

2008 Ford Mustang

2008 ENGINE PERFORMANCE Electronic Engine Controls - Mustang

2008 ENGINE PERFORMANCE

Electronic Engine Controls - Mustang

SPECIFICATIONS

Material

Item	Specification	Fill Capacity
High Temperature Nickel Anti-Seize Lubricant XL-2 (US); CXG-2-B (Canada)	ESE-M12A4-A	-
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A	-
Motorcraft SAE 5W-30 Premium Synthetic Blend Motor Oil XO-5W30-QSP (US); Motorcraft SAE 5W-30 Super Premium Motor Oil CXO-5W30-LSP12 (Canada); or equivalent	WSS-M2C929-A	-
Motorcraft SAE 5W-50 Full Synthetic Motor Oil XO-5W50-QGT or equivalent	WSS-M2C931-B	-
Penetrating and Lock Lubricant XL-1 (US); CXC-51-A (Canada)	-	-

TORQUE SPECIFICATIONS

Description	Nm	lb-ft	lb-in
A/C compressor stud bolts- 4.6L (3V), 5.4L (4V)	25	18	-
Camshaft position (CMP) sensor bolt - 4.0L	6	-	53
Catalyst monitor sensors	48	35	-
Charge motion control valve (CMCV) - 4.6L (3V)	10	-	89
CMP sensor bolt - 4.6L (3V), 5.4L (4V)	10	-	89
Crankshaft position (CKP) sensor bolts	10	-	89
Cylinder head temperature (CHT) sensor - 4.6L (3V)	10	-	89
CHT sensor - 5.4L (4V)	26	19	-
Engine coolant temperature (ECT) sensor - 5.4L (4V)	15	11	-
Fuel rail pressure and temperature sensor bolts	6	-	53
Heated oxygen sensors (HO2S)	48	35	-
Intake air temperature 2 (IAT2) sensor - 5.4L (4V) ^a	-	-	-
Knock sensor (KS) bolts	20	15	-
Mass air flow (MAF) sensor screws	2	-	18
PCM bolts	8	-	71
Supercharger (SC) bypass vacuum actuator - 5.4L (4V)	20	15	-
Throttle position (TP) sensor screws	3	-	27
Variable camshaft timing (VCT) solenoid - 4.6L (3V)	5	-	44

^a Refer to the procedure.

DESCRIPTION AND OPERATION

ELECTRONIC ENGINE CONTROLS

The electronic engine controls consist of the:

- PCM.
- throttle position (TP) sensor.
- camshaft position (CMP) sensor.
- crankshaft position (CKP) sensor.
- mass air flow (MAF) sensor.
- heated oxygen sensors (HO2S).
- catalyst monitor sensors.
- knock sensor (KS) - 4.0L SOHC and 4.6L (3V).
- fuel rail pressure and temperature sensor.
- engine coolant temperature (ECT) sensor - 4.0L SOHC and 5.4L (4V).
- cylinder head temperature (CHT) sensor - 4.6L (3V) and 5.4L (4V).
- charge motion control valve (CMCV) - 4.6L (3V) only.
- variable camshaft timing (VCT) oil control solenoid - 4.6L (3V) only.
- manifold intake air temperature 2 (IAT2) sensor - 5.4L (4V) only.

The PCM carries out the following:

- accepts input from various engine sensors to compute the fuel flow rate necessary to maintain a prescribed air/fuel ratio throughout the entire engine operational range.
- outputs a command to the fuel injectors to meter the appropriate quantity of fuel.

The TP sensor:

- sends the PCM a signal indicating the throttle plate angle.
- is the main input to the PCM from the driver.

The CMP sensor:

- sends the PCM a signal indicating camshaft position used for fuel synchronization.

The CKP sensor:

- sends the PCM a signal indicating crankshaft position.
- is essential for calculating spark timing.

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The MAF sensor:

- uses a hot wire sensing element to measure the amount of air entering the engine. Air passing over the hot wire causes it to cool.

The HO2S:

- creates a voltage signal dependent on exhaust oxygen content.
- provides feedback information to the PCM used to calculate fuel delivery.

The catalyst monitor sensor:

- monitors oxygen content after it flows through the catalytic converter.
- provides a voltage to the PCM used to calculate catalytic converter integrity.

The KS:

- is used to detect engine detonation.
- sends a voltage signal to the PCM.
- is able to provide a signal which retards the ignition timing, as necessary.

The fuel rail pressure and temperature sensor:

- measures the pressure and temperature of the fuel rail and sends these signals to the PCM.
- uses intake manifold vacuum as a pressure reference.

The ECT sensor:

- sends the PCM a signal indicating engine coolant temperature.
- voltage decreases as coolant temperature increases.

The CHT sensor:

- is mounted into the wall of the cylinder head and is not connected to any coolant passages.
- sends the PCM a signal indicating cylinder head temperature.
 - If the temperature exceeds approximately 121°C (250°F) (4.6L [3V] only)/176°C (348°F) (5.4L [4V] only), the PCM disables half of the fuel injectors at a time. The PCM will alternate which fuel injectors are disabled every 32 engine cycles. The cylinders that are not being fuel injected act as air pumps to aid in engine cooling.
 - If the temperature exceeds approximately 166°C (330°F) (4.6L [3V] only)/260°C (500°F) (5.4L [4V] only), the PCM disables all of the fuel injectors until the engine temperature drops below approximately 154°C (310°F) (4.6L [3V] only)/164°C (328°F) (5.4L [4V] only).
 - The coolant temperature gauge pointer will read fully hot.
 - The check gauge warning indicator will illuminate and DTCs are set.

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The 4.6L air induction system improves engine performance by using the CMCV assemblies as follows:

- The intake manifold has 2 runners per cylinder, feeding each of the intake ports in the cylinder heads.
- The CMCV assemblies are located between the intake manifold and cylinder heads, providing 2 air passages for each cylinder.
- One air passage is always open and the other passage switches from closed to open by means of a valve plate.
- The valve plates are opened and closed by the CMCV electric actuator, which is controlled by the PCM.

The VCT oil control solenoid:

- is an electrically controlled hydraulic valve that directs engine oil to the variable camshaft. Once the PCM transmits a signal, the solenoid moves a valve spool, directing oil into the camshaft phaser cavity. This action changes valve timing by either inducing an advance or retard condition. The camshaft is, thereby repositioned in relation to crankshaft timing and allows for optimum engine performance and lower emissions.

The IAT2 sensor mounted in the intake manifold:

- sends the PCM a signal indicating the temperature of the air entering the cylinders after passing over the charge air cooler.

DIAGNOSTIC TESTS

ELECTRONIC ENGINE CONTROLS

Refer to the [Introduction - Gasoline Engines](#) article.

REMOVAL AND INSTALLATION

CAMSHAFT POSITION (CMP) SENSOR - 4.0L SOHC

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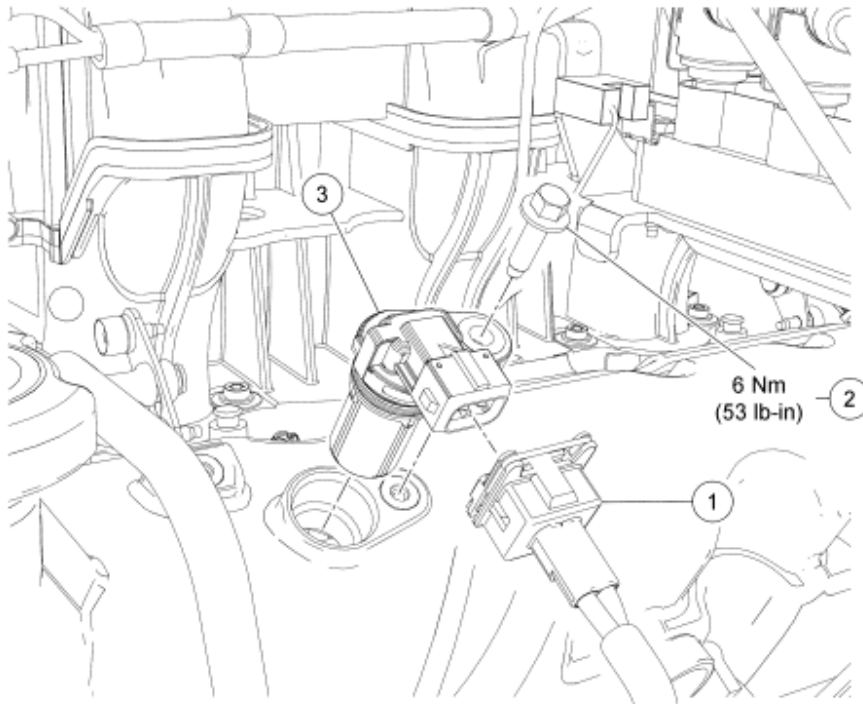


Fig. 1: Exploded View Of Camshaft Position (CMP) Sensor With Torque Specification - 4.0L SOHC
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	Camshaft position sensor (CMP) electrical connector
2	W500204	CMP sensor bolt
3	6B288	CMP sensor

REMOVAL AND INSTALLATION

1. Disconnect the camshaft position (CMP) sensor electrical connector.
2. Remove the bolt and the CMP sensor.
 - To install, tighten to 6 Nm (53 lb-in).
3. To install, reverse the removal procedure.

CAMSHAFT POSITION (CMP) SENSOR - 4.6L (3V)

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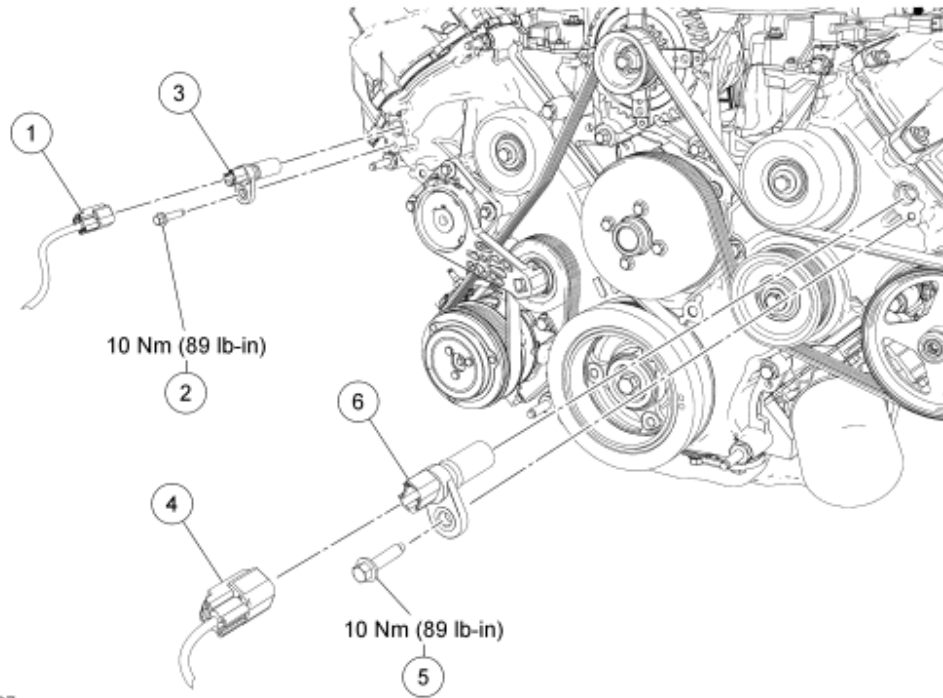


Fig. 2: Exploded View Of Camshaft Position (CMP) Sensor With Torque Specifications - 4.6L (3V)
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	RH camshaft position (CMP) sensor electrical connector (part of 12B637)
2	N806155	RH CMP sensor bolt
3	6B288	RH CMP sensor
4	14A464	LH CMP sensor electrical connector (part of 12B637)
5	N806155	LH CMP sensor bolt
6	6B288	LH CMP sensor

REMOVAL AND INSTALLATION

LH side

1. Remove the air cleaner outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION AND FILTERING** article.

Both sides

2. Disconnect the camshaft position (CMP) sensor electrical connector.
3. Remove the bolt and the CMP sensor.
 - To install, tighten to 10 Nm (89 lb-in).

