USER MANUAL

GPL-1200-KIT

G.hn Powerline Adapter

Version A1.0, July 11, 2019

261072-030

Preface

This manual provides information related to the installation and operation of this device. The individual reading this manual is presumed to have a basic understanding of telecommunications terminology and concepts.

If you find the product to be inoperable or malfunctioning, please contact technical support for immediate service by email at support@nexuslinkusa.com

For product update, new product release, manual revision, or software upgrades, please visit our website at https://www.nexuslinkusa.com

Important Safety Instructions

With reference to unpacking, installation, use, and maintenance of your electronic device, the following basic guidelines are recommended:

- ☐ Do not use or install this product near water, to avoid fire or shock hazard. For example, near a bathtub, kitchen sink or laundry tub, or near a swimming pool. Also, do not expose the equipment to rain or damp areas (e.g. a wet basement).
- ☐ To safeguard the equipment against overheating, make sure that all openings in the unit that offer exposure to air are not blocked.
- ☐ Avoid using a telephone (other than a cordless type) during an electrical storm. There may be a remote risk of electric shock from lightening. Also, do not use the telephone to report a gas leak in the vicinity of the leak.

WARNING

Disconnect the PLC from the power source before servicing.

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http://www.gnu.org/licenses/

NOTE: This document is subject to change without notice.

Protect Our Environment

This symbol indicates that when the equipment has reached the end of its useful life, it must be taken to a recycling centre and processed separate from domestic waste.

The cardboard box, the plastic contained in the packaging, and the parts that make up this PLC can be recycled in accordance with regionally established regulations. Never dispose of this electronic equipment along with your household waste; you may be subject to penalties or sanctions under the law. Instead, please be responsible and ask for disposal instructions from your local government.

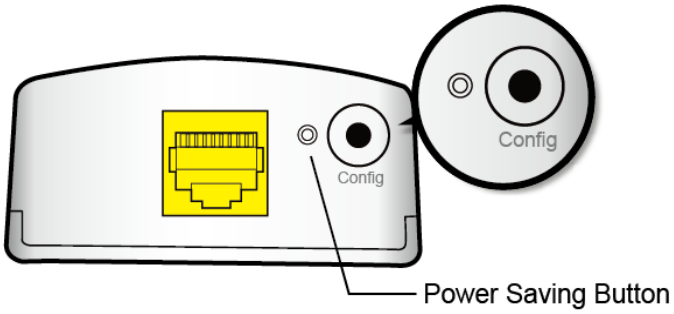
Table of Contents

Chapter 1 Product Information

1.1 Front Panel and LED indicators

LED	COLOR	MODE	Description
Coverage	Green	On	The current connection (line rate) is greater than 40 Mbps
	Orange	On	The current connection (line rate) is greater than 20 Mbps and less than 40 Mbps
	Red	On	The current connection (line rate) is between 1 and 20 Mbps per second)
		Off	No PLC connection exists
		Blink	Adapter in power saving mode (blinks twice every 5 seconds)
Ethernet	Green	On	LAN connection established
		Off	LAN connection is not established
		Blink	Data transmitting/receiving
Security	Green	On	Node is secure (it has either received or generated network keys)
		Off	Node is not secure, it has neither received nor generated network key parameters (domain name and encryption key)
		Blink	Node is in configuration mode (able to exchange network keys)

1.2 Bottom Panel



Item Name	Description
Config	• Press more than 2 seconds ("Security" LED starts slow blinking) and released: the "One Button Security Setup" (OBUS) procedure is started and configuration period is open. • Press more than 5 seconds ("Security" LED starts quick blinking) and released: security settings are set to default values. • Press more than 10 seconds ("Security" LED switches off) and released: a factory reset is performed.
Power Saving Button	• Press around 2 seconds (using a paper clip) to force the system into power saving mode. • While the system in power saving mode, press the button again, the system to restore to operational mode.

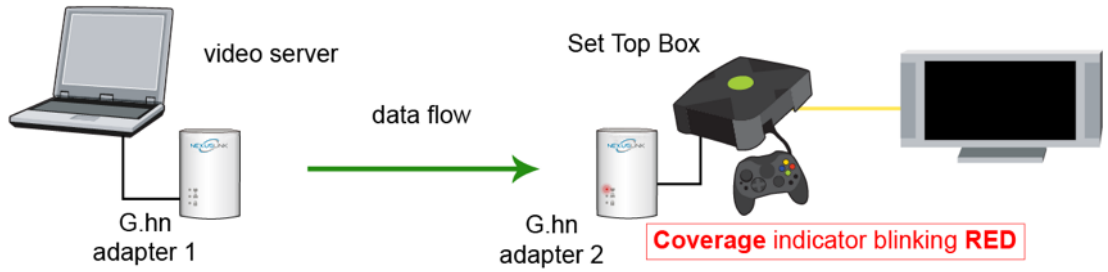
1.3 How to understand the COVERAGE LED colors

The COVERAGE LED displays quality of the network and provides important information that will provide solutions to common questions, such as why a High Definition (HD) movie is not showing or shows with pixels. The COVERAGE LED indicator will vary its color depending on the estimated speed of the Powerline connection. The speed is measured in Megabits Per Second (Mbps).

Color	Information
RED	The current connection has standard quality, normal Internet activities ex. 20Mbps are possible but the Powerline is unable to transmit either a Standard Movie or High Definition (HD) Movie.
ORANGE	The current connection has good quality and Internet activities ex. greater than 20Mbps and less than 40Mbps to transmit Standard Movie and HD Movie.
GREEN	The current connection has excellent quality and Internet activities ex. greater than 40Mbps to transmit multiple Standard Movies and HD Movies.

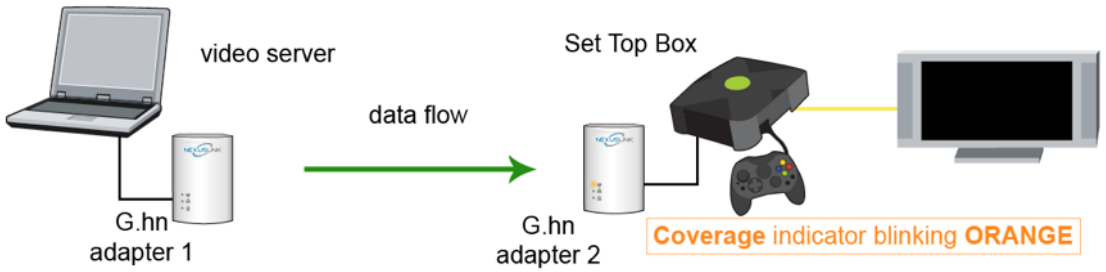
1.4 Point-to-Point Network

- **CASE 1**: Estimated throughput is less than 20 Mbps. The COVERAGE LED will be RED as shown in the following figure:



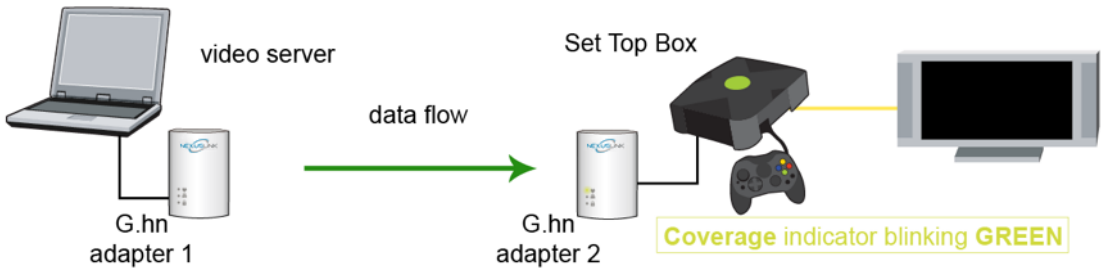
Estimated throughput < 20 Mbps

- **CASE 2**: Estimated throughput is greater than 20 Mbps but less than 40 Mbps. The COVERAGE LED will be ORANGE as shown in the following figure:



20 Mbps < Estimated throughput < 40 Mbps

- **CASE 3**: Estimated throughput is greater than 40 Mbps. The COVERAGE LED will be **GREEN** as shown here:



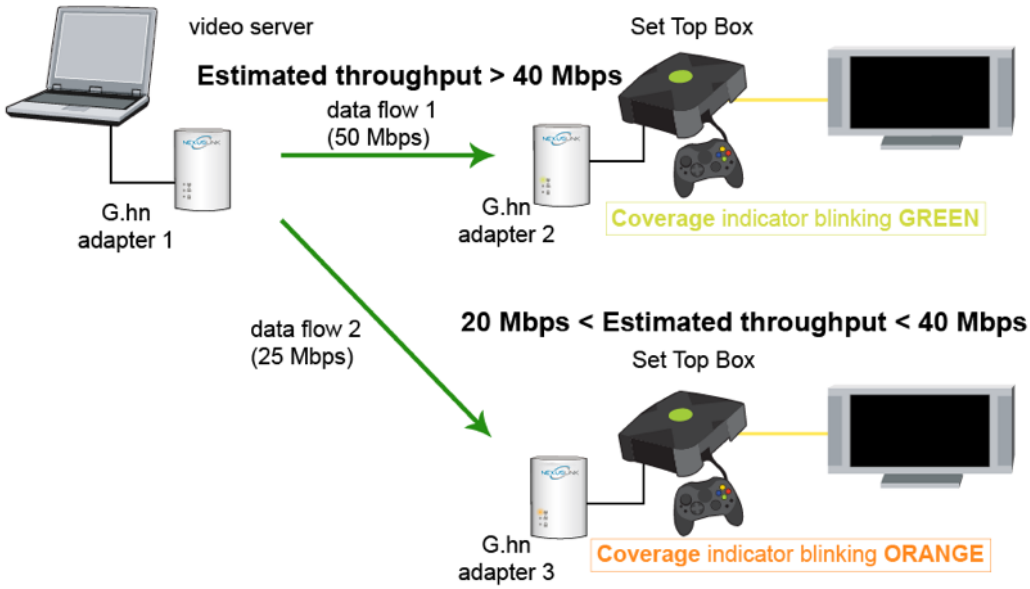
Estimated throughput > 40 Mbps

1.5 Point to Multipoint Network

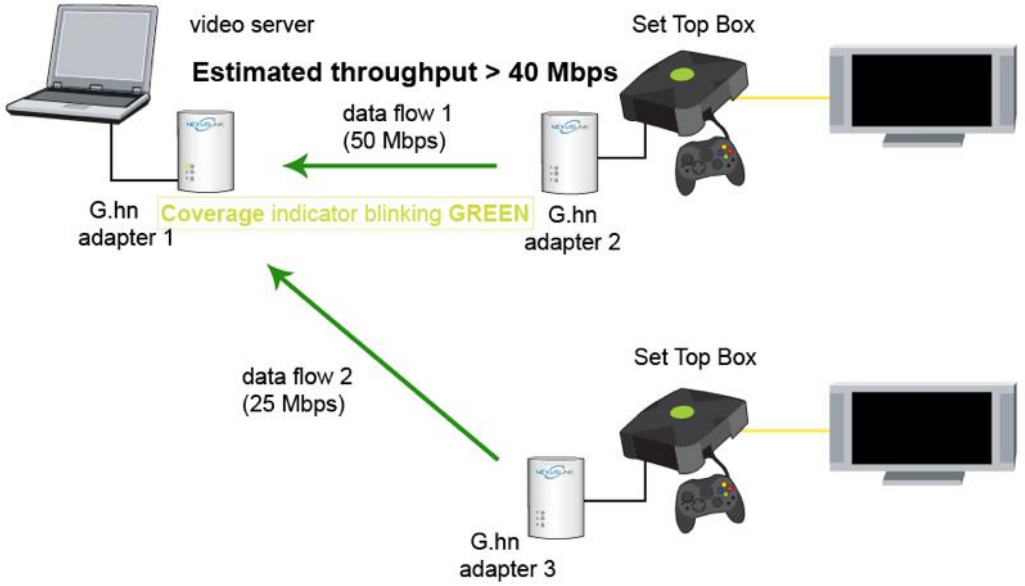
In the case where the PLC network is composed of three or more adapters, similar situations could arise as

with a point-to-point network.

- **CASE 1:** The COVERAGE LED in G.hn adapter 2 and G.hn adapter 3 will show the estimated level of the PLC link receiving from G.hn adapter 1.



- **CASE 2:** The COVERAGE LED in G.hn adapter 1 will show the estimated level of the PLC link from which it is receiving the most amount of traffic at any given time. For example, if G.hn adapter 1 is receiving traffic at 50Mbps from G.hn adapter 2 and is receiving 25Mbps from G.hn adapter 3, the COVERAGE LED will show the level with reference to the G.hn adapter 2 link, as shown in the following figure.



Chapter 2 Log In Procedure

2.1 Configure STATIC IP MODE

In static IP mode, you assign IP settings to your PC manually.

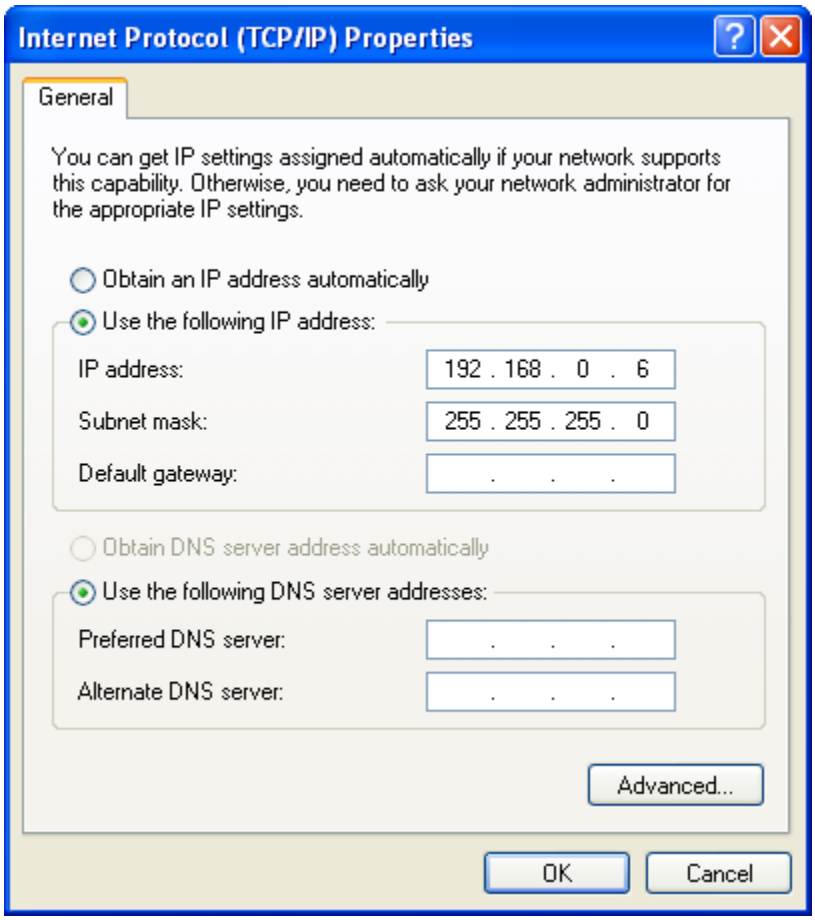
Follow these steps to configure your PC IP address to use subnet 192.168.0.x.

NOTE:	The following procedure assumes you are running Windows XP. However, the general steps involved are similar for most operating systems (OS). Check your OS support documentation for further details.

STEP 1: From the Network Connections window, open Local Area Connection (*You may also access this screen by double-clicking the Local Area Connection icon on your taskbar*). Click the **Properties** button.

STEP 2: Select Internet Protocol (TCP/IP) **and click the** Properties button.

STEP 3: Change the IP address to the domain of 192.168.0.x (6<x<255) with subnet mask of 255.255.255.0. The screen should now display as below.



STEP 4: Click **OK** to submit these settings.

2.2 Logging In

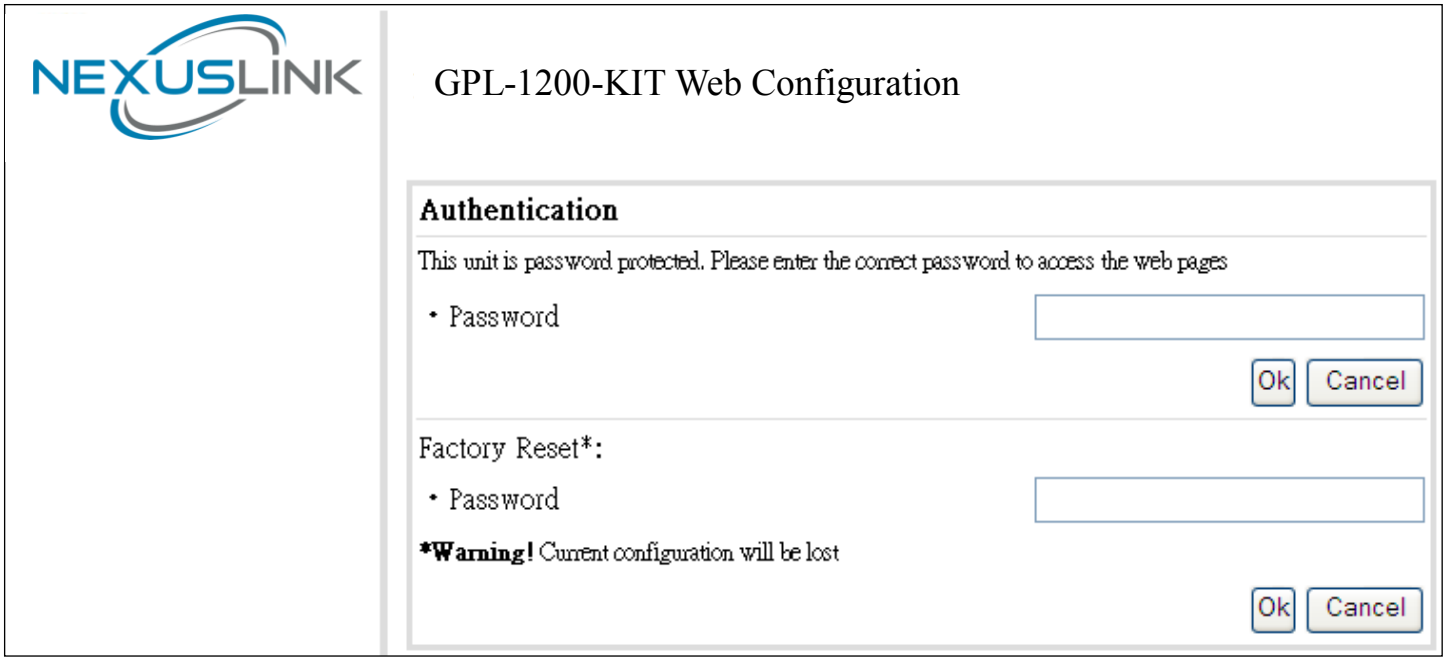
Perform the following steps to login to the web user interface.

