

Heating and Air Conditioning System Description and Operation

The air temperature and the air delivery description and operation are divided into eight areas:

- HVAC Control Components
- Air Speed (Front)
- Air Delivery (Front)
- Heating and A/C Operation
- Recirculation Operation
- Automatic Operation
- Engine Coolant
- A/C Cycle

HVAC Control Components

Radio/HVAC Control

The Radio/HVAC control contains buttons and dials, which are required to control the functions of HVAC and serve as interface between the operator and the HVAC control module. The selected values are passed to the HVAC control module via LIN-Bus.

HVAC Control Module

The HVAC control module is a GMLAN device that interfaces between the operator and the HVAC system to maintain and control desired air temperature and air distribution settings. The battery positive voltage circuit provides power that the HVAC control module uses for keep alive memory. If the battery positive voltage circuit loses power, all HVAC DTCs and settings will be erased from keep alive memory. The body control module (BCM), which is the vehicle mode master, provides a device ON-Signal. The HVAC control module provides blower, air delivery mode and air temperature settings.

Mode Actuator

The actuator is a 5-wire bi-directional electric motor that incorporates a feedback potentiometer. Low reference, 5 V reference, position signal, and 2 control circuits enable the actuator to operate. The control circuits use either a 0 or 12 V value to coordinate the actuator movement. When the actuator is at rest, both control circuits have a value of 0 V. In order to move the actuator, the HVAC control module grounds one of the control circuits while providing the other with 12 V. The HVAC control module reverses the polarity of the control circuits to move the actuator in the opposite direction. When the actuator shaft rotates, the potentiometers adjustable contact changes the door position signal between 0–5 V. The HVAC control module uses a range of 0–255 counts to index the actuator position. The door position signal voltage is converted to a 0–255 count range. When the module sets a commanded, or targeted, value, one of the control circuits is grounded. As the actuator shaft rotates the changing position signal is sent to the module. Once the position signal and the commanded value are within 2 counts of each other, the module removes power and ground from the control circuits.

Air Temperature Actuators

The actuator is a 5-wire bi-directional electric motor that incorporates a feedback potentiometer. Low reference, 5 V reference, position signal, and 2 control circuits enable the actuator to operate. The control circuits use either a 0 or 12 V value to coordinate the actuator movement. When the actuator is at rest, both control circuits have a value of 0 V. In order to move the actuator, the HVAC control module grounds one of the control circuits while providing the other with 12 V. The HVAC control module reverses the polarity of the control

circuits to move the actuator in the opposite direction. When the actuator shaft rotates, the potentiometers adjustable contact changes the door position signal between 0–5 V. The HVAC control module uses a range of 0–255 counts to index the actuator position. The door position signal voltage is converted to a 0–255 count range. When the module sets a commanded, or targeted, value, one of the control circuits is grounded. As the actuator shaft rotates the changing position signal is sent to the module. Once the position signal and the commanded value are within 4 counts of each other, the module removes power and ground from the control circuits.

Recirculation Actuator

The actuator is a 5-wire bi-directional electric motor that incorporates a feedback potentiometer. Low reference, 5 V reference, position signal, and 2 control circuits enable the actuator to operate. The control circuits use either a 0 or 12 V value to coordinate the actuator movement. When the actuator is at rest, both control circuits have a value of 0 V. In order to move the actuator, the HVAC control module grounds one of the control circuits while providing the other with 12 V. The HVAC control module reverses the polarity of the control circuits to move the actuator in the opposite direction. When the actuator shaft rotates, the potentiometers adjustable contact changes the door position signal between 0–5 V. The HVAC control module uses a range of 0–255 counts to index the actuator position. The door position signal voltage is converted to a 0–255 count range. When the module sets a commanded, or targeted, value, one of the control circuits is grounded. As the actuator shaft rotates the changing position signal is sent to the module. Once the position signal and the commanded value are within 2 counts of each other, the module removes power and ground from the control circuits.

Blower Motor

The blower motor speed is controlled by increasing or decreasing the voltage drop on the ground side of the blower motor speed control circuit. The HVAC control module provides a low side pulse width modulation (PWM) signal to the blower motor via the blower motor speed control circuit. As the requested blower speed increases, the HVAC control module increases the amount of time that the speed signal is modulated to ground. As the requested blower speed decreases, the HVAC control module decreases the amount of time that the signal is modulated to ground.

Duct Temperature Sensors

The air temperature sensors are 2-wire negative temperature co-efficient thermistors. The sensors operate within a temperature range of -40 to $+85^{\circ}\text{C}$ (-40 to $+185^{\circ}\text{F}$). The sensors are installed in the air distribution ducts and measure the temperature of the air that streams from the ducts. The HVAC control module uses these values to calculate the mixed air flap position.

Evaporator Temperature Sensor

The evaporator temperature sensor is a 2-wire negative temperature co-efficient thermistor. The sensor operates within a temperature range of -40 to $+85^{\circ}\text{C}$ (-40 to $+185^{\circ}\text{F}$). The sensor is installed at the evaporator and measures its temperature. If the temperature drops under 3°C (36.5°F), the compressor will be switched off in order to prevent a frozen evaporator.

A/C Refrigerant Pressure Sensor

The A/C refrigerant pressure sensor is a 3-wire piezoelectric pressure transducer. A 5 V reference voltage, low reference, and signal circuits enable the sensor to operate. The A/C pressure signal output can be between 0 - 5 V. When the A/C refrigerant pressure is low, the signal value is near 0 V. When the A/C refrigerant pressure is high, the signal value is near 5 V. The engine control module (ECM) converts the voltage signal to a pressure value. When pressure is too high or too low, the ECM will not allow the A/C compressor clutch to engage. As well as acting as an input to the ECM for A/C operation, the ECM also uses the information provided by the pressure transducer to determine what speed to operate the cooling fans at.

A/C Compressor

This A/C system uses a conventional clutch to engage and mechanically turn the compressor, and a variable displacement solenoid valve to alter the amount of displacement created by the turning of the compressor. The HVAC control module provides both battery voltage and a pulse width modulated ground to the variable displacement solenoid valve. When the A/C button is pressed, the HVAC control module grounds the variable displacement solenoid using a (PWM) signal in order to determine the amount of compressor displacement. The performance of the A/C compressor is based on adjusted interior temperature and engine load.

Ambient Light/Sunload Sensor

The ambient light/sunload sensor includes the sunload sensor and passenger compartment temperature sensor.

This sensor assembly provides information about:

- Sun heat intensity
- Elevation
- Azimuth
- Passenger compartment temperature

The sunload sensor is connected to ground and to a 12 V clocked power supply through the HVAC control module. This clocked power supply is to power the sensor electronics and to work as a clock generator to the sunload sensor micro controller. The sensor uses a pulse signal for data identification and transferring the sun intensity measurement. At each positive transition from the clocked supply input, the sunload sensor micro controller will shift channels enabling new intensity measurement on the signal output to the HVAC control module. The signal voltage varies between 0–4 V.

The passenger compartment temperature sensor is a negative temperature co-efficient thermistor. A signal and low reference circuit enables the sensor to operate. As the air temperature increases, the sensor resistance decreases. The sensor signal varies between 0–5 V.

Bright or high intensity light causes the vehicles interior temperature to increase. The HVAC system compensates for the increased temperature by diverting additional cool air into the vehicle.

Air Speed

The blower control switch is part of the Radio/HVAC control. The selected value of the blower switch position is sent to the HVAC control module via LIN-Bus.

The blower motor control module is an interface between HVAC control module and blower motor. The blower motor control module regulates supply voltage and ground circuits to blower motor. The HVAC control module provides a PWM signal to the blower motor control module in order to command the desired blower motor speed. The blower motor control module supplies battery voltage to the blower motor and uses the blower motor ground as a low side control to adjust the blower motor speed. The voltage can be adjusted between 2–13 V and changes linear to the height of the PWM signal.

Air Delivery

The HVAC control module controls the distribution of air by the use of recirculation and mode door actuator. The modes that may be selected are:

- Face mode: Directs air to both dashboard and console vents.
- Bi-level mode: Directs air to both dashboard and console vents and most of the remaining air to the floor vents. Cooler air is directed to the upper outlets and warmer air to the floor vents. Console vent temperature is a mix of dashboard and floor vent air.
- Floor mode: Directs most of the air to the floor vents and console vents, some to the outer dashboard vents, windscreen and side window demist vents.
- Blend mode (Floor and windscreen demist): Directs air between the windscreen, console vents and floor vents, some to the outer dashboard vents and side window demist vents.

- Defrost: Directs air to the windscreen, some to the outer dashboard vents and side window demist vents.

The desired air distribution mode can be selected with the air distribution buttons at the Radio/HVAC control. The Radio/HVAC control delivers the values to the HVAC control module via LIN-Bus. The HVAC control module controls the mode door actuator so that it drives the flap to the calculated position. Depending on the position of the flap, air is distributed through various ducts leading to the outlets in the dash. By selecting Defrost or Blend (Defrost/Foot) modes on the Radio/HVAC control, the HVAC control module will move the recirculation actuator to outside air and engage the compressor, reducing the risk of window fogging. When defrost is selected, the blower motor will be activated, regardless of the coolant temperature. A/C is available in all modes.

The rear window defogger operation does not affect the HVAC system.

Heating and A/C Operation

The purpose of the heating and A/C system is to provide heated and cooled air to the interior of the vehicle. The A/C system will also remove humidity from the interior and reduce windshield fogging. Regardless of the temperature setting, the following can affect the rate that the HVAC system can achieve the desired temperature:

- Recirculation actuator setting
- Difference between inside and desired temperature
- Blower motor speed setting
- Mode setting

When the A/C button or the AUTO button is pressed, the Radio/HVAC control sends a signal to the HVAC control module via LIN-Bus. The HVAC control module evaluates this signal and sends an A/C request signal to the ECM via CAN-Bus. The ECM checks all preconditions before releasing and if all conditions are met sends a release signal back to the HVAC control module. The A/C compressor is activated by the HVAC control module. The HVAC control module supplies battery voltage to the A/C compressor clutch. When the A/C button is pressed, the HVAC control module provides a pulse width modulation (PWM) signal to the A/C compressor in order to command the performance of the A/C compressor. The performance of the A/C compressor is regulated using adjusted interior temperature and engine load.

The following conditions must be met in order to activate the A/C compressor:

- Battery voltage is between 9–18 V
- Engine coolant temperature is less than 124°C (255°F)
- Engine speed is greater than 600 RPM
- Engine speed is less than 5500 RPM
- A/C high side pressure is between 269–3250 kPa (39–425 PSI)
- Throttle position is less than 100%
- Evaporator temperature is greater than 3°C (38°F)
- ECM does not detect immoderate torque load
- ECM does not detect insufficient idle quality
- The ambient temperature is above 0°C (32°F)

The sensor information is used by the ECM to determine the following:

- The A/C high side pressure
- An A/C system load on the engine
- An immoderate A/C high side pressure
- The heat load at the A/C condenser

The air streams into the passenger compartment through the heater core and the evaporator core. The air temperature actuator drives the mixed air flap to direct the airflow to achieve the

desired temperature. If the interior temperature should be increased, the mixed air flap is put into the position in which more air streams through the heater core. If the interior temperature should be decreased, the mixed air flap is put into the position in which less air streams through the heater core. In all cases, 100% of the incoming air is directed through the evaporator.

Recirculation Operation

The recirculation button is integrated into the Radio/HVAC control. The selected recirculation button state is sent to the HVAC control module via LIN-Bus. The HVAC control module controls the air intake using the recirculation actuator. In recirculation mode the recirculation flap opens in order to circulate the air within the vehicle. In fresh air mode the recirculation flap is closed in order to route outside air into the vehicle.

Automatic Operation

In automatic operation, the HVAC control module maintains the comfort level inside of the vehicle by controlling the A/C compressor, the blower motor, the air temperature actuators, mode actuator and recirculation actuator based on the set temperature.

To put the HVAC system in automatic mode, the following is required:

1. The auto switch must be activated.
2. The air temperature switch must not be in either the full hot or full cold position.

Once the desired temperature is reached, the blower motor, mode, recirculation and temperature actuators automatically adjust to maintain the temperature selected. The HVAC control module performs the following functions to maintain the desired air temperature:

- Monitors the following sensors:
 - Ambient air temperature sensor
 - Lower left duct air temperature sensor
 - Lower right duct air temperature sensor
 - Upper left duct air temperature sensor
 - Upper right duct air temperature sensor
 - Ambient light/sunload sensor
- Regulate the blower motor speed
- Position the air temperature actuators
- Position the mode door actuator
- Position the recirculation actuator
- Request A/C operation
- Control of the A/C compressor

When the temperature dial is set to hot when in automatic operation, the blower speed will increase gradually until the engine coolant reaches normal operating temperature. When normal operating temperature is reached the blower stays on high speed and the air temperature actuators stay in the full heat position.

When the temperature dial is set to cold when in automatic operation, the blower stays on high and the air temperature actuators stay in full cold position. The mode actuator remains in the panel (face outlets) position and the recirculation actuator will remain in the recirculation position.

Under cold ambient temperatures, the automatic HVAC system provides heat in the most efficient manner. The operator can select an extreme temperature setting but the system will not warm the vehicle any faster. Under warm ambient temperatures, the automatic HVAC system also provides air conditioning in the most efficient manner. Selecting an extreme cool temperature will not cool the vehicle any faster. The recommended temperature setpoint is 72°F (22°C)

Engine Coolant

Engine coolant is the essential element of the heating system. The thermostat controls the normal engine operating coolant temperature. The thermostat also creates a restriction for the cooling system that promotes a positive coolant flow and helps prevent cavitation.

Coolant enters the heater core through the inlet heater hose, in a pressurized state. The heater core is located inside the HVAC module. The ambient air drawn through the HVAC module absorbs the heat of the coolant flowing through the heater core. Heated air is distributed to the passenger compartment, through the HVAC module, for passenger comfort. Opening or closing the air temperature flap controls the amount of heat delivered to the passenger compartment. The coolant exits the heater core through the return heater hose and recirculates back to the engine cooling system.

A/C Cycle

Refrigerant is the key element in an air conditioning system. R-134a is a very low temperature gas that can transfer the undesirable heat and moisture from the passenger compartment to the outside air.

The A/C system used on this vehicle is a non-cycling system. Non-cycling A/C systems use a pressure transducer to protect the A/C system from a predetermined high pressure. The A/C system is also mechanically protected with the use of a high pressure relief valve. If the pressure transducer were to fail or if the refrigerant system becomes restricted and refrigerant pressure continues to rise, the high pressure relief will pop open and release refrigerant from the system.

The A/C compressor is belt driven. The compressor builds pressure on the vapour refrigerant. Compressing the refrigerant also adds heat. The refrigerant is discharged from the compressor through the discharge hose, and forced through the condenser and then through the balance of the A/C system.

Compressed refrigerant enters the condenser at a high-temperature, high-pressure vapour state. As the refrigerant flows through the condenser, the heat is transferred to the ambient air passing through the condenser. Cooling causes the refrigerant to condense and change from a vapour to a liquid state.

The condenser is located in front of the radiator for maximum heat transfer. The condenser is made of aluminium tubing and aluminium cooling fins, which allows rapid heat transfer for the refrigerant. The warm liquid refrigerant exits the condenser and flows through the liquid line to the internal heat exchanger (IHx) and then the thermostatic expansion valve (TXV).

The TXV is located at the evaporator inlet. The TXV is the dividing point for the high and the low pressure sides of the A/C system. As the refrigerant passes through the TXV, the pressure on the refrigerant is lowered, causing the refrigerant to vaporize at the TXV. The TXV also measures the amount of liquid refrigerant that can flow into the evaporator.

Refrigerant exiting the TXV flows into the evaporator core in a low-pressure, mixed liquid and vapour state. Ambient air is drawn through the HVAC module and passes through the evaporator core. Warm and moist air will cause the liquid refrigerant to boil inside the evaporator core. The boiling refrigerant absorbs heat from the ambient air and draws moisture onto the evaporator. The refrigerant exits the evaporator through the suction line and flows back to the internal heat exchanger (IHx) and then the compressor in a vapour state, completing the A/C cycle of heat removal. At the compressor, the refrigerant is compressed again and the cycle of heat removal is repeated.

The conditioned air is distributed through the HVAC module for passenger comfort. The heat and moisture removed from the passenger compartment condenses, and discharges from the HVAC module as water, via a drain to the ground below the vehicle.

Handling of Refrigerant Lines and Fittings

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

- Keep all metal tubing lines free of dents or kinks. Any line restrictions will cause the loss of system capacity.
- Never bend a flexible hose line to a radius of less than four times the diameter of the hose.
- Never allow a flexible hose line to come within 65 mm (2-1/2 in) of the exhaust manifold.
- Inspect flexible hose lines regularly for leaks or brittleness.
- Replace flexible hose lines with new lines if you find signs of deterioration or leaking.
- Discharge the refrigeration system of all refrigerant before disconnecting any fitting in the refrigeration system.
- Proceed very cautiously regardless of the gauge readings.

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

- Open the fittings very slowly.
- If you notice pressure when you loosen a fitting, allow the pressure to bleed off as described in Discharging, Adding Oil, Evacuating, and Charging Procedures for A/C System .
- Cap or tape any refrigerant line immediately after it is opened. This will prevent the entrance of moisture and dirt, which can cause internal compressor wear or plugged lines in the condenser, the evaporator core, the expansion valve, or the compressor inlet screens.
- Keep the sealing surfaces in perfect condition. A burr or a piece of dirt may cause a refrigerant leak.
- When seal washers are used, always install the seal washer without lubrication.
- When O-rings are used, always lightly coat the new O-ring seal with refrigerant oil prior to installation.

Symptoms - Heating, Ventilation, and Air Conditioning

Important: Review the system operation in order to familiarise yourself with the system functions. Refer to:

- [Automatic HVAC Description and Operation](#)
- [Heating and Air Conditioning System Description and Operation](#)

Visual/Physical Inspection

- Inspect for aftermarket devices which may affect the operation of the HVAC System. Refer to [Checking Aftermarket Accessories](#).
- Inspect the easily accessible or visible system components for obvious damage or conditions which may cause the symptom.
- Verify the A/C compressor turns freely and is not seized.
- The A/C compressor will not operate in cold outside air temperatures. Refer to [Automatic HVAC 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:
 - 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](#).

Symptom List

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

- [DTC B0193](#) for Blower Motor malfunctions.
- [Leak Testing](#).
- [Defrosting Insufficient](#).
- [Noise Diagnosis - Blower Motor](#).
- [Noise Diagnosis - Air Conditioning \(A/C\) System](#).
- [Noise Diagnosis - HVAC Module](#).
- [Odor Diagnosis](#).

Leak Testing

Special Tools

- J 41447 R-134a A/C Tracer Dye Box of 24
- J 42220 Universal 12 V Leak Detection Lamp
- J 43872 Fluorescent Dye Cleaner
- J-46053 Electronic Leak Detector
- J 46297 A/C Dye Injector Kit
- J 46297-12 Replacement Dye Cartridges

Refrigerant Leak Testing

Warning: Refer to [Safety Glasses Warning](#).

Verifying some passive leaks may require using the electronic leak detector or a fluorescent dye leak detection lamp. The fluorescent dye is factory installed. The dye mixes and flows with the polyalkylene glycol (PAG) oil throughout the refrigerant system. Due to the dye being factory installed, the only time that adding additional fluorescent dye is required is after flushing the A/C system.

Fluorescent Leak Detector

Note: Always use the colored glasses provided with your ultra violet lamp as these enhance the fluorescent dye color.

Fluorescent dye will assist in locating any leaks from the A/C system.

Note: PAG oil is water soluble.

- Condensation on the evaporator core or the refrigerant lines may wash the PAG oil and fluorescent dye away from the actual leak. Condensation may also carry the fluorescent dye through the HVAC module drain.
- Leaks in the A/C system will be indicated in a light green or yellow color when using the leak detection lamp.

Use the leak detection lamp in the following areas:

- All fittings or connections that use seal washers or an O-ring
- All of the A/C components
- The A/C compressor shaft seal
- The A/C hoses and pressure switches
- The HVAC module drain pipe (if the evaporator core is suspected of leaking)
- The service port sealing caps (the sealing cap is the primary seal for the service ports)
- Follow the instructions supplied with the J 42220 Universal 12 V Leak Detection Lamp.
- To prevent false diagnosis in the future, thoroughly clean the residual dye from any area where leaks were found. Use a rag and the approved J 43872 Fluorescent Dye Cleaner.

Fluorescent Dye Injection

Note: Avoid spilling fluorescent dye on the vehicle paint work, clean off straight away using an approved fluorescent dye cleaning agent.

Note: Use only fluorescent dye approved by the vehicle manufacturer.

- J 41447 R-134a A/C Tracer Dye can be poured directly into a removed A/C component.
- J 46297-12 Replacement Dye Cartridge is injected into the low side port using J 46297 A/C Dye Injector Kit.

- Not all fluorescent dyes are compatible with PAG oil. Some types of fluorescent dye decrease the oil viscosity or may chemically react with the oil.
- R-134a leak detection dye requires time to work. Depending upon the leak rate, a leak may not become visible for a duration between 15 minutes and 7 days.
Note: Do NOT overcharge the A/C system with dye. Use only one 7.39 ml (0.25 oz) charge.
- To prevent false diagnosis, thoroughly clean any residual dye from the service port with a shop cloth and the approved J 43872 Fluorescent Dye Cleaner.

Electronic Leak Detector

Make sure that the vehicle has at least 0.2 kg of refrigerant in the A/C refrigeration system in order to perform a leak test. Refer to [Refrigerant Recovery and Recharging](#), for the recharging of the A/C system.

Make sure that fresh batteries are installed at regular intervals, false readings may occur as a result of the batteries not being fully charged.

Make sure that the sensing tip inlet is free of dirt, also make sure that the sensing tip is kept at a distance of 5mm from the components/areas being tested.

Note: Follow a continuous path in order to make sure that all possible leaks are detected. Test all areas of the system for leaks.

Follow the instructions supplied with the electronic leak detector.

Soapy Water

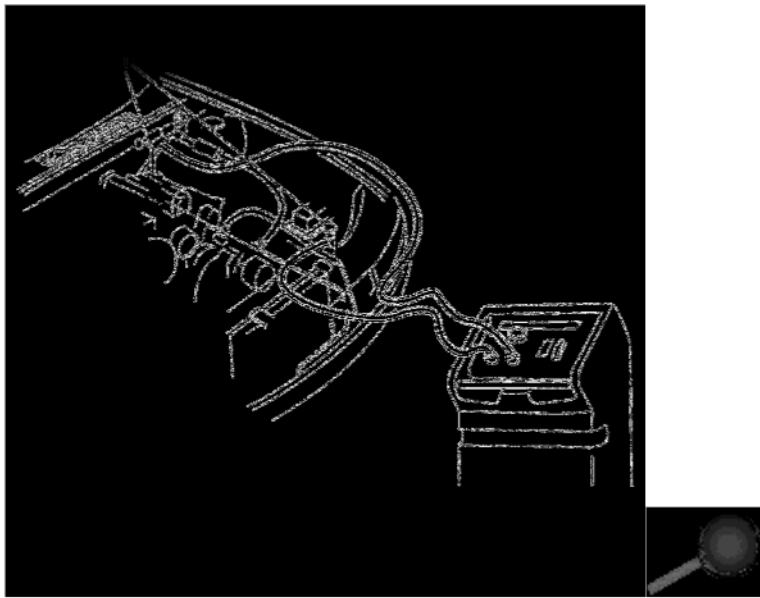
Fill the approved J 43872 Fluorescent Dye Cleaner with a solution of 50% water and 50% dish washing liquid. Operate the A/C system and spray the soapy solution over the joints and components. When a leak is evident the solution will bubble up.

This is an ideal method for hose and joint leaks.

Air Conditioning (A/C) System Performance Test

Note:

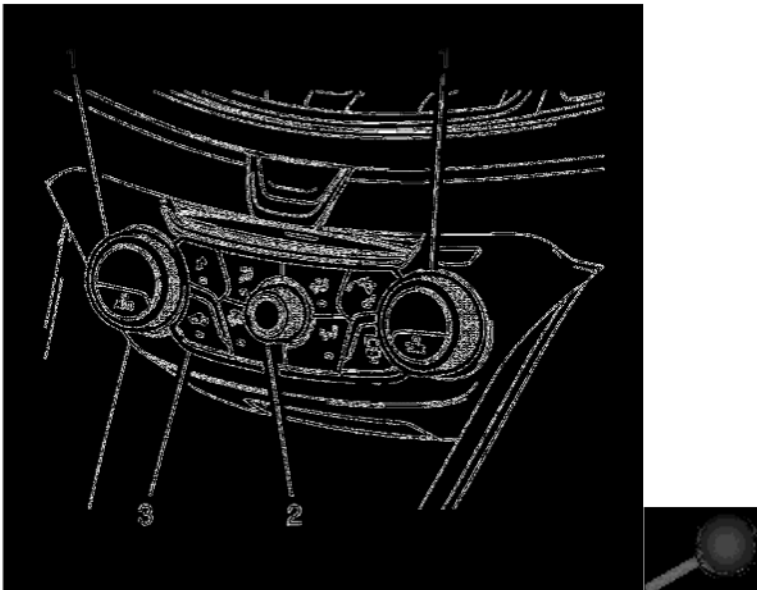
- Before carrying out the high/low pressure and centre vent temperature testing, make sure that the vehicle's A/C system has no visual or operational defects and that all refrigerant recovery and recharging safety requirements are adhered to. Refer to [Refrigerant Recovery and Recharging](#).
- Before commencing the testing follow the vehicle set up procedure. Failure to correctly set the vehicle up for testing will provide inaccurate diagnosis when comparing actual pressure readings to the table below.



1. Connect the calibrated high/low pressure gauges to the A/C system (1).
2. Confirm that the static pressures (vehicle not started or A/C engaged) are correct.

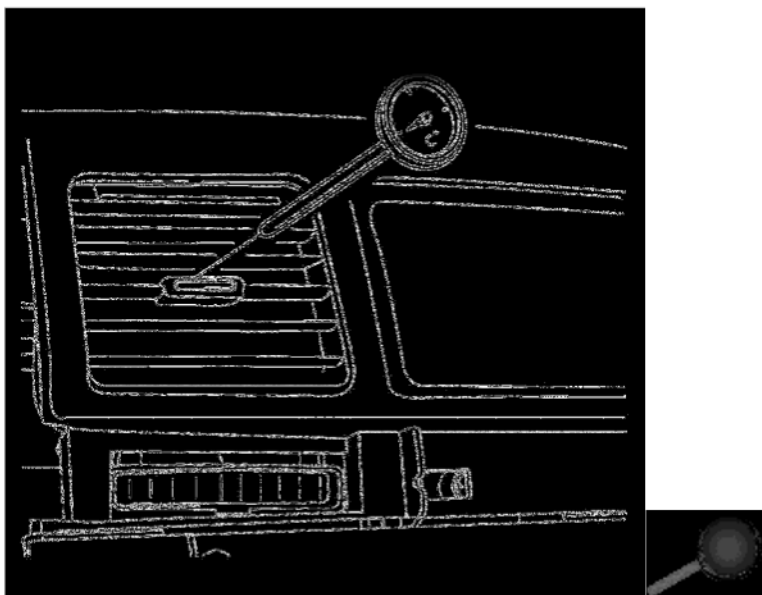
Note: When possible the vehicle should be tested in direct sunlight, especially in the case of climate control vehicles using solar sensors.

3. Record the ambient temperature conditions and the relative humidity at the time of the test.
4. DO NOT test the vehicle with the condenser air flow restricted, such as against a wall.



5. Set the blower motor speed control (2) to the highest blower motor speed.

6. Set the temperature controls (1) to the maximum cold setting.
7. Set the air intake mode control (3) to fresh air intake mode.



8. Set the mode outlet control to the face position with the instrument panel louvres open and facing straight ahead.

Note: Make sure that the thermometer probe is inserted to a length of approximately 50mm.

9. Insert a thermometer centrally into the face vent.
 10. Turn the engine ON and run at idle speed for 15 minutes.
 11. Close all vehicle doors and windows.
 12. Close the vehicle engine hood.
- Note:** For accurate testing the relative humidity percentage (RH%) should be known, as you will see the pressures and vent temperatures alter as RH% changes. Refer to the A/C performance table below.
13. Make a note of vent air temperature and A/C gauge readings.
 14. Turn the engine OFF and compare the readings with the data in the A/C performance table. A normally operating A/C system should not exceed levels shown. If the readings exceed the table limits, refer to [Symptoms - HVAC Systems - Automatic](#).

A/C Performance Table

Engine Speed (RPM)	Relative Humidity (%)	Ambient Air Temperature		Centre Air Outlet Temperature		Gauge Pressure Low Side Pressure		Gauge Pressure High Side Pressure	
		°F	°C	°F	°C	psi	kPa	psi	kPa
Idle	20	59	15	37	3.00	27	162	142	943
		68	20	37	3.00	31	185	168	1106
		77	25	40	4.64	36	209	191	1296
		86	30	47	8.60	42	236	225	1494
		95	35	54	12.49	50	265	266	1653
		104	40	62	16.45	58	300	304	1864
		113	45	69	20.47	63	334	323	2155

Engine Speed (RPM)	Relative Humidity (%)	Ambient Air Temperature		Centre Air Outlet Temperature		Gauge Pressure Low Side Pressure		Gauge Pressure High Side Pressure	
		°F	°C	°F	°C	psi	kPa	psi	kPa
	40	59	15	37	3.00	25	171	139	956
		68	20	38	3.50	28	197	164	1129
		77	25	44	6.79	32	222	192	1323
		86	30	52	11.27	36	252	209	1445
		95	35	61	15.94	42	288	248	1709
		104	40	69	20.76	48	329	279	1925
		113	45	77	25.18	54	375	306	2110
	60	59	15	37	3.00	26	177	140	966
		68	20	40	4.47	30	205	166	1146
		77	25	48	8.92	34	233	192	1326
		86	30	57	13.93	39	269	215	1480
		95	35	66	19.11	45	310	249	1718
		104	40	76	24.59	52	358	300	2072
		113	45	86	29.82	59	406	318	2196
	80	59	15	37	3.00	27	186	142	976
		68	20	43	6.11	31	214	168	1160
		77	25	52	11.15	36	250	191	1320
		86	30	62	16.95	42	289	225	1551
		95	35	74	23.23	50	342	266	1833
		104	40	85	29.27	58	398	304	2096
		113	45	96	35.65	63	436	323	2226

Refrigerant-134a Pressure-Temperature Relationship

°C	°F	kPa	psig	°C	°F	kPa	psig
----	----	-----	------	----	----	-----	------

DEFINITION: This table indicates the pressure of the Refrigerant-134a at various temperatures. For instance, a drum of refrigerant at room temperature of 26.6°C (80°F) will have a pressure of 595.6 kPa (86.4 psi). If the refrigerant is heated to 51.6°C (125°F), the

°C	°F	kPa	psig	°C	°F	kPa	psig
pressure will increase to 1278.8 kPa (185.5 psi). The refrigerant also can be used conversely in order to determine the temperature at which the Refrigerant-134a boils under various pressures. For example, at a pressure of 188.2 kPa (27.3 psi), the Refrigerant-134a boils at 0°C (32°F).							
				15.5	60	392.3	56.9
-23.3	-10	12.4	1.8	18.3	65	438.2	63.6
-20.5	-5	27.0	3.9	21.1	70	487.3	70.7
-17.7	0	43.2	6.3	23.8	75	539.7	78.3
15.0	5	60.8	8.8	26.6	80	595.6	86.4
-12.2	10	80.1	11.6	29.4	85	655.1	95.0
9.4	15	101.3	14.7	32.2	90	718.5	104.2
-6.6	20	124.3	18.0	35.0	95	785.6	113.9
-3.8	25	149.4	21.7	37.7	100	856.9	124.3
-1.1	30	176.6	25.6	40.5	105	932.3	135.2
0.0	32	188.2	27.3	43.3	110	1012.1	146.8
1.6	35	206.2	29.9	46.1	115	1096.4	159.0
4.4	40	238.0	34.5	48.8	120	1185.2	171.9
7.2	45	272.5	39.5	51.6	125	1278.8	185.5
10.0	50	309.5	44.9	54.4	130	1377.3	199.8
12.7	55	349.4	50.7	60.0	140	1589.6	230.5

A/C Diagnostics Chart

A/C Diagnostics Chart

Low Side Gauge Reading	High Side Gauge Reading	Potential Causes
Low	Low	Low Refrigerant Charge
		Restriction between Compressor and High Side port
	Low/Normal	Evaporator Freezing
	High	Restriction between the Low Side and High Side ports or Restricted TXV/Orifice Tube
		Compressor Stuck at Maximum Displacement
High	Low	Compressor has Low Displacement or Internal Malfunction
	High	Malfunctioning Cooling Fans
		Refrigerant Overcharge
		Restriction between the Low Side Port and Compressor Inlet
		Restricted Condenser Air Flow
		Expansion Device Stuck Open
		Air in A/C System
Normal/High	Normal/High	Refrigerant Contamination
		PAG or POE Oil Overcharge
High	Low	Internal Leak in the Internal Heat Exchanger (IHx)

Heating Performance Diagnostic

Heating Performance Diagnostic

Step	Action	Yes	No
DEFINITION: Heating system performance.			
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	—
2	1. Start the engine. 2. Allow the engine to idle. Does the engine reach normal operating temperature?	Go to Step 3	Go to Step 9
3	Warning: Refer to Moving Parts and Hot Surfaces Warning . 1. Select the FLOOR mode. 2. Select the minimum blower speed. 3. Select the warmest temperature setting. 4. Feel the temperature of the inlet and outlet heater hoses at the heater core. Does the inlet heater hose feel warmer than the outlet heater hose?	Go to Step 7	Go to Step 4
4	1. Select the PANEL mode. 2. Place a thermometer in the center air outlet. 3. Secure a thermometer to the heater core outlet heater hose. 4. Select the maximum blower speed. 5. Select the warmest temperature setting. 6. Record the temperature at the following locations: ◦ The center I/P PANEL air outlet. ◦ The heater core outlet heater hose. 7. Compare the recorded temperatures. Are the 2 temperature readings about equal?	Go to Step 5	Go to Step 6
5	1. Inspect and repair the following areas of the vehicle for cold air leaks: ◦ The cowl. ◦ The recirculation door. ◦ The HVAC module case. 2. Perform the necessary repairs.	Go to Step 10	—

Step	Action	Yes	No
	Are the repairs complete?		
6	1. Inspect the temperature door operation. Refer to Diagnostic System Check - Vehicle . 2. Perform any necessary repairs. Are the repairs complete?	Go to Step 10	—
7	1. Turn OFF the engine. 2. Back flush the heater core. 3. Start the engine. 4. Select the FLOOR mode. 5. Select the minimum blower speed. 6. Select the warmest temperature setting. 7. Feel the temperature of the inlet and outlet heater hoses at the heater core. Does the inlet heater hose feel warmer than the outlet heater hose?	Go to Step 8	Go to Step 10
8	Replace the heater core. Refer to Heater Core Replacement . Is the repair complete?	Go to Step 10	—
9	Repair the low engine temperature concern. Refer to Engine Fails To Reach Normal Operating Temperature . Is the repair complete?	Go to Step 10	—
10	Operate the system in order to verify the repair. Did you find and correct the condition?	System OK	Go to Step 2

Defrosting Insufficient

Defrosting Insufficient

Step	Action	Yes	No
DEFINITION: Time required to defrost the windshield is longer than normal.			
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	Go to Symptoms - HVAC Systems - Automatic
2	1. Start the engine. 2. Select the DEFROST/DEMIST mode. 3. Select the maximum blower speed. Does sufficient air flow from the defroster outlets?	Go to Step 3	Go to Step 10
3	Measure the engine operating temperature. Does engine reach a normal operating temperature?	Go to Step 4	Go to Step 8
4	1. Select the minimum blower speed. 2. Select the maximum temperature setting. Warning: Refer to Moving Parts and Hot Surfaces Warning . 3. Feel the temperature of the inlet and outlet hoses at the heater core. Does the inlet hose feel warmer than the outlet hose?	Go to Step 11	Go to Step 5
5	Test the operation of the A/C compressor. Refer to Air Conditioning (A/C) System Performance Test . Does the A/C Compressor operate?	Go to Step 7	Go to Step 6
6	Replace the A/C compressor. Refer to Air Conditioning Compressor Replacement . Is the repair complete?	Go to Step 14	—
7	Perform the A/C system performance test. Refer to Air Conditioning (A/C) System Performance Test . Is the A/C system operating within the specifications?	Go to Step 9	Go to Step 12
© 2014 General Motors. All rights reserved.			

Step	Action	Yes	No
8	Repair the low engine temperature concern. Refer to Engine Fails To Reach Normal Operating Temperature . Is the repair complete?	Go to Step 14	—
9	Inspect for correct operation of the recirculation door. Is the recirculation door operating correctly?	Go to Step 14	Go to Step 13
10	Repair the air delivery concern. Refer to DTC B0228, B0413, B0423, B1395, or B374A . Is the repair complete?	Go to Step 14	—
11	Repair the heating concern. Refer to Heating Performance Diagnostic . Is the repair complete?	Go to Step 14	—
12	Repair the A/C performance concern. Refer to Symptoms - HVAC Systems - Automatic . Is the repair complete?	Go to Step 14	—
13	Repair the recirculation door concern. Refer to HVAC System Malfunction . Is the repair complete?	Go to Step 14	—
14	Operate the system in order to verify the repair. Did you find and correct the condition?	System OK	Go to Step 2

Noise Diagnosis - Blower Motor

Noise Diagnosis - Blower Motor

Step	Action	Yes	No
DEFINITION: Noise originating from the blower motor.			
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	Go to Symptoms - HVAC Systems - Automatic.
2	Inspect the air inlet grille for debris. Is debris present?	Go to Step 8	Go to Step 3
3	1. Sit inside the vehicle. 2. Close the vehicle doors and windows. 3. Turn ON the ignition, with the engine OFF. 4. Cycle the blower motor through all of the speeds and modes in order to determine where and when the noise occurs. Is a noise evident during the blower operation?	Go to Step 4	Go to Step 11
4	Inspect for vibration at each blower motor speed by feeling the blower case. Is excess vibration present?	Go to Step 6	Go to Step 5
5	Listen to the blower motor at each speed. Is the blower motor making a squeaking or chirping noise?	Go to Step 9	Go to Step 11
6	1. Remove the blower motor. Refer to Blower Motor Replacement. 2. Inspect the blower motor impeller for deposits of foreign material. 3. Inspect the blower motor for deposits of foreign material. Did you find any foreign material on the blower motor or blower motor impeller?	Go to Step 8	Go to Step 7
7	Inspect the blower motor for the following conditions: • Cracked blades. • A loose impeller retainer. • Incorrect impeller alignment. Did you find any of these conditions?	Go to Step 9	Go to Step 10
© 2014 General Motors. All rights reserved.			

Step	Action	Yes	No
8	Remove the foreign material. Is the action complete?	Go to Step 10	—
9	Replace the blower motor. Refer to Blower Motor Replacement . Is the repair complete?	Go to Step 11	—
10	Install the blower motor. Refer to Blower Motor Replacement . Is the action complete?	Go to Step 11	—
11	Operate the system in order to verify the repair. Did you find and correct the condition?	System OK	Go to Step 2

Air Conditioning Compressor Oil Diagnosis

Air Conditioning Compressor Oil Diagnosis

Condition	Corrective Action
Note: To avoid repeat compressor failure, always inspect the condition of the refrigerant oil and take the appropriate corrective action before installing the replacement compressor.	
Clean Oil no debris present	No corrective action necessary.
Clean Oil with debris present	• Replace desiccant or component containing the desiccant. • Replace desiccant filter if applicable. • Remove, inspect, clean, or replace air conditioning evaporator thermal expansion valve.
Dark brown/black and/or pungent/unusual odor with no debris present	• Replace desiccant or component containing the desiccant. • Replace desiccant filter if applicable. • Flush refrigerant system.
Dark brown/black and/or pungent/unusual odor with debris present	• Replace desiccant or component containing the desiccant. • Replace desiccant filter if applicable. • Flush refrigerant system.
Oil Overcharge	Flush refrigerant system.
Refrigerant Contamination	Flush refrigerant system.

Noise Diagnosis - Air Conditioning (A/C) System

Noise Diagnosis - Air Conditioning (A/C) System

Step	Action	Yes	No
DEFINITION: Noise originating from the A/C compressor, drive belt or the A/C lines.			
1	Were you sent here from HVAC Symptoms or another diagnostic table?	Go to Step 2	Go to Diagnostic System Check - Vehicle .
2	Inspect and if necessary rectify any faults with the accessory drive belt and drive belt tensioner. Is the noise still present?	Go to Step 3	-
3	Run the engine and check for possible compressor noise. Does the noise last longer than 30 seconds?	Go to Step 5	Go to Step 4
4	- Allow the engine to run for a few minutes. - Stop engine and let it rest for a minute. - Restart engine. Is any noise detected using this procedure?	Go to Step 6	It is normal to observe a liquid sludging condition. This may occur after extended system shut down at warmer ambient temperatures, followed by an overnight ambient temperature drop
5	Check if the system has a low refrigerant charge. Is there enough system gas?	Go to Step 7	Go to Step 8
6	Check if the thermostatic expansion (TX) valve is stuck closed or open. Is the TX valve stuck?	Carry out TX valve diagnosis. Refer to Air Conditioning Evaporator Thermal Expansion Valve Replacement .	Go to Step 7
7	Check for any loose compressor bolt and/or A/C plumbing contacting the bodywork. Is there any A/C plumbing contacting the bodywork or mounting bolts loose?	Tighten bolts and/or relocate plumbing	Go to Step 8
© 2014 General Motors. All rights reserved.			

Step	Action	Yes	No
8	1. Recover refrigerant and replace compressor. 2. Recharge the system Are the gas pressures within specification?	System checks complete	Go to Step 1

Noise Diagnosis - HVAC Module

Noise Diagnosis - HVAC Module

Step	Action	Yes	No
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	Go to Symptoms - HVAC Systems - Automatic
2	1. Start the engine. 2. Cycle through all of the following: ◦ Blower motor speeds ◦ HVAC modes ◦ Temperature control settings 3. Determine the type of noise: ◦ Scrape, pop ◦ Tick/click, chirp or groaning ◦ Air rush/whistle Is a scrape or pop noise evident when selecting modes or temperature settings?	Go to Step 6	Go to Step 3
3	Is a tick/click, chirping, groaning or scraping noise present, but decreases as blower motor speed is decreased?	Go to Step 6	Go to Step 4
4	Is an air rush/whistle noise evident in all modes but not all temperature settings?	Go to Step 6	Go to Step 5
5	Is an air rush/whistle noise evident only in defrost or floor mode?	Go to Step 6	Go to Step 6
6	Remove the instrument panel assembly. Refer to Instrument Panel Assembly Replacement. Is the action complete?	Go to Step 7	—
7	1. Inspect the air flow doors for proper operation. 2. Inspect the ducts for obstructions or foreign materials. Were any of these conditions found?	Go to Step 10	Go to Step 8
8	Inspect the mode and temperature doors and seals for warping or cracking. Are the doors in normal condition?	Go to Step 11	Go to Step 9
9	Replace the appropriate door and/or seals. Is the repair complete?	Go to Step 11	—

Step	Action	Yes	No
10	Remove any obstructions or foreign material found. Is the action complete?	Go to Step 11	—
11	Install the instrument panel assembly. Refer to Instrument Panel Assembly Replacement . Is the action complete?	Go to Step 12	—
12	Operate the system to verify the repair. Did you find and correct the condition?	System OK	Go to Step 2

Odor Diagnosis

Odor Diagnosis

Step	Action	Yes	No
DEFINITION: Odor originating or noticed through the HVAC system.			
1	Were you sent here from Symptoms or another diagnostic table?	Go to Step 2	Go to Symptoms - HVAC Systems - Automatic
2	1. Sit inside the vehicle. 2. Close all of the doors and windows. 3. Start the engine. 4. Allow the engine idle at normal operating temperature. 5. Select the maximum blower speed. 6. Select the PANEL air outlet mode. 7. Select the coldest temperature setting. 8. Cycle through all of the blower speeds, modes, and temperatures to define what type of odor is present. ◦ Musty smell ◦ Coolant smell ◦ Oil smell Does the odor have a musty smell?	Go to Step 3	Go to Step 8
3	Inspect the HVAC module assembly filter and the air inlet grille for debris. Is debris present?	Go to Step 4	Go to Step 5
4	Remove and debris. Is the action complete?	Go to Step 15	—
5	Inspect for wet carpeting. Is the carpet wet?	Go to Step 6	Go to Step 14
6	1. Inspect for the following conditions: ◦ Water leaks around the windshield. ◦ Leaks around the door seals. 2. Turn blower motor fan to MAX. Danger: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist,	Go to Step 7	Go to Step 14

Step	Action	Yes	No
	support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist. 3. Raise the vehicle. 4. Check for air flow drain, LHS of vehicle above transmission. Is a leak present?		
7	Repair the leak as necessary. Is the repair complete?	Go to Step 15	—
8	Does the odor have a coolant smell?	Go to Step 9	Go to Step 12
9	Inspect the cooling system for leaks. Refer to Loss of Coolant. Is a Leak present?	Go to Step 10	Go to Step 12
10	Inspect for coolant leaking inside the vehicle or for a film build-up on the windshield. Is the condition present?	Go to Step 11	Go to Step 15
11	Replace the heater core. Refer to Heater Core Replacement. Is the repair complete?	Go to Step 15	—
12	Does the odor have an oily smell?	Go to Step 13	Go to Step 15
13	1. Inspect the engine compartment for any leaks. Refer to the following procedures: ◦ Oil Leak Diagnosis for the 3.6L engine or Oil Leak Diagnosis for the 6.0L engine ◦ Fluid Leak Diagnosis for the 6L50-E transmission or Transmission Fluid Leak Diagnosis for the Tremec 6-Speed transmission or Transmission Fluid Leak Diagnosis for the Aisin AY6 transmission 2. Repair any oil leaks. Is the repair complete?	Go to Step 15	—
14	A musty odor can be caused by mould or mildew build-up on the evaporator or the heater core or inside of the HVAC module assembly. Refer to Odor Correction. Is the action complete?	Go to Step 15	—
15	Operate the system in order to verify the repair. Did you find and correct the condition?	System OK	Go to Step 2

Odor Correction

Eliminating Air Conditioning Odor

1. Odors may be emitted from the air conditioning system primarily at start up in hot, humid climates. The following conditions may cause the odor:
 - Debris is present in the HVAC module assembly.
 - Microbial growth on the air conditioning evaporator core.
2. When the blower motor fan is turned on, the microbial growth may release an unpleasant musty odor into the passenger compartment. To remove odors of this type, the microbial growth must be addressed. Perform the following procedure:
 - Remove the air conditioning evaporator core. Refer to [Air Conditioning Evaporator Replacement](#).
 - Clean the air conditioning evaporator core with a solution of 40% vinegar and 60% water.
 - Install the air conditioning evaporator core. Refer to [Air Conditioning Evaporator Replacement](#).

Refrigerant Recovery and Recharging

Special Tools

- GE-48800 CoolTech A/C Recharge Machine
- J-43600 ACR 2000 Air Conditioning Service Center
- J-45037 A/C Oil Injector

For equivalent regional tools, refer to [Special Tools](#)

Warning: To prevent personal injury, avoid breathing A/C Refrigerant and lubricant vapor or mist. Work in a well ventilated area. To remove refrigerant from the A/C System, use service equipment designed for recovery that is certified to meet the requirements of the appropriate SAE Standards. If an accidental system discharge occurs, ventilate the work area before continuing service. Additional health and safety information may be obtained from the refrigerant, refrigerant recovery, and lubricant manufacturers.

Warning: For personal protection, goggles with side protection and lint-free gloves (insulated against heat loss and impermeable to refrigerant) must be worn and a clean cloth wrapped around fittings, valves, and connections when doing work that includes opening the refrigerant system. If refrigerant comes in contact with any part of the body severe frostbite and personal injury may result. The exposed area should be flushed immediately with cold water and prompt medical attention should be obtained.

Caution: You must replace the desiccant if the A/C refrigerant system has been open to atmosphere for more than four hours, or if the A/C refrigerant oil has been contaminated. Failure to replace the desiccant will result in damage to the A/C refrigerant system.

Caution: 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 and potentially void the vehicle warranty for the refrigerant system.

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

Caution: Do not lubricate A/C line seal washers as mineral oil will damage the seal and cause leaks. Use only 525 viscosity mineral oil to lubricate o-rings as well as fitting threads for the prevention of fitting seizure.

Caution: Use only GM approved Polyalkylene Glycol Synthetic Refrigerant Oil (PAG) for internal circulation through the R-134a A/C system.

Both the J-43600 ACR 2000 Air Conditioning Service Center and GE-48800 CoolTech A/C Recharge Machine are complete air conditioning service center for R-134a. Both units recovers, recycles, evacuates and recharges A/C refrigerant quickly, accurately and automatically. Both units have a display screen that contains the function controls and displays prompts that will lead the technician through the recover, recycle, evacuate and recharge operations. R-134a is recovered into and charged out of an internal storage vessel. Both units automatically replenishes this vessel from an external source tank in order to maintain a constant 5.45–6.82 kg (12–15 lbs) of A/C refrigerant.

The ACR 2000 has a built in A/C refrigerant identifier that will test for contamination, prior to recovery and will notify the technician if there are foreign gases present in the A/C system. If foreign gases are present, the ACR 2000 will not recover the refrigerant from the A/C system.

The ACR 2000 also features automatic air purge, single pass recycling and an automatic oil drain.

GE-48800 CoolTech A/C Recharge Machine is released as a required replacement for the previously essential J-43600 ACR 2000 Air Conditioning Service Center. The GE-48800 CoolTech A/C Recharge Machine is SAE J2788 compliant and meets GM requirements for A/C Refrigerant System Repairs on all General Motors vehicles, including Hybrid systems with Polyolester (POE) refrigerant oil.

Refer to the *J-43600* ACR 2000 Air Conditioning Service Center or *GE-48800* CoolTech A/C Recharge Machine manual for operation and setup instruction. Always recharge the A/C System with the proper amount of R-134a. Refer to [Refrigerant System Specifications](#) for the correct amount.

A/C Refrigerant System Oil Charge Replenishing

If oil was removed from the A/C system during the recovery process or due to component replacement, the same quantity of PAG oil must be replenished. If no oil was removed from the A/C system during recovery, do not charge any PAG oil into the A/C system. Oil can be injected into a charged system using *J-45037* A/C Oil Injector. For the proper quantities of oil to add to the A/C refrigerant system, refer to [Refrigerant System Specifications](#).

Flushing

Special Tools

- GE-41447 A/C Tracer Dye - Box of 24
- GE-45268 A/C Flushing Adapter Kit
- GE-48800 CoolTech A/C Recharge Machine
- GE-50078 Enhanced Leak Detector

For equivalent regional tools, refer to [Special Tools](#).

General Information

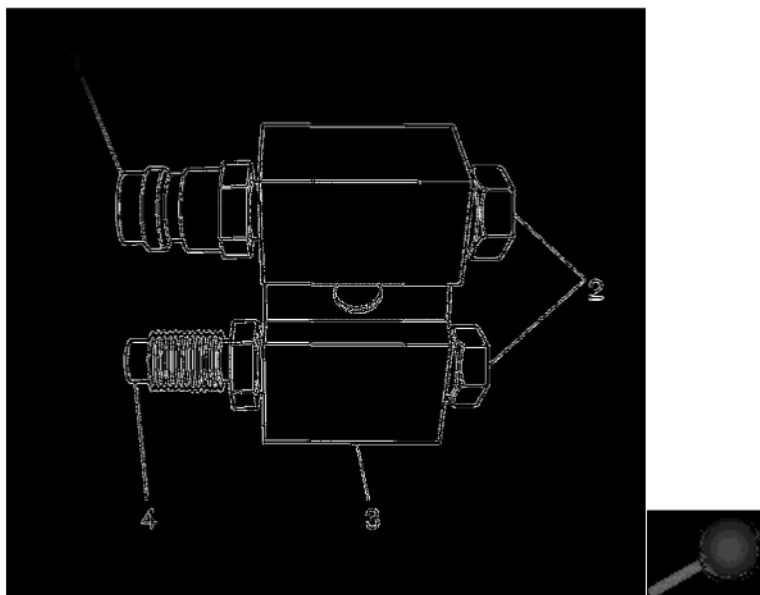
Note: Flushing is not intended to remove metal from the A/C system.

Flushing is intended to remove the following:

- Contaminated A/C Compressor oil
- Desiccant, following a desiccant bag failure
- Overcharge of A/C Compressor oil
- Refrigerant contamination

Note: Warmer engine or ambient temperatures decreases the refrigerant recovery time during the A/C flush procedure.

