

SECTION 1B

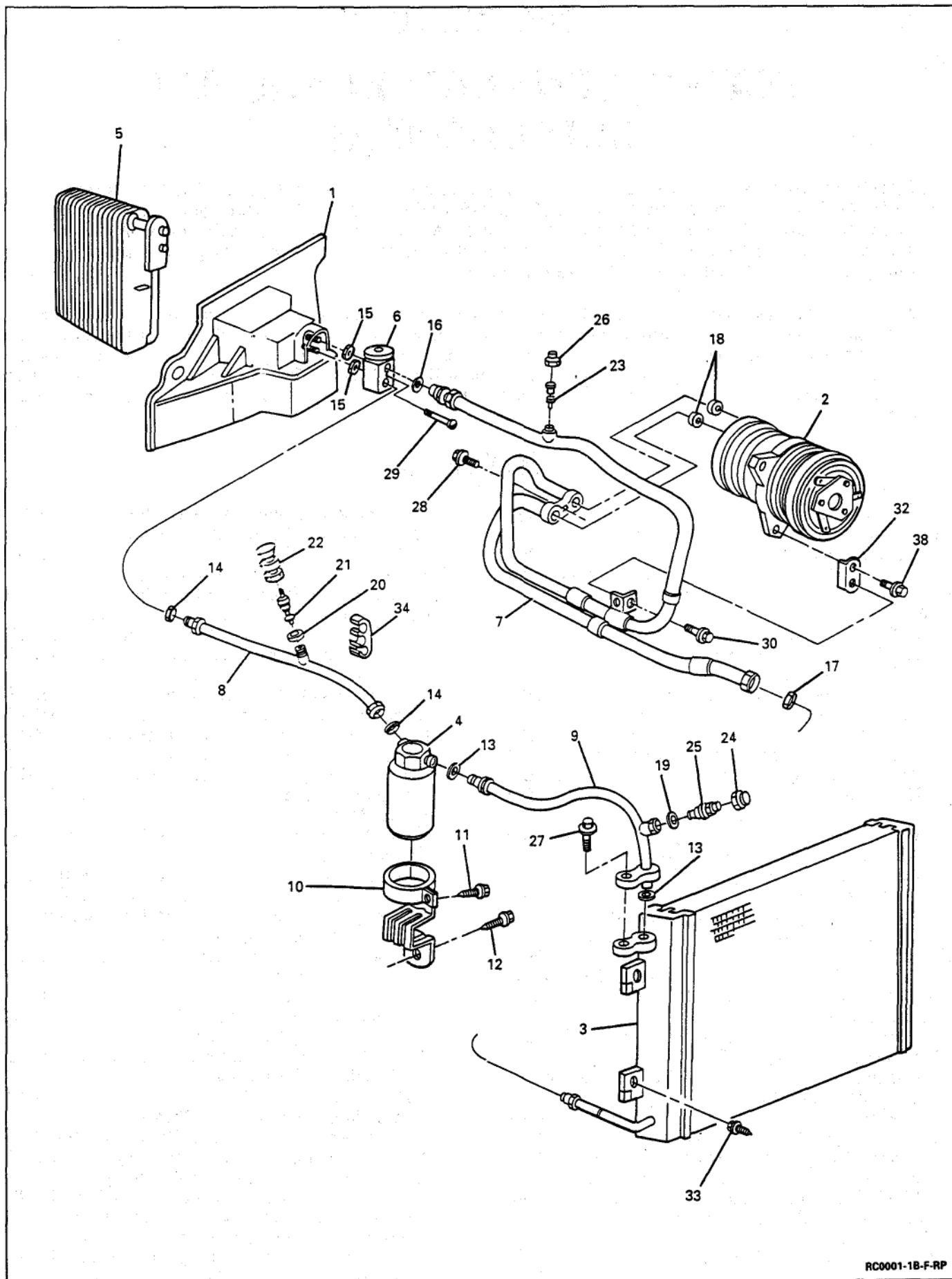
HEATER, VENTILATION AND AIR CONDITIONING

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: When fasteners are removed, always reinstall them at the same location from which they were removed. If a fastener needs to be replaced, use the correct part number fastener for that application. If the correct part number fastener is not available, a fastener of equal size and strength (or stronger) may be used. Fasteners that are not reused, and those requiring thread locking compound will be called out. The correct torque value must be used when installing fasteners that require it. If the above conditions are not followed, parts or system damage could result.

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Figure 1 – Refrigeration System Components

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GENERAL DESCRIPTION

HEATER, VENTILATION AND AIR CONDITIONING SYSTEM OPERATION

NOTICE: The refrigeration system on this vehicle uses R-134a which is not compatible with refrigerant 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 instructions included with service equipment before proceeding.

The air conditioning system (C60) delivers air that has been heated or cooled and dehumidified for occupant comfort. It also provides power ventilation, windshield assembly and side window defrosting.

During most operating conditions, outside air is drawn through the heater and air conditioning module assembly by the blower motor assembly. Additional outside air is also forced into the vehicle by forward movement of the vehicle.

Within the evaporator module assembly, air is pushed by the blower motor assembly through the evaporator, then through the heater core depending on the temperature valve position, then into the passenger compartment. For air conditioning or defroster operation at ambient temperatures above 7°C (45°F), the refrigera-

tion system will chill the evaporator to almost freezing. As the air passes through the evaporator, the air temperature drops which causes the moisture in the air to condense on the evaporator core fins. This moisture leaves the vehicle by gravity feed through a drain hole, dehumidifying the vehicle.

From the evaporator, some or all of the air may pass through the heater core assembly, which is warmed by engine coolant. Any of the air which is not to be heated will mix with the heated air before entering the passenger compartment.

When maximum air conditioning mode is selected, most of the air entering the blower motor assembly is taken from the passenger compartment (recirculated) where it is most likely to be cooler than the outside air. Only outside air is used in all other modes.

REFRIGERATION SYSTEM

Figures 1 and 2

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

- | | |
|---|--|
| 1 MODULE ASSEMBLY, HEATER AND AIR CONDITIONING EVAPORATOR | 20 O-RING, AIR CONDITIONING REFRIGERANT PRESSURE SENSOR |
| 2 COMPRESSOR ASSEMBLY, AIR CONDITIONING | 21 VALVE, AIR CONDITIONING REFRIGERANT PRESSURE SENSOR |
| 3 CONDENSER ASSEMBLY, AIR CONDITIONING | 22 SENSOR ASSEMBLY, AIR CONDITIONING REFRIGERANT PRESSURE |
| 4 RECEIVER AND DEHYDRATOR ASSEMBLY, AIR CONDITIONING | 23 CORE, AIR CONDITIONING REFRIGERANT SERVICE VALVE |
| 5 EVAPORATOR, AIR CONDITIONING | 24 CAP, AIR CONDITIONING REFRIGERANT CHARGE VALVE (SERVICE VALVE) |
| 6 VALVE ASSEMBLY, AIR CONDITIONING THERMOSTATIC EXPANSION | 25 VALVE, AIR CONDITIONING REFRIGERANT SERVICE |
| 7 HOSE ASSEMBLY, AIR CONDITIONING COMPRESSOR AND CONDENSER | 26 CAP, AIR CONDITIONING REFRIGERANT CHARGE VALVE |
| 8 TUBE, AIR CONDITIONING EVAPORATOR | 27 BOLT/SCREW, AIR CONDITIONING RECEIVER DEHYDRATOR TUBE |
| 9 TUBE, AIR CONDITIONING RECEIVER DEHYDRATOR | 28 BOLT/SCREW, AIR CONDITIONING COMPRESSOR AND CONDENSER HOSE |
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| 11 BOLT/SCREW, AIR CONDITIONING RECEIVER DEHYDRATOR CLAMP | 30 BOLT/SCREW, AIR CONDITIONING COMPRESSOR AND CONDENSER HOSE CLIP BRACKET |
| 12 BOLT/SCREW, AIR CONDITIONING RECEIVER DEHYDRATOR BRACKET | 32 BRACKET, AIR CONDITIONING COMPRESSOR HOSE CLIP (5.7L LT1 ENGINE) |
| 13 O-RING, AIR CONDITIONING RECEIVER DEHYDRATOR TUBE | 33 RETAINER, RADIATOR AIR UPPER BAFFLE |
| 14 O-RING, AIR CONDITIONING EVAPORATOR TUBE | 34 STRAP, AIR CONDITIONING COMPRESSOR AND CONDENSER HOSE |
| 15 SEAL, AIR CONDITIONING EVAPORATOR TUBE | 38 BOLT/SCREW, AIR CONDITIONING COMPRESSOR |
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| 17 O-RING, AIR CONDITIONING CONDENSER FITTING | |
| 18 SEAL, AIR CONDITIONING COMPRESSOR HOSE | |
| 19 SEAL, AIR CONDITIONING REFRIGERANT SERVICE VALVE | |

Figure 2 – Refrigeration System Components – Legend

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. 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 a R-134a system will cause compressor failure, refrigerant oil sludge or poor air conditioning system performance.

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

Use only polyalkylene glycol (PAG) synthetic refrigerant oil for internal circulation through the R-134a A/C system and only mineral base 525 viscosity refrigerant oil on fittings threads and O-rings. If lubricants other than those specified are used, compressor failure and/or fitting seizure is likely to occur.

Air Conditioning Receiver and Dehydrator Assembly

The receiver and dehydrator assembly is located on the right side wheelhouse panel, just downstream from the condenser assembly. It functions as a moisture separator that receives refrigerant liquid and refrigerant oil from the condenser. It only allows refrigerant liquid and a small amount of oil to continue on to the thermostatic expansion valve assembly.

At the bottom of the receiver and dehydrator assembly is the desiccant, which acts as a drying agent for moisture that may have entered the system. A filter is also located near the bottom of the receiver and dehydrator assembly outlet pipe to keep any particles from plugging the thermostatic expansion valve assembly.

Air Conditioning Compressor Assembly

The air conditioning compressor assembly is driven by a belt from the engine crankshaft through the 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 clutch coil, a clutch plate and hub assembly is drawn rearward toward the pulley. The magnetic force locks the clutch plate and pulley together as one unit to

drive the compressor shaft. For unit repair information, refer to SECTION 1D2.

Air Conditioning Condenser Assembly

The air conditioning condenser assembly in front of the radiator assembly is made up of coils, which carry the refrigerant and cooling fins to provide rapid transfer of heat. The air passing through the condenser assembly cools the high-pressure refrigerant vapor, causing it to condense into a liquid.

Electric Engine Coolant Fan Assembly

Coolant fan assembly operation is crucial to the proper operation of the air conditioning system. The coolant fan assembly ensures the proper amount of air flow across the condenser throughout the vehicle operating range.

Fan assembly operation should be checked during any air conditioning diagnosis procedure. Special attention should be given to the fan assembly whenever excessive high side pressures are encountered.

Thermostatic Expansion Valve Assembly

Figure 3

The purpose of the thermostatic expansion valve assembly is to regulate the flow of refrigerant through the evaporator to optimize its cooling performance. This is accomplished by monitoring the refrigerant conditions at the evaporator outlet and adjusting the inlet flow accordingly. This assures that all the liquid is evaporated before it is returned to the compressor assembly.

The refrigerant flow is controlled by the movement of a shaft that pushes a ball from its seat. As the ball is unseated, more flow is allowed through the evaporator. Shaft movement is controlled by the power dome which has two separate sides. The thermal side of the power dome is sealed and charged with refrigerant. The system side of the power dome is exposed to the pressure of the evaporator outlet or low side. Refrigerant exiting the evaporator flows over part of the thermal side of the power dome. The sealed refrigerant in the thermal side responds to the temperature changes of the refrigerant flowing out of the evaporator. As the refrigerant temperature rises, the pressure of the thermal side increases.

If the pressure on the thermal side of the power dome is greater than the pressure on the system side (the evaporator outlet or low-side pressure), the shaft moves down and pushes the ball off the seat allowing more refrigerant flow through the evaporator. When the opposite is true, the shaft moves up and reseats the ball reducing flow. A spring at the bottom of the thermostatic expansion valve assembly is not adjustable.

Although the thermostatic expansion valve assembly controls evaporator refrigerant flow, air conditioning capacity control (to prevent ice build-up) is managed by compressor cycling which is controlled by the powertrain control module (PCM).

