

# 2007 Heating, Ventilation, & Air Conditioning



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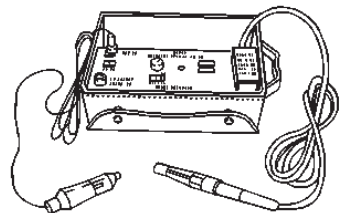

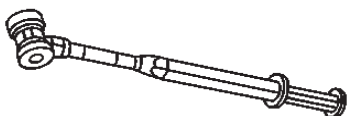
## SPECIFICATIONS

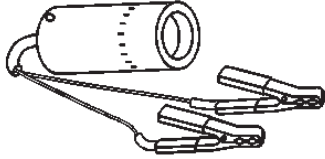
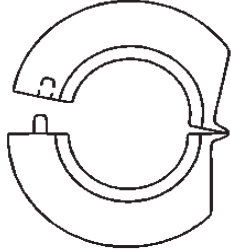
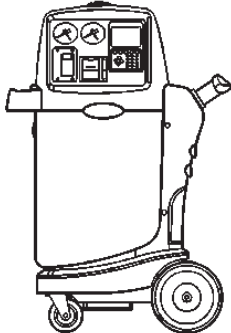
### TORQUE SPECIFICATIONS


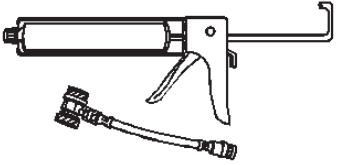
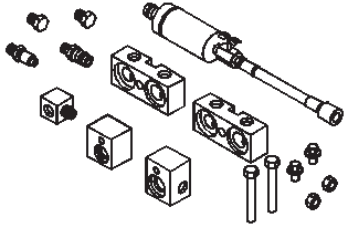
The following are torque values for components detailed in this section.

Description	Torque	
	N•m	lb ft
A/C Compressor Block Fitting Bolt	35 N•m	26 lb ft
A/C Compressor Bracket Bolt	50 N•m	37 lb ft
A/C Compressor Hose Clamp Bolt	35 N•m	26 lb ft
A/C Condenser Tube to A/C Receiver/Dryer Fitting	15 N•m	11 lb ft
Auxiliary Oil Cooler Bolts	35 N•m	26 lb ft
Compressor Hose Assembly Bolt	35 N•m	26 lb ft
Compressor Hose Assembly Nut	25 N•m	18 lb ft
Compressor Mounting Bolts	50 N•m	37 lb ft
Condenser Mounting Bolt	33 N•m	24 lb ft
Evaporator Connection	17 N•m	13 lb ft
Pressure Relief Valve	9 N•m	80 lb in
Receiver/Dryer Connection	17 N•m	13 lb ft
Refrigerant Hose Clamp Bolts	17 N•m	13 lb ft
Refrigerant Hose Fitting at Condenser	25 N•m	18 lb ft
Refrigerant Hose Fitting at Evaporator	32 N•m	24 lb ft
Refrigerant Hose to Receiver/Dryer	41 N•m	30 lb ft

### SPECIAL TOOL AND EQUIPMENT LIST

Tool Number/Description	Illustration
J 39400-A Halogen Leak Detector	
J 41447 R-134A A/C Tracer Dye - Box of 24	
J 41459 R-134A - A/C Tracer Dye Injector	

Tool Number/Description	Illustration
<p>J 42220</p> <p>Universal 12V Leak Detection Lamp</p>	
<p>J 43181</p> <p>Heater Line Q.C. Release Tool</p>	
<p>J 43600</p> <p>ACR 2000 Air Conditioning Service Center</p>	

Tool Number/Description	Illustration
<p>J 43872</p> <p>Fluorescent Dye Cleaner</p>	
<p>J 45037</p> <p>A/C Oil Injector</p>	
<p>J 45268</p> <p>Flush Adapter Kit</p>	

**REFRIGERANT OIL SPECIFICATIONS**

Application	Specification	
	Metric	English
All compressors: Drain the old compressor and measure the oil. If less than 30 ml (1 fl oz) is drained, add:	60 ml	2 fl oz
All compressors: If more than 30 ml (1 fl oz) is drained, add	The same amount that was drained out of the old compressor	
Receiver/Dryer: Oil is added to the replacement receiver/dryer to compensate for the oil retained by the original receiver/dryer desiccant bag assemblies. The receiver dryer should only be replaced when leaking due to the following conditions: <ul style="list-style-type: none"> <li>• A perforation</li> <li>• A damaged O-ring seat</li> <li>• Damaged threads</li> <li>• When replacing the receiver dryer, add</li> </ul>	90 ml	3 fl oz
Evaporator	90 ml	3 fl oz
Condenser	30 ml	1 fl oz

**COMPONENT LOCATOR**

**IMPORTANT**

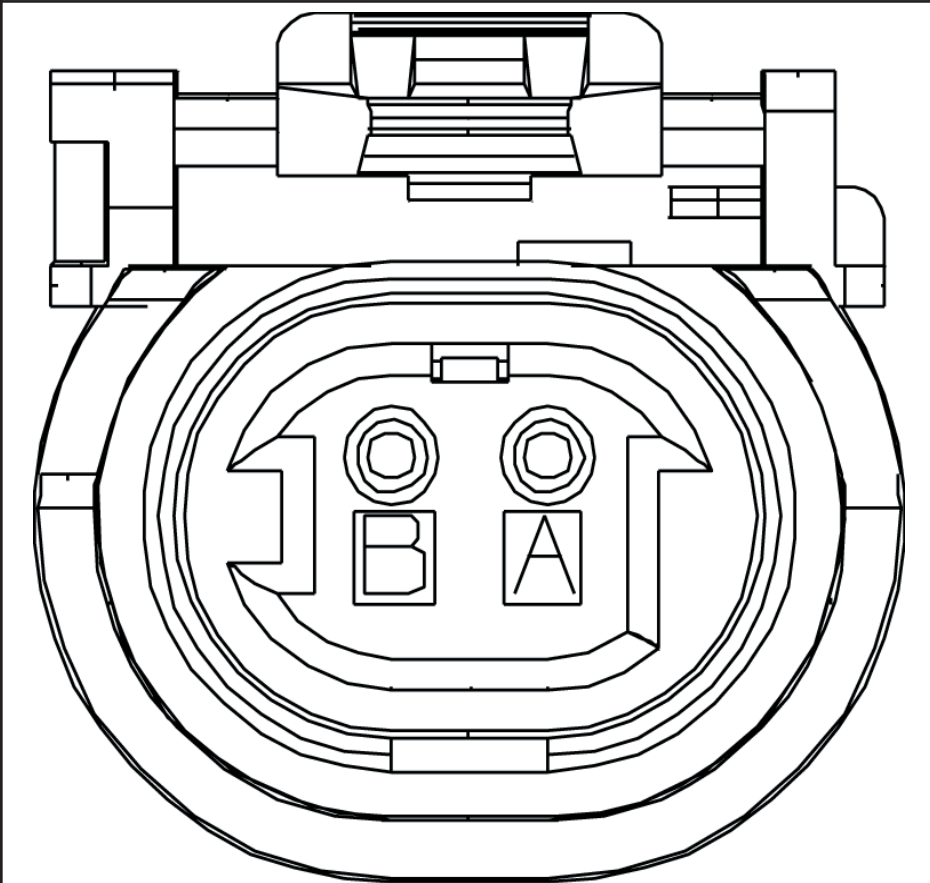
*The component locator chart will only include information on components that are provided and installed by Workhorse Custom Chassis. Components installed by the body builder are not included.*

Item	Location
Powertrain Control Module (All chassis with gas engines)	Mounted on top of the radiator support
Engine Control Module (W42 with 4.5L diesel engine)	Mounted on top of the radiator support
Receiver/Dryer	In front of the radiator support on the passenger side, connected to the condenser.
A/C Relay	Underhood fuse box. Refer to the electrical schematics for the specific chassis being worked on.
Condenser	In front of the radiator support.
High Pressure Switch	Located in the rear of the compressor.
Low Pressure Switch	Located in the suction line near the evaporator.



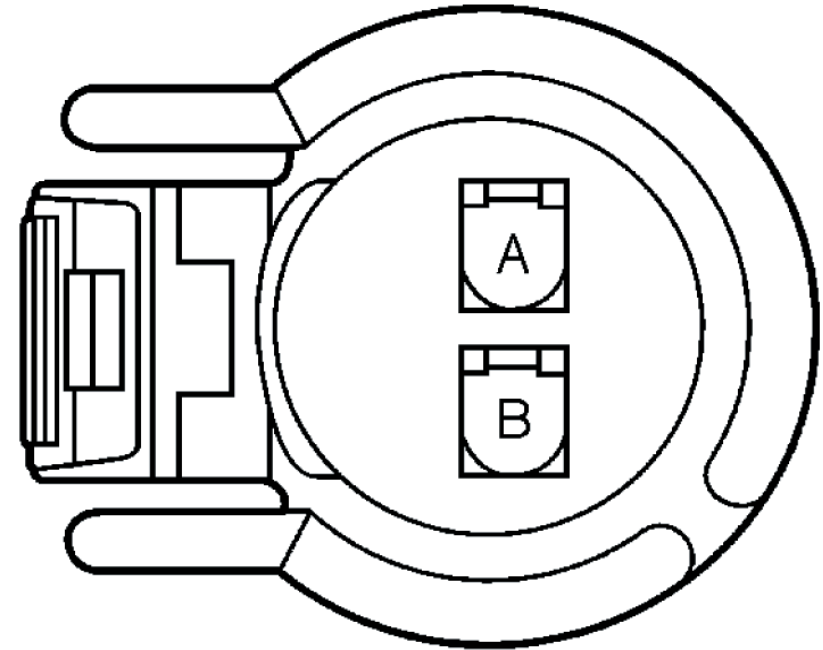
## CONNECTOR END VIEWS

**C115 (W16, W18, and W42 with 6.0L (LQ4 Engine))**



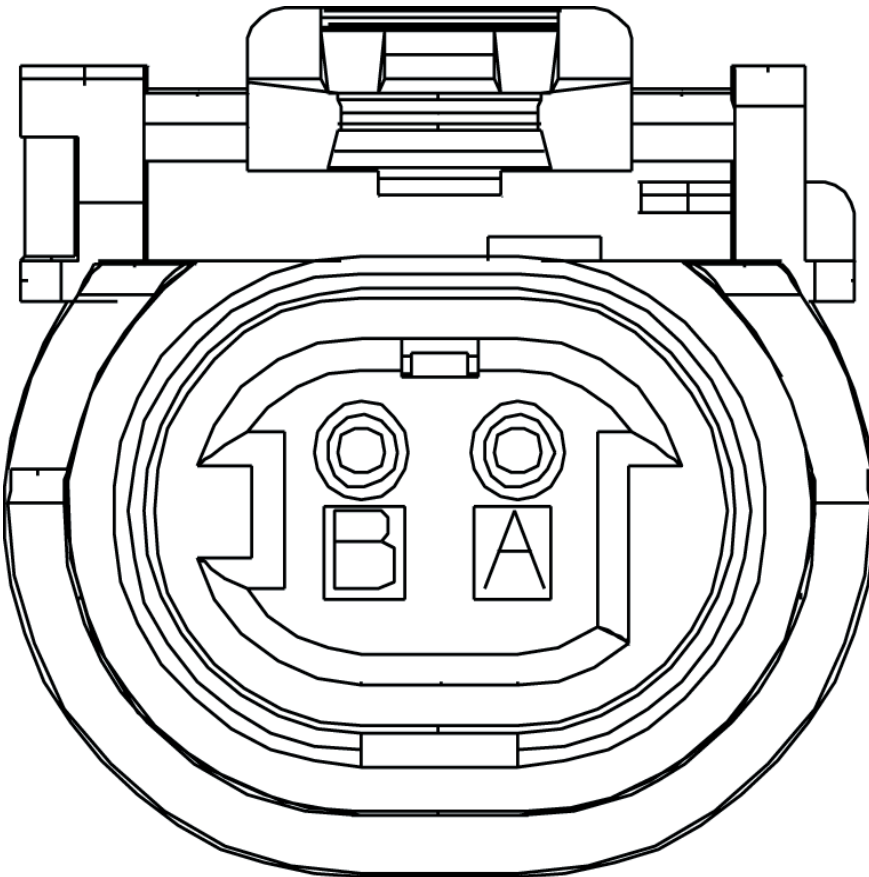
Connector Part Information		<ul style="list-style-type: none"> <li>• 15317968</li> <li>•</li> </ul>	
Pin	Wire Color	Circuit No.	Function
A	L-BU	E203	A/C high pressure switch to bodybuilder A/C controls
B	D-GN/WH	E762B	A/C high pressure switch to PCM

**C115 (W-Series with 8.1L (L18 Engine))**



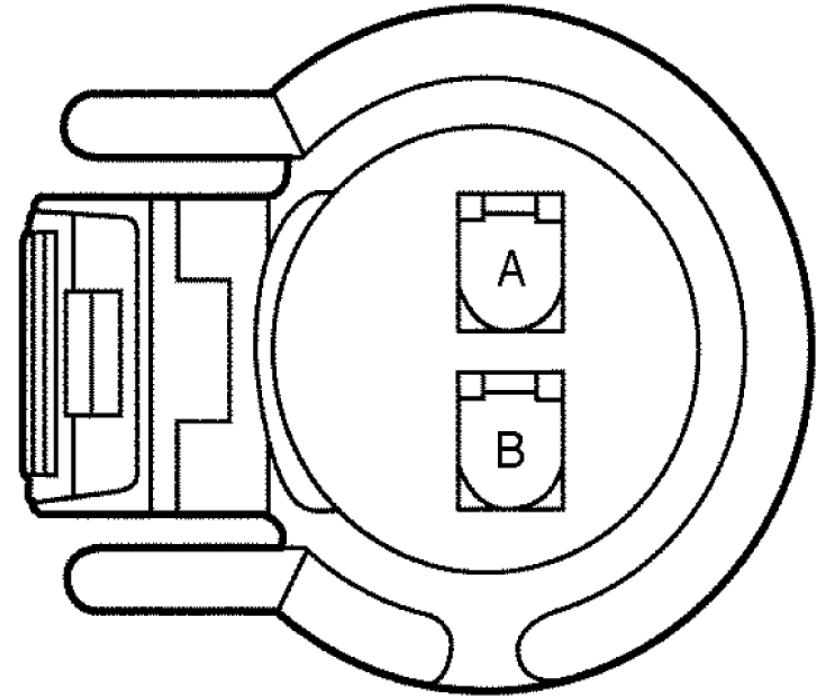
Connector Part Information		<ul style="list-style-type: none"> <li>• 12162438</li> <li>• 2-Way F 150 Series, Sealed (BLK)</li> </ul>	
Pin	Wire Color	Circuit No.	Function
A	L-BU	E203	A/C high pressure switch to bodybuilder A/C controls
B	D-GN/WH	E762B	A/C high pressure switch to PCM

**C115 (W42 with 4.5L (L6I Engine))**



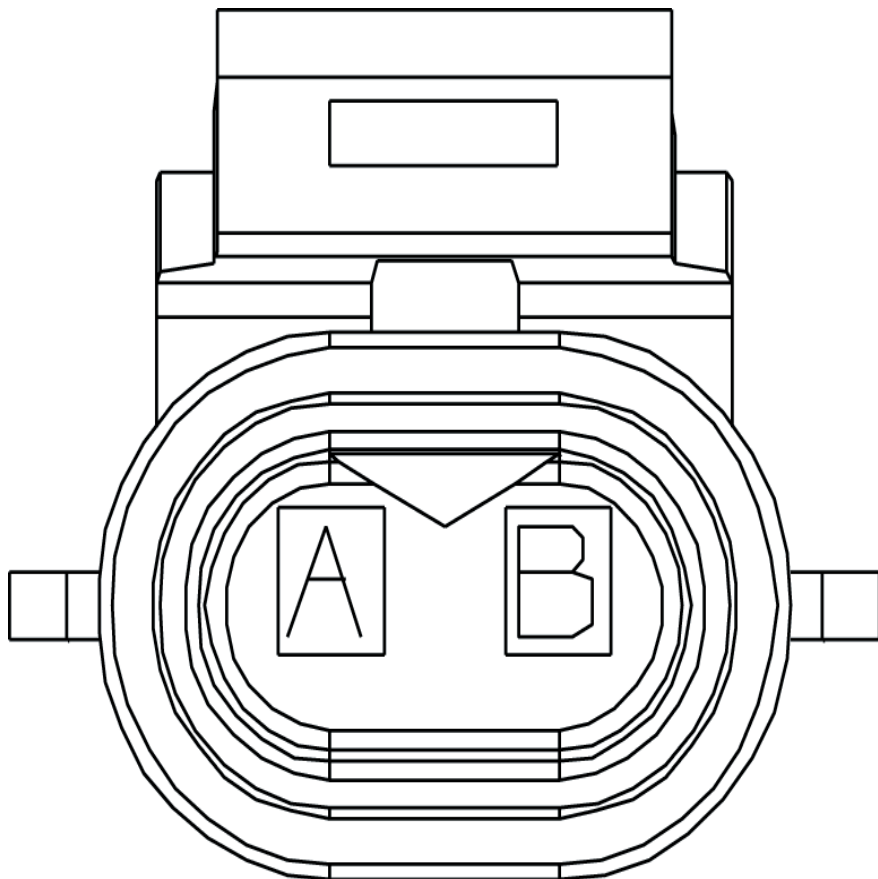
Connector Part Information		<ul style="list-style-type: none"> <li>• 184006-2</li> <li>•</li> </ul>	
Pin	Wire Color	Circuit No.	Function
A	L-BU	E203	A/C high pressure switch to bodybuilder A/C controls
B	D-BU	E604B	A/C high pressure switch to PCM

