Stack TPMS Pro Installation Guide *ST542117-003*

TPMS Pro
Installation Guide

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Loom Wiring

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1. TPMS Pro Configuration Software Set-up

Important – please read.

You must perform the following steps before you can use the TPMS interrogator:

- ***Install PC Configuration software***
- ***Import Pincodes***
- ***Write Pincodes to the Interrogator***
- ***On-car Antenna Installation***
- ***Sensor Installation in wheels.***

Introduction

This chapter will describe the TPMS configuration software and how to use the features in it. This software can be used to configure the TPMS control unit and to monitor the values in real time being measured.

System Requirements

The TPMS configuration software is compatible with the following 32-bit and 64-bit operating systems:

- Microsoft® Windows 7
- Microsoft® Windows Vista SP2
- Microsoft® Windows XP SP3

Software Installation

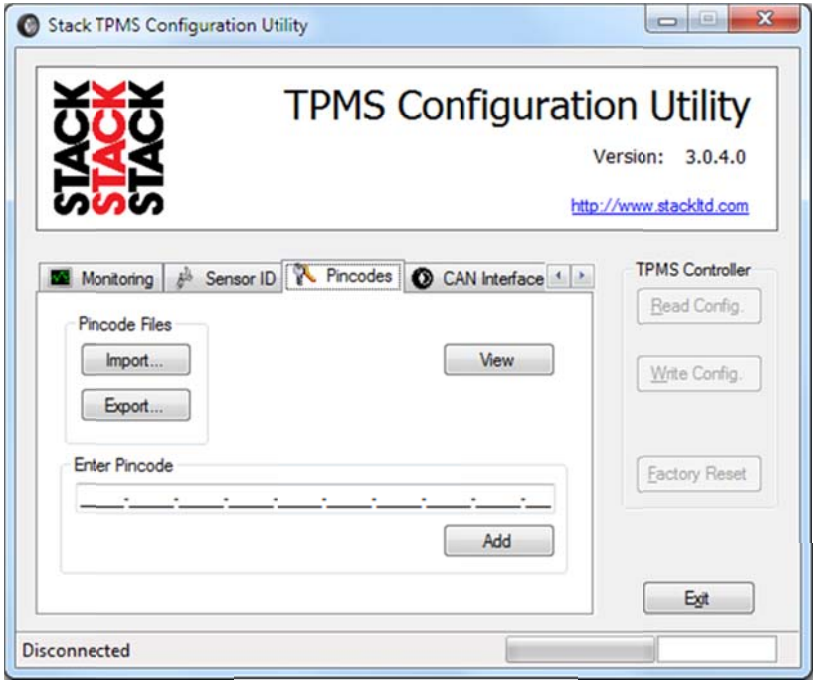
Double click on the TPMS Configuration Utility icon on the desktop or by navigating to Start->All Programs->Stack Limited->TPMS Configuration Utility.

Importing Pincodes

For the interrogator to read pressure and temperature data from a sensor, it **must** be programmed with the sensors that it will be authorised to read. Once a sensor is authorised for use with an interrogator it can be placed on any corner of the car and the interrogator will find and measure it. This is done via a pincode system.

The pincodes must be imported into the PC library first.

Scroll to the Pincodes tab in the configuration software. It can be found after the **Sensor ID** tab and before the **CAN Interface** tab.



Press the **Import** button.

