MobiRake 2000 Wireless Backhaul

OFDM-TDMA 5GHz Outdoor Radio

User Manual

Includes install, configuration and trouble shooting information for the broadband wireless access outdoor radio.

Version 2.0.1

Hypercable
MobiRake

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About This Manual

This manual includes install, configuration and trouble shooting for the 5GHz TDMA Outdoor Radio. It can help you in avoiding the unforeseen problems and use the outdoor radio correctly.

Technical Support

If you have difficulty resolving the problem while installing or using the wireless backhaul, Please contact the supplier for support.

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Conventions

This publication uses the following conventions to convey instructions and information:

	This symbol means ***reader take note.*** Notes contain helpful suggestions or references to materials not contained in this manual.

	This symbol means ***reader be careful.*** In this situation, you might do something that could result in equipment damage or loss of data.

	This warning symbol means ***danger***. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents.

Chapter 1   Introduction

With highly-powered OFDM-TDMA technology, this radio is a high capacity point-to-point backhaul for 5GHz ISM band wireless deployment in long distance. 5/10/20/40 MHz adjustable channel bandwidth provides the flexibility of deployment channel plan or high capacity backhaul -- truly throughput up to 50Mbps.

It utilizes Time Division Duplex technology allowing operation on a single channel with different uplink / downlink ratio. This improves the efficiency of channel BW usage rate. The Ethernet products are primarily designed to provide standard Ethernet interface in a wireless link between distant sites.

This long distance backhaul has powerful security management because it supports WEP-128bits, AES-256 bits encryption, and use the proprietary protocol. All these functions make the network much more secure and reliable.

1-1 Features and Benefits

■ Effective spectrum utility / variable capacities

This radio has 4 kinds of channel bandwidths (5/10/20/40 MHz) for optional, which is adjustable via software. This function provides flexibilities of channel plan and variable capacities for different applications.

■ OFDM-TDMA technology improves the performance in long distance

This radio improves the throughput performance up to 50~70% in long distance due to the better efficiency of OFDM-TDMA technology, that means the system has the same performance with lower EIRP (smaller antenna) compare to other standard wifi products.

■ Time-Division Multiplexing Access technique

TDMA tech can avoid the packets collision and send the packets more efficient and stable to improve the quality of wireless transmission in long distance.

■ High output power OFDM technology and Integrated antenna

Integrated panel antenna type with the high output power OFDM technology provides best performance and lowest price at the same time support this radio to be the most cost effective solution in the long distance wireless backhaul market.

■ Proprietary Security

This radio uses proprietary protocol, which means other standard wifi products can't connect to this radio. It also provides WEP-128bits and AES-256bits encryption to build the highest security mechanism to prevent the malicious attacking from the internet.

■ Antenna Alignment (Audible antenna alignment)

The site survey function provides the RSSI (signal strength) info to indicate the status of antenna alignment. The radio also supports audible antenna alignment

for aligning the antenna by the earphone of your mp3 player, quite easy and simple.

■ FETURES

- ➢ Provides the easy installation and high performance outdoor PTP / PTMP wireless backhaul up to 80 KM (With high gain external antenna).

- ➢ With a data rate up to 5.5Mbps / 10Mbps / 20Mbps / 40Mbps (with different bandwidth: 5MHz / 10MHz / 20MHz / 40MHz), customer can select the suitable bandwidth via the software.

- ➢ Technique operating in the 5GHz.

- ➢ Integrated antenna version uses 23dBi panel antenna.

- ➢ Transmit Power Control :

  Supports settable transmit power levels to adjust coverage cell size, ranging from full, half(50%), quarter(25%) eighth(12.5%) and min

- ➢ Provides WEP-128 bits AES-256bits as well as MAC access control to increase security.

- ➢ Provides Web-based configuration utility, user friendly interface.

- ➢ Support SNMP (Simple Network Management Protocol) for management.

- ➢ IP-68 rated weather-proof housing

Chapter 2   Hardware Installation

This chapter describes initial setup of the TDMA outdoor radio

Warnings

WARNING	In order to comply with international radio frequency (RF) exposure limits, dish antennas should be laced at a minimum of 8.7 inches (22 cm) from the bodies of all persons. Other antennas should be laced a minimum of 7.9 inches (20 cm) from the bodies of all persons.
WARNING	Do not work on the system or connect or disconnect cables during periods of lightning activity.
WARNING	This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available.
WARNING	Ultimate disposal of this product should be handled according to all national laws and regulations.
WARNING	Do not locate the antenna near overhead power lines or other electric light or power circuits, or where it can come into contact with such circuits. When installing the antenna, take extreme care not to come into contact with such circuits, as they may cause serious injury or death. For proper installation and grounding of the antenna, please refer to national and local codes (e.g. U.S.:NFPA 70, National Electrical Code, Article 810, in Canada: Canadian Electrical Code, Section 54).
WARNING	Only trained and qualified personnel should be allowed to install, replace, or service this equipment.
WARNING	To meet regulatory restrictions, the radio and the external antenna must be professionally installed. The network administrator or other IT professional responsible for installing and configuring the unit is a suitable professional installer. Following installation, access to the unit should be password protected by the network administrator to maintain regulatory compliance.
CAUTION	The 5GHz ISM band TDMA outdoor radio and POE injector can be damaged by incorrect power application. Read and carefully follow the installation instructions before connecing the system to its power source.

> **Follow the guidelines in this chapter to ensure correct operation and safe use of the ISM band radio.**

2-1 Product Kit

Before installation, make sure that you the following items:

◆ **5GHz TDMA Outdoor ODU**…………...…….….…….…......……..….…..x 1

◆ **Power over Ethernet**………………………………..……………..………x 1

◆ **Power Adapter**…………………………………………………….....…x 1

◆ **Power Cord**……………………………………………………….....…x 1

◆ **Water-proof connector for SFTP cable**…………………………….x 1

◆ **Mounting kit**..……………………………………………………........x 1

◆ **Product CD**………………………………………………………………x 1

◆ **Quick Installation Guide**………………………………….…………....x 1

> **NOTE:** If any of the above items are missing or damaged, please contact your local dealer for support.

2-2 System Requirements

Before installing the long distance wireless backhaul, please make sure that these requirements have been met:

■ A 10/100 Mbps Local Area Network device such as a hub or switch. (optional)

■ Category 5 UTP or STP networking cable. (From the PC to POE)

■ Category 5 SSTP or SFTP networking cable. (From the radio to POE)

■ A Web browser for configuration: Microsoft IE 5.0 or later, or Netscape Navigator 5.0 or later version.

