SECTION 1B

AIR CONDITIONING

CAUTION: This vehicle is equipped with Supplemental Inflatable Restraint (SIR). Refer to CAUTIONS in Section 9J under "ON-VEHICLE SERVICE" and the SIR Component and Wiring Location view in Section 9J before performing service on or around SIR components or wiring. Failure to follow CAUTIONS could result in possible air bag deployment, personal injury, or otherwise unneeded SIR system repairs.

NOTICE: Always use the correct fastener in the proper location. When you replace a fastener, use ONLY the exact part number for that application. General Motors will call out those fasteners that require a replacement after removal. General Motors will also call out the fasteners that require thread lockers or thread sealant. UNLESS OTHERWISE SPECIFIED, do not use supplemental coatings (paints, greases, or other corrosion inhibitors) on threaded fasteners or fastener joint interfaces. Generally, such coatings adversely affect the fastener torque and joint clamping force, and may damage the fastener. When you install fasteners, use the correct sequence and tightening specifications. Following these instructions can help you avoid damage to parts and systems.

CONTENTS

GENERAL INFORMATION

NOTICE: The refrigeration system on this vehicle uses R-134a which is not compatible with R-12. Before servicing the system, always make sure the proper servicing equipment is used or the system could become severely damaged. Always refer to the service text and manufacturer's instructions included with service equipment before proceeding.

When removing, installing or working near any electrical components, disconnect the negative (-) battery cable to prevent bodily injury and/or damage to the vehicle.

Before any work is performed on the air conditioning system, review precautions on handling Refrigerant-134a (R-134a) along with the discharging, recovery and recycling procedures located in this section.

Mechanical diagnosis of the compressor is located later in this section. For compressor unit repair and overhaul procedures, refer to SECTION 1D. For air conditioning system electrical diagnosis, refer to SECTION 8A.

Sealing caps should be removed from subassemblies just before making final connections. Always use new O-rings when assembling joints or installing switches. Use a second wrench to hold part of the connection so that an accurate torque value can be obtained when tightening fittings.

GENERAL DESCRIPTION

AIR DISTRIBUTION

Passenger compartment comfort is maintained by the mix of cooled ambient air and heated air as controlled by the temperature lever on the instrument panel.

The manually controlled air conditioning system in this vehicle delivers air that has been heated or cooled and dehumidified for occupant comfort. It also provides ram air, power ventilation and windshield defrosting.

During most operating conditions, fresh outside air is drawn into the ventilation ducts by the blower. Additional outside air (ram air), also may be forced into the ventilation ducts by the forward movement of the vehicle. Within the ventilation ducts, the air is pushed by the blower through the evaporator case. For air conditioning or defroster operating modes, the evaporator is chilled to almost freezing by the engine driven air conditioning refrigeration system. As a result, the evaporator cools all of the air going through the ventilation ducts. The cooling effect causes most of the moisture in the air to condense on the evaporator fins and drain away—dehumidifying the air.

From the evaporator case, some or all of the air may pass through the heater core which is warmed by a flow of hot engine coolant. Any of the air which is not to be heated will bypass the heater and be mixed with the heated air before being guided to the proper air ducts for the selected operating mode.

When the air conditioning mode is selected, the flow of engine coolant through the heater core is shut off to prevent any heating of the air flow before it is discharged. Most of the air entering the blower is outside air, or controls can be set so that air is taken from inside the passenger compartment where the air is likely to be much cooler than outside air in very hot weather.

For heater-only or ventilation modes, the refrigeration system is shut off so cooling is not provided. The amount of heating is governed by the proportions of the air directed through or around the heater core in the same manner as with air conditioning. The climate control assembly in the instrument panel gives the operator a means of selecting the desired operating mode, air temperature and blower speed when the engine is running.

REFRIGERATION SYSTEM

Refrigerant-134a

Figure 1

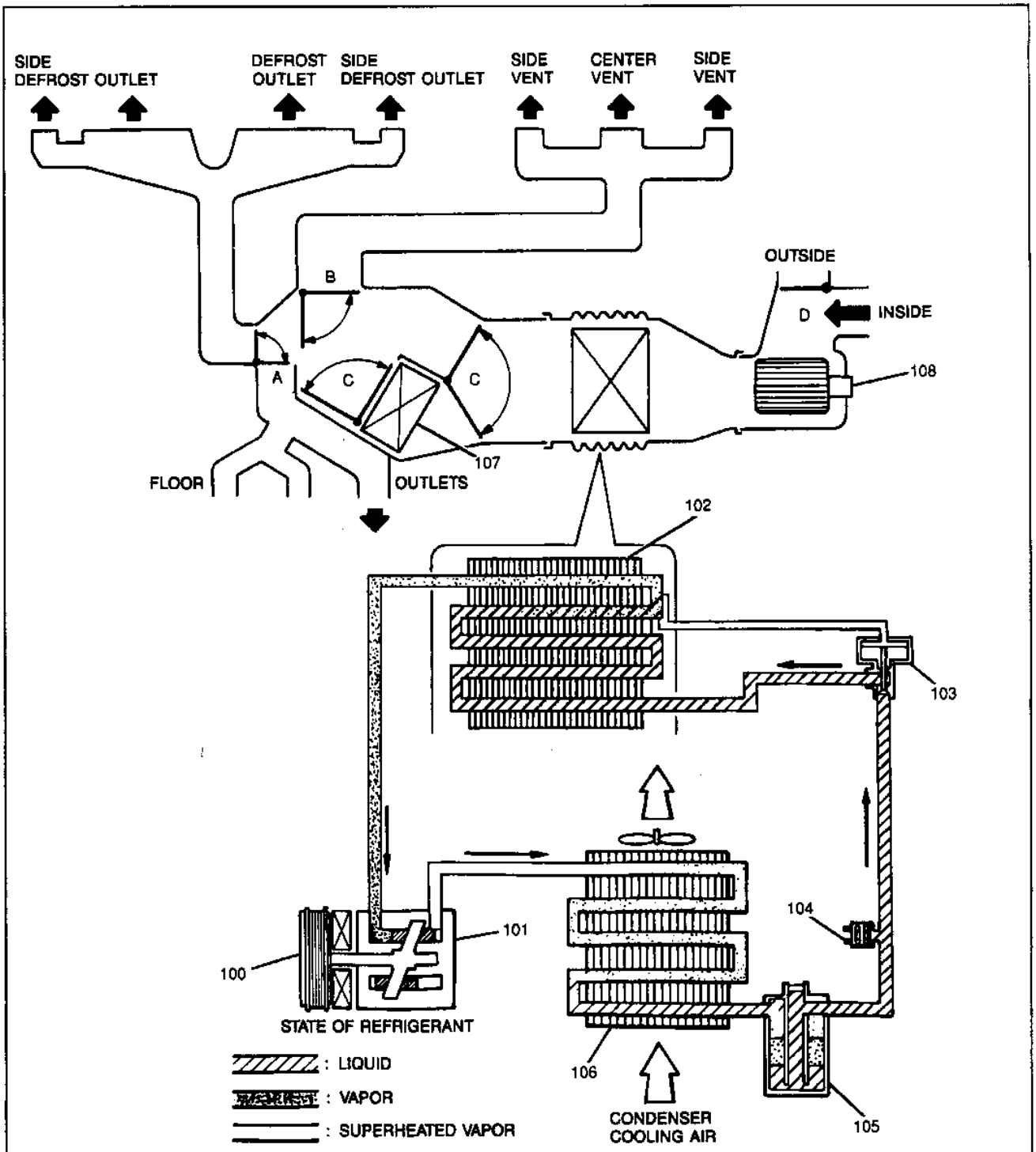
CAUTION: Avoid breathing A/C Refrigerant-134a and lubricant vapor or mist. Exposure may irritate eyes, nose and throat. To remove R-134a from the A/C system, use service equipment certified to meet the requirements of SAE J2210 (R-134a recycling equipment). If accidental system discharge occurs, ventilate work area before resuming service. Additional health and safety information may be obtained from refrigerant and lubricant manufacturers.

Like the coolant in the engine cooling system, the refrigerant is the substance in the air conditioning system that absorbs, carries and then releases heat (Figure 1). Although various substances are used as refrigerants in other types of refrigeration systems, past automotive air conditioning systems used a type called Refrigerant-12 (R-12).

This vehicle uses a new type of refrigerant called Refrigerant-134a (R-134a). It is a non-toxic, non-flammable, clear colorless liquefied gas.

While the R-134a A/C system is very similar to an R-12 A/C system, the differences in the refrigerant, lubricants and service equipment are important.

NOTICE: R-134a refrigerant is not compatible with R-12 refrigerant in an air conditioning system. R-12 in an R-134a system will cause compressor failure, refrigerant oil sludge or poor air conditioning system performance.



A	FLOOR/DEFROSTER DOOR	101	COMPRESSOR	106	CONDENSER
B	MODE (VENT) DOOR	102	EVAPORATOR	107	HEATER CORE
C	TEMPERATURE DOORS	103	EXPANSION VALVE	108	BLOWER MOTOR
D	AIR INLET DOOR	104	DUAL PRESSURE SWITCH		
100	A/C COMPRESSOR CLUTCH	105	RECEIVER/DRYER		

EJS0011B

Figure 1—Air Conditioning System

NOTICE: Refrigerant-134a carries a charge of special lubricating oil, polyalkaline glycol (PAG) refrigerant oil. GM PAG refrigerant oil will have a slight blue tint. The oil is hydroscopic (absorbs water from the atmosphere) and should be stored in closed containers.

Compressor

The compressor is powered by a drive belt from the engine crankshaft through the A/C compressor clutch pulley. The compressor pulley rotates freely, without turning the compressor shaft, until an electromagnetic clutch coil is energized. When voltage is applied to energize the A/C compressor clutch coil, a clutch plate and hub assembly is drawn rearward toward the pulley. The magnetic field locks the clutch plate and pulley together as one unit to drive the compressor shaft. As the compressor shaft turns, the compressor performs two main functions.

It compresses the low-pressure refrigerant vapor from the evaporator into a high-pressure, high-temperature vapor. The compressor also pumps refrigerant (and refrigerant oil) throughout the air conditioning system. For compressor overhaul procedures, refer to SECTION 1D.

Compressor Clutch

The compressor is belt-driven from the engine crankshaft via the A/C compressor clutch pulley. When the air conditioner is not operating the pulley turns freely. When the A/C is turned on the A/C compressor clutch engages the pulley, and the compressor begins pumping. The clutch is controlled by the A/C electrical circuit.

Condenser

The condenser assembly is mounted in front of the radiator and is comprised of small coils and cooling fins. When the high-pressure, high-temperature vapor, just discharged from the compressor, enters the condenser, heat is transferred from the refrigerant to passing ambient air through the condenser's cooling fins. By the time the refrigerant has traveled the length of the condenser's coils, most of the vapor has cooled and condensed into a liquid. Refrigerant passing through the condenser is transformed from a high-pressure, high-temperature vapor into a high-pressure, medium-temperature liquid.

Condenser Fan

The condenser fan is crucial to the proper operation of the A/C system. The fan ensures a sufficient amount of air flow across the condenser throughout the vehicle's operating spectrum. The fan should be checked during A/C diagnosis procedures. Special attention should be given to the fan whenever excessive high-side pressure is encountered. For condenser fan diagnosis, refer to SECTION 8A.

Expansion Valve

Figure 2

The expansion valve regulates the flow of liquid refrigerant into the core of the evaporator. As the condensed liquid refrigerant is released through the expansion valve, the refrigerant's pressure decreases considerably. As the pressure drops, the refrigerant's temperature also drops. Refrigerant passing through the expansion valve is transformed from a high-pressure, medium-temperature liquid into a low-pressure, low-temperature liquid (Figure 2).

Evaporator

The evaporator is housed in the evaporator case, located behind the right-hand side of the instrument panel. During air conditioning operation, ambient air is directed through the fins of the evaporator and into the vehicle's passenger compartment. Heat from the ambient air is transferred to the low-pressure, low-temperature liquid refrigerant passing through the evaporator.

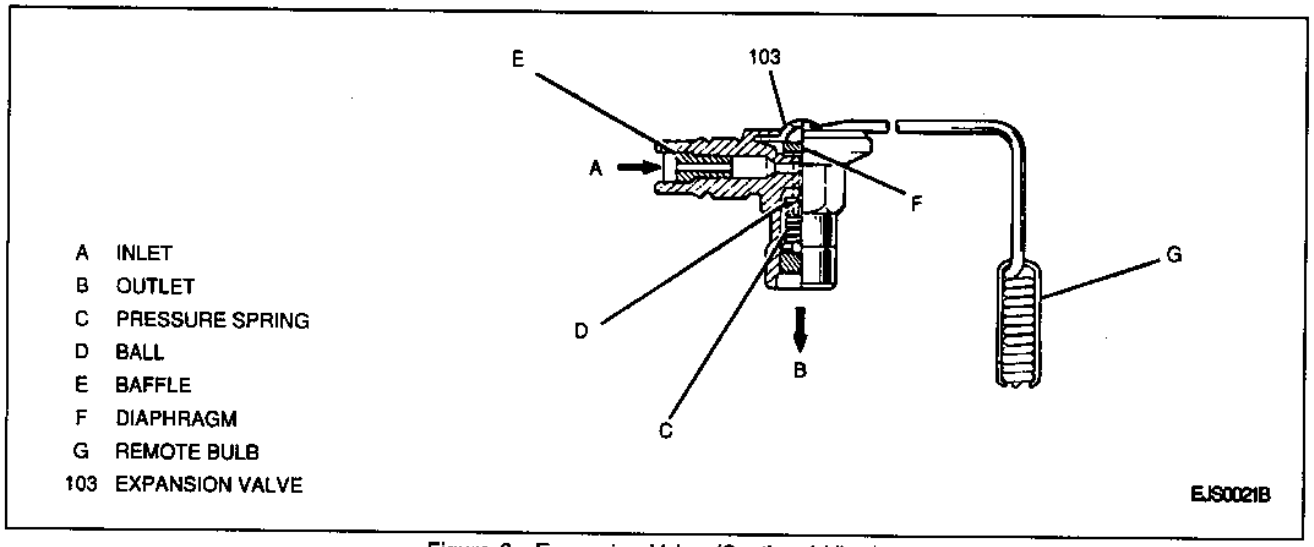


Figure 2—Expansion Valve (Sectional View)

Receiver/Dryer

Figure 3

The receiver/dryer is mounted to the right of the condenser and is connected to the condenser outlet pipe between the condenser and the evaporator. In order for the air conditioning system to operate properly, the receiver/dryer must perform three functions: first, the receiver/dryer serves as a temporary storage container for condensed liquid refrigerant. Second, the receiver/dryer acts as a filter which removes moisture and contaminants from the system. Third, the receiver/dryer incorporates a sight glass, through which the state of the system's refrigerant can be determined (Figure 3).

