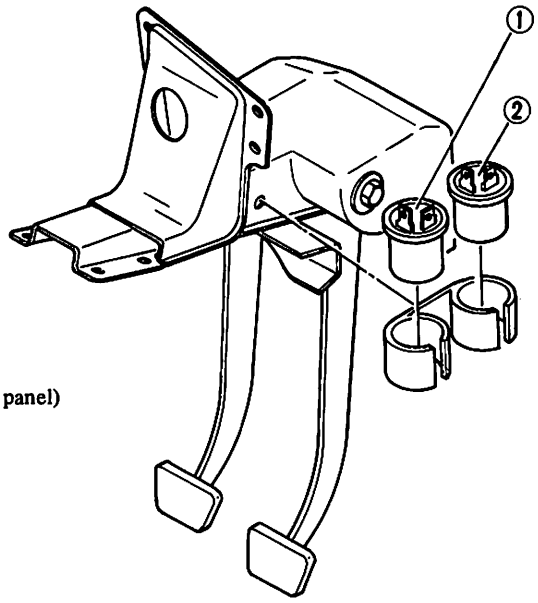
Notes:

a. There are two units. One is for turn signal and the other is for hazard switch. They can be distinguished from each other by colors.
For turn ..... Pink
For hazard ..... Gold

b. Prior to removing hazard flasher unit, be sure to disconnect battery ground cable.



1 Turn signal flasher unit (Pink)
2 Hazard unit (Gold)



1 Flasher unit for hazard
2 Flasher unit for turn signal

Fig. BE-42 Flasher units

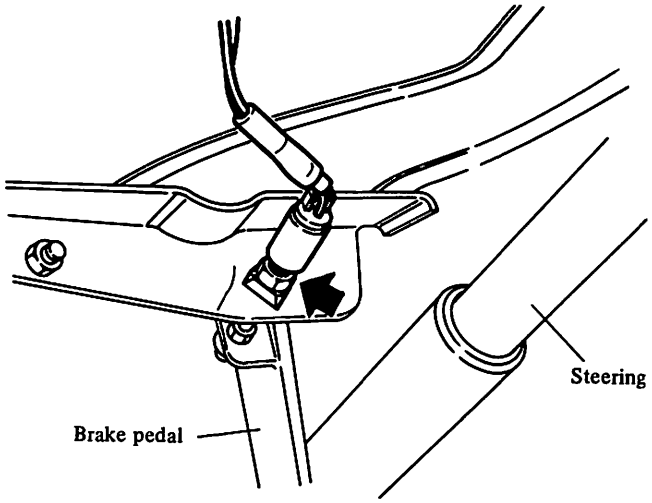


Fig. BE-43 Stop lamp switch

STOP LAMP SWITCH

REMOVAL AND INSTALLATION

Stop lamp switch is integral part to brake pedal height. Refer to Section BR for Adjustment.

1. Disconnect a pair of lead wires for stop lamp switch at connectors.
2. Loosen lock nut and remove stop lamp switch by rotating switch body. It can be then taken out easily.
3. Installation is in the reverse sequence of removal.

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INSPECTION

When plunger is pressed into switch assembly, stop lamp switch contacts are open, contacts are closed with plunger projected.

Therefore test the continuity as described previously by using test lamp or ohmmeter.

REMOVAL AND INSTALLATION

1. Remove rubber fitted around switch at lower pillar.
2. To pull switch assembly out of lower pillar, withdraw switch and wiring assembly and disconnect lead wires at connectors. Prior to performing operations of removal, be sure to disconnect battery ground cable.

Note: It may be difficult to pull out the connector. In such a case, remove inside trim and disconnect connector. Refer to Section BF for Removal.

3. Installation is in the reverse sequence of removal.

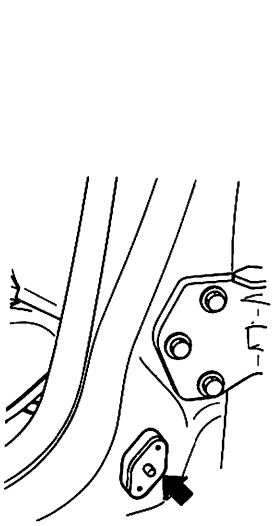
DOOR SWITCH

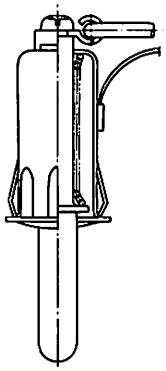
Door switches are installed on either side of center pillar. They differ from each other: The switch for L.H. has four lead wires and one for R.H. has two lead wires.

INSPECTION

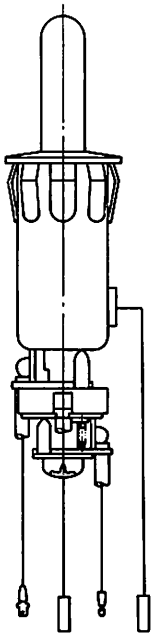
Inspect the continuity through door switch by using test lamp or ohmmeter.

When plunger is pressed into switch assembly, door switch contacts are open. Contacts are closed with plunger projected.





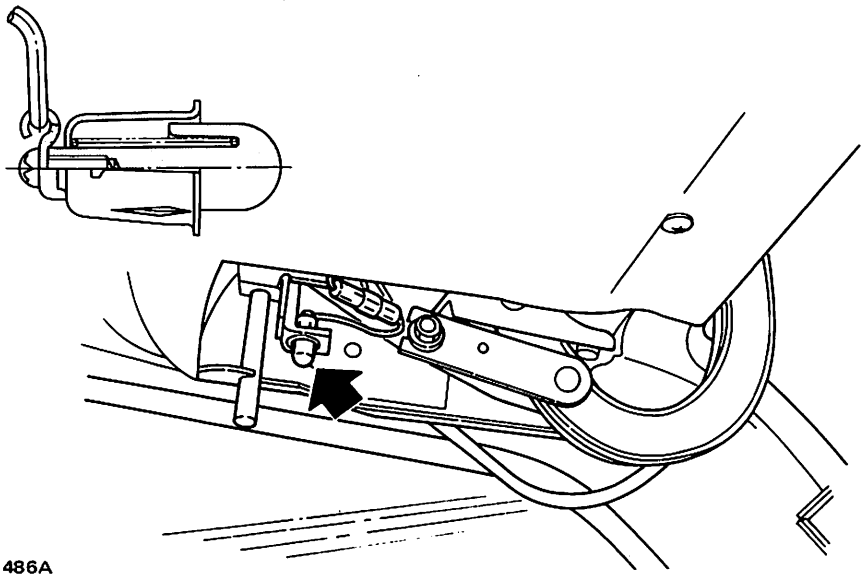
For R.H.



For L.H.

BE485A

Fig. BE-44 Door switch



BE486A

Fig. BE-45 Rear gate switch

TAIL GATE SWITCH (Station Wagon)

Tail gate switch is installed on the right side hinge of the tail gate.

REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Remove three tail gate hinge cover retaining screws and remove tail gate hinge cover.
3. To pull switch assembly out of bracket, withdraw switch and wiring assembly and disconnect lead wire at connector.
4. Installation is in the reverse sequence of removal.

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INSPECTION

Inspect continuity through tail gate switch with a test lamp or ohmmeter.

When plunger is pressed into switch assembly, tail gate switch contact is open. Contact is closed when plunger is projected.

BACK-UP SWITCH

REPLACEMENT

Back-up lamp switch is installed on transmission. On manual transmission, this switch is installed on its rear extension. On automatic transmission, it is an integral part of inhibitor switch. Removal and installation procedures are described in Section TM or AT as applicable.

INSPECTION

When transmission lever is in R position, continuity between two harnesses for back-up lamp switch must exist.

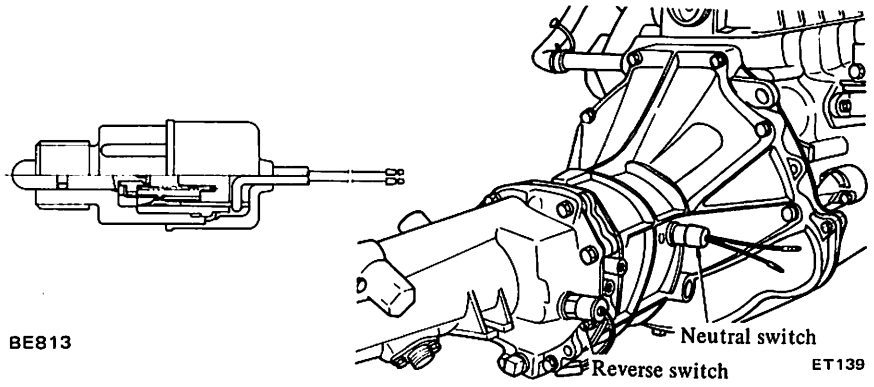


Fig. BE-46 Back-up switch

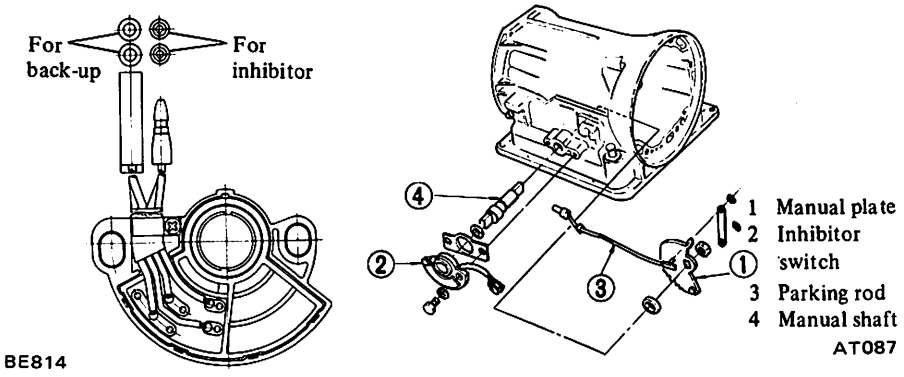


Fig. BE-47 Inhibitor switch

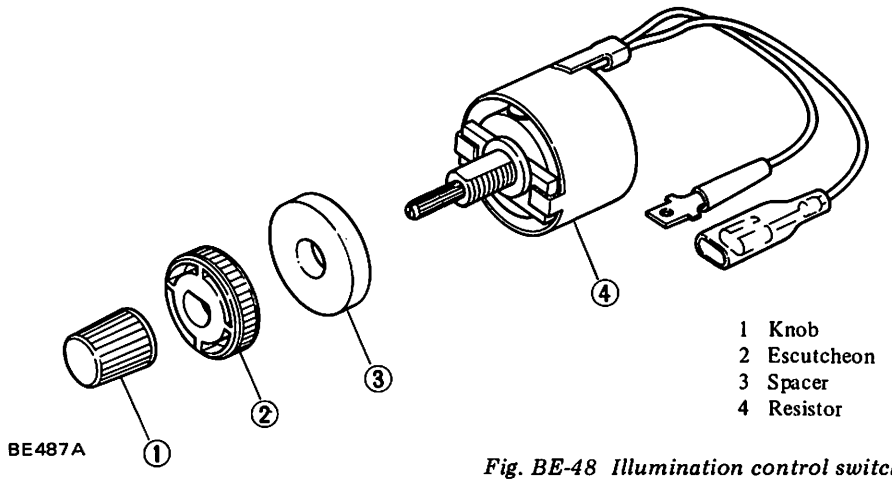


Fig. BE-48 Illumination control switch

ILLUMINATION CONTROL SWITCH

Illumination control switch is a variable resistor and controls the brightness of illumination for hazard switch, switch knobs and heater controls.

REMOVAL AND INSTALLATION

1. Pull out switch knob. Knob can be easily taken out.
2. Remove nut retaining control switch to instrument panel.
3. Reaching up beneath instrument panel and disconnect a pair of lead wires for control switch at connectors. The switch can then be taken out.
4. Installation is in the reverse sequence of removal.

INSPECTION

Test continuity and resistance between two lead wires through control switch. When switch is in OFF position, continuity must not exist. In ON position, the resistance varies from about 0Ω to 8Ω as knob is turned.

AUTOMATIC TRANSMISSION INDICATOR LAMP (A/T model)

The indicator lamp is located in the indicator finisher and illuminates the indicator of select lever. Removal and installation is described in Section BF

BULB REPLACEMENT

1. Remove console box.
2. Remove automatic transmission indicator finisher.
3. Remove socket with bulb from beneath indicator finisher.
4. Remove bulb from socket.
5. Install new bulb in the reverse sequence of removal.

Bulb wattage:

Automatic transmission illumination lamp 3.4W

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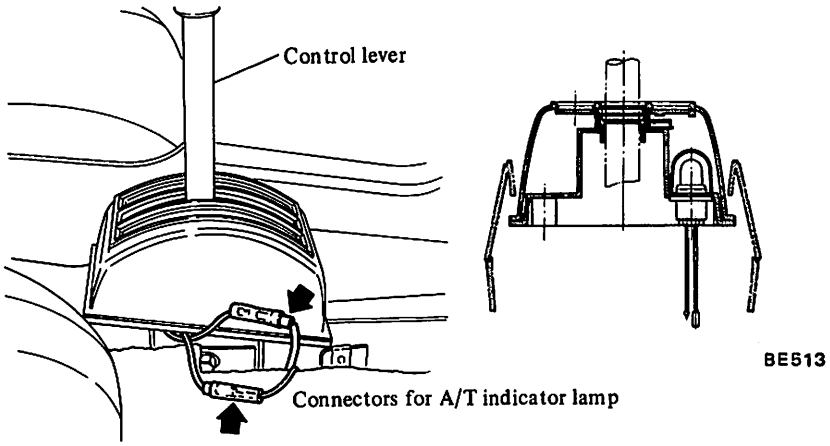


Fig. BE-49 Automatic indicator lamp

KNOB ILLUMINATION LAMP

BULB REPLACEMENT

The illumination lamp is located behind the cluster lid–C of instrument panel. See Figure BE-50.

This lamp illuminates the knob of wiper switch and lighting switch.

The fiber scopes between knobs and cap of illumination lamp, carries the light through its tube with inner reflective wall.

1. Reach up from underneath of instrument panel, and pull out socket with bulb from back of lamp body.
2. Pick up bulb and install a new one.

Bulb wattage:
Knob illumination lamp
..... 3.4W

REMOVAL AND INSTALLATION

1. Pull out fiber scopes from the cap of illumination lamp and disconnect lamp lead wires at connectors.

Note: The fiber scope is installed on the cap by its retainer at the end.

2. Remove knobs on cluster lid–C and remove retaining nuts.
3. Remove two screws retaining cluter lid–C and take out cluster lid–C. (Refer to page BE-45.)
4. Remove a screw retaining knob illumination lamp body to instrument panel. Lamp body can be then taken out.
5. Installation is in the reverse sequence of removal.

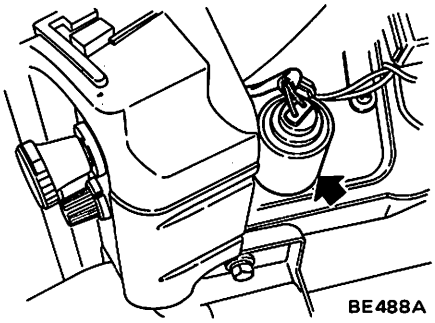


Fig. BE-50 Knob illumination lamp

METER ILLUMINATION LAMP

REPLACEMENT

To replace bulb, reach under instrument panel, turn bulb socket counterclockwise to dismount it from combination meter and remove bulb from socket.

All lamps used in combination meter are a 3.4W, wedge base type. Refer to the following section and Figure BE-58.

TROUBLE DIAGNOSES AND CORRECTIONS

HEAD LAMP

Condition	Probable cause	Corrective action
Head lamps do not light for both high and low beams.	Burnt fusible link (Brown color).	Correct cause and replace fuse.
	Loose connection or open circuit.	Check wiring and/or repair connection.
	Faulty combination switch.	Conduct continuity test and replace if necessary.
	Faulty light relay.	Check light relay for proper operation and replace if necessary.
	No ground.	Clean and tighten ground terminal.
High beam cannot be switched to low beam or vice versa.	Faulty combination switch.	Conduct continuity test and replace if necessary.
	Faulty light relay.	Check light relay for proper operation and replace if necessary.

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Condition	Probable cause	Corrective action
Head lamps dim.	Partly discharged or run-down battery.	Measure specific gravity of electrolyte and recharge or replace battery if necessary.
	Inoperative charging system.	Measure voltage at headlamp terminals. If it is less than 12.8V, check charging system for proper operation.
	Poor ground or loose connection.	Clean and/or tighten.
	Burnt fuse (HL or RL).	Replace.
Head lamp lights on only one side.	Loose head lamp connection.	Repair.
	Faulty headlamp beam.	Replace.

TURN SIGNAL LAMP

Condition	Probable cause	Corrective action.
Turn signals do not operate.	Burnt fuse.	Correct cause and replace.
	Loose connection or open circuit.	Check wiring and/or repair connection.
	Faulty flasher unit.	Replace.
	Faulty turn signal switch.	Conduct continuity test and replace if necessary.
Flashing cycle is too slow (pilot lamp does not go out.), or too fast.	Bulbs of wattage other than that specified is being used.	Replace with one specified.
	Burnt bulbs.	Replace.
	Loose connection.	Repair.
	Faulty flasher unit.	Replace.
Flashing cycle is irregular.	Burnt bulb.	Replace.
	Loose connection.	Repair.
	Bulb of wattage other than that specified is being used.	Replace with one specified.

TAIL LAMP, STOP LAMP AND BACK-UP LAMP

Condition	Probable cause	Corrective action
Both left and right lamps do not light.	Burnt fuse.	Correct cause and replace.
	Faulty stop lamp switch.	Conduct continuity test and replace if necessary.
	Faulty back-up lamp switch. Faulty inhibitor switch.	Conduct continuity test and replace if necessary.
	Loose connection or open circuit.	Check wiring and/or repair connection.
Lamp on only one side lights.	Burnt bulb.	Replace.
	Loose bulb.	Repair lamp socket.

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METER AND GAUGE

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DESCRIPTION

This section includes information on all meters and gauges. Bulbs for indicators or for illumination can be easily replaced by twisting bulb socket. The speedometer indicates vehicle velocity with aid of a pinion gear on transmission and speedometer cable. The tachometer indicates the number of engine revolution with aid of electrical trigger pulse from ignition coil.

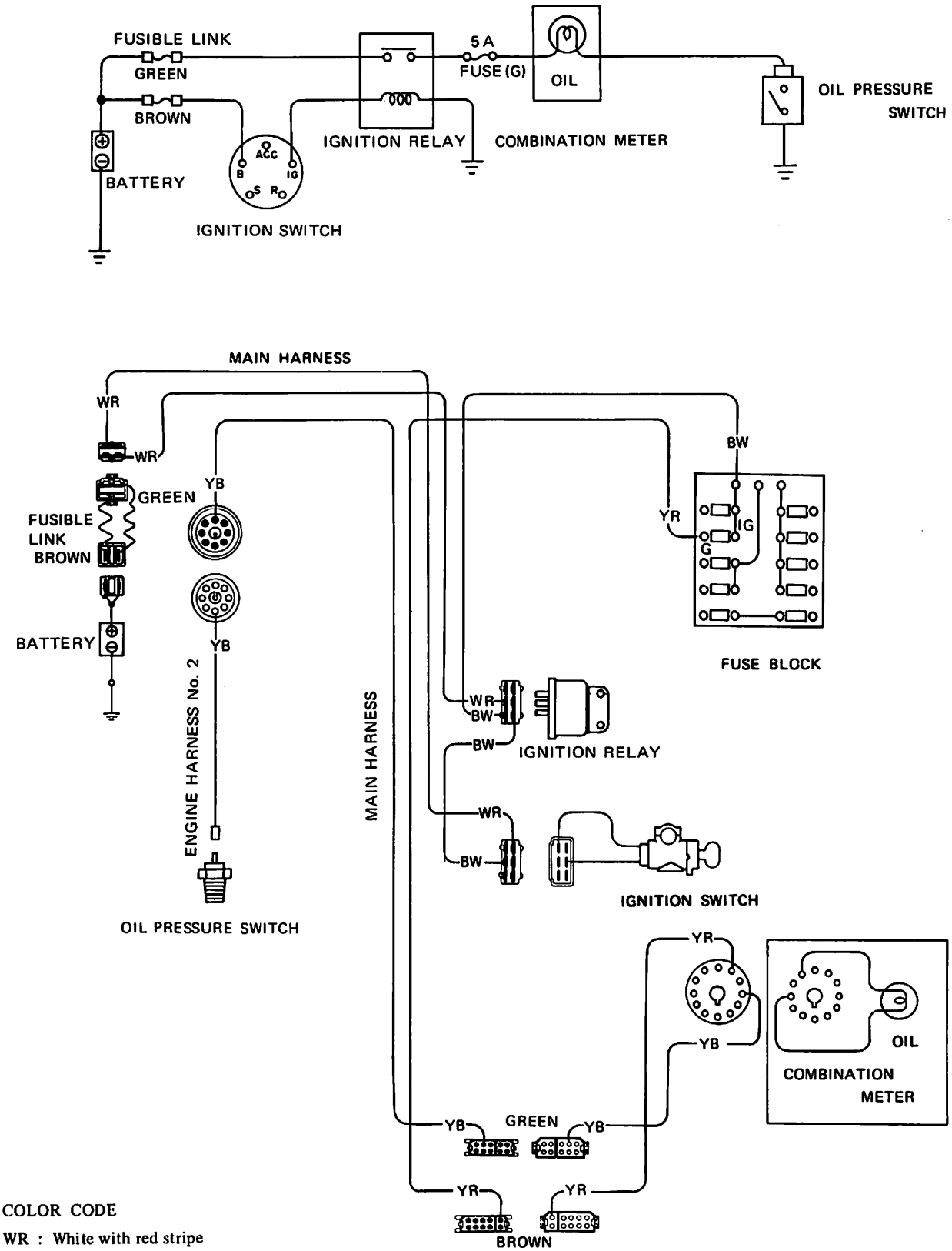
BULB SPECIFICATIONS

Item	Wattage	Type
Combination meter illumination lamp	3.4W	Wedge base type SAE trade number 158
Oil pressure warning lamp	3.4W	
Charge warning lamp	3.4W	
Brake warning lamp	3.4W	
Main beam indicator lamp	3.4W	
Seat belt warning lamp	3.4W	
Catalyzer temperature warning lamp	3.4W	
Floor temperature warning lamp	3.4W	
E.G.R. warning lamp	3.4W	

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CIRCUIT DIAGRAM

Circuit diagram of oil pressure warning lamp system



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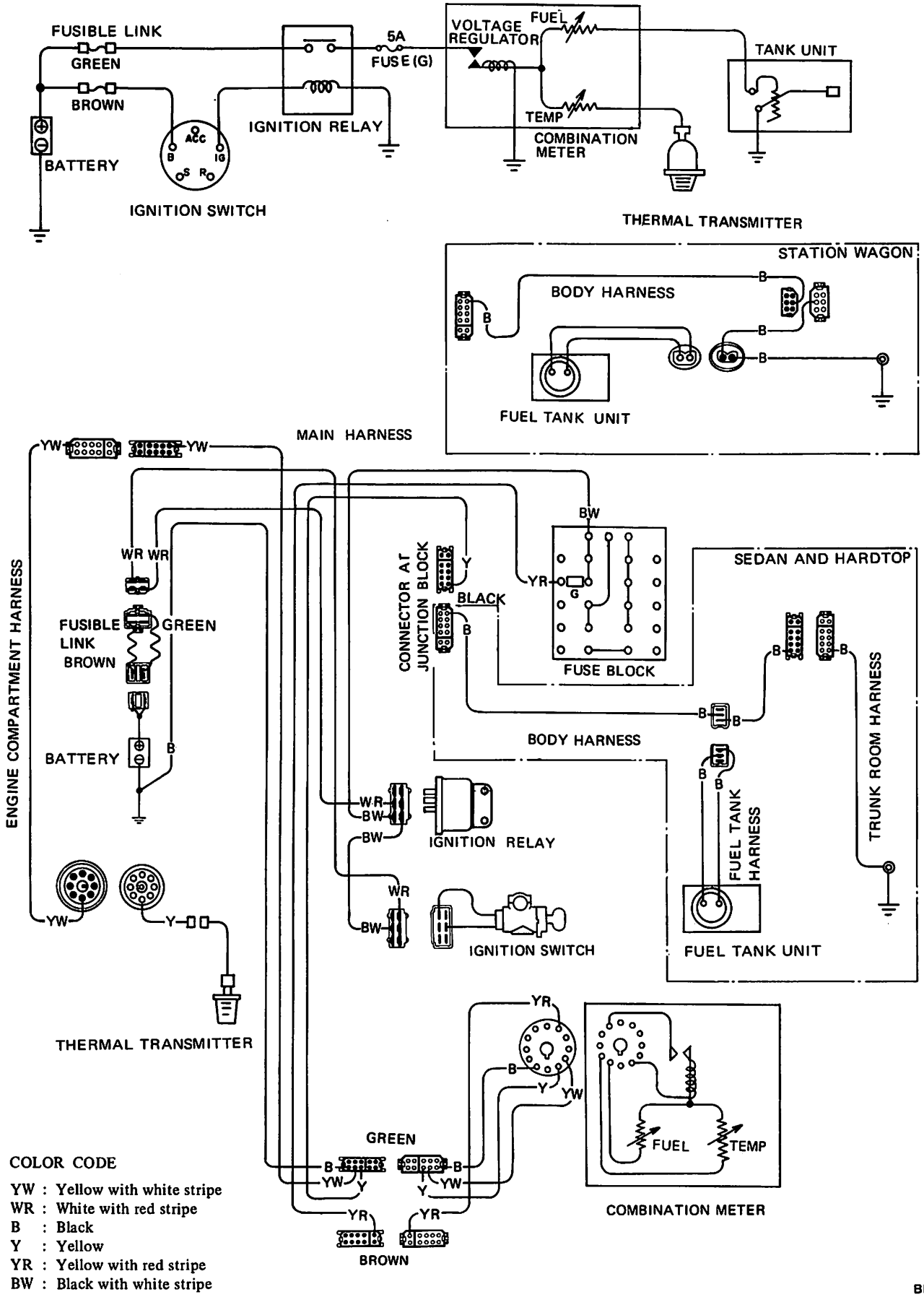
WR : White with red stripe
YB : Yellow with black stripe
BW : Black with white stripe
YR : Yellow with red stripe

BE489A

Fig. BE-51 Circuit diagram of oil pressure warning lamp system

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Circuit diagram of fuel and water temperature gauge

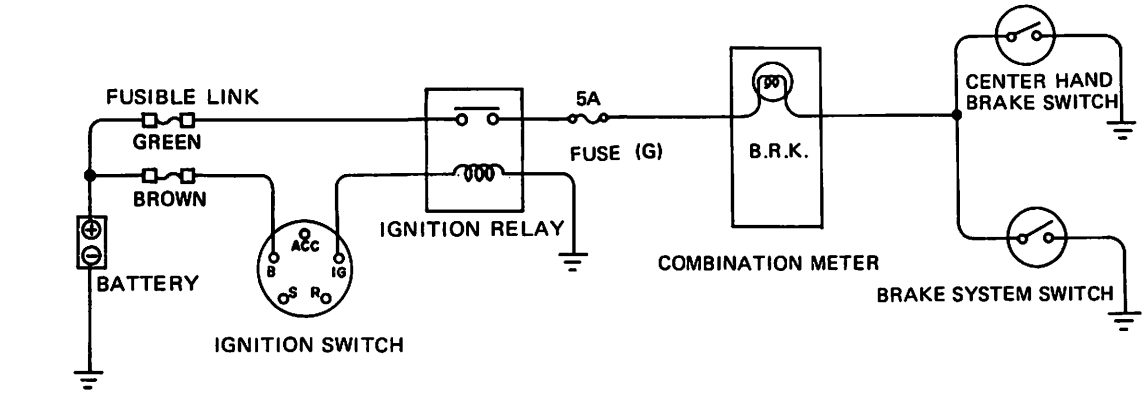


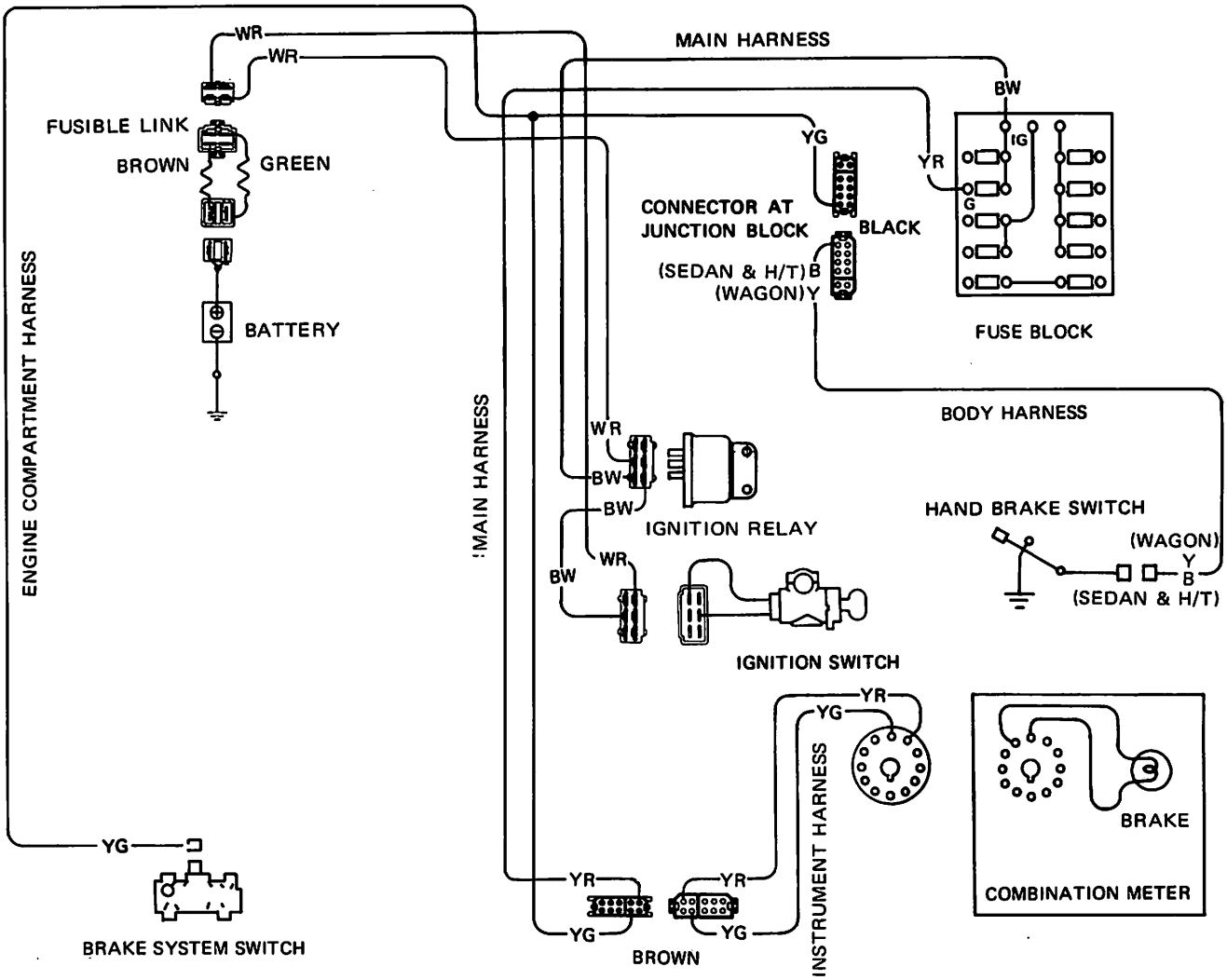
BE490A

Fig. BE-52 Circuit diagram of fuel and water temperature gauge

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Circuit diagram of brake warning lamp system





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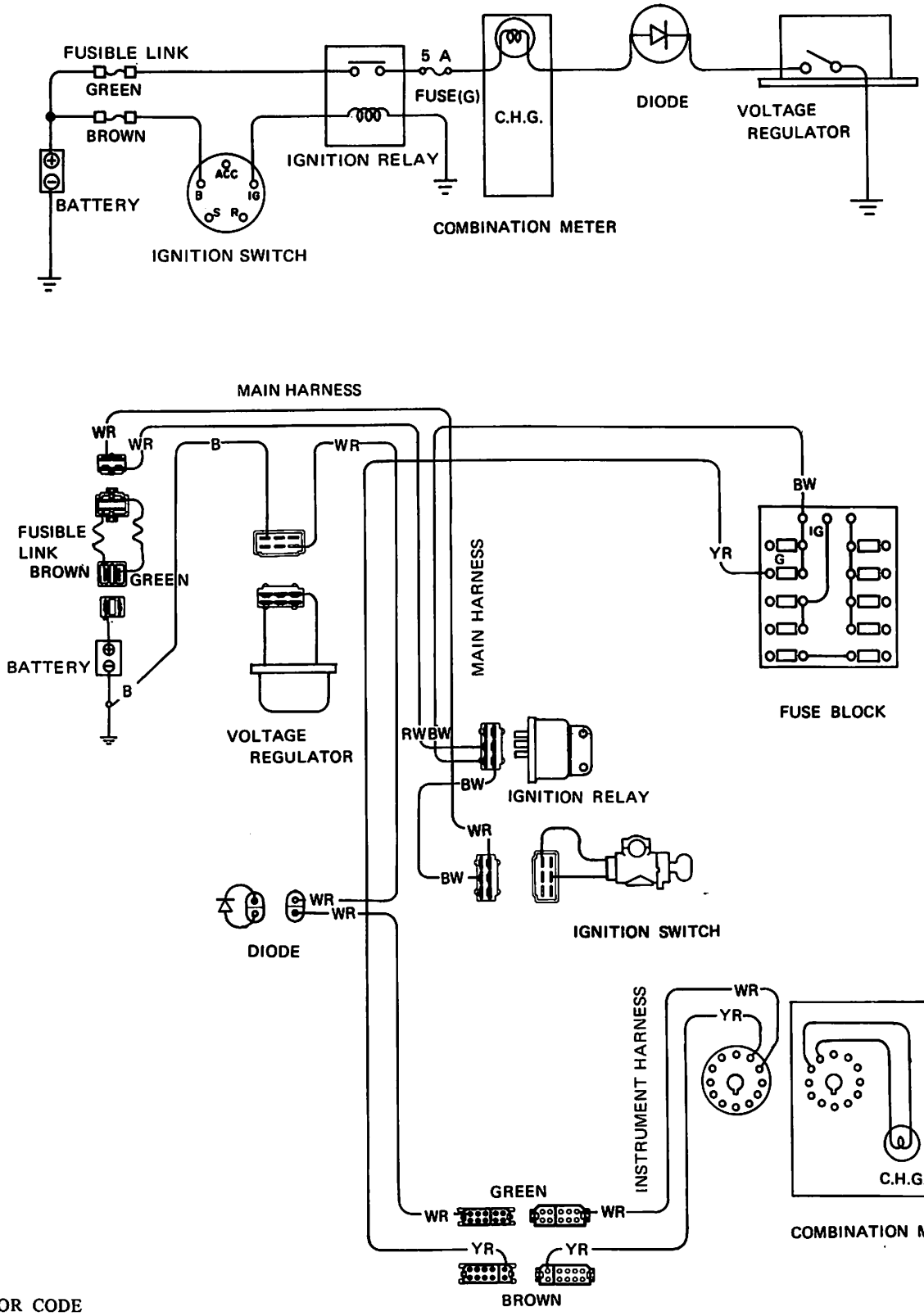
YR : Yellow with red stripe
YG : Yellow with green stripe
WR : White with red stripe
BW : Black with white stripe
Y : Yellow
B : Black

BE491A

Fig. BE-53 Circuit diagram of brake warning lamp system

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Circuit diagram of charge warning lamp



COLOR CODE

YR : Yellow with red stripe
WR : White with red stripe
B : Black
BW : Black with white stripe

BE492A

Fig. BE-54 Circuit diagram of charge warning lamp

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Circuit diagram of catalyzer temperature and floor temperature warning system (California only)

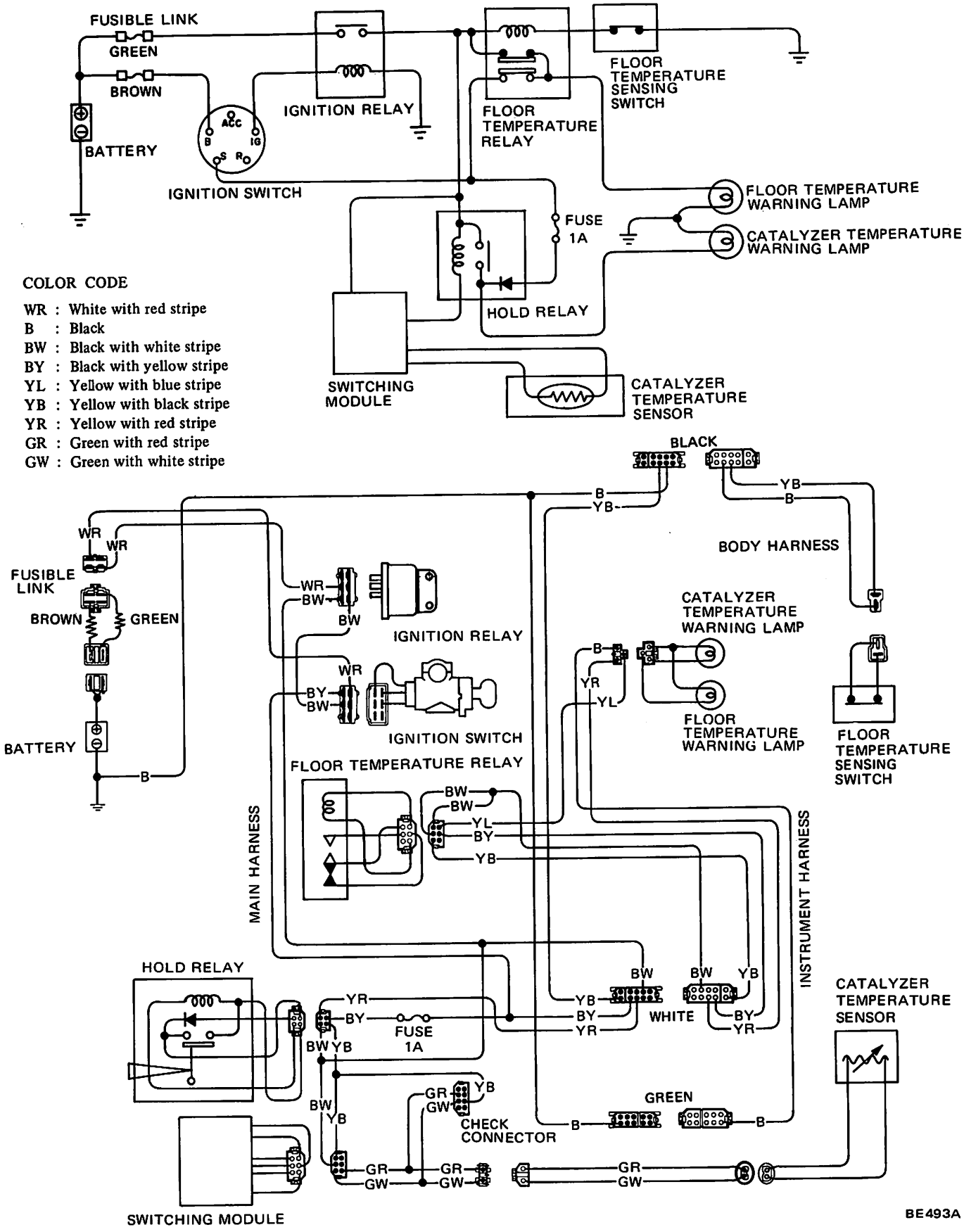
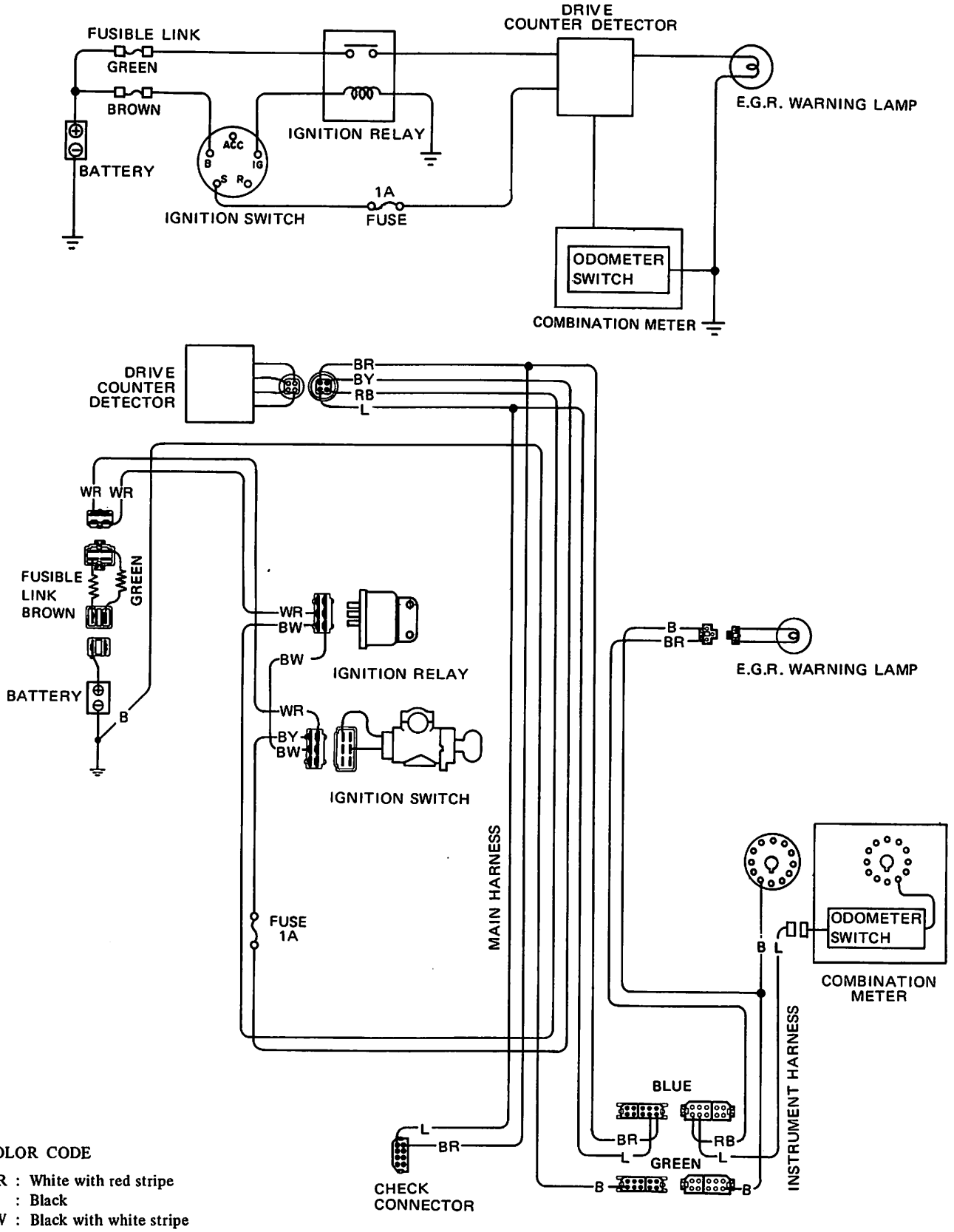


Fig. BE-55 Circuit diagram of catalyzer temperature and floor temperature warning system

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Circuit diagram of E.G.R. warning system (Except California and Canada)



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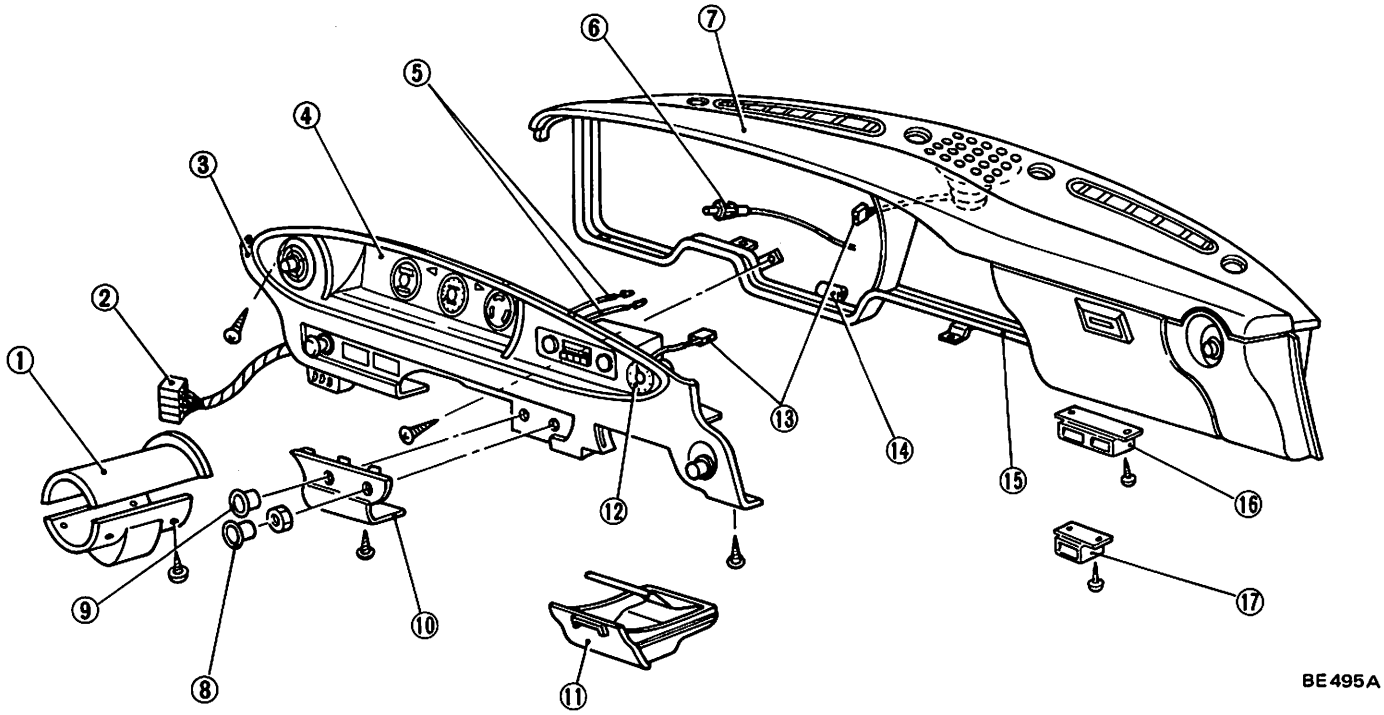
WR : White with red stripe
B : Black
BW : Black with white stripe
BY : Black with yellow stripe
BR : Black with red stripe
RB : Red with black stripe
L : Blue

BE494A

Fig. BE-56 Circuit diagram of E.G.R. warning system

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CLUSTER LID AND COMBINATION METER



1 Shell covers
2 Instrument harness
3 Cluster lid-A
4 Combination meter
5 Illumination fiber scope
6 Speedometer cable
7 Instrument upper pad
8 Wiper and washer switch knob
9 Illumination control switch
10 Cluster lid-C
11 Ash tray (inner case)
12 Clock
13 Speaker harness
14 Illumination bulb
15 Instrument panel
16 Catalyzer and floor temperature warning lamps (California only)
17 E.G.R. warning lamp (Except California and Canada)

Fig. BE-57 Cluster lid

REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Remove four screws securing shell covers and take out shell covers.

Note: To facilitate removal of cluster lid, remove steering wheel and turn signal switch.

Cluster lid-C

3. Remove wiper switch knob and illumination control switch located on cluster lid–C, and unscrew ring nut.
4. Remove two screws retaining cluster lid–C to instrument panel from beneath instrument panel. Cluster lid–C can be then taken out.

Cluster lid-A

5. Draw out ash tray.
6. Disconnect four connectors for instrument harness.

Note: These connectors are located behind left side of instrument panel.

7. Remove ten screws around cluster lid–A.

Note: Five screws are located upper side and three ones are located beneath cluster lid–A. Do not forget to remove two screws located at ash tray cover and behind cluster lid–C.

8. Disconnect speedometer cable, radio speaker harness and antenna feeder cable at connectors.

At the same time, wires to illumination lamp, knob illumination fiber scopes and connector to tachometer must be disconnected.

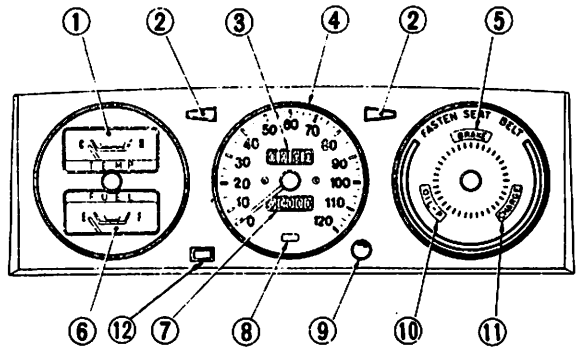
Note: Fiber scopes for wiper switch, hazard switch and lighting switch can be disconnected by pulling them out from cap of illumination lamp.

Combination meter

1. Remove cluster lid–A, referring to the previous section.
2. Disconnect multi-pole connector from lower housing of combination meter and remove odometer knob.
3. Remove six screws securing lower housing to combination meter. Lower housing can then be taken out.
4. Installation is in the reverse sequence of removal.

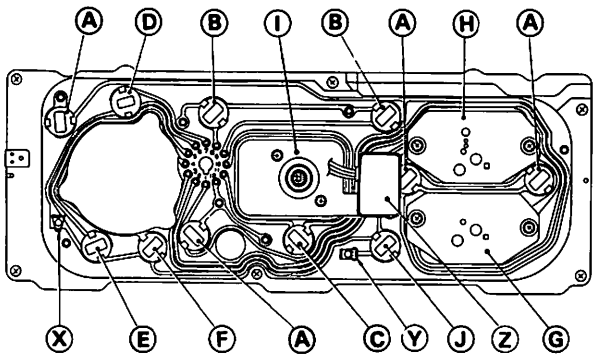
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METER AND GAUGE REPLACEMENT



L.H. drive model

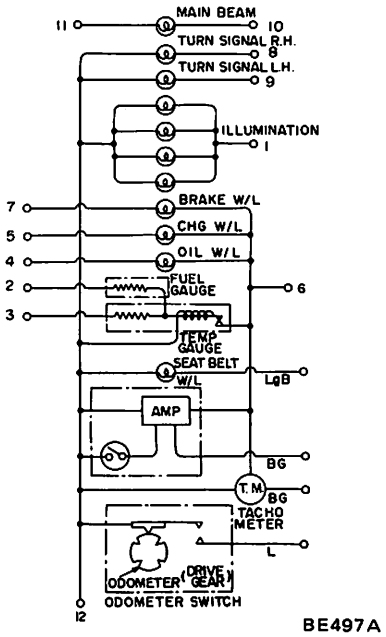
BE496A





1 Water temperature gauge
2 Turn signal pilot lamp
3 Trip meter
4 Speedometer
5 Hand brake warning lamp
6 Fuel gauge
7 Odometer
8 High beam indicator lamp
9 Trip meter re-set control
10 Oil pressure warning lamp
11 Charge warning lamp
12 Seat belt warning lamp

Ⓐ Illumination lamp socket
Ⓑ Turn signal lamp socket
Ⓒ High beam indicator light
Ⓓ Brake warning lamp socket
Ⓔ Charge warning lamp socket
Ⓕ Oil pressure warning lamp socket
Ⓖ Gauge assembly-Fuel
Ⓗ Gauge assembly-Temp
Ⓘ Speedometer
Ⓙ Seat belt warning lamp socket
Ⓧ Terminal for tachometer and speed switch
Ⓨ Terminal for seat belt warning lamp
Ⓩ Meter switch amplifier



BE497A

Fig. BE-58 Combination meter

Speedometer

Remove two screws from behind lower housing, securing speedometer to lower housing.

Speedometer can then be taken out.

Install new speedometer in the reverse sequence of removal.

Fuel, water temperature, oil pressure gauge

Each gauge is attached with two retaining screws. So gauge replacement can be easily carried out by removing the screws from back of lower housing of combination meter.

Illumination, indicator lamp

The bulbs are a wedged base type. To replace them, twist socket and take out socket with bulb. Pick up bulb and install new bulb in the reverse sequence of removal.

Tachometer replacement

Remove three retaining screws from back of lower housing of combination meter. Tachometer assembly can then be taken out easily.

Install new tachometer assembly in the reverse order of removal. There is no difference in removal in models with tachometer and in those without one.

In installing tachometer on a model previously without one, the procedure is the same as described before with the exception of connecting lead wires for tachometer.

Note: Tachometer has three lead wires. Two of them must be connected to X terminal and ground (Combination meter housing). The other one must be connected to tachometer harness from ignition coil.

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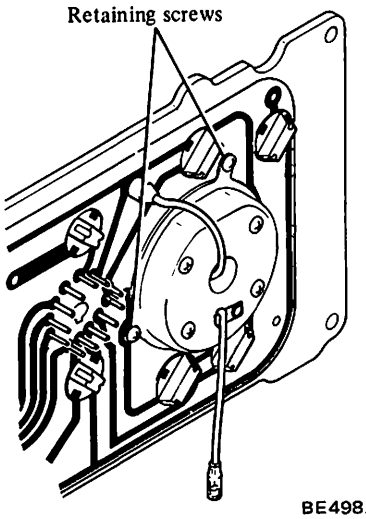


Fig. BE-59 Tachometer

Tachometer harness

Tachometer harness links tachometer to ignition coil and carries trigger pulse to tachometer.

On midway of this harness, a resistor is located. This resistor is 2.2kΩ and is held in a holder.

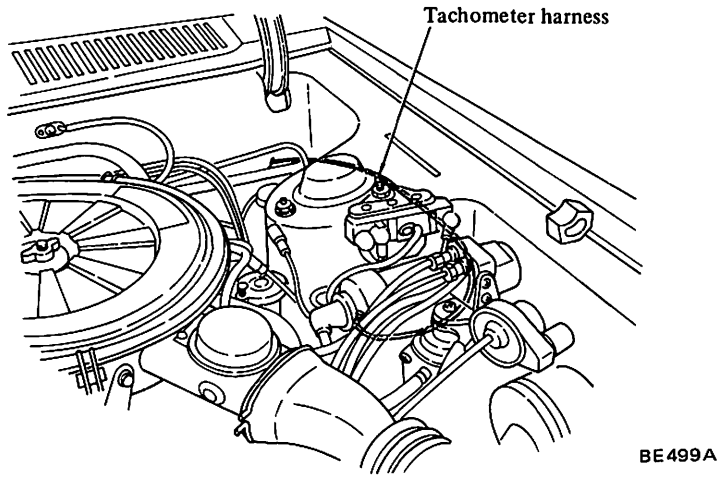


Fig. BE-60 Tachometer harness

FUEL LEVEL AND WATER TEMPERATURE INDICATING SYSTEM

DESCRIPTION

The fuel level indicating system consists of a tank unit and a fuel level gauge. The tank unit consists of a float which moves up and down in the fuel tank with changes in fuel level, and a sliding contact that slides back and forth on a resistance when the float moves. This changes the amount of electric resistance offered by the tank unit and controls the current flowing to the fuel level gauge. The gauge moves with the changes in current flow.

The water temperature indicating system consists of a thermaltransmitter located in the engine block and a water temperature gauge.

The thermaltransmitter is equipped with a thermister element which converts cooling water temperature variation to a resistance, and thus, the thermaltransmitter controls current flowing to the meter.

The fuel gauge and water temperature gauge are provided with a bimetal arm and heater coil. When the ignition switch is turned "ON", current flows to the heater coil, and the heater coil is heated. With this heat, the bimetal arm is bent, and thus, the pointer connected to the bimetal arm moves. The characteristics of both gauges are the same.

A tolerance may occur on the water temperature gauge or fuel gauge due to source voltage fluctuation. The voltage regulator is used to supply a constant voltage so that the water temperature gauge and fuel gauge operate correctly.

The operating part of the regulator consists of a bimetal arm and a heater coil. When the ignition switch is turned on, the bimetal arm is heated and bent by the coil, opening the contact. Consequently, current to the coil is interrupted. As the bimetal cools, the contact closes. The repetition of this operation produces a pulsating voltage of a 8 volts which is applied to the temperature and fuel gauges.

If both the water temperature gauge and fuel gauge become defective at the same time, there may be trouble in the voltage regulator.

REPLACEMENT

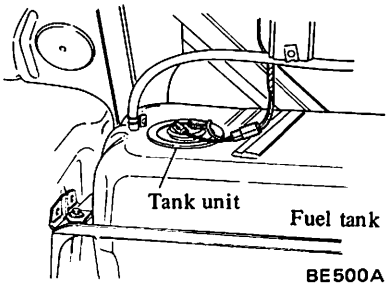
Gauge replacement

Fuel and temperature gauges can be removed by loosening two screws from combination meter. Refer to Figure BE-58.

Tank unit

Tank unit is located on fuel tank and has a pair of terminals. Refer to Section FE for removal.

Sedan and Hardtop



Station Wagon

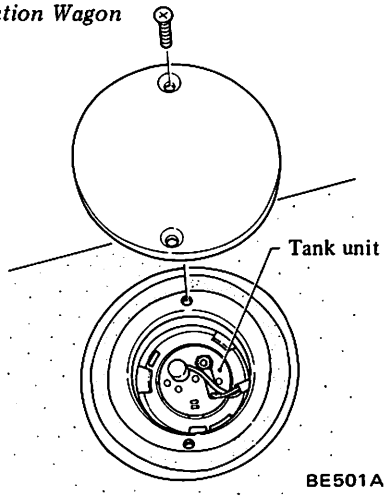


Fig. BE-61 Tank unit

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Thermal transmitter

To replace thermaltransmitter, disconnect lead wire from its terminal and unscrew the thermaltransmitter from engine cylinder block.

Be sure to apply conductive sealer to threads prior to installing new thermaltransmitter.

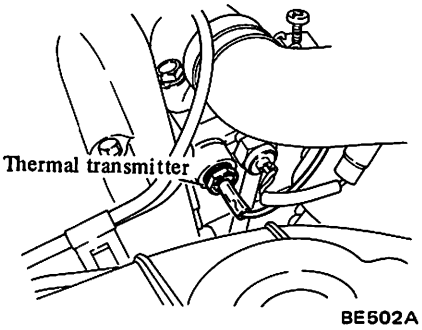


Fig. BE-62 Thermal transmitter

INSPECTION

Test continuity of the fuel and water temperature indicating system by using test lamp or ohmmeter. Refer to wiring diagram of water temperature indicating and fuel level indicating systems.

OIL PRESSURE WARNING SYSTEM

DESCRIPTION

The engine lubricating system incorporates an oil pressure warning lamp which glows whenever engine oil pressure falls below 0.2 to 0.4 kg/cm² (2.8 to 5.7 psi). Under normal operation, the light glows when the ignition switch is turned on. When the engine is running and oil pressure reaches the above range, the circuit opens and the light goes out.

REPLACEMENT

Oil pressure warning lamp

The bulb can be easily replaced by twisting bulb socket behind combination meter. See Figure BE-58.

Oil pressure switch

To replace oil pressure switch, disconnect lead wire from switch terminal and unscrew switch from engine cylinder block.

Prior to installing switch to cylinder block, be sure to apply conductive sealer to threads of new switch.

INSPECTION

Test continuity of the oil pressure warning system by using test lamp or ohmmeter referring to circuit diagram of oil pressure warning system.

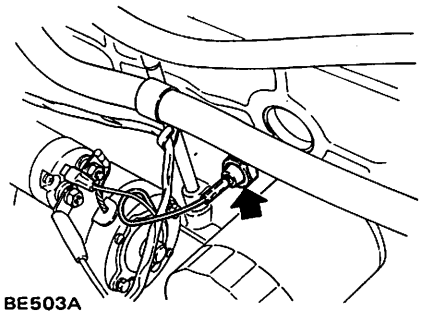


Fig. BE-63 Oil pressure switch

CHARGE WARNING SYSTEM

DESCRIPTION

The charge warning system consists primarily of charge warning lamp and voltage regulator.

The charge warning lamp glows when the ignition switch is turned "ON" with the engine shut down, or when the generator fails to charge when the engine is operating.

When the ignition switch is turned "ON", the charge warning circuit is closed and current flows from the ignition switch to the warning lamp and grounds through the regulator [Fig. BE-64-(1)]. When the engine is started and the generator comes into operation, the generator output current (N) opposes the current flowing from the warning lamp; as the current (N) increases, the solenoid is energized and the warning lamp relay contacts are opened–in effect breaking the warning circuit ground connection–and the lamp goes out [Fig. BE-64-(2)].

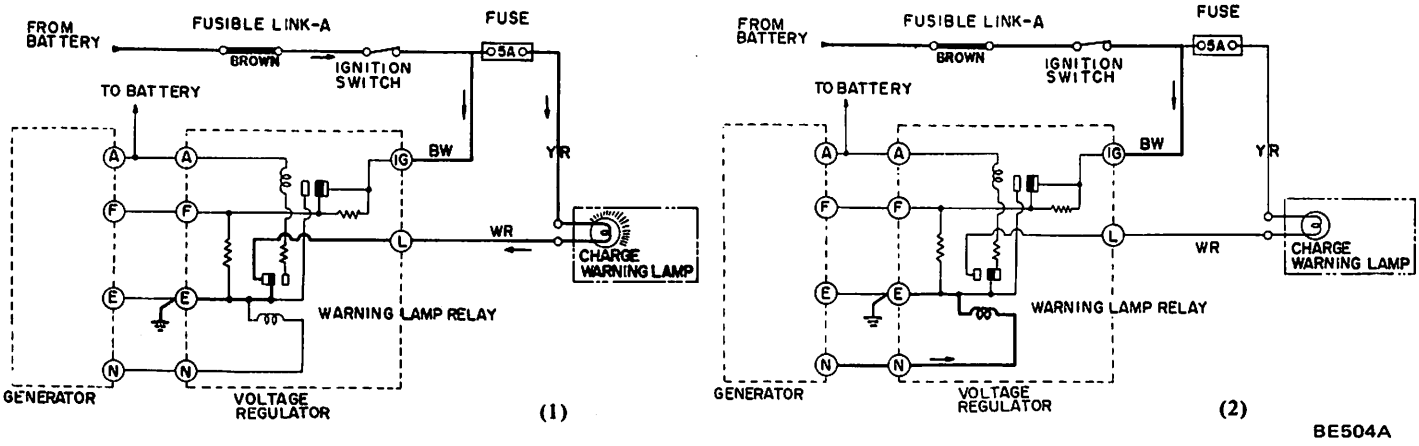


Fig. BE-64 Circuit of charge warning system

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REPLACEMENT

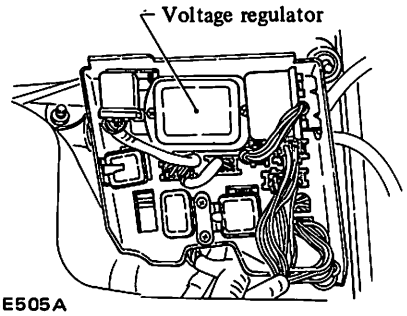
Charge warning lamp

The charge warning lamp bulb can be easily replaced by twisting the socket behind combination meter. Refer to Figure BE-58.

Voltage regulator

The voltage regulator is located behind the relay fixing bracket in the engine compartment.

Replacement can be easily carried out by removing two retaining screws on relay fixing bracket.



BE505A

Fig. BE-65 Voltage regulator

INSPECTION

Test continuity of charge warning system by using ohmmeter or test lamp, referring to Figure BE-54 circuit diagram of charge warning system.

BRAKE WARNING SYSTEM

DESCRIPTION

The brake warning system consists of warning lamp, hand brake switches and a brake indicator switch. The whole circuit is described in Figure BE-53.

The brake warning lamp glows when the hand brake is applied.

When the ignition switch is set to "ON", current flows from the ignition switch to the warning lamp. When the hand brake is applied, the hand brake warning switch is closed and the warning lamp glows.

When a problem occurs on brake fluid tube, the warning lamp also glows through brake indicator switch. For information on brake indicator switch, refer to Section BR for Warning Switch.

REPLACEMENT

Brake warning lamp

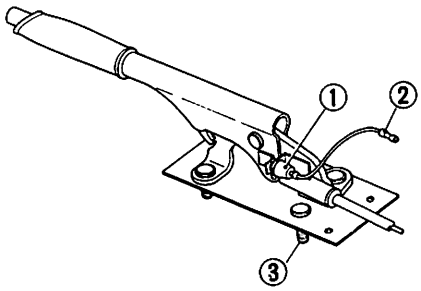
The brake warning lamp bulb can be easily replaced by twisting the socket behind combination meter. Refer to Figure BE-58.

Hand brake switch

The hand brake switch is mounted on the hand brake lever support bracket.

To replace hand brake switch, disconnect lead wire at connector plug and pull switch assembly out of bracket.

When plunger is pressed into switch assembly, hand brake switch contacts are open. Contacts are closed when plunger is projected.



1 Hand brake warning switch
2 Terminal
3 Bolt

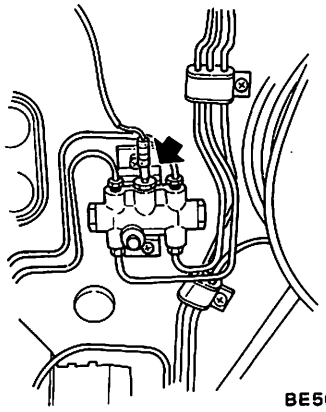
BR462

Fig. BE-66 Hand brake switch

Brake indicator switch

Brake indicator switch is located at rear end of engine compartment. To replace indicator switch, remove brake tubes and disconnect a lead wire at connector. Then remove retaining bolts and take it out. Installation is in the reverse sequence of removal.

Note: In installing warning switch, refer to Section BR for Instructions.



BE506A

Fig. BE-67 Brake indicator switch

INSPECTION

Check each switch for operation and test continuity of whole system by using ohmmeter or test lamp. Take care that each connection is tightened correctly. Refer to Figure BE-53 circuit diagram of brake warning system.

CATALYZER TEMPERATURE WARNING SYSTEM AND FLOOR TEMPERATURE WARNING SYSTEM (California only)

The circuit diagram is shown in Figure BE-55.

Refer to Section EC.

E.G.R. WARNING SYSTEM (Except California and Canada)

The circuit diagram is shown in Figure BE-56.

Refer to Section EC.

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TROUBLE DIAGNOSES AND CORRECTIONS

SPEEDOMETER

Condition	Probable cause	Corrective action
Speedometer pointer and odometer do not operate.	Loose speedometer cable union nut. Broken speedometer cable. Damaged speedometer drive pinion gear (Transmission side). Faulty speedometer.	Retighten. Replace. Replace. Replace.
Unstable speedometer pointer.	Improperly tightened or loose speedometer cable union nut. Damaged speedometer cable. Faulty speedometer.	Retighten. Replace. Replace.
Unusual sound occurs in response to increase of driving speed.	Excessively bent or twisted speedometer cable inner wire or lack of lubrication. Faulty speedometer.	Replace or lubricate. Replace.
Inaccurate speedometer indication.	Faulty speedometer.	Replace.
Inaccurate odometer operation.	Improperly meshed second and third gear or worn gears. Faulty feeding due to deformed odometer and pinion carrier.	Replace speedometer. Replace speedometer.

WATER TEMPERATURE AND FUEL GAUGES

Condition	Probable cause	Corrective action
Both water temperature gauge and fuel gauge do not operate.	Burnt fuse. Faulty gauge voltage regulator.	Correct cause and replace fuse. Replace water temperature gauge.
Both water temperature gauge and fuel gauge indicate inaccurately.	Faulty gauge voltage regulator (Gauge pointer fluctuates excessively). Loose or poor connection (Gauge pointer fluctuates slightly).	Replace water temperature gauge. Correct.
Water temperature gauge Water temperature gauge does not operate.	Faulty thermal transmitter or loose terminal connection. (When thermal transmitter yellow/white wire is grounded, gauge pointer fluctuates). Faulty water temperature gauge. Open circuit.	Replace or correct connection. Replace.

