

SmartTire™ *Tire Pressure Monitoring System* **by Bendix CVS**

SmartTire™ TPMS Maintenance Hand Tool



Revision 1.03

User Manual

Table of Contents

FCC Compliance Label	4
User Interface Illustration	4
Introduction	5
Testing Tire Sensors	5
Main Menu	6
Main Menu Icon Legend	7
Main Menu Details	7
Initiate Function.....	7
Example Display	8
Set-up Menu Icon Explanations	9
Maintenance Tool Software Update	9
Maintenance Tool software update program	10
Updating Maintenance Tool	10
PSI/BAR/kPa/C/F - Measurement Units.....	10
Walk-Around Learn	11
Walk-Around Learn Procedure.....	11
Ambient Sensor Learn	13
Ambient Pressure Compensation.....	13
Sensor Learn	14
Execution Icons	15
Application Notes, Display Examples, Sensor Initiation	15
Specifications	17
Hardware Specifications	17
General Specifications	17
Electrical Specifications	17
Communication Interfaces	17
System Resources	17
Power.....	17
Radio Frequency Specifications.....	17
Receiver Specifications.....	17
LF Transmitter Specifications.....	18
Antenna Type.....	18
Mechanical Specifications.....	18
Troubleshooting	19

FCC Compliance Label

The FCC compliance label is located on the back of the tool as shown in Figure 1.

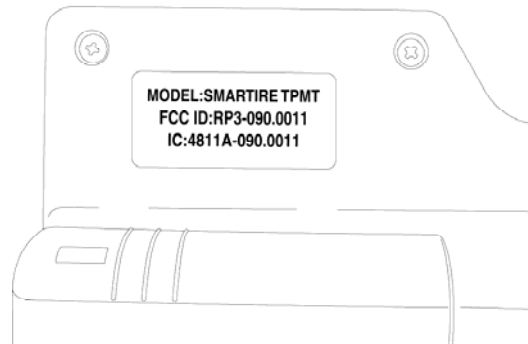


Figure 1

This device complies with part 15 of the FCC Rules and with RSS-210 of Industry Canada. Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

The term "IC:" before the radio certification number only signifies that Industry Canada technical specifications were met.

User Interface Illustration

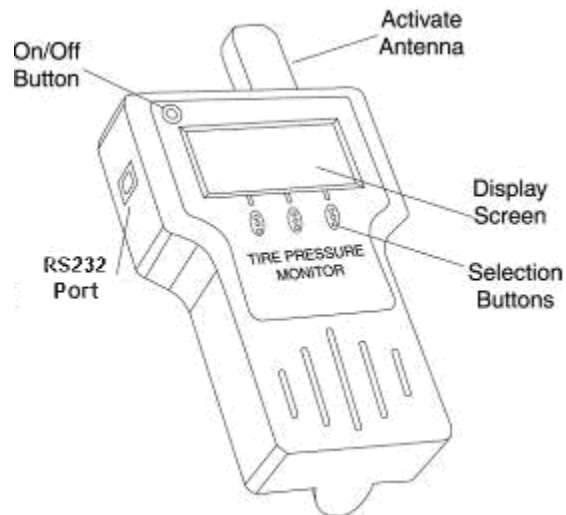


Figure 2

Introduction

The tire pressure monitoring system consists of a tire pressure sensor inside the tire that transmits a radio frequency (RF) signal containing a unique identification number (ID #), actual tire pressure, and sensor battery condition to a module in the vehicle. The vehicle module receives and interprets the RF signal from the sensor and warns the driver of low tire pressure.

Note: Early systems used one of two types of tire sensors: a tire sensor with an orange cover that had a battery-saving "stationary mode"; and an "always on" tire sensor with a yellow cover. Later systems exclusively use the yellow "always on" tire sensor.

It is important that the vehicle module knows exactly where each sensor is located on the vehicle so it can indicate to the driver which tire has incorrect pressure. *Note: Whenever the tires are serviced or rotated, it is important that the vehicle module relearns the current position of each tire pressure sensor and tire and wheel assembly. (See "Walk-around-learn" on page 11.)*

The tire pressure sensor responds with a signal for a period of time once the "activate" button is pressed on the hand tool.

