SmarTire
Tire Pressure Monitor
Tool
Users Manual

090.0011

Table of Contents

FCC Compliance Label

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

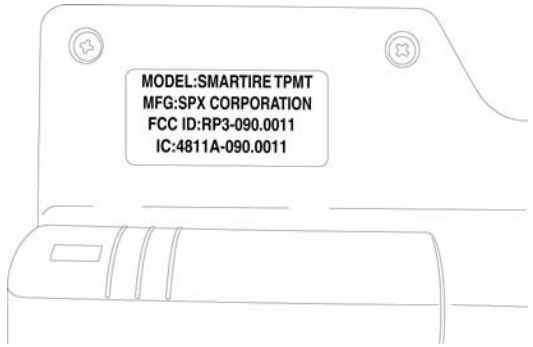


Figure 1

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

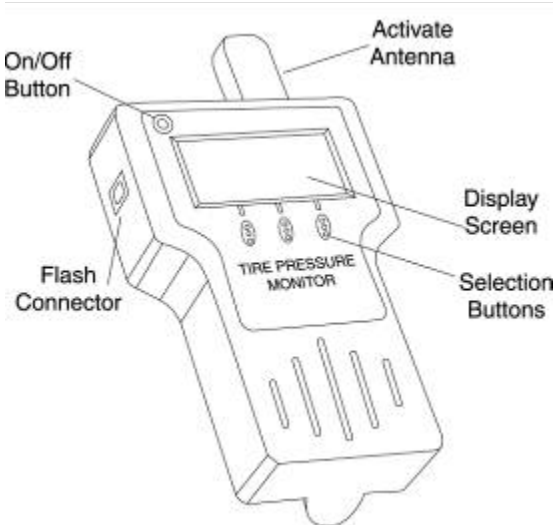


Figure 2

Introduction

The tire pressure monitoring system consists of a tire pressure sensor inside the wheel that will transmit a radio frequency (RF) signal that contains 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.

It is important that the vehicle module knows where each sensor is located on the vehicle, so it can indicate to the driver which tire is low on pressure. This means that when the tires are serviced or rotated, the vehicle module must relearn the position of each tire pressure sensor and tire and wheel assembly.

The tire pressure sensor outputs for a definitive period of time once the Activate button is pressed.

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

Tire Rotation

It is important that the receiver has learned the correct locations of each tire pressure sensor so the system indicates the correct location of the tire pressure condition, as well as sensor location for diagnostic procedures. Perform the sensor learn procedure after every tire rotation, sensor replacement, or receiver replacement.

1. **Enable the tire pressure sensor learn mode in the receiver. Refer to the vehicle service manual for more information.**

Testing Tire Sensors

The sensor test procedure is used to verify the sensors can transmit valid data after they have been activated with a Low Frequency (LF) transmission from the tool.
This test cannot verify if the sensor's internal roll switch is functioning properly, for that, a test drive is necessary. 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 to close to the rim (while initiating an inner tire sensor on a dual tire configuration, may cause the outer tire 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, 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, *Learn* mode and good signal strength.
4. Repeat step 3 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

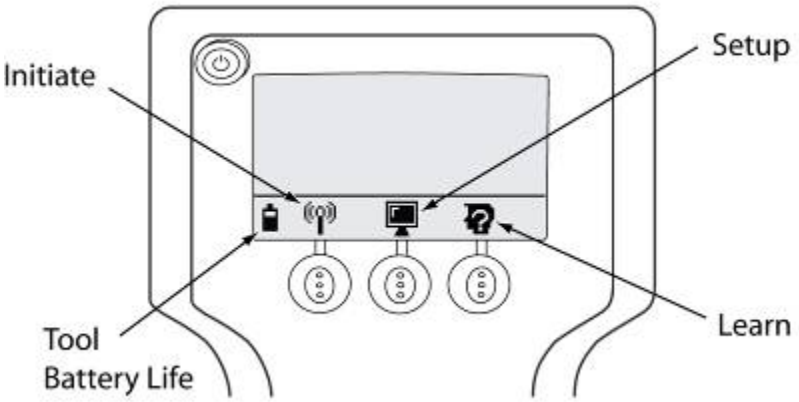


Figure 3

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

STATE	DESCRIPTION	ICON
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 *Check* mark. To turn off the tool and replace the batteries, press the X.	
Handheld Battery Life	This icon indicates the battery life of the handheld device.	
Initiation	This icon is used to indicate initiation. When the *Initiate* 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 *Learn*. When the *Learn* 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 battery is OK.

