e-RAKE WIRELESS MOBILE MESH NETWORKS

$$e = \sum_{n=0}^{\infty} \frac{1}{n!} = \lim_{n \to \infty} \left(\frac{1}{0!} + \frac{1}{1!} + \frac{1}{2!} + \cdots + \frac{1}{n!} \right).$$

Hypercable

SeaRake-LandRake

HYC-4009-30

300MHz 2x2 MIMO HT-OFDM Radio

SeaRake   LandRake   PWS

User Manual

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

Version 1.0.4
Janv.2017

www.hypercable.fr - www.e-rake.us.com

Recommandations à suivre impérativement

ATTENTION NE PAS METTRE SOUS TENSION SANS QUE L'EQUIPEMENT NE SOIT RACCORDE A UNE ANTENNE VERIRIEE OU A UNE CHARGE FICTIVE DE 0.5 à 5 WATTS 50 OHMS SELON LE TYPE DE MODEM.

ATTENTION A LA POLARITE DU 48 VDC NE PAS UTILISER DE POE AUTRE QUE CELUI FOURNI.

Attention, vérifiez en vous connectant aux antennes préinstallées, avec l'aide d'un analyseur de spectre à mémoire que le canal radio que vous allez choisir dans la bande utilisée (330-370, 445-505 MHz , 4.4-5.0 GHz, 4.8-6.2 GHz) n'est pas occupé par une porteuse d'un niveau supérieur à -70 dBm (par exemple -60 dBm est un niveau supérieur à -70 dBm) dans tous les cas choisir la zone de votre canal ou les niveaux parasites mesurés sont les plus faibles.

Manuel du Montage de l'antenne et du modem radio :

- Attention, le modem radio ayant changé le montage du modem est légèrement différent le support du modem est devenu aussi un capot protecteur.
- Impératifs techniques de pose **ICI**
- Montage antenne **ICI**

Nouveau Barled de pointage

- Montage cablage réglages Modems **ICI**

  - **Attention** certains modèles ont pour le pointage et a la place des écouteurs un Barled indiquant sur la CPE le niveau auquel est reçu le CPE par la station de base distante, si le pointage est fait par une seule personne qui doit se déplacer d'un point a un autre il faudra inverser les fonctions base station et CPE lors du pointage afin de bénéficier du visuel du barled sans avoir a se déplacer du côté opposé. Si le pointage est fait par deux personnes en liaison radio la personne coté "base sation" demandera a la personne coté CPE quel est l'affichage obtenu selon le pointage azimutal en cours.
  - **Attention** de ne pas pointer sur un lobe secondaire de l'antenne.

- Notice de montage des modems sur les antennes **ICI**
- Vérifiez le contenu des cartons associés aux Modems et ne pas jeter les cartons sans les ouvrir entièrement. Conserver les cartons emballages pour les retours sous garantie, les CD et manuels sont dans chaque Modem radio en cas de doute téléphoner au 06 82 82 38 73 ou ayez recours a un spécialiste installateur certifié pour la pose et configuration des radio Hypercable.

ATTENTION selon le découplage des antennes et la largeur du canal en version 4x4 le canal CH1 2x2 doit être éloigné du canal Ch2 2x2 de 200 Mhz à 400 Mhz par exemple CH1 sur 5700 MHz et Ch2 sur 5300 MHz pour des antennes omnidirectionnelles découplées dans le plan vertical afin d'éviter interférences et désensibilisation. En cas d'impossibilité des filtres de bande doivent être prévus. (Voir Montage des antennes installations recommandations)

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About This Manual

This manual includes install, configuration and trouble shooting for the 300 MHz 4x4 MIMO HT-OFDM MESH 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.

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.

Table of Contents

Chapter 1 Introduction

With MIMO High Throughput OFDM (HT-OFDM) technology, this radio is a high capacity 300MHz UHF band radio for Mobile Mesh or PTP/PTMP wireless deployment. It utilizes coordinate and internet map database to show the environment and status of the link. Customers can easily figure out the linking situation of the deployed radios.

There are 8 channel BW (2.5/3/3.5/4/5/6/7/8/10 MHz) options can be selected easily by software. UHF band with narrow channel BW provides the flexibility of deployment channel plan in high density city area and NLOS mobility applications.

This MIMO HT-OFDM mobile mesh radio has powerful security mechanism such as: WPA-PSK (TKIP) / WPA2-PSK (AES128), access control by allow/deny MAC address list, plus the proprietary protocol. This outdoor radio also supports excellent MTBF performance by IP-68 dust & water resistant ratings, integrated surge protection circuit in both radio and POE unit. All these functions make this outdoor radio much more secure and reliable.

1-1 Features and Benefits

● **Effective spectrum utility / variable capacities with 9 channel BWs**
This radio has 8 channel bandwidths (2.5/3/3.5/4/5/6/7/8/10 MHz) for optional, which is adjustable via software. This function provides flexibilities of channel plan in crowded urban environment and variable capacities for different applications.

● **MIMO HT-OFDM technology provides amazing spectral efficiency**
Up to 5.2 bits/s/Hz amazing spectral efficiency for all channel BW provided by the MIMO HT-OFDM technology. Work with the variable channel BW options, these two combination features provides great benefits for both crowded urban area and rural area with less interference.

● **Proprietary Security**
This radio uses proprietary protocol, which means other standard wifi products can't connect to this radio. It also provides WPA-PSK (TKIP) / WPA2-PSK (AES128), access control by allow/deny MAC address list to build the highest security mechanism to prevent the malicious attacking from the internet.

● **FEATURES**
  o Provides the easy installation for outdoor Mobile Mesh or PTP/PTMP applications with high performance.
 o ±2 ppm Frequency Stability for Mobility & NLOS

● Transmit Power Control:

max
75% of max (-1dB)
60% of max (-2dB)
50% of max (-3dB)
40% of max (-4dB)
30% of max (-5dB)
25% of max (-6dB)
20% of max (-7dB)
16% of max (-8dB)
12% of max (-9dB)
10% of max (-10dB)
min

Supports settable transmit power levels to adjust coverage cell size, ranging from max.(100%) to 10% of max., the adjustment step is 1dB.

- o 8Channel BW (2.5 /3/ 3.5/4/ 5 / 6 / 7/10MHz)
- o Multi-hops repeating & Built-in NMS with GPS Coordinates and Internet map.
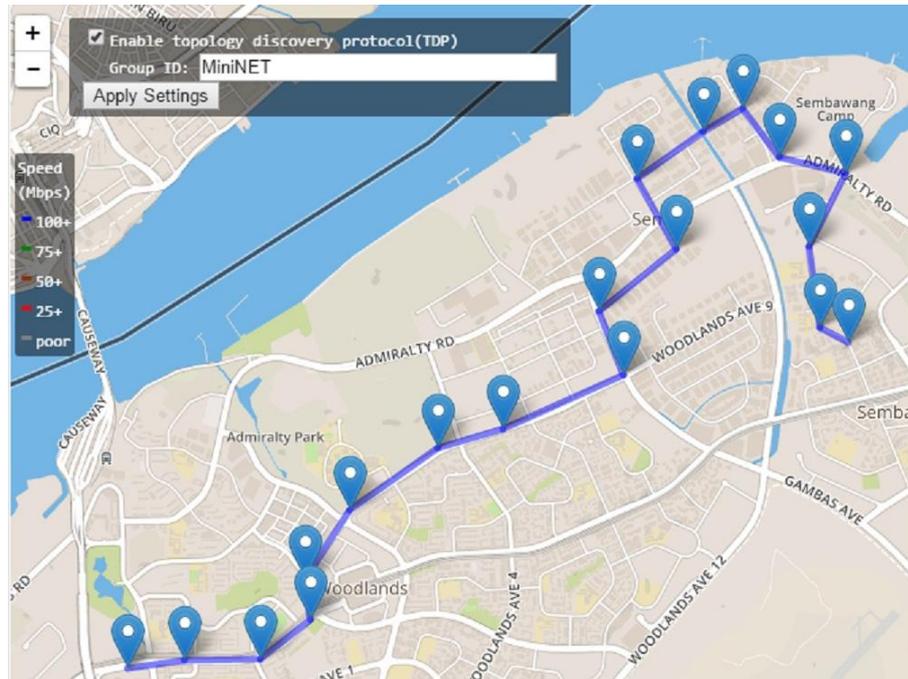
- o 5.2 bits/s/Hz amazing spectral efficiency
- o High Efficiency in Multi-hops Repeating

