

PowerGrid 9020 User Manual

Version A2.0, November 22, 2011



Introduction

This user manual provides practical information for the installation, operation and application of the device. It is suitable for those with little or no networking experience, although some advanced topics are also covered.

A glossary of acronyms is included in [Appendix A](#) for reference.

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 router 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, ask for disposal instructions from your municipal government.

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Chapter 1 - Introduction

This user manual provides details concerning the installation, configuration and application of COMTREND Corporation's PowerGrid 9020 Powerline adapter.

The PowerGrid 9020 extends Ethernet (10/100M) networks over internal power lines. It incorporates a power socket with AC filter, which allows for Powerline networking without depriving the user of a single power outlet.

The front panel of the PowerGrid 9020 has one button and three LEDs that allow the user to configure a secure network without the use of a computer. The Status LED shows the amount of bandwidth (data transmission) available to applications.

A master PG9020 device cannot command more than 15 slave PG9020 connections in a network; therefore, 16 units of PG9020 is the maximum quantity in a network.

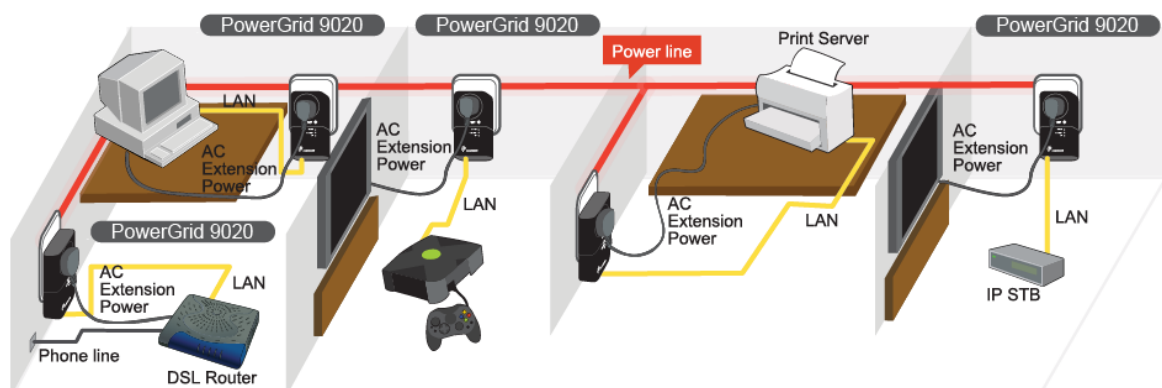
If several IHAV networks are coexisting, there is a network isolation protocol (Network ID) that ensures that no data from one network is received by another network. In addition to the data isolation protocol, encryption can be applied to protect data between networks.

SPECIAL FEATURES

- **One Button Security Setup** - Automatic generation of an Encryption Key and Network Identifier by pressing a single button!
- **Data Transmission Indicator** – The tri-color Status LED shows the amount of bandwidth (data transmission) available to applications.
- **Power Socket with AC Filter** - Plug the PowerGrid 9020 into a power outlet without losing use of the outlet for other applications.

APPLICATIONS

The figure below shows example applications of Comtrend PowerGrid products.



NOTE: PowerGrid 9020 units are fully compatible with all current and previous models as well as any UPA-compliant (Universal Powerline Association) device from 3rd party vendors

Chapter 2 - Basics

2.1 Visual Overview

These figures show the physical layout of the PowerGrid 9020.



FIGURE 1 – FRONT VIEW

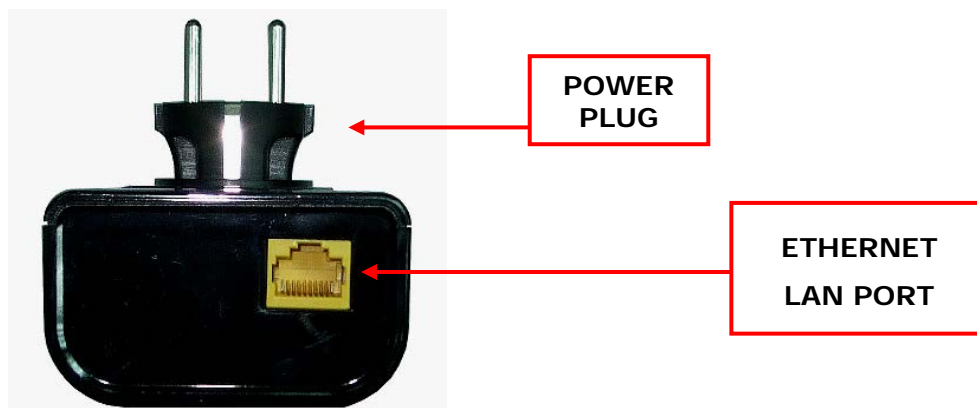


FIGURE 2 – BOTTOM VIEW

2.2 Front Panel

These two tables provide descriptions of the front panel interface.

BUTTON	FUNCTION
CONFIG/RESET (Security Setup / Factory Reset)	Press 1 ~ 10 seconds for One Button Security Setup . Press 10 seconds (or more) to perform a Factory Reset .

LED	COLOR	MODE	FUNCTION
STATUS [☆]	Red	On	Connection speed is less than (<) 4 Mbps. (or no PLC connection exists)
		Blink	Adapter in power saving mode (blinks twice every 5 seconds)
	Orange	On	Connection speed is greater than (>) 4 Mbps and less than (<) 10 Mbps.
	Green	On	Connection speed is greater than (>) 10 Mbps.
ETHERNET	Green	On	LAN connection established.
		Off	LAN connection is not established.
		Blink	LAN connection is active.
AP	Green	On	Adapter in AP (Access Point) mode.
		Off	Adapter in EP (End Point) mode
		Blink	Secure connection setup in progress.

[☆] Refer to [Chapter 4 - Network Performance](#) for more about connection speeds.

2.3 Default Settings

The factory default settings are presented below.

- Authentication password = paterna
- Factory Reset password = betera
- Factory Reset time = 10 seconds
- IP Configuration = FIXED
- FIXED IP address = 192.168.1.100
- FIXED IP subnet mask = 255.255.255.0
- Default Gateway IP address = 192.168.1.105
- DNS Server IP address = 192.168.10.252

- Network Identifier = Serial Number of AP Unit
- Encryption Key = This field is empty
- Encryption Type = 3DES (168-bit)
- Automatic Multicast = Disabled
- IGMP Aware Multicast = Disabled
- MLD Aware Multicast Syndication = Disabled
- Video Optimization = Automatic
- Priority (QoS) Configuration = UDP Priority 5, TCP Priority 0 (Default=4)
- VLAN Configuration = Disabled
- PHY – Notches = Enabled
- PHY – Power Control = Enabled
- Power Saving = Enabled (300 second delay)
- Link Layer Topology Discovery (LLTD) = Enabled

<p>NOTE: These configuration settings can be customized using a web browser. For further instructions, see Chapter 5 - Web User Interface. To return the adapter to factory default settings, follow the FACTORY RESET procedure in the Troubleshooting section of this manual.</p>

Chapter 3 - Quick Setup

This section is subdivided into three parts:

- Sections 3.1 and 3.2 contain the setup procedures.
- Section 3.3 provides a description of the power saving feature.

NOTE: A single PowerGrid 9020 unit and Ethernet cable are required for each device (e.g. PC, modem/router) you wish to connect to the network.

3.1 Internet Connection

These steps show how to connect a PowerGrid 9020 unit to a modem or router.

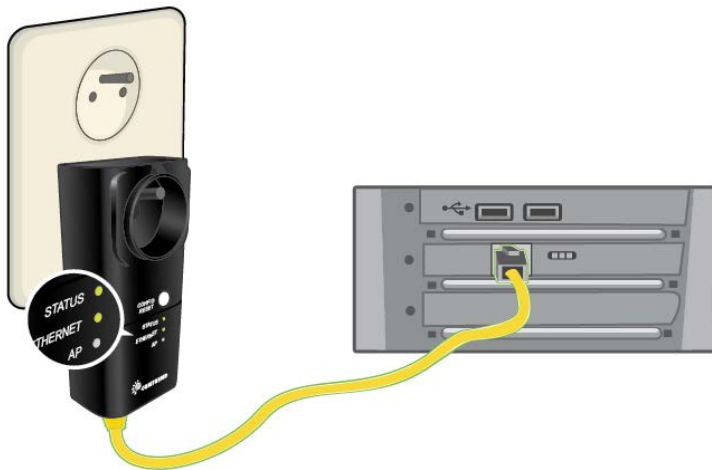
1. Turn on your modem or router.
2. Plug a PowerGrid 9020 unit into the power socket closest to the modem/router. The STATUS LED on the front panel of the PowerGrid 9020 should light up **RED**.
3. If the AP LED is GREEN continue to step 4. If not, go back to step 2 and try the other PowerGrid 9020 unit.
4. Connect the PowerGrid 9020 unit to the LAN port of the modem/router with an Ethernet (RJ-45) cable. The Ethernet LED on the unit should light up **GREEN**.



