SECTION 15

CHASSIS ELECTRICALS

INDEX

GENERAL DESCRIPTION

The chassis electrical system is designed to operate on 12 volt power supply and utilizes negative ground polarity.

A combination switch consisting of the light, turn signal, dimmer and passing light switches are installed on the right side face of the steering column while a combined windshield wiper and washer switch are provided on the left side face of the steering column for easy controlling.

Easy-to-read circular meters and large rear combination lights add to the safety of the PF series models.

WIRING

COLOR CODING OF CABLES

Color Coding

As the wiring harness includes a large number of cables to complete individual circuits, the insulator of each cable is colorcoded to prevent wrong wiring.

The alphabetical symbols in the following table represent the color of cables and the same symbols are also used in the wiring diagrams.

CLASSIFICATION / CIRCUITS IN USE	VINYL INSULATED CABLES					
STARTING MOTOR CIRCUIT	BLACK (B)	BLACK/ WHITE (BW)	BLACK/ YELLOW (BY)	BLACK/ RED (BR)		
CHARGING CIRCUIT	WHITE (W)	WHITE/ RED (WR)	WHITE/ BLACK (WB)	WHITE/ BLUE (WL)	WHITE/ YELLOW (WY)	WHITE/ GREEN (WG)
LIGHTING CIRCUIT	RED (R)	RED/ WHITE (RW)	RED/ BLACK (RB)	RED/ YELLOW (RY)	RED/ GREEN (RG)	RED/ BLUE (RL)
SIGNAL CIRCUIT	GREEN (G)	GREEN/ WHITE (GW)	GREEN/ RED (GR)	GREEN/ YELLOW (GY)	GREEN/ BLACK (GB)	GREEN/ BLUE (GL)
INSTRUMENT PANEL CIRCUITS	YELLOW (Y)	YELLOW/ RED (YR)	YELLOW/ BLACK (YB)	YELLOW/ GREEN (YG)	YELLOW/ BLUE (YL)	YELLOW/ WHITE (YW)
	BLUE (L)	BLUE/ WHITE (LW)	BLUE/ RED (LR)	BLUE/ BLACK (LB)		
OTHER CIRCUITS	BROWN/ (Br)	BROWN/ WHITE(BrW)				
	LIGHT-GREEN (Lg)	LIGHT-GREEN/ WHITE(LgW)				

NOTE: Grounding cables are black colored

The cable identification symbol consists of a figure and letters as shown in Fig. 15-1.
The figure preceding letters indicates, the size of wire while the first and second letters denote the color of background and color of trace, respectively.
The size of wire is indicated in terms of cross-sectional area as shown in the table.
The reference values given in the table are based on the environment temperature of 20 degrees centigrade as the maximum allowable current for a cable varies depending on its length, heat dissipation and length of time the current is applied.

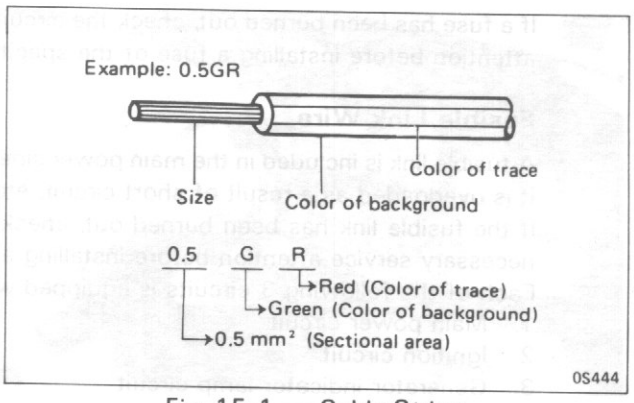


Fig. 15-1 — Cable Stripe

Size of Cable mm² (Awg)	Number of wires/ Wire diameter. mm (in.)	Resistance at normal room temperature of 20°C Ω/m	Maximum allowable Current A
0.5 (20)	7/0.32 (0.013)	0.03250	9.0
0.85 (18)	11/0.32 (0.013)	0.02050	12.0
1.25 (16)	16/0.32 (0.013)	0.01410	15.0
2 (14)	26/0.32 (0.013)	0.00867	20.0
3 (12)	41/0.32 (0.013)	0.00550	27.0
5 (10)	65/0.32 (0.013)	0.00347	37.0
8 (8)	50/0.45 (0.018)	0.00228	47.0
15 (6)	84/0.45 (0.018)	0.00136	59.0
20 (4)	41/0.80 (0.031)	0.00087	84.0
30 (2)	70/0.80 (0.031)	0.00051	120.0

FUSE CIRCUIT

Fuse Box

The fuse box includes 9 circuits which are arranged as shown in Fig. 15-2.

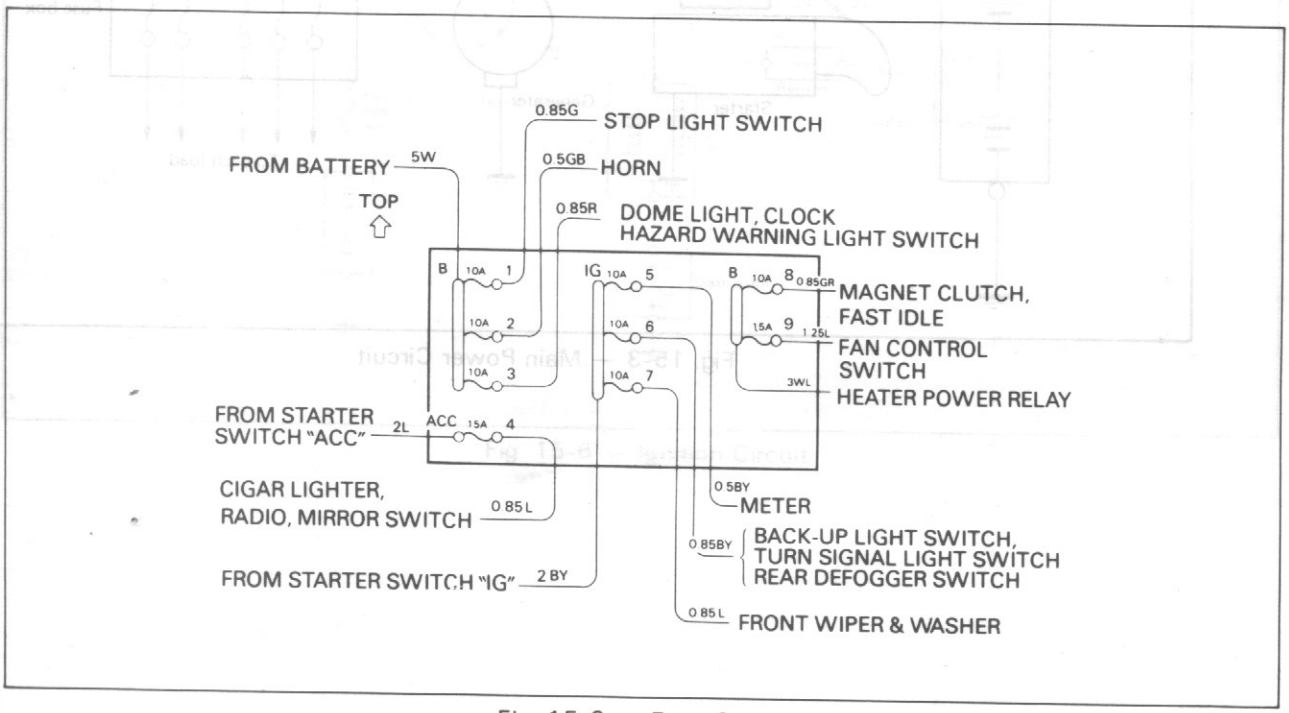


Fig. 15-2 — Fuse Chart

If a fuse has been burned out, check the circuit to establish the cause of overloading and give necessary service attention before installing a fuse of the specified amperage.

Fusible Link Wire

A fusible link is included in the main power side of the electrical circuit to protect the circuit against burning when it is overloaded as a result of short circuit, etc.

If the fusible link has been burned out, check the relative circuits to locate the cause of overloading and give necessary service attention before installing a new fusible link assembly.

Each of the following 3 circuits is equipped with fusible link wire.

1. Main power circuit.
2. Ignition circuit.
3. Generator indicator lamp circuit.

1. Main power circuit

In order to protect from excessive current through the starter circuit, generator and fuse box power source side circuit, fusible link wire has been employed.

In the case of RHD model, the fusible link wire is located at the positive terminal of the battery, while it is found at the power source side terminal of the starter in the case of LHD model.

Continuous allowable current	21A

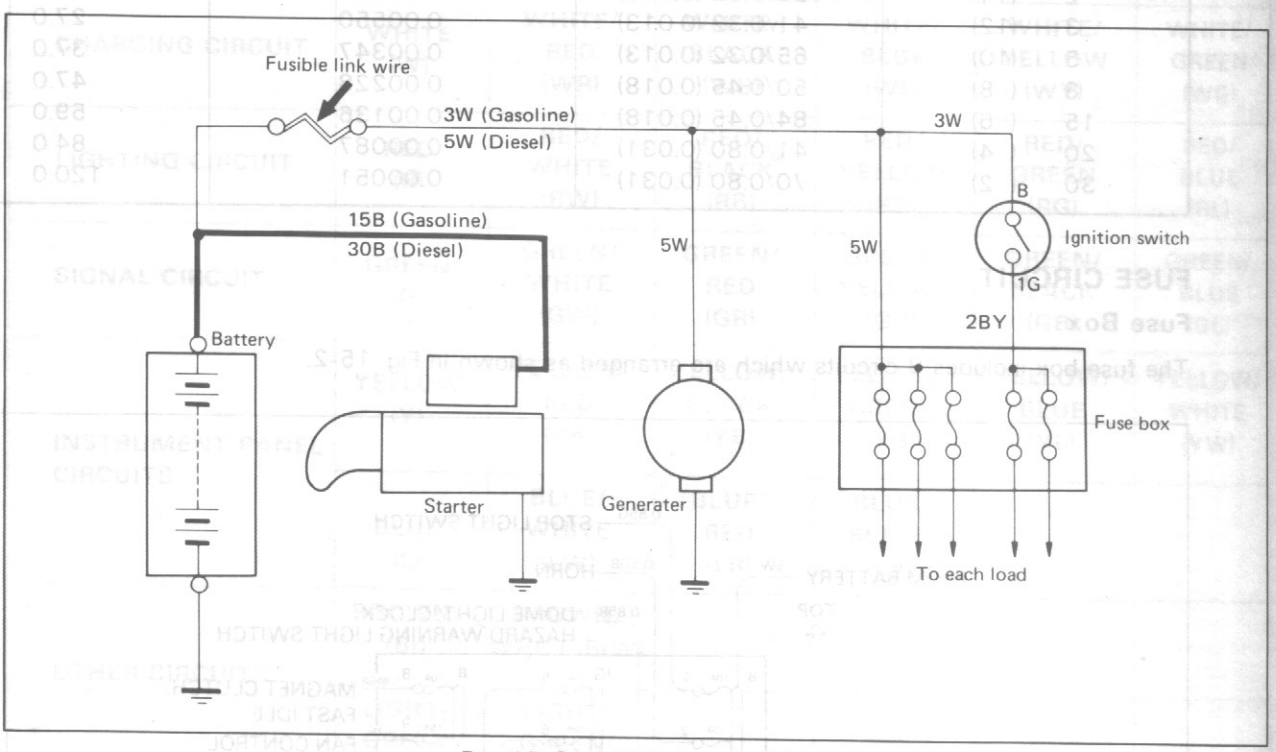


Fig. 15-3 — Main Power Circuit

2. Ignition circuit
Fusible link wire is used in lieu of fuse for the ignition circuit, fuel pump circuit, and regulator (IG) circuit in order to provide improved reliability.
This fusible link wire has been placed on the rear of the right hand side of the engine compartment.

Continuous allowable current	13A

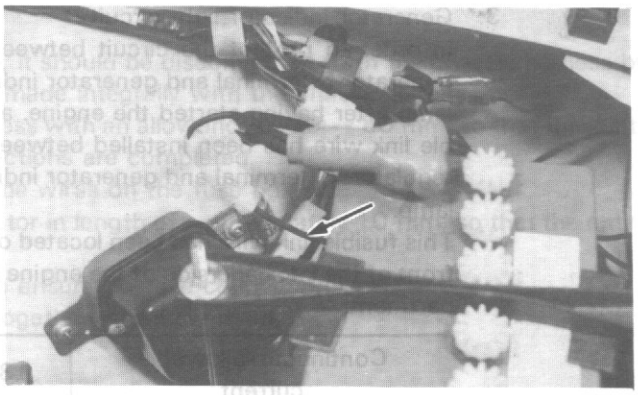


Fig. 15-4 — Fusible link wire (Main Power Circuit, Gasoline RHD)

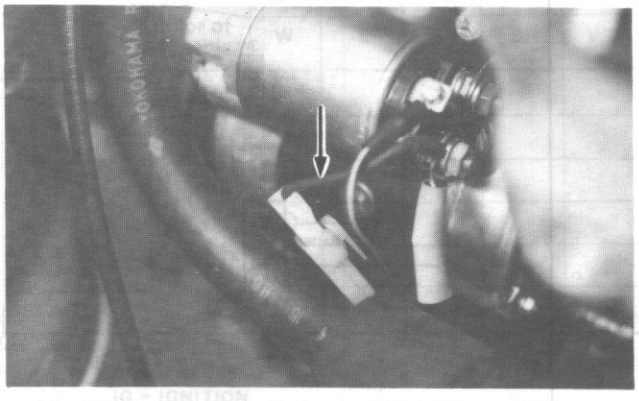


Fig. 15-5 — Fusible link wire (Main Power Circuit, Gasoline LHD)

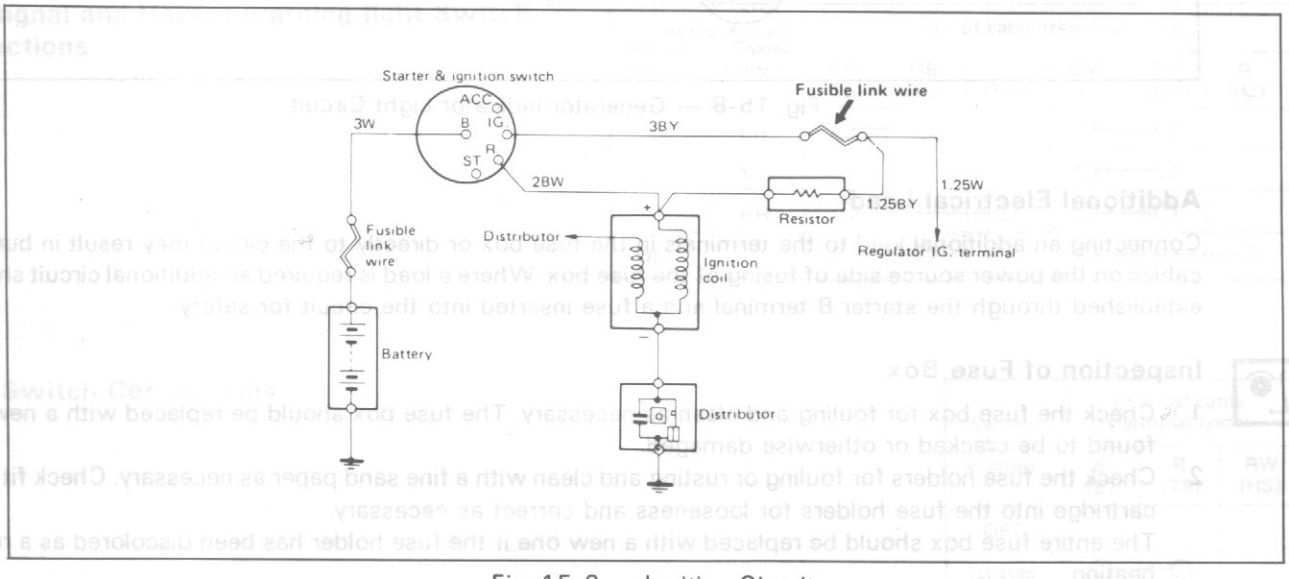


Fig. 15-6 — Ignition Circuit

3. Generator indicator light circuit
In order to protect the circuit between the generator B terminal and generator indicator lamp after having started the engine, a fusible link wire has been installed between the regulator W terminal and generator indicator lamp.
This fusible link wire has been located on the front of the left hand side of the engine compartment.

Continuous allowable current	13A

Fig. 15-7 — Fusible link wire (Ignition Circuit, Gasoline RHD/LHD)

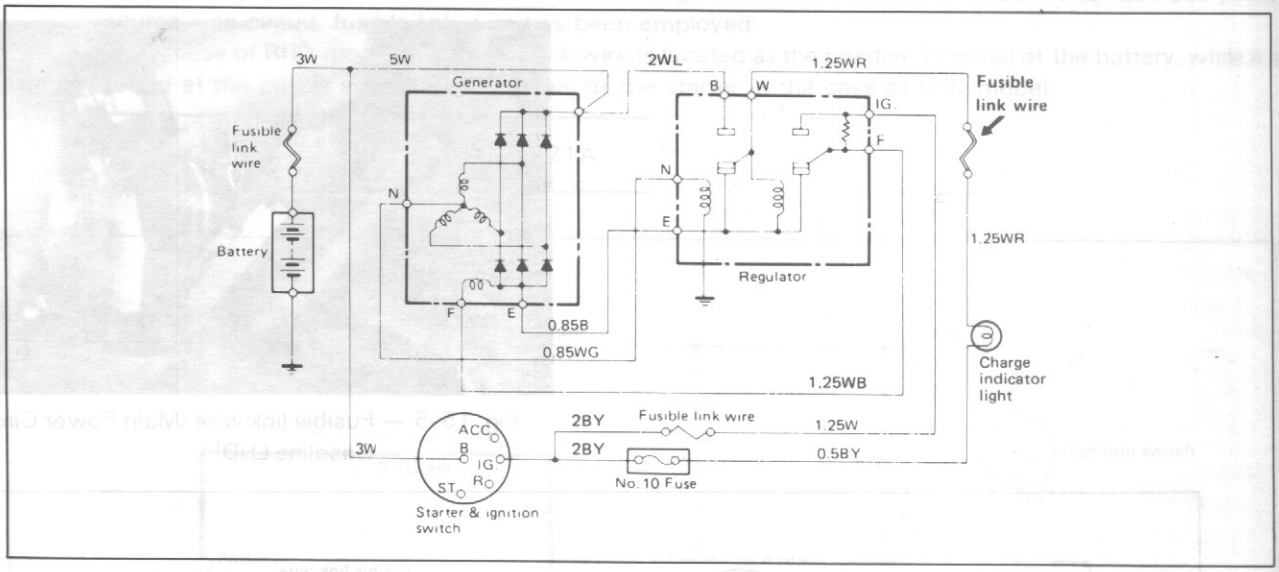


Fig. 15-8 — Generator Indicator Light Circuit

Additional Electrical Load

Connecting an additional load to the terminals in the fuse box or directly to the circuit may result in burning of cables on the power source side of fusing of the fuse box. Where a load is required an additional circuit should be established through the starter B terminal and a fuse inserted into the circuit for safety.

Inspection of Fuse Box

1. Check the fuse box for fouling and clean as necessary. The fuse box should be replaced with a new one if found to be cracked or otherwise damaged.
2. Check the fuse holders for fouling or rusting and clean with a fine sand paper as necessary. Check fit of fuse cartridge into the fuse holders for looseness and correct as necessary.
The entire fuse box should be replaced with a new one if the fuse holder has been discolored as a result of heating.

Replacement of Fuse Box

When replacing the fuse box assembly with a new one, it should be disconnected from the chassis harness by cutting the cables at a point near the fuse box as it is made integrally with the chassis harness.

1. Cut off wires extending from the fuse box and harness with an allowance of 70 — 80 mm, so that the joints of the adjacent wires are not lined up when connections are completed.
2. Cut off wires extending from the harness to suit the wires on the fuse box side. Connect the wires one at a time by removing insulator in length of approximately 10 mm, so that the entire wires are equally tensioned.
3. When the wires are connected, solder the joints to ensure positive connections.
4. Tape the individual joints, then fasten the cables together with tape neatly.

