ZYXEL
Your Networking Ally

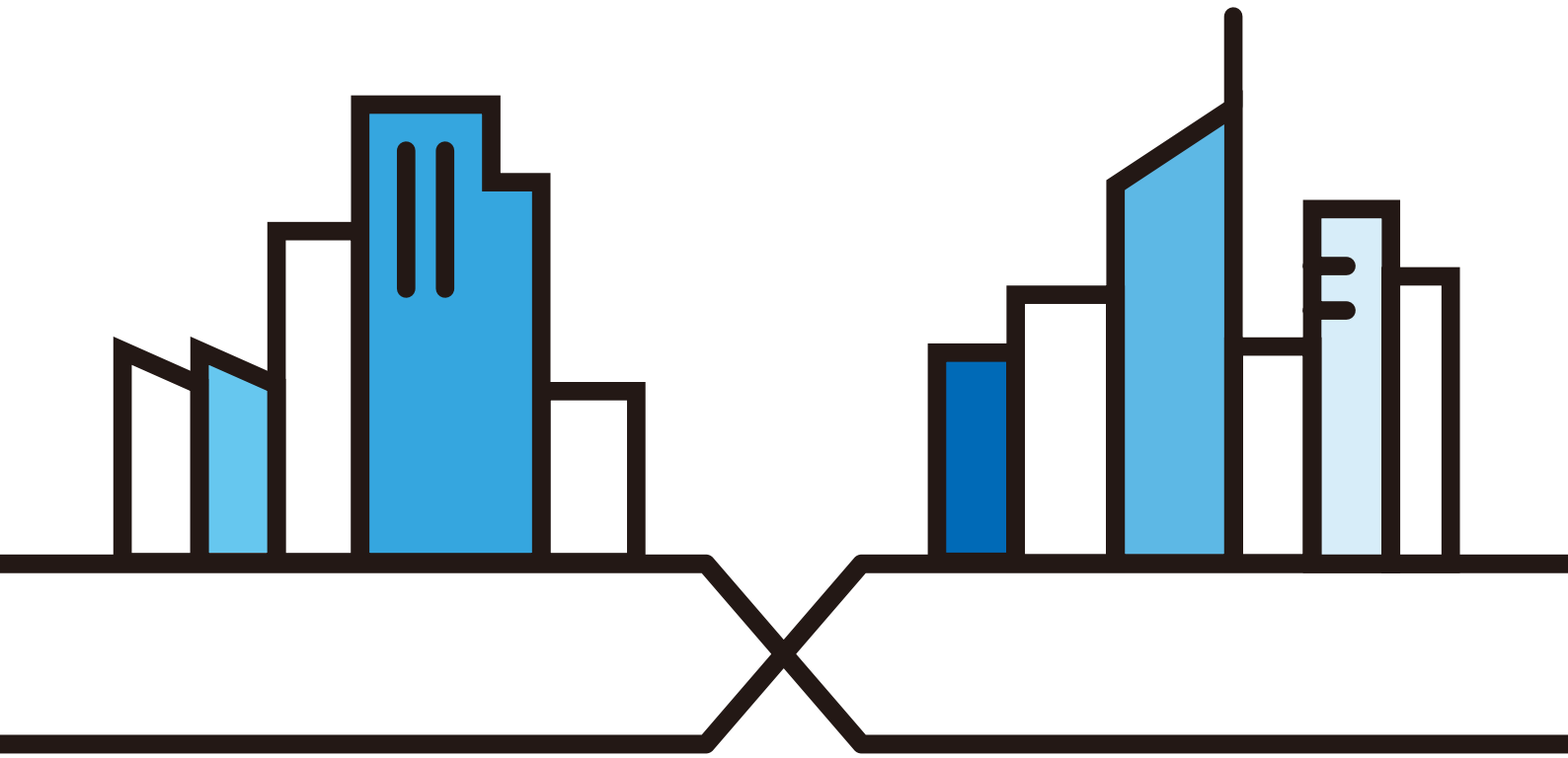
User's Guide

EMG2881-T20A

Dual-Band Wireless AC1300 Gigabit Ethernet Gateway

Default Login Details	
LAN IP Address	http://192.168.1.1
User Name	admin
Password	See the device label

Version 1.00 Edition 1, 01/2018



IMPORTANT!

READ CAREFULLY BEFORE USE.

KEEP THIS GUIDE FOR FUTURE REFERENCE.

Screenshots and graphics in this book may differ slightly from your product due to differences in your product firmware or your computer operating system. Every effort has been made to ensure that the information in this manual is accurate.

Related Documentation

- Quick Start Guide

  The Quick Start Guide shows how to connect the EMG2881-T20A and access the Web Configurator.

- More Information

  Go to **support.zyxel.com** to find other information on the EMG2881-T20A.

Document Conventions

Warnings and Notes

These are how warnings and notes are shown in this guide.

Warnings tell you about things that could harm you or your device.

Note: Notes tell you other important information (for example, other things you may need to configure or helpful tips) or recommendations.

Syntax Conventions

- The EMG2881-T20A may be referred to as the "EMG2881-T20A" in this guide.
- Product labels, screen names, field labels and field choices are all in **bold** font.
- A right angle bracket (>) within a screen name denotes a mouse click. For example, **Configuration > Log / Report > Log Settings** means you first click **Maintenance** in the navigation panel, then the **Log** sub menu and finally the **Log Setting** tab to get to that screen.

Icons Used in Figures

Figures in this user guide may use the following generic icons. The EMG2881-T20A icon is not an exact representation of your device.

EMG2881-T20A 	Generic Router 	Wireless Router / Access Point 
Switch 	Firewall 	Modem 
Server 	Cell Tower 	Printer 

Contents Overview

Table of Contents

PART I
User's Guide

CHAPTER 1
Introduction

1.1 Overview

This chapter introduces the main features and applications of the EMG2881-T20A.

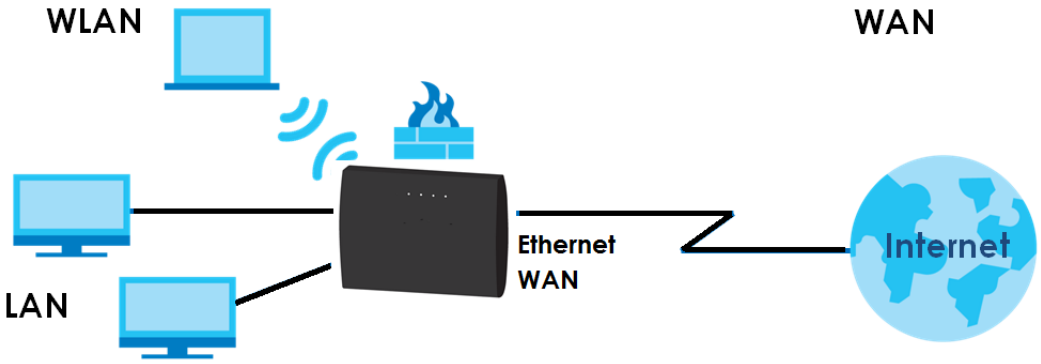
The EMG2881-T20A extends the range of your existing wired network without additional wiring, providing easy network access to mobile users. You can set up a wireless network with other IEEE 802.11a/ac/b/g/n compatible devices.

A firewall is also available for secure Internet computing.

1.1.1 Ethernet WAN

If you have another broadband modem or router (such as ADSL) available, you can use the Ethernet WAN port and then connect it to the broadband modem or router. This way, you can access the Internet via an Ethernet connection and still use the QoS, Firewall and parental control functions on the EMG2881-T20A.

Figure 1 EMG2881-T20A's Internet Access Application: Ethernet WAN



1.1.2 Wireless Access

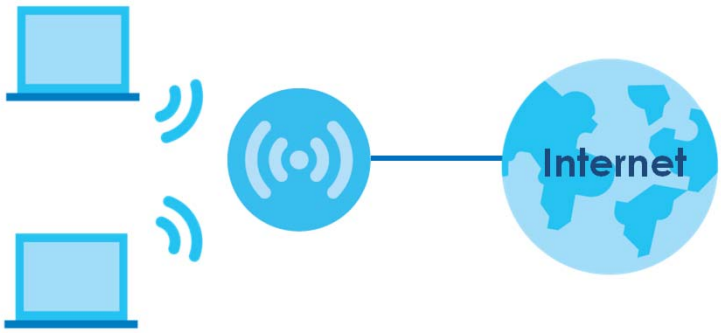
The EMG2881-T20A is a wireless Access Point (AP) for IEEE 802.11b/g/n/a/ac wireless clients, such as notebook computers, iPads, smartphones, etc. These devices can connect to the EMG2881-T20A to access network resources and the Internet.

Your EMG2881-T20A supports Wi-Fi Protected Setup (WPS), which allows you to quickly set up a wireless network with strong security.

You can configure your wireless network using the built-in Web Configurator.

See Chapter 4 on page 24 for more information about how to set up a wireless network.

Figure 2 Wireless Access Example



1.2 Applications

You can have the following networks with the EMG2881-T20A:

- **Wired**. You can connect network devices via the Ethernet ports of the EMG2881-T20A so that they can communicate with each other and access the Internet.
- **Wireless**. Wireless clients can connect to the EMG2881-T20A to access network resources. You can use WPS (Wi-Fi Protected Setup) to create an instant network connection with another WPS-compatible device.
- **WAN**. Connect to a broadband modem/router for Internet access.

1.3 Ways to Manage the EMG2881-T20A

Use any of the following methods to manage the EMG2881-T20A.

- WPS (Wi-Fi Protected Setup). You can use the WPS button or the WPS section of the Web Configurator to set up a wireless network with your EMG2881-T20A.
- Web Configurator. This is recommended for everyday management of the EMG2881-T20A using a (supported) web browser.

1.4 Good Habits for Managing the EMG2881-T20A

Do the following things regularly to make the EMG2881-T20A more secure and to manage the EMG2881-T20A more effectively.

- Change the password. Use a password that's not easy to guess and that consists of different types of characters, such as numbers and letters.
- Write down the password and put it in a safe place.
- Back up the configuration (and make sure you know how to restore it). Restoring an earlier working configuration may be useful if the device becomes unstable or even crashes. If you forget your password, you will have to reset the EMG2881-T20A to its factory default settings. If you backed up an earlier configuration file, you would not have to totally re-configure the EMG2881-T20A. You could simply restore your last configuration.

1.5 Hardware

1.5.1 Front Panel

The following graphic displays the front panel of the EMG2881-T20A.

Figure 3 LEDs on the EMG2881-T20A

1.5.2 Front Panel LEDs (Lights)

The following table describes the front panel LEDs.

Table 1 Front panel LEDs

LED	COLOR	STATUS	DESCRIPTION
Power	White	On	The EMG2881-T20A is receiving power and functioning properly.
		Off	The EMG2881-T20A is not receiving power.
Internet	White	On	The EMG2881-T20A has an IP connection but no traffic. Your device has a WAN IP address (either static or assigned by a DHCP server), PPP negotiation was successfully completed (if used) and the connection is up.
		Blinking	The EMG2881-T20A is sending or receiving IP traffic.
		Off	The EMG2881-T20A does not have an IP connection.
WLAN 2.4/5G	White	On	The 2.4 GHz/5 GHz wireless network is activated.
		Blinking	The EMG2881-T20A is communicating with 2.4 GHz/5 GHz wireless clients.
	Amber	Blinking	The EMG2881-T20A is setting up a WPS connection with a 2.4 GHz/5 GHz wireless client.
		Off	The wireless LAN is not ready or has failed.

1.5.3 Rear Panel

The following graphic displays the rear panel of the EMG2881-T20A.

Figure 4 EMG2881-T20A Rear Panel

The following table describes the items on the rear panel.

Table 2 Rear Panel Ports

LABEL	DESCRIPTION
WPS	Press the **WPS** button for more than one second to quickly set up a secure wireless connection between the EMG2881-T20A and a WPS-compatible client.
Reset	Press the button to return the EMG2881-T20A to the factory defaults.
LAN1 ~ LAN4	Connect computers or other Ethernet devices to Ethernet ports for Internet access.
WAN	Connect an Ethernet cable to the Ethernet WAN port for Internet access.
Power	Connect the power cable and press the power button to start the EMG2881-T20A.
Power Button	Press the power button after the power cable is connected to start the EMG2881-T20A.

1.5.4 Rear Panel LEDs (Lights)

The following table describes the rear panel LEDs.

Table 3 Rear panel LEDs

LED	COLOR	STATUS	DESCRIPTION
LAN 1-4	Green	On	The EMG2881-T20A recognizes an Ethernet cable through the LAN port.
		Blinking	The EMG2881-T20A is sending/receiving data through the LAN.
		Off	The EMG2881-T20A does not detect an Ethernet cable through the LAN port.
WAN	Green	On	The EMG2881-T20A recognizes an Ethernet cable through the WAN port.
		Blinking	The EMG2881-T20A is sending/receiving data through the WAN.
		Off	The EMG2881-T20A does not detect an Ethernet cable through the WAN port.

1.5.5 Using the WLAN and WPS Buttons

If the wireless network is turned off, go to the **Wireless** screen to turn it on. Once the **2.4G WLAN/WPS** or **5G WLAN/WPS** LED turns white, the wireless network is active.

You can also use the **WPS** button to quickly set up a secure wireless connection between the EMG2881-T20A and a WPS-compatible client by adding one device at a time.

To activate WPS:

1. Make sure the **POWER** LED is on and not blinking.
2. Press the **WPS** button for more than one second and release it.
3. Press the WPS button on another WPS-enabled device within range of the EMG2881-T20A. The **WLAN 2.4G** and **WLAN 5G** LEDs flash amber while the EMG2881-T20A sets up a WPS connection with the other wireless device.
4. Once the connection is successfully made, the **WLAN 2.4G** and **WLAN 5G** LEDs shine white.

1.5.6 Resetting the EMG2881-T20A

If you forget your password or IP address, or you cannot access the Web Configurator, you will need to use the **RESET** button at the back of the EMG2881-T20A to reload the factory-default configuration file. This means that you will lose all configurations that you had previously saved, the user name will be reset to "admin", the password will be reset to the factory default (see the device label), and the IP address will be reset to "192.168.1.1" (router mode).

1.5.6.1 How to Use the RESET Button

1. Make sure the **POWER** LED is on.
2. Press the **RESET** button for one to four seconds to restart/reboot the EMG2881-T20A.

3 Press the **RESET** button for longer than five seconds to set the EMG2881-T20A back to its factory-default configurations.

CHAPTER 2
Introducing the Web Configurator

2.1 Overview

This chapter describes how to access the EMG2881-T20A Web Configurator and provides an overview of its screens.

The Web Configurator is an HTML-based management interface that allows easy setup and management of the EMG2881-T20A via Internet browser. Use Internet Explorer 9.0 and later versions, Mozilla Firefox 21 and later versions, Safari 6.0 and later versions or Google Chrome 26.0 and later versions. The recommended screen resolution is 1024 by 768 pixels.

In order to use the Web Configurator you need to allow:

- Web browser pop-up windows from your device. Web pop-up blocking is enabled by default in Windows XP SP (Service Pack) 2.
- JavaScript (enabled by default).
- Java permissions (enabled by default).

Refer to the Troubleshooting chapter (Chapter 12 on page 106) to see how to make sure these functions are allowed in Internet Explorer.

2.2 Accessing the Web Configurator

1. Make sure your EMG2881-T20A hardware is properly connected and prepare your computer or computer network to connect to the EMG2881-T20A (refer to the Quick Start Guide).
2. Launch your web browser.
3. The EMG2881-T20A is in router mode by default. Type "http://192.168.1.1" as the website address.

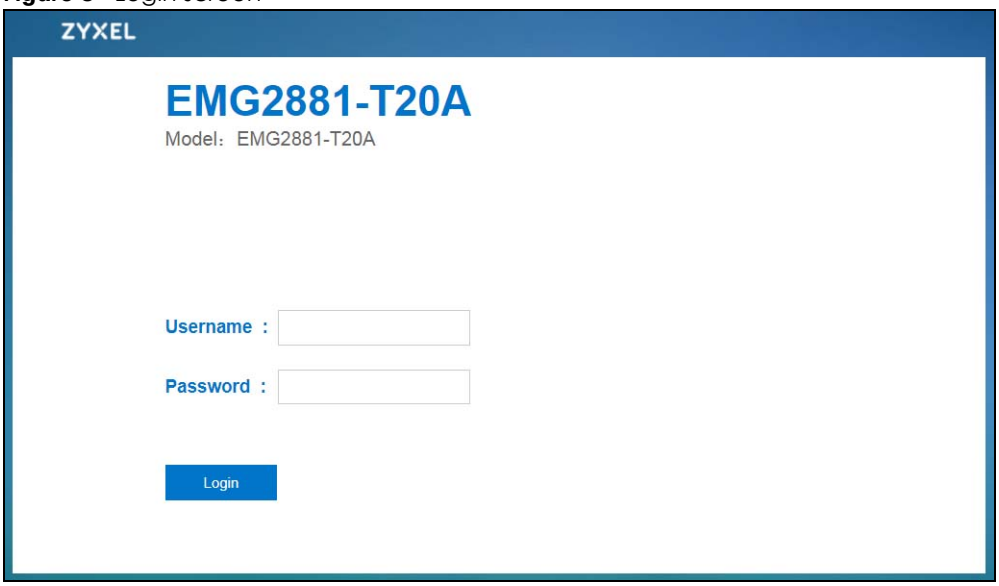
   Your computer must be in the same subnet in order to access this website address.

2.2.1 Login Screen

The Web Configurator initially displays the following login screen.

Type the default **Username** admin and randomly assigned default password (see the device label) in the **Login** screen and click **Login**.

Figure 5 Login screen



The following table describes the labels in this screen.

Table 4 Login screen

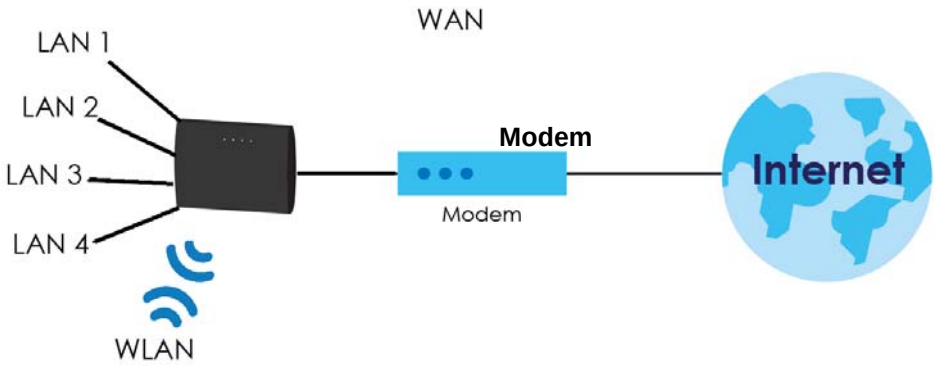
LABEL	DESCRIPTION
Username	Type "admin" (default) as the user name.
Password	Type the default password (on the device label). Click **Login**.

CHAPTER 3
Router Mode

3.1 Overview

The EMG2881-T20A is set to router mode by default. Routers are used to connect the local network to another network (for example, the Internet). In the figure below, the EMG2881-T20A connects the local network (**LAN1** ~ **LAN4**) to the Internet.

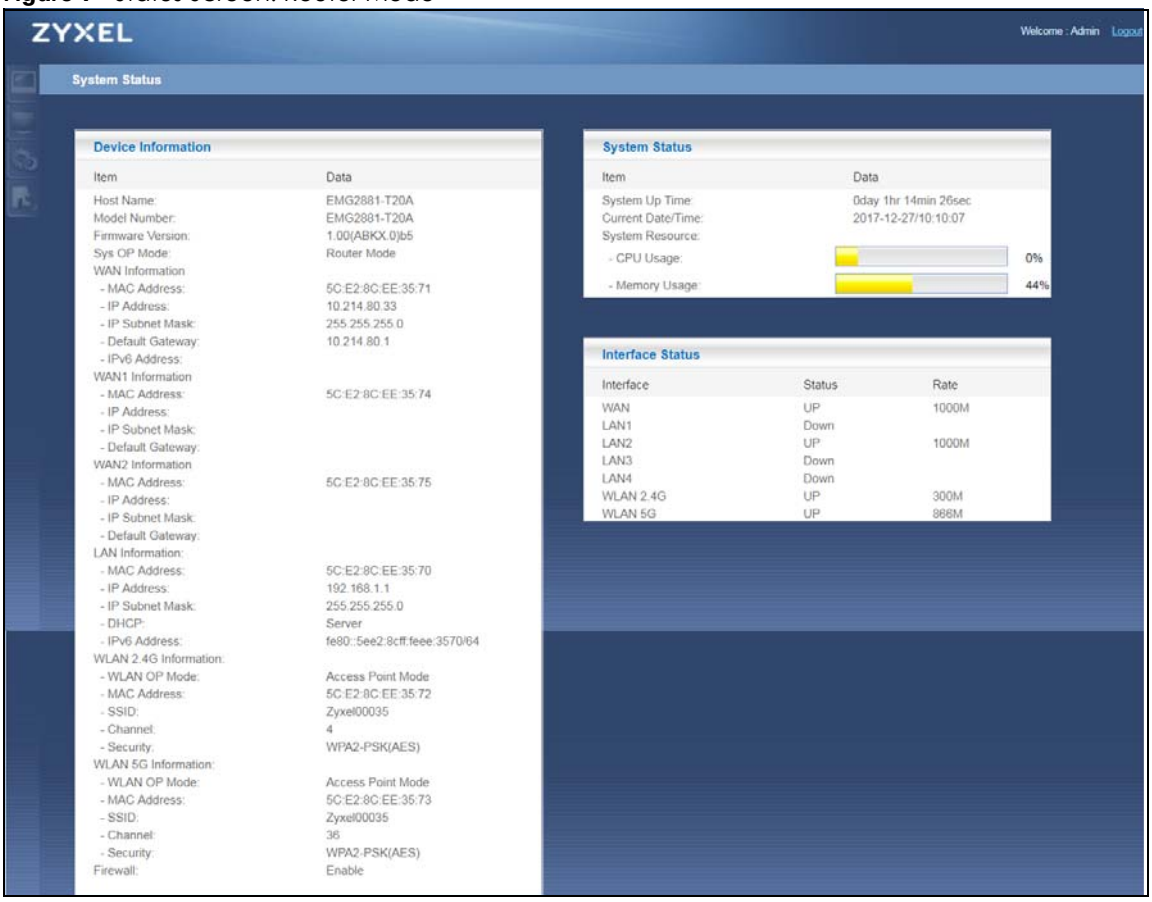
Figure 6 EMG2881-T20A Network



3.2 Router Mode Status Screen

Click  to open the status screen.

Figure 7 Status Screen: Router Mode



The following table describes the icons shown in the **Status** screen.

Table 5 Status Screen Icon Key

ICON	DESCRIPTION
Logout	Click this at any time to exit the Web Configurator.
	Click this icon to see the **Status** page. The information in this screen depends on the device mode you select.
	Click this icon to see the **Monitor** navigation menu.
	Click this icon to see the **Configuration** navigation menu.
	Click this icon to see the **Maintenance** navigation menu.

The following table describes the labels shown in the **Status** screen.

Table 6 Status Screen: Router Mode

LABEL	DESCRIPTION
Device Information	
Host Name	This is the **System Name** you enter in the **Maintenance** > **General** screen. It is for identification purposes.
Model Number	This is the model name of your device.
Firmware Version	This is the firmware version and the date created.
Sys OP Mode	This is the device mode to which the EMG2881-T20A is set - **Router Mode**.