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

If an error occurs, such as no information has been received, then the error screen appears retry the *Initiate* Function.

Example Display

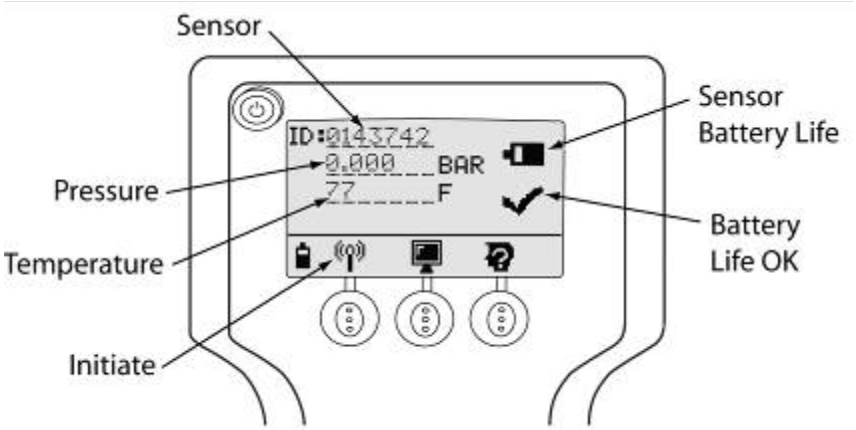


Figure 4

Set-up Menu Icon Legend

Selecting the Setup button commands the tool into Setup mode.

STATE	DESCRIPTION	ICON
Software Update	This icon indicates the software update option which allows the user to download the latest software from a personal computer.	
Measurement Units	This option allows the user to change the units of the parameters displayed.	***PSI/BAR/kPa/ C/F***
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 *Walk-Around Learn* process. When *Walk-Around Learn* 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 *SmartWave Maintenance Tool* software from a personal computer.

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	DESCRIPTION
Custom RS232 Cable	This cable is required to connect from the computer to the tool (see *Figure 6*).
Computer	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.

STEP	DESCRIPTION
1	Attach maintenance tool to personal computer using supplied custom RS232 cable.
2	Select update function on tool menu.
3	Open the maintenance tool software update program on the PC. Note: Refer to the software update program for further information regarding the download procedure.