**C118 (W-Series with 6.0L (LQ4 Engine) or 8.1L (L18 Engine))**



Connector Part Information		<ul style="list-style-type: none"> <li>• 12162440</li> <li>• 2-Way F 150 Series, Sealed P2S (BLK)</li> </ul>	
Pin	Wire Color	Circuit No.	Function
A	L-BU	E203	A/C high pressure switch to bodybuilder A/C controls
B	D-GN/WH	E762B	A/C high pressure switch to PCM

**C118 (W42 with 4.5L (L6I Engine))**



**Connector Part Information**

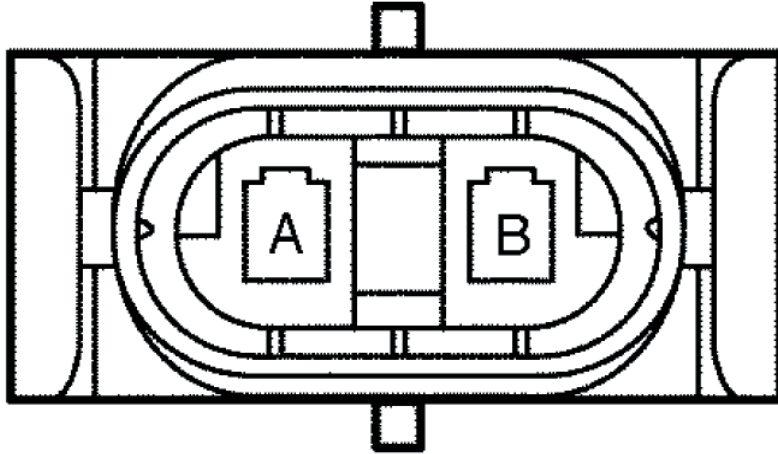
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Pin	Wire Color	Circuit No.	Function
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**C118 (W42 with 4.5L (L6I Engine))**

A	DK-BU	E604	A/C compressor reference pressure switch to high pressure switch
B	D-GN/WH	E762B	A/C high pressure switch to PCM

**C121 (W16/W18 with 6.0L (LQ4 Engine))**

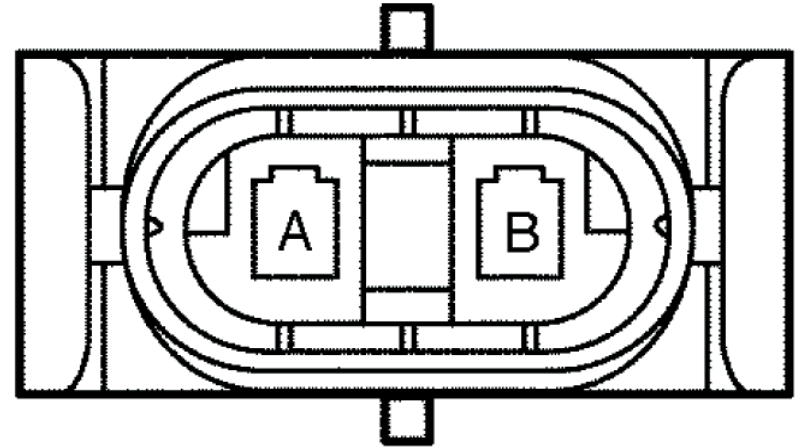


**Connector Part Information**

- 12162017
- 2-Way F Metri-Pack 150 Series, Sealed (GRY)

Pin	Wire Color	Circuit No.	Function
A	D-GN	E59	A/C compressor relay to A/C compressor clutch
B	D-GN/WH	E150J	A/C compressor clutch to ground

**C121 (W-Series with 8.1L (L18) Engine)**

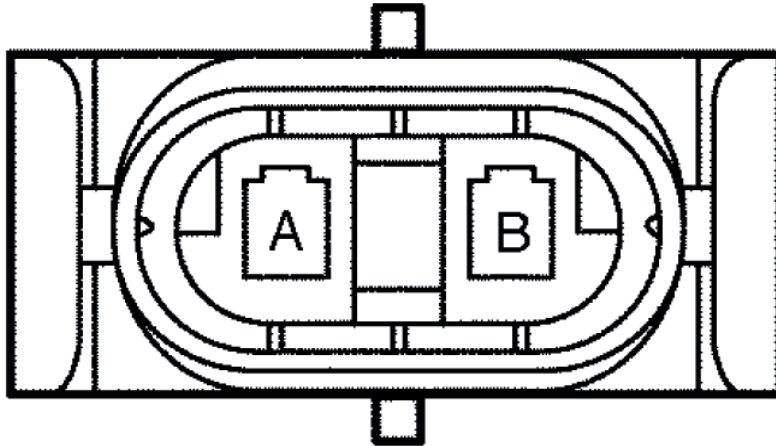


**Connector Part Information**

- 12162017
- 2-Way F Metri-Pack 150 Series, Sealed (GRY)

Pin	Wire Color	Circuit No.	Function
A	D-GN	E59B	A/C compressor relay to A/C compressor clutch
B	D-GN/WH	E150G	A/C compressor clutch to ground

**C121 (W42 with 6.0L (LQ4) Engine)**



**Connector Part Information**

- 12162017
- 2-Way F Metri-Pack 150 Series, Sealed (GRY)

Pin	Wire Color	Circuit No.	Function
A	D-GN	E59	A/C compressor relay to A/C compressor clutch
B	D-GN/WH	E150N	A/C compressor clutch to ground

**DESCRIPTION AND OPERATION**

**A/C SYSTEM DESCRIPTION**

The Motor home/Commercial chassis may be equipped with an optional factory air conditioning system. This system is an expansion valve type of system. Most of the air conditioning components on the vehicles are common between the two vehicles. However, the manufacturer of the body installs some of the components. The service manual only provides information on those components that were installed on the vehicle at the Workhorse Custom Chassis assembly plant. For service information for components installed by the body manufacturer, contact the manufacturer of the body. The following components are installed by the body manufacturer:

- The air conditioning (AC) evaporator
- The A/C expansion valve
- The air distributor duct
- The blower motor
- The blower motor resistor
- The control assembly and blower switch
- The heater core
- The heater hoses
- The heater module
- The mode actuator
- The recirculating/fresh air actuator
- The temperature control actuator

### **Air Distribution System Description**

The air distribution system is supplied by the body builder and is not covered under the Workhorse Warranty. The following information provides a general description of a typical air distribution system. Each body builders system will vary slightly. Within the HVAC module are a series of air doors. These doors are hinged parts that direct the airflow through various sections of the HVAC module. The doors provide the proper airflow for the selected operating mode. Each air door is controlled by an actuator.

A system of ducts and outlets directs air to the passenger compartment. In cases of poor air output, check the defroster, heater, air conditioning, and vent ducts for obstructions such as leaves, dirt, or objects that may have fallen into the ducts from the passenger compartment.

### **Refrigeration System Description**

The system contains a gas/liquid refrigerant, depending on the temperature and the pressure, as a heat exchange medium.

The liquid Refrigerant 134a (R-134a) requires heat in order to change to a gas or a vapor. The cooling of the vehicle occurs when R-134a changes from a liquid to a gas in the air conditioning (A/C) evaporator. Air passing through the A/C evaporator gives up heat to the R-134a. R-134a then absorbs the heat while changing to a gas. The blower motor circulates the cool air in the cab.

The refrigerant cycle starts at the A/C compressor where the refrigerant enters as a low pressure (2), low temperature vapor. The refrigerant compresses to a high pressure (1), high temperature vapor. The high pressure, high temperature vapor gives up heat to the cooler air passing through the A/C condenser cooling fins as the vapor flows through the A/C condenser tubes. The refrigerant changes to a high pressure liquid when the refrigerant vapor gives up the heat. The high pressure liquid passes through the A/C receiver/dryer or the dehydrator. The refrigerant filters through a screen. The refrigerant uses a desiccant in order to dry the moisture. The A/C receiver/dryer or the dehydrator also acts as a storage tank for the refrigerant.

The liquid refrigerant flows through the A/C expansion valve. The liquid refrigerant changes to a low pressure, low temperature liquid in the A/C evaporator. Warm inside air flows through the cooler A/C evaporator core or fins. The warm inside air gives up heat to the low pressure, low temperature liquid in the A/C evaporator. The low pressure vapor returns to the A/C compressor and the cycle restarts.

### **Heater System Description**

Some air conditioning (A/C) systems operate on the reheat principle. Reheating means that all of the air passing through the system is first chilled to an almost freezing temperature. The air is then reheated to a more comfortable temperature before being discharged into the passenger compartment.

Dehumidified air is reheated passing through the heater core in the air conditioning module. The heater is warmed by engine coolant passing through the tubes of the heater core. The hot engine coolant transfers heat to the heater core fins. The fins then heat the air that flows past them. The relative position of the air temperature valve in the air conditioning module determines how much of the total airflow passes through the heater. The amount of reheated air determines the warmth of the total airflow discharged into the passenger compartment.

### Odor Description

The air conditioning (A/C) system emits odors primarily at startup in hot, humid climates. This odor may result from the following conditions:

Debris in the heater/evaporator case  
Mold growth on the evaporator core.

In order to address this condition, a service kit is available through the Service Parts Group.

A single application of the deodorizer, P/N 12370470, removes odor from the A/C system. However, installation of a delayed blower control module is recommended in order to prevent the odor from returning. Refer to the supplied installation instructions.

The refrigerant functions like the coolant in the engine cooling system. The refrigerant is the substance in the air conditioning (A/C) system that absorbs, carries, and then releases heat. Although various substances can be used as refrigerants in other types of refrigeration

systems, some truck and automotive A/C systems use a type of refrigerant called Refrigerant-12 (R-12). These vehicles, however, use Refrigerant-134a (R-134a) which has the following properties:

- Non-toxic
- Non-flammable
- Clear
- Colorless
- Liquefied gas

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

#### 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. Refer to the manufacturer instructions included with the service equipment before servicing.*

#### IMPORTANT:

*Polyalkaline glycol (PAG) refrigerant oil distributed by General Motors is manufactured with blue coloring. If the color of PAG oil changes to any color other than blue during storage, replace it. PAG oil that is no longer blue has absorbed moisture and cannot be used.*

R-134A carries a special lubricant called polyalkaline glycol (PAG) refrigerant oil. P/N 12345923 PAG refrigerant oil will have a slight blue tint. The oil is hygroscopic, which means it absorbs water from the atmosphere. Store the PAG refrigerant oil in closed containers.

## Handling Refrigerant R-134a

### 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. Refer to the manufacturer instructions included with the service equipment before servicing.*

- Do not mix R-12 and R-134a, even in the smallest amounts. The refrigerants are incompatible with each other. Air conditioning (A/C) compressor failure is likely to occur if the refrigerants are mixed.
- Use only the specified lubricant (PAG) for the R-134a A/C system and the R-134a components. A/C compressor failure is likely to occur if you lubricants other than those specified are used.
- Coat all fittings and O-ring seals with clean 525 viscosity refrigerant oil in order to provide a leak-proof seal and to aid in the assembly and disassembly.
- Do not store or heat the refrigerant containers above 52°C (1 25°F).
- Do not heat a refrigerant container with an open flame. Place the bottom of the container in a pail of warm water, if warming is necessary.
- Do not intentionally drop, puncture or incinerate the refrigerant containers.
- Refrigerant will displace oxygen, therefore, be certain to work in well-ventilated areas in order to prevent suffocation.

- Do not introduce compressed air into any refrigerant container or refrigerant component. Compressed air will cause contamination.
- Do not carry a R-134a container in the passenger compartment of a vehicle.

All R-134a disposable (blue) containers are shipped with a metal screw cap in order to protect the valve and the safety plug of the container from damage. Replace the cap after each use to follow safety measures.

### Handling Compressor Oil

Unlike engine oil, no cleaning agent is added to compressor oil. Even if the compressor runs for a very long time, the oil never becomes cloudy or dirty looking as long as there is nothing wrong with the compressor or its method of use. Inspect the extracted oil for the following conditions:

- Moisture, dust, metal shavings, etc.
- Change to a varnish color



## Handling of Refrigerant Lines and Fittings

### IMPORTANT:

*Before opening the refrigeration system, ensure that the work area is well ventilated. Do not conduct welding or steam-cleaning operations on or near the following areas:*

- The refrigeration system lines.
- Other air conditioning (A/C) parts on the vehicle.
- Ensure that all of the metal tubing lines are free of dents or kinks that may cause line restriction. Line restriction may cause the loss of system capacity.
- Do not bend the flexible hose lines to a radius of less than 4 times the diameter of the hose.
- Do not allow the flexible hose lines to come within 6.5 mm (2.5 in) of the exhaust manifold.
- Regularly inspect the flexible hose lines for leaks or brittleness. Replace the lines with new lines if deterioration or leaking is found.
- When disconnecting any fitting in the refrigerant system, recover the system of all R-134a using the following procedure:
  1. Proceed very cautiously regardless of the gage readings.
  2. Open the fitting very slowly.
    3. Keep hands and face away from the fitting in order to prevent injury.
  4. If pressure is noticed when a fitting is loosened, allow the pressure to bleed off slowly.

### NOTICE:

*Never use alcohol to remove moisture from the refrigeration system. Damage to the system components could occur.*

- Immediately cap refrigerant lines that are opened to the atmosphere. This action prevents the entrance of moisture and dirt which can cause internal A/C compressor wear or plugged lines in the following areas:
  - The A/C condenser
  - The A/C evaporator core
  - The A/C expansion (orifice) tubes
  - The A/C compressor inlet screens
- Remove the sealing caps from subassemblies just before making the connections for final assembly. Apply a small amount of clean 525 viscosity refrigerant oil on all of the tube and hose joints.
- Use new O-ring seals dipped in 525 viscosity oil when assembling joints. The oil aids in assembly and helps provide a leakproof joint. The O-ring seals and seats must be in perfect condition because a burr or a piece of dirt can cause a refrigerant leak.
- Use the proper wrenches in order to make connections on the O-ring seal fittings.
- Tighten tubing connections to the specified torque. Refer to Fastener Tightening Specifications in HVAC.

## **Maintaining Chemical Stability**

The efficient operation and life of the air conditioning (A/C) system depends on the chemical stability of the refrigeration system. Contamination with dirt, air, or moisture lead to chemical instability, resulting in the following conditions:

- Unstable pressure-temperature relationships
- Reduced efficiency
- Interior corrosion
- Premature component wear
- Premature component failure

Observe the following general practices in order to ensure the chemical stability of the system:

- Before breaking a refrigerant connection, wipe away any dirt or oil. This will reduce the risk of contamination. Immediately cap, plug, or tape both sides of the connection.
- Keep all tools clean and dry, including the manifold gauge set and any replacement parts.
- When adding polyalkaline glycol (PAG) refrigerant oil, ensure that the transfer device and the container are clean and dry. Refrigerant oil must be as moisture-free as possible.
- Set up all necessary tools, cleaners, etc., before opening the A/C system. Do not leave the A/C system open any longer than is absolutely necessary.
- Evacuate the A/C system after opening and before recharging.

## **Thermal Expansion Valve Description**

The thermal expansion valve (TXV) is supplied by the body builder and is not covered under the Workhorse Warranty. The following information provides a general description of a typical TXV. Each body builders system will vary slightly.

The thermal expansion valve is a variable orifice valve located on the inlet pipe of the air conditioning (A/C) evaporator. The thermal expansion valve controls the rate at which refrigerant flows into the A/C evaporator, the speed of evaporation, and the A/C evaporator temperature.

A sealed metal bulb and tube are connected to one side of a diaphragm that moves the control valve. This bulb is held against the A/C evaporator outlet pipe and senses the outlet temperature. As the outlet temperature rises, the gas expands in the bulb and the tube. The expanding gas then causes the A/C expansion valve to open, allowing more refrigerant to enter the A/C evaporator. The increased flow of refrigerant in the evaporator lowers the evaporator temperature. When the evaporator temperature is just above freezing, the thermal expansion valve partially closes, and the evaporator temperature rises again, due to decreased refrigerant flow and evaporation. A balance tube that is connected to the A/C evaporator outlet pipe senses outlet pressure on the opposite side of the diaphragm from the metal bulb and tube.

## **Evaporator Description**

The evaporator is supplied by the body builder and is not covered under the Workhorse Warranty. The following information provides a general description of a typical evaporator. Each body builders system will vary slightly.

The air conditioning (A/C) evaporator:

- cools the air that enters the passenger compartment.
- dries the air.
- clears the air of pollen and pollutants.

Refrigerant enters the A/C evaporator as a low pressure liquid. The low pressure causes the liquid refrigerant to turn to gas (vaporize). This gas is able to absorb heat from the warm outside air that passes through the A/C evaporator fins. The cooled air is then directed into the passenger compartment. As heat is transferred to the A/C evaporator, moisture in the air condenses on the evaporator surface and is drained off carrying dust and pollen. A water drain port is located at the bottom of the evaporator housing. The temperature of the A/C evaporator must be high enough so that the surface condensation does not freeze and block off any air passages. The temperature of the A/C evaporator is regulated by both the A/C expansion valve and the thermostat. The A/C evaporator is located in the heater module under and behind the instrument panel.

