



TOYOTA TIRE PRESSURE WARNING SYSTEM

Toyota uses various tire pressure warning systems. Here, we'll discuss the system featured on the 2006 Land Cruiser.

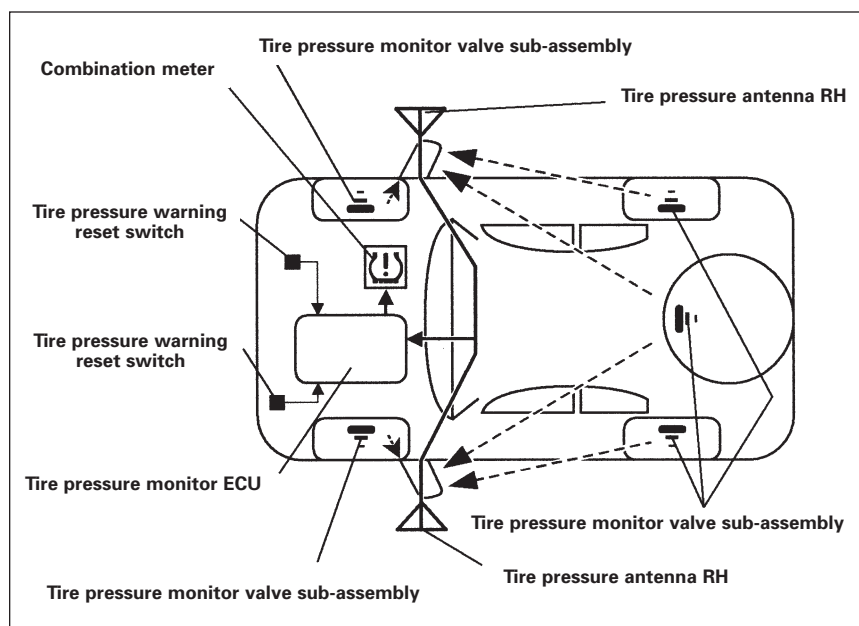
SYSTEM DESCRIPTION

Each wheel is equipped with a tire pressure monitor valve sub-assembly that has a tire pressure sensor and a transmitter, and is installed in each wheel. The sensors measure current tire pressure. This pressure reading, along with the transmitter ID, is sent to the tire pressure antenna as radio frequency waves (the antenna is located in the door mirror). These radio waves are then sent to the tire pressure monitor electronic control unit (ECU). As long as the transmitter IDs have been registered, the ECU compares the meas-



An example of a tire pressure monitor valve sub-assembly. This mounts to a drop area in the wheel.

TOYOTA TIRE PRESSURE WARNING SYSTEM



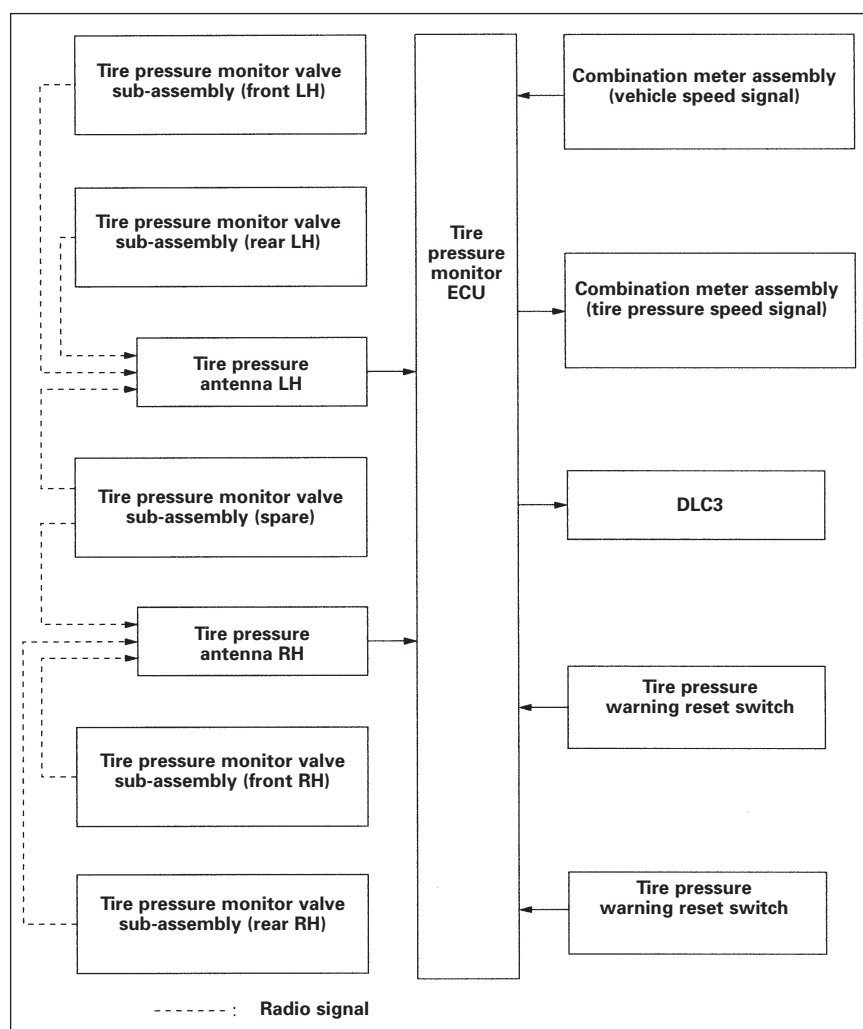
Tire pressure warning system component locations (shown here on a 2006 Land Cruiser).

