

Troubleshooting EnGenius Wi-Fi Devices

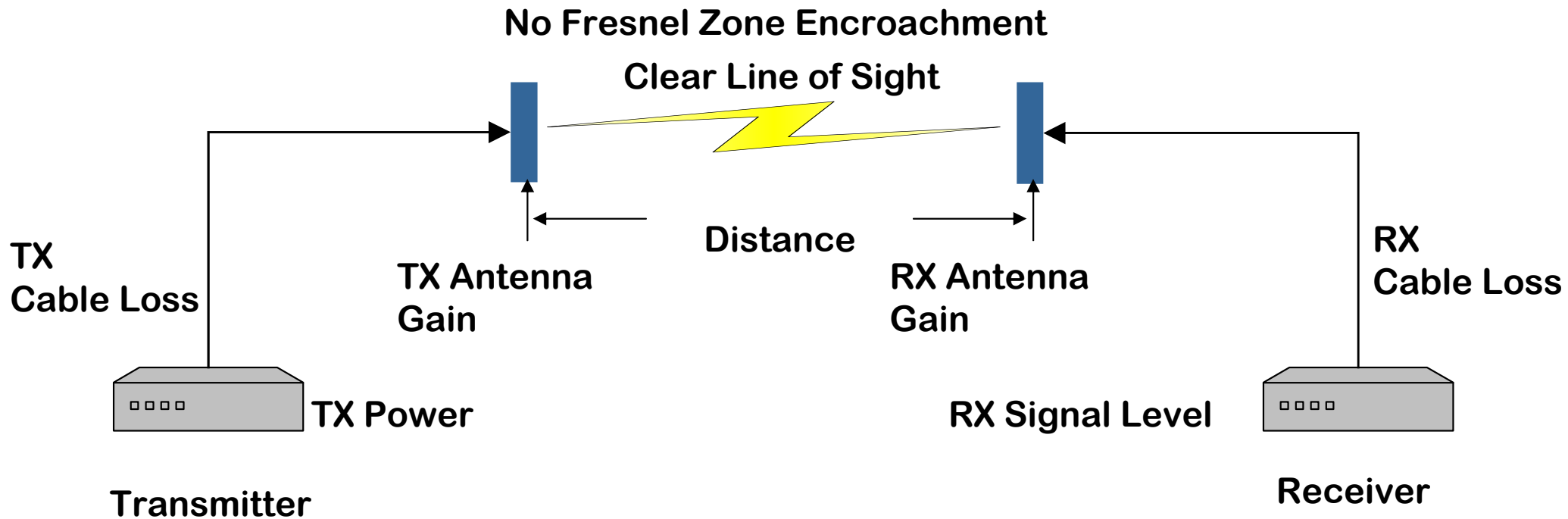


THE LEADER IN
Long Range Data Communications Systems

EnGenius™

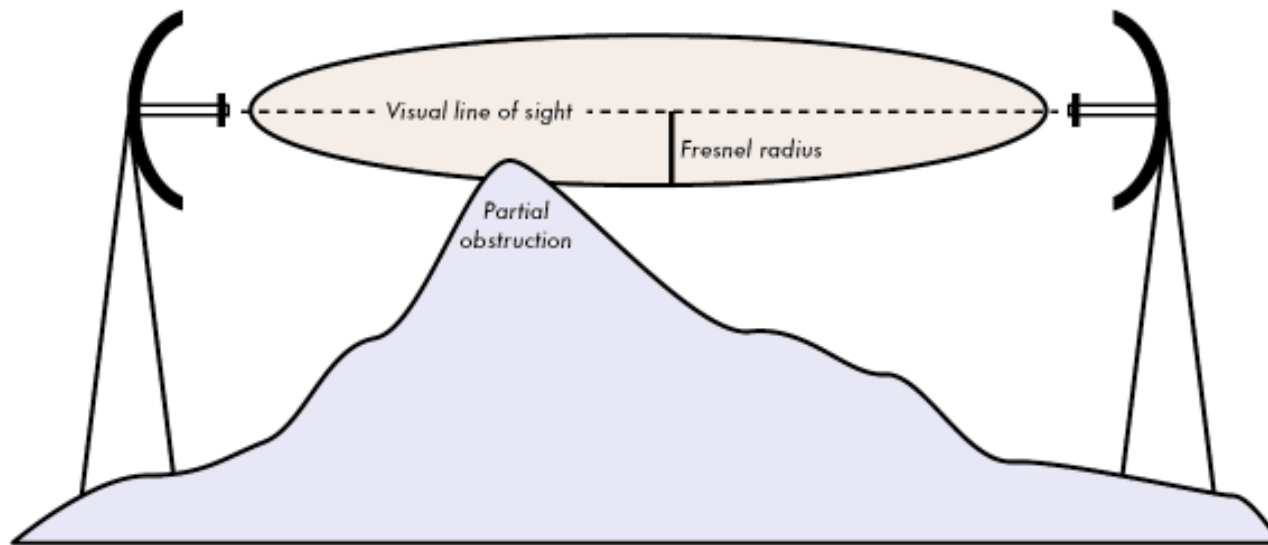
Long Range Links

- Line of sight is critical.
- Less than 30% obstruction of the Fresnel Zone.
- Proper antennas and alignment.
- Adequate Tx and Rx power on both ends.



Line of Sight

- The Fresnel zone for a radio beam is an elliptical area immediately surrounding the visual path. It varies in thickness depending on the length of the signal path and the frequency of the signal.
- Free space loss and curvature of the earth must also be considered.
- Elevate antennas to get above the obstruction.



High Gain Directional Antennas

- Antenna gain is how much the RF signal is focused. The higher the gain, the tighter the beam.
- Using horizontally polarized antennas can help reject 15 to 30dB of all vertical noise.
- Using a link budget calculator can help determine the antenna gain required on both ends.
- Free online link budget calculator:

<http://www.wirelessconnections.net/calcs/BudgetCalc.asp>

Frequency

Distance between antennas

Free Space Loss

Tx Antenna Gain

Rx Antenna Gain

Tx Cable Loss

Rx Cable Loss

Tx Power

Rx Sensitivity

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Transmit Power (Tx)

- Transmit power can be adjusted to provide better range.
- When using high gain antennas, transmit power can be turned down to stay within FCC Part 15 limits (EIRP 1 Watt).
- An increase of 3dBm = double the power in mW.

EnGenius | **Wireless Outdoor Access Point/ Client Bridge**

Client Bridge

Wireless Advanced Settings Home Reset

| | |
|------------------------------|------------|
| Data Rate | Auto |
| Transmit Power | 28 dBm |
| Fragment Length (256 - 2346) | 2346 bytes |
| RTS/CTS Threshold (1 - 2346) | 2346 bytes |
| Protection Mode | Disable |
| WMM | Disable |
| Distance (1-30km) | 2 km |

Apply Cancel

ACK Timeout

- Should only be used for distances over 2km.
- Can improve bandwidth over long distance wireless links if there is plenty of Tx power and Rx Sensitivity
- On the EOC-2610 and EOC-5610 models, the ACK is related to the **Distance** value in kilometers.

