SmarTire® by Bendix CVS Tire Pressure Monitoring System

SmarTire Trailer-Link™ TPMS

Tire Pressure Monitoring System

Operator's Manual

Bendix™

This booklet contains important operational and safety information that benefits you and subsequent owners.

SmarTire® Tire Pressure Monitoring System
by Bendix CVS

Sources of Additional Information about your SmarTire® System by Bendix™ CVS

Consult the vehicle manufacturer's documentation.

Visit **www.bendix.com** for free downloads of these publications from the Literature Center at www.bendix.com.

BW2799 SmarTire Tire Pressure Monitoring System (TPMS) Operator's Manual

BW2809 SmarTire TPMS Hand Tool Manual

BW2820 SmarTire Low Frequency (LF) Tool Users Manual

BS2822 SmarTire TPMS Walk Around Card

or

Contact the Bendix Tech Team at

techteam@bendix.com or

1-800-AIR-BRAKE (1-800-247-2725, option 2).

Representatives are available

Mon. - Fri. 8:00 a.m. to 6:00 p.m. ET.

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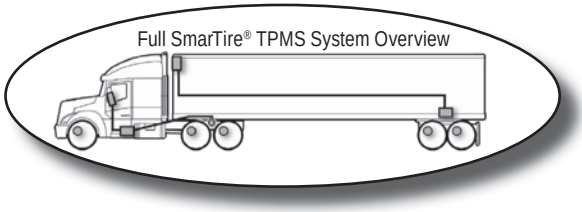
GENERAL SAFETY GUIDELINES

WARNING! PLEASE READ AND FOLLOW THESE INSTRUCTIONS TO AVOID PERSONAL INJURY OR DEATH:

When working on or around a vehicle, the following guidelines should be observed AT ALL TIMES:

- ▲ **Park the vehicle on a level surface, apply the parking brakes and always block the wheels. Always wear personal protection equipment.**
- ▲ **Stop the engine and remove the ignition key when working under or around the vehicle. When working in the engine compartment, the engine should be shut off and the ignition key should be removed. Where circumstances require that the engine be in operation, EXTREME CAUTION should be used to prevent personal injury resulting from contact with moving, rotating, leaking, heated or electrically-charged components.**
- ▲ **Do not attempt to install, remove, disassemble or assemble a component until you have read, and thoroughly understand, the recommended procedures. Use only the proper tools and observe all precautions pertaining to use of those tools.**
- ▲ **If the work is being performed on the vehicle's air brake system, or any auxiliary pressurized air systems, make certain to drain the air pressure from all reservoirs before beginning ANY work on the vehicle. If the vehicle is equipped with a Bendix® AD-IS® air dryer system, a Bendix® DRM™ dryer reservoir module, or a Bendix® AD-9si® air dryer, be sure to drain the purge reservoir.**
- ▲ **Following the vehicle manufacturer's recommended procedures, deactivate the electrical system in a manner that safely removes all electrical power from the vehicle.**
- ▲ **Never exceed manufacturer's recommended pressures.**
- ▲ **Never connect or disconnect a hose or line containing pressure; it may whip. Never remove a component or plug unless you are certain all system pressure has been depleted.**
- ▲ **Use only genuine Bendix® brand replacement parts, components and kits. Replacement hardware, tubing, hose, fittings, etc. must be of equivalent size, type and strength as original equipment and be designed specifically for such applications and systems.**
- ▲ **Components with stripped threads or damaged parts should be replaced rather than repaired. Do not attempt repairs requiring machining or welding unless specifically stated and approved by the vehicle and component manufacturer.**
- ▲ **Prior to returning the vehicle to service, make certain all components and systems are restored to their proper operating condition.**
- ▲ **For vehicles with Automatic Traction Control (ATC), the ATC function must be disabled (ATC indicator lamp should be ON) prior to performing any vehicle maintenance where one or more wheels on a drive axle are lifted off the ground and moving.**
- ▲ **The power MUST be temporarily disconnected from the radar sensor whenever any tests USING A DYNAMOMETER are conducted on a Bendix® Wingman® Advanced™-equipped vehicle.**
- ▲ **You should consult the vehicle manufacturer's operating and service manuals, and any related literature, in conjunction with the Guidelines above.**

About the SmarTire® Tire Pressure Monitoring System (TPMS) and SmarTire Trailer-Link™ TPMS



Thank you for purchasing the SmarTire Trailer-Link™ Tire Pressure Monitoring System (TPMS) by Bendix CVS. With SmarTire Trailer-Link TPMS onboard, your vehicle is equipped with a wireless communication network allowing seamless integration of wireless tire pressure sensing technology.

The SmarTire Trailer-Link TPMS system is an advanced tire pressure monitoring system specifically designed for commercial vehicle trailers. The system monitors the pressure and temperature of each trailer tire in order to provide real-time, tire status information and to warn the driver of a tire-related problem before it becomes dangerous.

Bendix SmarTire System Advantages

- Extends tire life;
- Reduces maintenance costs and time;
- Helps maximize fuel economy by ensuring that tires are properly inflated;
- Reduces trailer downtime; and
- Reduces accident risk caused by a tire blowout or tire fire.

System Features

- Temperature compensated alerts: Know when your tires are at risk no matter how long you've been driving;
- Real-time trailer tire information displayed on the dash whenever the tractor is equipped with the SmarTire TPMS system by Bendix CVS;
- Tire alerts provide instant visual warning of a tire problem using the tractor's dash display or a trailer lamp;
- There are three types of tire alerts: Pressure Deviation Alert, Critical Low Pressure Alert, and High Temperature Alert;
- The SmarTire Trailer-Link system data can be sent through the tractor's J1939 communication network via the tractor-mounted SmarTire TPMS for seamless vehicle integration; and
- The trailer tire data can be broadcast on the J1939 communication network and accessed by telematics devices for back-office reporting of tire data.

IMPORTANT NOTICE: PLEASE READ

To prevent sensor damage, when mounting and dismounting tires that have SmarTire® TPMS tire sensors, be sure that the maintenance facility is aware that a tire pressure monitoring system is installed.

If any rims are relocated or replaced, be sure to follow the SmarTire by Bendix system guidelines to permit the system to re-learn the tire sensor positions.

To monitor your trailer tires with your existing SmarTire by Bendix tractor ECU, you must ensure that the SmarTire Trailer-Link™ enable function is set to ON in the SmarTire TPMS system tractor-mounted ECU (part number 200.0216).

Additionally, for tractors equipped with ECU part number 200.0184, in order for the ECU to be able to communicate with the SmarTire Trailer-Link ECU, the ECU firmware MUST BE updated to new firmware. For instructions on performing this update, please contact your Bendix account manager or call 1-800 AIR-BRAKE (1-800-247-2725), option 2.

Section A - System Overview

1.0 System Overview

1.1 System Components

Figure 1 - *System Components and Hand Tool*

ECU. The Electronic Control Unit (ECU) of the SmarTire Trailer-Link™ Tire Pressure Monitoring System receives data transmissions from individual tire sensors mounted on each trailer wheel. The information received is compared to user-defined settings. An alert is triggered if the system detects that a tire is under-inflated and/or above expected temperatures.

Where the tractor is equipped with Bendix™ SmarTire® TPMS, the data and alerts are communicated to a dash display along with the tractor tire information. Alternately, where the tractor is not equipped with a SmarTire TPMS system, the Trailer-Link system alerts the driver using an optional trailer-mounted lamp.

Sensors. Designed for the harsh environment of a commercial truck tire, each tire sensor is mounted in a break-away cradle for extra protection.

The tire sensor measures internal tire pressure and temperature every 12 (twelve) seconds and transmits data every three to five minutes. If the system detects a pressure change of 3 PSI (0.206 bar) or greater, it does not wait until the next transmission, but will transmit the data immediately.

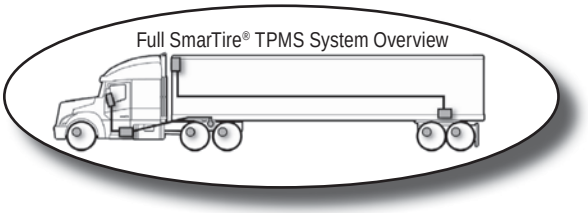
Sensor Straps. Sensors are mounted to the surface of the rim using a stainless steel strap, a reliable and universal method of sensor installation.

Harness. Designed to not require a separate power supply, the harness supplies trailer ABS system power to the SmarTire Trailer-Link Tire Pressure Monitoring System ECU.

1.2 Maintenance Tool

Maintaining tires in the yard is just as important as real-time tire information for the driver, but many TPMS systems don't include functionality to help yard maintenance personnel. The SmarTire universal hand tool acts like an "electronic billy-club" allowing maintenance personnel to wirelessly 'ping' each tire to measure its pressure and temperature. The SmarTire hand tool reduces diagnostic time and helps keep every tire rolling safely and cost-effectively. *(For the Maintenance Tool manual, see BW2809.)*

1.3 How Does The SmarTire Trailer-Link™ TPMS System Work?



1. The SmarTire Trailer-Link™ ECU creates a wireless bubble around the trailer, allowing it to sense and transfer trailer tire data to a SmarTire®-equipped tractor.
2. Tire sensors mounted on each trailer wheel measure tire pressure and temperature every twelve (12) seconds and wirelessly transmit tire data every three to five minutes.
3. Industrially-designed for the rugged requirements of a commercial trailer chassis, the SmarTire Trailer-Link ECU can monitor up to eight (8) wheel positions when linked with a tractor with SmarTire TPMS, and more when applied as a stand alone trailer TPMS. The total number of tires monitored on both the tractor and trailer cannot exceed twenty.
4. When the tractor connects up to the trailer, the wireless transmissions of the SmarTire Trailer-Link ECU will link up to the SmarTire tractor ECU. Once the link up is achieved, the tractor SmarTire display will restart and add the additional trailer axles to the tractor display. The new axles will be indicated as trailer axles by showing a “T” in front of the axle number, e.g. T1, T2, etc.
5. Real-time tire pressure and temperature information is available to the driver on demand via the SmarTire TPMS tractor display, if equipped. An easy-to-read and simple-to-use interactive gauge that provides real-time tire status information, the SmarTire display will alert the driver to a low pressure or high temperature trailer tire condition before it becomes dangerous.
6. Trailer tires can also be monitored using the system as a stand-alone application connected to an optional trailer-mounted alert lamp.
7. The SmarTire maintenance hand tool is used to check trailer tire pressures and temperatures during maintenance inspections. It can also be connected directly to the SmarTire Trailer-Link ECU to set the trailer axle Cold Inflation Parameters (CIPs) and to configure trailer tire sensor IDs. The SmarTire maintenance hand tool improves inflation accuracy and reduces diagnostic time in order to keep every tire rolling cost-effectively. Please refer to *Section 3.2* of this manual or BW2809 for detailed information on programming the SmarTire Trailer-Link ECU with the maintenance hand tool.

