AIR CONDITIONING SYSTEM

4-7

SUBARU

1988

REMARKS:

The description for air-conditioning system in this chapter pertains only to the SUBARU AIR-CONDITIONING SYSTEM that is installed as original equipment by the manufacturer (FUJI HEAVY INDUSTRIES, LTD.).

MECHANISM AND FUNCTION

ELECTRICAL SYSTEM

1) When the mode control switch is set at "A/C. MAX", "A/C", or "DEF", the air conditioner switch (microswitch) will be turned on. In this condition, when the blower switch is turned on, the blower relay and air conditioner relay will activate. This in turn causes the blower motor, fast idle solenoid (FICD) and compressor clutch to activate.
2) In addition, activating the pressure switch (main fan control) or the thermo switch will cause the main fan to activate.
3) When either the triple switch or the thermostat activates, all air conditioner circuits except the blower motor will deactivate. In this condition, however, when the temperature of the coolant in the radiator is high enough and the thermo switch turns on, the radiator fan (main fan) will activate.
4) When refrigerant pressure exceeds the specified value with the A/C switch to ON, the main fan will activate to help cool the condenser.
5) Electrical system is also used to open or close the mode selector shutter and internal/external air selector shutter by utilizing the electrical motor.

Wiring Harness Installation and Electrical Device

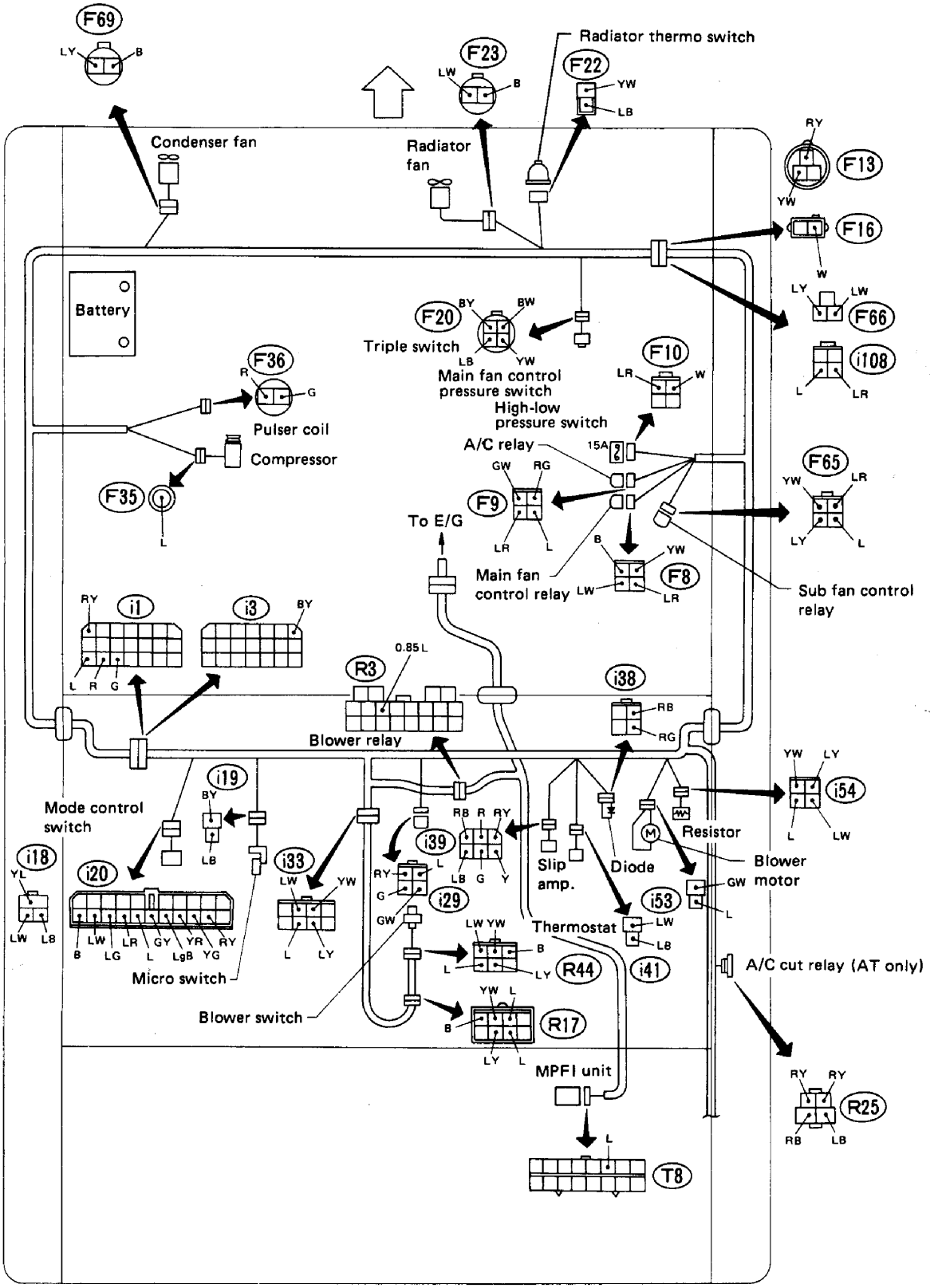


Fig. 1

L4-1520

F.I.C.D.

F.I.C.D. is of the solenoid valve type incorporated into throttle body. It operates when the air conditioner switch is turned on. Idle speed need not be adjusted.

Idle speed with F.I.C.D. in operation:
850 ± 50 rpm

BELT PROTECTION SYSTEM

General

Whenever the compressor rpm drops below the specified value, the belt protection system quickly turns off the magnet clutch of compressor and operations of alternator, water pump and power steering oil pump are kept normal. Disengagement of the clutch causes the compressor pulley to rotate freely so that belt is not broken.

Operation

In the system as shown in figure, while compressor is operating, the ratio of compressor rpm to engine rpm is monitored by a pulser amplifier. When compressor rpm drops more than 20 to 25% below the normal rpm, the system judges as if compressor is "locked" and turns off the magnet clutch of compressor.

Once the system defects a "locked" compressor, the magnet clutch remains off until the air conditioner switch is turned off and turned on again.

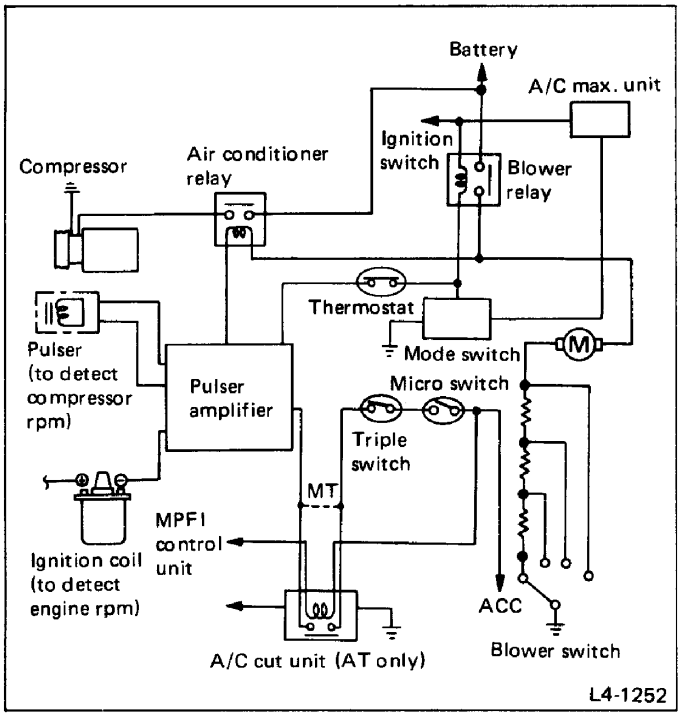


Fig. 2

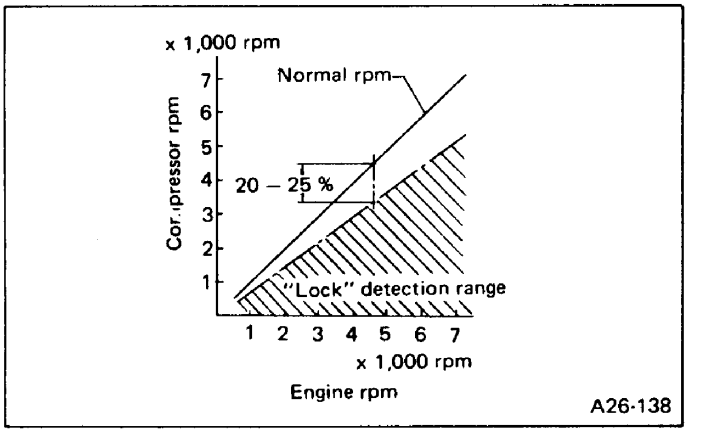


Fig. 3 Characteristic curves of "lock" detection

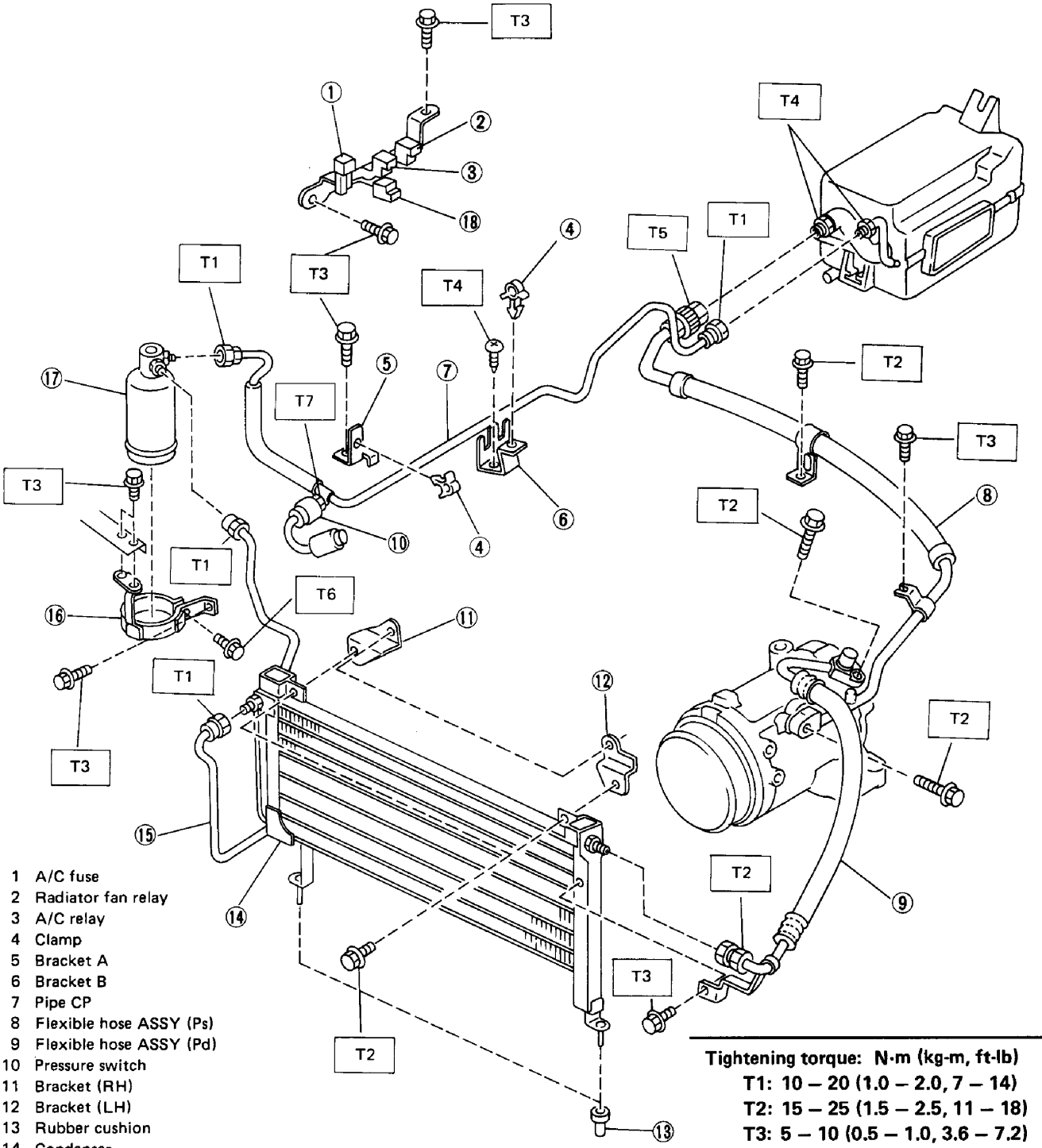
SPECIFICATIONS

Type of air conditioner		Reheat air mix type
Standard cooling efficiency (IMACA)		5,001 kW (4,300 kcal/h, 17,062 BTU/h)
Refrigerant		R-12 (CCL_2F_2) [0.74 – 0.79 kg (1.63 – 1.74 lb)]
Compressor	Type	Swash plate type MJS170-6DY
	Discharge	170 cm^3 (170 cc, 10.37 cu in)/rev.
	Max. permissible speed	7,500 rpm
Magnet clutch	Type	Dry, single-disc type PMC140-1PJ
	Power consumption	40 W
	Type of belt	Poly V type
	Pulley dia. (effective dia.)	122 mm (4.80 in)
	Pulley ratio	1.11
Condenser	Type	Corrugated fin type
	Front area	0.142 m^2 (1.53 sq ft)
	Core thickness	26 mm (1.02 in)
	Radiation area	3.43 m^2 (36.9 sq ft)
Receiver dryer	Effective inner capacity	420 cm^3 (420 cc, 25.63 cu in)
Expansion valve	Type	Automatic temperature control, internal pressure-balance type
Evaporator	Type	Corrugated fin type
	Dimensions (W x H x T)	101.3 x 170 x 230 mm (3.99 x 6.69 x 9.06 in)
Blower fan	Fan type	Sirocco fan type
	Outer diameter x width	140 x 65 mm (5.51 x 2.56 in)
	Power consumption	230 W at 12 V
Condenser fan (Sub fan)	Motor type	Magnet type
	Power consumption	140 W at 12 V
	Fan outer diameter	280 mm (11.02 in)
Radiator fan (Main fan)	Motor type	Magnet type
	Power consumption	140 W at 12 V
	Fan outer diameter	340 mm (13.39 in)
Idling speed with F.I.C.D. in operation		850 ± 50 rpm
Low-pressure-switch working pressure		196 ± 20 kPa (2.0 ± 0.2 kg/cm^2, 28 ± 2.8 psi) ON → OFF 206 ± 29 kPa (2.1 ± 0.3 kg/cm^2, 30 ± 4 psi) OFF → ON

High-pressure-switch working pressure	2,648 ± 196 kPa (27.0 ± 2.0 kg/cm^2, 384 ± 28 psi) ON → OFF DIFF 588 ± 196 kPa (6 ± 2 kg/cm^2, 85 ± 28 psi)
Pressure switch (Main fan control)	1,569 ± 127 kPa (16.0 ± 1.3 kg/cm^2, 228 ± 18 psi) OFF → ON 1,275 ± 147 kPa (13.0 ± 1.5 kg/cm^2, 185 ± 21 psi) ON → OFF

COMPONENT PARTS

Air Conditioner System



1 A/C fuse
2 Radiator fan relay
3 A/C relay
4 Clamp
5 Bracket A
6 Bracket B
7 Pipe CP
8 Flexible hose ASSY (Ps)
9 Flexible hose ASSY (Pd)
10 Pressure switch
11 Bracket (RH)
12 Bracket (LH)
13 Rubber cushion
14 Condenser
15 Pipe CP
16 Bracket
17 Receiver drier
18 Condenser fan relay

Tightening torque: N·m (kg-m, ft-lb)
T1: 10 – 20 (1.0 – 2.0, 7 – 14)
T2: 15 – 25 (1.5 – 2.5, 11 – 18)
T3: 5 – 10 (0.5 – 1.0, 3.6 – 7.2)
T4: 3 – 6 (0.3 – 0.6, 2.2 – 4.3)
T5: 20 – 29 (2.0 – 3.0, 14 – 22)
T6: 5.4 – 8.3 (0.55 – 0.85, 4.0 – 6.1)
T7: 15 – 18 (1.5 – 1.8, 11 – 13)

Fig. 4

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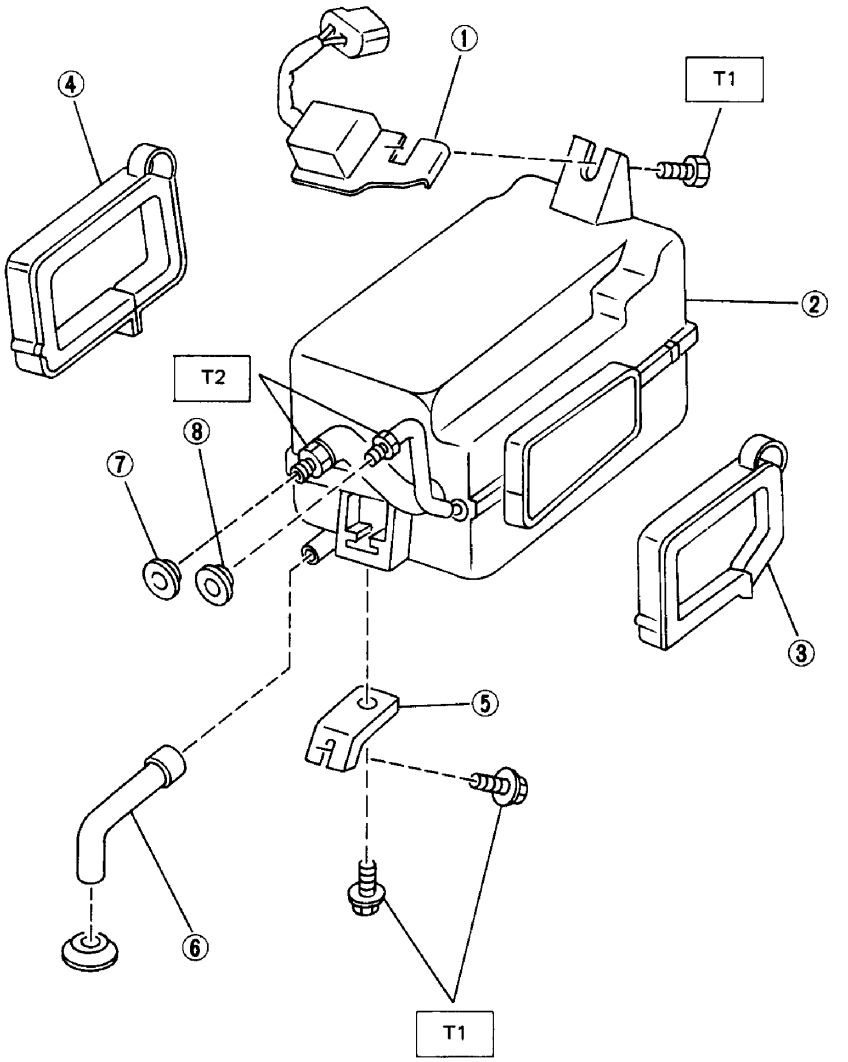
Evaporator



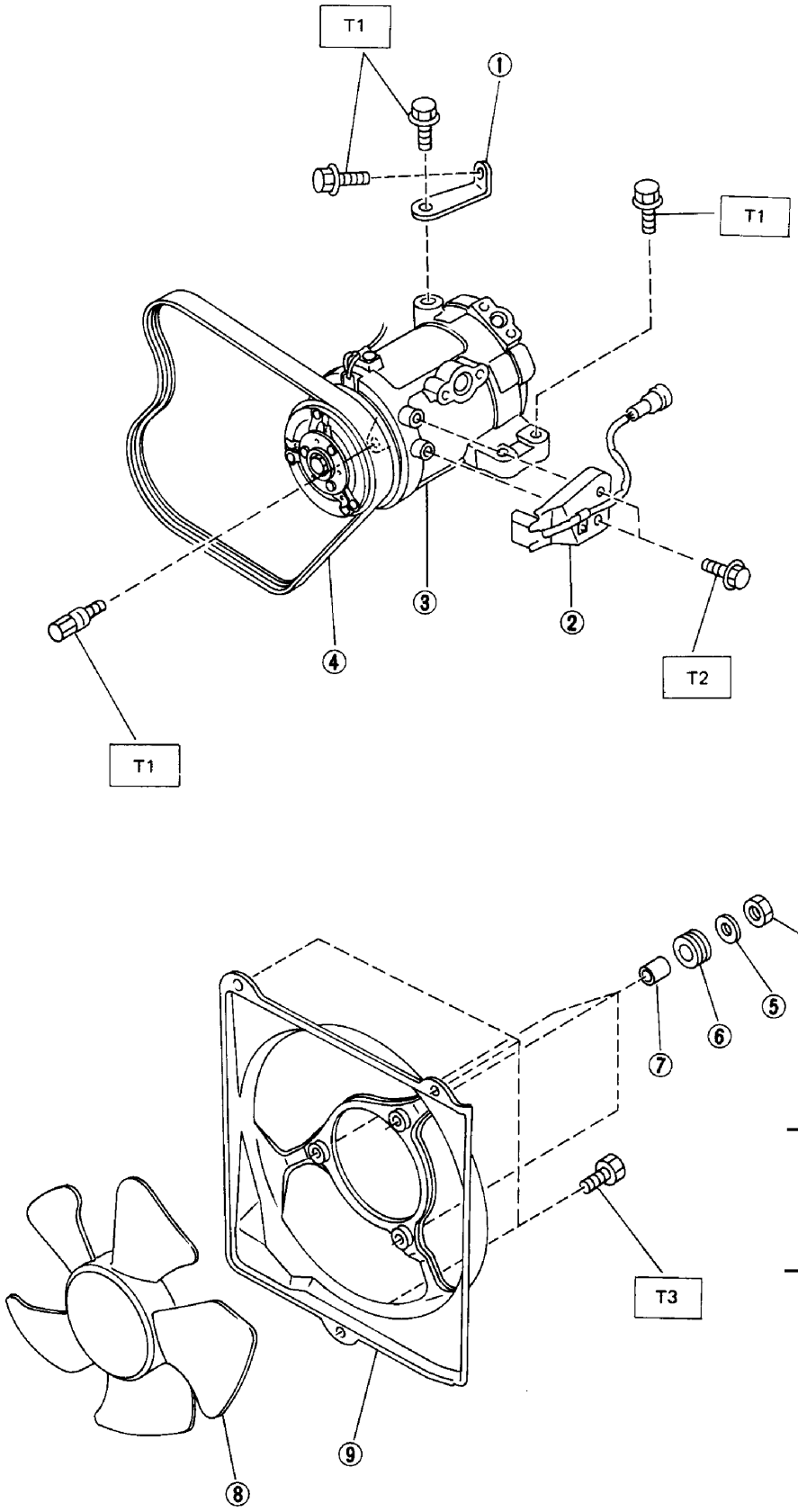
1 Pulser amplifier
2 Evaporator
3 Heater band ASSY
4 Blower band ASSY
5 Bracket
6 Drain hose
7 Grommet (Ps)
8 Grommet (Pd)

Tightening torque: N·m (kg-m, ft-lb)
T1: 5 – 10 (0.5 – 1.0, 3.6 – 7.2)
T2: 3 – 6 (0.3 – 0.6, 2.2 – 4.3)

Fig. 5

L4-1523

Compressor, Fan and Belt



1 Bracket
2 Pulser ASSY
3 Compressor CP
4 V-ribbed belt
5 Washer
6 Rubber cushion
7 Spacer
8 Fan motor ASSY
9 Shroud

Tightening torque: N·m (kg-m, ft-lb)
T1: 34 – 44 (3.5 – 4.5, 25 – 33)
T2: 15 – 25 (1.5 – 2.5, 11 – 18)
T3: 5 – 10 (0.5 – 1.0, 3.6 – 7.2)