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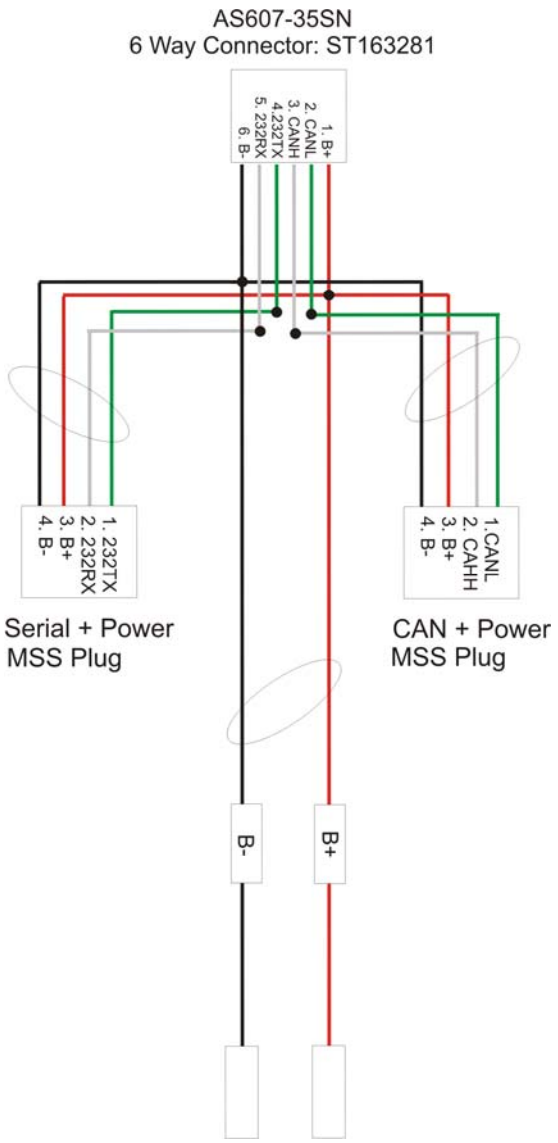
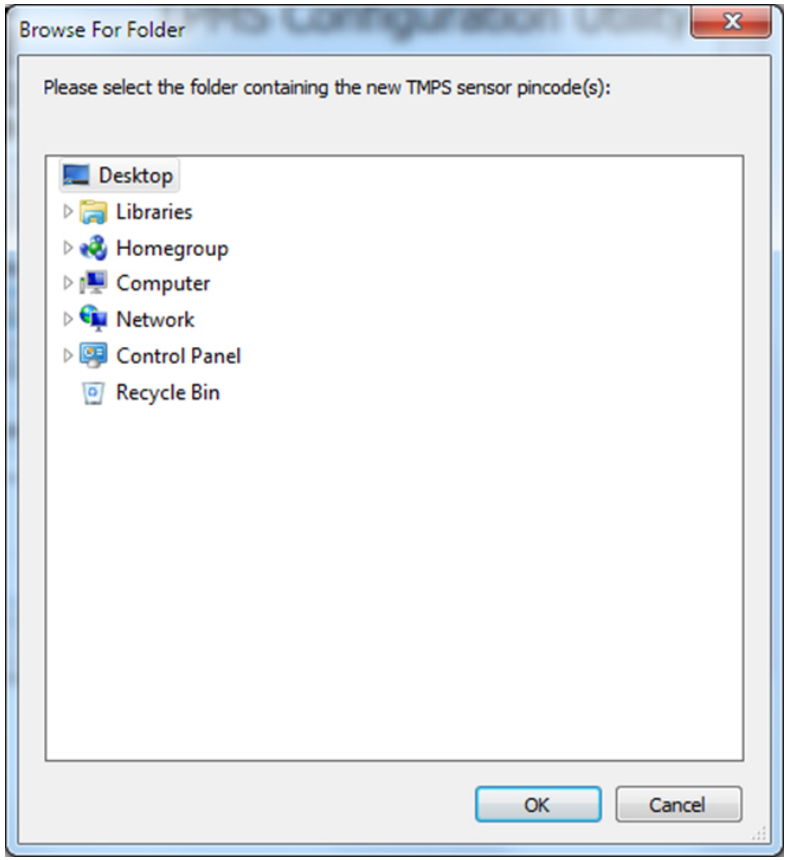
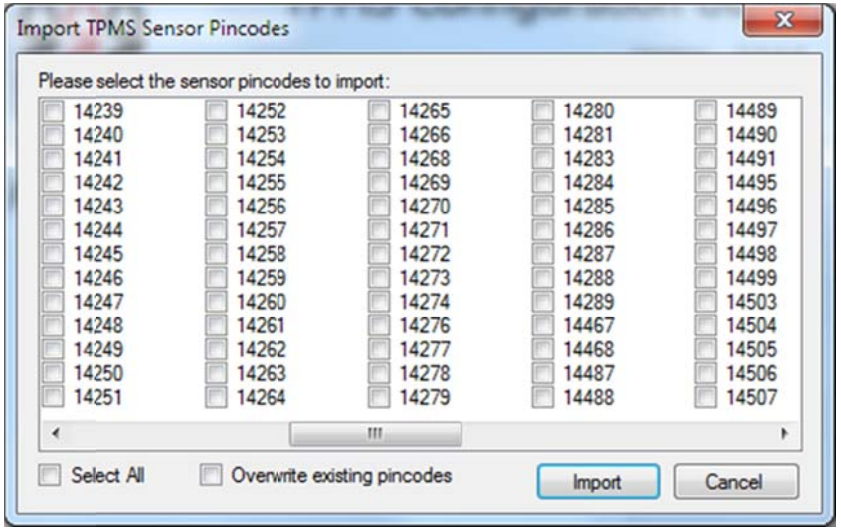
7. Stack TPMS PRO System Loom: ST918111



Now select the folder in which the Pincode files you have are to be found and press OK.



Now select the Pincodes you wish to import. We would recommend importing all of the Pincodes. You can use the **Select All** button for this.



When you have selected the Pincodes, click **Import**.

6. Interrogator Connector Pin-out Diagram

6-way Connector Pin-Out

The pin-out of the 6-way Connector on the flying lead of the Stack TPMS Pro Interrogator is as follows:

PIN	*FUNCTION*	*CABLE COLOUR*
1	B+	RED
2	CAN-L	BLUE
3	CAN-H	GREEN
4	RS232-TX	YELLOW
5	RS232-RX	WHITE
6	B-	BLACK

4-way CAN Sure-Seal Pin-Out

PIN	*FUNCTION*	*CABLE COLOUR*
1	CAN-L	GREEN
2	CAN-H	WHITE
3	B+	RED
4	B-	BLACK

4-way Serial Sure-Seal Pin-Out

PIN	*FUNCTION*	*CABLE COLOUR*
1	RS232-TX	GREEN
2	RS232-RX	WHITE
3	B+	RED
4	B-	BLACK

Replacement Parts

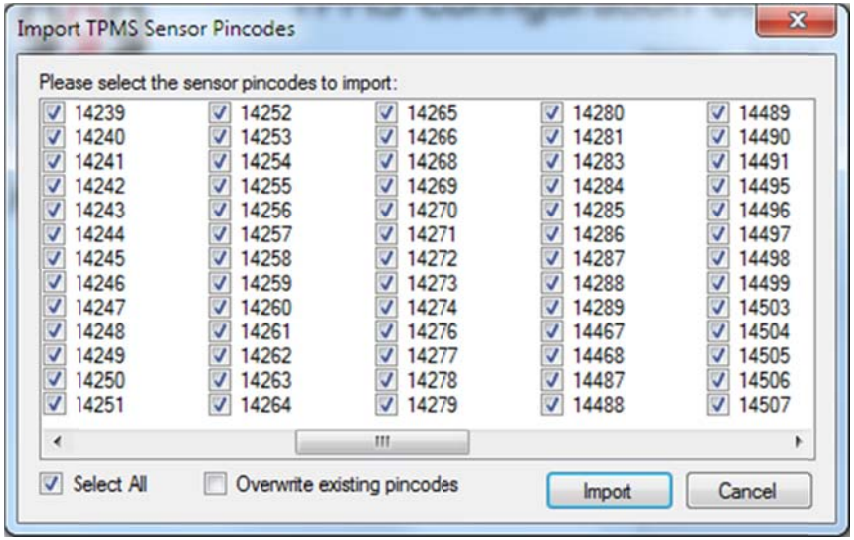
ST581 Mini Sure-SealKit (containing 5 connectors and associated pins) can be supplied by Stack.

5. TPMS Pro Installation Troubleshooting

Issue	*Possible Solution*	*Action Needed*
Low signal strength.	Antenna mounting position incorrect.	Refer to manual.
	SMA connector not done up correctly.	Tighten connectors.

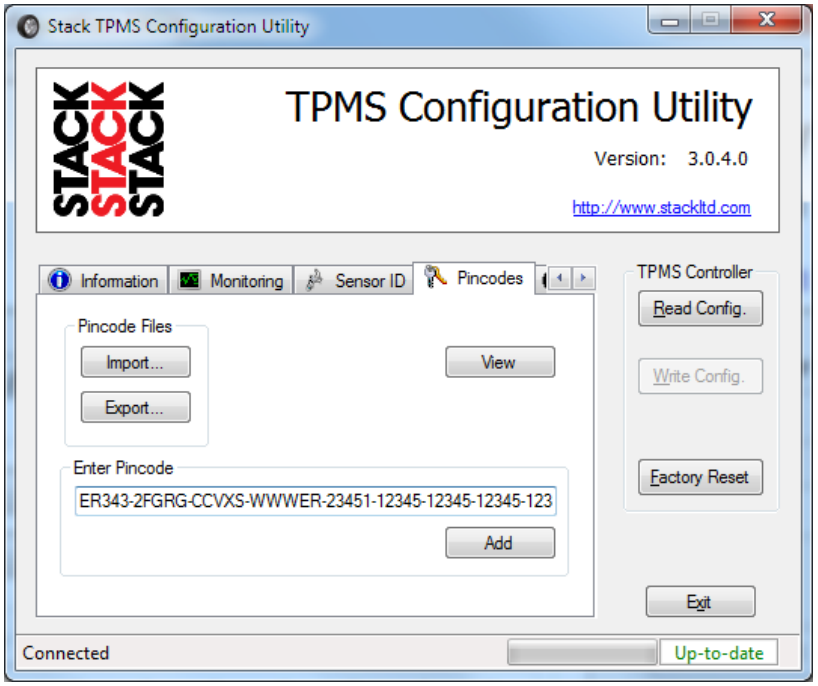
Issue	*Possible Solution*	*Action Needed*
Sensor readings incorrect.	SensorID allocated to wrong corner in interrogator.	Assign sensor to correct corner.
	Sensor is damaged.	Send back?
	Atmospheric pressure compensation set to wrong value	Set correct pressure or set to 1013 for no compensation.

Issue	*Possible Solution*	*Action Needed*
No sensors can be detected.	Sensors not authorised for use in interrogator.	Add sensors.
	Sensor damage	Replace sensors.
	Antenna position bad.	Refer to manual.
	Antenna cables not done up.	Tighten connectors.



The Pincodes will now be added to the sensor library on the PC and will be available to send to the interrogator.

You can add Pincodes manually by typing them into the area at the bottom of the tab marked **Enter Pincode** and clicking **Add**.



To view the Pincodes that you have in the Pincode library on the PC, press the **View** button.

CAN Receive Message Format

The TPMS interrogator can receive CAN messages to control some parameters

	Byte 0	Byte 1	Byte 2	Byte 3	Byte4	Byte 5	Byte6	Byte 7
CAN ID	Car Speed		Atmospheric Pressure (mb)		Spare	Moving Mode	Spare	Moving Flag
0x59F	U16		U16		N/A	U8	N/A	U8

Car Speed:
This is used to detect the car moving state when the Moving mode is set to 2. The units of this are not important as long as when the car is not moving the value is zero.

Atmospheric Pressure:
This is used to compensate for atmospheric pressure changes. The units are mBar.

Note: To enable this function you must enable Use CAN derived atmos. Pressure in the Misc tab of the configuration software.

Moving Flag:
This is the CAN bit that signals the moving state of the car when the Moving Mode is set to 1. Setting this to 1 will indicate the car is moving and setting it to zero will indicate to the interrogator that the car is stationary.

Moving Mode:
This sets the mode that the interrogator uses to determine when to scan for wheel changes and new sensors, i.e. when the car is not moving.

Value	***Moving Mode***
0	*Internal*
1	*CAN Moving Flag*
2	*CAN WSPD*

Note: It is recommended to leave the Interrogator in Internal moving mode.

4. TPMS Pro Control Unit CAN Message Format

Background

This section will describe the CAN message format for the TPMS control unit.