1.4 Fundamentally, Why Is Temperature Monitoring Important?

The Pressure/Temperature Relationship

Tire manufacturers specify that tire pressures should be checked and adjusted when a tire is “cold”, but most people may not know why, or even what a “cold tire” is. The temperature of a tire actually has a significant impact on its inflation pressure.

According to tire manufacturers, a tire is considered to be “cold” when its temperature is 65°F (18°C). The inflation values provided by vehicle manufacturers, fleet maintenance personnel, or industry-published load inflation tables are called ‘Cold Inflation Pressures’ (CIP) because they represent the correct amount of pressure a tire should be inflated to when it is “cold”. The reason that tires have cold inflation pressures set at specific temperatures is because a tire’s pressure will change relative to its temperature.

Air naturally expands when heated and contracts when cooled. Inside a contained vessel such as a tire, this expansion and contraction causes a change in contained air pressure. As a tire heats up, its pressure will naturally increase and as it cools down, its pressure will naturally decrease.

For example, a tire inflated to a CIP of 105 PSI at 65°F will increase in pressure to 125 PSI at 152°F and decrease in pressure to 97 PSI at 32°F. The SmarTire Trailer-Link™ tire monitoring system considers these changes in temperature and pressure as part of normal operation and adapts accordingly to provide more accurate information while helping to prevent false alerts.

Tire manufacturers never recommend inflating a tire to less than the specified cold inflation pressure. In extreme cases, the beads of a commercial tire can unseat if its pressure gets too low resulting in a catastrophic tire failure.

Always refer to the vehicle manufacturer’s recommendations for minimum cold inflation pressures.

The charts below illustrate the equivalent inflation values for a series of Cold Inflation Pressures (CIPs) at various temperatures. The temperature values represent the temperature of the air contained inside the tire. This temperature can be estimated for a cold tire using the outside, ambient temperature.

Pressure / Temperature Correlation Chart:
Low Pressure Range

AMBIENT/TIRE TEMPERATURE °C	°F	RECOMMENDED COLD INFLATION PRESSURE (PSI) 25	30	35	40	45	50	55	60	65	70	75	80
7	45	24	28	33	38	43	48	52	57	62	67	72	76
13	55	24	29	34	39	44	49	54	59	64	69	73	78
18	65	25	30	35	40	45	50	55	60	65	70	75	80
24	75	26	31	36	41	46	51	56	62	67	72	77	82
30	85	27	32	37	42	47	53	58	63	68	73	79	84
35	95	27	33	38	43	48	54	59	64	70	75	80	86
40	105	28	33	39	44	50	55	60	66	71	76	82	87
46	115	29	34	40	45	51	56	62	67	73	78	84	89
52	125	30	35	41	46	52	58	63	69	74	80	85	91
57	135	30	36	42	47	53	59	64	70	76	81	87	93
62	145	31	37	42	48	54	60	66	71	77	83	89	94
68	155	32	38	44	49	55	61	67	73	79	85	90	96
74	165	33	39	45	51	56	62	68	74	80	86	92	98

Chart 1

Pressure / Temperature Correlation Chart:
High Pressure Range

AMBIENT/TIRE TEMPERATURE °C	°F	RECOMMENDED COLD INFLATION PRESSURE (PSI) 85	90	95	100	105	110	115	120	125	130	135	140
7	45	81	86	91	96	100	105	110	115	120	125	129	134
13	55	83	88	93	98	103	108	113	118	123	127	132	137
18	65	85	90	95	100	105	110	115	120	125	130	135	140
24	75	87	92	97	102	107	113	118	123	128	133	138	143
30	85	89	94	100	105	110	115	120	126	131	136	141	146
35	95	91	96	101	107	112	117	123	128	133	138	144	149
40	105	93	98	103	109	114	119	125	130	136	141	147	152
46	115	95	100	106	111	117	122	127	133	138	144	149	155
52	125	97	102	108	113	119	125	130	136	141	147	152	158
57	135	98	104	110	115	121	127	132	138	144	149	155	161
62	145	100	106	112	117	123	129	135	140	146	152	158	164
68	155	102	108	114	120	126	131	137	143	149	155	161	167
74	165	104	110	116	122	128	134	140	146	152	158	164	170

Chart 2

⚠ The charts above are to be used as a guide only. Always refer to the tire and/or vehicle manufacturer's recommendations for minimum CIPs.

Thermal Equilibrium

As a vehicle moves, its tires naturally heat up due to friction from the road and the flexing of its side-walls. Weight, vehicle speed and a tire's starting inflation pressure all have an impact on how much, and how quickly, heat is generated.

As the tire generates heat, its pressure increases, causing a reduction in side-wall flexing. Less side-wall flexing and road resistance, combined with air rushing past the tire as the vehicle moves, effectively counteract the conditions that cause the tire to heat up. As a result, the temperature increase tapers off until the tire reaches a point of balance called "thermal equilibrium."

Tire thermal equilibrium is the point where the heat being generated is equal to the heat being dissipated. Tires are designed with the principles of temperature and pressure in mind in order for them to achieve thermal equilibrium. Once a properly inflated tire reaches thermal equilibrium, it will operate at its peak; providing the best performance, handling, tire life and fuel economy.

SmarTire Trailer-Link™ TPMS Temperature Compensation

Since a tire's contained air pressure naturally increases as a vehicle moves, it can be difficult to tell if a hot tire is under-inflated. Without some form of temperature compensation, a hot tire that is under-inflated might appear to be fine because its contained air pressure is at, or above, its Cold Inflation Pressure (CIP).

For example, a tire correctly inflated to a CIP of 105 PSI at 65°F will reach thermal equilibrium when its temperature increases to 152°F and its pressure increases to 125 PSI. A tire starting at 95 PSI at 65°F (10 PSI under inflated) would have to reach 202°F for it to reach thermal equilibrium (125 PSI). The tire will then be running 50°F hotter than it should be, causing more tire wear and the potential for a catastrophic failure or tire fire.

When checked using a handheld gauge or a tire monitoring system that does not measure operating temperature, this 10 PSI under-inflated tire can appear to be normal. When equipped with tire sensors that mount inside the tire, SmarTire Trailer-Link TPMS measures both tire pressure and temperature in order to provide "Temperature Compensated" pressure deviation values and alerts. By measuring the operating temperature of a tire and comparing it to the CIP value programmed into the system, the SmarTire Trailer-Link system will know what a tire's pressure is supposed to be in relation to its operating temperature.

The system is able to warn the driver of an under-inflated tire ***even if that tire's actual contained air pressure is at — or above — its CIP.***

The advantages of temperature compensation are even more dramatic when a tire has a slow leak. A tire that is constantly losing pressure will not be able to reach thermal equilibrium because the contained air simply cannot expand enough to generate the required pressure, regardless of how hot the tire becomes. Since the leak is slow, the tire may appear over an extended period of time to be properly inflated when it is actually dangerously under-inflated and operating well above its temperature capacity.

As air leaks from the tire, increased side-wall flexing and rolling resistance cause the tire's temperature and pressure to increase. The pressure increase will soon plateau and begin to slowly decrease while the tire's temperature continues to increase. Eventually, the tire will become so hot that its structure will degrade, and then fail in the form of a blow-out and/or tire fire.

2.0 Tire Maintenance

Proper tire maintenance is critically important for keeping tires rolling smoothly. When properly maintained and inflated, tires will provide shorter stopping distances, better vehicle handling in emergency situations, improved fuel economy and increased tire life.

Maintenance Tips for Long Tire Life:

- Keep tires properly inflated at all times.
- Visually inspect tires for injuries prior to each trip.
- Match dual tires for size and keep pressures within 5 PSI (0.344 bar).
- Re-tread tire before wear causes excessive belt damage or fatigue.

IMPORTANT

READ THESE INSTRUCTIONS PRIOR TO INSTALLATION

This SmartTire Trailer-Link™ TPMS kit is pre-programmed and ready to use, subject to your application:

- The sensors have been PRE-ASSIGNED TO WHEEL POSITIONS and are identified on each unit with a position label (P1, P2, P3, etc.) – install the sensors as shown in Figure 1.
- Default values have been assigned to each axle for the following (depending on kit configuration):
  - ◊ Cold Inflation Pressure (CIP) – preset to 100 PSI
  - ◊ First Alert Level (FAL) – preset to ±15% from expected (temperature compensated)
  - ◊ Second Alert Level (SAL) – preset to -20% from CIP
  - ◊ High temperature alert – 185°F (85°C)

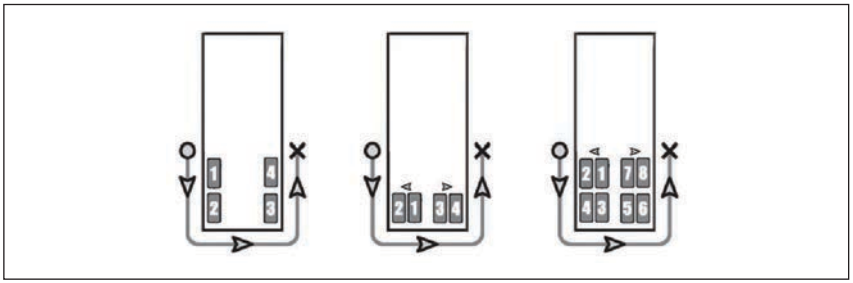


Figure 2

Section B - System Installation – Tire Sensors

3.0 System Installation: Tire Sensors

3.1 Sensor Overview

The SmarTire® TPMS sensor monitors tire pressure and temperature every twelve (12) seconds and transmits tire data every three (3) to five (5) minutes. If a pressure change of 3 PSI is detected, the sensor will not wait for the next regular transmission and will transmit tire data immediately. The sensor has an estimated battery life of five (5) years.

3.1.1 Break Away Cradle

If proper care is not taken when removing or installing a tire on a rim that has a tire sensor installed, damage can occur. Each SmarTire tire sensor is conveniently mounted in a break-away cradle so that if damage accidentally occurs, the inexpensive cradle is broken instead of the sensor.

