

# PTMPLRV1 Wireless Radio

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## I. Getting Started

This document is designed to help engineers/technicians in rapid configuring of PTMPLRV1\_Wireless Radio's. The document includes detailed instructions for first configuration steps and configuration scenarios for typical network topologies.

### 1. Scope of document

This document consists of the following chapters:

#### *Getting started*

This chapter includes the information about this document purpose and structure.

#### *Getting access to the radio*

The chapter describes how to get access to the radio via Ethernet port and to configure it.

#### *Point-to-point configuration*

This chapter includes a comprehensive list of instructions for point-to-point link configuration including providing LAN connectivity.

#### *Point-to-multipoint configuration*

The chapter briefly describes the difference between PTM and PTP topology when building a network based on PTMPLRV1\_Wireless Radio's. Due to similarity of PTM and PTP configuration it mostly references a previous chapter.

#### *Performing outdoor testing*

The chapter contains a list of requirements for outdoor testing. Also basic steps for link

### 2. Abbreviations

The following abbreviations are used in this document:

BS – Base Station

CPE – Customer Premises Equipment (also called **subscriber** or **subscriber unit**)

ODU – Outdoor Unit.

IDU – Indoor power supply Unit.

LOS – Line-of-Sight

STP cable – Shielded Twisted Pair cable to connect ODU and IDU.

PTP – Point-to-Point topology

PTM – Point-to-Multipoint topology

RMA – Routed Multiple Access Protocol

## Variants

- **LR1R-Hi:** High Range radio with transmitting power configurable up to 30 dBm. It is capable of working up to a distance of 50Km.
- **LR1R:** High range radio with transmitting power configurable up to 18 dBm. It is capable of working more than 30 Km.
- **SR:** Short Range radio with transmitting power configurable up to 14 dBm. It is capable of working up to 15 Km.
- **SR Internal:** Short Range radio with transmitting power configurable up to 14 dBm. It has a 16 dBi internal antenna built into the radio and has a port for external antenna as well.

## Frequency Range Available

- 2.4GHz band (2.600 - 2.657 GHz)
- 5.8GHz band (5.725 - 7.070 GHz)

## **Radio Specifications**

### Technology

Architecture : ODU & IDU Radios; connected with CAT5e cable.  
Legitimate Client Mode

RF Band : 2.6 GHz  
\*\*\*\*\*7.: GHz

Channel : 20 MHz (Configurable)

Transmit Power : 0 ~ 30 dBm (Configurable, model dependent)

Antenna : N Type female connector.

Range : Up to 50 to 60 Km

Data Rate : Up to 54 Mbps

### **Radio Specifications:**

#### 1. Management

### **System Management**

- SNMP and Web Based, SNMP v 1/2/3, SNMP Traps
- Committed Information Rate (CIR), Peak Information Rate (PIR), Committed Burst Size (CBS)

### **Upgrade Capabilities**

- Local & Remote Software upgrades
- Radio upgradeable from single radio station (point to point) to single radio base station (point to multipoint)

### **Environmental Specifications:**

ODU Enclosure Industrial Grade (IP67) All weather case

Temperature ODU: -40C to 70C  
IDU: 0C to 45C

Humidity ODU: 0% to 100%  
IDU: 10% to 100%

## I.Getting access to the router

### 1. PC/Laptop/LAN connection

#### *Cabling (lab)*

The sequence of actions to be performed in order to connect the radio to the PC/Laptop is the following:

1. Unpack the equipment
2. Locate IDU (white/black case) and ODU (white case).
3. Using STP Service cable connect ODU and IDU.

#### *Accessing the router via Ethernet*

If your PC/Laptop does not have a COM-port or you want to plug the radio to the LAN switch you can configure it using Winbox.

The default IP-address assigned to the **radio is 10.0.0.10** with 255.255.255.0 mask.

If you connect the router directly to the LAN/PC/Laptop you should either change the IP-address on the Ethernet adaptor or create an alias IP-address which would be located in **10.0.0.1/24** network.

Connect the router to LAN/PC/Laptop using UTP cable with RJ-45 connectors.

The procedure is the following:

1. Open the Control Panel in Windows. See Figure 10

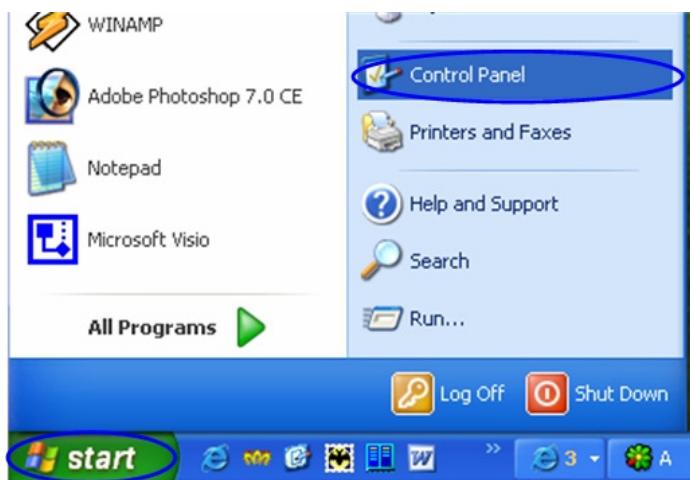


Figure below

1. Open Control Panel
2. Open “Network connections” icon. See Figure 11



Figure above. “Network connections”

3. In “Network connections” folder right mouse button click on the LAN connection and click “Properties”. See Figure below

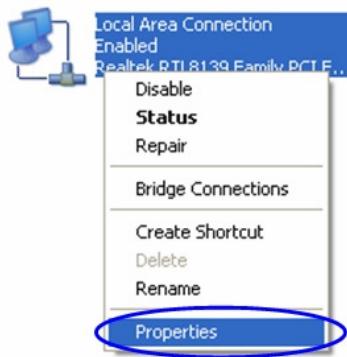


Figure above. LAN Connection properties

4. Choose “Internet protocol (TCP/IP)” and click “Properties”. See Figure below.

Connect using:

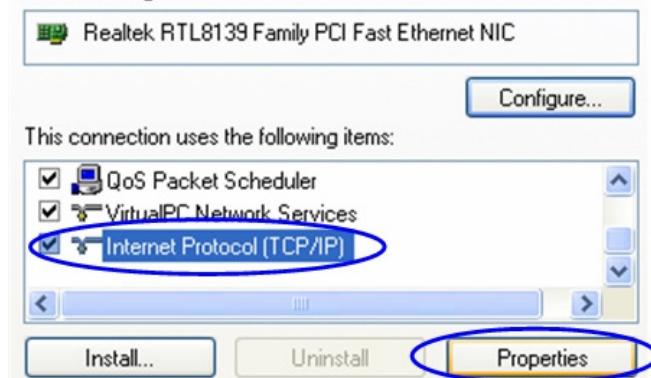


Figure above. Internet Protocol Properties

5. If you want to connect to the router using PC/Laptop you can just change an

IP-address on the Ethernet adaptor to some address from 10.10.10.0/24 network (e.g. change “IP-address” field to “10.0.0.11 and “Subnet mask” to “255.255.255.0”). After that click **OK** and move to step 7. See Figure 14

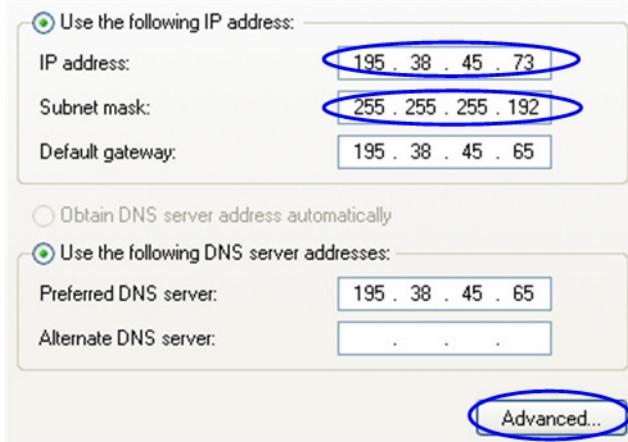


Figure 14. Change IP-address

6. If you are in a LAN and you do not want to change your primary IP-address so you could keep LAN connectivity, you can assign an alias. In order to do that, press “Advanced...” button (Figure 14). In “Advanced TCP/IP Settings” click “Add” and put alias IP-address and mask (e.g. “10.0.0.2” and “255.255.255.0” correspondingly). See Figure 15. Click **OK** in all windows opened in the described procedure.

### III. Point-to-Point configuration

In our point-to-point configuration example we will built a simple network as shown in Figure below.



Figure above. Sample network (PtP connection)

Here we will set up a connection between two PC/Laptops.



