D-Link

Building Networks for People

USER MANUAL

DXN-W224

Version 0.1

WIRELESS ETHERNET COAXIAL BRIDGE

SYSTEM REQUIREMENTS

- Windows 7 or XP , MAC OS
- 233MHz processor and at least 64MB of RAM
- An available Ethernet Adapter (100Mbit/s)

PACKAGE CONTENTS

- DXN-W224 Wireless Ethernet Bridge
- CAT5 Ethernet cable
- Power adapter

BACK PANEL

RESET
Press and hold at least 15 seconds to restore device back to the factory default settings.

CABLE
Connect one end of a coaxial cable to the DXN-W224 Coax Input/Output port and the other end to your cable outlet**.**
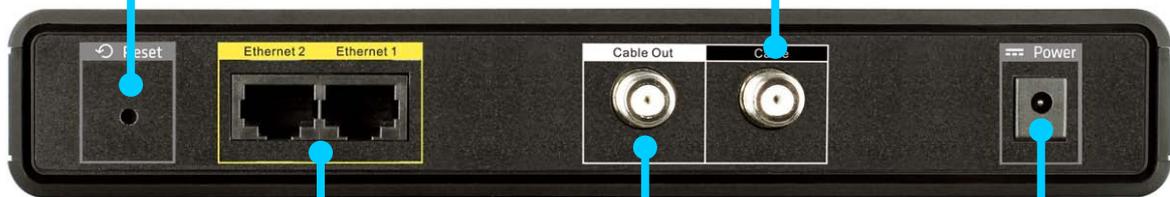
LAN
Connect one end of the CAT5 Ethernet cable to DXN-W224 LAN port and the other end to your Ethernet device.

CABLE OUT
Connect one end of a coaxial cable to the DXN-W224 TV out port and the other end to your television.

POWER
Connect the power adapter included in the product package of the DXN-W224.

FRONT PANEL
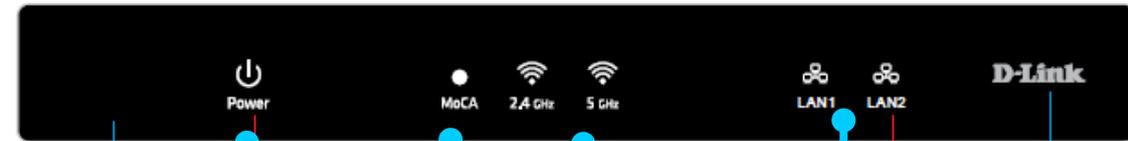
POWER LED
A solid light indicates that the device is receiving power.

MOCA LED
A solid light indicates that the device has formed a network over the coaxial cable with at least one other MoCA bridge.

2.4GHz/5GHz LED
A solid light indicates the wireless segment is ready. The LED blinks during wireless data transmission.

LAN LED
A solid light indicates that a connection on the Ethernet port. The LED blinks during data transmission.

INSTALLATION PLANNING OVERVIEW

The proper cable installation, placement of filter/amplifier, frequency planning and home preparation for signal coexistence should be planned out thoroughly before deploying the DXN-W224

Inadequate planning will not only affect the DXN-W224 network but also cause unwanted interference with other existing services. The following section discusses these installation considerations in more detail.

Proper Cable Installation

The rooms qualified to be part of the DXN-W224 network should have an existing coaxial connection and the following characteristics:

- The room is capable of receiving good quality analog television service (no set-top box required) over the coaxial cable.
- The room is capable of receiving digital television services using a set-top box.

If the room cannot receive digital or good quality analog television services, the Ethernet-Coaxial network capabilities may be compromised to this location.

Amplifier Bypassing

An electronic amplifier is a device that boosts a weak signal. The typical amplifier cannot pass DXN-W224 network signal because they are designed to be unidirectional devices. Hence, the amplifier should be uninstalled or bypassed if possible. To bypass an amplifier, user will need to install Diplexers to separate the DXN-W224 signal and other signal first and only install the amplifier between the paths of none DXN-W224 network signal.