4. To install, reverse the removal procedure.

CAMSHAFT POSITION (CMP) SENSOR - 5.4L (4V)

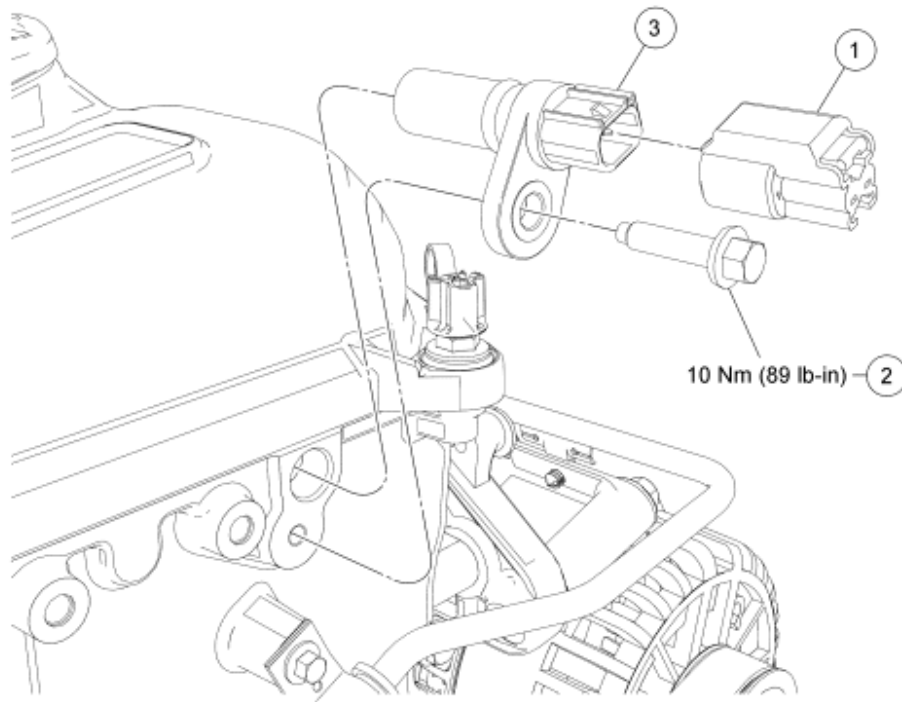


Fig. 3: Exploded View Of Camshaft Position (CMP) Sensor With Torque Specification - 5.4L (4V)
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	Camshaft position (CMP) sensor electrical connector
2	N806155	CMP sensor bolt
3	6B288	CMP sensor

REMOVAL AND INSTALLATION

1. Disconnect the camshaft position (CMP) sensor electrical connector.
2. Remove the bolt and the CMP sensor.
 - To install, tighten to 10 Nm (89 lb-in).
3. To install, reverse the removal procedure.

CRANKSHAFT POSITION (CKP) SENSOR - 4.0L SOHC

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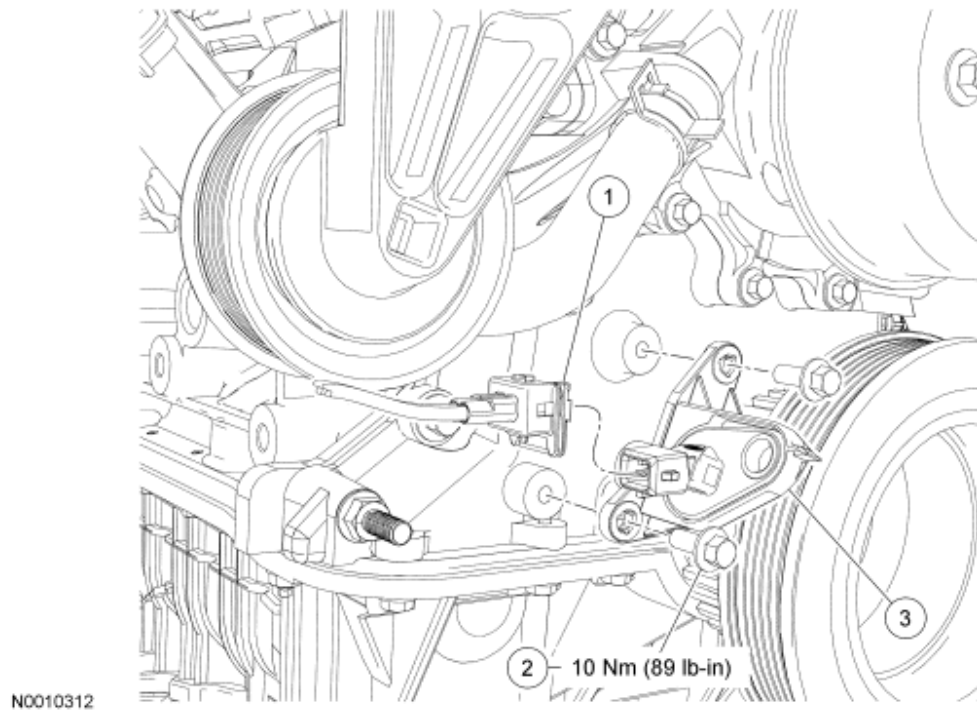


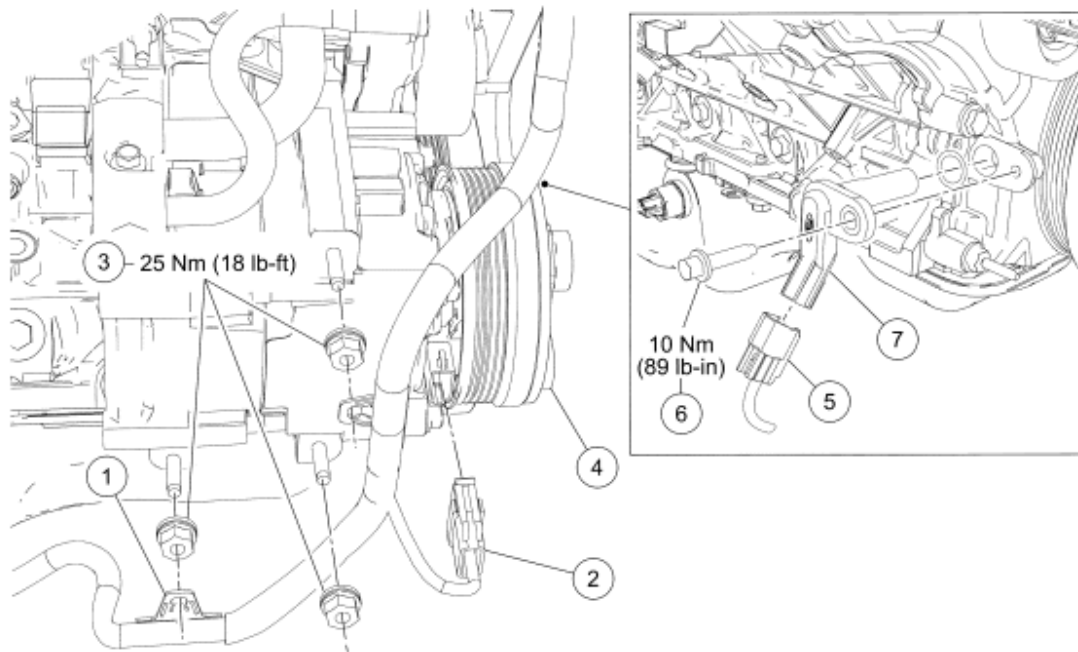
Fig. 4: Exploded View Of Crankshaft Position (CKP) Sensor With Torque Specification - 4.0L SOHC
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	Crankshaft position (CKP) sensor electrical connector
2	W500213	CKP sensor bolt (2 required)
3	6C315	CKP sensor

REMOVAL AND INSTALLATION

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING AND LIFTING** article.
2. Disconnect the crankshaft position (CKP) sensor electrical connector.
3. Remove the 2 bolts and the CKP sensor.
 - To install, tighten to 10 Nm (89 lb-in).
4. To install, reverse the removal procedure.

CRANKSHAFT POSITION (CKP) SENSOR - 4.6L (3V)



N0071204

Fig. 5: Exploded View Of Crankshaft Position (CKP) Sensor With Torque Specifications - 4.6L (3V)
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	-	Wiring harness retainer (part of 12B637)
2	14A464	A/C compressor electrical connector (part of 12B637)
3	N806184	A/C compressor stud bolts (3 required)
4	19703	A/C compressor
5	14A464	Crankshaft position (CKP) sensor electrical connector (part of 12B637)
6	N806155	CKP sensor bolt
7	6C315	CKP sensor

REMOVAL AND INSTALLATION

1. With vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING AND LIFTING** article.
2. Remove the accessory drive belt. For additional information, refer to **ACCESSORY DRIVE** article.
3. Detach the wiring harness retainers from the A/C compressor stud bolts.
4. Disconnect the A/C compressor field coil and the crankshaft position (CKP) sensor electrical connectors.
5. Remove the stud bolts and position the A/C compressor aside.
 - To install, tighten to 25 Nm (18 lb-ft).
6. Remove the CKP sensor bolt and sensor.

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- To install, tighten to 10 Nm (89 lb-in).
7. To install, reverse the removal procedure.

