TIRE PRESURE MONITORING SYSTEM (TPMS) v4.0

Tires Overview

Tires are designed to operate within a specific range of air pressures. The recommended inflation pressure is printed on the decal on the driver's door jamb (B-Pillar). The decal specifies the proper tire inflation.

Tire pressure should be checked monthly as recommended in the Owner Guide because all tires lose pressure over time.

A tire's inflation pressure cannot be judged by appearance alone. For example; often by the time a low profile radial tire looks low it may be 10 to 15 PSI underinflated.

Some new inexpensive tire pressure gauges accuracy can be off by several PSI. Checking the tire inflation pressure requires an accurate tire pressure gauge.

TPMS Overview

Tire Pressure Monitoring System, or TPMS as it is typically referred to, uses an instrument panel warning light or message center to alert the driver to low tire pressure.

Congress passed the Transportation, Recall, Enhancement, Accountability and Documentation (TREAD) Act in 2000. Part of the TREAD Act addresses concerns of low tire pressure.

The TREAD Act legislated that vehicle manufacturers must equip all passenger vehicles and light trucks with TPMS by the start of the 2008 model year. Industry-wide compliance was phased in starting with the 2006 model year. The 2003 Explorer and Mountaineer were the first Ford Motor Company products to receive the TPMS system. These systems are required to alert the driver if the tire pressure falls to 25 percent below the manufacturer's recommended tire pressure.

TPMS Technology

Currently, Ford Motor Company vehicles utilize the direct measurement TPMS sensor. The sensors are very accurate, usually within .25 PSI or less.

Direct measurement TPMS sensors use a small pressure sensor with a built-in battery and transponder. There is one sensor per tire. (The spare tire does not have a sensor in it.) The sensor sends a radio signal at a pre-determined interval to a control module in the vehicle. The control module identifies the signal from each wheel and tracks the tire pressure. If the air pressure drops below a predetermined threshold, the control module turns on the warning light on the instrument panel.

When the vehicle begins to move, a switch inside the sensor activates the pressure measurement and signal sending function. At about 20 mph, the sensor begins measuring the pressure every 30 seconds and transmits the results once each minute to the control module.

Motorcraft sensors complete an electrical connection either by a roll switch or an accelerometer. The roll switch was used on the 2003-2005 Explorer/Mountaineer and 2003-2006 Expedition/Navigator. All other vehicles use the accelerometer type switch.

The sensors transmit tire pressure data to the control module at 315 Mhz. (Some early sensors used 433 Mhz.)

Each wheel sensor has a unique identification code so the control module can recognize each sensor. When the vehicle is parked and has not moved for 15 minutes, the sensors will stop transmitting.

If the tire pressure drops below the minimum setting, the module will turn on the warning light. The warning light will not indicate which tire is low. All tires need to be inspected for proper tire pressure using an accurate tire pressure gauge. The recommended tire pressure is located on the tire label on the driver's door jamb (On the B-Pillar).

After inflating the tires to the recommended inflation pressure, the vehicle must be driven at 20 mph or more for a few minutes for the light to turn OFF.

Some heavier duty vehicles like F-150, F-Super Duty, or E-Series have tire pressures which are different in the front and rear tires. (Consult the tire label on the driver's door jamb for the recommended inflation pressures.) This is known as the split placard system.

When the tires are rotated on the split placard system, the TPMS system will need to be retrained to identify where the tires/sensors are located to determine the proper tire pressures.

All Ford and Lincoln/Mercury sensors can be retrained by using Rotunda Tool number 204-363 or Motorcraft Tool number TPMS-19. The valve mounted bolt-on sensors can also use Rotunda tool number 204-324.

Ford Motor Company uses three different designs of TPMS sensor:

- Valve mounted bolt-on sensors
- Banded Sensor
- Valve mounted Snap-in Sensors

Valve Mounted Bolt-On Sensors

The valve mounted sensors (also known as a Schrader Valve Sensor) are one-piece "bolt-on" valve mounted sensor where the sensor and valve stem are molded together. The sensor is secured in place by a hex nut and uses a rubber grommet to prevent any leaks. This sensor was replaced by the Banded Sensor.

Banded Sensors

The banded TPMS sensor assembly consists of:

- A metal band around the center of the wheel
- A cradle or bracket to hold the sensor
- A tire pressure sensor

Valve Mounted Snap-In Sensor

Beginning in 2009 with the Escape and F-150, a two piece snap-in valve mounted sensor was used. The sensor and valve stem are separate pieces which are screwed together and can be replaced separately.

The sensor is referred to as "snap-in" because it uses a more traditional rubber valve stem for installation and does not use a hex nut fastener or rubber o-ring for attachment. **NOTE: MUST USE NEW VALVE STEM PART NUMBER 9L3Z-1700-A.** It also eliminates the need for an expensive stainless steel band and cradle. The sensor is smaller and lighter than previous sensors and less apt to cause tire balancing concerns.

