TireAngel™ Installation Guide

Version 1.0
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Presented by:
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°Please read this Manual carefully before using this product.

TireAngel has been developed specifically to address the challenges of tire pressure monitoring on large-scale and multi-wheeled fleets.

TireAngel is designed to monitor tire pressure and temperature. It is not designed to provide warning of sudden critical tire damage and blowout caused by external effects. The driver should react promptly to any warning and correct the problem.

Tires can fail for other reasons besides low pressure or overloading. Always be on the alert for any other tire problems as indicated by unusual noises, vibrations, uneven tread wear, or bulges on the tire! If any of these symptoms occur, have the tires checked immediately by a professional staff!

Contents

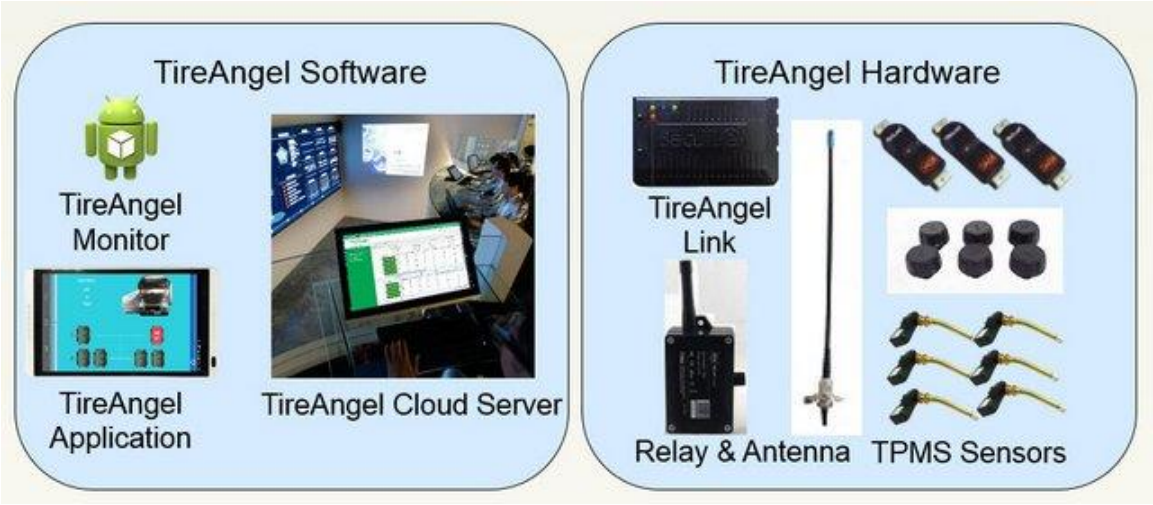
1 System Components

TireAngel™ software are tire management web services integrated with mobile clients. TireAngel™ products include TPMS sensors, ECU and accessories. Together they form a TireAngel™ system for fleets, tractor trailers, trucks, OTRs, buses and automobiles.

TireAngel™ system can manage your tires for you. Once you set-up and install TireAngel™ TPMS on your vehicle, TireAngel™ automatically monitors, displays and notifies you how to manage your tires to insure safety, maximize tire life, improve fuel economy, reduce labor cost and maximize operation.

TireAngel™ Software: TireAngel Monitor, TireAngel Application and TireAngel Cloud Server

TireAngel™ Hardware: TireAngel Link, TPMS Sensors, Antennas, Signal Relay and accessories.

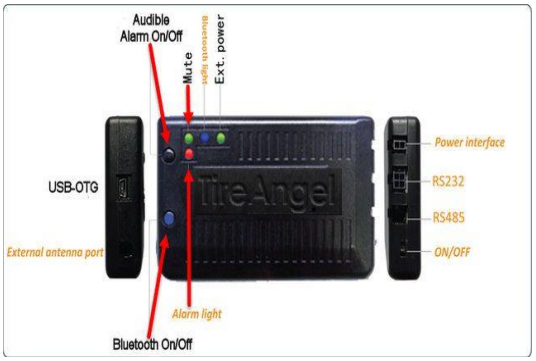


1.1 TireAngel Android 3G Mobile Tablet: Quad processor 1.2 GHz, 1024x640 color touch screen display, GPS, 3G, GSM, GPRS, WiFi, Bluetooth 4.0, Dual Camera, 8GB, Android 5.1 and USB-OTG. TireAngel Application displays pressure and temperature for up to 180 wheel positions and 10 attachable units with graphical vehicle representation for virtually any vehicle. Pressure and temperature color coded alerts, real-time pressure and temperature charts, audible alerts, Barcode sensor label scanner, TireAngel cloud TPMS data synchronization and one-step TPMS configuration. TireAngel tablet displays pressure and temperature information of each wheel in a color coded graphical vehicle representation in real-time with all wheel simultaneously. If vehicle wheel configuration is larger than screen display – display will auto-scroll to provide hands free operation. If there is a tire that is abnormal, the wheel will turn red and an audible alert will alarm to alert the driver to the condition before it becomes dangerous. Real-time pressure and temperature chart data is available at both TireAngel Tablet and Cloud server to further analyze the condition (slow leak, tire blow-out, overheated tire, brake failure or cracked wheel bearings). Online-offline data synchronization, GPS tracking and video capture.

 *1TireAngel Tablet & Mount*	 2TireAngel Link Kit	 *3Premium Tablet Mount*

Premium Tablet Mounting Bracket: Used to fix display on dashboard or windshield.

1.2 TireAngel Link: TireAngel Link is a programmable TPMS ECU, receives and monitors TPMS sensor transmissions, transmits tire status information to the TireAngel application in the Android mobile device. TireAngel Link is the heart of the system and is mounted near circuit box



1.3 TireAngel Mobile Link: Mobile Link TPMS ECU is like TireAngel Link but smaller and less I/O options and no internal battery, receives and monitors TPMS sensor transmissions, transmits tire status information to the TireAngel application in the Android mobile device. TireAngel Mobile Link is a complete TPMS controller and can act as a portable unit when plugged into a portable 5V power bank.