Fig. 6

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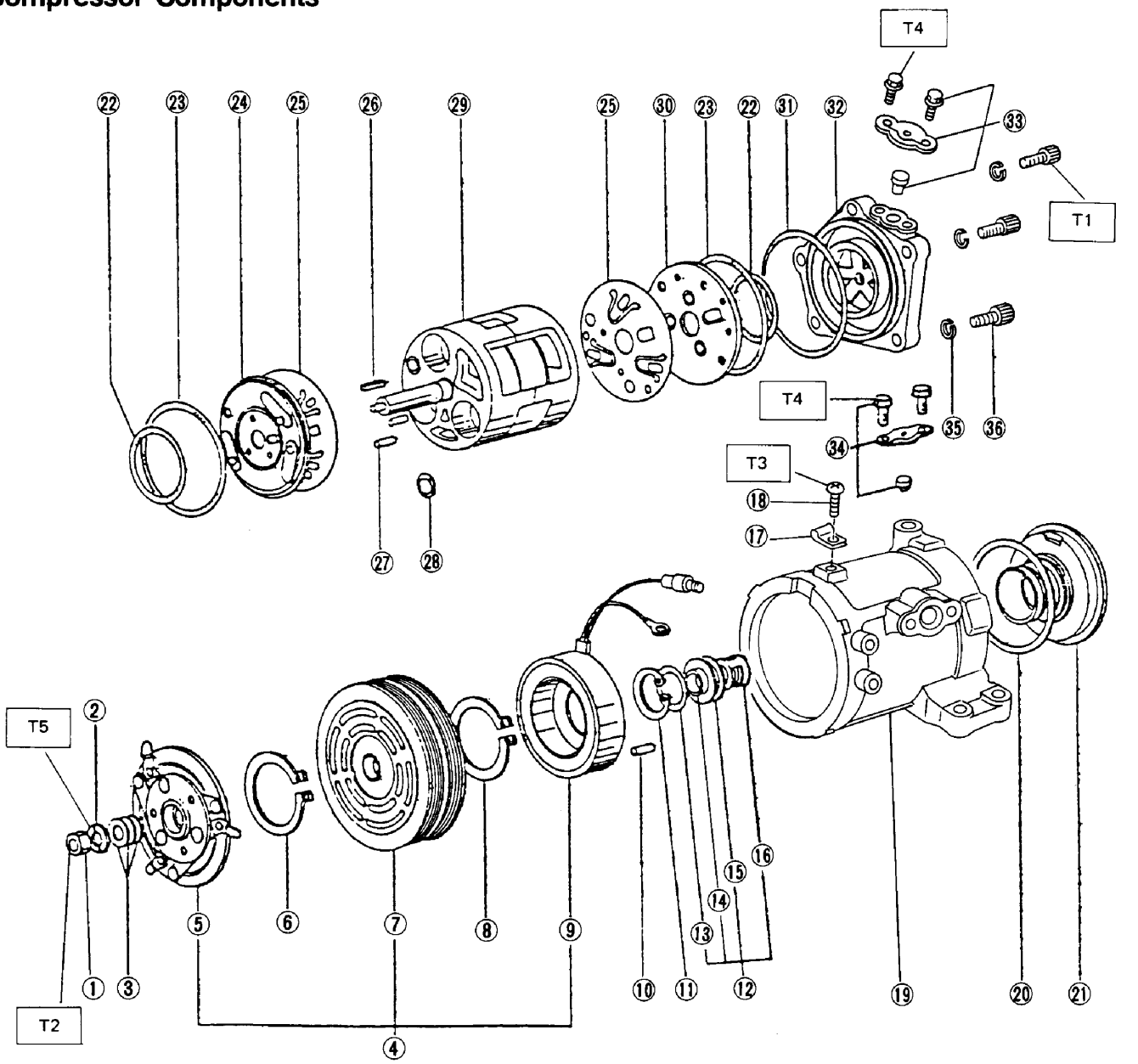
Compressor Components



No.	Part name	Bolt type	Tightening torque
T1	Cover end (R) bolt	10 mm x 25 mm socket head bolt	19 – 21 N·m (1.9 – 2.1 kg-m, 14 – 15 ft-lb)
T2	Clutch ASSY nut	8 mm nut	19 – 21 N·m (1.9 – 2.1 kg-m, 14 – 15 ft-lb)
T3	Wire clamping bolt	5 mm x 8 mm screw	2.7 – 3.3 N·m (0.28 – 0.34 kg-m, 2.0 – 2.5 ft-lb)
T4	Seal cover bolt	8 mm x 12 mm flange head bolt	5 – 6 N·m (0.5 – 0.6 kg-m, 3.6 – 4.3 ft-lb)
T5	Hub nut	24 mm x 7.5 mm nut	19 – 21 N·m (1.9 – 2.1 kg-m, 14 – 15 ft-lb)

1 Nut (8 mm)
2 Hub nut
3 Spacer
4 Clutch ASSY
5 Armature
6 Wedge ring (40 mm)
7 Rotor
8 Wedge ring (50 mm)
9 Stator
10 Key
11 Snap ring (32 mm)
12 Shaft seal ASSY
13 O-ring (28 mm)
14 Cover plate
15. Seal ring
16 Shaft seal
17 Wire clamp
18 Screw
19 Shell
20 Shell gasket
21 Cover end (F)
22 O-ring (Cylinder head IN)
23 O-ring (Cylinder head OUT)
24 Cylinder head (F)
25 Suction valve plate
26 Key
27 Knock pin
28 O-ring (12 mm, gas pipe)
29 Compressor cylinder
30 Cylinder head (R)
31 O-ring (Cover end R)
32 Cover end (R)
33 Seal cover set (Delivery)
34 Seal cover set (Suction)
35 Wave washer
36 Socket bolt (10 mm)

Fig. 7

L4-1525

SERVICE PROCEDURE

On-Car Service

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 lubrication 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.

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.

MAINTENANCE

Periodical maintenance and season-in inspection

Both periodical 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 INSTRUCTION

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.
- 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.

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 strike 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 (126°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.

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.

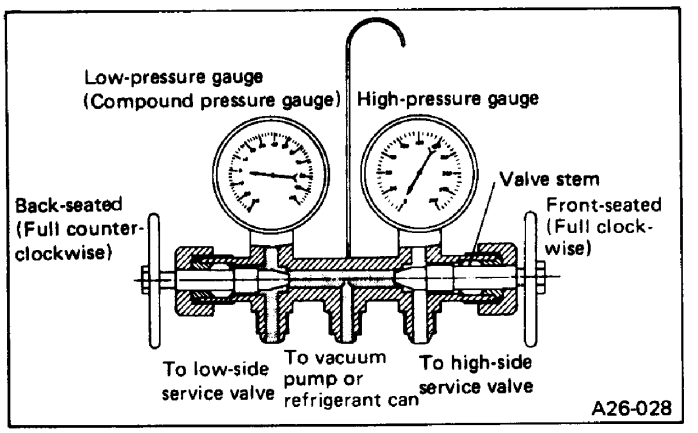


Fig. 8

(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.

(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:
When working with refrigerant, protect your fingers against frostbite by using gloves or other cloth material.

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:
When working with refrigerant, protect your fingers against frostbite by using gloves or other cloth material.

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.

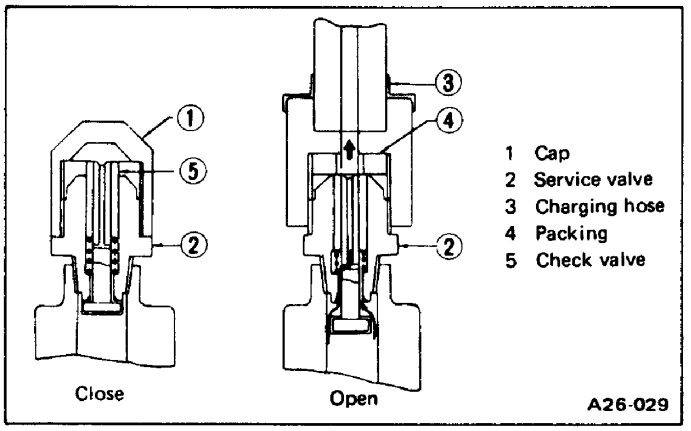


Fig. 9

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.

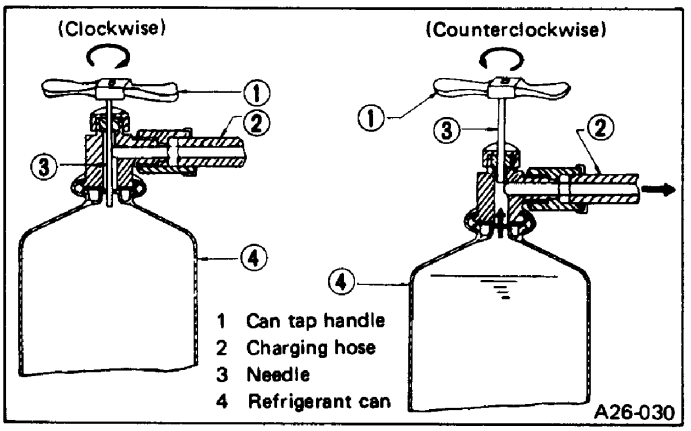


Fig. 10

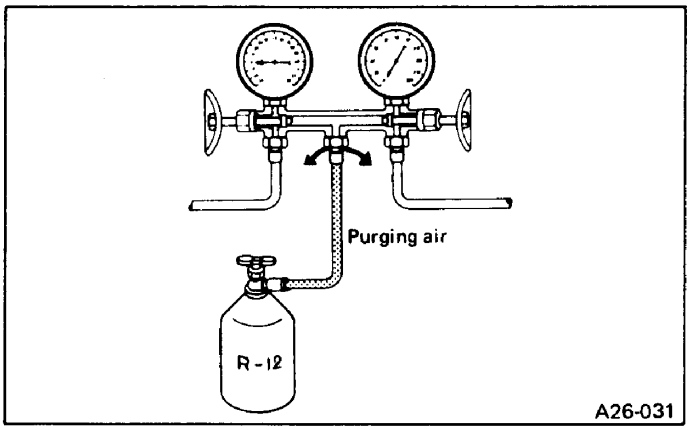


Fig. 11

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.

Do not allow refrigerant to rush out. Otherwise, compressor oil will be discharged along with refrigerant.

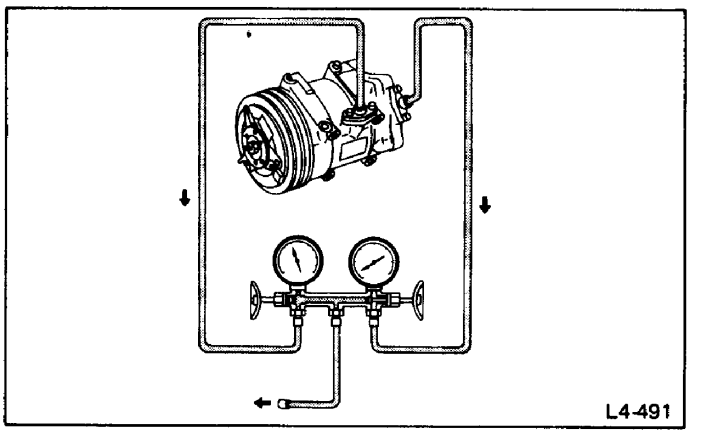


Fig. 12

CAUTION:
When connecting the charging hose to the service valve or disconnecting it therefrom, protect your fingers against frostbite by using gloves or other cloth material.

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.

5) When low-pressure gauge reading has reached to approximately 66.7 kPa (500 mmHg, 19.69 inHg), slowly open high-pressure valve.

6) When pressure inside system has dropped to 94.6 kPa (710 mmHg, 27.95 inHg), fully close both valves of manifold gauge and stop vacuum pump. Let it stand for 5 to 10 minutes in this state and confirm that the reading does not rise.

a. The low-pressure gauge reads lower by 3.3 kPa (25 mmHg, 0.98 inHg) per a 300 m (1,000 ft) elevation. Perform evacuation according to the following table.

Elevation m (ft)	Vacuum of system kPa (mm Hg, in Hg)
0 (0)	94.6 (710, 27.95)
300 (1,000)	91.3 (685, 26.97)
600 (2,000)	88.0 (660, 25.98)
900 (3,000)	84.6 (635, 25.00)
NOTE: **Values show readings of the low-pressure gauge.**	

b. The rate of ascension of the low-pressure gauge should be less than 3.3 kPa (25 mmHg, 0.98 inHg) 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 (0.9 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 94.6 kPa (710 mmHg, 27.95 inHg), fully close both valves of manifold gauge.

7) The above operation completes evacuation of system. Next, charge refrigerant. Refer to "Charging Refrigerant".

Evacuating system - First step

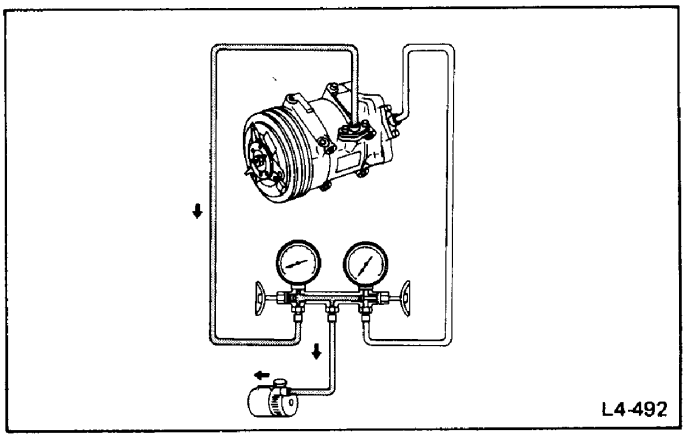


Fig. 13

Evacuating system - Second step

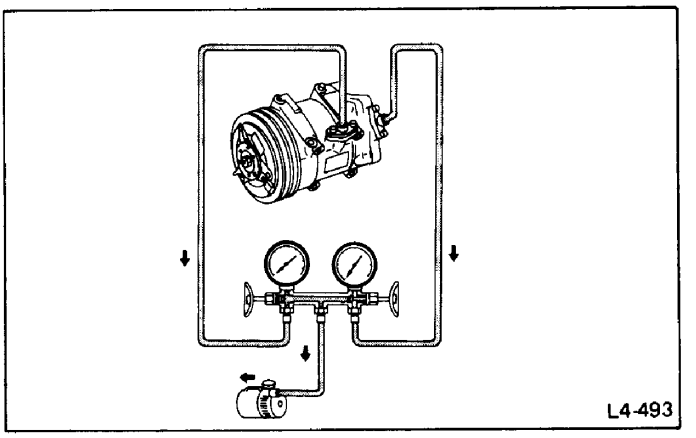


Fig. 14

Charging refrigerant

1) Install manifold gauge to system. Refer to "Handling Manifold Gauge".

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.

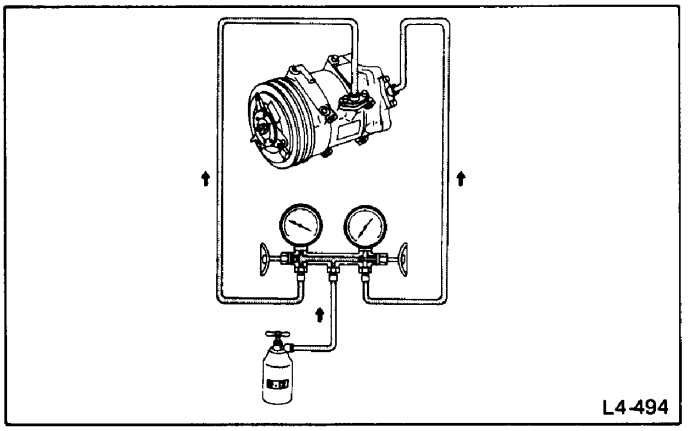


Fig. 15

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.

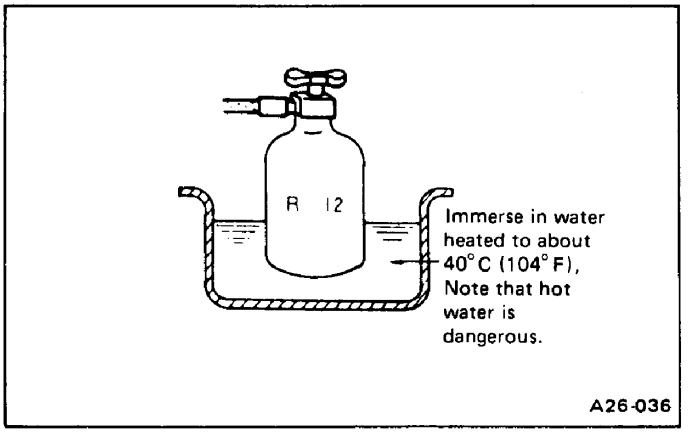


Fig. 16

CAUTION:
a. Under any circumstances the refrigerant can must not be warmed in water heated to a temperature of over 52°C (126°F).
b. A blow torch or stove must never be used to warm up the can.
c. 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.

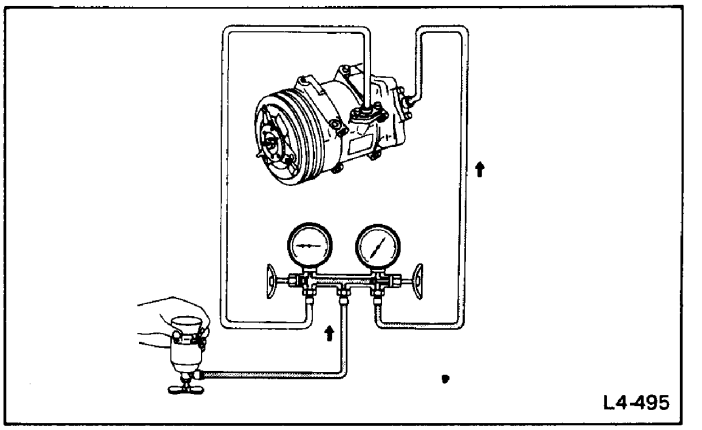


Fig. 17

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 speed.
(3) Set temperature control lever and fan switch at maximum cool and maximum speed respectively.
(4) Charge refrigerant while controlling low-pressure gauge reading at 275 kPa (2.8 kg/cm^2, 40 psi) or less by turning in or out low-pressure valve of manifold gauge.

Repeat from 3) when difference of pressure between low and high pressure gauges does not appear after one minute operation. It is not possible to charge refrigerant without pressure difference between low- and high-pressure gauges.

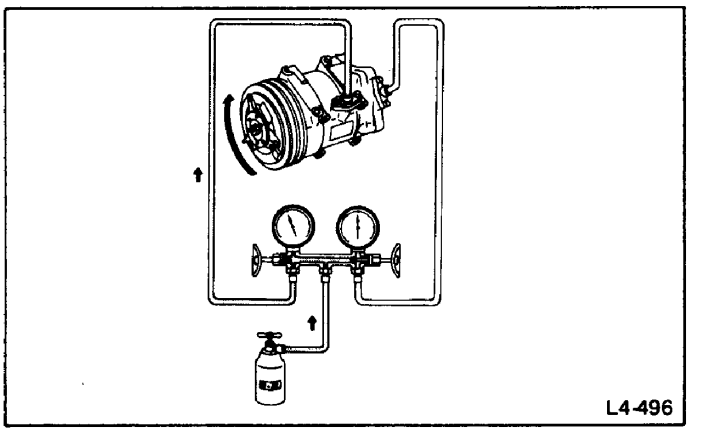


Fig. 18

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.

Measure the amount of charged refrigerant with a scale. Make a note of the amount charged from can.

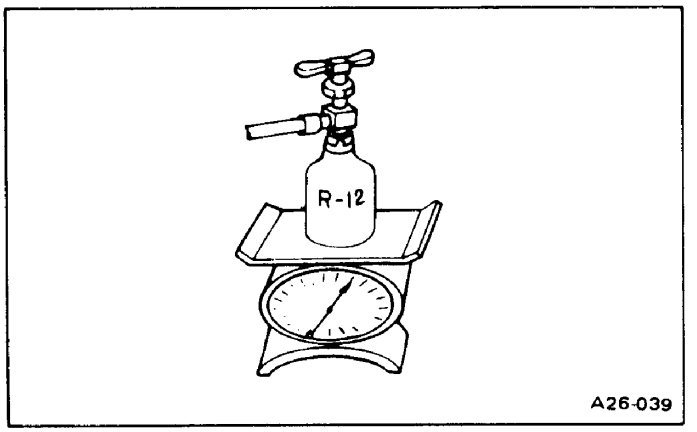


Fig. 19

Refrigerant capacity

Unit: kg (lb)

Refrigerant	Minimum	Maximum
R-12	0.74 (1.63)	0.79 (1.74)

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".

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".

Conducting a performance test prior to removing manifold gauge is a good service operation. Refer to "Performance Test".

Oil separator

The Oil Separator Kit is used to efficiently withdraw the oil in the refrigeration system (that is, to separate oil and refrigerant). If an excessive quantity of oil is charged in the system, or if the quantity of oil in the system is unknown, adjust the quantity of oil in the system to specification, proceeding as follows:
1) Discharge air conditioning system. (Refer to "Discharging System".)
2) Using two special flexible hoses and double union in Oil Separator Kit connect oil separator between compressor discharge side and condenser, as shown.
3) Evacuate and charge system. (Refer to "Evacuating and Charging System.")
4) Fully open all windows or all doors of car.
5) Operate compressor at engine idling with air conditioner set for maximum cooling and high fan speed.

Never allow engine speed to exceed idling speed.

6) Observe oil separator oil level gauge. If rise of oil level has stopped, immediately stop compressor operation. (This indicates that oil has been withdrawn.)

a. Do not continue oil withdrawal operation more than 10 minutes.
b. In some cases, fluid refrigerant may be mixed with oil, causing unusual rise of oil level. In such a case, stop compressor operation after ten minutes of withdrawal operation.

7) Discharge system. (Refer to "Discharging System.")
8) Disconnect oil separator, two flexible hoses and double union from system.
9) Connect refrigerant lines to original positions.
10) Disconnect low flexible hose from compressor suction valve.
11) Add 120 ml (4.1 US fl oz, 4.2 Imp fl oz) of new compressor oil from compressor suction valve.
After charging, rotate compressor clutch with hand 5 to 10 turns.
12) Connect low flexible hose to compressor suction valve. Evacuate and charge system. (Refer to "Evacuating System and Charging Refrigerant".)
13) Conduct leak test and performance test.
14) Gradually loosen drain cap of oil separator to release residual pressure. Remove cap and drain oil.
15) To prevent formation of rust and intrusion of moisture or dust, perform the following before placing oil separator kit into storage.
(1) Cap each opening of two flexible hoses and double union securely.
(2) Cap oil separator, evacuate it from service valve, and charge refrigerant.

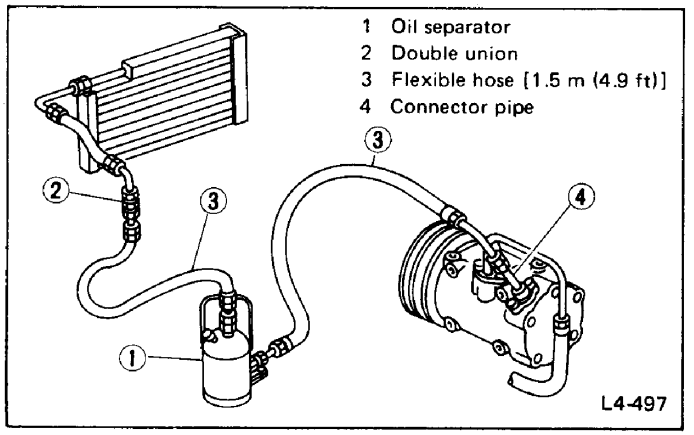


Fig. 20

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.

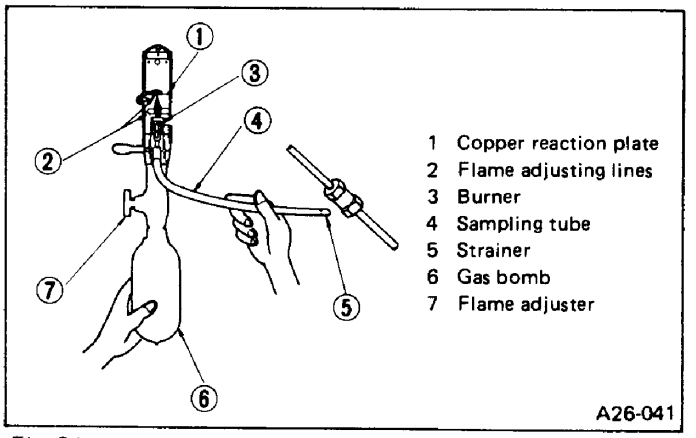


Fig. 21

	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 sufficient pressure needed for leak detection. Charge with 0.4 kg (0.9 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.

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.

CAUTION:

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

(3) Piping

- O-ring 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

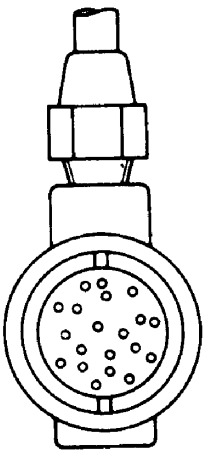
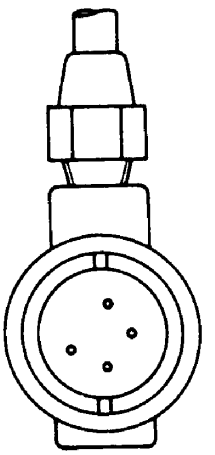
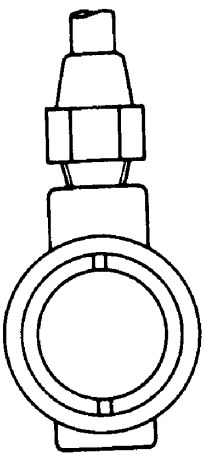
For the operational procedures, refer to the instructions furnished with each electric leak detector.