The main menu of the tool identifies 3 functions consisting of *Initiate*, *Setup* and *Learn* modes respectively.

Testing Tire Sensors

The sensor test procedure is used to verify that the sensors can transmit valid data after they have been activated with a low frequency (LF) transmission from the tool. Refer to the vehicle service manual for further diagnostic information. During this procedure, the tool receives sensor transmissions and displays the transmission data on the screen.

1. The antenna of the tool should be placed against the sidewall above the wheel rim at the valve stem location. Holding it too close to the rim (while initiating an inner tire sensor on a dual tire configuration, may cause the outer tire sensor to be initiated as well).
2. Press and release the *Initiate* button on the tool. The circling symbol indicates the tool is scanning for the sensor's transmission.
3. With the tool in position, observe the screen and wait 3-5 seconds for the sensor's transmission to be received. The screen should display an 8-digit ID number, tire pressure within 2 PSI of actual tire pressure, and the tire's temperature.
4. Repeat the steps above for the remaining sensors to verify all sensors are operating properly.

NOTE: Sensor transmission data displayed on the tool screen is erased each time the *Initiate* or *Learn* functions are selected.

Main Menu

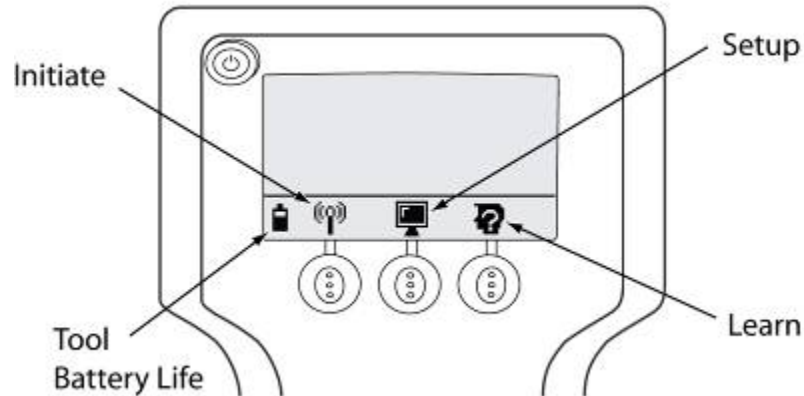


Figure 3

Initiate Function

If the *Initiate* button is pressed, the tool retrieves sensor ID, pressure data and battery status from the sensor which is displayed. Review the Application section of this guide for more information.







Setup Menu

If the *Setup* button is pressed, the tool enters the *Setup* mode. Review the Application section of this guide for more information.

Learn Function

If the *Learn* button is pressed, the tool learns/displays the sensor ID. Review the Application section of this guide for more information.

Main Menu Icon Legend


ICON	STATE	DESCRIPTION
	Handheld Battery Life	These icons indicate the battery life of the handheld device at startup. This icon is located in the lower left area of the tool display. To continue, press the <i>Check</i> mark. To turn off the tool and replace the batteries, press the <i>X</i> .
	Handheld Battery Life	This icon indicates the battery life of the handheld device.
	Initiation	This icon is used to indicate initiation. When the <i>Initiate</i> button is selected, this icon starts to blink during transmission.
	Initiation Failure	This icon indicates tool initiation failure. This could be caused by either a low battery in the wheel sensor or the tool.
	Set-up Menu	This icon is used to indicate the set-up menu. When this button is selected and held for 2 seconds the set-up menu appears. Refer to Menu Options for more information to set-up specific options.
	Learn	This icon is used to indicate sensor <i>Learn</i> . When the <i>Learn</i> button is selected this icon starts to blink during transmission.


Main Menu Details

Initiate Function

If the *Initiate* button is pressed, the tool will retrieve sensor ID, pressure data and battery status from the sensor that is displayed

- The button should be activated only once when pressed.
- The battery icon is used to show the battery status of the sensor.

 *Check* icons indicates the sensor is OK.