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Condition	Probable cause	Corrective action
Meter indicates only maximum temperature.	Faulty thermaltransmitter. (Meter pointer returns to original position when ignition switch is turned off).	Replace.
	Faulty water temperature gauge. (Meter pointer indicates maximum temperature even after ignition switch is turned off).	Replace.
Water temperature gauge does not operate accurately.	Faulty water temperature gauge.	[Connect a 116Ω resistance between thermaltransmitter yellow/white wire and ground. When meter indicates approximately 50°C (122°F), gauge is serviceable].
	Loose or poor connection.	Correct connector terminal contact.
Fuel gauge Fuel gauge does not operate.	Faulty tank unit or loose unit terminal connection. (Pointer deflects when tank unit yellow wire is grounded.)	Replace tank unit or correct terminal connection.
	Faulty fuel gauge.	Replace.
	Open circuit.	
Pointer indicates only "F" position.	Faulty tank unit. (Pointer drops below "E" mark when ignition switch is turned off.)	Replace.
	Faulty fuel gauge. (Pointer still indicates "F" position when ignition switch is turned off.)	Replace.
Fuel gauge does not operate accurately.	Faulty tank unit. (Pointer indicates a half level when a 32Ω resistance is connected between tank unit yellow wire and ground.)	Replace.
	Faulty fuel gauge.	Replace fuel gauge.
	Poor or loose connection.	Correct connector terminal contact.

OIL PRESSURE AND CHARGE WARNING LAMPS

Condition	Probable cause	Corrective action
Oil pressure warning lamp Lamp does not light when ignition switch is set to "ON".	Faulty oil pressure switch or loose switch terminal connection. (When switch yellow/black wire is grounded, warning lamp lights.)	Replace or correct connection.
	Burnt bulb or loose bulb.	Replace bulb or correct bulb socket.
	Open circuit.	

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Condition	Probable cause	Corrective action
Lamp does not go out while engine is being operated.	Lack of engine oil. Oil pressure too low. Faulty oil pressure switch.	Check oil level and add oil as required. Inspect engine oil pressure system. Replace.
Charge warning lamp Lamp does not light when ignition switch is set to "ON".	Burnt bulb or loose bulb. (Warning lamp does not light when voltage regulator white/red wire is grounded.) Open circuit.	Replace bulb or correct bulb socket.
Lamp does not go out when engine is started.	Faulty charging system.	Inspect charging system.

ELECTRIC ACCESSORY

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HEATER

DESCRIPTION

The heater is controlled by three levers – AIR, TEMP and FAN.

The AIR lever controls air discharge by means of three doors (air intake, mode and defroster room doors).

- The air intake door is used to let either outside- or inside-air flow into the heater unit. Outside air is drawn from the cowl top grille and delivered to the air intake box.
- The mode door serves to supply air flow to the outlet in the instrument panel. This door has three detent positions – open, close, middle.
- The defroster room door controls air flow discharged from heater unit. When door is open, air is discharged to the floor area with a small amount going to defroster nozzle. When closed, all air is discharged through defroster nozzle.

The TEMP lever controls the air mix door and mixes heated air with air bypassing the heater core to obtain the desired air temperature. In this manner, the temperature of air is effectively controlled.

The FAN lever controls switch that is located on the control lever assembly, providing three blower speeds.

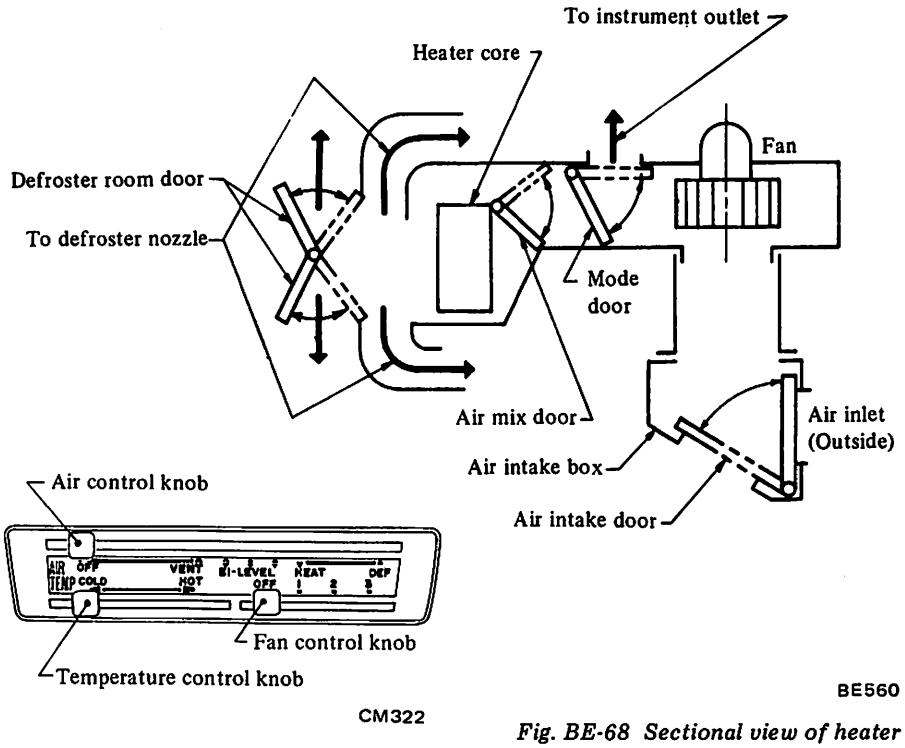
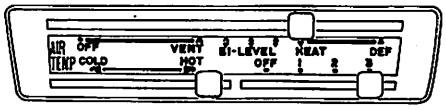


Fig. BE-68 Sectional view of heater

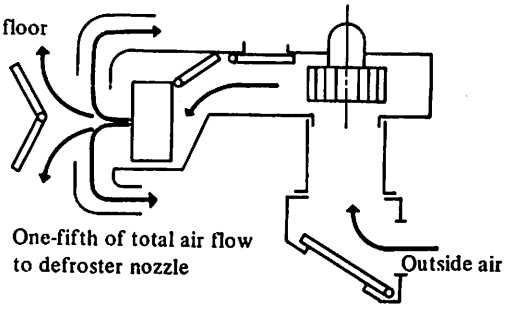
AIR FLOW

Heating

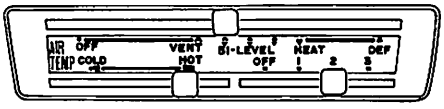


TEMP and FAN levers in any position

CM323

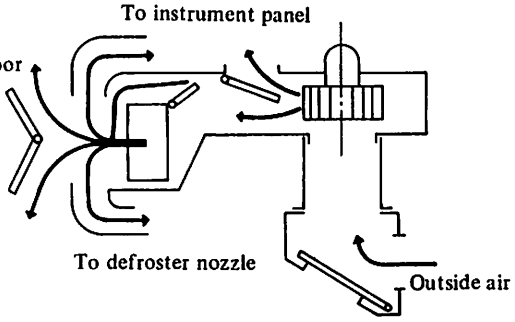


Heating and air ventilating (Bi level)



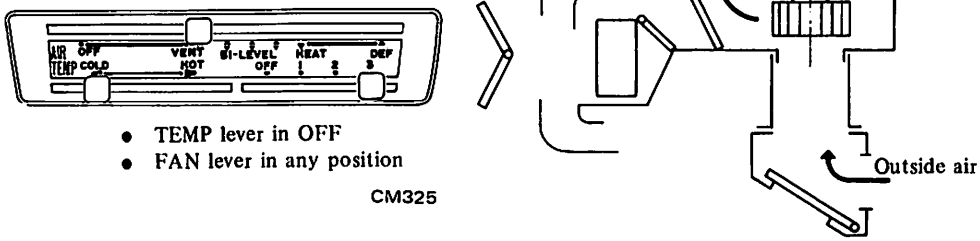
AIR lever in any position between VENT and HEAT

CM326



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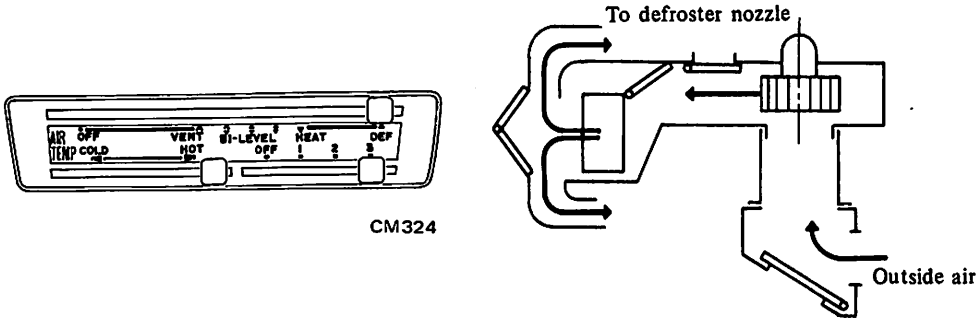
Air ventilating



- TEMP lever in OFF
- FAN lever in any position

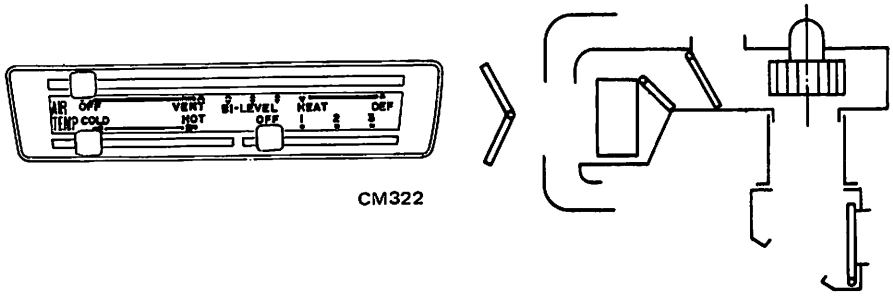
CM325

Defrosting



CM324

When not in use



CM322

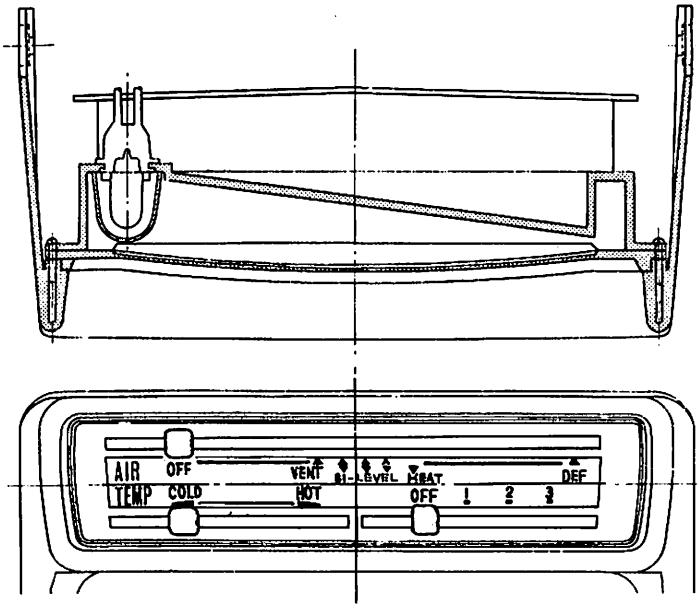
BE562

Fig. BE-69 Air flow

ILLUMINATION LAMP REPLACEMENT

The illumination lamp is located in the center ventilator.

1. Remove center ventilator. Refer to page BE-56 for Center Ventilator.
2. Remove bulb with socket from behind center ventilator.
3. Take out bulb.
4. Install new bulb in the reverse sequence of removal.



BE570

Fig. BE-70 Illumination lamp

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Bulb wattage:
Heater control illumination lamp
..... 3.4W

HEATER CORE REPLACEMENT

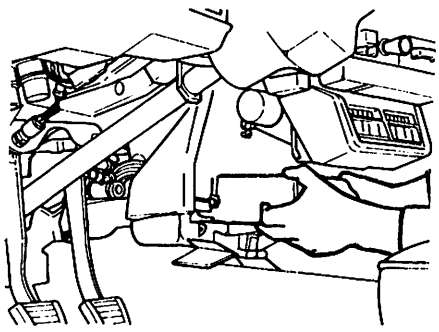
1. Drain engine coolant.
2. Remove clamps from heater core and disconnect heater hose from heater core.

Note: They are located on right side of heater unit.

3. Remove two clips and four screws retaining heating unit grille, and remove heating unit.

Notes:
a. It is necessary to remove console box if equipped.
b. Clips on the control cable for defroster room door must be loosened.

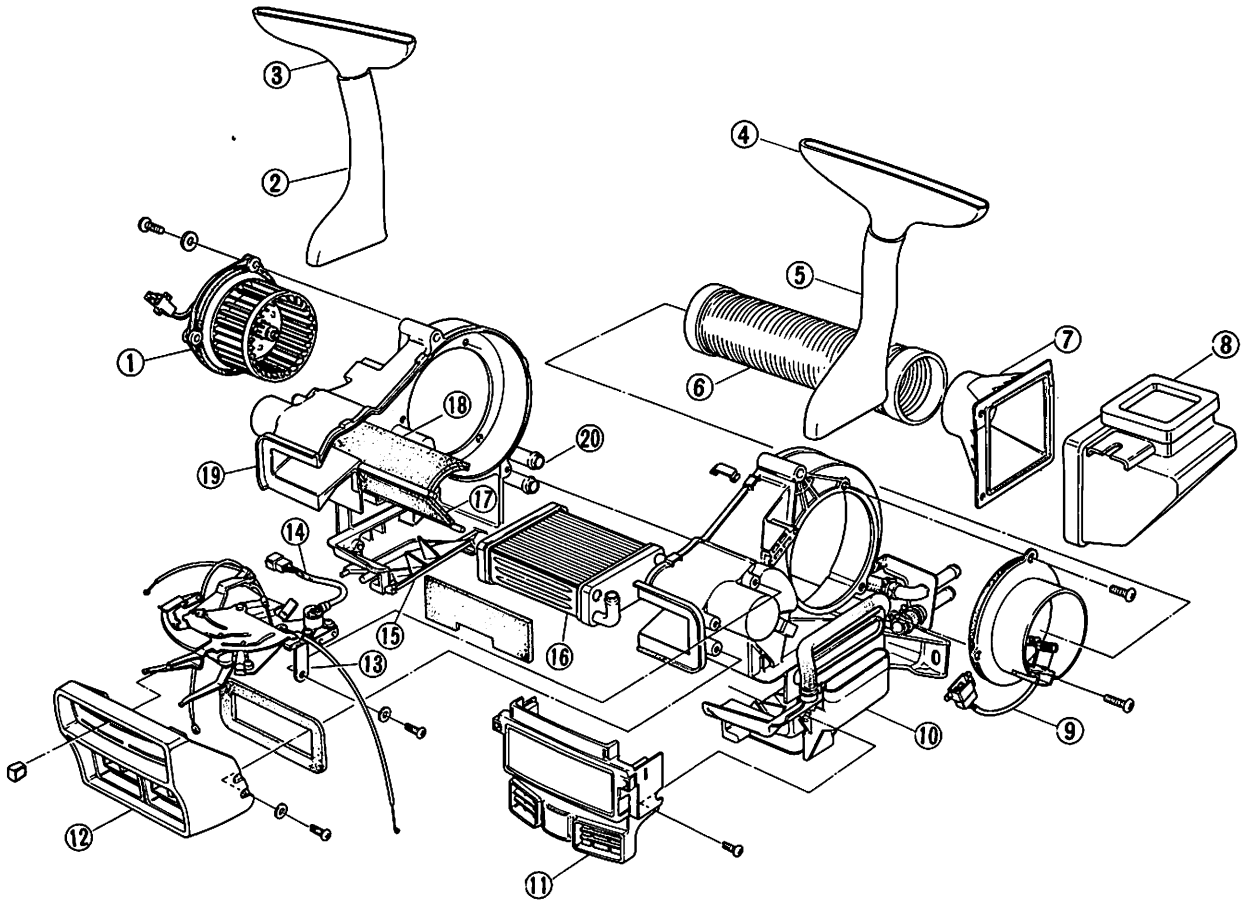
4. Pull out heater core forward. Heater core can then be taken out.
5. Installation is in the reverse sequence of removal.



BE569

Fig. BE-71 Removing heater core

REMOVAL AND REPLACEMENT



1 Fan and fan motor
2 Defroster duct (L.H.)
3 Defroster nozzle (L.H.)
4 Defroster nozzle (R.H.)
5 Defroster duct (R.H.)
6 Intake duct hose
7 Air intake duct
8 Air intake housing
9 Resistor
10 Heater box (R.H.)
11 Heating unit grille
12 Center ventilator
13 Heater control
14 Fan switch
15 Defroster room door
16 Heater core
17 Air mix door
18 Mode door
19 Heater box (L.H.)
20 Heater cock

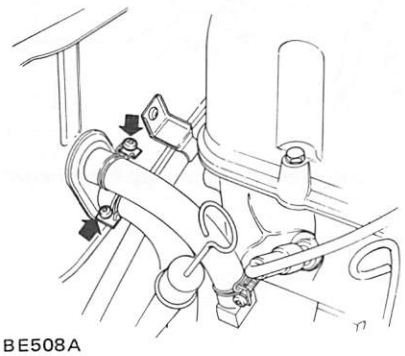
BE507A

Fig. BE-72 Exploded view of heater

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Engine compartment side

1. Disconnect battery ground cable.
2. Drain engine coolant and disconnect heater hose clamp.

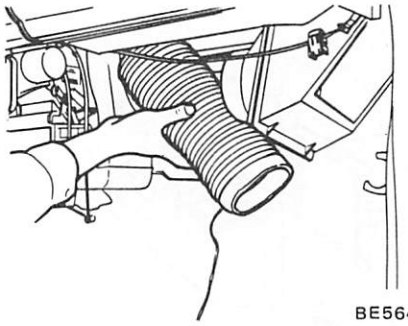


BE508A

Fig. BE-73 Removing clamp

Passenger compartment side

3. Remove intake duct hose, and demister duct on both sides from heater unit. Remove console box if equipped.

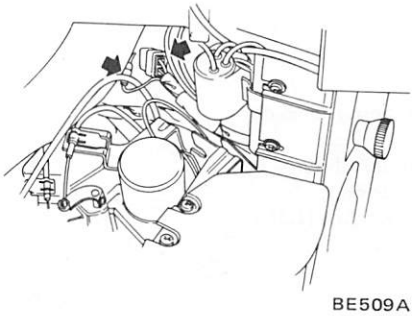


BE564

Fig. BE-74 Removing heater clutch hose

4. Disconnect heater lead wires at two connector.

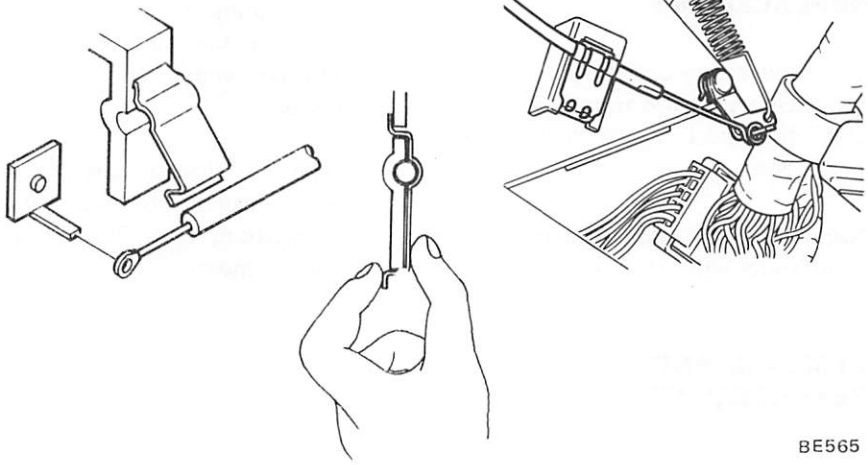
Note: There are two connectors. One is equipped with four terminals, and the other is with a terminal.



BE509A

Fig. BE-75 Disconnecting lead wire

5. Remove cable retaining clamp and remove control cables at intake box.



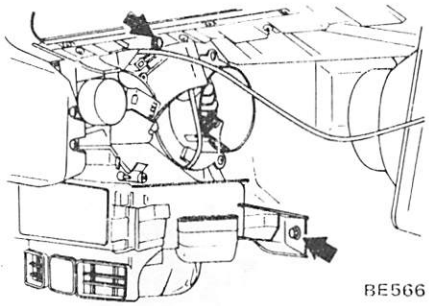
BE565

Fig. BE-76 Removing clamp

6. Remove three retaining bolts (Two on each side of heater unit and one on top of unit). Refer to Figure BE-77.

Heater unit assembly can then be taken out.

7. Installation is in reverse sequence of removal.

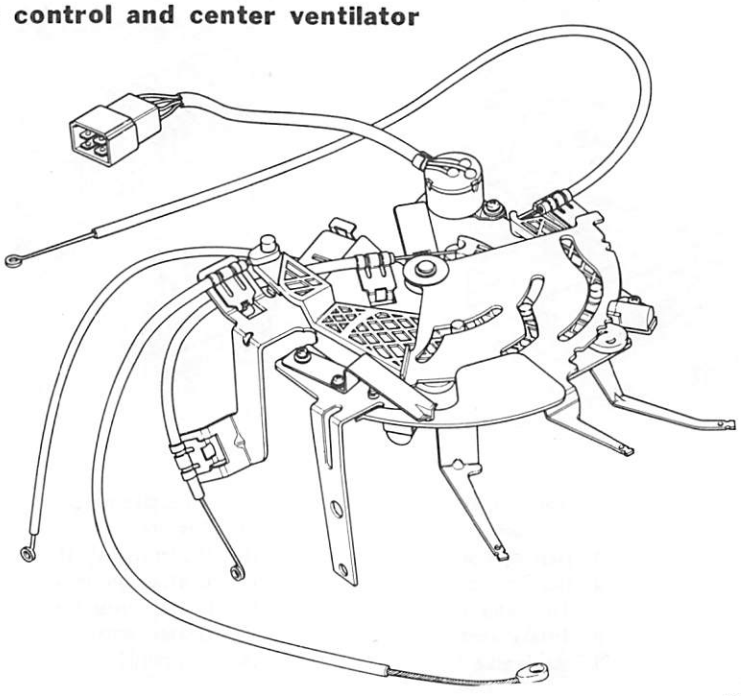


BE566

Fig. BE-77 Removing heater unit

DISASSEMBLY AND ASSEMBLY

Heater control and center ventilator

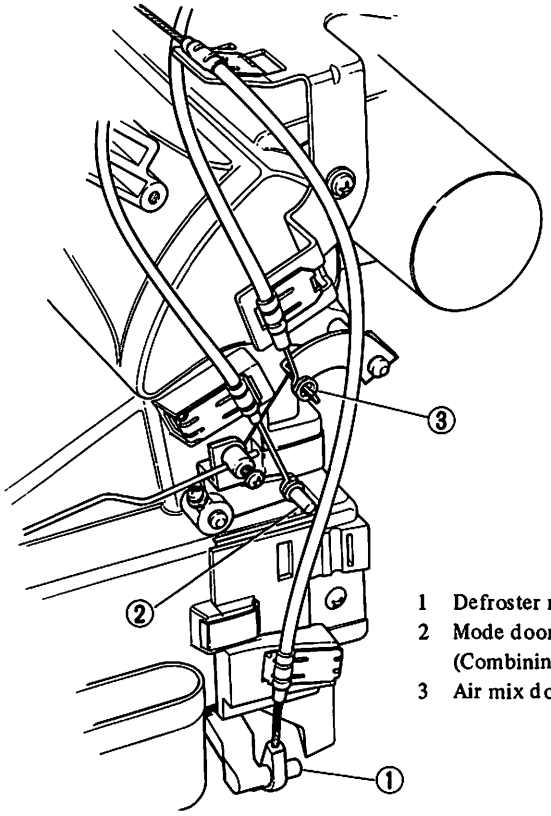


BE510A

Fig. BE-78 Heater control

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1. Pull heater control knobs out.
2. Remove three screws securing center ventilator to heater unit. (Two are located on right side, one is located on left side of center ventilator).
3. Disconnect heater control illumination lamp connectors.
4. Center ventilator can be taken out easily by moving towards this side.
5. Loosen clamps of four control wires and disconnect control wire at intake door, air-mix door defroster room door, and divider door.



1 Defroster room door control lever
2 Mode door control lever (Combining heater cock control)
3 Air mix door control lever

BE511A

Fig. BE-79 Disconnecting control wires

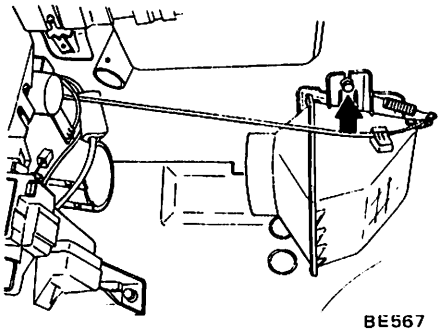
6. Loosen fan switch connector from heater sub-harness.
7. Remove screws securing heater control to heater unit.

Note: Heater control has three retaining flanges. Two are on left side and one is on right side.

Heater control can then be taken out by moving it forward.
8. Installation is in the reverse sequence of removal.

Air intake box

1. Remove heater duct hose.
2. Disconnect control cable for air intake door.
3. Remove screw securing air intake box in place. See Figure BE-80.



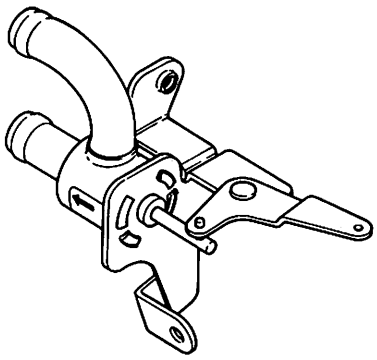
BE567

Fig. BE-80 Air intake box

4. Remove air intake box.
5. To install, reverse the sequence of removal.

Water cock

1. Remove clamps from water cock. There are two heater hoses for inlet and for outlet. Disconnect heater hose from water cock.



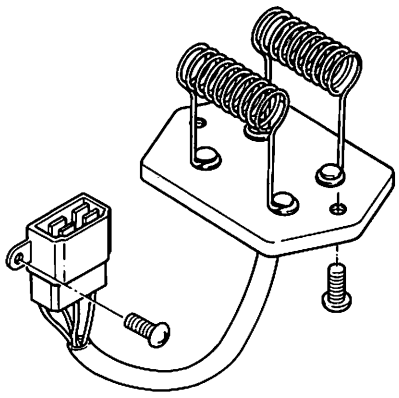
BE512A

Fig. BE-81 Water cock

2. Disconnect control rod at air mix door.
3. Remove two retaining screws. Water cock can be then taken out easily.
4. Installation is in the reverse sequence of removal.

Resistor

1. Remove three screws retaining intake duct-B and remove from heater box.



BE513A

Fig. BE-82 Resistor

2. Remove two screws retaining resistor. Resistor can then be taken out from intake duct-B.
3. Remove two screws retaining resistor connector to heater box. Resistor can then be taken out.
4. Installation is in the reverse sequence of removal.

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Fan motor

1. Remove three screws retaining fan motor.
2. Remove screw retaining fan motor connector.

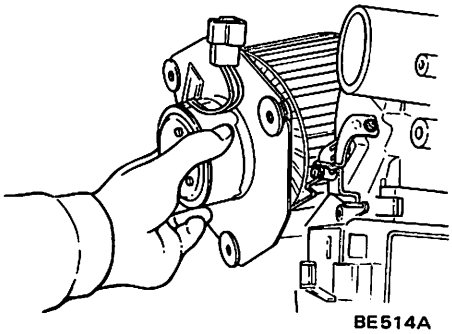


Fig. BE-83 Removing fan motor

3. Fan motor with fan can then be taken out from heater box.

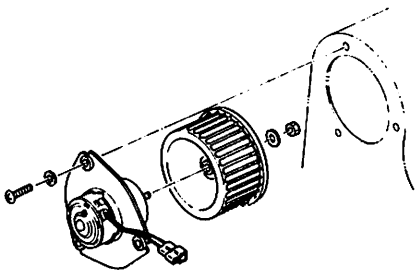


Fig. BE-84 Fan motor

ADJUSTMENT

Control assembly

Whenever a new or re-conditioned heater unit is to be installed, adjust control assembly as follows:

1. Move AIR lever to OFF position.
- Fit cable to door lever of air intake box, and fasten with a cable retaining clamp.
2. Move AIR lever to DEF position.
- Fit cable to defroster room door lever, and fasten with a cable retaining clamp.
- Fit cable to mode door lever, and fasten with a cable retaining clamp.
3. Move TEMP lever to left stop.
- Fit cable to air mix door lever, and fasten with a cable retaining clamp.

Note: Make sure that each control lever moves smoothly over its entire stroke.

INSPECTION

Check the following items if fan motor fails to rotate.

1. Fuse and fusible link
2. To check for burned fuse, use the same procedure as that for ordinary fuses by using a circuit tester or test lamp.
3. Loose wire connection

Fan motor power supply

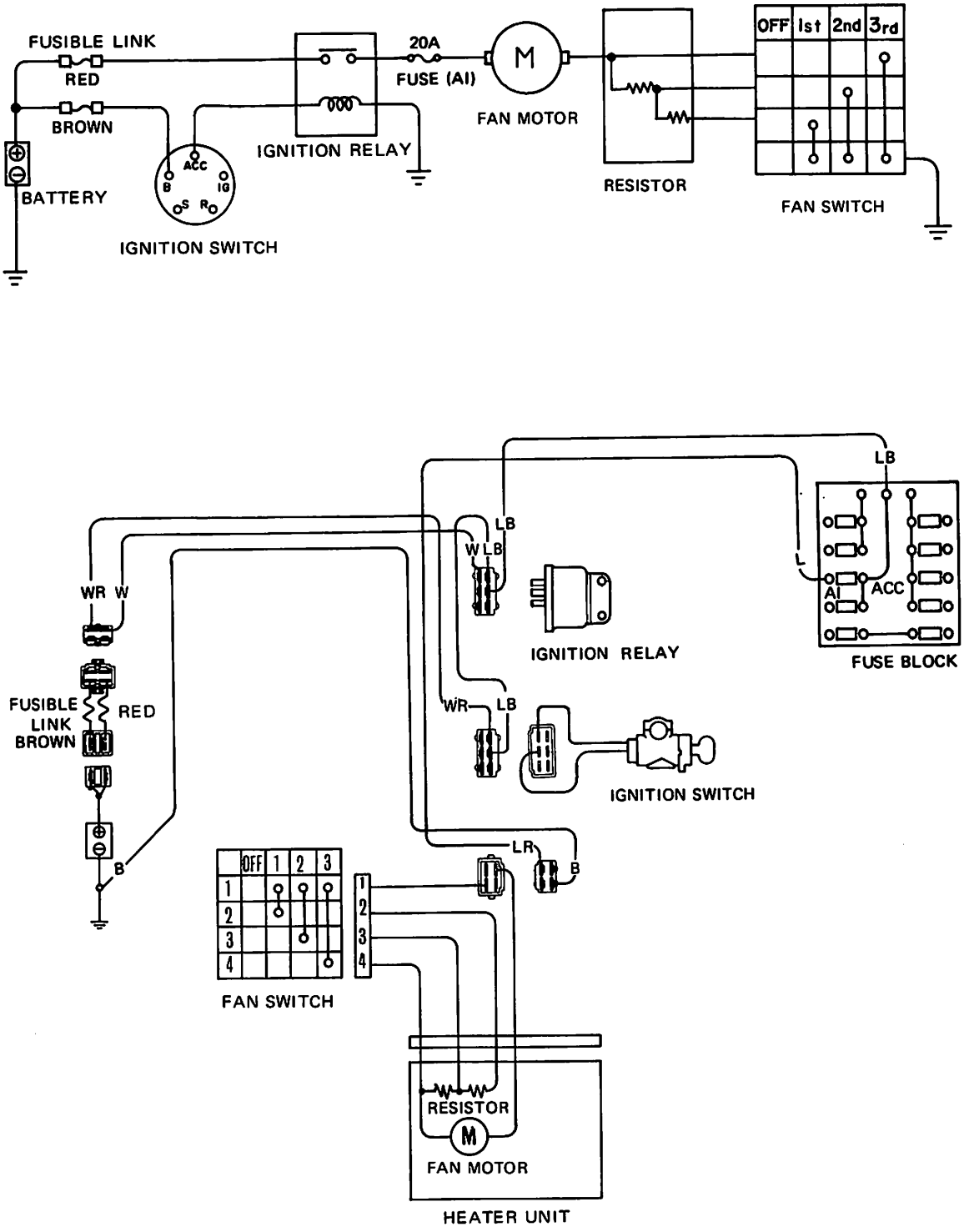
1. Disconnect lead wires at connector.
2. Move ignition switch to ACC position.
3. Connect test lamp lead wire to blue/white wire terminal in connector plug on instrument harness side and other to the ground.
4. Make sure that test lamp goes on.

Fan motor

1. Disconnect lead wires at connector.
2. Move ignition switch to ACC position.
3. Connect test lead to positive side of fuse block power supply and the other to blue/white wire terminal in connector plug on fan motor side.
4. Make sure that fan motor operates at each fan lever position.

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Heater



COLOR CODE

WR : White with red stripe
LB : Blue with black stripe
B : Black
L : Blue
W : White
LR : Blue with red stripe

BE515A

Fig. BE-85 Circuit diagram of heater

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TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause	Corrective action
Insufficient heating performance.		
No heated air discharged.	Cooling water temperature too low.	Check thermostat. Replace as necessary.
	Heater core plugged.	Clean.
	Insufficient cooling water level.	Refill.
	Water cock not operating properly.	Adjust control cable.
	Air mix door not operating properly.	Adjust control cable.
Insufficient air flow to floor.	Fan motor speed too low.	Check for motor terminal voltage. Repair poor connection and discontinuity. Replace motor if necessary.
	Floor door and mode door not operating properly.	Adjust control cable.
Insufficient defrosting performance.		
Cold air discharged.	Refer to "No heated air discharged".	
Insufficient air flow to defroster.	Floor door and mode door not operating properly (or seal defective).	Adjust control cable.
	Defroster nozzle plugged.	Clean.
	Leak at defroster duct-to-nozzle connection.	Correct.
Heated air discharged with lever in VENT.	Water cock not operating properly.	Adjust control cable.
No heated air discharged with lever in BILEVEL.	Air intake door not operating properly.	Adjust control cable.
Failure of fan to run.	Fuse melted.	Replace.
	Motor wire connector disconnected.	Correct.
	Switch defective.	Replace.
	Motor defective.	Check and correct.
Control lever drags.	Inner wire rubbing against outer case end.	Adjust control cable.
	Control cable bent excessively.	Correct.
	Doors, door levers, etc. not operating properly.	Check and correct.
Outside air comes in with fan in OFF.	Air intake door not operating properly.	Repair or replace.
	Control cable out of adjustment.	Adjust control cable.
Noise from fan motor.	Unusual noise from fan motor.	Check and tighten loose bolts.

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ELECTRIC REAR WINDOW DEFOGGER

DESCRIPTION

The electrical rear window defogger system consists of defogger switch and filaments in the rear window. Heat from the filament keeps rear window free of fog and frost. The filament is printed inside of the rear window. It can not be replaced, but can be repaired as described in this section.

REMOVAL AND INSTALLATION

Defogger switch

Defogger switch is held by spring pressure against cluster lid–A. The switch has an indicator lamp in body. To remove defogger switch, disconnect three wires at connector and take out switch assembly from cluster lid–A.

Note: If removal is difficult, use a screwdriver to free switch.

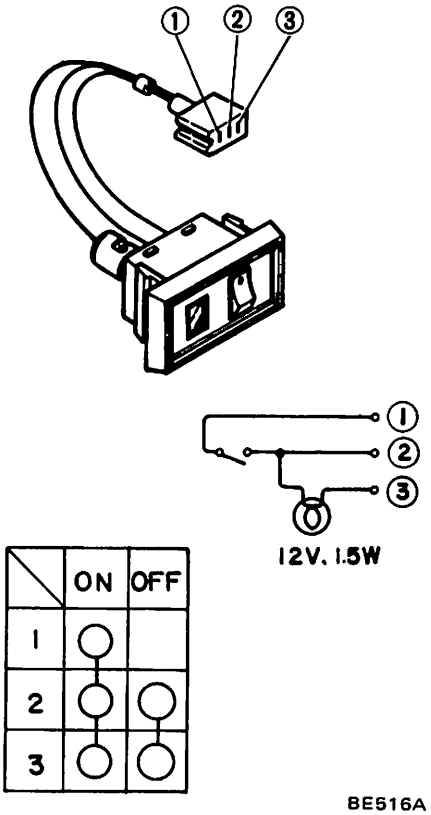


Fig. BE-86 Defogger switch

Defogger switch indicator lamp replacement

1. Remove defogger switch assembly from cluster lid–A as described previously.
2. Push socket located behind the switch, and turn it counterclockwise. Socket with bulb can then be taken out.
3. Pick up bulb from socket.
4. Install new bulb in the reverse sequence of removal.

Bulb wattage:
Defogger switch lamp ... 1.5W

Rear window filaments

The filaments are printed inside the rear window glass. Therefore, the element cannot be removed. Refer to Section BF for Removal of Rear Window Glass.

INSPECTION

Test continuity of system by using test lamp or ohmmeter. Refer to Figure BE-93.

Defogger switch

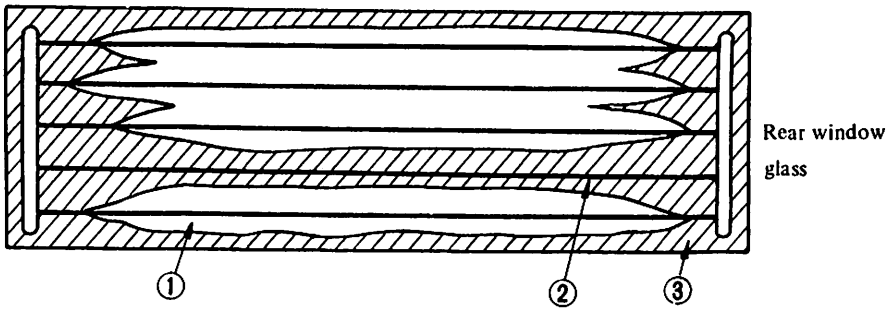
Test continuity of switch by using test lamp or ohmmeter. The test must be carried out with switch both ON and OFF.

Rear window filaments

Rear window defogger filament can be inspected for circuit breaks by one of three methods.

Method 1:

Start the engine and turn on the window defroster system. If the area around a specific filament is not defogged, that line is broken.



1 Defogged area
2 Broken heat wire
3 Fogged area

Fig. BE-87 Broken filament

Method 2:

Start the engine and turn on the window defroster system. With a direct-current voltmeter setup shown in Figure BE-88, check each heat wire for discontinuity. If the meter indicates 12 volts or 0 on a specific wire, that line is broken. (Normal indication: 6 volts)

A break in that line can then be detected by moving the positive lead of meter along the line until an abrupt variation in the meter indication is encountered.

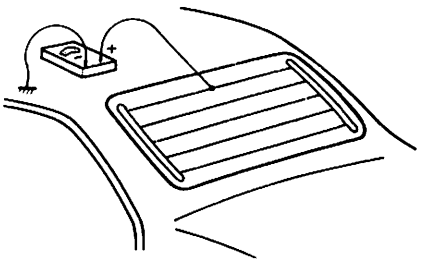


Fig. BE-88 Checking for broken filament with D-C voltmeter

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Method 3:

With an ohmmeter setup shown in Figure BE-89, place one lead on end of a heat wire and the other in the middle section of that wire. If the meter registers, on a specific grid line, a value twice as much on any other line, that line is broken.

A break in that line can then be located by an abrupt variation in the meter indication as the test lead moves along the broken heat wire.

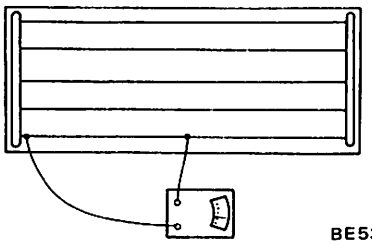


Fig. BE-89 Checking for broken filament with ohmmeter

3. Place ruler on glass along broken line to be repaired as shown in Figure BE-90. Deposit conductive silver composition on break line with drawing pen. Slightly overlap existing heat wire both sides [5 mm (0.2 in) preferable] of the break.

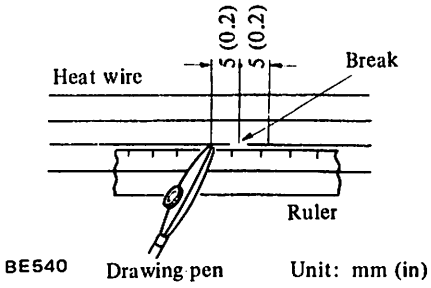


Fig. BE-90 Locating ruler in position

4. Wipe clean silver composition from tip of drawing pen.

5. After repair has been completed, check repaired wire for continuity. This check should be conducted 10 minutes after silver composition is deposited.

Note: Do not touch repaired area while test is being conducted.

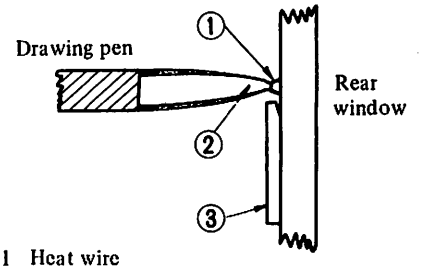


Fig. BE-91 Depositing silver composition in place

FILAMENT MAINTENANCE

Repair equipment

1. Conductive silver composition (Dupont No. 4817)
2. Ruler, 30 cm (12 in) long
3. Drawing pen
4. Heat gun
5. Alcohol
6. Cloth

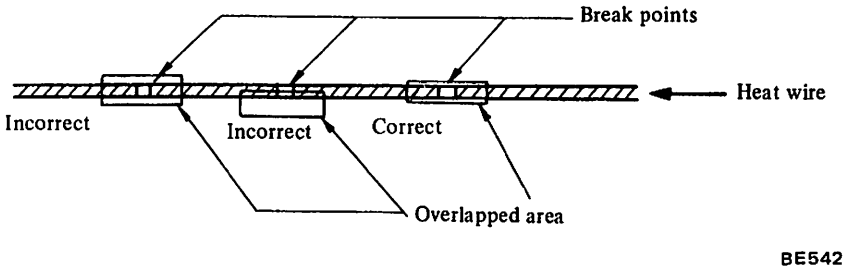


Fig. BE-92 Incorrect and correct deposition of silver composition

Repair procedure

1. Wipe clean broken heat wire and its surrounding area with a cloth dampened in alcohol.
2. Apply a small amount of conductive silver composition to the tip of drawing pen.

Note: Shake silver composition container before use.

6. 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 (1.18 in) should be kept between the repaired area and hot air outlet. If a heat gun is not available, leave the repaired area unattended for 24 hours.

Instructions after repair

Wipe clean the repaired area with a soft, clean cloth.

Note: Do not use a cleaning solvent containing much soapy water.

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Rear window defogger system

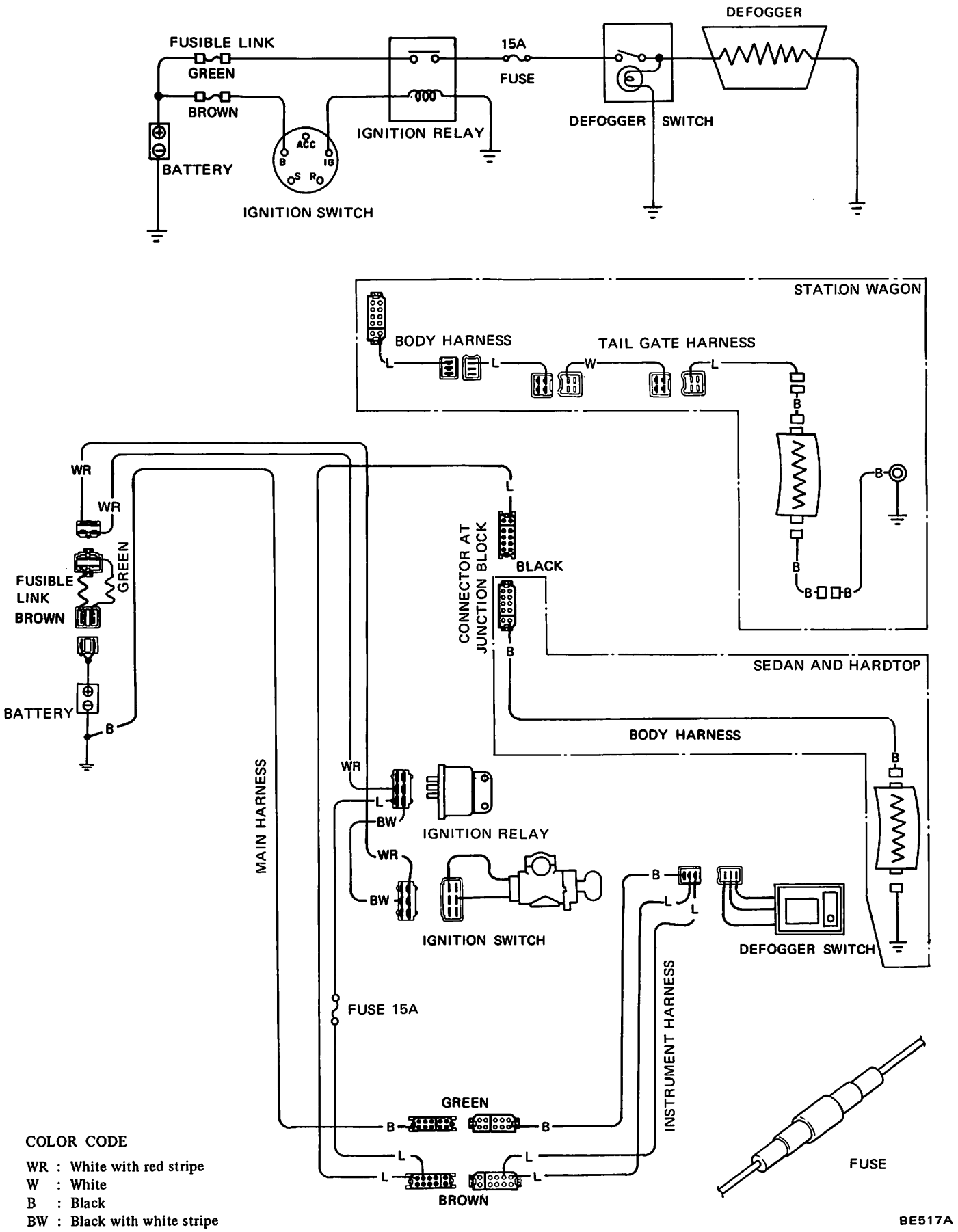


Fig. BE-93 Circuit diagram of rear window defogger

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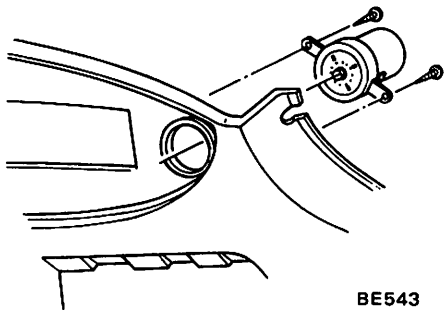
CLOCK

REMOVAL AND INSTALLATION

1. Remove cluster lid–A referring to page BE-45 for Cluster Lid and Combination Meter.
2. Disconnect wires to clock.
3. Remove two screws retaining clock to cluster lid–A from behind cluster lid–A.

Whole clock can then be taken out easily.

4. Installation is in the reverse sequence of removal.



BE543

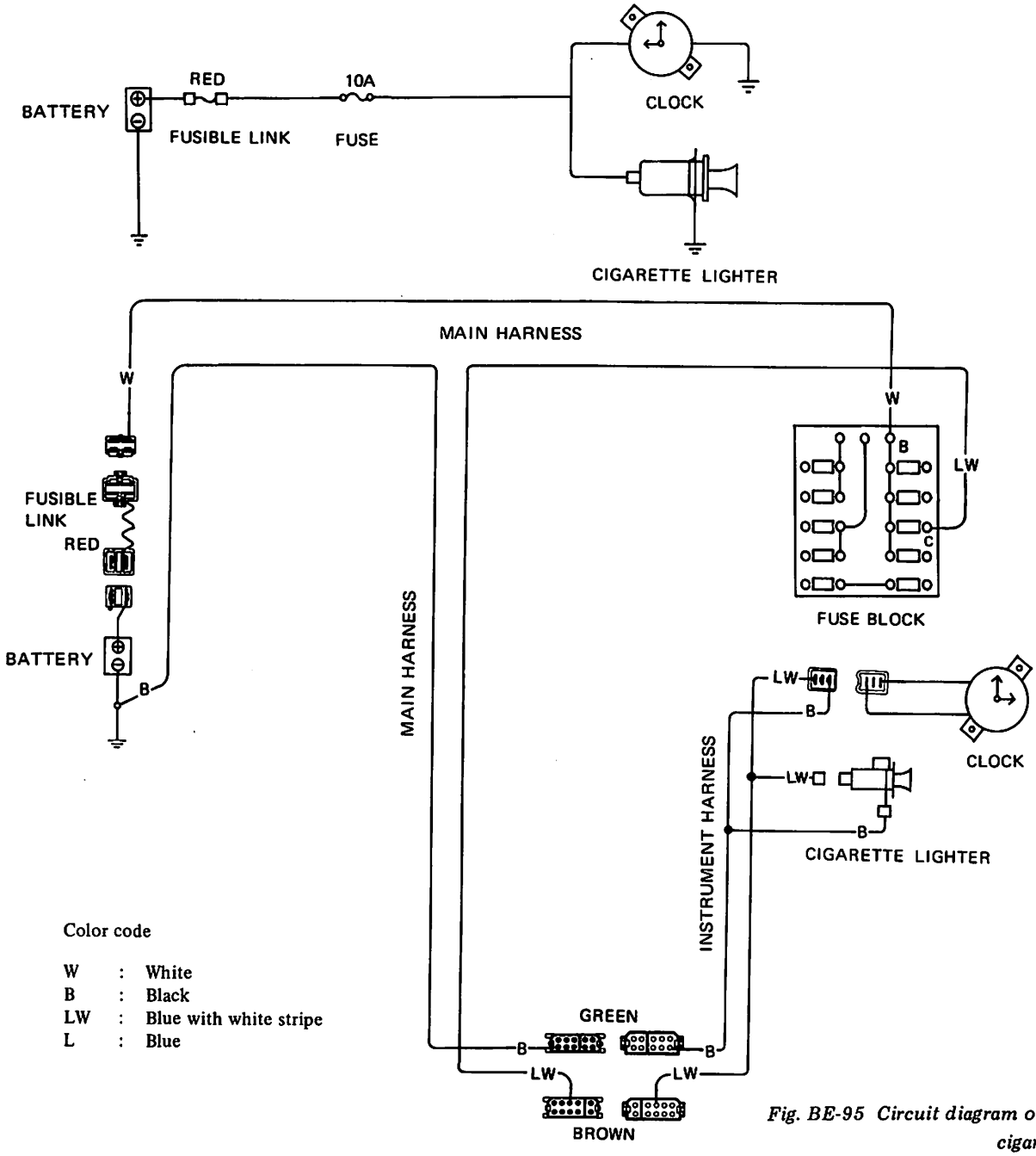
Fig. BE-94 Clock

ILLUMINATION LAMP REPLACEMENT

1. Remove clock assembly as described previously.
2. Remove illumination lamp socket located behind clock. Socket with bulb can then be taken out.
3. Pick up bulb from socket.
4. Install new bulb in the reverse sequence of removal.

Bulb wattage:
Clock illumination lamp
..... 3.4W

Clock and cigarette lighter system



BE518A

Fig. BE-95 Circuit diagram of clock and cigarette lighter

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HORN

DESCRIPTION

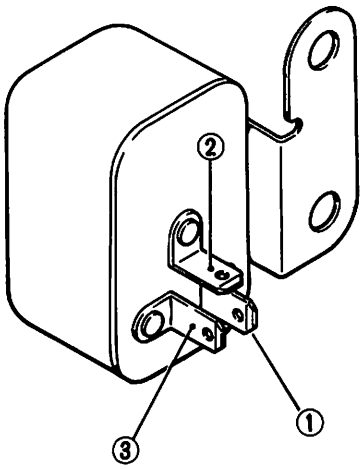
The horn circuit consists of horn relay, horn button and horn as sketched in Figure BE-100. When the horn button is pressed, current from the battery energizes the solenoid. As the solenoid is energized, the relay contacts are closed. This allows the current to flow to the horn.

The connector for horn switch is combined with that of turn signal switch.

REMOVAL AND INSTALLATION

Horn

To replace horn, disconnect horn wire at terminal on horn body and remove retaining bolt that holds horn bracket to radiator core support. Install new horn and bracket assembly in the reverse sequence of removal. See Figure BE-96.



Horn switch

The horn switch is integral with the steering wheel assembly. Remove switch assembly as described in page BE-31 for Turn Signal Switch.

ADJUSTMENT

1. Secure horn in a vise. Using a voltmeter, battery and ammeter, connect horn as shown in Figure BE-98.

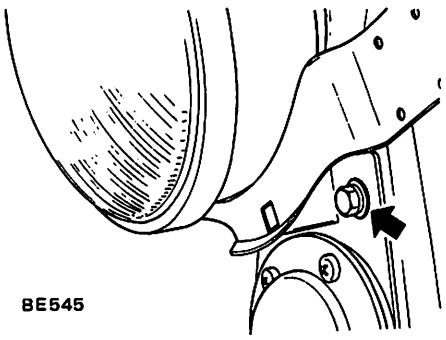


Fig. BE-96 Removing horn

Horn relay

The horn relay is mounted on the relay bracket or the front right side of the engine compartment. (See Figure BE-97.) To remove horn relay, disconnect battery ground cable and dismount relay bracket. Disconnect horn relay wire connector at terminals on horn relay and remove retaining screws.

Install horn relay in the reverse sequence of removal.

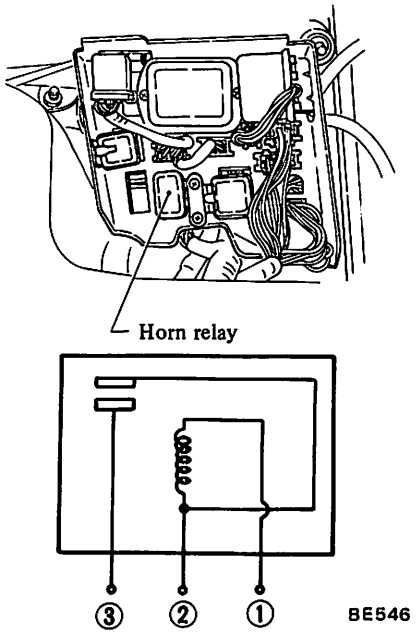


Fig. BE-97 Horn relay

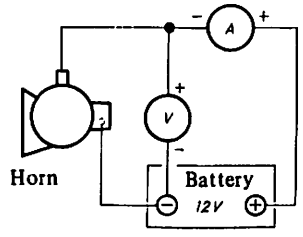


Fig. BE-98 Circuit of horn adjustment

2. Set switch to "ON", and make sure that voltmeter indicates between 12 and 12.5 volts.
3. Listen to horn for sound level, volume and tone. Adjust ammeter reading to consumed current at or below specifications. Make sure that horn sounds clear. See Figure BE-99.

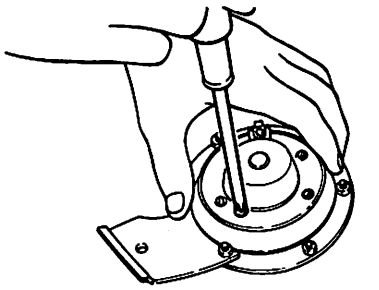


Fig. BE-99 Adjusting horn sound

Notes:

a. Adjustment is made by turning adjusting screw, after loosening lock nut.

b. When adjusting screw is turned;
Clockwise: Current increases
Counterclockwise:
Current decreases

Sound	Consumed current at 12 volts (Amperes)
Low pitch (330Hz)	1.5 to 3.5
High pitch (390Hz)	1.5 to 3.5

4. After tone adjustment has been made as outlined above, check sound again at alternator voltage (14 to 15 volts). If sound is clear through this check, then tighten lock nut securely.

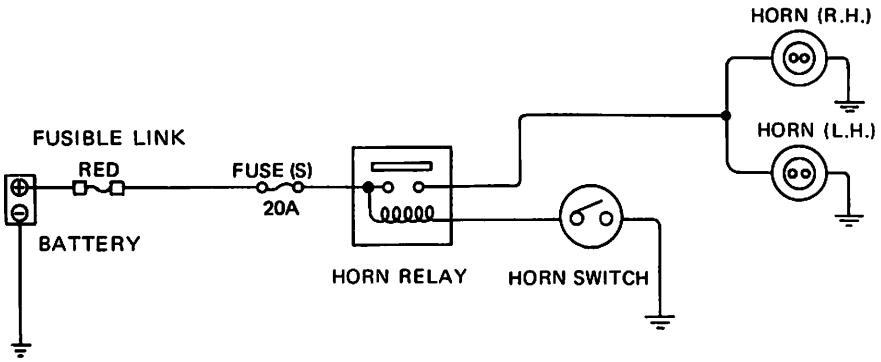
INSPECTION

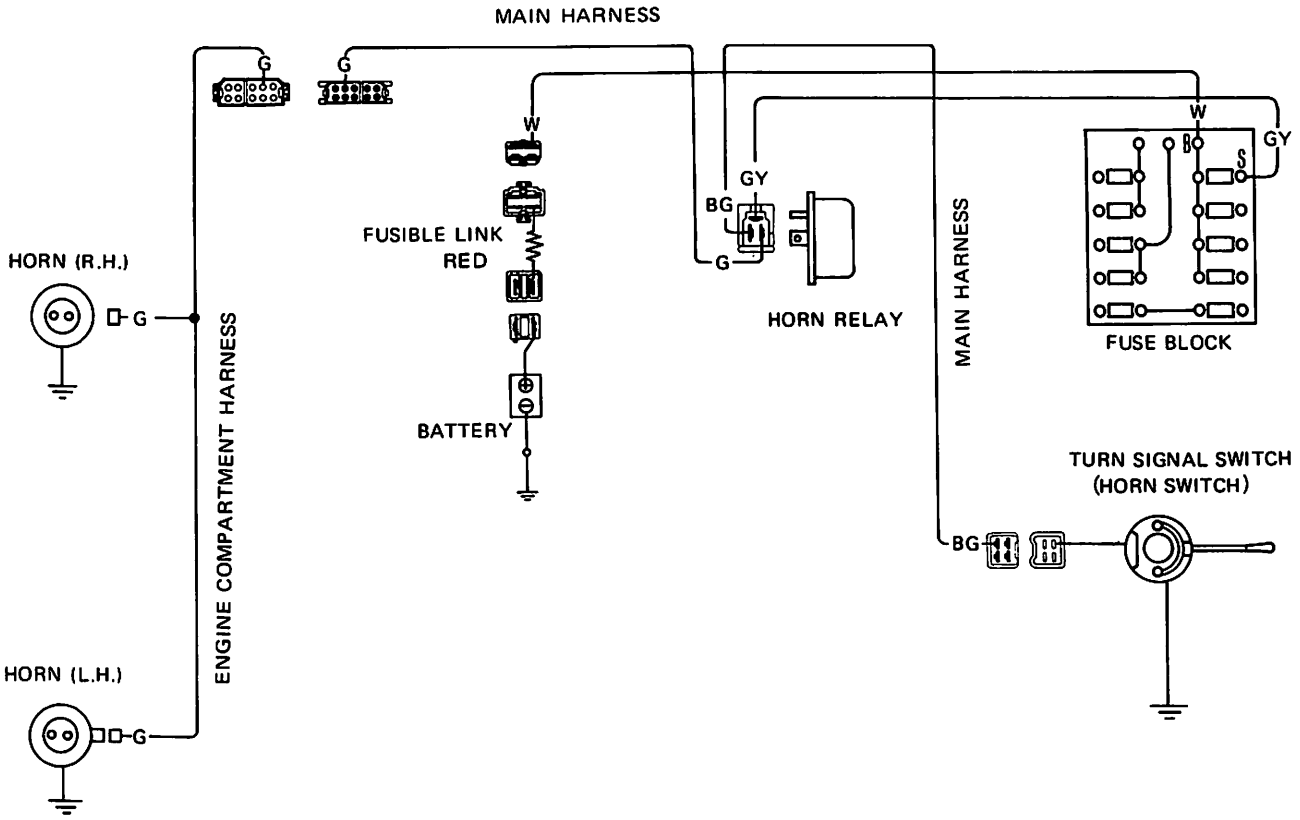
Test continuity of system by using test lamp or ohmmeter. See Figure BE-100.

In testing horn relay, there must be continuity between terminal ① and ③ when there is 12V between terminal ① and ②. See Figure BE-97.

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Horn





COLOR CODE

G : Green
GY : Green with yellow stripe
BG : Black with green stripe
W : White

BE519A

Fig. BE-100 Circuit diagram of horn

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TROUBLE DIAGNOSES AND CORRECTIONS

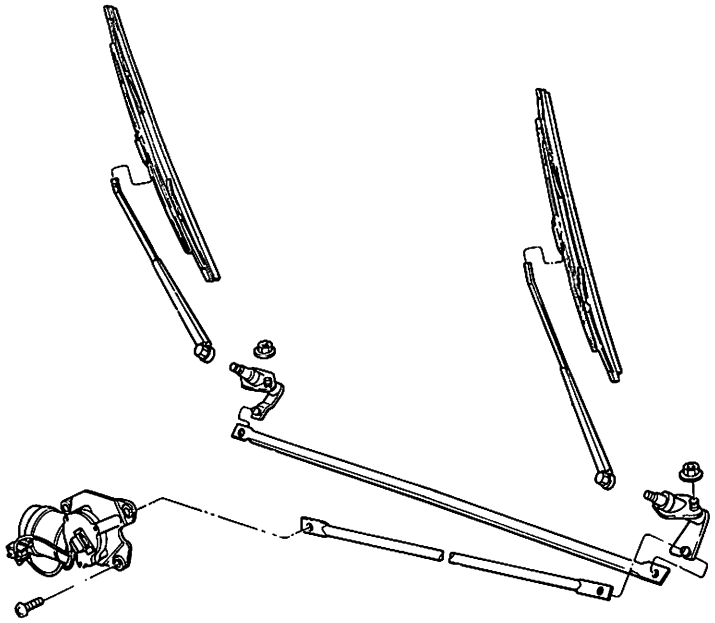
Condition	Probable cause	Corrective action
Horn does not operate.	Discharged battery. (Measure specific gravity of electrolyte.)	Recharge.
	Burnt fuse.	Correct cause and replace fuse.
	Faulty horn button contact. [Horn sounds when horn relay terminal(1) is grounded.]	Repair horn button.
	Faulty horn relay. [Horn sound when (2) and (3) horn relay terminals are connected with a test lead.]	Replace.
	Faulty horn or loose horn terminal connection.	Correct horn terminal connection or replace horn.
Horn sounds continuously.	Short-circuited horn button and/or horn button lead wire. [When black lead wire is disconnected from horn relay terminal(1), horn stops sounding.]	Repair horn button or its wiring.
	Faulty horn relay.	Replace.
Reduced volume and/ or tone quality.	Loose or poor connector contact. (Fuse, relay, horn and/or horn button.)	Repair.
	Faulty horn.	Replace.

WINDSHIELD WIPER AND WASHER

DESCRIPTION

The windshield wipers consists of wiper motor, links, wiper arm and blades. The motor unit consists of a motor and auto-stop mechanism. The wiper motor is a 2-speed type. Washer motor operates when knob is twisted.

The electrically operated windshield washer consists of washing fluid tank, washer nozzle and vinyl tube used to connect those components.



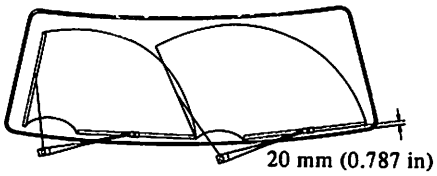
BE520A

Fig. BE-101 Windshield wiper

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ADJUSTMENT

Wiping area



BE521A

Fig. BE-102 Wiping area

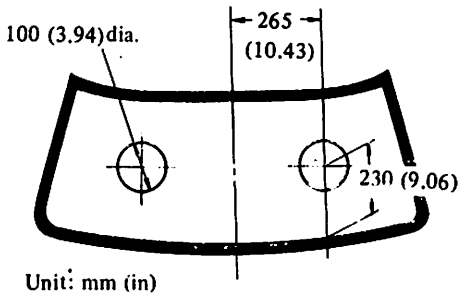
To adjust wiping area, loosen the arm set nut and adjust blade to correct installation angle to obtain correct sweeping zone as sketched in Figure BE-102.

Then, secure the nut at specified tightening torque.

Tightening torque:
0.8 to 0.9 kg-m
(5.8 to 6.5 ft-lb)

Nozzle direction

Adjust nozzle direction so that fluid is sprayed in proper range by bending nozzle with driver. This adjustment can be carried out through cowl top grille.



BE551

Fig. BE-103 Nozzle direction

REMOVAL AND INSTALLATION

Wiper arm and wiper blade

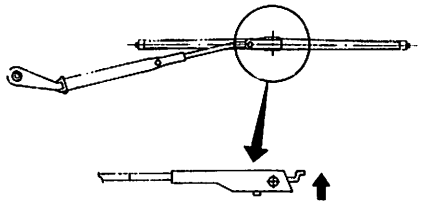
To remove and install arm and blade assembly from pivot, follow this sequence.

1. Raise wiper blade from windshield glass.
2. Unscrew arm set nut. Arm can then be pulled off pivot.
3. Installation is in the reverse sequence of removal.

Note: Be sure to install arm and blade assembly in correct peak position. The position of blade can be adjusted in pushing it onto pivot.

Tightening torque:
Arm set nut: 0.8 to 0.9 kg-m (5.8 to 6.5 ft-lb)

To remove blade, pick up tab to unlatch blade lock and pull blade off the top end of arm.

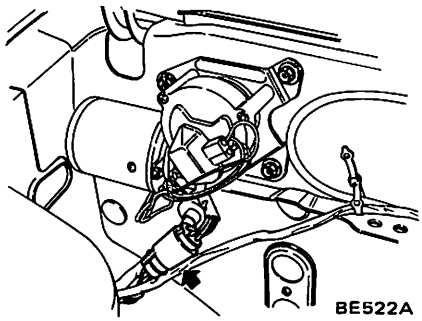


BE552

Fig. BE-104 Removing wiper blade

Wiper motor and linkage

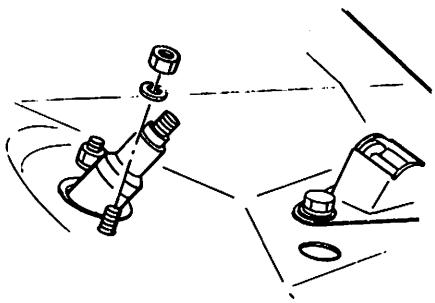
1. Remove wiper arm referring to previous section.



BE522A

Fig. BE-105 Disconnecting connector for wiper motor

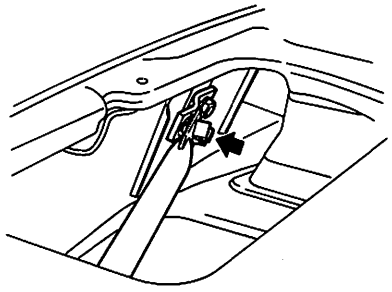
2. Open engine hood, and disconnect connector on the wiper motor.
3. Remove cowl top grille by removing cowl top retaining screws.
4. Remove two flange nuts attaching pivot to cowl top panel.