## **Condenser Description**

The condenser assembly is in front of the radiator. The condenser assembly consists of the following components:

- coils that carry the refrigerant.
- cooling fins that provide the rapid transfer of heat.

Air passing through the condenser assembly cools the high-pressure refrigerant vapor, causing the air to condense into a liquid.

## **Heater Core Description**

The heater core is supplied by the body builder and is not covered under the Workhorse Warranty. The following information provides a general description of a typical heater core. Each body builders system will vary slightly.

In any air conditioning (A/C) mode, the heater cores heat the cool, dehumidified air in order to achieve the desired temperature. The position of the control assembly temperature selector determines how much heat is added to the incoming air.

### **Receiver/Dryer Description**

The air conditioning (A/C) receiver/dryer acts as a refrigerant storage reservoir. This reservoir ensures that a full column of liquid refrigerant is fed to the thermal expansion valve under all operating conditions. The receiver/dryer also has a built-in filter and a desiccant that absorbs moisture.

### **Compressor Description**

The air conditioning (A/C) compressor can be identified by a label attached to the body giving the part and model number and the manufacturer's name.

The compressors are belt driven from the engine crankshaft, using an integral clutch 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 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 in order to drive the compressor shaft.

### **Control Assembly Description**

The control assembly is supplied by the body builder and is not covered under the Workhorse Warranty. The following information provides a general description of a typical control assembly. Each body builders system will vary slightly.

The air conditioning (A/C) button on the control assembly must be in the ON position for the A/C to work. The temperature selector and the fan control switch on the control assembly function to maintain comfort in the passenger compartment.

### **RELAYS AND SENSORS DESCRIPTION**

#### **Auxiliary Engine Coolant Fan A/C Pressure Switch**

(Commercial Diesels and all Motorhomes) The air conditioning (A/C) fan pressure switch is located on top of the receiver/dryer. The switch is normally open, but closes as a result of rising pressure. When the switch closes, the fan relay is energized. The switch requires 1620.3 kPa (235 psi) +I- 206.8 kPa (30 psi) to close.

#### **A/C Compressor High Pressure Cutoff Switch**

The high pressure cut-off switch is located on the rear cover of the compressor. This switch is normally closed, but opens at pressures of 2827-31 03 kPa (410-450 psi) to interrupt the voltage to the air conditioning (A/C) clutch circuit. When the high pressure switch opens, the compressor stops cycling and the pressure relief valve is prevented from discharging refrigerant and oil.

### **A/C Compressor Refrigerant Pressure Switch**

The evaporator (low) pressure switch is located on the suction line near the evaporator. The switch is normally open, but will close at 185 kPa (27 psi) +/- 35 kPa (5 psi). At pressures below 38 kPa (5.5 psi) +/- 24 kPa (3.5 psi), the switch opens and interrupts the air conditioning (A/C) clutch circuit.

### **A/C Compressor Relay**

This relay is controlled by the PCM (gas engines) or ECM (diesel engine). It controls power to the A/C Compressor Clutch.

## **DIAGNOSTIC INFORMATION AND PROCEDURES**

### **SCAN TOOL OUTPUT CONTROLS**

#### **PCM Scan Tool Output Controls**

<b>Scan Tool Output Control</b>	<b>Additional Menu Selection(s)</b>	<b>Description</b>
A/C Relay	Engine Output Controls	The scan tool displays ON or OFF selections. This command allows you to turn the A/C relay On or Off. When the A/C relay is commanded On, the A/C compressor clutch should be engaged.

## **SCAN TOOL DATA LIST**

Use the Scan Tool Data Display Values and Definitions Information in order to assist in diagnosing the Powertrain Control Module (PCM) concerns. Compare the vehicles actual scan tool data with the typical data display value table information. Use the data information in order to aid in understanding the nature of the concern when the vehicle does not match with the typical data display values.

The scan tool data values were taken from a known good vehicle under the following conditions:

- The ignition switch is in the ON position.
- The engine is running at idle.
- The vehicle is in PARK.
- The doors are closed.
- The windows are closed.
- The A/C is ON.
- The ambient air temperatures are at 22-27°C (70-80°F).

**PCM Scan Tool Data List 8.1L (L18)**

<b>PCM Scan Tool Data List 8.1L (L18)</b>			
<b>Scan Tool Parameter</b>	<b>Data List</b>	<b>Units Displayed</b>	<b>Typical Data Value</b>
Operating Conditions: Engine idling, A/C ON, ambient air temperature between 22-27°C (70-80°F)			
A/C Clutch Feedback Signal	Engine Data 2	Relay On/Relay Off	Relay On
A/C Compressor Cycling Switch	Engine Data 2	Low Pressure/Normal	Normal
A/C Relay Command	Engine Data 1 Engine Data 2 Misfire Data	On/Off	On
A/C Request Signal	Engine Data 2	Yes/No	Yes

**SCAN TOOL DATA DEFINITIONS – TECH II**

The HVAC Scan Tool Data Definitions contains a brief description of all HVAC related parameters available on the scan tool. The list is in alphabetical order. A given parameter may appear in any one of the data lists. In some cases, the parameter may appear more than once or in more than one data list in order to group certain related parameters together.



<b>Parameter</b>	<b>Definition</b>
A/C Clutch Feedback Signal	The scan tool displays Relay Off or Relay On. Represents the status of the relay.
A/C Compressor Cycling Switch	The scan tool displays Low Pressure or Normal. This parameter displays the state of the A/C compressor cycling switch. The A/C compressor cycling switch is a normally closed switch.
A/C Relay Command	The scan tool displays On or Off. This parameter displays the PCM commanded state of the A/C compressor clutch relay. When the scan tool displays ON, the A/C compressor clutch should be engaged.
A/C Request Signal	The scan tool displays Yes or No. The A/C Request Signal displays the state of the A/C request input circuit from the heating, ventilation, and air conditioning (HVAC) controls. The powertrain control module (PCM) uses the A/C request signal in order to determine whether the A/C compressor operation is being requested.

## SYMPTOMS - HVAC SYSTEMS – MANUAL

### IMPORTANT:

*Review the system operation in order to familiarize yourself with the system functions. Refer to:*

- Air Delivery Description and Operation
- Air Temperature Description and Operation

### Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the HVAC System. Refer to Checking Aftermarket Accessories in Wiring Systems.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.
- Verify the A/C compressor clutch turns freely and is not seized.
- The A/C compressor will not operate in cold outside air temperatures. Refer to Air Temperature Description and Operation .
  - The following conditions may cause window fogging:
    - Wet carpet or mats
    - High humidity
    - Interior water leak
    - Blocked A/C evaporator drain tube
    - Maximum passenger capacity
    - Blocked body pressure relief valves

- Inspect the air distribution system for causes of reduced air flow:
  - Obstructed or dirty passenger compartment air filter, if equipped
  - Blocked or damaged air inlet or outlet vents

### Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to Testing for Intermittent Conditions and Poor Connections in Wiring Systems.

### Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- HVAC Compressor Clutch Does Not Engage
- HVAC Compressor Clutch Does Not Disengage
- Leak Testing in Heating, Ventilation and Air Conditioning
- Defrosting Insufficient in Heating, Ventilation and Air Conditioning
- Noise Diagnosis - Blower Motor in Heating, Ventilation and Air Conditioning
- Noise Diagnosis - Air Conditioning (A/C) System in Heating, Ventilation and Air Conditioning
- Noise Diagnosis - HVAC Module in Heating, Ventilation and Air Conditioning

- Odor Diagnosis in Heating, Ventilation and Air Conditioning

## **HVAC COMPRESSOR CLUTCH DOES NOT ENGAGE (GAS ENGINES)**

### **Test Description**

The numbers below refer to the step numbers on the diagnostic table.

2. The A/C compressor relay output is disabled if engine coolant temperature (ECT) is above 121°C (250°F).
3. For the purpose of this and future steps where A/C operation is necessary, bi-level mode is used for consistent testing.
7. With each command, an audible click sound should be made.
11. There are 2 A/C request signal circuits that connect to the A/C high pressure switch. The circuit that is to be tested is wired between the HVAC control assembly and the A/C high pressure switch.
12. There are 2 A/C request signal circuits that connect to the A/C high pressure switch. The circuit that is to be tested is wired between the engine control module (ECM)/powertrain control module (PCM) and the A/C high pressure switch.

20. There are 2 A/C request signal circuits that connect to the A/C high pressure switch. The circuit that is to be tested is wired between the HVAC control assembly and the A/C high pressure switch.
21. There are 2 A/C request signal circuits that connect to the A/C high pressure switch. The circuit that is to be tested is wired between the ECM/PCM and the A/C high pressure switch.

<b>HVAC Compressor Does Not Engage (Gas Engines)</b>			
<b>Step</b>	<b>Action</b>	<b>Yes</b>	<b>No</b>
<b>Schematic Reference:</b> HVAC Schematics <b>Connector End View Reference:</b> HVAC Connector End Views			
<b>DEFINITION:</b> The A/C compressor clutch will not engage when an A/C request has been made and a powertrain DTC has not been set.			
1	Did you review the HVAC operation and perform the necessary inspections?	Go to Step 2	Go to Symptoms - HVAC Systems - Manual
2	1. Start the engine. 2. With a scan tool, observe the ECT Sensor parameter in the Powertrain Engine data list.  Does the ECT Sensor parameter indicate a value over 121°C (250°F)?	Go to Symptoms - Engine Cooling in Engine Cooling	Go to Step 3
3	<b>IMPORTANT:</b> <i>For A/C compressor operation, outside air temperature must be above 3°C (38°F).</i>  1. Start the engine. 2. Place the blower motor switch in the maximum speed position. 3. Place the mode switch in the BI-LEVEL position. 4. Place the air temperature switch in the coldest position. Does the A/C compressor operate?	Go to Testing for Intermittent Conditions and Poor Connections in Wiring Systems	Go to Step 4
4	1. Park the vehicle inside or in the shade. 2. Open the windows in order to ventilate the interior of the vehicle. 3. Turn OFF the ignition. 4. If the A/C system was operating, allow the A/C system to equalize for about 2 minutes. 5. Install the J 39500-B ACR - 4 Black Shroud. 6. Record the ambient temperature at the vehicle. 7. Record readings of the low and high side STATIC pressures.  Are the low and high side pressure values within the allowable limits for the recorded ambient air temperature (AAT), and within 103 kPa (15 psi) of each other?	Go to Step 5	Go to Leak Testing in Heating, Ventilation and Air Conditioning

<b>HVAC Compressor Does Not Engage (Gas Engines)</b>			
<b>Step</b>	<b>Action</b>	<b>Yes</b>	<b>No</b>
5	<ol style="list-style-type: none"> <li>1. Start the engine.</li> <li>2. With a scan tool, observe the A/C Request Signal parameter in the Powertrain Engine data list.</li> <li>3. Place the blower motor switch in the maximum speed position.</li> <li>4. Place the mode switch in the A/C position.</li> <li>5. Place the air temperature switch in the coldest position.</li> </ol> <p>Does the scan tool indicate that the A/C Request Signal parameter is YES?</p>	Go to Step 6	Go to Step 11
6	<p>With a scan tool, observe the A/C Compressor Cycling Switch parameter in the Powertrain Engine data list.</p> <p>Does the scan tool indicate that the A/C Compressor Cycling Switch parameter is YES?</p>	Go to Step 7	Go to Step 13

<b>HVAC Compressor Does Not Engage (Gas Engines)</b>			
<b>Step</b>	<b>Action</b>	<b>Yes</b>	<b>No</b>
7	<ol style="list-style-type: none"> <li>1. Start the engine.</li> <li>2. With a scan tool, command the A/C Relay ON and OFF.</li> </ol> <p>Does the A/C compressor clutch relay turn ON and OFF with each command?</p>	Go to Step 9	Go to Step 8
8	<ol style="list-style-type: none"> <li>1. Turn OFF the ignition.</li> <li>2. Disconnect the A/C compressor clutch relay.</li> <li>3. Connect a test lamp between the ignition 3 voltage circuit of the A/C compressor clutch relay to the A/C compressor clutch relay control circuit of the A/C compressor clutch relay.</li> <li>4. Start the engine.</li> <li>5. With a scan tool, command the A/C Relay ON and OFF.</li> </ol> <p>Does the test lamp illuminate with each command?</p>	Go to Step 26	Go to Step 15
9	<p>Probe the battery positive voltage circuit of the A/C compressor clutch relay with a test lamp that is connected to a good ground.</p> <p>Does the test lamp illuminate?</p>	Go to Step 10	Go to Step 23
10	<ol style="list-style-type: none"> <li>1. Turn OFF the ignition.</li> <li>2. Connect a 10-amp fused jumper across the battery positive voltage circuit of the A/C compressor clutch relay to the A/C compressor clutch supply voltage circuit of the A/C compressor clutch relay.</li> </ol> <p>Does the A/C compressor clutch engage?</p>	Go to Step 26	Go to Step 17
11	<ol style="list-style-type: none"> <li>1. Turn OFF the engine.</li> <li>2. Disconnect the A/C high pressure switch.</li> <li>3. Turn ON the ignition, with the engine OFF.</li> <li>4. Probe the A/C request signal circuit of the HVAC control assembly with a test lamp that is connected to a good ground.</li> </ol> <p>Does the test lamp illuminate?</p>	Go to Step 12	Go to Step 20
12	<ol style="list-style-type: none"> <li>1. Connect a 3-amp fused jumper across both of the A/C request signal circuits of the A/C high pressure switch.</li> <li>2. With a scan tool, observe the A/C Request Signal parameter in the Powertrain Engine data list.</li> </ol> <p>Does the scan tool indicate that the A/C Request Signal parameter is YES?</p>	Go to Step 27	Go to Step 21

<b>HVAC Compressor Does Not Engage (Gas Engines)</b>			
<b>Step</b>	<b>Action</b>	<b>Yes</b>	<b>No</b>
13	<ol style="list-style-type: none"> <li>1. Turn OFF the engine. 2. Disconnect the A/C low pressure switch.</li> <li>3. Turn ON the ignition, with the engine OFF.</li> <li>4. Probe the ground circuit of the A/C low pressure switch with a test lamp that is connected to battery positive voltage.</li> </ol> <p>Does the test lamp illuminate?</p>	Go to Step 14	Go to Step 24
14	<ol style="list-style-type: none"> <li>1. Connect a 3-amp fused jumper across the A/C low pressure switch signal circuit of the A/C low pressure switch and the ground circuit of the A/C low pressure switch.</li> <li>2. With a scan tool, observe the A/C Compressor Cycling Switch parameter in the Powertrain Engine data list.</li> </ol> <p>Does the scan tool indicate that the A/C Compressor Cycling Switch parameter is YES?</p>	Go to Step 28	Go to Step 22
15	<ol style="list-style-type: none"> <li>1. Turn OFF the engine.</li> <li>2. Connect a test lamp between the A/C compressor clutch relay control circuit of the A/C compressor clutch relay and battery positive voltage.</li> <li>3. Start the engine.</li> <li>4. With a scan tool, command the A/C Relay ON and OFF.</li> </ol> <p>Does the test lamp illuminate with each command?</p>	Go to Step 25	Go to Step 16
16	<p>Test the A/C compressor clutch relay control circuit of the A/C high pressure switch for the following conditions:</p> <ul style="list-style-type: none"> <li>• A high resistance</li> <li>• An open.</li> </ul> <p>Refer to Circuit Testing and Wiring Repairs in Wiring Systems.</p> <p>Did you find and correct the condition?</p>	Go to Step 38	Go to Step 31
17	<ol style="list-style-type: none"> <li>1. Disconnect the A/C compressor clutch.</li> <li>2. Probe the A/C compressor clutch supply voltage circuit of the A/C compressor clutch with a test lamp that is connected to a good ground.</li> </ol> <p>Does the test lamp illuminate?</p>	Go to Step 19	Go to Step 18

<b>HVAC Compressor Does Not Engage (Gas Engines)</b>			
<b>Step</b>	<b>Action</b>	<b>Yes</b>	<b>No</b>
18	<p>Test the A/C compressor clutch supply voltage circuit of the A/C compressor clutch for the following conditions:</p> <ul style="list-style-type: none"> <li>• A high resistance</li> <li>• An open</li> <li>• A short to ground. Refer to Circuit Testing and Wiring Repairs in Wiring Systems.</li> </ul> <p>Did you find and correct the condition?</p>	Go to Step 38	Go to Step 29
19	<p>Test the ground circuit of the A/C compressor clutch for the following conditions:</p> <ul style="list-style-type: none"> <li>• A high resistance</li> <li>• An open. Refer to Circuit Testing and Wiring Repairs in Wiring Systems.</li> </ul> <p>Did you find and correct the condition?</p>	Go to Step 38	Go to Step 29
20	<p>Test the A/C request signal circuit of the HVAC control assembly for the following conditions:</p> <ul style="list-style-type: none"> <li>• A high resistance</li> <li>• An open</li> <li>• A short to ground. Refer to Circuit Testing and Wiring Repairs in Wiring Systems.</li> </ul> <p>Did you find and correct the condition?</p>	Go to Step 38	Go to Step 30
21	<p>Test the A/C request signal circuit of the engine control module (ECM)/powertrain control module (PCM) for the following conditions:</p> <ul style="list-style-type: none"> <li>• A high resistance</li> <li>• An open</li> <li>• A short to ground. Refer to Circuit Testing and Wiring Repairs in Wiring Systems.</li> </ul> <p>Did you find and correct the condition?</p>	Go to Step 38	Go to Step 31



