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2013 Jeep Wrangler Service and Repair Manual

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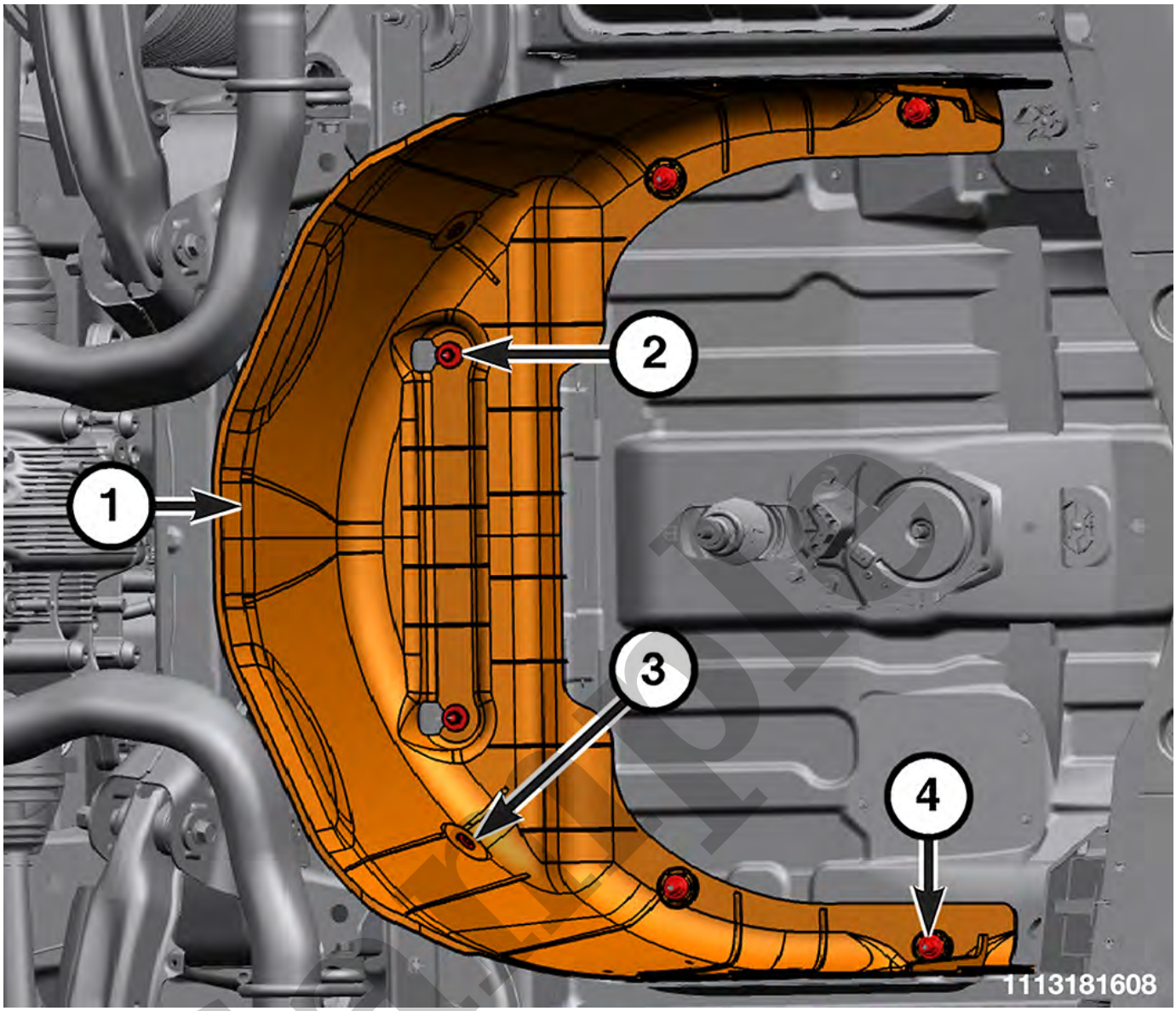
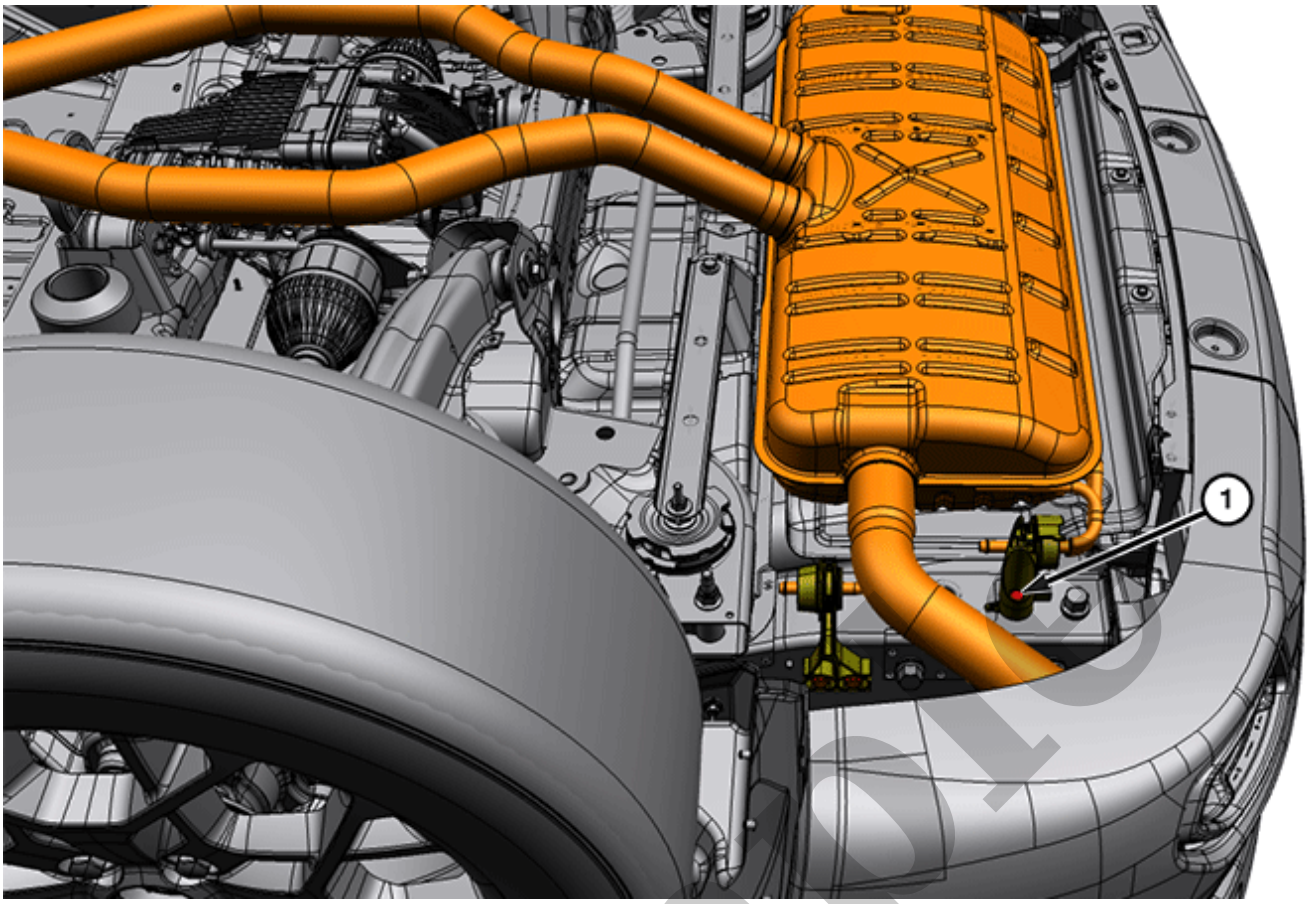