Air Conditioning Evaporator

The evaporator is a device which cools and dehumidifies the air before it enters the vehicle. High-pressure refrigerant flows through the thermostatic expansion valve assembly and becomes low-pressure refrigerant

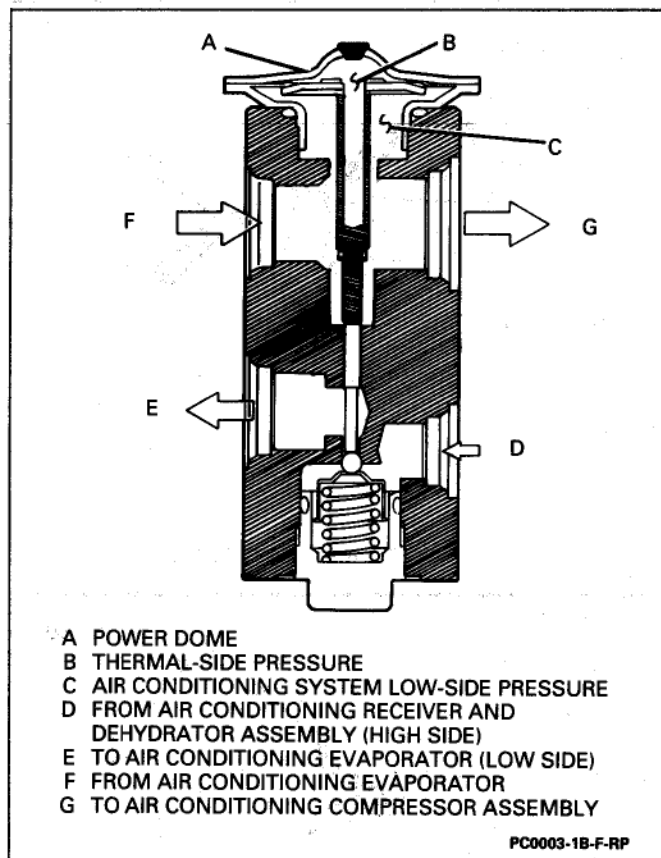


Figure 3 - Thermostatic Expansion Valve Assembly

before entering the evaporator. The heat in the air passing through the evaporator core is lost to the cooler surface of the core, thereby cooling the air. As the process of heat loss from the air to the evaporator core surface is taking place, any moisture (humidity) in the air condenses on the outside of the evaporator core and is drained off as water.

High Pressure Relief Valve

The compressor assembly is equipped with a pressure relief valve which is placed in the system as a safety factor. Under certain conditions, the refrigerant on the discharge side may exceed the designed operating pressure. To prevent system damage, the valve is designed to open automatically at approximately 3036 kPa (440 psi). Any condition that causes this valve to open should be corrected, and the refrigerant oil should be replaced as necessary. The air conditioning refrigerant pressure sensor should also be checked for proper calibration. Refer to SECTION 6E3 (DTC 61).

RELAYS AND SWITCHES

Blower Motor Assembly Relay

The blower motor assembly relay is used to provide battery voltage to the blower motor assembly only during high blower motor assembly speed. The blower motor resistor assembly is used to provide power to the blower motor assembly in all other speed settings. The blower motor relay is located under the instrument panel. Refer to SECTION 8A-63 for more information.

Air Conditioning Compressor Relay

The air conditioning compressor relay is used to provide battery voltage to the compressor clutch coil. The

relay is controlled by the powertrain control module (PCM) only. The relay is located in the underhood electrical center. Refer to SECTION 8A-64 for more information.

Air Conditioning Refrigerant Pressure Sensor Assembly

The A/C refrigerant pressure sensor assembly attached to the air conditioning evaporator liquid line, senses refrigerant pressure on the air conditioning system high-side. The refrigerant pressure status is sent to the PCM. The purpose of this sensor is to inform the PCM of high-side pressure status so the PCM can:

- Control cooling fan assembly operation.
- Prevent compressor assembly operation if ambient temperatures are too cold.
- Disable the compressor assembly before high-side pressure becomes too high.

Refer to SECTION 8A-64 for more information.

Air Conditioning Evaporator Temperature Sensor Assembly

The air conditioning evaporator temperature sensor assembly mounted to the heater and air conditioning evaporator module assembly has a probe inserted into the evaporator which measures evaporator temperature and sends a signal to the PCM. Within the probe is a thermistor which varies output according to temperature. The purpose of this sensor assembly is to inform the PCM of the evaporator temperature so the compressor assembly can be disabled before the evaporator freezes. The evaporator temperature sensor assembly is a solid state device, do not attempt to measure resistance. Measuring resistance across pins can cause sensor damage. Refer to SECTION 8A-64 for more information.

DIAGNOSIS

LEAK-TESTING THE REFRIGERATION SYSTEM

A refrigerant leak test should be performed on the system whenever a leak is suspected due to system indication of low charge or after any service operation which disturbs the components, lines, or connections. Many methods and special tools are available for this purpose; however, no matter which tool is used, care and diligence are the biggest keys to success.

Electric Halogen Leak Detector

Figures 4 and 5

Tool Required:

J 39400 Halogen Leak Detector

This type of leak detector has been found to be the most useful tool in locating refrigerant leaks. The J 39400 is a small unit which operates on 12 volts DC and provides an audible signal which increases in frequency when leaking refrigerant is detected. There are three settings: one for R-12, one for R-134a, and one for gross leaks. The gross leak setting is for isolating very large leaks already found at one of the other two settings. Care must be taken that the instrument is properly calibrated, per the included

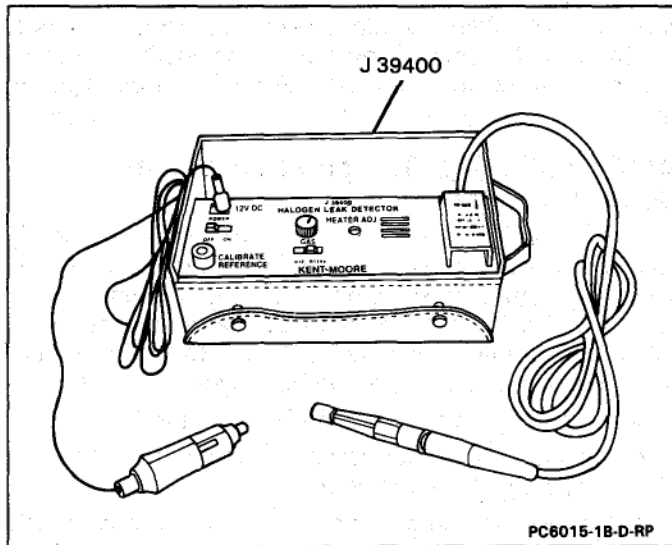


Figure 4 – Electric Halogen Leak Detector

instructions, and that it is used at the proper setting for the type of refrigerant in the system being tested.

Evaporator Core

Because the evaporator core is contained in a closed module and is inaccessible to leak detectors, it is one of the most difficult parts of the air conditioning system to check for leaks. To leak-test the evaporator core:

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

Compressor and Block Fitting

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.

Fluorescent Leak Detector

Fluorescent detection additive is now approved by GM for use in R-134a systems.

Liquid Leak Detectors and Pressure Testing

Due to their lack of sensitivity, liquid/bubble leak detectors have very limited usefulness and are not recommended.

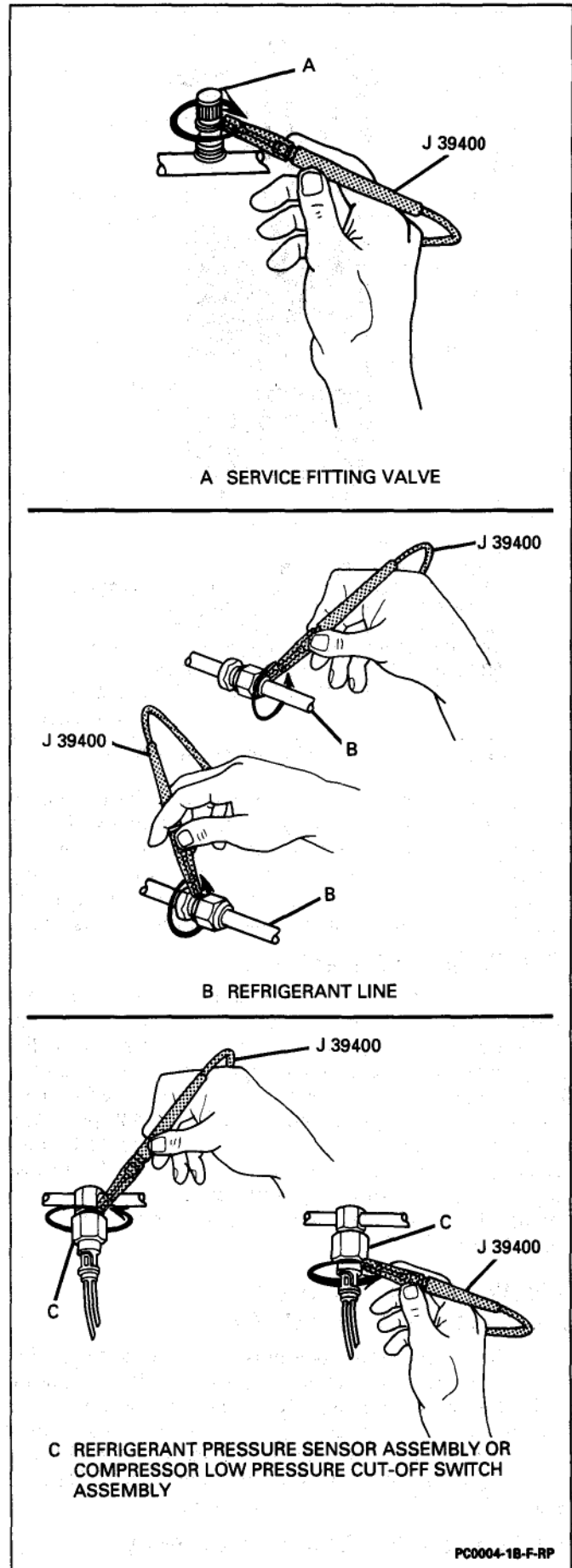


Figure 5 – Checking for Refrigerant Leaks

CAUTION: R-134a service equipment or vehicle A/C systems should not be pressure tested or leak-tested with compressed air. Some mixtures of air/R134a have been shown to be combustible at elevated pressures. These mixtures are potentially dangerous and may result in fire or explosion causing injury or property damage. Additional health and safety information may be obtained from refrigerant and lubricant manufacturers.

ELIMINATING AIR CONDITIONING ODOR

Tool Required:

J 36645 A/C Evaporator Cleaning Gun

Some vehicles may experience odors emitted from the air conditioning system primarily at start up in hot, humid climates. This odor may be the result of debris in the evaporator module case and/or microbial growth on the evaporator core. To eliminate this condition, the following equipment and procedure should be used.

CAUTION: This procedure should only be performed on a cold vehicle to prevent the disinfectant from coming in contact with hot engine components which could cause irritating vapors to form.

Disinfectant can cause substantial, but temporary, eye injury. Do not get in eyes or on clothing. Wash thoroughly with soap and water after handling disinfectant. If disinfectant gets into eyes, hold eyelids open and flush with a steady, gentle stream of water for fifteen minutes. Obtain medical attention if irritation persists.



Important

- This procedure will eliminate debris or microbial growth which can cause odors but will not keep such debris or microbes present in the environment from causing a recurrence of the problem.
1. Remove heater core assembly. Refer to SECTION 1A.
 2. Check evaporator module assembly case for debris, remove any debris present. If debris is imbedded into evaporator core face and cannot be removed, the core will have to be removed from vehicle and cleaned. If a large amount of debris is present in evaporator module assembly case, the air inlet screen will require sealing around the windshield wiper post holes and fender edges.
 3. Place drain pan with at least a two-liter (two-quart) capacity below evaporator drain hole to collect disinfectant and rinse water runoff.
 - The evaporator drain hole is located at the bottom of the evaporator lower case approximately 25 mm (1 inch) from the dash panel assembly (engine compartment side).

4. Connect battery charger to avoid draining battery assembly during cleaning procedure.
5. Position pedestal fan and turn it on high speed to provide cross ventilation during cleaning procedure.
6. Turn ignition switch to the "RUN" position but do not start vehicle.
7. Set heater and air conditioning control assembly to "LOW" blower motor speed, full "HOT" and "HEATER."
8. Open all windows and doors and exit vehicle.
9. Put on rubber gloves, safety goggles (ordinary safety glasses are not sufficient), and NIOSH-approved acid gas/organic vapor respirator with chlorine dioxide cartridges, 3M P/N C1842 or equivalent.
10. Pour small bottle of two-part GM Goodwrench air conditioning system disinfectant kit, GM P/N 25533404 or equivalent, into large bottle. Seal and invert large container once or twice to mix contents.
11. Use J 36645 or equivalent siphon-type parts-cleaning spray gun capable of delivering 60 ml (2 ounces) per minute of liquid when driven with 552 to 621 kPa (80 to 90 psi) of compressed air. Insert nozzle of spray gun through heater core opening and insert siphon hose into container of disinfectant. Direct spray toward evaporator face taking extra care to ensure adequate coverage of the corners and edges, completely saturating the entire core. Use entire container of solution.
12. Turn ignition switch to the "OFF" position and allow core to soak for five minutes.
13. Check underneath vehicle to verify proper drain operation. If necessary, unclog and increase drain plug hole with a rat-tail file.
14. Turn the ignition switch to the "RUN" position but do not start vehicle.
15. Thoroughly rinse evaporator core with one liter (one quart) of clean water using spray gun to remove any disinfectant residue.
16. Turn ignition switch to the "OFF" position and install heater core assembly. Refer to SECTION 1A.
17. Dispose of disinfectant and rinse water runoff collected in drain pan in an approved manner.

ON-VEHICLE SERVICE

REFRIGERATION SYSTEM SERVICES

Replacing O-Rings

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 Refrigerant-134a may occur. Refer to the part number for identification, not to the former color-coating method of identification, because some formerly color-coated service replacement O-rings may be black.

