TRANZEO TR-FDD

TRANZEO
WIRELESS TECHNOLOGIES INC.

Tranzeo TR-FDD Series
User Guide

Covers the following models:
TR-FDD-24
TR-FDD-N

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Tranzeo Wireless Technologies Inc.

19473 Fraser Way
Pitt Meadows, BC
Canada V3Y 2V4

Toll Free Number: 1.866.872.6936
Technical Support: 1.888.460.6366
Local Number: 1.604.460.6002
Fax Number: 1.604.460.6005

General Inquiries: info@tranzeo.com
Sales: sales@tranzeo.com
Technical Support: support@tranzeo.com

Safety Information

FCC Compliance

This device 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 when the device is operated in a residential environment. This device generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the user guide, may cause harmful interference to radio communication. In case of harmful interference, the users will be required to correct the interference at their own expense.

The users should not modify or change this device without written approval from Tranzeo Wireless. Modification will void warranty and authority to use the device.

For safety reasons, people should not work in a situation where RF exposure limits could be exceeded. To prevent this situation, the users should consider the following rules:

- Install the antenna so that there is a minimum of 100 cm (39.37 in) of distance between the antenna and people.
- Do not turn on power to the device while installing the antenna.
- Do not connect the antenna while the device is in operation.
- Do not collocate or operate the antenna used with the device in conjunction with any other antenna or transmitter.
- Use this product only with antennas of the same or lower gain as the following Tranzeo Antennas:

  TR-GD58-26 – 5.8 GHz 26 dBi Grid antenna
  TR-5.8-32db-ant—5.8 GHz 32dBi Dish antenna

- In order to ensure compliance with local regulations, the installer MUST enter the antenna gain at the time of installation. See *Chapter 3: Wireless Settings*, for details.

Industry Canada Compliance

Operation of this device 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.

Safety Instructions

You must read and understand the following safety instructions before installing the device:

- This antenna's grounding system must be installed according to Articles 810-15, 810 -20, 810-21 of the National Electric Code, ANSI/NFPA No. 70-1993. If you have any questions or doubts about your antenna's grounding system, contact a local licensed electrician.
- Never attach the grounding wire while the device is powered.
- If the ground is to be attached to an existing electrical circuit, turn off the circuit before attaching the wire.
- Use the Tranzeo Power over Ethernet (POE) adapter only with approved Tranzeo models.
- Never install radio equipment, surge suppressors or lightning protection during a storm.

Lightning Protection

The key to lightning protection is to provide a harmless route for lightning to reach ground. The system should not be designed to attract lightning, nor can it repel lightning. National, state and local codes are designed to protect life, limb, and property, and must always be obeyed. When in doubt, consult local and national electrical codes or contact an electrician or professional trained in the design of grounding systems.

Professional Installation Required

The product requires professional installation. Professional installers ensure that the equipment is installed following local regulations and safety codes.

Table of Contents

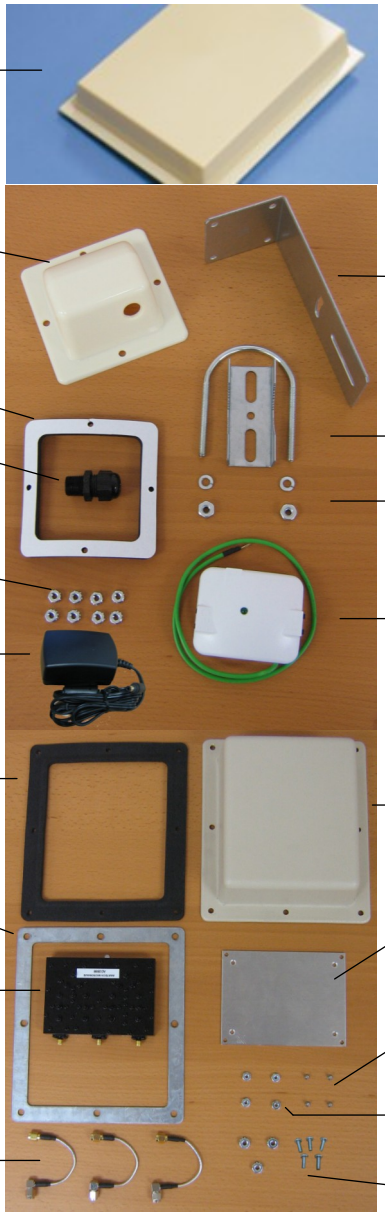
Chapter 1: Overview

Introduction

This next-generation wireless LAN device–the Tranzeo TR-FDD series– brings Ethernet-like performance to the wireless realm. Fully compliant with the IEEE802.11a standard, the TR-FDD series also provides powerful features such as the Internet-based configuration utility as well as WEP and WPA security.

Product Kit

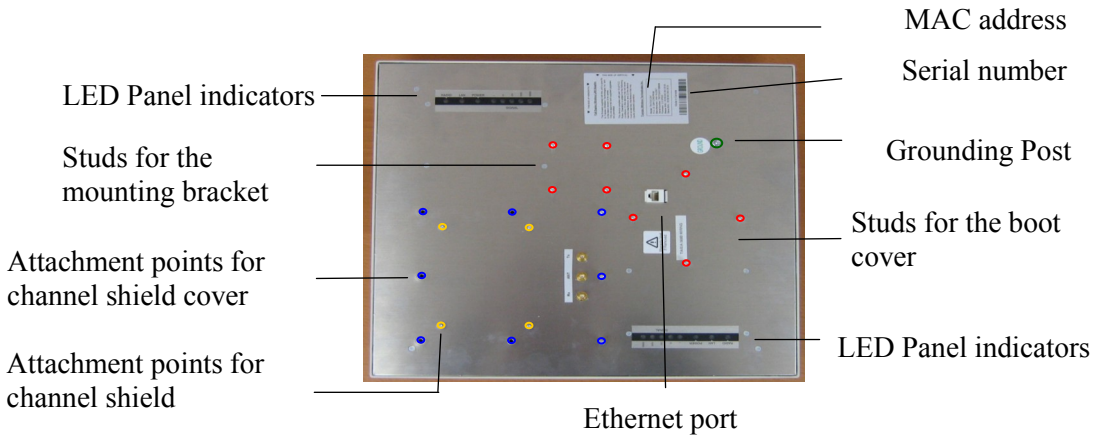
The TR-FDD Series product kit contains the items shown below. If any item is missing or damaged, contact your local dealer for support.



*Part of the TR-CSx Kit

Product Description

The LEDs, ports and product information are located at the back of the TR-FDD Series radio, as shown in the picture.



LED Panel Indicators

Label	Color	Indicators
Power	Red	**On:** Powered on **Off:** No power
LAN	Green	**On:** Ethernet link **Flashing:** Ethernet traffic **Off:** No Ethernet link
Radio	Amber	**On:** Radio link **Flashing:** Radio activity **Off:** No radio link
Signal	Red	Light up in sequence to indicate signal strength. Green being the highest signal.
	Amber	
	Green	

Chapter 2: Hardware Installation

The TR-FDD Series radios are easy to install, as you'll see in this chapter. Before starting, you will need to get the tools listed below and decide about the site and orientation of the device. Once ready, follow the instructions about how to install the Ethernet cable, mount the device, ground the antenna, and make the connections in order to get a proper installation.

Getting Ready

Tools Required

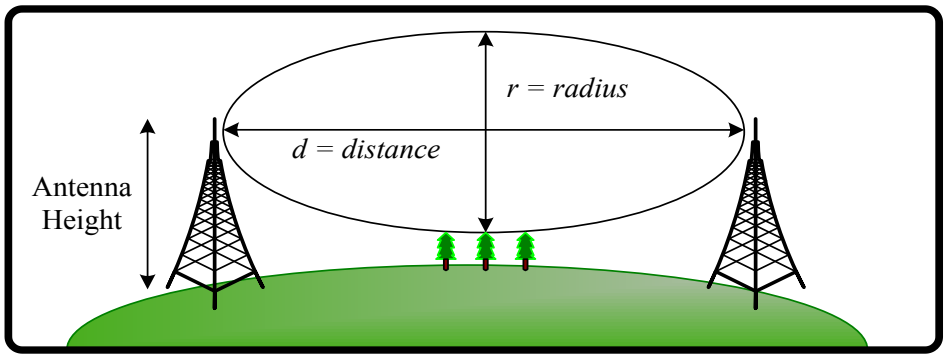
To install your TR-FDD Series radio you will need the following tools:

- 1/2" wrench x 1
- 3/4" wrench x 1
- 3/8" wrench x 1
- Cat 5 cable stripper x 1
- Cat 5 cable (to connect the radio to the POE adapter)
- RJ-45 patch cable
- RJ-45 crimper x 1
- RJ-45 connectors x 4
- #6 green grounding wire

Site Selection

Determine the location of the radio before installation. Proper placement of the device is critical to ensure optimum radio range and performance. You should perform a site survey to determine the optimal location.

Ensure the CPE is within line-of-sight of the access point. The line-of-sight is an ellipse, called the Fresnel zone. This zone should be clear of obstacles since obstructions will impede performance of the device.



Fresnel zone

Polarity

Determine if the antenna's polarization will be horizontal or vertical before installation. The TR-FDD radios can be used in either polarity. The Ethernet boot cover should always be placed so that the cable runs toward the ground for maximum environmental protection.

Power Supply

Only use a power adapter approved for use with the TR-FDD Series radio. Otherwise, the product may be damaged and will not be covered by the Tranzeo warranty.

Installing the Ethernet Cable

Step 1:

Insert the strain relief, without the cap nut, into the port opening of the boot cover.

Step 2:

Using a 3/4” wrench, tighten the strain relief until it touches the boot cover**.**

IMPORTANT! Use hand tools only. Do not over tighten.

Step 3:

Put the cap nut back over the strain relief and insert the Cat 5 cable through it. Wire the cable following the EIA/TIA T568B standard, and attach the RJ-45 connectors to each end of the cable. (See *Appendix F: Wiring Standard*).

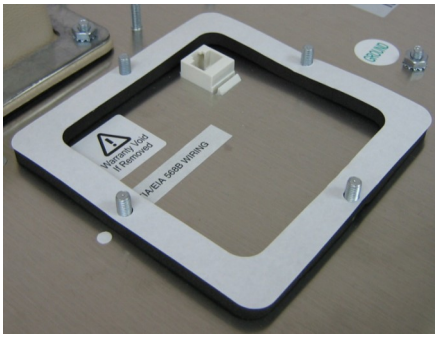
Step 4:

If you purchased the device with a dual port cover, repeat steps 1, 2, and 3 for the second port.

IMPORTANT! If you are not going to use the second port, insert the strain relief into the boot cover and tighten the cap nut to ensure a weather-tight seal, as shown in the picture.