SWITCHES, RELAYS AND SENSORS

A/C Amplifier

The A/C amplifier controls the operations of the vacuum switching valve and the compressor clutch in response to signals received from the dual pressure switch, the A/C engine coolant temperature (ECT) switch, the evaporator thermistor and the engine control module (ECM). With the air conditioning system in operation, the A/C amplifier performs the following functions:

- Energizes the A/C compressor clutch in response to air conditioning system request and upon determination of favorable system conditions for air conditioning operation.
- Control of engine idle speed during compressor operation.
- De-energizes the A/C compressor clutch in response to a high refrigerant pressure signal (from the dual pressure switch), a low refrigerant pressure signal (from the dual pressure switch), a high engine coolant temperature signal (from the A/C ECT switch), a low evaporator temperature signal (from the evaporator thermistor), or a high engine demand signal (from the ECM).

A/C Control Switch

Figure 4

Located on the instrument panel within the heater control panel, the A/C control switch activates the A/C system and allows the vehicle's driver to operate and control air conditioner functions (Figure 4).

Condenser Fan Relay and Compressor Clutch Relay

These relays control the flow of electric current to the condenser fan motor and the compressor clutch.

Dual Pressure Switch

Figure 5

The dual pressure switch, located atop the receiver/dryer, acts to cycle the compressor on and off under conditions of abnormally low or abnormally high refrigerant pressure. If pressure drops below 193 kPa (28 psi) or rises above 3137 kPa (455 psi), the dual pressure switch opens and signals the A/C amplifier to shut down the compressor (Figure 5). Reasons for abnormally low refrigerant pressure are an insufficient refrigerant supply or very low refrigerant temperatures. Reasons for abnormally high refrigerant pressure include extremely high refrigerant temperatures or an overcharging of the system during service.

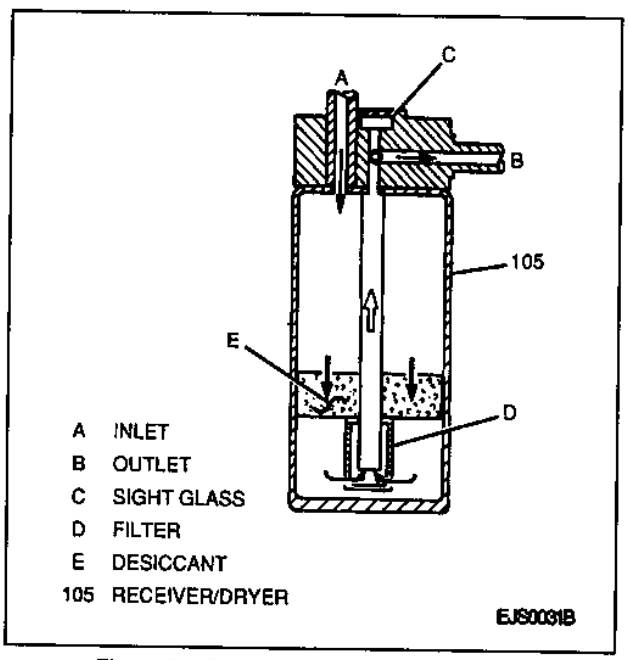


Figure 3—Receiver/Dryer (Sectional View)

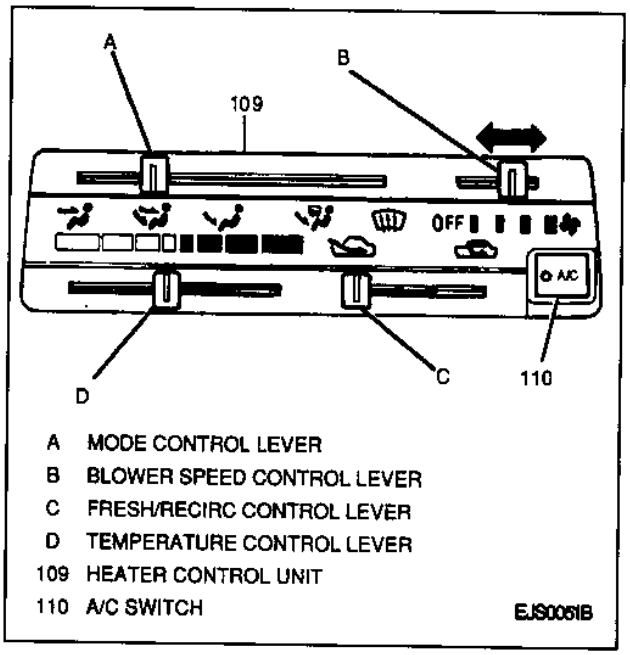


Figure 4—A/C Control Switch

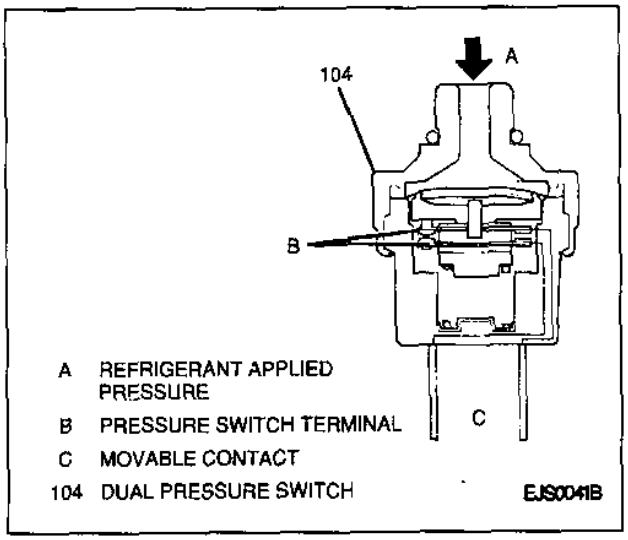


Figure 5—Dual Pressure Switch (Sectional View)

Evaporator Temperature Sensor (Thermistor)

The Evaporator Temperature Sensor is a thermistor which is a device that translates temperature into an electrical resistance. Thermistors are connected into electrical circuits to determine temperatures in critical areas. Thermistors are used in engine control systems as engine coolant temperature and intake manifold air temperature sensors. They are also widely used in air conditioning systems to determine temperatures at the evaporator core. If evaporator core temperatures drop to about 0° C (32° F), frost and ice will start to form on the evaporator fins. Ice formation on the evaporator fins seriously impedes the airflow through the evaporator and reduces the ability of the system to cool the vehicle's interior.

In order to prevent ice formation on the evaporator fins, this system incorporates an evaporator thermistor which is electrically connected to the A/C amplifier. When evaporator temperatures drop to 1° C (34° F), the A/C amplifier reads the corresponding thermistor resistance as a system cutout signal. When this signal is received, the A/C amplifier shuts down the compressor until evaporator core temperatures increase to 3° C (37° F).

DIAGNOSIS

GENERAL INFORMATION

Some conditions which are normal to proper air conditioning system operation may lead an owner to wrongly suspect a problem. Under conditions of high humidity, the air discharged from the air conditioning system may not feel as cold as expected. This is because the vaporized moisture in humid air heats more effectively than does dry air, making the humid air much harder to cool. In terms of overall comfort, however, the dryer dehumidified air coming from the air conditioning system in hot, humid weather will evaporate more moisture on a person's skin and provide more of a cooling effect than might be felt from cooler but more humid air. This fact should be explained to an owner if no mechanical cause can be found for a persistent complaint of insufficient cooling.

INSUFFICIENT COOLING CHECK

If outside air temperature is above 21° C (70° F), the following procedure can be used to quickly determine whether the air conditioning refrigeration system has the proper charge of R-134a. This check can be made in a few minutes, simplifying system diagnosis by localizing the problem of a low refrigerant charge or eliminating that possibility.

The engine must be at normal operating temperature and running at normal idle speed. The hood and all body doors must be open. The air conditioning controls must be set for outside air induction, high blower speed and the coldest temperature setting.

When the compressor is operating, the technician should use a hand to feel the temperature of the evaporator inlet and outlet pipes. The evaporator inlet pipes should feel hot to the touch; the evaporator outlet pipe should feel cold. If the evaporator inlet pipe is cooler than the outlet pipe, or if the inlet pipe has a coating of frost, a low refrigerant charge is indicated. The technician should add 0.11 kg (0.250 lbs.) of R-134a and allow the system to stabilize. Refer to "Handling Refrigerant-134a" later in this section. This should be repeated as necessary until the evaporator pipes are the correct temperature. Once this has been determined, another 0.40 kg (0.888 lbs.) of R-134a should be added to the refrigeration system.

REFRIGERATION SYSTEM CHECKS

Figures 6 through 11

If a malfunction in the refrigerant system is suspected, check the following items:

1. Check the outer surfaces of the radiator and condenser cores to be sure that the air flow is not blocked by dirt, leaves or other foreign material. Be sure to also check the area between the condenser and the radiator.
2. Check for restrictions or kinks in the condenser core, hoses, tubes, and fins.
3. Check for proper blower motor operation. Refer to SECTION 8A.
4. Check the entire system for refrigerant leaks.
5. Check all air distribution ducts for leaks or restrictions. A low air flow rate may also be caused by a blocked evaporator core.
6. Check the compressor clutch for slippage.
7. Check that the compressor drive belt is properly tensioned.
8. Check the expansion valve for blockage.
9. Check the sight glass in the receiver/dryer for bubbles (which would indicate a low refrigerant charge or moisture in the refrigerant) (Figure 11).

For further air conditioning system diagnosis, refer to Figures 6 through 11 and to SECTION 8A.

INSUFFICIENT COOLING "CHART A"

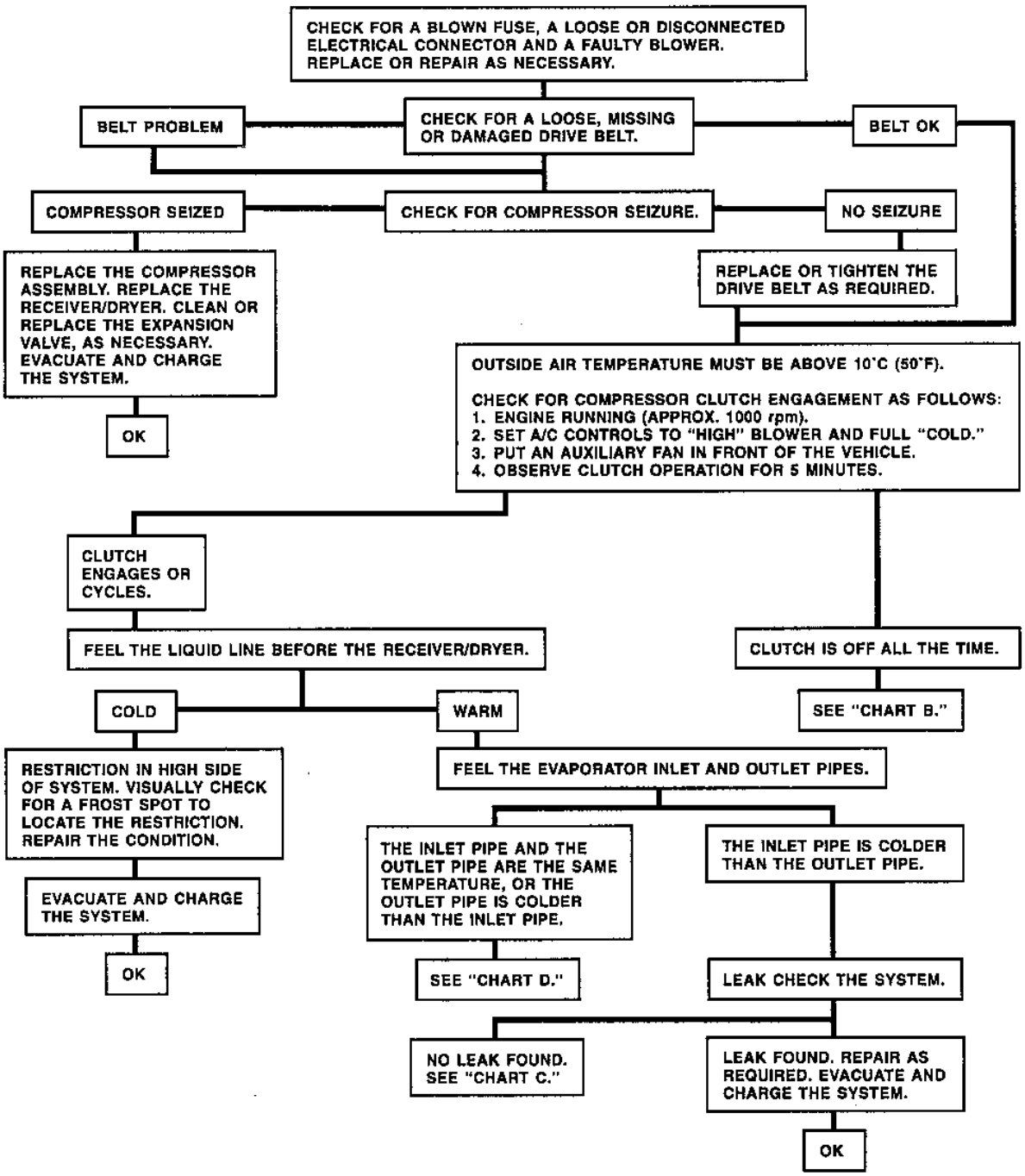


Figure 6—Insufficient Cooling Diagnostic Chart (1 of 4)