■ Installing TCP/IP protocol to the computer.

2-3 Mechanical Description

Please refer to the following table for the meaning of each feature.

ODU: (External antenna)

Bottom Side

Grounding stud   Grounding stud

Reset button & beeper   Membrane Vent   RJ-45 Port

Top Side

N- Jack Antenna Connector
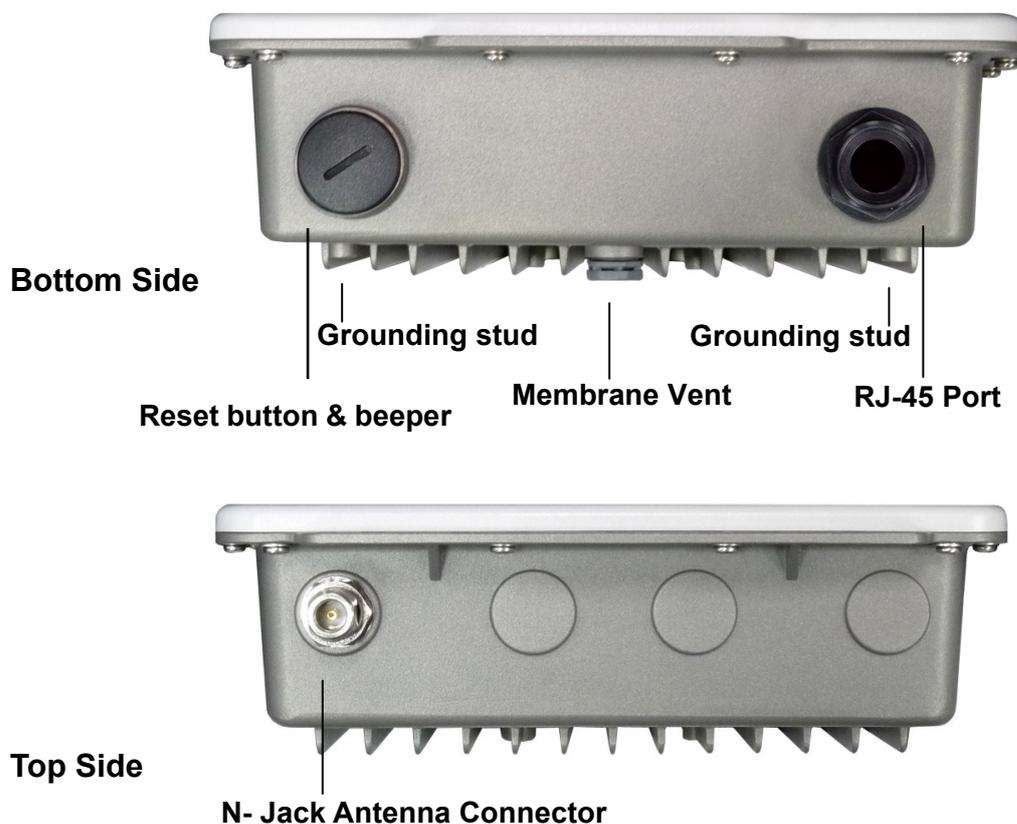
Outdoor Multi-function Radio Figure

| 1	RJ-45 Port	Use the SFTP cat.5 cable with weatherproof connector to connect to the "To ODU" side of the POE injector.
2	N- Jack Antenna Connector	Here you can attach the N-type external antenna to the TDMA outdoor radio. In order to improve the RF signal radiation of your antenna, proper antenna installation is necessary.
3	Grounding stud	Connect to the ground conductor with the ground wire.
4	Reset button	Revolve the plastic cap by coin, you will see the reset button. Press it and hold for 5~10 seconds, the radio will back to factory default settings.
5	Beeper	This function only works at adapter mode (or CPE mode) in the AP to CPE application, plug the headphone after remove the plastic cap, and check the signal level of the beeper for antenna alignment via earphone.
6	Membrane Vent	1. Moisture vapor permeable to help aid in condensation and fogging reduction in the ODU. 2. High airflow allows pressure equalization to prevent stress on enclosure seals

ODU: (integrated with 5GHz 23dBi panel antenna)

Reset button & beeper   **Grounding stud**   **Grounding stud**

Membrane Vent   **RJ-45 Port**
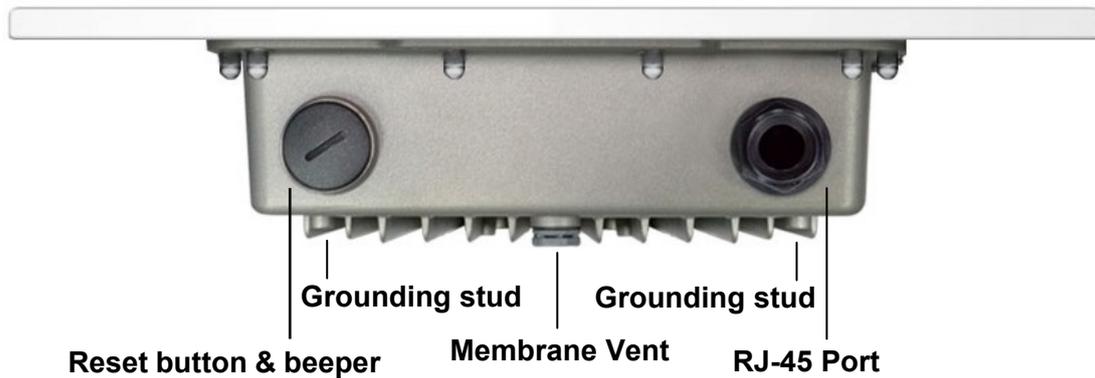
5GHz Outdoor Subscriber with integrated antenna

1	RJ-45 Port	Use the SFTP cat.5 cable with weatherproof connector to connect to the "To ODU" side of the POE injector.
2	Grounding stud	Connect to the ground conductor with the ground wire.
3	Reset button	Revolve the plastic cap by coin, you will see the reset button. Press it and hold the for 5~10 seconds, the radio will back to factory default settings.
4	Membrane Vent	1. Moisture vapor permeable to help aid in condensation and fogging reduction in the ODU. 2. High airflow allows pressure equalization to prevent stress on enclosure seals
5	Beeper	This function only works at adapter mode (or CPE mode) in the AP to CPE application, plug the headphone after remove the plastic cap, and check the signal level of the beeper for antenna alignment via earphone.

Note: screw the cap back well after you use the reset button or beeper.