 *4Mobile Link*	 *5TireAngel Mobile Link Kit*

1.4 Internal Steel Belt Mount TPMS Sensor with Cradle: Mounted inside the tire in a steel cradle and steel strap to continuously monitor tire pressure and temperature, checking pressure and temperature every 7.5 seconds and transmitting data via RF every 4 to 8 minutes to TireAngel Link TPMS ECU when tires are normal or immediately when the tires are abnormal.

 *6Internal Sensor & Cradle*	 *7Internal Sensor Pack*

1.5 Stainless Steel Strap: Tire transmitters are mounted to the surface of the rim using a stainless steel strap making it the most reliable TPMS sensor installation.

8Internal Sensor & Steel Cradle

1.6 Wheel Sensor QR2D Barcode Label: Internal TPMS Sensors come packaged with their corresponding R2D barcode labels printed on water-proof PET label. Affix the labels on a clean surface on the wheel rim. Each sensor package comes with several labels and very useful to track sensor and update wheel movement such as wheel rotation.

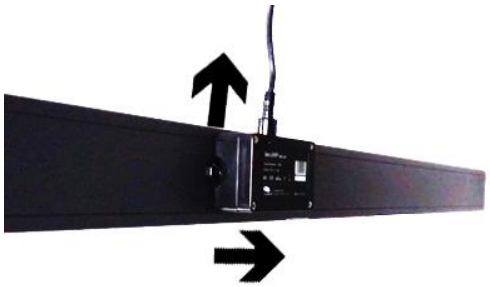
9Sensor ID Wheel Rim Label

10Sensor Pack Barcodes

1.7 TireAngel™ Mini Max Valve Stem External Sensor: Easy to use, reliable advance micro TPMS sensor are only 2 cm in height and weighs 10 grams. Unique durable brass core designed for high pressure commercial vehicle tire valve stem TPMS sensor applications. Powerful RF signal, robust, waterproof, rugged design, pressure range 0 to 188 psi and temperature range -40 to 80 ◦C. Designed to last for years and battery replaceable. Works with radial tubeless tires and tubular Tires. Barcoded for easy configuration and identification works with barcode enabled TireAngel software.

 *11Mini-Max Sensor with Barcode*	 *12Mini-Max Sensor Pack*

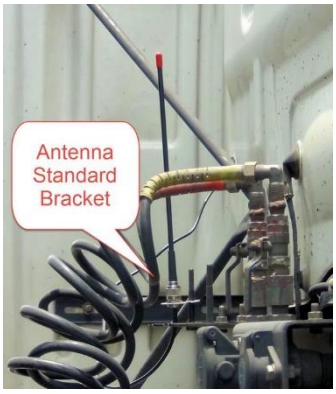
1.8 Relay: Relay is mounted on the trailer within 4 meters from furthest wheel within the tire group. With relay antenna pointed down and relay face pointed forward towards the tractor head. In a clear area not enclosed within any metal housing or enclosure. There are two mounting screws and two heavy duty tie wraps to secure relay to trailer chassis. TPMS Sensor RF transmission is boosted and relayed to the TireAngel Link TPMS ECU in the tractor head. When changing trailers all you need to do is select the drop function from the TireAngel smartphone application settings and then hook and select your trailer configuration file from the TireAngel cloud server.

 *13Relay & Cable*	 *14Relay Position*

1.9 High Gain External Antenna: Installed on tractor head door or behind tractor head in a clear high upright position to collect TPMS sensor transmissions from the tires. An external antenna ensures signal reception reliability so that the TireAngel Link TPMS ECU always has up-to-date tire information.

15High Gain Antenna Kit

16Antenna Mounted on Door



17Antenna Mounted Behind Tractor

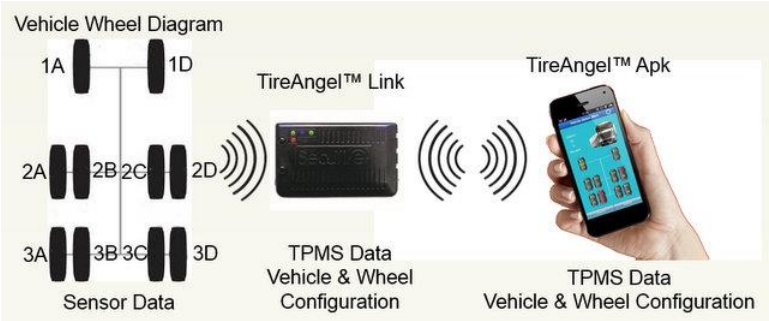
18Premium Antenna Mount with Cable running between Gap

19Premium Antenna Mount with Steel Screw Plate

1.10 NFC Quick Connect Tag Pad

: TireAngel application installed on an Android smartphone with NFC capabilities can perform as a portable Universal TPMS monitor and programmer. Simply tag the pre-configured NFC Quick Connect Tag Pad and your smartphone will automatically connect via Bluetooth when the Link TPMS ECU is within range. Your Link ECU may be equipped with a rechargeable battery or you may connect your Mobile Link to a portable power bank and take the smartphone and link device directly to the wheels you are performing maintenance on or tire rotation to capture data, sensor updates in real-time to the server.