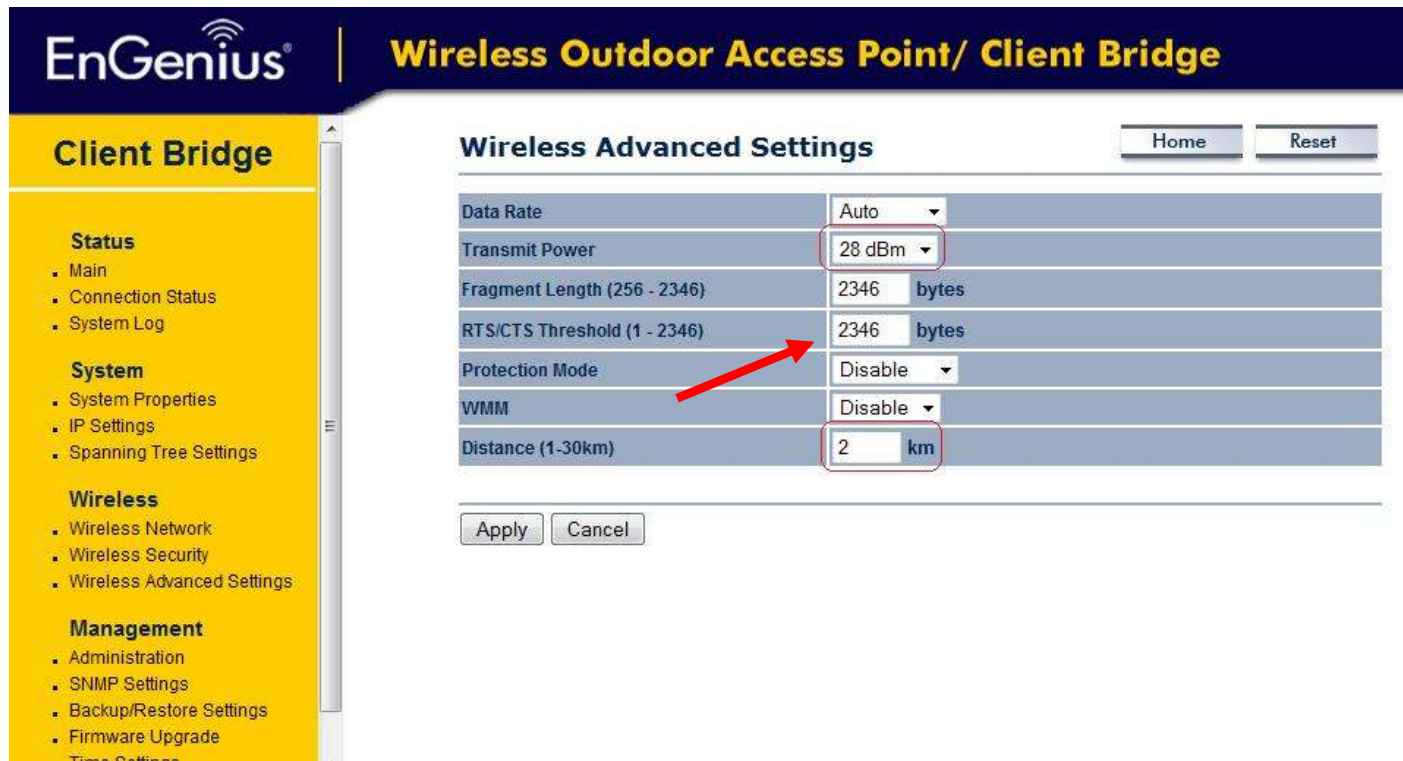
The screenshot shows the EnGenius web interface for a Wireless Outdoor Access Point/Client Bridge. The left sidebar contains a navigation menu with sections: Status (Main, Connection Status, System Log), System (System Properties, IP Settings, Spanning Tree Settings), Wireless (Wireless Network, Wireless Security, Wireless Advanced Settings), and Management (Administration, SNMP Settings, Backup/Restore Settings, Firmware Upgrade, Time Settings). The main content area is titled 'Wireless Advanced Settings' and includes 'Home' and 'Reset' buttons. A table of settings is displayed with the following values:

| | |
|------------------------------|------------|
| Data Rate | Auto |
| Transmit Power | 28 dBm |
| Fragment Length (256 - 2346) | 2346 bytes |
| RTS/CTS Threshold (1 - 2346) | 2346 bytes |
| Protection Mode | Disable |
| WMM | Disable |
| Distance (1-30km) | 2 km |

At the bottom of the settings table, there are 'Apply' and 'Cancel' buttons. A red arrow points to the 'Distance' field.

RTS / CTS

- Can reduce collisions caused by the “hidden node” problem.
- A node wishing to send data initiates the process by sending a Request to Send frame (RTS).
- The destination node replies with a Clear To Send frame (CTS).
- Any other node receiving the RTS or CTS frame should refrain from sending data for a given time



