EnGenius M2000

Wireless Outdoor
Access Point / Client Bridge / Mesh

User Manual

Version: 1.0

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Revision History

Version	Date	Remark
1.0	Nov 30, 2009	Initial Version

1 Introduction

M2000 is a long range outdoor wireless Access Point / Client Bridge that operates in the **2.4GHz** frequency. It provides high bandwidth up to 54Mbps and features high transmitted output power as well as superior sensitivity. M2000 extends radio coverage, avoids unnecessary roaming between Access Points and ensures a stable wireless connection while reduces the number of required equipments. With mesh function implemented, it can be used to establish mesh network, reduces the expense of equipment and risk of disconnection.

M2000 provides user friendly interface including flexible distance control with ranges from 1KM up to 30KM and RSSI LED indicator offering real time signal status. It comes with a PoE injector for convenient outdoor installation.

M2000 enforces transmission security with full support of latest encryption mechanism including 64/128-bit WEP, WPA and WPA2. With a 10dBi Dual Polarization internal antenna and superior performance, M5000 makes an optimal wireless solution for both small and large scale projects.

1.1 Features

Wireless

- ***MESH*** *Easily create a Mesh network of interconnected APs with best link reliability under harsh outdoor environment*
- ***High output power*** *Transmit high output power programmable for different country selections*
- ***10dBi Internal Antenna*** *Built-in 10dBi Dual Polarization Antenna for superior performance*
- ***External Antenna*** *SMA connector to attach higher gain antenna*
- ***High Data Rate*** *High speed transmitting rate up to 54Mbps, support large payload*
- ***Multifunction application*** *Access Point/Client Bridge/Client Router/WDS/MESH Function*
- ***Long range transmitting*** *Transmit power control and distance control (ACK timeout)*
- ***Narrow Bandwidth*** *Provides 5MHz/10MHz/20MHz bandwidth selection*
- ***Signal Strength Display*** *RF signal strength status shown with 3 color LEDs for easy deployment to find the best signal reception.*
- ***Multiple SSID*** *4 SSID supported. Each SSID can set itself wireless or WAN access setting*
- ***AP Detection*** *Scan all neighboring APs with their channels and signal strengths*
- ***QoS(WMM)*** *Enhance performance and density*

Networking

- ***PPPoE*** *Point-to-Point Protocol over Ethernet in Client Router mode.*
- ***PPTP*** *Point-to-Point Tunneling Protocol (PPTP) is a method for implementing virtual private networks*
- ***VPN Pass Through***

Security

- ***802.11i*** *WEP, WPA, WPA2 (Encryption support TKIP/AES)*
- ***MAC address functions*** *MAC address filter (AP mode)*
- ***802.1x*** *IEEE802.1x Authentication*
- ***Station isolation***

Management

- ***Firmware Upgrade*** *Upgrading firmware via web browser, setting are kept after upgrade*
- ***Reset & Backup*** *Reset to factory default. User can export all setting into a file via WEB Interface.*
- ***Ping & Trace Route*** *Built-in PING function & Trace Route function in Web GUI*
- ***MIB*** *MIB I, MIB II(RFC1213), Private MIB*
- ***SNMP*** *V1, V2c*

1.2 Package Contents

Open the package carefully, and make sure that none of the items listed below are missing. Do not discard the packing materials, in case of return; the unit must be shipped in its original package.

- 1* M2000
- 1* PoE injector (EPE-1212)
- 1* Power Adaptor (24V/0.6A)
- 1* CD with User's Manual
- 1* Quick Installation Guide (QIG)
- 1* Metal Strap
- 2* Special Screw Set

1.3 System Requirements

The following are the minimum system requirements in order to configure the device.

- PC/AT compatible computer with an Ethernet interface.
- Operating system that supports HTTP web-browser

1.4 Applications

The wireless LAN products are easy to install and highly efficient. The following list describes some of the many applications made possible through the power and flexibility of wireless LANs:

a) Difficult-to-wire environments

There are many situations where wires cannot be laid easily. Historic buildings, older buildings, open areas and across busy streets make the installation of LANs either impossible or very expensive.

b) Temporary workgroups

Consider situations in parks, athletic arenas, exhibition centers, disaster-recovery, temporary offices and construction sites where one wants a temporary WLAN established and removed.

c) The ability to access real-time information

Doctors/nurses, point-of-sale employees, and warehouse workers can access real-time information while dealing with patients, serving customers and processing information.

d) Frequently changing environments

Show rooms, meeting rooms, retail stores, and manufacturing sites where frequently rearrange the workplace.

e) Wireless extensions to Ethernet networks

Network managers in dynamic environments can minimize the overhead caused by moves, extensions to networks, and other changes with wireless LANs.

f) Wired LAN backup

Network managers implement wireless LANs to provide backup for mission-critical applications running on wired networks.

g) Training/Educational facilities

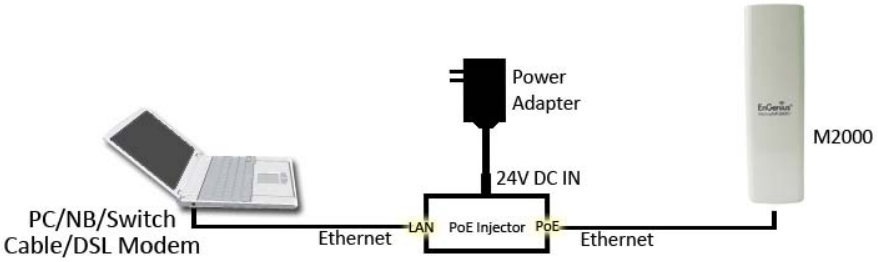
Training sites at corporations and students at universities use wireless connectivity to ease access to information, information exchanges, and learning.

2 Understanding the Hardware

2.1 Hardware Installation

1. Place the unit in an appropriate location after conducting a site survey.
2. Plug one end of the Ethernet cable into the Network port of the PoE injector and another end into your PC/Notebook.
3. Plug one end of another Ethernet cable to AP/Bridge port of the PoE injector and the other end into you cable/DSL modem (Internet)
4. Insert the DC-inlet of the power adapter into the 24V port of the PoE injector and the other end into the power socket on the wall.

This diagram depicts the hardware configuration



2.2 Hardware Description

The images below depict the front and rear panel of the unit.

Front Panel

Rear Panel

2.3 Mounting Kits

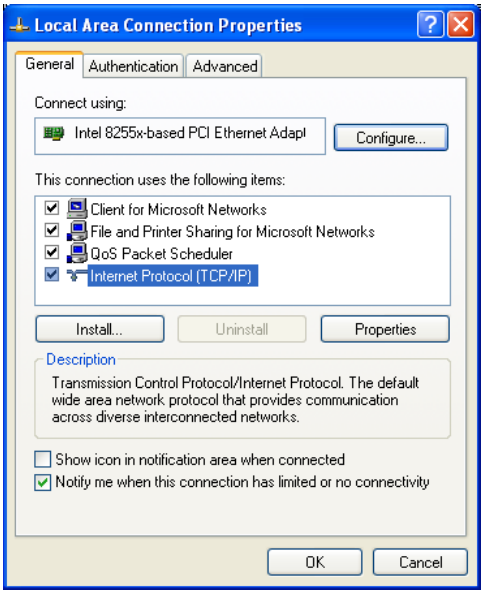
The images below depict the standard mounting kits.

Pole Mount **Wall Mount** **Window Mount**

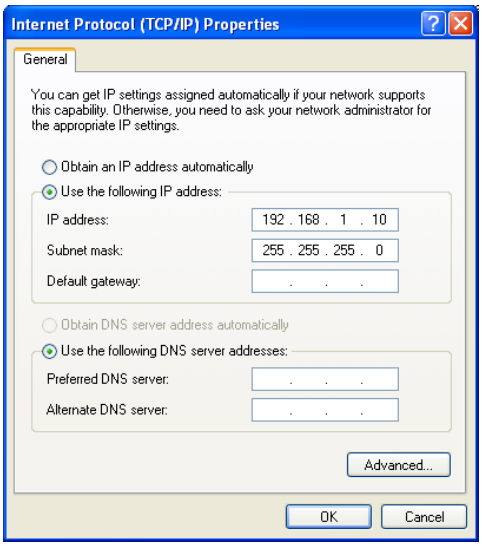
2.4 IP Address Configuration

This device can be configured as a **Access Point** / **Client Bridge** / **WDS Bridge** / **Client Router / MESH**. The default IP address of the device is **192.168.1.1**. And in order to log into this device, you must first configure the TCP/IP settings of your PC/Notebook.

1. In the control panel, double click Network Connections and then double click on the connection of your Network Interface Card (NIC). You will then see the following screen.



2. Select **Internet Protocol (TCP/IP)** and then click on the **Properties** button. This will allow you to configure the TCP/IP settings of your PC/Notebook.



3. Select **Use the following IP Address** radio button and then enter the IP address and subnet mask. Ensure that the IP address and subnet mask are on the same subnet as the device.
   For Example:
   PC IP address: 192.168.1.10
   PC subnet mask: 255.255.255.0

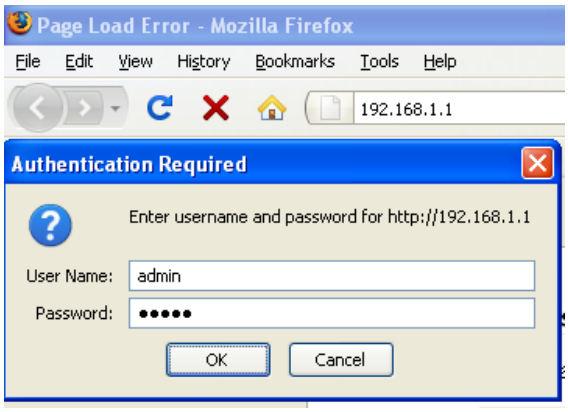
4. Click on the **OK** button to close this window, and once again to close LAN properties window.

3 Switching Between Operating Modes

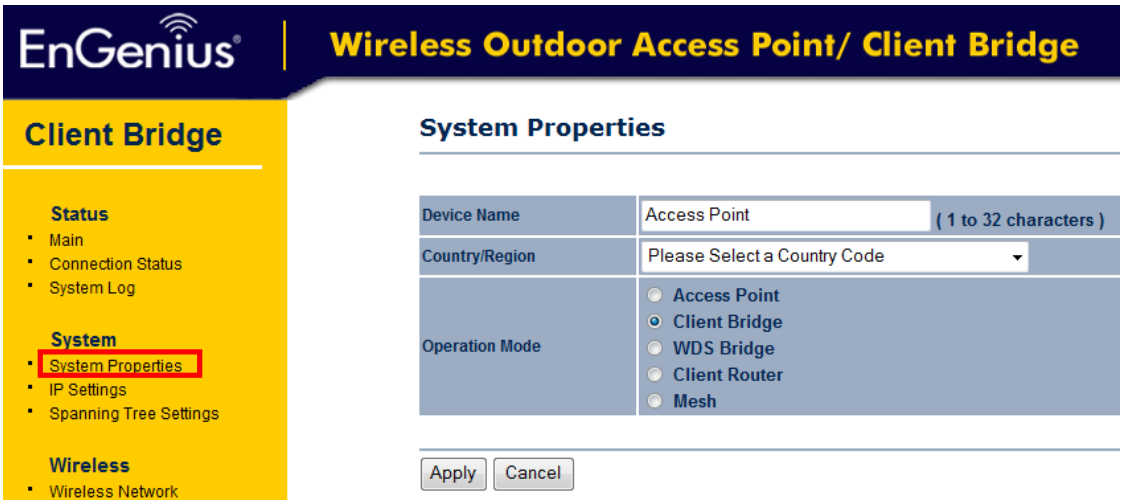
This device can operate in three modes: Access Point, Client Bridge, WDS Bridge, Client Router and Mesh modes. This chapter will describe how to switch between operating modes.

3.1 Logging In

- To configure the device through the web-browser, enter the IP address of the device (default: **192.168.1.1**) into the address bar of the web-browser and press **Enter**.
- Make sure that the device and your computer are configured on the same subnet. (Refer to **Chapter 2** in order to configure the IP address of your computer)
- After connecting to the IP address, the web-browser will display the login page.
- Specify **admin** for both the user name and password.



- After logging in, you will see the graphical user interface of the device. Click on the **System Properties** link under the **System** section of the left menu.

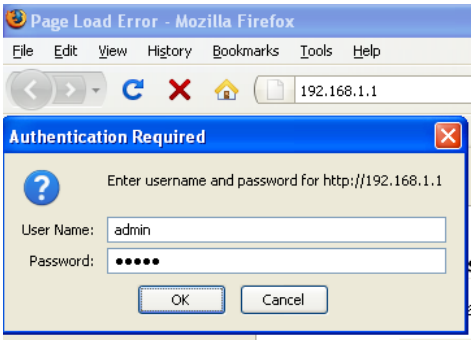


- Select operating mode you want from the list (Access Point, Client Bridge, WDS Bridge, Client Router or Mesh) and then click on the **Apply** button.

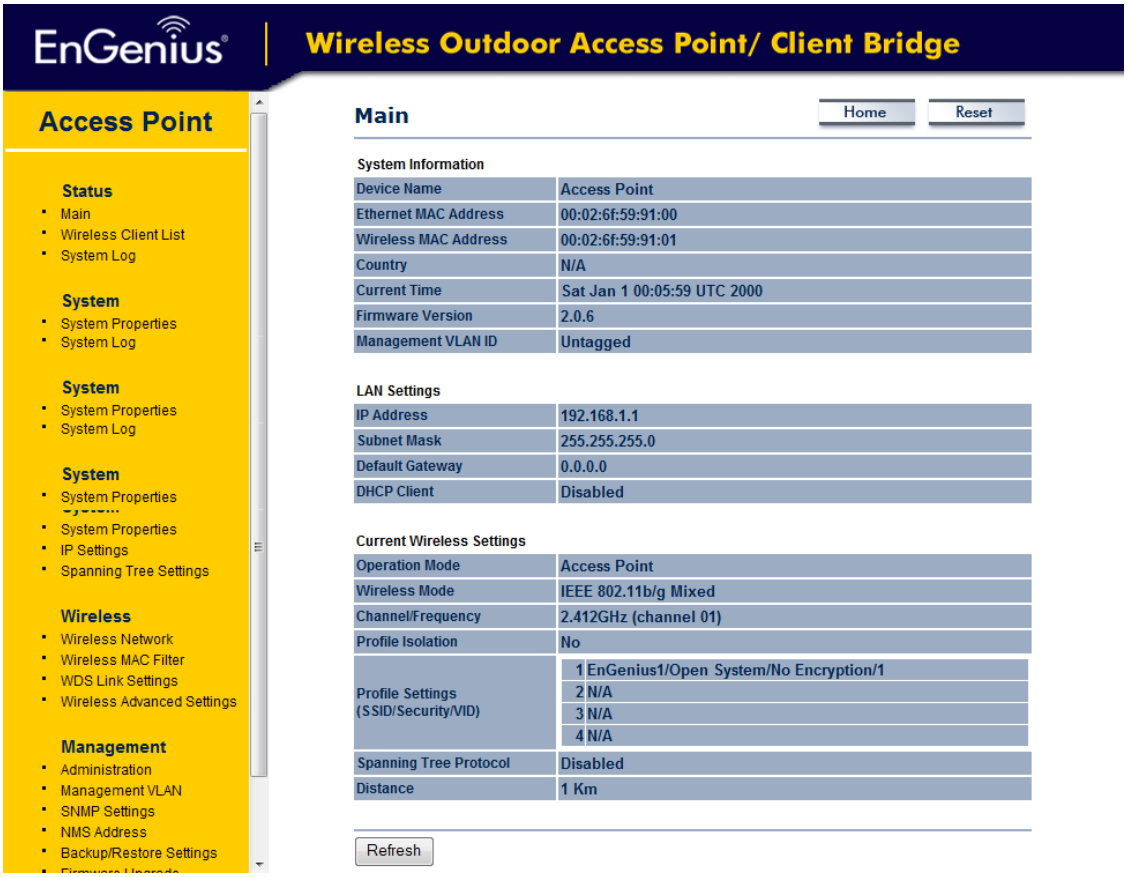
4 Access Point Operating Mode

4.1 Logging In

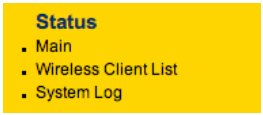
- To configure the device through the web-browser, enter the IP address of the device (default: **192.168.1.1**) into the address bar of the web-browser and press **Enter**.
- Make sure that the device and your computers are configured on the same subnet. Refer to **Chapter 2** in order to configure the IP address of your computer.
- After connecting to the IP address, the web-browser will display the login page.
- Specify **admin** for both the user name and password (Default settings)
- After logging in you will graphical user interface (GUI) of the device. The navigation drop-down menu on left is divided into four sections:



1. **Status**: Displays the overall status, connection status, and event log.
2. **System**: This menu includes the system properties, IP and Spanning Tree settings.
3. **Wireless**: This menu includes network setting, MAC filter, WDS link, advanced, and security.
4. **Management**: This menu includes the admin setup, SNMP, firmware upgrade, diagnostics, time setting and save/restore backup.



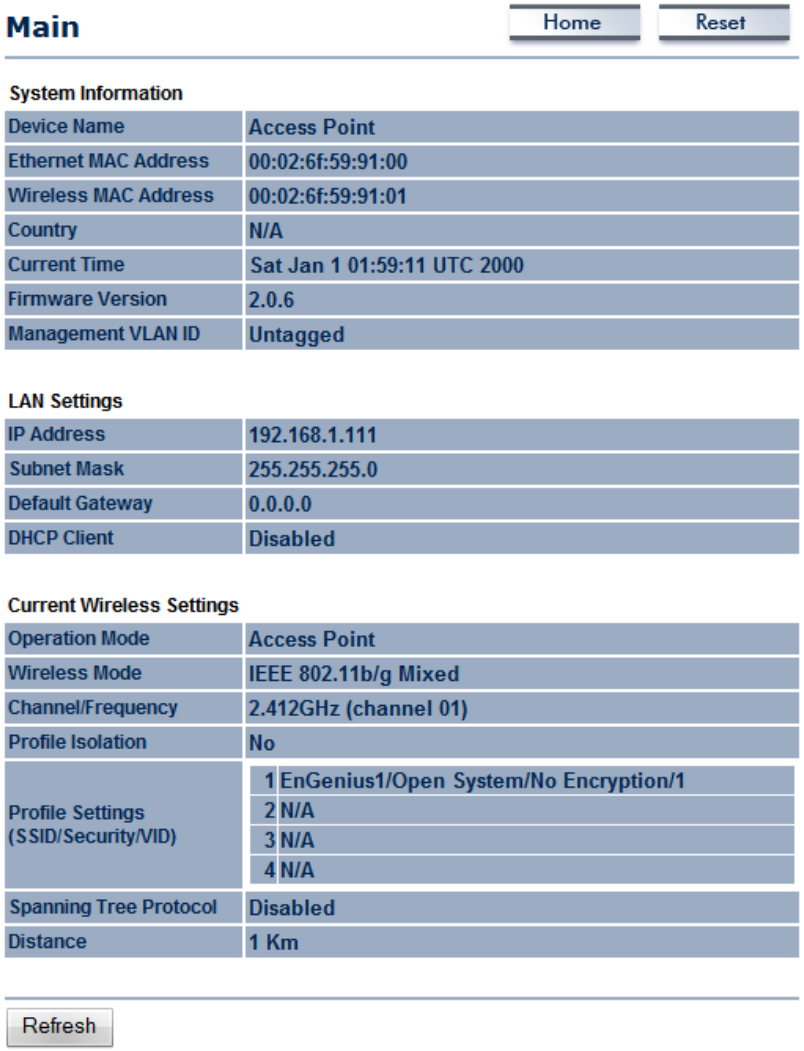
4.2 Status



- There are three options under the **Status** section of the left menu: **Main, Wireless Client List**, and **System Log**. Each option is described in detail below.

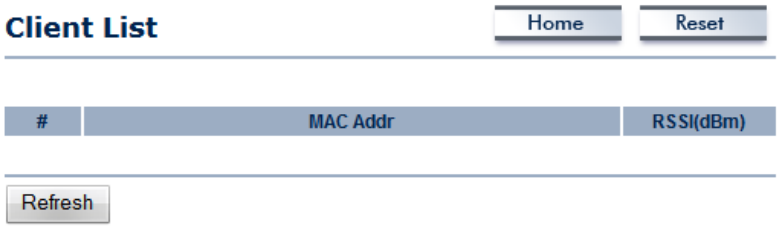
4.2.1 Main

- The status that is displayed corresponds with the operating mode that is selected. Information such as Device Name, MAC Address, Country, Current Time and Firmware Version are displayed in the 'System Information' section. IP address, Subnet Mask, and Default Gateway are displayed in the 'LAN Setting' section. In the 'Wireless Settings' section, Operation Mode, Wireless Mode, Channel/Frequency, MSSID with security, Spanning Tree and Distance setting are displayed.



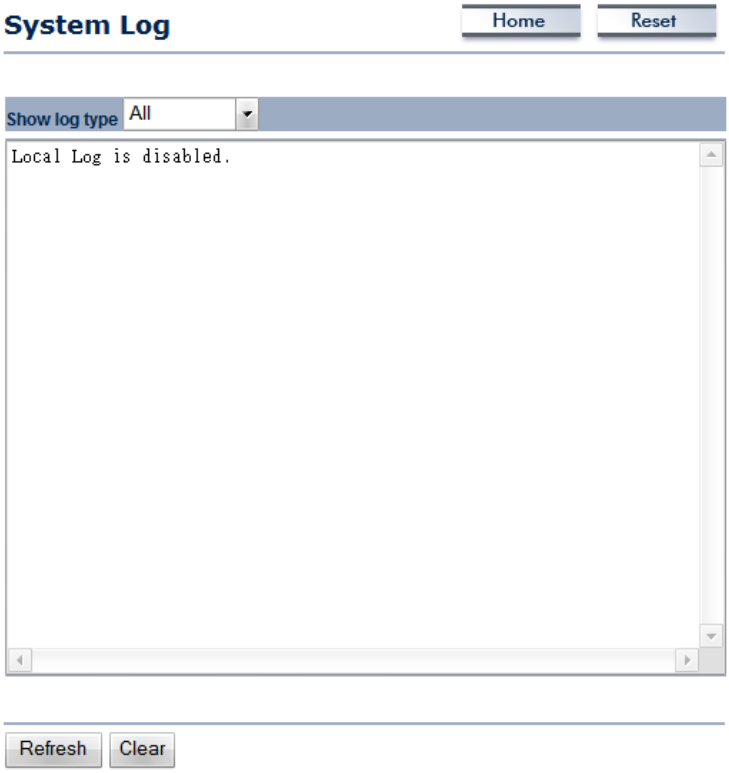
4.2.2 Wireless Client List

- This page displays the list of Clients that are associated to the Access Point.
- The MAC addresses and signal strength for each client is displayed. Click on the **Refresh** button to refresh the client list.

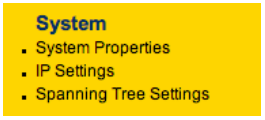


4.2.3 System Log

- The device automatically logs (records) events of possible interest in its internal memory. If there is not enough internal memory for all events, logs of older events are deleted, but logs of the latest events are retained.



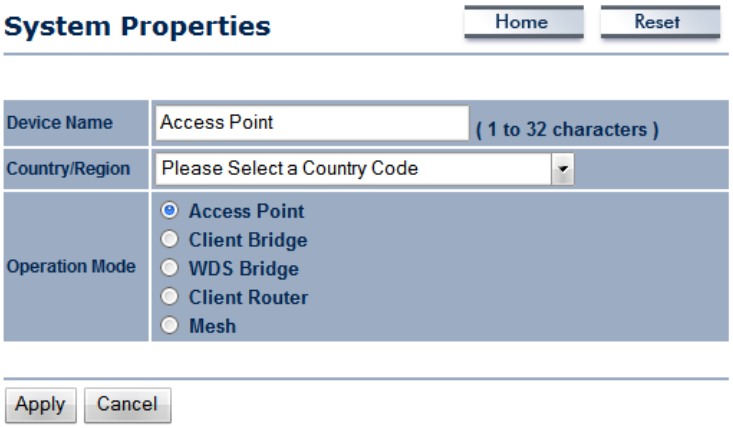
4.3 System



- Under the **System** section of the left menu, you will see the following options: **System Properties, IP Settings,** and **Spanning Tree Settings**. Each option is described in detail below.

4.3.1 System Properties

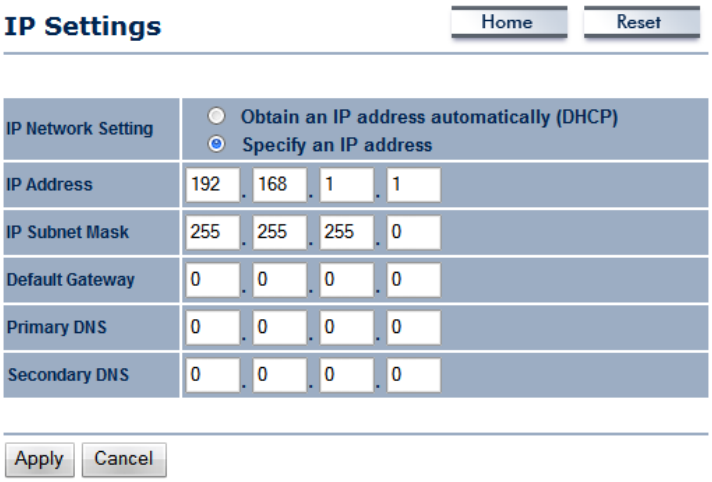
- This page allows you to switch the operating mode of the device, as well as specify a name and select the operating region.



- **Device Name**: Specify a name for the device (this is not the SSID),
- **Country/Region**: Select a country from the drop-down list.
- **Operating Mode**: Select an Operating Mode. Configuration for each Operating Mode is described in their respective chapters.
- Click on the **Apply** button to save the changes.

4.3.2 IP Settings

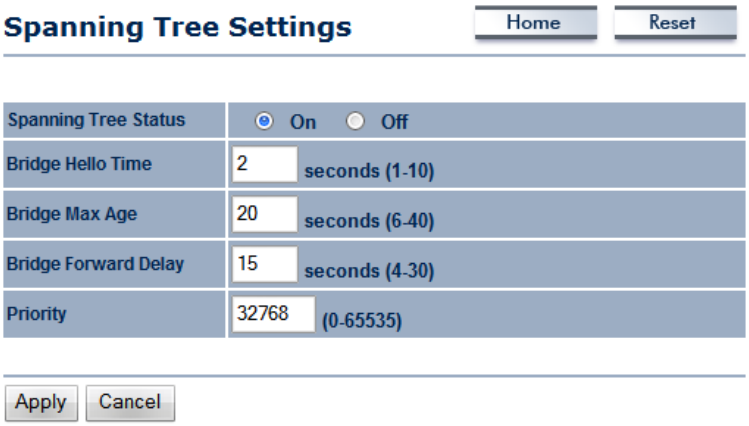
- This page allows you to configure the device with a static IP address or a DHCP client.



- **IP Network Setting**: Select **Obtain an IP address automatically (DHCP)** radio button if the Access Point is connected to a DHCP server. This will allow the Access Point to pass IP addresses to the clients associated with it. You may select **Specify an IP Address** radio button if you would like the device to use a static IP address. In this case, you would be required to specify an IP address, subnet mask, and default gateway IP address.
- **IP Address**: Specify an IP address
- **IP Subnet Mask**: Specify the subnet mask for the IP address
- **Default Gateway**: Specify the IP address of the default gateway.
- Click on the **Apply** button to save the changes.

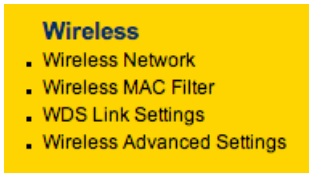
4.3.3 Spanning Tree Settings

- Spanning-Tree Protocol is a link management protocol that provides path redundancy while preventing undesirable loops in the network.



- **Spanning Tree Status**: Choose to enable or disable the spanning tree feature.
- **Bridge Hello Time**: Specify the Bridge Hello Time in seconds.
- **Bridge Max Age**: Specify the Bridge Max Age in seconds.
- **Bridge Forward Delay**: Specify the Bridge Forward Delay in seconds.
- **Priority**: Specify the priority number.
- Click on the **Apply** button to save the changes.