20TireAngel NFC Quick Connect

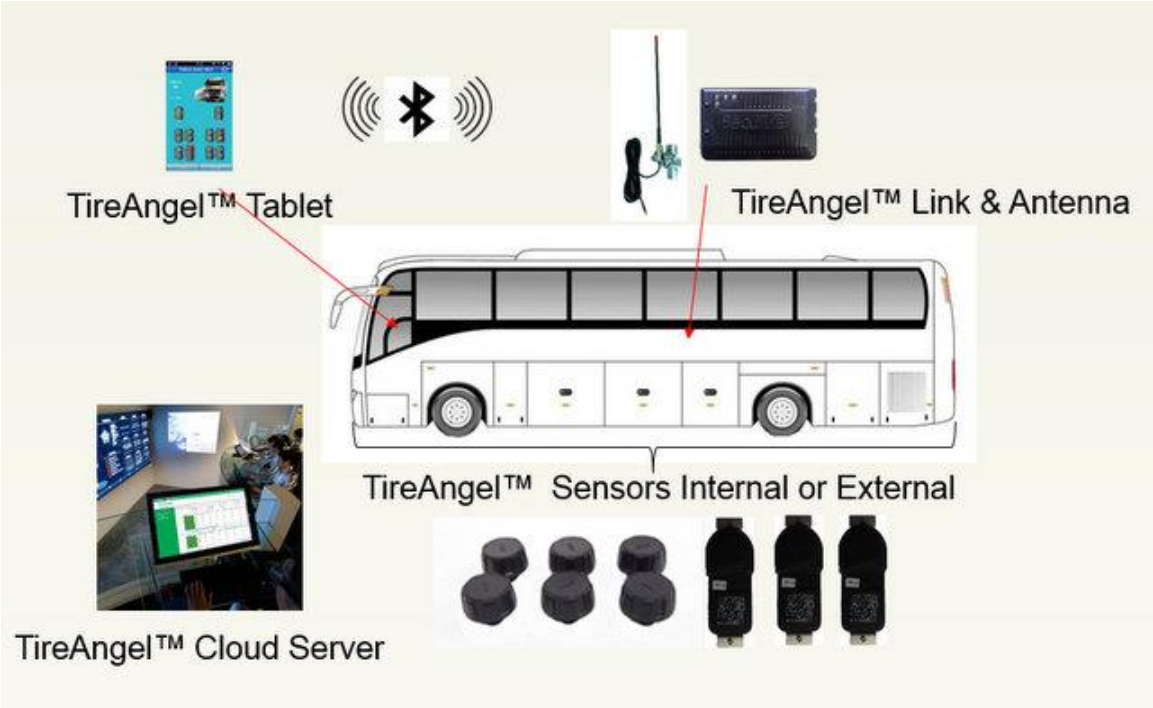


21Universal TPMS Controller

2 System Installation Configuration

Before installation it's necessary to learn about the whole installation configuration. The installation location of each component depends upon the location of the other components in the system and the vehicle's configuration. As such, it is best to select the overall location of each component before starting. The following diagrams show common system configuration.

2.1 - 6 Wheel Bus (2x4)



Components	Qty	Components	Qty
Android Tablet	1	Link – TPMS ECU	1
Tablet Cradle	1	USB-OTG Cable	1
Tablet USB Charger with Cigarette Lighter Converter	1	Link – Power Cable	1
Internal Sensor Package, Sensor, Cradle, VHB Tape, Wheel Barcode Labels	6	Stainless Steel Strap	6
High Gain External Antenna with standard mounting kit	1	Relay and Relay Mounting	0
Antenna extension Cable (3m)	1	Antenna Door Mount – optional accessory	1

2.2 - 10 Wheel Truck (2x4x4)

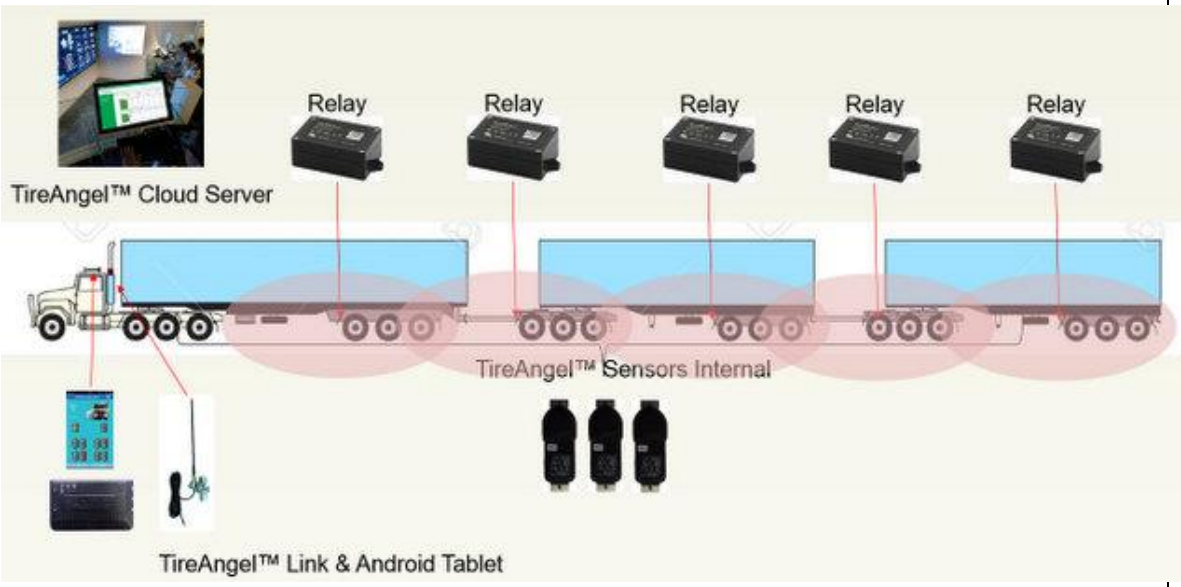
Components	Qty	Components	Qty
Android Tablet	1	Link – TPMS ECU	1
Tablet Cradle	1	USB-OTG Cable	1
Tablet USB Charger with Cigarette Lighter Converter	1	Link – Power Cable	1
Internal Sensor Package, Sensor, Cradle, VHB Tape, Wheel Barcode Labels	10	Stainless Steel Strap	10
High Gain External Antenna with standard mounting kit	1	Relay and Relay Mounting	1
Antenna extension Cable (3m)	1	Antenna Door Mount – optional accessory	1

2.3 - 18 Wheel Tractor & Trailer (2x4x4) (4x4)

Components	Qty	Components	Qty
Android Tablet	1	Link – TPMS ECU	1
Tablet Cradle	1	USB-OTG Cable	1
Tablet USB Charger with Cigarette Lighter Converter	1	Link – Power Cable	1
Internal Sensor Package, Sensor, Cradle, VHB Tape, Wheel Barcode Labels	18	Stainless Steel Strap	18
High Gain External Antenna with standard mounting kit	1	Relay and Relay Mounting	1
Antenna extension Cable (3m)	1	Antenna Door Mount – optional accessory	1