BE554

Fig. BE-106 Flange nuts

5. Disconnect linkage from wiper motor connecting arm at the part indicated below. Linkage can then be taken out.



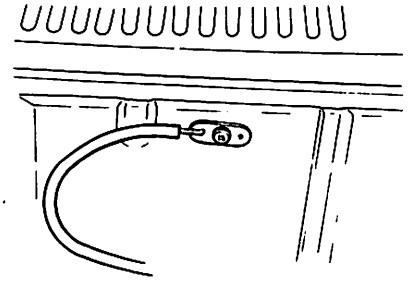
BE523A

Fig. BE-107 Disconnecting linkage from wiper motor

7. Install wiper linkage and wiper motor in the reverse sequence of removal.

Washer nozzle

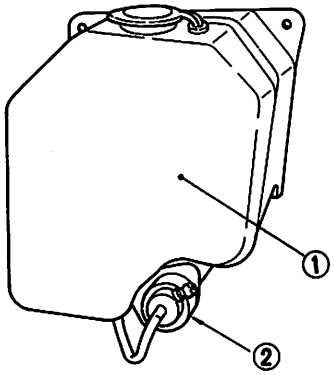
1. Remove washer nozzle fixing screws from cowl top panel.
2. Take out washer nozzle with tube.
3. Installation is in the reverse sequence of removal.



BE555

Fig. BE-108 Washer nozzle

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BE524A

1 Washer tank
2 Washer pump

Fig. BE-109 Washer pump and tank

Cautions for windshield washer operation

1. Be sure to use only washing solution.

Never mix soap powder or detergent with solution.

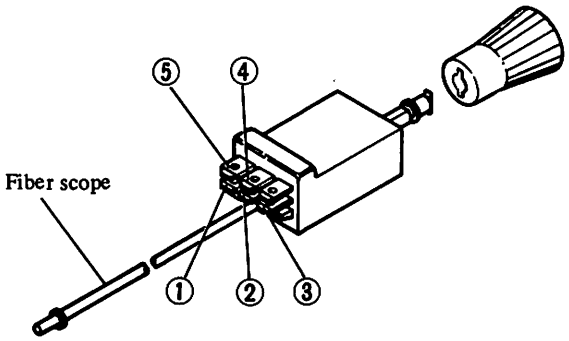
2. Do not operate windshield washer continuously more than 30 seconds or without washer fluid. This often causes improper windshield washer operation. Normally, windshield washer should be operated 10 seconds or less at one time.

1. Disconnect battery ground cable.
2. Reach up underneath instrument panel and disconnect connector and illumination fiber scope if installed.
3. Remove knob by pressing and twisting.
4. Remove retaining nut on cluster lid–C.
5. Take out cluster lid–C referring to page BE-45 for Cluster Lid and Combination Meter.
6. Remove metal retaining nut from cluster lid–A.

The cluster lid A can then be taken out.

7. Installation is in the reverse sequence of removal.

Wiper switch



	OFF	1 STEP	2 STEP	TWIST
1	○	○		
2		○	○	○
3			○	
4				○
5	○			

BE525A

Fig. BE-110 Wiper switch

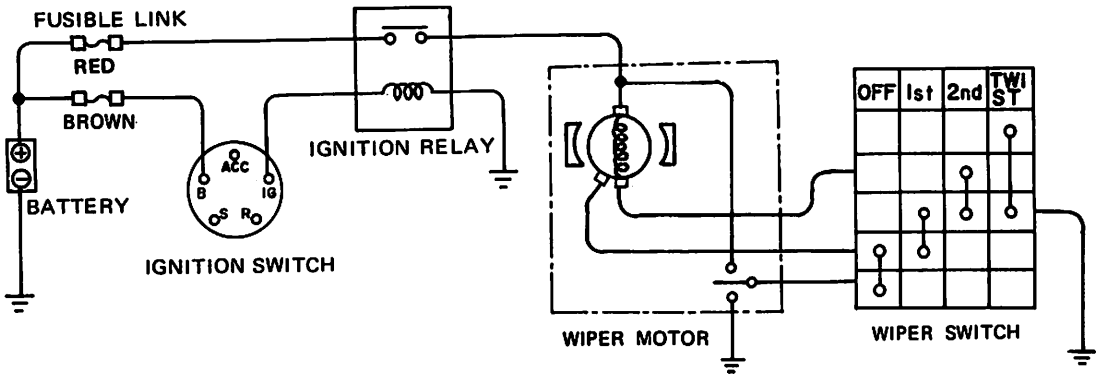
INSPECTION

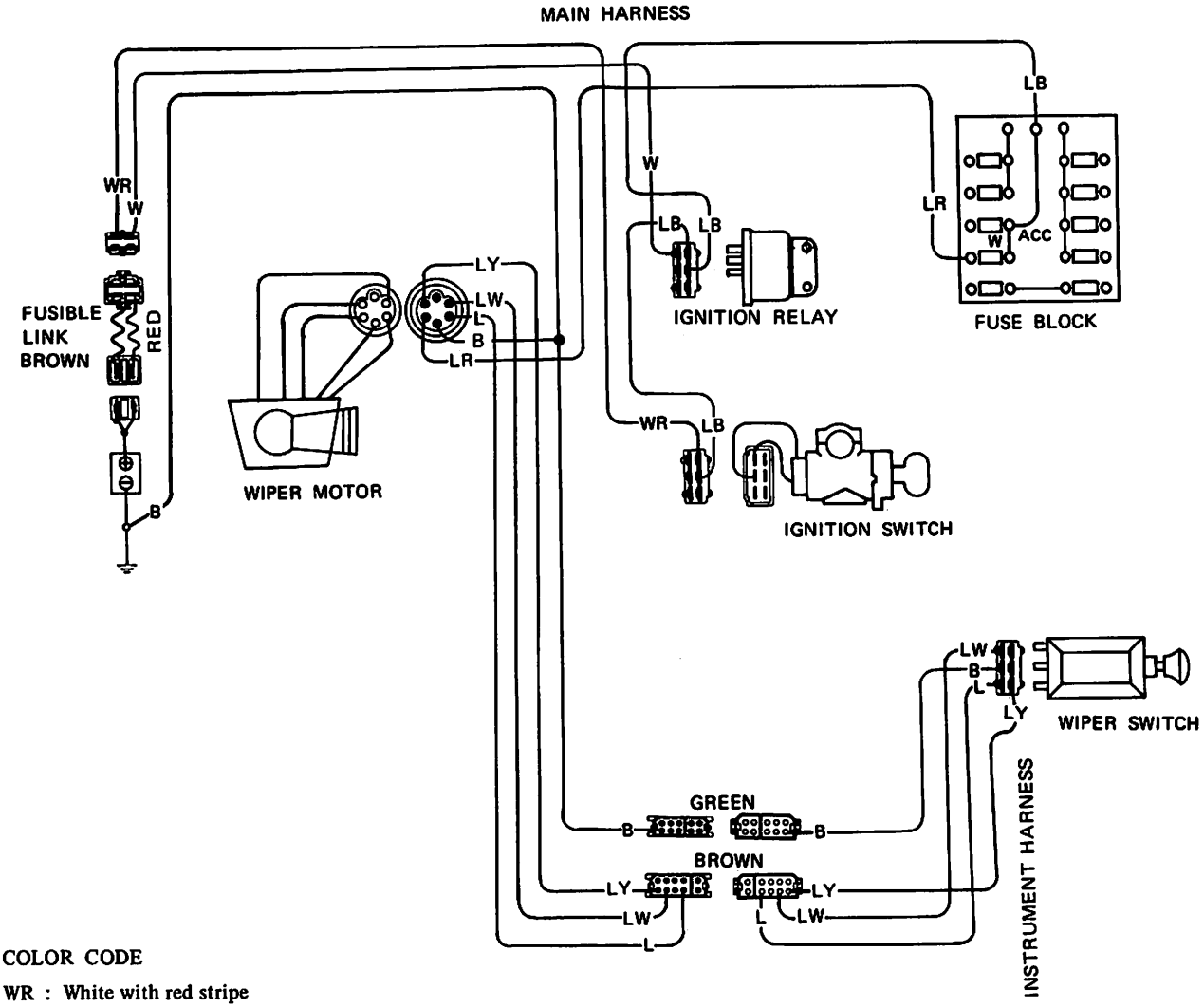
Test continuity of system by using test lamp or ohmmeter.

See Figures BE-111 and BE-112.

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Wiper system





COLOR CODE

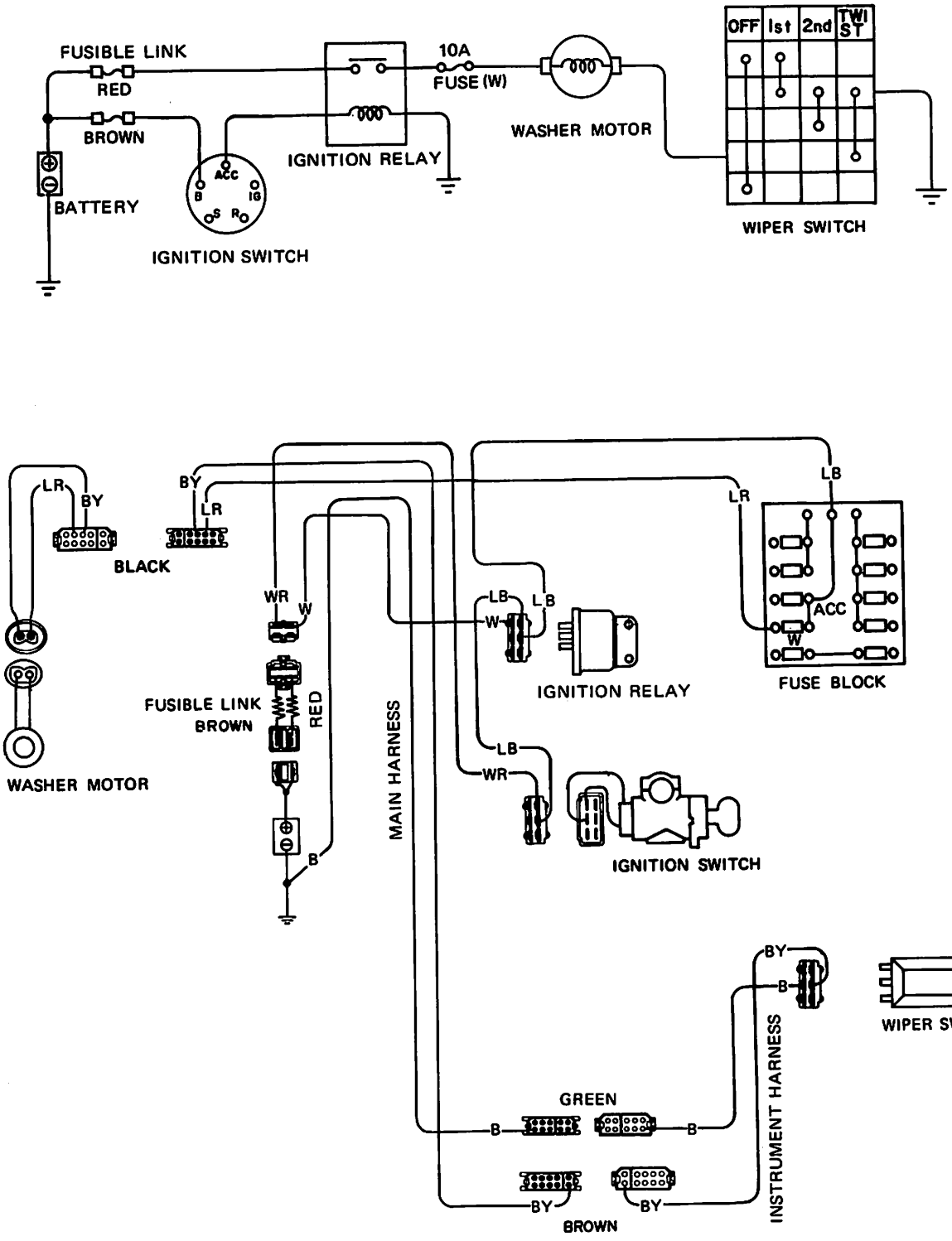
WR : White with red stripe
B : Black
LB : Blue with black stripe
LR : Blue with red stripe
L : Blue
LY : Blue with yellow stripe
LW : Blue with white stripe
W : White
Br : Brown

BE526A

Fig. BE-111 Circuit diagram for wiper

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Washer system



COLOR CODE

LR : Blue with red stripe
BY : Black with yellow
LB : Blue with black stripe
WR : White with red stripe
B : Black
W : White

BE527A

Fig. BE-112 Circuit diagram for washer

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TROUBLE DIAGNOSES AND CORRECTIONS

Condition	Probable cause		Corrective action
Windshield wiper does not operate.	Motor	No current flows to motor due to:	
		Broken armature.	Replace motor.
		Worn motor brush.	Replace motor.
		Motor is overheated due to seized motor shaft.	Replace motor.
		Windshield wiper fuse (10A) is easily fused due to short-circuit, rate short-circuit, or motor inside component burnt.	Replace motor or repair short-circuited part.
	Power supply and cable	Blown fuse due to trouble in other part of windshield wiper circuit.	Check other part for operation and correct trouble.
		Loose, open or broken wiring.	Check wiring near motor and connector for proper connection. Correct if necessary.
		Erroneous wiring.	Check each wire for color code, and correct if necessary.
		Improper grounding.	Correct.
	Switch	Improper switch contact.	Correct.
	Link	Foreign materials interrupt the movement of link mechanism.	Correct.
		Disconnected link rod.	Correct.
		Seized or rusted arm shaft.	Lubricate or replace arm shaft.
Windshield wiper operating speed is too slow.	Motor	With arm raised, excessive current still flows due to rare short-circuit of motor armature.	Replace motor.
		Windshield wiper stops when lightly held with hand due to worn motor brush.	Replace motor.
		With arm raised, excessive current still flows (3 to 5A) due to seized motor shaft.	Replace motor or lubricate bearing with engineoil.
	Power supply and cable	Low source voltage.	Measure voltage, check other electrical parts for operation, and take corrective action for power supply if necessary.
	Link	Humming occurs on motor in arm operating cycle due to seized arm shaft.	Lubricate or replace.
	Switch	Improper switch contact.	Conduct continuity test, and replace if necessary.

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Condition		Probable cause		Corrective action
		Windshield wiper blade	Windshield wiper blade sticks on windshield glass.	Raise arm and operate windshield wiper without applying load. Clean windshield glass and/or replace wiper blade.
Windshield wiper speed cannot be adjusted correctly.		Motor	Motor brush for either low or high speed is worn.	Replace motor.
Windshield wiper does not stop correctly.	Stops anywhere.	Motor	Contaminated auto-stop relay contacts or improper contact due to foreign matter.	Remove auto-stop device cover, and clean contacts carefully so as not to deform relay plate.
		Cable and switch	Improper connection between 1st and 2nd switch steps.	Remove switch, and make sure that 1st and 2nd steps are not connected at "OFF" position. If connected, replace switch.
	Does not stop.	Motor	Incomplete auto-stop operation (Contact is not interrupted.).	Remove auto-stop device cover, and correct relay plate bending.

CIGARETTE LIGHTER

DESCRIPTION

The cigarette lighter consist of lighter and housing. On some models, the cigarette lighter also contains its own illumination lamp. The housing is secured on the cluster lid with a nut or housing cover. In pushing the lighter into the housing, the lighter is retained by nails equipped in the housing and gets continuity through the heater coil equipped at the end of lighter.

When the heater is warmed enough, the bi-metal nail frees the lighter. Then the lighter pops out by spring back, and breaks continuity.

REMOVAL AND INSTALLATION

1. Remove lighter from housing.
2. Remove cluster lid–C referring to page BE-45 for Cluster Lid and Combination Meter.
3. Remove three lead wires.
4. Remove retaining nut on end of housing. Cover and housing nut can then be taken out.
5. Installation is in the reverse sequence of removal.

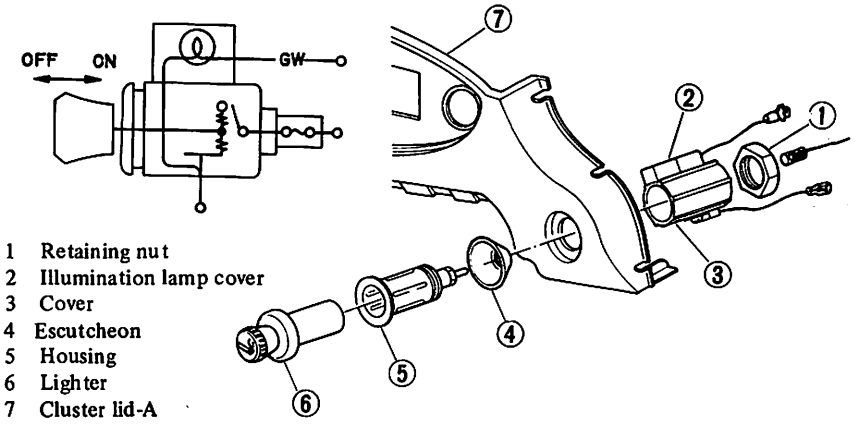


Fig. BE-113 Cigarette lighter

ILLUMINATION BULB REPLACEMENT

1. Take out cigarette lighter assembly following the procedure described previously.
2. Remove illumination lamp cover from cigarette lighter cover.
3. Remove bulb from socket.
4. Install new bulb and assembly in the reverse sequence of removal.

Bulb wattage:
Cigarette lighter illumination lamp 1.7W

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INSPECTION

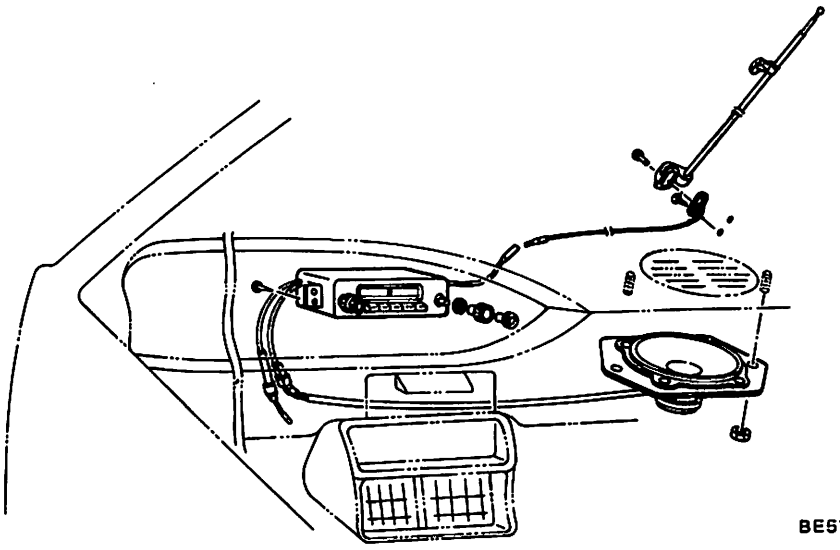
Test continuity of system by using test lamp or ohmmeter.

The illumination lamp must always remain lit when the lighting switch is turned on. Refer to Figure BE-95 for wiring diagram of cigarette lighter and Figure BE-22 wiring diagram of illumination system.

RADIO

DESCRIPTION

Radio system consist of antenna, speaker and radio receiver. Antenna is connected to radio receiver by feeder cable. Speaker is installed under the dash panel.



BE571

Fig. BE-114 Radio components

REMOVAL AND INSTALLATION

Radio receiver

1. Remove cluster lid–C and lid–A. Refer to page BE-45 for Cluster Lid and Combination Meter.
2. Remove four retaining screws and take out radio receiver.
3. Installation is in the reverse sequence of removal.

Speaker

1. Remove cluster lid–C and lid–A, refer to page BE-45 for Cluster Lid and Combination Meter.
2. Remove two screws securing speaker to dash panel from beneath dash panel.

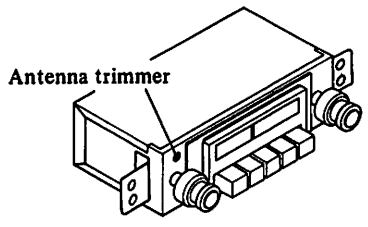
Speaker can then be taken out.

3. Installation is in the reverse sequence of removal.

Antenna and feeder cable

1. Remove upper and lower antenna retaining screws. Antenna with retainer can then be removed.
2. Remove two screws retaining antenna feeder base.
3. Disconnect feeder cable connector at radio receiver and loosen clamp of feeder cable.

Note: Connector and clamp are situated behind the cluster lid. Therefore it is recommended that the cluster lid be removed.

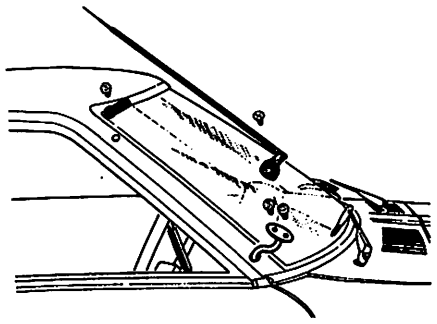


HITACHI-make radio

INSPECTION

When noise is generated, inspect

4. The feeder cable can be pulled out easily through the hole on the front pillar.
5. Installation is in the reverse sequence of removal.



BE279

Fig. BE-115 Radio antenna

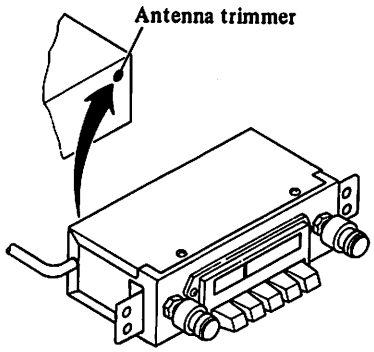
ANTENNA TRIMMER ADJUSTMENT

When a new radio receiver, antenna or antenna feeder cable is installed, antenna trimmer should be adjusted.

1. Extend antenna completely.
2. Tune in the weakest station between 12 and 16 (1,200 to 1,600 Hz) on dial.

Note: Noise may be generated but disregard it.

3. Turn antenna trimmer to left and right slowly with screwdriver and set it at position where receiving sensitivity is best.



CLARION-make radio

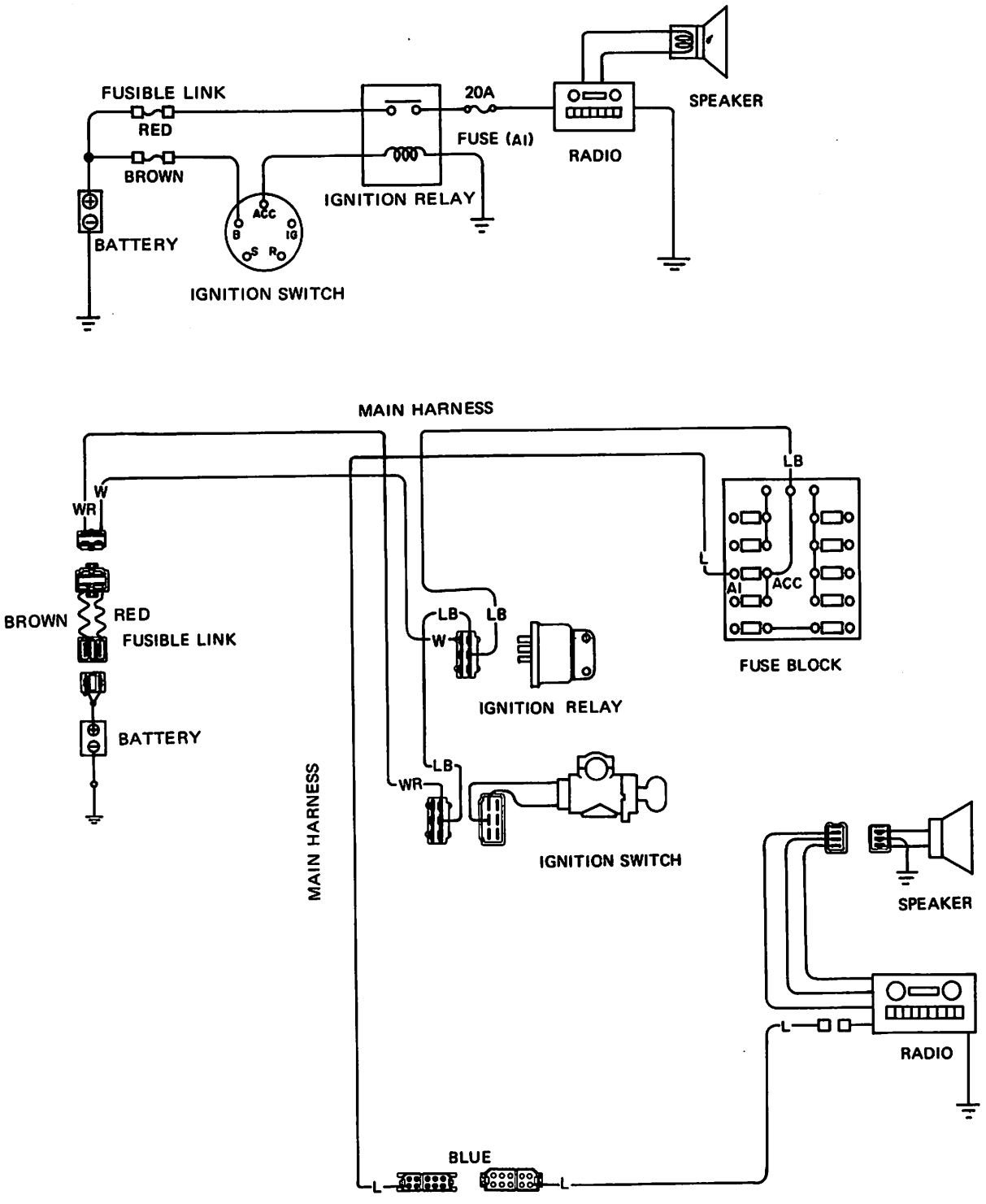
BE572

Fig. BE-116 Trimmer adjust screw

referring to the noise prevention chart described below.

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Radio



COLOR CODE

WR : White with red stripe
LB : Blue with black stripe
L : Blue
W : White

BE529A

Fig. BE-117 Circuit diagram for radio

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TROUBLE DIAGNOSES AND CORRECTIONS

NOISE PREVENTION CHART

Position car in an open area away from steel buildings, run engine, extend antenna to its maximum length, set volume control to maximum and set dial at a medium point without receiving broadcasting wave.

Condition	Probable cause	Corrective action
Ignition system Noise occurs when engine is operated.	High tension cable Ignition coil.	Install new high tension cable. Install a 0.5μF capacitor to primary side + terminal of ignition coil. **Note: Be careful not to install capacitor to secondary or primary breaker side. This will result in improper engine operation.**
Charging system. Sound of alternating current present.	Alternator.	Install a 0.5μF capacitor to charging terminal A. **Note: Do not use a larger capacitor. If capacitor is installed to terminal F, alternator coil will be damaged.**
When accelerator pedal is depressed or released, noise occurs.	Regulator.	Install a 0.5μF capacitor to "IGN" terminal of voltage regulator.
Fuel system When ignition switch is set to "ON", noise occurs.	Electric fuel pump.	Install a 0.5μF capacitor to power lead connector plug of electric fuel pump.

Notes:

a. **Be sure to locate capacitor as close to noise source as possible and connect in parallel.**
b. **Cut lead wire as short as possible.**
c. **Ground wire should be attached to the body completely.**
d. **Make installation and connections securely.**
e. **Carefully identify "+", "–", "IN" or "OUT" marks.**

THEFT PROTECTION SYSTEM

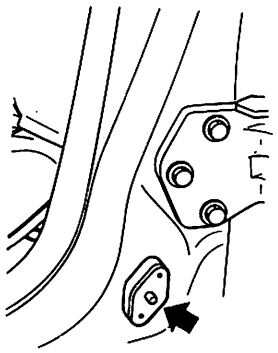
This system consists of ignition switch, door switch and buzzer. When L.H. door is opened with ignition key still in ignition switch, buzzer sounds. This system prevents driver from leaving car without removing key.

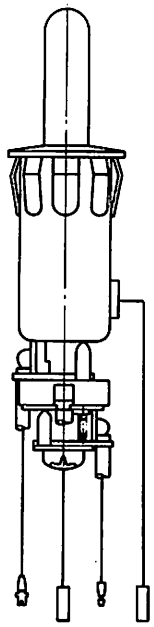
REMOVAL AND INSTALLATION

Door switch

Door switch is located at L.H. center door pillar

1. Withdraw switch and wire assembly from center pillar.
2. Disconnect lead wire at connectors. Switch can then be taken out.
3. Installation is in the reverse sequence of removal.





BE530A

Fig. BE-118 Door switch (L.H.)

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Ignition switch

For the purpose of making switch tamper-proof, self-shear type screws are used, and their heads are sheared off when installed so that the steering lock system cannot be easily removed. Replace the steering lock in accordance with the following instructions when required.

Break two self-shear type screws with a drill or other proper tool, then remove the steering lock from the steering lock clamp.

When installing a new steering lock, be sure to tighten two new self-shear type screws to shear off their heads.

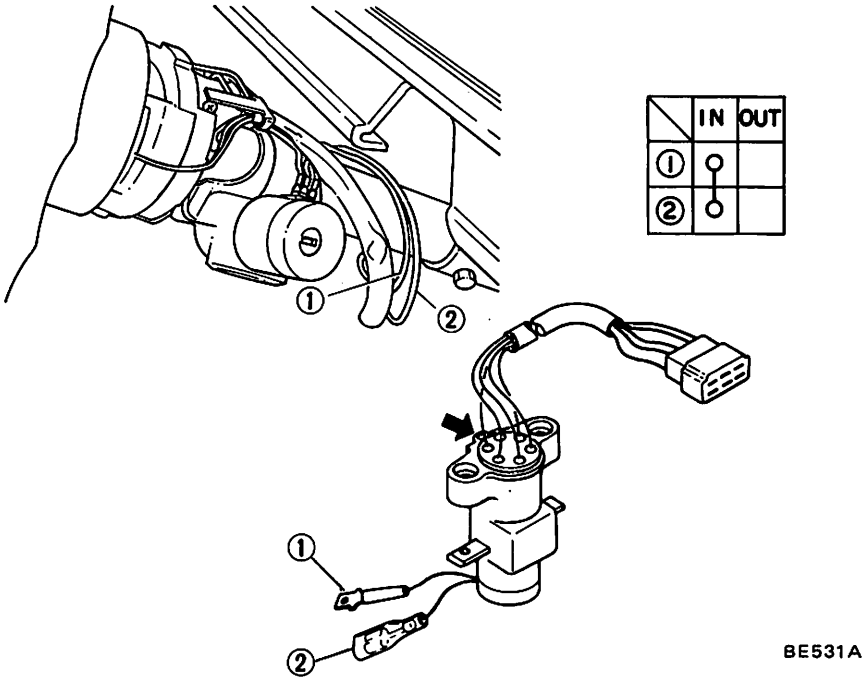


Fig. BE-119 Ignition switch

Warning buzzer

Warning buzzer is located behind the instrument panel.

1. Disconnect battery ground cable.
2. Remove all cluster lids.
   Refer to cluster lid removal.
3. Disconnect lead wires at connector.
4. Remove two screws retaining buzzer to stay.
   Bumper can then be taken out.
5. Installation is in the reverse sequence of removal.

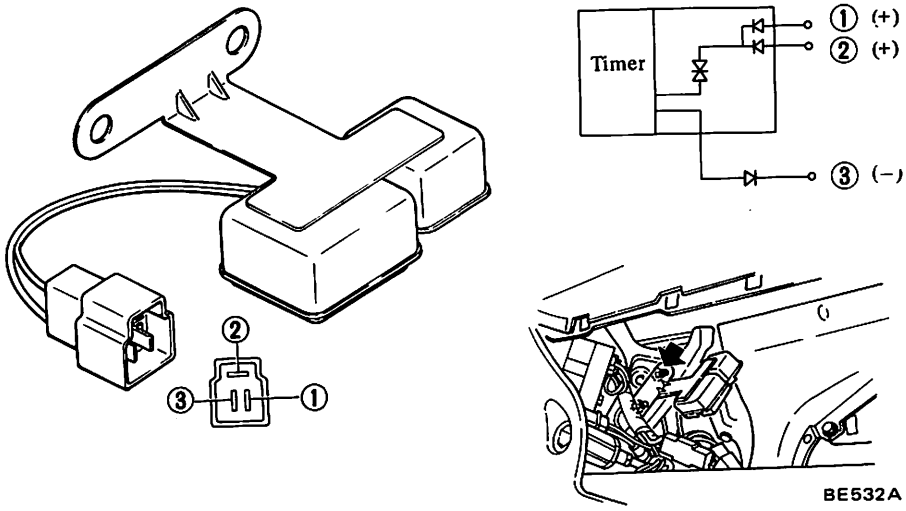


Fig. BE-120 Warning buzzer

INSPECTION

Door switch

There are three lead wires from door switch. Two of them are for warning buzzer and the other is for room lamp.

Inspect continuity through door switch by using test lamp or ohmmeter when plunger is pressed into switch assembly, door switch contacts are opened. Contacts are closed when plunger is projected. See Figure BE-118 door switch.

Warning buzzer

Apply 12V direct current between ①-③ or ②-③ and check whether buzzer sound or not. The buzzer must sound when ①-③ and ②-③ are connected to power circuit. See Figure BE-120 warning buzzer.

Note: Make sure that (–) negative terminal of power circuit is always connected to ③ terminal.

Ignition switch

Test continuity between two harnesses ①-② indicated in the Figure BE-119. When the key is inserted into switch continuity must exist. On the contrary, continuity must not exist when the key is removed from ignition switch.

Circuit

Test continuity through the circuit by using ohmmeter or test lamp. The whole circuit is described below in detail.

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Theft protection system

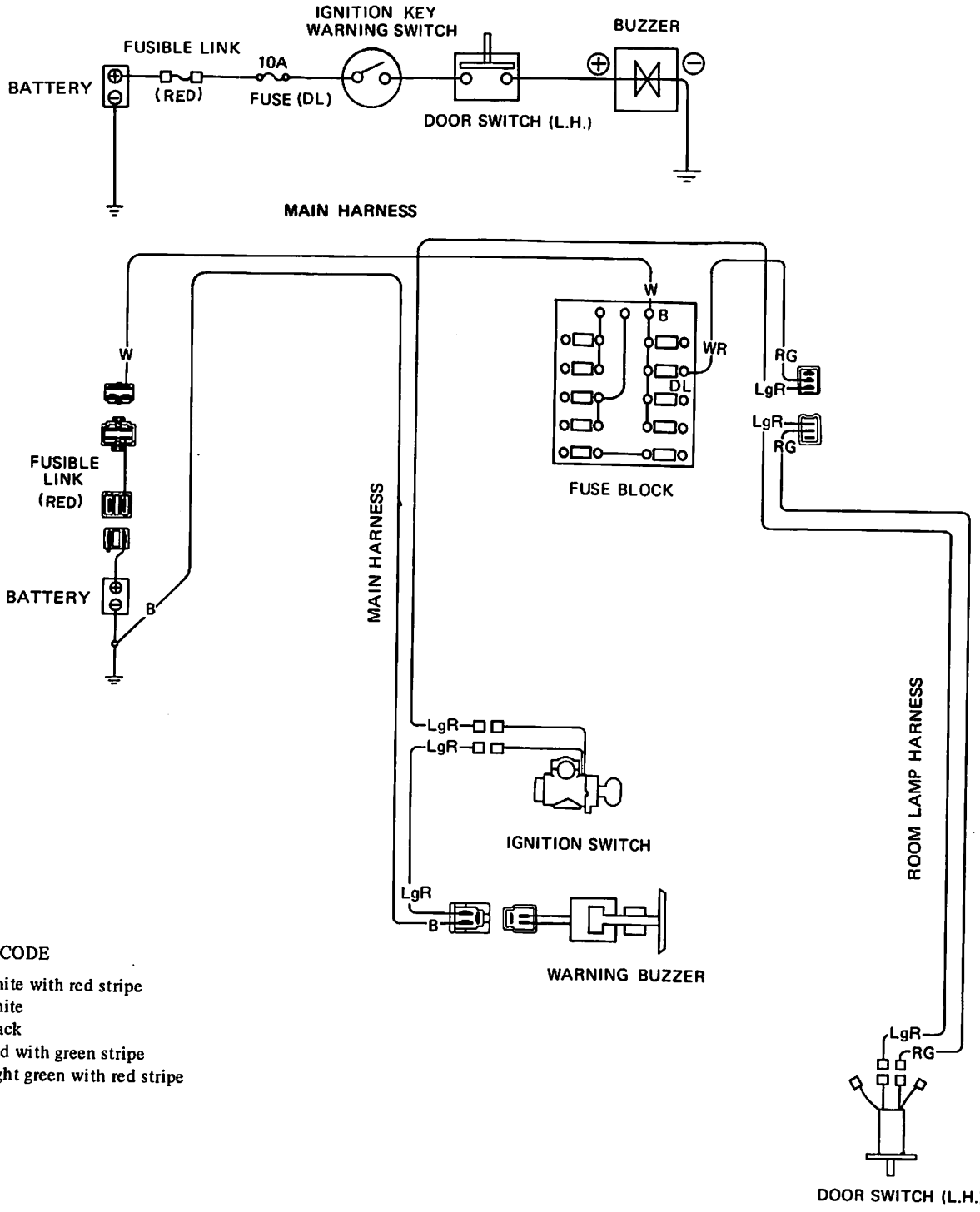


Fig. BE-121 Circuit diagram for theft protection system

KICKDOWN SYSTEM (For automatic transmission model)

DESCRIPTION

The kickdown system consists of kickdown switch and kickdown solenoid. Kickdown switch is located on the accelerator pedal. Kickdown solenoid is located on right side of automatic transmission. They are connected to each other. For details on automatic transmission, refer to Section Automatic Transmission.

REPLACEMENT

Kickdown switch

1. Disconnect a pair of lead wires.
2. Loosen lock nut on switch body.
3. Remove kickdown switch by rotating switch body.
4. Install in reverse sequence of removal.

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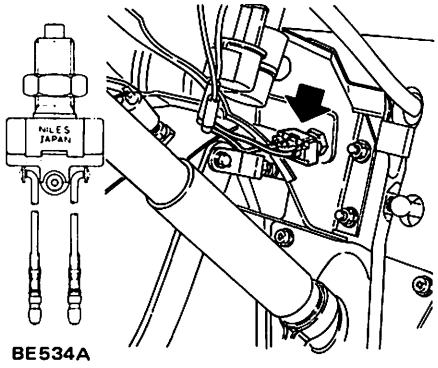


Fig. BE-122 Kickdown switch

Kickdown solenoid

Refer to Section AT for Removal of Kickdown Solenoid.

Kickdown system

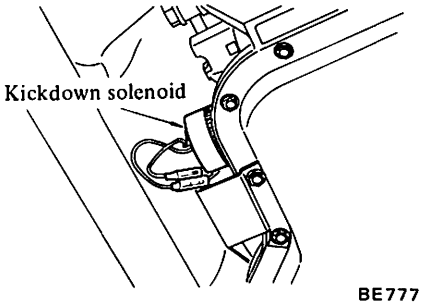


Fig. BE-123 Kickdown switch

INSPECTION

Kickdown switch

The switch plunger is controlled by accelerator pedal. When plunger is pressed into switch assembly, contacts are closed.

Therefore there must be continuity only when plunger is pressed into switch body.

Kickdown solenoid

Refer to Section AT for Inspection of Kickdown solenoid.

Wiring

Referring to following circuit diagram, test continuity by using ohmmeter or test lamp.

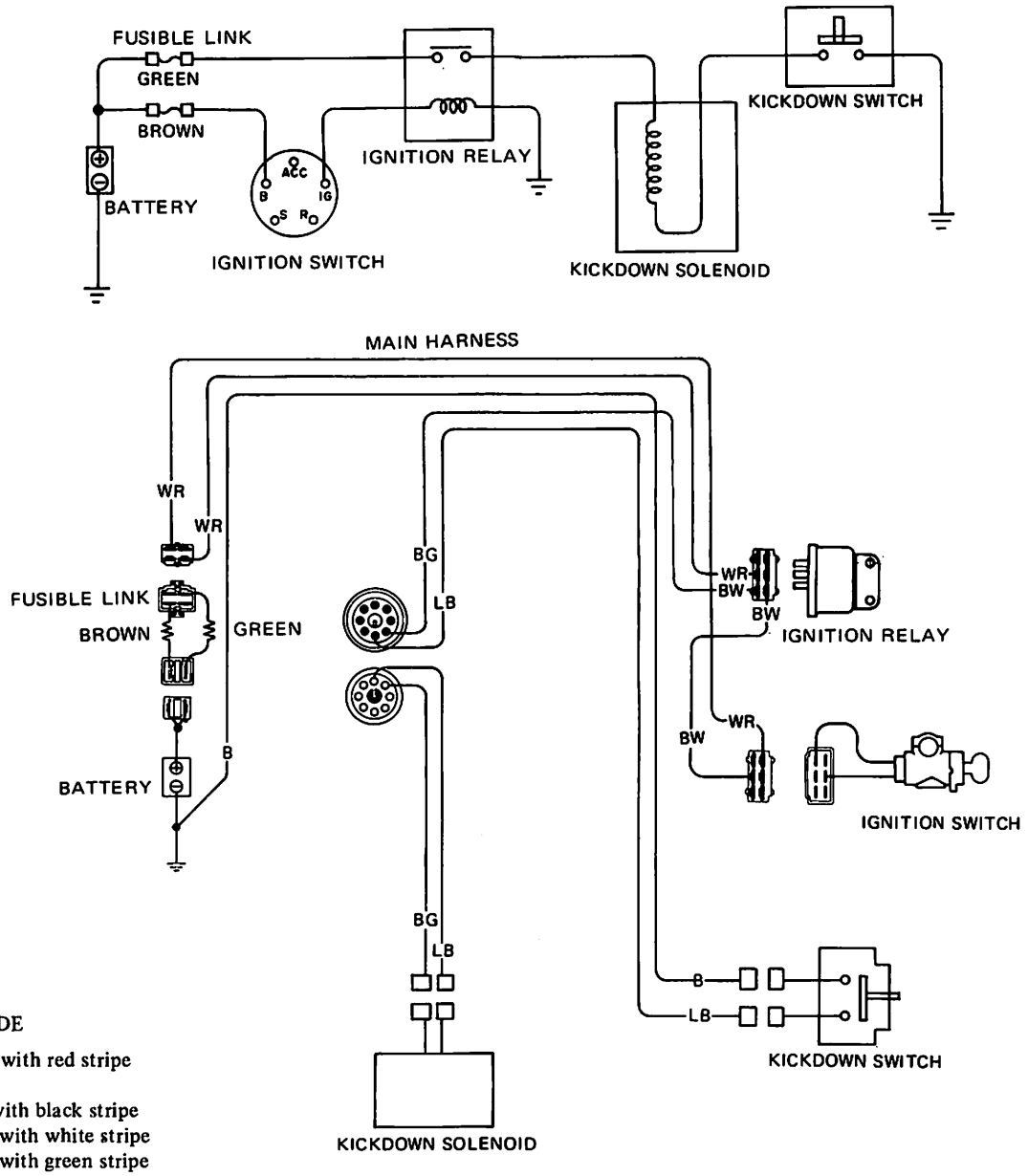
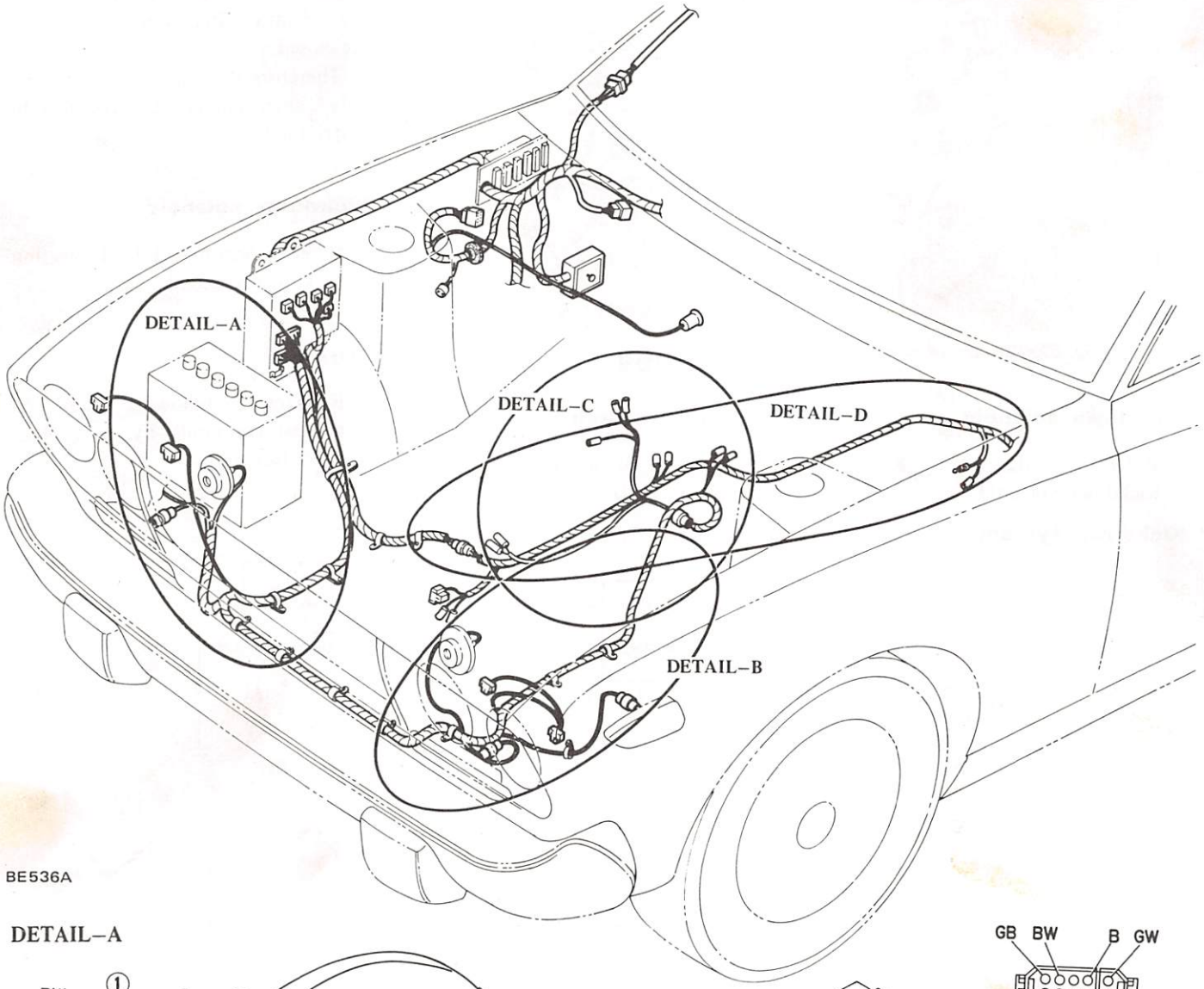


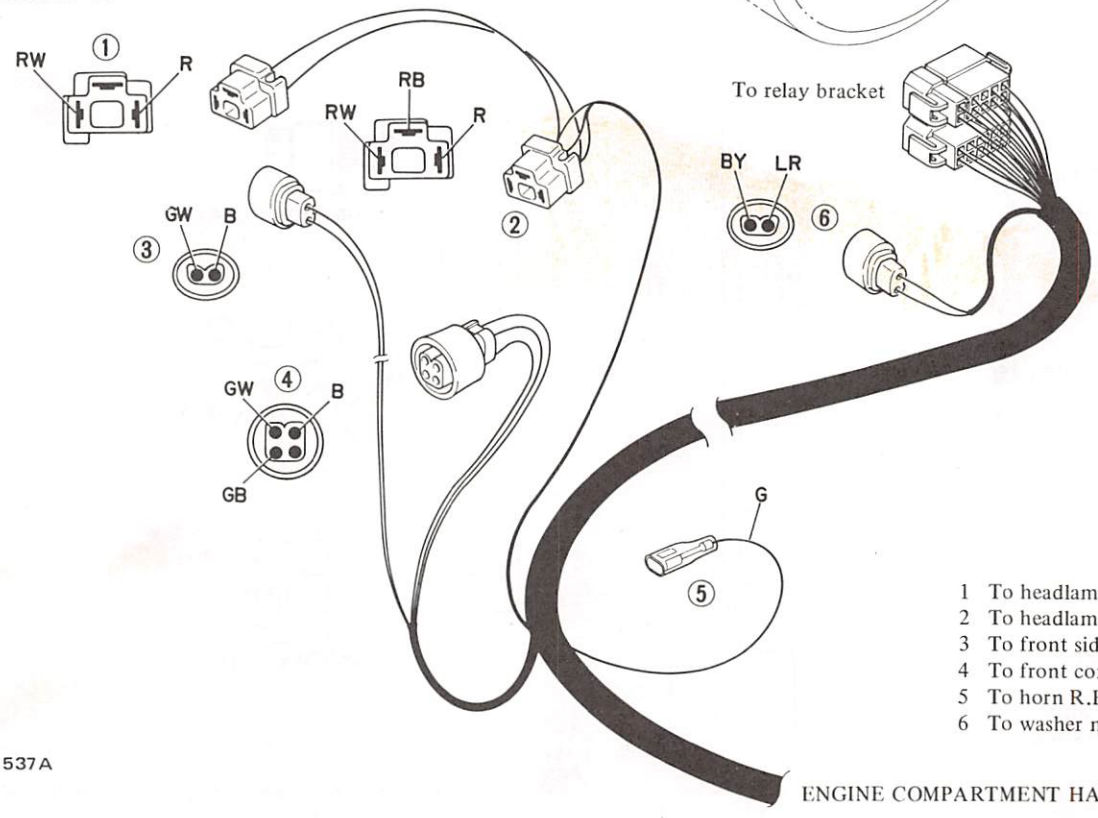
Fig. BE-124 Circuit diagram for kickdown switch

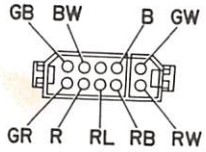
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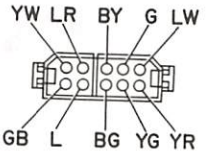
BE536A

DETAIL–A





Ⓐ (WHITE)



Ⓑ (GREEN)

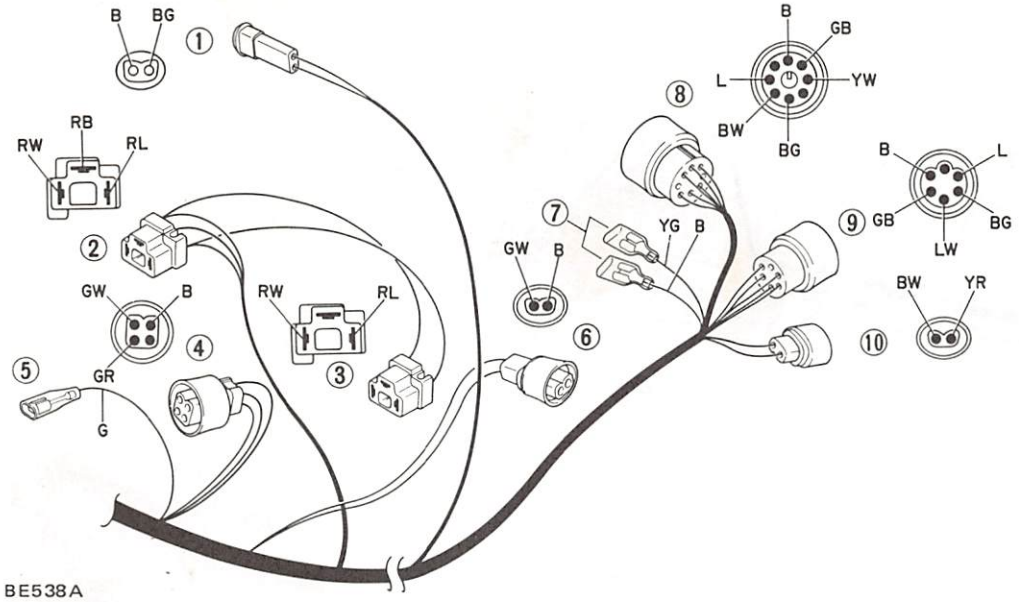
1 To headlamp R.H. (Inner)
2 To headlamp R.H. (Outer)
3 To front side marker lamp R.H.
4 To front combination lamp R.H.
5 To horn R.H.
6 To washer motor

BE537A

ENGINE COMPARTMENT HARNESS

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DETAIL–B

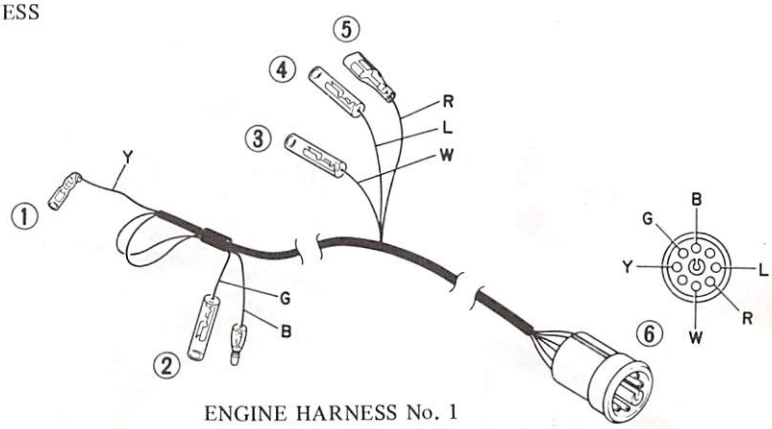


BE538A

1 To B.C.D.D. solenoid
2 To headlamp L.H. (Outer)
3 To headlamp L.H. (Inner)
4 To front combination lamp L.H.
5 To horn L.H.
6 To front side marker lamp L.H.
7 To brake level switch
8 To engine harness No. 1
9 Check connector
10 To solenoid valve for E.A.R.V.

ENGINE COMPARTMENT HARNESS

DETAIL–C

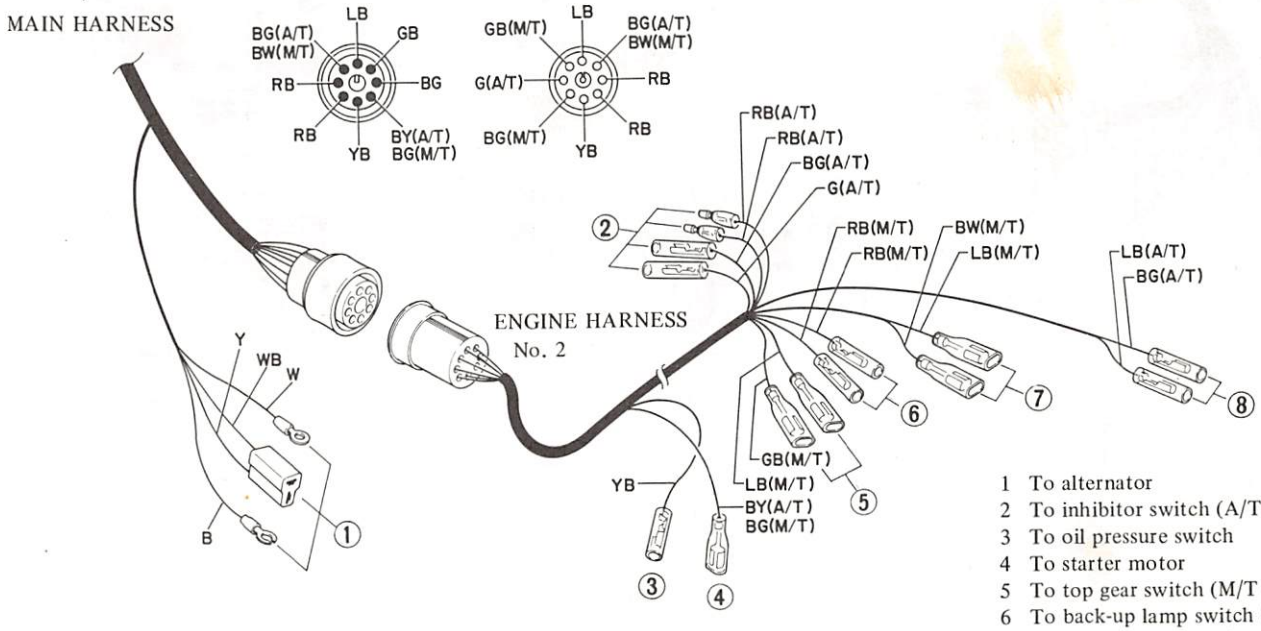


1 To thermal transmitter
2 To vacuum switching valve
3 To B.C.D.D. solenoid valve
4 To auto choke heater
5 To anti-dieseling solenoid
6 To engine compartment harness

ENGINE HARNESS No. 1

BE539A

DETAIL–D

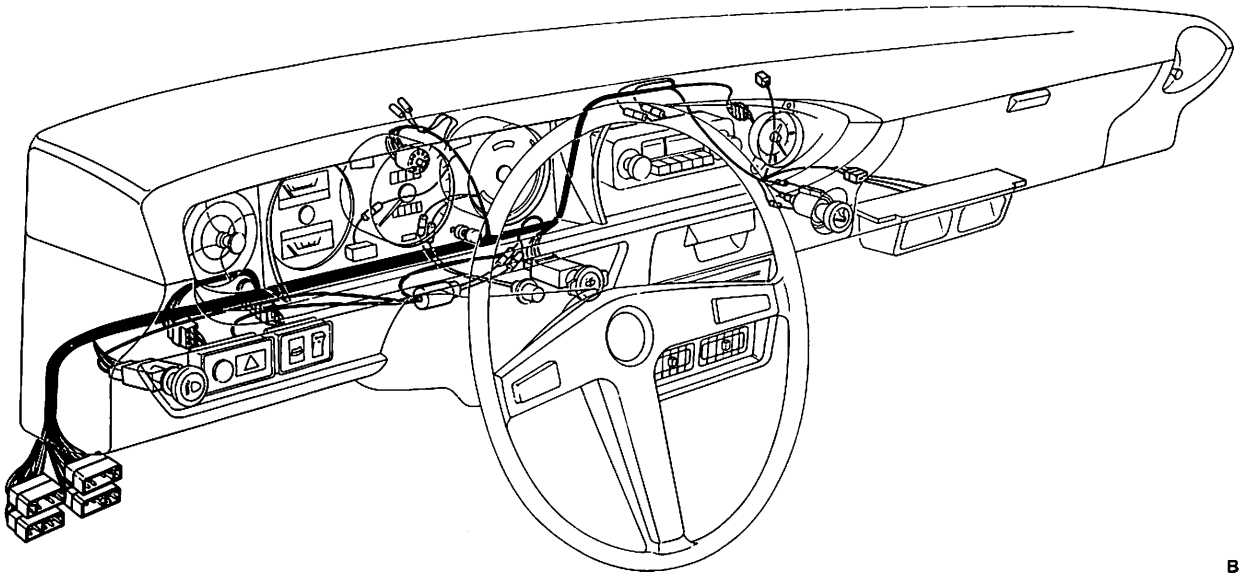


BE540A

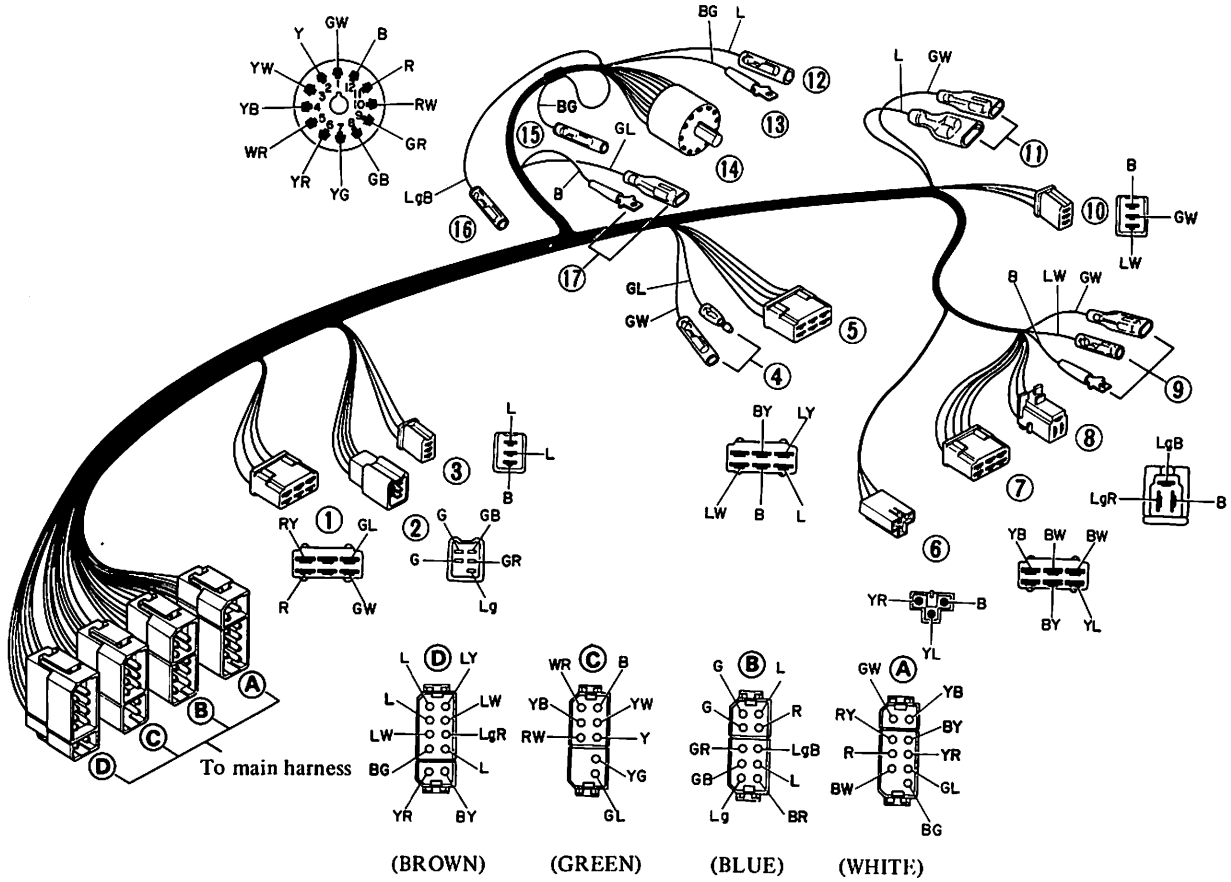
1 To alternator
2 To inhibitor switch (A/T only)
3 To oil pressure switch
4 To starter motor
5 To top gear switch (M/T only)
6 To back-up lamp switch (M/T only)
7 To neutral switch (M/T only)
8 To kickdown solenoid (A/T only)

Fig. BE-125 Wiring harness of engine compartment

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BE541A



1 To lighting switch
2 To hazard switch
3 To rear window defogger switch
4 To knob illumination lamp
5 To wiper switch
6 To catalyzer and floor temperature warning lamp (California)
E.G.R. warning lamp (except California and Canada)
7 To floor temperature relay
8 To warning buzzer
9 To cigarette lighter
10 To clock
11 To radio
12 To odometer switch
13 To meter AMP
14 To combination meter
15 To tachometer
16 To seat belt warning lamp
17 To illumination control switch

BE542A

Fig. BE-126 Wiring harness of instrument harness

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STARTER INTERLOCK SYSTEM (Except Canada)

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WARNING BUZZER AND LIGHT BE-83
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IGNITION SWITCH BE-101
EMERGENCY SWITCH BE-101

DESCRIPTION

The starting system of 710 Models is provided with STARTER INTERLOCK DEVICE in accordance with MVSS 208.

The engine can be started and the warning buzzer and light will not activate only when front seat occupants observe the following requirements for starting the engine.

REQUIREMENTS FOR STARTING THE ENGINE

1. Engine starts when every front seat occupant observes the following.
(1) Front seat belt is fastened after front occupant is seated.
(2) When none of the front seats are occupied.

CASE	DRIVER'S SEATING POSITION		FRONT OUTBOARD SEATING POSITION	
	SEAT SWITCH	BELT SWITCH	SEAT SWITCH	BELT SWITCH
1	ON-1	ON-2	ON-1	ON-2
2	ON-1	ON-2	OFF	OFF or ON-1
3	OFF	OFF or ON-1	ON-1	ON-2
4	OFF	OFF or ON-1	OFF	OFF or ON-1

Note: "–1" and "–2" in the switch columns indicate sequence of switch activation.

2. If the engine stops, the starter interlock device will allow restarting of the engine under any of the following conditions.
(1) The ignition key remains turned to the "ON" position.
(2) The driver remains seated.
(3) It is within 3 minutes after turning the ignition key to the "OFF" or "ACC" position.

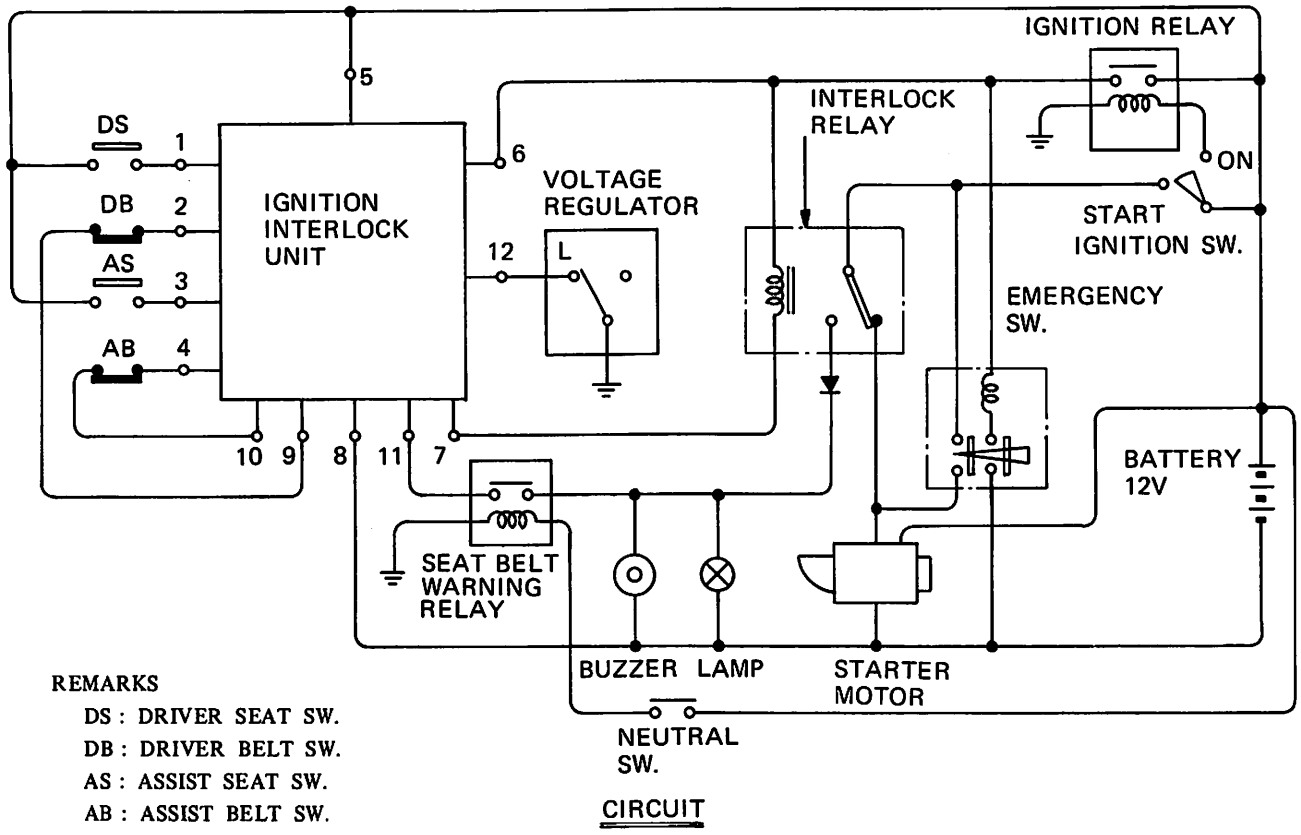
3. In an emergency, the engine can be started observing the following procedure.
(1) Turn the ignition key to the "ON" position.
(2) Push the switch button inside the engine compartment.
(3) Turn the ignition key to the "START" position.

WARNING BUZZER AND LIGHT

They activate under any of the following conditions.
1. A front occupant has not fasten his seat belt, and the gear shift lever is in any driving position and the ignition key is in the "ON" position.
2. Starter interlock relay operates with the ignition key in the "START" position.