 The *Wrench* icon indicates the sensor is due for a change at next service.

If an error occurs, such as no information has been received, an error screen will appear — retry the *Initiate* Function.

Example Display

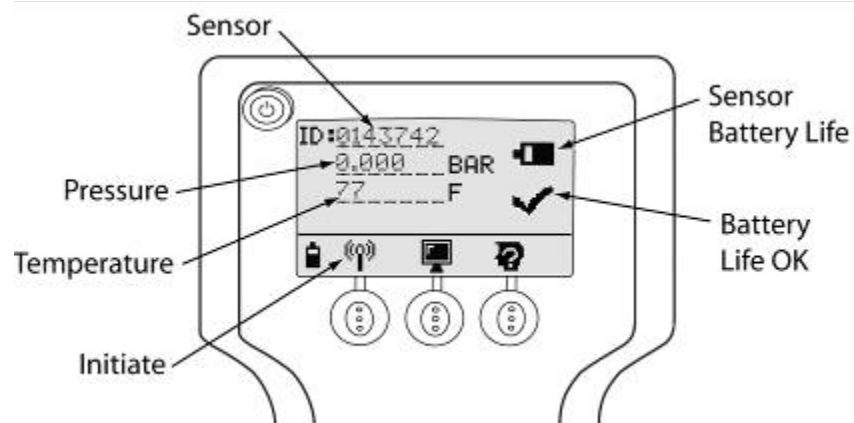


Figure 4

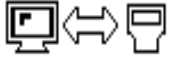


Set-up Menu Icon Legend

Selecting the Setup button commands the tool into Setup mode.

ICON	STATE	DESCRIPTION
	Software Update	This icon indicates the software update option which allows the user to download the latest software from a personal computer.
PSI/BAR/kPa/C/F	Measurement Units	This option allows the user to change the units of the parameters displayed. See page 10.
	Stored Sensor Information Retrieval	This option allows the user to refer to sensor information stored in memory. Up to 100 sensors can be stored.
	Delete Sensors in Memory	This option allows the user to delete all sensors stored in memory.
	Walk Around Learn	This option is used for the <i>Walk-Around Learn</i> process. When <i>Walk-Around Learn</i> is initiated the icon may appear indicating a low battery in either the wheel sensor or the tool.
	Ambient Sensor Learn	This option is used to activate and store pressure information from the ambient sensor to adjust the displayed readings for changes in altitude.
	Return	This option allows the user to return to the main window.

Set-up Menu Icon Explanations



Software Update

The software update function is used to download the latest *SmarTire™ by Bendix CVS Maintenance Tool* software from a personal computer. The current and legacy versions of the SmarTire™ by Bendix CVS software are available on the Manuals page of the www.smartire.com site and also on www.bendix.com (from Q4 of 2010).

Refer to update information supplied with future software updates.

Maintenance Tool Software Update

The maintenance tool function allows the user to easily upgrade the software in the field. The following describes the items and steps required to carry out the download.

Item Required	Description
Custom RS-232 Cable	This cable is required to connect from the computer to the tool (see <i>Figure 6</i>).
Computer	Microsoft® Windows® 95, 98, 2000, XP Required Refer to the user manual for instructions on how to use this software.
Update Tool Software	The software that is required to update the tool to the latest features.

1. Attach maintenance tool to a personal computer using the supplied custom RS-232 cable.
2. Select the "update" function on the tool menu.
3. Open the maintenance tool software update program on the PC.
4. Note: Refer to the software update program for further information regarding the download procedure.