Table 6 Status Screen: Router Mode (continued)

LABEL	DESCRIPTION
WAN/WAN 1/WAN 2 Information	
MAC Address	This shows the WAN Ethernet adapter MAC Address of your device.
IP Address	This shows the WAN port's IP address.
IP Subnet Mask	This shows the WAN port's subnet mask.
Default Gateway	This shows the WAN port's gateway IP address.
IPv6 Address	This shows the IPv6 address of the EMG2881-T20A on the WAN.
LAN Information	
MAC Address	This shows the LAN Ethernet adapter MAC Address of your device.
IP Address	This shows the LAN port's IP address.
IP Subnet Mask	This shows the LAN port's subnet mask.
DHCP	This shows the LAN port's DHCP role - **Server** or **Disable**.
IPv6 Address	This shows the IPv6 address of the EMG2881-T20A on the LAN.
WLAN 2.4G Information	
WLAN OP Mode	This is the device mode to which the EMG2881-T20A's wireless LAN is set - **Access Point Mode**.
MAC Address	This shows the 2.4GHz wireless adapter MAC Address of your device.
SSID	This shows a descriptive name used to identify the EMG2881-T20A in the 2.4GHz wireless LAN.
Channel	This shows the channel number which you select manually.
Security	This shows the level of wireless security the EMG2881-T20A is using.
WLAN 5G Information	
WLAN OP Mode	This is the device mode to which the EMG2881-T20A's wireless LAN is set - **Access Point Mode**.
MAC Address	This shows the 5GHz wireless adapter MAC Address of your device.
SSID	This shows a descriptive name used to identify the EMG2881-T20A in the 5GHz wireless LAN.
Channel	This shows the channel number which you select manually.
Security	This shows the level of wireless security the EMG2881-T20A is using.
Firewall	This shows whether the firewall is enabled or not.
System Status	
Item	This column shows the type of data the EMG2881-T20A is recording.
Data	This column shows the actual data recorded by the EMG2881-T20A.
System Up Time	This is the total time the EMG2881-T20A has been on.
Current Date/Time	This field displays your EMG2881-T20A's present date and time.
System Resource	
- CPU Usage	This displays what percentage of the EMG2881-T20A's processing ability is currently used. When this percentage is close to 100%, the EMG2881-T20A is running at full load, and the throughput is not going to improve anymore. If you want some applications to have more throughput, you should turn off other applications (for example, using bandwidth management.)
- Memory Usage	This shows what percentage of the heap memory the EMG2881-T20A is using.
Interface Status	
Interface	This displays the EMG2881-T20A port types. The port types are: **WAN**, **LAN** and **WLAN**.

Table 6 Status Screen: Router Mode (continued)

LABEL	DESCRIPTION
Status	For the LAN and WAN ports, this field displays **Down** (line is down) or **Up** (line is up or connected). For the 2.4GHz/5GHz WLAN, it displays **Up** when the 2.4GHz/5GHz WLAN is enabled or **Down** when the 2.4G/5G WLAN is disabled.
Rate	For the LAN ports, this displays the port speed or **N/A** when the line is disconnected. For the WAN port, it displays the port speed and duplex setting if you're using Ethernet encapsulation. This field displays **N/A** when the line is disconnected. For the 2.4GHz/5GHz WLAN, it displays the maximum transmission rate when the 2.4GHz/5GHz WLAN is enabled and **N/A** when the WLAN is disabled.

3.2.1 Navigation Panel

Use the sub-menus on the navigation panel to configure EMG2881-T20A features.

Figure 8 Navigation Panel: Router Mode

The following table describes the sub-menus.

Table 7 Navigation Panel: Router Mode

LINK	TAB	FUNCTION
Status		This screen shows the EMG2881-T20A's general device, system and interface status information. Use this screen to access the wizard, and summary statistics tables.
MONITOR		
Client Tables		Use this screen to view current DHCP client information.

Table 7 Navigation Panel: Router Mode (continued)

LINK	TAB	FUNCTION
CONFIGURATION		
WAN		
Management WAN	Management WAN	This screen allows you to configure ISP parameters, WAN IP address assignment, DNS servers, the WAN MAC address, and VLAN settings.
NAT	General	Use this screen to enable NAT.
	Port Trigger	Use this screen to change your EMG2881-T20A's port triggering settings.
	Passthrough	Use this screen to enable or disable the VPN passthrough feature.
Dynamic DNS	Dynamic DNS	Use this screen to set up dynamic DNS.
Interface Group	Interface Group	Use this screen to add a LAN interface or a VLAN ID to a new group.
Wireless		
Wireless	Wireless	Use this screen to enable the wireless LAN and configure wireless LAN and wireless security settings.
	More AP	Use this screen to configure multiple BSSs on the EMG2881-T20A.
	MAC Filter	Use the MAC filter screen to configure the EMG2881-T20A to block access to devices or block the devices from accessing the EMG2881-T20A.
	Advanced	This screen allows you to configure advanced wireless settings.
	WPS	Use this screen to configure WPS.
	Scheduling	Use this screen to schedule the times the Wireless LAN is enabled.
LAN	LAN IP	Use this screen to configure LAN IP address and subnet mask. Use this screen to enable the EMG2881-T20A's DHCP server.
	Static DHCP	This screen allows you to assign IP addresses on the LAN to specific individual computers based on their MAC addresses.
	IPv6 LAN	Use this screen to configure the IPv6 address for the EMG2881-T20A on the LAN.
Application		
Bandwidth MGMT	QoS General	Use this screen to enable or disable QoS and set the upstream bandwidth.
	Queue Setup	Use this screen to configure QoS queue assignment.
	Class Setup	Use this screen to configure QoS classifiers.
UPnP	UPnP	Use this screen to enable UPnP on the EMG2881-T20A.
Security		
IPv4 Firewall		Use this screen to configure IPv4 firewall rules.
IPv6 firewall		Use this screen to configure IPv6 firewall rules.
MAINTENANCE		
General	General	Use this screen to view and change administrative settings such as system and domain names.
Password	Password	Use this screen to change the password of your EMG2881-T20A.
Time	Time Setting	Use this screen to change your EMG2881-T20A's time and date.
Firmware Upgrade	Firmware Upgrade	Use this screen to upload firmware to your EMG2881-T20A.
Backup/ Restore	Backup/ Restore	Use this screen to backup and restore the configuration or reset the factory defaults to your EMG2881-T20A.

Table 7 Navigation Panel: Router Mode (continued)

LINK	TAB	FUNCTION
Restart	System Restart	This screen allows you to reboot the EMG2881-T20A without turning the power off.
Log	Log	Use this screen to view the list of activities recorded by your EMG2881-T20A.
ROMD	ROMD	Use this screen to save and/or clean the configuration to/from the ROMD file which can store customized default settings.

CHAPTER 4
Tutorials

4.1 Overview

This chapter provides tutorials for setting up your EMG2881-T20A.

- Set Up a Wireless Network Using WPS
- Connect to the EMG2881-T20A's WiFi Network Manually (No WPS)
- Using Multiple SSIDs on the EMG2881-T20A

4.2 Set Up a Wireless Network Using WPS

This section gives you an example of how to set up a wireless network using WPS. This example uses the EMG2881-T20A as the AP and a WPS-enabled Android 4.4.2 smartphone as the wireless client.

There are two WPS methods for creating a secure connection via the web configurator or utility. This tutorial shows you how to do both.

- **Push Button Configuration (PBC)** - create a secure wireless network simply by pressing a button. See Section 4.2.1 on page 24. This is the easier method.
- **PIN Configuration** - create a secure wireless network simply by entering a wireless client's PIN (Personal Identification Number) in the EMG2881-T20A's interface. See Section 4.2.2 on page 25. This is the more secure method, since one device can authenticate the other.

4.2.1 Push Button Configuration (PBC)

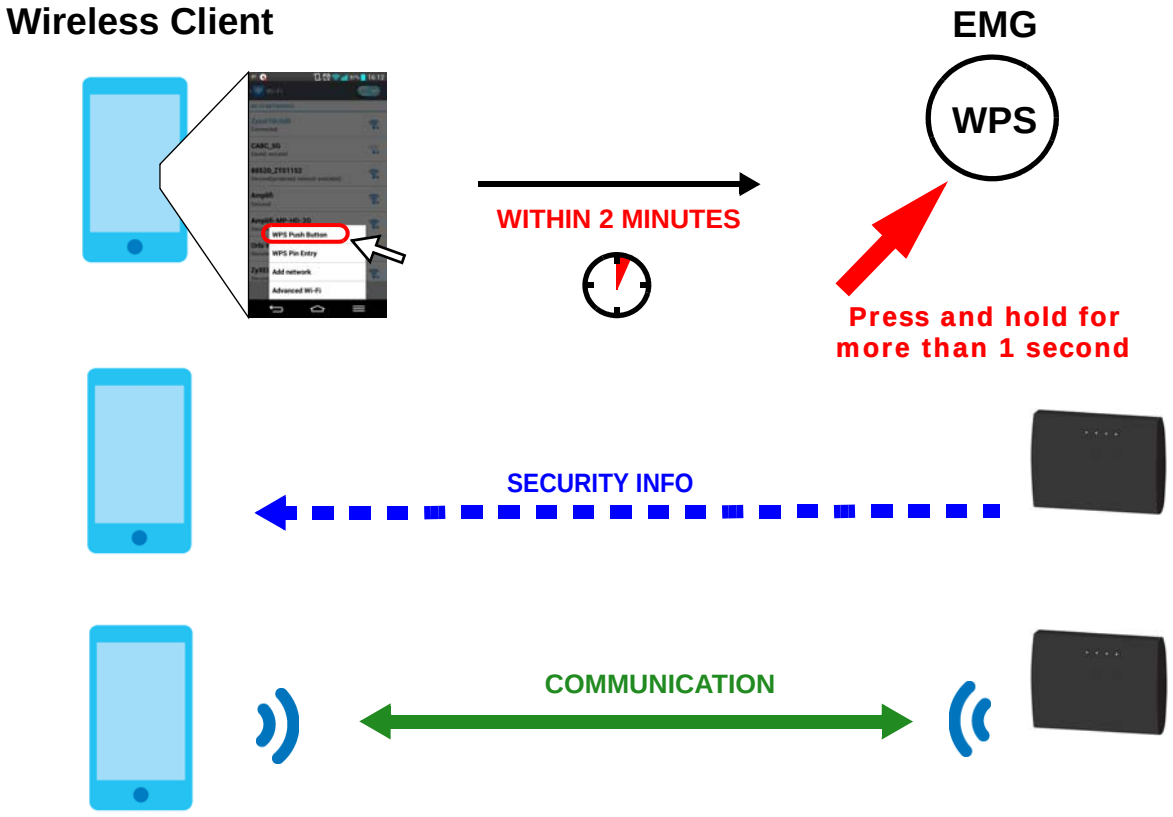
1. Make sure that your EMG2881-T20A is turned on and that the device is placed within range of your Android 4.42 smartphone.
2. WPS is enabled by default on the EMG2881-T20A. If not, log into EMG2881-T20A's Web Configurator and turn it on in the **Configuration > Wireless > WPS** screen. You can either press the **WPS** button on the EMG2881-T20A's panel or press the **Push Button** button in the **Configuration > Wireless > WPS** screen
3. Go to your phone settings and turn on Wi-Fi. Open the Wi-Fi networks list and tap **WPS Push Button** or the WPS icon ( ).

   Note: It doesn't matter which button is pressed first. You must press the second button within two minutes of pressing the first one.

   The EMG2881-T20A sends the proper configuration settings to the wireless client. This may take up to two minutes. Then the wireless client is able to communicate with the EMG2881-T20A securely.

The following figure shows you an example to set up wireless network and security by pressing a button on both EMG2881-T20A and wireless client (the Android 4.4.2 phone in this example).

Figure 9 Example WPS Process: PBC Method



4.2.2 PIN Configuration

When you use the PIN configuration method, you need to check the client's PIN number and use the EMG2881-T20A's configuration interface.

1 Go to your phone settings and turn on Wi-Fi. Open the Wi-Fi networks list and tap **WPS PIN Entry** to get a PIN number.

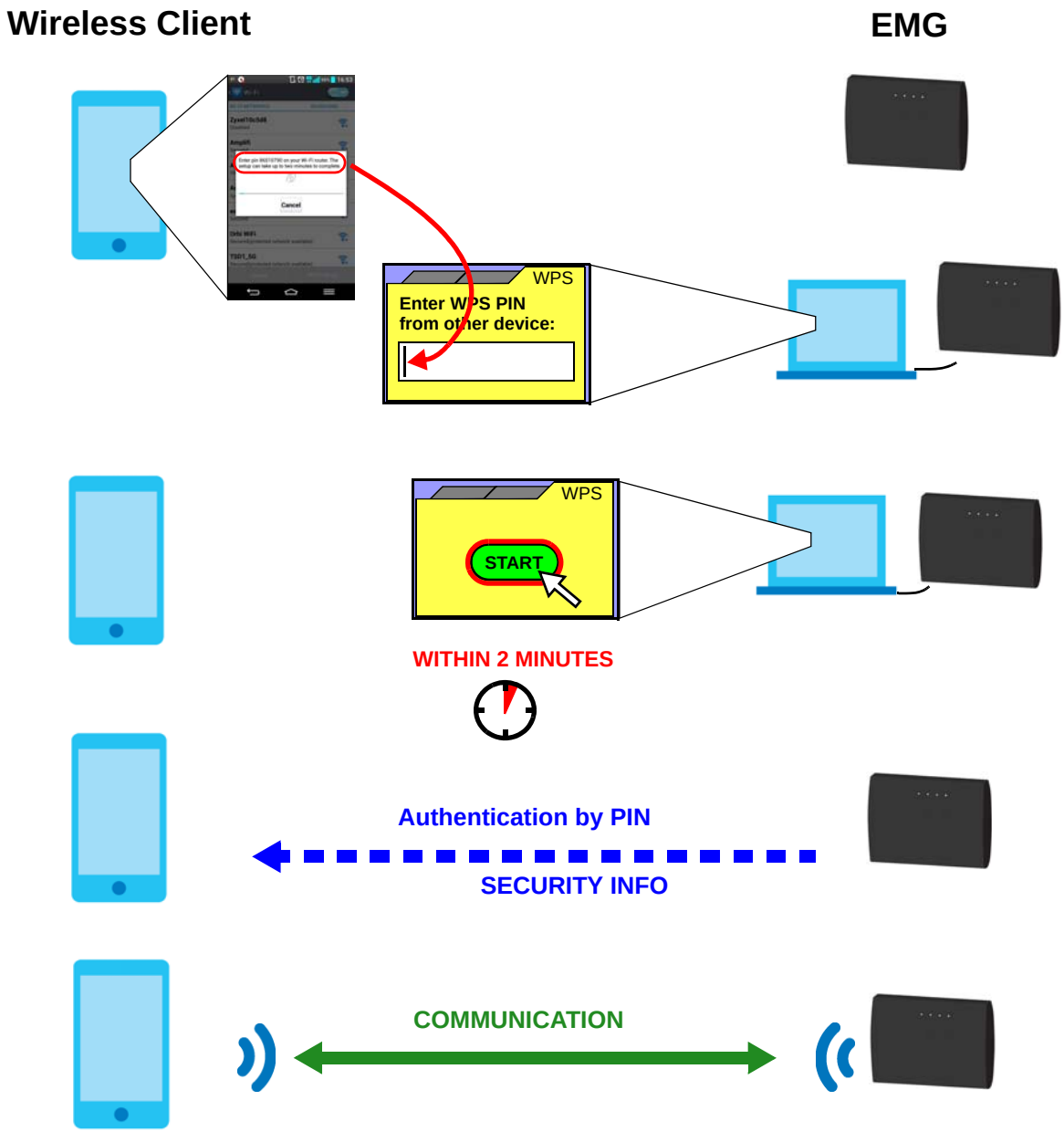
2 Enter the client's PIN number to the **PIN** field in the **Configuration > Wireless > WPS** screen on the EMG2881-T20A.

3 Click the **Start** button (or button next to the PIN field) on the EMG2881-T20A's **WPS** screen within two minutes.

The EMG2881-T20A authenticates the wireless client and sends the proper configuration settings to the wireless client. This may take up to two minutes. Then the wireless client is able to communicate with the EMG2881-T20A securely.

The following figure shows you the example to set up wireless network and security on EMG2881-T20A and wireless client (Android 4.4.2 smartphone in this example) by using PIN method.

Figure 10 Example WPS Process: PIN Method



4.3 Connect to the EMG2881-T20A's WiFi Network Manually (No WPS)

In this example, we change the EMG2881-T20A's wireless settings, and then manually select the EMG2881-T20A's new SSID and enter the Wi-Fi key to connect a wireless client to the EMG2881-T20A.

4.3.1 Configuring Wireless Security on the EMG2881-T20A

This section shows you how to configure wireless security settings with the following parameters on your EMG2881-T20A.

Frequency Band	2.4 GHz
SSID	SSID_Example
Channel	Auto
Security	WPA2-PSK (Pre-Shared Key: ThisismyWPA-PSKpre-sharedkey)

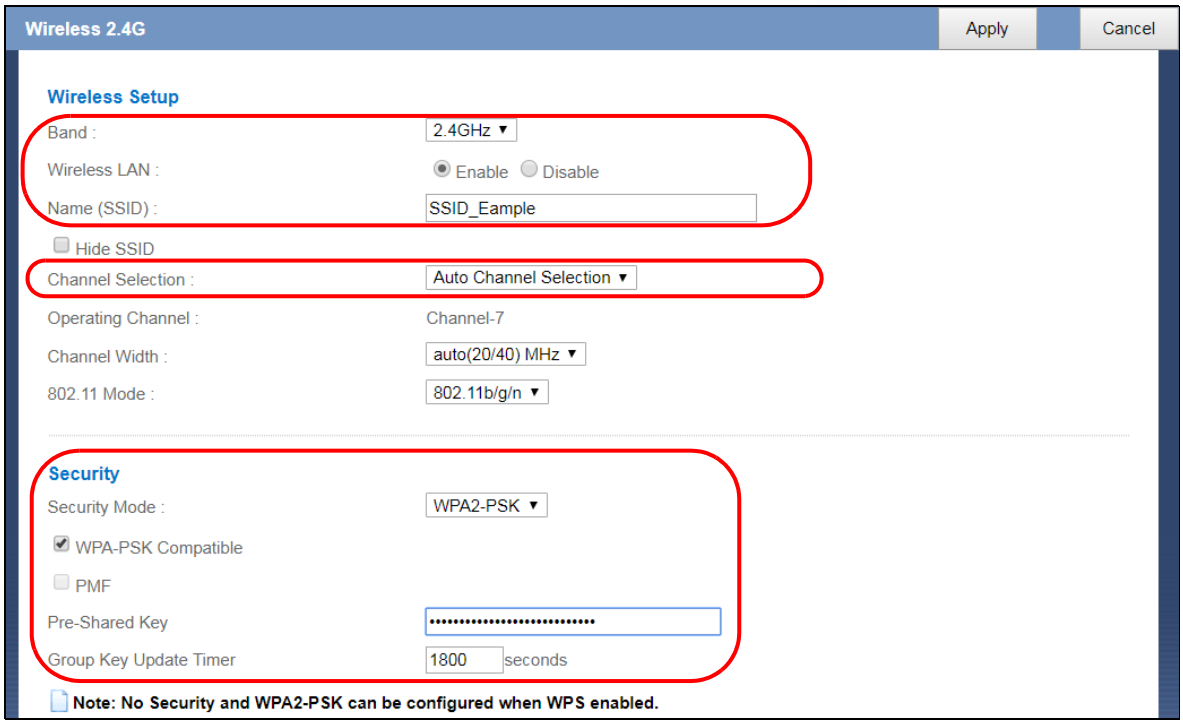
Follow the steps below to configure the wireless settings on your EMG2881-T20A.

The instructions require that your hardware is connected (see the Quick Start Guide) and you are logged into the Web Configurator through your LAN connection (see Section 2.2 on page 16).

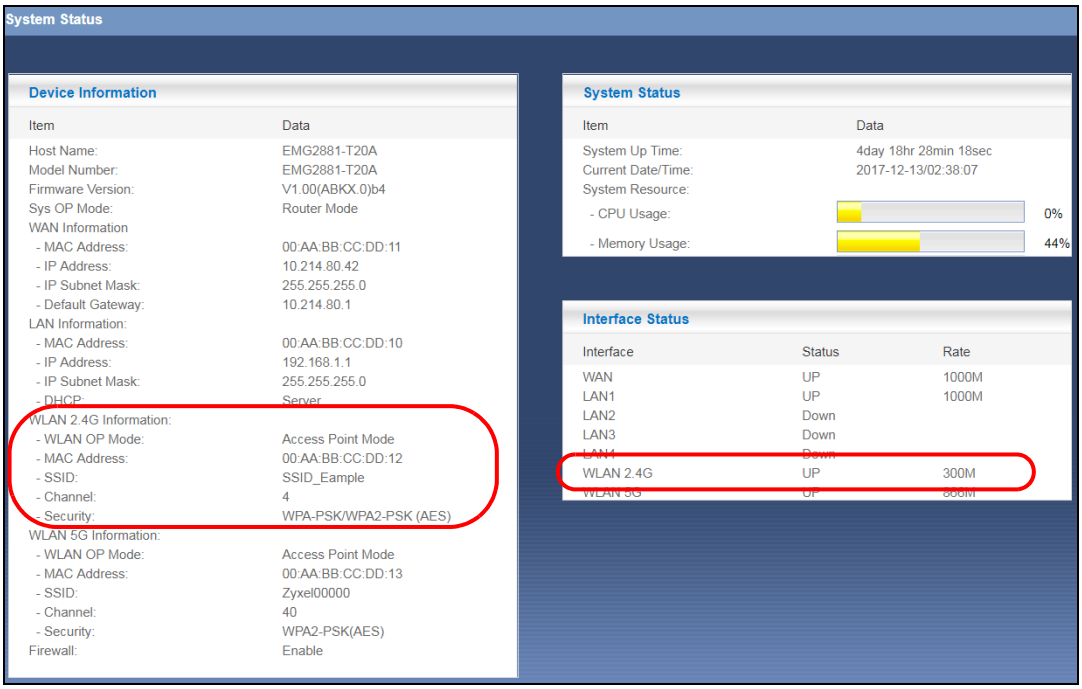
1 Go to the Configuration > Wireless > Wireless screen to enable the 2.4 GHz wireless network.

2 Enter **SSID_Example** as the SSID and select **Auto Channel Selection** to have the EMG2881-T20A scans for and select an available channel automatically.

3 Set security mode to **WPA2-PSK** and enter **ThisismyWPA-PSKpre-sharedkey** in the **Pre-Shared Key** field. Select **WPA-PSK Compatible** to allow wireless devices using WPA-PSK security mode to connect to the EMG2881-T20A. Click **Apply**.



4 Open the **Status** screen. Verify your wireless and wireless security settings under **Device Information** and check if the WLAN connection is up under **Interface Status**.

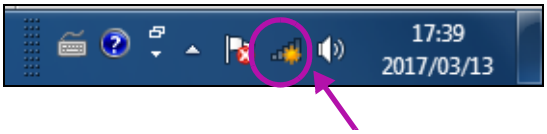


4.3.2 Configure Your Notebook

Note: In this example, we use a Windows 7 laptop that has a built-in wireless adapter as the wireless client.

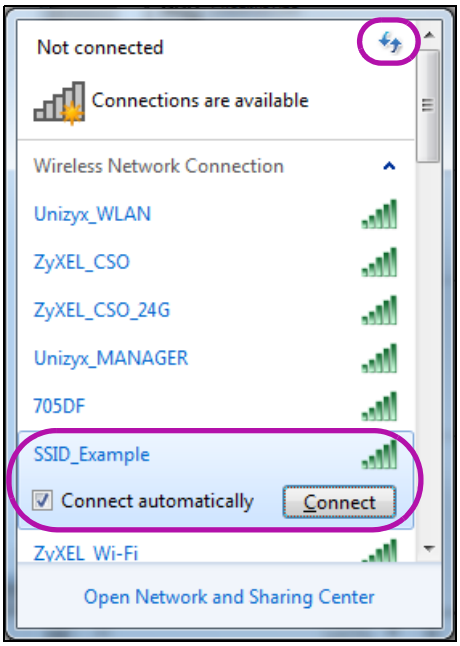
1 The EMG2881-T20A supports IEEE 802.11a, IEEE 802.11b, IEEE 802.11g, IEEE 802.11n, IEEE 802.11a, IEEE 802.11an, and IEEE 802.11ac wireless clients. Make sure that your notebook or computer's wireless adapter supports one of these standards.

2 Click the Wi-Fi icon in your computer's system tray

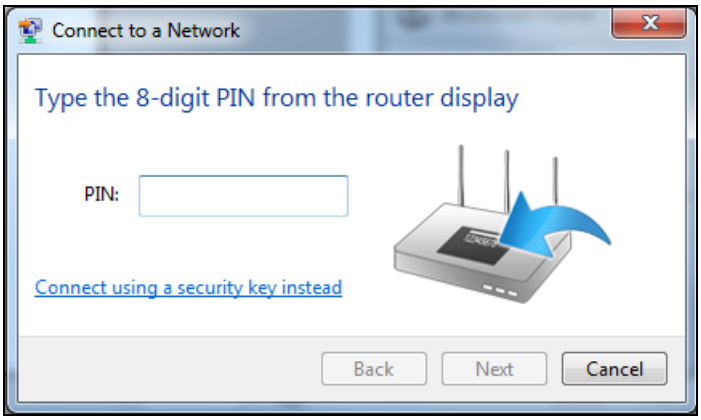


3 The **Wireless Network Connection** screen displays. Click the refresh button to update the list of available wireless APs within range.