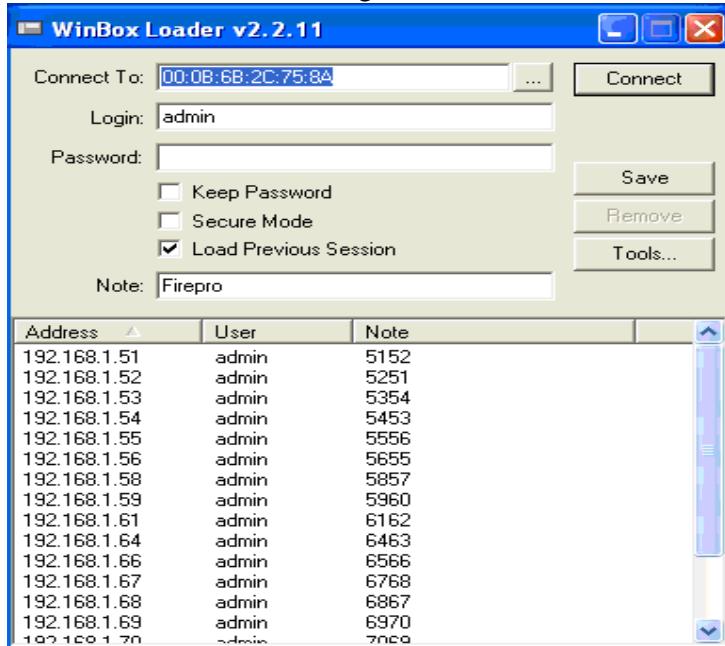
*All configuration samples and notes will use IP-addresses as specified in Figure 19.*

#### 1. Radio's configuration

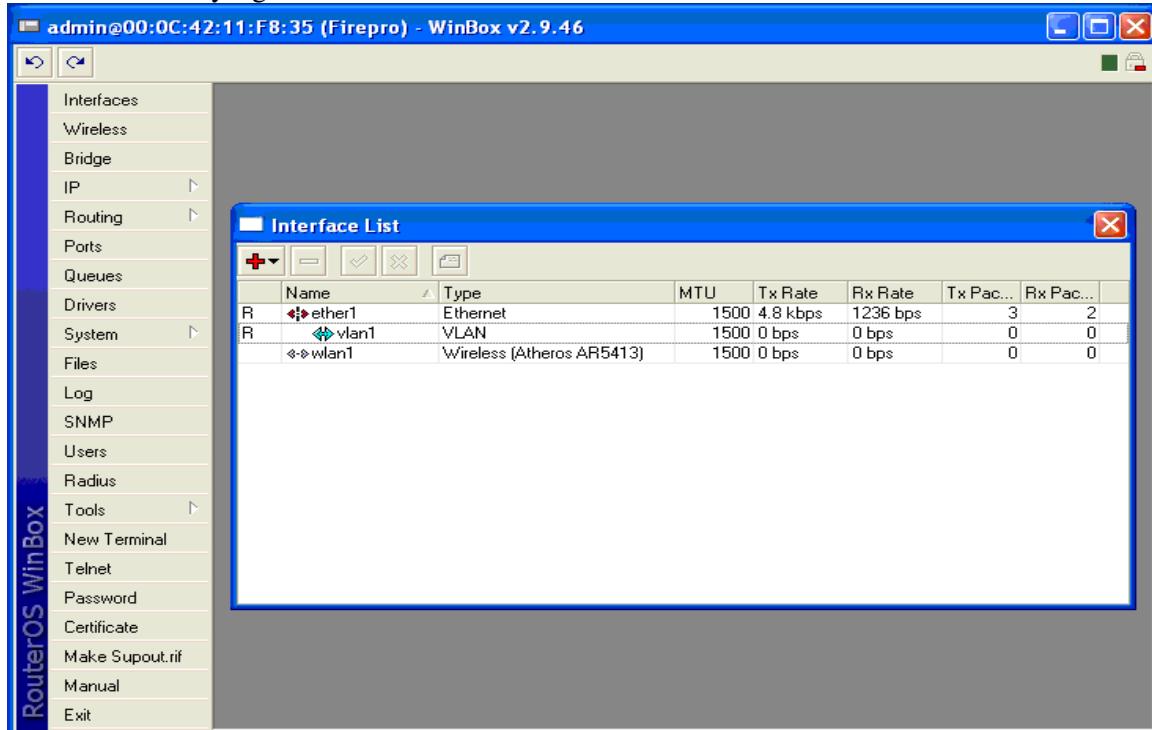
1. Choose one of the radio's to be CPE and the other one to be BS.
2. Provide connectivity from PC1 to CPE and PC2 to BS following the procedure described in "Getting access to the radio". As a result you should make sure that you can ping CPE from PC1 and ping BS from PC2
3. Now we will proceed to radio's configuration using WINBOX software.



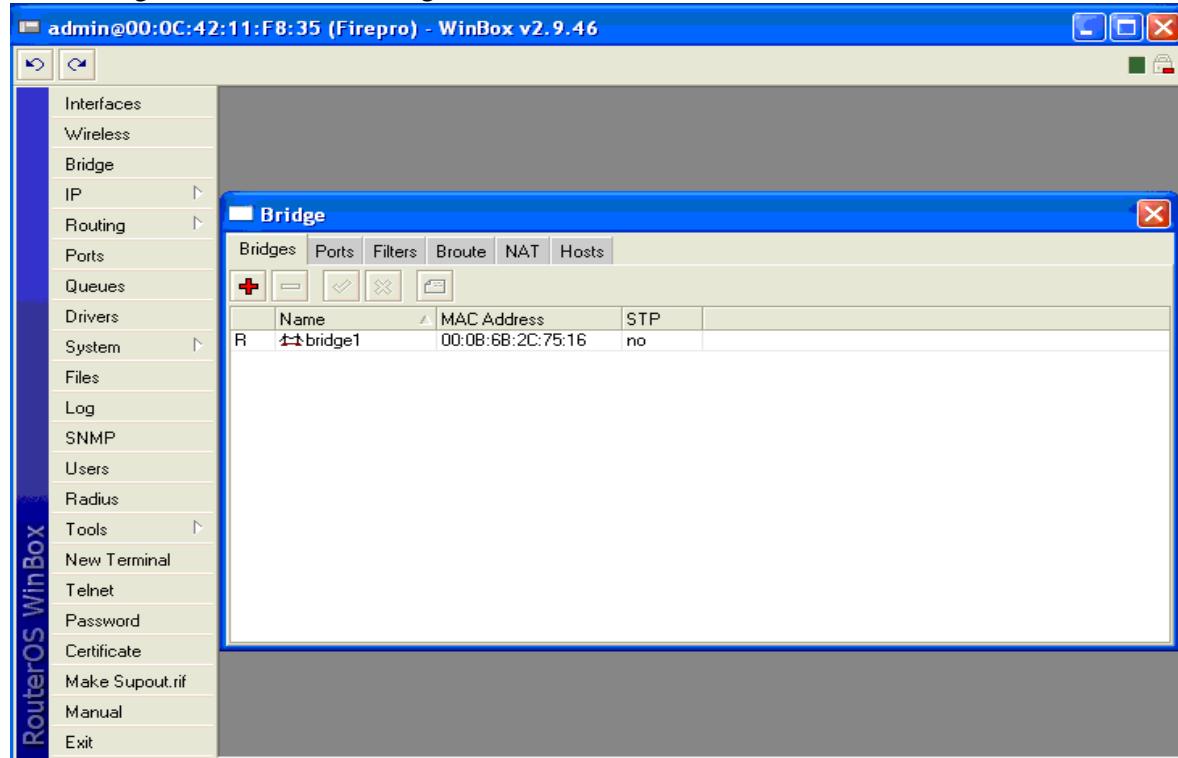
Use WINBOX software to login to the soft interface of the radio.



