500Mbps Powerline
PLV-500AV-PE

User Manual

V1.0

Contents

1 Introduction

The PLV-500AV-PE is a mini-PLC adapter. It can transmit data up to 500Mbps in the household powerline. It can be connected to the power socket directly without new wire. The PLV-500AV-PE adapter can enter power save mode triggered by multiple conditions. It can help you to establish a high-speed network that supports video, voice and data without wiring and drilling. It is suitable for using in a wide range of both residential (at home) and commercial (offices, apartments, hotels, warehouses) network applications.

1.1 Product Features

- Without new wiring, every power socket becomes a connection node in the household.
- Plug-and-play to your routers, computers and other network devices.
- Provides power save mode. In the power save mode, the output consumption of the device is less than 1W.
- The physical data rate is up to 500Mbps.

1.2 Application

- High Definition (HD) and Standard Definition (SD) video distribution
- Higher data rate broadband sharing for powerline LAN
- Shared broadband internet access
- TV over IP (IPTV) and Voice over Internet Protocol (VoIP)

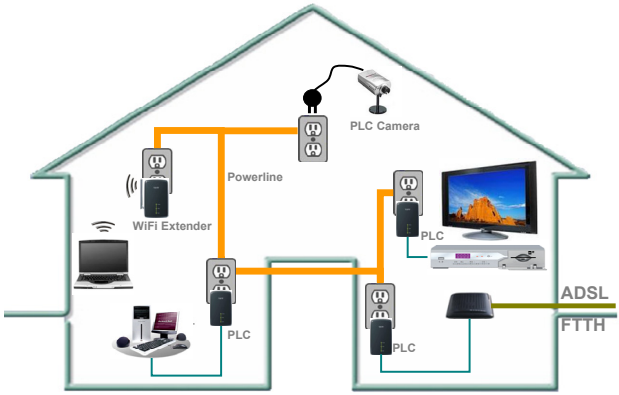


Figure 1 PLC network architecture

1.3 System Requirements

- Operating system: Windows 98SE, 2000, ME, XP 32/64 bit and Vista 32/64bit
- CPU: Intel Pentium III or better, clock rate faster than 2.0GHz recommended
- RAM: At least 128MB
- Screen resolution: Any resolution
- Free disk space: At least 20MB
- Network interface: At least one Fast Ethernet (100 Mbps) network card, and a Ethernet Cord

1.4 Packing List

- PLV-500AV-PE x 1
- CD ROM x 1
- RJ45 Ethernet cable x 1

2 Safety Precautions

This device is intended for connection to the AC powerline. For installation instructions, please refer to the installation section of this guide. The following precautions should be taken when using this product.

- Read all instructions before installing and operating this product.
- Follow all warnings and instructions marked on the product.
- Unplug the device from the wall outlet before cleaning. Use a damp cloth for cleaning. Do not use liquid cleaners or aerosol cleaners.
- Do not operate this product near water.
- This product should never be placed near or over a radiator or heat register.
- Do not use an extension cord between the device and the AC power source.
- Only a qualified technician should service this product. Opening or removing covers may result in exposure to dangerous voltage points or other risks.
- Do not plug the device into a power strip or surge protector because these devices may consist of filter and impair signal.
- Avoid plugging the device right next to noisy sources such as cell phone charger, Halogen light, noisy desktop computer, vacuum cleaner, etc. These cases result in poor transmission speed.
- Unplug the device from the wall outlet and refer the product to qualified service personnel for the following conditions:

  - If liquid has been spilled into the product
  - If the product has been exposed to rain or water
  - If the product does not operate normally when the operating instructions are followed
  - If the product exhibits a distinct change in performance

3 Getting to Know the Adapter

3.1 The Ethernet Interface

Ethernet: The Ethernet port connects to an Ethernet network cable. The other end of the cable connects to your computer or other Ethernet-enabled network device.

3.2 The Adapter's Buttons

The following figure shows the adapter's buttons.

Figure 1 Side panel of the device

Reset: Restore the factory default settings.

Security: (also referred to as the NMK button)**:** Set the status of the device members.

- Pressing and holding the **Security** button for more than 10 seconds randomizes the NMK value.

