

SECTION 412-01: Climate Control
DESCRIPTION AND OPERATION

2014 F-150 Workshop Manual
Procedure revision date: 10/25/2013

Air Conditioning

The A/C refrigerant system is a clutch cycling TXV type. The system components are the following:

- A/C compressor
- A/C condenser core
- A/C evaporator core
- Connecting refrigerant lines

The refrigeration system operation is controlled by the following:

- TXV
- Evaporator temperature sensor
- A/C compressor pressure relief valve
- A/C pressure transducer

The refrigerant system incorporates an A/C compressor controlled by the PCM through an A/C clutch relay. The HVAC module sends an A/C request signal over the MS-CAN to the BCM which relays the request over the HS-CAN to the PCM. An evaporator temperature sensor is used to disengage the A/C compressor clutch when the evaporator core temperature is slightly above the freezing point of water.

The PCM commands the A/C clutch relay to turn on the A/C compressor clutch if all of the following conditions are met:

- The HVAC module is set to a mode which provides an A/C request to the PCM via the IPC.
- The evaporator temperature sensor is reading an acceptable temperature.
- The A/C pressure transducer is not reading a pressure above 2,841 kPa (412 psi) in the high side of the refrigerant system.
- The A/C pressure transducer is not reading a pressure that is too low (indicating a low charge condition) in the high-pressure side of the refrigerant system.
- The engine coolant temperature is not excessively high.
- The PCM has not detected a WOT condition.

An A/C compressor pressure relief valve is installed in the A/C compressor to protect the refrigerant system against excessively high refrigerant pressures as a redundant backup to the A/C pressure transducer.

A/C Compressor and Clutch Assembly

NOTE: Internal A/C compressor components are not serviced separately. The A/C compressor is serviced only as an assembly. The clutch disc and hub, A/C compressor pulley and bearing and the clutch field coil are serviceable.

The A/C compressor uses the following:

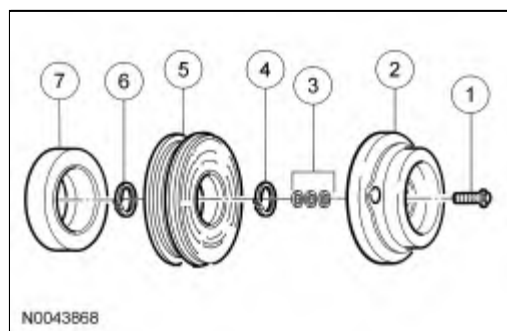
- A non-serviceable shaft seal
- A pressure relief valve installed in the rear of the compressor to protect the refrigerant system against

excessively high refrigerant pressures as a redundant backup to the A/C pressure transducer

- PAG oil or equivalent. This oil contains special additives required for the A/C compressor

Use the refrigerant oil adding procedure specified for this vehicle when installing a new A/C compressor. Refer to [Section 412-00](#).

A/C Compressor Clutch Assembly



Item	Part Number	Description
1	W711887	<u>A/C</u> clutch disc and hub bolt
2	19D786	<u>A/C</u> clutch disc and hub
3	19N689	<u>A/C</u> clutch disc and hub spacer
4	N805338	<u>A/C</u> compressor pulley snap ring
5	19D784	<u>A/C</u> compressor pulley
6	W711883	<u>A/C</u> clutch field coil snap ring
7	19D798	<u>A/C</u> clutch field coil

The magnetic A/C clutch has the following characteristics:

- The A/C clutch drives the compressor shaft
- When battery positive voltage (B+) is applied to the A/C clutch field coil, the clutch disc and hub assembly is drawn toward the A/C clutch pulley
- The magnetic force locks the clutch disc and hub assembly and the A/C clutch pulley together as one unit, causing the compressor shaft to rotate
- When B+ is removed from the A/C clutch field coil, springs in the clutch disc and hub assembly move the clutch disc away from the A/C clutch pulley

A/C Pressure Relief Valve

NOTE: If the A/C compressor is operating within limits and the A/C pressure relief valve is venting, or if the A/C pressure relief valve is leaking around the threads, replace the A/C pressure relief valve and O-ring seal. If the A/C pressure relief valve still vents after it is replaced, diagnose the refrigerant system for a restriction between the A/C compressor and A/C pressure transducer.