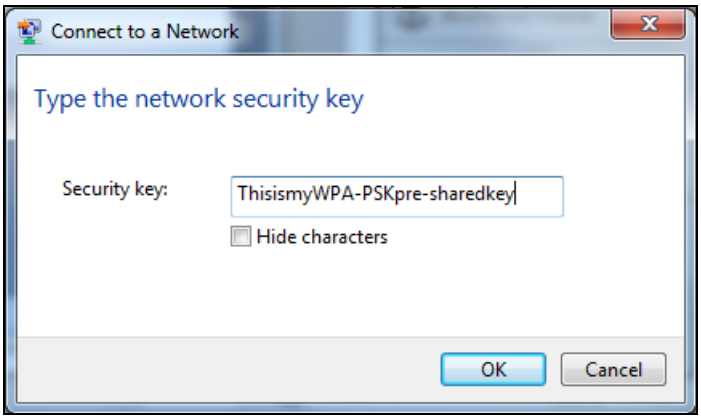
4 Select **SSID_Example** and click **Connect**.



5 The following screen displays if WPS is enabled on the EMG2881-T20A but you didn't press the WPS button. Click **Connect using as security key instead**.



6 Type the security key in the following screen. Click **OK**.



7 Check the status of your wireless connection in the screen below.

8 If the wireless client keeps trying to connect to or acquiring an IP address from the EMG2881-T20A, make sure you entered the correct security key.

If the connection has limited or no connectivity, make sure the EMG2881-T20A is connected to a router with the DHCP server enabled.

If your connection is successful, open your Internet browser and enter http://www.zyxel.com or the URL of any other web site in the address bar. If you are able to access the web site, your wireless connection is successfully configured.

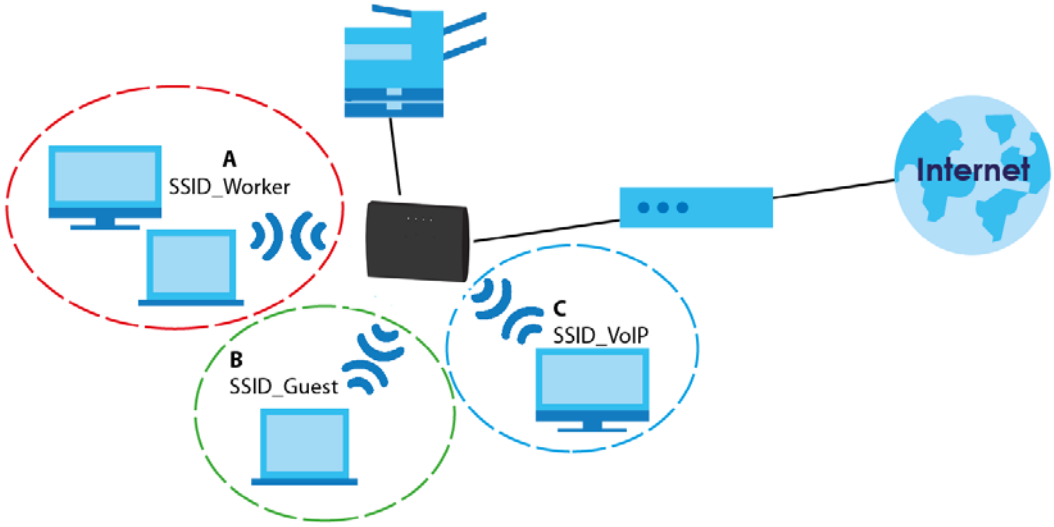
4.4 Using Multiple SSIDs on the EMG2881-T20A

You can configure more than one SSID on a EMG2881-T20A. See Section 7.4 on page 61.

This allows you to configure multiple independent wireless networks on the EMG2881-T20A as if there were multiple APs (virtual APs). Each virtual AP has its own SSID, wireless security type and MAC filtering settings. That is, each SSID on the EMG2881-T20A represents a different access point/wireless network to wireless clients in the network.

Clients can associate only with the SSIDs for which they have the correct security settings. Clients using different SSIDs can access the Internet and the wired network behind the EMG2881-T20A (such as a printer).

For example, you may set up three wireless networks (**A**, **B** and **C**) in your office. **A** is for workers, **B** is for guests and **C** is specific to a VoIP device in the meeting room.



4.4.1 Configuring Security Settings of Multiple SSIDs

The EMG2881-T20A is in router mode by default.

This example shows you how to configure the SSIDs with the following parameters on your EMG2881-T20A (in router mode).

SSID	SECURITY TYPE	KEY	INTRA-BSS TRAFFIC BLOCKING	MAC FILTERING
SSID_Worker	WPA2-PSK WPA Compatible	DoNotStealMyWirelessNetwork	No	Disable
SSID_VoIP	WPA-PSK WPA Compatible	VoIPOnly12345678	Yes	Allow 00:A0:C5:01:23:45
SSID_Guest	WPA-PSK WPA Compatible	keyexample123	No	Disable

1 Connect your computer to the LAN port of the EMG2881-T20A using an Ethernet cable.

2 The default IP address of the EMG2881-T20A in router mode is "192.168.1.1". In this case, your computer must have an IP address in the range between "192.168.1.2" and "192.168.1.254".

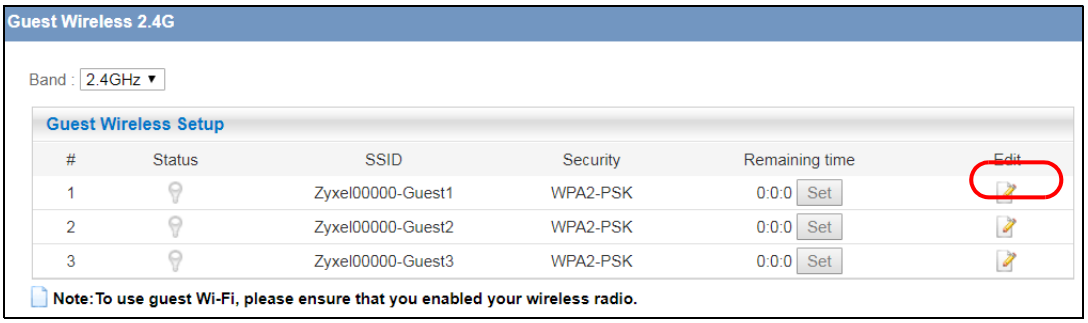
3 Click **Start > Run** on your computer in Windows. Type "cmd" in the dialog box. Enter "ipconfig" to show your computer's IP address. If your computer's IP address is not in the correct range then see Appendix B on page 121 for information on changing your computer's IP address.

4 After you've set your computer's IP address, open a web browser such as Internet Explorer and type "http://192.168.1.1" as the web address in your web browser.

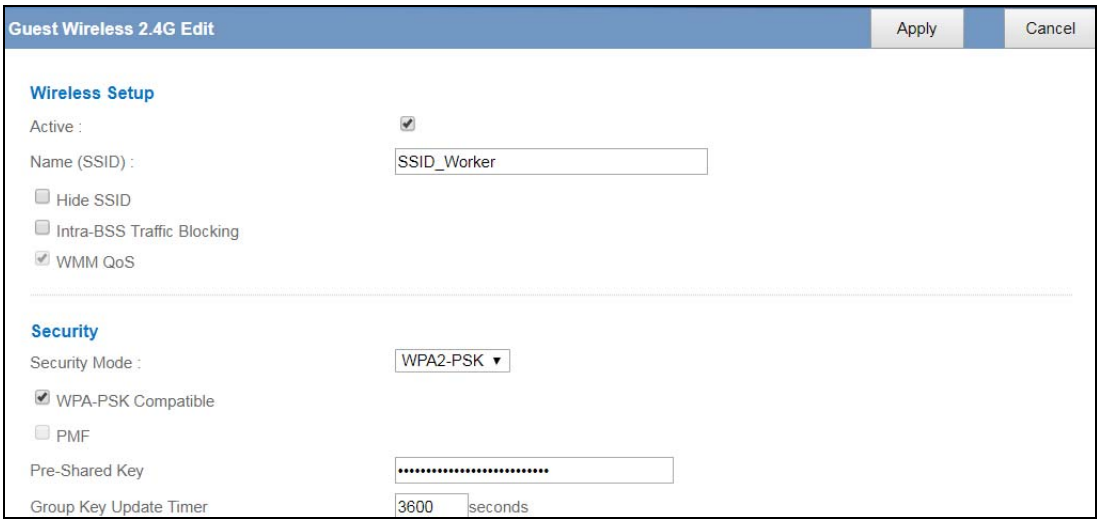
5 Enter the default password (on the device label) as the password and click **Login**.

6 Type a new password and retype it to confirm, then click **Apply**. Otherwise, click **Ignore**.

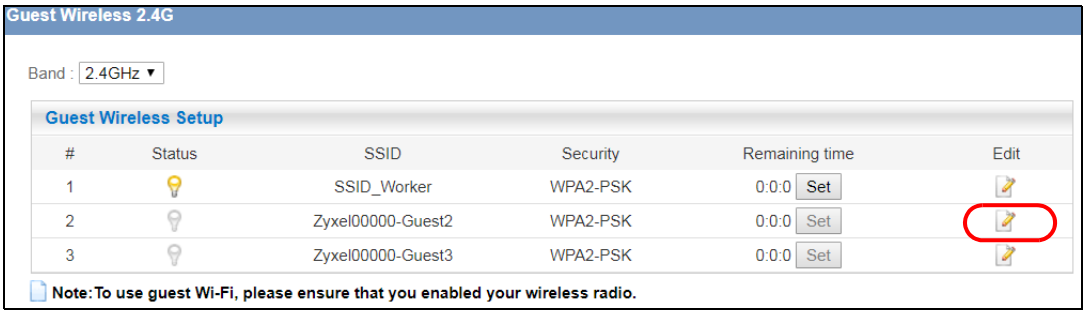
7 Go to **Configuration > Wireless > More AP**. Click the **Edit** icon of the first entry to configure wireless and security settings for **SSID_Worker**.



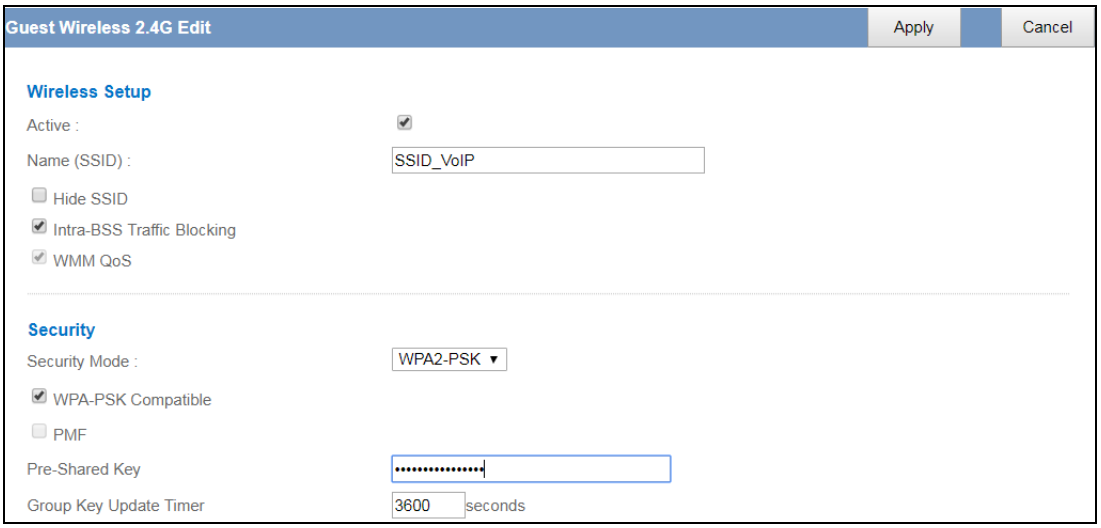
8 Configure the screen as follows. In this example, you disable **Intra-BSS Traffic** for **SSID_Worker**. Click **Apply**.



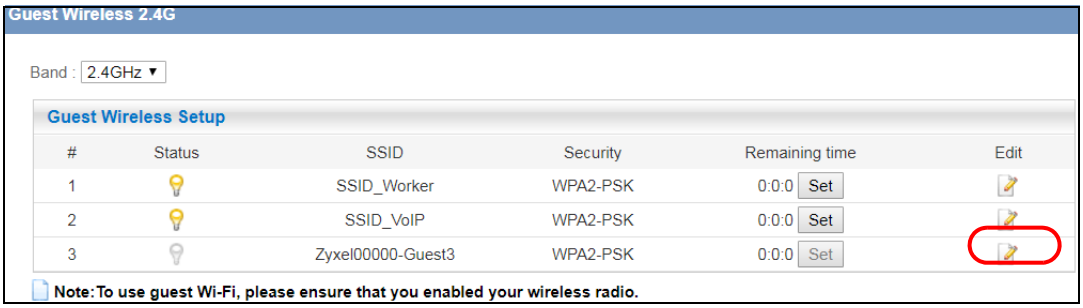
9 Click the **Edit** icon of the second entry to configure wireless and security settings for **SSID_VoIP**.



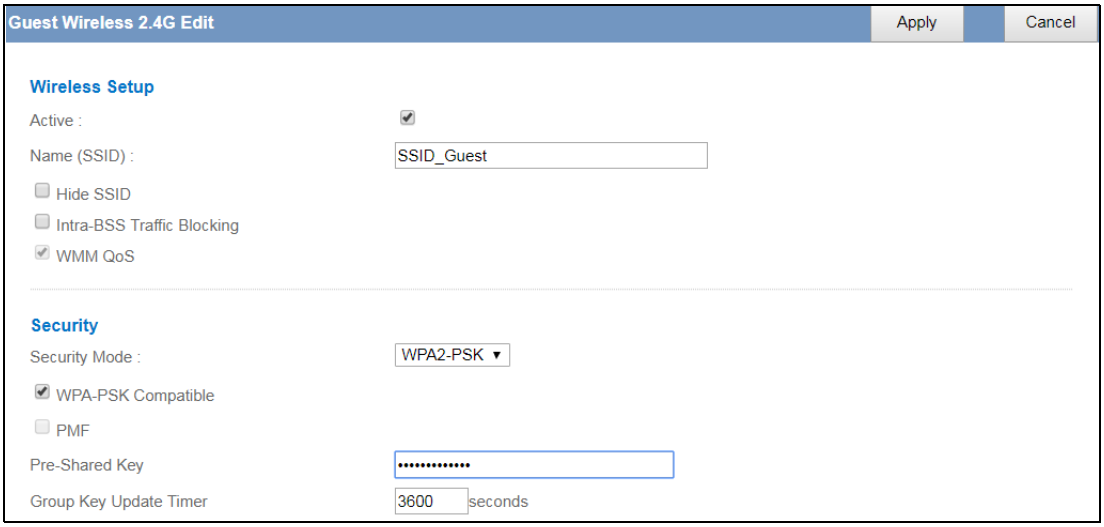
10 Configure the screen as follows. You enable **Intra-BSS Traffic** for **SSID_VoIP** to allow wireless clients in the same wireless network to communicate with each other. Click **Apply**.



11 Click the **Edit** icon of the third entry to configure wireless and security settings for **SSID_Guest**.



12 Configure the screen as follows. In this example, you disable **Intra-BSS Traffic** for **SSID_Guest.** Click **Apply**.



PART II
Technical Reference

CHAPTER 5
Monitor

5.1 Overview

This chapter discusses read-only information related to the device state of the EMG2881-T20A.

To access the **Monitor** screens, click  .

5.2 What You Can Do

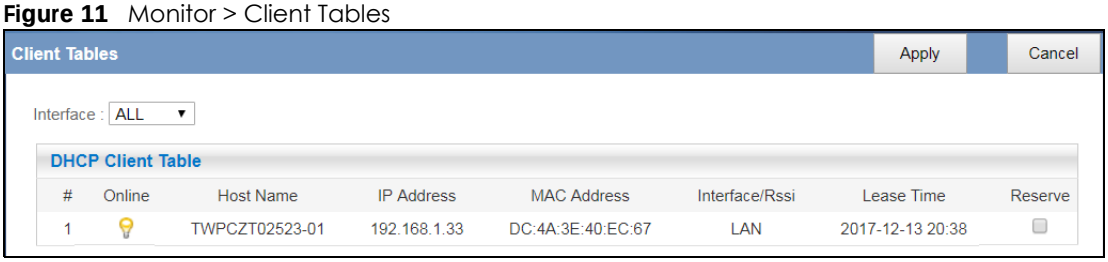
- Use the **Client Tables** screen to view information related to your DHCP status (Section 5.3 on page 35).

5.3 Client Tables

DHCP (Dynamic Host Configuration Protocol, RFC 2131 and RFC 2132) allows individual clients to obtain TCP/IP configuration at start-up from a server. You can configure the EMG2881-T20A's LAN as a DHCP server or disable it. When configured as a server, the EMG2881-T20A provides the TCP/IP configuration for the clients. If DHCP service is disabled, you must have another DHCP server on that network, or else the computer must be manually configured.

Click **Monitor > Client Tables**. Read-only information here relates to your DHCP status. The DHCP table shows current DHCP client information (including **MAC Address**, and **IP Address**) of all network clients using the EMG2881-T20A's DHCP server.

Figure 11 Monitor > Client Tables



The following table describes the labels in this screen.

Table 8 Monitor > Client Tables

LABEL	DESCRIPTION
Interface	Select the interface from the drop-down list box to display current DHCP client information.
#	This is the index number of the host computer.
Online	This field displays whether the connection to the host computer is up (a yellow bulb) or down (a gray bulb).
IP Address	This field displays the IP address relative to the # field listed above.
MAC Address	Every Ethernet device has a unique MAC (Media Access Control) address which uniquely identifies a device. The MAC address is assigned at the factory and consists of six pairs of hexadecimal characters, for example, 00:A0:C5:00:00:02.
Interface/Rssi	This field displays the device's interface type or received signal strength indicator (RSSI) that is currently connected to the EMG2881-T20A.
Reserve	Select this if you want to reserve the IP address for this specific MAC address.
Apply	Click **Apply** to save your changes back to the EMG2881-T20A.
Cancel	Click **Cancel** to reload the previous configuration for this screen.

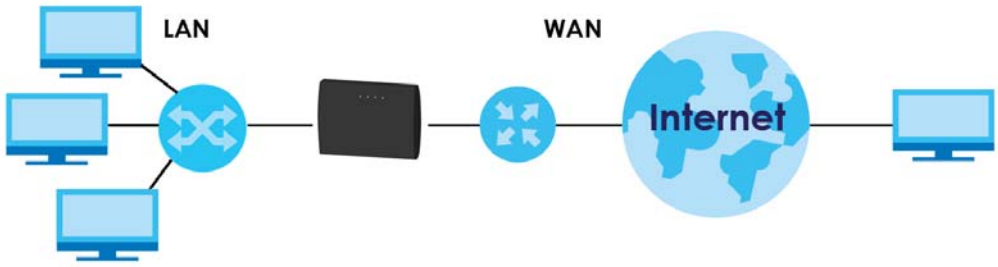
CHAPTER 6
WAN

6.1 Overview

This chapter discusses the EMG2881-T20A's **WAN** screens. Use these screens to configure your EMG2881-T20A for Internet access.

A WAN (Wide Area Network) connection is an outside connection to another network or the Internet. It connects your private networks such as a LAN (Local Area Network) and other networks, so that a computer in one location can communicate with computers in other locations.

Figure 12 LAN and WAN



6.2 What You Can Do

- Use the **Management WAN** screen to enter your ISP information and set how the computer acquires its IP, DNS and WAN MAC addresses (Section 6.4 on page 39).
- Use the **NAT > General** screen to enable NAT, set a default server and change your EMG2881-T20A's port forwarding settings (Section 6.5.1 on page 47).
- Use the **NAT > Port Trigger** screen to configure your EMG2881-T20A's trigger port settings (Section 6.5.2 on page 49).
- Use the **NAT > Passthrough** screen to configure your EMG2881-T20A's ALGs and VPN pass-through settings (Section 6.5.3 on page 49).
- Use the **Dynamic DNS** screen to change your EMG2881-T20A's DDNS settings (Section 6.6 on page 50).
- Use the **Interface Group** screen to manually add a LAN and/or WLAN interface to a new group (Section 6.7 on page 51).

6.3 What You Need To Know

The information in this section can help you configure the screens for your WAN connection, as well as enable/disable some advanced features of your EMG2881-T20A.

6.3.1 Configuring Your Internet Connection

Encapsulation Method

Encapsulation is used to include data from an upper layer protocol into a lower layer protocol. To set up a WAN connection to the Internet, you need to use the same encapsulation method used by your ISP (Internet Service Provider). If your ISP offers a dial-up Internet connection using PPPoE (PPP over Ethernet) or PPTP (Point-to-Point Tunneling Protocol), they should also provide a username and password (and service name) for user authentication.

WAN IP Address

The WAN IP address is an IP address for the EMG2881-T20A, which makes it accessible from an outside network. It is used by the EMG2881-T20A to communicate with other devices in other networks. It can be static (fixed) or dynamically assigned by the ISP each time the EMG2881-T20A tries to access the Internet.

If your ISP assigns you a static WAN IP address, they should also assign you the subnet mask and DNS server IP address(es) (and a gateway IP address if you use the Ethernet or ENET ENCAP encapsulation method).

DNS Server Address Assignment

Use Domain Name System (DNS) to map a domain name to its corresponding IP address and vice versa, for instance, the IP address of www.zyxel.com is 204.217.0.2. The DNS server is extremely important because without it, you must know the IP address of a computer before you can access it.

The EMG2881-T20A can get the DNS server addresses in the following ways.

1. The ISP tells you the DNS server addresses, usually in the form of an information sheet, when you sign up. If your ISP gives you DNS server addresses, manually enter them in the DNS server fields.
2. If your ISP dynamically assigns the DNS server IP addresses (along with the EMG2881-T20A's WAN IP address), set the DNS server fields to get the DNS server address from the ISP.

WAN MAC Address

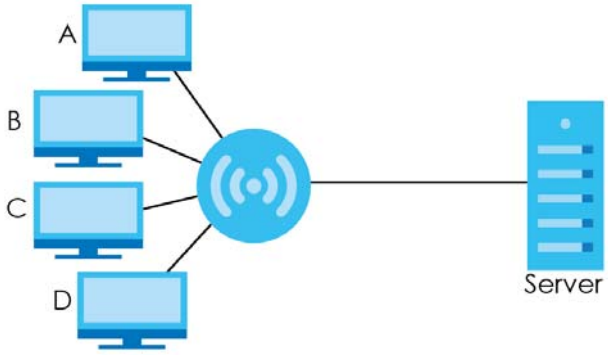
The MAC address screen allows users to configure the WAN port's MAC address by either using the factory default or cloning the MAC address from a computer on your LAN. Choose **Factory Default** to select the factory assigned default MAC Address.

Otherwise, click **Clone the computer's MAC address - IP Address** and enter the IP address of the computer on the LAN whose MAC you are cloning. Once it is successfully configured, the address will be copied to configuration file. It is recommended that you clone the MAC address prior to hooking up the WAN Port.

Multicast

Traditionally, IP packets are transmitted in one of either two ways - Unicast (1 sender - 1 recipient) or Broadcast (1 sender - everybody on the network). Multicast delivers IP packets to a group of hosts on the network - not everybody and not just 1.

Figure 13 Multicast Example



In the multicast example above, systems A and D comprise one multicast group. In multicasting, the server only needs to send one data stream and this is delivered to systems A and D.