Air conditioning O-rings should be coated with mineral base 525 viscosity refrigerant oil just before installation and should be slipped onto the flange tube to assure proper locating and sealing. To prevent the possibility of

swelling and a reduction in sealing effectiveness, O-rings should not be allowed to soak in refrigerant oil. Before installation, the 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 or excessive refrigerant leakage may result.

Handling Refrigerant-134a

The air conditioning system in this vehicle contains Refrigerant-134a (R-134a). This chemical mixture requires special handling procedures to avoid personal injury.

Always wear goggles and wrap a clean cloth around fittings, valves, and connections when performing work that involves opening the refrigerant system. Always work in a well ventilated area and avoid breathing any refrigerant fumes. Do not weld or steam clean on or near any vehicle-installed air conditioning lines or components.

If R-134a should come in contact with any part of the body, flush the exposed area with water and immediately seek medical attention.

CAUTION: Avoid breathing A/C refrigerant 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 or SAE J2209. If accidental system discharge occurs, ventilate work area before resuming service. Additional health and safety information may be obtained from refrigerant and lubricant manufacturers.

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

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.

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

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

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. Only containers that meet DOT SPEC 4BA or 4BW should be used.

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.

Use only polyalkylene glycol (PAG) synthetic refrigerant oil for internal circulation through the R-134a A/C system and only mineral base 525 viscosity refrigerant oil on fitting threads and O-rings. If lubricants other than those specified are used,

compressor failure and/or fitting seizure is likely to occur.

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

Before attempting any service which requires opening refrigeration system lines or components, refer to "Handling of Refrigerant Lines and Fittings" and "Maintaining Chemical Stability" that follow. Carefully follow the instructions for refrigerant recovery and recycling, adding oil, evacuating, and recharging the refrigeration system.

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 of the container to continue protection.

Handling Refrigerant Lines and Fittings

CAUTION: For personal protection, goggles should be worn and a clean cloth wrapped around fittings, valves and connections when doing work that includes opening the refrigeration system. If Refrigerant-134a comes in contact with any part of the body, severe frostbite and personal injury can result. The exposed area should be flushed immediately with cold water and prompt medical help should be obtained.

- All metal tubing lines should be free of dents or kinks to prevent loss of system capacity due to line restriction.
- The flexible hose lines should never be bent to a radius of less than four times the diameter of the hose.
- The flexible hose lines should never be allowed to come within a distance of 63.5 mm (2 1/2 inches) of the exhaust manifold.
- Flexible hose lines should be inspected regularly for leaks or brittleness and replaced with new lines if deterioration or leaking is found.
- When disconnecting any fitting in the refrigeration system, the system must first be discharged of all Refrigerant-134a. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" in this section.
- Once a refrigerant line is opened to the atmosphere, it should be capped or taped immediately to prevent entry of moisture and dirt.
- The use of the proper wrenches when making connections on O-ring fittings is important. The opposing fitting should always be backed up with a wrench to prevent distortion of connecting lines or components. Tighten all tubing connections to the specified torque for the fitting. Too little or too much torque when tightening can result in loose joints or deformed joint parts. Either condition can result in refrigerant leakage and an inoperative air condition-

ing system. Refer to "Fitting Tightening Specifications" at the end of this section.

- O-rings and seals must be in perfect condition. A burr or piece of dirt may cause a refrigerant leak. Install new O-rings that have been lubricated with mineral base 525 viscosity refrigerant oil. Do not use PAG oil.
- Keep polyalkylene glycol (PAG) refrigerant oil off fitting threads. Long term contact of PAG oil on threads may cause future disassembly difficulties. Flush threads of fittings with mineral base 525 viscosity refrigerant oil. Do not use PAG oil. Do not wipe threads with a cloth.

Maintaining Chemical Stability in the Refrigeration System

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

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

- Before breaking a refrigerant connection, wipe away any dirt or oil to reduce 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 entry of dirt, foreign material and moisture.
- Keep tools clean and dry. This includes the manifold gage set and replacement parts.
- When adding polyalkylene glycol (PAG) synthetic refrigerant oil, the transfer device and container should be exceptionally clean and dry to assure that refrigerant oil remains as moisture-free as possible.
- When it is necessary to "open" an A/C system, have everything needed ready and handy so that as little time as possible will be required to perform the operation. Do not leave the A/C system open any longer than is necessary.
- Any time the A/C system has been "opened," it should be properly evacuated before recharging with Refrigerant-134a.
- All service parts are dehydrated and sealed prior to shipping. They should remain sealed until just prior to making connections. All parts should be at room temperature before uncapping. This prevents condensation of moisture from the air entering the system. If for any reason caps are removed but the connections are not made, parts should be resealed as soon as possible.

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

General Description

Figure 6

The J 39500 air conditioning refrigerant recovery, recycling and recharging (ACR⁴) system 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 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. Do not attempt to use one set of equipment for both R-12 and R-134a, as all equipment contains residual amounts of refrigerant and/or lubricant, which will result in contamination, and damage to the recovery/recycle equipment. Adaptors to convert from one size fitting to the other must never be used; refrigerant/lubricant contamination will occur and system failure may result.

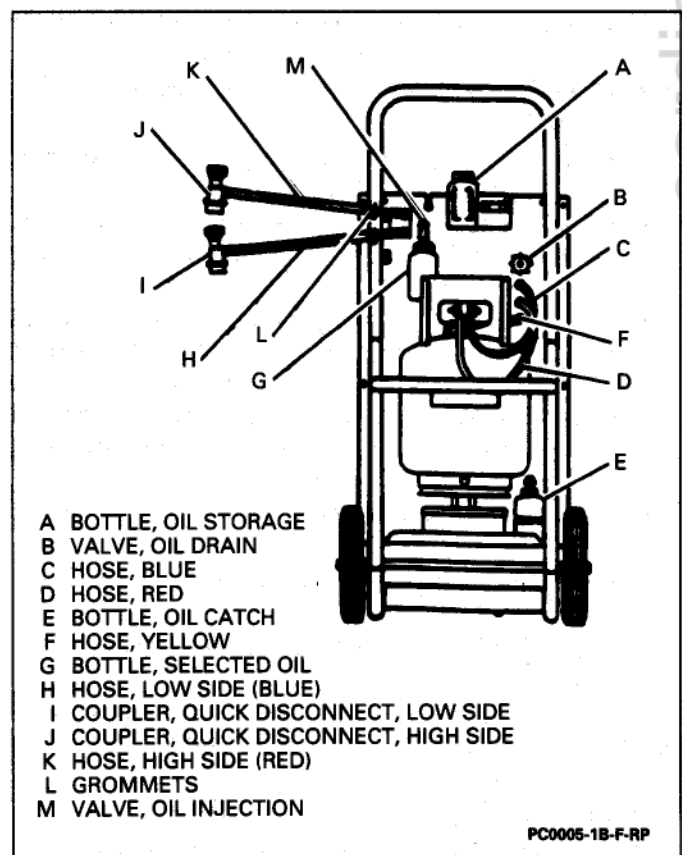


Figure 6 – Complete Operational Setup

Station (ACR⁴) Setup and Maintenance

Initial Setup

Refer to the manufacturer instructions for all initial setup procedures.

Operation Setup

Figure 6

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.

CAUTION: Use only authorized 23 kg (50-pound) refillable refrigerant tanks (J 39500-50). Use of other tanks could cause personal injury and void the warranty.

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 as severe system failure will result.

Connect high-side (red) and low-side (blue) hoses to the ACR⁴ unit. Be sure to route hoses through hose reel bracket grommets.

Control Panel Functions

Figures 7 and 8

This section explains the functions of the various components of the unit control panel (Figure 7).

- **Main Power Switch** – supplies electrical power to the control panel.
- **Beeper** – emits an audible tone to alert the operator to unit operating functions.
- **Digital Display** – shows the time programmed for vacuum and the weight of refrigerant programmed for recharging.
- **Low-Side Manifold Gage** – when connected to an A/C system, this gage shows the system low-side pressure.
- **High-Side Manifold Gage** – when connected to an A/C system, this gage shows the system high-side pressure.
- **Moisture Indicator** – shows if the refrigerant is wet or dry.
- **Low-Side Valve** – connects the low side of the A/C system to the unit.
- **High-Side Valve** – connects the high side of the A/C system to the unit.

In addition to the number keys, the control panel contains special keys that accomplish specific operating functions (Figure 8).

- **RECYCLE** – activates the recycling sequence.
- **RECOVER** – activates the recovery sequence.
- **SHIFT/RESET** – activates “shifted” position of keys on the keypad and resets the program mode.

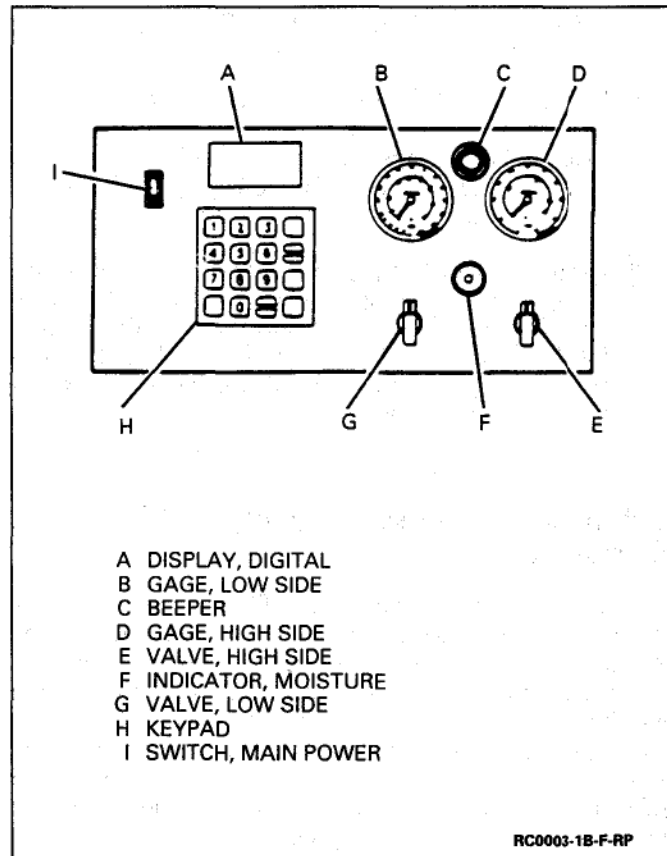


Figure 7 – Control Panel

- **FILTER** – automatically recovers and evacuates to 57 kPa (17 inches Hg) vacuum from the filter and low side of the unit.
- **CHG** – automatically charges the A/C system with the programmed amount of refrigerant.
- **HOLD/CONT** – interrupts the automatic cycle in the “HOLD” position, and then resumes functions in the “CONT” position. Press this button once for “HOLD” and again for “CONT.”
- **VACUUM** – activates the vacuum and automatic recycling sequence.
- **ENTER** – enters programmed data into the unit control memory.

Digital Display Functions

For information regarding the functions of the digital display, refer to the manufacturer instructions.

Maintenance

Refer to manufacturer instructions for all maintenance procedures.

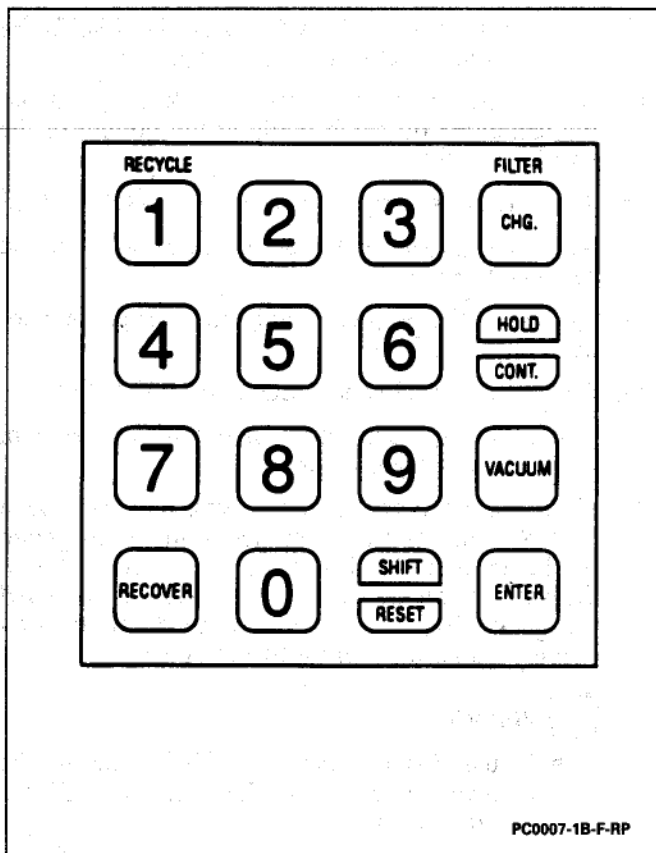


Figure 8 – Keypad Functions

Refrigerant Recovery

Figures 6 through 9

Tools Required:

J 39500 Air Conditioning Refrigerant Recovery, Recycling and Recharging (ACR⁴) System
J39500 50 lb. Refillable Recovery Tank

Important

- Use only the 23 kg (50-pound) unit refrigerant tank (J 39500-50) designed for the ACR⁴. The unit overfill limitation mechanism has been calibrated specifically for use with this tank, and the tank valving is set up specifically for use with the unit.

- Connect battery charger to vehicle battery assembly to prevent battery assembly drain.

