

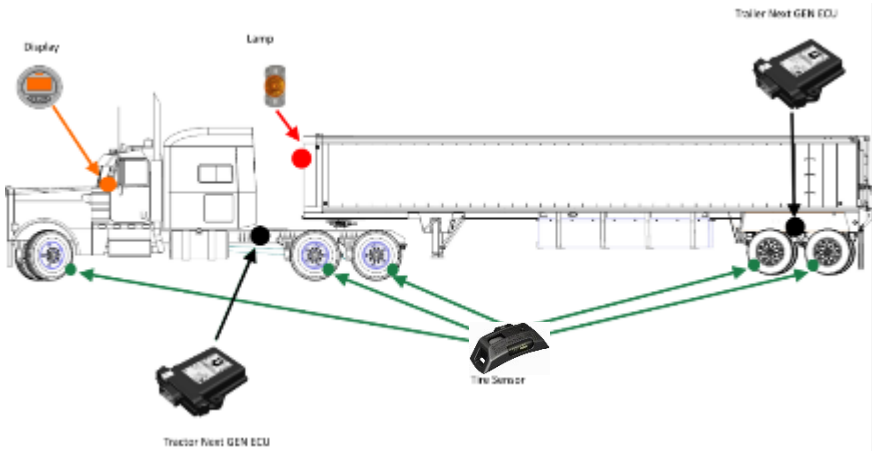
SmarTire Next GEN TPMS Service Data Manual

SD-XX-XXXX



Service Data

SMARTIRE™ TIRE PRESSURE MONITORING SYSTEM BY BENDIX CVS



Introduction:

The *SMARTIRE*™ tire pressure monitoring system (TPMS) is a real-time system that measures the contained tire pressure and temperature of each individual wheel position on a vehicle. This information is communicated wirelessly to an on-board receiver and display where the data can then be used to:

- Alert the driver of a loss of air pressure or of a dangerously high tire temperature
- Pressure Alerts are temperature compensated which allows accurate risk assessments no matter how long the tires have been driven or how hot they are.
- Real-time tire information is displayed on the dash for up to 48 tires and 12 axles
- Alerts provide immediate visual and optional audible notifications of a tire problem.
- Types of alerts and Icons:



First Level Low/High Pressure Alert



Second Level Critical Low Pressure Alert



High Temperature Alert

- Provide pressure information to maintenance personnel to ensure optimum operating conditions
- When connected to a tractor equipped with telematics, off board pressure, temperature and alerts via the telematics unit for back to base updates.

Once a tractor equipped with *SMARTIRE*™ TPMS is connected to a trailer equipped with *SMARTIRE*™ TPMS, an electronic handshake will occur and the trailer data will be automatically displayed on the tractor display and available for off boarding via telematics.

Importance of 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 and better fuel economy.

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 ensure tire pressures are within 5 PSI of one another.
- Re-tread tires before wear causes excessive belt damage or fatigue.



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.

Table of Contents

Introduction:	3
Model Part Numbers.....	8
Professional installation	9
System Features	10
Sensor Product Compatibility Matrix.....	12
ECU Product Compatibility Matrix.....	13
The Pressure Temperature Relationship	14
Cold Inflation Pressure (CIP)	15
SmarTire™ TPMS Temperature Compensation.....	16
Understanding the SmarTire TPMS Display	18
SCREEN OVERVIEW	18
SCREEN ICONS.....	19
READY SCREEN ICONS	19
ALERT ICONS	20
Display Power, Mounting, and Environmental Requirements.....	20
Understanding the Next Gen SmarTire TPMS ECU	22
Connector Pin Descriptions:	25
Truck and Trailer Location of Next Gen SmarTire TPMS ECU	26
Radio Frequency Specifications.....	27
Use of PIFA Antenna with Aftermarket Next Gen TPMS ECU ...	27
Understanding the Next Gen SmarTire TPMS Signal Lamp (optional)	28
System Troubleshooting.....	29
TROUBLESHOOTING TABLE.....	29
Section A – Troubleshooting Gauge Readouts	31
Section A continued – Gauge Startup, Actions and Alerts.....	33
Getting Started	33

How to Check Tire Pressure, Temperature and Pressure Deviation	34
Alerts & Warnings.....	35
PRESSURE AND TEMPERATURE ALERTS.....	35
FIRST ALERT LEVEL (FAL): PRESSURE DEVIATION ALERT	35
SECOND ALERT LEVEL (SAL): CRITICAL LOW PRESSURE ALERT ...	36
HIGH TEMPERATURE ALERT.....	36
OTHER ALERTS AND WARNINGS	37
SENSOR FAULT ALERT	37
LOW SENSOR BATTERY ALERT	37
NO TIRES PROGRAMMED ALERT	38
Setting Gauge Programming Restrictions	38
Section B – Troubleshooting DTCs	39
Section B Continued – Using ACom for DTC Readouts	40
Vehicle Response to the Addition of the TPMS ECU on the J1939 Network	41
Section C – Troubleshooting the Receiver/ECU.....	42
Section D&E – Troubleshooting the Sensor	43
Using ACom to change Sensor Fault Time Programming in the TPMS ECU.....	45
Appendix A – Using a Secondary PIFA Antenna for improved TPMS Sensor Reception.....	46
Guidelines and Best Practices	46

! **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.

Model Part Numbers

Next GEN ECU

K123716

K138357

K138362

K138367



Next GEN ECU with TNC

(External antenna option)

K138360

K138369

K138370

K138371

K138372



Professional installation

- This device is a wireless Tire Pressure Monitor Receiver and needs specially trained professionals to install and configure the device. For more details please refer to the user manual.
- Below is a list of the Antenna that is in compliance with FCC Rule Part 15 requirement. This is the only antenna that can be used for this device

Antenna Type	Part #	Antenna Gain	Frequency
PIFA	240.0162	0 dBi	433.92 MHZ
PIFA	240.0164	0 dBi	433.92 MHZ

- This product will not be sold directly to the general public through retail stores or online therefore the hardware is not readily available to the average consumer
- This device is only for industrial/commercial use
- The device requires it to be installed in an appropriate position as the position will affect the performance of the system. The device received power from the vehicle and communicates on the vehicles CAN Network. Therefore it requires it to be installed by a trained professional
- The product will be distributed through controlled distribution channels which has specially trained personnel to install the product
- The device is sold to OEMs or dealers who hire professional installers who need special training to install the product
- The product needs to be configured on the vehicle and requires special software to ensure the system is working reliably
- Maximum length for RS232 Communication = < 1m.

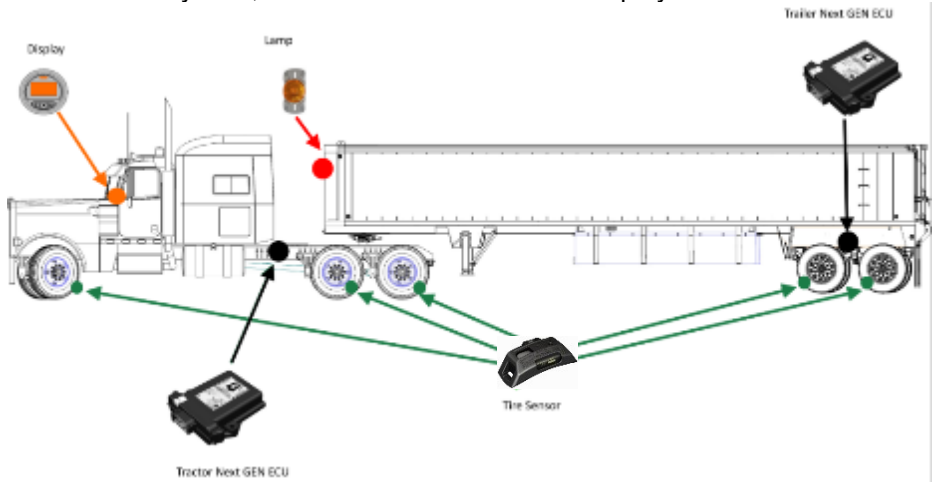
System Features

New graphics needed

Layout and Components

Tire sensors mounted on each wheel measure tire pressure and temperature every 12 seconds and wirelessly transmit tire data every three to five minutes or if the sensor detects a pressure change of +/- 3 PSI, the sensor will transmit its data immediately. Real-time tire pressure and temperature information is displayed to the driver on demand via the SmarTire™ display or an OEM integrated display.

If the tractor is connected to a trailer equipped with a SmarTire Next GEN-Trailer TPMS system, the trailer tires can also be displayed to the driver.



- A) **Next GEN Wireless Receiver/ECU** - The Wireless Receiver/ECU forms the "brain" of the SmarTire™ platform. The receiver captures data transmissions from tire sensors mounted on each wheel which is then analyzed against programmed user-defined settings and, if it determines that a tire is under-inflated or running over temperature, an alert is triggered.
- B) **Next GEN for Trailer ECU** – The Trailer ECU captures data transmissions from tire sensors mounted on each trailer wheel. This data is then analyzed against programmed user-defined settings contained in the ECU and, if it determines that a tire is under-inflated or running over temperature, an alert is triggered and relayed to the Receiver/ECU mounted on the tractor and if equipped with the SmarTire Display or supported by the OEM dash, displays the alert in the cab of the tractor.
- C) **SmarTire Display** - Real-time tire pressure and temperature information is available to the driver on demand via the SmarTire™ display. If the system detects a tire problem, the display will alert the driver to the condition so corrective action can be taken.
- D) **Tire Sensor** - The tire sensor measures internal tire pressure and temperature every 12 seconds and transmits data every three to five minutes. If the system detects a pressure change of +/- 3 PSI or greater, it breaks its regular schedule and transmits data immediately. Each tire sensor is mounted in a break away cradle so that in the event of in-field damage, the sensor remains unbroken and the cradle can be replaced allowing the sensor to be reused.
- E) **Optional Trailer Lamp** - When a tire problem occurs on a connected trailer, the trailer lamp will indicate it to the driver. The lamp illuminates at the first sign of trouble, as well as flashes to indicate the type of problem found during power up.