An A/C pressure relief valve is incorporated in the A/C compressor, as a redundant backup to the A/C pressure transducer, to prevent damage to the A/C compressor and other system components by relieving unusually high system discharge pressure buildups. Under normal conditions the A/C pressure relief valve will never vent. Only a failure of the A/C pressure transducer, a failure of the A/C clutch control system (clutch stuck on), overheating of the refrigerant system, or a restriction in the refrigerant system between the

A/C compressor and A/C pressure transducer will cause the A/C pressure relief valve to vent.

The A/C pressure relief valve is a separate component and can be replaced separately from the A/C compressor. It is necessary to recover the refrigerant before removing the A/C pressure relief valve.

A/C Condenser/Power Steering Combo Cooler

The A/C condenser/power steering combo cooler is an aluminum fin-and-tube design heat exchanger located in front of the vehicle radiator. It cools compressed refrigerant gas by allowing air to pass over fins and tubes to extract heat and by condensing gas to liquid refrigerant as it is cooled.

The receiver/drier is incorporated onto the LH side of the condenser core. The receiver/drier cartridge is a separate component and can be removed and installed separately from the condenser core.

The top portion of the condenser/power steering combo cooler is partitioned from the refrigerant system and is used for power steering fluid cooling.

Evaporator Core

The evaporator core is an aluminum plate/fin type and is located in the heater core and evaporator core housing. A mixture of refrigerant and oil enters the bottom of the evaporator core through the evaporator core inlet tube and continues out of the evaporator core through the evaporator core outlet tube as a vapor. During A/C operation, all airflow from the blower motor is cooled and dehumidified as it flows through the evaporator core fins.

TXV

The TXV is located between the evaporator core and the TXV manifold and tube assembly at the rear of the engine compartment. The TXV provides a restriction to the flow of refrigerant from the high-pressure side of the refrigerant system and separates the low-pressure and high-pressure sides of the refrigerant system. Refrigerant entering and exiting the evaporator core passes through the TXV through 2 separate flow paths. An internal temperature sensing bulb senses the temperature of the refrigerant flowing out of the evaporator core and adjusts an internal pin-type valve to meter the refrigerant flow into the evaporator core. The internal pin-type valve decreases the amount of refrigerant entering the evaporator core at lower temperatures and increases the amount of refrigerant entering the evaporator core at higher temperatures.

Desiccant Bag

NOTE: Installation of a new desiccant bag is not required when repairing the A/C system, except when there is physical evidence of contamination from a failed A/C compressor or damage to the receiver/drier desiccant bag. Damage to the receiver/drier desiccant bag includes physical damage to the receiver/drier desiccant bag or moisture contamination. Moisture contamination results only from a complete loss of refrigerant and equalization of the refrigerant system pressure with atmospheric pressure for a period longer than one hour. If even a slight amount of positive refrigerant pressure is present in the system before repairs are carried out, the receiver/drier desiccant bag should not be replaced.

The desiccant bag is integral to the A/C condenser/power steering combo cooler. It stores high-pressure liquid after it leaves the condenser core. The desiccant bag removes any moisture from the refrigerant. The

desiccant bag is a separate component and can be removed and installed separately from the A/C condenser/power steering combo cooler.

Evaporator Temperature Sensor

The evaporator temperature sensor contains a thermistor. The resistance of this thermistor varies by a specific amount based on the evaporator temperature. The HVAC module measures a voltage ratio between the reference voltage it supplies to the sensor and the sensor voltage to determine this resistance and the associated evaporator temperature.