CAN Transmit Message Format (Motorola Format)

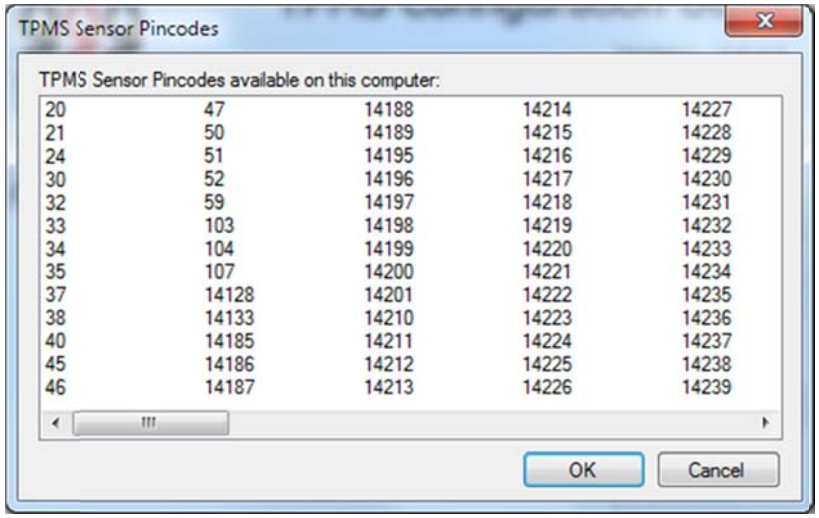
The TPMS control unit outputs the following CAN messages:

			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Corner	**CAN ID***	**Rate (ms)**	**SensorID**		**Pressure (0.001BAR)**		**Temp (0.01DegC)**		**System Status**	
FL	0x5A0	1000	0-65535		e.g 2094 = 2.094bar		e.g 2094 = 20.94DegC		Bit0 = 1 = No Sensor	
FR	0x5A1	1000	0-65535		e.g 2094 = 2.094bar		e.g 2094 = 20.94DegC		Bit0 = 1 = No Sensor	
RL	0x5A2	1000	0-65535		e.g 2094 = 2.094bar		e.g 2094 = 20.94DegC		Bit0 = 1 = No Sensor	
RR	0x5A3	1000	0-65535		e.g 2094 = 2.094bar		e.g 2094 = 20.94DegC		Bit0 = 1 = No Sensor	

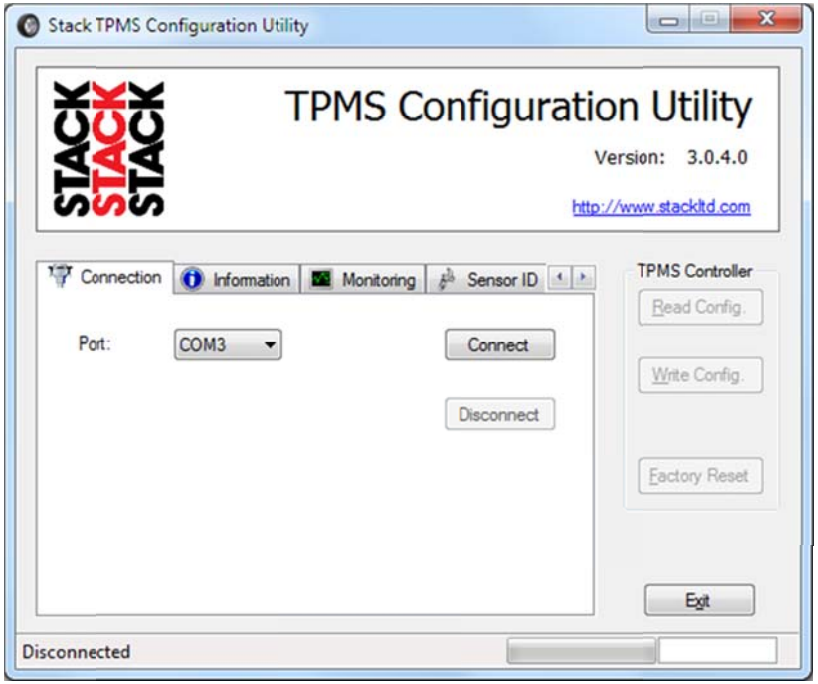
**Factory default settings*

The rate is dependent on the system type being used. It can be 1000ms, 200ms or 100ms (1Hz, 5Hz or 10hz)

The CAN ID's can be changed via the PC configuration software, but the message structure remains the same.



Ensure the Interrogator is plugged in, etc.



Select the COM port you are using to connect to the interrogator unit and press connect.

The Stack TPMS system is designed not to require sensors to be assigned to corners. We recommend that the Interrogator is programmed with all the sensors that you have. This way no matter which sensor is fitted to which wheel the system will be authorised to use that sensor.

To help this process if the PC software detects that there are sensors you have Pincodes for but are not authorised in the interrogator it will display a warning when the connection is made.

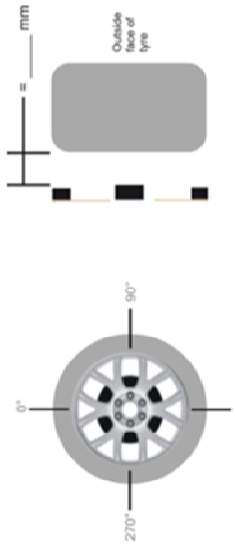
You have the option to **Add All** of the sensors, add some of them or ignore the message.

Car _____

Corner _____

Date _____

Stack TPMS Pro Installation Log



Note distance between sensors and tyre.