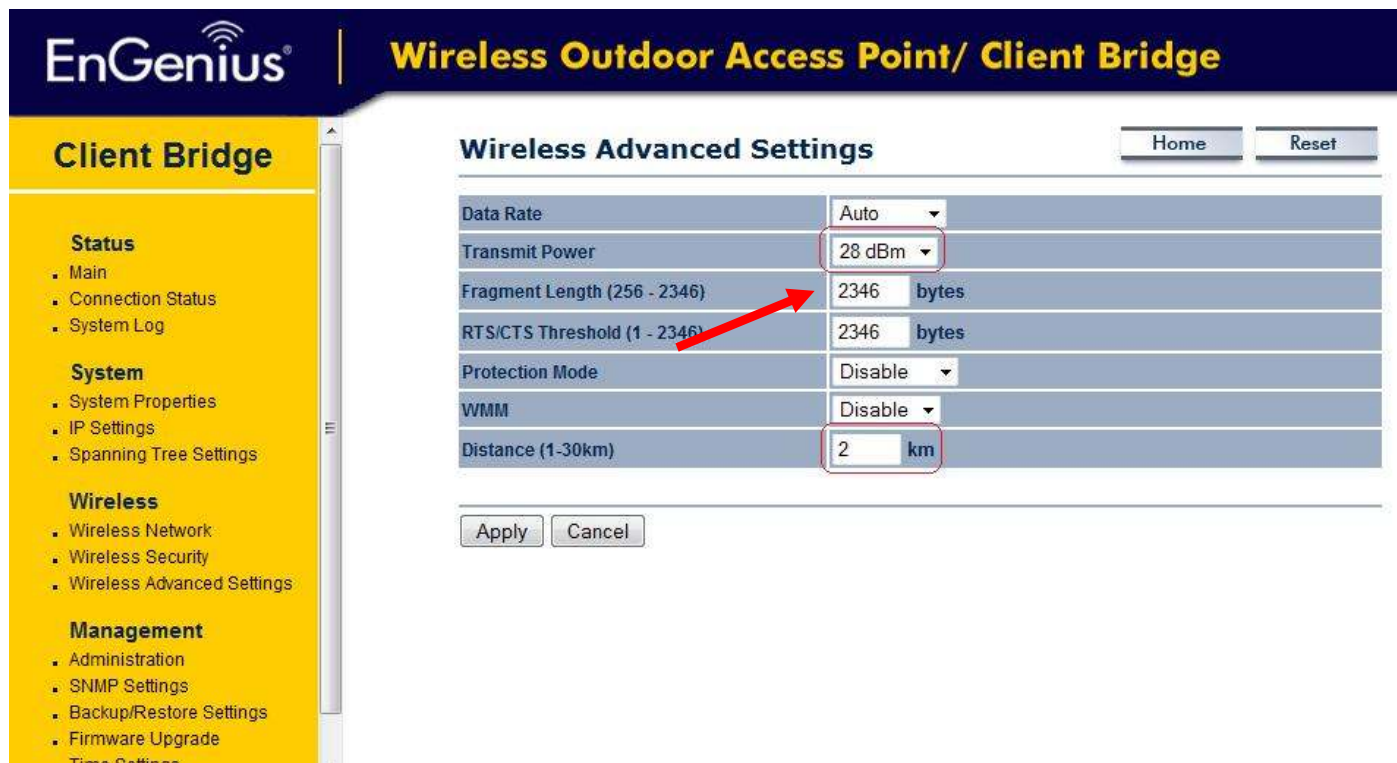
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| Setting | Value |
|------------------------------|------------|
| Data Rate | Auto |
| Transmit Power | 28 dBm |
| Fragment Length (256 - 2346) | 2346 bytes |
| RTS/CTS Threshold (1 - 2346) | 2346 bytes |
| Protection Mode | Disable |
| WMM | Disable |
| Distance (1-30km) | 2 km |

At the bottom of the settings table are 'Apply' and 'Cancel' buttons. A red arrow points to the 'RTS/CTS Threshold' setting.

Fragment Length

- Divides frames into smaller pieces and can increase reliability of frame transmissions.
- With smaller frames, collisions are less likely to occur.



The screenshot shows the EnGenius web interface for a Wireless Outdoor Access Point/Client Bridge. The left sidebar contains a navigation menu with sections: Status (Main, Connection Status, System Log), System (System Properties, IP Settings, Spanning Tree Settings), Wireless (Wireless Network, Wireless Security, Wireless Advanced Settings), and Management (Administration, SNMP Settings, Backup/Restore Settings, Firmware Upgrade, Time Settings). The main content area is titled 'Wireless Advanced Settings' and includes 'Home' and 'Reset' buttons. The settings table is as follows:

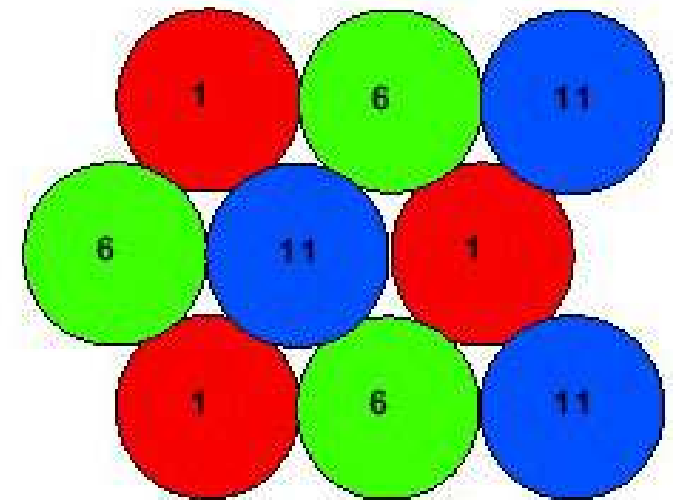
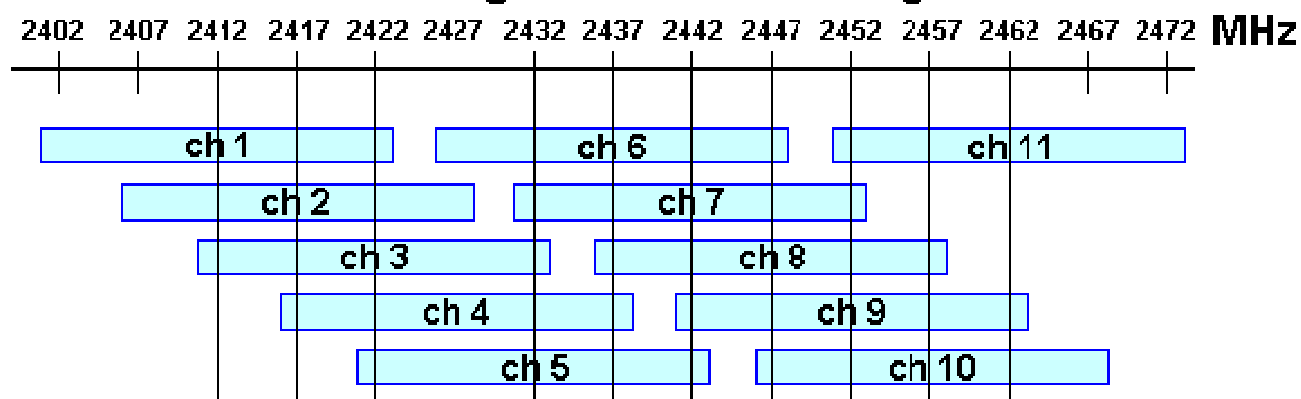
| Setting | Value | Unit |
|------------------------------|---------|-------|
| Data Rate | Auto | |
| Transmit Power | 28 dBm | |
| Fragment Length (256 - 2346) | 2346 | bytes |
| RTS/CTS Threshold (1 - 2346) | 2346 | bytes |
| Protection Mode | Disable | |
| WMM | Disable | |
| Distance (1-30km) | 2 | km |

At the bottom of the settings area are 'Apply' and 'Cancel' buttons. A red arrow points to the 'Fragment Length' value of 2346 bytes.

Choosing 2.4GHz Channels

- Choose non-overlapping channels to minimize interference when deploying multiple APs that are in range of one another.
- Channels are 22MHz wide, but only separated by 5MHz.
- Using 2437 as center frequency the signal covers between 2427 to 2447. The signal spans over the center frequency of 4 channels but encroaches on 6 channels signal span
- Site survey using a spectrum analyzer can determine other sources of 2.4GHz interference.

802.11b/g channel assignment



Choosing 5GHz Channels

- Channels 36-48 for indoor use.
- DFS Channels 52-60, 100-140 (UNI-II bands)
- Channels 149-161 for outdoor use.