Frequency Planning

The DXN-W224 is capable of operating between frequency bands of 1125MHz and 1525MHz. In order to avoid interference between the DXN-W224 device and other devices on the same cable network, DXN-W224 device must operate at a frequency spectrum that is different from other devices.

- 5-42MHz (Internet Access Upstream)
- 42-850MHz (Internet Access downstream)
- 50-806MHz (Off-Air TV)
- 50-860MHz (Cable TV)
- 950-2150MHz (Satellite L-Band)

One common scenario is where DXN-W224, cable television and high-speed Internet service need to coexist. The cable television in United States operates between 50-860MHz while high-speed Internet service upstream and downstream operate between 5-42MHz and 42-850 MHz respectively. Hence, the logical choice for DXN-W224 frequency would be between 940-1500MHz. The similar frequencies planning approach should be taken into consideration when dealing with Satellite and off-air antenna.

Terrestrial Television (Off-Air)

If you are receiving terrestrial television service using a broadband antenna, then additional components may have to be installed in order to be compliant with governmental regulations. DXN-W224 network signals operating in the 1125 to 1525 MHz range should be prevented from radiating out of the antenna by using a small, in-line Low Pass Filter(LPF-860Mhz). This filter will prevent DXN-W224 network signals from reaching the antenna.

Cable Television (CATV)

For a cable television subscriber, there are no additional components required to work with the DXN-W224 on the same cable network. The user may choose to install the DXN-W224 on the network and use it as-is if data rate is acceptable. Else, user may improve DXN-W224 network performance by inserting a Low Pass Filter (LPF-860Mhz) at Point of Entry (POE) where the drop cable enters the house.

DBS Satellite Television with Terrestrial Television (Off-Air)

The Direct Broadcast Satellite (DBS) uses proprietary satellite channel-stacking switch or Low-Noise Block (LNB) to distribute the resulting signal (usually 950 to 2150 MHz) in the same cable network that carries the lower-frequency terrestrial television from an outdoor antenna. Another Diplexer then separates the signals to the receiver of the TV set and the DBS set-top box (STB).

Most of the satellite switches are not designed to pass DXN-W224 network signal and prevents it from forming a network. It is recommended that satellite signal and DXN-W224 network signal should remain on separate cable networks. If separate wiring cannot be done, then additional components have to be installed:

1. Install Triplexer to separate UHF/VHF, DXN-W224, and DBS signals.
2. Install MoCA Coupler switch before the satellite switch.

Existing OSP installed MoCA network

The DXN-W224 will automatically scan for an available channel and form

Ethernet-Coaxial network. This may cause issue with the existing OSP MoCA network. It will not be permitted to join the OSP MoCA network unless utilizing the same frequency and password.

The remedy in this situation is to use the DXN-W224 software utility to configure the DXN-W224 to be on the same frequency with the same privacy network as the existing OSP MoCA network.

HARDWARE INSTALLATION

Power
Plug the DXN-W224 into an AC wall outlet or power strip.
Note: Power source is confirmed when the green LED Power indicator on the DXN-W224 is illuminated.

Connect the Ethernet Cable
Connect the included Ethernet cable to the LAN port located on the DXN-W224 and attached the other end of the Ethernet cable to the network or PC.

Connect the Coaxial Cable
Connect coaxial cable to the Coax I/O port located on DXN-W224 and attached the other end of the coax cable to your cable jack inside the house.
Note: Please make sure the DXN-W224's configuration switch is in
MoCA mode. Coaxial Network Connectivity is confirmed when the green LED COAX indicator on the DXN-W224 is illuminated.

If there is TV service being received in the room and you wish to continue viewing the service, connect the other coax cable to the TV Out port on the DXN-W224 and attach the other end of the coax cable to your television, Set-top Box (STB), or VCR as desired.