Mark sensor positions on the wheel diagram above.

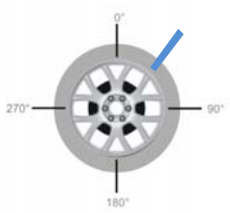
Angle °	Saw Strength %	RFID
0°		
45°		
90°		
135°		
180°		
225°		
270°		
315°		

Example Antenna Installation Log

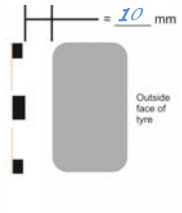
Keeping a hard copy log during antenna installation is a useful way of capturing the data in the field but can also be helpful in aiding a Stack engineer diagnose possible problems with an installation. A sample log may look like this:

Stack TPMS Pro Installation Log

Car *2*
Corner *1*
Date *19-JUL-11*



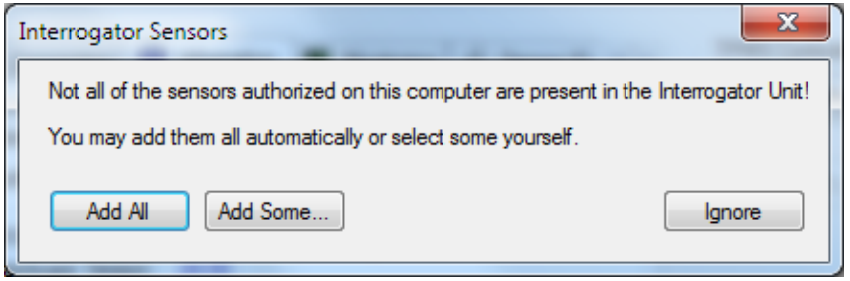
Mark sensor positions on the wheel diagram above.



Mark distance between sensors and tyre.

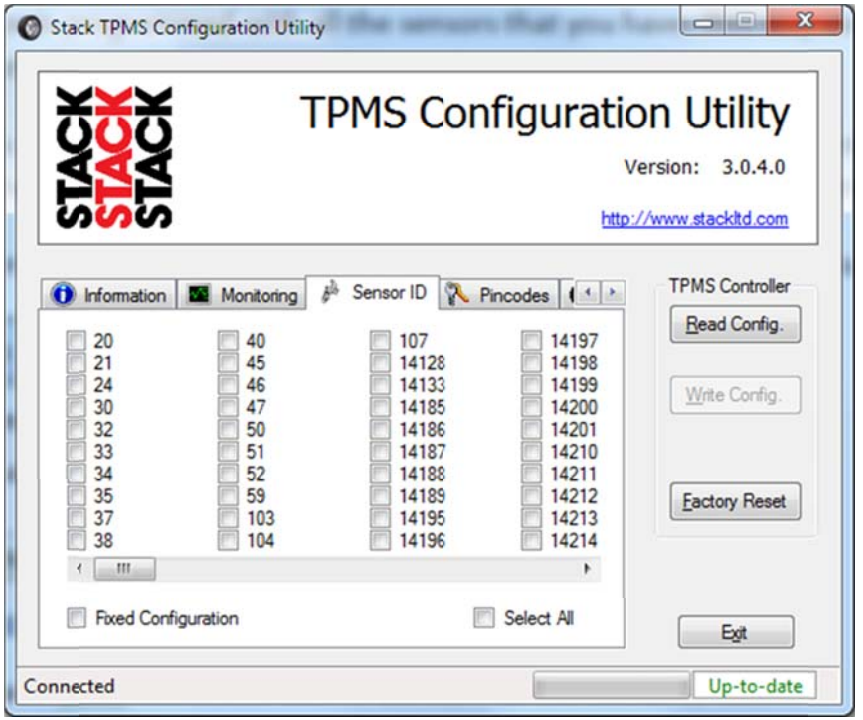
Angle °	Saw Strength %	RFID
0°	*42*	*113*
45°	*39*	*110*
90°	*38*	*105*
135°	*29*	*0*
180°	*0*	*0*
225°	*0*	*0*
270°	*37*	*10*
315°	*39*	*105*

A blank example log is printed overleaf.

