

SECTION 204-04: Wheels and Tires
DIAGNOSIS AND TESTING

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

Tire Pressure Monitoring System (TPMS)

Special Tool(s)

 ST2941-A	Activation Tool, Tire Pressure Monitor 204-363
 ST2869-A	Digital Tire Pressure Gauge 204-354
 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool

Principles of Operation

⚠ WARNING: The tire pressure monitoring system (TPMS) sensor battery may release hazardous chemicals if exposed to extreme mechanical damage. If these chemicals contact the skin or eyes, flush immediately with water for a minimum of 15 minutes and get prompt medical attention. If any part of the battery is swallowed, contact a physician immediately. When disposing of TPMS sensors, follow the correct procedures for hazardous material disposal. Failure to follow these instructions may result in serious personal injury.

The Tire Pressure Monitor (TPM) module monitors the tire pressure of all 4 road tires. The wheel-mounted tire pressure sensors transmit signals via radio frequency to the TPM module. The TPM module is a radio receiver that collects the tire pressure data from the tire pressure sensors. The TPMS sensor radio transmissions are sent once approximately every 60 seconds when the vehicle speed exceeds 32 km/h (20 mph). The data is then sent to the Body Control Module (BCM) where a predetermined pass/fail criteria is applied. The BCM compares each TPMS sensor transmission against a low-pressure limit. If it has been determined that the tire pressure has fallen below this limit, the BCM communicates this on the vehicle communication bus to the Instrument Panel Cluster (IPC). The IPC then illuminates the TPMS warning indicator and displays the appropriate message(s) in the message center.

Ambient Temperature Change and Tire Pressure

Tire pressures fluctuate with temperature changes. For this reason, tire pressure must be set to specification

when tires are at outdoor ambient temperatures. If the vehicle is allowed to warm up to shop temperatures, and the outside temperature is less than shop temperature, the tire inflation pressure must be adjusted accordingly.

If the tires are inflated to specification at shop temperatures, and the vehicle is moved outdoors when the outdoor ambient temperature is significantly lower, the tire pressure may drop enough to be detected by the TPMS and activate the TPMS warning indicator.

As the ambient temperature decreases by 6°C (10°F), tire pressure decreases 7 kPa (1 psi). Adjust the tire pressure by 7 kPa (1 psi) for each 6°C (10°F) ambient temperature drop as necessary to keep the tire at the specified Vehicle Certification (VC) label pressure. Refer to the following tables to adjust the tire pressure indoors for colder outside temperatures.

Table 1. Use Table to Adjust Tire Pressure Inside Garage for Colder Outside Temperature¹

**** Do Not Inflate Tire Higher than Maximum Pressure Stamped on Tire Sidewall. ****

Table is based on a Garage Temperature of 70°F. Max Pressure Adjustment is 7 psi.

Outside Temperature (°F)	Tire Placard Pressure (PSI)																	
	30	32	34	35	38	40	41	42	45	50	55	60	65	70	75	80	85	90
70	30	32	34	35	38	40	41	42	45	50	55	60	65	70	75	80	85	90
60	31	33	35	36	39	41	42	43	46	51	56	61	67	72	77	82	87	92
50	32	34	36	37	40	42	43	44	47	53	58	63	68	73	79	84	89	94
40	33	35	37	38	41	43	44	45	49	54	59	64	70	75	80	86	91	96
30	34	36	38	39	42	44	46	47	50	55	61	66	72	77	82	87	92	97
20	35	37	39	40	43	46	47	48	51	57	62	67	72	77	82	87	92	97
10	36	38	40	41	45	47	48	49	52	57	62	67	72	77	82	87	92	97
0	37	39	41	42	45	47	48	49	52	57	62	67	72	77	82	87	92	97
-10	37	39	41	42	45	47	48	49	52	57	62	67	72	77	82	87	92	97
-20	37	39	41	42	45	47	48	49	52	57	62	67	72	77	82	87	92	97
-30	37	39	41	42	45	47	48	49	52	57	62	67	72	77	82	87	92	97
-40	37	39	41	42	45	47	48	49	52	57	62	67	72	77	82	87	92	97

Table 2. Use Table to Adjust Tire Pressure Inside Garage for Colder Outside Temperature (Metric Units)¹

**** Do Not Inflate Tire Higher than Maximum Pressure Stamped on Tire Sidewall. ****

Table is based on a Garage Temperature of 21°C. Max Pressure Adjustment is 50 kPa.

Outside Temperature (°C)	Tire Placard Pressure (kPa)																	
	205	220	235	240	260	275	285	290	310	345	380	415	450	485	515	550	585	620
21	205	220	235	240	260	275	285	290	310	345	380	415	450	485	515	550	585	620
16	215	230	240	250	270	285	290	295	315	350	385	420	460	495	530	565	600	635
10	220	235	250	255	275	290	295	305	325	365	400	435	470	505	545	580	615	650
4	230	240	255	260	285	295	305	310	340	370	405	440	485	515	550	595	625	660
-1	235	250	260	270	290	305	315	325	345	380	420	455	495	530	565	600	635	670
-7	240	255	270	275	295	315	325	330	350	395	425	460	495	530	565	600	635	670
-12	250	260	275	285	310	325	330	340	360	395	425	460	495	530	565	600	635	670
-18	255	270	285	290	310	325	330	340	360	395	425	460	495	530	565	600	635	670
-23	255	270	285	290	310	325	330	340	360	395	425	460	495	530	565	600	635	670
-29	255	270	285	290	310	325	330	340	360	395	425	460	495	530	565	600	635	670
-34	255	270	285	290	310	325	330	340	360	395	425	460	495	530	565	600	635	670
-40	255	270	285	290	310	325	330	340	360	395	425	460	495	530	565	600	635	670

¹When Outside (Ambient) Temperature is greater than 21°C (70°F), Inflate tires to placard pressure.