Forward Flushing Setup

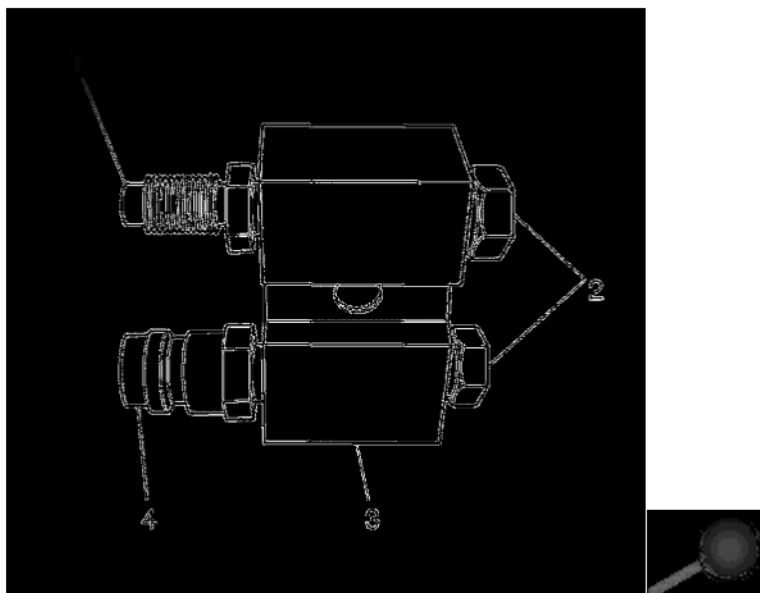


Note: Forward flow refrigerant flushing is recommended for contaminated refrigerant or PAG oil.

Note: Inspect and lubricate the GE-45268 A/C Flushing Adapter Kit fitting O-rings. Refer to [Air Conditioning O-Ring Seal Replacement](#).

1. Install both GE-45268-9 (2) onto the GE-45268-10 (3).
2. Install the GE-45268-7 (4) onto the suction side of the GE-45268-10 (3).
3. Install the GE-45268-8 (1) onto the discharge side of the GE-45268-10 (3).

Reverse Flushing Setup



Note: Reverse flow refrigerant flush is recommended for desiccant bag failure. Replace the condenser/receiver dehydrator assembly when the A/C flush is complete and perform the following procedure:

Note: Inspect and lubricate the GE-45268 A/C Flushing Adapter Kit fitting O-rings. Refer to [Air Conditioning O-Ring Seal Replacement](#).

1. Install both GE-45268-9 (2) onto the GE-45268-10 (3).
2. Install the GE-45268-8 (4) onto the suction side of the GE-45268-10 (3).
3. Install the GE-45268-7 (1) onto the discharge side of the GE-45268-10 (3).

Flush Procedure

Note: Warmer engine or ambient temperatures decreases the refrigerant recovery time during the A/C flush procedure.

1. Recover the refrigerant. Refer to [Refrigerant Recovery and Recharging](#).
2. Remove the thermal expansion valve (TXV). Refer to [Air Conditioning Evaporator Thermal Expansion Valve Replacement](#).
3. Install the TXV stud onto the GE-45268-115 adapter.
4. Install new sealing washers onto the evaporator core. Refer to [Air Conditioning System Seal Replacement](#).
5. Install GE-45268-115 in place of the TXV.

Caution: Refer to [Fastener Caution](#).

6. Install TXV mounting bolts and tighten to **5 N•m (44 lb in)**.
7. Install new washers onto the liquid line and suction hose. Refer to [Air Conditioning System Seal Replacement](#).
8. Connect the liquid line and suction hose to the GE-45268-115.
9. Install the TXV block fitting nut and tighten to **22 N•m (16 lb ft)**.
10. Remove the A/C compressor. Refer to [Air Conditioning Compressor Replacement](#).



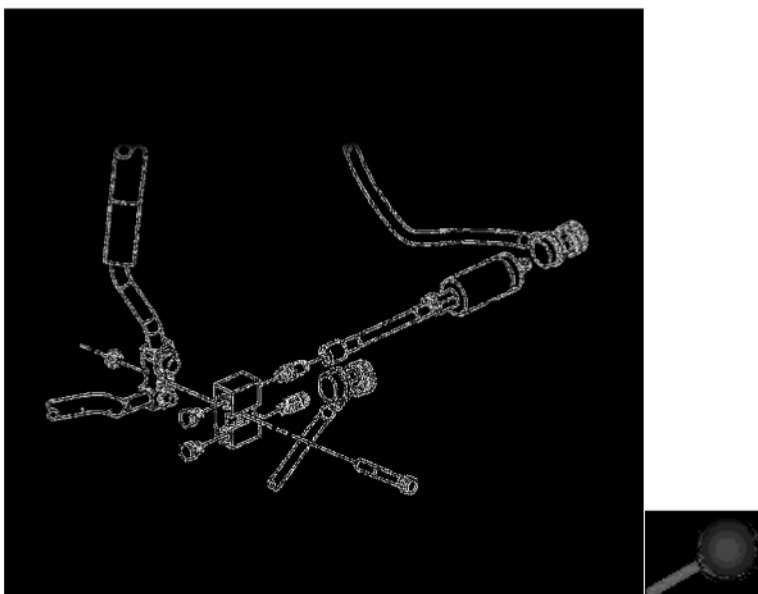
Note: The filter inside GE-45268-1 is serviceable. Remove and discard the check valve from the filter.

11. Service the filter before each flush.

Note: Install new sealing washers onto the compressor hose assembly. Refer to [Air Conditioning System Seal Replacement](#).

Assure that the suction and discharge ports on the GE-45268-10 correspond to the suction and discharge ports on the compressor hose assembly.

12. Install the GE-45268-10 to the A/C compressor to condenser hose assembly.
13. Connect the GE-45268-1 filter to GE-45268-7 adapter.



14. Connect the blue hose from the GE-48800 CoolTech A/C Recharge Machine to GE-45268-1 flush filter adapter.
 15. Connect the red hose from the GE-48800 CoolTech A/C Recharge Machine to fitting GE-45268-8.
- Note:** Close the valve on the external refrigerant tank, before starting the flush process.
16. Flush the A/C system. Follow the instructions supplied with the GE-48800 Air Conditioning Service Center.
 17. Disconnect the red hose from the GE-48800 CoolTech A/C Recharge Machine from GE-45268-8.
 18. Disconnect the blue hose from the GE-48800 CoolTech A/C Recharge Machine to GE-45268-1 flush filter adapter.
 19. Disconnect the GE-45268-1 flush filter from the GE-45268-10 flush adapter.

20. Remove the GE-45268-10 from the A/C compressor hose assembly.

Note: Flushing will remove all the PAG oil from the A/C system.

The A/C system must be replenished with the correct amount of PAG oil.

21. If you will reinstall the removed A/C compressor, perform the following procedure:

21.1. Remove the A/C compressor drain plug.

21.2. Drain the PAG oil from the A/C compressor. Rotate the compressor input shaft to assist in draining the PAG oil from the compressor.

21.3. Install the A/C compressor drain plug and tighten to **30 N•m (22 lb ft)**.

21.4. Add the total system capacity of PAG oil to the A/C compressor. Refer to [Refrigerant System Specifications](#).

22. If you will replace the A/C compressor after flushing the system, perform the following procedure:

22.1. Deduct 41 ml (1.4 oz), which is the amount of PAG oil shipped with the service compressor, from the amount of PAG oil listed in the capacities table. Refer to [Refrigerant System Specifications](#).

22.2. Add the calculated amount to the compressor, as needed.

Note: Flushing will remove fluorescent leak detection dye from A/C system.

23. Add one bottle of GE-41447 R-134A A/C Tracer Dye directly to the A/C Compressor.

24. Install the A/C compressor. Refer to [Air Conditioning Compressor Replacement](#).

25. Remove the TXV block fitting nut.

26. Disconnect the liquid line and suction hose from the GE-45268-115.

27. Remove the TXV bolts retaining the GE-45268-115.

28. Remove the GE-45268-115.

29. Inspect the TXV for debris. Clean or replace as needed.

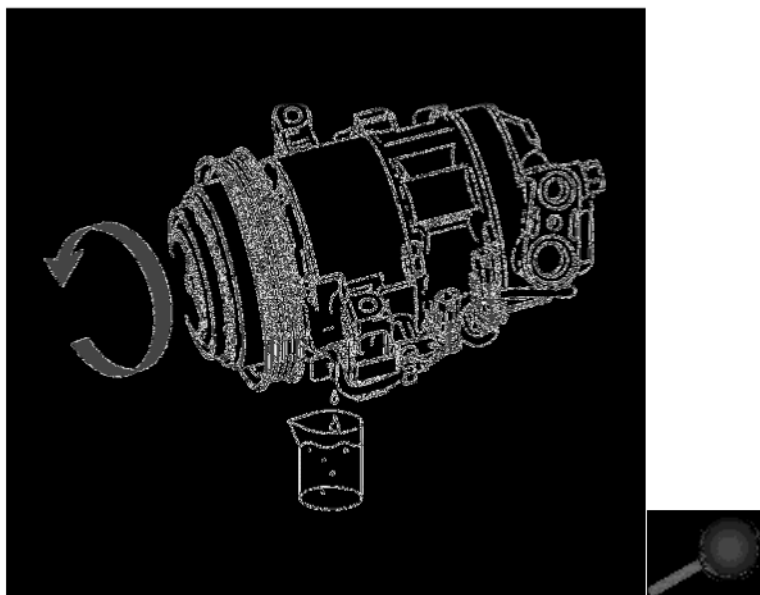
30. Install the TXV. Refer to [Air Conditioning Evaporator Thermal Expansion Valve Replacement](#).

31. Evacuate and recharge the A/C system. Refer to [Refrigerant Recovery and Recharging](#).

32. Leak test the fittings using GE-50078 Enhanced Leak Detector.

Air Conditioning Compressor Oil Balancing

Draining Procedure



Warning: Refer to [Safety Glasses Warning](#).

Note: Rotate the compressor (1) while draining to assist in polyalkylene glycol (PAG) oil removal.

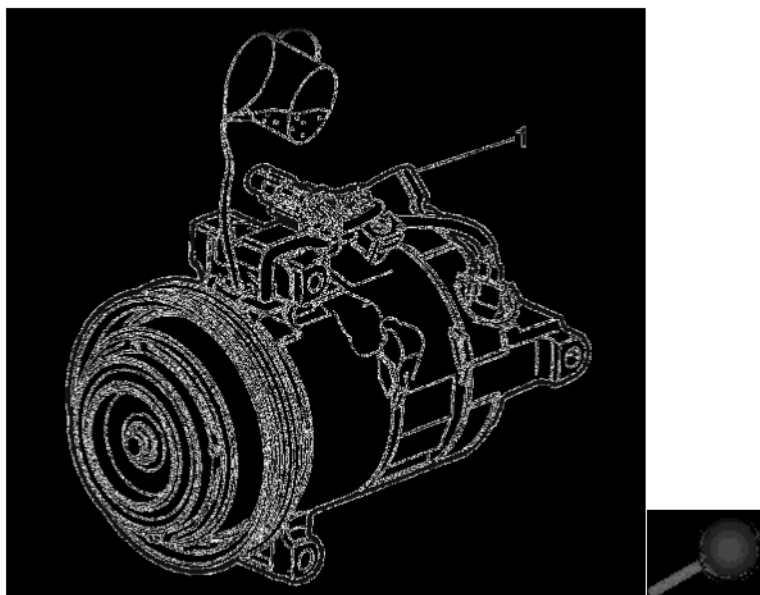
1. Drain and measure the PAG oil from the original compressor (1) via the drain plug and compressor ports into a clean, graduated container (2).
2. Record the amount of PAG oil drained from the removed compressor (1). This measurement will be used during installation of the replacement compressor.
3. Correctly discard the used PAG oil.
4. Clean the graduated cylinder.

Note: Drain and measure as much of the PAG oil as possible from the NEW compressor (1).

Rotate the compressor (1) while draining to assist in PAG oil removal.

5. Drain the PAG oil from the NEW compressor (1) via the drain plug and compressor ports into a clean, graduated container (2).

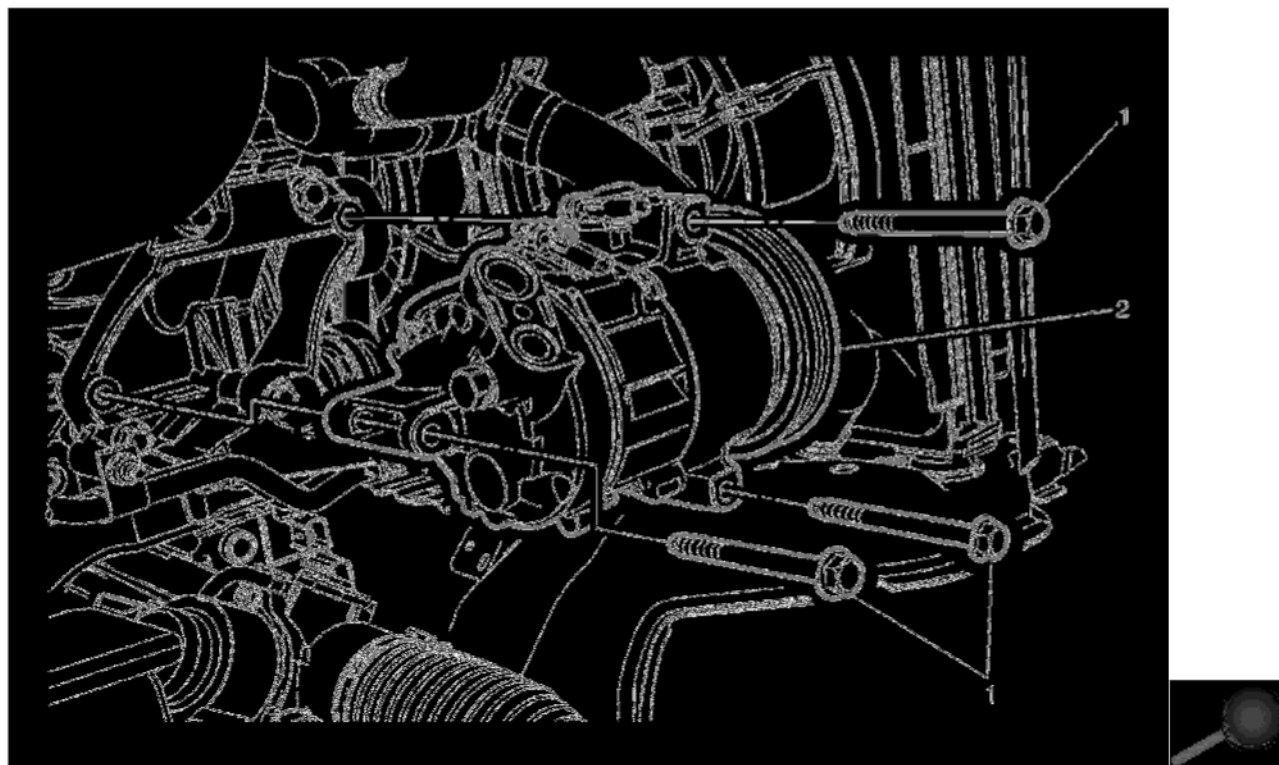
Balancing Procedure



Note: If the amount of PAG oil recorded from the removed compressor is less than 60 ml (2.0 fl. oz), disregard the recorded amount and pour a total of 60 ml (2.0 fl. oz) of the NEW PAG oil back into the NEW compressor (1).

1. Add back the same quantity of PAG oil to the NEW compressor (1) that was recorded from the removed compressor.
2. Rotate the NEW compressor (1) three times to lubricate the internal compressor components.
3. Install the air conditioning compressor drain plug and tighten to **30 N·m (22 lb ft)**.

Air Conditioning Compressor Replacement (L77, LS3, LSA)

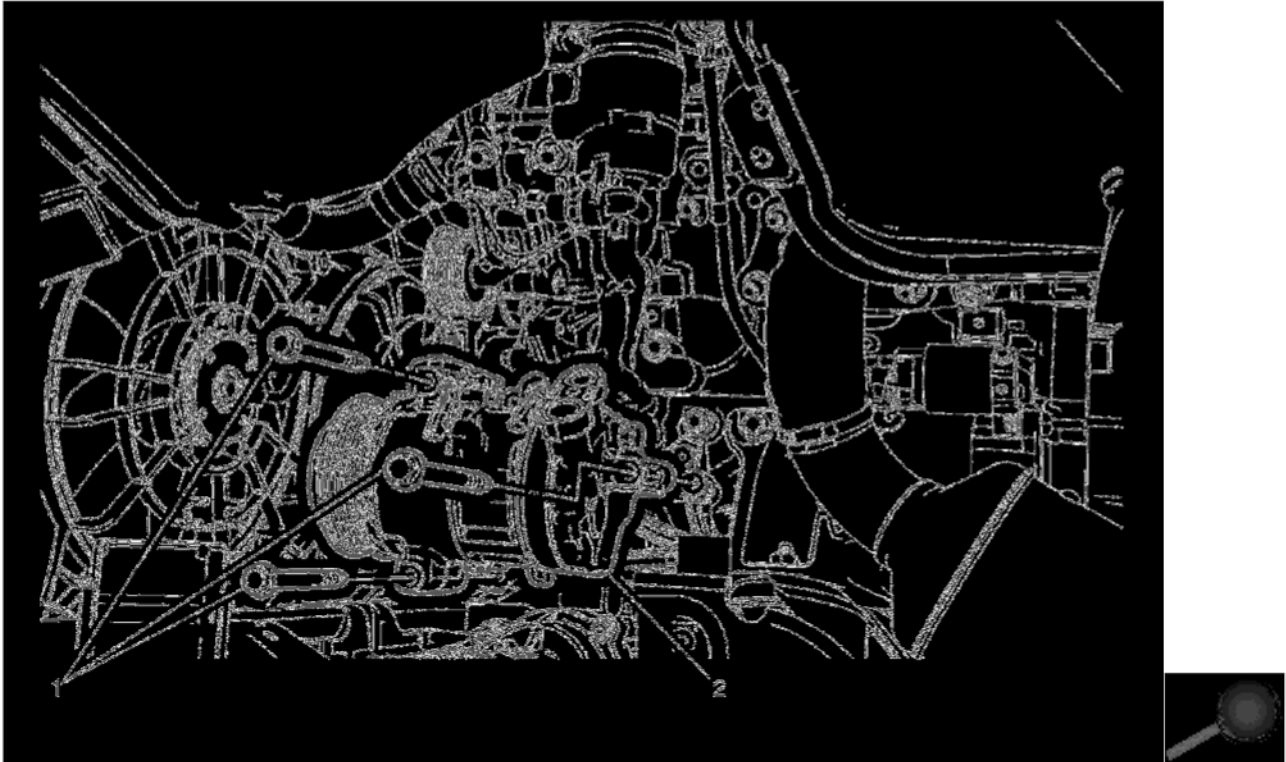


Air Conditioning Compressor Replacement

Callout	Component Name
Preliminary Procedure 1. Recover refrigerant. Refer to Refrigerant Recovery and Recharging. 2. Disconnect battery negative cable. Refer to Battery Negative Cable Disconnection and Connection. 3. Remove the air conditioning compressor belt from the compressor. Refer to Air Conditioning Compressor Belt Replacement. 4. Disconnect the air conditioning compressor hose from the compressor. Refer to Air Conditioning Compressor Hose Replacement.	
1	Air Conditioning Compressor Bolt (Qty: 3) Caution: Refer to Fastener Caution . Tighten 22 N•m (16 lb ft)
2	Air Conditioning Compressor Note: Remove the air conditioning compressor (2) from the vehicle by guiding it forward and up between the engine and radiator cooling fans. Procedure 1. Disconnect electrical connectors from the air conditioning (A/C) clutch coil and air conditioning compressor pressure relief valve.

Callout	Component Name
	2. Remove and discard old sealing washers and replace with NEW sealing washers. Refer to Air Conditioning System Seal Replacement. 3. When replacing the air conditioning compressor, balance compressor oil. Refer to Air Conditioning Compressor Oil Balancing.

Air Conditioning Compressor Replacement (LFW, LFX, LWR)



Air Conditioning Compressor Replacement

Callout	Component Name
Preliminary Procedure 1. Recover the refrigerant. Refer to Refrigerant Recovery and Recharging. 2. Disconnect the negative battery cable. Refer to Battery Negative Cable Disconnection and Connection. 3. Remove the cooling fan and shroud. Refer to Engine Coolant Fan Shroud Replacement. 4. Remove the air conditioning belt. Refer to Air Conditioning Compressor Belt Replacement. 5. Disconnect the air compressor hoses from the compressor. Refer to Air Conditioning Compressor Hose Replacement.	
1	Air Conditioning Compressor Bolt (Qty: 3) Caution: Refer to Fastener Caution . Tighten: 50 N•m (37 lb ft)
2	Air Conditioning Compressor Note: Remove the compressor from the compressor mounting bracket by sliding forwards and then tilting upwards out of the engine compartment. Procedure 1. Disconnect the air compressor harness connectors. 2. Cap or plug the suction/discharge ports on the compressor.

Callout	Component Name
	3. Perform the compressor balance procedure. Refer to Air Conditioning Compressor Oil Balancing .

Air Conditioning (A/C) System Oil Charge Replenishing

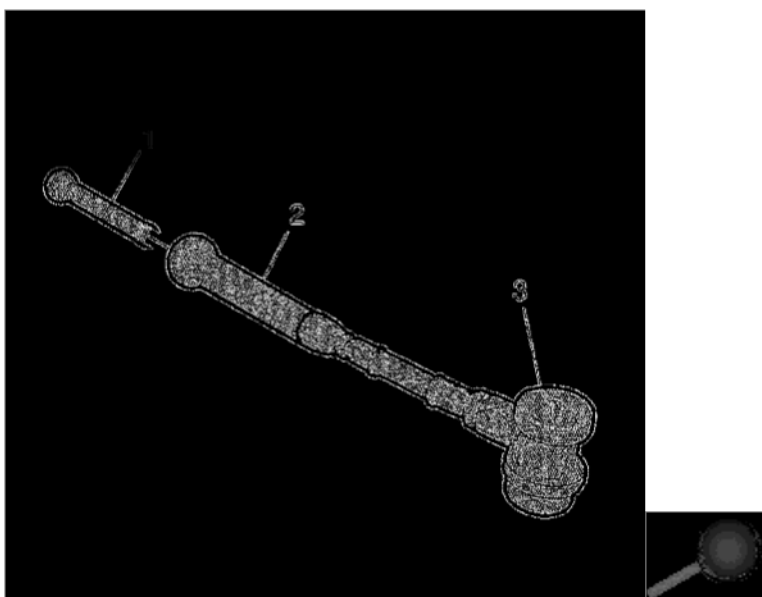
Special Tools

J-41459 A/C Oil Injector

For equivalent regional tools, refer to [Special Tools](#).

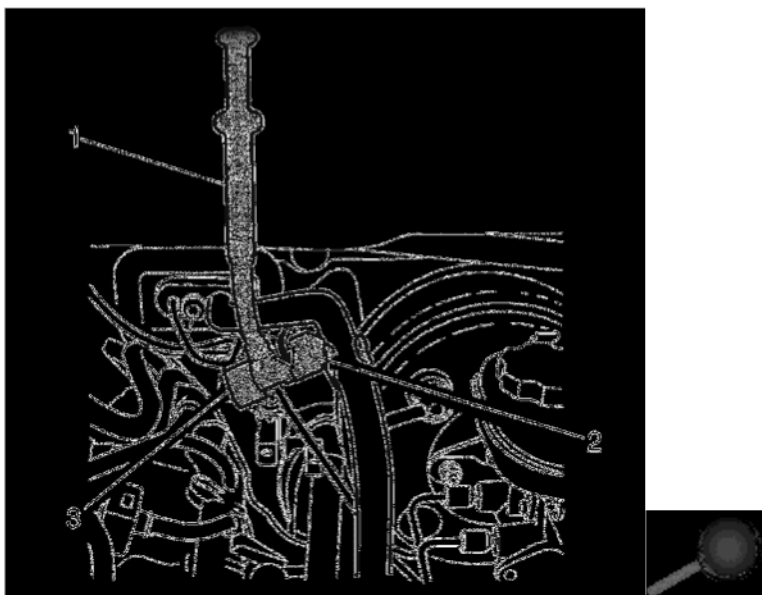
Note: The addition of lubricating oil must be carried out whenever any component is replaced in the A/C system to compensate for oil trapped in the removed component. Carrying out this procedure ensures the A/C system always has the correct amount of oil as specified by the manufacturer.

1. Evacuate the A/C system for a minimum of 30 minutes and to minus 100 kPa negative gauge pressure. Refer to [Refrigerant Recovery and Recharging](#).



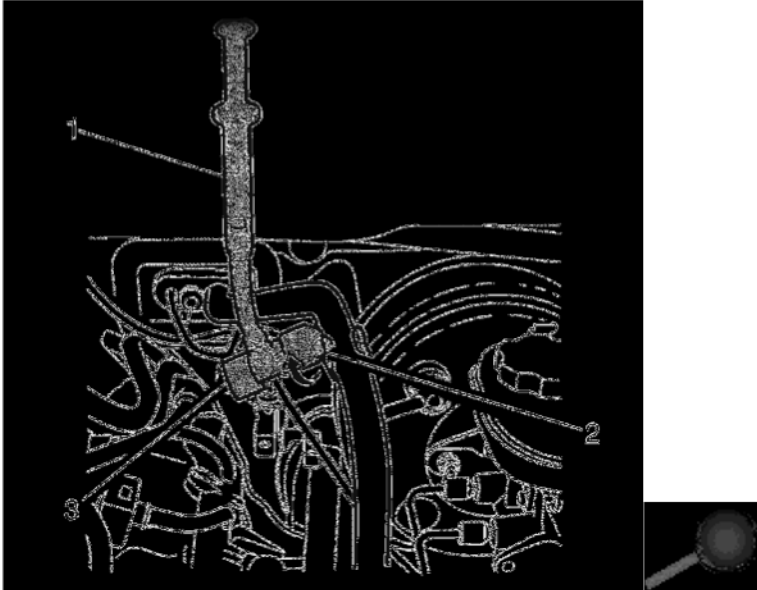
Note: Make sure the valve (3) is in the closed position.

2. Remove the plunger (1) from the J-41459 injector (2) and pour in the appropriate amount of polyalkylene glycol (PAG) oil specified for the replaced component. Refer to [Refrigerant System Specifications](#).
3. Jiggle the plunger (1) to remove any air in the J-41459 injector (2).



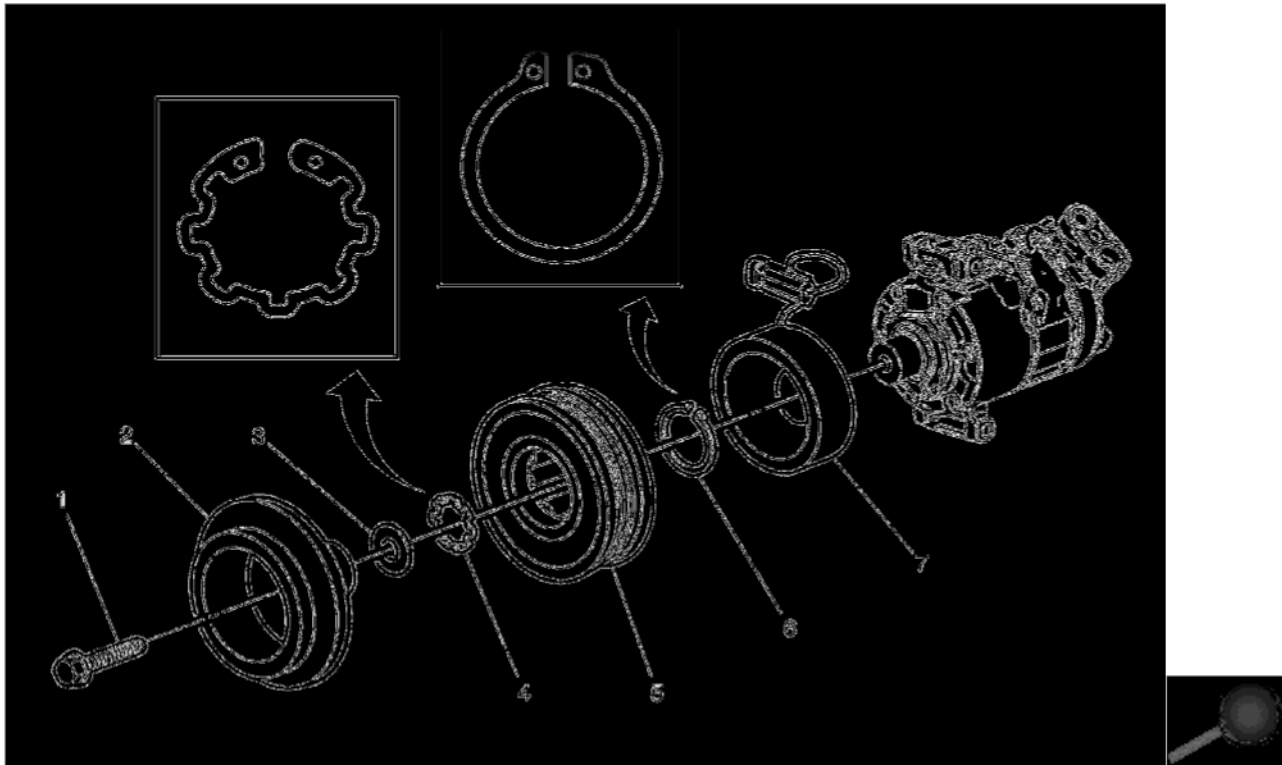
4. With the A/C system still evacuated, connect the *J-41459* injector (1) to the low side charging port (2).
5. Turn the *J-41459* injector shut off valve tap (3) to the open position to depress the low side charging port (2) schrader valve.

The oil should now be drawn into the A/C system due to the low pressure in the A/C system.



6. Once all the oil in the *J-41459* injector (1) has moved into the A/C system, turn the shut off valve tap (3) to the closed position.
7. Remove the *J-41459* injector (1) from the low side charging port (2).
8. Repeat steps 2 to 7 if more oil is required.

Air Conditioning Clutch Replacement

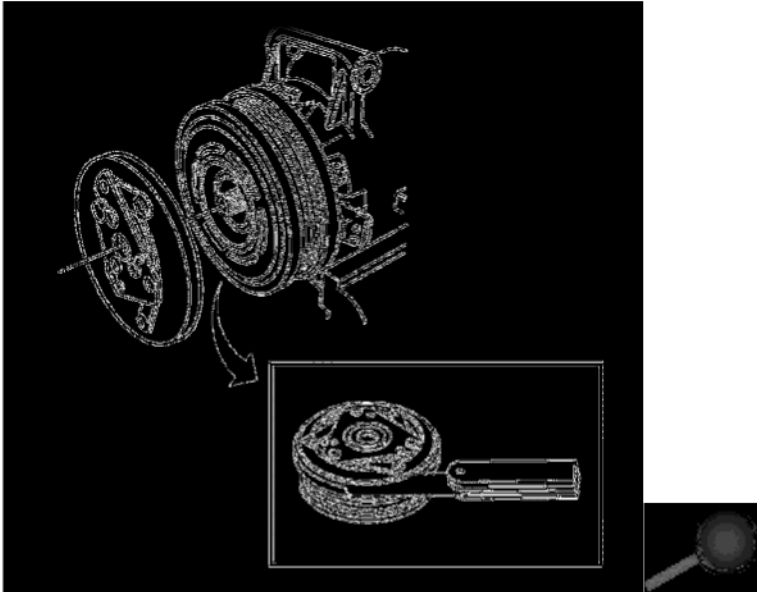


Air Conditioning Clutch Replacement

Callout	Component Name
Preliminary Procedure Remove the air conditioning compressor. Refer to Air Conditioning Compressor Replacement .	
1	Air Conditioning Compressor Clutch Pulley Bolt Caution: Refer to Fastener Caution . Procedure Use the J-37872 universal spanner wrench to hold the compressor clutch plate from turning when removing the bolt. Special Tools J-37872 Universal Spanner Wrench For equivalent regional tools, refer to Special Tools .
2	Air Conditioning Compressor Clutch Drive Plate Procedure Measure and adjust the air conditioning compressor clutch drive plate. Refer to Air Conditioning Clutch Drive Plate Adjustment .
3	Air Conditioning Compressor Clutch Shim
4	Retaining Ring
5	Air Conditioning Compressor Pulley
6	Retaining Ring

Callout	Component Name
7	Air Conditioning Compressor Coil

Air Conditioning Clutch Drive Plate Adjustment



1. Install the clutch plate assembly. Refer to [Air Conditioning Clutch Replacement](#)

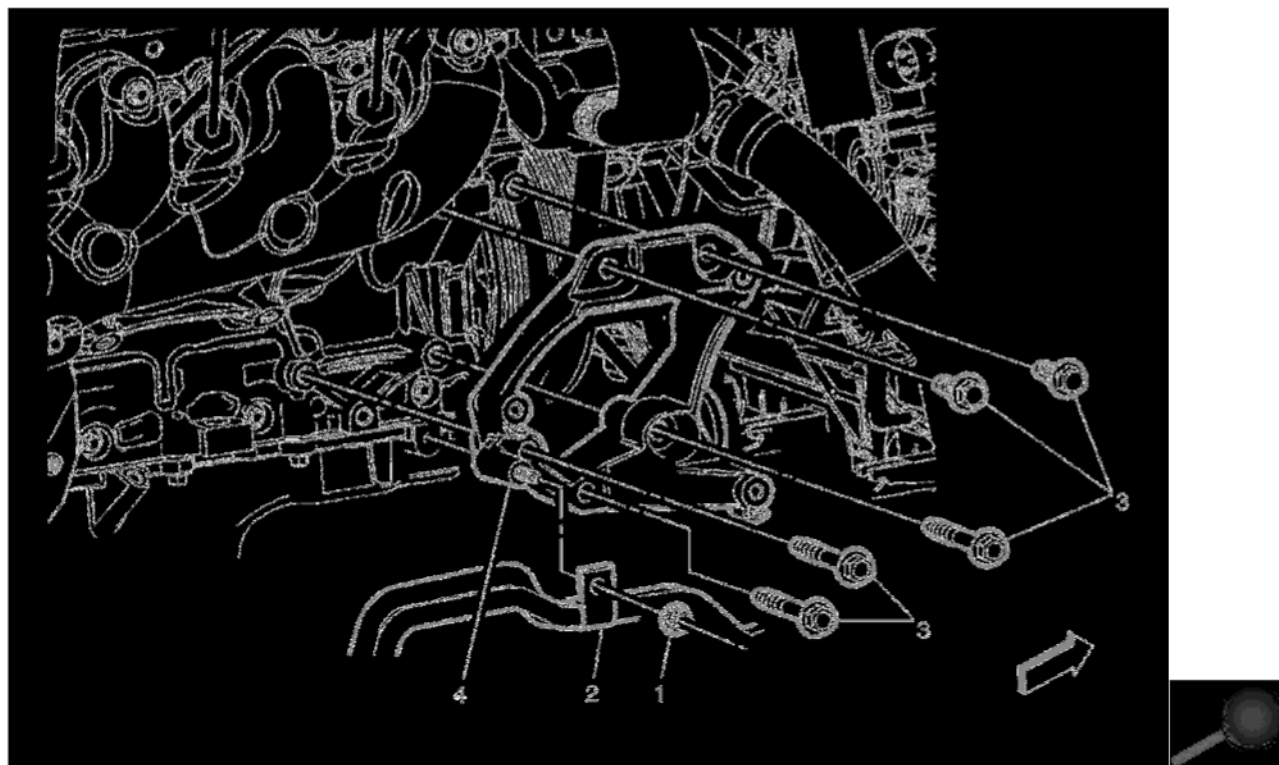
Note: Ensure the drive plate does not drag against the pulley when the pulley is rotated.

2. Measure the air gap between the pulley and the drive plate. Adjust the shims to achieve a 0.30–0.60 mm (0.011–0.023 in) air gap.

Caution: Refer to [Fastener Caution](#).

3. Install the clutch plate retaining bolt and tighten to **12 N•m (106 lb in)**.

Air Conditioning Compressor Bracket Replacement (L77, LS3, LSA)

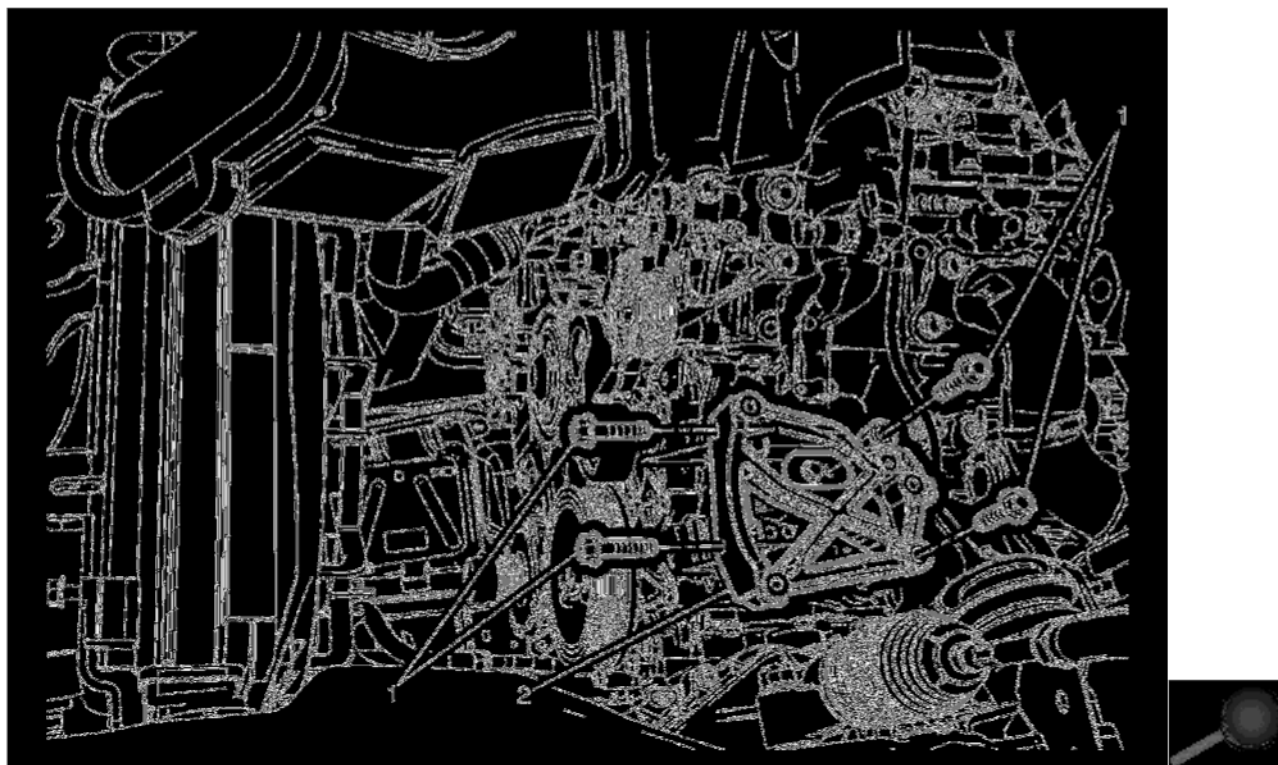


Air Conditioning Compressor Bracket Replacement

Callout	Component Name
Preliminary Procedure Remove the air conditioning compressor. Refer to Air Conditioning Compressor Replacement .	
1	Transmission Fluid Cooler Pipe Clip Nut Caution: Refer to Fastener Caution . Tighten: 17 N•m (13 lb ft)
2	Transmission Fluid Cooler Pipe Clip Procedure Remove the transmission fluid cooler pipe clip from the air conditioning compressor bracket stud.
3	Air Conditioning Compressor Bracket Bolt (Qty: 5) Tighten: 58 N•m (43 lb ft)
4	Air Conditioning Compressor Bracket Procedure 1. Remove the air conditioning compressor belt tensioner. Refer to Drive Belt Tensioner Replacement - Air Conditioning 2. Transfer all components as necessary.

Callout	Component Name
---------	----------------

Air Conditioning Compressor Bracket Replacement (LFW, LFX, LWR)



Air Conditioning Compressor Bracket Replacement

Callout	Component Name
Preliminary Procedure Remove the air conditioning compressor. Refer to Air Conditioning Compressor Replacement .	
1	Air Conditioning Compressor Bracket Bolt (Qty: 4) Caution: Refer to Fastener Caution . Tighten: 58 N•m (43 lb ft)
2	Air Conditioning Compressor Bracket

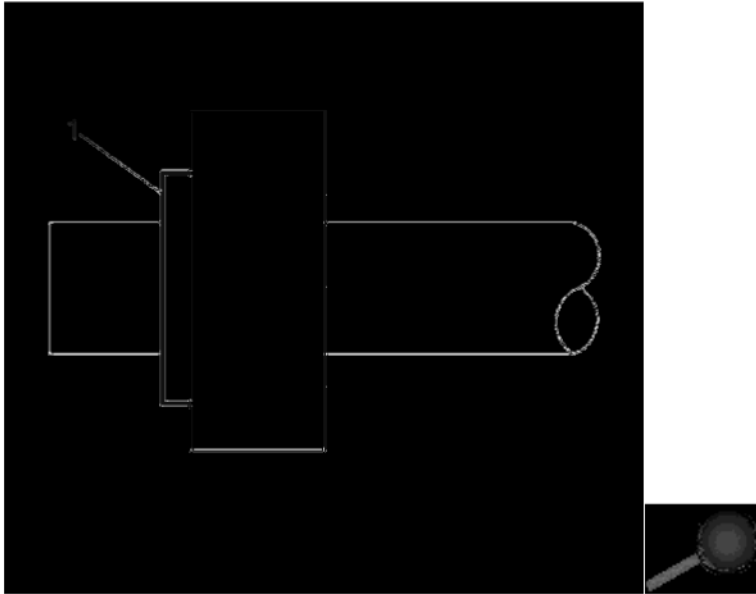
Air Conditioning System Seal Replacement

Removal Procedure

1. Disassemble the A/C refrigerant components. Refer to the appropriate repair procedure.

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

2. Cap or tape the A/C refrigerant components.

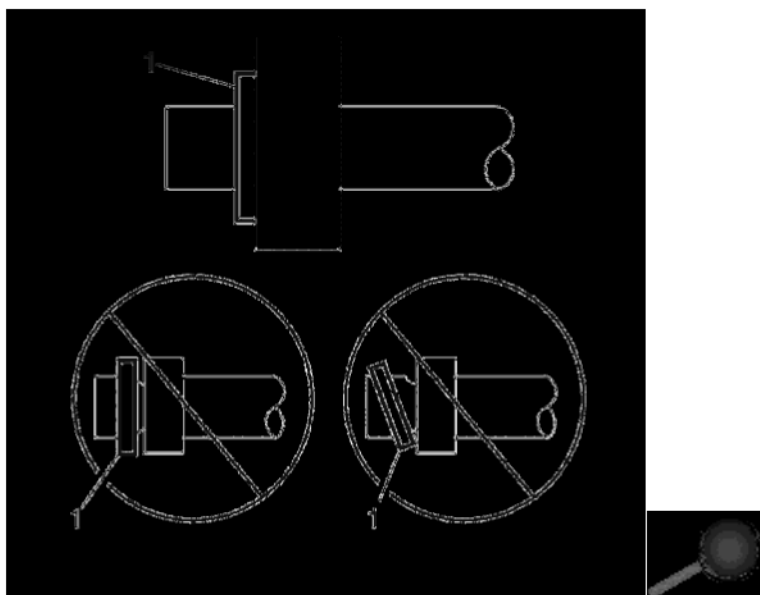


3. Remove the sealing washer (1) from the A/C refrigerant component.
 4. Inspect the seal washer for signs of damage to help determine the root cause of the failure.
 5. Inspect the A/C refrigerant components for damage or burrs. Repair if necessary.
- Note:** DO NOT reuse sealing washer.
6. DISCARD the sealing washer.

Installation Procedure

Note: Flat washer type seals do not require lubrication.

1. Inspect the new sealing washer for any signs of cracks, cuts, or damage.
Do not use a damaged sealing 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 sealing washer (1) onto the A/C refrigerant component. The sealing washer (1) must completely bottom against the surface of the fitting.

Note: After tightening the A/C components, there should be a slight sealing 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.

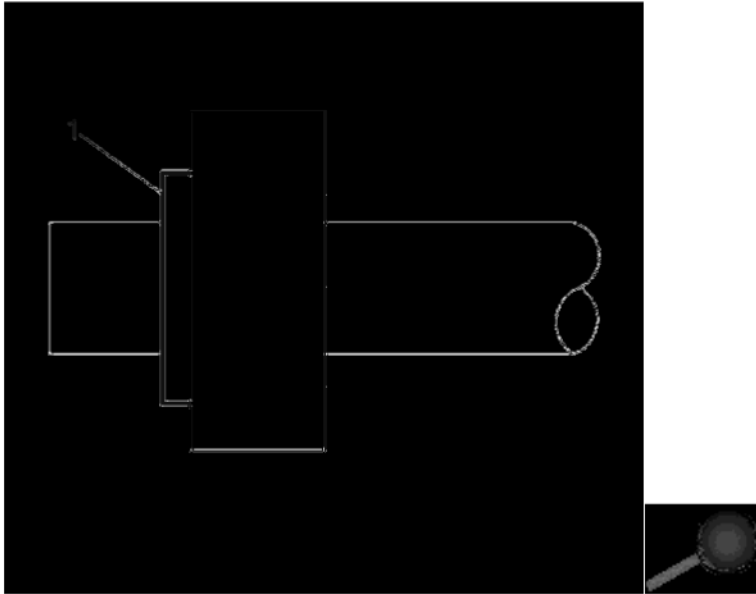
Air Conditioning System Seal Replacement

Removal Procedure

1. Disassemble the A/C refrigerant components. Refer to the appropriate repair procedure.

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

2. Cap or tape the A/C refrigerant components.

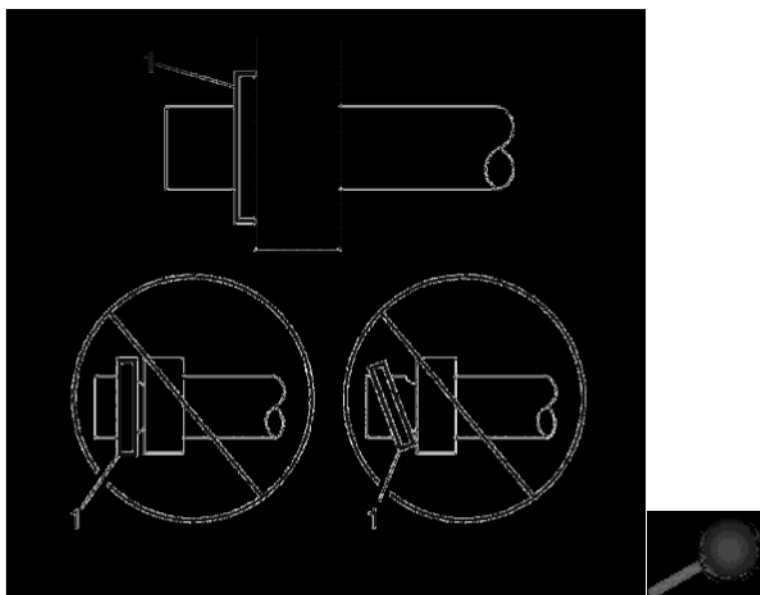


3. Remove the sealing washer (1) from the A/C refrigerant component.
 4. Inspect the seal washer for signs of damage to help determine the root cause of the failure.
 5. Inspect the A/C refrigerant components for damage or burrs. Repair if necessary.
- Note:** DO NOT reuse sealing washer.
6. DISCARD the sealing washer.

Installation Procedure

Note: Flat washer type seals do not require lubrication.

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

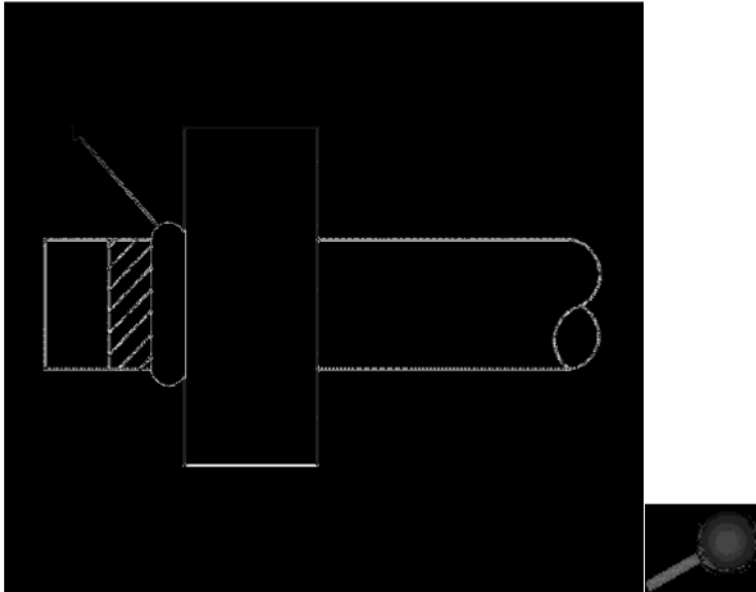


3. Using a lint-free clean, dry cloth, clean the sealing surfaces of the A/C refrigerant components.
4. Carefully install the NEW sealing washer (1) onto the A/C refrigerant component. The sealing washer (1) must completely bottom against the surface of the fitting.
5. Assemble the remaining A/C refrigerant components. Refer to the appropriate repair procedure.

Air Conditioning O-Ring Seal Replacement

Removal Procedure

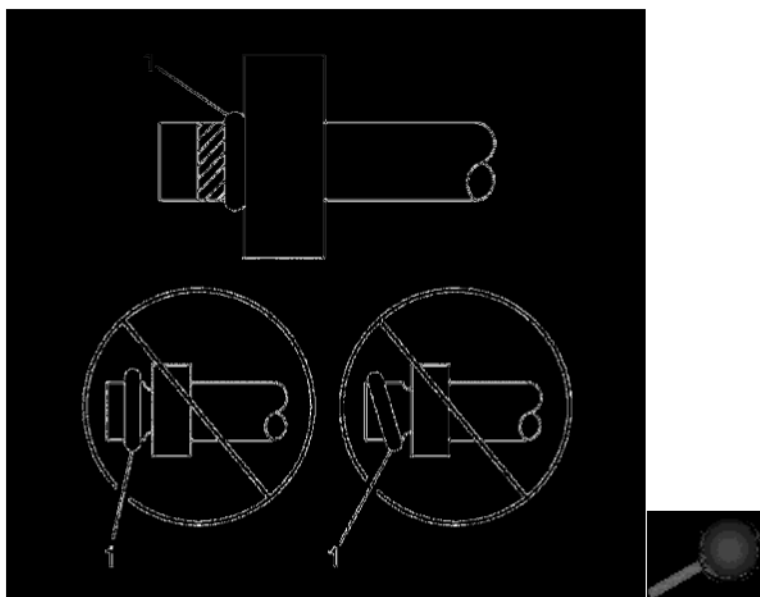
1. Disassemble the A/C refrigerant components. Refer to the appropriate repair procedure
Note: Cap or tape the open A/C refrigerant components immediately to prevent system contamination.
2. Cap or tape the A/C refrigerant components.



3. Remove the O-ring seal (1) from the A/C refrigerant component.
4. Inspect the O-ring seal for signs of damage to help determine the root cause of the failure.
5. Inspect the A/C refrigerant components for damage or burrs. Repair if necessary.
6. DISCARD the O-ring seal.

Installation Procedure

1. Inspect the new O-ring seal for any sign of cracks, cuts, or damage.
2. Remove the cap or tape from the A/C refrigerant components.
3. Using a lint-free clean, dry cloth, carefully clean the sealing surfaces of the A/C refrigerant components.
4. Lightly coat the new O-ring seal with refrigerant oil.
Note: DO NOT reuse O-ring seals.
5. Carefully slide the NEW O-ring seal (1) onto the A/C refrigerant component.