2.4 - 74 Wheel 19 Axle Road Train

Prime Mover (2x4x4x4) Trailer (4x4x4) Dolly (4x4x4) Trailer (4x4x4) Dolly (4x4x4) Trailer (4x4x4)



Components	Qty	Components	Qty
Android Tablet	1	Link – TPMS ECU	1
Premium Tablet Cradle	1	USB-OTG Cable	1
Tablet USB Charger with Cigarette Lighter Converter	0	Link – Power Cable	1
Internal Sensor Package, Sensor, Cradle, VHB Tape, Wheel Barcode Labels	74	Stainless Steel Strap	74
High Gain External Antenna with standard mounting kit	1	Relay and Relay Mounting	5
Antenna extension Cable (3m)	1	Antenna Door Mount – optional accessory	1
Antenna extension Cable (6m)	1		

3 Installation on Tractor

3.1 Installation TireAngel Tablet

Using the tablet cradle, mount the Android Tablet to either the windshield or dashboard in a clean and easily viewable location. Make sure it does not impair the driver's vision of the road and that is can be seen easily by the driver.

3.2 TireAngel Application Overview

TireAngel mobile application will only work with a TireAngel Link or Mobile Link connected or powered on.

First time the TireAngel launches it will check to see if the Link contains a configuration file, if there is no configuration file, the application will proceed to configuration process.

If you are using a TireAngel tablet the tablet is configured to power on automatically once it senses a charger or power. The application should be configured to automatically power off once power is off and it senses vehicle is off (this is configured in the TireAngel Monitor application)

If you are using your own tablet or smartphone you will need a process to make sure your tablet is power on when vehicle is power on and TireAngel is running.

TireAngel will follow Android standards, you will not see many prompts asking you to save. Once you accept a value, in most cases TireAngel has saved that value.

3.2.1 Android Tablet/Smartphone Settings

Android Settings, the goal is to make sure that the USB-OTG is enabled to communicate data with TireAngel Link, Display will adjust for daytime and nighttime, Sound is loudest, Android notifications don't pop up, Lock screen is optional and when plugged in the tablet does not go to sleep

TireAngel Tablet Android Recommended Settings (OTG)

1. Adaptive Brightness Enabled
2. Sleep after 1 Minute
3. Sound – Outdoor – Loudest
4. Notifications – Don't show notifications
5. Interruptions – Events and reminders - Disabled
6. Sound Enhancement – BesLoundness Enabled
7. Security – Screen Lock – None
8. Developers options – Stay awake – Enabled (for OTG Cable connection)
9. Developers options – USB debugging – Enabled (for OTG Cable connection)
10. Allow TireAngel app to Autostart

If you are using Bluetooth as your primary connection medium to TireAngel will connect via Bluetooth automatically and no password is necessary once you select the Link device.

3.3.2 TireAngel Monitor

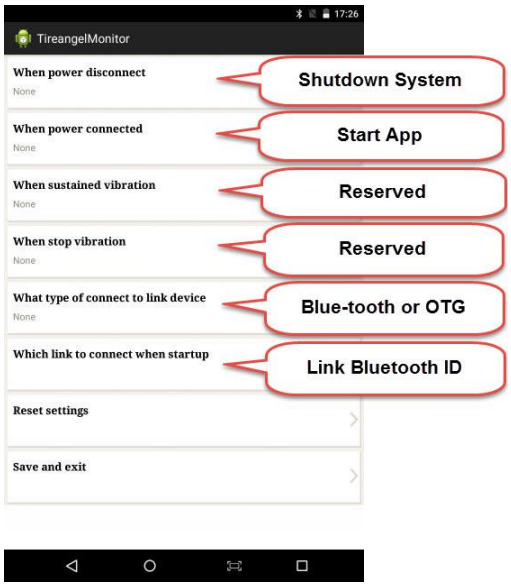
TireAngel Monitor is the application responsible for controlling TireAngel. Install TireAngel Monitor by downloading it from the server.

Every 20 minutes TireAngel Monitor will check the server to see if there is an available update to TireAngel. If your mobile device is a TireAngel tablet the update will happen automatically. If your mobile device is not rooted TireAngel monitor will ask you if you want to update your system.

Scan barcode

 *22TireAngel Monitor Barcode on back of TireAngel Mobile Link*	*Http://www.tireangel.com/download/TireAngel.apk*

Scan the TireAngel Monitor Barcode or download link in your smartphone browser TireAngel Monitor will handle updates.



23TireAngel Monitor

•When Power Connect – Start App: When you turn on your truck TireAngel will automatically start, Needs Android Settings to allow TireAngel to Autostart

•Enforce a Bluetooth connection to a particular Link device, must be connected first with TireAngel via Bluetooth manually in order for TireAngel Monitor to detect Bluetooth setting and save for later use.

3.2.3 Setup TireAngel Application

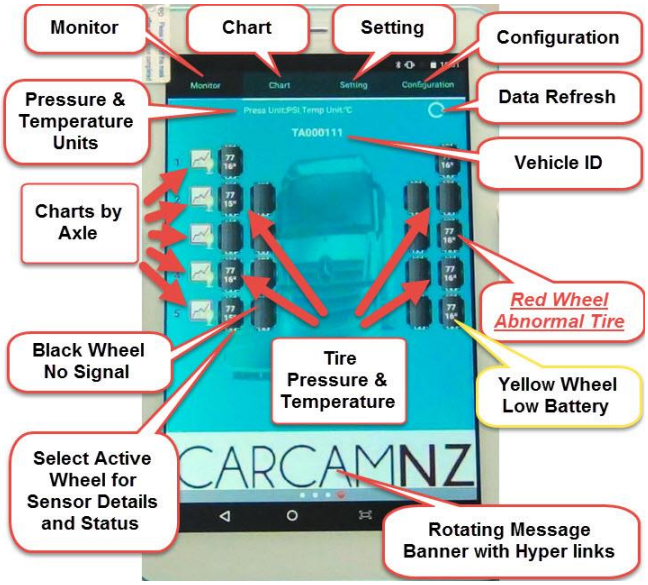
Connect to TireAngel Link via USB-OTG or Bluetooth