NETWORK FLOOR PLAN

OFFICE

COAXIAL BRIDGE

ROUTER

Existing Wall Wiring

BEDROOM

TV
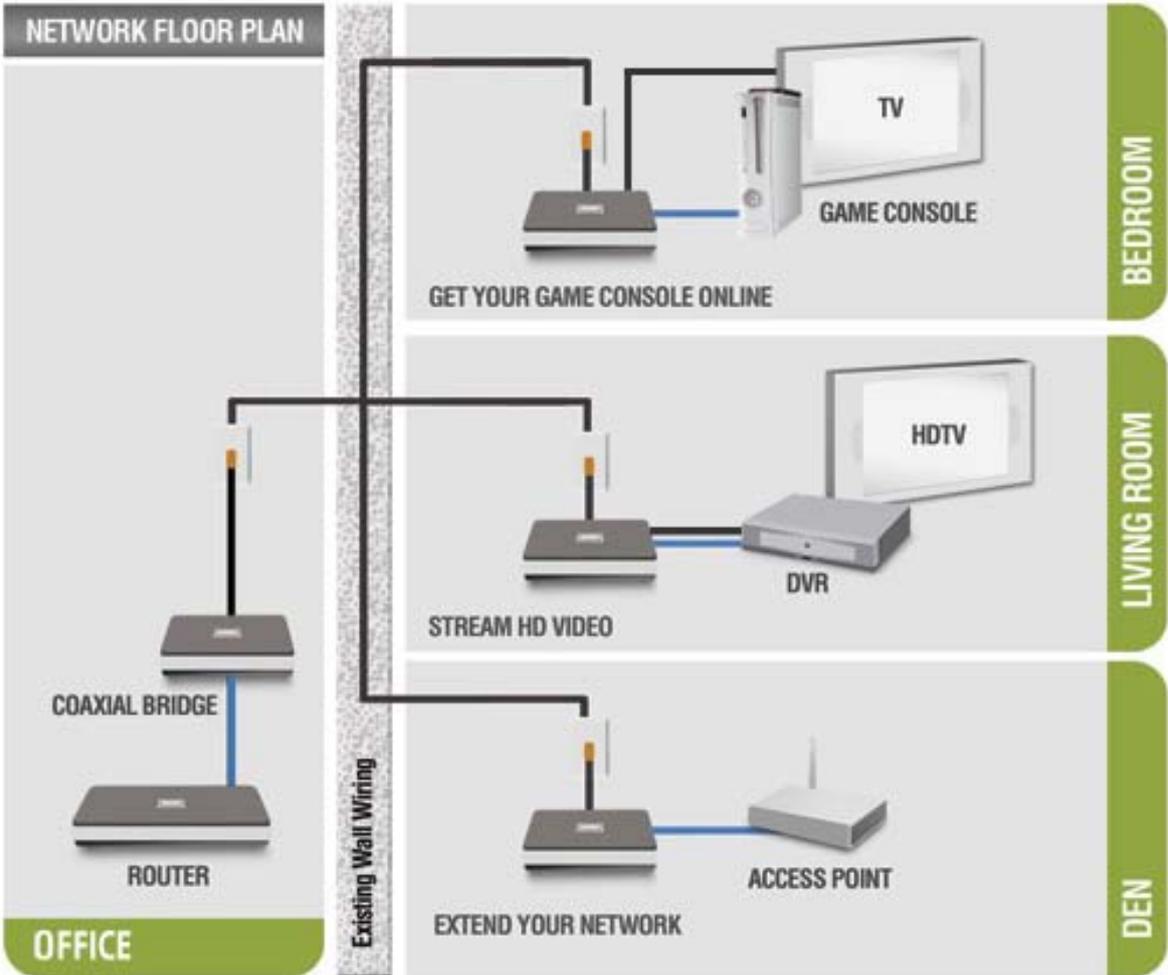
GAME CONSOLE

GET YOUR GAME CONSOLE ONLINE

LIVING ROOM

HDTV

DVR

STREAM HD VIDEO

DEN

ACCESS POINT

EXTEND YOUR NETWORK

CABLE =   ETHERNET =

SOFTWARE INSTALLATION

D-Link DXN-224 comes with software web-based configuration to allow control over certain coaxial networking parameter. The unit is shipped with default parameters that will allow operation on most coaxial network without any additional configuration.