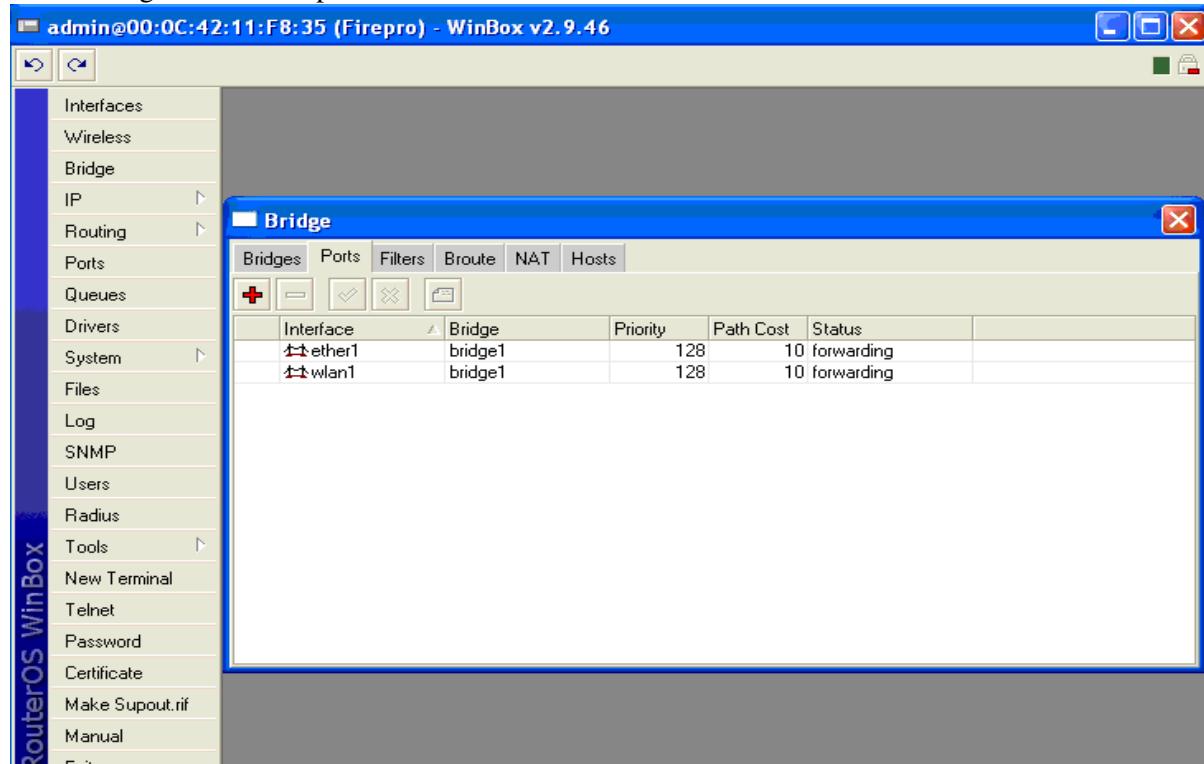
Enable WLAN by right click



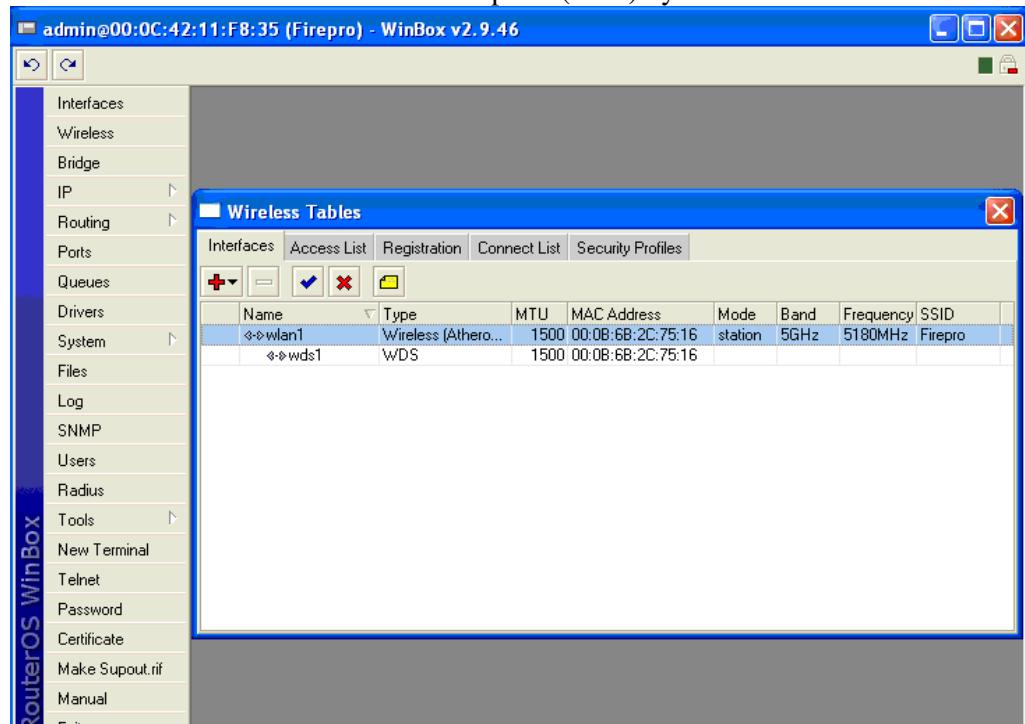
Go to bridge and create “wds-bridge”.



Go to Bridge and then to ports and create “ether1” and “wlan1”.

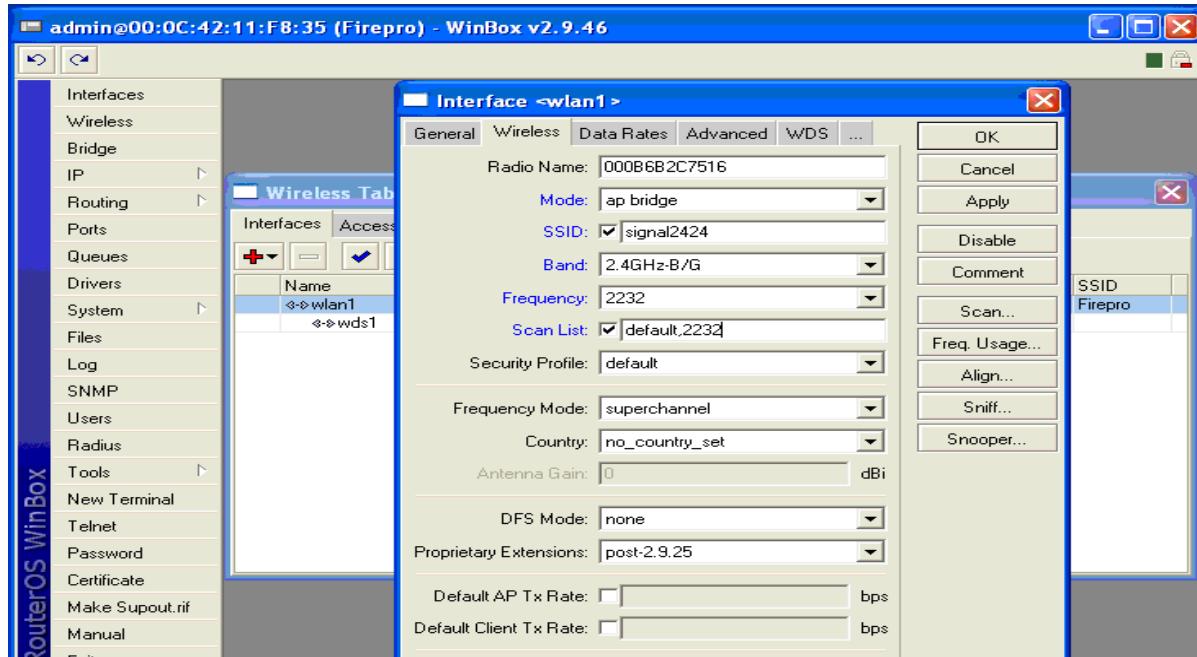


Go to Wireless and select the wireless option (wlan) by double click .

