User Guide

EZMesh

Multi-Radio Wireless Mesh Network Access Point

Teletronics Inc.
2 Choke Cherry Road
Suite 100
Rockville, MD 20850
USA

Table of Contents

IMPORTANT:
Information presented are based on information available and they are subject to change without notice.

Chapter 1

Overview

Teletronics 's Triple RF mesh access point extends hotspot coverage using multi 5GHz wireless technology as a backhaul connection between mesh access points, and uses one 802.11b/g as a client connection.

The EZMesh is designed for maximum performance, scalability, and ease of use. The EZMesh is ideal for metro Wi-Fi solutions and offers full 802.11b/g client compatibility, along with mesh network protection with user defined Mesh ID. The multiple wireless path design for both backhaul and user traffic eliminates adjacent AP signal interference and provides zero performance degradation.

Features

- Dual Radio Backhaul, Single Radio Client AP access
- Backhaul Encryption: WEP, WPA, WPA2
- Client AP Encryption: WEP, WPA2
- Full VPN compatibility
- MAC address access control lists
- Secure local and remote configuration via HTTPS
- Web (HTML) Browser-based management tool supports both http and https
- Network and client monitoring and statistical capture features
- Full 802.11b/g client compatibility
- Layer 2 support

Reliable, Intelligent, High Performance Mesh Network

- Patented Auto-discovery, auto-configure, and auto-healing POP (Predictable Optimum Path) mesh routing algorithm
- Multiple wireless path design for both backhaul and user traffic eliminates adjacent AP signal interference and provides zero performance degradation
- Best network throughput via layer 2 fast switching and bridging from AP to AP to support real time video, voice, and data applications

Fully Compatible with Existing Access Servers, Routers, and Gateways

- Transparent to layer 3 and up protocols, fully compatible with existing network equipment
- Directly connects to existing Routers, Gateways, or APs through 10/100 Ethernet

Management and Security

- GPS Receiver(optional) Antenna provides physical location information of each MeshAP, simplifies maintenance task and adds a new potential of location related services (outdoor version only)
- Web Based HTML browser management interface
- Supports WEP, WPA, MAC filtering, and AES encryption security across wireless mesh network
- Unique mesh network protection with user defined Mesh ID

Figure 1-1

EZMesh Full-Duplex Wireless Mesh Network Access Point

Power

Teletronics's EZMesh outdoor access point receives power from the power injector. It uses an external 48-VDC power module and injects the DC voltage into the Ethernet cables to power the outdoor access point.

External Antennas

Teletronics's EZMesh access point is designed for use with an external 2.4GHz antenna with an N-type male connector, and three external 5GHz antenna with an N-type male connector.

Ethernet Port

Teletronics's EZMesh access point is able to link to your 100BASE-T Ethernet LAN through the optional power injector. The Ethernet cables are used to supply inline 48-VDC power from the power injector.

Metal Enclosure

Teletronics's EZMesh access point consists of a weatherproof metal enclosure, providing an industrial grade temperature support of -40°F to 131°F (-40°C to 55°C).

Outdoor Wireless Benefits

Teletronics's EZMesh wireless solutions allow users to deploy a scalable, secure and cost-effective outdoor wireless network. The MeshAP solutions deliver a true wireless broadband network over large geographic areas or other locations where wiring is too difficult or expensive to install.

Outdoor Wireless Challenges

Outdoor wireless deployments offer a number of challenges, with the main one being interference. Special equipment may be needed in order to overcome signal interference. Listed below is a list of challenges that may affect an outdoor wireless network, compared to a standard indoor WLAN:

- Coverage
- Environment
- Equipment cost

Solution Features and Benefits

Auto-recovery Auto-configuring mesh

Teletronics 's intelligent wireless routing is based on the Predictable Optimum Path (POP). The POP mesh routing algorithm examines the network and makes appropriate connections among MeshAP access points in real time and dynamically optimizes the best route to the connected network within the mesh. This helps ensure high network capacity and provides resiliency to interference. The POP automatically determines the best path back to the Mesh Manager by calculating the cost of each path in terms of signal strength and hops. The POP continuously monitors changes in conditions and changes routes to reflect those changes.

Chapter 2

Safety Warnings

Warning: Do not place antennas near power circuits or power lines. Choose your location carefully and keep in mind that power lines look similar to phone lines so always use caution. Make sure not to come into contact with any such circuits while installing the antenna because it may cause serious injury or death.

Warning: Only qualified personnel should be allowed to install and/or replace the equipment.

Warning: Make sure to read the installation instructions thoroughly before you install the unit(s).

Warning: To avoid the risk of being electrocuted, do not work on the unit(s) during a lightning storm.

Warning: Disposal of any unit(s) should be handled according to national laws and regulations.

Installation Guidelines

Follow the guidelines below to ensure the best possible performance:

1. Before you install your outdoor unit(s), choose a location where buildings and trees will not block the signal.

2. Make sure to install your outdoor unit at a moderate height (approximately 40 feet), so it can provide a clear signal to neighboring nodes.

3. Before you install your outdoor unit(s), choose a location where power circuits or power lines are not near. Failing to do so could cause serious injury or death.

4. Plan your complete installation before you begin. It is best to have one person chaperone the installation team to be able to spot any signs of trouble.

5. When installing the antenna, make sure to do the following:
   - Wear shoes with rubber soles, rubber gloves, long sleeved shirt or jacket.
   - Do not use a metal ladder
   - Do not work on a wet or windy day

6. If the assembly starts to drop, let if fall. All the attachments are excellent conductors of electrical current, so even the slightest touch of any of the parts could electrocute you.

7. If any part of the unit comes in contact with a power line, do not touch it or remove it yourself. Call your local power company and they will safely remove it.

8. Mounting units on a "vertical" mount metal objects may interfere the signal pattern of the antenna. (Note: A horizontal mount metal object will not have this effect.)

9. Provide a clear signal to neighboring nodes.

10. When installing the unit(s), allow at least 20 feet of separation between each unit.

11. All the antennas need to be properly connected. The unit may experience permanent hardware failure if the antennas are not properly connected and the unit is powered on.
12. EZMesh unit MUST be properly grounded, surge protected, and lighting protected to avoid unit being damage with electrical stresses.

IMPORTANT: Any damages due to improper installation voids warranty.

Site Survey

Before any Wi-Fi mesh network is installed, a site survey is needed to determine how to maximize the coverage and network performance.

Data rates – Sensitivity and range are inversely proportional to data bit rates. The maximum radio range is achieved at the lowest workable data rate. A decrease in receiver sensitivity occurs as the radio data increases

Antenna type and placement – Do not place the antenna higher than necessary. The extra height could cause possible interference.

Physical environment – Open areas provide a better signal than closed areas.

Obstructions – Avoid placing the access points in a location where there are obstructions between the sending and receiving antennas such as trees, buildings or hills.

Package Contents

Each EZMesh contains the following items:

- Outdoor Wireless Mesh Access Point
- Quick Installation Guide
- CD (User Guide, Quick Installation Guide)

Optional Equipment

- Pole mounting kit
- Street light adapter
- PoE Injector
- 8dbi 5GHz Antenna
- 8dbi 2.4GHz Antenna

Installation Components

Review the figure below to familiarize yourself with the system components and connectors

Default Setting

User Name: **admin**
Password: **admin**
Wireless Network Name (SSID): **mymesh**
No Mesh Link (SSID): **arrow** (unchangeable)
IP Address: **192.168.1.8**
Subnet Mask: 255.255.255.0
Mesh Link Connection: **station**

Chapter 3

Installation Options

There are two common installation options:

- Installing the EZMesh access point on a pole
- Installing the EZMesh access point on a wall

Installing the EZMesh Access Point on a Pole

When removing the access point from its box, make sure not to remove the foam blocks attached to the antenna connectors, until after your unit is installed. This will protect the antenna connectors during installation.

Figure 3-1
Pole Mounting Kit with EZMesh Full-Duplex Wireless Mesh Network Access Point

1. You can attach any outdoor EZMesh access point to any light pole
2. Mount the access point to the pole within 3ft. of the outdoor lighting control.
3. Connect a 10-AWG or larger ground wire to one of the EZMesh access point screw. Make sure it is connected to a reliable earth ground, such as a grounded pole or a grounding rod.

Warning: This equipment must be externally grounded using a customer supplied ground wire before power is applied. Contact an electrician if you are uncertain that suitable grounding is available.

Notes: When powering the product with AC power the power plug should be installed where it can be conveniently accessed to de-energize power from the unit. Power should not be removed by disconnecting the AC power connector itself and where it is not subjected to water or outdoor elements.

Warning: Be careful when connecting the street light adapter to the pole. You may fall or electrocute yourself

4. Disconnect the lightning control from its fixture.
5. Make sure that the voltage available is between 100 and 240 VAC 50/60Hz.
6. Turn off power to the fixture at the designated circuits
7. Connect the adapter to the access point AC power connector.
8. Make sure the antennas are connected before the MeshAP is connected to electrical power. Failure to do so may result in permanent hardware damage to the MeshAP unit.
9. Plug the street light adapter into the outdoor control fixture
10. Plug the lighting control into the street light adapter

Note: Use your hands to tighten the cable until the connector locks.

11. Use either a level or the attached circular level to align the MeshAPs external antennas.

Loosely assemble the rest of the pole mount kit around the pole

Note: Each pole clamp is equipped with the bolts of the appropriate length. If a different length is required, purchase 3/16-16 bolts of the correct length for your installation.

Note: Leave the screws somewhat loose so you can adjust the access point's orientation.

12. Use a level to verify that the top edge of the pole clamp subassembly is horizontal, and tighten its adjustment screws.

Installing the EZMesh Access Point on a Wall

Figure 3-3
EZMesh with wall mounting kit installed

1. Use the mounting plate as a template to mark four screw hole locations on your mounting surface.

2. Mount the mounting plate on the back of the enclosure with two screws.

3. Mount the unit on the wall with 4 screws.

IMPORTANT: The EZMesh must be mounted level. A circular level is attached to assist with this.

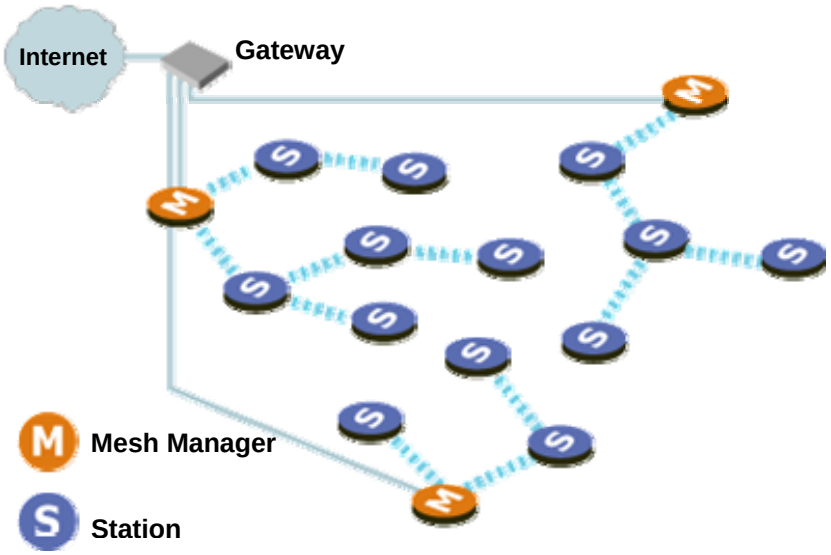
Chapter 4

MeshAP Infrastructure

Teletronics Wireless Mesh Network consists of multiple wireless nodes **(MeshAP Access Points**). In a typical Teletronics Wireless Mesh Network, one or more MeshAP units will be assigned as a Mesh Manager and other node will be assigned as Mesh Station. Any MeshAP access point can be assigned as a **Mesh Manager Mode** or **Station Mode**. (*The default setting for a MeshAP Access Point is set as **Station Mode**.*)

Mesh Manager Mode

The MeshAP unit configures as the Mesh Manager and has a direct-wired link to the Internet Gateway/Router/Access Server. It is used as the management unit and Internet Gateway for the MeshAP unit (Station) on the mesh network. (Any MeshAP access point can be configured as the Mesh Manger unit.)