- Install SIM card into Smartphone (unless you have mobile hotspot or mobile Wi-Fi)
- 1st time Bluetooth: Android may ask you to for a password for the Bluetooth device – select "**Cancel**" if that don't work enter "**1234**"
- 1st time USB-OTG: Android may ask you to "**Choose an app for the USB device**" select "**TireAngel**" and select "**Always**"
- 1st time USB-OTG: Android may ask: Open TireAngel when this USB accessory is connected? **check-off** "**Use by default for this USB accessory**" select "**OK**"
- If you are using USB-OTG accept prompt to default USB to TireAngel
- Connect to TireAngel Link via USB-OTG: Automatic (Link must be power On)
- Plug in USB-OTG cable to TireAngel Link (power on and connected to 12/24 volt power source to transfer data**)** and plug in USB-OTG to cable to Android Mobile (Android 4.1 and higher)
- Prepare your TPMS Sensor map and TireAngel will walk you through configuration.

Settings can be remotely managed from TireAngel server vehicle configuration push function.

3.2.4 Main Activity

The Main Activity present your vehicle wheel layout with TPMS information in an easy to understand color coded graphical interface.



24Main Activity

- Audible Alert will beep when the Settings – 'Voice Switch" is enabled
- **Audible Alert will stop once Data Refresh is pressed**
- Touch Screen to drag up and down to see other axles.
- Auto scrolling will rotate through all axles, touch to stop

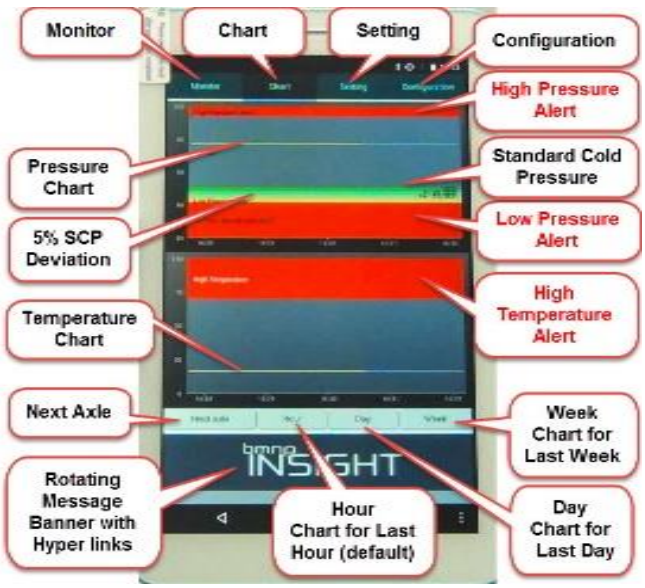
3.2.5 Chart Activity

Chart is enabled from “Settings” “Show Chart” enabled. Charts are generated from TPMS configuration and sensor history automatically.

Tire pressure and temperatures rise and falls with load, operation, road friction, tire flexing, brakes and weather.

With the charting function you can analyze the vehicle operation for proper load distribution, overheated brakes, bearing failure, slow leaks and how much pressure to add to a hot tire.

This function should not be used by the driver while driving because it may cause a distraction but it can be very useful while servicing the vehicle.



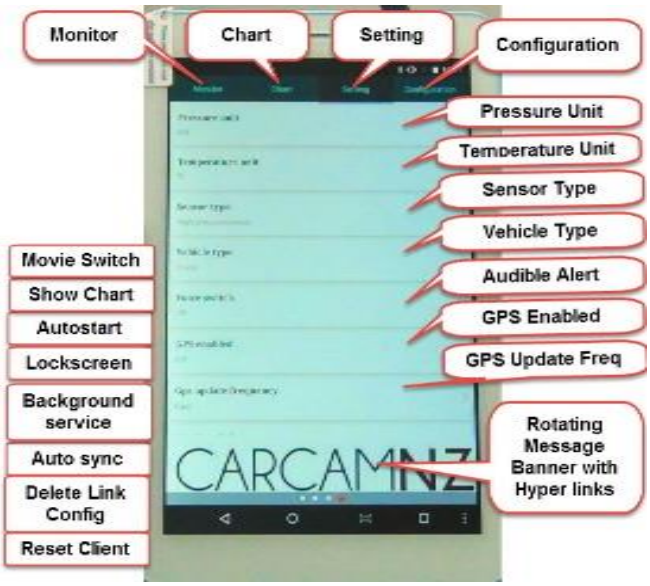
25Chart Activity

- Vehicle pressure and temperature history as a line chart by axle
- Selecting a line will give it’s details: wheel position, value and time
- The chart data is updated every 20 seconds
- Each color band is 5% deviation from normal Standard Cold Pressure

Gray = Normal Operation
Green = SCP 100 to 95%
Blue/Green = SCP 95 to 90%
Olive = SCP 90 to 85%
Yellow = SCP 85 to 80%
Yellow = Low Pressure Alert
Red = > 80 % Run Flat

3.2.6 Settings Activity

TireAngel application parameters are maintained in your settings activity. Sensor type and vehicle type cannot be changed once configuration is saved. If you want to change these values you will need to reinstall and select 'Delete Link Config'



26Settings Activity

- Drop & Hook Trailer options will only appear if vehicle type = 'Tractor'
- GPS Enabled allows you to track vehicle from server
- Movie Switch allows video capture from rear camera when tablet is held in landscape
- Background service allows program to run in background when you are using other programs in foreground i.e. Driver logging and GPS Navigation
- Auto sync = On

TireAngel will follow Android standards, you will not see many prompts asking you to save. Once you accept a value, in most cases TireAngel has saved that value.