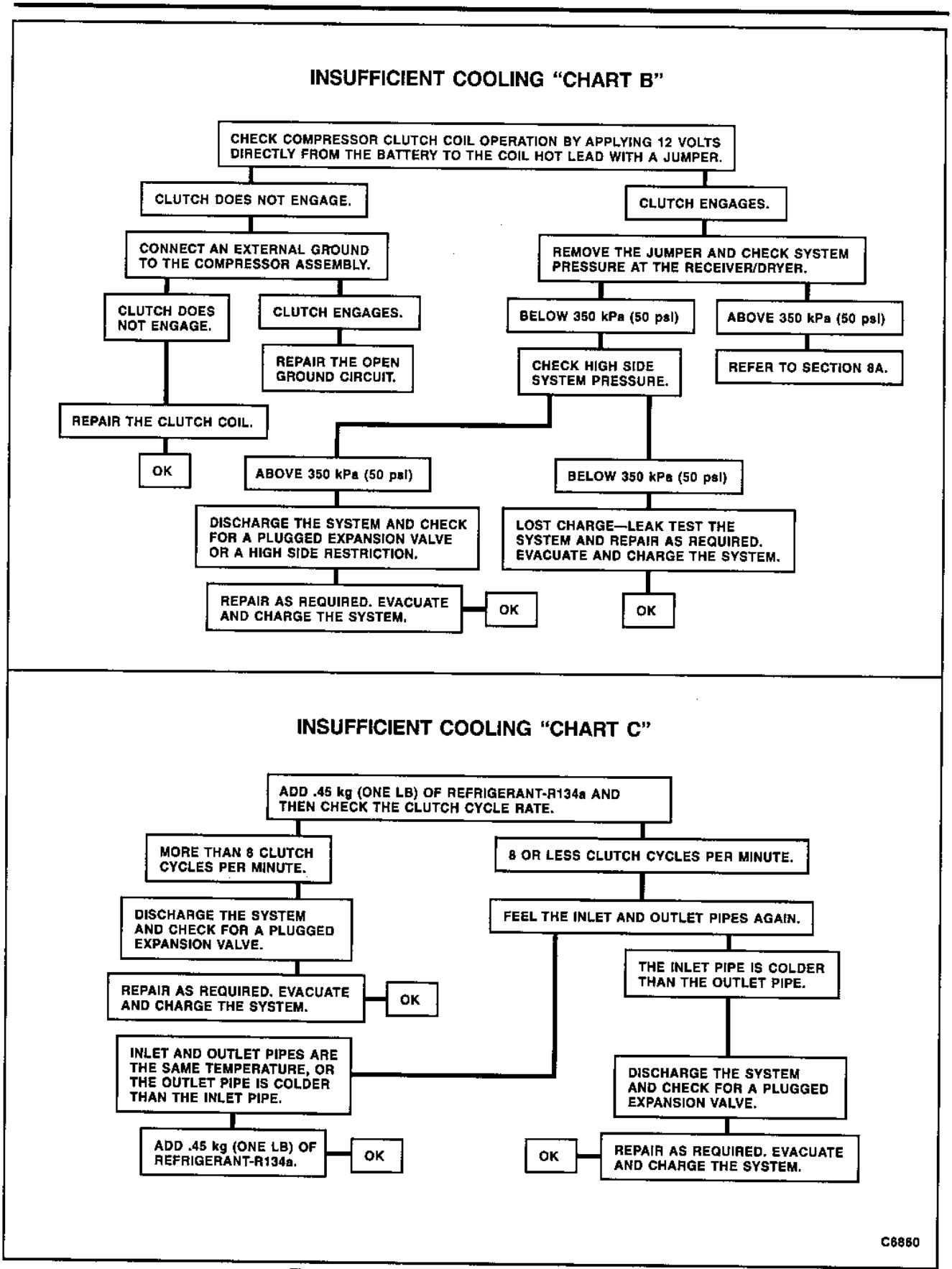


Figure 7—Insufficient Cooling Diagnostic Chart (2 of 4)

INSUFFICIENT COOLING "CHART D"

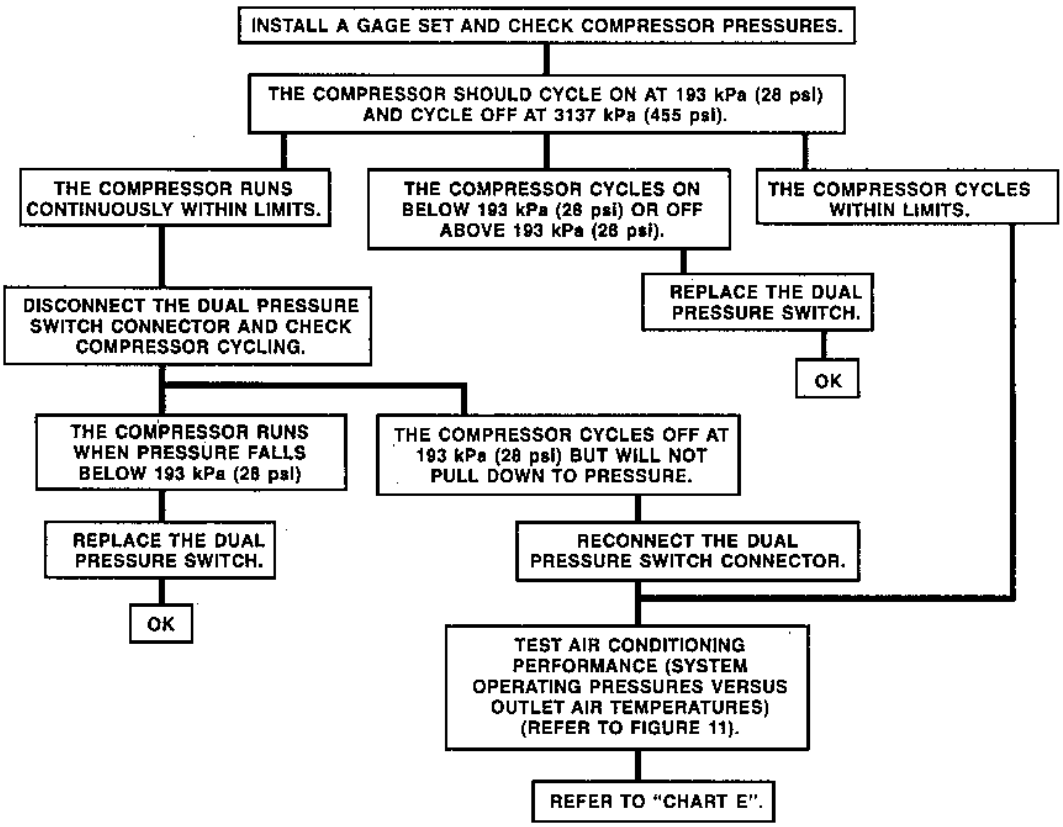


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Figure 8—Insufficient Cooling Diagnostic Chart (3 of 4)

INSUFFICIENT COOLING "CHART E"

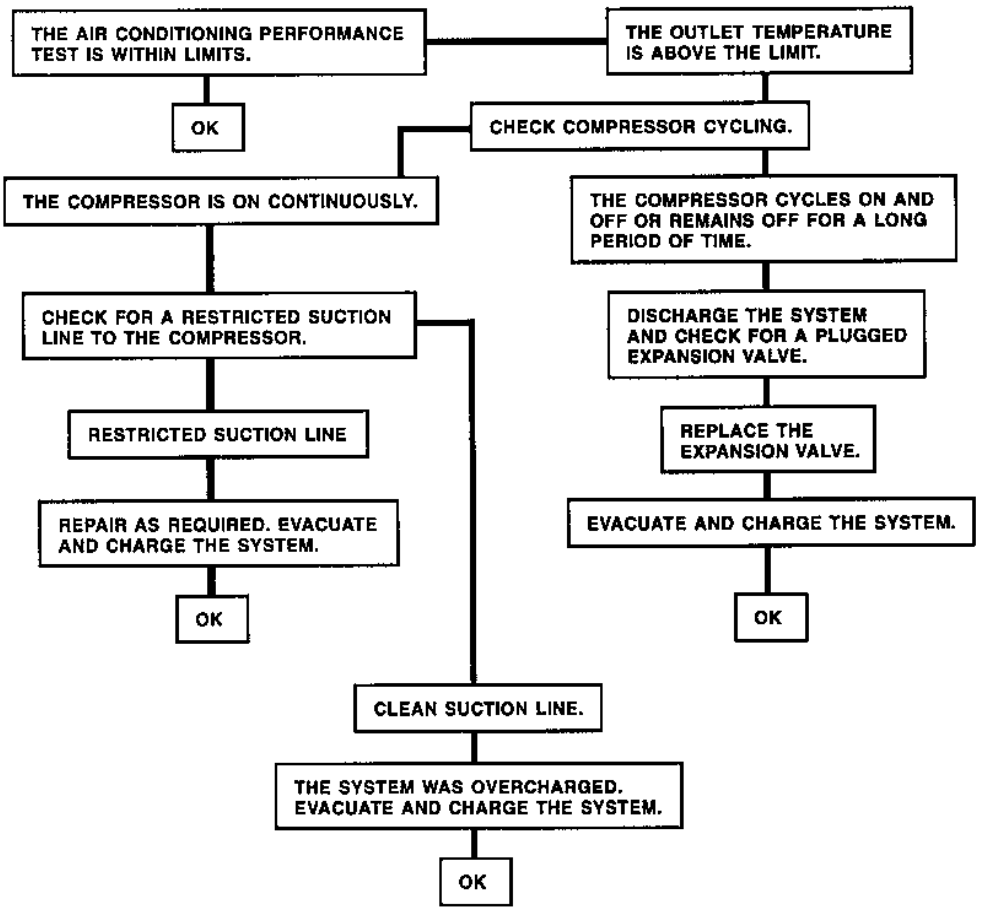

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Figure 9—Insufficient Cooling Diagnostic Chart (4 of 4)

RELATIVE HUMIDITY	AMBIENT AIR TEMP		MAXIMUM LOW SIDE PRESSURE		ENGINE SPEED	MAXIMUM RIGHT CENTER AIR OUTLET TEMP		MAXIMUM HIGH SIDE PRESSURE	
(%)	°F	°C	PSIG	kPaG	(rpm)	°F	°C	PSIG	kPaG
20	70	21	32	221	2000	43	6	175	1207
	80	27	32	221		44	7	225	1551
	90	32	32	221		50	10	275	1896
	100	38	33	228		51	11	275	1896
30	70	21	32	221	2000	45	7	190	1310
	80	27	32	221		47	8	235	1620
	90	32	34	234		54	12	290	2000
	100	38	38	262		57	14	310	2137
40	70	21	32	221	2000	46	8	210	1448
	80	27	32	221		50	10	255	1758
	90	32	37	255		57	14	305	2103
	100	38	44	303		63	17	345	2379
50	70	21	32	221	2000	48	9	225	1551
	80	27	34	234		53	12	270	1862
	90	32	41	283		60	16	325	2241
	100	38	49	338		69	21	380	2620
60	70	21	32	221	2000	50	10	240	1655
	80	27	37	255		56	13	290	2000
	90	32	44	303		63	17	340	2344
	100	38	55	379		75	24	395	2724
70	70	21	32	221	2000	52	11	255	1758
	80	27	40	276		59	15	305	2103
	90	32	48	331		67	19	355	2448
80	70	21	36	248	2000	53	12	270	1862
	80	27	43	296		62	17	320	2206
	90	32	52	356		70	21	370	2551
90	70	21	40	276	2000	55	13	285	1965
	80	27	47	324		65	18	335	2310

C6863

Figure 10—Performance Test

LEAK TESTING

CAUTION: Avoid breathing A/C Refrigerant-134a and lubricant vapor or mist. Exposure may irritate eyes, nose and throat. To remove R-134a from the A/C system, use service equipment certified to meet the requirements of SAE J2210 (R-134a recycling equipment). If accidental system discharge occurs, ventilate work area before resuming service. Additional health and safety information may be obtained from refrigerant and lubricant manufacturers.

Test for leaks whenever a refrigerant leak is suspected and when performing a service operation which disturbs pipes or connections.

Fluorescent Leak Detection

A fluorescent leak detection additive can be added to the air conditioning system refrigerant. With the engine running and the air conditioning system engaged, the technician can scan A/C system components and pipes with an ultraviolet lamp for refrigerant leaks. Any leak, even the smallest pin hole, will be easy to spot as it will show up as a bright yellowish-green spot under the ultraviolet light.

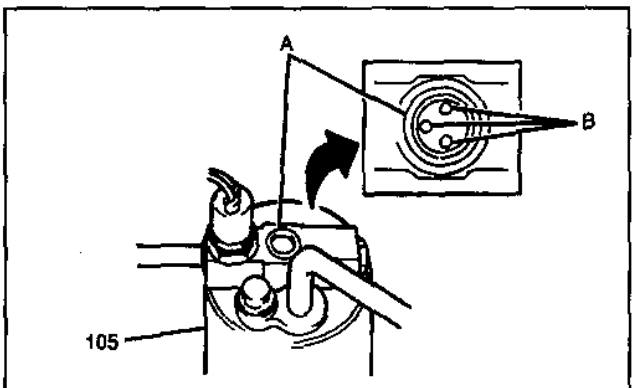


Figure 11—Receiver/Dryer Sight Glass

Electronic (Halogen) Leak Detector

Figures 12 and 13

Tools Required:
J 39400 Leak Detector

This type of leak detector has been found to be the most useful tool in locating refrigerant leaks. The J 39400 is small unit which operates on 12V DC current and provides an audible signal which increases in frequency as R-134a is detected (Figure 12). There are three leak size settings: one for R-12, one for R134a, and one for gross. The gross leak setting is for isolating very large leaks already found in one of the other two settings. The instrument must be properly calibrated according to the manufacturer's instructions. The detector must be used in the proper setting for the type of refrigerant being tested.

The most common leaks are found at the refrigerant fittings or connections. This may be caused by improper torque, damaged O-rings, lack of lubricant on the O-rings, or debris across the O-ring. Even the smallest piece of lint from cotton gloves or shop cloths can create a leak path across an O-ring.

The successful use of this or any other electronic leak detector depends greatly upon the scan rate and upon carefully following the manufacturer's instructions regarding calibration, operation and maintenance. Each joint must be completely circled moving at 25 to 51 mm (1 to 2 inches) per second with the tip of the detector probe as close to the joint as possible (the detector must not be farther than 6.1 mm [0.25-inch] away from the joint) without blocking the probe's air intake. A leak is indicated when the audible tone goes from a steady 1 to 2 clicks per second to a solid alarm. The balance knob should be adjusted frequently to maintain the 1 to 2 clicks per second rate.