Sensor Product Compatibility Matrix

Part Number Update

Bulletin No: PNU-248

Effective Date: 03/14/2019





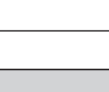
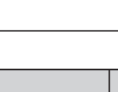
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Page: 1 of 1



Subject: New Bendix™ SmarTire® TPMS Part Numbers

Now available from Bendix CVS are new Bendix™ SmarTire® TPMS (Tire Pressure Monitoring System) Black Series sensor service replacement components. To identify the correct replacement, select the Gold or Black Series replacement table below.

Gold Series Replacement

Obsolete Gold Series Sensor		Description	Replacement Black Series Sensor		
OE & Service New Part No.	Image		Service New Part No.	Image	For Use With Bendix® ECU Part No.
<i>Gold Series (produced 2007–2018) - For servicing Bendix SmarTire TPMS Gold Series sensors. Take care to ensure you obtain the correct version of the new sensor as the communications protocol is different. Refer to the part number printed on the sensor being replaced to ensure the correct part number is selected. To confirm compatibility, refer to the Bendix® ECU (Electronic Control Unit) part number.</i>					
201.0009 (201.0009N)		SmarTire Black Series sensor replaces existing Gold Series sensor. Contains sensor/cradle assembly only. <u>Does not</u> include a strap.	K141469		200.0184 200.0189 200.0213 200.0216 200.0219 200.0220 201.0012
115.0009 (115.0009N)		SmarTire Black Series sensor replaces existing Gold Series sensor kits. Contains sensor and strap for 22.5" rims.	K141475		201.0013.V00 201.0013.V01 201.0014.V00 201.0014.V01
115.0010 (115.0010N)		SmarTire Black Series sensor replaces existing Gold Series sensor kits. Contains sensor and strap for 24.5" rims.	K141477		201.0022 201.0025

Black Series Replacement

Service New Part No.	Image	OE Part No.	Description	For Use With Bendix ECU Part No.
<i>Black Series (produced 9-2018 to current) - For servicing Black Series sensors. The part numbers shown in this table <u>cannot</u> be used to service the Bendix SmarTire TPMS Gold Series sensors. The Black Series sensors are designed to be compatible with new versions of the same. To ensure compatibility, refer to the Bendix ECU (Electronic Control Unit) part number.</i>				
K141467		K141466	SmarTire Black Series sensor replaces Black Series sensors. Contains sensor/cradle assembly only. <u>Does not</u> include a strap.	200.0223 200.0224 200.0225
K141471		K141470	SmarTire Black Series sensor replaces Black Series sensors. Contains sensor and strap for 22.5" rims.	200.0229 200.0240 200.0300
K141473		K141472	SmarTire Black Series sensor replaces Black Series sensors. Contains sensor and strap for 24.5" rims.	201.0032
K158040	–	K131302	Sensor cradle replacement for Black Series.	–

CAUTION: Use of the incorrect sensor will lead to a sensor fault, resulting in data from the sensor not being received by the Bendix ECU. If using a tool to learn the new sensor, the system will not accept the incorrect sensor type. However, if programming the ID directly into the ECU—via Bendix® ACom® software—the ID code will be accepted, but the sensor transmissions will not be recognized by the ECU and, after a period of time, the system will issue a sensor fault.

Bendix announces the availability of new SmarTire TPMS (Tire Pressure Monitoring System). See the table below for the details on which ECU is compatible with which sensor types. Please note, the new sensor is backwards compatible with the existing sensors it is replacing but care needs to be taken to ensure you order the correct version of the new sensor and new ECU as the communications protocol is different.

ECU Product Compatibility Matrix

ECU part numbers	Sensor All Part Number	New Sensor All Part Number	Obsolete Sensor OE Part Number	New OE Sensor Part	Description	Old Sensor Picture	New Sensor Picture	External Antenna	Gauge Display
200.0104, 200.0109, 200.0216, 200.0213, 200.0218, 200.0012, 200.0013, 200.0014, 200.0014-002, 200.0014, 200.0014, 200.0022, 200.0024, 200.0029 and 200.0012	201.0000N	K141469	201.0009	K141468	SmartTire Black Series Sensor - Replaces existing Gold Series Sensors. Contains sensor/valve assembly only. Does not include a strap.				
	115.0000N	K141470	115.0009	K141474	SmartTire Black Series Sensor - Replaces existing Gold Series Sensor K14. Contains sensor and strap for 22.5" tires.				
	115.0010N	K141477	115.0010	K141476	SmartTire Black Series Sensor - Replaces existing Gold Series Sensor K14. Contains sensor and strap for 24.5" tires.				
200.0224, 200.0225, 200.0223, 200.0229, 200.0240, 200.0300, 200.0022		K141467		K141466	SmartTire Black Series Sensor. Contains sensor/valve assembly only. Does not include a strap.				
		K141471		K141470	SmartTire Black Series Sensor. Contains sensor and strap for 22.5" tires.				
		K141473		K141472	SmartTire Black Series Sensor. Contains sensor and strap for 24.5" tires.				
K13000, K13020			201.0000 115.0009 115.0010	K141462, K141467 K141470, K141471 K141472, K141473 K141466, K141468 K141474, K141475 K141476, K141477					
			K141466, K141467 K141470, K141471 K141472, K141473						
			K141466, K141468 K141474, K141475 K141476, K141477						
K123716, K130257				K141466, K141467 K141470, K141471 K141472, K141473					
			K141466, K141468 K141474, K141475 K141476, K141477						

The Pressure Temperature Relationship

WHY IS IT IMPORTANT? 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**.

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 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 recommended inflation values provided by vehicle manufacturers, fleet maintenance personnel or 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.

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.

Cold Inflation Pressure (CIP)

The chart below illustrates the equivalent inflation values for a series of cold inflation pressures 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.

Note: The Figure 1 is to be used as a guide only. Always refer to the tire or vehicle manufacturer’s recommendations for minimum cold inflation pressures.

Pressure / Temperature Correlation Chart:
High Pressure Range

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

Figure 1

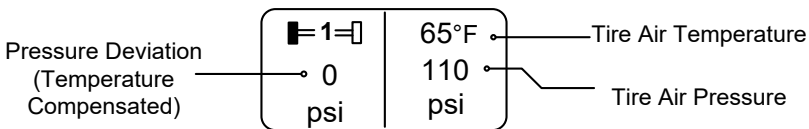
SmarTire™ TPMS Temperature Compensation

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).

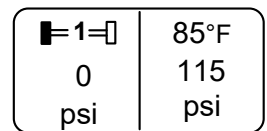
When checked using a handheld gauge or a tire monitoring system that does not measure operating temperature, an under-inflated tire can appear to be normal. When equipped with **SmarTire™ TPMS tire sensors mounted inside the tire measure both tire pressure and temperature in order to provide “Temperature Compensated” pressure deviation values and alerts.** The **Deviation Value** represents the amount of over or under inflation based on the tire's current temperature. This value can be used to warn the driver of an under-inflated tire even if that tire's actual contained air pressure is at or above its CIP. This value is also useful when maintaining the tire as it represents how much air should be added or removed from the tire to bring it to the desired pressure, which the system calculates based on the programmed CIP value and the tire's current temperature.

The advantages of temperature compensation are even more dramatic when a tire has a slow leak. 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. 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.

To further illustrate this concept, on the SmarTire display you may see that the pressure is above the CIP, but due to the temperature of the tire, the pressure is actually low or high depending on the Deviation value. The image below shows a tire with a CIP value of 110 PSI at ambient temperature. This is a properly aired tire and therefore the deviation value displayed is zero.



As the vehicle is driven and the tires warm up, the pressure measured will change due to this natural increase in the temperature. The Pressure Deviation value compensates for this change in temperature and displays a zero value for a properly air tired.



Now consider an example where the tire is low. Again, due to this natural increase in pressure due to temperature as the tire warms up, the actual air pressure of the tire may appear to be correct because it is at 110 PSI which is the correct CIP, but in reality due to the increased temperature of the tire, the pressure is actually 5 PSI low. The image to the right shows what would be shown on the display. The pressure deviation value would indicate the amount of under inflation based on the temperature compensated value as described above. In this case, the Deviation Value is shown as - 5, meaning the tire is 5 psi low and should be inflated to 115 PSI. If this value were +5, the tire would be 5 PSI high for this temperature.

■ 1 ■	85°F
- 5 psi	110 psi

The Pressure Deviation value is a useful tool in maintaining tire pressures as it takes the guess work out of inflating tires, simply add the amount of air indicated until this value is 0 and the tires will be properly inflated!

Understanding the SmarTire TPMS Display

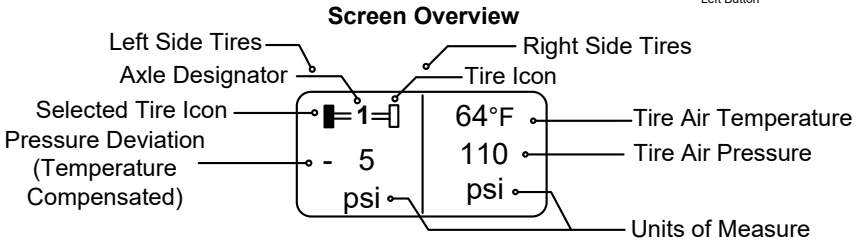
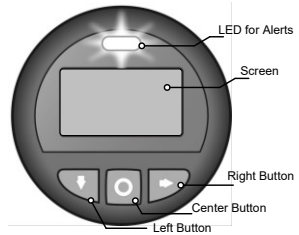


Note: The following directions apply if vehicle is equipped with SmarTire display. For OEM please refer to the vehicle manual for further instructions.

SCREEN OVERVIEW

SmarTire displays tire status information by axle using various axle screens. Each axle programmed in the display has a corresponding axle screen.

The image below outlines the different screen elements.