¹Use the table to adjust tire pressure for P-metric and LT tires only.

¹Do NOT use table for Commercial Truck Tires (i.e. 19.5 inch tires for F450 & F550). See F-Super Duty Service Manual for tire inflation procedure.

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Tire Pressure Monitoring System (TPMS) Warning Indicator and Message Center Messages

The TPMS warning indicator and vehicle message center sometimes display faults that cannot be resolved by the customer. Treat these messages as TPMS faults that must be serviced.

Tire Pressure Monitoring System (TPMS) Warning Indicator Illuminates Continuously

NOTE: When directed to train or re-train any TPMS sensors, use **only** the sensor training procedure outlined in [Tire Pressure Monitoring System \(TPMS\) Sensor Training](#). Do not use the TPMS reset procedure outlined in the Owner's Literature as this procedure **will not** program new sensors to the module.

The TPMS warning indicator remains on continuously and the message center displays LOW TIRE PRESSURE when any of the tire pressures are low. When this condition exists, adjust the tire pressure to the recommended cold pressure indicated on the VC label.

NOTE: The TPMS sensors do not transmit when the vehicle is stationary. If the vehicle has been stationary for more than 30 minutes, it is necessary to wake up the sensors so that they transmit the latest tire pressure information to the TPM module.

If the vehicle has been stationary for more than 30 minutes, carry out the [Tire Pressure Monitoring System \(TPMS\) Sensor Activation](#) procedure in this section.

TPMS Warning Indicator Flashes

The TPMS warning indicator flashes for 70 seconds, then remains ON continuously when the ignition switch is turned to the ON position and 1 or more of the following conditions exists:

- Tire Pressure Sensor Fault — The message center displays TIRE PRESSURE SENSOR FAULT when a TPMS sensor is malfunctioning. GO to [Symptom Chart](#).
- No communication with the BCM. The TPMS indicator is illuminated when the IPC has not received any signals from the BCM for more than 5 seconds. The message center displays TIRE PRESSURE MONITOR FAULT. GO to [Symptom Chart](#).
- Tire Pressure Monitor Fault — The message center displays TIRE PRESSURE MONITOR FAULT when the TPMS is malfunctioning or communication with the IPC has been lost. GO to [Symptom Chart](#).

The TP_STAT PID can be used to determine why the TPMS warning indicator is flashing.

Tire Pressure Monitoring System (TPMS) PID Definitions and Intermittent Troubleshooting

TPMS Status PID

The TPM monitors the TPMS status. The current status can be viewed by accessing the TPMS status PID: TPMS_STAT using the scan tool. This helps identify the current system status and may aid in diagnosing the system. The PID has 4 valid states:

1. TPMS_STAT = SENSOR FAULT.
 - If the module has not received the tire pressure status from 1 to 3 TPMS sensors for 20 minutes when the vehicle speed is above 32 km/h (20 mph), the PID displays SENSOR FAULT.

2. TPMS_STAT = SYSTEM FAULT.
 - If the module has not received the tire pressure status from all 4 TPMS sensors for 20 minutes and the vehicle speed is above 32 km/h (20 mph), the PID displays SYSTEM FAULT.
3. TPMS_STAT = LOW.
 - If the module has detected that at least 1 TPMS sensor is reporting low tire pressure, the PID displays LOW.
4. TPMS_STAT = SYSTEM ACTIVE.
 - If the TPMS is functioning normally, the PID displays SYSTEM ACTIVE.

TPMS Last Warning Event PID Definitions

The TPMS uses the TPMS last warning event PIDs to store detailed information about the last 5 times the TPMS warning indicator was activated. These PIDs can be used to acquire more information about a particular TPMS event, but must be used carefully.

EVT1_AGE_IGN through EVT5_AGE_IGN

The number of key cycles since the TPMS indicator was activated. This PID cycles from zero to 255. Default is \$00, this can be used to determine how long ago a TPMS event occurred and the time (in key cycles) between events.

EVT1_TR_LOC through EVT5_TR_LOC

This is the last programmed location for the sensor identifier causing each TPMS event. Due to tire rotation, the sensor may no longer be at the original location. It is suggested that all the PIDs be recorded, the system retrained, and then the sensor identifier PIDs be used to pinpoint the actual location of each sensor.

EVT1_PRESS through EVT5_PRESS

This is the tire pressure associated with each TPMS warning indicator event. This can be used along with the function code to clearly identify the TPMS events that were strictly due to low pressure. It can also be used to determine when a sensor is transmitting inaccurate tire pressure.

EVT1_SNSR_ST through EVT5_SNSR_ST

Describes the warning status of each TPMS event by using the information received from the TPMS status (TPMS_STAT) PID. If there is a communication issue, the status could be Normal.

- Unknown
- Normal (normal operation)
- Low (low pressure event)
- Fault (sensor fault or system fault)

EVT1_SNSR_ID through EVT5_SNSR_ID

This is the identifier of the sensor involved in each TPMS event. EVT1 is the most recent event that triggered the TPMS warning indicator. Default is \$ 00 00 00 00.