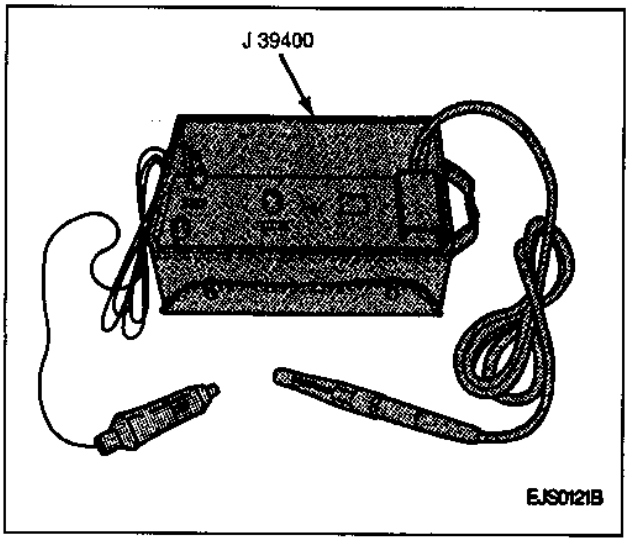


Figure 12—J 39400 Leak Detector

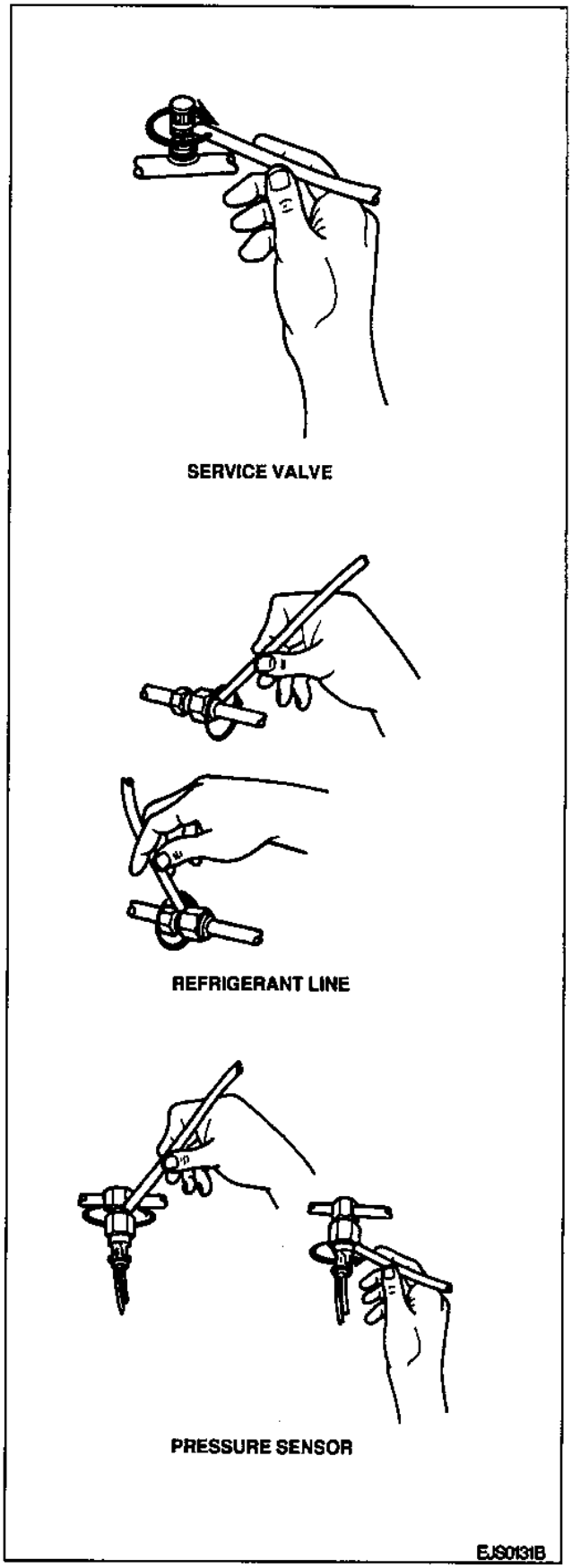


Figure 13—A/C Leak Scan Method (Typical)

Important

- Halogen leak detectors are sensitive to windshield washer solvent, many other solvents, cleaners and some adhesives. Care should be taken to prevent a false warning by making sure all surfaces are clean. Also, surfaces should be dry since ingestion of liquids will damage the detector. To assure no gases are present that may cause a false warning, blow out engine compartment with air hose prior to test.

  The dual pressure switch, pipe/hose connections, and the inlet and outlet pipes/hoses for all A/C components can easily be tested using this method (Figure 13).

Important

- Always follow the refrigerant system around in a continuous path so that no leaks are missed. Always test all the above areas to assure the entire system is leak free, even when one leak is already found.

CAUTION: Care must be taken to prevent personal injury which could occur due to touching a hot engine when testing. Tests should be done with the engine off and as cool as possible. Do not operate the detector in a combustible atmosphere since its sensor operates at high temperatures.

Service Ports/Access Valves

The primary seal for the service ports is the sealing cap. This cap contains a specially designed O-ring or gasket which provides a leak free seal. Should the cap become loose, missing or the wrong cap is used, it will result in the loss of refrigerant charge. Make sure the cap has a rubber seal.

Evaporator Core

One of the most difficult leaks to find is in the evaporator core because the core is encapsulated into a closed module and due to its inaccessibility to leak detector devices. To leak test the core:

1. Turn the blower fan on to high for 15 or more seconds then shut off.
2. Wait 10 minutes.
3. Remove blower motor case. Refer to SECTION 1A.
4. Insert leak detector probe into blower motor case opening. If the detector goes to a solid alarm, a leak has been found.

Compressor

1. Blow shop air behind and in front of the compressor clutch/pulley for at least 15 seconds.
2. Probe the compressor area. If the detector goes to a solid alarm, a leak has been found.

ELECTRICAL SYSTEM DIAGNOSIS

To diagnose problems in the air conditioning system's electrical circuitry, refer to SECTION 8A.

BLOWER NOISE

A constant air rush is typical of high-speed blower operation. Some systems and modes may be worse than others. If possible, check another similar vehicle to determine whether the noise is typical or excessive. For diagnosis of excessive blower noise, refer to SECTION 1A.

ON-VEHICLE SERVICE

NOTICE: It is essential to tighten all tubing connections to the specified torque for the type and size of tube fitting. When tightening steel-to-aluminum connections, the torque specified for aluminum tubing must be used. Insufficient or excessive torque when tightening can result in loose joints or deformed joint parts. Either condition can result in refrigeration leakage and an inoperative air conditioning system. Refer to "Specifications" later in this section.

REFRIGERATION SYSTEM SERVICES

Important

- Before attempting any service which requires opening of refrigerant pipes, hoses or components, the person performing the work should be thoroughly familiar with the information under "Handling Refrigerant-134a," "Handling Refrigerant Pipes/Hoses and Fittings" and "Maintaining Chemical Stability." Very carefully follow the instructions in the "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" for the unit being serviced.

Handling Refrigerant-134a

CAUTION: Avoid breathing A/C Refrigerant-134a and lubricant vapor or mist. Exposure may irritate eyes, nose and throat. To remove R-134a from the A/C system, use service equipment certified to meet the requirements of SAE J2210 (R-134a recycling equipment). If accidental system discharge occurs, ventilate work area before resuming service. Additional health and safety information may be obtained from refrigerant and lubricant manufacturers.

CAUTION: Do not intentionally drop, puncture or incinerate refrigerant containers.

CAUTION: Refrigerant will displace oxygen, therefore be certain to work in well ventilated areas to prevent suffocation.

CAUTION: If it is necessary to carry a container of "DOT CFR" Refrigerant-134a in a vehicle, it should not be carried in the passenger compartment.

NOTICE: R-12 refrigerant and R-134a refrigerant must never be mixed, even in the smallest of amounts, as they are incompatible with each other. If the refrigerants are mixed, compressor failure is likely to occur.

NOTICE: Use only specified lubricant (PAG) for the R-134a A/C system and R-134a components. If lubricants other than those specified are used, compressor failure is likely to occur.

NOTICE: Do not store or heat refrigerant containers above 52° C (125° F).

NOTICE: Do not heat a refrigerant container with an open flame: if container warming is required, place the bottom of the container in a pail of warm water.

NOTICE: Do not introduce compressed air to any refrigerant container or refrigerant components, because contamination will occur.

Important

- All Refrigerant-134a disposable (colored blue) containers are shipped with a heavy metal screw cap to protect the valve and safety plug of the container from damage. It is good practice to replace the cap after each use to continue protection.

Maintaining Chemical Stability

The life and efficient operation of the air conditioning system is dependent upon the chemical stability of the refrigeration system. When foreign materials, such as dirt or moisture, contaminate the refrigeration system, they change the stability of the Refrigerant-134a and polyalkaline glycol (PAG) refrigerant oil. They will also affect the pressure/temperature relationship and reduce efficiency, and could cause interior corrosion and abnormal wear of moving parts.

The following general practices should be followed to ensure chemical stability in the system:

1. Whenever it becomes necessary to disconnect a hose connection, wipe away any dirt or oil at and near the connection to eliminate the possibility of dirt entering the system. Both sides of the connection should be capped, plugged or taped as soon as possible to prevent the entrance of dirt and moisture. (It must be remembered that all air contains moisture. Air that enters any part of the refrigeration system will carry moisture with it and the exposed surfaces will collect the moisture quickly.)
2. Keep tools clean and dry. This includes the manifold gage set and all replacement parts.
3. When adding polyalkaline glycol (PAG) refrigerant oil, the container/transfer tube through which the oil will flow should be exceptionally clean and dry due to the fact that the refrigerant oil should be as moisture-free as possible.
4. When it is necessary to "open" an air conditioning system, have everything needed ready so that as little time as possible will be required to perform the operation. Do not leave the air conditioning system open any longer than necessary.
5. Any time the air conditioning system has been "opened," it should be properly evacuated before recharging.

Handling of Refrigerant Pipes/Hoses and Fittings

Important

- When opening the refrigeration system, the work area should be well ventilated. Welding or steam cleaning operations should not be done on or near refrigeration system pipes/hoses or other air conditioning parts on the vehicle.
- All metal tubing pipes should be free of dents or kinks to prevent loss of system capacity due to pipe restriction.
- The flexible hoses should never be bent to a radius of less than four times the diameter of the hose.
- The flexible hoses should never be allowed to come within a distance of 64 mm (2.5-inches) of the exhaust manifold.
- Flexible hoses should be inspected regularly for leaks or brittleness and replaced with new hoses if deterioration or leaking is found.
- When disconnecting any fitting in the refrigerant system, the system must be discharged of all Refrigerant-134a. However, proceed very cautiously, regardless of the gage readings. Open very slowly, keeping your face and hands away so that no injury can occur. If pressure is noticed when a fitting is loosened, allow it to bleed off very slowly.

NOTICE: Alcohol should never be used in the refrigeration system in an attempt to remove moisture. Damage to system components could occur.

- If any refrigerant pipe/hose is opened to the atmosphere, it should be immediately capped to prevent the entrance of moisture and dirt. This can cause internal compressor wear or plugged pipes in the condenser and evaporator core and expansion valve.
- Sealing caps should be removed from subassemblies just before making connections for final assembly. A small amount of clean polyalkaline glycol (PAG) refrigerant oil should be used on all tube and hose joints. The oil will aid in assembly and help to provide a leakproof joint. O-rings and seats must be in perfect condition because a burr or a piece of dirt can cause a refrigerant leak.
- The use of the proper wrenches when making connections on O-ring fittings is important. The use of improper wrenches may damage the connection. The opposing fitting should always be backed up with a wrench to prevent distortion of connection pipes/hoses or components. When connecting the flexible hose connections, it is important that the swaged fitting and the flare nut, as well as the coupling to which it is attached, be held at the same time using three different wrenches to prevent turning the fitting and damaging the seat.

Tighten all connections to the specified torque. Refer to "Specifications" later in this section.

O-Ring Replacement

Install new GM-approved service replacement air conditioning O-rings when a joint or a fitting is installed, except when the O-rings are provided on new replacement components. Unless service replacement O-rings of the specified part numbers are used, excessive leakage of R-134a may occur. Refer to the part number for identification.

Air conditioning O-rings should be coated with polyalkaline glycol (PAG) refrigerant oil just prior to installation and should be slipped onto the flange pipe to assure proper locating and sealing. To prevent the possibility of swelling and a reduction in sealing effectiveness, O-rings should not be soaked in PAG refrigerant oil. Before installation, O-rings and the fittings should be examined to ensure that they have not been nicked or deformed. Nicked or deformed parts must be replaced to prevent refrigerant leakage.

Important

- Keep PAG refrigerant oil off fitting threads. Long term contact of oil on threads may cause future disassembly difficulties.

REFRIGERANT RECOVERY AND RECYCLING, ADDING OIL, EVACUATING AND RECHARGING PROCEDURES

The Air Conditioning Refrigerant Recovery, Recycling and Recharging (ACR4) System (J 39500) removes Refrigerant-134a from the vehicle A/C system, recycles and recharges all with one hook-up.

Single pass filtering during recovery cycle, plus automatic multiple pass filtering during the evacuation cycle assures constant supply of clean/dry refrigerant for A/C system charging.

NOTICE: R-12 and R-134a require separate and non-interchangeable sets of recovery, recycling and recharging equipment because the refrigerants and lubricants are not compatible and cannot be mixed even in the smallest amounts.

NOTICE: Do not attempt to use one set of equipment for both R-12 and R-134a. All equipment will contain residue amounts of refrigerant and/or lubricant, which will result in contamination and damage to the recovery/recycling equipment.

NOTICE: Refrigerant-134a systems have special fittings (per SAE specifications) to avoid cross-contamination with Refrigerant-12 systems. Do not attempt to adapt this unit to Refrigerant-12 systems. Severe system failure will result.

On-Vehicle Setup

Figure 14

CAUTION: Always wear goggles and gloves when doing work that involves opening the refrigeration system. If liquid refrigerant comes into contact with the skin or eyes, injury may result.

1. Connect the high side (red) and low side (blue) hoses to their respective ports on the vehicle (Figure 14).
2. Refer to the ACR4 instruction manual for all initial setup procedures and operating instructions.

COMPRESSOR DRIVE BELT INSPECTION AND ADJUSTMENT

Figures 15 and 16

Routine inspection of the compressor drive belt may reveal small cracks in the belt ribs. The technician must decide whether or not these cracks are serious enough to impair belt performance, thus requiring belt replacement. If any sections of the belt are missing, the belt should be replaced immediately.

Inspect

1. Belt for proper alignment on the compressor and the crankshaft drive pulley (Figure 15).
2. Compressor mounting brackets for cracks or structural fatigue.
3. Compressor drive belt tension using thumb pressure and adjust to specification, if necessary (Figure 16).
4. Adjust belt tension by loosening the compressor mounting bolts and repositioning compressor along the upper mounting bracket axis.