| Frequency Band | Channel ID | FCC (GHz) | ETSI (GHz) | MKK (GHz) | SG (GHz) | ASIA (GHz) | TW (GHz) |
|-------------------------------|------------|-----------|------------|--------------------|----------|------------|----------|
| Lower Band (36 = default) | 34 | — | — | 5.170 ¹ | — | — | — |
| | 36 | 5.180 | 5.180 | — | 5.180 | — | — |
| | 38 | — | — | 5.190 | — | — | — |
| | 40 | 5.200 | 5.200 | — | 5.200 | — | — |
| | 42 | — | — | 5.210 | — | — | — |
| | 44 | 5.220 | 5.220 | — | 5.220 | — | — |
| | 46 | — | — | 5.230 | — | — | — |
| | 48 | 5.240 | 5.240 | — | 5.240 | — | — |
| Middle Band (52 = default) | 52 | 5.260 | 5.260 | — | — | — | 5.260 |
| | 56 | 5.280 | 5.280 | — | — | — | 5.280 |
| | 58 | 5.300 | 5.300 | — | — | — | 5.300 |
| | 60 | 5.320 | 5.320 | — | — | — | 5.320 |
| H Band | 100 | — | 5.500 | — | — | — | — |
| | 104 | — | 5.520 | — | — | — | — |
| | 108 | — | 5.540 | — | — | — | — |
| | 112 | — | 5.560 | — | — | — | — |
| | 116 | — | 5.580 | — | — | — | — |
| | 120 | — | 5.600 | — | — | — | — |
| | 124 | — | 5.620 | — | — | — | — |
| | 128 | — | 5.640 | — | — | — | — |
| | 132 | — | 5.660 | — | — | — | — |
| | 136 | — | 5.680 | — | — | — | — |
| | 140 | — | 5.700 | — | — | — | — |
| Upper Band (149 = default) | 149 | 5.745 | — | — | 5.745 | 5.745 | 5.745 |
| | 153 | 5.765 | — | — | 5.775 | 5.675 | 5.675 |
| | 157 | 5.785 | — | — | 5.785 | 5.785 | 5.785 |
| | 161 | 5.805 | — | — | 5.805 | 5.805 | 5.805 |
| ISM Band | 165 | 5.825 | — | — | 5.825 | — | 5.825 |

Note 1: Channel 34 is the default channel for Japan

Multiple SSIDs and VLANs

- Lowers equipment and installation cost.
- Separate networks for staff and guests using the same APs.
- Must use switches that support VLAN tagging.
- VLAN support only available in AP mode

EnGenius Wireless Access Point/Client Bridge

Access Point

Wireless Network

Wireless Mode: 802.11b/g Mixed (2.4GHz/54Mbps)

Channel / Frequency: CH1-2 412GHz

| SSID | Security | VID | Enable | Edit |
|-----------|---------------------------|-----|-------------------------------------|------|
| EnGenius1 | Open System No Encryption | 100 | <input checked="" type="checkbox"/> | Edit |
| EnGenius2 | Open System No Encryption | 2 | <input type="checkbox"/> | Edit |
| EnGenius3 | Open System No Encryption | 3 | <input type="checkbox"/> | Edit |
| EnGenius4 | Open System No Encryption | 4 | <input type="checkbox"/> | Edit |

Profile (SSID) Isolation

No Isolation

Isolate all Profiles (SSIDs) from each other using VLAN (802.1Q) standard

Apply Cancel

EnGenius1
Guest Internet Access

EnGenius2
Staff Network

EnGenius3
IT Dept

EnGenius4
Security



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Assigning a VLAN tag to an SSID

- Navigate to Wireless Network then click on edit for the SSID you wish to assign a VLAN tag to.

EnGenius | **Wireless Access Point/Client Bridge**

Access Point

Wireless Network Home Reset

Wireless Mode: 802.11b/g Mixed (2GHz/54Mbps)

Channel / Frequency: Ch1-2.412GHz Auto

AP Detection:

Current Profiles

| SSID | Security | VID | Enable | Edit |
|-----------|---------------------------|-----|-------------------------------------|-------------------------------------|
| EnGenius1 | Open System/No Encryption | 1 | <input checked="" type="checkbox"/> | <input type="button" value="Edit"/> |
| EnGenius2 | Open System/No Encryption | 2 | <input type="checkbox"/> | <input type="button" value="Edit"/> |
| EnGenius3 | Open System/No Encryption | 3 | <input type="checkbox"/> | <input type="button" value="Edit"/> |
| EnGenius4 | Open System/No Encryption | 4 | <input type="checkbox"/> | <input type="button" value="Edit"/> |

Profile (SSID) Isolation: No Isolation Isolate all Profiles (SSIDs) from each other using VLAN (802.1Q) standard

VLAN ID Tag

- In the pop up window for **SSID Profile**, set the **VLAN ID** tag, then click **Save**.