Wheel Rotation and Sensor Training Techniques

Moving a Problem Sensor/Wheel to a Different Position

If a sensor in a certain location has caused several events, yet the sensor trains and seems to operate normally, moving that particular wheel to a different location on the vehicle is a good way to isolate the issue to a certain sensor/wheel location. Rotate the wheels and road test the vehicle. This can be done in an attempt to replicate the issue. This determines if the issue followed the sensor or remained in the original sensor location.

Training Sensors in a Different Order

This is a technique to get past a left front sensor that may not be responding to determine if the remaining sensors train to the module. This can help save time determining if other sensors are having issues or if the module is experiencing training difficulties with a certain location.

Training Known Good Sensors From Another Vehicle

Training known good sensors from another vehicle cannot differentiate between a faulted module and Radio Frequency Interference (RFI), as some noise source could be preventing the TPM module from receiving the tire pressure status from the original sensors as well as the known good sensors. This technique can be used to differentiate between a sensor and module issue. If the TPM module cannot train any of the sensors on the same vehicle, and likewise cannot train known good sensors from another vehicle, then the issue is with the TPM module or RFI and not with the original sensors. The original sensors should not be replaced.

Items That Cause RFI

Non-OEM Equipment

The following equipment has been found to sometimes cause RFI:

- Video equipment has been found to cause RFI especially when the video and power supply lines are near the TPMS.
- Car alarms (even those installed by dealerships) have been found to create enough RFI to cause the TPMS to malfunction or lose considerable range. These car alarms can sometimes be difficult to locate, as they are usually hidden somewhere out of the way for reduced accessibility.
- Many different in-vehicle cell phone chargers have been found to cause considerable RFI. The vehicles with the power point closest to the TPM module are the most affected. It must be noted that most cell phone chargers do not produce high levels of RFI all the time. This depends on the state of charge of the cell phone battery. The phone must be almost completely discharged in some cases.
- Power supplies and DC/AC inverters typically create a lot of RFI. Most consumer grade equipment has very little filtering or shielding.

OEM Modules

In some cases, the RFI may actually be caused by a module or ground on the vehicle. Depending on the severity of the issue, a dirty ground, improperly built ground shield or module can disable the system. Modules that have microcontrollers using clock circuits to create the timing pulses for the microprocessor may radiate RFI.

Using Customer's Electronics to Pinpoint the Radio Frequency Interference (RFI) Source

This can be a way to determine the cause of an issue well before the sensors and module are replaced with little or no affect on the system performance. Since this takes more up-front work, it relies on working with the customer to determine what equipment was being used at the time of the event.

Options for Eliminating Intermittent TPMS Conditions Caused by RFI

- If an OEM component or customer device is causing an RFI issue, replace the device.

- If a phone charger is causing an RFI issue, the customer should consult their cell phone provider to acquire a different phone charger.
- If a device such as a dealer-installed alarm is causing an RFI issue, move the device to another location on the vehicle. In the case of a portable device, move the power cord to another power point location.

In summary, if the RFI source is present and cannot be moved or replaced, the intermittent issue remains. The TPMS system must accept RFI and the unwanted system operation it can cause.

Inspection and Verification

1. Verify the customer concern. Keep the following items in mind when diagnosing any TPMS related issue:
 - The tire pressure sensors are not designed to be used with aftermarket wheels. The use of run-flat tires (tires with steel body cord plies in the tire sidewall) that are not originally equipped, may block the TPMS signal and are not recommended.
 - Non-OEM modifications made to the vehicle may result in false TPMS warnings.
 - Swapping wheels on vehicles with the same TPMS sensors sets a fault if the sensors are not trained. Refer to [Tire Pressure Monitoring System \(TPMS\) Sensor Training](#) in this section.
 - The tire pressure calibrations in the TPM for the system cannot be changed to use lower tire pressures than those listed on the Vehicle Certification (VC) label.
 - Certain non-OEM electronic equipment may cause RFI and false TPMS warnings. To aid in diagnosis, obtain information from the owner regarding any equipment that has been added or was in use at the time the TPMS fault occurred.
 - It may be necessary to disconnect any electronic add-on equipment to verify its impact on TPMS operation. For intermittent cases, it may be necessary to ask the customer to provide portable electronic equipment to verify its impact on the system.
2. Visually inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
• Low tire pressure • Spare tire installed as a road wheel • Sensors not trained after a tire rotation • Tire Pressure Monitoring System (TPMS) sensor damaged or missing • Incorrect <u>TPMS</u> sensor installed • <u>TPMS</u> sensor installed incorrectly • Non-OEM wheels installed (aftermarket rims) • Non-OEM equipped run-flat tires or rigid sidewall tires (19.5" steel carcass heavy-duty tires) installed • Other non-OEM modifications (roll cages, service barriers, part racks, ladder racks)	• Body Control Module (BCM) fuse 26 (5A) • Wiring, terminals or connectors • <u>TPM</u> missing or damaged • Aftermarket electronic accessories (in-car chargers or supplies, DC/AC inverters, video screens, car alarms)

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step.

4. **NOTE:** Make sure to use the latest scan tool software release.

If the cause is not visually evident, connect the scan tool to the Data Link Connector (DLC).

5. **NOTE:** The Vehicle Communication Module (VCM) LED prove-out confirms power and ground from the DLC are provided to the VCM.

If the scan tool does not communicate with the VCM:

- check the VCM connection to the vehicle.
- check the scan tool connection to the VCM.
- refer to [Section 418-00](#), No Power To The Scan Tool, to diagnose no power to the scan tool.

6. If the scan tool does not communicate with the vehicle:

- verify the ignition key is in the ON position.
- verify the scan tool operation with a known good vehicle.
- refer to [Section 418-00](#), The PCM Does Not Respond To the Scan Tool, to diagnose no response from the PCM.