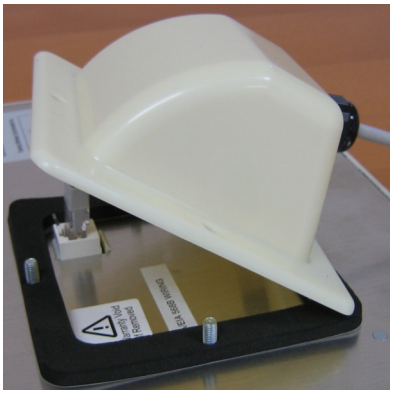
Step 5:

Place the gasket—with the adhesive side facing up—over the 4 studs around the port of the radio. Flatten the gasket ensuring there are no gaps. Remove the backing.



Step 6:

Plug the Cat 5 cable inserted in the boot cover into the port. Remember to place the boot cover according to the desired polarization, so that the strain relief faces the ground.



Step 7:

Fit the boot cover over the 4 studs and the gasket. Secure with 4 keps nuts. Tighten with a 3/8” wrench until the gasket is at least 50% compressed.

Step 8:

Make sure the cap nut of the strain relief is tightened properly to ensure a weather-proof seal.

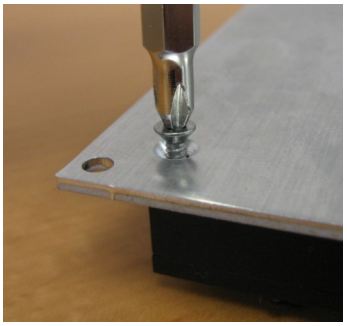
IMPORTANT! Hand tighten only. Do not over tighten as you may damage the weather-tight seal of the strain relief.

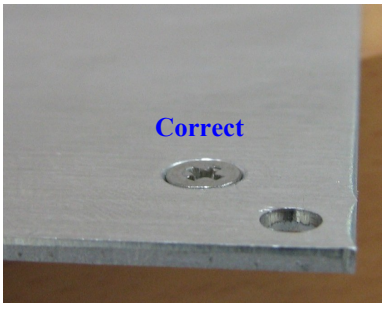
Attaching the Channel Shield

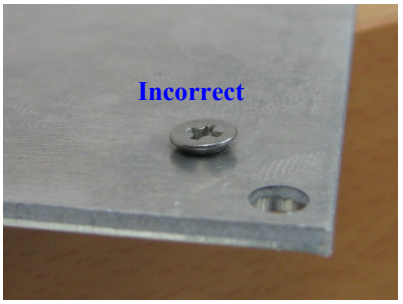
Step 9:

Attach Channel shield to the channel shield mounting plate.

The screws should fit in the counter sunk holes.

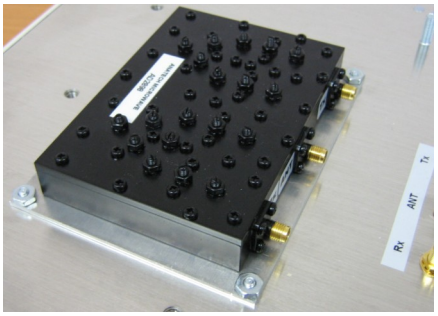






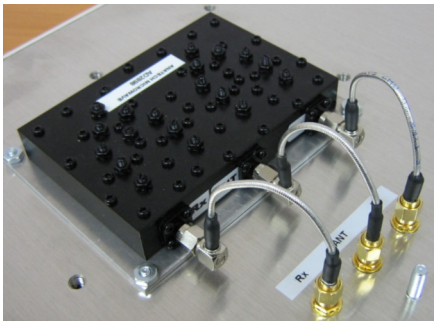
Step 10:

Attach Channel shield mounting plate to the TR-FDD with the included nuts.



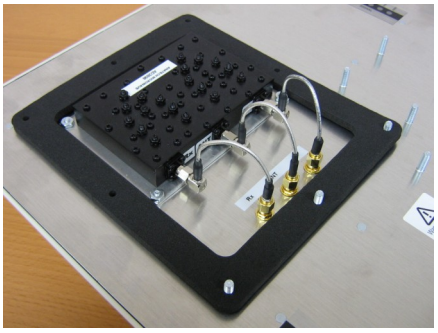
Step 11:

Attach right angle SMA to SMA male cables as shown between the channel shield and the TR-FDD.



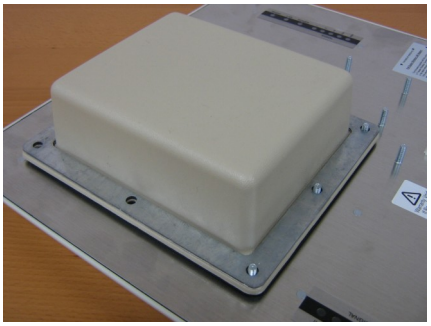
Step 12:

Place the Channel shield gasket as shown.



Step 13:

Place the channel shield cover and channel shield compression ring over the channel shield as shown.



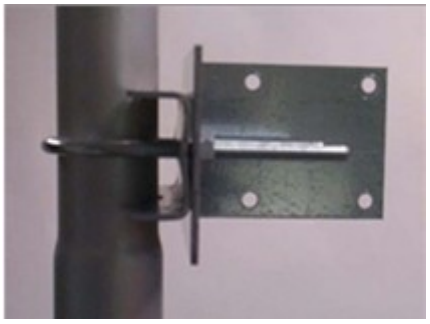
Step 14:

Attach and tighten the screws and nuts as shown ensuring that the gasket is compressed equally around the cover.

Mounting the Radio

Step 15:

Attach the mounting bracket to the pole using the U-bolt. Secure the U-bolt with the lock washers and the nuts. Align if necessary, and then tighten the nuts enough to prevent any movement.



Step 16:

Fit the radio to the mounting bracket. Secure the radio with kep nuts.

IMPORTANT! The strain relief must be always facing the ground.

Grounding the Antenna

Step 17:

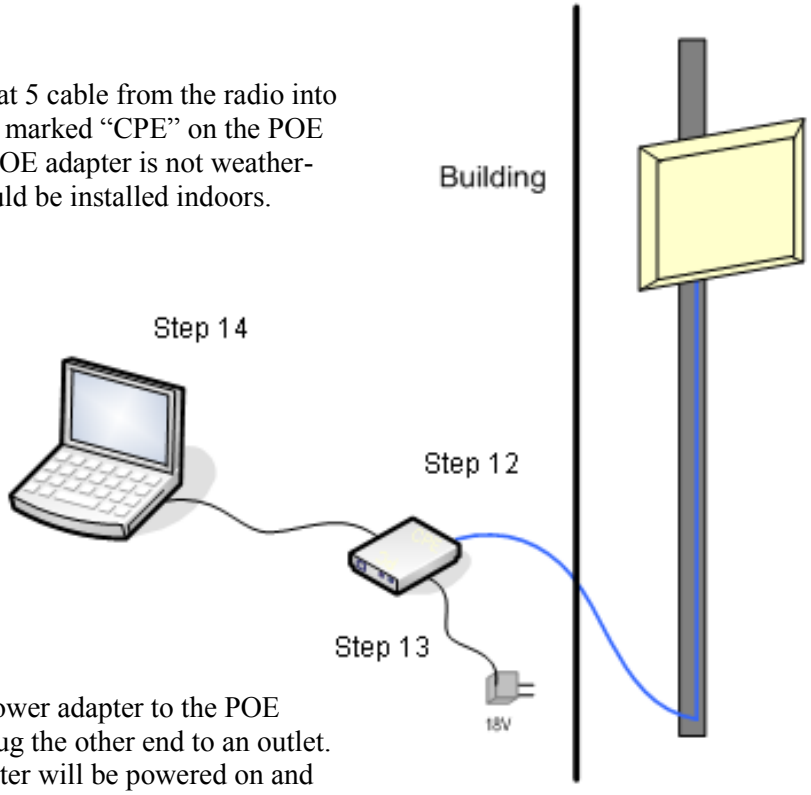
Using a #6 green grounding wire, connect the grounding lug on the radio to a proper ground. See Appendix A: Grounding and Lighting Protection Information.

IMPORTANT: This device must be grounded. Connect the green grounding wire to a known good earth ground, as outlined in the National Electrical Code. See *Appendix A: Grounding and Lightning Protection Information* for details.

Connecting the Radio

Step 12:

Connect the Cat 5 cable from the radio into the RJ-45 jack marked “CPE” on the POE adapter. The POE adapter is not weather-proof and should be installed indoors.



Step 13:

Connect the power adapter to the POE adapter and plug the other end to an outlet. The POE adapter will be powered on and the power indicator on the top panel will turn on. We recommend connecting the power adapter to an outlet with surge suppression capability with an uninterrupted power supply (UPS) for reduced outages.

IMPORTANT! Use the power adapter supplied with the radio. Otherwise, it may be damaged.

Step 14:

To configure the TR-FDD Series radio, connect the Ethernet cable to the POE adapter and to a computer. Ensure that the distance between the computer and the radio does not exceed 300 ft (90 m).

Note: If connecting to a hub or switch, a crossover cable may be required.

Best Practices

Follow these practices to ensure a correct installation and grounding.

- Always try to run long Cat 5 and LMR cables inside of the mounting pole. This helps to insulate the cable from any air surges.
- Keep all runs as straight as possible. Never put a loop into the cables.
- Test all grounds to ensure that you are using a proper ground. If using an electrical socket for ground, use a socket tester, such as Radio Shack 22-141.
- Keep a copy of the National Electrical Code Guide at hand and follow its recommendations.
- If you are in doubt about the grounding at the location, drive your own rod and bond it to the house ground. At least you will know that one rod is correct in the system.

Chapter 3: Configuration

The TR-FDD Series radios can be configured through an HTML configuration interface, accessible using any Internet browser. The configuration interface allows you to define and change settings, and also shows information about the performance of the device.

In this chapter we'll cover how to access the configuration interface, configure the TR-FDD Series radio, and interpret the information displayed in the interface.

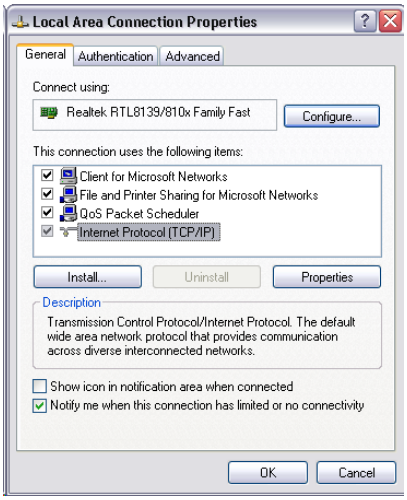
Depending on whether the device is defined as an AP or CPE (infrastructure station), some menu options, windows, and fields in the interface may vary or may not appear at all. We'll indicate so when describing each window.