1 - Spare Tire Heat Shield
2 - Spare Tire Heat Shield Bolts
3 - Push Pin Fasteners
4 - Spare Tire Heat Shield Nuts

3. Remove the spare tire heat shield bolts securing the spare tire heat shield.
4. Remove the push pin fasteners.
5. Remove the spare tire heat shield nuts and the spare tire heat shield.

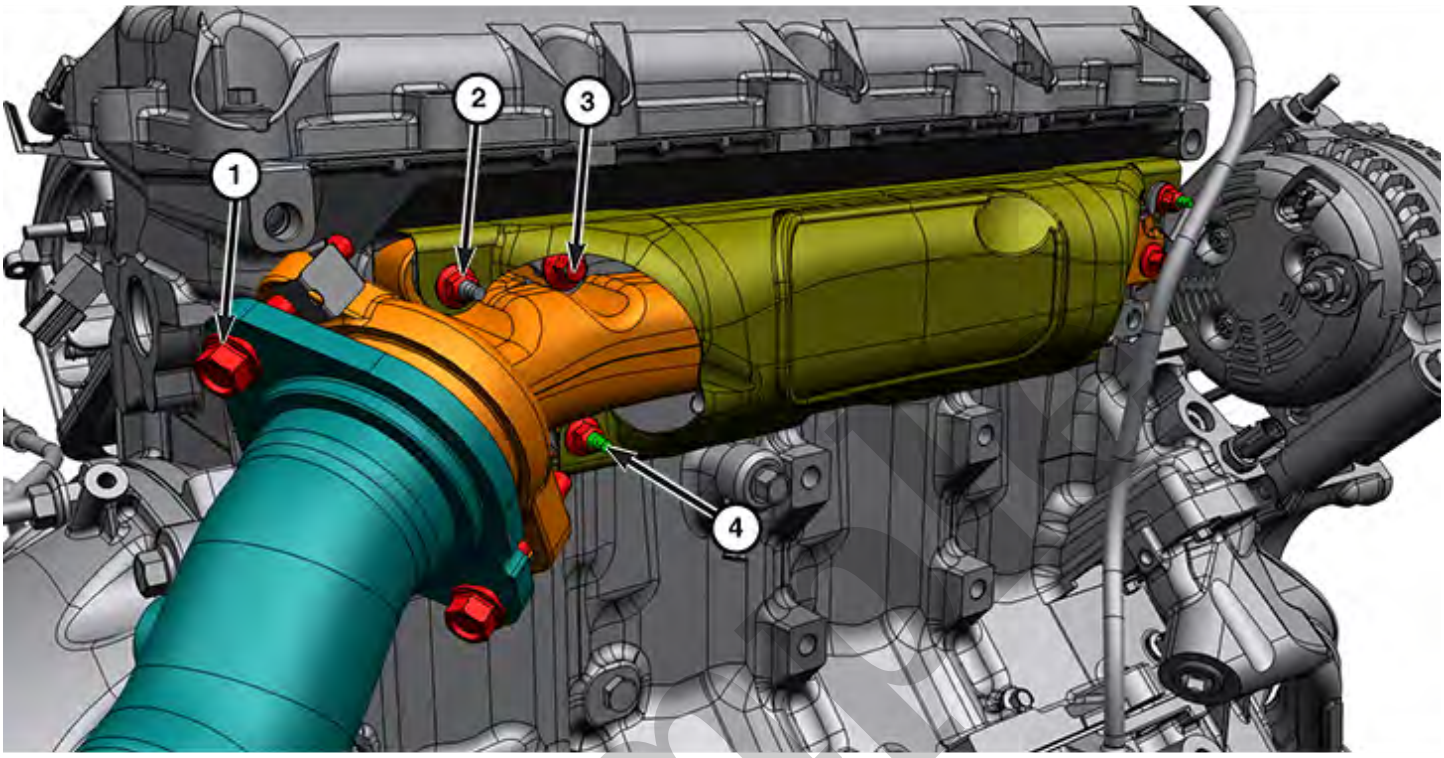
INSTALLATION



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Rear Isolator Bolts	**25 N·m (18 Ft. Lbs.)**	–

Follow the removal procedure in reverse for general reassembly of the components on the vehicle.