Axle Designator – This number represents the location of the axle you are viewing. The first axle on your vehicle starting at the front of the vehicle is “Axle 1”, the next axle is “Axle 2” and so forth. If you are towing a trailer equipped with SmarTire Trailer-Link TPMS, the trailer axles will be shown after the last axle on the tractor and will be displayed with a “T” in front of the number. For example the first axle on a trailer will be shown as “T1”. Just as with the tractor axles, the axles are numbered from the front of the trailer to the back so the second axle is displayed as “T2”.

Tire Icon – This Icon indicates the axle’s tire configuration. One box on each side indicate single tires, two boxes on each side indicate dual tires.

Selected Tire Icon – This

indicates which tire is selected and which tire data is actively displayed on the screen (Pressure, Temperature and Deviation Value).

Axle Designation, Tire and Selected Tire Legend			
	1	Single Tire Axle	Left Tire Selected
	2	Dual Tire Axle	Right Outer Dual Selected
	2	Sensor Missing	
	2	Dual Tire Imbalance	
	T1	Trailer Axle	

Pressure Deviation Value - The pressure deviation value indicates the amount of under or over inflation. When the indicator has a + 5, it means 5 PSI of air should be removed and when it's - 5, it means 5 PSI of air should be added.

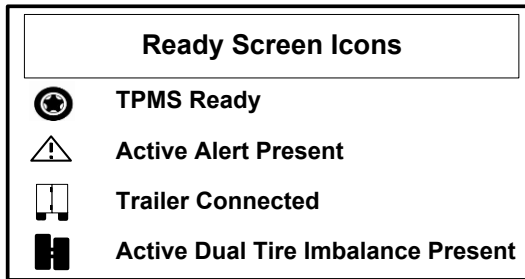
Tire Air Temperature – This value indicates the current internal air temperature for the selected tire. Temperature may be shown in degrees F or C.

Tire Air Pressure – This value indicates the current pressure value for the selected tire. This is the actual pressure value and is not temperature compensated.

Units of Measure – Indicates the units the pressure value is displayed in. This may be set to PSI, BAR, or kPa.

SCREEN ICONS

READY SCREEN ICONS







Wheel Icon – This icon appears on the TPMS Ready Screen and indicates the system is ready and active.

Triangle – When shown on the TPMS Ready Screen, this icon indicates an active alert is present.

Trailer – This icon indicates a Trailer-Link™ TPMS system is wirelessly connected to the tractor ECU and indicates trailer data is available.

Dual Tire – This icon appears on the TPMS ready screen and indicates an active dual tire imbalance is present. This icon is also shown on the individual axle screen and indicates the wheel end where the imbalance is present.

ALERT ICONS

Alert Icons	
	First Level Alert (FAL)
	Second Level Pressure Alert (SAL)
	High Temperature Alert
	Sensor Low Battery

Triangle –When displayed on the individual axle screen, this icon indicates a First Level Alert (FAL) is active.

Tire with Exclamation Point - This icon is shown on the individual axle screen and indicates a Second Level Alert (SAL)/Critical Low Pressure Alert is active.

Thermometer – This icon is shown on the individual axle screen and indicates a High Temperature Alert is active.

Low Battery – This icon is shown on the individual axle screen and indicates a sensor with a low battery.

For additional Display information including operation and programming, please refer to SmarTire Next GEN ECU Operator's Manual BW8002.

Display Power, Mounting, and Environmental Requirements

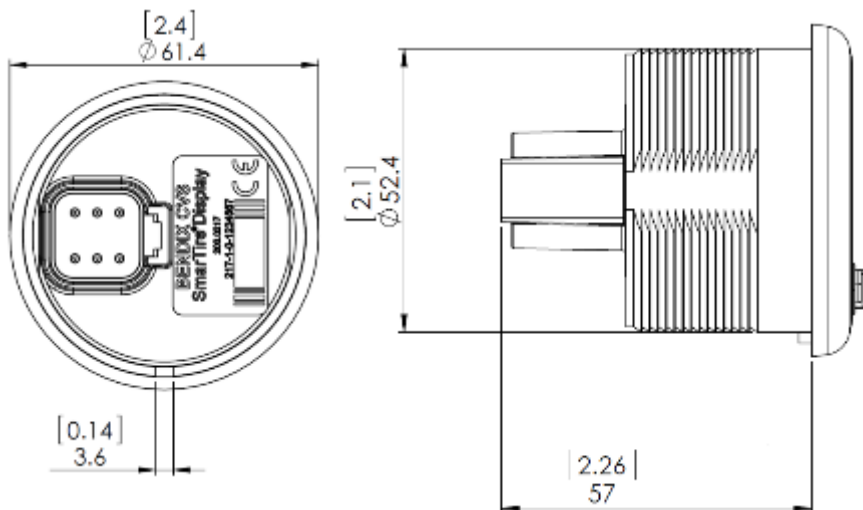
- Operating voltage range
 - Display: 8.5 – 36V
 - Buzzer: Open connector output
 - DIM: 10% to 100% of supply voltage
- Typical current consumption (with no external loads) 30mA
- Connector type: 1062-16-0122-Deutsch
- Lock: W6S-Deutsch
- Plugs: DT06-6S-Deutsch
- SAE J1939 protocol compliant, 250 kbps



- Overall depth of unit (back of bezel to the end of the connector): 2.26 in (57 mm).
- Bezel thickness: 0.30 in (7.5 mm).
- Bezel diameter: 2.4 in (61.4 mm).
- Panel Cutout: Std. SAE 2 in. gauge panel cutout.
- Mounting nut thickness: 0.7 in (18 mm).

Display Dimension

Note: Dimensions in Brackets [] are in imperial units (inch)



J1939-AT-DISPLAY

P5 PIN #	CKT	P3/P4 PIN #	WIRE CLR
4	CAN-H	A	YEL
5	CAN-L	B	GRN
--	Not used	C	--
1	VIN	--	RED
6	BUZ	--	WHT-BUZ
3	DIM	--	WHT-ILUM
2	GND	--	BLK

Understanding the Next Gen SmarTire TPMS ECU

Tire Pressure and Temperature Sensing Functionalities

The Next Gen TPMS ECU receives tire pressure and temperature information from Bendix Wheel mounted tire sensors via a wireless signal. Upon reception of new data from transmitters, Next Gen TPMS ECU searches for abnormal conditions. If it detects an alarm based on the thresholds and limits, programmed to Next Gen TPMS ECU, it communicates these alarm conditions via DM1 messages.



Startup Sequence

The Next Gen TPMS ECU performs a hardware unit initialization upon startup. It then checks for setup errors. The setup error occurs when there are no sensors programmed into Next Gen TPMS ECU's memory. This is a system level error. Then previously captured alarm conditions related to each configured sensor are checked. These alarms may be one or any of the following:

- Second level low pressure
- High temperature
- First level low pressure
- First level high pressure
- Sensor fault (when the sensor is not communicating)
- Sensor Low battery
- Sensor Internal error

Bendix recommends the following ECU Alert default settings:

- FAL (First Alert Level) 15% Temperature Compensation Enable
- SAL (Second Alert Level) 20% Temperature Compensation Disabled
- High Temperature Alert 185F° / 85°C
- Sensor Autolearn – No

If any alarm conditions exist, it will communicate these alarm conditions via DM1 messages. After initial checks are complete Next Gen TPMS ECU constantly repeats the following tasks:

- Monitoring RF communications for sensor data
- Decoding Sensor data detecting alarm conditions
- Relaying data and alarm conditions on the J1939 bus

- Recording alarms and configuration changes to Event Recorder
- Keeping track of the device's total running time since the ignition was turned on

Supported Sensor Types

Next Gen TPMS ECU is to support GenIV sensor, and GenIIB sensor. However, AM (After Market) ECU variant supports GenIV sensor, GenIIB sensor and GenIIA sensor.

Need picture and part number of sensor types here!

Key on Status Feature

The Next Gen TPMS ECU supports key on TPMS information. On previous Bendix TPMS systems, when the vehicle was turned off, all power was removed from the ECU and all wheel information was lost. When the vehicle was turned on, the TPMS system would not have current information on all monitored wheels. It was necessary to wait up to 5 minutes for all the sensors to transmit the current information.

Next Gen TPMS ECU features a low power mode. It enters low power mode when it detects that the ignition line has been turned off. In low power mode the Next Gen TPMS ECU draws very little current. It will periodically wake up and receive current sensor information from its monitored wheel locations and stores this information internally. When the ignition line turns back on, the current sensor information stored is immediately available to Next Gen TPMS ECU. Current tire information is then available on the J1939 bus and any fault information is presented to the driver immediately.

Although, the low power mode current is very low, the active mode current when it tries to receive tire sensor signals via RF is substantially higher. To prevent the ECU from draining the vehicle battery the ECU wakes up at specific intervals which are programmable by the end user.

The Next Gen TPMS ECU monitors the vehicle's battery voltage and if it drops too low the Next Gen TPMS ECU will completely turned off until the vehicle is started again. The voltage that causes this shutdown is programmable along with the intervals between detection cycles.