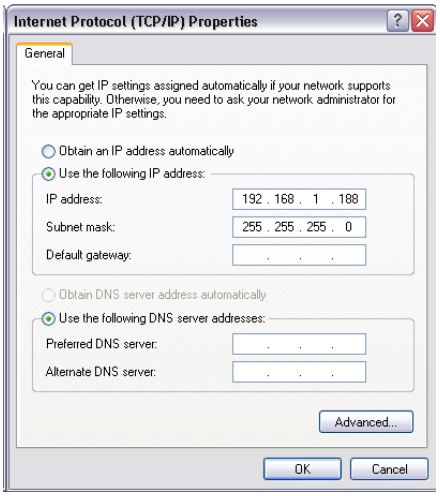
Connecting to the Radio

Before accessing the configuration interface, you have to change the network connection settings in your computer to be on the same subnet as the radio.

Changing the IP Address - Windows XP

1. In your computer, open Control Panel > Network Connections > Local Area Connection.
2. In Local Area Connection Status > General, click **Properties**.
3. In Local Area Connection Properties > General, select **Internet Protocol (TCP/IP)** and click **Properties**.
4. In Internet Protocol (TCP/IP) Properties > General, select **Use the following IP address**.
5. Enter your **IP address** and **Subnet Mask**. The default IP address of the radio is **192.168.1.100**, which cannot be used here.
6. Click **OK** and **Close**.

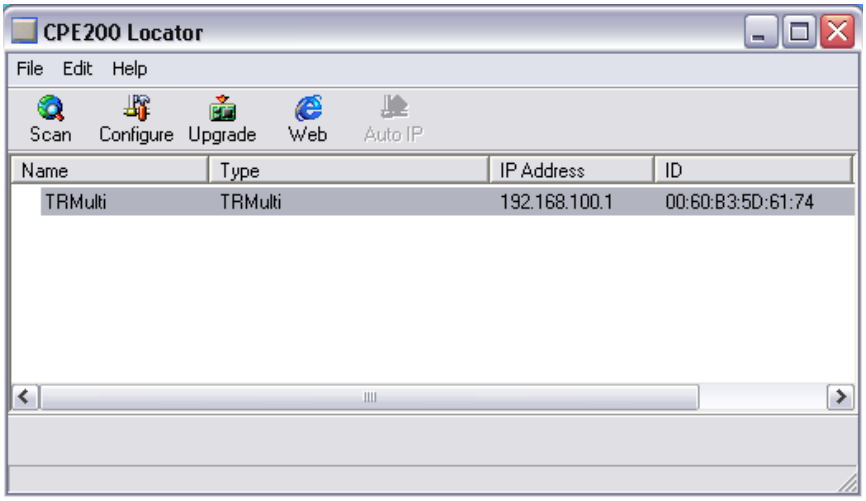




Changing the IP Address Using the Tranzeo Locator

The Tranzeo Locator is a utility that allows users to quickly change the IP address of the Tranzeo radios. It sends out a broadcast on the network and displays a list of other Tranzeo radios connected, from which you can configure the IP address for your device.

Note: The Locator cannot locate radios through routers.



The Tranzeo Locator displays the following options:

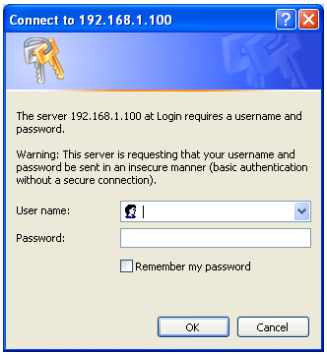
Scan:	Locates Tranzeo radios connected to the network. A yellow icon appears before the name when the radio is not in the same subnet.
Configure:	Used to set a static IP address or set the radio into DHCP mode.
Upgrade:	Under development.
Web:	Opens a browser to access the configuration interface.
Auto IP:	To automatically set the radio to an IP address one number higher than the IP address of the computer.

Find the latest version of the Tranzeo Locator at www.tranzeo.com, under Tranzeo Support > Support Files > Radio Utilities.

Login into the Configuration Interface

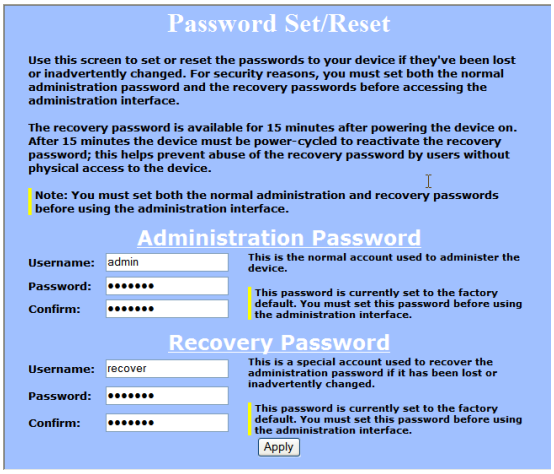
After defining the network settings, follow these steps to login into the Tranzeo Configuration Interface.

1. Open your Internet browser (Internet Explorer, Netscape, or Firefox).
2. In the address bar, type your IP address (default IP: **http://192.168.1.100**).
3. In the login dialog, enter your **Username** and **Password** (if you're a first-time user, follow the instructions below).
4. Click **OK**. You will then access the configuration interface.



If you're a first-time user:

1. Enter the default username **admin** and the default password **default**.
2. You will be prompted to enter your new username and password in the login dialog. You will then access the configuration interface.
3. In the Password Set/Reset window, change the **Administration** and **Recovery* passwords**. They cannot be left as default and must be different from each other. You can change the usernames too.
4. Click **Apply** to save the changes.



* The recovery username and password are used to access the Password Set/Reset window if the administration password is lost.

Information Page

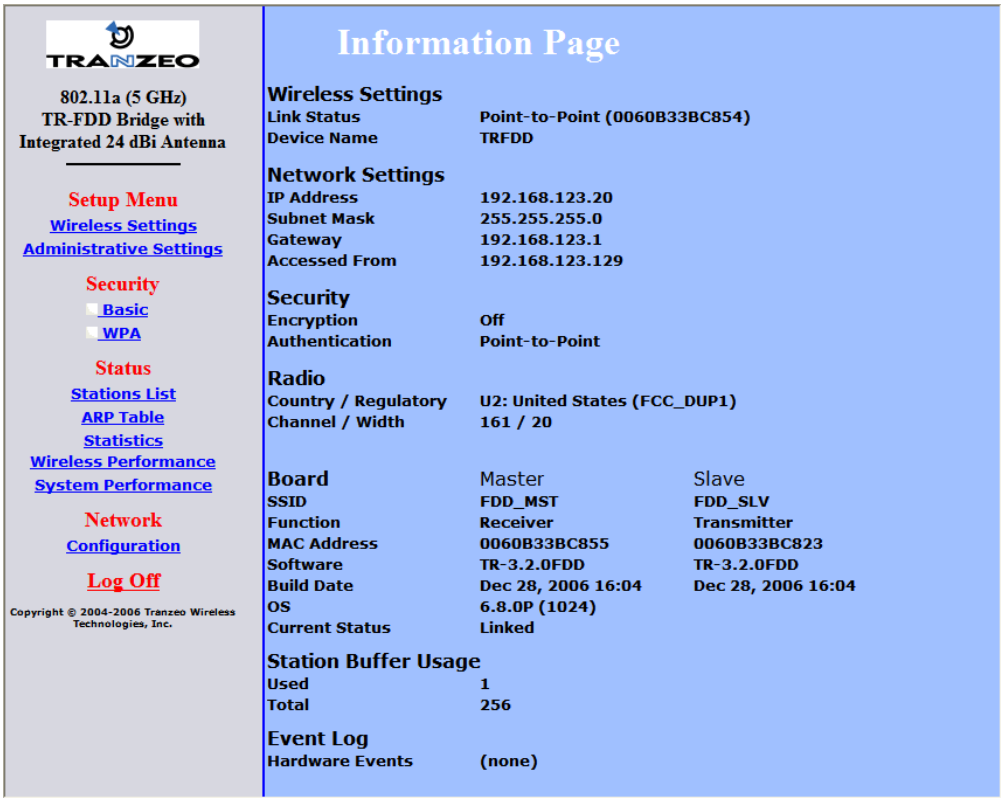
This is the first window of the configuration interface. It shows the main menu and information about the device settings, like wireless, network, and security settings.

The menu is divided in four sections:

- Setup Menu
- Security
- Status
- Network

Each section contains navigation links to the configuration windows.

Information Page

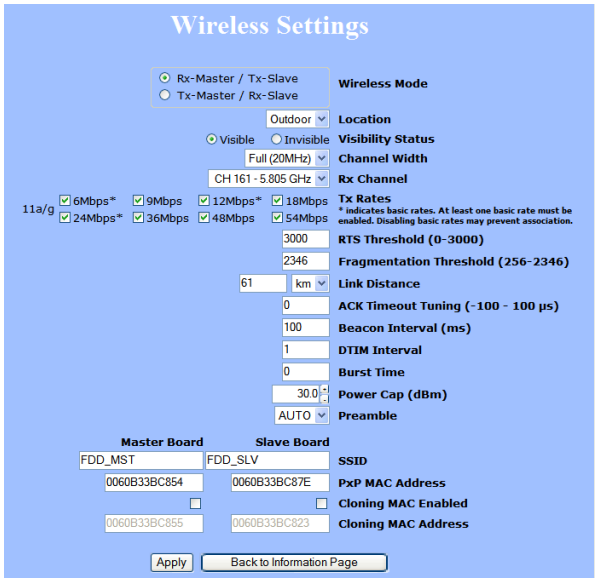


Setup Menu

In this section you would be able to configure wireless and administrative settings for the TR-FDD Series radio.

Wireless Settings

This window displays the wireless configuration of the device.



Wireless Mode: Rx-Master / Tx-Slave or Tx-Master / Rx-Slave. One radio of the pair needs to be set to Rx-Master / Tx-Slave and the other radio of the pair needs to be set to Tx-Master / Rx-Slave.

SSID: The Service Set Identifier (SSID) is the name that identifies a specific wireless LAN. Devices must have the same SSID to communicate with each other. The Master Board SSID must be set the same as the Master Board SSID on the peer radio. The Slave Board SSID also needs to be set to the same as the Slave Board SSID on the peer radio.

Visibility Status: You can set your access point to be **Visible** or **Invisible** to clients.

Location: You can set the location of the radio to be **Outdoor** or **Indoor**. The available channels may differ depending on the location.