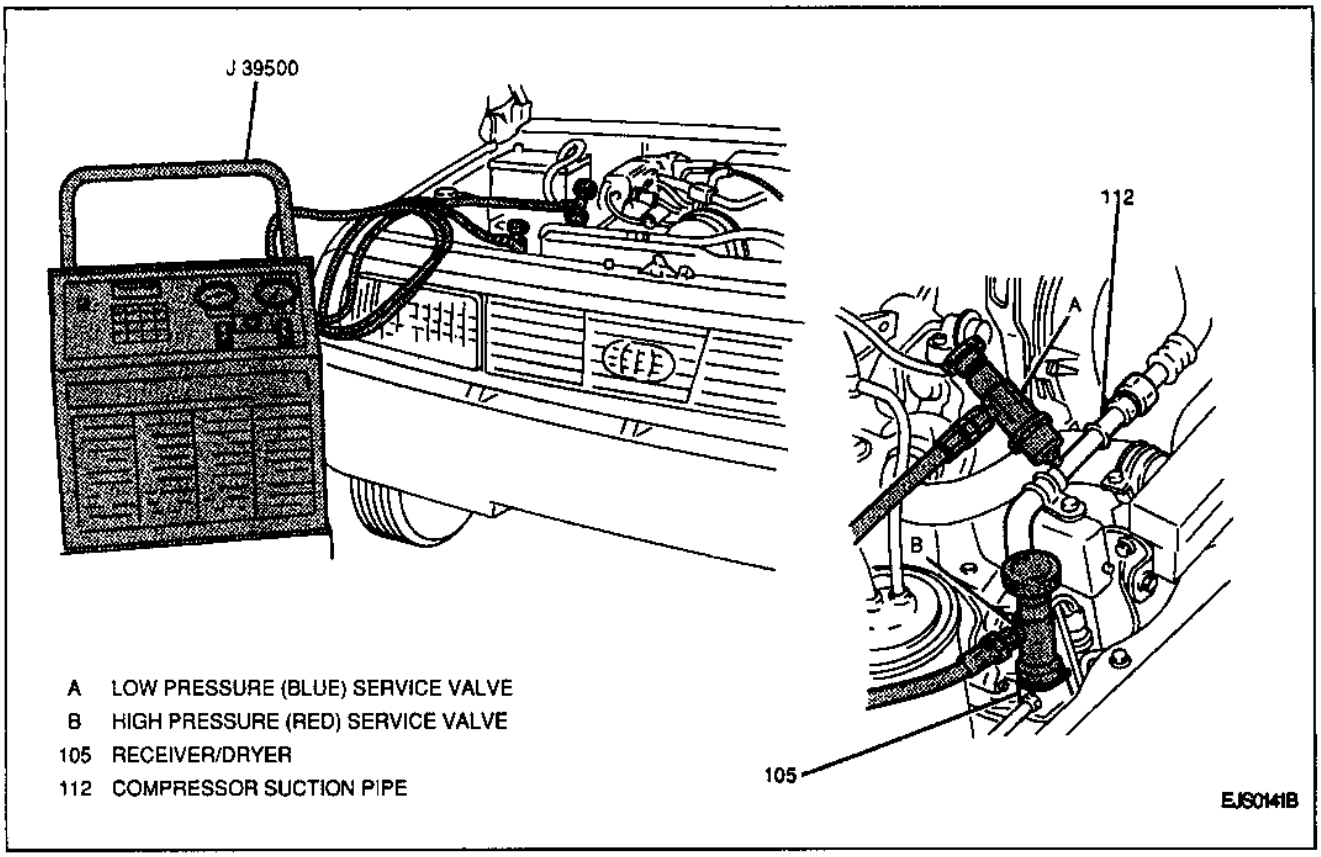


Figure 14—ACR4 Setup

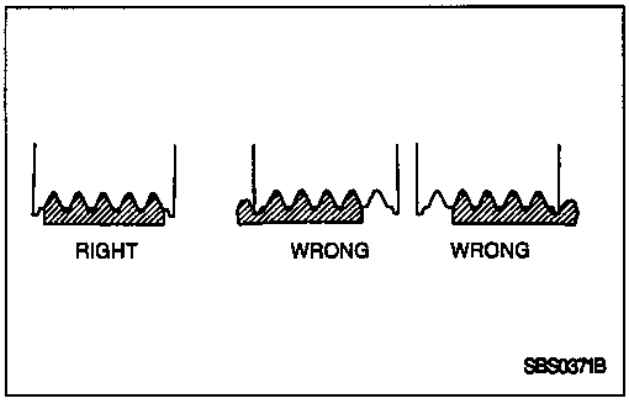


Figure 15—Compressor Drive Belt Alignment

Tighten

- Compressor mounting bolts to 18 to 28 N·m (13 to 20 lbs. ft.).

REPLACEMENT PROCEDURES

A/C Amplifier

Remove or Disconnect

1. Negative (-) battery cable.
2. Pull out instrument panel compartment while pushing its stopper from both left and right sides.

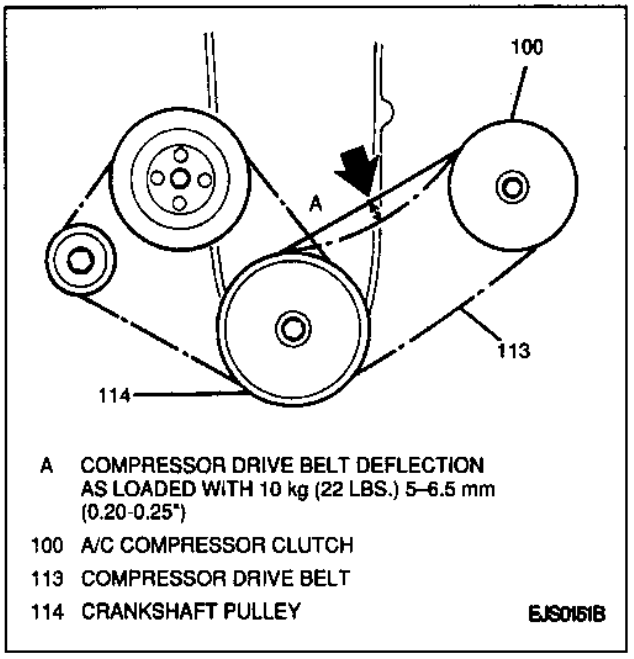


Figure 16—Compressor Drive Belt Tension

3. A/C amplifier electrical connector.
4. A/C amplifier from evaporator case. Slide amplifier up and out of mounting slots.

Install or Connect

1. A/C amplifier to evaporator case. Slide down into mounting slots.
2. A/C amplifier electrical connector.
3. Close instrument panel compartment.
4. Negative (-) battery cable.

Tighten

- Negative (-) battery cable-to-negative (-) battery terminal retainer to 15 N.m (11 lbs. ft.).

A/C Switch

Figures 17 and 18

Remove or Disconnect

1. Negative (-) battery cable.
2. Four control knobs from heater control unit.
3. Pull heater control unit face plate from instrument panel (Figure 17).
4. Heater control unit illumination lamp socket from face plate (Figure 18).
5. Pull out instrument panel compartment while pushing its stopper from both left and right sides.
6. A/C switch electrical connector.
7. A/C switch from heater control unit face plate.

Install or Connect

1. A/C switch to heater control unit face plate.
2. A/C switch electrical connector.
3. Close instrument panel compartment.
4. Illumination lamp bulb socket to heater control unit face plate.
5. Press heater control unit face plate into position on instrument panel.
6. Heater control unit control knobs.
7. Negative (-) battery cable.

Tighten

- Negative (-) battery cable-to-negative (-) battery terminal retainer to 15 N.m (11 lbs. ft).

Air Ducts and Deflector Outlets

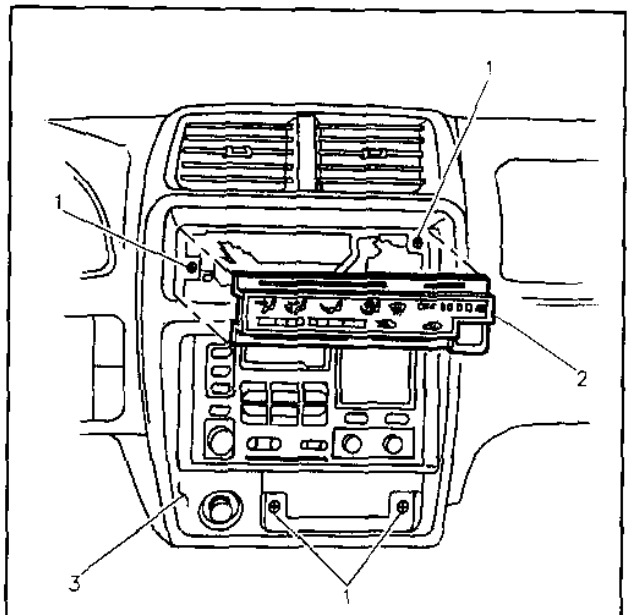
Service procedures for the air ducts and deflector outlets can be found in SECTION 1A.

Compressor

Figure 19

Remove or Disconnect

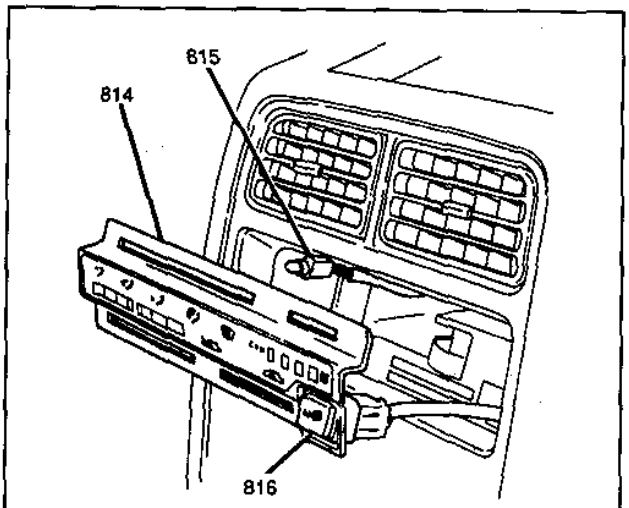
1. Discharge and recover refrigerant. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" earlier in this section.



1 CENTER TRIM BEZEL SCREWS
2 HEATER CONTROL UNIT FACE
3 CENTER TRIM BEZEL

EJT0129A

Figure 17—Heater Control Unit Face Plate Removal

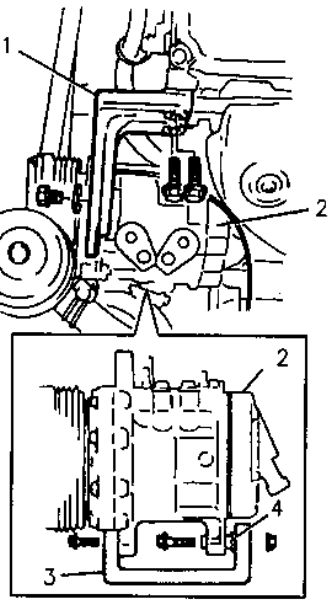


814 HEATER CONTROL GARNISH
815 HEATER CONTROL ILLUMINATION LAMP
816 A/C SWITCH

EJS0048C

Figure 18—Heater Control Unit Illumination Lamp and A/C Switch

2. Negative (-) battery cable.
3. Evaporator-to-compressor (compressor inlet) pipe at compressor fitting (one bolt).
4. Compressor-to-condenser (compressor outlet) pipe at compressor fitting (one bolt). Plug openings to keep out dirt and moisture.



1 UPPER MOUNTING BRACKET
2 COMPRESSOR
3 LOWER MOUNTING BRACKET
4 BUSHING

EJS0821B

Figure 19—Compressor Mounting

5. A/C compressor clutch electrical connector; disengage from clamp.
6. One upper bracket-to-compressor mounting bolt (Figure 19).
7. Two lower bracket-to-compressor mounting bolts, while disengaging compressor drive belt from A/C compressor clutch pulley (Figure 19).
8. Compressor from vehicle.

Install or Connect

1. Compressor to vehicle; secure with two lower bracket-to-compressor mounting bolts. Do not tighten fully.
2. Compressor drive belt to A/C compressor clutch pulley.
3. Upper bracket-to-compressor mounting bolt.
4. A/C compressor clutch electrical connector. Secure wiring harness with clamp.

Adjust

- Compressor drive belt tension. Refer to "Compressor Drive Belt Inspection and Adjustment" earlier in this section.

Tighten

- Upper and lower bracket-to-compressor mounting bolts to 18 to 28 N.m (13 to 20 lbs. ft.).

5. Compressor-to-condenser (compressor outlet) pipe at compressor fitting; secure with one bolt.
6. Evaporator-to-compressor (compressor inlet) pipe at compressor fitting; secure with one bolt.

Important

- Install new O-rings to compressor fittings. Coat new O-rings with clean refrigerant oil.

Tighten

- Compressor pipe fitting bolts to 25 N.m (18 lbs. ft.).

7. Negative (-) battery cable.

Tighten

- Negative (-) battery cable-to-negative (-) battery terminal retainer to 15 N.m (11 lbs. ft.).

8. Evacuate and charge A/C system. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" earlier in this section.
9. Operate A/C system and check for refrigerant leaks. Refer to "Leak Testing" earlier in this section.

Compressor Clutch

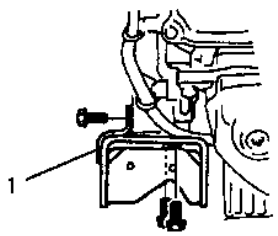
For procedures for removal of the compressor clutch and compressor unit repair, refer to SECTION 1D.

Compressor Lower Mounting Bracket

Figures 20 and 21

Remove or Disconnect

1. Compressor from mounting brackets. Refer to "Compressor" earlier in this section.
2. Three compressor lower mounting bracket bolts and bracket from vehicle (Figures 20 or 21).



1 LOWER MOUNTING BRACKET (W/O P/S)

EJS0801B

Figure 20—Compressor Lower Mounting Bracket (without Power Steering)

Install or Connect

1. Compressor lower mounting bracket to vehicle; secure with three bolts.

Tighten

- Compressor lower mounting bracket bolts (with power steering) to 18 to 25 N.m (13 to 20 lbs. ft.).
- Compressor lower mounting bracket side bolts (without power steering) to 40 to 60 N.m (29 to 43 lbs. ft.).

2. Compressor to mounting brackets. Refer to "Compressor" earlier in this section.

Compressor Upper Mounting Bracket

Figure 19

Remove or Disconnect

1. Negative (-) battery cable.
2. Three compressor upper mounting bracket bolts and bracket from vehicle (Figures 19).

Install or Connect

1. Compressor upper mounting bracket; secure with three bolts.

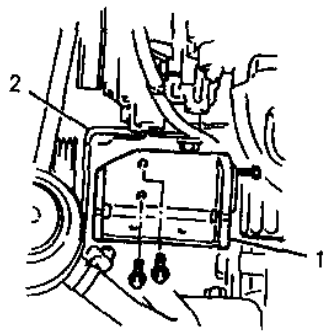
Adjust

- Compressor drive belt tension. Refer to "Compressor Drive Belt Inspection and Adjustment" earlier in this section.

Tighten

- Compressor upper bracket-to-engine bolts to 40 to 60 N.m (29 to 43 lbs. ft.).
- Compressor upper bracket-to-compressor bolt to 18 to 28 N.m (13 to 20 lbs. ft.).