TORQUE SPECIFICATION - EXHAUST SYSTEM - 5.7L



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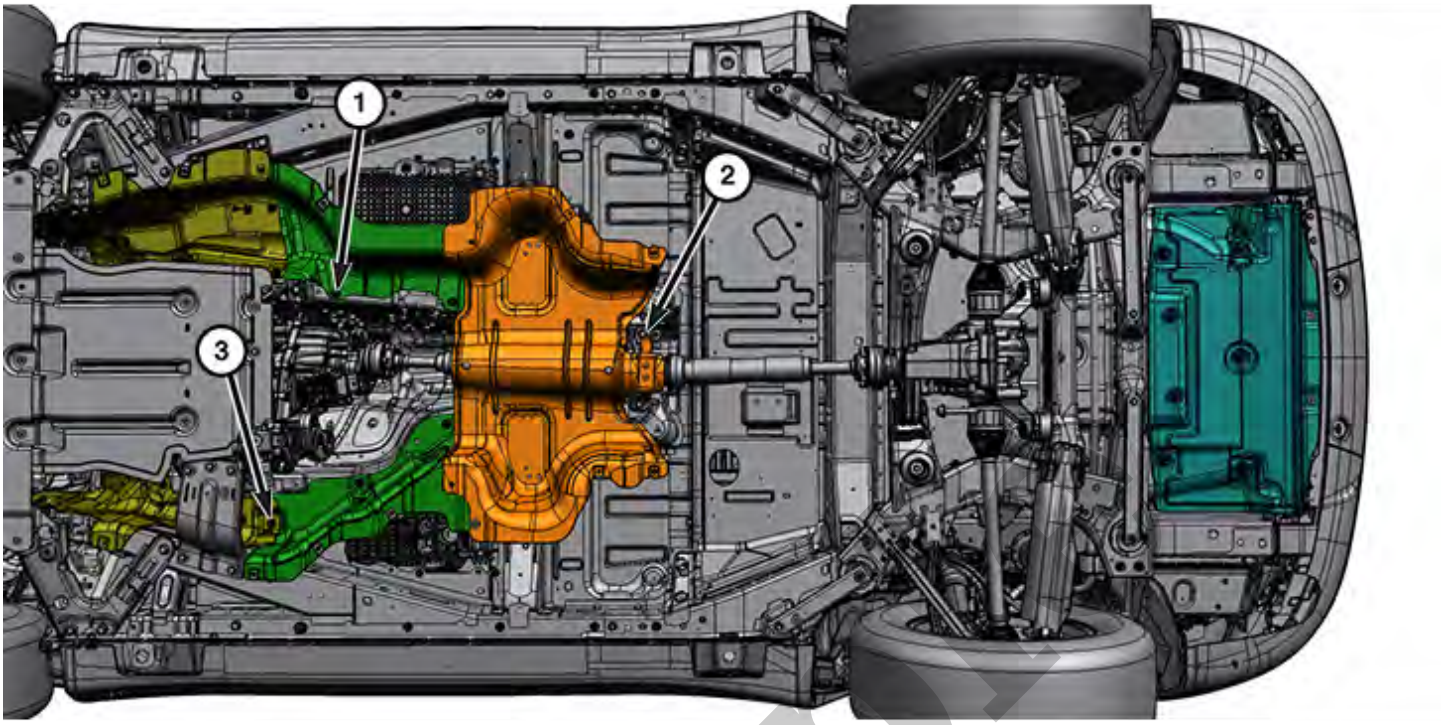
CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Catalytic Converter To Manifold Bolts	**30 N·m (22 Ft. Lbs.)**	–
2	Exhaust Manifold Heat Shield Nuts	**10 N·m (7 Ft. Lbs.)**	–
3	Exhaust Manifold Bolts	**25 N·m (18 Ft. Lbs.)**	Tightening Sequence - Left Manifold