ured air pressure of each tire (including the spare) with the registered threshold value. If the measured air pressure is less than the threshold value, the tire pressure warning light (on the dash combination meter) illuminates.

The system has a tire pressure warning reset switch to address the differences in the air pressure settings between the front and rear tires.

BASIC SYSTEM INFORMATION

If the tire pressure warning light does not go off, or if it activates during driving, check the tire pressure at all five locations as soon as possible.



Tire pressure warning system diagram.

If the warning light activates within several hours after adjusting tire pressure, one or more tires may have a slow leak. If the warning light activates immediately even after adjusting tire pressure, there is a strong possibility that the threshold value was registered improperly or too low.

CONDITIONS THAT MAY CAUSE THE SYSTEM TO MALFUNCTION

1. Initialization performed incorrectly (threshold pressure set too low).

2. Wheel swapped with another vehicle without transferring the sensor number.

3. Wheels may be installed on the vehicles that do not have a tire pressure monitor valve sub-assembly.

4. The tire pressure warning valve sub-assembly sensor battery may be depleted.

5. Similar radio frequencies in the immediate area may interfere with the system.

6. A radio device of similar frequency is being used in the vehicle.

7. Studded snow tires or tire

chains may disrupt radio signals.

8. If non-specified wheels are used, the system may malfunction because the radio waves are transmitted at different angles from the pressure sensor.

9. Some tires may cause the system to malfunction even if the specified wheels are used.

10. Excessive snow/ice on the vehicle (especially around wheels and wheel wells) may cause poor transmitter radio signal operation.

NOTE: The average life of the tire pressure monitor valve sub-assembly grommet is about five years, at which time the sensor & the grommets should be replaced.

TIRE PRESSURE WARNING SYSTEM COMPONENTS AND THEIR FUNCTIONS

Tire pressure monitor valve/sensor sub-assembly:

The sensor is combined as a single unit with a wheel air valve, this component measures tire pressure and temperature. This information is sent (using an ID number) to the system ECU for both identification (wheel location) and measurement values.

Tire pressure antenna:

The antenna receives a signal from the transmitter, and then sends this signal to the tire pressure monitor ECU.

Tire pressure monitor ECU:

The tire pressure monitor receives the relayed signal from the transmitter(s) and identifies the signal as correct (essentially confirming

the “fingerprint” identity of the signal). If the air pressure is equal to or lower than the threshold value, it sends a signal that activates the tire pressure warning light.

Tire pressure warning light:

Located in the dash-mounted combination meter, the tire pressure warning light alerts the driver of low tire air pressure and/or of any system failure.

Tire pressure warning reset switch:

This component enters the initialization mode for tire or wheel replacement, or for tire rotation.

Tire pressure warning select switch:

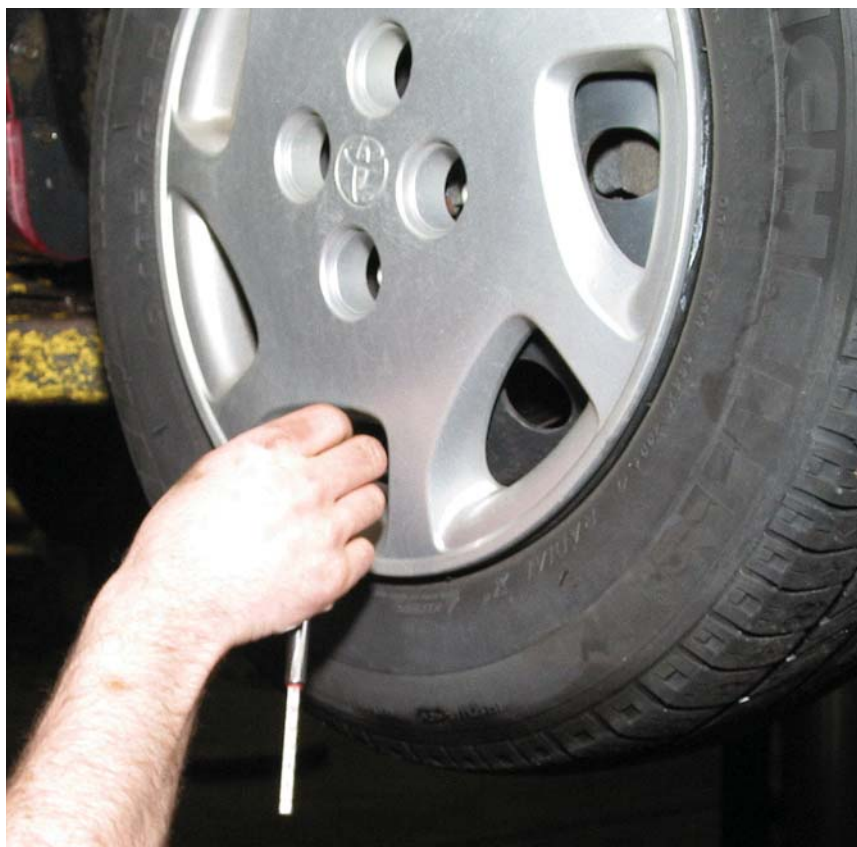
When two sets of IDs are registered in the tire pressure monitor ECU, either set can be selected by changing the switch between “Main” and “2nd” modes.