SSID Profile

Wireless Setting

| | | |
|--------------------|------------------------------|--|
| SSID | EnGenius1 | (1 to 32 characters) |
| VLAN ID | 55 | (1-4095) |
| Suppressed SSID | <input type="checkbox"/> | |
| Station Separation | <input type="radio"/> Enable | <input checked="" type="radio"/> Disable |

Wireless Security

| | |
|---------------|----------|
| Security Mode | Disabled |
|---------------|----------|

Save Cancel

Profile (SSID) Isolation

- The newly assigned tag will appear in the **VID** column.
- Next to **Profile (SSID) Isolation**, make sure to select **Isolate all Profiles (SSIDs) from each other using VLAN (802.1Q) standard**.
- Make sure to click **Apply**.

Wireless Network Home Reset

Wireless Mode: 802.11b/g Mixed (2GHz/54Mbps) ▾

Channel / Frequency: Ch1-2.412GHz ▾ Auto

AP Detection:

Current Profiles

| SSID | Security | VID | Enable | Edit |
|-----------|---------------------------|-----|-------------------------------------|-------------------------------------|
| EnGenius1 | Open System/No Encryption | 55 | <input checked="" type="checkbox"/> | <input type="button" value="Edit"/> |
| EnGenius2 | Open System/No Encryption | 2 | <input type="checkbox"/> | <input type="button" value="Edit"/> |
| EnGenius3 | Open System/No Encryption | 3 | <input type="checkbox"/> | <input type="button" value="Edit"/> |
| EnGenius4 | Open System/No Encryption | 4 | <input type="checkbox"/> | <input type="button" value="Edit"/> |

Profile (SSID) Isolation: No Isolation
 Isolate all Profiles (SSIDs) from each other using VLAN (802.1Q) standard

Management with VLAN

- When VLAN with Profile Isolation enabled, you can only access the AP from the profile with the same VLAN tag specified in the **Management VLAN** page.

The screenshot displays the EnGenius web interface for configuring a Wireless Access Point/Client Bridge. The page title is "Management VLAN Settings". On the left, a yellow sidebar lists navigation categories: "Access Point", "Status", "System", "Wireless", and "Management". The "Management" category is expanded, and "Management VLAN" is highlighted with a red box and a red arrow. The main content area features a "Caution" message: "If you reconfigure the Management VLAN ID, you may lose connectivity to the access point. Verify that the switch and DHCP server can support the reconfigured VLAN ID, and then re-connect to the new IP address." Below this, the "Management VLAN ID" section has two radio buttons: "No VLAN tag" and "Specified VLAN ID". The "Specified VLAN ID" option is selected and highlighted with a red box, with a red arrow pointing to it. The input field next to it contains the value "55" and is also highlighted with a red box. Below the radio buttons, there is a note: "(must be in the range 1 ~ 4095.)". At the bottom of the configuration area, there are "Apply" and "Cancel" buttons, both highlighted with red boxes. The top right of the page has "Home" and "Reset" buttons.

L2.5 Bridging

- In L2.5 bridging, the Client Bridge inserts its MAC address in the source MAC field of any frame that passes through it.
- Can prevent applications using MAC registration is a requirement such authentication gateways and VoIP SIP registrars from working properly.
- A work around is to use **WDS Bridge** mode which is transparent.

Firmware Upgrades

- Many times a new firmware may be available to fix bugs or add new features.
- Download the firmware [here](#).
- Firmware can be easily upgraded via the web based GUI.

The screenshot displays the EnGenius web-based GUI for a Wireless Access Point/Client Bridge. The interface is divided into a left sidebar and a main content area. The sidebar, highlighted in yellow, contains a menu with the following categories and items:

- Client Bridge**
- Status**
 - Main
 - Connection Status
 - System Log
- System**
 - System Properties
 - IP Settings
 - Spanning Tree Settings
- Wireless**
 - Wireless Network
 - Wireless Security
 - Wireless Advanced Settings
- Management**
 - Administration
 - SNMP Settings
 - Backup/Restore Settings
 - Firmware Upgrade** (circled and pointed to by a red arrow)
 - Time Settings
 - Log

The main content area is titled "Firmware Upgrade" and includes the following elements:

- Buttons for "Home" and "Reset".
- A text box displaying "Current firmware version: 1.0.38".
- A text box with the instruction "Locate and select the upgrade file from your hard disk:".
- An input field for the file path, followed by a "Browse..." button.
- An "Upgrade" button.

Two red arrows are present: one pointing to the "Firmware Upgrade" menu item in the sidebar, and another pointing to the file selection input field in the main content area.