Maintenance Tool software update program

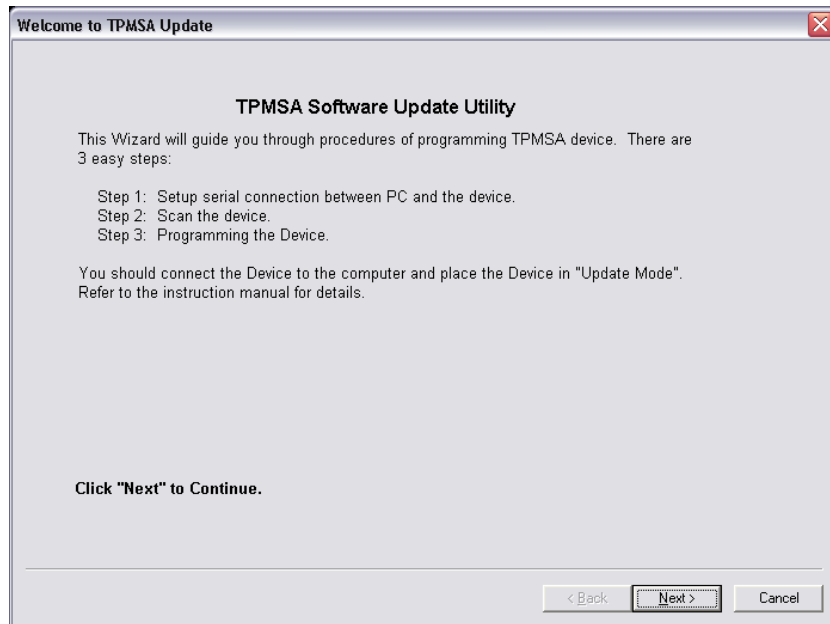


Figure 5

Updating Maintenance Tool

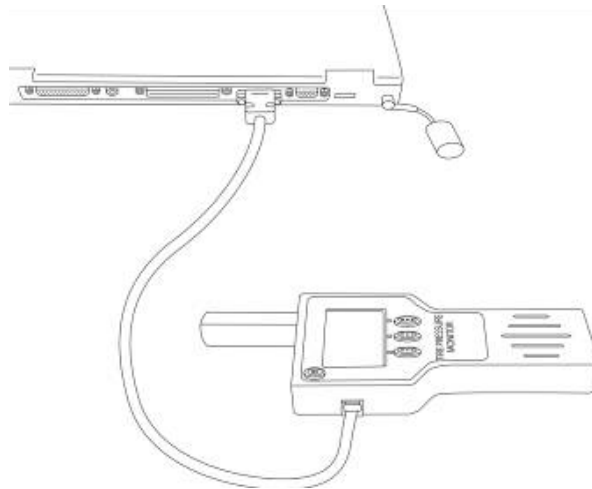


Figure 6

PSI/BAR/kPa/C/F - Measurement Units

This function changes the measurement units of the parameters displayed: PSI (pounds [pound-force] per square inch), BAR (equal to 100 kilopascals), kPa (kilopascals), C (Celcius), and F (Fahrenheit).



Stored Sensor Information Retrieval

This function allows the user to refer to sensor information stored in the tool memory. Up to 100 sensor readings can be stored & retrieved.



Delete Sensors in Memory

This function is used to delete all sensor data stored in the tool memory.



Walk-Around Learn

Walk-Around Learn Procedure

When the tires are rotated or replaced on a vehicle with a tire pressure monitoring system, the vehicle must re-learn the position of each tire. The *Walk-Around Learn* procedure is used to activate each sensor in its new location, store the sensor information and download to the vehicle's tire pressure sensor receiver.

The unit will learn and store the location of each sensor as the user walks around the vehicle in a U-shaped pattern starting at the left side (looking forward) front-most tire location. If this is a dual tire axle start with the inner tire location. The new location information (tire IDs) for each sensor collected is then uploaded to the receiver in the vehicle.

Perform the following steps:

1. Power up the vehicle's tire pressure sensor receiver (see vehicle's service information for specific details).
2. Press and hold the *Setup* button until a list of menu items appear.




3. Select the *Walk-Around Learn* icon.
4. Select the number of tires on the vehicle.



5. Activate each of the vehicle's wheel sensors in the proper order (counter-clockwise and inner tire to outer tire, starting from front left tire). See the "*Walk-Around Learn*" card included with the tool.



6. Hold the SmarTire™ system tool's antenna against the tire's upper sidewall in line with the valve stem. Press the *Learn* button.  The tool is able to receive signals from an inner tire on a dual tire configuration as well. Just hold the tool in line with the circumferential position of the valve stem of the inner wheel, as indicated in Figure 7.