The HVAC module maintains evaporator core temperature and prevents the evaporator core from icing. This is accomplished by switching the A/C request signal off when the evaporator temperature sensor reading falls below acceptable levels (slightly above the freezing point of water), and by switching the A/C request signal on when the evaporator temperature rises above acceptable levels.

The evaporator temperature sensor electrical connector is located outside of the heater core and evaporator core housing behind the glove compartment, with the sensor pigtail leading into the housing to the sensor probe which is inserted between the evaporator core fins.

The evaporator temperature sensor is not available as a separate component. To install a new evaporator temperature sensor, a new heater core and evaporator core housing must be installed.

A/C Pressure Transducer

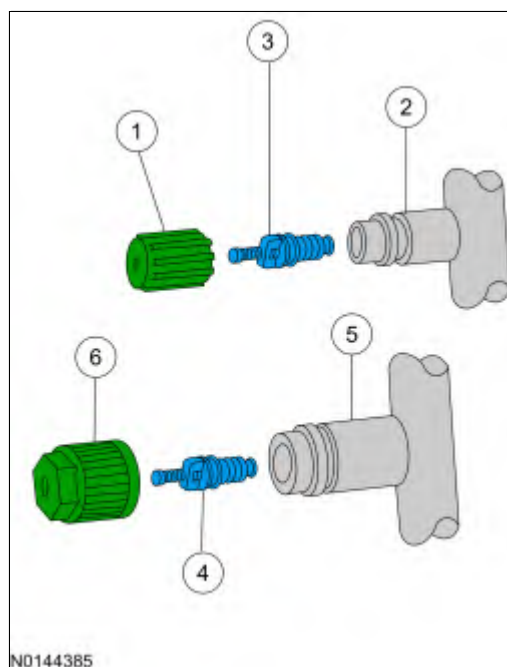
The A/C pressure transducer monitors the compressor discharge pressure and sends a variable voltage signal representing the pressure to the PCM. The PCM will interrupt A/C compressor operation in the event that the A/C pressure transducer indicates high system discharge pressures. It is also used to sense low charge conditions. If the pressure is below a predetermined value for a given ambient temperature, the PCM will not allow the clutch to engage.

The A/C pressure transducer is located on the compressor-to-condenser discharge line near the condenser inlet fitting. It is not necessary to recover the refrigerant before removing the A/C pressure transducer.

Service Gauge Port Valves

The high-pressure service gauge port valve is located on the condenser-to-evaporator line.

The low-pressure service gauge port valve is located on the evaporator outlet portion of the TXV manifold and tube assembly.



Item	Torque	Description
1	0.8 Nm (7 lb-in)	Low-pressure service gauge port valve cap
2	—	Low-pressure service gauge port valve
3	2.26 Nm (20 lb-in)	Low-pressure Schrader-type valve
4	3.4 Nm (30 lb-in)	High-pressure Schrader-type valve
5	—	High-pressure service gauge port valve
6	0.8 Nm (7 lb-in)	High-pressure service gauge port valve cap

The fitting is an integral part of the refrigeration line or component.

- Special couplings are required for both the high-side and low-side service gauge ports.
- A very small amount of leakage around the Schrader-type valve with the service gauge port valve cap removed is considered normal. Install a new Schrader-type valve core if the seal leaks excessively.
- The A/C service gauge port valve caps are used as primary seals in the refrigerant system to prevent leakage through the Schrader-type valves from reaching the atmosphere. Always install and tighten the A/C service gauge port valve caps to the correct torque after they are removed.

Refrigerant System Dye

A fluorescent refrigerant system dye wafer is added to the receiver/drier desiccant bag to assist in refrigerant system leak diagnosis using a Rotunda-approved UV blacklight. This fluorescent dye wafer dissolves after about 30 minutes of continuous A/C operation. It is not necessary to add additional dye to the refrigerant system before diagnosing leaks, even if a significant amount of refrigerant has been removed from the system.

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