3.2 Device Connection

These steps show how to connect a PowerGrid 9020 to any network device. In this case, we use the example of a personal computer (PC).

1. Turn on your PC (or other device).
2. Plug a PowerGrid 9020 unit into the power socket closest to the PC.
The Status LED on the PowerGrid 9020 should light up.
3. Connect the PowerGrid 9020 to the computer with an Ethernet cable.
The Ethernet LED on the PowerGrid 9020 should light up **GREEN**.



4. The STATUS LED on the PowerGrid 9020 should now be **GREEN** or **ORANGE**.

If it is not, please consult Chapter 6 - HELP.

3.3 Power Saving

These units have a smart power saving mode for energy conservation. They will enter power saving mode if there is no Ethernet link detected within a 5 minute period, and assuming that the unit is not required for Powerline routing.

For greater power savings, you can also unplug PowerGrid 9020 units. You may consider doing so, if you are going on holiday or a business trip for an extended period. These units keep their network security settings even after losing power, so that you do not need to worry about losing network settings. This feature is especially useful when moving networked devices or after a power outage.

Chapter 4 - Network Performance

The Status LED shows an estimate of available throughput in the application layer. There are three levels of throughput indicated by three different LED colors. A particular adapter shows, with one color, the throughput level with reference to the adapter sending the most data to it. In the case of a network consisting of two adapters, they always show the level of throughput with reference to the other.

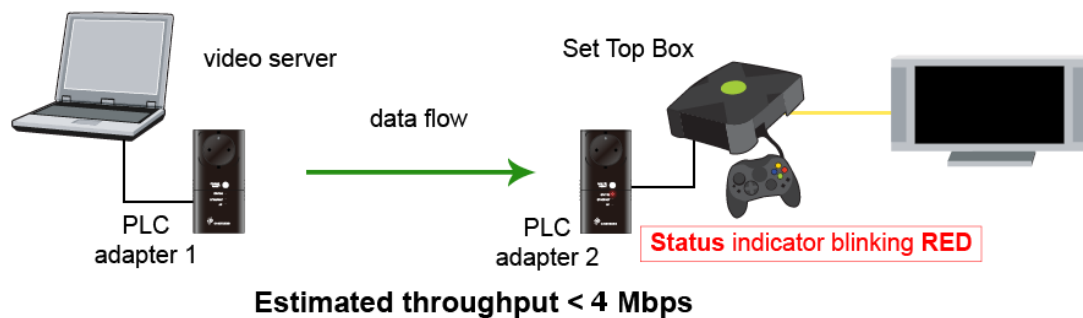
However, in the case of a network of three or more adapters, each one internally measures the amount of bytes received from the other adapters in the network and only shows the level of throughput with reference to the one that is sending the most data. A throughput estimator also keeps track of the number of neighboring networks since available bandwidth will be divided between them when sharing the channel. The thresholds for these levels of throughput are preconfigured in the system.

The STATUS LED behavior is summarized in the table below.

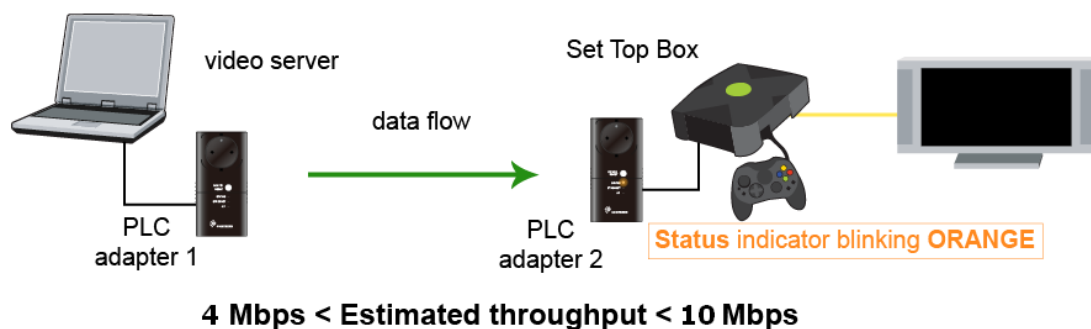
LED	STATUS
RED	Estimated Throughput < Low Threshold (4 Mbps)
ORANGE	Low Threshold (4 Mbps) < Estimated Throughput < High Threshold (10 Mbps)
GREEN	Estimated Throughput > High Threshold (10 Mbps)

4.1 Point-to-Point Network

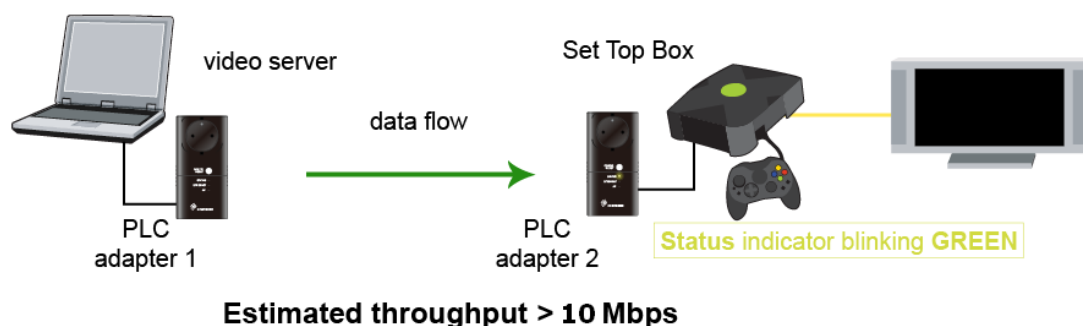
- **CASE 1:** Estimated throughput is less than 4 Mbps. The PLC channel is not able to transmit an SDTV channel. The STATUS LED will be RED as shown in the following figure:



- **CASE 2:** Estimated throughput is greater than 4 Mbps but less than 10 Mbps. The PLC channel is able to transmit an SDTV channel, but not two SDTV channels simultaneously or one HDTV channel. The STATUS LED will be ORANGE as shown in the following figure:

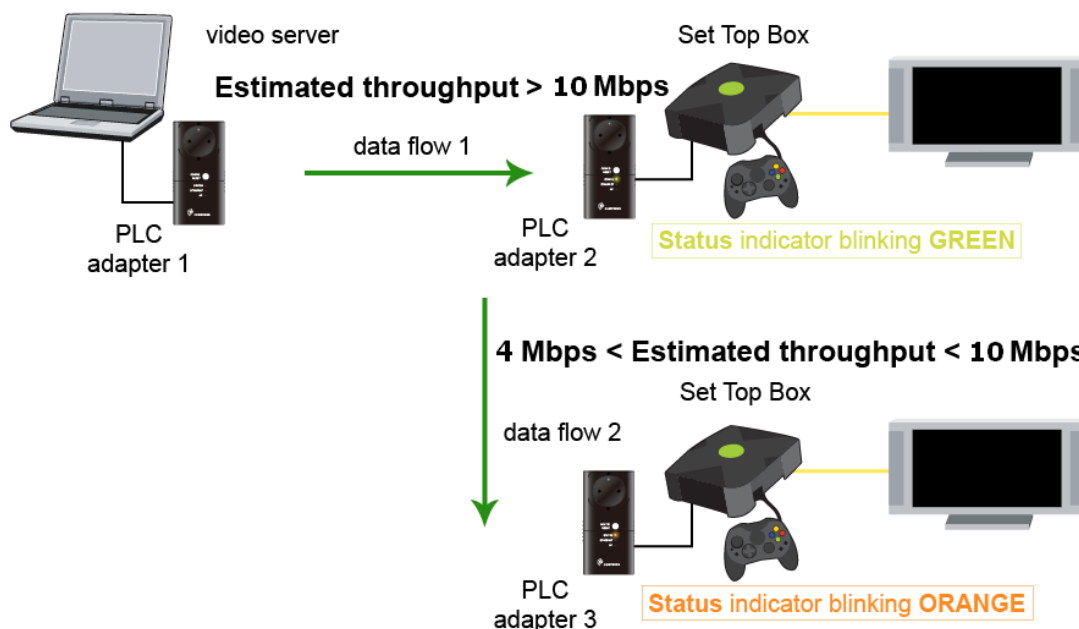


- **CASE 3:** Estimated throughput is greater than 10 Mbps. The PLC channel is able to play at least two SDTV channels or 1 HDTV. The STATUS LED will be GREEN as shown here:

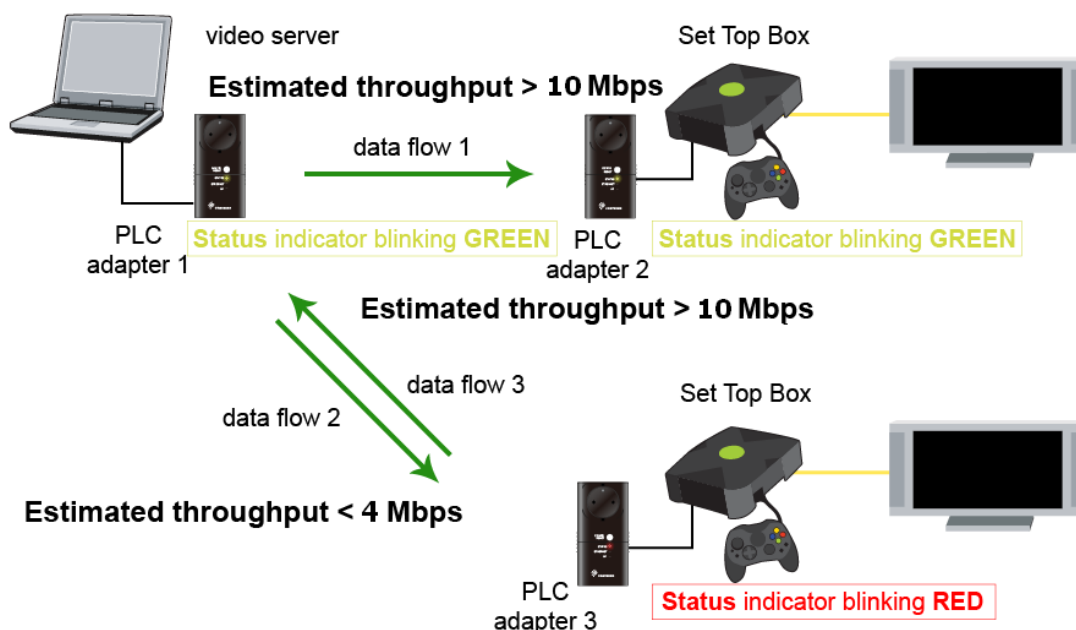


4.2 Point to Multipoint Network

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. These are illustrated in the following figures:

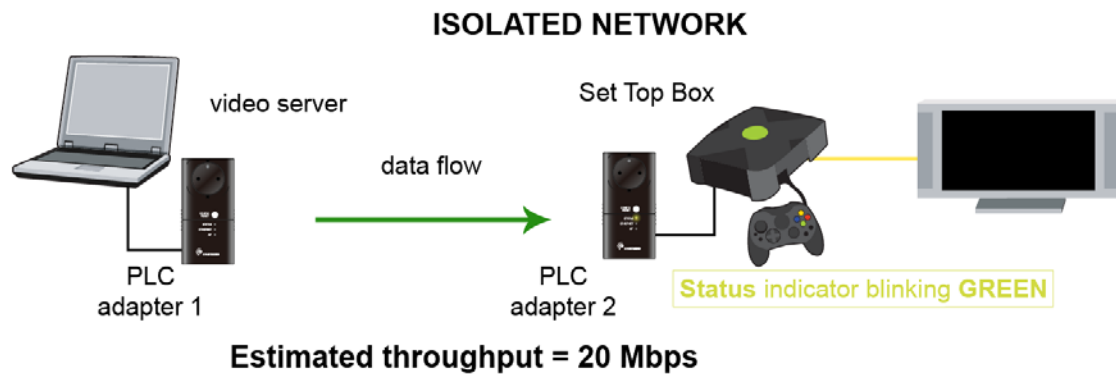


The STATUS LED in each adapter will show the estimated level of the PLC link from which it is receiving the most amount of traffic at any given time. The status LED in PLC adapter 3, for example, could be showing a level of throughput available from PLC adapter 2 for a period of time as illustrated in the figure above. However, traffic flow could change through user intervention and then the status LED in PLC adapter 3 could show the level with reference to the PLC adapter 1 link, as shown in the following figure.

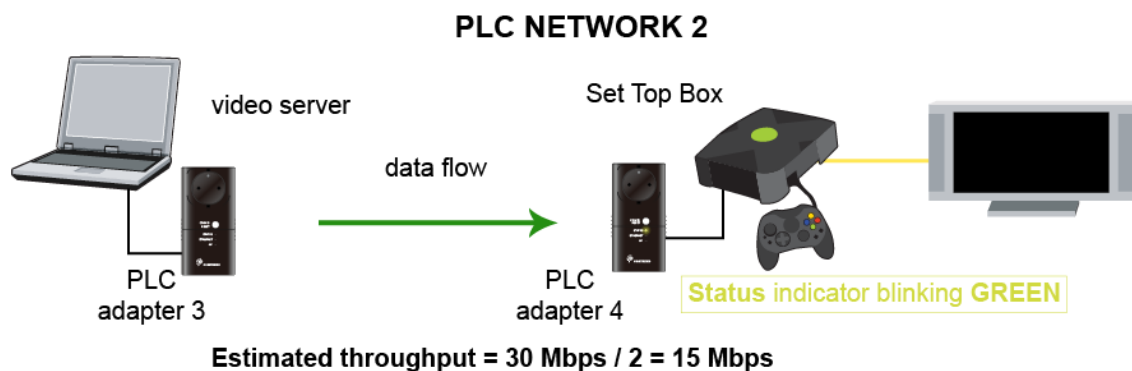
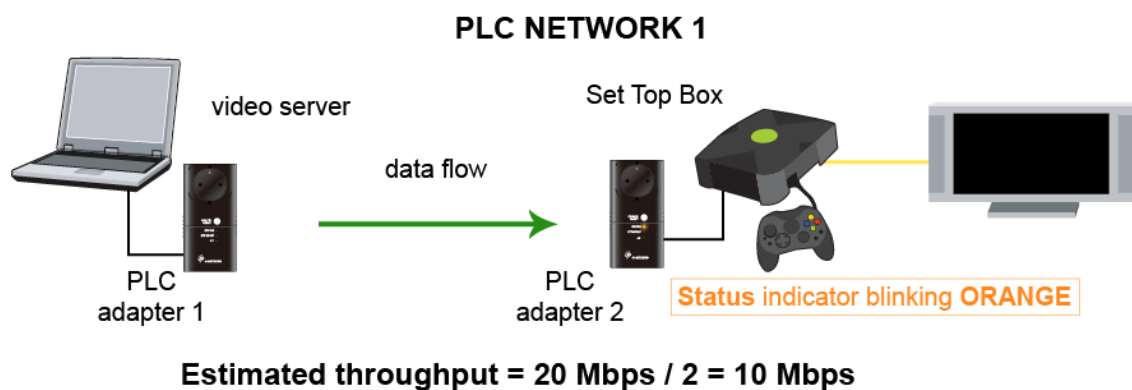


4.3 Neighboring Networks

The Status LED also takes into account the possibility of having neighboring networks. In such a case, the throughput evaluator will divide the available bandwidth in two when there is visibility between any two networks since the PLC channel must be shared on a time basis. In the following figure, an example of an isolated network is first shown.



In the next figure, the previous network (network 1) sees a new neighboring network (network 2), and a new evaluation of throughput is made to show the user that channel conditions have changed and available bandwidth has decreased:



Chapter 5 - Web User Interface

The web-based user interface (**WUI**) provides access to information about your PowerGrid 9020 units and can also be used to configure or reset device settings.

The WUI is accessed using a web browser, such as Microsoft Internet Explorer. The following instructions assume that the PowerGrid network has been configured correctly (i.e. according to the instructions in Chapter 3) and that the host computer is running Windows XP.

NOTE: The process described in the following sections will work for any operating system (OS), but the specific steps will need to be adjusted to match your particular computing environment.

5.1 IP Configuration

Before using the WUI, you first need to adjust the IP configuration of the host PC. This is a two-step process addressed in subsections [5.1.1](#) and [5.1.2](#).

FYI: The IP configuration defines the location of your computer within the network using Internet Protocol (**IP**) addressing. Your computer needs an IP address so it can receive and send information on the network. In **Fixed IP** mode you assign this IP address yourself; while in **DHCP** mode it is assigned automatically by a DHCP server.