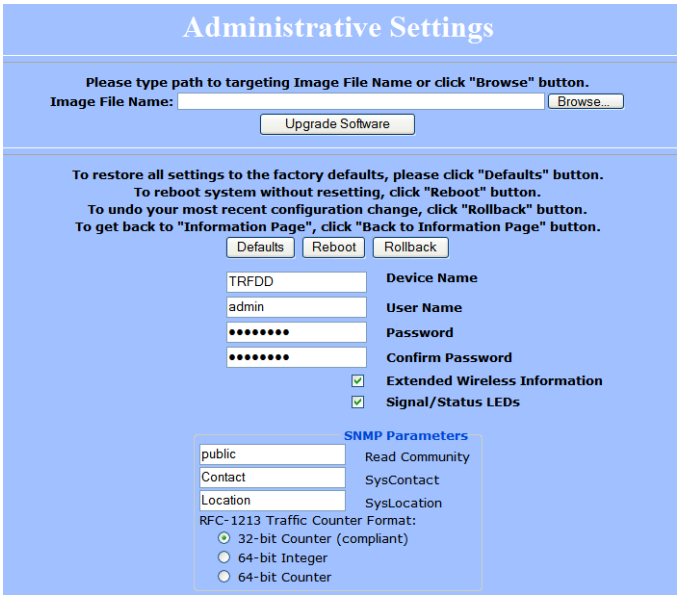
Channel: Select the channel that matches the channel filter you are using with the radios.

TX Rate: The transmission speed at which the radio and access point communicate with each other. Basic rates must be selected.
Note: Setting this rate below the maximum possible does not limit bandwidth and often has a negative impact on the operation of your network.

RTS Threshold:	This is the maximum size for a packet to be sent automatically. When it exceeds the RTS threshold, the CPE sends first a 'request to send' (RTS) to the access point before sending the packet. Note: The more clients you have, the lower the value should be set.
Fragmentation Threshold:	This is the size at which packets are fragmented in order to be transmitted. Setting this value too low decreases the amount sent on each transmission. In noisy areas, this can improve performance. However, in quiet areas, this will decrease throughput.
Link Distance:	This is the distance between the two TR-FDD radios. This setting is necessary to define the correct ACK timing. Setting this value too low or too high will result in low throughput and high retries.
ACK Timeout Tuning:	The time that the radio waits for an acknowledgment (ACK) from the access point accepting transmission before re-attempting to send the data. This is an offset from the ACK timing set by the link distance.
Beacon Interval:	This is the rate at which the access point broadcasts its beacons.
DTIM Interval*:	The DTIM interval (Delivery Traffic Indication Message) helps to keep marginal clients connected by sending wake up frames.
Burst Time:	This allows to send data without stopping. Note that other wireless devices in the network will not be able to transmit data for this number of microseconds.
Power Cap:	It is the maximum output power of the radio.
Antenna Gain:	Select the gain of the antenna. This information must be set by the installer at the time of installation.(1)
Preamble:	Select type: **Long** uses long preamble only, **Auto** (recommended) tries short preamble first, then long.
PxP MAC Address:	The Master Board PxP MAC Address must be set to the Master Board PxP MAC Address on the peer radio. The Slave Board PxP MAC Address must be set to the peer radio Slave Board MAC Address.

Administrative Settings

Use this window to upgrade the software, change your password, and define SNMP parameters.



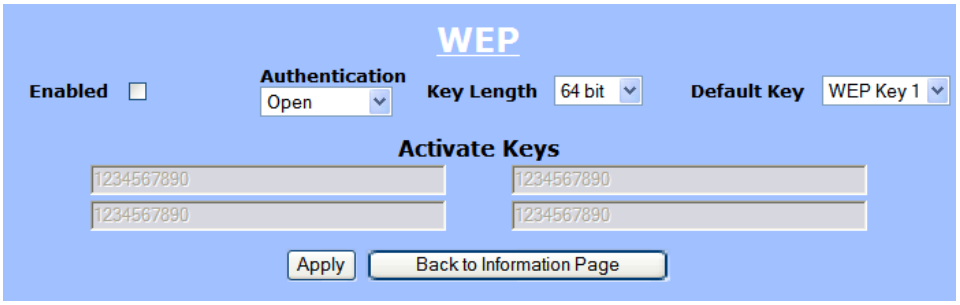
Upgrade Software:	Enter the location of the software update file or **Browse** to locate it in your computer. Click **Upgrade Software**. If the radio does not refresh the Information Page after 1 minute, press **Refresh**, **Reload** or **F5**. Verify the new firmware is installed correctly.
Defaults:	Returns all settings to factory defaults, including passwords.
Reboot:	Restarts the system without changing settings.
Rollback:	To undo the most recent change.
Device Name:	It is the network name of the device. This name appears in the Locator and on the Tranzeo stations list.
User Name:	This is the login username.
Password:	Enter a new password if you want to change it.
Confirm Password:	Re-type the new password.
Extended Wireless Information:	Enables extended information (name and IP address), which is only displayed with Tranzeo access points.
Signal/Status LEDs:	Un-check to turn off the LED panel indicators.
SNMP Parameters:	Here you set the **Read Community** string and Contact/Location information. It's highly recommended that you change the **Read Community** string immediately to prevent unauthorized scanning of your network. You can also select the traffic counter format that you would like to use.

Security

In this section you can configure both basic and advanced security settings for your device.

Basic Security Settings

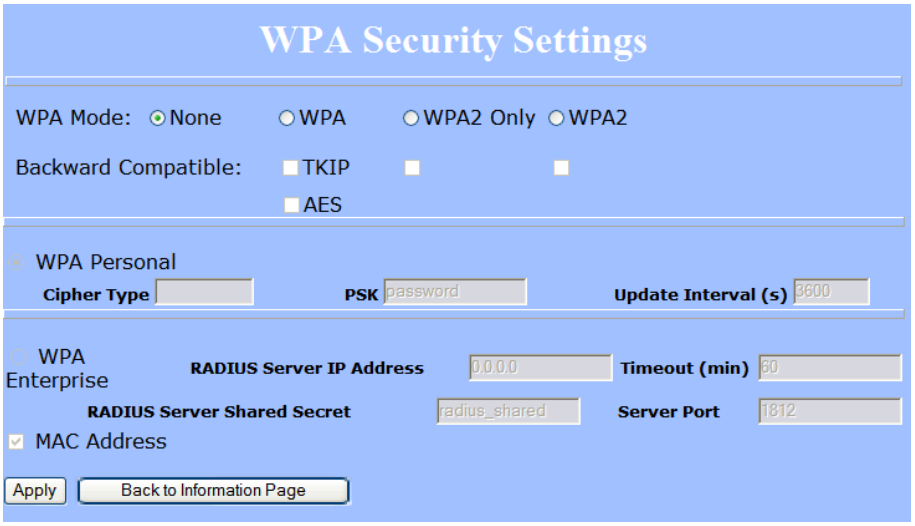
In this window you can define WEP parameters. WEP provides security by encrypting data so that it's protected when transmitted from one point to another.



Enabled:	Check to turn on WEP security protocol.
Authentication:	Select your system to be open or shared. **Open** is always recommended.
Key Length:	This is the level of encryption. Note that 64 bit is referred to as 40 bit on some systems.
Default Key:	Select the default WEP key from the list.
Activate Keys:	Enter the four WEP keys you want to activate. Keys must be entered in HEX only.

Advanced Security Settings

In this window you can enter WPA parameters. WPA provides a higher level of security, enhancing the security features of WEP.



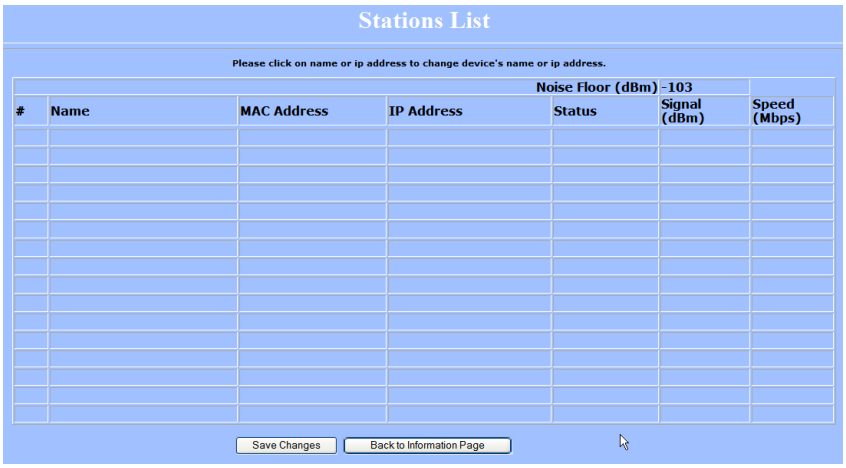
WPA Mode:	Select the WPA mode.
Backward Compatible:	Select **TKIP** or **AES** backwards compatibility if required.
Cipher Type:	Select the level of encryption.
PSK:	Enter your PSK password.
Update Interval:	This is the interval at which the PSK password will be updated.
WPA Enterprise:	Ensures that only authorized network users can access the network. Enter the information about the RADIUS server from your Internet Service Provider.

Status

This section displays information about the status and performance of your radio. Most options and information cannot be modified in this section.

Stations List (Rx-Master / Tx-Slave Only)

This window displays a list of the stations associated with the access point and their connection statistics.



Name: This information appears here when the device is a Tranzeo 6000 and the **Extended Wireless Information** option in the Administrative Settings window is checked. Otherwise, the field will be blank. You can manually enter a name by left clicking on the field and typing in. However, if the **Extended Wireless Information** option is turned on at the client, the name you entered will be overwritten with the name on the client.

Mac Address: The Mac addresses of the associated stations.

IP Address: Works as with the **Name**. It appears when the **Extended Wireless Information** option in the Administrative Settings window is checked.

Status: Indicates if the station is associated.

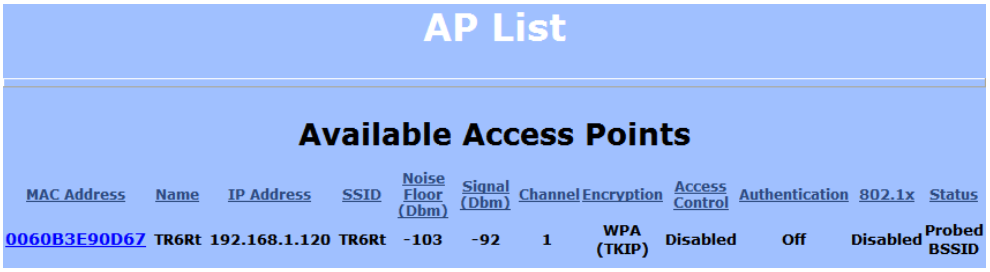
Signal: This is the radio frequency power in dBm as detected at the access point. A strong link is defined by both the AP signal and the client signal. Links should also be at least 10 dB higher than the receive sensitivity of the weakest element or the noise floor, whichever is higher, on both sides.

Speed: This is the radio speed of the link. Speed is based on both signal strength and the quality of the link. If the link is losing a lot of packets due to poor Fresnel zones or interference, the speed will be lower than the strength can support.