1. Attach the high-side (red) hose with the quick disconnect coupler to the high-side refrigerant service valve fitting of the vehicle A/C system. This valve is located in the receiver dehydrator tube, between the receiver and dehydrator assembly and the condenser assembly. Open the coupler valve after attachment.
2. Attach the low-side (blue) hose with the quick disconnect coupler to the low-side refrigerant charge valve fitting of the vehicle A/C system. This valve is located in the compressor and condenser hose assembly, between the compressor assembly and the

thermostatic expansion valve assembly. Open the coupler valve after attachment.

3. Check the high-side and low-side gages on the unit control panel to be sure the A/C system has pressure. If there is no pressure, there is no refrigerant in the system to recover.

Important

- If there is no refrigerant in the A/C system, do not continue with the recovery operation. Air will be drawn into the recovery tank.
4. Open both the high-side and the low-side valves on the control panel (Figure 7).
 5. Open both the red "GAS" (vapor) and the blue "LIQUID" valves on the tank.
 6. Slowly open the oil drain valve to see if the oil separator contains oil (Figure 6).
 - If any oil drains into the catch bottle at the bottom of the unit, allow it to drain until there is no more oil in the separator.
 7. Close the oil drain valve.
 - Dispose of the oil in the catch bottle in an appropriate manner and return the bottle to its place on the unit.
 8. Plug the unit into the proper voltage outlet and turn on the "MAIN POWER" switch.
 9. Start engine and run for one minute with A/C system "ON" in order to stabilize system.
 10. Turn ignition switch "OFF," then back to "RUN," and blower motor assembly to "HIGH." A battery charger should be connected to prevent battery assembly drain.

Important

- Blower motor assembly setting to "HIGH" will increase the rate at which refrigerant can be recovered.
11. Press "RECOVER" on the keypad. Before recovery begins, the unit will clear itself of refrigerant. "CL-L" will appear on the display. The cleaning process takes from thirty seconds to three minutes to complete (Figure 9).

Important

- Maintain A/C blower motor assembly on "HIGH" during recovery operation.
12. When cleaning is complete. The unit will automatically start recovery, and the control panel display will show the unit is in the "RECOVER" mode of the "AUTOMATIC" cycle. Also, the weight of refrigerant being recovered will be displayed.
 13. The compressor shuts off automatically when initial recovery has occurred, at approximately 57 kPa (17 inches Hg) vacuum.

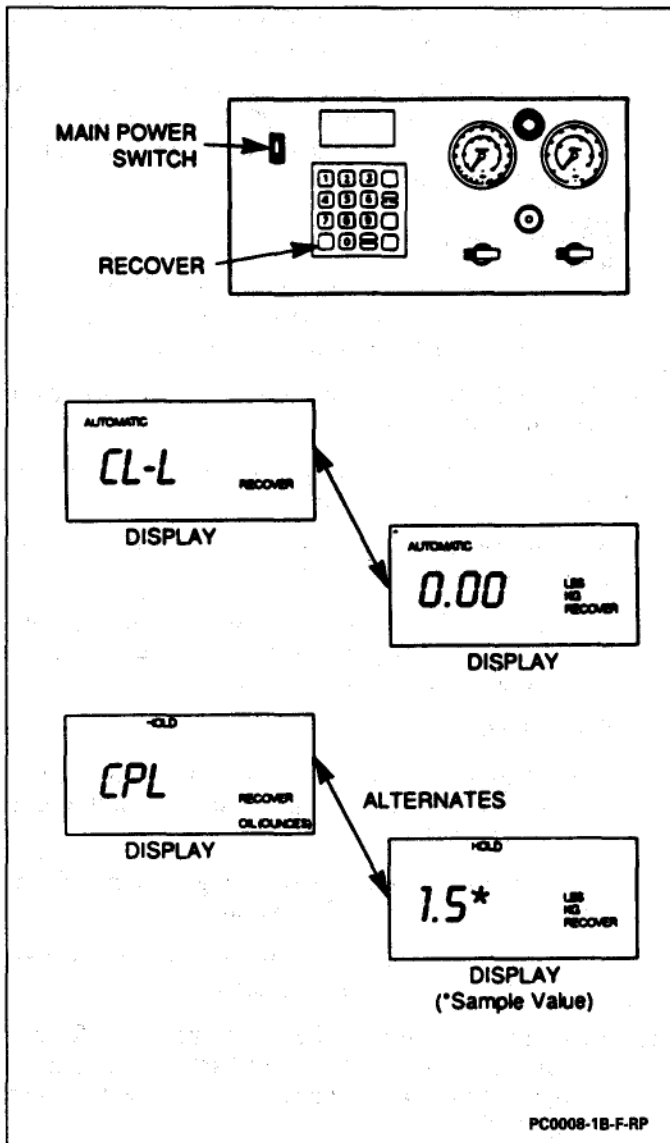


Figure 9 – Refrigerant Recovery

14. At the end of the initial recovery process, the display shows "CPL" and then alternately flashes the weight of refrigerant recovered and "OIL/OZ" ("OIL/GMS").

Important

- A small amount of A/C system lubricating oil polyalkylene glycol (PAG) might be removed with the refrigerant during recovery. The amount of oil removed (often there will be none) will vary greatly depending on a variety of conditions of the vehicle being serviced. The ACR⁴ separates the oil from the refrigerant.
- The "OIL/OZ" ("OIL/GMS") flashing is a reminder to always drain the recovered oil at this time. The same amount of oil must be

replaced in to the A/C system later when the system is recharged with refrigerant.

15. Slowly open the oil drain valve and drain the oil into the calibrated oil catch bottle at the bottom of the unit (Figure 6).
16. After the oil is completely drained, close the valve.
17. Read and record the amount of oil removed in the catch bottle.
18. Dispose of the recovered oil in an appropriate manner. Never reuse this oil.
19. Check the control panel "LOW-SIDE GAGE."
 - If the A/C system has maintained a vacuum, the recovery is complete.
20. If the "LOW-SIDE GAGE" pressure rises above "0," this indicates the presence of more refrigerant in the system. In this case, press the "HOLD/CONT" key on the keypad to recover the additional refrigerant. Repeat this step as needed until the system maintains vacuum for two minutes.

Important

- If the display flashes "FULL" during the recovery process, and the unit shuts off, the unit tank is full.
- An empty unit tank (J 39500-50) must be installed to accommodate additional refrigerant, before proceeding to the next step in the recovery operation. Do not use any other kind of tank.
- It is possible to lower the amount of refrigerant in the unit tank by charging other vehicles.

Evacuation

Figures 10 and 11

The ACR⁴ unit tank must contain sufficient R-134a refrigerant for A/C system charging. Check the amount of refrigerant in the tank by simultaneously pressing "RESET" and "ENTER" on the keypad to enter the diagnostic mode. Once in the diagnostic mode, press "7". When "7" is pressed, the ACR⁴ unit will display the amount of R-134a refrigerant available in the tank. If less than 3.6 kg (8 pounds) is displayed, add new refrigerant to the tank. Refer to the manufacturer's instructions for adding refrigerant.

1. With the high side and low side hoses connected to the vehicle A/C system, open both the high-side (red) and the low-side (blue) valves on the unit control panel.
2. Open both the red "GAS" (vapor) and the blue "LIQUID" valves on the tank.

Important

- To remove all the air and properly dry the A/C system, the unit automatically goes to a pre-programmed evacuation time.

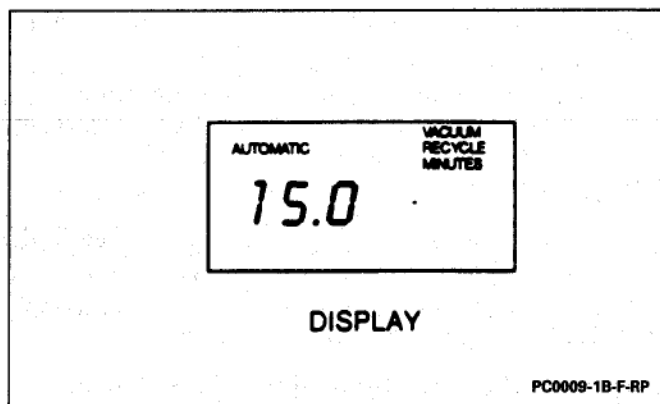


Figure 10 – System Evacuation (1 of 2)

- It is possible to evacuate longer. Press keys to enter time desired. New entry will show on the display. Press “ENTER,” the display will blink indicating input of data (Figure 10).
3. Press “VACUUM” to start the vacuum pump. The display counts down the vacuum time to zero to indicate operation time remaining. The display reads “RECYCLE” five seconds after the vacuum pump starts and continues while the process takes place.

Important

- Automatic refrigerant recycling during each evacuation is a feature of the ACR⁴ system. No action is required by the technician.
 - The control panel “MOISTURE INDICATOR” must be green during recycling verifying refrigerant moisture content is within specifications. Yellow indicates a set condition requiring a filter/drier cartridge change. See the manufacturer instructions for this procedure.
 - Non-condensable gases (mostly air) are automatically vented from the tank during the recycling process. An audible sound of pressure release may be heard as this happens. This is a normal function.
4. At approximately the 12-minute mark on the display (pump has run for three minutes), press “HOLD/CONT” key to stop vacuum pump (Figure 11).
 - A. A “0” vacuum reading indicates a major system leak. Repair leak and restart evacuation procedure.
 - B. If a vacuum reading of 91-101 kPa (27-30 inches of Hg) is indicated, close the low-side and high-side valves. Observe the vacuum level for a few minutes as a leak check of the A/C system. If vacuum is not maintained, find and repair the A/C system leak before continuing.
 - C. If a vacuum reading of 91-101 kPa (27-30 inches of Hg) is maintained, open the high-side and low-side valves and press the “HOLD/CONT” key to restart the vacuum pump.

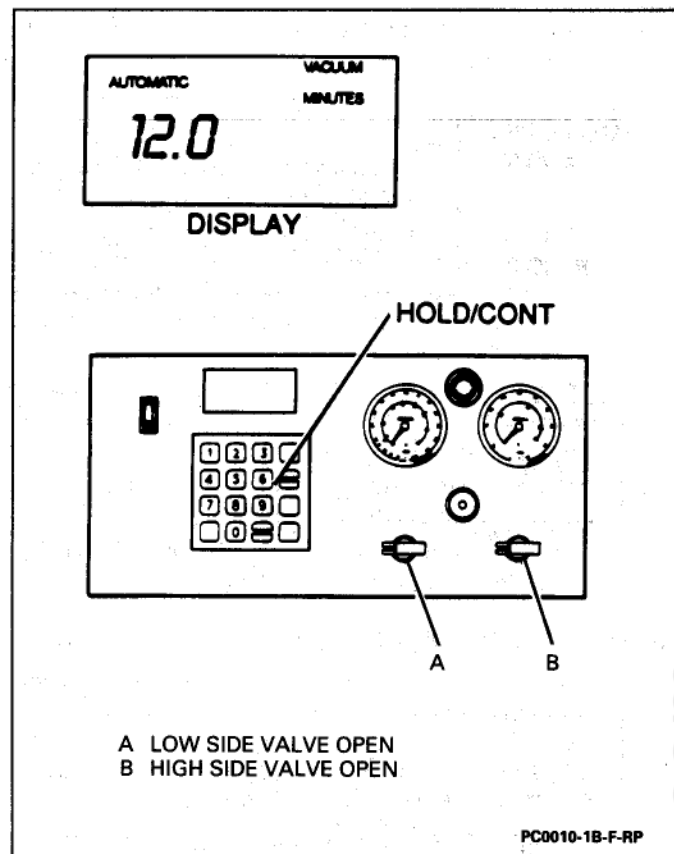


Figure 11 – System Evacuation (2 of 2)

5. When the vacuum sequence has run the programmed time, the display shows “CPL” to indicate that evacuation is complete.

Important

- The vacuum pump oil must be changed frequently.
- When the pump has run for a total time of ten hours, the message “OIL” will flash on the control panel display as a reminder to change the oil.
- If the “OIL” warning flashes during operation, press “CONT” and change the oil before the next operation. See the manufacturer instructions for this procedure.

A/C System Oil Charge Replenishing

If oil was removed from the AC system during the recovery process or due to component replacement, it must be replenished at this time. Refer to “Refrigerant Oil Distribution” that follows for proper oil capacities.

1. Select the graduated bottle of replenishing polyalkylene glycol (PAG) synthetic refrigerant oil (GM P/N 12345923 or equivalent).
2. Adjust the O-ring around the PAG oil bottle to the required oil charge level.

Example: If bottle oil level is at 4 ounces and 1/2 ounce of oil is required, adjust O-rings to 3 1/2 ounces as final level mark.

3. Install the bottle on the oil injection system on the back of the unit.

Important

- Keep the oil bottles tightly capped at all times to keep out moisture and contamination.
 - Do not open the oil injection valve while there is positive pressure in the A/C system. This will result in oil blow-back through the bottle vent. A/C system vacuum is required for this operation.
 - Never let the oil level drop below the pick-up tube while charging or replenishing. This will allow air into the A/C system.
4. Open the valve at the top of the plastic container and watch the level of oil being drawn into the system.
 5. Close the valve when the required oil charge has been pulled into the system.