STEP 1: Start the Internet browser and enter the default IP address for the device in the Web address field. For example, if the default IP address is 192.168.0.5, type http://192.168.0.5

STEP 2: A dialog box will appear, such as the one below. Input the default Authentication Password.

Authentication Password: **admin**

-

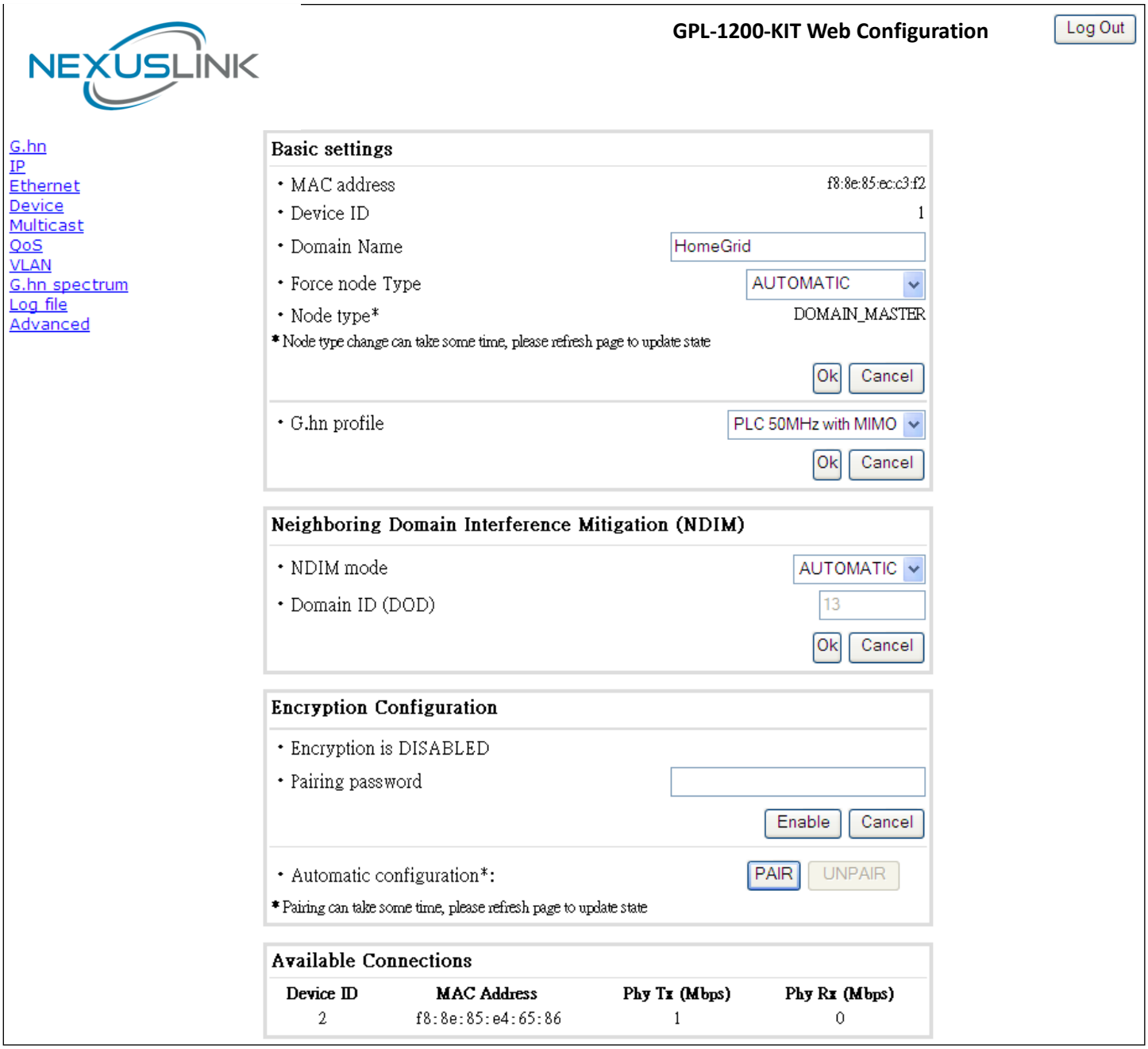


Click **OK** to continue.

Note:

The Factory Reset password is: **betera**

Chapter 3 G.hn Interface



3.1 Basic Configuration

- **Domain Name** string of all nodes in the network.
- **Domain Master Node** shows MAC address of domain master node of the network, The G.hn Media Access Control is based on a time division multiple access (TDMA) architecture, in which a "domain master" schedules Transmission Opportunities (TXOPs) that can be used by one or more devices in the "domain".
- **G.hn profile** of all nodes in the network: selecting which G.hn profile must be applied to the network (PLC 50MHz, PLC 50MHz with MIMO, PLC 100MHz, COAX 100MHz and PHONE 100MHz).

3.2 NDIM Configuration

- **NDIM type** set to Automatic for enabling automatic DOD selection functionality and set to Manual for manual configuration of DOD.
- **Domain ID (DOD)** manually set the DOD number from 1 to 15 to use a different preamble seed than the default 0.

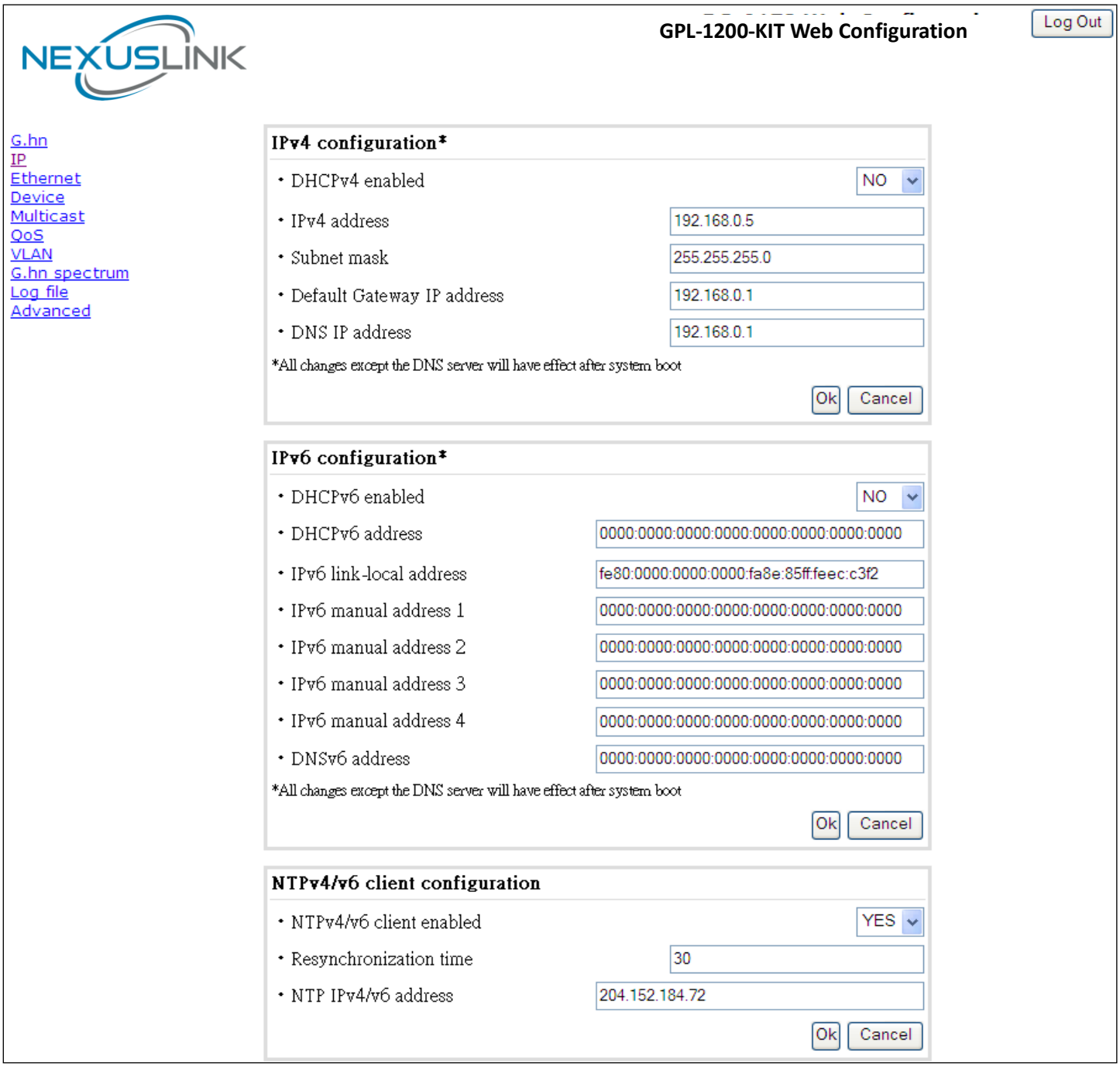
3.3 Encryption Configuration via WEB UI

- **Node security configuration**: Domain Name and Encryption Configuration (Encryption Password String) of selected node can be read and updated. There is also a label to indicate if the security keys of the pairing process have been successfully received. Finally the pairing/unpairing order can be sent to the node. It is the same behavior as the "Config" button.