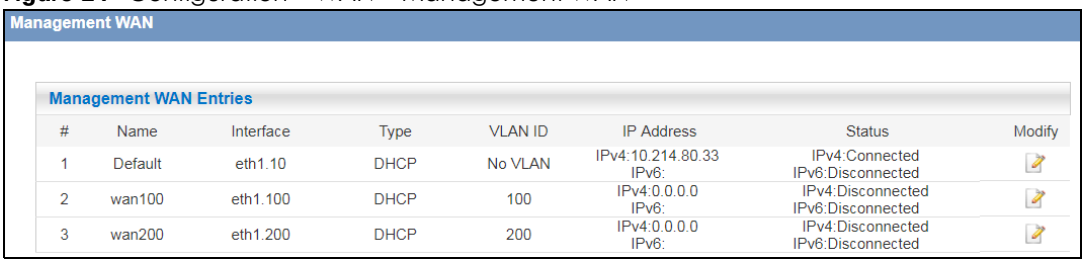
IGMP (Internet Group Multicast Protocol) is a network-layer protocol used to establish membership in a multicast group - it is not used to carry user data. The EMG2881-T20A supports both IGMP version 1 (**IGMP-v1**) and IGMP version 2 (**IGMP-v2**).

At start up, the EMG2881-T20A queries all directly connected networks to gather group membership. After that, the EMG2881-T20A periodically updates this information. IP multicasting can be enabled/disabled on the EMG2881-T20A WAN interface in the Web Configurator (**WAN**). Select **None** to disable IP multicasting on these interfaces.

6.4 Management WAN

Use this screen to view, change, or add your EMG2881-T20A's Internet access settings. Click **Configuration** > **WAN** > **Management WAN**. The following screen opens.

Figure 14 Configuration > WAN > Management WAN



The following table describes the labels in this screen.

Table 9 Configuration > WAN > Management WAN

LABEL	DESCRIPTION
#	This is the index number of the connection.
Name	This is the service name of the connection.
Interface	This is the interface of the connection.
Type	This shows the type of interface used by this connection.
VLAN ID	This indicates the VLAN ID number assigned to traffic sent through this connection.
IP Address	This is the WAN IP address used by this connection.
Status	This shows the status of the connection.
Modify	Click the **Edit** icon to configure the connection. Click the **Delete** icon to delete this connection from the EMG2881-T20A. A window displays asking you to confirm that you want to delete the connection.

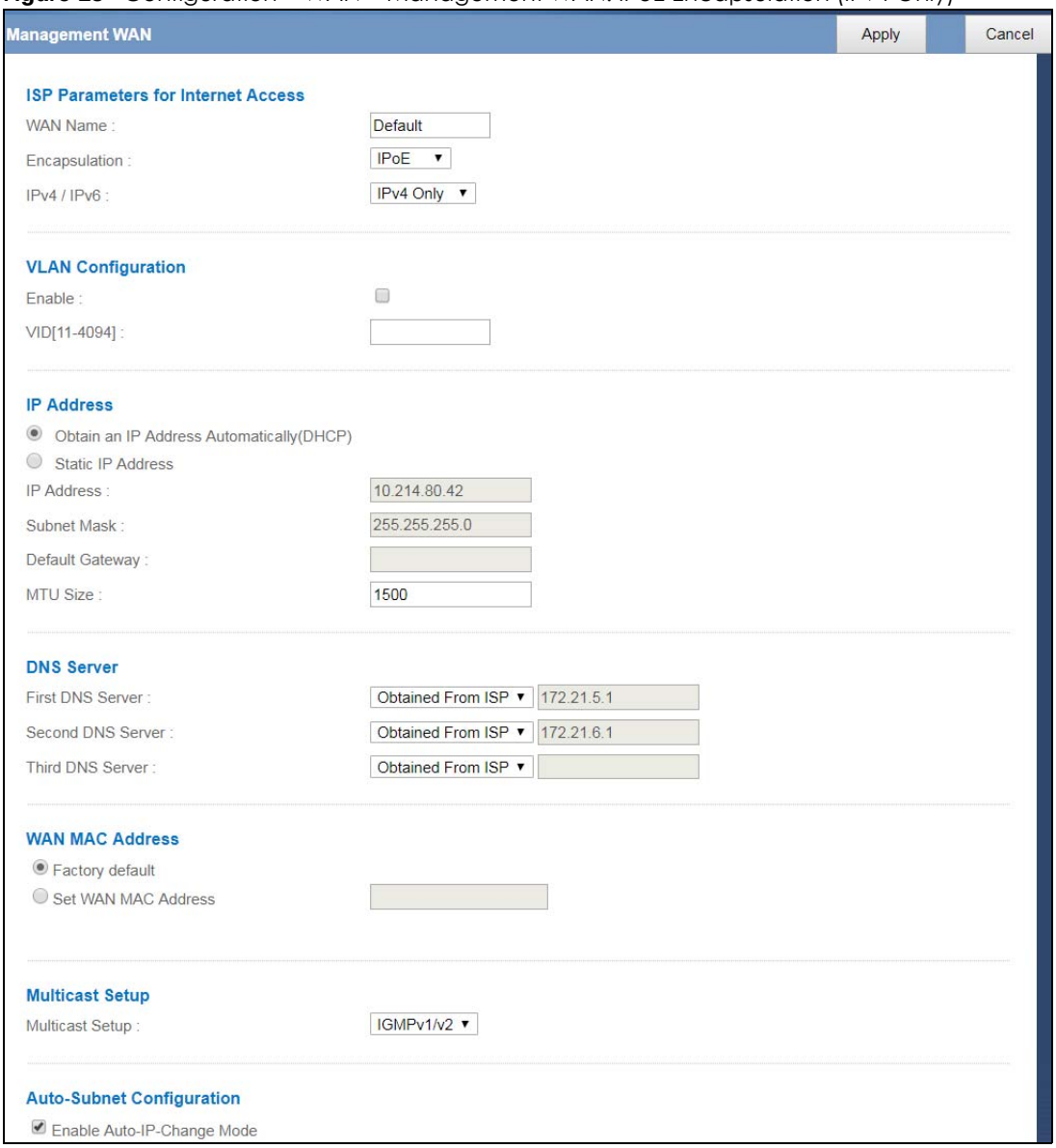
6.4.1 Edit WAN Connection

Click the **Edit** icon next to the connection you want to configure. Use this screen to configure a WAN connection. The screen varies depending on the encapsulation you select.

6.4.1.1 IPoE Encapsulation

This screen displays when you select **IPoE** encapsulation.

Figure 15 Configuration > WAN > Management WAN: IPoE Encapsulation (IPv4 Only)



The following table describes the labels in this screen.

Table 10 Configuration > WAN > Management WAN: IPoE Encapsulation

LABEL	DESCRIPTION
ISP Parameters for Internet Access	
WAN Name	Enter the name to use for this connection definition.
Encapsulation	You must choose the **IPoE** option when the WAN port is used as a regular Ethernet.
IPv4 / IPv6	Select **IPv4 Only** if you want the EMG2881-T20A to run IPv4 only. Select **Dual Stack** to allow the EMG2881-T20A to run IPv4 and IPv6 at the same time. Select **IPv6 Only** if you want the EMG2881-T20A to run IPv6 only.
VLAN Configuration	
Enable	Select the check box to activate VLAN on this WAN interface. Otherwise, deselect the check box to deactivate.

Table 10 Configuration > WAN > Management WAN: IPoE Encapsulation (continued)

LABEL	DESCRIPTION
VID	Enter a VLAN identifier between 11 to 4094 (the 802.1Q tag specifies only a priority and is referred to as a priority tag). VID 1 (the default VLAN ID) is reserved for a management VLAN. Note: This field is not available when you are configuring the default WAN entry.
IP Address This is not available when you select **IPv4 Only** or **Dual Stack** in the **IPv6/IPv4** field.	
Obtain an IP Address Automatically	Select this option If your ISP did not assign you a fixed IP address. This is the default selection.
Static IP Address	Select this option If the ISP assigned a fixed IP address.
IP Address	Enter your WAN IP address in this field if you selected **Static IP Address**.
Subnet Mask	Enter the **Subnet Mask** in this field.
Gateway IP Address	Enter a **Gateway IP Address** (if your ISP gave you one) in this field.
MTU Size	Enter the MTU (Maximum Transmission Unit) size for each packet. If a larger packet arrives, the EMG2881-T20A divides it into smaller fragments.
DNS Server	
First DNS Server Second DNS Server Third DNS Server	Select **Obtained From ISP** if your ISP dynamically assigns DNS server information (and the EMG2881-T20A's WAN IP address). The field to the right displays the (read-only) DNS server IP address that the ISP assigns. Select **User-Defined** if you have the IP address of a DNS server. Enter the DNS server's IP address in the field to the right. Select **None** if you do not want to configure DNS servers. If you do not configure a DNS server, you must know the IP address of a computer in order to access it.
WAN MAC Address	The MAC address section allows users to configure the WAN port's MAC address by using the EMG2881-T20A's MAC address, or manually entering a MAC address.
Factory default	Select **Factory default** to use the factory assigned default MAC Address.
Set WAN MAC Address	Select this option and enter the MAC address you want to use.
IPv6 Address	This is not available when you select **IPv6 Only** or **Dual Stack** in the **IPv6/IPv4** field.
Obtain an IP Address Automatically	Select this if you want to obtain an IPv6 address from a DHCPv6 server. • Select **DUID-LL** (Default) to have the EMG2881-T20A use DUID-LL (DUID Based on Link-layer Address) for identification when exchanging DHCPv6 messages. • Select **DUID-LLT** to have the EMG2881-T20A use DUID-LLT (DUID Based on Link-layer Address Plus Time) for identification when exchanging DHCPv6 messages.
Static IP Address	Select this if you have a fixed IPv6 address assigned by your ISP.
IPv6 Address	Enter the IPv6 address assigned by your ISP.
Prefix length	Enter the address prefix length to specify how many most significant bits in an IPv6 address compose the network address.
IPv6 Default Gateway	Enter the IP address of the next-hop gateway. The gateway is a router or switch on the same segment as your EMG2881-T20A's interface(s). The gateway helps forward packets to their destinations.
Link Local Only	Select this option to use the link-local address which uniquely identifies a device on the local network (the LAN).
IPv6 DNS server This is not available when you select **IPv6 Only** or **Dual Stack** in the **IPv6/IPv4** field.	

Table 10 Configuration > WAN > Management WAN: IPoE Encapsulation (continued)

LABEL	DESCRIPTION
First DNS Server Second DNS Server Third DNS Server	Select **Obtained From ISP** to have the EMG2881-T20A get the IPv6 DNS server addresses from the ISP automatically. Select **User-Defined** and enter the IPv6 DNS server address assigned by the ISP to have the EMG2881-T20A use the IPv6 DNS server addresses you configure manually. Select **None** if you do not want to configure DNS servers. If you do not configure a DNS server, you must know the IPv6 address of a computer in order to access it.
Multicast Setup	
Multicast Setup	Select **IGMPv1/v2** to enable multicasting. This applies to traffic routed from the WAN to the LAN. Select **None** to disable this feature. This may cause incoming traffic to be dropped or sent to all connected network devices.
Auto-Subnet Configuration	
Enable Auto-IP-Change Mode	Select this option to have the EMG2881-T20A change its LAN IP address to 10.0.0.1 or 192.168.1.1 accordingly when the EMG2881-T20A gets a dynamic WAN IP address in the same subnet as the LAN IP address. Select this option to have the EMG2881-T20A change its LAN IP address to 10.0.0.1 or 192.168.1.1 accordingly when the EMG2881-T20A gets a DNS server IP address in the same subnet as the LAN IP address. The NAT, DHCP server and firewall functions on the EMG2881-T20A are still available in this mode.
Apply	Click **Apply** to save your changes back to the EMG2881-T20A.
Cancel	Click **Cancel** to begin configuring this screen afresh.

6.4.1.2 PPPoE Encapsulation

The EMG2881-T20A supports PPPoE (Point-to-Point Protocol over Ethernet). PPPoE is an IETF standard (RFC 2516) specifying how a personal computer (PC) interacts with a broadband modem (DSL, cable, wireless, etc.) connection. The **PPP over Ethernet** option is for a dial-up connection using PPPoE.

For the service provider, PPPoE offers an access and authentication method that works with existing access control systems (for example Radius).

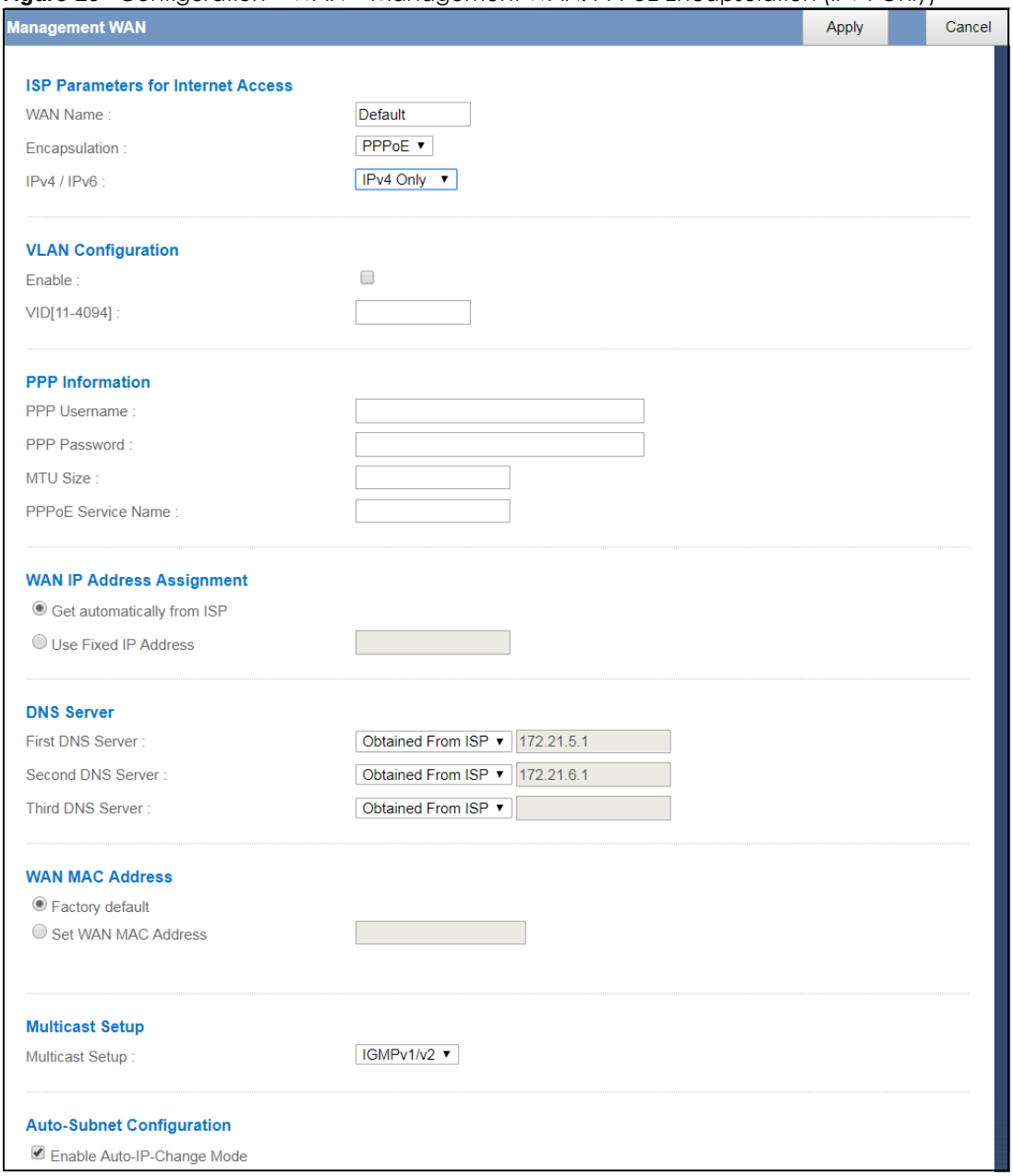
One of the benefits of PPPoE is the ability to let you access one of multiple network services, a function known as dynamic service selection. This enables the service provider to easily create and offer new IP services for individuals.

Operationally, PPPoE saves significant effort for both you and the ISP or carrier, as it requires no specific configuration of the broadband modem at the customer site.

By implementing PPPoE directly on the EMG2881-T20A (rather than individual computers), the computers on the LAN do not need PPPoE software installed, since the EEMG2881-T20A does that part of the task. Furthermore, with NAT, all of the LANs' computers will have access.

This screen displays when you select **PPPoE** encapsulation.

Figure 16 Configuration > WAN > Management WAN: PPPoE Encapsulation (IPv4 Only)



The following table describes the labels in this screen.

Table 11 Configuration > WAN > Management WAN: PPPoE Encapsulation

LABEL	DESCRIPTION
ISP Parameters for Internet Access	
WAN Name	Enter the name to use for this connection definition.
Encapsulation	You must choose the **PPPoE** option when the WAN port is used as a regular Ethernet.
IPv4 / IPv6	Select **IPv4 Only** if you want the EMG2881-T20A to run IPv4 only. Select **Dual Stack** to allow the EMG2881-T20A to run IPv4 and IPv6 at the same time. Select **IPv6 Only** if you want the EMG2881-T20A to run IPv6 only.

Table 11 Configuration > WAN > Management WAN: PPPoE Encapsulation (continued)

LABEL	DESCRIPTION
VLAN Configuration	
Enable	Select the check box to activate VLAN on this WAN interface. Otherwise, deselect the check box to deactivate.
VID	Enter a VLAN identifier between 11 to 4094 (the 802.1Q tag specifies only a priority and is referred to as a priority tag). VID 1 (the default VLAN ID) is reserved for a management VLAN. Note: This field is not available when you are configuring the default WAN entry.
PPP Information	
PPP Username	Type the user name given to you by your ISP.
PPP Password	Type the password associated with the user name above.
MTU Size	Enter the Maximum Transmission Unit (MTU) or the largest packet size per frame that your EMG2881-T20A can receive and process.
PPPoE Service Name	Enter the PPPoE service name specified in the ISP account.
WAN IP Address Assignment	
Get automatically from ISP	Select this option If your ISP did not assign you a fixed IP address. This is the default selection.
Use Fixed IP Address	Select this option If the ISP assigned a fixed IP address.
DNS Server	
First DNS Server Second DNS Server Third DNS Server	Select **Obtained From ISP** if your ISP dynamically assigns DNS server information (and the EMG2881-T20A's WAN IP address). The field to the right displays the (read-only) DNS server IP address that the ISP assigns. Select **User-Defined** if you have the IP address of a DNS server. Enter the DNS server's IP address in the field to the right. Select **None** if you do not want to configure DNS servers. If you do not configure a DNS server, you must know the IP address of a computer in order to access it.
WAN MAC Address	The MAC address section allows users to configure the WAN port's MAC address by using the EMG2881-T20A's MAC address, or manually entering a MAC address.
Factory default	Select **Factory default** to use the factory assigned default MAC Address.
Set WAN MAC Address	Select this option and enter the MAC address you want to use.
IPv6 Address	This is not available when you select **IPv6 Only** or **Dual Stack** in the **IPv6/IPv4** field.
Obtain an IP Address Automatically	Select this if you want to obtain an IPv6 address from a DHCPv6 server. • Select **DUID-LL** (Default) to have the EMG2881-T20A use DUID-LL (DUID Based on Link-layer Address) for identification when exchanging DHCPv6 messages. • Select **DUID-LLT** to have the EMG2881-T20A use DUID-LLT (DUID Based on Link-layer Address Plus Time) for identification when exchanging DHCPv6 messages.
Link Local Only	Select this option to use the link-local address which uniquely identifies a device on the local network (the LAN).
IPv6 DNS server This is not available when you select **IPv6 Only** or **Dual Stack** in the **IPv6/IPv4** field.	

Table 11 Configuration > WAN > Management WAN: PPPoE Encapsulation (continued)

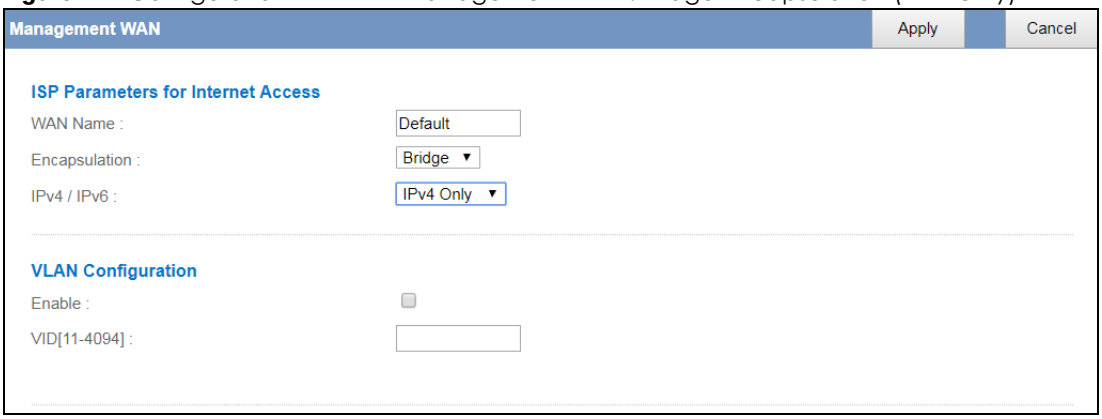
LABEL	DESCRIPTION
First DNS Server Second DNS Server Third DNS Server	Select **Obtained From ISP** to have the EMG2881-T20A get the IPv6 DNS server addresses from the ISP automatically. Select **User-Defined** and enter the IPv6 DNS server address assigned by the ISP to have the EMG2881-T20A use the IPv6 DNS server addresses you configure manually. Select **None** if you do not want to configure DNS servers. If you do not configure a DNS server, you must know the IPv6 address of a computer in order to access it.
Multicast Setup	
Multicast Setup	Select **IGMPv1/v2** to enable multicasting. This applies to traffic routed from the WAN to the LAN. Select **None** to disable this feature. This may cause incoming traffic to be dropped or sent to all connected network devices.
Auto-Subnet Configuration	
Enable Auto-IP-Change Mode	Select this option to have the EMG2881-T20A change its LAN IP address to 10.0.0.1 or 192.168.1.1 accordingly when the EMG2881-T20A gets a dynamic WAN IP address in the same subnet as the LAN IP address. Select this option to have the EMG2881-T20A change its LAN IP address to 10.0.0.1 or 192.168.1.1 accordingly when the EMG2881-T20A gets a DNS server IP address in the same subnet as the LAN IP address. The NAT, DHCP server and firewall functions on the EMG2881-T20A are still available in this mode.
Apply	Click **Apply** to save your changes back to the EMG2881-T20A.
Cancel	Click **Cancel** to begin configuring this screen afresh.

6.4.1.3 Bridge Encapsulation

Select **Bridge** as the encapsulation mode. The screen varies depending on the item you select in the IPv4 / IPv6 field.

If you select IPv4, the following screen appears.

Figure 17 Configuration > WAN > Management WAN: Bridge Encapsulation (IPv4 Only)



The following table describes the labels in this screen.

Table 12 Configuration > WAN > Management WAN: Bridge Encapsulation

LABEL	DESCRIPTION
ISP Parameters for Internet Access	
WAN Name	Enter the name to use for this connection definition.
Encapsulation	Select **Bridge** when your ISP provides you more than one IP address and you want the connected computers to get individual IP address from ISP's DHCP server directly. If you select **Bridge**, you cannot use routing functions, such as QoS, Firewall, DHCP server and NAT on traffic from the selected LAN port(s).
IPv4 / IPv6	Select **IPv4 Only** if you want the EMG2881-T20A to run IPv4 only. Select **Dual Stack** to allow the EMG2881-T20A to run IPv4 and IPv6 at the same time. Select **IPv6 Only** if you want the EMG2881-T20A to run IPv6 only.
VLAN Configuration	
Enable	Select the check box to activate VLAN on this WAN interface. Otherwise, deselect the check box to deactivate.
VID	Enter a VLAN identifier between 11 to 4094 (the 802.1Q tag specifies only a priority and is referred to as a priority tag). VID 1 (the default VLAN ID) is reserved for a management VLAN. Note: This field is not available when you are configuring the default WAN entry.
IPv6 DNS server This is not available when you select **IPv6 Only** or **Dual Stack** in the **IPv6/IPv4** field.	
First DNS Server Second DNS Server Third DNS Server	Select **Obtained From ISP** to have the EMG2881-T20A get the IPv6 DNS server addresses from the ISP automatically. Select **User-Defined** and enter the IPv6 DNS server address assigned by the ISP to have the EMG2881-T20A use the IPv6 DNS server addresses you configure manually. Select **None** if you do not want to configure DNS servers. If you do not configure a DNS server, you must know the IPv6 address of a computer in order to access it.
Apply	Click **Apply** to save your changes back to the EMG2881-T20A.
Cancel	Click **Cancel** to begin configuring this screen afresh.