2. Negative (-) battery cable.



1 LOWER MOUNTING BRACKET
2 POWER STEERING BRACKET
EJS0811B

Figure 21—Compressor Lower Mounting Bracket (with Power Steering)

Tighten

- Negative (-) battery cable-to-negative (-) battery terminal retainer to 15 N.m (11 lbs. ft.).

Condenser

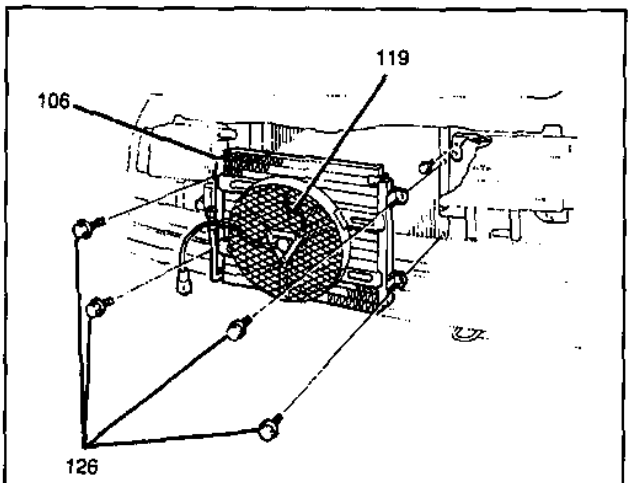
Figure 22

Remove or Disconnect

1. Discharge and recover refrigerant. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" earlier in this section.
2. Negative (-) battery cable.
3. Front grille and grille net. Refer to SECTION 10-5.
4. Horn electrical connector.
5. Horn from vehicle (one bolt).
6. Radiator core center brace (four bolts).
7. Front end upper panel from radiator core support (six upper bolts, four lower bolts).
8. Condenser-to-receiver/dryer (condenser outlet) pipe from pipe fitting in front of radiator (one nut).
9. Compressor-to-condenser (condenser inlet) pipe from condenser fitting (one bolt).
10. Condenser fan electrical connector.
11. Four condenser mounting bolts (Figure 22).
12. Condenser and fan from vehicle.
13. Condenser fan from condenser (four bolts).

Inspect

- Condenser fins for blockage and damage.
- Condenser fittings for leaks.



106 CONDENSER
119 CONDENSER FAN
126 CONDENSER MOUNTING BOLTS
EJS0171B

Figure 22—Condenser and Fan

Install or Connect

1. Condenser fan to condenser; secure with four mounting bolts.

Tighten

- Condenser fan mounting bolts to 15 N.m (11 lbs. ft.).

2. Condenser and fan to vehicle; secure with four mounting bolts.

Tighten

- Condenser mounting bolts to 20 N.m (15 lbs. ft.).

3. Compressor-to-condenser (condenser inlet) pipe to condenser fitting; secure with one bolt.
4. Condenser-to-receiver-dryer (condenser outlet) pipe to fitting in front of radiator.

Tighten

- Compressor-to-condenser (condenser inlet) pipe fitting bolt to 25 N.m (18 lbs. ft.).
- Condenser-to-receiver/dryer (condenser outlet) pipe fitting nut to 35 N.m (26 lbs. ft.).

5. Condenser fan electrical connector.
6. Front end upper panel to radiator core support; secure with six upper bolts, four lower bolts.

Tighten

- Front end upper panel bolts to 20 N.m (15 lbs. ft.).

7. Radiator core center brace; secure with four bolts.

Tighten

- Radiator core center brace bolts to 20 N.m (15 lbs. ft.).

8. Horn to vehicle; secure with one bolt.

Tighten

- Horn bolt to 15 N.m (11 lbs. ft.).

9. Horn electrical connector.
10. Front grille and grille net. Refer to SECTION 10-5.
11. Negative (-) battery cable.

Tighten

- Negative (-) battery cable-to-negative (-) battery terminal retainer to 15 N.m (11 lbs. ft.).

12. Evacuate and charge A/C system. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" earlier in this section.
13. Operate A/C system and check for refrigerant leaks. Refer to "Leak Testing" earlier in this section.

Important

- If condenser was replaced, 20 to 30 mL (0.7 to 1.0 oz.) of refrigerant oil must be added to compressor suction-side.

Condenser Fan Relay and Compressor Clutch Relay

The following procedures apply to both the compressor clutch relay and the condenser fan relay. They are located between the battery and the fuse box in the engine compartment.

Remove or Disconnect

1. Negative (-) battery cable.
2. Pull relay(s) from mounting bracket.
3. Electrical connector from relay(s).

Install or Connect

1. Relay electrical connector(s).
2. Relay(s) into mounting bracket.
3. Negative (-) battery cable.

Tighten

- Negative (-) battery cable-to-negative (-) battery terminal retainer to 15 N.m (11 lbs. ft.).

Dual Pressure Switch

Inspect

Tool Required:
J 39200 Digital Multimeter

- Dual pressure switch on the vehicle at normal temperature (approximately 25° C, 77° F). Make sure that the A/C system has a proper refrigerant charge and that the A/C compressor is in operation.
- Using a J 39200, check for continuity. The switch should show no continuity when the refrigerant pressure is below 193 kPa (28 psi), or when the pressure is above 3137 kPa (455 psi). Between those two pressure extremes, the switch should show continuity.
- If the dual pressure switch fails to perform to specification, it must be replaced.

Remove or Disconnect

1. Discharge and recover refrigerant. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" earlier in this section.
2. Negative (-) battery cable.
3. Dual pressure switch electrical connector.
4. Dual pressure switch by unscrewing from the top of the receiver/dryer.

Install or Connect

1. Dual pressure switch to top of receiver/dryer.

Tighten

- Dual pressure switch to 18 N.m (13 lbs. ft.).

2. Dual pressure switch electrical connector.
3. Negative (-) battery cable.

Tighten

- Negative (-) battery cable-to-negative (-) battery terminal retainer to 15 N.m (11 lbs. ft.).

4. Evacuate and charge A/C system. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" earlier in this section.
5. Operate A/C system and check for refrigerant leaks. Refer to "Leak Testing" earlier in this section.

Evaporator

Figures 23 through 26

Remove or Disconnect

1. Discharge and recover refrigerant. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" earlier in this section.
2. Negative (-) battery cable.
3. Disable the SIR. Refer to SECTION 9J.
4. Evaporator inlet and outlet pipes at bulkhead by loosening pipe nuts.
5. Evaporator case mounting nut on engine side of bulkhead (near refrigerant pipes).
6. Pull out instrument panel compartment while pushing its stopper from both left and right sides.
7. Instrument panel compartment by removing two hinge pins.
8. Two bolts and right-side instrument panel center support (Figure 23).
9. Blower motor and resistor electrical connectors.
10. Fresh/recirc air control cable from blower motor case.
11. Wiring harness from guide brackets on blower case.
12. Three bolts, two screws and passenger-side SIR module.
13. Blower case from vehicle by removing two upper retaining bolts and one lower nut.
14. Loosen evaporator-to-heater connector band; slide band on to heater case (Figure 24).
15. Evaporator case drain hose.
16. A/C amplifier and evaporator temperature sensor (thermistor) electrical connectors.
17. SIR harness loop.
18. Two evaporator case upper mounting bolts.
19. Evaporator case from vehicle.

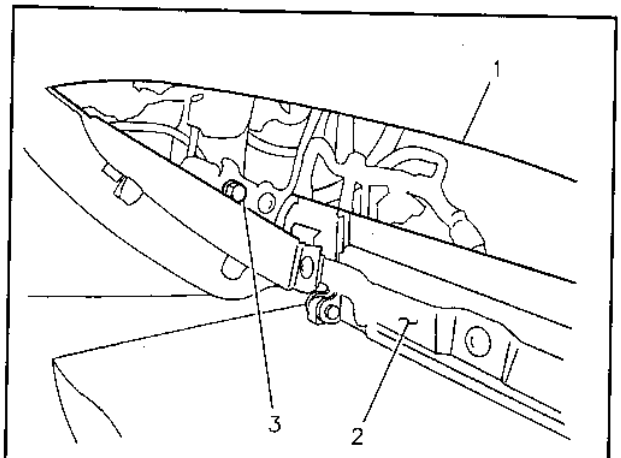


Figure 23—Right-Side Instrument Panel Center Support

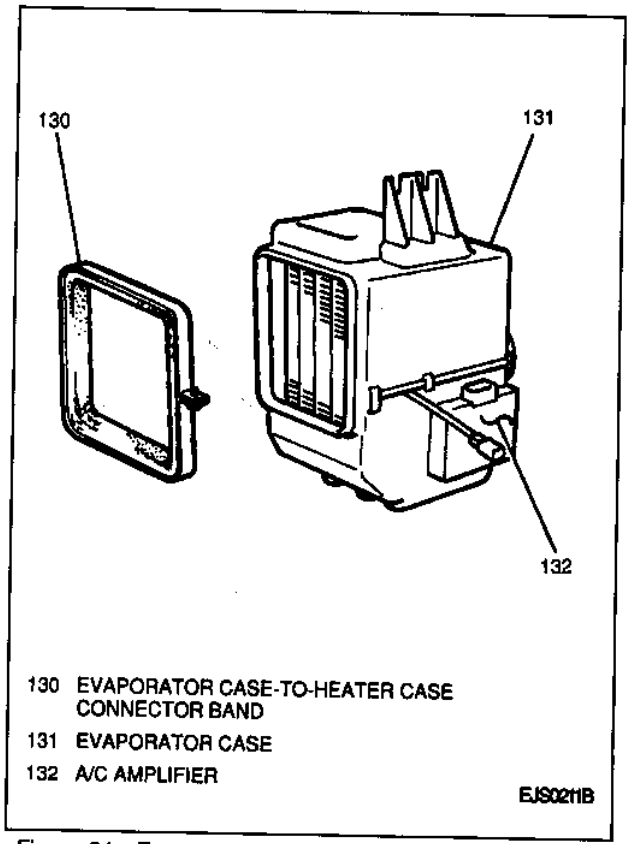
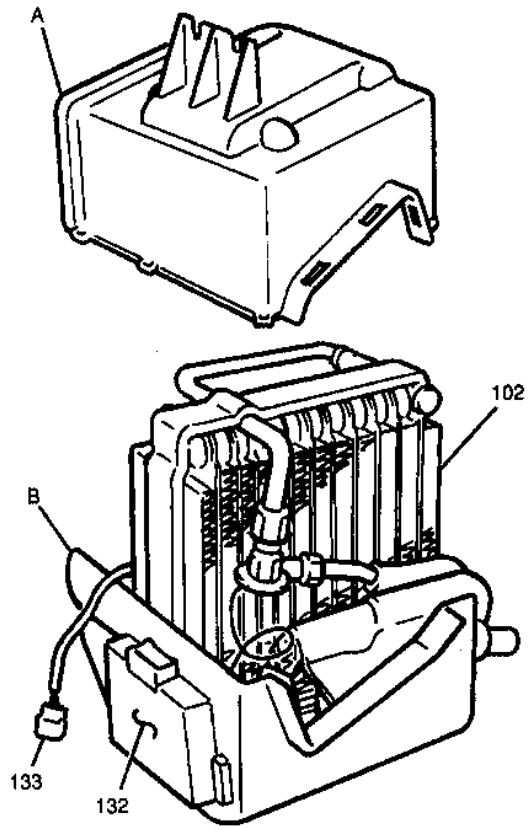


Figure 24—Evaporator Case and Heater Case Connector Band



A UPPER EVAPORATOR CASE
B LOWER EVAPORATOR CASE
102 EVAPORATOR
132 A/C AMPLIFIER
133 A/C THERMISTOR ELECTRICAL CONNECTOR
EJS0221B

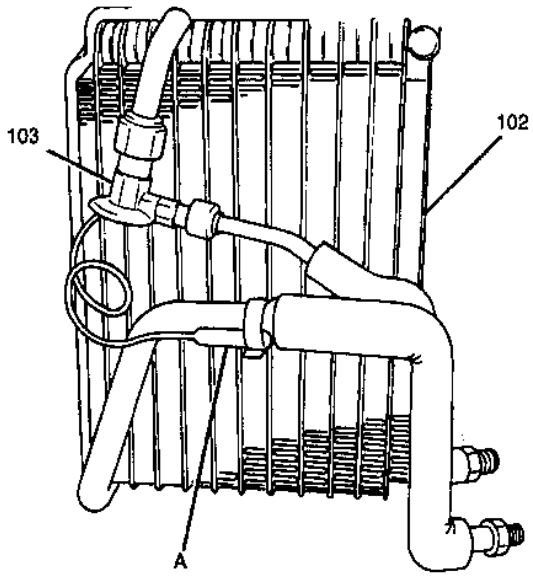
Figure 25—Separating Evaporator Case

Disassemble

1. Separate upper and lower case halves by disengaging five retaining clips and one screw (Figure 25).
2. Evaporator pipe retaining clamp from lower case.
3. Evaporator from lower case.
4. Expansion valve from evaporator by removing two nuts (Figure 26).
5. Evaporator temperature sensor (thermistor) from evaporator.
6. A/C amplifier from outside of lower case.

Inspect

1. Evaporator fins for blockage. If a blockage is found, use compressed air to clean fins.
2. Inlet and outlet fittings for cracks or scratches. Replace if required.



A EXPANSION VALVE REMOTE BULB
102 EVAPORATOR
103 EXPANSION VALVE
EJS0231B

Figure 26—Evaporator and Expansion Valve

3. Expansion valve operation. Refer to "Expansion Valve" later in this section.
4. Evaporator temperature sensor operation. Refer to "Evaporator Temperature Sensor" later in this section.

Remove or Disconnect

1. A/C amplifier to outside of lower case.
2. Evaporator temperature sensor to evaporator.
3. Expansion valve to evaporator; secure with two nuts.

Tighten

- Larger expansion valve pipe nut to 35 N·m (26 lbs. ft.).
- Smaller expansion valve pipe nut to 13 N·m (115 lbs. in.).

4. Evaporator attaching screws and evaporator to lower case.
5. Evaporator pipe retaining clamp to lower case.
6. Evaporator case halves; secure with five retaining clips and one screw.

Install or Connect

1. Evaporator case to vehicle; secure with two upper mounting bolts and one nut on the engine side of the bulkhead.

Tighten

- Evaporator case mounting bolts and nut to 15 N.m (11 lbs. ft.).

2. SIR harness loop.
3. A/C amplifier and evaporator temperature sensor electrical connectors.
4. Evaporator case drain hose.
5. Evaporator case-to-heater case connector band; slide band on from heater case and tighten.
6. Blower case to vehicle; secure with two upper retaining bolts and one lower nut.

Tighten

- Blower case retaining bolts and nut to 10 N.m (89 lbs. in.).