TIRE PRESSURE WARNING RESET SWITCH

By operating the tire pressure warning reset switch, the tire pressure monitor ECU can be set to learn the present tire pressure condition, and then stores these values in the ECU. The dealer or technician must set the warning threshold to the proper value in order to comply with the placard, owner’s manual or tire inflation label.

The inflation pressures of all tires must be adjusted before operating the tire pressure warning reset switch.

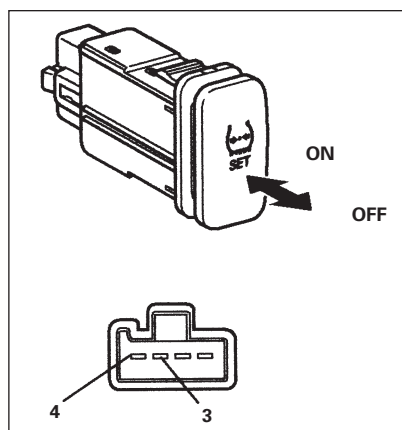
To initialize the system, press and hold the tire pressure warning reset



Before beginning any diagnosis of a tire pressure warning system, check inflation pressures.

switch for three seconds or longer with the ignition switch ON. After the system has been initialized, the warning light should blink three times (one second on, one second off). During initialization, the tire

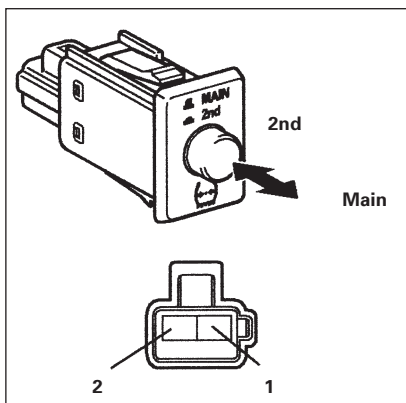
pressure monitor valve sub-assembly measures the tire inflation pressure and registers the signals that are sent to the system’s ECU at a frequency of one per minute. The initialization process is complete when a signal from each tire has been received. The ignition switch should remain on for a minimum of 10 minutes after the reset switch is pressed to ensure the ECU initializes with the current tire pressure. The tire threshold pressure is now learned.



Tire pressure warning reset switch.

TIRE PRESSURE WARNING SELECT SWITCH

The tire pressure warning select switch for the 2006 Land Cruiser is located inside the glove box.



Tire pressure warning select switch. Switch button out = Main mode; button in = 2nd mode.

The switch allows the system to be switched between two sets of tires. There's no need to log the ID each time a tire set is changed because the tire pressure monitor ECU can be programmed to register two sets of transmitter IDs.

PROBLEMS AND SUSPECTED CAUSES

The tire pressure warning system does not operate:

1. Threshold learn procedure performed incorrectly.
2. Wheel swap between different vehicles (incorrect monitor valve sub assembly programmed).
3. Tire pressure monitor valve sub-assembly.
4. Tire pressure antenna.
5. Power source circuit.
6. TC and CG terminal circuit.
7. Combination meter assembly.
8. Tire pressure monitor ECU.

The DTC check cannot be completed:

1. Power source circuit.
2. TC and CG terminal circuit.
3. Tire pressure monitor ECU.

Tire pressure warning light does not activate:

1. Power source circuit.
2. Tire pressure warning light circuit.
3. Combination meter assembly.
4. Tire pressure monitor ECU.