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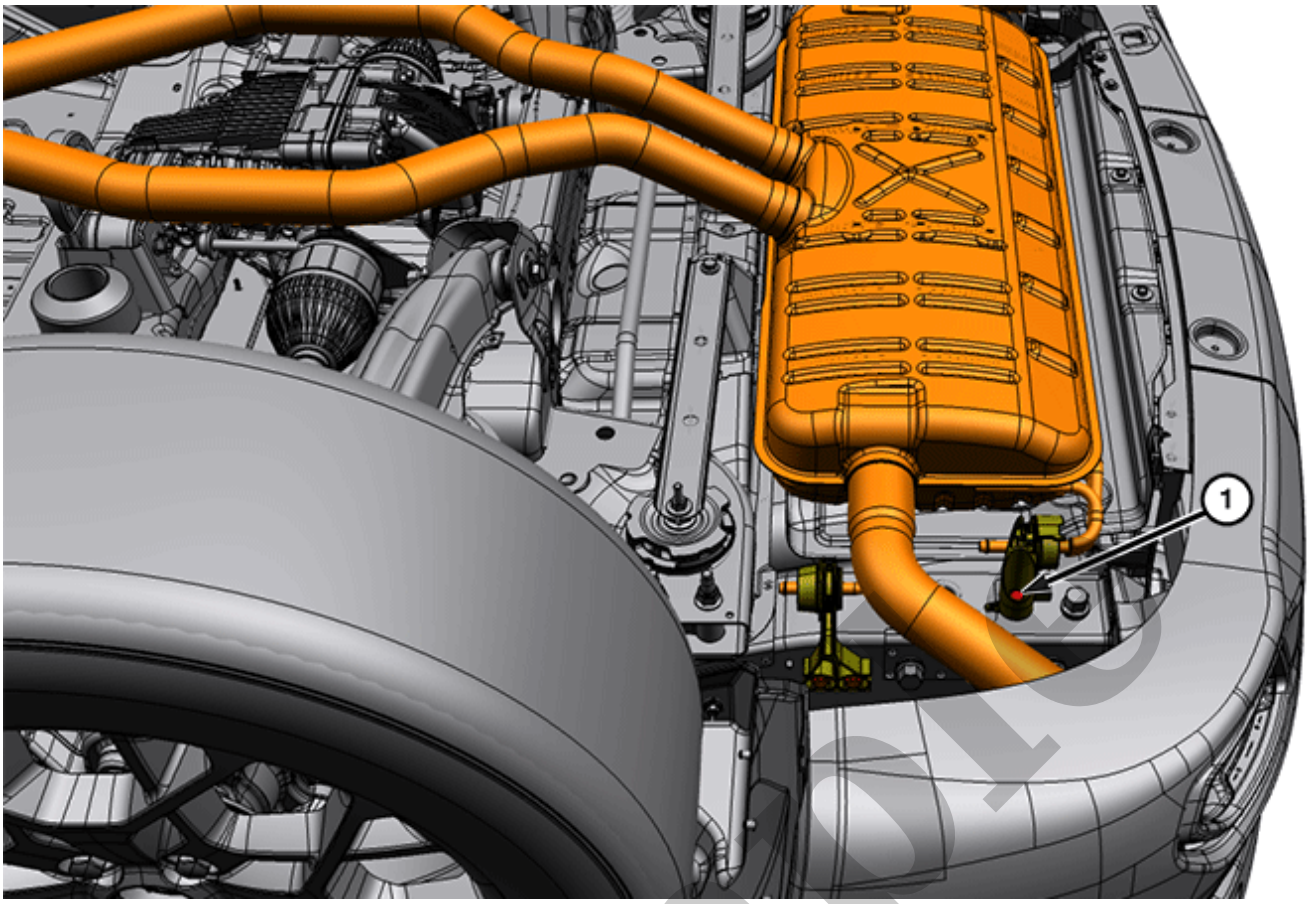
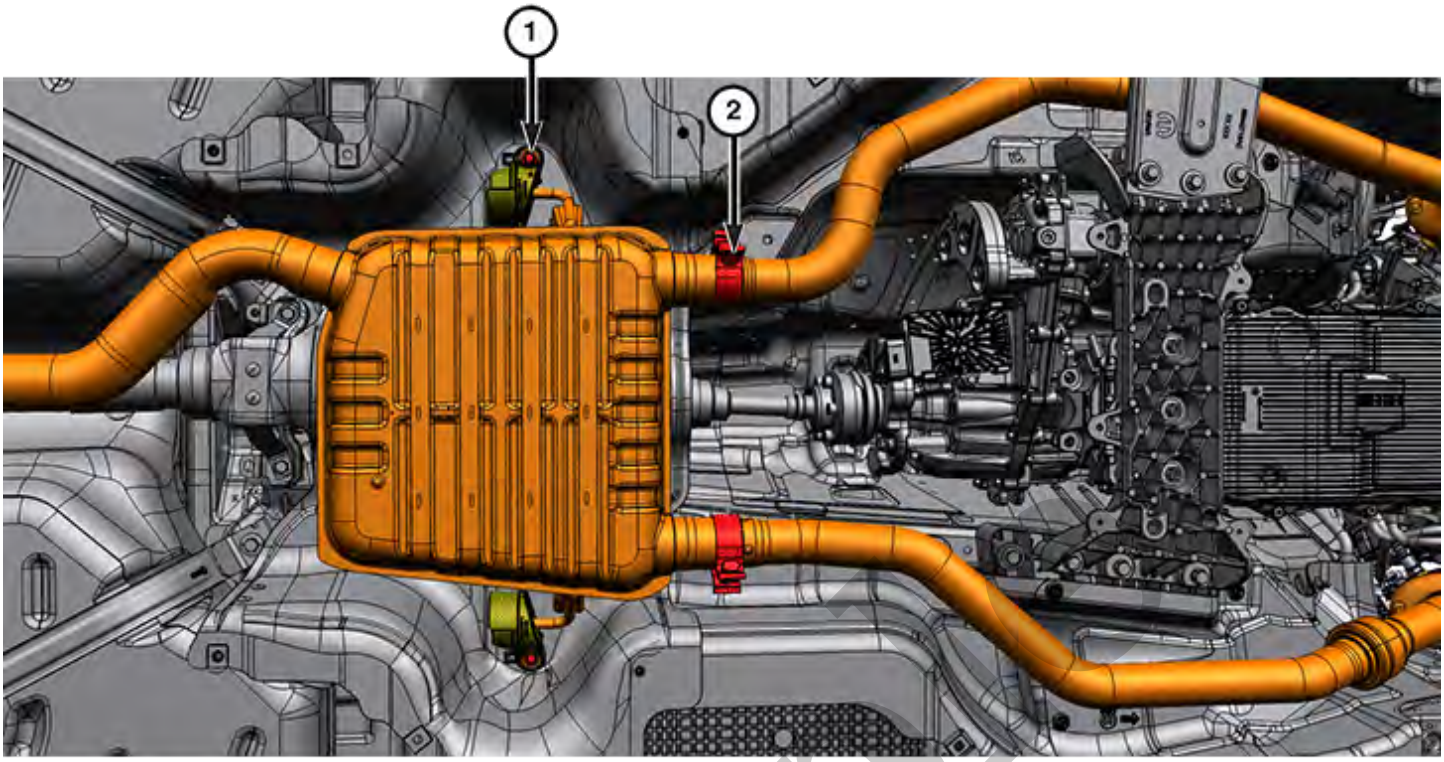
CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Heat Shield Nuts - Plastic	**5 N·m (44 In. Lbs.)**	–
2	Heat Shield Bolts	**18 N·m (13 Ft. Lbs.)**	–
3	Heat Shield Nuts - Steel	**8 N·m (71 In. Lbs.)**	–
–	Spare Tire Heat Shield To Underbody (Heat Shield Bolts)	**6 N·m (53 In. Lbs.)**	–



CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Rear Isolator Bolts	**25 N·m (18 Ft. Lbs.)**	–



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CALLOUT	DESCRIPTION	SPECIFICATION	COMMENT
1	Exhaust Isolator Bolts	**25 N·m (18 Ft. Lbs.)**	–
2	Torca Clamp Nut	**48 N·m (35 Ft. Lbs.)**	–

Switching 4-Wire O2 Sensor Description:

The traditional Switching (4-wire) O2 Sensors are mounted in the vehicle exhaust system. They are used to monitor how much unburned oxygen is in the exhaust as the exhaust exits the engine. Monitoring oxygen levels in the exhaust is a way of gauging the fuel mixture. The O2 Sensors report to the Powertrain Control Module (PCM) if the fuel mixture is burning rich (less oxygen) or lean (more oxygen).

Switching 4-Wire O2 Sensor Operation:

- **O2 Sensor Heater Operation** - For a typical Switching (4-wire) Oxygen (O2) Sensor output signal to function, the sense element must be heated to operating temperature. A resistive heater element is incorporated within the sensor to allow for rapid heating of the sensor to reach operating temperature faster and closed loop fuel control. The O2 Sensor Heater resistance is directly proportional to the heater temperature, meaning that as heater temperature increases, the heater resistance increases. The Powertrain Control Module (PCM) makes a calculation to determine the heater resistance and temperature. The heater resistance is calculated by measuring the Battery voltage and current draw on the heater control circuit, Then the heater temperature is determined using the resistance versus temperature characteristic. The heater temperature is monitored continuously and the heating rate is adjusted using Pulse Width Modulation (PWM) to prevent damaging the heating element. If the PCM detects a fault in the O2 Sensor heater circuitry the internal PCM driver is disabled during the current ignition cycle.
- **O2 Sensor Output Operation** - Normal range of the O2 Sensor output is a 0 to 1.0 volt Analog to Digital (A/D) signal when the sensor is in normal operating temperature range. The output voltage is generated by comparing the Oxygen content in the atmosphere, collected in a reference chamber to the Oxygen content in the exhaust stream collected in a comparison chamber. When the oxygen content is high (caused by a lean air/fuel mixture) the sensor produces a low voltage. When the oxygen content is low (caused by a rich air/fuel mixture) it produces a higher voltage. In some instances a negative offset output of up to -1.0 volts may be introduced if the sensors reference chamber is contaminated. To allow for the negative voltage to be read, each O2 Sensor Return circuit has a 2.5 volt bias added to shift the signal voltage to between 2.5 volts and 3.5 volts.