- Pressing and holding the **Security** button for less than 3 seconds makes the adapter a member of the existing AVLN. For more details, see chapter 6 .

3.3 The Adapter's LEDs

All adapter's LEDs are located on the front panel. There are 3 LEDs to indicate the adapter's status.

Figure 2 Top view

The following table describes the LEDs on the device.

LED	Color	Behavior	Description
(Power)	Green	On	System runs normally.
	Green	Blink	● System enters the power save mode. ● System is resetting. ● System is in the process of password synchronization.

LED	Color	Behavior	Description
	-	Off	The PLC adapter is powered off.
 (Ethernet)	Green	On	Ethernet connection has established.
	Green	Blink	Data is being transmitted.
	-	Off	No Ethernet connection.
 (Data)	Green/Red	On	The PLC adapter has connected to the powerline network. The **Data** LED color will vary according to the physical rate. ● PHY RATE>80Mbps: green ● 40<PHY RATE<80Mbps: orange ● PHY RATE<40Mbps: red
	-	Off	The PLC adapter does not connect to the powerline network.

Note:

The Power, Ethernet and Data indicators blink quickly when the device is powered on. At that moment, the Power and Ethernet indicators are green, and the Data indicator is orange.

When data is being transmitted, the Data indicator keeps on but does not blink.

4 How to Install the Utility

Note:

Before installing the PLC utility software, make sure that there is no any other powerline utility installed on your computer. If there is another utility installed, please uninstall it and restart your computer.

Follow the steps below to install the utility. No password or CD-Key is needed.

Step 1 Please insert the utility CD into the computer's CD-ROM drive. Select the **PLC 500AV Utility Installation** folder and then double-click the setup.exe. A page for installing the utility software appears.

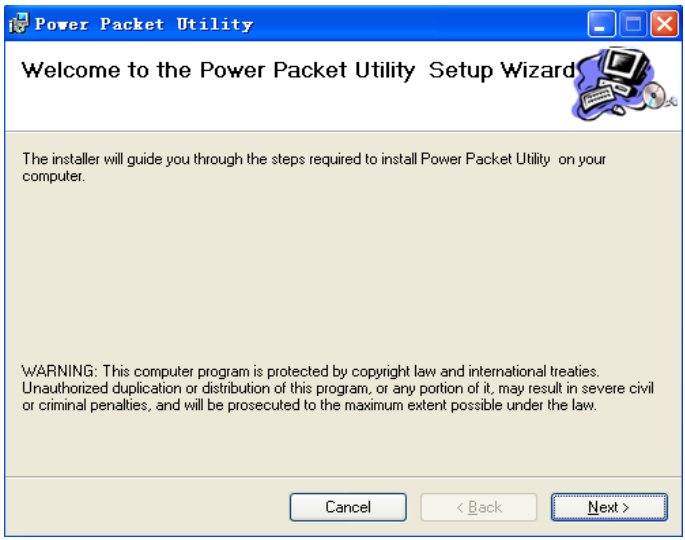


Figure 3 Opening the setup wizard

Step 2 Click **Next >** to show the following page.

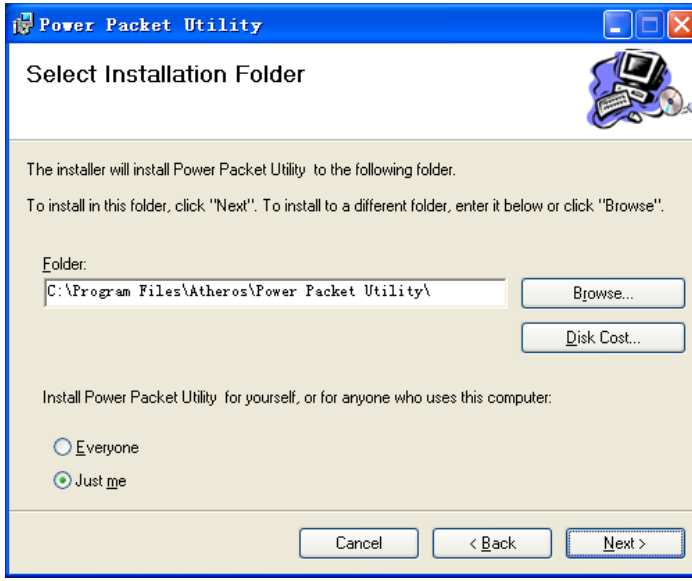


Figure 4 Selecting the folder

Step 3 Click **Browse…** to select the installation folder, and then click **Next >** to continue.