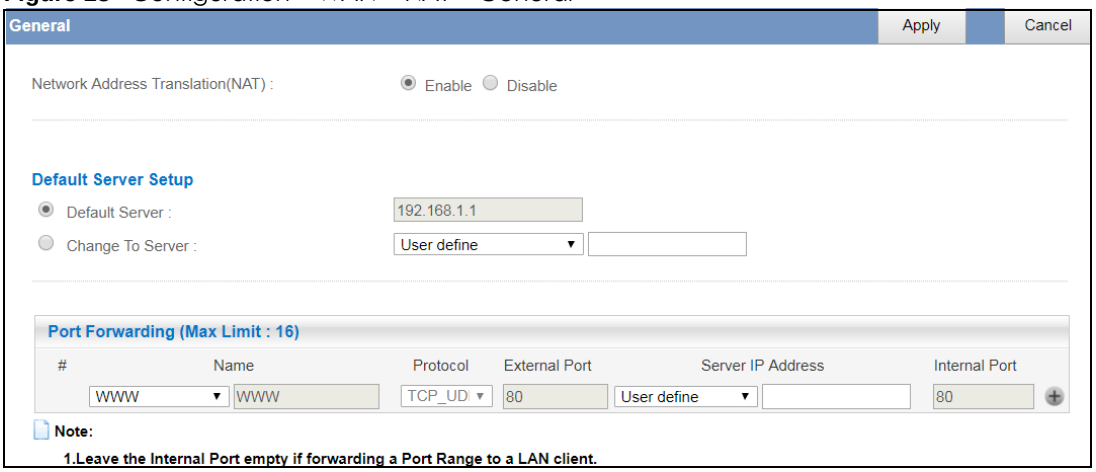
6.5 NAT

Use this screen to change your EMG2881-T20A's NAT (Network Address Translation) settings. Click **Configuration** > **WAN** > **NAT**.

6.5.1 General Screen

Use this screen to enable NAT, set a default server and configure your EMG2881-T20A's port forwarding settings to forward incoming service requests to the server(s) on your local network. Click **Configuration > WAN > NAT > General**.

Figure 18 Configuration > WAN > NAT > General



The following table describes the labels in this screen.

Table 13 Configuration > WAN > NAT > General

LABEL	DESCRIPTION
General	
Network Address Translation (NAT)	Network Address Translation (NAT) allows the translation of an Internet protocol address used within one network (for example a private IP address used in a local network) to a different IP address known within another network (for example a public IP address used on the Internet). Select **Enable** to activate NAT. Select **Disable** to turn it off.
Default Server Setup	
Default Server	You can decide whether you want to use the default server or specify a server manually. In addition to the servers for specified services, NAT supports a default server. A default server receives packets from ports that are not specified in the port forwarding summary table below. Select this to use the default server.
Change To Server	Select this and manually enter the server's IP address.
Port Forwarding (Max Limit : 16)	
#	This is the number of an individual port forwarding server entry.
Name	Select a pre-defined service from the drop-down list box. The pre-defined service port number(s) and protocol will be displayed in the port forwarding summary table. Otherwise, select **User define** to manually enter the port number/range and select the **Protocol**.
Protocol	Select the transport layer protocol supported by this virtual server. Choices are **TCP**, **UDP**, or **TCP_UDP**. If you have chosen a pre-defined service in the **Name** field, the protocol will be configured automatically.
External Port	This shows the port number(s) that identifies the service if you select a pre-defined service. If you select **User define** in the **Name** field, enter the port number(s) manually.
Server IP Address	Select **User define** to manually enter the inside IP address of the virtual server here.
Internal Port	This shows the port number(s) that identifies the service if you select a pre-defined service. If you select **User define** in the **Name** field, enter an internal port number manually or leave the field blank for port range forwarding.
Add	Click ⊕ to add the rule in the port forwarding summary table.
Delete	Click ⊖ to remove a rule.

Table 13 Configuration > WAN > NAT > General (continued)

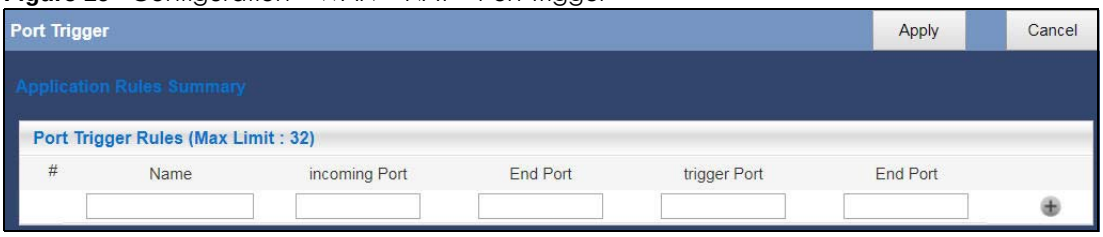
LABEL	DESCRIPTION
Apply	Click **Apply** to save your changes back to the EMG2881-T20A.
Cancel	Click **Cancel** to begin configuring this screen afresh.

6.5.2 Port Trigger Screen

To change your EMG2881-T20A's trigger port settings, click **Configuration > WAN > NAT > Port Trigger**. The screen appears as shown.

Note: Only one LAN computer can use a trigger port (range) at a time.

Figure 19 Configuration > WAN > NAT > Port Trigger



The following table describes the labels in this screen.

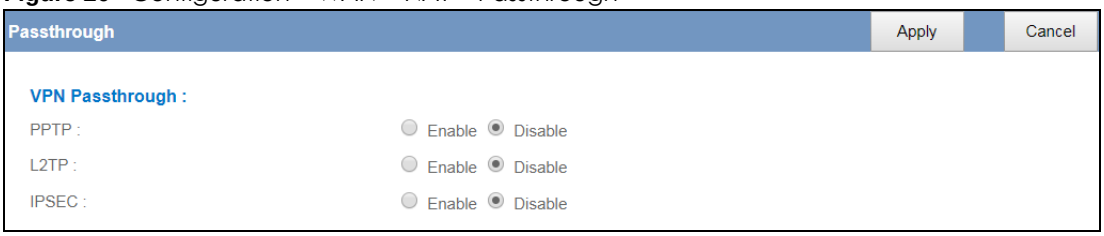
Table 14 Configuration > WAN > NAT > Port Trigger

LABEL	DESCRIPTION
Port Trigger Rules (Max Limit : 32)	
#	This is the rule index number (read-only).
Name	Type a unique name (up to 15 characters) for identification purposes. All characters are permitted - including spaces.
Incoming Port	Incoming is a port (or a range of ports) that a server on the WAN uses when it sends out a particular service. The EMG2881-T20A forwards the traffic with this port (or range of ports) to the client computer on the LAN that requested the service. Type a port number or the starting port number in a range of port numbers.
End Port	Type a port number or the ending port number in a range of port numbers.
Trigger Port	The trigger port is a port (or a range of ports) that causes (or triggers) the EMG2881-T20A to record the IP address of the LAN computer that sent the traffic to a server on the WAN. Type a port number or the starting port number in a range of port numbers.
End Port	Type a port number or the ending port number in a range of port numbers.
Add	Click ⊕ to add the rule in the port trigger summary table.
Delete	Click ⊖ to remove a rule.
Apply	Click **Apply** to save your changes back to the EMG2881-T20A.
Cancel	Click **Cancel** to begin configuring this screen afresh.

6.5.3 Passthrough Screen

To change your EMG2881-T20A's VPN passthrough settings, click **Configuration > WAN > NAT > Passthrough**. The screen appears as shown.

Figure 20 Configuration > WAN > NAT > Passthrough



The following table describes the labels in this screen.

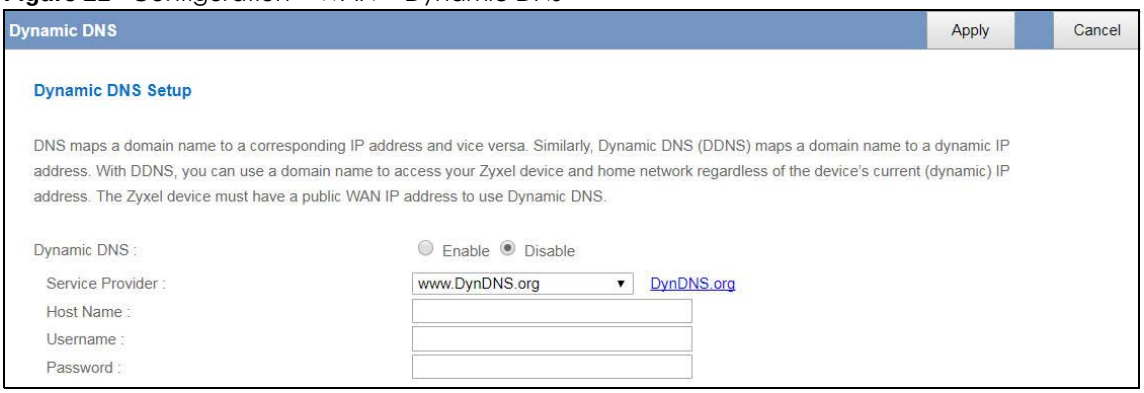
Table 15 Configuration > WAN > NAT > Passthrough

LABEL	DESCRIPTION
VPN Passthrough	
PPTP	Select **Enable** to allow VPN clients to make outbound PPTP connections. It is required in order to connect to a PPTP VPN account. If **PPTP** is disabled, then when a client sends a request to a VPN server, the server will reply to the EMG2881-T20A and the EMG2881-T20A will drop the request. When **PPTP** is enabled, the EMG2881-T20A will forward the reply from the VPN server to the client that initiated the request, and the connection will establish successfully.
L2TP	Select **Enable** to allow VPN clients to make outbound L2TP connections. It is required in order to connect to a L2TP VPN account. If **L2TP** is disabled, then when a client sends a request to a VPN server, the server will reply to the EMG2881-T20A and the EMG2881-T20A will drop the request. When **L2TP** is enabled, the EMG2881-T20A will forward the reply from the VPN server to the client that initiated the request, and the connection will establish successfully.
IPSEC	Select **Enable** to allow VPN clients to make outbound IPSec connections. It is required in order to connect to a IPSec VPN account. If **IPSEC** is disabled, then when a client sends a request to a VPN server, the server will reply to the EMG2881-T20A and the EMG2881-T20A will drop the request. When **IPSEC** is enabled, the EMG2881-T20A will forward the reply from the VPN server to the client that initiated the request, and the connection will establish successfully.
Apply	Click **Apply** to save your changes back to the EMG2881-T20A.
Cancel	Click **Cancel** to begin configuring this screen afresh.

6.6 Dynamic DNS Screen

To change your EMG2881-T20A's DDNS, click **Configuration > WAN > Dynamic DNS**. The screen appears as shown.

Figure 21 Configuration > WAN > Dynamic DNS



The following table describes the labels in this screen.

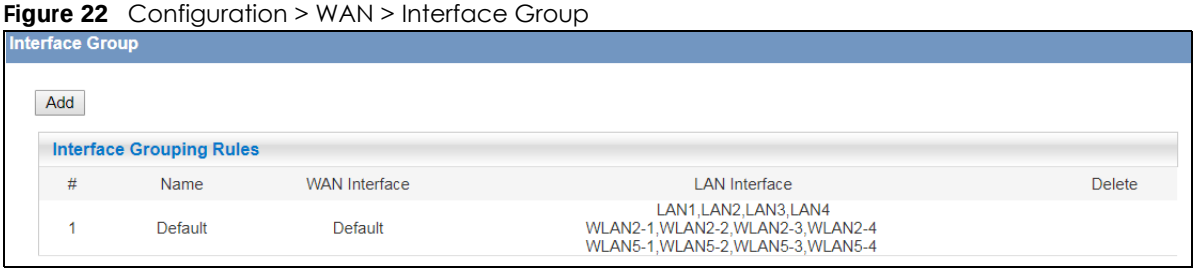
Table 16 Configuration > WAN > Dynamic DNS

LABEL	DESCRIPTION
Dynamic DNS Setup	
Dynamic DNS	Select **Enable** to use dynamic DNS. Select **Disable** to turn this feature off.
Service Provider	Select the name of your Dynamic DNS service provider.
Host Name	Enter a host names in the field provided.
Username	Enter your user name.
Password	Enter the password assigned to you.
Apply	Click **Apply** to save your changes back to the EMG2881-T20A.
Cancel	Click **Cancel** to begin configuring this screen afresh.

6.7 Interface Group Screen

You can manually add a LAN and/or WLAN interface to a new group. Click **Configuration > WAN > Interface Group** to open the following screen.

Figure 22 Configuration > WAN > Interface Group



The following table describes the fields in this screen.

Table 17 Configuration > WAN > Interface Group

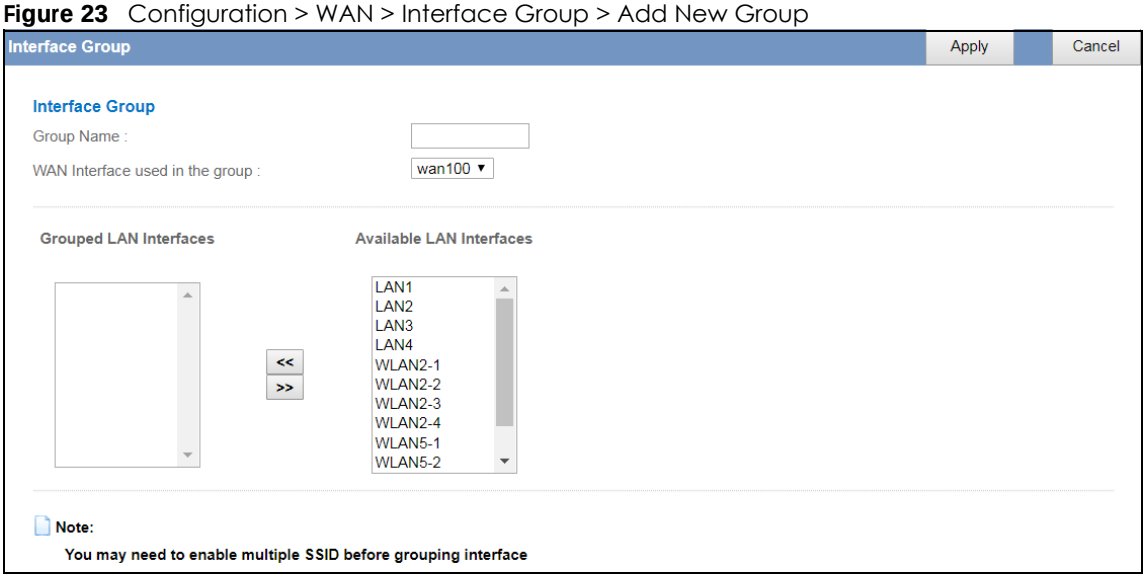
LABEL	DESCRIPTION
Add	Click this to add a new interface grouping rule. You must configure a WAN connection before you can add a new interface grouping rule. See Chapter 6 on page 37 for more information.
Interface Grouping Rules	
#	This is the rule index number (read-only).
Name	This shows the descriptive name of the group.
WAN Interface	This shows the WAN interfaces in the group.
LAN Interfaces	This shows the LAN and/or WLAN interfaces in the group.
Delete	Click the **Delete** icon to remove the group.

6.7.1 Add Interface Group

Click the **Add** button in the **Interface Group** screen to open the following screen. Use this screen to create a new interface group.

Note: An interface can belong to a group only.

Figure 23 Configuration > WAN > Interface Group > Add New Group



The following table describes the fields in this screen.

Table 18 Configuration > WAN > Interface Group > Add New Group

LABEL	DESCRIPTION
Group Name	Enter a name to identify this group.
WAN Interfaces used in the group	Select a WAN interface to be used in this group. Select **None** to not add a WAN interface to this group.
Grouped LAN Interfaces Available LAN Interfaces	Select a LAN or wireless LAN interface in the **Available LAN Interfaces** and use the left-facing arrow to move it to the **Grouped LAN Interfaces** to add the interface to this group. To remove a LAN or wireless LAN interface from the **Grouped LAN Interfaces**, use the righ-facing arrow.
Apply	Click this button to save your settings back to the EMG2881-T20A.
Cancel	Click **Cancel** to begin configuring this screen afresh.

CHAPTER 7
Wireless LAN

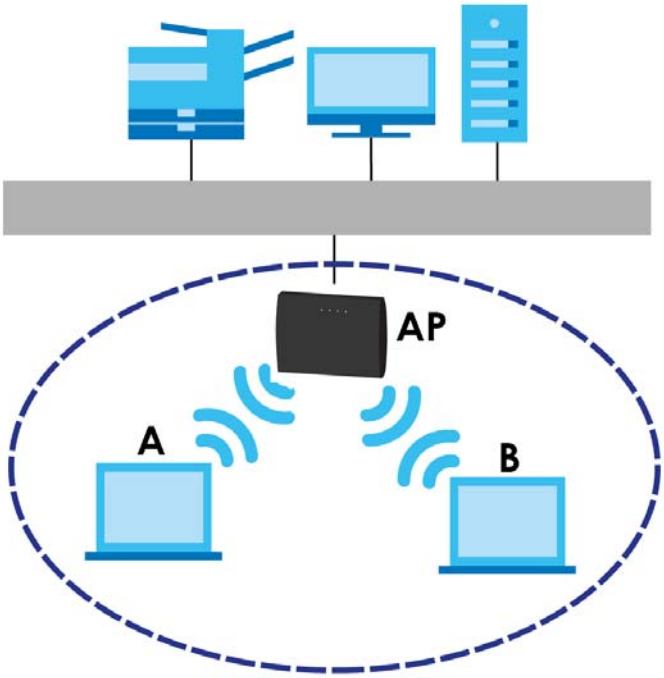
7.1 Overview

This chapter discusses how to configure the wireless network settings in your EMG2881-T20A. The EMG2881-T20A is able to function both 2.4GHz and 5GHz network at the same time. You can have different wireless and wireless security settings for 2.4GHz and 5GHz wireless LANs. Click **Configuration > Wireless** to configure to do so.

See the appendices for more detailed information about wireless networks.

The following figure provides an example of a wireless network.

Figure 24 Example of a Wireless Network



The wireless network is the part in the blue circle. In this wireless network, devices **A** and **B** are called wireless clients. The wireless clients use the access point (AP) to interact with other devices (such as the printer) or with the Internet. Your EMG2881-T20A is the AP.

7.1.1 What You Can Do

- Use the **Wireless** screen to turn the wireless connection on or off, set up wireless security between the EMG2881-T20A and the wireless clients, and make other basic configuration changes (Section 7.2 on page 57).
- Use the **More AP** screen to set up multiple wireless networks on your EMG2881-T20A (Section 7.4 on page 61).
- Use the **MAC Filter** screen to allow or deny wireless stations based on their MAC addresses from connecting to the EMG2881-T20A (Section 7.5 on page 64).
- Use the **Advanced** screen to allow intra-BSS networking and set the RTS/CTS Threshold (Section 7.6 on page 65).
- Use the **WPS** screen to quickly set up a wireless network with strong security, without having to configure security settings manually (Section 7.7 on page 66).
- Use the **Scheduling** screen to set the times your wireless LAN is turned on and off (Section 7.8 on page 68).

7.1.2 What You Should Know

Every wireless network must follow these basic guidelines.

- Every wireless client in the same wireless network must use the same SSID.

  The SSID is the name of the wireless network. It stands for Service Set IDentity.
- If two wireless networks overlap, they should use different channels.

  Like radio stations or television channels, each wireless network uses a specific channel, or frequency, to send and receive information.
- Every wireless client in the same wireless network must use security compatible with the AP.

  Security stops unauthorized devices from using the wireless network. It can also protect the information that is sent in the wireless network.

Wireless Security Overview

The following sections introduce different types of wireless security you can set up in the wireless network.

SSID

Normally, the AP acts like a beacon and regularly broadcasts the SSID in the area. You can hide the SSID instead, in which case the AP does not broadcast the SSID. In addition, you should change the default SSID to something that is difficult to guess.

This type of security is fairly weak, however, because there are ways for unauthorized devices to get the SSID. In addition, unauthorized devices can still see the information that is sent in the wireless network.

MAC Address Filter

Every wireless client has a unique identification number, called a MAC address.[1] A MAC address is usually written using twelve hexadecimal characters[2]; for example, 00A0C5000002 or 00:A0:C5:00:00:02.

1. Some wireless devices, such as scanners, can detect wireless networks but cannot use wireless networks. These kinds of wireless devices might not have MAC addresses.

To get the MAC address for each wireless client, see the appropriate User's Guide or other documentation.

You can use the MAC address filter to tell the AP which wireless clients are allowed or not allowed to use the wireless network. If a wireless client is allowed to use the wireless network, it still has to have the correct settings (SSID, channel, and security). If a wireless client is not allowed to use the wireless network, it does not matter if it has the correct settings.

This type of security does not protect the information that is sent in the wireless network. Furthermore, there are ways for unauthorized devices to get the MAC address of an authorized wireless client. Then, they can use that MAC address to use the wireless network.

User Authentication

You can make every user log in to the wireless network before they can use it. This is called user authentication. However, every wireless client in the wireless network has to support IEEE 802.1x to do this.

For wireless networks, there are two typical places to store the user names and passwords for each user.

- In the AP: this feature is called a local user database or a local database.
- In a RADIUS server: this is a server used in businesses more than in homes.

If your AP does not provide a local user database and if you do not have a RADIUS server, you cannot set up user names and passwords for your users.

Unauthorized devices can still see the information that is sent in the wireless network, even if they cannot use the wireless network. Furthermore, there are ways for unauthorized wireless users to get a valid user name and password. Then, they can use that user name and password to use the wireless network.

Local user databases also have an additional limitation that is explained in the next section.

Encryption

Wireless networks can use encryption to protect the information that is sent in the wireless network. Encryption is like a secret code. If you do not know the secret code, you cannot understand the message.

The types of encryption you can choose depend on the type of user authentication. (See page 55 for information about this.)

Table 19 Types of Encryption for Each Type of Authentication

	NO AUTHENTICATION	RADIUS SERVER
Weakest	No Security	WPA
↕	Static WEP	
	WPA-PSK	
Strongest	WPA2-PSK	WPA2

For example, if the wireless network has a RADIUS server, you can choose **WPA** or **WPA2**. If users do not log in to the wireless network, you can choose no encryption, **Static WEP**, **WPA-PSK**, or **WPA2-PSK**.

2. Hexadecimal characters are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, and F.

Usually, you should set up the strongest encryption that every wireless client in the wireless network supports. For example, suppose the AP does not have a local user database, and you do not have a RADIUS server. Therefore, there is no user authentication. Suppose the wireless network has two wireless clients. Device A only supports WEP, and device B supports WEP and WPA. Therefore, you should set up **Static WEP** in the wireless network.

Note: It is recommended that wireless networks use **WPA-PSK**, **WPA**, or stronger encryption. IEEE 802.1x and WEP encryption are better than none at all, but it is still possible for unauthorized devices to figure out the original information pretty quickly.

Note: It is not possible to use **WPA-PSK**, **WPA** or stronger encryption with a local user database. In this case, it is better to set up stronger encryption with no authentication than to set up weaker encryption with the local user database.

When you select **WPA2** or **WPA2-PSK** in your EMG2881-T20A, you can also select an option (**WPA/WPA-PSK Compatible**) to support WPA/WPA-PSK as well. In this case, if some wireless clients support WPA and some support WPA2, you should set up **WPA2-PSK** or **WPA2** (depending on the type of wireless network login) and select the **WPA/WPA-PSK Compatible** option in the EMG2881-T20A.