Station Mode

The MeshAP unit configured as the Station (node), and is the child unit of the Mesh Manager unit. Station units expand the wireless signal coverage for the mesh network. Stations could be added to the mesh network based on network signal quality needs.

Chapter 5

Accessing the MeshAP Access Point (Login)

Important Default Settings of the MeshAP

User Name: **admin**
Password: **admin**
Wireless Network Name (SSID): **mymesh**
No Mesh Link [AP] (SSID): **arrow** (unchangeable)*
No Mesh Link [Backhaul] (SSID): **span** (unchangeable)*
IP Address: **192.168.1.8**
Subnet Mask: **255.255.255.0**
Mesh Link Connection: **station**
Default Mesh Manager IP Address: **192.168.1.254** **
This ONLY applies when MeshAP "Working Mode**" is set to "**Manager**" mode

***The SSID, "arrow", is reserved for a MeshAP Station that has not associated with(or formed an uplink) with another MeshAP.**

Direct Ethernet Connection

WARNING---The antennas must be connected before the MeshAP is powered on.

Step 1. Make sure the MeshAP unit is **Powered On** and **Ready.** Once it is powered on, it takes about 35 seconds for the MeshAP unit to completely get booted and be ready for service and configuration.

Use wireless WLAN utility application on PC to scan for SSID: **mymesh**. Make sure the SSID: **mymesh** MeshAP unit has the correct Mac address.

Note: The SSID for Client AP(802.11b/g), **"arrow"**, is reserved for a MeshAP Station that has not associated with(or formed an uplink) with any MeshAP network.

The SSID for Backhaul Radio, **"span"**, is reserved for a MeshAP Station that has not associated with(or formed an uplink) with any MeshAP network.

This can prevent end users from accidentally connecting to APs that are not part of a mesh network. They will not get internet access when they connect to APs that are not part of a mesh network.

Step 2. Change PC IP address to **192.168.1.XXX** Subnet mask: **255.255.255.0**

Step 3. Access MeshAP via **WAN Ethernet Port**

Make sure the Ethernet cable is properly connected to both MeshAP - **WAN Ethernet Port** and PC - **Ethernet Port**. (Connect via **PoE Injector**)

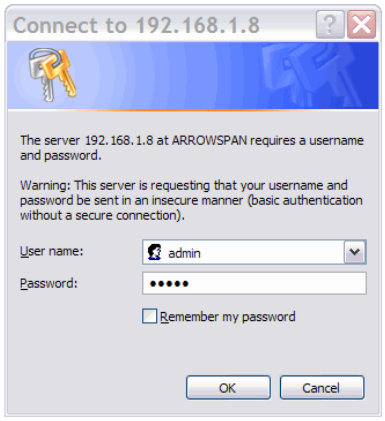
Note: Please review the Hardware installation Guide for more information.

Step 4. Open a Web Browser and type **192.168.1.8** to access the MeshAP Access Point.

Step 5. User Name: admin

Password: admin

Click "**OK**



Wireless LAN Access

Step 1. Make sure the MeshAP unit is **Powered On** and **Ready.** Once it is powered on, it takes about 35 seconds for the MeshAP unit to completely get booted and be ready for service and configuration.

Use wireless WLAN utility application on PC to scan for SSID: **mymesh**. Make sure the SSID: **mymesh** unit has the correct Mac address.

Note: The SSID for Client AP(802.11b/g), **"arrow"**, is reserved for a MeshAP Station that has not associated with(or formed an uplink) with any MeshAP network.

The SSID for Backhaul Radio, **"span"**, is reserved for a MeshAP Station that has not associated with(or formed an uplink) with any MeshAP network.

This can prevent end users from accidentally connecting to APs that are not part of a mesh network. They will not get internet access when they connect to APs that are not part of a mesh network.

Step 2. Change the PC IP address to **192.168.1.XXX** Subnet mask: **255.255.255.0**

Step 3. Access the MeshAP via **Wireless LAN**

Make sure the PC is connected to the SSID: **MeshAP** (The default SSID for MeshAP)

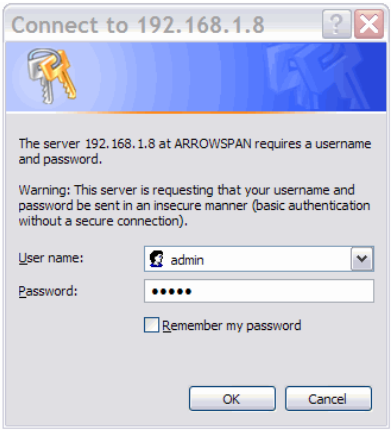
Note: Please review the Hardware installation Guide for more information.

Step 4. Open a Web Browser and type **192.168.1.8** to access the MeshAP Access Point.

Step 5. User Name: admin

Password: admin

Click "**OK**



Access MeshAP unit via Mesh Manager's Topology Page

(See Chapter 8 - Managing the Topology on the Mesh Manager unit)

Chapter 6

Mesh Manager Configuration

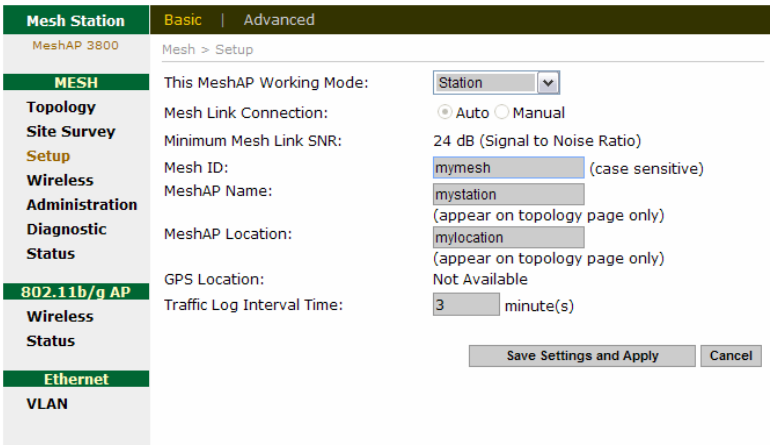
Setup Mesh Manager Unit

The Mesh Manager has a direct wired link to the existing network and Internet. The Mesh Manager unit also manages all the Station units associated with the MeshAP.

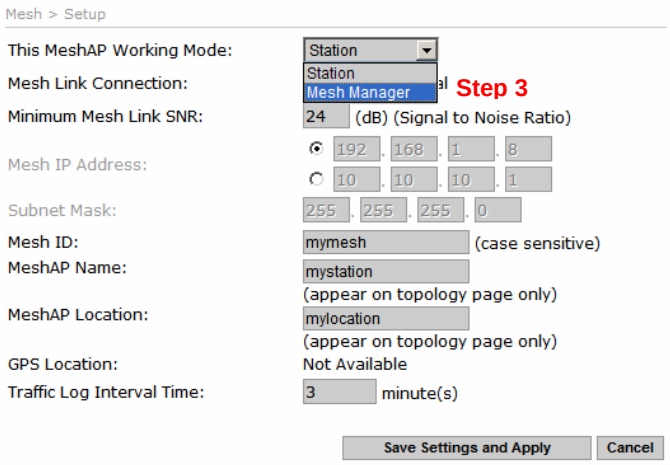
Note: ANY MeshAP unit could be setup as the Mesh Manager unit.

Step 1. Login to the MeshAP Access Point.

Step 2. Go to the **Setup** page.



Step 3. Select **"Mesh Manager"** to assign a MeshAP unit to become a Mesh Manager unit on the mesh network.



Click **"Save Setting and Apply"** The unit will apply the change and reboot.

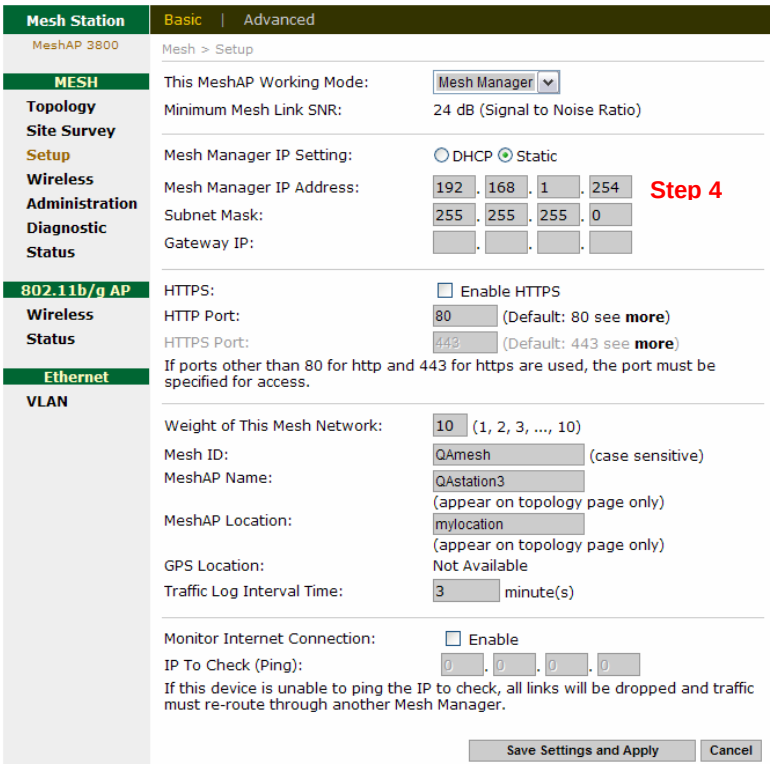
Step 4. Assign IP Address to Mesh Manager unit.

IMPORTANT: The default IP Address for Mesh Manager is **192.168.1.254**
The IP address will be automatic assign to Mesh Manager unit once the "MeshAP Working Mode Change from "Mesh Station" to "Mesh Manager"

There are two modes available to assign IP address to the Mesh Manager unit

DHCP Mode – Auto Assign an IP address to Mesh Manager unit via Network Gateway/Router.

Static Mode – Assign IP address manually to Mesh Manager unit



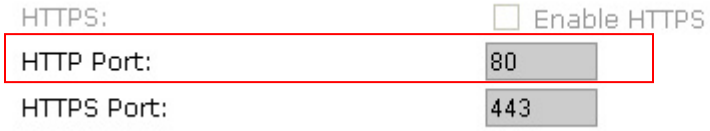
- *Replace* the default **IP address** to an IP address of your choice that could be reached from the existing network. You can also select an IP address provided by the ISP as your **MeshAP IP Address**
- *Replace* the default **Subnet Mask** with the one belonging to the above IP address.
- *Enter* the **Gateway IP** of the above IP address or the IP address provided by your ISP as a **Gateway IP** address. (For Remote Management)

IMPORTANT: Make sure the gateway address and the IP address of the unit are under the same network. If not, the unit may not be able to log-on because the network is not logically connected.

EXAMPLE: (IP address and Gateway should under same domain.)
Mesh IP Address: **192.168.0.120**, and Gateway IP: **192.168.0.1**

Http Port

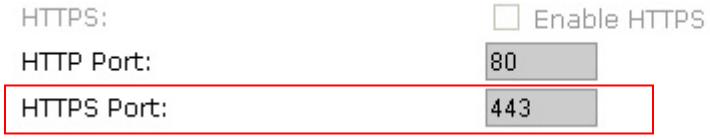
The default **Http Port** for MeshAP is **80**. Http Port could be set to any port number based on the network administrator's requirement.