6. The O-ring seal (1) must be fully seated.
7. Assemble the A/C components.
Refer to the appropriate repair procedure.

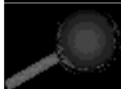
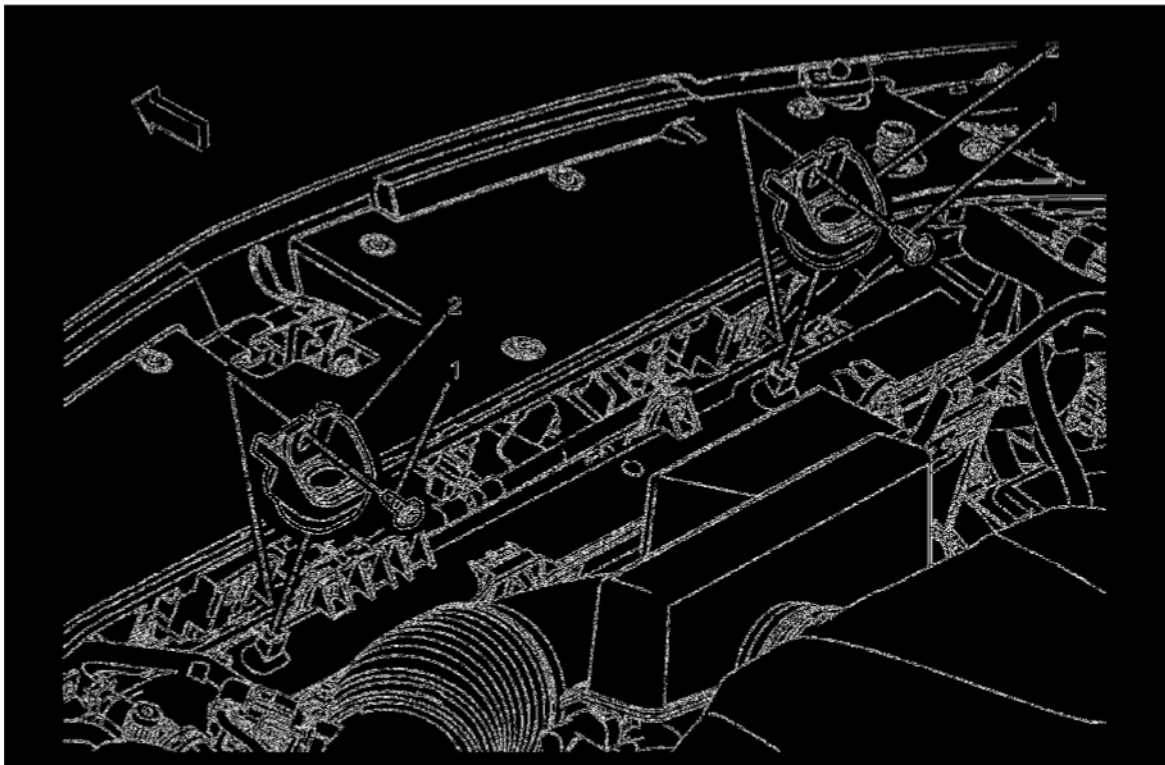
Air Conditioning Compressor Hose Replacement (LFW, LFX, LWR)

Special Tools

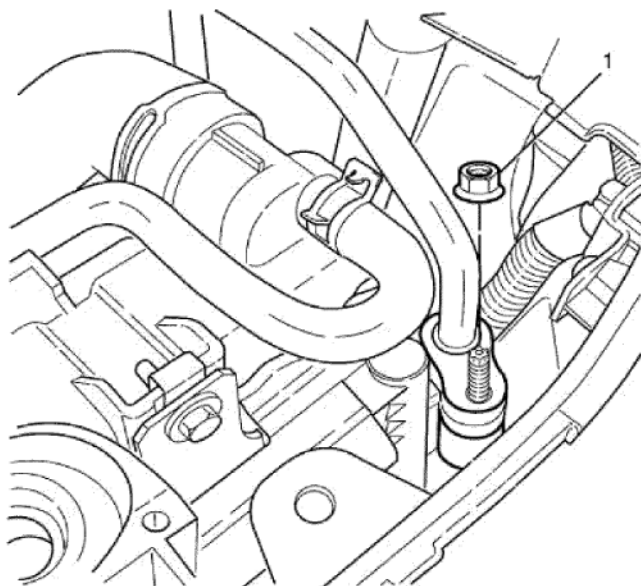
J 39400-A Halogen Leak Tester

Removal Procedure

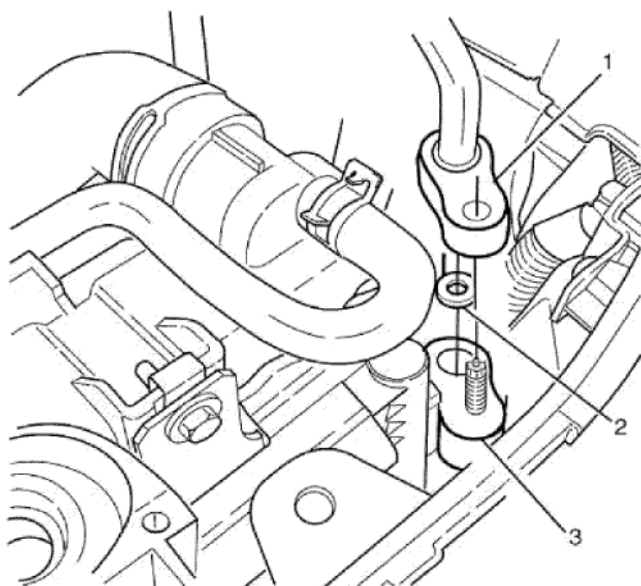
1. Recover the refrigerant. Refer to [Refrigerant Recovery and Recharging](#).
- Warning:** Refer to [Battery Disconnect Warning](#).
2. Disconnect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
3. Remove the air cleaner outlet duct. Refer to [Air Cleaner Outlet Duct Replacement](#).
4. Remove the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#).



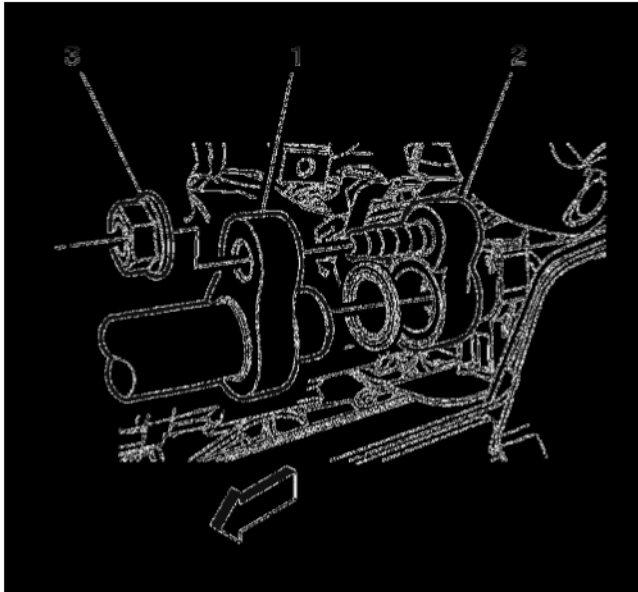
5. Remove the radiator upper mount bolts (1) and mounts (2). Refer to [Radiator Upper Mount Replacement](#).



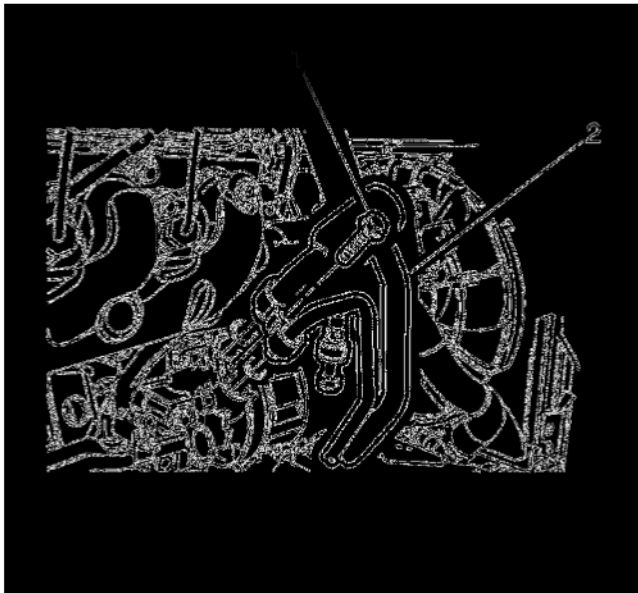
6. Gently push the radiator and condenser towards the engine to allow removal of air conditioning compressor hose to condenser retaining nut (1).
7. Remove the air conditioning compressor hose to condenser retaining nut (1).



8. Disconnect the air conditioning compressor hose (1) from the condenser (3).
9. Remove and discard the sealing washer (2).
10. Cap or tape the open A/C refrigerant components immediately to prevent system contamination.

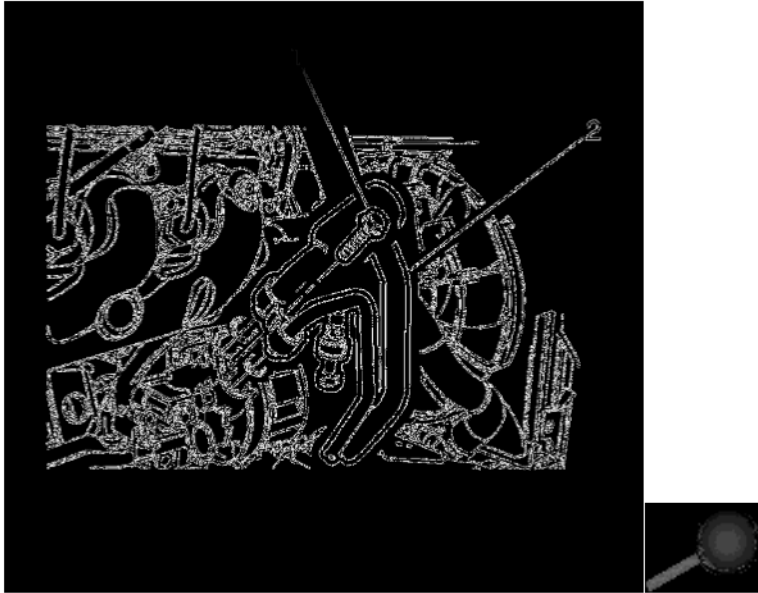


11. Remove the air conditioning evaporator thermal expansion valve tube nut (3) from the air conditioning evaporator thermal expansion valve tube (2).
12. Remove the air conditioning compressor hose (1) from the air conditioning evaporator thermal expansion valve tube (2).
13. Remove and discard the sealing washer.
14. Cap or tape the open A/C refrigerant components immediately to prevent system contamination.

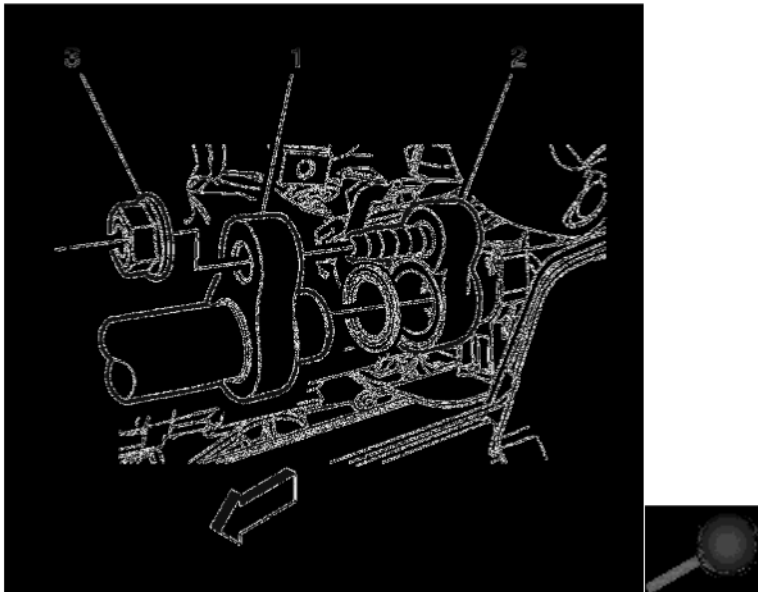


15. Remove the air conditioning compressor bolt (1) from the air conditioning compressor.
16. Remove the air conditioning compressor hose (2) from the air compressor.
17. Remove and discard the sealing washer.
18. Cap or tape the open A/C refrigerant components immediately to prevent system contamination.
19. Remove the air conditioning compressor hose (2) from the vehicle.

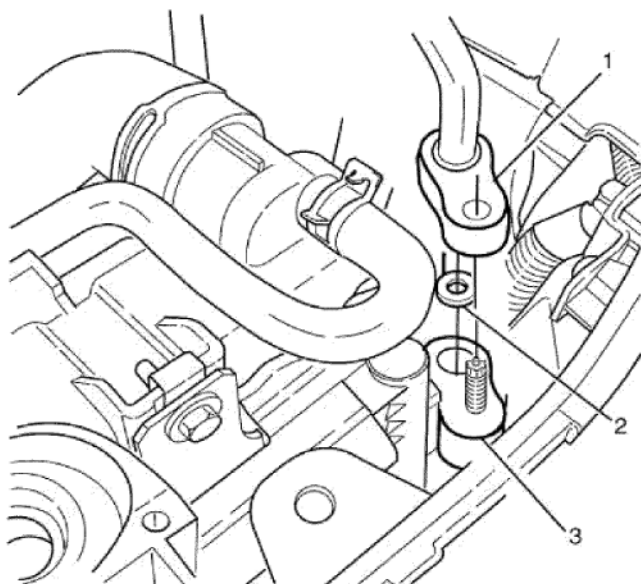
Installation Procedure



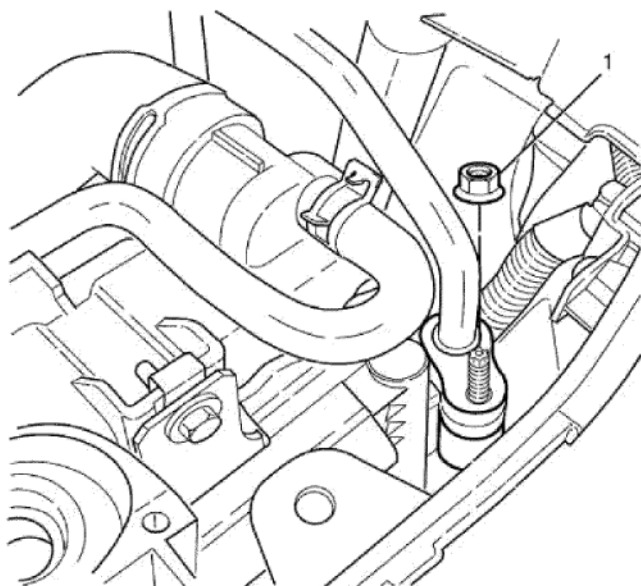
1. Install the air conditioning compressor hose (2) to the vehicle.
 2. Install NEW sealing washers to the air conditioning compressor hose (2). Refer to [Air Conditioning System Seal Replacement](#).
 3. Install the air conditioning compressor hose (2) to the air conditioning compressor.
- Caution:** Refer to [Fastener Caution](#).
4. Install the air conditioning compressor hose bolt (1) to the air conditioning compressor and tighten to **22 N•m (16 lb ft)**.



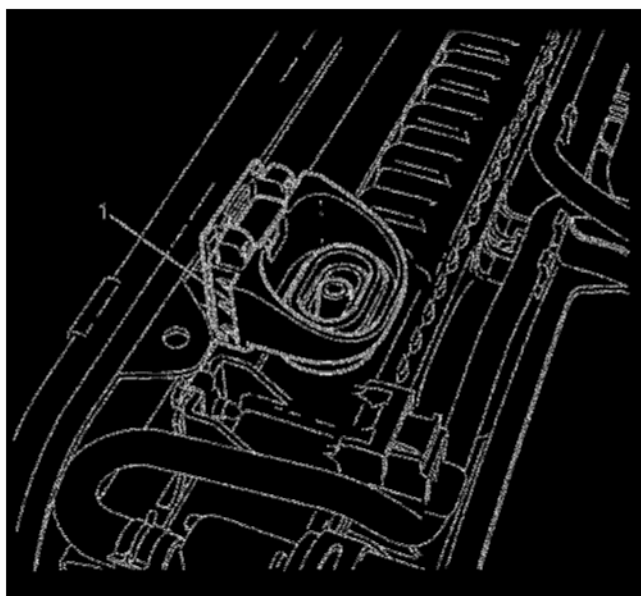
5. Install NEW sealing washer to the air conditioning compressor hose (1). Refer to [Air Conditioning System Seal Replacement](#).
6. Install the air conditioning compressor hose (1) to the air conditioning evaporator thermal expansion valve tube (2).
7. Install the air conditioning evaporator thermal expansion valve tube nut (3) to the air conditioning evaporator thermal expansion valve tube (2) and tighten to **22 N•m (16 lb ft)**.



8. Install NEW sealing washer (2) to the air conditioning compressor hose (1). Refer to [Air Conditioning System Seal Replacement](#).
9. Install the air conditioning compressor hose (1) to the condenser (3).



10. Install the air conditioning compressor hose nut (1) to the condenser and tighten to **22 N•m (16 lb ft)**.

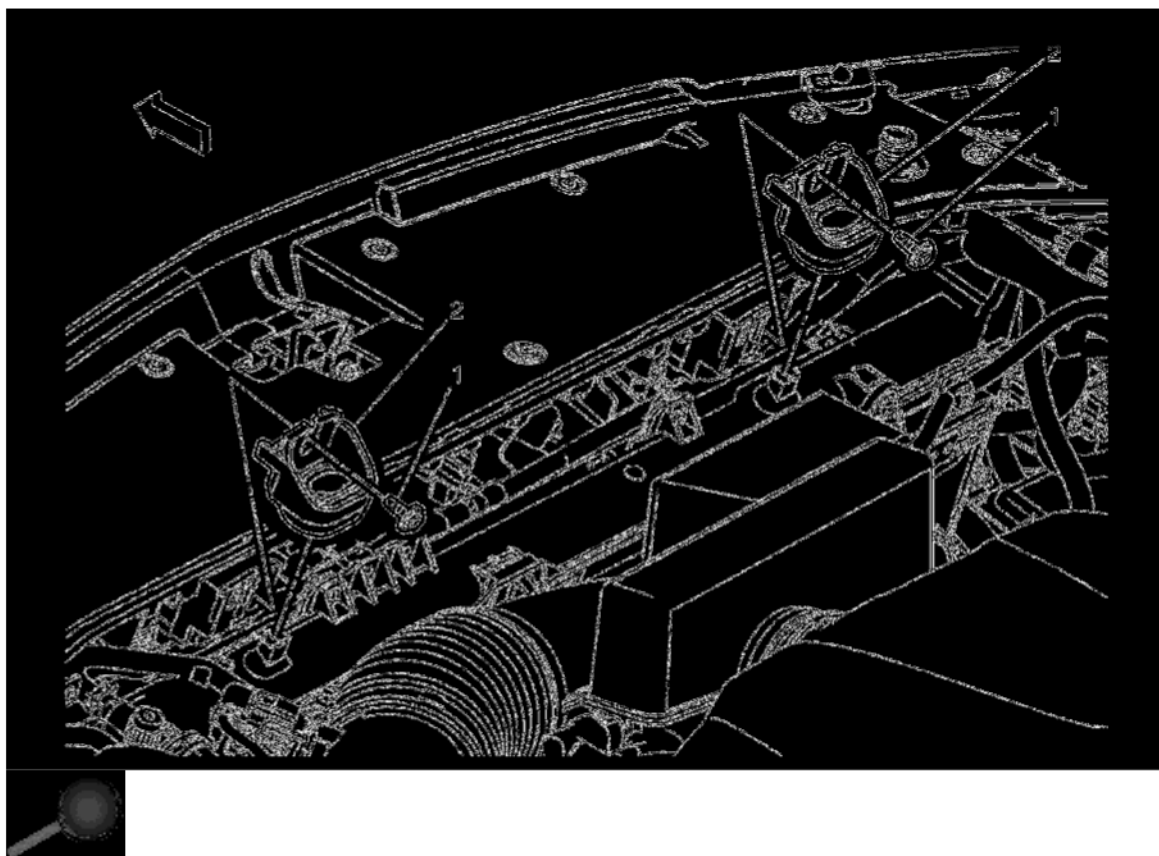


11. Install the radiator upper mounts and mount bolts (1). Refer to [Radiator Upper Mount Replacement](#).
12. Install the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#).
13. Install the air cleaner outlet duct. Refer to [Air Cleaner Outlet Duct Replacement](#).
14. Connect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
15. Recharge the refrigerant system. Refer to [Refrigerant Recovery and Recharging](#).
16. Leak test the fittings of the component using the J 39400-A halogen leak tester.

Air Conditioning Compressor Hose Replacement (L77, LS3, LSA)

Removal Procedure

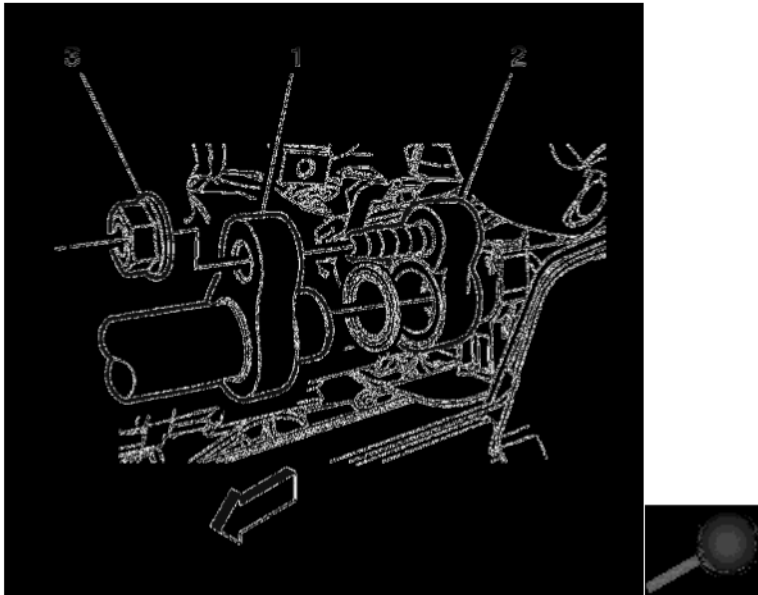
1. Recover the refrigerant. Refer to [Refrigerant Recovery and Recharging](#).
2. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
3. Remove the air cleaner outlet duct. Refer to [Air Cleaner Outlet Duct Replacement](#).
4. Remove the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#).



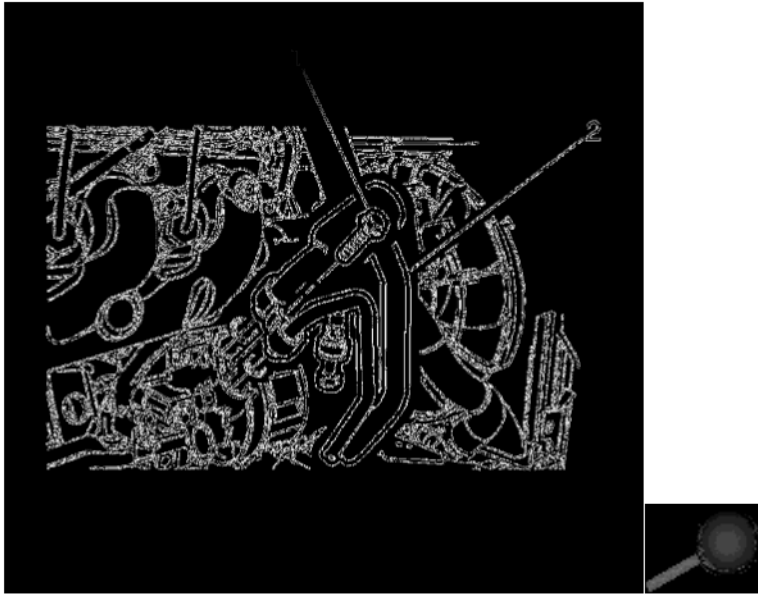
5. Remove the radiator upper mounts (2). Refer to [Radiator Upper Mount Replacement](#).



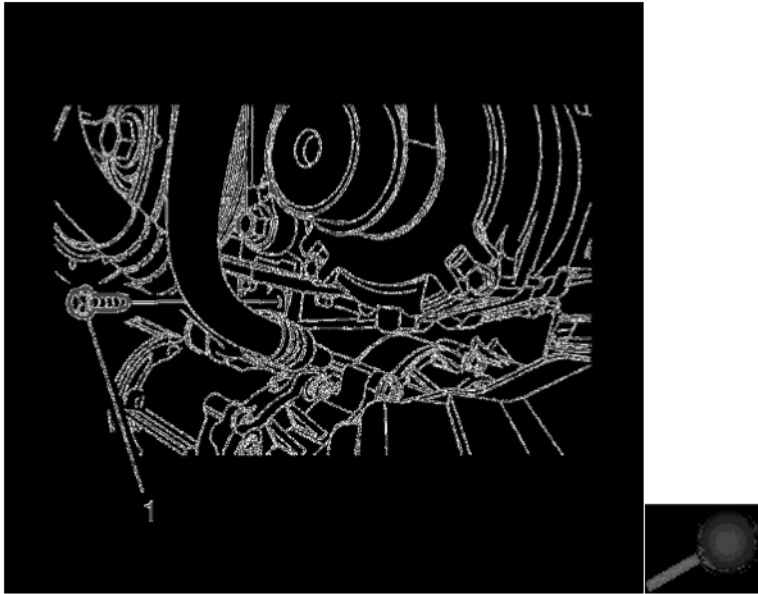
6. Gently push the radiator and condenser towards the engine to allow removal of the air conditioning compressor hose nut.
7. Remove the air conditioning compressor hose nut (2).
8. Remove the air conditioning compressor hose (1) from the condenser.
9. Remove and discard old sealing washers (3).
10. Cap or tape the open A/C refrigerant components immediately to prevent system contamination.



11. Remove the air conditioning compressor hose nut (3) from the air conditioning evaporator thermal expansion valve tube (2).
12. Remove the air conditioning compressor hose (1) from the air conditioning evaporator thermal expansion valve tube (2).
13. Remove and discard old sealing washers.
14. Cap or tape the open A/C refrigerant components immediately to prevent system contamination.



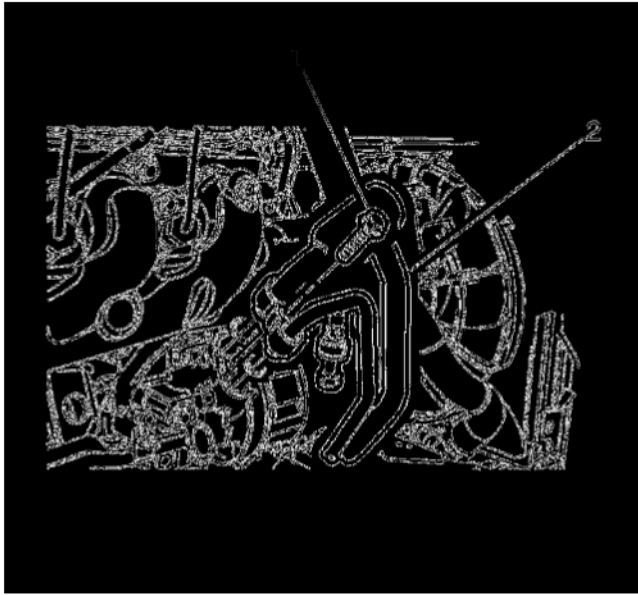
15. Remove the air conditioning compressor hose bolt (1) from the air conditioning compressor.
16. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
17. Remove the front bumper fascia extension. Refer to [Front Bumper Fascia Extension Replacement](#).
18. Disconnect the air conditioning (a/c) refrigerant pressure sensor electrical connector.
19. Remove the air conditioning compressor hose (2) from the air conditioning compressor.
20. Remove and discard old sealing washers.
21. Cap or tape the open A/C refrigerant components immediately to prevent system contamination.



22. Remove the air conditioning compressor hose bolt (1) from the engine.
23. Remove the air conditioning compressor hose from the vehicle.
24. Transfer components as necessary.

Installation Procedure

1. Install the air conditioning compressor hose to the engine.

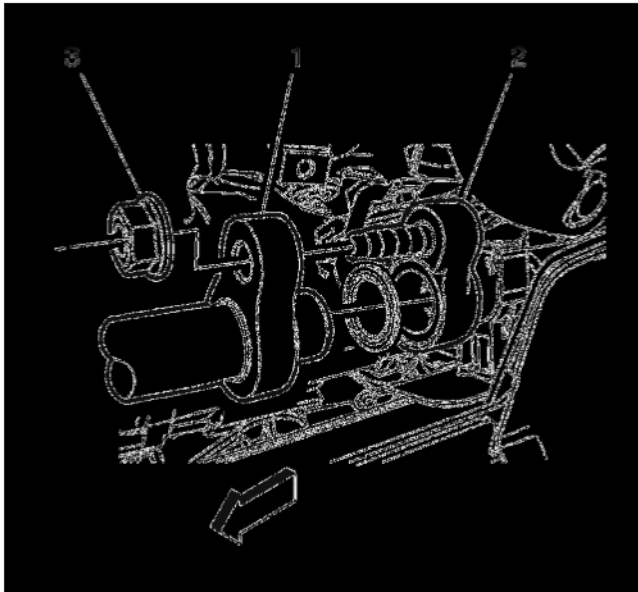


2. Install NEW sealing washers to the air conditioning compressor hose. Refer to [Air Conditioning System Seal Replacement](#).
3. Install the air conditioning compressor hose (2) to the air conditioning compressor.
4. Install the air conditioning compressor hose bolt (1) to the air conditioning compressor and hand tighten.



Caution: Refer to [Fastener Caution](#).

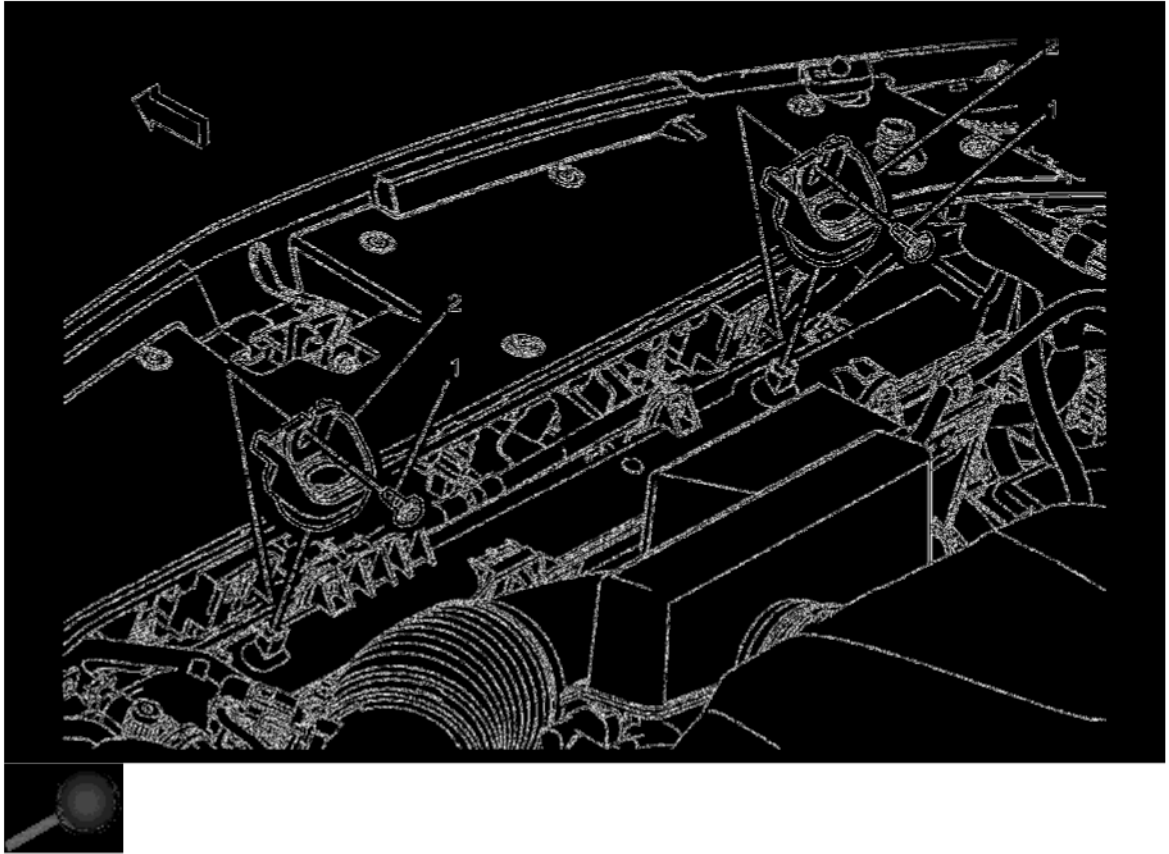
5. Install the air conditioning compressor hose bolt (1) to the engine and tighten to **9 N·m (80 lb in)**.
6. Connect the air conditioning (a/c) refrigerant pressure sensor electrical connector.
7. Install the front bumper fascia extension. Refer to [Front Bumper Fascia Extension Replacement](#).
8. Lower the vehicle.
9. Tighten the air conditioning compressor hose bolt (1) to **22 N·m (16 lb ft)**.



10. Install NEW sealing washers to the air conditioning compressor hose (1). Refer to [Air Conditioning System Seal Replacement](#).
11. Install the air conditioning compressor hose (1) to the air conditioning evaporator thermal expansion valve tube (2).
12. Install the air conditioning compressor hose nut (3) to the air conditioning evaporator thermal expansion valve tube (2) and tighten to **22 N•m (16 lb ft)**.



13. Install NEW sealing washer (3) to the air conditioning compressor hose. Refer to [Air Conditioning System Seal Replacement](#).
14. Install the air conditioning compressor hose (1) to the condenser.
15. Install the air conditioning compressor hose nut (2) to the condenser and tighten to **22 N•m (16 lb ft)**.

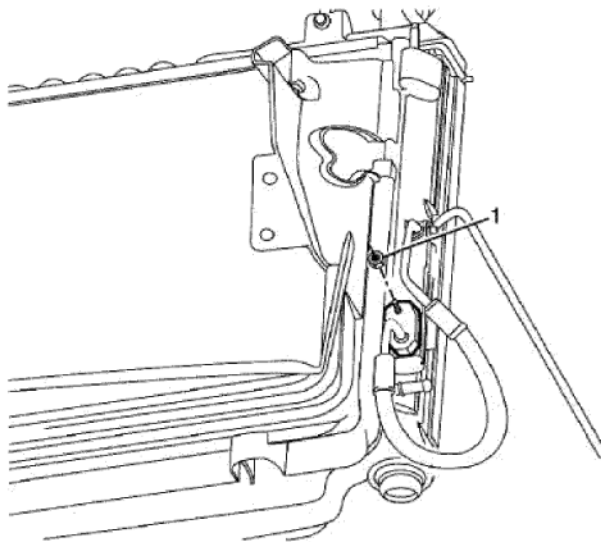


16. Install the radiator upper mounts (2). Refer to [Radiator Upper Mount Replacement](#).
17. Install the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#).
18. Install the air cleaner outlet duct. Refer to [Air Cleaner Outlet Duct Replacement](#).
19. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
20. Evacuate and charge the refrigerant system. Refer to [Refrigerant Recovery and Recharging](#).
21. Check the air conditioning system for leaks. Refer to [Leak Testing](#).

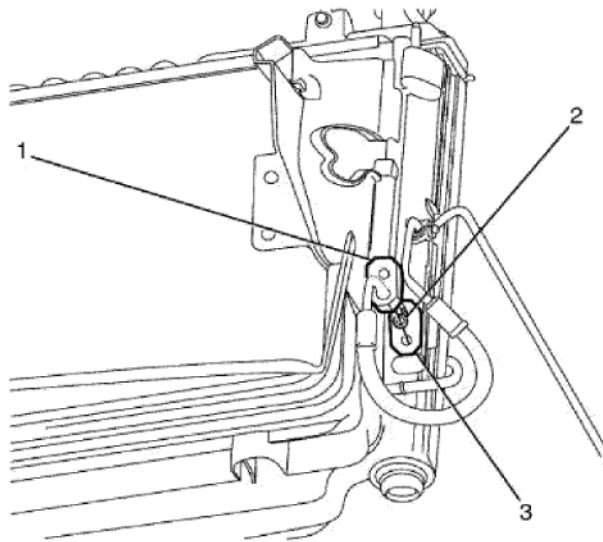
Air Conditioning Evaporator Thermal Expansion Valve Tube Replacement

Removal Procedure

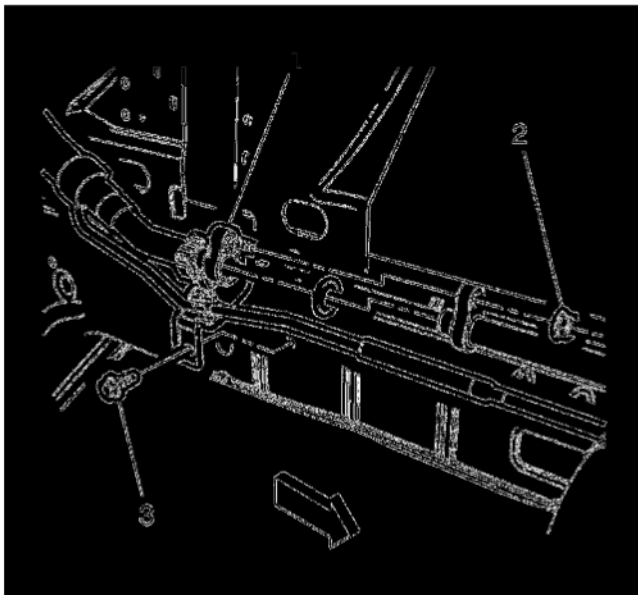
1. Recover the refrigerant. Refer to [Refrigerant Recovery and Recharging](#).
- Warning:** Refer to [Battery Disconnect Warning](#).
2. Disconnect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
3. Remove the lower air inlet grille panel. Refer to [Air Inlet Grille Panel Replacement](#).
4. Remove the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#).
5. Remove the engine cover. Refer to [Engine Cover Replacement](#).
6. Remove the battery positive cable extension cable from the front wheelhouse panel upper bracket and front suspension strut housing reinforcement, and position aside. Refer to [Engine Wiring and Battery Positive Cable Harness Replacement](#).
7. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
8. Remove the front bumper fascia extension. Refer to [Front Bumper Fascia Extension Replacement](#).



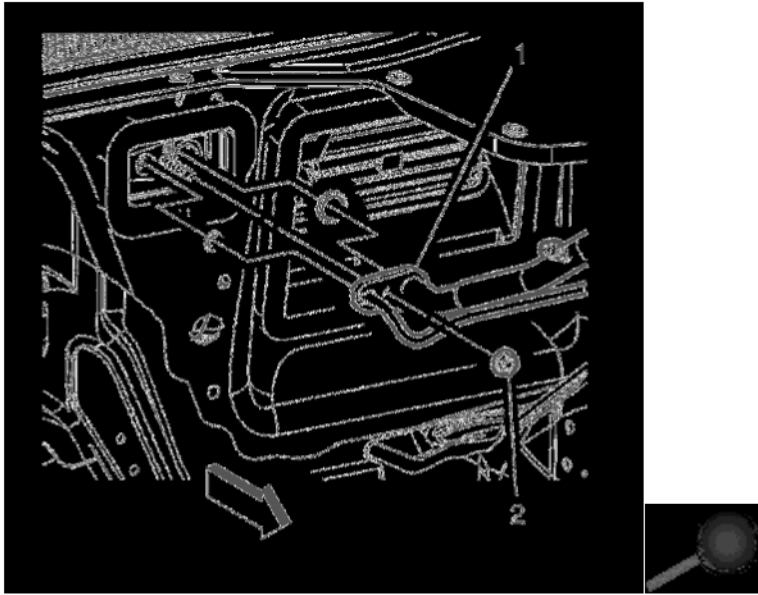
9. Remove the air conditioning evaporator thermal expansion valve tube nut from the condenser (1).



10. Remove the air conditioning evaporator thermal expansion valve tube (1) from the condenser (3).
11. Remove and discard old sealing washers.
12. Cap or tape the open A/C refrigerant components immediately to prevent system contamination.
13. Lower the vehicle.

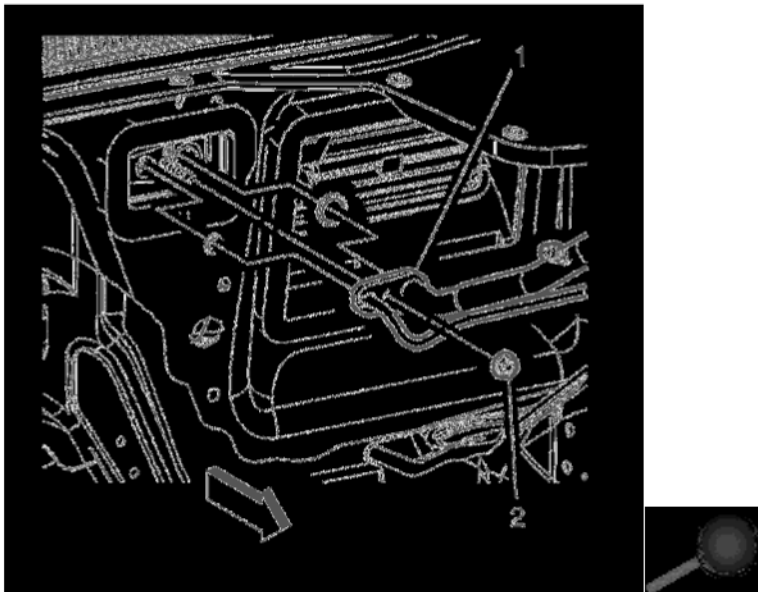


14. Remove the air conditioning evaporator thermal expansion valve tube nut (2) from the air conditioning evaporator thermal expansion valve tube (1).
15. Remove the air conditioning evaporator thermal expansion valve tube (1) from the air conditioning compressor hose.
16. Remove and discard old sealing washer.
17. Cap or tape the open A/C refrigerant components immediately to prevent system contamination.
18. Remove the air conditioning evaporator thermal expansion valve tube bolt (3) from the front compartment inner side lower rail.
19. Remove the air conditioning evaporator thermal expansion valve tube (1) from the front compartment inner side lower rail.



20. Remove the air conditioning evaporator thermal expansion valve tube nut (2) from the air conditioning evaporator thermal expansion valve.
21. Remove the air conditioning evaporator thermal expansion valve tube (1) from the air conditioning evaporator thermal expansion valve.
22. Remove and discard old sealing washer.
23. Cap or tape the open A/C refrigerant components immediately to prevent system contamination.
24. Remove the air conditioning evaporator thermal expansion valve tube (1) from the vehicle.

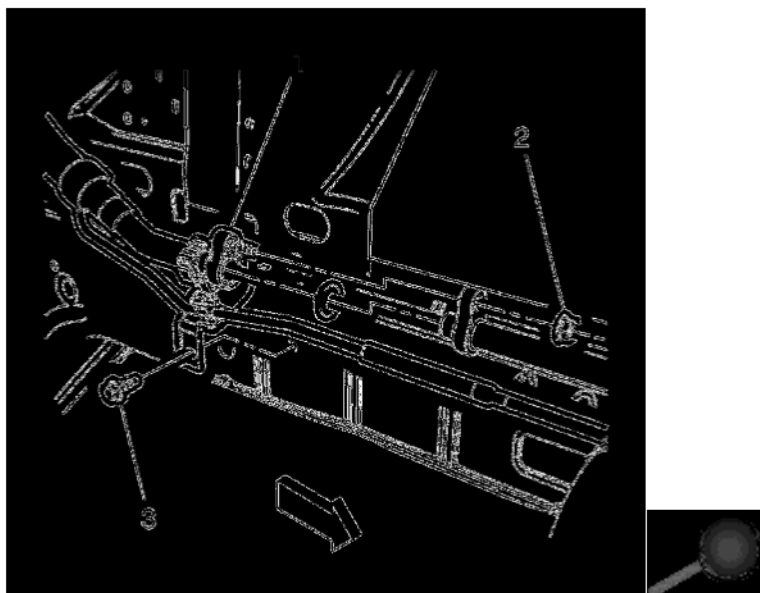
Installation Procedure



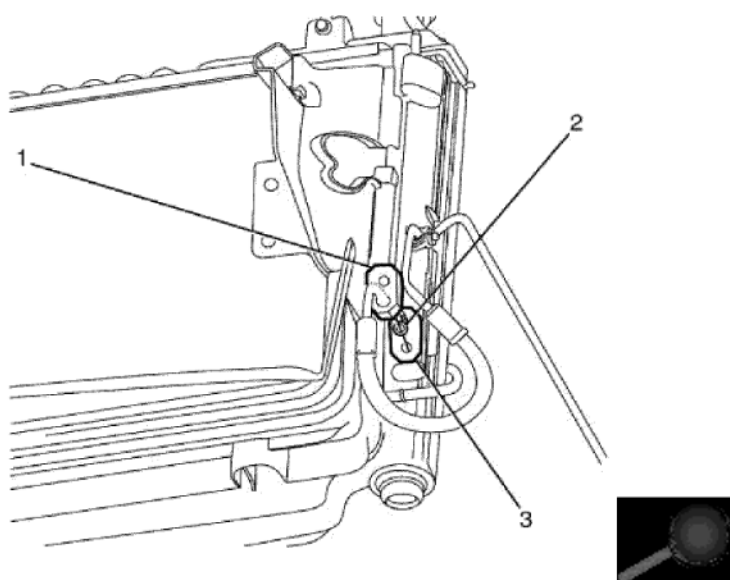
1. Install NEW sealing washers to the air conditioning evaporator thermal expansion valve tube (1). Refer to [Air Conditioning System Seal Replacement](#).
2. Install the air conditioning evaporator thermal expansion valve tube (1) to the vehicle.
3. Install the air conditioning evaporator thermal expansion valve tube (1) to the air conditioning evaporator thermal expansion valve.

Caution: Refer to [Fastener Caution](#).

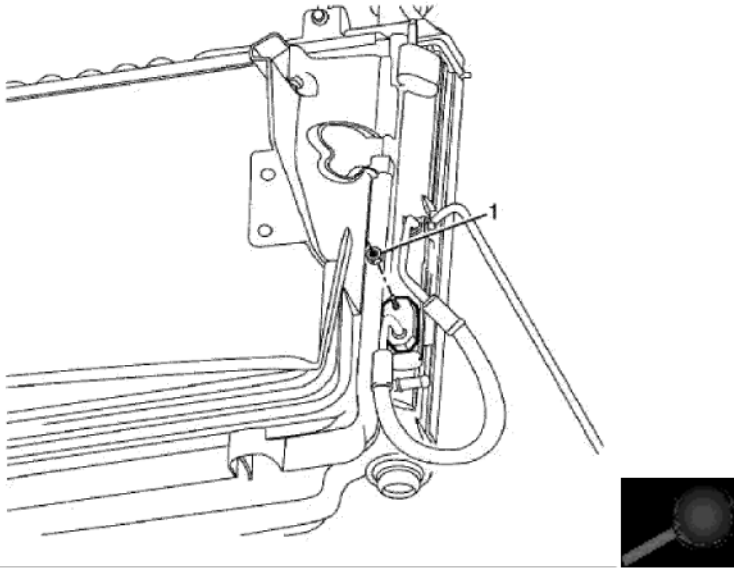
4. Install the air conditioning evaporator thermal expansion valve tube nut (2) to the air conditioning evaporator thermal expansion valve and tighten to **22 N•m (16 lb ft)**.



5. Install the air conditioning evaporator thermal expansion valve tube (1) to the front compartment inner side lower rail.
6. Install the air conditioning evaporator thermal expansion valve tube bolt (3) to the front compartment inner side lower rail.
7. Install NEW sealing washer to the air conditioning compressor hose. Refer to [Air Conditioning System Seal Replacement](#).
8. Install the air conditioning compressor hose to the air conditioning evaporator thermal expansion valve tube (1).
9. Install the air conditioning evaporator thermal expansion valve tube nut (2) to the air conditioning evaporator thermal expansion valve tube (1) and tighten to **22 N·m (16 lb ft)**.



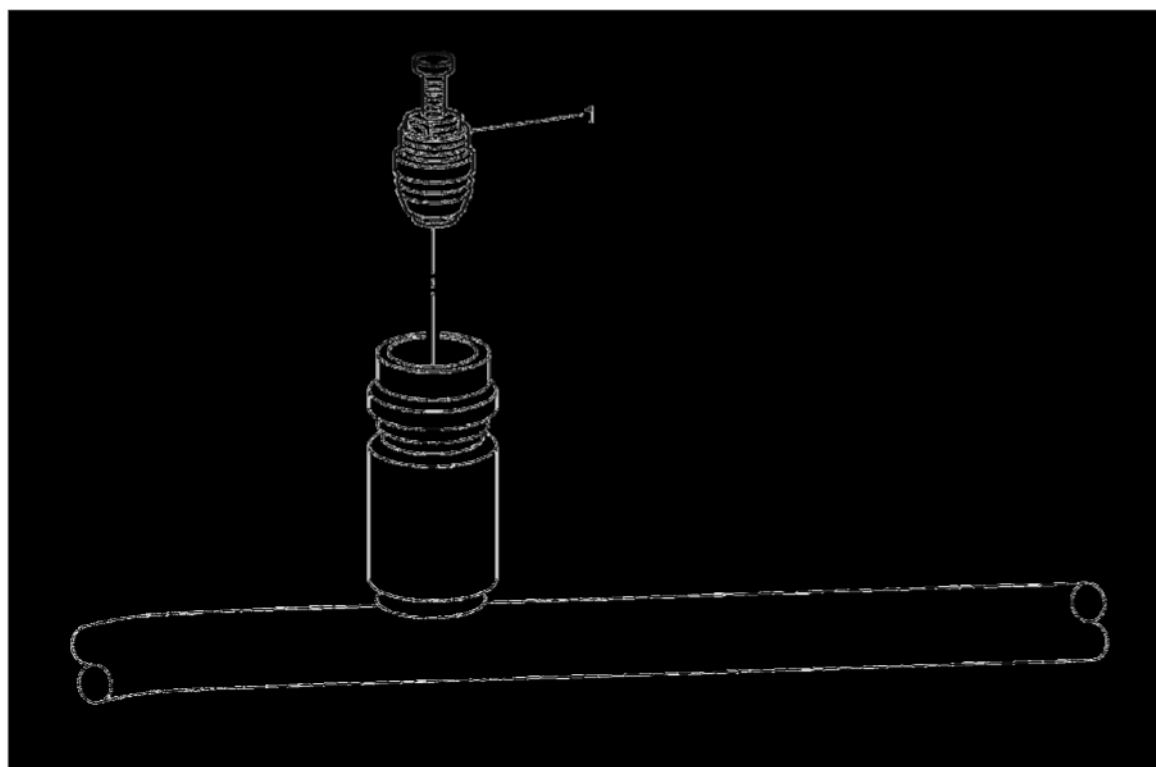
10. Install NEW sealing washer to the air conditioning evaporator thermal expansion valve tube (1). Refer to [Air Conditioning System Seal Replacement](#).
Install the air conditioning evaporator thermal expansion valve tube (1) to the condenser (3).



Caution: Refer to [Fastener Caution](#).

11. Install the air conditioning evaporator thermal expansion valve tube nut to the condenser (1) and tighten to **22 N•m (16 lb ft)**.
12. Install the front bumper fascia extension. Refer to [Front Bumper Fascia Extension Replacement](#).
13. Install the battery positive cable extension cable to the front wheelhouse panel upper bracket and front suspension strut housing reinforcement. Refer to [Engine Wiring and Battery Positive Cable Harness Replacement](#).
14. Install the engine cover. Refer to [Engine Cover Replacement](#).
15. Install the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#).
16. Install the lower air inlet grill panel. Refer to [Air Inlet Grille Panel Replacement](#).
17. Connect the battery negative cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
18. Evacuate and recharge the A/C system. Refer to [Refrigerant Recovery and Recharging](#).

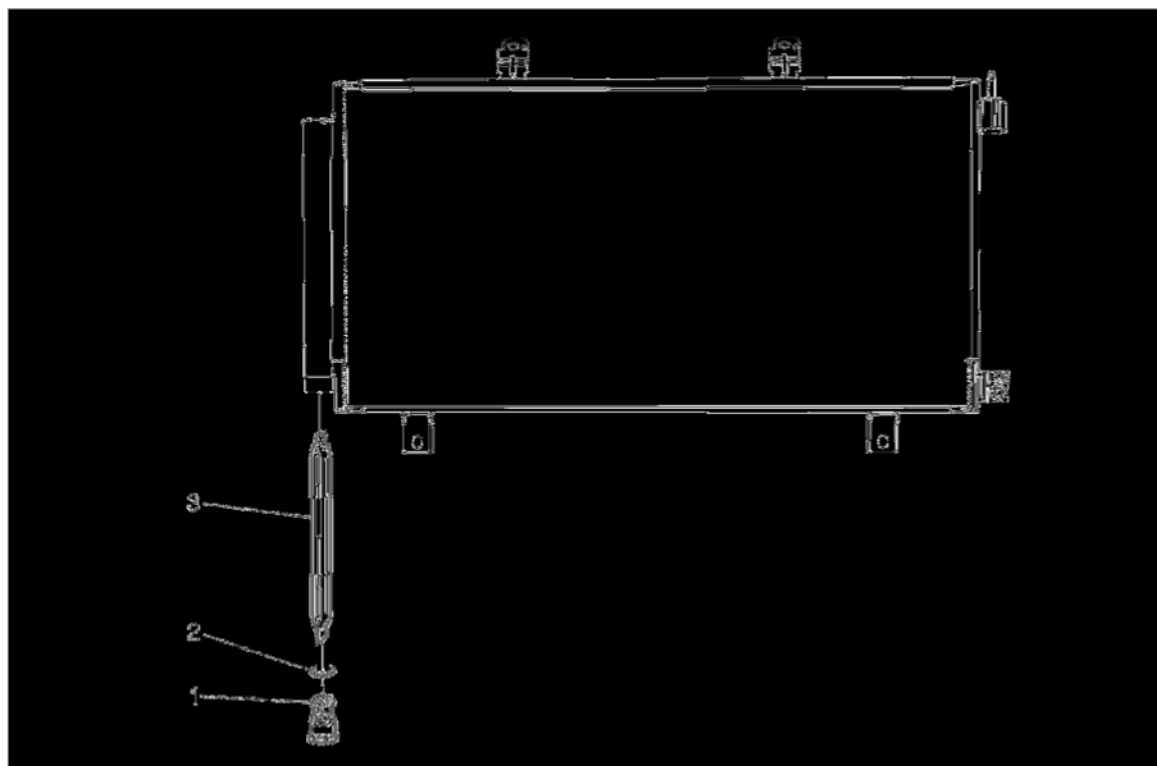
Air Conditioning Refrigerant Service Valve Core Replacement



Air Conditioning Refrigerant Service Valve Core Replacement

Callout	Component Name
Preliminary Procedure 1. Remove the service port cap. 2. Recover the refrigerant. Refer to Refrigerant Recovery and Recharging.	
1	Air Conditioning Refrigerant Service Valve Caution: Refer to Fastener Caution. Procedure 1. Use GE-46246 tool to remove the air conditioning refrigerant valve. 2. Replace the O-ring. Refer to Air Conditioning O-Ring Seal Replacement. 3. Test the system for refrigerant leaks. Refer to Leak Testing. Tighten 2 N•m (18 lb in) Special Tools GE-46246 Valve Core Tool For equivalent region tools, refer to Special Tools.