Tire pressure warning light remains on:

1. Tire pressure check.
2. Tire pressure monitor ECU poorly connected.

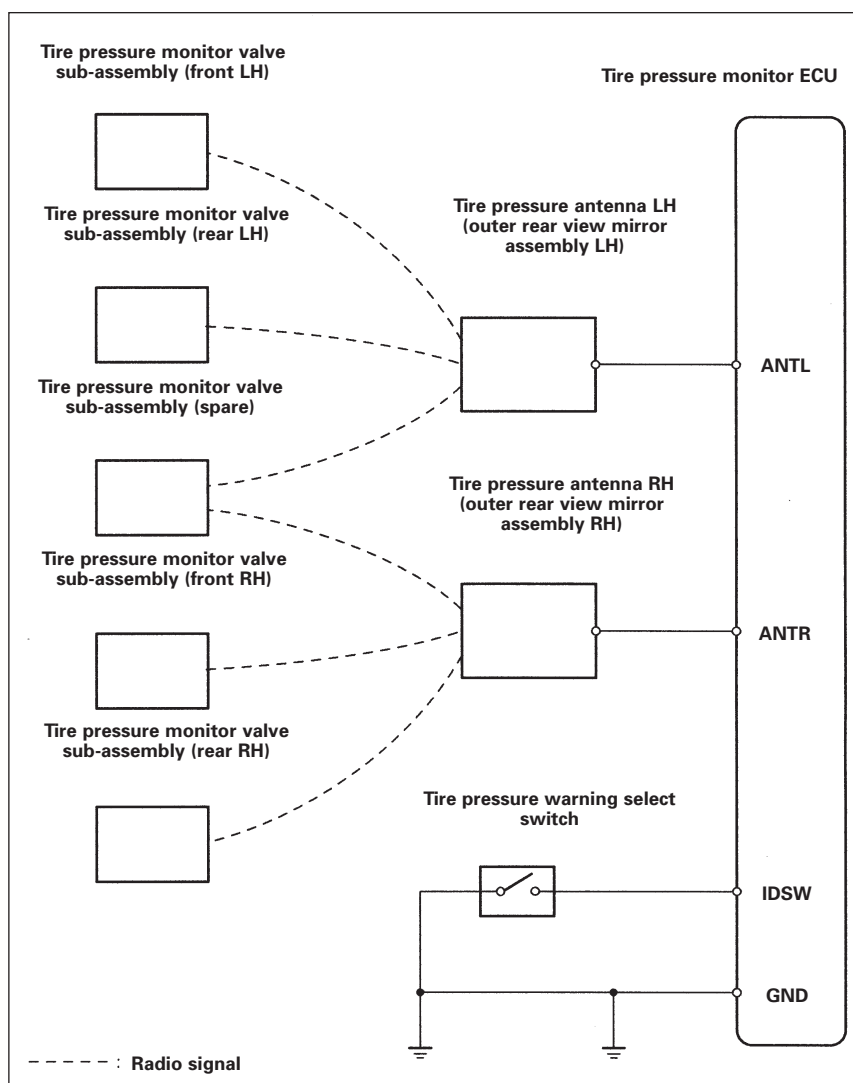
3. Tire pressure warning light circuit.

4. Combination meter assembly.
5. Tire pressure monitor ECU.

The tire pressure warning light blinks:

1. Check DTC.
2. TC and CG terminal circuit.
3. Test mode (signal check).
4. Tire pressure monitor ECU.

Initialization cannot be completed:



Tire pressure warning system wiring diagram.



1. The test mode (or signal check).
2. Tire pressure warning reset switch.
3. Tire pressure monitor ECU.

Cannot switch between “Main” and “2nd”:

1. Tire pressure warning select switch.

2. Wire harness.
3. Tire pressure monitor ECU.

SYSTEM INITIALIZATION

The tire pressure warning system

DIAGNOSTIC TROUBLE CODES FOR TIRE PRESSURE WARNING

CODES

C2111/11 (transmitter ID1 operation stop)
C2112/12 (transmitter ID2 operation stop)
C2113/13 (transmitter ID3 operation stop)
C2114/14 (transmitter ID4 operation stop)
C2115/15 (transmitter ID5 operation stop)
C2121/21 (no signal from transmitter ID1 in Main mode)
C2122/22 (no signal from transmitter ID2 in Main mode)
C2123/23 (no signal from transmitter ID3 in Main mode)
C2124/24 (no signal from transmitter ID4 in Main mode)
C2125/25 (no signal from transmitter ID5 in Main mode)
C2131/31 (no signal from transmitter ID1 in 2nd mode)
C2132/32 (no signal from transmitter ID2 in 2nd mode)
C2133/33 (no signal from transmitter ID3 in 2nd mode)
C2134/34 (no signal from transmitter ID4 in 2nd mode)
C2135/35 (no signal from transmitter ID5 in 2nd mode)

TROUBLE AREA FOR ABOVE CODES

Tire pressure monitor valve sub-assembly
Tire pressure antenna
Tire pressure warning select switch
Tire pressure monitor ECU
Wire harness