<b>HVAC Compressor Does Not Engage (Gas Engines)</b>			
<b>Step</b>	<b>Action</b>	<b>Yes</b>	<b>No</b>
22	<p>Test the A/C low pressure switch signal circuit of the ECM/PCM for the following conditions:</p> <ul style="list-style-type: none"> <li>• A high resistance</li> <li>• An open. Refer to Circuit Testing and Wiring Repairs in Wiring Systems.</li> </ul> <p>Did you find and correct the condition?</p>	Go to Step 38	Go to Step 31
23	<p>Repair the battery positive circuit of the A/C compressor clutch relay. Refer to Wiring Repairs in Wiring Systems.</p> <p>Did you find and correct the condition?</p>	Go to Step 38	—
24	<p>Repair the ground circuit of the A/C low pressure switch. Refer to Wiring Repairs in Wiring Systems.</p> <p>Did you find and correct the condition?</p>	Go to Step 38	—
25	<p>Repair the ignition 3 voltage circuit of the A/C compressor clutch relay. Refer to Wiring Repairs in Wiring Systems.</p> <p>Did you find and correct the condition?</p>	Go to Step 38	—
26	<p>Inspect for poor connections at the harness connector of the A/C compressor clutch relay. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems.</p> <p>Did you find and correct the condition?</p>	Go to Step 38	Go to Step 32
27	<p>Inspect for poor connections at the harness connector of the A/C high pressure switch. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems.</p> <p>Did you find and correct the condition?</p>	Go to Step 38	Go to Step 33

<b>HVAC Compressor Does Not Engage (Gas Engines)</b>			
<b>Step</b>	<b>Action</b>	<b>Yes</b>	<b>No</b>
28	Inspect for poor connections at the harness connector of the A/C low pressure switch. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems.  Did you find and correct the condition?	Go to Step 38	Go to Step 34
29	Inspect for poor connections at the harness connector of the A/C compressor clutch coil. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems.  Did you find and correct the condition?	Go to Step 38	Go to Step 35
30	Inspect for poor connections at the harness connector of the HVAC control assembly. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems.  Did you find and correct the condition?	Go to Step 38	Go to Step 36
31	Inspect for poor connections at the harness connector of the ECM/PCM. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems.  Did you find and correct the condition?	Go to Step 38	Go to Step 37
32	Replace the A/C compressor clutch relay. Refer to Compressor Relay Replacement in Heating, Ventilation and Air Conditioning.  Did you complete the replacement?	Go to Step 38	—
33	Replace the A/C high pressure switch. Refer to Air Conditioning (A/C) High Pressure Switch Replacement in Heating, Ventilation and Air Conditioning.  Did you complete the replacement?	Go to Step 38	—
34	Replace the A/C low pressure switch. Refer to Air Conditioning (A/C) Low Pressure Switch Replacement in Heating, Ventilation and Air Conditioning.  Did you complete the replacement?	Go to Step 38	—

<b>HVAC Compressor Does Not Engage (Gas Engines)</b>			
<b>Step</b>	<b>Action</b>	<b>Yes</b>	<b>No</b>
35	Replace the A/C compressor clutch coil or A/C compressor. Refer to the appropriate repair procedure: <ul style="list-style-type: none"> <li>• Compressor Clutch Coil Replacement in Heating, Ventilation and Air Conditioning</li> <li>• Compressor Replacement in Heating, Ventilation and Air Conditioning.</li> </ul> Did you complete the replacement?	Go to Step 38	—
36	Replace the HVAC control assembly. Refer to HVAC Control Assembly Replacement.  Did you complete the replacement?	Go to Step 38	—
37	Replace the PCM. Refer to Powertrain Control Module (PCM) Replacement in Engine Controls - 8.1L.  Did you complete the replacement?	Go to Step 38	—
38	Operate the system in order to verify the repair.  Did you correct the condition?	Go to Step 2	—

## HVAC COMPRESSOR CLUTCH DOES NOT ENGAGE (W42 WITH 4.5L (L6I) ENGINE)

### IMPORTANT:

*The Tech II cannot be used to retrieve codes from the ECM on the 4.5L diesel engine. The EZ-Tech III (used by International Truck & Engine Dealers) is the tool used to interface with the ECM.*

### Normal Operation

Under normal operation, 12 volts are applied through the A/C CMPR fuse to the A/C compressor relay contact and to the A/C relay coil. When the PCM provides the ground for the coil side of the relay, the switch in the relay closes and power is then sent from the switch side of the relay to the A/C compressor clutch coil.

The ECM supplies power to the A/C compressor reference pressure switch. If the low-charge protection switch is reading an acceptable pressure in the low-pressure side of the refrigerant system, it will be in the CLOSED position. If the high-pressure cutoff switch is reading an acceptable pressure in the high-pressure side of the refrigerant system, it will be in the CLOSED position. After the high-pressure cutoff switch, power is supplied to the A/C control switch provided by the body builder.

### Possible Causes

- Low refrigerant charge
- A/C compressor reference switch
- High-pressure cutoff switch
- PCM
- A/C clutch relay
- A/C compressor/clutch
- An open in circuit E762 (DK\_GN/WH), E604 (DK\_BU), E203 (LT\_BU), E441C (BN), E459 (DK\_GN/WH), E441B (BN), or E59 (DK\_GN).

### IMPORTANT:

*The following table includes basic diagnostic information. If unable to resolve the problem using this table, access to an EZ-Tech III and to the International Service Information Solutions (ISIS) website. If these items are not available contact Technical Assistance for guidance.*

<b>HVAC Compressor Clutch Does Not Engage (Diesel Engine)</b>			
<b>Step</b>	<b>Action</b>	<b>Yes</b>	<b>No</b>
1	Before using this table, confirm that the air conditioning (A/C) system has an adequate state of charge.  Does the A/C system have an adequate state of charge?	Go to Step 2	Go to Refrigerant System Checks
2	Check the A/C CMPR fuse:  Is the fuse blown?	Go to Step 3	Go to Step 4
3	Check the circuits protected by the fuse for shorts to ground/power.  Was the condition found and corrected?	Go to Step	Go to Step 4
4	Switch out the A/C CMPR Relay with a known good relay. Operate the system.  Does the A/C system operate with the new relay installed?	System has been repaired.	Re-install the previous relay. Go to Step 5
5	Check circuits E762 (DK_GN/WH), E604 (DK_BU), E203 (LT_BU), E441C (BRN), E459 (DK_GN/WH), E441B (BN), or E59 (DK_GN).  Has the condition been found and corrected?	Go to Step 7	Go to Step 6
6	Contact Technical Assistance.	—	—
7	Test the system for proper operation.  Does the system operate within specifications?	Diagnosis complete.	Go to Step 1.

**HVAC Compressor Clutch Does Not Disengage (Gas Engines)**

- 2. Placing the blower motor switch in the OFF position and the mode switch to the floor position, disables an A/C request.
- 4. There are 2 A/C request signal circuits of the A/C high pressure switch. Both must be tested or misdiagnosis could occur.

<b>HVAC Compressor Clutch Does Not Disengage (Gas Engines)</b>				
<b>Step</b>	<b>Action</b>	<b>Value(s)</b>	<b>Yes</b>	<b>No</b>
<b>Schematic Reference:</b> HVAC Schematics				
<b>Connector End View Reference:</b> HVAC Connector End Views				
<b>DEFINITION:</b> A/C compressor clutch will not disengage when an A/C request has not been made and a powertrain DTC has not been set.				
1	Did you review the HVAC operation and perform the necessary inspections?	—	Go to Step 2	Go to Symptoms - HVAC Systems - Manual
2	1. Start the engine. 2. Place the blower motor switch in the OFF position. 3. Place the mode switch in the FLOOR position.  Does the A/C compressor operate?	—	Go to Step 3	Go to Testing for Intermittent Conditions and Poor Connections in Wiring Systems
3	1. Turn ON the ignition. 2. With a scan tool, observe the A/C Request Signal parameter in the Powertrain Engine Data list.  Does the scan tool indicate that the A/C Request parameter is YES?	—	Go to Step 4	Go to Step 6
4	Test both of the A/C request signal circuits of the A/C high pressure switch for a short to voltage. Refer to Circuit Testing and Wiring Repairs in Wiring Systems.  Did you find and correct the condition?	—	Go to Step 18	Go to Step 5

<b>HVAC Compressor Clutch Does Not Disengage (Gas Engines)</b>				
<b>Step</b>	<b>Action</b>	<b>Value(s)</b>	<b>Yes</b>	<b>No</b>
5.	1. Turn OFF the ignition. 2. Disconnect the A/C high pressure switch. 3. Start the engine. 4. Place the blower motor switch in the OFF position. 5. With a scan tool, observe the A/C Request Signal parameter.  Does the scan tool indicate that the A/C Request parameter is YES?	—	Go to Step 12	Go to Step 11
6.	Remove the A/C compressor clutch relay.  Does the A/C compressor clutch turn OFF?	—	Go to Step 7	Go to Step 9
7.	Measure the resistance between the switch side A/C compressor clutch relay terminals at the relay.  Does the resistance measurement equal the specified value?	∞	Go to Step 8	Go to Step 10
8.	Test the A/C compressor clutch relay control circuit for a short to ground. Refer to Circuit Testing and Wiring Repairs in Wiring Systems.  Did you find and correct the condition?	—	Go to Step 18	Go to Step 12
9.	Test the A/C compressor clutch supply voltage circuit for a short to voltage. Refer to Circuit Testing and Wiring Repairs in Wiring Systems.  Did you find and correct the condition?	—	Go to Step 18	Go to Step 13
10.	Inspect for poor connections at the A/C compressor clutch relay. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems.  Did you find and correct the condition?	—	Go to Step 18	Go to Step 14
11.	Inspect for poor connections at the harness connector of the HVAC control assembly. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems.  Did you find and correct the condition?	—	Go to Step 18	Go to Step 16

<b>HVAC Compressor Clutch Does Not Disengage (Gas Engines)</b>				
<b>Step</b>	<b>Action</b>	<b>Value(s)</b>	<b>Yes</b>	<b>No</b>
12.	Inspect for poor connections at the harness connector of the powertrain control module (PCM)/engine control module (ECM). Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems.  Did you find and correct the condition?	—	Go to Step 18	Go to Step 17
13.	Inspect for poor connections at the harness connector of the A/C compressor clutch. Refer to Testing for Intermittent Conditions and Poor Connections and Connector Repairs in Wiring Systems.  Did you find and correct the condition?	—	Go to Step 18	Go to Step 15
14.	Replace the A/C compressor clutch relay. Refer to Compressor Relay Replacement in Heating, Ventilation and Air Conditioning.  Did you complete the replacement?	—	Go to Step 18	—
15.	Replace the A/C compressor. Refer to Compressor Replacement in Heating, Ventilation and Air Conditioning.  Did you complete the replacement?	—	Go to Step 18	—
16.	Replace the HVAC control assembly. Refer to HVAC Control Assembly Replacement.  Did you complete the replacement?	—	Go to Step 18	—
17.	Replace the PCM. Refer to Powertrain Control Module (PCM) Replacement in Engine Controls – 8.1L  Did you complete the replacement?	—	Go to Step 18	—
18.	Operate the system in order to verify the repair.  Did you correct the condition?	—	System OK	Go to Step 3



## **Refrigerant System Checks**

### ***Functional Tests***

- The operation of the air conditioning (A/C) blower at all speeds in any position except the OFF position and the engagement of the A/C compressor clutch will indicate that the electrical circuits are functioning properly.
- The same “hand-felt” temperature of the A/C evaporator inlet pipe and the A/C receiver/dryer or the dehydrator surface of an operating system will indicate a properly charged system.
- The operation of the A/C control head in order to distribute the air from the designed outlets will indicate proper functioning.

### ***Performance Test***

#### ***Tools Required***

- J 39500 A/C Refrigerant, Recovery, Recycling and Recharging Station
  1. Park the vehicle inside or in a shaded area.
  2. Place the transmission in the PARK or the NEUTRAL position.
  3. Open the hood.
  4. Secure the hood.
  5. Remove the low pressure hose cap.
  6. Remove the high pressure hose cap.
  7. Connect the low pressure hose (2). Connect the high pressure hose (1).
  8. Start the engine.
  9. Stabilize the engine to the normal idling condition.
  10. Press the A/C button to the ON position.
  11. Press the MAX/RECIRC button to the ON position.
  12. Adjust the blower speed to the HI position.
  13. Adjust the temperature control to full cold.
  14. Carefully follow the manufacturer’s instructions.

The normal temperature guideline for the pressures reading is approximately 25-30°C (77-86°F).

The normal pressure guideline at the ambient for the low pressure side is approximately 127-265 kPa (1 8.5-38.4 psi).

The normal pressure guideline at the ambient for the high pressure side as approximately 1373-1 765 kPa (1 99-255.9 psi).

**HFC-134A PRESSURE-TEMPERATURE RELATIONSHIP**

Pressure		Temperature	
kPa	psi	°C	°F
36	5.3	-20	-4.4
67	9.7	-15	5
104	15	-10	14
147	21	-5	23
196	28	0	32
255	37	5	41
314	45	10	50
392	57	15	59
471	68	20	68
569	82	25	77
677	98	30	86
785	114	35	95
912	132	40	104
1059	154	45	113
1216	176	50	122

**Leak Testing**

**Tools Required**

- J 39400-A Electronic Leak Detector

**CAUTION:**

***Do not operate the detector in a combustible atmosphere since its sensor operates at high temperatures or personal injury and/or damage to the equipment may result.***

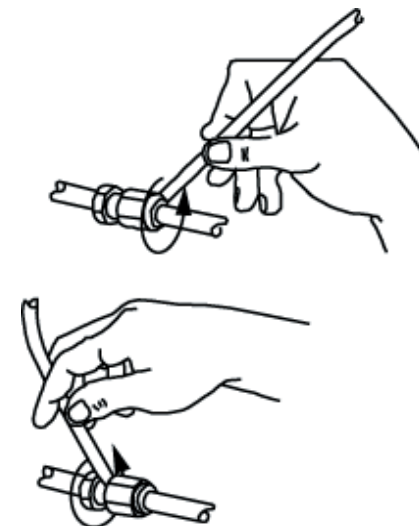
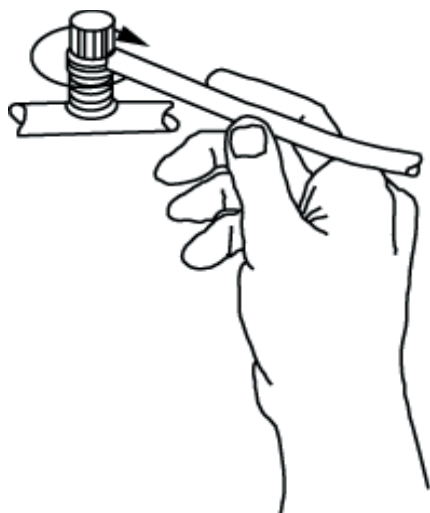
**IMPORTANT:**

***Halogen leak detectors are sensitive to windshield washing solutions, many solvents, cleaners, and some adhesives used in the vehicle. Ensure that the surfaces are clean and dry in order to prevent a false warning. The ingestion of liquids will damage the detector.***

Perform a refrigerant leak test when the following conditions exist:

- A leak is suspected
- After performing a service operation which disturbs the following items:
  - The components
  - The connections
  - The lines

Many methods and special tools are available for use in order to perform the refrigerant leak test. No matter which tool is used, care and diligence are the biggest keys to success



The electronic leak detector has been found to be the most useful tool in locating refrigerant leaks. The J 39400-A Electronic Leak Detector is a small unit which operates on a 12V DC and produces an audible signal which increases in frequency as R-134a is detected. Ensure that the instrument is properly calibrated according to the instructions. Ensure the detector is in the proper setting for the type of refrigerant being tested. Place the detector GAS switch in the R-134a setting prior to use.

The most common leaks are found at the refrigerant fittings or the connections. The following conditions may cause the leaks:

- Improper torque
- Damaged O-rings seals
- Lack of lubricant on the O-ring seals
- Dirt or debris across the O-ring seals

Even the smallest piece of lint from cotton gloves or shop cloths can create a leak path across an O-ring seal.

The successful use of this and any other electronic detector depends greatly upon the scan rate. Carefully follow the manufacturer's instructions regarding the following items:

- The calibration
- The operation
- The maintenance

**IMPORTANT:**

*Always follow the refrigerant system around in a continuous path so that any areas of potential leaks are not missed. Always test all areas in order to ensure that the entire system is leak free, even when one leak is already found.*

Circle each joint completely by moving at 25-51 mm (1 -2 in) per second with the tip of the probe as close to the surface as possible. Circle the joint no more than 6 mm (0.25 in) away. Do not block the air intake. The audible tone will go from a steady 1-2 clicks per second to a solid alarm to indicate a leak. Frequently adjust the balance knob in order to maintain the 1-2 clicks per second rate.