CRANKSHAFT POSITION (CKP) SENSOR - 5.4L (4V)

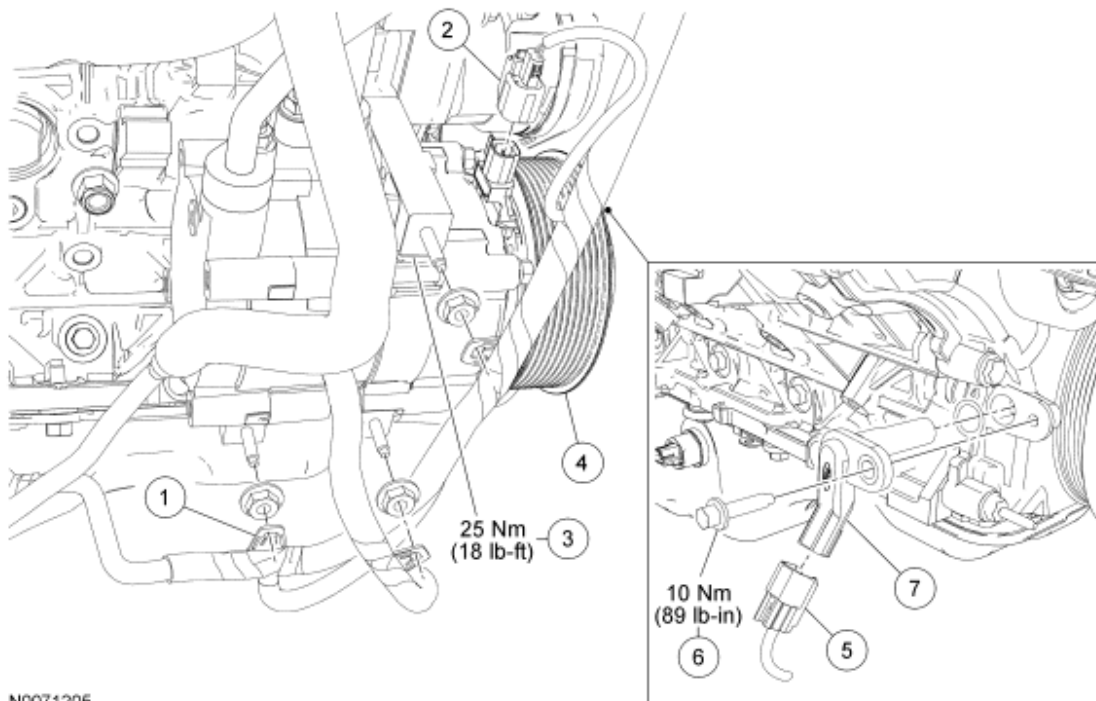


Fig. 6: Exploded View Of Crankshaft Position (CKP) Sensor With Torque Specifications - 5.4L (4V)
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	-	Wiring harness retainer (part of 12B637)
2	14A464	A/C compressor electrical connector
3	W707821	A/C compressor stud bolt (3 required)
4	190629	A/C compressor
5	14A464	Crankshaft position (CKP) sensor electrical connector
6	N806155	CKP sensor bolt
7	6C315	CKP sensor

REMOVAL AND INSTALLATION

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING AND LIFTING** article.
2. Remove the supercharger (SC) belt. For additional information, refer to **ACCESSORY DRIVE** article.
3. Detach the wiring harness retainers from the A/C compressor stud bolts.
4. Disconnect the A/C compressor field coil and the crankshaft position (CKP) sensor electrical connectors.

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5. Remove the 3 stud bolts and position the A/C compressor aside.
 - To install, tighten to 25 Nm (18 lb-ft).
6. Remove the CKP sensor bolt and sensor.
 - To install, tighten to 10 Nm (89 lb-in).
7. To install, reverse the removal procedure.

POWERTRAIN CONTROL MODULE (PCM)

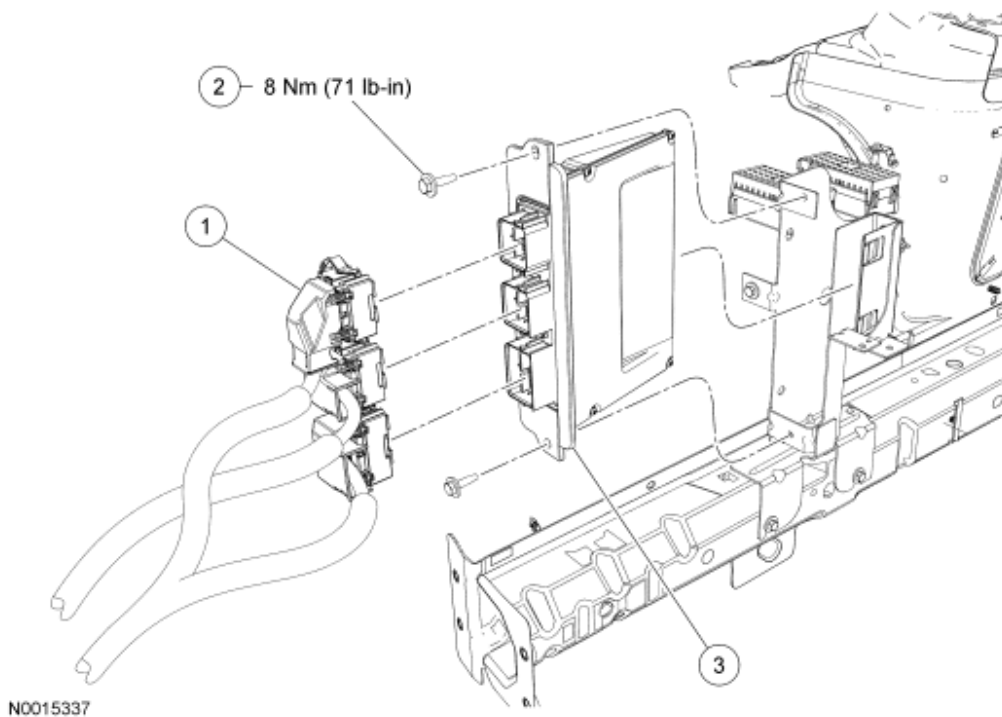


Fig. 7: Exploded View Of Powertrain Control Module (PCM) With Torque Specification
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	PCM electrical connector (3 required)
2	W505423	PCM bolt (2 required)
3	12A650	PCM

REMOVAL

NOTE: Any PCM replacement will require that ALL customer keys are available to be programmed at the time of installation. PCM replacement DOES NOT require new keys.

1. Retrieve the module configuration. Carry out the module configuration retrieval steps of the Programmable Module Installation procedure. For additional information, refer to **MODULE**

CONFIGURATION article.

2. Disconnect the 3 PCM electrical connectors.
3. Remove the 2 bolts and the PCM.

INSTALLATION

1. Install the PCM and the 2 bolts.
 - Tighten to 8 Nm (71 lb-in).
2. Connect the 3 PCM electrical connectors.
3. Restore the module configuration. Carry out the module configuration restore steps of the Programmable Module Installation procedure. For additional information, refer to **MODULE CONFIGURATION** article.
4. Reprogram the passive anti-theft system (PATS). Carry out the Key Programming Using Two Programmed Keys procedure. For additional information, refer to **ANTI-THEFT - PASSIVE ANTI-THEFT SYSTEM (PATS)** article.

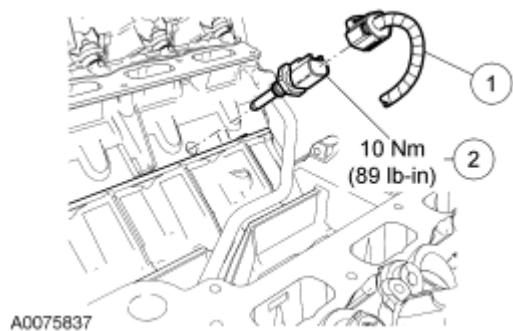
CYLINDER HEAD TEMPERATURE (CHT) SENSOR - 4.6L (3V)

Fig. 8: Exploded View Of Cylinder Head Temperature (CHT) Sensor With Torque Specification
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	Cylinder head temperature (CHT) sensor electrical connector (part of 14B102)
2	6G004	CHT sensor

REMOVAL AND INSTALLATION

1. Release the fuel system pressure. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** article.
2. Disconnect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING AND CABLES** article.
3. Remove the intake manifold. For additional information, refer to **ENGINE - 4.6L (3V)** article.
4. Disconnect the cylinder head temperature (CHT) sensor electrical connector.

5. Remove and discard the CHT sensor.
 - To install, tighten to 10 Nm (89 lb-in).
6. To install, reverse the removal procedure.
 - Do not reuse the CHT sensor, install a new sensor.

CYLINDER HEAD TEMPERATURE (CHT) SENSOR - 5.4L (4V)

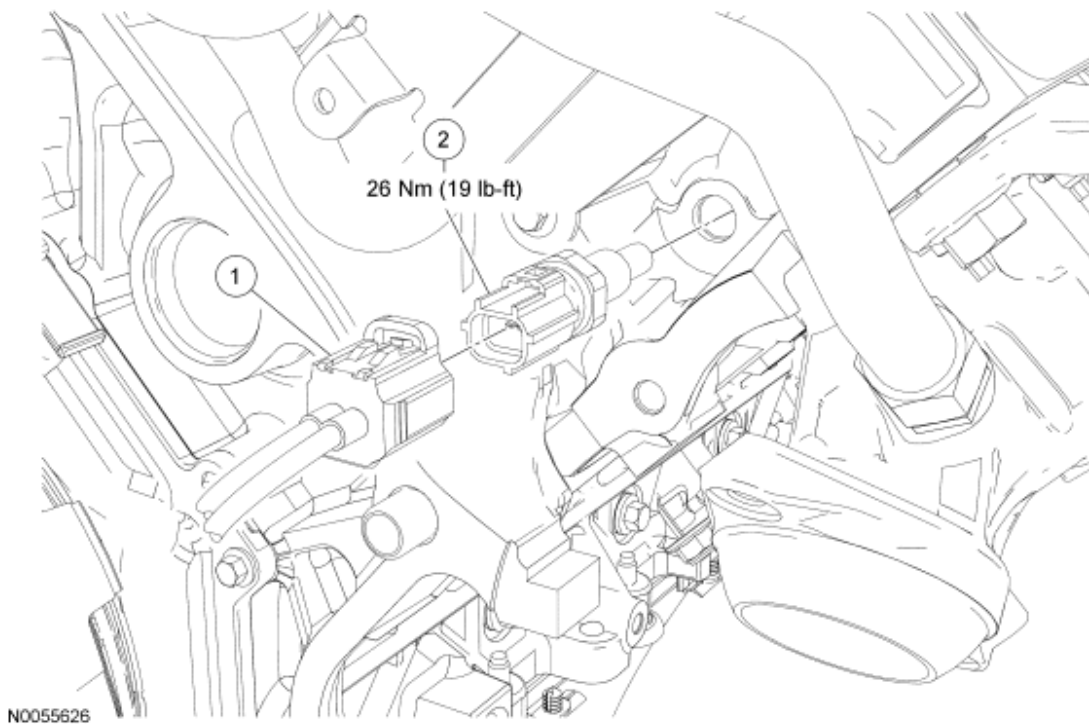


Fig. 9: Exploded View Of Cylinder Head Temperature (CHT) Sensor With Torque Specification - 5.4L (4V)

Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	Cylinder head temperature (CHT) sensor electrical connector
2	6G004	CHT sensor

REMOVAL AND INSTALLATION

1. Remove the battery tray. For additional information, refer to **BATTERY, MOUNTING AND CABLES** article.
2. Disconnect the cylinder head temperature (CHT) sensor electrical connector.
3. Remove and discard the CHT sensor.
 - To install, tighten to 26 Nm (19 lb-ft).
4. To install, reverse the removal procedure.

- Do not reuse the CHT sensor, install a new sensor.