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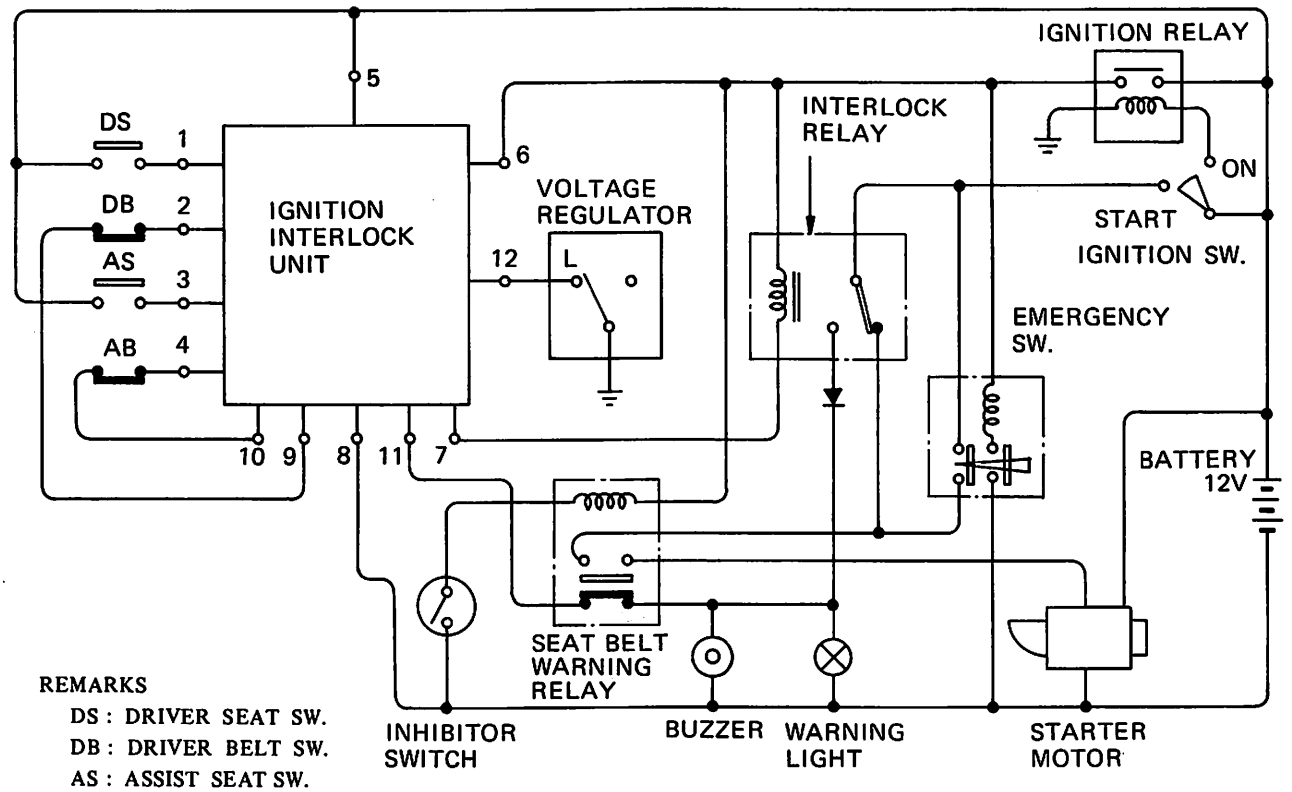
MANUAL TRANSMISSION



REMARKS
DS : DRIVER SEAT SW.
DB : DRIVER BELT SW.
AS : ASSIST SEAT SW.
AB : ASSIST BELT SW.

CIRCUIT

AUTOMATIC TRANSMISSION



REMARKS
DS : DRIVER SEAT SW.
DB : DRIVER BELT SW.
AS : ASSIST SEAT SW.
AB : ASSIST BELT SW.

CIRCUIT

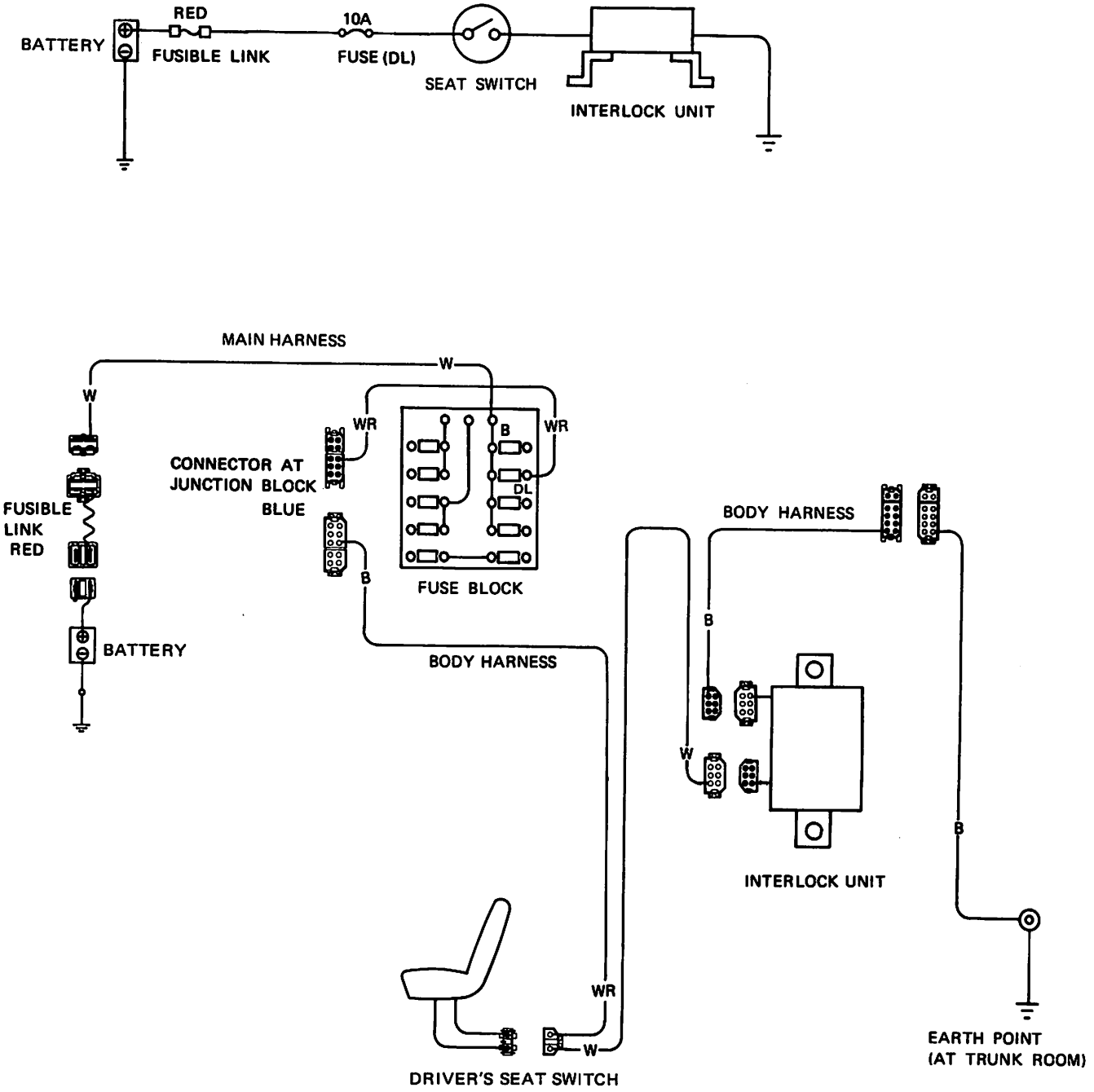
BE543A

Fig. BE-127 Circuit diagram of starter interlock system

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CIRCUIT DIAGRAM OF INTERLOCK SYSTEM

Driver's seat switch



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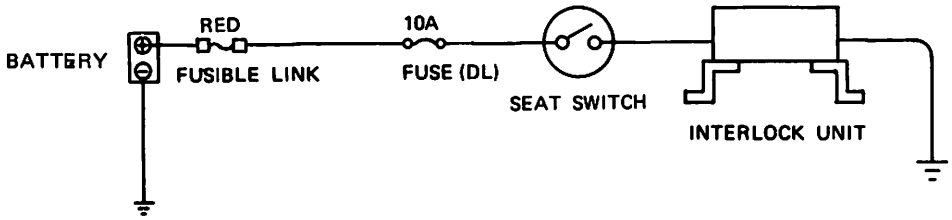
W : White
WR : White with red stripe
B : Black

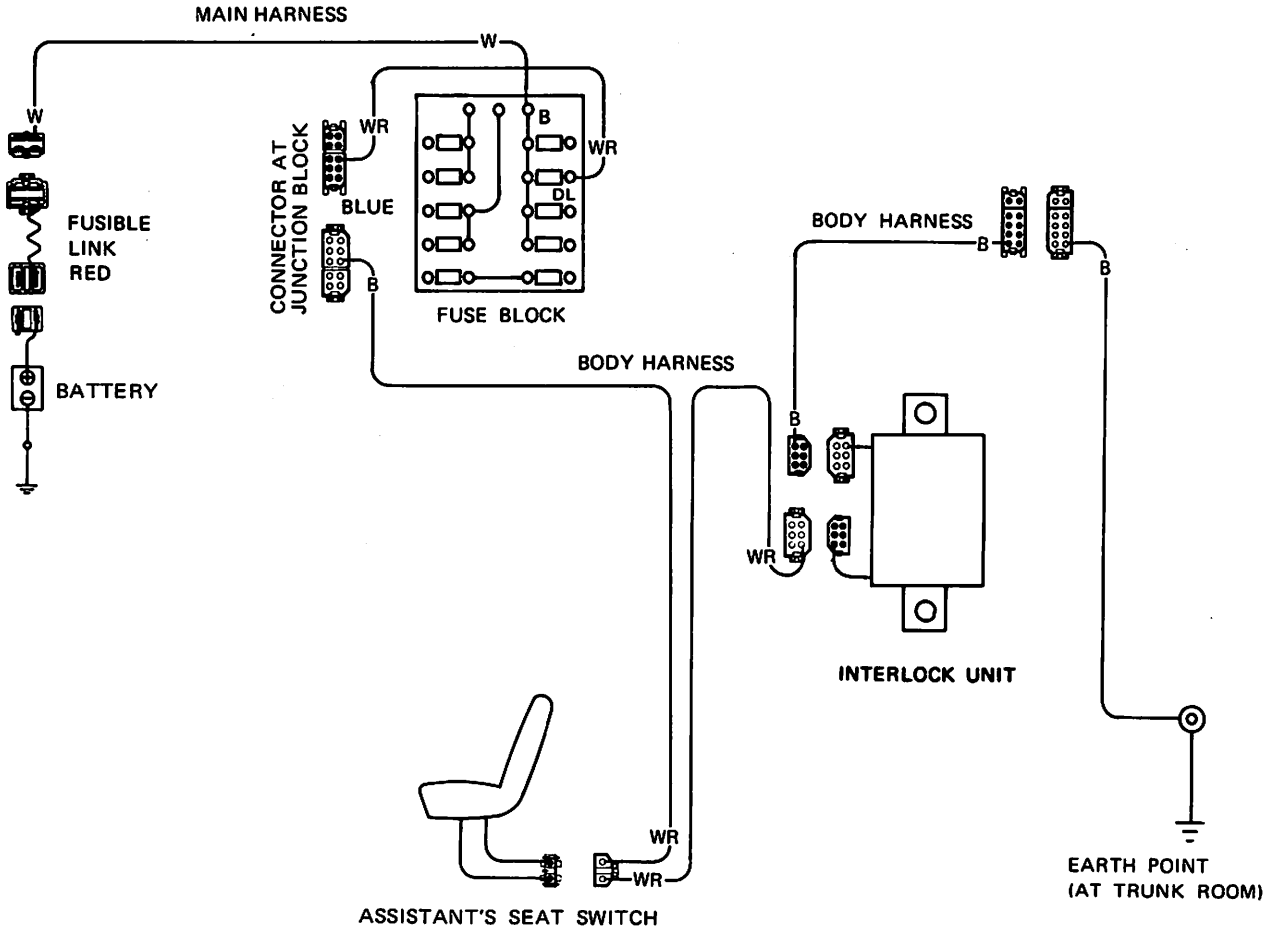
BE545A

Fig. BE-128 Circuit diagram of driver's seat switch

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Assistant's seat switch





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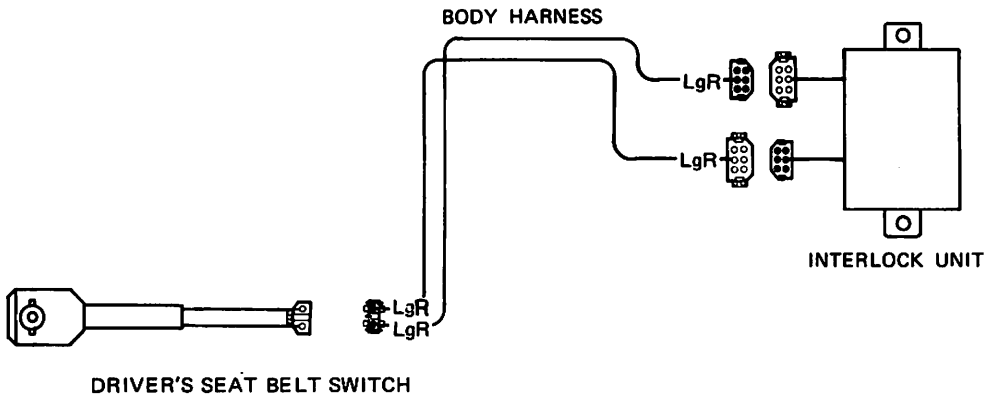
W : White
WR : White with red stripe
B : Black

BE544A

Fig. BE-129 Circuit diagram of assistant's seat switch

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Driver's seat belt switch



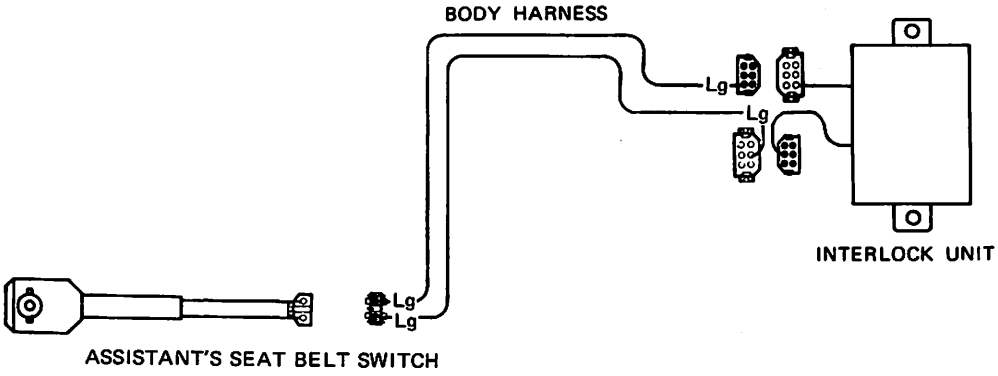
Color code

LgR' : Light green with red stripe

BE546A

Fig. BE-130 Circuit diagram of driver's seat belt switch

Assistant's seat belt switch



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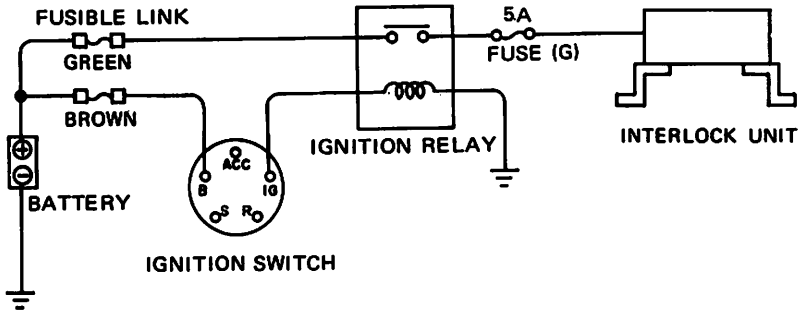
Lg : Light green

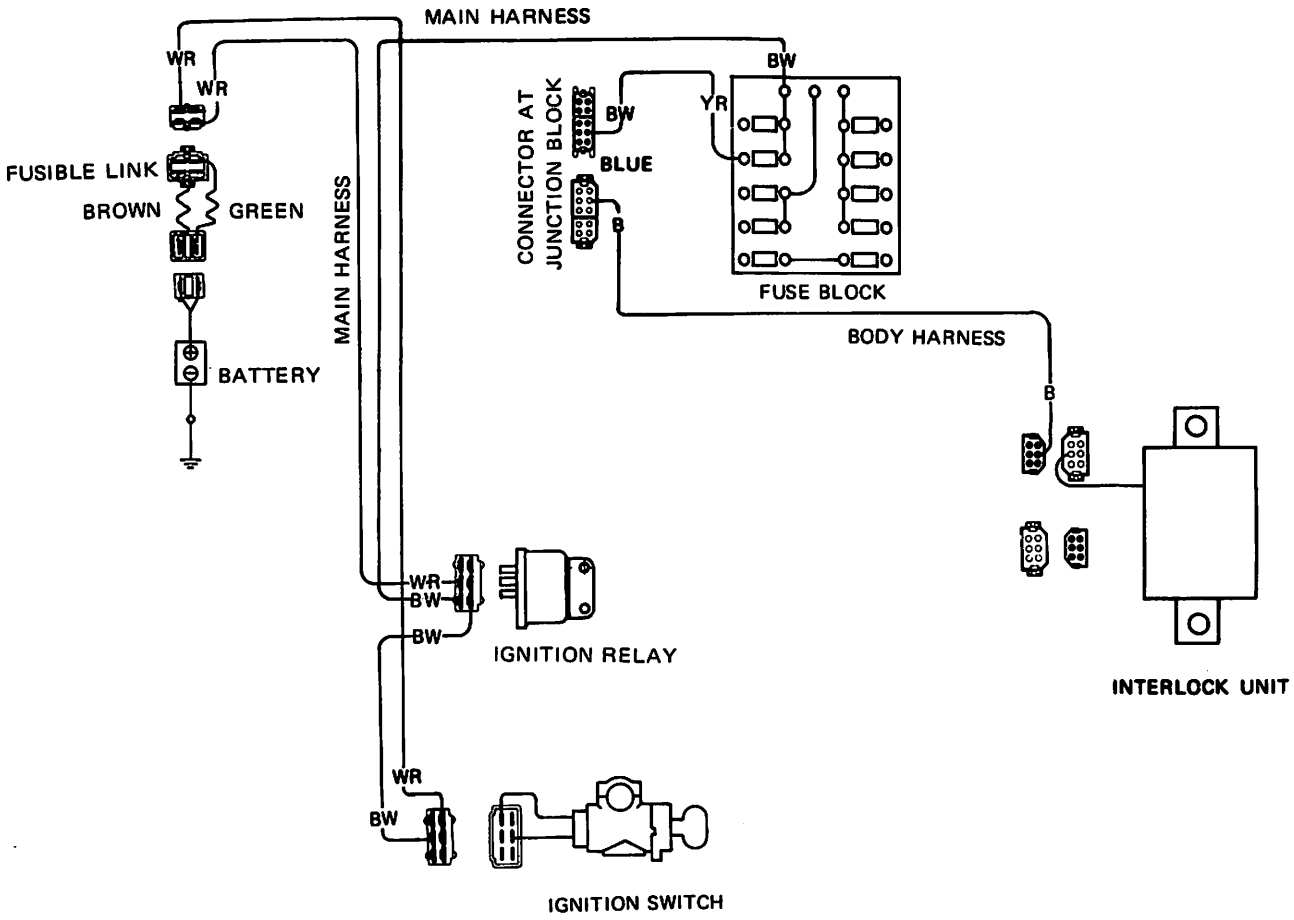
BE547A

Fig. BE-131 Circuit diagram of assistant's seat belt switch

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Ignition switch





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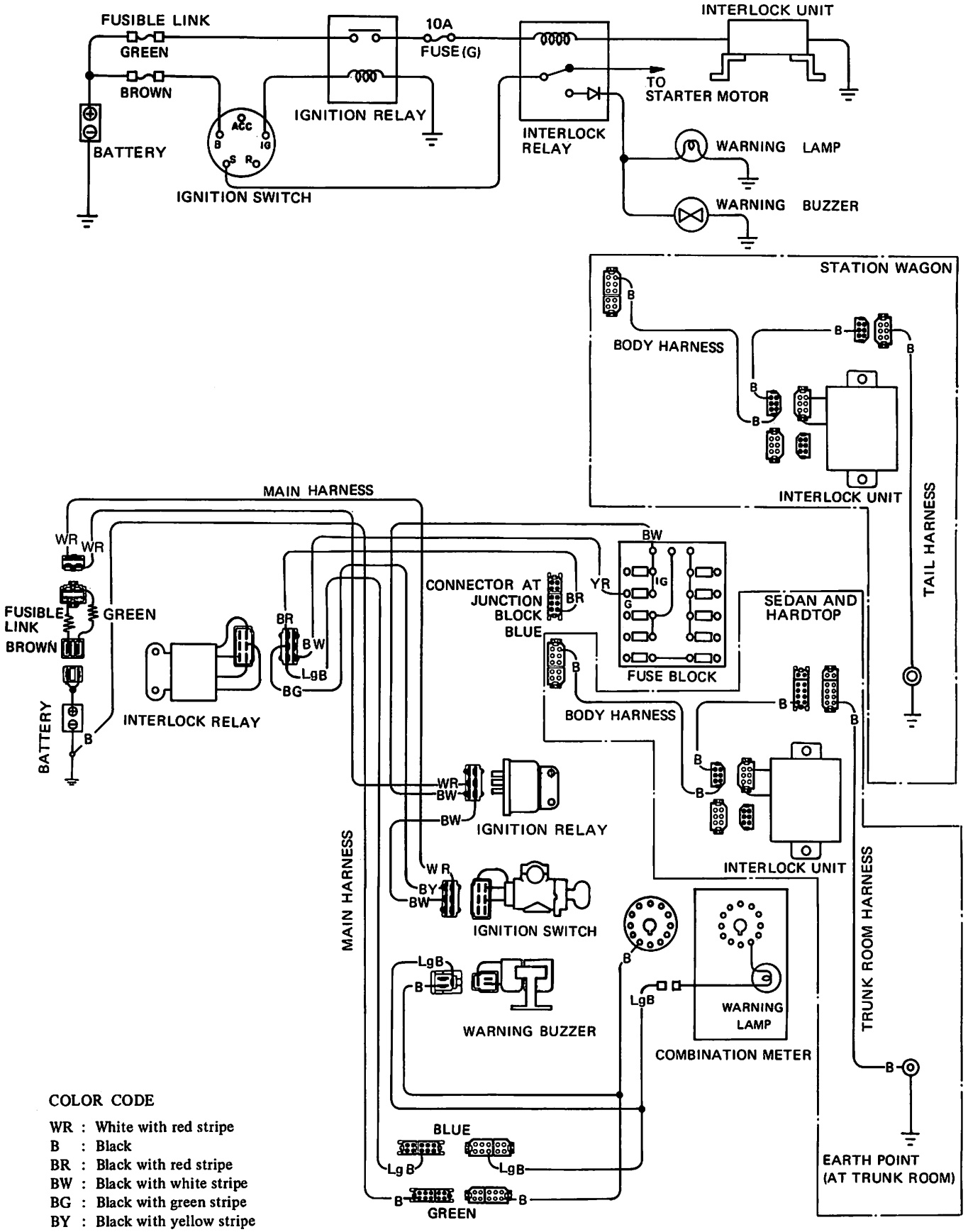
WR : White with red stripe
B : Black
BW : Black with white stripe
YR : Yellow with red stripe

BE548A

Fig. BE-132 Circuit diagram of ignition switch

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Interlock relay



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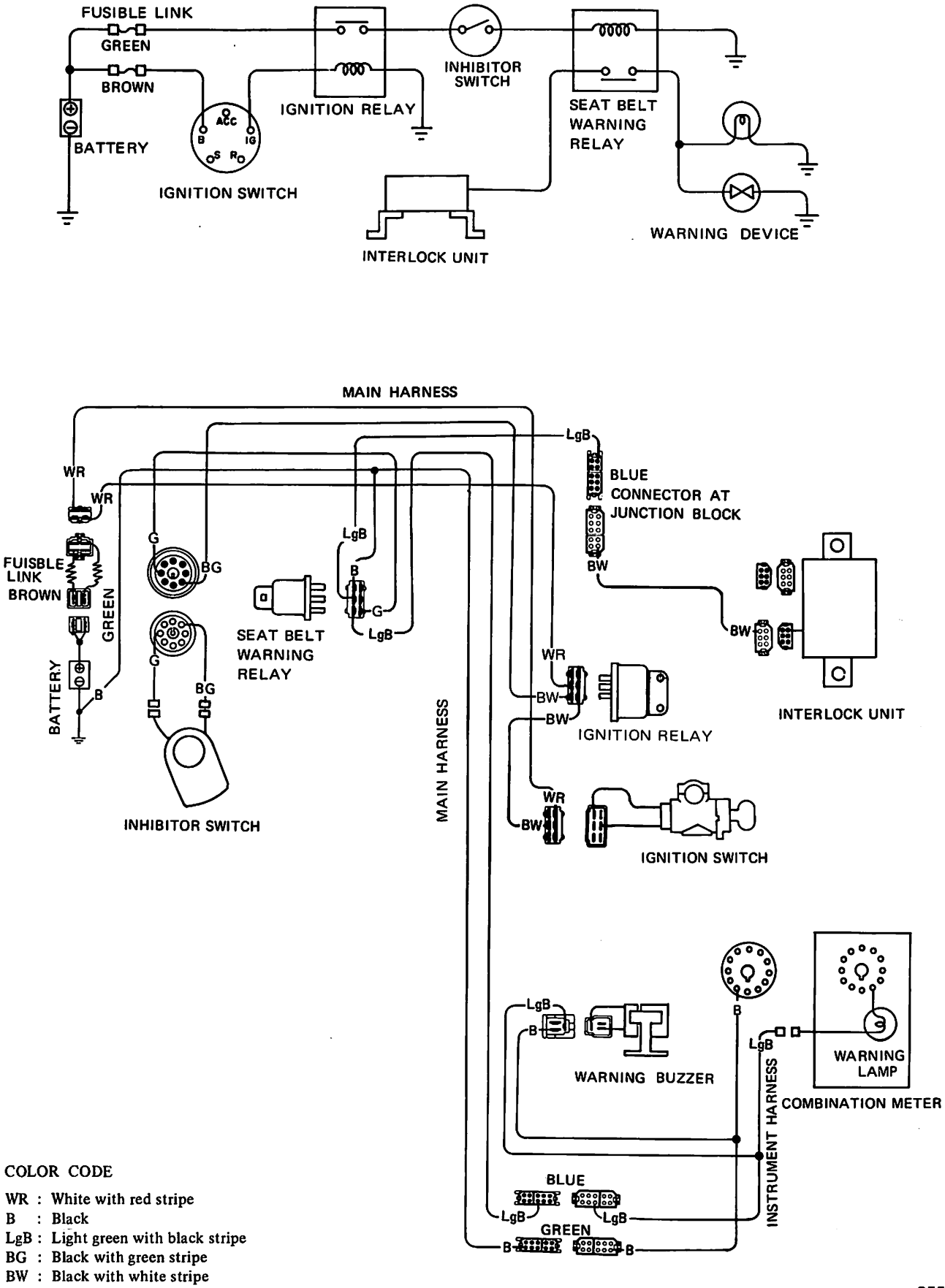
WR : White with red stripe
B : Black
BR : Black with red stripe
BW : Black with white stripe
BG : Black with green stripe
BY : Black with yellow stripe
LgB : Light green with black stripe
YR : Yellow with red stripe

BE549A

Fig. BE-133 Circuit diagram of interlock relay

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Inhibitor switch and warning device (A/T)



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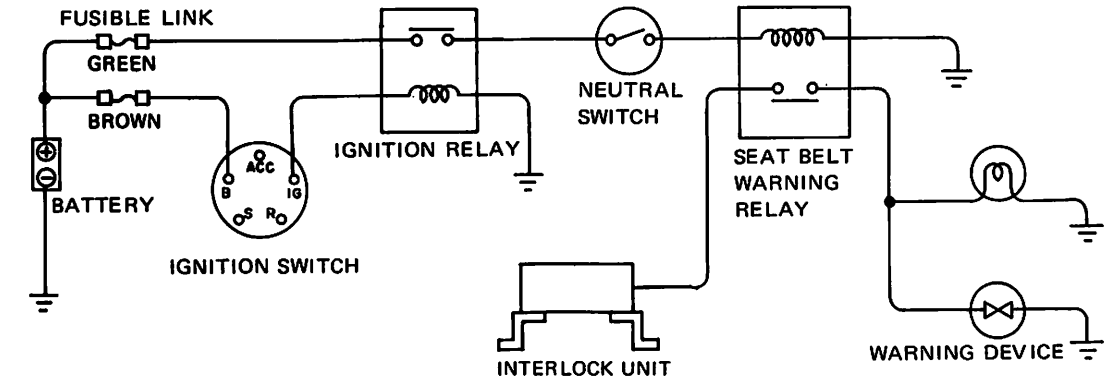
WR : White with red stripe
B : Black
LgB : Light green with black stripe
BG : Black with green stripe
BW : Black with white stripe
G : Green

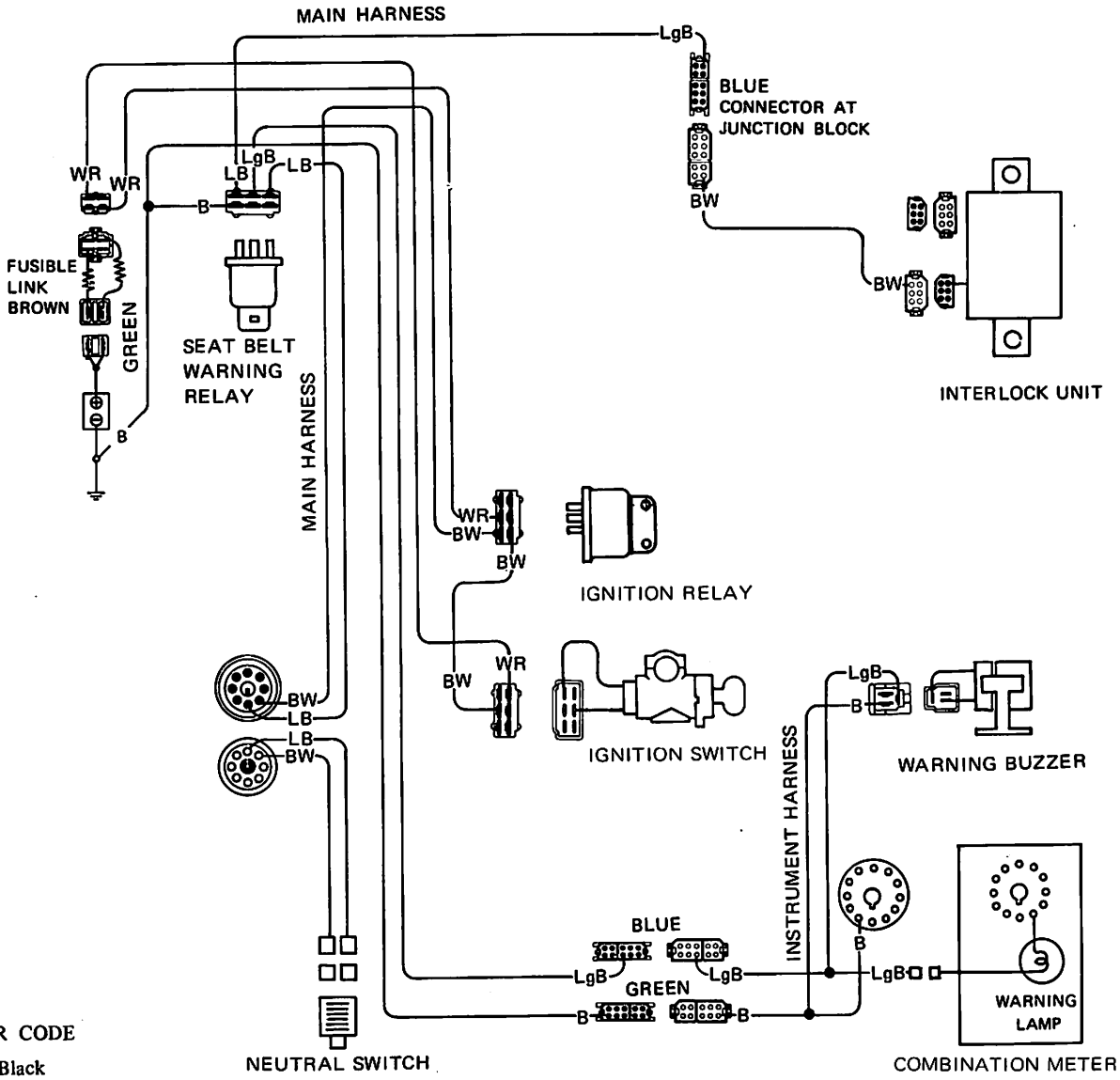
BE550A

Fig. BE-134 Circuit diagram of inhibitor switch and warning device (A/T)

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Neutral switch and warning device (M/T)





COLOR CODE

B : Black
LgB : Light green with black stripe
BW : Black with white stripe
WR : White with red stripe
LB : Blue with black stripe

BE551A

Fig. BE-135 Circuit diagram of neutral switch and warning device (M/T)

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Engine revolution sensor

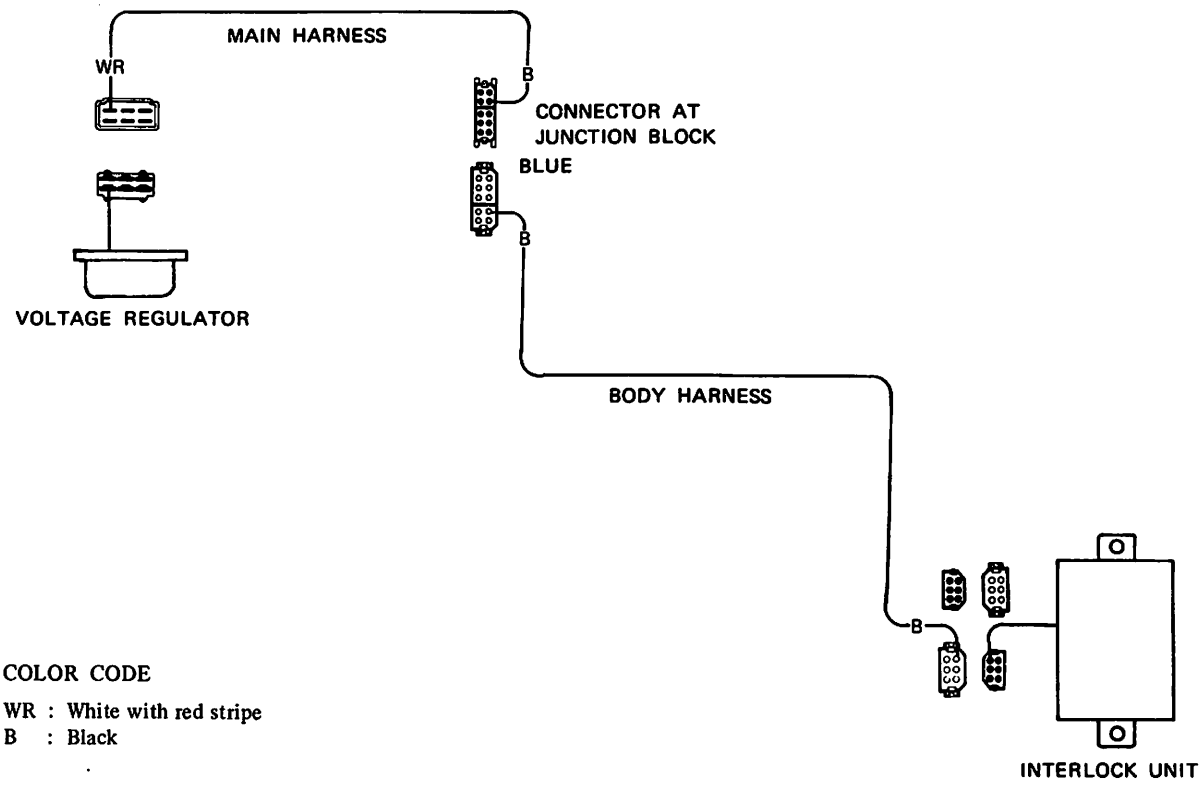


Fig. BE-136 Circuit diagram of engine revolution sensor

Battery (Power source)

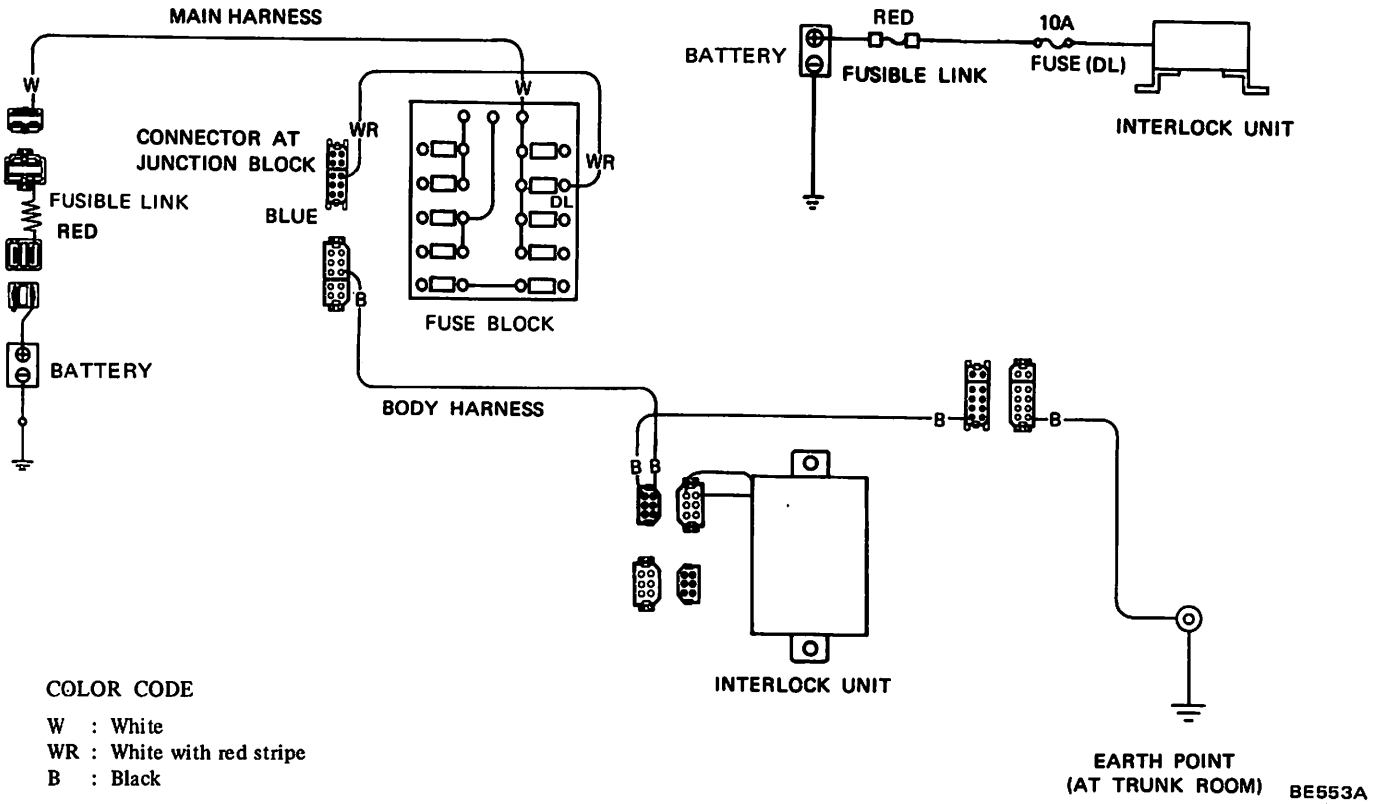
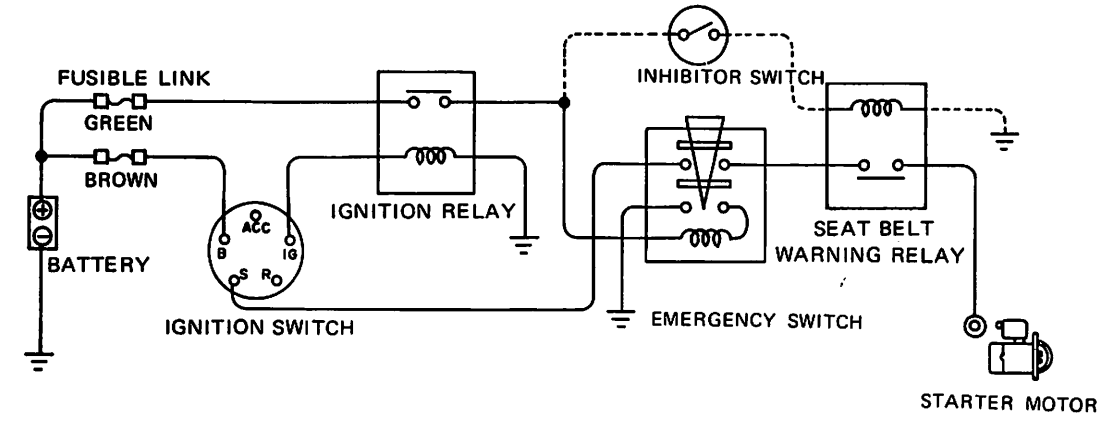
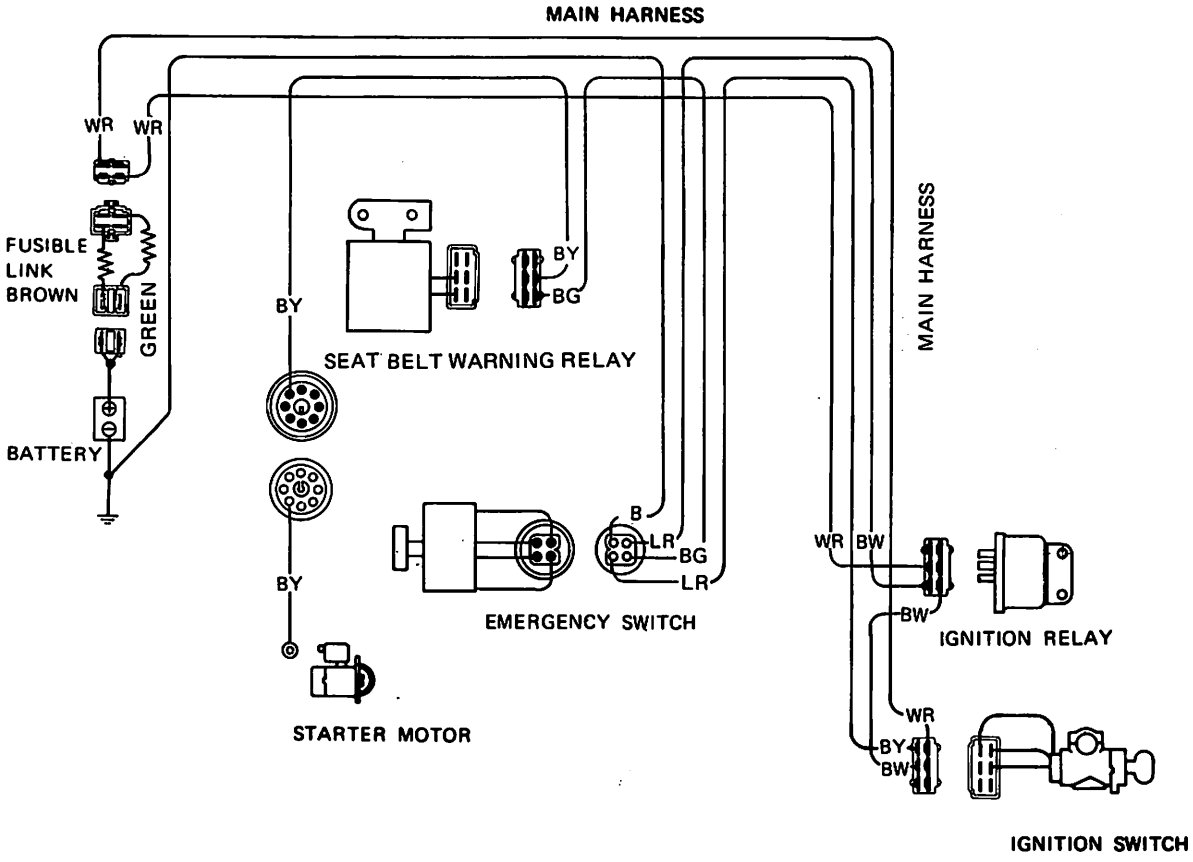


Fig. BE-137 Circuit diagram of battery (power source)

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Emergency switch (A/T)





COLOR CODE

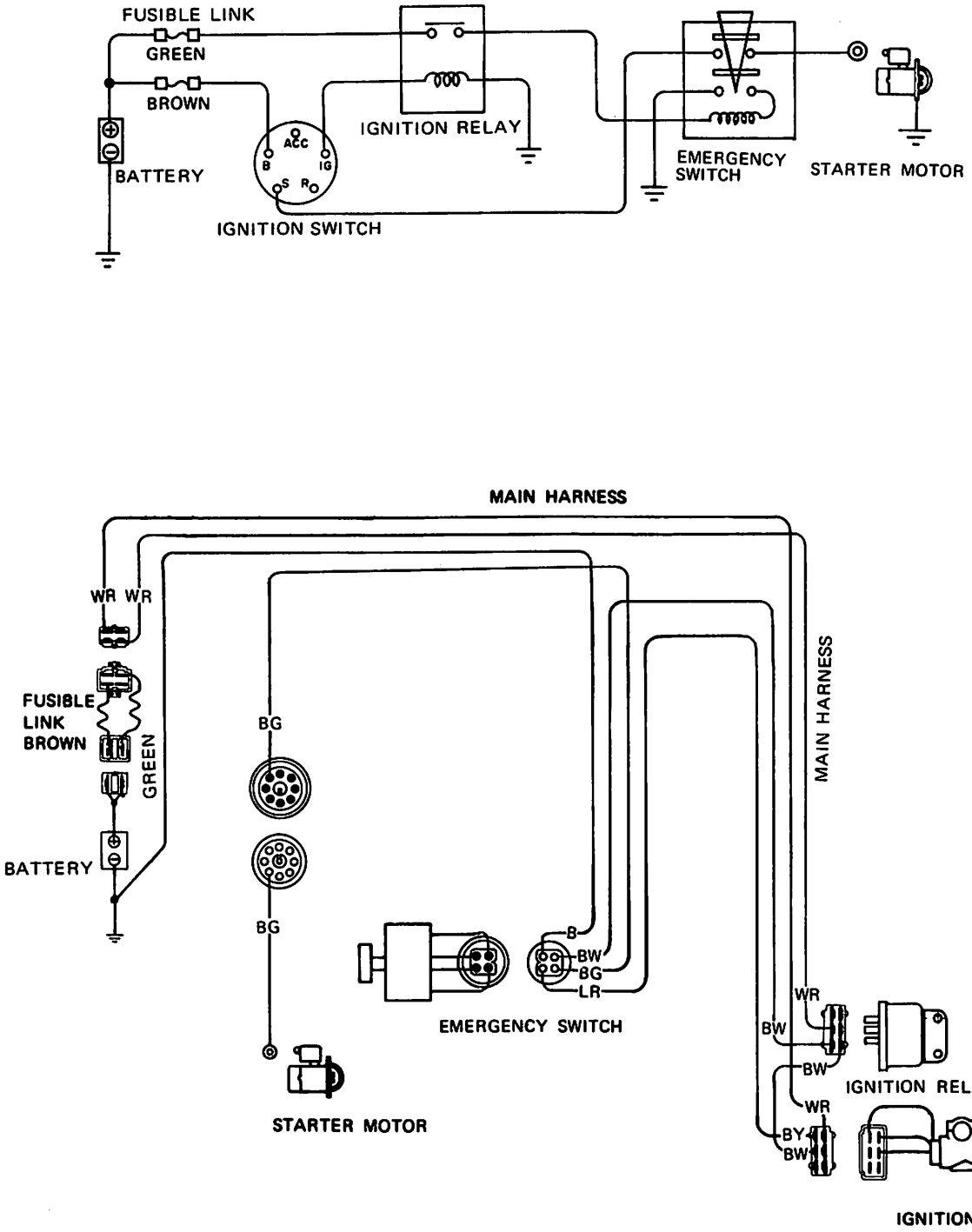
WR : White with red stripe
B : Black
BY : Black with yellow stripe
LY : Blue with yellow stripe
LR : Blue with red stripe
L : Blue
BW : Black with white stripe

BE554A

Fig. BE-138 Emergency switch (A/T)

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Emergency switch (M/T)



COLOR CODE

WR : White with red stripe
B : Black
BY : Black with yellow stripe
BW : Black with white stripe
LR : Blue with red stripe
BG : Black with green stripe

BE555A

Fig. BE-139 Emergency switch (M/T)

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TROUBLE DIAGNOSES AND CORRECTIONS

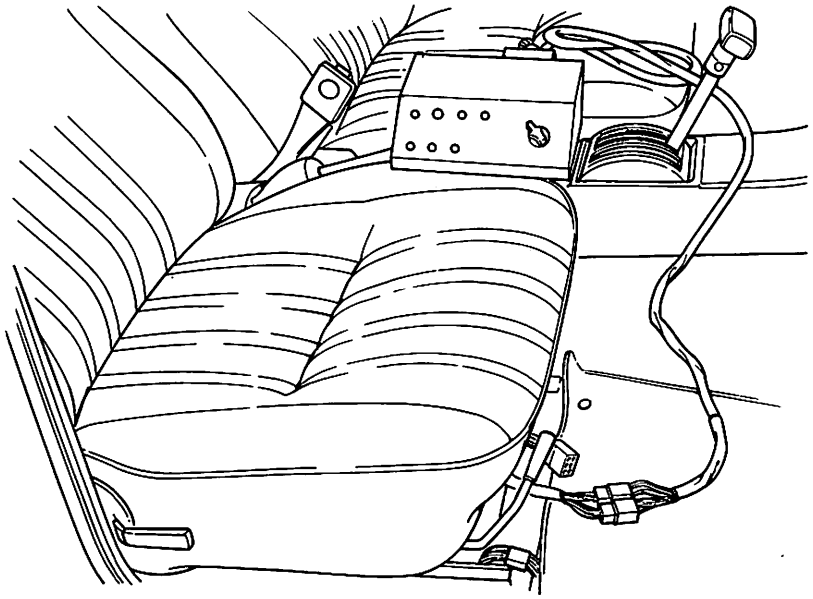
STEP 1. Check the system operation according to the conditions alleged by a customer.

- The system does not function properly. Repeat the above operations after connecting a new interlock unit.
  - The system does not function properly. System trouble except for interlock unit. Proceed to STEP 2.
  - The system functions properly. Interlock unit trouble. Replace the interlock unit.
- The system functions properly. The system is in good condition. But, the requirements for starting the engine has not been filled.

STEP 2. Inspection with the harness checker.

1. Disconnect the interlock unit at connectors.
2. Connect the checker with the connectors of the main harness as shown below.

Identify which check light is off and check interlock relay operation.
Replace the interlock relay if malfunctioning, and replace the parts indicated by each check light which remains off.



BE556A

Fig. BE-140 Connecting the checker

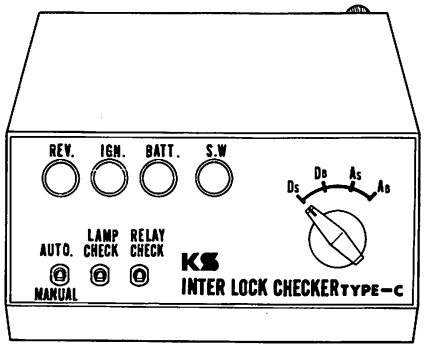
For your reference, the handling method of the harness checker is described below:

This checker permits checking all the system components except the interlock unit.

1. Check items

(1) Driver's seat switch with harness (Ds)
(2) Driver's seat belt switch with harness (D_B)
(3) Passenger's seat switch with harness (As)
(4) Passenger's seat belt switch with harness (A_B)
(5) Ignition switch with harness (IGN)
(6) Interlock relay with harness (INTERLOCK RELAY)
(7) Seat belt warning light and buzzer (including neutral switch) with harness
(8) Engine revolution sensor with harness (REV)
(9) Battery with harness (BAT)

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BE557A

Fig. BE-141 Checker type—C

2. Operation of checker

The checker should function as described below, if the system components other than the interlock unit are in normal condition.

Before connecting the checker to the main harness, place the AUTOMATIC-MANUAL selector switch as required.

Item 1

The indication lamp is turned on, when the inspector turns on the sensor switch with the change over switch set in the position of a corresponding sensor switch.

Item 2

The indication lamp lights, if the ignition key is turned to the "ON" position.

Item 3

The starter runs, if the interlock relay switch is pushed up and the ignition switch set in the "START" position. With the interlock relay switch pushed down and the ignition switch in the "START" position, the starter will not turn and the warning buzzer and light will be actuated.

Item 4

Manual Transmission

Place the AUTOMATIC-MANUAL selector switch in the "MANUAL" position.

When the shift lever is in the "NEUTRAL" position, the warning buzzer does not sound and the light does not go on. With the shift lever in other than "NEUTRAL" position, the buzzer sounds and the light goes on.

Automatic Transmission

Place the AUTOMATIC-MANUAL selector switch in the "AUTOMATIC" position.

When the ignition switch is in the "ON" position and the AUTOMATIC-MANUAL selector switch is in the "P" position, the warning buzzer does not sound and the light does not go on. With the selector switch in other than the "P" position, the buzzer sounds and the light goes on.

Item 5

The indication lamp goes on immediately after the engine starts.

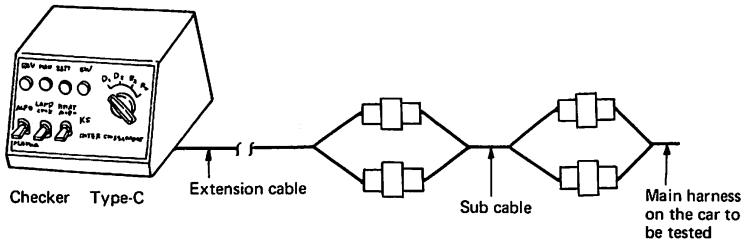
Item 6

The indication lamp lights when the checker is connected to the connectors of the main harness.

Note: The harness checker is equipped with a lamp check switch that permits the simultaneous checking of all the indication lamps. Before checking, push this switch to make sure that all the indication lamps are on.

Operational Precautions

1. Each connector should be securely connected at the proper position.
2. The checker should be located in a place that is free from rain, moisture and excessive vibrations.
3. If the checker is connected to the automatic transmission model being tested when the AUTOMATIC-MANUAL selector switch is in the "MANUAL" position, the warning devices will operate.
4. The indicator lamps should be checked periodically.
5. When connecting the checker to the car being tested, the sub-cables should be used.



BE558A

Fig. BE-142 Checker harness

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COMPONENTS OF SYSTEM

Starting interlock system consists of interlock unit, seat switch, belt switch, interlock relay ignition switch, voltage regulator, warning buzzer and warning lamp. In addition to above components, neutral switch (M/T) or inhibitor switch (A/T) and seat belt warning relay are installed. These components are connected to each other with harness.

If this interlock system will not operate correctly, check for broken unit and test their operation. If the units operate correctly, test continuity of wiring harness and tighten any loose connections.

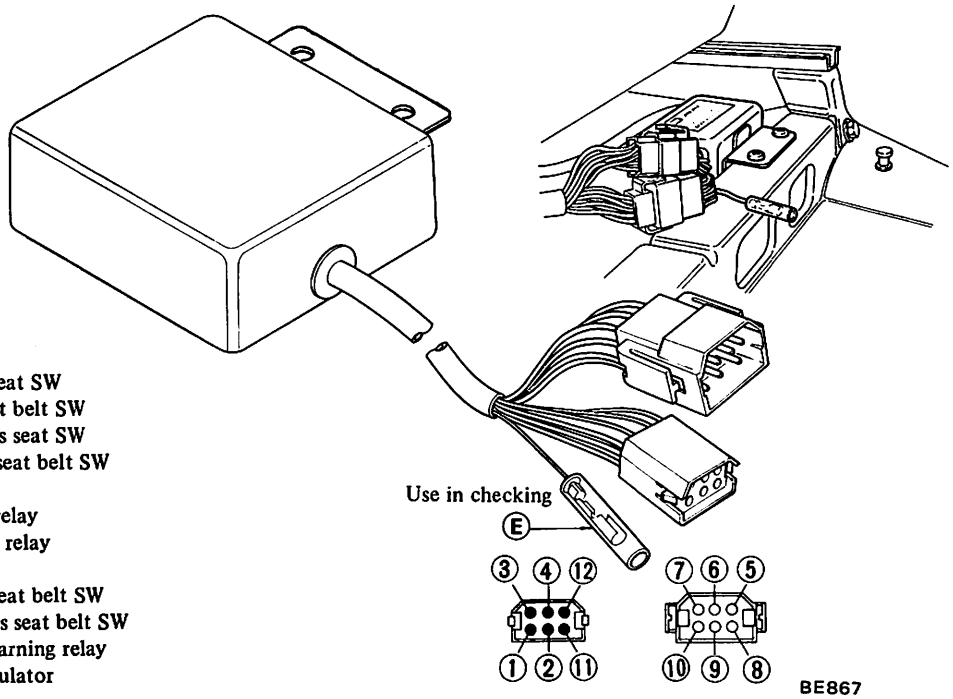
An emergency switch is also added; this switch completes bypass circuit for engine starting motor. Push button on switch keeping ignition switch in ON(IG) position. The engine will start no matter what the condition of starting interlock system is.

INTERLOCK UNIT

Replacement

Interlock unit is located beneath passenger seat and is connected to interlock harness.

1. Remove two bolts securing interlock unit to floor. Interlock unit can then be taken out.
2. Install new unit in the reverse sequence of removal.



1 From driver's seat SW
2 For driver's seat belt SW
3 From assistant's seat SW
4 For assistant's seat belt SW
5 From battery
6 From ignition relay
7 From interlock relay
8 For battery
9 From driver's seat belt SW
10 From assistant's seat belt SW
11 For seat belt warning relay
12 For voltage regulator

Fig. BE-143 Interlock unit

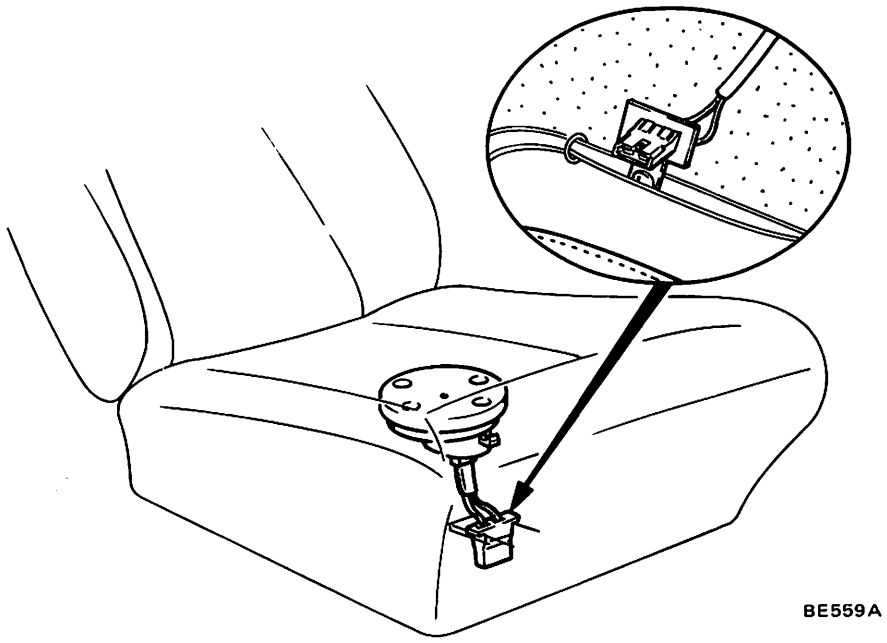


Fig. BE-144 Seat switch

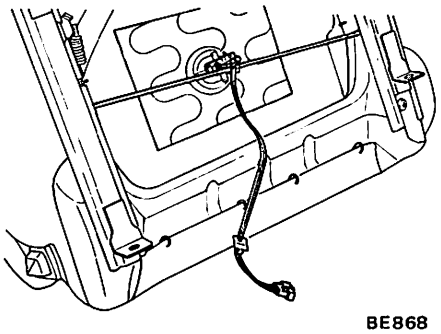
SEAT SWITCH

Replacement

Seat switch is located beneath both driver's and assistant's seats.

1. Remove four bolts securing seat to body.
2. Lifting seat, disconnect lead wires at connector.
3. Take out seat and turn it upside down. Seat switch can then be taken out easily.
4. Installation is in the reverse sequence of removal.

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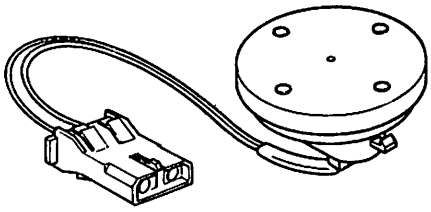


BE868

Fig. BE-145 Taking seat switch

Inspection

Test continuity by using ohmmeter or test lamp when upper face of switch is pressed, continuity between two lead wires must exist. Conversely, continuity between two lead wires must not exist when released.



BE869

Fig. BE-146 Seat switch

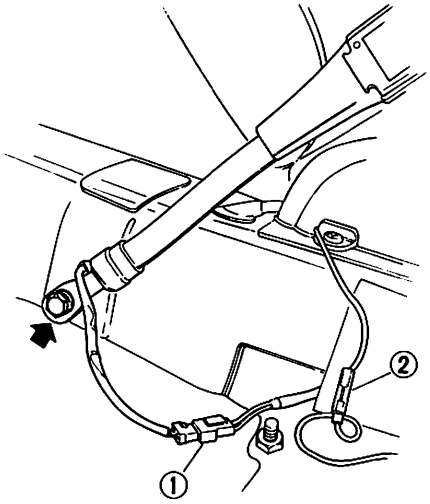
BELT SWITCH

Replacement

1. Remove seat belt fastener securing bolt.
2. Disconnect belt switch lead wire at connector.
3. Seat belt fastener can then be taken out.
4. Installation is in the reverse sequence of removal.

Inspection

Test continuity between two lead wires from seat belt switch by using ohmmeter or test lamp when the seat belt is fastened. Continuity between lead wires must not exist. Conversely continuity must exist when released.



BE560A

1 Connector for belt switch
2 Connector for hand brake switch

Fig. BE-147 Seat belt switch

NEUTRAL SWITCH (Manual transmission)

Replacement

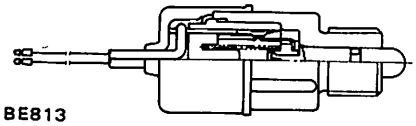
Neutral switch is located on rear extension of transmission and is connected to a pair of lead wires colored LB (Blue with Black stripe) and BW (Black with White stripe).

1. Disconnect lead wires at connectors.
2. Unscrew neutral switch from transmission rear extension.
3. Installation is in the reverse sequence of removal.

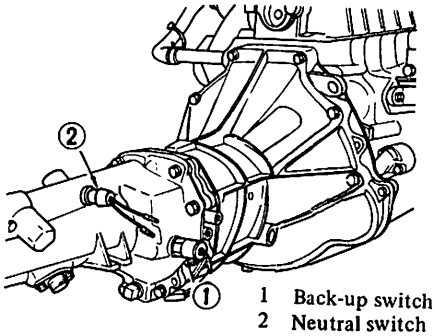
Inspection

Test continuity between two lead wires by using ohmmeter or test lamp.

When the plunger is projected, continuity between the lead wires must exist. Conversely when the plunger is pressed into switch body, continuity must not exist.



BE813



1 Back-up switch
2 Neutral switch

Fig. BE-148 Neutral switch

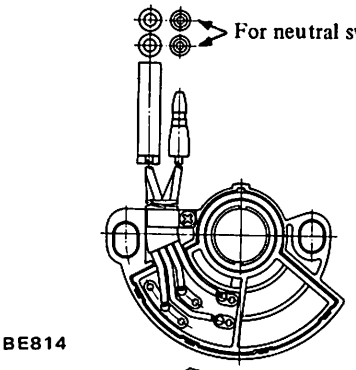
INHIBITOR SWITCH (Automatic transmission)

Inhibitor switch is located on right side of automatic transmission. Removal and installation is described in Section AT (Automatic transmission).

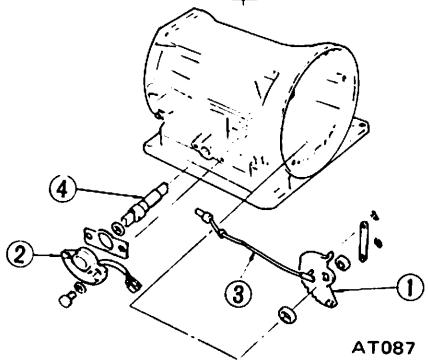
Inspection

Neutral switch is an integral part of inhibitor switch. The harness for neutral switch is a pair of G (Green) and BG (Black with Green stripe).

When the transmission lever is set in the N position, continuity within G and BG harnesses must exist.



BE814



AT087

1 Manual plate
2 Inhibitor switch
3 Parking rod
4 Manual shaft

Fig. BE-149 Inhibitor switch

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INTERLOCK RELAY

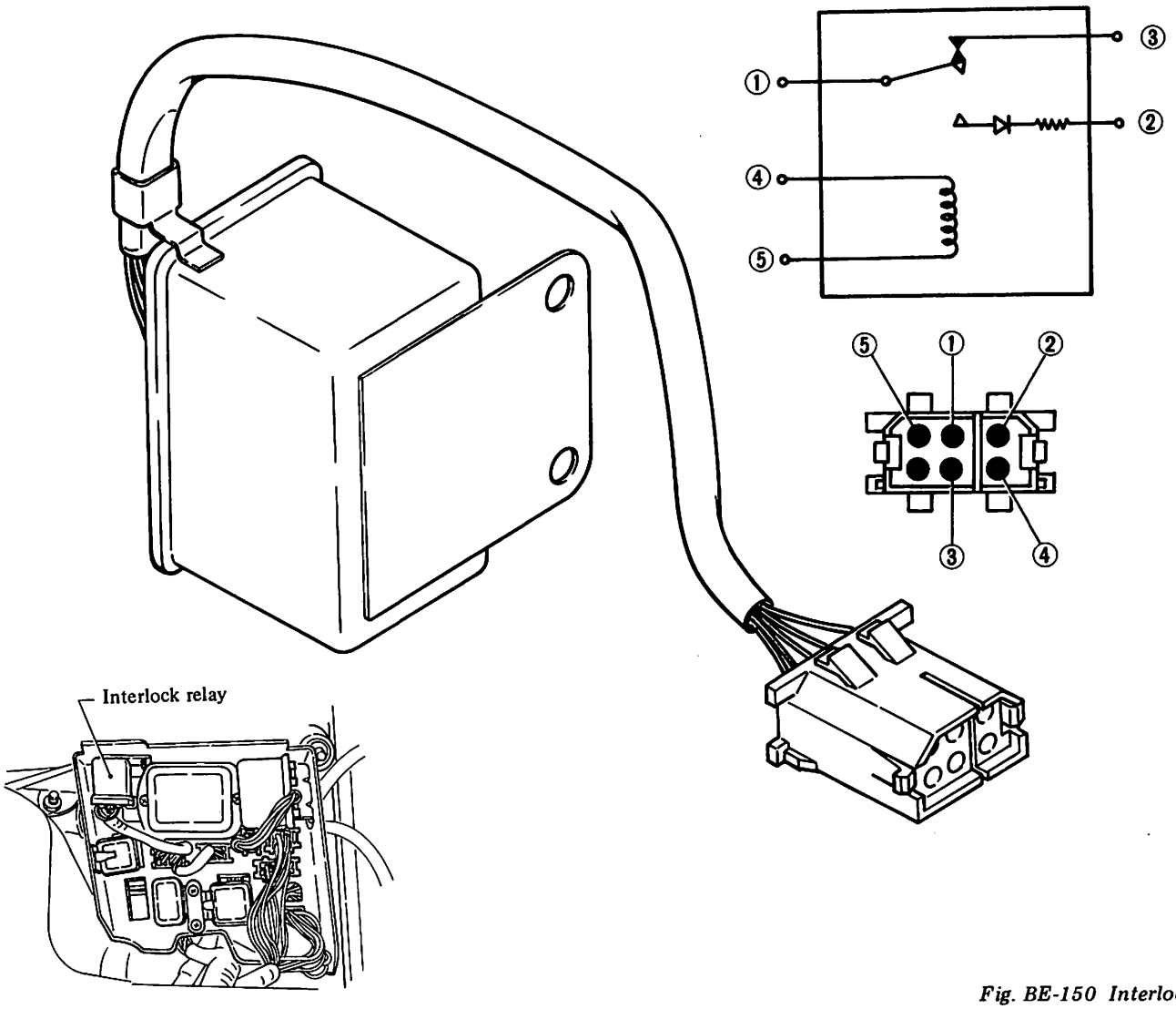
Replacement

Interlock relay is located on relay bracket.