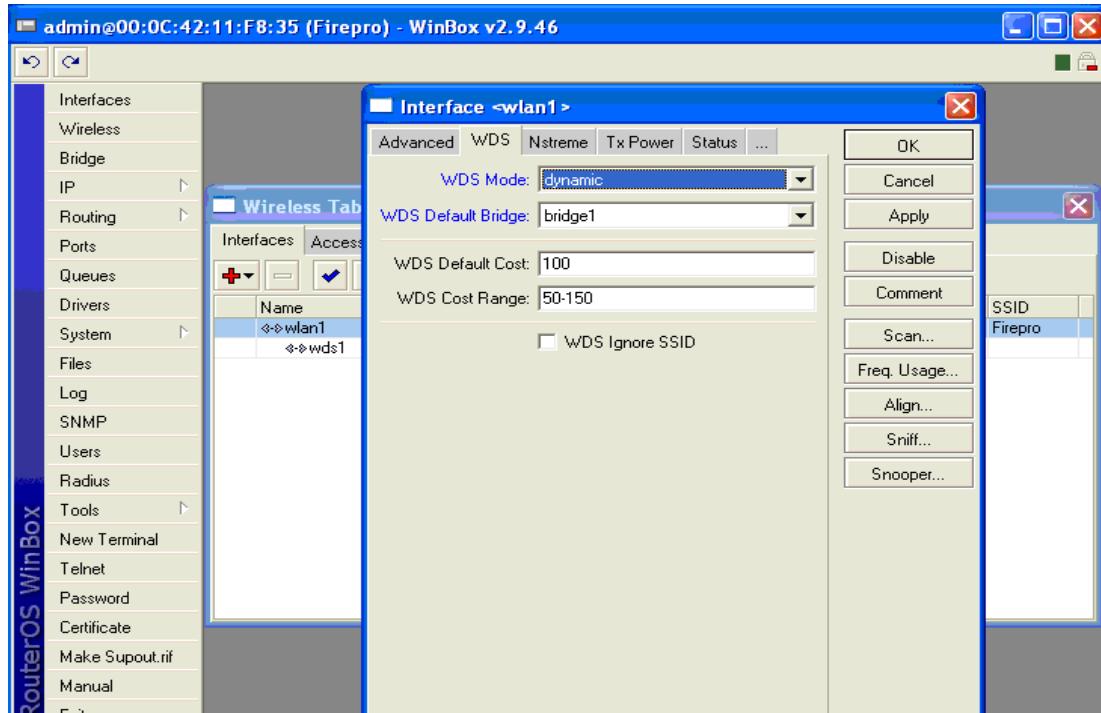


In the wireless tab enter below mentioned values

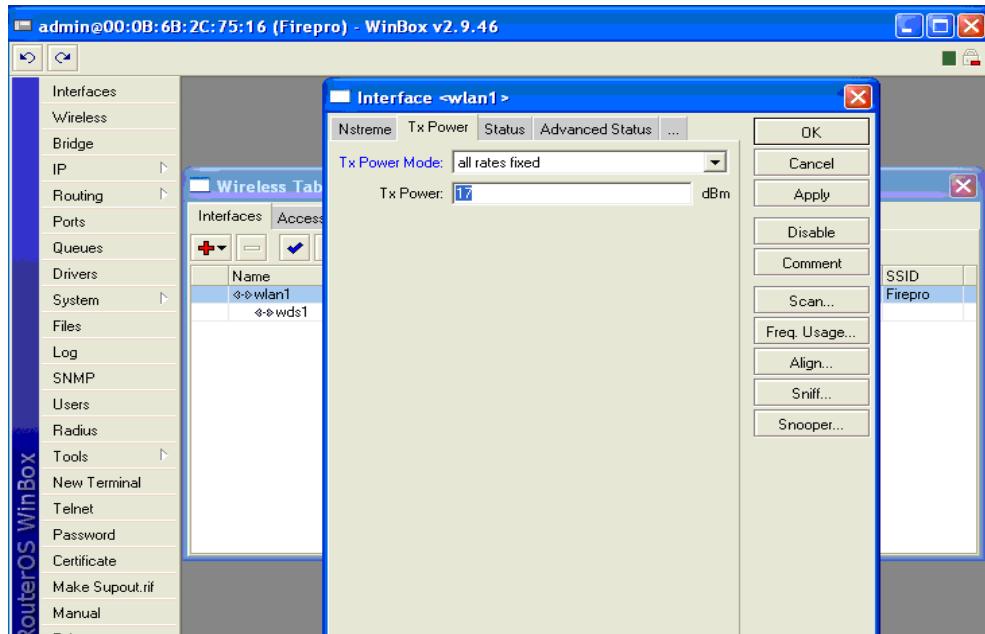
- SSID – It should be same in Tx & Rx Modem.
- Select Mode – Station WDS for Rx and Bridge for Tx in case of PTP and AP-Bridge in case of Base Station.
- Select Band and then sub frequency available in that band. Manually add the same frequency in the scan list so as to avoid the radio to search for other sub frequencies in that particular band.



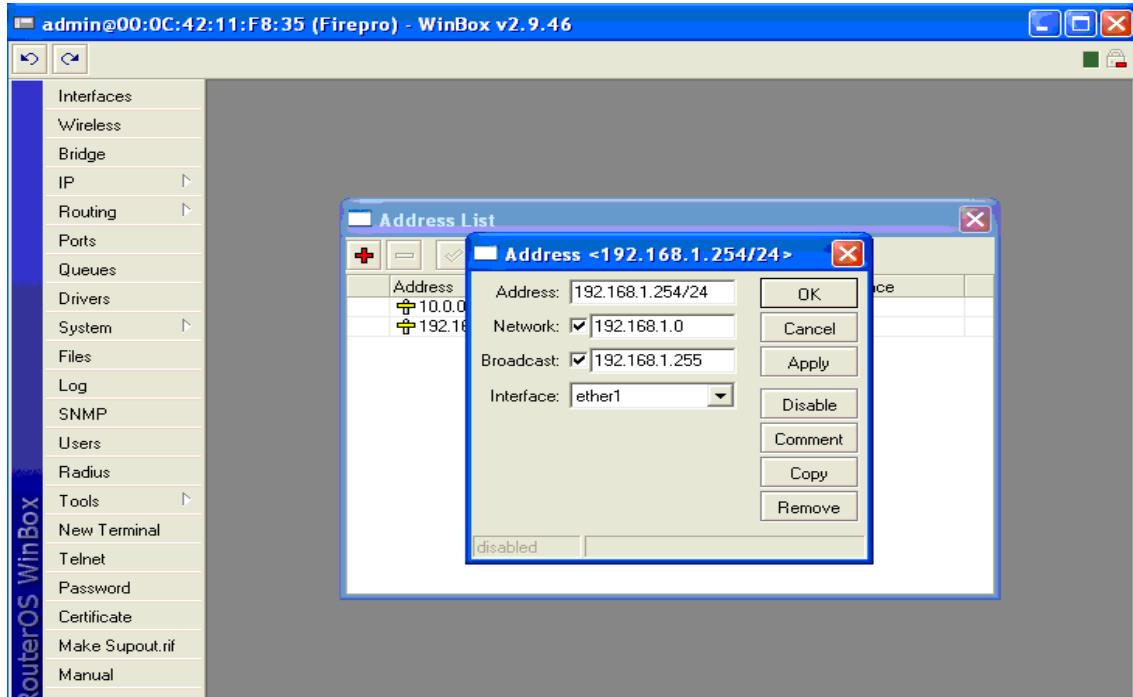
Go to WDS option and change WDS Mode to “Dynamic” and WDS default bridge to “wds-bridge”.



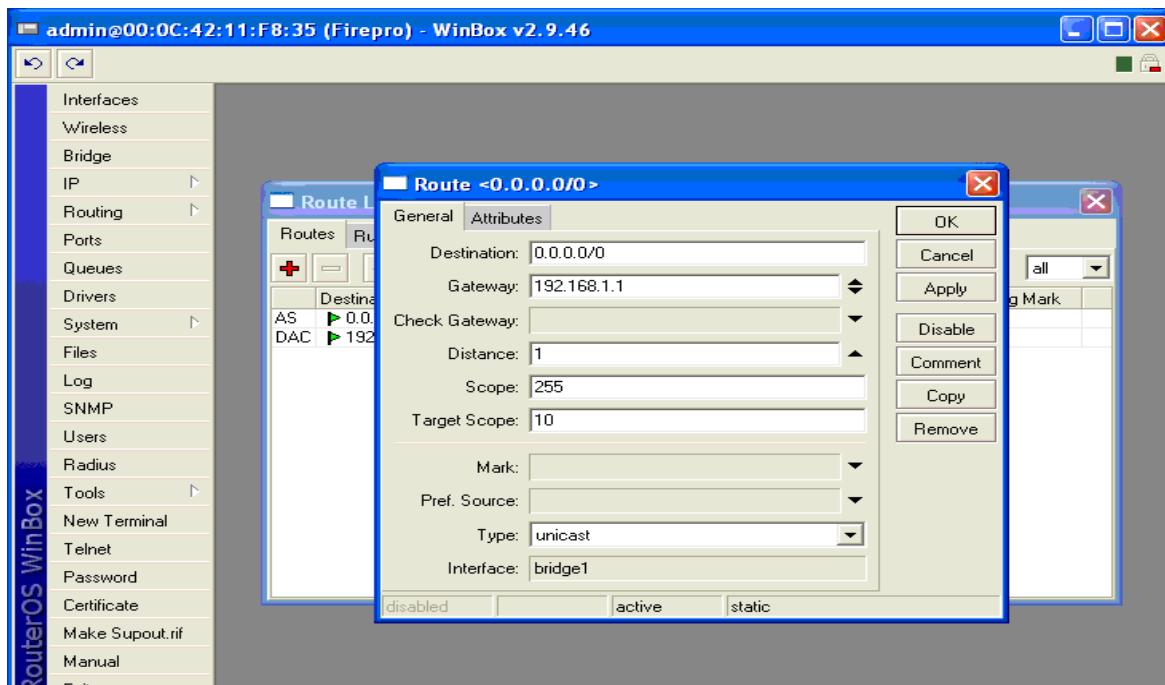
Go to “Tx Power” option and use power as per Arial distance starting from 0dBm to 30dBm (Model Specific).



Go to IP option and add your radio's IP Address provided to you followed by "/24" or any subnet mask and ones you click on apply "network" option and "broadcast" option will have the values automatically. Then click on "ok".



Go to Routes and add default route of your network (ex - 192.168.1.1 with destination as 0.0.0.0). Then click on apply.



## PTMPLRV1\_ Configuration Manual through Web Based application



Use PTMPLRV1\_ 's web based software to login to the radio

Default IP Address – 192.168.1.1/24

Default Username - admin

Default Password –admin01



Go to “configuration” and assign local radio IP Address, subnet mask and default gateway.

The screenshot shows the firepro configuration interface. The top navigation bar includes links for STATUS, CONFIGURATION (which is selected), SYSTEM, and TOOLS. The right side of the top bar has links for Network, Wireless Basic, Wireless Security, Wireless Advanced, Services, and Expert, along with a LOGOUT button. Below the top bar is a blue header bar with buttons for 'Apply page changes' and 'Apply'. The main content area is divided into sections: 'Network Settings' and 'Operating Mode'. In the 'Network Settings' section, there are input fields for IP address (192.168.103.253), Subnet mask (255.255.255.0), Default gateway (192.168.103.1), DNS server 1, and DNS server 2. In the 'Operating Mode' section, it shows 'Radio ath0 (on ath0)' with an 'Operating mode' dropdown set to 'Master' and buttons for 'Add' and 'Delete' WDS peers.

In the “operation mode” (below ip address assignment) select one end radio as master and remote end radio as slave.

The screenshot shows the firepro configuration interface. The top navigation bar includes links for STATUS, CONFIGURATION (which is selected), SYSTEM, and TOOLS. The right side of the top bar has links for Network, Wireless Basic, Wireless Security, Wireless Advanced, Services, and Expert, along with a LOGOUT button. Below the top bar is a blue header bar with buttons for 'Apply page changes' and 'Apply'. The main content area is divided into sections: 'Network Settings' and 'Operating Mode'. In the 'Network Settings' section, there are input fields for IP address (192.168.103.253), Subnet mask (255.255.255.0), Default gateway (192.168.103.1), DNS server 1, and DNS server 2. In the 'Operating Mode' section, it shows 'Radio ath0 (on ath0)' with an 'Operating mode' dropdown set to 'Master' and buttons for 'Add' and 'Delete' WDS peers.

Add remote end radio MAC Address at “WDS peer MAC 1” option. MAC Address of the local radio can be located by clicking on status → Interface.

