

Date	Group	No.	Page
6.2009	<b>776</b>	<b>00</b>	1(18)

## Tire Pressure Monitoring System (TPMS)

### Tire Pressure Monitoring System (TPMS)

Since properly inflated tires increase safety, fuel economy, tire longevity and reduce maintenance costs, Volvo Trucks are now offered with an active Tire Pressure Monitoring System (TPMS). This bulletin covers general information about the TPMS.

Information is subject to change without notice. Illustrations are used for reference only and may differ slightly from the actual vehicle being serviced. However, key components addressed in this information are represented as accurately as possible.

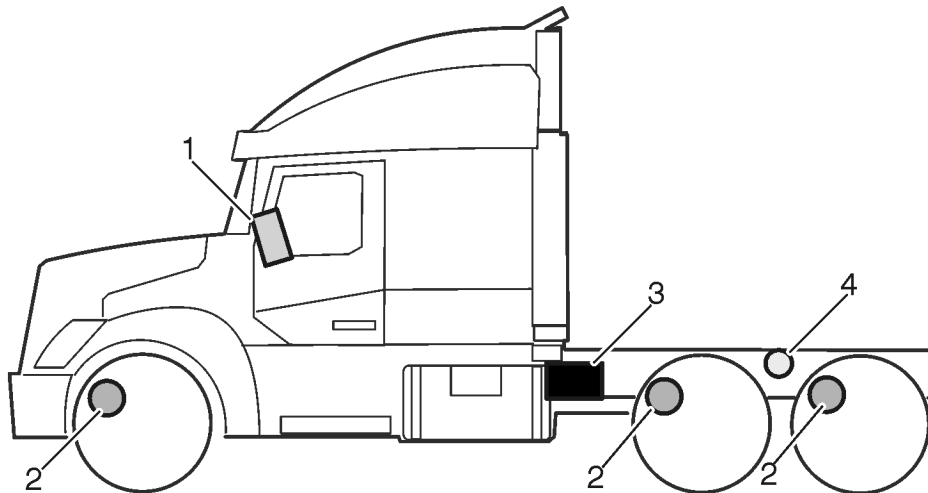
#### Contents:

- "Tire Pressure Monitoring" page 2
- "Components" page 3
- "Air Pressure Monitoring and Alert" page 5
- "Tire Temperature Monitoring and Alert" page 5
- "Special Tools" page 6
- "LF Initiator" page 7
- "SwartWave Diagnostic Software" page 9
- "Tire Set Point" page 10

## Tire Pressure Monitoring

The Tire Pressure Monitoring System (TPMS) is an active wireless sensing system that is now available on Volvo Trucks. The system is designed to monitor the trucks tire cavity pressures and temperatures in real-time, and provides early warning for the operator when they are

not within the recommended specification for proper operation of the vehicle (for more information on tire pressure specifications refer to, "Tire Set Point" page 10). The system is made up of the following components;



- 1 Driver's Information Display (DID)
- 2 Tire Pressure/Temperature Sensor
- 3 Electronic Control Unit (ECU)
- 4 Antenna

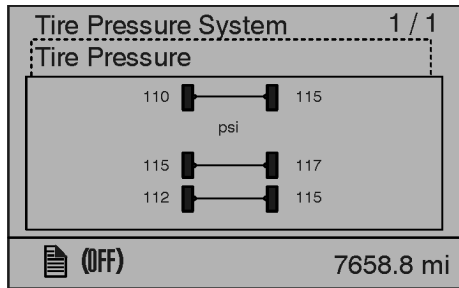
W7001464

The TPMS receiver creates a wireless bubble around the vehicle, allowing various sensing technologies to seamlessly interact. Tire sensors mounted on each wheel of the tractor, measure tire pressure and temperature every 12 seconds and wirelessly transmit data every three to five minutes. If a sensor detects a pressure change of 3 psi or more, it breaks its regular schedule and transmits tire data immediately. The system can monitor up to 20 wheel positions and is able handle complex commercial applications.