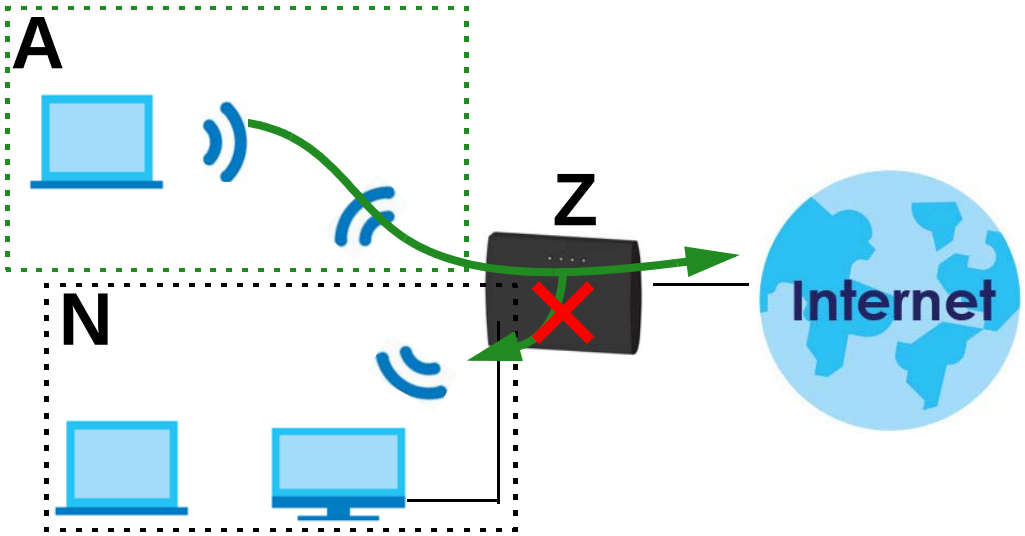
Many types of encryption use a key to protect the information in the wireless network. The longer the key, the stronger the encryption. Every wireless client in the wireless network must have the same key.

Guest WLAN

Guest WLAN allows you to set up a wireless network where users can access to Internet via the EMG2881-T20A (**Z**), but not other networks connected to the **Z**. In the following figure, a guest user can access the Internet from the guest wireless network **A** via **Z** but not the home or company network **N**.

Note: The home or company network **N** and Guest WLAN network are independent networks.

Figure 25 Guest Wireless LAN Network

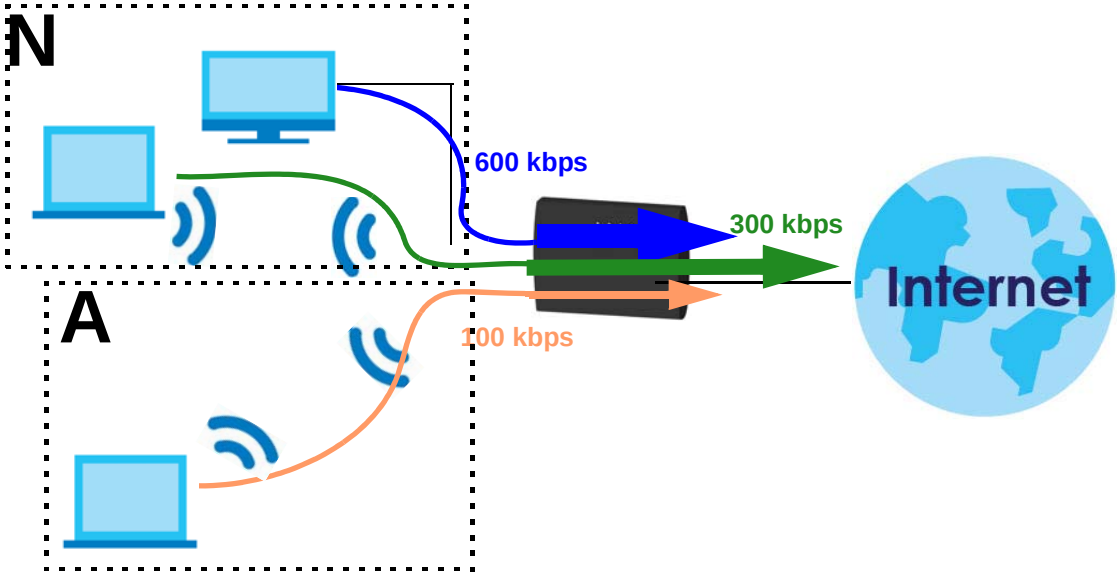


Guest WLAN Bandwidth

The Guest WLAN Bandwidth function allows you to restrict the maximum bandwidth for the guest wireless network. Additionally, you can also define bandwidth for your home or office network. An

example is shown next to define maximum bandwidth for your networks (**A** is Guest WLAN and **N** is home or company network.)

Figure 26 Example: Bandwidth for Different Networks



WPS

WiFi Protected Setup (WPS) is an industry standard specification, defined by the WiFi Alliance. WPS allows you to quickly set up a wireless network with strong security, without having to configure security settings manually. Depending on the devices in your network, you can either press a button (on the device itself, or in its configuration utility) or enter a PIN (Personal Identification Number) in the devices. Then, they connect and set up a secure network by themselves. See how to set up a secure wireless network using WPS in the Section 4.2 on page 24.

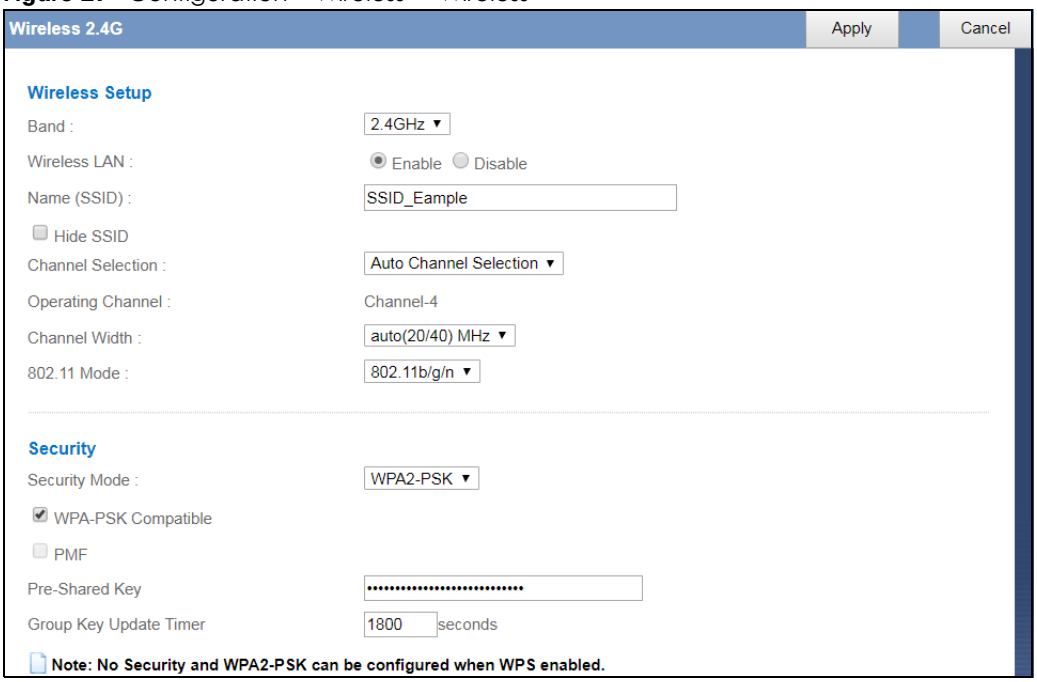
7.2 Wireless LAN Screen

Use this screen to configure the SSID and wireless security of the wireless LAN.

Note: If you are configuring the EMG2881-T20A from a computer connected to the wireless LAN and you change the EMG2881-T20A's SSID, channel or security settings, you will lose your wireless connection when you press **Apply** to confirm. You must then change the wireless settings of your computer to match the EMG2881-T20A's new settings.

Click **Configuration** > **Wireless** to open the **Wireless** screen.

Figure 27 Configuration > Wireless > Wireless



The following table describes the general wireless LAN labels in this screen.

Table 20 Configuration > Wireless > Wireless

LABEL	DESCRIPTION
Band	This shows the wireless band which this radio profile is using. **2.4GHz** is the frequency used by IEEE 802.11b/g/n wireless clients while **5GHz** is used by IEEE 802.11a/ac wireless clients.
Wireless LAN	Select **Enable** to activate the 2.4GHz and/or 5GHz wireless LAN. Select **Disable** to turn it off. Note: You can enable or disable both 2.4GHz and 5GHz wireless LANs by using the **WIFI** button located on the side panel of the EMG2881-T20A.
Name (SSID)	The SSID (Service Set IDentity) identifies the Service Set with which a wireless client is associated. Enter a descriptive name (up to 32 printable characters found on a typical English language keyboard) for the wireless LAN.
Hide SSID	Select this check box to hide the SSID in the outgoing beacon frame so a station cannot obtain the SSID through scanning using a site survey tool.
Channel Selection	Set the operating frequency/channel depending on your particular region. Select a channel from the drop-down list box. The options vary depending on the frequency band and the country you are in. Refer to the Connection Wizard chapter for more information on channels. This option is only available if **Auto Channel Selection** is disabled.
Operating Channel	This displays the channel the EMG2881-T20A is currently using.

Table 20 Configuration > Wireless > Wireless

LABEL	DESCRIPTION
Channel Width	Select the wireless channel width used by EMG2881-T20A. A standard 20 MHz channel offers transfer speeds of up to 144Mbps (2.4GHz) or 217Mbps (5GHZ) whereas a 40MHz channel uses two standard channels and offers speeds of up to 300Mbps (2.4GHz) or 450Mbps (5GHZ). An IEEE 802.11ac-specific 80MHz channel offers speeds of up to 1.3Gbps. Because not all devices support 40 MHz and/or 80 MHz channels, select **Auto 20/40 MHz** or **Auto 20/40/80 MHz** to allow the EMG2881-T20A to adjust the channel bandwidth automatically. Select **20 MHz** if you want to lessen radio interference with other wireless devices in your neighborhood or the wireless clients do not support channel bonding.
802.11 Mode	If you are in the **Wireless LAN 2.4G > General** screen, you can select from the following: • **802.11b**: allows either IEEE 802.11b or IEEE 802.11g compliant WLAN devices to associate with the EMG2881-T20A. In this mode, all wireless devices can only transmit at the data rates supported by IEEE 802.11b. • **802.11g**: allows IEEE 802.11g compliant WLAN devices to associate with the Device. IEEE 802.11b compliant WLAN devices can associate with the EMG2881-T20A only when they use the short preamble type. • **802.11bg**: allows either IEEE 802.11b or IEEE 802.11g compliant WLAN devices to associate with the EMG2881-T20A. The EMG2881-T20A adjusts the transmission rate automatically according to the wireless standard supported by the wireless devices. • **802.11n**: allows IEEE 802.11n compliant WLAN devices to associate with the EMG2881-T20A. This can increase transmission rates, although IEEE 802.11b or IEEE 802.11g clients will not be able to connect to the EMG2881-T20A. • **802.11gn**: allows either IEEE 802.11g or IEEE 802.11n compliant WLAN devices to associate with the EMG2881-T20A. The transmission rate of your EMG2881-T20A might be reduced. • **802.11 bgn**: allows IEEE802.11b, IEEE802.11g and IEEE802.11n compliant WLAN devices to associate with the EMG2881-T20A. The transmission rate of your EMG2881-T20A might be reduced. If you are in the **Wireless LAN 5G > General** screen, you can select from the following: • **802.11a**: allows only IEEE 802.11a compliant WLAN devices to associate with the EMG2881-T20A. • **802.11a/an**: allows both IEEE802.11n and IEEE802.11a compliant WLAN devices to associate with the EMG2881-T20A. The transmission rate of your EMG2881-T20A might be reduced. • **802.11a/an/ac**: allows both IEEE802.11a, IEEE802.11n and IEEE802.11ac compliant WLAN devices to associate with the EMG2881-T20A. The transmission rate of your EMG2881-T20A might be reduced.
Security Mode	Select **WPA2-PSK** to add security on this wireless network. The wireless clients which want to associate to this network must have same wireless security settings as this device. After you select to use a security, additional options appears in this screen. See Section 7.3 on page 59 for detailed information on different security modes. Or you can select **No Security** to allow any client to associate this network without authentication. Note:
Apply	Click **Apply** to save your changes back to the EMG2881-T20A.
Cancel	Click **Cancel** to reload the previous configuration for this screen.

See the rest of this chapter for information on the other labels in this screen.

7.3 Wireless Security

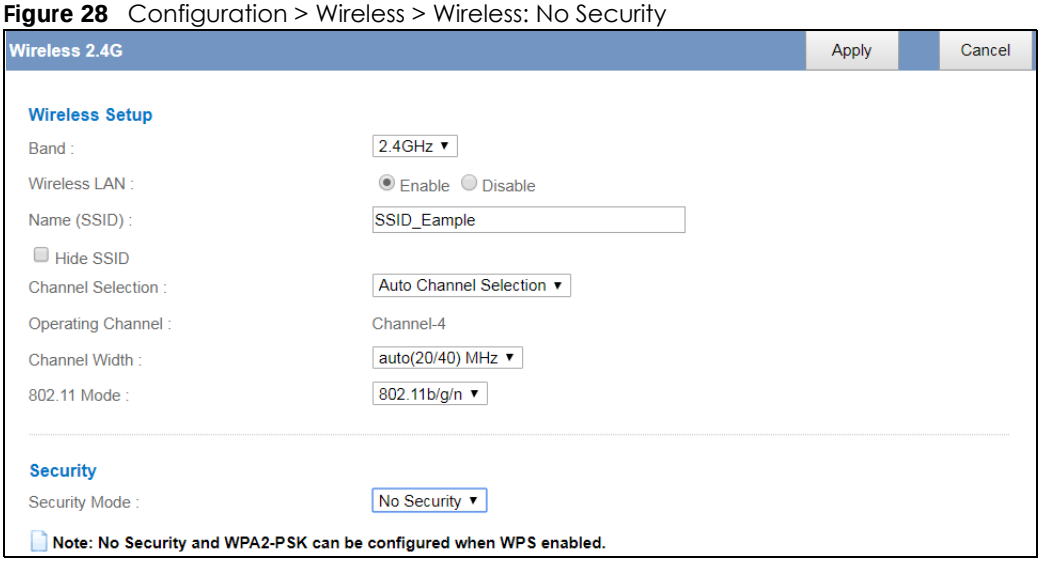
The screen varies depending on what you select in the **Security Mode** field.

7.3.1 No Security

Select **No Security** to allow wireless clients to communicate with the access points without any data encryption.

Note: If you do not enable any wireless security on your EMG2881-T20A, your network is accessible to any wireless networking device that is within range.

Figure 28 Configuration > Wireless > Wireless: No Security



The following table describes the labels in this screen.

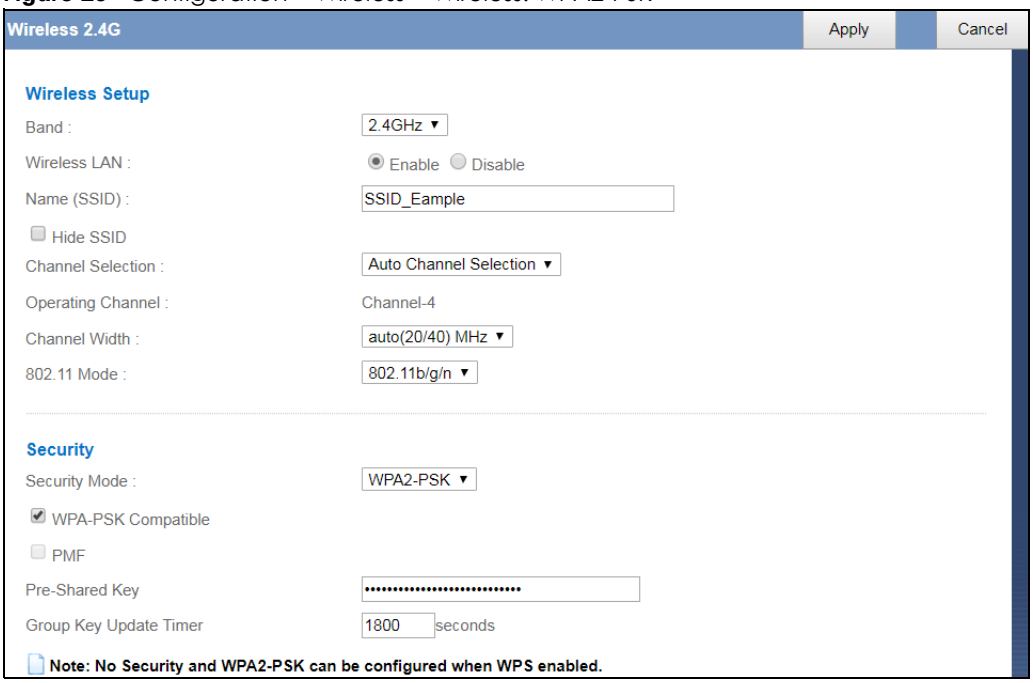
Table 21 Configuration > Wireless > Wireless: No Security

LABEL	DESCRIPTION
Security Mode	Choose **No Security** from the drop-down list box.
Apply	Click **Apply** to save your changes back to the EMG2881-T20A.
Cancel	Click **Cancel** to reload the previous configuration for this screen.

7.3.2 WPA2-PSK

Select **WPA2-PSK** from the **Security Mode** list.

Figure 29 Configuration > Wireless > Wireless: WPA2-PSK



The following table describes the labels in this screen.

Table 22 Configuration > Wireless > Wireless: WPA-PSK/WPA2-PSK

LABEL	DESCRIPTION
Security Mode	Select **WPA2-PSK** to enable data encryption.
WPA-PSK Compatible	This field appears when you choose **WPA2-PSK** as the **Security Mode**. Check this field to allow wireless devices using **WPA-PSK** security mode to connect to your EMG2881-T20A.
PMF	Protected Management Frames (PMF) is a protection mechanism of action management frames. Check this field to allow wireless devices using the PMF protection mechanism to connect to your EMG2881-T20A.
Pre-Shared Key	**WPA-PSK/WPA2-PSK** uses a simple common password for authentication. Type a pre-shared key from 8 to 63 case-sensitive keyboard characters.
Group Key Update Timer	The **Group Key Update Timer** is the rate at which the AP sends a new group key out to all clients. The default is **3600** seconds (60 minutes).
Apply	Click **Apply** to save your changes back to the EMG2881-T20A.
Cancel	Click **Cancel** to reload the previous configuration for this screen.

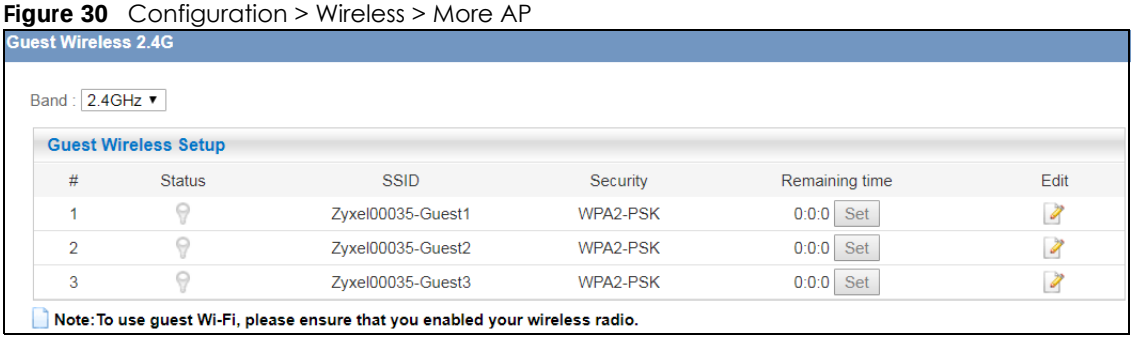
7.4 More AP Screen

This screen allows you to enable and configure multiple wireless networks and guest wireless network settings on the EMG2881-T20A.

You can configure up to four SSIDs to enable multiple BSSs (Basic Service Sets) on the EMG2881-T20A. This allows you to use one access point to provide several BSSs simultaneously. You can then assign varying security types to different SSIDs. Wireless clients can use different SSIDs to associate with the same access point.

Click **Configuration > Wireless > More AP**. The following screen displays.

Figure 30 Configuration > Wireless > More AP



The following table describes the labels in this screen.

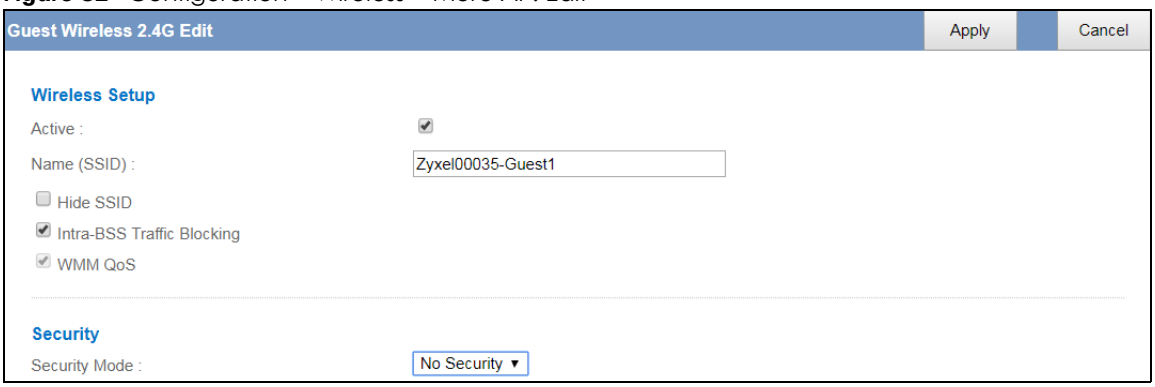
Table 23 Configuration > Wireless > More AP

LABEL	DESCRIPTION
Band	Use 2.4GHz or 5GHz to set up the EMG2881-T20A's guest WiFi network.
#	This is the index number of each SSID profile.
Status	This shows whether the SSID profile is active (a yellow bulb) or not (a gray bulb).
SSID	An SSID profile is the set of parameters relating to one of the EMG2881-T20A's BSSs. The SSID (Service Set IDentifier) identifies the Service Set with which a wireless device is associated. This field displays the name of the wireless profile on the network. When a wireless client scans for an AP to associate with, this is the name that is broadcast and seen in the wireless client utility.
Security	This field indicates the security mode of the SSID profile.
Remaining Time	If the user is currently not permitted to access the Internet, you can click **Set** to allow access for a specified period of time. A screen then displays allowing you to set how long (in hours) the user is allowed to access the Internet. This field displays the amount of Internet access time that remains for each user before the EMG2881-T20A blocks the user from accessing the Internet. **0:0:0** means there is no extra Internet access time.
Edit	Click the **Edit** icon to configure the SSID profile.

7.4.1 More AP Edit

Use this screen to edit an SSID profile. Click the **Edit** icon next to an SSID in the **More AP** screen. The following screen displays.

Figure 31 Configuration > Wireless > More AP: Edit



The following table describes the labels in this screen.

Table 24 Configuration > Wireless > More AP: Edit

LABEL	DESCRIPTION
Active	Select this to activate the SSID profile.
Name (SSID)	The SSID (Service Set IDentity) identifies the Service Set with which a wireless client is associated. Enter a descriptive name (up to 32 printable characters found on a typical English language keyboard) for the wireless LAN.
Hide SSID	Select this check box to hide the SSID in the outgoing beacon frame so a station cannot obtain the SSID through scanning using a site survey tool.
Intra-BSS Traffic	A Basic Service Set (BSS) exists when all communications between wireless clients or between a wireless client and a wired network client go through one access point (AP). Intra-BSS traffic is traffic between wireless clients in the BSS. When Intra-BSS is enabled, wireless clients can access the wired network and communicate with each other. When Intra-BSS is disabled, wireless clients can still access the wired network but cannot communicate with each other.
WMM QoS	Check this to have the EMG2881-T20A automatically give a service a priority level according to the ToS value in the IP header of packets it sends. WMM QoS (Wifi MultiMedia Quality of Service) gives high priority to voice and video, which makes them run more smoothly.
Security Mode	Select **WPA2-PSK** to add security on this wireless network. The wireless clients which want to associate to this network must have same wireless security settings as this device. After you select to use a security, additional options appears in this screen. See Section 7.3 on page 59 for detailed information on different security modes. Or you can select **No Security** to allow any client to associate this network without authentication. Note:
WPA-PSK Compatible	This field appears when you choose **WPA2-PSK** as the **Security Mode**. Check this field to allow wireless devices using **WPA-PSK** security mode to connect to your EMG2881-T20A.
PMF	Protected Management Frames (PMF) is a protection mechanism of action management frames. Check this field to allow wireless devices using the PMF protection mechanism to connect to your EMG2881-T20A.
Pre-Shared Key	**WPA2-PSK** uses a simple common password for authentication. Type a pre-shared key from 8 to 63 case-sensitive keyboard characters.
Group Key Update Timer	The **Group Key Update Timer** is the rate at which the AP sends a new group key out to all clients. The default is **3600** seconds (60 minutes).