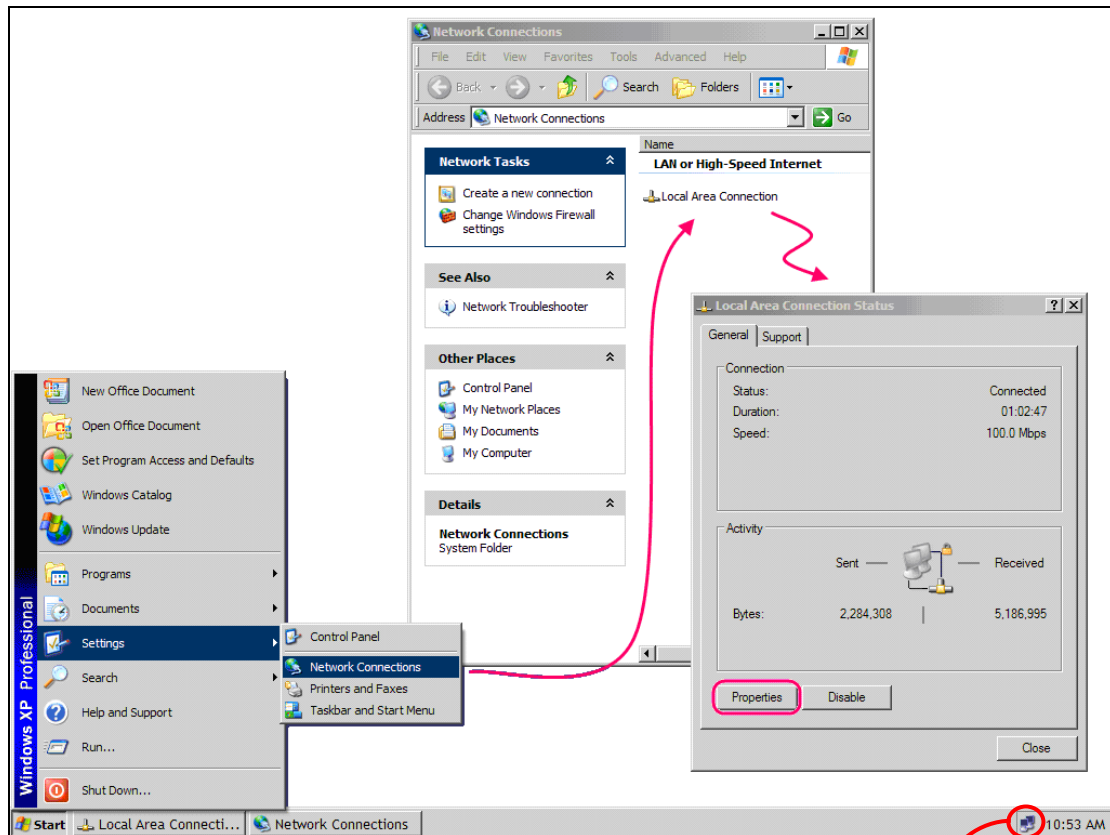
5.1.1 Fixed IP

The following instructions describe how to change the IP configuration of your computer to **FIXED IP** mode, so that you can access the WUI.

STEP 1: Turn on your computer (and login, if necessary).

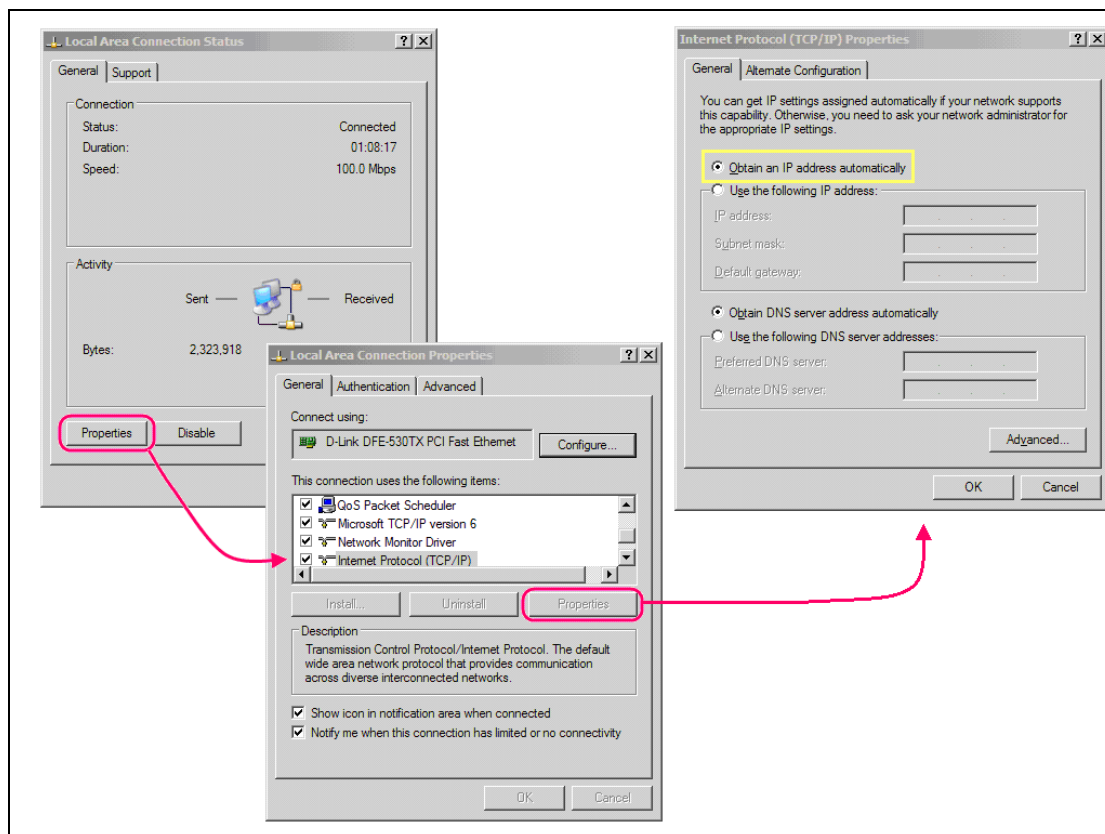


STEP 2: From the desktop (as shown below), click on the **Start** button and select **Network Connections**. Next, double-click **Local Area Connections** to open its window and then click the **Properties** button.



NOTE: You may also access this window by double-clicking the Local Area Connection icon on your taskbar.

STEP 3: Select **Internet Protocol (TCP/IP)** and click the **Properties** button.



STEP 4: Check the settings in the **Internet Protocol (TCP/IP) Properties** dialog box (shown on the far right in the figure above). Make sure to record all the settings you see here, as you may need to reset them.

STEP 5: If the "Obtain an IP address automatically" radio button is selected, then your PC is configured in **DHCP** mode. You should select the "Use the following IP address" radio button to enter **FIXED IP** mode.

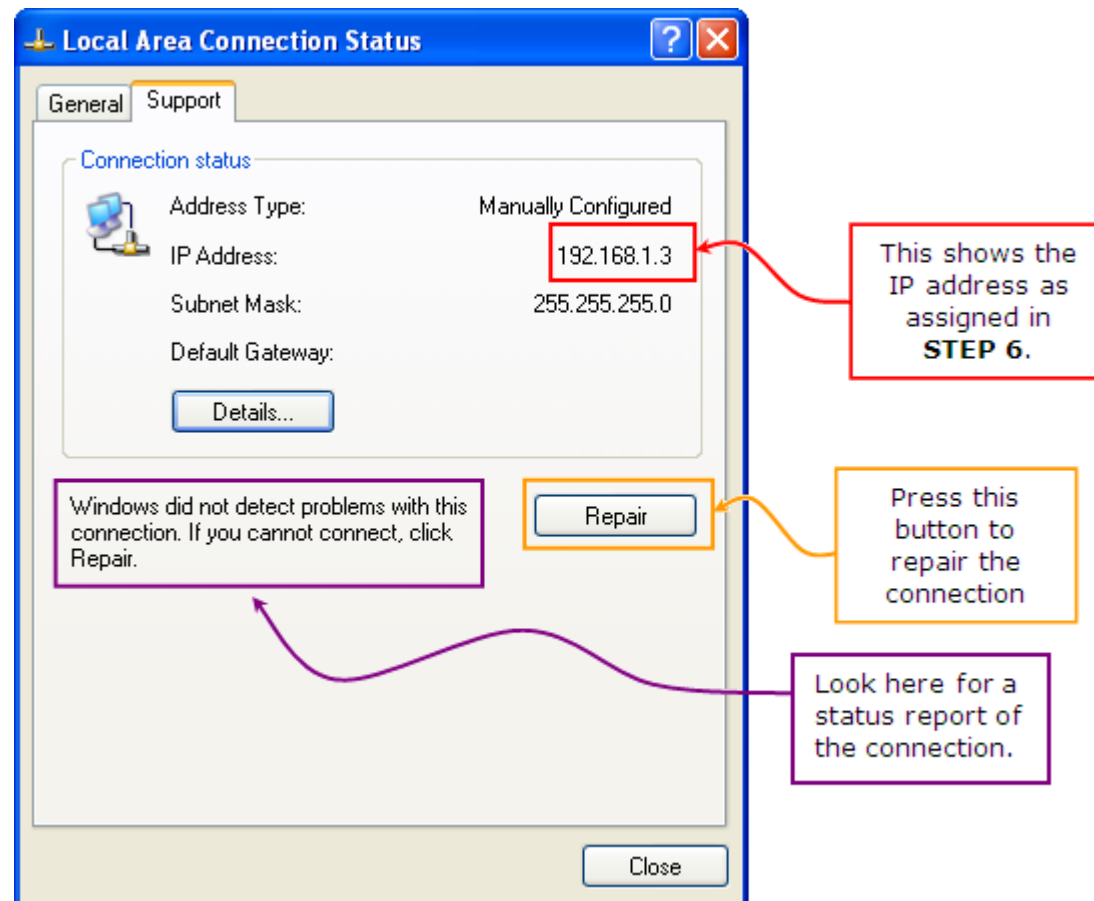
STEP 6: Change the **IP address**, **Subnet Mask** and **Default Gateway** to match those values shown in the figure below and click the **OK** button.