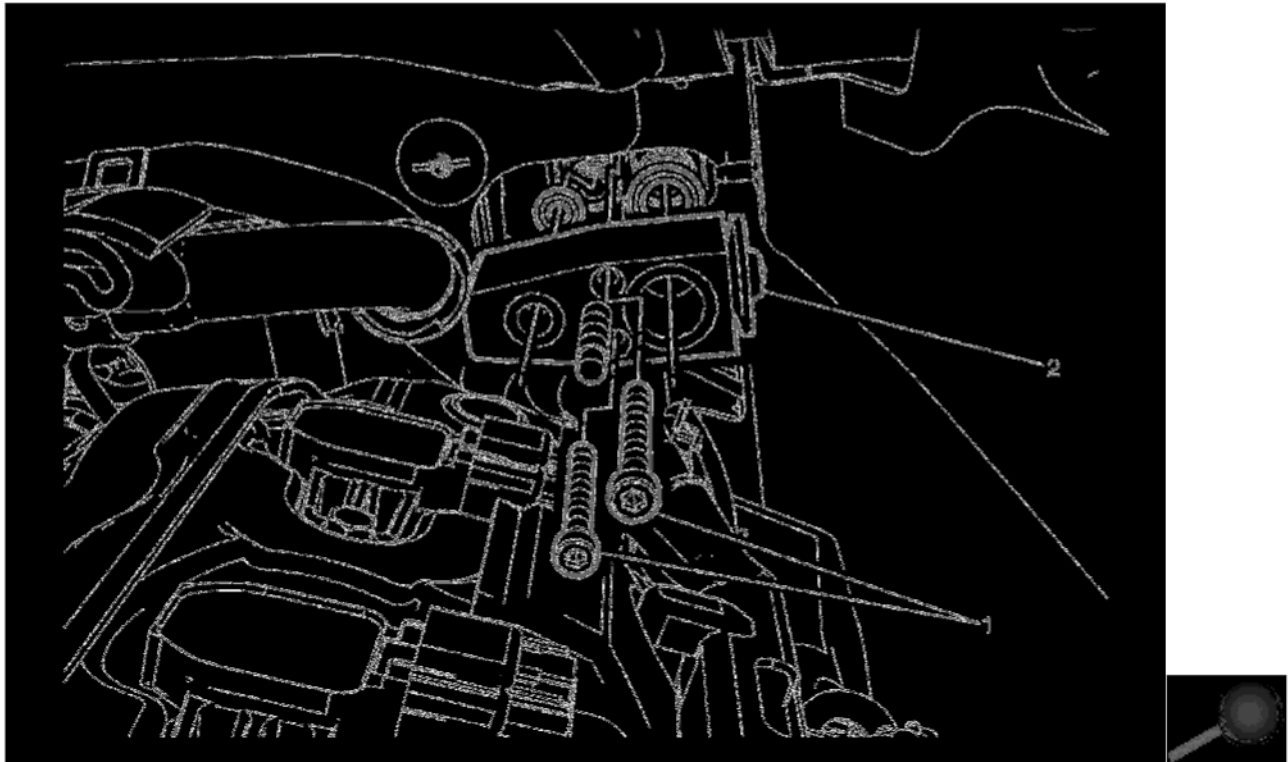
Receiver and Dehydrator Replacement



Receiver and Dehydrator Replacement

Callout	Component Name
Preliminary Procedure Remove the air conditioning (A/C) condenser. Refer to Air Conditioning Condenser Replacement .	
1	Air Conditioning Receiver and Dehydrator Plug Caution: Refer to Fastener Caution . Tighten 3 N•m (27 lb in)
2	Air Conditioning Receiver and Dehydrator Cover Seal
3	Air Conditioning Refrigerant Desiccant

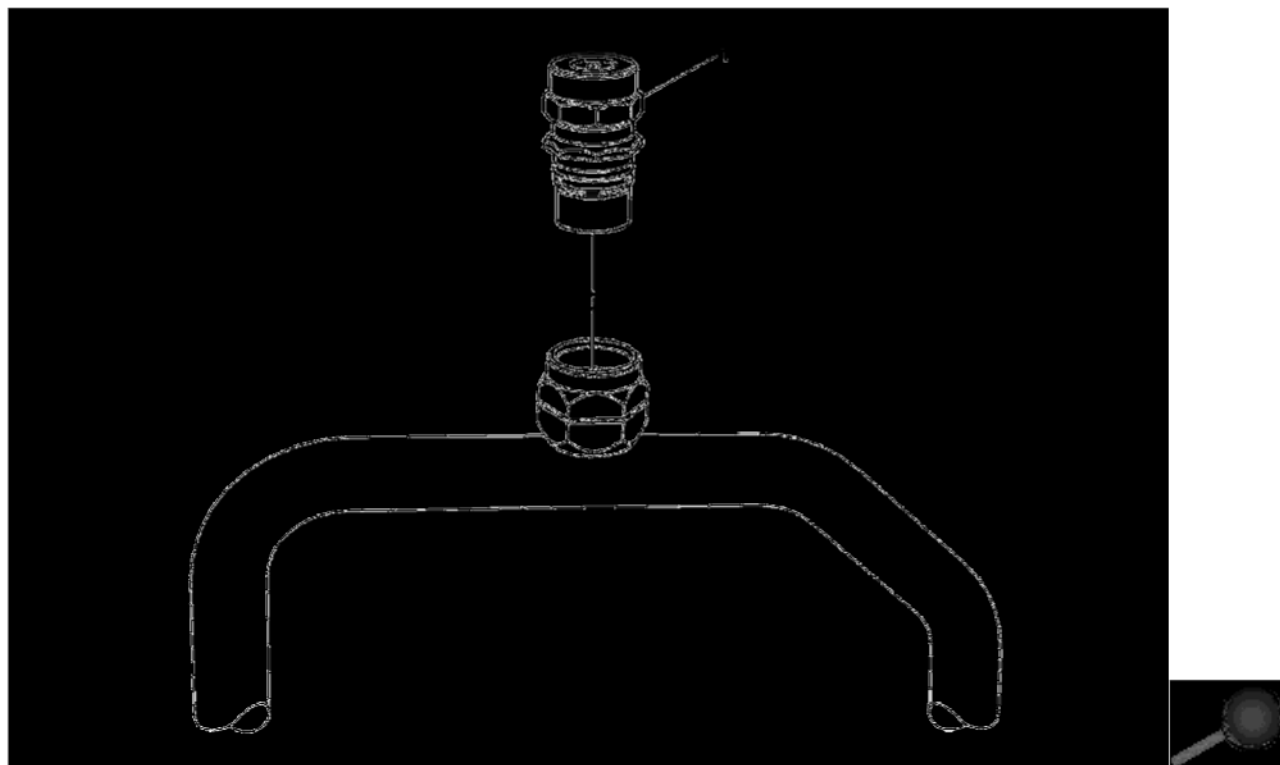
Air Conditioning Evaporator Thermal Expansion Valve Replacement



Air Conditioning Evaporator Thermal Expansion Valve Replacement

Callout	Component Name
Preliminary Procedures 1. Recover the refrigerant. Refer to Refrigerant Recovery and Recharging. 2. Remove the engine cover. Refer to Engine Cover Replacement. 3. Remove the lower air inlet grille panel. Refer to Air Inlet Grille Panel Replacement. 4. Remove the air conditioning evaporator thermal expansion valve tube from the air conditioning evaporator thermal expansion valve. Refer to Air Conditioning Evaporator Thermal Expansion Valve Tube Replacement.	
1	Auxiliary Air Conditioning Evaporator Tube Bracket Bolt (Qty: 2) Caution: Refer to Fastener Caution .
2	Air Conditioning Evaporator Thermal Expansion Valve Procedure Remove and discard old sealing washers and replace with NEW sealing washers. Refer to Air Conditioning System Seal Replacement .

Air Conditioning Refrigerant High Pressure Service Valve Replacement



Air Conditioning Refrigerant High Pressure Service Valve Replacement

Callout	Component Name
Preliminary Procedure 1. Remove the service port cap. 2. Recover the refrigerant. Refer to Refrigerant Recovery and Recharging.	
1	Air Conditioning Refrigerant Service Valve Caution: Refer to Fastener Caution. Procedure 1. Use GE-39037 socket to remove the air conditioning refrigerant valve. 2. Replace the O-ring. Refer to Air Conditioning O-Ring Seal Replacement. 3. Test the system for refrigerant leaks. Refer to Leak Testing. Tighten 2 N•m (18 lb in) Special Tools GE-39037 Charge Valve Octagon Socket For equivalent region tools, refer to Special Tools.

Air Conditioning (A/C) Refrigerant Pressure Sensor Replacement (LFW, LFX, LWR)

Special Tools

J 39400-A Halogen Leak Detector

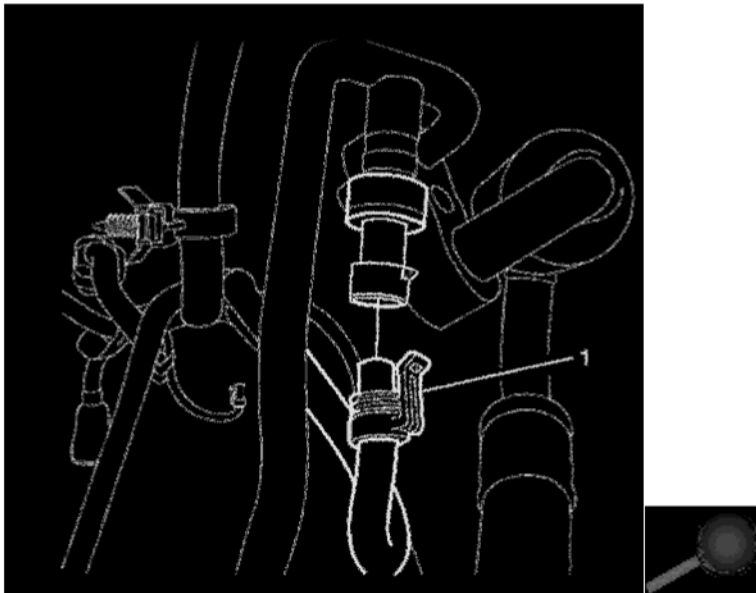
For equivalent regional tools, refer to [Special Tools](#).

Removal Procedure

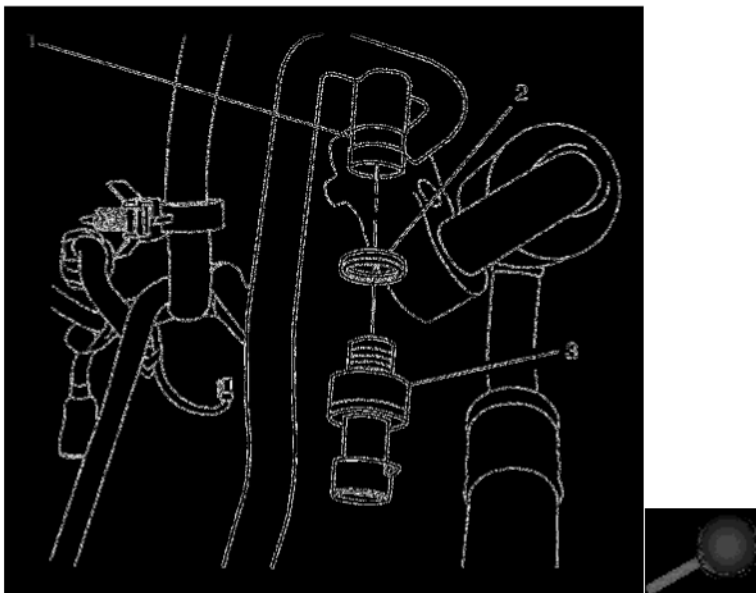
Danger: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

Warning: Refer to [Safety Glasses Warning](#).

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).



2. Disconnect the A/C refrigerant pressure sensor electrical connector (1).



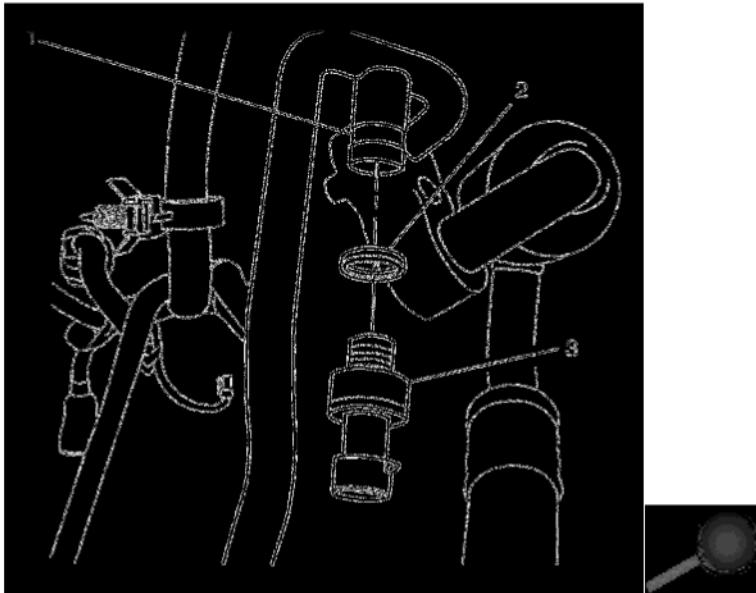
Note: A Schrader valve is fitted to the A/C refrigerant pressure sensor port (1). Upon removal of the A/C refrigerant pressure sensor (3) you will, for a very short period, hear refrigerant escape until the Schrader valve reseats. If refrigerant continues to escape while removing the A/C refrigerant pressure sensor (3) STOP IMMEDIATELY. The Schrader valve has a fault and the refrigerant will have to be recovered.

3. Remove the A/C refrigerant pressure sensor (3) from the A/C refrigerant pressure sensor port (1).

Note: The O-ring seal (2) is a single use item and must be discarded after use.

4. Remove the O-ring seal (2). Refer to [Air Conditioning O-Ring Seal Replacement](#).
Discard the O-ring seal.

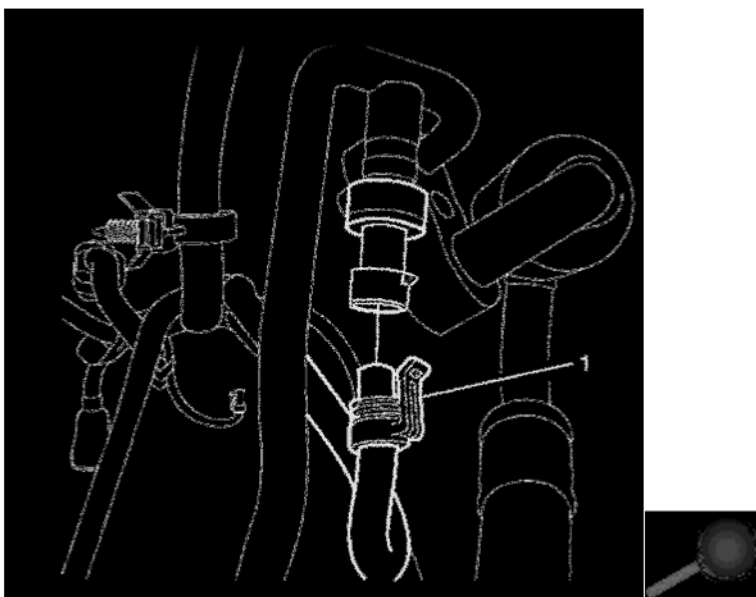
Installation Procedure



1. Install the NEW O-ring seal (2). Refer to [Air Conditioning O-Ring Seal Replacement](#).

Caution: Refer to [Fastener Caution](#).

2. Install the A/C refrigerant pressure sensor to the A/C refrigerant pressure sensor port (1) and tighten to **6 N•m (53 lb ft)**.



3. Connect the A/C refrigerant pressure sensor electrical connector (1).
4. Lower the vehicle to the ground.
5. Leak test the fittings of the component using the J 39400-A Halogen Leak Detector.

Air Conditioning (A/C) Refrigerant Pressure Sensor Replacement (L77, LS3, LSA)

Special Tools

J 39400-A Halogen Leak Detector

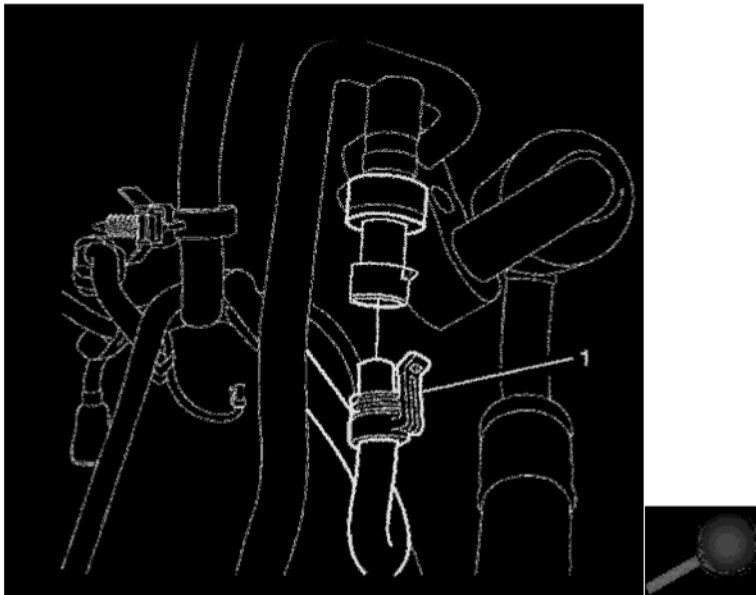
For equivalent regional tools, refer to [Special Tools](#).

Removal Procedure

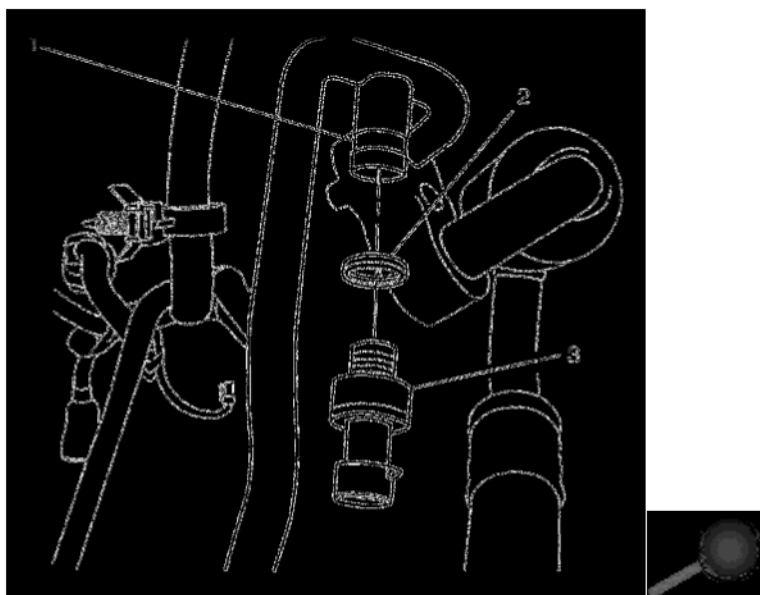
Danger: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

Warning: Refer to [Safety Glasses Warning](#).

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Remove the right front wheelhouse splash shield. Refer to [Front Wheelhouse Liner Replacement](#).



3. Disconnect the A/C refrigerant pressure sensor electrical connector (1).



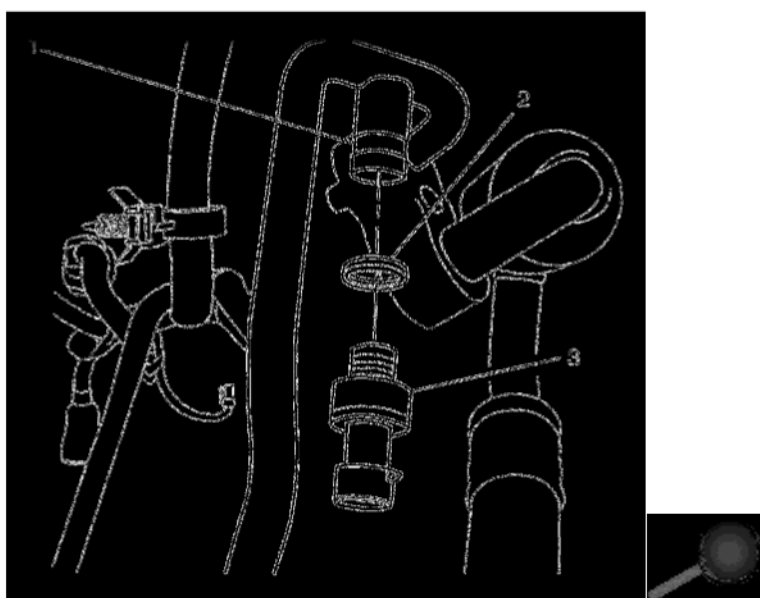
Note: A Schrader valve is fitted to the A/C refrigerant pressure sensor port (1). Upon removal of the A/C refrigerant pressure sensor (3) you will, for a very short period, hear refrigerant escape until the Schrader valve reseats. If refrigerant continues to escape while removing the A/C refrigerant pressure sensor (3) STOP IMMEDIATELY. The Schrader valve has a fault and the refrigerant will have to be recovered.

4. Remove the A/C refrigerant pressure sensor (3) from the A/C refrigerant pressure sensor port (1).

Note: The O-ring seal (2) is a single use item and must be discarded after use.

5. Remove the O-ring seal (2). Refer to [Air Conditioning O-Ring Seal Replacement](#). Discard the O-ring seal.

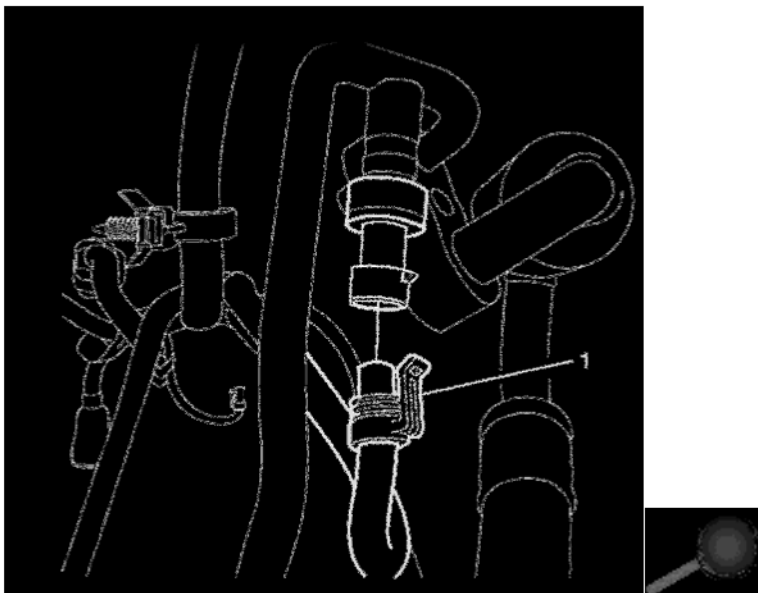
Installation Procedure



1. Install the NEW O-ring seal (2). Refer to [Air Conditioning O-Ring Seal Replacement](#).

Caution: Refer to [Fastener Caution](#).

2. Install the A/C refrigerant pressure sensor to the A/C refrigerant pressure sensor port (1) and tighten to **6 N·m (53 lb ft)**.



3. Connect the A/C refrigerant pressure sensor electrical connector (1).
4. Install the right front wheelhouse splash shield. Refer to [Front Wheelhouse Liner Replacement](#).
5. Lower the vehicle to the ground.
6. Leak test the fittings of the component using the *J 39400-A* Halogen Leak Detector.

Air Conditioning Condenser Replacement (LWR, LFW, LFX)

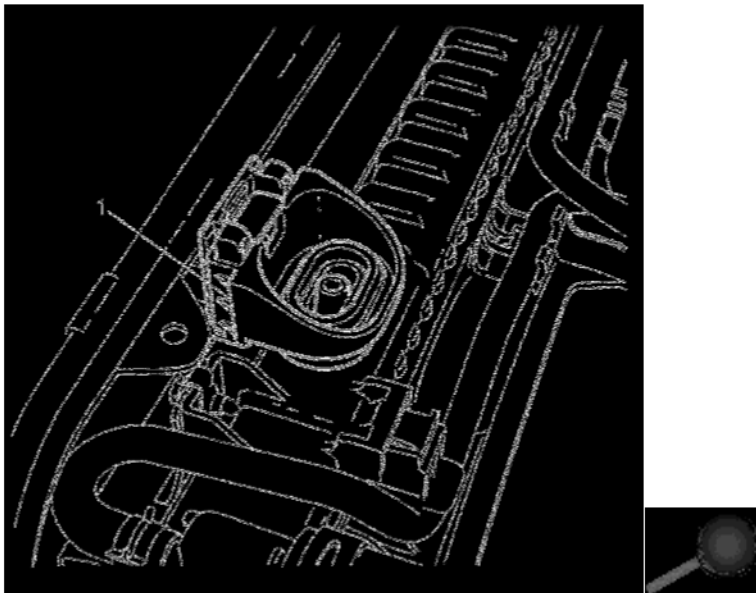
Special Tools

J 39400-A Halogen Leak Tester

Removal Procedure

Warning: Refer to [Safety Glasses Warning](#).

1. Recover the refrigerant. Refer to [Refrigerant Recovery and Recharging](#).
2. Remove the air cleaner outlet duct. Refer to [Air Cleaner Outlet Duct Replacement](#).
3. Remove the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#).
4. Recover the refrigerant. Refer to [Refrigerant Recovery and Recharging](#).

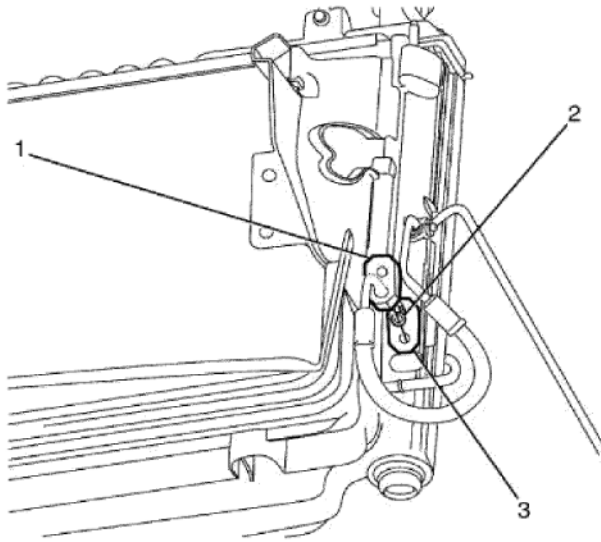


Note: Remove the upper radiator support brackets by raising the securing lock upwards 10 mm and slide the bracket out of the radiator slide pin.

5. Remove the upper radiator support bracket fasteners and upper radiator support brackets (1).

Danger: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

6. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
7. Remove the air deflector front. Refer to [Radiator Air Inlet Duct Replacement](#).
8. Place a large suitable container under the condenser.



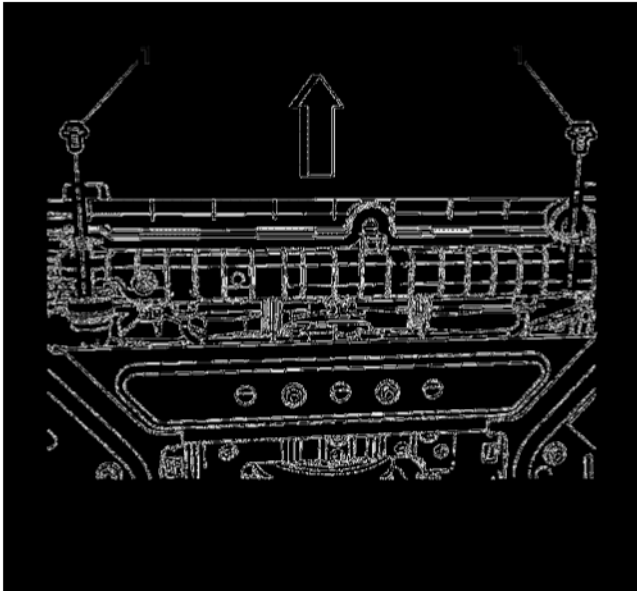
9. Disconnect the air conditioning evaporator tube (1) from the condenser port (3). Refer to [Air Conditioning Evaporator Thermal Expansion Valve Tube Replacement](#).

Note: The sealing washer is a single use item and must be discarded after use.

10. Remove and discard the sealing washer (2).

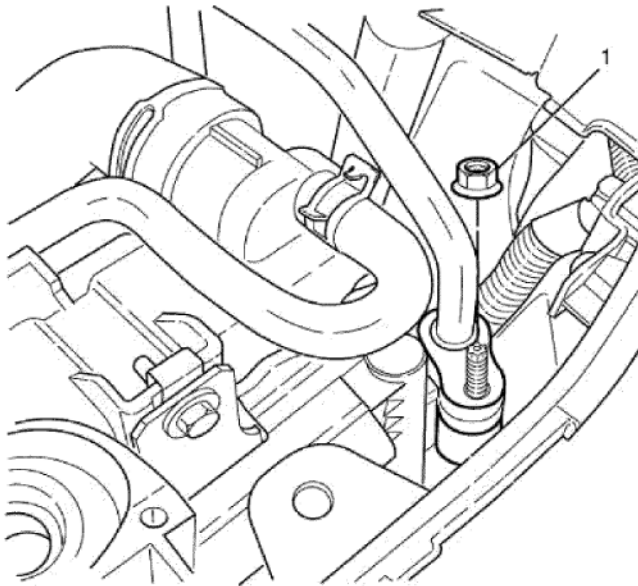
Note: Cover any opening of the A/C system with a suitable cap or tape immediately, to prevent absorption of moisture from the atmosphere.

11. Cap or plug the air conditioning evaporator tub (1) and the condenser port (3).



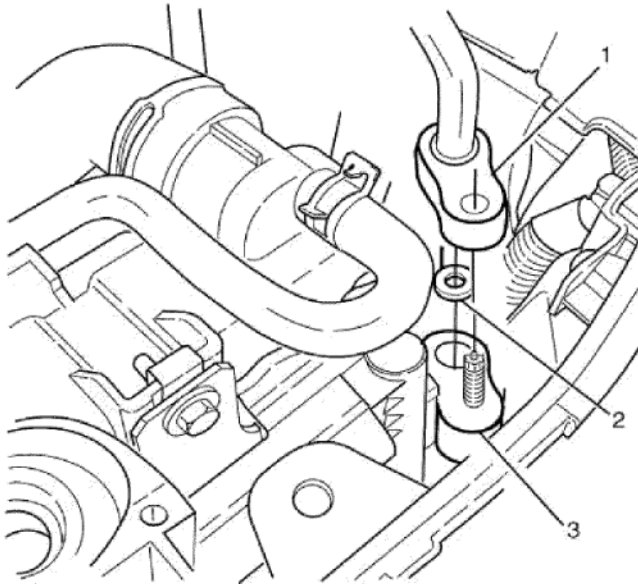
12. Remove the lower condenser to radiator retaining fasteners (1).

13. Lower the vehicle. Refer to [Lifting and Jacking the Vehicle](#).



Note: Gently push the radiator and condenser towards the engine to allow removal of the discharge pipe to condenser retaining nut (1).

14. Remove the air compressor hose to condenser retaining nut (1).

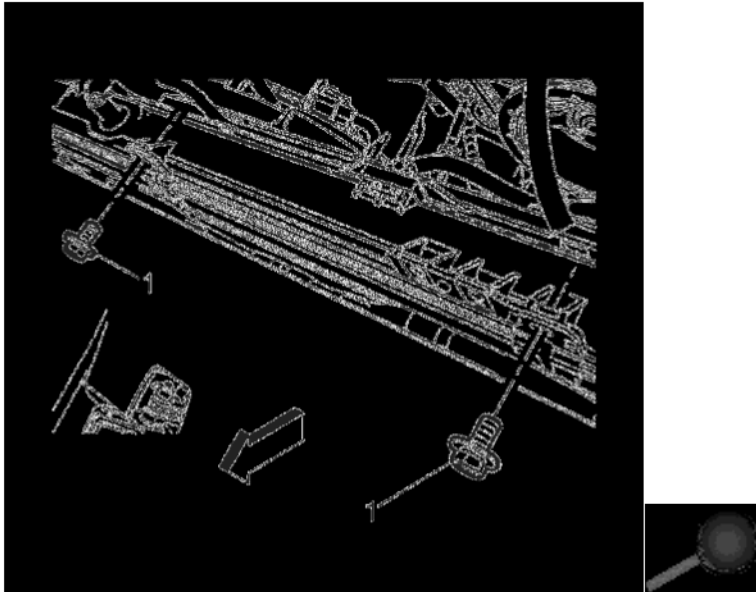


15. Disconnect the air compressor hose to condenser (1) from condenser (3) and position aside.

16. Remove and discard the sealing washer (2).

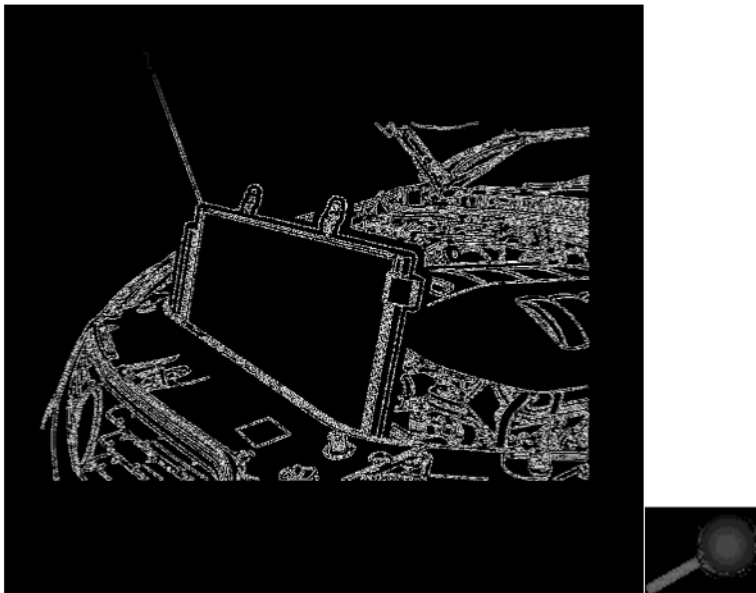
Note: Cover any opening of the A/C system with a suitable cap or tape immediately, to prevent absorption of moisture from the atmosphere.

17. Cap or plug the air compressor hose to condenser (1) and the condenser (3).



Note: Gently push the radiator and condenser towards the engine to allow removal of the condenser to radiator retaining bolts (1).

18. Remove the upper condenser to radiator retaining bolts (1).



Caution: When removing/installing the Air Conditioning Condensor from the vehicle, use caution as to not damage surrounding components. Replacement of a damaged component will be required if damage has occurred.

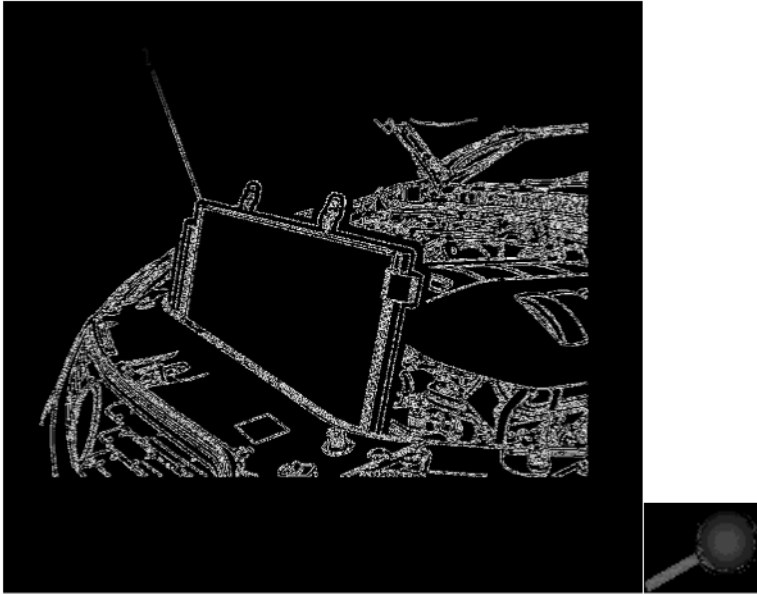
Note: Remove the condenser (1) by lifting it up between the radiator and radiator support.

19. Remove the condenser (1) from the engine compartment.

Installation Procedure

Note: The receiver and dehydrator is a single use only component. A NEW receiver and dehydrator must be installed whenever a closed A/C system is opened or exposed to atmosphere. If the receiver and dehydrator has been replaced following a service/repair and it is deemed necessary to immediately re-open the A/C system it is not necessary to replace the receiver and dehydrator again providing the A/C system is plugged/capped correctly.

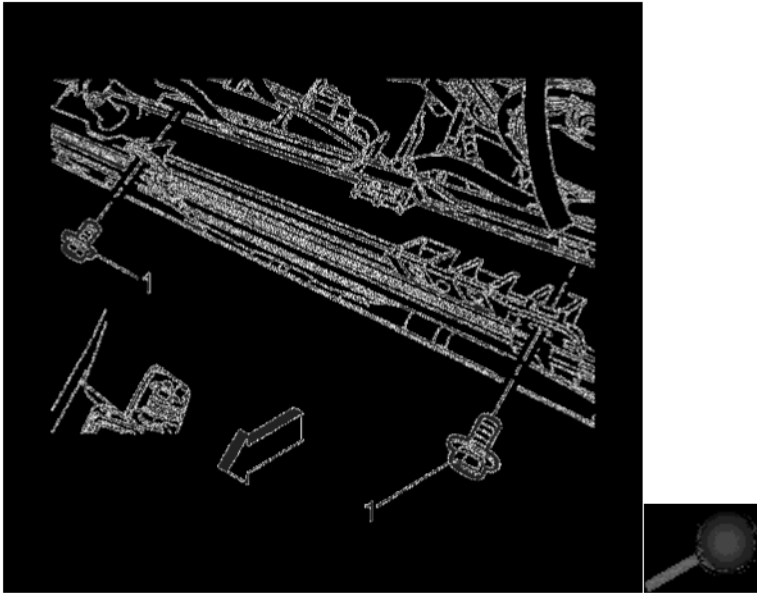
1. Replace the receiver and dehydrator. Refer to [Receiver and Dehydrator Replacement](#).



Note: Install the condenser (1) by lowering down between the radiator and radiator support.

Caution: When removing/installing the Air Conditioning Condenser from the vehicle, use caution as to not damage surrounding components. Replacement of a damaged component will be required if damage has occurred.

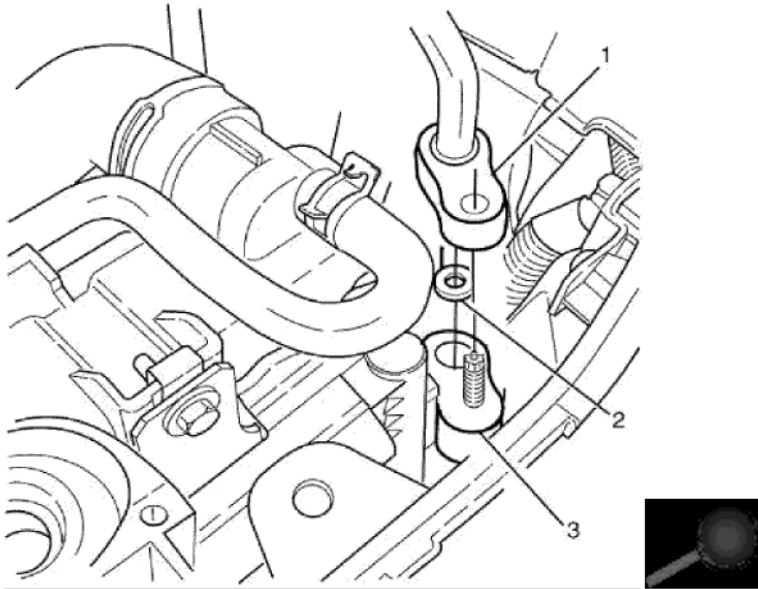
2. Install the condenser (1) to the engine compartment.



Caution: Refer to [Fastener Caution](#).

Note: Gently push the radiator and condenser towards the engine to allow removal of the condenser to radiator retaining bolts (1).

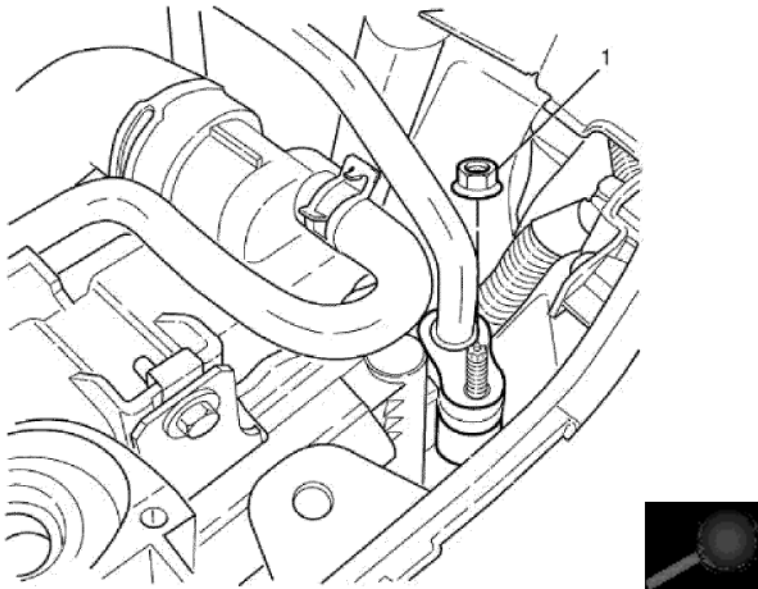
3. Install the upper condenser to radiator retaining bolts (1) and tighten to **5 N•m (44 lb in)**.



4. Remove the plugs or caps from the air compressor hose (1) and the condenser (3).

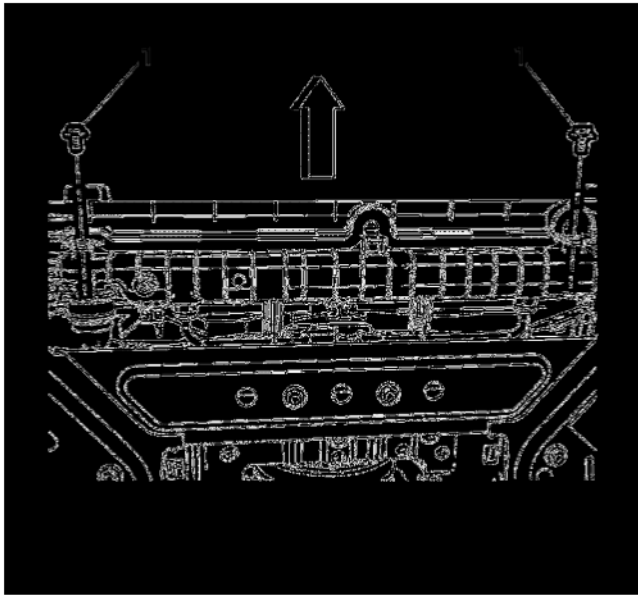
Note: DO NOT coat the NEW sealing washer (2) with oil, they must be fitted dry. The use of mineral oil will render the sealing washer (2) useless, as the sealing washer (2) WILL swell causing refrigerant to leak out.

5. Install a NEW sealing washer (2).
6. Install the air compressor hose (1) to condenser (3).

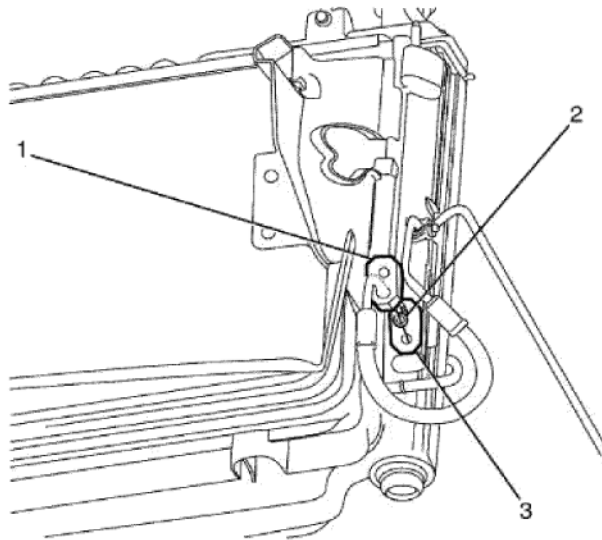


Note: Gently push the radiator and condenser towards the engine to allow installation of the discharge pipe to condenser retaining nut (1).

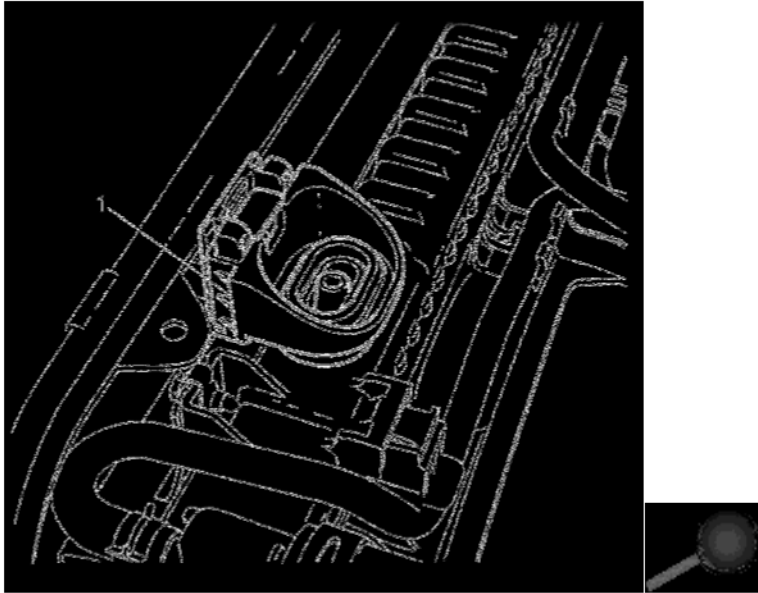
7. Raise the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
8. Install the air compressor hose to condenser retaining nut (1) and tighten to **18 N·m (13 lb ft)**.



9. Install the lower condenser to radiator retaining fasteners (1) and tighten to **5 N•m (44 lb in)**.



10. Remove the plugs or caps from the suction pipe liquid pipe (1) and the condenser port.
Note: DO NOT coat the NEW sealing washer with oil, they must be fitted dry. The use of mineral oil will render the sealing washer useless, as the sealing washer WILL swell causing refrigerant to leak out.
11. Install a NEW sealing washer.
12. Connect the air conditioning evaporator tube (1) to the condenser port (3). Refer to [Air Conditioning Evaporator Thermal Expansion Valve Tube Replacement](#).
13. Install the front air deflector. Refer to [Radiator Air Inlet Duct Replacement](#).
14. Lower the vehicle. Refer to [Lifting and Jacking the Vehicle](#).



15. Install radiator upper retaining brackets (1) and fasteners. Tighten the fasteners to **9 N•m (80 lb in)**.
16. Recharge the A/C system. Refer to [Refrigerant Recovery and Recharging](#).
17. Install the air cleaner assembly. Refer to [Air Cleaner Assembly Replacement](#).
18. Install the air cleaner outlet duct. Refer to [Air Cleaner Outlet Duct Replacement](#).
19. Leak test the fittings of the component using the J 39400-A halogen leak tester.

Air Conditioning Condenser Replacement (LSA)

Special Tools

J 39400-A Halogen Leak Tester

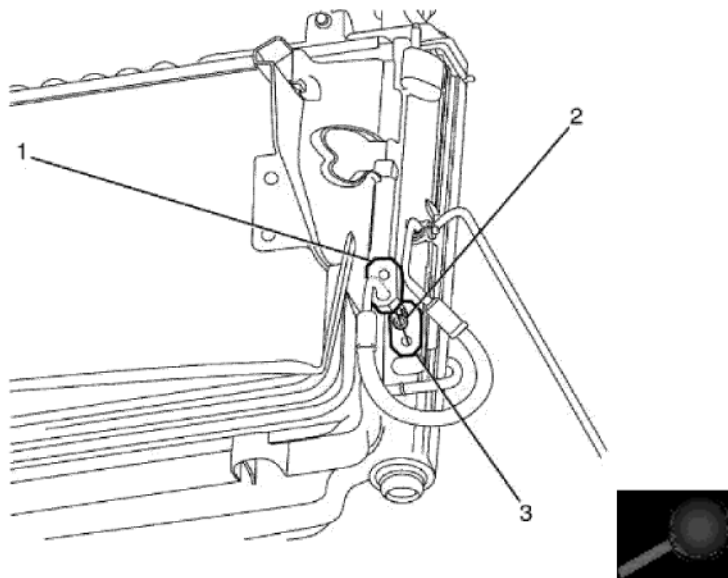
Removal Procedure

Warning: Refer to [Safety Glasses Warning](#).

1. Recover the refrigerant. Refer to [Refrigerant Recovery and Recharging](#).
2. Remove the air cleaner outlet duct. Refer to [Air Cleaner Outlet Duct Replacement](#).
3. Remove the air cleaner housing cover. Refer to [Air Cleaner Element Replacement](#).
4. Remove the radiator upper mounts. Refer to [Radiator Upper Mount Replacement](#).

Danger: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

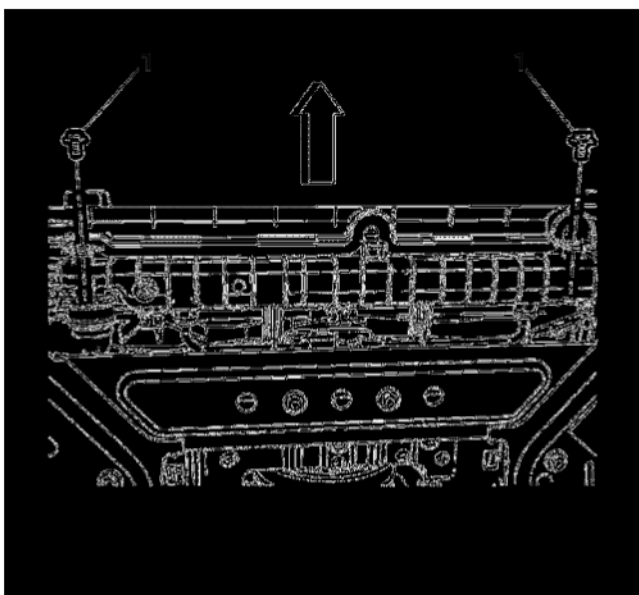
5. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
6. Remove the charge air cooler lower bracket. Refer to [Charge Air Cooler Bracket Replacement](#).
7. Place a drain pan under the air conditioning condenser.



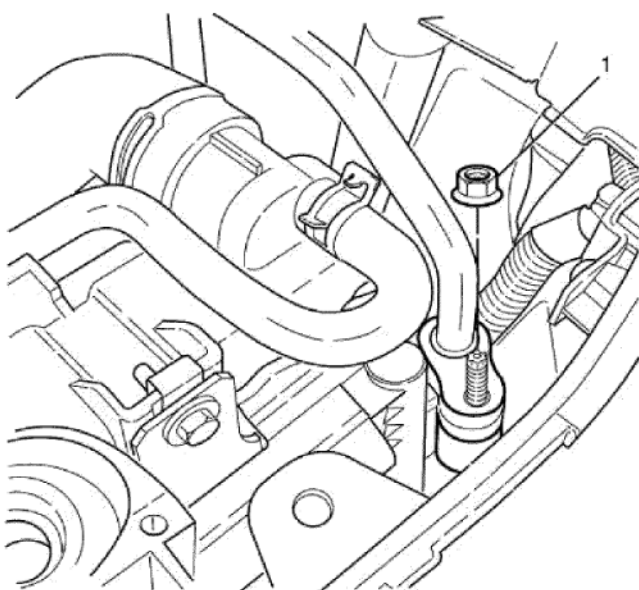
8. Disconnect the air conditioning evaporator thermal expansion valve tube (1) from the air conditioning condenser (3). Refer to [Air Conditioning Evaporator Thermal Expansion Valve Tube Replacement](#).
9. Cap or tape the open A/C refrigerant components immediately to prevent system contamination.

Note: The sealing washer is a single use item and must be discarded after use.

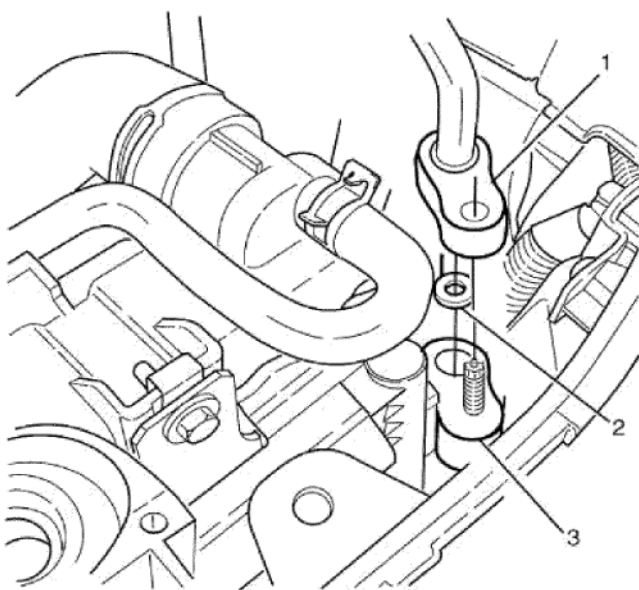
10. Remove and discard the sealing washer (2).