⚠ IMPORTANT NOTICE: PLEASE READ

Please read this section carefully and follow each step precisely to ensure that you do not damage a sensor and that the sensors are installed in the correct, pre-programmed locations.

SmarTire tire sensors can be broken when mounting and dismounting a tire unless specific instructions are followed. If tire work is done by an unauthorized facility, please let them know that a tire pressure monitoring system is installed on the vehicle before they remove a tire from a wheel.

Exercise caution and take precautions when cutting the steel strap (*See Section 3.3 step 2.*). Beware of potential sharp edges!

Figure 3

3.2 Tools Required

Installing the Sensors

1. 5/16" or 8 mm hexagon driver
2. Metal cutter
3. Torque wrench

4. Tire changing equipment
5. Tire balancing equipment

3.3 Tire Sensor Installation

1. Remove the wheel from the vehicle and then remove the tire.
2. Wrap the strap around the rim in the lowest point of the drop center well and mark it 1” (2.5 cm) past the worm gear. Cut the strap at the mark. Excess strap MUST be removed or it will break-off and damage the tire.
3. Slide on the sensor.

Figure 4

4. With the strap and sensor positioned in the lowest point of the center well, feed the end of the strap into the worm gear and pull it tight. Orient the sensor so that it is positioned at the valve with the worm gear 4" (10 cm) away from the edge of the sensor. The sensor *MUST* always be installed at the valve in order to know its approximate location after the tire has been mounted.

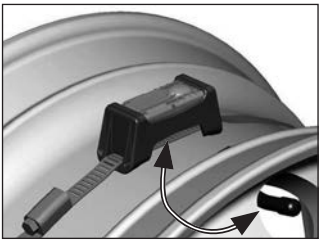


Figure 5

5. Tighten the strap using a 5/16" (8 mm) hexagon driver until the sensor can not be moved. Reference torque: 35 in-lbs (4 Nm).

⚠ CAUTION: Do not over tighten the strap.

6. Indicate the location of the sensor by applying the supplied rim label to a clean and dry location on the rim.

Figure 6 - The actual label design may vary

3.4 Re-mounting Tires After A Sensor Has Been Installed

Please read this section carefully and follow each step precisely to ensure you do not damage the sensor when mounting the tire. If steps are not taken to avoid the sensor located in the drop center well of the rim, it can be damaged by tire beads as the tire is mounted.

3.4.1 Internal Tire Sensor Servicing

SmarTire® TPMS tire sensors are designed to be serviceable if damage occurs during the mounting or de-mounting process. Each sensor is mounted inside a break-away cradle that is designed to absorb the impact of damage during the tire mounting / de-mounting process. If damage occurs, the inexpensive cradle will break instead of the tire sensor.

If a sensor cradle is damaged, it along with the mounting strap must be replaced. Carefully remove the tire sensor from the damaged cradle, re-insert it into a new cradle (Bendix part number 264.00228N), and then continue the mounting process.

3.4.2 Re-Mounting Tires Using Tire Irons

To avoid damaging the sensor, simply mount the tire ensuring that the last part of the bead to slip over the flange happens directly at the sensor. Start at one end of the tire and work towards the opposite end with the tire oriented so that the beads are first pushed under the rim flange directly opposite the sensor (1) and then worked over the flange toward the sensor (2). The bead will finally slip over the rim flange at the sensor without contacting it (3). Repeat for the remaining bead.

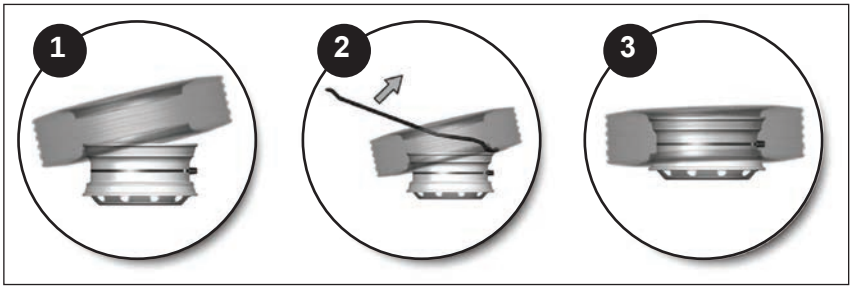


Figure 7

3.4.3 Re-Mounting Commercial Tires Using a Vertical Tire Machine

1. Place the rim on the machine so that the rim flange clamp is at the 12 o'clock position, the sensor is at the 2 o'clock position and the mounting hook is at the 8 o'clock position.

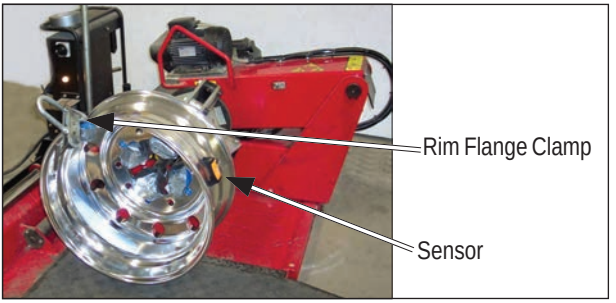


Figure 8

2. Advance the wheel clockwise to pass both beads over the rim flange simultaneously. The tire should mount onto the wheel without contacting the sensor.

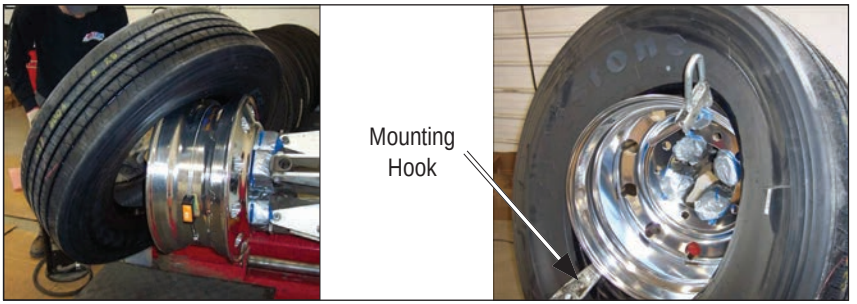


Figure 9

3.4.4 Re-Mounting Commercial Vehicle Tires Using A Center Post Tire Machine

1. Place the rim on the machine with the mounting shoe at the 9 o'clock position and the sensor at the 5 o'clock position.

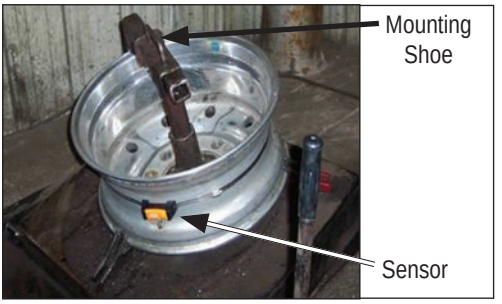


Figure 10

2. Place the tire on the rim with the bottom bead under the flange at the 6 o'clock position with the mounting shoe at the 9 o'clock position.
3. Advance the mounting shoe clockwise to pass the lower bead over the rim flange.
4. Return the mounting shoe to the 9 o'clock position, depress the upper bead under the rim flange at the 6 o'clock position and advance the mounting shoe clockwise until the second bead is completely mounted.

3.4.5 Dual Wheel Assemblies

In order to accommodate SmarTire® TPMS system programming, dual wheels MUST always be mounted on the vehicle with the valve stems 180° apart or as close as possible to opposite each other.

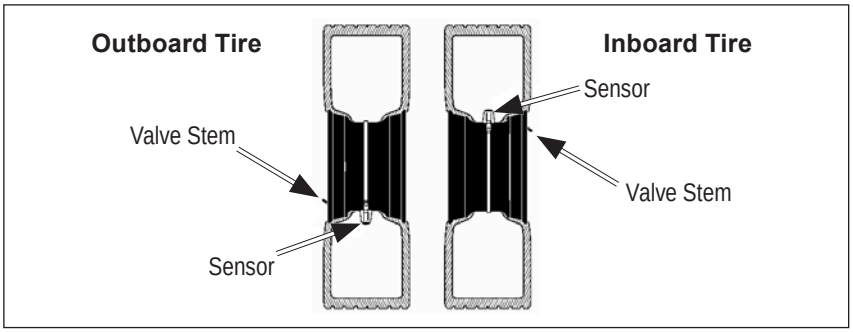


Figure 11

3.4.6 Re-Mounting Light Truck Tires Using a Tire Machine

1. Place the rim on the turn-table of a tire mounting machine with the sensor at the 7 o'clock position and the mount head at the 12 o'clock position.
2. Starting from the mount head, manually depress the bottom bead of the lubricated tire on the rim and into the drop center well until its pinch point is approximately 3" (7.5 cm) before the sensor.

   (Note: The pinch point, also known as a "traction point" is the position on the rim where the tire bead encounters resistance when trying to slip over the rim flange.)

Figure 12

3. Advance the turn-table clockwise using the mount head to guide the rest of the bottom bead over the flange and on to the rim. When assembled correctly, the bead will slip over the flange without contacting the sensor.
4. Repeat for the top bead. Do not allow the pinch point to slip as the rim rotates or the sensor could be broken.
5. Finish the tire installation as normal (seat the beads, install the valve core, inflate to the recommended cold inflation pressure, balance tires and mount wheels in specified locations).

3.5 Removing A Tire That Has A SmarTire® TPMS Sensor Installed

This section outlines the correct methods for removing a tire from a wheel that is equipped with a SmarTire® sensor. Instructions for using both tire irons and a tire mounting machine are provided.

Please read these instructions carefully and follow each step precisely to ensure you do not damage a sensor when dismounting the tire. If steps are not taken to avoid the sensor located in the drop center well of the rim, it can be crushed by the beads as the tire is removed.

3.5.1 Using Tire Irons

1. After removing the deflated tire / wheel assembly from the vehicle, lay the assembly on a floor mat and unseat both beads directly opposite the sensor. The sensor should be located at the valve stem (the rim mounted decal should also indicate the sensor's location). Do not unseat the bead at or near the sensor/valve stem.

Figure 13

2. Ensure that the mounting side of the wheel is facing upward and both the bead and wheel flange are properly lubricated.
3. Starting near the sensor, lift the top bead over the wheel flange using tire irons and progressively work away from the sensor until the top bead is free. Be careful not to contact the sensor with the tire irons.
4. Again starting near the sensor, repeat the process for the bottom bead until the tire is free from the wheel.