Available Connections

- In this tab table, all the available **G.hn connections** are presented. Remote node DID and MAC address, transmission and reception physical speeds.

Chapter 4 IP Interface



4.1 IP config

In the **IP configuration** tab of one G.hn node, the IPv4 and IPv6 settings can be read and changed.

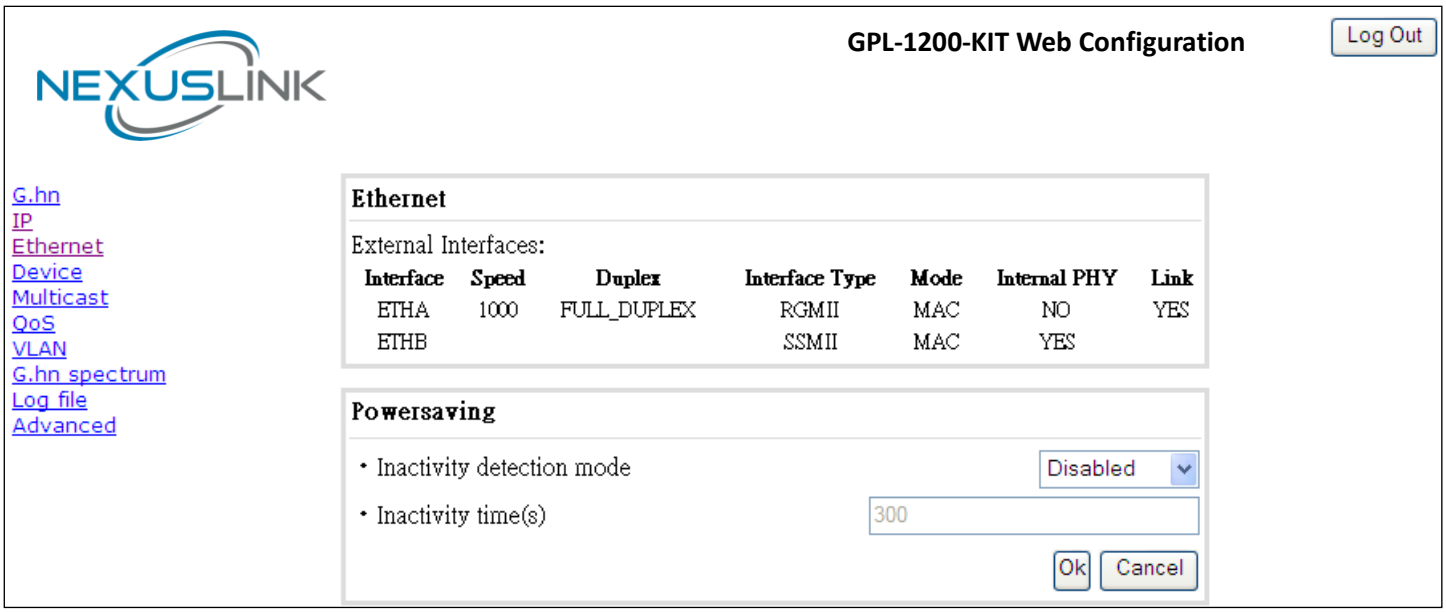
IPv4 subsection:

- **Type of IPv4 Configuration**: set the G.hn node IPv4 configuration to be either **DHCP** or **Fixed**.
- **DHCPv4 enabled**: in the case of choosing "Fixed" IP configuration in the previous option, the IPv4 Address, Subnet Mask, Default Gateway and DNS IPv4 Address should be configured; fill these fields in. In the case of choosing DHCP they will be filled automatically when configuration is received from the DHCP server.

IPv6 subsection:

- **DCHPv6 enabled**: to enable the IPv6 DHCP configuration or choose not to.
- **DHCPv6 Address**: to read the node's DHCPv6 address in case the DHCPv6 is enabled.
- **IPv6 Link Local Address**: to read the node's Link Local address.
- **Manual IPv6 Manual Address**: to configure up to four IPv6 Manual Addresses for the node.
- **DNSv6 Address**: to configure the DNS address.

Chapter 5 Ethernet Interface

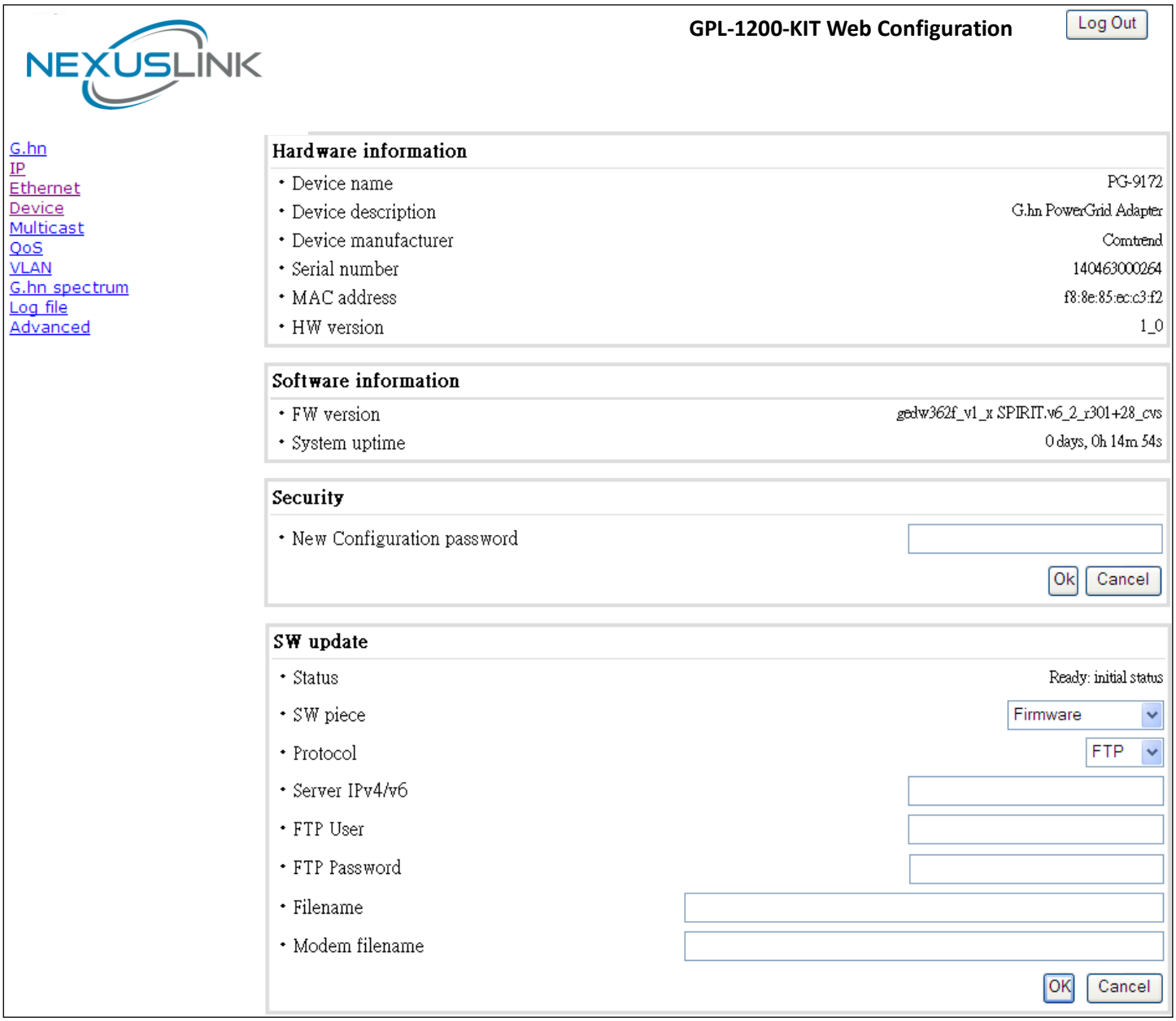


The Ethernet table shows the status & Info of the Ethernet interface; including Interface, Speed, Duplex, Interface Type, Mode, Internal PHY & Link.

Powersaving

Ethernet powersaving can be disabled, enabled by Ethernet link or enabled by Ethernet activity; idle timer can be configured as well.