Table 24 Configuration > Wireless > More AP: Edit (continued)

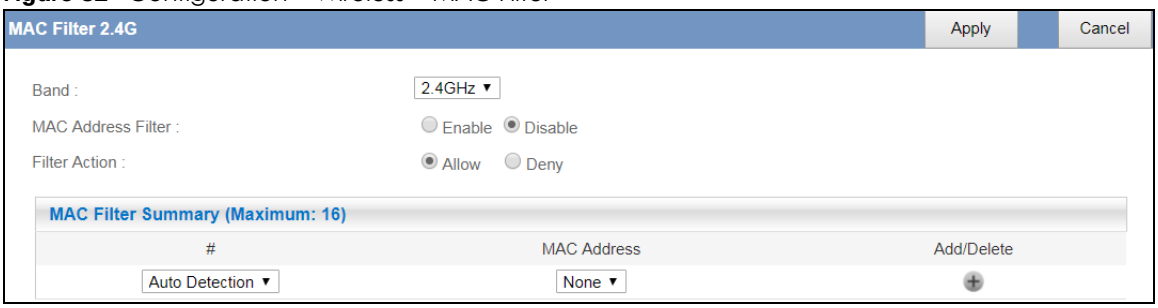
LABEL	DESCRIPTION
Apply	Click **Apply** to save your changes back to the EMG2881-T20A.
Cancel	Click **Cancel** to reload the previous configuration for this screen.

7.5 MAC Filter Screen

The MAC filter screen allows you to configure the EMG2881-T20A to give exclusive access to devices (**Allow**) or exclude devices from accessing the EMG2881-T20A (**Deny**). Every Ethernet device has a unique MAC (Media Access Control) address. The MAC address is assigned at the factory and consists of six pairs of hexadecimal characters, for example, 00:A0:C5:00:00:02. You need to know the MAC address of the devices to configure this screen.

To change your EMG2881-T20A's MAC filter settings, click **Configuration** > **Wireless** > **MAC Filter**. The screen appears as shown.

Figure 32 Configuration > Wireless > MAC Filter



The following table describes the labels in this menu.

Table 25 Configuration > Wireless > MAC Filter

LABEL	DESCRIPTION
Band	Select the frequency band to set whether you want to apply the wireless and security settings to the default **2.4GHz** or **5GHz** wireless LAN.
MAC Address Filter	Select to turn on (**Enable**) or off (**Disable**) MAC address filtering.
Filter Action	Define the filter action for the list of MAC addresses in the **MAC Filter Summary** table. Select **Allow** to permit access to the EMG2881-T20A, MAC addresses not listed will be denied access to the EMG2881-T20A. Select **Deny** to block access to the EMG2881-T20A, MAC addresses not listed will be allowed to access the EMG2881-T20A.
MAC Filter Summary	
#	This is the index number of the MAC address.
MAC Address	Enter the MAC address of the wireless station that are allowed or denied access to the EMG2881-T20A.
Add/Delete	Click ⊕ to add the rule in the MAC filter summary table. Click ⊖ to remove a rule.

Table 25 Configuration > Wireless > MAC Filter (continued)

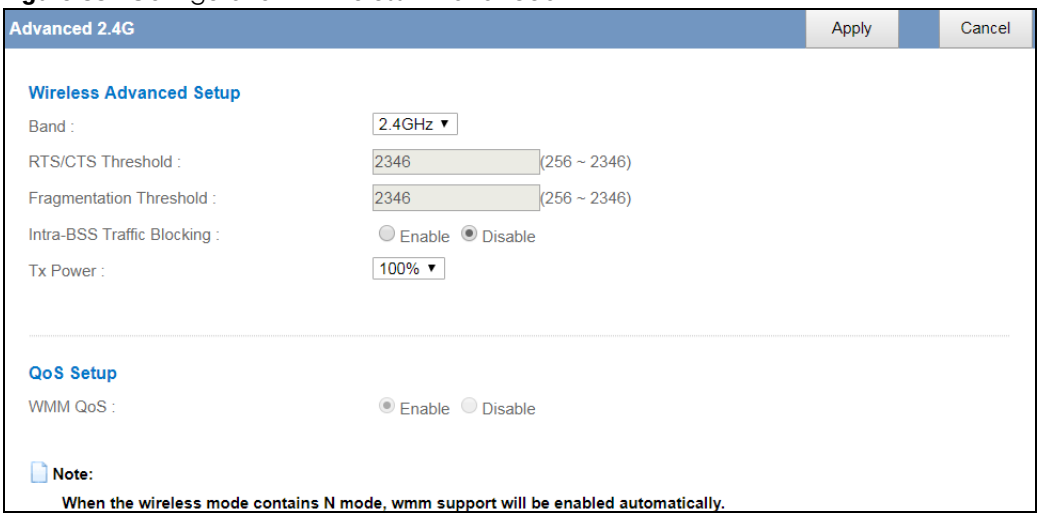
LABEL	DESCRIPTION
Apply	Click **Apply** to save your changes back to the EMG2881-T20A.
Cancel	Click **Cancel** to reload the previous configuration for this screen.

7.6 Advanced Screen

Use this screen to allow wireless advanced features, such as the output power, RTS/CTS Threshold settings.

Click **Configuration** > **Wireless** > **Advanced**. The screen appears as shown.

Figure 33 Configuration > Wireless > Advanced



The following table describes the labels in this screen.

Table 26 Configuration > Wireless > Advanced

LABEL	DESCRIPTION
Band	Select the frequency band to set whether you want to apply the wireless and security settings to the default **2.4GHz** or **5GHz** wireless LAN.
RTS/CTS Threshold	Data with its frame size larger than this value will perform the RTS (Request To Send)/CTS (Clear To Send) handshake. This field is not configurable and the EMG2881-T20A automatically changes to use the maximum value if you select **802.11a/an**, **802.11a/an/ac**, **802.11n**, **802.11gn** or **802.11bgn** in the **Wireless LAN 2.4G/5G > General** screen.
Fragmentation Threshold	The threshold (number of bytes) for the fragmentation boundary for directed messages. It is the maximum data fragment size that can be sent. This field is not configurable and the EMG2881-T20A automatically changes to use the maximum value if you select **802.11a/an**, **802.11a/an/ac**, **802.11n**, **802.11gn** or **802.11bgn** in the **Wireless LAN 2.4G/5G > General** screen.

Table 26 Configuration > Wireless > Advanced (continued)

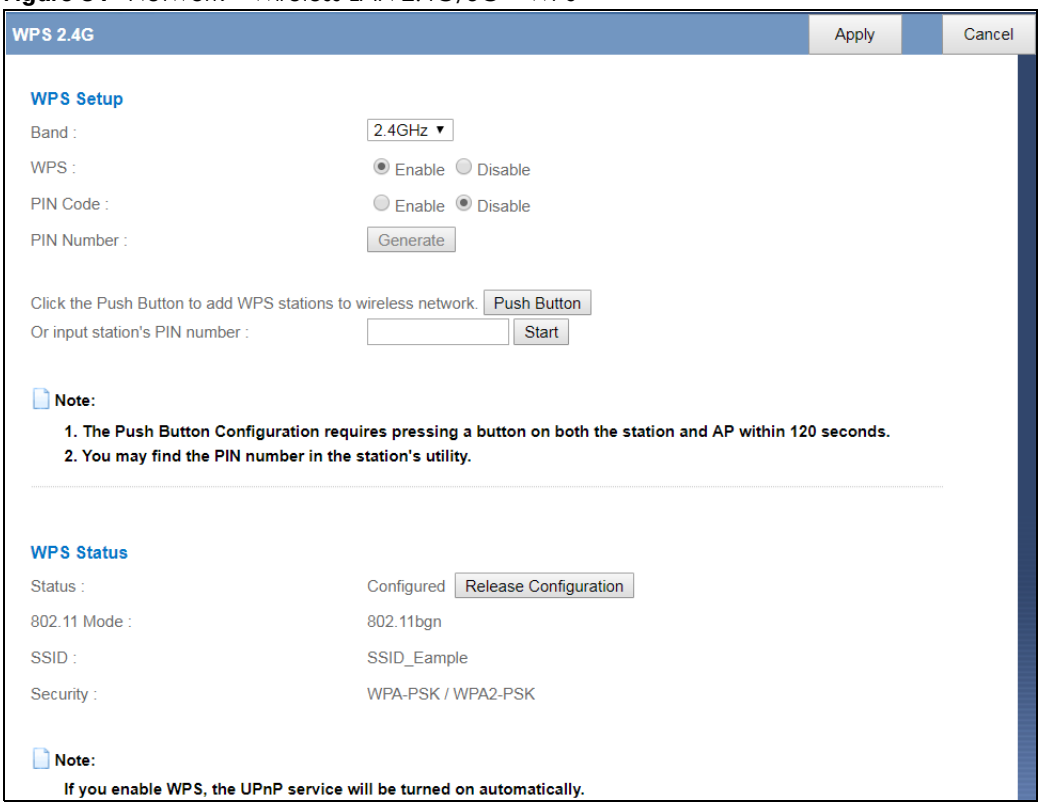
LABEL	DESCRIPTION
Intra-BSS Traffic Blocking	A Basic Service Set (BSS) exists when all communications between wireless clients or between a wireless client and a wired network client go through one access point (AP). Intra-BSS traffic is traffic between wireless clients in the BSS. When Intra-BSS is enabled, wireless clients can access the wired network and communicate with each other. When Intra-BSS is disabled, wireless clients can still access the wired network but cannot communicate with each other.
Tx Power	Set the output power of the EMG2881-T20A in this field. If there is a high density of APs in an area, decrease the output power of the EMG2881-T20A to reduce interference with other APs. Select one of the following **100%**, **90%**, **75%**, **50%**, **25%** or **10%**.
QoS Setup	
WMM QoS	Select **Enable** to have the EMG2881-T20A automatically give a service a priority level according to the ToS value in the IP header of packets it sends. WMM QoS (Wifi MultiMedia Quality of Service) gives high priority to voice and video, which makes them run more smoothly. This field is not configurable and the EMG2881-T20A automatically enables WMM QoS if you select **802.11n**, **802.11an**, **802.11gn** or **802.11bgn** in the **Expert > Wireless** screen.
Apply	Click **Apply** to save your changes back to the EMG2881-T20A.
Cancel	Click **Cancel** to reload the previous configuration for this screen.

7.7 WPS Screen

Use this screen to enable/disable WPS, view or generate a new PIN number and check current WPS status. To open this screen, click **Configuration** > **Wireless** > **WPS**.

Note: With WPS, wireless clients can only connect to the wireless network using the first SSID on the EMG2881-T20A.

Figure 34 Network > Wireless LAN 2.4G/5G > WPS



The following table describes the labels in this screen.

Table 27 Network > Wireless LAN 2.4G/5G > WPS

LABEL	DESCRIPTION
WPS Setup	
Band	Select the frequency band to set whether you want to apply the wireless and security settings to the default **2.4GHz** or **5GHz** wireless LAN.
WPS	Select **Enable** to turn on the WPS feature. Otherwise, select **Disable**.
PIN Code	Select **Enable** and click **Apply** to allow the PIN Configuration method. If you select **Disable**, you cannot create a new PIN number.
PIN Number	This is the WPS PIN (Personal Identification Number) of the EMG2881-T20A. Enter this PIN in the configuration utility of the device you want to connect to the EMG2881-T20A using WPS. The PIN is not necessary when you use WPS push-button method. Click **Generate** to generate a new PIN number.
Push Button	Use this button when you use the PBC (Push Button Configuration) method to configure wireless stations's wireless settings. Click this to start WPS-aware wireless station scanning and the wireless security information synchronization.
Or input station's PIN number	Use this button when you use the PIN Configuration method to configure wireless station's wireless settings. Type the same PIN number generated in the wireless station's utility. Then click **Start** to associate to each other and perform the wireless security information synchronization.
WPS Status	

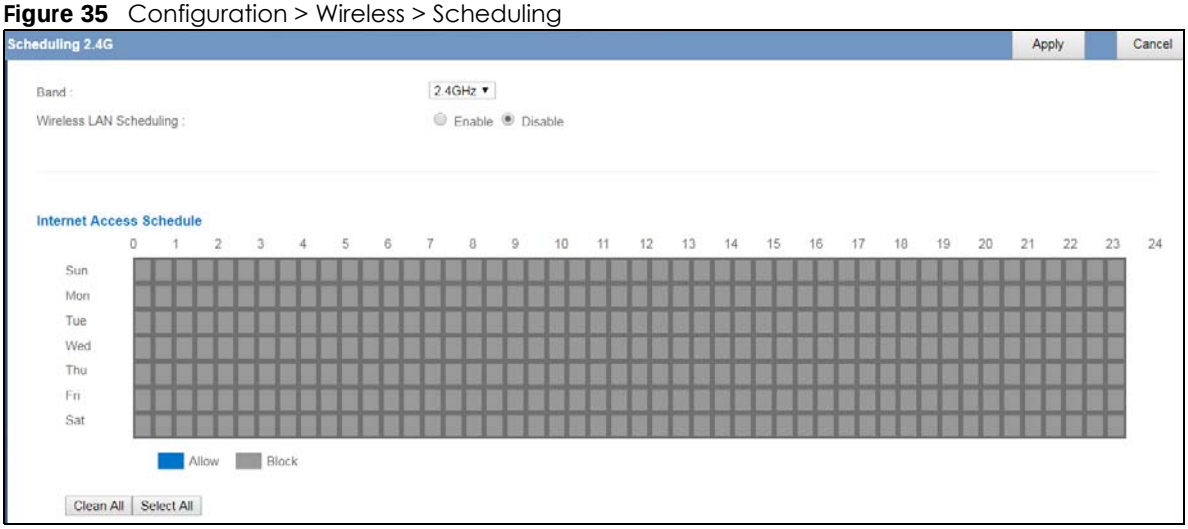
Table 27 Network > Wireless LAN 2.4G/5G > WPS (continued)

LABEL	DESCRIPTION
Status	This displays **Configured** when the EMG2881-T20A has connected to a wireless network using WPS or when **WPS Enable** is selected and wireless or wireless security settings have been changed. The current wireless and wireless security settings also appear in the screen. This displays **Unconfigured** if WPS is disabled and there are no wireless or wireless security changes on the EMG2881-T20A or you click **Release Configuration** to remove the configured wireless and wireless security settings.
Release Configuration	This button is only available when the WPS status displays **Configured**. Click this button to remove all configured wireless and wireless security settings for WPS connections on the EMG2881-T20A.
802.11 Mode	This is the 802.11 mode used. Only compliant WLAN devices can associate with the EMG2881-T20A.
SSID	This is the name of the wireless network (the EMG2881-T20A's first SSID).
Security	This is the type of wireless security employed by the network.
Apply	Click **Apply** to save your changes back to the EMG2881-T20A.
Cancel	Click **Cancel** to reload the previous configuration for this screen.

7.8 Scheduling Screen

Use this screen to set the times your wireless LAN is turned on and off. Wireless LAN scheduling is disabled by default. The wireless LAN can be scheduled to turn on or off on certain days and at certain times. To open this screen, click **Configuration** > **Wireless** > **Scheduling** tab.

Figure 35 Configuration > Wireless > Scheduling



The following table describes the labels in this screen.

Table 28 Configuration > Wireless > Scheduling

LABEL	DESCRIPTION
Band	Select the frequency band to set whether you want to apply the wireless and security settings to the default **2.4GHz** or **5GHz** wireless LAN.
Wireless LAN Scheduling	Select **Enable** to activate the wireless LAN scheduling feature. Select **Disable** to turn it off.

Table 28 Configuration > Wireless > Scheduling

LABEL	DESCRIPTION
Internet Access Schedule	The y-axis shows the time period in days. The x-axis shows the time period in hours. Click **Select All** or click gray blocks to specify days and times to turn the Wireless LAN on or off. If you click **Select All** you can not select any specific days and times. Click **Clean All** to remove all the wireless LAN scheduling.
Apply	Click **Apply** to save your changes back to the EMG2881-T20A.
Cancel	Click **Cancel** to reload the previous configuration for this screen.

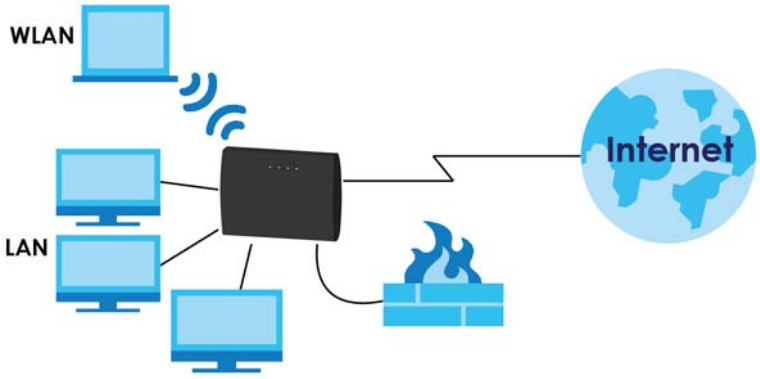
CHAPTER 8
LAN

8.1 Overview

This chapter describes how to configure LAN settings.

A Local Area Network (LAN) is a shared communication system to which many computers are attached. A LAN is a computer network limited to the immediate area, usually the same building or floor of a building.

Figure 36 LAN Example



The LAN screens can help you configure a manage IP address, and partition your physical network into logical networks.

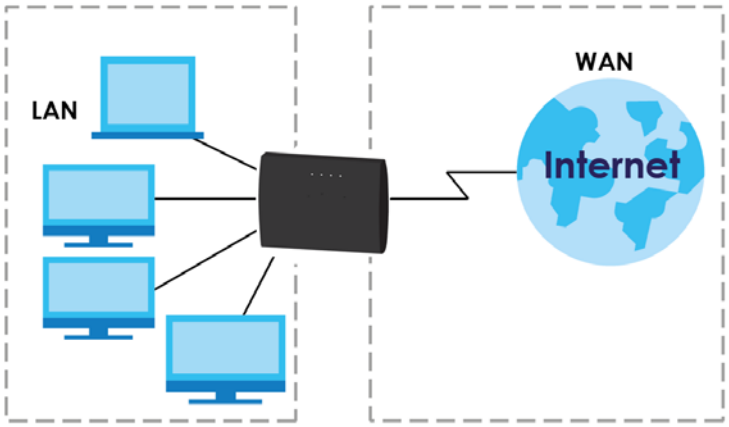
8.2 What You Can Do

- Use the **LAN IP** screen to configure the IPv4 and IPv6 addresses for your EMG2881-T20A on the LAN (Section 8.4 on page 71).
- Use the **Static DHCP** screen to assign IP addresses on the LAN to specific individual computers based on their MAC Addresses (Section 8.5 on page 72).
- Use the **IPv6 LAN** screen to configure the IPv6 address for your EMG2881-T20A on the LAN (Section 8.6 on page 73).

8.3 What You Need To Know

The actual physical connection determines whether the EMG2881-T20A ports are LAN or WAN ports. There are two separate IP networks, one inside the LAN network and the other outside the WAN network as shown next.

Figure 37 LAN and WAN IP Addresses



The LAN parameters of the EMG2881-T20A are preset in the factory with the following values:

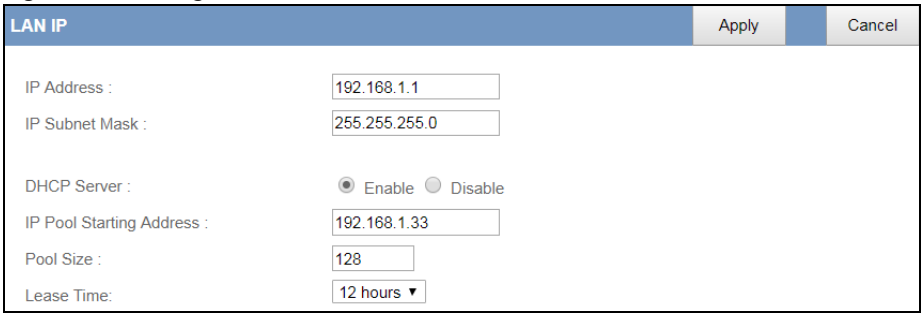
- IPv4 address of 192.168.1.1 with subnet mask of 255.255.255.0 (24 bits)
- DHCP server enabled with 128 client IPv4 addresses starting from 192.168.1.33.

These parameters should work for the majority of installations.

8.4 LAN IP Screen

Use this screen to change the IP address for your EMG2881-T20A. Click **Configuration > LAN > LAN IP**.

Figure 38 Configuration > LAN > LAN IP



The following table describes the labels in this screen.

Table 29 Configuration > LAN > LAN IP

LABEL	DESCRIPTION
IP Address	Type the IP address of your EMG2881-T20A in dotted decimal notation.
IP Subnet Mask	The subnet mask specifies the network number portion of an IP address. Your EMG2881-T20A will automatically calculate the subnet mask based on the IP address that you assign. Unless you are implementing subnetting, use the subnet mask computed by the EMG2881-T20A.

Table 29 Configuration > LAN > LAN IP (continued)

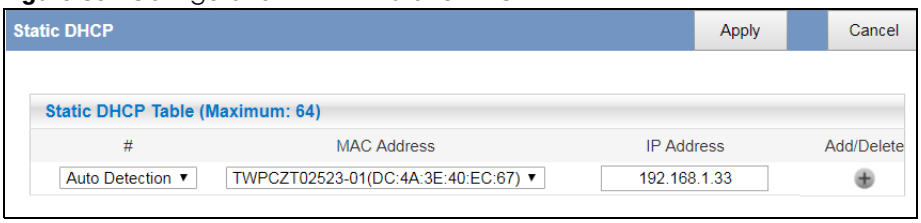
LABEL	DESCRIPTION
DHCP Server	Select **Enable** to activate DHCP for LAN. DHCP (Dynamic Host Configuration Protocol, RFC 2131 and RFC 2132) allows individual clients (computers) to obtain TCP/IP configuration at startup from a server. Enable the DHCP server unless your ISP instructs you to do otherwise. Select **Disable** to stop the EMG2881-T20A acting as a DHCP server. When configured as a server, the EMG2881-T20A provides TCP/IP configuration for the clients. If not, DHCP service is disabled and you must have another DHCP server on your LAN, or else the computers must be manually configured. When set as a server, fill in the following four fields.
IP Pool Starting Address	This field specifies the first of the contiguous addresses in the IP address pool for LAN.
Pool Size	This field specifies the size, or count of the IP address pool for LAN.
Lease Time	This is the period of time DHCP-assigned addresses is used. DHCP automatically assigns IP addresses to clients when they log in. DHCP centralizes IP address management on central computers that run the DHCP server program. DHCP leases addresses, for a period of time, which means that past addresses are "recycled" and made available for future reassignment to other systems.
Apply	Click **Apply** to save your changes back to the EMG2881-T20A.
Cancel	Click **Cancel** to begin configuring this screen afresh.

8.5 Static DHCP Screen

This screen allows you to assign IP addresses on the LAN to specific individual computers based on their MAC addresses.

To change your EMG2881-T20A's static DHCP settings, click **Configuration > LAN > Static DHCP**.

Figure 39 Configuration > LAN > Static DHCP



The following table describes the labels on this screen.

Table 30 Configuration > LAN > Static DHCP

LABEL	DESCRIPTION
#	This is the index number of the static IP table entry (row). Select **Auto Detection** to automatically detect the MAC address of a computer on your LAN. Otherwise, select **User define** to enter the MAC address of a computer on your LAN in the **MAC Address** field.
MAC Address	This field displays the MAC address of a computer on your LAN. If you select **User define** in the **#** field, enter the MAC address(es) manually.
IP Address	This field displays the LAN IP address of a computer on your LAN. If you select **User define** in the **#** field, enter the IP address(es) manually.
Add/Delete	Click ⊕ to add the rule in the MAC filter summary table. Click ⊖ to remove a rule.