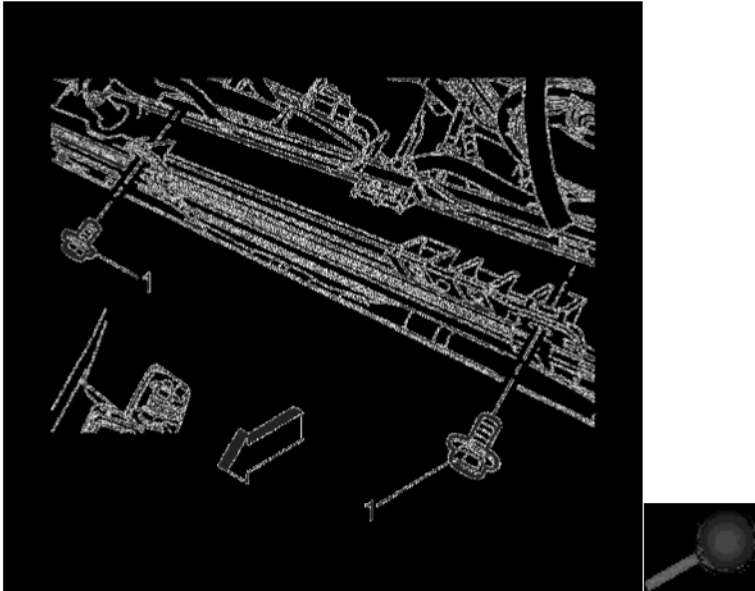
11. Remove the lower air conditioning condenser bolts (1).
12. Lower the vehicle. Refer to [Lifting and Jacking the Vehicle](#).



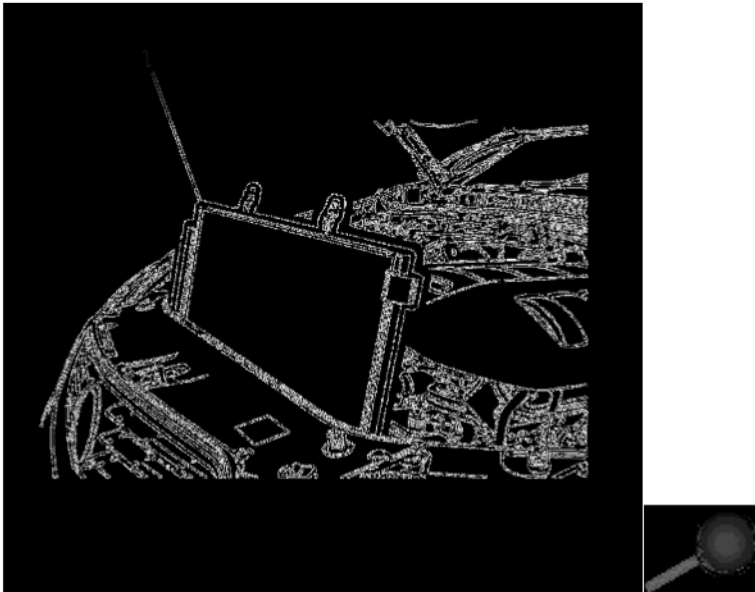
13. Gently push the radiator and air conditioning condenser towards the engine to allow removal of the air conditioning compressor hose retaining nut (1).
14. Remove the air conditioning compressor hose nut (1).



15. Remove the air conditioning compressor hose (1) from the air conditioning condenser (3) and position aside.
16. Cap or tape the open A/C refrigerant components immediately to prevent system contamination.
17. Remove and discard the sealing washer (2).



18. Gently push the radiator and air conditioning condenser towards the engine to allow removal of the upper air conditioning condenser bolts (1).
19. Remove the upper air conditioning condenser bolts (1).



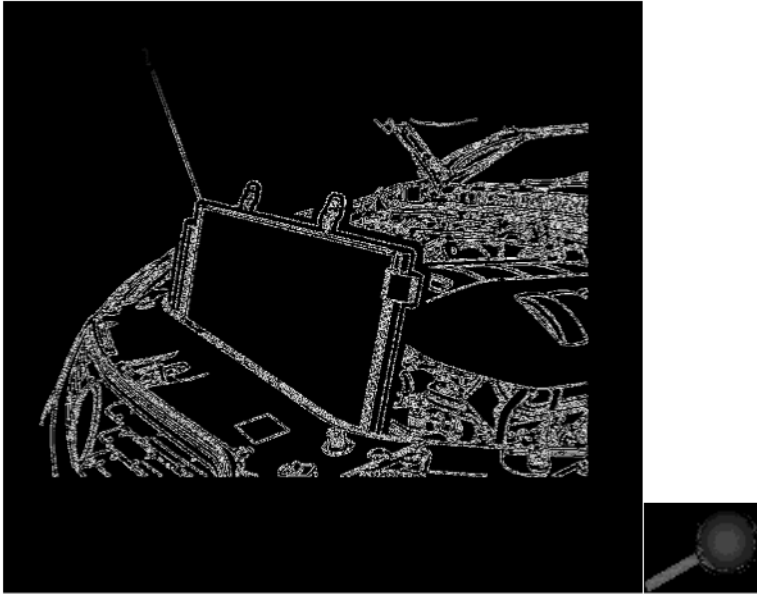
Caution: When removing/installing the Air Conditioning Condenser from the vehicle, use caution as to not damage surrounding components. Replacement of a damaged component will be required if damage has occurred.

20. Remove the air conditioning condenser (1) by lifting it up between the radiator and radiator support.

Installation Procedure

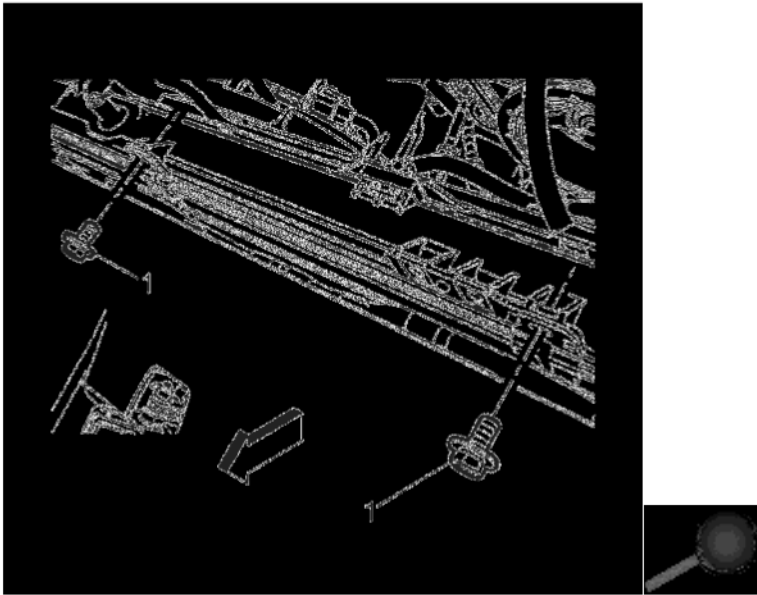
Note: The receiver and dehydrator is a single use only component. A NEW receiver and dehydrator must be installed whenever a closed A/C system is opened or exposed to atmosphere. If the receiver and dehydrator has been replaced following a service/repair and it is deemed necessary to immediately re-open the A/C system it is not necessary to replace the receiver and dehydrator again providing the A/C system is plugged/capped correctly.

1. Replace the receiver and dehydrator. Refer to [Receiver and Dehydrator Replacement](#).



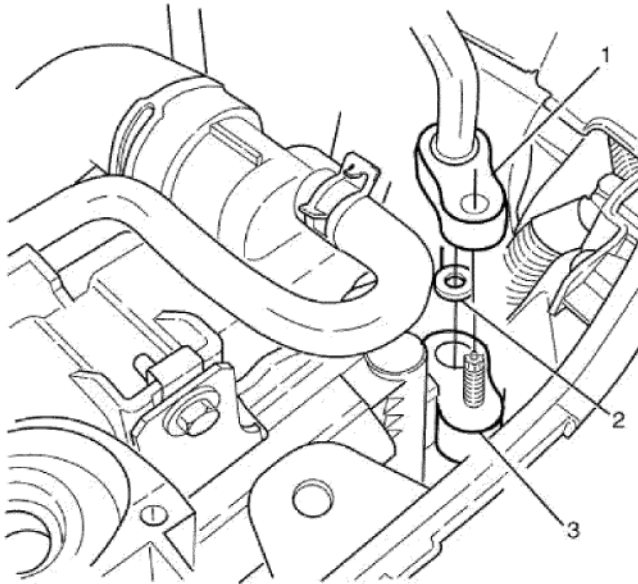
Caution: When removing/installing the Air Conditioning Condenser from the vehicle, use caution as to not damage surrounding components. Replacement of a damaged component will be required if damage has occurred.

2. Install the air conditioning condenser (1) by lowering down between the radiator and radiator support.



Caution: Refer to [Fastener Caution](#).

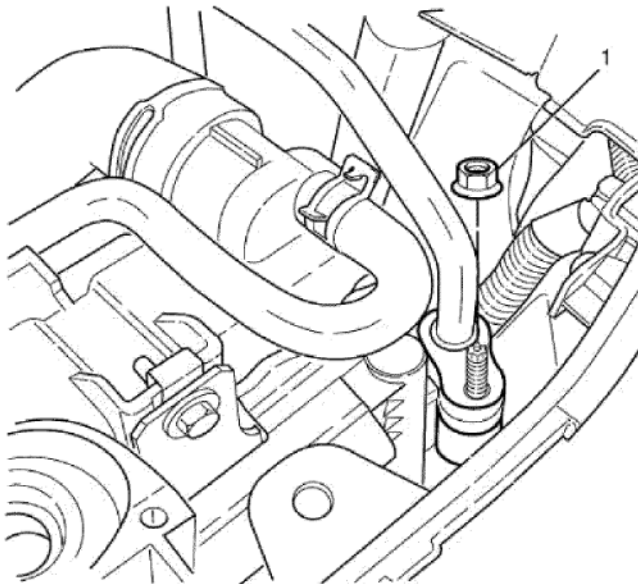
3. Gently push the radiator and air conditioning condenser towards the engine to allow installation of the upper air conditioning condenser bolts (1).
4. Install the upper air conditioning condenser bolts (1) and tighten to **5 N·m (44 lb in)**.



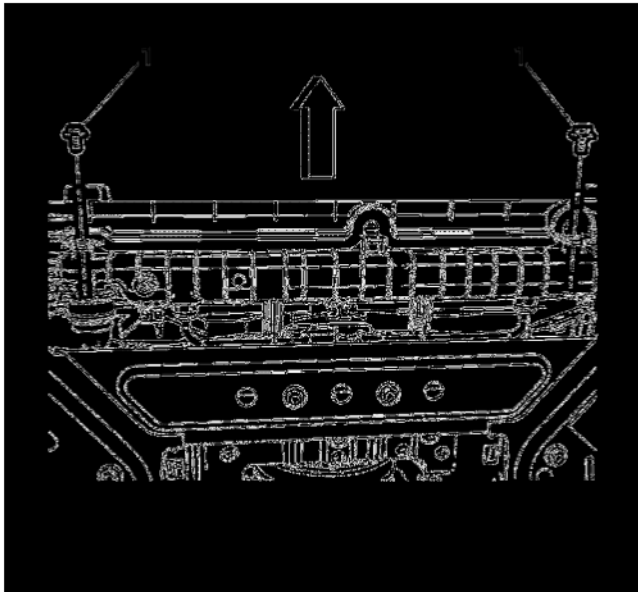
5. Remove the plugs or caps from the air compressor hose (1) and the condenser (3).

Note: DO NOT coat the NEW sealing washer (2) with oil, they must be fitted dry. The use of mineral oil will render the sealing washer (2) useless, as the sealing washer (2) WILL swell causing refrigerant to leak out.

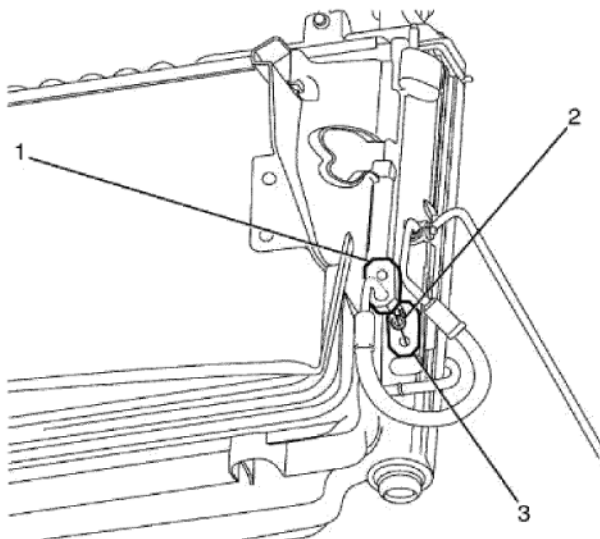
6. Install a NEW sealing washer (2). Refer to [Air Conditioning System Seal Replacement](#).
7. Install the air conditioning compressor hose (1) to the air conditioning condenser (3).



8. Gently push the radiator and air conditioning condenser towards the engine to allow installation of the air conditioning compressor hose nut (1).
Install the air conditioning compressor hose nut (1) and tighten to **22 N·m (16 lb ft)**.
9. Raise the vehicle. Refer to [Lifting and Jacking the Vehicle](#).



10. Install the lower air conditioning condenser bolts (1) and tighten to **5 N•m (44 lb in)**.



11. Remove the plugs or caps from the air conditioning evaporator thermal expansion valve tube (1) and the air conditioning condenser (3).

Note: DO NOT coat the NEW sealing washer with oil, they must be fitted dry. The use of mineral oil will render the sealing washer useless, as the sealing washer WILL swell causing refrigerant to leak out.

12. Install a NEW sealing washer. Refer to [Air Conditioning System Seal Replacement](#).
13. Connect the air conditioning evaporator thermal expansion valve tube (1) to the condenser (3). Refer to [Air Conditioning Evaporator Thermal Expansion Valve Tube Replacement](#).
14. Install the charge air cooler lower bracket. Refer to [Charge Air Cooler Bracket Replacement](#).
15. Lower the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
16. Install the radiator upper mounts. Refer to [Radiator Upper Mount Replacement](#).
17. Recharge the A/C system. Refer to [Refrigerant Recovery and Recharging](#).
18. Install the air cleaner housing cover. Refer to [Air Cleaner Element Replacement](#).
19. Install the air cleaner outlet duct. Refer to [Air Cleaner Outlet Duct Replacement](#).
20. Leak test the fittings of the component. Refer to [Leak Testing](#).

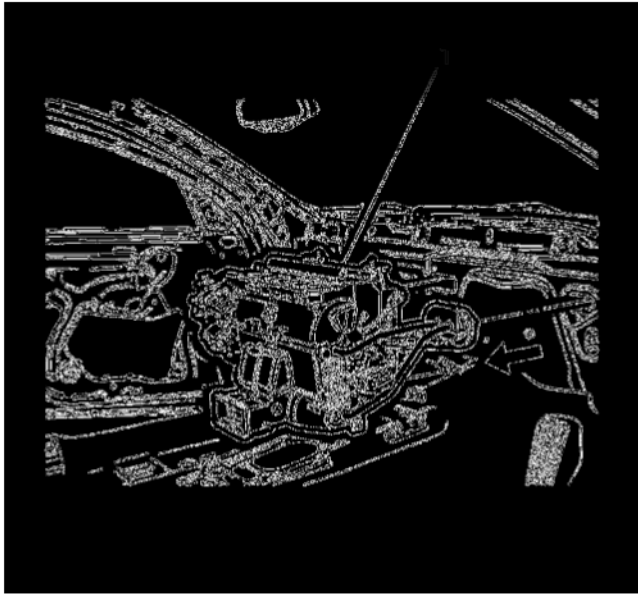
Heater and Air Conditioning Evaporator and Blower Module Removal and Installation (LFX, LWR, LFW, MV5)

Removal Procedure

1. Disconnect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Recover the refrigerant system. Refer to [Refrigerant Recovery and Recharging](#).
3. Drain the engine coolant system. Refer to [Cooling System Draining and Filling](#).
4. Remove the intake manifold insulator. Refer to [Intake Manifold Insulator Replacement](#).
5. Remove the passenger side air inlet grille panel. Refer to [Air Inlet Grille Panel Replacement](#).
6. Remove the heater inlet hose from the heater core tube. Refer to [Heater Inlet Hose Replacement](#).
7. Remove the heater outlet hose from the heater core tube. Refer to [Heater Outlet Hose Replacement](#).
8. Remove the air conditioning evaporator thermal expansion valve tube from the air conditioning evaporator thermal expansion valve. Refer to [Air Conditioning Evaporator Thermal Expansion Valve Tube Replacement](#).
9. Remove the instrument panel tie bar assembly. Refer to [Instrument Panel Tie Bar Replacement](#).
10. Disconnect the instrument panel wiring harness from the remote HVAC control module.
11. Temporary support the heater and air conditioning evaporator and blower module (HVAC) assembly.
12. Remove the brake, accelerator, and clutch pedal assembly. Refer to [Brake, Accelerator, and Clutch Pedal Replacement](#).
13. Reposition the vacuum hoses and under the hood wiring harness out of the way.
14. Reposition the dash panel outer insulator assembly to access the HVAC module bolts. Refer to [Dash Panel Outer Insulator Replacement](#).



15. From within the engine compartment, remove the HVAC module assembly bolts (1) at the blower, heater pipe and TXV pass through areas securing the HVAC module assembly to the cowl panel.

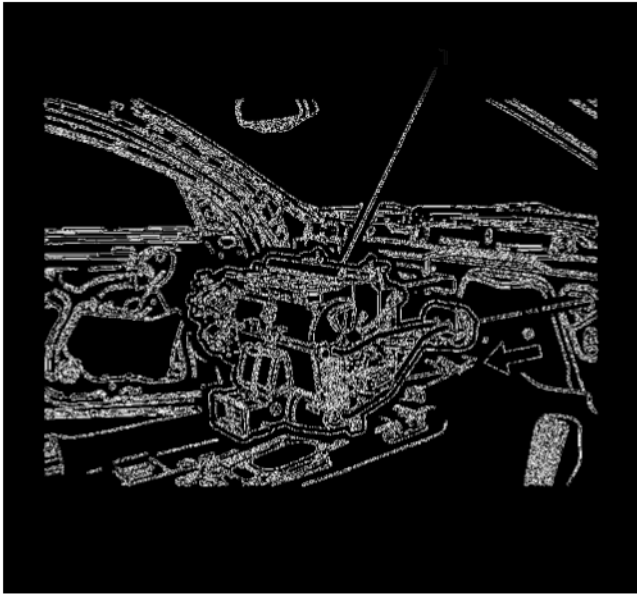


16. Slide the HVAC module assembly back to clear the air conditioning evaporator module drain housing, and remove the HVAC module assembly (1) from the vehicle.
17. Transfer all the necessary components.

Installation Procedure



1. Replace the blower module drain tube seal if equipped, and install drain hose grommet (1) onto the air conditioning evaporator module drain housing (2).
2. Lubricate the blower case drain bracket port and drain hose grommet with silicon spray (1).

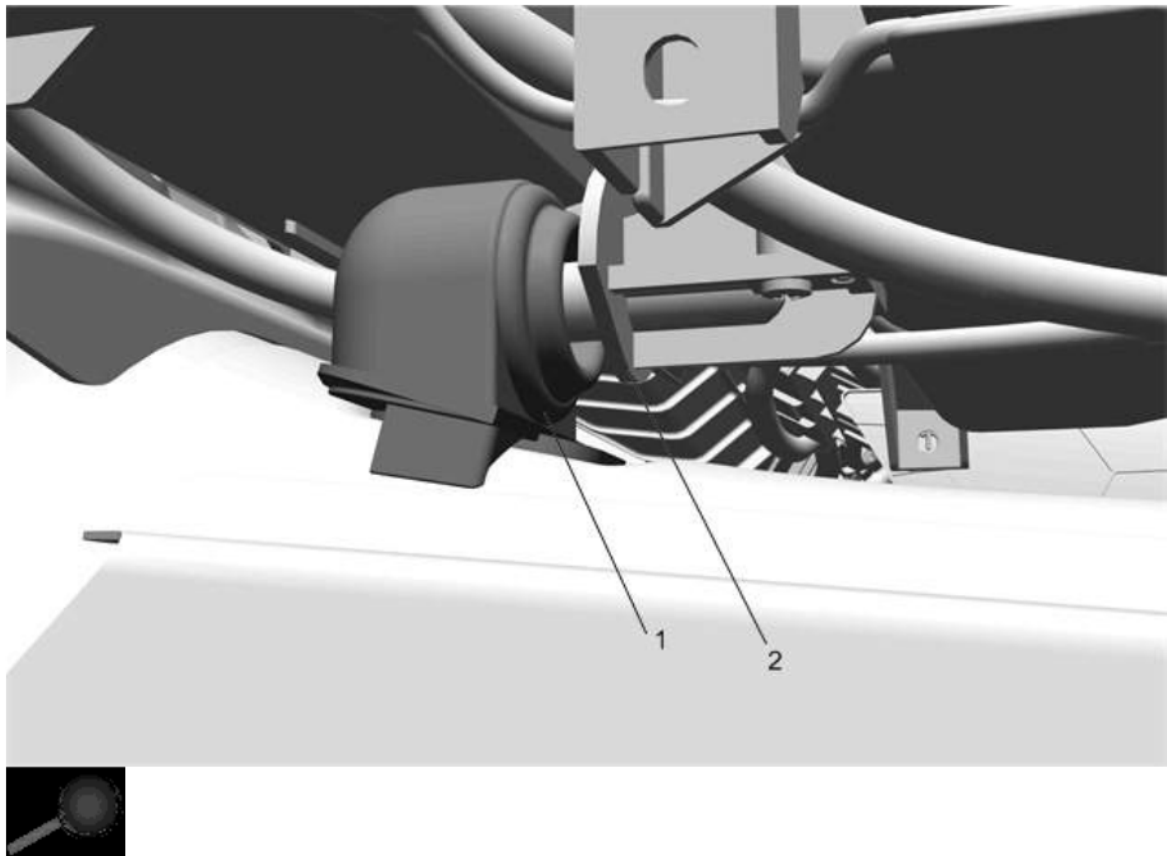


3. Align the air conditioning evaporator and blower case drain bracket port to the air conditioning evaporator module drain housing.
4. Slide the HVAC module assembly forward while position the HVAC module assembly (1) into the vehicle, and temporarily support it.



Caution : Refer to [Fastener Caution](#).

5. From within the engine compartment, install the HVAC module assembly bolts (1) at the blower, heater pipe and TXV pass through areas securing the HVAC module assembly to the cowl panel, and tighten to **9.0 N·m (7 lb ft)**.
6. Install the dash panel outer insulator assembly. Refer to [Dash Panel Outer Insulator Replacement](#).
7. Reposition the vacuum hoses and under the hood wiring harness to there proper route position.



8. Inspect the air conditioning evaporator and blower case drain bracket port (2) to the air conditioning evaporator module drain housing grommet (1) for proper alignment.
9. Install the brake, accelerator, and clutch pedal assembly. Refer to [Brake, Accelerator, and Clutch Pedal Replacement](#).
10. Install the instrument panel tie bar assembly. Refer to [Instrument Panel Tie Bar Replacement](#).
11. Do not install the right and left side front floor console extension panels at this time.
12. Connect the instrument panel wiring harness to the remote HVAC control module.
13. Install the air conditioning evaporator thermal expansion valve tube to the air conditioning evaporator thermal expansion valve. Refer to [Air Conditioning Evaporator Thermal Expansion Valve Tube Replacement](#).
14. Install the heater outlet hose to the heater core tube. Refer to [Heater Outlet Hose Replacement](#).
15. Install the heater inlet hose to the heater core tube. Refer to [Heater Inlet Hose Replacement](#).
16. Install the passenger side air inlet grille panel. Refer to [Air Inlet Grille Panel Replacement](#).
17. Install the intake manifold insulator. Refer to [Intake Manifold Insulator Replacement](#).
18. Connect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
19. Fill the engine coolant system. Refer to [Cooling System Draining and Filling](#).
20. Recharge the refrigerant system. Refer to [Refrigerant Recovery and Recharging](#).
21. Inspect the air conditioning evaporator module drain housing grommet to air conditioning evaporator and blower case drain bracket port for water leaks.
22. Install the right side front floor console extension panel. Refer to [Front Floor Console Extension Panel Replacement - Right Side](#).
23. Install the left side front floor console extension panel. Refer to [Front Floor Console Extension Panel Replacement - Left Side](#).
24. Visually inspect for coolant leaks.
25. Visually inspect for refrigerant leaks.

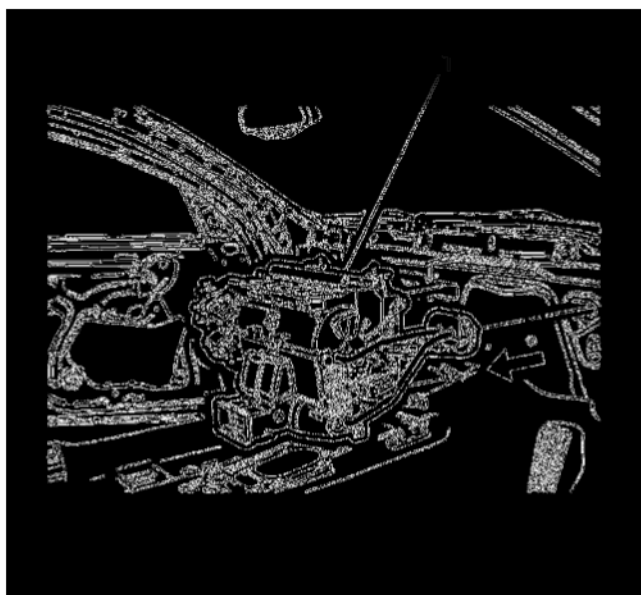
Heater and Air Conditioning Evaporator and Blower Module Removal and Installation (L77, LS3, LSA, MER, MG9)

Removal Procedure

1. Disconnect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Recover the refrigerant system. Refer to [Refrigerant Recovery and Recharging](#).
3. Drain the engine coolant system. Refer to [Cooling System Draining and Filling](#).
4. Remove the intake manifold cover. Refer to [Intake Manifold Cover Replacement - Front](#).
5. Remove the passenger side air inlet grille panel. Refer to [Air Inlet Grille Panel Replacement](#).
6. Remove the heater inlet and outlet hose from the heater core tubes. Refer to [Heater Inlet and Outlet Hose Replacement](#).
7. Remove the air conditioning evaporator thermal expansion valve tube from the air conditioning evaporator thermal expansion valve. Refer to [Air Conditioning Evaporator Thermal Expansion Valve Tube Replacement](#).
8. Remove the instrument panel tie bar assembly. Refer to [Instrument Panel Tie Bar Replacement](#).
9. Disconnect the instrument panel wiring harness from the remote HVAC control module.
10. Temporary support the heater and air conditioning evaporator and blower module (HVAC) assembly.
11. Remove the brake, accelerator, and clutch pedal assembly. Refer to [Brake, Accelerator, and Clutch Pedal Replacement](#).
12. Reposition the vacuum hoses and under the hood wiring harness out of the way.
13. Reposition the dash panel outer insulator assembly to access the HVAC module bolts. Refer to [Dash Panel Outer Insulator Replacement](#).



14. From within the engine compartment, remove the HVAC module assembly bolts, (1) at the blower, heater pipe and TXV pass through areas securing the HVAC module assembly to the cowl panel.

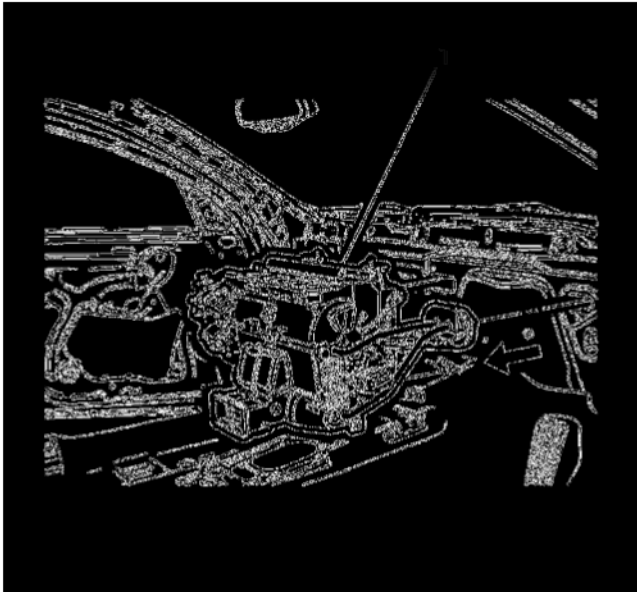


15. Slide the HVAC module assembly back to clear the air conditioning evaporator module drain housing, and remove the HVAC module assembly (1) from the vehicle.
16. Transfer all the necessary components.

Installation Procedure



1. Replace the blower module drain tube seal if equipped, and install drain hose grommet (1) onto the air conditioning evaporator module drain housing (2).
2. Lubricate the blower case drain bracket port and drain hose grommet with silicon spray (1).

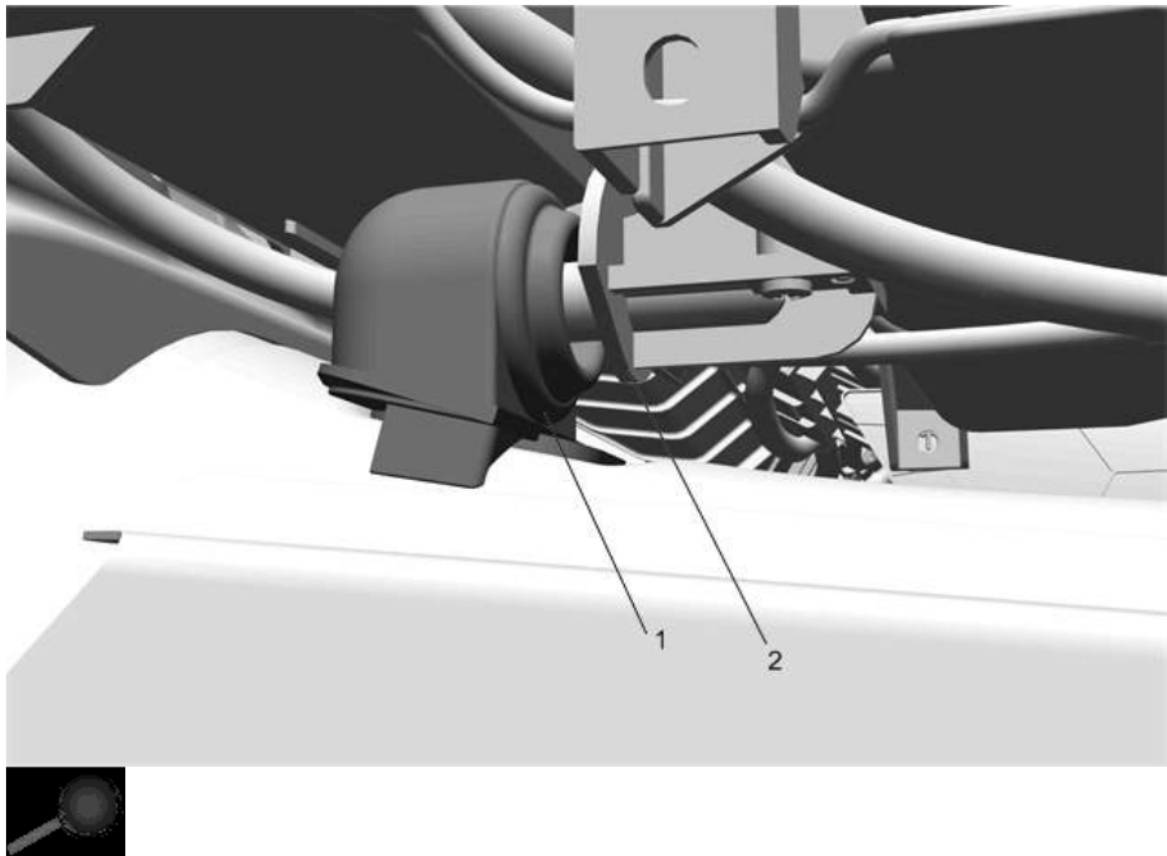


3. Align the air conditioning evaporator and blower case drain bracket port to the air conditioning evaporator module drain housing.
4. Slide the HVAC module assembly forward while position the HVAC module assembly (1) into the vehicle, and temporarily support it.



Caution : Refer to [Fastener Caution](#).

5. From within the engine compartment, install the HVAC module assembly bolts (1) at the blower, heater pipe and TXV pass through areas securing the HVAC module assembly to the cowl panel, and tighten to **9.0 N·m (7 lb ft)**.
6. Install the dash panel outer insulator assembly. Refer to [Dash Panel Outer Insulator Replacement](#).
7. Reposition the vacuum hoses and under the hood wiring harness to there proper route position.



8. Inspect the air conditioning evaporator and blower case drain bracket port (2) to the air conditioning evaporator module drain housing grommet (1) for proper alignment.
9. Inspect the air conditioning evaporator and blower case drain bracket port to the air conditioning evaporator module drain housing for proper alignment.
10. Install the brake, accelerator, and clutch pedal assembly. Refer to [Brake, Accelerator, and Clutch Pedal Replacement](#).
11. Install the instrument panel tie bar assembly. Refer to [Instrument Panel Tie Bar Replacement](#).
12. Do not install the right and left side front floor console extension panels at this time.
13. Connect the instrument panel wiring harness to the remote HVAC control module.
14. Install the air conditioning evaporator thermal expansion valve tube to the air conditioning evaporator thermal expansion valve. Refer to [Air Conditioning Evaporator Thermal Expansion Valve Tube Replacement](#).
15. Install the heater inlet and outlet hose to the heater core tubes. Refer to [Heater Inlet and Outlet Hose Replacement](#).
16. Install the passenger side air inlet grille panel. Refer to [Air Inlet Grille Panel Replacement](#).
17. Install the intake manifold cover. Refer to [Intake Manifold Cover Replacement - Front](#).
18. Connect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
19. Fill the engine coolant system. Refer to [Cooling System Draining and Filling](#).
20. Recharge the refrigerant system. Refer to [Refrigerant Recovery and Recharging](#).
21. Inspect the air conditioning evaporator module drain housing grommet to air conditioning evaporator and blower case drain bracket port for water leaks.
22. Install the right side front floor console extension panel. Refer to [Front Floor Console Extension Panel Replacement - Right Side](#).
23. Install the left side front floor console extension panel. Refer to [Front Floor Console Extension Panel Replacement - Left Side](#).
24. Visually inspect for coolant leaks.
25. Visually inspect for refrigerant leaks.

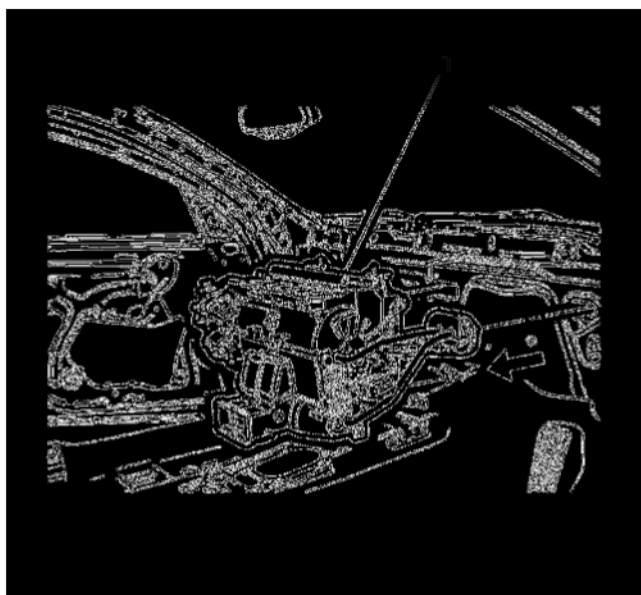
Heater and Air Conditioning Evaporator and Blower Module Removal and Installation (LFX, LWR, LFW, MYA)

Removal Procedure

1. Disconnect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Recover the refrigerant system. Refer to [Refrigerant Recovery and Recharging](#).
3. Drain the engine coolant system. Refer to [Cooling System Draining and Filling](#).
4. Remove the intake manifold insulator. Refer to [Intake Manifold Insulator Replacement](#).
5. Remove the passenger side air inlet grille panel. Refer to [Air Inlet Grille Panel Replacement](#).
6. Remove the heater inlet hose from the heater core tube. Refer to [Heater Inlet Hose Replacement](#).
7. Remove the heater outlet hose from the heater core tube. Refer to [Heater Outlet Hose Replacement](#).
8. Remove the air conditioning evaporator thermal expansion valve tube from the air conditioning evaporator thermal expansion valve. Refer to [Air Conditioning Evaporator Thermal Expansion Valve Tube Replacement](#).
9. Remove the instrument panel tie bar assembly. Refer to [Instrument Panel Tie Bar Replacement](#).
10. Disconnect the instrument panel wiring harness from the remote HVAC control module.
11. Temporary support the heater and air conditioning evaporator and blower module (HVAC) assembly.
12. Remove the brake, and accelerator pedal assembly. Refer to [Brake and Accelerator Pedal Assembly Replacement](#).
13. Reposition the vacuum hoses and under the hood wiring harness out of the way.
14. Reposition the dash panel outer insulator assembly to access the HVAC module bolts. Refer to [Dash Panel Outer Insulator Replacement](#).



15. From within the engine compartment, remove the HVAC module assembly bolts, (1) at the blower, heater pipe and TXV pass through areas securing the HVAC module assembly to the cowl panel.

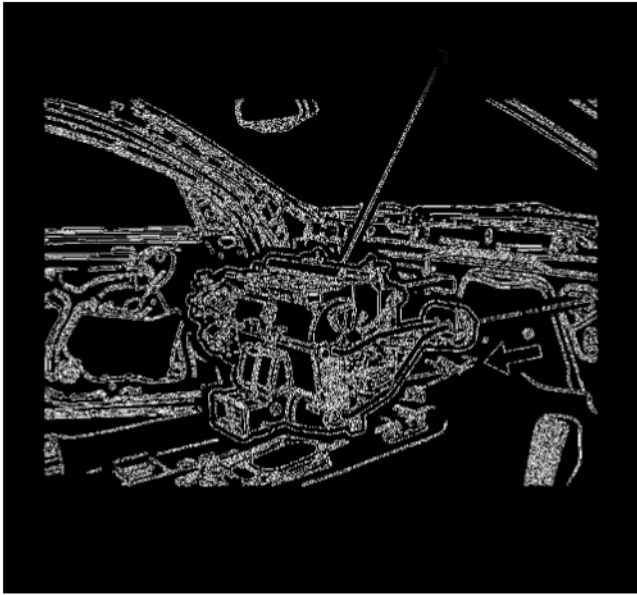


16. Slide the HVAC module assembly back to clear the air conditioning evaporator module drain housing, and remove the HVAC module assembly (1) from the vehicle.
17. Transfer all the necessary components.

Installation Procedure



1. Replace the blower module drain tube seal if equipped, and install drain hose grommet (1) onto the air conditioning evaporator module drain housing (2).
2. Lubricate the blower case drain bracket port and drain hose grommet with silicon spray (1).

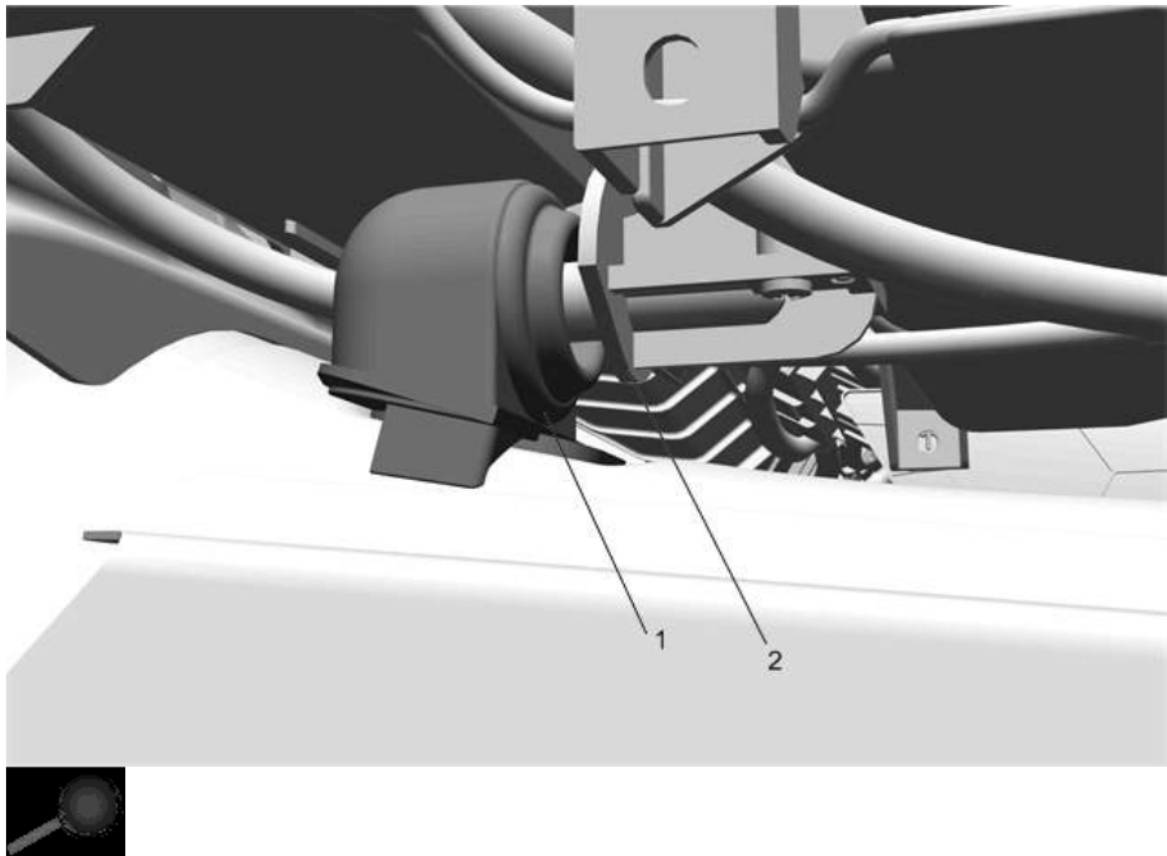


3. Align the air conditioning evaporator and blower case drain bracket port to the air conditioning evaporator module drain housing.
4. Slide the HVAC module assembly forward while position the HVAC module assembly (1) into the vehicle, and temporarily support it.



Caution : Refer to [Fastener Caution](#).

5. From within the engine compartment, install the HVAC module assembly bolts (1) at the blower, heater pipe and TXV pass through areas securing the HVAC module assembly to the cowl panel, and tighten to **9.0 N·m (7 lb ft)**.
6. Install the dash panel outer insulator assembly. Refer to [Dash Panel Outer Insulator Replacement](#).
7. Reposition the vacuum hoses and under the hood wiring harness to there proper route position.



8. Inspect the air conditioning evaporator and blower case drain bracket port (2) to the air conditioning evaporator module drain housing grommet (1) for proper alignment.
9. Install the brake, and accelerator pedal assembly. Refer to [Brake and Accelerator Pedal Assembly Replacement](#).
10. Install the instrument panel tie bar assembly. Refer to [Instrument Panel Tie Bar Replacement](#).
11. Do not install the right and left side front floor console extension panels at this time.
12. Connect the instrument panel wiring harness to the remote HVAC control module.
13. Install the air conditioning evaporator thermal expansion valve tube to the air conditioning evaporator thermal expansion valve. Refer to [Air Conditioning Evaporator Thermal Expansion Valve Tube Replacement](#).
14. Install the heater outlet hose to the heater core tube. Refer to [Heater Outlet Hose Replacement](#).
15. Install the heater inlet hose to the heater core tube. Refer to [Heater Inlet Hose Replacement](#).
16. Install the passenger side air inlet grille panel. Refer to [Air Inlet Grille Panel Replacement](#).
17. Install the intake manifold insulator. Refer to [Intake Manifold Insulator Replacement](#).
18. Connect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
19. Fill the engine coolant system. Refer to [Cooling System Draining and Filling](#).
20. Recharge the refrigerant system. Refer to [Refrigerant Recovery and Recharging](#).
21. Inspect the air conditioning evaporator module drain housing grommet to air conditioning evaporator and blower case drain bracket port for water leaks.
22. Install the right side front floor console extension panel. Refer to [Front Floor Console Extension Panel Replacement - Right Side](#).
23. Install the left side front floor console extension panel. Refer to [Front Floor Console Extension Panel Replacement - Left Side](#).
24. Visually inspect for coolant leaks.
25. Visually inspect for refrigerant leaks.

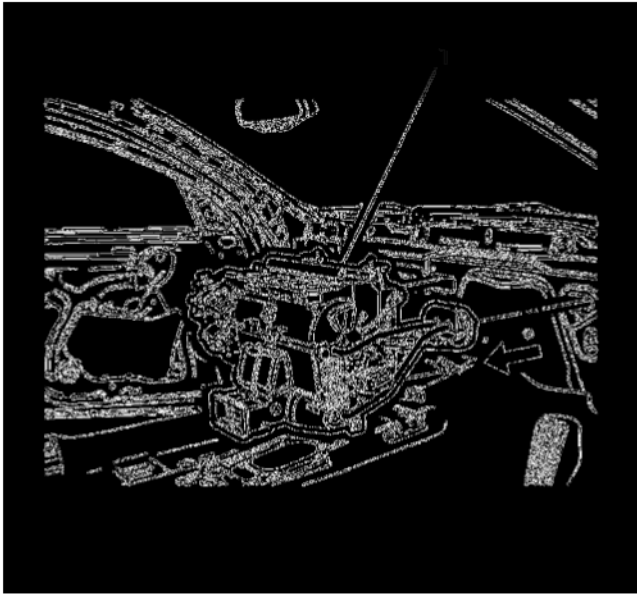
Heater and Air Conditioning Evaporator and Blower Module Removal and Installation (L77, LS3, LSA, MYC, MYD)

Removal Procedure

1. Disconnect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
2. Recover the refrigerant system. Refer to [Refrigerant Recovery and Recharging](#).
3. Drain the engine coolant system. Refer to [Cooling System Draining and Filling](#).
4. Remove the intake manifold cover. Refer to [Intake Manifold Cover Replacement - Front](#).
5. Remove the heater inlet and outlet hose from the heater core tubes. Refer to [Heater Inlet and Outlet Hose Replacement](#).
6. Remove the air conditioning evaporator thermal expansion valve tube from the air conditioning evaporator thermal expansion valve. Refer to [Air Conditioning Evaporator Thermal Expansion Valve Tube Replacement](#).
7. Remove the instrument panel tie bar assembly. Refer to [Instrument Panel Tie Bar Replacement](#).
8. Disconnect the instrument panel wiring harness from the remote HVAC control module.
9. Temporary support the heater and air conditioning evaporator and blower module (HVAC) assembly.
10. Remove the brake, and accelerator pedal assembly. Refer to [Brake and Accelerator Pedal Assembly Replacement](#).
11. Reposition the vacuum hoses and under the hood wiring harness out of the way.
12. Loosen the dash panel outer insulator assembly to access the HVAC module bolts. Refer to [Dash Panel Outer Insulator Replacement](#).
13. Remove the passenger side air inlet grille panel. Refer to [Air Inlet Grille Panel Replacement](#).



14. From within the engine compartment, remove the HVAC module assembly bolts, (1) at the blower, heater pipe and TXV pass through areas securing the HVAC module assembly to the cowl panel.



15. Slide the HVAC module assembly back to clear the air conditioning evaporator module drain housing, and remove the HVAC module assembly (1) from the vehicle.

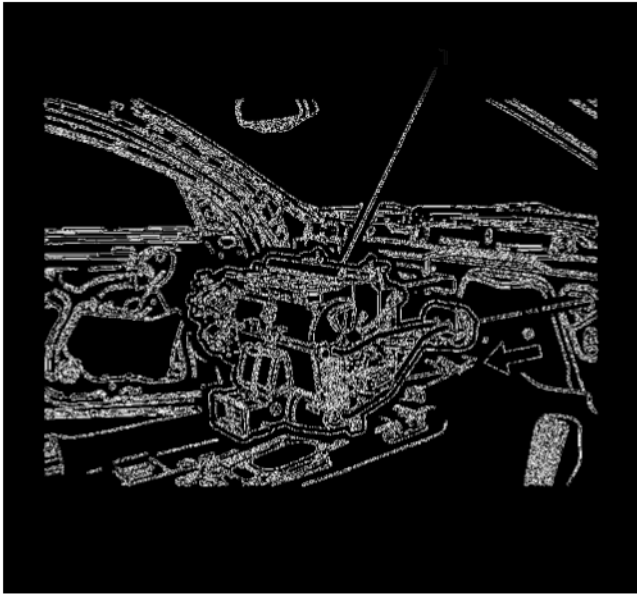
Note: Use care when removing the HVAC module so as to ensure engine coolant and air conditioning lubricant are not spilled onto the carpet and interior trim.

16. Transfer all the necessary components.

Installation Procedure



1. Replace the blower module drain tube seal if equipped, and install drain hose grommet (1) onto the air conditioning evaporator module drain housing (2).
2. Lubricate the blower case drain bracket port and drain hose grommet with silicon spray (1).

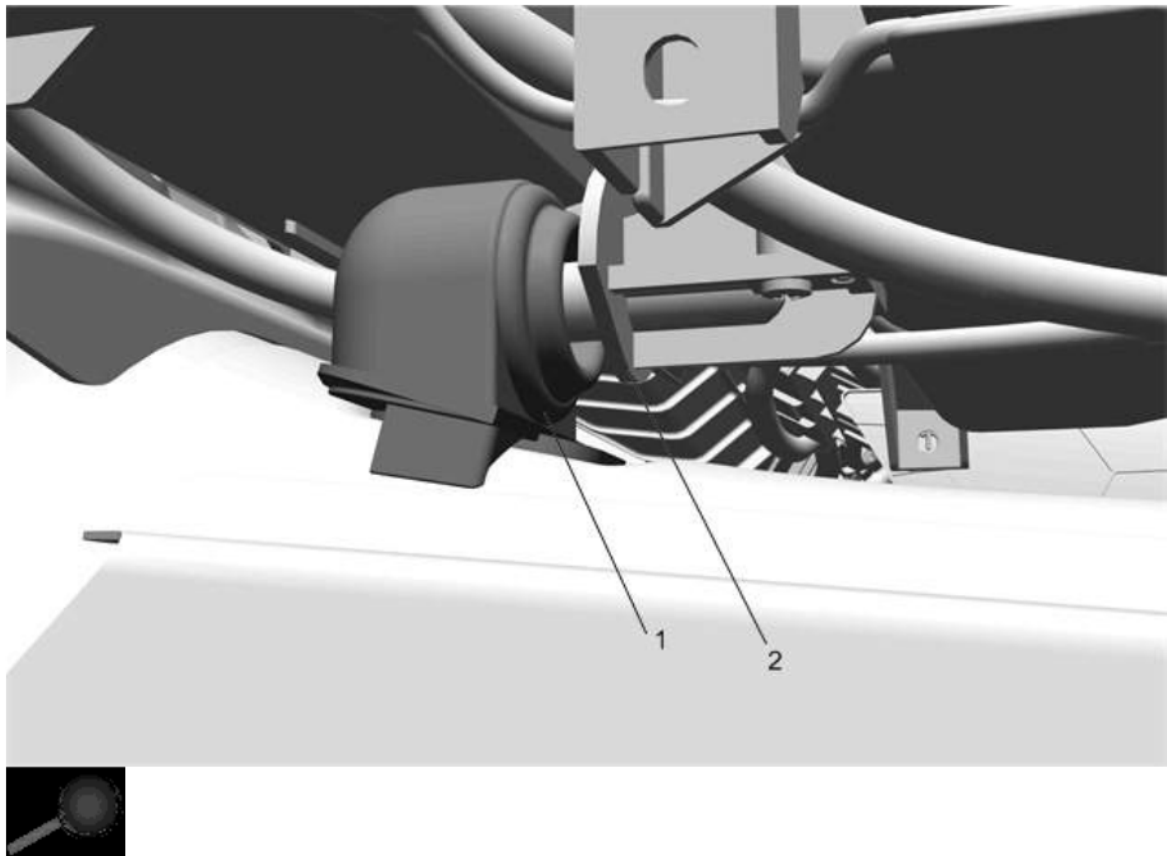


3. Align the air conditioning evaporator and blower case drain bracket port to the air conditioning evaporator module drain housing.
4. Slide the HVAC module assembly forward while position the HVAC module assembly (1) into the vehicle, and temporarily support it.