1. Disconnect interlock relay lead wires at connector.
2. Remove two screws retaining interlock relay. Relay can then be taken out easily.
3. Installation is in the reverse sequence of removal.

Inspection

Test continuity through relay by using ohmmeter or test lamp. Continuity should exist only between ①-③ and ④-⑤ in normal condition when 12V direct current is applied to ④-⑤, continuity must exist between ①-② instead of ①-③. In checking continuity between ①-②, positive terminal must be connected to ① terminal.



BE561A

Fig. BE-150 Interlock relay

SEAT BELT WARNING RELAY

Replacement

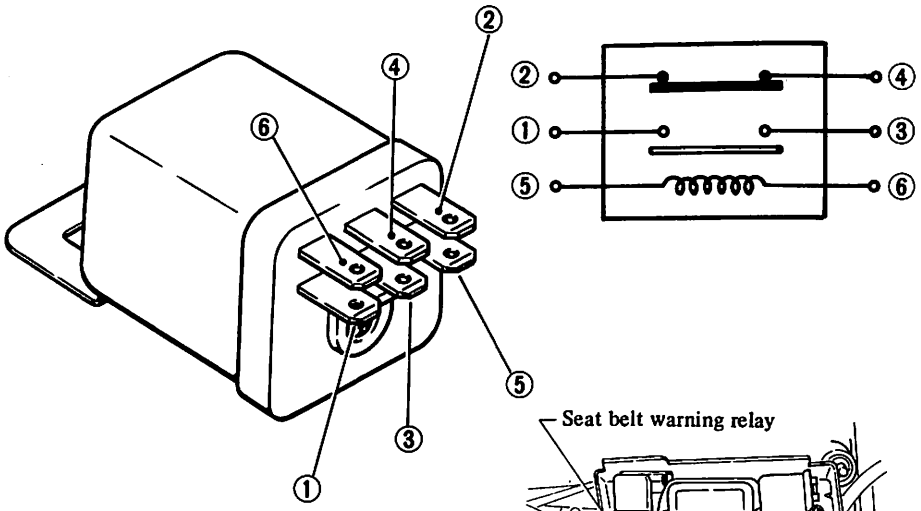
Seat belt warning relay is located on relay bracket.

1. Disconnect seat belt warning relay lead wires at connector.
2. Remove screw securing seat belt warning relay and remove relay from bracket.
3. Installation is in the reverse sequence of removal.

Inspection

Test continuity through relay with an ohmmeter or test lamp. In normal condition, continuity between ②-④ and ⑤-⑥ must exist. When 12-volt direct current is applied to ⑤-⑥, continuity between ①-③ instead of ②-④ must exist. See Figure BE-151.

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BE562A

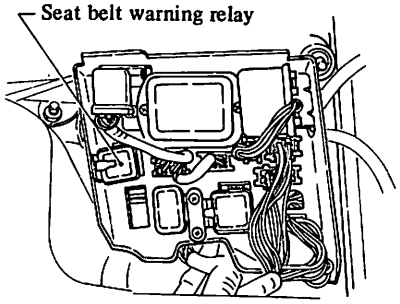


Fig. BE-151 Seat belt warning relay

WARNING BUZZER

Warning buzzer is located behind the instrument panel.

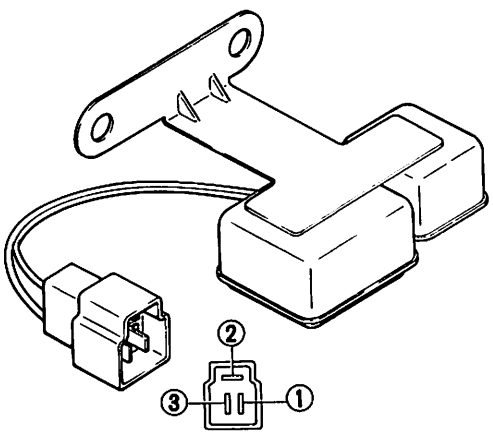
Replacement

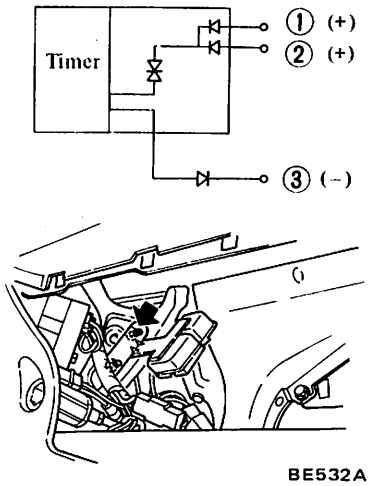
1. Disconnect battery ground cable.
2. Remove all cluster lids.
   Refer to cluster lid removal.
3. Disconnect lead wires at connector.
4. Remove two screws retaining buzzer to stay.
   Buzzer can then be taken out.
5. Installation is in the reverse sequence of removal.

Inspection

Apply 12V direct current between ①-③ or ②-③ and check if the buzzer sounds. The buzzer must sound whenever terminals are connected to power circuit.

Note: When connecting power circuit to buzzer, make sure that (–) negative terminal is always connected to ③ terminal.





BE532A

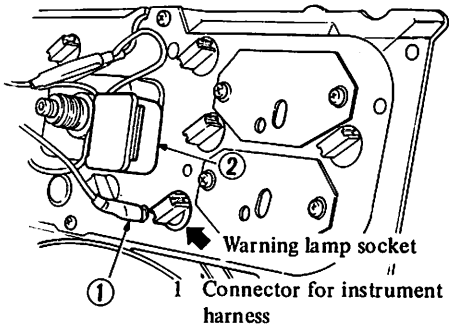
Fig. BE-152 Warning buzzer

WARNING LAMP

Bulb replacement

Warning lamp is located in combination meter.

1. Disconnect lead wire at connector.
2. Twist warning lamp socket. Socket with bulb can then be taken out.
3. Pick up bulb from socket.
4. Install new bulb in the reverse sequence of removal.



1 Connector for instrument harness
2 Meter switch amplifier

BE563A

Fig. BE-153 Warning lamp

VOLTAGE REGULATOR (Engine revolution sensor)

Replacement

Voltage regulator is located behind relay bracket. See Figure BE-152.

1. Disconnect voltage regulator lead wires.
2. Remove two bolts retaining voltage regulator to relay bracket. Voltage regulator can then be taken out.
3. Installation is in the reverse sequence of removal.

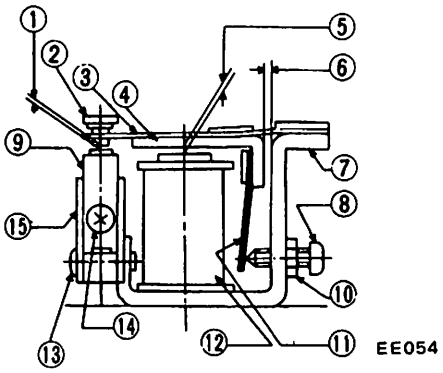
Inspection

Remove two screws retaining cover to voltage regulator and take out cover. Connect lead wires to voltage regulator.

Check the movement of contact point indicated in the following figure.

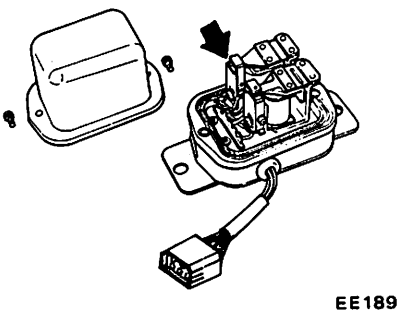
When engine is stopped
  Contact points must be closed
When engine is running
  Contact points must be opened

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Construction of charge relay

1	Point gap	10	Lock nut
2	Charge relay contact	11	Adjust spring
3	Connecting spring	12	Coil
4	Armature	13	3 mm (0.118 in) dia. screw
5	Core gap		
6	Yoke gap	14	4 mm (0.157 in) dia. screw
7	Yoke		
8	Adjusting screw	15	Contact set
9	Voltage regulator contact		



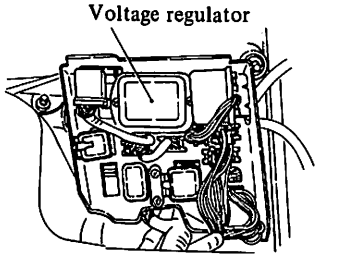


Fig. BE-154 Voltage regulator

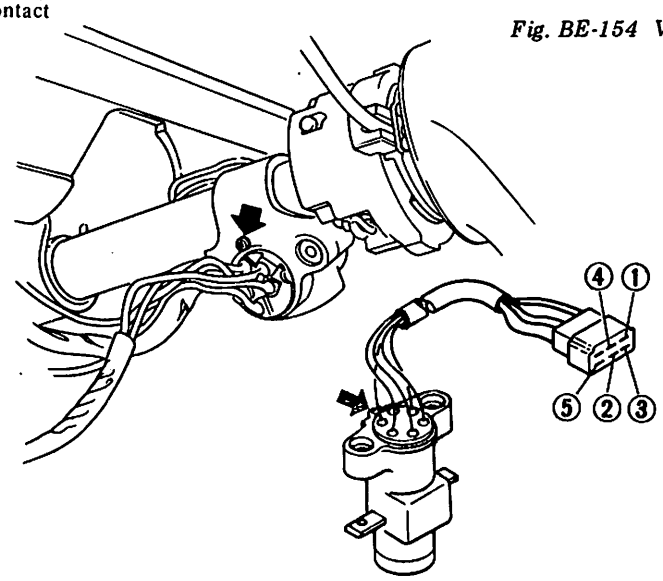


Fig. BE-155 Ignition switch

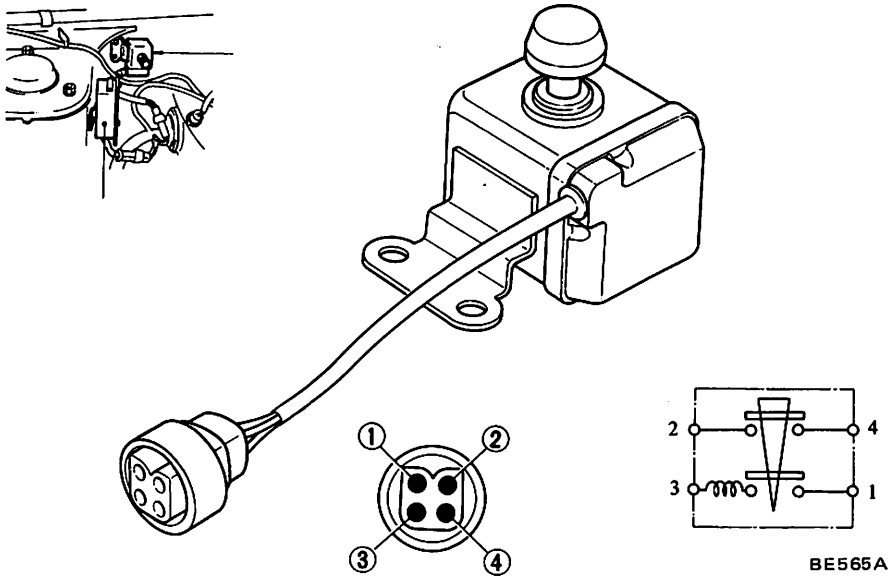


Fig. BE-156 Emergency switch

IGNITION SWITCH

Replacement

The ignition switch is installed at bottom of steering lock.

1. Remove four screws retaining shell covers and remove shell covers.
2. Disconnect ignition switch lead wires at connector.
3. Remove a small screw retaining ignition switch to steering lock. Ignition switch can then be taken out.
4. Installation is in the reverse sequence of removal.

INSPECTION

Test continuity through the switch at each step by using ohmmeter or test lamp. Refer to Figure BE-155 for continuity diagram of ignition switch.

EMERGENCY SWITCH

Replacement

This switch is installed on the dash panel on the engine compartment side.

Remove two screws retaining switch then switch can be taken out.

Inspection

Test continuity through the switch by using ohmmeter or test lamp.

When the switch button is pressed in, continuity between ②-④ and ③-① must exist.

Apply 12V direct current to ③-① and then press the button in; continuity between ②-④ must exist even if the button is released.

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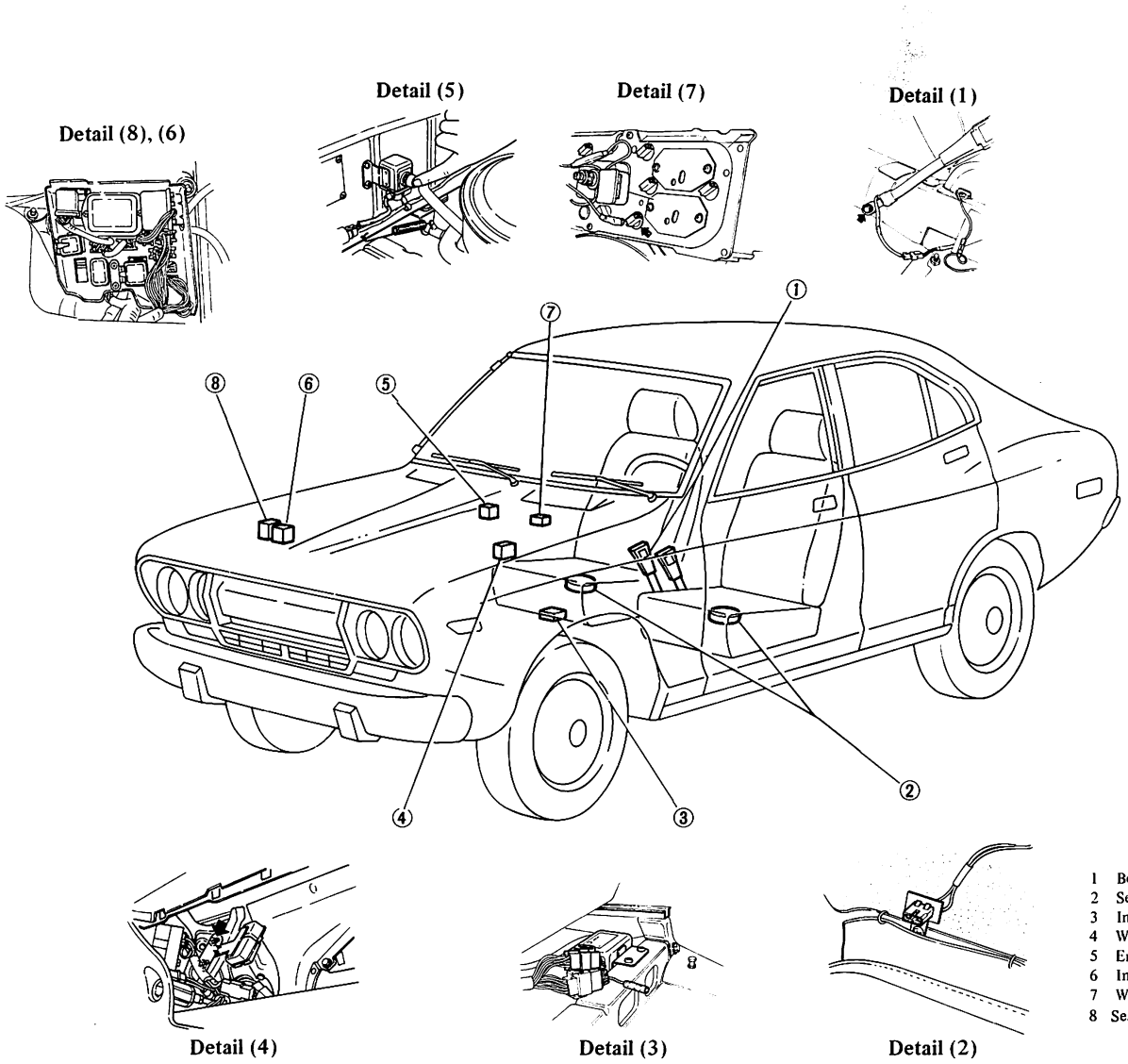


Fig. BE-157 Wiring diagram of starter interlock unit

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SERVICE MANUAL

DATSUN 710
MODEL 710 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION AC

AIR CONDITIONING

DESCRIPTION ..... AC- 2
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REMOVAL AND INSTALLATION AC-26
TROUBLE DIAGNOSES AND CORRECTIONS AC-37
HOW TO INSTALL AIR CONDITIONER AC-50
COMPRESSOR AC-55
SPECIAL SERVICE TOOLS AC-68

AC

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DESCRIPTION

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REFRIGERATION SYSTEM ..... AC- 4
EVAPORATOR ..... AC- 4
COMPRESSOR ..... AC- 4
CONDENSER ..... AC- 4
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EXPANSION VALVE ..... AC- 5
AIR FLOW AND VACUUM SYSTEM ..... AC- 6
AIR FLOW ..... AC- 6
VACUUM SYSTEM AC-11
ELECTRICAL CIRCUIT AC-12
BLOWER MOTOR OPERATION AC-12
COMPRESSOR AND F.I.C.D. OPERATION .. AC-14
VACUUM COCK OPERATION AC-14

OUTLINE OF AIR CONDITIONER

The air conditioner is a combined unit of an evaporator, heater and blower and provides heating and cooling functions. In addition, it has bi-level and ventilation functions, enabling comfortable air conditioning at all seasons. Its control system consists of a mechanical system using cables and engine vacuum and electric system.

All units are housed in the dash panel, thereby assuring driving comfort.

The functional principle of this system is as shown in Figure AC-1.

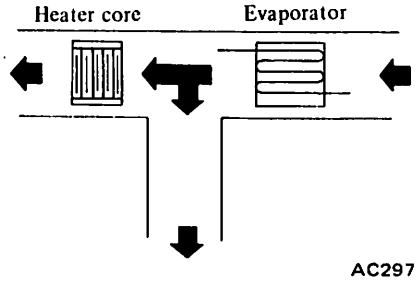


Fig. AC-1 Principle of air flow

The component units of the air conditioner are installed in the engine room and passenger compartment; the compressor and condenser in the former and the unit comprising the evaporator, heater and blower and its control in the latter. The units in the passenger compartment are summarized as below:

Air intake housing

This housing is internally provided with an air intake door that takes in outside air.

Evaporator housing

An evaporator is contained in this housing, which cools air passing through the fins with refrigerant circulating in the system.

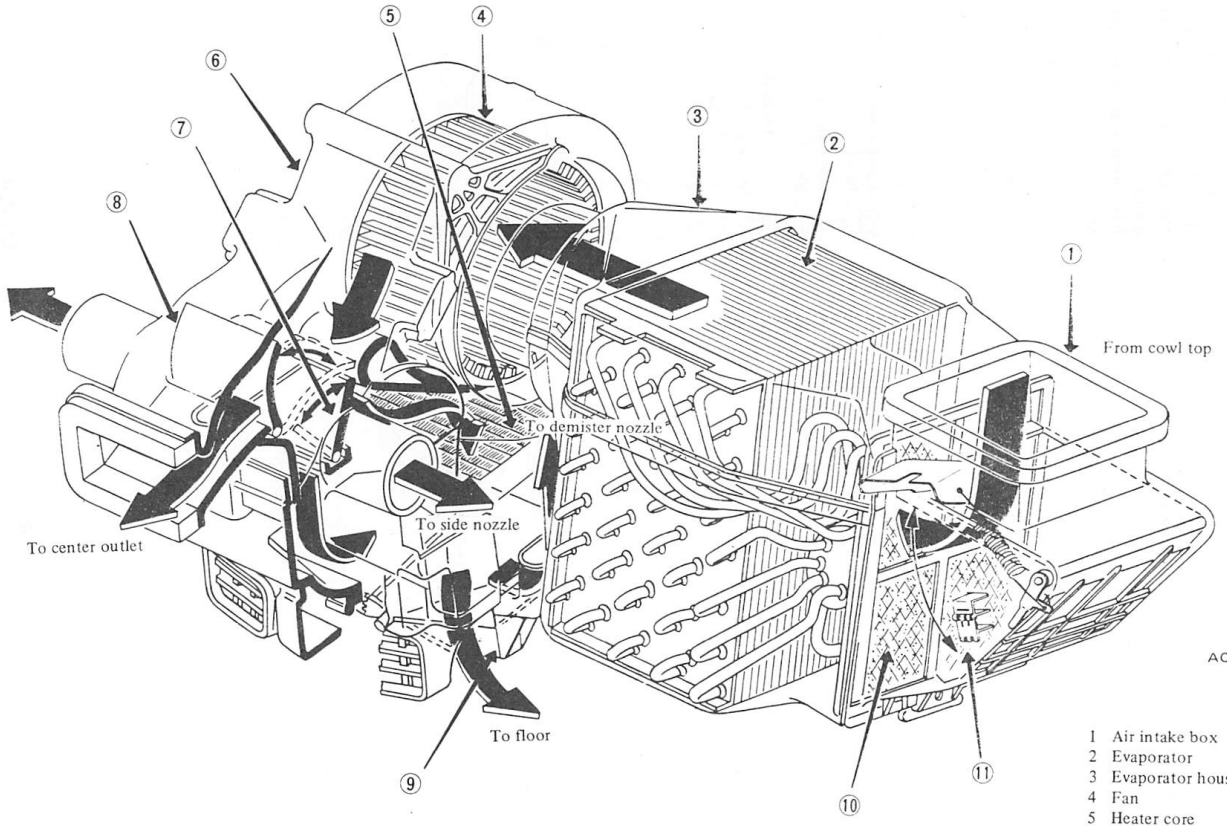
Heater unit

A heater core is housed in this unit, in which hot water from the engine runs to warm the air passing through the fins. Also, the housing contains a blower motor, by which the air is blown to the heater.

FEATURES

1. When the AIR lever is set in BI-LEVEL position, the mode door is set halfway between full open and full close. Fresh air is blown out from the three outlets in the instrument panel, and warm air from underfoot; thus both ventilation and heating functions are available at the same time.
2. The adjustment of temperature is made by changing the opening angle of the air mix door and of the water cock by means of the cables attached to the TEMP lever. In other words, by changing the opening angle of the air mix door, the mixing ratio of warm air passing through the heater core and cool air bypassing the core is changed.
3. When the air conditioner is operating, the temperature is adjusted by automatically switching the compressor on or off by means of the thermostat. The prescribed temperature on the thermostat is set by one cable from the TEMP lever.

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1 Air intake box
2 Evaporator
3 Evaporator housing
4 Fan
5 Heater core
6 Heater unit
7 Air mix door
8 Mode door
9 Heater door
10 Air filter
11 Air intake door

Fig. AC-2 Sectional view of air conditioner

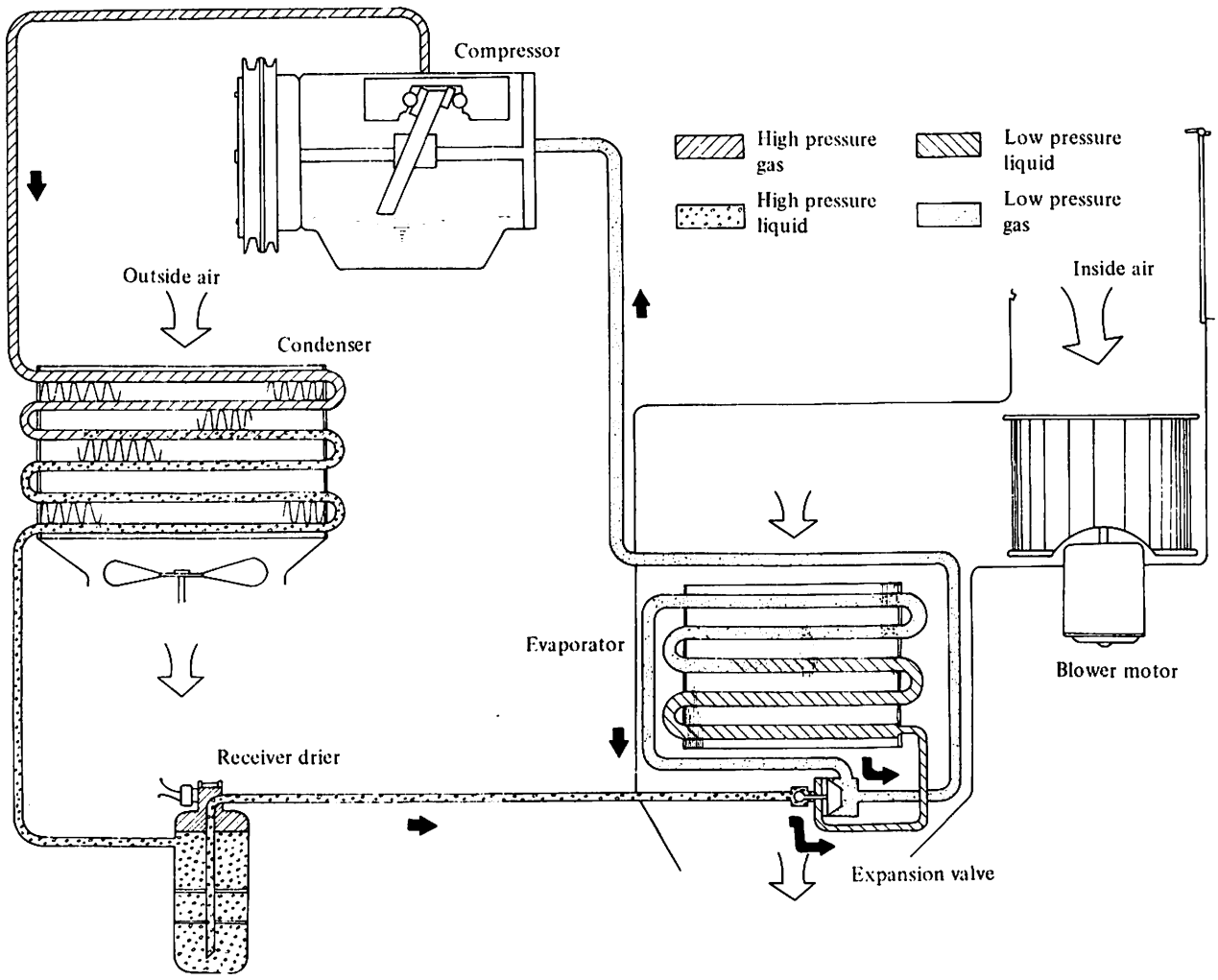
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REFRIGERATION SYSTEM

If you were to paint your finger with alcohol, your finger would feel cold. This is because the liquid alcohol takes heat away from your finger while it evaporates. If a quickly evaporating liquid such as alcohol is placed in a container inside a box, the temperature inside the box will drop. This is because the alcohol is evaporated absorbing the heat from the air inside the box. If the gaseous alcohol is collected and cooled with cold water, it will be changed back into a liquid by absorption of its heat by the cold water.

The cooler operates on this principle. The liquid used is the refrigerant R-12. The heat inside the passenger compartment is absorbed by changing the refrigerant from a liquid to a gas and then dissipated to the outside by changing the refrigerant from a gas back to a liquid.

The refrigeration system is shown in Figure AC-3.



AC229

Fig. AC-3 Refrigeration cycle

The operation of the five devices of the refrigeration system are described below.

EVAPORATOR

The heat of the inside air which is force-circulated by the blower motor is absorbed by vaporizing the liquid refrigerant passed through the evaporator. This cools the air.

COMPRESSOR

The compressor is installed to the side of the engine and is driven by crank pulley through a belt. The refrigerant gas leaving the evaporator is forced out to the condenser by compressor and the low pressure refrigerant gas is compressed to a high pressure and high temperature.

CONDENSER

The condenser is installed to the front of the radiator. The heated and compressed refrigerant gas from the compressor condenses to a liquid by being cooled by air passing between the fins of the condenser.

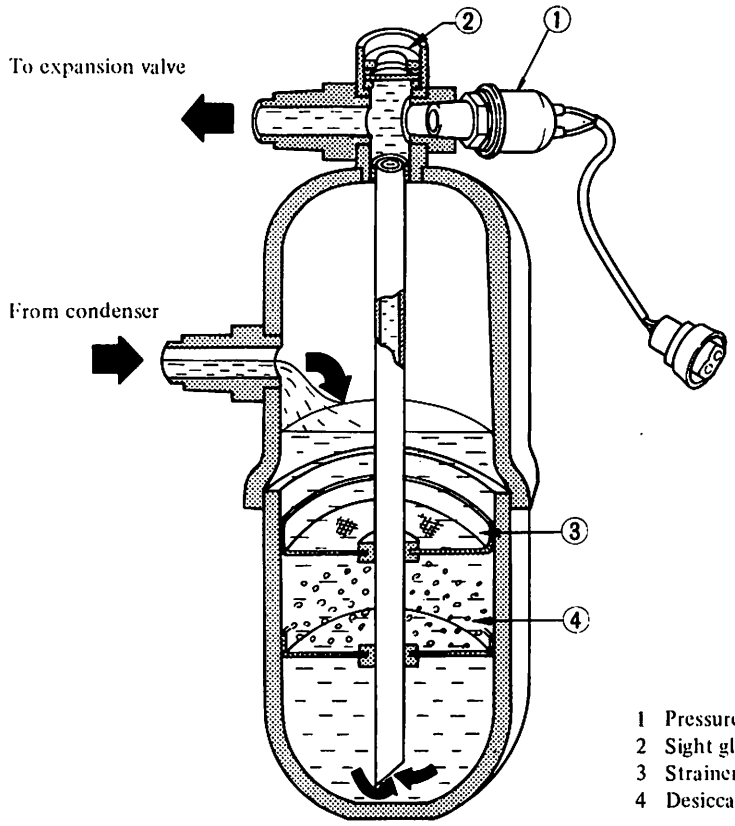
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RECEIVER DRIER

The receiver drier serves the purpose of storing the liquid refrigerant. The amount of the liquid refrigerant flowing through the system varies with the operating condition of the air conditioner. To be accurate, the receiver drier stores excess amount of refrigerant when the heat load is lowered. It also releases stored refrigerant when additional cooling is needed, thus maintaining the optimum flow of refrigerant within the system.

The receiver drier includes a strainer and desiccant. They have the job of removing moisture and foreign particles as the refrigerant circulates within the system.

The pressure switch is installed beside sight glass of receiver drier. The purpose of the switch is to stop the compressor operation in the event an excessive system pressure builds up on the high pressure lines.



1 Pressure switch
2 Sight glass
3 Strainer
4 Desiccant

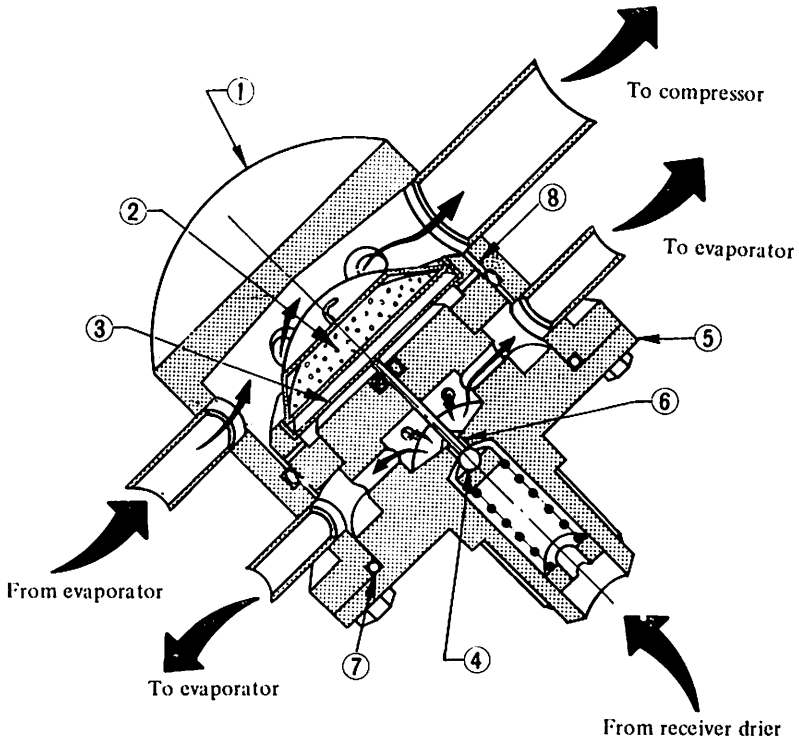
AC533

Fig. AC-4 Receiver drier

EXPANSION VALVE

The expansion valve restricts the flow of liquid refrigerant as it passes through it and delivers sprayed refrigerant to the evaporator for facilitating refrigerant evaporation.

The refrigerant within the thermo bulb changes in pressure through the super heat condition of vaporized refrigerant gas which comes out of the evaporator, causing the deflection of the diaphragm. The lift of the ball valve attached to the diaphragm is changed by the deflection of the diaphragm, thus controlling the amount of refrigerant passing the orifice.



1 Valve housing
2 Thermo bulb
3 Diaphragm
4 Valve ball
5 Valve body
6 Orifice
7 O-ring
8 Equalizer

AC231

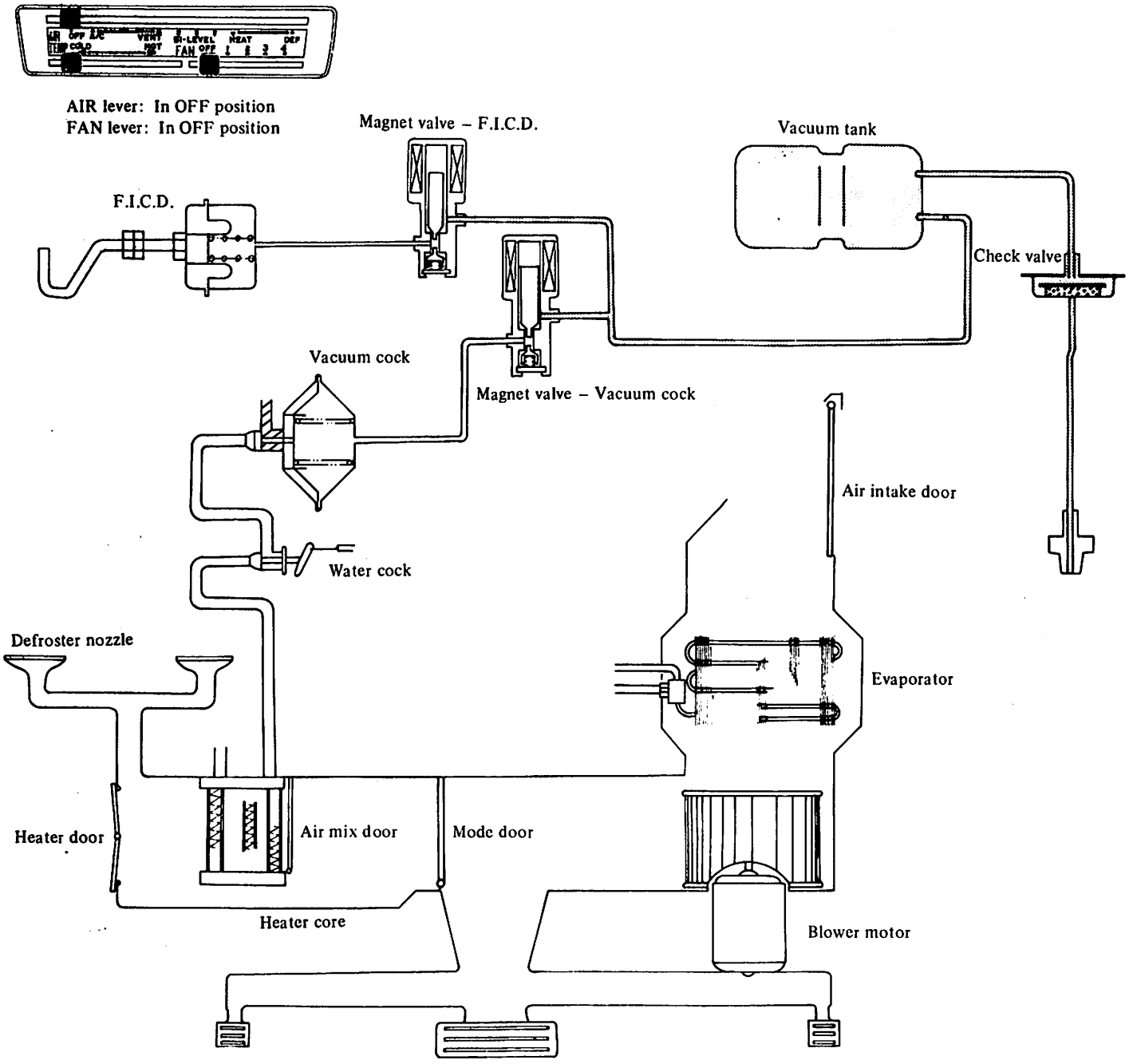
Fig. AC-5 Expansion valve

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AIR FLOW AND VACUUM SYSTEM

AIR FLOW

OFF position



AC364

Fig. AC-6 Air flow - OFF position

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A/C (Air conditioner) position

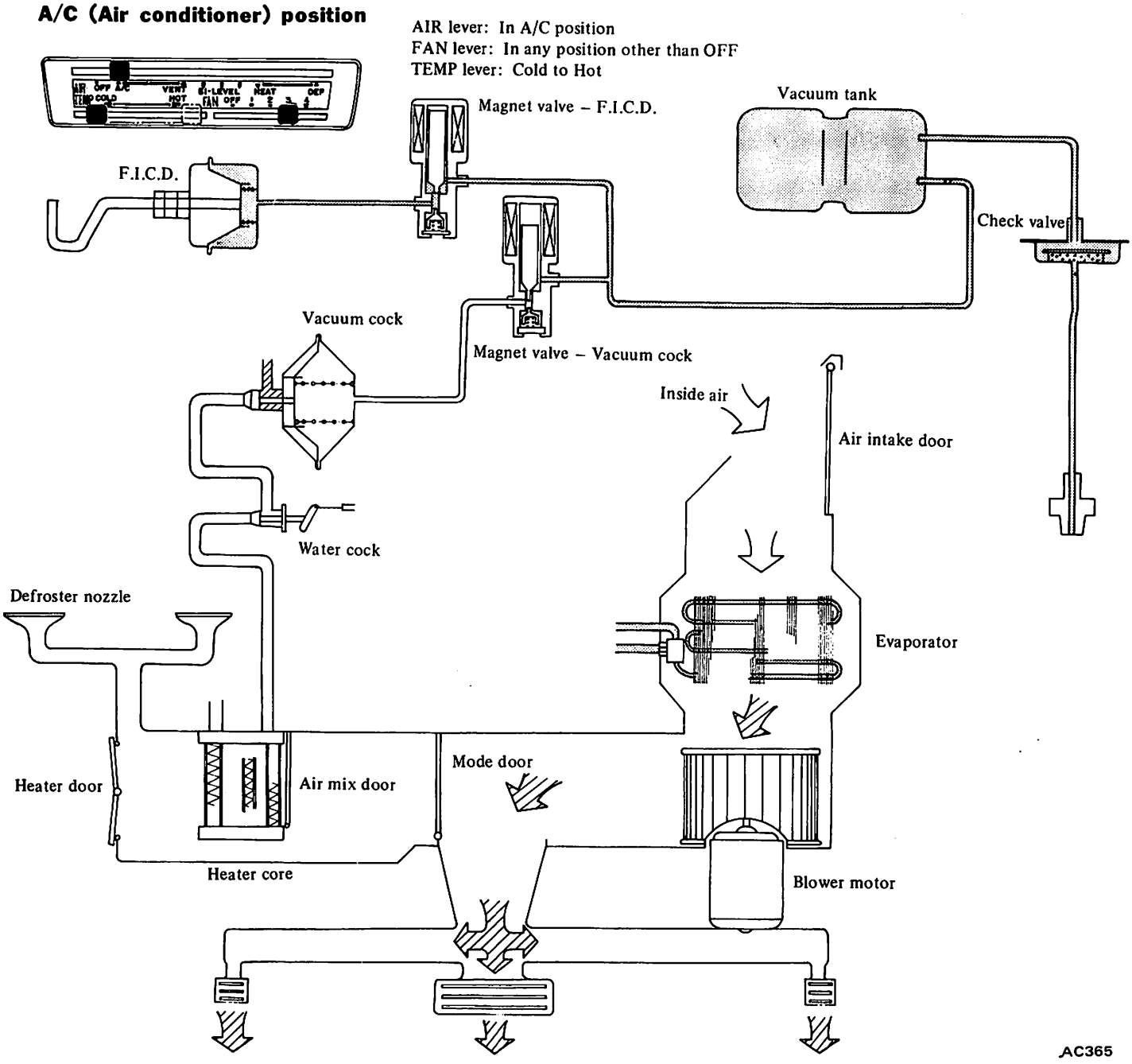


Fig. AC-7 Air flow - A/C (Air Conditioner) position

With the AIR lever set in the A/C position, vacuum flow and air flow becomes as illustrated in the above figure.

1. Air intake door

The air intake door is put in the position where the incoming outside air is shut off and the inside air drawn. Air is circulating inside the passenger compartment.

2. Mode door

The mode door is in the closed position, and the air drawn from the air intake is cooled in the evaporator and then directed to the outlets provided in the instrument panel.

Note: When the AIR lever is set at A/C position, current will flow through the compressor clutch coil. As the coil is energized, the compressor starts to rotate and the refrigerant is circulated through the system.

3. Vacuum cock

Vacuum is not induced to the vacuum cock actuator and the cock is shut off.

4. Fast idle actuator

Vacuum is induced to the fast idle actuator, by which the actuator is operated to slightly move the throttle lever of the carburetor in the open direction, thereby increasing the idling speed. The induction of vacuum is controlled by means of a magnet valve. This magnet valve is electrically controlled.

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VENT (Ventilation) position

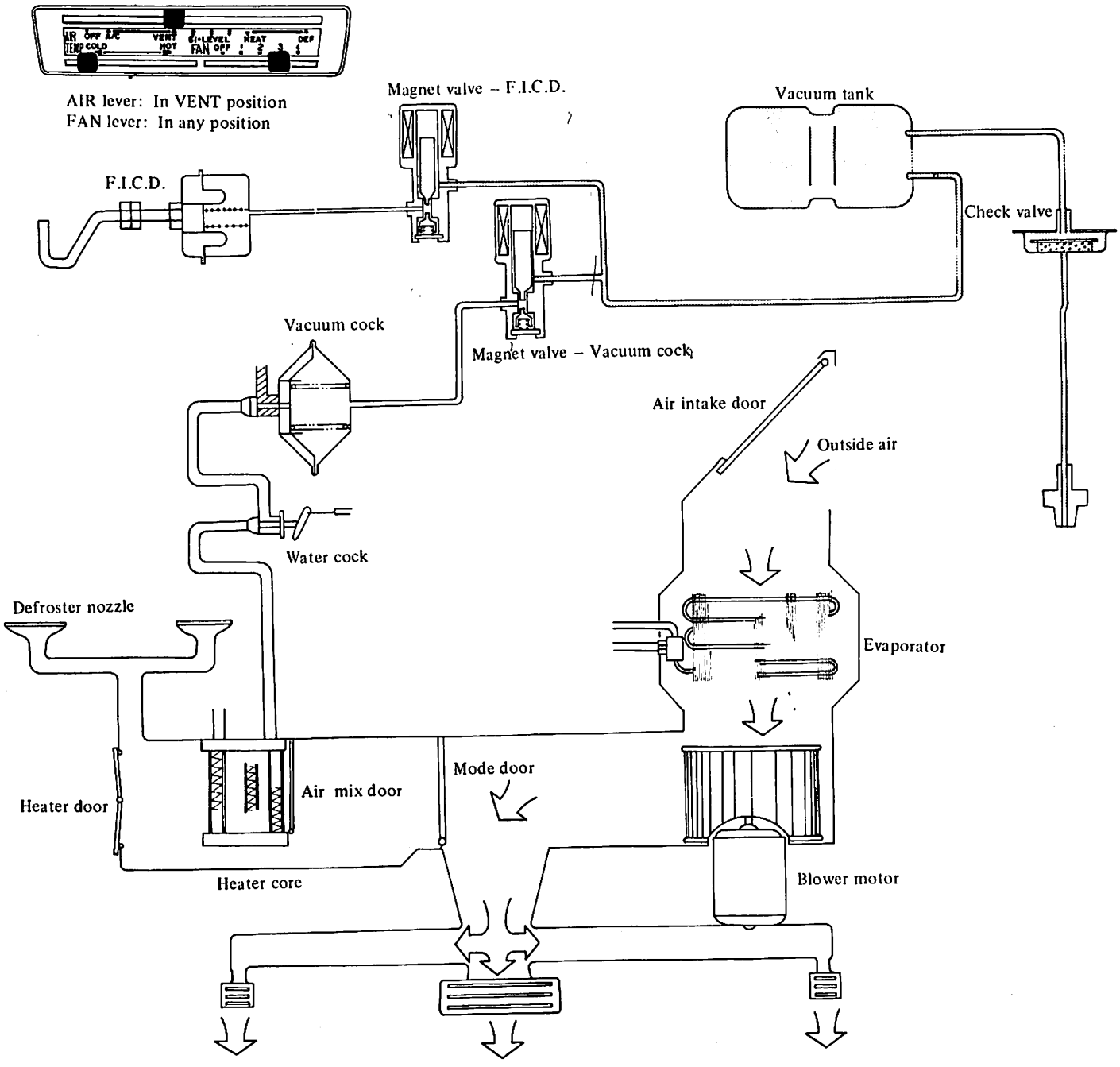


Fig. AC-8 Air flow - VENT (Ventilation) position

1. Air intake door

The air intake door is opened by the control cable according to the AIR lever movement. The outside air enters the unit of the air conditioner.

Note: As current does not flow through the compressor clutch coil, the compressor will stop the rotation and the refrigerant is not circulated through the system.

2. Mode door

The mode door is in the closed position, and the outside air is discharged from the outlets in the instrument panel.

3. Vacuum cock

The vacuum cock is closed and hot water is shut off by the cock.

4. Air mix door and water cock

As far as the TEMP lever is set in the COLD position, the air mix door shuts off the intake communicating to the heater core and the water cock is completely closed.

5. Heater door

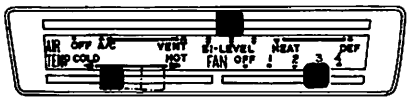
The heater door is closed.

6. Fast idle actuator

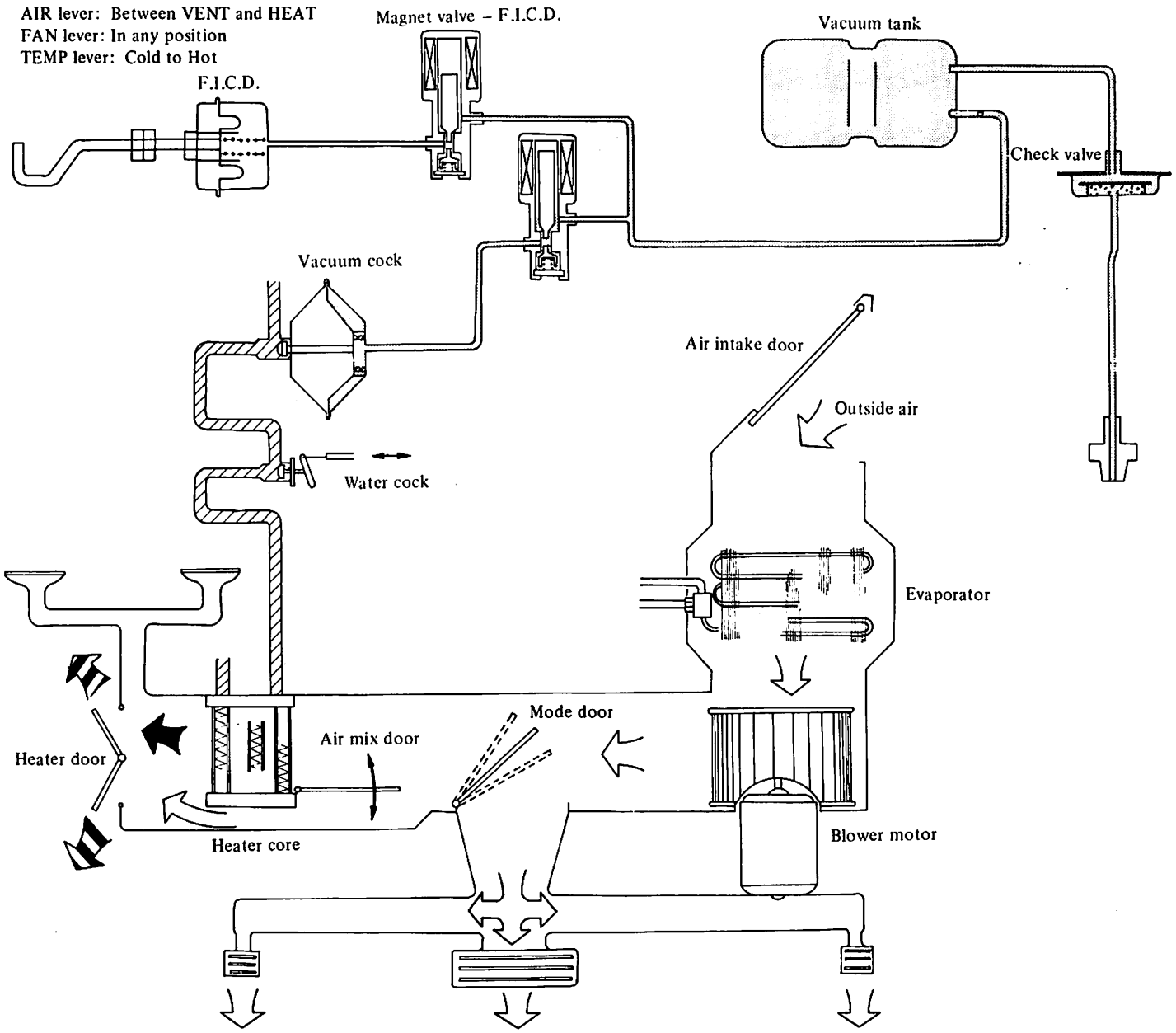
Vacuum being induced to the fast idle control device is shut off and the actuator stops operating. The control lever is returned to the original position by the tension of the spring inside the actuator.

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BI-LEVEL position



AIR lever: Between VENT and HEAT
FAN lever: In any position
TEMP lever: Cold to Hot



AC367

Fig. AC-9 Air flow - BI-LEVEL position

1. Air intake door
   The air intake door is open.

2. Mode door
   The mode door is set halfway between the open and closed positions by the control cable from the AIR lever according to the lever movement. In short, the outside air admitted through the air intake door is diverted to the heater core and the air outlets in the instrument panel.

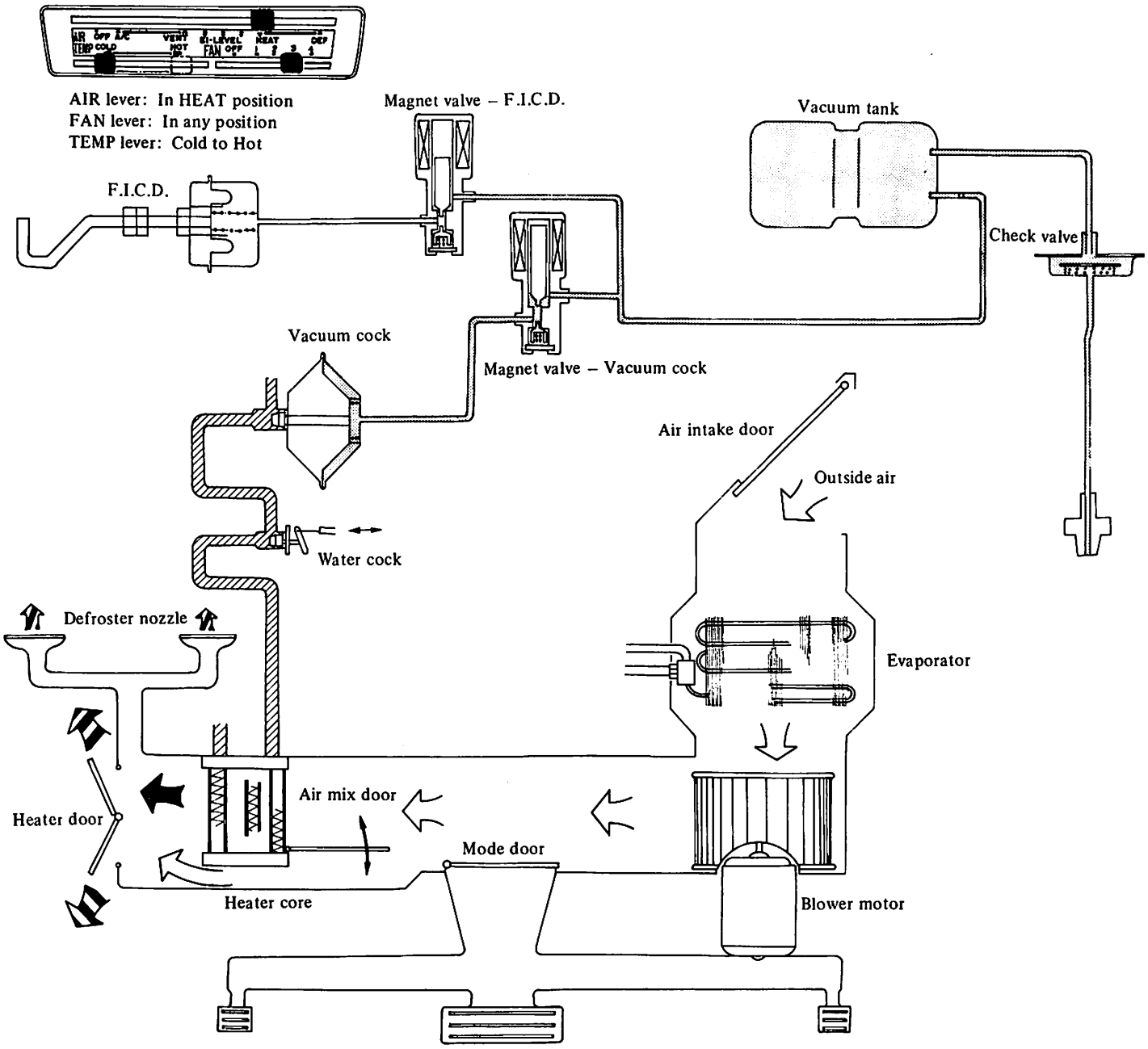
3. Vacuum cock
   Vacuum is induced to the vacuum cock actuator and the cock is fully opened. A magnet valve is used to control the induction of vacuum. This magnet valve is electrically controlled.

4. Air mix door and water cock
   When the TEMP lever is adjusted to a desired temperature position, the air mix door and water cock are opened at the necessary opening angle by each control cable.

5. Heater door
   The heater door is opened by the control cable according to the AIR lever movement. The air warmed is discharged underfoot.

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HEAT (Heater) position



AC368

Fig. AC-10 Air flow - HEAT (Heater) position

1. Air intake door
   The air intake door is open.
2. Mode door
   The mode door is fully open, and the outside air introduced from the air intake is directed to the heater core.
3. Vacuum cock
   Vacuum is induced to the vacuum cock actuator and the cock is fully open.
4. Air mix door and water cock
   The air mix door and water cock are opened at a necessary opening angle by setting the TEMP lever and hot water runs into the heater core.
5. Heater door
   The heater door is open. The air warmed by the heater core blows towards the floor.

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DEF (Defrost) position

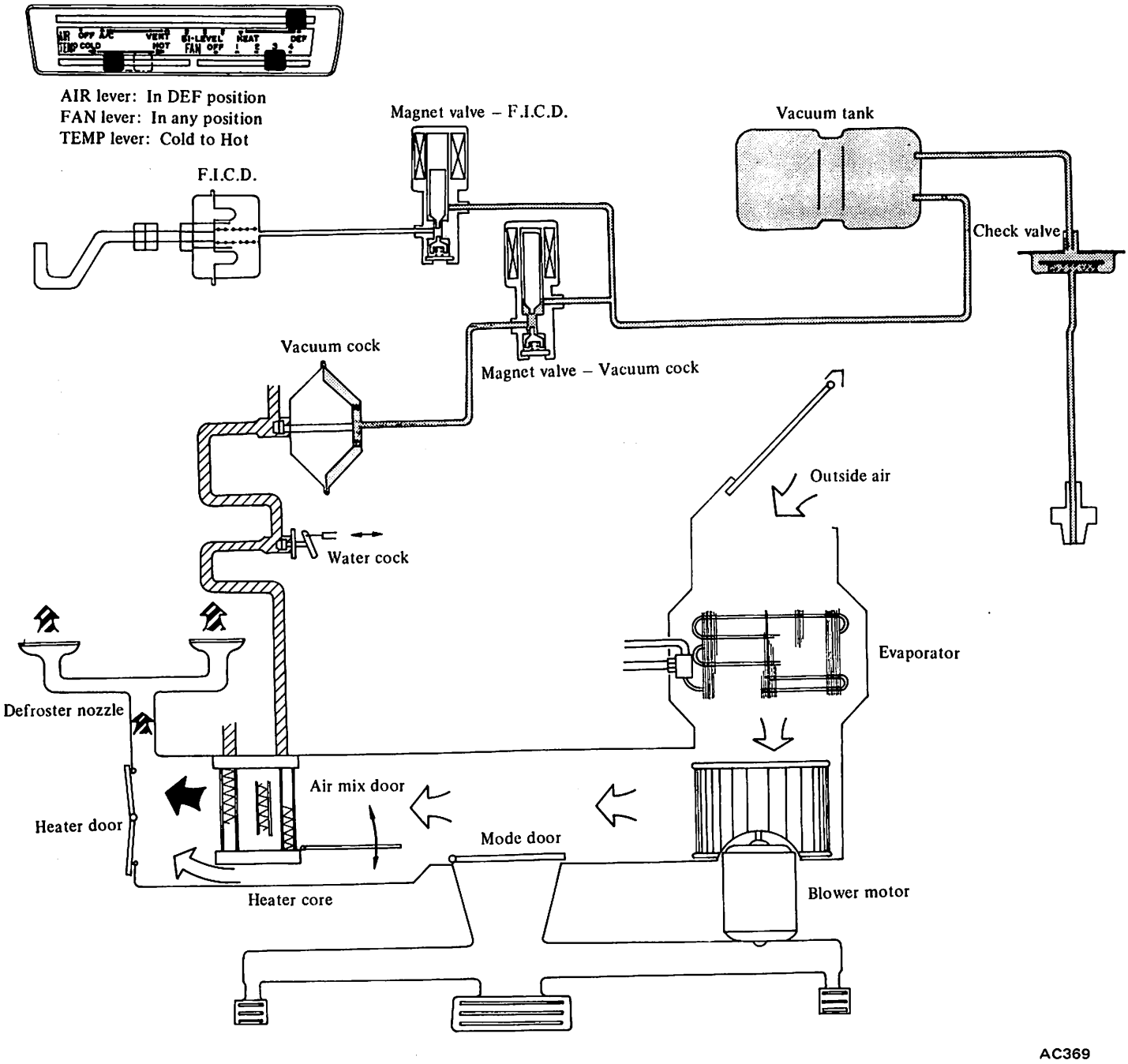


Fig. AC-11 Air flow - DEF (Defrost) position

1. Air intake door
   The air intake door is open.
2. Mode door
   The mode door is open, and the outside air drawn through the air intake wholly flows to the heater core.
3. Vacuum cock
   Vacuum is induced to the vacuum cock actuator and the cock is fully open.
4. Air mix door and water cock
   The air mix door and water cock are opened at a necessary opening angle by setting the TEMP lever, and hot water runs into the heater core.
5. Heater door
   The heater door is closed. The air warmed by the heater core is directed to the defroster nozzles.

VACUUM SYSTEM

Vacuum tank

It is necessary to control the amount of vacuum that the engine intake manifold produces. This is important since the amount of vacuum varies with speed and load of the engine. The vacuum tank stores the vacuum to help maintain a constant supply of vacuum to the system.

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Check valve

The check valve is located between the engine intake manifold and the vacuum tank. Its valve opens at a negative pressure on the engine side 20 mm Hg (4/5 in Hg) higher than that on the vacuum tank side.

The valve closes when the manifold pressure is higher than that in the vacuum tank to prevent the flow of pressure from the manifold to the tank.

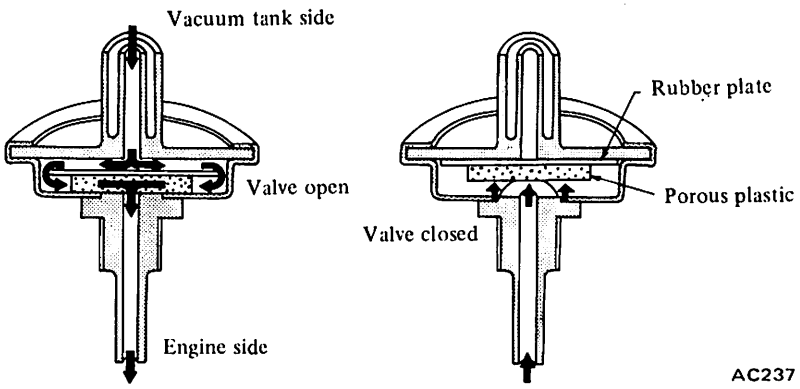


Fig. AC-12 Check valve

Magnet valve

Two magnet valves are used; one for the fast idle control device and the other for the vacuum cock. The two micro switches provided on the control assembly control these magnet valves in accordance with the movement of the AIR lever by individually switching on and/or off the electric current running to each magnet valve.

When the solenoid of the magnet valve is charged with an electric current, the needle is lifted up and vacuum in the vacuum tank is allowed to flow to the actuator. When the current running in the solenoid is shut off, the vacuum induced in the actuator is exposed to atmospheric pressure and hence the vacuum pressure is lost.

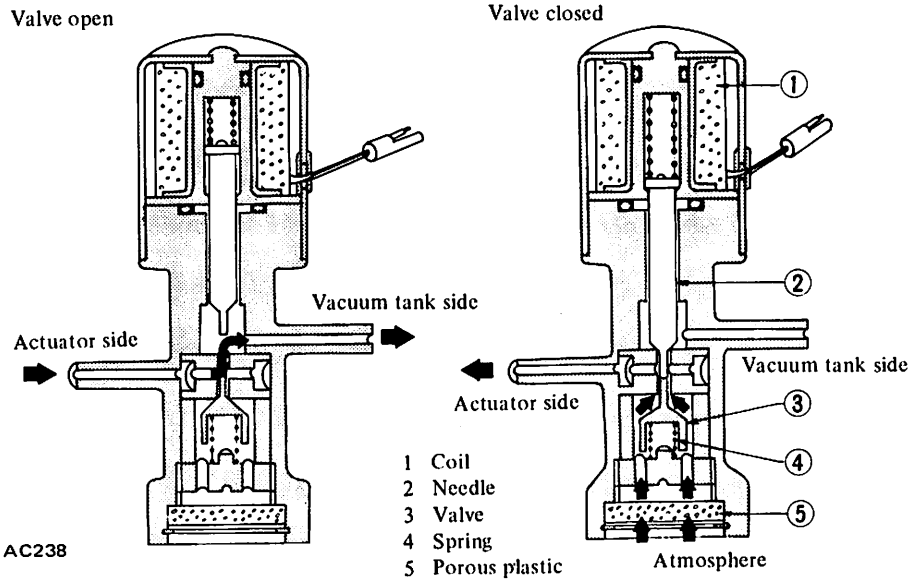


Fig. AC-13 Magnet valve

Fast idle control device (F.I.C.D.) -Fast idle actuator

The fast idle control device increases engine idle speed so that the air conditioner continues to cool the passenger compartment even when the car is at a stand still.

The device is a vacuum actuator and is equipped with a diaphragm. The diaphragm deflects when vacuum pressure is applied, and as the result, the operating lever attached to it is moved. This operating lever is connected with the carburetor throttle lever. When the vacuum pressure acting on the diaphragm is lost, the diaphragm is returned to the original position by the tension of the inner spring.

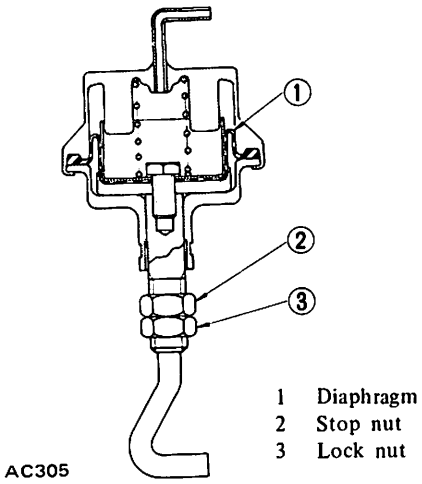


Fig. AC-14 Fast idle actuator

Vacuum water cock

This cock, too, has a vacuum actuator, by which two-stage operations of opening and closing the cock are performed. This cock opens and closes the passage of the cooling water which flows into the heater core.

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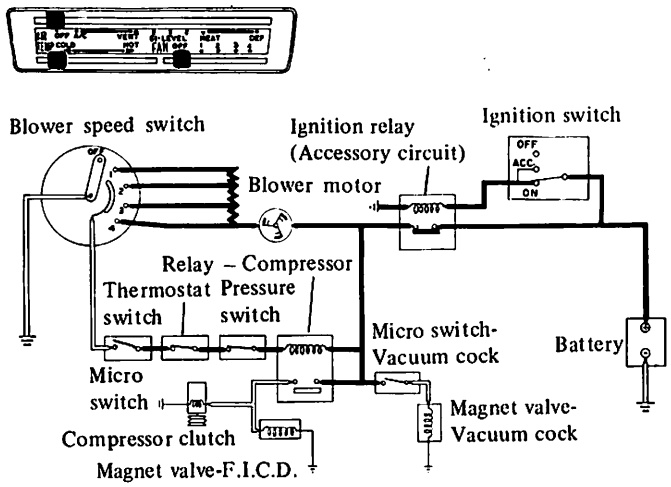
ELECTRICAL CIRCUIT

The electrical circuit of the air conditioner is designed to control the ground circuit. The blower motor operation, compressor and F.I.C.D. operation and vacuum cock operation are as described below:

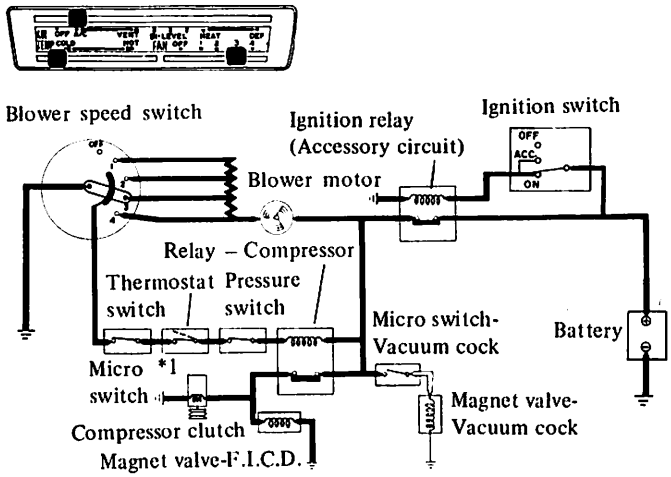
BLOWER MOTOR OPERATION

When the ignition switch is put on, the ignition relay is closed to supply an electric current to the blower speed switch through the blower motor and resistor. With the blower speed switch turned on at this time, the ground circuit is completed and the blower motor turns.