SWITCH CONNECTIONS

Ignition and Starter Switch Connections

Key Position \ Terminal code / Color of cable		B W	ACC L	IG BY	R BR	ST WB
Lock	Removed					
	Inserted					
OFF						
ACC		○—○				
ON		○—○	○—○			
START		○—○	○—○	○—○	○—○	

B = BATTERY
ACC = ACCESSORIES
IG = IGNITION
R = RUN
ST = START

Turn signal and Hazard warning light Switch Connections

Hazard Switch	Turn Switch	Color of cable (terminal code) GW (TB)	GB (TL)	GL (TR)	GY (F)	BY (B1)	G (B2)
OFF	LH	○—○			○—○		
	N				○—○		
	RH	○—○		○—○	○—○		
ON		○—○	○—○	○—○	○—○	○—○	

Light Switch Connections

Switch Knob Position	Color of cable (terminal code) B (E)	R (TS)	RW (HS)
OFF			
1st step	○—○		
2nd step	○—○	○—○	

Dimmer/Passing Light Connections

Lever Position	Color of cable (terminal code)		
	B (E)	RL (HU)	RW (HS)
Upper	○——	——○	
Lower			
Passing	○——	——○	——○

Heater and Air Conditioner Fan Control Switch Connections

Switch Knob Position	Color of cable (terminal code)					
	L (B)	LW (L)	LY (M1)	LR (M2)	LB (H)	G (A/C)
1	○——	——○				
2	○——		——○			
3	○——			——○		
4	○——				——○	
A/C	○——					——○

Windshield Wiper and Washer Switch Connections

Switch Knob Position	Color of cable (terminal code)						
	LY (HI)	LW (LO)	LR (AS)	(INT)	(INT)	L (B)	LB (SW)
OFF		○——	——○			○- - - -	- - - -○
INT		○——	——○	○——	——○	○- - - -	- - - -○
LO		○——				○- - - -	- - - -○
HI	○——					○- - - -	- - - -○

Press the switch knob

Inhibiter Switch Connection (A/T Model only)

Shift Lever Position	Color of cable (terminal code)			
	BL (P1)	B (P2)	RB (R1)	RL (R2)
P, N	○——	——○		
R			○——	——○
D, 2, 1				

WIRING DIAGRAM (PF50, PF60 RHD MODEL)

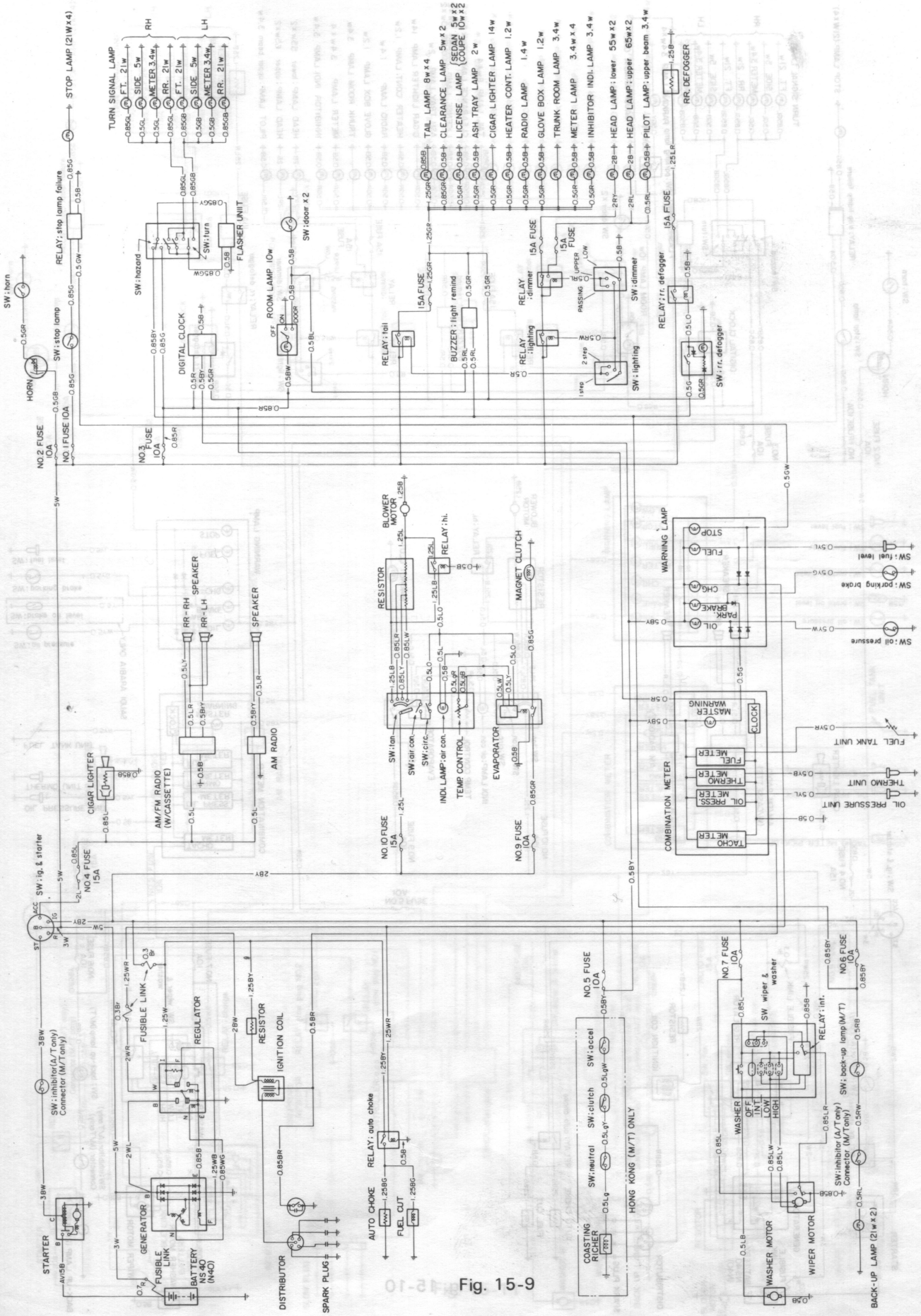


Fig. 15-9

WIRE HARNESS ROUTING (RHD MODEL)

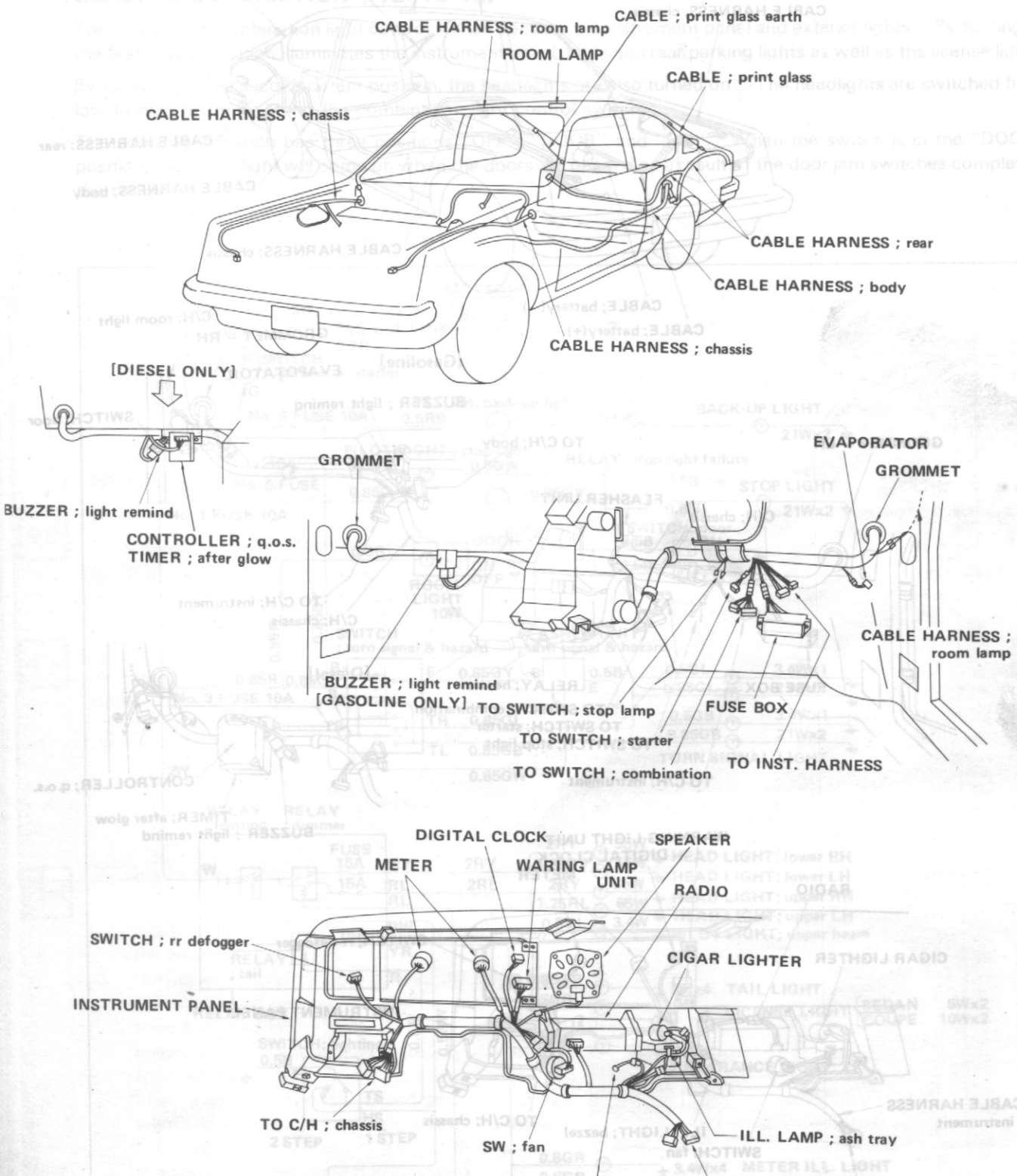


Fig. 15-13

LIGHTS

GENERAL DESCRIPTION (FIG. 15-15)

The function of combination light control switch controls the instrument panel and exterior lights. By turning to the first detent position illuminates the instrument panel, front and rear parking lights as well as the license lights.

By turning it to the second detent position, the headlights are also turned on. The headlights are switched from low to high beam by lifting the combination light control switch.

The dome light switch has three positions "OFF", "DOOR" and "ON". When the switch is in the "DOOR" position, the dome light will come on when the doors are opened as a result of the door jam switches completing the circuit.

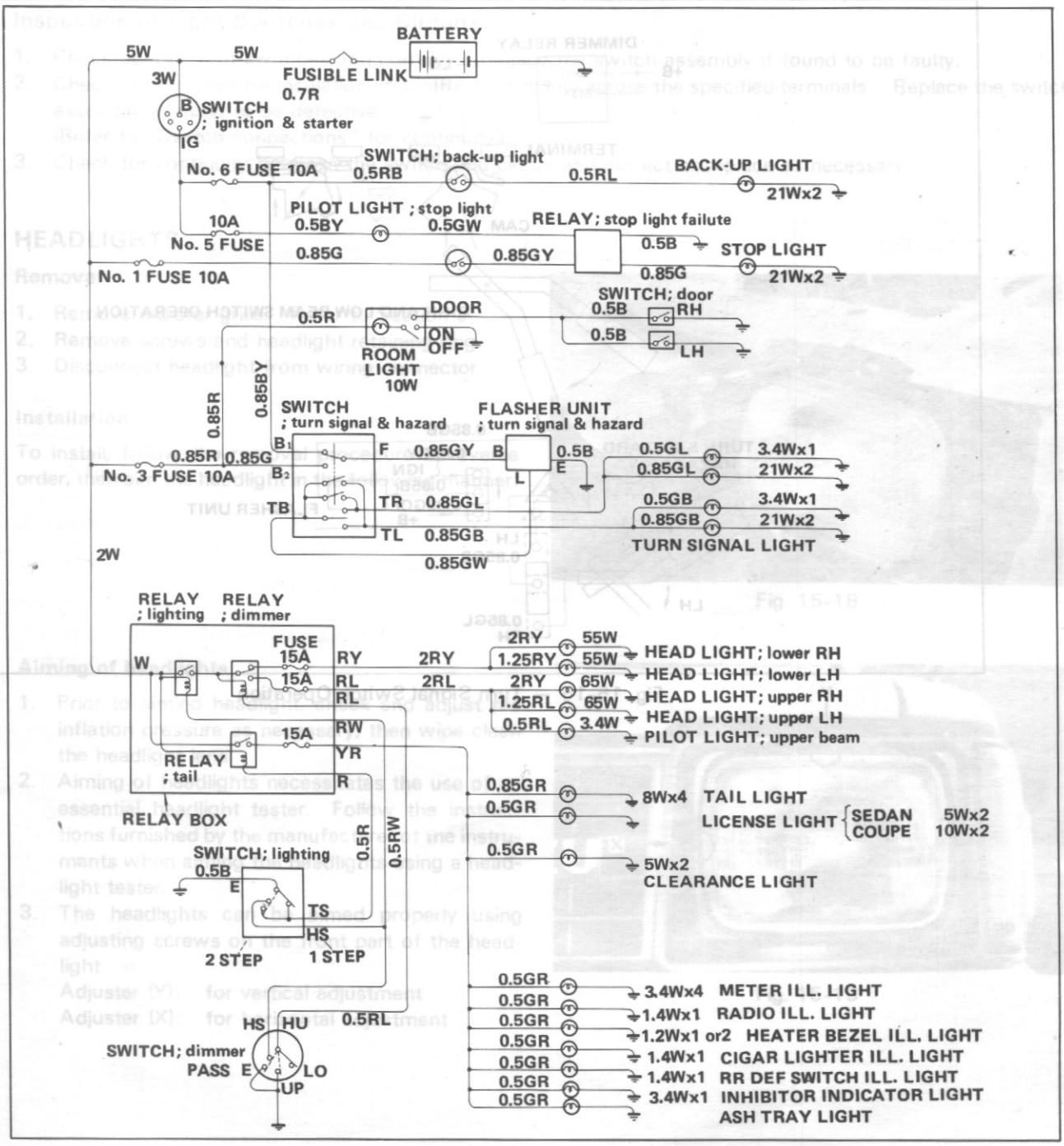


Fig. 15-15 — Lighting System Controls

COMBINATION SWITCH

— Light control switch, windshield wiper and washer control switch and Hazard Warning Switch —

Removal

1. Disconnect battery ground cable.
2. Remove steering wheel. Refer to steering wheel removal.
3. Remove screw retaining the upper and lower column covers.
4. Disconnect electrical connections.
5. Remove the combination switch by removing the retaining screws.

Installation

To install, follow the removal procedure in reverse order.

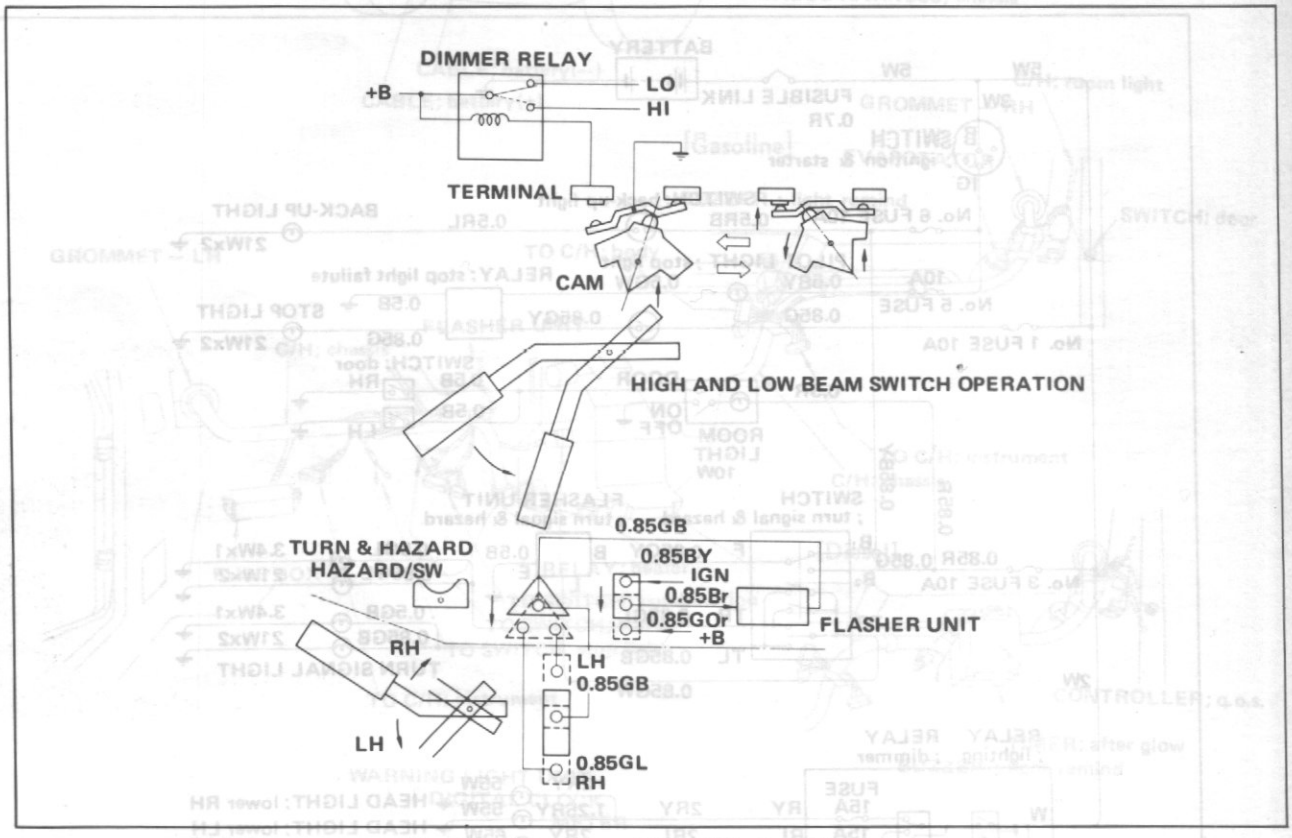


Fig. 15-16 — Turn Signal Switch Operation

Removal of room light

1. Pry off the lens carefully by inserting a screw driver into the slot in the light housing.
2. Remove the three screws fixing the light housing and remove the housing.

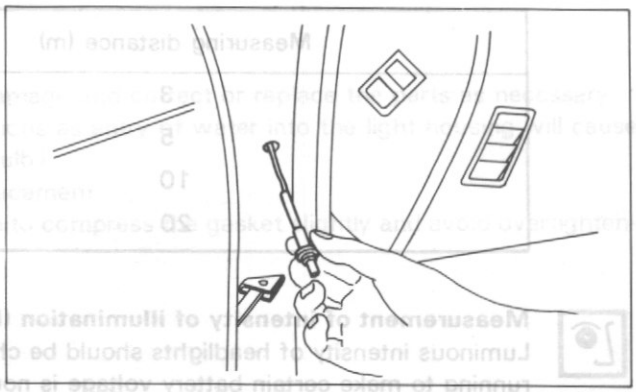


Fig. 15-17

Removal of Door Switch

1. Remove the switch assembly by using the wrench.
2. Disconnect the lead wire from the switch.

Installation

To install, reverse the removal procedure.

Inspection of Light Switches and Circuits

1. Check operation of switches and correct or replace the switch assembly if found to be faulty.
2. Check the switches for insulation and make a continuity across the specified terminals. Replace the switch assembly if found to be defective.
   (Refer to "Switch connections" for continuity.)
3. Check for continuity between the switch and circuit and correct or replace as necessary.

HEADLIGHTS

Removal

1. Remove radiator grille. Refer to Section 3.
2. Remove screws and headlight retaining ring.
3. Disconnect headlight from wiring connector.

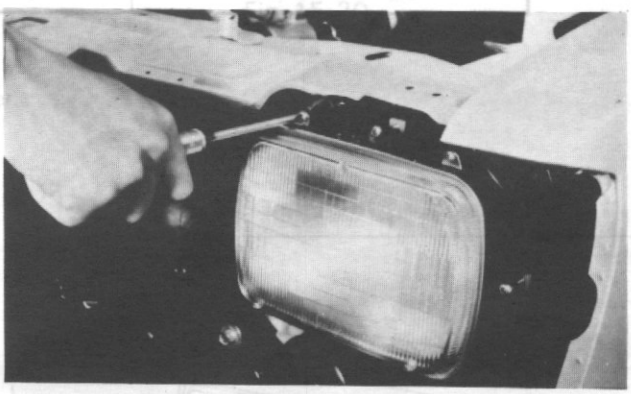


Fig. 15-18

Installation

To install, follow the removal procedure in reverse order, then aim the headlight in the following manner:

Aiming of headlights

1. Prior to aiming headlight, check and adjust tire inflation pressure as necessary, then wipe clean the headlight lens.
2. Aiming of headlights necessitates the use of an essential headlight tester. Follow the instructions furnished by the manufacturer of the instruments when aiming the headlights using a headlight tester.
3. The headlights can be aimed properly using adjusting screws on the front part of the headlight.
   Adjuster (Y): for vertical adjustment
   Adjuster (X): for horizontal adjustment

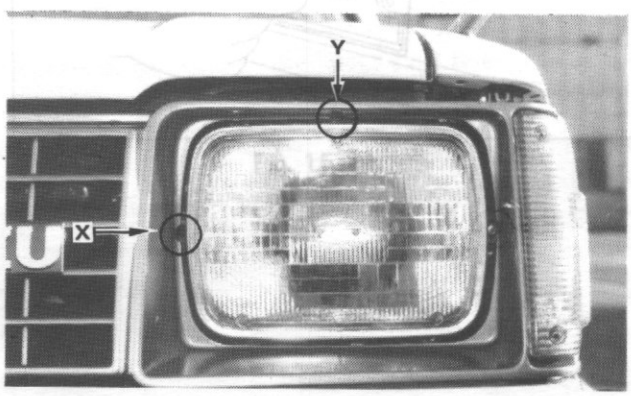


Fig. 15-19

Measuring distance (m)	Direction of main beam (mm)
3	10
5	32
10	64
20	160

Measurement of intensity of illumination (Luminous intensity)

Luminous intensity of headlights should be checked, when aiming is completed, using a tester with the engine running to make certain battery voltage is normal.

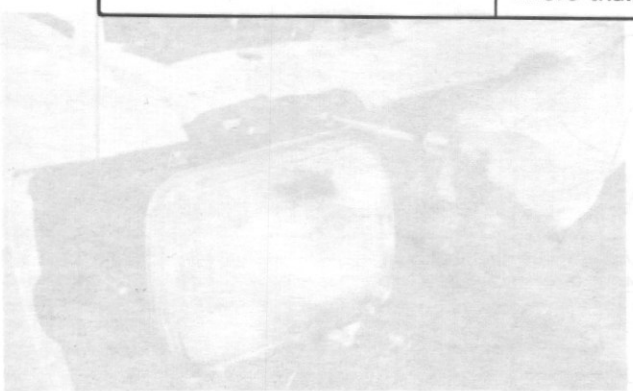
NOTE: Relationship between luminous intensity and intensity of illumination. Luminous intensity is measured at the source of light and is represented in terms of candella (cd).

Intensity of illumination is the brightness an object receives and is represented in terms of lux (LX).

The relationship between luminous intensity and intensity of illumination can be represented by the following formula:

$$\text{Intensity of illumination (LX)} = \frac{\text{Luminous intensity (cd)}}{\text{Distance (m)}^2}$$

Dual headlight inspection standard (Per signal headlight)	Luminous intensity (Candela)	Intensity of illumination at a point 3 meters ahead (Lux)
	More than 15,000 (cd)	More than 1,666 (LX)



OTHER LIGHTS

General Precautions

1. Check the lights for distortion, cracks, fouling or damage and correct or replace the parts as necessary. (Check seals and drain holes for damage or restrictions as entry of water into the light housing will cause rusting of socket and resting damage to the light bulb.)
2. Always use bulbs of the specified wattage for replacement.
3. When installing the lens, tighten screws just enough to compress the gasket slightly and avoid overtightening, cracking or damage to the lens will result.

Front Clearance Lights.

Removal

1. Remove two screws fixing the lens and remove the lens.
2. Remove bulb from the socket by pushing it in and turning it counter-clockwise.

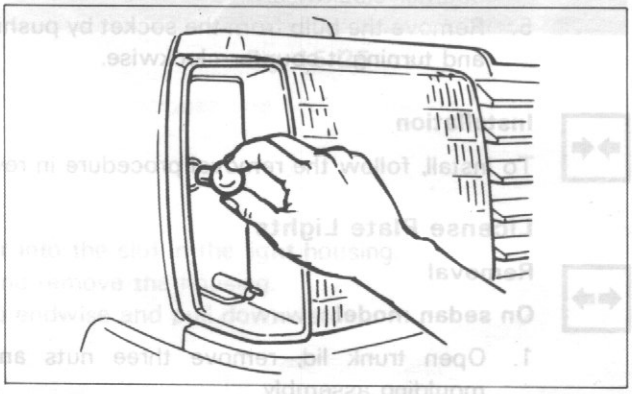


Fig. 15-20

Installation

To install, follow the removal procedure in reverse order.

Front Turn Signal Lights

Removal

1. Remove two screws fixing the lens and remove the lens.
2. Remove bulb from the socket by pushing it in and turning it counter-clockwise.

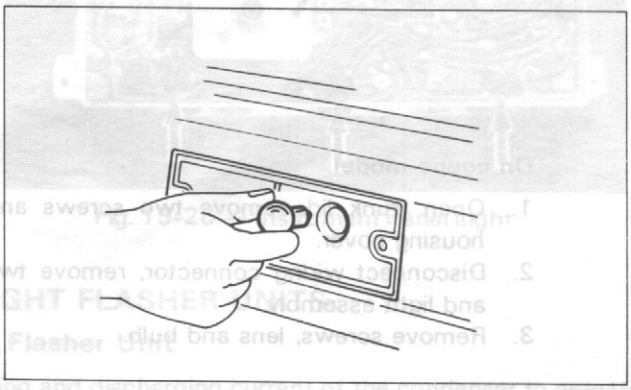


Fig. 15-21

Installation

To install, follow the removal procedure in reverse order.

Rear Combination Lights

Removal

1. Open the luggage compartment lid and take out the two screws fixing the light housing cover, then remove the cover.
2. Remove the nuts fixing the light housing.
3. Disconnect the wiring at the connector and remove the light assembly toward outside of luggage compartment.
4. To replace the bulb, remove the socket on the rear face of the light housing by turning it counter-clockwise.
5. Remove the bulb from the socket by pushing it in and turning it counter-clockwise.

Fig. 15-22

Installation

To install, follow the removal procedure in reverse order.

License Plate Lights

Removal

On sedan model

1. Open trunk lid, remove three nuts and rear moulding assembly.
2. Remove three screws and light holder from mounding.
3. Remove two screws, lens and bulb.