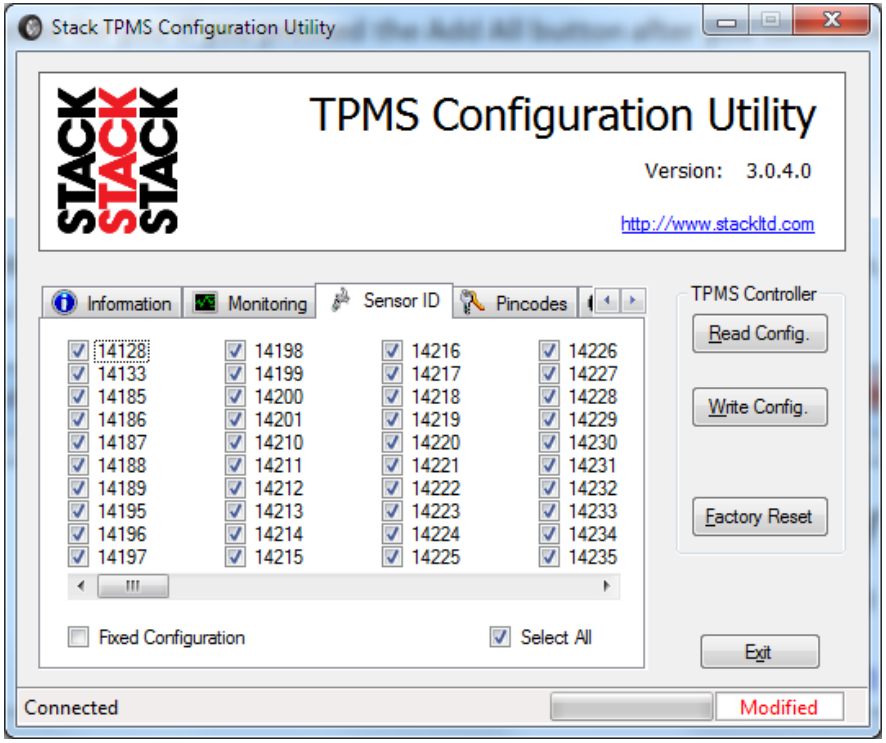


Clicking **Add All** or **Add Some** will switch the PC software to the **Sensor ID** tab. The **Sensor ID** tab is used to tell the Interrogator which sensors it is authorised to use.

A sensor is selected by ticking the box next to the sensor number. This sensor number will be marked on the sensor itself.



We recommend selecting all the Pincodes. You can use the select all button to select them all. This will have been selected for you if you pressed the **Add All** button after you connected.



The software will display Modified when the configuration on the PC does not match the configuration in the interrogator.

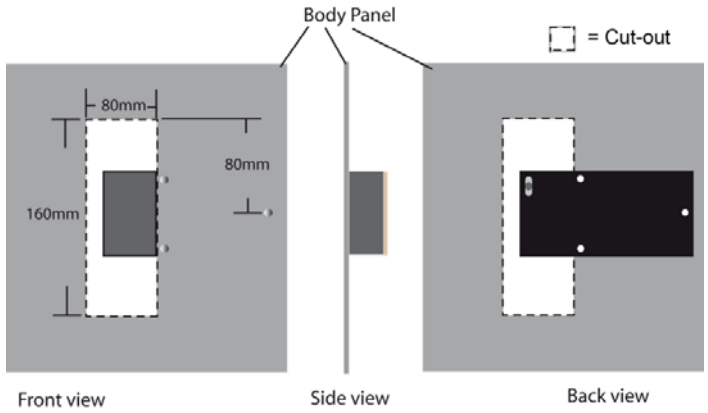
You can now write the pincodes to the interrogator by pressing the **Write Config** button. This will save the pincodes to the box.

The box has now had the basic configuration it requires and is ready for use.

Antenna Placement Restrictions

- If you have to mount the antenna to a conductive surface (metal, carbon) then you MUST space it off the surface by 10mm. Dual lock is ideal for this.

- Should you have to mount the antenna behind a conduction surface then please ensure that you cut a window for the antenna that is the same as the dimensions below. This is essential for the correct operation of the antenna.



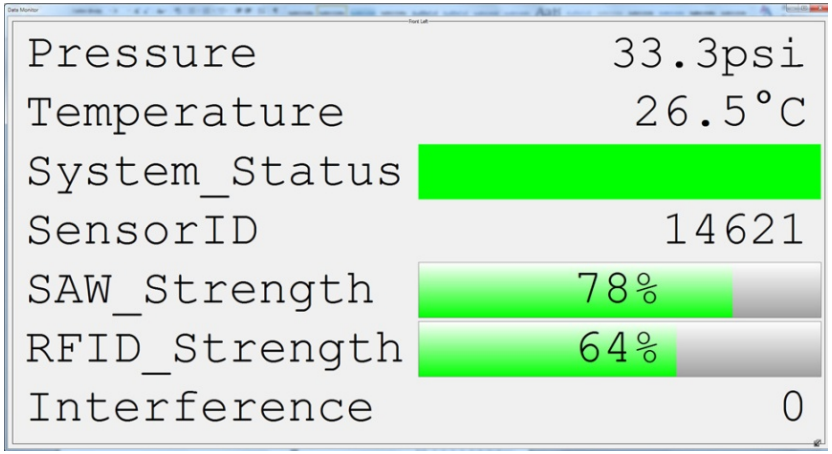
Antenna Do's and Don'ts

Do

- Ensure the antenna is mounted following the guidelines in this manual
- Take the time to ensure the antenna placement and tuning is as good as possible
- Make sure the RFID signal can be read over at least 90deg of wheel rotation
- Ensure the SAW signal is as strong as possible throughout the whole wheel rotation

Don't

- Mount the antenna behind a conductive panel (Carbon, Metal) without first making the hole as above in the panel
- Don't hold the antenna when performing the installation. Use dual lock
- Don't cut or modify the ground plane of the antenna. This is crucial for correct operation.



The **SAW_Strength** and **RFID_Strength** indicators can be used to tune the antenna position.

Antenna Placement

The antenna installation is normally done in several parts. The first is to choose an initial location for the antenna based on the above guidelines and measure the signal strength during a complete wheel rotation. This will give a baseline to work from. Then the process is repeated with a new antenna position. Each time the goal is to increase the wheel rotation coverage or signal strength.

Note: Please ensure that the antenna is secured onto the car with Velcro/dual lock when taking measurements. Holding the antenna can lead to signal variations.