- Low Throughput dropped @ 40MHz Ch BW (≧170 Mbps @ 20 hops)

- Short Latency increased @ 40MHz Ch BW (≦35 ms @ 20 hops)

- Network Architecture:
  - o P-T-P: 1+0/2+0 / 1+1
  - o P-T-MP Ring (Redundant)
  - o Mobile MESH
- Fast Seamless Roaming

- High Speed up to 180km/hr
- IEC61000-4-5 Surge Protection
- IP-68 Water & Dust Resistant

Chapter 2 Hardware Installation

This chapter describes initial setup of the 300MHz UHF band 2x2 MIMO HT-OFDM MESH Radio

$$e = \sum_{n=0}^{\infty} \frac{1}{n!} = \lim_{n \to \infty} \left(\frac{1}{0!} + \frac{1}{1!} + \frac{1}{2!} + \cdots + \frac{1}{n!} \right).$$

Warnings

In order to comply with international radio frequency (RF) exposure limits, dish antennas should be placed 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.

Do not work on the system or connect or disconnect cables during periods of lightning activity.

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.

Ultimate disposal of this product should be handled according to all national laws and regulations.

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) and CE regulations.

Only trained and qualified personnel should be allowed to install, replace, or service this equipment.

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.

$$e = \sum_{n=0}^{\infty} \frac{1}{n!} = \lim_{n \to \infty} \left(\frac{1}{0!} + \frac{1}{1!} + \frac{1}{2!} + \cdots + \frac{1}{n!} \right).$$

The 300 MHz UHF Band 2x2 MIMO HT-OFDM MESH 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 300Mhz 2x2 MIMO HT-OFDM MESH Radio.

2-1 Product Kit

Before installation, make sure that you the following items:

- **300 MHz 2x2 MIMO HT-OFDM MESH Radio**…..……………….…….….………….….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 300 MHz long distance wireless backhaul, please make sure that these requirements have been met:

- A 10/100/1000 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: Google Chrome or Microsoft IE 9.0 or later.
- 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
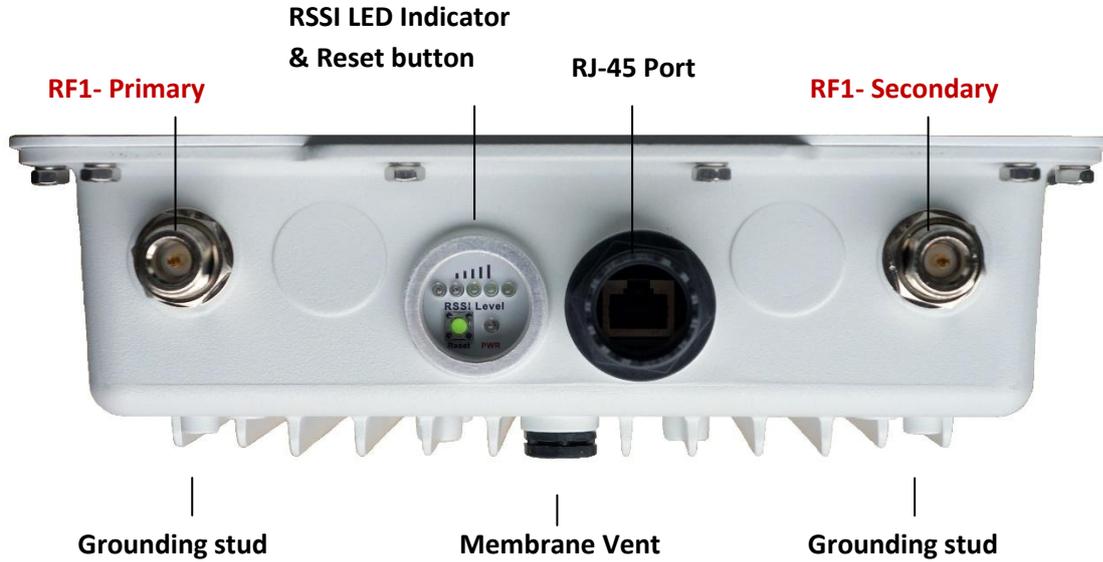
Outdoor Multi-function Radio Figure

Note:

1. RF1-Primary port connect to V. polarization of the MIMO antenna. Or -45° slant or RHCP

**2. RF1-Secondary port connect to H. Polarization of the MIMO antenna. Or +45° slant or LHCP**

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 300 MHz 4x4 MIMO HT-OFDM MESH 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, you will see the reset button. Press it and hold for 5~10 seconds, the radio will back to factory default settings.
5	RSSI LED Indicator	Indicate the link status info of the Wireless modules, please refer to segment 2-5 for the LED indicating rules.
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

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

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.

Antenna location definition version 4x4:
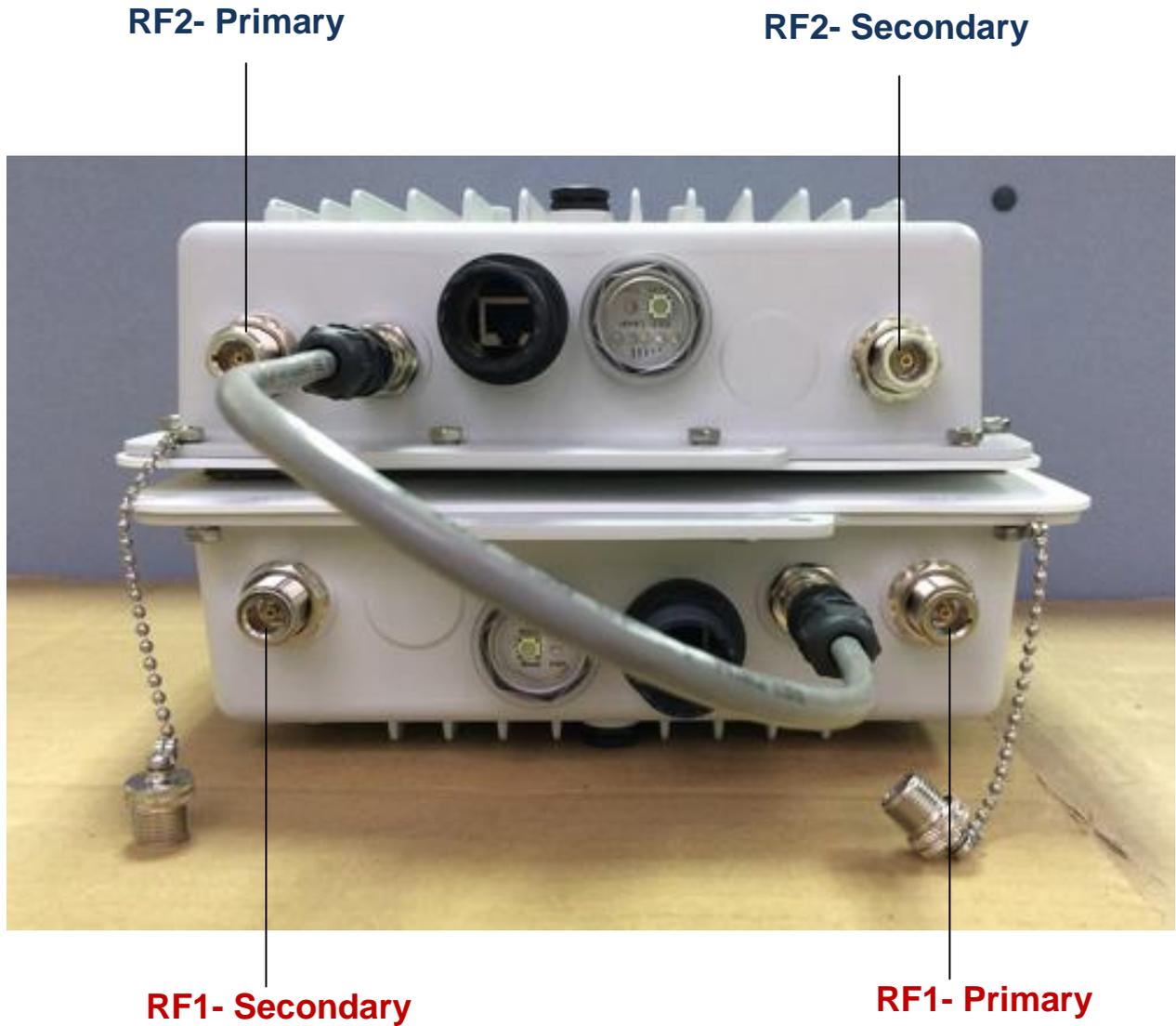
RF2- Primary