However, if a special network security password is required or if a specific channel operating frequencies is required, then the default parameters will need to be modified.

Web-based Configuration Utility

To access the configuration utility, open a web-browser such as Internet Explorer and enter the IP address of the router (192.168.0.50).
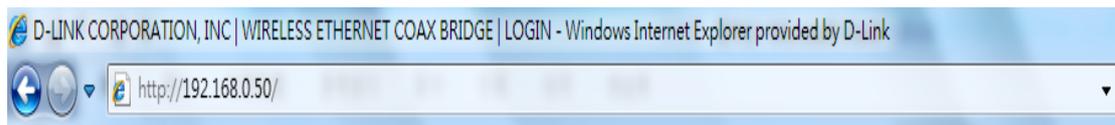
Select any one of user name from the drop-down menu and then enter your password as below.
User name: MSO, Technician or User
Password: [leave this blank by default]
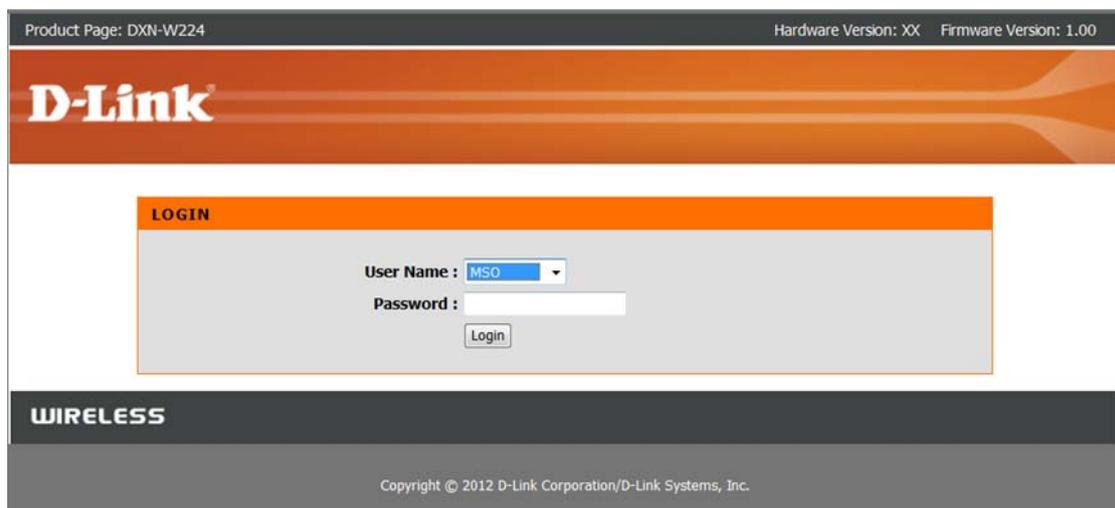
LAN Settings
Internet Setup –Dynamic IP

My LAN connection: Select **Dynamic IP (DHCP)** to obtain IP Address information automatically from your ISP. Select this option if your ISP does not give you any IP numbers to use. This option is commonly used for cable modem services such as Comcast and Cox.

DEVICE NAME

Device Name allows you to configure this device more easily.You can enter "http://"device name" into your web browser instead of IP address for configuration. (Default: http://dlinkrouter)

Device Name : dlinkap

LAN IPV4 CONNECTION TYPE

Choose the IPv4 mode to be used by the Access Point

My LAN Connection is : Dynamic IP (DHCP) ▾

DYNAMIC IP(DHCP) LAN CONNECTION TYPE

Enter the IPv4 Address Information.

IP Address : 192.168.0.1
Subnet Mask : 255.255.255.0
Gateway Address : 0.0.0.0
Primary DNS Server : 0.0.0.0
Secondary DNS Server : 0.0.0.0

LAN IPv6 CONNECTION TYPE

Choose the IPv6 mode to be used by the Access Point.