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) Turn on A/C switch.
3) Set blower to maximum speed.
4) Check sight glass after the lapse of about five minutes. Judge according to the following table.

<table>
<tr><th>Amount of refrigerant / Check item</th><th>Almost no refrigerant</th><th>Insufficient</th><th>Suitable</th><th>Too much refrigerant</th></tr>
<tr><td>Temperature of high pressure and low pressure pipes.</td><td>Almost no difference between high pressure and low pressure side temperature.</td><td>High pressure side is warm and low pressure side is fairly cold.</td><td>High pressure side is hot and low pressure side is cold.</td><td>High pressure side is abnormally hot.</td></tr>
<tr><td>State in sight glass.</td><td>Bubbles flow continuously. Bubbles will disappear and something like mist will flow when refrigerant is nearly gone.
 
A26-042
Fig. 22</td><td>The bubbles are seen at intervals of 1 - 2 seconds.
 
A26-043
Fig. 23</td><td colspan="2">Almost transparent. Bubbles may appear when engine speed is raised and lowered. No bubbles can be seen.
No clear difference exists between these two conditions.
 
A26-044
Fig. 24</td></tr>
<tr><td>Pressure of system.</td><td>High pressure side is abnormally low.</td><td>Both pressure on high and low pressure sides are slightly low.</td><td>Both pressures on high and low pressure sides are normal.</td><td>Both pressures on high and low pressure sides are abnormally high.</td></tr>
<tr><td>Repair.</td><td>Stop compressor and conduct an overall check.</td><td>Check for gas leakage, repair as required, replenish and charge system.</td><td></td><td>Discharge refrigerant from service valve of low pressure side.</td></tr>
</table>

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 with refrigerant gas while compressor is operating. 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 speed from 1,000 rpm to 1,500 rpm with controls set for maximum cooling and high blower speed for about 10 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) When exchanging the compressor for new one which contains 150 cm^3 (150 cc, 9.15 cu in) oil, drain 80 cm^3 (80 cc, 4.88 cu in) oil from it respectively or adjust the amount of oil to the same of the removed compressor.
4) If the oil separator is not available, control the quantity of oil in accordance with the following table, when charging compressor oil into the system from suction port of compressor by using funnel as below picture.

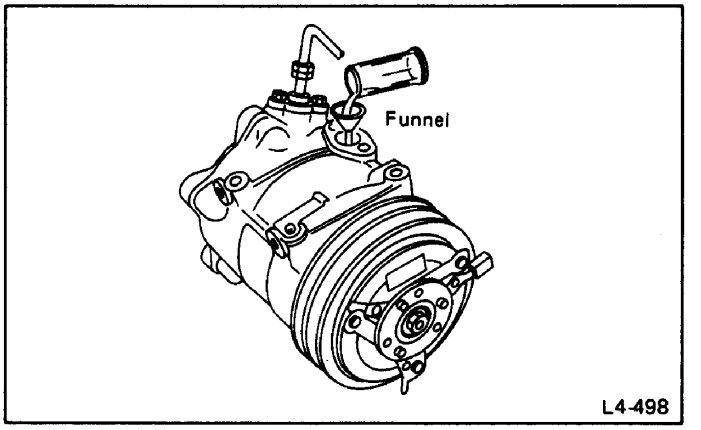


Fig. 25

OIL CHARGE TABLE

Condition		Proper charging method	Amount of oil to be added mℓ (US fl oz, Imp fl oz)
Replacement of compressor		Remove all oil from new compressor* and charge it with amount of oil shown in right column.	70 (2.4, 2.5)
Replacement of evaporator		Add amount of oil shown in right column.	70 (2.4, 2.5)
Replacement of receiver drier (liquid tank)		Oil need not be added.	–
Replacement of condenser	There is no sign of oil leakage from condenser.	Oil need not be added.	–
	There is evidence of a large amount of oil leakage from condenser.	Add amount of oil shown in right column.	50 (1.7, 1.8)
Replacement of flexible hose or copper tube	There is no sign of oil leakage.	Oil need not be added.	–
	There is evidence of a large amount of oil leakage.	Add amount of oil shown in right column.	50 (1.7, 1.8)
Gas leakage	There is no sign of oil leakage.	Oil need not be added.	–
	There is evidence of a large amount of oil leakage.	Add amount of oil shown in right column.	50 (1.7, 1.8)

* Remove compressor oil as follows:

1. With the compressor upside down, completely drain the oil through the suction port (cast-out letter "S" mark side). Be sure to use a clean container to receive the oil.
2. When the oil stops flowing out, rotate the clutch hub (compressor shaft) two or three times to completely drain the oil.

When replacing two or more of the parts indicated in the above chart, follow each instruction under the proper charging method column for the proper amount of oil to be added.

– Example –

When replacing the evaporator and compressor, drain all oil out of the new compressor and then charge the compressor with the total amount of 140 mℓ (4.7 US fl oz, 4.9 Imp fl oz) oil [70 mℓ (2.4 US fl oz, 2.5 Imp fl oz) for the evaporator and 70 mℓ (2.4 US fl oz, 2.5 Imp fl oz) for compressor].

CAUTION:

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.

If compressor is inoperative due to defective compressor or heavy loss of refrigerant, exchange the compressor through the procedure from 2 to 5.

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 mode switch to A/C MAX position.
6) Set temperature control lever to COLD position.
7) Start the engine and hold engine speed at 1,500 rpm.
8) After the air conditioner has been operated for about 10 minutes, measure system pressures at high-pressure (discharge) side and low-pressure (suction) side.
9) Measure the temperatures of inlet air to blower and outlet air at the grilles.
10) 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.
11) Check for any abnormalities by comparing the test results with standard pressure in "Performance Chart".

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 "Troubleshooting".

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.
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 leaks are found, evacuate and charge system.

PERFORMANCE CHART

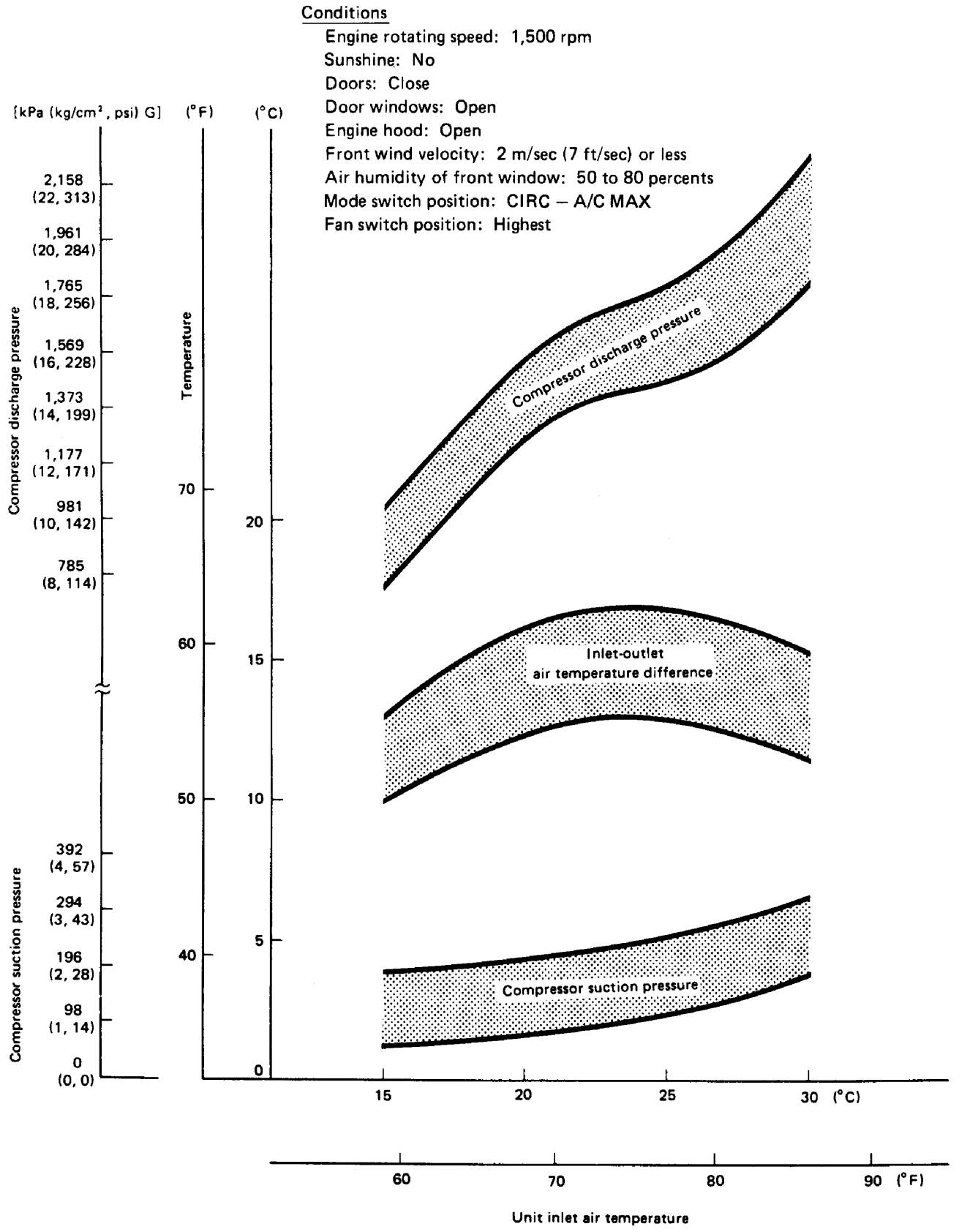


Fig. 26

A26-079

Compressor

The MJS-170 compressor employs an oil-mist jet system in which some lubricant is mixed in the refrigerant and the mixture is sprayed directly to the sliding portions from the compressor suction side.

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 within specifications at all peripheral points.

Clearance: mm (in)
0.5 – 0.8 (0.020 – 0.031)

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 10.5 V.

REMOVAL

1) Battery negative terminal
2) Pulser (pulser and compressor connector)
3) Discharge refrigerant using manifold gauge
   (1) Fully close low-pressure valve of manifold gauge.
   (2) Connect low-pressure charging hose of manifold gauge to low-pressure service valve.
   (3) Slightly open low-pressure manifold gauge valve and slowly discharge refrigerant from system.

Do not allow refrigerant to rush out. Otherwise, compressor oil will be discharged along with refrigerant.

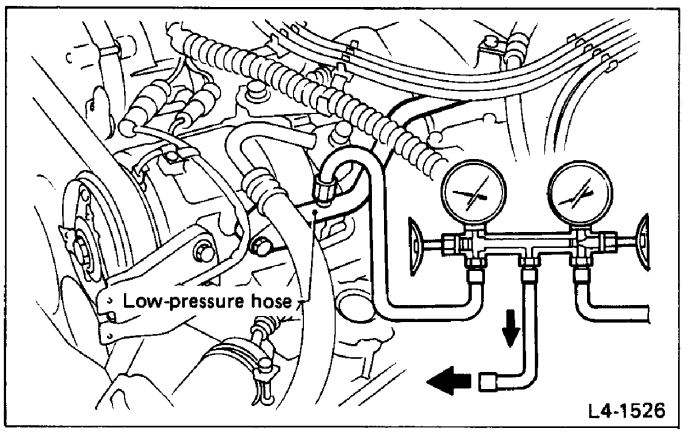


Fig. 27

4) High-pressure hose (Flexible hose Pd)

Plug the opening to prevent foreign matter from getting in.

5) Low-pressure hose (Flexible hose Ps)

Plug the opening to prevent foreign matter from getting in.

6) V-belt (Refer to Chapter 2-2 "Oil Pump Assembly.")
7) Remove compressor and compressor upper bracket.

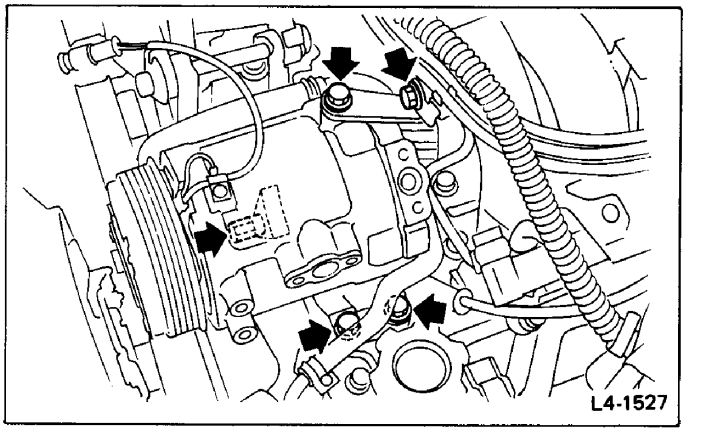


Fig. 28

INSTALLATION

1) Compressor

Tighten compressor mounting bolts in numerical sequence, as shown in figure below, to specified torque.

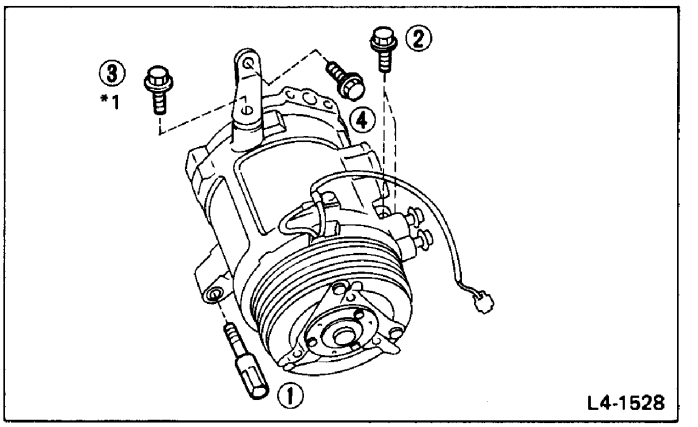


Fig. 29

***1:**
Tighten this bolt with your fingers until it stops go. Tighten all other bolts and then this bolt to specified torque.
When tightening this bolt, be careful because it has a coarse-thread pitch.

Tightening torque:
Compressor mounting bolt:
34 – 44 N·m (3.5 – 4.5 kg-m, 25 – 33 ft-lb)

2) V-belt
(1) Loosen belt tension pulley lock nut.
(2) Turn adjusting bolt to adjust belt tension. The belt tightens when the bolt is turned clockwise and vice versa.

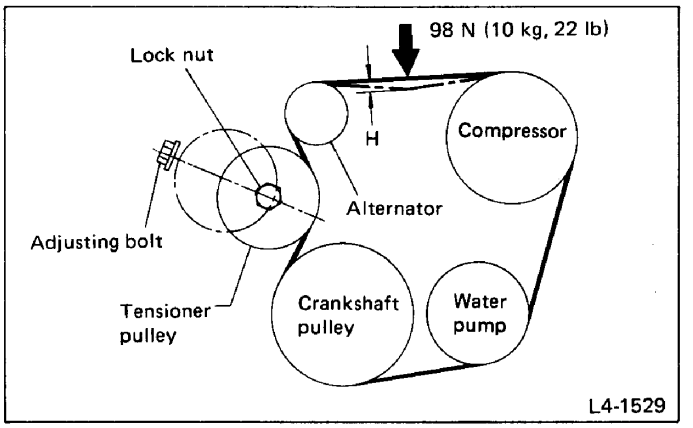


Fig. 30

	H: mm (in)/98 N (10 kg, 22 lb)	Tension: N (kg, lb)
New belt	5.5 – 6.5 (0.217 – 0.256)	637 – 736 (65 – 75, 143 – 165)
Existing belt	6.5 – 7.5 (0.256 – 0.295)	441 – 637 (45 – 65, 99 – 143)

(3) Tighten lock nut.

Tightening torque:
34 – 44 N·m (3.5 – 4.5 kg-m, 25 – 33 ft-lb)

(4) After adjusting belt tension, turn adjusting bolt counterclockwise to lock.

Tightening torque:
4 – 6 N·m (0.4 – 0.6 kg-m, 2.9 – 4.3 ft-lb)

a. When replacing belt with a new one, adjust its tension to the specification, then readjust it to the same specification after running engine for 5 minutes in consideration of its initial expansion.
b. Ensure that the V-belt is aligned correctly. If it is not, check for loose bolts.

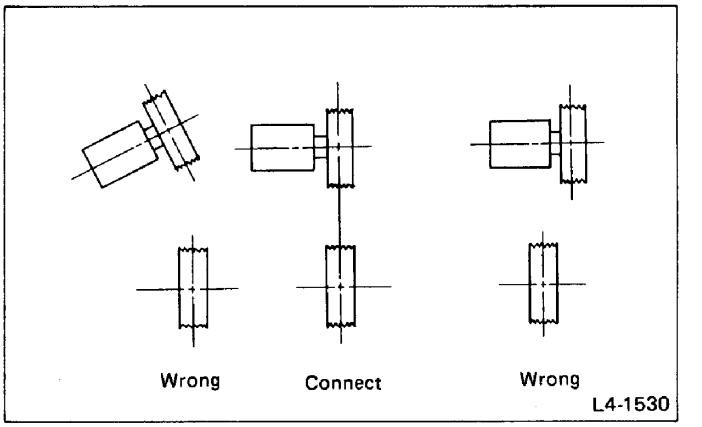


Fig. 31 Confirming pulley alignment

a. The V-belt should not be too tight or too loose.
A belt which is too tight may break bearing or cause gas to leak from the shaft seal. A belt which is too loose slips, thereby causing the belt cut.
b. After completing the compressor installation and testing the system operation, check and adjust the tension of both V-belts again.

3) Low-pressure hose (Flexible hose Ps)
Connect low-pressure hose with compressor.
4) High-pressure hose (Flexible hose Pd)
Connect high-pressure hose with compressor.

Tightening torque:
Low- and High-pressure hoses:
15 – 25 N·m (1.5 – 2.5 kg-m, 11 – 18 ft-lb)

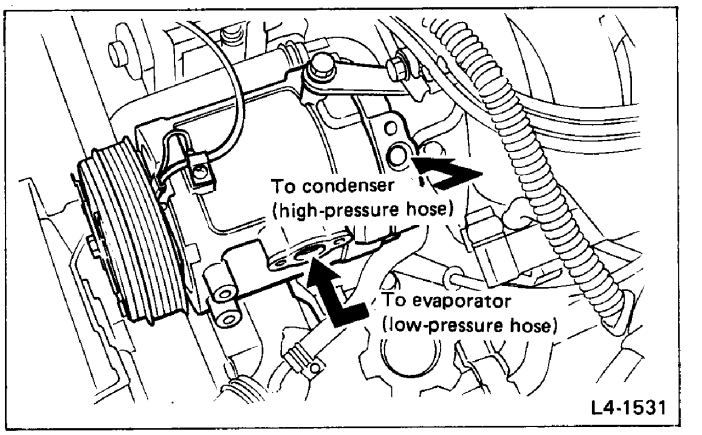


Fig. 32

Be sure to apply compressor oil to the periphery of O-ring.

5) Pulser
(1) Install pulser onto the compressor.

Tightening torque:
15 – 25 N·m (1.5 – 2.5 kg-m, 11 – 18 ft-lb)

Be sure to provide a specified clearance between the pulser's sending portion and compressor clutch.

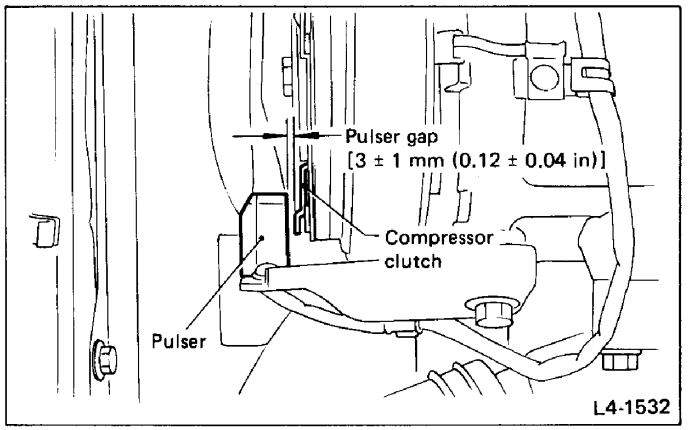


Fig. 33

(2) Connect pulser and compressor connector.

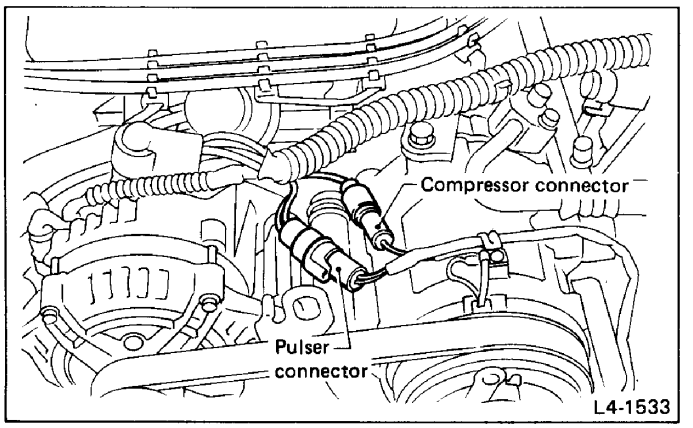


Fig. 34

6) Battery negative terminal
7) Charging refrigerant (Refer to 4-7 "On-Car Service.")

DISASSEMBLY

1) Discharging refrigerant
(1) When removing the compressor from the vehicle using manifold gauge, gradually discharge the refrigerant from the low pressure side.

Do not suddenly discharge the refrigerant, otherwise oil will also be discharged with the refrigerant.

(2) When using the compressor which has been stored, remove the seal cover from the inlet and outlet ports of the high pressure and low pressure sides.

a. Insert the INJECTOR NEEDLE (926190000) into the hole in the seal cover, and gradually discharge the high pressure gas.
b. After discharging, remove the seal cover.

2) Discharging oil
Hold the compressor upside down, and discharge the oil from the refrigerant inlet port [approx. 20 to 50 mℓ (0.7 to 1.7 US fl oz, 0.7 to 1.8 Imp fl oz)].

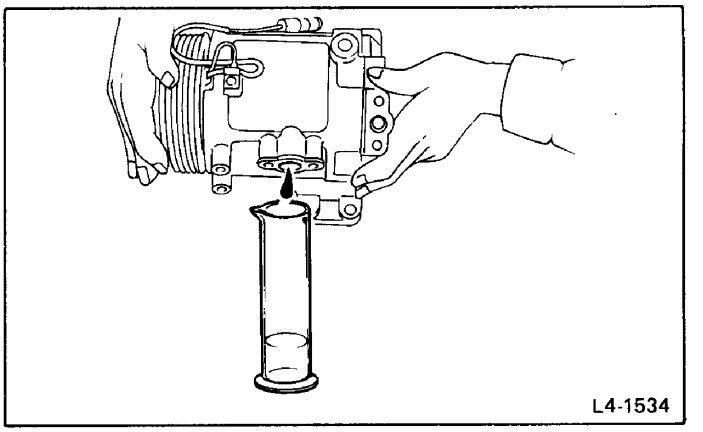


Fig. 35

If the compressor has been removed from the vehicle, measure the amount of oil discharged.

3) Removing clutch ASSY
(1) Remove the 8 mm nut and hub nut using CLUTCH TIGHTENER (925770000) and 13 mm socket.

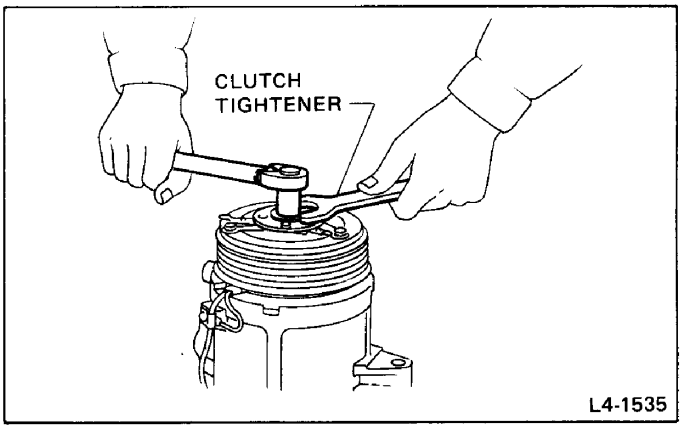


Fig. 36

Fix the CLUTCH TIGHTENER securely when turning the socket wrench.

(2) Remove the clutch armature using CLUTCH ARMATURE REMOVER (926130000).