7. Passenger-side SIR module; secure with three bolts and two screws.

Tighten

- Passenger-side SIR module bolts to 23 N.m (16.5 lbs. ft.).
- Passenger-side SIR module screws to 5.5 N.m (4.0 lbs. ft.).

8. Wiring harness to guide brackets on blower case.
9. Fresh/recirc air control cable to blower case.
10. Turn signal electrical connectors.
11. Blower motor and resistor electrical connectors.
12. Right-side instrument panel center support; secure with two bolts.
13. Instrument panel compartment; secure with two hinge pins.
14. Evaporator inlet and outlet pipes at bulkhead; secure with pipe nuts.

Important

- Install new O-rings to evaporator pipe fittings. Coat new O-rings with clean refrigerant oil.

Tighten

- Evaporator inlet pipe nut to 35 N.m (26 lbs. ft.).
- Evaporator outlet pipe nut to 45 N.m (33 lbs. ft.).

15. Enable the SIR. Refer to SECTION 9J.
16. Negative (-) battery cable.

Tighten

- Negative (-) battery cable-to-negative (-) battery terminal retainer to 15 N.m (11 lbs. ft.).

17. Evacuate and charge A/C system. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" earlier in this section.
18. Operate A/C system and check for refrigerant leaks. Refer to "Leak Testing" earlier in this section.

Evaporator Temperature Sensor (Thermistor)

Figures 25 and 27

Remove or Disconnect

1. Evaporator from vehicle. Refer to "Evaporator" earlier in this section.
2. Separate upper and lower case halves by disengaging retaining five clips and one screw (Figure 25).
3. Evaporator pipe retaining clamp from lower case.
4. Evaporator from lower case.
5. Evaporator temperature sensor from evaporator.

Inspect

- Evaporator temperature sensor operation.
  Tool Required:
  J 39200 Digital Multimeter

A. Using a J 39200, measure the resistance of the evaporator temperature sensor.
B. Using a thermometer, measure the ambient air temperature.
C. Refer to the evaporator temperature sensor resistance/temperature relationship chart to make sure evaporator temperature sensor resistance falls within specification for a given temperature. If the evaporator temperature sensor does not perform to specification, it should be replaced (Figure 27).

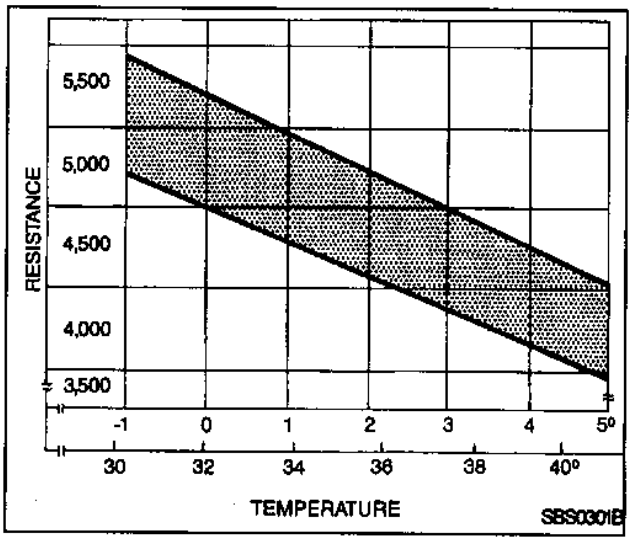


Figure 27—Evaporator Temperature Sensor Resistance/Temperature Relationship

Install or Connect

1. Evaporator temperature sensor to evaporator.
2. Evaporator to lower case.
3. Evaporator pipe retaining clamp to lower case.
4. Evaporator case halves; secure with five retaining clips and one screw.
5. Evaporator case to vehicle. Refer to "Evaporator" earlier in this section.

Expansion Valve

Figures 26 through 29

Remove or Disconnect

1. Evaporator from vehicle. Refer to "Evaporator" earlier in this section.
2. Separate upper and lower case halves by disengaging five retaining clips and one screw (Figures 25).
3. Evaporator pipe retaining clamp from lower case.
4. Evaporator from lower case.
5. Expansion valve from evaporator by removing two nuts (Figure 26).

Inspect

- Expansion valve operation.
  Tool Required:
  J 39183-C R-134a Manifold Gage Set

A. Connect the expansion valve to a J 39183-C; connect the gage set's charging hose to a R-134a refrigerant drum (Figure 28).
B. Soak the valve's remote bulb in water.
C. Close both the high and low-pressure valves.
D. Open the valve to the refrigerant drum.
E. Open the high-pressure valve to approximately 482.65 kPa (70 psi).
F. Read the pressure indicated on the low-pressure gage, and measure the water temperature with a thermometer.
G. The pressure/temperature relationship should fall within the specifications shown in Figure 29. If it does not, the expansion valve should be replaced.

Install or Connect

1. Expansion valve to evaporator; secure with two nuts.

Important

- Install new O-rings to expansion valve fittings. Coat new O-rings with clean refrigerant oil.

Tighten

- Larger expansion valve pipe nut to 35 N·m (26 lbs. ft.).
- Smaller expansion valve pipe nut to 13 N·m (115 lbs. in.).

2. Evaporator attaching screws and evaporator to lower case.
3. Evaporator pipe retaining clamp to lower case.
4. Evaporator case halves; secure with one screw and five retaining clips.
5. Evaporator. Refer to "Evaporator" earlier in this section.

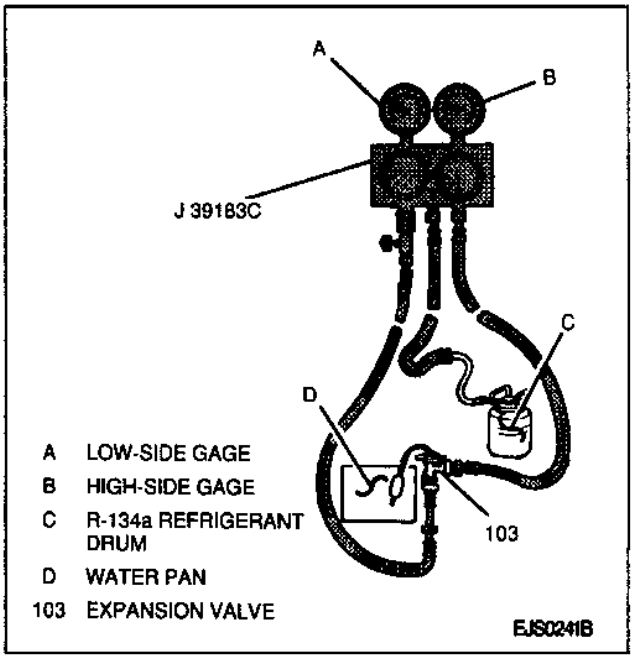


Figure 28—Expansion Valve Operation

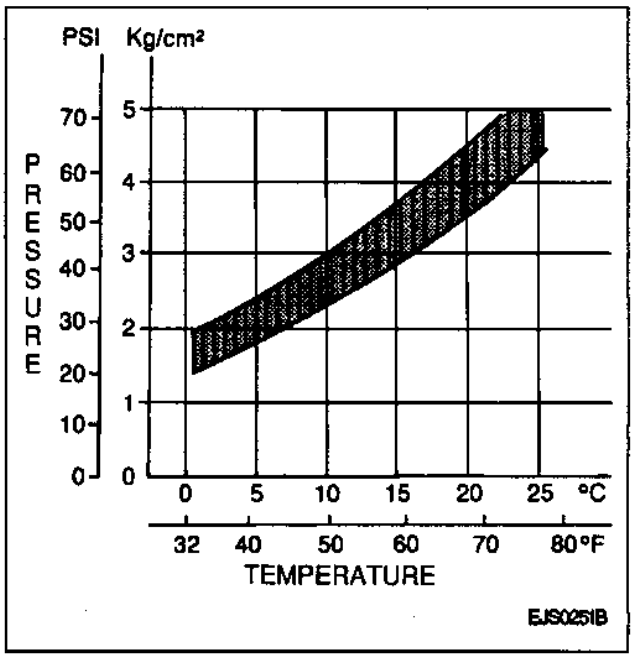


Figure 29—Expansion Valve Pressure/Temperature Relationship Chart

Receiver/Dryer

Figure 30

Remove or Disconnect

1. Discharge and recover refrigerant. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" earlier in this section.
2. Negative (-) battery cable.
3. Dual pressure switch electrical connector.
4. Receiver/dryer inlet and outlet pipes at fittings.
5. Two screws and receiver/dryer from mounting bracket (Figure 30).

Install or Connect

1. Receiver/dryer to mounting bracket; secure with two screws.
2. Receiver/dryer inlet and outlet pipes at fittings; secure with pipe bolt.

Tighten

- Receiver/dryer pipe fitting bolts to 35 N.m (26 lbs. ft.).

3. Dual pressure switch electrical connector.
4. Negative (-) battery cable.

Tighten

- Negative (-) battery cable-to-negative (-) battery terminal retainer to 15 N.m (11 lbs. ft.).

5. Evacuate and charge A/C system. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" earlier in this section.
6. Operate A/C system and check for refrigerant leaks. Refer to "Leak Testing" earlier in this section.

Important

- If receiver/dryer was replaced, 10 mL (0.3 oz.) of refrigerant oil must be added to compressor suction-side.

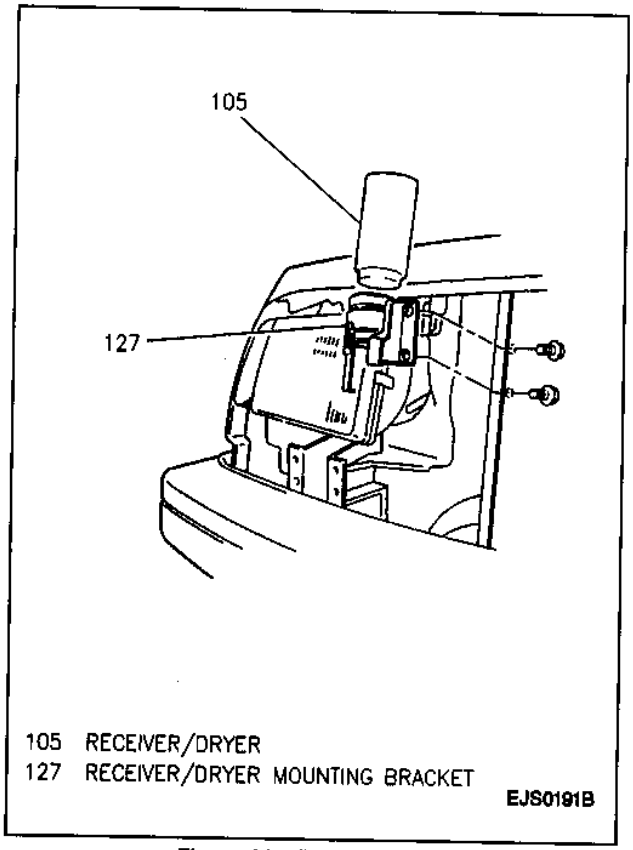
Refrigerant Pipes and Hoses

Compressor-to-Compressor Pipe Hose (Compressor Discharge)

Figure 31

Remove or Disconnect

1. Discharge and recover refrigerant. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" earlier in this section.



105 RECEIVER/DRYER
127 RECEIVER/DRYER MOUNTING BRACKET
EJS0191B

Figure 30—Receiver/Dryer

2. Negative (-) battery cable.
3. Compressor discharge hose at compressor fitting (one bolt).
4. Compressor pipe fitting (one pipe nut) and hose from vehicle (Figure 31).

Install or Connect

1. Hose to vehicle; secure with compressor pipe fitting nut.

Important

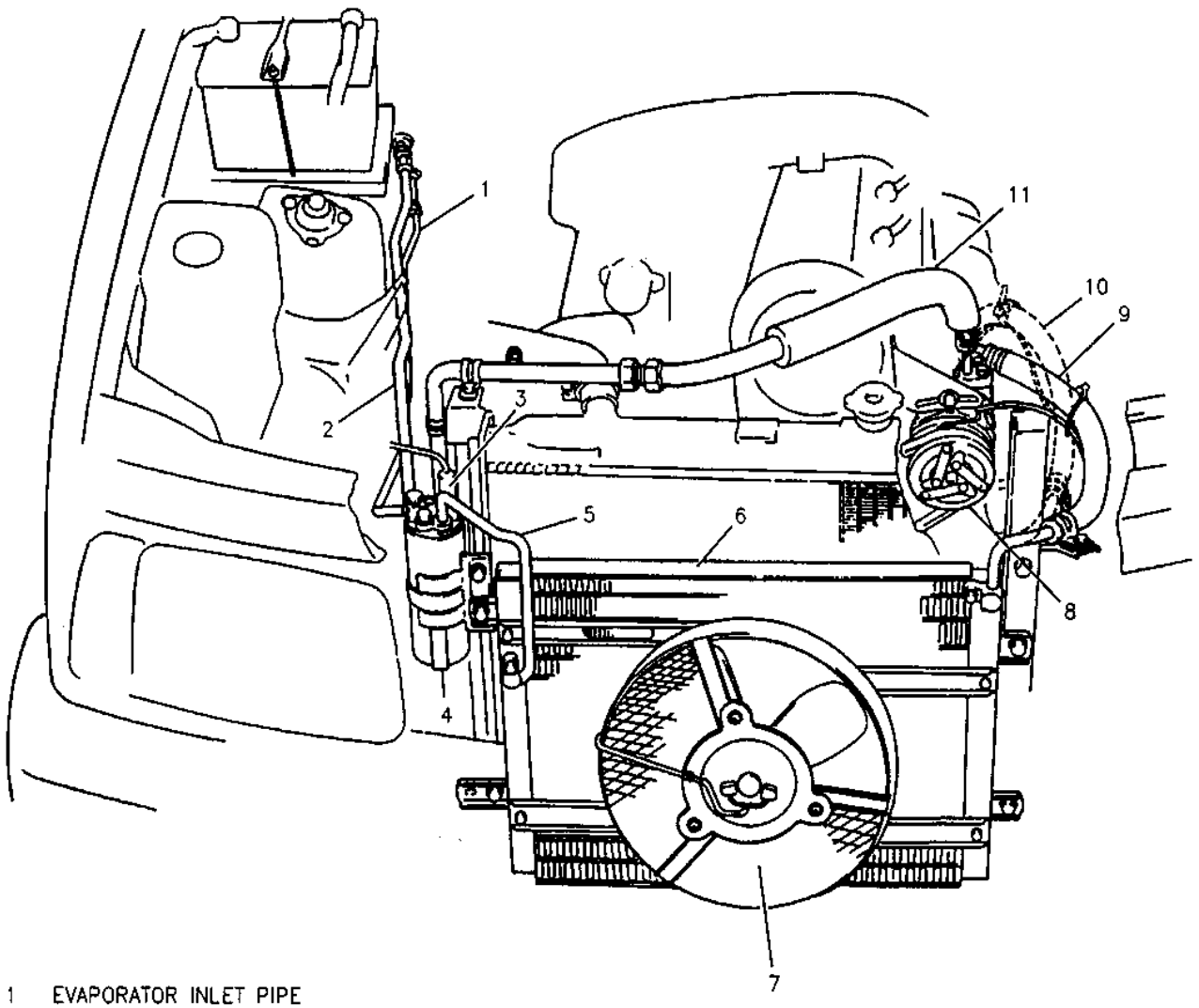
- Install new O-rings to refrigerant pipe fittings. Coat new O-rings with clean refrigerant oil.