To reassign a number Http Port enter the desire port number to Http Port field. And *Click* **Save Setting and Apply**

Https Port

The default **Https Port** for MeshAP is **443**. Http Port could be set to any port number based on the network administrator's requirement.



To reassign a number Http Port enter the desire port number to Https Port field. And *Click* **Save Setting and Apply**

Weight

Weight number (1 – 10) help identify the level of connection desire for the nodes (Stations) to connect to particular Mesh Manager unit on the Mesh. Setting a Mesh Manager's Weight to "10" may force all nodes on the mesh network to associate with this Mesh Manager than other Mesh Manager on the mesh. Whereas Setting Mesh Manager to "1" may force this Mesh Manager low chance for Nodes to associate to compare with other high Weight number Mesh Manager on the mesh.

Note: Total Bandwidth score is based on Hop Count, Signal Quality, and Mesh Manager Weight. This guideline affects the routing decision of each node on the mesh to decide which Mesh Manager to associate

To set Mesh Manager weight, Enter number (1-10) in the "Weight of this Mesh Network" field and *Click* **Save Setting and Apply**

Mesh ID

The Mesh ID is a unique identification for a mesh network. Only MeshAP Access Points with the same Mesh ID will be able to associate with each other on the mesh network.

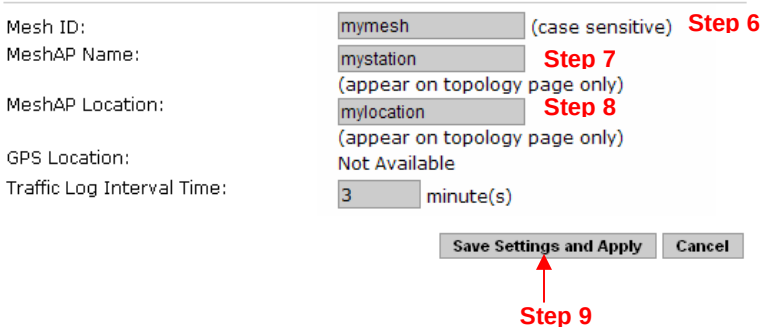
Step 6. *Replace* the default **Mesh ID** with a preferred name.

Note: MeshAP Stations MUST have the same Mesh ID to be able to associate with each other and to be managed by the Mesh Manager unit.

Step 7. *Update* Station Name. (Station Name is NOT required, it is recommended for easy identification of each Station.) The Station Name will appear on the Mesh Manager's topology page.

Step 8. *Update* **Station Location.** (Station Location is NOT required, it is recommended for easy identification of each Station.)

Step 9. *Click* "**Save Settings and Apply**" to confirm changes.



Chapter 7

Station Configuration

Mesh Link Connection Mode

There are two modes available for the MeshAP Station, **Auto** and **Manual**.

Auto Mode – The MeshAP Station automatically determines which MeshAP to form an upstream link, or uplink, with. The POP algorithm uses the Bandwidth Score to make this determination.

Manual Mode – The upstream link, or uplink, is selected from the Site Survey page on the MeshAP Station. From the Site Survey page, it possible to select one or more MeshAP devices to be the uplink.

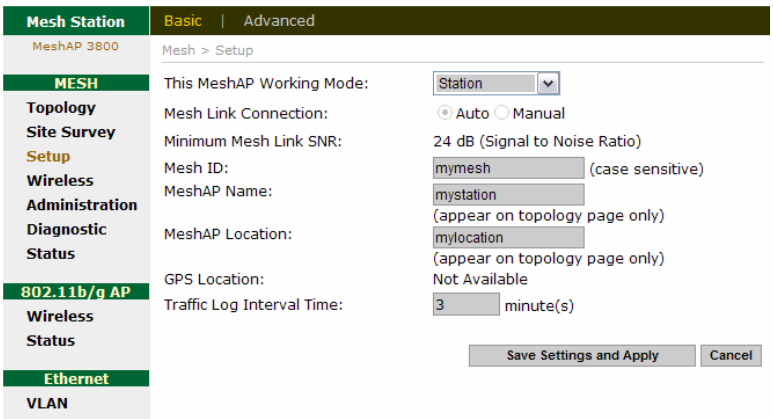
Setup Station in Auto Mode

IMPORTANT: To access a MeshAP Station unit on the mesh network, you need to access the MeshAP Mesh Manager unit fist and then you could access the MeshAP station from the **Topology** page.

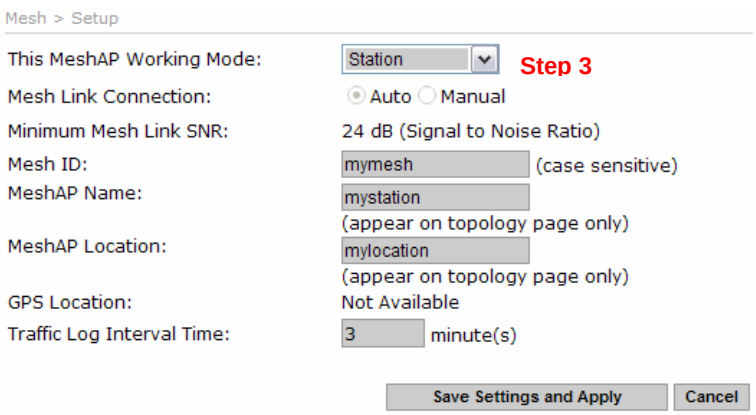
(See Chapter 5 for more detail information)

Step 1. *Login* to the MeshAP Access Point.

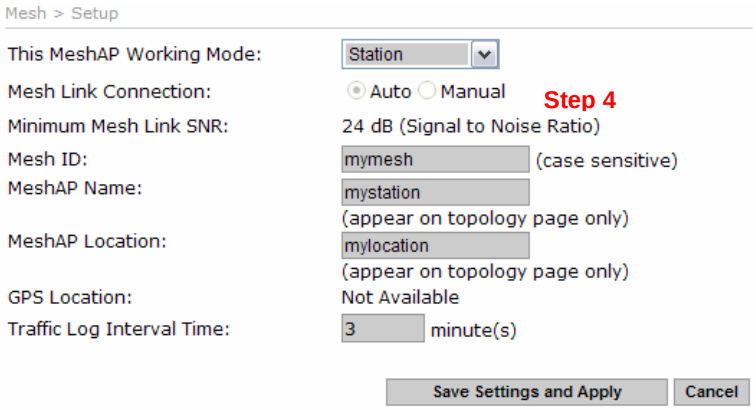
Step 2. *Go to* **Setup** page.



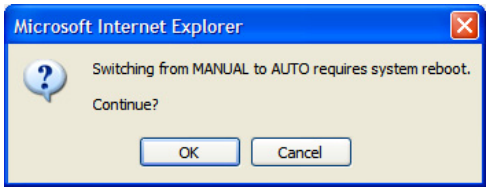
Step 3. *Select* "**Station"** for This MeshAP Working Mode.



Step 4. *Select* "**Auto**" for a Mesh Link Connection



Note: The system will reboot when changed from "**Manual**" mode to "**Auto**" mode. It takes about 40 seconds and requires re-login to the unit
(See Step 1 in Chapter 1).



Note: "Minimum Mesh Link SNR" is 24dB. This setting could not be change to ensure the routing protocol is function property under the Auto mode.

***SNR - Signal to Noise Ratio**

Note: The grayed out area is the default IP address and subnet mask for the unit. This setting should be used to access the MeshAP Station unit if the MeshAP Station unit lost the mesh link connection with the Mesh Manager unit.

Mesh ID

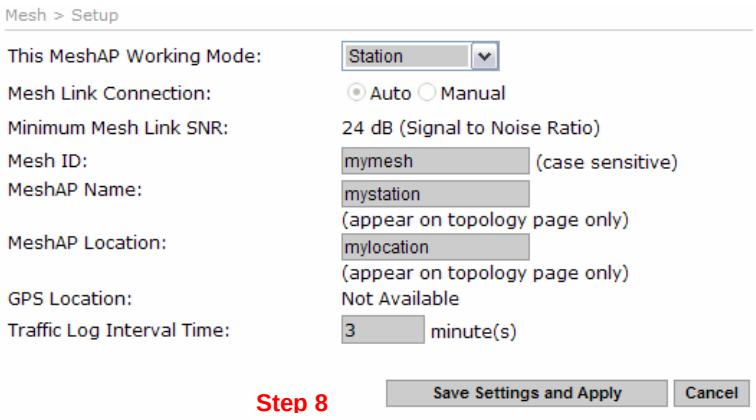
The Mesh ID is a unique identification for a mesh network. Only MeshAP Access Points with the same Mesh ID will be able to associate with each other on the mesh network.

Step 5. *Replace* the default **Mesh ID** with a preferred name that is identical with the Mesh Manager. MeshAP Stations MUST use the same Mesh ID in order to be managed by the Mesh Manager unit.

Step 6. *Update* **Station Name.** (The Station Name is NOT required, it is recommended for easy identification of each Station.)

Step 7. *Update* **Station Location.** (The Station Location is NOT required, it is recommended for easy identification of each Station.)

Step 8. *Click* "Save Settings and Apply" to confirm changes.



Connect a MeshAP Station to other Stations/Mesh Managers under Auto Mode

MeshAP Stations with identical Mesh IDs under the Auto Mode will automatically associate with the Mesh Manager or the Stations on the mesh network. The association will be based on the wireless signal quality and hop counts of the adjacent unit.

Each MeshAP Access Point will only accept up to five (5) child Stations.

Step 1. Power ON the MeshAP Station with Auto Mode.

Step2. Login to the Mesh Manager unit.

Step 3. Review the **Topology** section to manage the Stations on the mesh network.

Note: The MeshAP Station under Auto Mode should automatically associate with the Mesh Manager unit or the other Stations on the mesh network. The only way to make sure the Station is properly associated with the mesh network is to review the **Topology** in the Mesh Manager.

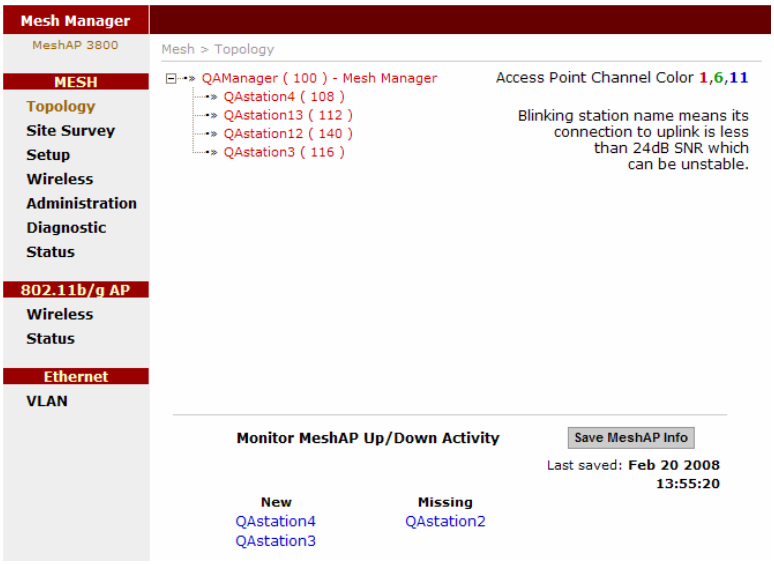
Chapter 8

Managing the Topology of the Mesh Manager unit

Accessing the Topology Page

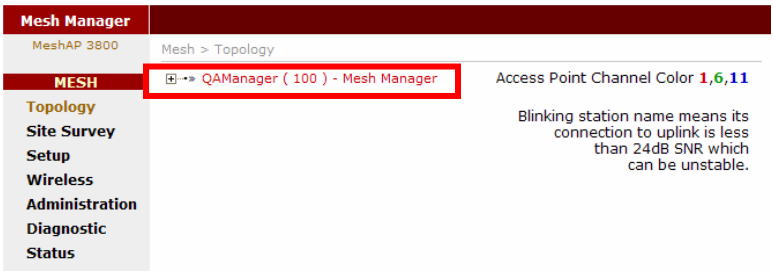
Step 1. *Login* to the Mesh Manager unit