Chapter 6 Device Interface



6.1 HW information

In this tab, basic information such as MAC Address, Serial Number, HW Product and Revision, ASIC and Chipset of the selected node is shown. Other information about the Ethernet port is also shown.

6.2 SW information

Shows the FW version and system uptime.

Configuration password

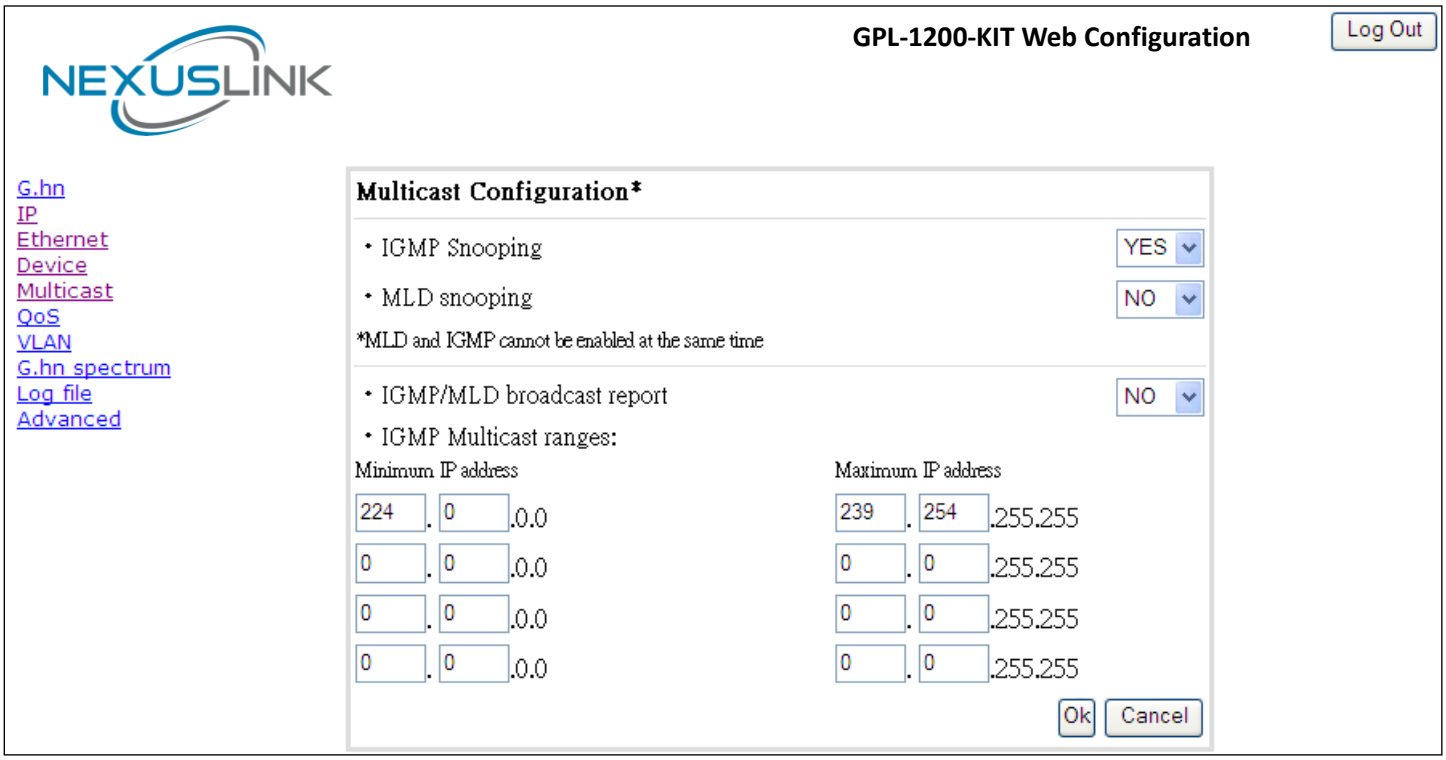
The nodes in the network: to change the configuration password string from the default ("paterna") to another; decided by the user.

Firmware update:

Current loaded firmware and API version are shown. Any flash section can be upgraded; the first flash section should be selected and after clicking on the "**OK**" button the corresponding file should be chosen. Usually, a reboot should be performed afterwards to make sure the changes are effective.

The protocol is by FTP client or TFTP client. L2 is proprietary and is reserved for future use.

Chapter 7 Multicast Interface



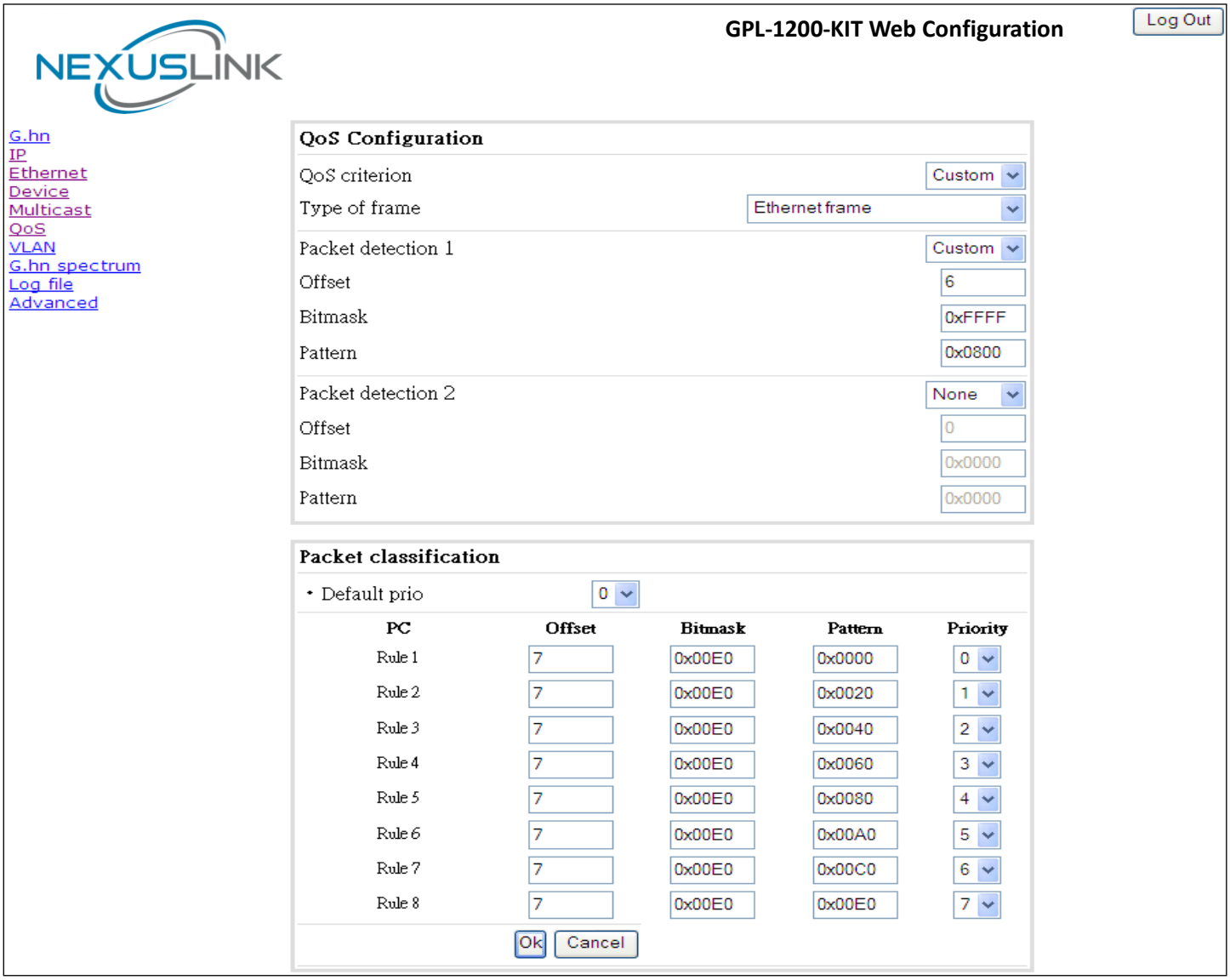
7.1 MCAST Configuration

In the **MCAST Configuration** tab of "My Network", **IGMP snooping and MLD** features can be enabled or disabled. Also, IGMP multicast IP addresses ranges which the G.hn PLC network will sniff; can be configured.

- **Multicast Snooping Type**: choose from IGMP snooping, MLD snooping or None.
- **IGMP/MLD broadcast report (allowed)**: set to NO for enabling reports dropping until the video source is detected, this is a recommended setting when IGMP/MLD is enabled. Set to YES for broadcasting reports until the video source is detected; this implies the multicast video stream is sent as broadcast and it is the recommended state when IGMP/MLD is disabled.

IGMP Multicast ranges configuration: 4 multicast IP address ranges can be configured defining the minimum and maximum IP addresses of each range. Only multicast traffic within these ranges will be processed.