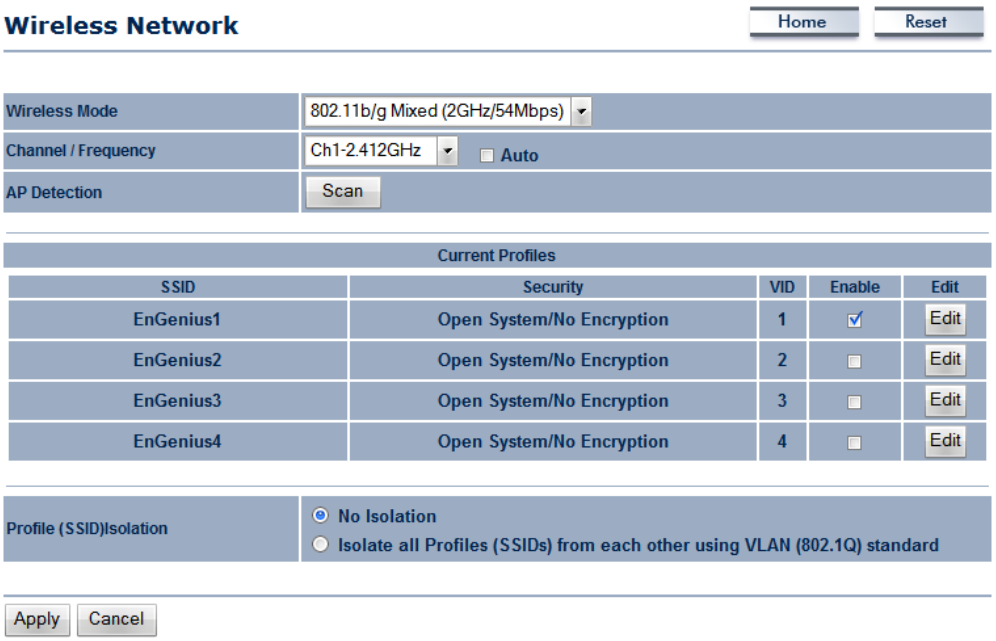
4.4 Wireless



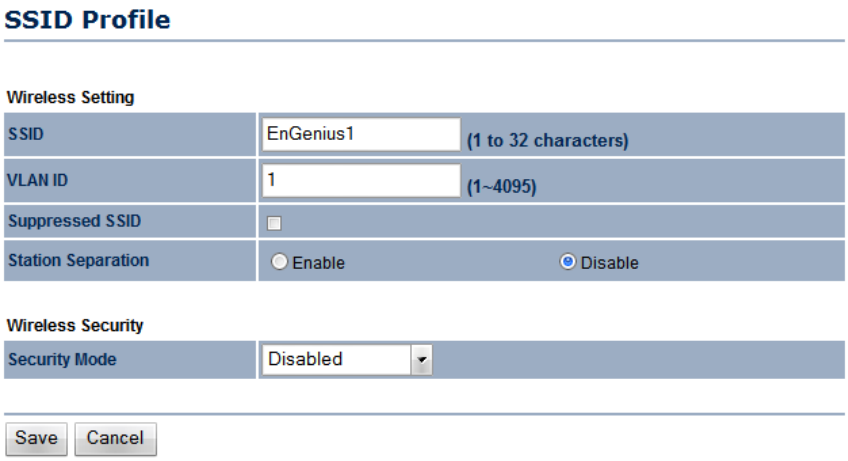
- The **Wireless** section of the left menu has the following options: **Wireless Network, Wireless MAC Filter, WDS Link Settings**, and **Wireless Advanced Settings**. Each option is described below.

4.4.1 Wireless Network

- The **Wireless Network** page allows you to configure the wireless mode, channel, SSID, and security settings.

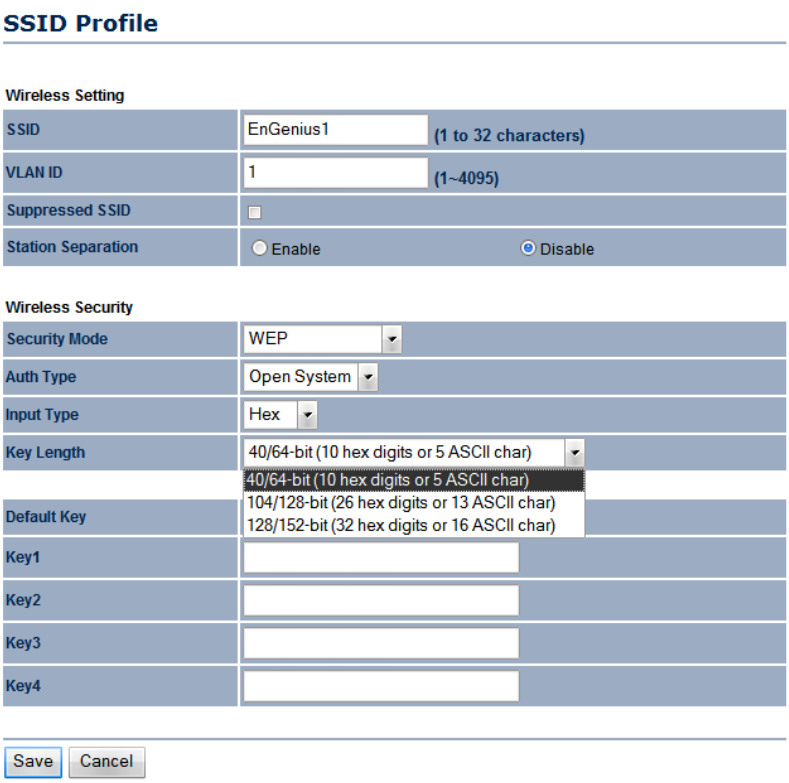


- **Wireless Mode**: Depending on the type of wireless clients that are connected to the network, you may select **B**, **G or B/G-mixed or Super-G**. If you are not sure about which clients will be accessing the wireless networks, it is recommended that you select **B/G-mixed** for the best performance.
- **Channel / Frequency**: Select a channel from the drop-down list. The channels available are based on the country's regulation.
- **Auto**: The M2000 will scan nearby wireless signals and choose the channel with the least interference.
- **AP Detection:** Press the **Scan** button to find nearby wireless signals.
- **Current Profiles**: User can setup SSID configuration in this item. M2000 supports 4 SSIDs, user can decide to use how many SSID via "Enable" or not. When click "Edit" button, you can setup detail, include SSID, VLAN ID and Security Mode.
- **Profile (SSID) Isolation**: When you select this function to enable, unit can isolate all profiles(SSIDs) from each other using VLAN standard.



- **SSID**: Type in your SSID
- **VLAN ID:** Specify the VLAN ID to be applied to this SSID.
- **Suppressed SSID:** When enabled, the SSID will be hidden.
- **Station Separation:** When enabled, wireless clients on different SSID's cannot connect with each other.

Wireless Security – Security Mode : WEP



Security Mode: Select **WEP** from the drop-down list if your wireless network uses WEP encryption. WEP is an acronym for Wired Equivalent Privacy, and is a security protocol that provides the same level of security for wireless networks as for a wired network.

Authentication Type: Select an authentication method. Options available are **Open Key**, **Shared Key**. An open system allows any client to authenticate as long as it conforms to any MAC address filter policies that may have been set. All authentication packets are transmitted without encryption. Shared Key sends an unencrypted challenge text string to any device attempting to communicate with the Access Point. The device requesting authentication encrypts the challenge text and sends it back to the Access Point. If the challenge text is encrypted correctly, the Access Point allows the requesting device to authenticate.

Input Type: Select Hex or ASCII from the drop-down list

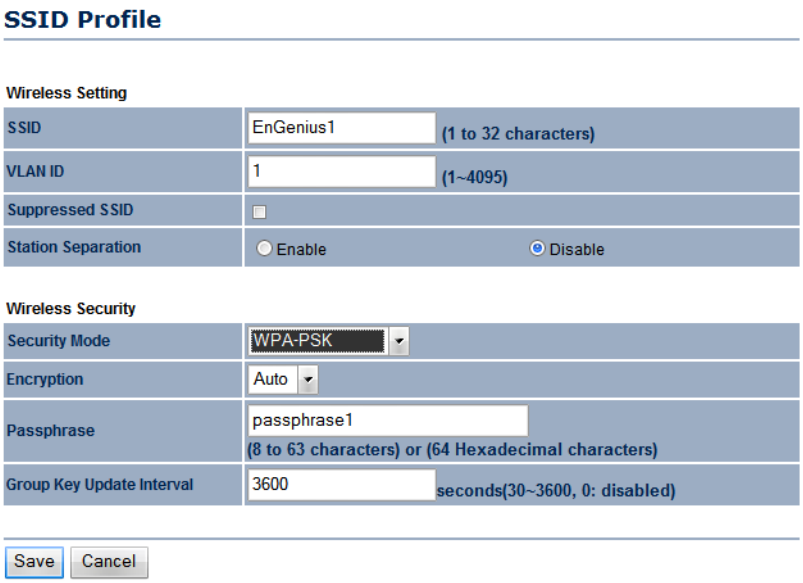
Key Length: Select a key format from the drop-down list. 64bit-hex keys require 10 characters, where as 128-bit keys require 26 characters and 152-bit keys require 32 characters. A hex key is defined as a number between 0 through 9 and letter between A through F and a through f.

Default Key: You may use up to four different keys for four different networks. Select the current key that will be used.

Key 1-4: You may enter four different WEP keys.

Click on the **Save** button to save the changes.

▶ **Wireless Security – Security Mode : WPA-PSK, WPA2-PSK, WPA-PSK Mixed**



▶▶ **Security Mode**: Select **WPA-PSK, WPA2-PSK, or WPA-PSK Mixed** from the drop-down list if your wireless network uses WPA pre-shared key.

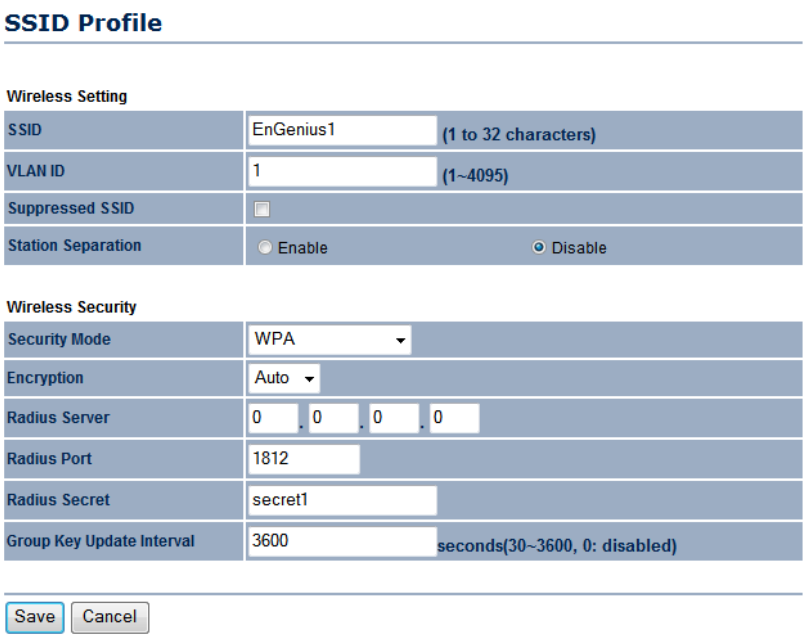
▶▶ **Encryption**: Select **TKIP**, **AES** or **Auto** from the drop-down list if your wireless network uses this encryption. WPA (Wi-Fi Protected Access) was designed to improve upon the security features of WEP (Wired Equivalent Privacy). The technology is designed to work with existing Wi-Fi products that have been enabled with WEP. WPA provides improved data encryption through the Temporal Integrity Protocol (TKIP), which scrambles the keys using a hashing algorithm and by adding an integrity checking feature which makes sure that keys haven't been tampered with. AES is an even more advanced method of encryption which offers the highest level of WPA/WPA2 security.

▶▶ **Passphrase**: Specify a passphrase that is shared amongst the Access Points and clients.

▶▶ **Group Key Update Interval**: Specify the number of seconds after which the Access Point will probe the client for the passphrase.

▶▶ Click on the **Save** button to save the changes.

Wireless Security – Security Mode : WPA, WPA2, WPA Mixed



Security Mode: Select **WPA**, **WPA2 or WPA Mixed** from the drop-down list if your wireless network uses WPA. WPA (Wi-Fi Protected Access) was designed to improve upon the security features of WEP (Wired Equivalent Privacy). The technology is designed to work with existing Wi-Fi products that have been enabled with WEP. WPA provides improved data encryption through the Temporal Integrity Protocol (TKIP), which scrambles the keys using a hashing algorithm and by adding an integrity checking feature which makes sure that keys haven't been tampered with.

Encryption: Select **TKIP**, **AES** or **Auto** from the drop-down list if your wireless network uses this encryption.

RADIUS Server: Enter the IP address of the RADIUS server.

RADIUS Port: Enter the port number of the RADIUS server. The default is usually 1812.

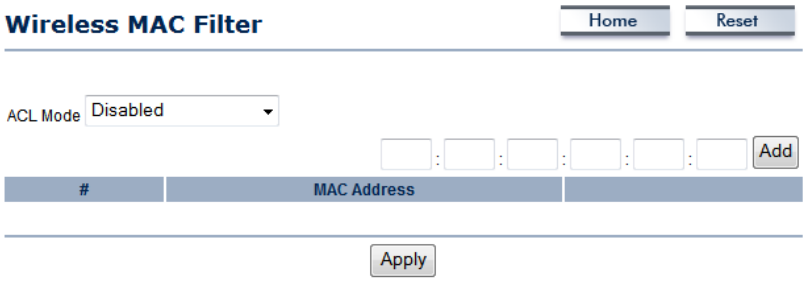
RADIUS Secret: Enter the shared password of the RADIUS server.

Group Key Update Interval: Specify the number of seconds after which the Access Point will probe the client for the secret.

Click on the **Save** button to save the changes.

4.4.2 Wireless MAC Filter

- On this page you can filter the MAC address by allowing or blocking access the network.

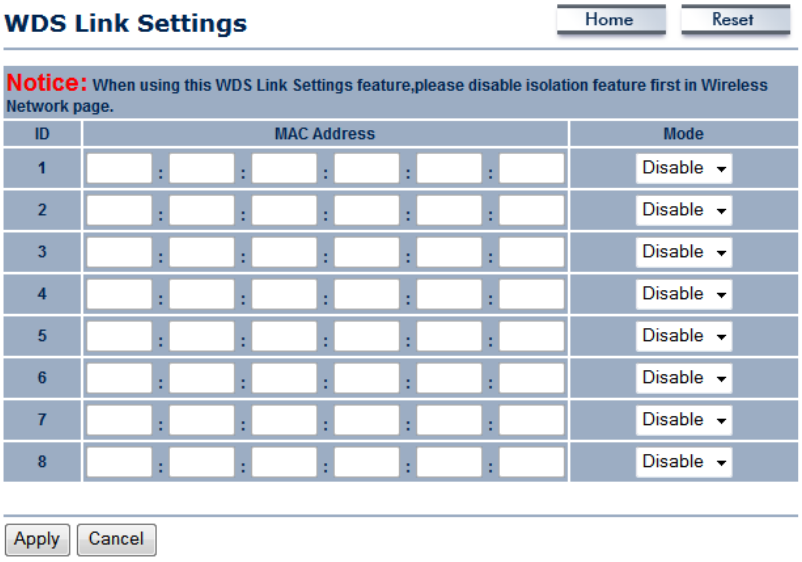


- **ACL (Access Control) Mode:** You may choose to **Disable**, **Allow Listed**, or **Deny Listed** MAC addresses from associating with the network. By selecting **Allow MAC in the List**, only the address listed in the table will have access to the network; all other clients will be blocked. On the other hand, selected **Deny MAC in the List**, only the listed MAC addresses will be blocked from accessing the network; all other clients will have access to the network.
- **MAC Address:** Enter the MAC address.
- This table lists the blocked or allowed MAC addresses; you may delete selected MAC address or delete all the addresses from the table by clicking on the **Delete** button.
- Click on the **Apply** button to save the changes.

4.4.3 WDS Link Settings

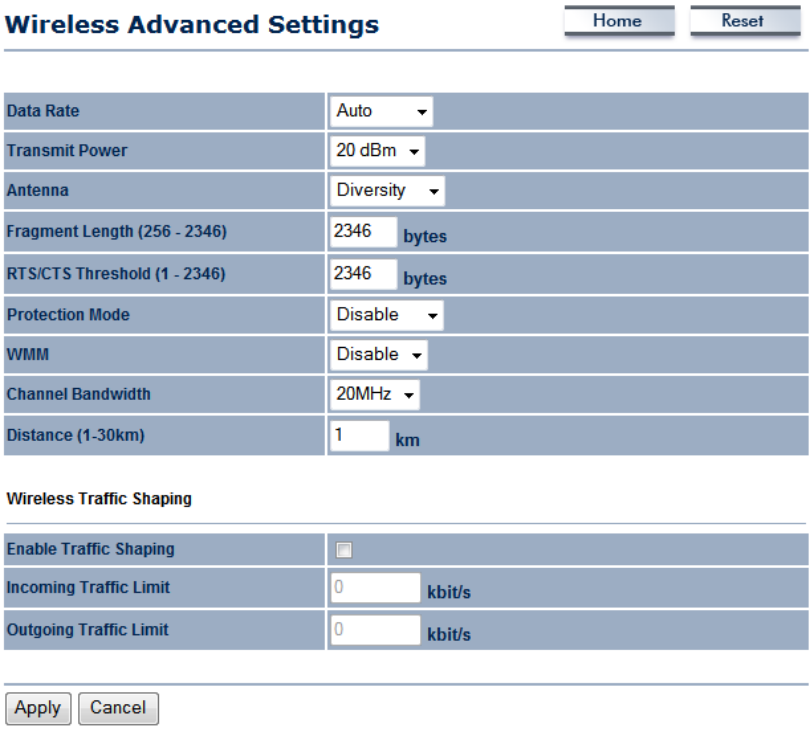
On this page you can set the WDS link to connect to another WDS AP or WDS Bridge. The Maximum connection is up to 8 units.

Please enter the MAC Addresses of the other Access Points in your WDS network.



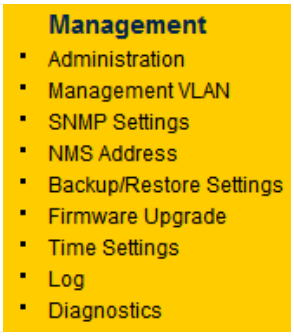
4.4.4 Wireless Advanced Settings

- On this page you can configure the advanced settings to tweak the performance of your wireless network. Options available are: **Data Rate, Transmit Power, Fragment Length, RTS Threshold, Protection Mode** and **Distance**.



- **Data Rate**: If you would like to have a fixed data rate, you may select one from the drop-down list. However, for best performance it is recommended to use the **Auto** setting.
- **Transmit Power**: You may have the different application distance of the device by selecting a value from the drop-down list. This feature can be helpful in restricting the coverage area of the wireless network.
- **Antenna**: You can select the antenna polarization to Diversity, Horizontal or Vertical.
- **Fragment Length**: Packets over the specified size will be fragmented in order to improve performance on noisy networks.
- **RTS/CTS Threshold**: Packets over the specified size will use the RTS/CTS mechanism to maintain performance in noisy networks and preventing hidden nodes from degrading the performance.
- **Protection Mode**: If your wireless network is using both 802.11b and 802.g devices then it is recommended to enable this feature so that the 802.11b devices will not degrade the performance of 802.11g devices.
- **WMM**: Enable wireless Quality of Service
- **Distance (1-30km)**: Specify a distance between 1 and 30Km.
- **Channel Bandwidth**: For different application, you can select 20MHz, 10MHz or 5MHz channel bandwidth.
- **Wireless Traffic Shaping:** Specify the maximum bandwidth allocated to Incoming and Outgoing traffic.
- Click on the **Apply** button to save the changes.

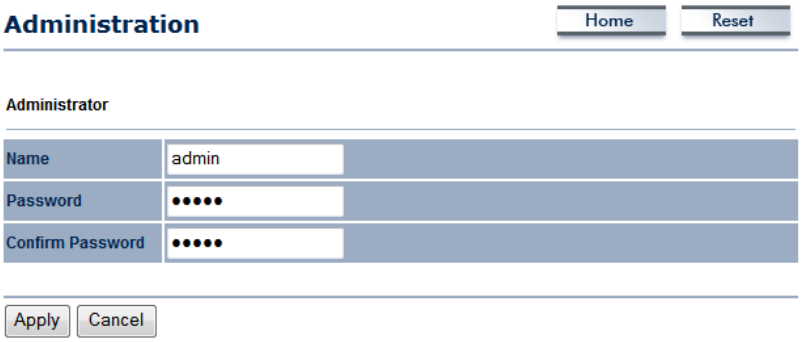
4.5 Management



- The following options are under the **Management** section of the left menu: **Administration, SNMP Settings, Backup/Restore Settings, Firmware Upgrade, Time Settings**, **Log** and **Diagnostics**. Each option is described below.

4.5.1 Administration

- This option allows you to create a user name and password for the device. By default, this device is configured without a user name and password **admin**. For security reasons it is highly recommended that you create a new user name and password.

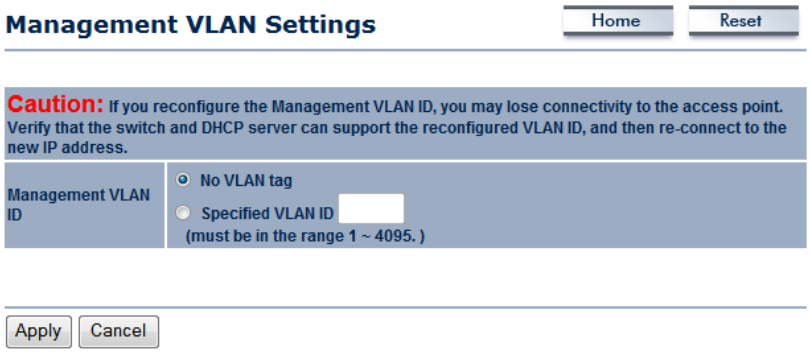


- **Name**: Specify a user name into the first field.
- **Password**: Specify a password into this field and then re-type the password into the **Confirm Password** field.
- Click on the **Apply** button to save the changes.

4.5.2 Management VLAN

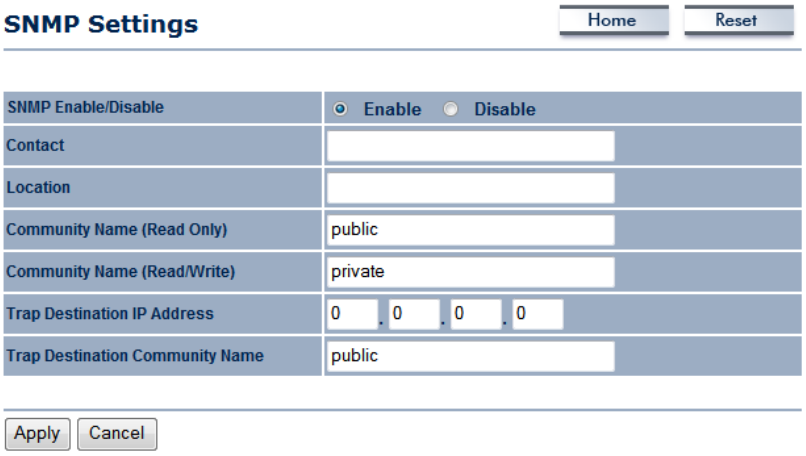
- This option allows you to specify VLAN ID (From 1 to 4095).

  Caution: If you reconfigure the Management VLAN ID, you may lose connectivity to the access point. Verify the switch and DHCP server can support the reconfigured VLAN ID, and then reconnect to new IP address.



4.5.3 SNMP Settings

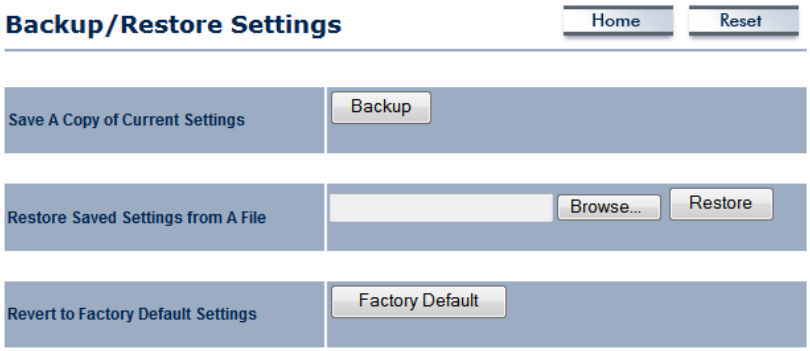
- This option allows you to assign the contact details, location, and community name and trap settings for SNMP. This is a networking management protocol used to monitor network-attached devices. SNMP allows messages (called protocol data units) to be sent to various parts of a network. Upon receiving these messages, SNMP-compatible devices (called agents) return data stored in their Management Information Bases.



- **SNMP Enable/Disable**: Choose to **enable** or **disable** the SNMP feature.
- **Contact**: Specify the contact details of the device.
- **Location**: Specify the location of the device.
- **Read-Only Community Name**: Specify the password for access the SNMP community for read only access.
- **Read-Write Community Name**: Specify the password for access to the SNMP community with read/write access.
- **Send SNMP Trap**: Specify the IP address of the computer that will receive the SNMP traps.
- **Trap Community Name**: Specify the password for the SNMP trap community.
- Click on the **Apply** button to save the changes.

4.5.4 Backup/Restore settings, Reset to factory default settings

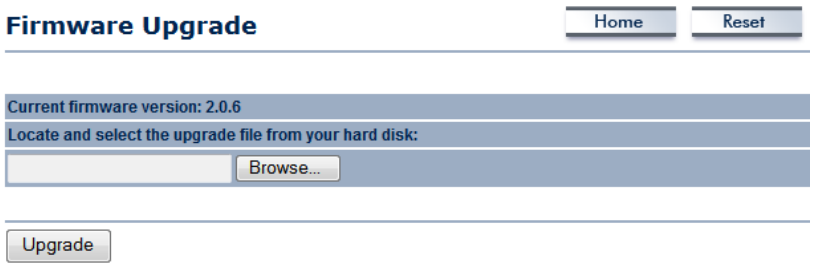
- This option is used to save the current settings of the device in a file on your local disk or load settings on to the device from a local disk. This feature is very handy for administrators who have several devices that need to be configured with the same settings.



- **Save a copy of the current settings**: Click on the Backup button to save the current configuration.
- **Restore saved settings from a file**: Once a file has been backed up, you may restore it by clicking on the Browse button to select the file, and then the **Restore** button.
- **Revert to factory default settings**: Click on the Factory Default Settings button to reset the device to the default settings. Please wait while the device restart and then access the device using the default IP address: **192.168.1.1**

4.5.5 Firmware Upgrade

- This page is used to upgrade the firmware on the device. Make sure that downloaded the appropriate firmware from your vendor.

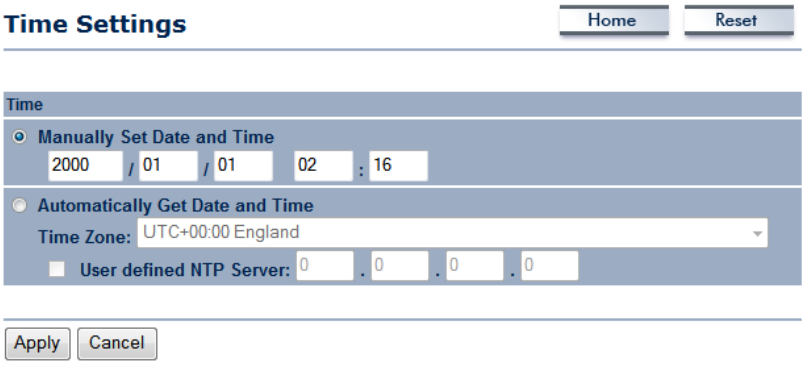


- Click on the **Browse** button and then select the appropriate firmware and then click on the **Upgrade** button.

  Note: The upgrade process may take about 1 minute to complete. Do not power off the device during this process as it may crash the device and make it unusable. The device will restart automatically once the upgrade is complete.