2. Compressor discharge hose at compressor fitting (one bolt).

Tighten

- Compressor discharge hose fitting bolt to 25 N.m (18 lbs. ft.).

3. Front grille and grille net. Refer to SECTION 10-5.
4. Evacuate and charge A/C system. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" earlier in this section.
5. Negative (-) battery cable.



1 EVAPORATOR INLET PIPE
2 EVAPORATOR OUTLET PIPE
3 DUAL PRESSURE SWITCH
4 RECEIVER/DRYER
5 RECEIVER/DRYER INLET PIPE
6 CONDENSER
7 CONDENSER FAN
8 COMPRESSOR
9 COMPRESSOR DISCHARGE PIPE (8-VALVE ENGINE)
10 COMPRESSOR DISCHARGE PIPE (16-VALVE ENGINE)
11 COMPRESSOR SUCTION PIPE

EJS0831B

Figure 31—Refrigerant Pipes and Hoses

Tighten

- Negative (-) battery cable-to-negative (-) battery terminal retainer to 15 N.m (11 lbs. ft.).

6. Operate A/C system and check for refrigerant leaks. Refer to "Leak Testing" earlier in this section.

Compressor Hose-to-Condenser Pipe (Compressor Discharge)

Figure 31

Remove or Disconnect

1. Discharge and recover refrigerant. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" earlier in this section.
2. Negative (-) battery cable.
3. Front grille and grille net. Refer to SECTION 10-5.
4. Compressor discharge hose at compressor fitting (one bolt).
5. Pipe at condenser inlet fitting (one bolt).
6. One bolt and pipe from vehicle (Figure 31).

Install or Connect

1. Pipe to vehicle; secure with bracket and bolt.

Important

- Install new O-rings to refrigerant pipe fittings. Coat new O-rings with clean refrigerant oil.

2. Pipe at condenser inlet fitting (one bolt).
3. Compressor discharge hose at compressor fitting (one bolt).

Tighten

- Condenser inlet pipe fitting bolt to 25 N.m (18 lbs. ft.).
- Compressor discharge hose fitting bolt to 25 N.m (18 lbs. ft.).

4. Front grille and grille net. Refer to SECTION 10-5.
5. Evacuate and charge A/C system. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" earlier in this section.
6. Negative (-) battery cable.

Tighten

- Negative (-) battery cable-to-negative (-) battery terminal retainer to 15 N.m (11 lbs. ft.).

7. Operate A/C system and check for refrigerant leaks. Refer to "Leak Testing" earlier in this section.

Condenser-to-Receiver/Dryer (Receiver/Dryer Inlet) Pipe

Figure 31

Remove or Disconnect

1. Discharge and recover refrigerant. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" earlier in this section.
2. Negative (-) battery cable.
3. Front grille and grille net. Refer to SECTION 10-5.
4. Condenser-to-receiver/dryer (receiver/dryer inlet) pipe at receiver/dryer fitting (one bolt).
5. Pipe at condenser fitting in front of radiator (one bolt).
6. Pipe from radiator-mounted guide bracket and from vehicle (Figure 31).

Install or Connect

1. Pipe to vehicle; secure at radiator-mounted guide bracket.

Important

- Install new O-rings to refrigerant pipe fittings. Coat new O-rings with clean refrigerant oil.

2. Pipe at condenser fitting in front of the radiator (one pipe nut).
3. Condenser-to-receiver/dryer (receiver/dryer inlet) pipe at receiver/dryer fitting (one bolt).

Tighten

- Receiver/dryer pipe fitting bolt to 35 N.m (26 lbs. ft.).
- Condenser pipe nut to 35 N.m (26 lbs. ft.).

4. Front grille and grille net. Refer to SECTION 10-5.
5. Negative (-) battery cable.

Tighten

- Negative (-) battery cable-to-negative (-) battery terminal retainer to 15 N.m (11 lbs. ft.).

6. Evacuate and charge A/C system. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" earlier in this section.
7. Operate A/C system and check for refrigerant leaks. Refer to "Leak Testing" earlier in this section.

Evaporator-to-Compressor (Compressor Suction) Pipe

Figure 31

Remove or Disconnect

1. Discharge and recover refrigerant. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" earlier in this section.
2. Negative (-) battery cable.
3. Evaporative emissions (EVAP) canister.
4. Evaporator-to-compressor (compressor suction) hose fitting (one nut) on top of radiator.
5. Pipe at evaporator outlet bulkhead fitting (one pipe nut).
6. Pipe from two radiator-mounted guide brackets bolts and pipe from vehicle (Figure 31).

Install or Connect

1. Evaporator-to-compressor (compressor suction) pipe to vehicle; secure at radiator-mounted guide brackets with bolts.

Important

- Install new O-rings to refrigerant pipe fittings. Coat new O-rings with clean refrigerant oil.

2. Pipe at evaporator outlet bulkhead fitting (one pipe nut).
3. Pipe at compressor hose fitting (one nut).

Tighten

- Evaporator outlet pipe nut to 45 N.m (33 lbs. ft.).

4. EVAP canister to vehicle.
5. Negative (-) battery cable.

Tighten

- Negative (-) battery cable-to-negative (-) battery terminal retainer to 15 N.m (11 lbs. ft.).

6. Evacuate and charge A/C system. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" earlier in this section.
7. Operate A/C system and check for refrigerant leaks. Refer to "Leak Testing" earlier in this section.

Receiver/Dryer-to-Evaporator (Evaporator Inlet) Pipe

Figure 31

Remove or Disconnect

1. Discharge and recover refrigerant. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" earlier in this section.
2. Negative (-) battery cable.
3. Dual pressure switch electrical connector.
4. Dual pressure switch from top of receiver/dryer.
5. Evaporative emissions (EVAP) canister.
6. Receiver/dryer-to-evaporator (evaporator inlet) pipe at evaporator inlet bulkhead fitting (one nut).
7. Pipe at receiver/dryer fitting (one bolt) (Figure 31).

Install or Connect

1. Receiver/dryer-to-evaporator (evaporator inlet) pipe at evaporator inlet bulkhead fitting (one nut).

Important

- Install new O-rings to refrigerant pipe fittings. Coat new O-rings with clean refrigerant oil.

2. Pipe at receiver/dryer fitting (one bolt).

Tighten

- Evaporator inlet pipe nut to 35 N.m (26 lbs. ft.).
- Receiver/dryer pipe fitting bolt to 35 N.m (26 lbs. ft.).

3. EVAP canister.
4. Dual pressure switch to top of receiver/dryer.

Tighten

- Dual pressure switch to 18 N.m (13 lbs. ft.).

5. Dual pressure switch electrical connector.
6. Negative (-) battery cable.

Tighten

- Negative (-) battery cable-to-negative (-) battery terminal retainer to 15 N.m (11 lbs. ft.).

7. Evacuate and charge A/C system. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" earlier in this section.
8. Operate A/C system and check for refrigerant leaks. Refer to "Leak Testing" earlier in this section.

SPECIFICATIONS

FASTENER TORQUES

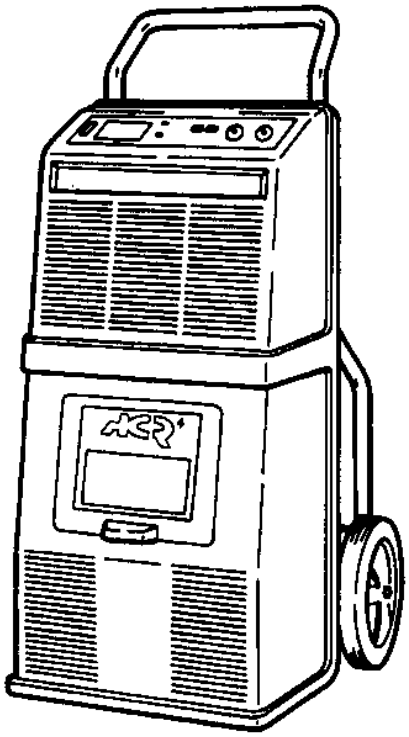
Blower Case Retaining Bolts And Nut	10 N·m (89 lbs. In.).
Compressor Discharge Hose Fitting Bolt	25 N·m (18 lbs. ft.).
Compressor Lower Mounting Bracket Bolts (With Power Steering)	18 to 25 N·m (13 to 20 lbs. ft.).
Compressor Lower Mounting Bracket Side Bolts (Without Power Steering)	40 to 60 N·m (29 to 43 lbs. ft.).
Compressor Pipe Fitting Bolts	25 N·m (18 lbs. ft.).
Compressor Upper Bracket-to-Compressor Bolt	18 to 28 N·m (13 to 20 lbs. ft.).
Compressor Upper Bracket-to-Engine Bolts	40 to 60 N·m (29 to 43 lbs. ft.).
Compressor-to-Condenser (Condenser Inlet) Pipe Fitting Bolt	25 N·m (18 lbs. ft.).
Condenser Fan Mounting Bolts	15 N·m (11 lbs. ft.).
Condenser Inlet Pipe Fitting Bolt	25 N·m (18 lbs. ft.).
Condenser Mounting Bolts	20 N·m (15 lbs. ft.).
Condenser Pipe Nut	35 N·m (26 lbs. ft.).
Condenser-to-Receiver/Dryer (Condenser Outlet) Pipe Fitting Nut	35 N·m (26 lbs. ft.).
Dual Pressure Switch	18 N·m (13 lbs. ft.).
Evaporator Case Mounting Bolts And Nut	15 N·m (11 lbs. ft.).
Evaporator Inlet Pipe Nut	35 N·m (26 lbs. ft.).
Evaporator Outlet Pipe Nut	45 N·m (33 lbs. ft.).
Front End Upper Panel Bolts	20 N·m (15 lbs. ft.).
Horn Bolt	15 N·m (11 lbs. ft.).
Larger Expansion Valve Pipe Nut	35 N·m (26 lbs. ft.).
Passenger-Side SIR Module Bolts	23 N·m (16.5 lbs. ft.).
Passenger-Side SIR Module Screws	5.5 N·m (4.0 lbs. ft.).
Radiator Core Center Brace Bolts	20 N·m (15 lbs. ft.).
Receiver/Dryer Pipe Fitting Bolt	35 N·m (26 lbs. ft.).
Smaller Expansion Valve Pipe Nut	13 N·m (115 lbs. In.).
Upper And Lower Bracket-to-Compressor Mounting Bolts	18 to 28 N·m (13 to 20 lbs. ft.).
Compressor Mounting Bolts	18 to 28 N·m (13 to 20 lbs. ft.).
Negative (-) Battery Cable-to-Negative (-) Battery Terminal Retainer	15 N·m (11 lbs. ft.).

REFRIGERATION SYSTEM CAPACITIES

Refrigerant-134a System Capacity	600 g (1.32 lbs.)
Polyalkaline Glycol (PAG) Refrigerant Oil Capacity	100 ml (3.4 fl. oz.)

SPECIAL TOOLS

1
J 39500



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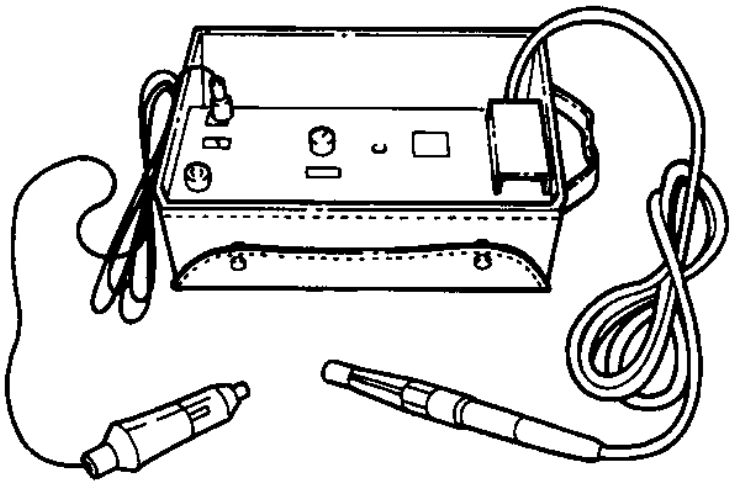
J 39400



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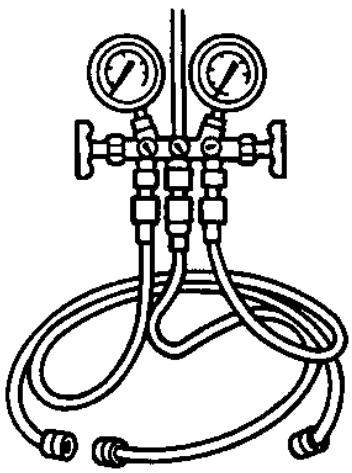

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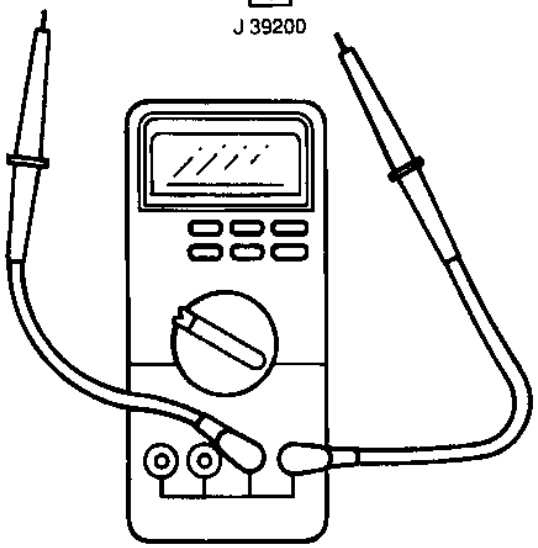

1 AIR CONDITIONING REFRIGERANT RECOVERY RECYCLING AND RECHARGING STATION (ACR⁴)
2 R-134a MANIFOLD GAGE SET
3 ELECTRONIC LEAK DETECTOR
4 DIGITAL MULTIMETER

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