3.5.2 Using a Tire Mounting Machine

1. After removing the deflated tire / wheel assembly from the vehicle, unseat the beads directly opposite the sensor and valve stem. The sensor should be located at the valve stem (the rim mounted decal should also indicate the sensor's location). Do not break the bead at or near the sensor / valve stem.
2. Position the lubricated tire / wheel assembly on the machine so that the dismount head and the sensor are approximately aligned.
3. Lift the bead over the rim flange with the bead lifting bar and then advance the assembly / dismount head clockwise to remove the top bead.
4. Repeat steps 2 and 3 to remove the bottom bead.

NOTE: This information should be provided to tire installers that are not authorized SmarTire® TPMS distribution outlet to ensure a sensor is not broken when a tire is dismounted.

3.6 Tire Sensor Specifications

	Tire Sensor (with cradle)
Power	Internal Lithium Battery
Weight	1.89 oz (58.7 g)
Dimensions	3.58 x 1.65 x 1.34 in. (91 x 42 x 34 mm)
Operating Temperature (-40°C to 125°C)	-40°F to 257°F
Pressure Accuracy at 0°C to 50°C	+/- 2.39 PSI (0.65 bar)
Maximum Cold Inflation Pressure	160 PSI (11.03 bar)
Maximum Sensing Pressure	188 PSI (13.0 bar)
Battery Life	5 years operational, 5 year shelf

Table 3

Section C: System Installation – Components and Programming

4.0 Installing The SmarTire® Trailer-Link™ System

What follows are the steps to install the SmarTire® Trailer-Link™ TPMS system components for trailers built after 1998 with integrated power supply lines and ABS modules already equipped. Installation of the TPMS sensors onto wheels is excluded in this section. For additional harness, component, and sensor installation details, refer to *Sections B and E*.

⚠ CAUTION: It is recommended to install all Trailer TPMS sensors in their pre-assigned locations prior to completing the actions below and in accordance with the sensor mounting instructions in *Section B*.

Step 1. For a multi-axle trailer, use *Figure 3* to identify the ideal SmarTire Trailer-Link ECU mounting location. To do so, picture a line drawn from the left front trailer tire to the rear right trailer tire, and a line drawn from the front right to the rear left tire. Where the lines intersect is the approximate mounting location of the provided SmarTire Trailer-Link bracket and ECU. For a single axle trailer, place the ECU slightly in front of the axle.

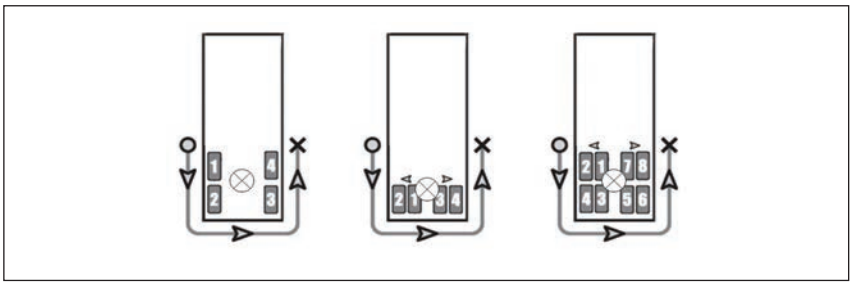


Figure 14

To ensure optimal signal reception, make sure the distance between any tire and the SmarTire Trailer-Link ECU does not exceed six (6) feet.

Step 2. To install the SmarTire Trailer-Link ECU mounting bracket, find a flat surface at or near the location indicated in Figure 3, and use a minimum of three hex bolts to secure the bracket against the surface. Trailer cross members are ideal for mounting the bracket. For dimensions of the mounting bracket, please refer to *Section D*.

Step 3. Mount the SmarTire Trailer-Link ECU against the bracket by using the two hex bolt sets provided. Ensure that the ECU module's flat top is facing parallel to the trailer tires, with the harness connector facing away from the driving direction. See mounting example below; arrow shows driving direction of the trailer.

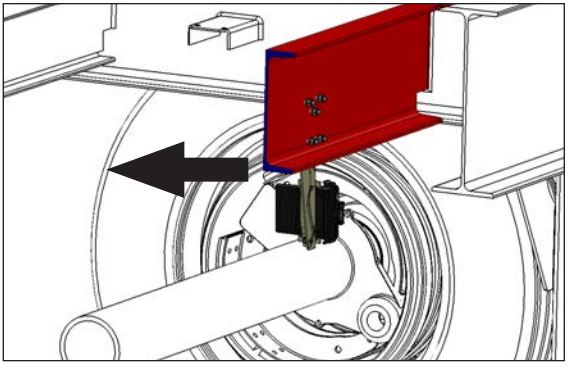


Figure 15

Step 4. Find the ABS power supply on the underside of the trailer. This power supply is usually located just ahead of the trailer axles along the frame, or directly next to the ABS module. Free the connector of any dirt and debris and wipe down the ABS connection joint with a dry cloth before moving on. Lift the plastic locking tab slightly to pull the ABS power splice connection apart. Be careful as this tab can break off easily if pushed up too far.

Step 5. Interconnect the SmarTire® Trailer-Link™ ABS-Power Splice Harness (Part No: K075867) with the original ABS power supply. Ensure the locking tab is re-engaged and that the connector plugs are greased with the supplied dielectric grease.

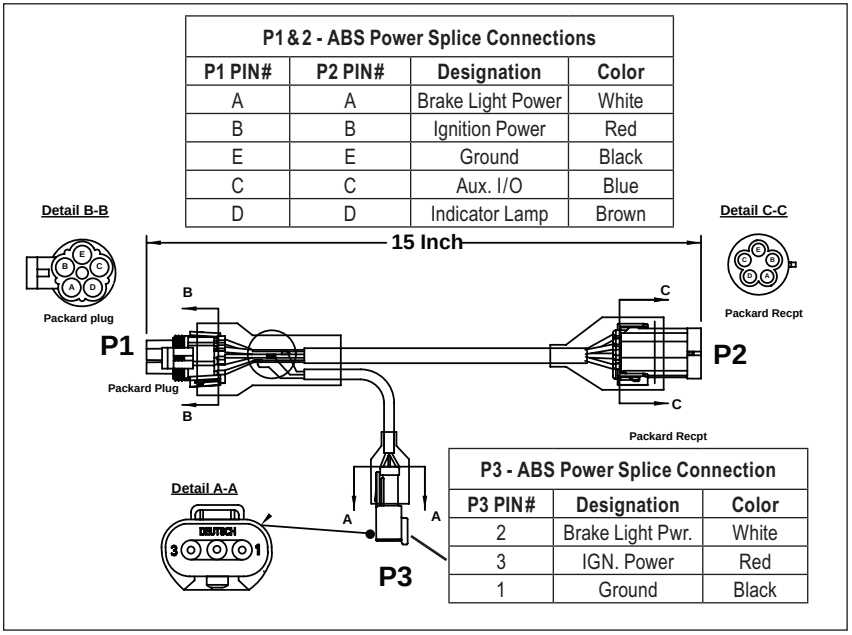
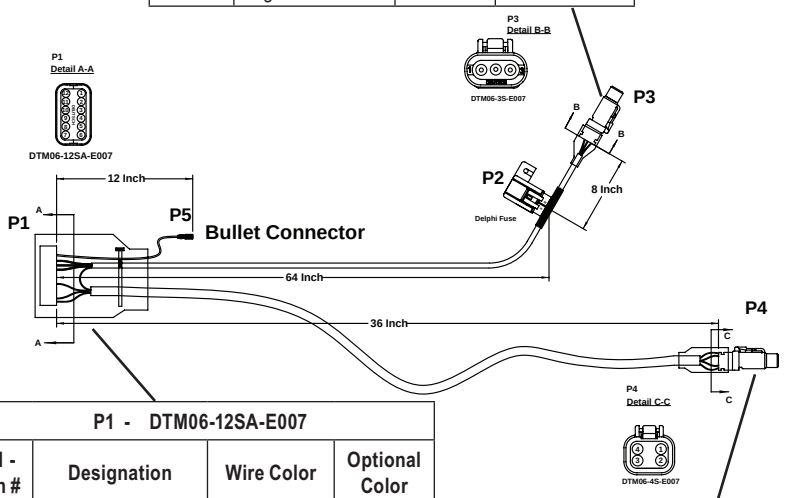


Figure 16 - SmarTire Trailer-Link™ TPMS ABS Power Splice (Part No: K075867)

Step 6. After installing the ABS Power Splice harness, connect the 3-pin power connector, *(P3 in Figure 16)* to the SmarTire Trailer-Link™ TPMS Wiring Harness, *(P3 in Figure 17)*. Then route the harness along the underside of the trailer, taking care to avoid any slider mounts and suspension components. Secure the harness every foot with zip ties. Connect the other end of the harness, *P1 in Figure 17* to the SmarTire Trailer-Link ECU.

P3 - ABS Power Splice Interconnection			
P3 PIN#	**Designation**	**Color**	**Optional Color**
2	Brake Light Power	White	White
1	Ground	Black	Yellow
3	Ignition Power	Red	Red



P1 - DTM06-12SA-E007			
P1 - Pin #	**Designation**	**Wire Color**	**Optional Color**
1	RS232-Transmit	Blue	Black
2	Not Used	Sealing Plug	---
3	Brake Light Power	Orange	White
4	Not Used	Sealing Plug	---
5	Not Used	Sealing Plug	---
6	Ignition Power	Red	Red
7	Not Used	Sealing Plug	---
8	LED - Diagnostic	Brown	Brown
9	Not Used	Sealing Plug	---
10	Lamp Driver	Purple	Purple
11	Ground	Black	Yellow
12	RS232-Receive	White	White

P4 - Serial Port with LED Diagnostic			
P4 PIN#	**Designation**	**Color**	**Optional Color**
2	RS232-Transmit	Blue	Black
3	RS232-Receive	White	White
1	Ground	Black*	Yellow
4	LED-Diagn.	Brown	Brown
* Splice Required into main GND wire			

Figure 17 - 6ft SmarTire® Trailer-Link™ TPMS Harness Part No: K075868

In some cases, the supplied 6ft harness may not be sufficient for your installation. If this is the case, there is an optional 15 ft SmarTire Trailer-Link™ TPMS Harness Part No: K075869 available. Please contact your distributor to order this part.

Step 7. Route the 4-pin diagnostic LED line to the side of the trailer or slider and secure the line every foot with zip ties. Ensure the Bendix diagnostics LED Cap part number K075866 is placed over the end of the diagnostic connector, P4 in Figure 17 when not used with the Maintenance Hand tool. Connect the trailer to power and watch for the LED to light up briefly to confirm the SmarTire Trailer-Link ECU is functional. Refer to the blink code table in *Section C* for more information.