Real-time tire pressure and temperature data is available to the driver on demand via the Drivers Information Display (DID). The DID also is responsible for the system alerts.

## Components

### Driver's Information Display (DID)



W7001465

### Tire Pressure/Temperature Sensor



W7001463

The DID in the instrument cluster, displays real-time tire pressure and temperature data to the operator. The DID will also alert the operator to a low pressure or high temperature condition before it becomes dangerous. For more information about the alerts refer to "Air Pressure Monitoring and Alert" page 5.



#### CAUTION

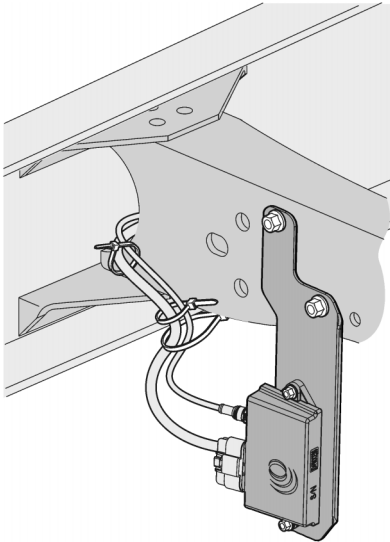
Care must be exercised when disassembling a tire and wheel assembly that is equipped with a tire pressure sensor. **Do not** pry on, strike or apply an force on the sensor. Failure to do so may result in sensor damage.

The tire pressure/temperature sensor is attached to each wheel with a stainless steel tire strap and is located in line with the wheels valve stem. This self powered sensor is responsible for transmitting the tire cavity pressure and temperature to the system via a radio frequency sign that is received by the system antenna.

**Note:** When installing tandem rear wheels equipped with these sensors, the wheels should be installed with the valve stems 180° apart. If they are installed too closely together, the learn protocol may not work properly and the ECU may identify the tire in the wrong position or both tires in one position.

**Note:** Refer to, "Tire Pressure Sensor Replacement" in function group 776 for more information.

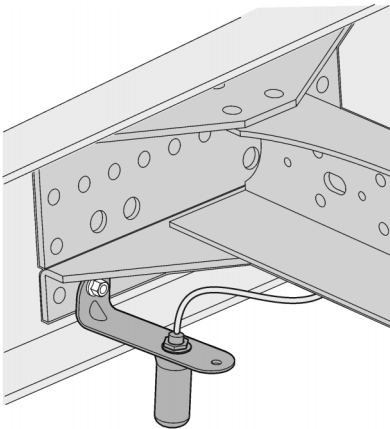
## Electronic Control Unit (ECU)



W7001467

The ECU is a wireless gateway receiver, capturing data transmissions from tire sensors mounted at each wheel. This data is then analyzed against programmed user-defined settings and, if it determines that a tire is under-inflated or running over temperature, an alert is triggered. Robust and weatherproof in design, the wireless gateway is conveniently mounted directly to the aft-transmission or intermediate crossmember forward of the yaw-rate sensor (right side of vehicle). The ECU also interfaces with the vehicle's J1939 network for seamless integration.

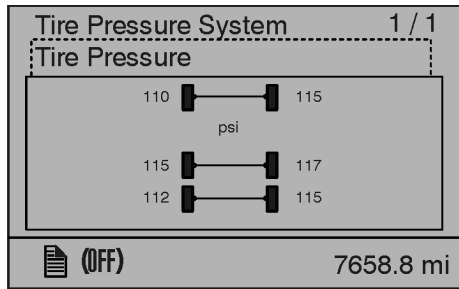
## Antenna



W7001468

Wireless signals from the tires at the front axle are captured by the wireless gateway ECU directly, while signals from the rear axles and the trailer are captured by an antenna mounted at the rear of the vehicle. An external antenna ensures signal reception reliability so that TPMS always has up-to-date-tire status information accessible at the push of a button.