⚠ WARNING	**This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available.**

POE

24VDC POE
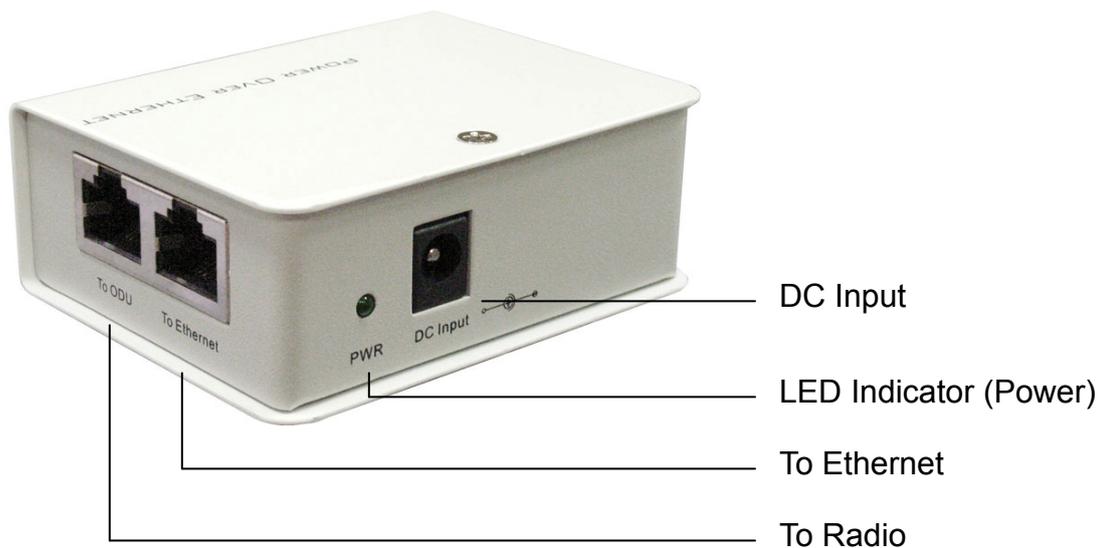
Power Over Ethernet

Power Over Ethernet Injector Figure

1	To Ethernet	This RJ-45 port is used to connect to the 10/100 Base T complied device such as switch, router or PC.
2	To ODU	This RJ-45 port is used to connect to the ODU.
3	DC Input	Connect to the Power adaptor for DC input.
4	LED Indicator	Power LED

+/- 48VDC POE (optional solution)

Grounding stud
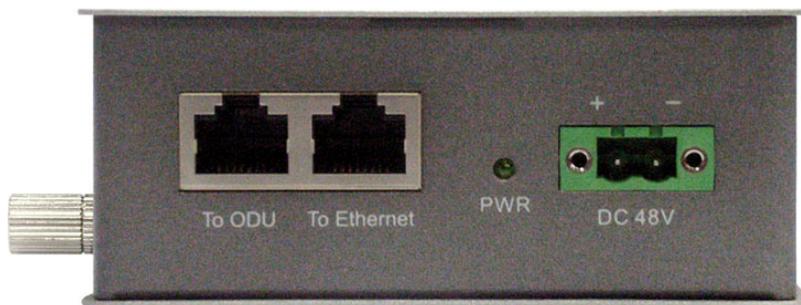
Power Over Ethernet Injector Figure

1	To Ethernet	This RJ-45 port is used to connect to the 10/100 Base T complied device such as switch, router or PC.
2	To ODU	This RJ-45 port is used to connect to the ODU.
3	DC 48V	Connect to the +/- 48V DC source
4	LED Indicator (PWR)	Power LED
5	Grounding stud	Connect to the ground conductor with the ground wire.

2-4 Hardware Installation

The 5GHz TDMA outdoor radio is a radio device, so it is susceptible to common causes of interference that can reduce throughput and range. Follow these basic guidelines to ensure the best possible performance:

➢ IF there is any other 5GHz RF device deployed around the outdoor radio, try to set the channel to the non-overlapping one.

➢ Install the bridge at a height sufficient place where structures, trees, or hills do not obstruct radio signals to and from the unit. A clear line-of-sight path can guarantee the performance of the RF link.

■ **Site Surveys**

Clear and flat area provide better RF range and data rate, on the contrary, physical obstructions such as trees, electric tower, hills or buildings can reduce the performance of RF devices. Do not deploy your radios in the location where there is any obstacle between the antennas.
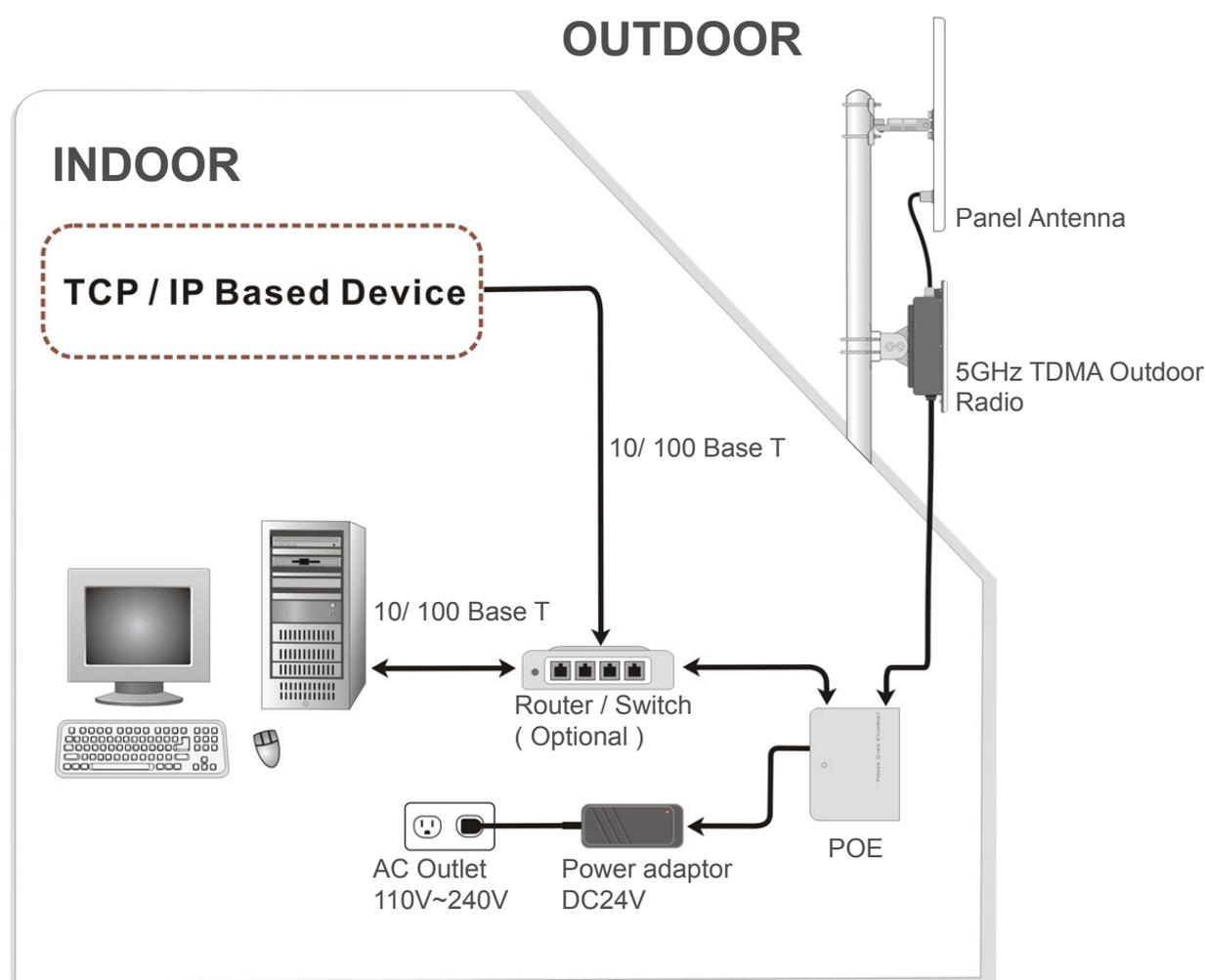
Hardware Installation Figure