NOTE: ***It is strongly recommended that you spend the time at this stage to find the optimum antenna position as it will significantly reduce the potential for problems later on.***

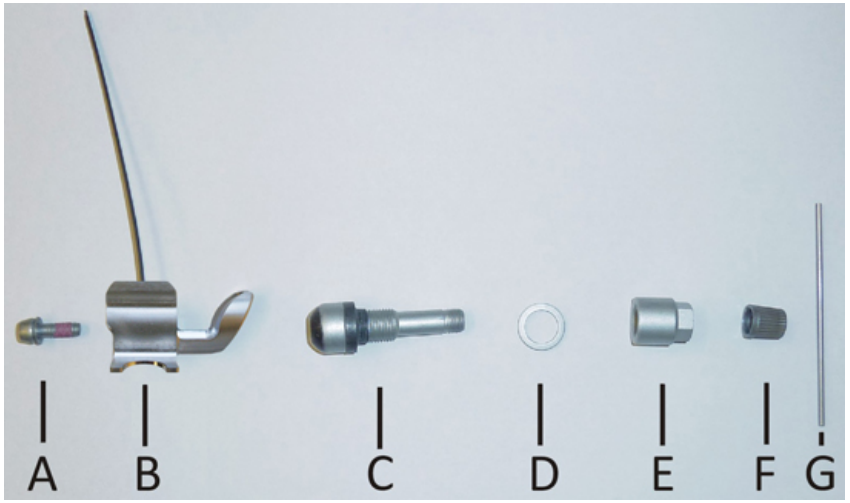
2. TPMS Pro Sensor Installation

Tools Required

The following tools will be required for the fitting process:

- **Torx (R) T20 Screwdriver /Torque driver (RS 662-608, DemonTweeks BIKTORXKEY)**
- **4Nm Torque screwdriver ¼" Drive (e.g. Teng Tools 1492SD)**
- **11mm x 50mm Socket (e.g. Teng Tools M140611-C)**

Parts Description



TPMS Fitting Kit

A: Self Locking Torx Screw

B: Sensor

C: Valve

D: Spacer Ring

E: Collar Nut

F: Valve Cap

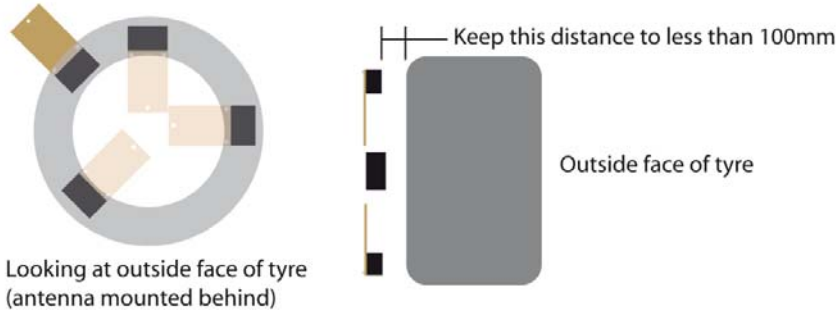
G: Installation Bar

Valve Fitting

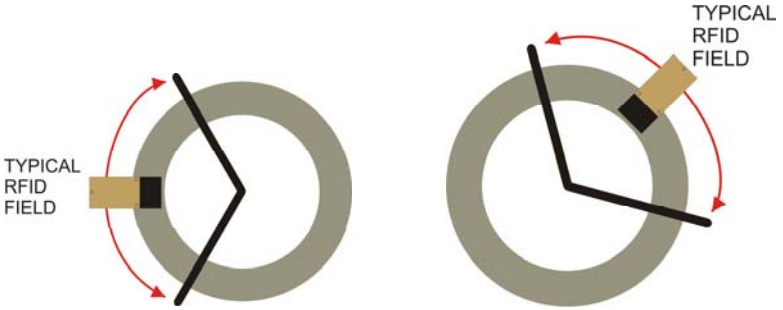
- Ensure the wheel rim is cleaned and degreased around the valve and wheel well (Green area).

- Insert valve into wheel rim. Fit the spacer ring (D) and then the collar nut (E) finger tight.

- The antenna must be mounted radially from the centre of the tyre.
- The Ground plane can point towards or away from the centre of the wheel.
- The antenna can be mounted behind NON conductive panels (Kevlar, GRP)



In a typical installation you will achieve 90-120deg of RFID coverage and 270 degrees of SAW coverage. It is important to optimise the RFID coverage to maximise the area at which the RFID can be read over.



Typically the RFID cannot be read outside the area shown above. This should not be a concern when finding an antenna position as long as you have the coverage shown above.

It is important to get to as close to 120deg of rotational coverage as possible for optimum system operation.

For ease of installation we recommend you use the Monitor mode in the TPMS configuration software. This can be found on the **Monitor** tab of the configuration software. Selecting simple monitoring mode will allow you to see the following information.

3. TPMS Pro Antenna Installation

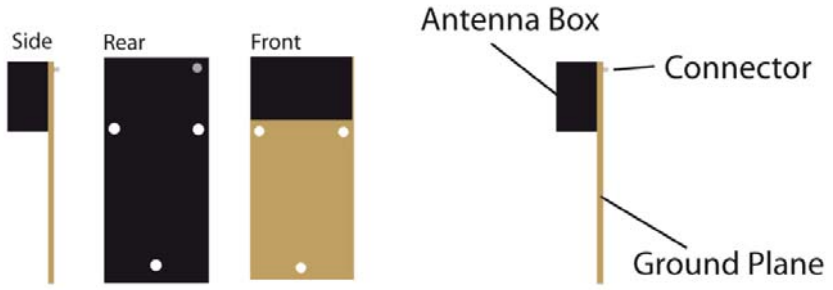
Introduction

This chapter will describe the fitting of the TPMS Pro Dual-Band Antennas to a vehicle. Please ensure you read this guide carefully to obtain the best performance out of the system.