Network Settings

IP address

Subnet mask

Default gateway

DNS server 1

DNS server 2

Operating Mode

Radio ath0 (on ath0)

Operating mode

WDS peers

WDS peer MAC 1

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firepro

STATUS

CONFIGURATION

SYSTEM

TOOLS

System Information

Interfaces

Wireless

Routes

ARP Table

LOGOUT

Refresh

Network Statistics

Interface	Receive statistics				Transmit statistics			
	bytes	packets	errors	drops	bytes	packets	errors	drops
eth0	0	0	0	0	0	0	0	0
ath0	103845	1412	0	0	103845	759	0	0
br0	84183	1414	0	0	84183	760	0	0

Network Configuration

Interface	MAC address	IP address	Netmask	Broadcast
br0	00:0B:6B:2C:74:A4	192.168.103.254	255.255.255.0	192.168.103.255

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Go to configuration → wireless basic and assign

- i) SSID (it should be same on both radios)
- ii) Channel should be selected on auto and full
- iii) Automatic data rate mode option should be clicked.

Country Code

Country code

Basic Wireless Settings

Radio ath0 (on ath0)

Enable radio

IEEE mode

Throughput enhancements  Fast Frames  Packet Bursting  Dynamic Turbo

SSID

Broadcast SSID

Current channel

Channel

Quality of service (WMM)

go to configuration → wireless advanced and fix transmit power as per need (Model Specific)

**Advanced Wireless Settings**

Radio ath0 (on ath0)

Transmit power (dBm):  Note: The actual value of the Transmit power depends on radio hardware; check for it in the radio module manufacturer's technical specification.

ACK timeout:

Fragmentation:

RTS:

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For the simplicity of alignment – go to Tools → Antenna Alignment and click on start. RSSI level will be displayed on graph format.

**Antenna Alignment**

Wireless interface: ath0

RSSI

44
44
44
44
44
44
45
45
45
45
45
46

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We can preview the radio settings using status → wireless tab. This can also be used to check link status

The screenshot shows the firepro wireless interface. The top navigation bar includes a logo, a status bar with 'firepro wireless', and a menu with 'STATUS', 'CONFIGURATION', 'SYSTEM', 'TOOLS', 'System Information', 'Interfaces', 'Wireless', 'Routes', 'ARP Table', and 'LOGOUT'. A 'Refresh' button is in the top right.

**Wireless Statistics**

Interface	Parent	Status	Link Level	Noise	Invalid network ID	Decryption errors	Invalid fragments	Retry count	Miscellaneous errors	Missed beacons
ath0	ath0	up	0	160	160	7	0	0	0	0

**Wireless Configuration**

Country	India				
Interface	Parent	MAC address	IEEE mode	Channel	ESSID
ath0	ath0	00:03:7F:FE:04:4F	A	165	5.1-5.3

**Stations/Access-Points**

No Peers/Access-Points found.

Security can be enabled in PTMPLRV1\_ radio using configuration → Wireless security tab

The screenshot shows the firepro wireless interface. The top navigation bar includes a logo, a status bar with 'firepro wireless', and a menu with 'STATUS', 'CONFIGURATION', 'SYSTEM', 'TOOLS', 'Network', 'Wireless Basic', 'Wireless Security', 'Wireless Advanced', 'Services', 'Expert', and 'LOGOUT'. A 'Apply page changes' and 'Apply' button are in the top right.

**Wireless Security**

Radio ath0 (on ath0)

Authentication method	WPA-PSK-AES
Passphrase	tulipfirepro

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Default username and password can be changed by system → account option

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STATUS  
CONFIGURATION  
**SYSTEM**  
TOOLS

Account  
License  
Skins  
Management  
Maintenance

LOGOUT

Apply page changes **Apply**

**Administrative Account**

Username admin

Old password

New password

Verify password

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Advanced configuration like VLAN management, SNMP settings etc can be done through using the option System → Management

firepro wireless

STATUS  
CONFIGURATION  
**SYSTEM**  
TOOLS

Management VLAN Settings

Enable VLAN

RCMS Settings

Enable RCMS

Friendly Name

Name WDS\_Unit\_1

SNMP Settings

Enable SNMP

Name WDS\_Unit\_1

Management VLAN Settings

Enable VLAN

RCMS Settings

Enable RCMS

Friendly Name

Name WDS\_Unit\_1

SNMP Settings

Enable SNMP

Name WDS\_Unit\_1

System location The\_Address

System contact Administrator

Read only community (v1/v2) public

Read only user (v3) public2

Apply page changes **Apply**

Management VLAN Settings

Enable VLAN

RCMS Settings

Enable RCMS

Friendly Name

Name WDS\_Unit\_1

SNMP Settings

Enable SNMP

Name WDS\_Unit\_1

System location The\_Address

System contact Administrator

Read only community (v1/v2) public

Read only user (v3) public2

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We can use the scanning feature of radio to know which all sub frequencies are working where link deployment has to be done in order to choose the best available free sub frequency using the option tools → site survey

Throughput test can be used to know the actual radio throughput capacity ones the link is installed by using the option tools → traffic monitor. Even other parameters link ACK test can be performed

## Case Study Tulip Telecom Ltd. – VLAN tagging.

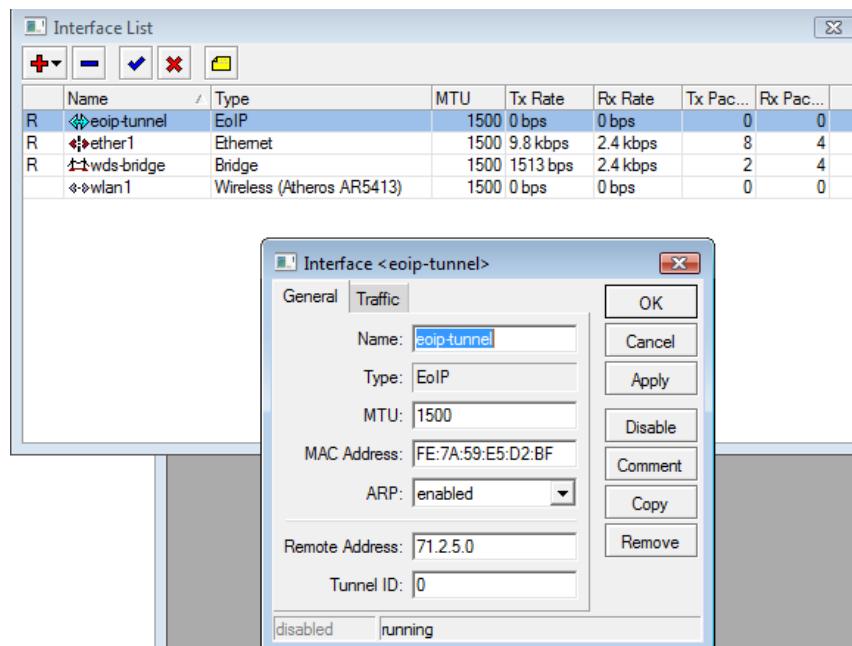
There are two ways of getting the PTMPLRV1\_ Radio at customer end tagged:-

1. Through the use of EOIP tunnel.
2. Through the use Wds-bridge wherein we bridge the VLAN and the Ethernet interface but not the WLAN interface.

In both the cases we have to give the service provider's series IP to the PTMPLRV1\_ in the WLAN interface assuming the pop end radio monitoring subnet is /24.

### <----- EOIP SCENARIO ----->

In EOIP assume now that the pop end PTMPLRV1\_ is given the IP of 71.2.213.5, standard practise is to give some ip like 15.15.15.0/30 to the wlan interface on the popend and client end radio, to get it into monitoring. We now have to give the wlan interface a subscribers series IP assuming 71 series/30 IP. Now assume we are giving 71.2.5.1/30 to the popend wlan and 71.2.5.2/30 to the client end wlan.



Address	Network	Broadcast	Interface
71.2.5.1/30	71.2.5.0	71.2.5.3	wlan1
71.5.213.5/24	71.5.213.0	71.5.213.255	ether1

Address	Network	Broadcast	Interface
71.2.5.2/30	71.2.5.0	71.2.5.3	wlan1
71.5.213.6/24	71.5.213.0	71.5.213.255	ether1

Figure above shows the IP Addresses assigned in both radios.

Now on the pop end radio we have to add a route IP route 71.2.5.0 255.255.255.252 71.2.213.5 (which is the ethernet ip of the pop end radio) .