OUTDOOR

INDOOR

TCP / IP Based Device

5GHz TDMA Outdoor
Subscriber

10/ 100 Base T

10/ 100 Base T

Router / Switch
(Optional)

POE

AC Outlet
110V~240V

Power adaptor
DC 24V
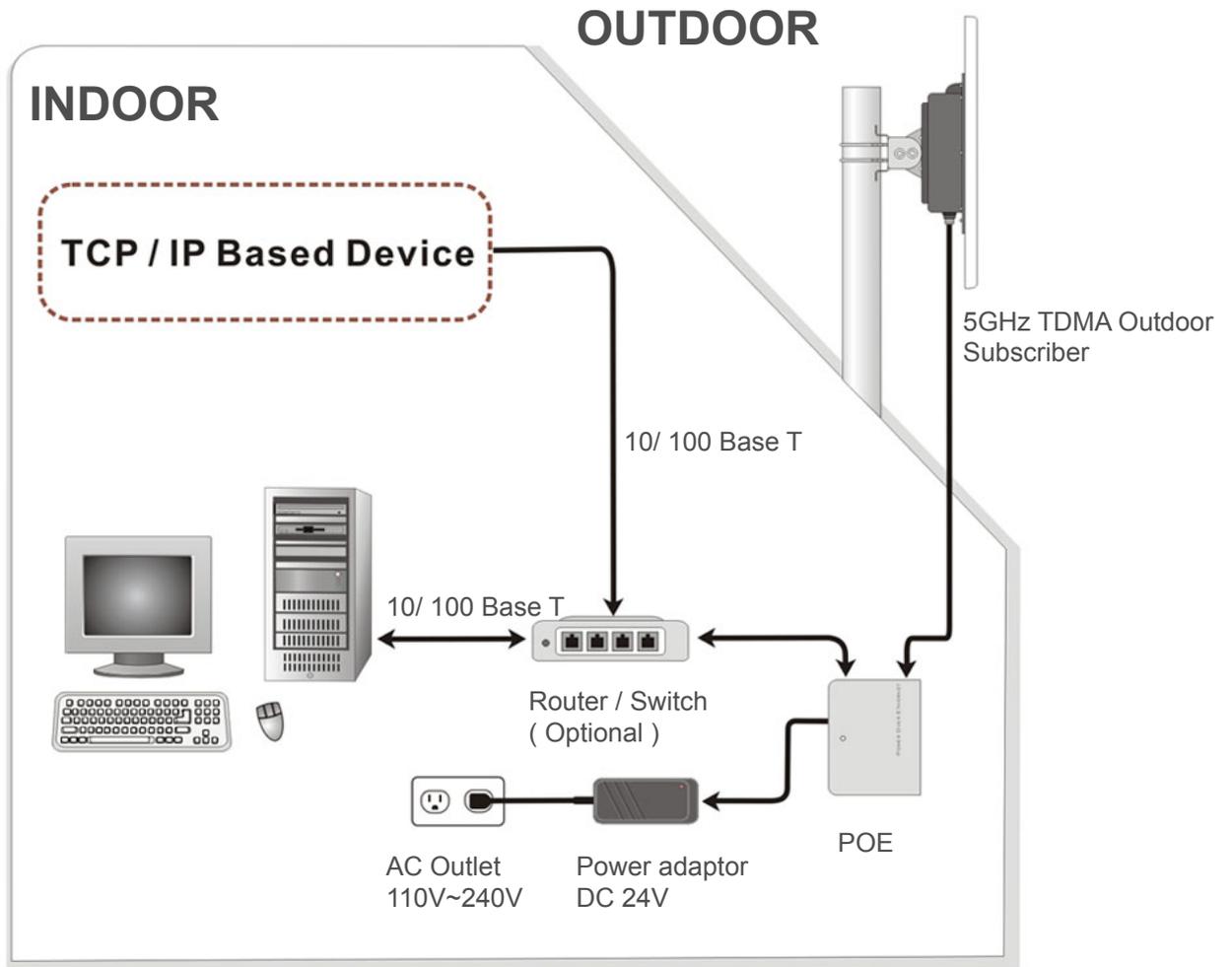
Configure and verify the 5GHz TDMA outdoor radio operations first before you mount the radio in a remote location.

Power Over Ethernet Injector is not a waterproof unit, should not be exposed to outdoor without any protection.

Chapter 3   Configuration

3-1 Start-up and Log in

In order to configure the long distance backhaul, use the web browser and please do the following:

1. Type the IP address **http://192.168.1.1** of this radio in the Location (for IE) or Address field and press Enter.

2. Enter the system name (the default setting is **"admin"**) and password (the default setting is **"password"**).

3. Click on the **"Login"** button.

After you have logged-in the main page, the **About**, **Basic Setup**, **Wireless Setup,** **Status, Statistics, Management** and **Logout** buttons will be shown. The main menu provides links to the whole sections of the web configuration interface.

About

The About screen describes the product information briefly. Information of the radio includes **Device Name**, **MAC Address**, and **Firmware Version information**.