Step 8. If needed, adjust the Cold Inflation Pressure (CIP) of each axle using the SmarTire® Maintenance Hand tool (090.0011) and diagnostics harness part number K092501 as described in *Section 3.1* to complete the installation.

If the optional trailer warning lamp is not installed, please use the supplied dielectric grease and fill the trailer lamp output connector (P5 in Figure 17) with grease to protect it from corrosion. For instructions on how to install the optional trailer warning lamp, continue to step 9.

Optional Step 9. Using the lamp output connector (P5 in Figure 17) a trailer lamp may also be installed at the nose of the trailer to provide trailer TPMS alerts regardless if the tractor is equipped with a SmarTire TPMS unit. Extend a power line from the connector to the lamp (standard 12-24V lamp with max one (1) Amp draw can be used, not provided by Bendix) and ground the lamp to the trailer chassis at its mounting point. Place the provided Trailer Lamp alert sticker underneath the trailer lamp. See *Section C* for blink codes.

Figure 18

⚠ CAUTION: A 5-Amp fuse is included with all SmarTire Trailer-Link TPMS harnesses. If the fuse needs to be replaced, use a maximum 5-Amp fuse to protect the SmarTire Trailer-Link ECU.

4.1 Configuring & Customizing Your SmarTire Trailer-Link™ System

During the installation process, the default settings for SmarTire Trailer-Link™ TPMS should be customized to the trailer by the installer. Using the SmarTire Trailer-Link Diagnostics Software within Bendix® ACom® Diagnostics 6.6 (or higher), alert thresholds can be made more or less sensitive and system settings can be adjusted to accommodate trailer changes and use.

Replacing trailer tires or installing the system on a new trailer may also require adjustment of pre-configured settings. The following section describes how to adjust the pre-configured settings of your SmarTire Trailer-Link TPMS.

4.1.1 Pre-Configured Settings

Generally, the SmarTire Trailer-Link TPMS is pre-configured with the default settings listed below. Depending on your vehicle, your system may have a different initial setup.

- Cold Inflation Pressure (CIP):
  - ◊ 4-Wheel (2-axle Configuration)
    - Trailer Axle 1&2: 100 PSI (6.89 bar)
  - ◊ 8-Wheel (2-axle Configuration)
    - Trailer Axle 1&2: 100 PSI (6.89 bar)
- First Alert Level (FAL) Pressure Deviation Alert: CIP ±15% (temperature compensated)
- Second Alert Level (SAL) Critical Low Pressure Alert: CIP -20%
- High Temperature Alert: 185°F (85°C)

Default cold inflation pressure settings should always be customized to the trailer. Check the trailer's placard or the industry published load inflation table to determine the recommended cold inflation pressure settings. Bendix recommends setting the Second Alert Level (SAL) critical low pressure alert at 20% below the recommended cold inflation pressure for your trailer. Bendix also does not recommend changing the First Alert Level (FAL) pressure deviation alert setting as well as the High Temperature Alert setting of 185F.

To make changes to the FAL, SAL, and High Temperature settings refer to the SmarTire Trailer-Link Diagnostics settings within Bendix ACom Diagnostics. For programming sensor IDs and changing the axle CIP using the Maintenance Hand tool, see the instructions that follow. These instructions can also be found in the Maintenance Hand tool manual (BW2809).

4.2 SmarTire Trailer-Link™ Axle Cold Inflation Pressure (CIP) Adjustment Instructions

4.2.1 Equipment

- SmarTire Trailer-Link™ Diagnostic Harness Kit K092501
- SmarTire® TPMS Maintenance Hand tool Kit 090.0011

4.2.2 Trailer CIP Programming Procedure

The default CIP programmed into the SmarTire Trailer-Link ECU is 100 PSI for all axles. Each axle can be configured to have a unique CIP. If the case arises where different CIP values are required, the following programming procedure should be used.

Perform the following steps:

1. Power up the SmarTire Trailer-Link ECU. In most cases the trailer will need to be connected to a tractor in order to receive power. The diagnostic LED on the SmarTire Trailer-Link harness can be viewed at power up to ensure that the ECU has power.
2. Using the Maintenance Hand Tool, press and hold the Setup button until a list of menu items appear.
3. Select the Trailer CIP menu item and press the Return button
4. Use the Up and Down arrow buttons to configure the system for the total number of axles installed on the trailer. A maximum of 5 axles can be configured. When the correct number of axles is selected, press the Return button.

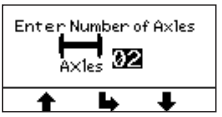


Figure 19

5. Next, adjust the CIP value for each axle. The default value of 100 PSI will be shown on the screen (if imperial units are selected).

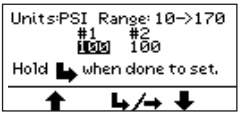


Figure 20

Use the Up and Down arrow buttons to adjust the value of the CIP. Holding down the arrow buttons will cause the values to increment at an increasing rate. Press the Return/Right button to advance to the next axle.

6. When the Cold Inflation Pressure (CIP) values have been adjusted to the desired setting, press and hold the Return ↳ button for 3 seconds until the programming screen bellow is displayed.

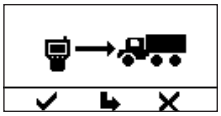


Figure 21

7. Using the SmarTire Trailer-Link™ programming cable (Part Number K092501), connect the tool to the SmarTire Trailer-Link harness.

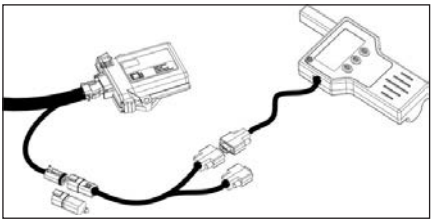


Figure 22

8. Press the Check ✓ button to initiate programming. You may also press the Return ↳ button to return to the CIP adjustment screen or press the ✕ button to return to the main menu.
9. Once programming has been initiated, the following screen is shown:

Figure 23

10. After successful programming, the following screen is shown:

Figure 24

11. Press the Return ↳ button to exit to the main menu.
12. In the case of a programming error, the following screen is shown:

Figure 25

If this occurs, ensure the SmarTire Trailer-Link ECU is powered and the connection from the tool to the SmarTire Trailer-Link harness is correct. Press the Check ✓ button to retry the operation, press the Return ↳ button to return to the CIP adjustment screen in step 5, or press the ✕ button to abort the programming and return to the main menu.

4.2.3 Trailer Sensor ID Walk-Around Learn Procedure

The following steps are only to be used for the SmarTire Trailer-Link™ ECU.

When the tires are rotated or replaced on a trailer equipped with a SmarTire tire pressure monitoring system, the trailer TPMS module must be taught the new position of each sensor ID code. The Walk-Around Learn procedure is used to activate each sensor in its new location, store the sensor information and download this information into the SmarTire Trailer-Link ECU.

The SmarTire Maintenance Hand Tool (P/N 090.0011) will learn and store the location of each sensor as the user walks around the trailer in a U-Shaped pattern, starting at the left side (looking forward) front most tire location *(see Figure 28)*. If this is a dual tire axle, start with the inner tire location. The new location information (ID codes) for each sensor collected is then uploaded to the SmarTire Trailer-Link receiver.

1. Power up the SmarTire Trailer-Link receiver. In most cases the trailer will need to be connected to a tractor in order to receive power. The diagnostic LED on the SmarTire Trailer-Link harness can be viewed at power up to ensure that the ECU has power.
2. Using the Maintenance Hand Tool, press and hold the Setup button until a list of menu items appear.
3. Select the Walk-Around Learn icon and press the Return button.
4. Use the Up and Down arrow buttons to select the number of tires on the trailer.

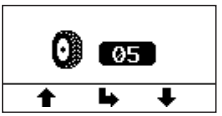


Figure 26

5. When the correct number of tires is selected, press the Return button to initiate the walk around learn procedure.

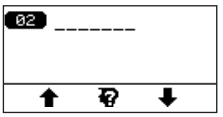


Figure 27

6. Using the SmarTire® TPMS Maintenance Hand Tool, go to the first tire to be programmed and proceed to activate each of the trailer's tire pressure sensors in the proper order. Starting on the left side (road side) of the trailer at the forward axle, begin by activating the inner tire and proceed to work counterclockwise from inner to outer tire. Work in a U-shaped pattern around the trailer ending with the right side (curb side) forward outer tire. If using wide-based single tires, simply start at the forward left side tire and work in a U-Shaped pattern around the trailer ending with the right side forward tire. Some examples are shown below:

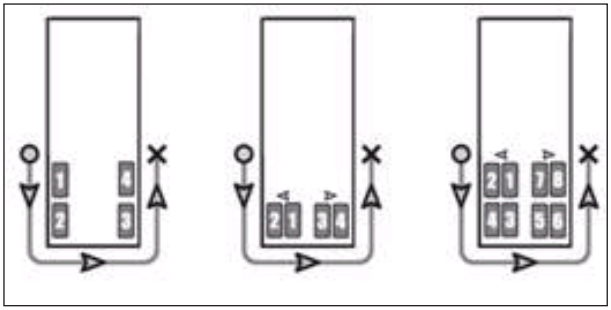


Figure 28

7. To activate the tire pressure sensor, hold the SmarTire Maintenance Hand Tool's antenna against the tire's upper sidewall in-line with the valve stem. Press the Learn Button to learn the ID code of the sensor. In most cases, the Maintenance Hand Tool is able to receive signals from the inner tire on the dual tire configuration as well. To program the inner tire, hold the tool in line with the circumferential position of the valve stem of the inner wheel, as indicated below:

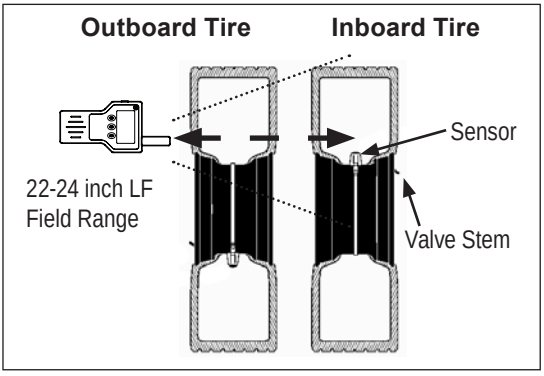


Figure 29 - Initiating Transmissions From Dual Wheels

If the sensor is not programmed from this position, you many also place the tool between the dual tire assemblies and activate the sensor by placing the antenna near the tire sidewall, in-line with the inner valve stem. Pressing the button will abort the Walk-Around Learn procedure.