Address	Network	Broadcast	Interface
71.2.5.1/30	71.2.5.0	71.2.5.3	wlan1
71.5.213.6/24	71.5.213.0	71.5.213.255	ether1

Destination	Gateway	Pref. Source	Distance	Interface	Routing Mark
0.0.0.0/0	71.2.5.0	71.2.5.1	1	wlan1	unknown
71.2.5.0/30			0	wlan1	
71.5.213.0/24		71.5.213.6	0	wds-bridge	

**Route <0.0.0.0/0>**

**General** **Attributes**

Destination: 0.0.0.0/0

Gateway: 71.2.5.0

Check Gateway:

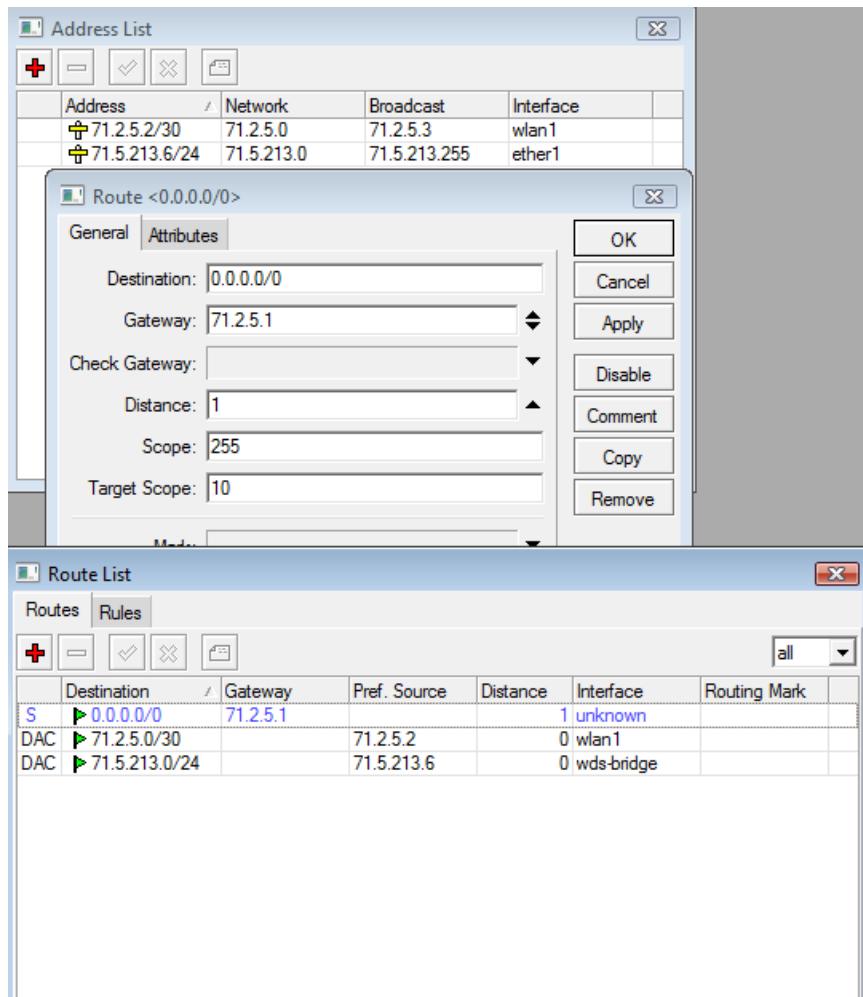
Distance: 1

Scope: 255

Target Scope: 10

**OK** **Cancel** **Apply** **Disable** **Comment** **Copy** **Remove**

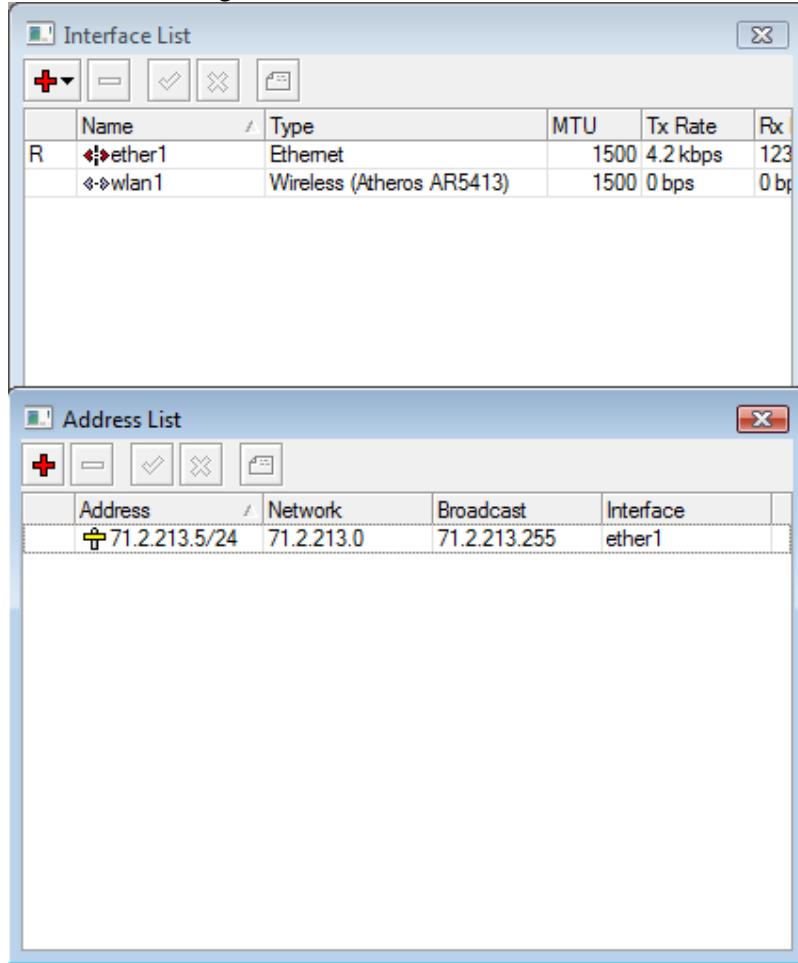
And on the client end radio, point the default route to 71.2.5.1.



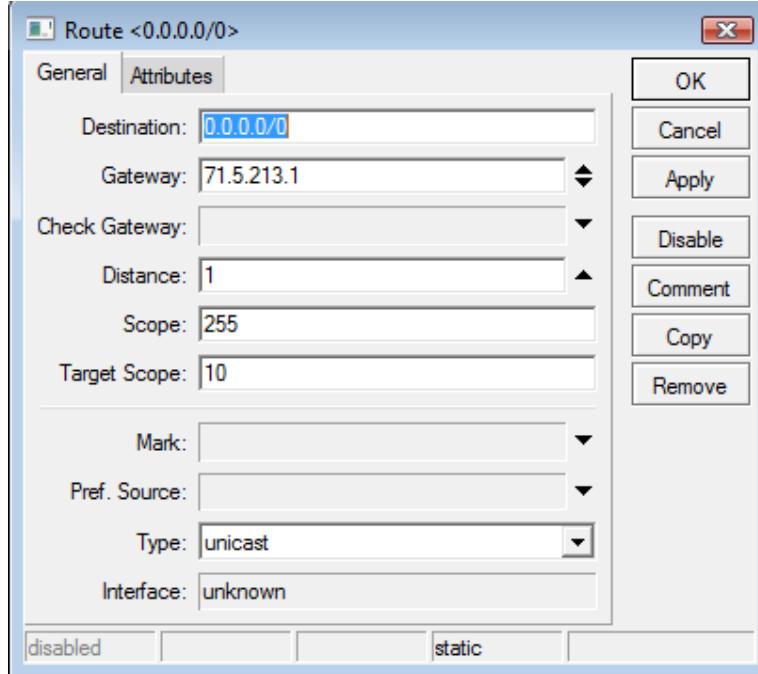
You do not need to give an IP to the Ethernet interface of the client end radio.

### <-----WDS scenario ----->

WDS scenario is even simpler as we do not need additional /30 71 series IP's using the above example we will keep the pop end radio IP as 71.2.213.5 and now to the client end WLAN interface we will give the IP as 71.2.213.6/24.

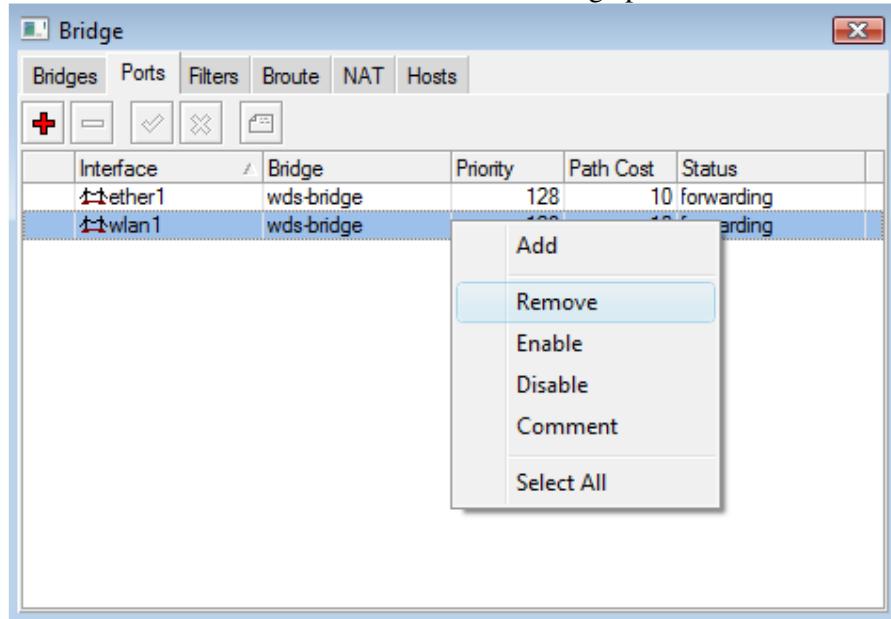


Set the default route to 71.2.213.1 (which is the pop end router) in the client end modem, no other interface on the client end radio needs a IP.