AP List (Tx-Master / Rx-Slave only)

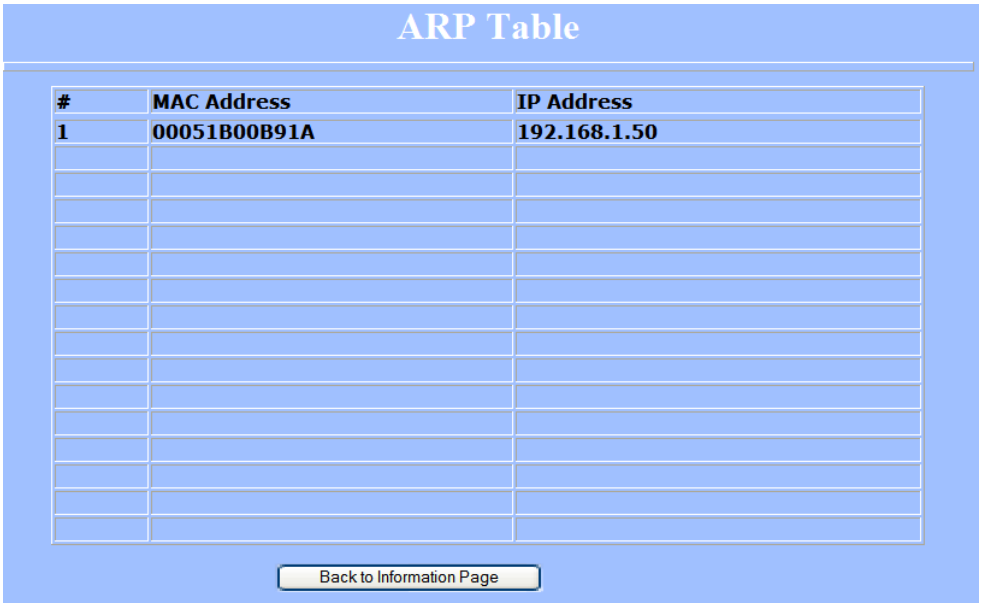
This window displays information about the access points associated with the CPE and the connection statistics.

You can set an access point's SSID as your primary SSID by clicking on the MAC address when it's displayed as a link. This will automatically reboot the radio.



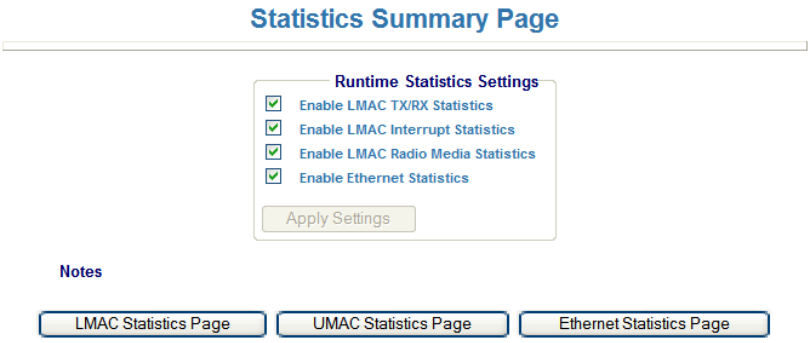
ARP Table

This table lists the devices that have communicated with your device via TCP. There should be a limited number of entries in this table, especially if the interstation blocking is turned on at the access point.



Statistics

This section is divided in 3 windows: LMAC (Lower Mac), UMAC (Upper Mac), and Ethernet, which can be accessed from the Statistic Summary Page.

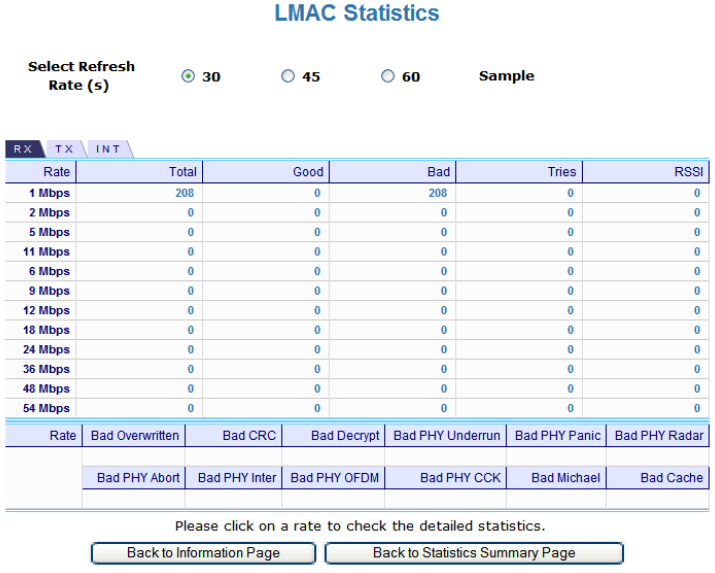


LMAC Statistics

The LMAC functions occur in the radio chipset. While the UMAC divides the statistics into clean and failed packets, LMAC defines why packets failed.

This window contains three tabs: TX, RX and INT. TX and RX values are useful to ISPs and other users. The INT (internal) statistics are intended for use by Tranzeo Wireless Technical Support.

You can click onto each speed level and see how the traffic breaks down. In the TX statistics, there should little to no Tries at Series 2, 3 or 4. The radio will try to send a packet 4 times at Series 1 and then will try the next series 4 times. In the RX statistics, you should look for bad CRCs and bad decrypts for signs of RF interference or Fresnel interference links. Bad PHYs generally are caused when the radio is unable to decode the packets due to noise.

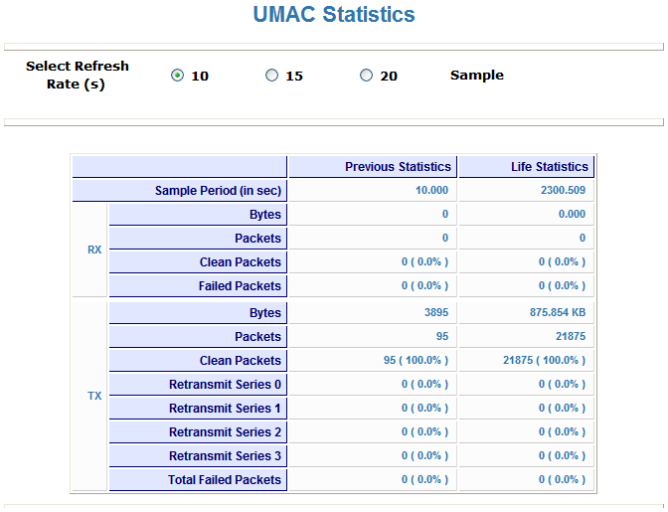


Note:
Communication between access points and CPEs always occurs at the lowest rate. In a normal link, you should see a fair number of transactions at the lowest rate.

UMAC Statistics

The UMAC functions occur in the unit's processor. The UMAC statistics are likely the most useful for radio troubleshooting. This window breaks down the statistics into clean and failed packets.

The failed packets should be less than 10% in a normal operating environment. In the TX statistics, there should be little to no Retransmits at Series 2, 3 or 4. Life Statistics are reset on each reboot.

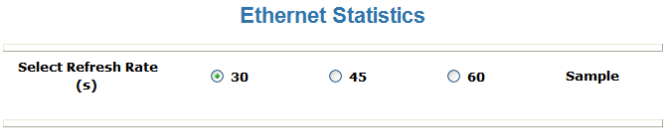


		Previous Statistics	Life Statistics
	Sample Period (in sec)	10.000	2300.509
RX	Bytes	0	0.000
	Packets	0	0
	Clean Packets	0 (0.0%)	0 (0.0%)
	Failed Packets	0 (0.0%)	0 (0.0%)
TX	Bytes	3895	875.854 KB
	Packets	95	21875
	Clean Packets	95 (100.0%)	21875 (100.0%)
	Retransmit Series 0	0 (0.0%)	0 (0.0%)
	Retransmit Series 1	0 (0.0%)	0 (0.0%)
	Retransmit Series 2	0 (0.0%)	0 (0.0%)
	Retransmit Series 3	0 (0.0%)	0 (0.0%)
	Total Failed Packets	0 (0.0%)	0 (0.0%)

Ethernet Statistics

In this window, excessive collisions are usually a sign that the radio and the device it is linked to are not on the same duplex settings. One is at full while the other is at half. Try locking both to the same values.

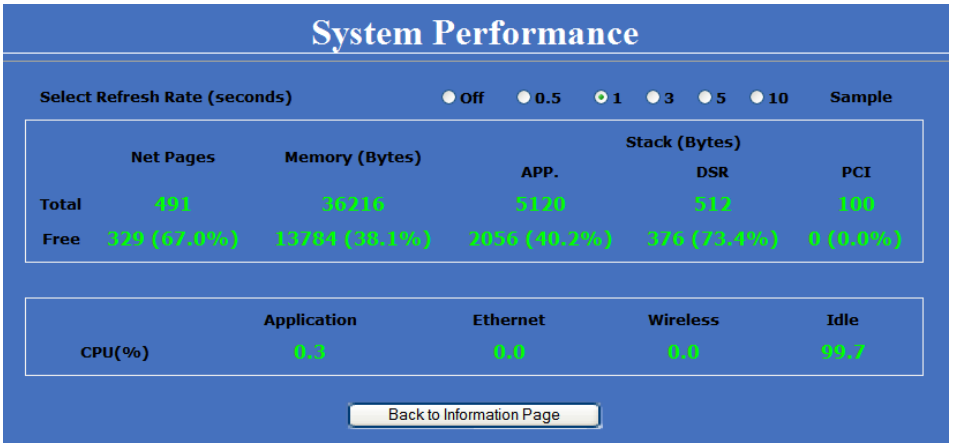
Collisions do normally occur on an Ethernet network and are generally handled by the Carrier Sense Multiple Access with Collision Detect (CSMA/CD) mechanism. Alignment, length and excessive FCS errors could the result of a bad radio link, or a bad Ethernet cable.



		Ethernet 1	Ethernet 2
TX	Total	360	0
	Dropped by Software	0	0
	Dropped by Link	0	0
	Collision	0	0
	Late Collision	0	0
	Excessive Collision	0	0
RX	Total	236	0
	Dropped by HRT	0	0
	Dropped by DSR	0	0
	Dropped by Software	0	0
	Frames over 2048 bytes	0	0
	Frames over 1518 and less than 2048 bytes	0	0
	FCS Error	0	0
	Length Error	0	0
	Alignment Error	0	0

System Performance

This window shows information about the memory usage and the CPU. Many browsers do not allow infinite refreshes of a page through scripts, so this window may stop updating. If it does, simply change the refresh rate to another value to restart the process.