7. Carry out the network test.

- If the scan tool responds with no communication for one or more modules, refer to [Section 418-00](#).
- If the network test passes, retrieve and record Continuous Memory Diagnostic Trouble Codes (CMDTCs).

8. Clear the CMDTCs and carry out the self-test diagnostics for the BCM and the TPM module.

9. If the DTCs retrieved are related to the concern, go to the BCM DTC Chart or the TPM Module DTC Chart. For all other DTCs, refer to the Diagnostic Trouble Code (DTC) Chart in [Section 419-10](#).

10. If no DTCs related to the concern are retrieved, GO to [Symptom Chart](#).

DTC Charts

Body Control Module (BCM) DTC Chart

DTC	Description	Action
B1182:00	Tire Pressure Monitoring System (TPMS): No Sub Type Information	GO to Pinpoint Test F .
B1182:55	Tire Pressure Monitoring System (TPMS): Not Configured	This DTC is only present when a new <u>BCM</u> is installed, the <u>BCM</u> is flashed or is reconfigured. TRAIN the tire pressure sensors. REFER to Tire Pressure Monitoring System (TPMS) Sensor Training in this section.
B124D:02	Tire Pressure Sensor: General Signal Failure	NOTE: If the vehicle has been stationary for more than 30 minutes, the sensors go into sleep mode to conserve battery power. It may be necessary to wake them up so they transmit the latest tire pressure information to the <u>TPM</u> module. ACTIVATE the <u>TPMS</u> sensors. REFER to Tire Pressure Monitoring System (TPMS) Sensor Activation in this section.

		REPEAT the self-test. If DTC B124D:02 is retrieved again, GO to Pinpoint Test F.
B1251:00	Tire Pressure Sensor Low Battery: No Sub Type Information	GO to Pinpoint Test H.
B1254:51	Right Rear (Outside on Dual Wheel) Tire Pressure Sensor and Transmitter Assembly: Not Programmed	This DTC is only present when a new <u>BCM</u> is installed, the <u>BCM</u> is flashed or reconfigured. TRAIN the tire pressure sensors. REFER to Tire Pressure Monitoring System (TPMS) Sensor Training in this section.
B1255:51	Left Rear (Outside on Dual Wheel) Tire Pressure Sensor and Transmitter Assembly: Not Programmed	This DTC is only present when a new <u>BCM</u> is installed, the <u>BCM</u> is flashed or reconfigured. TRAIN the tire pressure sensors. REFER to Tire Pressure Monitoring System (TPMS) Sensor Training in this section.
C1A56:51	Left Front Tire Pressure Sensor and Transmitter Assembly: Not Programmed	This DTC is only present when a new <u>BCM</u> is installed, the <u>BCM</u> is flashed or reconfigured. TRAIN the tire pressure sensors. REFER to Tire Pressure Monitoring System (TPMS) Sensor Training in this section.
C1A58:51	Right Front Tire Pressure Sensor and Transmitter Assembly: Not Programmed	This DTC is only present when a new <u>BCM</u> is installed, the <u>BCM</u> is flashed or reconfigured. TRAIN the tire pressure sensors. REFER to Tire Pressure Monitoring System (TPMS) Sensor Training in this section.
All other DTCs	—	REFER to Section 419-10.

Tire Pressure Monitor (TPM) Module DTC Chart

DTC	Description	Action
B1D55:01	Antenna #2: General Electrical Failure	REFER to Section 303-06.
U0140:87	Lost Communication with Body Control Module: Missing Message	GO to Pinpoint Test I.
U0422:68	Invalid Data Received from Body Control Module (BCM): Event Information	RETRIEVE and REPAIR all non-network DTCs in the <u>BCM</u> . REFER to Section 419-10.

Symptom Chart

Symptom Chart

NOTE: For vehicles with different front and rear tire pressures, the tire pressures must be adjusted and the tire pressure sensors must be trained following a tire rotation. Failure to train the sensors results in a false low tire pressure event, causing the Tire Pressure Monitoring System (TPMS) indicator to illuminate.

For vehicles with the same tire pressure for front and rear tires, training the sensors is not necessary after a tire rotation.

Failure of a **TPMS** component may not cause the message center to display a fault message or store a DTC. The Symptom Chart is a starting point to begin diagnosis of these concerns.

Condition	Possible Sources	Action
The Tire Pressure Monitoring System (TPMS) warning indicator is on continuously and the message center displays LOW TIRE PRESSURE	- Spare tire currently in use - Tire pressure not set to specifications listed on the Vehicle Certification (VC) label TPMS sensors not trained following tire rotation TPMS sensor(s)	GO to Pinpoint Test D.
The Body Control Module (BCM) cannot enter sensor training mode when using the TPMS sensor training procedure	- Stoplamp switch concern - Ignition switch concern BCM	GO to Pinpoint Test E.
The TPMS warning indicator illuminates with DTCs present	- Not all TPMS sensors are installed TPMS sensors not trained TPMS sensor(s) - Intermittent TPMS operation due to Radio Frequency Interference (RFI) TPM module wiring TPM module BCM wiring BCM	GO to Pinpoint Test F.
The TPMS warning indicator illuminates with no DTCs present	- Communication network concern - Instrument Panel Cluster (IPC)	REFER to Section 413-01 to diagnose the TPMS warning indicator is always on.
One or more TPMS sensors do not train and DTCs are present	TPMS sensor(s) - Vehicle communication issue - Intermittent TPMS operation due to RFI TPM module wiring TPM module BCM wiring BCM	FOLLOW the diagnostics for the DTC(s) retrieved. REFER to DTC Charts in this section.
One or more TPMS sensors do not train and no DTCs are present	TPMS sensor(s) - Radio Frequency Interference (RFI)	GO to Pinpoint Test G.