Step 2. *Go to* the **Topology** page under Mesh



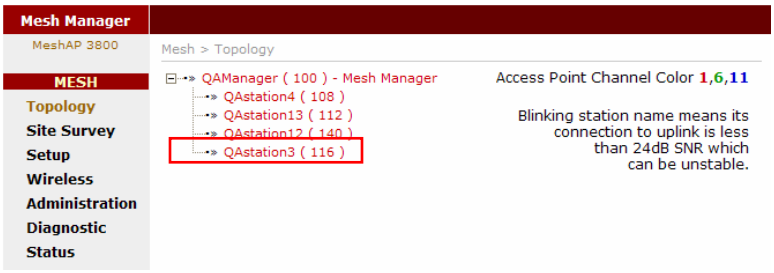
Topology Tree Expanded

Step 3. *Click* the **"+"** to expand the topology tree. The color Red represents the MeshAP under Channel 1, Black represents the MeshAP under Channel 6, and Blue represents the MeshAP under channel 11

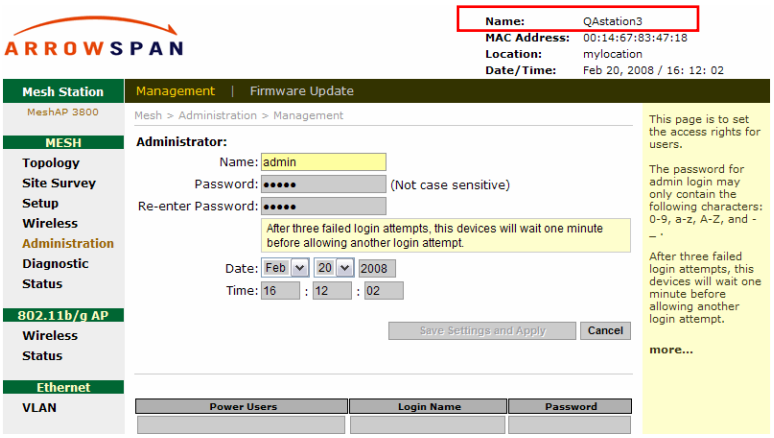


Managing the MeshAP on the Topology Tree

To manage any MeshAP under the Topology, click the **Station Name** on the **Topology tree,** the GUI will automatically enter into the station for management.

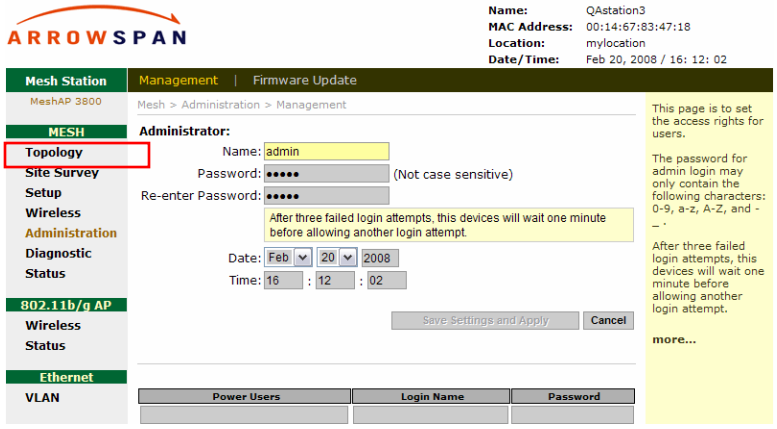


Once the user enters the **Station** unit, the screen will change to the **Mesh Station** Administration page**.**

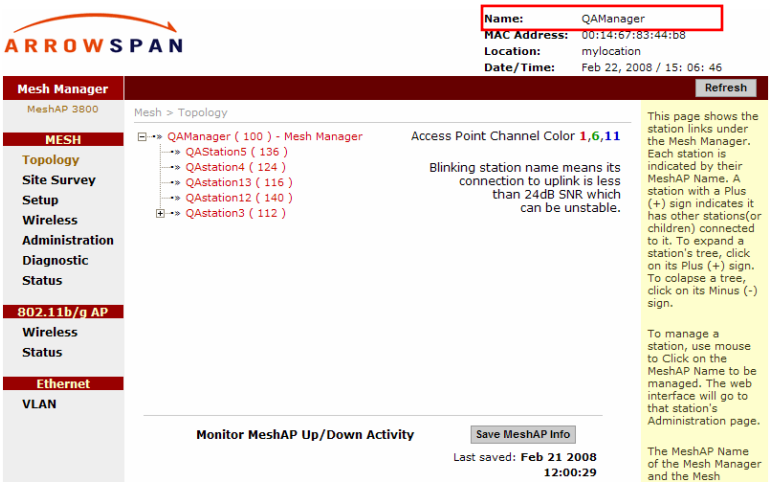


Go back to the Mesh Manager unit

Click on the **Topology** page link to re-enter the **Mesh Manager** unit.



Back to the **Mesh Manager** unit.



Chapter 9

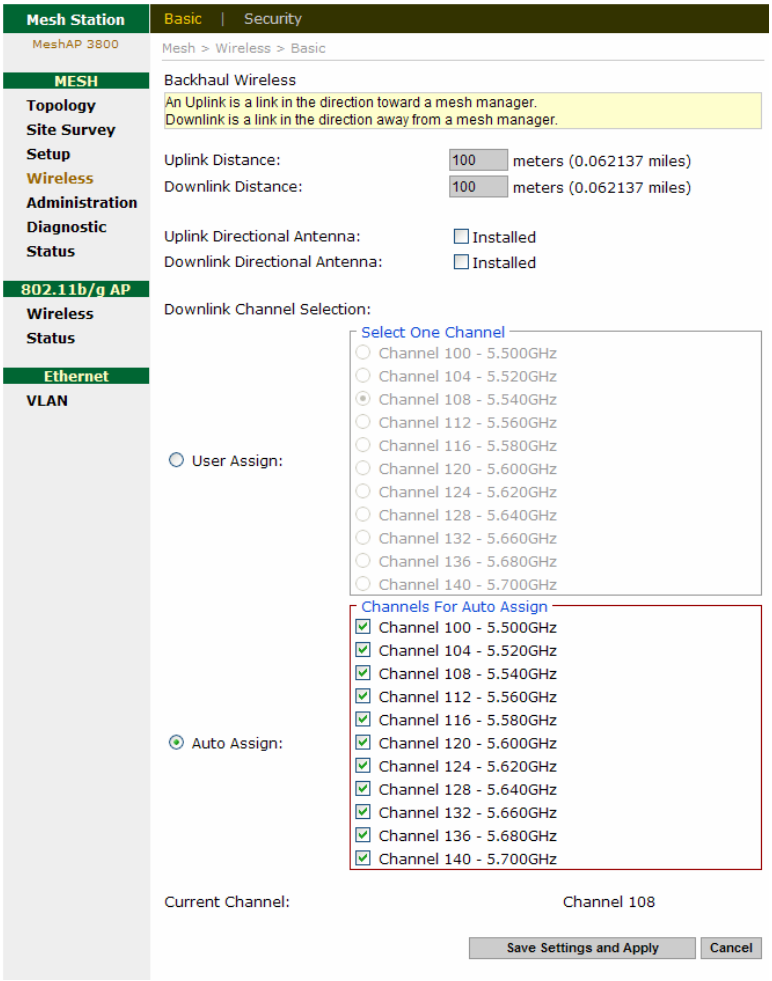
Setup Mesh Wireless (Backhaul)

Step 1. *Login* to the MeshAP Access Point.

Note: To access a MeshAP Access Point on the mesh network, login to the Mesh Manager unit, and access the Topology page to locate the MeshAP Access Point unit needing configuration.

Step 2. *Go to* the **Wireless** page under the **MESH** section.

Step 3. *Select* the Auto Assign or User Assign for the wireless backhaul



Note: the Channels shown on the interface may vary base on country of regulation. The image captured above is based on the **US version**.

Mesh Wireless Channel (Backhaul)

Channel/Frequency. This field identifies which operating frequency will be used. The selection is set automatically by the MeshAP unit based on the environmental conditions.

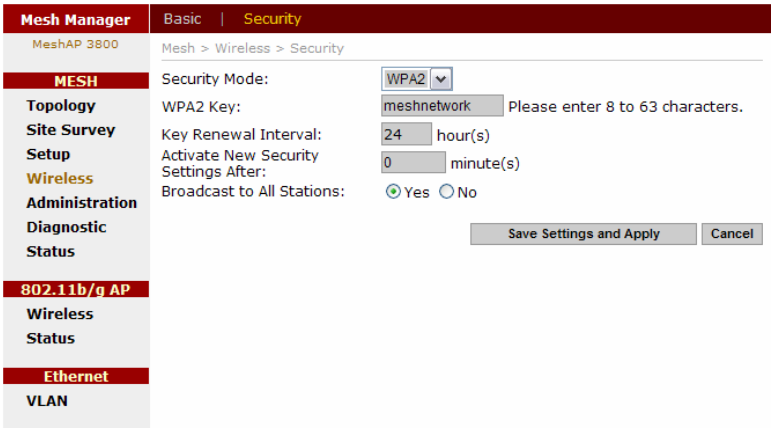
MeshAPs associated with a Mesh Manager unit will automatically calibrate its channel to reduce interference between MeshAPs on the mesh network.

Mesh Wireless Security (Backhaul)

Mesh Wireless Security

The Mesh Wireless (Backhaul) Security could only be configured at Mesh Manager unit

The default setting of the wireless security mode for the MeshAP unit is "WPA2."



WPA2 Key

Step 1. To automatically program the data encryption *Enter* a Passphrase in the **WPA2 Key** field.

Note: It is important to remember the WPA2 key. This key needs to be applied for both MeshAP units on the mesh network.

Step 2. *Click* **"Save Settings and Apply"** to apply the new setting.

WPA Key

Step 1. To automatically program the data encryption *Enter* a Passphrase in the **WPA Key** field.

Note: It is important to remember the WPA key. This key needs to be applied for both MeshAP units on the mesh network.

Step 2. *Click* **"Save Settings and Apply"** to apply the new setting.

Wireless Diagnostic

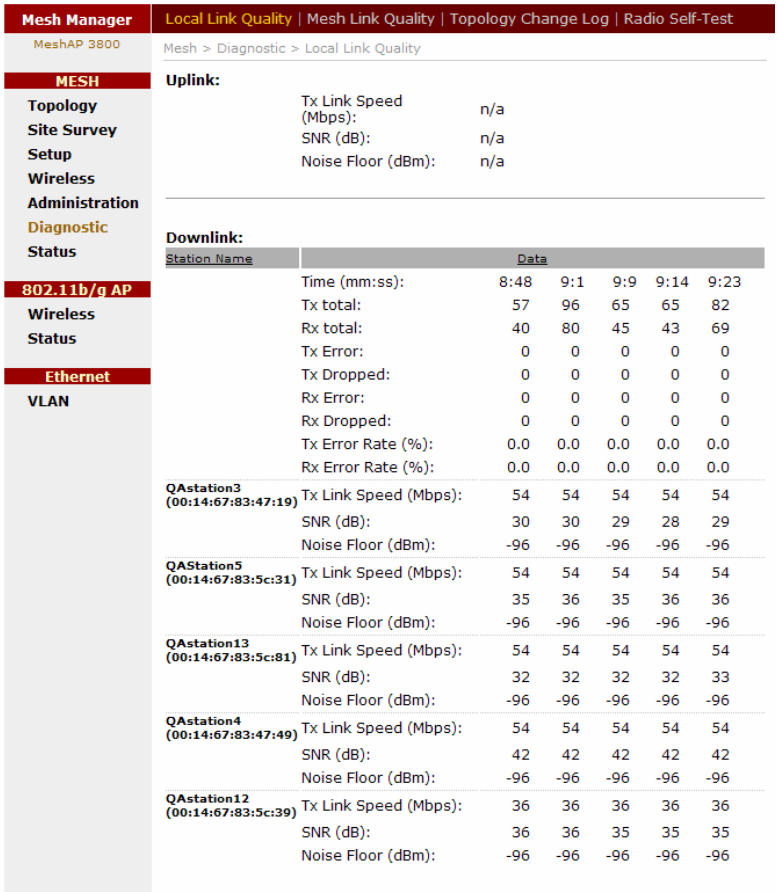
Diagnostic page provides Link Speed, Signal Noise Ratio, and Noise Floor rate for the Station.