8. Once the tool has learned the tire pressure sensor ID for the given position, it briefly displays the received ID code and automatically switches to the next tire position.

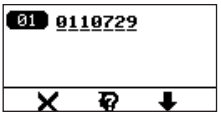


Figure 30

Figure 31

Press the Learn button to initiate the next tire sensor. Repeat until all the tires have been learned into the tool. At this point you may also press the Up and Down arrow buttons to select and view any previously learned wheel positions. If needed, you may also reprogram a tire position by simply selecting a previously learned position and pressing the Learn button. Any previously learned sensor ID codes will be replaced by the new ID code for that position.

9. If a sensor failed to activate, the following screen will be displayed (Figure 32). If this occurs, ensure that the tool is placed at the correct position around the tire and retry the sensor activation by pressing the Learn button.

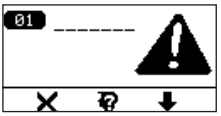


Figure 32

10. If, while learning a particular wheel position, a tire pressure sensor ID code is received that is already used in a different position, the following "Duplicate ID" error screen is displayed.

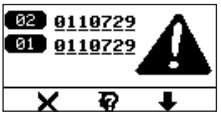


Figure 33

Pressing the button will delete the received ID and the screen will go to the previously learned position. Press the Learn button to learn the tire sensor into the position again.

11. After the last tire position has been learned into the tool, press the Down arrow button. The tool is now ready to transmit this information to the SmarTire Trailer-Link™ receiver.

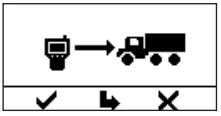


Figure 34

12. Using the SmarTire Trailer-Link programming cable (Part Number K092501), connect the tool to the SmarTire Trailer-Link harness.

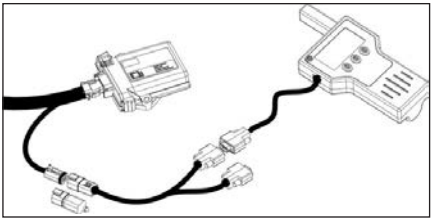


Figure 35

13. Press the Check ✔ button to begin downloading the new tire sensor IDs into the SmarTire Trailer-Link™ receiver.

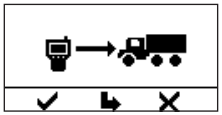


Figure 36

14. In the case of a programming error, the following screen is shown:

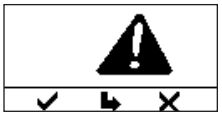


Figure 37

15. If this occurs, ensure the SmarTire Trailer-Link™ ECU is powered and the connection from the tool to the SmarTire Trailer-Link harness is correct. Press the Check ✔ button to retry the operation, press the Return ↳ button to return to the learn procedure screen in step 5, or press the ✕ button to abort the learn procedure and return to the main menu.
16. If the tool screen reverts back to the screen for entering the number of tires, then the number of tires entered does not match the number of tires currently programmed into the SmarTire Trailer-Link receiver.

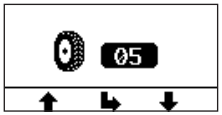


Figure 38

Make sure the number of tires entered on the tool matches the number of tires being monitored by the SmarTire Trailer-Link receiver and then return to Step 4 and repeat the Walk-Around Learn procedure.

Section D: SmarTire Trailer-Link™ TPMS Display Options

5.0 Trailer Information Display Options

5.1 Tractor SmarTire Dash Display

When the SmarTire Trailer-Link™ TPMS system is combined with a tractor equipped with the SmarTire® TPMS system, the trailer tires will be added in the form of 'T' axles following the last tractor axle on the 2-inch SmarTire dash display. The dash gauge will reboot shortly after the wireless connection is established with the SmarTire Trailer-Link system and the new trailer axle positions will be displayed for the tractor. To become more familiar with the functions of the SmarTire dash display, refer to *Section C* of the SmarTire Operator's Manual BW2799 before continuing on in this section.

⚠ CAUTION: The tractor dash display cannot be used to make any SmarTire Trailer-Link system parameter adjustments or to change the sensor configuration programmed into the SmarTire Trailer-Link ECU! These parameters are stored directly in the SmarTire Trailer-Link ECU and must be configured by connecting to the SmarTire Trailer-Link ECU as described in *Section 4.1*.

Ensure the SmarTire Trailer-Link Enable function is set in the SmarTire tow-vehicle-mounted ECU part number 200.0216.

For tractors equipped with the part number 200.0184 ECU to be able to communicate with the SmarTire Trailer-Link ECU, the ECU firmware MUST BE updated to new firmware. For instructions on performing this update, please contact your Bendix account representative or call 1-800-AIR-BRAKE (1-800-247-2725).

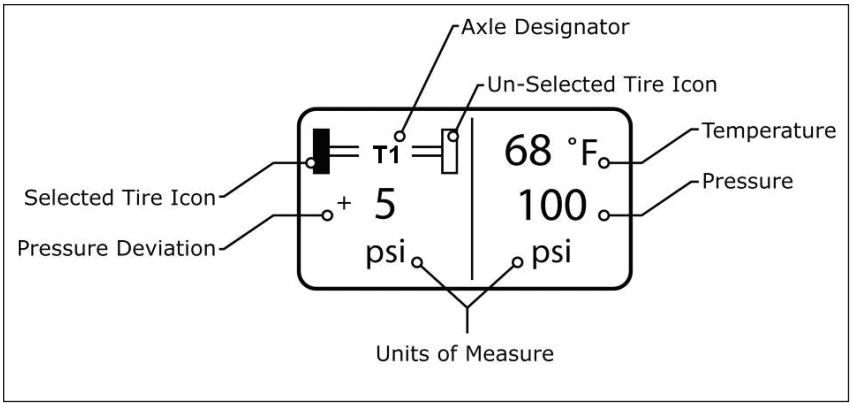


Figure 39

5.2 Tractor SmarTire® TPMS Dash Display Alerts

After the SmarTire Trailer-Link™ connection has been established, the same three tire alerts, first level pressure, second level pressure and temperature alerts will be reported from the trailer that are reported from the tractor-mounted SmarTire® TPMS system. In addition, trailer tire sensor Diagnostic Trouble Codes (DTCs) and low battery alerts will also be reported. Please note, alert levels configured in the tractor TPMS ECU do not override the settings in the SmarTire Trailer-Link ECU. For example, if the tractor has its first level alert set to 10% -- but the SmarTire Trailer-Link ECU is configured for a 15% first level alert – the driver will see trailer tire alerts based on the 15% figure stored in the Trailer-link ECU.

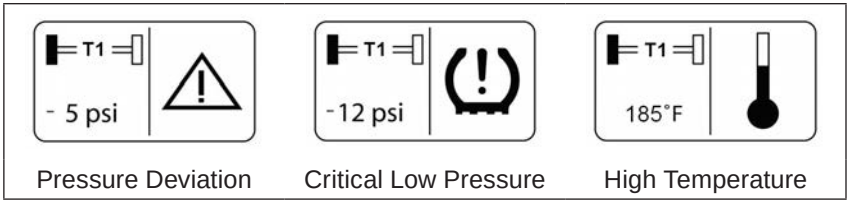


Figure 40

5.3 SmarTire Trailer-Link™ To SmarTire TPMS Dash Display Link-Up Procedure

The SmarTire® ECU must be configured to allow SmarTire Trailer-Link connections. There are three options available and can be configured with the Bendix ACom 6.6 (or later) diagnostic software.

1. Disabled: In this mode Trailer Linking is disabled and trailer tires will not show up on the dash display.
2. Automatic Learn Mode: In this mode the SmarTire ECU will try and auto detect the attached trailer. In this mode the SmarTire Trailer-Link should link up within 30 seconds but could take as long as 5 minutes.
3. Dedicated Trailer Mode. In this mode the ID code of a particular trailer can be programmed into the SmarTire ECU. This mode is normally used if the tow vehicle always pulls the same trailer. Link-up in this mode should take 30 seconds.

When the tractor drops a trailer, it will unlink from the SmarTire ECU in 9 minutes at which time the dash display will remove the trailer tires.

5.4 Trailer Lamp Blink Codes

If an optional trailer lamp is installed and connected via the lamp output on the SmarTire Trailer-Link ECU, the following table shows the blink codes that will be displayed by the system in the event of an active Diagnostic Trouble Code (DTC) condition. The SmarTire Trailer-Link lamp alerts will be displayed for one (1) minute after system power-up and then will either show the lamp on — or off — depending on status of the system.

TPMS Lamp Alerts (repeated for 1 Minute after Start-up, then ON or OFF depending on Priority)		Cause and Solution
High Temperature	5x Blinks & then ON after 1 min.	Contained Air Temperature is over 85C/185F – Stop and allow tire to cool down, assess cause of temperature increase, possible brake, wheel bearing, or pressure issue
Critical Low Pressure	4x Blinks & then ON after 1 min.	Tire Pressure has dropped below the critical threshold (-20% default), stop and check for punctures, bead leaks, valve leaks, etc. and air up the tire
Minor Over or Under Pressure	2x Blinks & then OFF after 1 min.	The minor over- or under-pressure threshold has been reached, have the tire serviced during the next maintenance check, set the recommended pressure and compensate for changes in ambient temperature (see temp chart in *Section A*)
Sensor Diagnostic Trouble Code (DTC)	1x Blink & then OFF after 1 min.	Data from a TPMS sensor has not been received for 35 min. This may be related to the signal reception of the sensor. Continue to drive to clear the DTC. If the Diagnostic Trouble Code (DTC) persists, check the programming and functionality of all trailer TPMS sensors by using the Maintenance Hand tool 090.0011 and replace sensors if unresponsive
Setup Diagnostic Trouble Code (DTC)	3x Blinks & then OFF after 1 min.	The SmarTire Trailer-Link™ ECU is not properly programmed and is unable to connect. Check the programming using the Maintenance Tool, Diagnostics Software and Diagnostics Harness K092501