My IPv6 Connection is : Local Connectivity Only ▾

LAN IPv6 ADDRESS SETTINGS

Use this section to configure the internal network settings of your AP. The LAN IPv6 Link-Local Address is the IPv6 Address that you use to access the Web-based management interface.

LAN IPv6 Link-Local Address : FE80::218:22FF:FE32:3351/64

Internet Setup-Static (assigned by ISP)

Select Static IP Address if all the Internet port's IP information is provided to you by your ISP. You will need to enter in the IP address, subnet mask, gateway address, and DNS address(es) provided to you by your ISP. Each IP address entered in the fields must be in the appropriate IP form, which are four octets separated by a dot (x.x.x.x). The Router will not accept the IP address if it is not in this format.

LAN IPV4 CONNECTION TYPE

Choose the IPv4 mode to be used by the Access Point

My LAN Connection is : [Static IP ▼]

STATIC IP LAN CONNECTION TYPE

Enter the IPv4 Address Information.

IP Address : [192.168.0.1]
Subnet Mask : [255.255.255.0]
Gateway Address : [0.0.0.0]
Primary DNS Server : [0.0.0.0]
Secondary DNS Server : [0.0.0.0]

LAN IPv6 CONNECTION TYPE

Choose the IPv6 mode to be used by the Access Point.

My IPv6 Connection is : [Local Connectivity Only ▼]

LAN IPv6 ADDRESS SETTINGS

Use this section to configure the internal network settings of your AP. The LAN IPv6 Link-Local Address is the IPv6 Address that you use to access the Web-based management interface.

LAN IPv6 Link-Local Address : FE80::218:22FF:FE32:3351/64

IP Address: Enter the IP address assigned by your ISP.

Subnet Mask: Enter the Subnet Mask assigned by your ISP.

Default Gateway: Enter the Gateway assigned by your ISP.

DNS Servers: The DNS server information will be supplied by your ISP

IPv6 Connection type:

If you select **"LOCAL Connectivity Only"**:

The user may see the LAN IPv6 Link-local address in the following section. It's the IPv6 address that you can use to access the web-based management interface. The user can configure the IPv6 local settings.

The Link-local address is used by nodes and routers when communicating with neighboring nodes on the same link. This mode enables IPv6-capable devices to communicate with each other on the LAN side.

If you select" **Static IPv6**":

IPv6 Address: Enter the IP address supplied by your ISP (Internet service provider).

Subnet Prefix length: Enter the value used here. This subnet supported with prefix /64 is supported in LAN.

Default gateway: Enter the info provided by your ISP.

Primary IPv6 DNS server: Enter the info provided by your ISP.

Secondary IPv6 DNS server: Enter the info provided by your ISP

If you select "**AutoConfiguration (SLAAC/DHCPv6)**":

DXN-W224 can automatically assign IPv6 address through SLAAC/DHCPv6 (Stateless Address AutoConfiguration) this option.

The user can select "obtain IPv6 DNS server automatically" and the DHCPv6 server will assign the DNS server address automatically.

Or the user may manually enter the specific DNS server address through "Use the following IPv6 DNS server"

LAN IPv6 CONNECTION TYPE

Choose the IPv6 mode to be used by the Access Point.

My IPv6 Connection is :   Autoconfiguration (SLAAC/DHCPv6) ▼

IPv6 DNS SETTINGS

Obtain DNS server address automatically or enter a specific DNS server address.

- ◉ Obtain IPv6 DNS servers automatically
- ○ Use the following IPv6 DNS servers

Primary IPv6 DNS Server : [   ]
Secondary IPv6 DNS Server : [   ]

Wireless Settings

This section provides the users to configure the settings of 2.4GHz and 5GHz wireless networks.

802.11mode Select one of the following:

802.11g Only - Select if all of your wireless clients are 802.11g.

Mixed 802.11n and 802.11g - Select if you are using both 802.11n and 802.11g wireless clients.

802.11n Only - Select only if all of your wireless clients are 802.11n.

802.11b is not suggested to use unless the user has specific preferences.