4.5.6 Time Settings

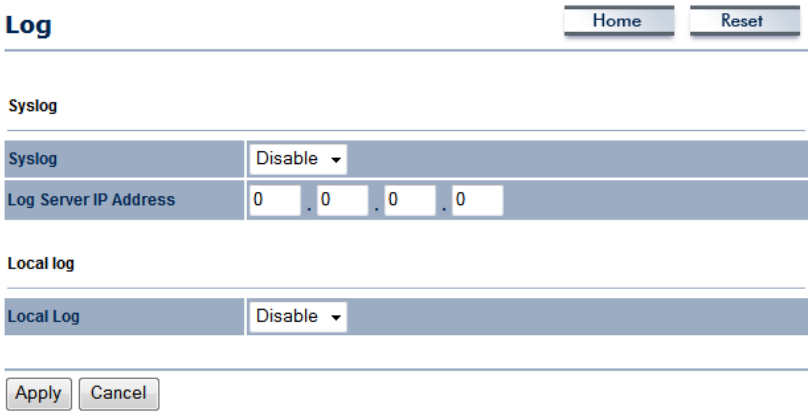
- This page allows you to configure the time on the device. You may do this manually or by connecting to a NTP server.



- **Manually Set Date and Time**: Specify the date and time
- **Automatically Get Date and Time**: Select the time zone from the drop down list and then specify the IP address of the NTP server.
- Click on the **Apply** button to save the changes.

4.5.7 Log

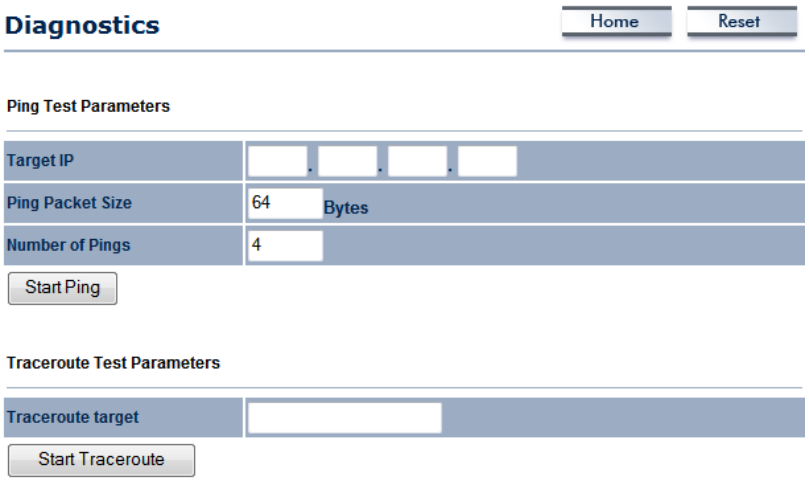
- The **Log** page displays a list of events that are triggered on the Ethernet and Wireless interface. This log can be referred when an unknown error occurs on the system or when a report needs to be sent to the technical support department for debugging purposes.



- **Syslog**: Choose to enable or disable the system log.
- **Log Server IP Address**: Specify the IP address of the server that will receive the system log.
- **Local Log**: Choose to enable or disable the local log.
- Click on the **Apply** button to save the changes.

4.5.8 Diagnostics

- In this page, user can let unit to ping other network equipment. And user also can monitor a route from unit to your target.

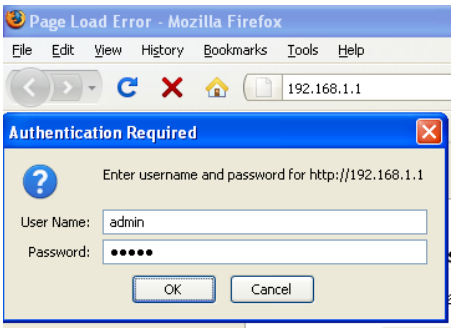


- **Ping Test Parameters** : User can input Target IP, Ping Size and Ping Quantity of other network device which connected you want. And then you can find the ping condition after click Start Ping.
- **Traceroute Test Parameters**: This function help user to monitor a network trace. User can input IP or domain name on Traceroute target.

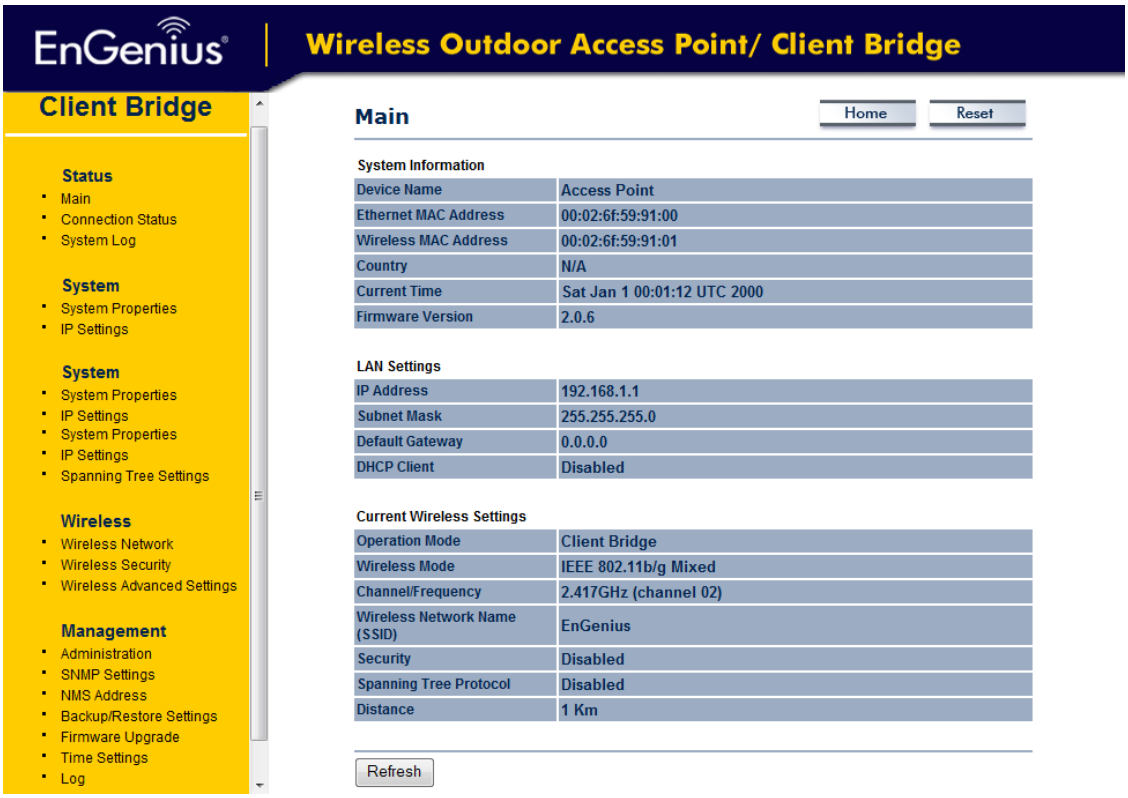
5 Client Bridge Operating Mode

5.1 Logging In

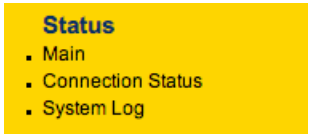
- To configure the device through the web-browser, enter the IP address of the device (default: **192.168.1.1**) into the address bar of the web-browser and press **Enter**.
- Make sure that the device and your computers are configured on the same subnet. Refer to **Chapter 2** in order to configure the IP address of your computer.
- After connecting to the IP address, the web-browser will display the login page.
- Specify **admin** for both the user name and password.
- After logging in you will graphical user interface (GUI) of the device. The navigation drop-down menu on left is divided into four sections:



1. **Status**: Displays the overall status, connection status, and system log.
2. **System**: This menu includes the system properties, IP and Spanning Tree settings.
3. **Wireless**: This menu includes network, security and advanced settings.
4. **Management**: This menu includes the admin setup, SNMP, firmware upgrade, time settings, diagnostics and save/restore backup.



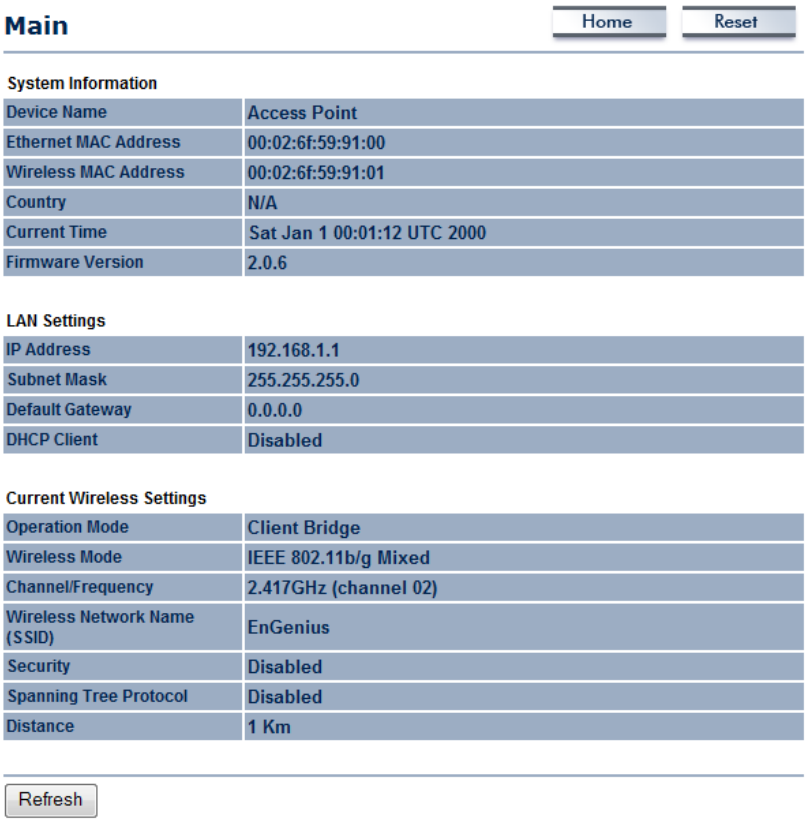
5.2 Status



- There are three options under the **Status** section of the left menu: **Main, Connection Status,** and **System Log**. Each option is described in detail below.

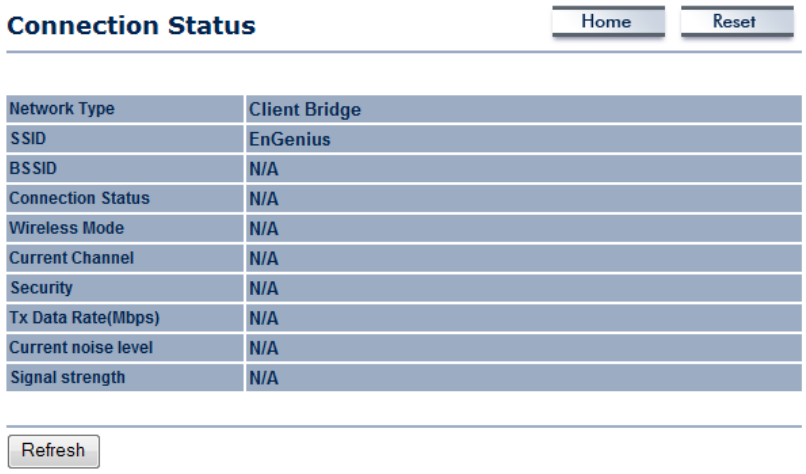
5.2.1 Main

- Click on the **Main** link under the **Status** drop-down menu. The status that is displayed corresponds with the operating mode that is selected. Information such as device name, firmware version, MAC address, country and current time are displayed in the 'System Information' section. IP address, subnet mask, default gateway and DHCP client are displayed in the 'LAN Settings' section. In the 'Current Wireless Settings' section, the operation mode, wireless mode, channel/frequency, SSID, security and distance are displayed.
-



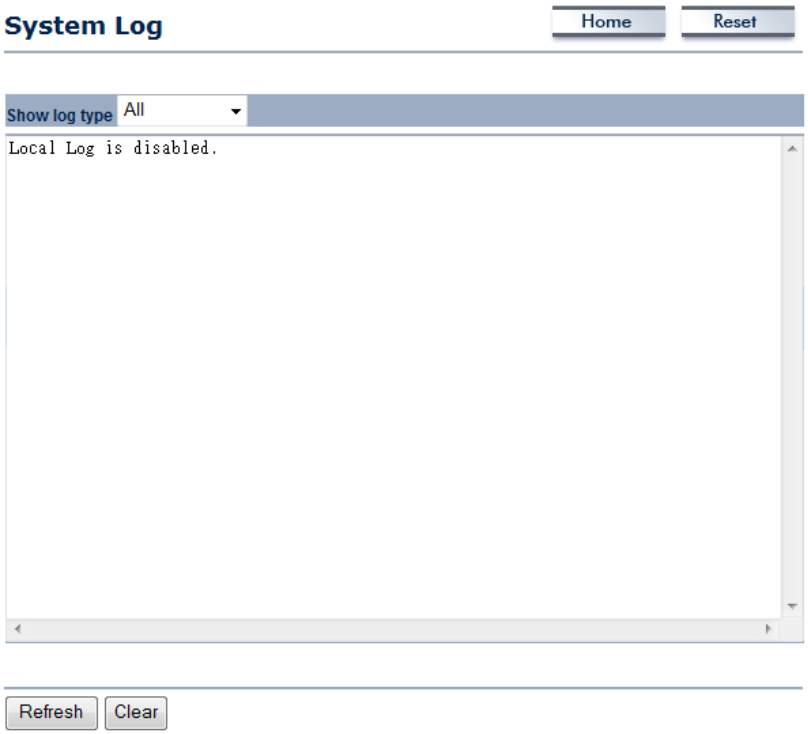
5.2.2 Connection Status

- Click on the **Connection Status** link under the **Status** drop-down menu. This page displays the current status of the network, including network type, SSID, BSSID, connection status, wireless mode, current channel, security, data rate, noise level and signal strength.

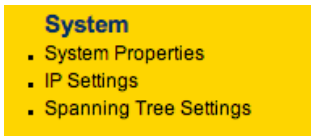


5.2.3 System Log

- The device automatically logs (records) events of possible interest in its internal memory. If there is not enough internal memory for all events, logs of older events are deleted, but logs of the latest events are retained.



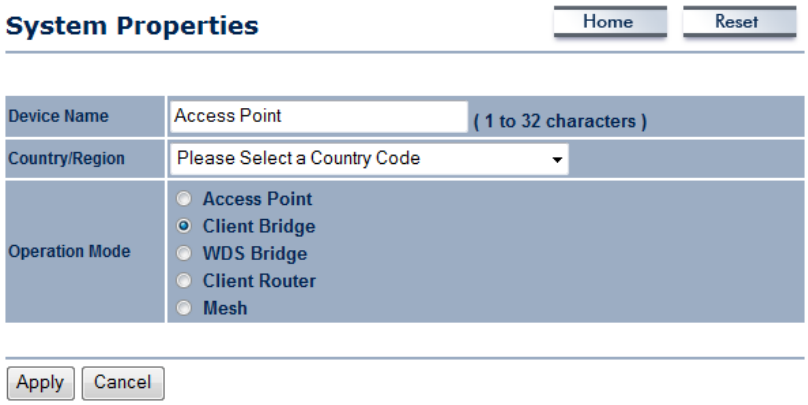
5.3 System



- Under the **System** section of the left menu, you will see the following options: **System Properties, IP Settings**, and **Spanning Tree Settings**. Each option is described in detail below.

5.3.1 System Properties

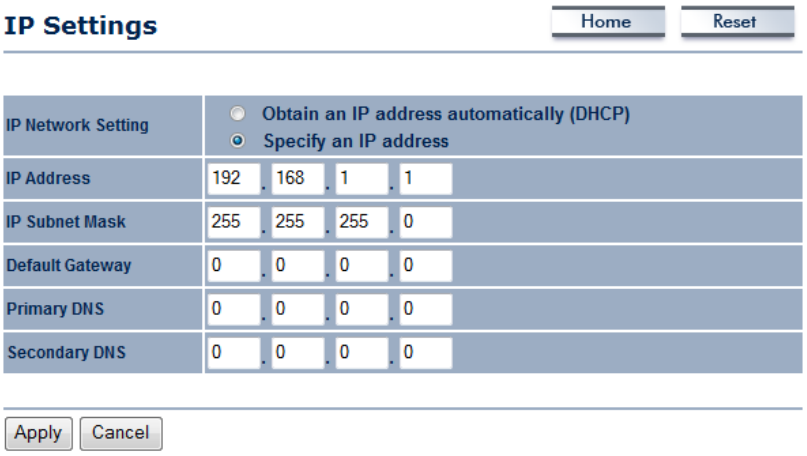
- This page allows you to switch the Operating Mode of the device, as well as specify a name and select the operating region.



- **Device Name**: Specify a name for the device (this is not the SSID),
- **Country/Region**: Select a country from the drop-down list.
- **Operating Mode**: Select an Operating Mode. Configuration for each Operating Mode is described in their respective chapters.
- Click on the **Apply** button to save the changes.

5.3.2 IP Settings

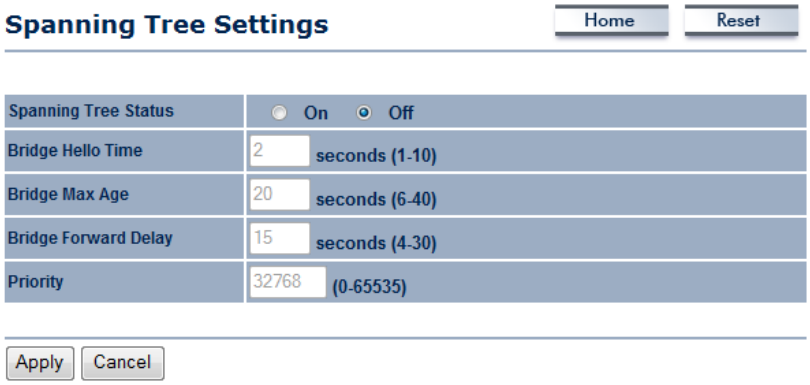
- This page allows you to configure the device with a static IP address or a DHCP client.



- **IP Network Setting**: Select **Obtain an IP address automatically (DHCP)** radio button if the Access Point is connected to a DHCP server. This will allow the Access Point to pass IP addresses to the clients associated with it. You may select **Specify an IP Address** radio button if you would like the device to use a static IP address. In this case, you would be required to specify an IP address, subnet mask, and default gateway IP address.
- **IP Address**: Specify an IP address
- **IP Subnet Mask**: Specify the subnet mask for the IP address
- **Default Gateway**: Specify the IP address of the default gateway.
- Click on the **Apply** button to save the changes.

5.3.3 Spanning Tree Settings

- Click on the **Spanning Tree** link under the **System** drop-down menu Spanning-Tree Protocol is a link management protocol that provides path redundancy while preventing undesirable loops in the network.



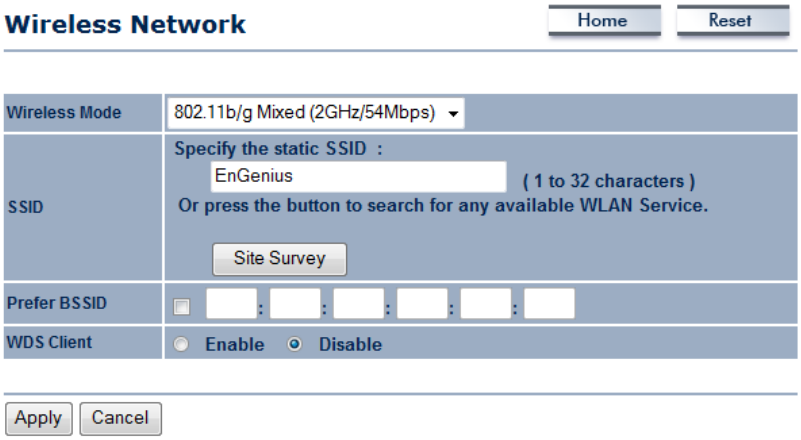
- **Spanning Tree Status**: Choose to enable or disable the spanning tree feature.
- **Bridge Hello Time**: Specify the Bridge Hello Time in seconds.
- **Bridge Max Age**: Specify the Bridge Max Age in seconds.
- **Bridge Forward Delay**: Specify the Bridge Forward Delay in seconds.
- **Priority**: Specify the Priority number.
- Click on the **Apply** button to save the changes.

5.4 Wireless

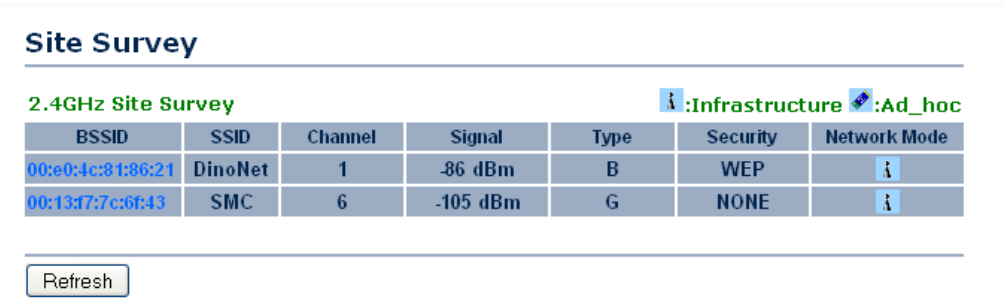
- The **Wireless** section of the left menu has the following options: **Wireless Network, Wireless Security,** and **Wireless Advanced Settings**. Each option is described below.

5.4.1 Wireless Network

- The **Wireless Network** page allows you to configure the wireless mode, channel, SSID, and security settings.

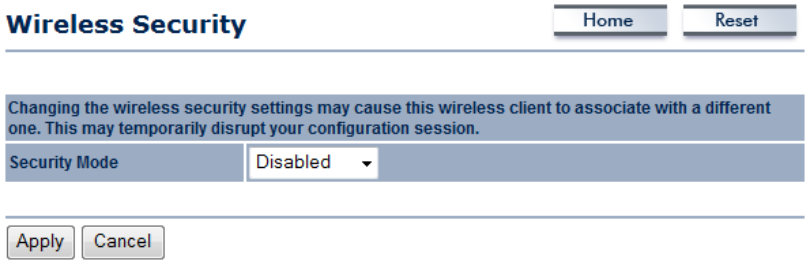


- **Wireless Mode**: Depending on the type of wireless clients that are connected to the network, you may select **B**, **G**, **B/G-mixed or Super-G**. If you are not sure about which clients will be accessing the wireless networks, it is recommended that you select **B/G-mixed** for the best performance.
- **SSID**: The SSID is a unique named shared amongst all the points of the wireless network. The SSID must be identical on all points of the wireless network and cannot exceed 32 characters. You may specify an SSID or select one from the **Site Survey**.
- **Site Survey**: Click on the **Site Survey** button in order to scan the 2.4GHz frequency for devices that broadcast their SSID. Click on the **BSSID** link to connect to the Access Point. Click on the **Refresh** button to re-scan the frequency.



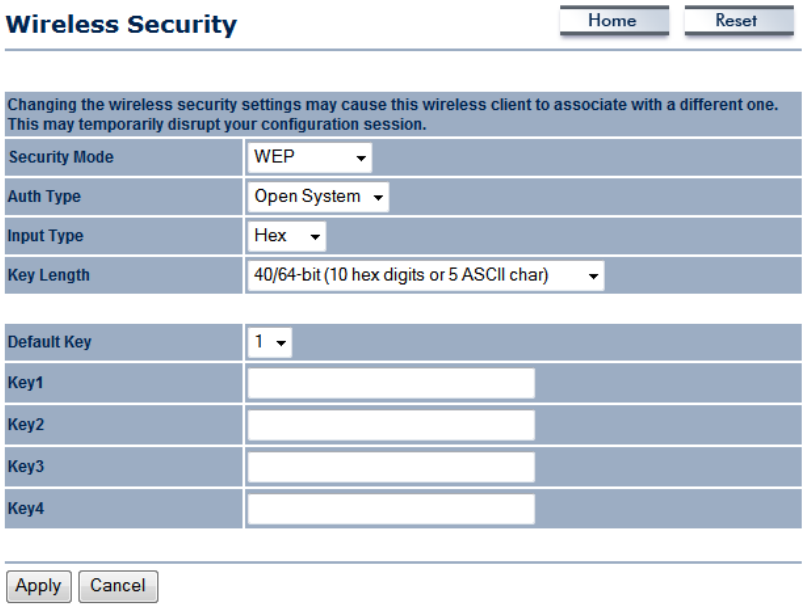
5.4.2 Wireless Security

- You can change the wireless security settings may cause this wireless client to associate with a different one. This may temporarily disrupt your configuration session.



Wireless Security : WEP

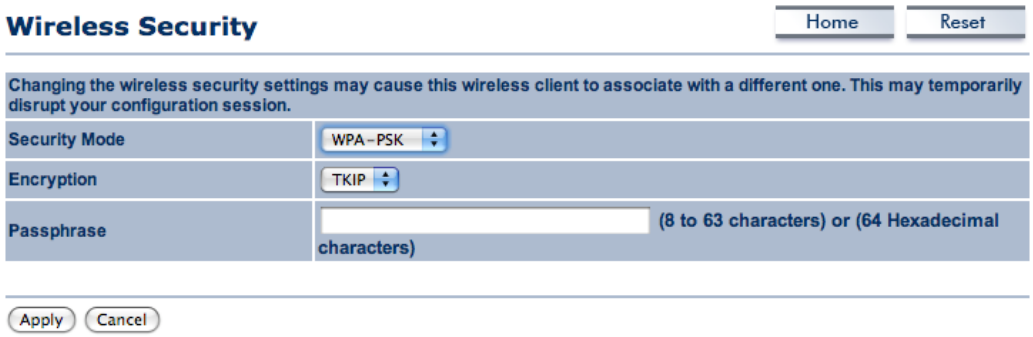
- **Security Mode**: Select **WEP** from the drop-down list if your wireless network uses WEP encryption. WEP is an acronym for Wired Equivalent Privacy, and is a security protocol that provides the same level of security for wireless networks as for a wired network.



- **Authentication Type:** Select an authentication method. Options available are **Open Key**, **Shared Key**. An open system allows any client to authenticate as long as it conforms to any MAC address filter policies that may have been set. All authentication packets are transmitted without encryption. Shared Key sends an unencrypted challenge text string to any device attempting to communicate with the Access Point. The device requesting authentication encrypts the challenge text and sends it back to the Access Point. If the challenge text is encrypted correctly, the Access Point allows the requesting device to authenticate. It is recommended to select Auto if you are not sure which authentication type is used.
- **Input Type**: Select Hex or ASCII from the drop-down list
- **Key Length**: Select a key format from the drop-down list. 64bit-hex keys require 10 characters, where as 128-bit keys require 26 characters and 152-bit keys require 32 characters. A hex key is defined as a number between 0 through 9 and letter between A through F and a through f.
- **Default Key**: You may use up to four different keys for four different networks. Select the current key that will be used.
- **Key 1-4**: You may enter four different WEP keys.
- Click on the **Apply** button to save the changes.

Wireless Security : WPA-PSK

- **Security Mode**: Select **WPA-PSK** from the drop-down list if your wireless network uses WPA pre-shared key.

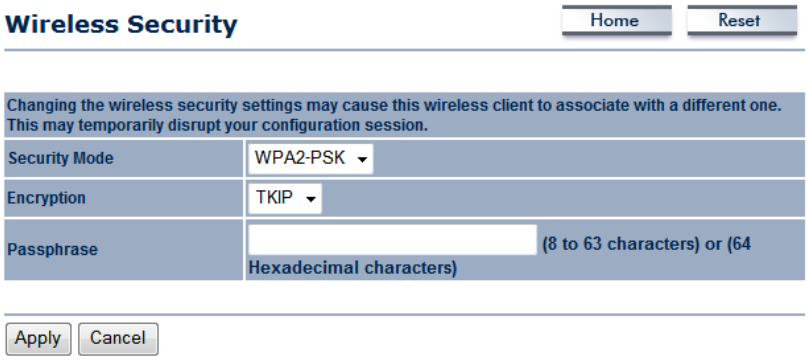


- **Encryption**: Select **TKIP** or **AES** from the drop-down list if your wireless network uses this encryption. WPA (Wi-Fi Protected Access) was designed to improve upon the security features of WEP (Wired Equivalent Privacy). The technology is designed to work with existing Wi-Fi products that have been enabled with WEP. WPA provides improved data encryption through the Temporal Integrity Protocol (TKIP), which scrambles the keys using a hashing algorithm and by adding an integrity checking feature which makes sure that keys haven't been tampered with. AES is an even more advanced method of encryption which offers the highest level of WPA/WPA2 security.
- **Passphrase**: Specify a passphrase that is shared amongst the Access Points and clients.