Maintenance Tool software update program

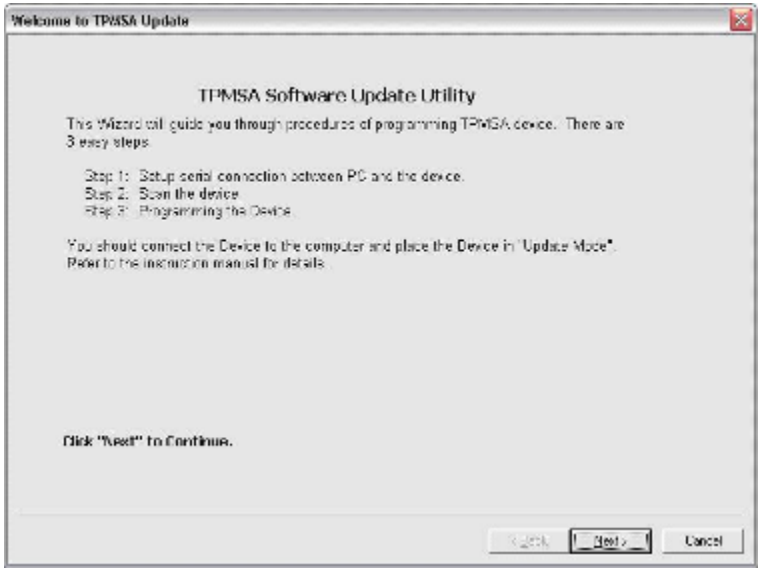


Figure 5

Updating Maintenance Tool

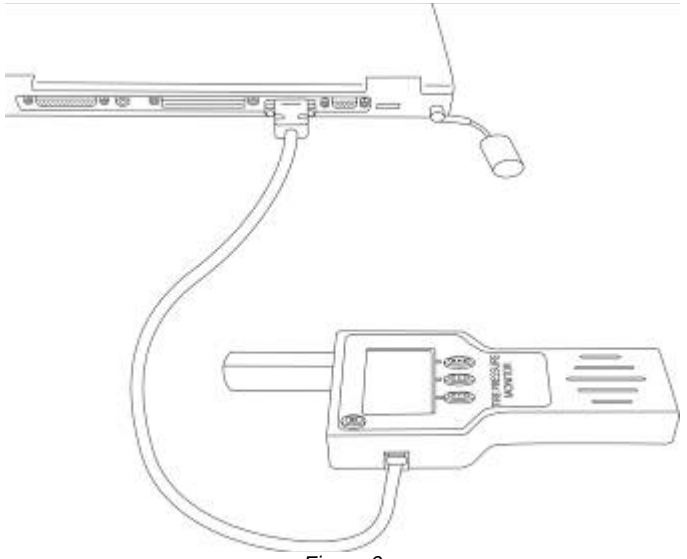


Figure 6

Measurement Units

PSI/BAR/kPa/C/F

This function changes the measurement units of the parameters displayed.

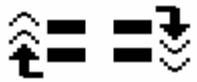
Stored Sensor Information Retrieval

This function allows the user to refer to sensor information stored in the tool memory. Up to 100 sensors 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 learns and stores 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.

(continued)

3. Select the walk around icon  .
4. Select the number of tires on the vehicle  example. A typical heavy-duty truck contains 10.
5. Activate each of the vehicle's wheel sensors in the proper order (see service information for the activation order).
6. Hold the SmartWave 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.

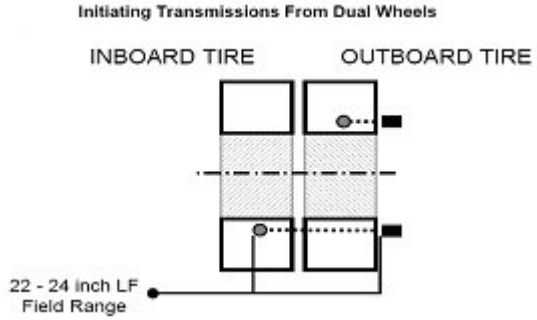


Figure 7

7. Once the tool has learned the tire sensor ID for the given position, 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, you are 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.
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 a warning. 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. Make sure the number of tires entered on the tool matches the number of tires being monitored to the vehicle and repeat the *Walk-Around Learn* procedure.

Walk-Around Learn Download

The maintenance tool contains a function which allows the user to connect the tool directly to the vehicle's J1939 receiver. This function downloads all new (learned) sensor IDs into the receiver.

The following describes the items and steps required to carry out the download.

ITEM	DESCRIPTION
Custom RS232 Cable	This cable is required to connect from the Computer to the tool. *(See Figure 8)*
J1939 Receiver	SmartWave J1939 receiver with RS232 connection.

