Component Procedures: Tire Monitoring System

Table of Contents

Component Procedures: Tire Monitoring System

Parts and Labor (itype_189)

Labor

Operation	Qualifier Path	Skill	Std Hrs	Wty Hrs
Remove & Replace	Tire Pressuring Monitoring > Tire Pressure Se?	B	0.6	0.6

Tire Pressure Monitor (Article 13616)

Figure 1: Tire Pressure Monitoring Block Diagram
Special Tools
- EL-46079/J-46079 - Tire Pressure Monitor Diagnostic Tool
- EL-50448 - Tire Pressure Monitor Sensor Activation Tool
For equivalent regional tools, refer to Special Tools .
Tire Pressure Monitoring System Operation
The tire pressure monitor system warns the driver when a significant loss or gain of tire pressure occurs in any of the 4 tires . It allows the driver to display the individual tire pressures and their locations on the driver information center .
The system uses the body control module (BCM), driver information center , instrument cluster , remote control door lock receiver, and a radio frequency transmitting pressure sensor in each tire assembly. Each sensor has an internal power supply.
When the vehicle is stationary, the sensors internal shock sensor is inactive which puts the sensors into a Stationary state. In this state the sensors sample tire pressure once every 30 sec and do not transmit at all if the tire pressure does not change. As vehicle speed increases, the shock sensor pulses every wheel rotation, which puts the sensor into Rolling mode. The remote control door lock receiver receives and then sends the tire pressure and temperature data to the body control module (BCM). The BCM translates the data contained in the tire pressure sensor radio frequency transmissions into sensor presence, sensor mode, and tire pressure. Once vehicle speed is greater than 40 km/h (25 MPH), the sensors begin to transmit once a minute keeping the pressure data up to date.
Each sensor has its own unique identification (ID) code which it transmits as part of each RF message and must be learned into the BCM memory. Once all 4 ID's have been learned and vehicle speed is greater than 40 km/h (25 mph), the BCM continuously compares ID's and pressure data in the received transmissions to the learned ID's and pressures to determine if all 4 sensors are present and if one or more tires are low. If the BCM detects a low tire pressure condition, or a malfunction in the system, it will send a serial data message to the instrument cluster requesting the appropriate tire pressure monitor indicator illumination and also to display the appropriate data message on the driver information center, if equipped.
The sensors continuously compare their last pressure sample to their current pressure sample and will transmit in Alert mode if a 8.3 kPa (1.2 PSI) change in tire pressure has been detected in either a Stationary or Rolling state. When the tire pressure system detects a significant loss, or gain of tire pressure, the tire pressure monitor indicator icon is continuously illuminated on the instrument cluster and if equipped, a check tire pressure type message is displayed on the driver information center.
Both the indicator icon and driver information center message can be cleared by adjusting the tire pressures to the recommended kPa/PSI and driving the vehicle above 40 km/h (25 MPH) for at least 9 min.
If power is disconnected from the BCM or if the vehicle battery is disconnected each tire pressure sensor ID is retained but all of the tire pressure information is lost. Under these circumstances the BCM cannot assume that the tire pressures were maintained over an unknown period of time. Cars equipped with the driver information center will display dashes and the scan tool will indicate a default tire pressure value of 1020 kPa (148 PSI) for each tire. To reactivate the sensors, the vehicle must be driven above 40 km/h (25 MPH) for at least 9 min. When the sensors are activated, the driver information center displays the current tire pressures. The EL-46079/J-46079 tire pressure monitor diagnostic tool, EL-50448 tire pressure monitor sensor activation tool, or equivalent may also be used to activate the sensors as well.
The BCM has the ability to detect malfunctions within the tire pressure monitor system. In the event a DTC is set, the tire pressure monitor indicator icon on the instrument cluster will flash for approximately 1 min. and then remain illuminated for the remainder of the key cycle. After a key cycle and the instrument cluster bulb check has been completed the indicator will again flash for 1 min. and then remain illuminated if the DTC persists. Any malfunction detected will cause the driver information center to display a service tire monitor system type message.

Tire Pressure Monitoring - Adhesives, Fluids, Lubricants, and Sealers (Article 13630)

Application Type of Material GM Part Number Canadian Part Number
Valve Stem Mounting Lubricant 12345884 88863415

Tire Pressure Monitoring - Fastener Specifications (Article 13631)

Application Specification
Metric (English)
Tire Pressure Indicator Sensor Fastener 1.4 Nm (12.4 lb in)

All Technical Service Bulletins (itype_100)

Tsbs
- Tire Monitor System - TPMS Lamp On, No Tire Pressures Displayed (PI1241, 2014/05/16)

Repair Tips (itype_110)

Tsbs
- Tire Monitor System - TPMS Lamp On, No Tire Pressures Displayed (PI1241, 2014/05/16)

Tire Pressure Indicator Sensor Learn (Article 13626)

Special Tools
- EL-46079 - Tire Pressure Monitor Diagnostic Tool
- EL-50448 - Tire Pressure Monitor Sensor Activation Tool

For equivalent regional tools, refer to Special Tools .