Click on the **Apply** button to save the changes.

Wireless Security : WPA2-PSK

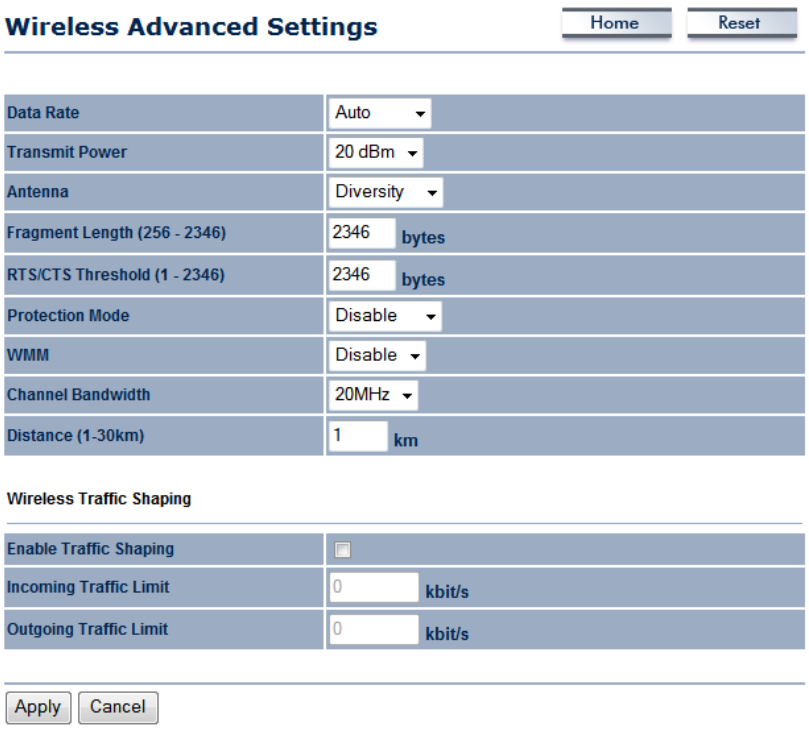
- **Security Mode**: Select **WPA2-PSK** from the drop-down list if your wireless network uses WPA2 pre-shared key.



- **Encryption**: Select **TKIP** or **AES** from the drop-down list if your wireless network uses this encryption. WPA (Wi-Fi Protected Access) was designed to improve upon the security features of WEP (Wired Equivalent Privacy). The technology is designed to work with existing Wi-Fi products that have been enabled with WEP. WPA provides improved data encryption through the Temporal Integrity Protocol (TKIP), which scrambles the keys using a hashing algorithm and by adding an integrity checking feature which makes sure that keys haven't been tampered with. AES is an even more advanced method of encryption which offers the highest level of WPA/WPA2 security.
- **Passphrase**: Specify a passphrase that is shared amongst the Access Points and clients.
- Click on the **Apply** button to save the changes.

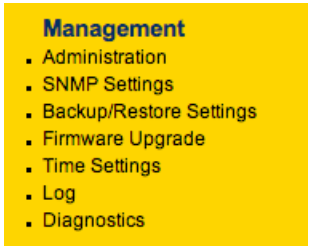
5.4.3 Wireless Advanced Settings

- On this page you can configure the advanced settings to tweak the performance of your wireless network. Options available are: data rate, transmit power, fragmentation threshold, RTS threshold, protection mode and distance.



- **Data Rate**: If you would like to force a data rate, you may select one from the drop-down list. However, for best performance it is recommended to use the **Auto** setting.
- **Transmit Power**: You may have the different application distance of the device by selecting a value from the drop-down list. This feature can be helpful in restricting the coverage area of the wireless network.
- **Antenna**: You can select the antenna polarization to Diversity, Horizontal or Vertical.
- **Fragment**: Packets over the specified size will be fragmented in order to improve performance on noisy networks.
- **RTS Threshold**: Packets over the specified size will use the RTS/CTS mechanism to maintain performance in noisy networks and preventing hidden nodes from degrading the performance.
- **Protection Mode**: If your wireless network is using both 802.11b and 802.g devices then it is recommended to enable this feature so that the 802.11b devices will not degrade the performance of 802.11g devices.
- **Distance (1-30km)**: Specify a distance between 1 and 30Km.
- **Wireless Traffic Shaping:** Specify the maximum bandwidth allocated to Incoming and Outgoing traffic.
- Click on the **Apply** button to save the changes.

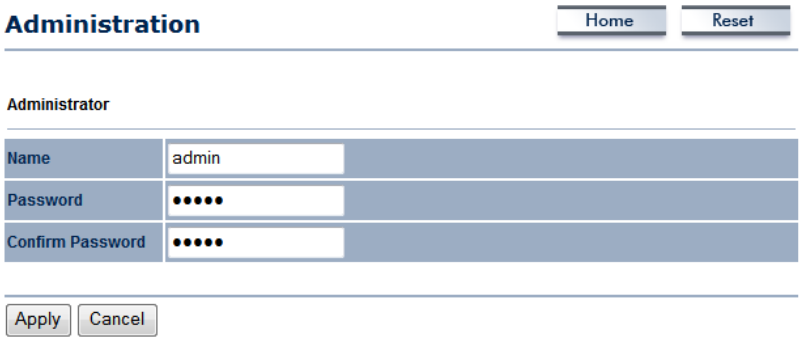
5.5 Management



- The following options are under the Management section of the left menu: **Administration, SNMP Settings, Backup/Restore Settings, Firmware Upgrade, Time Settings, Log** and **Diagnostics**. Each option is described below.

5.5.1 Administration

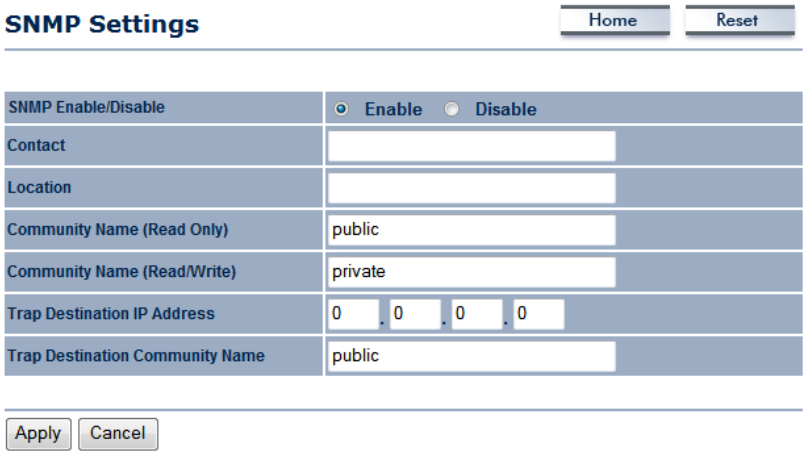
- This option allows you to create a user name and password for the device. By default, this device is configured without a user name and password **admin**. For security reasons it is highly recommended that you create a new user name and password.



- **Name**: Specify a user name into the first field.
- **Password**: Specify a password into this field and then re-type the password into the **Confirm Password** field.
- Click on the **Apply** button to save the changes.

5.5.2 SNMP Settings

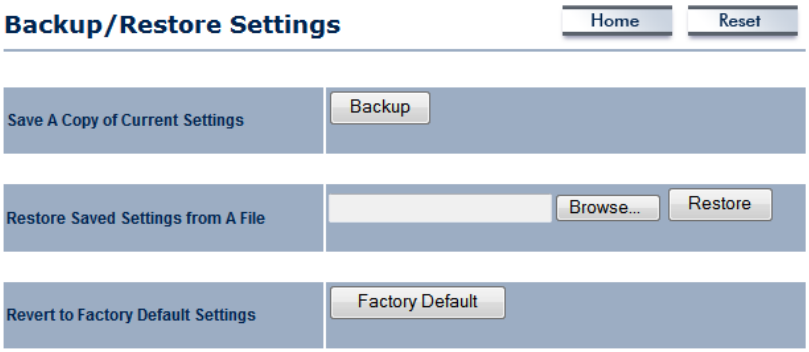
- This option allows you to assign the contact details, location, and community name and trap settings for SNMP. This is a networking management protocol used to monitor network-attached devices. SNMP allows messages (called protocol data units) to be sent to various parts of a network. Upon receiving these messages, SNMP-compatible devices (called agents) return data stored in their Management Information Bases.



- **SNMP Enable/Disable**: Choose to **enable** or **disable** the SNMP feature.
- **Contact**: Specify the contact details of the device.
- **Location**: Specify the location of the device.
- **Read-Only Community Name**: Specify the password for access the SNMP community for read only access.
- **Read-Write Community Name**: Specify the password for access to the SNMP community with read/write access.
- **Send SNMP Trap**: Specify the IP address of the computer that will receive the SNMP traps.
- **Trap Community Name**: Specify the password for the SNMP trap community.
- Click on the **Apply** button to save the changes.

5.5.3 Backup/Restore settings, Reset to factory default settings

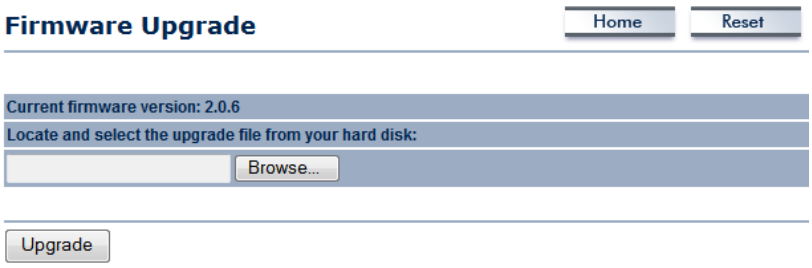
- This option is used to save the current settings of the device in a file on your local disk or load settings on to the device from a local disk. This feature is very handy for administrators who have several devices that need to be configured with the same settings.



- **Save a copy of the current settings**: Click on the Backup button to save the current configuration.
- **Restore saved settings from a file**: Once a file has been backed up, you may restore it by clicking on the Browse button to select the file, and then the **Restore** button.
- **Revert to factory default settings**: Click on the Factory Default Settings button to reset the device to the default settings. Please wait while the device restart and then access the device using the default IP address: **192.168.1.1**

5.5.4 Firmware Upgrade

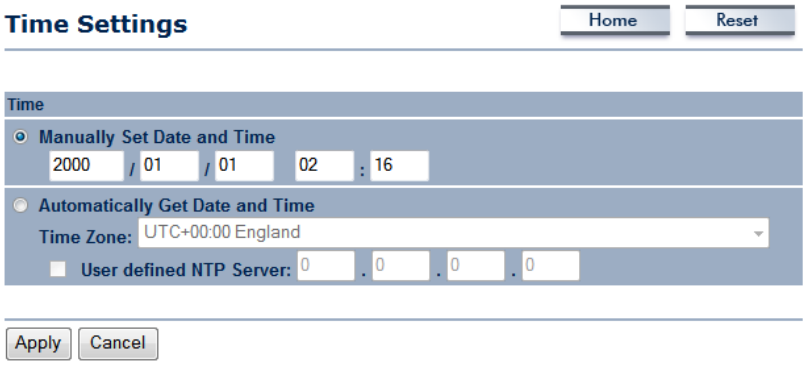
- This page is used to upgrade the firmware on the device. Make sure that downloaded the appropriate firmware from your vendor.



- Click on the **Browse** button and then select the appropriate firmware and then click on the **Upgrade** button.
  Note: The upgrade process may take about 1 minute to complete. Do not power off the device during this process as it may crash the device and make it unusable. The device will restart automatically once the upgrade is complete.

5.5.5 Time Settings

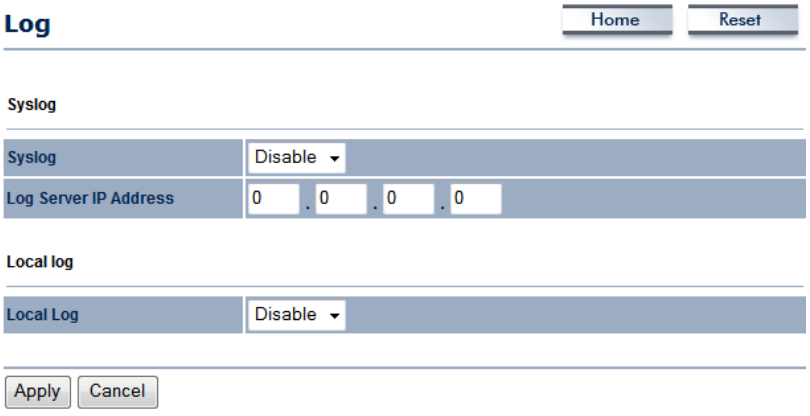
- This page allows you to configure the time on the device. You may do this manually or by connecting to a NTP server.



- **Manually Set Date and Time**: Specify the date and time
- **Automatically Get Date and Time**: Select the time zone from the drop down list and then specify the IP address of the NTP server.
- Click on the **Apply** button to save the changes.

5.5.6 Log

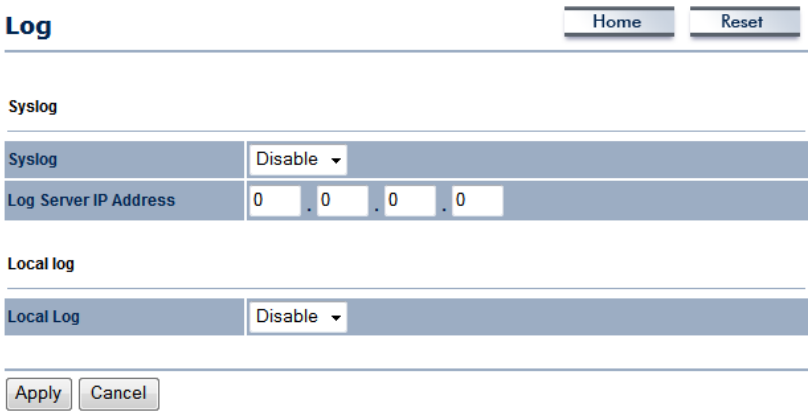
- Click on the **Log** link under the **Management** menu. The **Log** page displays a list of events that are triggered on the Ethernet and Wireless interface. This log can be referred when an unknown error occurs on the system or when a report needs to be sent to the technical support department for debugging purposes.



- **Syslog**: Choose to enable or disable the system log.
- **Log Server IP Address**: Specify the IP address of the server that will receive the system log.
- **Local Log**: Choose to enable or disable the local log.
- Click on the **Apply** button to save the changes.

5.5.7 Diagnostics

- Click on the **Diagnostics** link under the **Management** menu. In this page, user can let unit to ping other network equipment. And user also can monitor a route from unit to your target.

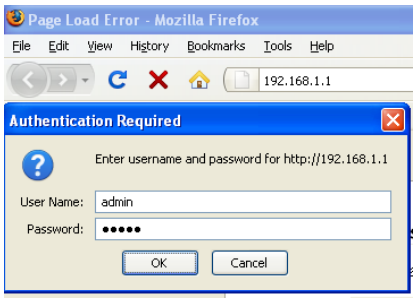


- **Ping Test Parameters** : User can input Target IP, Ping Size and Ping Quantity of other network device which connected you want. And then you can find the ping condition after click Start Ping.
- **Traceroute Test Parameters**: This function help user to monitor a network trace. User can input IP or domain name on Traceroute target.

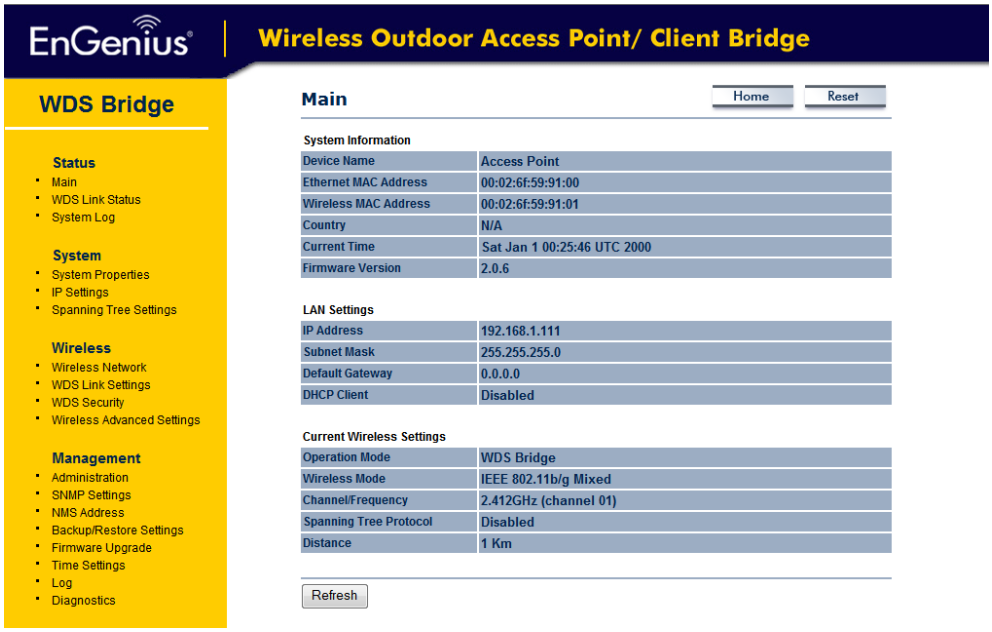
6 WDS Bridge Operating Mode

6.1 Logging In

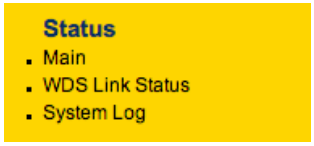
- To configure the device through the web-browser, enter the IP address of the device (default: **192.168.1.1**) into the address bar of the web-browser and press **Enter**.
- Make sure that the device and your computers are configured on the same subnet. Refer to **Chapter 2** in order to configure the IP address of your computer.
- After connecting to the IP address, the web-browser will display the login page.
- Specify **admin** for both the user name and password.
- After logging in you will graphical user interface (GUI) of the device. The navigation drop-down menu on left is divided into four sections:



1. **Status**: Displays the overall status, WDS link status and system log.
2. **System**: This menu includes the system properties, IP and Spanning Tree settings.
3. **Wireless**: This menu includes network setting, WDS link setting, WDS security and advanced setting.
4. **Management**: This menu includes the admin setup, SNMP, firmware upgrade, time setting, diagnostics and save/restore backup.



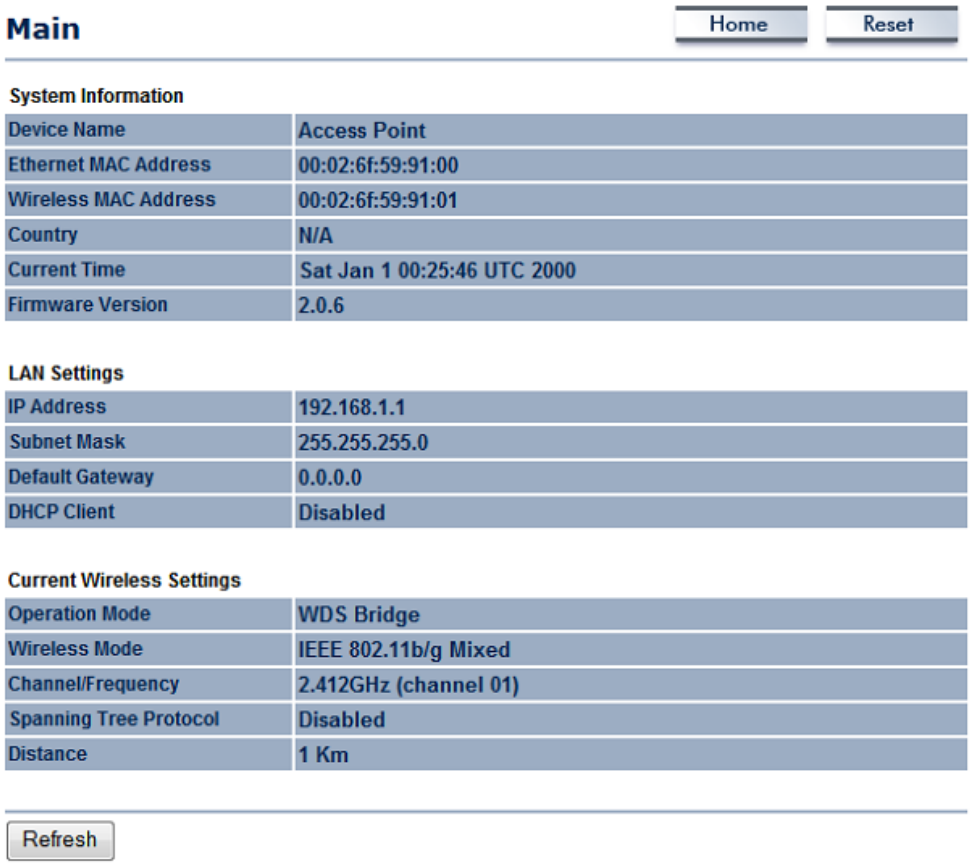
6.2 Status



- There are three options under the **Status** section of the left menu **Main, WDS Link Status**, and **System Log**. Each option is described in detail below.

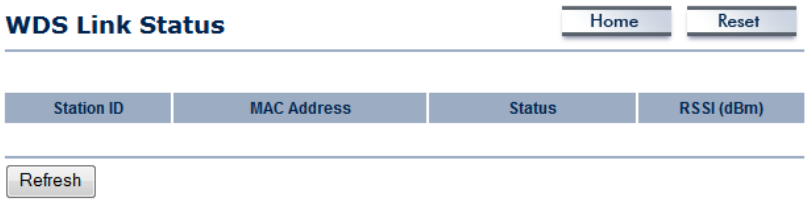
6.2.1 Main

- The status that is displayed corresponds with the operating mode that is selected. Information such as Device Name, Ethernet MAC Address, Wireless MAC Address, Country, Current Time and Firmware are displayed in the 'System Information' section. IP address, Subnet Mask, Default Gateway and DHCP Client are displayed in the 'LAN Settings' section. In the 'Current Wireless Settings' section, the Operation Mode, Wireless Mode, Channel/Frequency, Spanning Tree Protocol and Distance are displayed.



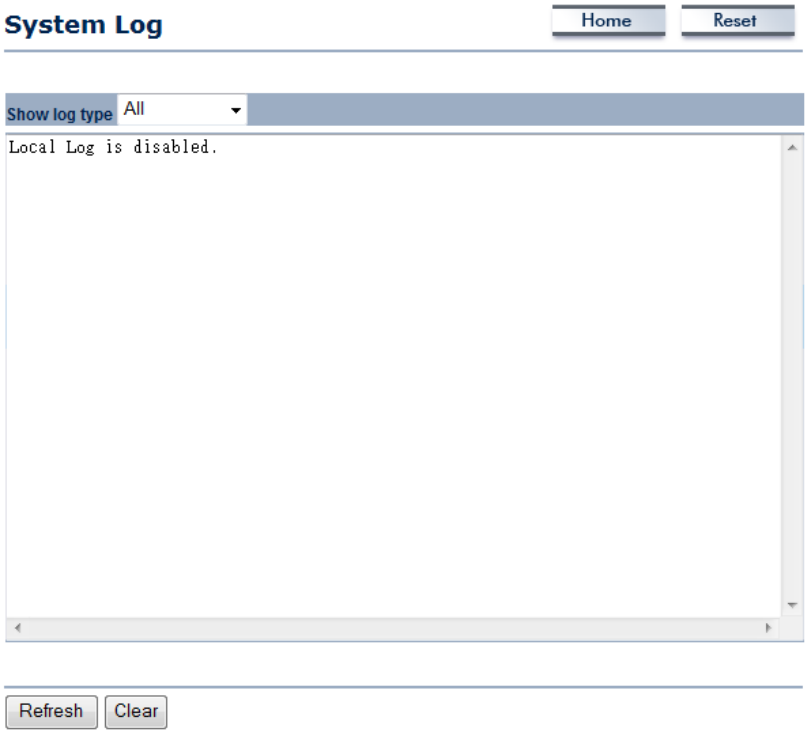
6.2.2 WDS Link Status

- This page displays the current status of the WDS Link, including Station ID, MAC address, Status, RSSI (Received Signal Strength Indicator).

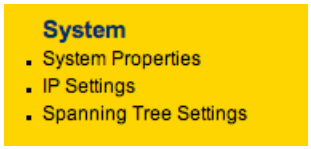


6.2.3 System Log

- The device automatically logs (records) events of possible interest in its internal memory. If there is not enough internal memory for all events, logs of older events are deleted, but logs of the latest events are retained.



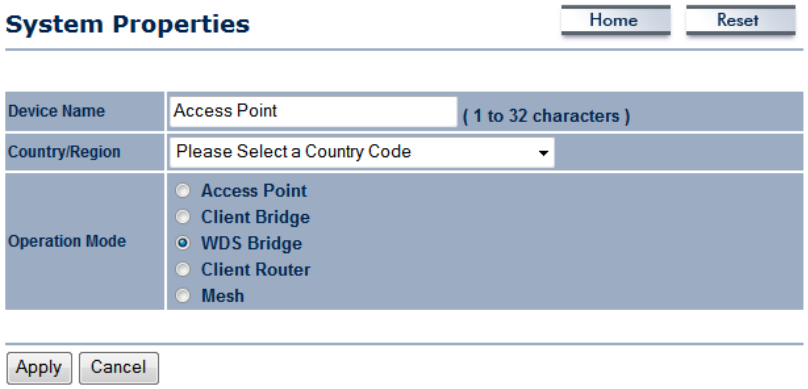
6.3 System



- Under the **System** section of the left menu, you will see the following options: **System Properties, IP Settings** and **Spanning Tree Settings**.

6.3.1 System Properties

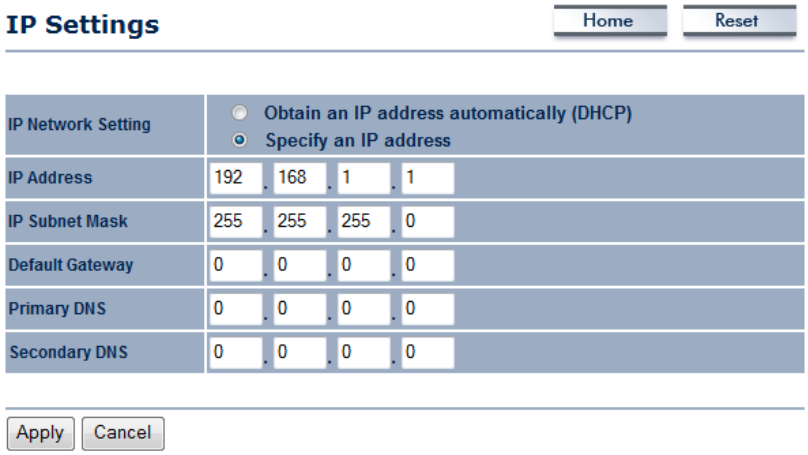
- This page allows you to switch the Operating Mode of the device, as well as specify a name and select the operating region.



- **Device Name**: Specify a name for the device (this is not the SSID),
- **Country/Region**: Select a country from the drop-down list.
- **Operating Mode**: Select an Operating Mode. Configuration for each Operating Mode is described in their respective chapters.
- Click on the **Apply** button to save the changes.

6.3.2 IP Settings

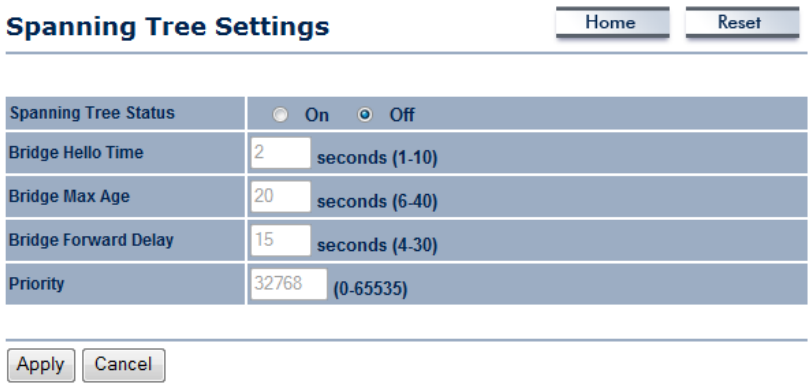
This page allows you to configure the device with a static IP address or a DHCP client.



- **IP Network Setting**: Select **Obtain an IP address automatically (DHCP)** radio button if the Access Point is connected to a DHCP server. This will allow the Access Point to pass IP addresses to the clients associated with it. You may select **Specify an IP Address** radio button if you would like the device to use a static IP address. In this case, you would be required to specify an IP address, subnet mask, and default gateway IP address.
- **IP Address**: Specify an IP address
- **IP Subnet Mask**: Specify the subnet mask for the IP address
- **Default Gateway**: Specify the IP address of the default gateway.
- Click on the **Apply** button to save the changes.