## Air Pressure Monitoring and Alert



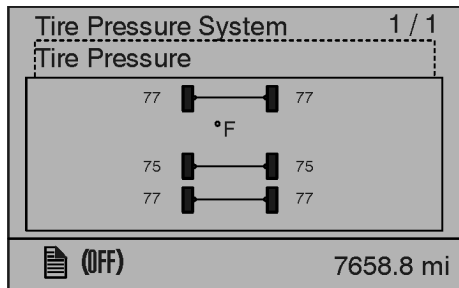
W7001465

The air pressure of each programmed tire can monitored by the operator via the DID. The system monitors tire air pressure in all cab tires independently and alerts the operator of low tire pressures in two stages;

**1. Low Pressure Alert** — The low pressure alert is triggered when tire pressure is 8% below it's "Set Point". The operator is alerted by an amber warning telltale light/buzzer that is displayed in the instrument cluster. The set point pressure is a nominal tire pressure that is set at the factory. For more information about set point refer to "Tire Set Point" page 10.

**2. Critically Low Air Pressure** — The critically low air pressure alert is triggered when tire pressure is 18% below it's "Set Point". The driver is alerted by a red flashing telltale light/buzzer that is displayed in the instrument cluster. The set point pressure is a nominal tire pressure that is set at the factory. For more information about set point, refer to "Tire Set Point" page 10.

## Tire Temperature Monitoring and Alert

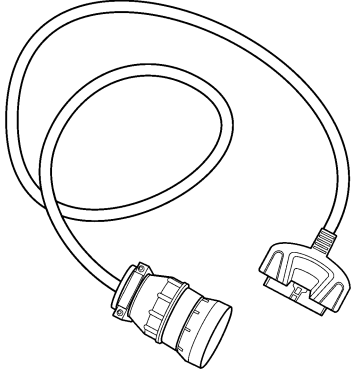
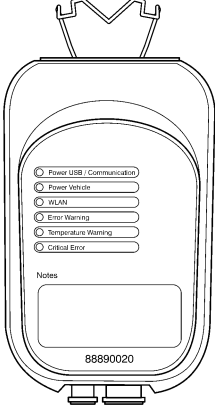



W7001466

The cavity air temperature of each programmed tire can monitored by the operator via the DID. The system monitors cavity air temperature in all cab tires independently and alerts the operator when any of these tire cavity temperature reaches 77°C (170°F). The operator is alerted by a red flashing telltale light/buzzer that is displayed in the instrument cluster.

## Special Tools

The following tools are used in conjunction with the Bendix "SmartWave Diagnostic Software" and are necessary for servicing as well as system diagnostics.

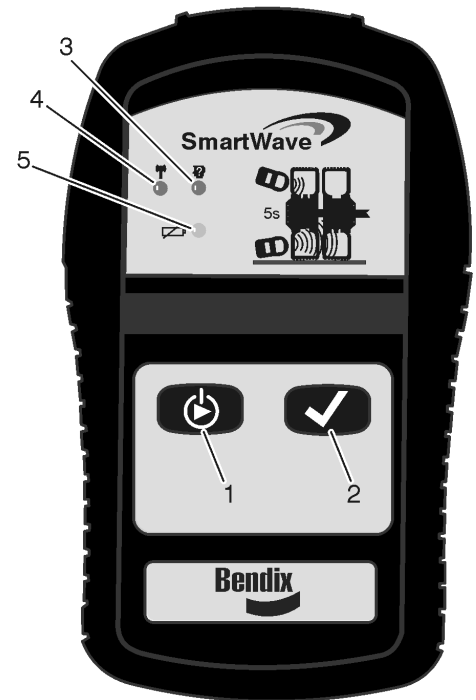
 <small>W0002454</small>	 <small>W0002455</small>
<p><b>88890034</b> Communications Cable</p>	<p><b>88890020</b> Communications Adapter</p>
 <small>W7001462</small>	
<p><b>88890132</b> LF Initiator</p>	