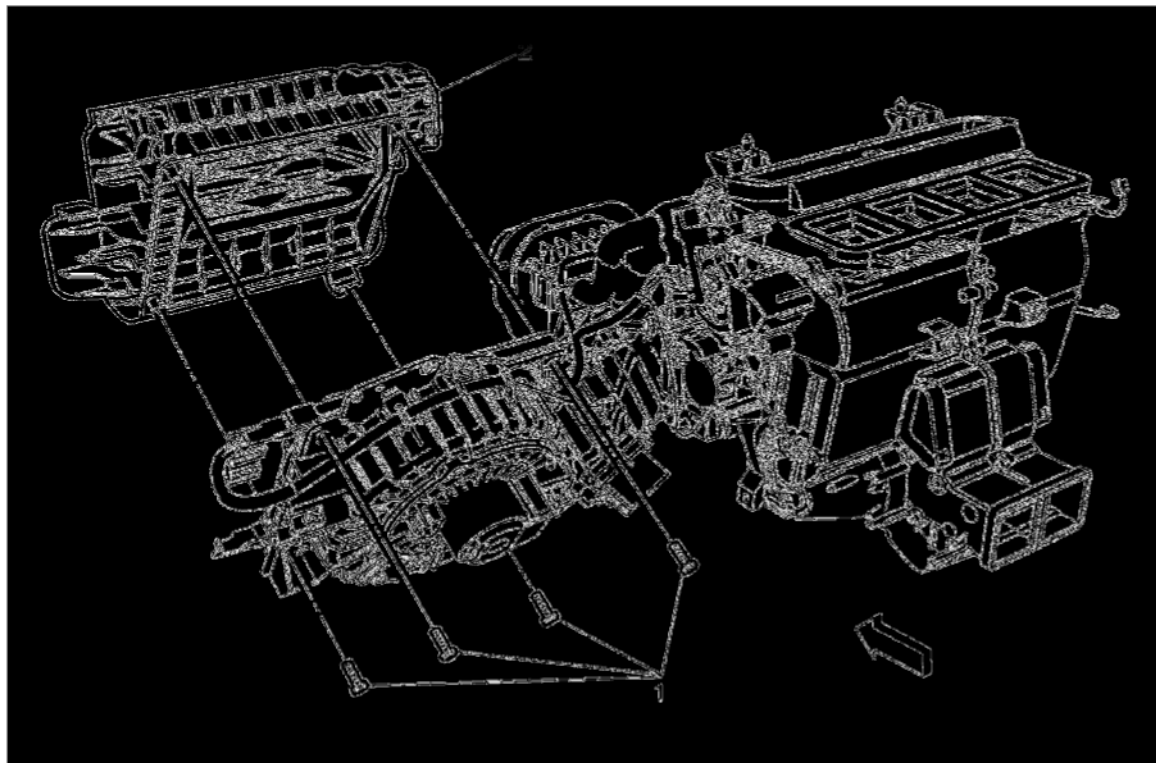
Caution : Refer to [Fastener Caution](#).

5. From within the engine compartment, install the HVAC module assembly bolts (1) at the blower, heater pipe and TXV pass through areas securing the HVAC module assembly to the cowl panel, and tighten to **9.0 N·m (7 lb ft)**.
6. Install the dash panel outer insulator assembly. Refer to [Dash Panel Outer Insulator Replacement](#).
7. Reposition the vacuum hoses and under the hood wiring harness to their proper route position.



8. Inspect the air conditioning evaporator and blower case drain bracket port (2) to the air conditioning evaporator module drain housing grommet (1) for proper alignment.
9. Install the brake, and accelerator pedal assembly. Refer to [Brake and Accelerator Pedal Assembly Replacement](#).
10. Connect the instrument panel wiring harness to the remote HVAC control module.
11. Install the instrument panel tie bar assembly. Refer to [Instrument Panel Tie Bar Replacement](#).
12. Do not install the right and left side front floor console extension panels at this time.
13. Install the air conditioning evaporator thermal expansion valve tube to the air conditioning evaporator thermal expansion valve. Refer to [Air Conditioning Evaporator Thermal Expansion Valve Tube Replacement](#).
14. Install the heater inlet and outlet hose to the heater core tubes. Refer to [Heater Inlet and Outlet Hose Replacement](#).
15. Install the passenger side air inlet grille panel. Refer to [Air Inlet Grille Panel Replacement](#).
16. Install the intake manifold cover. Refer to [Intake Manifold Cover Replacement - Front](#).
17. Connect the negative battery cable. Refer to [Battery Negative Cable Disconnection and Connection](#).
18. Fill the engine coolant system. Refer to [Cooling System Draining and Filling](#).
19. Recharge the refrigerant system. Refer to [Refrigerant Recovery and Recharging](#).
20. Inspect the air conditioning evaporator module drain housing grommet to air conditioning evaporator and blower case drain bracket port for water leaks.
21. Install the right side front floor console extension panel. Refer to [Front Floor Console Extension Panel Replacement - Right Side](#).
22. Install the left side front floor console extension panel. Refer to [Front Floor Console Extension Panel Replacement - Left Side](#).
23. Visually inspect for coolant leaks.
24. Visually inspect for refrigerant leaks.

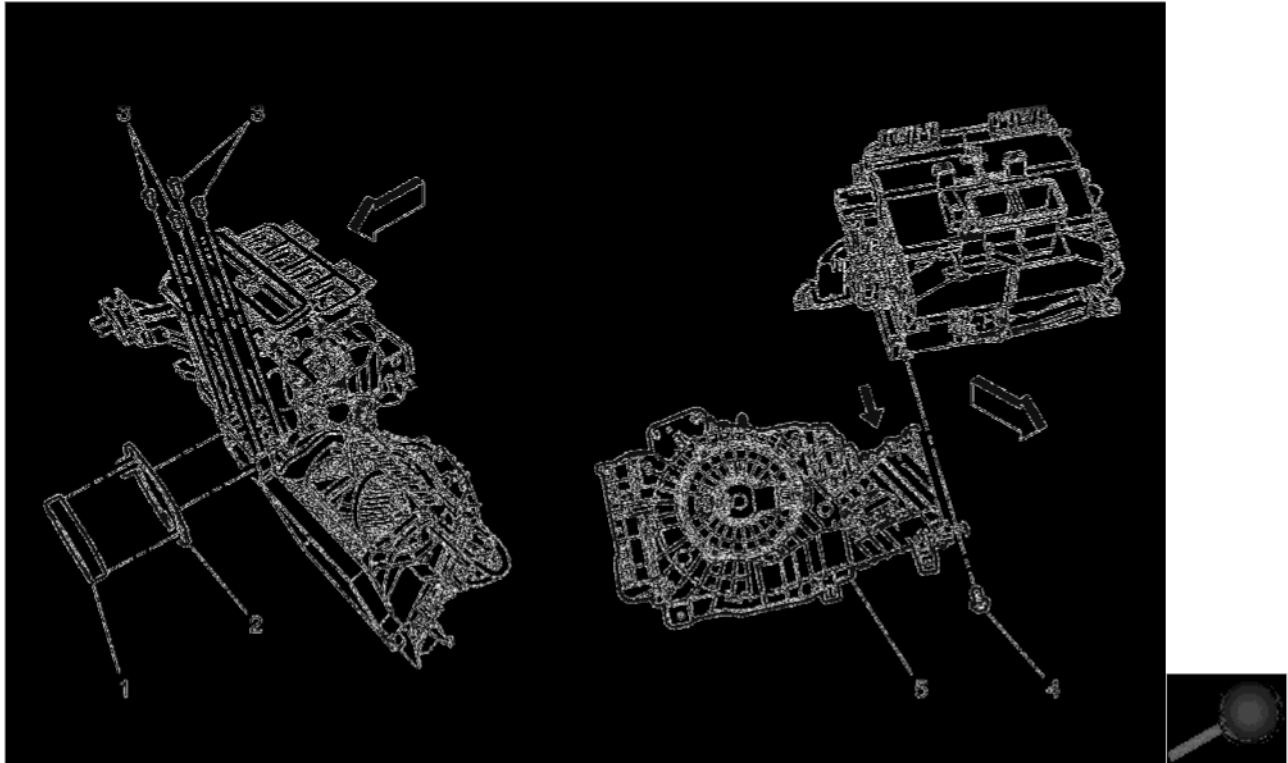
Blower Front Case Replacement



Blower Front Case Replacement

Callout	Component Name
Preliminary Procedure Remove the heater and air conditioning evaporator and blower module. Refer to Heater and Air Conditioning Evaporator and Blower Module Removal and Installation .	
1	Blower Front Case Assembly Fastener (Qty: 4) Caution: Refer to Fastener Caution .
2	Blower Front Case Assembly Procedures 1. Disconnect the fresh air recirculation mode valve actuator motor electrical connector. 2. Remove the fresh air recirculation mode valve actuator motor. Refer to Mode Valve Actuator Motor Replacement - Fresh Air Recirculation. 3. Transfer the components as necessary.

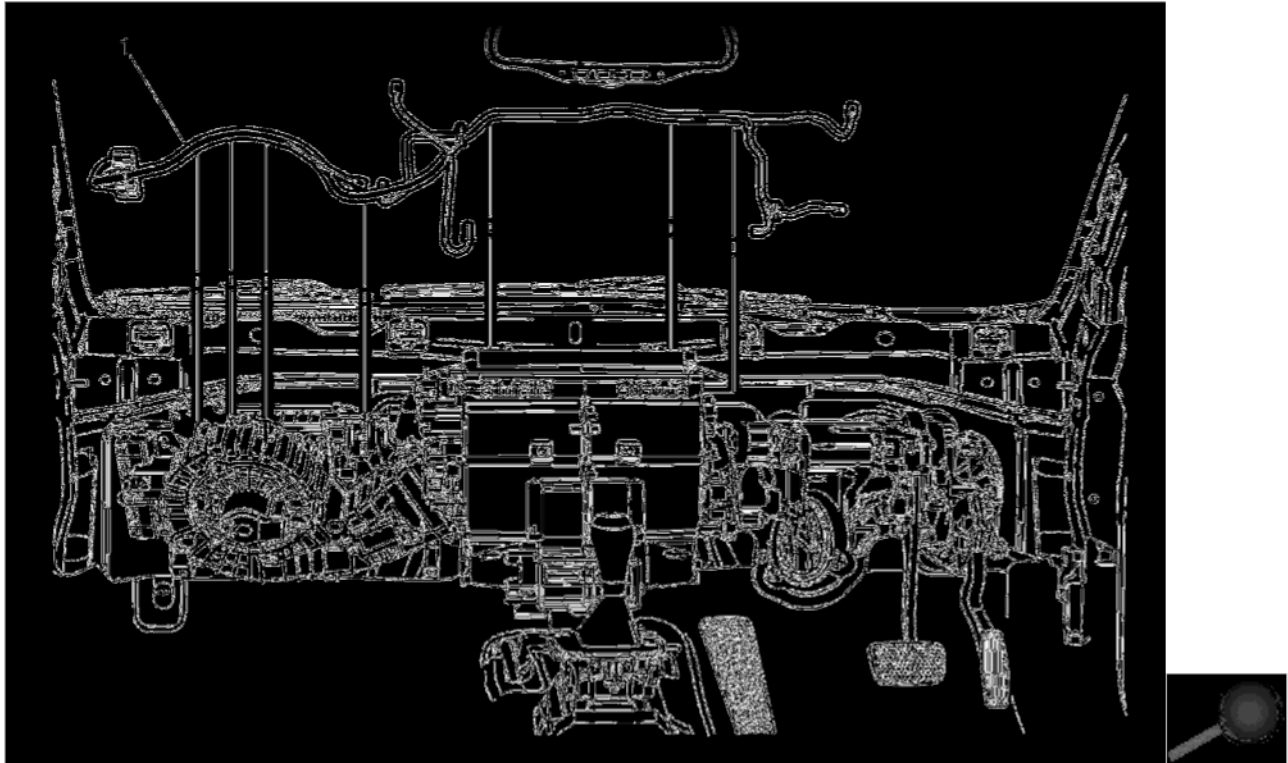
Blower Assembly Replacement



Blower Assembly Replacement

Callout	Component Name
Preliminary Procedure Remove the heater and air conditioning evaporator and blower module. Refer to Heater and Air Conditioning Evaporator and Blower Module Removal and Installation .	
1	Air Conditioning Evaporator Thermal Expansion Valve Cover Seal
2	Heater and Air Conditioning Evaporator and Blower Module Backing Plate
3	Heater and Air Conditioning Evaporator and Blower Module Fastener (Qty: 4) Caution: Refer to Fastener Caution .
4	Blower Assembly Fastener
5	Blower Assembly Procedures 1. Disconnect the blower assembly electrical connectors. 2. Remove the blower motor. Refer to Blower Motor Replacement. 3. Remove the blower control module. Refer to Blower Motor Control Module Replacement. 4. Remove the fresh air recirculation mode valve actuator motor. Refer to Mode Valve Actuator Motor Replacement - Fresh Air Recirculation. 5. Transfer the components as necessary.

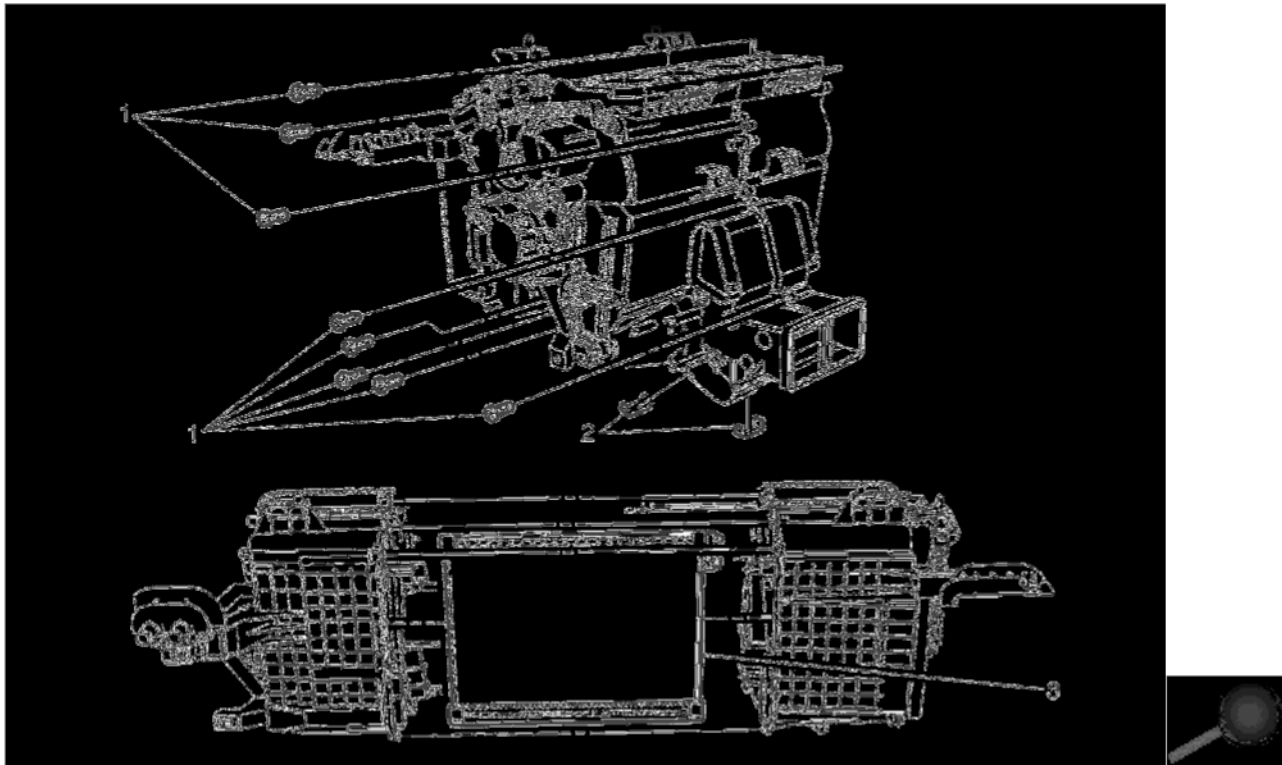
Air Valve Actuator Control Module Harness Replacement



Air Valve Actuator Control Module Harness Replacement

Callout	Component Name
Preliminary Procedure Remove the instrument panel assembly. Refer to Instrument Panel Assembly Replacement .	
1	Air Valve Actuator Control Module Harness Procedures 1. Prior to removal of the air valve actuator control module harness, note the proper routing of the harness, and the location of the electrical connectors. 2. Disconnect the air valve actuator control module harness electrical connectors. 3. Disconnect all of the duct air temperature sensors electrical connectors. 4. Disconnect the evaporator air temperature sensor electrical connector. 5. Disconnect all of the mode valve actuator motors electrical connectors. 6. Route the air valve actuator control module harness between the plenum and the heater and air conditioning evaporator and blower module. 7. Secure the air valve actuator control module harness to the heater and air conditioning evaporator and blower module.

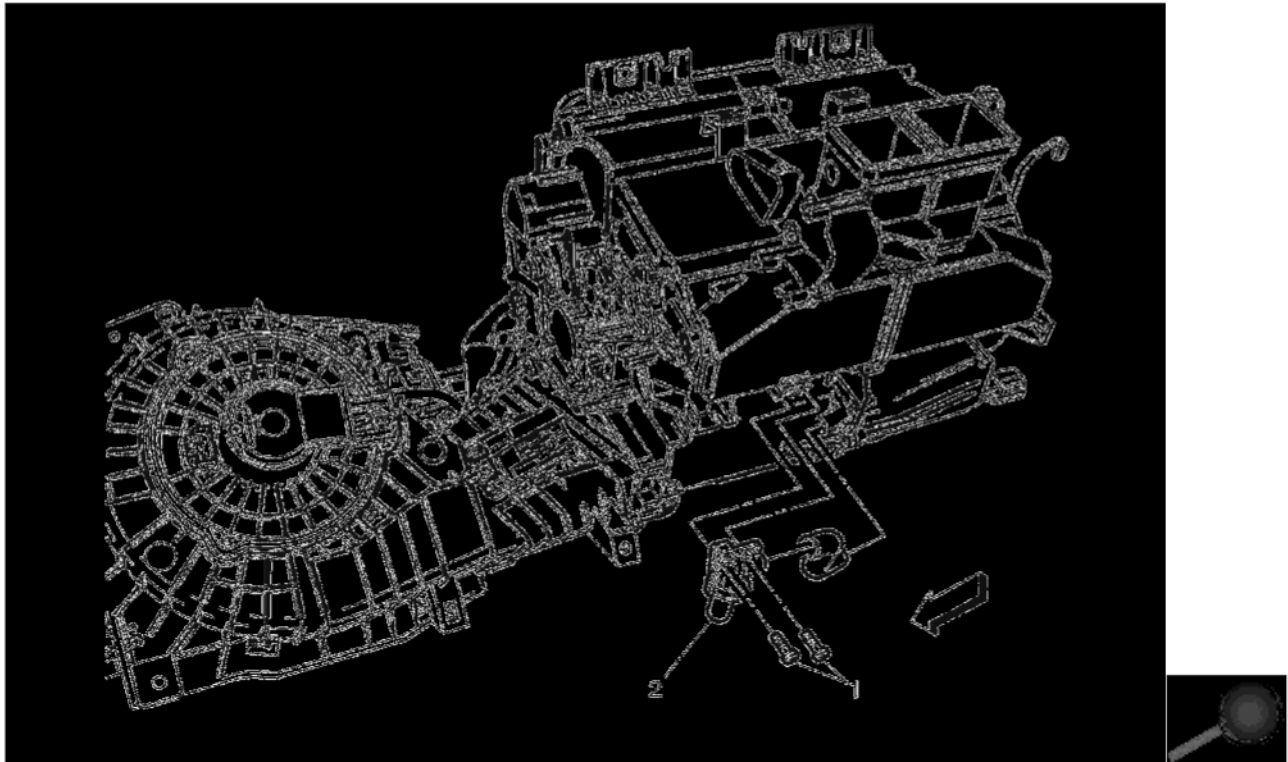
Air Conditioning Evaporator Replacement



Air Conditioning Evaporator Replacement

Callout	Component Name
Preliminary Procedure Remove the auxiliary air conditioning evaporator inlet tube. Refer to Auxiliary Air Conditioning Evaporator Inlet Tube Replacement .	
1	Heater and Air Conditioning Evaporator and Blower Module Fastener (Qty: 8) Caution: Refer to Fastener Caution . Tighten 1.1 N•m (10 lb in)
2	Heater and Air Conditioning Evaporator and Blower Module Retaining Clip (Qty: 2)
3	Air Conditioning Evaporator Core Procedures 1. Separate the left and right side heater and air conditioning evaporator and blower module case halves. 2. Transfer the components as necessary. 3. Replace all the heater and air conditioning evaporator and blower module seals as contained in the service seal kit.

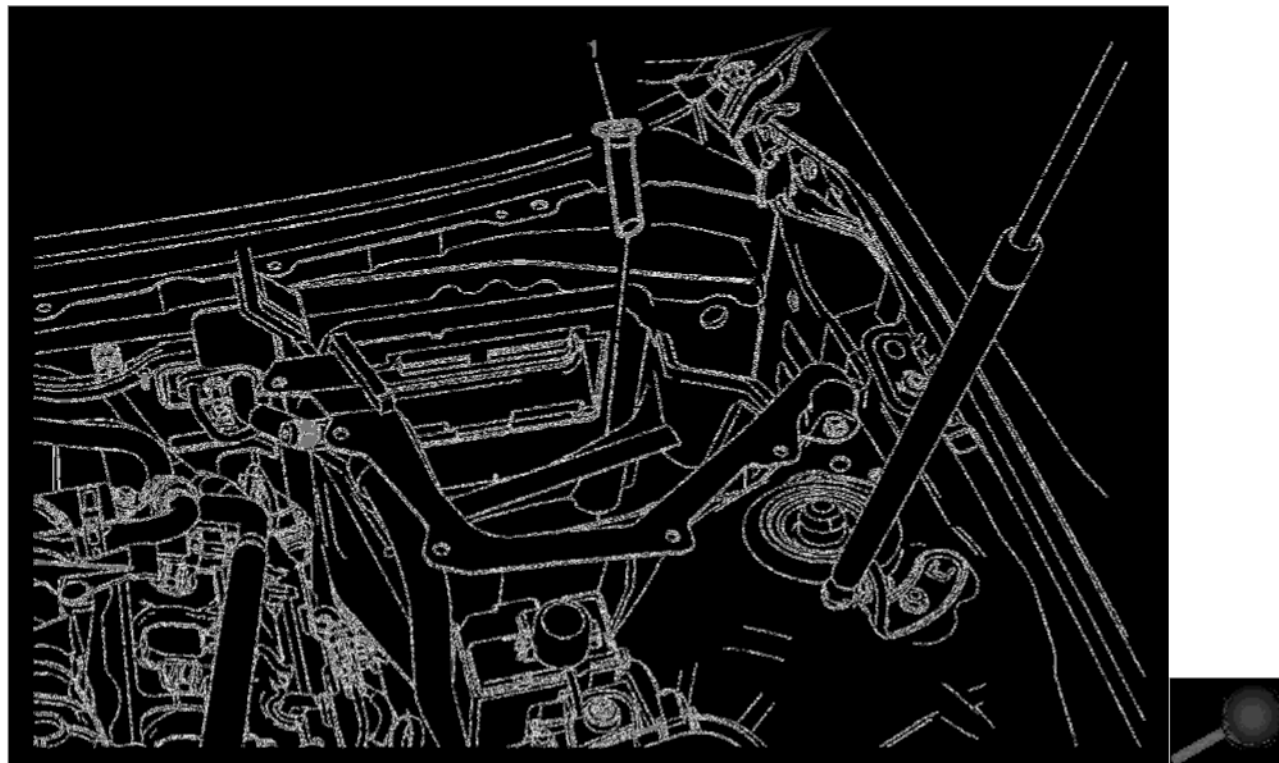
Air Conditioning Evaporator and Blower Case Drain Bracket Replacement



Air Conditioning Evaporator and Blower Case Drain Bracket Replacement

Callout	Component Name
Preliminary Procedure Remove the heater and air conditioning evaporator and blower module assembly. Refer to Heater and Air Conditioning Evaporator and Blower Module Removal and Installation .	
1	Air Conditioning Evaporator and Blower Case Drain Bracket Fastener (Qty: 2)
2	Air Conditioning Evaporator and Blower Case Drain Bracket Procedure Inspect the air conditioning evaporator and blower case drain bracket hose and replace as necessary.

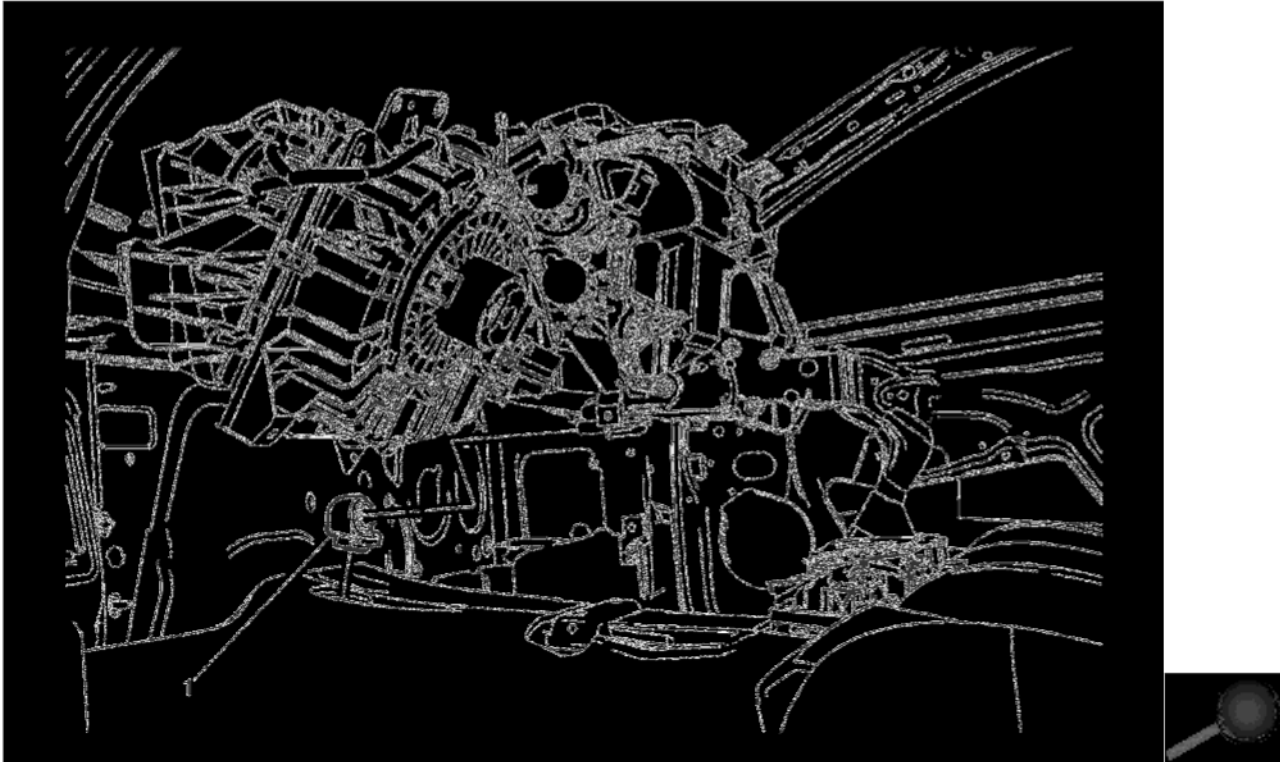
Blower Outlet Duct Drain Hose



Blower Outlet Duct Drain Hose

Callout	Component Name
Preliminary Procedure Remove the air inlet screen. Refer to Air Inlet Screen Replacement .	
1	Blower Outlet Duct Drain Hose

Air Conditioning Evaporator Module Drain Housing Replacement



Air Conditioning Evaporator Module Drain Housing Replacement

Callout	Component Name
Preliminary Procedure Remove the heater and air conditioning evaporator and blower module assembly. Refer to Heater and Air Conditioning Evaporator and Blower Module Removal and Installation .	
1	Air Conditioning Evaporator Module Drain Housing

Heater Inlet Hose Replacement (LFW, LFX)

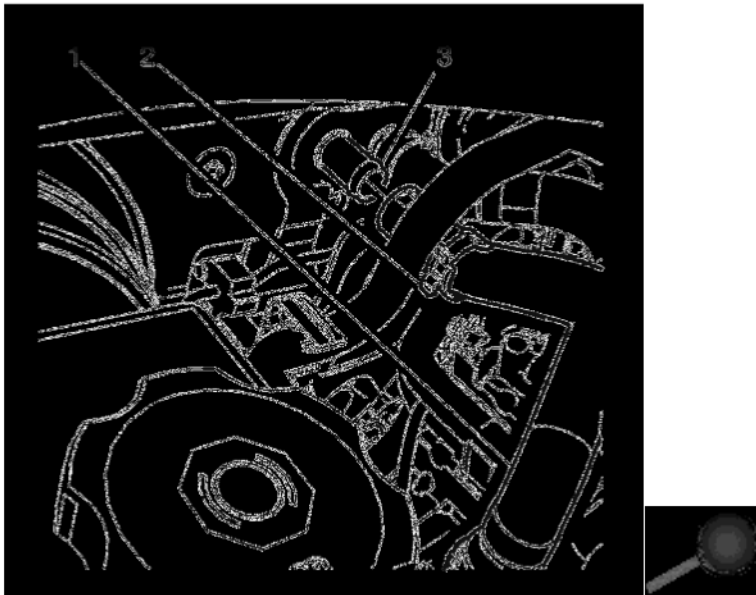
Special Tools

J 38185 Hose Clamp Pliers

Removal Procedure

Warning: Refer to [Safety Glasses Warning](#).

1. Drain the cooling system. Refer to [Cooling System Draining and Filling](#).
2. Remove the engine cover. Refer to [Intake Manifold Sight Shield Replacement](#).



Note: Mark the position of the heater inlet hose (1) and the heater inlet hose retaining clamp (2) before removal to make sure of correct alignment during installation.

3. Using J 38185 hose clamp pliers compress the heater inlet hose retaining clamp (2) and slide along the heater inlet hose (1).
4. Disconnect the heater inlet hose (1) from the heater core inlet pipe (3).



Note: Using a suitable tool, detach the heater inlet hose (1) by releasing the heater inlet hose quick connect fitting retaining clip (2).

5. Detach the heater inlet hose (1) from the heater inlet pipe quick connect fitting retaining clip (2).
6. Remove the heater inlet hose (1) from the heater inlet pipe (3).

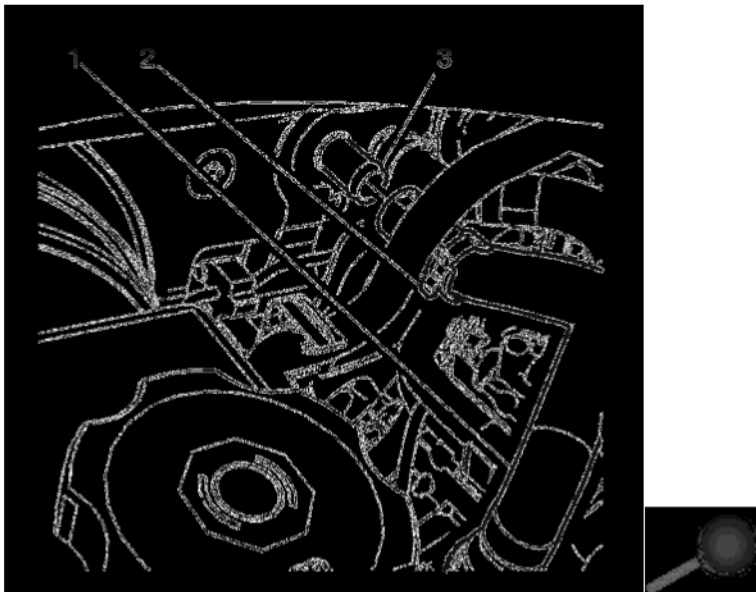
Installation Procedure



1. Install the heater inlet hose (1) to the heater inlet pipe (3).

Note: Listen for an audible click to confirm fitting.

2. Attach the heater inlet hose (1) to the heater inlet pipe quick connect fitting retaining clip (2).



Caution: Refer to [Installing Hoses without Twists or Bends Caution](#).

Note: If reusing the heater inlet hose (1), align the heater inlet hose (1) with the marks made on the heater core inlet pipe (3) during the removal procedure.

3. Connect the heater inlet hose (1) to the heater core inlet pipe (3).
4. Using J 38185 hose clamp pliers slide the heater inlet hose retaining clamp (2) back into the original position on the heater inlet hose (3).
5. Install the engine cover. Refer to [Intake Manifold Sight Shield Replacement](#).
6. Fill the cooling system. Refer to [Cooling System Draining and Filling](#).

Heater Inlet Hose Replacement (LSA)

Special Tools

BO-38185 Hose Clamp Pliers

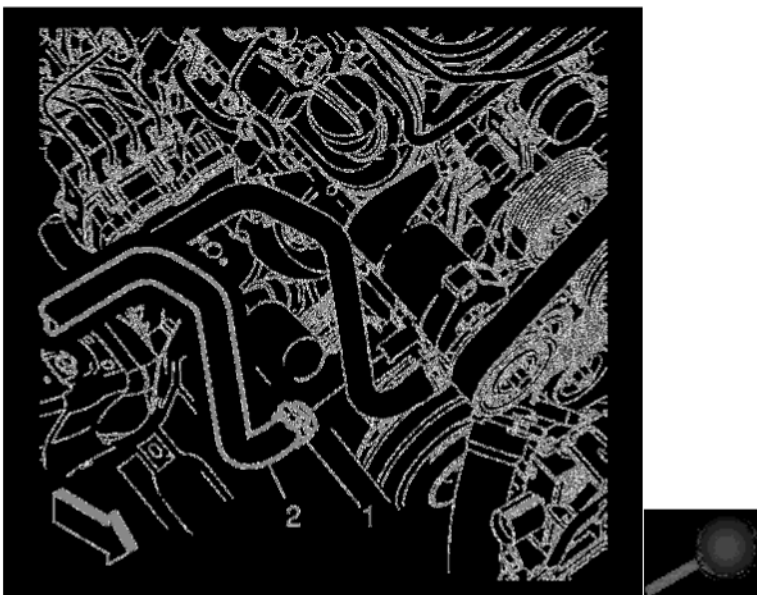
For equivalent regional tools, refer to [Special Tools](#).

Removal Procedure

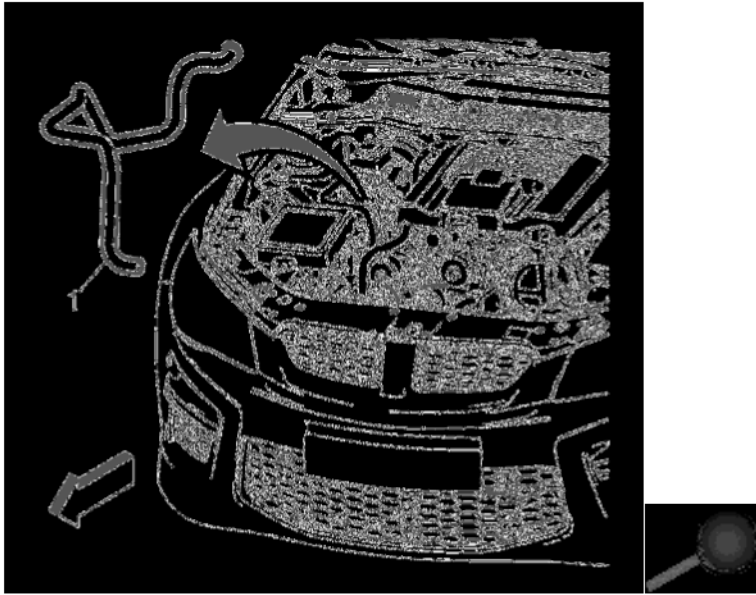
1. Drain the cooling system. Refer to [Cooling System Draining and Filling](#).
2. Remove the intake manifold cover. Refer to [Intake Manifold Cover Replacement - Front](#).



3. Reposition the heater inlet hose clamp (1) using BO-38185 hose clamp pliers.
4. Remove the heater inlet hose (2) from the heater core tube.

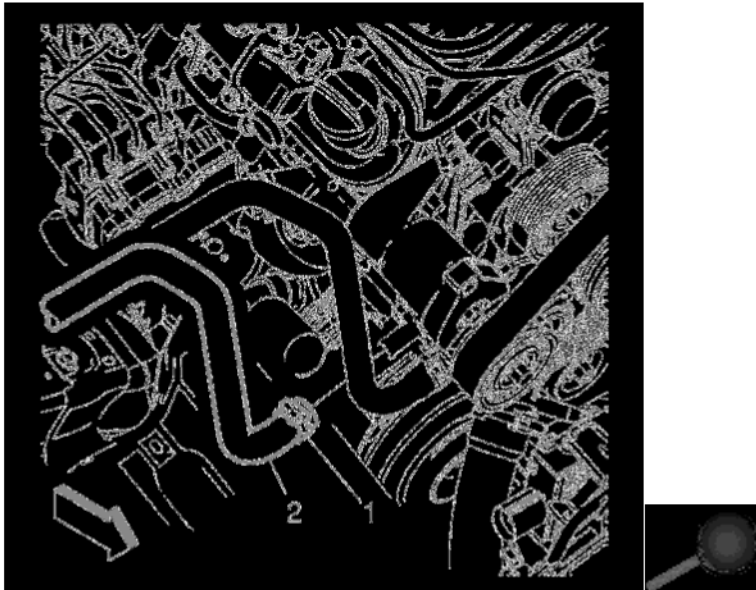


5. Reposition the heater inlet hose clamp (1) using BO-38185 hose clamp pliers.
6. Remove the heater inlet hose (2) from the water pump housing tube.



7. Remove the heater inlet hose (1) from the vehicle.

Installation Procedure

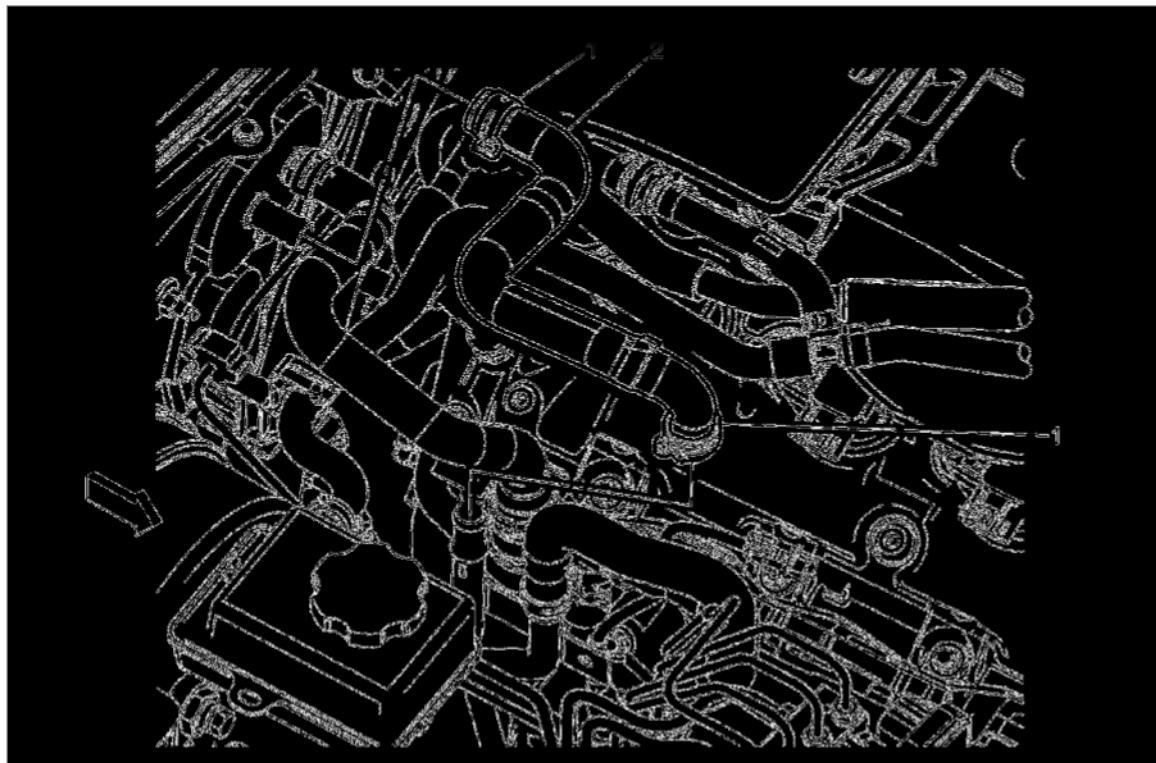


1. Install the heater inlet hose clamp (1) using *BO-38185* hose clamp pliers.
2. Lubricate the inside diameters of the hose with clean coolant prior to installation.
3. Install the heater inlet hose (2) to the heater core tube.
4. Reposition the heater inlet hose clamp (1) using *BO-38185* hose clamp pliers.



5. Install the heater inlet hose clamp (1) using *BO-38185* hose clamp pliers.
6. Install the heater inlet hose (2) to the water pump housing tube.
7. Reposition the heater inlet hose clamp (1) using *BO-38185* hose clamp pliers.
8. Install the intake manifold cover. Refer to [Intake Manifold Cover Replacement - Front](#).
9. Fill the cooling system. Refer to [Cooling System Draining and Filling](#).
10. Check for coolant leaks. Refer to [Cooling System Leak Testing](#).

Heater Inlet Hose Replacement (LWR)



Heater Inlet Hose Replacement

Callout	Component Name
Preliminary Procedures Warning: Refer to Safety Glasses Warning . 1. Drain the cooling system. Refer to Cooling System Draining and Filling . 2. Remove the engine cover. Refer to Intake Manifold Sight Shield Replacement . 3. Remove the radiator outlet hose from the radiator outlet pipe. Refer to Radiator Outlet Hose Replacement .	
1	Heater Inlet Hose Clamp (Qty: 2) Procedure Reposition the heater inlet hose clamp using the <i>BO-38185</i> hose clamp pliers. Special Tools <i>BO-38185</i> Hose Clamp Pliers For equivalent regional tools, refer to Special Tools .
2	Heater Inlet Hose Procedure 1. Fill the cooling system to the proper level. Refer to Cooling System Draining and Filling . 2. Inspect the cooling system for leaks.

Heater Inlet and Outlet Hose Replacement (Lower With L77, LS3)

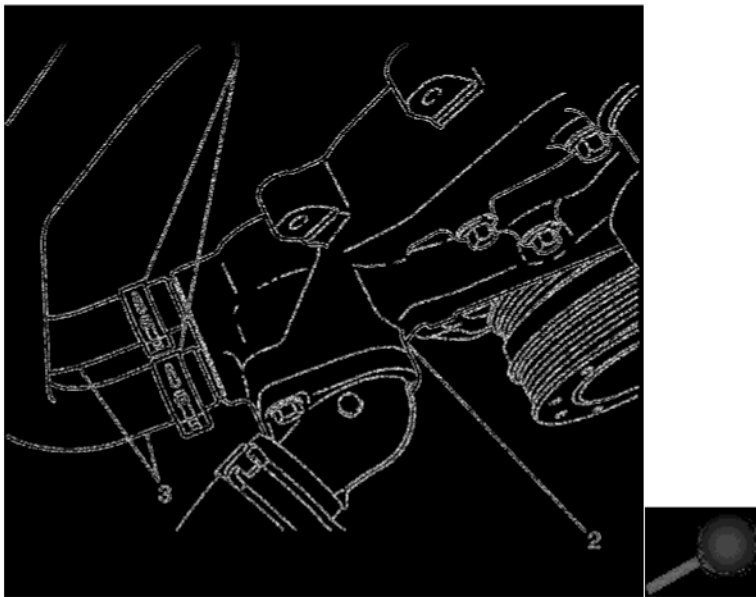
Special Tools

J 38185 Hose Clamp Pliers

Removal Procedure

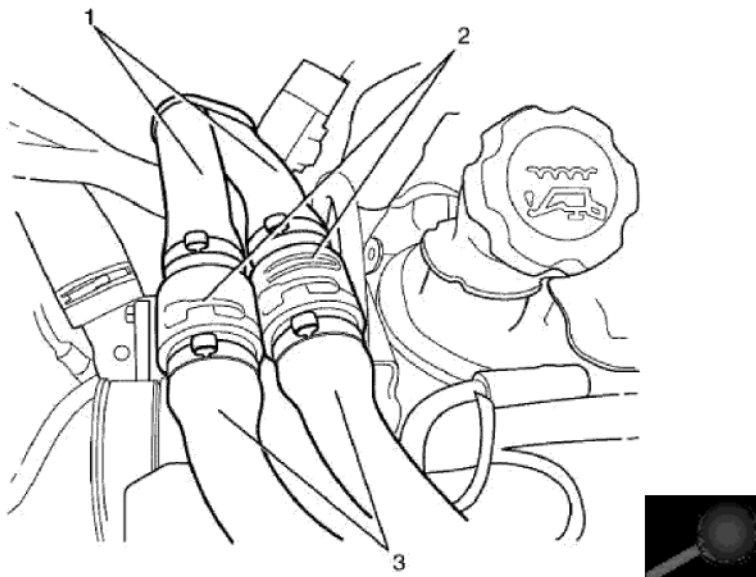
Warning: Refer to [Safety Glasses Warning](#).

1. Drain the cooling system. Refer to [Cooling System Draining and Filling](#).



Note: Mark the position of heater hoses (3) and heater hose retaining clamps (1) before removal to make sure of correct alignment during assembly.

2. Using J 38185 hose clamp pliers compress the heater hose retaining clamps (1) and slide along the heater hoses (3).
3. Disconnect the heater hoses (3) from the water pump housing (2).

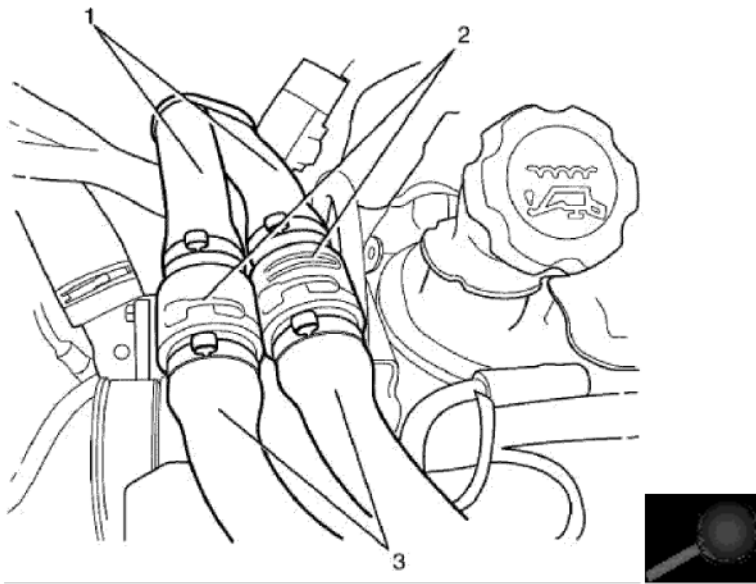


Note: Using a suitable tool, detach the lower heater hose (3) by releasing the heater hose quick connect fitting retaining clip (2).

4. Detach the lower heater hose (3) from the heater hose quick connect fitting (2).

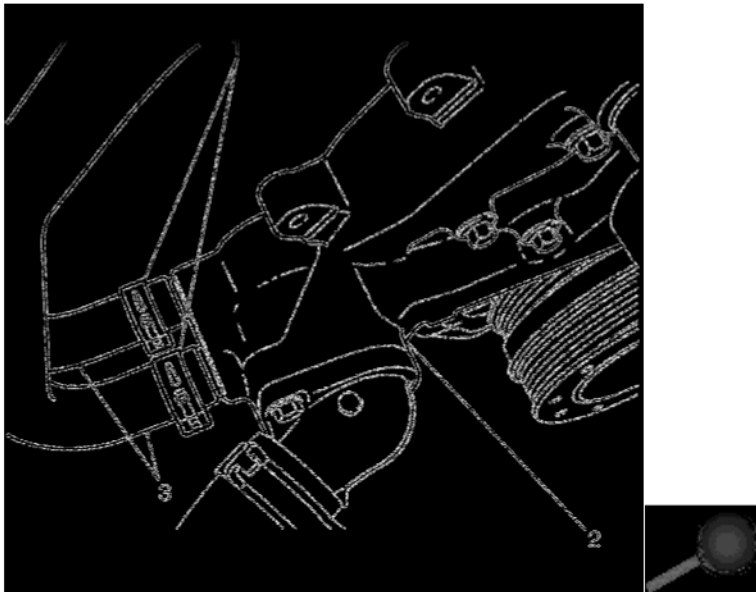
5. Remove the lower heater hose (3).

Installation Procedure



Note: Listen for an audible click to confirm fitting.

1. Connect the lower heater hose (3) to the heater hose quick connect fitting (2).



Caution: Refer to [Installing Hoses without Twists or Bends Caution](#).

Note: If reusing the heater hoses (3), align the heater hoses (3) with the marks made on the water pump housing (2) during the removal procedure.

2. Connect the heater hoses (3) to the water pump housing (2).
3. Using J 38185 hose clamp pliers slide the heater hose retaining clamps (1) back into the original position on the heater hoses (3).
4. Fill the cooling system. Refer to [Cooling System Draining and Filling](#).

Heater Inlet and Outlet Hose Replacement (Upper with L77, LS3)

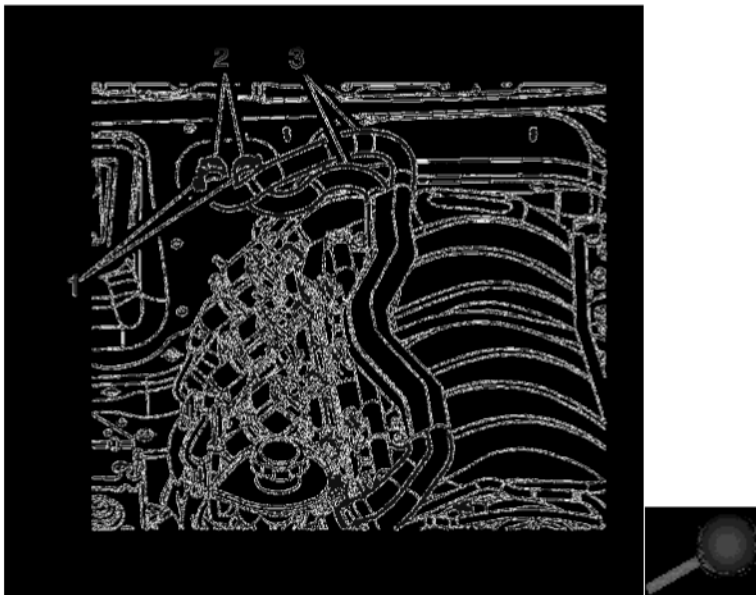
Special Tools

J 38185 Hose Clamp Pliers

Removal Procedure

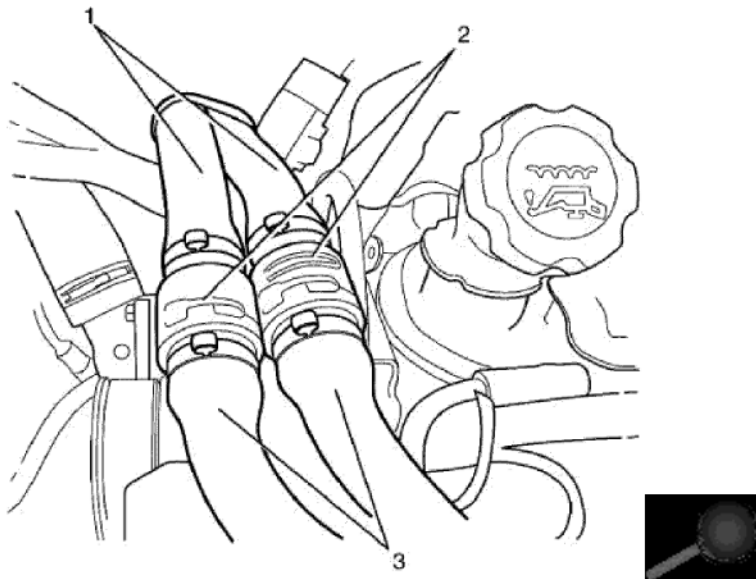
Warning: Refer to [Safety Glasses Warning](#).

1. Remove the engine cover. Refer to [Engine Cover Replacement](#).
2. Drain the cooling system. Refer to [Cooling System Draining and Filling](#).



Note: Mark position of heater hoses (3) and heater hose retaining clamps (1) before removal to make sure of correct alignment during assembly.

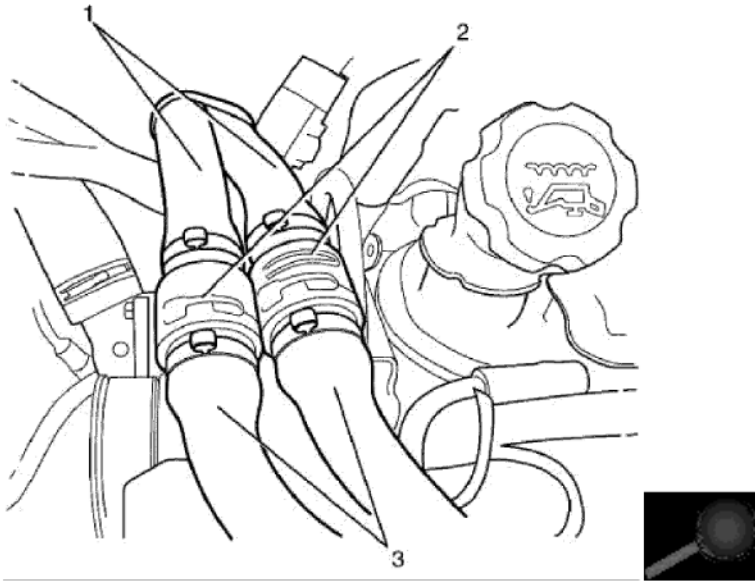
3. Using J 38185 hose clamp pliers compress the heater hose retaining clamps (1) and slide 50 mm (2 in) along the heater hose (3).
4. Disconnect the heater hoses (3) from the heater core pipes (2).