CODES

C2141/41 (transmitter ID1 error)
C2142/42 (transmitter ID2 error)
C2143/43 (transmitter ID3 error)
C2144/44 (transmitter ID4 error)
C2145/45 (transmitter ID5 error)
C2165/65 (abnormal temperature inside ID1 tire)
C2166/66 (abnormal temperature inside ID2 tire)
C2167/67 (abnormal temperature inside ID3 tire)
C2168/68 (abnormal temperature inside ID4 tire)
C2169/69 (abnormal temperature inside ID5 tire)

TROUBLE AREA FOR ABOVE CODES

Tire pressure monitor valve sub-assembly
Tire pressure monitor ECU
Tire pressure antenna

CODES

C2171/71 (transmitter ID not registered in Main mode)
C2172/72 (transmitter ID not registered in 2nd mode)

TROUBLE AREA FOR ABOVE CODES

Tire pressure warning select switch
Tire pressure monitor ECU
Wire harness

CODE

C2176/76 (Receiver error)

TROUBLE AREA FOR PREVIOUS CODE

Tire pressure monitor ECU

CODE

C2177/77 (initialization not complete)

TROUBLE AREA FOR ABOVE CODE

Tire pressure monitor valve sub-assembly
Tire pressure monitor ECU
Tire pressure antenna
Tire pressure warning reset switch
Tire pressure warning select switch
Wire harness

CODES

C2181/81 (transmitter ID1 not received....test mode DTC)
C2182/82 (transmitter ID2 not received....test mode DTC)
C2183/83 (transmitter ID3 not received....test mode DTC)
C2184/84 (transmitter ID4 not received....test mode DTC)
C2185/85 (transmitter ID5 not received....test mode DTC)

TROUBLE AREA FOR ABOVE CODES

Tire pressure monitor valve sub-assembly
Each tire pressure monitor valve sub-assembly
Tire pressure warning select switch
Tire pressure monitor ECU
Wire harness

CODE

C2191/91 (vehicle speed signal error....test mode DTC)

TROUBLE AREA FOR ABOVE CODE

Vehicle speed sensor
Tire pressure monitor ECU
Combination meter
Wire harness

CODE

C2192/92 (select switch error....test mode DTC)

TROUBLE AREA FOR ABOVE CODE

Tire pressure warning select switch
Tire pressure monitor ECU
Wire harness

CODE

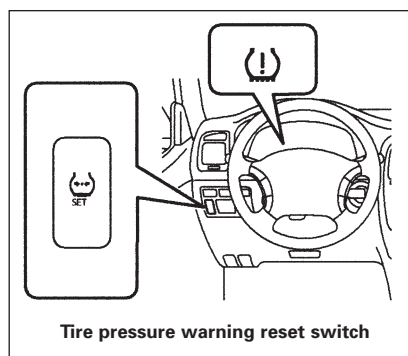
C2195/95 (multi-receiver antenna circuit....test mode DTC)

TROUBLE AREA FOR ABOVE CODE

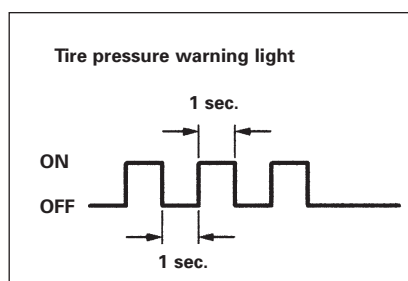
Tire pressure antenna
Tire pressure monitor ECU
Wire harness



must be initialized after any interruption of battery power (i.e., the battery negative terminal has been



Location of the tire pressure warning reset switch and warning light, shown here on a 2006 Land Cruiser.



The tire pressure warning light sequence is one second ON and one second OFF. The light will blink three times if the system has been reset properly.



This photo shows a tire pressure monitor valve sub-assembly mounted to a wheel. Care must be taken during tire mounting/demounting to avoid sensor damage.

disconnected, battery replaced, etc.), after replacing the ECU, after replacing tires with those requiring different pressure, after rotating tires, or after replacing a tire pressure monitor valve sub-assembly.

NOTE: Only perform tire pressure adjustment after the vehicle has sufficiently cooled down.

Keep the tire pressure warning reset switch pressed for 3 seconds or more with the ignition switch ON.

Check that the tire pressure warning light blinks three times (one second ON, one second OFF). Do not turn the ignition switch OFF during the initialization process, which takes about 10 minutes. Initialization is complete when a signal is received from each wheel. Initialization will be canceled if the ignition is turned OFF during this process.

Using the Toyota Diagnostic Tester, confirm that initialization is complete and that the pressure for each tire is displayed in INIT THRESHOLD 1 to 5.

REGISTRATION

If the tire pressure monitor ECU or the tire pressure monitor valve sub-assembly is replaced, you must register the transmitter ID. The initial registration is stored in the ECU and is marked on the tire pressure monitor valve sub-assembly. The registration can be retrieved from the old ECU by using the Toyota Diagnostic Tester.

Set the tire pressure of all wheels (including the spare) to the specified value.