Antenna Details

The PRO antenna is an advanced Dual-Band Antenna (DBA). For optimum system performance, care should be taken to fit the antennas according to the guidelines in this document. The system performance can be impaired with poor antenna placement.

The antenna picks up 2 signals. The first is the SAW (433 MHz). This is the signal used to measure pressure and temperature. The second signal is the RFID or Sensor ID (868 MHz). This is used to pick up the sensor serial number and the calibration details. Both signals are required for successful operation of the TPMS system.

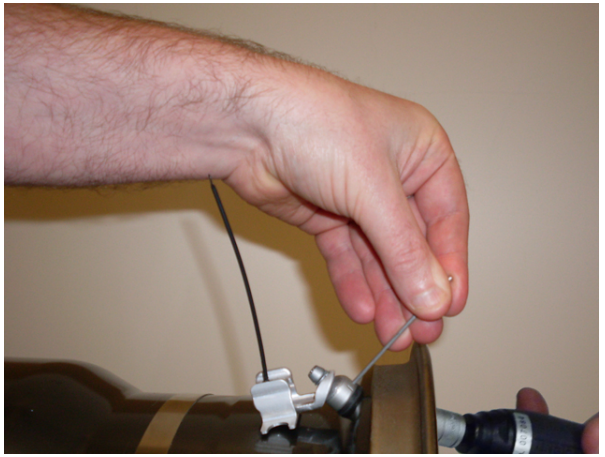


Antenna Placement

The goal of choosing an antenna position is to achieve the strongest signal strength for both SAW and RFID over the widest wheel rotation. There will be some points of wheel rotation where a signal will not be strong enough to take a measurement. These are generally called NULLS. It is common to have 3 nulls per rotation of the wheel for the SAW signal.

- The antenna must be placed as close as possible to the wheel.
- The antenna front “box” must be directly in line with the tyre sidewall

- Insert the installation bar (G) into the valve body and tighten the collar nut (E).

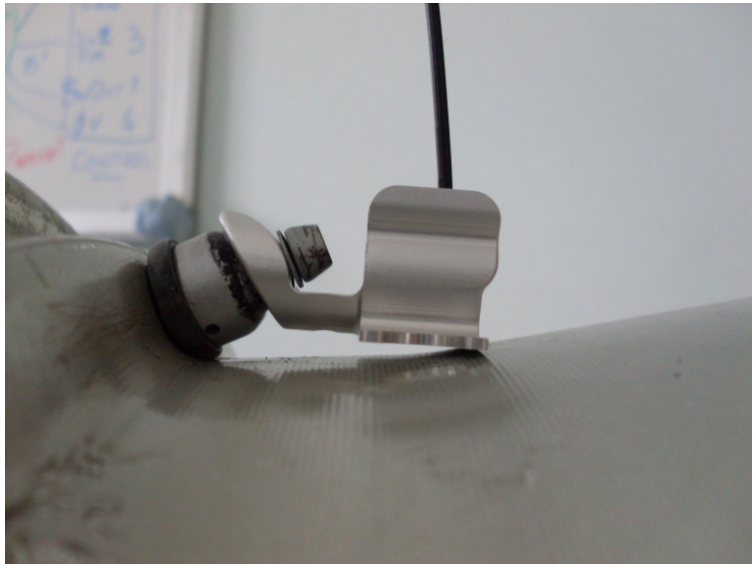


- Press the sensor down into the wheel well so that base of the sensor is touching the rim.

NOTE: The base of the sensor must make contact with the wheel rim.
NOTE: The sensor antenna must point away from the centre of the wheel.

- Tighten the Torx screw (A) to an appropriate level.

- Once tightened check the sensor is still in contact with the rim.



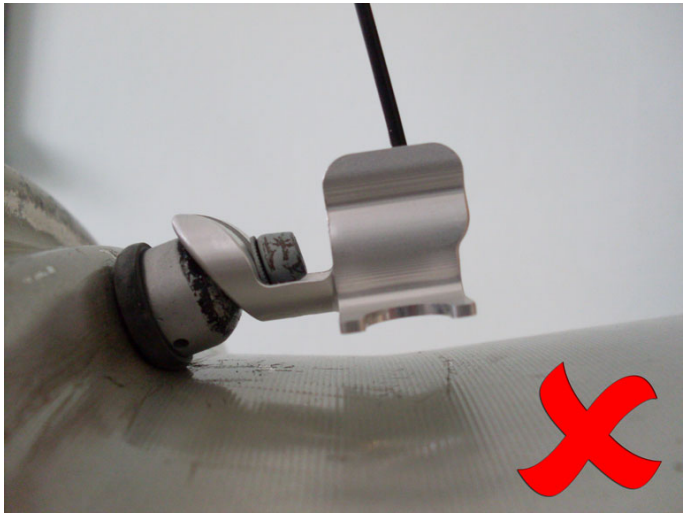
The sensor is now fitted correctly to the rim and ready for the tyre mounting.

NOTE: It is recommended to fit some identifying mark on the outside of the tyre to indicate the rim is fitted with a TPMS sensor. This will alert tyre fitters to the fact there is a sensor fitted and extra care should be taken when mounting/dismounting the tyres.

Incorrect Fitting Examples

The following are examples of bad fitment that will degrade the performance of the system:

- Sensor not in contact with rim.



- Sensor antenna pointing away from wheel centre and sensor base not touching rim