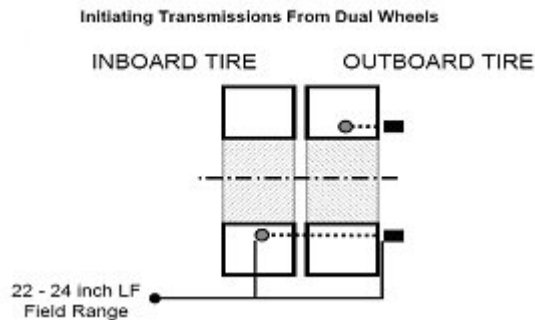
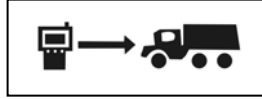


Figure 7

7. Once the tool has learned the tire sensor ID for the given position, it automatically switches to the next tire position. Repeat until all the tires have been learned.
8. After the last tire has been learned, press the down arrow. The tool is now ready to transmit this information to the vehicle's tire pressure sensor receiver.



9. Using the supplied cable, connect the tool to the diagnostic port of the tire pressure sensor receiver. See Figure 8.

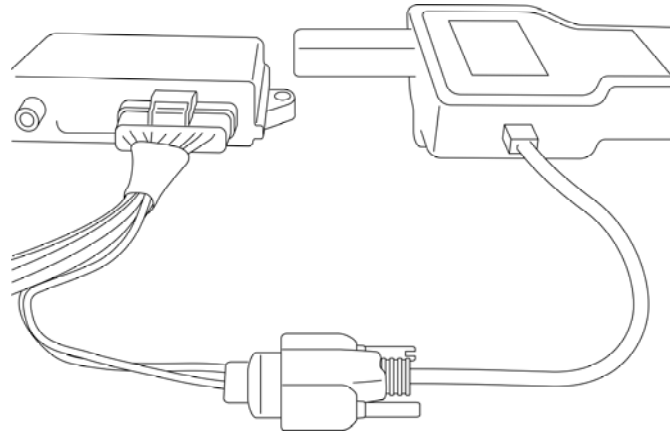
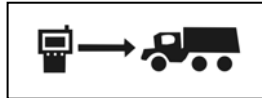


Figure 8

10. Press the check mark to begin downloading the new tire sensor IDs into the receiver.



11. If there is a communication error, the tool displays an alert.



Check all the connections and try again.

12. If the tool screen reverts back to the screen for entering the number of tires, then the number of tires that was entered does not match the number of tires in the vehicle's receiver.



13. Make sure the number of tires entered on the tool matches the number of tires being monitored to the vehicle and then repeat the *Walk-Around Learn* procedure.



Ambient Pressure Sensor Learn

Ambient Pressure Sensor Learn is used to activate and store atmospheric pressure information from the ambient sensor to compensate the displayed readings for changes in altitude.

Ambient Pressure Compensation

1. Scroll down the Menu and set the maintenance tool to *Ambient Sensor Learn*.
2. The previously learned ambient pressure appears on the first line of the screen. To learn a new ambient sensor, press the learn button (center).
3. When a new sensor is detected, the second line of the screen will show the new ambient pressure value received. Press the *Check* icon (left) to save this value as the new ambient pressure, or press the *Cancel* icon (right) to discard this value and exit the screen.