This is a close-up of the 'Internet Protocol (TCP/IP) Properties' dialog box, specifically the 'Use the following IP address' section. It contains three input fields: 'IP address' with the value '192 . 168 . 1 . 3', 'Subnet mask' with the value '255 . 255 . 255 . 0', and 'Default gateway' which is empty. Below these fields are 'OK' and 'Cancel' buttons. A yellow arrow points to the 'OK' button.

Click OK

STEP 7: Close the previous two windows. Since you made changes, click **OK**, but not **Cancel**! You then must wait for the LAN connection to reset.

After the connection recovers, you should check the connection status on the support tab of the **Local Area Connection Status** dialog box, as shown below.



5.1.2 Isolation

Now that the IP configuration of the computer is complete, we will proceed by isolating the PowerGrid 9020 unit you wish to access. This is required since every unit on the network is configured by default with the same Fixed IP address.

STEP 1: Relocate the PowerGrid unit you wish to access to a power jack nearby your computer and then connect the Ethernet cable from your computer (or network hub) to this PowerGrid unit.

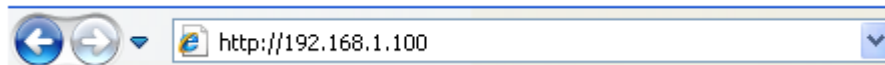
STEP 2: Unplug every other PowerGrid unit from its power jack.

When you have finished using the WUI, return the PowerGrid 9020 unit to its previous location, reset the IP configuration of the host computer, and press the **Repair** button again to return your system to its previous condition.

5.2 Login Screen

Perform the following steps to login to the WUI:

STEP 1: Start the Internet browser and enter the IP address as a HTTP link in the URL address field and press **Enter**. For the default IP address of 192.168.1.100, you must input <http://192.168.1.100>, as shown below.



STEP 2: The login screen should appear, as shown below. Enter the login password in the top section and click **OK** to continue. To perform a factory reset on the device you must enter the factory reset password in the bottom section and click **OK**. The WUI login password and other default settings can be found in [section 2.3](#).

Authentication

This unit is password protected. Please enter the correct password to access the web pages

• Password

Ok Cancel

Factory Reset*:

• Password

Ok Cancel

***Warning!** Current configuration will be lost

NOTE: You can change this password in the WUI (see Security in [section 5.5](#)).

5.3 WUI homepage

If login is successful, you will arrive at the WUI homepage. This screen provides summary information concerning the PowerGrid 9020 and its connections. It also provides access to the [Further Information](#) and [Change Configuration](#) screens discussed in sections 5.4 and 5.5.

PowerGrid 9020 Web Configuration
[Log Out](#)

Available Connections
PLC Connections:

PLC Port	MAC Address	Phy Tx Throughput	Phy Rx Throughput	Bridge State	Network Id
Empty list					

External Interfaces:

Interface	Phy Throughput	Bridge State
EXTA	100 Mbps	Forwarding

[Further information](#)
[Change configuration](#)

General Information

MAC Type	In-Home AV	Node Type	AP
MAC Address	64680CABB294		
IP Address	192.168.1.100	Number of Boots	1
SYNC	-	MODE	13
AGC RX	Enabled	RXG	7
AGC TX	Disabled	TXG	2
Access Protocol	DONE		

[Further information](#)
[Change configuration](#)
[Log out](#)

See the table below for details.

Available Connections	
PLC Connections	The total number of PowerGrid units in the network.
PLC PORT	The PLC data connection port for each connection.
MAC Address	This is a code that identifies all remote devices connected to this unit. On PowerGrid units, it is printed on the back label under the barcode.
Phy Tx/Rx Throughput	Physical Transmission / Reception Throughput is a measure of network bandwidth. Available data transmission capacity is roughly half this value.
Bridge State	Enabled indicates there is a data connection. Disabled indicates no data connection.
Network Id	Network ID is used for network security. If present, it means the remote device is on the same network.

External Interfaces	
Interface	EXTA = Ethernet
Phy Throughput	Physical Throughput = Data Transmission Capacity
Bridge State	Forwarding = Active

General Information	
MAC Type	The MAC Address shown above is an In-Home AV type.
MAC Address	This code identifies the PowerGrid unit that is currently being managed with the WUI. The MAC Address is printed on the back label of the unit, under the barcode.
IP Address	The IP Address defines the location of the PowerGrid unit on the local area network.
Node Type	This will show as Fixed AP, EP or AP.
Number of Boots	The number of times this PowerGrid unit has been rebooted since the last Factory Reset.
NOTE: The remaining fields are advanced settings used for technical support.	

5.4 Further Information

This screen provides more detailed information concerning your network. It is divided into various sections with each section divided by a "**Return to main page**" link back to the WUI homepage. These sections are shown below and each section is followed by a table that explains it.

SYSTEM INFORMATION

System Information	
Uptime	0 days, 0h 50m 0s
Firmware Version	PG-9020-A001-4836T02-C01_R01

Field	Description
Uptime	This shows the length of time the PowerGrid unit has been on.
Firmware Version	This shows the PowerGrid installed firmware version.

MAC STATUS

This section provides information for identification of the PowerGrid 9020 by MAC Address, in addition to PowerGrid network encryption details.

MAC Status	
MAC Address	64680CABB294
MAC Type	In-Home AV
Node Type	AP
Network Identifier	10042200047A
Encryption Key	<i>Disabled</i>
Encryption Type	None

Field	Description
MAC Address	This is a code that identifies each PowerGrid unit. It can be found on the back label of the unit below the barcode.
MAC Type	In-Home AV is the only option at this time.
Node Type	This will show as Fixed AP, EP or AP.
Network Identifier	This field is used to identify the network. It can be up to 20 ASCII characters long.
Encryption Key	This key is used to encrypt the network. It is encoded in either ASCII or HEX format.
Encryption Type	The possibilities are 168 bit <i>3DES</i> or <i>128/256</i> bit <i>AES</i> .

NETWORK STATUS

This section shows the current IP configuration.

Network Status	
IP Configuration	Fixed
IP Address	192.168.1.100
Subnet Mask	255.255.255.0
Default Gateway IP Address	192.168.1.105
DNS server IP Address	192.168.10.252

Field	Description
IP Configuration	Either DHCP (Automated) or Fixed (Manual)
IP Address / Subnet Mask	These values define the location of the PowerGrid unit on the local area network.
Default Gateway IP Address	The IP address of the router that forwards traffic to a destination that is out of reach of the PowerGrid unit.
DNS server IP Address	The IP address of the server that provides Domain Name System (DNS) services such as hostname IP lookup.

PHY STATUS

This section summarizes the physical parameters of the network.

PHY Status	
Notches	Enabled
Power Control	Enabled
Dynamic PSD Control	Disabled

Field	Description
Notches	Radio-frequency (RF) interference reduction.
Power Control	This function minimizes the transmission power of each PowerGrid unit while maintaining data throughput performance.
*Dynamic PSD Control	<p>The modem's Ethernet port monitors the incoming traffic rate and subsequently calculates the transmission power required that permits this rate of transmission.</p> <p>The higher the incoming traffic rate, the greater the phy rate and transmission power required. The lower the rate, the lesser the phy rate and transmission power required.</p>

- * This feature has been developed to reduce the transmission power so as to cut the power consumption of the device and minimize the interference to other electronic devices in the vicinity.