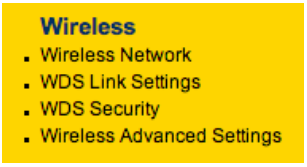
6.3.3 Spanning Tree Settings

Spanning-Tree Protocol is a link management protocol that provides path redundancy while preventing undesirable loops in the network.



- **Spanning Tree Status**: Choose to enable or disable the spanning tree feature.
- **Bridge Hello Time**: Specify the Bridge Hello Time in seconds.
- **Bridge Max Age**: Specify the Bridge Max Age in seconds.
- **Bridge Forward Delay**: Specify the Bridge Forward Delay in seconds.
- **Priority**: Specify the Priority number.
- Click on the **Apply** button to save the changes.

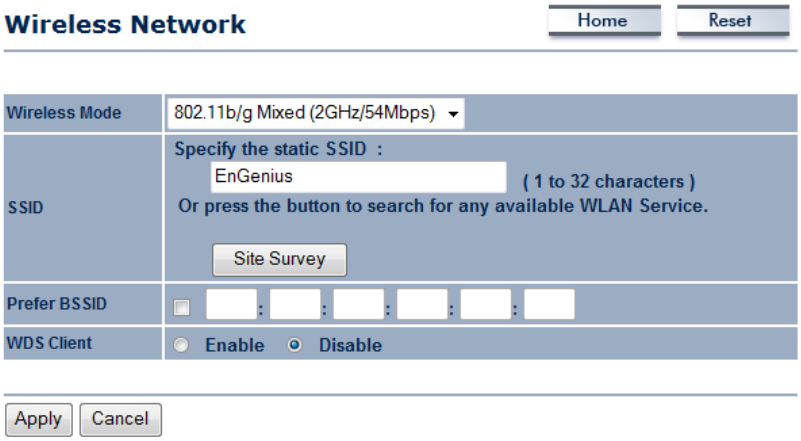
6.4 Wireless



- The **Wireless** section of the left menu has the following options: **Wireless Network, WDS Link Settings, WDS Security** and **Wireless Advanced Settings**. Each section is described in detail below.

6.4.1 Wireless Network

- The **Wireless Network** page allows you to configure the wireless mode, channel, SSID, and security settings.



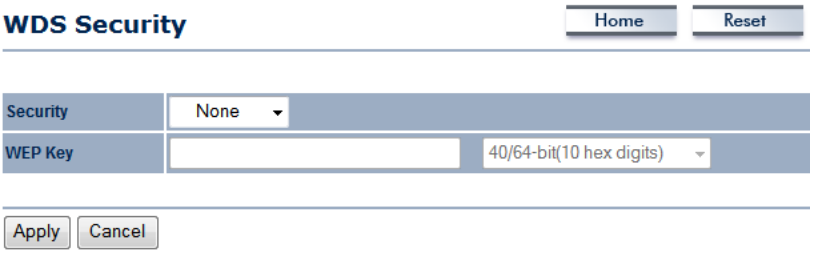
- **Wireless Mode**: Depending on the type of wireless clients that are connected to the network, you may select **B**, **G, B/G-mixed or Super-G**. If you are not sure about which clients will be accessing the wireless networks, it is recommended that you select **B/G-mixed** for the best performance.
- **Channel/Frequency**: Select a channel from the drop-down list. The channels available are based on the country's regulation.

6.4.2 WDS Link Settings

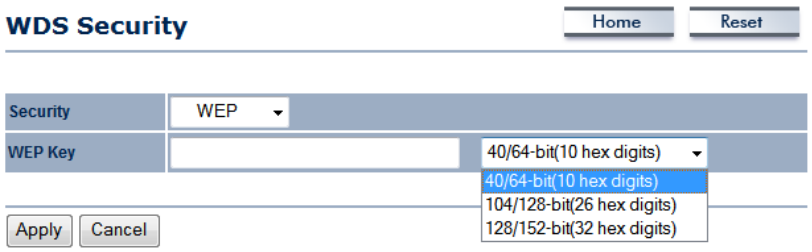
- This page allows you to setting your WDS device link up to 16 units.

- **MAC Address**: you can input the MAC address of WDS device, which you want to link.
- **Mode**: Enable to connect, and Disable to disconnect.
- Click on the **Apply** button to save the changes.

6.4.3 WDS Security



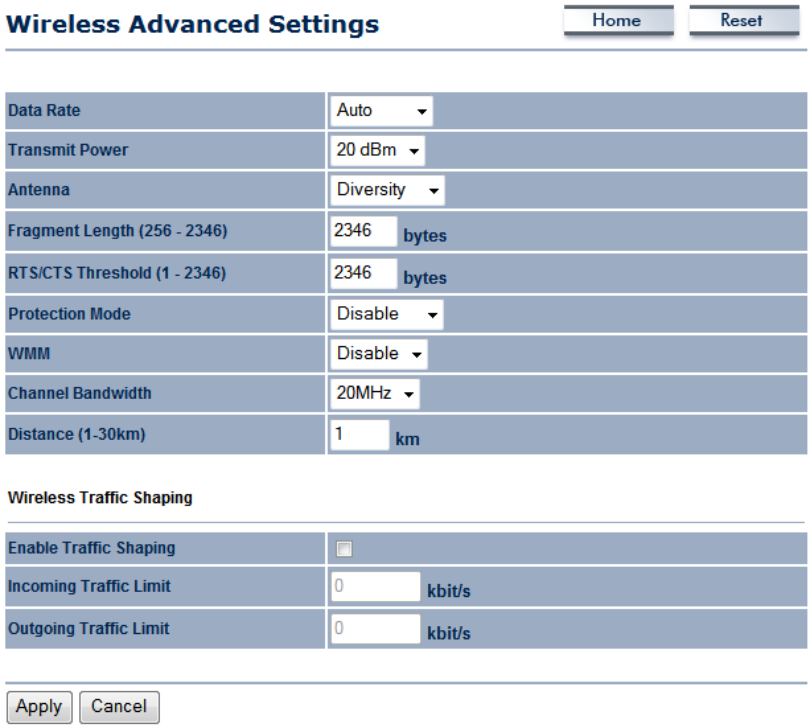
- **Security Mode**: Select **WEP** from the drop-down list if your wireless network uses WEP encryption. WEP is an acronym for Wired Equivalent Privacy, and is a security protocol that provides the same level of security for wireless networks as for a wired network.



- **WEP Key**: Select a key format from the drop-down list. 64bit-hex keys require 10 characters, where as 128-bit keys require 26 characters and 152-bits keys require 32 characters. A hex key is defined as a number between 0 through 9 and letter between A through F and a through f.
- Click on the **Apply** button to save the changes.

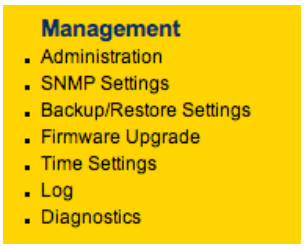
6.4.4 Wireless Advanced Settings

On this page you can configure the advanced settings to tweak the performance of your wireless network. Options available are: Data Rate, Transmit Power, Fragment Length, RTS Threshold, Protection Mode and Distance.



- **Data Rate**: If you would like to have a fixed data rate, you may select one from the drop-down list. However, for best performance it is recommended to use the **Auto** setting.
- **Transmit Power**: You may have the different application distance of the device by selecting a value from the drop-down list. This feature can be helpful in restricting the coverage area of the wireless network.
- **Antenna**: You can select the antenna polarization to Diversity, Horizontal or Vertical.
- **Fragment Length**: Packets over the specified size will be fragmented in order to improve performance on noisy networks.
- **RTS/CTS Threshold**: Packets over the specified size will use the RTS/CTS mechanism to maintain performance in noisy networks and preventing hidden nodes from degrading the performance.
- **Protection Mode**: If your wireless network is using both 802.11b and 802.g devices then it is recommended to enable this feature so that the 802.11b devices will not degrade the performance of 802.11g devices.
- **WMM**: Enable wireless Quality of Service
- **Distance (1-30km)**: Specify a distance between 1 and 30Km.
- **Wireless Traffic Shaping:** Specify the maximum bandwidth allocated to Incoming and Outgoing traffic.
- Click on the **Apply** button to save the changes.

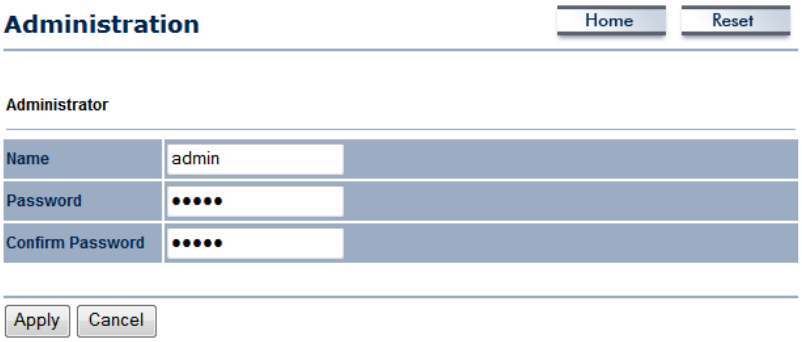
6.5 Management



- The following options are under the **Management** section of the left menu: **Administration, SNMP Settings, Backup/Restore Settings, Firmware Upgrade, Time Settings, Log** and **Diagnostics**. Each option is described below.

6.5.1 Administration

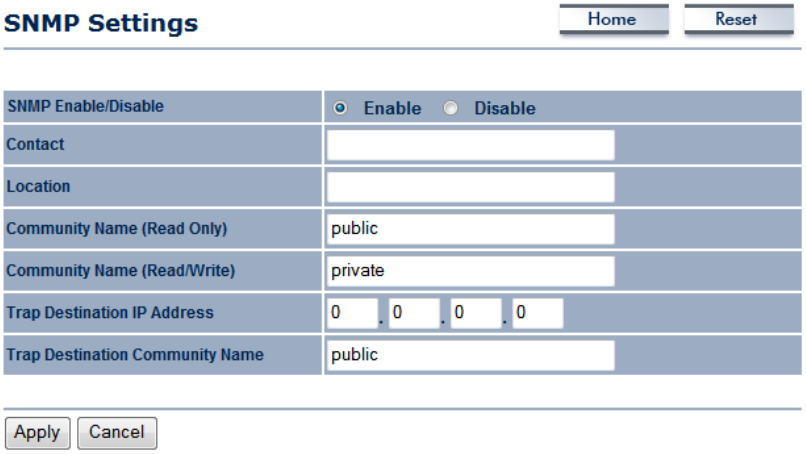
- This option allows you to create a user name and password for the device. By default, this device is configured without a user name and password **admin**. For security reasons it is highly recommended that you create a new user name and password.



- **Name**: Specify a user name into the first field.
- **Password**: Specify a password into this field and then re-type the password into the **Confirm Password** field.
- Click on the **Apply** button to save the changes.

6.5.2 SNMP Settings

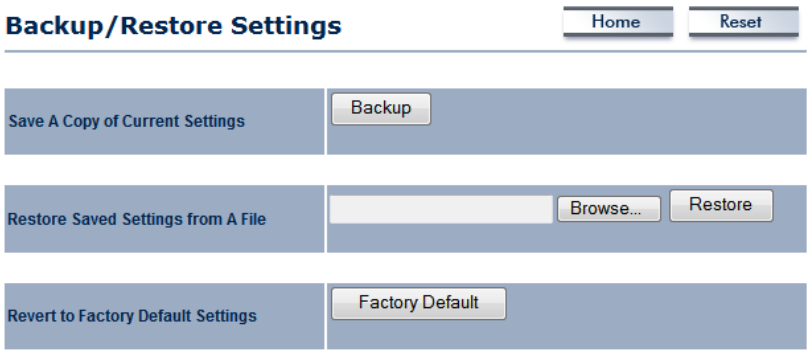
- This option allows you to assign the contact details, location, and community name and trap settings for SNMP. This is a networking management protocol used to monitor network-attached devices. SNMP allows messages (called protocol data units) to be sent to various parts of a network. Upon receiving these messages, SNMP-compatible devices (called agents) return data stored in their Management Information Bases. .



- **SNMP Enable/Disable**: Choose to **enable** or **disable** the SNMP feature.
- **Contact**: Specify the contact details of the device.
- **Location**: Specify the location of the device.
- **Read-Only Community Name**: Specify the password for access the SNMP community for read only access.
- **Read-Write Community Name**: Specify the password for access to the SNMP community with read/write access.
- **Trap Destination IP Address**: Specify the IP address of the computer that will receive the SNMP traps.
- **Trap Destination Community Name**: Specify the password for the SNMP trap community.
- Click on the **Apply** button to save the changes.

6.5.3 Backup/Restore settings, Reset to factory default settings

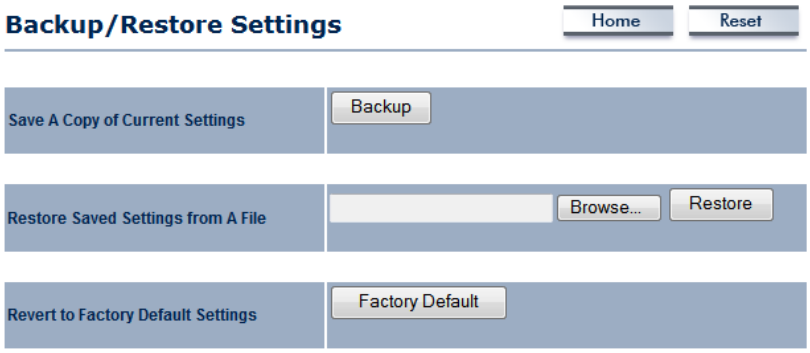
- This option is used to save the current settings of the device in a file on your local disk or load settings on to the device from a local disk. This feature is very handy for administrators who have several devices that need to be configured with the same settings.



- **Save a copy of the current settings**: Click on the Backup button to save the current configuration.
- **Restore saved settings from a file**: Once a file has been backed up, you may restore it by clicking on the Browse button to select the file, and then the **Restore** button.
- **Revert to factory default settings**: Click on the Factory Default Settings button to reset the device to the default settings. Please wait while the device restart and then access the device using the default IP address: **192.168.1.1**

6.5.4 Firmware Upgrade

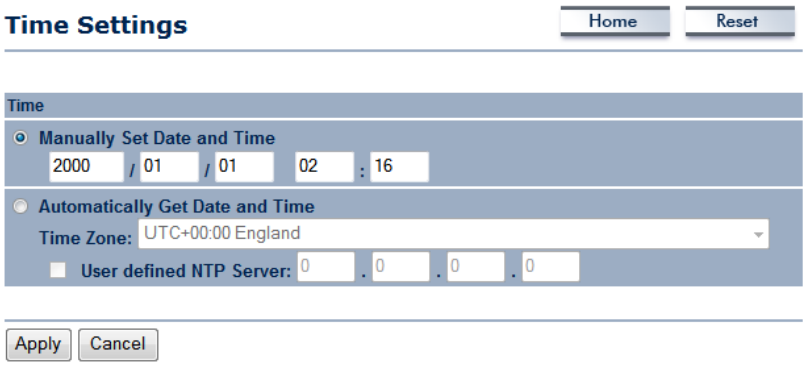
- This page is used to upgrade the firmware on the device. Make sure that downloaded the appropriate firmware from your vendor.



- Click on the **Browse** button and then select the appropriate firmware and then click on the **Upgrade** button.
  Note: The upgrade process may take about 1 minute to complete. Do not power off the device during this process as it may crash the device and make it unusable. The device will restart automatically once the upgrade is complete.

6.5.5 Time Settings

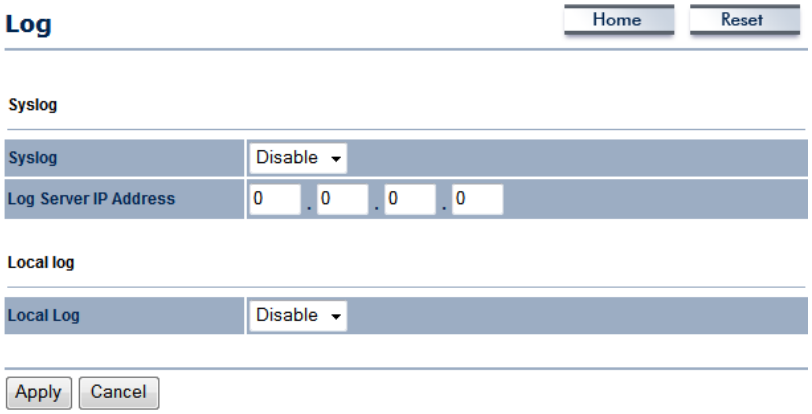
- This page allows you to configure the time on the device. You may do this manually or by connecting to a NTP server.



- **Manually Set Date and Time**: Specify the date and time
- **Automatically Get Date and Time**: Select the time zone from the drop down list and then specify the IP address of the NTP server.
- Click on the **Apply** button to save the changes.

6.5.6 Log

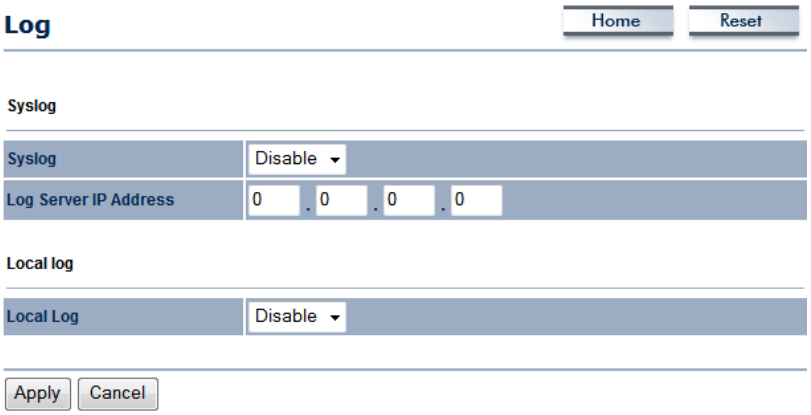
- **Log** page displays a list of events that are triggered on the Ethernet and Wireless interface. This log can be referred when an unknown error occurs on the system or when a report needs to be sent to the technical support department for debugging purposes.



- **Syslog**: Choose to enable or disable the system log.
- **Log Server IP Address**: Specify the IP address of the server that will receive the system log.
- **Local Log**: Choose to enable or disable the local log.
- Click on the **Apply** button to save the changes.

6.5.7 Diagnostics

- In this page, user can let unit to ping other network equipment. And user also can monitor a route from unit to your target.

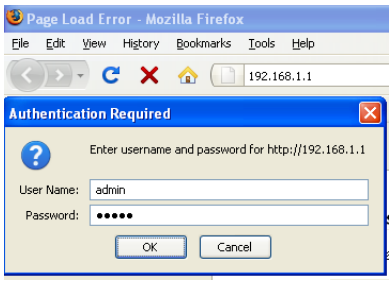


- **Ping Test Parameters** : User can input Target IP, Ping Size and Ping Quantity of other network device which connected you want. And then you can find the ping condition after click **Start Ping**.
- **Traceroute Test Parameters**: This function help user to monitor a network trace. User can input IP or domain name on Traceroute target.

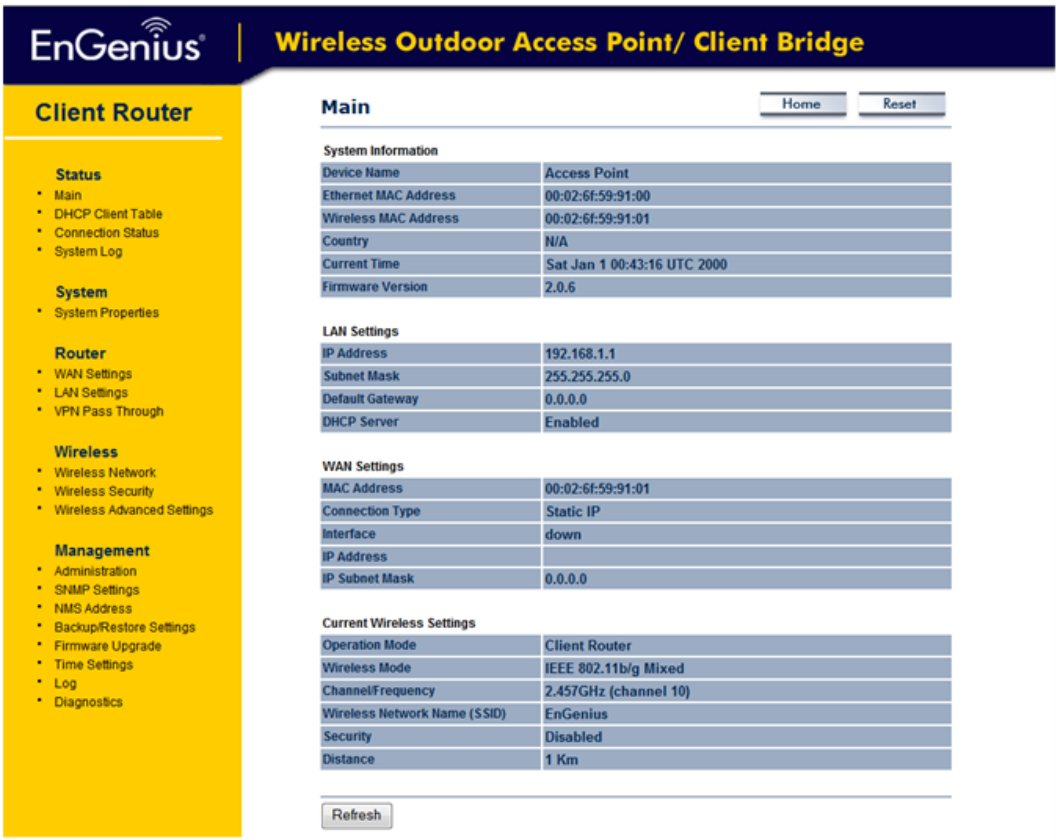
7 Client Router Operating Mode

7.1 Logging In

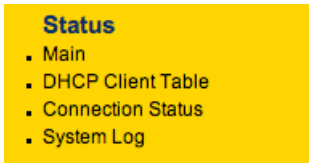
- To configure the device through the web-browser, enter the IP address of the device (default: **192.168.1.1**) into the address bar of the web-browser and press **Enter**.
- Make sure that the device and your computers are configured on the same subnet. Refer to **Chapter 2** in order to configure the IP address of your computer.
- After connecting to the IP address, the web-browser will display the login page.
- Specify **admin** for both the user name and password.
- After logging in you will graphical user interface (GUI) of the device. The navigation drop-down menu on left is divided into four sections:



1. **Status**: Displays the overall status, DHCP client table, connection status and system log.
2. **System**: This menu includes the system properties.
3. **Router**: This includes WAN, LAN, and VPN settings.
4. **Wireless**: This menu includes wireless network, security and advanced settings.
5. **Management**: This menu includes the admin setup, SNMP settings, firmware upgrade, save/restore backup, time setting and diagnostics.



7.2 Status



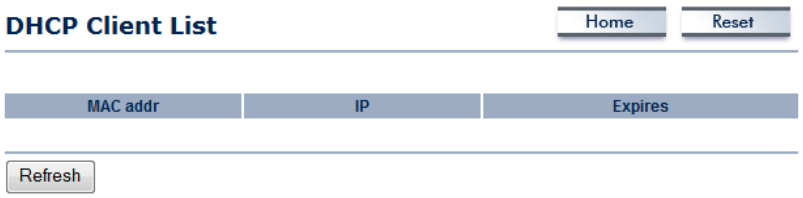
- Under the **Status** section of the left menu, you will see the following options: **Main, DHCP Client Table, Connection Status** and **System Log**. Each option is described in detail below.

7.2.1 Main

- The status that is displayed corresponds with the operating mode that is selected. Information such as Device Name, MAC Address, Country, Current and Firmware Version are displayed in the 'System Information' section. IP Address, Subnet Mask, Default Gateway and DHCP Server condition are displayed in the 'LAN Settings' section. In the 'WAN Settings', MAC Address, Connection Type, Interface and IP Address/Subnet Mask are displayed. The 'Current Wireless Settings' section displays Operation Mode, Wireless Mode, Channel/Frequency, SSID, Security and Distance control.

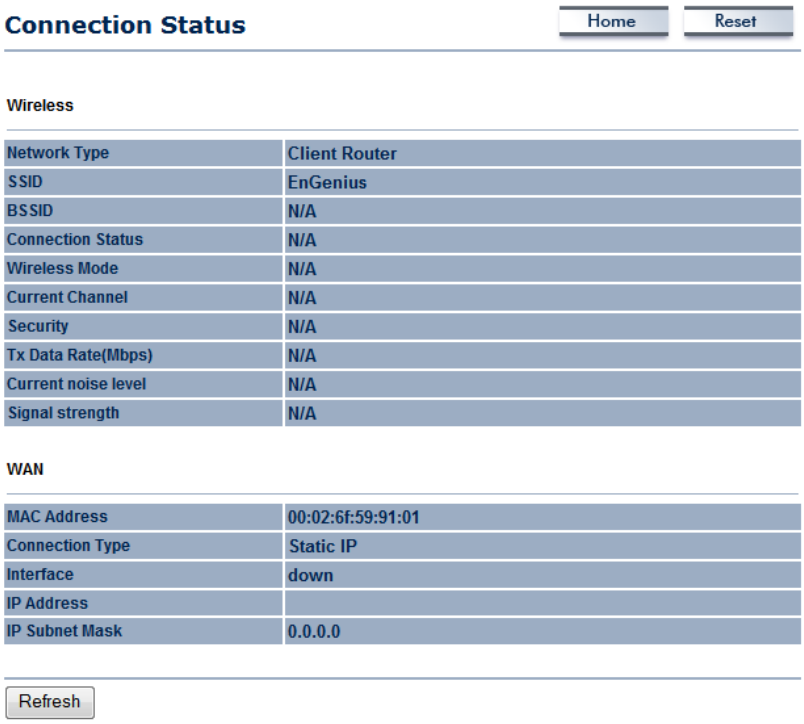
7.2.2 DHCP Client Table

- This page displays the current status of all DHCP clients, including MAC address, IP and Expires information.



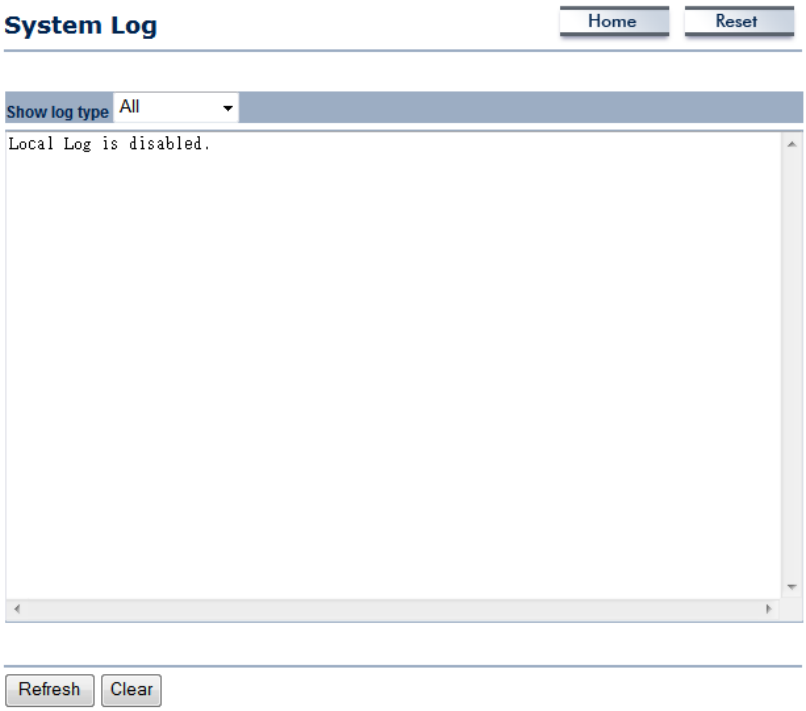
7.2.3 Connection Status

This page displays the current status of the network, including network type, SSID, BSSID, connection status, wireless mode, current channel, security, data rate, noise level and signal strength.

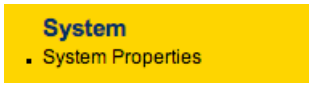


7.2.4 System Log

The device automatically logs (records) events of possible interest in its internal memory. If there is not enough internal memory for all events, logs of older events are deleted, but logs of the latest events are retained.