Local Link Quality

Local Link Quality provides link quality for both the uplink and downlink data rate, signal to noise ratio(SNR), and noise floor are displayed.

Tx Link Speed: (in Mbps)
SNR: (in dB)
Noise Floor Level: (in dBm)
Tx Error, Tx Dropped, Rx Error, and Rx Dropped: (Number of packets)
Tx and Rx Error Rates: (% difference between dropped and total packets)

Note: The data is updated every second and the last five samples are displayed.



Mesh Link Quality

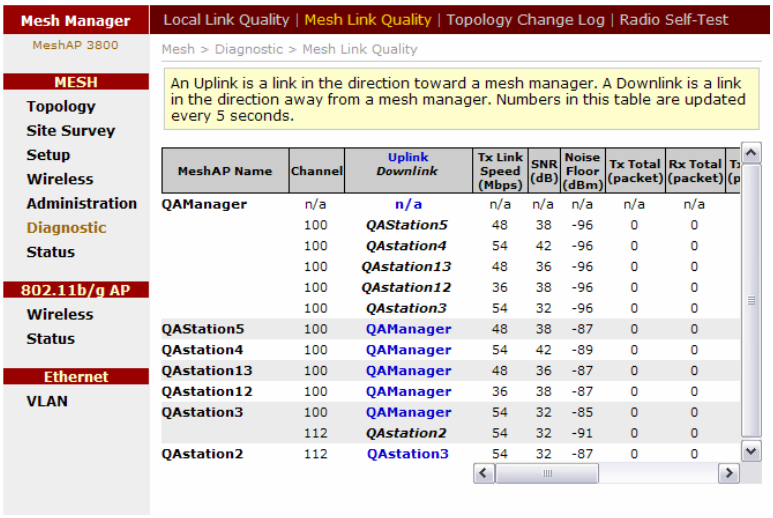
The Mesh Link Quality page only appears on the Mesh Manager. It displays the link data for every link in the mesh network.

The MeshAP Name column lists all the devices that are a part of this mesh. Uplink--Downlink column lists the MeshAP that each of those devices have a mesh link with. An Uplink is a link in the direction toward a mesh manager. A Downlink is a link in the direction away from a mesh manager. Downlinks are displayed in italics text. Uplinks are displayed in normal text and their text is blue.

A Mesh Manager will only have downlinks.

The packet count listed in the following columns: Tx Total, Rx Total, Tx Error, RxError, Tx Dropped, and Rx Dropped, are the number packets that have passed in the previous five seconds.

Note: The data is updated every second and the last five samples are displayed.



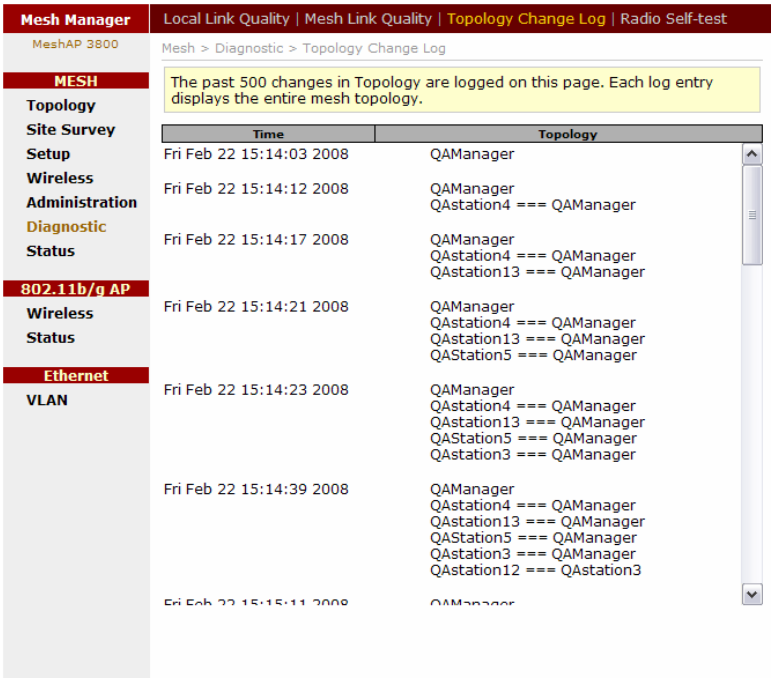
Topology Change Log

Topology Change Log shows the history of the Topology. The Time column represents the Time and the Date the log was generated. The Topology column shows the structure of Topology when the log was generated.

Example:
Node 1
Node 2 === Node1

The Left side of the Topology shows the Root node, and Child node. The Right side of the Topology shows the Parent node.

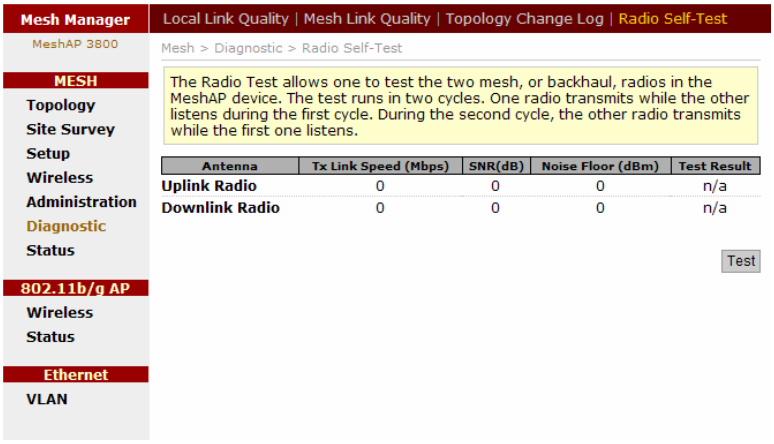
The Link Line between Child node, and Parent node
=== Normal link
- - - Weak Link



Radio Self-Test

The Radio Test tests backhaul radios in the MeshAP device. The test runs in two cycles. One radio transmits while the other listens during the first cycle. During the second cycle, the other radio transmits while the first one listens.

The results of the previous test are displayed. Prior to running a radio self-test, the results will be zero.



Chapter 10

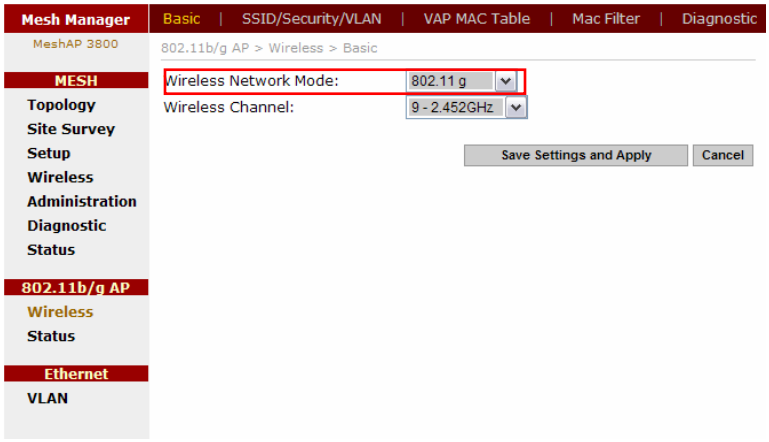
Setup AP Wireless

This section demonstrate how to change SSID, and channel setting for the mesh network

Wireless Mode

802.11b/g Mode

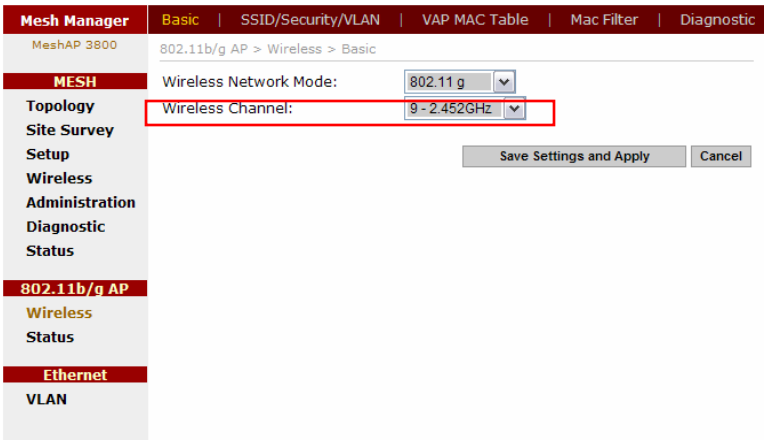
MeshAP is set under “Auto Mode”, MeshAP Access Point will accept both only 802.11g and 802.11g clients.



Wireless Channel

Channel/Frequency. This field identifies which operating frequency will be used. The selection is set automatically by the MeshAP unit based on the environmental conditions.

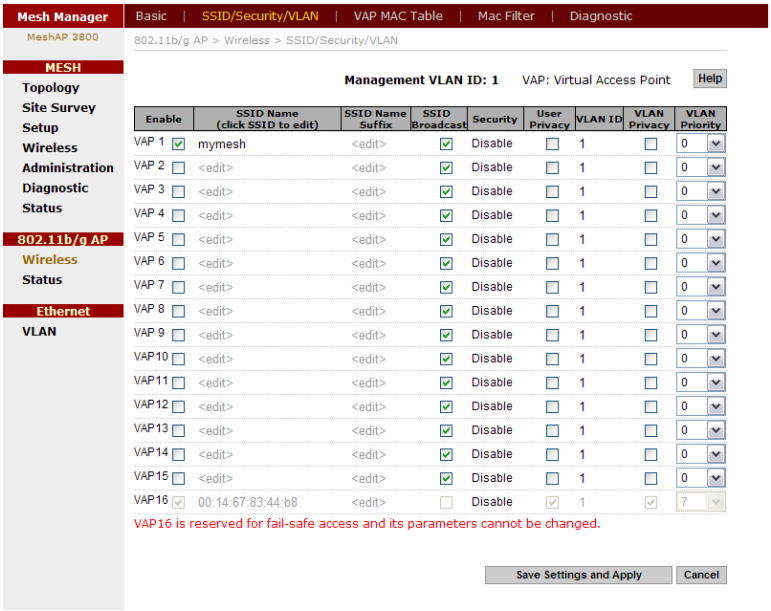
To Manually setup Wireless Channel simply use the drop down menu to select the ideal channel.



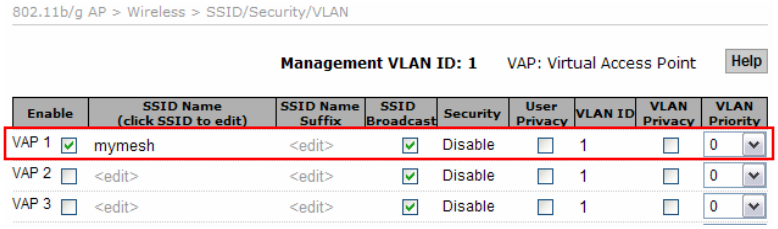
Changing and modifying the SSID

Step 1. *Login* to the MeshAP Manager unit.