LLTD STATUS

LLTD (Link Layer Topology Discovery) is a protocol supported by Windows Vista. LLTD enables applications to discover the topology of a network and includes optional QoS Extensions that applications can use to diagnose problems.

LLTD Status	
Link Layer Topology Discovery (LLTD)	Enabled

Field	Description
Link Layer Topology Discovery (LLTD)	When enabled, multicasting is limited to either IGMP or MLD Aware Multicast Syndication.

MULTICAST STATUS

IGMP (Internet Group Membership Protocol) and MLD (Multicast Listener Discovery) are protocols used by IP hosts to report their multicast group memberships to any neighboring multicast routers.

Multicast Status	
Automatic Multicast	Disabled
IGMP Aware Multicast Syndication	Disabled
MLD Aware Multicast Syndication	Disabled

Field	Description
Automatic Multicast	Auto-configures the local network for multicasting.
IGMP Aware Multicast Syndication (IPv4)	Multicasting for IPv4 networks. Enabled in EP mode. Disabled in AP mode. (See LLTD description above)
MLD Aware Multicast Syndication (IPv6)	Multicasting for IPv6 networks.

VIDEO OPTIMIZATION

The optimization strategy for video streams is shown here.

Video Optimization	
Video Optimization Mode	Automatic Optimization

Video Optimization Mode	Description
Automatic Optimization	Optimization based on video traffic type (TCP or UDP).
Optimized for Media Player	Improved transmission of TCP video.
Optimized for IPTV Service	Improved transmission of UDP video.

POWERSAVING MECHANISM

This function activates a low power mode when the PowerGrid 9020 is inactive, unless that unit is assigned as a master or repeater within the Powerline network.

PowerSaving mechanism	
PowerSaving mechanism	Enabled
Hysteresis time (Ethernet Link):	300

Field	Description
PowerSaving mechanism	Enabled = PowerSaving On Disabled = PowerSaving Off
Hysteresis time (Ethernet Link)	PowerSaving mode becomes active when it is Enabled and there is no Ethernet Link for {x} number of seconds, where {x} is the Hysteresis time. It is inactivated when an Ethernet Link is detected.

VLAN STATUS

With this function an 802.1Q VLAN Tag is added to the data packet header. This enables a physical LAN to be divided into several discrete virtual LANs. Data packets are given priority based upon their VLAN Tag and VLAN Priority settings. Note, the PowerGrid 9020 does not filter data packets; it merely tags them.

VLAN Status	
VLAN Configuration	Disabled
VLAN Tag	0
VLAN Priority	0

Field	Description
VLAN Configuration	Enabled = VLAN tagging on Disabled = VLAN tagging off
VLAN Tag	A number in the range of 2 to 4094.
VLAN Priority	A number between 0 and 7 (highest priority).

PRIORITY STATUS

Improve the end-user experience by prioritizing audio, video and voice traffic and optimizing the way shared network resources are allocated among applications.

Priority Status		
Default Priority		4
Criterion 1		Custom
Criterion 2		None
Custom Criterion 1:		
Offset		16
Pattern	0800000000000000	
Bitmask	FFFF000000000000	
Class Offset		27
Class Bitmask	FF00000000000000	
Class Pattern 1	1100000000000000	
Class Priority 1		5
Class Pattern 2	0600000000000000	
Class Priority 2		0
Class Pattern 3	0000000000000000	
Class Priority 3		4
Class Pattern 4	0000000000000000	
Class Priority 4		4
Class Pattern 5	0000000000000000	
Class Priority 5		4
Class Pattern 6	0000000000000000	
Class Priority 6		4
Class Pattern 7	0000000000000000	
Class Priority 7		4
Class Pattern 8	0000000000000000	
Class Priority 8		4

Field	Description
Default Priority	The priority level assigned to non-prioritized traffic.
Criteria (1 & 2)	None, Custom, 8021p, TOS, ARP, TCP_8021p, or TCP_TOS

Custom Criterion 1:	Description
Offset	A decimal ordinal number representing the starting byte for the pattern in the data packet.
Pattern (hex)	Defines the pattern (8-byte size).
Bitmask (hex)	A bitwise operation applied to the pattern.

Class Offset	A decimal ordinal number representing the starting byte for the class pattern in the data packet.
Class Bitmask(hex)	A bitwise operation applied to Class Patterns 1-8.
Class Pattern 1-8 (hex)	Defines a class pattern (8-byte size).
Class Priority 1-8	This value ranges from 0 to 7, with 0 being the lowest priority and 7 the highest priority.

SECURITY STATUS

This section shows the current login password requirement status.

Security Status	
Status	Password is currently installed

Field	Description
Status	Password is currently installed / No password installed

5.5 Change Configuration

This screen provides various configuration options with each section divided by a “**Return to main page**” link back to the WUI homepage. These sections are shown below and each section is followed by a table that explains it.

MAC CONFIGURATION

This section provides options to configure the PowerGrid 9020 MAC characteristics and network encryption mode.

MAC Configuration

• MAC Type

In-Home AV ▼

Ok Cancel

In-Home AV Configuration:

• Node Type

EP ▼

Ok Cancel

• Network Identifier

10042200047A

• Encryption Key

Disabled ▼

• Encryption Type*

3DES ▼

• AES Key Length

256 ▼

*Remember that AES encryption is not compatible with Wisconsin modems

Ok Cancel

Field	Description
MAC Type	In-Home AV is the only option at this time.
Node Type	Choose Fixed AP or EP.
Network Identifier	This field is used to identify the network. It can be up to 20 ASCII characters long.
Encryption Key	This key is used to encrypt the network. It is encoded in either ASCII or HEX format.
Encryption Type	The possibilities are <i>168 bit 3DES</i> or <i>128/256 bit AES</i> .
AES Key Length	AES encryption can be set as 128 or 256 bit strength.
NOTES: <i>In 3DES mode, the Encryption Key can be up to 24 ASCII characters or 42 hexadecimal numbers. In AES mode, it can be up to 36 ASCII characters or 64 hexadecimal numbers (256 bit mode). Hexadecimal encryption is stronger.</i>	

NETWORK CONFIGURATION

The section provides options to configure the IP configuration.

Network Configuration*

• IP Configuration

Fixed ▼

Fixed IP Configuration:

• IP Address

192.168.1.100

• Subnet Mask

255.255.255.0

• Default Gateway IP Address

192.168.1.105

• DNS server IP Address

192.168.10.252

*All changes in *Network Configuration* (except the DNS server) will have effect after system boot

Ok

Cancel

Field	Description
IP Configuration	Either DHCP (Automated) or FIXED IP (Manual).
NOTE: <i>In FIXED mode the IP Address, Subnet Mask and Default Gateway IP Address can be set manually, while in DHCP mode they are assigned by a server. Changes do not become effective until after a reboot of the PowerGrid unit.</i>	
IP Address / Subnet Mask	These values define the location of the PowerGrid unit on the local area network.
Default Gateway IP Address	The IP address of the router that forwards traffic to a destination that is out of reach of the PowerGrid unit.
DNS server IP Address	The IP address of the server that provides Domain Name System (DNS) services such as hostname IP lookup.

PHY CONFIGURATION

This section provides options to configure the physical parameters of the network.

PHY Configuration

• Notches

Enabled ▼

• Power Control

Enabled ▼

• Dynamic PSD Control

Disabled ▼

Ok

Cancel

Field	Description
Notches	RF interference reduction is disabled by default.
Power Control	This function minimizes the transmission power of each PowerGrid unit while maintaining data throughput performance.
*Dynamic PSD Control	<p>The modem's Ethernet port monitors the incoming traffic rate and subsequently calculates the transmission power required that permits this rate of transmission.</p> <p>The higher the incoming traffic rate, the greater the phy rate and transmission power required. The lower the rate, the lesser the phy rate and transmission power required.</p>

- * This feature has been developed to reduce the transmission power so as to cut the power consumption of the device and minimize the interference to other electronic devices in the vicinity.

LLTD CONFIGURATION

LLTD (Link Layer Topology Discovery) is a protocol supported by Windows Vista. LLTD enables applications to discover the topology of a network and includes optional QoS Extensions that applications can use to diagnose problems.

Field	Description
Link Layer Topology Discovery (LLTD)	When enabled, multicasting is limited to either IGMP or MLD Aware Multicast Syndication.