System Log
Home
Reset
Show log type
All
Local Log is disabled.
Refresh
Clear

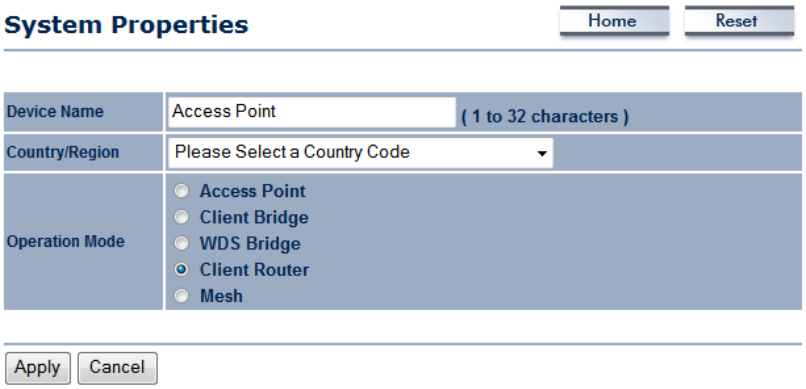
7.3 System



- Under the **System** section of the left menu, you will see the following options: **System Properties**, which is described below.

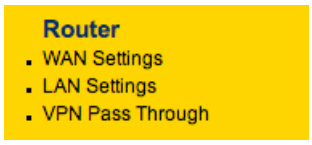
7.3.1 System Properties

- This page allows you to switch the operating mode of the device, as well as specify a name and select the operating region.



- **Device Name**: Specify a name for the device (this is not the SSID),
- **Country/Region**: Select a country from the drop-down list.
- **Operating Mode**: Select operating mode. Configuration for each operating mode is described in their respective chapters.
- Click on the **Apply** button to save the changes.

7.4 Router



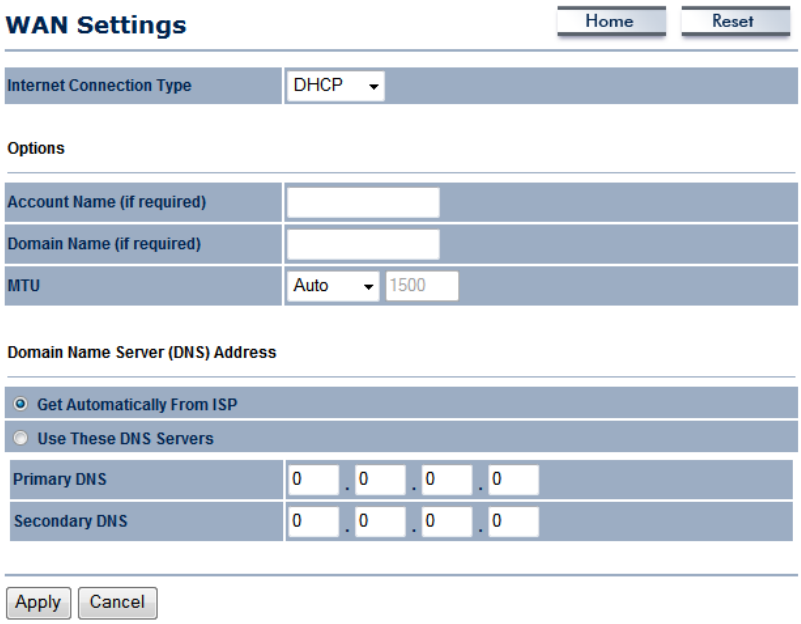
- Under the **Router** section of the left menu, you will see the following options: **WAN Settings, LAN Settings**, and **VPN Pass Through**. Each section is described in detail below.

7.4.1 WAN Settings

- This page allows you to configure the WAN interface as DHCP, Static IP, PPPoE or PPTP.

7.4.1.1 WAN – DHCP

- The WAN interface can be configured as a DHCP Client in which the ISP provides the IP address to the device. This is also known as Dynamic IP.

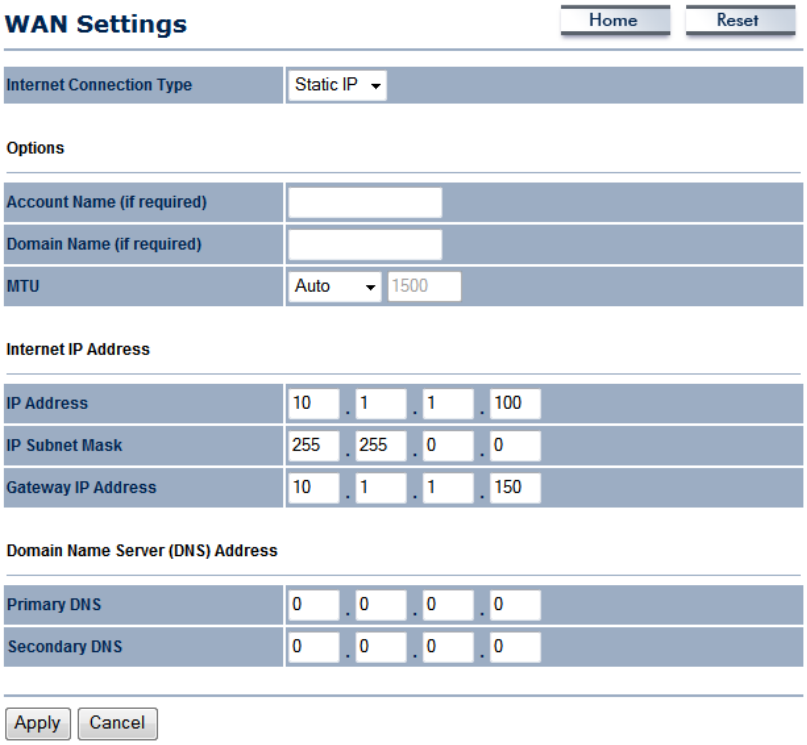


- **Internet Connection Type**: Select the **DHCP** from the drop-down list.
- **Account Name**: Specify an account name if your ISP has provided you with one.
- **Domain Name**: Specify a domain name if the ISP has provided you with one.
- **MTU**: The Maximum Transmission Unit (MTU) is a parameter that determines the largest packet size (in bytes) that the router will send to the WAN. If LAN devices send larger packets, the router will break them into smaller packets. Ideally, you should set this to match the MTU of the connection to your ISP. Typical value is 1500 bytes for an Ethernet connection. If the router's MTU is set too high, packets will be fragmented downstream. If the router's MTU is set too low, the router will fragment packets unnecessarily and in extreme cases may be unable to establish some connections. In either case, network performance can suffer.

- **Domain Name Service**: Select **Get Automatically from ISP** if the ISP will provide the DNS address, if not, select **Use these DNS servers** and specify the primary and secondary DNS server IP address.
- Click on the **Apply** button to save the changes.

7.4.1.2 WAN – Static IP

- The WAN interface can be configured as Static IP address. In this type of connection, your ISP provides you with a dedicated IP address (which does not change as DHCP).

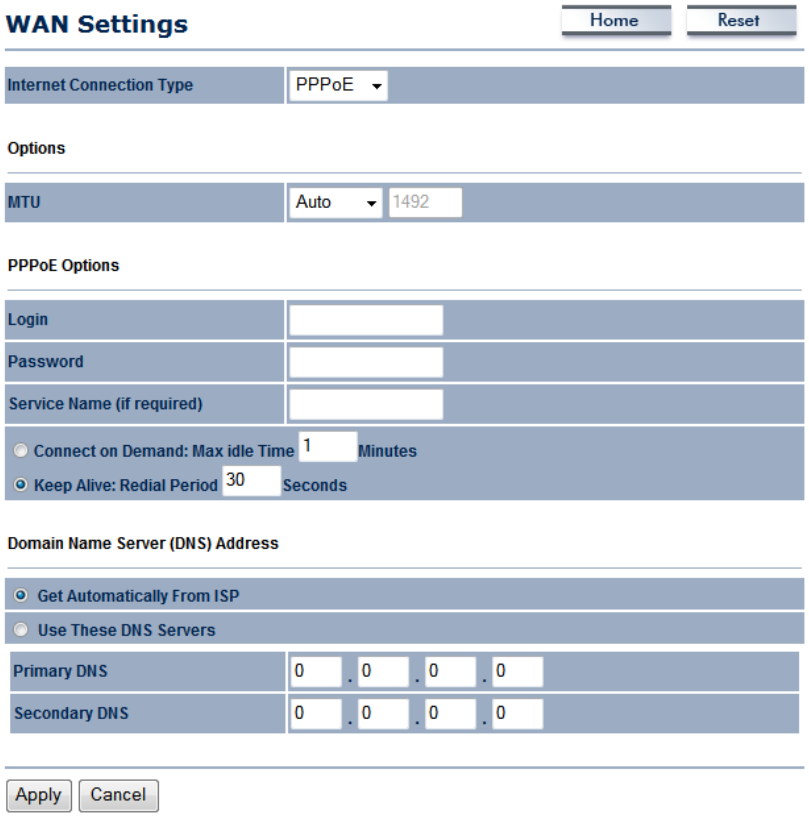


- **Internet Connection Type**: Select the **Static IP** from the drop-down list.
- **Account Name**: Specify an account name if your ISP has provided you with one.
- **Domain Name**: Specify a domain name if the ISP has provided you with one.
- **MTU**: The Maximum Transmission Unit (MTU) is a parameter that determines the largest packet size (in bytes) that the router will send to the WAN. If LAN devices send larger packets, the router will break them into smaller packets. Ideally, you should set this to match the MTU of the connection to your ISP. Typical value is 1500 bytes for an Ethernet connection. If the router's MTU is set too high, packets will be fragmented downstream. If the router's MTU is set too low, the router will fragment packets unnecessarily and in extreme cases may be unable to establish some connections. In either case, network performance can suffer.
- **IP Address:** Specify the IP address for this device, which is assigned by your ISP.
- **Subnet Mask:** Specify the subnet mask for this IP address, which is assigned by your ISP.

- **Gateway IP Address:** Specify the IP address of the default gateway, which is assigned by your ISP.
- **Domain Name Service**: Specify the primary and secondary DNS server IP address.
- Click on the **Apply** button to save the changes.

7.4.1.3 WAN – PPPoE

- The WAN interface can be configured as PPPoE. This type of connection is usually used for a DSL service and requires a username and password to connect.

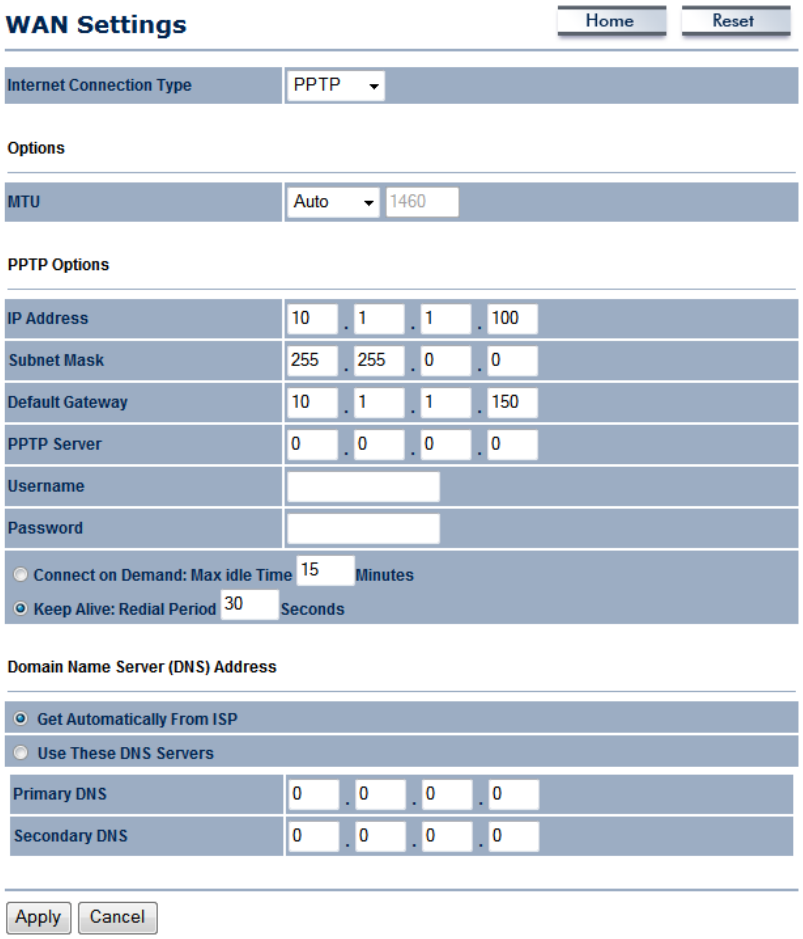


- **Internet Connection Type**: Select **PPPoE** from the drop-down list.
- **MTU**: The Maximum Transmission Unit (MTU) is a parameter that determines the largest packet size (in bytes) that the router will send to the WAN. If LAN devices send larger packets, the router will break them into smaller packets. Ideally, you should set this to match the MTU of the connection to your ISP. Typical values are 1500 bytes for an Ethernet connection. If the router's MTU is set too high, packets will be fragmented downstream. If the router's MTU is set too low, the router will fragment packets unnecessarily and in extreme cases may be unable to establish some connections. In either case, network performance can suffer.
- **Login**: Specify the user name which is provided by your ISP.
- **Password:** Specify the password which is provided by your ISP, and then verify it once again in the next field.
- **Service Name**: Specify the name of the ISP.

- **Type**: Select a reconnection type: **Keep Alive** (A connection to the Internet is always maintained), **Connect on Demand**: You have to open up the Web-based management interface and click the **Connect** button manually any time that you wish to connect to the Internet.
- **Domain Name Service**: Select **Get Automatically from ISP** if the ISP will provide the DNS address, if not, select **Use these DNS servers** and specify the primary and secondary DNS server IP address.
- Click on the **Apply** button to save the changes.

7.4.1.4 WAN – PPTP

- The WAN interface can be configured as PPTP. This type of connection is usually used for a DSL service and requires a username and password to connect.



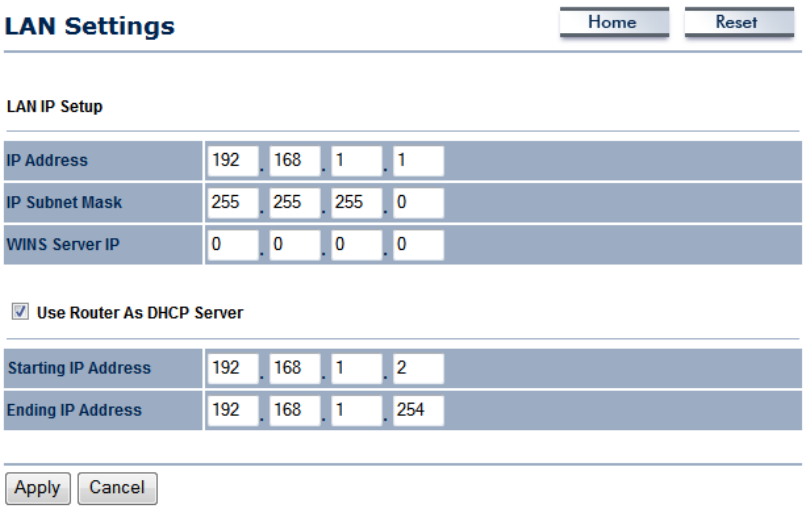
- **Internet Connection Type**: Select **PPPoE** from the drop-down list.
- **MTU**: The Maximum Transmission Unit (MTU) is a parameter that determines the largest packet size (in bytes) that the router will send to the WAN. If LAN devices send larger

packets, the router will break them into smaller packets. Ideally, you should set this to match the MTU of the connection to your ISP. Typical value is 1500 bytes for an Ethernet connection. If the router's MTU is set too high, packets will be fragmented downstream. If the router's MTU is set too low, the router will fragment packets unnecessarily and in extreme cases may be unable to establish some connections. In either case, network performance can suffer.

- **PPTP Options**: Specify IP address, subnet mask, default gateway and PPTP server.
- **Username**: Specify the user name which is provided by your ISP.
- **Password:** Specify the password which is provided by your ISP, and then verify it once again in the next field.
- **Type**: Select a reconnection type: **Keep Alive** (A connection to the Internet is always maintained), **Connect on Demand**: You have to open up the Web-based management interface and click the **Connect** button manually any time that you wish to connect to the Internet.
- **Domain Name Service**: Select **Get Automatically from ISP** if the ISP will provide the DNS address, if not, select **Use these DNS servers** and specify the primary and secondary DNS server IP address.
- Click on the **Apply** button to save the changes.

7.4.2 LAN Settings

This page allows you to configure the LAN interface as IP address, IP subnet mask and WINS server IP. When you enable 'Use Router As DHCP Server', specify the IP address from starting to ending.



7.4.3 VPN Pass Through

- This page allows you to enable the pass through feature.

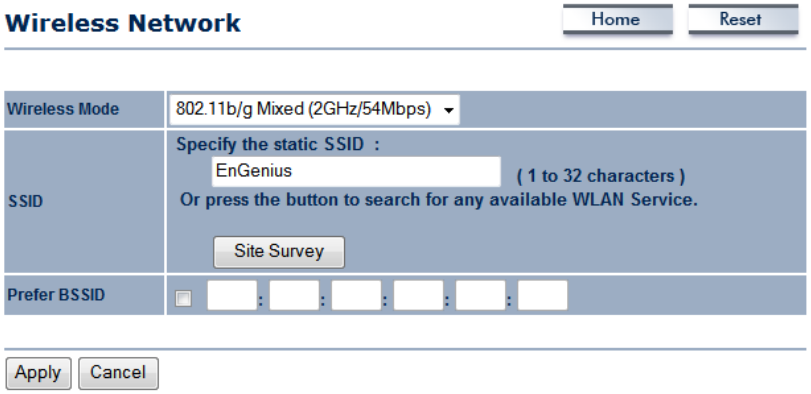
- **PPTP Pass Through**: Place a check in this box if you would like to enable this pass through. PPTP is a protocol (set of communication rules) that allows corporations to extend their own corporate network through private "tunnels"
- **L2TP Pass Through**: Place a check in this box if you would like to enable this pass through. Layer 2 Tunneling Protocol is a transport protocol that enables tunneling through the Internet for the establishment of virtual private networks.
- **IPSec Pass Through**: Place a check in this box if you would like to enable this pass through. IPSec is a VPN protocol used to implement secure exchange of packets at the IP layer.
- Click on the **Apply** button to save the changes.

7.5 Wireless

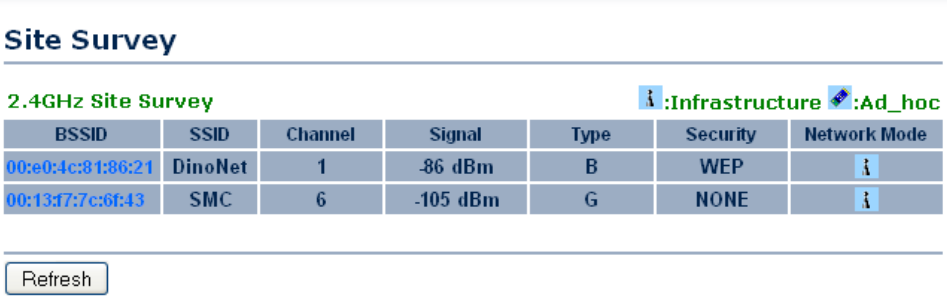
- Under the **Wireless** section of the left menu, you will see the following options: **Wireless Network, Wireless Security,** and **Wireless Advanced Settings**. Each option is described below.

7.5.1 Wireless Network

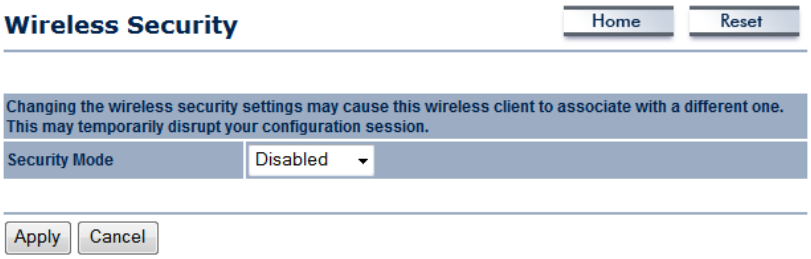
- The **Wireless Network** page allows you to configure the wireless mode, channel, SSID, and security settings.



- **Wireless Mode**: Depending on the type of wireless clients that are connected to the network, you may select **B**, **G**, **B/G-mixed or Super-G**. If you are not sure about which clients will be accessing the wireless networks, it is recommended that you select **B/G-mixed** for the best performance.
- **SSID**: The SSID is a unique named shared amongst all the points of the wireless network. The SSID must be identical on all points of the wireless network and cannot exceed 32 characters. You may specify an SSID or select one from the **Site Survey**.
- **Site Survey**: Click on the **Site Survey** button in order to scan the 2.4GHz frequency for devices that broadcast their SSID. Click on the **BSSID** link to connect to the Access Point. Click on the **Refresh** button to re-scan the frequency.

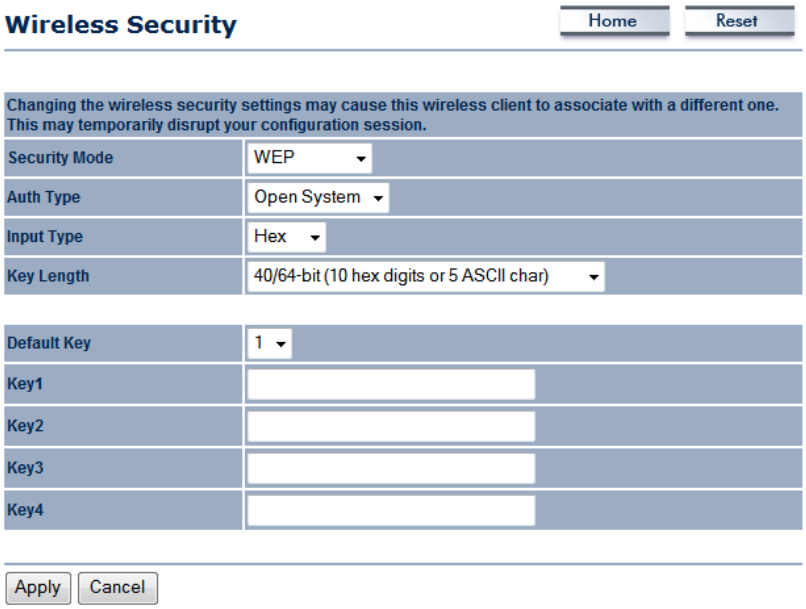


7.5.2 Wireless Security



7.5.2.1 Wireless Security : WEP

- **Security Mode**: Select **WEP** from the drop-down list if your wireless network uses WEP encryption. WEP is an acronym for Wired Equivalent Privacy, and is a security protocol that provides the same level of security for wireless networks as for a wired network.

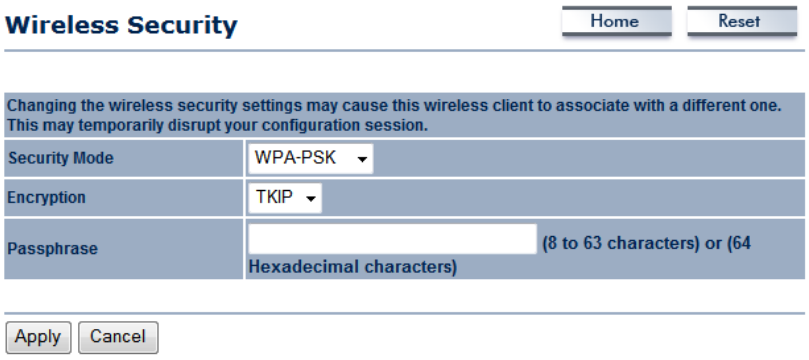


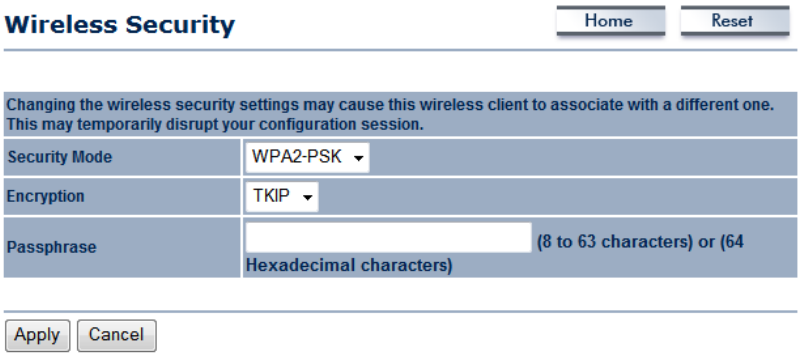
- **Authentication Type:** Select an authentication method. Options available are **Open Key**, **Shared Key**. An open system allows any client to authenticate as long as it conforms to any MAC address filter policies that may have been set. All authentication packets are transmitted without encryption. Shared Key sends an unencrypted challenge text string to any device attempting to communicate with the Access Point. The device requesting authentication encrypts the challenge text and sends it back to the Access Point. If the challenge text is encrypted correctly, the Access Point allows the requesting device to authenticate. It is recommended to select Auto if you are not sure which authentication type is used.
- **Input Type**: Select Hex or ASCII from the drop-down list
- **Key Length**: Select a key format from the drop-down list. 64bit-hex keys require 10 characters, where as 128-bit keys require 26 characters. A hex key is defined as a number between 0 through 9 and letter between A through F and a through f.

- **Default Key**: You may use up to four different keys for four different networks. Select the current key that will be used.
- **Key 1-4**: You may enter four different WEP keys.
- Click on the **Apply** button to save the changes.

7.5.2.2 Wireless Security : WPA-PSK, WPA2-PSK,

- **Security Mode**: Select **WPA-PSK or WPA2-PSK** from the drop-down list if your wireless network uses WPA pre-shared key.

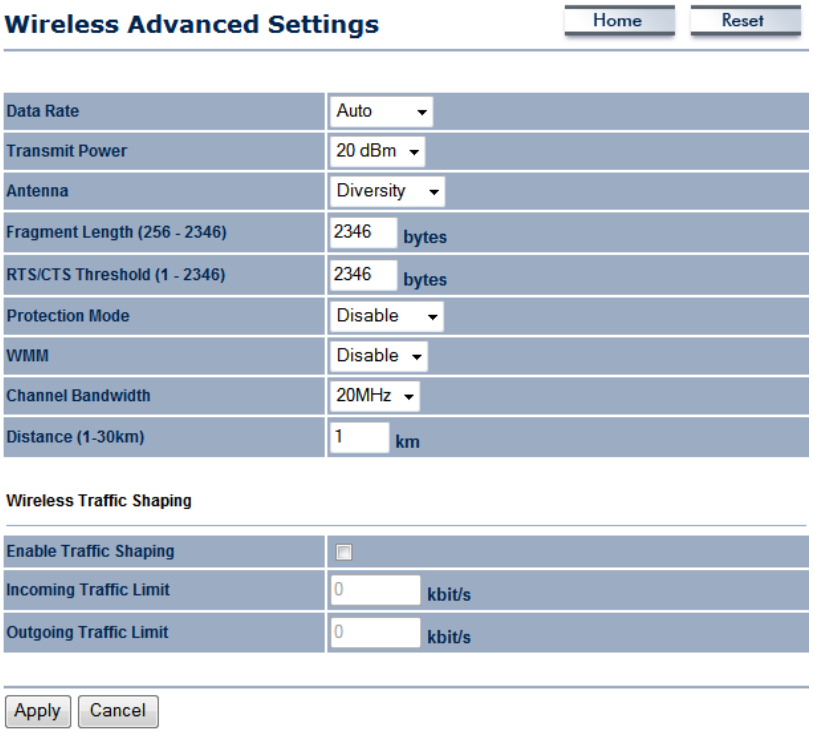




- **Encryption**: Select **TKIP** or **AES** from the drop-down list if your wireless network uses this encryption. WPA (Wi-Fi Protected Access) was designed to improve upon the security features of WEP (Wired Equivalent Privacy). The technology is designed to work with existing Wi-Fi products that have been enabled with WEP. WPA provides improved data encryption through the Temporal Integrity Protocol (TKIP), which scrambles the keys using a hashing algorithm and by adding an integrity checking feature which makes sure that keys haven't been tampered with.
- **Passphrase**: Specify a passphrase that is shared amongst the Access Points and clients.
- Click on the **Apply** button to save the changes.

