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# TPMS Pro Installation Guide

Loading Pincodes into Configuration Software Sensor Installation Antenna Installation CAN Message Formats Troubleshooting Connector Wiring 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<sup>®</sup> Windows Vista SP2
- Microsoft<sup>®</sup> Windows XP SP3

### **Software Installation**



Configuration Utility on the desktop or by navigating to Start-

>All Programs->Stack Limited->TPMS Configuration Utility.

Double click on the TPMS Configuration Utility icon

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### **Importing Pincodes**

For the interrogator to read pressure and temperature data from a sensor, it <u>must</u> 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.

STACK STACK STACK	TPMS Configuration	On Utility /ersion: 3.0.4.0
Monitoring the Sense Pincode Files Import Export	or ID Pincodes O CAN Interface	TPMS Controller Read Config.
Enter Pincode	Add	Eactory Reset
		Egt

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.

Browse For Folder
Please select the folder containing the new TMPS sensor pincode(s):
📃 Desktop
D 🧊 Libraries
🛛 🖓 Homegroup
▷ 🖳 Computer
🛛 🖓 Network
P I Control Panel
Recycle Bin
OK Cancel

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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.

14239	14252	14265	14280	14489
14240	14253	14266	14281	14490
14241	14254	14268	14283	14491
14242	14255	14269	14284	14495
14243	14256	14270	14285	14496
14244	14257	14271	14286	14497
14245	14258	14272	14287	14498
14246	14259	14273	14288	14499
14247	14260	14274	14289	14503
14248	14261	14276	14467	14504
14249	14262	14277	14468	14505
14250	14263	14278	14487	14506
14251	14264	14279	14488	14507
1		m		

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	В-	BLACK

### 4-way CAN Sure-Seal Pin-Out

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

### 4-way Serial Sure-Seal Pin-Out

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

### **Replacement Parts**

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

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## **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.

14239	14252	V 14265	<b>V</b> 14280	14489
14240	14253	V 14266	14281	<b>V</b> 14490
14241	14254	V 14268	14283	14491
J 14242	14255	14269	14284	14495
14243	14256	14270	14285	14496
J 14244	14257	14271	14286	14497
14245	14258	14272	14287	14498
14246	14259	14273	14288	14499
14247	14260	14274	14289	14503
14248	14261	14276	14467	14504
14249	14262	<b>V</b> 14277	14468	14505
14250	14263	14278	14487	14506
14251	14264	14279	14488	14507

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.

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Stack TPMS Configuration Utility	
TPMS Configuration	on Utility ersion: 3.0.4.0
	//www.stackltd.com
Information Monitoring Sensor ID Pincodes  Pincode Files Import View	TPMS Controller <u>Read Config.</u>
Export Enter Pincode	Eactory Reset
ER343-2FGRG-CCVXS-WWWER-23451-12345-	
	Exit
Connected	Up-to-date

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

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### **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
			Atmospheric Pressure		· · ·	Moving		Moving
CAN ID	Car Speed		(mb)		Spare	Mode	Spare	Flag
0x59F	U	16	ι	J16	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	Byte	Byte	Byte	Byte	Byte	Byte	Byte
			0	1	2	3	4	5	6	7
	CAN	Rate			Pres	sure				
Corner	ID*	(ms)	Sens	orID	(0.001	LBAR)	Temp (0	.01DegC)	System	Status
	0x5A				e.g 20	094 =	e.g 2	094 =	Bit0 =	1 = No
FL	0	1000	0-65535		2.09	4bar	20.94	DegC	Ser	isor
	0x5A				e.g 20	094 =	e.g 2	094 =	Bit0 =	1 = No
FR	1	1000	0-65	535	2.09	4bar	20.94	DegC	Ser	Isor
	0x5A				e.g 20	094 =	e.g 2	094 =	Bit0 =	1 = No
RL	2	1000	0-65	535	2.09	4bar	20.94	DegC	Ser	isor
	0x5A				e.g 20	094 =	e.g 2	094 =	Bit0 =	1 = No
RR	3	1000	0-65	535	2.09	4bar	20.94	DegC	Ser	isor

\*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.

PM5 Sens	or Pincodes available of	on this computer:		
20	47	14188	14214	14227
21	50	14189	14215	14228
24	51	14195	14216	14229
30	52	14196	14217	14230
32	59	14197	14218	14231
33	103	14198	14219	14232
34	104	14199	14220	14233
35	107	14200	14221	14234
37	14128	14201	14222	14235
38	14133	14210	14223	14236
40	14185	14211	14224	14237
45	14186	14212	14225	14238
46	14187	14213	14226	14239
•	III			

Ensure the Interrogator is plugged in, etc.

## Stack TPMS Pro Installation Guide ST542117-003 Stack TPMS Configuration Utility **TPMS** Configuration Utility

Version: 3.0.4.0 http://www.stackltd.com 🍄 Connection 🚺 Information 📓 Monitoring 🤞 Sensor ID 💶 **TPMS** Controller Read Config. COM3 Port: Connect -Write Config. Disconnect Eactory Reset Exit Disconnected

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.

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Corner Date Car



Note distance between sensors and tyre.	Saw Strength %	

Angle °	Saw Strength %	RFID
0°		
45°		
•06		
135°		
180°		
225°		
270°		
315°		

Mark sensor positions on the wheel diagram above.

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### **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	<u> 19-JUL-11</u>

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
2 70°	37	10
315°	39	105

#### A blank example log is printed overleaf.

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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.

STAC	'	FIIS C	v http://www.com/	ersion: 3.0.4.0
<ul> <li>Information</li> <li>20</li> <li>21</li> <li>24</li> <li>30</li> <li>32</li> <li>33</li> <li>34</li> <li>35</li> <li>37</li> <li>38</li> <li>4 III</li> </ul>	Monitoring 40 45 46 47 50 51 51 52 59 103 104	Sensor ID 107 14128 14133 14185 14185 14186 14187 14188 14189 14195 14196	Pincodes	TPMS Controller Read Config. Write Config.
Fixed Config	uration		Select All	Ext

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.

#### Stack TPMS Pro Installation Guide ST542117-003 X Stack TPMS Configuration Utility **TPMS Configuration Utility** Version: 3.0.4.0 http://www.stackltd.com TPMS Controller 蔚 Sensor ID 💦 Pincodes 🚺 🚹 🕨 Information Monitoring Read Config. 1419814199 ✓ 14216✓ 14217 **v** 14128 14226 ✓ ✓ ✓ ✓ 14133 14227 **V** 14200 14218 V 14228 14185 Write Config. 14186 7 14201 14219 V 14229 1 14187 1 14210 14220 J 14230 V 14188 V 14211 J 14221 14231 V V 14222 14232 14189 14212 1 14195 V 14213 14223 14233 Eactory Reset V 14196 V 14224 14234 14214 14197 14215 14225 V 14235 . ..... Fixed Configuration Select All Exit

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.

Connected

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### **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

Modified

- 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.

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Data Monter Canada da Canada da Canada da Canada Canada da	and send serve and ABH serve serve serve serve and an Athene
Pressure	33.3psi
Temperature	26.5°C
System_Status	
SensorID	14621
SAW_Strength	78%
RFID_Strength	64%
Interference	0

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

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### **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.



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- 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

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• 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.

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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. Stack TPMS Pro Installation Guide

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### **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