Step 2. *Go to* the **Wireless** page under the **SSID/Security/VLAN** tab at the **802.11b/gAP** section.



Step 3. click on the SSID “mymesh” to change to the appropriate SSID. The SSID will propagate to all mesh units in the mesh network.



Note: Certain PCs or laptops may not reflect SSID changes instantly. If this occurs, disable and re-enable the Wireless Network Connection in the Operation System, doing this will ensure that all the updates are received.

Wireless Security

Disable Wireless Security (Default)

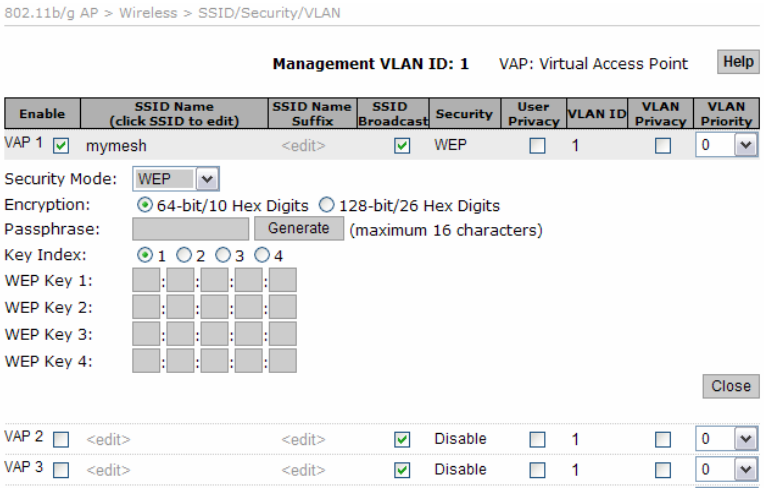
The default setting of the wireless security mode for the MeshAP unit is “Disable".

Configure WEP Wireless Security

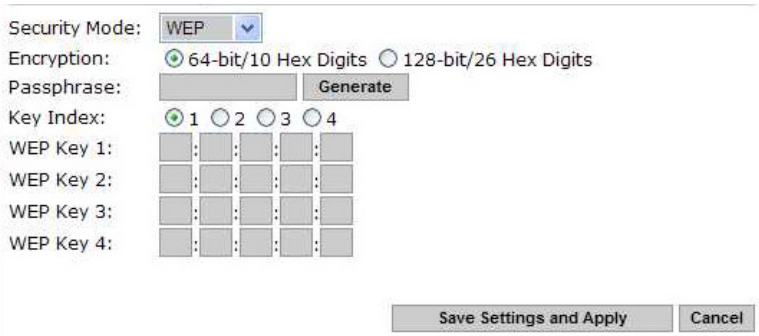
To configure WEP data encryption, follow these steps:

Step 1. Go to the Security section under Administration.

Step 2. Use the drop down menu to select WEP Mode.

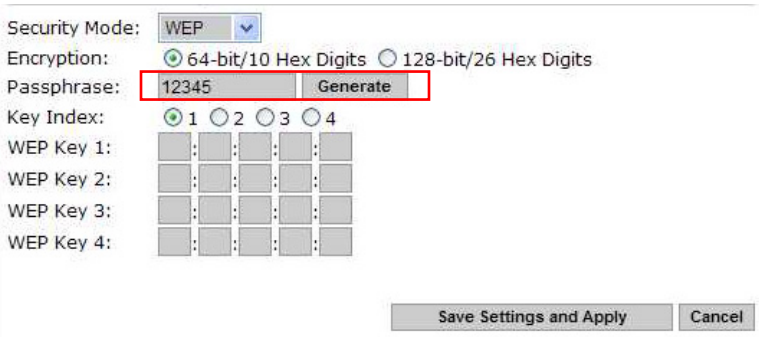


Step 3. Select the Encryption Strength, and Select 64- or 128-bit encryption

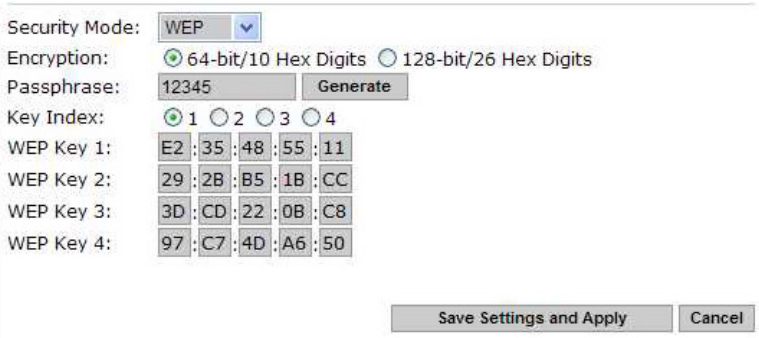


Note: You can manually or automatically program the four data encryptions to be identical on all PCs and access points in your network.

Step 4. To automatically program the data encryption, *Enter* a Passphrase in the **Passphrase** field and *Click* "**Generate"** to generate the WEP key.

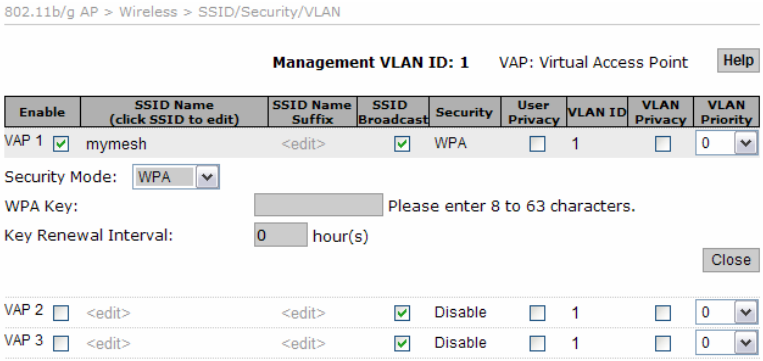


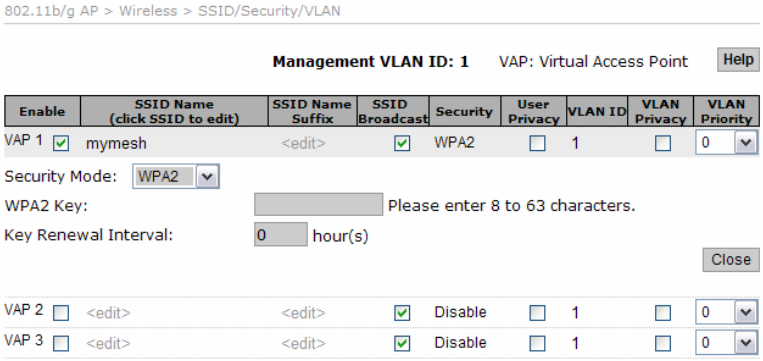
There will be four sets of WEP Keys generated from the Passphrase. You could choose any set of the WEP Keys from the Index by selecting the radio button of the Key Index.



Note: It is important to remember the WEP key. This key needs to be applied for both MeshAP units on the mesh network and for the client devices that need to access the mesh network.

Step 5. *Click* **"Save Settings and Apply"** to apply the new setting.


802.11b/g AP > Wireless > SSID/Security/VLAN
Management VLAN ID: 1
VAP: Virtual Access Point
Help
Enable
SSID Name (click SSID to edit)
SSID Name Suffix
SSID Broadcast
Security
User Privacy
VLAN ID
VLAN Privacy
VLAN Priority
VAP 1 mymesh <edit> WPA 1 0
Security Mode: WPA
WPA Key:
Please enter 8 to 63 characters.
Key Renewal Interval: 0 hour(s)
Close
VAP 2 <edit> <edit> Disable 1 0
VAP 3 <edit> <edit> Disable 1 0


802.11b/g AP > Wireless > SSID/Security/VLAN
Management VLAN ID: 1
VAP: Virtual Access Point
Help
Enable
SSID Name (click SSID to edit)
SSID Name Suffix
SSID Broadcast
Security
User Privacy
VLAN ID
VLAN Privacy
VLAN Priority
VAP 1 mymesh <edit> WPA2 1 0
Security Mode: WPA2
WPA2 Key:
Please enter 8 to 63 characters.
Key Renewal Interval: 0 hour(s)
Close
VAP 2 <edit> <edit> Disable 1 0
VAP 3 <edit> <edit> Disable 1 0

Chapter 11

Multiple SSID / VLAN Configuration

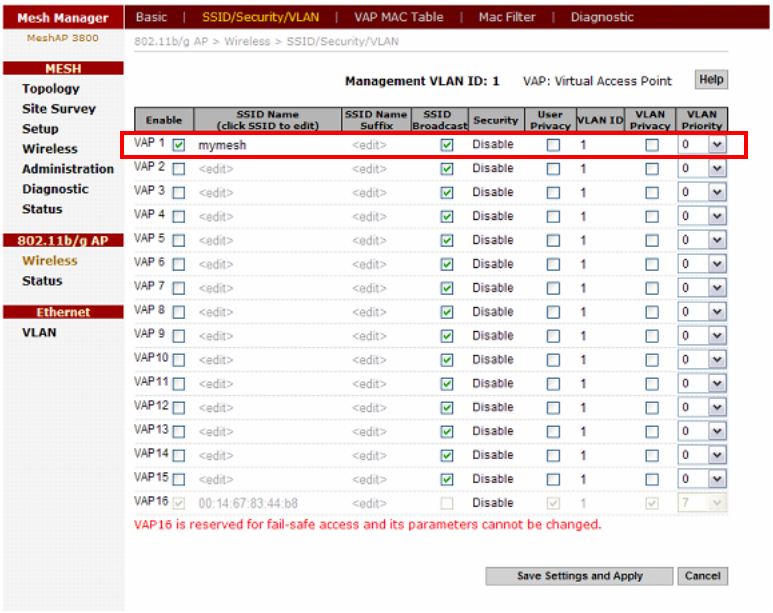
SSID / VLAN Page

MeshAP access point has the ability to set up to sixteen(16) sets of SSID and VLAN.

To Set Multiple SSID and VLAN

Step 1. *Login* to the **Mesh Manager** unit and access the **802.11b/g AP Wireless** page

Step 2. *Go to* **SSID/Security/VLAN** tab



Step 3. *Check* the **Enable box** for the next available **VLAN ID.**
Enter the appropriate SSID, and Security to finish the configuration.

Step 4. *Click* **Save Setting and Apply**

Understand SSID “span” and “arrow

As for the "span", it is the default name for SSID to indicate that this MeshAP has not joined any mesh network yet. It serves as a warning and provides a way for fast meshing. Once the station joins a mesh network, the "span" is replaced with last 3 bytes of MAC address.

The other question regarding MAC addresses is a little bit complicated. Each MeshAP has many networking interfaces, which has ONE or MORE MAC addresses associated with each interface. This is why you may see MAC addresses differ from the MAC address on label.

VLAN Tag

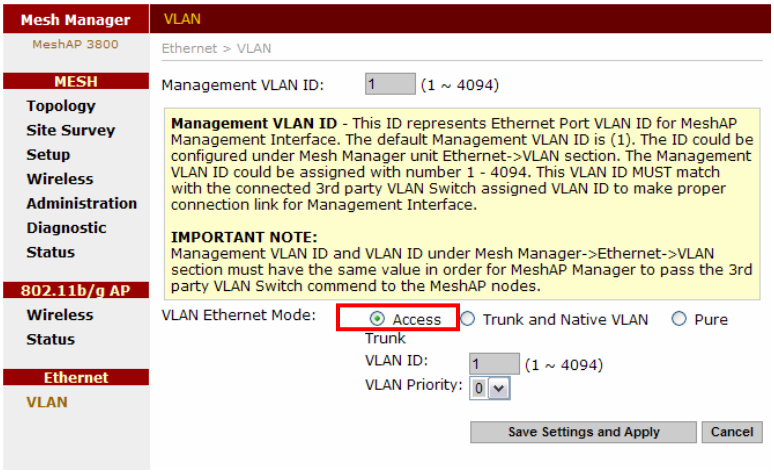
Access Mode

Untagged (no VLAN ID) frames entering (ingress) the Ethernet port will be accepted, and transit the network with the VLAN ID and priority specified in the VLAN ID field. Tagged (with a VLAN tag) frames entering the Ethernet port will be dropped. The VLAN tag will be removed from frames leaving (egress) the Ethernet port.