Use this procedure in order to test the following components:

- The air conditioning (A/C) evaporator inlet
- The A/C evaporator outlet
- The A/C accumulator inlet
- The A/C accumulator outlet
- The A/C condenser inlet
- The A/C condenser outlet
- All brazed areas
- All welded areas
- Any area that shows signs of damage
- The hose couplings
- The A/C compressor rear head
- The housing joints

**Service Ports/Access Valves**

The primary seal for the service ports is the sealing cap. The cap contains a specially designed O-ring seal or gasket which provide a leak-free seal. A loss of refrigerant charge will result if the following conditions exist:

- The cap is loose
- The cap is missing
- The wrong cap is used

**Air Conditioning (A/C) Evaporator Core**

One of the most difficult leaks to find is in the air conditioning (A/C) evaporator core. Use the following procedure in order to leak test the core:

1. Turn the blower fan on high for 15 or more seconds.
2. Turn the blower fan off.
3. Wait for 10 minutes.
4. Remove the blower motor resistor.
5. Insert the leak detector probe as close to the A/C evaporator as possible. A leak is detected if the detector goes to a solid alarm.
6. If possible, visually inspect the core face with a flashlight for evidence of refrigerant oil.

## Air Conditioning (A/C) Compressor Block

### *Fitting and Shaft Seal*

1. Blow shop air behind and in front of the air conditioning (A/C) compressor clutch/pulley for at least 15 seconds.
2. Wait for 1-2 minutes.
3. Probe the area in front of the pulley.

A leak is detected if the detector goes to a solid alarm.

### When Leak Cannot Be Found

#### *Tools Required*

- J 41447 R-134a Florescent Dye
- J 41459 Dye Injector
- J 39400-A Leak Detector
- J 39500 R-134a A/C Refrigerant Recovery, Recycling, and Recharging Station (ACR4)

The following diagnostic procedure should be used when an air conditioning (A/C) refrigerant leak cannot be found when using a leak detector, J 39400-A.

1. Make a copy of Attachment 1 (Service Information Form).
2. Using an J 39500, record the necessary information.
3. Recover the existing R-134a refrigerant and record the refrigerant weight.
4. Add J 41447 or P/N 12346303, using the J 41459.
5. Re-charge the system.
6. Check the system for leaks using a high intensity black

light or P/N 12377979.

#### **IMPORTANT:**

*R-134a florescent dye will remain in the lubricant for the life of the vehicle as long as the vehicle's A/C system has not been flushed. If no leaks can be found, return the vehicle to the customer and advise them of the dye in the system and that it may need to be rechecked at a later date. Attach the Service Information Form to the Warranty Repair Order when completed.*

**Odor Diagnosis**

**IMPORTANT:**

*Under certain climate and operating conditions a must odor develops from mold growth in the evaporator core face. The odor is generally temporary. As climate conditions change, the odor will disappear and repair. If the odor persists it will become necessary to remove the evaporator core and clean the face of the evaporator core with the appropriate cleaner.*

**Musty Smell**

Problem	Action
<b>DEFINITION:</b> There is a musty smell in the air conditioning system.	
<b>IMPORTANT:</b> <i>Under certain climate and operating conditions a must odor develops from mold growth in the evaporator core face. The odor is generally temporary. As climate conditions change, the odor will disappear and repair. If the odor persists it will become necessary to remove the evaporator core and clean the face of the evaporator core with the appropriate cleaner.</i>	
There are water leaks in the body.	Seal the body.
The evaporator drains.	Clean the drain.
The evaporator has mold or mildew.	Clean the evaporator.

**Coolant Smell**

Problem	Action
<b>DEFINITION:</b> The air conditioning (A/C) system has a coolant smell	
Anti-freeze.	<ul style="list-style-type: none"> <li>• Heater core.</li> <li>• Heater pipe/hoses.</li> </ul>

**Refrigerant Leak**

Problem	Action
<b>DEFINITION:</b> The air conditioning (A/C) system has a refrigerant leak.	
Refrigerant oil.	Clean the evaporator core.

## REPAIR INSTRUCTIONS

### Odor Correction

#### Tools Required

- J 36645 Air Conditioning Cleaning Gun

In hot, humid climate the air conditioning (A/C) system may emit odors. The following conditions may cause the odors:

- Debris in the heater/A/C evaporator case.
- The growth of mold on the A/C evaporator core In order to correct the odor problem, use the following procedure:

#### IMPORTANT:

***If disinfectant gets into the eyes, hold the eyelids open and flush the eyes with a steady, gentle stream of water for 15 minutes. Obtain medical attention if the irritation persists.***

1. Put on rubber gloves and safety glasses.
2. Pour a small bottle of the two-part Air Conditioning System Disinfectant P/N 25533404 or the equivalent into the large bottle. Seal and invert the large container once or twice to mix the contents.
3. Inspect underneath the vehicle in order to verify that the drain outlet is not plugged.
4. Connect the battery charger in order to avoid draining the battery during the cleaning procedure.
5. Remove the blower motor resistor. Leave the wiring connectors attached.
6. Inspect the heater/A/C evaporator module for debris.

Remove any debris that is present through the blower resistor opening. If the debris is imbedded into the A/C evaporator core face and cannot be removed, remove the core from the vehicle and clean the core. If a large amount of debris is present in the heater/A/C evaporator case, the air inlet screen will require sealing around the air intake in the cowl area.

7. Turn the ignition to the ON position. Do not start the vehicle.
8. Set the mode selector to the following positions:
  - Max/Rec/Rc
  - The blower speed to 1
  - The temperature to full cold
9. Open all of the windows and the doors.
10. Exit the vehicle.
11. Place a drain pan with at least a 2 quart capacity below the heater/A/C evaporator drain hole in order to collect the disinfectant and the rinse water runoff. If necessary, install an additional hose onto the drain so that all of the fluid goes into the drain pan.
12. Turn the pedestal fan on 4 in order to provide cross ventilation during the cleaning procedure.

#### IMPORTANT:

***Do not allow the disinfectant to come into contact with hot engine components such as the exhaust manifold.***

13. Use the J 36645 Air Conditioning Cleaning Gun, or an equivalent spray gun while performing the following procedure:
  - 13.1. Insert the nozzle of the spray gun through the blower resistor opening.

- 13.2. Insert the siphon hose into the container of the disinfectant.
- 13.3. Take extra care to ensure the adequate coverage of the corner and the edges.
- 13.4. Spray directly toward the A/C evaporator face.
- 13.5. Completely saturate the core. Use the entire container of the solution.
14. Turn the ignition to the OFF position. Allow the core to soak for 5 minutes.
15. Verify the proper drain operation underneath the vehicle. If necessary, unclog and increase the drain plug slits with a razor blade or sharp knife.
16. Turn the ignition to the ON position. Do not start the vehicle.
17. Thoroughly rinse the A/C evaporator core with clean water using the spray gun in order to remove all of the disinfectant residue. A 2 quart rinse is recommended.
18. Turn the ignition to the OFF position.
19. Reinstall the blower resistor.
20. Properly dispose of the disinfectant and the rinse water runoff that was collected in the drain pan in an approved manner.

## Refrigerant Recovery and Recharging

### Tools Required

- J 39500 A/C Refrigerant Recovery, Recycling and Recharging (ACR4) System
- J 41810 PureGuard 2
- J-41810-100A Active Flow Control Valve

### **CAUTION:**

***Avoid breathing the A/C Refrigerant 134a (R-134a) and the lubricant vapor or the mist. Exposure may irritate the eyes, nose, and throat. Work in a well ventilated area. In order to remove R-134a from the A/C system, use service equipment that is certified to meet the requirements of SAE J 2210 (R-134a recycling equipment). If an accidental system discharge occurs, ventilate the work area before continuing service. Additional health and safety information may be obtained from the refrigerant and lubricant manufacturers.***

### **CAUTION:**

***For personal protection, goggles and gloves should be worn and a clean cloth wrapped around fittings, valves, and connections when doing work that includes opening the refrigerant system. If R-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:**

***R-134a is the only approved refrigerant for use in this vehicle. The use of any other refrigerant may result in poor system performance or component failure.***

### **NOTICE:**

***To avoid system damage use only R-134a dedicated tools when servicing the A/C system.***



**NOTICE:**

*Use only Polyalkylene Glycol Synthetic Refrigerant Oil (PAG) for internal circulation through the R-134a A/C system and only 525 viscosity mineral oil on fitting threads and O-rings. If lubricants other than those specified are used, compressor failure and/or fitting seizure may result.*

**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. Refer to the manufacturer instructions included with the service equipment before servicing.*

The J 39500 removes the Refrigerant-134a from the vehicle's A/C system. The recovery procedure uses one filtering cycle. The evacuation procedure uses an automatic multiple pass filtering cycle. These filtering cycles ensure a constant supply of clean, dry refrigerant for A/C system charging. The Initial Set-Up Instruction Manual, provided with the J 39500, contains specific procedures for proper recovery, evacuation and recharging. For ACR4 technical assistance in the US, call 1-800-345-2233.

**Compressor Replacement (Gas Engines)**

*Removal Procedure*

**CAUTION:**

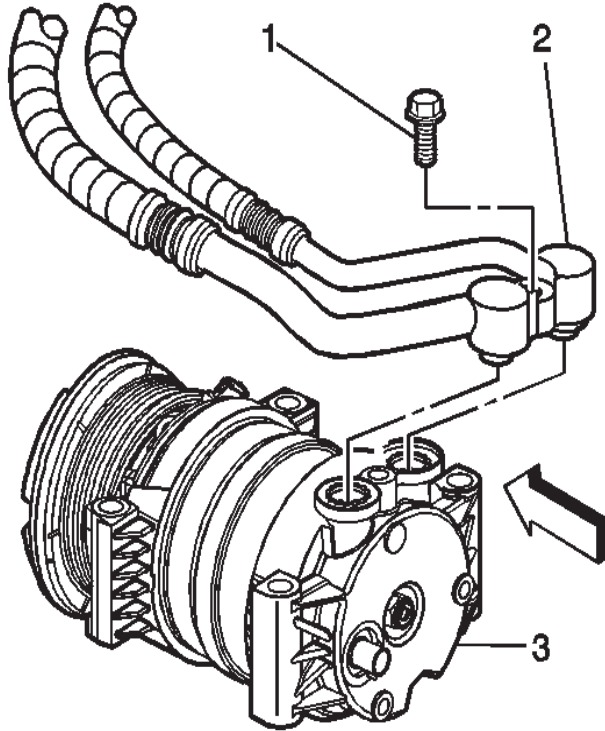
*Refer to Battery Disconnect Caution in Cautions and Notices.*

1. Recover the refrigerant from the system. Refer to Refrigerant Recovery and Recharging.
2. Remove the drive belt.
3. Disconnect the electrical connectors from the A/C compressor.

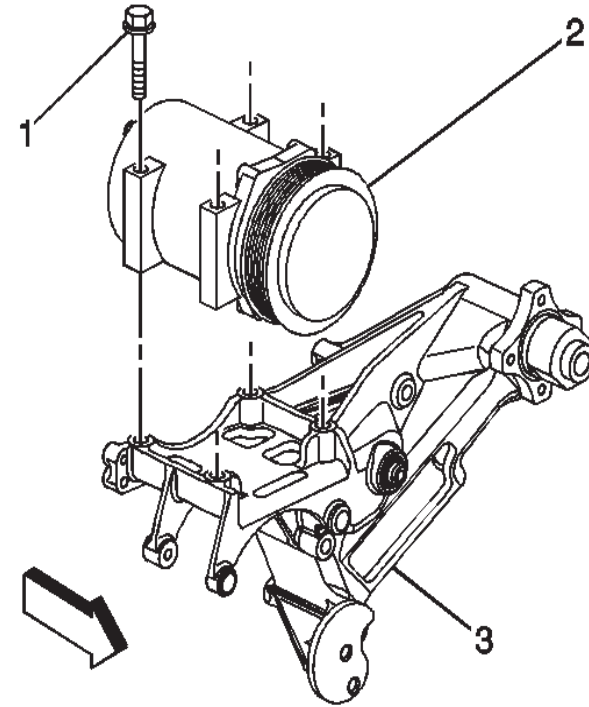
**IMPORTANT:**

*When removing the sealing washers, prevent dirt and foreign material from getting on the following sealing surfaces:*

- The washers
- The A/C compressor ports
- Use a lint-free cloth to clean all of the sealing surfaces.



4. Remove the A/C compressor hose bolt and clamp.
5. Remove and discard the A/C compressor sealing washers.



6. Remove the bolts and the compressor from the bracket.

**Installation Procedure**

1. Fill the A/C compressor. If the A/C compressor is being replaced, refer to Refrigerant Oil Distribution Specifications.

**NOTICE:**

Refer to Fastener Notice in Cautions and Notices.

2. Install the compressor and bolts to the bracket.
3. Tighten the A/C compressor bracket bolts to 50 N•m (37 lb ft).

**IMPORTANT:**

*When installing the sealing washers, prevent dirt and foreign material from getting onto the sealed surfaces of the following components:*

- The washers
- The block fitting
- The A/C compressor ports

*Clean all of the sealing surfaces with a lint-free cloth.*

*Do not oil the sealing washers prior to assembly. “*

*Do not reuse the sealing washers.*

4. Install the new sealing washers onto the pilots of the hose fitting. Ensure that the washers bottom against the surface of the hose fitting.
5. Install the refrigerant hoses on the A/C compressor.
6. Secure the refrigerant hoses with the A/C compressor hose clamp bolt.

**NOTICE:**

*Refer to Fastener Notice in Cautions and Notices.*

7. Tighten the A/C compressor hose clamp bolt to 35 N•m (26 lb ft).
8. Install the electrical connectors to the A/C compressor.
9. Install the drive belt. Refer to Drive Belt Replacement (Gas Engines) in Engine Mechanical.
10. Add refrigerant to the system. Refer to Refrigerant Recovery and Recharging.
11. Inspect the system for leaks. Refer to Leak Testing.

**Compressor Replacement (W42 with 4.5L (L6I) Engine)**

**Removal Procedure**

1. Recover the refrigerant from the system. Refer to Refrigerant Recovery and Recharging.
2. Remove the drive belt.
3. Disconnect the electrical connectors from the A/C compressor.

**IMPORTANT:**

*When removing the sealing washers, prevent dirt and foreign material from getting on the following sealing surfaces:*

- The washers
  - The A/C compressor ports
  - Use a lint-free cloth to clean all of the sealing surfaces.
4. Remove the A/C compressor hose bolt and clamp.
  5. Remove and discard the A/C compressor sealing washers.
  6. Remove the bolts and the compressor from the bracket.

**Installation Procedure**

1. Fill the A/C compressor. If the A/C compressor is being replaced, refer to Refrigerant Oil Distribution Specifications.

**NOTICE:**

*Refer to Fastener Notice in Cautions and Notices.*

2. Install the compressor and bolts to the bracket.
3. Tighten the A/C compressor bracket bolts to **50 N•m (37 lb ft)**.

**IMPORTANT:**

*When installing the sealing washers, prevent dirt and foreign material from getting onto the sealed surfaces of the following components:*

- The washers
- The block fitting
- The A/C compressor ports

*Clean all of the sealing surfaces with a lint-free cloth.  
Do not oil the sealing washers prior to assembly.  
Do not reuse the sealing washers.*

4. Install the new sealing washers onto the pilots of the hose fitting. Ensure that the washers bottom against the surface of the hose fitting.
5. Install the refrigerant hoses on the A/C compressor.
6. Secure the refrigerant hoses with the A/C compressor hose clamp bolt.

**NOTICE:**

*Refer to Fastener Notice in Cautions and Notices.*

7. Tighten the A/C compressor hose clamp bolt to 35 N•m (26 lb ft).
8. Install the electrical connectors to the A/C compressor.
9. Install the drive belt.
10. Add refrigerant to the system. Refer to Refrigerant Recovery and Recharging.
11. Inspect the system for leaks. Refer to Leak Testing.

**COMPRESSOR OIL BALANCING (DELPHI)**

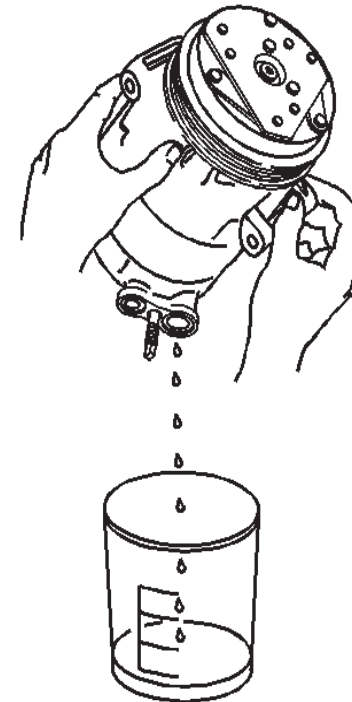
**Draining**

**IMPORTANT:**

*Drain and measure as much of the refrigerant oil as possible from the removed compressor.*

1. Drain the oil from both the suction and discharge ports of the removed compressor into a clean, graduated container.

Rotate the compressor shaft to assist in draining the compressor.