ENGINE COOLANT TEMPERATURE (ECT) SENSOR - 4.0L SOHC

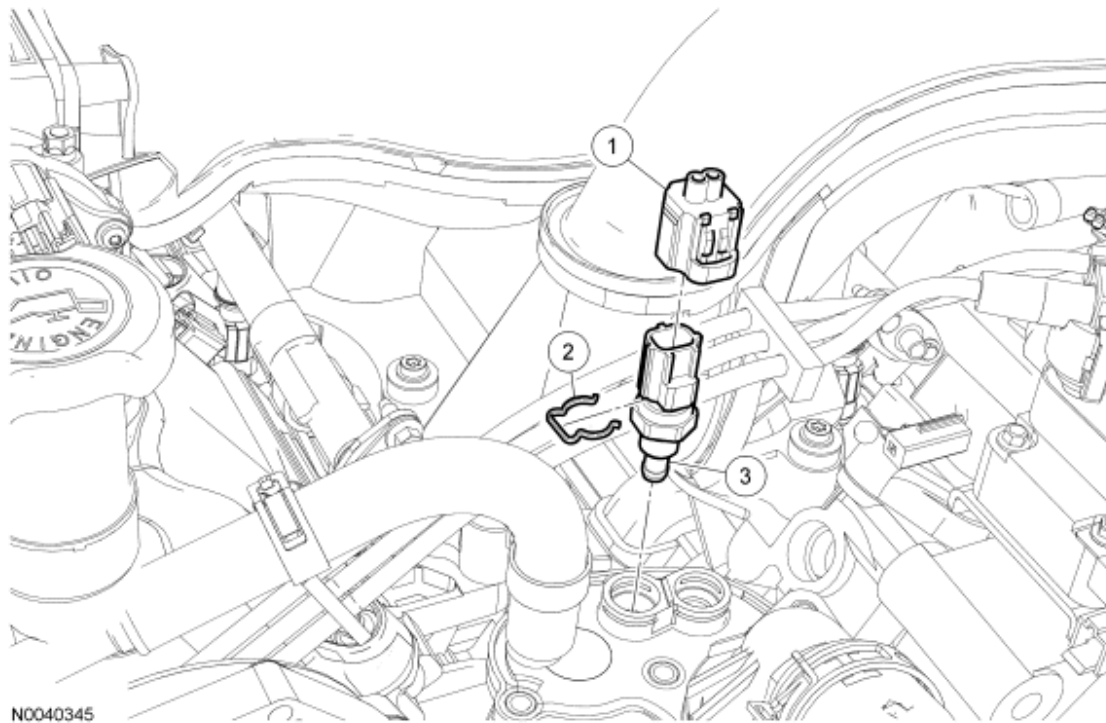


Fig. 10: Exploded View Of Engine Coolant Temperature (ECT) Sensor - 4.0L SOHC
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	Engine coolant temperature (ECT) sensor electrical connector
2	-	ECT sensor retaining clip
3	12A648	ECT sensor

REMOVAL AND INSTALLATION

1. Drain the cooling system. For additional information, refer to **ENGINE COOLING** article.
2. Disconnect the engine coolant temperature (ECT) sensor electrical connector.
3. Remove the retaining clip and the ECT sensor.
4. To install, reverse the removal procedure.
5. Fill and bleed the cooling system. For additional information, refer to **ENGINE COOLING** article.

ENGINE COOLANT TEMPERATURE (ECT) SENSOR - 5.4L (4V)

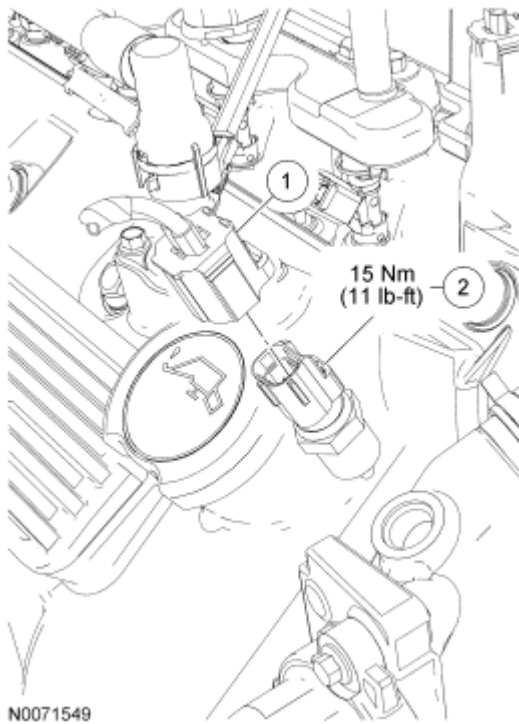


Fig. 11: Exploded View Of Engine Coolant Temperature (ECT) Sensor With Torque Specification - 5.4L (4V)

Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	Engine coolant temperature (ECT) sensor
2	12A648	ECT sensor

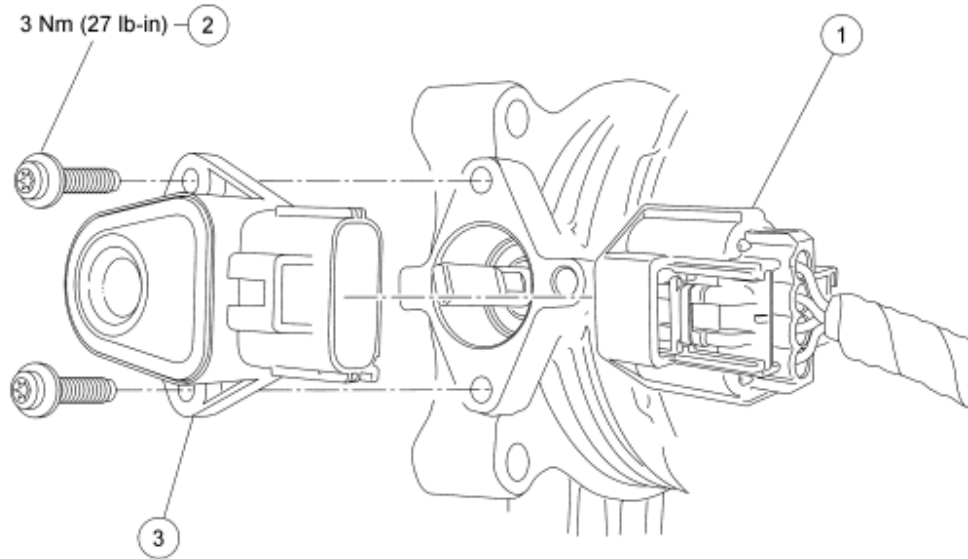
REMOVAL AND INSTALLATION

1. Drain the cooling system. For additional information, refer to **ENGINE COOLING** article.
2. Disconnect the engine coolant temperature (ECT) sensor electrical connector.
3. Remove the ECT sensor.
 - To install, tighten to 15 Nm (11 lb-ft).
4. To install, reverse the removal procedure.
5. Fill and bleed the cooling system. For additional information, refer to **ENGINE COOLING** article.

THROTTLE POSITION (TP) SENSOR

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N0010738

Fig. 12: Exploded View Of Throttle Position (TP) Sensor With Torque Specification
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	Throttle position (TP) sensor electrical connector
2	W707535	TP screw (2 required)
3	9E928	TP sensor

REMOVAL

1. Disconnect the throttle position (TP) sensor electrical connector.

CAUTION: Failure to remove the TP sensor screws in the following manner will result in damage to the screws. First loosen the screws 1-2 full turns using a hand tool and then use a suitable high-speed driver to complete the removal.

2. Remove and discard the 2 screws and the TP sensor.

INSTALLATION

CAUTION: Do not use a high-speed driver to install the new screws or damage to the TP sensor may occur.

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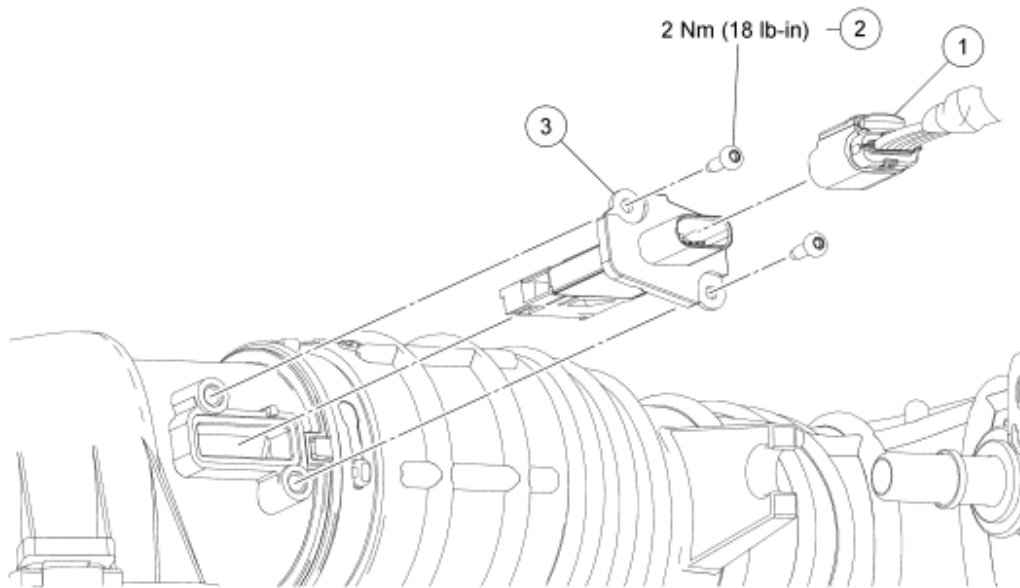
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NOTE: Do not reuse the TP sensor and screws. A new TP sensor and screws must be installed.

NOTE: When installing the new TP sensor, make sure that the radial locator tab on the TP sensor is aligned with the radial locator hole on the throttle body.

1. Position the new TP sensor and install the 2 new screws.
 - Tighten to 3 Nm (27 lb-in).
2. Connect the TP sensor electrical connector.

MASS AIR FLOW (MAF) SENSOR



N0004891

Fig. 13: Exploded View Of Mass Air Flow (MAF) Sensor With Torque Specification
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	Mass air flow (MAF) sensor electrical connector (part of 12B637)
2	W709287	MAF sensor screw (2 required)
3	12B579	MAF sensor

REMOVAL AND INSTALLATION

1. Disconnect the mass air flow (MAF) sensor electrical connector.
2. Remove the 2 screws and the MAF sensor.
 - To install, tighten to 2 Nm (18 lb-in).
3. To install, reverse the removal procedure.