Chapter 8 QoS menu



8.1 QoS Configuration

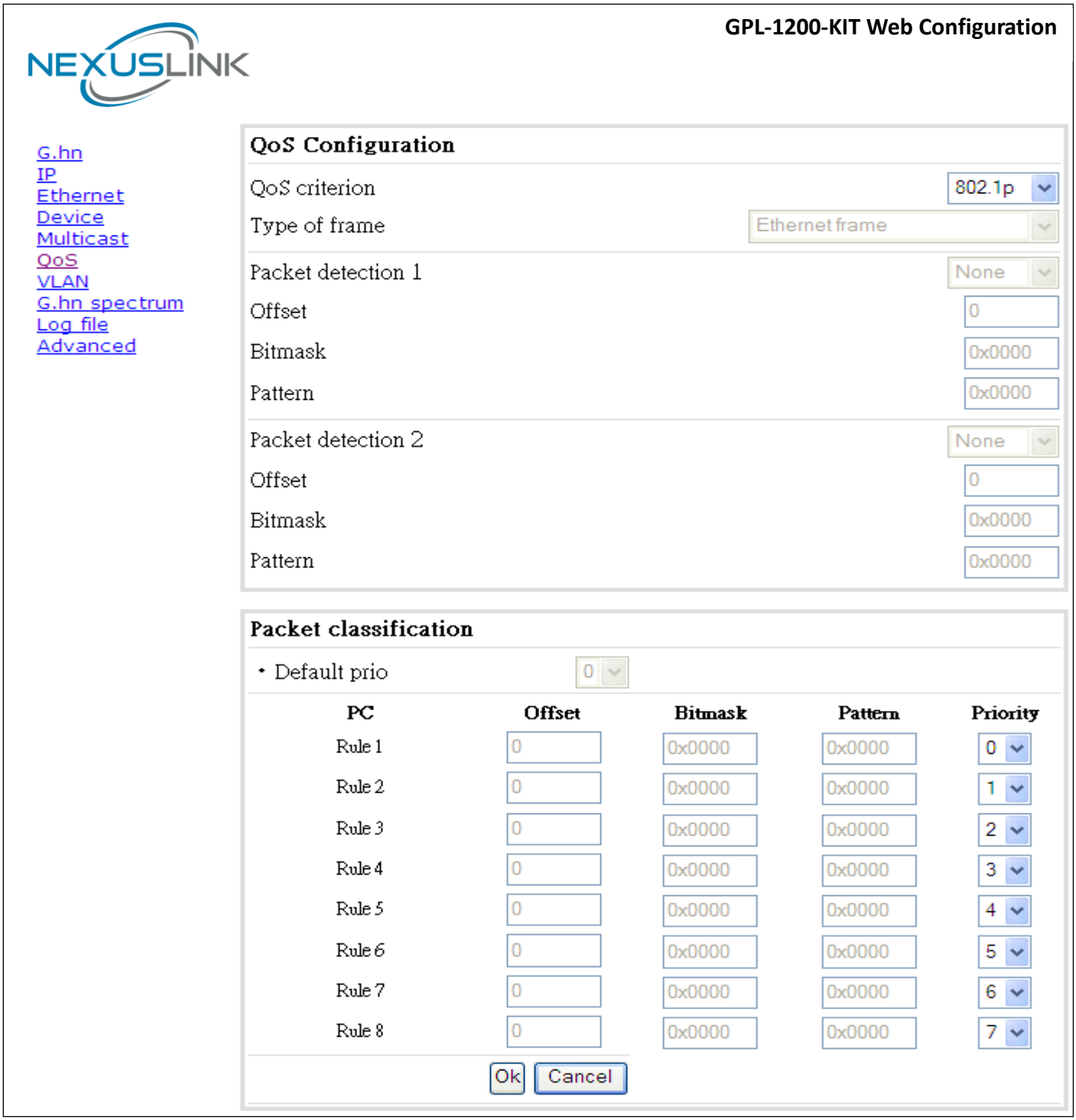
In the **QoS** configuration tab, the packet classifier can be managed to define a QoS rule for incoming Ethernet traffic, and assign a priority to be used in the G.hn network. Press the "**Update**" button for loading the newly configured settings:

- **QoS CRITERION**: a general criterion can be chosen among "None" (no QoS), "Custom" and "802.1p".
- **Type of Frame**: with this parameter the type of Ethernet traffic being transmitted by the G.hn network should be selected. Based on this parameter, the internal offsets in the system are adjusted. In the QoS tab, Ethernet frame offsets should be set **counting number** as they appear in the sniffer SW (for instance, the same field will be in a different position if normal Ethernet frames or 802.1Q tagged frames exist).
- **Packet detection 1**: first packet detection rule can be configured (offset, bitmask and pattern). Packets which accomplish it will be sent to the classification module.

- **Packet detection 2**: if second packet detection is also enabled, both, first and second detection criteria must be accomplished to pass packets to the classification module.

- **Packet classification**: up to 8 classification rules can be defined in this section for packets which have previously been correctly detected. For 802.1p only priorities can be managed, offset, bitmask and pattern are predefined to sniff the PCP field.
- **Default priority**: select default priority; which will be applied to non classified incoming packets. Priority 7 is the highest. Priority 0 is the lowest.

Example 1

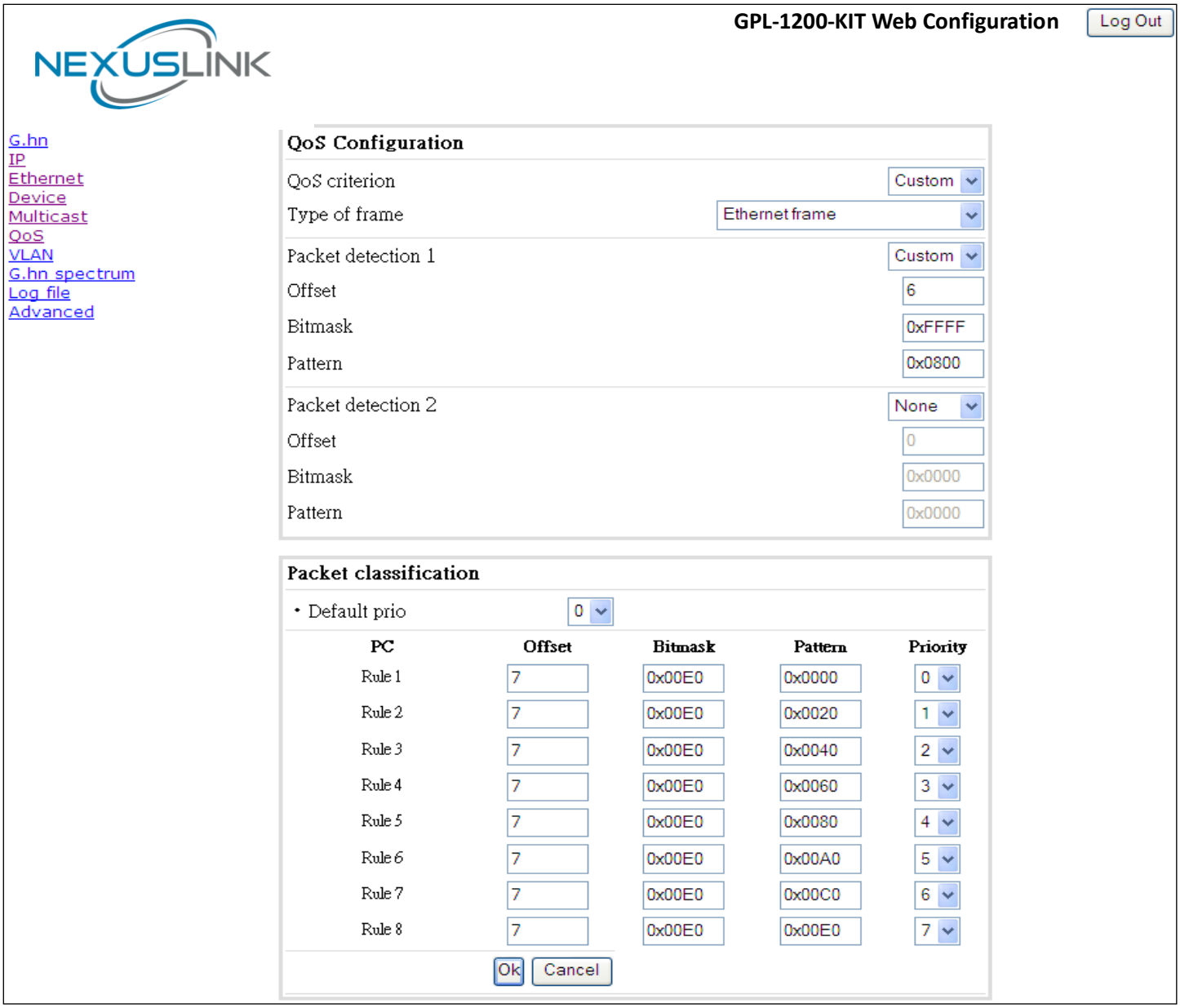


If QoS criterion: 802.1p, all other options are grayed out, and follow the QoS rules below.
According to G.9960 specs, the priority mapping recommended by [IEEE 802.1D] subclause 7.7.3 is presented in Table III.1. for four priority queues.