Enable Auto Channel Scan: The **Auto Channel Scan** setting can be selected to allow the DXN-W224 to choose the channel with the least amount of interference.

Wireless Channel: Indicates the channel setting for the DXN-W224. By default the channel is set to 6. The Channel can be changed to fit the channel setting for an existing

wireless network or to customize the wireless network. If you enable **Auto Channel Scan**, this option will be greyed out.

Channel Width: default is auto mode (HT20/40). This is used for the scenario when you have both 11n and non-11n devices.

2.4GHz/5GHz Multi-SSID

SSID Service: There four options-"Private", "Home security", "Home hotspot", "future service" for users to select the appropriate settings for specific SSID.

Enable SSID: Check the box to enable the service.

Wireless Network name: The user may provide a SSID name in this option.

Visibility Status: Select the options to allow the SSID is open to wireless clients. Default is "Visible". You may configure to "Invisible" that your SSID will not be broadcasted by DXN-W224.

HT20/40 Coexistence: The default is HT20/40 coexist. Enable this to allow connection for both 11n or non-11n wireless devices.

WMM enable: Check this box to allow the

WPA: Support the security to protect your wireless network from unsecure access. Enter the security settings and pre shared key in this section.

5GHz Multi-SSID

Please reference the 2.4Ghz multi SSID configuration.

COAX Configuration

This section allows the user to configure the COAX network and privacy settings.

Channel: Select the specific channel frequency to use or select "SCAN" to automatically scan for available channel frequency.

Privacy Password: Select to turn the coaxial network security mode on (Enable) or off (Disable). Type in the password to use for the network. Your password must be 12 to 17 numeric characters long, and it cannot contain any letters. The password must be the same for all nodes on the coaxial network to ensure connectivity. Default is blank.

Beacon Power: This provides options to select the different beacon power level from 0 to 15dB.

ADVANCED-MAC Filter

Use MAC (Media Access Control) Filters to allow or deny LAN (Local Area Network) computers by their MAC addresses from accessing the network. You can either manually add a MAC address or select the MAC address from the list of clients that are currently connected to the Broadband Router.

Configure MAC Filtering: Select **Turn MAC Filtering Off**, **Allow MAC addresses listed below**, or **Deny MAC addresses listed below** from the drop-down menu.

MAC Address: Enter the MAC address you would like to filter.

DHCP Client: Select a DHCP client from the drop-down menu and click **<<** to copy that MAC Address.

Clear: Click to remove the MAC address.

ADVANCED-Wi-Fi Protected Setup

Wi-Fi Protected Setup (WPS) System is a simplified method for securing your wireless network during the "Initial setup" as well as the "Add New Device" processes. The Wi-Fi Alliance (WFA) has certified it across different products as well as manufactures. The process is just as easy, as depressing a button for the Push-Button Method or correctly entering the 8-digit code for the Pin-Code Method. The time reduction in setup and ease of use are quite beneficial, while the highest wireless Security setting of WPA2 is automatically used.

ENABLE: Check this box to enable WPS service.

Current PIN: Shows the current value of the router's PIN.

A PIN is a unique number that can be used to add the router to an existing network or to create a new network. The default PIN may be printed on the bottom of the router. For extra security, a new PIN can be generated. You can restore the default PIN at any time. Only the Administrator ("admin" account) can change or reset the PIN.

Generate New PIN: Create a random number that is a valid PIN. This becomes the router's PIN. You can then copy this PIN to the user interface of the registrar.

Reset PIN To Default: Restore the default PIN of the router.

Add Wireless Station: This Wizard helps you add wireless devices to the wireless network.

The wizard will either display the wireless network settings to guide you through manual configuration, prompt you to enter the PIN for the device, or ask you to press the configuration button on the device. If the device supports Wi-Fi Protected

Setup and has a configuration button, you can add it to the network by pressing the configuration button on the device and then the on the router within 60 seconds. The status LED on the router will flash three times if the device has been successfully added to the network.

There are several ways to add a wireless device to your network. A "registrar" controls access to the wireless network. A registrar only allows devices onto the wireless network if you have entered the PIN, or pressed a special Wi-Fi Protected Setup button on the device. The router acts as a registrar for the network, although other devices may act as a registrar as well.