Sample Settings Configuration:

1. Pressure Unit: PSI
2. Temperature Unit: ° C
3. Sensor type: High pressure sensor
4. Vehicle type: Truck (If you are performing drop hook then vehicle type = Tractor)
5. Voice Switch: On (Audible alert)
6. GPS enabled: Off (Careful function drains battery)
7. Autostart: On for Bluetooth, Off for USB-OTG - OTG will start program automatically once connected.
8. Lockscreen: On/Off
9. Background service: Off (Turn on if you plan to run GPS/Navigation program in foreground and have TireAngel always on in background)
10. Auto sync: On (Must be On if you want to monitor from server)
11. Delete Link Config: Clears all values stored in TireAngel Link
12. Reset Client: Erase all local settings

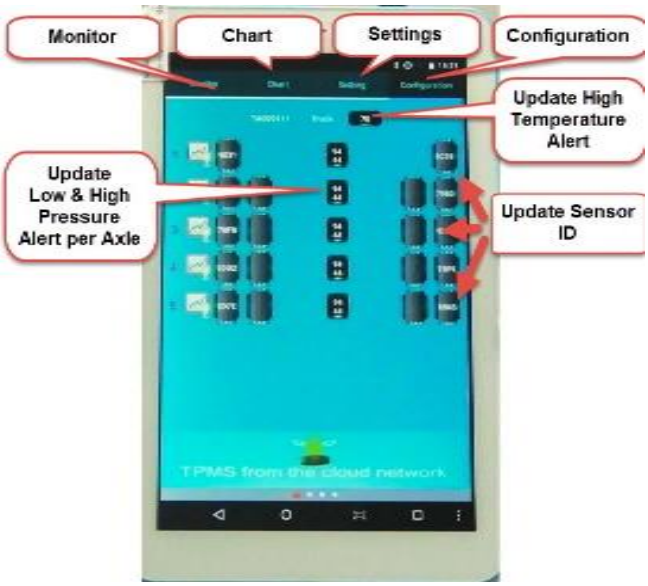
Settings can be remotely managed from TireAngel server vehicle configuration push function.

3.2.7 Configuration Activity

TPMS configuration parameters are maintained in your configuration activity. The vehicle wheels are presented in a layout as defined during the initial configuration process. If you need to change the layout you will need to delete the Link configuration from the 'Settings Activity'. The 'High Temperature Alert' will become the upper band in the 'Temperature Chart'. The 'High Pressure Alert' will become the upper band in the 'Pressure Chart' per axle. The 'Low Pressure Alert' value will be used to calculate the 'Run Flat' lower band in the 'Pressure Chart' per axle:

Standard Cold Pressure = Low Pressure Alert / .85 (15% below Standard Cold Pressure)

Standard Cold Pressure x .80 = Run Flat (20% below Standard Cold Pressure)



27Configuration Activity

Select an object to update:

- Vehicle High Temperature Alert
- High Pressure Alert per axle
- Low Pressure per axle

The first time you connect to TireAngel Link the system will step you through configuration.

Sample Configuration:

1. Vehicle Type: Truck (Auto, Bus, Truck, Tractor, Trailer and Other)
2. Vehicle id: XXXXXXXX – typical license plate number (8 characters)
3. Sensor type: High pressure sensor
4. Pressure unit: PSI
5. Temperature unit: °C
6. Vehicle High Temperature alert: 70
7. Then wheel layout – axle by axle
8. Low pressure alert: 15% < standard cold pressure
9. High pressure alert: 25% > standard cold pressure
10. Sensor ID: 4 digit id – then repeat till axle wheel positions complete
11. Repeat above for each axle till vehicle complete
12. Finish to program configuration into TireAngel Link

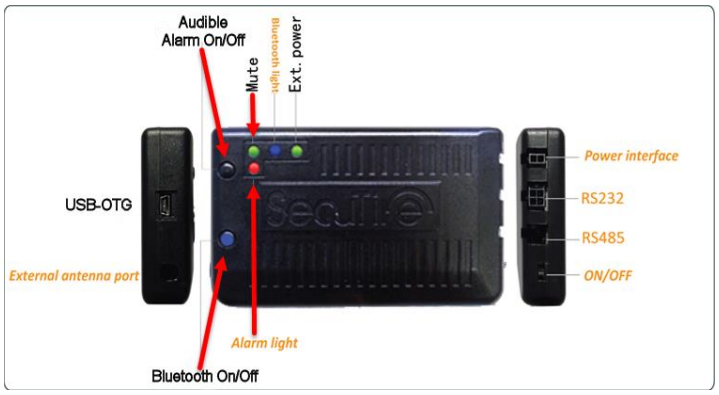
13. After a period data sync will update TireAngel server, you can login to check

Note: <Delete Link Config> will step you through this process again

Configuration can be remotely managed from TireAngel server vehicle configuration push function.

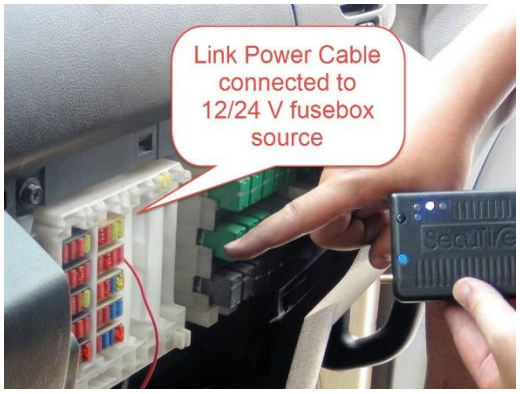
3.2 Installation Link TPMS ECU

Before installation, make sure the switch for Link TPMS ECU is at off position.



3.2.1 Power cable: Plug the mini-Amphenol adapter into the Power interface and connect the wires to a 12/24 watt power supply from the vehicle circuit box.

3.2.2 Connect to circuit box: Remove the cover of circuit box. Correctly connect the red wire and black wire with anode and cathode respectively. Tie up all the cables with a strap and put in the compartment, then replace the cover of circuit box.

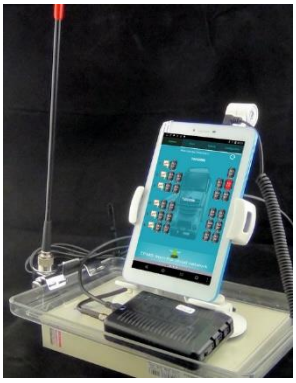


Secure the Link TPMS ECU in a secure location.