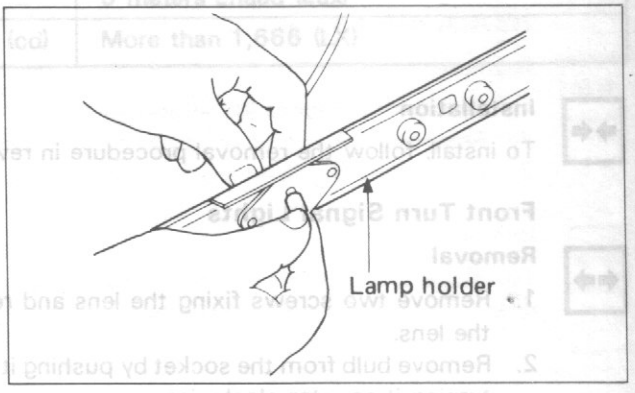


Fig. 15-23

On coupe model

1. Open trunk lid, remove two screws and light housing cover.
2. Disconnect wiring connector, remove two nuts and light assembly.
3. Remove screws, lens and bulb.

Installation

To install, reverse the removal procedure.

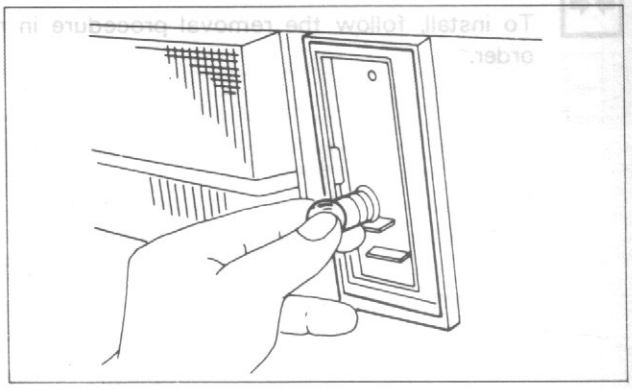


Fig. 15-24

Side Turn Signal Lights

1. Remove two screws fixing the lens and remove the lens.
2. Pull out the bulb.

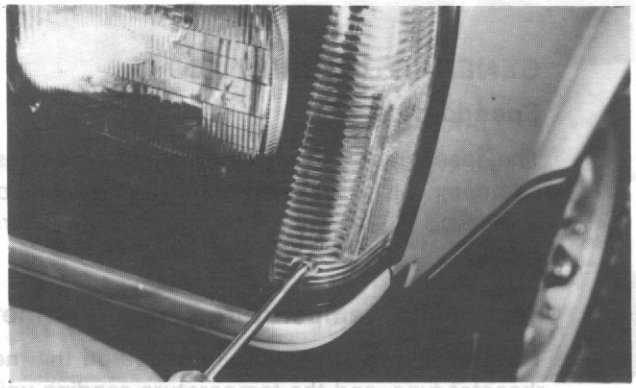


Fig. 15-25

1. To install, reverse the removal procedure.

Room Light

1. Pry off the lens carefully by inserting a screw driver into the slot in the light housing.
2. Remove the three screws fixing the light housing and remove the housing.
3. To replace the bulb, remove the lens and push bulb endwise and pull downward.
   To install, reverse the removal procedure.

Instrument Panel Light

1. Remove instrument panel assembly.
   Refer to Section 3.
2. Turn the bulb attaching knob, then pull it off.
3. Reverse procedure for installation.

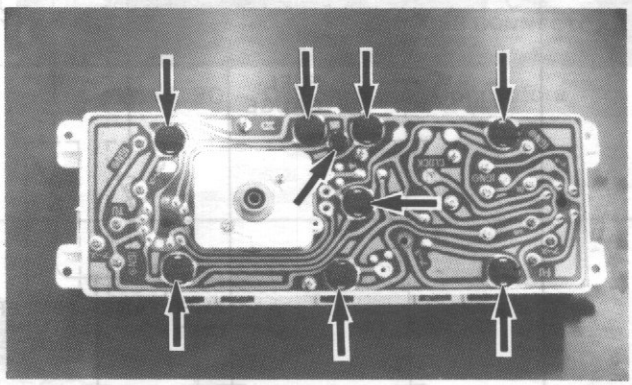


Fig. 15-26 — Instrument Panel Light

TURN SIGNAL AND HAZARD WARNING LIGHT FLASHER UNITS

Construction and Operation of Condenser Type Flasher Unit

The condenser type flasher unit makes use of the charging and discharging current of the condenser to actuate the relay thereby causing the turn signal lights to flash.
The condenser type flasher unit operates on the following illustration.

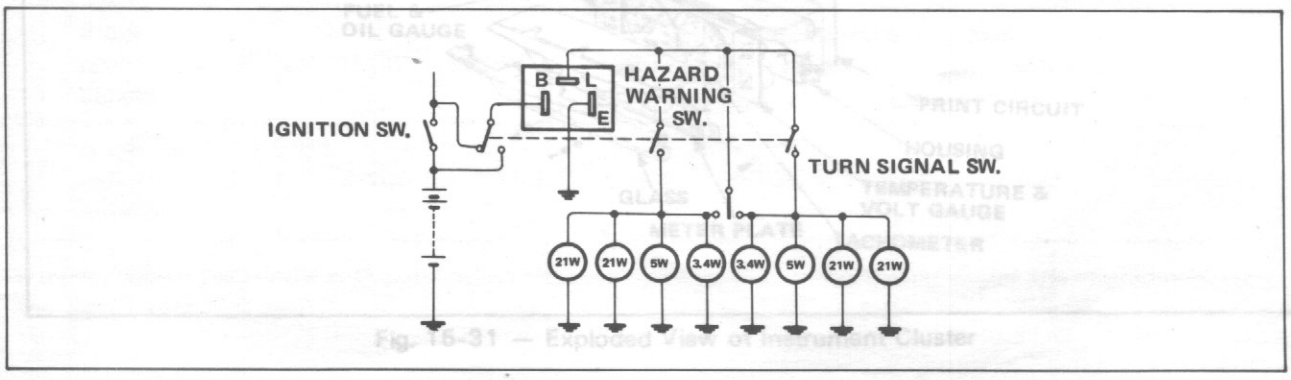


Fig. 15-27

INSTRUMENTS

GENERAL DESCRIPTION

Speedometer

The speedometer is a rotary magnet type consisting of a magnet with shaft, rotor, hair spring, dial needle and odometer. It is designed to indicate a speed of 60 Km/h (60 MPH) when the speedometer cable is rotating at 637 rpm (1026 rpm). The odometer registers 1 Km (1 mile) for every 637 (1026) turns of the speedometer cable.

Fuel gauge, temperature gauge, voltmeter and oil pressure gauge

The fuel and the temperature gauge on the meter side are of air cored type. The fuel tank sending unit is of rheostat type, and the temperature sending unit is of thermistor type. Then the voltmeter and the oil pressure gauge are combined to those gauges. The voltmeter is of moving magnetic type.
the oil pressure gauge and sending unit are of bi-metal type.

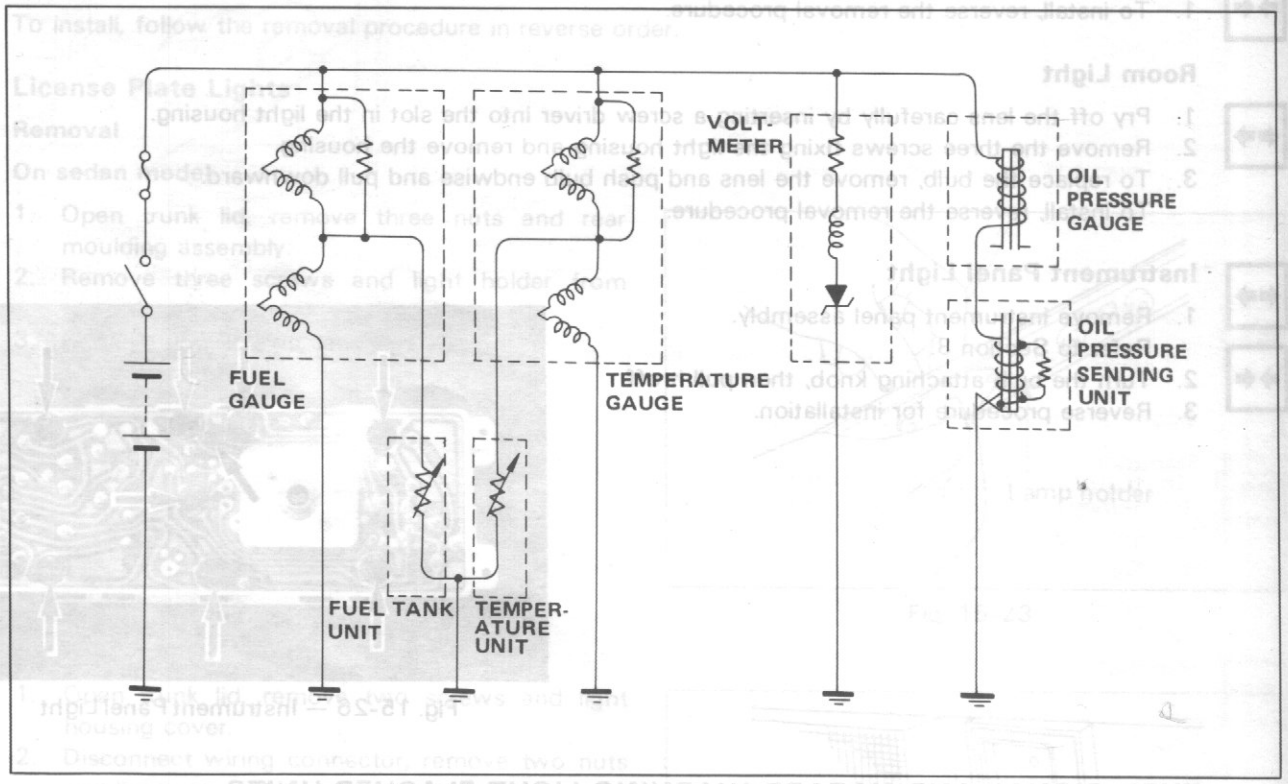


Fig. 15-28 — Combination Fuel - Temperature Gauge

COMPONENT REPLACEMENT AND REPAIR

Instrument cluster removal

1. Disconnect ground cable from battery.
2. Remove cluster panel.
3. Remove instrument cluster attaching screws.

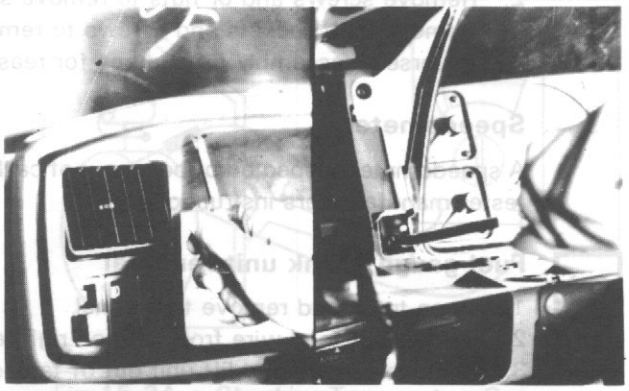


Fig. 15-29 — Removing Cluster Screws

4. Rotate cluster assembly outward, disconnect the round 6 and 12 pole connectors and speedometer cable.
5. Reverse removal procedures for installation.

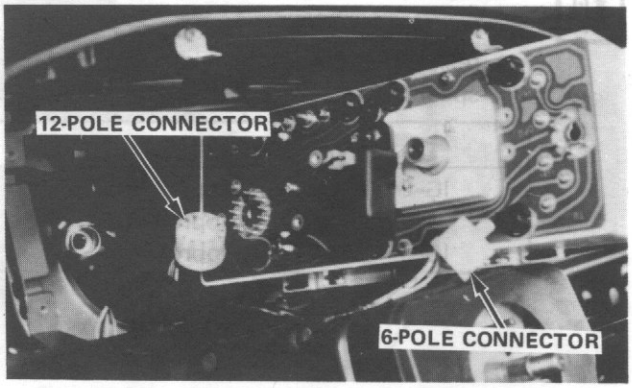


Fig. 15-30 — Disconnecting Connectors

Instrument cluster disassembly

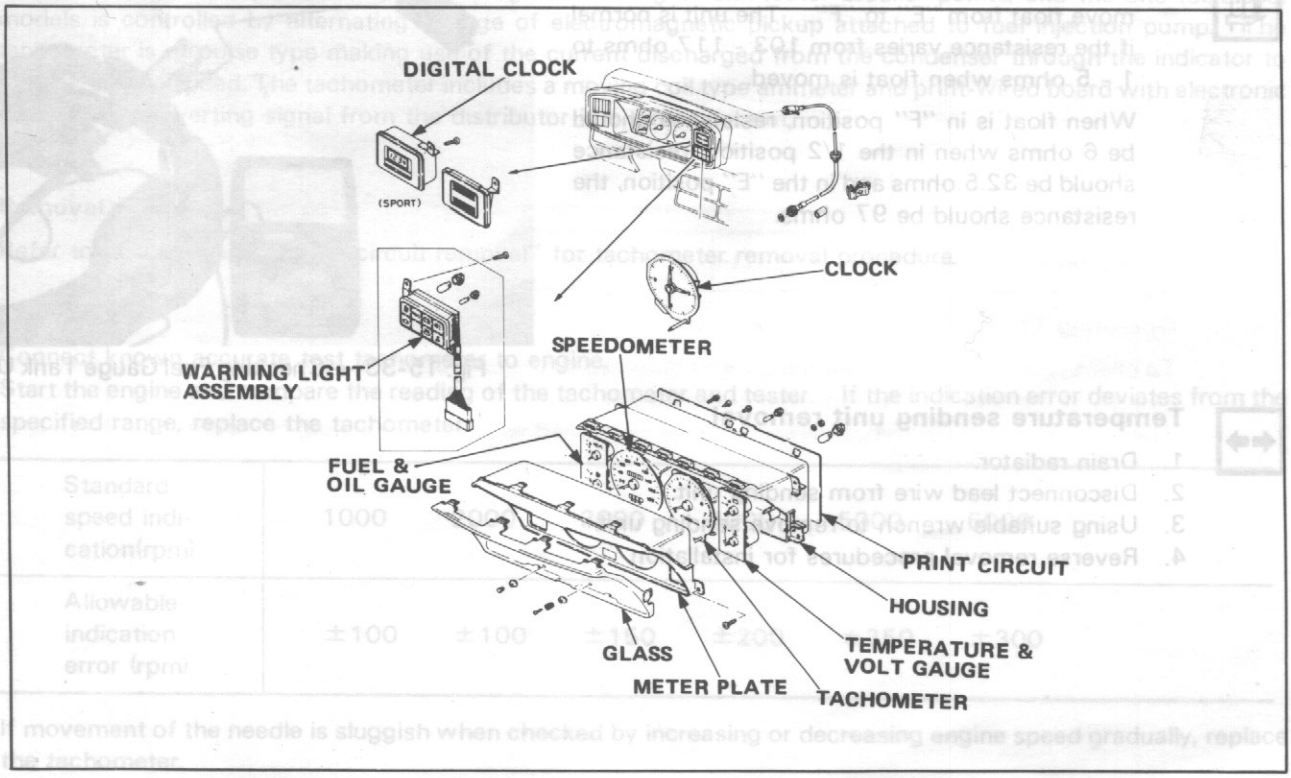


Fig. 15-31 — Exploded View of Instrument Cluster

1. Bend hooks of bezel and separate bezel from housing.
2. Remove screws and or nuts to remove speedometer and or gauges.
3. Remove bulb sockets and screws to remove printed circuit.
4. Reverse disassembly procedures for reassembly.

Speedometer

A speedometer suspected of being out of calibration should be checked with a speedometer tester following the tester manufacturers instructions.

Fuel gauge - tank unit removal

1. Open trunk and remove trim panel.
2. Disconnect feed wire from unit on right end of tank.
3. Remove screws and lift unit out of tank so as not to bend float arm.
4. Reverse removal procedures for installation.

Fuel gauge

1. Measure fuel gauge resistance as shown. If the resistance values deviate greatly from the specified values, replace the gauge assembly.

	Resistance (Ω)
IG-U	Approx. 102
U-E	Approx. 102
IG-E	Approx. 204

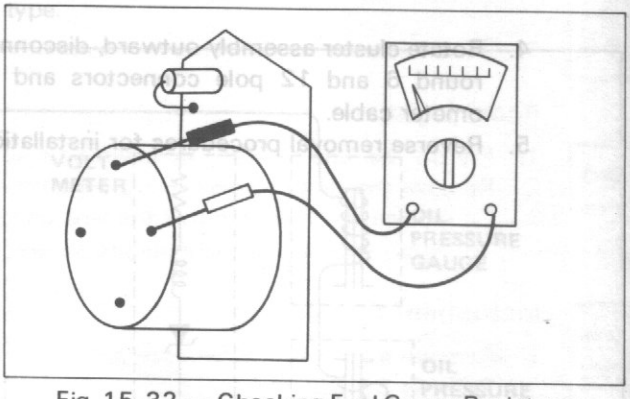


Fig. 15-32 — Checking Fuel Gauge Resistance

Fuel tank unit

1. Connect ohmmeter to tank unit as shown and move float from "E" to "F". The unit is normal if the resistance varies from 103 - 117 ohms to 1 - 5 ohms when float is moved.

   When float is in "F" position, resistance should be 6 ohms when in the 1/2 position, resistance should be 32.5 ohms and in the "E" position, the resistance should be 97 ohms.

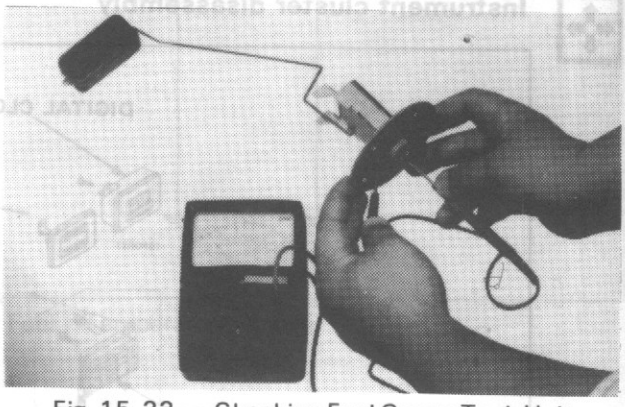


Fig. 15-33 — Checking Fuel Gauge Tank Unit

Temperature sending unit removal

1. Drain radiator.
2. Disconnect lead wire from sending unit.
3. Using suitable wrench to remove sending unit.
4. Reverse removal procedures for installation.

Temperature gauge

1. Measure temperature gauge resistance across terminals should be 55 ohms. Replace temperature gauge if measured values deviate greatly.

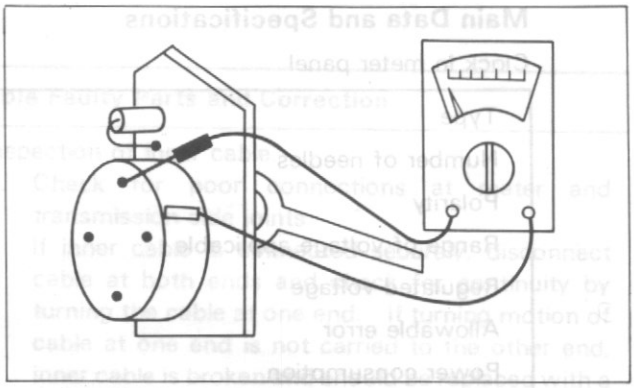


Fig. 15-34 — Checking Temperature Gauge Resistance

Temperature sending unit

1. Measure temperature gauge resistance across terminals. Replace temperature gauge if measured values deviate greatly.

	Resistance (Ω)
IG-U	Approx. 90
U-E	Approx. 158
IG-E	Approx. 248

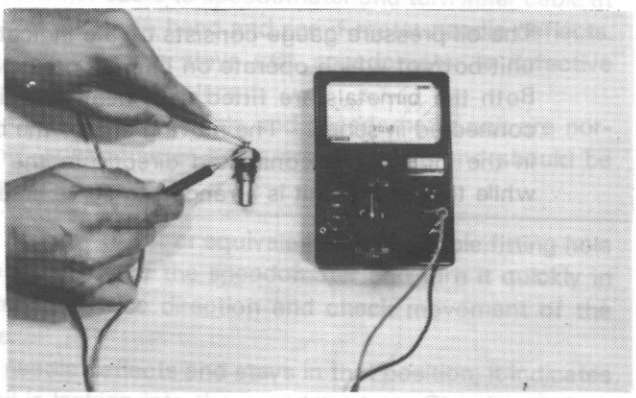


Fig. 15-35 — Checking Sending Unit Resistance

Tachometer (If so equipped)

The tachometer consists essentially of a transistorized condenser circuit. The transistorized condenser circuit for gasoline models is controlled by opening and closing of distributor breaker points, and the one for diesel models is controlled by alternating voltage of electromagnetic pickup attached to fuel injection pump. The tachometer is of pulse type making use of the current discharged from the condenser through the indicator to register engine speed. The tachometer includes a moving coil type ammeter and print-wired board with electronic circuits for converting signal from the distributor into direct current.

Removal

Refer to "Gauges and printed circuit removal" for tachometer removal procedure.

Inspection

Connect known accurate test tachometer to engine.
Start the engine and compare the reading of the tachometer and tester. If the indication error deviates from the specified range, replace the tachometer.

Standard speed indication(rpm)	1000	2000	3000	4000	5000	6000
Allowable indication error (rpm)	±100	±100	±150	±200	±250	±300

If movement of the needle is sluggish when checked by increasing or decreasing engine speed gradually, replace the tachometer.

CLOCK (OPTIONAL PARTS)

Main Data and Specifications

Clock in meter panel

Type	Micro DC motor driven type
Number of needles	3 (hours, minutes, seconds)
Polarity	Negative (—) ground
Range of voltage applicable	DC 11 — 13V
Regulated voltage	DC 13V
Allowable error	Within ±1 minute/day (at DC 13V)
Power consumption	Less than 30 mA (at DC 13V)

OIL PRESSURE GAUGE (OPTIONAL PARTS)

The oil pressure gauge consists of the indicator and unit both of which operate on bimetal principle. Both the bimetals are fitted with heat wire and are connected in series. The moving end of the bimetal in the indicator is connected directly to the needle while that in the unit is arranged to serve as a point.

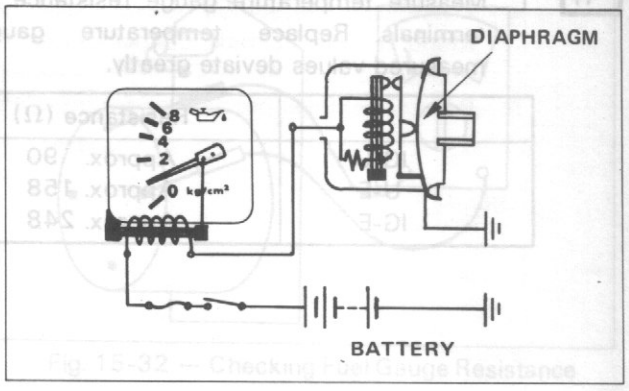


Fig. 15-36

Inspection

1. Inspection of oil pressure gauge unit
   Disconnect wiring from the unit and apply battery current to the unit terminal via a 3.4W bulb. If the bulb remains out when the engine is stationary but begins to flash when the engine is started and flashing rate increases with engine speed, the unit is normal. Replace the unit if found to be defective.
2. Inspection of gauge
   Check the resistance across the gauge terminals. If the measured value deviates greatly from the specified range, replace the gauge.