OFF POSITION

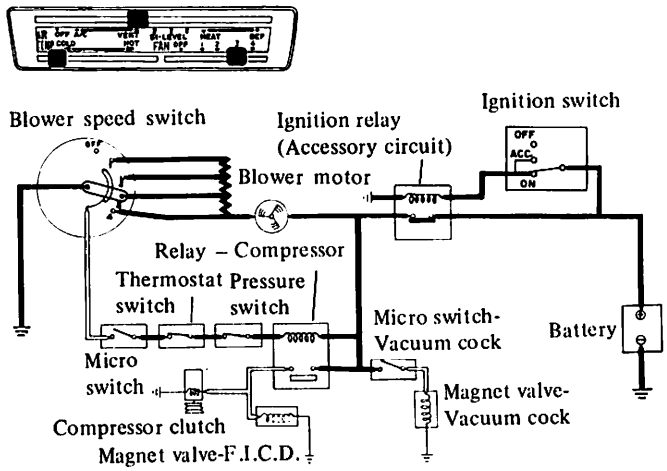


A/C POSITION

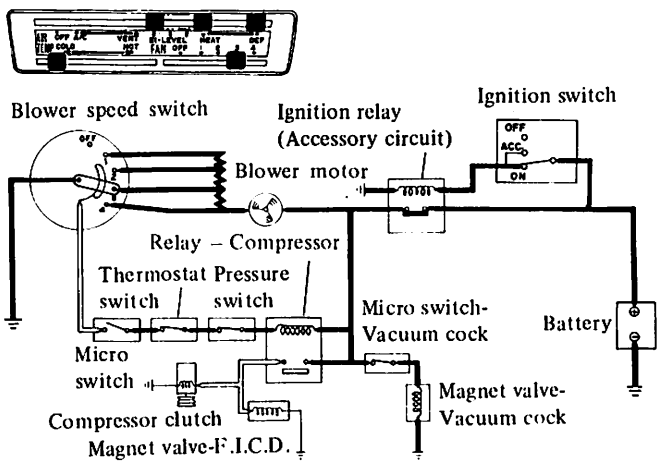


*1 On or off by switching thermostat switch on or off.

VENT POSITION



BI-LEVEL
HEAT
DEF
POSITION



AC632

FigAC-15 Electrical circuit

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COMPRESSOR AND F.I.C.D. OPERATION

An exclusive relay for the compressor and F.I.C.D. is provided in this circuit. The solenoid energizing circuit comprises a blower speed switch, micro switch, thermostat, and pressure switch arranged in a series. The electric current flowing to the compressor clutch and F.I.C.D. magnet valve is controlled by changing over each of these switches.

VACUUM COCK OPERATION

An exclusive micro switch is provided in the power circuit for the vacuum cock magnet valve.

Relay

Two relays are used. One is in the line between the blower motor and the battery. When the ignition switch is set at ON or ACC, the current flows through the solenoid to the ground, that is, the relay solenoid is energized so that the relay contacts are closed and the current flows to the blower motor.

The other relay is located in the line on the way to compressor clutch and F.I.C.D. magnet valve. The pressure switch, thermostat, micro switch and blower speed switch are in series connection in the line where the solenoid branches off. The current passes through the blower speed switch to the same ground circuit as the blower motor.

Blower speed switch

The blower speed switch is directly actuated by the FAN lever. The current passes through the blower motor to the resistor. Then it passes through the blower speed switch to the ground. The speed of the blower motor is changed to four speeds with the FAN lever's position.

Magnet valve

The magnet valve controls vacuum flowing into the actuator.

This valve is opened and closed electrically by the electric solenoid.

Pressure switch

The pressure switch, mounted on the receiver drier, cuts the electric current running in the compressor clutch to bring the compressor to a stop, when the high side pressure rises abnormally.

Micro switch

Two micro switches are used. Each micro switch is actuated by the AIR lever. When the AIR lever is put in the BI-LEVEL, HEAT or DEF, the micro switch for the vacuum cock is turned on. The other is put on when the AIR lever is moved to the A/C position.

Thermostat

The thermostat has one sensor, which is located in the center of the evaporator core of the evaporator housing and which senses the temperature of air forced out of the evaporator. In the thermostat, the contact is switched to ON and OFF according to the change in the temperature sensed by the sensor; in other words, the current which is sent to the compressor clutch is cut so as to stop the compressor's operation and to maintain steady the temperature of air forced out. One of the control cables from the TEMP lever changes the temperature setting for operation of the thermostat.

Compressor clutch

The compressor clutch engages and disengages the clutch disc electrically by the electric solenoid, and transmits the engine speed to the shaft of the compressor.

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GENERAL SERVICE

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REFRIGERANT R-12

The refrigerant used in the air conditioner is generally called "Refrigerant-12 (R-12)". No other refrigerant than the above refrigerant should be used.

This refrigerant is usually available in a small can or a cylinder. In either case, it is liquefied under high pressure in the container.

Refrigerant evaporates easily (has a low evaporation point) and, moreover, since the latent heat of the refrigerant is large, it can absorb a large amount of heat when evaporating. Extreme care must be exercised when handling the refrigerant.

COMPRESSOR OIL

The "SUNISO 5GS" refrigeration lubricant should be used to assure the successful compressor operation. Use of oils other than recommended or mixing of the oil with other oils would cause chemical reaction or lead to lowered viscosity or deficient lubrication.

The oil absorbs moisture as it contacts the air. This points out the need for care not to expose it to atmosphere for an extended period of time.

MAINTENANCE

PERIODIC MAINTENANCE AND SEASON-IN INSPECTION

Both periodic maintenance and season-in inspection are most essential to enable the air conditioner to give full performance.

Perform the following checks.

1. Start engine and check refrigerant level through sight glass on receiver drier. For details, refer to relative topics under "Refrigerant Level Check".
2. Check the entire system for sign of refrigerant leaks. Refer to relative topics under "Checking for Leaks" and "Refrigerant Leaks".

If any trace of oil is noted at and around connection fittings, it is a sure indication that refrigerant is leaking. This condition can be corrected easily by retightening the joints. If any joint on line is suspected of small amount of leakage, use a leak detector to locate leaking points.

3. Check compressor drive belts for proper deflection.

Season-off

Observe the following maintenance tips to allow the air conditioner to operate normally in the next season.

1. Keep the entire system free from refrigerant leakage by periodically checking for refrigerant gas leak even out of season.
2. Turn the compressor for 10 minutes at least once a month by running the engine at 1,500 rpm.

GENERAL SERVICE INSTRUCTIONS

The servicing of the air conditioner should be carried out only by well-trained servicemen. This chapter describes essential points of servicing.

- If a large amount of dirt and sand enter the system, they will be carried with refrigerant and may clog the system or scratch rotating parts. This points out the need for care in servicing the system. That is, disconnecting joints should be carried out in a clean place.
- Water should not be allowed to get inside the system. The refrigerant does not readily mix with water. However, the presence of even a minute amount of water will cause a chemical reaction at high temperature which will in turn produce hydrochloric acid (HCl). Since hydrochloric acid is highly corrosive to metals, the aluminum and copper piping, etc. will become corroded and the refrigeration system will become clogged.

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- Water in the system will ice the orifice when the high pressure refrigerant is changed to low pressure refrigerant by expansion valve, etc., and will obstruct the refrigerant flow.

The following are general instructions to be closely observed in servicing the system.

1. When a system line is disconnected, plug the opening immediately. This is especially necessary to prevent moisture condensation from forming in the line and to keep out dirt and dust. It is also necessary to keep the line at and above surrounding air temperatures at all times. When connecting system lines, do not attempt to remove the plug from the opening until ready for immediate use.
2. Always keep the working place clean and dry and free from dirt and dust. Wipe clean water that comes into contact with the pipe joint before disconnecting.
3. Have all necessary tools in preparation beforehand and have tools clean and dry.
4. The compressor oil will easily absorb moisture when exposed to air. Immediately close the opening of the container after use. It is also necessary to observe the following notes:

Notes:

a. **The oil should not be transfused from a container into another, as the failure will possibly cause moisture to mix with the oil.**
b. **The used oil should not be returned into a container.**
c. **The oil should not be used if its state of preservation is not clear enough.**

5. When connecting or disconnecting pipes from the refrigeration system, use two wrenches. One wrench is used for holding the fixing nut in place while the other for turning the mating flare nut. Failure to do so may result in a twisted tube or may damage connection.
6. Also use care not to give scratches to the seating surface at connections. A small scratch on the seating surface may be the cause of gas leakage. Before connecting pipes, be sure to give coating of compressor oil to the seating surfaces.

SAFETY PRECAUTIONS

1. Since direct contact of the liquid refrigerant with your skin will cause frostbite, always be careful when handling the refrigerant. **Wear gloves or wrap a piece of cloth around service valve to protect your fingers against frostbite by refrigerant.** If any of the refrigerant should get into your eyes when charging the refrigerant, splash your eyes with cool water to raise the temperature gradually. Apply a protective film to the eye to avoid infection. Do not rub your eyes. Consult an eye specialist. **Always wear goggles or glasses to protect your eyes when working around the system. Should refrigerant strikes your body, splash on cool water and apply a protective film.**
2. The refrigerant service container has a safe strength. However, if handled incorrectly, it will explode. Therefore, **always follow the instructions on the label. In particular, never store it in a hot location [above 52°C (125°F)] or drop it from a high height.**
3. The refrigerant gas is odorless and colorless and breathing may become difficult due to the lack of oxygen. Since the refrigerant gas is heavier than air and will lay close to the floor, be especially careful when handling it in small, confined spaces.
4. The refrigerant itself is nonflammable. **However, a toxic gas (phosgene gas) is produced when it contacts fire and special care is therefore required when checking for leaks in the system with a halide torch.**
5. Do not steam clean on the system, especially condenser since excessively high pressure will build up in the system, resulting in explosion of the system.

The above precautions are essential in handling of Refrigerant-12, and their strict observation requires sufficient training. Therefore, it is of first importance that any other personnel than a well-trained serviceman should not be allowed to handle the refrigerant.

EVACUATING AND CHARGING SYSTEM

During servicing, use caution to keep air from getting into refrigerant. When air enters the system, all refrigerant must be evacuated from system prior to charging new refrigerant. Air in refrigerant has the following deleterious effects:

1. Since the condensation temperature of the air is extremely low, the air will not be condensed when refrigerant gas is condensed in the condenser, and the air will thus remain in gaseous form. Consequently, the effective thermal transmission area of condenser for refrigerant gas will be reduced and refrigerant gas to be condensed will be reduced. The pressure rise will become proportional to the volume of the air in system.
2. When air and refrigerant are mixed in system, a chemical reaction will be produced and hydrochloric acid which will adversely affect the aluminum, copper, iron, and other materials in system may be generated.

HANDLING MANIFOLD GAUGE

The pressure at the high- and low-sides of system should be measured when evacuating and charging refrigerant and when diagnosing trouble in the system. The manifold gauge is used for these purposes. A manifold gauge has two pressure gauges; a low pressure gauge and a high pressure gauge. These gauges are connected to the high- and low-side service valves of system through flexible charging hoses. The construction of manifold gauge is shown in Figure AC-15.

When valve stem is fully screwed, the valve is front-seated and valve path and the center path are blocked. When valve stem is backed off, the paths are opened.

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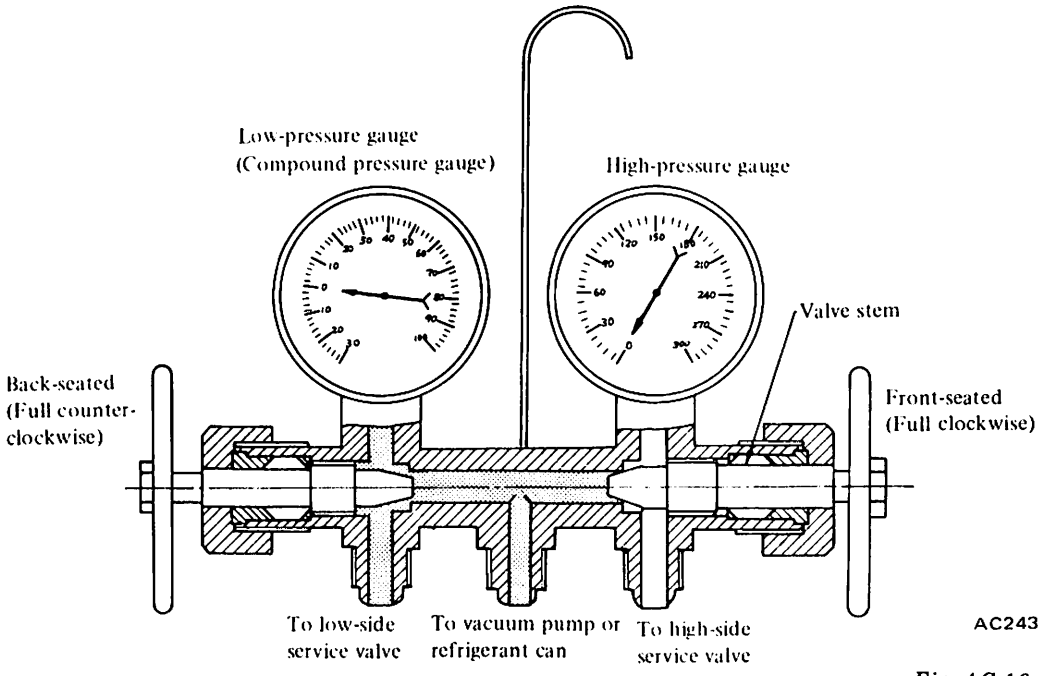


Fig. AC-16 Manifold gauge

Connection to service valve

1. Fully close both valves of manifold gauge. Connect high- and low-pressure charging hoses to manifold gauge.
2. Remove caps from service valves. Connect high- and low-pressure charging hoses to service valves in system. The refrigerant gas will be discharged since check valve is open when pressing charging hose onto service valve.
3. Next, loosen the connection fitting of charging hose at manifold gauge side for 2 to 3 seconds to purge any air inside charging hose by the pressurized gas in system.

HANDLING SERVICE VALVE

An automatic check valve is built into service valve. When this valve presses against the connection fitting, that is, when charging hose is connected to service valve, the valve is open. When charging hose is disconnected, the valve is closed automatically. Always observe the following usage precautions:

1. Always install valve cap after using service valve.

When high speed operation is performed without valve cap, a negative pressure will gradually build up at the low pressure side of system and air may be sucked in. In addition, dirt and dust will easily enter the valve resulting in foreign matter entering the system.

2. Check valve will be half opened during connection and disconnection of charging hoses and refrigerant will be forcefully discharged. Therefore, connect and disconnect charging hoses quickly while pressing flare nut of charging hose against service valve.

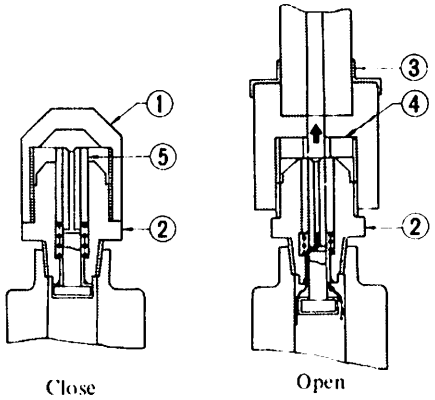
Caution: Work with fingers protected with cloth against frostbite by refrigerant.

3. Since close contact between the thread of valve cap and the thread of service valve will prevent gas leakage, keep these sections clean and free of scratches and damage.
4. Since packing of charging hose will be lost during long use, always check packing prior to installing charging hose.

Disconnection from service valve

1. Fully close both valves of manifold gauge.
2. Disconnect two charging hoses from service valves. At this time, the gas will be discharged until check valve is closed. Therefore, disconnect hose quickly.

Caution: Work with fingers protected with cloth against frostbite by refrigerant.



1 Cap
2 Service valve
3 Charging hose
4 Packing
5 Check valve

Fig. AC-17 Service valve

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Note: The two service valves are provided not only on the compressor, but also on the piping. See Figure AC-18.

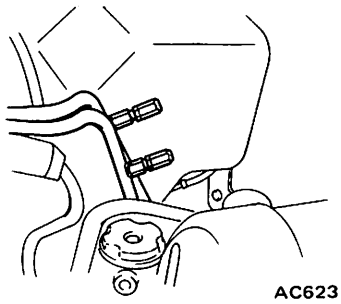


Fig. AC-18 Service valve

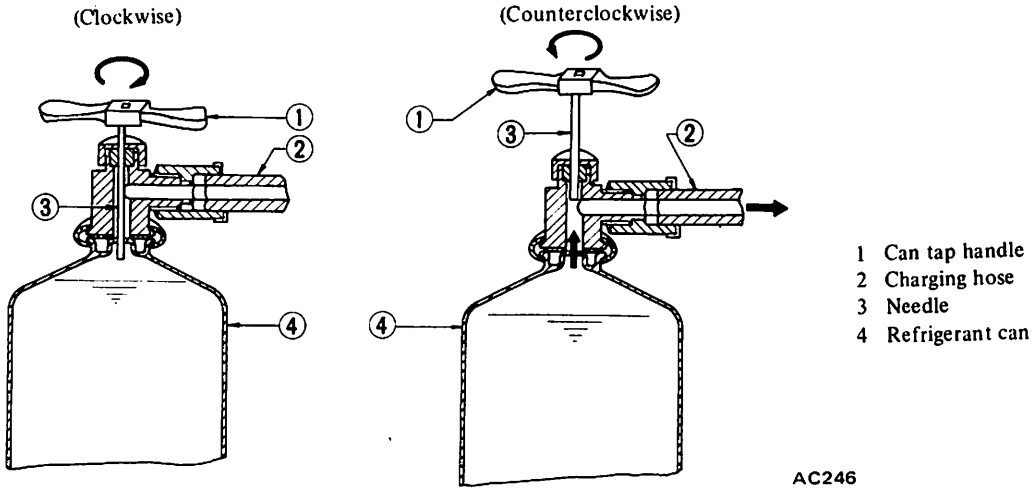
HANDLING CAN TAP

A wide variety of can taps are available. The following procedures apply to conventional can taps.

For the correct usage, refer to the manufacturer's instructions.

Caution: Use can tap of good quality.

1. Connect charging hose to the center fitting of manifold gauge. At this time, confirm that both stems are fully turned in (front-seated).
2. Turn can tap handle fully counterclockwise so that the needle is pulled up.
3. Attach can tap to refrigerant can firmly.
4. Turn can tap handle fully clockwise to make a hole in refrigerant can.
5. Turn the handle fully counterclockwise to raise the needle. Refrigerant gas will flow up to the center fitting of manifold gauge.
6. Loosen the connection at the center fitting of manifold gauge for a few seconds to purge air inside charging hose. See Figure AC-19.



1 Can tap handle
2 Charging hose
3 Needle
4 Refrigerant can

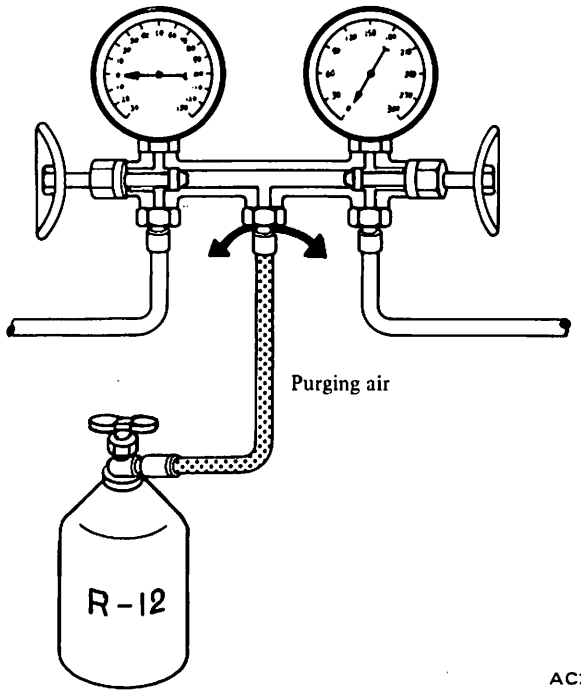


Fig. AC-19 Can tap and Purging air

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DISCHARGING SYSTEM

The pressurized refrigerant gas inside system must be discharged to a pressure approaching atmospheric pressure prior to evacuating refrigerant inside system. This operation should be made to permit safe removal when replacing system components.

1. Close high- and low-pressure valves of manifold gauge fully.
2. Connect two charging hoses of manifold gauge to their respective service valves.
3. Open both manifold gauge valves slightly and slowly discharge refrigerant from system. See Figure AC-20.

Note: Do not allow refrigerant to rush out. Otherwise, compressor oil will be discharged along with refrigerant.

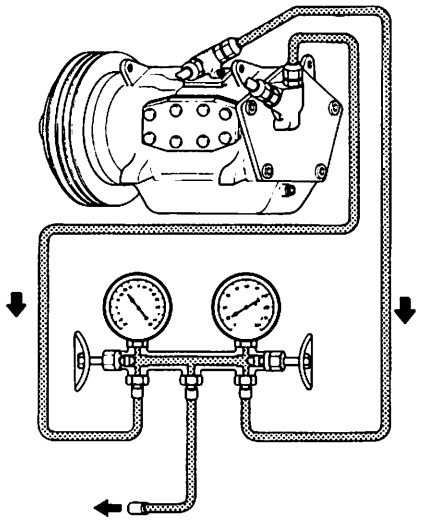


Fig. AC-20 Discharging system

Caution: Protect fingers with cloth against frostbite by refrigerant when connecting the charging hose to the service valve or disconnecting it therefrom.

EVACUATING SYSTEM

1. Connect high- and low-pressure charging hoses of manifold gauge to their respective service valves of system and discharge refrigerant from system. Refer to "Discharge System".
2. When refrigerant has been discharged to a pressure approaching atmospheric pressure, connect center charging hose to a vacuum pump.
3. Close both valves of manifold gauge fully. Then start vacuum pump.
4. Open low-pressure valve and suck old refrigerant from system. See Figure AC-21.
5. When low-pressure gauge reading has reached to approximately 500 mm Hg (20 in Hg), slowly open high-pressure valve. See Figure AC-22.
6. When pressure inside system has dropped to 710 mm Hg (28 in Hg), fully close both of valves of manifold gauge and stop vacuum pump. Let stand it for 5 to 10 minutes in this state and confirm that the reading does not rise.

Notes:

a. The low-pressure gauge reads lower by 25 mm Hg (1 in Hg) per a 300 m (1,000 ft) elevation. Perform evacuation according to the following table.

Elevation m (ft)	Vacuum of system mm Hg (in Hg)
0 (0)	710 (28)
300 (1,000)	685 (27)
600 (2,000)	660 (26)
900 (3,000)	635 (25)

Note: Values show readings of the low-pressure gauge.

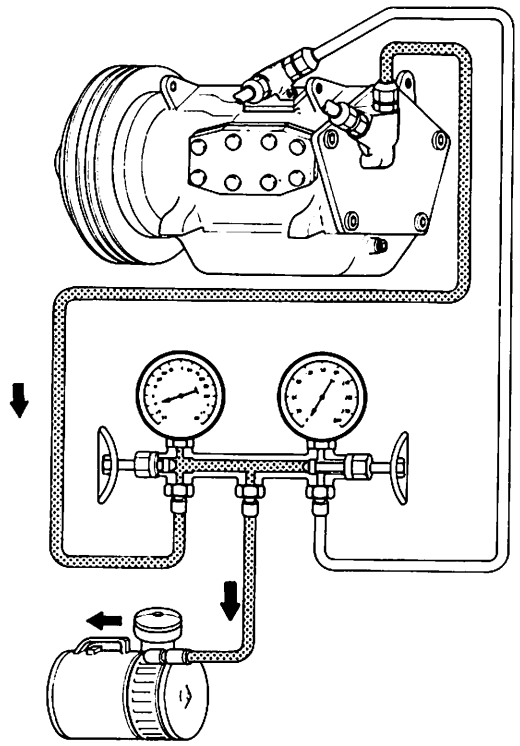
b. The rate of ascension of the low-pressure gauge should be less than 25 mm Hg (1 in Hg) in five minutes.

If the pressure rises or the specified negative pressure can not be obtained, there is a leak in the system. In this case, immediately charge system with refrigerant and repair the leak described in the followings.

(1) Confirm that both valves of manifold gauge are fully closed and then disconnect center charging hose from vacuum pump.
(2) Connect center hose to can tap in place of vacuum pump. Attach refrigerant can to can tap and pass refrigerant to manifold gauge.
(3) Loosen the connection of center fitting of manifold gauge to purge air from center hose.
(4) Open low-pressure valve of manifold gauge and charge refrigerant into system. After one can [about 0.4 kg (1 lb)] of refrigerant has been charged into system, close low-pressure valve.
(5) Check for refrigerant leakage with a leak detector. Repair any leakages found. Refer to "Checking for Leaks" and "Refrigerant Leaks".
(6) Confirm that both valves of manifold gauge are fully closed and then change center charging hose from can tap to vacuum pump.
(7) Open high- and low-pressure valves and operate vacuum pump to such refrigerant from system. When the pressure in system has dropped to 710 mm Hg (28 in Hg), fully close both valves of manifold gauge.

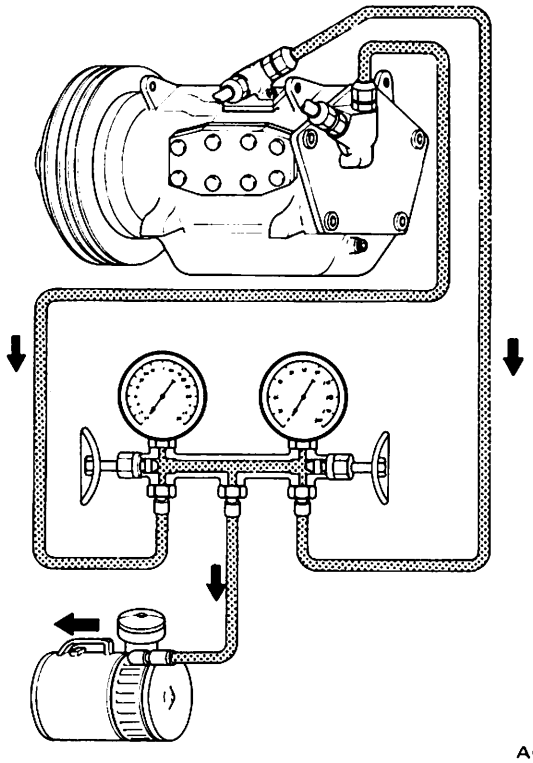
7. The above operation completes evacuation of system. Next, charge refrigerant. Refer to "Charging Refrigerant".

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AC249

Fig. AC-21 Evacuating system - First step



AC250

Fig. AC-22 Evacuating system - Second step

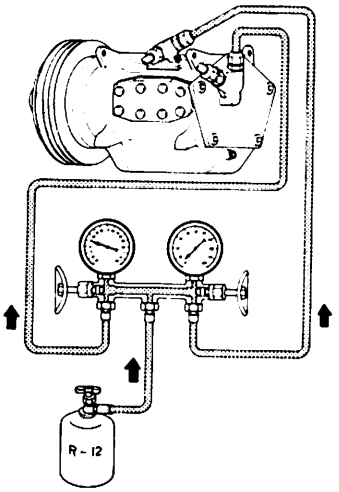
CHARGING REFRIGERANT

1. Install manifold gauge to system. Refer to "Handling Manifold Gauge".

Notes:

a. **Be sure to purge air from the high- and low-pressure charging hoses.**
b. **If air is mixed with refrigerant gas in system, evacuation of system should be performed. Refer to "Evacuating System".**

2. Attach center charging hose of manifold gauge to refrigerant can through can tap. Break seal of refrigerant can to allow refrigerant to enter manifold gauge. Loosen charging hose at the center fitting of manifold gauge and purge air from inside charging hose. Refer to "Handling Can Tap".
3. Open high- and low-pressure valves of manifold gauge and charge refrigerant into system. See Figure AC-23.



AC251

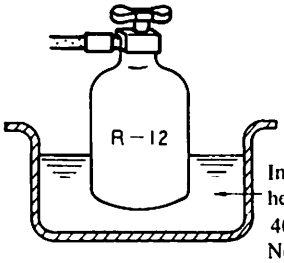
Fig. AC-23 Charging refrigerant

Notes:

a. **When refrigerant charging speed is slow, immerse refrigerant can in water heated to a temperature of about 40°C (104°F). However, note that this is dangerous when water is hot. See Figure AC-24.**

Cautions:

a. **Under any circumstances the refrigerant can must not be warmed in water heated to a temperature of over 52°C (125°F).**
b. **A blow torch or stove must never be used to warm up the can.**



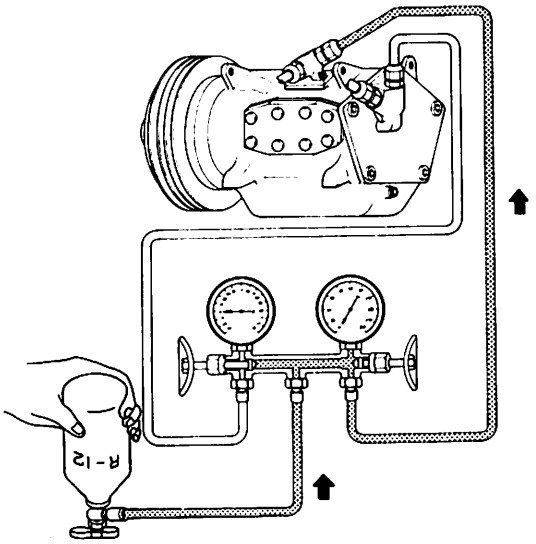
Immerse in water heated to about 40°C (104°F). Note that hot water is dangerous.

AC252

Fig. AC-24 Charging refrigerant

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b. When charging liquefied refrigerant into the system with the can turned upside down to reduce charging time, charge it only through high pressure valve, but not through low-pressure valve.
After completion of charging, the compressor should always be turned several times manually. See Figure AC-25.



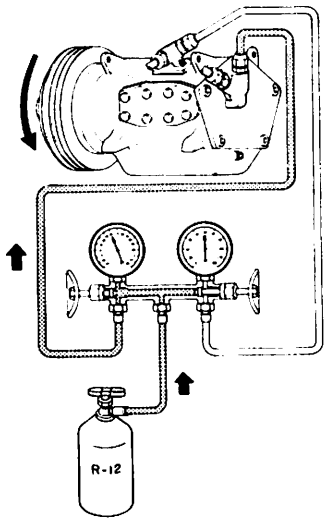
AC253

Fig. AC-25 Charging refrigerant

4. If refrigerant charging speed slows down, charge it while running the compressor for ease of charging. After having taken the steps up to (3) above, proceed with charging in the following order.
(1) Shut off high pressure valve of manifold gauge.

Caution: Never charge refrigerant through high pressure side of system since this will force refrigerant back into refrigerant can and can may explode.

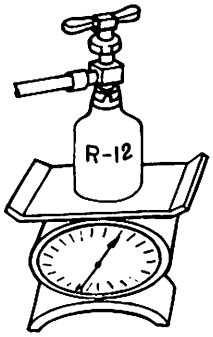
(2) Run the engine at idling speeds below 1,500 rpm.
(3) Set the TEMP lever and FAN switch at maximum cool and maximum speed respectively.
(4) Charge refrigerant while controlling low-pressure gauge reading at 2.8 kg/cm² (40 psi) or less by turning in or out low-pressure valve of manifold gauge. See Figure AC-26.



AC254

Fig. AC-26 Charging refrigerant

5. When refrigerant can is empty, fully close both valves of manifold gauge and replace refrigerant can with a new one.
Before opening manifold gauge valve to charge refrigerant from new can, be sure to purge air from inside charging hose.
6. Charge the specified amount of refrigerant into system by weighing charged refrigerant with scale. Overcharging will cause discharge pressure to rise. See Figure AC-27.



AC255

Measure the amount of charged refrigerant with a scale.
Make a note of the amount charged from can.

Fig. AC-27 Charging refrigerant

Refrigerant capacity

Unit: kg (lb)

Refrigerant	Minimum	Maximum
R-12	0.6 (1.3)	0.9 (2.0)

Note: The presence of bubbles in sight glass of receiver drier is an unsuitable method of checking the amount of refrigerant charged in system. The state of the bubbles in sight glass should only be used for checking whether the amount of charged refrigerant is small or not. The amount of charged refrigerant can be correctly judged by means of discharge pressure. Refer to "Refrigerant Level Check".

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7. After the specified amount of refrigerant has been charged into system, close manifold gauge valves. Then detach charging hoses from service valves of system. Be sure to install valve cap to service valve.

8. Confirm that there are no leaks in system by checking with a leak detector.

Refer to "Checking for Leaks".

Note: Conducting a performance test prior to removing manifold gauge is a good service operation. Refer to "Performance Test".

CHECKING FOR LEAKS

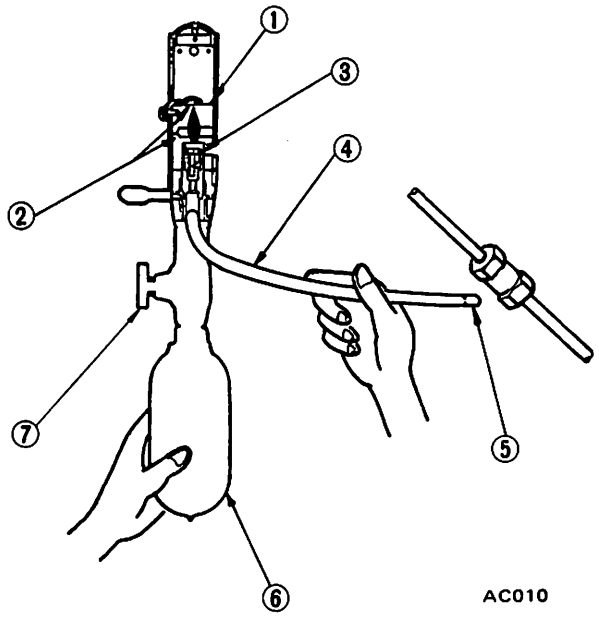
Conduct a leak test whenever leakage of refrigerant is suspected and when conducting service operations which are accompanied by disassembly or loosening of connection fittings.

Refrigerant is a colorless, odorless gas and leakage from system is difficult to detect. Accordingly, the use of a leak detector facilitates check for leaks. Two methods of checking are available; one employs a halide leak detector which burns propane gas or butane gas and the other is an electric type leak detector.

HALIDE LEAK DETECTOR

Since the propane leak detector and butane leak detector are the same in respect to their operation, this section describes the operation of the propane leak detector.

The copper screen is heated by the burning of propane. Refrigerant gas decomposes to color the flame when it contacts the heated screen. The gas to be checked is drawn into the sampling tube and sent out to the burner. A refrigerant leak can clearly be detected by variations in the color of the flame.



1 Copper reaction plate
2 Flame adjusting lines
3 Burner
4 Sampling tube
5 Strainer
6 Gas bomb
7 Flame adjuster

Fig. AC-28 Checking for leaks

	Propane type	Butane type
NO LEAK	Greenish blue	Pale blue
SMALL LEAK	Yellow	Bright blue
LARGE LEAK	Purple	Vivid green

1. Discharge refrigerant in one or two seconds to ascertain that system has a sufficient pressure needed for leak detection. Charge with 0.4 kg (1 lb) of refrigerant, if necessary.
2. Light leak detector. Adjust the height of the flame between flame adjusting lines at the top and bottom of combustion tube. A reaction plate will immediately become red hot.
3. Place the end of sampling tube near the point of the suspected leak in system.

Notes:

a. **Since refrigerant gas is heavier than air, small leaks can be easily detected by placing sampling tube directly below the check point.**
b. **Suitable ventilation is required. If refrigerant gas is mixed with the surrounding air, leak detector will always indicate a response and detection of the actual leak will be difficult.**
c. **Never hold leak detector at an angle.**

Cautions:

a. **Never inhale the fumes produced by combustion of refrigerant gas since they are toxic.**
b. **Never use halide torch in a place where combustible or explosive gas is present.**

4. The flame will be almost colorless when there is no refrigerant gas being burned. When there is a small refrigerant gas leak, the flame will be green or yellowgreen. When refrigerant gas leakage is large, the flame will be brilliant blue or purple. Since the color of the flame will be yellow when dust is being burned or there is aging scale on copper reaction plate, always keep the strainer of sampling tube and reaction plate clean.
5. Major check points

(1) Compressor

- Compressor shaft seal (rotate the compressor by hand)
- Oil filler plug
- Flexible hose connections
- Rear cover and side cover gaskets.
- Service valve

(2) Condenser

- Condenser pipe fitting
- Condenser inlet and outlet pipe connections

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(3) Piping
- Flared section of high pressure and low pressure flexible hose.
- Pipe connections
- Service valve

(4) Evaporator housing
- Inlet and outlet pipe connections
- Expansion valve

ELECTRIC LEAK DETECTOR

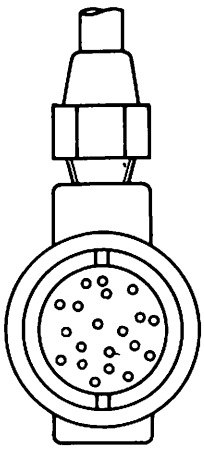
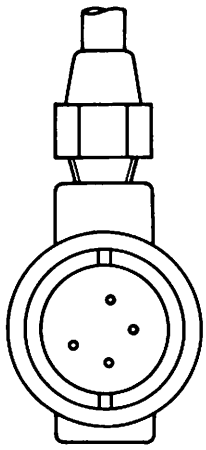
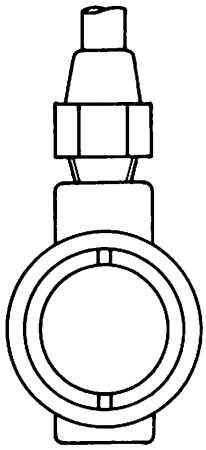
For the operational procedures, refer to the instructions furnished with each electric leak detector.

REFRIGERANT LEVEL CHECK

SIGHT GLASS

Sight glass is provided at the top of receiver drier. One guide for whether there is enough refrigerant in system is given by observing refrigerant flow through sight glass. However, this method is unsuitable for judging the amount of refrigerant. The correct refrigerant level can be judged by measuring the system pressures in accordance with the procedures as described "Performance Test".

1. Start the engine and hold engine speed at 1,500 rpm.
2. Set AIR lever to A/C position.
3. Set blower to maximum speed.
4. Check sight glass after the lapse of about five minutes. Judge according to the following table.

Amount of refrigerant / Check item	Almost no refrigerant	Insufficient	Suitable	Too much refrigerant
Temperature of high pressure and low pressure pipes.	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 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.

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Notes:

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. Be sure to 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 of refrigerant is normal. In this case, the outlet side pipe of the receiver drier becomes considerably cold.**

PERFORMANCE TEST

Check for the amount of refrigerant in the system can be made by measuring pressure on discharge side.

The correct amount of refrigerant is in the system, if pressure on the discharge side is within the specified range. For details, refer to "Performance Test" described later.

Overcharging will show up in higher pressure on discharge side.

COMPRESSOR OIL LEVEL CHECK

The oil used to lubricate compressor circulates into system from the oil sump while compressor is operating. Therefore, to correctly measure compressor oil, the amount of oil flowing to system must be considered. If a considerable amount of leakage of refrigerant gas happens, the leakage of compressor oil is also considered. There will be no compressor oil leakage from a completely sealed system. When system operates under satisfying condition, the compressor oil level check is unnecessary.

When checking the level of compressor oil or when replacing any component part of the system, use the following service procedure. This facilitates to return oil to compressor.

1. Operate compressor at engine idling speed (1,000 rpm or below) with controls set for maximum cooling and high blower speed for 10 to 15 minutes in order to return compressor oil to compressor.
2. Stop the engine and discharge refrigerant of system and then remove compressor from the car.
3. Remove compressor drain plug.

   Drain compressor oil from compressor oil sump and measure the amount.
4. Compressor oil is satisfactory if the following amount of oil remains in the compressor.

   Residual oil:
   85 to 128 gr (3 to 4 ½ oz)
5. Check the cleanliness of the oil. If the oil contains chips or other foreign material, clean oil sump with new oil.
6. Discard the used oil and fill with the same amount of new oil. Add oil if found less than above amount.

If compressor is inoperative due to defective compressor or heavy loss of refrigerant, remove compressor and repair as necessary. Then pour oil up to correct level and install on engine. After above steps have been completed, recheck oil level; drain oil to correct level if level is excessively high.

PERFORMANCE TEST

The cooling performance of the air conditioner changes considerably with changes in surrounding conditions. Testing must be performed using the correct method. This test is used to judge whether system is operating correctly and can also be used as a guide in checking for problems.

1. Park the car indoors or in the shade.
2. Open all the windows of the car fully. However, close the doors.
3. Open the hood.
4. Connect manifold gauge to high- and low-side service valves of the system. Refer to "Handling Manifold Gauge".
5. Set AIR lever to A/C position.
6. Set TEMP lever to max. cool position.
7. Set blower to its highest speed.
8. Start the engine and hold engine speed at 1,500 rpm.
9. After the air conditioner has been operated for about 10 minutes, measure system pressures at high-pressure (discharge) side and low-pressure (suction) side.
10. Measure the temperature of discharge air at outlet grille.
11. Measure the temperature and humidity of the ambient air at a point 1 m (3.3 ft) front of condenser. However, a dry bulb and wet bulb must not be placed in direct sunlight.
12. Check for any abnormalities by comparing the test results with standard pressure in "Performance Chart".

Notes:

a. **The pressure will change in the following manner with changes in conditions:**
   - **When blower speed is low, discharge pressure will drop.**
   - **When the relative humidity of intake air is low, discharge pressure will drop.**

b. **The temperature will change in the following manner with changes in conditions:**
   When the ambient air temperature is low, the outlet air temperature will become low.

If the test reveals that there is any abnormality in system pressure, isolate the cause and repair by reference to the "Trouble Diagnoses and Corrections".

REFRIGERANT LEAKS

If leaks are noticeable, leaky parts should be repaired. Then system should be filled with refrigerant. **Do not operate compressor with refrigerant level excessively low.**

If this caution is neglected, a burnt compressor will result since heavy loss of refrigerant usually indicates heavy loss of compressor oil.

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If system has been exposed to atmosphere for an extended period of time, receiver drier must be replaced. If leaks are slight and no air is present in system, add refrigerant as necessary.

To detect leaks, refer to relative topics under "Checking for Leaks". Here is how leaks are stopped.

1. Check torque on the connection fitting and, if too loose, tighten to the proper torque. Check for gas leakage with a leak detector.
2. If leakage continues even after the fitting has been retightened, discharge refrigerant from system, disconnect the fittings, and check its seating face for damage. Always replace even if damage is slight.
3. Check compressor oil and add oil if required.
4. Charge refrigerant and recheck for gas leaks. If no leaks are found, evacuate and charge system.

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COMPRESSOR

REMOVAL

It is advisable that compressor be taken out toward the underside of car.

1. Disconnect battery ground cable.
2. Discharge the air conditioning system.

Refer to the Section "Discharging System" in "General Service".

3. Disconnect high and low flexible hoses from compressor.

Notes:

a. Use wrench to fix joint nut on compressor side, and then loosen flare nut on flexible hose with another wrench.

b. Immediately plug up flexible hose openings and compressor connection joints.

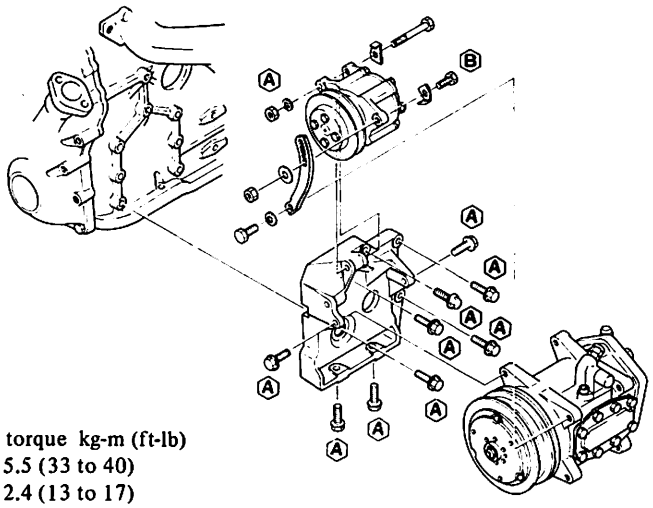
4. Raise the front of car and support with stands.
5. Remove under cover.
6. Remove left tension rod bracket.
7. Loosen idler pulley attaching nut (1) and then loosen tension adjusting bolt (2). See Figure AC-29.
8. Loosen air pump attaching bolt.
9. Loosen tension adjusting bar bolt for air pump drive belt. Then loosen drive belt tension.
10. Remove compressor upper and lower attaching bolts. While doing this work, hold compressor by hand to prevent it from falling.
11. Holding compressor, remove compressor drive belt and air pump drive belt from compressor clutch pulley.
12. Take compressor out under car, holding it with both hands.
13. Using the same procedure as described in "Compressor Oil Level Check" in "General Service", check quality of oil in compressor.

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Notes:

a. Do not attempt to leave the compressor on its side or upside down for more than 10 minutes, as the compressor oil enters the low pressure chamber.
If, under that condition, compressor should be operated suddenly, internal damages would result. To expel oil from chambers, hand-crank compressor several times in its installed condition.

b. When storing a compressor, be sure to fill it with refrigerant through low pressure service valve and purge air from compressor through high pressure service valve.



Tightening torque kg-m (ft-lb)
Ⓐ 4.5 to 5.5 (33 to 40)
Ⓑ 1.8 to 2.4 (13 to 17)

AC624

Fig. AC-29 Exploded view of compressor

INSTALLATION

To install compressor, reverse the order of removal, observing the following points:

1. Oil in compressor to be installed should be equal in amount of what remained in compressor removed. New compressor contains the prescribed amount of oil; before its installation, drain the excessive amount of oil.
2. Check tightening torque of bolt holding compressor bracket. Retighten bolt if necessary. See Figure AC-29.
3. Compressor plugs and flexible hose plugs should be kept in place until preparation of piping is completed.
4. Upon installation of compressor, turn compressor by hand a few turns.
5. As to tightening torque on piping connection, refer to "Piping".
6. As to compressor drive belt tension, refer to "Idler Pulley". Make sure that cooling fan belt have the specified deflection.
7. Evacuate and recharge system. Refer to "Evacuating and Charging System" in "General Service".
8. Conduct leak test and make sure that there is no leak from around connections.
9. Check engine idling speed.
10. Check "CO" percent at idle speed.

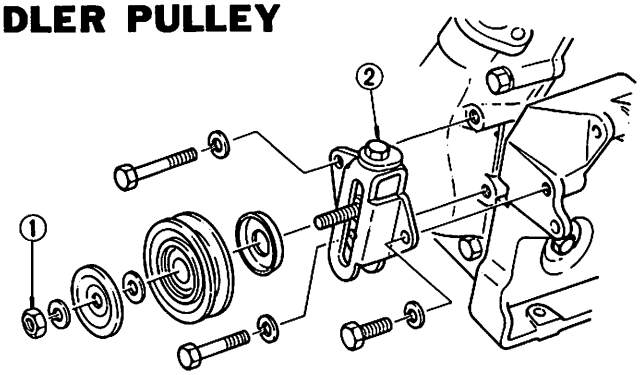
COOLING FAN AND TORQUE COUPLING

Removal and installation procedures are described in Section "CO".

It is necessary to use the following parts which are exclusively designed for the air conditioner.

1. Torque coupling for air conditioning.
2. 380 mm (14.96 in) dia. 8-blade cooling fan
3. Fan spacer

IDLER PULLEY



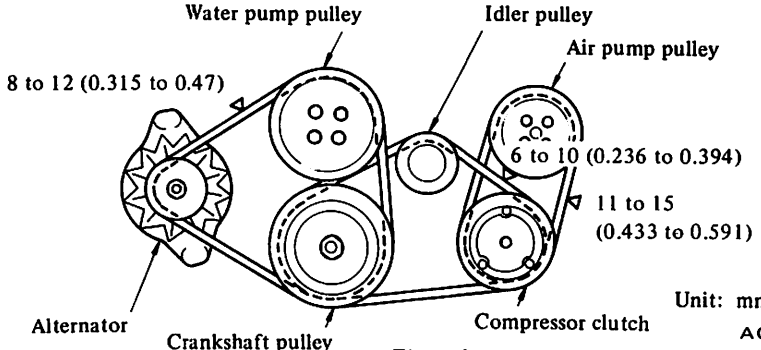
1 Idler pulley attaching nut
2 Belt tension adjusting bolt

AC625

Fig. AC-30 Exploded view of idler pulley

ADJUSTMENT OF BELT TENSION

Normal compressor drive belt deflection is 6 to 10 mm (0.236 to 0.394 in) when moderate thumb pressure is applied midway between pulleys. Move idler pulley up or down by turning adjusting bolt to correct belt deflection.



Unit: mm (in)

AC636

Fig. AC-31 Adjustment of belt tension

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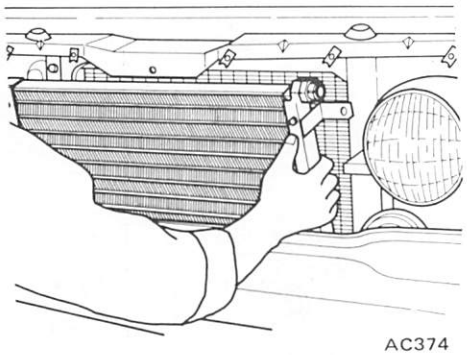
CONDENSER

REMOVAL

1. Disconnect battery ground cable.
2. Discharge system. Refer to "Discharge System" in "General Service".
3. Remove front grille.
4. Remove hood lock stay.
5. Disconnect inlet and outlet refrigerant lines from condenser.

Note: Plug up all pipe openings to prevent entrance of dirt and moisture.

6. Remove four mounting bolts, then remove condenser from radiator core support. Radiator, which is bolted together with condenser, is also removed in this work process.



AC374

Fig. AC-32 Removing condenser

INSPECTION

Inspect joints of inlet and outlet pipes for cracks or scratches. Upon finding any problem which may cause gas to leak, repair or replace condenser.

Condenser fins or air passages clogged with dirt, insects or leaves will reduce cooling efficiency of condenser. In such a case, clean fins or air passages with compressed air or water.

Note: Condenser of the system completed should not be cleaned with steam for fear that system should burst by excessively high pressure created therein. Be sure to use cold water or compressed air.

INSTALLATION

To install condenser, reverse the order of removal, observing the following points.

1. When a new condenser is used as replacement, be sure to add 28 g (1 oz) of new compressor oil therein.
2. Keep piping plug in place until immediately before piping work is started.
3. As to tightening torque on piping connection, refer to "Piping".
4. As to evacuating and charging system, refer to "General Service".
5. Conduct leak test and make sure that there is no leak from around connection.

RECEIVER DRIER

REMOVAL

1. Disconnect battery ground cable.
2. Discharge system. Refer to "General Service".
3. Disconnect pressure switch wires at connector.
4. Disconnect refrigerant lines from receiver drier.

Note: Plug up all pipe openings to prevent entrance of dirt and moisture.

5. Remove three screws and remove receiver drier from car.

INSTALLATION

To install, reverse the order of removal, observing the following points.

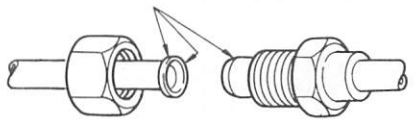
1. When replacing receiver drier with new one, charge system with 28 g (1 oz) of new compressor oil.
2. Receiver drier's plugs and pipe plugs should be kept in place until preparation of piping is completed.
3. As to tightening torque on piping, refer to "Piping".
4. As to evacuating and charging system, refer to "General Service".
5. Conduct leak test, and make sure that there is no leak from around connection.

PIPING

Refrigerant system piping is as shown in Figure AC-34. To replace flexible hose and tube, note the following points.

1. Before starting work, be sure to discharge system.
2. In disconnecting tubes, be sure to use two wrenches on both tubes.
3. Upon disconnecting tubes, plug up all pipe openings immediately to prevent entrance of dirt and moisture.
4. Compressed air must never be used to clean dirty piping. Always clean with refrigerant gas.
5. In connecting tubes, be sure to apply compressor oil to seating surface and then tighten tubes to the prescribed tightening torque.

Be sure to use two wrenches when tightening a flare nut of tube.



AC263

Fig. AC-33 Pipe connection

6. Make sure of proper clamping. Start engine and raise engine speed to see that there is vibration or unusual noise.
7. As to evacuating and charging system, refer to "General Service".
8. Conduct leak test and make sure that there is no leak from around connection.

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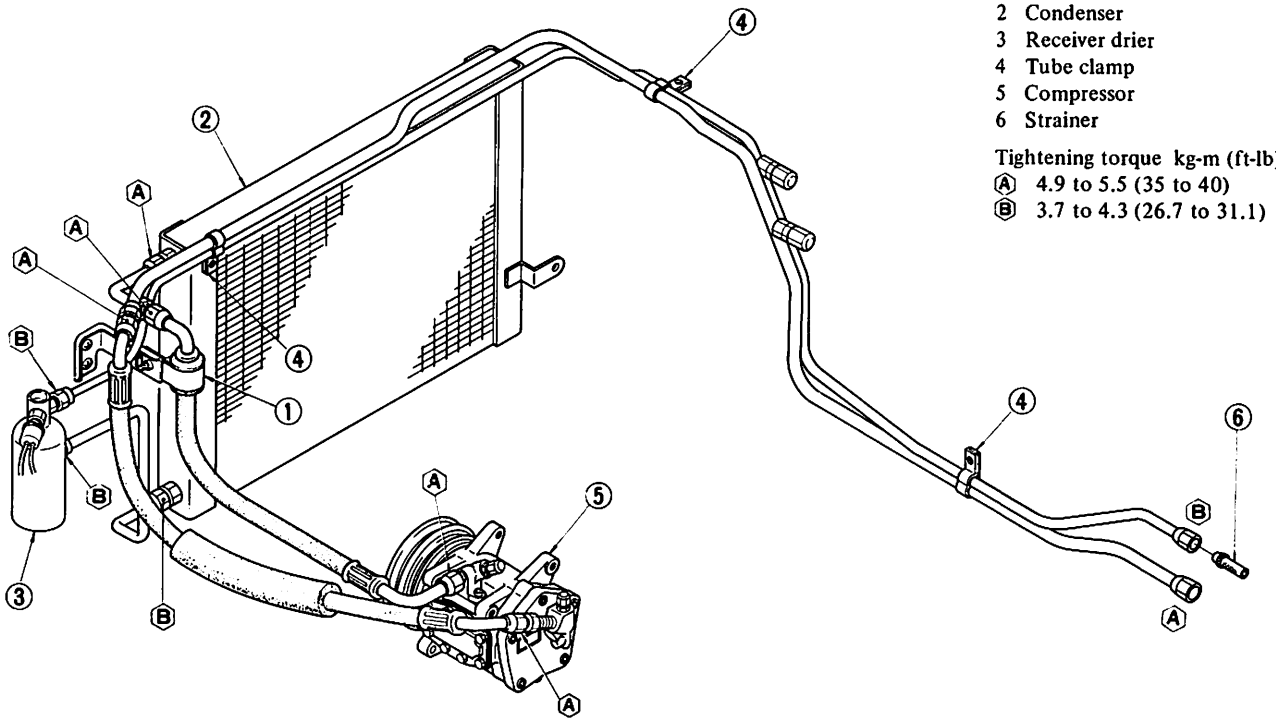


Fig. AC-34 Refrigeration line

FAST IDLE ACTUATOR

ADJUSTMENT OF IDLE SPEED

Engine model	Transmission	When A/C is OFF	When A/C is ON (F.I.C.D. is actuated)
L20B	Manual	800 rpm	800 rpm
	Automatic	650 rpm at "D" range	800 rpm at "N" range

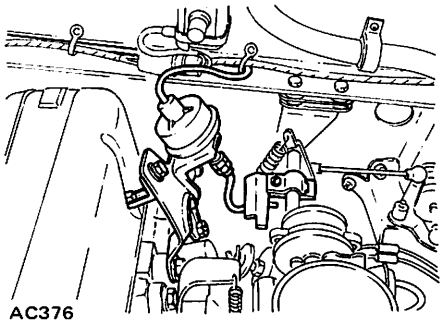


Fig. AC-35 Fast idle actuator

The fast idle control device is used on cars equipped with an air conditioner to raise the idle speed automatically.

Use the following procedures when adjusting.

1. Run the engine until it reaches operating temperature.
2. With air conditioner in OFF (when compressor is not operated), make sure that engine is at the correct idle speed.
3. With air conditioner in ON (when F.I.C.D. is actuated), set the engine speed to 800 rpm using the following procedures as a guide.

(1) Adjust the fast idle actuator's stroke by varying the length of lever until engine speed is 800 rpm.

On cars equipped with an automatic transmission, make this adjustment with the shift control lever in the "N" position.

(2) Depress and release the accelerator pedal several times, and make sure that the engine speed reduces to 800 rpm as the pedal is released.

If correct adjustment is not made, repeat steps (1) and (2) above until the engine speed is 800 rpm at idling.

CONTROL ASSEMBLY

REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Remove ash tray.
3. Pull knobs of control lever out.
4. Remove three screws securing center ventilator to heater unit. (Two are located on the right and one on the left of center ventilator.)
5. Disconnect air conditioner control illumination lamp connector. Pull out center ventilator to remove it.
6. Remove ash tray outer case by loosening two screws securing it to instrument panel.

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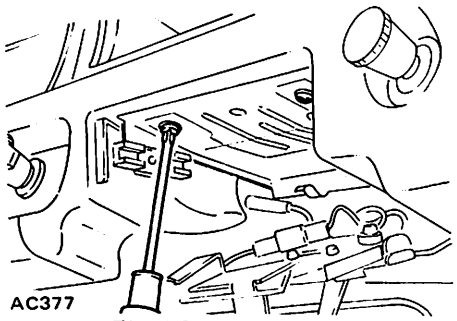


Fig. AC-36 Removing ash tray outer case

7. Loosen clamps of five control cables and disconnect control cables from intake door, air mix door, heater door, mode door and thermostat lever.

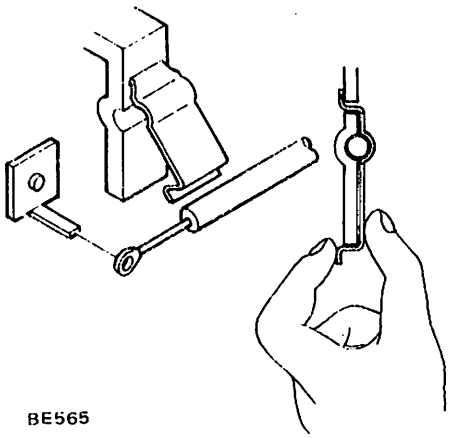


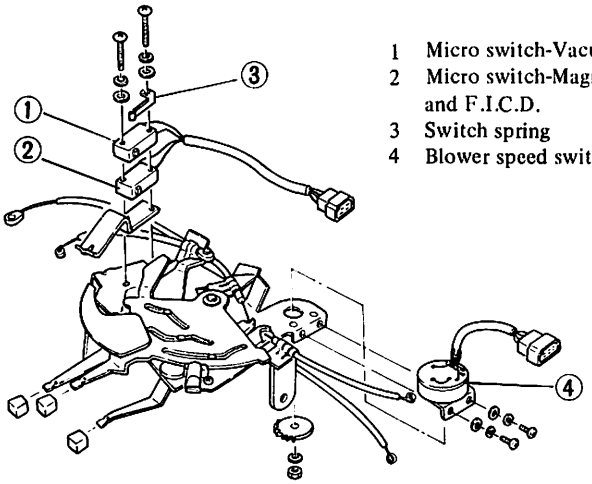
Fig. AC-37 Removing clamp and control cable

8. Disconnect micro switch connector and blower speed switch connector from air conditioner subharness.
9. Remove screws securing air conditioner control to heater unit.

Note: Air conditioner control has three retaining flanges. Two are on the left side and one is on the right side.

10. Pull out control assembly to remove it.
11. Install control assembly in the reverse order of removal. As to adjustment of cable, refer to "Adjustment of Control Cable".

DISASSEMBLY AND ASSEMBLY



1 Micro switch-Vacuum cock
2 Micro switch-Magnet clutch and F.I.C.D.
3 Switch spring
4 Blower speed switch

Fig. AC-38 Exploded view of control assembly

ADJUSTMENT OF CONTROL CABLE

Air intake door

Set AIR lever at OFF position. Hook control cable with air intake door. Place air intake door in position to shut off outside air, and keep it pressed against seal material (in order to prevent air from entering; and fix cable on case with clamp.

Thermostat

Move TEMP lever fully in direction of COLD. Move thermostat lever to position of COLD. Hook cable with lever, and fix cable with clamp.

Heater door

Set AIR lever in DEF position. Close heater door completely, hook lever with cable and fix cable with clamp.

Mode door

Set AIR lever in DEF position. Place mode door under condition that no air flows to outlets on instrument panel; hook cable with lever; and fix cable with clamp.

Air mix door

Move TEMP lever fully in direction of COLD. Set air mix door in such position that air bypasses heater core; Press door lever to the arrow direction in Figure AC-39. With outer case of cable pulled toward the control assembly side, fix cable in that position by clamp. Then, while pressing water cock rod toward front and door lever to the arrow direction, fix water cock rod to door lever.

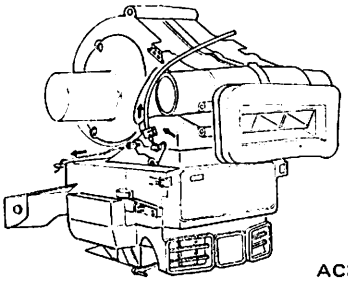


Fig. AC-39 Installing air mix door control cable

EVAPORATOR HOUSING, AIR INTAKE HOUSING AND THERMOSTAT

An air filter is installed between the evaporator housing and the air intake housing. This filter prevents foreign particles from entering the unit when outside air is drawn in. It is necessary that the filter is pulled downwards and cleaned once in a while. See Figure AC-40.

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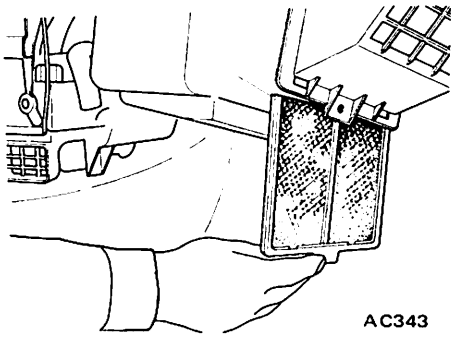


Fig. AC-40 Removing air filter

REMOVAL

1. Disconnect battery ground cable.
2. Discharge refrigerant from system. Refer to "General Service".
3. Loosen flare nuts at each connection of inlet and outlet pipes of evaporator. Plug up all open fittings at once to prevent entry of dust.
4. Remove package tray.
5. Remove cluster lid-B
6. Remove air duct.
7. Remove wiring harness from its clips locating on air intake housing and evaporator housing.
8. Disconnect control cables at air intake door and thermostat.
9. Disconnect thermostat connector from air conditioner harness.
10. Remove attaching bolt as shown in Figure AC-41 and remove air intake housing.

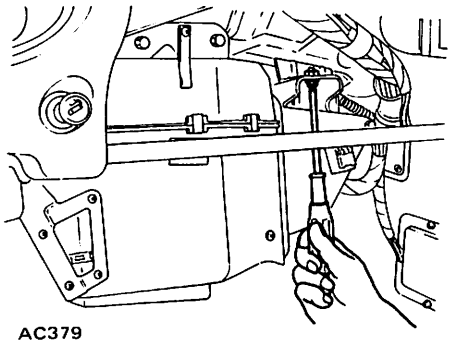


Fig. AC-41 Removing air intake housing

11. Disconnect drain hose from the bottom of evaporator housing.
12. Remove three mounting bolts and remove evaporator housing from dash panel. See Figure AC-42

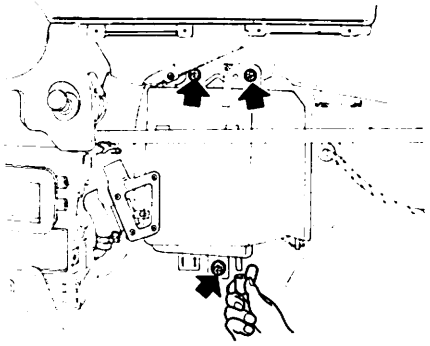


Fig. AC-42 Removing evaporator housing

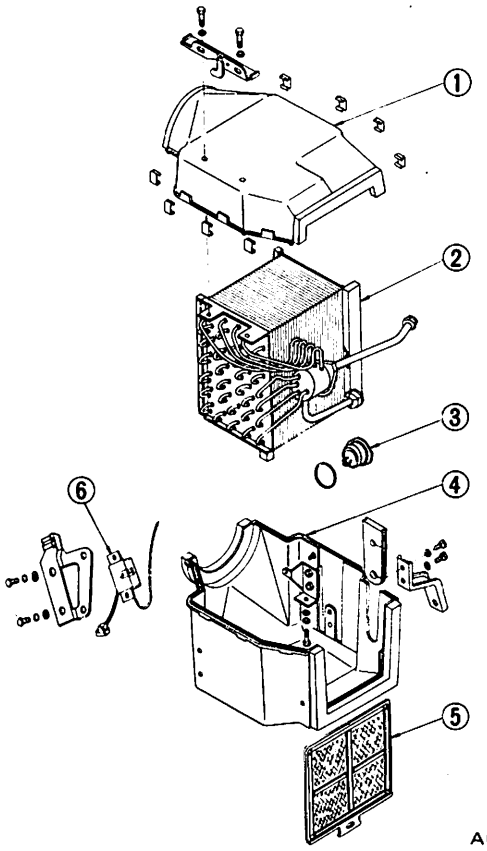
DISASSEMBLY AND ASSEMBLY OF EVAPORATOR HOUSING

1. Pull out air filter.
2. Remove clips fixing upper case to lower case.
3. Remove bolts attaching upper bracket to upper case.
4. Separate upper case from lower case by pulling it upward.
5. Cut off sealing packing with knife at the conjunction of cases.
6. Remove thermostat capillary tube from evaporator core.

Note: Capillary tube should not be bent too sharp.

7. Remove thermostat from lower case by removing attaching screws.
8. Remove bolts attaching lower bracket to lower case.
9. Withdraw evaporator core out of lower case.

To assemble, reverse the order of disassembly.



1 Upper case
2 Evaporator core
3 Expansion valve
4 Lower case
5 Air filter
6 Thermostat

Fig. AC-43 Exploded view of evaporator housing

INSPECTION

In case evaporator core or expansion valve has gas leaking, repair or replace it with a new one as necessary.

Dirt and nicotine accumulation on evaporator housing will go bad and smell.

This means that you have to remove them from time to time to assure healthful fresh air inside car.

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INSTALLATION

1. When replacing evaporator with new one, add 28 g (1 oz) of new compressor oil to new evaporator.
2. Install evaporator housing on dash panel.

Note: The evaporator housing should be installed as close as possible to heater unit.

3. Connect drain hose to the bottom of evaporator housing.
4. Install air intake housing.

Note: Make sure that air intake housing is installed close to evaporator housing.

5. Adjust control cables as outlined in "Control Assembly".
6. Connect thermostat connector to air conditioner harness.
7. Install wiring harness with its clip on air intake housing and evaporator housing.
8. Install air duct.
9. Install cluster lid-B.
10. Install package tray.
11. Tighten flare nuts at each connection of inlet and outlet pipes of evaporator.

Refer to Figure AC-34 for correct tightening torque.

12. Connect battery ground cable.
13. Evacuate and charge system. Refer to "General Service".
14. Conduct leak test and make sure that there is no leak from around connection.

Refer to "General Service".

EXPANSION VALVE

Expansion valve malfunctions, such as valve stuck open, valve stuck closed, refrigerant leakage at O-ring, and improper adjustment of expansion valve are described. The first two conditions require replacement of expansion valve.

When both water and refrigerant are circulated in the system, frost will form near the ball of expansion valve and block the flow of refrigerant. In this case, however, operation of the valve can be returned to normal by heating the valve.

Expansion valve is equipped with an adjusting screw. However, since the screw is set properly at the factory, adjustment is unnecessary. If expansion valve is damaged, replace with a new one.

REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Discharge refrigerant from system.

Refer to "General Service".

3. Loosen flare nuts at each connection of inlet and outlet pipes of evaporator. Plug up all open fittings at once to prevent entry of dust.
4. Remove center console box (if equipped).
5. Remove air intake housing and evaporator housing as described in "Evaporator Housing, Air Intake Housing and Thermostat".
6. Disassemble evaporator and expansion valve assembly as a single unit from evaporator housing. Refer to "Disassembly and Assembly of Evaporator Housing".
7. Remove tube from expansion valve by loosening flare nut.
8. Remove two mounting nuts, and pull out valve from expansion valve case. Discard two O-rings. See Figures AC-44 and AC-45.