NOTE: Although the three different systems use similar methods for communicating, the tire pressure sensors are not interchangeable.

Early Bolt-On Valve Stem System

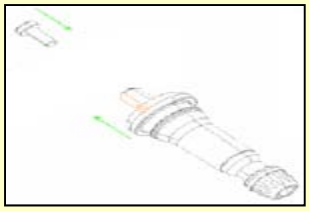
The bolt-on system uses a grommet to seal the sensor in the rim and a nut to retain the sensor. When the sensor is removed or a tire is replaced, a new mounting kit must be installed. The mounting kit includes a new grommet, valve core, valve cap and hex nut.

Banded Sensor

The banded sensor uses a band mounted to the rim which retains a cradle. The sensor is then mounted to the cradle. The band and cradle are serviced in a kit. The sensor is serviced separately.

Snap-In Valve Mounted Sensor

The Snap-in sensor does not require the use of a grommet or a hex nut like the bolt-on sensor. The sensor is mounted to the valve by using a Torx screw. When the valve needs to be replaced, the sensor can be removed and a new valve kit can be in installed. The valve kit consists of a new valve, valve cap and Torx screw.

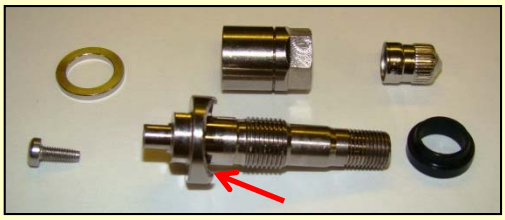


Note: All of these TPMS systems require specific instructions for tire mounting and dismount procedures. See instructions on following pages.

Note: Use of Tire Sealers in Tires / Wheels Equipped With TPMS Systems

Whenever emergency tire sealers are used on a vehicle equipped with a TPMS system, the sensor and valves must be replaced, which is not covered under the new vehicle warranty. Before installing a new tire all of the sealant must be removed from the tire/wheel assembly. Failure to do so can cause the TPMS system to give false tire pressure measurements and cause the new sensor to fail.

Bolt-On Valve



Starting with the 2013 model year, the TPMS system on the Shelby GT500 will have a bolt-on valve. The wheels are designed so the valve is recessed to limit the chance of contact which could damage the valve. The valve and sensor can be purchased as an assembly or the valve can be purchase in a separate kit shown above. The screw which secures the sensor to the valve is a self-tapping design, which cannot be reused. If the sensor is removed from the valve, the valve must be replaced. The valve retaining nut torque is 7.5-8.5 Nm (66-75 lb-in) and the sensor screw torque is 1.2-1.6 Nm (11-14 lb-in). The angled edge of the valve seat (red arrow) must be indexed toward the inside of the rim.

Things you should know about TPMS

Whether the vehicle that you are servicing uses Valve Mounted Bolt-On, Banded or Snap-In TPMS sensors, there are several key items you need to know to properly service the vehicle.

Cold Weather- During colder weather, a drop in ambient temperature will cause tire pressure to decrease because air molecules are closer together in the tire. This may cause the TPMS warning light to turn ON. Tire pressure drops 1 PSI for every 10˚ F drop in ambient temperature.

Mounting Tires onto Wheels- Special care must be taken when removing or installing tires on wheels with the TPMS system. The sensors can be damaged by the tire machine or the tire if the proper mounting and dismounting procedures are not used. For the proper procedure review the enclosed job aids or the appropriate workshop manual.

Sensor ID- Each Sensor has a unique identification code which is identified by the TPMS control module. The TPMS module uses this information to ensure that it is monitoring the proper vehicle tire pressure and does not receive a stray signal from another vehicle.

Sensor Reset/Training- The TPMS needs to identify each sensor location. Heavy duty vehicles may have different tire pressures on the front and rear axles. This is known as split placard. To verify the vehicle has split placard, review the tire label on the driver's door or door jamb. The TPMS system needs to identify the locations of each sensor to be able to determine the proper tire pressure setting. When the tires are rotated the system must be reset. A reset tool is included in the Owner Information Kit in the glove box and the Owner Guide has the instructions on how to reset the TPMS system. The tool can be purchased and the Motorcraft number is TPMS-19.

For the 2010 model year, some vehicles with the split placard system have a new procedure to reset the TPMS system and do not require the use of the tool. The procedure can be found in the Owner Guide or the Workshop Manual.

Aerosol Inflators With Sealant- Tire inflators with sealant should only be used for emergencies. Use of these products can damage the TPMS sensor and cause the system to malfunction. If these products are used, the TPMS sensor will need to be replaced at the customer's expense. When the tire is repaired or replaced, all of the sealant must be cleaned from the tire and rim to ensure the new TPMS sensor is not damaged.