RF2- Secondary

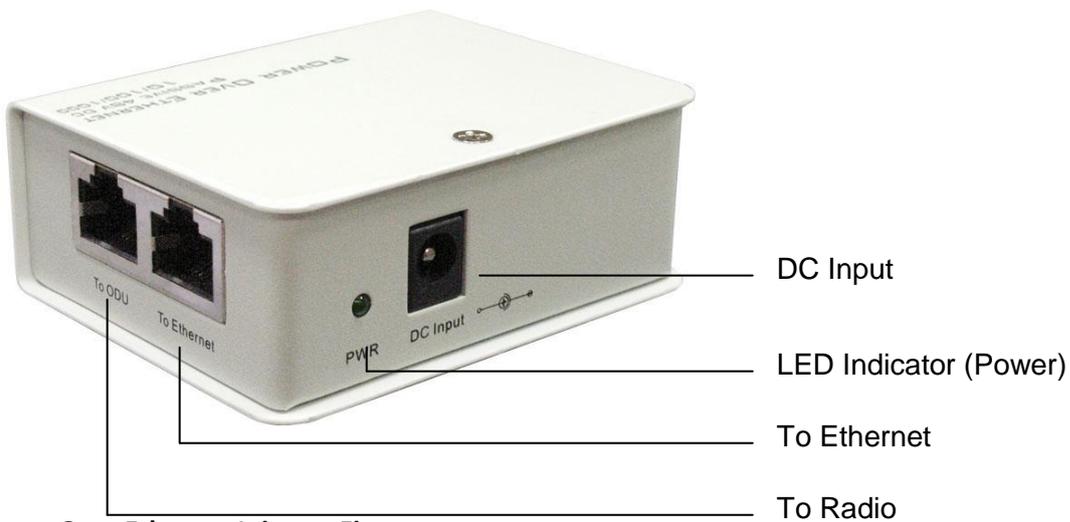RF1- Secondary

RF1- Primary

※ **Note:**
1. **When you set the RF to 1x1 instead of 2x2 MIMO, only Primary port works.**
2. **RF1 = Wireless 1 / RF2 = Wireless 2 in the configuration page.**

3. **With Daisy chain M12 junction cable**

Antenna location definition version 2x2:

GPS Ant　　　　　　　　　　　Option WiFi

RF1- Secondary　　　　　　　RF1- Primary

※ **Note:**
1. When you set the RF to 1x1 instead of 2x2 MIMO, only Primary port works.
2. RF1 = Wireless 1 / RF2 = Wireless 2 in the configuration page.

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POE – 10 / 100 / 1000 with Passive 48V DC

DC Input

LED Indicator (Power)

To Ethernet

To Radio

Power Over Ethernet Injector Figure

1	To Ethernet	This RJ-45 port is used to connect to the 10 / 100 / 1000 Base T complied device such as switch, router or PC.
2	To ODU	This RJ-45 port (10 / 100 / 1000) is used to connect to the ODU. .
3	DC Input	Connect to the Power adaptor for DC input. (Passive 48V DC)
4	LED Indicator	Power LED

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

2-4 Hardware Installation

The 300MHz UHF band 2x2 MIMO HT-OFDM 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 300MHz RF device deployed around the outdoor radio, try to set the channel to the non-overlapping one.

OUTDOOR

INDOOR

TCP / IP Based Device

MIMO Panel Antenna

Multi-MIMO Mesh outdoor radio

10/100/1000 Mbps

Router / Switch (Optional)

AC Outlet   Power adaptor   POE 10/100/1000 Mbps
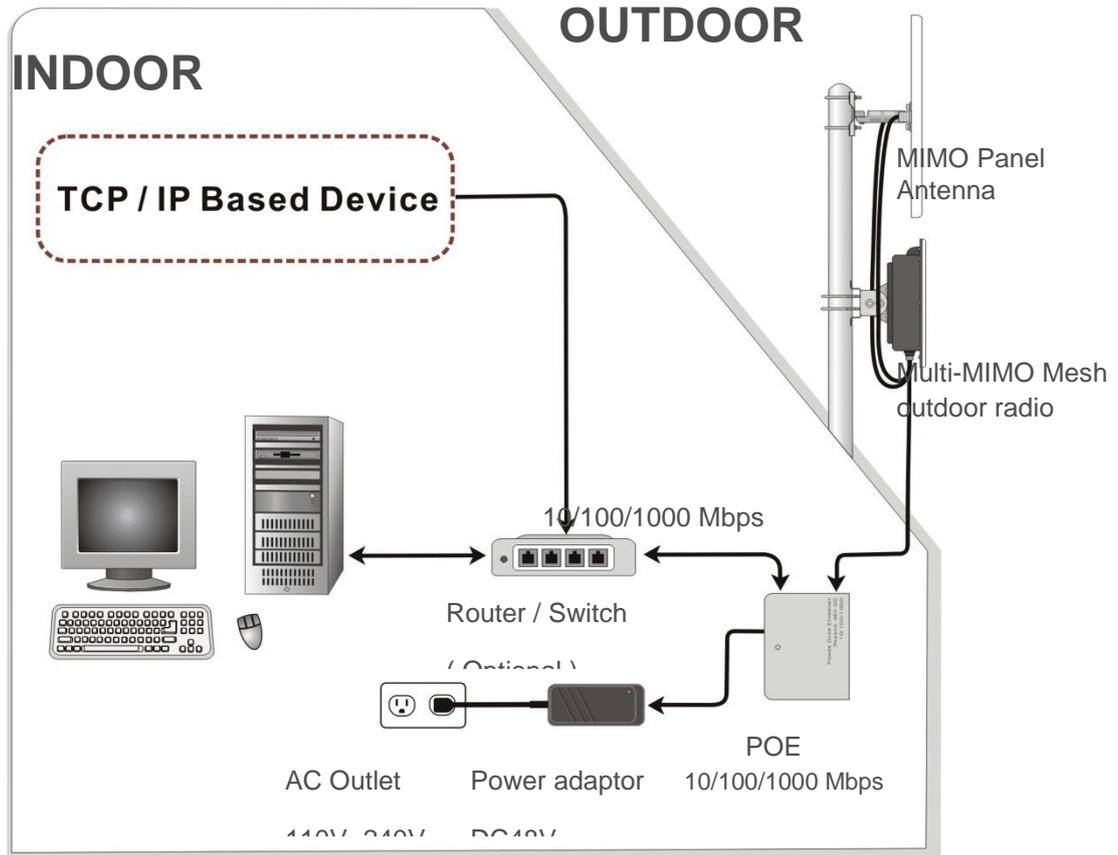
Hardware Installation Figure

➢ 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.

Configure and verify the 300 MHz UHF 2x2 MIMO HT-OFDM MESH 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.

2-5 LED Indicators

1　2　3　4　5
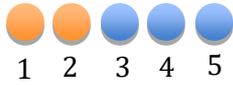
BS mode: (PTP / PTMP)

Only LED 1 & 2 will be functional

　　LED1: On = RF enable;

　　　　Off = RF disable

　　LED2: On = there is CPE associated;

　　　　Off = 0 CPE associated.

CPE/ Bridge/Mesh

Disconnected: Scanning mode

　　LED1 ~ 5 blinking one by one.