Updating The Receiver With New ID Codes

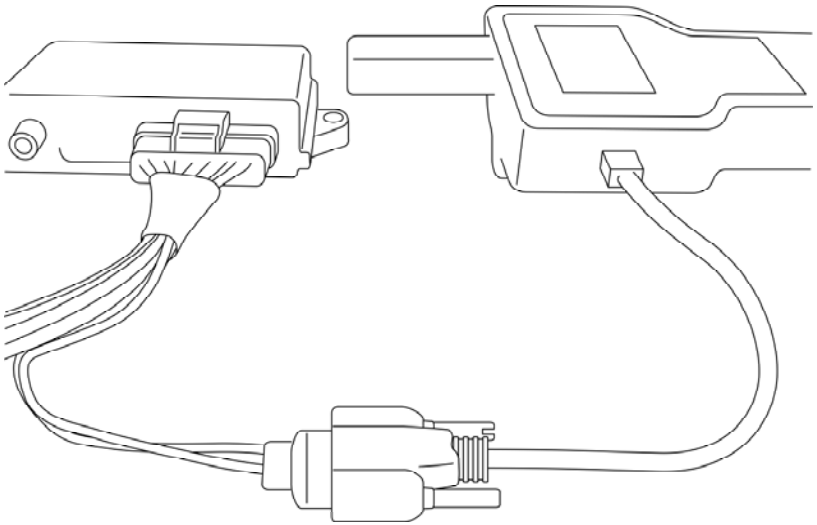


Figure 8

Ambient Sensor Learn

Ambient 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

STEP	DESCRIPTION
1	Scroll down the *Menu* and set the maintenance tool to *Learn* Ambient Pressure.
2	Activate ambient sensor using the *Learn* function.
3	The ID of the ambient sensor to be used for compensating the ambient pressure appears on the maintenance tool display. All future pressure measurements determined by the maintenance tool will compensate for environmental atmospheric pressure.

Return

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

Sensor Learn

The following is displayed after activating a sensor within sensor LF range pressing the *Learn* button.

Information Received From Sensor After Activating *Learn*

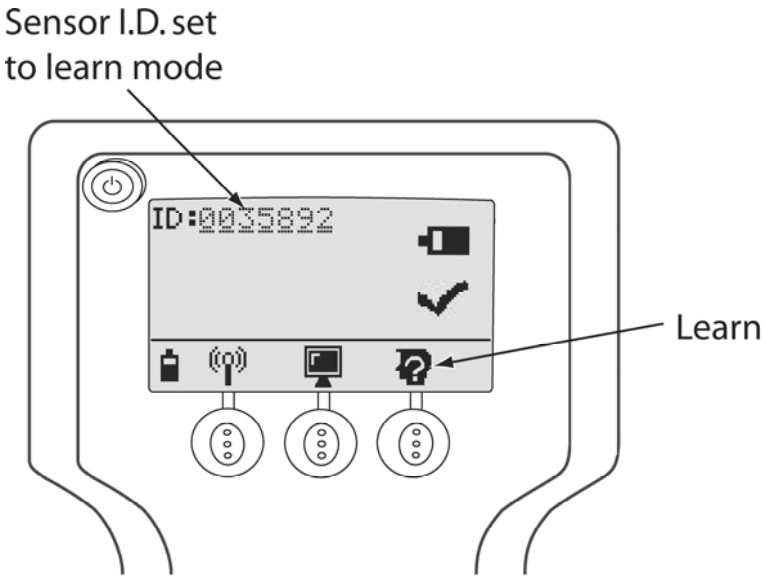


Figure 9

Execution Icons

STATE	DESCRIPTION	ICON
Confirm	Good	✓
Cancel	Cancels current action.	X
Back	Back, Select, Enter, Return to main menu.	
Scroll	Scroll displayed data or selection.	
Warning	Sensor information was not received or sensor ID has already been designated to a tire location. **Note: This only applies during *Walk- Around Learn* mode.**	
Sensor Maintenance	The battery of the tire pressure sensor may be low.	
Unknown	Battery information not received by the tool. Try again.	?

Application Notes, Display Examples
Sensor Initiation

The following are possible scenarios 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.