The default maximum voltage is 24 volts and minimum voltage is 12 volts

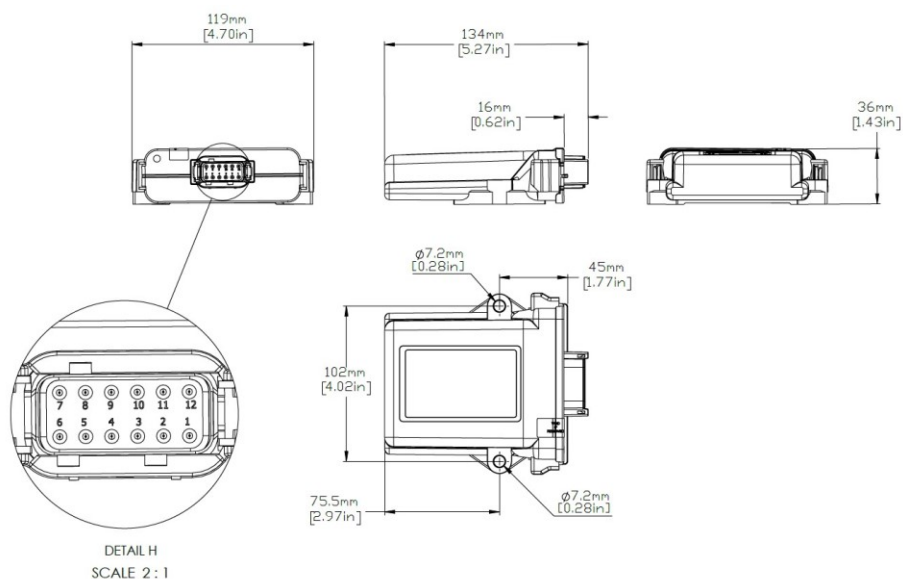
There are three sleep stages each with a programmable time that the ECU must be off before it checks for tire pressure information from sensors. The first two stages contain a cycle count on how often they become active before the next interval is entered.

For example, if Next Gen TPMS ECU was configured as follows

Stage	Repetition Count	Sleep Interval
Stage 1	4	2 hours
Stage 2	3	12 hours
Stage 3	NA	48 hours

In this configuration the ECU will wake up every 2 hours and retrieve all the TPMS information from the wheel sensors. It will repeat this 4 times after which it will wake up at 12 hours intervals. After the 12 hour wake up has occurred 3 times it will then wake up every 48 hours.

Dimensions and pin out:



Signal	IGN	IN 3	CAN-L	HS1-LP1	GND	RS232-RX
Pin	7	8	9	10	11	12
Pin	6	5	4	3	2	1
Signal	V IN	HS1-SP1	CAN-H	BRAKE LIGHT	IN 4	RS232-TX

Figure 2

Connector Pin Descriptions:

Vin: This is the main power connection. It should be connected to constant vehicle voltage. Operating voltage range 9.0 – 36V. Typical current consumption operating (with no external loads): 36ma @ 12V supply. Typical current consumption ignition off: 43ua @ 12V supply.

IGN: This should be connected to a switched power source. When the vehicle is turned off, this line should be disconnected from power. This will cause the ECU to enter low power mode. The two high side drivers are powered from the IGN pin. Therefore, if incandescent lamps are connected to the high side drivers, the IGN pin must be able to source enough current to drive these lamps. The high side drives have a max current consumption of 1 amp.

CAN-H and CAN-L: SAE J1939 protocol compliant, 250, 500 kbps (based on variant)

RS232-RX and RS232-TX: RS-232 level diagnostic port. This port defaults to 57,600k baud.

HS1-LP1: This output is used to drive a warning lamp during TPMS related faults. It is a high side driver capable of sourcing 1Amp current. This output has monitoring capabilities to detect short to power, short to ground, and open circuit detection. Any fault detected on this line will generate a DTC trouble code on the J1939 bus

HS1-SP1: This is an auxiliary high side output. It currently is not used. It also is capable of sourcing 1Amp current. This output has monitoring capabilities to detect short to power, short to ground, and open circuit detection. Any fault detected on this line will generate a DTC trouble code on the J1939 bus

Brake Light: This is an input signal normally connected to the vehicle brake light. This is used to aid in the connection synchronization with the Bendix Trailer system. Normally when the ECU is installed on a truck, this line can be left disconnected as the Brake signal is received over the J1939bus. However, when the ECU is installed on a trailer this input should be connected to the trailers brake light wiring.

IN3 and IN4: These are auxiliary inputs and are currently not used by the TPMS system.

Truck and Trailer Location of Next Gen SmartTire TPMS ECU

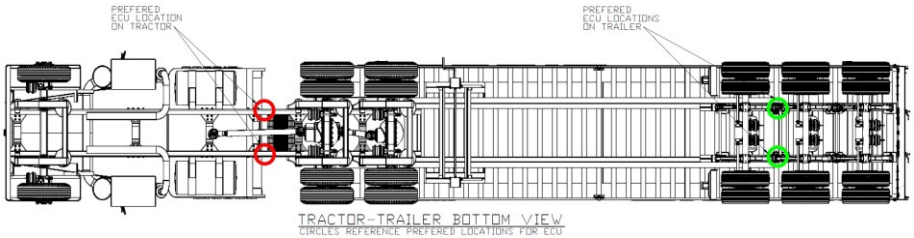


Figure 3 – Red circles indicate preferred tractor TPMS ECU locations – Green circles indicate preferred trailer TPMS ECU locations

Important ECU Placement Considerations:

- TPMS ECU houses a wireless receiver and internal antenna. Its signal reception performance changes at different mounting positions/orientations. Orient the receiver so that it has a clear line of sight to the tires. It cannot be shielded by any metal on the underside of the vehicle.
- Preferred mounting orientation is horizontal with the connector side facing toward the rear of the vehicle, label side up, center line along the vehicle. It is recommended to follow the guidelines provided by Bendix Engineering. For additional mounting information, please refer to Document Z093608
- The ECU must be properly secured via bolt-on faceplate, heavy duty straps, or custom mount.

Caution! Do not apply any form of coating/paint/label on the ECU unit to prevent signal reception issues. In addition, DO NOT:

- Do not place the ECU near large concentrations of metal e.g. steel I-beam support, axle differentials, etc.
- Do not place ECU near large concentrations of electrical wiring, generators, amplifiers or pre-existing transceiver assemblies (e.g. GPS/Telematics systems, CB Radio, Data Loggers, etc).
- Do not place the ECU on or near moving parts such as steering linkages, drive shafts, or suspension assemblies.

Caution: Make sure all power input lines (Ignition and battery) are fitted with 5 Amp fuses for proper protection of the components. If the ECU,

Gauge, and Diagnostics port are hooked to the same power line, only one 5 Amp fuse is required before the line branches to each part.

Radio Frequency Specifications

Receiver Specifications

Frequency 433.92 MHz

Modulation type: OOK

300 KHZ Band Width

Sensitivity (OOK) at 433.92 MHz

- Internal or External Antenna: -110 dBm

Transmitter Specifications

Frequency 433.92 MHz

Modulation type: OOK

Transmitter output power

- Internal Antenna (Single ECU only): < 1 mW
- External Antenna (ECU with TNC): < 1 mW

Use of PIFA Antenna with Aftermarket Next Gen TPMS ECU

In some cases, due to vehicle layout, size, number of axles, armor, underbody protection, etc. it is necessary to install a secondary PIFA antenna for optimal TPMS sensor reception. Please refer to Appendix A for steps on how to properly install the secondary antenna.

Understanding the Next Gen SmarTire TPMS Signal Lamp (optional)

The Next Gen TPMS ECU can be equipped with a signal lamp for trailer or in-cab use if necessary, to provide flash patterns in case of alerts and diagnostics.

By default, the Lamp is disabled to display. Once the Lamp is enabled (in ACom), the Lamp may be in one of the following states:

- Off
- On solid
- Flashing with a pattern
- Flashing at 2Hz



During ECU startup or wake up from sleep mode, the Lamp outputs perform a bulb check and will be on for 3 seconds. It will then turn off for 1.5 seconds. After the 1.5 seconds of off time, a flashing pattern will repeat for one minute. The flashing 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.

After the one minute flashing interval the Lamp will be off for all alarms except those in stated in the “While Driving” column of the table below. If there are multiple alarms active, the alarm with the highest priority will be displayed.

Alarms	Priority	Lamp	
		One Minute Flashing	While Driving
NO ALARMS	0	Off	Off
SECOND LEVEL LOW PRESSURE (SAL)	6	Pattern flashing code: 4	ON
SAL CLEARED	0	Off	Off
FIRST LEVEL HIGH PRESSURE (FAL_H)	4	Pattern flashing code: 2	Off
FIRST LEVEL LOW PRESSURE (FAL_L)	3	Pattern flashing code: 2	Off
FAL CLEARED	0	Off	Off
HIGH TEMPERATURE	7	Pattern flashing code: 5	ON
HIGH TEMPERATURE CLEARED	0	Off	Off
SENSOR FAULT SET	2	Pattern flashing code: 1	Off
SENSOR FAULT CLEARED	0	Off	Off
SET UP FAULT	5	Pattern flashing code: 3	Off
SET UP FAULT CLEARED	0	Off	Off