Connected: RSSI mode

No LEDs on : RSSI $<$ -85dBm

LED1 on: -81dB $\geqq$ RSSI $\geqq$ -85dBm

LED1~2 on: -76dB $\geqq$ RSSI $\geqq$ -80dBm

LED1~3 on: -71dB $\geqq$ RSSI $\geqq$ -75dBm

LED1~4 on: -66dB $\geqq$ RSSI $\geqq$ -70dBm

LED1~5 on: RSSI $\geqq$ -65dBm

　　● **Note 1: when the radio is configured as mesh mode, the RSSI is value is average RSSI which is calculated from all the connected mesh nodes.**

　　● **Note 2: LED indicator showed the status of Wireless1.**

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.

Name	admin
Password	••••••••

Login   Reset
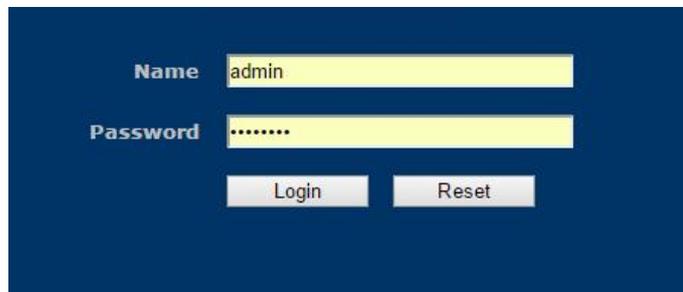
After you have logged-in the main page, the **Information, Status, MAP, System, Mesh, Management** and **Logout** buttons will be shown in left part. The main menu provides links to the whole sections of the web configuration interface.

Information

This page shows most of the product information briefly, that includes **General Information**, **Network Information, MESH, Wireless Network 1, Wireless Network 2 and Wired Network**

Long Distance Backhaul

- Information
- Status
- MAP
- System
- Mesh
- Wireless
- Management
- Logout

Information

General Information

Device Name	DEVICE00284A
Device Uptime	00:01:36
Firmware Version	MiniOS v1.3.2_OID41899
Firmware Build Time	Nov 22 2016 14:04:04
Product Key	5BVAZ-IACRV-80AQO-JABAT
License	Level 2
Hardware Version	A7

Network Information

IP Address	192.168.1.1
Subnet Mask	255.255.255.0
Gateway Address	0.0.0.0

MESH

MESH Protocol	Disabled
MESH Ports	Wireless, Ethernet
MESH Network ID	MP-MESH
Acceptable RSSI	-30 ~ -85 dBm

Wireless Network

MAC Address	00:1b:5c:00:28:4a
Frequency Band	330.000 MHz ~ 370.000 MHz
Operation Mode	Bridge (Point-to-point)
Remote MAC Address	00:1b:5c:00:29:f9
Frame Schedule Policy	As soon as possbile
Channel Bandwidth	10MHz
Channel Frequency	360.000MHz
TX Data Rate(SS)	SS BPSK 1/2 ~ SS 64QAM 5/6
TX Data Rate(DS)	SS BPSK 1/2 ~ DS 64QAM 5/6
Coverage Range	1 Km

Wired Network

MAC Address	00:1b:5c:00:28:4b
Speed	1000.0 Mbps

Information -1

Status

This page shows all the status of the radio in one page, such as **System**, **mesh**, **wireless** and **port statistics**.

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Status -1 – (Base station mode)

Status -2 (Base station mode)

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Long Distance Backhaul

Information
Status
MAP
System
Mesh
Wireless
Management
Logout

Status

System — Refresh
Current time: Tue 2016/11/22 06:22:54
Coordinates: LatLng(0°0'0.00"N, 0°0'0.00"E), Altitude:0.00 m

MESH — Refresh <<
Status: Disabled
Network ID: MP-MESH
MESH Points: 0 (Count)

Index	MAC Address	IP Address	GPS Coordinates	Alt(m)	Neigh

Wireless — Pause <<
Status: CPE mode Enabled
Channel: 360.500MHz
Bit Rate: 32.5 Mbps
Associated: 1

N	MAC Address	IP Address	Local RSSI	Remote RSSI	TX Rate	RX Rate	TX Modulation	RX Modulation
1	00:1b:5c:00:28:4a	192.168.1.1	-74/-74	-73/-73	29.82Mbps	32.50Mbps	DS 64QAM 3/4	DS 64QAM 5/6

Port Statistic — Refresh Clear <<
Wireless: 32.5 Mbps, Half Duplex

Clear	Total bytes	Total packets	Unicast packets	Multicast	Errors	Dropped	Traffic kbps	Traffic pps	MCAST pps
Sent	1,149,657,615	1,399,212	1,399,212	0	0	0	11,650	1,766	0
Received	1,256,721,460	2,015,763	2,015,589	174	0	0	12,750	2,581	1

Ethernet: 100 Mbps, Full Duplex

Clear	Total bytes	Total packets	Unicast packets	Multicast	Errors	Dropped	Traffic kbps	Traffic pps	MCAST pps
Sent	2,012,579,579	3,365,100	3,364,581	519	0	0	12,211	2,576	2
Received	1,932,525,091	2,428,438	2,427,934	504	0	0	10,998	1,727	0

Status -CPE mode

Long Distance Backhaul

Information
Status
MAP
System
Mesh
Wireless
Management
Logout

Status

System — Refresh
Current time: Tue 2016/11/22 06:03:11
Coordinates: LatLng(0°0'0.00"N, 0°0'0.00"E), Altitude:0.00 m

MESH — Refresh <<
Status: Disabled
Network ID: MP-MESH
MESH Points: 0 (Count)

Index	MAC Address	IP Address	GPS Coordinates	Alt(m)	Neigh

Wireless — Refresh <<
Status: P2P Bridge mode Enabled
Channel: 360.000MHz
Bit Rate: 65 Mbps
Associated: 1

N	MAC Address	IP Address	Local RSSI	Remote RSSI	TX Rate	RX Rate	TX Modulation	RX Modulation
1	00:1b:5c:00:29:f9	192.168.1.2	-70/-71	-71/-73	61.90Mbps	65.00Mbps	DS 64QAM 5/6	DS 64QAM 5/6

Port Statistic — Refresh Clear <<
Wireless: 65 Mbps, Half Duplex

| Clear	Total bytes	Total packets	Unicast packets	Multicast	Errors	Dropped	Traffic kbps	Traffic pps	MCAST pps
Sent	335,718,785	501,306	501,306	0	0	0	25,179	5,065	0
Received	208,034,625	253,151	252,989	162	0	0	22,188	3,372	0

Ethernet: 1000 Mbps, Full Duplex

Clear	Total bytes	Total packets	Unicast packets	Multicast	Errors	Dropped	Traffic kbps	Traffic pps	MCAST pps
Sent	201,505,869	253,156	252,969	187	0	0	21,486	3,371	0
Received	322,772,804	501,380	501,366	14	0	0	23,958	5,041	0