Pinpoint Tests

Pinpoint Test D: The Tire Pressure Monitoring System (TPMS) Warning Indicator Is ON Continuously and The Message Center Displays LOW TIRE PRESSURE

Normal Operation

The Tire Pressure Monitor (TPM) module monitors the air pressure of all 4 road tires. The wheel-mounted tire pressure sensors transmit data via radio frequency signals to the TPM module. The TPM module is a radio receiver that collects the air pressure data from the Tire Pressure Monitoring System (TPMS) tire pressure sensors. The data is then sent to the Body Control Module (BCM) where a predetermined pass/fail criteria is applied. The TPMS sensor radio transmissions are sent approximately once every 60 seconds when the vehicle speed exceeds 32 km/h (20 mph). The BCM compares each TPMS sensor transmission against a low-pressure limit. If it has been determined that the tire pressure has fallen below this limit, the BCM communicates this on the vehicle communication bus to the Instrument Panel Cluster (IPC). The IPC then illuminates the TPMS warning indicator and displays the appropriate message(s) in the message center .

This symptom can also be caused by a spare tire currently being used in place of a road tire. Make sure that the spare tire is not currently in use. On vehicles with different front and rear tire pressures, if the sensors are not trained following a tire rotation, this symptom may result. Advise the customer that on vehicles with different front and rear tire pressures, the sensors must be trained as directed in the Owner's Literature.

This pinpoint test is intended to diagnose the following:

- Spare tire currently in use
- Tire pressure not set to specifications listed on the Vehicle Certification (VC) label
- TPMS sensors not trained following tire rotation
- TPMS sensor(s)

PINPOINT TEST D: THE TPMS WARNING INDICATOR IS ON CONTINUOUSLY AND THE MESSAGE CENTER DISPLAYS LOW TIRE PRESSURE

NOTE: Use only the Digital Tire Pressure Gauge any time tire pressures are measured to be sure that accurate values are obtained.

NOTE: If a warranty case is opened for an actual TPMS fault, document and include the actual tire pressure data in all warranty communications.

Test Step	Result / Action to Take
D1 CHECK FOR LOW TIRE PRESSURE	
• Using the Digital Tire Pressure Gauge, measure and record the air pressure in all 4 tires. • Adjust the pressure for those found to be below the specification listed on the VC label. • Activate each sensor at least twice with the training tool or customer activation tool to make sure the <u>TPM</u> module gets the latest air pressure data. Refer to Tire Pressure Monitoring System (TPMS) Sensor Activation or drive the vehicle for at least 2 minutes above 32 km/h (20 mph) to clear the low pressure warning. Do not train the sensors at this time. • Has the <u>TPMS</u> warning indicator gone out?	Yes The system is operating correctly at this time. The concern was caused by low tire pressure. No GO to D2.
D2 CHECK FOR SPARE TIRE IN USE	
NOTE: The spare tire is not programmable even if it is	Yes REPAIR and REMOUNT the

equipped with a <u>TPMS</u> sensor. If a damaged road wheel is located in the cargo area, the sensor may still be recognized by the <u>TPMS</u> as low. Make sure the spare tire is not currently in use. To restore <u>TPMS</u> functionality, repair the damaged road wheel and re-mount it to the vehicle. • Check spare tire location. • Is the spare tire in use?	wheel to the vehicle. REFER to Wheel and Tire in this section. ADJUST tire pressures to the required pressure as defined on the <u>VC</u> label located in the driver door jam. No GO to D3.
D3 CHECK IF THE TIRES WERE ROTATED WITHOUT <u>TPMS</u> SENSOR TRAINING NOTE: If the <u>TPMS</u> sensors at the front of the vehicle are still trained in the rear positions but inflated to the front air pressures, the <u>TPMS</u> warning indicator illuminates continuously. • Ignition ON. • Enter the following diagnostic mode on the scan tool: DataLogger — <u>BCM</u>. • Monitor and record the following <u>BCM</u> PIDs: ■ Left Front Tire Pressure (TPM_PRES_LF) ■ Right Front Tire Pressure (TPM_PRES_RF) ■ Left Rear Tire Pressure (TPM_PRES_LRO) ■ Right Rear Tire Pressure (TPM_PRES_RRO) • Do the rear PIDs show front air pressures and the front PIDs show rear air pressures?	Yes The tires have been rotated without training the sensors. TRAIN the sensors. REFER to Tire Pressure Monitoring System (TPMS) Sensor Training in this section. No GO to D4.
D4 CHECK FOR STUCK <u>TPMS</u> SENSOR • Monitor and record the following <u>BCM</u> PIDs: ■ Left Front Tire Pressure (TPM_PRES_LF) ■ Right Front Tire Pressure (TPM_PRES_RF) ■ Left Rear Tire Pressure (TPM_PRES_LRO) ■ Right Rear Tire Pressure (TPM_PRES_RRO) • Using the Digital Tire Pressure Gauge, measure the actual tire pressures. • Compare the air pressure PIDs with the actual air pressures. • Do the compared tire pressure values match within ± 5 psi?	Yes REFER to Section 413-01 to diagnose the <u>TPMS</u> warning indicator is always on. No INSTALL a new <u>TPMS</u> sensor (s) for the sensor(s) in question. REFER to Tire Pressure Monitoring System (TPMS) Sensor in this section.