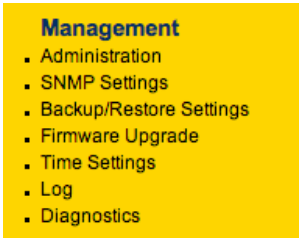
7.5.3 Wireless Advanced Settings

- On this page you can configure the advanced settings to tweak the performance of your wireless network. Options available are: data rate, transmit power, fragmentation threshold, RTS threshold, protection mode and distance.



- **Data Rate**: If you would like to force a data rate, you may select one from the drop-down list. However, for best performance it is recommended to use the **Auto** setting.
- **Transmit Power**: You may have the different application distance of the device by selecting a value from the drop-down list. This feature can be helpful in restricting the coverage area of the wireless network.
- **Antenna**: You can select the antenna polarization to Diversity, Horizontal or Vertical.
- **Fragment**: Packets over the specified size will be fragmented in order to improve performance on noisy networks.
- **RTS Threshold**: Packets over the specified size will use the RTS/CTS mechanism to maintain performance in noisy networks and preventing hidden nodes from degrading the performance.
- **Protection Mode**: If your wireless network is using both 802.11b and 802.g devices then it is recommended to enable this feature so that the 802.11b devices will not degrade the performance of 802.11g devices.
- **WMM**: Enable wireless Quality of Service
- **Distance (1-30km)**: Specify a distance between 1 and 30Km.
- Click on the **Apply** button to save the changes.

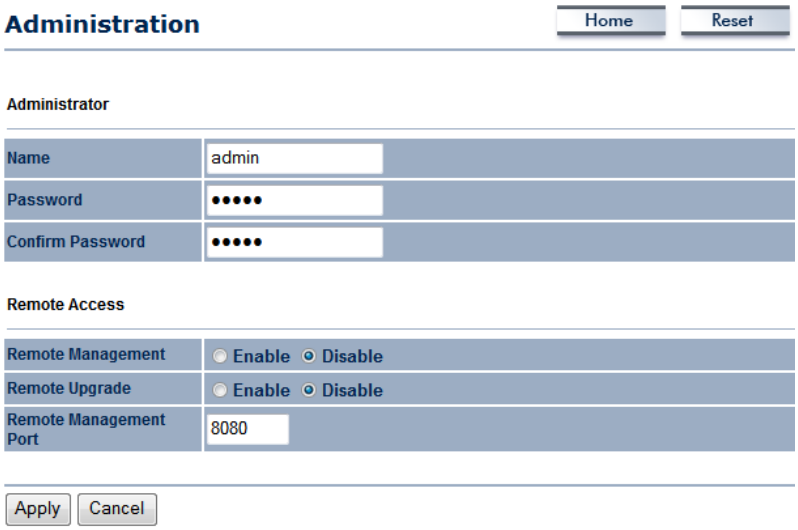
7.6 Management



- Under the **Management** section of the left menu, you will find the following options: administration, SNMP settings, backup/restore settings, firmware upgrade, time settings, log and Diagnostics. Each option is described below.

7.6.1 Administration

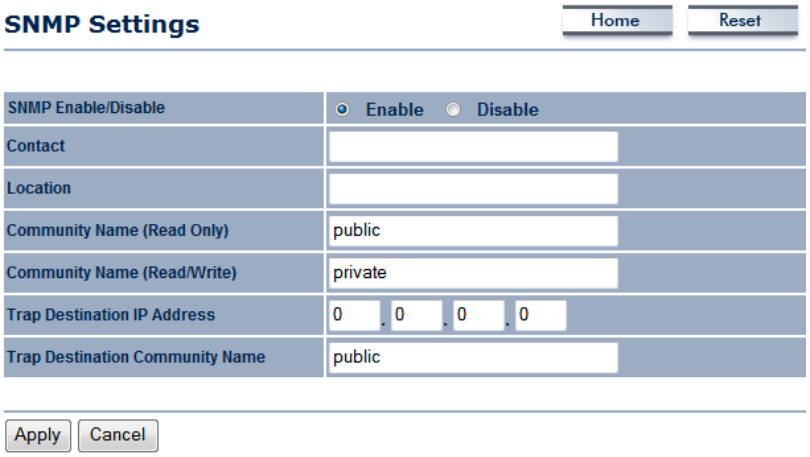
- This option allows you to create a user name and password for the device. By default, this device is configured without a user name and password **admin**. For security reasons it is highly recommended that you create a new user name and password.



- **Name**: Specify a user name into the first field.
- **Password**: Specify a password into this field and then re-type the password into the **Confirm Password** field.
- **Remote Management**: Choose to enable or disable remote management.
- **Remote Upgrade**: Choose to enable or disable remote firmware upgrade.
- **Remote Management Port**: Specify a port for remote management. For example, if you specify 8080, then you will need to specify *<IP address>:<port>* 192.168.1.1:8080 to connect to the web interface of the device.
- Click on the **Apply** button to save the changes.

7.6.2 SNMP Settings

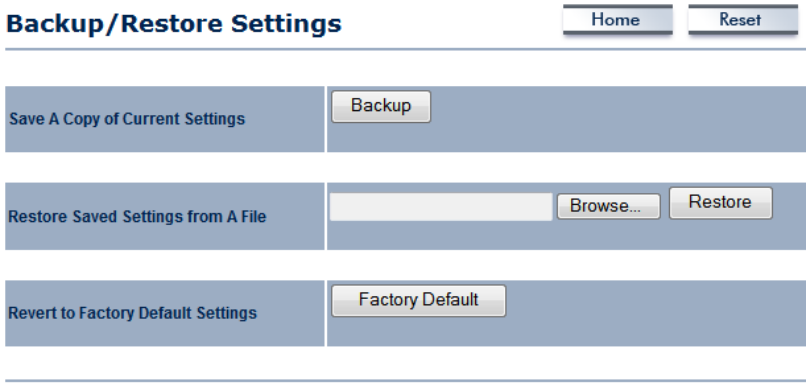
- This option allows you to assign the contact details, location, and community name and trap settings for SNMP. This is a networking management protocol used to monitor network-attached devices. SNMP allows messages (called protocol data units) to be sent to various parts of a network. Upon receiving these messages, SNMP-compatible devices (called agents) return data stored in their Management Information Bases.



- **SNMP Enable/Disable**: Choose to **enable** or **disable** the SNMP feature.
- **Contact**: Specify the contact details of the device.
- **Location**: Specify the location of the device.
- **Read-Only Community Name**: Specify the password for access the SNMP community for read only access.
- **Read-Write Community Name**: Specify the password for access to the SNMP community with read/write access.
- **Trap Destination IP Address**: Specify the IP address of the computer that will receive the SNMP traps.
- **Trap Destination Community Name**: Specify the password for the SNMP trap community.
- Click on the **Apply** button to save the changes.

7.6.3 Backup/Restore settings, Reset to factory default settings

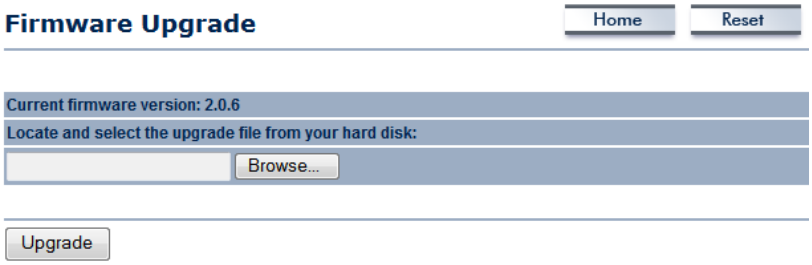
- This option is used to save the current settings of the device in a file on your local disk or load settings on to the device from a local disk. This feature is very handy for administrators who have several devices that need to be configured with the same settings.



- **Save a copy of the current settings**: Click on the Backup button to save the current configuration.
- **Restore saved settings from a file**: Once a file has been backed up, you may restore it by clicking on the Browse button to select the file, and then the **Restore** button.
- **Revert to factory default settings**: Click on the Factory Default Settings button to reset the device to the default settings. Please wait while the device restart and then access the device using the default IP address: 192.168.1.1

7.6.4 Firmware Upgrade

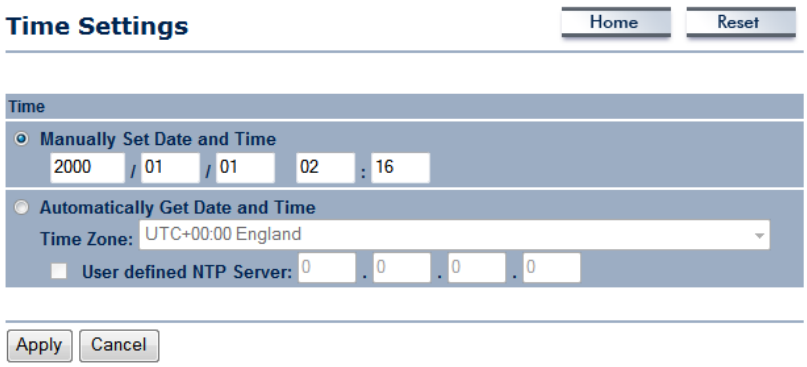
- This page is used to upgrade the firmware on the device. Make sure that downloaded the appropriate firmware from your vendor.



- Click on the **Browse** button and then select the appropriate firmware and then click on the **Upgrade** button.
  Note: The upgrade process may take about 1 minute to complete. Do not power off the device during this process as it may crash the device and make it unusable. The device will restart automatically once the upgrade is complete.

7.6.5 Time Settings

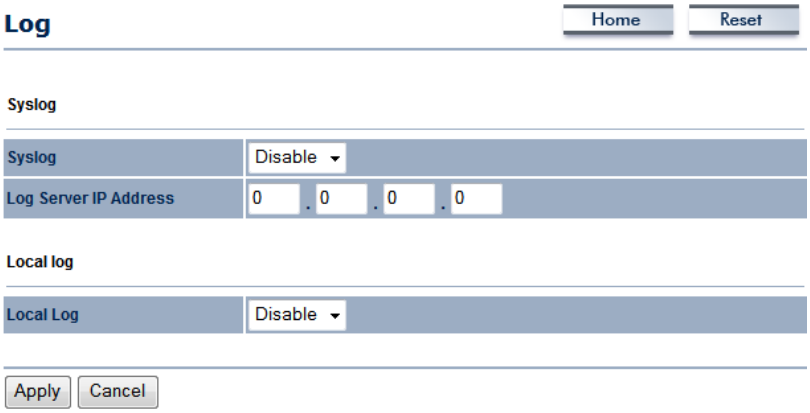
- Click on the **Time Settings** link under the **Management** menu. This page allows you to configure the time on the device. You may do this manually or by connecting to a NTP server.



- **Manually Set Date and Time**: Specify the date and time
- **Automatically Get Date and Time**: Select the time zone from the drop down list and then specify the IP address of the NTP server.
- Click on the **Apply** button to save the changes.

7.6.6 Log

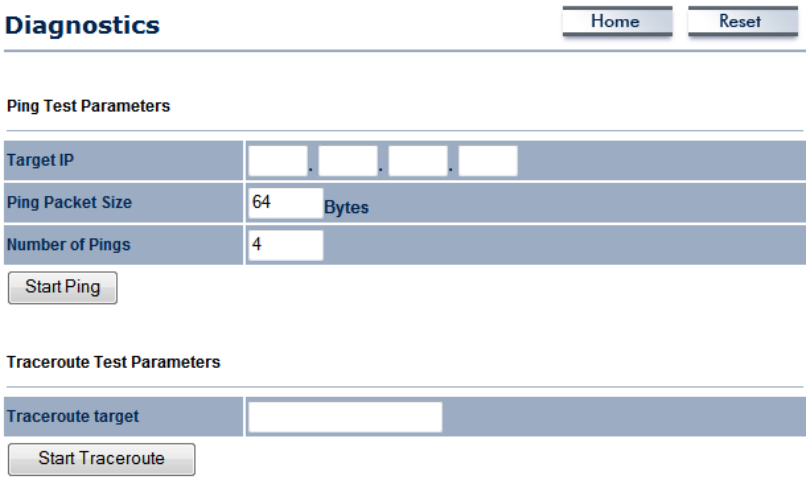
- Click on the **Log** link under the **Management** menu. The **Log** page displays a list of events that are triggered on the Ethernet and Wireless interface. This log can be referred when an unknown error occurs on the system or when a report needs to be sent to the technical support department for debugging purposes.



- **Syslog**: Choose to enable or disable the system log.
- **Log Server IP Address**: Specify the IP address of the server that will receive the system log.
- **Local Log**: Choose to enable or disable the local log.
- Click on the **Apply** button to save the changes.

7.6.7 Diagnostics

- In this page, user can let unit to ping other network equipment. And user also can monitor a route from unit to your target.

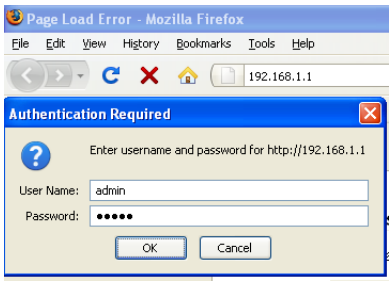


- **Ping Test Parameters** : User can input Target IP, Ping Size and Ping Quantity of other network device which connected you want. And then you can find the ping condition after click **Start Ping**.
- **Traceroute Test Parameters**: This function help user to monitor a network trace. User can input IP or domain name on Traceroute target.

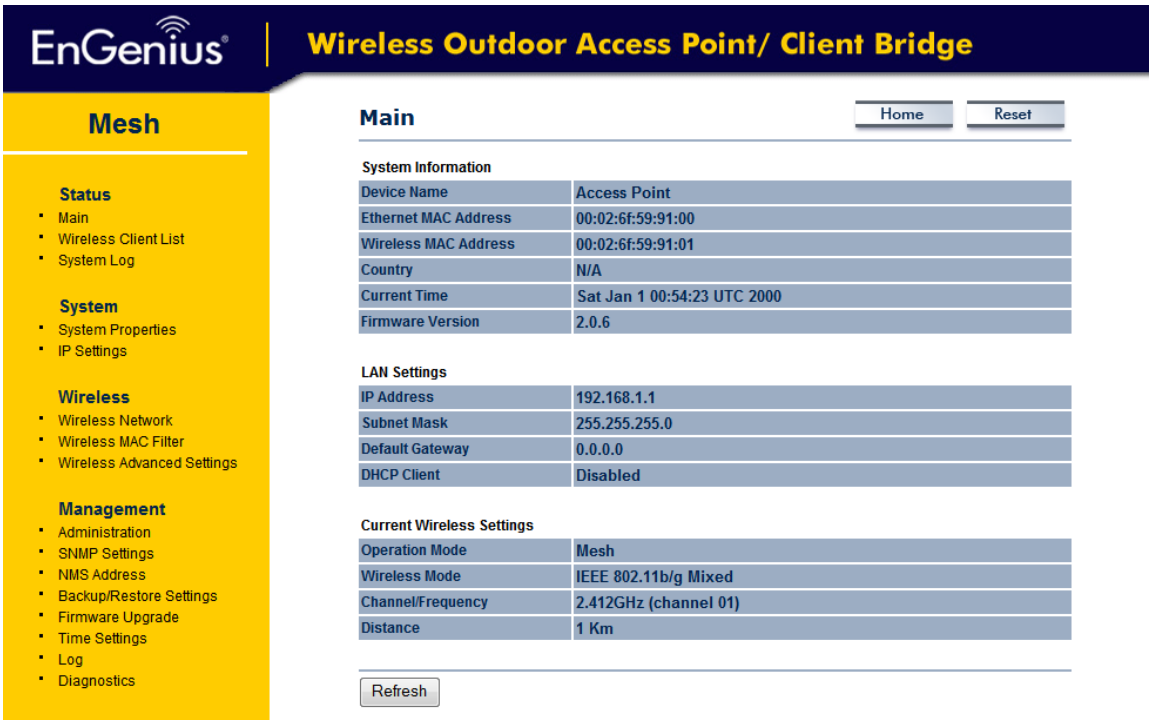
8 Mesh Operating Mode

8.1 Logging In

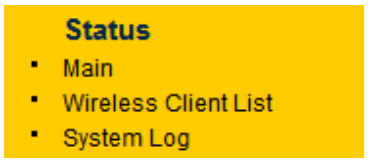
- To configure the device through the web-browser, enter the IP address of the device (default: **192.168.1.1**) into the address bar of the web-browser and press **Enter**.
- Make sure that the device and your computers are configured on the same subnet. Refer to **Chapter 2** in order to configure the IP address of your computer.
- After connecting to the IP address, the web-browser will display the login page.
- Specify **admin** for both the user name and password.
- After logging in you will graphical user interface (GUI) of the device. The navigation drop-down menu on left is divided into four sections:



6. **Status**: Displays the overall status, Wireless client list and system log.
7. **System**: This menu includes the system properties.
8. **Wireless**: This menu includes wireless network, security and advanced settings.
9. **Management**: This menu includes the admin setup, SNMP settings, firmware upgrade, save/restore backup, time setting and diagnostics.



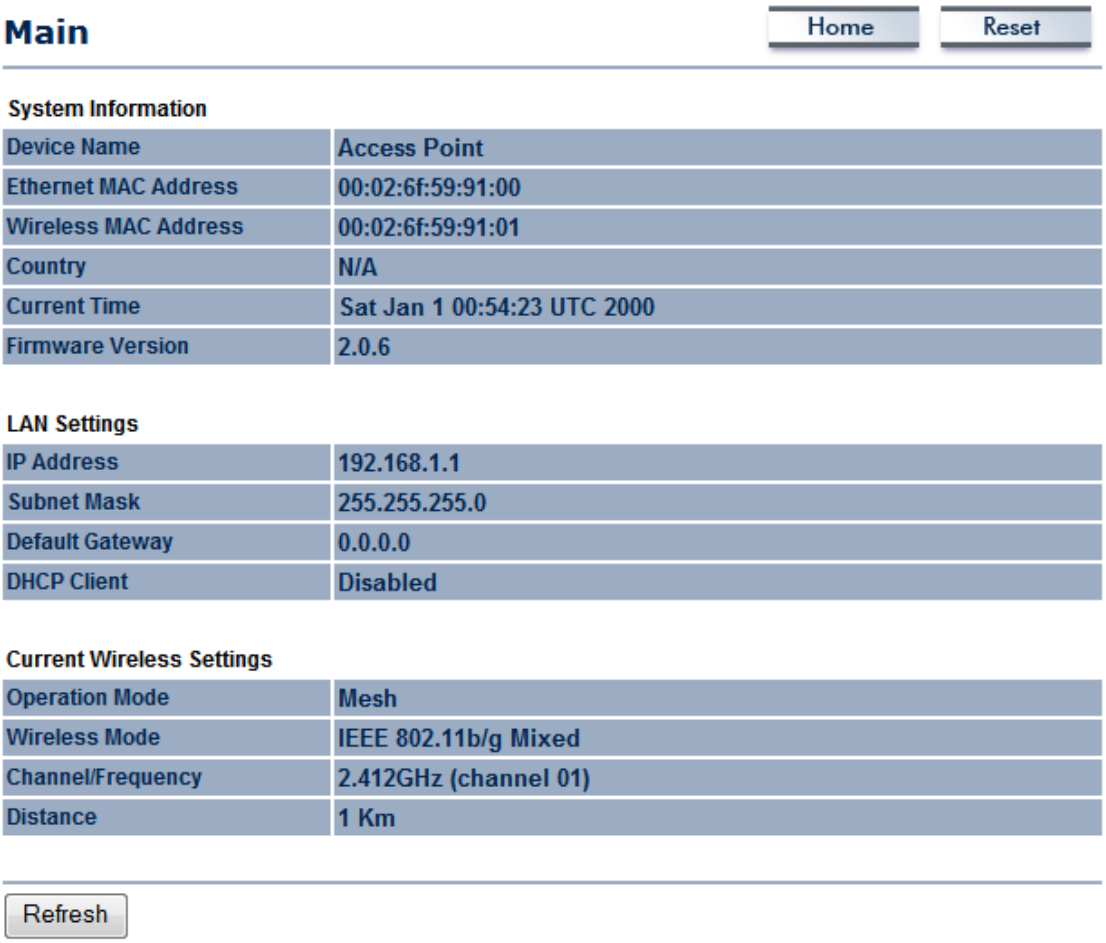
8.2 Status



- Under the **Status** section of the left menu, you will see the following options: **Main, Wireless Client List** and **System Log**. Each option is described in detail below.

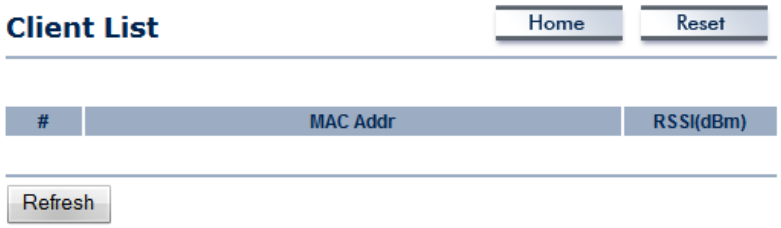
8.2.1 Main

- The status that is displayed corresponds with the operating mode that is selected. Information such as Device Name, MAC Address, Country, Current and Firmware Version are displayed in the 'System Information' section. IP Address, Subnet Mask, Default Gateway and DHCP Server condition are displayed in the 'LAN Settings' section. The 'Current Wireless Settings' section displays Operation Mode, Wireless Mode, Channel/Frequency and Distance control.



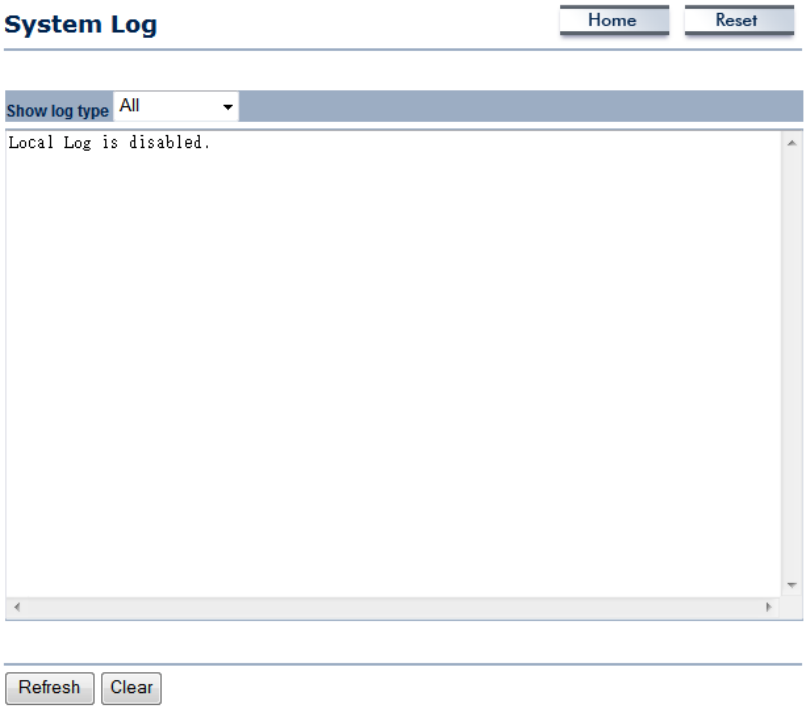
8.2.2 Wireless Client List

- This page displays the list of Clients that are associated to the Access Point.
- The MAC addresses and signal strength for each client is displayed. Click on the **Refresh** button to refresh the client list.

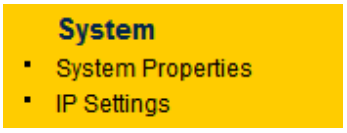


8.2.3 System Log

The device automatically logs (records) events of possible interest in its internal memory. If there is not enough internal memory for all events, logs of older events are deleted, but logs of the latest events are retained.



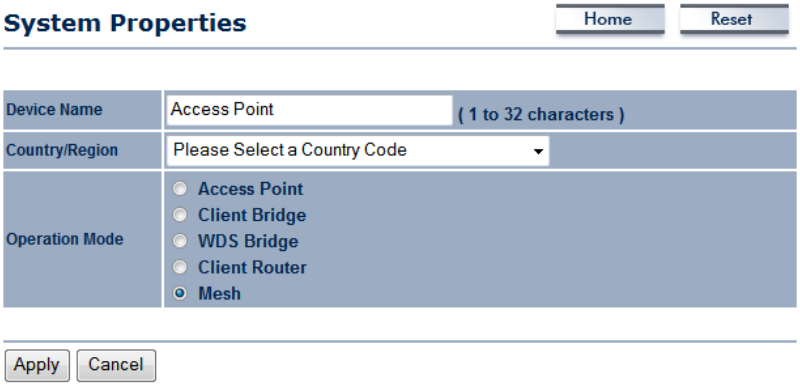
8.3 System



- Under the **System** section of the left menu, you will see the following options: **System Properties setting** and **IP Setting**, which are described below.

8.3.1 System Properties

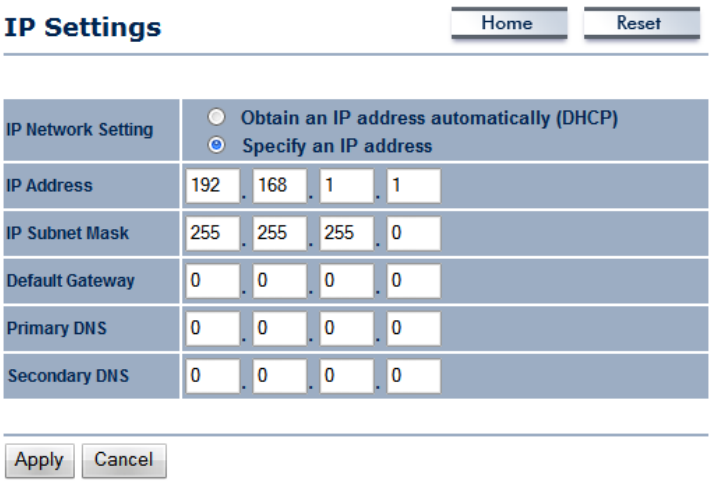
- This page allows you to switch the operating mode of the device, as well as specify a name and select the operating region.



- **Device Name**: Specify a name for the device (this is not the SSID),
- **Country/Region**: Select a country from the drop-down list.
- **Operating Mode**: Select an Operating Mode. Configuration for each operating mode is described in their respective chapters.
- Click on the **Apply** button to save the changes.

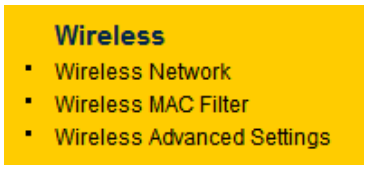
8.3.2 IP Settings

- This page allows you to configure the device with a static IP address or a DHCP client.



- **IP Network Setting**: Select **Obtain an IP address automatically (DHCP)** radio button if the Access Point is connected to a DHCP server. This will allow the Access Point to pass IP addresses to the clients associated with it. You may select **Specify an IP Address** radio button if you would like the device to use a static IP address. In this case, you would be required to specify an IP address, subnet mask, and default gateway IP address.
- **IP Address**: Specify an IP address
- **IP Subnet Mask**: Specify the subnet mask for the IP address
- **Default Gateway**: Specify the IP address of the default gateway.
- Click on the **Apply** button to save the changes.