Table 4

Section E: Additional Component Details

6.0 SmarTire Trailer-Link™ System Component Details

6.1 SmarTire Trailer-Link Module Specifications

6.1.1 Power, Mounting, and Environmental Requirements

- Operating voltage range 9 – 36V
- Typical current consumption (with no external loads) 30mA
- 5A fuse is required between the main power line of the trailer link and the vehicle battery
- Frequency 433.92 MHz
- Modulation type: OOK
- Design protected for FSK
- 500 kHz Band Width
- Sensitivity (OOK) at 433.92 MHz : -112 dBm
- Internal antenna only
- Uses standard Deutsch enclosure
- Tested to SAE J1455 Specifications
- Operating temperature range: -40C to +85C
- Survivability temperature range: -40C to +85C
- Sealed to IP67
- Preferred mounting orientation to shed water is vertical (Connector side facing rear of trailer, away from driving direction)
- Preferred Mounting hardware: ¼-20 (M6X1) Flange Head CAPSCREW, torque to 7-10 FT/LBS (13 Nm)
- The SmarTire Trailer-Link ECU has an internal antenna and should be mounted free of any metal (only half the enclosure should be covered by the chassis or metal bracket)

6.1.2 SmarTire Trailer-Link™ Module Dimensions in Inches/[mm]

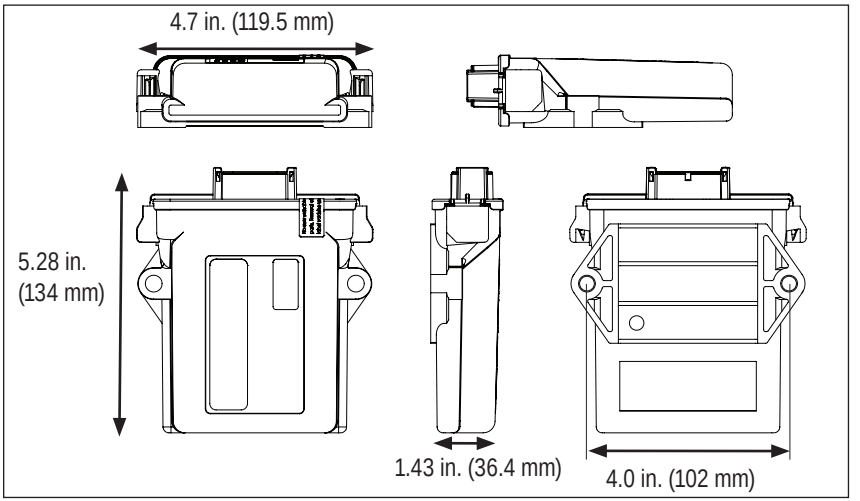


Figure 41

6.1.3 SmarTire Trailer-Link Module Connector Pin Description

Position	Signal
1	RS232-TX
2	NOT USED
3	BRAKE LIGHT-L
4	NOT USED
5	NOT USED
6	VIN
7	NOT USED
8	LED-DIAG
9	NOT USED
10	LAMP DRIVER
11	GROUND
12	RS232-RX

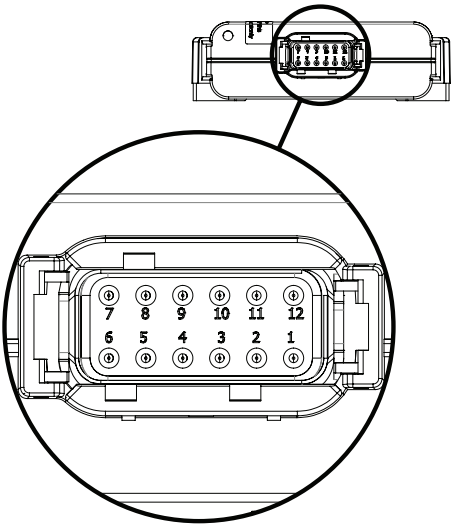


Figure 42 - PIN-OUT TABLE

6.1.4 SmarTire Trailer-Link™ TPMS Diagnostics Interface Harness Part No: K071016

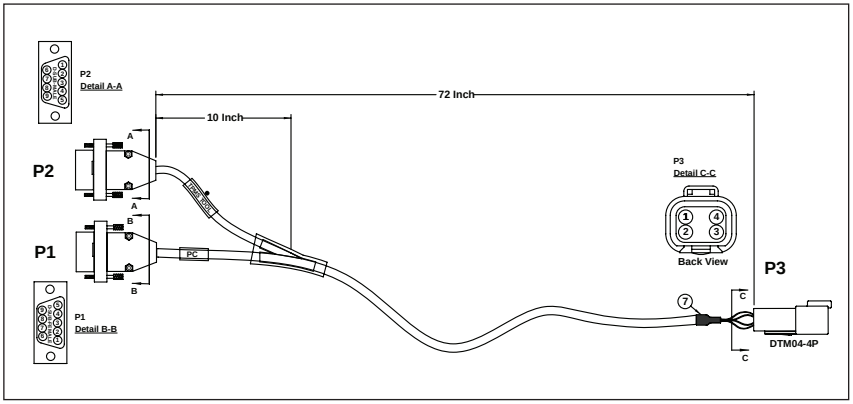


Figure 43

6.1.5 SmarTire Trailer-Link™ Mounting Bracket
Part No: K092801 (dimensions in inches)

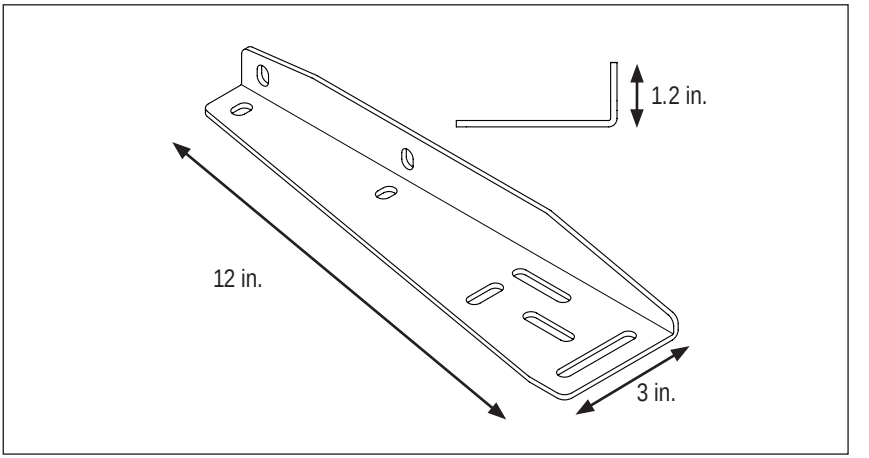


Figure 44

Section F: Troubleshooting

7.0 Troubleshooting Guide

7.1 SmarTire® TPMS Gauge Display And SmarTire Trailer-Link™ Module Q&A

7.1.1 Q: The SmarTire Trailer-Link™ module does not connect to the tractor. How can the SmarTire Trailer-Link module be diagnosed further?

A: In the event that the SmarTire Trailer-Link ECU does not connect with the SmarTire vehicle-mounted TPMS system, follow these steps:

1. Check to make sure the SmarTire Trailer-Link ECU and vehicle-mounted TPMS ECU power up during start up. The red diagnostics LED (P/N K075866) on the SmarTire Trailer-Link harness should light up during power-up to confirm that power is being supplied to the SmarTire Trailer-Link ECU.
2. Ensure the SmarTire Trailer-Link Enable function is set in the SmarTire tow-vehicle-mounted ECU part number 200.0216 and that the tow-vehicle ECU is loaded with TPMS firmware part number is 248.0091 min. version 1.02 and CAN firmware part number 248.0092 min. version 1.03. Use Bendix ACom 6.6 (or later) Diagnostics to verify the software version on the vehicle-mounted ECU.
3. Check the SmarTire Trailer-Link harness to ensure all connections are secure. Ensure the locking tab on the ABS-power splice is engaged as well as the main connector on the SmarTire Trailer-Link ECU module.
4. Cycle power to restart the link-up process and reset the ECUs.
5. If the SmarTire Trailer-Link ECU still does not connect with the SmarTire vehicle-mounted TPMS system please refer to 7.1.4 for further Diagnostics.

7.1.2 Q: The gauge only displays dashes for the trailer tire information; there is no pressure, temperature, or deviation value.

A: After the wireless link between the tractor SmarTire® TPMS ECU and the SmarTire Trailer-Link™ module has been established and the gauge has rebooted, trailer tire sensor data will be displayed within five (5) to eight (8) minutes on the gauge.

To facilitate the quicker display of tire information, use the SmarTire LF Tool or SmarTire Maintenance Hand tool and initiate each of the tires that have not reported to the Gauge. On the SmarTire TPMS Maintenance Hand tool, press the left-most button as you point the tool's antenna into the tire sidewall above the valve stem (default sensor location). Remember, that both the SmarTire LF Tool and SmarTire Maintenance Hand tool are capable of activating the inner tire on a dual tire assembly from the outboard tire position. For use of the SmarTire LF Tool, please refer to manual BW2820.

In cases where no transmissions were received from a specific tire, move the Hand tool five (5) inches in a clockwise or counterclockwise direction and try again. Should the problem persist, a defective, missing, or misplaced sensor may need to be diagnosed – see *Section 7.3*.

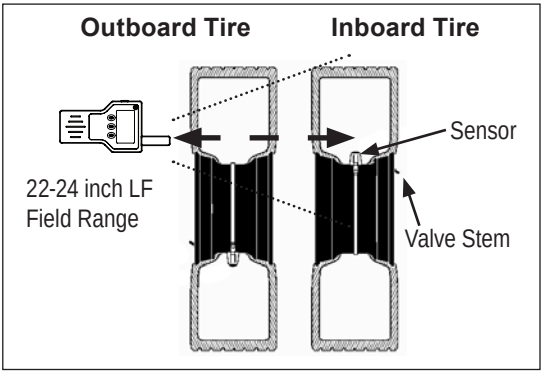


Figure 45

7.1.3 Q: When the Gauge first powers up, the alert lamp is blinking and a triangle with an exclamation mark is displayed. A few minutes later the alert clears and the display returns to normal. Was there an alert?

A: During the start up sequence, the Gauge may clear itself of a previous alert condition or issue a momentary alert if a tire sensor has not reported in.

Figure 46

As soon as the tire sensors report their latest readings and they do not constitute an alert condition, the Gauge will clear the alert.

Ensure that the user keeps an eye on the particular alert until it is cleared. If the alert does not clear itself, the user may indeed have an alert condition that needs to be checked further. Updating the given tire position with new information by using the LF Tool or Maintenance Hand tool (press “Initiate”), would clear the alert faster, unless an alert condition does exist or the sensor is malfunctioning.