Oil pressure gauge resistance (Ω)	Approx. 40

Operating Test

To check meter indication with the gauge combined to the unit, connect a pressure gauge and take reading of the gauges at the specified speeds and compare the values.
The indication error of the oil pressure gauge combined with the unit should be held within the range equivalent to the width of the needle.

DIAGNOSIS

Speedometer

Complaint	Possible Faulty Parts and Correction
Speedometer needle inoperative.	(1) Inspection of inner cable. 1. Check for poor connections at meter and transmission side joints. 2. If inner cable is connected securely, disconnect cable at both ends and check for continuity by turning the cable at one end. If turning motion of cable at one end is not carried to the other end, inner cable is broken and should be replaced with a new one. (2) If inner cable is found to be in normal condition, connect inner cable to speedometer and turn inner cable at other end with hand and see if meter needle deflects. If meter needle stays still, speedometer is defective and should be replaced. (3) If both the inner cable and speedometer unit are normal, speedometer gears are defective and should be replaced.
Movement of needle is sluggish an does not return to zero position when decelerated.	Insert a screw driver or equivalent into the cable fitting hole in the rear face of the speedometer and turn it quickly in counter clockwise direction and check movement of the needle. If the needle deflects and stays in that position, it indicates that oil is leaking into the speedometer. Clean or replace the speedometer and cable.
Speedometer needle dances or it does not deflect beyond a certain point.	1. Check flexible shaft for sharp kinks or deformation and correct or replace with a new one as necessary. 2. If the speedometer cable is normal, the speedometer unit is defective and should be corrected or replaced.
Odometer inoperative.	Odometer is defective and should be corrected or replaced.
Speedometer indication erratic.	Check accuracy of speedometer using a speedometer tester.

Fuel Gauge and Temperature Gauge

Complaint	Possible Faulty Parts	Correction
	1. Unit defective.	Measure the internal resistance of unit, using a circuit tester. If the measured value deviates greatly from the specified range, unit is defective and should be replaced.
	2. Circuit between gauge and unit shorted.	Turn on ignition switch with lead wire disconnected from the unit and check meter indication. If gauge needle deflects, gauge circuit is shorted and should be corrected or replaced.
Gauge needle inoperative.	1. Gauge unit defective.	Turn ignition switch with a voltmeter connected between secondary terminal of voltage regulator and ground. If gauge needle remains still, voltage regulator is defective and should be replaced together with fuel gauge.
	2. Gauge defective.	Measure the internal resistance of the gauge using a circuit tester. If the measured value deviates greatly from the specified range, the gauge is defective and should be replaced.
	3. Circuit defective.	Check circuit for loose connectons and correct as necessary.
Gauge indicator erratic.	1. Gauge unit defective.	If indication of either fuel gauge or temperature gauge is erratic, the unit is defective and should be replaced with a new one.
	2. Circuit defective.	Check circuit for loose connections and correct as necessary.
Gauge Indication inaccurate	1. Gauge or unit defective.	If indication of either the fuel gauge or temperature gauge is incorrect, either the gauge or unit is at fault. Make a test using units that are know to be accurate. If the gauge indication is still incorrect, the gauge is defective and should be replaced.

Turn signal light circuit

Complaint	Inspection and Correction
Lights remain on and do not flash.	1. Check circuit for open or poor connections and correct as necessary. 2. If light bulbs and wiring are normal, flasher unit is defective and should be replaced.
Lights on one side inoperative.	If wiring is normal, turn signal switch is defective. Disconnect switch wiring at connector and make a continuity test across terminals with the lever set in position of ON. If no continuity exists across specified terminals, switch is defective and should be replaced.
Entire lights inoperative.	1. Operate switch lever with flasher unit B and L terminals shorted. If lights turn on, flasher unit is defective. 2. If lights do not turn on, either switch or circuit is faulty. 3. Short out the Hazard switch terminals GW and GB with the terminals B and L shorted. If lights turn on, hazard warning light switch is defective. 4. Flasher unit poorly grounded (applicable to NIPPON DENSO unit only).
Flashing rate too high or too low	1. Check to see if light bulbs are of specified wattage. If light bulbs are normal, flasher unit is defective. 2. Check light circuit for poor grounding. Excessive load will cause flashing rate to increase. Flashing rate: 60 - 120/min. 3. Check light bulbs (21W). If bulb burnt, flashing rate will be increase over 120/min.

Stop light switch

Complaint	Cause	Correction
Stop lights inoperative.	1. Fuse or bulb filament burned out.	Replace fuse or bulb.
	2. Circuit open or poorly connected.	Correct.
	3. Stop light switch defective or stroke poorly adjusted.	Replace switch or correct.
Light on one side inoperative.	1. Bulb filament burned out.	Replace bulb.
	2. Circuit open or poorly connected.	Correct.
Lights remain on and do not go out.	Switch defective or stroke poorly adjusted.	Replace switch or correct.

Oil pressure indicator light

Complaint	Cause	Correction
Indicator light does not go on when ignition switch is turned on.	1. Fuse burned out	Replace fuse.
	2. Bulb filament burned out or circuit poorly connected.	Replace bulb or correct.
	3. Wiring between switch and light or between light and fuse box broken, or poor connections.	Correct.
	4. Pressure switch defective. Make a continuity test across pressure switch terminal and body with load removed.	Replace pressure switch.
Indicator light remains on with no trouble in the lubricating system	1. Circuit shorted. Make a test with wires disconnected at pressure switch side. If light remains on, it indicates that circuit between light and pressure switch is shorted.	Correct.
	2. Pressure switch defective.	Replace pressure switch.
	3. Engine trouble. If a cause of trouble cannot be found through checks 1. and 2. above, the cause of trouble lies within the engine.	Refer to Section 3 of Gasoline engine (G180Z) workshop manual or Section 6 of Diesel engine (4FB1) workshop manual.

Back-up light switch

Complaint	Possible Cause	Correction
Light does not turn on.	1. Fuse or bulb filament burned out.	Replace fuse or bulb.
	2. Circuit open or poorly connected.	Correct.
	3. Back-up light switch defective or stroke poorly adjusted.	Replace switch or adjust stroke.
Light remains on and does not go out.	Back-up light switch defective or stroke incorrect.	Replace switch or adjust stroke.

Brake system indicator light

Complaint	Possible Cause	Correction
Indicator light does not turn on when brake lever is pulled up.	1. Fuse burned out. 2. Bulb filament burned out or poor connections. 3. If no trouble is found through checks 1. and 2. above, switch is defective.	Replace fuse. Replace bulb or correct. Replace switch.
Indicator light remains on and does not go out when brake lever is released.	1. Wiring between light and switch is shorted. 2. If wiring is normal: (1) brake fluid in the reservoir is lower than the specified level. (2) If no trouble is found through check (1), parking brake switch or fail indicator switch is defective.	Correct. Correct. Replace switch.

Oil Pressure Gauge

Complaint	Cause	Inspection	Correction
Gauge needle deflects when ignition switch is turned on with the engine stationary	1. Unit defective	Turn on ignition switch with the unit side terminal disconnected. If gauge needle stays still, unit is defective.	Replace Unit
	2. Wiring shorted.	If gauge needle deflects, wiring is shorted.	Correct or replace
	3. Oil pressure gauge defective	If gauge needle deflects when switch is turned on with unit side wiring disconnecterd, gauge is defective.	Replace gauge assembly
Gauge needle does not deflect when engine is running and oil pressure is high.	1. Circuit loosely connected	Disconnect wiring at unit side of gauge and connect gauge to ground via a resistance of 40 ohm. If the gauge needle deflects, circuit is open or poorly connected.	Correct or replace
	2. Gauge defective	If gauge needle does not deflect, gauge is defective.	Replace gauge assembly
	3. Unit defective	Turn on ignition switch with the unit side terminal disconnected. If gauge needle stays still, unit is defective	Replace unit

Complaint	Cause	Inspection	Correction
Gauge indication erratic	1. Wiring loosely connected	Check terminals, and connector for looseness.	Correct
	2. Unit defective	Repeat test with a new unit installed.	Replace unit
	3. Gauge defective	Repeat test a new gauge installed.	Replace gauge assembly
Gauge indication	1. Unit defective	To determine whether unit or gauge is defective, make a test using a new unit.	Replace unit
	2. Gauge defective	If gauge indication is still inaccurate, gauge is defective.	Replace gauge assembly

PILOT LIGHT AND INDICATOR LIGHTS

GENERAL DESCRIPTION

The generator and oil pressure gauge circuits of adopts an individual indicator light for easy checking. The generator indicator light circuit and oil pressure gauge circuit are so designed that the indicator light remains out at normal operation of the circuit but turns on when the circuit fails to function properly. In order to prevent starting of the vehicle with the parking brake dragged, a pilot light switch is installed on the parking brake that turns on when the parking brake is applied and goes out when it is released.

OIL PRESSURE INDICATOR LIGHT

Construction and Operation

The oil pressure switch is installed in the oil gallery at the right side face of the cylinder block and is wired to the ignition switch through the indicator light. As the moving contact connected to the diaphragm is held closed by the return spring, battery current is grounded via the switch terminal and return spring, causing the indicator light to remain on before the oil pump is operated.

However, when the engine is started and gallery oil pressure increasses, the diaphragm pushes the contact point open against the tension of the return spring, causing the indicator light to go out.

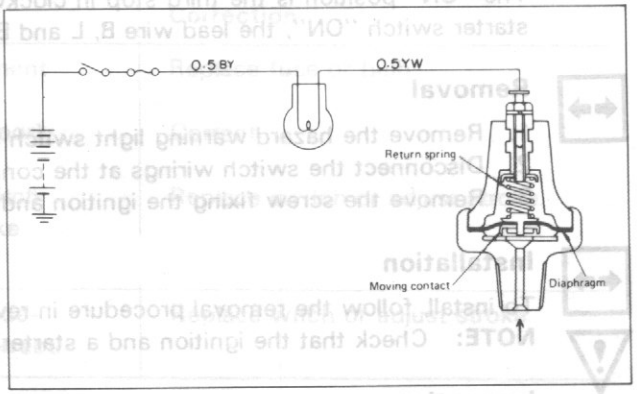


Fig. 15-37

Data

Switch actuating pressure (kg/cm²)	0.3 — 0.7
Resistance to pressure (kg/cm²)	10

BRAKE SYSTEM INDICATOR LIGHT

Parking brake indicator light

The parking brake indicator light is connected in series to the parking brake indictor light switch installed on the parking brake lever bracket and turns on when the braker lever is pulled out and goes out when the lever is fully released. The parking brake indicator light circuit is designed to prevent driving of the vehicle with the parking brake on and does not indicate the condition of the parking brake system.

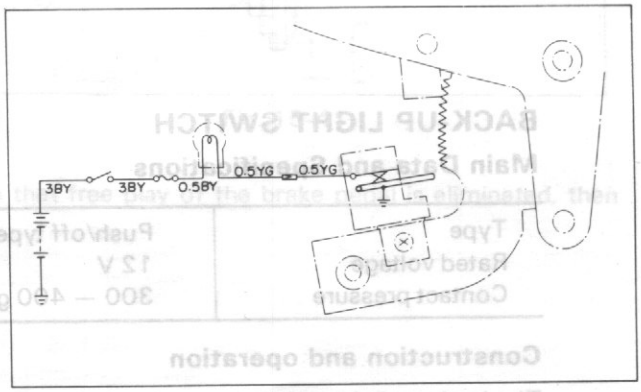


Fig. 15-38

Brake system indicator light

The indicator light turns on when the parking brake lever is pulled with the starter switch "ON", or the brake fluid in the reservoir is lower than the specified level with the parking brake lever is released.

SWITCHES

IGNITION AND STARTER SWITCH

Construction and Operation

With the ignition and starter switch turned to "LOCK" and "OFF", all the electrical circuits are de-energized with the exception of light circuit. When the ignition and starter switch is turned to the fourth stop in the clockwise direction or start position, the starting motor is energized for engine cranking causing the lead wire B and WB to be connected. When the key is released, the switch will return to "ON" position automatically. The "ACC" position is the second stop in the clockwise direction from the "LOCK" position and the lead wire L is connected to the B.

The "ON" position is the third stop in clockwise direction from the "LOCK" position. With the ignition and starter switch "ON", the lead wire B, L and BY are connected.

Removal

1. Remove the hazard warning light switch and remove the steering cowl.
2. Disconnect the switch wirings at the connectors.
3. Remove the screw fixing the ignition and starter switch and remove the switch.

Installation

To install, follow the removal procedure in reverse order and note the following point.

NOTE: Check that the ignition and a starter switch is set in proper relation to the key.

Inspection

With a circuit tester make a continuity test between the terminals with the switch turned to each position. If a continuity exists between the terminals other than the switch is defective and should be replaced. (Refer to "Switch connections" for continuity.)

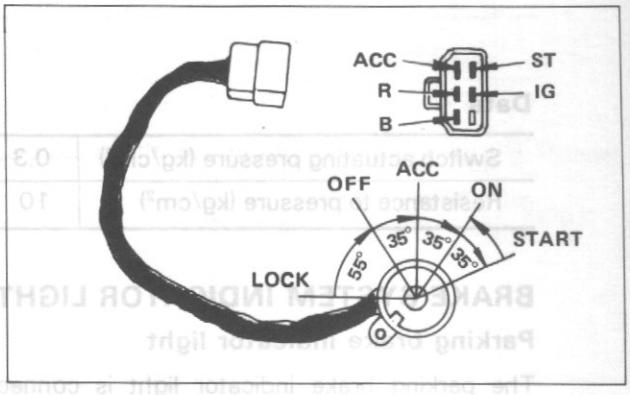


Fig. 15-39

BACK-UP LIGHT SWITCH

Main Data and Specifications

Type	Push/off type
Rated voltage	12 V
Contact pressure	300 — 400 g

Construction and operation

The back-up light switch is constructed as shown in Fig. 15-40. The ball is released and causes the spring to force the shaft outward closing the contact points when shifted into reverse gear.

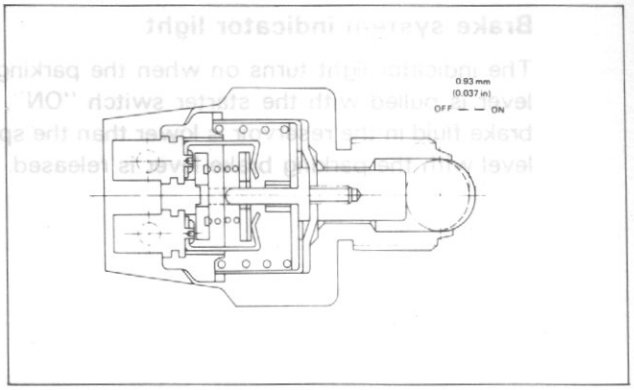


Fig. 15-40

Inspection

1. Make a continuity test across switch terminals with switch installed on transmission. If tester indicates a continuity only when shifted into reverse, switch is normal.
2. If test result is unsatisfactory, repeat the test with switch removed from transmission. If tester indicates a continuity across terminals when switch is in free state, switch is normal (continuity should not exist when ball is pushed in).
3. If switch is known to be in good condition but circuit is not functioning properly, adjust stroke with gasket fitted between quadrant box and switch.

Back-Up Light Switch Trouble-Shooting

Complaint	Possible Cause	Correction
Light does not turn on.	1. Fuse or bulb filament burned out.	Replace fuse or bulb.
	2. Circuit open or poorly connected.	Correct.
	3. Back-up light switch defective or stroke poorly adjusted.	Replace switch or adjust stroke.
Light remains on and does not go out.	Back-up light switch defective or stroke incorrect.	Replace witch or adjust stroke.

STOP LIGHT SWITCH

Construction and Operation

The stop light switch is mechanical push/off type and is wired as shown in Fig. 15-41.
When the brakes are not in use, the switch is held turned off as the switch shaft is depressed by the brake pedal arm. The switch turns on, when the brake pedal is depressed, to operate the stop lights.

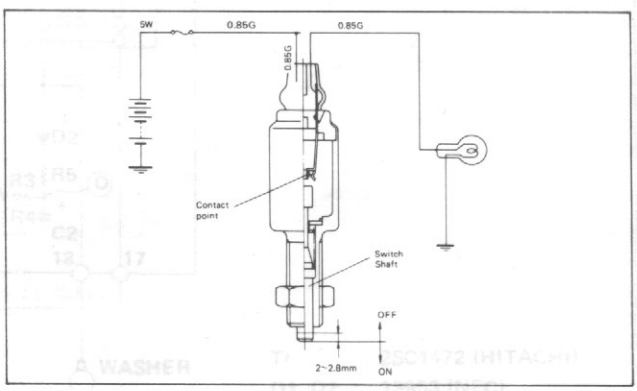


Fig. 15-41

Inspection

Make a continuity test between the switch terminals with the wires disconnected from the switch.
the switch is normal when the tester indicates a continuity as the switch shaft is released.

Installation Precautions

Push the brake pedal by turning the stop light switch, so that free play of the brake pedal is eliminated, then tighten the stop light switch lock nut.

Stop Light Switch Diagnosis

Complaint	Cause	Correction
Stop lights inoperative.	1. Fuse or bulb filament burned out. 2. Circuit open or poorly connected. 3. Stop light switch defective or stroke pooorly adjusted.	Replace fuse or bulb. Correct. Replace switch or correct.
Light on one side inoperative.	1. Bulb filament burned out. 2. Circuit open or poorly connected.	Replace bulb. Correct.
Lights remain on and do not go out.	Switch defective or stroke poorly adjusted.	Replace switch or correct.

WINDSHIELD WIPER AND WASHER

GENERAL DESCRIPTION

The windshield wiper system is driven by a 2-speed motor. The wiper circuit incorporates a self-parking device consisting of a worm gear and cam plate to keep the circuit engaged temporarily when the switch is turned off.

The wipers operate in tandem and are equipped with an automatic, non-depressed park system. Both wipers and washers are controlled by a switch on the steering column.

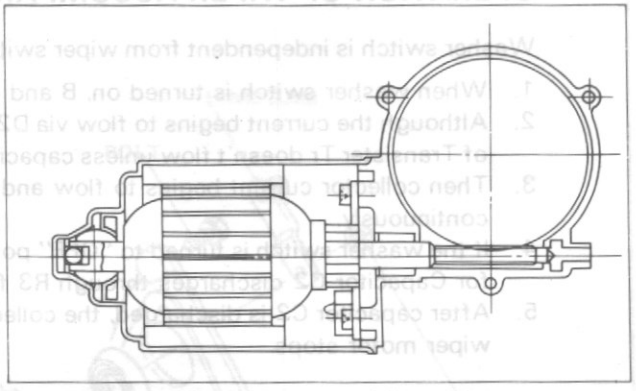


Fig. 15-42 — Windshield Wiper Motor

OPERATION OF INTERMITTENT WIPER

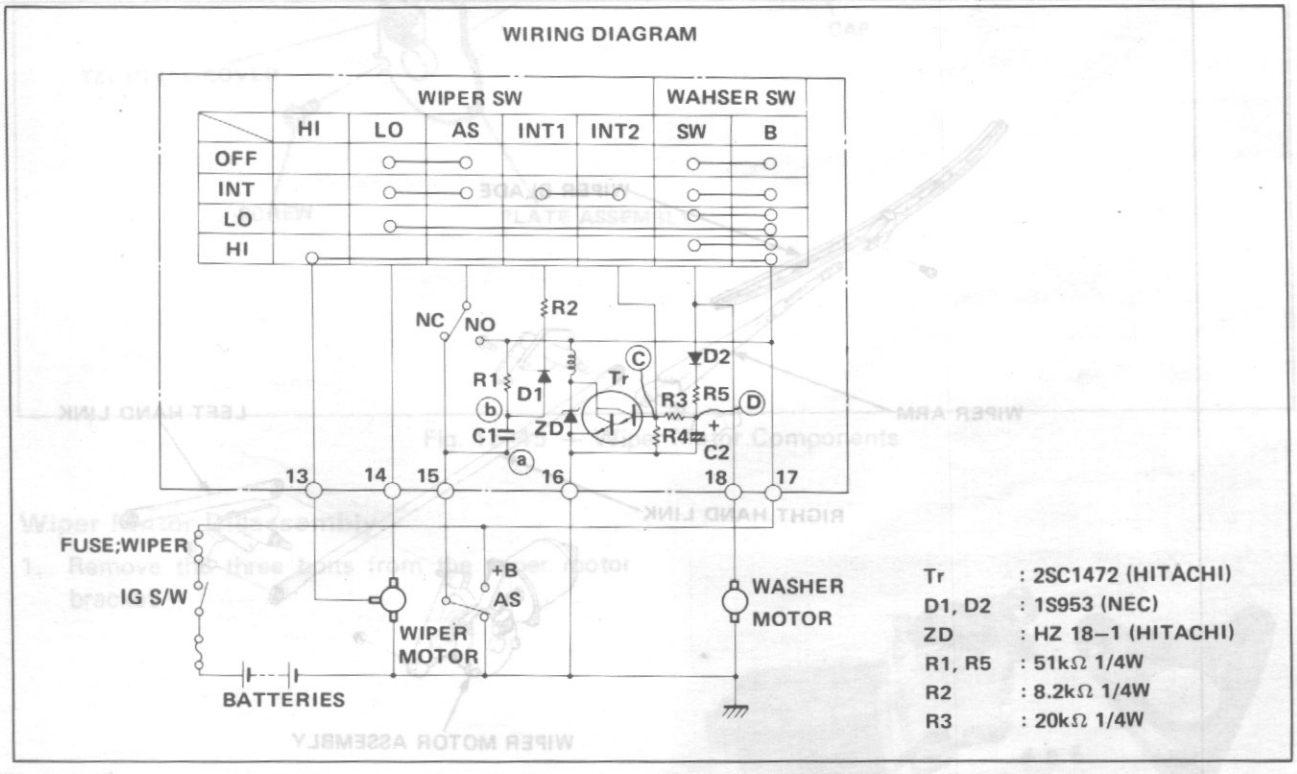


Fig. 15-43 — Intermittent Wiper Circuit

1. When the wiper switch is turned to "INT" position, INT1 and INT2 terminals are connected, base current of Transister Tr flows through R1 and D1, collector current begins to flow and then the Relay turns to NO position.
2. Through AS and LO terminals, the current flows and the wiper motor begins to rotate. As switch is turned to the contact point (+B).
3. After one rotation, AS switch is turned to the position of ground connection and the voltage at Point (a) of Capacitor C1 is reduced by battery voltage.
4. At the same time, the voltage at Point (b) is reduced by battery voltage. So the voltage at Point (c) becomes lower than the base voltage of Transister Tr and collector current is stopped.
5. The Relay turns to NC position and wiper motor stops.
6. In a while, Capacitor C1 is charged, then the voltage at Point (b) rises up and consequently the voltage at Point (c) rises up.

7. When the voltage at Point (c) reaches the base voltage, the collector current begins to flow again and the same sequence will be repeated from 1.

OPERATION OF WIPER ACCOMPANIED WITH WASHER

Washer switch is independent from wiper switch. So washer is operative when wiper switch is in any position.

1. When washer switch is turned on, B and SW terminals are connected and washer motor begins to rotate.
2. Although the current begins to flow via D2 and R5, Capacitor C2 is completely discharged and base current of Transister Tr doesn't flow unless capacitor is recharged, and the voltage at Point D becomes high enough.
3. Then collector current begins to flow and the relay turns to NO position, the wiper motor begins to rotate continuously.
4. If the washer switch is turned to "OFF" position, the washer motor stops, but the wiper motor keeps turning for Capacitor C2 discharges through R3 for a while.
5. After capacitor C2 is discharged, the collector current stops to flow and the relay turnes to NC position and wiper motor stops.