Turn on power switch

3.2.3 Connecting power to Android Tablet: (2 Methods)

1. Connecting the USB-OTG directly from the Link TPMS ECU to the Android Tablet



28TireAngel Link Kit

29USB-OTG Coil Cable Micro to Mini

2. Connect the Android Tablet to the USB charger cable to a cigarette lighter. (Use the 2.0A USB Port)

30TireAngel Tablet

31USB Cigarette Lighter Adapter

Note: The Tablet and Link can be powered by separate power sources and connected wirelessly with Bluetooth. (In case of Road Train due to the number of wheels, direct OTG connection is advisable due the high dataflow)

Note: Connecting the Android Tablet to it's own power source will give the Tablet more power in case you run many high power consumption programs on your tablet.

3.3 Installation Antenna on Tractor

Placement of Antenna is critical to the performance of your TireAngel system.

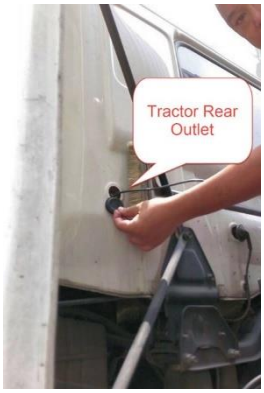
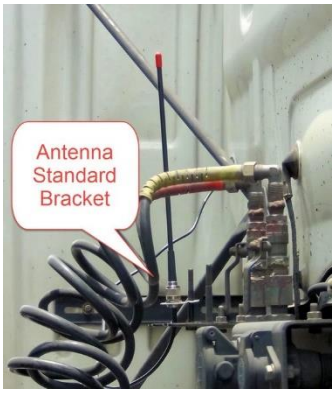
DO AND DON'T

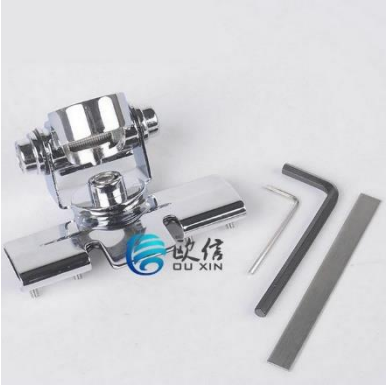
- Place antenna is a high position
- The antenna requires a clear line-of-sight to the tires for signal reception.
- Install the antenna vertically pointing upward, higher the position is preferred.
- Do not mount the antenna near large concentration of metal which will shield signal transmission.
- Do not have the antenna touch the vehicle except its mounting base.
- Protect the cable from heat and sharp edges --- Keep adequate distance from exhaust pipes and sharp metal.
- Provide some extra cable to allow for slight adjustment if needed.
- Apply cable tie wrap every 50 cm (1.7 feet) to ensure it is held firmly in place.
- Apply cable tie wrap on both sides of the connectors to avoid the connectors loosening.
- Do not over tighten cable tie wraps.

3.3.1 Connect the antenna extension cable to the Link TPMS ECU or Mobile Link and secure it from tangling.

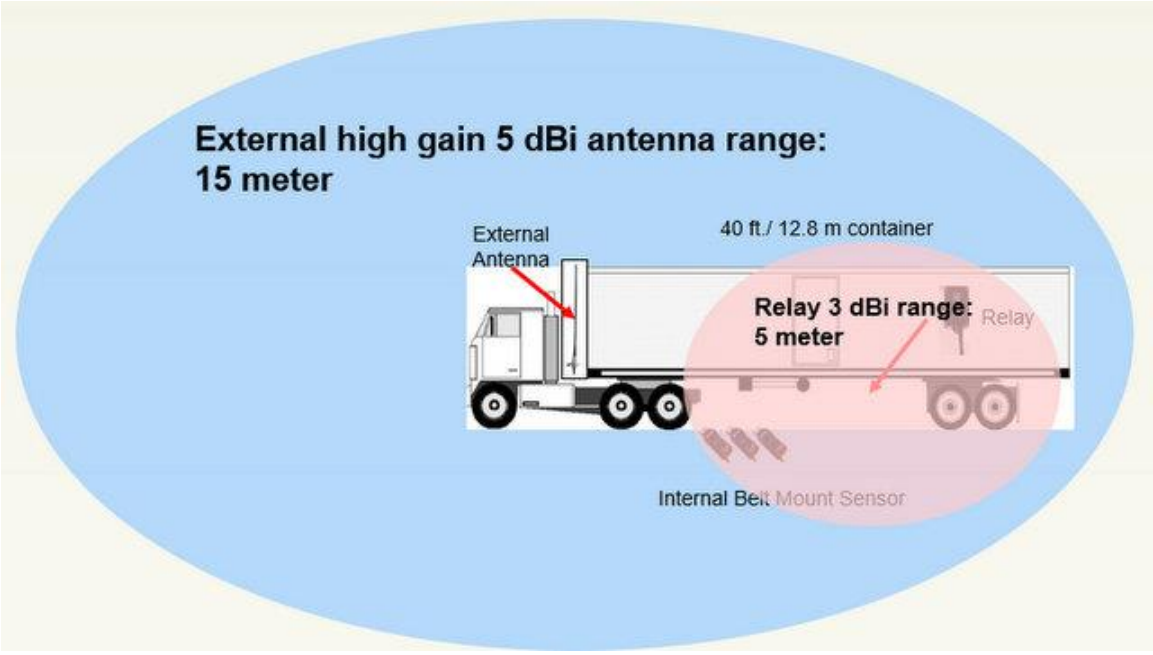
3.3.2 Place the antenna extension cable along the door or base board extending to the antenna mount on the door/window or rear of tractor, screw the antenna onto the antenna extension cable and fix the antenna mount on the door/window on side of tractor near circuit box or rear of tractor.