Pinpoint Test E: The Body Control Module (BCM) Cannot Enter Sensor Training Mode When Using the Tire Pressure Monitoring System (TPMS) Sensor Training Procedure

Normal Operation

For the Body Control Module (BCM) to enter Tire Pressure Monitoring System (TPMS) sensor training mode, the BCM must receive valid inputs from the stoplamp switch (off) and ignition switch (run), and it must receive valid vehicle speed sensor input (0 km/h [0 mph]). Refer to [Tire Pressure Monitoring System \(TPMS\) Sensor Training](#) in this section for the complete sensor training procedure.

This pinpoint test is intended to diagnose the following:

- Stoplamp switch concern
- Ignition switch concern
- BCM

PINPOINT TEST E: THE BCM CANNOT ENTER SENSOR TRAINING MODE WHEN USING THE TPM SENSOR TRAINING PROCEDURE

Test Step	Result / Action to Take
E1 CHECK THE STOPLAMP OPERATION	
- Ignition ON. - Press and release the brake pedal while monitoring the stoplamps. Do the stoplamps operate properly?	Yes GO to E2. No REFER to Section 417-01 to continue diagnosis of the stoplamp switch.
E2 CHECK THE IGNITION SWITCH INPUT	
- Ignition ON. - Enter the following diagnostic mode on the scan tool: <u>BCM_DataLogger</u>. - Monitor the <u>BCM</u> ignition switch PID (IGN_SW_STATE) with the ignition in the RUN position. Does the PID indicate the correct ignition switch position?	Yes GO to E3. No REFER to Section 211-05 to continue diagnosis of the ignition switch.
E3 CHECK FOR VEHICLE SPEED-RELATED DTCs IN THE <u>BCM</u>	
- Carry out the <u>BCM</u> self-test. Are any vehicle speed-related DTCs present?	Yes REFER to the <u>BCM</u> DTC Chart in Section 419-10. No GO to E4.
E4 CHECK FOR CORRECT <u>BCM</u> OPERATION	
- Disconnect all the <u>BCM</u> connectors. - Check the connectors for: - corrosion - damaged pins - pushed-out pins - Connect all the <u>BCM</u> connectors and make sure that they are seated correctly. - Operate the system and verify the concern is still present. Is the concern still present?	Yes INSTALL a new <u>BCM</u>. REFER to Section 419-10. TEST the system for normal operation. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector.

Pinpoint Test F: The Tire Pressure Monitoring System (TPMS) Warning Indicator Illuminates With DTCs Present

Normal Operation

If there is a fault with 1, 2 or 3 of the Tire Pressure Monitoring System (TPMS) sensors, DTC B124D:02 sets. The TPMS warning indicator flashes for 70 seconds and then remains on continuously when the ignition switch is turned to the ON position and the message center displays TIRE PRESSURE SENSOR FAULT.

If the TPM module does not get a response from all 4 of the TPMS sensors and transfers that information to

the BCM, DTC B1182:00 sets and the message center displays TIRE PRESSURE MONITOR FAULT.

It should be noted that TPMS sensor communication to the TPM module can be interrupted by radio frequency noise, which can cause intermittent issues that are not vehicle concerns. Radio frequency noise is generated by electrical motors and appliance operation, cellular telephones, remote transmitters, power inverters and portable entertainment equipment. Anytime the TPMS sensor training procedure is performed successfully, the warning indicator is extinguished and the vehicle must be driven for 18-20 minutes before the TPM module sets a fault.

- DTC B1182:00 (Tire Pressure Monitoring System (TPMS): No Sub Type Information) — set by the BCM when **all 4** of the tire pressure sensors are faulted, not responding or not heard by the TPM module.
- DTC B124D:02 (Tire Pressure Sensor: General Signal Failure) — set by the BCM when 1, 2 or 3 of the tire pressure sensors are faulted, not responding or not heard by the TPM module.
- TPMS_STAT PID = SENSOR FAULT — when the BCM does not receive the tire pressure status for 1 to 3 TPMS sensors from the TPM module for 20 minutes with vehicle speed above 32 km/h (20 mph).
- TP_STAT PID = SYSTEM FAULT when the BCM does not receive a signal transmission from **all 4** TPMS sensors from the TPM module for 20 minutes with vehicle speed above 32 km/h (20 mph).

This pinpoint test is intended to diagnose the following:

- Not all TPMS sensors are installed
- TPMS sensors not trained
- TPMS sensor(s)
- TPM module wiring
- TPM module
- BCM wiring
- BCM

PINPOINT TEST F: THE TPMS WARNING INDICATOR ILLUMINATES WITH DTCs PRESENT

NOTE: If a warranty case is opened for an actual TPMS fault, document and include the actual tire pressure data in all warranty communications.

NOTE: If the vehicle has been stationary for more than 30 minutes, the sensors go into a "sleep mode" to conserve battery power. It is necessary to wake them up so that they transmit the latest tire pressure information to the TPM module.

Test Step	Result / Action to Take
F1 VERIFY <u>TPM</u> MODULE COMMUNICATION	
• Ignition ON. • Using a scan tool, carry out the Network Test. • Does the <u>TPM</u> module pass the Network Test?	Yes GO to F2. No REFER to Section 418-00 to diagnose the <u>TPM</u> module does not respond to the scan tool.
F2 CHECK THE SENSOR IDENTIFIER <u>PIDs</u> AND SYSTEM STATUS <u>PID</u>	
• Enter the following diagnostic mode on the scan tool: DataLogger —	Yes GO to F3.