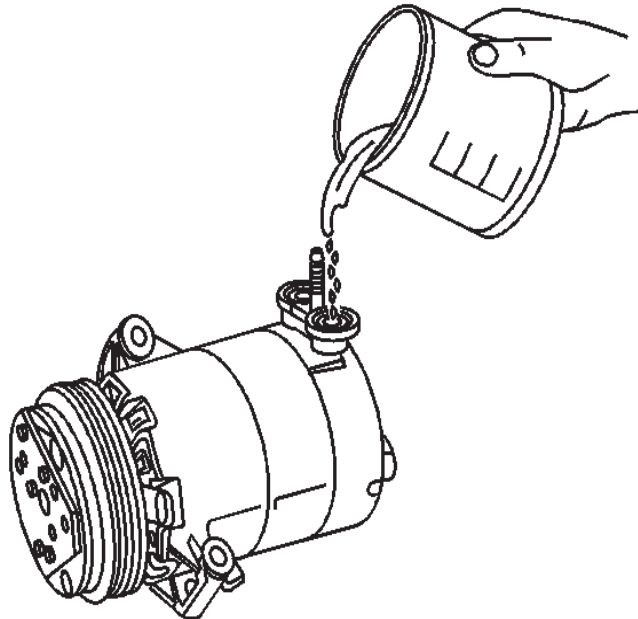
2. Measure and record the amount of oil drained from the removed compressor.
3. This measurement will be used during installation of the replacement compressor. Properly discard the used refrigerant oil.

## Balancing

### IMPORTANT:

*The refrigerant oil in the A/C system must be balanced during compressor replacement.*

1. The replacement compressor is shipped without refrigerant oil.



2. Calculate the amount of refrigerant oil required for oil balancing.

Compare the following refrigerant oil capacities:

- The amount drained and recorded during compressor removal.
  - The amount recommended for component replacement. Refer to Refrigerant System Capacities .
3. Add the greater amount of refrigerant oil to the A/C compressor.

## Compressor Leak Testing

### Bench-Check Procedure

#### Tools Required

- J 34992 Compressor Holding Fixture
- J 39400-A Leak Detector
- J 39893 Pressure Testing Connector
- J 39500 R-134a A/C Refrigerant Recovery, Recycling and Recharging System (ACR4)

1. Install the J 39893 on the rear head of the compressor.
2. Using the J 39500, attach the center hose of the manifold gauge set on the charging station to a refrigerant drum that is standing in an upright drum.
3. Connect the charging station high and low pressure lines to the corresponding fittings on the J 39893. The suction port (low-side) of the compressor has a large internal opening. The discharge port (high-side) has a smaller internal opening into the compressor. The discharge port (high-side) also has a deeper recess.

4. Open the following controls on the charging station in order to allow refrigerant vapor to flow into the compressor:
  - The low pressure control
  - The high pressure control
  - The refrigerant control
5. Use the J 39400-A to check for leaks at the following locations:
  - The pressure relief valve
  - The rear head switch location
  - The compressor front head seal
  - The compressor rear head seal
  - The center cylinder seal
  - The through bolt head gaskets
  - The compressor shaft seal
6. Turn the low-pressure control and the high-pressure control on the charging station off.
7. Perform the following steps if an external leak exists:
  - 7.1. Perform the necessary corrective measures.
  - 7.2. Inspect the components for leaks again in order to verify that the leak is corrected.
8. Recover the refrigerant.
9. Disconnect both hoses from the J 39893.
10. Add 90 ml (3 fl oz) of new PAG lubricant to the compressor assembly.
11. Slowly rotate the complete compressor assembly (excluding the crankshaft and the drive plate hub) several turns in order to distribute the oil to all of the cylinder and the piston areas.
12. Install a M9 x 1.25 threaded nut on the compressor crankshaft if the drive plate and clutch assembly are not installed.
13. Use a box-end wrench or socket and handle in order to rotate the compressor crankshaft or clutch drive plate on the crankshaft several turns. Performing the above action will ensure piston assembly to cylinder wall lubrication.
14. Using the J 39500, connect the J 39893 to the test plate high-side connector.
15. Using the J 39500, connect the charging station low-pressure line to the low-pressure port of the J 39893. Oil will drain out of the compressor suction port if the compressor is positioned with the suction port downward.
16. Attach the compressor to the J 34992.
17. Mount the compressor in a vise in order to place the compressor in a horizontal position.
18. Use a wrench to rotate the compressor crankshaft or the drive plate hub ten complete revolutions at the speed of approximately one-revolution per second. Turning the compressor at less than one-revolution per second can result in a lower pump-up pressure. Low pump-up pressure may disqualify a good pumping compressor.
19. Observe the reading on the high-pressure gauge at the completion of the tenth revolution of the compressor.

The pressure reading for a good pumping compressor should measure 690 kPa (100 psi) or above. A pressure reading less than 620 kPa (90 psi) indicates one or more of the suction and/or discharge valves have an internal leak or an inoperative valve.

Perform the following procedure if one of the valves are leaking or inoperative:

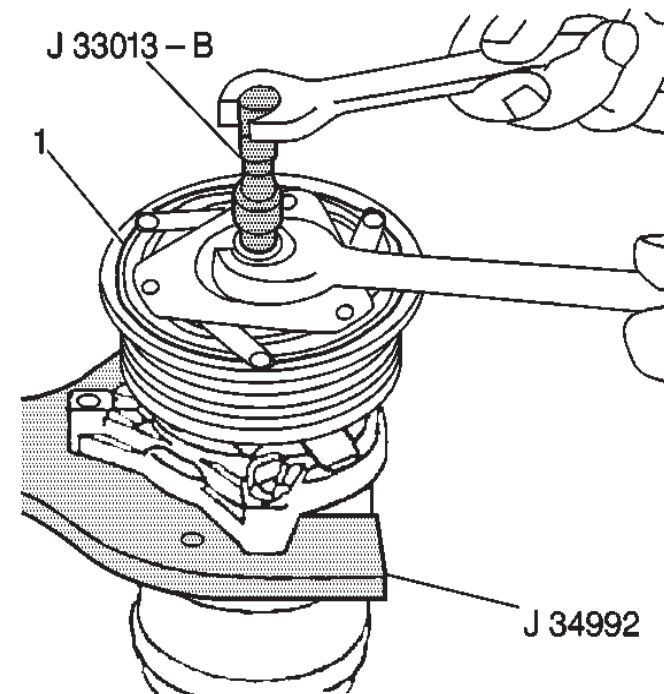
- 19.1. Recover the refrigerant.
- 19.2. Disassemble the compressor.
- 19.3. Inspect the compressor for the cause of the leak.
- 19.4. Repair the compressor as necessary.
- 19.5. Reassemble the compressor.
- 19.6. Repeat the pump-up test.
- 19.7. Test for external leaks

20. Recover the refrigerant from the high-side.
21. Remove the J 39893.
22. Tilt the compressor with the compressor suction port and the discharge port positioned downward.
23. Drain the PAG lubricant from the compressor. Allow the compressor to drain for 10 minutes.
24. Refill the compressor with the proper amount of PAG lubricant. Pour the PAG lubricant into the suction port.
25. If further assembly or processing is necessary, install a shipping plate or the J 39893. The shipping plate or the J 39893 prevents the following materials from entering the compressor until the compressor is installed:
  - Air
  - Dirt
  - Moisture

## **Compressor Clutch Plate and Hub Assembly Removal**

### **Tools Required**

- J 34992 Compressor Holding Fixture
- J 33013-B Hub and Drive Plate Remover/Installer



1. Clamp the J 34992 in a vise.
2. Use thumb screws in order to attach the compressor to the holding fixture.

**NOTICE:**

*Do not drive or pound on the clutch hub or shaft. Internal damage to the compressor may result. The forcing tip on the J 33013-B remover/installer center screw must be flat or the end of the shaft/axial plate assembly will be damaged.*

3. Ensure that the center screw forces the tip to thrust against the end of the shaft.
4. Thread the J 33013-B into the hub.
5. While holding the body of J 33013-B of the remover with a wrench, turn the center screw into the remover body in order to remove the clutch plate and hub assembly (1).
6. Remove the shaft key. Retain the shaft key for reassembly.

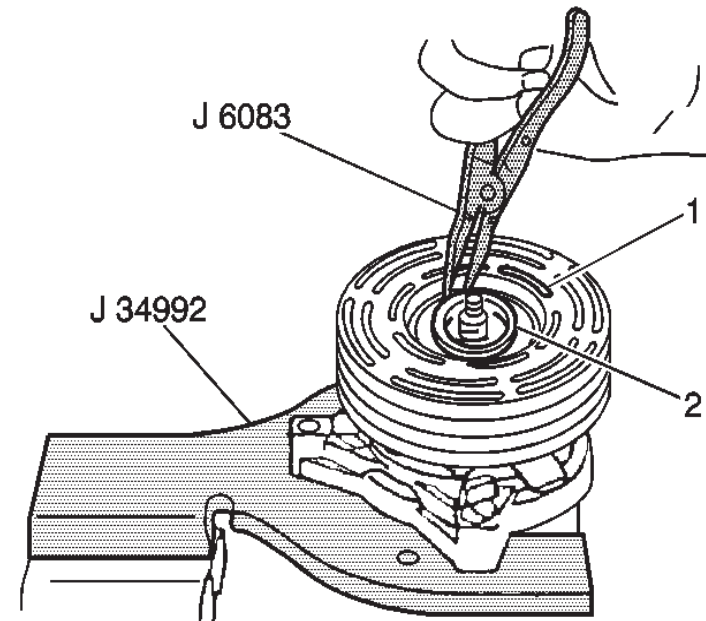
**Clutch Rotor and/or Bearing Replacement**

**Removal Procedure**

**Tools Required**

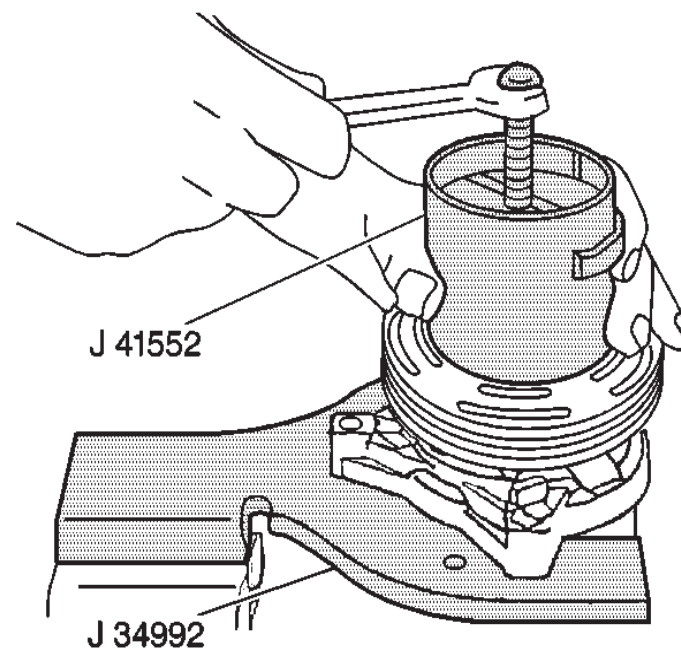
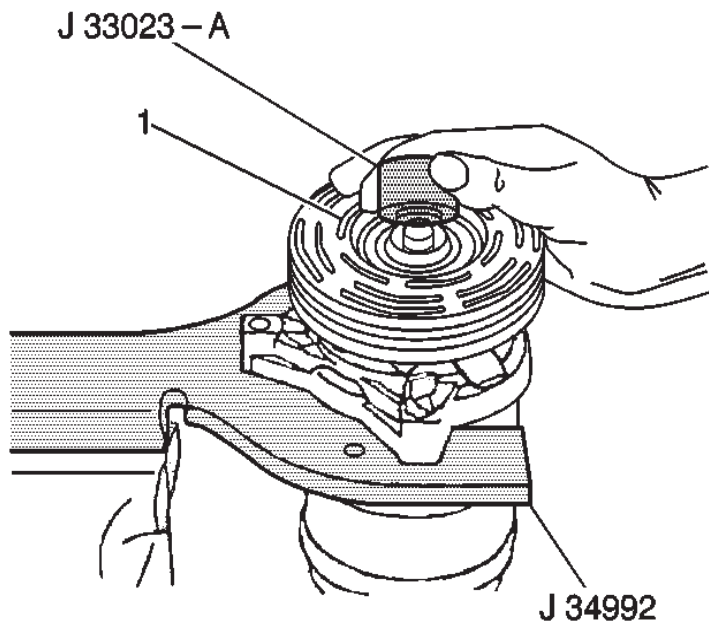
- J 6083 External Snap Ring Pliers
- J 33023-A Puller Pilot
- J 41552 Compressor Pulley Puller
- J 29886 Driver Handle
- J 21352-A Support Block
- J 9481-A Bearing Installer
- J 33019 Pulley Bearing Staking Tool
- J 33017 Pulley and Bearing Installer
- J 8433-1 Puller Bar
- J 9398-A Rotor Bearing Remover
- J 34992 Compressor Holding Fixture

1. Remove the A/C compressor. Refer to Compressor Replacement .



2. Remove the clutch plate and hub assembly. Refer to Compressor Clutch Plate/Hub Assembly Replacement .
3. Use the J 6083 in order to remove the following components:
  - The pulley rotor (1)
  - The bearing assembly retaining ring (2)





4. Install the J 33023-A to the front head.
5. Install the J 41552 down into the inner circle of slots (1) in the rotor.

6. Turn the J 41552 clockwise in the slots in the rotor.
7. Perform the following steps in order to remove the pulley rotor and bearing assembly:
  - A. Hold the J 41552 in position.
  - B. Tighten the puller screw against the puller guide.
  - C. Remove the pulley rotor and bearing assembly.
8. Use the following procedure to properly support the rotor hub during bearing removal in order to prevent pulley rotor damage:
  - A. Remove the forcing screw from the J 41552 .
  - B. Ensure that the puller tangs still engage in the rotor slots.

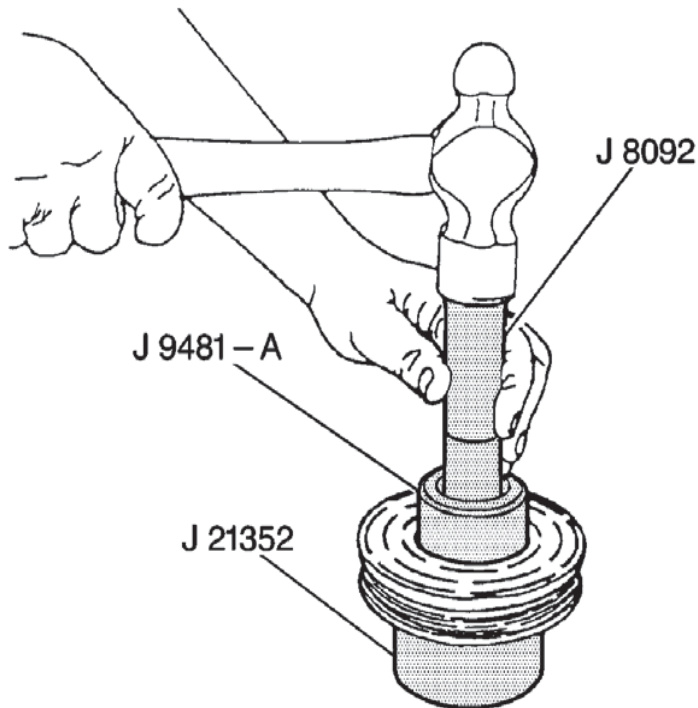
C. Invert the assembly onto a solid flat surface or blocks.

**NOTICE:**

*It is not necessary to remove the staking in front of the bearing to remove the bearing, however, it will be necessary to file away the old stake metal for proper clearance for the new bearing to be installed into the rotor bore or the bearing may be damaged.*

9. Use the J 9398-A and the J 29886 in order to drive the bearing out of the rotor hub.

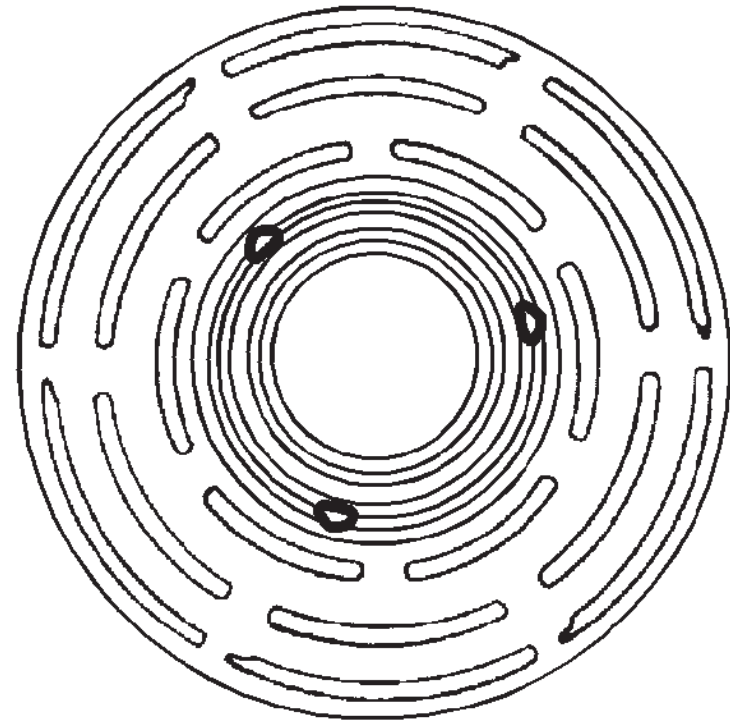
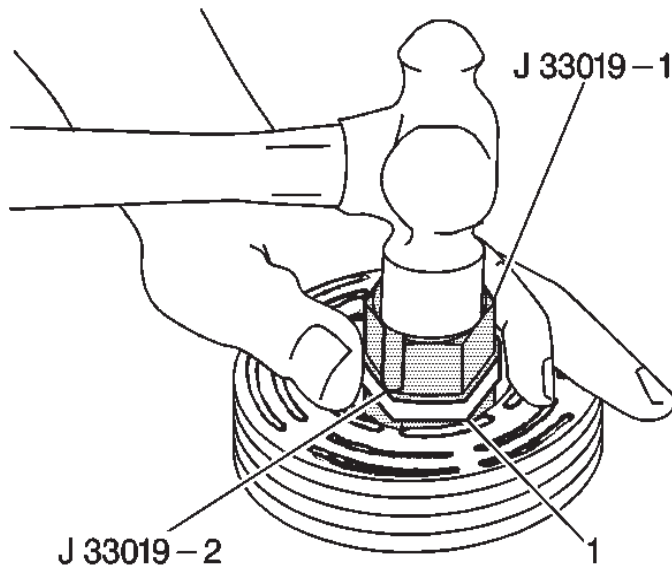
**Installation Procedure**



**NOTICE:**

*Do not support the rotor by resting the pulley rim on a flat surface during the bearing installation or the rotor face will be bent.*

1. Place the pulley rotor on the J 21352-A in order to fully support the rotor hub during bearing installation.
2. Use the following tools in order to align the new bearing squarely with the hub bore:
  - The J 41552
  - The J 9481-A
  - The J 29886
3. Drive the bearing fully into the hub.  
The installer will apply force to the outer race of the bearing, if used as shown.