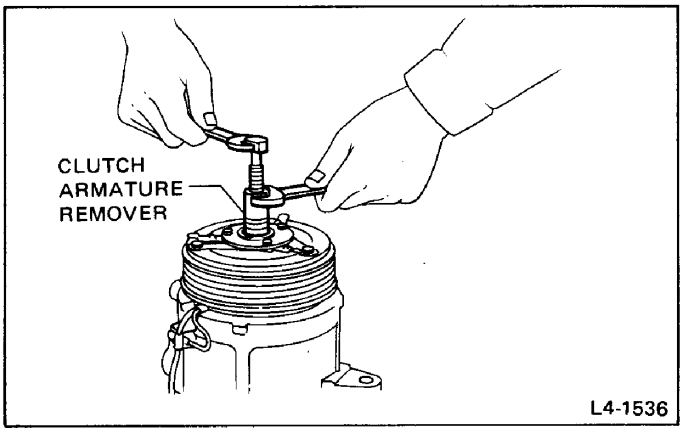


Fig. 37

(3) Remove the spacer ASSY.

Retain the parts for reassembly.

(4) Remove the 40 mm wedge ring using snap ring pliers.

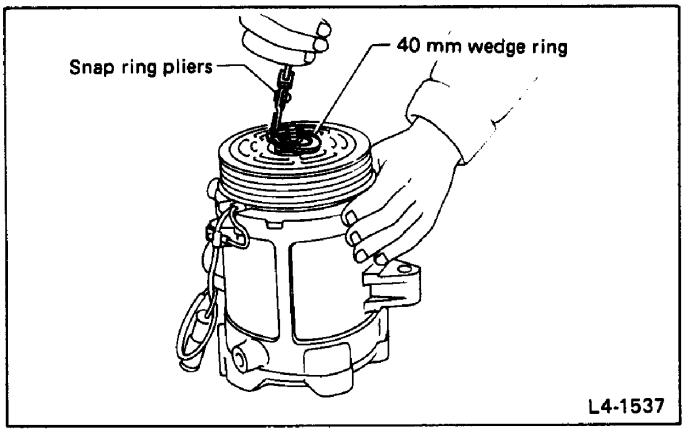


Fig. 38

Do not reuse the removed part.

(5) Remove the rotor.

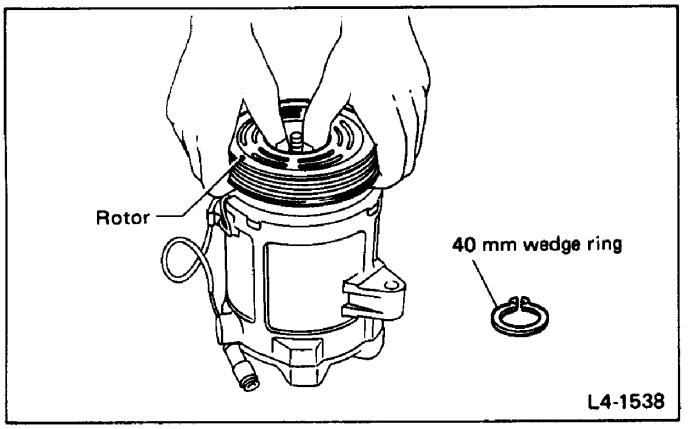


Fig. 39

(6) Remove the 5 mm screw fixing the lead wire clamp using standard screwdriver.

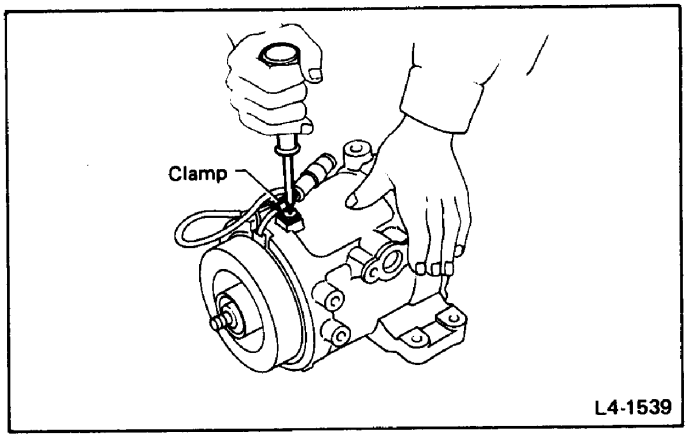


Fig. 40

(7) Remove the 50 mm wedge ring using snap ring pliers.

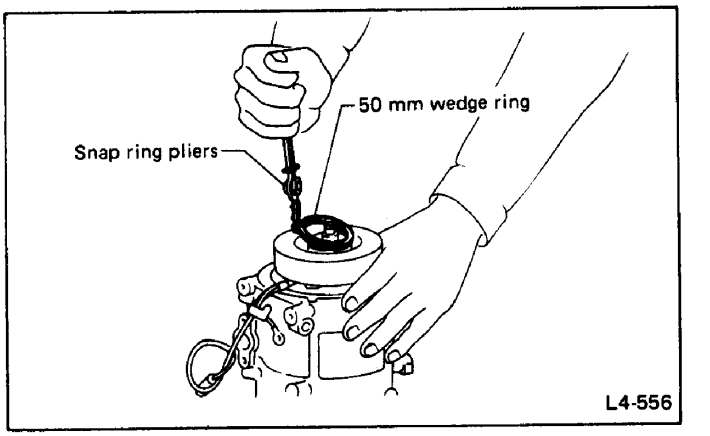


Fig. 41

Do not reuse the removed part.

(8) Remove the stator.

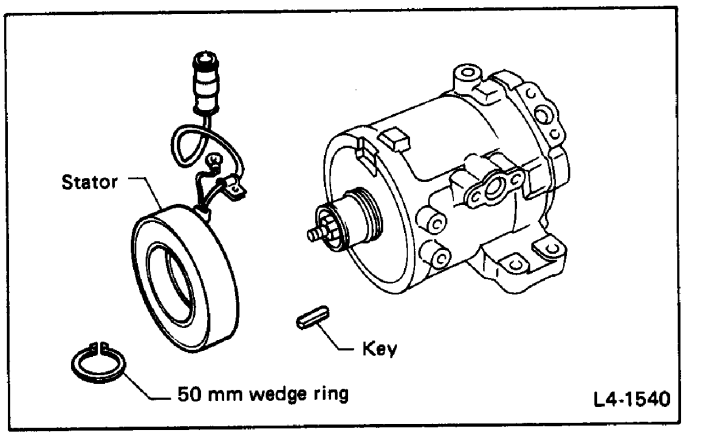


Fig. 42

Check the terminal for damage.
Do not damage the terminal when storing.

(9) Remove the key.

Do not reuse the removed part.

4) Removing shaft seal
(1) Remove the 32 mm snap ring using snap ring pliers.

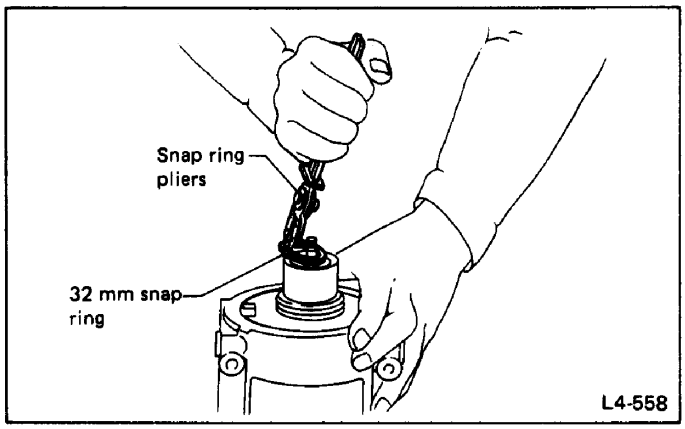


Fig. 43

Do not damage the cover end (F).

(2) Remove cover plate using refrigerant, charging hose, charging valve and INJECTOR NEEDLE (926190000).

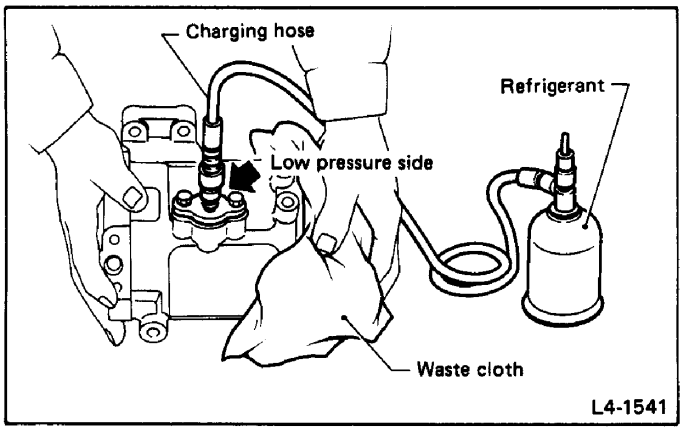


Fig. 44

a. Attach the seal cover to the inlet and outlet ports, and apply pressure to the low pressure side.
b. Using waste cloth on the shaft portion receive the cover plate pushed out.
c. Do not use air pressure for pressurizing. Water in the air will cause rust to be formed inside the compressor.
d. Be sure to cover the shaft portion with cloth since the cover plate will be ejected suddenly.
e. If it does not eject, push it back, and then press it again.
f. Do not reuse the removed part.

(3) Remove the seal ring using SHAFT SEAL INSTALLER (926120000).

a. Using the SHAFT SEAL INSTALLER, push the ring while rotating it slowly in either direction, then carefully withdraw it.
b. Do not reuse the removed parts.

5) Removing cover end (R)
(1) Attach FRONT COVER TIGHTENER (926170000).

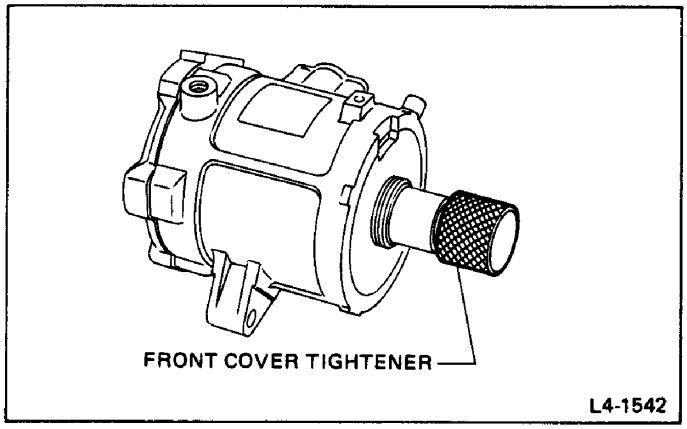


Fig. 45

Remove dirt and other foreign matter from the tapered surface at the end of the cover end (F).

(2) Remove the 10 mm socket bolt using 8 mm hexagon wrench or 8 mm HEXAGON SOCKET WRENCH (926180000).

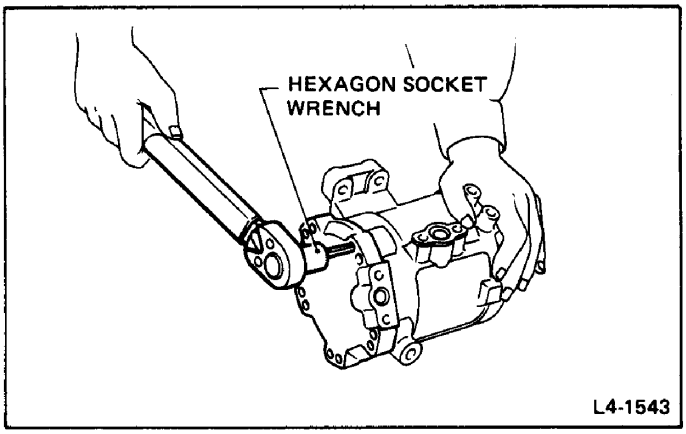


Fig. 46

a. Loosen each bolt one turn in diagonal selection, then loosen bolts off.
b. Check the thread and neck portion of each bolt for deformation.

(3) Remove the cover end (R) using plastic hammer.

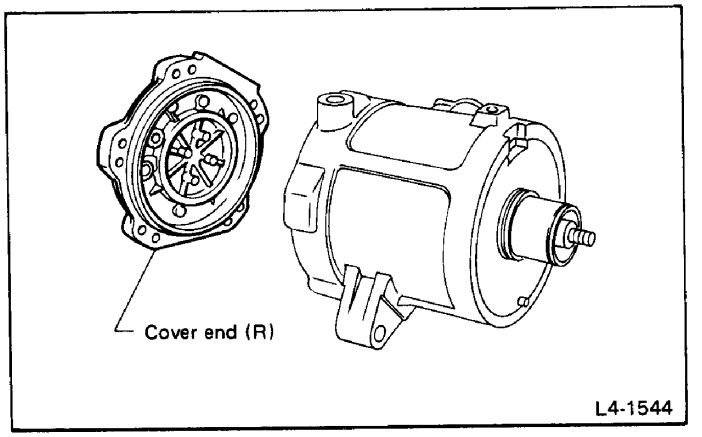


Fig. 47

Slowly withdraw by holding with a hand. If hard to remove, tap the flange portion lightly by diagonal selection with a plastic hammer.

(4) Remove the O-rings.
115 mm, 110 mm, 63 mm

Do not reuse the removed O-rings.

(5) Remove the cylinder head (R) and SV plate.

a. Do not damage the seat surface.
b. Do not deform the SV plate when removing.

6) Removing cover end (F)
(1) Remove the shell using plastic hammer.

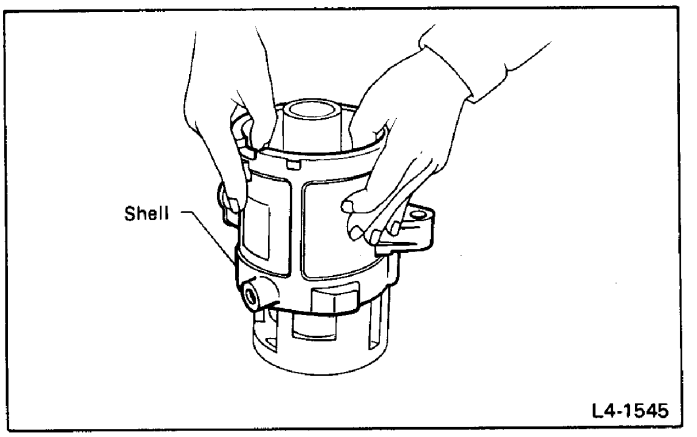


Fig. 48

a. Place the shell with its clutch side facing up, and pull it off upward while tapping the flange portion with a plastic hammer.
b. Use a stand (90 mm cylinder) to facilitate removal of shell.

(2) Remove the shell packing.

a. Clean the packing surface of the shell using a knife or the like.
b. Replace the shell packing with a new one.

(3) Remove the cover end (F).

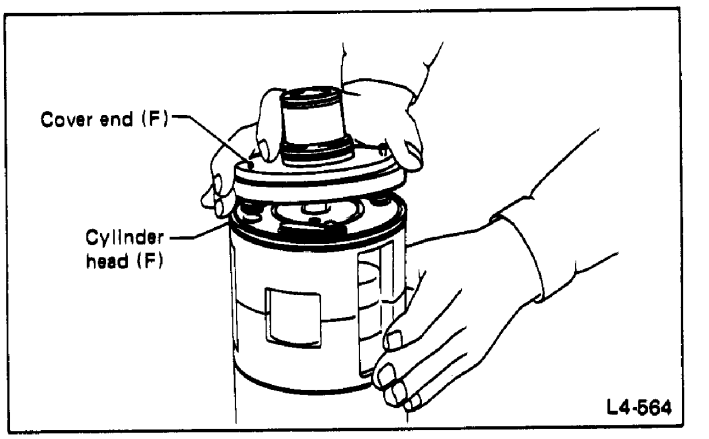


Fig. 49

(4) Remove the O-rings.
115 mm, 110 mm, 63 mm

Replace the O-rings with new ones.

(5) Remove the cylinder head (F) and SV plate.

a. Do not damage the seat surface.
b. Do not deform the SV plate when removing.

INSPECTION

a. After washing the parts, dry them naturally; avoid use of compressed air for drying, because water in the air may be trapped inside the compressor.
b. Check each part visually to see whether it can be used again by referring to "Disassembled Parts Check List".

Parts Check List

Part name	Check point
Armature	(1) Rotor contacting surface for uneven wear or sign of uneven contact. (2) Plate spring for permanent set, deformation, cracks, or breakage. (3) Key groove for deformation. (4) Shaft fitting surface for seizure or fretting. (5) Disk and hub for offset. (6) Stopper rubber for hardening or missing.
Rotor	(1) Armature contacting surface for uneven wear or sign of uneven contact. (2) Pulley for deformation or crack. (3) Bearing for seizure, damage, or leakage of grease. (4) Bearing for slackening or noise in rotation.
Stator	(1) Resin and coil portion for burn or projected coil. (2) Harness for disconnection, or broken coating.
Shell	(1) Inlet port sealing surface for damage. (2) Threaded portion for deformation or damage. (3) Cylinder contacting surface (inside) for dents or deformation.
Shaft seal	(1) Seal ring seating surface for damage or sign of uneven contact. (2) Seal ring for crack, break, or abnormal wear. (3) O-ring for hardening, deformation, or crack. (4) Spring for permanent set. (5) Case for deformation or crack.
Cover plate	(1) Sealing surface for damage, roughness, sign of uneven contact, or abnormal wear. (2) O-ring groove for damage.
Cover end (F)	(1) Shell packing surface for damage, or deformation. (2) Bearing fitting surface for abnormal wear. (3) Cylinder head fitting surface for damage, or deformation. (4) Cracks, deformation, or breakage.
Cylinder head	(1) Valve for floating up. (Any floating up of a valve is unpermissible.) (2) Valve for damage, cracks, deformation, or rust. (3) Plate for rust. (4) Valve seating surface for flaws, deformation, or sign of uneven contact. (5) Discoloration by temperature rise.
SV plate	(1) Damage, crack, deformation, or rust.
Cylinder	(1) Whether the cylinder rotates smoothly when the shaft is manually turned. (2) Cylinder shaft for axial play, or noise in rotation. (3) Cylinder for crack or damage. (4) Swash plate slipper sliding surface for flaws, abnormal wear, or seizure. (5) Shaft for deformation, damage, abnormal wear; key groove for damage; 8 mm bolt for damage; armature fitting surface for excessive fretting.
Cover end (R)	(1) Cylinder head (R) contacting surface for flaws, or deformation. (2) Separator for incorrect positioning, cracks, or deformation. (3) Cracks, deformation, or damage.

ASSEMBLY

When reassembling, wash each part in clean washing fluid (trichlene or gasoline) and left dry, then check for damage or any other faults.

Do not reuse the packings, O-rings keys and snap rings, replace them with new ones when reassembling.

1) Assembling cover end (F)
   (1) Fit the knock pins in the knock pin holes of the cylinder ASSY.
   (2) Assemble the 12 mm O-ring, SV plate, and cylinder head (F) in this order.

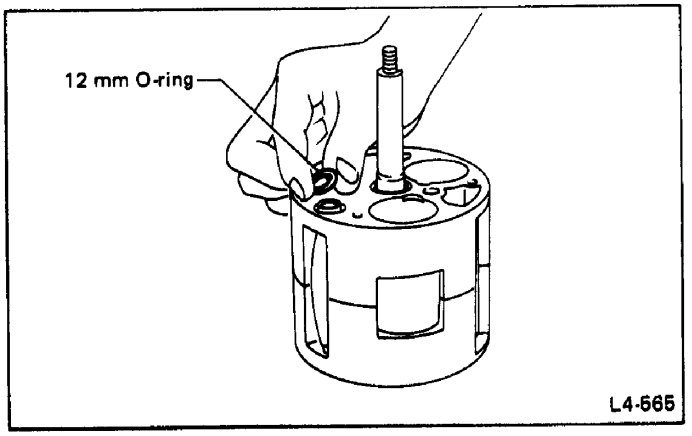


Fig. 50

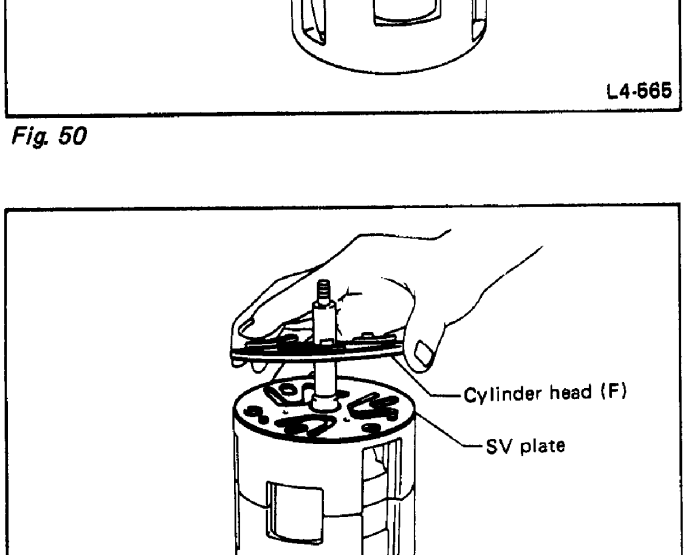


Fig. 51

a. Be careful not to confuse cylinder head (F) with cylinder head (R).
(Assemble it so that the gas pipe is aligned with the 12 mm hole.)

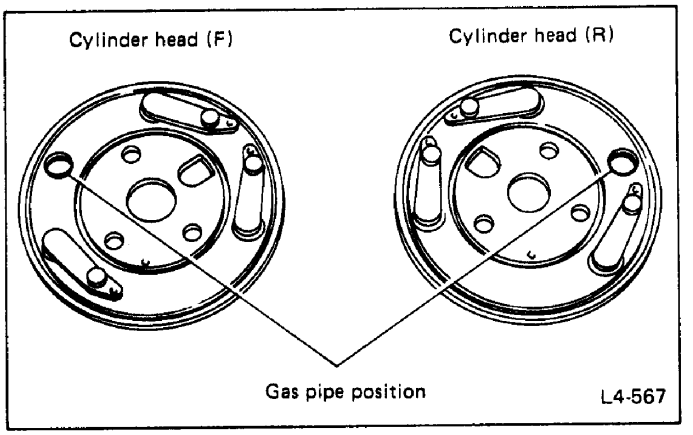


Fig. 52

b. Coat the O-ring with oil when assembling.
c. Carefully assemble the SV plate into correct position.
*** (Two knock pin holes will not fit if the plate is incorrectly positioned. Make sure the valve of the SV plate fits with the valve seat of the cylinder.)**

(3) Assemble the O-ring (110 mm, 63 mm) and seal ring using SHAFT SEAL INSTALLER (926120000).

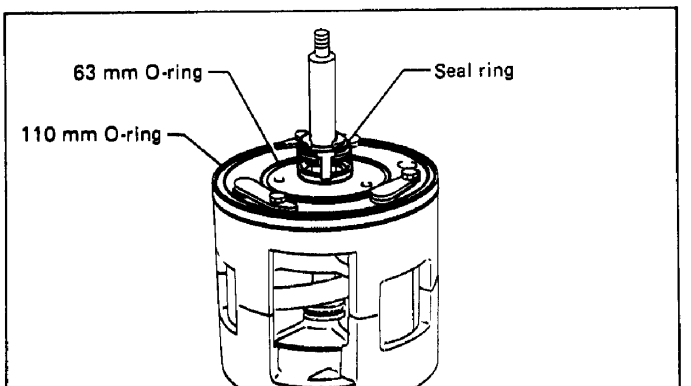


Fig. 53

a. Coat the O-ring and seal ring with oil when assembling.
b. Insert the seal ring by aligning the cut portion of the ring with the cut portion in the shaft.
c. Do not damage the O-ring of the seal ring with the sharp end of the key groove. Be sure not to damage the sliding surface.

(4) Install the cover end (F).

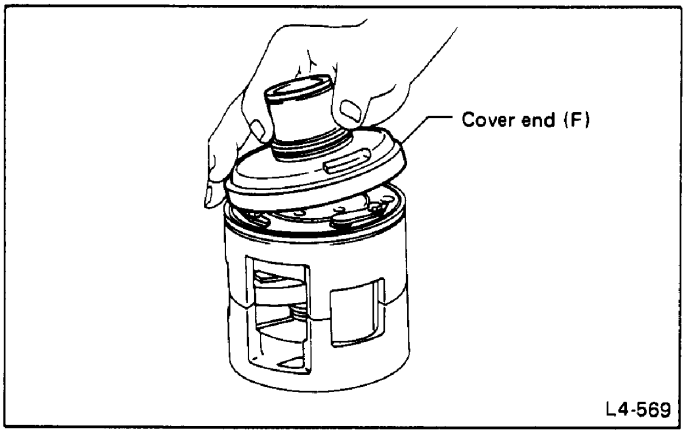


Fig. 54

Install the cover end (F) so that the terminal, when installed the coil, will face the same side as the shell inlet port.