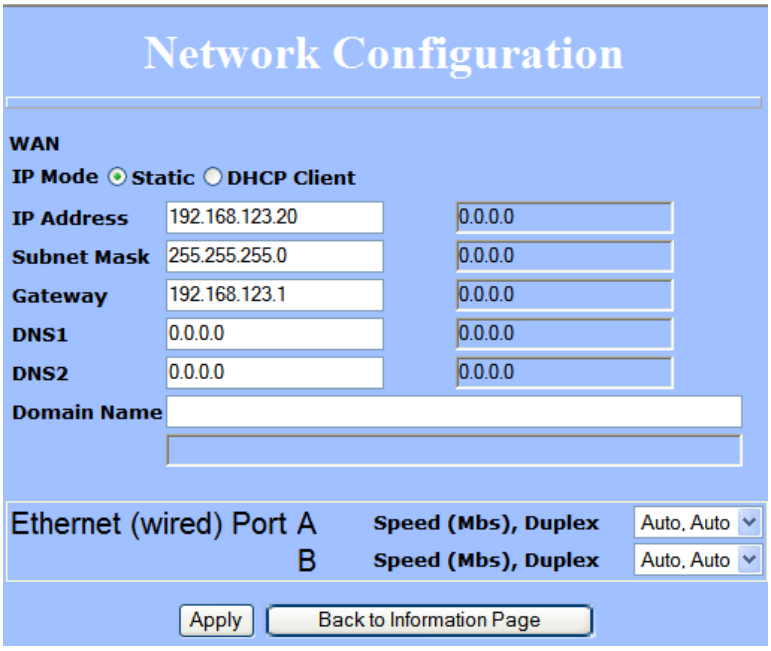
Select Refresh Rate:	Set the time for automatic refreshes.
Net Pages:	This is the memory used for data transmission
Memory:	This is the total memory of the system.
Stack:	This section displays the memory used and available for each stack: App. (applications), DSR, and PCI. This information is relevant for programmers.

Network Configuration

In this window you can control the network configuration of the device. First, you must define if your radio will operate with a static IP address or a DHCP address. The content of the window varies depending on your selection.

When changing modes, the radio may need to reboot before certain features become available.

Static IP



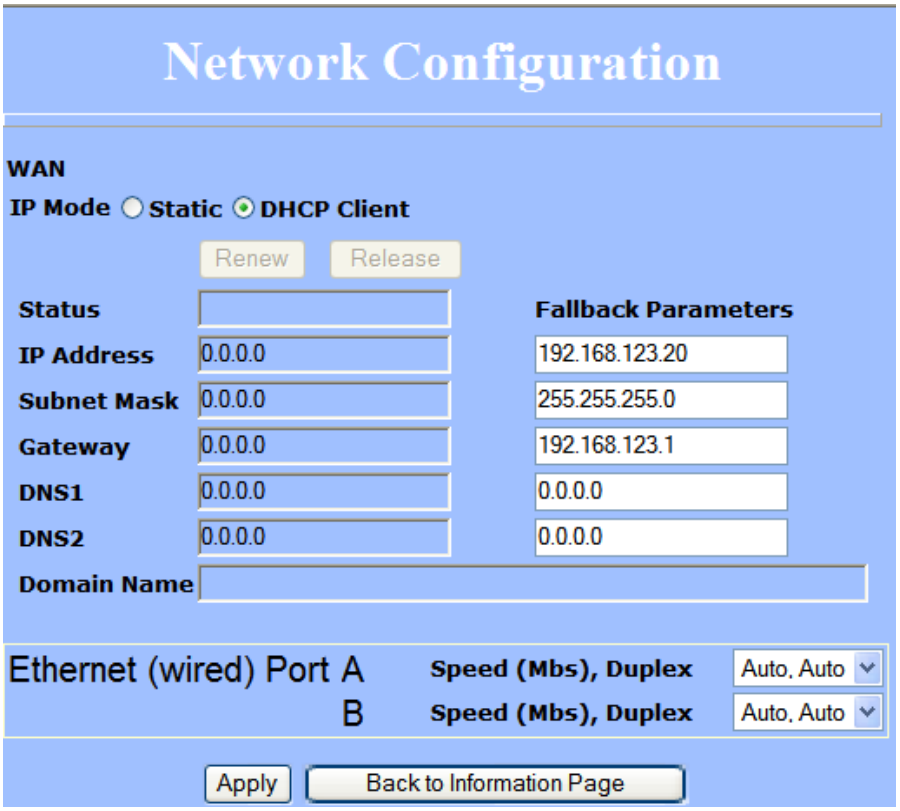
IP Mode: You can select to use **Static** IP or **DHCP Client** (dynamic). Note: If a DHCP server is not available, the device will try to get an IP. If has no success, it will use a fallback IP address. The fallback IP is the address that is set in the static address fields.

Ethernet Port Speed: Set as **Auto** by default.

Note:

Many Ethernet devices do not auto-negotiate properly. If you see large numbers of dropped pings, you may have collisions. Try locking the device at 10/half as a troubleshooting step. If the packet losses stop, step up to 100/full. If the device the radio is connecting cannot support 100/full, you should replace the device or place a switch in line.

DHCP CLIENT



IP Mode:	You can select to use **Static** IP or **DHCP Client** (dynamic). Note: If a DHCP server is not available, the device will try to get an IP. If has no success, it will use a fallback IP address. The fallback IP is the address that is set in the static address fields.
Ethernet Port Speed:	Set as **Auto** by default.

Note:

Many Ethernet devices do not auto-negotiate properly. If you see large numbers of dropped pings, you may have collisions. Try locking the device at 10/half as a troubleshooting step. If the packet losses stop, step up to 100/full. If the device the radio is connecting cannot support 100/full, you should replace the device or place a switch in line.

Appendix A: Grounding and Lightning Protection Information

What is a proper ground?

This antenna must be grounded to a proper earth ground. According to the National Electrical Code Sections 810-15s and 810-21, the grounding conductor shall be connected to the nearest accessible locations of the following:

- The building or structure grounding electrode
- The grounded interior metal water piping system
- The power service accessible means external to enclosure
- The metallic power service raceway
- The service equipment enclosure
- The grounding electrode conductor

Why is coiling the LMR or Cat 5 bad?

The myth is that lighting follows the path of least resistance. It actually follows the path of least impedance. Coiling cables creates an air-wound transformer, which lowers the impedance. This means you are in fact making your radios a more appealing target for surges.

What standard does Tranzeo Wireless equipment meet?

This radio exceeds International Standard IEC 61000-4-5 when properly grounded. For a copy of the full testing report, see Report Number TRL090904 - *Tranzeo Surge Protection board* located on the Tranzeo website (www.tranzeo.com).

Is lightning damage covered by the warranty?

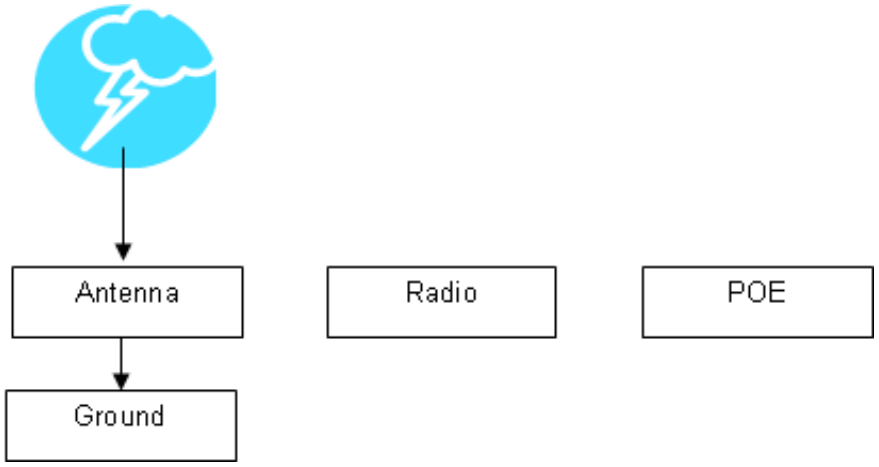
No. Lightning is not covered by the warranty. If you follow the instructions, your chances of lightning damage are greatly reduced, but nothing can protect a radio from a direct lightning strike.

Where to ground the device?

This radio must be grounded at the pole and at the POE. This is because the radio is between the exterior antenna and the POE ground. See the examples below.

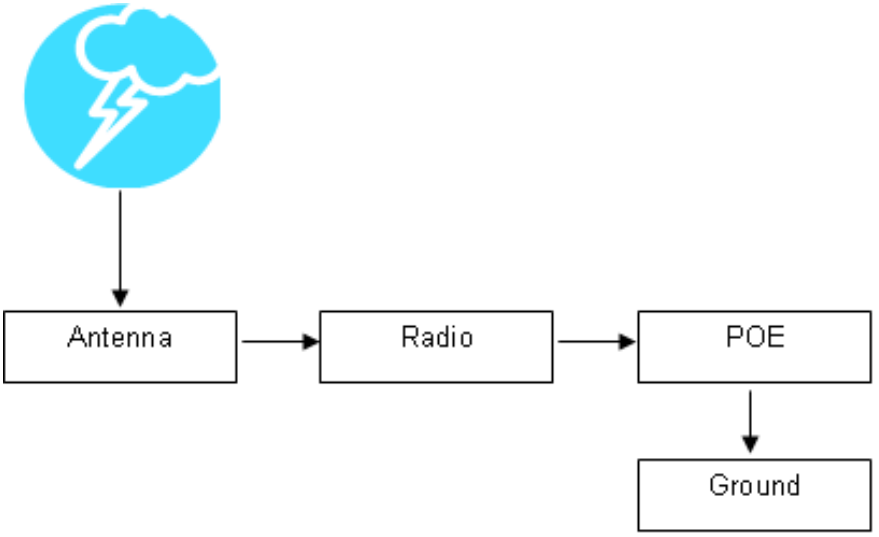
Grounded Radio

A grounded radio causes the surge to pass directly to ground, bypassing the radio.



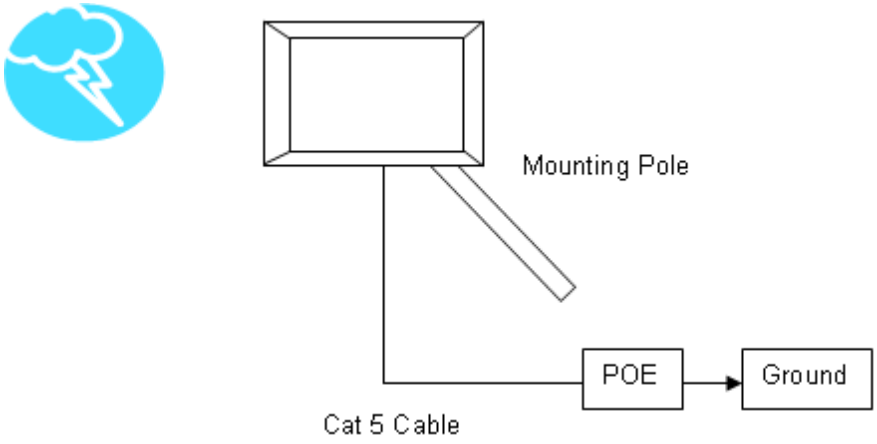
Ungrounded Radio

An ungrounded radio causes the surge to pass through the radio. In this case, the radio most likely will be damaged.