3.3.3 Place antenna mount on door or rear of tractor trailer.

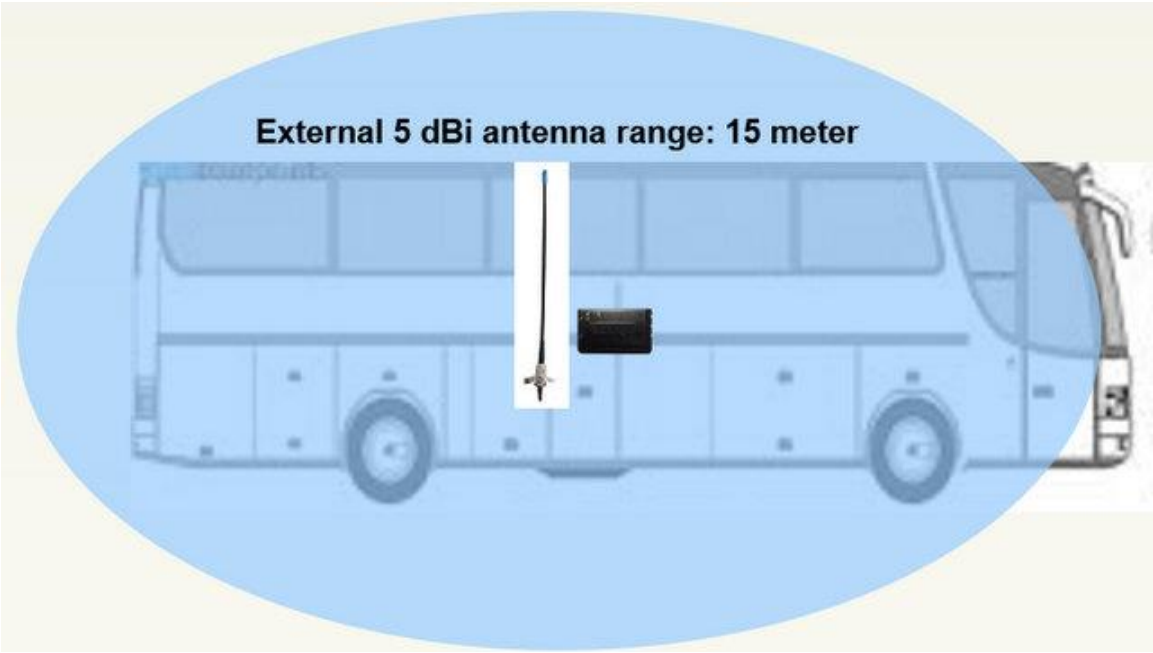
Antenna place in front	
 *32Antenna Mounted on Mirror*	 *33Antenna Mounted on Door*
Antenna place in rear	
 *34Tractor Head Rear Cable Outlet*	 *35Antenna Mounted Behind Tractor Head*

Premium Antenna Mount	
 *36High Gain Antenna Mount (3m) Cradle*	 *37Run Cable Between Gap*
 *38Premium Antenna Mount & Tooling*	 *39Insert Screw Plate*

3.3.4 Sensor Transmission, Antenna and Relay Range



Tractor Trailer Antenna Range



Bus Antenna Range

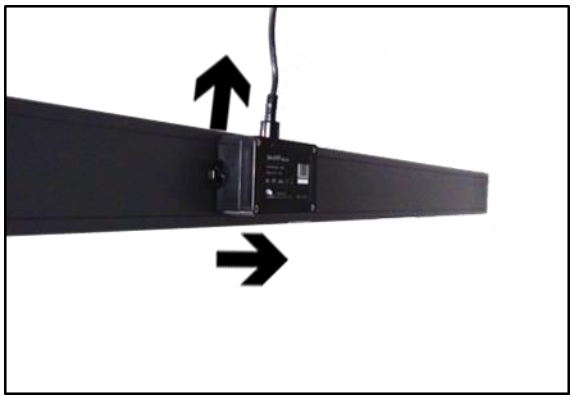
3.4 Installation Relay

Mount relay securely under trailer and to the side (preferably the side where antenna mounted), choose a location that is: easy to access, easy to connect to trailer power lines, easy to view relay activity LED and within 4 meters of furthest wheel: Effective range is 4 meters (pink circle).

- Mount Relay on bottom of truck on side of truck near power lines and within 4 meters of furthest wheel
- Connect power cable to trailer auxiliary power lines (12/24 volt): power light will light
- Relay should be facing wheels and not block by steel beam the top of the relay is the face of the relay and the transmission antenna is directional so it needs to be pointed towards the receiving antenna.
- Relay receiving antenna should be vertical and clear of metal obstruction.
- Do not install relay inside steel beam
- Do not install relay behind steel beam
- Relay should have relatively clear line of sight to receiving antenna
- Secure all power lines and water-proof all cable connection with shrink wrap with adhesive.

40Relay & Cable

43Relay Mounted on Steel Beam



44Relay Upright and Facing Forward towards Antenna

Relay Specifications

Operating temperature range	- 40 °C to + 85 °C
Receiving Frequency	433.92MHz ± 150KHz
Receiver Sensitivity	-107dBm
Transmit Frequency	433. 92MHz ± 100KHz
Transmit Power	<10dBm
Voltage	DC12V/24V
Operating current	<15mA
Working distance	> 25 m
Size Length Width	4.3 x 2.4 x 1.3 LxHxW in inch) 10.9 x 6 x 3.4 LxHxW in cm)

Part 5 Installation TPMS Sensor

5.1 Installation Internal Belt Mount Sensor

- Insert steel belt in sensor cradle
- Clean wheel rim surface where VHB “Very High Bond” tape will contact wheel rim
- Remove protective layer on VHB Tape
- Wrap wheel rim and secure belt
- Position Sensor Cradle away from coupling screw
- Tighten belt firmly
- Trim belt and bend tail up
- Clean Wheel Rim and Affix Barcode Sensor ID Label

45Steel Belt Mount Sensor & Cradle

46VHB - Very High Bond Tape

47Wrap Steel Belt around rim

48Cut to proper length

49Position Sensor Cradle away from coupling screw

50Tighten Steel Belt Firmly

51Trim and Bend Tail

52Bend Tail

53Affix Barcode Sensor ID on Wheel Rim