Learn Mode Description

The tire pressure monitor system uses the instrument cluster , body control module (BCM), 4 radio frequency transmitting pressure sensors, remote control door lock receiver (RCDLR) and the serial data circuit to perform the tire pressure monitor learn mode functions. The sensor learn procedure must be performed after every tire rotation , BCM replacement, or sensor replacement. Once the Learn mode has been enabled, each of the sensors unique identification codes can be learned into the BCM memory. When a sensor ID has been learned, the BCM sounds a horn chirp indicating the sensor has transmitted its ID and the BCM has received and learned it. The BCM must learn the sensor IDs in the proper sequence to determine correct sensor location. The first learned ID is assigned to the left front location, the second to right front, the third to right rear and the fourth to left rear. The turn signals will individually illuminate indicating which location is to be learned in the proper sequence.

Sensor Functions Using EL-46079, EL-50448, or Equivalent

Each sensor has an internal low frequency coil. When the tire pressure monitor special tool is used in activate mode, it produces a low frequency transmission that activates the sensor. The sensor responds to a low frequency activation by transmitting in Learn Mode-Remotely Triggered. When the BCM receives a learn mode transmission while in Learn mode, it will assign that sensors ID to the location on the vehicle relative to the order in which it was learned.

Learn Mode Cancellation

The Learn mode will cancel if the ignition is cycled to OFF or if more than 2 minutes has elapsed for any sensor or 5 min overall has elapsed to match all four sensors. If the relearn mode is cancelled before the first sensor is learned, the original sensor IDs will be maintained. If the relearn mode is canceled after the first sensor is learned, the following will occur:
- All stored sensor IDs will be invalidated in the BCM memory.
- If equipped, the driver information center will display dashes instead of tire pressures.
- DTC C0775 will be set.

These conditions will now require the Learn procedure to be repeated for the system to function properly.

Tire Pressure Monitor Learn Procedure
- Apply park brake.
- Ignition On/Vehicle in Service Mode, using a scan tool or driver information center buttons (refer to owners manual), initiate the Tire Pressure Sensor s Learn mode. A double horn chirp will sound indicating the Learn mode has been enabled. The left front turn signal will also be illuminated.
- Starting with the left front tire, activate the sensor by holding the antenna of the tire pressure monitor special tool aimed upward against the tire sidewall close to the wheel rim at the valve stem location. Press and release the activate button. Ensure that the transmit indicator on the special tool indicates that the sensor activation signal is being transmitted. Wait for a horn chirp. If the horn does not chirp, repeat the sensor activation sequence with the tool. Once the horn chirp has sounded, the sensor information is learned and the turn signal in the next location to be learned will illuminate.

- After the horn chirp has sounded and the right front turn signal is illuminated, repeat step 3 for the remaining 3 sensors in the following order:
- Right front
- Right rear
- Left rear
- When the left rear sensor has been learned and a double horn chirp has sounded, the learn process is complete and the BCM exits the Learn mode.

Symptoms - Tire Pressure Monitoring (Article 13625)

- Perform the Diagnostic System Check - Vehicle , before using the Symptom Tables in order to verify that all of the following are true:
- There are no DTCs set.
- The control modules can communicate via the serial data link.
- Review the system operation in order to familiarize yourself with the system functions. Refer to Tire Pressure Monitor Description and Operation .

Visual/Physical Inspection

- Inspect if tires are inflated per placard values.
- Inspect for aftermarket devices which could affect the operation of the Tire Pressure Monitoring (TPM) System.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to Testing for Intermittent Conditions and Poor Connections .

Symptom List

Refer to Low Tire Pressure Indicator Malfunction in order to diagnose the symptom.

Low Tire Pressure Indicator Malfunction (Article 13624)

Diagnostic Instructions

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

Circuit/System Description

The tire pressure monitor system has a radio frequency transmitting pressure sensor in each wheel / tire assembly. As vehicle speed increases, centrifugal force puts the sensor into Drive mode. The sensors send the tire pressure data to the remote control door lock receiver (RCDLR), using radio frequency (RF) transmissions. The RCDLR then decodes the RF data and passes it to the body control module (BCM). In turn, the BCM translates the data contained in the tire pressure sensor radio frequency transmissions into sensor presence, sensor mode, and tire pressure. Once vehicle speed is greater than 40 km/h (25 MPH), the BCM waits for the sensors to go into Drive mode.