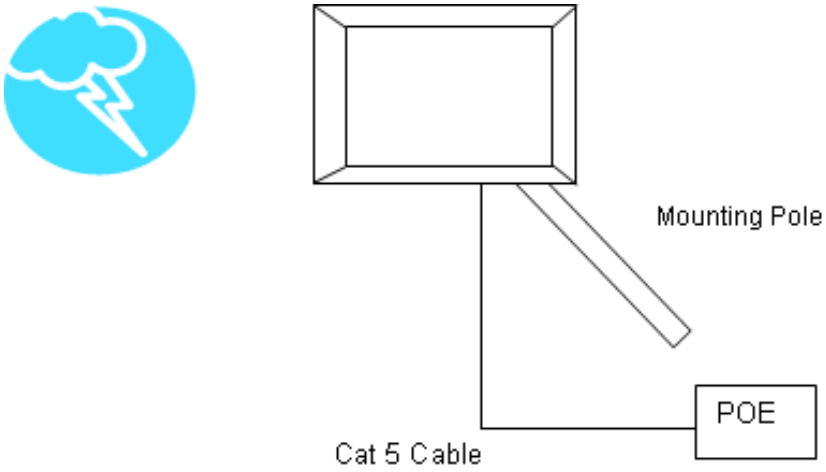
Grounded POE

In this case, the surge will be picked up by the Cat 5 cable and since the POE is grounded, the route for the surge is through the POE to ground.



Ungrounded POE

In this case, the surge will be picked up by the Cat 5 cable and since the POE is not grounded, the route for the surge is through the radio to the antenna, and out through the building.



Appendix B: Channel Allocations

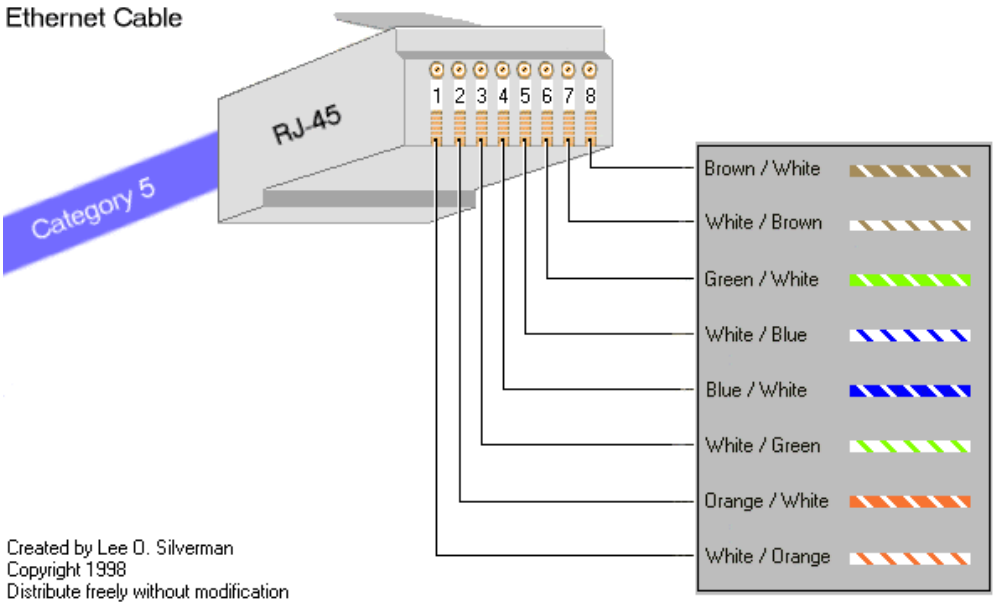
The following tables list the channel numbers and center frequencies used for 802.11a. Note that while all of these frequencies are in the unlicensed ISM and U-NII bands, not all channels are available in all countries. Many regions impose restrictions on output power as well as indoor and outdoor use on some channels. These regulations are rapidly changing, so always check your local regulations before transmitting.

These tables show the center frequency for each channel. Channels are 20 MHz wide in 802.11a.

802.11a	
Channel #	**Center Frequency (GHz)**
149	5.745
153	5.765
157	5.785
161	5.805
165	5.825

Appendix C: Wiring Standard

TIA/EIA-568-B is a set of standards for cabling telecommunications products and services. Follow these standards, as described in the diagram below, to wire the Cat 5 cable during installation of the Tranzeo radio (see Step 3 in Chapter 2: Hardware Installation - Installing the Ethernet Cable).



Appendix D: PxP Install Checklist

The following are some of the steps you should go through when planning a Point to Point (PxP) link.

Step 1: Finding the Location

- Determine the 2 endpoint locations.
- Calculate the distance between the locations.
- Find the heights of the locations

Link Distance _____

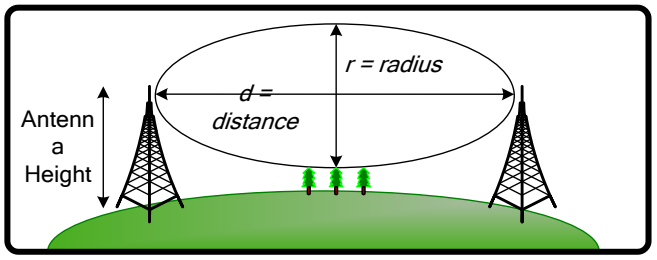
Tower Heights _____

Free Space Loss

Free space attenuation = 36.6 + 20log F + 20log D
where F = frequency in MHz and D = distance in miles

Step 2: Check the Line of

- Make sure that the line of sight is clear of obstruction.
- Check your Fresnel clearance with calculations to verify that you have enough room in the center of the path.
- Take photos of the line of sight from both sides of the proposed link.
- See example 1 below.



Fresnel zone
The cross section radius of the Fresnel zone is the highest in the center of the RF LoS which can be calculated as:

$$r = 43.3\sqrt{d/(4f)}$$

where r = radius in feet,
d = distance in miles,
and f = frequency in GHz.

Example 1: Fresnel Zone Calculation

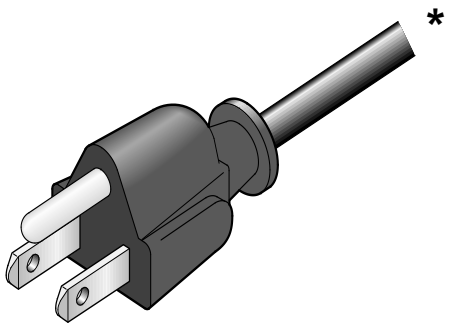
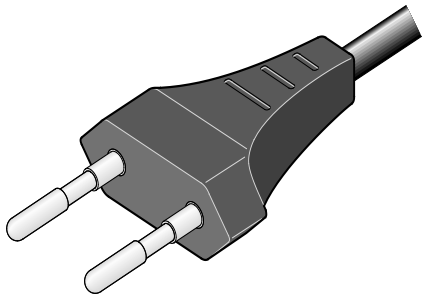
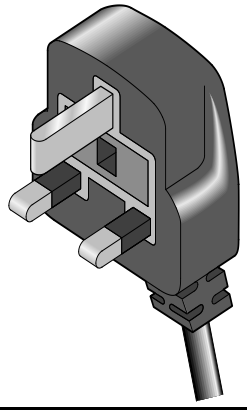
Step 3: Choose Hardware

- Select the hardware appropriate for the distance and type of link that you are installing

Appendix E: Glossary of Terms

AP: Access Point
ARP: Address Resolution Protocol
CPE: Client Premise Equipment
CTS: Clear To Send
DFS: Dynamic Frequency Selection
DHCP: Dynamic Host Configuration Protocol
DNS: Domain Name Server
DTIM: Delivery Traffic Indication Message
EIRP: Effective Isotropic Radiated Power
FTP: File Transport Protocol
HTML: HyperText Markup Language
HTTP: HyperText Transport Protocol
IP: Internet Protocol
ISP: Internet Service Provider
LAN: Local Area Network
MTU: Maximum Transmission Unit
NAT: Network Address Translation
NIC: Network Interface Card
NOC: Network Operation Center
POP: Post Office Protocol or Point Of Presence
PxP: Point to Point
P2P: Peer to Peer
PPPoE: Point-to-Point Protocol over Ethernet
QOS: Quality Of Service
RADIUS: Remote Authentication Dial-in User Service
RF: Radio Frequency
RTS: Request To Send
SMTP: Simple Mail Transport Protocol
SNMP: Simple Network Management Protocol
TCP: Transmission Control Protocol
TPC: Transmit Power Control
UDP: User Datagram Protocol
VPN: Virtual Private Network
WAN: Wide Area Network
WEP: Wired Equivalent Privacy
WDS: Wireless Distribution System
WINS: Windows Internet Naming Service
WISP: Wireless Internet Service Provider
WPA: Wi-Fi Protected Access

Appendix F: Tranzeo Electrical Plugs

Electrical Plug Type	Letter	Description
 *	F	FCC / North American adapter
	C	ETSI / Euro adapter
	A	FCC / Euro adapter
	U	ETSI / UK adapter
	M	FCC / UK adapter

*** 24 volt version shown.**

Appendix G: Warranty Terms

Warranty Terms For Canada / US

1. The following Tranzeo Wireless manufactured products are warranted against defects in material and workmanship for a period of one year from date of purchase, under normal use.
    - All products manufactured prior to May 1st, 2006
    - All TR-CPE200-N
    - All TR-CPE200-15
    - All TR-CPE200-19
    - All Antennas
    - All Cables
2. All Tranzeo Wireless Power Over Ethernet and power supplies adaptors are covered by a 90 day warranty.
3. All other Tranzeo Wireless CPE, AP and Backhaul Radio products manufactured after May 1st, 2006 are warranted against defects in material and workmanship for a period of two years from date of manufacture, under normal use.
4. All other Tranzeo Wireless CPE, AP and Backhaul Radio products manufactured after Dec 1st, 2006 are warranted against defects in material and workmanship for a period of three years from date of manufacture, under normal use.
5. Tranzeo Wireless manufactured products are covered by a Parts and Labor Depot Warranty. Depot warranty means the customer is responsible for delivering the defective product to the designated service depot for repair or replacement.
6. Tranzeo Wireless will repair or replace a product that was found to be defective by Tranzeo during the warranty period at its discretion.
7. All non-Tranzeo manufactured products carry the Original Equipment Manufacturer's warranty, which is passed on by Tranzeo Wireless. Warranty Claims against non-Tranzeo manufactured products must be filed with the appropriate manufacturer.
8. This warranty does not cover dealer labor cost for removing and reinstalling the machine for repair nor for any expendable parts that are readily replaced in normal use.
9. The sole responsibility of Tranzeo Wireless Systems under this warranty shall be limited to repair of this product, or replacement thereof, at the sole discretion of Tranzeo Wireless Systems.
10. All RMA items shipped to Tranzeo Wireless must be freight prepaid. Tranzeo Wireless will pay the return freight via a service of Tranzeo Wireless Technologies' choice. Customer is responsible for payment of any shipping upgrades.