Basic Setup / IP Setup

The **Device Name** is used to give a name to your TDMA outdoor radio This will enable you to manage your Wireless backhaul more easily if you have multiple radios on your network.

Ethernet Data Rate: you can choose the Ethernet data rate you need
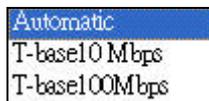
VLAN (802.1Q): enable this feature and assign a management Vlan ID to the radio. Those PC without same Vlan ID will not be allowed to connect this radio and configure it.

IP Address: Type the IP address you want to set to your TDMA outdoor radio (Default: 192.168.1.1).

IP Subnet Mask: The Wireless backhaul's Subnet Mask must be the same as your Ethernet network. We recommended that you do NOT change the value. (Default: 255.255.255.0).

Default Gateway: The Wireless backhaul will use this value for default Gateway.

Primary DNS Server: The Wireless backhaul will use this value for primary Domain Name Server.

Secondary DNS Server: The Wireless backhaul will use this value for secondary Domain Name Server.

Basic Setup / STP Setup

Spanning tree protocol (STP): You may Enable or Disable the Spanning Tree Protocol used in this radio.

Note: If you complete the settings, please click on "Apply" for changes to take effect.

3-2 Wireless Setup

Wireless Setup / Radio Settings

Radio Frequency (RF): You can enable/disable the RF interface.

Group Name: Base station and CPEs in same network must have the same Group name.

Operating Mode:
  Base Station：The default mode is Base Station.
  CPE：Perform as a client station associated to other APs. Be sure that they share the same SSID when connected.

Time Slot: Time slot divide using time between every client, default is 10ms. (only available in base station mode)

Upload Stream Time Ratio: Decide upload (CPE to BS) packets time ratio of every time slot, default is 50%. (only available in base station mode)

Only Base Station: Set the MAC of base station, this CPE can only connect to the base station with this MAC address. (Only available in CPE mode)

RF Bandwidth: Decide bandwidth of Radio Frequency. Including 5 / 10 / 20 / 40 MHz, default is 20MHz.

Channel / Frequency: Set the operation frequency of the radio.

TX Rate Range: Normally choice transmission rate as "Best", system will adapt best rate for real environment.

Including:
64QAM 3/4, (54Mbps)
64QAM 2/3, (48Mbps)
16QAM 3/4, (36Mbps)
16QAM 1/2, (24Mbps)
QPSK 3/4, (18Mbps)
QPSK 1/2, (12Mbps)
BPSK 3/4, (9Mbps)
BPSK 1/2, (6Mbps)

TX Power :
Setting power of TX, default is Full
Half = full - 3 dBm
Quarter = full - 6 dBm
Eighth = full - 9 dBm
Min = full -12 dBm

Fragmentation packet length:
Decide the length of the maximum fragmentation packet. When packet is large than setting, it would divide to smaller segment package. By default, it will divide the length of segment packet automatic
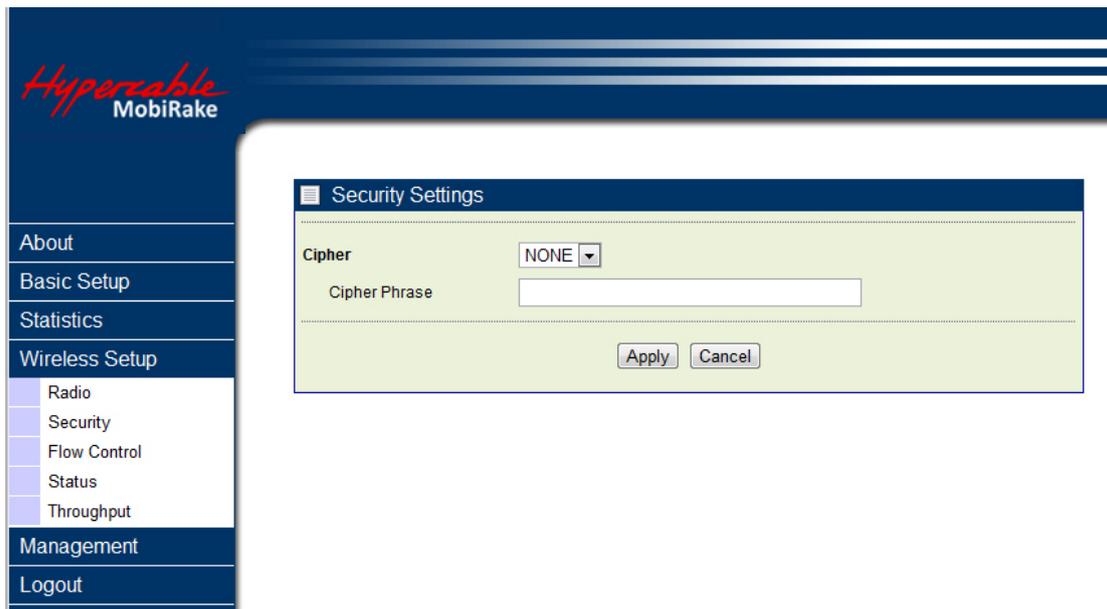
Security/Cipher To prevent unauthorized radios from accessing data transmitted over the link, the Encryption Settings window offers WEP/AES features, making your data transmission over air more secure and allows you to specify Encryption Key(s) if you enable encryption for the radio. There are three degrees of encryption could be selected: **NONE, 128 bits WEP and 256 bits AES**.

Security/Cipher Phrase After you select the encryption, please key-in the same phrase in this field of the both radios (local and remote) and then press apply, radio will generate a password automatically.

Flow control Flow control is the process of managing the rate of data transmission

between two nodes to prevent a fast sender from outrunning a slow receiver. It provides a mechanism for the receiver to control the transmission speed, so that the receiving node is not overwhelmed with data from transmitting node.

Status / Connections

The connections page provides below information: **Time, MAC Address** (remote radio), **IP Address** (remote radio), **channel info** (RF bandwidth / frequency), **Rx rate, Tx rate, RSSI, remote RSSI** and **Best Remote RSSI**.