HEATED OXYGEN SENSOR (HO2S) - 4.0L SOHC

Special Tools

Illustration	Tool Name	Tool Number
 ST1106-A	Socket, Exhaust Gas Oxygen Sensor	303-476 (T94P-9472-A)

Material

Item	Specification
High Temperature Nickel Anti-Seize Lubricant XL-2 (US); CXG-2-B (Canada)	ESE-M12A4-A
Penetrating and Lock Lubricant XL-1 (US); CXC-51-A (Canada)	-

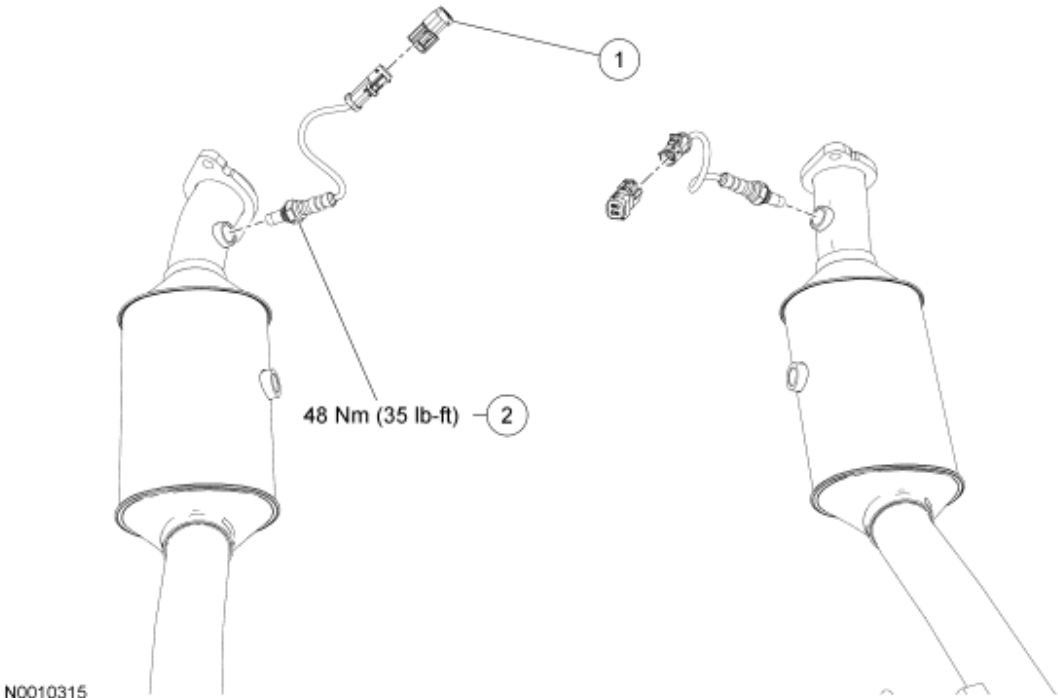


Fig. 14: Exploded View Of Heated Oxygen Sensor (HO2S) With Torque Specification - 4.0L SOHC
 Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	Heated oxygen sensor (HO2S) electrical connector (2 required)
2	9G444	HO2S (2 required)

REMOVAL AND INSTALLATION

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING AND LIFTING** article.
2. Disconnect the heated oxygen sensor (HO2S) electrical connector.

NOTE: If necessary, lubricate the HO2S with penetrating and lock lubricant to aid in removal.

3. Using the special tool, remove the HO2S.
 - To install, tighten to 48 Nm (35 lb-ft).

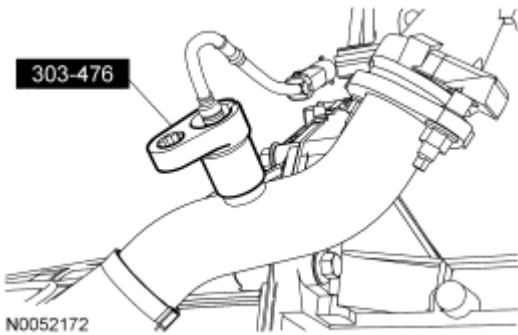


Fig. 15: Removing HO2S Using Special Tool (303-476)
Courtesy of FORD MOTOR CO.

4. To install, reverse the removal procedure.
 - Apply a light coat of anti-seize lubricant to the threads of the HO2S before installing.

HEATED OXYGEN SENSOR (HO2S) - 4.6L (3V), 5.4L (4V)

Material

Item	Specification
High Temperature Nickel Anti-Seize Lubricant XL-2 (US); CXG-2-B (Canada)	ESE-M12A4-A
Penetrating and Lock Lubricant XL-1 (US); CXC-51-A (Canada)	-

NOTE: 4.6L (3V) shown, 5.4L (4V) similar.

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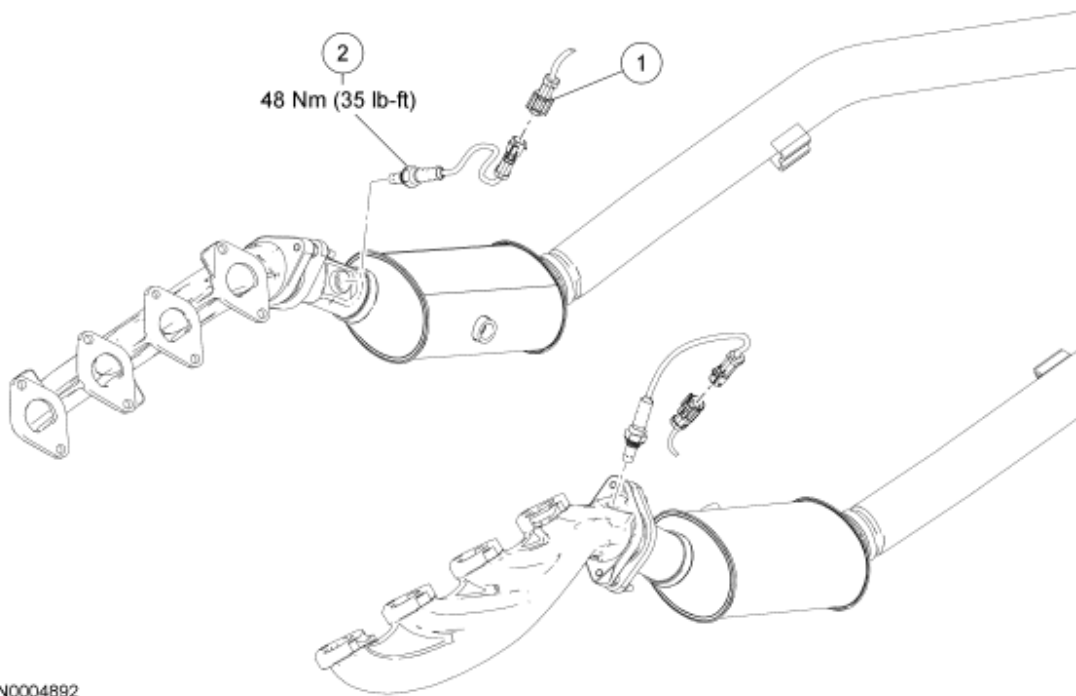


Fig. 16: Identifying Exploded View Of Heated Oxygen Sensor (HO2S) With Torque Specification - 4.6L (3V), 5.4L (4V)

Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	Heated oxygen sensor (HO2S) electrical connector (2 required)
2	9G444	HO2S

REMOVAL AND INSTALLATION

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING AND LIFTING** article.
2. Disconnect the heated oxygen sensor (HO2S) electrical connector.

NOTE: If necessary, lubricate the HO2S with penetrating and lock lubricant to aid in removal.

3. Using a suitable crowfoot wrench, remove the HO2S.
 - To install, tighten to 48 Nm (35 lb-ft).
4. To install, reverse the removal procedure.
 - Apply a light coat of anti-seize lubricant to the threads of the HO2S before installing.

CATALYST MONITOR SENSOR - 4.0L SOHC

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Special Tools

Illustration	Tool Name	Tool Number
 ST1106-A	Socket, Exhaust Gas Oxygen Sensor	303-476 (T94P-9472-A)

Material

Item	Specification
High Temperature Nickel Anti-Seize Lubricant XL-2 (US); CXG-2-B (Canada)	ESE-M12A4-A
Penetrating and Lock Lubricant XL-1 (US); CXC-51-A (Canada)	-

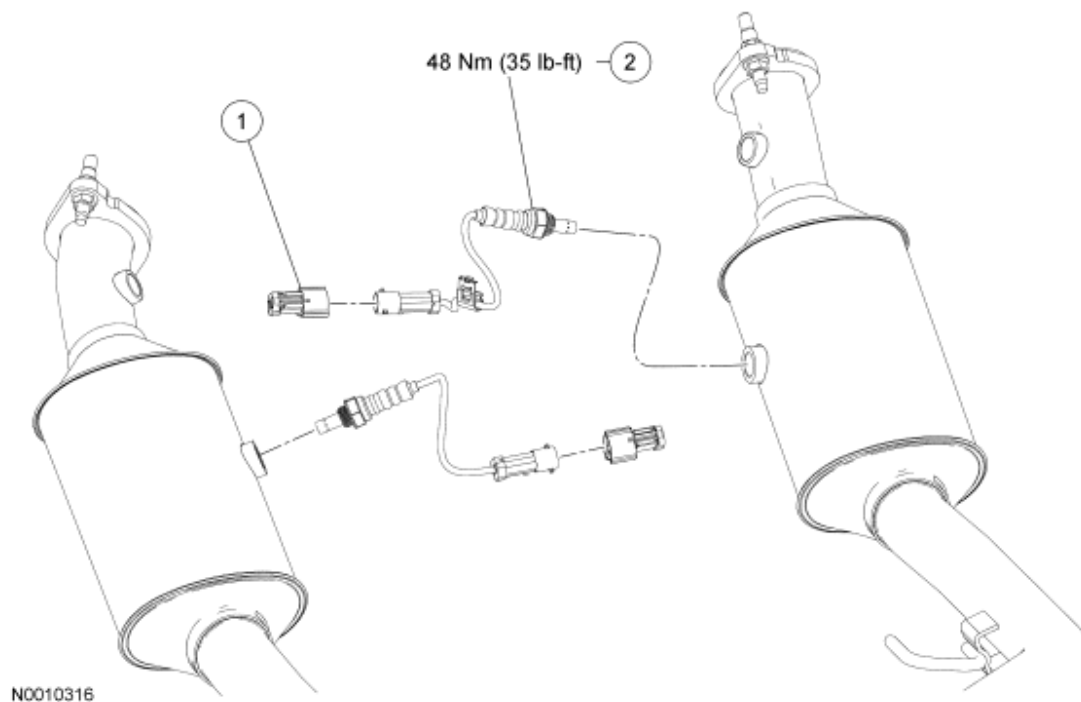


Fig. 17: Exploded View Of Catalyst Monitor Sensor With Torque Specification - 4.0L SOHC
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	Catalyst monitor sensor electrical connector (2 required)
2	9F472	Catalyst monitor sensor (2 required)

REMOVAL AND INSTALLATION

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1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING AND LIFTING** article.
2. Disconnect the catalyst monitor sensor electrical connector.

NOTE: If necessary, lubricate the catalyst monitor sensor with lock lubricant to aid in removal.

3. Using the special tool, remove the catalyst monitor sensor.
 - To install, tighten to 48 Nm (35 lb-ft).

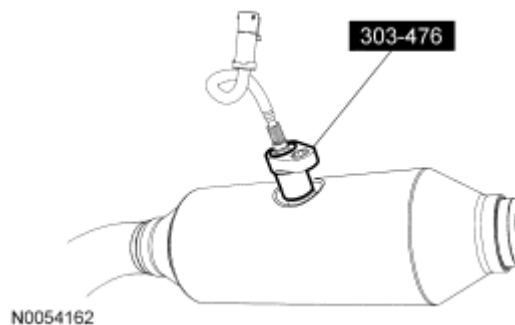
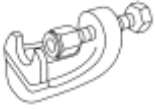


Fig. 18: Removing Catalyst Monitor Sensor By Using Special Tool (303-476)
Courtesy of FORD MOTOR CO.