## LF Initiator

The LF Initiator is a handheld tool designed to provoke data transmissions from the pressure sensors. This tool is design to be used in conjunction with the Bendix “SmartWave Diagnostic Software” and is used to configure the system. The “SmartWave Diagnostic Software” needs to be configured to the appropriate mode first, before the LF Initiator performs any given function. For more information about the Bendix “SmartWave Diagnostic Software” and it’s use, refer to “SwartWave Diagnostic Software” page 9. The LF initiator is used to assist the installer in performing the following:

- **New System Installations or ECU Replacement** — programming sensor ID numbers & vehicle configuration into the receiver
- **Pressure Sensor Replacement** — programming new sensor ID numbers into the receiver
- **Tire Rotations** — programming tire location on the vehicle
- **Installation Verification** — (without moving vehicle)

The initiator is used to wirelessly 'ping' a tire or add tires to the system configuration, either during the initial setup or when tires are changed.



W7028713

LF Initiator

- 1 On/Off and Function Selection Button
- 2 Trigger/Activate Function Button
- 3 Learn LED Indicator
- 4 Initiate LED Indicator
- 5 Battery Low LED Indicator

### On/Off and Function Selection

This button (1) is used to turn the LF initiator on or off. To power up, press and hold the button for five seconds. To power the tool down, press and hold the button for five seconds or until the LED indicators turn off.

This button is also used to select between the initiate and learn functions when the tool is on. To change the function, press the button once (do not hold the button). The selected function can be identified by a solid green

LED indicator turning on. Functions can not be change if the function is activate or in standby mode (refer to “Standby Mode” page 8). To change functions when the tool is in standby mode, press the button once to terminate the standby function then press the button again to toggle to the next function. For more information about the functions refer to “Initiate Function” page 8 or “Learn Function” page 8.

### Trigger/Activate Function

This button (2) is used to trigger or activate the functions protocol. To activate a function, first select the function (refer to “On/Off and Function Selection” page 7) then press, but do not hold the button. An active function is identified by a fast blinking green LED indicator. Functions

stay active for approximately five seconds to perform their protocol and then return to standby mode. Standby mode can be identified by a slower steady blinking green LED indicator. For more information about the functions refer to “Initiate Function” page 8 or “Learn Function” page 8.

### **Learn Function**

This function (3) is used to transmit the sensor ID numbers to the receiver when programming (setting tire location in the receiver), whether in new positions (tire rotation) or a new sensor into an existing position (when sensor is replaced). Use this function in conjunction with the Bendix "SmartWave Diagnostic Software" for programming. For more information about the Bendix "SmartWave Diagnostic Software", refer to "SwartWave Diagnostic Software" page 9

To perform the learn function, select the function (refer to "On/Off and Function Selection" page 7) and hold the initiator approximately 2.5 cm (1 in.) from the center of the tire's sidewall surface in line with the valve location. Activate the function (refer to "Trigger/Activate Function" page 7) holding the tool in its location for approximately five seconds, or until the tool goes into standby mode (refer to "Standby Mode" page 8).

### **Initiate Function**

This function (4) will prompt the sensor to transmit its ID number, tire pressure data and tire temperature data. This function is used when confirming that sensors are installed in the correct wheel locations on a vehicle after system installation or for diagnostic purposes. Use this function in conjunction with the Bendix "SmartWave Diagnostic Software" which allows you to see the location of the tire and to read the data. For more information about the Bendix "SmartWave Diagnostic Software", refer to "SwartWave Diagnostic Software" page 9.

To perform the initiate function, select the function (refer to "On/Off and Function Selection" page 7) and hold the initiator approximately 2.5 cm (1 in.) from the center of the tire's sidewall surface in line with the valve location. Activate the function (refer to "Trigger/Activate Function" page 7) holding the tool in its location for approximately five seconds, or until the tool goes into standby mode (refer to "Standby Mode" page 8).