Note: Using a suitable tool, detach the upper heater hose (1) by releasing the heater hose quick connect fitting retaining clip (2).

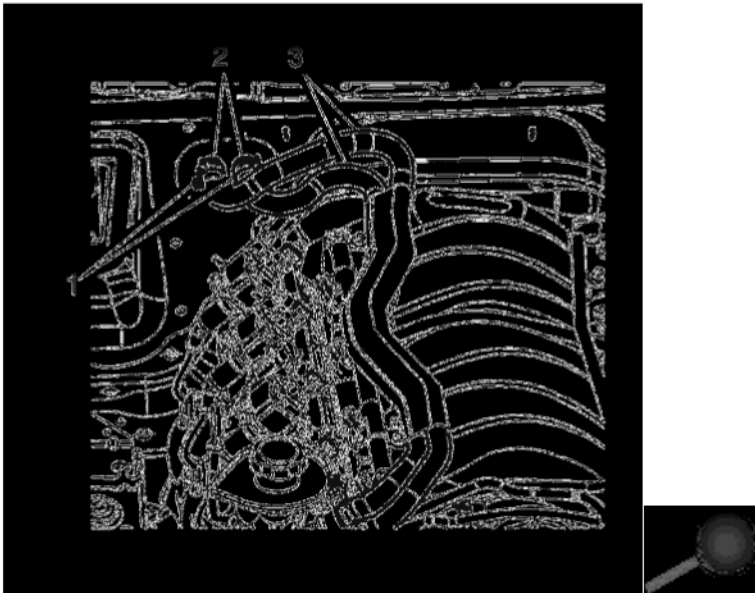
5. Detach the upper heater hose (1) from the heater hose quick connect fitting (2).
6. Remove the upper heater hose (1).

Installation Procedure



Note: Listen for an audible click to confirm fitting.

1. Connect the upper heater hose (1) to the heater hose quick connect fitting (2).



Caution: Refer to [Installing Hoses without Twists or Bends Caution](#).

Note: If reusing the heater hoses (3), align the heater hoses (3) with the marks made on the heater core pipes (2) during the removal procedure.

2. Connect the heater hoses (3) to the heater core pipes (2).
3. Using J 38185 hose clamp pliers slide the heater hose retaining clamps (1) back into the original position on the heater hoses (3).
4. Fill the cooling system. Refer to [Cooling System Draining and Filling](#).
5. Install the engine cover. Refer to [Engine Cover Replacement](#).

Heater Outlet Hose Replacement (LFW, LFX)

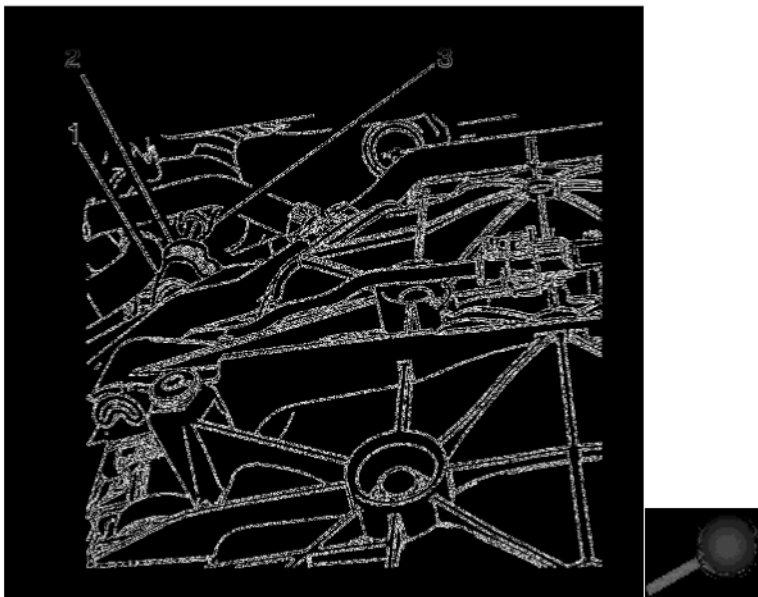
Special Tools

J 38185 Hose Clamp Pliers

Removal Procedure

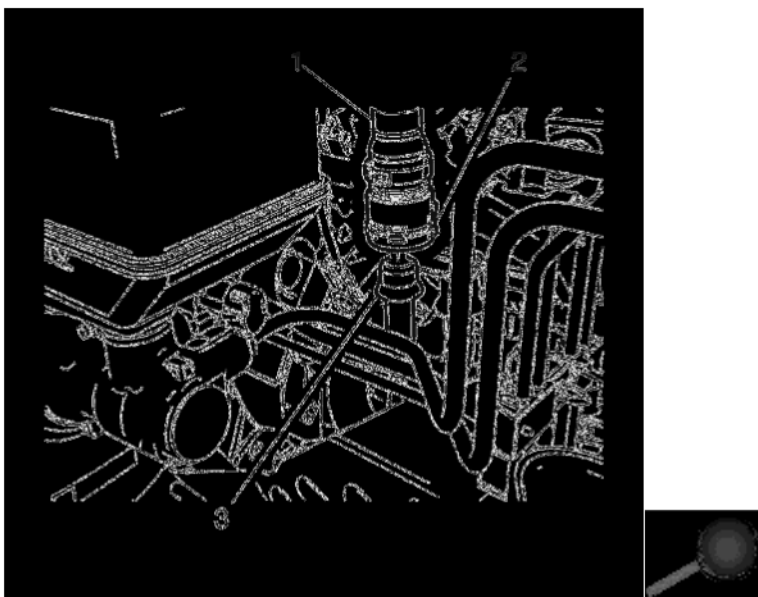
Warning: Refer to [Safety Glasses Warning](#).

1. Drain the cooling system. Refer to [Cooling System Draining and Filling](#).
2. Remove the engine cover. Refer to [Intake Manifold Sight Shield Replacement](#).



Note: Mark the position of the heater outlet hose (1) and the heater outlet hose retaining clamp (2) before removal to make sure of correct alignment during installation.

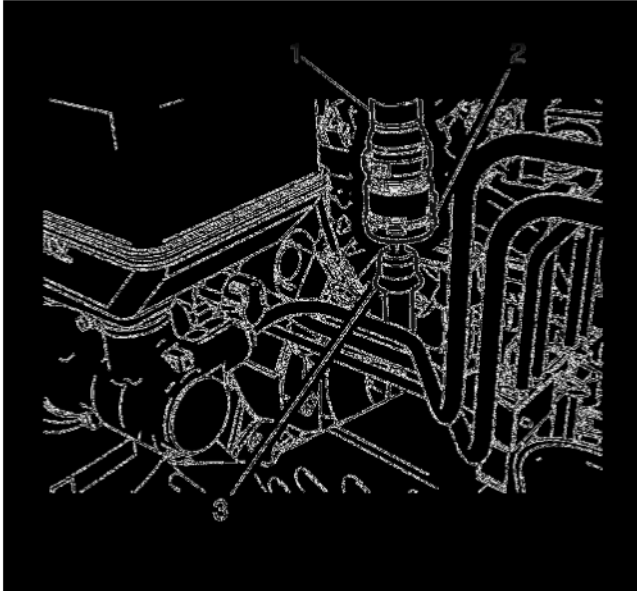
3. Using J 38185 hose clamp pliers compress the heater outlet hose retaining clamp (2) and slide along the heater outlet hose (1).
4. Disconnect the heater outlet hose (1) from the heater core outlet pipe (3).
5. Remove the heater inlet hose from the heater inlet pipe and move pipe out of the way. Refer to [Heater Inlet Hose Replacement](#)



Note: Using a suitable tool, detach the heater outlet hose (1) by releasing the heater outlet hose quick connect fitting retaining clip (2).

6. Detach the heater outlet hose (1) from the heater outlet pipe quick connect fitting retaining clip (2).
7. Remove the heater outlet hose (1) from the heater outlet pipe (3).

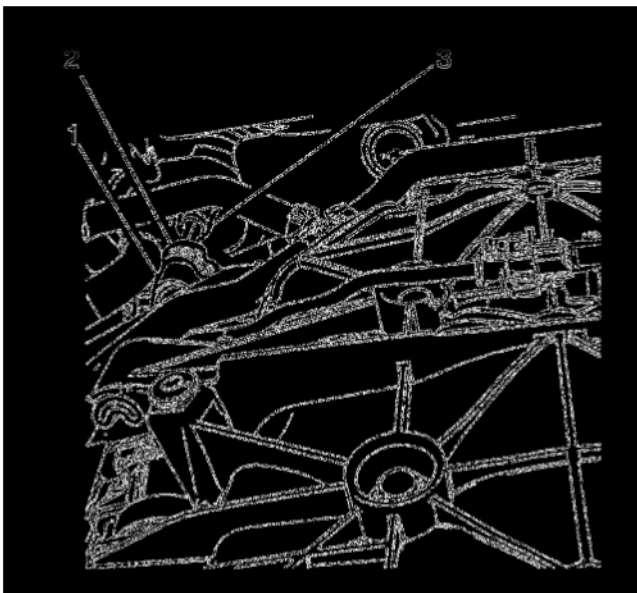
Installation Procedure



1. Install the heater outlet hose (1) to the heater outlet pipe (3).

Note: Listen for an audible click to confirm fitting.

2. Attach the heater outlet hose (1) to the heater outlet pipe quick connect fitting retaining clip (2).
3. Install the heater inlet hose from the heater inlet pipe. Refer to [Heater Inlet Hose Replacement](#)



Caution: Refer to [Installing Hoses without Twists or Bends Caution](#).

Note: If reusing the heater outlet hose (1), align the heater outlet hose (1) with the marks made on the heater core outlet pipe (3) during the removal procedure.

4. Connect the heater outlet hose (1) to the heater core outlet pipe (3).
5. Using J 38185 hose clamp pliers slide the heater outlet hose retaining clamp (2) back into the original position on the heater outlet hose (1).
6. install the engine cover. Refer to [Intake Manifold Sight Shield Replacement](#).

7. Fill the cooling system. Refer to [Cooling System Draining and Filling](#).

Heater Outlet Hose Replacement (LSA)

Special Tools

BO-38185 Hose Clamp Pliers

For equivalent regional tools, refer to [Special Tools](#).

Removal Procedure

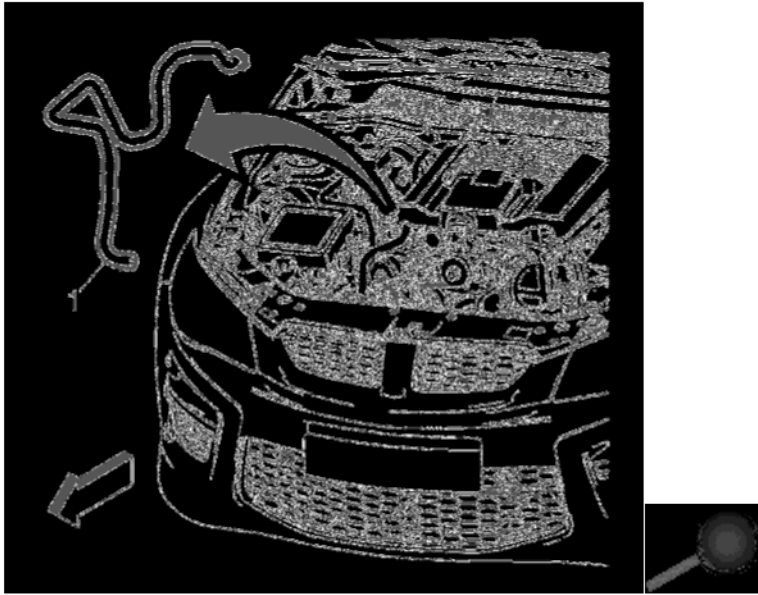
1. Drain the cooling system. Refer to [Cooling System Draining and Filling](#).
2. Remove the intake manifold cover. Refer to [Intake Manifold Cover Replacement - Front](#).



3. Reposition the heater outlet hose clamp (1) using BO-38185 hose clamp pliers.
4. Remove the heater outlet hose (2) from the heater core tube.



5. Reposition the heater outlet hose clamp (1) using BO-38185 hose clamp pliers.
6. Remove the heater outlet hose (2) from the water pump housing tube.



7. Remove the heater outlet hose (1) from the vehicle.

Installation Procedure

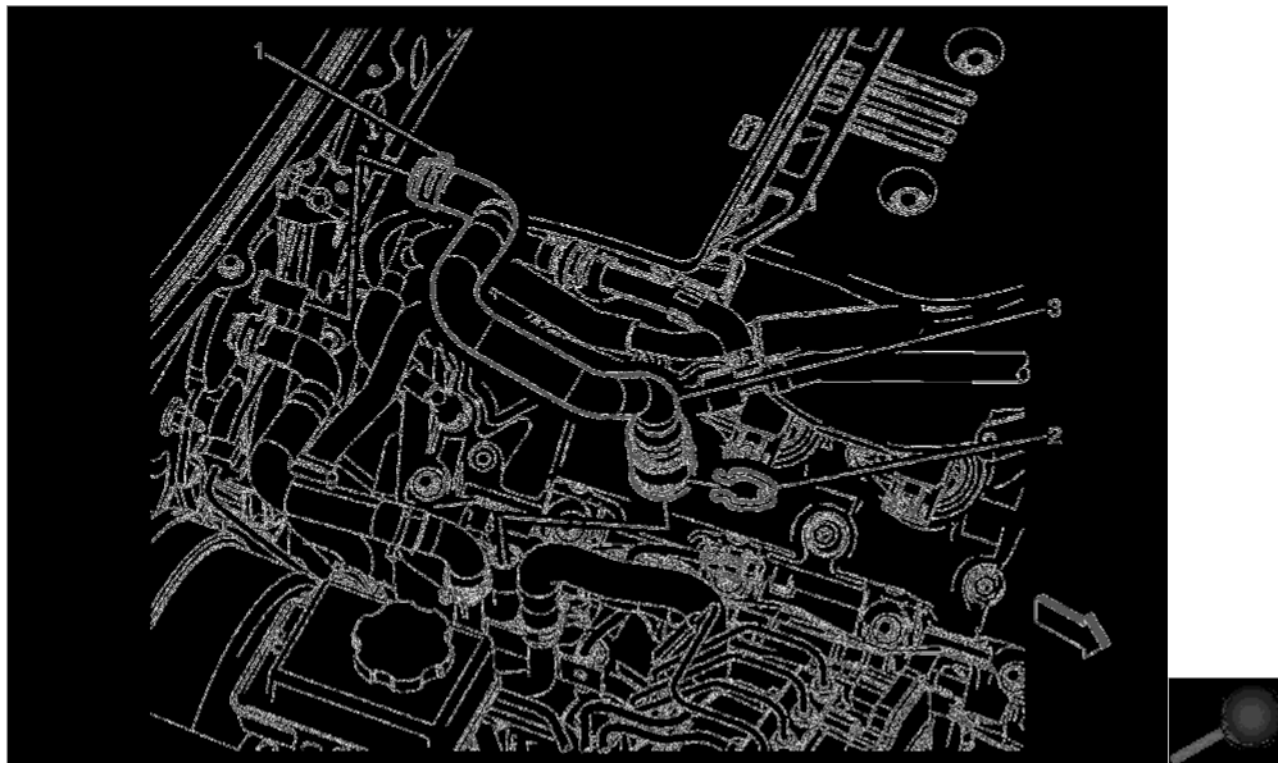


1. Install the heater outlet hose clamp (1) using *BO-38185* hose clamp pliers.
2. Lubricate the inside diameters of the outlet hose with clean coolant prior to installation.
3. Install the heater outlet hose (2) to the heater core tube.
4. Reposition the heater outlet hose clamp (1) using *BO-38185* hose clamp pliers.



5. Install the heater outlet hose clamp (1) using *BO-38185* hose clamp pliers.
6. Install the heater outlet hose (2) to the water pump housing tube.
7. Reposition the heater outlet hose clamp (1) using *BO-38185* hose clamp pliers.
8. Install the intake manifold cover. Refer to [Intake Manifold Cover Replacement - Front](#).
9. Fill the cooling system. Refer to [Cooling System Draining and Filling](#).
10. Check for coolant leaks. Refer to [Cooling System Leak Testing](#).

Heater Outlet Hose Replacement (LWR)



Heater Outlet Hose Replacement

Callout	Component Name
Preliminary Procedures Warning: Refer to Safety Glasses Warning . 1. Drain the cooling system. Refer to Cooling System Draining and Filling . 2. Remove the engine cover. Refer to Intake Manifold Sight Shield Replacement . 3. Remove the radiator outlet hose from the radiator outlet pipe. Refer to Radiator Outlet Hose Replacement .	
1	Heater Outlet Hose Clamp Procedure Reposition the heater outlet hose clamp using the <i>BO-38185</i> hose clamp pliers. Special Tools <i>BO-38185</i> Hose Clamp Pliers For equivalent regional tools, refer to Special Tools .
2	Heater Outlet Hose Retaining Clip Procedure Using a suitable tool, detach the heater outlet hose retaining clip.
3	Heater Outlet Hose Procedure 1. Fill the cooling system to the proper level. Refer to Cooling System Draining and Filling .

Callout	Component Name
	2. Inspect the cooling system for leaks.

Air Inlet Housing Cover Replacement



Air Inlet Housing Cover Replacement

Callout	Component Name
Preliminary Procedure Remove the steel plenum air inlet grille panel. Refer to Air Inlet Grille Panel Replacement .	
1	Air Inlet Housing Cover Procedure Release the retaining tabs from the air inlet housing.

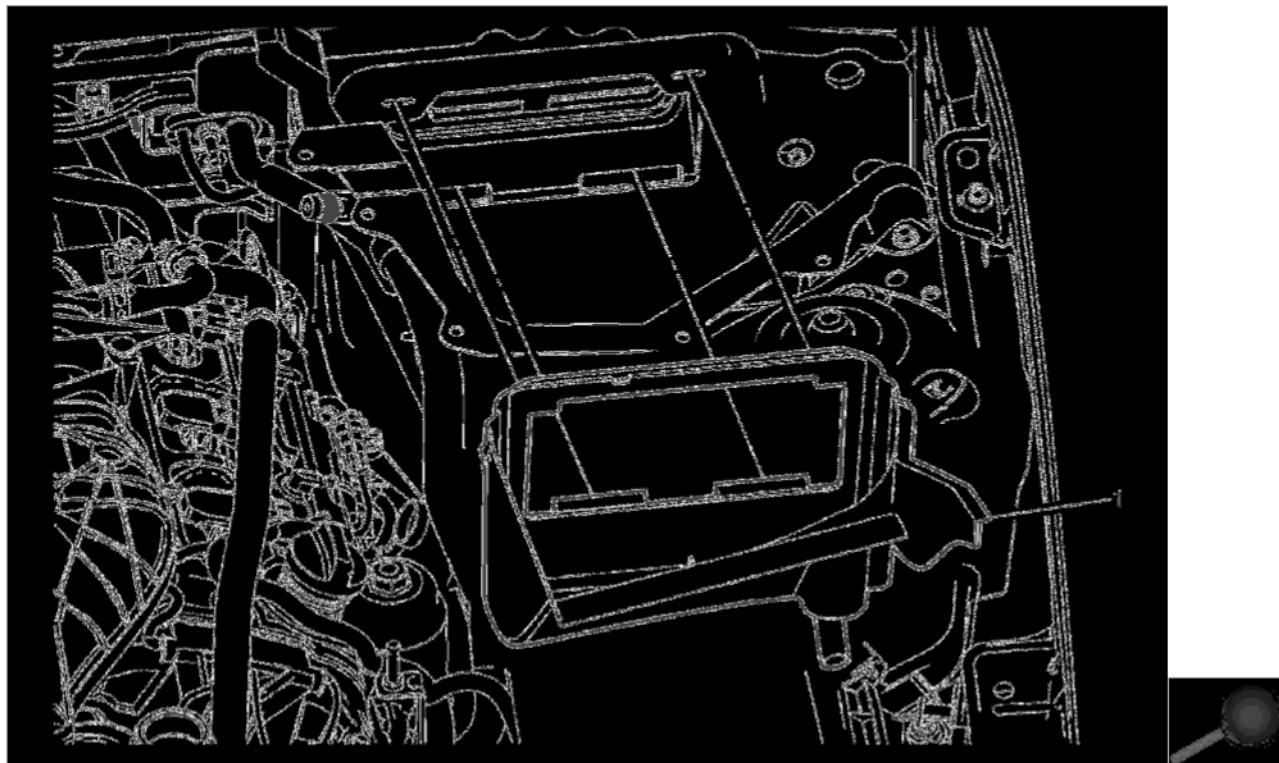
Air Inlet Screen Replacement



Air Inlet Screen Replacement

Callout	Component Name
Preliminary Procedure Remove the steel plenum air inlet grille panel. Refer to Air Inlet Grille Panel Replacement .	
1	Air Inlet Housing Cover Procedure Release the retaining tabs from the air inlet housing.
2	Air Inlet Screen

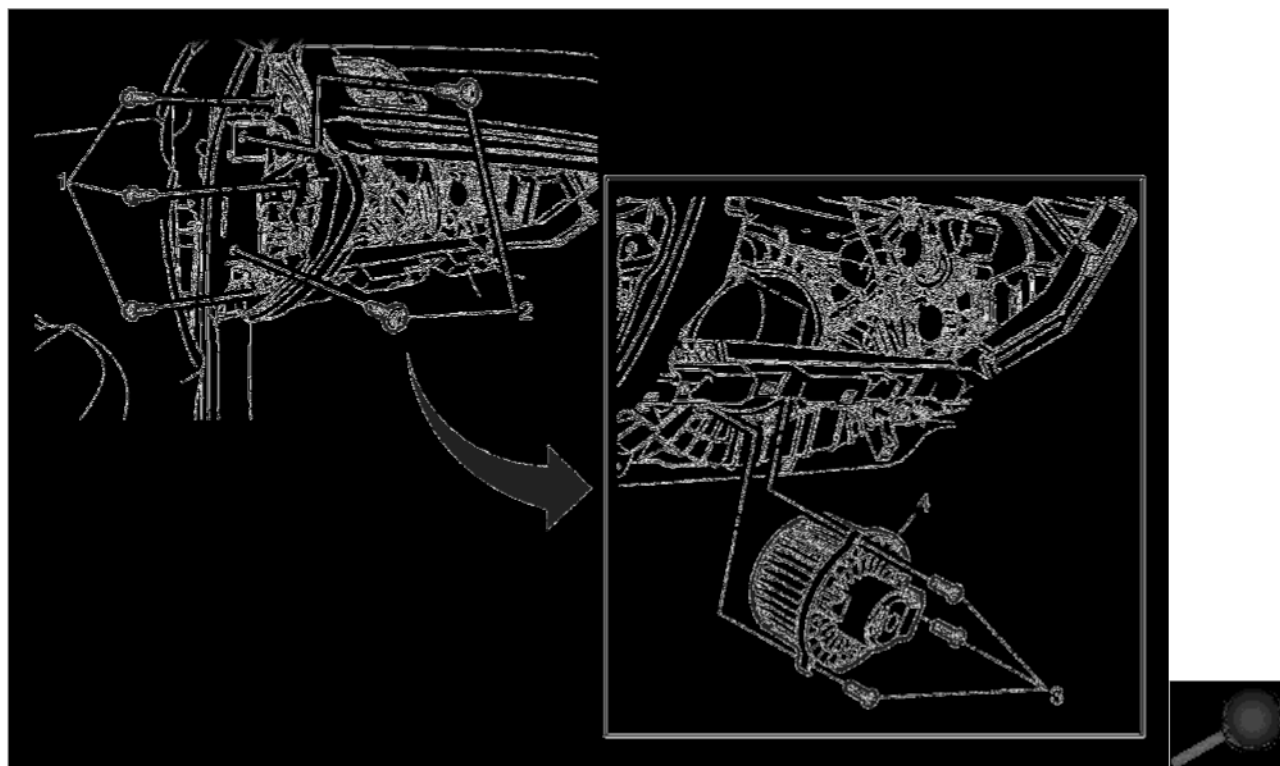
Air Inlet Housing Replacement



Air Inlet Housing Replacement

Callout	Component Name
Preliminary Procedure Remove the air inlet screen. Refer to Air Inlet Screen Replacement .	
1	Air Inlet Housing Procedure Release the retaining clips from the plenum.

Blower Motor Replacement

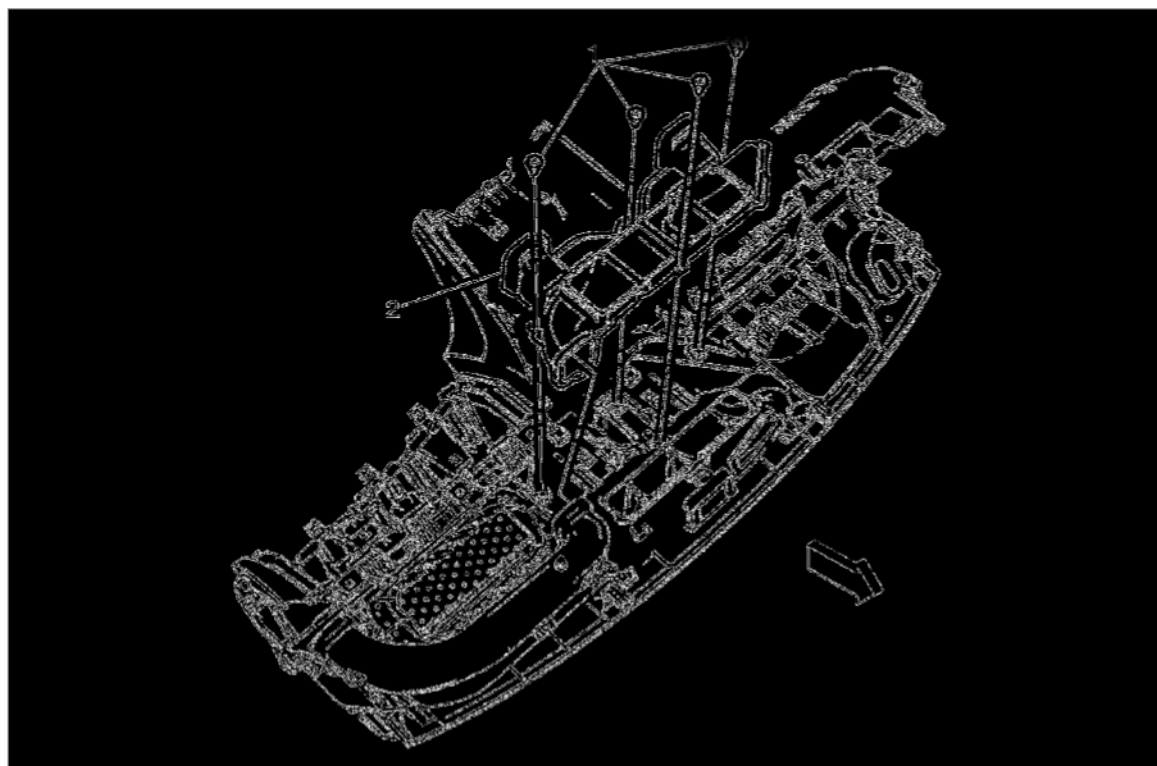


Blower Motor Replacement

Call out	Component Name
Preliminary Procedures 1. Remove the left instrument panel outer trim cover. Refer to Instrument Panel Outer Trim Cover Replacement. 2. Remove the left side floor front air outlet duct. Refer to Floor Front Air Outlet Duct Replacement - Left Side.	
1	Instrument Panel Fastener (Qty: 3) Caution: Refer to Fastener Caution . Tighten 2.5 N•m (22 lb in)
2	Instrument Panel Tie Bar Bolt (Qty: 2) Tighten 25 N•m (18 lb ft)
3	Blower Motor Bolt (Qty: 3) Tighten 1.5 N•m (13 lb in)
4	Blower Motor Assembly Procedures 1. Disconnect the blower motor electrical connector.

Call out	Component Name
	2. Maneuver the blower motor assembly down and out from behind the instrument panel while pull lightly outward on the instrument panel assembly.

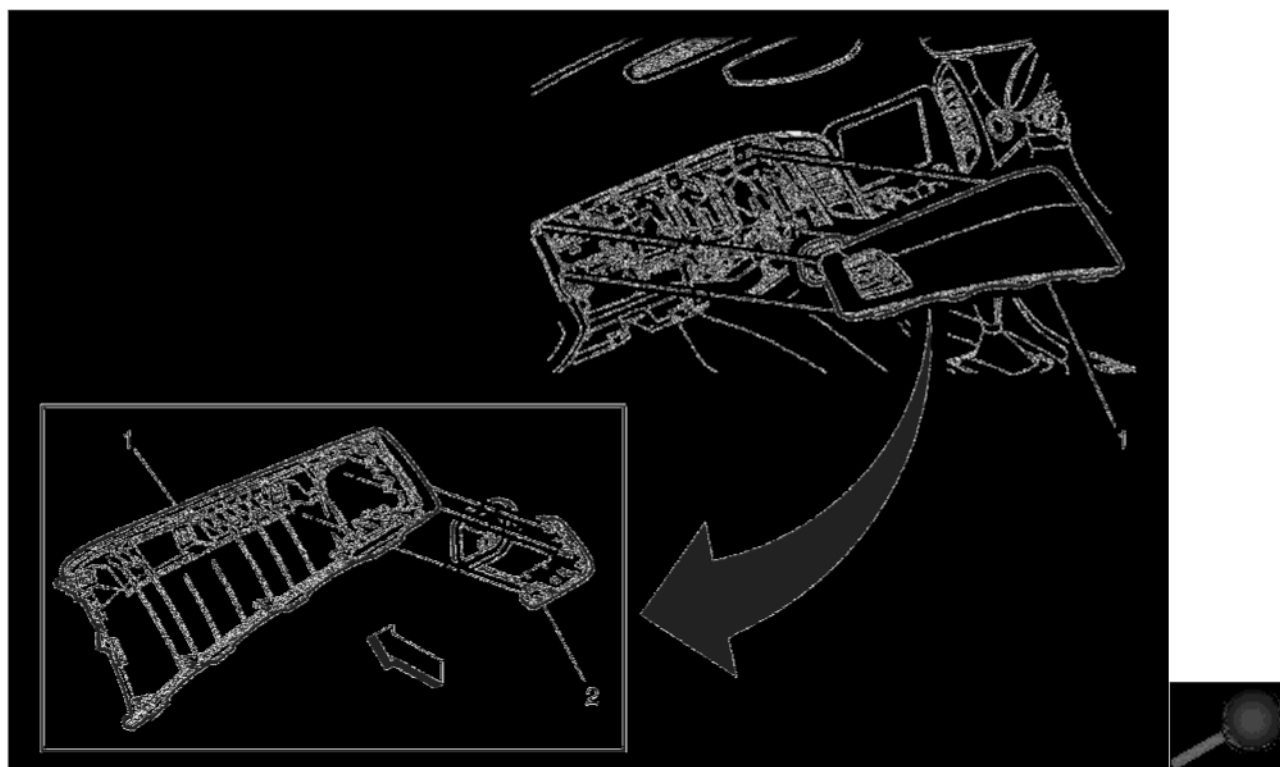
Air Distributor Duct Replacement



Air Distributor Duct Replacement

Callout	Component Name
Preliminary Procedure Remove the instrument panel assembly. Refer to Instrument Panel Assembly Replacement .	
1	Air Distributor Duct Fastener (Qty: 4) Caution: Refer to Fastener Caution . Tighten 2.0N•m (18 lb in)
2	Air Distributor Duct Procedure Remove the air distributor duct from the left side instrument panel outer air outlet duct.

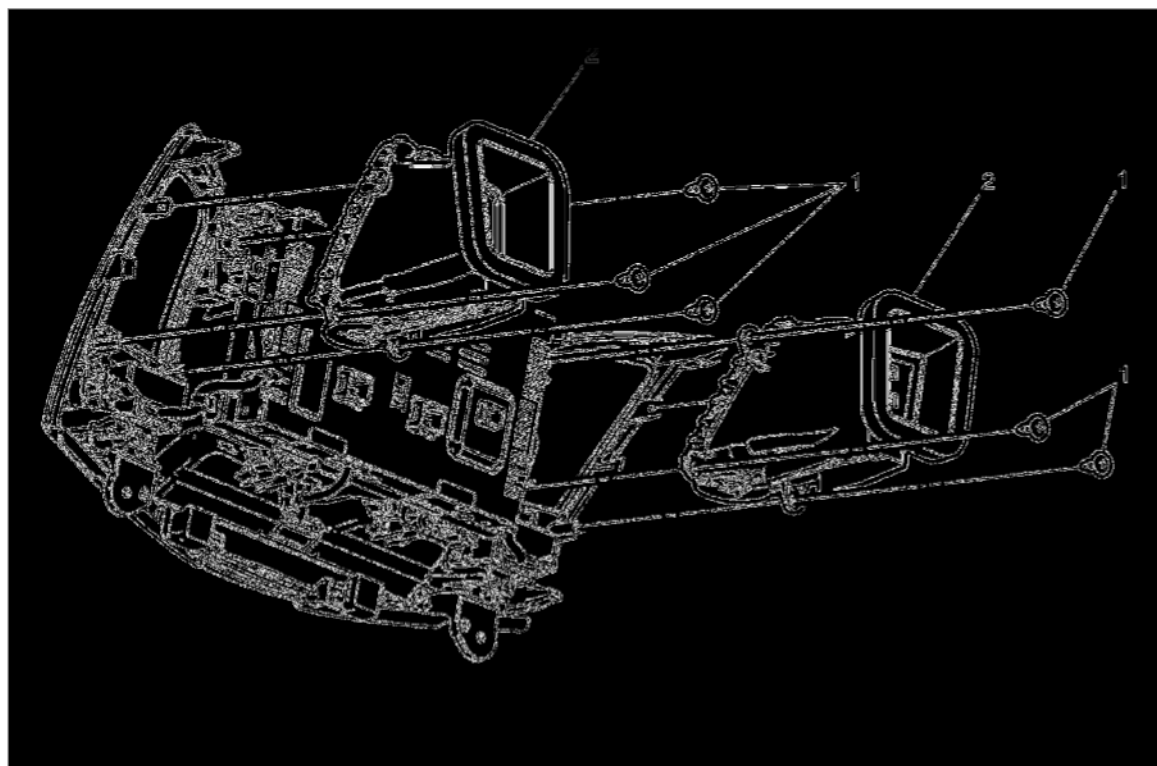
Instrument Panel Outer Air Outlet Replacement - Left Side



Instrument Panel Outer Air Outlet Replacement - Left Side

Callout	Component Name
1	Instrument Panel Upper Trim Panel - Left Side Refer to Instrument Panel Upper Trim Panel Replacement - Left Side .
2	Instrument Panel Outer Air Outlet - Left Side Procedure Use a flat bladed plastic trim tool to aid in the removal of the outer air outlet from the instrument panel upper trim panel.

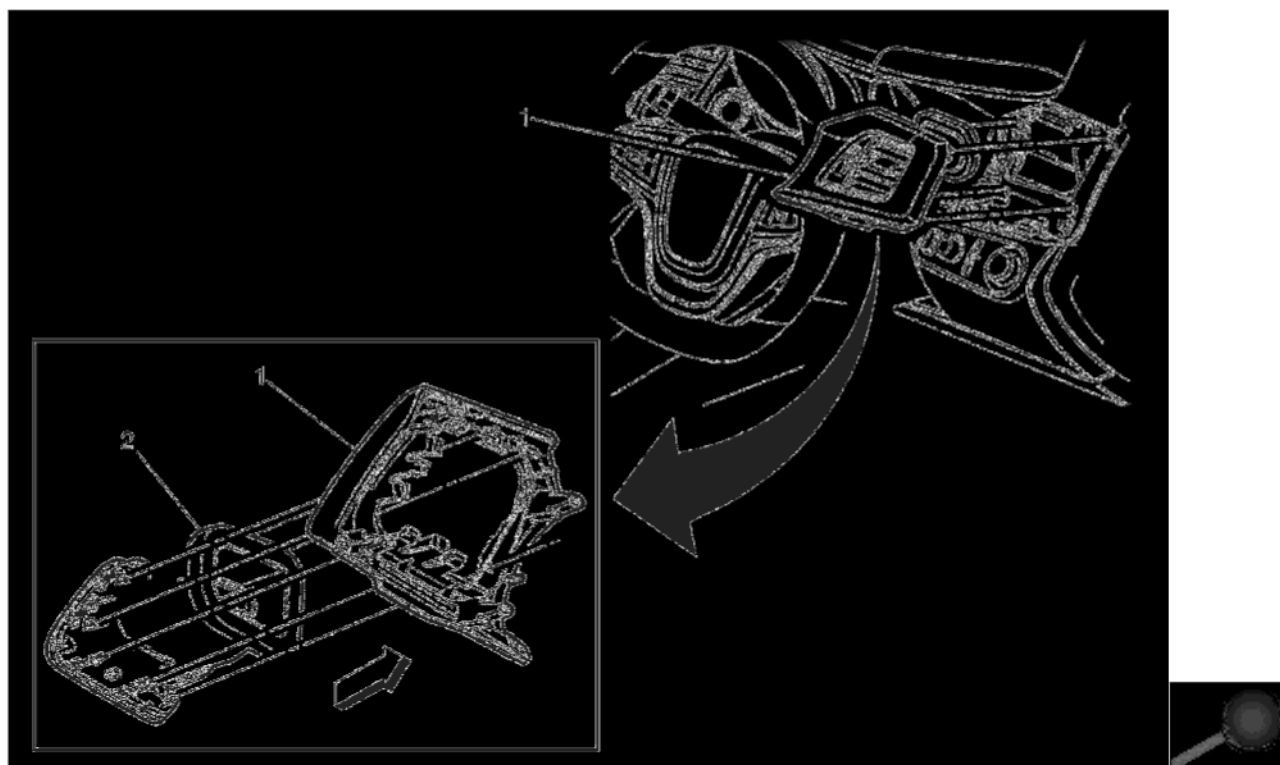
Instrument Panel Center Air Outlet Replacement



Instrument Panel Center Air Outlet Replacement

Callout	Component Name
Preliminary Procedure Remove the radio control assembly. Refer to Radio Control Assembly Replacement .	
1	Instrument Panel Center Air Outlet Bolt (Qty: 6) Caution: Refer to Fastener Caution . Tighten 1.5 N•m (13.3 lb in)
2	Instrument Panel Center Air Outlet Procedure Use a suitable tool to release the tabs securing the outlets to the radio control assembly.

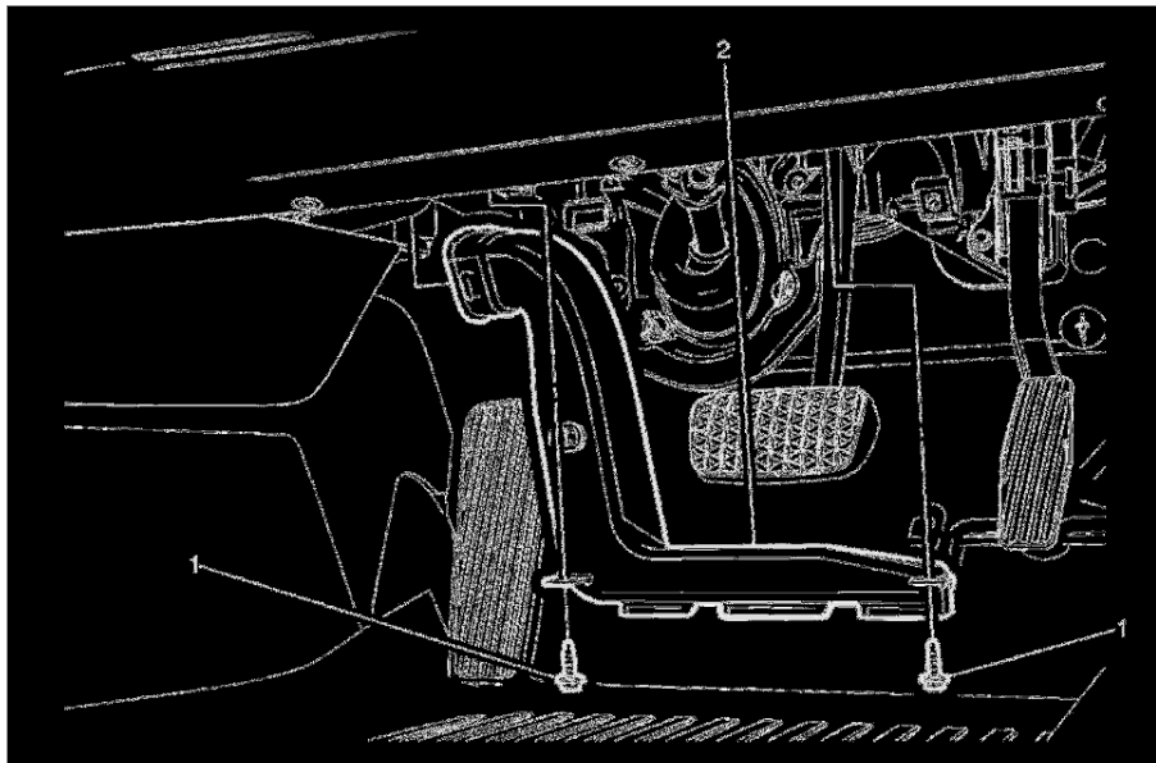
Instrument Panel Outer Air Outlet Replacement - Right Side



Instrument Panel Outer Air Outlet Replacement - Right Side

Callout	Component Name
1	Instrument Panel Upper Trim Panel - Right Side Refer to Instrument Panel Upper Trim Panel Replacement - Right Side .
2	Instrument Panel Outer Air Outlet - Right Side Procedure Use a flat bladed plastic trim tool to aid in the removal of the outer air outlet from the instrument panel upper trim panel.

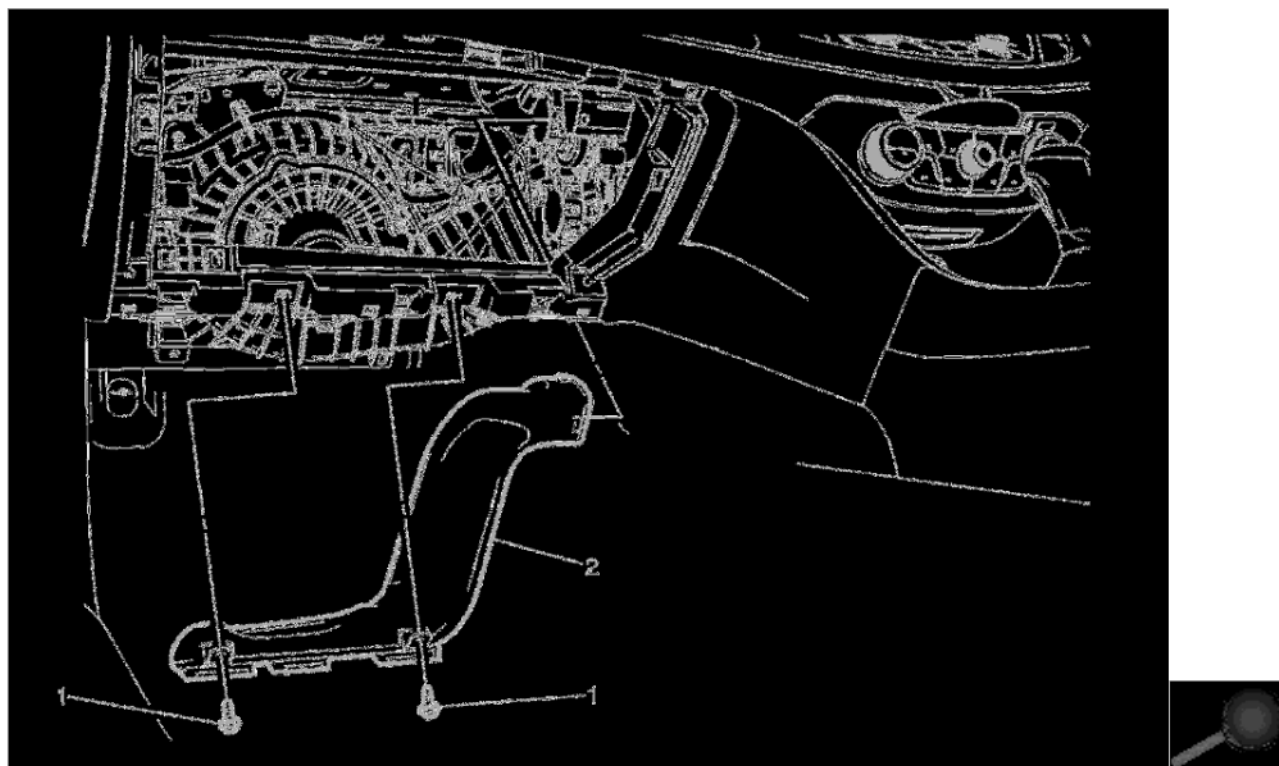
Floor Front Air Outlet Duct Replacement - Right Side



Floor Front Air Outlet Duct Replacement - Right Side

Callout	Component Name
Preliminary Procedure Remove the right side instrument panel lower trim panel insulator. Refer to Instrument Panel Lower Trim Panel Insulator Replacement - Right Side .	
1	Floor Front Air Outlet Duct Fastener (Qty: 2) Caution : Refer to Fastener Caution . Tighten 2.0N•m (18 lb in)
2	Floor Front Air Outlet Duct — Right Side Procedures 1. Disconnect the right lower duct air temperature sensor electrical connector. 2. Transfer the components as necessary.

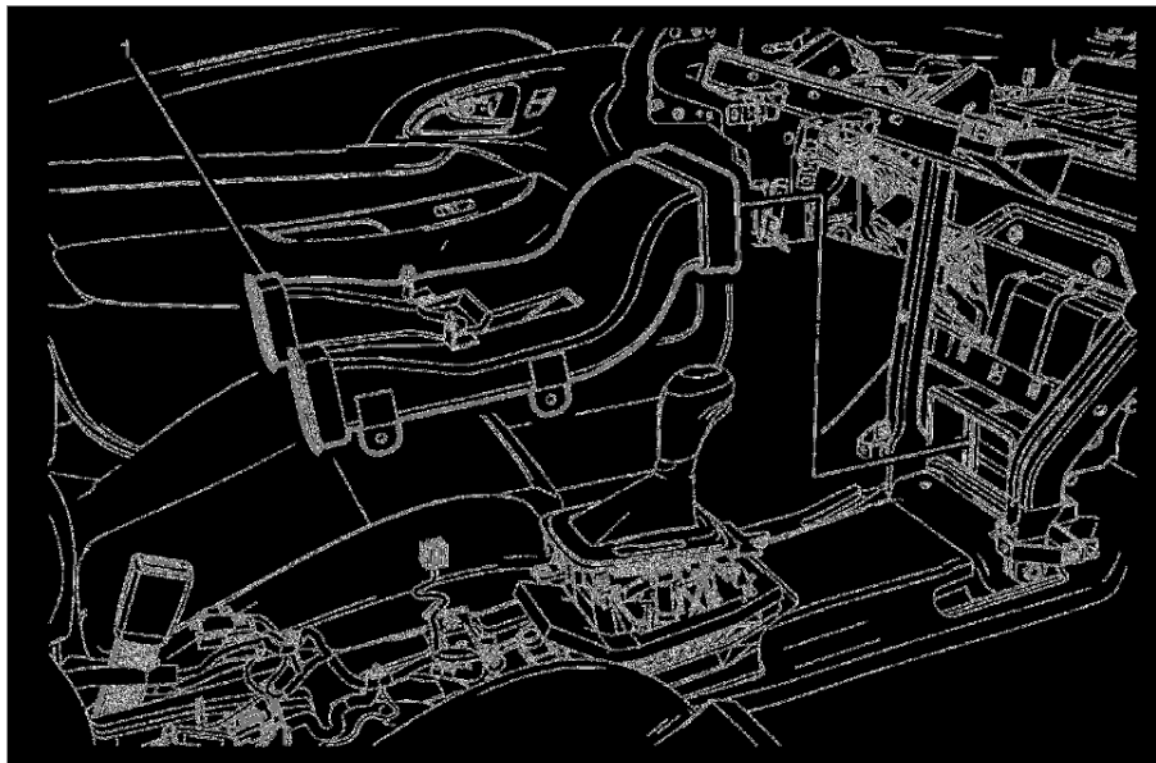
Floor Front Air Outlet Duct Replacement - Left Side



Floor Front Air Outlet Duct Replacement - Left Side

Callout	Component Name
Preliminary Procedure Remove the instrument panel compartment door opening frame. Refer to Instrument Panel Compartment Door Opening Frame Replacement .	
1	Floor Front Air Outlet Duct Fastener (Qty: 2) Caution: Refer to Fastener Caution . Tighten 2.0N•m (18 lb in)
2	Floor Front Air Outlet Duct — Left Side Procedures 1. Disconnect the left lower duct air temperature sensor electrical connector. 2. Transfer the components as necessary.

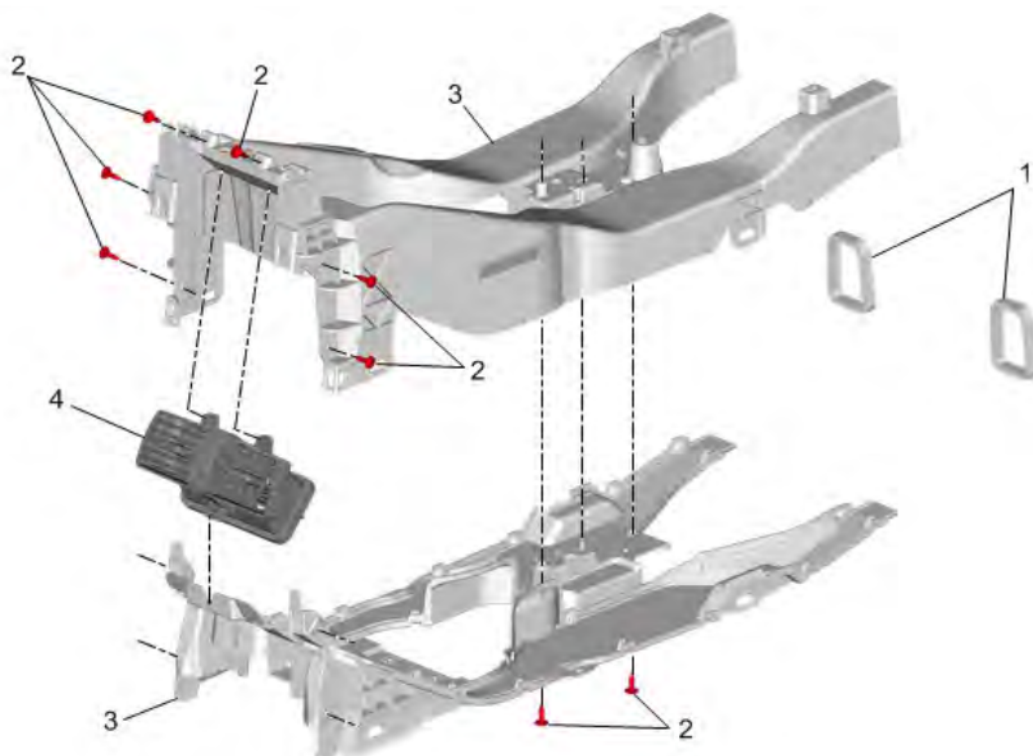
Front Floor Console Front Air Duct Replacement



Front Floor Console Front Air Duct Replacement

Callout	Component Name
Preliminary Procedure Remove the instrument panel assembly. Refer to Instrument Panel Assembly Replacement .	
1	Front Floor Console Front Air Duct Procedure Disconnect the wiring harness from the front floor console front air duct.