Status – PTP Bridge mode

Map

The MAP page shows the **location / IP address / MAC address** of your radio, **GPS coordinates info**, and **Topology Status** of PTP/PTMP & Mesh Network. It also allows you to drag the radio location mark to the place wherever you want. And in topology mode, you can also monitor the **RF settings** and the **link quality** among the radios.
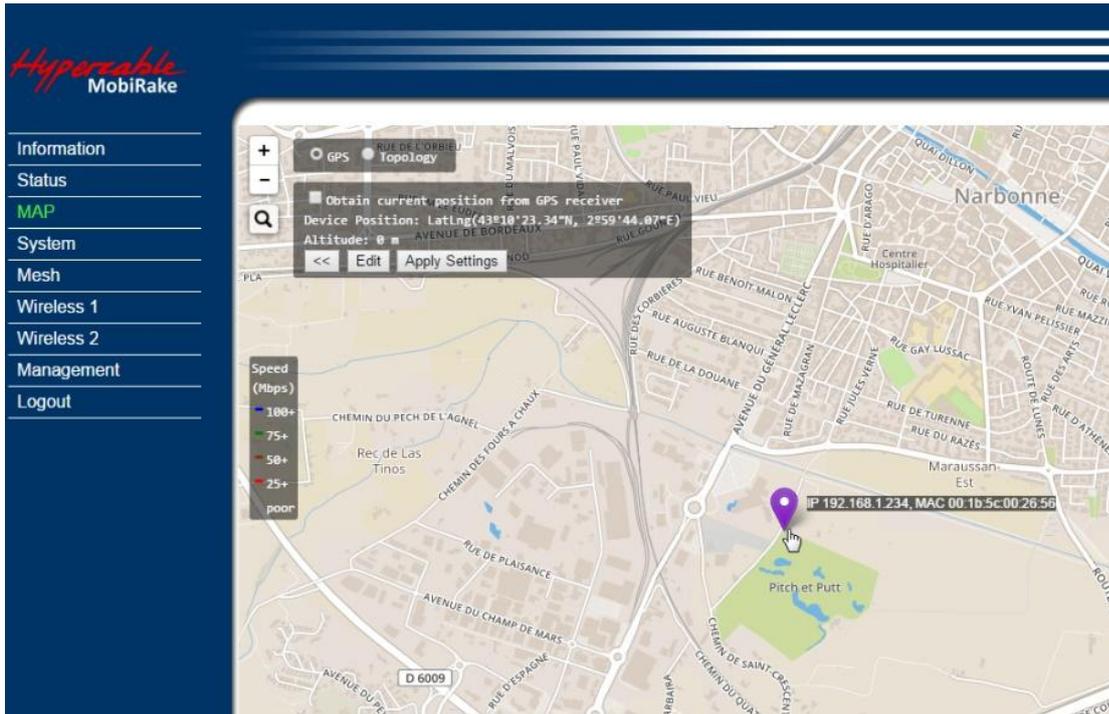
There are 3 ways to set the location of the radio.

1. You can select "Obtain current position from GPS receiver" with the radio type that integrated GPS module.

Attach an external GPS active antenna to the GPS port, you can see the received list of the GPS satellites.

2. Enter the coordinates manually (this can also be done in **System / Basic Setup**) or

3. Drag the location mark of the radio to anywhere in the map you want.
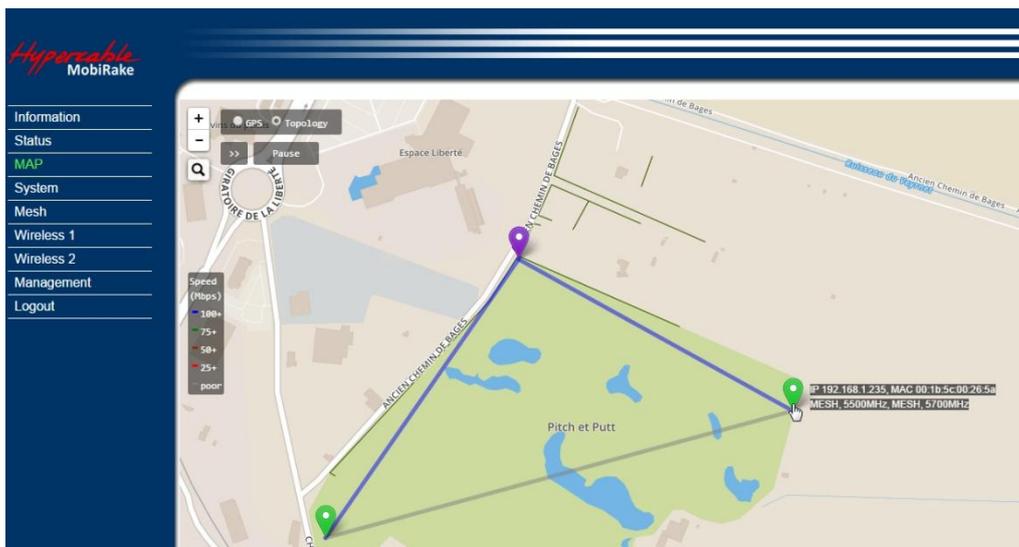
MAP – Topology

Topology Map – Radio info (IP address/ MAC / operating mode & Frequency)
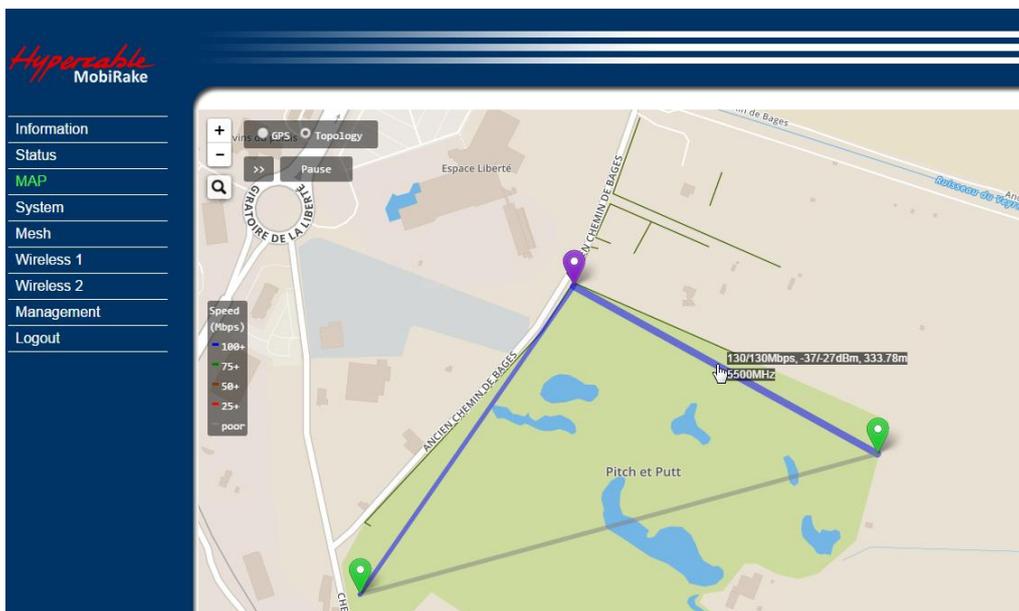
Topology Map – Link status (Data rate / RSSI / Distance / Frequency)
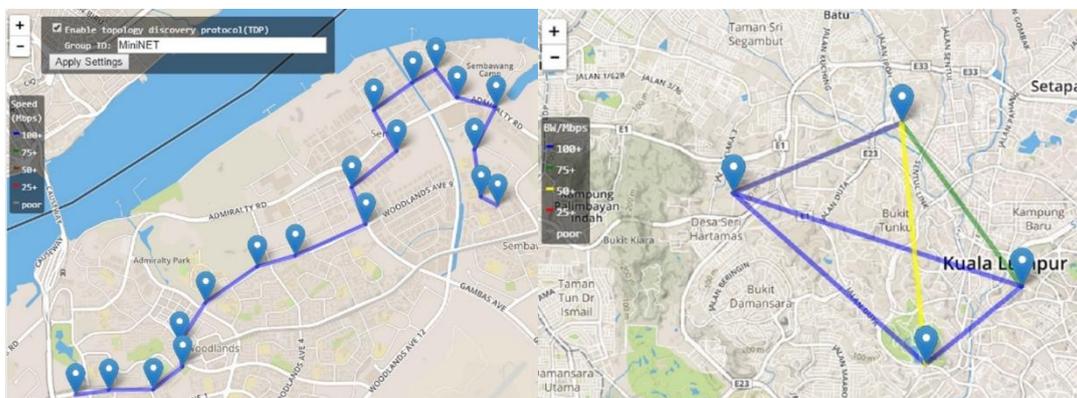
Topology Map – Multi-hops repeating   *Topology Map – Mesh Network*