### **Battery Low Indicator**

An orange LED will be illuminated when the battery voltage falls to approximately 7.5V. To prolong battery life,

the tool will automatically power down 3 minutes from when either of the two buttons were last pressed.

### **Standby Mode**

After a function protocol has been transmitted, the tool will revert to a "standby" mode. This mode is identified when the LED of the last selected protocol flashes at a slower rate of once a second. The LED will stay in this mode until one of the following occurs:

- The "Activate" button is pressed again to repeat the protocol
  - The On/Off button is pressed to select another function
- Or**
- The tool is turned off manually or automatically



## SwartWave Diagnostic Software

The “SmartWave Diagnostic Software” is necessary for diagnostic and system service. This PC software is easy to use and provide the quickest diagnostic capabilities. Using PC diagnostics offers the following capabilities:

- View alerts and warnings.
- Monitor system status, tire pressure status, and sensor battery condition.
- Test receiver operation.
- Setup or change system configuration and parameters.

This PC software is also used to service components. By placing the system into a learning mode it needed to performs the following:

- New System Installations or ECU Replacement — programming sensor ID numbers & vehicle configuration into the receiver
- Pressure Sensor Replacement — programming new sensor ID numbers into the receiver

- Tire Rotations — programming tire location on the vehicle
- Installation Verification — (without moving vehicle)

Volvo recommends loading this software to the Volvo Premium Tech Tool, as it already contains the drivers that are needed to use tool numbers 88890020 (Communications Adapter) and 88890034 (Communications Cable) which are needed to interface with the vehicle. The “SmartWave Diagnostic Software”, setup and tool instructions, can be downloaded free by visiting <http://www.smartire.com/support/manuals>. Always read and understand the tool setup instructions before installing it to your PC. Failure to do so may result in software performance issues. Also, read and understand the PC software use instructions before attempting to service any vehicle. Failure to do so may result in an improper or incomplete repair.

## Tire Set Point

The tire "Set Point" is the nominal tire pressure specification for proper tire performance. This set point is predetermined and set at the factory and is calculated

using tire size and axle load. The following charts contain the set point pressures for steer and drive axle tires.

### Steer Axle 22.5"

Tire	Load per Axle (lb.)	Pressure Set Point (psi)
11R22.5 "G"	9980	80
	10440	85
	11020	90
	11460	95
	11900	100
	12350	105
11R22.5 "H"	9980	80
	10440	85
	11020	90
	11460	95
	11900	100
	12350	105
	12640	110
	12930	115
	13220	120
12R22.5 "H"	10900	80
	11380	85
	12010	90
	12410	95
	12810	100
	13220	105
	13740	110
	14260	115
	14780	120
275/80R22.5 "G"	9880	80
	10310	85
	10740	90
	11020	95
	11560	100
	11960	105
	12350	110

275/80R22.5 "H"	10350	80
	10870	85
	11380	90
	11880	95
	12380	100
	12870	105
	13360	110
	13840	115
	14320	120
295/75R22.5 "G"	9880	80
	10310	85
	10740	90
	11020	95
	11560	100
	11960	105
	12650	110
295/75R22.5 "H"	9880	80
	10310	85
	10740	90
	11020	95
	11560	100
	11960	105
	12350	110
	12740	115
	13220	120
295/80R22.5 "H"	11320	80
	11880	85
	12440	90
	12990	95
	13540	100
	14080	105
	14600	110
	15140	115
	15660	120

315/80R22.5 "J"	12350	80
	12830	85
	13340	90
	13880	95
	14380	100
	14880	105
	15220	110
	15840	115
	16540	120
315/80R22.5 "L"	13880	80
	14700	85
	15300	90
	16100	95
	16460	100
	17020	105
	17640	110
	18100	115
	18740	120
386/65R22.5 "J"	13880	80
	14700	85
	15300	90
	16100	95
	16460	100
	17020	105
	17640	110
	18100	115
	18740	120
425/65R22.5 "L"	16540	80
	17480	85
	18200	90
	18740	95
	19580	100
	20200	105
	21000	110
	21400	115
	22000	120