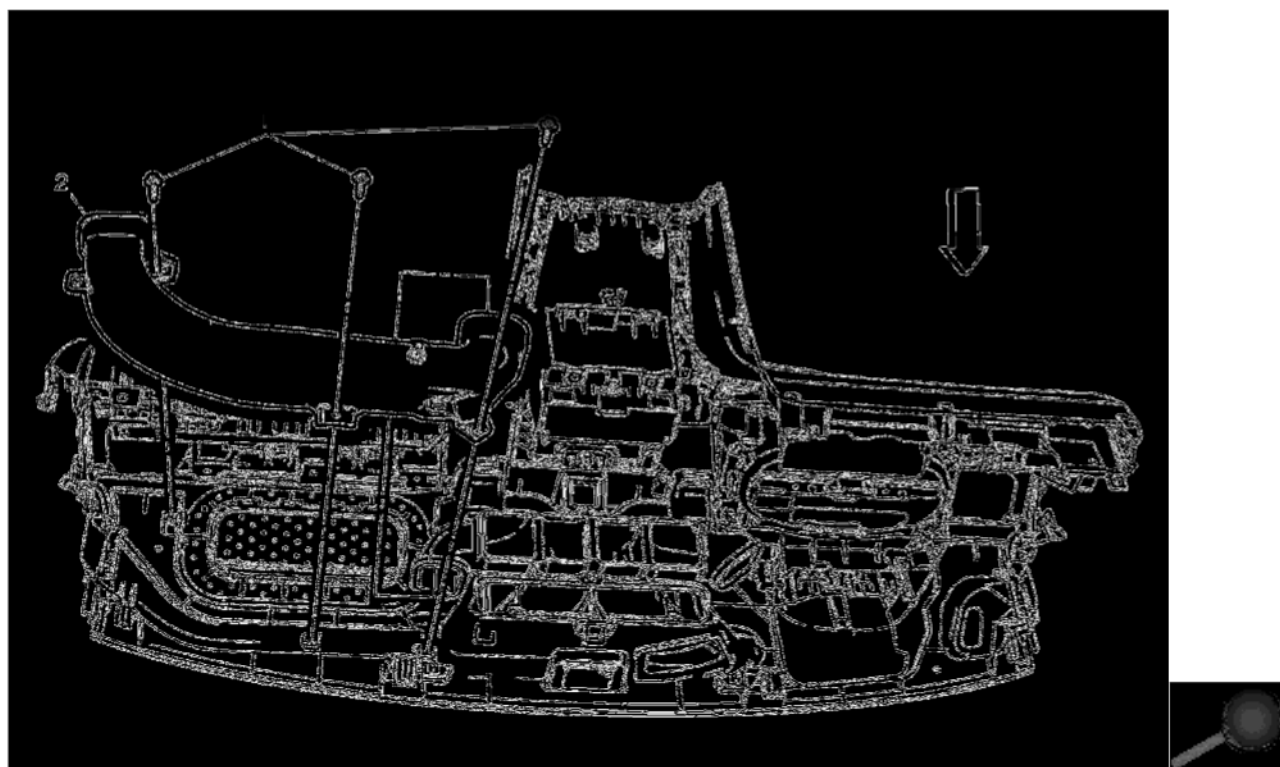
Front Floor Console Rear Air Outlet Replacement



Front Floor Console Rear Air Outlet Replacement

Callout	Component Name
Preliminary Procedure Remove the front floor console reinforcement. Refer to Front Floor Console Reinforcement Replacement .	
1	Insulation Tape (Qty: 2) Procedure Install new insulation tape when installing the front floor console reinforcement.
2	Floor Panel Reinforcement Bolt (Qty: 8) Caution: Refer to Fastener Caution . Tighten 2 N•m (18 lb in)
3	Front Floor Console Reinforcement Procedure Use a flat bladed plastic trim tool in order to release the tabs securing the upper duct to the lower duct.
4	Front Floor Console Rear Air Outlet

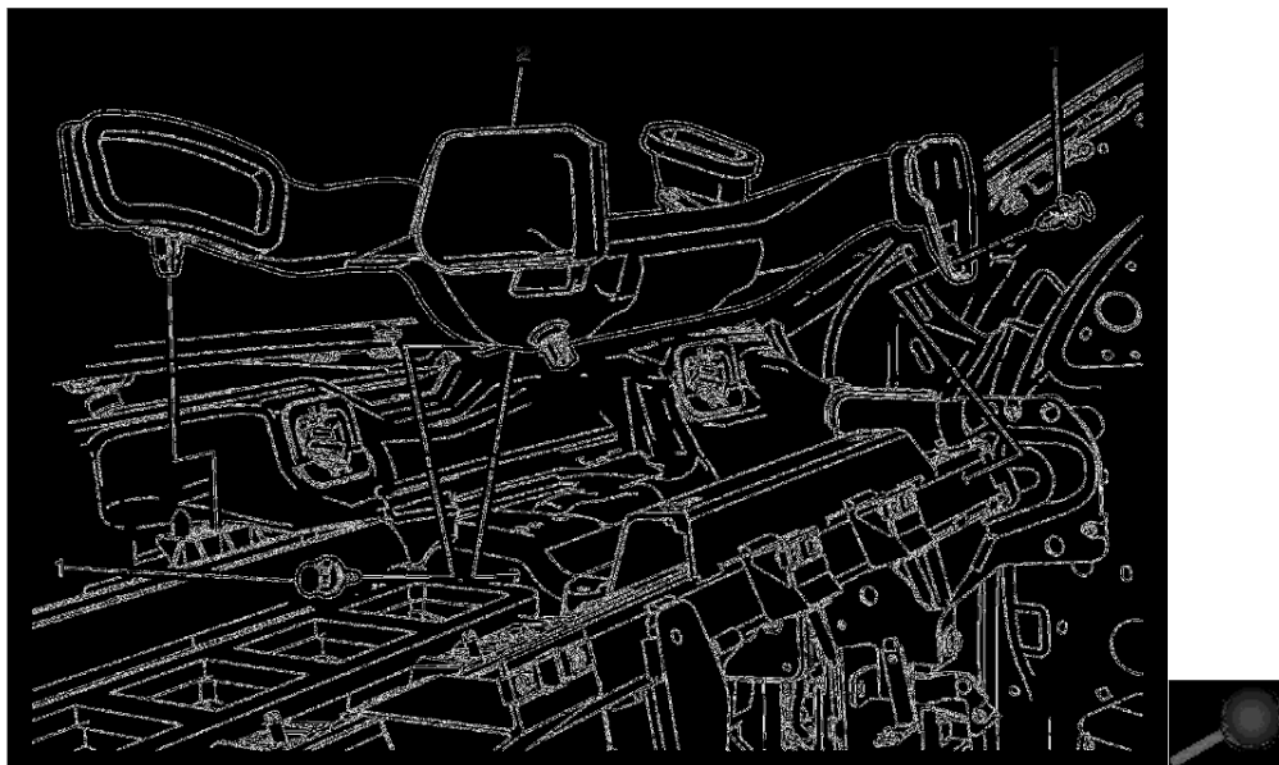
Instrument Panel Outer Air Outlet Duct Replacement - Left Side



Instrument Panel Outer Air Outlet Duct Replacement - Left Side

Callout	Component Name
Preliminary Procedure Remove the instrument panel assembly. Refer to Instrument Panel Assembly Replacement .	
1	Instrument Panel Outer Air Outlet Duct Fastener (Qty: 3) Caution: Refer to Fastener Caution . Tighten 2.0N•m (18 lb in)
2	Instrument Panel Outer Air Outlet Duct — left Side Procedures 1. Remove the left side instrument panel outer air outlet duct from the air distributor duct. 2. Transfer the left side upper duct air temperature sensor.

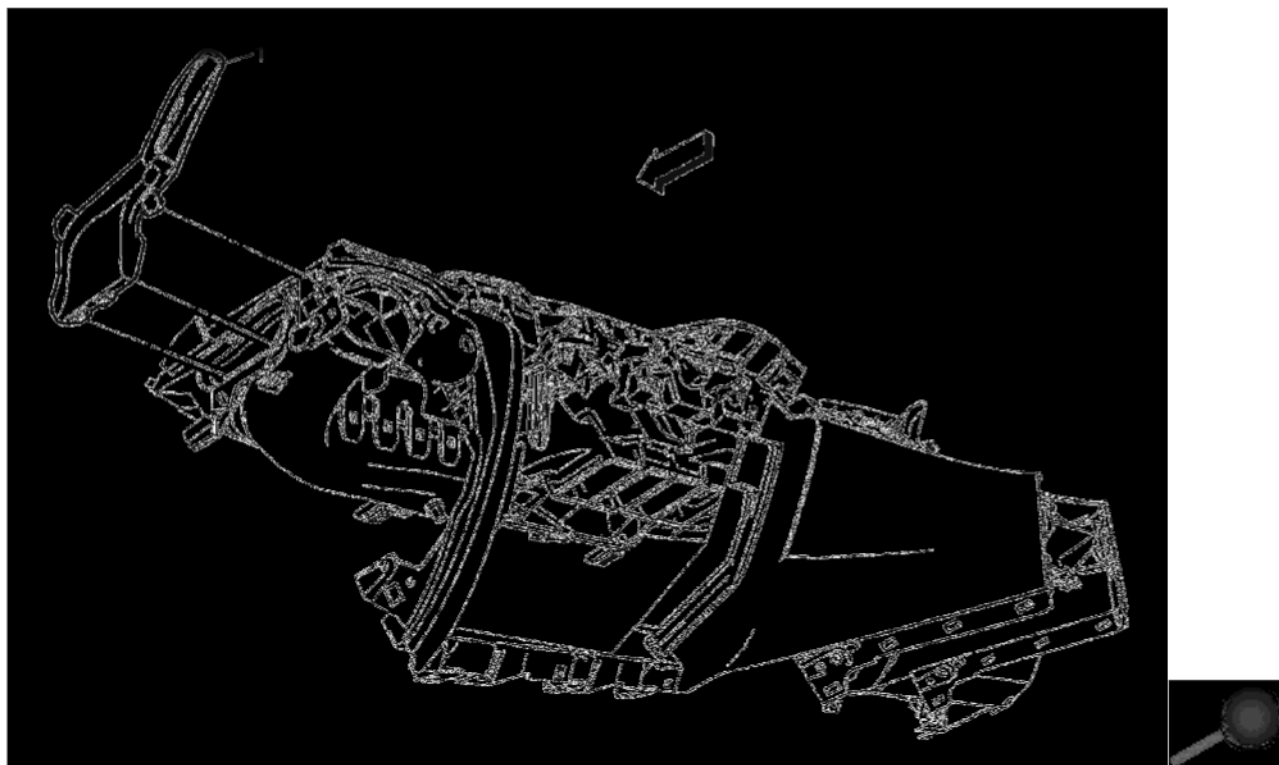
Instrument Panel Outer Air Outlet Duct Replacement - Right Side



Instrument Panel Outer Air Outlet Duct Replacement - Right Side

Callout	Component Name
Preliminary Procedure Remove the instrument panel assembly. Refer to Instrument Panel Assembly Replacement .	
1	Instrument Panel Outer Air Outlet Duct Retainer (Qty: 2)
2	Instrument Panel Outer Air Outlet Duct — Right Side Procedures 1. Un-clip the right side instrument panel outer air outlet duct to remove. 2. Transfer the right upper duct air temperature sensor.

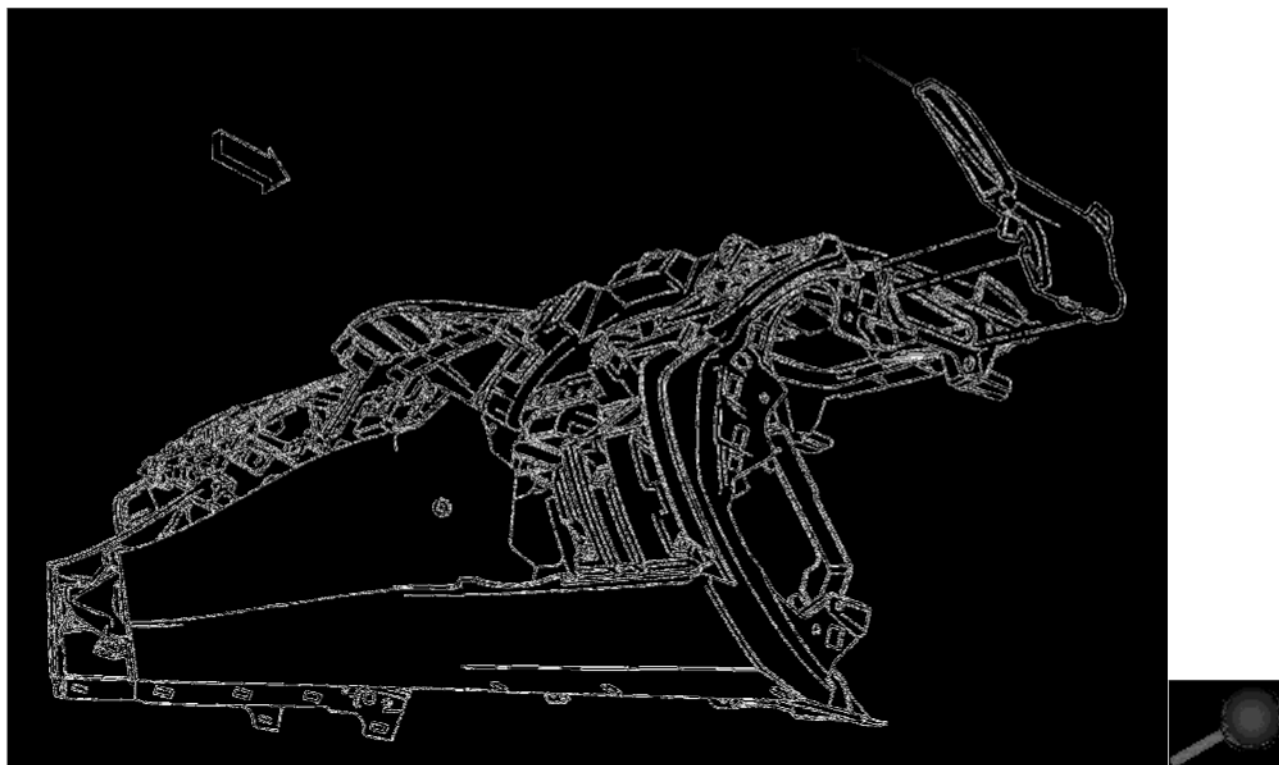
Side Window Defogger Outlet Outer Duct Replacement - Left Side



Side Window Defogger Outlet Outer Duct Replacement - Left Side

Callout	Component Name
Preliminary Procedure Remove the left side windshield garnish molding. Refer to Windshield Garnish Molding Replacement .	
1	Side Window Defogger Outlet Outer Duct - Left Side

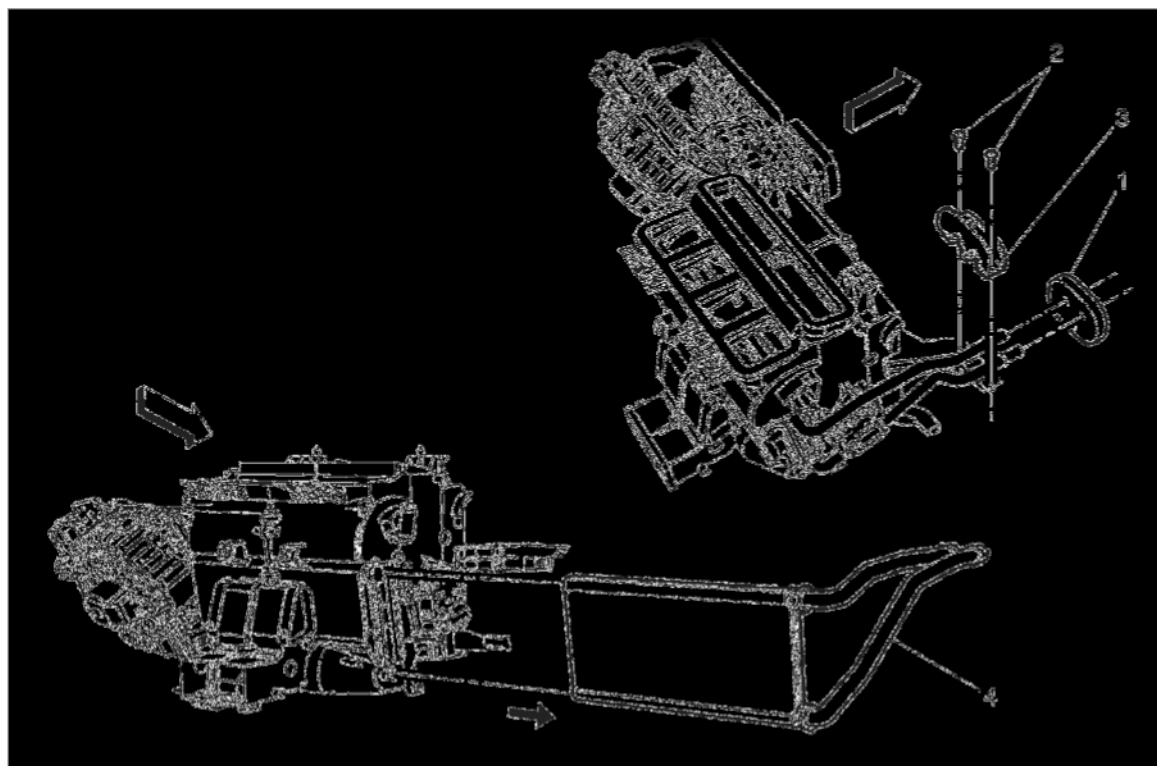
Side Window Defogger Outlet Outer Duct Replacement - Right Side



Side Window Defogger Outlet Outer Duct Replacement - Right Side

Callout	Component Name
Preliminary Procedure Remove the right side windshield garnish molding. Refer to Windshield Garnish Molding Replacement .	
1	Side Window Defogger Outlet Outer Duct - Right Side

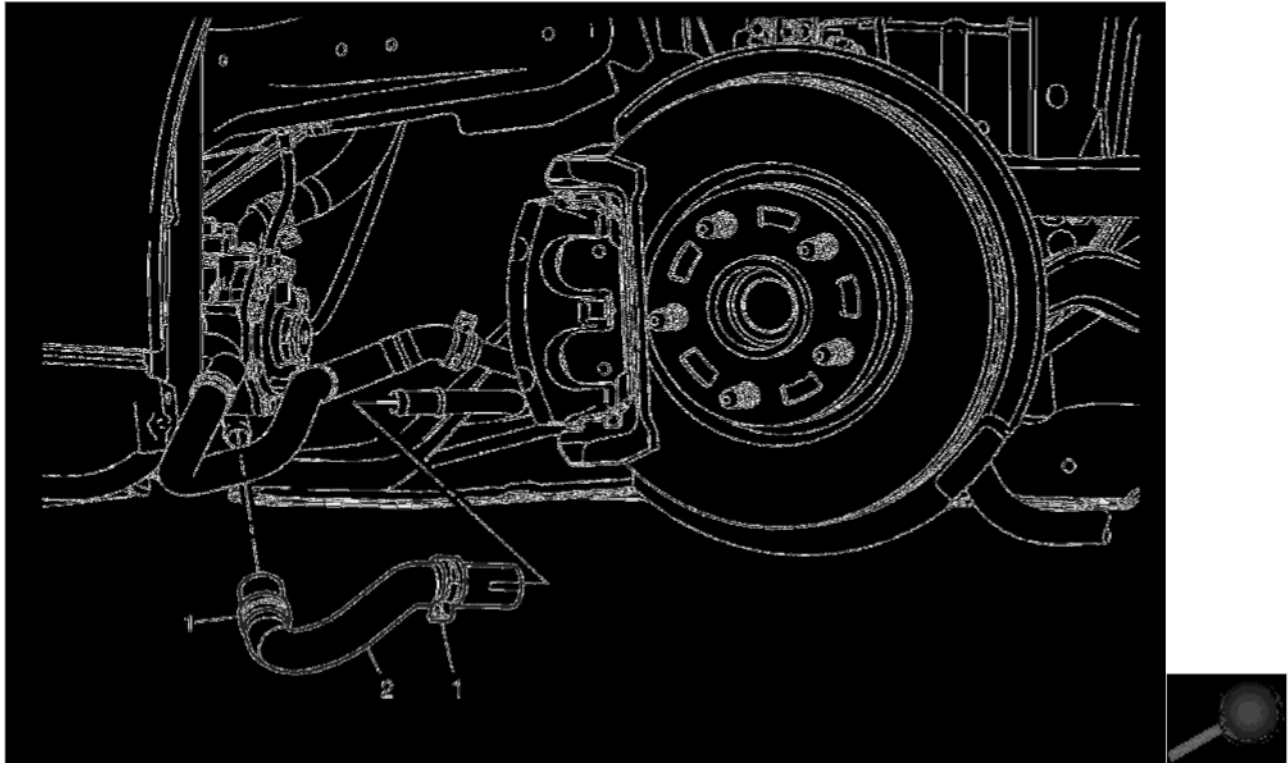
Heater Core Replacement



Heater Core Replacement

Callout	Component Name
Preliminary Procedure Remove the Heater and Air Conditioning Evaporator and Blower Module. Refer to Heater and Air Conditioning Evaporator and Blower Module Removal and Installation .	
1	Heater Core Pipe Seal
2	Heater Core Pipe Bracket Fastener (Qty: 2) Caution: Refer to Fastener Caution .
3	Heater Core Pipe Bracket
4	Heater Core

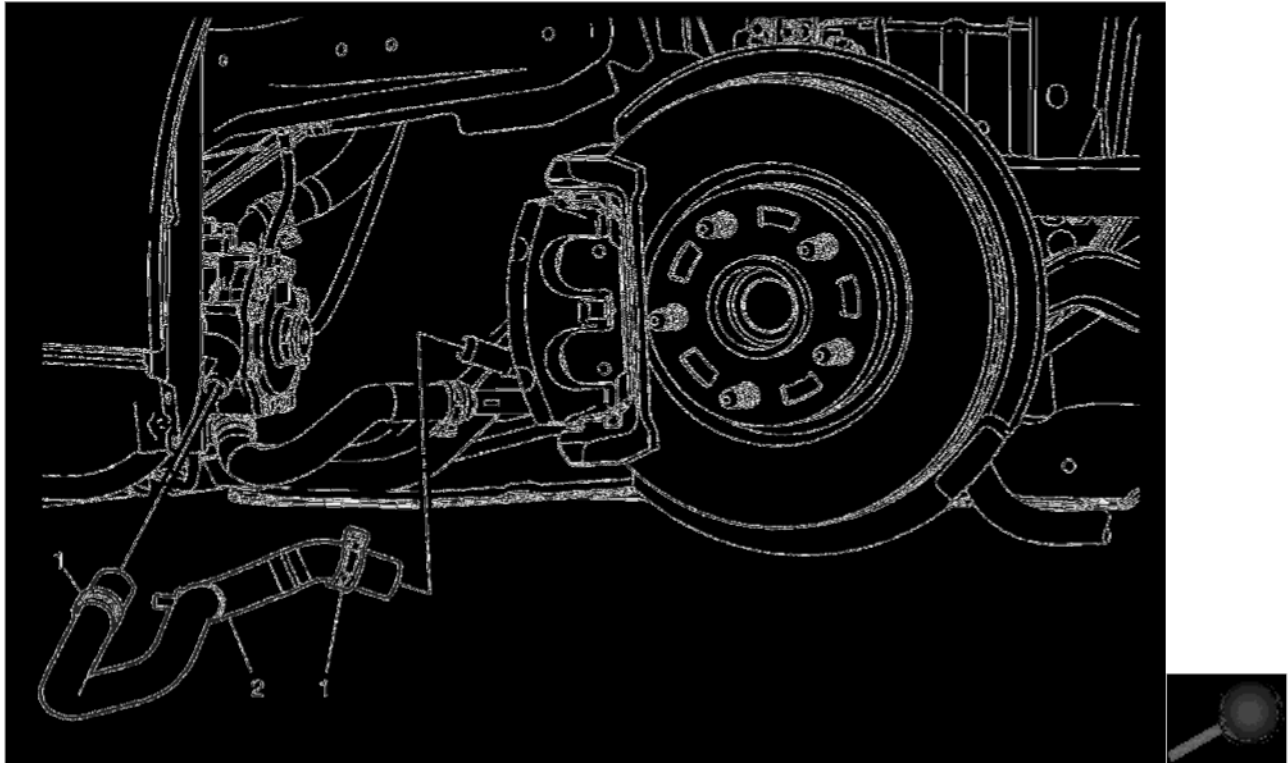
Fuel Heater Inlet Hose Replacement (LWR)



Fuel Heater Inlet Hose Replacement

Callout	Component Name
Warning: Refer to Radiator Cap Removal Warning. Warning: Refer to Safety Glasses Warning. Preliminary Procedures 1. Drain the cooling system. Refer to Cooling System Draining and Filling. 2. Remove the front wheelhouse liner. Refer to Front Wheelhouse Liner Replacement.	
1	Hose Clamps (Qty: 2) Note: The clamps are designed to stay attached to the hose at a predetermined position. Procedure Use BO-38185 Hose Clamp Pliers to unclip the heater hose. Special Tools BO-38185 Hose Clamp Pliers . For equivalent regional tools, refer to Special Tools.
2	Fuel Heater Inlet Hose

Fuel Heater Outlet Hose Replacement (LWR)



Fuel Heater Outlet Hose Replacement

Callout	Component Name
Warning: Refer to Radiator Cap Removal Warning. Warning: Wear safety glasses in order to avoid eye damage. Preliminary Procedures 1. Drain the cooling system. Refer to Cooling System Draining and Filling. 2. Remove the front wheelhouse liner. Refer to Front Wheelhouse Liner Replacement. Special Tools J-38185 Hose Clamp Pliers . For equivalent regional tools, refer to Special Tools.	
1	Hose Clamp (Qty,2) Procedure Use J-38185 Hose Clamp Pliers to unclip the heater hose. Note: The clamp is attached to the hose at a predetermined position.
2	Fuel Heater Outlet Hose Note: Unclip the hose before removing.

Fuel Heater Inlet and Outlet Pipe Replacement

Special Tools

BO-38185 Hose Clamp Pliers

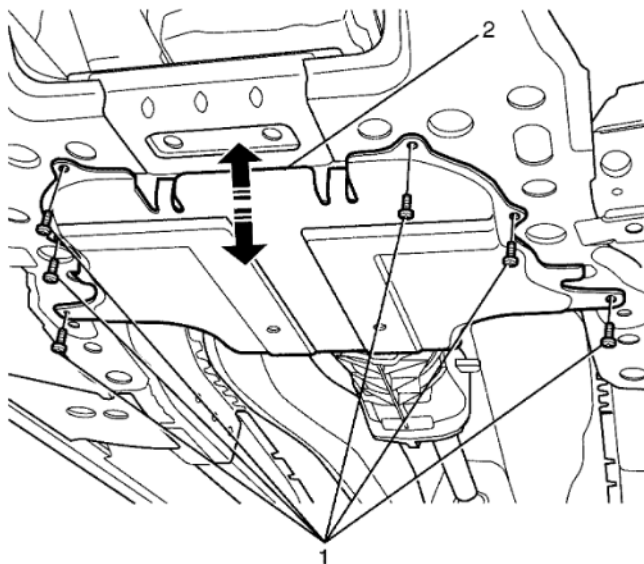
For equivalent regional tools, refer to [Special Tools](#).

Removal Procedure

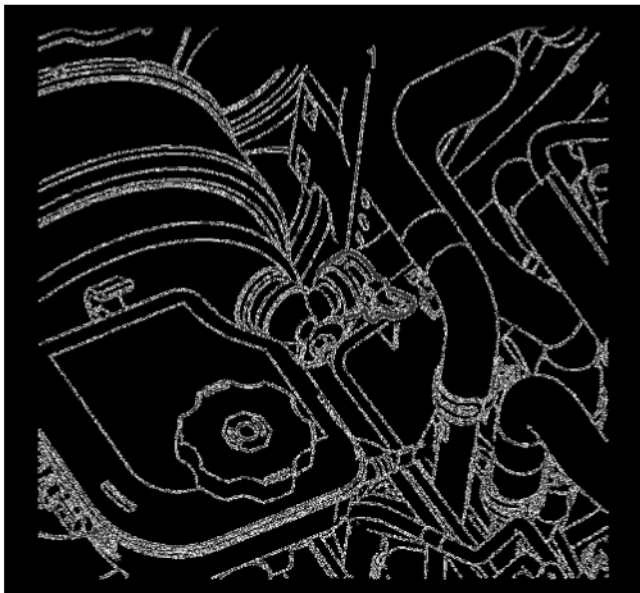
Warning: Refer to [Radiator Cap Removal Warning](#).

Warning: Refer to [Safety Glasses Warning](#).

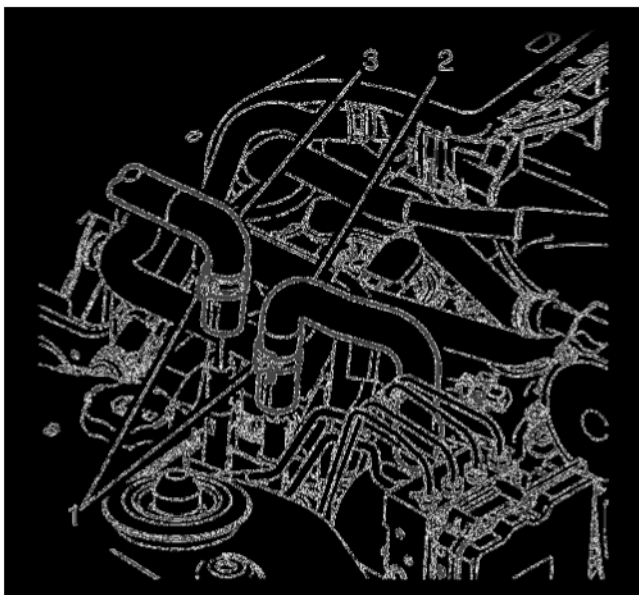
1. Remove the engine cover. Refer to [Intake Manifold Sight Shield Replacement](#).
2. Remove the front wheelhouse liner. Refer to [Front Wheelhouse Liner Replacement](#).
3. Drain the cooling system. Refer to [Cooling System Draining and Filling](#).



4. Remove the oil pan shield (2). Refer to [Oil Pan Shield Replacement](#).

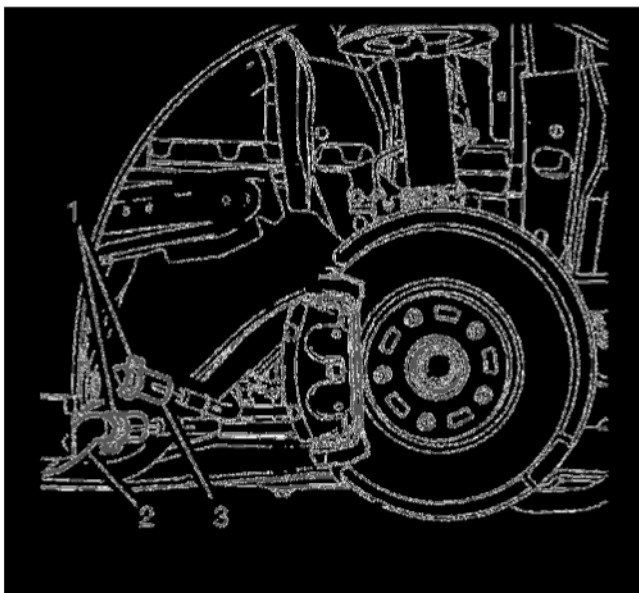


5. Disconnect brake booster hose (1) and reposition to the side.

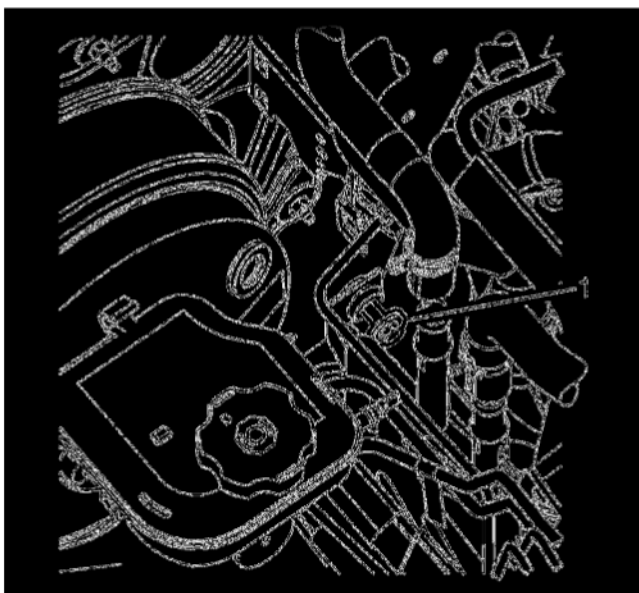


Note: Hose and clamps are a matched set. If these come apart or there is a requirement to replace either item, they come as an assembly.

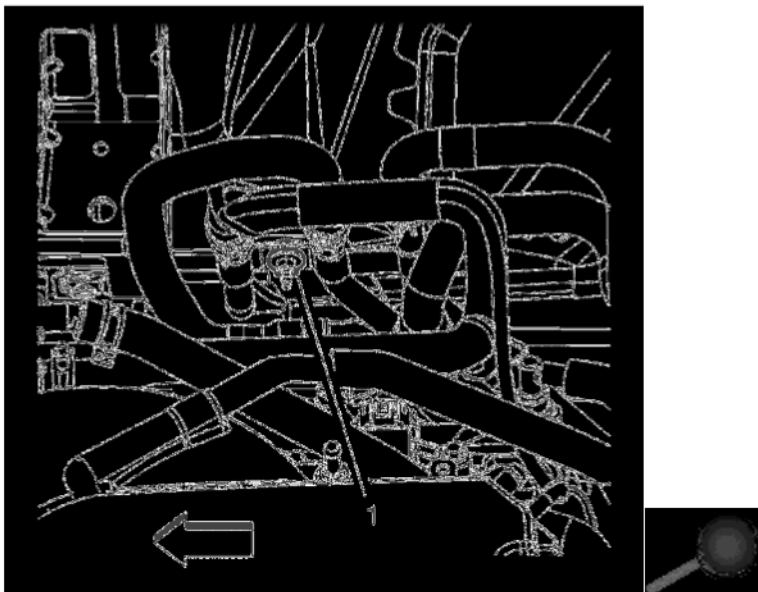
6. Unclip the hose clamps (1) using *BO-38185* Hose Clamp Pliers.
7. Disconnect fuel heater inlet (2) and outlet hoses (3).



8. Unclip the hose clamps (1) using *BO-38185* Hose Clamp Pliers.
9. Disconnect fuel heater inlet (2) and fuel outlet hoses (3).



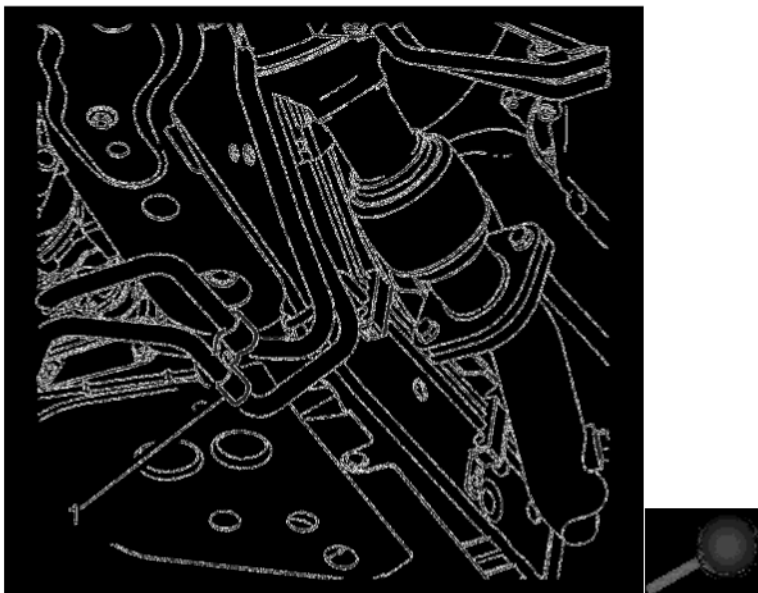
10. Remove the fuel heater pipe bolt (1).



11. Remove the fuel heater pipe nut (1).

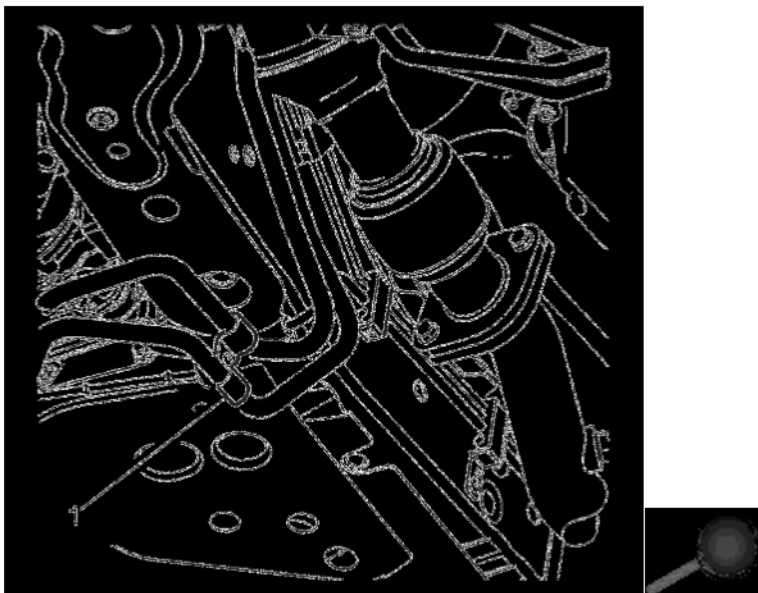


12. Remove the fuel heater pipe bolt (1).



13. Remove the fuel heater inlet and outlet pipe (1).

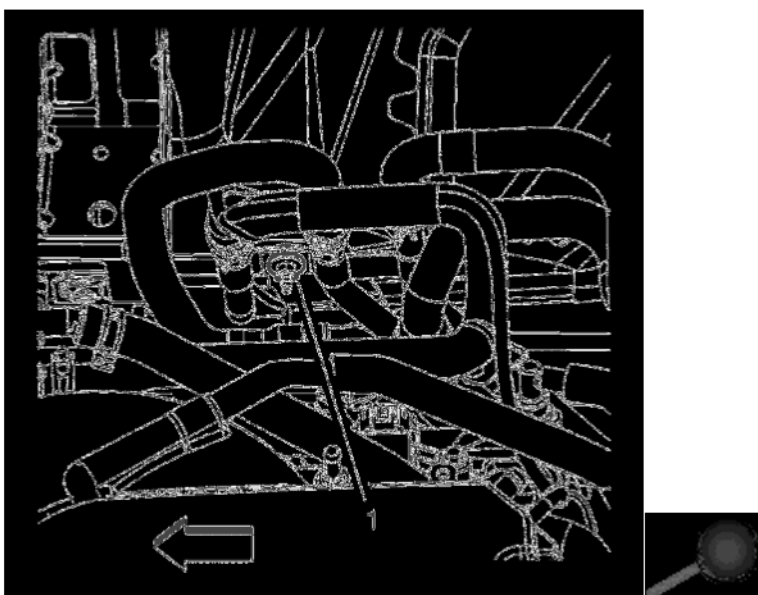
Installation Procedure



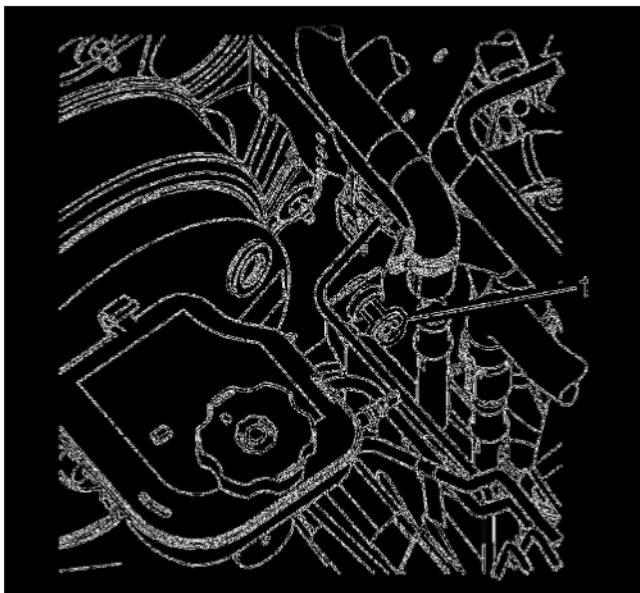
1. Install the fuel heater inlet and outlet pipe (1).



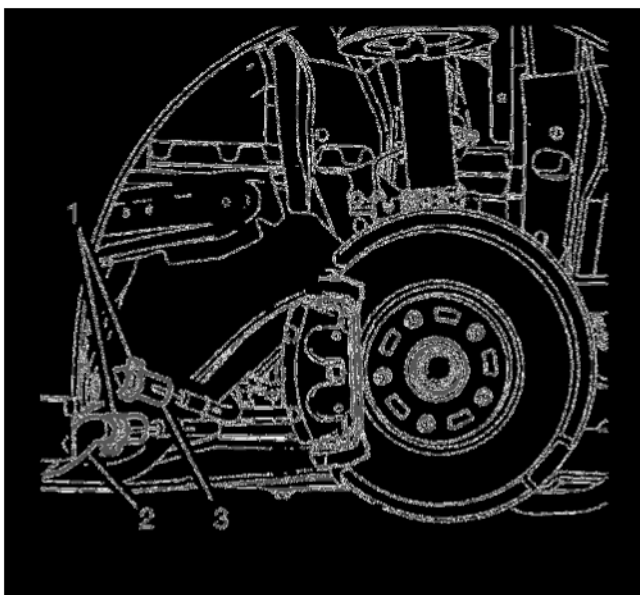
2. Install the fuel heater pipe bolt (1) and tighten to **6 N·m (53 lb in)**.



3. Install the fuel heater pipe nut (1) and tighten to **12 N·m (9 lb ft)**.

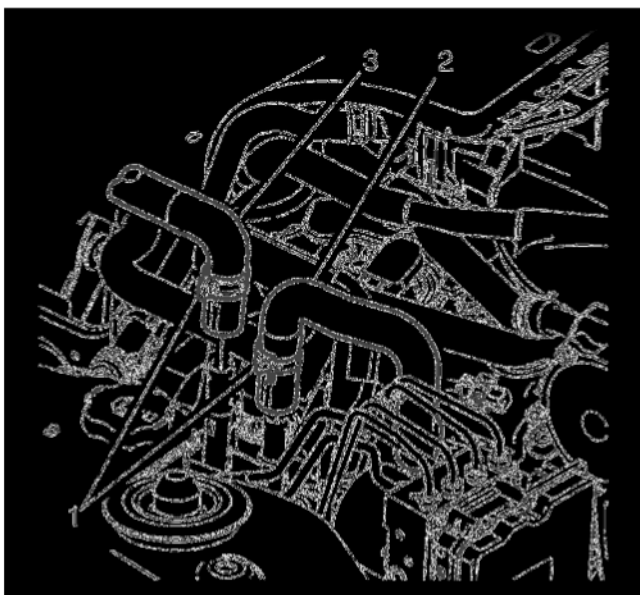


4. Install the fuel heater pipe bolt (1) and tighten to **6 N•m(53 lb In)**.



5. Applying pressure to the hose clamps (1) using *BO-38185* Hose Clamp Pliers.

6. Connect fuel heater inlet (2) and outlet hoses (3).



7. Applying pressure to the hose clamps (1) using *BO-38185* Hose Clamp Pliers.

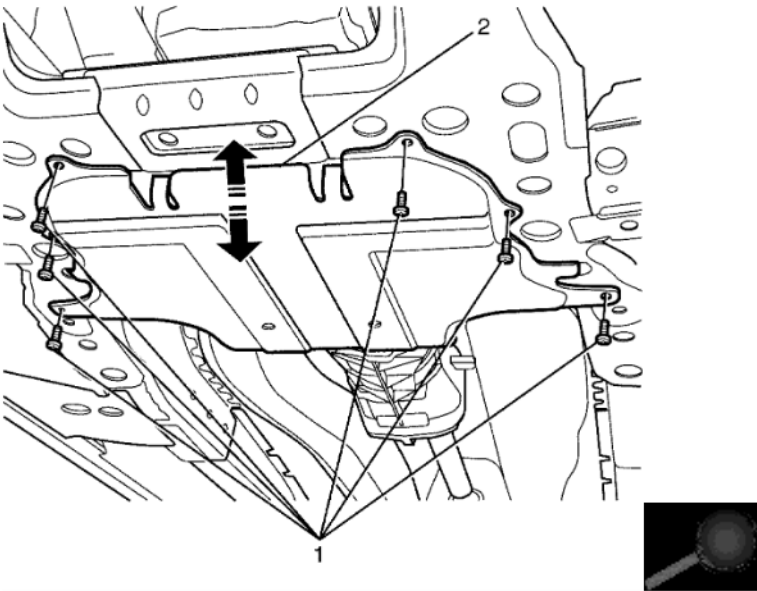
8. Connect fuel heater inlet (2) and outlet hoses (3).



9. Connect brake booster hose (1).

10. Fill the cooling system. Refer to [Cooling System Draining and Filling](#).

11. Inspect for leaks. Repair as required.

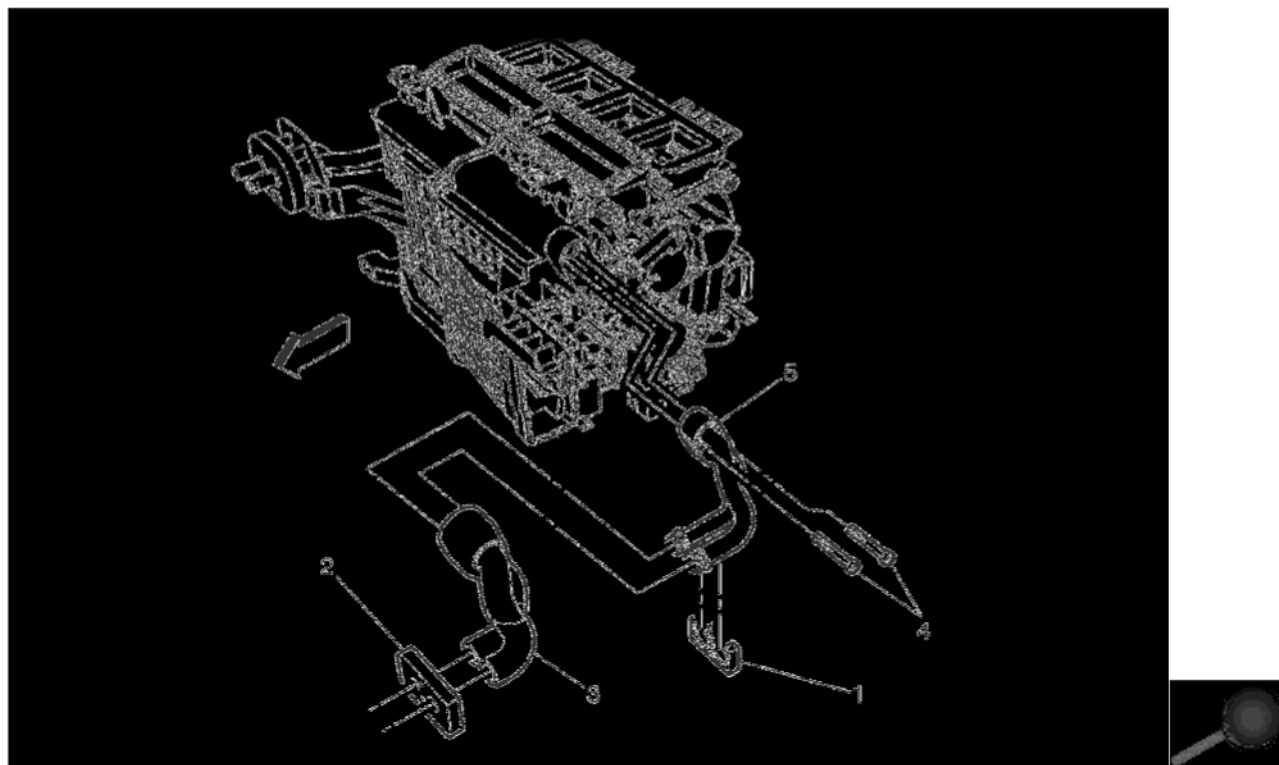


12. Install the oil pan shield (2). Refer to [Oil Pan Shield Replacement](#).

13. Install the front wheelhouse liner. Refer to [Front Wheelhouse Liner Replacement](#).

14. Install the engine cover. Refer to [Intake Manifold Sight Shield Replacement](#).

Auxiliary Air Conditioning Evaporator Inlet Tube Replacement



Auxiliary Air Conditioning Evaporator Inlet Tube Replacement

Call out	Component Name
Preliminary Procedure Remove the blower assembly. Refer to Blower Assembly Replacement .	
1	Air Conditioning Evaporator Inlet Tube Bracket Backing Plate
2	Auxiliary Air Conditioning Evaporator Inlet Tube Seal
3	Auxiliary Air Conditioning Evaporator Inlet Tube Insulator Cover
4	Auxiliary Air Conditioning Evaporator Inlet Tube Bolt (Qty: 2) Caution: Refer to Fastener Caution . Tighten 3.5 N•m (31 lb in)
5	Auxiliary Air Conditioning Evaporator Inlet Tube Procedures 1. Remove and discard the sealing washers and replace with New. Refer to Air Conditioning System Seal Replacement. 2. Wrap the auxiliary air conditioning evaporator inlet tube with butyl.

Fastener Tightening Specifications

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Air Conditioning Compressor Bolt	22 N•m	16 lb ft
Air Conditioning Compressor Bracket Bolt	58 N•m	43 lb ft
Air Conditioning Compressor Hose Bolt at Compressor	22 N•m	16 lb ft
Air Conditioning Compressor Hose Bolt at Oil Pan	9 N•m	80 lb in
Air Conditioning Compressor Hose Nut at Condenser	22 N•m	16 lb ft
Air Conditioning Evaporator Thermal Expansion Valve Tube Nut at Air Conditioning Compressor Hose	22 N•m	16 lb ft
Air Conditioning Evaporator Thermal Expansion Valve Tube Nut at Condenser	22 N•m	16 lb ft
Air Conditioning Evaporator Thermal Expansion Valve Tube Nut at Evaporator Thermal Expansion Valve	22 N•m	16 lb ft
Air Conditioning Receiver and Dehydrator Plug	3 N•m	27 lb in
Air Conditioning Refrigerant High Pressure Valve	2.5 N•m	22 lb in
Air Conditioning Refrigerant Pressure Sensor	6 N•m	53 lb in
Air Conditioning Refrigerant Service Valve Core	2 N•m	18 lb in
Fuel Heater Pipe Bolt	6 N•m	53 lb in
Fuel Heater Pipe Nut	12 N•m	9 lb ft
Lower Air Conditioning Condenser Bolts	5 N•m	44 lb in
Transmission Fluid Cooler Pipe Nut	17 N•m	13 lb ft
Upper Air Conditioning Condenser Bolts	5 N•m	44 lb in

[2014 Holden VF Sedan](#) | [VF/WN - Sedan, Ute, Sportwagon, Caprice, Lumina, HSV Service Manual 5617662](#) | [HVAC](#) |
[Heating, Ventilation, and Air Conditioning](#) | [Specifications](#) | **Document ID: 2334237**

Adhesives, Fluids, Lubricants, and Sealers

Adhesives, Fluids, Lubricants, and Sealers

Application	Type of Material	GM Part Number
PAG Oil	Lubricant	12378526

Refrigerant System Specifications

Refrigerant System Capacities

Application	Specification	
	Metric	US English
PAG Oil - Refer to Adhesives, Fluids, Lubricants, and Sealers .		
Compressor Replacement		
The Denso Service Compressor is precharged with the total system specified amount of PAG Oil	Refer to Air Conditioning Compressor Oil Balancing	
Condenser Replacement	30–40 ml	1–1.4 oz
Filter Drier Replacement	15–20 ml	0.5–0.7 oz
Evaporator Replacement	30–40 ml	1–1.4 oz
Total System PAG Oil Capacity	100–140 ml	3.3–4.7 oz
HFC R-134a		
Refrigerant Charge	480 g	17 oz
If more than the specified amount of PAG oil was drained from a component, add the equal amount of oil drained.		

Special Tools

Illustration	Tool Number / Description
	J 37872 Universal Spanner Wrench
	B 38185 J 38185 Hose Clamp Pliers
	J 39400-A Halogen Leak Detector
	J 41447 R-134a A/C Tracer Dye - Box of 24
	J 41459 A/C Oil Injector

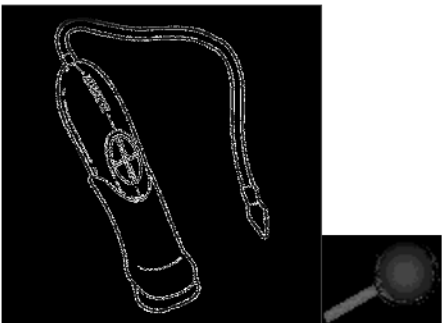
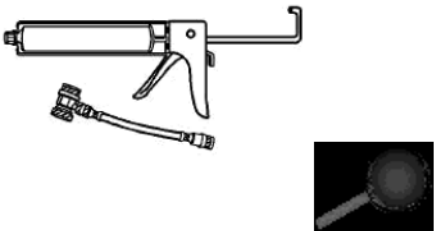
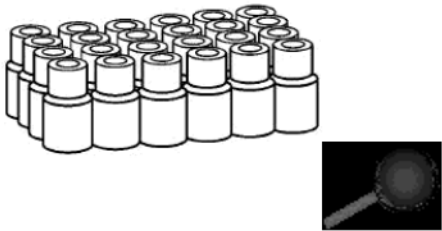
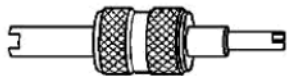
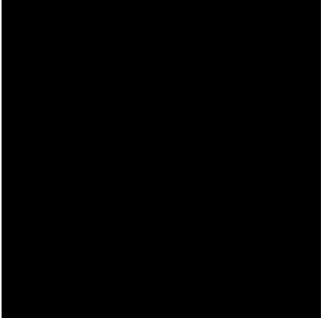
Illustration	Tool Number / Description
	J 42220 Universal 12V Leak Detection Lamp
	J 43872 Fluorescent Dye Cleaner
	J 46053 Electronic Leak Detector
	J 46297 A/C Dye Injector Kit
	J 46297-12 Replacement Dye Cartridges
	GE 39037 Charge Valve Octagon Socket

Illustration	Tool Number / Description
 	
 	GE 46246 Valve Core Tool