Refrigerant Oil Distribution

Compressor systems require 240 ml (8 fluid ounces) of polyalkylene glycol (PAG) synthetic refrigerant oil (GM P/N 12345923 or equivalent). During component replacement and conditions stated, new oil quantities should be added to the system as follows:

- Compressor assembly replaced.
 - If less than 30 ml (1 fluid ounce) is drained, add 60 ml (2 fluid ounces).
 - If more than 30 ml (1 fluid ounce) is drained, add same amount.
- Receiver and dehydrator assembly replaced.
 - Add 30 ml (1 fluid ounce) more than what was drained from old receiver and dehydrator assembly.
- Evaporator replaced.
 - Add 90 ml (3 fluid ounces) oil.
- Condenser assembly replaced.
 - Add 30 ml (1 fluid ounce) oil.

Refrigerant Oil Loss Due to a Large Leak

If the refrigerant charge is abruptly lost due to a large refrigerant leak, approximately 90 ml (3 fluid ounces) of refrigerant oil will be carried out of the system suspended in the refrigerant. Any failure that caused an abrupt refrigerant discharge will experience this oil loss. Failures that allow the refrigerant to seep or bleed off over time do not experience this oil loss.

Upon replacement of a component which caused a large refrigerant leak, add 90 ml (3 fluid ounces) of new polyalkylene glycol (PAG) synthetic refrigerant oil (GM P/N 12345923 or equivalent) plus the required amount of oil for the particular component (as outlined above).

Add the oil directly to the replaced component if possible. If the oil cannot easily be added to the replaced part, add the oil to the receiver dehydrator assembly.

The normal blue tint of the PAG oil may not be seen once the vehicle's A/C system has been run. Be sure to use the GM-approved PAG oil for this system.

Compressor System

Up to 120 ml (4 fluid ounces) of oil can collect in the crankcase. Therefore, it is important when replacing a compressor assembly that the oil in the old compressor crankcase be drained and measured (discard the oil after recording the amount).

All replacement compressor assemblies will be shipped with approximately 240 ml (8 fluid ounces) of oil in the crankcase. The oil must be drained and retained. Then replace the oil in the same amount as previously recorded from the old compressor assembly.

Charging the A/C System (Engine Off)

Figures 6, 12 and 13

Important

- The A/C system must be evacuated prior to charging.
 - Check that the "LB/KG" switch on the back of the unit to be sure it is set for the desired units of weight system (operate switch with main power "OFF").
1. Close the low-side valve on the control panel.
 2. Open the high-side valve on the control panel.
 3. Press "CHG" on the keypad to be sure the unit is in the program mode.
 4. Enter the amount of refrigerant charge to charge the A/C system by pressing the appropriate number keys. Be sure to use correct unit of weight (pounds or Kg).

Important

- Charge A/C system with amounts of R-134a specified. Do not overcharge.
 - Charge A/C system (C60) with 0.91 kg (2.0 pounds).
5. Press "ENTER."
 - A blink of the display indicates the charge amount is in the unit memory.
 6. Press "CHG" on the keyboard to begin the charging process.
 7. The display shows "AUTOMATIC" and the amount of refrigerant programmed for charging.
 - The display counts down to zero as the charging process proceeds.
 - At the end of the process, the display shows "CPL."

Important

- If the transfer of refrigerant stops before complete, refer to "Unsuccessful Transfer" that follows.

Successful Transfer Complete

1. Close the high-side valve on the unit control panel (both valves should now be closed).
2. Start the vehicle and the A/C system and let run until the readings on the high-side and low-side gages sta-

bilize. Compare readings, outlet temperatures and ambient temperature and humidity to the "Air Conditioning Performance Chart" in SECTION 1B1.

3. With the A/C system running, close the high-side coupler valve and disconnect the high-side (red) hose from the vehicle.
4. Open both the high-side and low-side valves on the control panel.
5. Refrigerant from both hoses will be drawn quickly into the A/C system through the low-side (blue) hose.
6. Close the low-side coupler valve and disconnect from the vehicle.

Unsuccessful Transfer

On rare occasions, the total charge does not transfer to the vehicle A/C system. There are two reasons why this can occur.

1. If the transfer is too slow because the pressure in the unit tank and the vehicle A/C system are about the

same, the unit will emit an audible signal and the display shows the weight remaining for transfer. In this case:

- A. Close the high-side valve (Figure 13).
 - B. Open the low-side valve.
 - C. Start the vehicle A/C system, and press "HOLD/CONT" on the keyboard. This will put the remainder of the charge into the A/C system.
 - D. Continue with the previous procedure, "Successful Transfer Complete."
2. If the transfer will not complete and the display shows "CHECK REFRIGERANT," there is not enough refrigerant in the tank to complete the process. This condition requires the recovery of the partial charge of refrigerant in the vehicle A/C system and another complete evacuation and charge procedure.
 - A. Press "HOLD/CONT" on the keypad to interrupt the cycle.
 - B. Press "RESET" to reset the unit.
 - C. Recover the refrigerant that has been charged into the system, refer to "Refrigerant Recovery" in this section.
 3. Add refrigerant to the tank following the manufacturer instructions, and refer to "Evacuation" in this section.

REPLACEMENT PROCEDURES

CAUTION: For personal protection, goggles should be worn and a clean cloth wrapped around fittings, valves and connections when doing work that includes opening the refrigeration system. If Refrigerant-134a comes in contact with any part of the body, severe frostbite and personal injury can result. The exposed area should be flushed immediately with cold water and prompt medical help should be obtained.

NOTICE: Tighten all tubing connections to the specified torque for the fitting. Too little or too much torque when tightening can result in loose joints or deformed joint parts. Either condition can result in refrigerant leakage and an inoperative air conditioning system. Refer to "Fitting Tightening Specifications" at the end of this section.

Air Conditioning Compressor and Condenser Hose Assembly

Figures 1, 2 and 14

Remove or Disconnect

1. Recover refrigerant. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" in this section.
2. Strap (34) from compressor and condenser hose assembly (7).

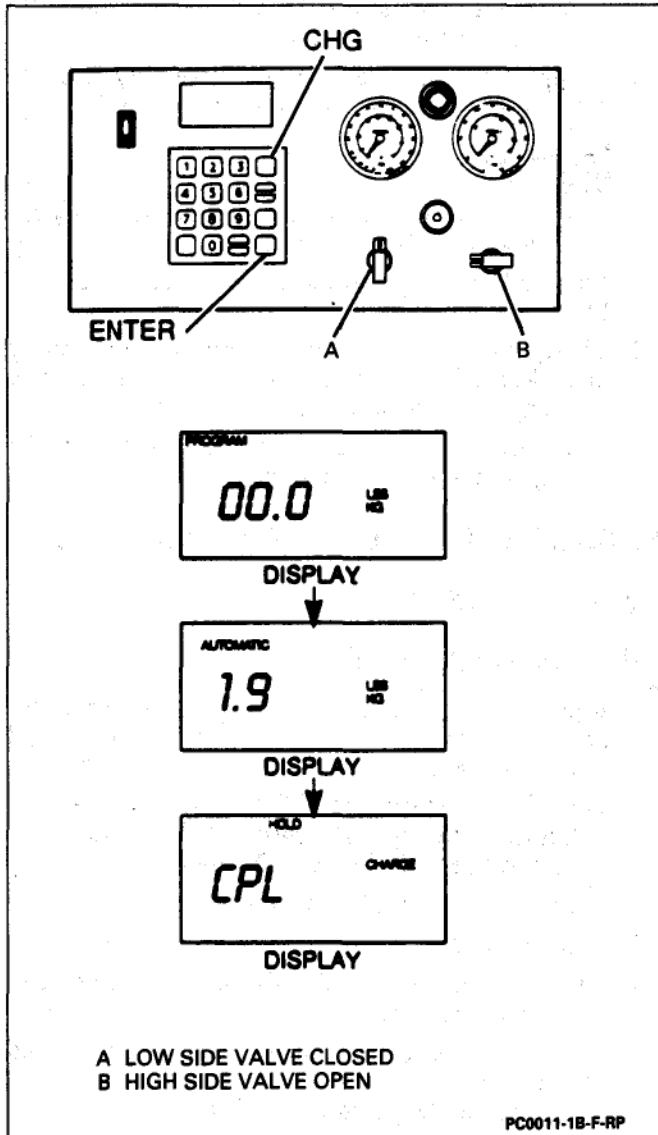


Figure 12 – System Charging (1 of 2)

3. Compressor and condenser hose assembly fitting at thermostatic expansion valve assembly (6).
 - Discard seal (16).
4. Raise and suitably support vehicle. Refer to SECTION 0A.
5. Compressor and condenser hose assembly fitting at condenser assembly (3).
 - Use a back-up wrench to hold condenser assembly fitting while loosening compressor and condenser hose assembly fitting.
 - Discard O-ring (17).
6. Bolt/screw (30).
7. Compressor assembly. Refer to "Air Conditioning Compressor Assembly" in this section.
8. Compressor and condenser hose assembly (7).
 - Discard seals (18).

Install or Connect

NOTICE: See "Notice" on page 1B-1 of this section.

1. Clean fittings with mineral base 525 viscosity refrigerant oil.
 - Do not allow refrigerant oil to enter A/C system.
2. Seals (18) to compressor and condenser hose assembly (7).
 - Lightly coat seals (18) with mineral base 525 viscosity refrigerant oil.

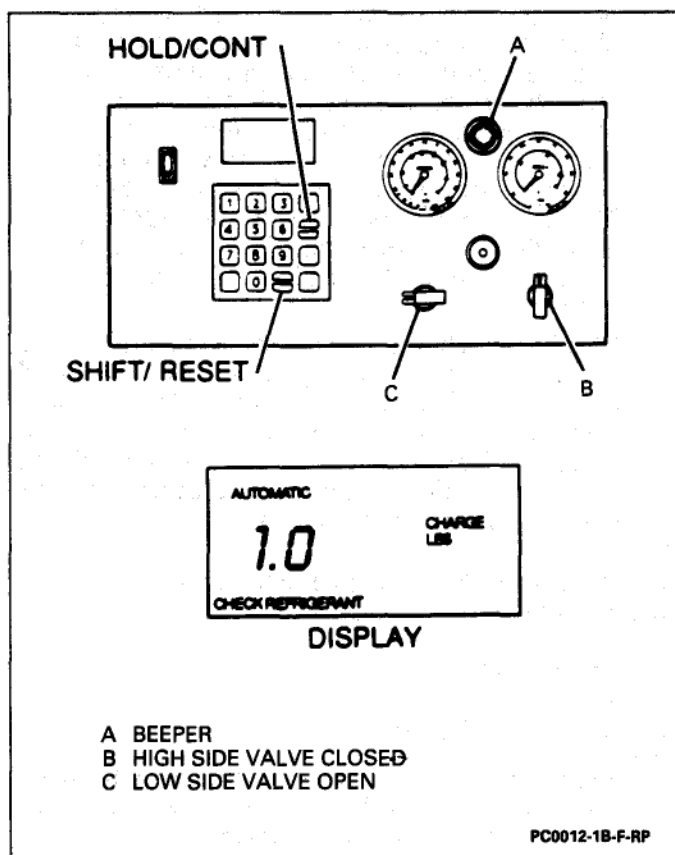


Figure 13 – System Charging (2 of 2)

3. Compressor and condenser hose assembly (7) into position.
4. Compressor assembly. Refer to "Air Conditioning Compressor Assembly" in this section.
5. O-ring (17) to compressor and condenser hose assembly (7).
6. Compressor and condenser hose assembly fitting to condenser assembly (3).

Tighten

- Compressor and condenser hose assembly fitting to 27 N•m (20 lb. ft.).
7. Bolt/screw (30).

Tighten

- Bolt/screw (30) to 10 N•m (89 lb. in.).
8. Lower vehicle.
 9. Seal (16) to compressor and condenser hose assembly fitting.
 - Lightly coat seal (16) with mineral base 525 viscosity refrigerant oil.
 10. Compressor and condenser hose assembly fitting to thermostatic expansion valve assembly (6).

Tighten

- Compressor and condenser hose assembly fitting to 37 N•m (27 lb. ft.).
11. Strap (34) to compressor and condenser hose assembly (7).
 12. Charge A/C system. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" in this section.
 13. Leak-test fittings. Refer to "Leak-Testing the Refrigeration System" in this section.