4. To install, reverse the removal procedure.
 - Apply a light coat of anti-seize lubricant to the threads of the catalyst monitor sensor before installing.

CATALYST MONITOR SENSOR - 4.6L (3V), 5.4L (4V)

Special Tools

Illustration	Tool Name	Tool Number
 ST1106-A	Socket, Exhaust Gas Oxygen Sensor	303-476 (T94P-9472-A)

Material

Item	Specification
High Temperature Nickel Anti-Seize Lubricant XL-2 (US); CXG-2-B (Canada)	ESE-M12A4-A
Penetrating and Lock Lubricant XL-1 (US); CXC-51-A (Canada)	-

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NOTE: 4.6L (3V) shown, 5.4L (4V) similar.

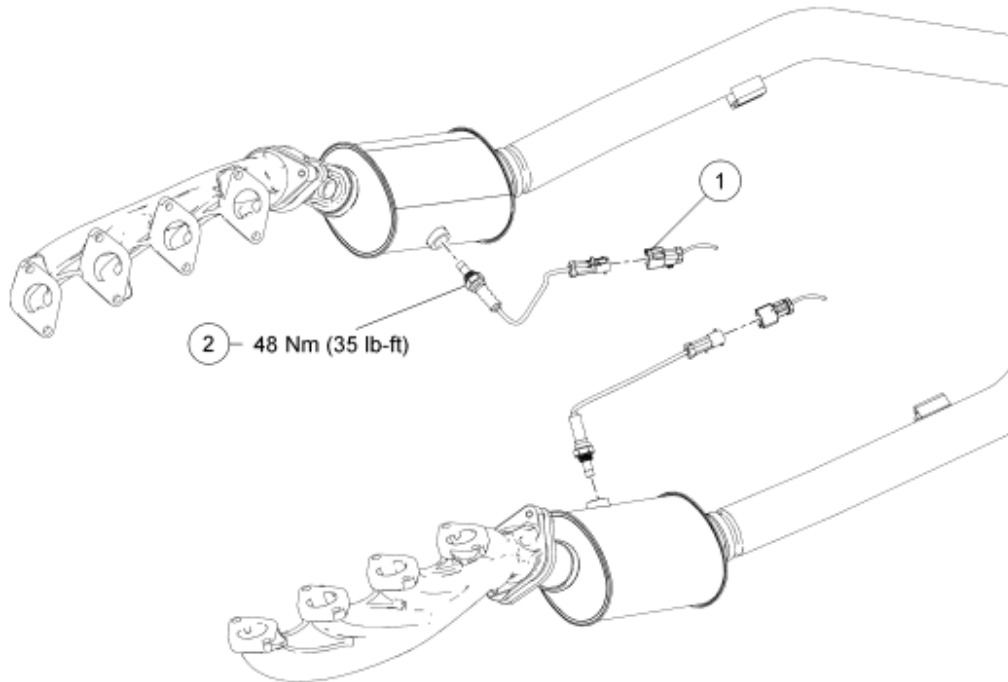


Fig. 19: Exploded View Of Catalyst Monitor Sensor With Torque Specification - 4.6L (3V), 5.4L (4V)
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	Catalyst monitor sensor electrical connector
2	9F472	Catalyst monitor sensor (2 required)

REMOVAL AND INSTALLATION

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING AND LIFTING** article.
2. Disconnect the catalyst monitor sensor electrical connector.

NOTE: If necessary, lubricate the catalyst monitor sensor with penetrating and lock lubricant to aid in removal.

3. Using the special tool, remove the catalyst monitor sensor.
 - To install, tighten to 48 Nm (35 lb-ft).

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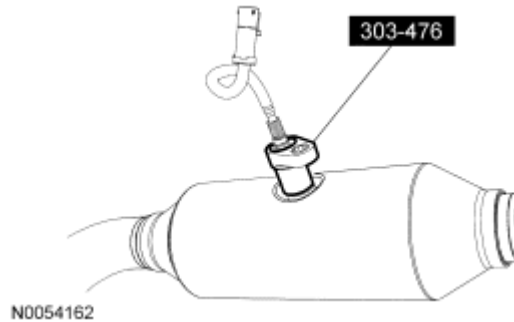


Fig. 20: Removing Catalyst Monitor Sensor By Using Special Tool (303-476)
Courtesy of FORD MOTOR CO.

4. To install, reverse the removal procedure.
 - Apply a light coat of anti-seize lubricant to the threads of the catalyst monitor sensor before installing.

CLUTCH PEDAL POSITION (CPP) SWITCH

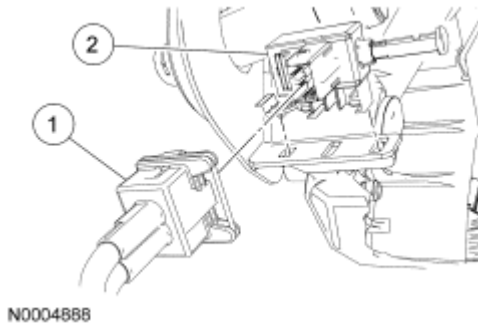


Fig. 21: Exploded View Of Clutch Pedal Position (CPP) Switch
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	11A152	Clutch pedal position (CPP) switch electrical connector (part of 12638)
2	14489	CPP switch

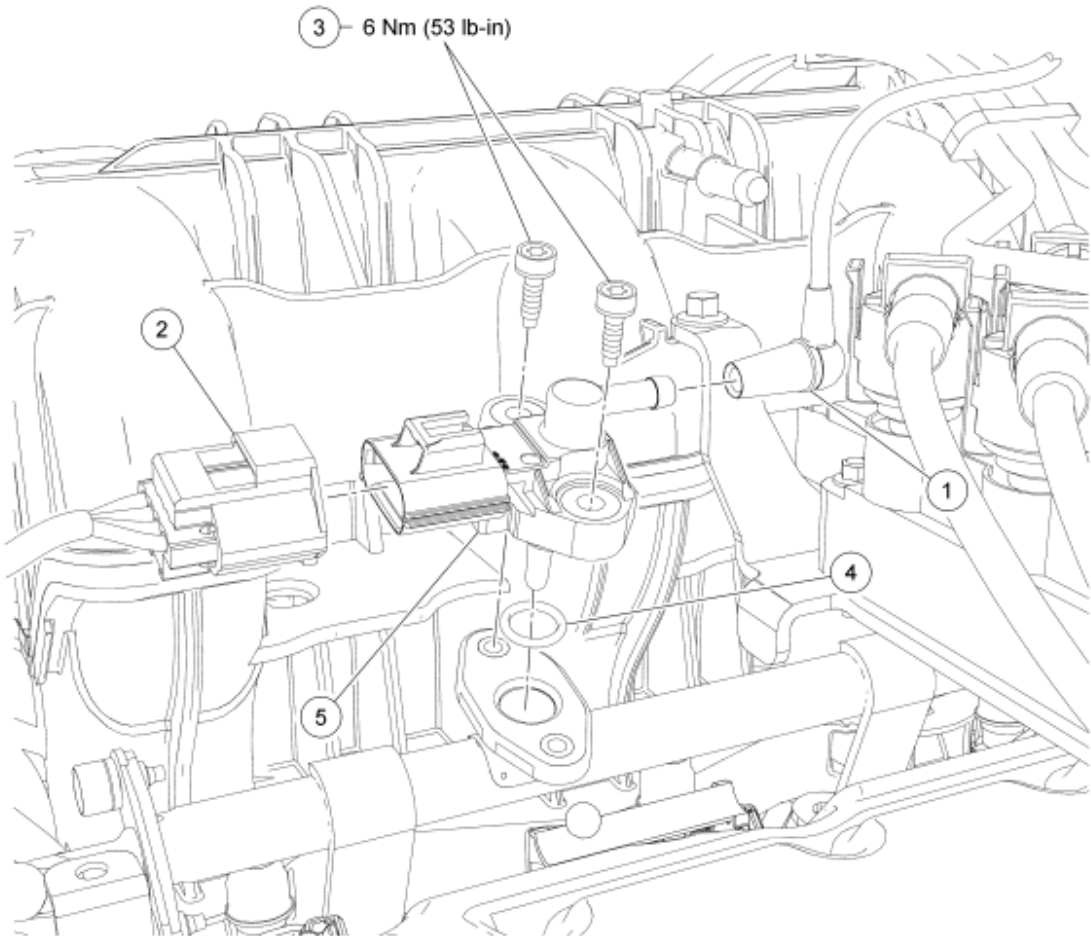
REMOVAL AND INSTALLATION

1. Disconnect the clutch pedal position (CPP) switch electrical connector.
2. Release the CPP switch from the clutch pedal bracket.
3. To install, reverse the removal procedure.

FUEL RAIL PRESSURE AND TEMPERATURE SENSOR - 4.0L SOHC

Material

Item	Specification
Motorcraft SAE 5W-30 Premium Synthetic Blend Motor Oil XO-5W30-QSP (US); Motorcraft SAE 5W-30 Super Premium Motor Oil CXO-5W30-LSP12 (Canada); or equivalent	WSS-M2C929-A



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Fig. 22: Exploded View Of Fuel Rail Pressure and Temperature Sensor With Torque Specification - 4.0L SOHC
 Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	9E498	Fuel rail pressure and temperature sensor vacuum hose
2	14A464	Fuel rail pressure and temperature sensor electrical connector

3	-	Fuel rail pressure and temperature sensor bolts (2 required)
4	9G756	O-ring seal (part of 9G756)
5	9G756	Fuel rail pressure and temperature sensor

REMOVAL AND INSTALLATION

WARNING: Do not smoke, carry lighted tobacco or have an open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

WARNING: Before working on or disconnecting any of the fuel tubes or fuel system components, relieve the fuel system pressure to prevent accidental spraying of fuel. Fuel in the fuel system remains under high pressure, even when the engine is not running. Failure to follow this instruction may result in serious personal injury.

1. Release the fuel system pressure. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** article.
2. Disconnect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING AND CABLES** article.
3. Disconnect the fuel rail pressure and temperature sensor electrical connector.
4. Disconnect the vacuum hose from the fuel rail pressure and temperature sensor.
5. Remove the 2 bolts and the fuel rail pressure and temperature sensor.
 - To install, tighten to 6 Nm (53 lb-in).
6. To install, reverse the removal procedure.
 - Inspect the O-ring seal and install new as necessary.
 - Lubricate the O-ring seal with clean engine oil.