(5) Attach the front cover tightener using FRONT COVER TIGHTENER (926170000).

Remove dirt and other foreign matter from the tapered surface at the end of the cover end (F).

(6) Install the shell packing.

a. Coat the packing with oil.
b. If the packing is protruded, re-adjust its position.

(7) Insert the shell.

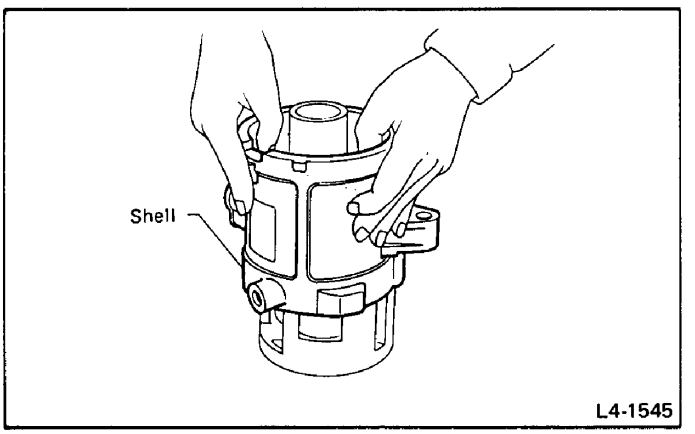


Fig. 55

a. Install the shell so the oil reservoir of the cylinder will be at the lower portion.

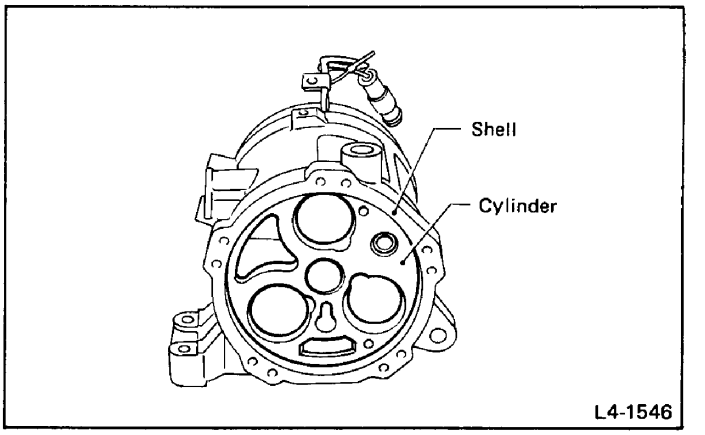


Fig. 56

b. After installing the shell, turn the assembly upside down by holding the shaft.

2) Assembling cover end (R)

(1) Fit the knock pin into the knock pin hole of the cylinder ASSY.

(2) Install the 12 mm O-ring, SV plate and cylinder head (R) in this order.

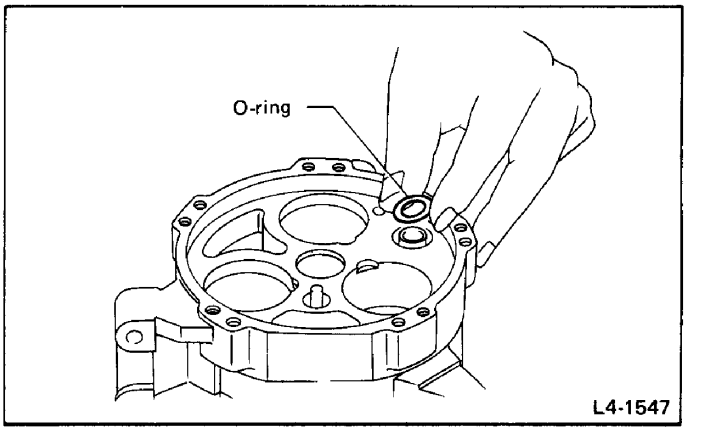


Fig. 57

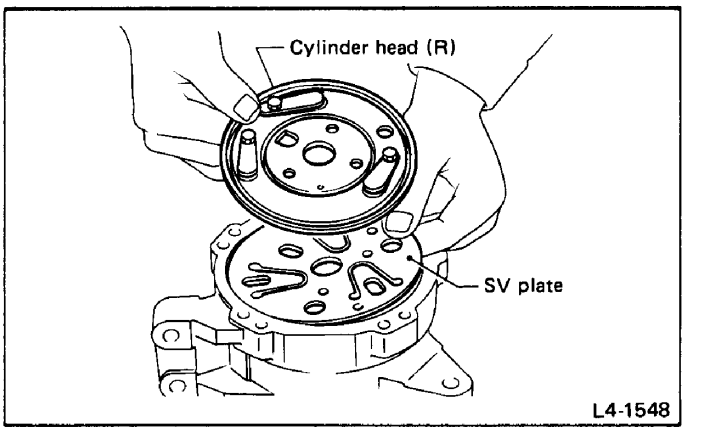


Fig. 58

a. Coat the O-ring with oil when assembling.
b. Carefully install the SV plate into correct position.

(3) Install the O-rings.
110 mm, 63 mm

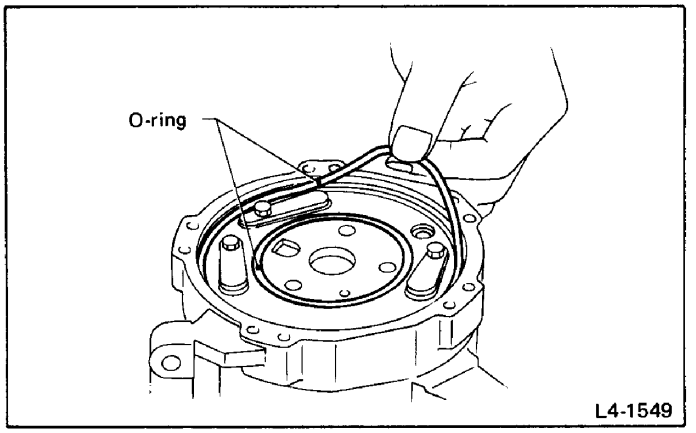


Fig. 59

Coat the O-rings with oil when assembling.

(4) Install the 115 mm O-ring.

Coat the O-ring with oil when assembling.

(5) Install the cover end (R).

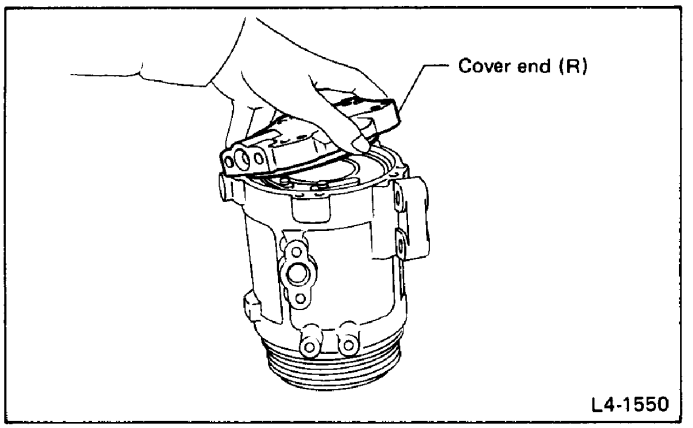


Fig. 60

(6) Tighten the 10-mm hexagon socket head bolts together with the wave washers using hexagon wrench, torque wrench and 5-mm hexagon socket wrench.

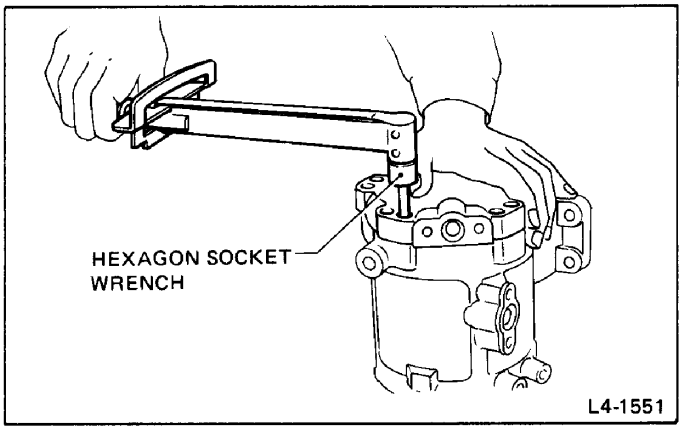


Fig. 61

Tighten bolts lightly by diagonal selection, and finally tighten to the torque of 19 to 21 N·m (1.9 to 2.1 kg-m, 14 to 15 ft-lb).

3) Installing shaft seal
(1) Install the cover plate fitted in advance with the 28 mm O-ring in its outer groove into the cover end (F) using SHAFT SEAL INSTALLER (926120000).

a. Check the O-ring for damage.
b. Apply oil to the O-ring.

(2) Install 32 mm snap ring using snap ring pliers.

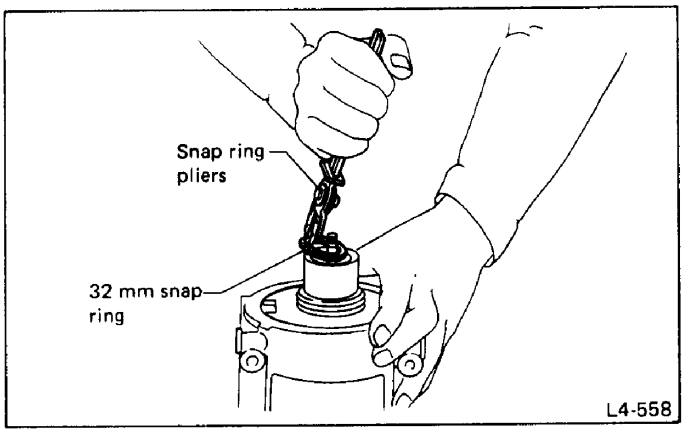


Fig. 62

Make sure the snap ring is fitted correctly into the groove.

4) Installing clutch ASSY
(1) After installing the stator, install 50 mm wedge ring using snap ring pliers.

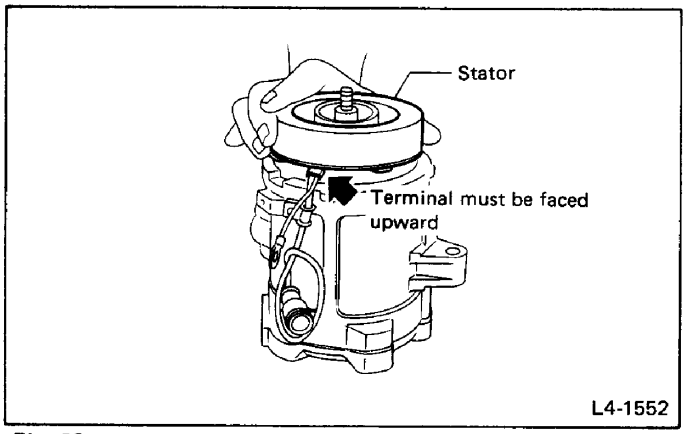


Fig. 63

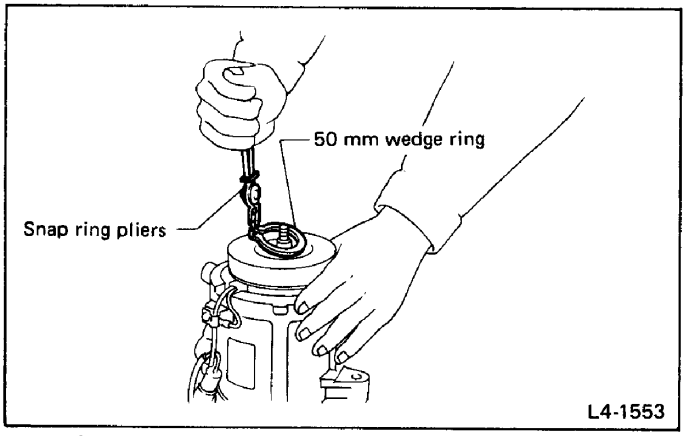


Fig. 64

a. Do not damage the coil bearing portion.
b. Install the wedge ring with its tapered surface facing up.

(2) Tighten 5 mm x 8 screws to secure the clamp using Phillips-head screwdriver and torque driver.

Tightening torque:
2.7 – 3.3 N·m (0.28 – 0.34 kg-m, 2.0 – 2.5 ft-lb)

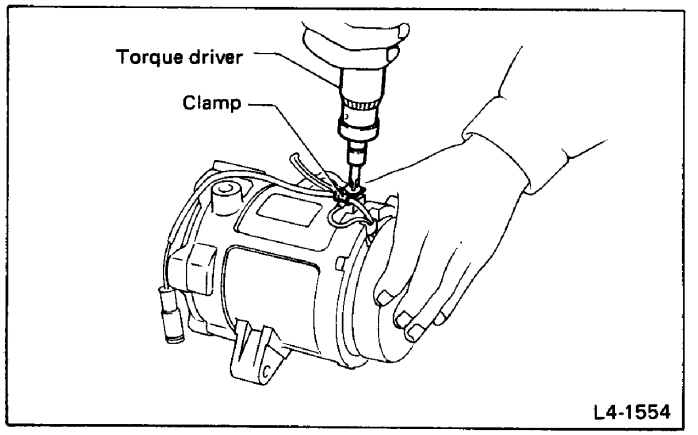


Fig. 65

a. Thoroughly wipe off dirt and oil from the clamp mounting surface on the compressor side.
b. Do not damage the lead and earth wires.
c. Avoid interference of the lead and earth wires with the pulley.

(3) Carefully install the rotor while rotating it by a hand.

Remove dirt and oil from the armature contacting surface.

(4) Install the 40 mm wedge ring using snap ring pliers.

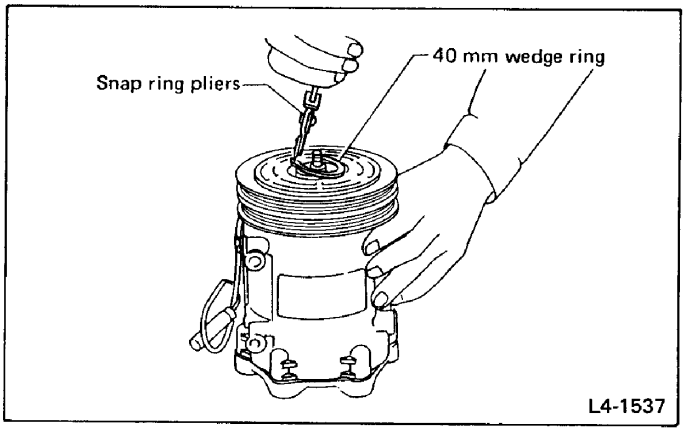


Fig. 66

Install the wedge ring with its tapered surface facing up.

(5) Install the key to the key groove in the shaft.

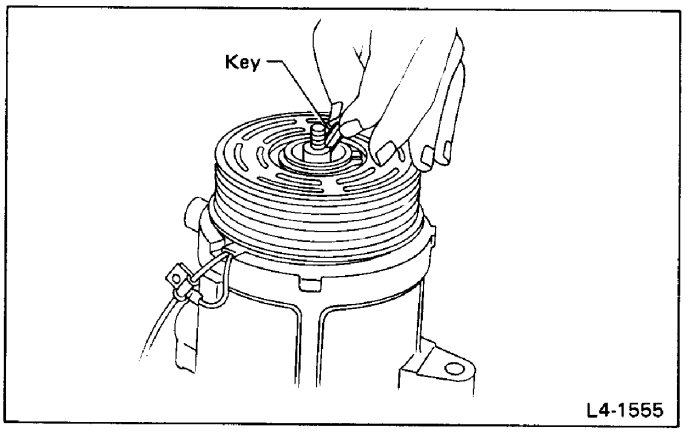


Fig. 67

Make sure the key is free from burrs or any other damage.

(6) Install the spacer ASSY using thickness gauge.

Spacer sizes:
Thickness 0.1 mm (0.004 in), 0.3 mm (0.012 in), 0.8 mm (0.031 in)

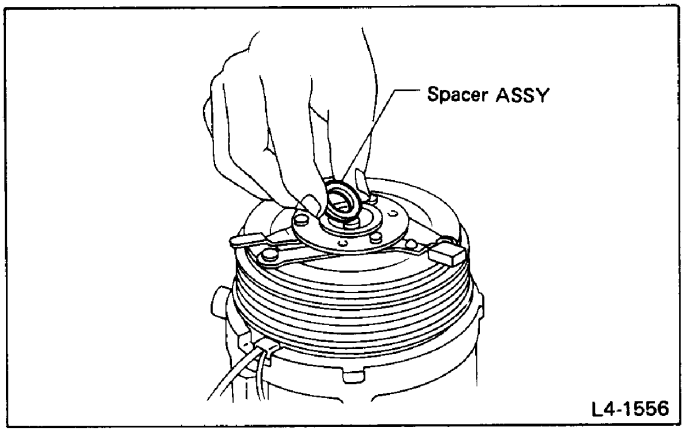


Fig. 68

Adjust the spacer ASSY so that the gap between the pulley and armature (armature gap) is within 0.5 to 0.8 mm (0.020 to 0.031 in).

(7) Install the armature while aligning it with the groove.

Remove dirt and oil from the rotor contacting surface.

(8) Install the 8 mm nut and hub nut using CLUTCH TIGHTENER (925770000), torque wrench and 13 mm socket.

Tightening torque:
19 – 21 N·m (1.9 – 2.1 kg-m, 14 – 15 ft-lb)

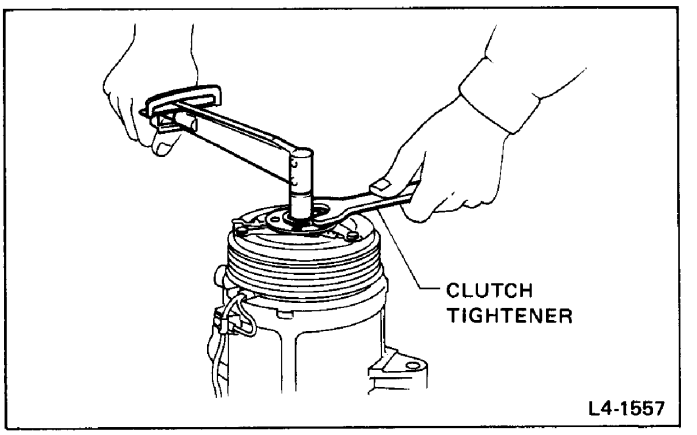


Fig. 69

5) Charging oil and refrigerant
(1) Charge oil using measuring cylinder and plastic oiler.

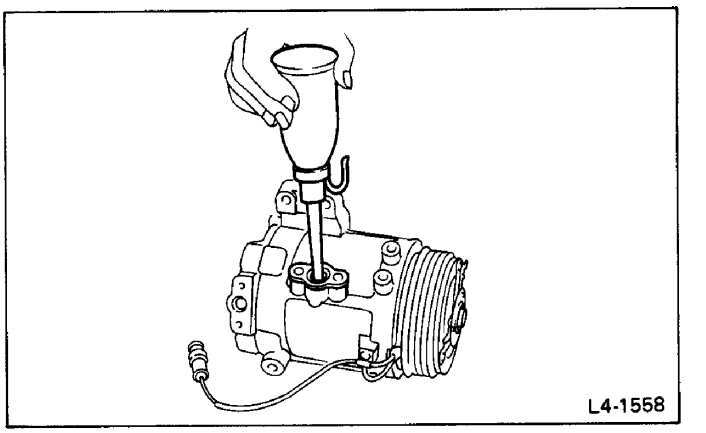


Fig. 70

Measure 150 mℓ (5.1 US fl oz, 5.3 Imp fl oz) of oil using a measuring cylinder, and charge oil from the inlet port using a plastic oiler. [If some oil is already charged in the cycle of the cycle carrier, adjust the amount of new oil to be charged so that the total amount will be 150 mℓ (5.1 US fl oz, 5.3 Imp fl oz) in the cycle.]

(2) Run the compressor on the cycle carrier for checking DV leakage, and also for checking compressor performance.

Before starting the operation, be sure to evacuate the refrigerant cycle to avoid air trapped inside.

(3) Charge refrigerant using INJECTOR NEEDLE (926190000).

a. Charging pressure 98 to 147 kPa (1.0 to 1.5 kg/cm², 14 to 21 psi).
b. Refer to "Charging Refrigerant" in manual.

TEST

NOISE TEST

Open the compressor outlet and inlet ports, and rotate the armature. No abnormal noises nor irregular rotation must be noted inside the compressor and magnet clutch.

COMPRESSION TEST

Close the compressor outlet or inlet port with a finger, and rotate the armature, and check for normal compression or suction.

GAS LEAKAGE TEST

Charge R-12 into the compressor and pressurize (to the saturation pressure). Then check the gas leakage by using an electric leak detector.

1) Immediately direct air to the shaft seal portion before measurement in order to blow off any gas from around the sea.

In this state, the deflection of the needle must be less than 1×10^{-4} mmHg-ℓ/sec (20 gr/year).

2) For other portions, deflection of needle must be less than 0.6×10^{-4} mmHg-ℓ/sec (12 gr/year).

CLUTCH ASSEMBLY OPERATION TEST

1) Rotate the rotor with a hand. No abnormal noise nor play must be noted.

2) Apply a voltage of 12V (battery voltage) across the coil terminals. The clutch plate must be attracted.

3) Make sure the armature gap is 0.5 to 0.8 mm (0.020 to 0.031 in).

BREAK-IN TEST

After completing the above-mentioned tests, install the compressor to the refrigerant cycle unit (if unavailable, actual vehicle), and perform break-in operation for 30 minutes under the following conditions:

Conditions:
Rotating speed: 1,800 rpm
High pressure: 1,324 ± 98 kPa
(13.5 ± 1 kg/cm², 192 ± 14 psi)
Low pressure: 147 – 196 kPa
(1.5 – 2 kg/cm², 21 – 28 psi)

DV LEAKAGE TEST

Stop the compressor when the pressure difference between the outlet side and inlet side is 686 kPa (7 kg/cm², 100 psi). Pressure rise in the inlet side must be less than 490 kPa (5 kg/cm², 71 psi) within five minutes.

Condenser

REMOVAL AND INSTALLATION

1) Disconnect battery negative terminal.
2) Discharge refrigerant from low pressure side.
3) Remove horn ASSY, stay, hood lock ASSY and front hood cable cover.

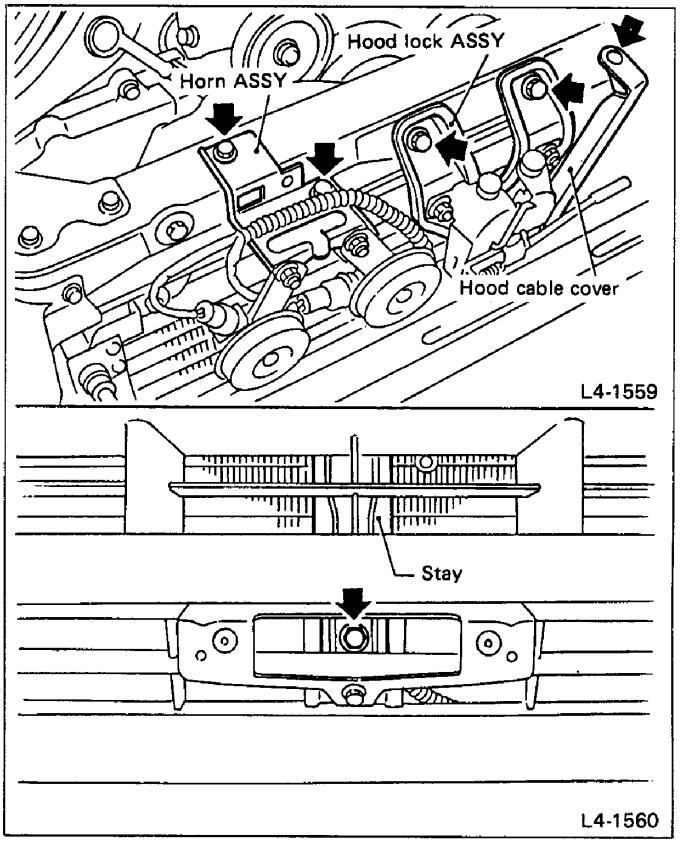


Fig. 71

4) Disconnect pipe connections.

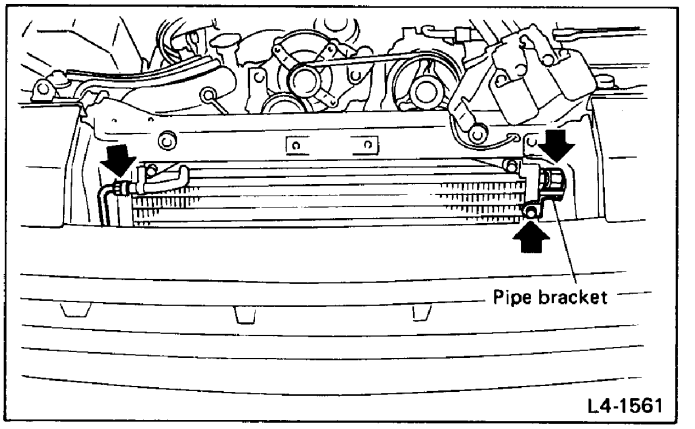


Fig. 72

5) Remove two upper bolts and then take out the condenser.