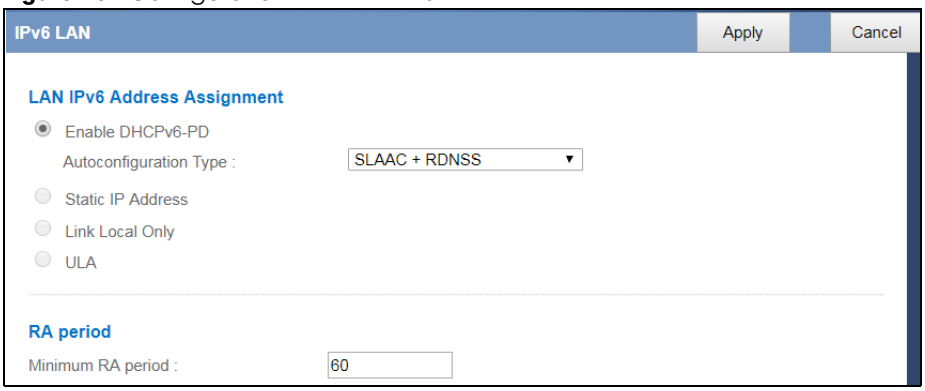
Table 30 Configuration > LAN > Static DHCP (continued)

LABEL	DESCRIPTION
Apply	Click **Apply** to save your changes with the EMG2881-T20A.
Cancel	Click **Cancel** to begin configuring this screen afresh.

8.6 IPv6 LAN Screen

Use this screen to configure the IP address for your EMG2881-T20A on the LAN. Click **Configuration** > **LAN** > **IPv6 LAN**.

Figure 40 Configuration > LAN > IPv6 LAN



The following table describes the labels in this screen.

Table 31 Configuration > LAN > IPv6 LAN

LABEL	DESCRIPTION
LAN IPv6 Address Assignment	
Enable_DHCPv6-PD Select this option to use DHCPv6 prefix delegation. The EMG2881-T20A will obtain an IPv6 prefix from the ISP or a connected uplink router for the LAN.	
Autoconfiguration Type	Select **SLAAC + RDNSS** to enable IPv6 stateless auto-configuration on this interface. The interface will generate an IPv6 IP address itself from a prefix obtained from an IPv6 router in the network. Select **SLAAC + Stateless DHCPv6** to enable IPv6 stateless auto-configuration on this interface. The interface will get an IPv6 address from an IPv6 router and the DHCP server. The IP address information gets through DHCPv6. Select **Stateful DHCPv6** to allow a DHCP server to assign and pass IPv6 network addresses, prefixes and other configuration information to DHCP clients.
IPv6 Address range (Start)	Enter the beginning of the range of IP addresses that this address object represents.
IPv6 Address range (End)	Enter the end of the range of IP address that this address object represents.
IPv6 Lifetime	Enter the IPv6 lifetime in the LAN.
Static IP Address Select this option to manually enter an IPv6 address if you want to use a static IP address.	

Table 31 Configuration > LAN > IPv6 LAN (continued)

LABEL	DESCRIPTION
LAN IPv6 Address	Enter the LAN IPv6 address you want to assign to your EMG2881-T20A in hexadecimal notation.
LAN IPv6 Prefix Length (48~64)	Enter the 48 to 64 address prefix length to specify in an IPv6 address compose the network address.
Prefix Preferred Lifetime	Enter the preferred lifetime for the prefix.
Prefix Valid Lifetime	Enter the valid lifetime for the prefix.
Link Local Only Select this option to only use the link local address on the EMG2881-T20A interfaces in the LAN.	
ULA Select this option to identify a unique local address of the EMG2881-T20A in the LAN.	
RA period	
Minimum RA period	Enter the minimum time in seconds between router advertisement messages.
Apply	Click **Apply** to save your changes back to the EMG2881-T20A.
Cancel	Click **Cancel** to begin configuring this screen afresh.

CHAPTER 9
Applications

9.1 Overview

This chapter shows you how to configure bandwidth management and UPnP.

Quality of Service (QoS)

Quality of Service (QoS) refers to both a network's ability to deliver data with minimum delay, and the networking methods used to control the use of bandwidth. Without QoS, all traffic data is equally likely to be dropped when the network is congested. This can cause a reduction in network performance and make the network inadequate for time-critical application such as video-on-demand.

Configure QoS on the EMG2881-T20A to group and prioritize application traffic and fine-tune network performance. Setting up QoS involves these steps:

1 Configure classifiers to sort traffic into different flows.

2 Assign priority and define actions to be performed for a classified traffic flow.

The EMG2881-T20A assigns each packet a priority and then queues the packet accordingly. Packets assigned a high priority are processed more quickly than those with low priority if there is congestion, allowing time-sensitive applications to flow more smoothly. Time-sensitive applications include both those that require a low level of latency (delay) and a low level of jitter (variations in delay) such as Voice over IP (VoIP) or Internet gaming, and those for which jitter alone is a problem such as Internet radio or streaming video.

This chapter contains information about configuring QoS and editing classifiers.

Universal Plug-and-Play (UPnP)

UPnP hardware is identified as an icon in the Network Connections folder (Windows XP). Each UPnP compatible device installed on your network will appear as a separate icon. Selecting the icon of a UPnP device will allow you to access the information and properties of that device.

9.1.1 What You Can Do in this Chapter

- The **QoS General** screen lets you enable or disable QoS and set the upstream bandwidth (Section 9.3 on page 78).
- The **Queue Setup** screen lets you configure QoS queue assignment (Section 9.4 on page 79).
- The **Class Setup** screen lets you add, edit or delete QoS classifiers (Section 9.5 on page 80).
- Use the **UPnP** screen to enable UPnP on your EMG2881-T20A (Section 9.6 on page 83).

9.2 What You Need to Know

The following terms and concepts may help as you read through this chapter.

QoS versus CoS

QoS is used to prioritize source-to-destination traffic flows. All packets in the same flow are given the same priority. CoS (class of service) is a way of managing traffic in a network by grouping similar types of traffic together and treating each type as a class. You can use CoS to give different priorities to different packet types.

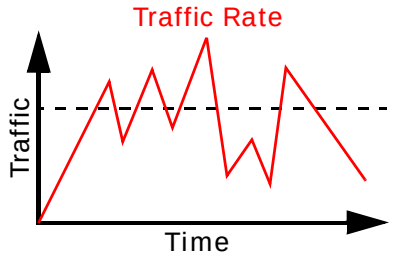
CoS technologies include IEEE 802.1p layer 2 tagging and DiffServ (Differentiated Services or DS). IEEE 802.1p tagging makes use of three bits in the packet header, while DiffServ is a new protocol and defines a new DS field, which replaces the eight-bit ToS (Type of Service) field in the IP header.

Tagging and Marking

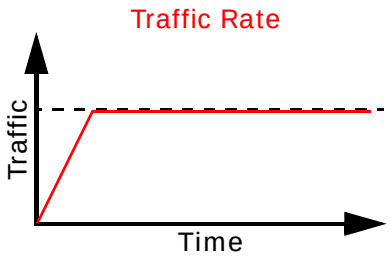
In a QoS class, you can configure whether to add or change the DSCP (DiffServ Code Point) value, IEEE 802.1p priority level and VLAN ID number in a matched packet. When the packet passes through a compatible network, the networking device, such as a backbone switch, can provide specific treatment or service based on the tag or marker.

Traffic Shaping

Bursty traffic may cause network congestion. Traffic shaping regulates packets to be transmitted with a pre-configured data transmission rate using buffers (or queues). Your EMG2881-T20A uses the Token Bucket algorithm to allow a certain amount of large bursts while keeping a limit at the average rate.



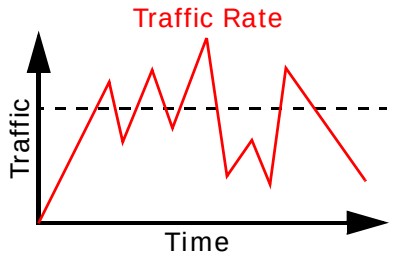
(Before Traffic Shaping)



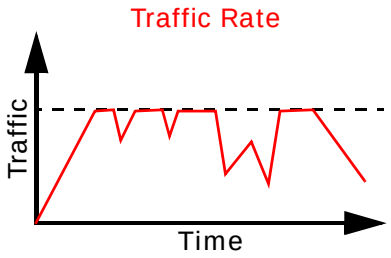
(After Traffic Shaping)

Traffic Policing

Traffic policing is the limiting of the input or output transmission rate of a class of traffic on the basis of user-defined criteria. Traffic policing methods measure traffic flows against user-defined criteria and identify it as either conforming, exceeding or violating the criteria.



(Before Traffic Policing)



(After Traffic Policing)

The EMG2881-T20A supports three incoming traffic metering algorithms: Token Bucket Filter (TBF), Single Rate Two Color Maker (srTCM), and Two Rate Two Color Marker (trTCM). You can specify actions which are performed on the colored packets. See Section 9.7 on page 83 for more information on each metering algorithm.

NAT Traversal

UPnP NAT traversal automates the process of allowing an application to operate through NAT. UPnP network devices can automatically configure network addressing, announce their presence in the network to other UPnP devices and enable exchange of simple product and service descriptions. NAT traversal allows the following:

- Dynamic port mapping
- Learning public IP addresses
- Assigning lease times to mappings

Windows Messenger is an example of an application that supports NAT traversal and UPnP.

See the NAT chapter for more information on NAT.

Cautions with UPnP

The automated nature of NAT traversal applications in establishing their own services and opening firewall ports may present network security issues. Network information and configuration may also be obtained and modified by users in some network environments.

When a UPnP device joins a network, it announces its presence with a multicast message. For security reasons, the EMG2881-T20A allows multicast messages on the LAN only.

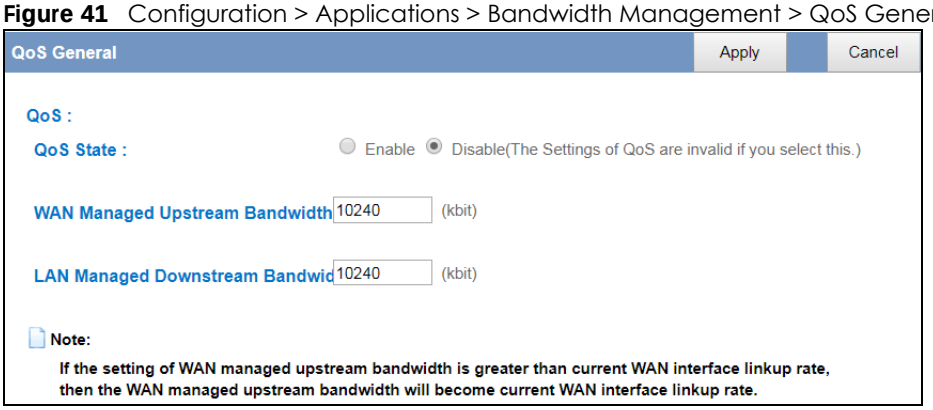
All UPnP-enabled devices may communicate freely with each other without additional configuration. Disable UPnP if this is not your intention.

9.3 The QoS General Screen

Click **Configuration > Applications > Bandwidth Management > QoS General** to open the screen as shown next.

Use this screen to enable or disable QoS and set the upstream bandwidth. See Section 9.1 on page 75 for more information.

Figure 41 Configuration > Applications > Bandwidth Management > QoS General



The following table describes the labels in this screen.

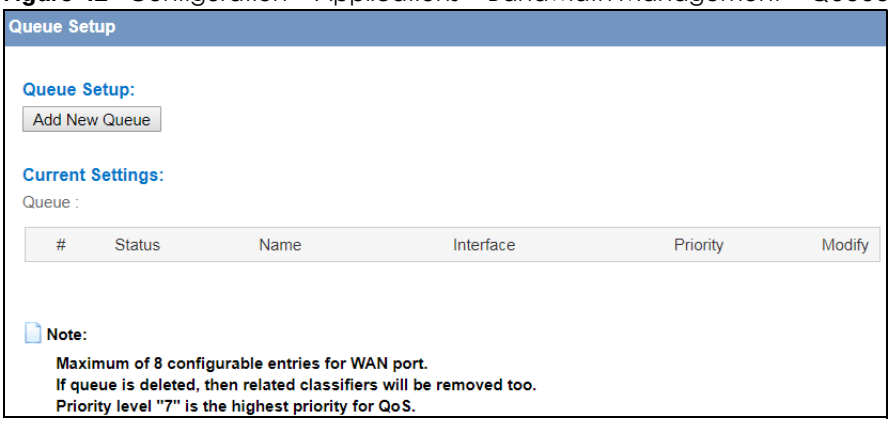
Table 32 Management > Bandwidth MGMT > General

LABEL	DESCRIPTION
QoS State	Select the **Enable** check box to turn on QoS to improve your network performance.
WAN Managed Upstream Bandwidth	Enter the amount of upstream bandwidth for the WAN interfaces that you want to allocate using QoS. The recommendation is to set this speed to match the interfaces' actual transmission speed. For example, set the WAN interfaces' speed to 100000 kbps if your Internet connection has an upstream transmission speed of 100 Mbps. You can set this number higher than the interfaces' actual transmission speed. The EMG2881-T20A uses up to 95% of the DSL port's actual upstream transmission speed even if you set this number higher than the DSL port's actual transmission speed. You can also set this number lower than the interfaces' actual transmission speed. This will cause the EMG2881-T20A to not use some of the interfaces' available bandwidth. If you leave this field blank, the EMG2881-T20A automatically sets this number to be 95% of the WAN interfaces' actual upstream transmission speed.
LAN Managed Downstream Bandwidth	Enter the amount of downstream bandwidth for the LAN interfaces (including WLAN) that you want to allocate using QoS. The recommendation is to set this speed to match the WAN interfaces' actual transmission speed. For example, set the LAN managed downstream bandwidth to 100000 kbps if you use a 100 Mbps wired Ethernet WAN connection. You can also set this number lower than the WAN interfaces' actual transmission speed. This will cause the EMG2881-T20A to not use some of the interfaces' available bandwidth. If you leave this field blank, the EMG2881-T20A automatically sets this to the LAN interfaces' maximum supported connection speed.
Apply	Click **Apply** to save your changes.
Cancel	Click **Cancel** to restore your previously saved settings.

9.4 The Queue Setup Screen

Use this screen to configure QoS queue assignment. Click **Configuration > Applications > Bandwidth Management > Queue Setup** to open the screen as shown next.

Figure 42 Configuration > Applications > Bandwidth Management > Queue Setup



The following table describes the labels in this screen.

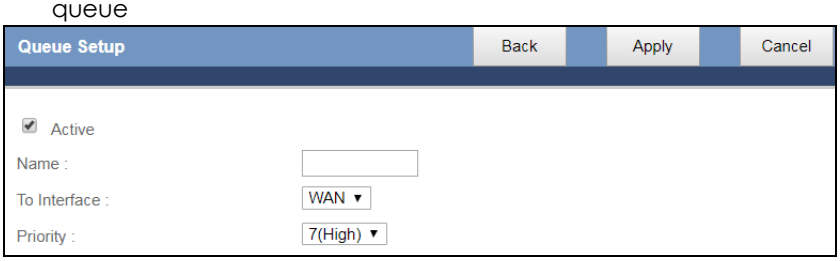
Table 33 Management > Bandwidth MGMT > Queue Setup

LABEL	DESCRIPTION
Add new Queue	Click this button to create a new queue entry.
#	This is the index number of the entry.
Status	This field displays whether the queue is active or not. A yellow bulb signifies that this queue is active. A gray bulb signifies that this queue is not active.
Name	This shows the descriptive name of this queue.
Interface	This shows the name of the EMG2881-T20A's interface through which traffic in this queue passes.
Priority	This shows the priority of this queue.
Modify	Click the **Edit** icon to edit the queue. Click the **Delete** icon to delete an existing queue. Note that subsequent rules move up by one when you take this action.

9.4.1 Add/Edit a Queue

Click **Add New Queue** or the **Edit** icon in the **Queue Setup** screen to configure a queue.

Figure 43 Configuration > Applications > Bandwidth Management > Queue Setup: Add/Edit new queue



The following table describes the labels in this screen.

Table 34 Management > Bandwidth MGMT > Queue Setup: Add/Edit new queue

LABEL	DESCRIPTION
Active	Select to enable or disable this queue.
Name	Enter the descriptive name of this queue. Note that \"<>%\\^[]`\+\$\,='#&@.:() are not allowed.
To Interface	Select the interface to which this queue is applied.
Priority	Select the priority level (from 1 to 7) of this queue. The smaller the number, the higher the priority level. Traffic assigned to higher priority queues gets through faster while traffic in lower priority queues is dropped if the network is congested.
Back	Click this to return to the previous screen.
Apply	Click this to save your changes.
Cancel	Click this to exit this screen without saving.

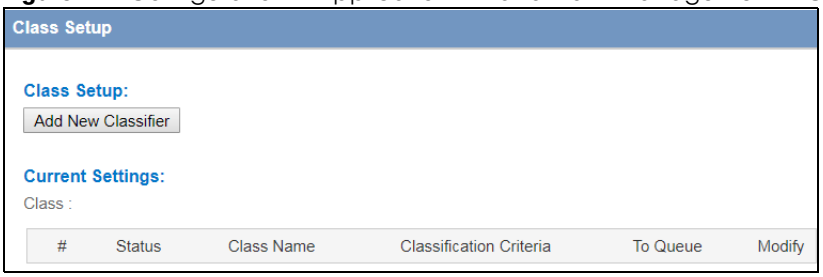
9.5 The Class Setup Screen

Use this screen to add, edit or delete QoS classifiers. A classifier groups traffic into data flows according to specific criteria such as the source address, destination address, source port number, destination port number or incoming interface. For example, you can configure a classifier to select traffic from the same protocol port (such as Telnet) to form a flow.

You can give different priorities to traffic that the EMG2881-T20A forwards out through the WAN interface. Give high priority to voice and video to make them run more smoothly. Similarly, give low priority to many large file downloads so that they do not reduce the quality of other applications.

Click **Configuration > Applications > Bandwidth Management > Class Setup** to open the following screen.

Figure 44 Configuration > Applicatioin > Bandwidth Management > Class Setup



The following table describes the labels in this screen.

Table 35 Configuration > Applications > Bandwidth Management > Class Setup

LABEL	DESCRIPTION
Add new Classifier	Click this to create a new classifier.
#	This is the index number of the entry.
Status	This field displays whether the classifier is active or not. A yellow bulb signifies that this classifier is active. A gray bulb signifies that this classifier is not active.
Class Name	This is the name of the classifier.

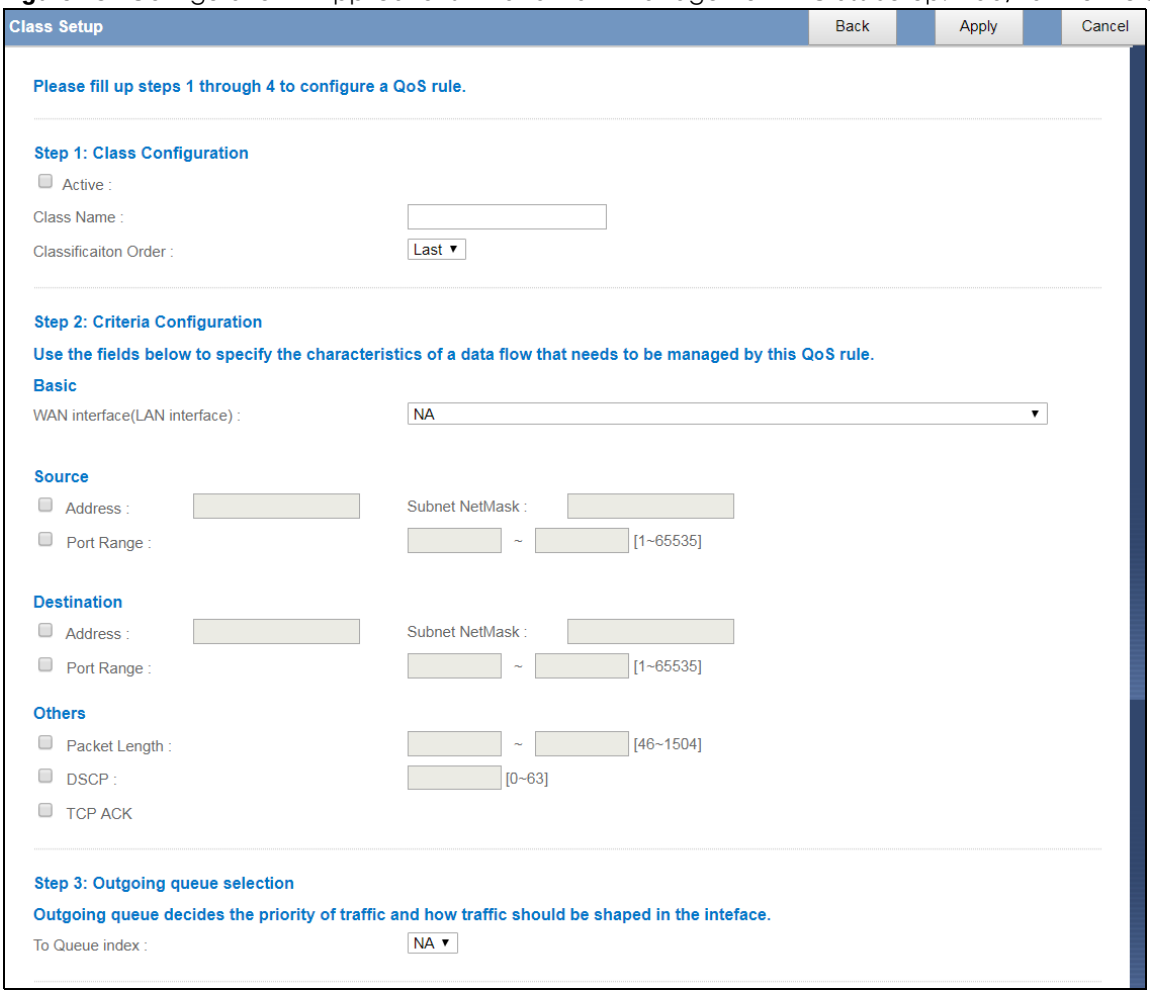
Table 35 Configuration > Applications > Bandwidth Management > Class Setup (continued)

LABEL	DESCRIPTION
Classification Criteria	This shows criteria specified in this classifier, for example the interface from which traffic of this class should come and the source MAC address of traffic that matches this classifier.
To Queue	This is the name of the queue in which traffic of this classifier is put.
Modify	Click the **Edit** icon to edit the classifier. Click the **Delete** icon to delete an existing classifier. Note that subsequent rules move up by one when you take this action.

9.5.1 Add/Edit a Classifier

Click **Add New Classifier** in the **Class Setup** screen or the **Edit** icon next to a classifier to open the following screen.

Figure 45 Configuration > Applications > Bandwidth Management > Class Setup: Add/Edit new class



The following table describes the labels in this screen.

Table 36 Configuration > Applications > Bandwidth Management > Class Setup: Add/Edit new class

LABEL	DESCRIPTION
Step 1: Class Configuration	
Active	Select this to enable this classifier.
Class Name	Enter a descriptive name of up to 15 printable English keyboard characters, not including spaces.
Classification Order	Select an existing number for where you want to put this classifier to move the classifier to the number you selected after clicking **Apply**. Select **Last** to put this rule in the back of the classifier list.
Step 2: Criteria Configuration	
Basic	
WAN interface(LAN interface)	If you select **From LAN** in the Interface field, you can select specific interface(s) from which traffic is received. ra0 ~ ra3 means wireless interfaces WLAN0 to WLAN3. If you select **From WAN** in the Interface field, you can select a specific WAN connection (PVC0~PVC2) from which traffic is received.
Source	
Address	Select the check box and enter the source IP address in dotted decimal notation. A blank source IP address means any source IP address.
Subnet Netmask	Enter the source subnet mask.
Port Range	If you select **TCP** or **UDP** in the **IP Protocol** field, select the check box and enter the port number(s) of the source.
Destination	
Address	Select the check box and enter the source IP address in dotted decimal notation. A blank source IP address means any source IP address.
Subnet Netmask	Enter the source subnet mask.
Port Range	If you select **TCP** or **UDP** in the **IP Protocol** field, select the check box and enter the port number(s) of the source.
Others	
Packet Length	This field is available only when you select **IP** in the **Ether Type** field. Select this option and enter the minimum and maximum packet length (from 46 to 1500) in the fields provided.
DSCP	This field is available only when you select **IP** in the **Ether Type** field. Select this option and specify a DSCP (DiffServ Code Point) number between 0 and 63 in the field provided.
TCP ACK	This field is available only when you select **IP** in the **Ether Type** field. If you select this option, the matched TCP packets must contain the ACK (Acknowledge) flag.
Step 3: Outgoing queue selection	
To Queue Index	Select a queue that applies to this class. You should have configured a queue in the **Queue Setup** screen already.
Back	Click this to return to the previous screen.
Apply	Click this to save your changes.
Cancel	Click this to exit this screen without saving.