WIRELESS MOBILE MESH NETWORKS

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22
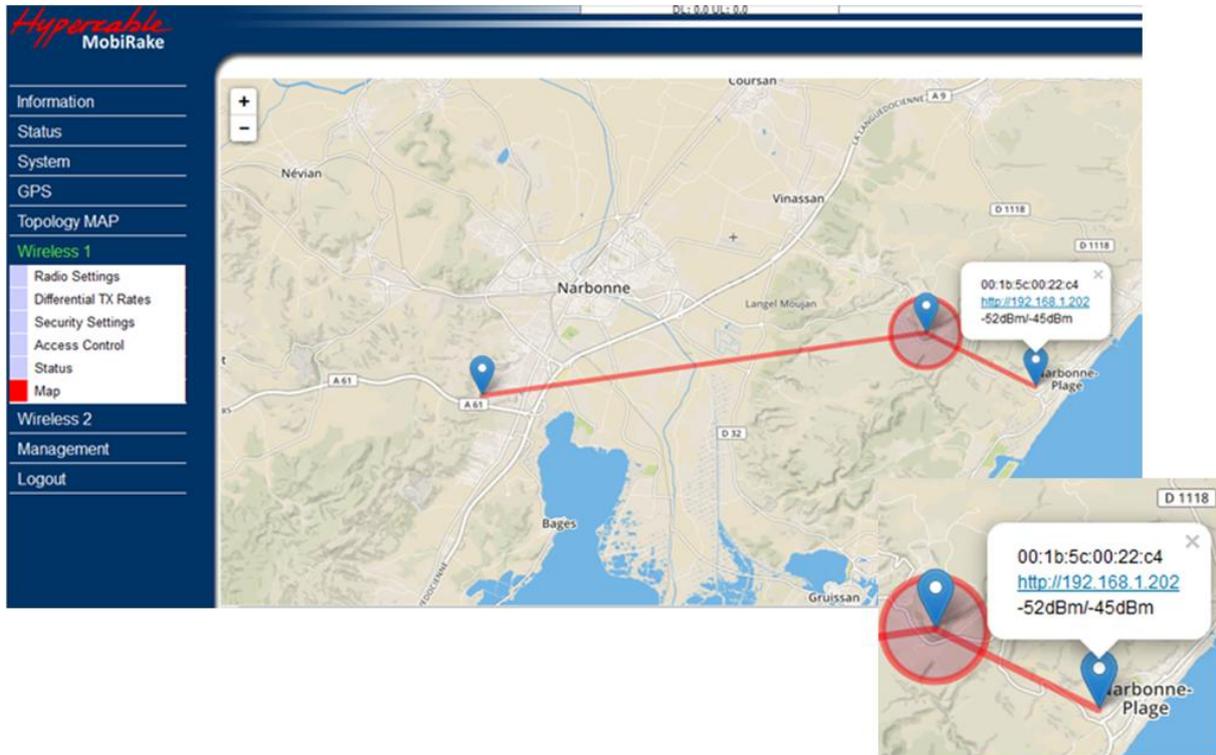
Topology Map – PMPT from a Relay repeater in the Mountain

System / Basic Setup
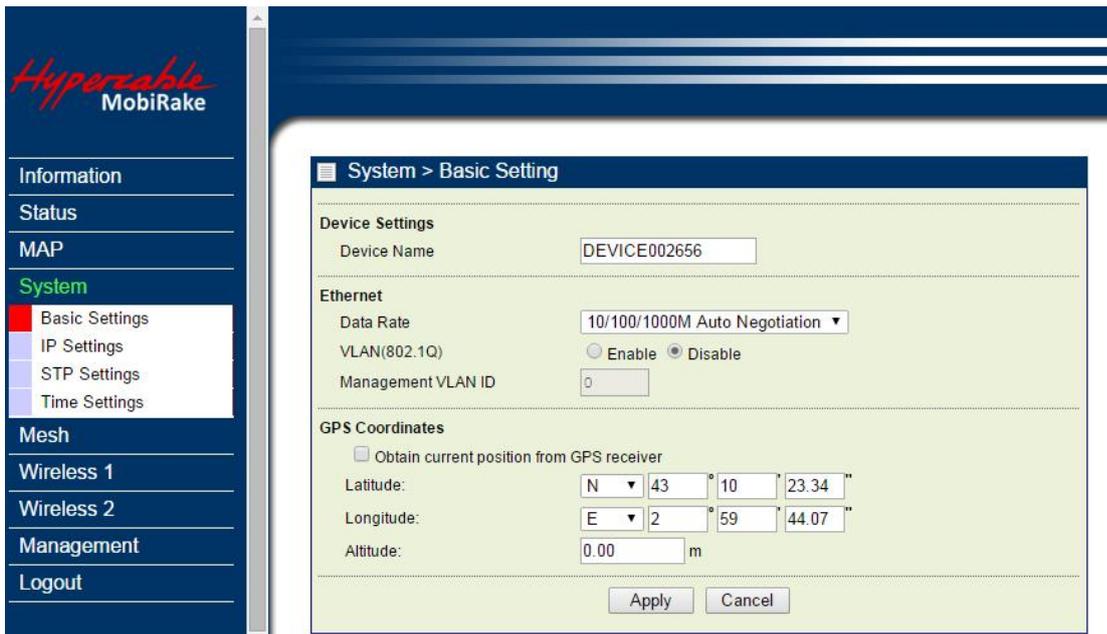
The **Device Name** is used to give a name to your 300 MHz 4x4 MIMO HT-OFDM MESH Radio. This will enable you to manage your radio more easily if there are many radios in your network.

Ethernet Data Rate: you can choose the Ethernet data rate of this radio.

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.

GPS Coordinates: Input the Latitude and Longitude info of the 300 MHz 4x4 MIMO HT-OFDM MESH Radio's location, and click apply, radio will get the map from internet automatically.

If your radio type support integrated GPS module, you can check the select box **"Obtain current position from GPS receiver"**

System / IP Settings
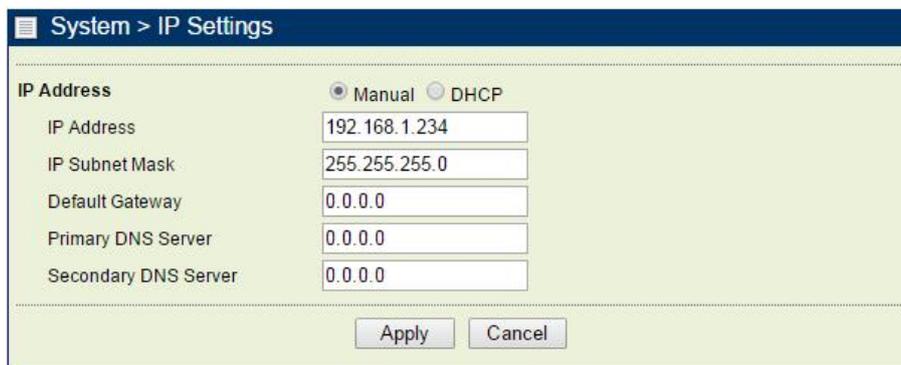
IP Address: Type the IP address you want to set to your 300 MHz 4x4 MIMO HT-OFDM MESH Radio (Default: 192.168.1.1).

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.

System / STP Settings

Ageing Time: Configure the length of time that a dynamic entry can remain in the bridge table from the time the entry is created or last updated.

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

Bridge Priority	Specifies the bridge STP priority
Hello Time	Specifies the interval between the hello BPDUs
Max Age	Specifies the interval that the bridge waits to hear BPDUs from the spanning tree root
Forward Delay	Specifies a forward delay interval on the bridge

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

System / Time Setting

System > Time Settings

Current Time

Current Time	Thu 2016/02/11 01:09:37
Time Zone	(GMT-08:00) Pacific Time (US & Canada); Tijuana ▼
	☐ Adjust for Daylight Saving Time

GPS Time Setting

☑ Synchronize time with GPS

Internet Time Setting

☐ Synchronize with an Internet time server

Time Server	128.138.141.172 ▼
Time Server Port	123

[Apply] [Cancel]

Current 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 Zone: You may select the appropriate local time zone for your radio from a list of all available time zones. Such as below list:

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

GPS time settings: Sync the time with GPS module.

Time Server: the central time of the Time Server.

Time Server Port: the port of the Time Server.