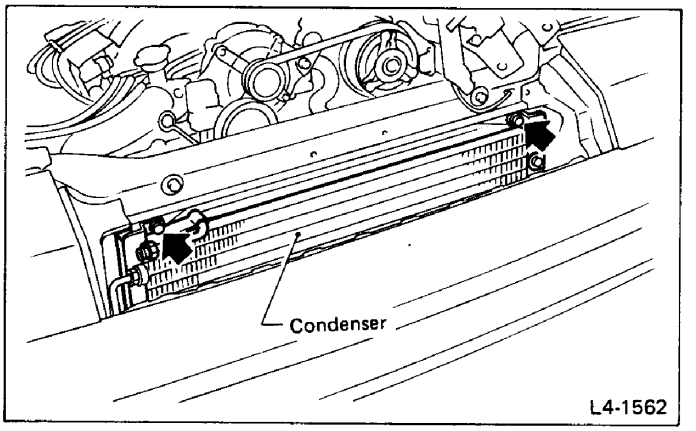


Fig. 73

6) The condenser should be installed in the reverse order in which it was removed.
When installing the condenser, pay attention to the following:

Before connecting the pipe, be sure to apply oil to the periphery of O-ring.

Tightening torque:
Left-hand piping nut
15 – 25 N·m (1.5 – 2.5 kg-m, 11 – 18 ft-lb)
Right-hand piping nut
10 – 20 N·m (1.0 – 2.0 kg-m, 7 – 14 ft-lb)
Bracket bolt
5 – 10 N·m (0.5 – 1.0 kg-m, 3.6 – 7.2 ft-lb)
Upper bolts
15 – 25 N·m (1.5 – 2.5 kg-m, 11 – 18 ft-lb)

INSPECTION

1) Make sure the condenser fins are free from dust and insects. If the fins are clogged, clean by blowing air or water through them.

To prevent dust and water from getting into the condenser, this work must be done when the condenser is installed in an actual vehicle.

2) Check all of the condenser's parts to see if they show any sign of oil seepage. Should oil ooze or gas leak from a particular part, replace it with a new one.

Receiver Drier

REMOVAL AND INSTALLATION

1) Disconnect battery negative terminal.
2) Discharge refrigerant.
3) Remove canister and place it on the engine.
4) Disconnect two pipes from receiver drier.

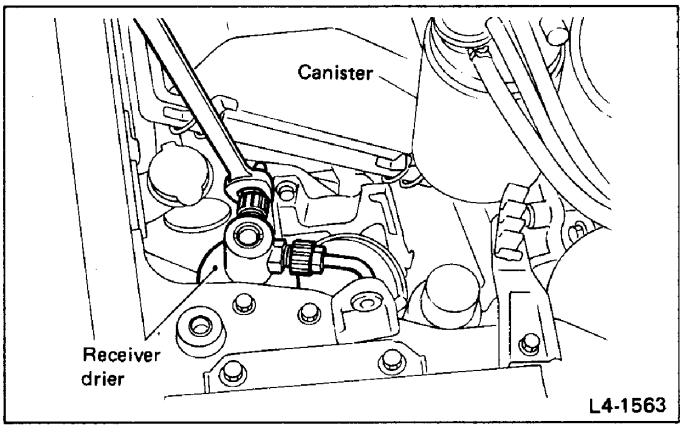


Fig. 74

5) Remove receiver drier by removing mounting bolts.

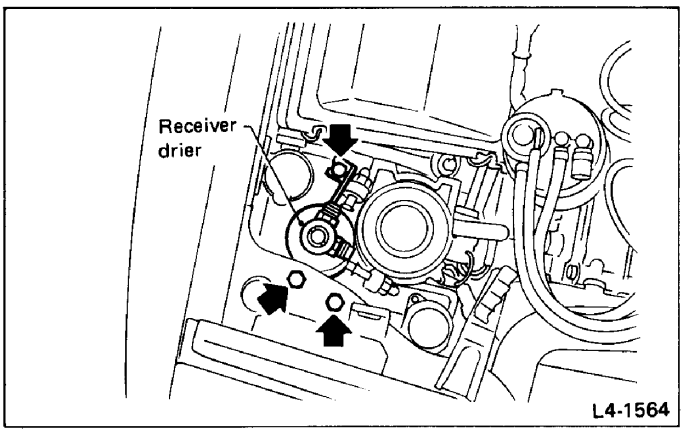


Fig. 75

The receiver drier contains a desiccant. Be sure to put a blind plug in the detached receiver drier to protect it from moisture.

6) Install the receiver drier in the reverse order of removal.

Tightening torque:
Mounting bolt
5 – 10 N·m (0.5 – 1.0 kg-m, 3.6 – 7.2 ft-lb)
Pipe nut
10 – 20 N·m (1.0 – 2.0 kg-m, 7 – 14 ft-lb)

Evaporator

REMOVAL AND INSTALLATION

1) Disconnect battery negative terminal.
2) Discharge refrigerant.
3) Disconnect discharge pipe, suction pipe and grommets.

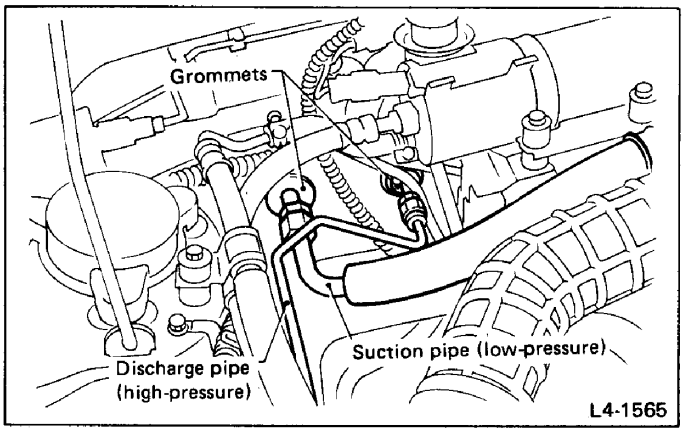


Fig. 76

4) Remove under cover trim.
5) Remove pocket ASSY.
6) Disconnect wiring harness from evaporator thermostat.
7) After removing two bands, remove evaporator.
8) Install the evaporator in the reverse order of removal.

When installing the evaporator in the car body, make sure the wiring harness and vacuum hose do not get caught between the body parts.

DISASSEMBLY & ASSEMBLY

1) Using a flat-bladed screwdriver, remove the eight clamps and the evaporator upper case.

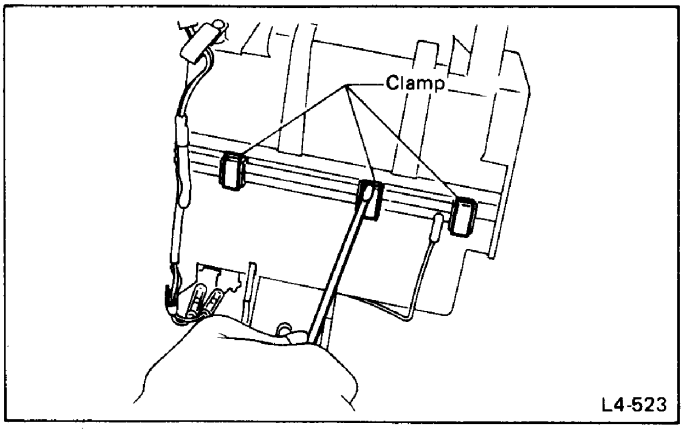


Fig. 77

2) Remove lower case from evaporator.
3) Remove the component parts from evaporator.
   (1) Thermostat
   (2) Disconnect the connection between the expansion valve and pipe from receiver drier.
   (3) Remove the expansion valve from the header pipe.

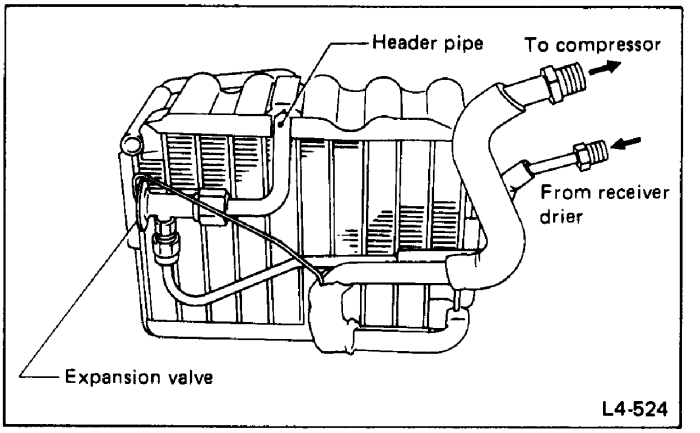


Fig. 78

4) Check to see if the evaporator fins are clogged. If they are, clean them with compressed air.

Water must never be used to clean the evaporator.

5) Check parts that have been removed for cracks or scratches, and repair or replace them with new ones, if necessary.
6) Reassemble the evaporator in the reverse order of disassembly. Observe the following points during the reassembly process:
   (1) Confirm that the O-ring is inserted in the specified position.
   (2) Tightening torque

Tightening torque:
Expansion valve's mounting nut
2.5 – 4.4 N·m (0.25 – 0.45 kg-m, 1.8 – 3.3 ft-lb)
Discharger pipe union nut
10 – 20 N·m (1.0 – 2.0 kg-m, 7 – 14 ft-lb)
Nut on discharge side
10 – 20 N·m (1.0 – 2.0 kg-m, 7 – 14 ft-lb)
Nut on suction side
20 – 29 N·m (2.0 – 3.0 kg-m, 14 – 22 ft-lb)

Condenser Fan Assembly

REMOVAL AND DISASSEMBLY

1) Disconnect battery negative terminal.
2) Remove pulser.
3) Remove the bolts from upper side of fan shroud.

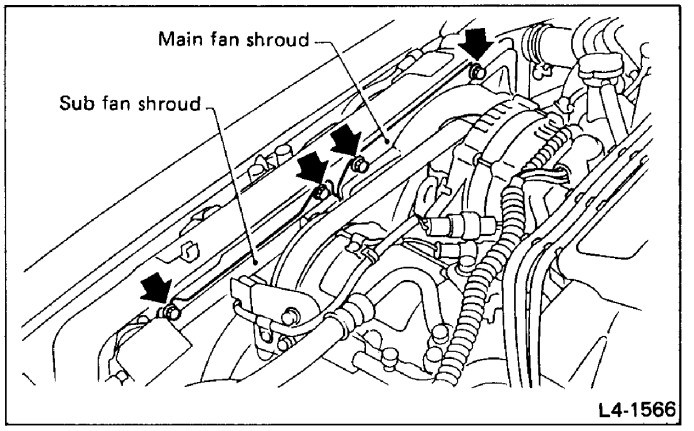


Fig. 79

4) Raise the car.
5) Disconnect the fan motor connector, and remove the bolt from lower side of fan shroud.

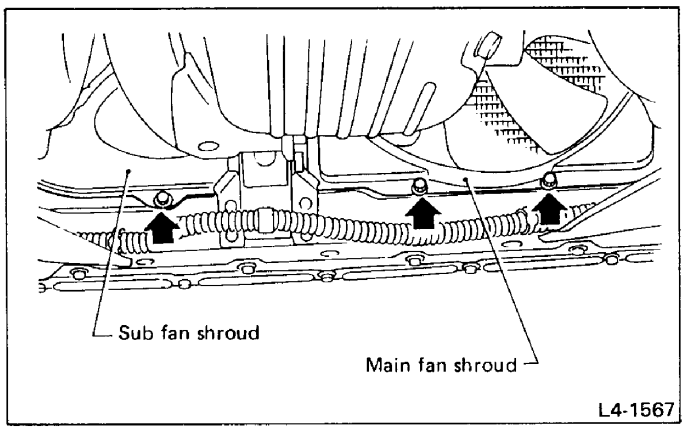


Fig. 80

6) Lower car to the floor.
7) Remove condenser fan assembly.
8) Remove fan motor and fan from shroud.

Fan and fan motor are balanced and must not be separated.

INSTALLATION

Installation is in the reverse order of removal.

Tightening torque:
Fan motor ASSY to shroud:
5 – 10 N·m (0.5 – 1.0 kg-m, 3.6 – 7.2 ft-lb)
Condenser fan shroud to body:
5 – 10 N·m (0.5 – 1.0 kg-m, 3.6 – 7.2 ft-lb)

Flexible Hose

With the following cautions, replace flexible hoses with new ones if they are damaged or swollen.

(1) The flexible hoses should be free from twists and tension after they have been connected.
(2) The flexible hoses must not be bent forcibly.

REMOVAL

1) Disconnect battery negative terminal.
2) Discharge refrigerant.
3) Remove low pressure hose.
(1) Remove hose attaching bolts from compressor side.

Plug the opening to prevent foreign matter from getting in.

(2) Disconnect the connector at evaporator unit.

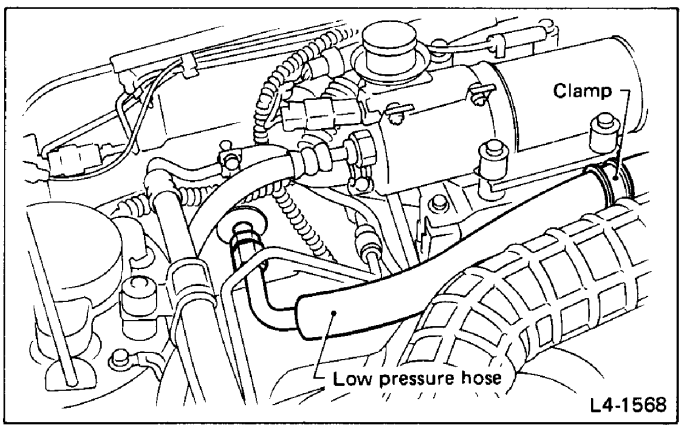


Fig. 81

(3) Unclamp the hose.

4) Remove high-pressure hose.
   (1) Remove hose attaching bolts from compressor side.

Plug the opening to prevent foreign matter from getting in.

   (2) Remove bolt holding pipe to condenser.
   (3) Disconnect the pipe connection at condenser.

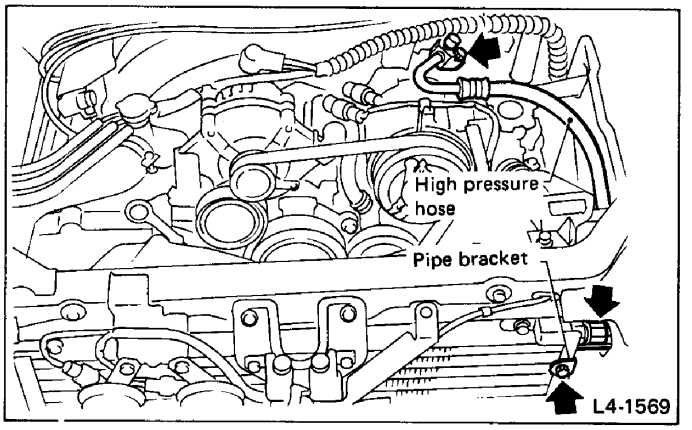


Fig. 82

INSTALLATION

Installation is in the reverse order of removal.
Tightening torque for flexible hose connections:

Tightening torque:
Low-pressure pipe to evaporator unit:
20 – 29 N·m (2.0 – 3.0 kg-m, 14 – 22 ft-lb)
High-pressure pipe to condenser:
15 – 25 N·m (1.5 – 2.5 kg-m, 11 – 18 ft-lb)
Pipe (high and low) to compressor:
15 – 25 N·m (1.5 – 2.5 kg-m, 11 – 18 ft-lb)
Pipe holding bolt (condenser side):
5 – 10 N·m (0.5 – 1.0 kg-m, 3.6 – 7.2 ft-lb)

Be sure to clamp and clip the hose.

Relay and Fuse

The air conditioner relay, main fan control relay, and air conditioner fuse are installed as shown in the figures below.

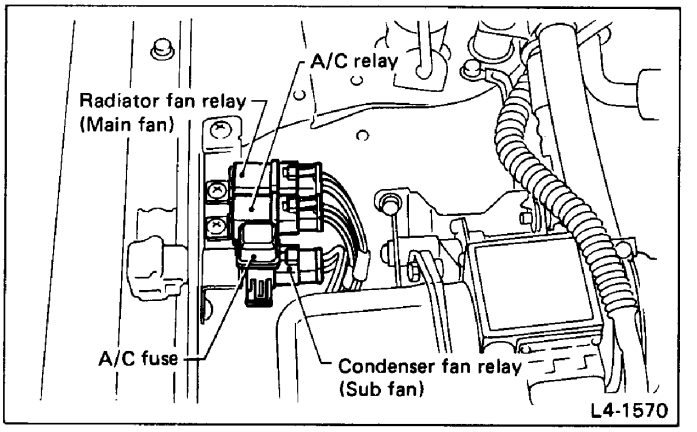


Fig. 83

INSPECTION

Check conduction with a circuit tester (ohm range) according to the following table.

- A/C relay, Fan control relay, Condenser fan relay

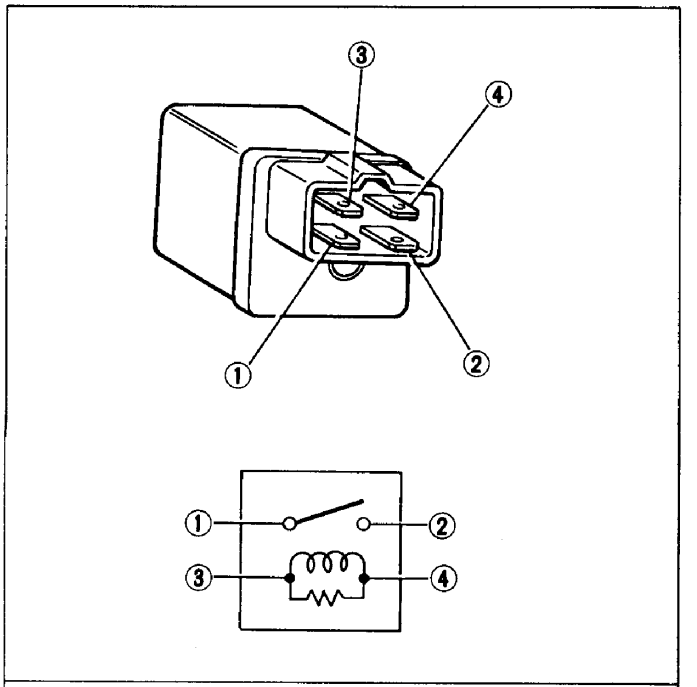


Fig. 84

Pressure switch

The pressure switch is provided with a main fan control switch and a high/low-pressure switch.

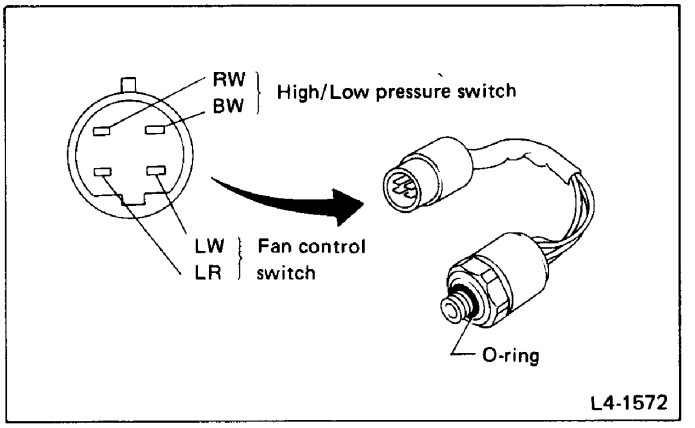


Fig. 85

REMOVAL AND INSTALLATION

1) Disconnect battery negative terminal.
2) Discharge refrigerant.
3) Remove canister and place it on the engine.
4) Disconnect pressure switch connector and remove pressure switch.

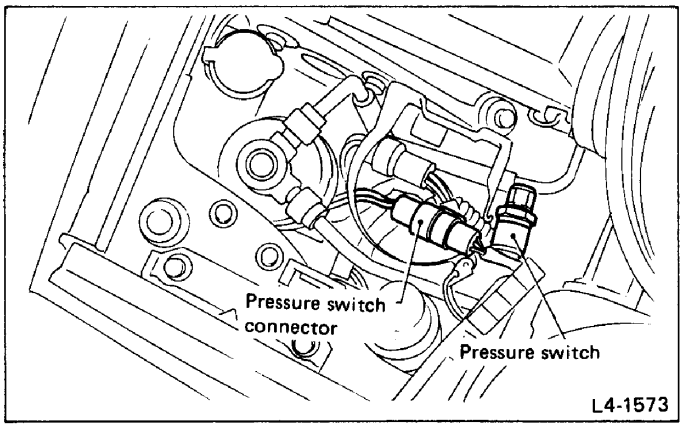


Fig. 86

5) Install pressure switch in the order of its removal.

Coat O-ring of pressure switch with compressor oil before installing pressure switch.

Tightening torque:
15 – 18 N·m (1.5 – 1.8 kg-m, 11 – 13 ft-lb)

Microswitch

REMOVAL AND INSTALLATION

1) Select "Heat" mode on control wing.
2) Lift up a steering wheel.
3) Remove driver's side lower cover.
4) Remove side ventilation duct.
5) Disconnect harness couplers.
6) To facilitate the work, push up the harness coming from meter ASSY into steering column lower cover.
7) Remove microswitch.
8) Installation is in the reverse order of removal.

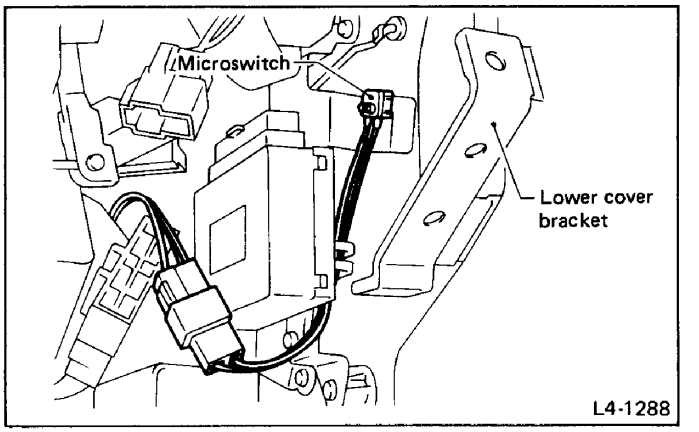


Fig. 87

Pulser Amplifier

FUNCTION

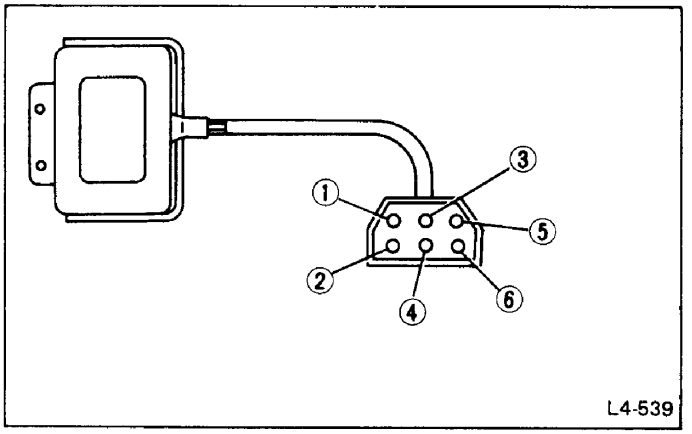


Fig. 88

REMOVAL AND INSTALLATION

1) Remove instrument panel lid and pocket.
2) Remove front shelf.
3) Disconnect body harness (6-pole connector) from amplifier.
4) Loosen the bolt installing evaporator and remove pulser amplifier.