Statistics

The Statistics screen provides various Ethernet and Wireless TX/RX packet statistics.
Click the **Refresh** button to update the statistics on this screen.
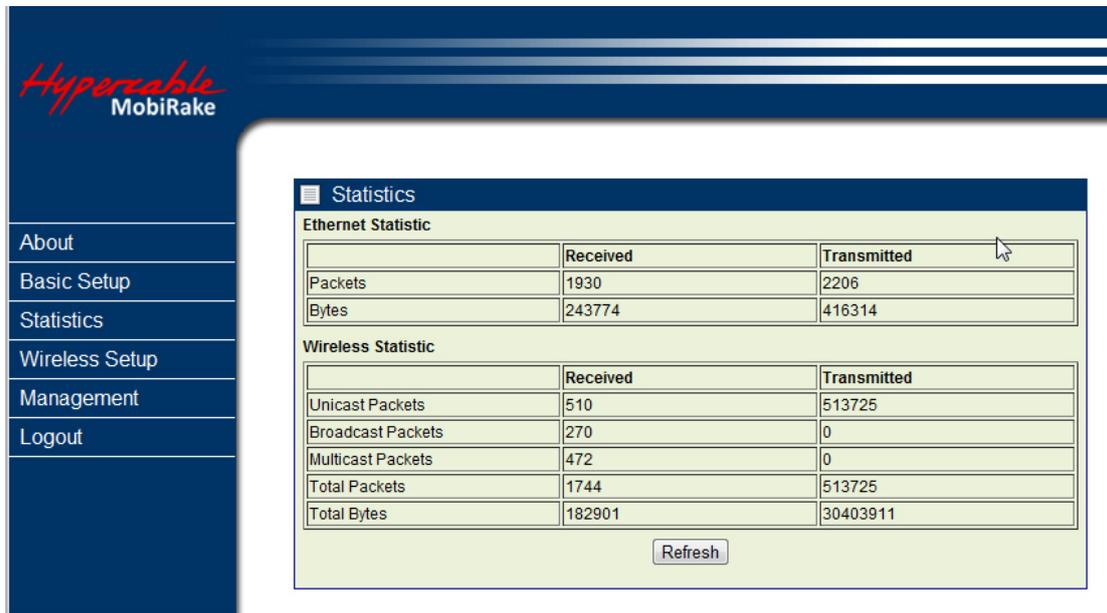
3-4 Management

Management / Change Password

This page allow you to change password of the TDMA outdoor radio.

1. Key in the current password in the "Current Password" filed. Default password of this radio is "password"

2. Key in the new password to the New Password field, and then type it again into the Repeat New password field to confirm the new password.

3. Click the "Apply" button to active the settings.

4. You can restore to default password too by check the "yes" option.

Note: After you change password, please take note of your new password. Otherwise, you will not able to access the radio with correct password.

Management / Upgrade Firmware

The Upgrade Firmware menu will display the Upgrade Firmware page, you can update the latest firmware to the TDMA outdoor radio.

Please make sure that you are using the latest and correct firmware before you doing the upgrade procedure.
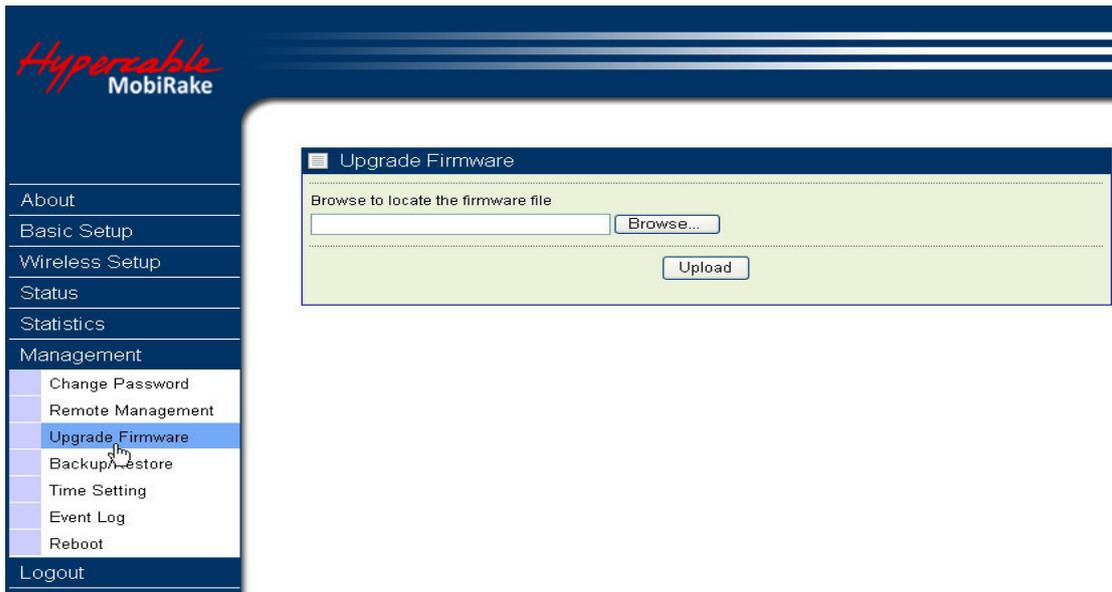
Below are the upgrade procedures:

● Using browser to access the main page of the TDMA outdoor radio

1. Select "Upgrade Firmware" from the **Management** page.

2. Input the exact file path and name or select the file by clicking **Browse** button, then press **Upload** button to upgrade the firmware.

3. Please wait for few seconds.

● If download fail, please repeat the step 1~3 to download again.

Note! Do not power off the unit when it is being upgraded.

Management / Backup / Restore Settings

The current system settings can be saved into a file as a backup by clicking "**Backup**". The saved file can be loaded back on the radio by clicking "**Browse**". When you have selected the settings file, click "**Retrieve**" to begin the process. Furthermore, you may click "**Restore**" to factory default settings.
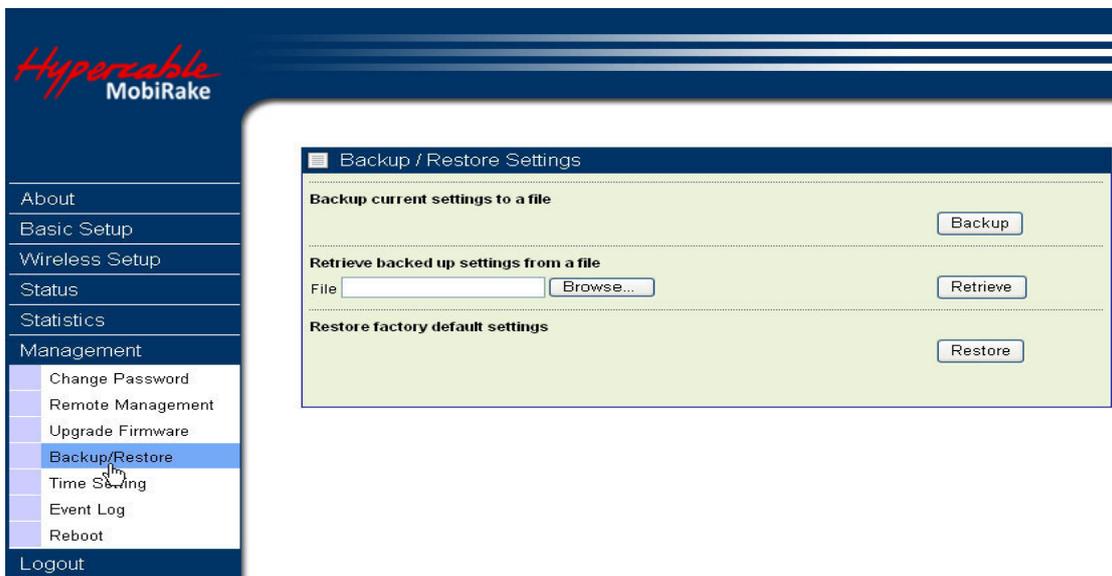
Management / Time Setting