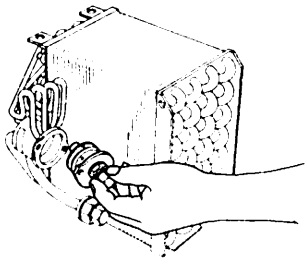


Fig. AC-44 Removing expansion valve

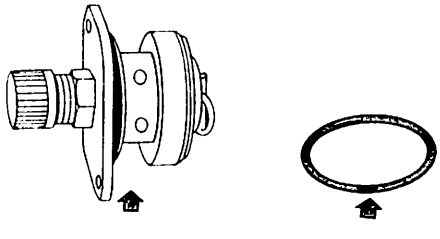


Fig. AC-45 Expansion valve O-ring

INSTALLATION

1. Replace two O-rings with new ones.
2. Apply adequate compressor oil to new O-rings, and install them on expansion valve.
3. Fit expansion valve to the valve case, and install bolts and nuts thereon.

Note: In inserting valve into case, be sure to insert it parallelly with case without turning it. Never twist valve in the case, otherwise O-rings will be twisted.

4. Tighten two mounting nuts horizontally.
5. Connect tube to expansion valve.
6. Work that follows is to be done in reverse sequence of removal.
7. Lastly, evacuate and recharge system. As to evacuating and charging system, refer to "Evacuating and Charging System".
8. Conduct leak test and insure that there is no leak from around connection.

HEATER UNIT

REMOVAL

1. Disconnect battery ground cable.
2. Drain engine coolant completely.
3. Remove inlet and outlet heater hoses in the engine compartment.

Remove grommet cover and grommet from dash panel.

4. Discharge refrigerant.

Refer to "General Service".

5. Loosen flare nuts at each connection of inlet and outlet pipes of evaporator. Plug up all open fittings at once to prevent entry of dust.
6. Remove package tray.
7. Remove center console box (if equipped).
8. Remove cluster lid-B.
9. Remove air duct.
10. Remove wiring harness from its clips locating on air intake housing and evaporator housing.
11. Disconnect control cables at air intake door and thermostat.
12. Disconnect thermostat connector from air conditioner harness.
13. Disconnect drain hose from the bottom of evaporator housing.

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14. Remove air intake housing. See Figure AC-41.
15. Remove evaporator housing. See Figure AC-42.
16. Remove defroster ducts.
17. Disconnect air conditioner harness connectors from main harness and air conditioner engine room harness.
18. Remove three attaching bolts and then remove heater unit from car. See Figure AC-46.

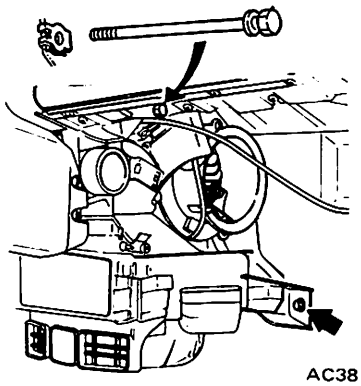


Fig. AC-46 Removing heater unit

DISASSEMBLY AND ASSEMBLY

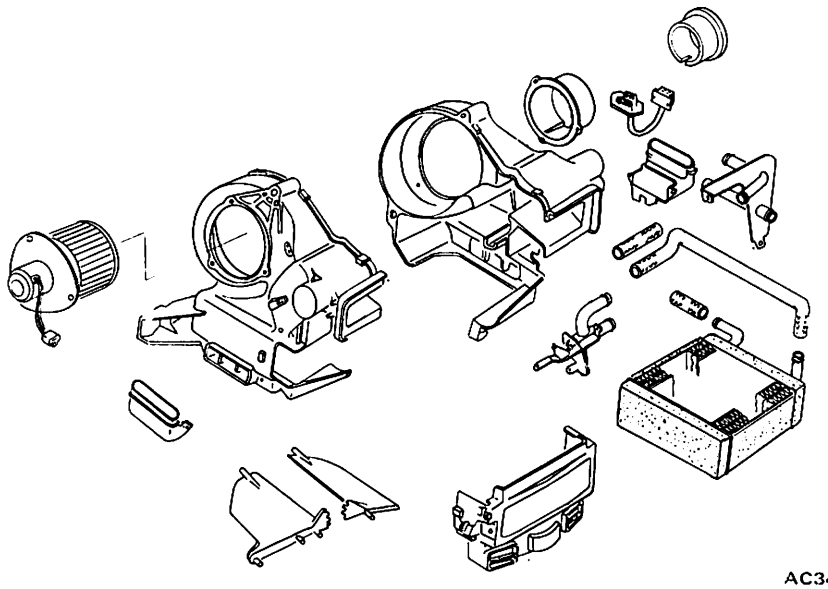


Fig. AC-47 Exploded view of heater unit

INSTALLATION

To reinstall heater unit, reverse the order of removal.

BLOWER MOTOR

REMOVAL

1. Remove defroster duct.
2. Disconnect blower motor connector from air conditioner sub-harness.
3. Remove screw securing blower motor connector to heater case.
4. Remove three screws securing blower motor to heater unit and remove blower motor.
5. Take out blower motor with its fan. See Figure AC-48.

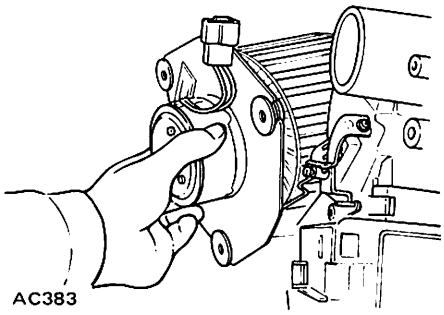


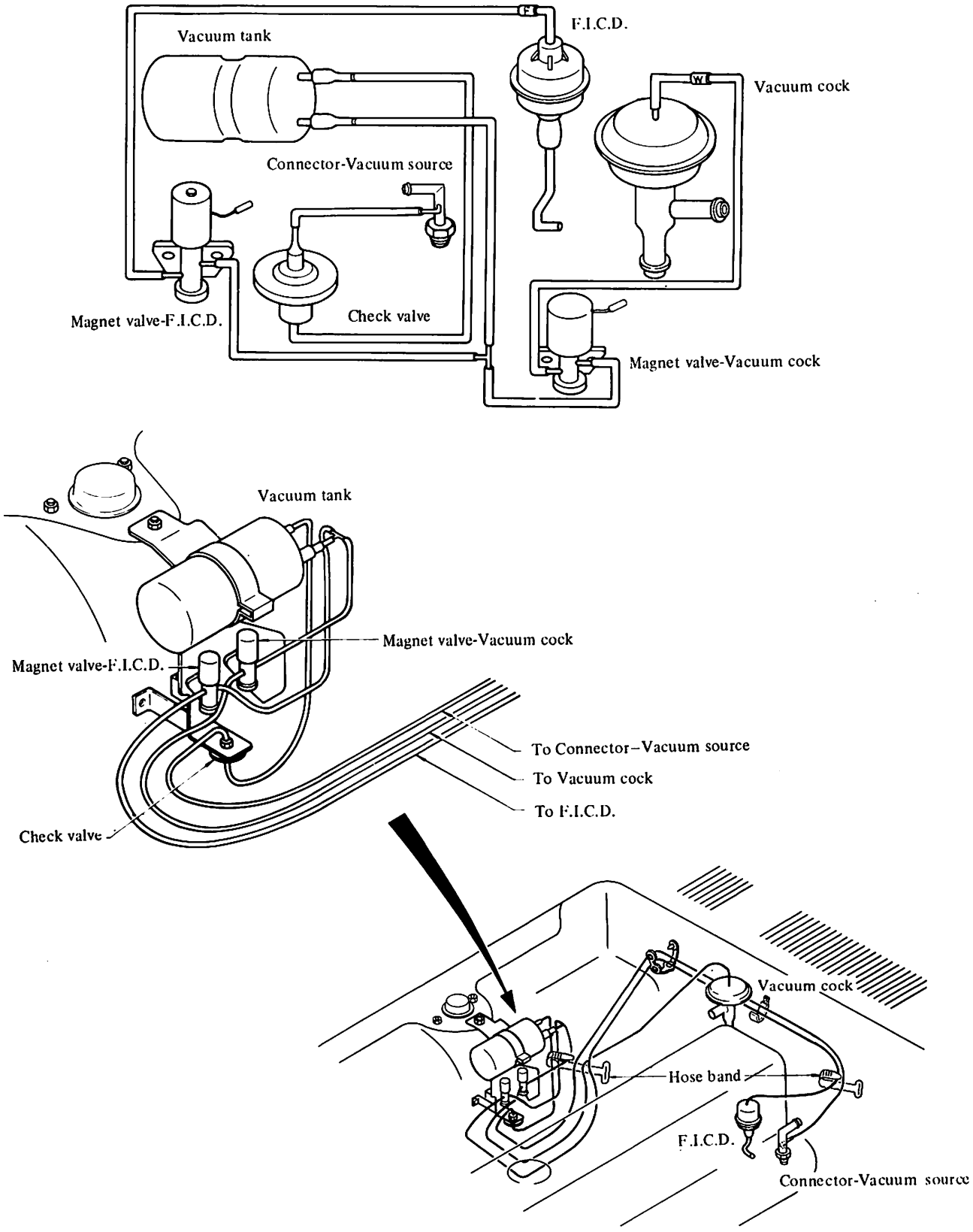
Fig. AC-48 Removing blown motor

INSTALLATION

To install blower motor, reverse the order of removal.

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VACUUM HOSE DIAGRAM

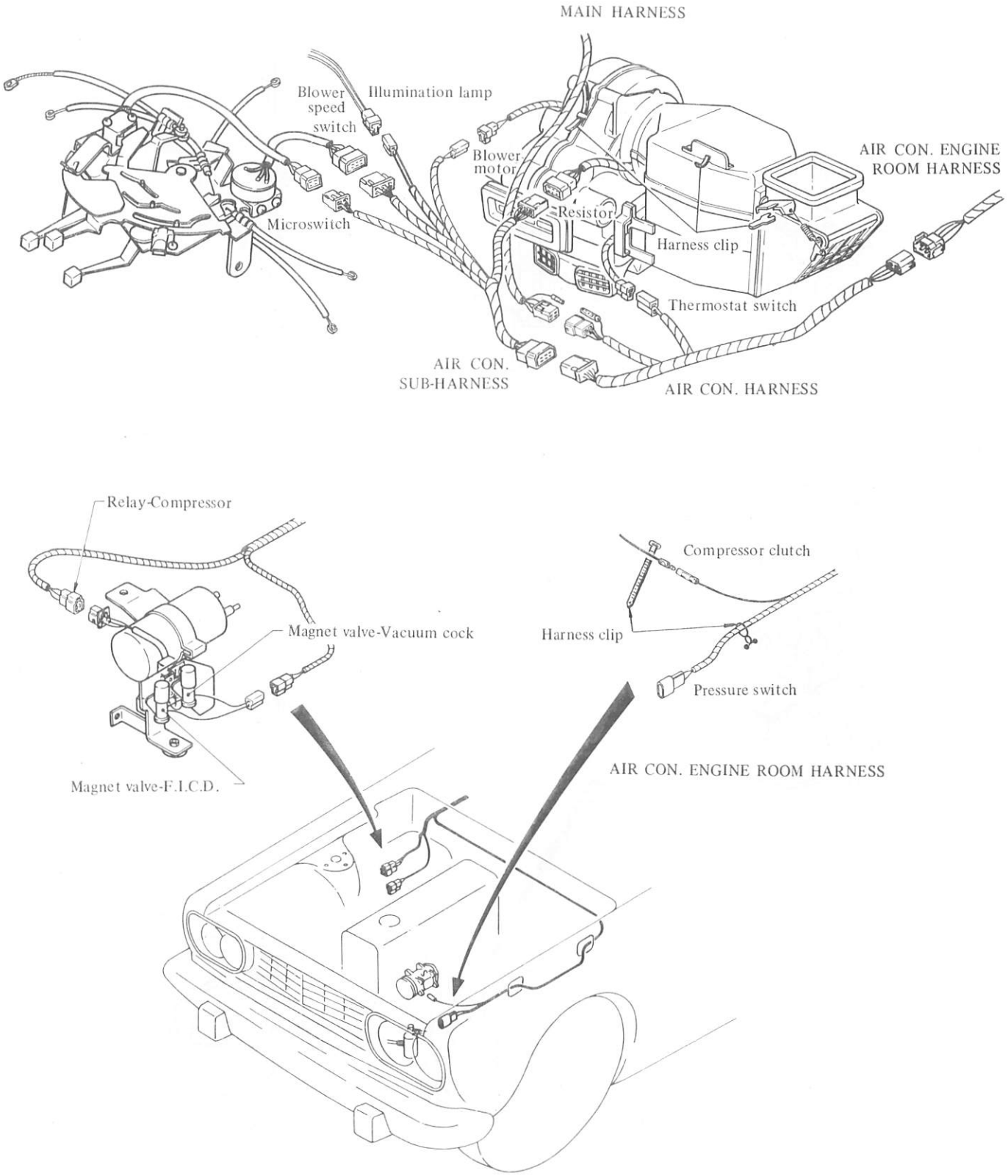


AC627

Fig. AC-49 Vacuum hose diagram

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WIRING HARNESS DIAGRAM

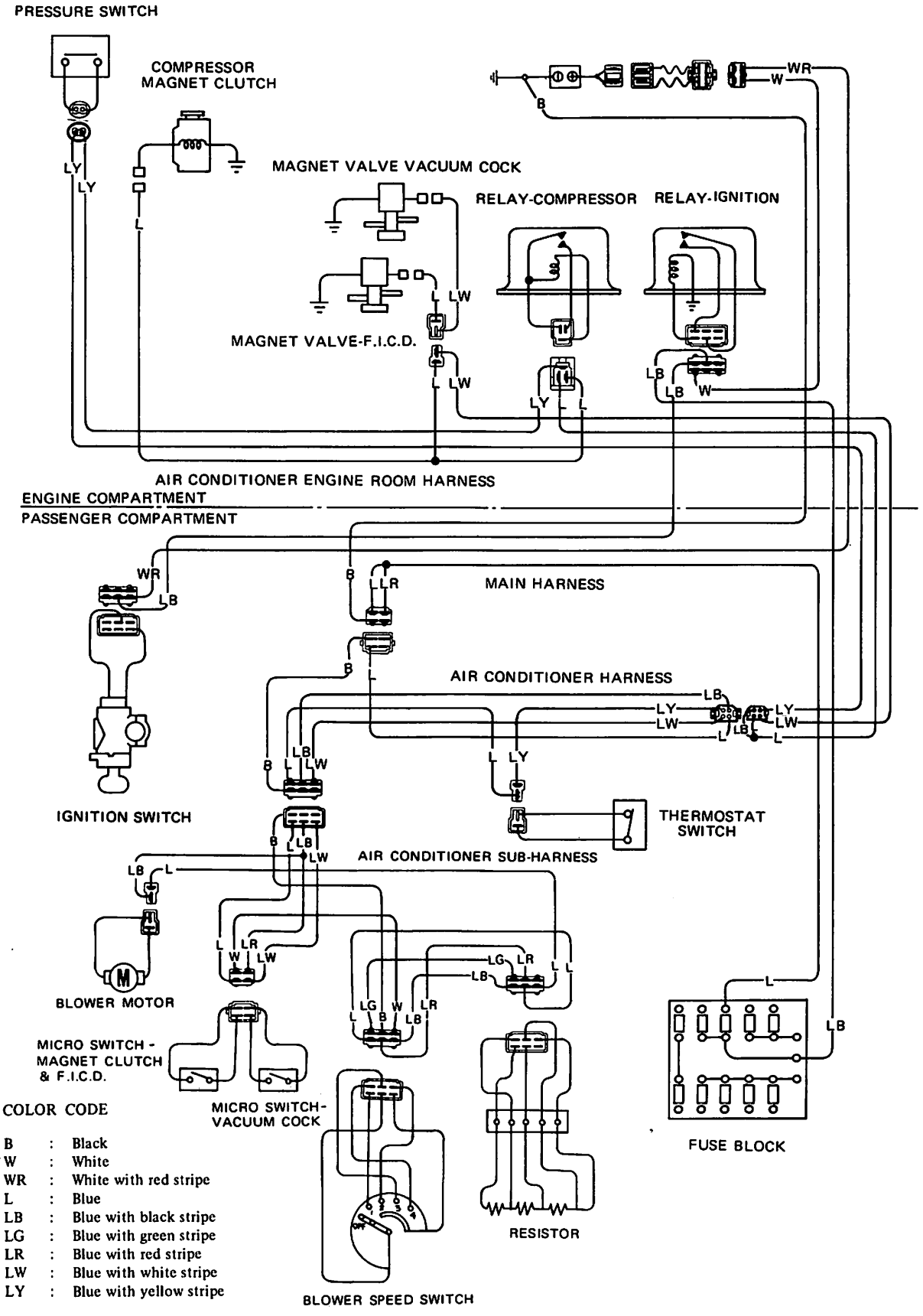


AC537

Fig. AC-50 Wiring harness

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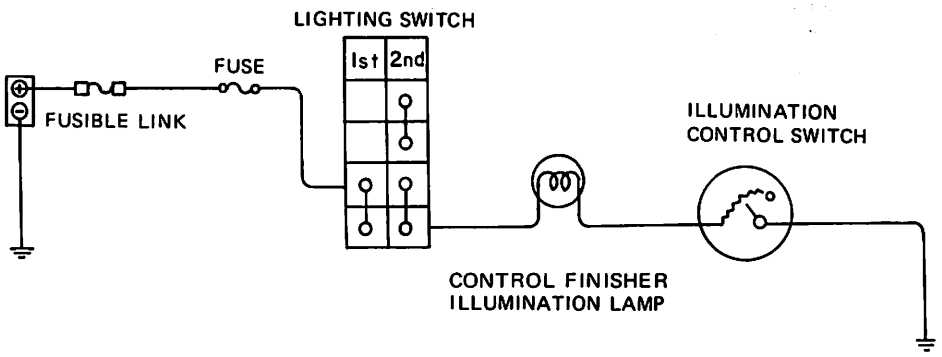
Circuit diagram of air conditioner



AC635

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Circuit diagram of illumination lamp



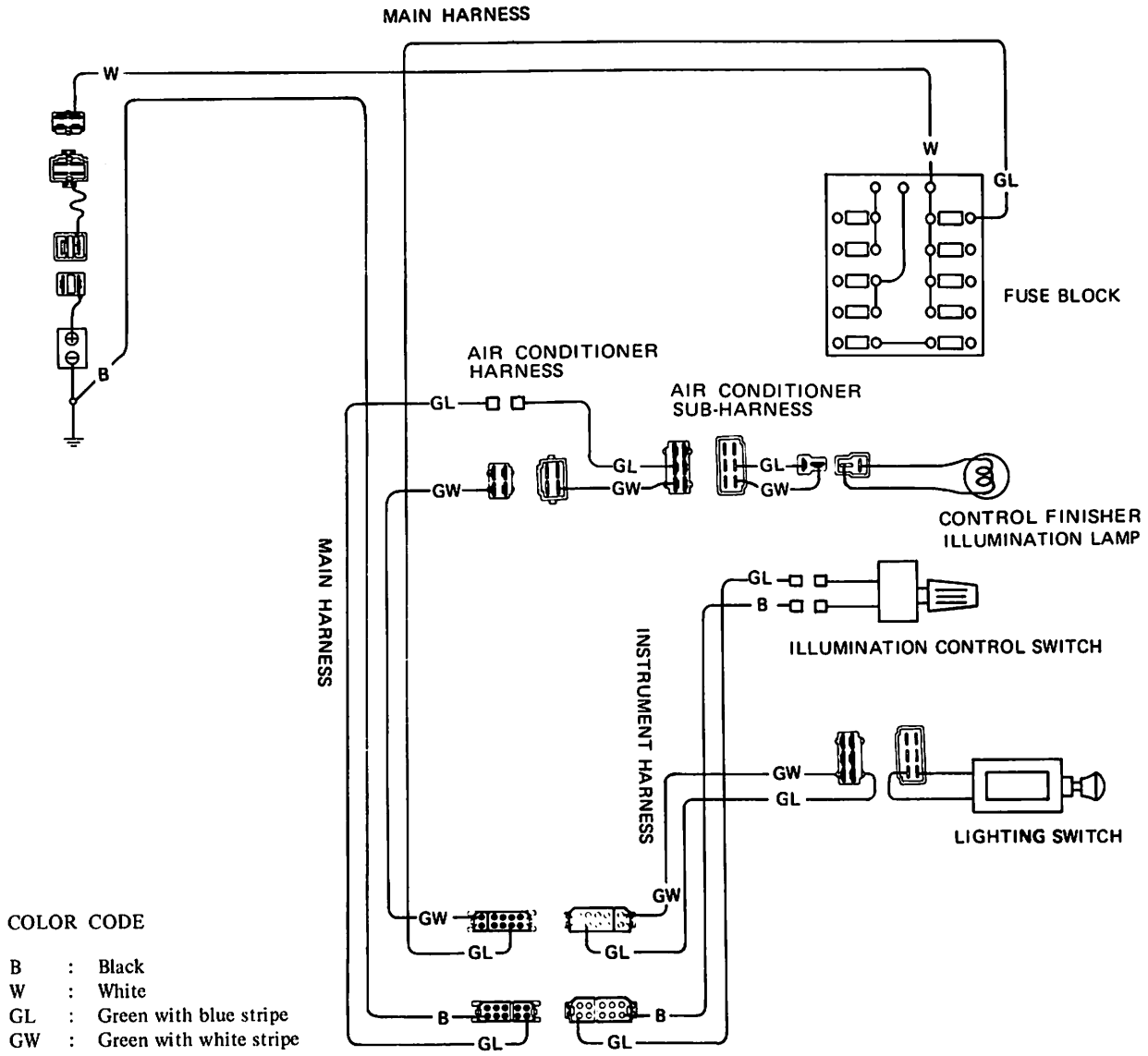
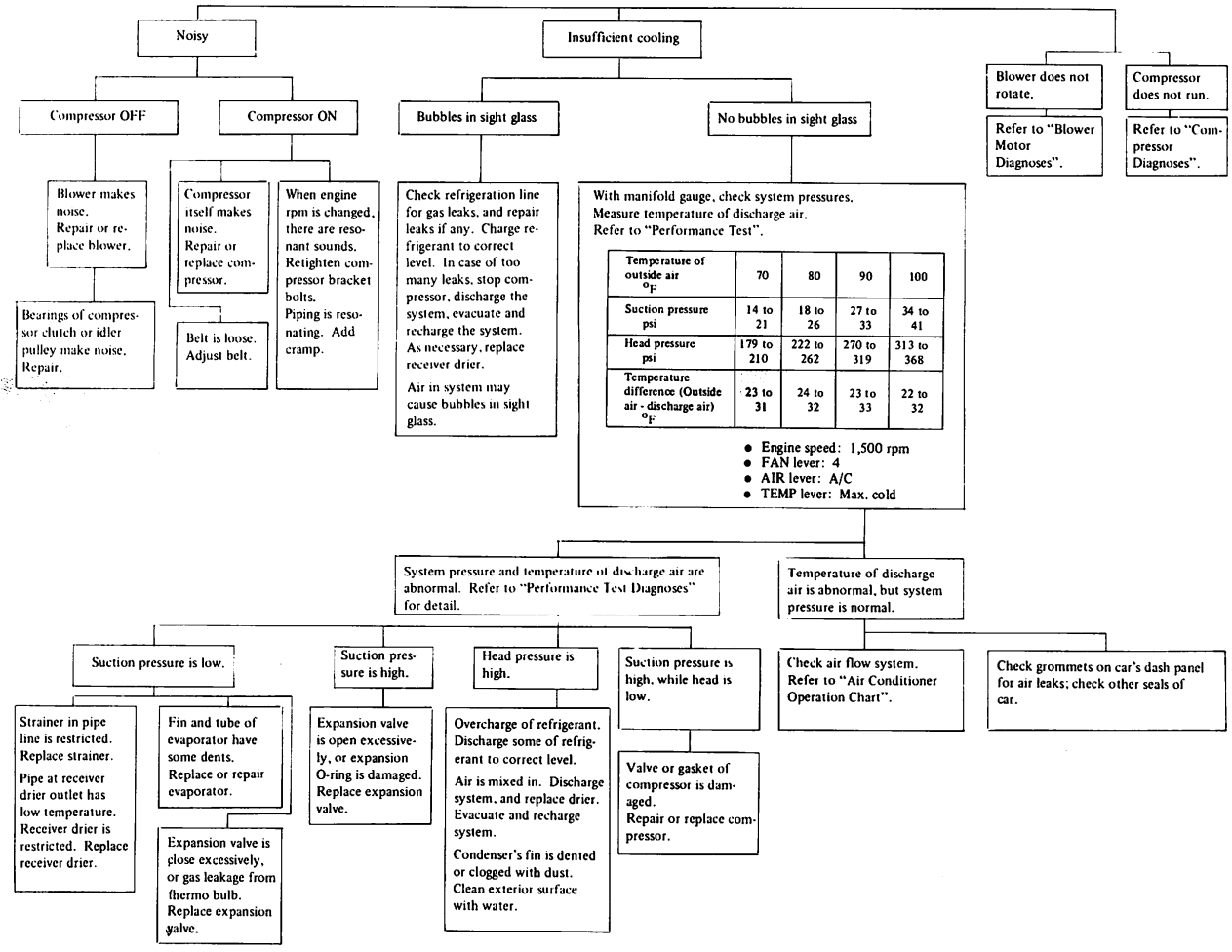


Fig. AC-51 Wiring harness

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TROUBLE DIAGNOSES AND CORRECTIONS

AIR CONDITIONER DIAGNOSES



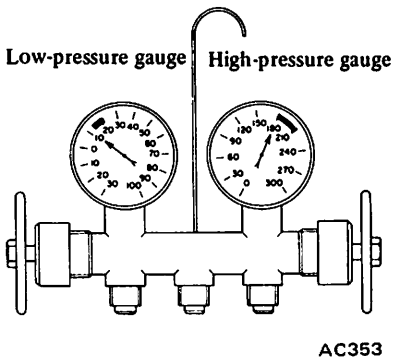
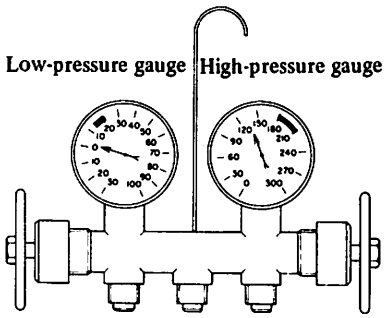
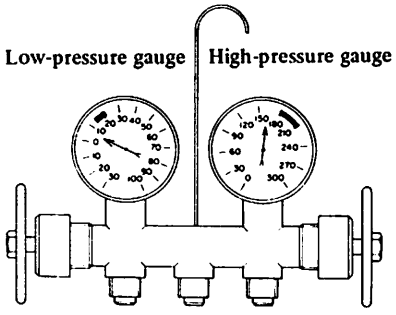
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PERFORMANCE TEST DIAGNOSES

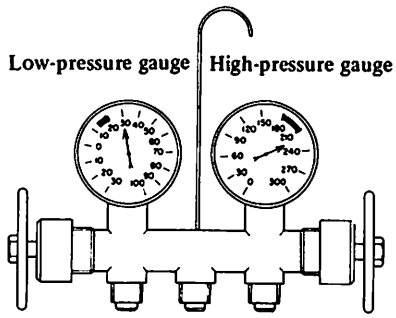
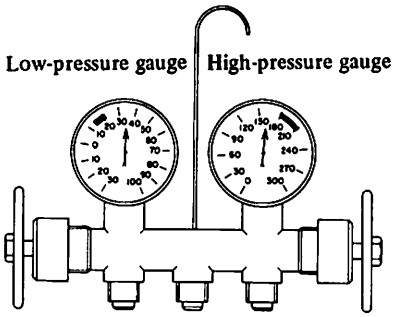
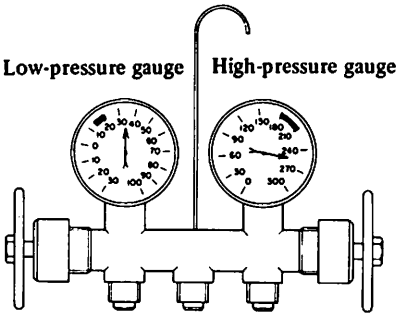
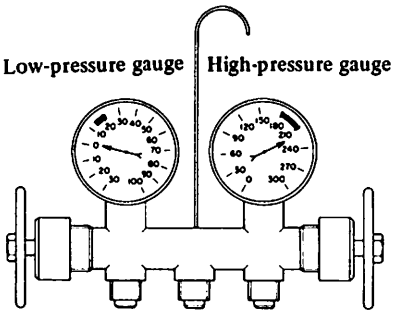
Of various conditions caused to the air conditioning system, the characteristics revealed on manifold gauge reading are shown in the following.

As to the method of a performance test, refer to the item of "Performance Test".

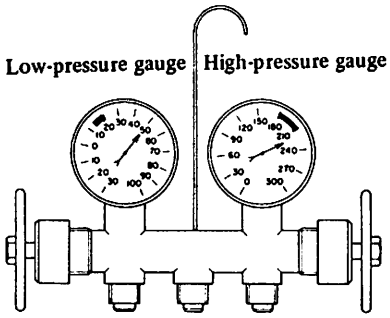
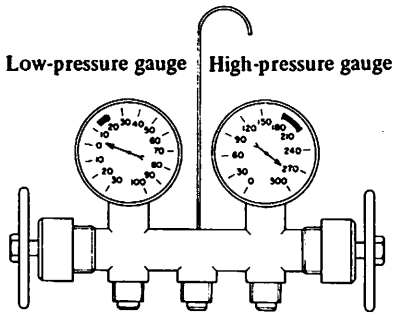
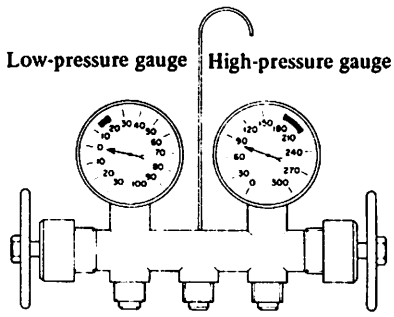
Each shaded area on the following tables indicates a reading of the normal system when the temperature of outside air is 21.1°C (70°F).

Condition	Probable cause	Corrective action
INSUFFICIENT REFRIGERANT CHARGE  AC353 Insufficient cooling. Bubbles appear in sight glass.	Refrigerant is small, or leaking a little.	1. Leak test. 2. Repair leak. 3. Charge system. **Note: Evacuate, as necessary, and recharge system.**
ALMOST NO REFRIGERANT  AC354 No cooling action. In sight glass appear a lot of bubbles or something like mist.	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.
FAULTY EXPANSION VALVE  AC355 Slight cooling. Sweating or frosted 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.

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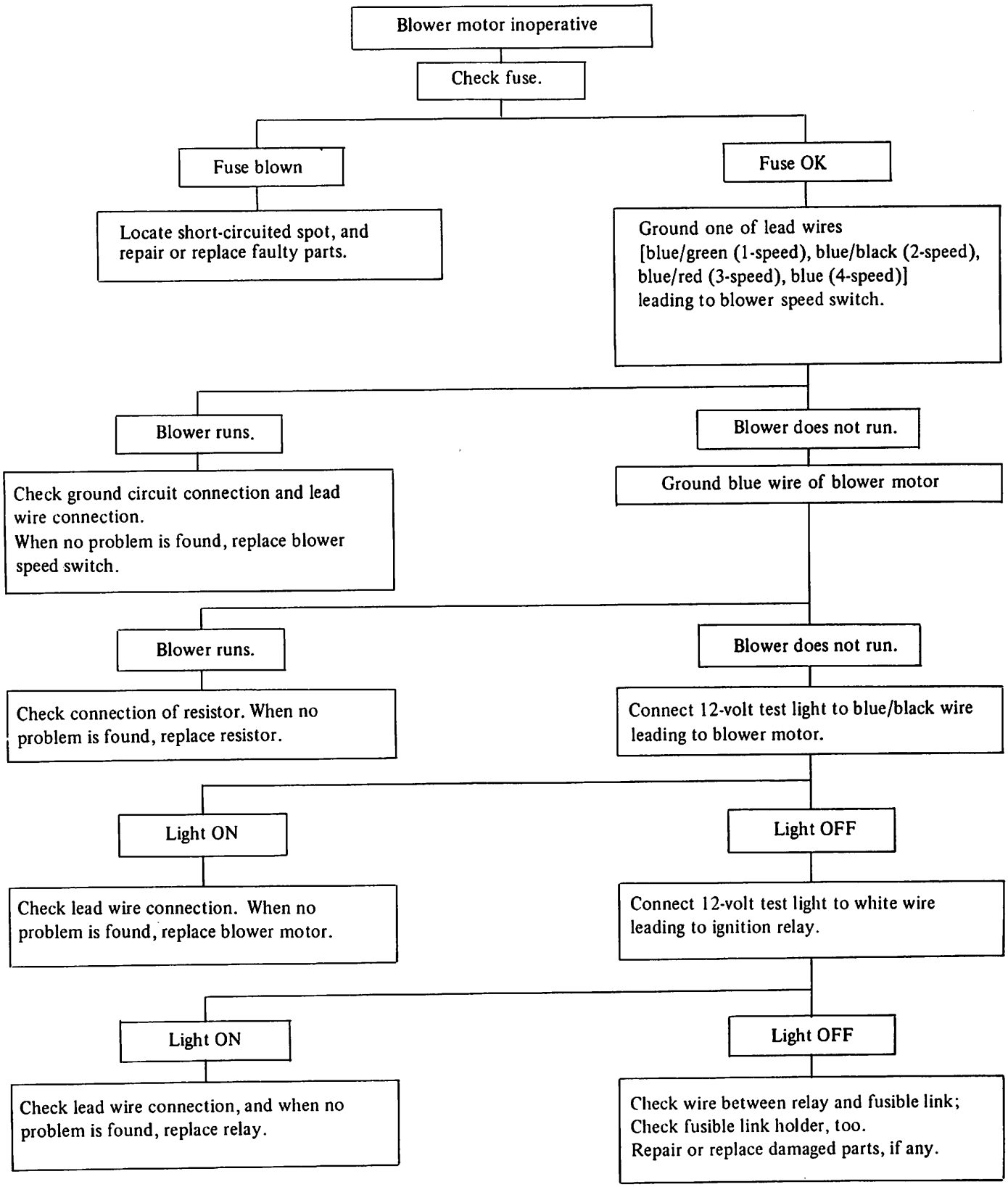
Condition		Probable cause	Corrective action
 AC356	Insufficient cooling. Sweated suction line.	Expansion valve allows too much refrigerant through evaporator.	Check valve for operation. If suction side does not show a pressure decrease, replace valve.
 AC357	No cooling. Sweating or frosted suction line.	Faulty seal of O-ring in expansion valve.	1. Discharge system. 2. Remove expansion valve and replace O-ring. 3. Evacuate and replace system.
AIR IN SYSTEM  AC358	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  AC359	After operation for a while, pressure on suction side may show vacuum pressure reading. During this condition, discharge air will be warm. As warning of this, reading shows 0.4 kg/cm² (5 lb/in²) vibration.	Drier is saturated with moisture. Moisture has frozen at expansion valve. Refrigerant flow is restricted.	1. Discharge system. 2. Replace receiver drier (twice if necessary). 3. Evacuate system completely. (Repeat 30-minute evacuating three times.) 4. Recharge system.

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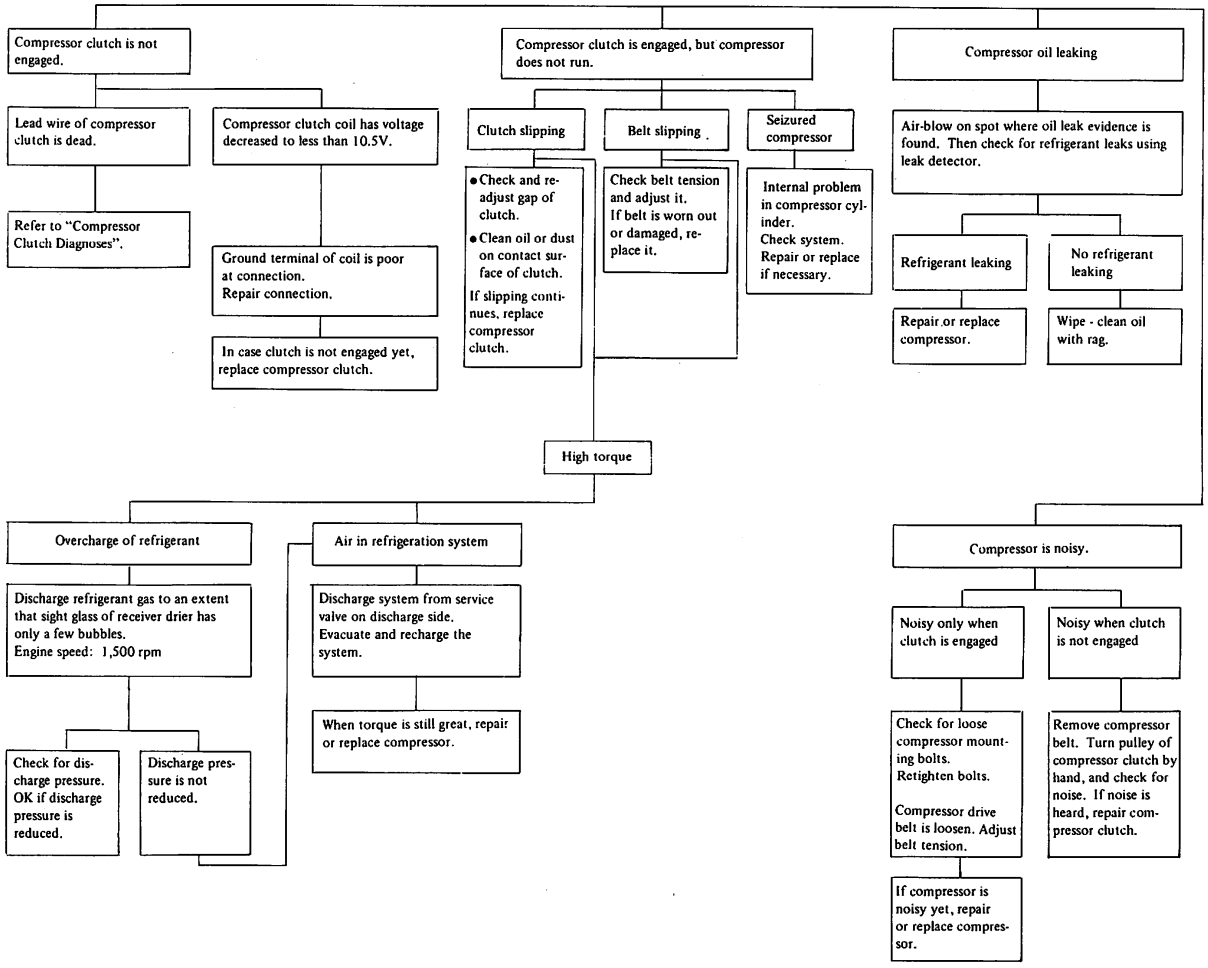
Condition	Probable cause	Corrective action
FAULTY CONDENSER  AC360 No cooling action: engine may overheat. Bubbles appear in sight glass of drier. Suction line is very hot.	Condenser is often found not functioning well.	• Check fan belt and fluid coupling. • Check condenser for dirt accumulation. • Check engine cooling system for overheat. • Check for refrigerant overcharge. **Note: If pressure remains high in spite of all above actions taken, remove and inspect the condenser for possible oil clogging.**
HIGH PRESSURE LINE BLOCKED  AC361 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.
FAULTY COMPRESSOR  AC362 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.

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BLOWER MOTOR DIAGNOSES

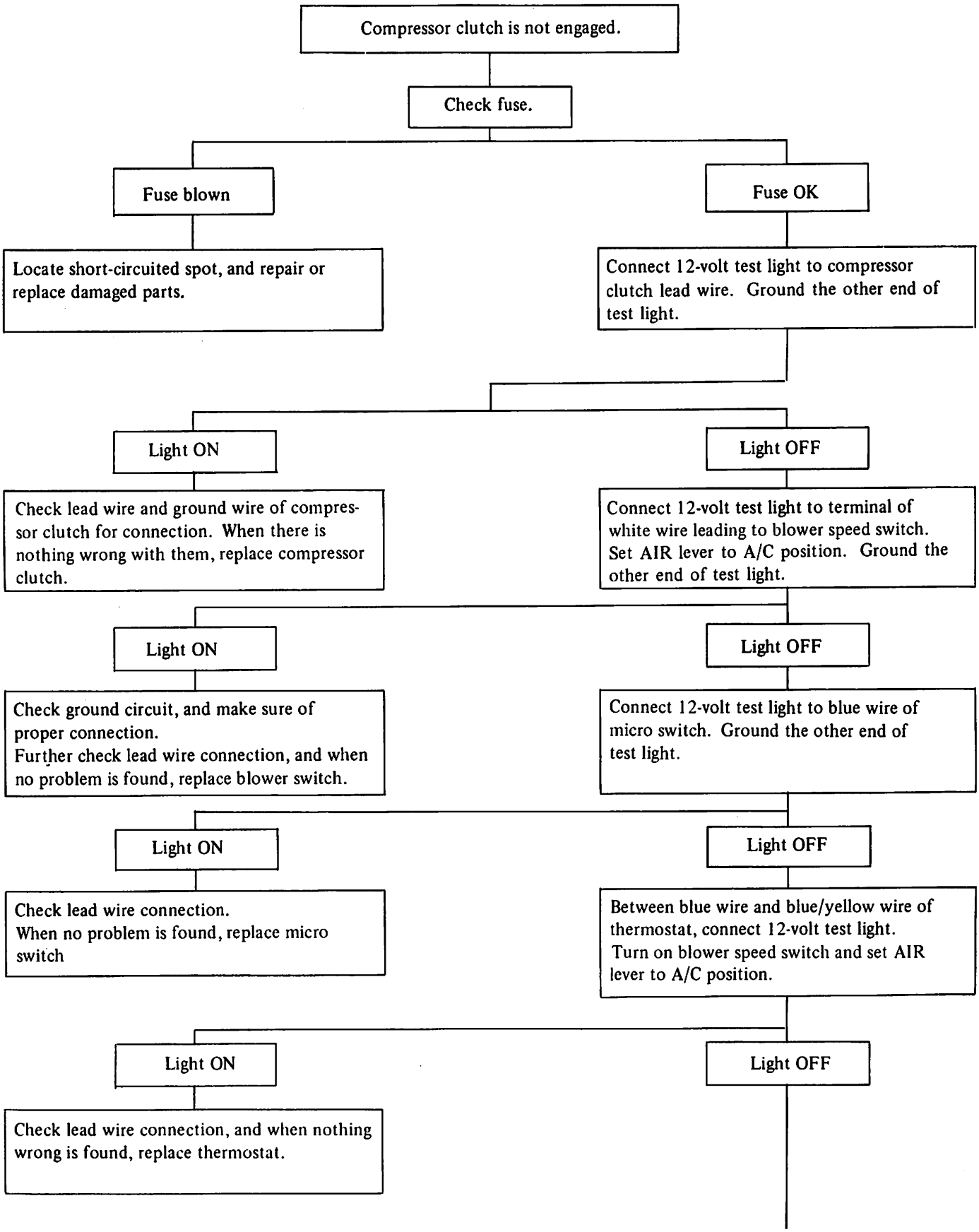


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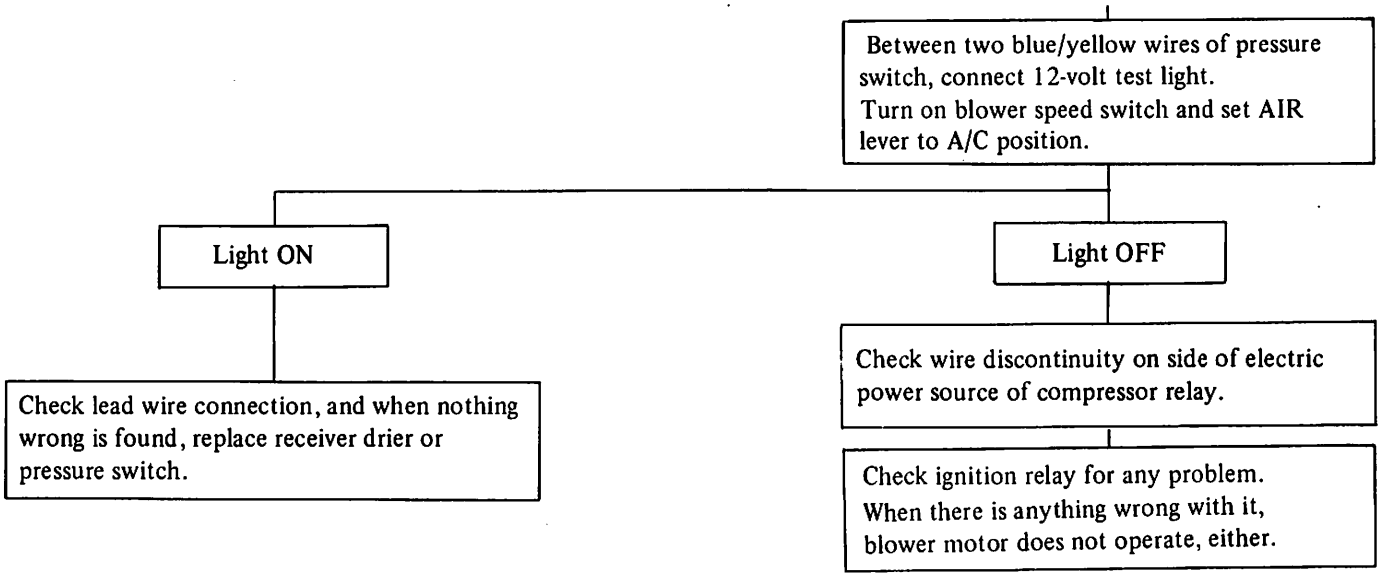


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COMPRESSOR CLUTCH DIAGNOSES



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AIR CONDITIONER OPERATION CHART

Control lever position			Operation	
AIR lever	FAN lever	TEMP lever	Item	Correct action
OFF	OFF	At any position	Blower motor Air intake door	OFF Position of isolating outside air.
	1 to 4		Discharge air Air intake door	Instrument – 100% Position of isolating outside air.
A/C Engine at idle	1 to 4	Cold	Discharge air Air intake door Air temperature Vacuum cock Magnet valve F.I.C.D. Magnet valve Compressor Compressor clutch	Instrument – 100% Position of isolating outside air. Cold Vacuum – OFF Current – ON Vacuum – ON *1 Current – ON *1 ON *1 Current – ON *1 *1 – (May be on or off by switching thermostat on or off)
	OFF	Cold	Blower motor F.I.C.D. Magnet valve Compressor Magnet clutch	OFF Vacuum – OFF Current – OFF OFF Current – OFF
VENT	1 to 4	At any position	Discharge air Air intake door Air temperature Vacuum cock Magnet valve	Instrument – 100% Position of admitting outside air. Same as outside air Vacuum – OFF Current – OFF
BI-LEVEL Engine at idle	1 to 4	Hot ↓ Cold	Discharge air Air intake door Air temperature Vacuum cock Magnet valve Water cock	Floor & Instrument Position of admitting outside air. Floor – Warm → Cool Instrument – same as outside air Vacuum – ON Current – ON Open → closed

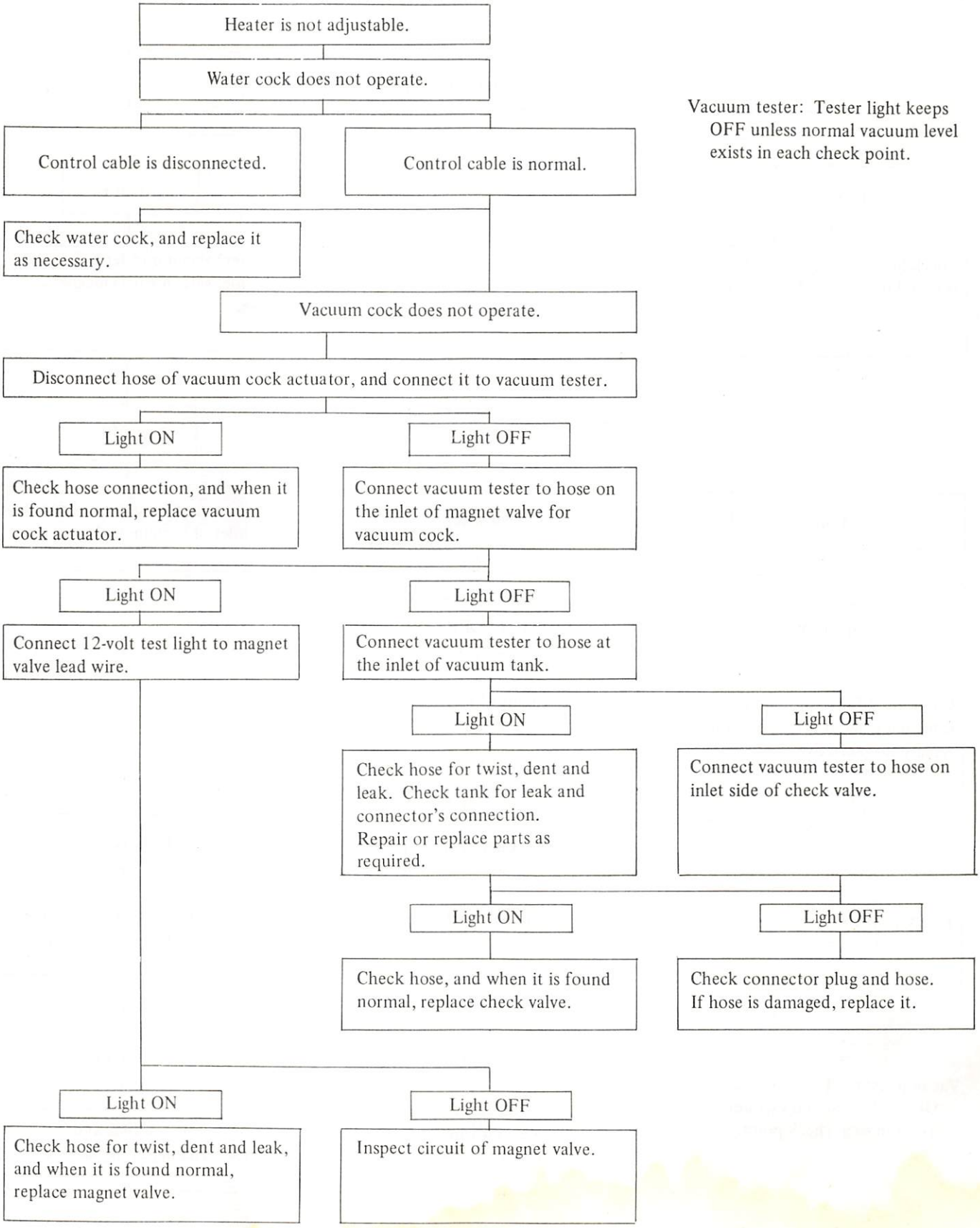
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Control lever position			Operation	
AIR lever	FAN lever	TEMP lever	Item	Correct action
HEAT Engine at idle	1 to 4	Hot ↓ Cold	Discharge air Air intake door Air temperature Vacuum cock Magnet valve Water cock	Floor – 80% Defroster nozzle – 20% Position of admitting outside air. Warm → Cool Vacuum → ON Current → ON Open – closed
DEF Engine at idle	1 to 4	Hot ↓ Cold	Discharge air Air intake door Air temperature Vacuum cock Magnet valve Water cock	Defroster nozzle – 90% Position of admitting outside air. Warm → Cool Vacuum – ON Current – ON Open → closed

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VACUUM SYSTEM DIAGNOSES

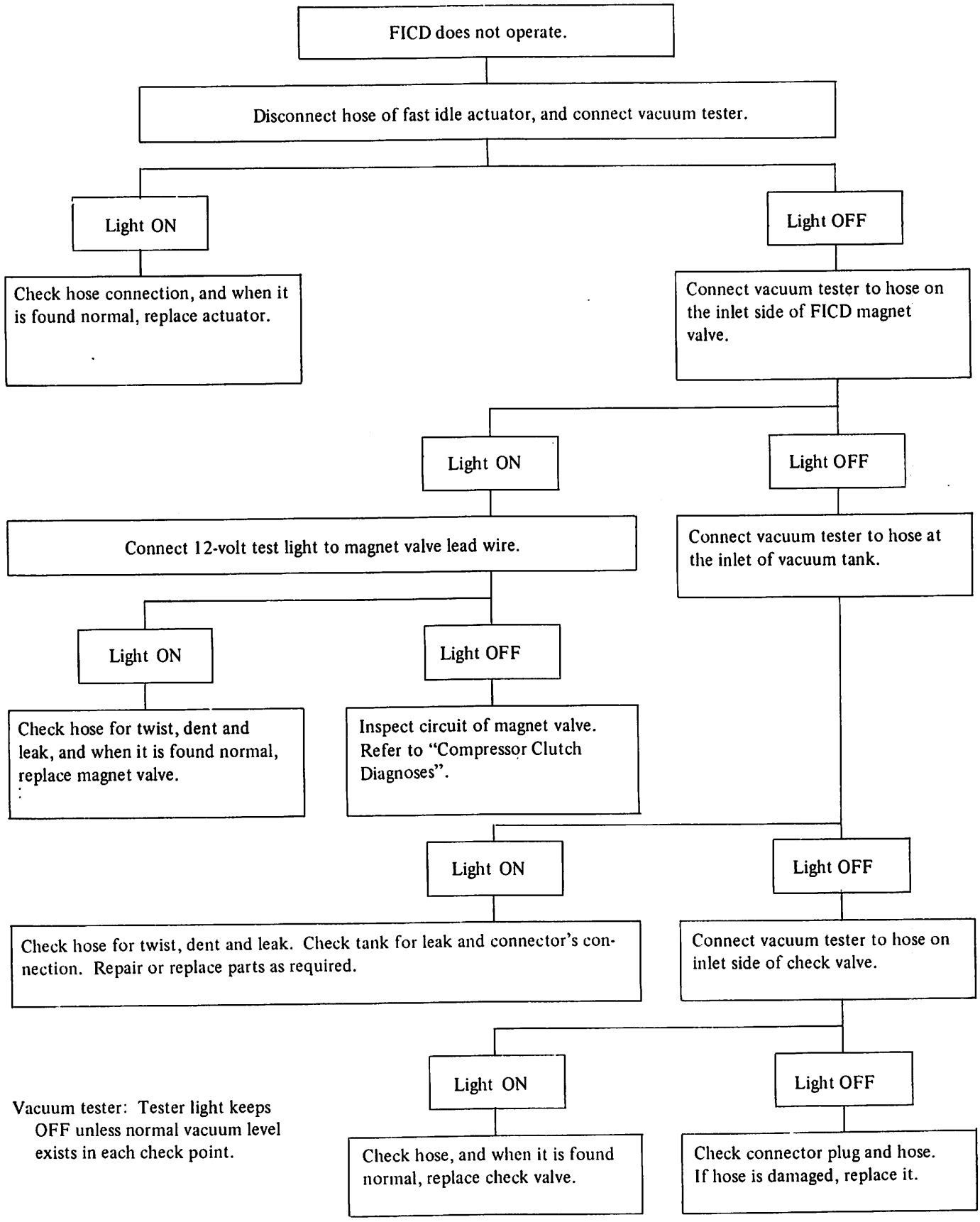
VACUUM COCK DIAGNOSES



Vacuum tester: Tester light keeps OFF unless normal vacuum level exists in each check point.

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FAST IDLE CONTROL DEVICE DIAGNOSES



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PERFORMANCE CHART

Engine speed : 1,500 rpm
FAN lever : 4
AIR lever : A/C
TEMP lever : Max. Cold

Ambient Air		Discharge Air Temperature °F (°C)	Pressure High (Discharge side) psi (kg/cm²)	Pressure Low (Suction side) psi (kg/cm²)
Relative Humidity	Air Temperature °F (°C)			
80	70 (21.0) 80 (26.5) 90 (32.0) 100 (38.0)	47.0 - 54.5 (8.5 - 12.5) 56.5 - 64.5 (13.5 - 18.0) 66.5 - 75.0 (19.0 - 24.0) 78.0 - 86.0 (25.5 - 30.0)	210 - 250 (14.8 - 17.6) 261 - 310 (18.4 - 21.8) 319 - 376 (22.4 - 26.4)	21 - 26 (1.5 - 1.9) 26 - 31 (1.8 - 2.2) 33 - 38 (2.3 - 2.7) 41 - 47 (2.9 - 3.3)
70	70 (21.0) 80 (26.5) 90 (32.0) 100 (38.0)	43.0 - 50.5 (6.0 - 10.5) 52.0 - 60.0 (11.0 - 15.5) 62.0 - 70.5 (16.5 - 21.5) 73.5 - 82.5 (23.0 - 28.0)	193 - 230 (13.6 - 16.2) 240 - 284 (16.9 - 20.0) 293 - 346 (20.6 - 24.3) 340 - 398 (23.9 - 28.1)	18 - 24 (1.3 - 1.7) 21 - 28 (1.5 - 2.0) 28 - 36 (2.0 - 2.5) 37 - 44 (2.6 - 3.1)
60	70 (21.0) 80 (26.5) 90 (32.0) 100 (38.0)	39.0 - 47.0 (4.0 - 8.5) 47.0 - 56.5 (8.5 - 13.5) 58.0 - 66.2 (14.5 - 19.0) 68.0 - 78.0 (20.5 - 25.5)	179 - 210 (12.6 - 14.8) 222 - 262 (15.6 - 18.4) 270 - 319 (19.0 - 22.4) 313 - 368 (22.1 - 25.9)	14 - 21 (1.0 - 1.5) 18 - 26 (1.3 - 1.8) 27 - 33 (1.9 - 2.3) 34 - 41 (2.4 - 2.9)
50	70 (21.0) 80 (26.5) 90 (32.0) 100 (38.0)	35.0 - 43.0 (1.5 - 6.0) 43.5 - 52.0 (6.5 - 11.0) 54.0 - 62.0 (12.5 - 16.5) 64.5 - 73.5 (18.0 - 23.0)	169 - 193 (11.9 - 13.6) 208 - 240 (14.6 - 16.9) 250 - 293 (17.6 - 20.6) 289 - 340 (20.3 - 23.9)	11 - 18 (0.8 - 1.3) 16 - 21 (1.1 - 1.5) 23 - 28 (1.6 - 2.0) 31 - 37 (2.2 - 2.6)
40	70 (21.0) 80 (26.5) 90 (32.0) 100 (38.0)	39.5 - 47.5 (4.5 - 8.5) 50.0 - 58.0 (10.0 - 14.5) 60.0 - 68.0 (15.5 - 20.5)	161 - 179 (11.3 - 12.6) 196 - 222 (13.8 - 15.6) 233 - 270 (16.4 - 19.0) 267 - 314 (18.8 - 22.1)	7 - 14 (0.5 - 1.0) 13 - 18 (0.9 - 1.3) 20 - 27 (1.4 - 1.9) 28 - 34 (2.0 - 2.4)
30	70 (21.0) 80 (26.5) 90 (32.0) 100 (38.0)	35.5 - 43.5 (2.0 - 6.5) 45.5 - 54.0 (7.5 - 12.5) 55.5 - 64.5 (13.0 - 18.0)	152 - 169 (10.7 - 11.9) 183 - 208 (12.9 - 14.6) 218 - 250 (15.3 - 17.6) 249 - 289 (17.5 - 20.3)	6 - 11 (0.4 - 0.8) 9 - 16 (0.6 - 1.1) 17 - 23 (1.2 - 1.6) 26 - 31 (1.8 - 2.2)

Note: These data are based on the results when air conditioner has been in operation approximately for 10 minutes.

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HOW TO INSTALL AIR CONDITIONER

I. First remove the heater unit from the passenger compartment side. Prior to removal prepare the engine compartment by:

1) Disconnecting battery ground cable.
2) Draining engine coolant.
3) Disconnecting inlet and outlet heater hoses and removing grommet that seals the clearance between hoses and dash panel.

Note: Take care not to damage the heater unit during removal because the heater unit can be used, after suitable modifications, as a component of air conditioner.

1. Remove package tray, and console box if equipped.
2. Remove defroster ducts and heater duct hose. Discard heater duct hose.

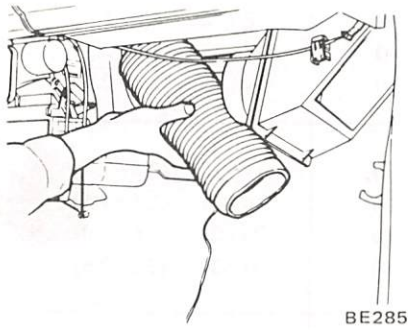


Fig. AC-52 Removing heater duct hose

3. Remove control cable clamp on intake housing and disconnect the cable from intake door.

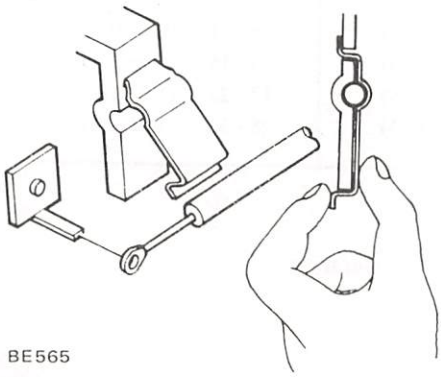


Fig. AC-53 Removing clamp and control cable

4. Remove air intake housing.

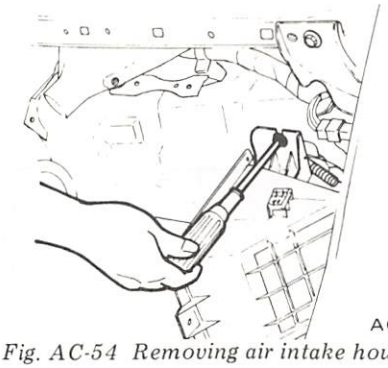


Fig. AC-54 Removing air intake housing

5. Disconnect heater sub-harness from main harness connector.
6. Remove heater unit by removing one bolt from upper heater unit and then two bolts from both sides of heater unit.

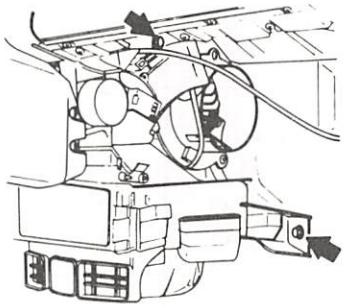


Fig. AC-55 Removing heater unit

7. Remove center ventilator and heater control from heater unit.
8. Remove cluster lid-B. Refer to "Instrument Panel" in BF section.
9. Remove right side ventilator nozzle.
10. Remove steering shell cover.
11. Pull out cluster lid-A as shown in Figure AC-56. Refer to "Instrument Panel" in BF section.
12. Remove left side ventilator nozzle.

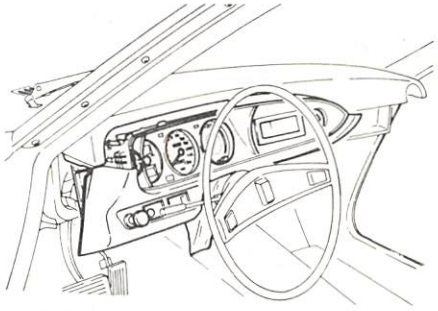


Fig. AC-56 Removing cluster lid-A

II. Modify heater component parts for use as the component parts of air conditioner according to the following procedures:

AIR INTAKE HOUSING

Remove four screws ① and air intake duct ② from air intake housing ③. Discard air intake duct ②. See Figure AC-57.

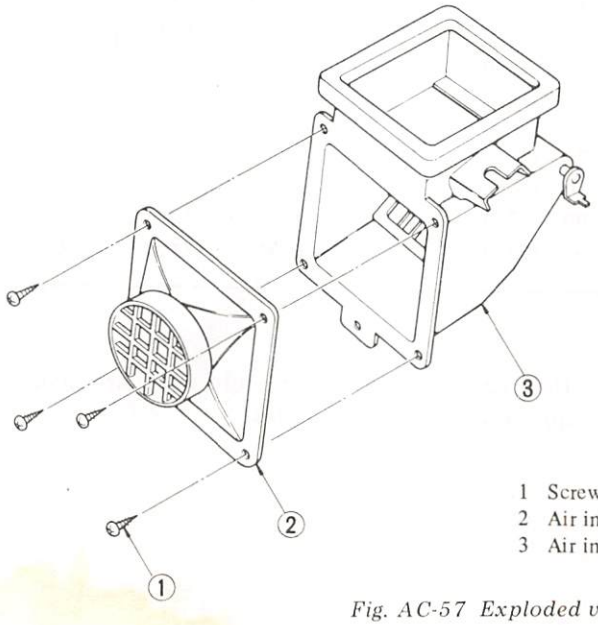


Fig. AC-57 Exploded view of air intake duct

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HEATER UNIT

See Figure AC-58.

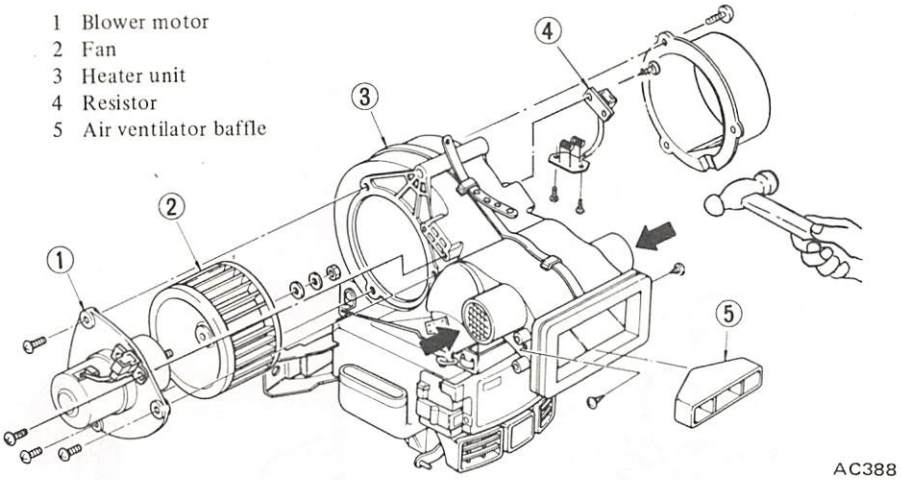


Fig. AC-58 Heater unit

1. Replace resistor ④ with a new one for air conditioner.
2. Remove three screws and take out blower motor ① from heater unit. Remove blower fan ② from the motor shaft. Reinstall blower fan to the power-up type blower motor for air conditioner and install its assembly to heater unit in reverse sequence of removal (Except car models shipped to Canada).
3. Hammer to break down the blind plates, hatched section in Figure AC-58, on the left and right side ventilator air outlets. Take special care not to damage the surroundings of the plates.
4. Newly assemble air ventilator baffle ⑤ using two screws.

III. Modify heater control assembly for use as the component parts of air conditioner according to the following procedure:

1. Remove blower speed switch for heater, and replace it with blower speed switch for air conditioner. See Figure AC-59.

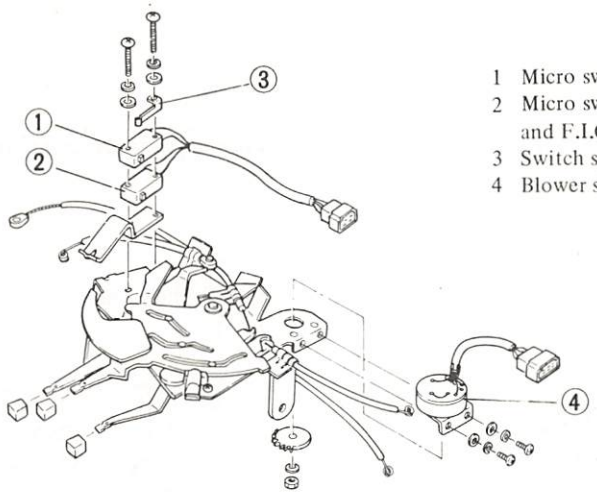


Fig. AC-59 Installing blower speed switch and micro switches

2. Install two micro switches and switch spring as shown in Figure AC-59.
3. Install thermostat control cable as shown in Figure AC-60.