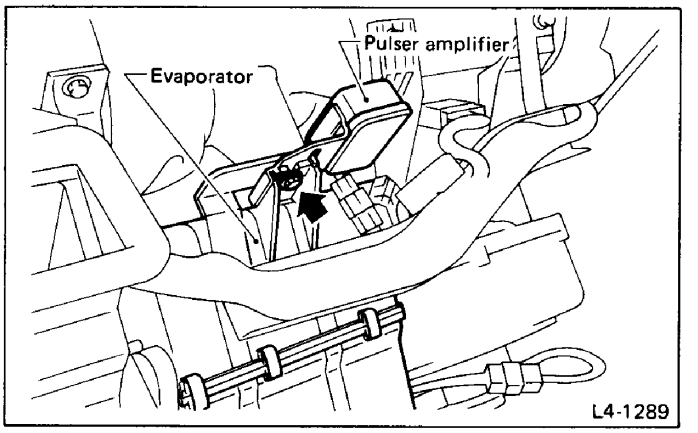


Fig. 89

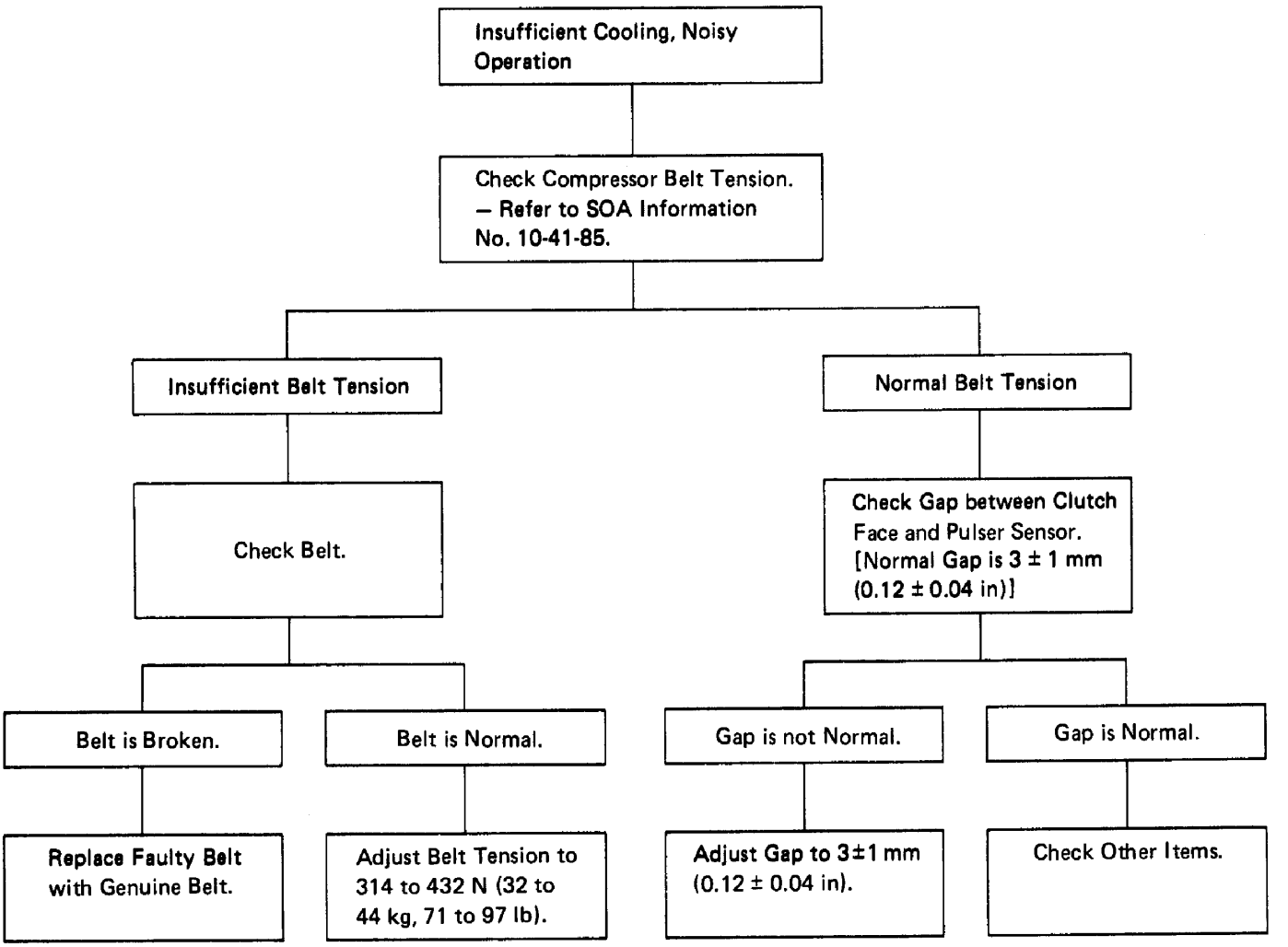
5) Install in the reverse order of removal.

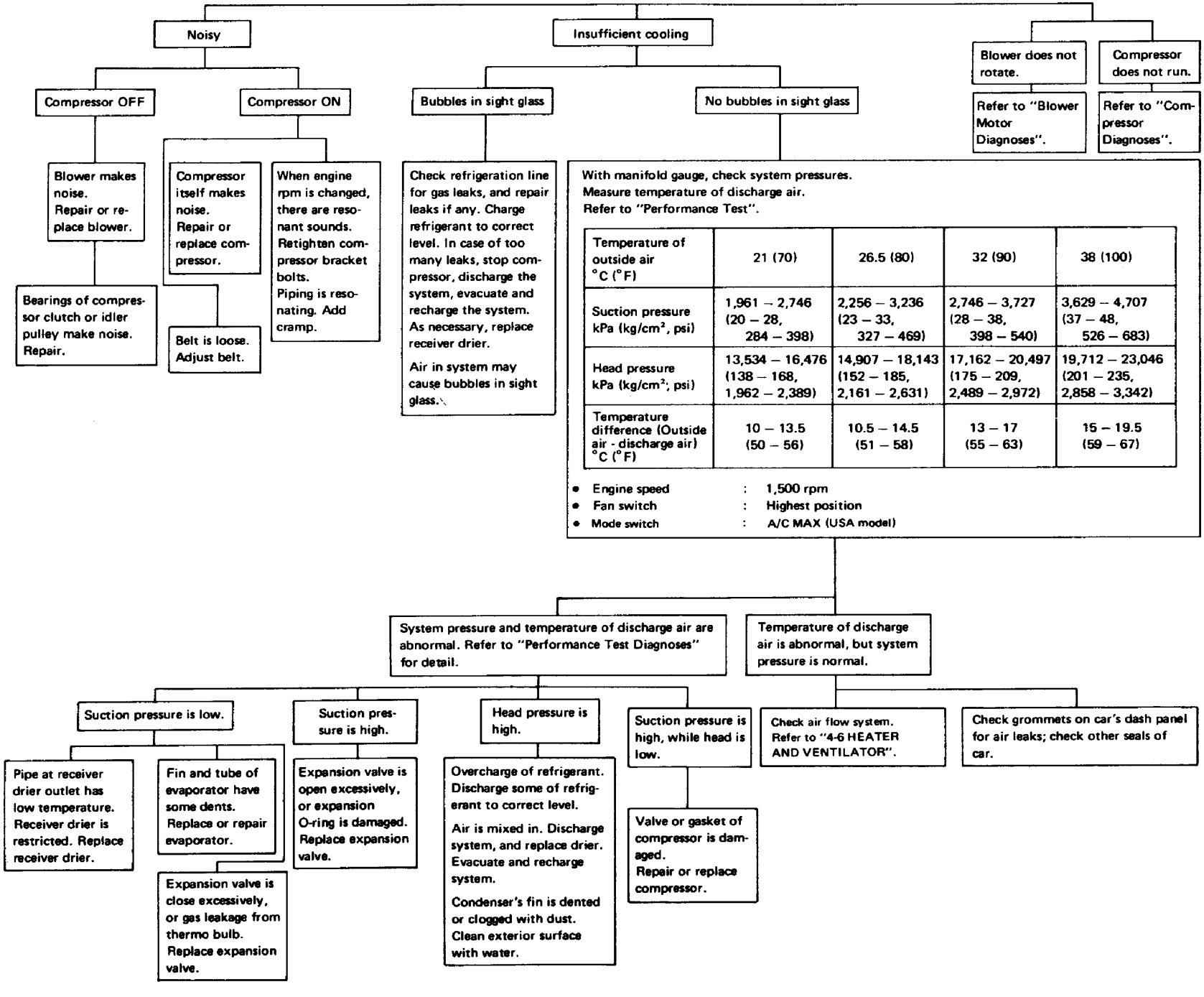
Terminal			Description
No.	Cable color	Destination	
1	RY	Power supply	Supplies current to the pulser amplifier through the air conditioner switch and triple (low-pressure) switch for the purpose of activating accessories.
2	Y	Ignition coil (−)	Transmits engine rpms to the pulser amplifier in pulse form.
3	R	Pulse sensor (−)	Transmits compressor rpms to the pulser amplifier for comparison with ignition pulses. When compressor rpms drop below 75 to 80% of engine rpms, the RB's grounding circuit will open.
4	G	Pulse sensor (+)	
5	RB	Magnetic clutch drive relay coil	When the thermostat activates to close the ground circuit with the air conditioner switch "ON", the clutch will engage. When compressor is locked, the thermostat activates to open the ground circuit, disengaging the clutch.
6	LB	Ground	The thermostat opens and closes the ground circuit, depending on the temperature of the evaporator.

TROUBLESHOOTING

Air Conditioning System Diagnosis

Follow this chart first when following troubles occur.



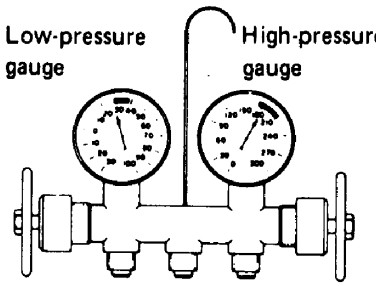
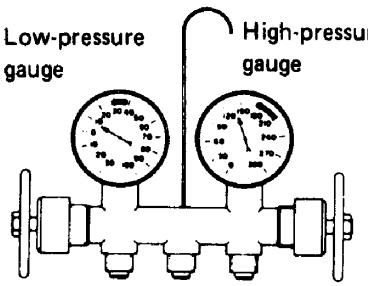
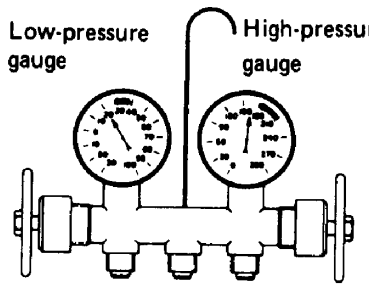


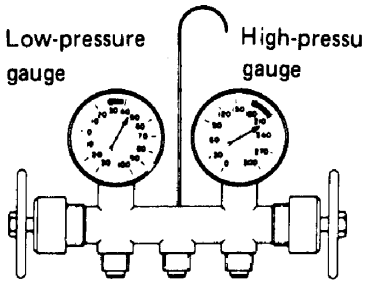
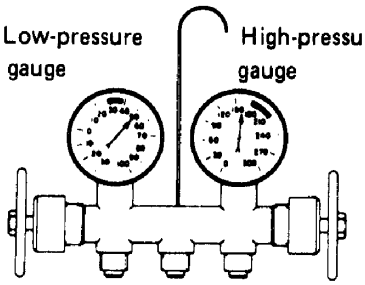
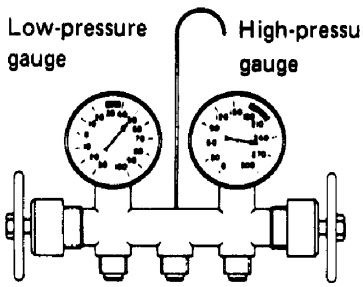
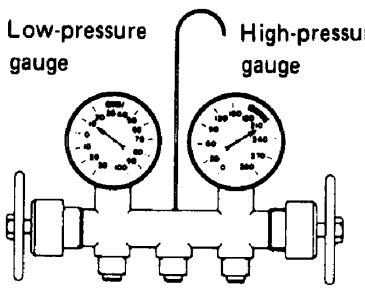
Temperature of outside air °C (°F)	21 (70)	26.5 (80)	32 (90)	38 (100)
Suction pressure kPa (kg/cm², psi)	1,961 – 2,746 (20 – 28, 284 – 398)	2,256 – 3,236 (23 – 33, 327 – 469)	2,746 – 3,727 (28 – 38, 398 – 540)	3,629 – 4,707 (37 – 48, 526 – 683)
Head pressure kPa (kg/cm²; psi)	13,534 – 16,476 (138 – 168, 1,962 – 2,389)	14,907 – 18,143 (152 – 185, 2,161 – 2,631)	17,162 – 20,497 (175 – 209, 2,489 – 2,972)	19,712 – 23,046 (201 – 235, 2,858 – 3,342)
Temperature difference (Outside air - discharge air) °C (°F)	10 – 13.5 (50 – 56)	10.5 – 14.5 (51 – 58)	13 – 17 (55 – 63)	15 – 19.5 (59 – 67)

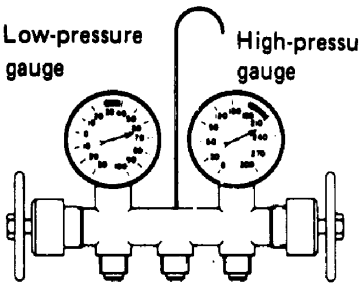
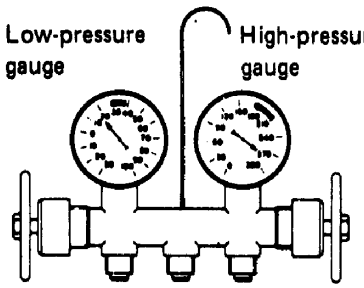
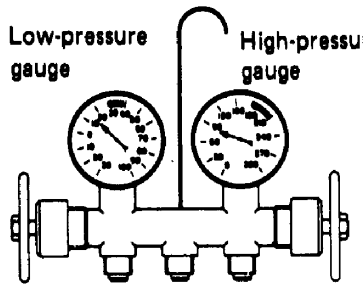
Performance Test Diagnoses

Of various conditions caused to the air conditioning system, the characteristics revealed on manifold gauge reading are shown in the following.

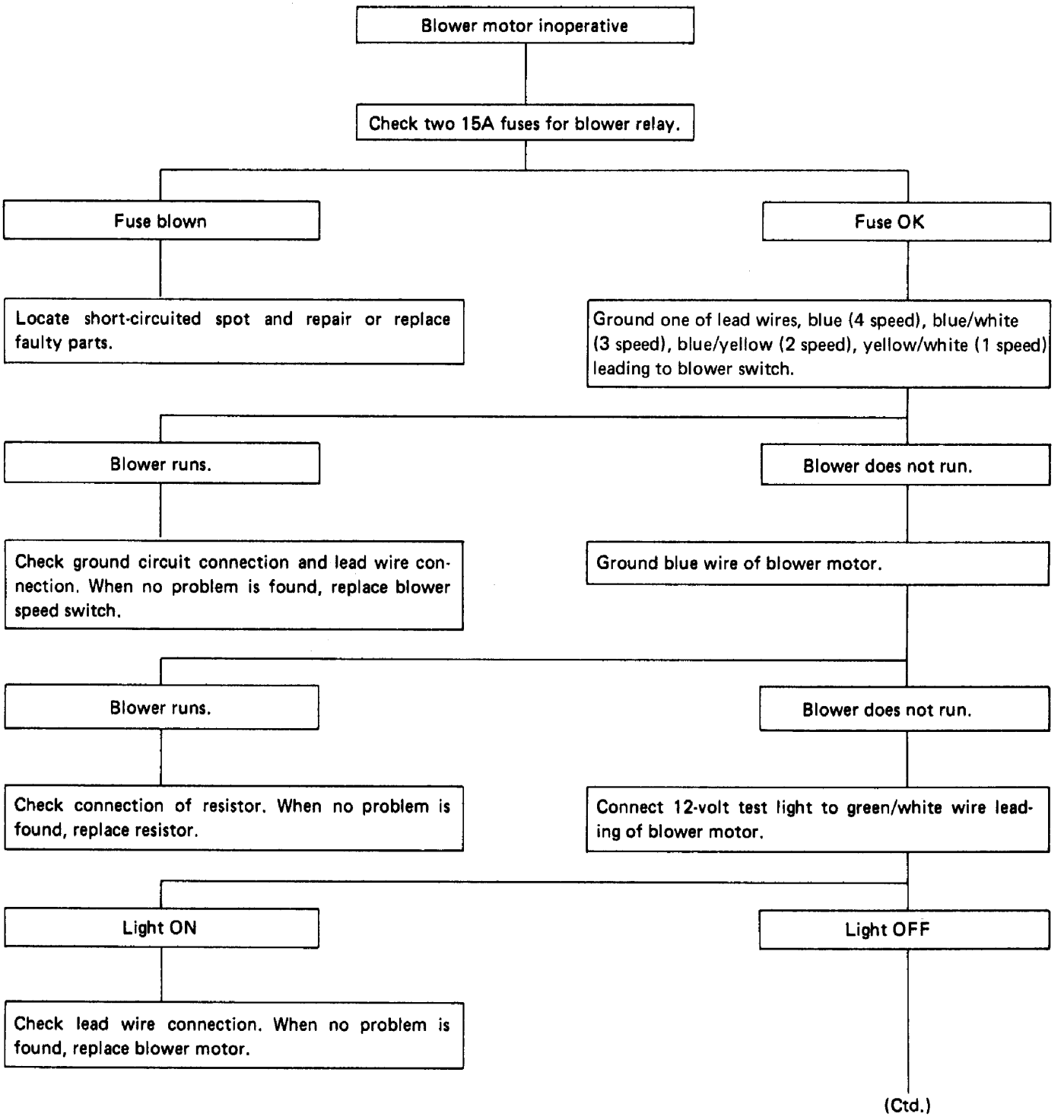
As to the method of a performance test, refer to the item of "Performance Test".
Each shaded area on the following tables indicates a reading of the normal system when the temperature of outside air is 32.5°C (91°F).

Condition	Probable cause	Corrective action
INSUFFICIENT REFRIGERANT CHARGE  *Fig. 90* A26-069 Insufficient cooling. Bubbles appear in sight glass.	Refrigerant is small, or leaking a little.	1. Leak test. 2. Repair leak. 3. Charge system. **Evacuate, as necessary, and recharge system.**
ALMOST NO REFRIGERANT  *Fig. 91* A26-070 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  A26-071 *Fig. 92* 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.

Condition		Probable cause	Corrective action
 *Fig. 93* A26-072	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.
 *Fig. 94* A26-073	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  *Fig. 95* A26-074	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  *Fig. 96* A26-075	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 39 kPa (0.4 kg/cm^2, 6 psi) 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.

Condition		Probable cause	Corrective action
FAULTY CONDENSER  A26-076 *Fig. 97*	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 condenser cooling fan. • Check condenser for dirt accumulation. • Check engine cooling system for overheat. • Check for refrigerant overcharge. **If pressure remains high in spite of all above actions taken, remove and inspect the condenser for possible oil clogging.**
HIGH PRESSURE LINE BLOCKED  A26-077 *Fig. 98*	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  A26-078 *Fig. 99*	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.

Blower Motor Diagnoses



Connect 12-volt test light to blue wire leading to relay.

Light ON

Light OFF

Check lead wire connection.
When no problem is found, replace relay.

Check connector and check fuse holder, too.
Repair or replace damaged parts, if any.

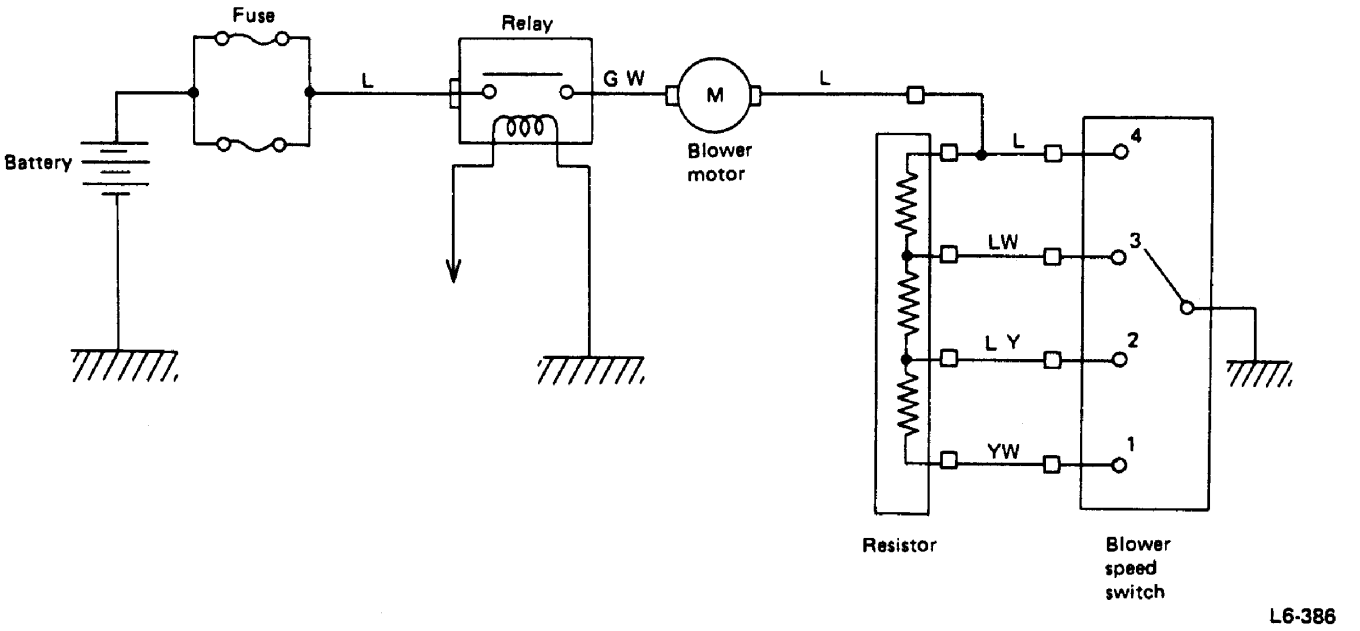
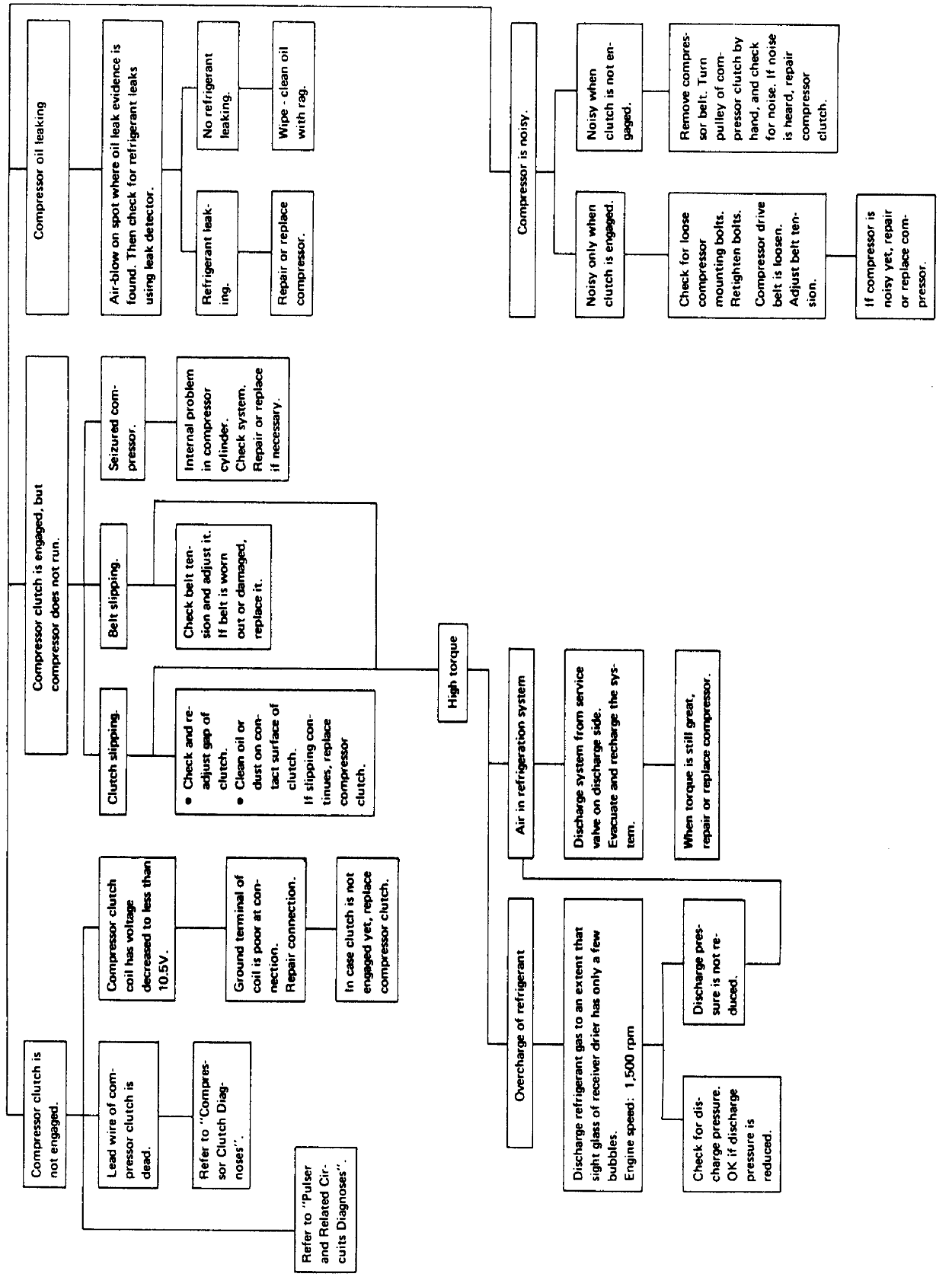
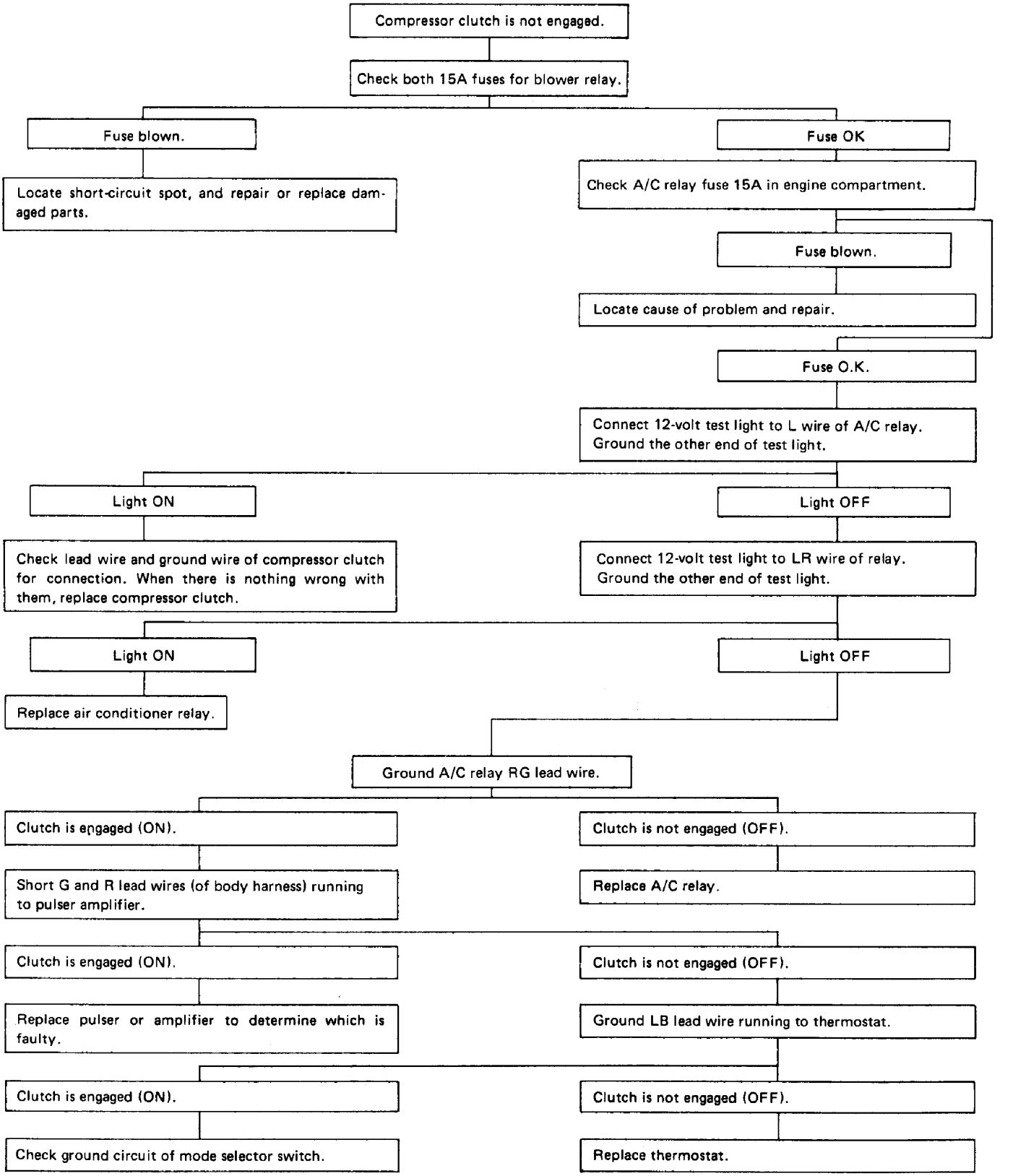