MULTICAST CONFIGURATION

IGMP (Internet Group Membership Protocol) and MLD (Multicast Listener Discovery) are protocols used by IP hosts to report their multicast group memberships to any neighboring multicast routers.

Field	Description
Automatic Multicast	Auto-configures the local network for multicasting.
IGMP Aware Multicast Syndication (IPv4)	Multicasting for IPv4 networks. Enabled in EP mode. Disabled in AP mode. (See LLTD description above)
MLD Aware Multicast Syndication (IPv6)	Multicasting for IPv6 networks.

VIDEO OPTIMIZATION

Select an optimization strategy for video streams.

Video Optimization

• Video Optimization Mode

Automatic Optimization

Ok

Cancel

Video Optimization Mode	Description
Automatic Optimization	Optimization based on video traffic type (TCP or UDP).
Optimized for Media Player	Improved transmission of TCP video.
Optimized for IPTV Service	Improved transmission of UDP video.

POWERSAVING MECHANISM

This function activates a low power mode when the PowerGrid 9020 is inactive, unless that unit is assigned as a master or repeater within the Powerline network.

PowerSaving Configuration

• PowerSaving mechanism

Enabled

• Hysteresis time (Ethernet Link)

300


Ok

Cancel

Field	Description
PowerSaving mechanism	Enabled = PowerSaving On Disabled = PowerSaving Off
Hysteresis time (Ethernet Link)	PowerSaving mode becomes active when it is Enabled and there is no Ethernet Link for {x} number of seconds, where {x} is the Hysteresis time. It is inactivated when an Ethernet Link is detected.

VLAN STATUS

With this function an 802.1Q VLAN Tag is added to the data packet header. This enables a physical LAN to be divided into several discrete virtual LANs. Data packets are given priority based upon their VLAN Tag and VLAN Priority settings. Note, the PowerGrid 9020 does not filter data packets; it merely tags them.



The image shows a 'VLAN Configuration' dialog box. It has a title bar 'VLAN Configuration'. Inside, there are three items in a list: 'VLAN Configuration', 'VLAN Tag (2, 3, ... 4094)', and 'VLAN Priority'. To the right of 'VLAN Configuration' is a dropdown menu showing 'Disabled'. To the right of 'VLAN Tag (2, 3, ... 4094)' is a text input field containing the number '0'. To the right of 'VLAN Priority' is a dropdown menu showing '0'. At the bottom right of the dialog are two buttons: 'Ok' and 'Cancel'.

Field	Description
VLAN Configuration	Enabled = VLAN tagging on Disabled = VLAN tagging off
VLAN Tag	Choose a number in the range of 2 to 4094.
VLAN Priority	Choose a number between 0 and 7 (highest priority).

PRIORITY STATUS

Improve the end-user experience by prioritizing audio, video and voice traffic and optimizing the way shared network resources are allocated among applications.

Priority Configuration

- Default Priority

4

Ok Cancel

- Criterion 1

Custom

Custom Criterion 1 Configuration:

- Offset

16
 - Pattern (hex)

0800000000000000
 - Bitmask (hex)

FFFF000000000000
 - Class Offset

27
 - Class Bitmask (hex)

FF00000000000000
 - Class Pattern 1 (hex)

1100000000000000
 - Class Priority 1

5
 - Class Pattern 2 (hex)

0600000000000000
 - Class Priority 2

0
 - Class Pattern 3 (hex)

0000000000000000
 - Class Priority 3

4
 - Class Pattern 4 (hex)

0000000000000000
 - Class Priority 4

4
 - Class Pattern 5 (hex)

0000000000000000
 - Class Priority 5

4
 - Class Pattern 6 (hex)

0000000000000000
 - Class Priority 6

4
 - Class Pattern 7 (hex)

0000000000000000
 - Class Priority 7

4
 - Class Pattern 8 (hex)

0000000000000000
 - Class Priority 8

4

Ok Cancel

- Criterion 2

None

Ok Cancel

[• Easy Priority Configuration](#)

The table below provides details about the section shown in figure above.

Field	Description								
Default Priority	The priority level assigned to non-prioritized traffic.								
Criteria (1 & 2)	None, Custom, 8021p, TOS, ARP, TCP_8021p, or TCP_TOS								
<p>The QoS criteria are applied as follows:</p> <ul style="list-style-type: none"> a) Criterion 1 is processed first (and Criterion 2 second) b) If Criterion 1 is met, Criterion 2 will NOT be applied <p>Thus, Criterion 2 should be more general than Criterion 1. There are also certain incompatibilities that arise between these criteria, as outlined in the table below.</p> <table> <tr> <th>If Criterion 1 Protocol is ...</th><th>Then Criterion 2 can be ...</th></tr> <tr> <td>Origin IP / Destination IP</td><td>None of these protocols.</td></tr> <tr> <td>TCP with port</td><td>UDP Protocol, Origin and destination IP address for UDP packets</td></tr> <tr> <td>UDP with port</td><td>TCP Protocol, Origin and destination IP address for TCP packets</td></tr> </table>		If Criterion 1 Protocol is ...	Then Criterion 2 can be ...	Origin IP / Destination IP	None of these protocols.	TCP with port	UDP Protocol, Origin and destination IP address for UDP packets	UDP with port	TCP Protocol, Origin and destination IP address for TCP packets
If Criterion 1 Protocol is ...	Then Criterion 2 can be ...								
Origin IP / Destination IP	None of these protocols.								
TCP with port	UDP Protocol, Origin and destination IP address for UDP packets								
UDP with port	TCP Protocol, Origin and destination IP address for TCP packets								

Custom Criterion Configuration	
Offset	A decimal ordinal number representing the starting byte for the pattern in the data packet.
Pattern (hex)	Defines the pattern (8-byte size).
Bitmask (hex)	A bitwise operation applied to the pattern.
Class Offset	A decimal ordinal number representing the starting byte for the class pattern in the data packet.
Class Bitmask (hex)	A bitwise operation applied to Class Patterns 1-8.
Class Pattern 1-8 (hex)	Defines a class pattern (8-byte size).
Class Priority 1-8	This value ranges from 0 to 7, with 0 being the lowest priority and 7 the highest priority.

SECURITY STATUS

This section allows you to change (or remove) the configuration password, used to access the WUI, and perform a factory reset to recover default settings.

Security Configuration

Status

Password is currently installed

Set Configuration Password:

New password

Confirm new password

Ok

Cancel

Factory Reset*:

Password

Ok

Cancel

*Warning! Current configuration will be lost

Ok

Cancel

Field	Description
Status	Password is currently installed / No password installed
Set Configuration Password	To change the configuration password, notice that you must enter it twice; first in the New password field and again in the Confirm new password field. The configuration password can be up to 20 characters in length. To remove the configuration password, leave these fields empty. Click OK to make a change.
Factory Reset	To reset the device to factory settings, enter the factory reset password (see section 2.3) and click OK . Use this function with caution, as it will erase the current configuration settings.

HARDWARE RESET

Press the **Hardware Reset** button to reboot the device. It will not erase the configuration settings. It performs the same function as holding down the **CONFIG/RESET** button for 10 seconds or more. You must perform a hardware reset of the device to change some settings, such as IP mode (DHCP/FIXED).

Hardware Reset

Hardware Reset

FLASH UPGRADE

Flash memory is divided into six separate sections which can be upgraded independent of each other using FTP, TFTP or L2 (Layer 2) server protocols.

Flash Upgrade

Status

Ready: initial status

• Flash Section

Firmware

• Upgrade Protocol

FTP

• Server IP Address

• FTP User

• FTP Password

• Filename

Ok

Cancel

Field	Description
Status	Reports the current status of the flash upgrade.
Flash section	Choose Firmware , Loader , NVRAM , DSP , Analog Symbols or Factory settings .
Upgrade Protocol	Choose FTP , TFTP or L2 protocol.
Server IP Address	Input the IP address of the FTP or TFTP server.
FTP User and Password	Input the user name and password if required
Filename	This is the filename of the flash upgrade on the server. The firmware and loader have .bin extensions, while factory settings are stored as .cfg files.

PROCEDURE:

STEP 1: Choose a **Flash Section** (File Type) to upload.

STEP 2: Choose **FTP**, **TFTP** or **L2** upgrade protocol.

STEP 3: Enter the Server IP Address.

STEP 4: For FTP only, enter User name and Password.

STEP 5: Enter the Filename with file extension

STEP 6: Click **OK**. The PowerGrid 9020 will attempt to download the file.

Warning! Do not interrupt the download progress once it has started! The flash memory will become corrupt and the device will be disabled. In this case, you will need to contact your supplier for technical support.