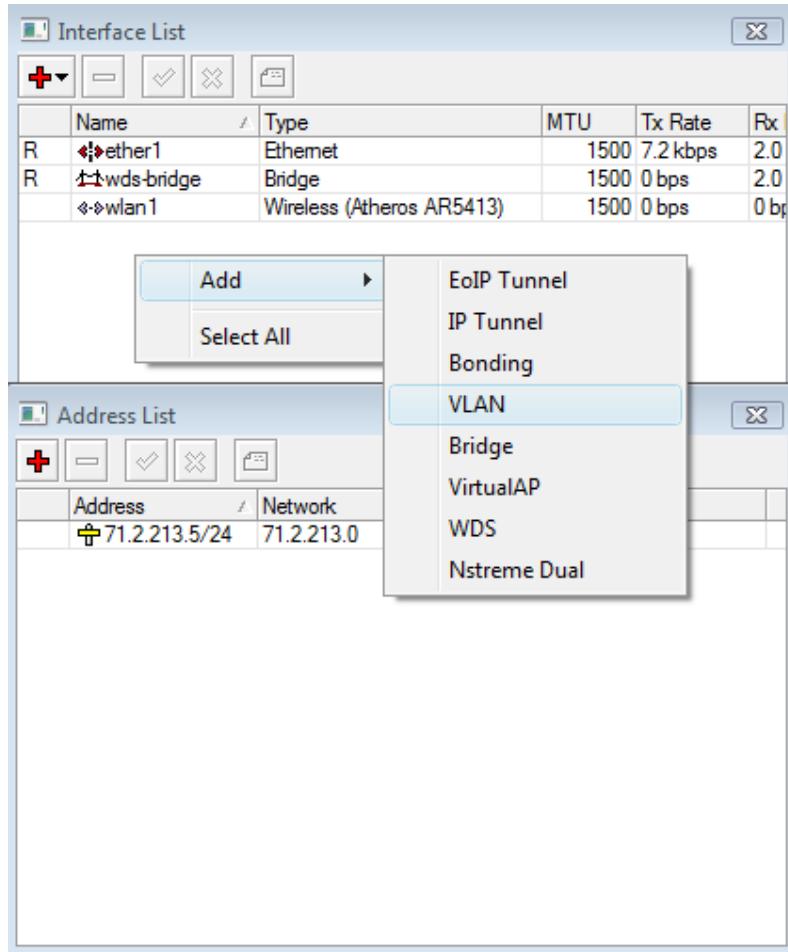


Now at this point the radio is in monitoring, but we need to tag it. On the client end radio you will notice that in the bridge ports section we have the wlan interface and the ethernet interface.

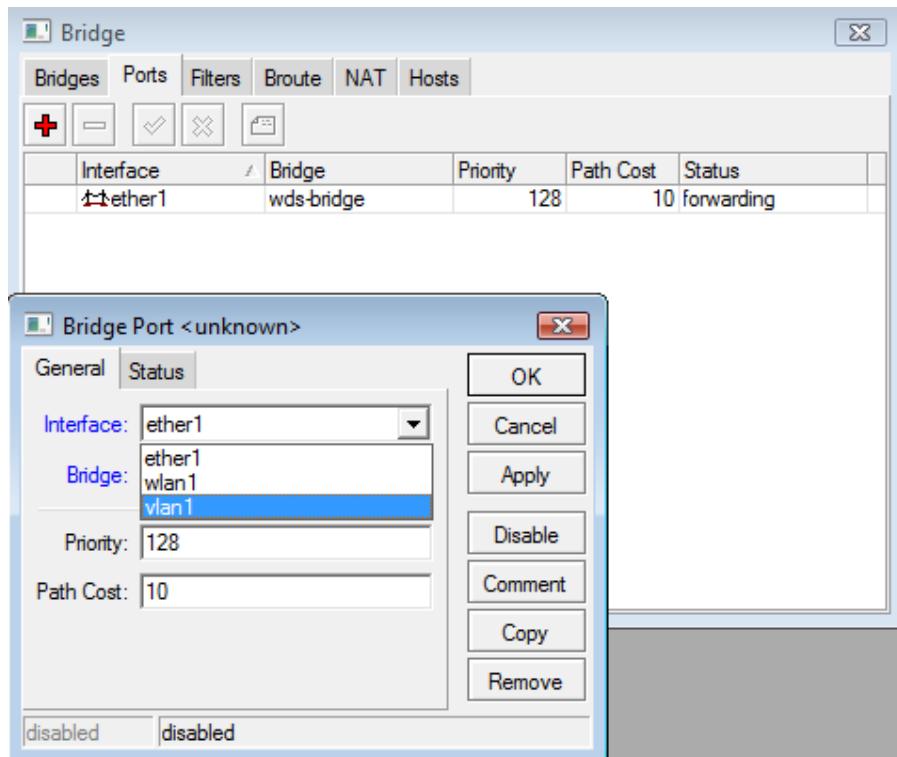
Then remove the WLAN interface from the bridge ports section if it is already there.



Now we create a VLAN interface under the WLAN interface and give the needed tag to it.



Then we add the VLAN interface to the bridge port. So now we have 2 interfaces on the bridge port. The VLAN and the Ethernet port the VLAN traffic of the client will begin.



## **V. Performing outdoor testing**

Before carrying out outdoor testing make sure that the equipment is properly configured and tested in the lab. If you use outdoor equipment please prepare service cables to connect IDU and ODU and check them in the lab. Also the following accessories may be very useful while outdoor testing:

1. LAPTOP with WINBOX software to perform configuration of the rooftops/masts etc
2. Binoculars to locate the opposite side
3. Mobile phones at either side to coordinate each others actions
4. Screwdrivers set
5. Crimping tool in case if you have to fix some problems with connectors.
6. Voltage analyzer to reveal cable problems if any

When planning your outdoor testing it is **strongly recommended** to perform calculations using:

- Speed/Range Calculator
- Fade Margin Calculator

How-to-use instructions are located in the Technical User Manual on the CD delivered with the equipment.

## **Learning link status/antenna alignment procedure**

In order to install the equipment, please do the following:

1. Install ODU and antenna at the roof top/mast etc. Connect ODU and antenna using RF cable. If the link is just for testing usage make sure that it is not going to rain or snow (because in this case you do not have to seal the connectors).
2. Even in test link it is highly recommended to provide all grounding. Ground the ODU to the mast/building grounding contour
3. Usually when installing ODU at the top, the ODU-IDU service cable is already connected to the ODU.
4. Connect ODU-IDU cable to IDU indoors
5. Provide IDU grounding to the LAN grounding contour
6. Connect power cable to IDU and plug this cable into the power socket

## Basic Trouble Shooting Steps

### Problem : LOCAL RADIO NOT ACCESSIBLE

#### Common Causes:

- Power failure / SDA faulty
- Faulty /loose Cable / Connector
- Wrong Cable type Selection ( cross/straight )
- Configuration loss
- Logical Isolation due to VLAN configurations
- Hardware Failure

#### Physical Observation:

- Check power Status.
- Look for SDA blinking (BSR/SPR) or power adapter LED indication
- Physical connection between SDA to Router.
- Physical Connectivity between Laptop / Router
- Connect the laptop with the straight cable at rooftop and the other end with switch/hub of customer premises. If the LAN port is up then the cable is O.K. or the cable is faulty.
- Check the cable connectivity with the help of LAN tester or multimeter.
- Ensure cable length is less then 100 meters. In all the cases.
- Please refer the table (1a) to identify cable requirement

#### Things to Remember

- A straight cable has identical ends. ( 1-1 )
- A crossover cable has different ends (1 to 3 and 2 to 6).
- A straight cable is used as a patch cord in Ethernet connections.
- A crossover is used to connect two Ethernet devices without a hub or for connecting two hubs.
- A crossover has one end with the Orange set of wires switched with the Green set.
- Odd numbered pins are always striped; even numbered pins are always solid colored.
- Looking at the RJ-45 with the clip facing away from you, Brown is always on the right, and pin 1 is on the left.

#### Recommended Procedure

- Connect the laptop to SDA. Disable the firewall in Laptop and configure the laptop in the same Subnet Mask as Radio is.
- Check the speed setting of Laptop should be compatible with the Radio Setting.
- Check the VLAN tag if on local ping is sometime not possible. (If VLAN Tagging is done then radio can only be access from the Wireless PORT and not from the Wired Ethernet port. Ie RJ-45. VLAN tag is required to be removed to get the local access.
- Bring down the ODU check it with Console Cable
- Connect the ODU & IDU with test cable reconfigure for the local access.
- If the equipment still remains inaccessible then can be considered faulty and RMA can be raised.

## **PROBLEM: . REMOTE MODEM NOT ACCESIBLE**

### **Common cause**

- Power failure / SDA faulty at Remote
- Faulty /loose Cable / Connector at Remote
- SDA Ethernet port faulty
- Configuration loss
- Hardware Failure

### **Physical Observation:**

- Check power Status.
- SDA blinking (BSR/SPR) or power adapter LED indication
- Connect the laptop with the straight cable at rooftop and the other end with switch/hub of customer premises. If the LAN port is up then the cable is O.K. or the cable is faulty.
- Check the cable connectivity with the help of LAN tester or multimeter.
- Ensure cable length is less then 100 meters. In all the cases.