System Troubleshooting

TROUBLESHOOTING TABLE

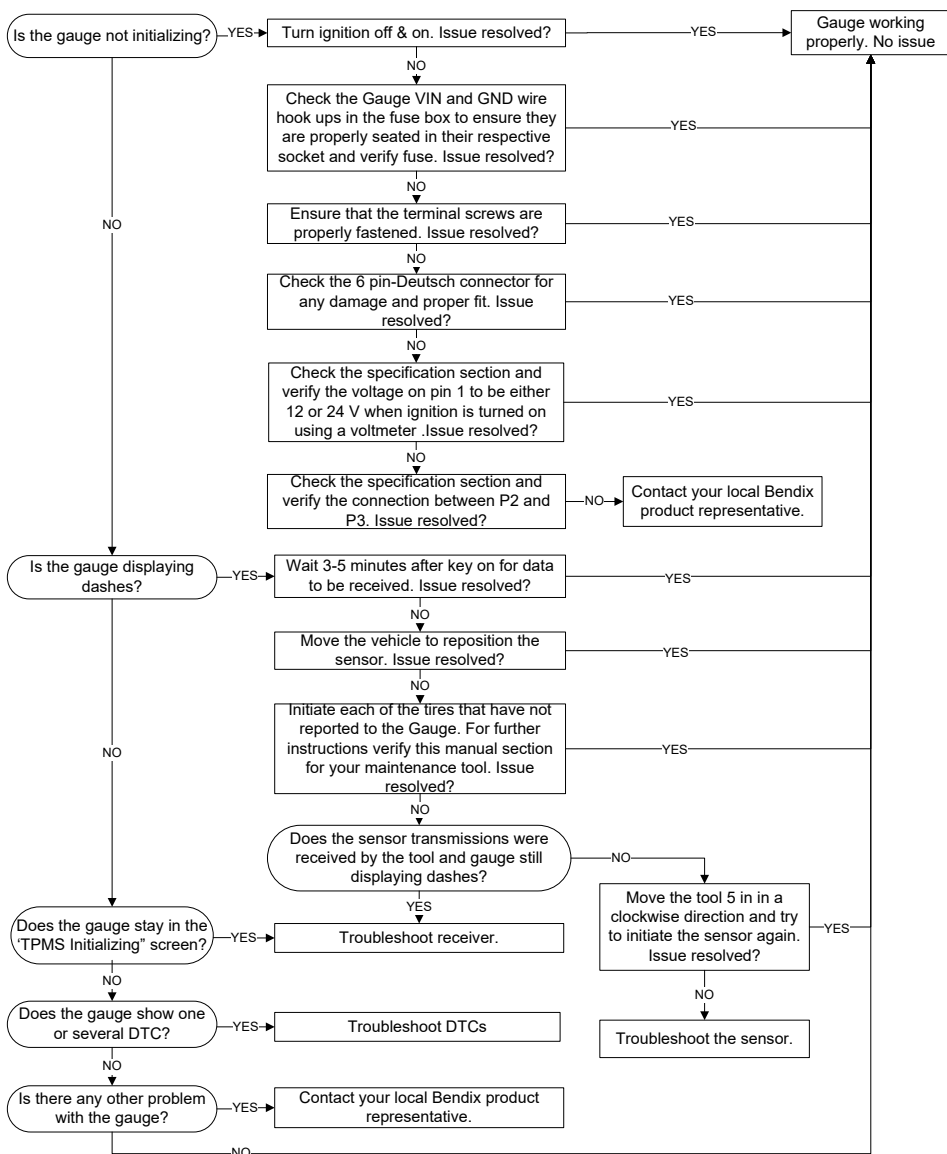
This chart indicates appropriate actions for the most common TPMS issues. For additional information on gauge alerts, DTCs, ECU diagnostics, TPMS Sensor response, and Antenna troubleshooting see sections A to F.

Problem	Gauge is not initializing	Dashes displayed on gauge	Gauge shows a Pressure or Temperature Alert	Tire pressure is not being updated after pressure correction (greater than 3PSI)	Tire pressure value is decreasing over time	Gauge shows Sensor Fault Alert	Several tires are reporting sensor Diagnostic Trouble Codes
Turn ignition off & on	X						
Wait 5 minutes after key on for data to be received		X				X	X
Signal may not be received, move the vehicle to reposition the sensor		X		X		X	X
Go to the section "Gauge Startup, Actions and Alerts" and follow the indications for the specific alert			X				X
The tire is exhibiting a slow leak. Take appropriate steps to have the tire inspected for any damage or leaks.					X		
Follow the indications on Sensor Fault Troubleshooting						X	
Report to maintenance	X	X		X	X	X	X

ORDER OF TROUBLESHOOTING



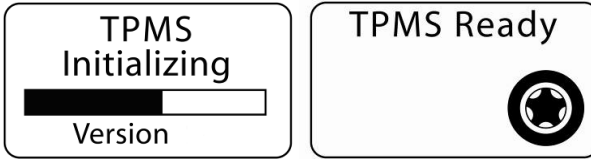
Section A: Troubleshooting the gauge



Section A – Troubleshooting Gauge Readouts

Common Issues:

At start-up, if the TPMS display does not initialize and does not show the TPMS READY Screen (see below), this typically indicates that the system is not finding the J1939 Bus data link and not communication with the SmarTire ECU.



If so, test the following:

1. Check for loose connections to the data link wiring.
2. Ensure the SmarTire ECU is powered.
3. Ensure the SmarTire ECU connector is properly seated.
4. Use PC diagnostics to check the J1939 Bus.
5. Ensure that the TPMS ECU and display are not connected on different sides of a CAN gateway. If so, the gateway may not be allowing messages to pass between the SmarTire ECU and display. To correct this issue, the ECU and SmarTire display will need to be connected to the same J1939 Bus branch.

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

A: Check the CIP value (Cold Inflation Pressure base line) in the Gauge to make sure it matches that of the intended inflation value for the tire in question. A CIP is set for each given axle. To do so, please refer to the SmarTire™ system manual or use ACom to verify the CIP as well as the inflation table Figure 1 in System Features. 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.

Q: Pressure readings at a tire location do not change on the gauge when air is added, or removed, to correct tire pressure value.

A: Wait for a new transmission to be received or initiate a transmission with the SmarTire™ LF Tool, or SmarTire™ Hand Tool.

Transmitters will transmit data every 3 to 5 minutes. In cases where no transmission was received from the specific tire, move the Hand Tool, or LF Tool 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 E.

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: Tire / Wheel assemblies may have been relocated on the vehicle without the ECU being updated. Cycle power to the ECU, initiate a transmission from that tire location and note the location where pressure is registered on the display. Correct the preprogrammed tire locations as necessary using the Gauge or ACom and Hand Tool or LF Tool.

The sensor location correction can be made using the Gauge and LF Tool or SmarTire™ Maintenance Tool by going through the single tire learn process for each affected tire location. In the case of a sensor location mismatch, at least 2 tire positions need to be corrected.

Section A continued – Gauge Startup, Actions and Alerts

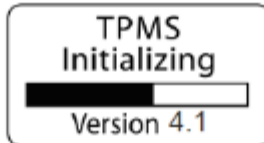
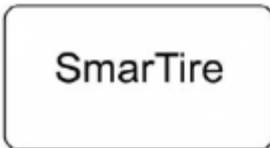


NOTE: It is normal for the TPMS system to take up to 5 minutes for all tire sensor data to be received and displayed to the driver as the sensors transmit data every 3-5 minutes. In some instances the tire could be in a position where the sensor signal could be blocked and not seen by the receiver. In this case, after 35 minutes of not seeing a sensor, the system will issue a Sensor Fault Alert for that

location. If a Sensor Fault Alert occurs and does not clear after the vehicle is driven, please report this condition to your maintenance personnel as it may indicate a problem with the system.

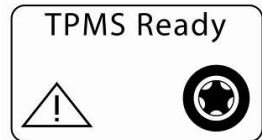
Getting Started

When the vehicle's ignition switch is turned on, the SmarTire™ system will power up and the display will indicate that the system is initializing. After a short period, the display will show the "TPMS Ready" screen indicating that the system is ready to receive tire data from the sensors.



If an Alert icon (triangle with an exclamation mark) is displayed and the LED light is illuminated when the TPMS Ready screen is shown, this is an indication that an active alert has been detected and should be investigated / corrected before the vehicle is

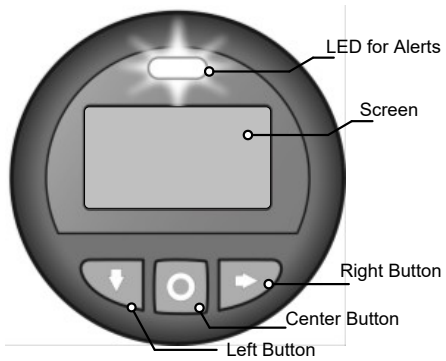
driven. Bendix recommends that tire pressure and temperature conditions always be corrected before a vehicle is driven to ensure the safety of the driver, vehicle and cargo.



How to Check Tire Pressure, Temperature and Pressure Deviation

You can navigate through the SmarTire display by following the steps below.

1. Starting from the TPMS Ready Screen, press the right button once and the display will show the first axle screen starting at the front of the vehicle with left tire position highlighted. The pressure, temperature and pressure deviation values are then displayed for the selected tire.



2. To move to the next wheel on the axle, press the right button once. Each time the right button is pushed, the next tire in sequence will be selected and its information displayed. Pressing the right button when the last tire on the axle is selected will re-select the first tire on that axle.
3. To move to the next axle on the vehicle, press the left button once. Once again, pressing the right button will scroll the display to the next tire on that axle. Each time the left button is pressed the display will show the next axle on the vehicle. When the left button is pressed from the last axle screen, the first axle will once again be shown. To exit back to the "TPMS Ready" screen, press the center button once.

Alerts & Warnings



IMPORTANT: It is important to always react to the alerts and warnings provided by the SmarTire TPMS (Tire Pressure Monitoring System). It is recommended that tire conditions always be corrected as soon as possible and before the vehicle is driven. Once the pressure is restored or the temperature is reduced, the alert will automatically turn off.

PRESSURE AND TEMPERATURE ALERTS

FIRST ALERT LEVEL (FAL): PRESSURE DEVIATION ALERT

Indicated By: Flashing LED Light, Alert Triangle, + or - Deviation Value.



This alert is intended to give you an early indication that the tire is low/high. This alert is typically based on the temperature compensated value (if temperature compensation is selected for the alert). If so, you may see that the pressure is above the CIP, but due to the temperature of the tire, the pressure is actually low or high depending on the deviation value showed.

The axle designator and the highlighted wheel position indicate the position of the tire that is under- or over-inflated. The pressure deviation value indicates the amount of under (-), or over (+) inflation that should be corrected.

To acknowledge this alert and return to the TPMS ready screen, press any button. The LED will stop flashing but remain illuminated until the problem is corrected. To correct the problem, add or remove air to the affected tire as indicated by the deviation value. When the deviation value is 0 the tire is properly inflated.

SECOND ALERT LEVEL (SAL): CRITICAL LOW PRESSURE ALERT

Indicated By: Flashing LED Light, Alert Tire Icon, Deviation Value.



This alert is intended to give you an indication that the tire is critically low and needs **immediate attention to prevent a critical failure.**

The axle designator and the highlighted wheel position indicates the tire that is under inflated. The pressure deviation value indicates the amount of under- or over-inflation.

IMPORTANT: This alert indicates that the tire is critically underinflated and should be addressed immediately.