Wide-Band O2 Sensor Description:

The wide-band O2 Sensor operates differently than traditional O2 Sensors. The wide-band O2 Sensor tip consists of two cells that provide different functions, a measurement chamber and a detection chamber with pumping capabilities. The oxygen pumping function is the ability to pump oxygen into or out of the measurement chamber depending on the level of oxygen in the measurement chamber. This function provides the wide-band sensing capabilities and is critical for proper oxygen measurement. The O2 Sensor Reference circuit provides a common bias supply to both the O2 Sensor Signal and the O2 Sensor Pump Cell Current circuits.

Wide-Band O2 Sensor Operation:

- **O2 Sensor Heater Operation** - For the wide-band O2 Sensor to deliver accurate readings the sensing elements must be heated. A Positive Temperature Coefficient (PTC) element inside the O2 Sensor heats

	affected O2 Sensor raw signal voltage to read high (usually stays above 4.0 volts) and can also eventually set a Signal Circuit High DTC. It is not unusual to have a Heater Control Circuit High or Low DTC and a Sensor Signal High DTC to be set together. **Important Note: A small amount of resistance (3-4 Ohms) may not set a Heater Control Circuit DTC but will affect heater operation and cause the SENSOR SIGNAL HIGH DTC to set** . Monitoring the heater duty cycle and temperature for a sensor that is reading high on the raw signal voltage can help in diagnosing this issue. A heater circuit with 4.0 - 5.0 Ohms resistance can increase the heater temperature reading on the diagnostic scan tool for the affected sensor by as much as 371°C (700°F) when compared to the other Switching (4-wire) O2 Sensors. As little as 2.0 Ohms can increase the temperature reading approximately 121°C (250°F) on the diagnostic scan tool. **NOTE** When a normally operating Switching O2 Sensor is heated to operating temperature the typical duty cycle percentage will be between approximately 30 and 50%. The typical heater temperature will range approximately 649-760°C (1200-1400°F) on the diagnostic scan tool. If there is an issue with the O2 Sensor heater or circuitry, the PCM will disable the heater driver and the duty cycle will be 0%. Any issues in the heater circuitry, even a small amount of resistance, will cause the temperature reading to be noticeably different.
O2 Sensor Signal Low Diagnosis:	Monitor the diagnostic scan tool and start the engine. With an O2 Sensor Signal shorted to ground and the O2 Sensor cold, the raw signal voltage will be at 0 volts, but the (0-1) differential voltage signal will read -2.5 volts and increase toward 0 volts as the sensor heats up. When the sensor is warm, the raw signal voltage reading and the (0-1) differential voltage reading will both read near 0 volts. It will also pull the sensor return bias voltage low through the O2 Sensor. This will cause the raw voltage signals to switch between the 0-1 volt range on the other O2 Sensors. This may also cause the O2 Sensor Reference (Return) Voltage Circuit Low DTC to set.
O2 Sensor Signal High Diagnosis:	The O2 Sensor Signal High diagnostic can fail due to several conditions. As mentioned above, an open, short or any resistance in the heater circuitry can cause the signal voltage to remain high. Looking for abnormalities in the heater duty cycle or heater temperature of the affected sensor would indicate a heater control issue causing the signal circuit high fault. An open in a O2 sensor signal or return circuit will cause the raw signal voltage to read high, 4.0-5.0 volts, and the (0-1) differential voltage reading to be near 2.5 volts for the sensor. If both of the Downstream O2 Sensors are affected, it could indicate an open in the return circuit that is before the splice in the harness.