### **Recommended Procedure**

- Check the RSSI & RF association with other end.
- Check the configuration parameters with remote end.(SSIN, Airmac, Frequency, Transmit Power)
- Check weather proofing & Pigtail cable, RF connector.
- Check alignment according to bearing of remote side.
- Check LOS.
- Check antenna and feeder

## **PROBLEM:.. MITIGATING INTERFERENCE PROBLEM.**

### **Common cause**

- Less space between Mounted antennas
- Back to back installed antennas
- Lack of frequency planning
- Existence of strong RF links in that area

### **Physical Observation:**

- Check for space between antennas
- Check for alternate polarization between PTP links

### **Things to remember:**

- Keep frequency planner /detail ready with you
- Keep frequency detail of PTP links separately
- Use software spectrum analyzer (inbuilt feature of modem) to identify occupied frequency in that area and mark the frequency for future reference
- Frequency re-usability at the same POP to be done using different polarization / direction between the links operating on same frequency.
- For all co-located links in the same band to be preferably on non-overlapping frequency.
- RSSI / Signal strength is the indicator of RAW Rf signal received at a particular band. Good RSSI value depicts the clear line of sight. It's a combination of both wanted and unwanted signal.
- Signal Quality is the proportion of wanted signal in aggregate received RAW Rf signal at a particular band. Good Signal Quality depicts the clear and non-interference zone.

### **Recommended Procedure:**

- Scan all channel and keep which is giving max RSSI
- Use frequency planner and plan channel spacing between links.
- Ensure there is no Frequency overlapping done with the co-located Radios without
- If fade margin is more then 10 dbm and variation is more then -3dbm then antenna alignment is recommended.
- If Signal Strength is stable and Signal Quality is varying in high degree then it a case of high interference and Antenna Alignment is not recommended, optimization to be done using RF parameters.
- If Signal Quality is Stable but there is variation in excess of 3dbm on Signal strength then there is a possibility of antenna misalignment.
- Adjust Transmitting power according to link distance
- Adjust Channel Width in accordance to Bandwidth Requirement. (All customer links to be configured @ 5Mhz)
- Adjust power by decreasing 1 by 1 up to healthy fade margin
- Change polarization of the antenna at both end
- Keep at least 3 ft space between antennas (back to back)

## **PROBLEM : EQUIPMENT HANG/ REPEAT EQUIPMENT FAILURE**

### **Common Causes**

- Low signal Strength (In stable Signal Strength & Signal Quality)
- Low signal strength can cause equipment hang if configured on high Data Rate (Complex Modulation).
- Overheat.(If equipment going 45c (indoor)
- Earthing Problems

### **Physical Observations**

- Operating Humidity (+30c @ 90% and above).
- Check the Socket in which our SDA is powered up
- Check weather the equipment is on raw power.
- Check for the power fluctuations.
- Voltage level between earth and neutral to be no more then 2 volts.
- All Our equipment is must be on UPS.

### **Things to Remember**

- Input AC Voltage **threshold 180v to 250volts**
- Output Voltage is (30 To 55 VDC) Non Regulated.
- Operational temperature for outdoor units to be within the range of (-20c to +60c). Operational Temperature of equipment is always 10-15 degrees higher than ambiance temperature.
- Voltage levels above 60 VDC is considered over voltage.

Adaptive Modulation to be configured which will switch back to lower modulation in case of drop in signal strength without loosing sync between the modems.(Please refer Table 1 b in APPENDIX below)

## RSSI FLACTUATION

- Check the Alignment according to the bearing of the client side.
- Do frequency management.
- Check LOS.

## EARTHING PROBLEMS

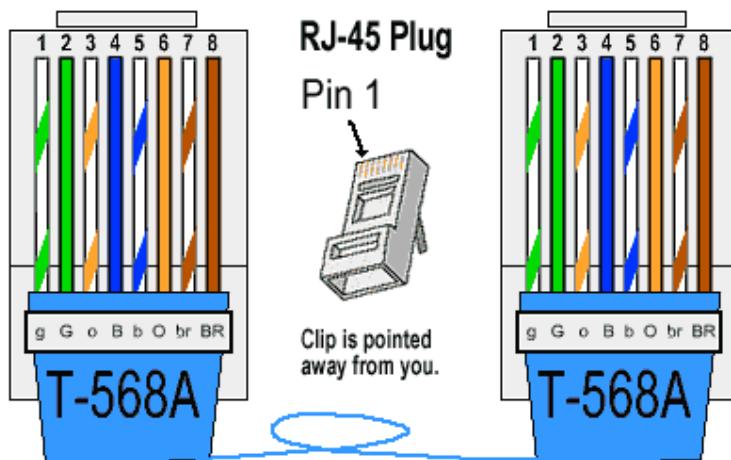
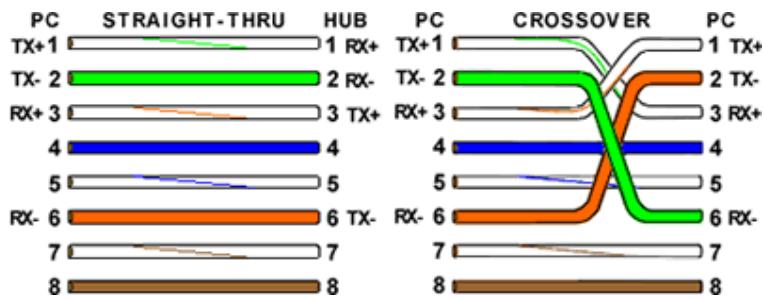
- At the power Source the voltage between the Neutral and Earth to be no more then 2 Volts. •Please verify the GND connections as desried in the user manual and guidelines documentation provided. (Some radios require grounding on the enclosure where as some does it using one of the pins of the connector. Please refer manual to cross verify) In case where enclosure needs to be referenced the GND should be connected to : IDU,ODU, Cable between IDU<->ODU the mesh shielded cable and Rj45 shielded connectors must are/should be used to reference the ground between the IDU & ODU.

## Recommended Preventive Measures

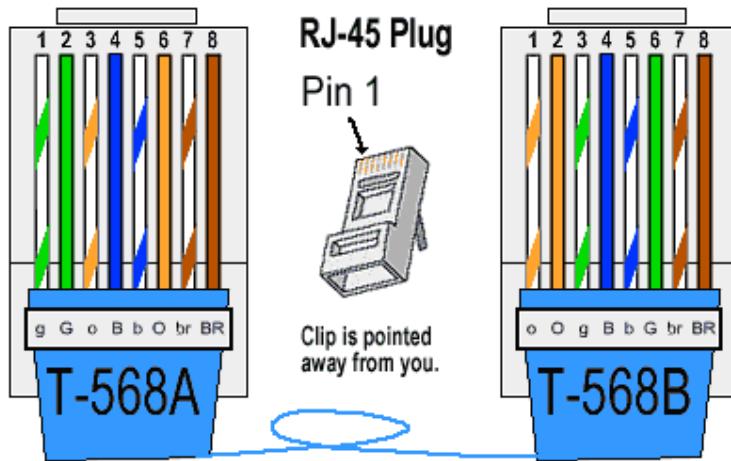
- *No more than 1/2" of the Ethernet cable should be untwisted otherwise it will be susceptible to crosstalk.* •Cables with exposed ends (i.e. not yet crimped) should be covered with protective polythene bags during external cable installation processes. •Disturbance of cables on an In-Service exchange can cause loss of Service. Extreme care must be taken when installing cables at any customer or Subscriber premises. *Do not deform, do not bend, do not stretch, do not staple, do not run parallel with power cables, and do not run Ethernet cables near noise inducing components.*

## STANDARD Connections

### T-568A Straight-Through Ethernet Cable



### RJ-45 Crossover Ethernet Cable



## **What's New in PTMPLRV1\_**

### **Supported Standards**

- IEEE 802.11a/b/g
- IEEE 802.11i
- IEEE 802.11d - Country element support
- IEEE 802.11e - Enhancements: QoS, including packet bursting
- IEEE 802.11h - 5 GHz spectrum, Dynamic Frequency Selection (DCS/DFS) and Transmit Power Control (TPC) for European Union compatibility

### **Wireless Functionality**

- Virtual AP (MBSSID)
- Multiple wireless interfaces
- Per virtual AP (MBSSID) wireless security settings
- Association limitation per Virtual AP (MBSSID)
- Automated channel selection
- Antenna diversity control
- Output power control
- Wireless distribution system (WDS)
- Secure client mode with WEP, WPA, WPA2 PSK and enterprise (dynamic key) with Half and quarter rate channels support

### **Public Access**

- WEB login redirection (captive portal) with HTTP proxy support and multiple/selective authentication methods (PAP/CHAP/MSCHAP/MSCHAPv2)
- RADIUS MAC authentication
- SMTP redirection
- RADIUS client with support for multiple authentication and accounting RADIUS servers
- RADIUS accounting client supports fail over and backup modes
- RADIUS authentication client supports fail over mode

### **Management**

- WEB management via HTTPS
- Command line management via SSH and serial console
- Configuration file upload via HTTPS and SFTP
- VLAN for management traffic
- Management access control list
- Administrator authentication via RADIUS or TACACS
- SNMP V1/2/3
- SNMP traps

## FCC Statement:

### Federal Communication Commission Interference Statement

This equipment 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 in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

For product available in the USA/Canada market, only channel 1~11 can be operated. Selection of other channels is not possible.

This device and its antenna(s) must not be co-located or operated in conjunction with any other antenna or transmitter.

### IMPORTANT NOTE:

#### FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 25cm between the radiator & your body.