7.1.4 Q: What additional diagnostic information is available?

A: The external LED part # K075866 is connected via the cable harness as a separate plug. Please refer to *Section C*, 4.0, step 7 for details on installation and location of this LED. The LED functions as described in the table below. Flashing with pattern will have periods of 0.3 second on and 0.3 second off repeating every 6 seconds. The number of high pulses in each 6–second window will be determined by a code. For example if the flash code is 2, the pattern will be 0.3 second on, 0.3 second off, 0.3 second on, 5.1 seconds off and repeating.

Alarms	Priority	External LED	See Note
No Alarms	0	Off	-
Second Level Low Pressure (SAL)	6	Pattern flashing code: 4	-
SAL Cleared	0	Off	-
First Level High Pressure (FAL_H)	4	Pattern flashing code: 2	-
First Level Low Pressure (FAL_L)	3	Pattern flashing code: 2	-
FAL Cleared	0	Off	-
High Temperature	7	Pattern flashing code: 5	-
High Temperature Cleared	0	Off	-
Sensor Diagnostic Trouble Code (DTC) Set	2	Pattern flashing code: 1	1
Sensor DTC Cleared	0	Off	-
ROM To Both Copy Performed	10	Pattern flashing code: 7	2
Set Up DTC	5	Pattern flashing code: 3	3
Set Up DTC Cleared	0	Off	-
Factory To Custom Copy Performed	9	Pattern flashing code: 7	2
Custom To Factory Copy Performed	8	Pattern flashing code: 7	4
Watchdog Reset	11	Pattern flashing code: 8	5
Sensor Battery Low Alert	1	Pattern flashing code: 6	-

Table 5

Notes for Table 5

Note 1: This Diagnostic Trouble Code (DTC) occurs when the SmarTire Trailer-Link™ ECU has not received information from a tire sensor for 35 minutes. Possible causes are:

1. A tire has been replaced and a tire sensor is no longer in range of the ECU and is therefore no longer being received. In this situation the missing sensor must be replaced and the ECU reconfigured to add this new sensor.
2. There is poor radio frequency signal quality between the sensor and the ECU. Check the installation of the ECU and ensure it is not mounted close to any metal objects and is in the correct location as described in *Section C*, 4.0.
3. There is a malfunctioning sensor in one of the vehicle's tires. In this situation the malfunctioning sensor must be replaced and the ECU reconfigured to add this new sensor.

Note 2: This Diagnostic Trouble Code (DTC) is generated when the configuration information within the ECU has become corrupt. During this DTC the ECU's configuration is restored to the default factory setting. If this DTC occurs all sensors registered in the ECU will be lost and all programmable settings restored to factory settings. The ECU must be re-configured to become operational again.

Note 3: This DTC is active if there are no tire sensors registered in the ECU. This could be caused if the ECU was never configured or corruption of the configuration information has occurred as in Note 3. To correct this situation, tire sensors installed on the trailer must be learned into the ECU.

Note 4: This DTC is generated when the configuration information within the ECU has become corrupt. The ECU has recovered from this by restoring the configuration from a backup copy. Normally this DTC is self-corrected by the ECU but the configuration should be analyzed to make sure all settings are correct.

Note 5: This DTC is generated when the ECU has restarted due to a software related failure. If this DTC occurs on a regular basis, the ECU should be returned to Bendix for analysis.

7.2 SmarTire® TPMS System Q&A

7.2.1 Q: A trailer tire continues to show a deviation value/alert although it was aired up properly.

A: Set the Cold Inflation Pressure value (CIP) for each trailer axle to make sure it matches that of the intended inflation value for the tire in question. To do so, please refer to *Section C,* 4.2.2 as well as the inflation tables in *Section A* under *Section 1.4*. If the CIP value is matched to the recommended inflation pressure for the vehicle and the prevailing ambient temperature but the deviation value continues to show up, the tire is exhibiting a slow leak. Take appropriate steps to have the tire inspected for any damage or leaks.

7.2.2 Q: Pressure readings at a tire location do not change on the gauge when air is added, or removed, to correct tire pressure, and a new transmission has been received.

A: Wheel assemblies may have been relocated/rotated on the trailer without the SmarTire Trailer-Link™ ECU having been updated. To correct this, follow the steps in *Section C*, 4.2.3 in combination with the SmarTire® TPMS Maintenance Hand tool to relearn sensors into their correct tire positions.

7.3 Diagnosing A Defective, Missing, Or Misplaced Sensor

In the event that a tire sensor does not report to the display after having gone through the steps above, the following sensor checks should also be performed:

a. Try to initiate the sensor opposite of the valve stem. There are times when the tire installer accidentally places the sensor 180 degrees opposite of the valve by misreading the instructions (sensors are required to be placed 180 degrees opposite of each other for dual wheel assemblies). Check for new data on the gauge for the affected wheel position.

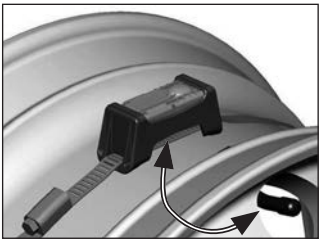


Figure 47

b. If step a. was unsuccessful, try to initiate the sensor at the bottom of the wheel, no matter where the valve stem is located. If this attempt updated the display screen, rotate the wheel 180 degrees forward and initiate the sensor again at the BOTTOM of the wheel. If the second initiation also provided new data (cycle power between tries to empty the screen, not necessary when using SmarTire Maintenance Hand tool), it is evidence of a broken cradle and/or strap. The sensor is simply falling to the lowest point in the wheel after each rotation. Remove the tire and replace the cradle and strap. Depending on the damage done to the sensor itself,

it may simply be pressed into a new cradle for reuse. Avoid reusing the strap – worm gear could be damaged internally.

c. If points a. and b. did not yield any results, the sensor is either missing or has been damaged. Remove the wheel carefully and inspect the inside tire lining for any damage if the sensor, strap, and cradle are found to have been damaged and non-operational. Replace strap, cradle, and sensor. Program the new ID into the system using the SmarTire® TPMS Maintenance Hand tool as described in *Section C*, 4.2.3.

7.4 SmarTire® TPMS Hand Tool Troubleshooting

7.4.1 Q: The Tool does not power-up or turns off when the "Activate" button is pressed.

A: Replace the batteries.

7.4.2 Q: No tire pressure sensor data is received.

A: Make sure the Activate Antenna is held within 6" of the tire pressure sensor and positioned before the "Activate" button is momentarily pressed and that the 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 sensor.

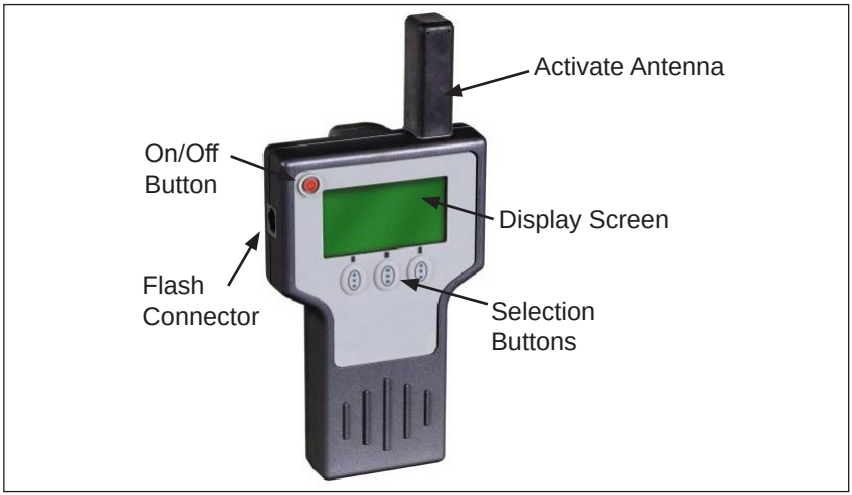


Figure 48

Appendix 1: Replacement Parts

8.0 Replacement Parts

DESCRIPTION	OE Part Number	AM Bendix Part Number
Bolt Kit for Receiver Mounting Plate	090.0017	090.0017N
Bolt Kit for Mounting Trailer ECU to Plate	090.0020	090.0020N
SmarTire Trailer-Link™ ECU	200.0189	200.0189N
SmarTire® TPMS Maintenance Tool Kit	-	090.0011
SmarTire LF Tool	-	090.0021
Tire Sensor with Cradle	201.0007	201.0007N
6 ft SmarTire Trailer-Link TPMS Harness	K075868	K095615
15 ft SmarTire Trailer-Link TPMS Harness	K075869	K095616
SmarTire Trailer-Link TPMS Diagnostics Interface Harness	-	K092501
SmarTire Trailer-Link ABS-Power Splice Harness	K075867	K095614
Sensor Mounting Cradle – High	264.0228	264.0228N
SmarTire Trailer-Link Mounting Bracket	K092801	K096638
Plate-style SmarTire Trailer-Link Mounting Bracket	K068737	K092425
Rim Labels	269.0155	269.0155N
Strap for 22.5" Rims	264.0328	264.0328N
Strap for 24.5" Rims	264.0332	264.0332N
Sensor Replacement Kit for 22.5" Rims (Includes Sensor, Strap and Rim Label)	-	115.0003
Sensor Replacement Kit for 24.5" Rims (Includes Sensor, Strap and Rim Label)	-	115.0004

Table 6

Contact your local authorized Bendix distribution outlet for parts pricing.

Note: The parts in the table above are for reference purposes only during ordering of spare and replacement components. The table does not represent the contents of any kit.

Appendix 2: System Scope Of Use & Alerts

9.0 System Scope Of Use And Alerts

This tire monitoring system does not in any way replace the need for regular maintenance of the tire pressures and visual inspection of tires for damages.

9.1 System Installation And Usage

Warranty of the SmarTire® TPMS system requires that it has been properly installed and programmed by qualified personnel according to Bendix specifications. This includes all manuals and any supplementary installation instructions included with system components.

9.2 Use Of Chemicals

Use of temporary re-sealing or re-inflation products containing internal sealers or propellants in any tire/wheel assembly may adversely affect the operation of the Sensor/Transmitters and void the warranty.

9.3 Reacting To Alerts

⚠ **CAUTION. When an alert is detected, reduce vehicle speed to an appropriate, safe level and proceed to a safe stopping location or facility where the tire can be inspected and serviced.**

9.4 Federal Communications Commission (FCC) Notice

This device complies with part 15 of the FCC rules. 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. This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna,
- Increase the separation between the equipment and receiver,
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected,
- Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications to this device without the express approval of Bendix may void the user's authority to use this device.

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SEE PAGE 2 FOR A LIST OF FURTHER SOURCES OF INFORMATION.

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