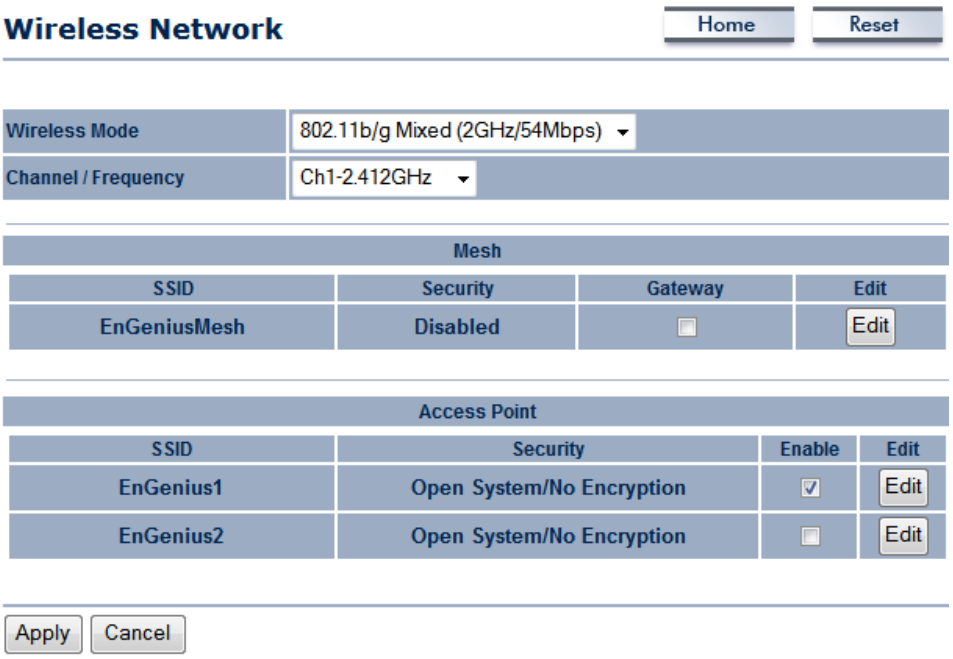
8.4 Wireless



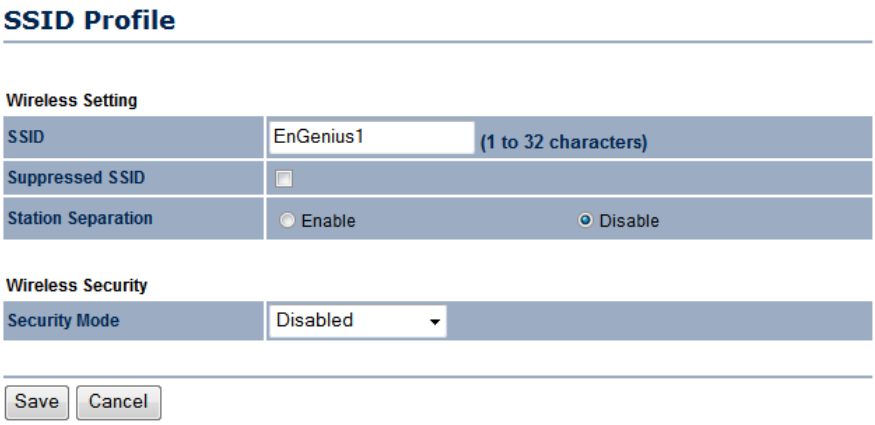
- Under the **Wireless** section of the left menu, you will see the following options: **Wireless Network, Wireless Security**, and **Wireless Advanced Settings**. Each option is described below.

8.4.1 Wireless Network

- The **Wireless Network** page allows you to configure the wireless mode, channel, SSID, and security settings.

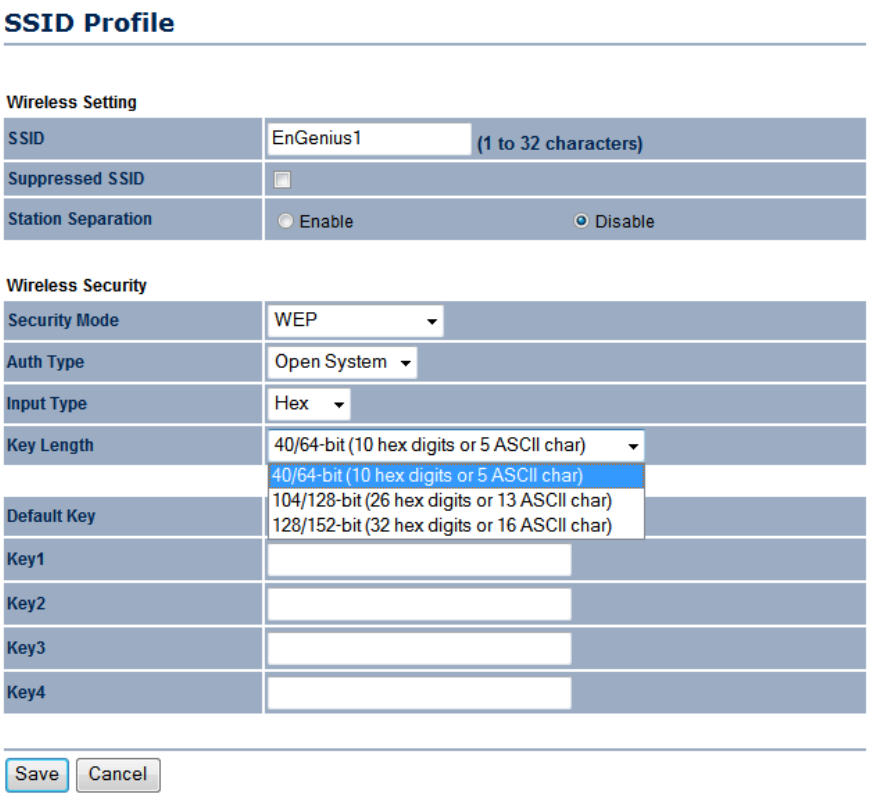


- **Wireless Mode**: Depending on the type of wireless clients that are connected to the network, you may select **B**, **G or B/G-mixed**. If you are not sure about which clients will be accessing the wireless networks, it is recommended that you select **B/G-mixed** for the best performance.
- **Channel / Frequency**: Select a channel from the drop-down list. The channels available are based on the country's regulation.
- **Mesh**: User can setup the SSID configuration and WEP security setting of the Mesh network.
- **Current Profiles**: User can setup SSID configuration in this item. In Mesh mode, the M2000 supports 2 SSIDs, the user can decide whether to "Enable" the SSID. Click the "Edit" button to configure the settings for the SSID.



- **SSID**: Type in your SSID
- **Suppressed SSID:** When enabled, the SSID will be hidden.
- **Station Separation:** When enabled, wireless clients on different SSID's cannot connect with each other.

▶ **Wireless Security – Security Mode : WEP**



▶▶ **Security Mode**: Select **WEP** from the drop-down list if your wireless network uses WEP encryption. WEP is an acronym for Wired Equivalent Privacy, and is a security protocol that provides the same level of security for wireless networks as for a wired network.

▶▶ **Authentication Type:** Select an authentication method. Options available are **Open Key**, **Shared Key**. An open system allows any client to authenticate as long as it conforms to any MAC address filter policies that may have been set. All authentication packets are transmitted without encryption. Shared Key sends an unencrypted challenge text string to any device attempting to communicate with the Access Point. The device requesting authentication encrypts the challenge text and sends it back to the Access Point. If the challenge text is encrypted correctly, the Access Point allows the requesting device to authenticate. It is recommended to select Auto if you are not sure which authentication type is used.

▶▶ **Input Type**: Select Hex or ASCII from the drop-down list

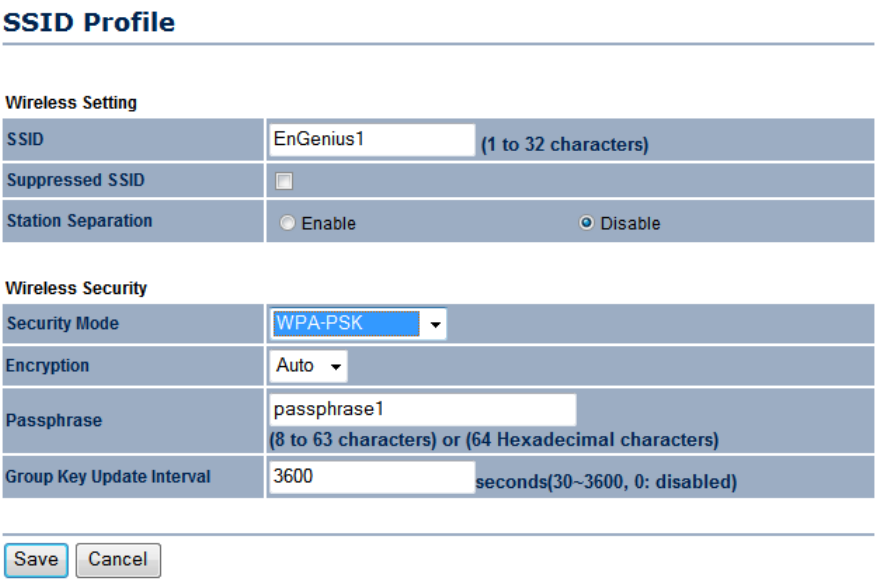
▶▶ **Key Length**: Select a key format from the drop-down list. 64bit-hex keys require 10 characters, where as 128-bit keys require 26 characters. A hex key is defined as a number between 0 through 9 and letter between A through F and a through f.

▶▶ **Default Key**: You may use up to four different keys for four different networks. Select the current key that will be used.

▶▶ **Key 1-4**: You may enter four different WEP keys.

▶▶ Click on the **Save** button to save the changes.

Wireless Security – Security Mode : WPA-PSK, WPA2-PSK, WPA-PSK Mixed



Security Mode: Select **WPA-PSK, WPA2-PSK, or WPA-PSK Mixed** from the drop-down list if your wireless network uses WPA pre-shared key.

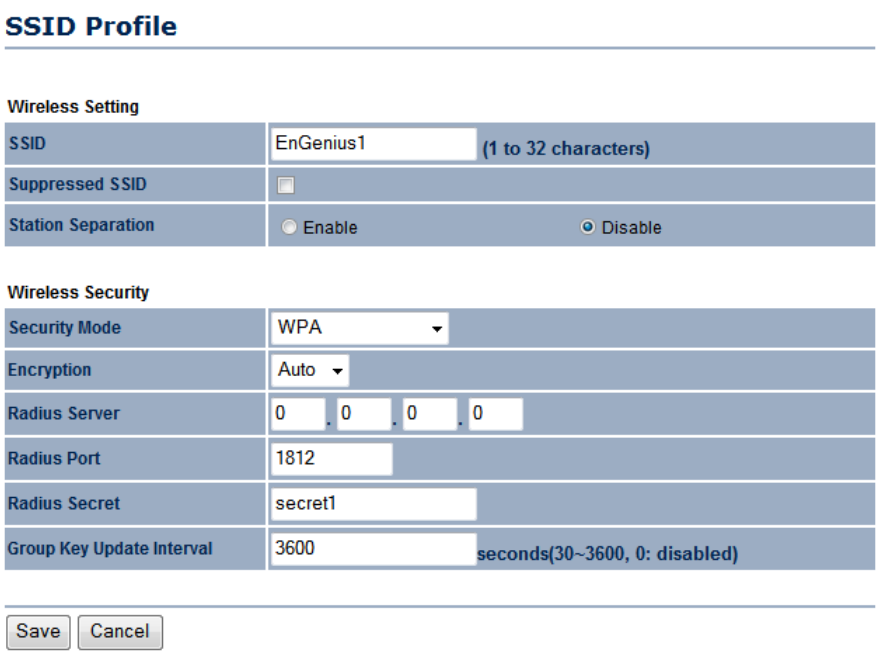
Encryption: Select **TKIP**, **AES or Auto** from the drop-down list if your wireless network uses this encryption. WPA (Wi-Fi Protected Access) was designed to improve upon the security features of WEP (Wired Equivalent Privacy). The technology is designed to work with existing Wi-Fi products that have been enabled with WEP. WPA provides improved data encryption through the Temporal Integrity Protocol (TKIP), which scrambles the keys using a hashing algorithm and by adding an integrity checking feature which makes sure that keys haven't been tampered with. AES is an even more advanced method of encryption which offers the highest level of WPA/WPA2 security.

Passphrase: Specify a passphrase that is shared amongst the Access Points and clients.

Group Key Update Interval: Specify the number of seconds after which the Access Point will probe the client for the passphrase.

Click on the **Save** button to save the changes.

Wireless Security – Security Mode : WPA, WPA2, WPA Mixed



Security Mode: Select **WPA**, **WPA2 or WPA Mixed** from the drop-down list if your wireless network uses WPA. WPA (Wi-Fi Protected Access) was designed to improve upon the security features of WEP (Wired Equivalent Privacy). The technology is designed to work with existing Wi-Fi products that have been enabled with WEP. WPA provides improved data encryption through the Temporal Integrity Protocol (TKIP), which scrambles the keys using a hashing algorithm and by adding an integrity checking feature which makes sure that keys haven't been tampered with.

Encryption: Select **TKIP**, **AES or Auto** from the drop-down list if your wireless network uses this encryption.

RADIUS Server: Enter the IP address of the RADIUS server.

RADIUS Port: Enter the port number of the RADIUS server. The default is usually 1812.

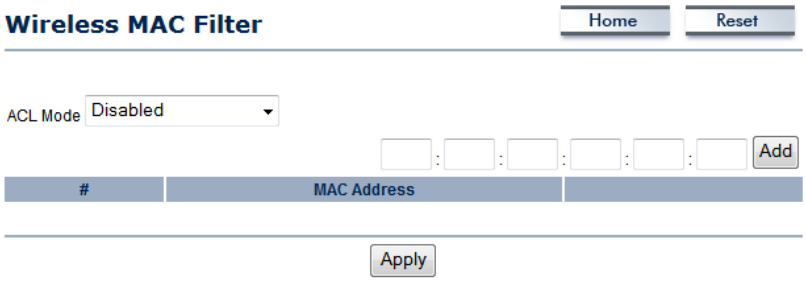
RADIUS Secret: Enter the shared password of the RADIUS server.

Group Key Update Interval: Specify the number of seconds after which the Access Point will probe the client for the secret.

Click on the **Save** button to save the changes.

8.4.2 Wireless MAC Filter

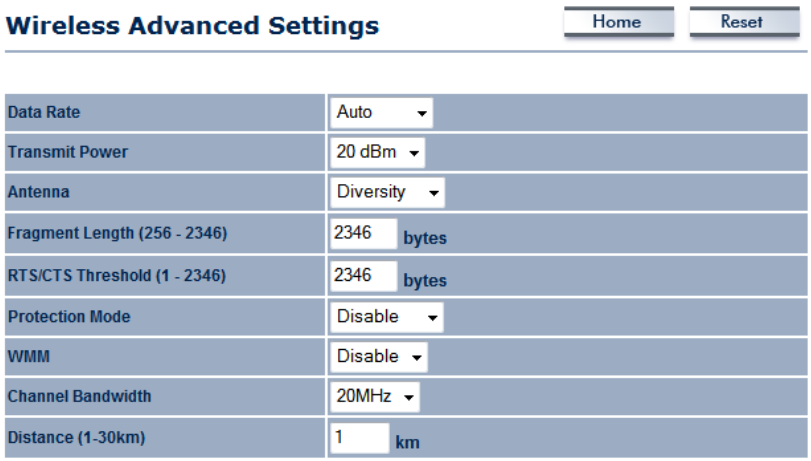
- On this page you can filter the MAC address by allowing or blocking access the network.



- **ACL (Access Control) Mode:** You may choose to **Disable**, **Allow Listed**, or **Deny Listed** MAC addresses from associating with the network. By selecting **Allow MAC in the List**, only the address listed in the table will have access to the network; all other clients will be blocked. On the other hand, selected **Deny MAC in the List**, only the listed MAC addresses will be blocked from accessing the network; all other clients will have access to the network.
- **MAC Address:** Enter the MAC address.
- This table lists the blocked or allowed MAC addresses; you may delete selected MAC address or delete all the addresses from the table by clicking on the **Delete** button.
- Click on the **Apply** button to save the changes.

8.4.3 Wireless Advanced Settings

- On this page you can configure the advanced settings to tweak the performance of your wireless network. Options available are: data rate, transmit power, fragmentation threshold, RTS threshold, protection mode and distance.



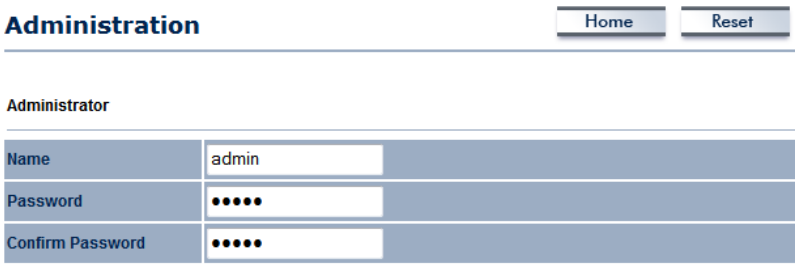
- **Data Rate**: If you would like to force a data rate, you may select one from the drop-down list. However, for best performance it is recommended to use the **Auto** setting.
- **Transmit Power**: You may have the different application distance of the device by selecting a value from the drop-down list. This feature can be helpful in restricting the coverage area of the wireless network.
- **Antenna**: You can select the antenna polarization to Diversity, Horizontal or Vertical.
- **Fragment Length**: Packets over the specified size will be fragmented in order to improve performance on noisy networks.
- **RTS/CTS Threshold**: Packets over the specified size will use the RTS/CTS mechanism to maintain performance in noisy networks and preventing hidden nodes from degrading the performance.
- **Protection Mode**: If your wireless network is using both 802.11b and 802.g devices then it is recommended to enable this feature so that the 802.11b devices will not degrade the performance of 802.11g devices.
- **WMM**: Enable wireless Quality of Service
- **Distance (1-30km)**: Specify a distance between 1 and 30Km.
- **Channel Bandwidth**: For different application, you can select 20MHz, 10MHz or 5MHz channel bandwidth.
- Click on the **Apply** button to save the changes.

8.5 Management

- Under the **Management** section of the left menu, you will find the following options: **Administration, SNMP Settings, Backup/Restore Settings, Firmware Upgrade, Time Settings, Log** and **Diagnostics**. Each option is described below.

8.5.1 Administration

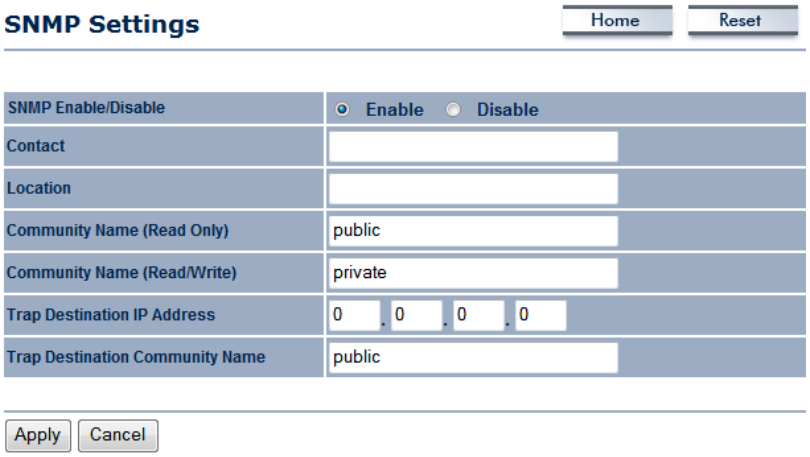
- This option allows you to create a user name and password for the device. By default, this device is configured without a user name and password **admin**. For security reasons it is highly recommended that you create a new user name and password.



- **Name**: Specify a user name into the first field.
- **Password**: Specify a password into this field and then re-type the password into the **Confirm Password** field.
- Click on the **Apply** button to save the changes.

8.5.2 SNMP Settings

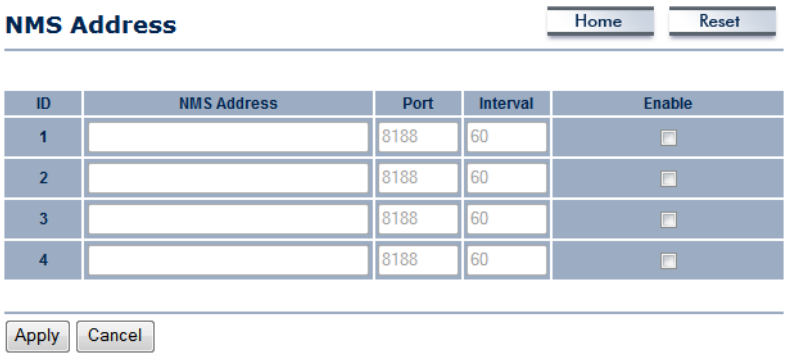
- This option allows you to assign the contact details, location, and community name and trap settings for SNMP. This is a networking management protocol used to monitor network-attached devices. SNMP allows messages (called protocol data units) to be sent to various parts of a network. Upon receiving these messages, SNMP-compatible devices (called agents) return data stored in their Management Information Bases.



- **SNMP Enable/Disable**: Choose to **enable** or **disable** the SNMP feature.
- **Contact**: Specify the contact details of the device.
- **Location**: Specify the location of the device.
- **Read-Only Community Name**: Specify the password for access the SNMP community for read only access.
- **Read-Write Community Name**: Specify the password for access to the SNMP community with read/write access.
- **Trap Destination IP Address**: Specify the IP address of the computer that will receive the SNMP traps.
- **Trap Destination Community Name**: Specify the password for the SNMP trap community.
- Click on the **Apply** button to save the changes.

8.5.3 NMS Settings

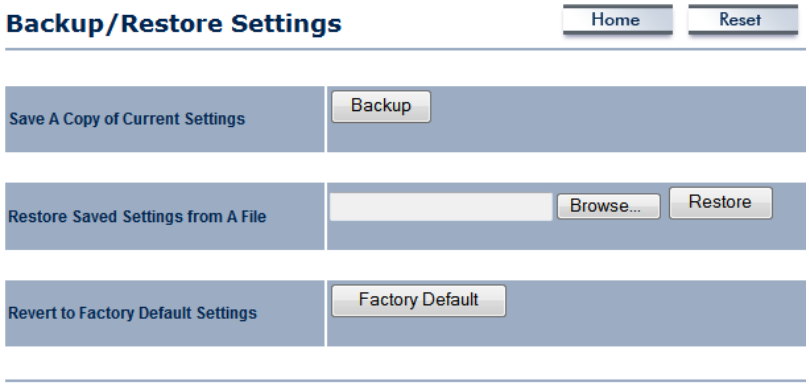
- This option allows you to specify the address of the NMS server.



- **NMS Address**: Specify the address of the NMS server.
- **Port:** Specify the port of the NMS server.
- **Interval:** Specify how often the M2000 requests an update from the NMS server.
- **Enable:** Allow the M2000 to connect to the specified NMS server.

8.5.4 Backup/Restore settings, Reset to factory default settings

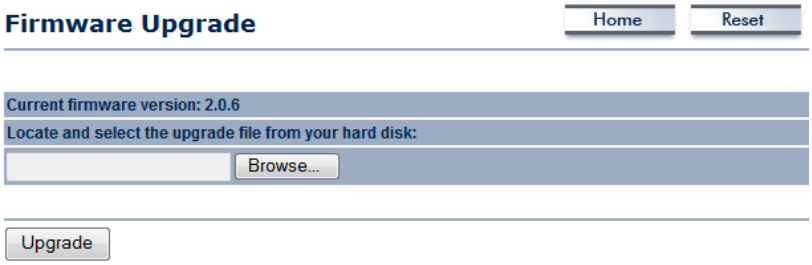
- This option is used to save the current settings of the device in a file on your local disk or load settings on to the device from a local disk. This feature is very handy for administrators who have several devices that need to be configured with the same settings.



- **Save a copy of the current settings**: Click on the Backup button to save the current configuration.
- **Restore saved settings from a file**: Once a file has been backed up, you may restore it by clicking on the Browse button to select the file, and then the **Restore** button.
- **Revert to factory default settings**: Click on the Factory Default Settings button to reset the device to the default settings. Please wait while the device restart and then access the device using the default IP address: 192.168.1.1

8.5.5 Firmware Upgrade

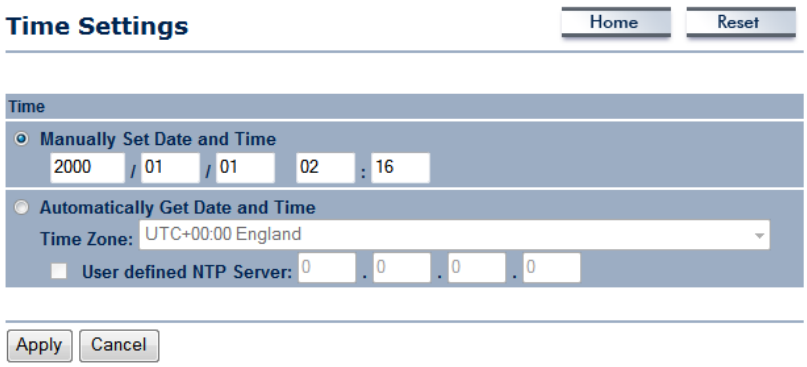
- This page is used to upgrade the firmware on the device. Make sure that downloaded the appropriate firmware from your vendor.



- Click on the **Browse** button and then select the appropriate firmware and then click on the **Upgrade** button.
  Note: The upgrade process may take about 1 minute to complete. Do not power off the device during this process as it may crash the device and make it unusable. The device will restart automatically once the upgrade is complete.

8.5.6 Time Settings

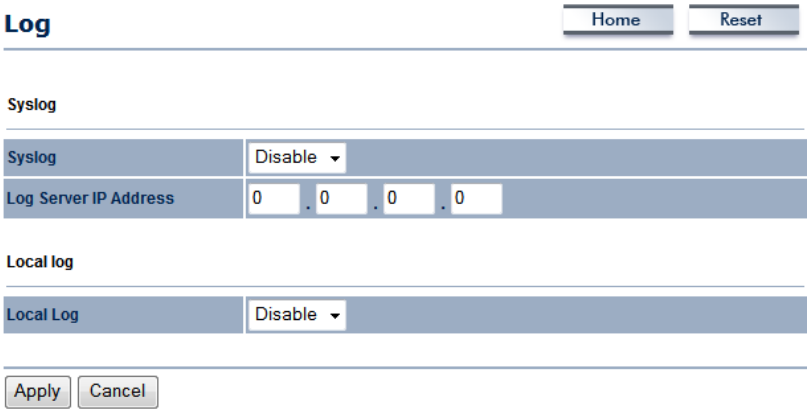
- Click on the **Time Settings** link under the **Management** menu. This page allows you to configure the time on the device. You may do this manually or by connecting to a NTP server.



- **Manually Set Date and Time**: Specify the date and time
- **Automatically Get Date and Time**: Select the time zone from the drop down list and then specify the IP address of the NTP server.
- Click on the **Apply** button to save the changes.

8.5.7 Log

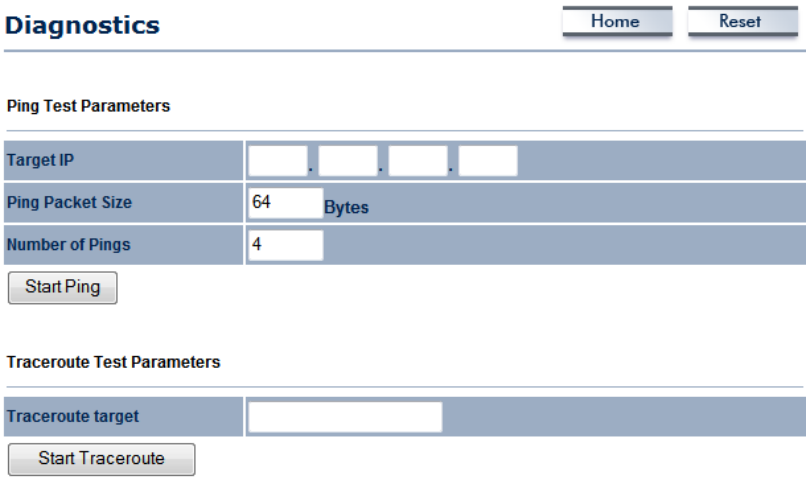
- Click on the **Log** link under the **Management** menu. The **Log** page displays a list of events that are triggered on the Ethernet and Wireless interface. This log can be referred when an unknown error occurs on the system or when a report needs to be sent to the technical support department for debugging purposes.



- **Syslog**: Choose to enable or disable the system log.
- **Log Server IP Address**: Specify the IP address of the server that will receive the system log.
- **Local Log**: Choose to enable or disable the local log.
- Click on the **Apply** button to save the changes.

8.5.8 Diagnostics

- In this page, user can let unit to ping other network equipment. And user also can monitor a route from unit to your target.



- **Ping Test Parameters** : User can input Target IP, Ping Size and Ping Quantity of other network device which connected you want. And then you can find the ping condition after click **Start Ping**.
- **Traceroute Test Parameters**: This function help user to monitor a network trace. User can input IP or domain name on Traceroute target.

Appendix A – FCC Interference 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.

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 20cm between the radiator & your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Appendix B – IC Statement

Industry Canada statement:

This device complies with RSS-210 of the Industry Canada 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.

IMPORTANT NOTE:

Radiation Exposure Statement:

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

This device has been designed to operate with an antenna having a maximum gain of 5 dBi. Antenna having a higher gain is strictly prohibited per regulations of Industry Canada. The required antenna impedance is 50 ohms.