Fig. 100

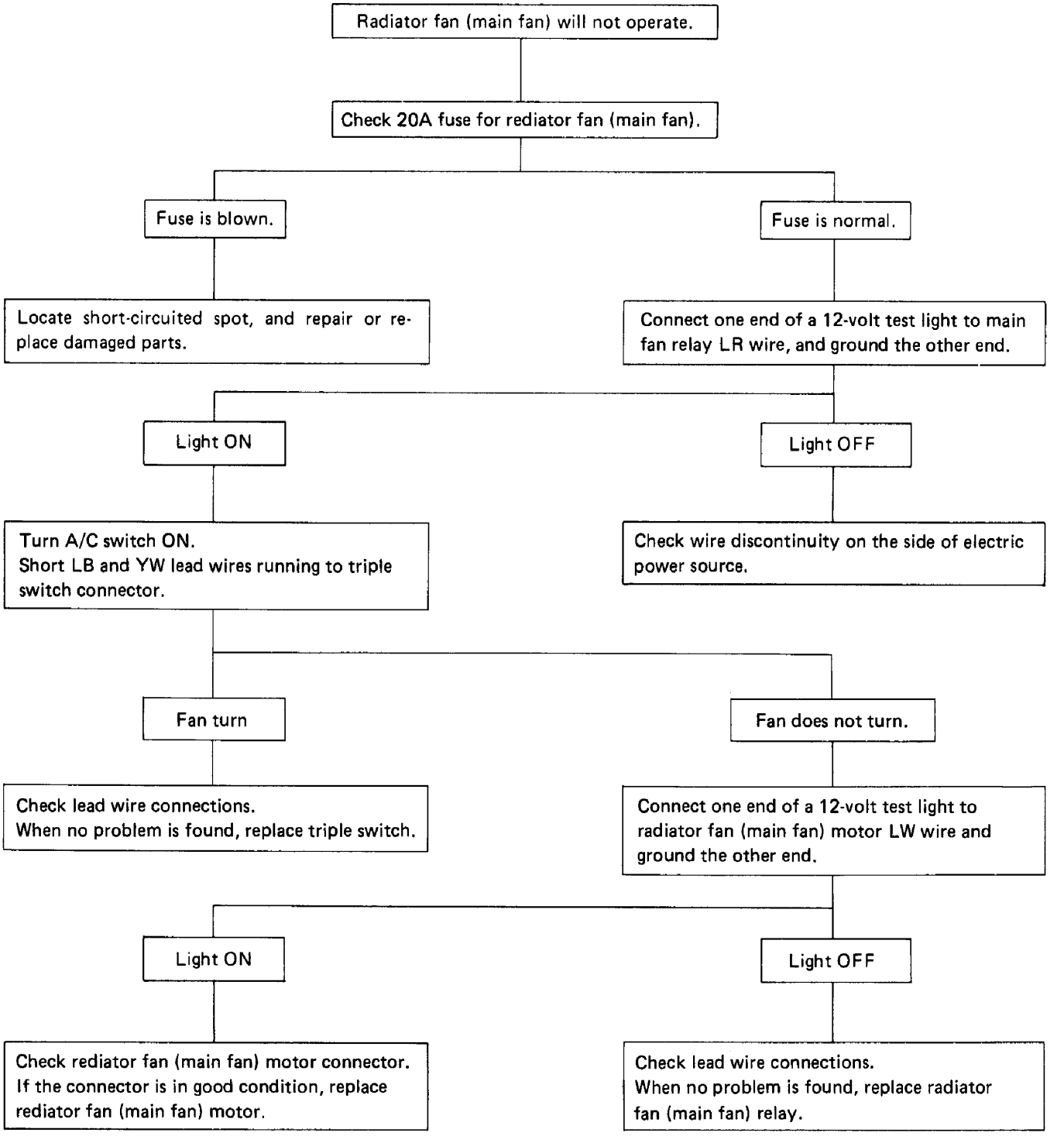
Compressor Diagnoses



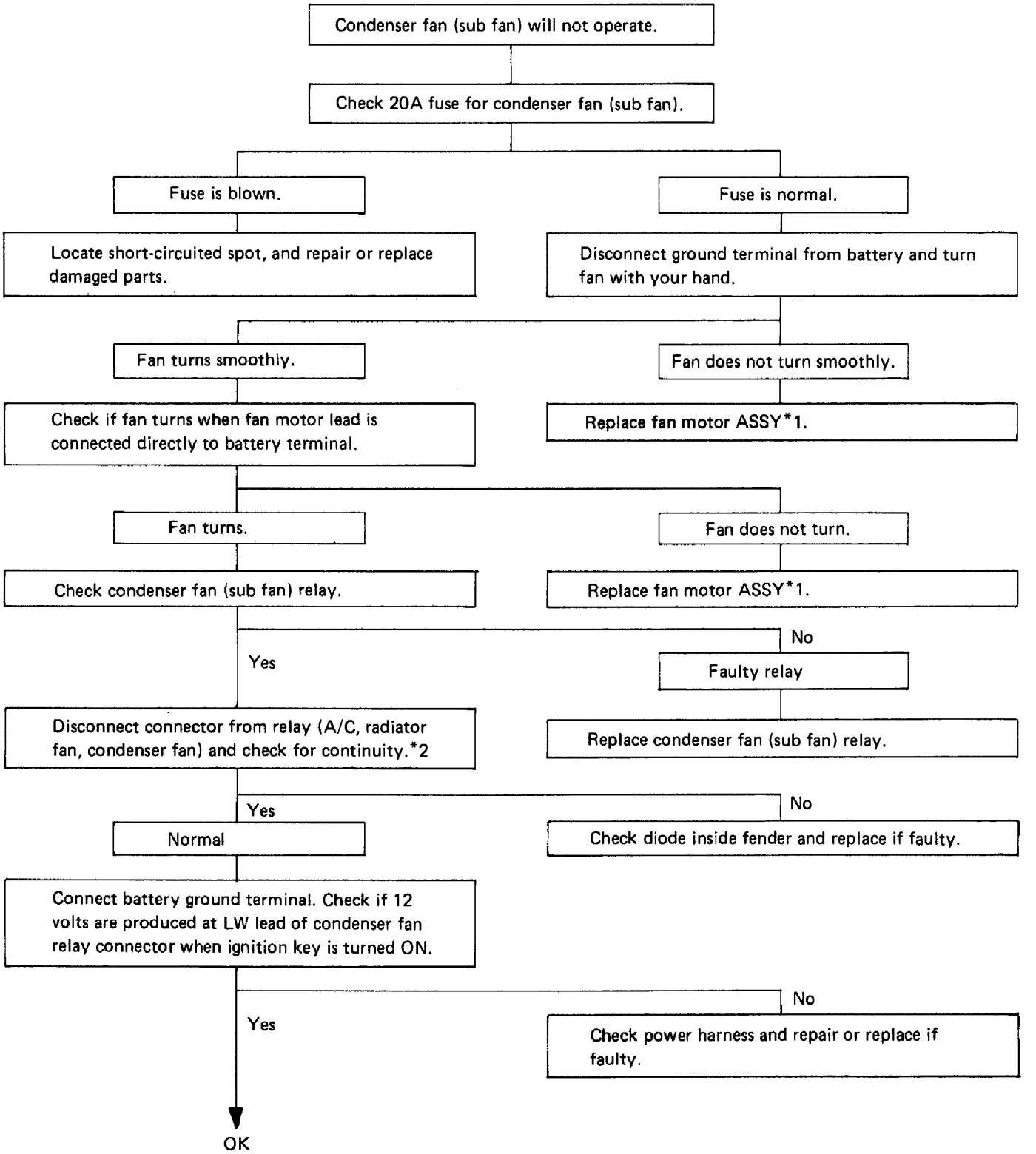
Compressor Clutch Diagnoses



Radiator Fan (Main Fan) Diagnoses



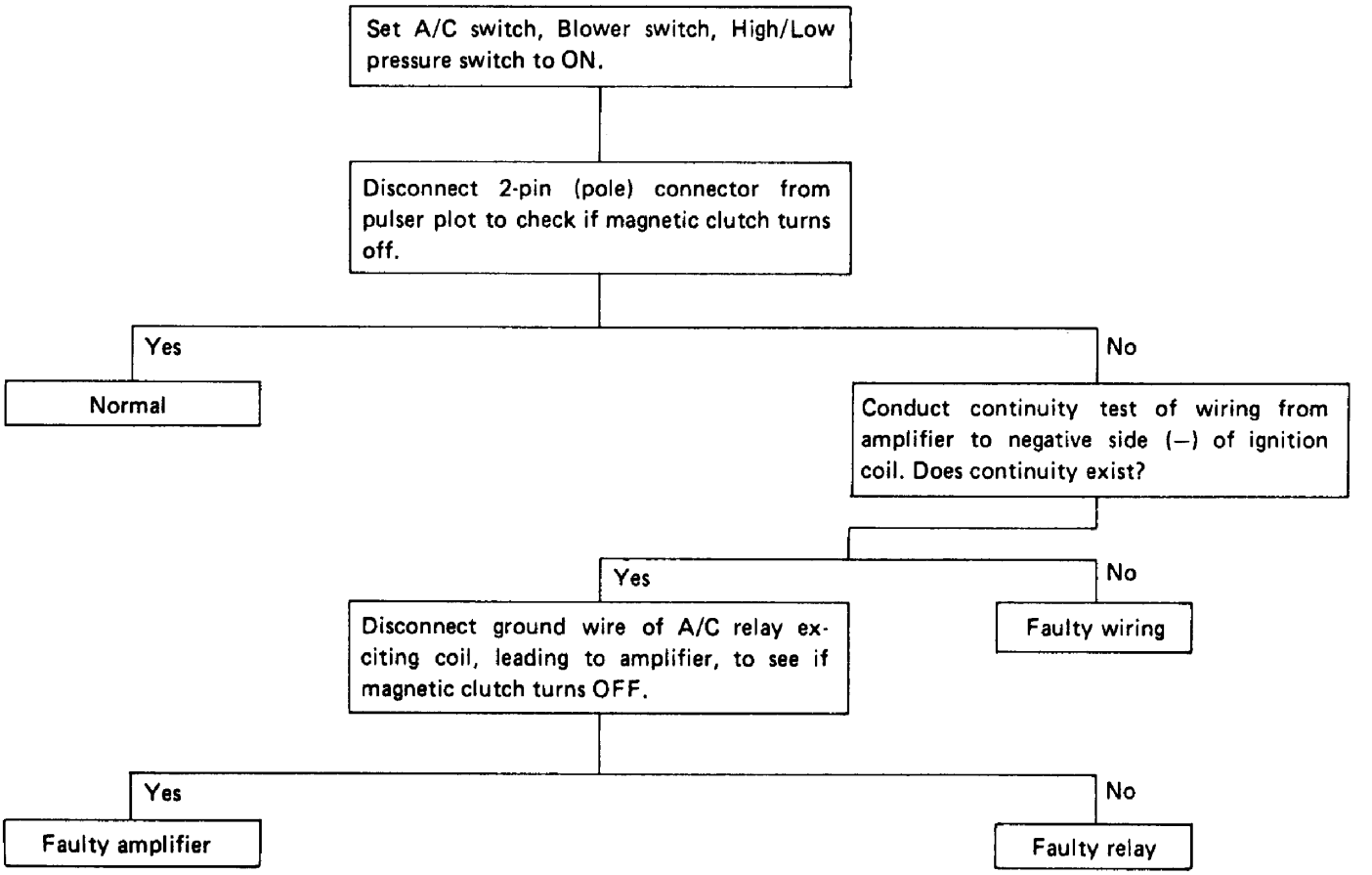
Condenser Fan (Sub Fan) Diagnoses

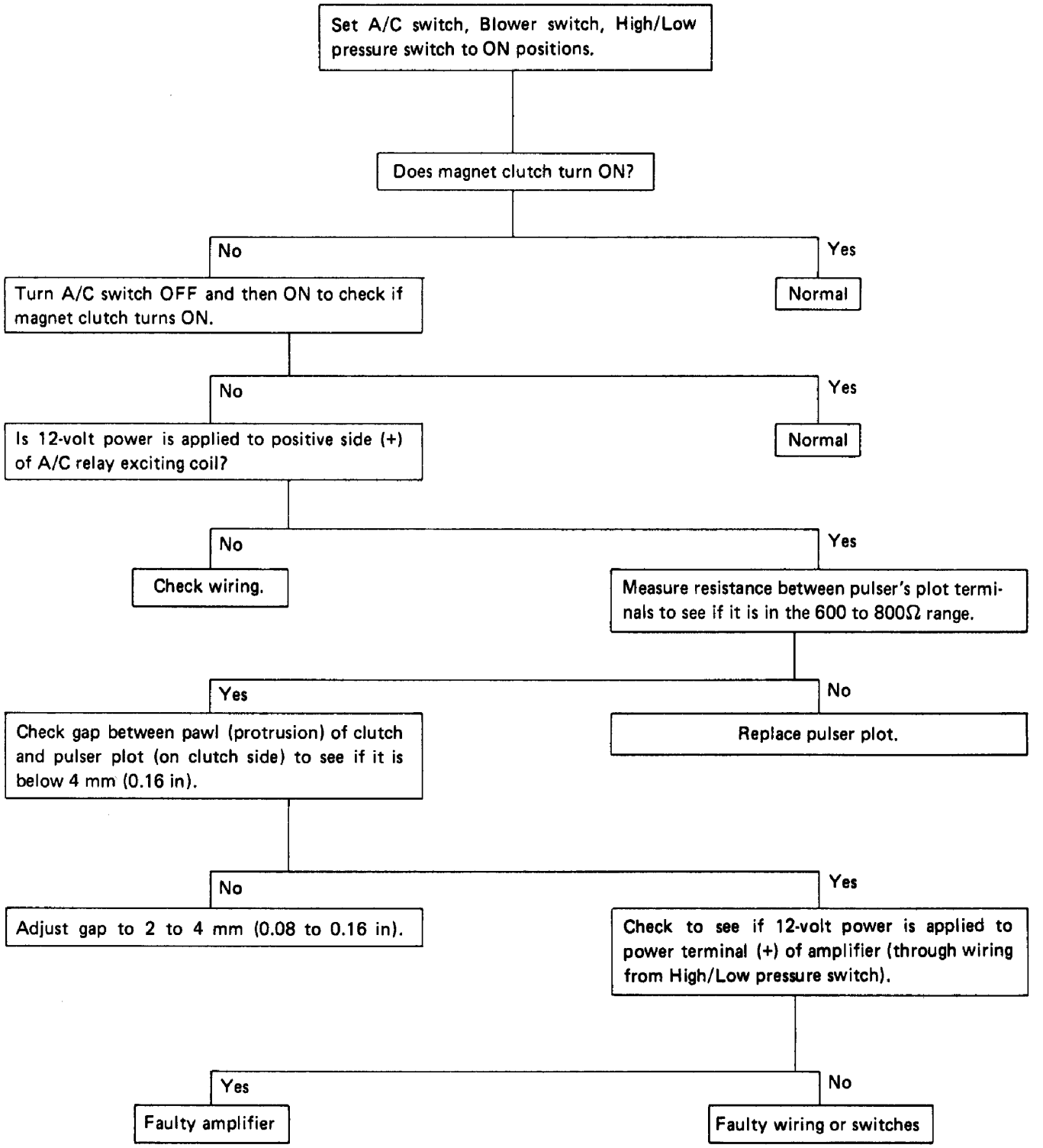


***1: Replace fan and fan motor as a unit because they are balanced.**
***2: Connect tester leads to LR leads of condenser fan relay connector, YW lead of radiator fan relay connector and L lead of A/C relay connector. Check for continuity, as shown in Table below.**

	Tester lead	
	Positive (+)	Negative (−)
No continuity	LR ——— L LR ——— YW	
Continuity	L ——— LR YW ——— LR	

Pulser and Related Circuits Diagnoses




Set A/C switch, Blower switch, High/Low pressure switch to ON positions.
Does magnet clutch turn ON?
No
Yes
Normal
Turn A/C switch OFF and then ON to check if magnet clutch turns ON.
No
Yes
Normal
Is 12-volt power is applied to positive side (+) of A/C relay exciting coil?
No
Yes
Check wiring.
Measure resistance between pulser's plot terminals to see if it is in the 600 to 800Ω range.
Yes
No
Check gap between pawl (protrusion) of clutch and pulser plot (on clutch side) to see if it is below 4 mm (0.16 in).
Replace pulser plot.
No
Yes
Adjust gap to 2 to 4 mm (0.08 to 0.16 in).
Check to see if 12-volt power is applied to power terminal (+) of amplifier (through wiring from High/Low pressure switch).
Yes
No
Faulty amplifier
Faulty wiring or switches

Air Conditioning System

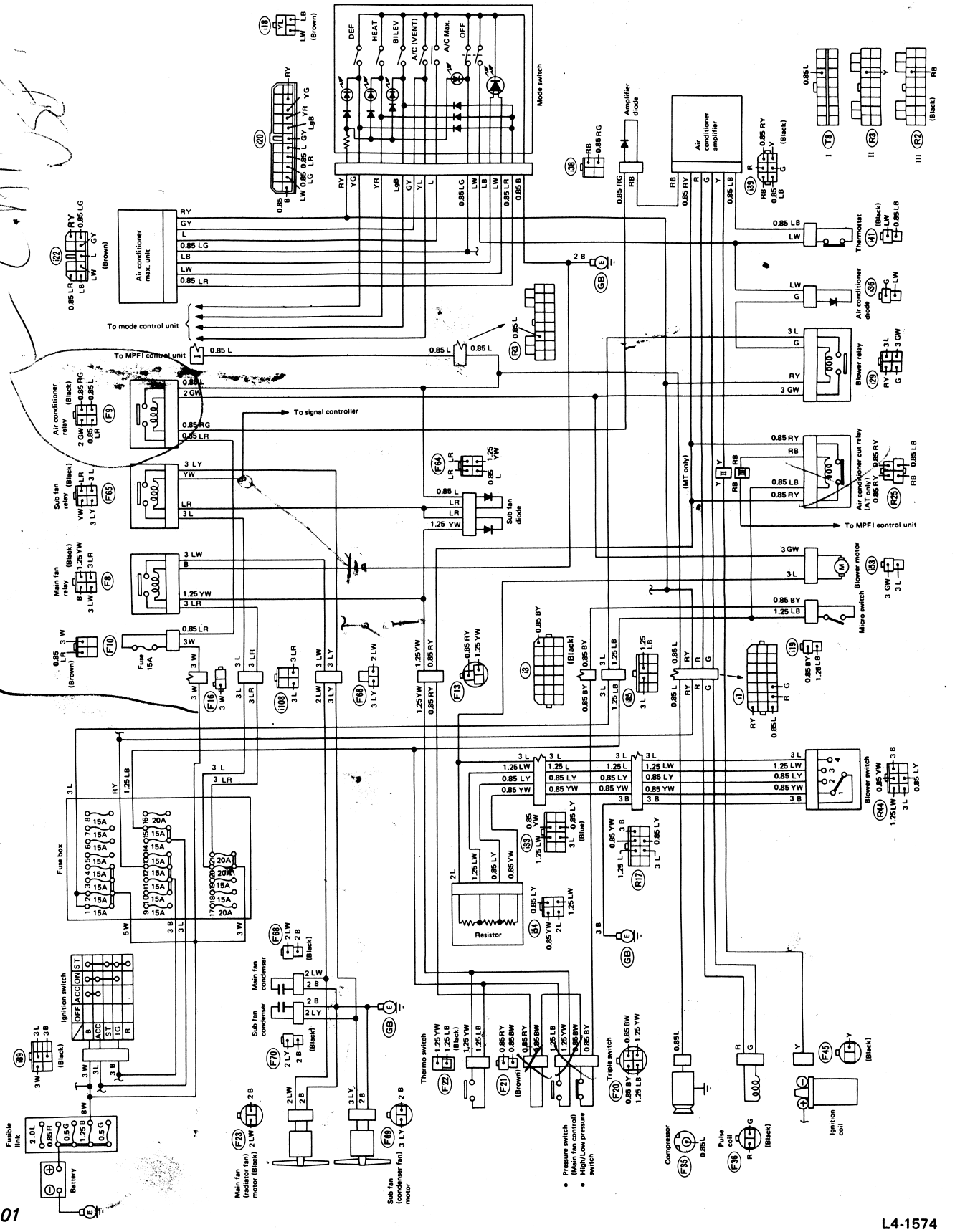


Fig. 101

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