COMPONENT REPLACEMENT AND REPAIR

WIPER MOTOR AND LINKAGE

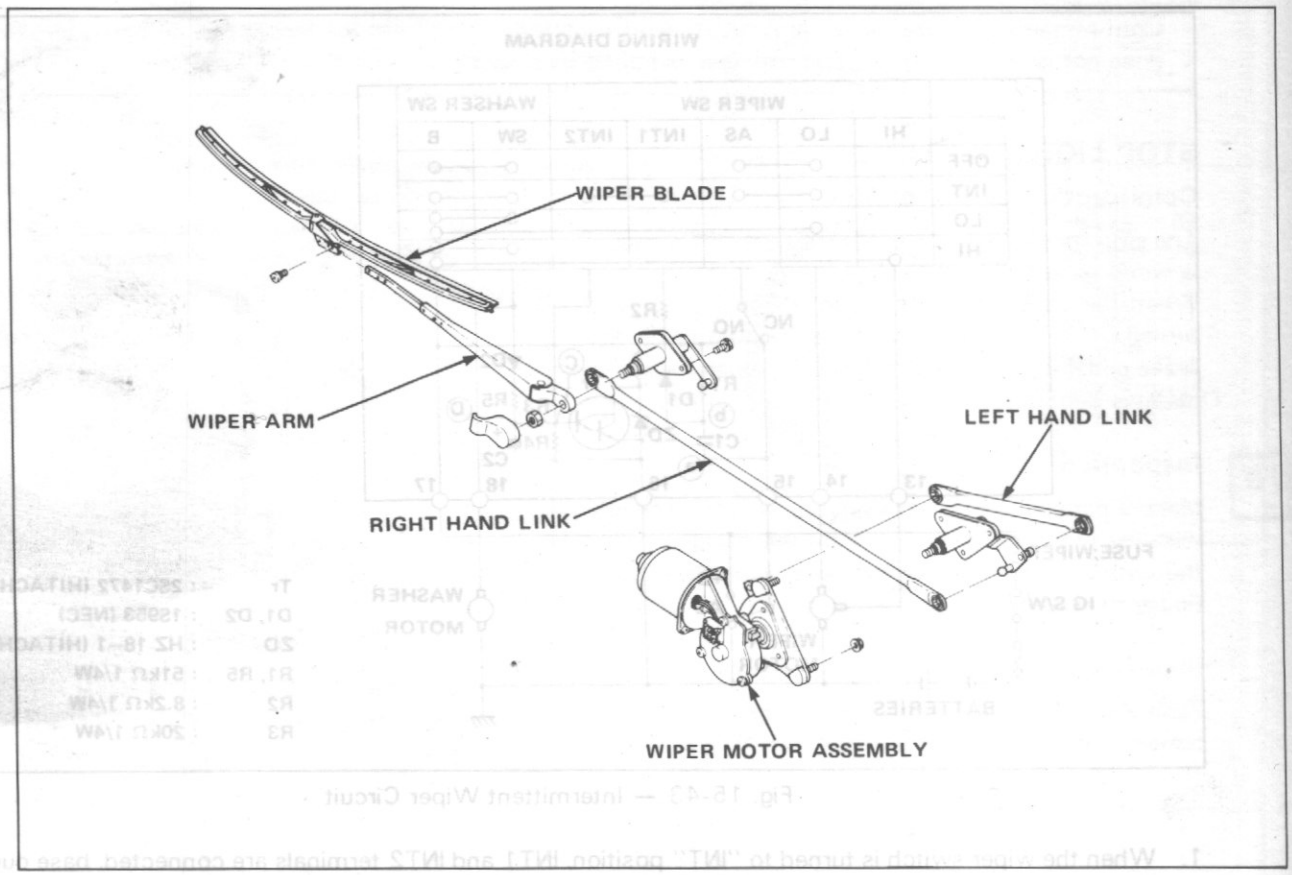


Fig. 15-44 — Wiper System Components

Wiper Motor Removal and Installation

1. Disconnect ground cable from battery.
2. From under instrument panel remove nut and crank-arm from motor.
3. Disconnect wiring connector.
4. Remove three nuts and motor assembly.
5. Reverse procedures for installation.

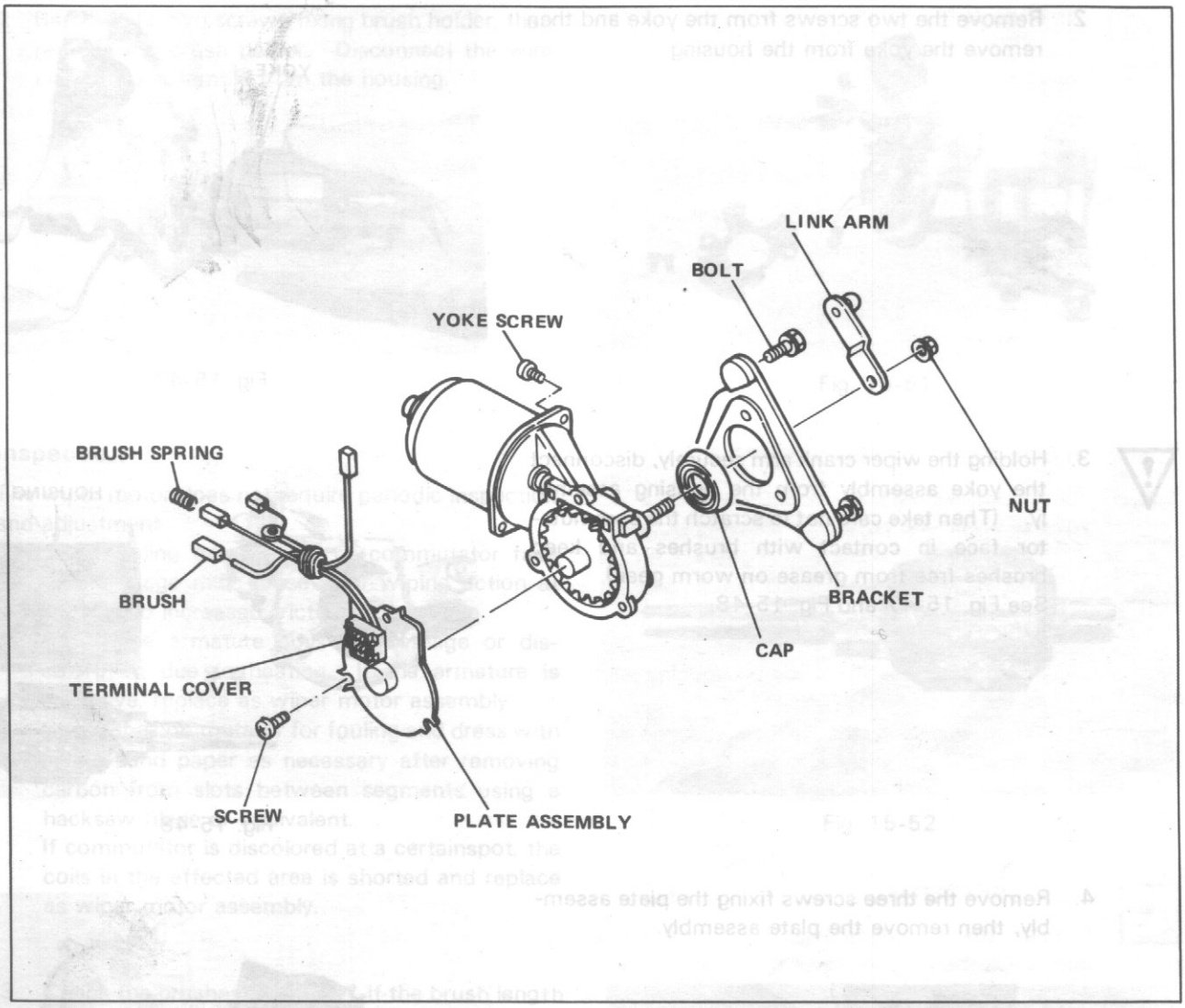


Fig. 15-45 — Wiper Motor Components

Wiper Motor Disassembly

1. Remove the three bolts from the wiper motor bracket.

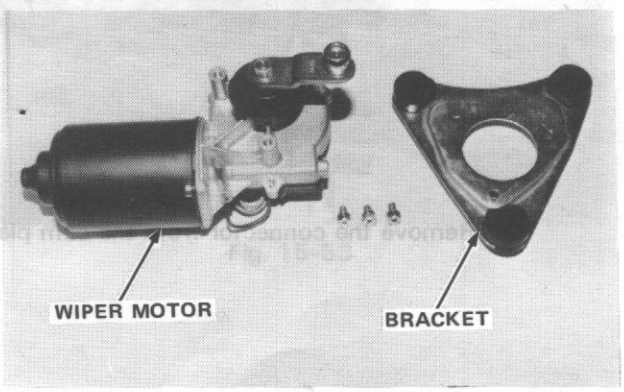


Fig. 15-46

2. Remove the two screws from the yoke and then remove the yoke from the housing.

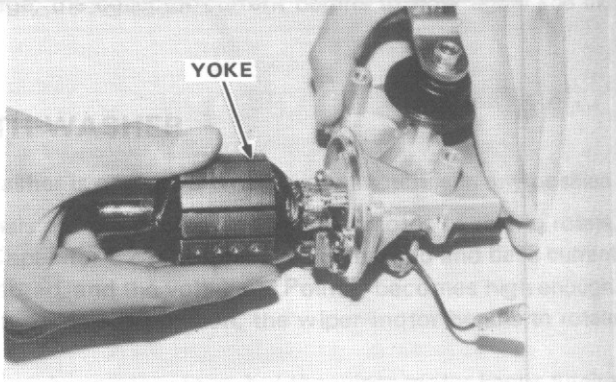


Fig. 15-47

3. Holding the wiper crank arm securely, disconnect the yoke assembly from the housing assembly. (Then take care not to scratch the commutator face in contact with brushes and keep brushes free from grease on worm gear.) See Fig. 15-47 and Fig. 15-48.

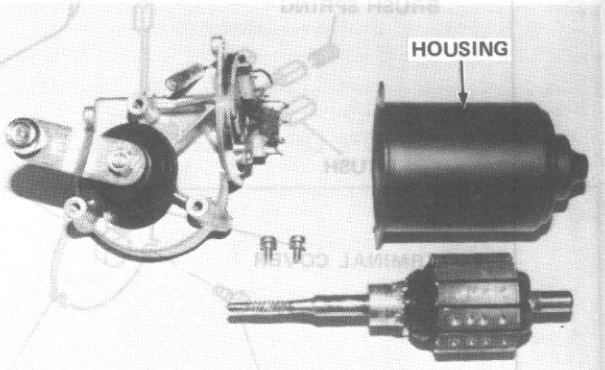


Fig. 15-48

4. Remove the three screws fixing the plate assembly, then remove the plate assembly.

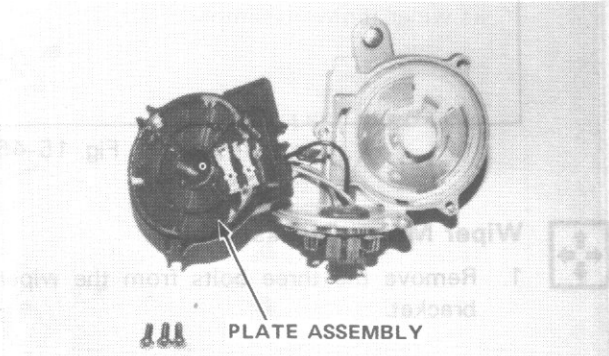


Fig. 15-49

5. Remove the connector from the cam plate.

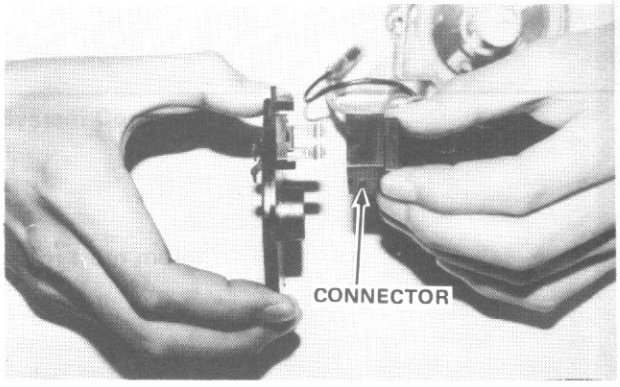


Fig. 15-50

6. Remove the two screws fixing brush holder, then remove the brush holder. Disconnect the wire and brush assembly from the housing.

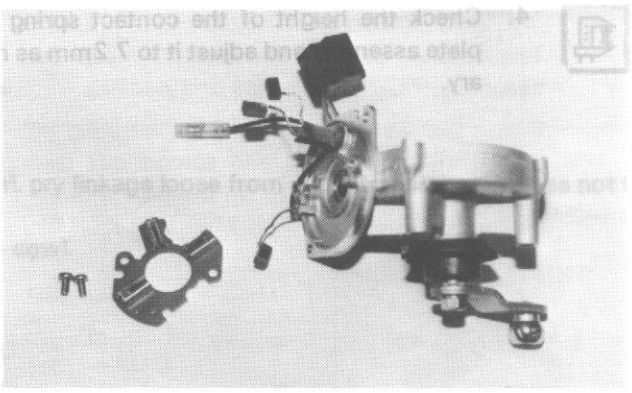


Fig. 15-51

Inspection

The wiper motor does not require periodic inspection and adjustment.

However, fouling or roughing of commutator face during the usage may cause poor wiping action at starting due to increased frictional resistance.

1. Check the armature coils for damage or discoloration due to heating. If the armature is defective, replace as wiper motor assembly.
2. Check the commutator for fouling and dress with a fine sand paper as necessary after removing carbon from slots between segments using a hacksaw blade or equivalent.
   If commutator is discolored at a certainspot, the coils in the effected area is shorted and replace as wiper motor assembly.

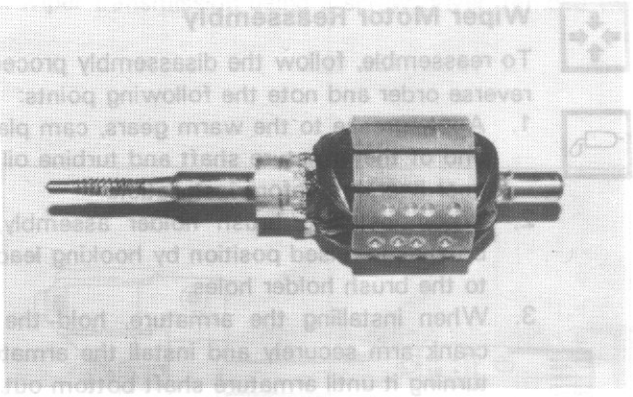


Fig. 15-52

3. Check the brushes for wear. If the brush length is shorter than 4mm, replace wire and brush assembly.

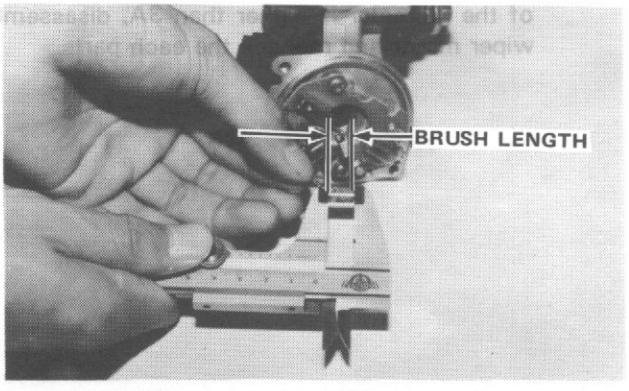


Fig. 15-53

4. Check the height of the contact spring on the plate assembly and adjust it to 7.2mm as necessary.

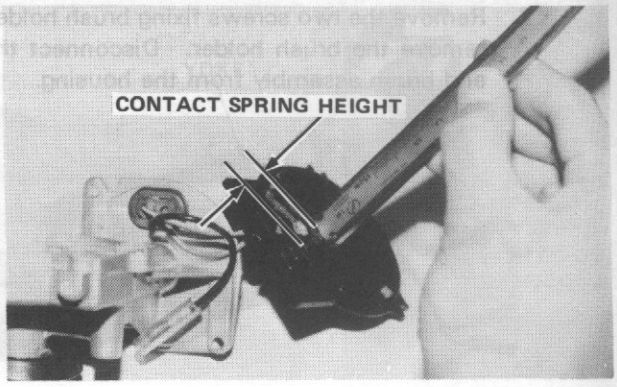


Fig. 15-54

Wiper Motor Reassembly

To reassemble, follow the disassembly procedure in reverse order and note the following points:

1. Apply grease to the warm gears, cam plate and end of the armature shaft and turbine oil to the gear bearings before installation.
2. When installing brush holder assembly, keep brushes in raised position by hooking lead wires to the brush holder holes.
3. When installing the armature, hold the wiper crank arm securely and install the armature by turning it until armature shaft bottom out.

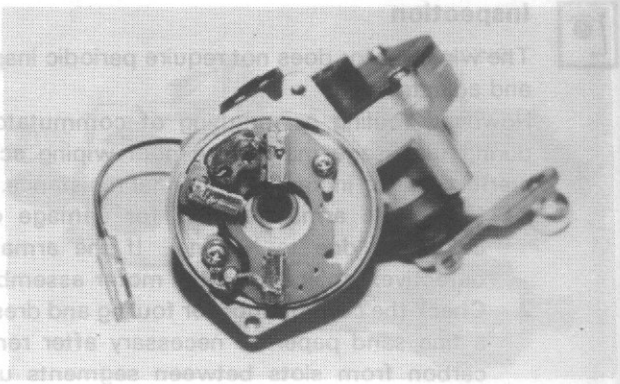


Fig. 15-55

Inspection After Assembly

Connect the ammeter in high-speed circuit as shown and check the current is less than 3A. If the reading of the ammeter is higher than 3A, disassemble the wiper motor and recheck the each parts.

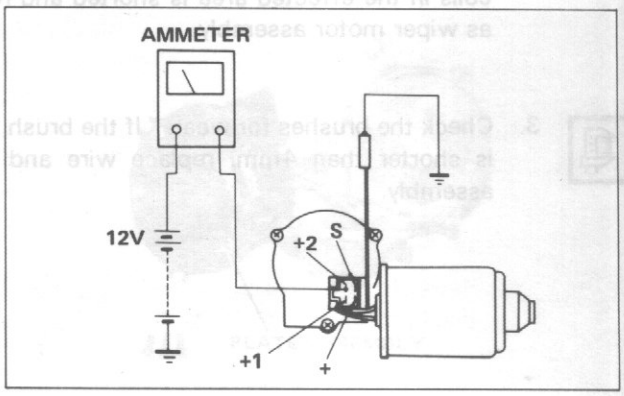


Fig. 15-56

Left Wiper Transmission Replacement

1. Disconnect ground cable from battery.
2. Remove left wiper arm retaining nut and wiper arm.
3. Remove steering wheel. (Refer to Section 4).
4. Remove instrument cluster.
5. Reaching through cluster opening in instrument panel, pry linkage loose from wiper transmission so as not to damage nylon bushing.
6. Remove three screws and wiper transmission from cowl.
7. Reverse procedures for installation.

Right Wiper Transmission Replacement

1. Disconnect ground cable from battery.
2. Remove right wiper arm retaining nut and wiper arm.
3. Remove glove box.
4. Reach through glove box opening, pry linkage from wiper transmission using a screw driver, remove two screws and transmission from cowl.
5. Reverse procedures for installation.

WIPER SWITCH

The wiper switch is of the rotary type combined with the washer switch.

Rotate the switch clockwise to "LO" for low-speed and to "HI" for high-speed.

If wiper with intermittent is installed, rotate the switch clockwise to "the first detent" for intermittent operation.

The washer switch is of the push type and operated independently of the wiper switch.

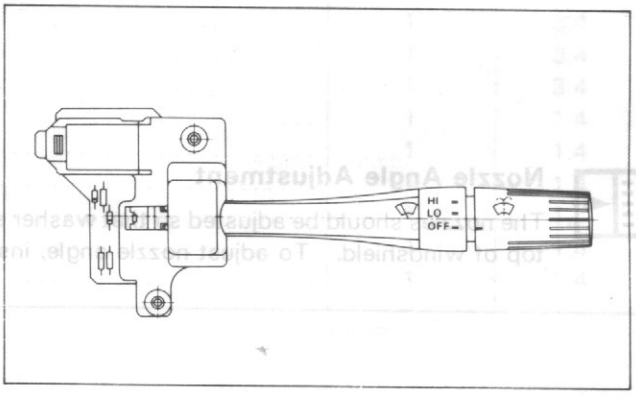


Fig. 15-57 — Wiper Switch

Removal and Installation

1. Disconnect ground cable from battery.
2. Remove steering wheel.
3. Remove steering column cover.
4. Remove screws and switch assembly.
5. Reverse procedures for installation.

WINDSHIELD WASHER

The washer system consists of motor and pump assembly, fluid tank, tubes and nozzles.

When the switch is pushed in, washing solution is drawn into the pump and forced out through the nozzles by the action of an impeller attached to the motor shaft.

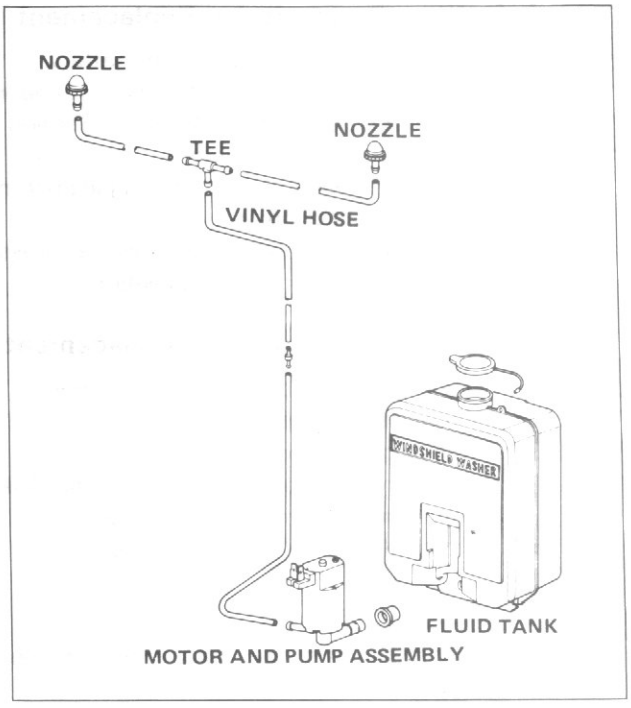


Fig. 15-58 — Washer System Components

Nozzle Angle Adjustment

The nozzles should be adjusted so that washer solution is squirted to a point 1/3 of windshield height down from top of windshield. To adjust nozzle angle, insert a pin into nozzle hole and move as required.