MAINTENACE-ADMIN

This section is to provide the MSO able to configure different access levels for different users. ADMIN can set the password for three different levels.

MAINTENACE- SYSTEM

Save settings to local hard drive: Use this option to save the current router configuration settings to a file on the hard disk of the computer you are using. First, click the **Save** button. A file dialog will appear, allowing you to select a location and file name for the settings.

Local settings from local hard drive: Use this option to load previously saved router configuration settings. First, use the **Browse** option to find a previously saved file of configuration settings. Then, click the **Load** button to transfer those settings to the router.

Restore the (wireless) to factory default settings: This option will restore wireless or all configuration settings back to the settings that were in effect at the time the router was shipped from the factory. Any settings that have not been saved will be lost, including any rules that you have created. If you want to save the current router configuration settings, use the **Save** button above.

Reboot the device: Click to reboot the router.

MAINTENACE-FIRMWARE

You can upgrade the firmware of the access point here. Make sure the firmware you

want to use is on the local hard drive of the computer. Click on **Browse** to locate the firmware file to be used for the update. Please check the D-Link support website for firmware updates at **http://support.dlink.com**. You can download firmware upgrades to your hard drive from this site.

Browse: After you have downloaded the new firmware, click **Browse** to locate the firmware

Upload: After you have downloaded the new firmware, click **Browse** to locate the firmware update on your hard drive. Click **Upload** to complete the firmware upgrade.

Once you have a firmware update on your computer, use this option to browse for the file and then upload the information into the access point.

FIRMWARE

There may be new firmware for your DXN-W224 to improve functionality and performance.
Click here to check for an upgrade on our support site.

After your have download the new firmware file from our support site, click the Browse button below to find the firmware file on your local hard drive. Click the upload button to update the firmware on the DXN-W224.

Do not update firmware through wireless network!!

FIRMWARE AND LANGUAGE PACK INFORMATION

Current Firmware Version : 1.00   Date: 2012/8/22

Check Online Now for Latest Firmware Version: [Check Now]

FIRMWARE UPGRADE

Note: Some firmware upgrades reset the configuration options to the factory defaults. Before performing an upgrade, be sure to save the current configuration from the Tools → System screen.

To upgrade the firmware, your PC must have a wired connection to the router. Enter the name of the firmware upgrade file, and click on the Upload button.

Upload : [_____] [瀏覽...]
          [Upload]

MAINTENCE-TIME

Current Time: Displays the current date and time of the router.

Time Zone: Select your Time Zone from the drop-down menu.

Enable Daylight saving: To select Daylight Saving time manually, select enabled or disabled, and enter a start date and an end date for daylight saving time.

Enable NTP server: NTP is short for Network Time Protocol. A NTP server will sync the time and date with your router. This will only connect to a server on the Internet, not a local server. Check the box to enable this feature.

NTP server used: Enter the IP address of a NTP server or select one from the drop-down menu.

Set the day and time manually: To manually input the time, enter the values in these fields for the Year, Month, Day, Hour, Minute, and Second and then click **Set Time**.

You can also click **Copy Your Computer's Time Settings** to synch the date and time with the computer you are currently on.

MAINTENACE-System check

The **Ping Test** is used to send Ping packets to test if a computer is on the Internet. Enter the IP address that you wish to Ping and click **Ping**.
Enter the IPv6 address that you wish to Ping and click **Ping**.
The results of your ping attempts will be displayed here.

PING TEST

Ping Test sends "ping" packets to test a computer on the Internet.

PING TEST

Host Name or IP Address : [   ] [ping]

IPV6 PING TEST

Host Name or IPv6 Address: [   ] [ping]

PING RESULT

Enter a host name or IP address above and click "Ping"

STATUS- Device info

This page displays the current information for the DXN-W224.

General info: Displays the router's time and firmware version.

LAN Displays the MAC address and the public IP settings.

Displays the MAC address and the private (local) IP settings for the router.