Connect the Toyota Diagnostic Tester to the DLC3, and turn the ignition switch ON.

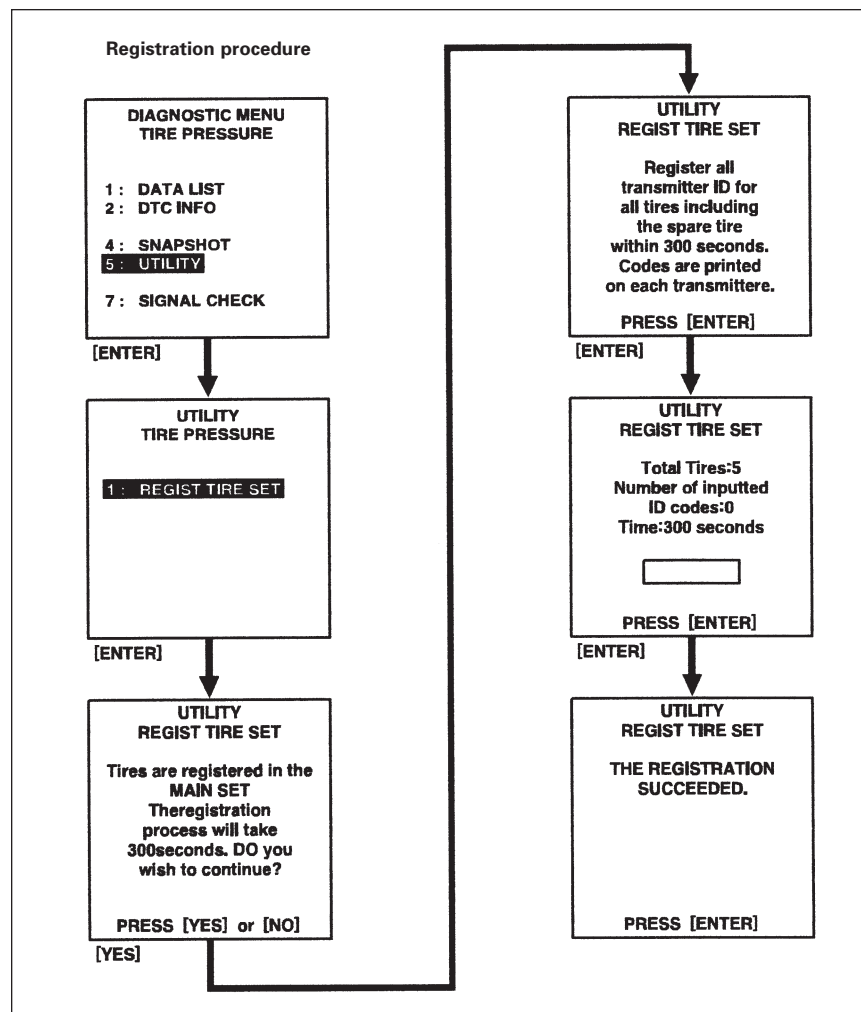
1. Read (and record) the ID (ID1 to ID5) by using the Data List.
2. Select the REGIST TIRE following the Toyota diagnostic tester screen.
3. Select the registration mode "Main"
4. Input the ID (ID1 to ID5) using the Toyota Diagnostic Tester and transmit the ID to the tire pressure monitor ECU.

NOTE: Steps 1 through 3 must be completed within five minutes. If not, the system will return to normal operation mode.

Once registration is complete, you must confirm that the registration was successful. Before starting, make sure that all tires have been adjusted to their specified pressure value.

Connect the Toyota Diagnostic Tester to the DLC3 and turn the ignition switch ON. Select "Signal Check" mode on the tester. A "forced transmission" is now possible.

Rapidly reduce the pressure of the first tire by removing the valve core, dropping pressure by 5.8 psi or



Use the Data List to read the registration numbers. Select the Utility REGISTER TIRE set mode to input the tire ID numbers.

more during a 30-second timeframe. This will cause the transmitter ID to signal the ECU. Perform this test on all five tires.