MAIN DATA AND SPECIFICATIONS

LIGHTS

Bulb	Quantity	Watt
Headlight-Low/High	2	55/65
Turn Signal Light-Front	2	21
Turn Signal Light-Rear	2	21
Turn Signal Light-Side	2	5
Tail/Stop Light	4	8/21
Back-Up Light	2	21
Clearane Lights	2	7.5
Parking Lights	2	3.8
License Plate Light (2 door)	2	7.5
License Plate Light (4 door)	2	3.8
Dome Light	1	10
Meter Illumination Light	5	3.4
Turn Signal Indicator Light	2	3.4
Rear Window Defogger Indicator Light	1	3.4
Shift Indicator Light (A/T only)	1	3.4
Master Warning Light	1	3.4
Fuel Reserve Indicator Light	1	3.4
High Beam Indicator Light	1	1.4
Oil Pressure Indicator Light	1	1.4
Generator Indicator Light	1	1.4
Parking Brake Indicator Light	1	1.4
Glow Indicator Light (Diesel Engine only)	1	1.4
Fuel Filter Indicator Light (Diesel Engine only)	1	1.4

TURN SIGNAL

	Turn signal	Hazard Warning
Type	Semi-transistor type	
Rating	12.8V — 66 cp	12.8V — 132 cp
Flashing rate	60 — 120 cycles per min.	
21W Bulb burnt	Over 120 cycles per min.	—

WIPER MOTOR

Rated voltage	12V
Rated output	1.5 kg-m
Operating valtage	10 — 15V
Starting voltage	8V
Starting torque	0.75 kg-m
NO-LOAD current	3A or less
Output current	4A or less
Current constrained	18A or less
Insulation resistance	1 MΩ or more (500V)
Low speed	40 — 50 rpm.
High speed	63 — 77 rpm.
Wiping angle	Left side: 83 — 89 degress Right side: 105 — 111 degrees

WINDSHIELD WASHER

Motor type	Direct current ferrite magnet type
Pump type	Centrifugal type
Rated voltage	12V
Injection nozzle	1.0mm (0.04 in.)
Orifice diameter	
Tank capacity	1.5 liters (1.6 quarts)
Operating current	3.5A or less
Injection pressure	0.8kg/cm^2 (11.38 psi.) or more
Volume of delivery	130 c.c (7.9 cu. in.)/10 sec.

DIAGNOSIS

Windshield wiper and washer

NOTICE: When testing the windshield wiper, keep the windshield wet with water or washing solution.

Complaint	Possible Cause	Correction
Poor wiping action.	1. Blade(s) defective.	Replace blade(s).
	2. Wiper link distorted or joint worn.	Correct or replace link.
Wiping action sluggish.	1. Circuit poorly connected or grounded.	Correct.
	2. Resistance increased due to twisting of link. (Check operation of link with motor disconnected.)	Correct link.
	3. Motor defective. (Disconnect linkage from motor and make a test on motor.)	Replace motor.
Wiper circuit Inoperative.	1. Fuse burned out.	Replace fuse.
	2. Wiring broken or poorly connected.	Correct.
	3. Switch defective.	Replace switch.
	4. Motor defective. (If motor does not operate when negative and positive leads are connected to L and LY (or LW) terminals, respectively, the motor is defective.)	Replace motor.

Complaint	Possible Cause	Correction
Motor continues to run and does not stop when switch is turned off.	1. Cam plate insulator defective. (Motor continues to operate when switch leads are disconnected at connector.)	Replace motor assembly.
	2. Switch defective.	Replace switch.
Motor stops immediately when switch is turned off.	1. Points in self-parking device defective.	Correct or replace motor assembly.
	2. Motor poorly grounded.	Correct.
Washing solution not injected when switch is turned on.	1. Washer tank empty.	Replenish.
	2. Fuse burned out.	Replace fuse.
	3. Circuit open or poorly connected.	Correct.
	4. Washer pump defective.	Replace washer tank assembly.
	5. Nozzle or pipes clogged.	Clean.
Injection pressure insufficient.	1. Restrictions in nozzle or piping.	Clean.
	2. Washer pump defective.	Replace washer tank assembly.

HORNS

The dual horn assembly consisting of high and low tone horns is electrically connected.

HORN CIRCUIT

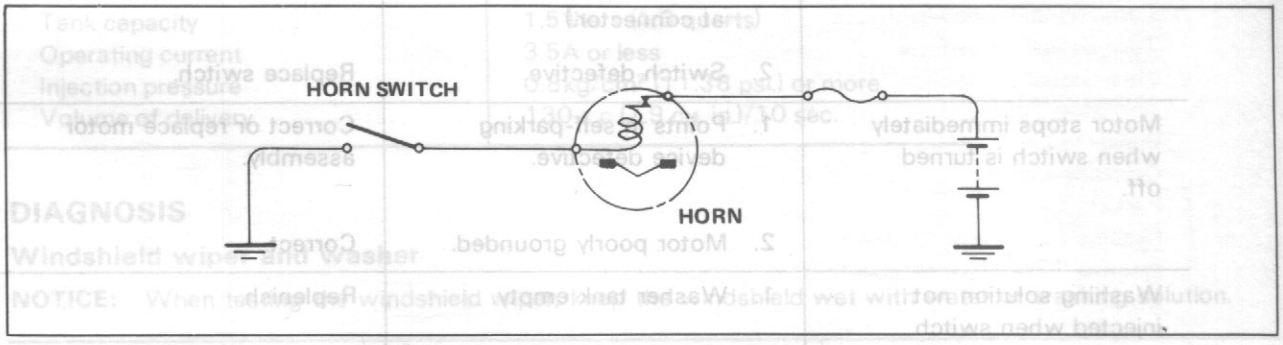


Fig. 15-59 — single note hone circuit

HORN REPLACEMENT

1. Remove radiator grille.
2. Disconnect wire connector.
3. Remove bolt and horn.
4. Reverse procedure for installation.

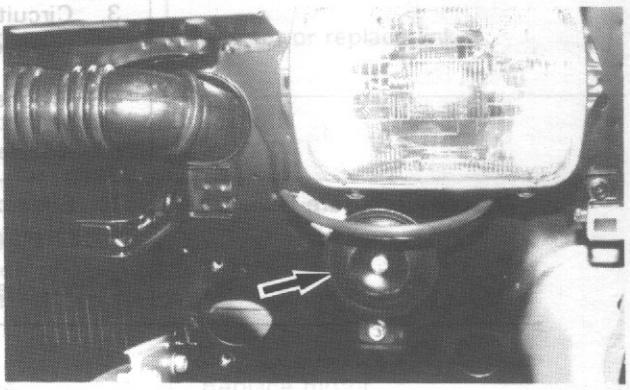


Fig. 15-60

Horn Switch Removal and Installation

1. Disconnect battery ground cable.
2. Deluxe wheel — Remove the two screws retaining the hone shroud and disconnect the horn contact.
   Sporty wheel — Remove the horn shroud from center of wheel.

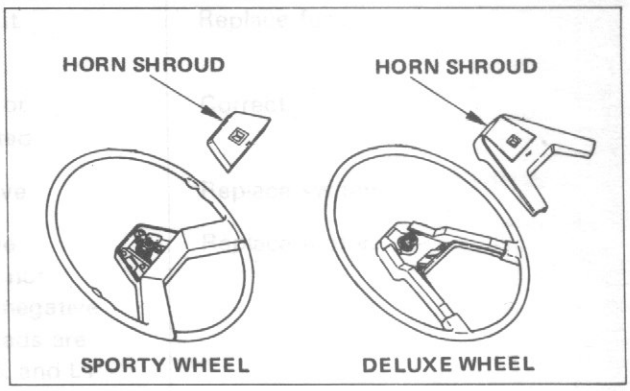


Fig. 15-61

1. To install, reverse the removal procedure.

MAIN DATA AND SPECIFICATIONS

Horn

Item \ Data	High tone horn	Low tone horn
Rated voltage	12V	12V
Rated current	Less than 3A	Less than 3A
Sound pressure	100 — 110 dB (1 m)	100 — 110 dB (1 m)
Frequency	420 — 460 cycle/sec.	350 — 390 cycle/sec.
Range of operating voltage	10 — 14.5 V	10 — 14.5 V

TROUBLE-SHOOTING

Complaint	Inspection and correction
Horns do not sound when horn bar is depressed	1. Check battery voltage, fuse and wiring. 2. If battery voltage, fuse and wiring are normal, check the horn relay. Connect S terminal to ground. Horns sound — Horn switch or horn switch circuit at fault Horns do not sound — Check the following points: Short out B terminal with H terminal Horns sound — Horn relay defective Horns do not sound — Horns defective
Horns continue to sound and do not stop	1. Check returning action of horn switch and correct as necessary. 2. Check horn relay points for seizing and replace relay with a new one as necessary. 3. Check wiring between horn relay and switch for shorts and correct as necessary.

LIGHT REMIND BUZZER

If the light switch is left in the "ON" position and driver's door is opened, the warning buzzer will remind driver to turn off it.

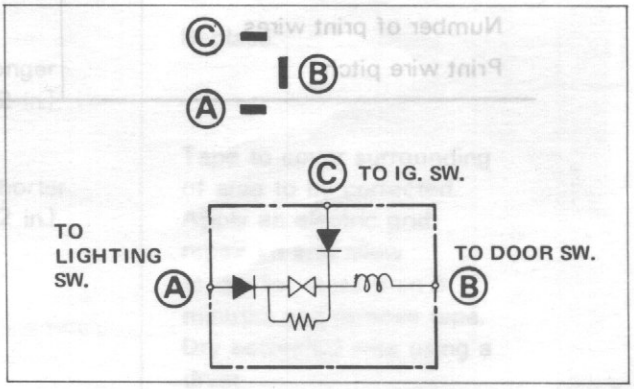


Fig. 15-62

MAIN DATA AND SPECIFICATIONS

Rated voltage	12V
Rated current	Less than 150mA
Sound pressure	60 ±10 dB (at 1m)
Range of operating voltage	9 — 14.5V

REAR WINDOW DEFOGGER (OPTION)

The rear window defogger consists essentially of the heat wire, switch and relay.
When the switch is turned on, the battery current flows via the relay and heat wire bonded to the rear window glass thereby defogging the window glass through evaporation of water particles.

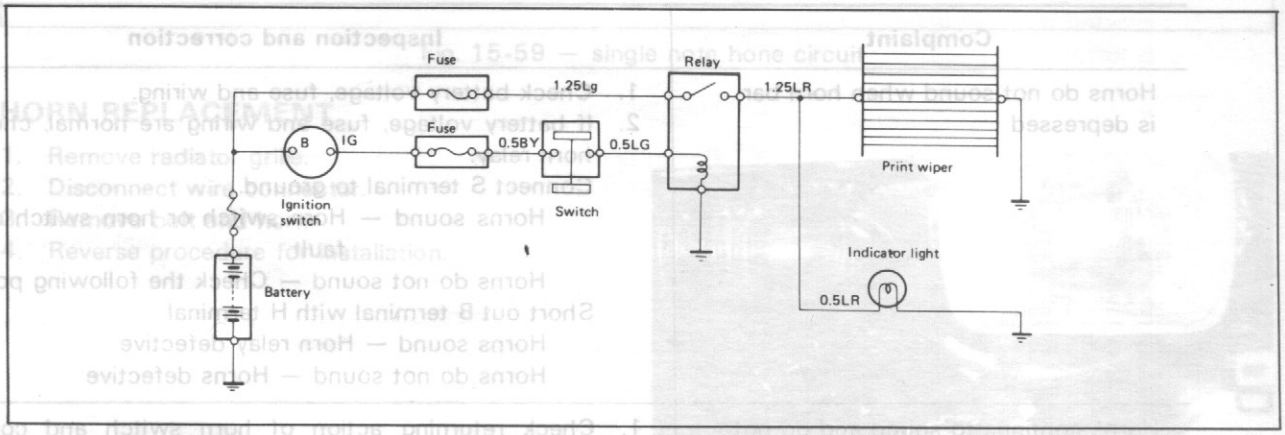


Fig. 15-63

MAIN DATA AND SPECIFICATIONS

Item \ Model	Coupe	Sedan
Rated voltage	12V	12V
Power consumption	110 — 150 W	100 — 140 W
Width of print wire	0.4 mm	0.4 mm
Number of print wires	13	12
Print wire pitch	30 mm	30 mm

DIAGNOSIS

Rear-wind deffogger

Complaint	Possible Cause	Correction
Fuse	(1) Check for blown out fuse or poor contact.	Correct or replace.
Defogger switch and relay	(1) Check voltage at lead extension from the switch and connected to the relay with the ignition switch and defogger switch turned on.	
	• Voltage is normal (12 V)	Check parts mentioned under paragraph (2) below.
	• Voltage is too low, or voltage is not being applied.	Defogger switch defective. Poor connections in circuit. (Correct or replace.)
	(2) Check voltage at relay power lead	Check parts mentioned under paragraph (3) below.
	• Voltage is normal (12V)	
	• Voltage is too low, or voltage is not being applied	No. 4 fuse is blown out, poor connections or circuit open. (Correct or replace.)
	(3) Check voltage at relay output lead	
	• Voltage is normal (12V)	Poor connections or wire broken between relay and heat wire. (Correct)
	• Voltage is too low, or voltage is not being applied	Relay defective. (Replace.)
Heat wire	(1) If a part of heat wires is inoperative, check the particular wire.	
	• If the length of broken wire is longer then 3 mm (0.12 in.).	Replace.
	• If the length of broken wire is shorter than 3 mm (0.12 in.).	Tape to cover surrounding of area to be corrected. Apply an electric grid repair kit and allow to dry for more than 5 minutes and remove tape. Dry corrected area using a dryer.
Indicator light	(1) Indicator light inoperative.	
	• Check wiring for open or poor connections or poor contact.	Correct.

RADIO (OPTION)

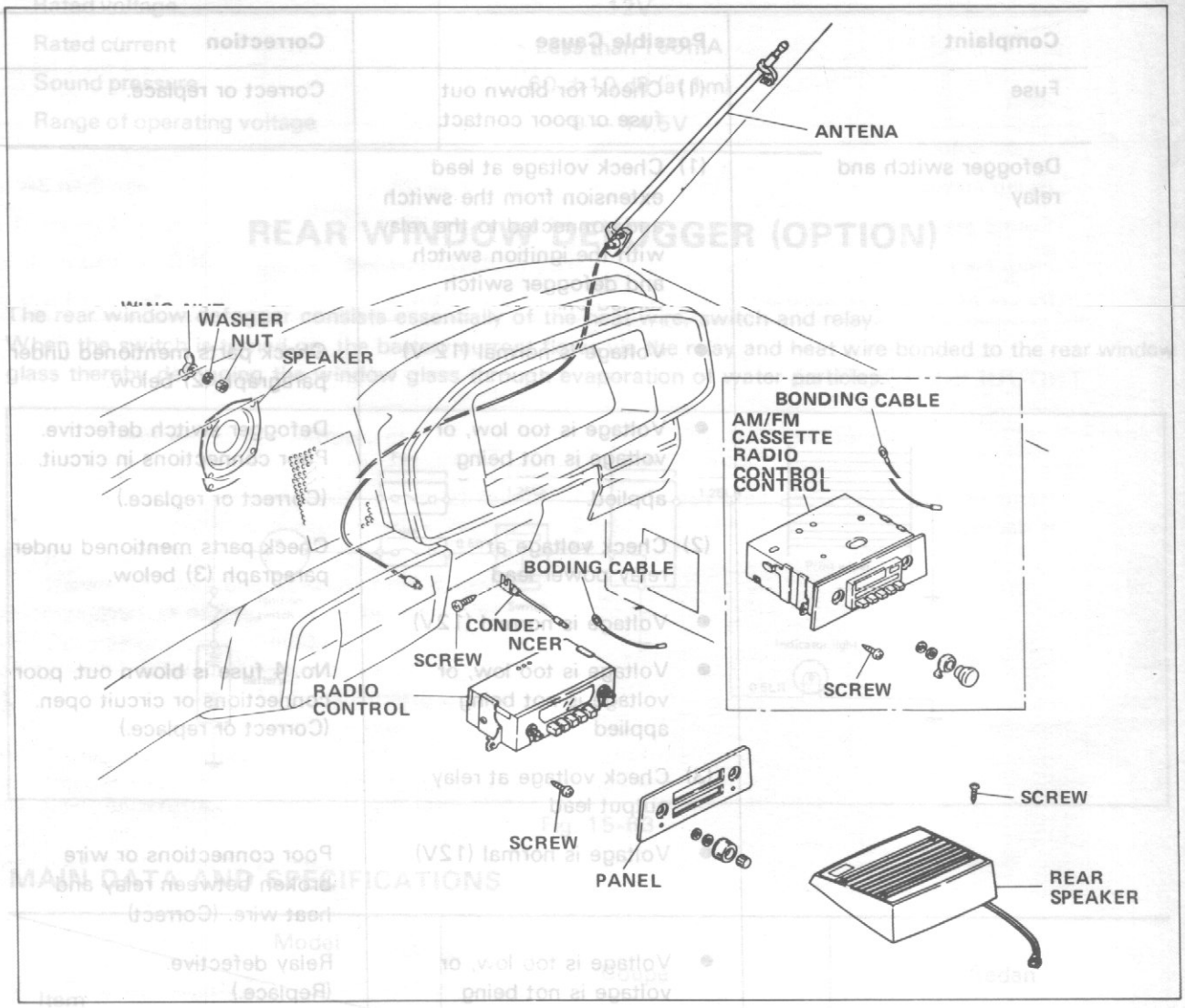


Fig. 15-64

CASSETE STEREO OR AM/FM RADIO CONTROL REPLACEMENT

Removal

1. Disconnect the battey ground cable.
2. Remove the radio control knobs by pulling off.
3. Remove the radio shaft nuts and trim panel.
4. Remove the ashtray.
5. Remove the air conditioning control knobs by pulling off.
6. Remove 4 screws, then remove the control panel.
7. Remove 2 panel lights.
8. Remove 2 screws retaining the radio control.
9. Disconnect electrical connectors and lead-in cable, then remove the radio.

Installation

1. To install, reverse removal procedures trimming radio before installing.

SPEAKER REPLACEMENT

Removal

Remove the wing nuts fixing the speaker by reaching from under the insturument panel, disconnect the wiring at the connector and remove the speaker.

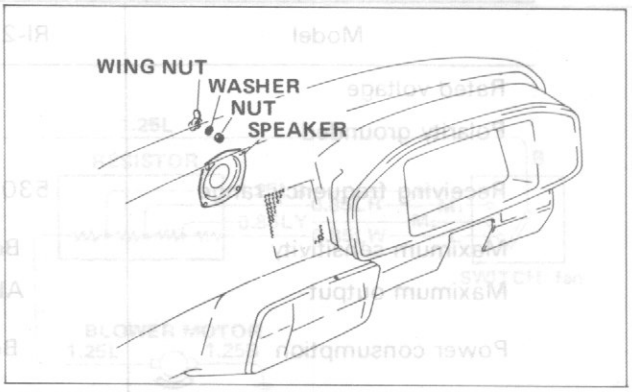


Fig. 15-65

Installation

To install reverse the removal procedure.

ANTENNA

Removal

1. Remove the screws fixing the antenna mounting bracket at two portions, then remove the antenna.
2. Disconnect antenna feeder from the radio control.

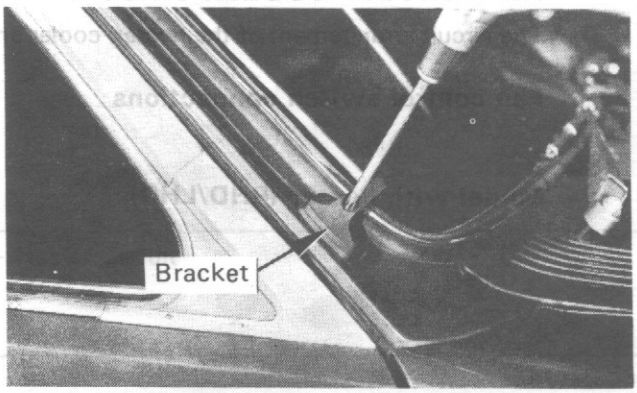


Fig. 15-66

3. Remove the screw fixing the antenna base, then pull the feeder apart.

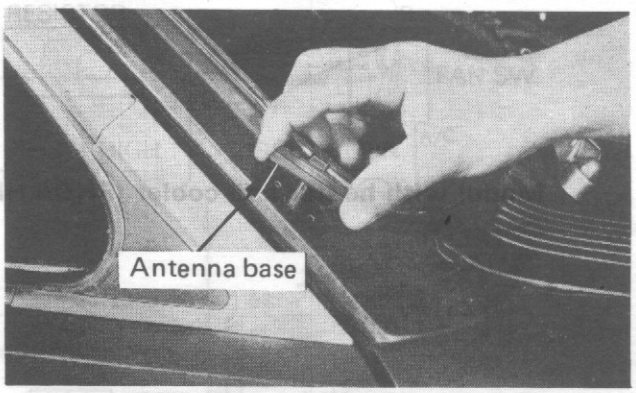


Fig. 15-67

INSTALLATION

To install reverse the removal procedure

NOTE: Replacement of radio control or antenna distroys tuning of radio control to antenna. Match the radio to the antenna input with the antenna trimmer on the rear face of the radio control.
Adjustment with antenna trimmer: Fully extend the antenna and tune in the radio receiver to a weak station in the vicinity of 1400 kHz and with antenna trimmer seek a point where sound volume reaches the maximum level.

MAIN DATA AND SPECIFICATIONS

Model	RI-202 (CRALION)	PI-779-AB (CRALION)
Rated voltage	13.2 V	
Polarity grounded	Nagative (—)	
Receiving frequency range	530 — 1605 kHz	AM : 530 — 1605 kHz FM : 88—108 MHz
Maximum sensitivity	Below 20 dB	AM : 20dB MAX. FM : 15dB MAX.
Maximum output	Above 5.5 W	4 W
Power consumption	Below 0.4 A	2.7A MAX. (Volume Max.) 4.8A (Program Change)

HEATER AND AIR CONDITIONER

HEATER AND COOLER CIRCUIT

The circuit arrangement of the heater, cooler and heater & cooler system is shown in Fig. 15-68 through 15-70.