Air Conditioning Receiver Dehydrator Tube

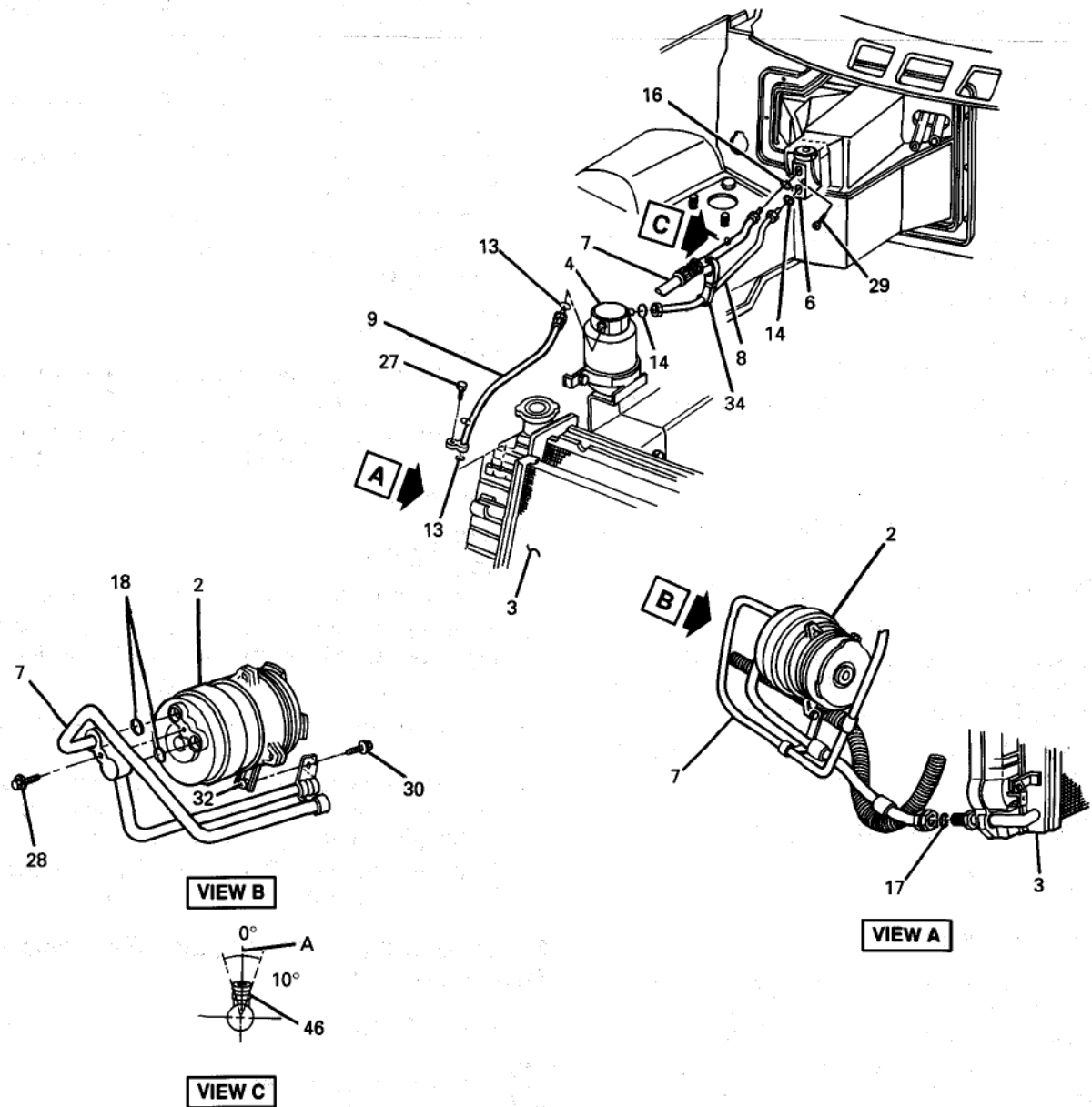
Figures 1, 2 and 14

Remove or Disconnect

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

CAUTION: Refer to "Caution" under "Disconnecting the Battery Negative Cable Assembly" in SECTION 0A.

2. Battery negative cable assembly.
3. Bolt/screw (27).
4. Receiver dehydrator tube fitting at receiver and dehydrator assembly (4).
 - Use a back-up wrench to hold receiver and dehydrator assembly port while loosening receiver dehydrator tube fitting.
5. Receiver dehydrator tube (9).
 - Discard O-rings (13).



- A** VERTICAL REFERENCE LINE
2 COMPRESSOR ASSEMBLY, AIR CONDITIONING
3 CONDENSER ASSEMBLY, AIR CONDITIONING
4 RECEIVER DEHYDRATOR ASSEMBLY, AIR CONDITIONING
6 VALVE ASSEMBLY, AIR CONDITIONING THERMOSTATIC EXPANSION
7 HOSE ASSEMBLY, AIR CONDITIONING COMPRESSOR AND CONDENSER
8 TUBE, AIR CONDITIONING EVAPORATOR
9 TUBE ASSEMBLY, AIR CONDITIONING RECEIVER DEHYDRATOR
13 O-RING, AIR CONDITIONING RECEIVER DEHYDRATOR TUBE
14 O-RING, AIR CONDITIONING EVAPORATOR TUBE
16 SEAL, AIR CONDITIONING COMPRESSOR AND CONDENSER HOSE

- 17** O-RING, AIR CONDITIONING CONDENSER FITTING
18 SEAL, AIR CONDITIONING HOSE
27 BOLT/SCREW, AIR CONDITIONING RECEIVER DEHYDRATOR TUBE
28 BOLT/SCREW, AIR CONDITIONING COMPRESSOR AND CONDENSER HOSE
29 BOLT/SCREW, AIR CONDITIONING THERMOSTATIC EXPANSION VALVE
30 BOLT/SCREW, AIR CONDITIONING COMPRESSOR AND CONDENSER HOSE CLIP BRACKET
32 BRACKET, AIR CONDITIONING COMPRESSOR AND CONDENSER HOSE CLIP
34 STRAP, AIR CONDITIONING COMPRESSOR AND CONDENSER HOSE
46 VALVE, AIR CONDITIONING REFRIGERANT CHARGE

PC0013-1B-F-RP

Figure 14 - Refrigerant Lines and Hoses

Install or Connect

NOTICE: See "Notice" on page 1B-1 of this section.

1. Clean fittings with mineral base 525 viscosity refrigerant oil.
 - Do not allow refrigerant oil to enter A/C system.
2. O-rings (13) to receiver dehydrator tube (9).
 - Lightly coat O-rings (13) with mineral base 525 viscosity refrigerant oil.
3. Receiver dehydrator tube (9).
4. Bolt/screw (27).
 - Do not tighten at this time.
5. Receiver dehydrator tube fitting to receiver and dehydrator assembly (4).

Tighten

- Receiver dehydrator tube fitting to 27 N•m (20 lb. ft.).
 - Bolt/screw (27) to 16 N•m (12 lb. ft.).
6. Battery negative cable assembly.
 7. Charge A/C system. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" in this section.
 8. Leak-test fittings. Refer to "Leak-Testing the Refrigeration System" in this section.

Air Conditioning Evaporator Tube**Figures 1, 2 and 14****Remove or Disconnect**

1. Recover refrigerant. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" in this section.
2. Electrical connector at refrigerant pressure sensor assembly (22).
3. Strap (34) from evaporator tube (8).
4. Receiver dehydrator tube. Refer to "Air Conditioning Receiver Dehydrator Tube" in this section.
5. Bolt/screw (12).
6. Evaporator tube fitting at receiver and dehydrator assembly (4).
 - Use a back-up wrench to hold receiver and dehydrator assembly port while loosening evaporator tube fitting.
7. Evaporator tube fitting at thermostatic expansion valve assembly (6).
8. Evaporator tube (8).
 - Discard O-rings (14).

Install or Connect

NOTICE: See "Notice" on page 1B-1 of this section.

1. Clean evaporator tube fittings with mineral base 525 viscosity refrigerant oil.
 - Do not allow refrigerant oil to enter evaporator tube (8).
2. O-rings to evaporator tube (8).
 - Lightly coat O-rings with mineral base 525 viscosity refrigerant oil.
3. Evaporator tube fitting at thermostatic expansion valve assembly (6).
 - Do not tighten at this time.
4. Evaporator tube fitting at receiver and dehydrator assembly (4).

Tighten

- Evaporator tube fitting at receiver and dehydrator assembly (4) to 7 N•m (62 lb. in.).
 - Evaporator tube fitting at thermostatic expansion valve assembly (6) to 18 N•m (13 lb. ft.).
5. Bolt/screw (12).

Tighten

- Bolt/screw (12) to 14 N•m (10 lb. ft.).
6. Receiver dehydrator tube. Refer to "Air Conditioning Receiver Dehydrator Tube" in this section.
 7. Strap (34) to evaporator tube (8).
 8. Electrical connector at refrigerant pressure sensor (22).
 9. Charge A/C system. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" in this section.
 10. Leak-test fittings. Refer to "Leak-Testing the Refrigeration System" in this section.

Air Conditioning Thermostatic Expansion Valve Assembly**Figures 1, 2 and 14****Remove or Disconnect**

1. Recover refrigerant. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" in this section.
2. Evaporator tube. Refer to "Air Conditioning Evaporator Tube" in this section.
3. Compressor and condenser hose assembly fitting at thermostatic expansion valve assembly (6).
 - Discard seal (16).
4. Bolts/screws (29).
5. Thermostatic expansion valve assembly (6).
6. Seals (15) from evaporator (5).
 - Discard seals (15).

Install or Connect

NOTICE: See "Notice" on page 1B-1 of this section.

1. Seals (15) to evaporator (5).

- Lightly coat seals with mineral base 525 viscosity refrigerant oil.
- 2. Thermostatic expansion valve assembly (6).
- 3. Bolts/screws (29).

**Tighten**

- Bolts/screws (29) to 7 N•m (62 lb. in.).
- 4. Clean compressor and condenser hose assembly fitting with mineral base 525 viscosity refrigerant oil.
 - Do not allow refrigerant oil to enter A/C system.
- 5. Seal (16) to compressor and condenser hose assembly (7).
 - Lightly coat seal with mineral base 525 viscosity refrigerant oil.
- 6. Compressor and condenser hose assembly fitting to thermostatic expansion valve assembly (6).

**Tighten**

- Compressor and condenser hose assembly fitting to 37 N•m (27 lb. ft.).
- 7. Evaporator tube. Refer to "Air Conditioning Evaporator Tube" in this section.
- 8. Charge A/C system. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" in this section.
- 9. Leak-test fittings. Refer to "Leak-Testing the Refrigeration System" in this section.

Air Conditioning Receiver and Dehydrator Assembly

Figures 1, 2 and 14

**Remove or Disconnect**

CAUTION: Refer to "Caution" under "Disconnecting the Battery Negative Cable Assembly" in SECTION 0A.

1. Battery negative cable assembly.
2. Recover refrigerant. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" in this section.
3. Bolt/screw (27).
4. Receiver dehydrator tube fitting at receiver and dehydrator assembly (4).
 - Use a back-up wrench to hold receiver and dehydrator assembly port while loosening receiver dehydrator tube fitting.
5. Receiver dehydrator tube (9).
 - Discard O-rings (13).
6. Bolt/screw (11) at receiver dehydrator bracket clamp.

7. Evaporator tube fitting at receiver and dehydrator assembly (4).

- Use a back-up wrench to hold receiver and dehydrator assembly port while loosening evaporator tube fitting.
- 8. Receiver and dehydrator assembly (4) from bracket (10).
 - Discard O-ring (14).

**Install or Connect**

NOTICE: See "Notice" on page 1B-1 of this section.

1. If receiver and dehydrator assembly is being replaced, drain and measure amount of PAG oil in old receiver and dehydrator assembly. Add the drained amount plus 30 ml (1 fluid ounce) more of new PAG oil to new receiver and dehydrator assembly.
2. Receiver and dehydrator assembly (4) to bracket (10).
3. Clean fittings with mineral base 525 viscosity refrigerant oil.
 - Do not allow refrigerant oil to enter A/C system.
4. O-ring (14) to evaporator tube (8).
 - Lightly coat O-ring (14) with mineral base 525 viscosity refrigerant oil.
5. Evaporator tube fitting to receiver and dehydrator assembly (4).

**Tighten**

- Evaporator tube fitting to 7 N•m (62 lb. in.).
- 6. Bolt/screw (11) at receiver dehydrator bracket clamp.

**Tighten**

- Bolt/screw (11) to 9 N•m (80 lb. in.).
- 7. O-rings (13) to receiver dehydrator tube (9).
- 8. Receiver dehydrator tube (9).
- 9. Bolt/screw (27).
 - Do not tighten at this time.
- 10. Receiver dehydrator tube fitting to receiver and dehydrator assembly (4).

**Tighten**

- Receiver dehydrator tube fitting to 27 N•m (20 lb. ft.).
- Bolt/screw (27) to 16 N•m (12 lb. ft.).
- 11. Battery negative cable assembly.
- 12. Charge A/C system. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" in this section.

13. Leak-test fittings. Refer to "Leak-Testing the Refrigeration System" in this section.

Air Conditioning Condenser Assembly

Figures 1, 2, 14 and 15

Remove or Disconnect

1. Recover refrigerant. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" in this section.
2. Air intake duct. Refer to SECTION 6E3.
3. Air cleaner assembly. Refer to SECTION 6E3.
4. Upper radiator shroud assembly. Refer to SECTION 6B.
5. Raise and suitably support vehicle. Refer to SECTION 0A.
6. Hose assembly (7) at condenser assembly (3).
 - Discard O-ring (17).
7. Lower vehicle.
8. Receiver dehydrator tube. Refer to "Air Conditioning Receiver Dehydrator Tube" in this section.
9. Radiator air upper baffle from condenser assembly, if necessary. Refer to SECTION 6B.
10. Condenser assembly (3) from radiator assembly (47).
 - Disconnect retaining tangs from grooves.