Setup Access Mode

Step 1. *Login* to the **Ethernet/VLAN**

Step 2. *Check* "Access" radio button under the **VLAN Ethernet Mode**



Step 3. *Click* **Save Setting and Apply**

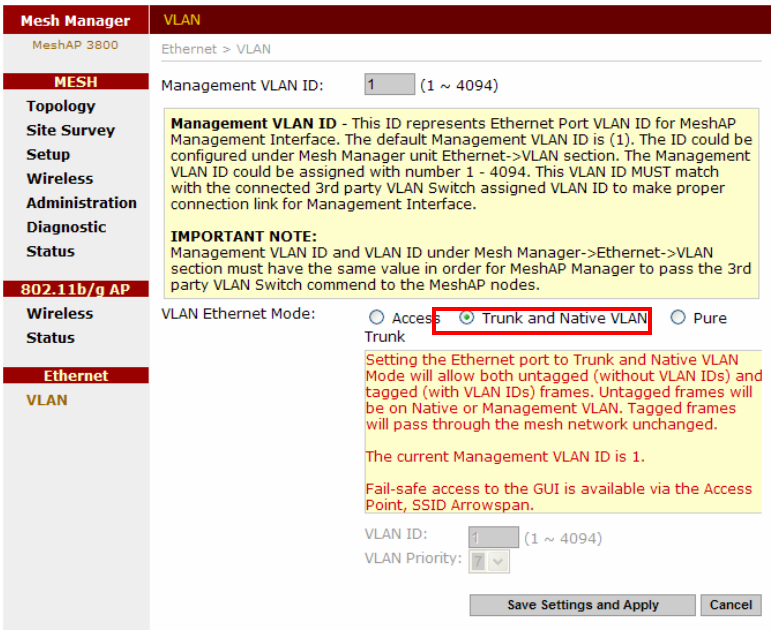
Trunk and Native VLAN Mode

Trunk and Native VLAN - Both untagged and tagged (VLAN IDs and priority included) frames entering the Ethernet port will be accepted. Untagged frames will be on Native or Management VLAN. Tagged frames will pass through the mesh network unchanged. Egress (outgoing) frames will exit the Ethernet port unaltered. If the frame leaving the Ethernet port contains a VLAN tag, it will be transmitted with that same tag. If the frame leaving the Ethernet port does not contain a VLAN tag, the frame will be transmitted without a tag.

Setup Trunk and Native VLAN Mode

Step 1. *Login* to the **Ethernet/VLAN**

Step 2. *Check* "Trunk and Native VLAN" radio button under the **VLAN Ethernet Mode**



Step 3. *Click* **Save Setting and Apply**

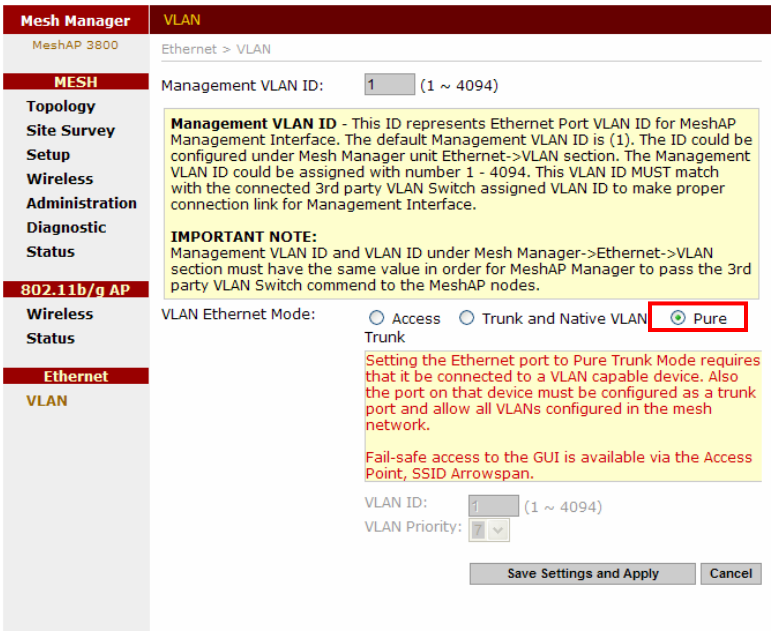
Pure Mode

Pure Trunk - Only tagged (VLAN IDs and priority included) frames entering the Ethernet port will be accepted. Egress frames will exit the Ethernet port unaltered. If the frame leaving the Ethernet port contains a VLAN tag, it will be transmitted with that same tag. If the frame leaving the Ethernet port does not contain a VLAN tag, the frame with be transmitted without a tag. In this mode, the MeshAP must be connected to a VLAN capable device and the port on that device must be configured as a Trunk port.

Setup Pure Mode

Step 1. *Login* to the **Ethernet/VLAN**

Step 2. *Check* "Pure" radio button under the **VLAN Ethernet Mode**



Step 3. *Click* **Save Setting and Apply**

Chapter 12

Firmware Upgrade

Direct Upgrade – Mesh Station

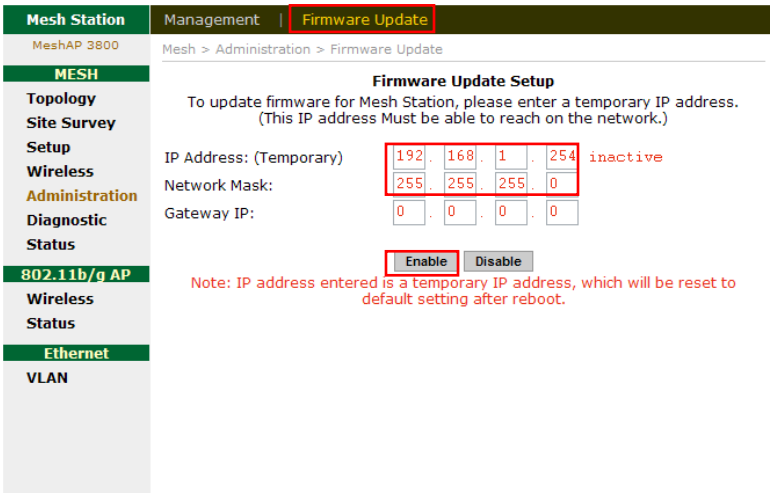
Step 1. *Login* to the MeshAP Access Point.

Step 2. *Go to* the **Status** link under the **AP** section, and check the current firmware version/build date.

Step 3. *Go to* Administration: **Firmware Update** link,

Enter a Temporary IP for firmware update. The IP must be reachable from the network.

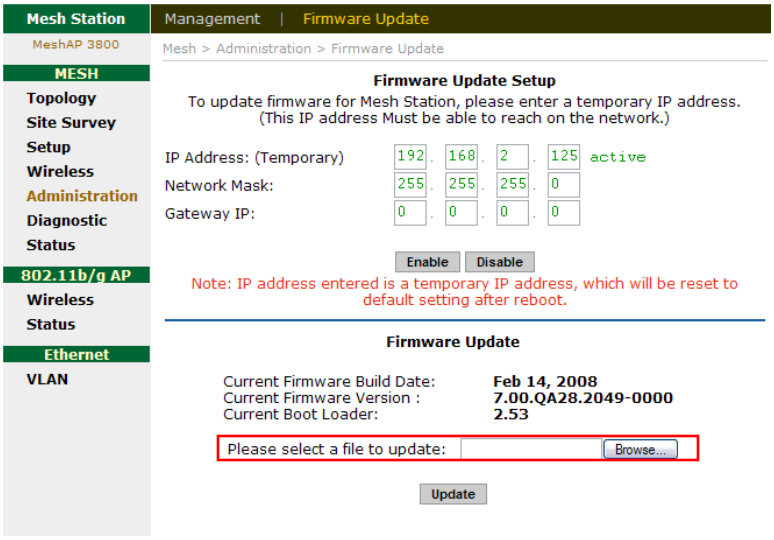
Click on "**Enable"** to temporary enable to IP for the unit



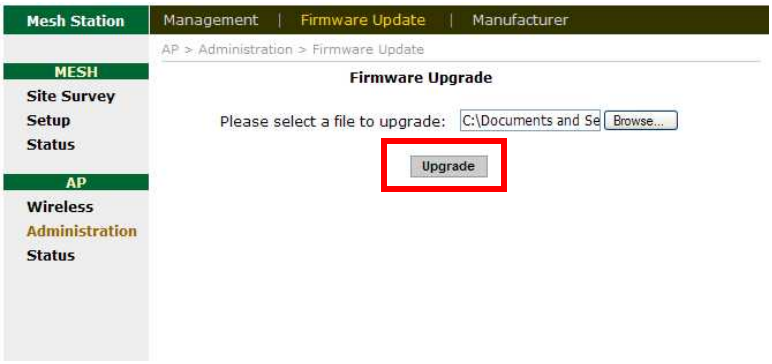
IMPORTANT: Once the temporary IP has assigned the unit will prompt for re-login.

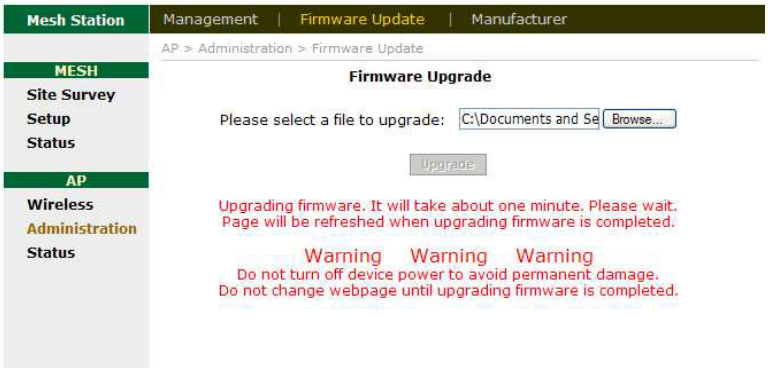
Follow the **Login prompt** to login with username/password.

Step 4. *Click* "**Browse…**" to select the firmware bin file on the local hard drive for update

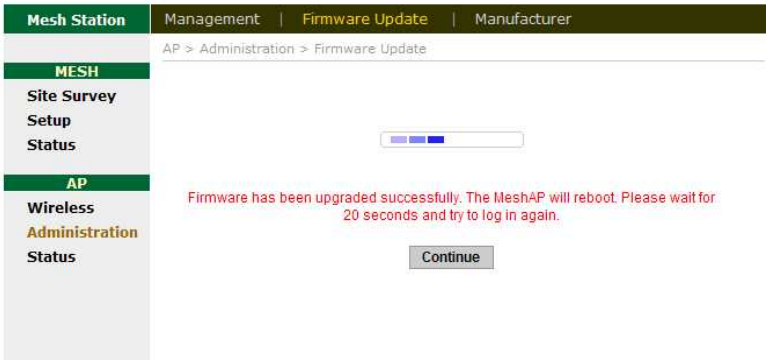


Step 4. *Click* **Upgrade** to start the firmware upgrade process. The firmware upgrade process takes about 2 minutes.