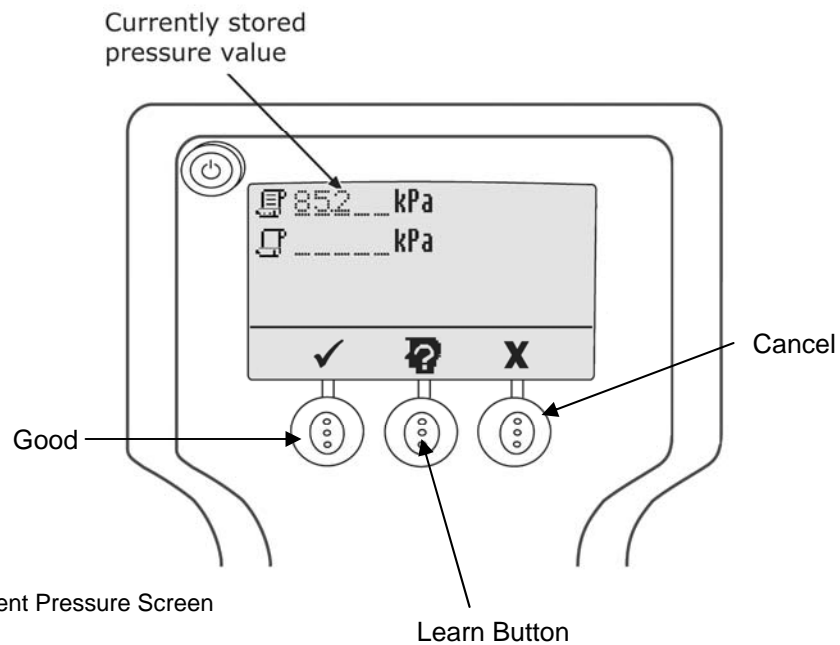


Figure 9 Ambient Pressure Screen



Return

Selecting the *Return* icon moves the user to the previous menu screen.



Sensor Learn

To detect a sensor inside of a tire, press the *Sensor Learn* icon while holding the tip of the tool's antenna against the sidewall of the tire above the air valve.

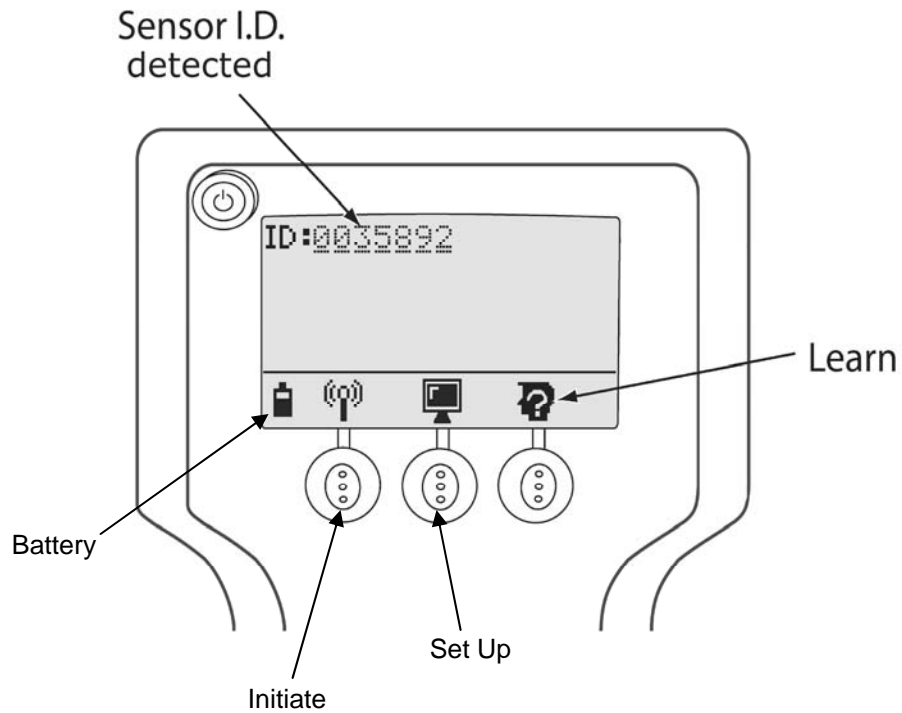


Figure 10 Sensor Learn Screen

Execution Icons

ICON	STATE	DESCRIPTION
✓	Confirm	Good
X	Cancel	Cancels current action.
↩	Back	Back, Select, Enter, Return to main menu.
⬇ ⬆	Scroll	Scroll displayed data or selection.
⚠	Alert	Sensor information was not received. If in Walk-Around Learn mode, the sensor ID has already been designated to a tire location.
🔧	Sensor Maintenance	The battery of the tire pressure sensor may be low.
?	Data Not Received	Battery information not received by the tool. Try again.