FUEL RAIL PRESSURE AND TEMPERATURE SENSOR - 4.6L (3V), 5.4L (4V)

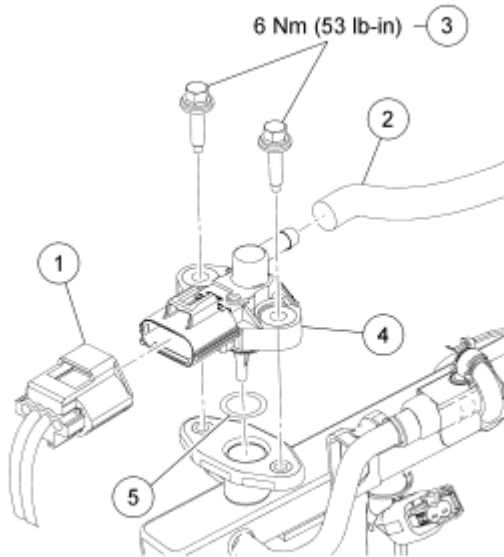
Material

Item	Specification
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent - 4.6L (3V)	WSS-M2C930-A
Motorcraft SAE 5W-50 Full Synthetic Motor Oil XO-5W50-QGT or equivalent	WSS-M2C931-B

NOTE: 4.6L (3V) shown, 5.4L (4V) similar.

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N0015335

Fig. 23: Exploded View Of Fuel Rail Pressure & Temperature Sensor With Torque Specification - 4.6L (3V), 5.4L (4V)

Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	Fuel rail pressure and temperature sensor electrical connector
2	9C482/9E498	Vacuum hose (4.6L [3V]/ 5.4L [4V])
3	W705870	Fuel rail pressure and temperature sensor bolts (2 required)
4	9G756	Fuel rail pressure and temperature sensor
5	-	O-ring seal

REMOVAL AND INSTALLATION

WARNING: Do not smoke, carry lighted tobacco or have an open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

WARNING: Before working on or disconnecting any of the fuel tubes or fuel system components, relieve the fuel system pressure to prevent accidental spraying of fuel. Fuel in the fuel system remains under high pressure, even when the engine is not running. Failure to follow this instruction may result in serious personal injury.

1. Release the fuel system pressure. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** article.
2. Disconnect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING AND CABLES** article.
3. Disconnect the fuel rail pressure and temperature sensor electrical connector.
4. Disconnect the vacuum hose from the fuel rail pressure and temperature sensor.
5. Remove the 2 bolts and the fuel rail pressure and temperature sensor.
 - To install, tighten to 6 Nm (53 lb-in).
6. To install, reverse the removal procedure.
 - Inspect the O-ring seal and install new as necessary.
 - Lubricate the O-ring seal with clean engine oil.

KNOCK SENSOR (KS) - 4.0L SOHC

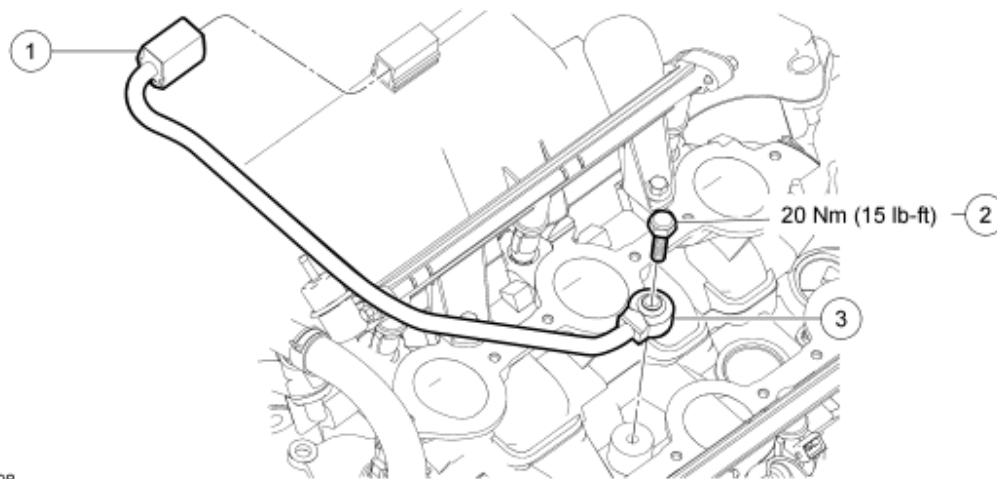


Fig. 24: Exploded View Of Knock Sensor (KS) With Torque Specification - 4.0L SOHC
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A624	Knock sensor (KS) electrical connector (part of 12B637)
2	W500225	KS bolt
3	12A699	KS

REMOVAL AND INSTALLATION

1. Remove the intake manifold. For additional information, refer to **ENGINE - 4.0L SOHC** article.
2. Disconnect the knock sensor (KS) electrical connector.
3. Remove the bolt and the KS.
 - To install, tighten to 20 Nm (15 lb-ft).

4. To install, reverse the removal procedure.

KNOCK SENSOR (KS) - 4.6L (3V)

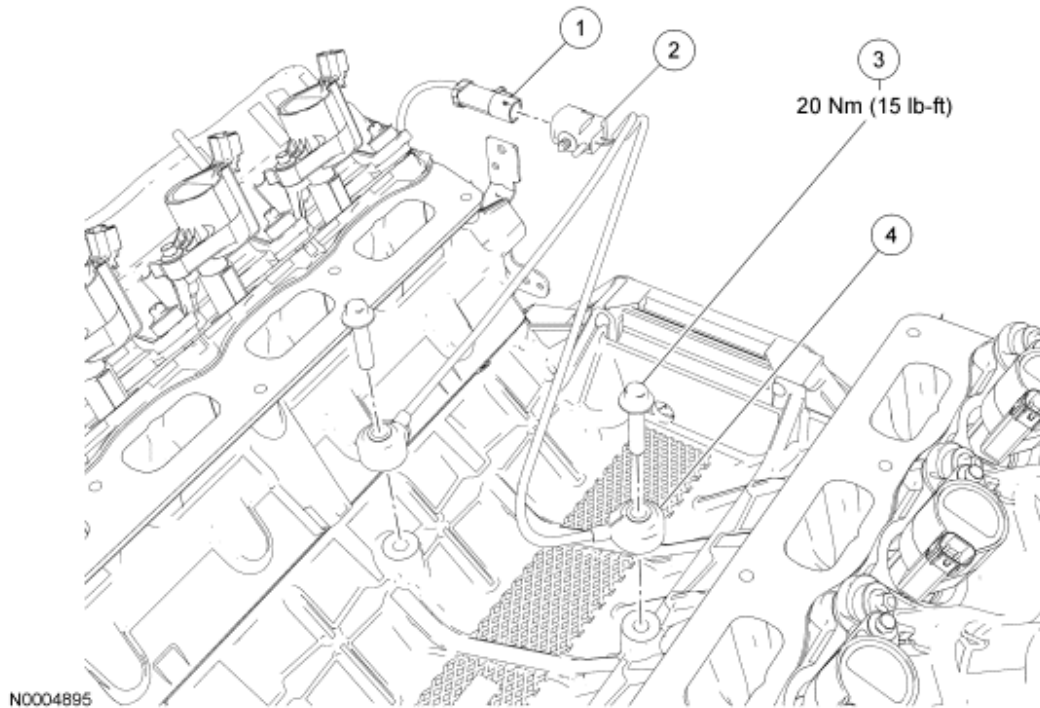


Fig. 25: Exploded View Of Knock Sensor (KS) With Torque Specification - 4.6L (3V)
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	Knock sensor (KS) electrical connector (part of 12B637)
2	-	Pin-type retainer (part of 12A699)
3	W500110	KS bolt (2 required)
4	12A699	KS

REMOVAL AND INSTALLATION

1. Remove the intake manifold. For additional information, refer to **ENGINE - 4.6L (3V)** article.
2. Disconnect the knock sensor (KS) electrical connector.
 - Detach the pin-type retainer.
3. Remove the 2 bolts and the KS.
 - To install, tighten to 20 Nm (15 lb-ft).
4. To install, reverse the removal procedure.

VARIABLE CAMSHAFT TIMING (VCT) OIL CONTROL SOLENOID - 4.6L (3V)

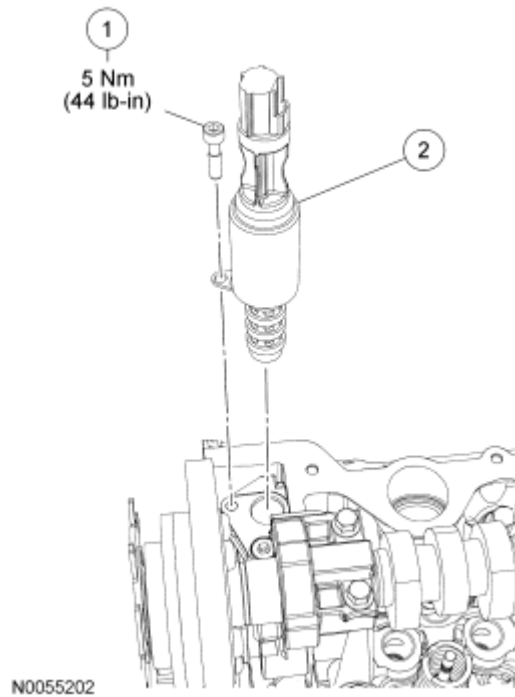


Fig. 26: Exploded View Of Variable Camshaft Timing (VCT) Oil Control Solenoid With Torque Specification

Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6C260	Variable camshaft timing (VCT) oil control solenoid bolt
2	6B297	VCT oil control solenoid

REMOVAL AND INSTALLATION

1. Remove the LH or RH valve cover. For additional information, refer to **ENGINE - 4.6L (3V)** article.
2. Remove the bolt and the variable camshaft timing (VCT) oil control solenoid.
 - To install, tighten to 5 Nm (44 lb-in).
3. To install, reverse the removal procedure.

INTAKE AIR TEMPERATURE 2 (IAT2) SENSOR - 5.4L (4V)

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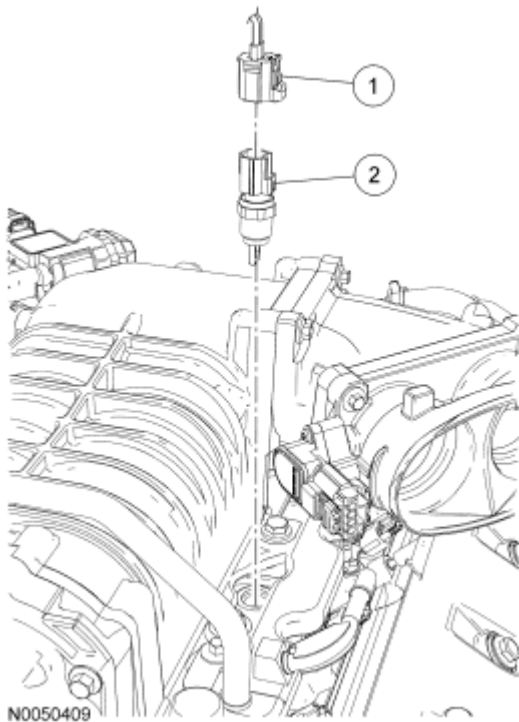


Fig. 27: Exploded View Of Intake Air Temperature 2 (IAT2) Sensor - 5.4L (4V)
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	Intake air temperature 2 (IAT2) sensor electrical connector
2	12A697	IAT2 sensor

REMOVAL

1. Disconnect the intake air temperature 2 (IAT2) sensor electrical connector.
2. Remove the IAT2 sensor.

INSTALLATION

1. Install the IAT2 sensor. Tighten the IAT2 sensor in 2 stages:
 - Stage 1: Tighten the IAT2 sensor to 15 Nm (11 lb-ft).