Step 5. When the firmware upgrade is ready, the following page will be displayed on the screen. *Click* "**Continue".**



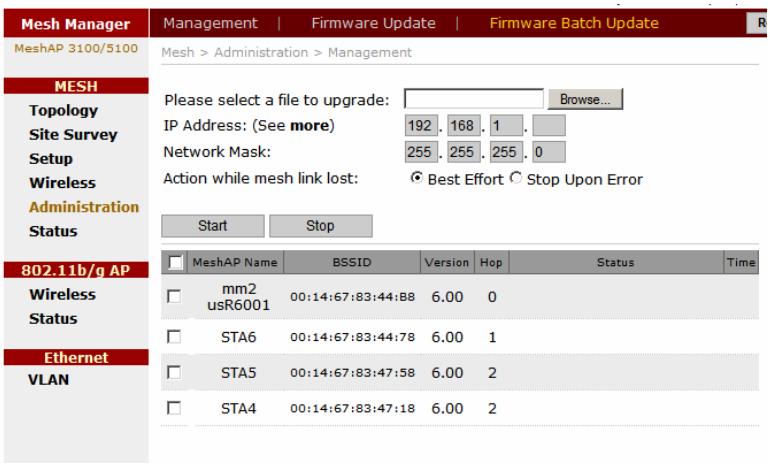
If after 30 seconds the same image still appears on the screen, please click on the **Continue** button and re-login to the unit.

Smart Firmware Upgrade

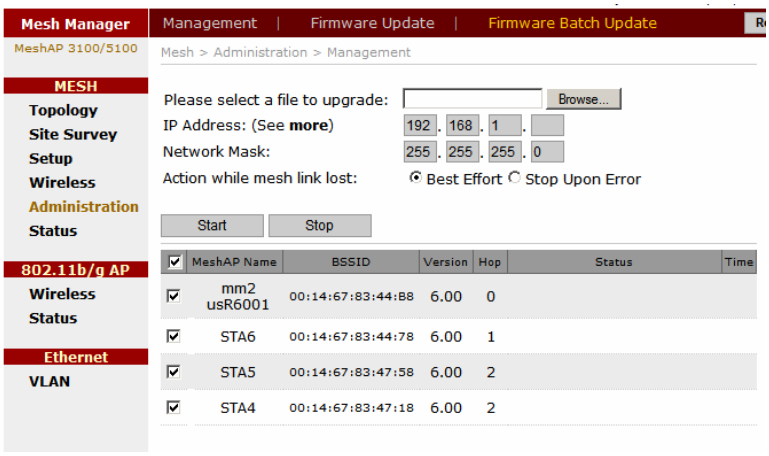
Smart Firmware update propagate flash update to all Mesh Stations via Mesh Manager

Step 1. *Login* to the Mesh Manager unit.

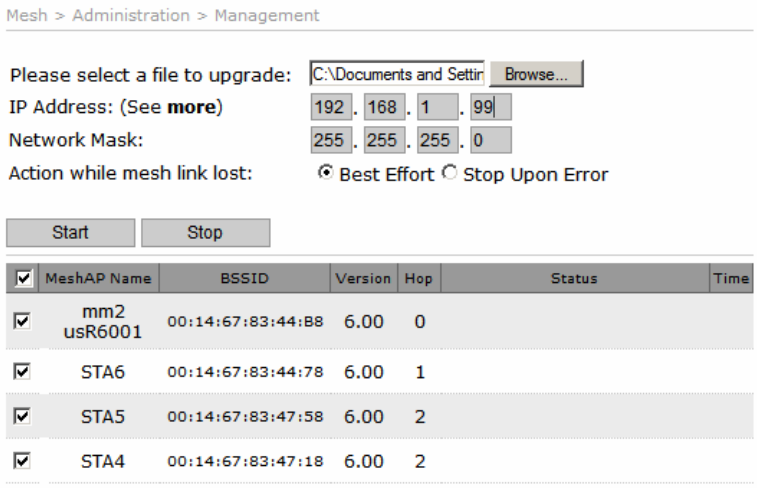
Step 2. *Go to* Firmware Batch Update tab under the Administration page.



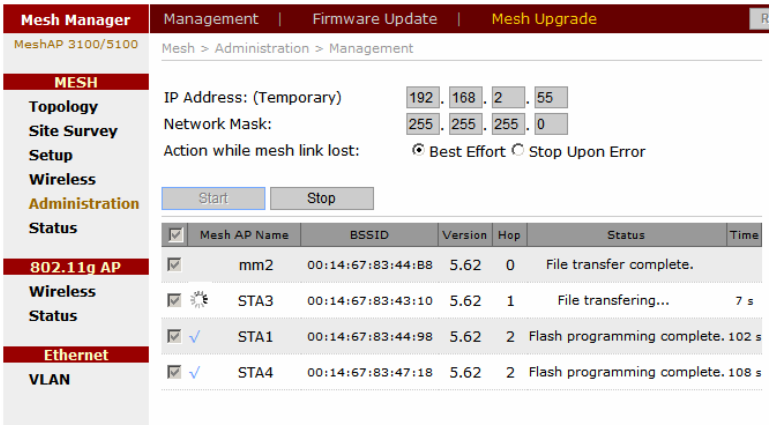
Step 3. *Check* the appropriate MeshAP units for firmware update



Step 4. *Browse* the appropriate firmware update file, and Enter a temporally IP Address in the IP Address file. The IP Address must be reachable in the mesh network.



Step 5. *Click* Start to begin the update.



Once the batch update is complete the MeshAP Name will have a check mark next to the unit.

APPENDIX A

Specification

Wireless

Standards: IEEE 802.11a, IEEE 802.11g, IEEE 802.11b **Media Access Protocol:** CSMA/CA with ACK
Frequency: 5GHz ISM radio band
2.4GHz ISM radio band

Modulation

802.11a: OFDM(64-QAM, 16-QAM, QPSK, BPSK)
802.11g: OFDM(64-QAM, 16-QAM, QPSK, BPSK)
802.11b: CCK(11, 5.5MHz), DOPSK(2Mbps), DQPSK(1Mbps)

Data Rates

802.11a: 6, 9, 12, 18, 24, 36, 48, 54Mbps
802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps
802.11b: 1, 2, 5.5, 11Mbps

Tx Power

802.11a: typical 22.5dBm
802.11g: typical 23dBm
802.11b: typical 24dBm

Wireless Channels

802.11a:
USA, Canada: 12 non-overlapping channels (5.15 ~ 5.35GHz, 5.725~5.825GHz
Europe: 19 non-overlapping channels (5.15~5.35GHz)
Japan: 8 non-overlapping channels (4.9~5.1GHz and W56 channels)
China: 5 non-overlapping channels (5.725~5.85GHz)

802.11g:
USA, Canada: 11
Most European countries: 13
France: 4
Japan: 13
China: 13

802.11b:

USA, Canada, Taiwan: 11
Most European countries: 13
France: 4
Japan: 14
China: 13

Antenna (Not included in package)
(3x) 8dbi 5GHz omni directional antenna
(1x) 8dbi 2.4GHz omni directional antenna
(1x) GPS Antenna (MA3100G series)

Operating Range

Backhaul
Outdoor: 304m(1000ft)@54Mbps

802.11g
Outdoor: 150m@54Mbps

(Transmission speed may vary according to the environment)

Network Management
Web (HTML) based Management, and SNMP

Encryption & Security
64bit, 128bit WEP encryption (Hardware Accelerated)
WPK (Hardware Accelerated)
SSID broadcast enable/disable
Mesh operator username/password
Mesh ID protection
RESET button to factory default (Inside Enclosure)

Network Ports
(1) 10/100Mbps auto crossover Ethernet WAN Port
(For connecting to 3rd party network device)
IEEE 802.3, 802.3u compliant

Power
Power Interface: POE

Input: 48VDC 380mA

Environmental Conditions

Operating Temperature:
-40°F to 131°F (-40°C to 55°C)

Storage Temperature:
-50°F to 158°F (-58°C to 70°C)

Humidity: 95% maximum relative humidity, non-condensing

Physical Specifications

Enclosure Rating: IP 66

Antenna Connector: (3) weatherproof antenna connectors

Power Connector:
(1) weatherproof Power/Data connector
(1) 100V-240V power connector

Dimension: 23.4cm x 17cm x6.3cm

Weight: 3.4lb (1.5kg)

Regulatory Compliance
FCC Part 15
UL 60950-1

APPENDIX B

Power Consumption and PoE Injector Pin Assignments

Power Consumption

48V DC 380mA

Maximum power consumption

18W

PoE Injector Pin assignments of RJ45 connector

EZMesh has a RJ45 modular jack for data connection and PoE power input. The pin assignments of RJ45 connector are

Data Line:

Pair 1: Pin 1 and pin 2

Pair 2: Pin 3 and pin 6

Power Pins:

+VDC: Pin 4 and pin 5

-VDC: Pin 7 and pin 8

Caution: EZMesh does not support reverse polarity power input.

Appendix C: Warranty Policy

Limited Warranty

All Teletronics' products are warranted to the original purchaser to be free from defects in materials and workmanship under normal installation, use, and service for a period of one (1) year from the date of purchase.
Under this warranty, Teletronics International Inc. shall repair or replace (at its discretion) during the warranty period, any part that proves to be defective in material of workmanship under normal installation, use and service, provided the
product is returned to Teletronics International Inc. or to one of its distributors with transportation charges prepaid. Returned products must include a copy of the purchase receipt. In the absence of a purchase receipt, the warranty period shall be one (1) year from the date of manufacture.
This warranty shall be voided if the product is damaged as a result of defacement, misuse, abuse, neglect, accident, destruction or alteration of the serial number, improper electrical voltages or currents, repair, alteration or maintenance by any person or party other than a Teletronics International, Inc. employee or authorized service facility, or any use in violation of instructions furnished by Teletronics International, Inc.
This warranty is also rendered invalid if this product is removed from the country in which it was purchased, if it is used
in a country in which it is not registered for use, or if it is used in a country for which it was not designed. Due to variations in communications laws, this product may be illegal for use in some countries. Teletronics International, Inc.
assumes no responsibility for damages or penalties incurred resulting from the use of this product in a manner or location other than that for which it is intended.
IN NO EVENT SHALL TELETRONICS INTERNATIONAL, INC. BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR
CONSEQUENTIAL DAMAGES FOR BREACH OF THIS OR ANY OTHER WARRANTY, EXPRESSED OR IMPLIED,
WHATSOEVER.
Some states do not allow the exclusion or limitation of special, incidental or consequential damages, so the above exclusion or limitation may not apply to you.
This warranty gives you specific legal rights, and you may also have other rights that vary from state to state.

Appendix D: RMA Policy

Product Return Policy

It is important to us that all Teletronics' products are bought with full confidence. If you are not 100% satisfied with any
product purchased from Teletronics you may receive a prompt replacement or refund subject to the terms and
conditions outlined below.
IMPORTANT: Before returning any item for credit or under warranty repair, you must obtain a Return Merchandise
Authorization (RMA) number by filling out the RMA form. Products will not be accepted without an RMA number. All
products being shipped to Teletronics for repair / refund / exchange must be freight prepaid (customer pays for
shipping). For all under warranty repair/replacement, Teletronics standard warranty applies.

30-Day full refund or credit policy:

1. Product was purchased from Teletronics no more than 30 day prior to the return request.
2. All shipping charges associated with returned items are non-refundable.
3. Products are returned in their original condition along with any associated packaging, accessories, mounting
hardware and manuals. Any discrepancy could result in a delay or partial forfeiture of your credit.

Unfortunately Teletronics cannot issue credits for:

1. Products not purchased from Teletronics directly. If you purchased from a reseller or distributor you must contact
them directly for return instructions.
2. Damaged items as a result of misuse, neglect or improper environmental conditions.
3. Products purchased directly from Teletronics more than 30 days prior to a product return request.
To return any product under 1 year warranty for repair/replacement, follow the RMA procedure.