445/65R22.5 "L"	18180	80
	18960	85
	19740	90
	20400	95
	21200	100
	22000	105
	22800	110
	23400	115
	24600	120

**Steer Axle 24.5"**

Tire	Load per Axle (lb.)	Pressure Set Point (psi)
11R24.5 "G"	10620	80
	11100	85
	11680	90
	12190	95
	12700	100
	113220	105
11R24.5 "H"	10620	80
	11100	85
	1680	90
	12190	95
	12700	100
	13220	105
	13580	110
	13940	115
	14320	120
12R24.5 "H"	11580	80
	12080	85
	12790	90
	13300	95
	13820	100
	14320	105
	14760	110
	15200	115
	15660	120

275/80R24.5 "G"	9880	80
	10420	85
	10840	90
	11350	95
	11670	100
	12080	105
	12350	110
285/75R24.5 "G"	9880	80
	10420	85
	10840	90
	11350	95
	11670	100
	12080	105
	12350	110

**Drive Axle 22.5"**

<b>Tire</b>	<b>Load per Axle (lb.)</b>	<b>Pressure Set Point (psi)</b>
11R22.5 "G"	19040	80
	19800	85
	20820	90
	21660	95
	22500	100
	23360	105
11R22.5 "H"	19040	80
	19800	85
	20820	90
	21660	95
	22500	100
	23360	105
	23580	110
	23800	115
24020	120	

12R22.5 "H"	20760	80
	21560	85
	22700	90
	23140	95
	23580	100
	24020	105
	25060	110
	26100	115
	27120	120
255/70R22.5 "H"	15880	80
	16440	85
	17100	90
	17640	95
	17820	100
	18440	105
	18700	110
	19660	115
	20280	120
275/80R22.5 "G"	18160	80
	18760	85
	19540	90
	20280	95
	21040	100
	21760	105
275/80R22.5 "H"	19120	80
	20060	85
	21000	90
	21940	95
	22860	100
	23760	105
	24660	110
	25560	115
	26440	120

295/75R22.5 "G"	18160	80
	18760	85
	19540	90
	20280	95
	21040	100
	21760	105
	22700	110
295/75R22.5 "H"	18160	80
	18760	85
	19540	90
	20280	95
	21040	100
	21760	105
	22700	110
	23180	115
	24020	120
315/80R22.5 "L"		80
	21540	85
	24640	90
	25740	95
	26800	100
	27880	105
	28960	110
	30000	115
	31040	120
	21040	125
	33080	130
445/50R22.5 "L"	14620	80
	15360	85
	16060	90
	16780	95
	17480	100
	18180	105
	18740	110
	19560	115
	20400	120



455/55R22.5 "L"	15800	80
	16580	85
	17360	90
	18120	95
	18880	100
	19640	105
	21400	110
	21200	115
	22000	120
	N/A	125

**Drive Axle 24.5"**

<b>Tire</b>	<b>Load per Axle (lb.)</b>	<b>Pressure Set Point (psi)</b>
11R24.5 "G"	20280	80
	21040	85
	22040	90
	22700	95
	23360	100
	24020	105
11R24.5 "H"	20280	80
	21040	85
	22040	90
	22700	95
	23360	100
	24020	105
	24820	110
	25620	115
	26440	120
12R24.5 "H"	22080	80
	22920	85
	23360	90
	24380	95
	25400	100
	26440	105
	27160	110
	27880	115
	28640	120

275/80R24.5 "G"	18160	80
	18960	85
	19720	90
	20820	95
	21240	100
	21980	105
	22700	110
285/75R24.5 "G"	18160	80
	18960	85
	19720	90
	20820	95
	21240	100
	21980	105
	22700	110