<u>BCM</u>. - Read and record the following <u>PIDs</u> : - Left Front Tire Transmitter Identifier (TPM_S_ID_LF) - Right Front Tire Transmitter Identifier (TPM_S_ID_RF) - Left Rear Tire Transmitter Identifier (TPM_S_ID_LRO) - Right Rear Tire Transmitter Identifier (TPM_S_ID_RRO) - Monitor the <u>TPMS</u> system status (TPMS_STAT) <u>PID</u>. Does the TPMS_STAT PID display SENSOR FAULT?	No If the TPMS_STAT <u>PID</u> displays SYSTEM FAULT, GO to F4.
F3 CARRY OUT THE SENSOR TRAINING PROCEDURE (SENSOR FAULT) - Train all 4 tire pressure sensors. Refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section. Did all of the tire pressure sensors transmit correctly and did the horn sound when each TPMS sensor transmitted to the TPM module?	Yes Using the scan tool, LOCATE the updated <u>TPMS</u> sensor identifiers trained to the <u>BCM</u> module. COMPARE these values to those recorded prior to the <u>TPMS</u> sensor training procedure. Disregarding sensor position, any sensor identifiers that do not match those retrieved from the module were changed, but not retrained. The sensors are now trained to the vehicle, diagnosis is complete. DOCUMENT all <u>TPMS</u> sensor identifiers on the applicable warranty claim. TEST the system for normal operation. No Before installing a new sensor(s) : If a sensor does not respond to the Tire Pressure Monitor Activation Tool, MOVE the vehicle to rotate the wheels at least one-fourth of a turn and ATTEMPT to activate the same sensor again. If the sensor still fails to train, ATTEMPT to train the sensor with the vehicle doors open. If the sensor(s) fails to train a second time, INSTALL a new <u>TPMS</u> sensor (s) for the sensor(s) in question. REFER to Tire Pressure Monitoring System (TPMS) Sensor in this section.
F4 CARRY OUT THE SENSOR TRAINING PROCEDURE (SYSTEM FAULT) - Train all 4 tire pressure sensors. Refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section. Did all of the tire pressure sensors transmit correctly and did the horn sound when each TPMS sensor transmitted to the TPM module?	Yes Using the scan tool, LOCATE the updated <u>TPMS</u> sensor identifiers trained to the <u>BCM</u> module. COMPARE these values to those recorded prior to the Tire Pressure Monitoring System (TPMS) Sensor Training procedure. Disregarding sensor position, any sensor identifiers that do not match those retrieved from the module were changed, but not retrained. The sensors are now trained to the vehicle, diagnosis is complete. DOCUMENT all <u>TPMS</u> sensor identifiers on the applicable warranty claim. TEST the system for normal operation.

	No Before installing a <u>TPM</u> module : If sensors do not respond to the Tire Pressure Monitor Activation Tool, MOVE the vehicle to rotate the wheels at least one-fourth of a turn and ATTEMPT to activate the same sensors again. If the sensors still fail to train, ATTEMPT to train the sensors with the vehicle doors open. If the sensors still fail to train, INSTALL a new <u>TPM</u> module. REFER to Tire Pressure Monitor (TPM) Module in this section. TEST the system for normal operation. If the concern is still present, GO to F5.
F5 CHECK FOR CORRECT <u>BCM</u> OPERATION • Disconnect all the <u>BCM</u> electrical connectors. • Check the connectors for: ■ corrosion ■ damaged pins ■ pushed-out pins • Connect all the <u>BCM</u> connectors and make sure that they are seated correctly. • Operate the system and verify the concern is still present. • Is the concern still present?	Yes NOTE: The <u>TPMS</u> sensors may not be present. DISMOUNT the tire. REFER to Wheel and Tire in this section. VERIFY the <u>TPMS</u> sensors are present and mounted to the wheels. If missing, INSTALL new <u>TPMS</u> sensors. If the <u>TPMS</u> sensors are present, INSTALL a new <u>BCM</u>. REFER to Section 419-10 . CLEAR the DTCs. REPEAT the self-test. No The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

Pinpoint Test G: One Or More TPMS Sensors Do Not Train And No DTCs Are Present

NOTE: If the vehicle has been stationary for more than 30 minutes, the sensors go into a sleep mode to conserve battery power. It becomes necessary to wake them up so they transmit the latest tire pressure information to the TPM module. For additional information, refer to [Tire Pressure Monitoring System \(TPMS\) Sensor Activation](#) in this section.

Normal Operation

The TPM module monitors the tire pressure of all 4 road tires. The wheel-mounted tire pressure sensors transmit signals via radio frequency to the Tire Pressure Monitor (TPM) module. The TPM module is a radio receiver that collects the tire pressure data from the tire pressure sensors. The TPMS sensor radio transmissions are sent approximately once every 60 seconds when the vehicle speed exceeds 32 km/h (20 mph). The BCM learns the position on the vehicle of each TPMS sensor through the training process. Refer to [Tire Pressure Monitoring System \(TPMS\) Sensor Training](#) in this section for the complete sensor training procedure.