To acknowledge this alert and return to the TPMS ready screen, press any button. The LED will stop flashing but remain illuminated until the problem is corrected. To correct the problem add air to the affected tire as indicated by the deviation value. When the deviation value is 0 the tire is properly inflated.

HIGH TEMPERATURE ALERT

Indicated by: Flashing LED Light, Alert Thermometer, Temperature Value.



This alert is intended to give you an indication that the temperature of the air in the tire has reached a critical point and should be investigated.

The axle designator and the highlighted wheel position indicates the tire that is critically hot. High tire temperatures are typically caused by under-inflation and the system will usually provide a pressure alert in advance of a temperature alert. If triggered on its own, this alert can be an indication of an alternative

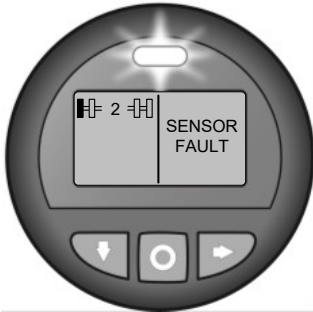
problem, such as a dragging brake or a bearing failure.

To acknowledge this alert and return to the TPMS ready screen, press any button. The LED will stop flashing but remain illuminated until the problem is corrected. To correct the problem investigate what is causing the elevated temperature.

OTHER ALERTS AND WARNINGS

SENSOR FAULT ALERT

Indicated by: Flashing LED Light, Sensor Fault Alert Message

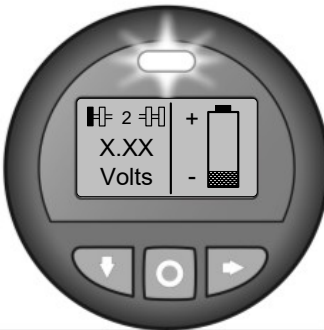


A Sensor Fault Alert will be issued for any programmed sensor for which the Receiver/ECU has not received data for a predetermined time. Typically, this time is set to 35 minutes. Sensor Fault Alerts are self-clearing as soon as data is received from the given sensor. Prolonged Sensor Fault Alerts can be an indicator of damaged or missing sensors and should be addressed to ensure the system is functioning properly. **Tires with active Sensor Faults cannot provide**

pressure and temperature alerts. Sensor Fault Alerts may also appear when the vehicle is stopped and idling for an extended period of time. Due to the nature of RF signals, the reception from a tire sensor may be blocked when the vehicle is stationary. **If the fault occurs and does not clear after the vehicle is driven, please report this condition to maintenance personnel as it may indicate there is a damaged or missing sensor.**

LOW SENSOR BATTERY ALERT

Indicated by: Flashing LED Light, Battery Alert Icon



Typically, a low sensor battery alert will be triggered when the battery reaches 2.1 Volts and below. This alert indicates that the sensor should be replaced as soon as possible before the battery dies and the sensor stops transmitting. If not replaced, once a sensor stops transmitting, after 35 minutes a Sensor Fault will be activated for that tire location and prevent pressure and temperature alerts from being issued for the tire location.

NO TIRES PROGRAMMED ALERT

Indicated by: Flashing LED Light, No Tires Programed Alert Message



This message will be displayed after the startup sequence if the Receiver/ECU has not been programmed with any axle and wheel configurations. **In this case the system is not functioning and no pressure or temperature alerts will be displayed.** This should be reported to maintenance to be corrected as soon as possible.

Setting Gauge Programming Restrictions

ACom 6.12 and higher allows the user to set programming restrictions for the Bendix Gauge. By enabling these restrictions, the function is removed from the display menu and no longer available for use until the restriction is disabled in ACom. This is a useful feature to keep drivers and unauthorized personnel from making changes to the TPMS system via the gauge setup menu.

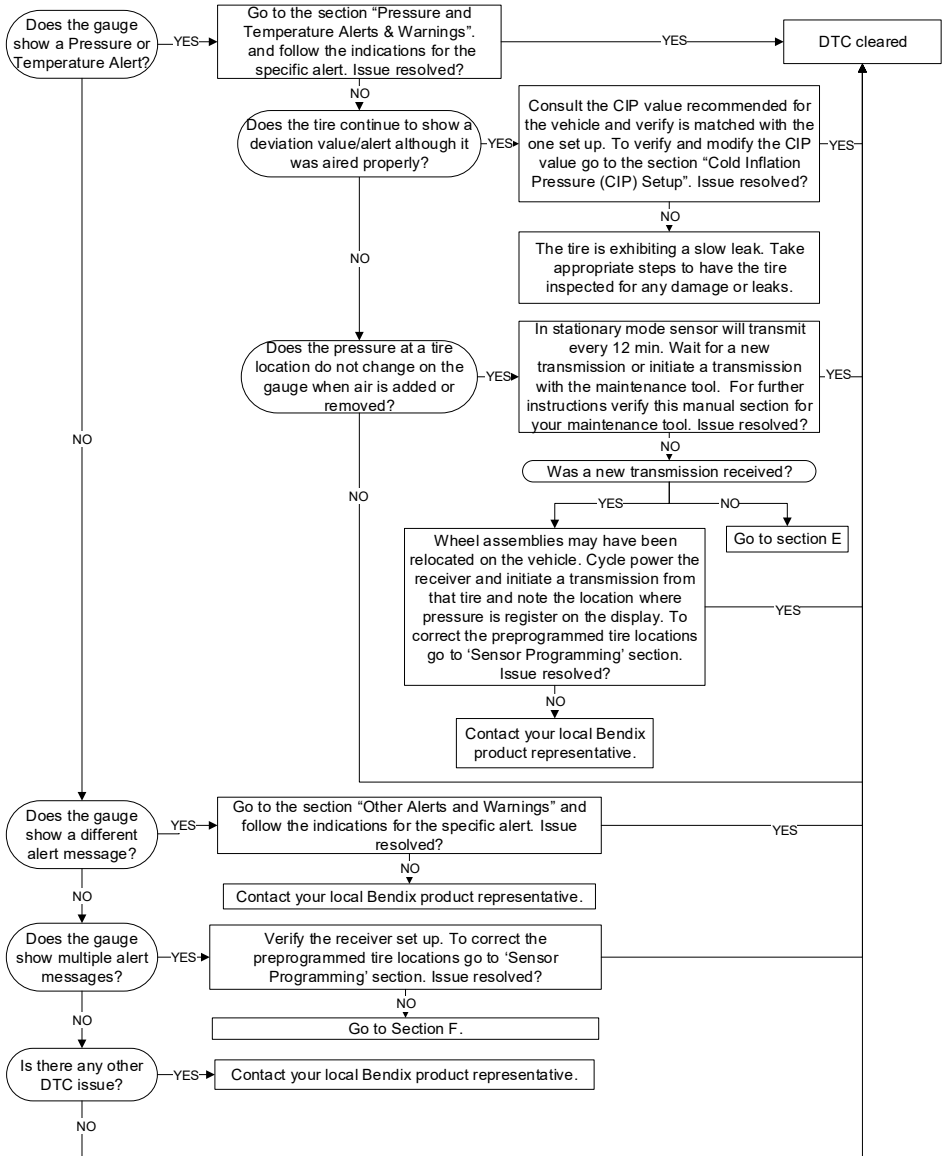
Each of the following programmable features can independently be turned on or off:

- Changing Units
- Vehicle Parameters
- Axle Parameters
- Password Entry
- Learn Sensor
- Profile Definition
- Altitude Adjust

For access to this feature, use the TPMS application in ACom and Select the 'System Parameters' tab, then go to header tab 'Programming Restriction' and make the necessary selections.

Section B – Troubleshooting DTCs

Section B: Troubleshooting DTCs



Section B Continued – Using ACom for DTC Readouts

Using ACom Diagnostics software version 6.12 or later, Diagnostic Trouble Codes can be retrieved directly from the ECU. In the ACom TPMS application, select the DTC button to open the current, active Diagnostic Trouble Code table. This table will display the details of any active codes and can be used to check that codes are cleared after troubleshooting has been completed. An optional Report can also be generated for Bendix Engineering, if additional assistance is needed.

The following parameters are provided in the DTC table:

SPN - Suspect Parameter Number, MSB of the DTC

FMI - Failure Mode Identifier, LSB of the DTC (5 bits)