Fan control switch connections

Model with heater (RHD/LHD)

Switch position	Color-coding of cable				
	L	LW	LY	LR	LB
0	○				
1	○	○			
2	○		○		
3	○			○	
4	○				○

Model with heater and cooler (RHD/LHD)

Switch position	Color-coding of cable						
	L	LW	LY	LR	LB	(A/C)	
						L	Y
0	○						
1	○	○				○	○
2	○		○			○	○
3	○			○		○	○
4	○				○	○	○

Model with heater

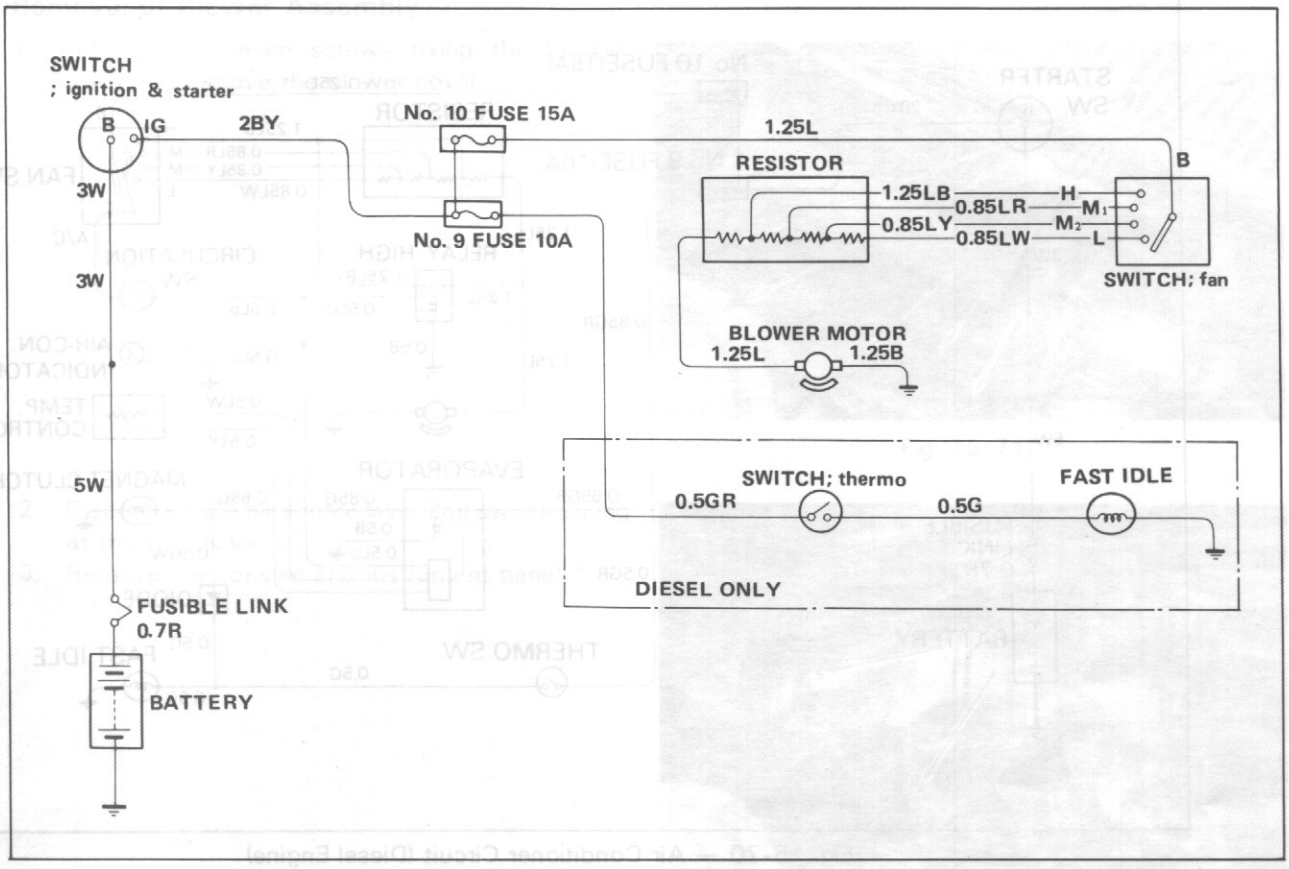


Fig. 15-68 — Heater Circuit

Model with air conditioner

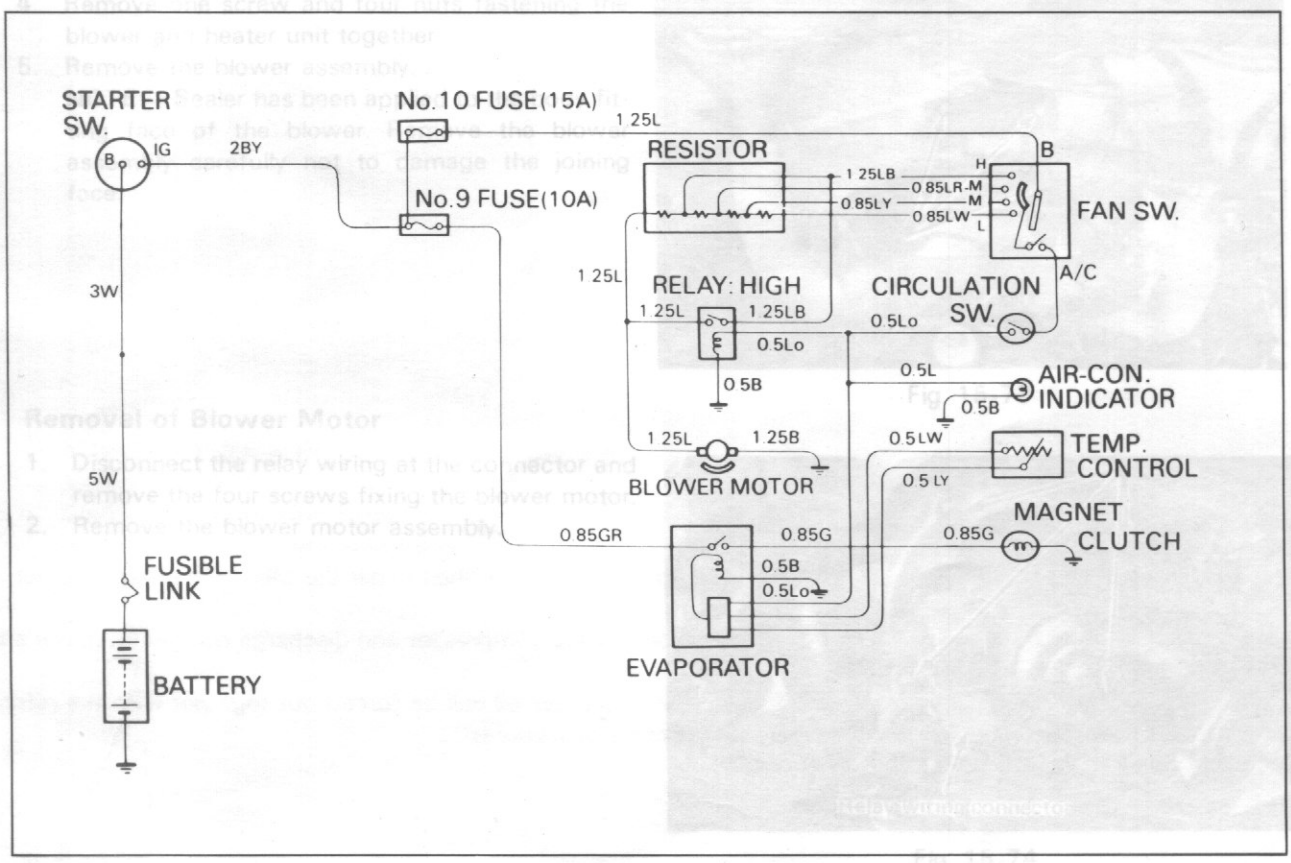


Fig. 15-69 — Air Conditioner Circuit (Gasoline Engine)

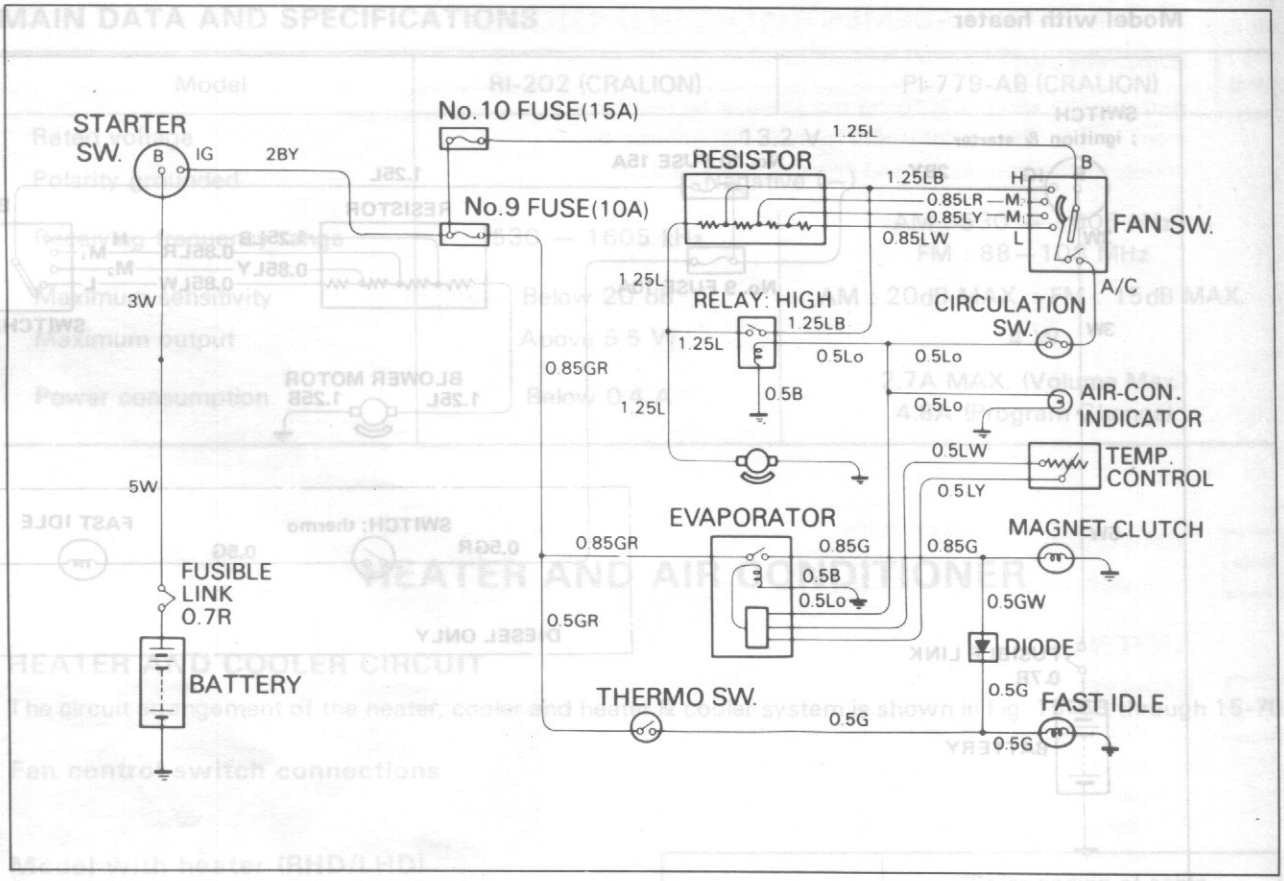


Fig. 15-70 — Air Conditioner Circuit (Diesel Engine)

REMOVAL

Removal of Blower Assembly

1. Remove the seven screws fixing the blower cover and remove the blower cover.

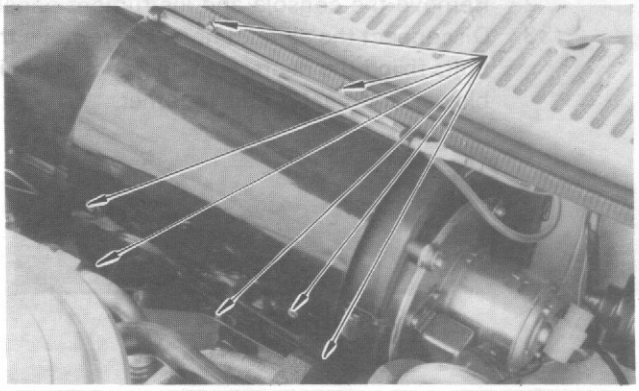


Fig. 15-71

2. Disconnect the air source lever and switch wiring at the connector.
3. Remove the console and instrument panel.

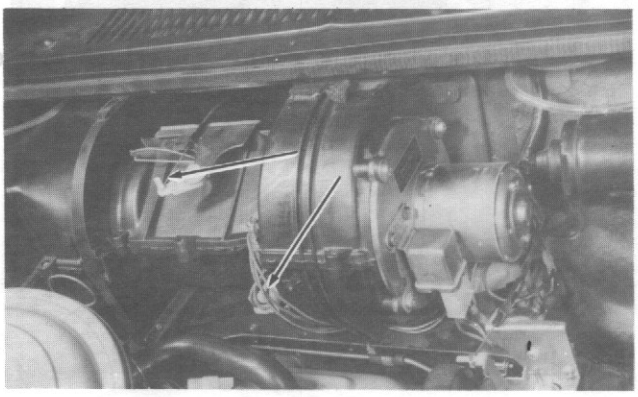


Fig. 15-72

4. Remove one screw and four nuts fastening the blower and heater unit together.
5. Remove the blower assembly.

NOTE: Sealer has been applied to the body fitting face of the blower. Remove the blower assembly carefully not to damage the joining face.

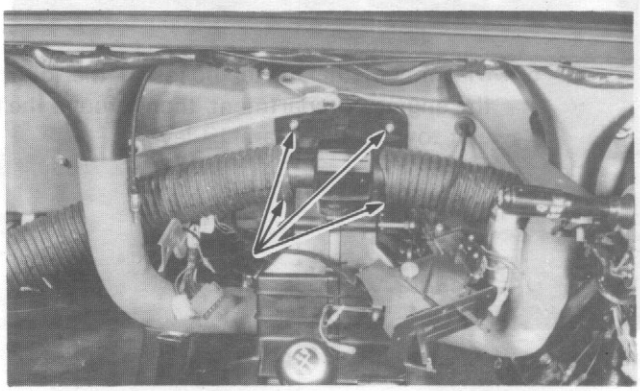


Fig. 15-73

Removal of Blower Motor

1. Disconnect the relay wiring at the connector and remove the four screws fixing the blower motor.
2. Remove the blower motor assembly.

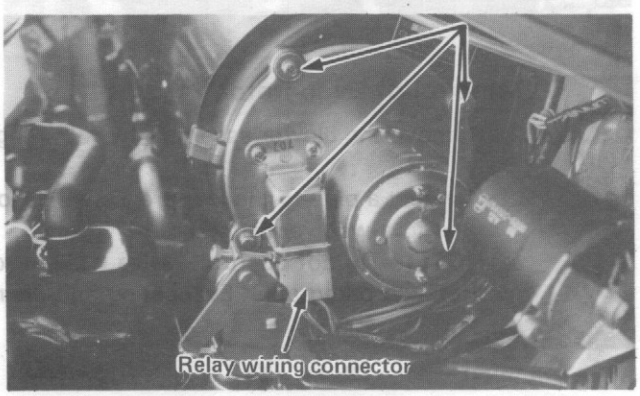


Fig. 15-74

Removal of Heater Unit

1. Drain the radiator.
2. Remove the console and instrument panel.
3. Disconnect the air duct hose and remove the thru bolts fixing the heater unit and nuts fastening the blower and heater unit together.

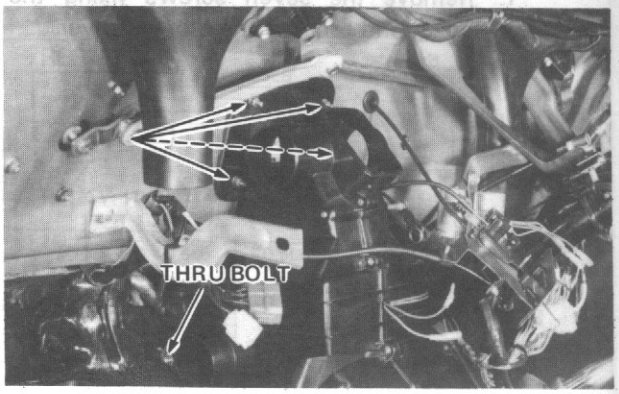


Fig. 15-75

4. Disconnect the control cable from the selector lever.

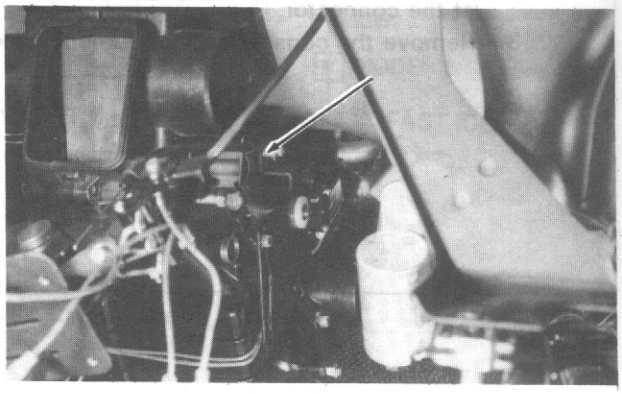


Fig. 15-76

5. Disconnect the heater hoses at the joint within the engine compartment, then remove the heater unit toward the gearshift lever.

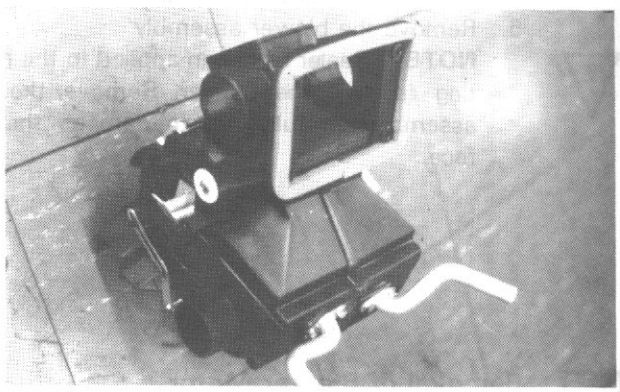


Fig. 15-77

Removal of Evaporator

1. Remove the blower assembly by following the steps described under the title "Removal of blower assembly".
2. Connect a pipe to the low pressure side joint of the compressor and discharge refrigerant gases a little at a time to a well ventilated area.

NOTE: Do not open the valve wide, or compressor oil will be forced out together with the refrigerant. (Refer to paragraph "Evacuating and charging procedures".)

3. Disconnect the pipes at the inlet and outlet side joints of the evaporator using a pair of wrenches to avoid applying localized stresses on the adjacent parts.

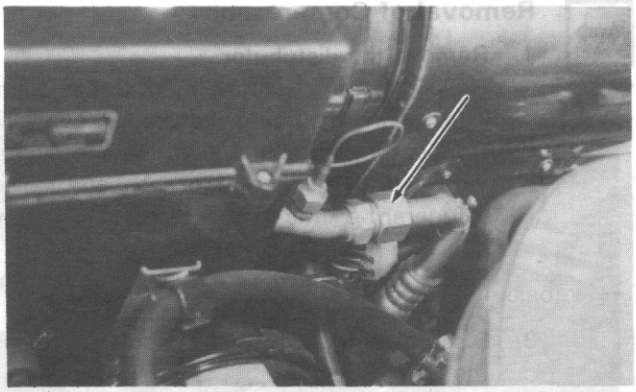


Fig. 15-78

4. Disconnect the windshield washer hoses and remove the bolt fixing the evaporator to the rear face of the vacuum hose bracket.

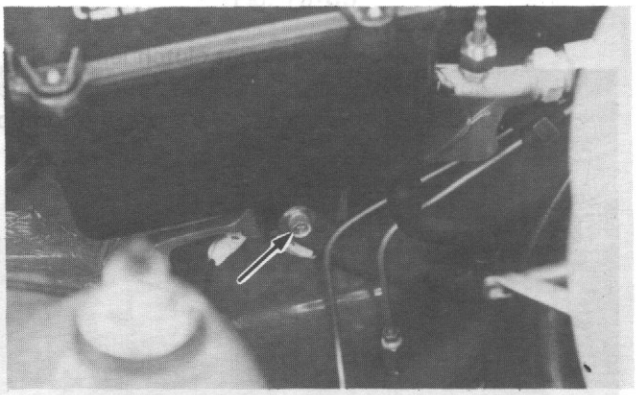


Fig. 15-79

5. Remove the two bolts fixing the evaporator within the passanger compartment.

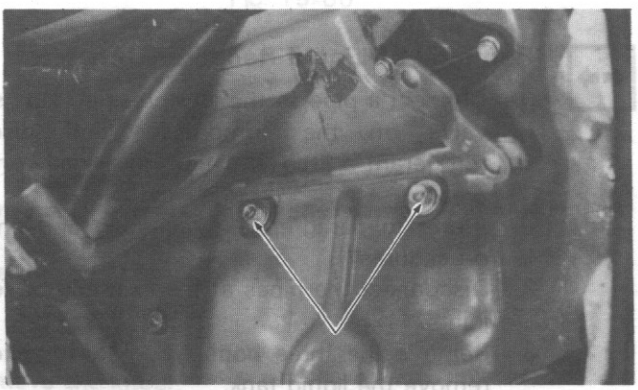


Fig. 15-80

6. Remove the band clip and rubber using care not to break the rubber as it is fixed in position with sealer.
7. Disconnect the thermo switch wiring at the connector and remove the evaporator.

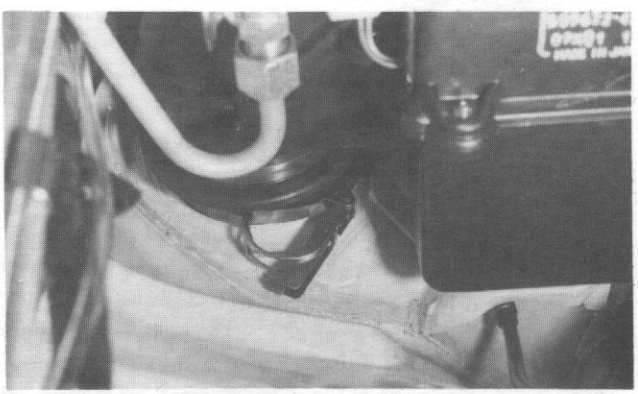


Fig. 15-81

Removal of Compressor

1. Remove the distributor.
   NOTE: Apply a setting mark to the joining portions of the distributor before removal.
2. Connect a pipe to the low pressure side service valve on the compressor and discharge refrigerant a little at a time to a well ventilated area.
   (Refer to paragraph "Evacuating and charging procedures").
3. Disconnect the high and low pressure pipes from the compressor.
4. Loosen the idle pully center bolt and remove the compressor belt by turning the adjust bolt clockwise.
5. Disconnect the magnet clutch lead wiring at the connector and remove the four bolts attaching the compressor and remove the compressor assembly.

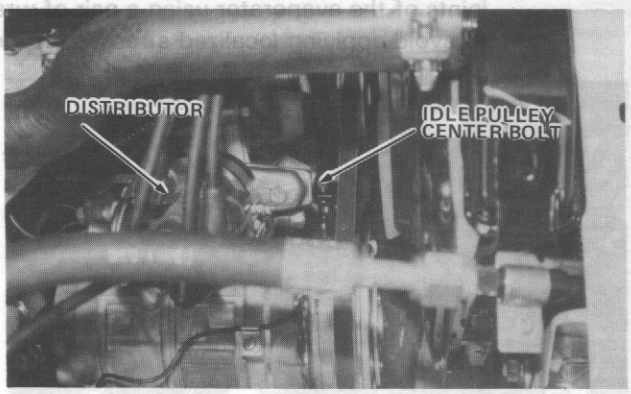


Fig. 15-82

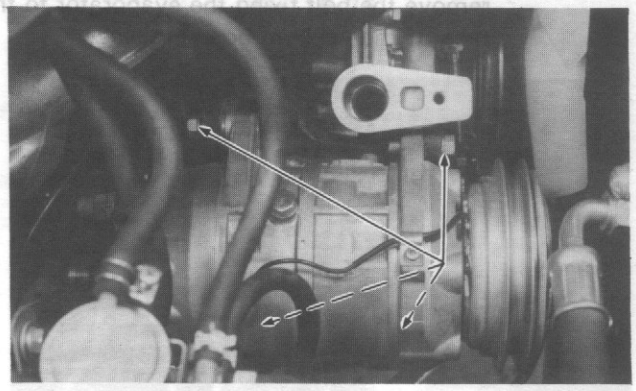


Fig. 15-83

Removal of Liquid Receiver Unit

1. Connect a pipe to the low pressure side service valve on the compressor and discharge refrigerant a little at a time to a well vantilated area.
   (Refer to paragraph "Evacuating and charging procedures").
2. Disconnect the pipes at the inlet and outlet side joints.
3. Remove the three bolts fixing the bracket and remove the liquid tank.