PCP	Priority	Acronym	Traffic Types
1	0 (Third)	BK	Background
0	1 (lowest)	BE	Best Effort
2	2 (lowest)	EE	Excellent Effort
3	3 (Third)	CA	Critical Applications
4	4 (second)	VI	Video, < 100 ms latency and jitter
5	5 (second)	VO	Voice, < 10 ms latency and jitter
6	6 (highest)	IC	Internetwork Control
7	7 (highest)	NC	Network Control

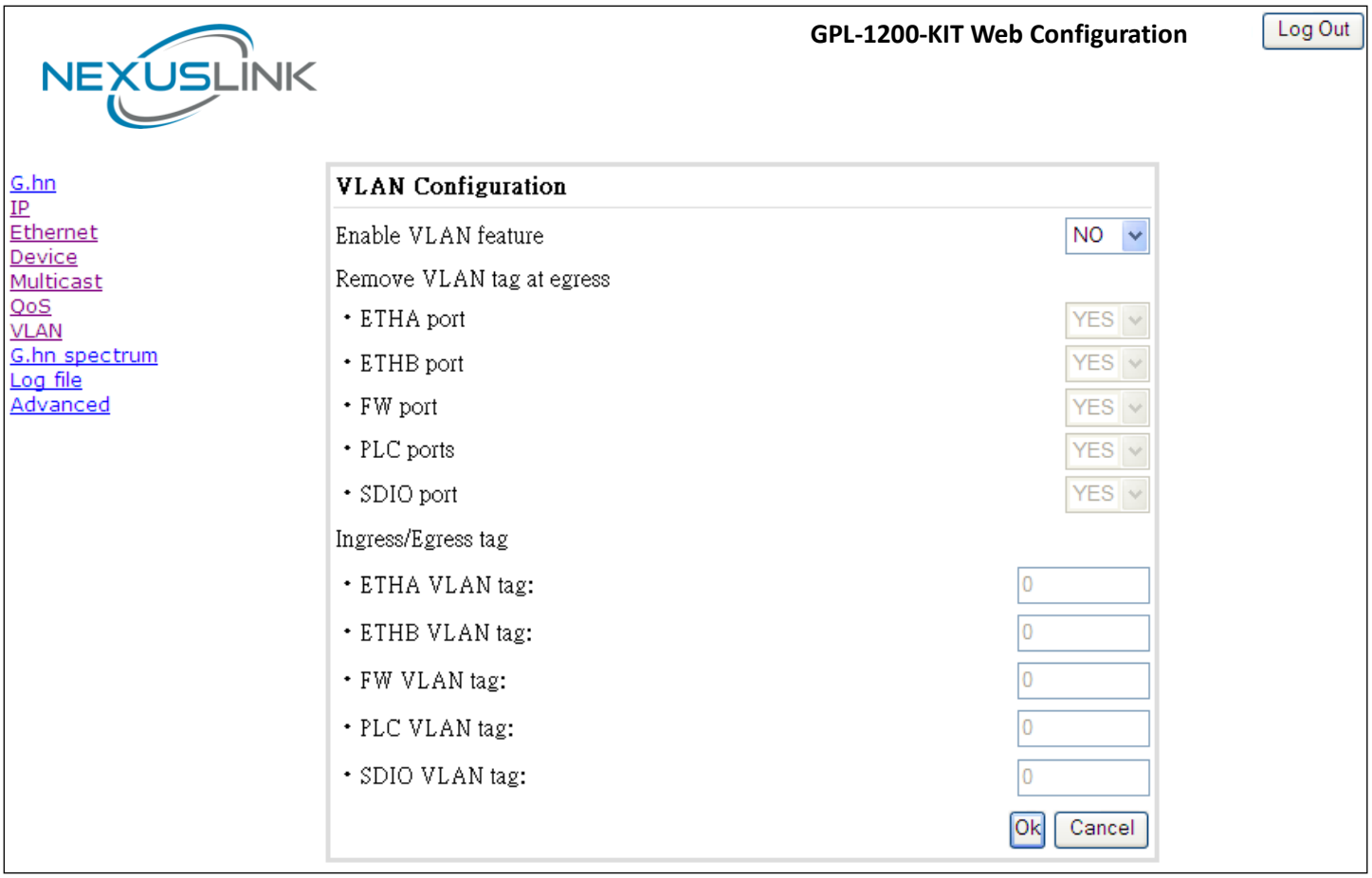
In summary, the sequence of priority queue, (7,6) > (5,4) > (3,0) > (2,1)

Note: If the user selects "Custom" as the QoS criterion, there will be an inaccuracy after the user clicks the **OK** button at the bottom of the screen (i.e the Offset value will increase by two (from 7-9 in the rule 1-8 boxes).



In this case you can reset the factory defaults in the Advanced menu to recall Factory Resets if necessary. If you want to correct this inaccuracy, manually change the values in the Offset boxes to the number 5. Upon clicking the OK button the Offset values will all display 7 respectively.

Chapter 9 VLAN Interface



9.1 VLAN Configuration

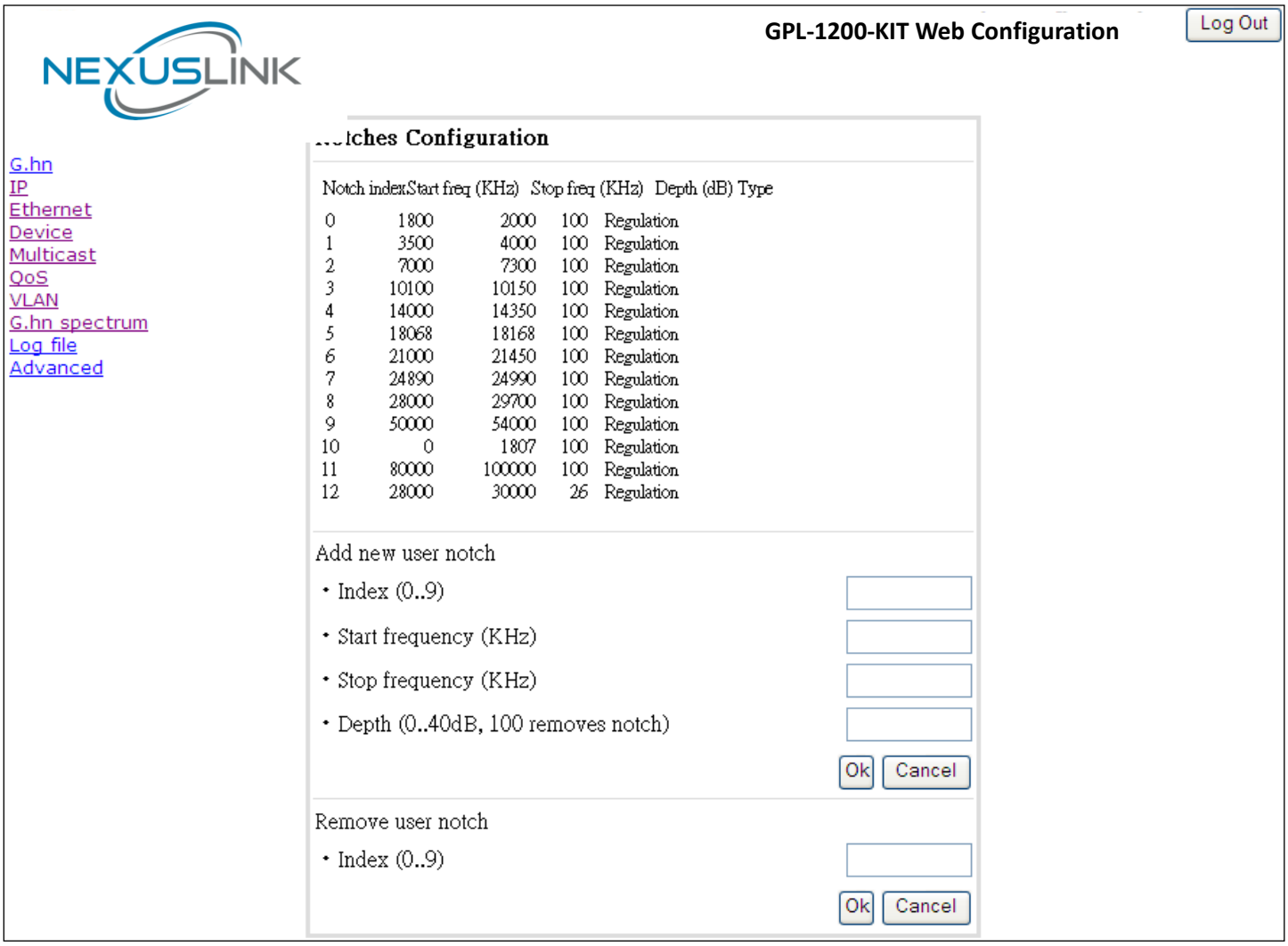
In the **VLAN Configuration** tab of one G.hn node, a VLAN tag can be added or removed per interface. Also, removing a tag at egress per interface can be also enabled or disabled:

- **VLAN tag configuration: adding/removing tag**. A tag value (from 1 to 4095) per interface can be added in this section. Set value to 0 for no tagging.

- **VLAN tag configuration: trunk ports**. Removing all tags at egress of a port can be configured by setting the parameter to NO or default YES keeps tags but removes the one configured in the previous section (if any).