Time server for a Lan connection to an Orange ADSL router is   192.168.1.1

3-2 Mesh Protocol Configuration
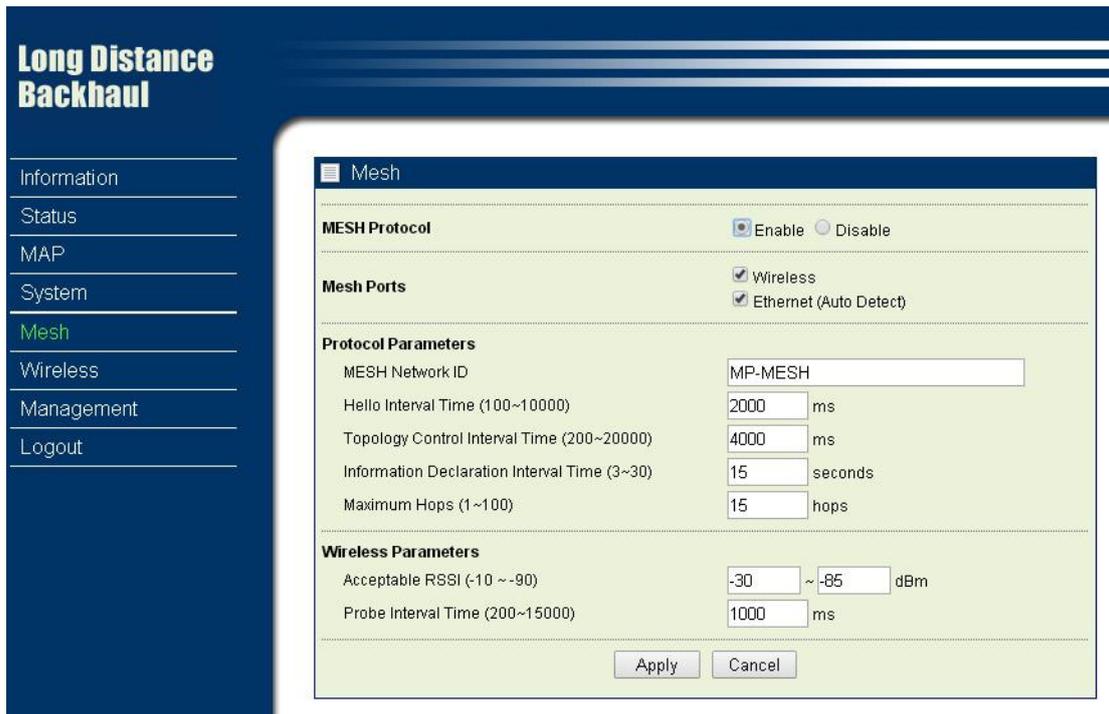
Mesh Protocol: You can Enable or Disable Mesh Routing protocol here.

Mesh Ports: Enable Mesh Protocol per interfaces. When the interfaced been checked, it has to connect to the other port with same mesh protocol. Otherwise, the connection will be failed. But the Ethernet port with Auto Detect can auto detect the protocol and get link automatically.

Mesh Network ID: All mesh nodes in the same network must have the same ID.

Hello interval time (1~10s): Time between Hello packets sent by the router on this interface. This value should be same for all interfaces connected to common network. The default value is 2 seconds.

Topology Control interval Time (1~20s): Topology Control message interval time. Topology control protocols are designed to exploit node density in the network to extend the network lifetime and provide connectivity. The following criteria have been identified as the key concepts for designing topology control protocols for wireless sensor networks.

1. Sensor nodes should be able to self-configure to accommodate changing network dynamics.
2. Selection of redundant nodes should be done based on distributed localized algorithms.
3. Topology control protocols must ensure minimum connectivity in the network, so that the network is not partitioned.
4. Topology control protocols should take advantage of the high node density in large-scale wireless sensor networks to reduce the energy dissipated in the network.

Maximum Hops (1~30): Define the max repeating hops in the mesh network.

Acceptable RSSI (-50~-90dBm): This RSSI threshold is an important reference parameter to decide to hold the link between the Mesh nodes or change to other better optional path.
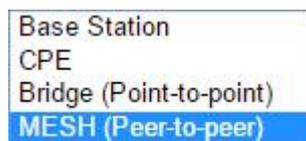
Probe interval time: Configuring the Time Interval between Probes.

3-3 Wireless Setup

Wireless Setup / Radio

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

Base Station
The default mode is Base Station, which can be scanned and connected by other CPEs.
CPE
Perform as a client station associated to other BS. Be sure that they share the
same SSID when connected.

Bridge (Point-to-point)

Perform as a point to point bridge, enter the MAC address of the remote radio that you want to connect.

MESH (Peer-to-peer)

Perform as a mesh node in the mesh network.

Topology Hybrid model:

Unstructured peer to peer model

Each mesh nodes is equal to each other, free connection by the best path.

Client-server model: Server mode

Server mode can be scanned and connected by Client-server model: client mode and Hybrid model: client mode.

Client-server model: Client mode

Client mode can only connect to Client-server model: Server mode and Hybrid model: Server mode.

Hybrid model: Server mode

Hybrid model: Server mode can connect to Client-server model: Client mode, Hybrid model: Client mode and Unstructured peer to peer mode.

Hybrid model: Client mode

Hybrid model: Client mode can connect to Client-server model: Server mode, Hybrid model: Server mode and Unstructured peer to peer mode.

Wireless Network Name (SSID):

Mesh nodes, Base station and CPEs in same network must have the same network name.

Modulation: HT-OFDM, high throughput OFDM modulation.

RF Bandwidth: Decide bandwidth of Radio Frequency. Including 2.5 / 3 / 3.5 / 4 / 5 / 6 / 7/ 8 / 10 / MHz, default is 5 MHz.

```
2.5MHz
3MHz
3.5MHz
4MHz
5MHz
6MHz
7MHz
8MHz
10MHz
```

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

TX Rate Range: Here you can setup the min. Rate and max. Rate of the Tx Rate range.

```
SS BPSK  1/2           SS BPSK  1/2
SS QPSK  1/2           SS QPSK  1/2
SS QPSK  3/4           SS QPSK  3/4
SS 16QAM 1/2           SS 16QAM 1/2
SS 16QAM 3/4           SS 16QAM 3/4
SS 64QAM 2/3           DS 16QAM 1/2
SS 64QAM 3/4           DS 16QAM 3/4
SS 64QAM 5/6           DS 64QAM 2/3
                       DS 64QAM 3/4
                       DS 64QAM 5/6
```

TX Power: Setting power of TX, default is Max.

```
max
75% of max (-1dB)
60% of max (-2dB)
50% of max (-3dB)
40% of max (-4dB)
30% of max (-5dB)
25% of max (-6dB)
20% of max (-7dB)
16% of max (-8dB)
12% of max (-9dB)
10% of max (-10dB)
min
```

Coverage Range: The max. coverage range value will be changed by the channel BW, less channel BW can transmit longer distance. Set the proper coverage range parameters is helpful to get the stable link.

RTS Threshold: "Request to send" is the optional mechanism used by the 802.11 wireless networking protocol to reduce frame collisions introduced by the hidden node problem. Set the packet size to trigger RTS/CTS enable. This is normally set in base station side only because the hidden station

problem does not exit from the perspective of the AP. RTS Threshold can be set between 256 - 2346 bytes.

A-MPDU Aggregation: Aggregate MAC Service Data Unit. The concept of A-MPDU aggregation is to join Multiple MPDU sub frames with a single leading PHY header. A key difference from A-MSDU aggregation is that A-MPDU functions after the MAC header encapsulation process. This method offer higher MAC throughput compare to A-MSDU.
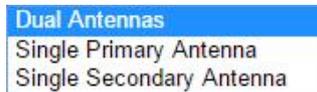
A-MSDU Aggregation: Aggregate MAC Protocol Data Unit. The concept of A-MSDU is to allow multiple MSDUs to be sent to the same receiver concatenated in a single MPDU. This supporting function for A-MSDU within 802.11n is mandatory at the receiver. Due to Destination Address (DA) and sender Address (SA) in the sub-frame header must match to same receiver address (RA) and the transmitter address (TA) in the MAC header, A-MSDU cannot be used for broadcast & multicast.

Short Guard Interval (SGI): The guard interval is the space between symbols (characters) being transmitted. Adding time between symbol transmissions allows these echoes and reflections to settle in before the next symbol is transmitted. In normal 802.11 operations, the guard interval is 800ns. In good link condition without interferences, enable the short guard interval will short the time between symbol transmissions into 400ns to enhance the efficiency of data transmission.