Description - A short description of the error

Value – The value that lead to the fault

Unit – What unit of measure is used

Position – Which wheel position does this DTC refer to

Active - Indicates if the error is currently active

Vehicle Response to the Addition of the TPMS ECU on the J1939 Network

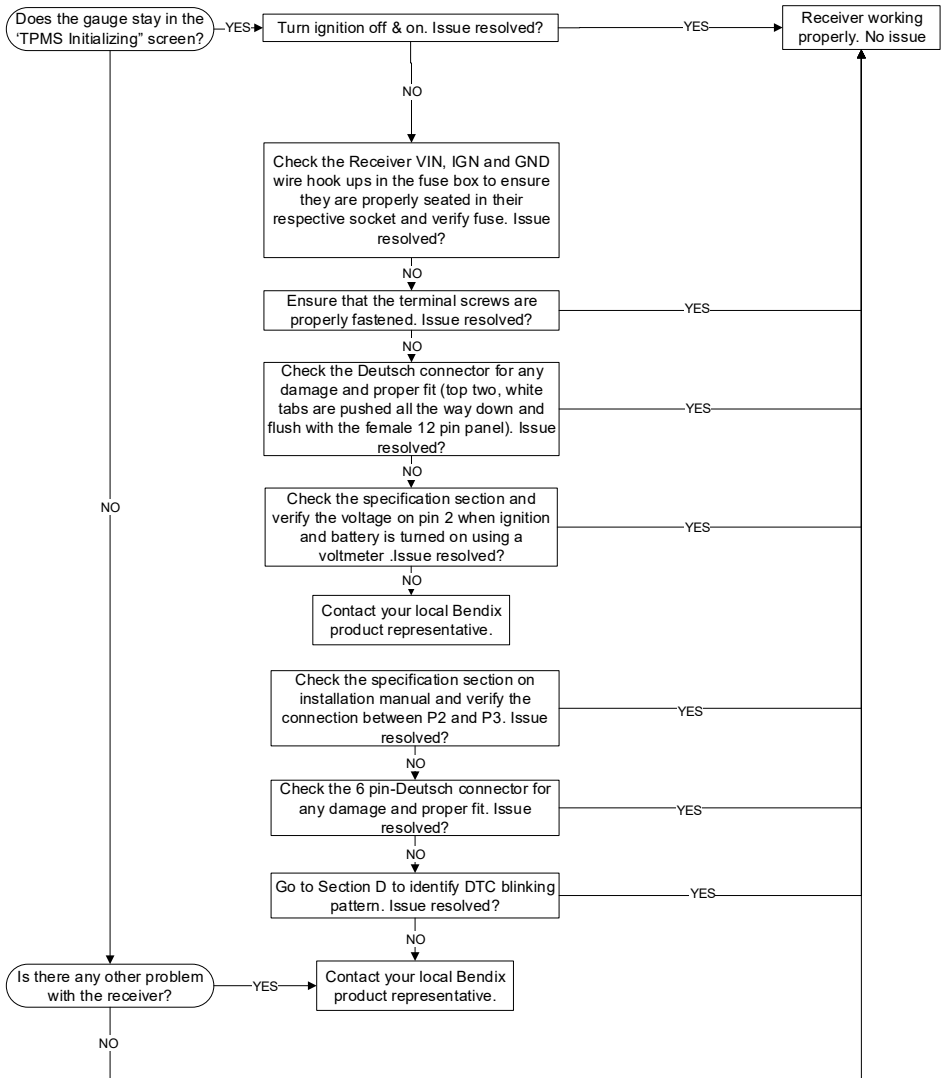
After installation, the vehicle instrument cluster will now respond to any alerts that the TPMS receiver sends out. The DM1 alert messages are a common SAE standard and therefore the AMBER or RED warning triangles in the instrument cluster will illuminate. The table below shows which lamps will illuminate with which alert.

Alarm	SPN	FMI Value	Lamp Status
Ambient Sensor Fault	108 (0x6C)	12	Amber
Second level low pressure	241 (0xF1)	1	Red
First level high pressure	241 (0xF1)	16	Amber
First level low pressure	241 (0xF1)	18	Amber
High temperature	242 (0xF2)	16	Amber
Sensor fault (No Signal Received)	929 (0x3A1)	12	Amber
EEPROM Fault (either reset or copy between primary and backup)	929 (0x3A1)	31	None
Sensor battery low alert	1697 (0x6A1)	4	Amber

It has been noted with certain OEM installs that the Amber Caution and Red Stop lamps will now come on for all alerts. Additionally, if there is an audible warning for either light, this will also be enabled. When these lamps are illuminated, the driver should refer to the SmarTire 2"round display or the integrated vehicle display to identify the issue and respond accordingly.

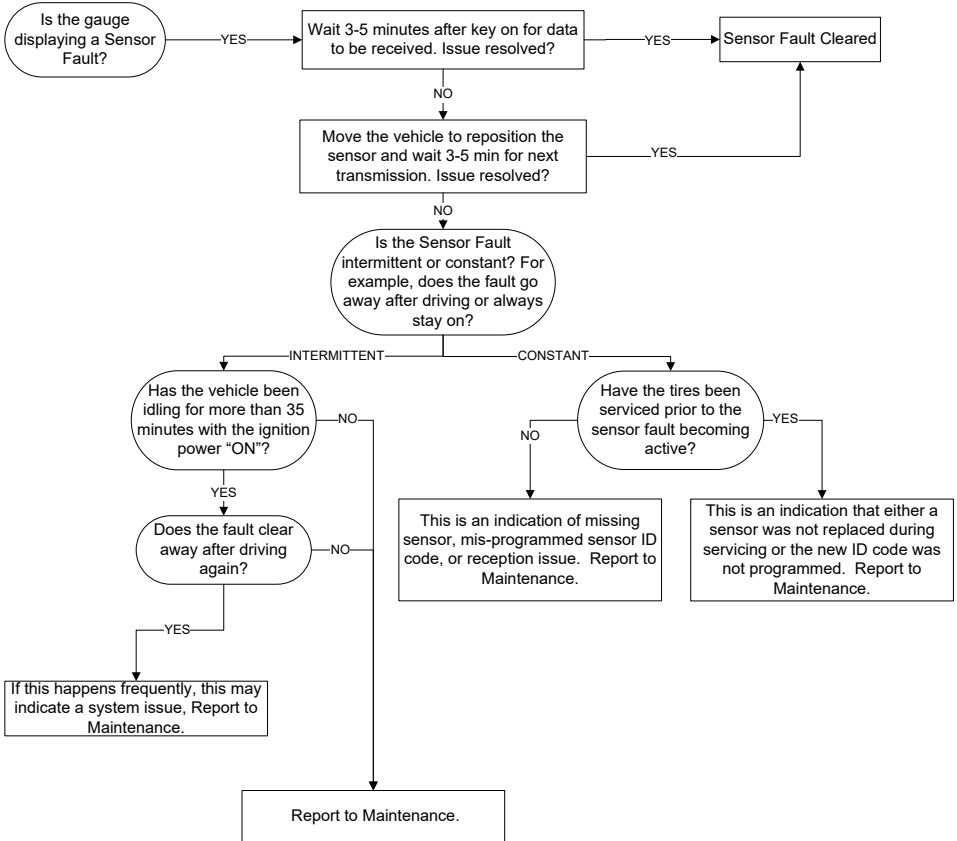
Section C – Troubleshooting the Receiver/ECU

Section C: Troubleshooting the receiver

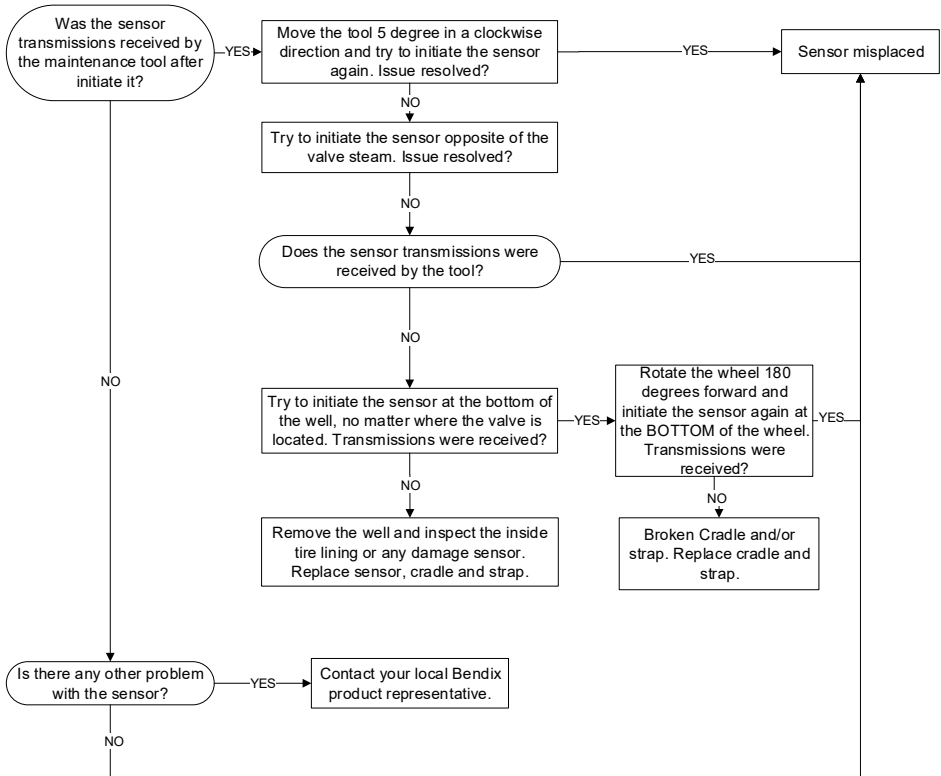


Section D&E – Troubleshooting the Sensor

Driver Sensor Fault Troubleshooting



Section E: Troubleshooting the sensor



Using ACom to change Sensor Fault Time Programming in the TPMS ECU

For certain system applications, it may be necessary to change the default sensor fault time programming in the TPMS ECU. This can be accomplished in the TPMS module of ACom under the System Parameters tab, subsection 'Sensor Fault Time Programming'.

Applications may include long vehicle idle times, low speed operation, specialty equipment, non-standard tire configurations, heavy duty machinery, military vehicles, and excess false alert elimination.

Sensor Fault Time Programming

Sensor Fault Time Programming tab on the System Parameters page will allow the user to maintain and configure the time intervals between sensor faults. Each of the following programmable features can independently be set/ changed/ turned on or off:

- Sensor fault interval when vehicle is moving
- Disable Sensor faults when vehicle is stationary
- Sensor fault interval when vehicle is stationary
- Disable Ambient Sensor faults
- Ambient Sensor fault interval

Intervals are set in number of Minutes. Fault reporting can be enabled or disabled for stationary vehicles as well as for optional Ambient sensors that measure atmospheric temperature and pressure for use in significant altitude change applications. For more information, see the TPMS help section of ACom.

Appendix A – Using a Secondary PIFA Antenna for improved TPMS Sensor Reception

General Location of the Secondary Antenna

The Aftermarket Next Gen ECU has an external, auxiliary antenna port in addition to its internal antenna allowing it to support a secondary Bendix PIFA antenna. Mount the second antenna at the rear axle. If there are two axles at the rear of the vehicle, mount the antenna between the two axles or just beyond the rear differential.