This pinpoint test is intended to diagnose the following:

- TPMS sensors
- Radio Frequency Interference (RFI)

PINPOINT TEST G: ONE OR MORE TPMS SENSORS DO NOT TRAIN AND NO DTCs ARE PRESENT

Test Step	Result / Action to Take
G1 ATTEMPT TO TRAIN THE TPMS SENSORS	
NOTE: Banded <u>TPMS</u> sensors are not compatible with the valve mounted <u>TPMS</u> sensor system. NOTE: The <u>BCM</u> has a 2-minute time limit between sensor responses. If the <u>BCM</u> does not recognize any 1 of the 4 tire pressure sensors during this time limit, the horn sounds twice, the message center displays TIRE NOT TRAINED REPEAT, and the entire procedure must be repeated. - Train all 4 <u>TPMS</u> sensors. Refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section. Do all of the <u>TPMS</u> sensors train?	Yes The system is operating correctly at this time. The concern may have been caused by RFI. No If one or more <u>TPMS</u> sensors trained, GO to G2. If none of the <u>TPMS</u> sensors trained, GO to Pinpoint Test E.
G2 CHECK FOR RADIO FREQUENCY INTERFERENCE	
- Ignition ON. - Move the vehicle to rotate the wheels at least one-fourth turn. - Train all 4 <u>TPMS</u> sensors. Refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section. Did the <u>TPMS</u> sensor(s) train?	Yes The system is operating correctly at this time. The concern may have been caused by RFI. No ATTEMPT to train the <u>TPMS</u> sensor(s) with the doors open. If the <u>TPMS</u> sensor(s) still do not train INSTALL a new <u>TPMS</u> sensor(s) for the sensor(s) in question. REFER to Tire Pressure Monitoring System (TPMS) Sensor Training in this section. TEST the system for normal operation.

Pinpoint Test H: DTC B1251:00**Normal Operation**

- DTC B1251:00 (Tire Pressure Sensor Low Battery: No Sub Type Information) — This DTC sets in continuous memory in the Body Control Module (BCM) when there is a fault in the Tire Pressure Monitoring System (TPMS), such as a damaged or missing TPMS sensor(s), or when attempting to train a TPMS sensor(s) with a low battery. The TPMS warning indicator flashes for 70 seconds then illuminates continuously when the ignition switch is turned to the ON position. The message center also displays TIRE PRESSURE SENSOR FAULT.

This pinpoint test is intended to diagnose the following:

- TPMS sensor(s)

PINPOINT TEST H: DTC B1251:00

Test Step	Result / Action to Take
H1 TRAIN THE <u>TPMS</u> SENSORS TO DETERMINE THE INOPERATIVE SENSOR	

- Train all 4 <u>TPMS</u> sensors. Refer to Tire Pressure Monitoring System (TPMS) Sensor Training in this section. Did all of the <u>TPMS</u> sensors transmit correctly when each <u>TPMS</u> sensor transmitted to the <u>TPM</u> module?	Yes CLEAR the DTCs. REPEAT the self-test. TEST the system for normal operation. No If the <u>TPMS</u> sensors fail to train, REFER to Wheel Rotation And Sensor Training Techniques in this section. If the <u>TPMS</u> sensor(s) fails to train a second time, INSTALL a new <u>TPMS</u> sensor(s) for the sensor(s) in question. REFER to Tire Pressure Monitoring System (TPMS) Sensor in this section.
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Pinpoint Test I: DTC U0140:87

Normal Operation

- DTC U0140:87 (Lost Communication With Body Control Module: Missing Message) — This DTC is set by the Tire Pressure Monitor (TPM) module in continuous memory if data messages received from the BCM are missing.

This pinpoint test is intended to diagnose the following:

- Communication network concern
- TPM module
- BCM

PINPOINT TEST I: DTC U0140:87

Test Step	Result / Action to Take
I1 VERIFY THE CUSTOMER CONCERN	
- Ignition ON. - Verify there is an observable symptom present. Is an observable symptom present?	Yes GO to I2. No The system is operating normally at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.
I2 CHECK THE COMMUNICATION NETWORK	
- Ignition ON. - Using a scan tool, carry out the Network Test. Do both the <u>BCM</u> and the <u>TPM</u> module pass the Network Test?	Yes GO to I3. No If either module does not pass the Network Test, REFER to Section 418-00 to diagnose the <u>BCM</u> does not respond to the scan tool or the <u>TPM</u> module does not respond to the scan tool.
I3 CHECK THE <u>TPM</u> MODULE	

CMDTCs • Using a scan tool, carry out the <u>TPM</u> module self-test. • Using a scan tool, clear the <u>TPM</u> module DTCs. • Ignition OFF. • Wait 10 seconds. • Ignition ON. • Using a scan tool, carry out the <u>TPM</u> module self-test. • Is DTC U0140:87 retrieved again?	Yes GO to 14. No The system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.
I4 CHECK FOR DTCs IN THE BCM • Using a scan tool, carry out the <u>BCM</u> self-test. • Is DTC U3003:16 or U3003:17 present?	Yes <u>TPM</u> module DTC U0140:87 may have been set due to a voltage issue in the <u>BCM</u>. REFER to the <u>BCM</u> DTC Chart in Section 419-10. No GO to 15.
I5 CHECK FOR DTC U0140, U0140:00, OR U0140:87 SET IN OTHER MODULES • Clear the <u>CMDTCs</u> from all modules. • Ignition OFF. • Ignition ON. • Wait 10 seconds. • Using a scan tool, retrieve the <u>CMDTCs</u> from all modules. • Is DTC U0140, U0140:00, or U0140:87 set in more than one module?	Yes INSTALL a new <u>BCM</u>. REFER to Section 419-10. CLEAR all continuous DTCs. REPEAT the self-test. No INSTALL a new <u>TPM</u> module. REFER to Tire Pressure Monitor (TPM) Module in this section. TEST the system for normal operation.

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