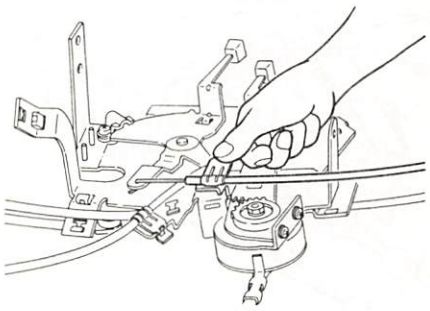


Fig. AC-60 Installing thermostat control cable

4. Replace heater control finisher on center ventilator with one for air conditioner.

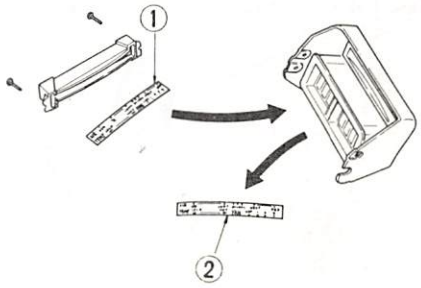
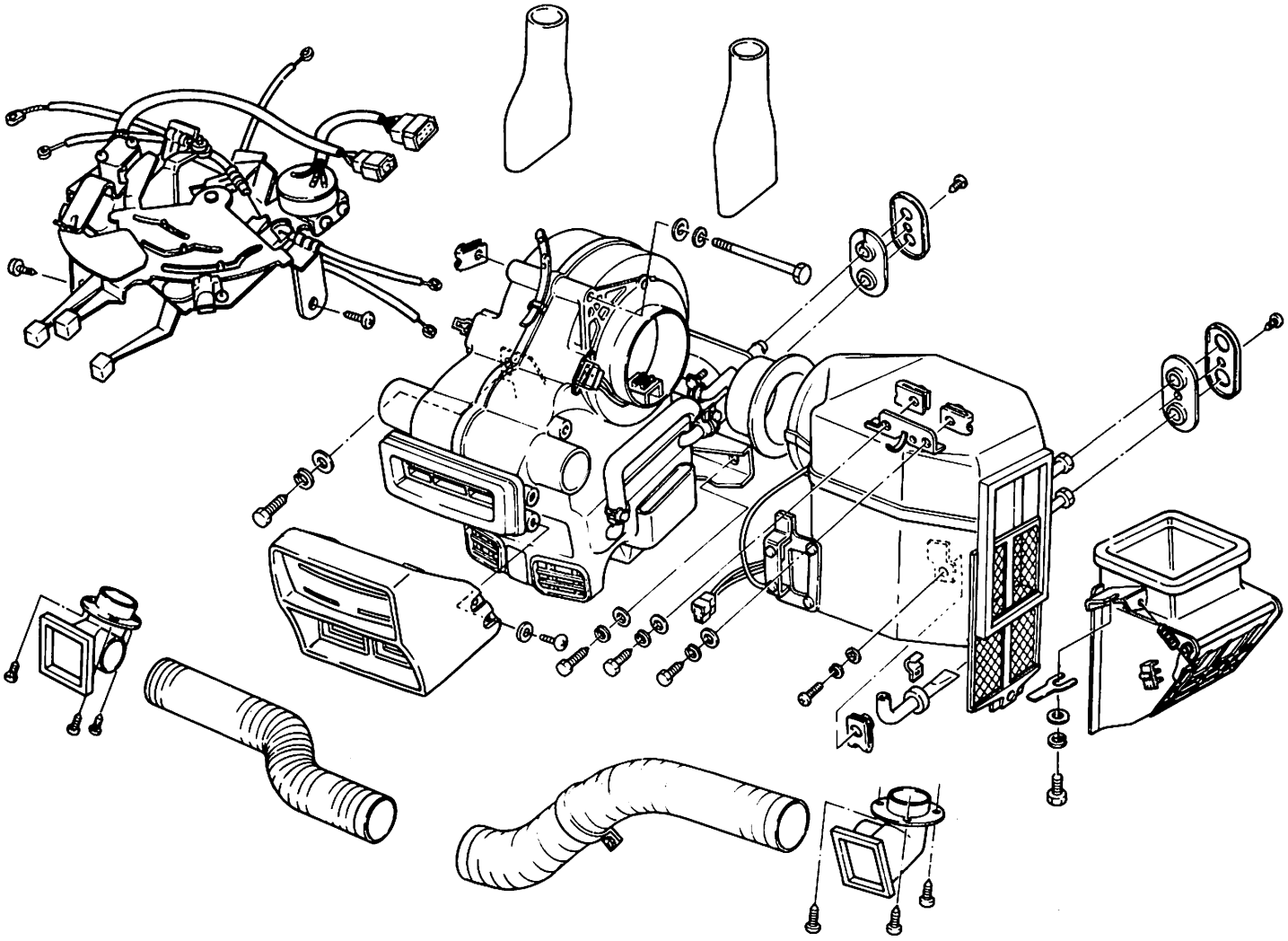


Fig. AC-61 Replacing control finisher

5. Install modified control assembly together with center ventilator to heater unit.

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AC538

Fig. AC-62 Exploded view of air conditioner parts in the passenger compartment

IV. Install air conditioner component parts in the passenger compartment in the following manner:

1. Drill holes in dash panel to allow hoses and tubes to pass through the holes for their installation.

(1) Remove grommet cover and grommet for refrigeration piping.

Discard grommet, while reserving grommet cover for future use.

(2) Remove blind grommets provided for drain hose and for air con. engine room harness.

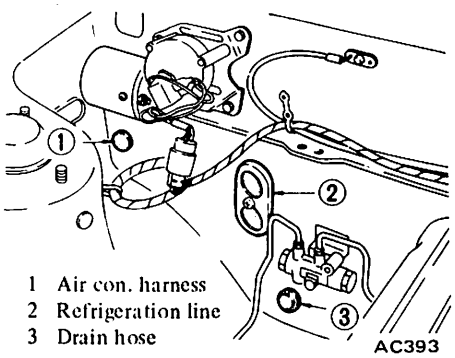


Fig. AC-63 Grommets

(3) Drill holes in dash panel insulator from the passenger compartment side. Remove the round cutout from the insulator.

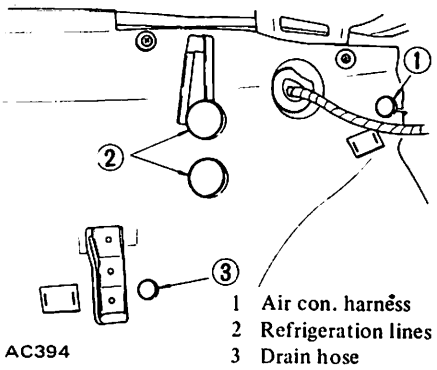


Fig. AC-64 Dash insulator

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2. Install both side ventilator nozzles with new ones for air conditioner.

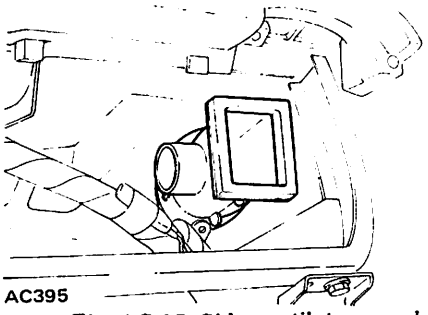


Fig. AC-65 Side ventilator nozzle

3. Installation of heater unit.
(1) Install heater unit assembly modified for use with air conditioner in place below instrument panel. Fit it securely in that place by tightening one bolt on the upper side of heater unit and two bolts on the both sides of heater unit. See Figure AC-55.
(2) From the engine compartment side, seal the pass-through holes using grommet and grommet cover.
4. Installation of evaporator housing.
(1) Newly assemble intake duct stopper to the air intake side of heater unit. See Figure AC-66.

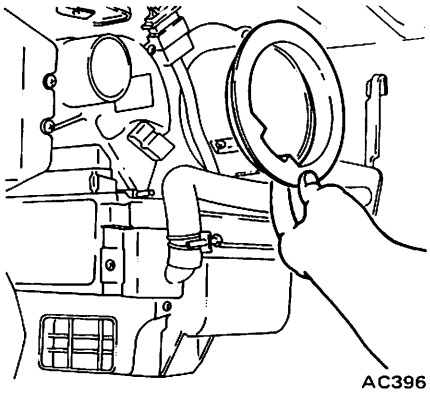


Fig. AC-66 Installing intake duct stopper

(2) Install defroster ducts.
(3) Install evaporator housing with three bolts and J-nuts at the upper side and the lower side. See Figure AC-42.

Note: The evaporator housing should be installed as close as possible to heater unit.

(4) Install drain hose on the bottom of evaporator housing and direct its end into engine compartment through dash panel. Properly seal through-hole for drain hose with grommet in place, and secure drain hose with clamp inside engine compartment.
(5) Seal the pass-through holes of refrigeration tubes using grommet and grommet cover.

Note: Do not remove the blind plug from the opening of evaporator tube until ready for piping in the engine compartment.

5. Pass air con. engine room harness through the hole in dash panel, and fit harness grommet in the hole.
6. Installation of air intake housing.
(1) Install air intake housing previously modified for use with air conditioner onto the right side of evaporator housing. Fasten harness clip with screw together with air intake housing. See Figure AC-62.

Note: Make sure that air intake housing is installed close to evaporator housing.

(2) Connect new wiring harness of air conditioner, and fasten with three clips attached to the upper part of heat unit, evaporator housing and intake housing. See Figure AC-50 for relative location of these parts.
(3) Install air duct in place between the outlet of heater unit and side ventilator nozzle. Install shorter one on the left-hand side.
Fix right-hand air duct using a clamp fitted to defroster nozzle attaching screw.

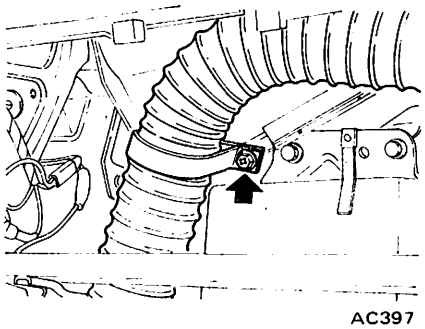


Fig. AC-67 Installing air duct

(4) Connect five control cables to the respective levers. Refer to "Adjustment of control cable" in "Control Assembly".

V. Succeeding works should be conducted in the engine compartment to make necessary modification of engine.

1. Remove radiator grille.
2. Remove engine undercover.
3. Remove radiator shroud and radiator.
4. Remove air cleaner.
5. Remove fan belt.
6. Remove cooling fan and water pump assembly.
7. Remove air pump drive belt, air pump, air pump adjusting bar and air pump bracket.
Discard bracket, drive belt and adjusting bar. Replace air hose (air pump to air hose connector) with one specified for use with air conditioner. Replace air pump pulley with a new one for air conditioner.
8. Remove crank pulley and replace with a new one for air conditioner.
9. Newly install compressor bracket to cylinder block. See Figure AC-29.
10. Install idler pulley bracket onto compressor bracket together with front cover. See Figure AC-30.
11. Install compressor onto compressor bracket. At this time, install adjusting shim between bracket and compressor, if necessary. See Figure AC-29.
12. Install water pump assembly for air conditioner and fan spacer. See Figure AC-68.

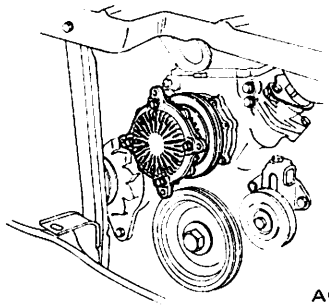


Fig. AC-68 Water pump assembly and fan spacer

13. Install air pump onto compressor bracket. At this time, install adjusting shim between bracket and air pump, if necessary.
Then install air pump adjusting bar for air conditioner. See Figure AC-29.
14. Install air pump drive belt for air conditioner and adjust its tension. See Figure AC-31.

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15. Newly install compressor drive belt and adjust its tension. See Figure AC-31.
16. Reinstall fan belt and adjust its tension. See Figure AC-31.
17. Install cooling fan for air conditioner.
18. Newly install fast idle actuator onto cylinder head. See Figure AC-69.

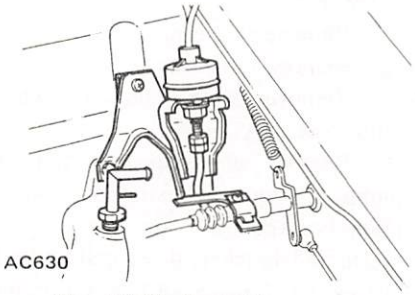


Fig. AC-69 Fast idle actuator and vacuum connector

19. Newly install fast idle lever onto torsion shaft. See Figure AC-35.
20. Remove blind plug of vacuum hose connector on intake manifold. See Figure AC-69.

VI. After completion of engine modification, install all the necessary component parts in the engine compartment according to the following procedure:

1. Set down radiator and condenser onto the rear and front sides, respectively, of radiator core support. Install in place by tightening them together with four bolts. See Figure AC-32.
2. Install upper and lower radiator shrouds.
3. Reinstall radiator upper and lower hoses and, if so equipped, oil cooler tubes.
4. Using three screw holes in hood ledge panel, newly attach receiver drier with screws.



Fig. AC-70 Receiver drier

5. Arrange piping of refrigeration tubes. See Figure AC-34.

Notes:
a. When connecting system lines, do not attempt to remove the blind plug from the opening until ready for immediate use.
b. In connecting tubes, be sure to apply compressor oil to seating surface, and then tighten tubes to prescribed tightening torque.
Be sure to use two wrenches when tightening a flare nut of tube.
c. Use care not to give scratches to the seating surface at connections.
d. Take care to tighten securely piping clamps so unusual noise or vibration can be prevented. Drill screw hole in panel, if necessary.

6. Newly install vacuum tank to the hood ledge panel. See Figure AC-71. Drill two screw holes in hood ledge panel.

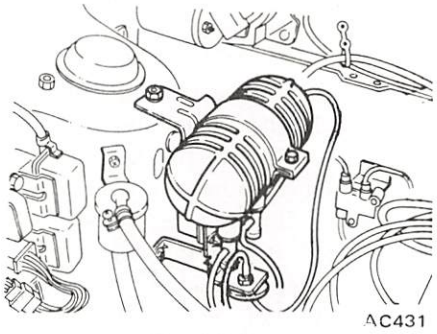


Fig. AC-71 Vacuum tank

7. Drill two screw holes in dash panel and newly attach vacuum water cock onto dash panel with two screws. Remove existing heater hoses and install in that place new hoses specified for use with air conditioner. See Figure AC-72.

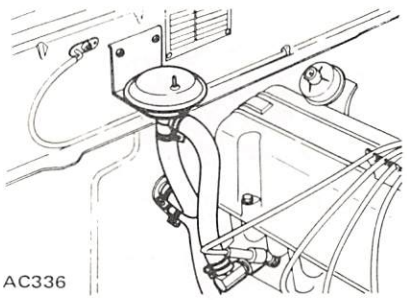


Fig. AC-72 Vacuum water cock

8. Arrange piping of vacuum hoses. See Figure AC-49.
9. Arrange wiring harness. See Figure AC-50.
10. Install hood sealing rubber to the front side of hood panel.

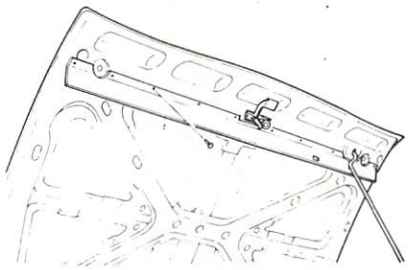


Fig. AC-73 Hood sealing rubber

VI. After completion of all the works before mentioned, charge the system with refrigerant and check for the proper functioning as follows:

1. Evacuate system completely.
2. Charge the specified amount of refrigerant into system.

Refrigerant capacity:
0.6 to 0.9 kg
(13 to 2.0 lb)

3. Conduct leak test and insure that there is no gas leak from connection.
4. Pour in engine coolant, connect battery ground cable, and start up engine. Check electrical system and vacuum system in the air conditioner for their proper functioning, referring to "AIR CONDITIONER OPERATION CHART".
5. Adjust F.I.C.D. stroke, referring to "FAST IDLE ACTUATOR".
6. Install all the parts listed below.
(1) Air cleaner
Clamp vacuum tubes and all other hoses leading to air cleaner securely clamped to the same places as before.
(2) Under cover
(3) Radiator grille
(4) Cluster lids and shell cover
(5) Console box, if so equipped.
(6) Install package tray for air conditioner.
7. Check ignition timing.
8. Check engine idle speed and "CO" percent at idle speed.
9. Conduct the performance test of air conditioner system to check for proper functioning of the system.
10. Check the height of front bumper and, if necessary, adjust. Refer to instruction of Section BF.

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11. After completion of all the previous steps, conduct the following:
(1) Attach caution label under hood.
(2) Attach kit number at the specified position.

COMPRESSOR

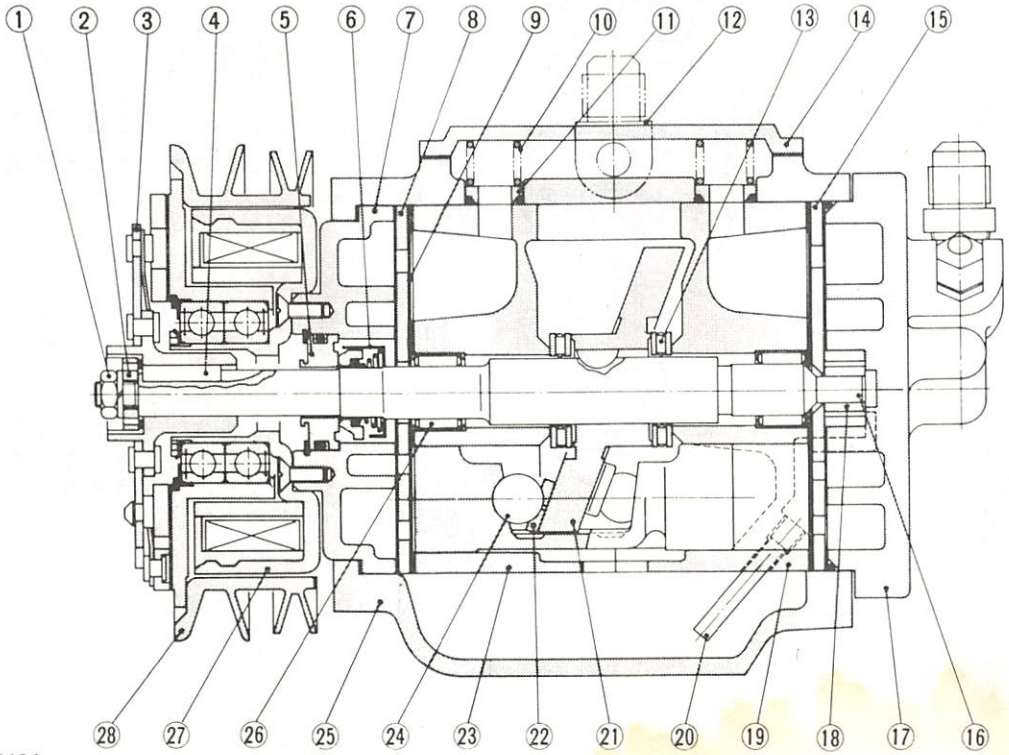
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DESCRIPTION

Model SWP123 is a swash plate type compressor. As with conventional crank type compressors, reciprocating pistons compress incoming gas. The principal difference between these two types of compressors lies in the way in which the piston is driven, by crankshaft rotation on the one hand and by swash plate rotation on the other. When the swash plate compressor is used in air conditioning system, the following advantages are obtained.

1. The shape is cylindrical, facilitating installation.
2. Torque changes are minimal since a number of cylinders are used.
3. Complete mechanical balance is possible, limiting vibration and noise and allowing high-speed operation.
4. Discharge per unit of compressor volume is quite high, resulting in high cooling capacity and superb cooling characteristics.

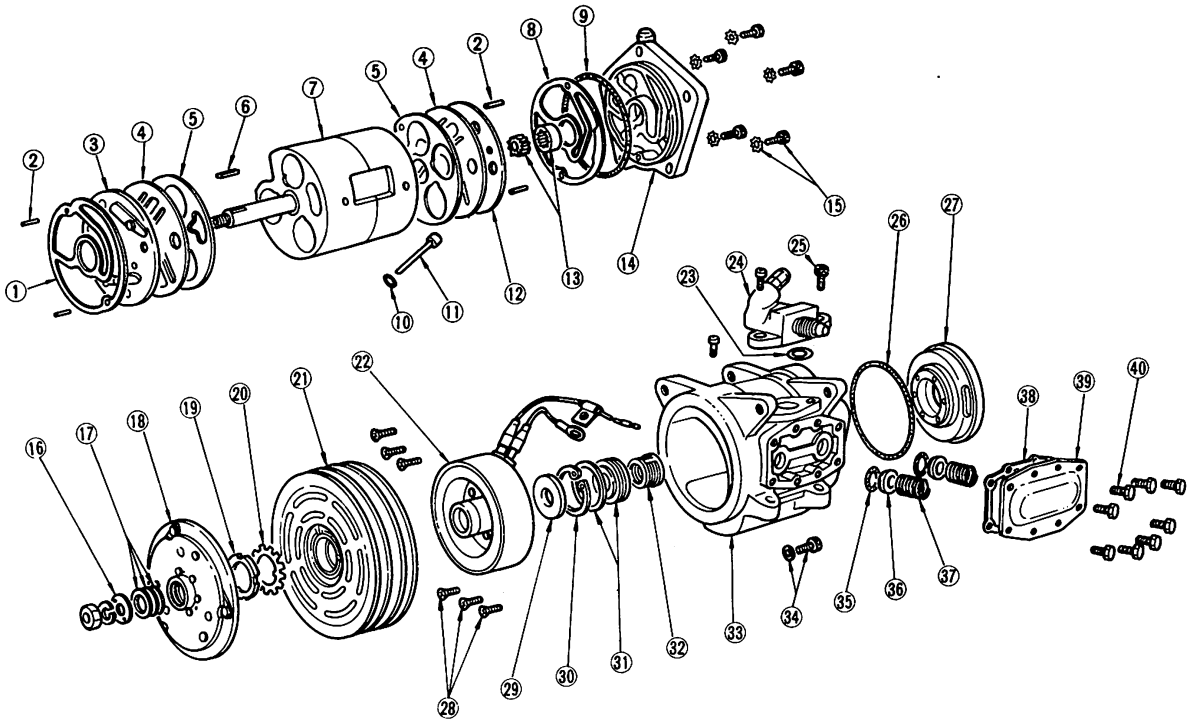


AC194

1 Shaft nut
2 Clutch hub nut
3 Clutch hub
4 Key
5 Shaft seal seat
6 Shaft seal
7 Front end cover
8 Front cylinder head
9 Suction valve plate
10 Silencer spring
11 Silencer piece
12 Discharge valve
13 Thrust bearing
14 Side cover
15 Rear cylinder head
16 Compressor shaft
17 Rear end cover
18 Oil pump
19 Rear cylinder
20 Oil pipe
21 Swash plate
22 Shoe disc
23 Front cylinder
24 Drive ball
25 Shell
26 Needle bearing
27 Clutch coil
28 Pulley and bearing assembly

Fig. AC-74 Sectional view of compressor

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1 Gasket
2 Knock pin
3 Front cylinder head
4 Suction valve plate
5 Gasket
6 Key
7 Compressor cylinder assembly
8 Gasket
9 Rear end cover O-ring
10 Oil pipe O-ring
11 Oil pipe
12 Rear cylinder head
13 Gear pump assembly
14 Rear end cover
15 Rear end cover fixing bolt and washer
16 Hub nut
17 Spacer
18 Clutch hub
19 Lock nut
20 Lock washer
21 Pulley and bearing assembly
22 Coil assembly
23 Discharge valve O-ring
24 Discharge valve assembly
25 Discharge valve fixing bolt
26 Gasket
27 Front end cover
28 Coil mounting screw
29 Felt
30 Retainer ring
31 Shaft seal seat and O-ring
32 Shaft seal
33 Compressor shell
34 Drain plug and gasket
35 Silencer piece O-ring
36 Silencer piece
37 Silencer spring
38 Gasket
39 Side cover
40 Side cover fixing bolt

AC222

Fig. AC-75 Exploded view of compressor

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COMPRESSOR CLUTCH

The most likely source of problem is clutch slippage. Factors are listed here. Exercise ample care.

1. Clearance between clutch hub and pulley should be 0.5 to 0.8 mm (0.020 to 0.031 in) at all peripheral points.
2. Make sure that there is no oil or dirt on friction surfaces of clutch disc (clutch hub) and pulley. Remove any oil or dirt with a dry rag.
3. Make sure that terminal voltage at magnetic coil is above 10.5V.

REMOVAL

1. Using Clutch Hub Wrench KV99412302, hold clutch hub. With suitable socket wrench, remove shaft nut from shaft.
2. Then, using Hub Nut Socket KV99412305, remove clutch hub nut. Remove spacers.

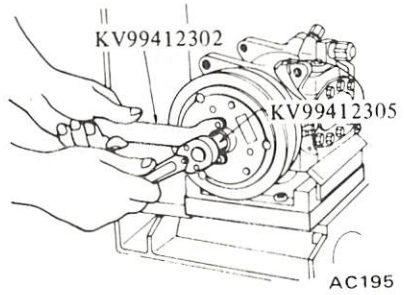


Fig. AC-76 Removing clutch hub nut

3. Using Clutch Hub Puller KV99412306, remove clutch hub. Thread tool into the bore of clutch hub, hold tool with wrench, and then thread in center bolt.

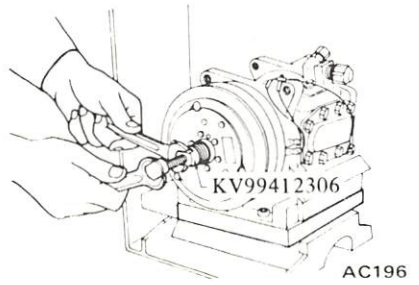


Fig. AC-77 Removing clutch hub

4. With an ordinary screwdriver, flatten lock washer tab.

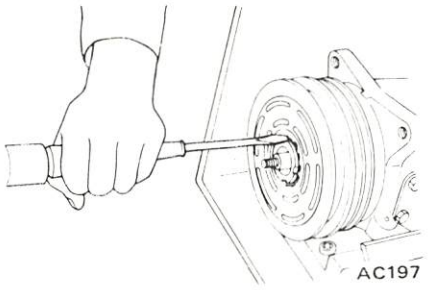


Fig. AC-78 Flattening lock washer tab

5. Using Lock Nut Socket KV99412310, loosen lock nut. Remove lock nut and lock washer.

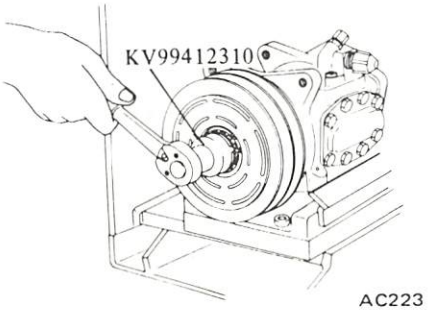


Fig. AC-79 Removing lock nut

6. Remove pulley and bearing assembly. When the assembly can not be removed by hand, use a puller, Puller Adapter KV99412313 and Puller Pilot KV99412312.

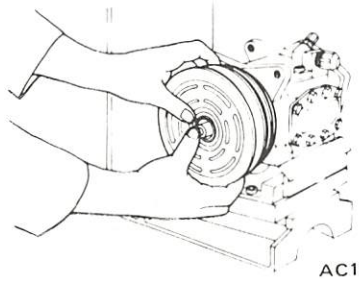


Fig. AC-80 Removing pulley

7. Using an impact tool, loosen six coil mounting screws. Use of the impact tool is advisable as screws have been calked.

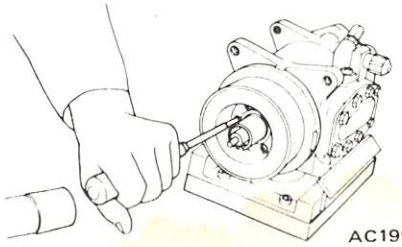


Fig. AC-81 Loosening coil mounting screw

8. Remove coil mounting screws and separate coil assembly.

INSPECTION

1. Check the friction surfaces of the clutch for damage due to excessive heat, or excessive grooving due to slippage. If necessary, replace coil, pulley and bearing assembly, and clutch hub as a set.
2. Oil or dirt on the friction surfaces should be cleaned with a suitable solvent and a dry rag.
3. Check coil for shorted or opened binding leads.
4. When replacing compressor clutch assembly, do not forget break-in operation, accomplished by engaging and disengaging the clutch some thirty times. Break-in operation raises the level of transmitted torque.

INSTALLATION

1. Using a Phillips screwdriver, tighten coil assembly mounting screws in an alternating pattern. After screws have been firmly tightened, punch-lock each at one location to prevent loosening. Correct tightening torque is 0.28 to 0.35 kg-m (2.0 to 2.5 ft-lb).

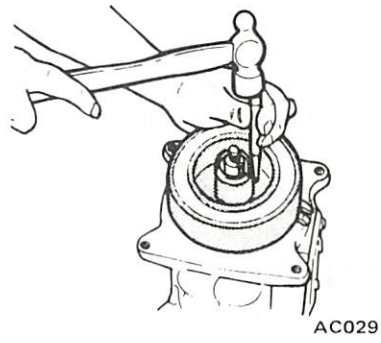


Fig. AC-82 Punch-locking

2. Using a plastic mallet, drive pulley and bearing assembly onto the neck of the installed coil assembly. Turn the pulley, making sure that there is no noise and that rotation is free. Also make sure that there is no pulley play.
3. Position lock washer and lock nut in place. Using Lock Nut Socket KV99412310, tighten lock nut firmly. With lock washer tab and lock nut cutouts matched, bend the tab with the screwdriver. Proceed carefully to avoid bearing cage damage. Correct

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tightening torque is 2.5 to 2.8 kg-m (18.1 to 20.2 ft-lb).

4. Fit key and clutch hub to the shaft. Select adjusting spacer which gives the correct clearance between the pulley and clutch hub.

Tighten hub nut to 1.8 to 2.1 kg-m (13 to 15 ft-lb)

5. Tighten shaft nut with spring washer in place.

Tightening torque:
1.6 to 1.7 kg-m
(11.5 to 12.3 ft-lb)

6. Using a thickness gauge, measure the clutch hub-to-pulley gap. If the gap is 0.5 to 0.8 mm (0.020 to 0.031 in), adjustment is correct.

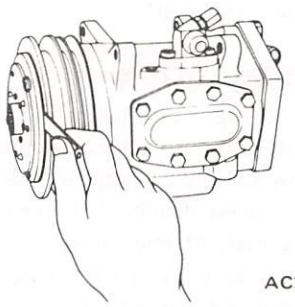


Fig. AC-83 Checking clutch hub-to-pulley clearance

Note: If the specified gap is not obtained, replace adjusting spacer and readjust.

SHAFT SEAL

To prevent refrigerant leakage at the cylinder shaft exit point, tightness must be maintained at friction surfaces between shaft seal and shaft seal seat and at contact surfaces between shaft seal seat and front end cover. Use extreme care in removing or assembling seals not to damage the sealing surfaces. Discard the old seals. Do not re-use them.

REMOVAL

The system must be discharged beforehand. When compressor is removed, do not turn it on its side or upside down without first draining the oil. Remove dirt from the exterior. Clean the workbench to be used, tools and your hands.

1. Remove drain plug, thereby draining the oil.
2. Remove clutch hub, pulley and bearing assembly, and coil assembly. Proceed according to information under "Compressor Clutch".
3. Using snap ring pliers, compress and remove retainer ring.

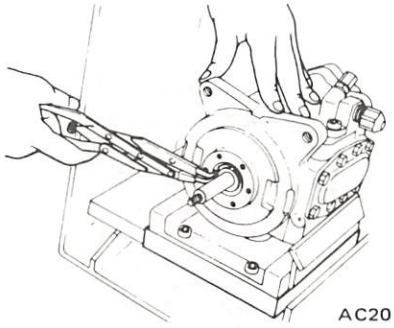


Fig. AC-84 Removing retainer ring

4. Using Shaft Seal Seat Puller KV99412320, remove shaft seal seat.

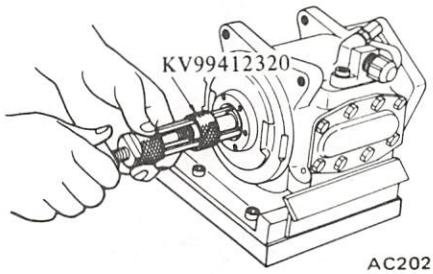


Fig. AC-85 Removing shaft seal seat

5. Insert Shaft Seal Remover & Installer KV99412321 through the open end of front end cover. Depress the carbon seal and hook the tool at the case projection of shaft seal. Slowly pull out the tool, thereby removing shaft seal.

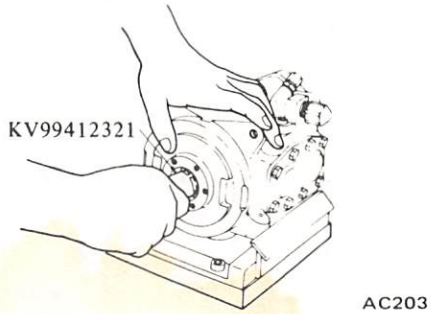


Fig. AC-86 Inserting special tool

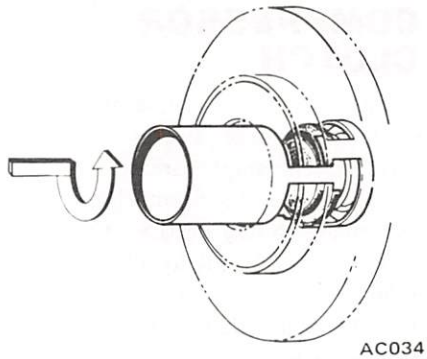


Fig. AC-87 Removing shaft seal

INSPECTION

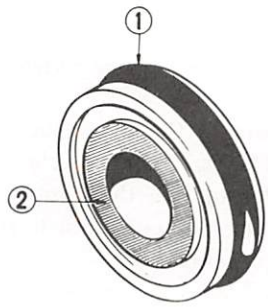
1. Check the carbon seal surface of shaft seal for damage.



1 Carbon seal
2 Contact surface AC035

Fig. AC-88 Checking shaft seal

2. Check O-ring and the carbon seal contact surface of shaft seal seat for damage. Make sure that O-ring contact surface at front end cover is not damaged.



1 O-ring
2 Contact surface AC036

Fig. AC-89 Checking shaft seal seat

Notes:

a. Do not re-use shaft seal seat and shaft seal.
b. In placing a new seal on the workbench, make sure that the contact surface faces upward. Take necessary steps to avoid damage.

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INSTALLATION

1. Make sure that the shaft seal contact surface is free of dirt and amply lubricated with oil.
2. Cap Shaft Seal Pilot KV99412322 to the top end of compressor shaft.
3. Using Shaft Seal Remover & Installer KV99412321, insert shaft seal with shaft seal case and shaft cutout aligned.

Apply force to turn the seal somewhat to the left and right. Insure that shaft seal seats properly in the shaft cutout.

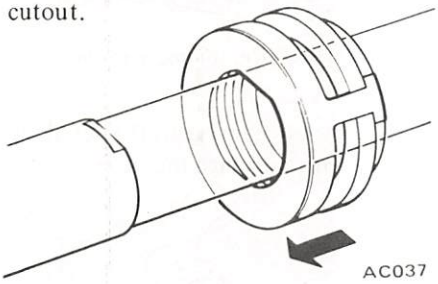


Fig. AC-90 Inserting shaft seal

4. Fit O-ring to the outside groove of shaft seal seat, making sure that it seats properly.
5. Coat seal contact surface and periphery of shaft seal seat with an ample amount of oil, so that shaft seat is easy to slip on the inside surface of front end cover. Following this, push in shaft seal seat so that it seats properly at the land of front end cover.
6. Using snap ring pliers, compress retainer ring and fit it into front end cover. Seat retainer ring firmly in the groove.
7. Then, check for gas leakage as follows:

(1) Plug high- and low-pressure joints on compressor with blind caps.
(2) Connect charging hoses in the lines between manifold gauge and high- and low-pressure service valves.

Connect refrigerant can to the middle hose of manifold gauge.

(3) Open valve of can tap, and charge refrigerant. Loosen oil plug on compressor to purge air out of compressor.
(4) Install Shaft Handle Socket KV99412329 to the shaft of compressor, and turn the shaft 5 to 6 turns in the clockwise direction. Then, confirm that pressure does not decrease on the low pressure gauge. If the gauge indicates a pressure decrease, there is a leak. Conduct a leak test. Under such a condition, remove and then install parts again.

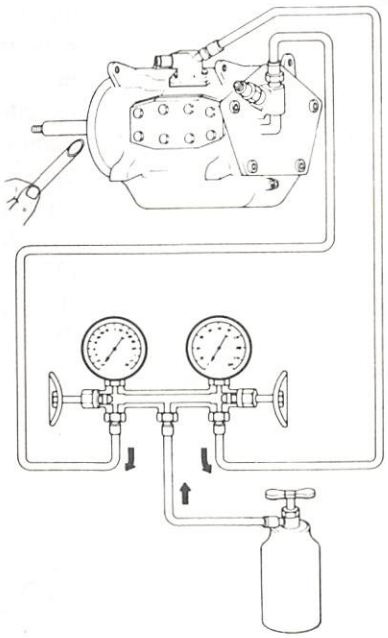


Fig. AC-91 Checking for gas leaks

(5) Install compressor clutch assembly according to information under "Installation" of "Compressor Clutch".
(6) Fill with oil.

DISCHARGE VALVE

REMOVAL

1. Using Allen Socket KV99412324, remove two hex. socket head bolts.

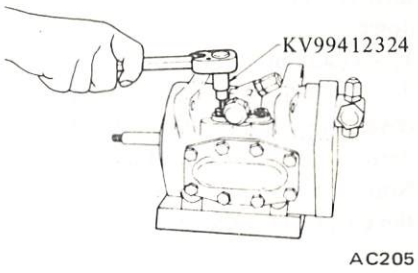


Fig. AC-92 Removing bolts

2. Remove discharge valve.
3. Discard the old O-ring.

INSPECTION

1. Check for scratched seating surface of discharge valve and of shell. Do not re-use the old O-ring.
2. Replace discharge valve which is scratched.
3. If a scratch is found on the groove of shell O-ring, replace shell.

INSTALLATION

1. Apply a coating of compressor oil to the groove of discharge valve and O-ring, and install these parts in their proper positions on shell.
2. Using Allen Socket KV99412324, secure discharge valve to shell with two hex. socket head bolts.

Tightening torque:
1.8 to 2.0 kg-m
(13 to 14.5 ft-lb)

3. Conduct a gas leak test by referring to the topic "Installation" of "Shaft Seal".

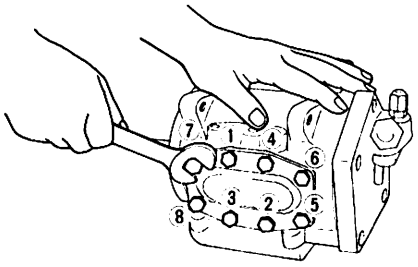
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SIDE COVER

REMOVAL

Discharge the system before beginning work. Work may be carried out with compressor mounted. If compressor is to be removed, first drain oil. Unless oil has been drained, do not turn compressor on its side or upside down.

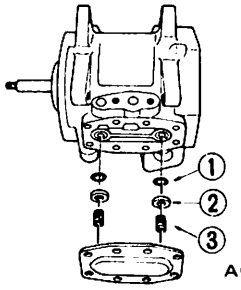
1. Drain oil.
2. Loosen and remove eight side cover mounting bolts in an alternate pattern as shown in Figure AC-93. Note that two silencer springs inside the cover will force up side cover.



AC206

Fig. AC-93 Loosening cover mounting bolt

3. Remove side cover and side cover gasket. Discard the gasket.
4. Remove silencer springs, pieces, and O-rings. Do not damage O-ring surface of silencer piece during this process. Discard used O-rings.



AC207

1 O-ring
2 Piece
3 Silencer spring

Fig. AC-94 Exploded view of silencer spring, pieces and O-ring

INSPECTION

1. Make sure that side cover gasket surface and shell gasket surface are not damaged.
2. Make sure that silencer pieces and shell contact surfaces in contact with O-ring are not damaged.
3. Do not reuse old gasket and O-rings.

INSTALLATION

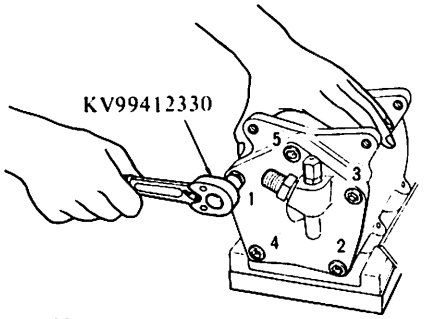
1. Place the mounting surface of side cover upward.
2. Make sure that holes of cylinder and shell are aligned and install O-rings.
3. Coat O-ring and the area around shell hole with an ample amount of oil. Using O-ring Installer KV99412328, install O-ring into the shell hole. Then install silencer piece with Silencer Piece Installer KV99412327.
4. Coat the gasket surface of shell with oil and position gasket and side cover.
5. Hold side cover in place by hand and thread in eight mounting bolts. Tighten these bolts evenly in an alternating pattern as shown in Figure AC-85. Tightening torque is 1.8 to 2.0 kg-m (13 to 14.5 ft-lb).
6. Fill with oil.
7. Upon completion of the above operations, conduct a gas leak test by referring to the item "Installation" under the topic "Shaft Seal".

REAR END COVER AND REAR CYLINDER HEAD

Before beginning work, remove dirt from the exterior of the detached compressor. Clean the workbench to be used, tools, and your hands.

DISASSEMBLY

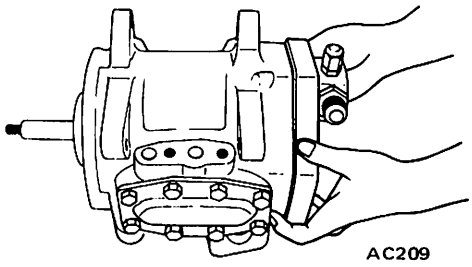
1. Drain oil.
2. Using Allen Socket KV99412330, remove five rear end cover mounting bolts. Starting at the top, loosen all bolts one turn in an alternating pattern. Then remove bolts in turn.



AC208

Fig. AC-95 Loosening bolts

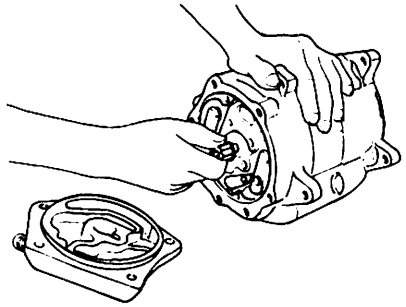
3. Grasp rear end cover and carefully separate it from compressor. Tap the flange lightly and alternately as required with a plastic mallet. Do not tap on the compressor shaft.



AC209

Fig. AC-96 Removing rear end cover

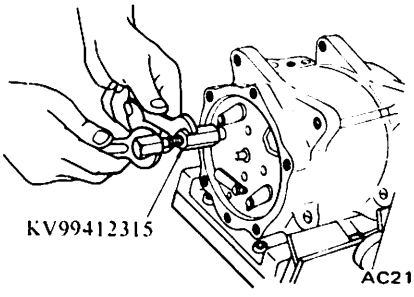
4. Remove pump gear. Do not allow pump gear to damage the surface.



AC042

Fig. AC-97 Removing pump gear

5. Remove O-ring, gasket and two pins. Discard the O-ring and gasket.
6. Remove rear cylinder head, suction valve plate and gasket. Discard the gasket. Carefully remove suction valve plate, avoiding deformation.
7. When removal proves difficult, use Cylinder Head Remover KV99412315. Insert this tool into hole in cylinder head as shown in Figure AC-98. With the nut in firm contact with the back side of cylinder head, tighten the bolt slowly to break loose the head.



AC210

Fig. AC-98 Removing rear cylinder head

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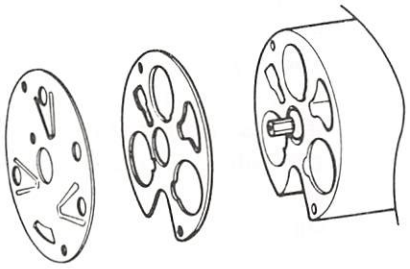
INSPECTION

1. Do not reuse old gasket and O-ring.
2. Make sure that the gasket contact surface is free of damage.
3. If replacement of rear end cover connector and check valve is necessary, replace rear end cover with a new one.
4. Check suction valve plate and cylinder head for broken valves.
5. Check pump gear for wear and damage.

ASSEMBLY

Using clean oil, remove dirt and other matter from end cover, cylinder head and suction valve plate. Clean the workbench.

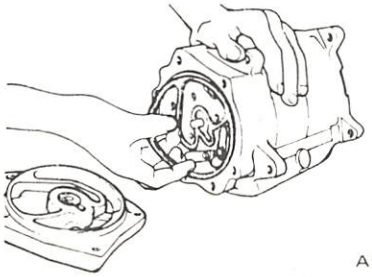
1. Using suitable blocks, position compressor with the front face downward and the rear upward.
2. Insert two pins in the rear of cylinder.
3. Coat both surfaces of cylinder head gasket with oil and align gasket with cylinder.
4. Install suction valve plate, making sure that the three valves properly align with cylinders and gasket cutouts.



AC224

Fig. AC-99 Cutouts of cylinder and gasket

5. Install cylinder head, gasket, and O-ring in the order listed. Coat gasket and O-ring beforehand with an ample amount of oil.



AC045

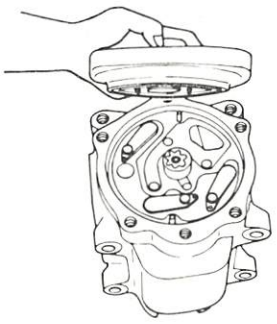
Fig. AC-100 Installing gasket



AC046

Fig. AC-101 Cylinder head and gasket

6. Fit pump gear to rear end cover.
7. Carefully fit rear end cover to the rear of compressor.



AC211

Fig. AC-102 Installing rear end cover

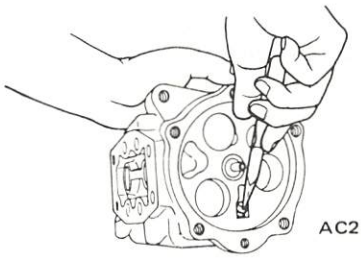
8. Using Allen Socket KV99412330, tighten up five bolts in an alternating pattern, starting at the top. Do not forget lock washers. Then, using torque wrench, tighten these bolts to 3.0 to 3.5 kg-m (21.5 to 25.5 ft-lb) in the same sequence.
9. Fill with oil.
10. Upon completion of the above operation, conduct a leak test by referring to the topic under "Shaft Seal".

REPLACEMENT OF CYLINDER

Before proceeding, remove all dirt and other matter from the detached compressor. Clean the workbench, tools, and your hands. Lay out parts in the order in which they were removed, in space set aside for this purpose. This procedure facilitates reassembly.

REMOVAL

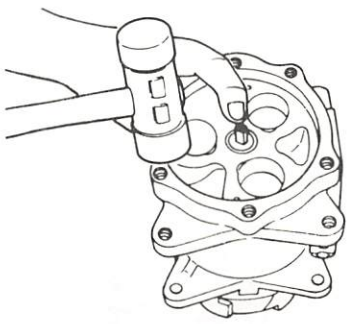
1. Drain oil.
2. Remove compressor clutch assembly. Refer to "Compressor Clutch".
3. Using snap ring pliers, remove shaft seal retainer ring. Then remove shaft seal seat. Refer to "Shaft Seal". Removal of shaft seal is not absolutely necessary. It may be removed when cylinder assembly is removed from front end cover. In fact, this approach facilitates work.
4. Remove side cover. Refer to "Side Cover".
5. Remove rear end cover. Refer to "Rear End Cover and Rear Cylinder Head". Remove O-ring, gasket, two pins, cylinder head, suction valve plate, and gasket in the order listed. This exposes the rear part of cylinder.
6. Using long nose pliers or other suitable tool, pull out oil pipe. Proceed carefully as oil pipe is easily bent. **UNLESS OIL PIPE HAS BEEN REMOVED, DO NOT ATTEMPT THE FOLLOWING STEPS.**



AC212

Fig. AC-103 Pulling out oil pipe

7. With the front facing downward support compressor shell. Using a plastic mallet, tap at the rear end of the shell flange, driving shell straight downward. Discard front end cover gasket.

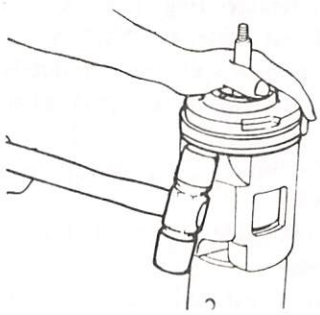


AC213

Fig. AC-104 Removing shell

8. Detach front end cover from cylinder assembly. Using a plastic mallet, drive end cover upward. Refrain from excessive force to avoid cover damage.

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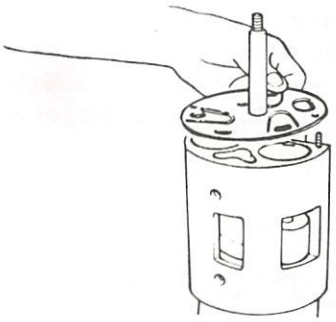
AC050

Fig. AC-105 Removing front end cover

9. Remove shaft seal from the shaft.
10. Remove two pins, gasket, cylinder head, suction valve plate, and gasket. In removing two pins, proceed carefully to avoid cylinder head damage. Do not deform suction valve plate in removing suction valve plate. Discard old gasket.

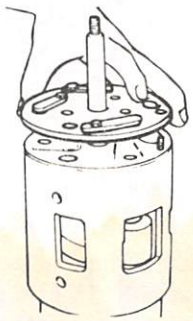
INSTALLATION

1. Using suitable blocks, face cylinder assembly upward. Insert two pins. Position gasket and suction valve plate in the order listed while making sure that three valves of suction valve plate are aligned with the cylinder and gasket cutouts. Coat gasket with oil prior to assembly. Gaskets and suction valve plates are the same for front and rear. The cylinder head with the smaller numbers of holes goes to the front. Do not mix front and rear parts.



AC051

Fig. AC-106 Installing suction valve plate



AC052

Fig. AC-107 Installing cylinder head

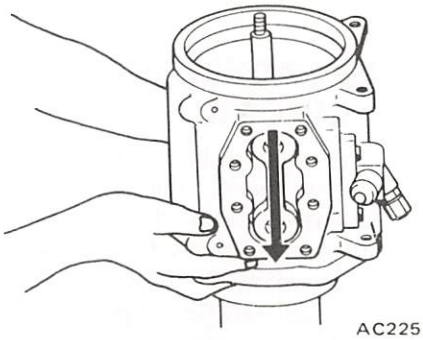
2. Align shaft seal with the shaft cutaway. Firmly seat shaft seal at the shaft land. Attempt to turn shaft seal to the left and right, confirming that it is seated properly.
3. Place gasket on cylinder head and install front end cover. Coat gasket with oil beforehand. Gasket differs for the front and rear. Make sure that the correct gasket is used. After completing this work, gasket protruding from front end cover and cylinder head should be adjusted by hand.



AC053

Fig. AC-108 Installing front end cover

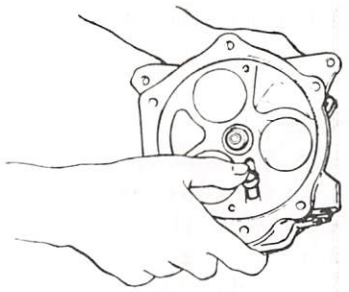
4. Fit gasket to front end cover. Then bring the shell into place over the cylinder assembly. At this time, make sure that the two holes of side cover and the cylinder holes are matched. Note that later adjustment will no longer be possible, as inside and outside diameters of these are not perfectly round. Note that moving the shell up and down may cause the gasket to slip out of place.



AC225

Fig. AC-109 Installing shell

5. Turn over the assembled shell and cylinder assembly, that is, face the front downward.
6. Coat oil pipe and O-ring with an ample amount of oil. Insert oil pipe at the rear of the cylinder. After making sure that the hole lines are matched as specified in step (4), continue with step (6) work.



AC226

Fig. AC-110 Installing oil pipe

7. Continue with work up to installation of rear end cover, according to "Installation" under "Rear End Cover and Rear Cylinder Head".
8. Continue with work up to installation of side cover, according to "Installation" under "Side Cover".
9. Install shaft seal seat according to instructions in "Installation" under "Shaft Seal".
10. Install and adjust compressor clutch according to instructions in "Installation" under "Compressor Clutch".
11. Charge compressor oil 270 g (9.5 oz), and tighten oil plug with copper gasket in place.

Tightening torque:
1.8 to 2.0 kg-m
(13 to 14.5 ft-lb)

12. Conduct a leak test by referring to the topic under "Shaft Seal".

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SERVICE DATA AND SPECIFICATIONS

Specifications

Type		Swash plate
Model		SWP123
Displacement	cc (cu in)	123 (7.6)
Cylinder bore x stroke	mm (in)	32 x 25.4 (1.26 x 1)
Direction of rotation		Clockwise (viewed from drive end)
Lubricating oil type	g (oz)	SUNISO 5GS 270 (9.5)
Refrigerant		R-12
Weight with compressor clutch	approx. kg (lb)	11.6 (25.5)

Tightening torque

	kg-m (ft-lb)
Rear end cover bolt	3.0 to 3.5 (21.5 to 25.5)
Side cover bolt	1.8 to 2.0 (13 to 14.5)
Coil screw	0.28 to 0.35 (2.0 to 2.5)
Clutch hub nut	1.8 to 2.1 (13 to 15)
Shaft nut	1.6 to 1.7 (11.5 to 12.3)
Oil plug	1.8 to 2.0 (13 to 14.5)
Discharge valve assembly bolt	1.8 to 2.0 (13 to 14.5)

Adjustment specifications

Clutch hub to pulley clearance	mm (in)	0.5 to 0.8 (0.0020 to 0.031)
Shaft end play	mm (in)	0 to 0.02 (0 to 0.0008)

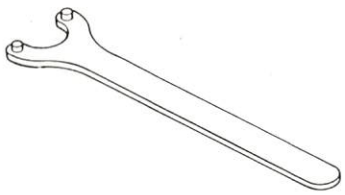
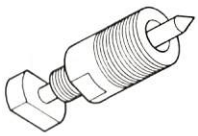
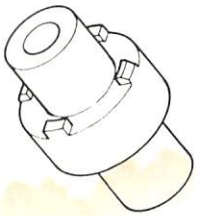
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TROUBLE DIAGNOSES AND CORRECTIONS

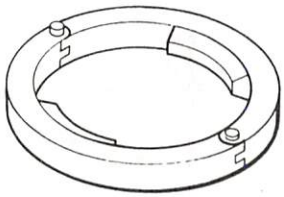
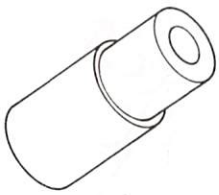
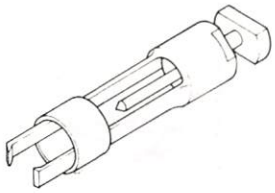
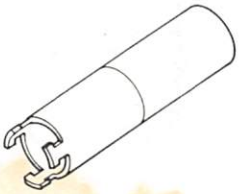
Condition	Probable cause	Corrective action
Noise from compressor	Broken delivery valve.	Replace cylinder head.
	Broken suction valve.	Replace suction valve plate.
	Worn shoe disc.	Replace cylinder assembly or repair cylinder.
	Oil level high.	Adjust oil level.
	Broken radial bearing.	Replace cylinder assembly or replace needle bearing.
	Broken thrust bearing.	Replace cylinder assembly or repair cylinder.
	Contact between pulley and clutch hub.	Adjust clearance.
	Loose bracket bolt, cracked or broken bracket.	Tighten bolt or replace bracket.
Rough rotation. (can be sensed by hand)		
Roughness.	Broken radial bearing.	Replace cylinder assembly or replace needle bearing.
Seizure Erratic operation	Worn shaft, bearing fault. Lack of lubrication.	Replace cylinder assembly. Check and add oil or replace cylinder assembly.
Compressor locked.	Broken piston.	Replace cylinder assembly.
	Burned shoe disc.	Replace cylinder assembly.
Hot compressor.	Ruptured oil pipe O-ring.	Replace O-ring.
	Broken delivery valve.	Replace cylinder head.
	Ruptured gasket.	Replace.
Compressor gas leakage.	Gas leaking from magnetic clutch mounting.	Replace shaft seal and shaft seal seat.
	Gas leaking from check valve.	Replace discharge valve or rear end cover.
	Gas leaking between end cover (R) and shell.	Replace O-ring.
	Gas leaking between end cover (F) and shell.	Replace front end cover gasket.
Compressor clutch does not operate.	Open coil or leads.	Replace compressor clutch or leads.
	Poor terminal contact.	Clean dirt from terminals, etc.

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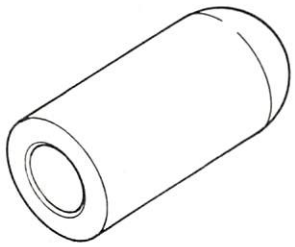
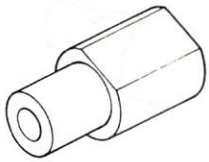
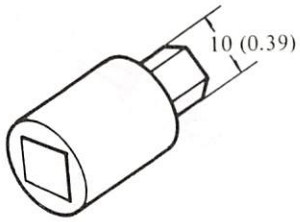
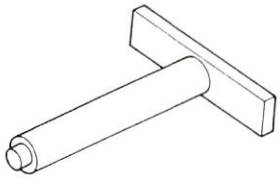
SPECIAL SERVICE TOOLS

No.	Tool number & tool name	Description	For use on	Reference page or Figure No.
1.	KV99412302 Clutch hub wrench	This tool is used to hold clutch hub.  SE353	710 610 S30	Fig. AC-76
2.	KV99412305 Hub nut socket	This tool is used to remove clutch hub nut.  SE354	710 610 S30	Fig. AC-76
3.	KV99412306 Clutch hub puller	This tool is used to remove clutch hub.  SE355	710 610 S30	Fig. AC-77
4.	KV99412310 Lock nut socket	This tool is used to loosen lock nut.  SE356	710 610 S30	Fig. AC-79

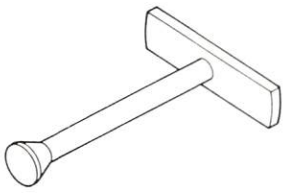
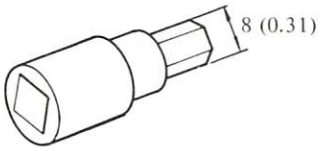
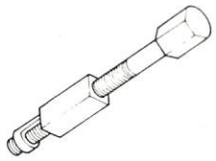
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No.	Tool number & tool name	Description	For use on	Reference page or Figure No.
5.	KV99412313 Puller adapter	These tools are used when removing pulley and bearing assembly.  SE357	710 610 S30	Page AC-57
6.	KV99412312 Puller pilot	 SE358	710 610 S30	Page AC-57
7.	KV99412320 Shaft seal seat puller	This tool is used to remove shaft seal seat.  SE359	710 610 S30	Fig. AC-85
8.	KV99412321 Shaft seal remover and installer	This tool is used to remove or to install shaft seal.  SE360	710 610 S30	Fig. AC-86

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No.	Tool number & tool name	Description Unit: mm (in)	For use on	Reference page or Figure No.
9.	KV99412322 Shaft seal pilot	This tool is used when installing shaft seal so as not to damage it.  SE361	710 610 S30	Page AC-59
10.	KV99412329 Shaft handle socket	This tool is used to turn the shaft of compressor.  SE362	710 610 S30	Page AC-59
11.	KV99412324 Allen socket	This tool is used to remove discharge valve.  SE363	710 610 S30	Fig. AC-92
12.	KV99412327 Silencer piece installer	 SE364	710 610 S30	Page AC-60

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No.	Tool number & tool name	Description Unit: mm (in)	For use on	Reference page or Figure No.
13.	KV99412328 O-ring installer	 SE365	710 610 S30	Page AC-60
14.	KV99412330 Allen socket	This tool is used to remove rear end cover.  SE366	710 610 S30	Fig. AC-95
15.	KV99412315 Cylinder head remover	This tool is used to remove cylinder head.  SE367	710 610 S30	Fig. AC-98

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SERVICE MANUAL

DATSUN 710
MODEL 710 SERIES

NISSAN

NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

SECTION SE

SERVICE EQUIPMENT

SERVICE EQUIPMENT ..... SE- 2

SE

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SERVICE EQUIPMENT

GENERAL DESCRIPTION

Most service tools designed for the 610 series are directly adaptable to the 710 series.

The engine service tools are exactly the same as those for the 1975 610 series.

SPECIAL TOOL SET AND TOOL KIT

Since the special tool set and tool kit used on the 610 series are directly adaptable to the 710 series, those designed exclusively for use on the 710 series have not as yet been established.

GENERAL SPECIFICATIONS

Special Tools play an important role in car maintenance. They are essential to safe, accurate and speedy servicing.

The working times listed in the column under FLAT RATE TIME in the FLAT RATE SCHEDULE are based on the use of Special Tools. The identification code of maintenance tools is made up of 2 alphabetical letters and 8-digital figures.

The two letters roughly classify tools or equipment as follows:

ST00000000:	Special Tool
EM00000000:	Engine Overhauling Machine
EG00000000:	Engine Service for Gasoline
GG00000000:	General Gauge
HT00000000:	Hand Tool

CLASSIFICATION OF SPECIAL TOOL

	Classification	
	Important	General
I. Inspection and minor repair	1	4
II. General disassembly and assembly	2	5
III. Special disassembly and assembly	3	6

A. Important
   a. Exclusive with no alternative
   b. Parts likely to be damaged if repaired without special tool
   c. Gauges

B. General
   To facilitate servicing

I. Inspection and minor repair
   a. Inspection and maintenance
   b. Unit replacement
   c. Minor unit disassembly

II. General disassembly and assembly
   a. General disassembly such as engine, differential gear carrier and transmission.

III. Special disassembly and assembly
   a. Disassembly of exclusive parts such as automatic transmission and electrical accessories.
   b. Special work such as boring.
   c. Work rarely required

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TOOL LIST

No.	Tool Number	Tool Name	Class	Reference
1.	ENGINE		5	
	ST0501S000	Engine stand Ass'y		
	├ST05011000	Engine stand		
	└ST05012000	Base		
	ST05260001	Engine attachment	5	
	ST10120000	Cylinder head bolt wrench	2	
	ST10640001	Pivot adjuster	1	
	ST1103S000	Valve guide reamer set	3	
	├ST11031000	Reamer [12.2 mm (0.480 in) dia.]		
	├ST11032000	Reamer [8.0 mm (0.315 in) dia.]		
	└ST11033000	Drift	2	
	ST11650001	Valve seat cutter set	5	
	ST12070000	Valve lifter	2	
	ST13030001	Piston pin press stand	2	
	ST15310000	Crankshaft rear oil seal drift	2	
	ST1651S000	Crankshaft main bearing cap puller		
	├ST16511000	Body	3	
	└ST16520001	Adapter	2	
	ST1661001	Pilot bushing puller		
	ST17420001	Chain stopper		
	ST19320000	Oil filter wrench	1	
	ST19870000	Air pump test gauge	1	
	ST19810000	Hexagonal wrench	3	
	ST19890000	Rear pump housing supporter	2	
	ST19900000	Dummy shaft	2	
	ST19910000	Bearing drift	2	
	ST19920000	Rotor support	2	
	ST19930000	Front pump housing supporter	—	
	ST19940000	Bearing pressing tool	3	
	ST19880000	Relief valve remove stand	2	
	EM03470000	Piston ring compressor		
2.	CLUTCH			
	ST16610001	Pilot bushing puller	4	
	ST20050010	Plate	4	
	ST20050051	Set bolts	4	
	ST20050100	Distance piece [7.8 mm (0.307 in) thickness]	4	
	ST20050240	Diaphragm spring adjusting wrench	4	
	ST20630000	Clutch aligning bar	2	
3.	MANUAL TRANSMISSION			
	ST23100000	Countershaft guide [17 mm (0.67 in) dia.]	2	
	ST23540000	Fork rod pin punch [4 mm (0.16 in) dia.]	2	
	ST23840000	Expander		

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No.	Tool Number	Tool Name	Class	Reference
	ST3003S000	Bearing replacer	2	Same tool as that used for gear carrier
	├ST30031000	Puller		
	└ST30032000	Base		
4.	AUTOMATIC TRANSMISSION			
	ST07870000	Transmission case stand	3	
	ST25050001	Oil pressure gauge set	1	
	ST25160000	Torque driver	3	
	ST25320001	Snap ring remover	3	
	ST25420001	Clutch spring compressor	3	
	ST25490000	Socket extension	3	Former No. 25512001
	ST25570001	Hex.-head extension	3	Former No. 25570000
	ST25580000	Oil pump assembling gauge	3	
	ST25850000	Sliding hammer	3	
	GG93010000	Torque wrench	3	
	HT61000800	Hexagon wrench	3	
	HT62350000	Spinner handle	6	
	HT69860000	Snap ring remover	3	
5.	GEAR CARRIER			
	ST06360001	Diff. attachment	5	
	ST23510000	Solid punch	2	
	ST3003S000	Drive pinion rear inner bearing puller assembly	2	
	├ST30031000	Puller		
	└ST30032000	Base		
	ST30611000	Drive pinion outer race drift bar	2	
	ST30612000	Drive pinion outer race drift adapter	2	
	ST30613000	Drive pinion outer race drift adapter	2	
	ST30720000	Gear carrier front oil seal drift	2	
	ST3114S000	Drive pinion setting gauge assembly	2	
	├ST31141000	Arrangement gauge		
	└ST31142000	Dummy gauge		
	ST3127S000	Preload gauge *	5	
	├GG9103000	Torque wrench		
	├HT6290000	Socket adapter		
	└HT6294000	Socket adapter		
	ST31530000	Drive pinion flange wrench	2	
	ST3305S001	Diff. side bearing puller	2	
	├ST33051001	Body		
	└ST33052000	Adapter [28 mm (1.10 in) dia.]		
	ST33210000	Diff. side bearing drift	2	
	ST33290001	Gear carrier oil seal puller *	2	
	ST31190000	Preload gauge	5	

* Each tool is used for the same purpose.

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No.	Tool Number	Tool Name	Class	Reference
6.	FRONT AXLE			
	ST27700002	Strut and steering gear housing attachment	5	
	ST35300000	Front wheel bearing drift	3	
	ST35500001	Grand packing wrench	2	
	ST3565S000	Coil spring compressor	2	
	├ ST35651001	Body		
	└ ST3562000	Clamp		
	ST36700000	Transverse link replacer	3	
7.	REAR AXLE			
	ST07640000	Rear axle stand	2	
	ST36230000	Sliding hammer	5	
	ST37820000	Rear axle shaft oil seal drift	2	
	ST37840000	Rear axle shaft guide	2	
	ST38210000	Rear axle shaft bearing collar press stand	2	
	ST38300000	Snap ring pliers	5	
	HT72480000	Rear axle shaft bearing puller	2	
8.	STEERING			
	ST27700002	Strut & Steering gear box attachment	2	Same tool as for front axle
	ST27140000	Steering gear arm puller	2	
	ST27180001	Steering wheel puller	2	
	ST27850000	Steering ball joint remover	2	
9.	BRAKE			
	GG94310000	Brake pipe torque wrench	2	
	ST08060000	Master-Vac oil seal press-fit tool	3	
	ST08080000	Master-Vac wrench	3	
10.	BODY			
	ST08730000	Door adjusting wrench	1	
	ST08800000	Sucker	5	
	ST08810000	Caulking hand gun		

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Issued: October 1974 (020334)
Printed in Japan Publication No. SM5E-0710U0

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