Guidelines and Best Practices

Antenna Placement

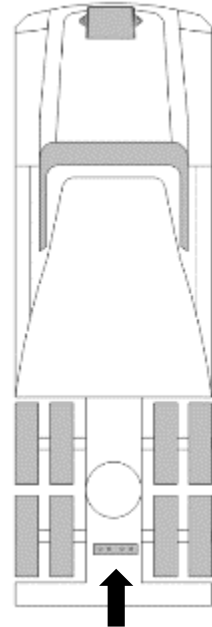
DO:

The antenna(s) require a clear line of- sight to the tires. Mount the antenna to the underside of the vehicle in a location that is open and unobstructed with as much ground clearance as possible. Antenna should be installed as close to the axle as possible along the vehicle's centerline and should be attached to frame rails, sub frames, brackets, or face plates as required.

Choose a location in which the antenna does not contact the vehicle. The antenna should only contact the vehicle at its mounting base.

Choose a location for the antenna that is within the allowable cable length for connection to the Wireless Gateway Receiver (e.g. 40 ft antenna cable will not reach a straight-line point 40 ft away on a given vehicle).

Orient the antenna so that it has clear line of sight to the tires. If it is pointed downward, a minimum of 1.5 feet (46 cm) is required between the tip of the antenna and the ground. If it is pointed upward, it cannot be shielded by any metal on the underside of the vehicle.



Antenna

When placing an antenna near or on suspension supports, make sure there is enough room to allow the suspension to travel to its full compression.

DO NOT:

Do not place the antenna near large concentrations of metal e.g. steel I-beam support, axle differentials, etc.

Do not place antenna near large concentrations of electrical wiring, generators, amplifiers or pre-existing transceiver assemblies (e.g. GPS/Telematics systems, CB Radio, Data Loggers, etc).

Do not place the antenna on or near moving parts such as steering linkages, drive shafts, or suspension assemblies.

Antenna Cable Routing

DO:

Choose the proper cable length for the given antenna location.

Protect the cable from heat and sharp edges e.g. keep adequate distance from exhaust pipes and avoid potential chafing on sharp metal.

Route the cable along existing cable tree on the underside of vehicle (i.e. along I-beams for tractor trailer).

Provide some slack in the cable (a few feet depending on vehicle application) at each end point of cable / antenna to allow for slight repositioning if needed.

Route “head first” for hole-through when passing cable through frame holes and tight access points (route small cable end first always).

Apply cable ties every 2 feet (61 cm) to ensure secure attachment – avoid chafing by not over tightening.

Secure antenna cable with cable ties on both sides of the connectors for extensions, splitters and antenna mounts.

Make sure all connections are properly locked and secured.

For TNC Hex heads, apply 17 to 23 inch-pounds of torque.

DO NOT:

Do not strain the cable and its connectors if length barely reaches – choose a longer cable (chassis-flex during driving may tear an already tight cable).

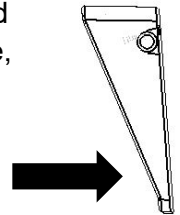
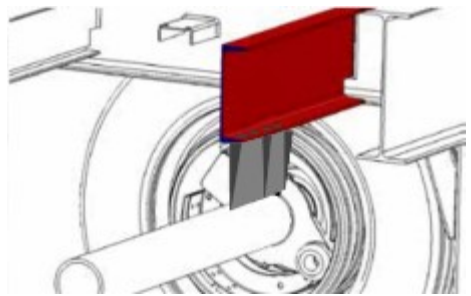
Do not subject the cable to sharp bends – try to allow for a natural cable path flow.

Do not route over or under moving parts like steering linkages and shock mounts.

Do not over-tighten cable ties.

Antenna Installation

1. Remove antenna from plastic bag and uncoil 2ft TNC connector cable.
2. Following antenna placement guidelines, locate a spot along the vehicle underside which will leave a minimum of 3 inches of clearance from any metal object on all sides of the antenna (except the mounting side).
3. Use a minimum of 2 of the 4 integrated mounting holes to bolt the antenna to the frame or a bracket. Do NOT enlarge the mounting holes in the antenna body! Use only matching bolts and washers. Do NOT over tighten the bolts as this may cause damage to the integrated bolt hole sleeves.
4. Mount the antenna with flat side facing the forward driving direction along the centerline of the vehicle, close to the axles for best results. This will also prevent the trapping of mud and debris in the base angle of the antenna. Arrow points to forward driving direction.



5. Tape up the TNC connectors on both ends of the antenna cable extension to prevent any dirt or grease from entering the connector during the cable routing process. Ensure that the proper end is routed from the TPMS ECU to the antenna. Run the cable the length of the vehicle and connect it to the external antenna port on the AM Next Gen TPMS ECU. Following antenna cable routing guidelines secure the antenna cable along the chassis with cable ties and allow for additional cable flex at bend points. Be sure that the cables avoid moving parts and excessive heat.

6. Test the sensor signal strength using the TPMS Diagnostics Panel within ACom 6.12 or higher as follows:
 - 1) Click on "Start Signal Test" button on the window to initiate a signal test sequence.
 - 2) Once pressed the RSSI (Received Signal Strength Indicator in dbm) for each wheel location will change to --- and the tire graphics will change to black.
 - 3) ACom will then place the ECU into test mode.
 - 4) When in this mode; the ECU will transmit a proprietary message each time a sensor transmission is received.
 - 5) The message contains the sensor ID code, Wheel Position and RSSI value.
 - 6) Each time one of these proprietary messages is received, ACom calculates the new, average RSSI value for the wheel location in question, then displays this average RSSI value next to the wheel location,
 - 7) Steps 3 to 6 will repeat unless the user clicks on the "End Signal Test" button to stop testing the signal strength.
 - 8) Click on "End Signal Test" button to stop signal test sequence.

Note: Clicking on "Start Test With Log" will allow the user to log all received transmissions to a file that can be sent to Bendix engineering for analysis.

The wheel locations change color depending on their signal strength. The color of the wheel will be set on the following RSSI values:

- Green if the RSSI value is greater than -95dbm (good strength)
- Yellow if the RSSI value is between -99dbm and -95dbm (medium strength)
- Red if the RSSI is lower than 99dbm (poor reception)

Refer to the ACom color Legend for additional states.

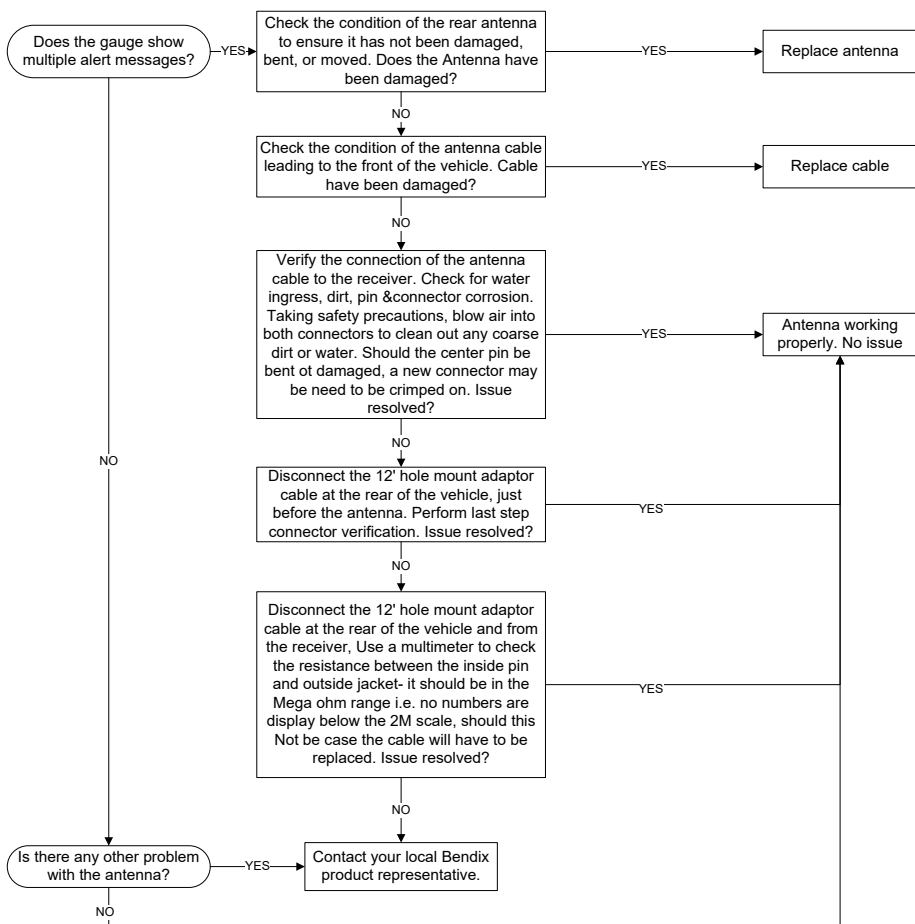
Note: Repeat the RSSI Test two more times, after moving the vehicle 3ft each time in the same direction to allow the sensors to transmit from different locations inside the tire relative to the antenna.

Antenna Placement Evaluation

If the majority of the wheel locations return a medium signal during the ACom RSSI test, consider relocating the PIFA antenna to a more favorable spot with less metal occlusion – the key is good line of sight from the PIFA to each wheel end.

Should any of the locations continuously show red RSSI, it is likely those locations will be unable to send their TPMS data during normal operation to the ECU, resulting in sensor faults from those locations after 35min of operation. Log the RSSI tests and consult Bendix Engineering for additional help.

Section F: Troubleshooting the antenna



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.

This device complies with Industry Canada's license-exempt RSSs. Operation is subject to the following two conditions:

- (1) This device may not cause interference; and*
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.*

Cet appareil est conforme aux RSS exempts de licence d'Industrie Canada. L'opération est soumise aux deux conditions suivantes:

- (1) Cet appareil ne doit pas causer d'interférences; et*
- (2) Cet appareil doit accepter toute interférence, y compris les interférences susceptibles de provoquer un fonctionnement indésirable de l'appareil.*

"Este equipamento não tem direito à proteção contra interferência prejudicial e não pode causar interferência em sistemas devidamente autorizados".