The current system settings can be saved into a file as a backup by clicking "**Backup**". The saved file can be loaded back on the radio by clicking "**Browse**". When you have selected the settings file, click "**Retrieve**" to begin the process. Furthermore, you may click "**Restore**" to factory default settings.

Time: While you connect this Wireless backhaul to Internet, it could automatically synchronize the current time with the Time Server that you have set.

Time Server: the central time of the Time Server.

Time Server Port: the port of the Time Server.

Time Zone: You may select the appropriate local time zone for your radio from a list of all available time zones. Default: GMT.

(GMT-12:00) International Date Line West
(GMT-11:00) Midway Island, Samoa
(GMT-10:00) Hawaii
(GMT-09:00) Alaska
(GMT-08:00) Pacific Time (US & Canada); Tijuana
(GMT-07:00) Arizona
(GMT-07:00) Chihuahua, La Paz, Mazatlan
(GMT-07:00) Mountain Time (US & Canada)
(GMT-06:00) Central America
(GMT-06:00) Central Time (US & Canada)
(GMT-06:00) Guadalajara, Mexico City, Monterrey
(GMT-06:00) Saskatchewan
(GMT-05:00) Bogota, Lima, Quito
(GMT-05:00) Eastern Time (US & Canada)
(GMT-05:00) Indiana (East)
(GMT-04:00) Atlantic Time (Canada)
(GMT-04:00) Caracas, La Paz
(GMT-04:00) Santiago
(GMT-03:30) Newfoundland
(GMT-03:00) Brasilia
(GMT-03:00) Buenos Aires, Georgetown
(GMT-03:00) Greenland
(GMT-02:00) Mid-Atlantic
(GMT-01:00) Azores
(GMT-01:00) Cape Verde Is.
(GMT) Casablanca, Monrovia
(GMT) Greenwich Mean Time: Dublin, Edinburgh, Lisbon, London
(GMT+01:00) Amsterdam, Berlin, Bern, Rome, Stockholm, Vienna
(GMT+01:00) Belgrade, Bratislava, Budapest, Ljubljana, Prague
(GMT+01:00) Brussels, Copenhagen, Madrid, Paris

Management / Event Log

Enable SysLog if you have a Syslog Server on your network environment. If enable, you need to input the Syslog Server IP Address (default is 0.0.0.0) and the port number your Syslog Server is configured to use. The default port number is 514. The Event Log Window lists Wireless backhaul events. Click on "Refresh" to update the network events or "Save As…" to save the event into a file on your computer. Click "Apply" if you made any changes.

Management / Reboot
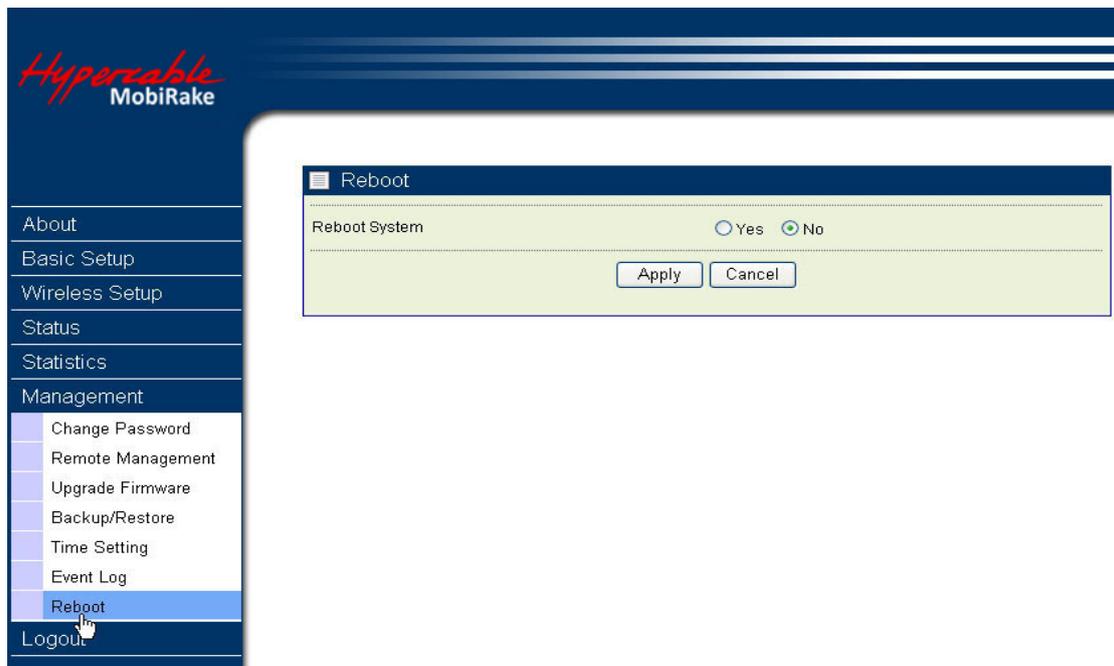
The Reboot screen enables you to reboot your TDMA outdoor radio if any changes are made and you want to refresh the radio, you need to reboot the TDMA outdoor radio Select the "**Yes**" check box and click "**Apply**". It will take you about 50 seconds to go through reboot. The Web-browser will not be accessible until the Wireless backhaul has finished its reboot process.