TPMS Sensor Batteries- All TPMS sensors contain a small battery to power the sensor and the transponder. The batteries are designed to have an estimated life of 10 years or 150,000 miles. When the batteries are at the end of the useful life, the TPMS system may start setting diagnostic codes. If the vehicle requires a replacement tire near 10 years or 150,000 miles, the TPMS sensors should be replaced as part of preventative maintenance.

Tire Pressure- When inspecting the tire pressure setting always use a high quality tire pressure gauge. Inexpensive gauges can be inaccurate. When filling the tire with air, always use clean dry air to prevent damage to the TPMS sensor.

Tire Changers- Tires should be mounted using a tire changer to guarantee a proper fit and to prevent damage to the TPMS sensor. The tire, rim, and changer should be clean of dust and dirt. If dirt or moisture gets into the tire, the TPMS sensor can malfunction. Always use the proper mounting and dismounting procedures outlined in this job aid or in the Workshop Manual.

Tire Replacement- Always replace the tires with the proper size that were installed on the vehicle as original equipment. This information can be found on the tire label located on the B-Pillar. Failure to do so can cause the TPMS system to operate improperly.

TPMS Identification Chart

Model Year:	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Expedition / Navigator	#1	#1	#2	#2	#4	#4	#4	#4	#6	#6	#6
All New Explorer									#6	#6	#6
Explorer / Mountaineer	#1	#1	#1	#3	#3	#3	#3	#3			
Aviator	#1	#1	#1								
Explorer Sport Track					#3	#3	#3	#3			
Escape / Mariner (Including Hybrid)				#3	#3	#3	#6	#6	#6	#6	#6
Freestar / Monterey				#3	#3						
Edge / MKX					#4	#4	#4	#4	#6	#6	#6
Mustang					#3	#3	#3	#6	#6	#6	#6
Shebly GT500					#3	#3	#3	#6	#6	#6	#7
Mark LT					#3	#3					
F-150					#3	#3	#6	#6	#6	#6	#6
F-Series Heavy Duty					#5	#5	#6	#6	#6	#6	#6
Ranger					#3	#3	#3	#3			
Focus						#4	#4	#6	#6	#6	#6
E-Series Under 10,000 GVWR						#5	#5	#5 or #6	#6	#6	#6
Fusion / Milan / MKZ (Including Hybrid)						#3	#3	#6	#6	#6	#6
Taurus / Sable / Taurus X						#4	#4				
Crown Victoria / Grand Marquis / Town Car						#3	#3	#3	#3		
F-Super Duty Under 10,000 GVWR						#5	#5	#6	#6	#6	#6
MKS							#4	#4	#6	#6	#6
Flex							#4	#4	#6	#6	#6
MKT								#4	#6	#6	#6
All New Taurus								#4	#6	#6	#6
Transit Connect								#6	#6	#6	#6
C-Max											#6
Fiesta									#6	#6	#6

Band-On Sensor

Bolt-On Sensor

Snap-In Sensor

Bolt-On Sensor

Motorcraft

TPMS Identifications

2010 Econoline

Standard High Pressure
Valve Stem
Band-On Sensor

Full Metal
Valve Stem
Band-On Sensor

Snap-In
Valve Stem
Snap-In Sensor

Valve Mounted Bolt-on Sensor and Snap-In Sensor

Bolt-On Stem
Note: Aluminum Nut

Sensor Type 1&2

Snap-In Stem
Note: Brass Collar

Sensor Type 6

Bolt-On Stem
Note: Nickel Plated
Brass Valve
Sensor Type 7

TPMS Sensor Attachment on Rim

Valve Mounted Bolt-On

Type: 1&2

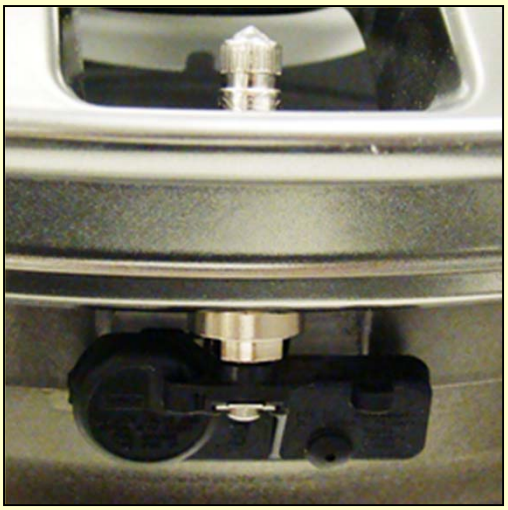
Banded

Type: 3,4,&5

Valve Mounted Snap-In

Type: 6

Bolt-On Valve



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