Warranty Terms For The European Union

1. All Tranzeo Wireless Power Over Ethernet and power adaptors are covered by a 90 day warranty.
2. All other Tranzeo Wireless manufactured CPE; AP and Backhaul Radio products are warranted against defects in material and workmanship for a period of two years from date of purchase, under normal use.
3. All other Tranzeo Wireless CPE, AP and Backhaul Radio products manufactured after Dec 1st, 2006 are warranted against defects in material and workmanship for a period of three years from date of manufacture, under normal use.
4. Products must be used in accordance with relevant local regulations. Only products designed for and marketed to the European Market by Tranzeo will be honored for warranty service.
5. Tranzeo Wireless manufactured products are covered by a Parts and Labor Warranty. The customer is responsible for delivering the defective product to the designated service depot for repair or replacement.
6. Tranzeo Wireless will repair or replace a product that was found to be defective by Tranzeo during the warranty period at its discretion.

7. All non-Tranzeo manufactured products carry the OEM's warranty, which is passed on by Tranzeo Wireless. Warranty Claims against non-Tranzeo manufactured products must be filed with the appropriate manufacturer.
8. This warranty does not cover dealer labor cost for removing and reinstalling the machine for repair nor for any expendable parts that are readily replaced in normal use.
9. VAT, Customs and other local taxes are the responsibility of customer.
10. The sole responsibility of Tranzeo Wireless Systems under this warranty shall be limited to repair of this product, or replacement thereof, at the sole discretion of Tranzeo Wireless Systems.
11. All RMA items shipped to Tranzeo Wireless must be freight prepaid. Tranzeo Wireless will arrange the return freight. Customer is responsible for payment of any shipping costs. Shipping costs must be pre-paid before the item is shipped.

Warranty Terms For The Rest of the World

1. The following Tranzeo Wireless manufactured products are warranted against defects in material and workmanship for a period of one year from date of purchase, under normal use.
    - TR-CPE200-N
    - TR-CPE200-15
    - TR-CPE200-19
2. All Tranzeo Wireless Power over Ethernet adaptors are covered by a 90 day warranty.
3. All other Tranzeo Wireless manufactured CPE; AP and Backhaul Radio products are warranted against defects in material and workmanship for a period of two years from date of purchase, under normal use.
4. Tranzeo Wireless manufactured products are covered by a Parts and Labor Warranty. The customer is responsible for delivering the defective product to the designated service depot for repair or replacement.
5. Tranzeo Wireless will repair or replace a product that was found to be defective by Tranzeo during the warranty period at its discretion.
6. All non-Tranzeo manufactured products carry the OEM's warranty, which is passed on by Tranzeo Wireless. Warranty Claims against non-Tranzeo manufactured products must be filed with the appropriate manufacturer.
7. This warranty does not cover dealer labor cost for removing and reinstalling the machine for repair nor for any expendable parts that are readily replaced in normal use.
8. VAT, Customs and other local taxes are the responsibility of customer.
9. The sole responsibility of Tranzeo Wireless Systems under this warranty shall be limited to repair of this product, or replacement thereof, at the sole discretion of Tranzeo Wireless Systems.
10. All RMA items shipped to Tranzeo Wireless must be freight prepaid. Tranzeo Wireless will arrange the return freight. Customer is responsible for payment of any shipping costs. Shipping costs must be pre-paid before the item is shipped.

Limitation of Warranty

This warranty does not apply if the Product:

- has been opened and/or altered, except by Tranzeo Wireless technical personnel,
- has been painted in way shape or form,
- has been damaged due to errors or defects in cabling
- has not been maintained in accordance with instructions supplied by Tranzeo Wireless,
- has been subjected to abnormal physical or electrical stress, including lightening

strike, misuse, negligence, or accident;
- removal of serial number label, or
- equipment sold under resale agreements, i.e. Amplifiers, Antennas.

Who to Contact for an RMA?

There are 3 ways to discuss any technical difficulties and request an RMA #:

1. Fill out our online RMA Request Form at support@tranzeo.com
2. Call our Technical Support Center at 604-460-6002
3. Or email our RMA Department at rma@tranzeo.com

What information will be required?

- Dealer Username and Password
- Customer name/ID # and contact information
- Warranty Status (Data of purchase)
- Problem Description
- Part Number or Serial Number
- Troubleshooting actions taken so far

Warranty Repair

a) RMA number is valid for 90 days only.
b) If the product is not received within 90 days, the RMA will be cancelled.
c) Tranzeo Wireless will carefully test and evaluate all returned products and will repair or replace defective products that are under warranty at no charge.
d) If the malfunction is due to a manufacturing defect, it will be repaired, tested, aligned and calibrated as necessary, with strict adherence to factory specified procedures and parts, to working order.
e) If the malfunction is due to an issue not covered by warranty, a $35.00 evaluation fee will be charged, plus the actual costs of the repair. Tranzeo's current shop rate is $70.00 per hour, plus parts.
f) When your unit is returned to you, you must restore configuration and or applications before full use can resume.
g) If the product cannot be repaired, a refurbished replacement product will be provided.
h) However, if Tranzeo Wireless cannot duplicate the problem or condition causing the return, the unit will be returned to the customer at the customers cost as: "No Problem Found" and a $35.00 evaluation fee may be charged.
i) Repaired or replaced product will be subject to the original warranty period but not less than 30 days.
j) All items must be shipped pre-paid. Tranzeo Wireless will not accept any collect packages. Tranzeo will pay the shipping to return your products. We recommend insuring the package using the values from our commercial invoice.
k) Be sure to package the items well. Original packaging should be used for shipping. Tranzeo is not responsible for further damage caused to the unit due to inadequate packaging.
l) We recommend that you use a shipping service with tracking (i.e. UPS/FedEx ground) to ship your RMA. Tranzeo will not accept any packages that arrive with charges owing.
m) Be sure to include the password for each device. Any device that arrives without a password may be subject to a $60 rebuilding charge per unit.

Out of Warranty Replacements

Product that is out warranty will be repaired on a fee for service basis at Tranzeo's shop rate of $70.00 per hour plus parts. A $75.00 deposit is charged for all non-warranty repairs when the RMA is issued.

Any goods left for more than 90 days without instructions will be considered abandoned and be disposed of.

What to ship?

Products that are returned for RMA work should be shipped in the original package and include the items that that are to be repaired. All returned product must reference the RMA # on the outside of the box. A returned product without clearly marked RMA# will be refused and returned to sender.

How to ship?

- We recommend that you use a shipping service with tracking (i.e. UPS/FedEx ground) to ship your RMA.
- Products returned for warranty repair or out-of-warranty replacement, must be marked with a valid RMA number and shipped FOB Destination, Prepaid.
- Approximate turnaround time is 7 business days for warranty repairs and replacements.
- Shipping Time is generally 7 business days to any location in the United States.
- Tranzeo Wireless will refuse any item that does not have an RMA# clearly marked on the outside of the box.
- Tranzeo Wireless is NOT responsible for any damage to the products during transit by the shipping company.
- All claims for shipment errors must be made within 3 days after receipt of shipment.

Warranty Disclaimer

Except in only the limited express warranty set forth above, there are no expressed or implied warranties of merchantability and fitness for a particular purpose. In no event will Tranzeo Wireless Systems be liable for any direct, special, or consequential damages arising out of, or in connection with, the delivery, use, inability to use, or performance of this product.

Goods Damaged in Transit

Tranzeo Wireless Technologies ships all item FOB Factory. This means that title for the item transfers to the buyer once the courier picks up the package. If there is damage, a

claim must be filed with the courier by the owner of the goods, which is the buyer. Shipping damage is not covered by the warranty. Damage claims are between the recipient of the goods and the courier.

Shipping Firms do have legal obligations and limitations as to when and how much to compensate for damage, but only if the claim is filed on time and in the correct manner. You must file the claim as soon as possible.

Making a Damage Claim

If you receive a shipment that appears to have been damaged by the shipper during shipping, take the steps on the on the box (shown below), then contact us so we have a record of the incident. We will assist in any way we can in filing and advocating for your claim.

If you choose to accept the shipment and sign for it, have the shipper stay with you while you open and inspect the contents of the container for any additional damage that was not visible before opening. Make sure the shipper notes all damage on the shipping bill before you sign. By signing the waybill, you release the Shipping Company from all obligations unless the damage is clearly noted.

If it is possible to take any photos of the damage and forward to the shipper and us, Before signing the shipping bill (for receipt of the shipment), **have the shipper note on the shipping bill the exact details of the damage.**

Appendix H: How Can We Improve?

Please take a moment to help us improve your experience with Tranzeo Wireless. Please fax the completed questionnaire to 604-460-6005. Each month we will draw for a free gift.

Product Quality

Was this your first order from Tranzeo Wireless?
- ☐ Yes
- ☐ No

Was your order complete?
- ☐ Yes
- ☐ No, I was missing:

_____

How would you rate our website?
- ☐ Very Informative
- ☐ Generally good
- ☐ Quality varies
- ☐ Poor quality

How would you rate our packaging?
- ☐ Consistent high quality
- ☐ Generally good
- ☐ Quality varies shipment to shiment
- ☐ Poor quality

How would you rate our order process?
- ☐ Consistent high quality
- ☐ Generally good
- ☐ Quality varies daily
- ☐ Poor quality

How would you rate our Technical Support?
- ☐ Consistent high quality
- ☐ Generally good
- ☐ Quality varies each time
- ☐ Poor quality

Service and Environment

Did you Sales Rep answer all your questions and explain your best options?
- ☐ Yes
- ☐ No

How long did you wait for your product after ordering?
- ☐ 1 to 3 days
- ☐ 3 to 5 days
- ☐ More than 5 days

How would you rate the Tranzeo Wireless staff you have dealt with to date?
- ☐ Friendly and helpful
- ☐ Average
- ☐ Varies on each call
- ☐ Poor service

Was the entire experience positive?
- ☐ Yes
- ☐ No

If No why?:_____

Additional Comments

_____

_____

About You (optional)

Name		E-mail	
Address		Phone	
City, State, ZIP Code			
May we add you to our mailing list, which offers news and exciting promotions? ☐ Yes ☐ No			

Thank you for your participation!

Appendix I: Notes