STEP 7: Once the file has successfully downloaded. Click **Hardware Reset**. The PowerGrid 9020 will reboot and then load the new flash section. The browser should refresh to the WUI login screen (pg. 17).

Explanations of the various status messages are provided in the table below.

Flash Upgrade Status Failed

Flash Upgrade	
Status	Failed. Bad image. Not for this flash section (-8)
Flash Section	Factory Settings
Destination Flash Offset (hex)	00014000
Upgrade Protocol	TFTP
Server IP Address	192.168.1.241
Filename	657003-217(PG-9020-A001-4836TO2-C01_R01).bin
Download Progress	0 of 916236 bytes (0 %)
<div></div>	
This page is updated automatically every 30 seconds. The modem must be reset once the upgrade has finished.	
<div>Hardware Reset</div>	

This status message means the upgrade was not successful.
Click the back button on your browser and check settings before trying again.

If the file upload fails, we recommend the following:

- (1) Once you have decided on the file you want to upload (firmware or factory setting), make sure the name is correct and there are no typing errors. Also, ensure that the file (name) and the required flash section match.
- (2) Make sure that the TFTP or FTP server is ready for upgrade. If the user runs TFTP server, select TFTP (from the dropdown menu) for the upgrade protocol. If the user runs FTP server, select FTP (from the dropdown menu) for the upgrade protocol.
- (3) Be sure that the server IP address that you input is the IP address of the TFTP or FTP "server" not your PG-9020's IP address. Also, check that the IP configuration of the PG-9020 is on the same network segment as the server (see [IP Configuration](#) for details).
- (4) The file required for upgrade needs to be placed in a folder/directory that the TFTP/FTP server can access.
- (5) For FTP Server: Make sure that the correct User Name and Password are inputted.

DOWNLOADING

This status message indicates that the file has been successfully located on the server. You can watch the Download Progress at the bottom of this section. The browser will automatically refresh every 30 seconds; but to check the download progress more frequently, you can manually refresh the browser at any time.

Flash Upgrade

Status	Running: downloading image
Flash Section	Firmware
Destination Flash Offset (hex)	00016000
Upgrade Protocol	TFTP
Server IP Address	192.168.1.241
Filename	657003-217(PG-9020-A001-4836TO2-C01_R01).bin
Download Progress	6144 of 916236 bytes (0 %)

This page is updated automatically every 30 seconds. The modem must be reset once the upgrade has finished.

[Hardware Reset](#)

UPGRADE SUCCESSFUL

If the upgrade was successful the status message will display as shown below.

Flash Upgrade

Status	Ready: finished correctly
Flash Section	Firmware
Destination Flash Offset (hex)	00016000
Upgrade Protocol	TFTP
Server IP Address	192.168.1.241
Filename	657003-217(PG-9020-A001-4836TO2-C01_R01).bin
Download Progress	916236 of 916236 bytes (100 %)

This page is updated automatically every 30 seconds. The modem must be reset once the upgrade has finished.

[Hardware Reset](#)

Chapter 6 - HELP

The PowerGrid 9020 has been designed to be a reliable and easy-to-use home networking device. However, should you experience any problems, please refer to the troubleshooting and FAQ sections below to resolve your issue.

6.1 Troubleshooting

Please consult the following procedures to resolve your current issue. The first two sections (**steps A-C**) provide general procedures that are used in later steps.

FACTORY RESET

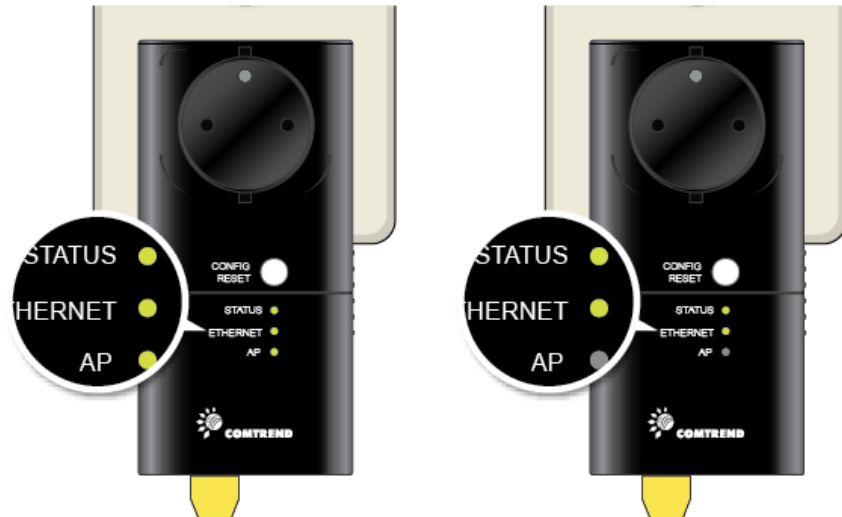
- A. To reset a unit to factory default settings, press the **CONFIG/RESET** button for 10 seconds or more. The PowerGrid 9020 will then reset its configuration to factory default settings and auto-reboot.
- The PowerGrid 9020 is set as an EP after the factory reset. (When you will do the reset on AP, this configuration disappears and unit will be back as the EP.) When you will plug PowerGrid 9020 back into the network, you have to do the "pairing". Description in QSG, Part C. Adding a Third PowerGrid 9020.
- Please press the CONFIG/RESET button on the unit already in network, AP LED starts blinking, and then release it. You now have thirty (30) seconds to complete the EP set up.
 - Before the unit AP LED stops blinking, press the CONFIG/RESET button on the EP unit. Wait for its AP LED to start blinking and then release the button. After a few seconds, the AP LED (on 3rd PowerGrid 9020) should flash quickly and then turn OFF.
 - After adding the EP unit to the PowerGrid network, check that the AP LED on the AP unit has stopped blinking and remains ON.

ISSUE #1: POOR NETWORK PERFORMANCE

- B. If the network is performing slowly or not at all, do the following.
- Confirm that your networked devices are turned ON and working correctly.
 - Check the ETHERNET LED on every PowerGrid 9020. The ETHERNET LED on every unit should be **GREEN**. If the ETHERNET LED on any unit is **OFF**, check that the ETHERNET cable is connected securely.
 - Check the STATUS LED of every unit. The STATUS LED color should be **ORANGE** or **GREEN**. Perform a **FACTORY RESET** (see **step A**) on any units with a **RED** STATUS LED.

ISSUE #2: HOME WIRING

- C. If the previous steps were unsuccessful, your home wiring may be at fault. To test this possibility, repeat the following steps on the EP unit.
- Unplug the EP unit from the power outlet, detach the Ethernet cable, and relocate the EP unit close to the AP unit (i.e. within the same room).
 - Perform a **FACTORY RESET** (see **step A**) on the EP unit.



- iii. If the LED indicators on the two units display as shown above, then the test was successful. If the STATUS LED on the EP unit is **ORANGE** or **RED** then the PowerGrid 9020 may be damaged. Contact your local agent for further assistance.
- iv. If the EP unit tested successfully, the problem you are experiencing is likely due to RF interference or poor wiring in your home. In this case, you can contact your local agent for further assistance.

6.2 FAQ

The following are frequently asked questions (FAQ) and answers.

1. Do PowerGrid 9020 units work with surge protected power strips?

Basic power strips provide simple protection for a surges in voltage. More expensive models have this feature, but also include a filter which provides protection against EMI (Electro-Magnetic Interference) or RFI (Radio Frequency Interference). Our test lab and user experience indicates that the more expensive strips, those with EMI/RFI filters, should not be used.

2. What if my neighbor has Powerline devices as well?

You need not worry as PowerGrid network traffic is securely encrypted.

3. Is it safe to leave the PowerGrid units on all the time?

PowerGrid units are CE certified and completely safe to leave plugged in all the time. They may become slightly warm in use - this is perfectly normal.

3. How much power do PowerGrid units use?

The Adapters use 4.4 Watts when in use and less than 1 Watt in standby mode. Section [3.3 Power Saving](#) explains standby mode in more detail.

4. Who can I contact for help?

If this chapter has failed to resolve or address your issue, please consult your local agent for further assistance. We would also appreciate any suggestions or comments that you would like to share regarding our product or user documentation. Your feedback will be used to improve our products.

Appendix A - Acronyms

The following list of acronyms is provided for your reference.

ACRONYM	EXPANDED
3DES	Triple DES
AES	Advanced Encryption Standard
AP	Access Point
DES	Data Encryption Standard
EP	End Point
HDTV	High Definition TV
ISP	Internet Service Provider
PC	Personal Computer
PowerGrid	Comtrend brand name
SDTV	Standard Definition TV
STB	Set Top Box
WUI	Web User Interface