Troubleshooting Examples

Figures 11 through 14 show examples of potential screens after activating a sensor (within LF sensor range) using the *Initiate* command. The received information by the maintenance tool is stored in the tool memory and can be recalled by selecting the *Sensor Information Storage* command in the menu settings.

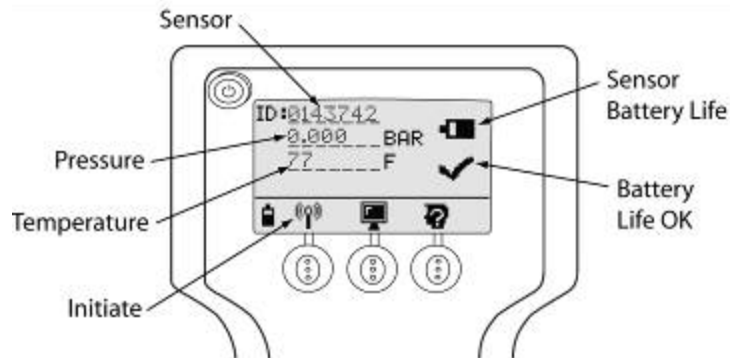


Figure 11 Sensor OK: Sensor name, tire pressure & temperature, battery OK

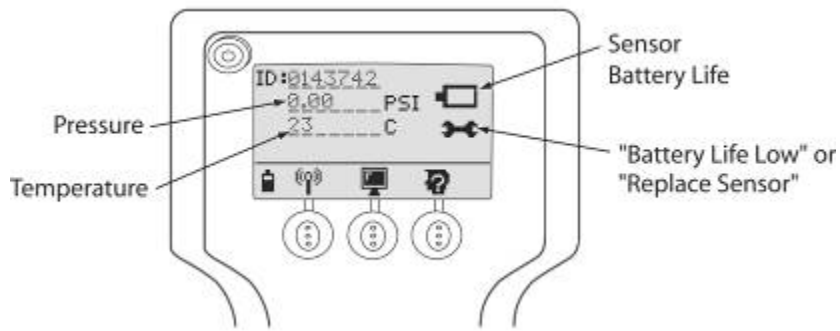


Figure 12 Sensor with low battery

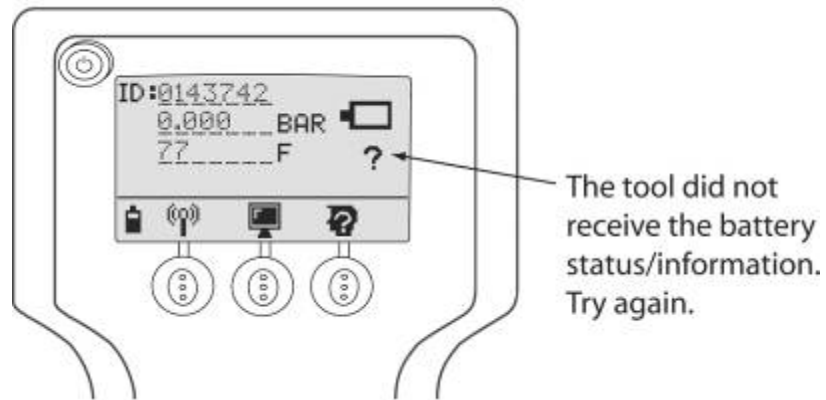


Figure 13 Sensor battery information not received

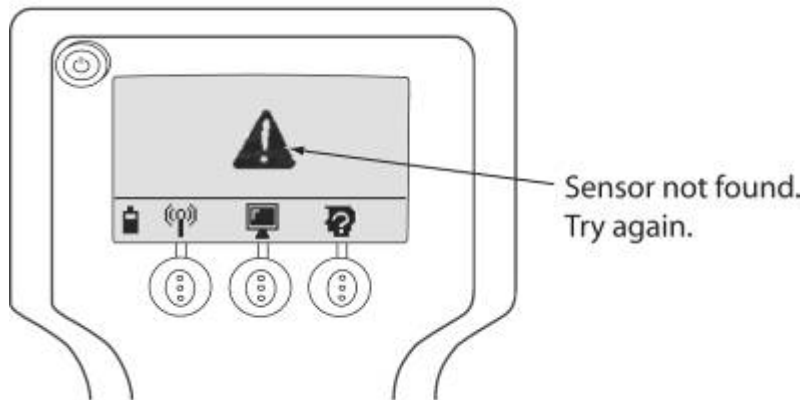


Figure 14 Sensor not found

Specifications

Hardware Specifications

General Specifications

- Handheld 125 kHz LF generator.
(To provide activation of SmarTire™ sensors)
- Requires replaceable “C” Cell Batteries (either Alkaline or NiMH)

The battery compartment is in the rear of the unit.

Battery life expectancy is approximately 300+ Activations.

A Tool Battery Level Indicator is located in the lower left hand corner of the main display screen.

Electrical Specifications

Communication Interfaces

- RS-232 (diagnostic interface port): Used for updating the tool and for communicating with J1939 receiver.

System Resources

- 100 sensor memory space.

Power

PARAMETERS	CONDITION	VALUE
Supply Voltage	(Alkaline or NiMH)	Three “C” Cell Batteries Or equivalent NiMH rechargeable.

Radio Frequency Specifications

Receiver Specifications

PARAMETERS	CONDITION	VALUE	UNITS
RF Frequency	-	433.92	MHz
Receiver Sensitivity (2E-3 BER)	Direct Measurement	-95	dBm
Modulation Type (Receiver)	-	OOK (On-Off Keying)	
Receiver Bandwidth	-	400	KHz

PARAMETERS	CONDITION	VALUE	UNITS
Receive Distance	Compatible with LF transmitter operation distance		

LF Transmitter Specifications

PARAMETERS	CONDITION	VALUE	UNITS
Frequency	-	118 to 130	KHz
Distance	To SmarTire™ sensor	22 ± 1	Inches
Magnetic Field Strength	Distance of 7 inches	1.5 ± 0.1 1.9	mA/m nT

Note: Communication with a SmarTire™ by Bendix CVS tire sensor will operate up to a maximum distance of 22 inches.