Management / Logout

Click log out when you finished all the configuration, if there is anything missed, you can selected "login again" to enter the configuration process again.
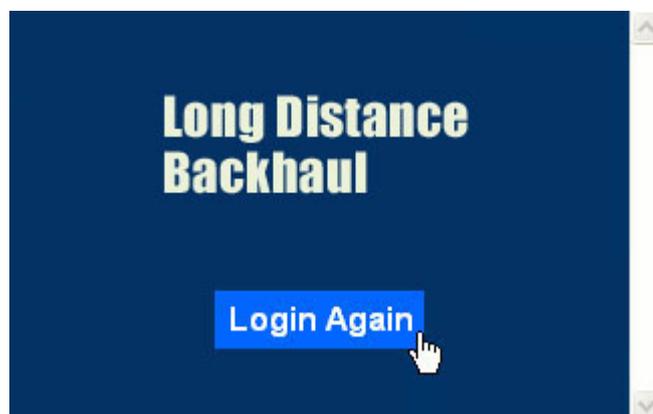
Hardware reset

If your Web User Interface stops responding, ping the IP address of the radio to check whether "reply" is obtained, or unplug and then plug back in the power supply of the Radio. This will reboot the Radio. If you are still unable to communicate with the Web User Interface, remove the plastic cap in the left of radio's bottom, Then use a stick to press in and hold the RESET button for 6~9 seconds. This will reset the Radio to the factory default settings. If you applied any personal configuration settings, you will need to make the changes again.

Beeper for antenna alignment
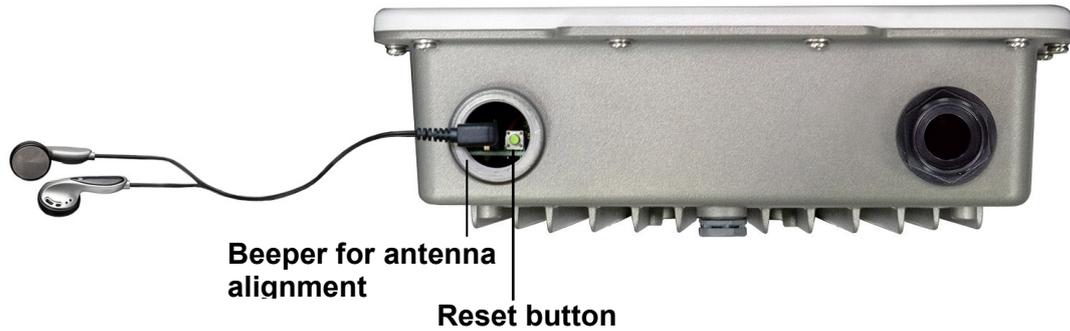
Reset button

Beeper and Reset button of the radio

Appendix A: Trouble shooting

This Appendix helps you to isolate and solve the problems with the 5GHz TDMA outdoor radio. Before you start troubleshooting, it is important that you have checked the details in the product user manual and QIG.

In some cases, rebooting the unit clears the problem. If the radio still can't work well, please try to contact your local vendor or supplier.

General Descriptions

To successfully use the radios, engineers must be able to troubleshoot the system effectively. This section will show you how an 5GHz TDMA outdoor radio could be analyzed in the case of "no link," usually, we thinks that the link is down because there is no traffic being passed. The four main reasons that a link may not work are list as below:

- Configuration
- Path issues (such as distance, obstacles, RF reflection…)
- Personal reasons (careless mounting or the incorrectly connection.)
- Hardware (includes the radio, cable and connectors…etc. In few cases, the radio will conflict with the laptop or PC)
- Environment (anything that is outside the equipment and not part of the path itself)

After verified the correct configuration, double-checked the path terms, ensure no personal reasons and the hardware works well in the office, but the user still report that the link does not work. Most likely, the problem reported is caused by the environment or by improper tests to verify the connection. Assumes that the test method, cabling, antennas, and antenna alignment have been checked, (Always ensure this before checking the environment.) then you can do the follow to check the environment.

General Check

Two general checks are recommended before taking any action:

- Check whether the software version at both sides is the most current
- Check for any reported alarm messages in the Event Log

Analyzing the Spectrum

The best way to discover if there is a source of interference is to use the spectrum analyzer. By turning the antenna 360 degrees, you can find out which direction is the interference coming from. it will also show the frequencies and the level of signal is detected.

Avoiding Interference

When a source of interference is identified and when the level and frequencies are known, the next step is to avoid the interference. Some of the following actions can be tried:

- Change the RF channel to the one away from the interference source

- Change the polarization of the antenna; try to change to a polarization different from the interferer.

- A small beam antenna may helps. (Such as some grid or dish antenna, align the antenna in to the particular direction will reduce the affects from the interference source) This solution cannot help when the source of interference is right behind the remote site.

Before checking for interference, ensure all the hardware works well and configurations are correct. The path analysis, cabling and antennas should be checked as well.

Connection Issues

This section describes several common troubles the customer might have while setting the radios.

Radio Does Not Boot

When the Radio does not Boot, do the following steps to check your whole system:

1. Ensure that the power supply is properly working and correctly connected.

2. Ensure that all cables are workable and connected correctly.

3. Check the power source.

Cannot use the Web Interface

If the radio boot, but can't enter it via the Web site.

1. Open a command prompt window and enter **ping <ip address unit>** (for example: **ping 192.168.1.1**). If there is no response from the radio, make sure that you the IP address is correct. If there is response, the Ethernet connection is working properly, do the next step.

2. Make sure that you are using one of the following Web browsers:

    - Microsoft Internet Explorer version 5.0 or later

3. Ensure that you are not using a proxy server for the connection with your Web browser.

Double-check the physical network connections (includes the cables and the connectors). Use a well-known unit to ensure the network connection is properly functioning.

Configuration Issues

The following problems relate to setup and configuration problems.

Some basic configurations might make the link fail, below are the major ones:

- RF Channel
- Group name
- IP address
- Rule of MAC address filter
- Rule of security settings (such as WEP or WPA)

If the links of the two radios works within close distance of each other, then there are two possible reasons why wireless connectivity is not possible while the 5GHz TDMA outdoor radios are at their desired locations:

■ RF path, for example, a bad antenna alignment, the tower is not tall enough when the radios are installed in a long distance or the connector do not attachment well…etc (these are the most common problems in installations)

■ Interference problem caused by a high signal level from another unit. The interference can be checked by changing the frequency and then see if another channel works better. Or you can change the polarization of the antenna as a way of avoiding the interfering signal. To know in advance how much interference is present in a given environment, a Spectrum Analyzer can be attached to a (temporary) antenna for measuring the signal levels on all available Channels.

NOTE	**If the link still not works after resetting the configurations, checking the connectors and cables, double-check the path and environment issues, then the problem is possible a hardware problem. Acquiring a third radio and then testing it amongst the existing units will help to find out the broken unit.**
NOTE	**Please contact your local vendor for advance technical support.**