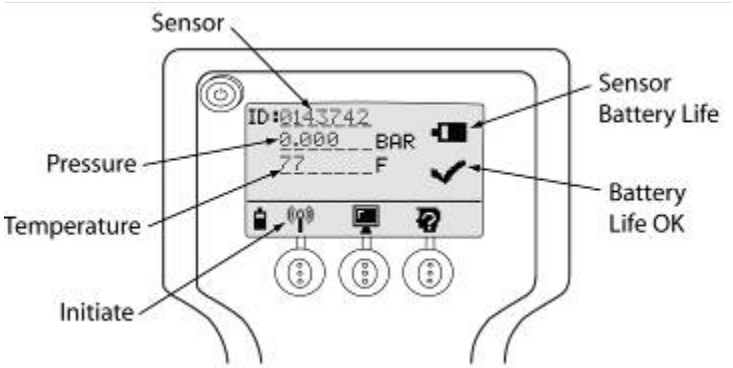


Figure 10

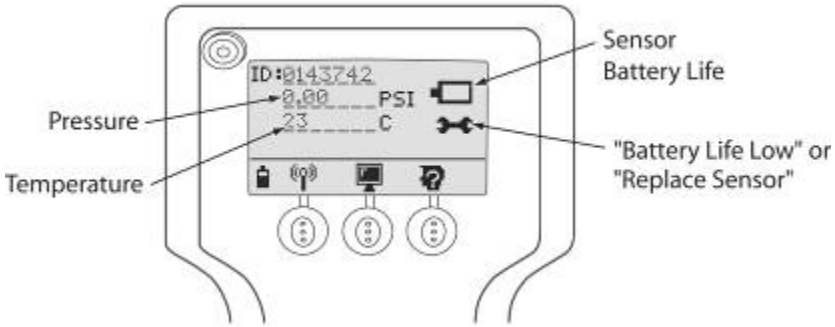


Figure 11

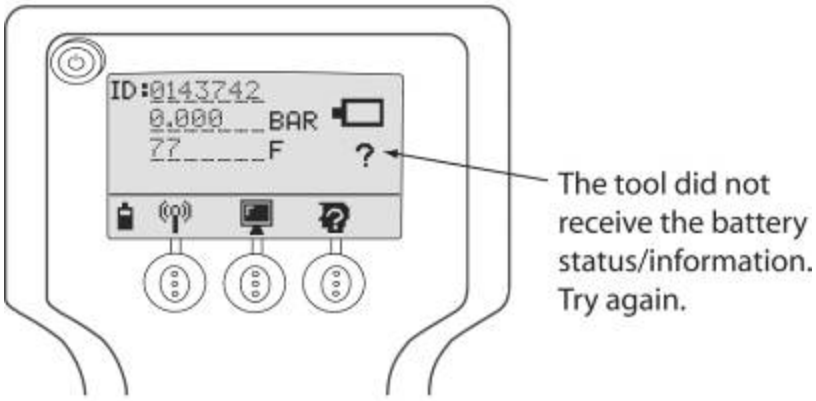


Figure 12

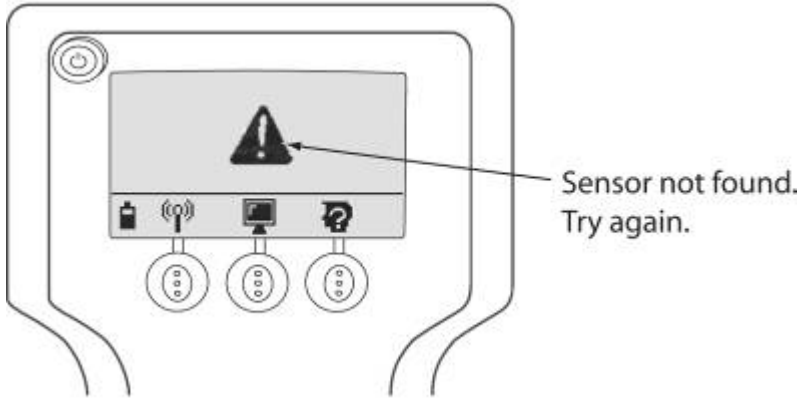


Figure 13

Specifications

The Battery compartment is in the rear of unit.

Recommended battery usage: 3 “C” Alkaline Cells.
Battery life expectancy is approximately 300+ Activations.

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

Hardware Specifications

General Specifications

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

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 (Receiver)		OOK	
Receiver Bandwidth		400	KHz
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 20cm	1.5 ± 0.1 1.9	mA/m nT

Note: Transmission/communication of SmartWave tire sensor at a maximum distance of 12 inches.

Antenna Types

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

Mechanical Specifications

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

Troubleshooting

The tool does not power up or turns off when the *Activate* button is pressed.	Replace batteries.
No tire pressure sensor data is received.	Make sure the Activate Antenna is held within 22” of the tire pressure sensor in position before the *Activate* button is momentarily selected and that tool is held in that position for at least 3.5 to 5 seconds. Try to activate and receive tire pressure sensor data from another tire pressure sensor.
Setup menu button does not work.	Be sure to press and hold the button for 2 seconds.
The tool does not receive a sensor transmission after a sensor has been activated.	Make sure the tool's antenna is held within 6 inches of the sensor when activating a sensor. 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.
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 6 inches of the tire pressure sensor (the antenna should be held against the outer tire when activating the inner tire on a dual tire configuration)

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