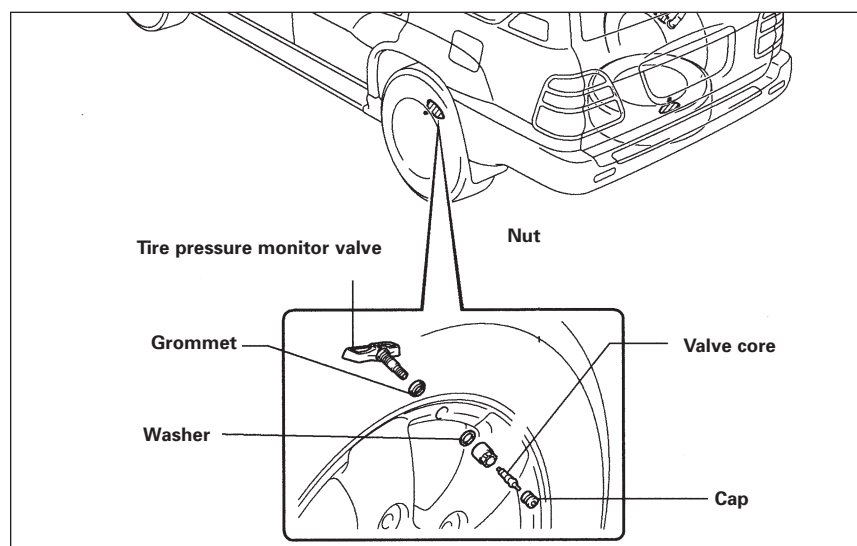
When the test is finished, erase the test mode DTCs to complete the registration. If the codes have not been erased, reset the tire pressures to specified value and rotate each tire 90 to 270 degrees, then perform a forced transmission of the transmitter IDs for all wheels. If the codes are still output, register the transmitter IDs. If the ID cannot be registered, short circuit the TC and CG terminals of the DLC3.

DETERMINING WHEEL TRANSMITTER ID STATUS

A wheel location's transmitter system status may be listed under "Main" or "2nd." In order to determine the installed wheel's transmitter ID status, turn the ignition switch ON. Set the tire pressure warning select switch to the "Main" position. Make sure that all tires are inflated to the specified pressure. Rapidly reduce the pressure of any tire to 17 psi. If the tire pressure warning light illuminates, the installed wheel is registered in the "Main" file. If the warning light does not activate, switch the tire pressure warning select switch to "2nd." If the warning light now activates, the wheel is registered in the "2nd" mode in the system.

REMOVAL AND INSTALLATION OF TIRE PRESSURE MONITOR VALVE SUB-ASSEMBLY

Several precautions should be noted before attempting any wheel/tire service.



Tire pressure monitor valve sub-assembly installation example.

1. To prevent damaging the sensor when installing a tire, make sure that the tire pressure monitor valve does not interfere with the tire bead.

2. Once the tire has been mounted (with bead seated and initially inflated), remove the valve core to rapidly release air and verify that the warning light activates.

3. If there is air leakage, tighten the valve nut with a force of 35 in. lbf and push the valve core two or three times to remove any contaminants. If air leakage is still present, replace the grommet, washer and nut.

4. When installing the tire pressure monitor valve, check for cleanliness of the rim, grommet, washer and nut. Use only the manufacture-specified valve cap.

5. When inflating the tire, first install the tire pressure valve straight onto the stem of the tire pressure monitor valve.

6. When tire and/or wheel sensors are replaced, make sure to register the transmitter ID.

NOTE: It is extremely important that the tire pressure valve is clean. Thoroughly inspect the grommet, washer and nut and rim surface for damage or dirt.

If the tire pressure warning light illuminates, immediately check tire pressure and adjust to specified value. The tire pressure warning light could activate when there is an open in the tire pressure warning light circuit.

NOTE: Check the spare tire as well because this system monitors the pressure of all five tires.

If the tire pressure warning light blinks there is a system malfunction. Check for DTCs.

Changing the tire pressure warning switch between “Main” and “2nd” allows registration of two transmitter ID sets. Check the tire pressure warning switch to see if the tire is registered in “Main” or “2nd.” If the vehicle is driven without selecting the switch state correctly, the tire pressure monitor ECU determines the system is malfunctioning, causing the warning light to blink.

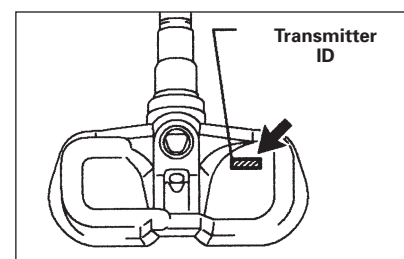
It is necessary to register the transmitter ID in the tire pressure monitor ECU after replacing the tire pressure monitor valve sub-assembly and/or the tire pressure monitor ECU.

When replacing the tire pressure monitor ECU, read the transmitter IDs already registered in the ECU and make a note of these before removing the tire pressure monitor ECU. Register the transmitter IDs after installing a new tire pressure monitor ECU.

When replacing the tire pressure monitor valve sub-assembly, before replacing the tire note the seven-digit transmitter ID number that appears on the new tire pressure monitor valve sub-assembly.

When tires and wheels are replaced, always be sure to register the transmitter ID correctly.

If the wheels/tires are rotated (installed in a position different



Location of the transmitter number on a tire pressure monitor valve sub-assembly. Always note this number before mounting a tire.

than initially installed and initialized), or if tires are installed that require different inflation pressure, or if the pressure monitor ECU or pressure valve sub-assembly is replaced, the system must be initialized in order to operate correctly.