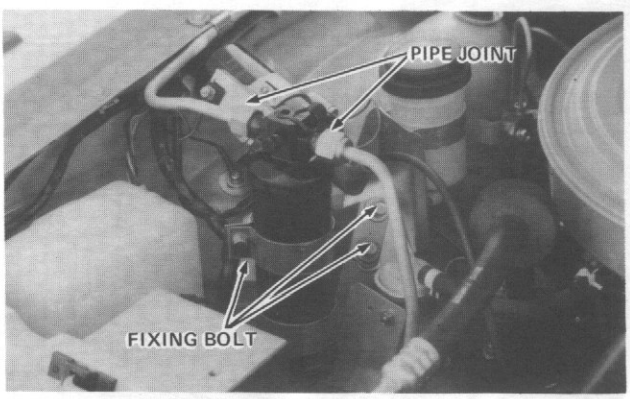


Fig. 15-84

Removal of Condenser

1. Remove the under cover.
2. Drain the radiator.
3. Remove the fan guide and disconnect the upper and lower hoses at the radiator side.
4. Connect a pipe to the low pressure side service valve on the compressor and discharge refrigerant a little at time to a well ventilated area. (Refer to paragraph "Evacuating and charging procedures").
5. Disconnect the cooler pipe leading to the liquid receiver unit and flexible hose leading to the compressor at the joints.

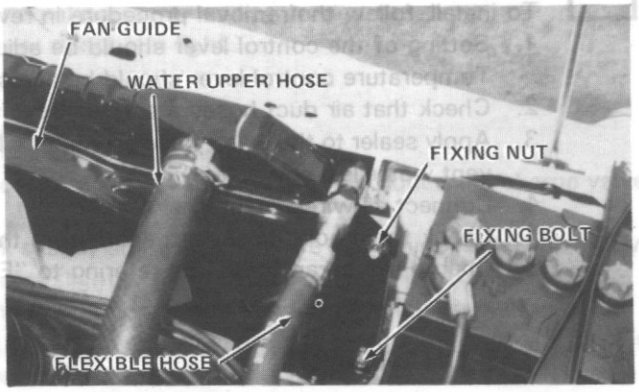


Fig. 15-85

6. Remove the two nuts and two bolts fixing the condenser together with the radiator remove the radiator, then remove the condenser.

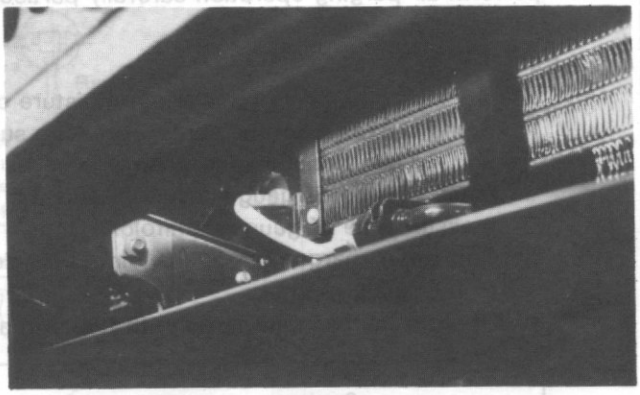


Fig. 15-86

Removal of Control Lever

1. Disconnect the battery ground cable.
2. Remove the instrument panel.
3. Remove the seven screws fixing the blower cover and remove the blower cover.
4. Disconnect the three bowden cables from the heater unit, blower unit and water valve.
5. Disconnect the lead wires at the connector.
6. Remove the control lever assembly together with the bowden cables.

Removal of Blowr Switch

1. Remove the lock bolt fixing the switch knob and remove the knob.
2. Press out the switch toward rear of the instrument panel, disconnect the switch wiring at the connector, then remove the switch.

INSTALLATION

To install, follow the removal procedure in reverse order and note the following points:

1. Setting of the control lever should be adjusted if the control lever assembly has been removed. Temperature control lever should be adjusted, so that the clearance on each side of the lever is equalized.
2. Check that air duct hoses are apart from the windshield wiper linkage.
3. Apply sealer to the water hose grommet, blower fitting face and evaportor rubber before installation to prevent water leakage.
4. Connect all wires securely.
5. Check that cooler hoses are apart from the engine and body members.
6. Charge refrigerant gases by refering to "Evacuating and charging procedures".

GAS CHARGING

Even a small amount of moisture or other foreign matter in the cycle will cause rusting of parts, ice formation or restinctions in the circuit which, in turn, leads to permanent trouble. Before refilling the system with refrigerant, perform air-purging operation carefully particularly in rainy season.

Air-Purging

Use a vacuum pump to remove air, moisture or other foreign matter from the system.

1. Remove caps from the service valve on suction side of compressor and the service valve of liquid receiver unit. Then connect one charge hose at the service valve on suction side of compressor and the low pressure side of gauge manifold and the other hose at the service valve of liquid receiver and the high pressure side of gauge manifold.
2. Connect a charge hose to the joint at the center part of the manifold, then connect another end of the hose to the vacuum pump.
3. Operate the vacuum pump with the high and low pressure valves on the gauge manifold opened.

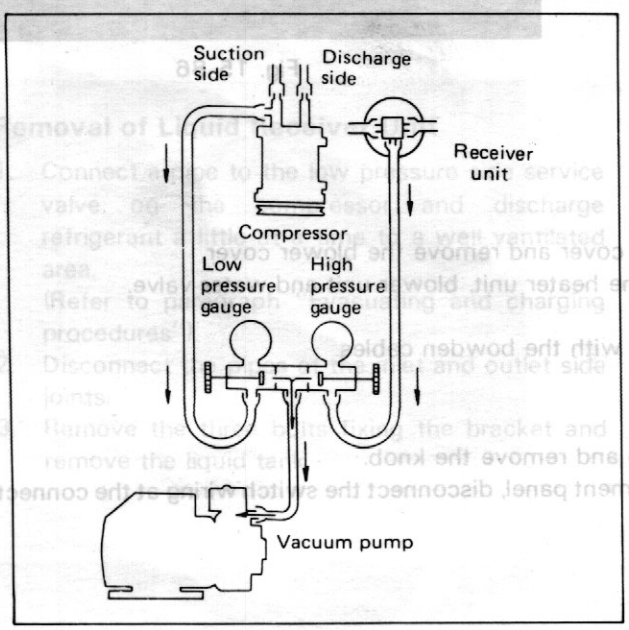


Fig. 15-87

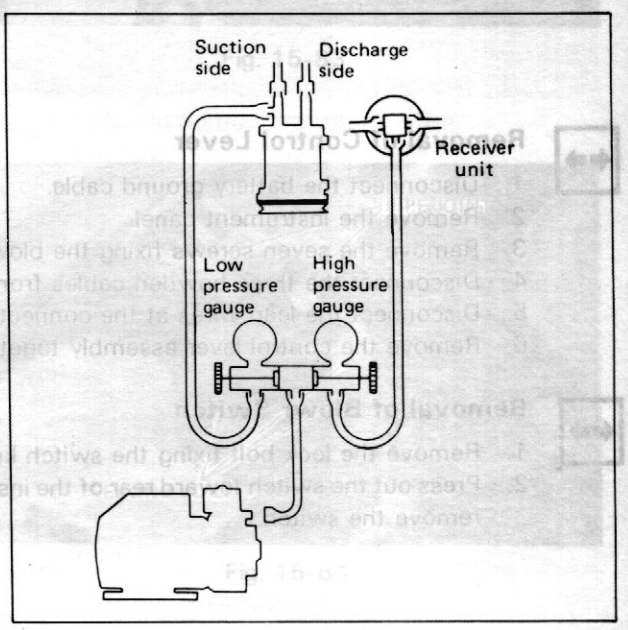


Fig. 15-88

4. Continue to operate the vacuum pump until the gauge on the low pressure side gives a reading of 740 mmHg and give an additional 5 minutes of pumping. If the vacuum gauge does not indicate negative pressure condition, check pipe line for leakage and correct as necessary.
5. Close the valve on the high and low pressure gauges when bleeding operation is completed.
6. Stop the vacuum pump and disconnect the hose from the vacuum pump side joint.

   NOTE: Disconnect hose after stopping vacuum pump and do not disconnect hose before stopping vacuum hose, or foreign matter will be drawn into the pump.
7. Leave the valves closed for approximately 10 minutes and check that reading of the vacuum gauge remains unchanged.

Refrigerant Handling Precautions

Heating of gas container causes rapid increase in the internal pressure, leading to rupture. Do not leave gas container on a stove or radiator or under direct sun light.

Gas-Charging

Charge the system with refrigerant after air-purging and inspection for leaks.

1. Connect charge valve to the charge hose disconnected from the vacuum pump and open the charge valve fully.
2. Connect gas container to the charge valve and break seal by screwing the valve in, then open the valve fully.
3. Bleed the hose by loosening gauge manifold side joint slightly, then fully tighten the joint.
4. Lead refrigerant gas into the system by opening the low pressure side valve on the gauge manifold.

NOTE: Do not invert gas container, or refrigerant in a liquid state will run into the compressor and causes waterhammering to occur when compressor is operated.

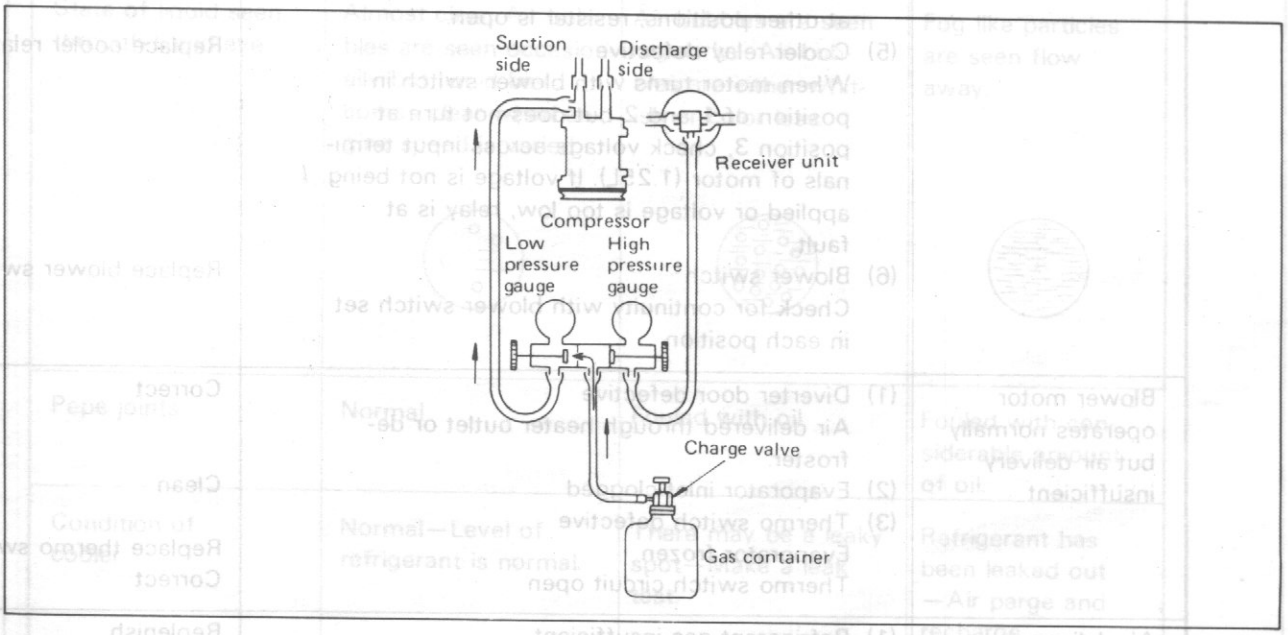


Fig. 15-89

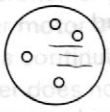
5. When charging of gas into the system is finished, start and let the engine run at approximately 1,000 rpm.
6. Close the low pressure side valve on the gauge manifold when the low pressure side gauge indicates nearly zero and gas container is emptied.
7. Repeat the operation described under paragraphs 1 through 4 until white color bubbles disappear and liquid becomes clear as viewed through the sight glass in the liquid receiver unit.
   When the sight glass becomes clear, it indicates that the system is fully charged.
   (Refrigerant capacity; 800g)
8. Close the valve on the low pressure side.
9. Disconnect charge hose from the service valves on the air compressor and replace the caps.

DIAGNOSIS

Cooler

Complaint	Cause and inspection procedure	Correction
Blower motor inoperative	(1) Fuse blown out or in poor contact	Correct or replace fuse
	(2) Circuit open or poor connections.	Correct
	(3) Blower motor defective Disconnect motor leads at rear of motor and make a continuity test. If tester does not indicate a continuity, motor is defective.	Correct or replace motor
	(4) Resister turned out If motor runs at high speed with blower switch set in position of 3 but does not turn at other positions, resister is open.	Replace resister
	(5) Cooler relay defective When motor turns with blower switch in position of 1 and 2 but does not turn at position 3, check voltage across input terminals of motor (1.25L). If voltage is not being applied or voltage is too low, relay is at fault.	Replace cooler relay
	(6) Blower switch Check for continuity with blower switch set in each position	Replace blower switch
Blower motor operates normally but air delivery insufficient	(1) Diverter door defective Air delivered through heater outlet or defroster.	Correct
	(2) Evaporator inlet clogged	Clean
	(3) Thermo switch defective Evaporator frozen	Replace thermo switch
	Thermo switch circuit open	Correct
Air delivery is sufficient and compressor is working normally but air is not cooled sufficiently.	(1) Refrigerant gas insufficient Operate cooler 5 — 10 minutes and touch high and low pressure pipes on the compressor with hand. If temperature of pipes is nearly equal, check liquid eye on the liquid receiver unit. When white color bubbles are seen through liquid eye, it indicates that refrigerant level is insufficient.	Replenish
	(2) Refrigerant level too high Air bubbles do not pass through liquid eye immediately when condenser is cooled with water.	Discharge refrigerant a little at a time until air bubbles are seen through liquid eye occasionally.

Complaint	Cause and inspection procedure	Correction

Condition of Cooloer	Normal	Abnormal	
Temperature of high and low pressure pipes	There is a noticeable difference between temperature of high and low pressure pipes; High pressure pipe is high in temperature and low pressure pipe is cold.	High pressure pipe is warm and low pressure pipe is not warm —There is very little difference between temperature of pipes.	There is very little difference between temperature of high and low pressure pipes
State of liquid seen through liquid eye	Almost clear. Air bubbles are seen occasionally but liquid becomes clear when engine speed is varied 	Air bubbles are seen regularly—Air bubbles are either whitish or color less. 	Fog like particles are seen flow away. 
Pepe joints	Normal	Fouled with oil	Fouled with considerable amount of oil.
Condition of cooler	Normal—Level of refrigerant is normal.	There may be a leaky spot—Make a leak test.	Refrigerant has been leaked out —Air parge and recharge.

Blower motor	(3) Pressure at low pressure side too high	
	1. Thermo switch defective magnet clutch lowers.	Replace thermo switch
	2. Compressor gasket or valve defective Indication of high and low pressure side gauges balances immediately as compressor is stopped.	Clean valves or replace compressor
	3. Heat sensor of expansion valve in poor contact Compressor connector is frosted and is colder than pipe at evaporator outlet.	Bring heat sensor into firm contact with low pressure pipe
	4. Expansion valve defective Compressor connector is frosted and is colder than pipe at evaporator outlet. Temperature of compressor connector remain almost uncharged as tested with heat sensor pulled apart away from pipe.	Replace expansion valve

Complaint	Cause and inspection procedure	Correction
	(4) Pressure at low pressure side too low	
	1. Level of refrigerant insufficient.	Refer to paragraph(1)
	2. Liquid receiver unit clogged. There is a great difference between temperature at outlet and inlet sides of liquid receiver and liquid receiver tank to get frosted.	Replace liquid receiver unit
	3. Expansion valve clogged Inlet side of expansion valve is frosted causing pressure at low pressure side of gauge to become zero.	Replace expansion valve
	4. Pipe(s) clogged or flattend. Low pressure side of gauge indicates negative pressure condition.	Clean or replace pipe
	5. Thermo switch defective Evaporator frozen	Replace thermo switch
	(5) Pressure at high pressure side too high	
	1. Condenser defective Condenser fouled or clogged	Clean condenser
	2. Level refrigerant too high	Refer to paragraph(2)
	3. Air in circuit Indication of high pressure side gauge too high (Higher than 20 kg/cm^2)	Discharge refrigerant and recharge after air purging
	(6) Pressure at high pressure side too low	
	1. Level of refrigerant too low	Refer to paragraph(1)
Compressor inoperative or operation sluggish	(1) Compressor belt loosely fitted	Adjust belt tension
	(2) Compressor defective Belt slips	Replace compressor
	(3) Battery under-charged — Clutch slips	Recharge
	(4) Wire broken, poorly connected or poorly grounded	Correct
	(5) Magnet clutch defective	
	1. Magnet clutch layers shorted — Clutch slips	Replace magent clutch
	2. Oil on clutch face Magnet clutch fouled with	Clean
	3. Clearance between clutch disc and clutch wheel excessive	Adjust clearance or replace clutch
	4. Coils open No continuity exsists across lead and ground	Replace magnet clutch

Heater

Complaint	Cause and inspection procedure	Correction
Blower motor turns but air is not heated	(1) Valve remains closed Check valve operation with control wire disconnected.	Make an adjustment, so that valve is fully opened or closed with control lever Replace valve when it is found to be stuck
	(2) Whater hose kinked or clogged	Clean or replace
Poor defrosting effect	(1) Defroster hose disconnected (2) Room defrostr door inopeative	Correct Correct
Fan speed not controlled with blower switch	(1) Blower switch defective. Make a continuity test across switch terminals with switch set in each position	Replace blower switch
	(2) Poor connections	Correct
Blower motor inoperative	(1) Fuse blown out or in poor contact (2) Wire broken or poorly connected (3) Blower motor defective Make a continuity test across motor leads. If tester does not indicate a continuity, motor is defective	Correct or replace fuse Correct Overhaul or replace motor
	(4) Resister open When motor speed is not changed with blower switch set in position of 1, 2 or 3, or when motor does not operate with switch set in any position, resister is open.	Replace resister
	(5) Blower switch defective Make a continuity test with switch set in each position.	Replace blower switch

RELAY

The following shows the types and position of installation of relays on PFD60 model.

Parts Name	Location
Glow pulg relay No. 1 Glow plug relay No. 2 Starter relay neutral relay	Within relay box located at right front side of engine compartment.
Intermittent wiper relay Rear window defogger relay	Dash board; engine room side.

FUEL FILTER WARNING LIGHT

The VE type fuel injection pump relies on fuel for internal lubrication and removal of water in fuel is necessary. Therefore, a water filter is built into the cartridge type fuel filter, and a switch which operates when the amount of water traped within the filter becomes approx. 80 cc.

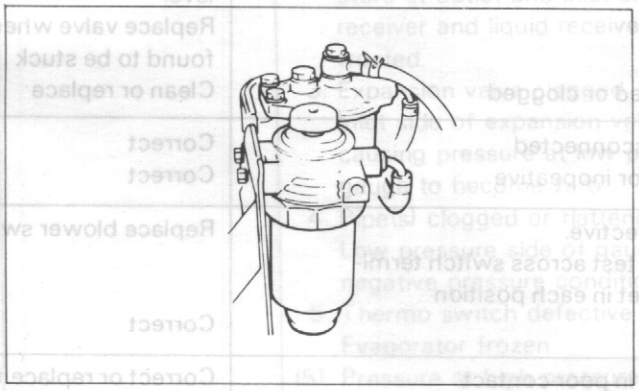


Fig. 15-90

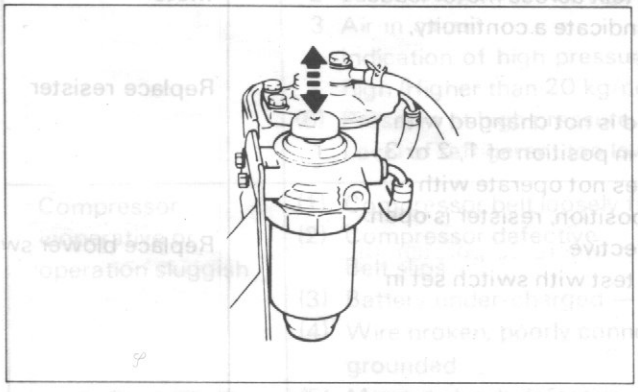


Fig. 15-91

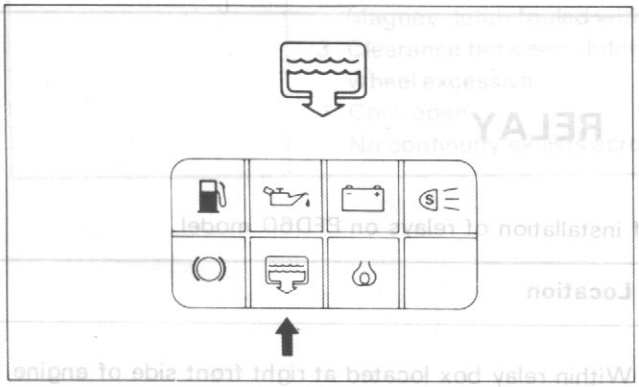


Fig. 15-92

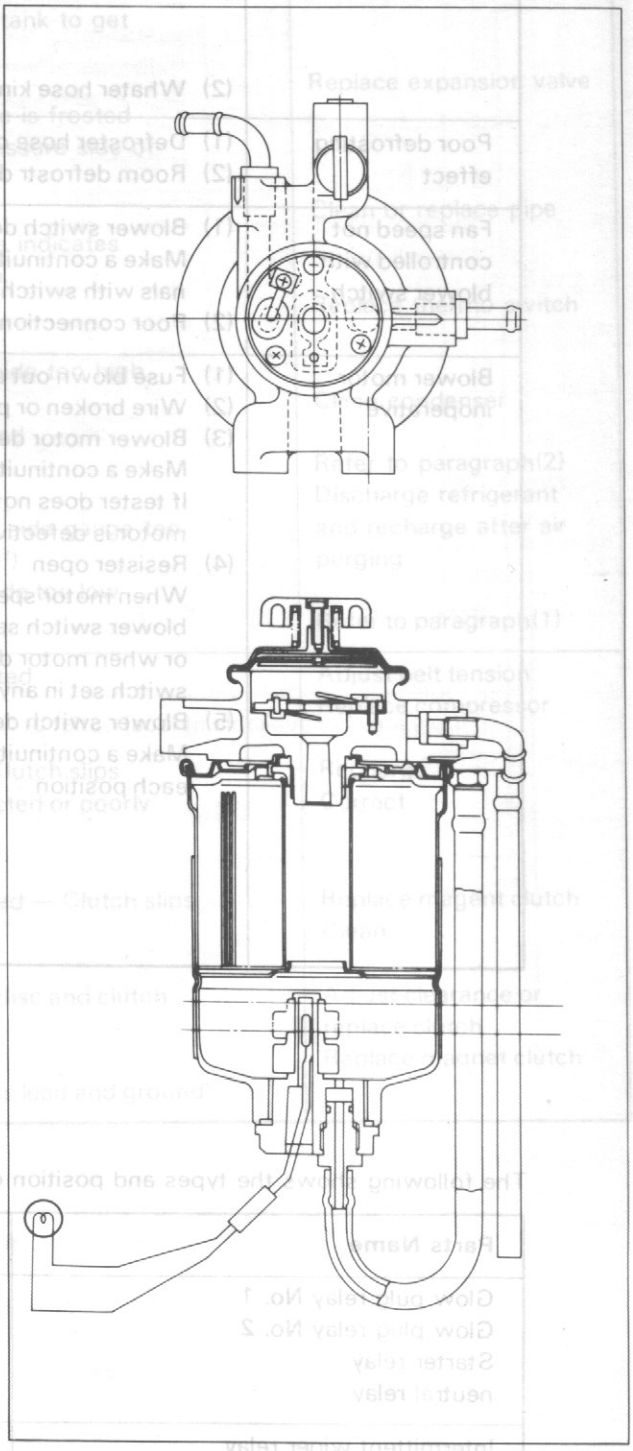


Fig. 15-93