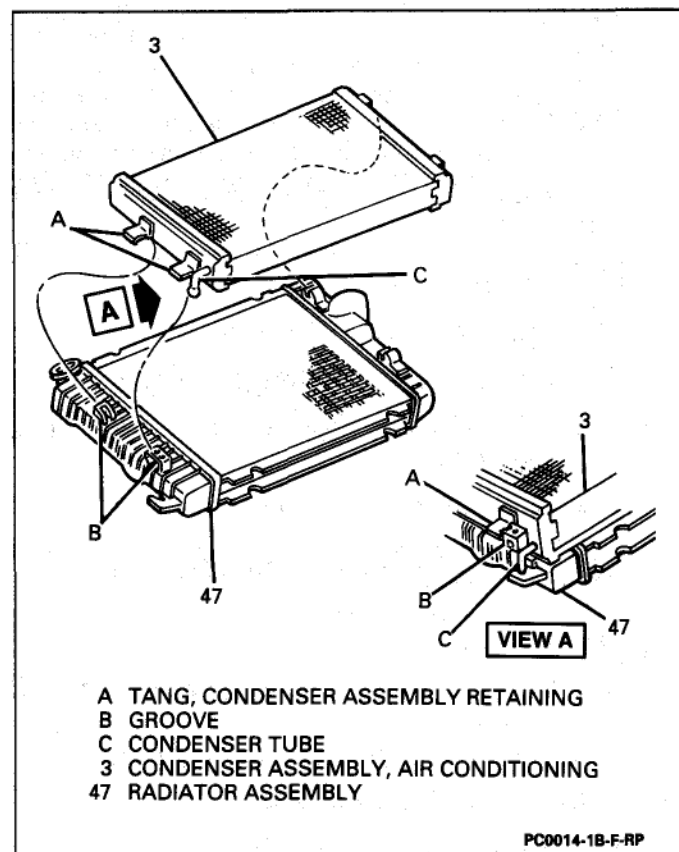


Figure 15 - Condenser Assembly

Install or Connect

NOTICE: See "Notice" on page 1B-1 of this section.

1. Condenser assembly (3) to radiator assembly (47).
 - Retaining tangs must be fully seated in grooves (Figure 15).

Important

- If a retaining tang finger breaks, reinstall the finger by drilling a small hole into the existing tab and use appropriate screw to fasten finger to the tab. Make sure not to puncture radiator coolant tank when doing this procedure.
2. Radiator air upper baffle to condenser assembly, if removed. Refer to SECTION 6B.
 3. Receiver dehydrator tube. Refer to "Air Conditioning Receiver Dehydrator Tube" in this section.
 4. Raise and suitably support vehicle. Refer to SECTION 0A.
 5. Clean hose assembly fitting and condenser assembly fitting with mineral base 525 viscosity refrigerant oil.
 - Do not allow refrigerant oil to enter A/C system.
 6. O-ring (17) to hose assembly (7).
 - Lightly coat O-ring with mineral base 525 viscosity refrigerant oil.
 7. Hose assembly (7) to condenser assembly (3).

Tighten

- Hose assembly fitting to 27 N•m (20 lb. ft.).
8. Lower vehicle.
 9. Upper radiator shroud assembly. Refer to SECTION 6B.
 10. Air cleaner assembly. Refer to SECTION 6E3.
 11. Air intake duct. Refer to SECTION 6E3.
 12. Charge A/C system. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" in this section.
 13. Leak-test fittings. Refer to "Leak-Testing the Refrigeration System" in this section.

Air Conditioning Compressor Assembly

Figures 1, 2, 16 and 17

Remove or Disconnect

1. Recover refrigerant. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" in this section.
2. Raise and suitably support vehicle. Refer to SECTION 0A.
3. Serpentine drive belt. Refer to SECTION 6A2A (3.4L L32 engine) or SECTION 6A3A (5.7L LT1 engine).

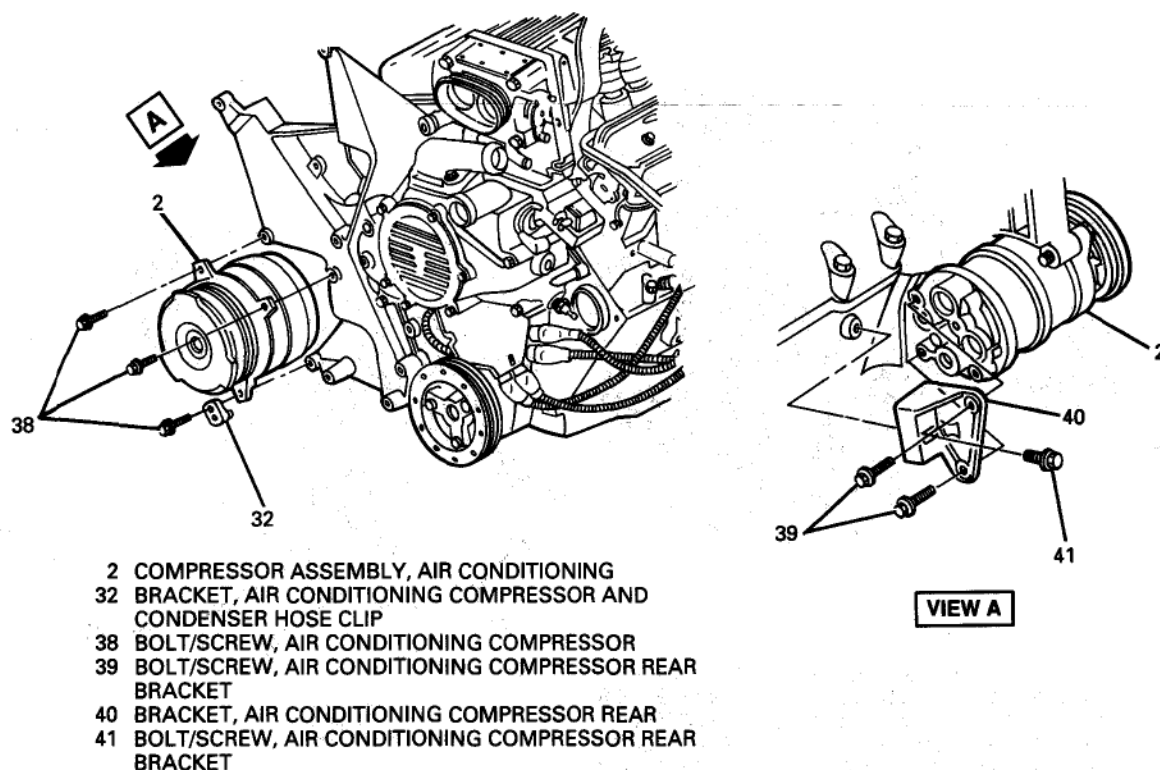


Figure 16 – Air Conditioning Compressor Assembly Mounting and Bracket (5.7L LT1 Engine)

4. Drive belt tensioner assembly, 5.7L LT1 engine only. Refer to SECTION 6A3A.
5. Bolt/screw (30).
6. Bolt/screw (28).
7. Hose assembly (7) from compressor assembly (2).
 - Discard seals (18).
8. Lower transmission oil cooler pipe assembly at radiator assembly. Refer to SECTION 7A.
9. Electrical connector at compressor assembly (2).
10. Bolt/screw (41) on 5.7L LT1 engine only.
11. Bolts/screws (45) on 3.4L L32 engine only.
12. Bolts/screws (38).
13. Compressor assembly (2).
14. Bolts/screws (44) and support (43) on 3.4L L32 engine only, if necessary.
15. Bolts/screws (39) and bracket (40) on 5.7L LT1 engine only, if necessary.

Install or Connect

NOTICE: See “Notice” on page 1B-1 of this section.

1. Polyalkaline glycol (PAG) refrigerant oil.
 - If compressor assembly (2) is being replaced, drain refrigerant oil from both defective compressor and new replacement compressor. Measure amount removed from defective com-

pressor. If measured amount is less than 30 ml (1 fluid ounce), add 60 ml (2 fluid ounces) to new replacement compressor. If more than 30 ml (1 fluid ounce) is drained from defective compressor add same amount to new compressor. Use PAG refrigerant oil GM P/N 12345923 or equivalent.

2. Bracket (40) and bolts/screws (39) on 5.7L LT1 engine only, if removed.

Tighten

- Bolts/screws (39) to 25 N•m (18 lb. ft.).
3. Support (43) and bolts/screws (44) on 3.4L L32 engine only, if removed.

Tighten

- Bolts/screws (44) to 25 N•m (18 lb. ft.).
4. Compressor assembly (2).
 5. Bolts/screws (38).

Tighten

- Bolts/screws (38) to 50 N•m (37 lb. ft.).
6. Bolts/screws (45) on 3.4L L32 engine only.

Tighten

- Bolts/screws (45) to 50 N•m (37 lb. ft.).

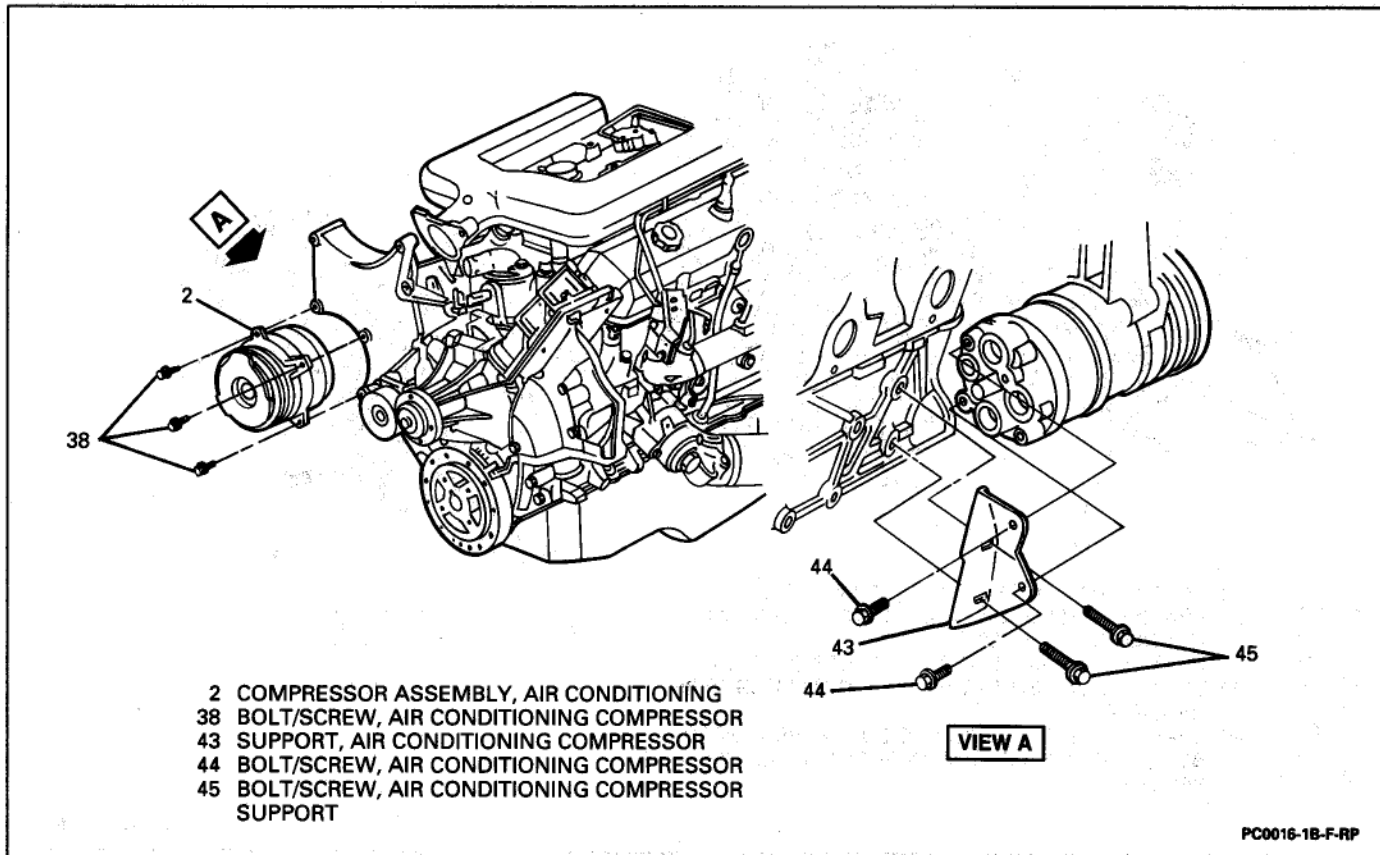


Figure 17 – Air Conditioning Compressor Assembly Mounting and Support (3.4L L32 Engine)

7. Bolt/screw (41) on 5.7L LT1 engine only.

**Tighten**

- Bolt/screw (41) to 33 N•m (24 lb. ft.).
8. Electrical connector at compressor assembly (2).
 9. Lower transmission oil cooler pipe assembly at radiator assembly. Refer to SECTION 7A.
 10. Seals (18) to hose assembly (7).
 • Lightly coat seals with mineral base 525 viscosity refrigerant oil.
 11. Hose assembly (7) to compressor assembly (2).
 12. Bolt/screw (28).