Antenna Type

- The SmarTire™ system tool has an internal antenna for communicating with SmarTire™ system sensors.

Mechanical Specifications

PARAMETERS	CONDITION	VALUE	UNITS
Weight	Without batteries	2	Lbs
Housing Material	-	Injection molded plastic enclosure	

Troubleshooting

Problem	Potential Solution
The tool does not power up or turns off when the Initiate button is pressed.	Replace batteries.
No tire pressure sensor data is received.	<p>Make sure the antenna is held within 22 inches of the tire pressure sensor in position before the Initiate button is momentarily selected and that tool is held in that position for at least 3.5 to 5 seconds.</p> <p>If still unsuccessful, try to activate and receive tire pressure sensor data from another tire pressure sensor. If the other sensor is received successfully, you may need to replace the first sensor.</p>
Setup menu button does not work.	Be sure to press and hold the button for at least 2 seconds.
The tool does not receive a sensor transmission after a sensor has been activated.	<p>Make sure the tool's antenna is held within 22 inches of the sensor when activating a sensor.</p> <p>This process may need to be repeated up to 3 times. If a sensor continues to not respond, refer to the vehicle service manual for further diagnostic or repair information.</p>
Wrong sensor initiated (dual tire only).	When initiating a sensor in a dual tire configuration the ID codes received are the same for both the inner and outer tires, the antenna of the tool should be moved within 22 inches of the target tire pressure sensor (the antenna should be held against the outer tire when activating the inner tire on a dual tire configuration).
LCD Backlight is off during operation.	If the Battery Indicator on the bottom left corner of the display is showing that the battery level is low (the icon mostly empty), the backlight will automatically turn off to conserve power. Replace the batteries when convenient.

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SmartTire™ *Tire Pressure Monitoring System*
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