4. Place the J 33019 in the hub bore.
5. Shift the rotor and bearing assembly on the J 21352-A in order to fully support the hub under the staking pin location.

Use a heavy-duty rubber band (1) in order to hold the stake pin in the guide. Properly position the stake pin in the guide after each impact on the pin.

**IMPORTANT:**

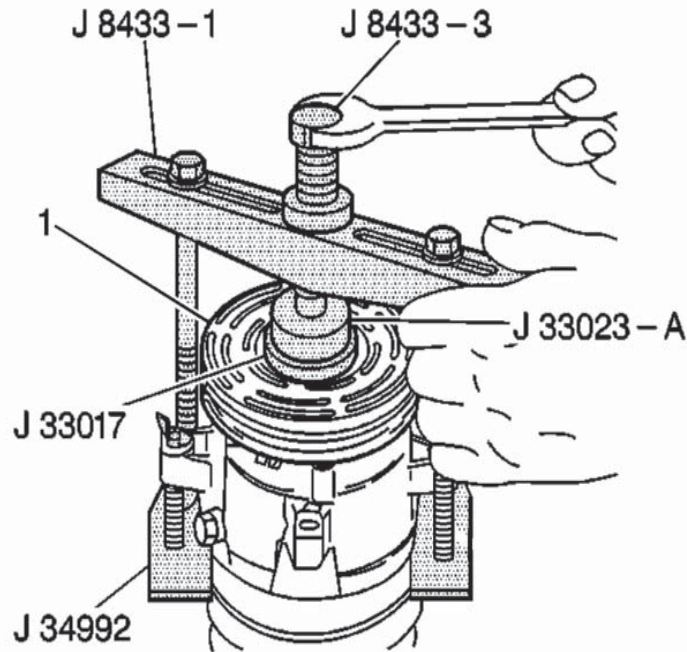
*Use care in order to prevent personal injury when striking the staking pin with a hammer.*

6. Strike the staking pin with a hammer until a metal stake, similar to the original, forms down to but not touching the bearing.

**IMPORTANT:**

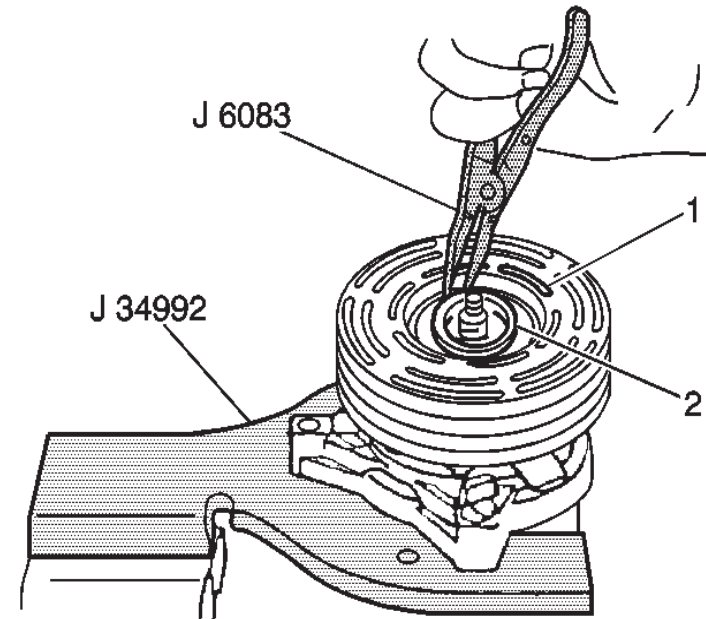
*Noisy bearing operation and reduced bearing life may result if the outer bearing race is deformed while staking. Ensure that the stake metal does not contact the outer race of the bearing.*

7. Stake 3 locations on the bearing race 120 degrees apart as shown.



8. With the compressor mounted on the J 34992 , position the pulley rotor (1) and the bearing assembly on the front head.
9. Position the J 33017 and the J 33023-A directly over the inner race of the bearing.
10. Position the J 8433-1 on the J 33023-A .
11. Assemble the 2 through bolts and the washers through the puller bar slots.
12. Thread the through bolts into the J 34992 .

13. Ensure that the thread of the through bolts engage the full thickness of the J 34992 . Tighten the center screw in the J 8433-1 in order to force the pulley rotor and bearing assembly onto the compressor front head. If the J 33017 slips off direct in-line contact with the inner race of the bearing, perform the following steps:
  - A. Loosen the J 8433-3 .
  - B. Realign the installer and the pilot in order to ensure that the J 33017 properly clears the front head.



14. Use the snap ring pliers in order to install the following components:
  15. The pulley rotor (1)
  16. The retaining ring (2)

17. Install the clutch plate and hub assembly. Refer to Compressor Clutch Plate/Hub Assembly Replacement .
18. Install the A/C compressor. Refer to Compressor Replacement .

### **Compressor Clutch Coil and/or Pulley Rim**

#### ***Removal Procedure***

#### ***Tools Required***

- J 41790* Compressor Holding Fixture
- J 8433-1* Compressor Pulley Puller
- J 8433-3* Forcing Screw
- J 33025* Clutch Coil Puller Legs
- J 33023-A* Puller Pilot

1. Remove the compressor from the vehicle. Refer to Compressor Replacement (Gas Engines) or Compressor Replacement (W42 with 4.5L (L6I) Engine).
2. Install the compressor onto the *J 41790*.
3. Install the *J 33023-A* onto the front head of the compressor.
4. Remove the compressor clutch plate and hub assembly. Refer to Compressor Clutch Plate and Hub Assembly.
5. Remove the compressor rotor and bearing assembly. Refer to Clutch Rotor and/or Bearing.
6. Mark the clutch coil terminal location (2) on the compressor front head.
7. Install the *J 33025* onto the *J 8433-1*.

8. Install the *J 8433-1* onto the compressor clutch coil (1) and tighten the puller leg bolts.
9. Tighten the center forcing screw *J 8433-3* of the compressor pulley puller *J 8433-1* against the puller pilot to remove the compressor clutch coil from the compressor.

#### ***Installation Procedure***

#### ***Tools Required***

- *J 41790* Compressor Holding Fixture
- *J 33024* Clutch Coil Installer Adaptor
- *J 33025* Clutch Coil Puller Legs
- *J 8433-1* Compressor Pulley Puller
- *J 8433-3* Forcing Screw

1. Place the clutch coil assembly (1) on the front head with the clutch coil terminal at the positioned at the mark made during disassembly.
2. Place the *J 33024* over the internal opening of the clutch coil housing and align installer with the compressor front head.
3. Install the *J 8433-3* into the *J 8433-1* and center the screw in the countersunk center hole of the *J 33024*.
4. Install the 4 inch through bolts and washers from the *J 42136* tool kit into the *J 33025* and attach them to the compressor mounting bosses.
5. Turn the center forcing screw of the *J 8433-3* to press the clutch coil onto the front head until the clutch coil is fully seated. Make sure the clutch coil and the *J 33024* stay in line with each other while pressing the clutch coil onto the compressor.

6. Install the compressor clutch rotor and bearing assembly. Refer to Clutch Rotor and/or Bearing.
7. Install the compressor clutch plate and hub assembly. Refer to Compressor Clutch Plate and Hub Assembly.
8. Remove the compressor from the J 41790.
9. Install the compressor into the vehicle. Refer to Compressor Replacement (Gas Engine) or Compressor Replacement (W42 with 4.5L (L6I) Engine).

### **Compressor Shaft Seal**

#### ***Removal Procedure***

#### ***Tools Required***

*J 41790* Compressor Holding Tool

*J 42136 A/C* Lip Seal Remover

1. Remove the compressor from the vehicle. Refer to Compressor Replacement (Gas Engine) or Compressor Replacement (W42 with 4.5L (L6I) Engine).
2. Place the compressor on the J 41790.
3. Remove the compressor clutch plate and hub assembly. Refer to Compressor Clutch Plate and Hub Assembly.
4. Remove the compressor shaft seal retainer ring (2), using internal snap ring pliers (1).
5. To prevent any dirt or foreign material from getting into the compressor, thoroughly clean the following components:
  - The inside of the compressor neck area surrounding the shaft
  - The exposed portion of the compressor shaft seal

- The compressor shaft
  - The O-ring groove
6. Fully engage the lip of the J 42136 into the recessed portion of the seal (1) the turning the handle clockwise.
  7. Remove the compressor shaft seal from the compressor with a rotary pulling motion.
  8. Recheck the shaft and the inside of the compressor neck for dirt or foreign material and make sure these areas are perfectly clean before installing the new compressor shaft seal.

#### ***Installation Procedure***

#### ***Tools Required***

*J 9625-A* Leak Test Adaptor

*J 42136 A/C* Lip Seal Remover

*J 34614* Shaft Seal Protector

*J 41790* Compressor Holding Tool

1. Dip the new compressor shaft seal (1) in clean 525 viscosity refrigerant oil. Assemble the seal onto the J 42136 by turning the handle clockwise.
2. Install the J 34614 onto the compressor shaft.
3. Using a rotary motion, slide the new compressor shaft seal onto the compressor shaft until the seal is fully seated.
4. Remove the J 34614 by turning the handle counter clockwise.
5. Install a new compressor shaft seal retaining ring (2), using internal snap ring pliers (1). Make sure that the chamfer side of the retaining ring is facing up and that the retaining ring snaps into the groove.

6. Leak test the compressor, using the J 9625-A.
  - 6.1. Install the J 9625-A onto the compressor and pressurize the suction and high-side of the compressor with R-134a.
  - 6.2. Temporarily install the shaft nut.
  - 6.3. With the compressor in a horizontal position, rotate the compressor shaft in the normal direction of rotation, several turns by hand.
  - 6.4. Leak test the seal area and repair if necessary.
  - 6.5. Remove the shaft nut.
7. Recover the refrigerant. Refer to Refrigerant Recovery and Recharging.
8. Remove and clean any excess oil resulting from installing the new seal parts from the shaft and inside the compressor neck.
9. Install the compressor clutch plate and hub assembly. Refer to Compressor Clutch Plate and Hub Assembly.
10. Remove the compressor from the J 41790.
11. Install the compressor into the vehicle. Refer to Compressor Replacement (Gas Engine) or Compressor Replacement (W42 with 4.5L (L6I) Engine).

## **Compressor Pressure Relief Valve**

### **Removal Procedure**

#### **Tools Required**

- J 39500 R-134a A/C Refrigerant Recovery, Recycling and Recharging System (ACR4)

### **CAUTION:**

**Refer to SIR Handling Caution in Cautions and Notices.**

1. Use the J 39500 to recover the refrigerant.
2. Remove the old pressure relief valve (5).

### **Installation Procedure**

#### **Tools Required**

- J 39500 R-134a A/C Refrigerant Recovery, Recycling and Recharging System (ACR4)
  1. Clean the valve seat area on the rear head.
  2. Lubricate the O-ring of the new pressure relief valve (5) and the O-ring assembly using new 525 viscosity refrigerant oil.

### **NOTICE:**

**Refer to Fastener Notice in Cautions and Notices.**

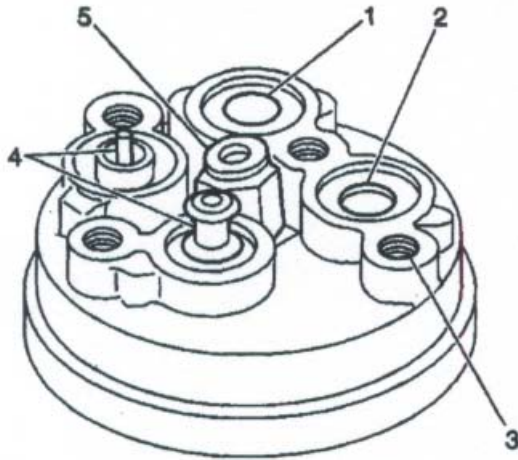
3. Install the new pressure relief valve (5) and tighten the new valve to 9.0 N•m (6.1 lb ft).
4. Evacuate and recharge the system. Use the J 39500.
5. Leak test the system.

## Compressor Control Switches

### Removal Procedure

#### Tools Required

- J 9553-01 O-Ring Remover
  - J 5403 Snap Ring Pliers
1. Recover the refrigerant.
  2. Disconnect the electrical connector from the switch (4) in the rear head of the compressor.
  3. Remove the switch retaining ring using the J 5403.
  4. Remove the switch (4) from the compressor.
  5. Remove the old O-ring seal from the switch cavity using the J 9553-01.



### Installation Procedure

#### Tools Required

- J 5403 Snap Ring Pliers
1. If you are reinstalling an existing control switch in the compressor, use a new O-ring and a new retainer ring. An O-ring and a retainer ring is included in a new switch kit.
  2. Inspect the switch cavity and the O-ring groove in the rear head or dirt of foreign material.
  3. Clean as necessary.
  4. Lubricate the new O-ring using clean refrigerant oil.
  5. Install the new O-ring into the groove in the switch cavity.
  6. Lubricate the control switch housing using clean refrigerant oil.
  7. Install the switch (4) into the switch cavity until the switch bottoms in the cavity.
  8. Using the J 5403, install the switch retaining ring. Ensure that the high point of the curved sides is adjacent to the switch housing.
  9. Ensure that the retaining ring is properly seated in the switch cavity retaining groove.
  10. Leak test according to bench test procedure.



## Compressor Sealing Washers Replacement

### Removal Procedure

#### IMPORTANT:

*Keep dirt and foreign material from getting on the sealing surfaces of the following components when removing the sealing washers:*

- The washers
- The block fitting
- The air conditioning (A/C) compressor ports
- Clean all sealing surfaces with a lint-free rag.

### CAUTION:

*Refer to Battery Disconnect Caution in Cautions and Notices.*

1. Disconnect the negative battery cables.
2. Discharge and recover the refrigerant from the system. Refer to Refrigerant Recovery and Recharging.
3. Remove the following items from the A/C compressor:
  - The A/C compressor hose block fitting bolt
  - The A/C compressor sealing washers
  - The A/C compressor hoses
4. Discard the A/C compressor sealing washers.

### Installation Procedure

#### IMPORTANT:

- *Keep dirt and foreign material from getting on the following sealing surfaces when installing the sealing washers:*

- The washers
- The block fitting

– The A/C compressor ports

- *Clean all sealing surfaces with a lint-free rag.*
- *Do not reuse the sealing washers.*
- *Do not oil the sealing washers prior to the assembly.*

1. Install the new sealing washers onto the pilots of the block fitting. Bottom the washers against the surface of the block fitting.
2. Install the A/C compressor hoses on the A/C compressor with the A/C compressor hose block fitting bolt.

#### NOTICE:

*Refer to Fastener Notice in Cautions and Notices.*

#### IMPORTANT:

*Verify that there is a 1.2 mm (0.047 in) space between the block fitting and the A/C compressor rear head.*

3. Hold the block in place. Hand tighten the A/C compressor block fitting bolt to 35 N•m (26 lb ft).

### CAUTION:

*Refer to Battery Disconnect Caution in Cautions and Notices.*

4. Connect the negative battery cables.
5. Install the refrigerant to the system. Refer to Refrigerant Recovery and Recharging.
6. Inspect the system for leaks. Refer to Leak Testing

## Compressor Hose Assembly Replacement

### Removal Procedure

#### **CAUTION:**

***Refer to Battery Disconnect Caution in Cautions and Notices.***

1. Disconnect the negative battery cable.
2. Discharge and recover the refrigerant from the system. Refer to Refrigerant Recovery and Recharging.
3. Remove the nut.
4. Remove the bolt and the washer.
5. Remove the hose assembly from the rear of the compressor.
6. Remove the sealing washers. Refer to Compressor Sealing Washers Replacement in HVAC.
7. Remove the hose assembly from the receiver/dryer.
8. Remove the O-ring seal.
9. Remove the hose assembly from the condenser.
10. Remove the O-ring seal.