NOTE: During Stage 2, do not tighten the IAT2 sensor more than one full turn and do not rotate the IAT2 sensor counter clockwise after tightening.

- Stage 2: Tighten the IAT2 sensor until it is aligned as shown.

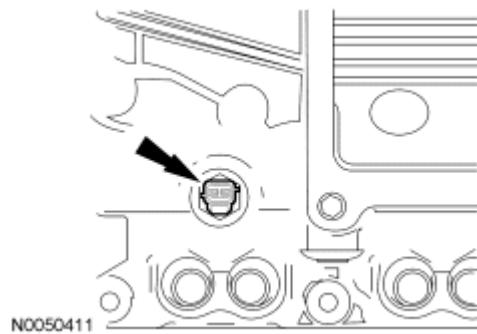


Fig. 28: Locating IAT2 Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

2. Connect the IAT2 sensor electrical connector.

SUPERCHARGER BYPASS VACUUM ACTUATOR

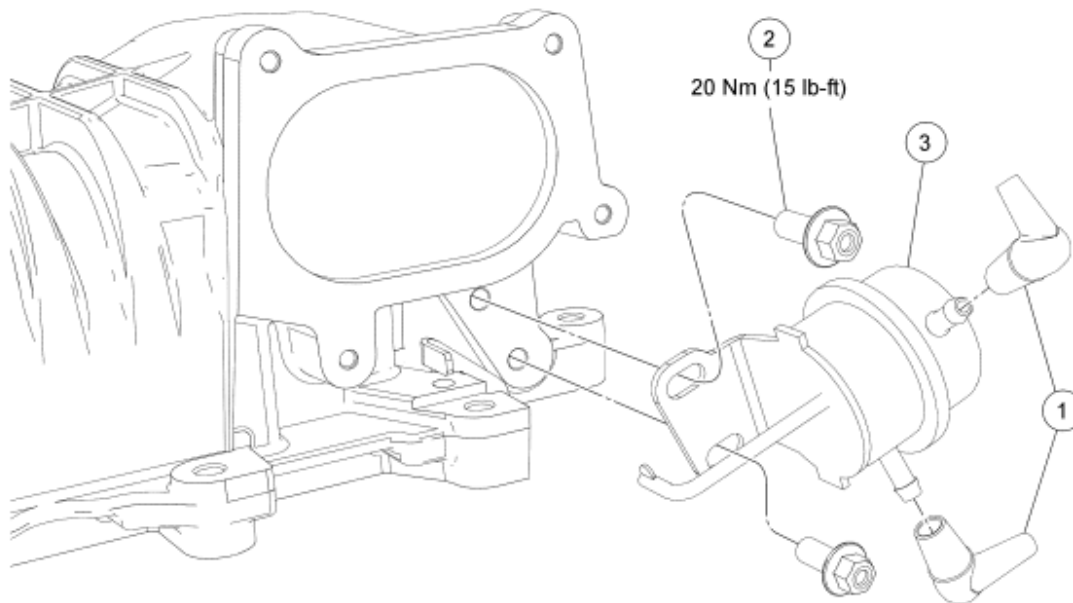


Fig. 29: Exploded View Of Supercharger Bypass Vacuum Actuator With Torque Specification
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	9E499	Supercharger (SC) bypass vacuum actuator vacuum connectors
2	-	SC bypass vacuum actuator bolts (2 required)
3	6F066	SC bypass vacuum actuator

REMOVAL

1. Remove the throttle body. For additional information, refer to **FUEL CHARGING AND CONTROLS - 5.4L (4V)** article.
2. Disconnect the 2 supercharger (SC) bypass vacuum actuator vacuum connectors.
3. Remove the 2 SC bypass vacuum actuator bolts.
4. Rotate the SC bypass vacuum actuator to align the actuator rod with the slot in the linkage, and remove the actuator.

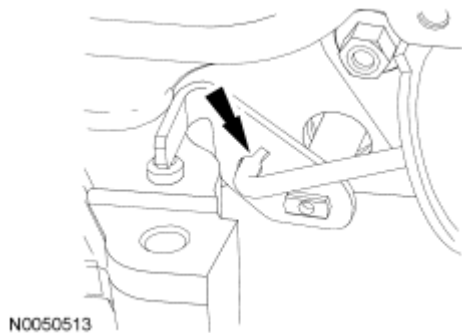


Fig. 30: Locating Actuator Rod
Courtesy of FORD MOTOR CO.

INSTALLATION

CAUTION: The actuator adjustment tool included with the new actuator kit must be used when installing the supercharger (SC) bypass vacuum actuator. Failure to correctly adjust the actuator will result in incorrect operation of the SC assembly.

1. Install the adjustment tool on the motor, making sure the tool is correctly attached to the actuator rod.

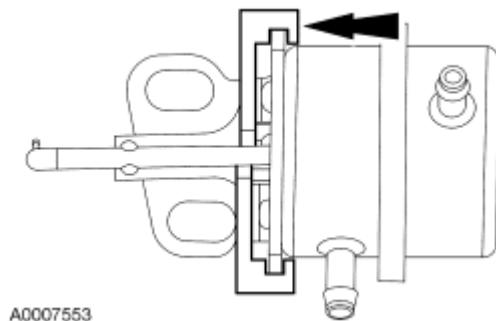


Fig. 31: Locating Adjustment Tool On Motor
Courtesy of FORD MOTOR CO.

2. Align the actuator rod with the slot in the linkage, and rotate the SC bypass vacuum actuator into position.



Fig. 32: Locating Actuator Rod
Courtesy of FORD MOTOR CO.

3. Install the 2 SC bypass vacuum actuator bolts.
 - Tighten to 20 Nm (15 lb-ft).
4. Connect the 2 SC bypass vacuum actuator vacuum connectors.
5. Remove the adjustment tool.
6. Install the throttle body. For additional information, refer to **FUEL CHARGING AND CONTROLS - 5.4L (4V)** article.

CHARGE MOTION CONTROL VALVE (CMCV) - 4.6L (3V)

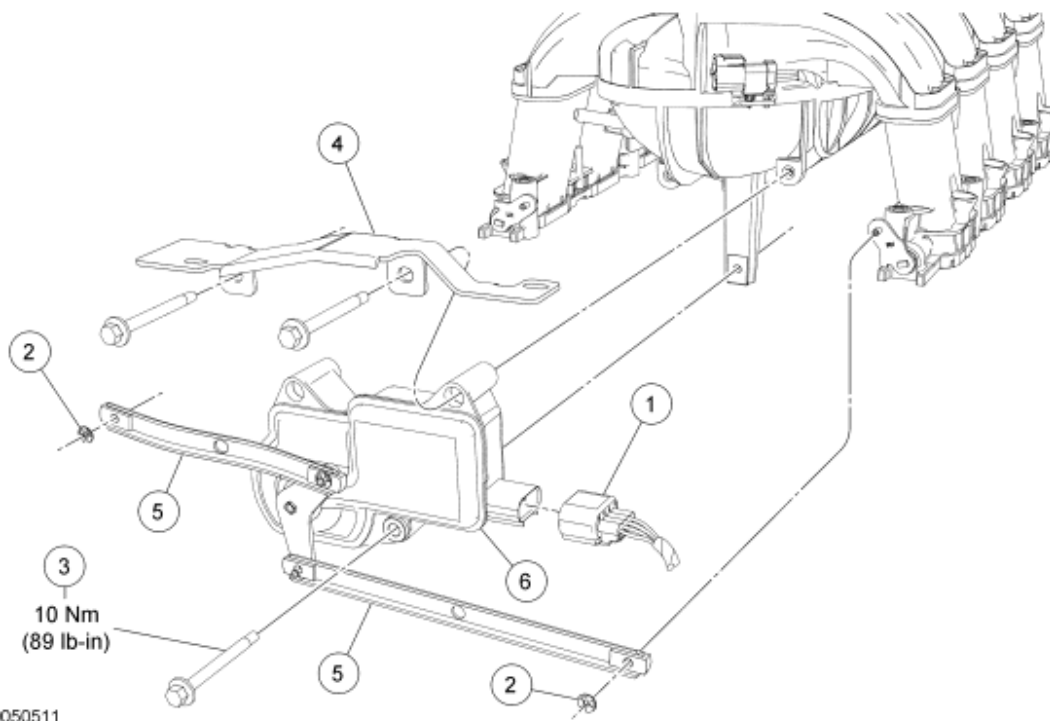


Fig. 33: Exploded View Of Charge Motion Control Valve (CMCV) With Torque Specification - 4.6L (3V)
Courtesy of FORD MOTOR CO.

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Item	Part Number	Description
1	14A464	Charge motion control valve (CMCV) electrical connector
2	W710420	E-clips (2 required)
3	W708165	CMCV bolt (3 required)
4	-	CMCV bracket
5	9B841	CMCV linkages
6	9G730	CMCV

REMOVAL

1. Remove the intake manifold. For additional information, refer to **ENGINE - 4.6L (3V)** article.
2. Remove and discard the 2 E-clips and disconnect the charge motion control valve (CMCV) linkages.

NOTE: Bent shaft or damaged components will require the intake manifold to be replaced.

3. Rotate each CMCV shaft by hand to verify that they do not stick or bind.
4. Disconnect the CMCV electrical connector.
5. Remove the 3 bolts, bracket and the CMCV.

INSTALLATION

1. Position the CMCV, bracket and install the 3 bolts loosely.
 - Do not tighten the bolts at this time.
2. Rotate each CMCV shaft so that the plates are in the closed position.
3. Install the RH and LH CMCV plate alignment locks.

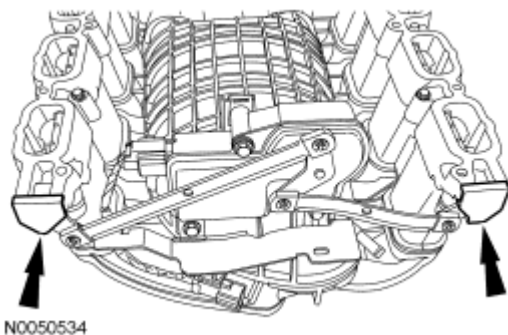


Fig. 34: Locating RH & LH CMCV Plate Alignment Locks
Courtesy of FORD MOTOR CO.

4. Connect the RH and LH CMCV linkages and install 2 new E-clips.
5. Verify that the CMCV plate alignment locks are still properly located and tighten the 3 CMCV bolts.
 - Tighten to 10 Nm (89 lb-in).

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6. Remove the RH and LH alignment locks.

NOTE: **Make sure that the wiring harness is routed away from the CMCV system.**

7. Connect the CMCV electrical connector
8. Install the intake manifold. For additional information, refer to **ENGINE - 4.6L (3V)** article.
9. Perform the KOEO self test. For additional information, refer to **Introduction - Gasoline Engines** article.