Transmission Antenna: There are 3 antenna options for selection
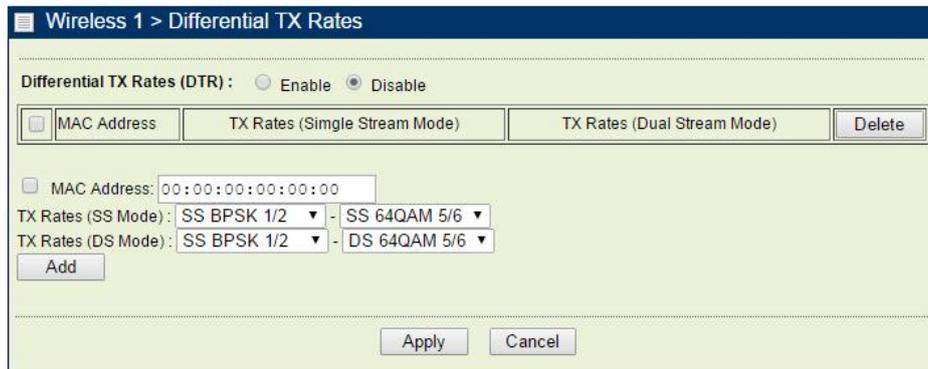
Dual Antennas
Single Primary Antenna
Single Secondary Antenna
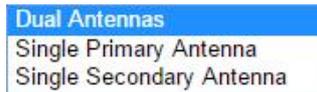
Receiving Antenna: Same as Transmission Antenna, there are 3 antenna options for selection too.

Dual Antennas
Single Primary Antenna
Single Secondary Antenna

Wireless Setup / Differential Tx Rates

In this page, you can set the Differential Tx rates at fixed range.

Wireless 1 > Differential TX Rates

Differential TX Rates (DTR) : ○ Enable ● Disable

☐	MAC Address	TX Rates (Simple Stream Mode)	TX Rates (Dual Stream Mode)	Delete

☐ MAC Address: 00:00:00:00:00:00
TX Rates (SS Mode) : SS BPSK 1/2 ▼ - SS 64QAM 5/6 ▼
TX Rates (DS Mode) : SS BPSK 1/2 ▼ - DS 64QAM 5/6 ▼
Add

Apply   Cancel

Wireless Setup / Security *(This is NOT Available in Mesh mode)*

Security/Cipher To prevent unauthorized radios from accessing data transmitted over the link, the Encryption Settings window offers WPA2 PSK features, making your data transmission over air more secure and allows you to specify Encryption Key(s).

$$e = \sum_{n=0}^{\infty} \frac{1}{n!} = \lim_{n \to \infty} \left(\frac{1}{0!} + \frac{1}{1!} + \frac{1}{2!} + \cdots + \frac{1}{n!} \right).$$
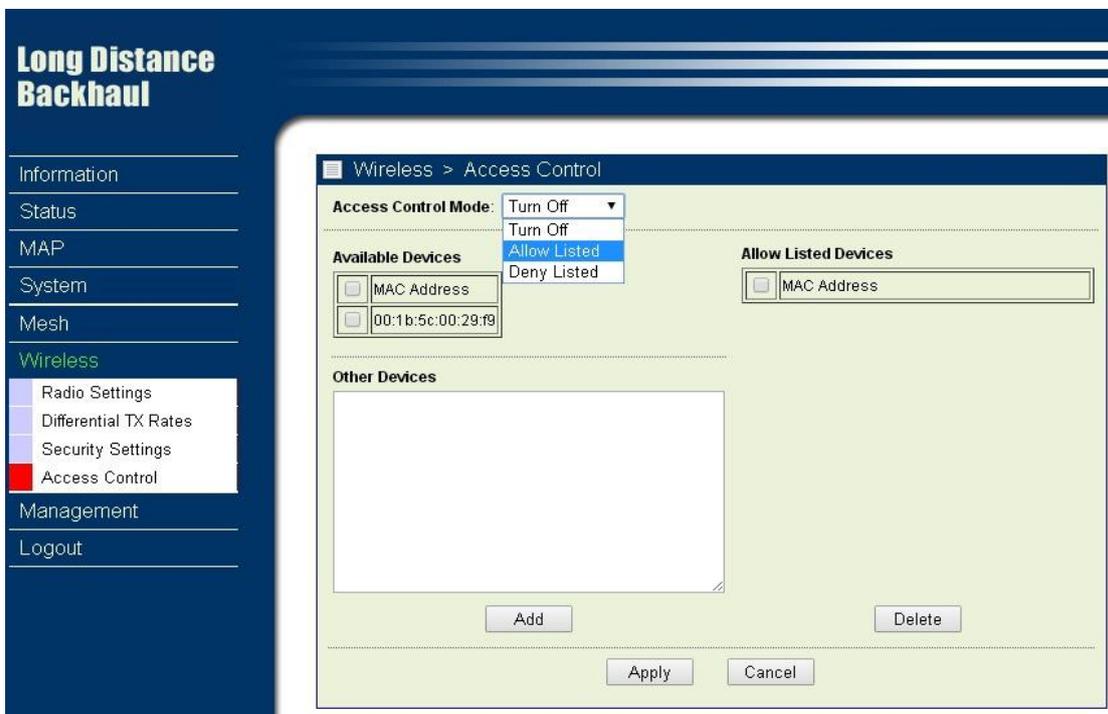
31

Open System – without encryption

WPA2 PSK – AES encryption

Wireless Setup / Access control *(This is NOT Available in Mesh mode)*

You can enable the MAC address Access control feature and decide which mode you want to control, Allow or Deny.

3-4 Management

Management / Change Password

This page allow you to change password of the 300 MHz 4x4 MIMO HT-OFDM MESH 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 / Remote Management

You can doing the remote Management via Secure Shell (SSH) or SNMP by setting the parameters in this page.

www.hypercable.fr - www.e-rake.us.com

Management / Upgrade Firmware

The Upgrade Firmware menu will display the Upgrade Firmware page, you can update the latest firmware to the 300 MHz 4x4 MIMO HT-OFDM MESH 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 300 MHz 4x4 MIMO HT-OFDM MESH 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.
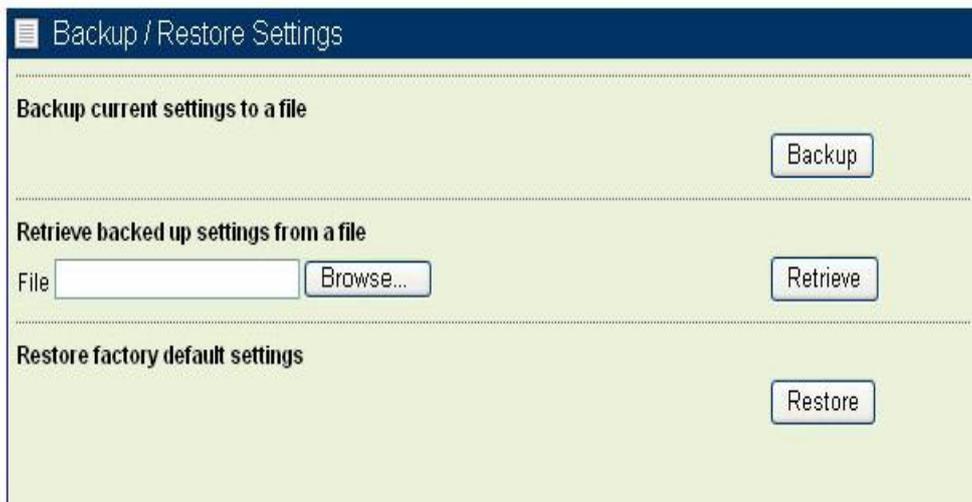
Management / Event Log

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 300 MHz 4x4 MIMO HT-OFDM MESH Radio if any changes are made and you want to refresh the radio, you need to reboot the 300 MHz 4x4 MIMO HT-OFDM MESH 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.

Reset button

Reset button of the radio