### Installation Procedure

1. Install the new O-ring seal. Coat the O-ring seal with 525 viscosity refrigerant.

#### **NOTICE:**

***Refer to Fastener Notice in Cautions and Notices.***

2. Install the hose assembly to the condenser and tighten the hose assembly to 24 N•m (18 lb ft).
3. Install the new O-ring seal. Coat the O-ring seal with 525 viscosity refrigerant oil.
4. Install the hose assembly to the receiver/dryer and

tighten the hose assembly to 41 N•m (30 lb ft).

5. Install the sealing washers. Refer to Compressor Sealing Washers Replacement in HVAC.
6. Install the hose assembly to the rear of the compressor.
7. Install the washer.
8. Install the bolt and tighten the bolt to 35 N•m (26 lb ft).
9. Install the nut and tighten the nut to 25 N•m (18 lb ft).

#### **CAUTION:**

***Refer to Battery Disconnect Caution in Cautions and Notices.***

11. Connect the negative battery cable.
12. Add the refrigerant to the system. Refer to Refrigerant Recovery and Recharging.
13. Inspect the system for leaks. Refer to Leak Testing in HVAC.

## Evaporator Tube Replacement

### Removal Procedure

#### **CAUTION:**

***Refer to Battery Disconnect Caution in Cautions and Notices.***

1. Disconnect the negative battery cable.
2. Discharge and recover the refrigerant from the system. Refer to Refrigerant Recovery and Recharging.
3. Remove the evaporator tube from the evaporator.
4. Remove the O-ring seal.
5. Remove the evaporator tube from the receiver/dryer.

6. Remove the O-ring seal.

#### **Installation Procedure**

1. Install the new O-ring seal. Coat the O-ring seal with 525 viscosity refrigerant oil.
2. Install the evaporator tube to the evaporator.
3. Install the new O-ring seal. Coat the O-ring seal with 525 viscosity refrigerant oil.

#### **NOTICE:**

*Refer to Fastener Notice in Cautions and Notices.*

4. Install the evaporator tube to the receiver/dryer.
5. Tighten the receiver/dryer connection to 17 N•m (13 lb ft).
6. Tighten the evaporator connection to 17 N•m (13 lb ft).

#### **CAUTION:**

*Refer to Battery Disconnect Caution in Cautions and Notices.*

5. Connect the negative battery cable.
6. Add the refrigerant to the system. Refer to Refrigerant Recovery and Recharging.
7. Inspect the system for leaks. Refer to Leak Testing in HVAC.

#### **Receiver Dehydrator and Evaporator Hose Assembly**

#### **Removal Procedure**

#### **IMPORTANT:**

*Keep dirt and foreign material from getting on the sealing surfaces of the following components when removing the sealing washers:*

- The washers

- The block fitting
- The air conditioning (A/C) compressor ports
- Clean all sealing surfaces with a lint-free rag.

#### **CAUTION:**

*Refer to Battery Disconnect Caution in Cautions and Notices.*

1. Disconnect the negative battery cables.
2. Discharge and recover the refrigerant from the system. Refer to Refrigerant Recovery and Recharging.
3. Remove the following components from the A/C compressor:
  - The A/C compressor hose block fitting bolt
  - The A/C compressor sealing washers
  - The refrigerant hoses
  - Discard the A/C compressor sealing washers.
4. Remove the refrigerant hose from the A/C condenser.
5. Remove the O-ring seal. Discard the O-ring seal.
6. Remove the refrigerant hose from the A/C evaporator.
7. Remove the O-ring seal. Discard the O-ring seal.
8. Remove the following items from the hose attachment points:
  - The hose clamp nuts
  - The washers
  - The bolts
  - The hose clamps

### Installation Procedure

#### IMPORTANT:

*Keep dirt and foreign material from getting on the following sealing surfaces when installing the sealing washers:*

- The washers
- The block fitting
- The A/C compressor ports
- Clean all sealing surfaces with a lint-free rag.
- Do not reuse the sealing washers.
- Do not oil the sealing washers prior to the assembly.

#### NOTICE:

*Refer to Fastener Notice in Cautions and Notices.*

1. Install the hose clamps to the refrigerant hoses and the hose attachment points with the following items:
  - The bolts
  - The washers
  - The nuts
2. Tighten the refrigerant hose clamp nuts to 17 N•m (13 lb ft).
3. Coat the new O-ring seal with 525 viscosity refrigerant oil.
4. Install the new O-ring seal in the A/C evaporator end of the refrigerant hose.
5. Install the refrigerant hose to the A/C evaporator.
6. Tighten the refrigerant hose fitting at the A/C evaporator to 32 N•m (24 lb ft).
7. Coat the new O-ring seal with 525 viscosity refrigerant

oil.

8. Install the new O-ring seal in the A/C condenser end of the refrigerant hose.
9. Install the refrigerant hose to the A/C condenser.
10. Tighten the refrigerant hose fitting at the A/C condenser to 23 N•m (17 lb ft).
11. Fill the refrigerant hoses. Refer to Refrigerant Oil Distribution Specifications in HVAC.
12. Install the new sealing washers onto the pilots of the block fitting. Bottom the washers against the surface of the block fitting.
13. Install the refrigerant hoses on the A/C compressor with the A/C compressor hose block fitting bolt.

#### IMPORTANT:

*There should be a 1.2 mm (0.047 in) space between the block fitting and the A/C compressor rear head.*

14. Hold the block in place. Hand tighten the A/C compressor block fitting bolt.
15. Tighten the A/C compressor hose block fitting bolt to 35 N•m (26 lb ft).

#### CAUTION:

*Refer to Battery Disconnect Caution in Cautions and Notices.*

16. Connect the negative battery cables.
17. Add the refrigerant to the system. Refer to Refrigerant Recovery and Recharging in HVAC.
18. Inspect the system for leaks. Refer to Leak Testing in HVAC.

## Receiver/Dryer Replacement

### Removal Procedure

#### **CAUTION:**

**Refer to Battery Disconnect Caution in Cautions and Notices.**

1. Disconnect the negative battery cables.
2. Discharge and recover the refrigerant from the system. Refer to Refrigerant Recovery and Recharging.
3. If equipped, remove the air conditioning (A/C) receiver/dryer electrical connector from the A/C receiver/dryer pressure switch.  
If equipped, remove the dehydrator electrical connector from the dehydrator pressure switch.
4. If equipped, remove the A/C condenser tube and the O-ring seal from the A/C receiver/dryer.  
If equipped, remove the A/C condenser tube and the O-ring seal from the dehydrator.  
Discard the O-ring seal.
5. Remove the A/C evaporator hose and the O-ring seal from the A/C condenser.  
Discard the O-ring seal.
6. If equipped, remove the A/C receiver/dryer clamp bolt.  
If equipped, remove the dehydrator clamp bolt.
7. If equipped, remove the A/C receiver/dryer from the A/C receiver/dryer clamp.  
If equipped, remove the dehydrator from the dehydrator clamp.

### Installation Procedure

1. If equipped, install the A/C receiver/dryer in the A/C receiver/dryer clamp.  
If equipped, install the dehydrator in the dehydrator clamp.
2. Coat the new O-ring seal with 525 viscosity refrigerant oil.
3. Install the new O-ring seal.

#### **NOTICE:**

**Refer to Fastener Notice in Cautions and Notices.**

4. If equipped, connect the A/C condenser tube to the A/C receiver/dryer.  
If equipped, connect the A/C condenser tube to the dehydrator.  
Tighten the A/C condenser tube to the A/C receiver/dryer or the dehydrator fitting to 15 N•m (11 lb ft).
5. Coat the new O-ring seal with 525 viscosity refrigerant.
6. Install the new O-ring seal.
7. Connect the A/C evaporator hose to the A/C condenser.
8. If equipped, install the A/C receiver/dryer clamp bolt.  
If equipped, install the dehydrator clamp bolt.
9. If equipped, install the A/C receiver/dryer electrical connector to the A/C receiver dryer pressure switch.  
If equipped, install the dehydrator electrical connector to the dehydrator pressure switch.

#### **CAUTION:**

**Refer to Battery Disconnect Caution in Cautions and Notices.**

10. Connect the negative battery cabled.
11. Add the refrigerant to the system. Refer to Refrigerant Recovery and Recharging.
12. Inspect the system for leaks. Refer to Leak Testing in HVAC.

## Compressor Relay Replacement

### Removal Procedure

#### **CAUTION:**

**Refer to Battery Disconnect Caution in Cautions and Notices.**

1. Disconnect the negative battery cable.
2. Remove the relay from the fuse block.

### Installation Procedure

1. Install the relay.

#### **CAUTION:**

**Refer to Battery Disconnect Caution in Cautions and Notices.**

2. Connect the negative battery cable.
3. Inspect the circuit operation.

## Condenser Fan Replacement

### Removal Procedure

#### **CAUTION:**

**Refer to Battery Disconnect Caution in Cautions and Notices.**

1. Disconnect the negative battery cables.

2. Remove the air conditioning (A/C) condenser fan electrical connector from the A/C condenser fan.
3. Remove the 4 bolts and the A/C condenser fan from the A/C condenser.

### Installation Procedure

1. Install the A/C condenser fan to the A/C condenser with the 4 bolts.
2. Install the A/C condenser fan electrical connector to the A/C condenser fan.

#### **CAUTION:**

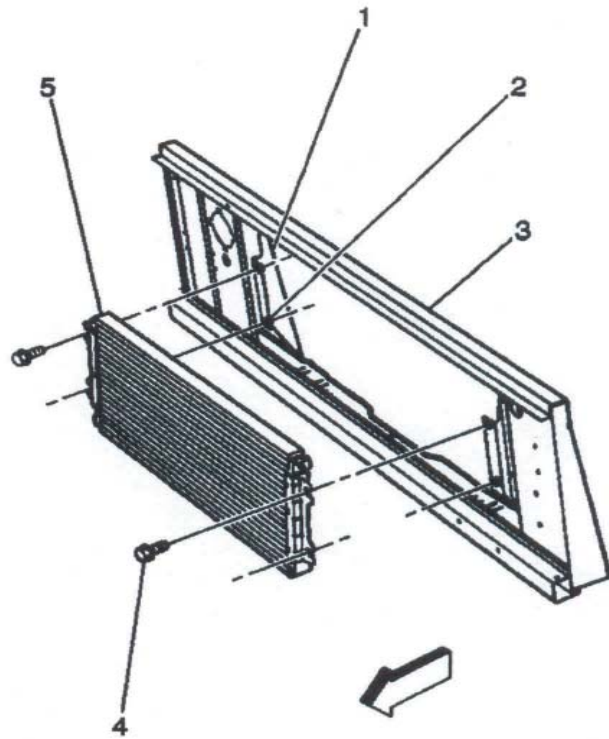
**Refer to Battery Disconnect Caution in Cautions and Notices.**

3. Connect the negative battery cables.

## Condenser Replacement (Commercial)

### Removal Procedure

1. Remove the bolts (4).
2. Remove the condenser (5).



### Installation Procedure

1. Install the condenser (5).

#### NOTICE:

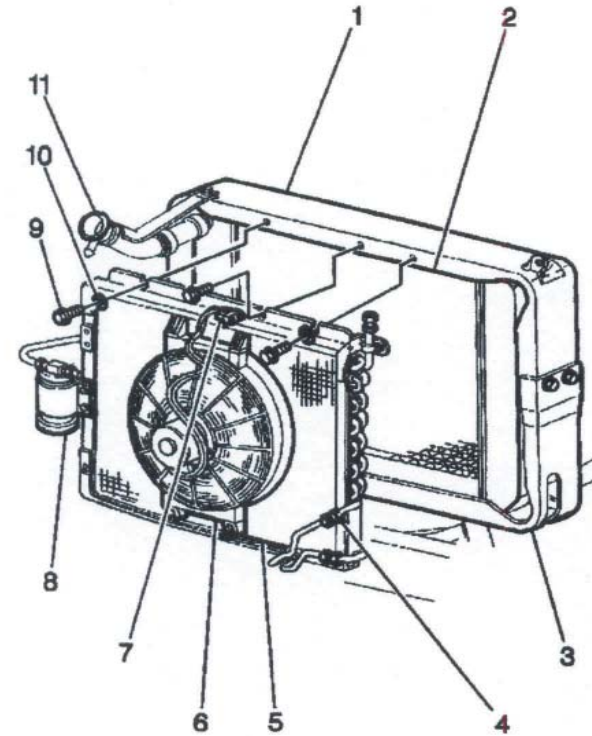
*Refer to Fastener Notice in Cautions and Notices.*

2. Install the bolts (4) and tighten to 33 N•m (24 lb ft).

### Condenser Replacement (Motorhome)

#### Removal Procedure

1. Remove the bolts (9).
2. Remove the washers (10).
3. Remove the condenser (5).



### Installation Procedure

1. Install the condenser (5).
2. Install the washers (10).

#### NOTICE:

*Refer to Fastener Notice in Cautions and Notices.*

3. Install the bolts (9) and tighten to 6 N•m (53 lb in).

### Heater Hoses Replacement

#### Removal Procedure

1. Drain the cooling system. Refer to Draining and Filling Cooling System.

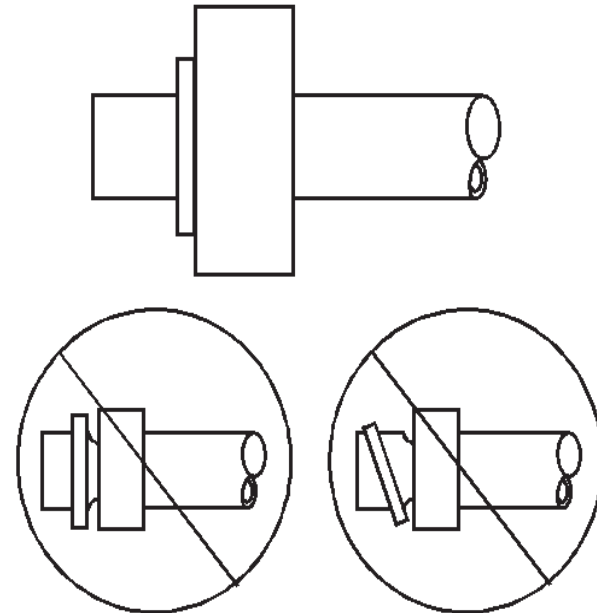
2. Remove the air intake tube.
3. Remove the heater hoses from the mounting clip.
4. Disconnect the heater hoses from the heater core inlet and the outlet.
5. Remove the inlet heater hose from the engine.
6. Remove the outlet heater hose from the radiator.
7. Remove the heater hoses.

**Installation Procedure**

1. Install the heater hoses.
2. Install the outlet heater hose to the radiator
3. Install the heater hose to the engine
4. Connect the heater hoses to the heater core.
5. Install the heater hoses to the mounting clip.
6. Install the air intake tube.
7. Fill the cooling system. Refer to Draining and Filling Cooling System
8. Inspect the cooling system for leaks.

**Sealing Washer Replacement**

**Removal Procedure**



1. Remove the seal washer from the A/C refrigerant component.

**IMPORTANT:**

***Cap or tape the open A/C refrigerant components immediately to prevent system contamination.***

2. Inspect the seal washer for signs of damage to help determine the root cause of the failure.



3. Inspect the A/C refrigerant components for damage or burrs. Repair if necessary.

**IMPORTANT:**

***DO NOT reuse sealing washer.***

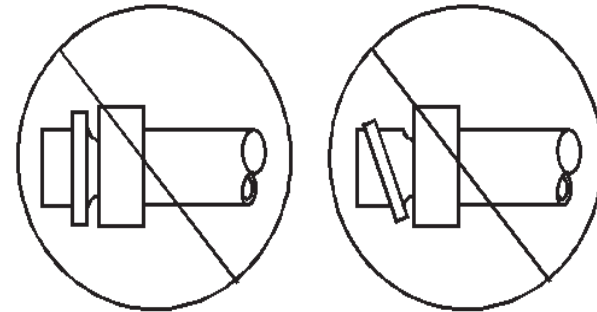
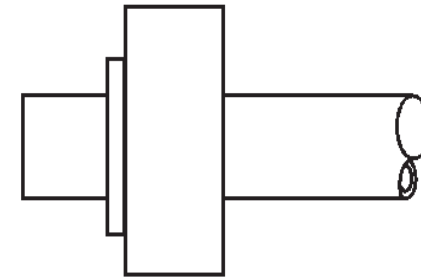
4. Discard the sealing washer.

**Installation Procedure**

**IMPORTANT:**

***Flat washer type seals do not require lubrication.***

1. Inspect the new seal washer for any signs of cracks, cuts, or damage.  
Do not use a damaged seal washer.
2. Remove the cap or tape from the A/C refrigerant components.



3. Using a lint-free clean, dry cloth, clean the sealing surfaces of the A/C refrigerant components.
4. Carefully install the new seal washer onto the A/C refrigerant component.  
The washer must completely bottom against the surface of the fitting.

**IMPORTANT:**

***After tightening the A/C components, there should be a slight sealing washer gap of approximately 1.2 mm (3/64 in) between the A/C line and the A/C component.***

5. Assemble the remaining A/C refrigerant components.  
Refer to the appropriate repair procedure.