Displays computers and devices that are connected to the router via Ethernet and that are receiving an IP address assigned by the router (DHCP).

STATUS- LOGS

The router automatically logs (records) events of possible interest in it's internal memory. If there isn't enough internal memory for all events, logs of older events are deleted but logs of the latest events are retained. The Logs option allows you to view the router logs. You can define what types of events you want to view and the level of the events to view. This router also has external Syslog Server support so you can send the log files to a computer on your network that is running a Syslog utility.

LOGS

Use this option to view the device logs. You can define what types of events you want to view and the event levels to view.

LOG OPTIONS

Log Type : ☐ System Activity
　　　　　　 ☑ Debug Information
　　　　　　 ☐ Attacks
　　　　　　 ☐ Dropped Packets
　　　　　　 ☐ Notice

[Apply Log Settings Now]

LOG DETAILS

[First Page]　[Last Page]　[Previous]　[Next]

[Refresh]　[Clear]　[Save Log]

1/1

Time	Message
Aug 23 19:07:13	ath3: WPA rekeying GTK
Aug 23 19:07:11	ath2: WPA rekeying GTK
Aug 23 19:07:10	ath1: WPA rekeying GTK
Aug 23 19:07:09	ath0: WPA rekeying GTK

Log Type: You can select the types of messages that you want to display from the log. System Activity, Debug Information, Attacks, Dropped Packets, and Notice messages can be selected. Click **Apply Log Settings Now** to activate your settings.

Refresh: Updates the log details on the screen so it displays any recent activity.

Clear: Clears all of the log contents.

Save Log: This option will send a copy of the router log to your email address configured in the **Tools** > **Email Settings** screen.

This option will save the router log to a file on your computer.

STATUS-Statistics

The screen below displays the **Traffic Statistics**. Here you can view the amount of packets that pass through the DXN-W224 on both the WAN, LAN ports.

STATUS-Wireless

The wireless client table displays a list of current connected wireless clients and the MAC address of the clients.

WIRELESS

All of your wireless connection details are displayed on this page.

2.4GHZ MULTI-SSID

802.11 Mode : Mixed 802.11n and 802.11g
Channel Width : 20/40MHz
Channel : auto
SSID List :

Wi-Fi Network Name (SSID)	Status	MAC Address	Security Mode	Number of clients connected
HOME-6789-2.4G	Enable	00:18:22:32:33:51	wpa2auto_psk	0
HOME-SECURITY-2.4G	Enable	02:18:22:32:33:51	wpa2auto_psk	0
HOME-HOTSPOT-2.4G	Enable	12:18:22:32:33:51	wpa2auto_psk	0
FUTURE-SERVICES-2.4G	Enable	22:18:22:32:33:51	wpa2auto_psk	0

5GHZ MULTI-SSID

802.11 Mode : Mixed 802.11n and 802.11a
Channel Width : 20/40MHz
Channel : auto
SSID List :

Wi-Fi Network Name (SSID)	Status	MAC Address	Security Mode	Number of clients connected
HOME-678B-5G	Enable	00:00:00:00:00:00	wpa2auto_psk	0
HOME-SECURITY-5G	Enable	00:00:00:00:00:00	wpa2auto_psk	0
HOME-HOTSPOT-5G	Enable	00:00:00:00:00:00	wpa2auto_psk	0
FUTURE-SERVICES-5G	Enable	00:00:00:00:00:00	wpa2auto_psk	0

STATUS- IPv6

The IPv6 page displays a summary of the Router's IPv6 settings and lists the IPv6 address and host name of any IPv6 clients.

IPv6 Network Information

All of your IPv6 Internet and network connection details are displayed on this page.

IPv6 Connection Information

IPv6 Connection Type : Local Connectivity Only
LAN IPv6 Link-Local Address : fe80::218:22ff:fe32:3351/64

Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

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

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

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

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
Operations in the 5.15-5.25GHz band are restricted to indoor usage only.

IMPORTANT NOTE:
FCC Radiation Exposure Statement:
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.