- **Disable VLAN feature and all settings back to defaults**: Click to disable completely the VLAN functionality, removing all tags and trunk ports.

Chapter 10 G.hn spectrum Interface



10.1 Notches

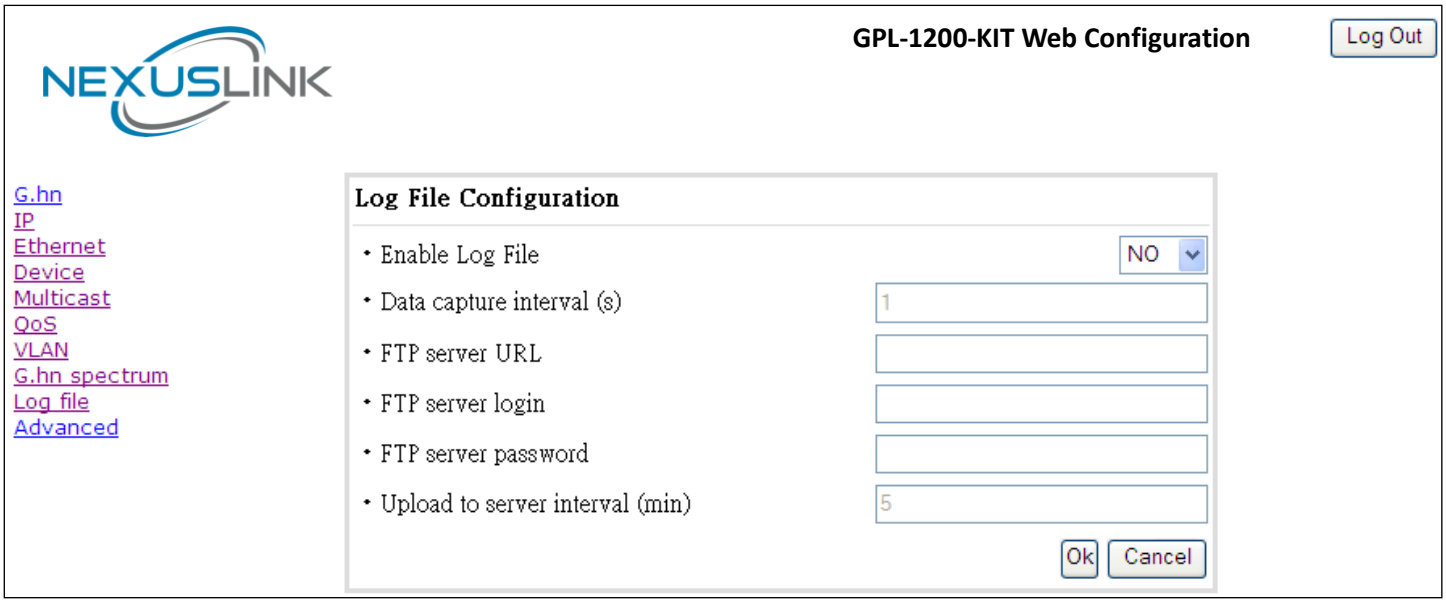
In this tab a table with all configured **Notches** of selected node will be shown. The table is composed of next columns for every notch: Notch Number, Type of notch, Start Frequency (KHz), Stop Frequency (KHz), Depth (in dB) and Enabled. The "**Refresh**" button will update the table.

The first 22 notches (Regulation) are Read Only, **RO**, in the system and they can be neither removed nor modified. The next 40 notches (Vendor) are defined by the vendor using SDK and they are also RO. The last 10 notches (User) are R/W and they can be added/removed by user using this tool.

To add new notches the user should fill the "**Add a new User Notch**" fields, setting Start and Stop frequencies in KHz and depth in dB of notch and then press the "**Add**" button. They will be added in first User free position from number 1 to 10.

To remove a User Notch, the "**Remove a User Notch**" section should be used, setting notch number to be removed from 1 to 10 and pressing the "**Remove**" button.

Chapter 11 Log file Interface

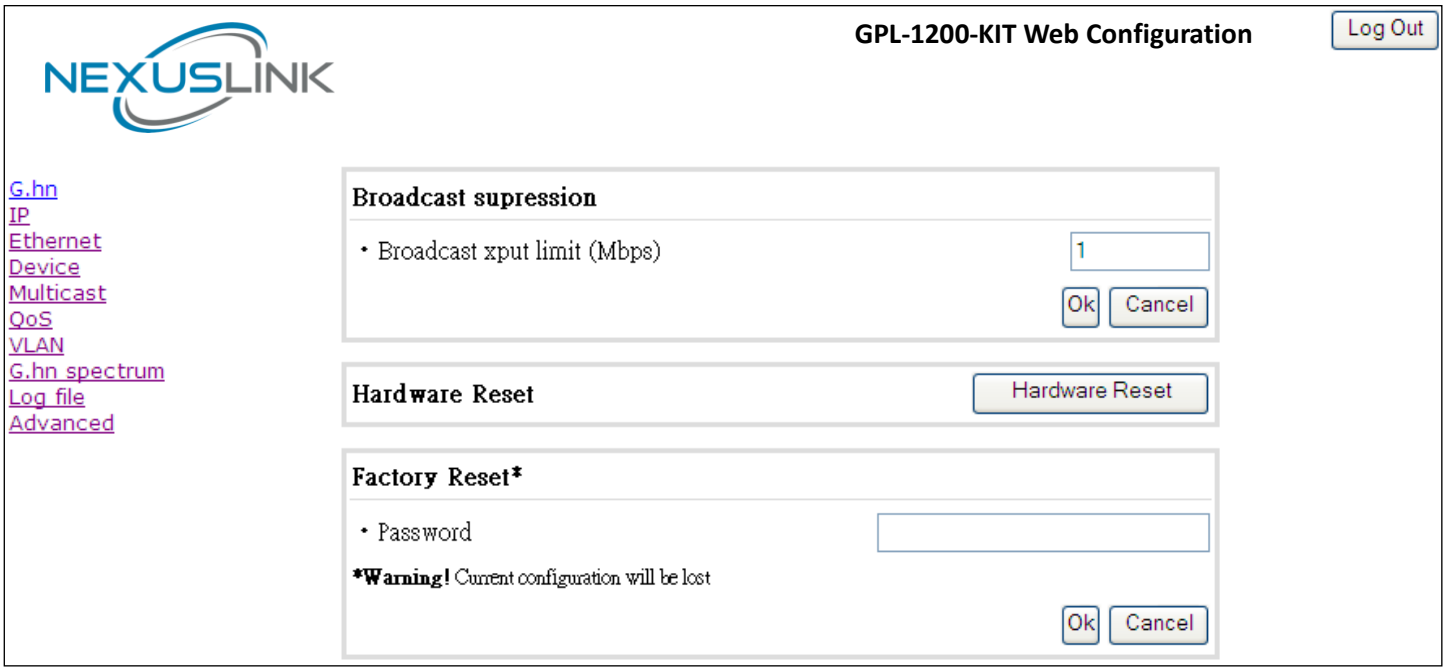


11.1 Log File

In the **Log File** configuration tab the following settings can be read, and changed by clicking on the corresponding "**Update**" button for the selected node:

- **Enable Log File** set to YES for enabling Log File functionality in the node and set to NO for disabling it.
- **Data Capture Interval** sets the interval of time in seconds to capture data.
- **FTP Server URL** configures the url for the remote FTP server where the files will be uploaded.
- **FTP Server Login** configures the user for the FTP server.
- **FTP Server Password** configures the password for the FTP server.
- **Upload to Server Interval** sets the interval of time in minutes to send the captured file to the remote server.

Chapter 12 Advanced Interface



12.1 Traffic filtering

In this tab the broadcast suppression feature can be managed. Broadcast traffic higher than the selected value will be dropped. To disable, set the value to 0.

Reboot: click on this button to perform a reset in the node.

Factory reset: click on this button to order a factory reset of the node.

Chapter 13 G.hn Profiles

- 50MHz: Using 50Mhz spectrum but in SISO setting
- 1000MHz: Using the whole 100MHz spectrum but using SISO
- 100MHz MIMO: Using MIMO at 100Mhz not using the boost option
- 50MHz MIMO boost: Power has been increased to overcome some line noise. Because of the increased power the throughput is better as line attenuation increases (compared to non-boost profile).
- 50MHz MIMO: Standard power default setting. The throughput is inversely proportionate to the attenuation.
- 100MHz Boost: Power has been increased but only using SISO setting.
- 50MHz vs 100Mhz Boost Profile: The 50MHz boost is more robust as you increase attenuation. Example: In a 40db attenuation point of the line with 50Mhz MIMO boost you will have about 2.2x more throughput compared to a 50MHz MIMO line. In a 100MHz boost, you will probably get about

1.8x more throughput compared to a 100MHz SISO line. Please note that without the boost MIMO and SISO would have the same throughput.

Note:

SISO: Single In Single Out. Using only Phase and Neutral. It is only used when the home does not have a ground or unreliable ground line.

MIMO: Multiple In Multiple Out. Using Phase and Neutral and Ground: Ideal for most cases as you have ground to combat line noise mostly present in phase and Neutral lines.