VALVE SUB-ASSEMBLY REPLACEMENT PROCEDURE

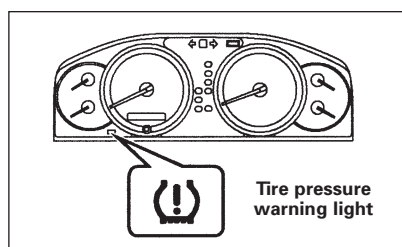
Remove the tire/wheel assembly, and then remove the valve cap and valve core, releasing air from the tire. Once pressure has been fully released, remove the nut and washer from the valve and drop the valve inside the tire.

After dislodging the valve and dropping it inside the tire, disengage the outer and inner tire beads. Be careful not to damage the tire pressure monitor valve during bead service.

Remove the outer bead from the wheel rim and pull out the valve sensor. Inspect the valve grommet. If damaged, replace the grommet.

If a replacement tire pressure valve sub-assembly is to be installed, note the new valve's ID number, since this number must be registered in the ECU.

Inspect the wheel valve hole for



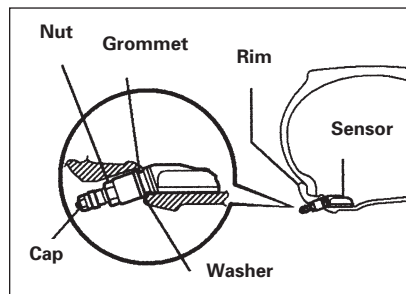
Shown here is the location of the tire pressure warning light on the combination meter of a 2006 Land Cruiser.



cleanliness and clean if necessary.

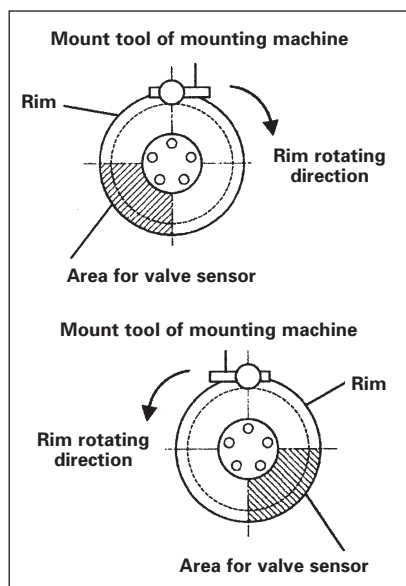
Check the valve sub-assembly for visible deformation or other damage.

Insert the valve into the valve



This illustration shows the orientation of the installed valve sub-assembly. Note the location of the grommet, washer and nut.

installation hole. Insert it from inside the rim, so that the printed surface can be seen (printed surface facing toward the tire tread). If the valve is installed in reverse, the tire pressure monitor valve may be damaged or may fail to properly transmit signals at high speeds.



Pay particular attention to valve sensor position relative to the mounting machine's bead arm to avoid damaging the sensor.

When mounting the tire onto the wheel, install the inner tire bead first. Position the main body of the valve sensor in the 7 o'clock position relative to the mounting machine's bead pusher arm. See illustration.

If the valve sensor is positioned outside this area, it interferes with the tire bead and may damage the sensor.

Install the upper bead - do not clamp the valve sensor with the bead. Once the tire beads are seated and the tire is fully inflated, re-check the valve nut and retighten to 35 in. lbf. Check for air leaks with a soapy water solution.

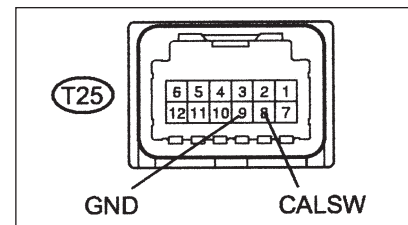
TIRE PRESSURE MONITOR VALVE SUB-ASSEMBLY DISPOSAL

A lithium battery powers the tire pressure monitor valve. When disposing the tire pressure monitor valve, first remove the battery and dispose correctly.

Using a slim flat-blade screwdriver, pry off the assembly cover. The battery and base board (covered with silicon resin) are exposed. Cut the two terminals that connect the battery and base board and remove the battery.

INSPECTING THE TIRE PRESSURE MONITOR ECU

Connect the T25 ECU connector and connect the T27 switch connector. Measure the voltage of the ECU. With the ignition switch ON and the reset switch ON, voltage should be below 1.5V. With the ignition switch ON and the reset switch OFF, voltage should be 8 to 15V. If both conditions are not met, replace the



Tire pressure monitor ECU tester connection.

tire pressure warning reset switch.

Please refer to your Toyota vehicle service manuals for details concerning diagnosis of specific DTCs. ★

TOYOTA Tire Pressure Sensor:

These units are Toyota specific and easy to install.



These Toyota Genuine Parts can be exclusively sourced through your Toyota STAR Dealer. Looking for more technical information? Please visit <http://techinfo.toyota.com> and see how easy it is to subscribe and gain access to parts and repair information for Toyota vehicles.