**Tighten**

- Bolt/screw (28) to 33 N•m (24 lb. ft.).
13. Bolt/screw (30).
-
- Tighten**
- Bolt/screw (30) to 10 N•m (89 lb. in.).
14. Drive belt tensioner assembly, 5.7L LT1 engine only. Refer to SECTION 6A3A.
 15. Serpentine drive belt. Refer to SECTION 6A2A (3.4L L32 engine) or SECTION 6A3A (5.7L LT1 engine).
 16. Lower vehicle.

17. Charge A/C system. Refer to “Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures” in this section.

18. Leak-test A/C system. Refer to “Leak-Testing the Refrigeration System” in this section.

Air Conditioning Refrigerant Service Valve**Figures 1 and 2**

Tool Required:

J 39037 Octagon Socket

**Remove or Disconnect**

1. Recover refrigerant. Refer to “Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures” in this section.
2. Valve cap (24).
3. Service valve (25).
 • Use J 39037 to remove valve.

**Install or Connect**

1. Service valve (25).
 • Coat seal (19) with mineral base 525 viscosity refrigerant oil.
 • Use J 39037 to install valve.

**Tighten**

- Service valve to (25) 11 N•m (97 lb. in.).

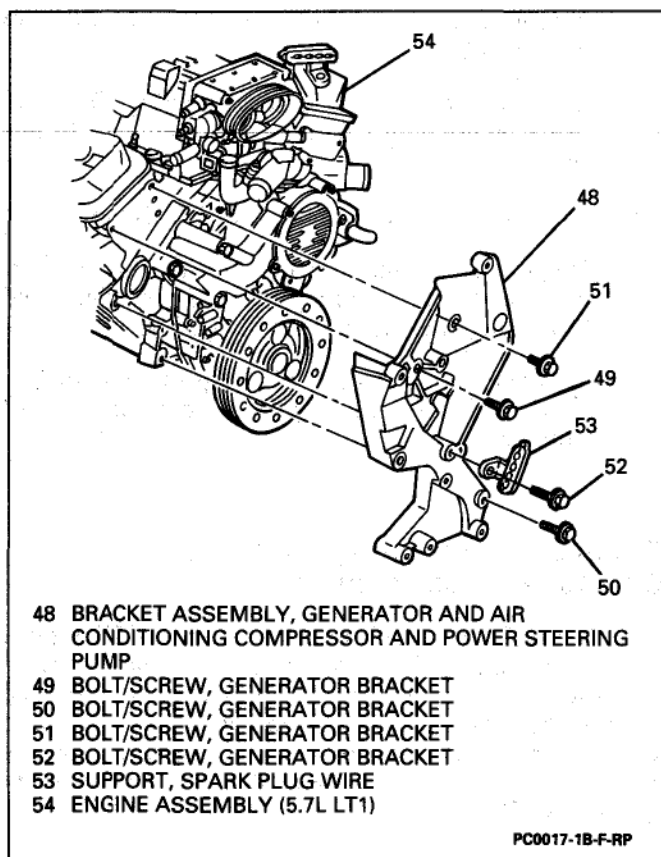


Figure 18 – Bracket Assembly (5.7L LT1 Engine)

2. Valve cap (24).
3. Charge A/C system. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" in this section.
4. Leak-test valve. Refer to "Leak-Testing the Refrigeration System" in this section.

Generator and Air Conditioning Compressor and Power Steering Pump Bracket Assembly (5.7L LT1 Engine)

Figure 18

Remove or Disconnect

1. Generator assembly. Refer to SECTION 6D3.
2. Power steering pump assembly. Refer to SECTION 3B.
3. Air conditioning compressor assembly. Refer to "Air Conditioning Compressor Assembly" in this section.
4. Bolts/screws (49, 50, 51 and 52).
5. Spark plug wire support (53).
6. Bracket assembly (48).

Install or Connect

1. Bracket assembly (48).
2. Spark plug wire support (53).
3. Bolts/screws (49, 50, 51 and 52) loosely.

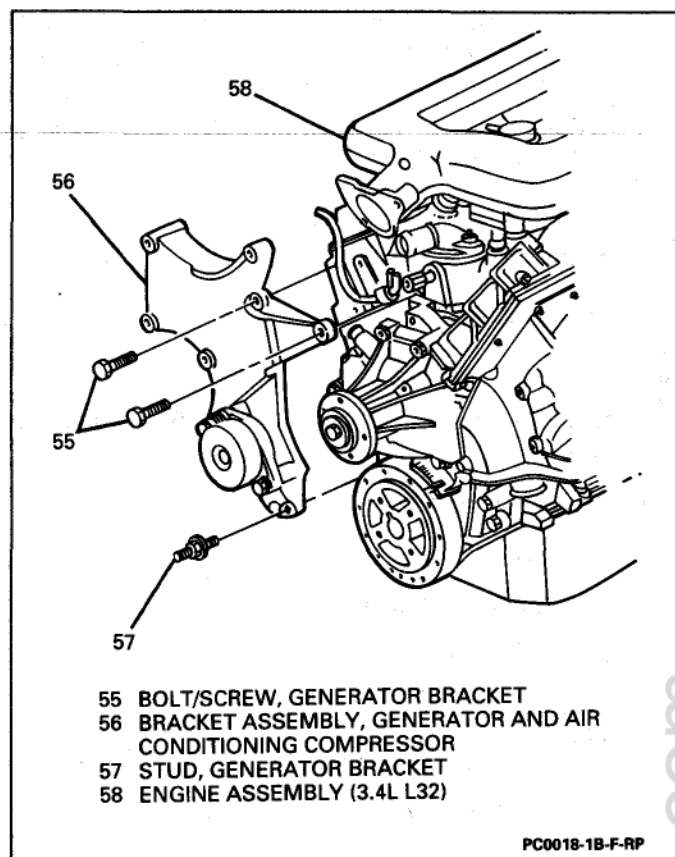


Figure 19 – Bracket Assembly (3.4L L32 Engine)

Tighten

- In sequence:
 - Bolt/screw (49) to 33 N•m (24 lb. ft.).
 - Bolt/screw (50) to 33 N•m (24 lb. ft.).
 - Bolt/screw (51) to 33 N•m (24 lb. ft.).
 - Bolt/screw (52) to 33 N•m (24 lb. ft.).
- 4. Air conditioning compressor assembly. Refer to "Air Conditioning Compressor Assembly" in this section.
- 5. Power steering pump assembly. Refer to SECTION 3B.
- 6. Generator assembly. Refer to SECTION 6D3.
- 7. Bleed power steering system. Refer to SECTION 3B.
- 8. Charge A/C system. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" in this section.
- 9. Leak-test A/C fitting at rear of compressor assembly. Refer to "Leak-Testing the Refrigeration System" in this section.

Generator and Air Conditioning Compressor Bracket Assembly (3.4L L32 Engine)

Figure 19

Remove or Disconnect

1. Generator assembly. Refer to SECTION 6D3.

2. Air conditioning compressor assembly. Refer to "Air Conditioning Compressor Assembly" in this section.
3. Serpentine drive belt tensioner assembly. Refer to SECTION 6A2A.
4. Bolts/screws (55).
5. Stud (57).
6. Bracket assembly (56).

Install or Connect

NOTICE: See "Notice" on page 1B-1 of this section.

1. Bracket assembly (56).
2. Stud (57).
 - Do not tighten at this time.
3. Bolts/screws (55).

Tighten

- Bolts/screws (55) to 33 N•m (24 lb. ft.).
- Stud (57) to 33 N•m (24 lb. ft.).

4. Serpentine drive belt tensioner assembly. Refer to SECTION 6A2A.
5. Air conditioning compressor assembly. Refer to "Air Conditioning Compressor Assembly" in this section.
6. Generator assembly. Refer to SECTION 6D3.
7. Charge A/C system. Refer to "Refrigerant Recovery and Recycling, Adding Oil, Evacuating and Recharging Procedures" in this section.
8. Leak-test fitting at rear of compressor assembly. Refer to "Leak-Testing the Refrigeration System" in this section.

Compressor Assembly On-Vehicle Minor Component Replacement

Due to the limited clearance on the 5.7L LT1 engine, it is recommended that the compressor assembly be serviced after the compressor assembly is removed from the vehicle. Vehicles with 3.4L L32 engines have clearance to service compressor assembly minor components on-vehicle. For component replacement procedures, refer to SECTION 1D2.

SPECIFICATIONS

GENERAL SPECIFICATIONS

A/C System O-Ring and Fitting Lubricant	525 Viscosity Mineral Oil, GM P/N 12301108 or Equivalent
A/C System Internal Lubricant (Including Compressor Assembly)	Polyalkylene Glycol (PAG) Synthetic Refrigerant Oil, GM P/N 12345923 or Equivalent
A/C System R-134a Charge Capacity	0.91 kg (2.0 lb.)

FASTENER TIGHTENING SPECIFICATIONS

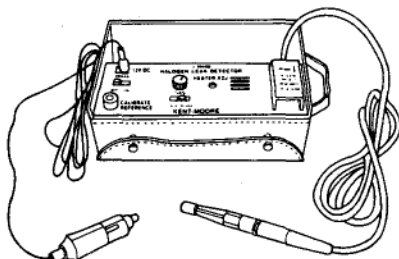
Air Conditioning Compressor Bolt/Screw (To Main Bracket, All Engines)	50 N•m (37 lb. ft.)
Air Conditioning Compressor (Rear Support) Bolt/Screw (To Compressor Assembly, 3.4L L32 Engine)	25 N•m (18 lb. ft.)
Air Conditioning Compressor and Condenser Hose Bolt/Screw	33 N•m (24 lb. ft.)
Air Conditioning Compressor and Condenser Hose Clip Bracket Bolt/Screw	10 N•m (89 lb. in.)
Air Conditioning Compressor Low Pressure Cutoff Switch Assembly	6 N•m (53 lb. in.)
Air Conditioning Compressor Rear Bracket Bolt/Screw (To Compressor Assembly, 5.7L LT1 Engine)	25 N•m (18 lb. ft.)
Air Conditioning Compressor Rear Bracket Bolt/Screw (To 5.7L LT1 Engine)	33 N•m (24 lb. ft.)
Air Conditioning Compressor Rear Support Bolt/Screw (To 3.4L L32 Engine)	50 N•m (37 lb. ft.)
Air Conditioning Receiver Dehydrator Bracket Bolt/Screw	14 N•m (10 lb. ft.)
Air Conditioning Receiver Dehydrator Bracket Clamp Bolt/Screw	9 N•m (80 lb. in.)
Air Conditioning Receiver Dehydrator Tube Bolt/Screw	16 N•m (12 lb. ft.)
Air Conditioning Refrigerant Pressure Sensor Assembly	6 N•m (53 lb. in.)
Air Conditioning Refrigerant Service Valve	11 N•m (97 lb. in.)
Air Conditioning Thermostatic Expansion Valve Bolt/Screw	7 N•m (62 lb. in.)
Generator Bracket Bolt/Screw	33 N•m (24 lb. ft.)
Generator Bracket Stud	33 N•m (24 lb. ft.)

FITTING TIGHTENING SPECIFICATIONS

Air Conditioning Compressor and Condenser Hose Assembly Fitting (At Condenser Assembly)	27 N•m (20 lb. ft.)
Air Conditioning Compressor and Condenser Hose Assembly Fitting (At Thermostatic Expansion Valve Assembly)	37 N•m (27 lb. ft.)
Air Conditioning Evaporator Tube Fitting (At Receiver and Dehydrator Assembly)	7 N•m (62 lb. in.)
Air Conditioning Evaporator Tube Fitting (At Thermostatic Expansion Valve Assembly)	18 N•m (13 lb. ft.)
Air Conditioning Receiver Dehydrator Tube Fitting (At Receiver and Dehydrator Assembly)	27 N•m (20 lb. ft.)

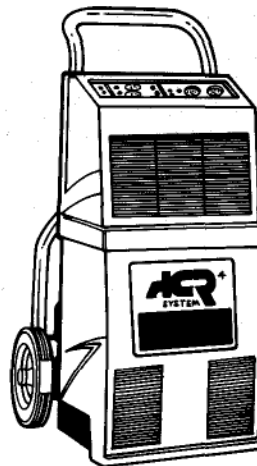
SPECIAL TOOLS

1.



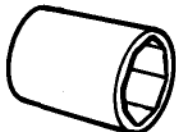
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4.



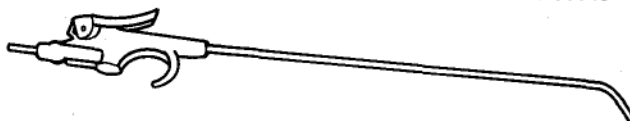
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2.



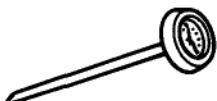
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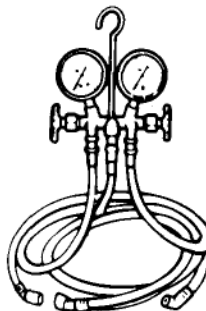
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3.



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6.



J 39183-C

7.



J 39500-50

1. HALOGEN LEAK DETECTOR
2. OCTAGON SOCKET
3. PRECISION THERMOMETER
4. AIR CONDITIONING REFRIGERANT RECOVERY, RECYCLING AND RECHARGING (ACR⁺) SYSTEM
5. AIR CONDITIONING EVAPORATOR CLEANING GUN
6. R-134a MANIFOLD GAUGE SET
7. 50 LB REFILLABLE RECOVERY TANK