Each sensor has its own unique identification (ID) code, which it transmits as part of each RF message, that must be learned into the BCM memory. Once all 4 IDs have been learned and vehicle speed is greater than 40 km/h (25 mph), the BCM continuously compares IDs and pressure data in the received transmissions to the learned IDs and vehicle placard pressures to determine if all 4 sensors are present and if one or more tires are low. If the BCM detects a low tire pressure condition or a malfunction in the system, it will send a serial data message to the instrument cluster requesting the appropriate tire pressure monitor indicator illumination and also to display the appropriate data message on the driver information center , if equipped.

Diagnostic Aids

- If unsure about the condition, cycle the ignition and observe the tire pressure monitor indicator icon. If the tire pressure monitor indicator icon is continuously illuminated after the instrument cluster bulb check is completed, a low tire pressure condition is present. Check the tires for damage or leaks and inflate to the tire placard specifications. Refer to Vehicle Certification, Tire Placard, Anti-Theft, and Service Parts ID Label . If the tire pressure monitor indicator icon flashes for 1 min after the instrument cluster bulb check is completed and then remains illuminated, a tire pressure monitor system DTC is set. Perform the Diagnostic System Check - Vehicle to proceed with the proper diagnosis.
- Temperature can greatly effect tire pressures. Low tire pressure on a cold morning may cause the tire pressure monitor indicator icon to turn ON. The air pressure in the tire increases as the ambient temperature rises or as the tire warms up while the vehicle is driven. The pressure may increase enough to exceed the predetermined low pressure threshold which will turn OFF the tire pressure monitor indicator icon .

- Some aftermarket wheel valve stem holes are located further from the wheel rim than original equipment wheels . When using the tire pressure monitor special tool to activate a sensor, ensure the tool antenna is no further than 15 cm (6 in) from the sensor and is aiming upward.
- Aftermarket wheel value stem locations can cause a sensor to not function correctly.
- A sensor may have been damaged due to a previous wheel/tire service or flat tire event. This is a courtesy item as it is not covered by warranty.
- The use of other than GM approved tire sealants can obstruct the sensor pressure sensing port and cause inaccurate tire pressure readings. If this condition is verified, remove the sealer from the tire and replace the sensor. Refer to Tire Pressure Indicator Sensor Replacement .
- The sensor activation procedure may have to be repeated up to 3 times before determining a sensor is malfunctioning. In the event a particular sensor's information is displayed on the special tool upon activation but the horn does not chirp, it may be necessary to rotate the wheel valve stem to a different position due to the RF signal is being blocked by another component.
- Occasionally sensor transmissions are not received by the BCM due to vehicle level RF interference from items such as but not limited to aftermarket ignition systems, DVD players, CB radios, or metallic type window tinting.
- The Hit Rate of the sensor will help confirm the success rate at which the sensor transmission is being received. A low Hit Rate will signal that there may be interference from aftermarket items.

Reference Information

Description and Operation

Tire Pressure Monitor Description and Operation

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

- Adjust all tire pressures to the correct pressure. Refer to Vehicle Certification, Tire Placard, Anti-Theft, and Service Parts ID Label .
- Drive the vehicle over 40 km/h (25 mph) for greater than 2 min.
- Verify the low tire pressure indicator is OFF.
- If the low tire pressure indicator is ON
- Perform the Tire Pressure Indicator Sensor Learn .
- Record all 4 Tire Pressure Parameters values from the scan tool.
- Check and record the tire pressures with a known accurate hand held tire pressure gauge.
- Verify that the scan tool Tire Pressure parameters do not differ more than 27.6 kPa (4 psi) from the actual tire pressure readings.
- If the scan tool Tire Pressure parameters differ more than 27.6 kPa (4 psi), replace the appropriate B2 Tire Pressure Sensor then perform the Tire Pressure Indicator Sensor Learn .
- If the scan tool Tire Pressure parameters do not differ more than 27.6 kPa (4 psi)
- Verify the BCM Tire Type and Pressure selections are setup correctly with a scan tool. Refer to the Vehicle Certification, Tire Placard, Anti-Theft, and Service Parts ID Label .
- If the BCM Tire Type and Pressure selections are incorrect, input the proper placard values for the vehicle with the scan tool then drive the vehicle over 40 km/h (25 mph) for greater than 2 min.
- If the BCM Tire Type and Pressure selections are correct
- Ignition On/Vehicle in Service Mode..
- Verify the low tire pressure monitor indicator icon turns ON and OFF when commanding All Indicators ON and OFF with a scan tool.
- If the low tire pressure monitor icon does not turn ON and OFF, replace the P16 Instrument Cluster.
- If the low tire pressure monitor icon turns ON and OFF
- All OK
- If the tire pressure indicator is OFF

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair.

- Tire Pressure Indicator Sensor Replacement
- Tire Pressure Indicator Sensor Learn
- Control Module References for control module replacement, programming, and setup.

Tire Pressure Monitoring (Article 13629)

Illustration Tool Number/Description

Click for full-size image EL 46079 Tire Pressure Monitor Diagnostic Tool

Click for full-size image EL 50448 Tire Pressure Monitor Sensor Activation Tool