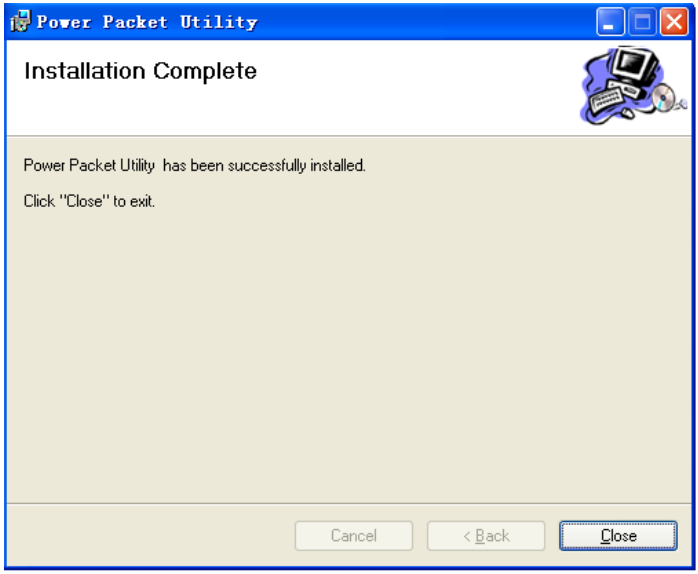


Figure 5 Completing the installation

Step 4 Click **Close** to finish the installation.

5 How to Use the Utility

5.1 Main Tab

The **Main** screen provides a list of all powerline devices logically connected to the computer when the utility is running.

The **top panel** shows the local HomePlug devices connected to the network interface card (NIC) of the computer. Click **Connect**. The utility automatically scans the powerline periodically for other HomePlug devices when it is connected to the local device. If no local HomePlug device is discovered, the status bar displays **NO HOMEPLUG ADAPTERS DETECTED.**

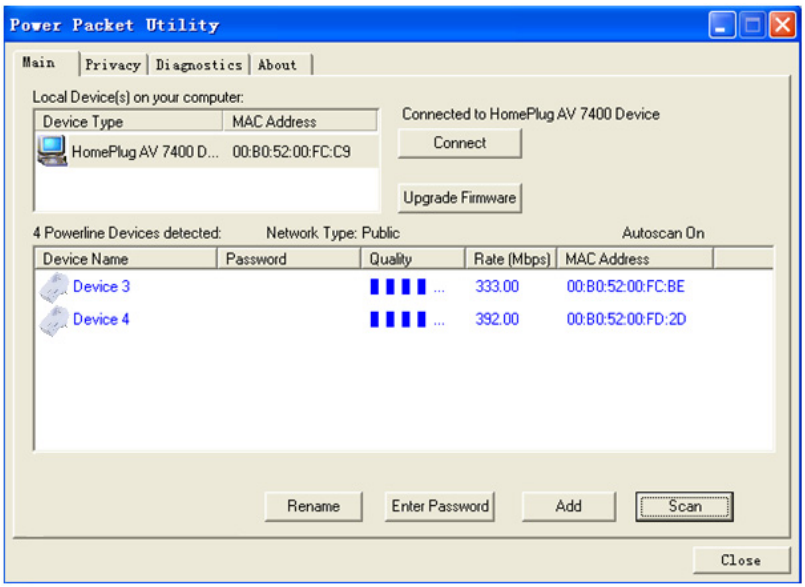


Figure 6 Main tab

The **lower panel** displays all the HomePlug remote devices, which are discovered in the current logical network. The total number of remote devices connected in the same network is displayed above the remote device panel. **Network type** (**Public**

or **Private**) depends on the network status of the local device. **Autoscan** shows whether the autoscan function is on. The following information is displayed for all the devices that appear in the lower panel.

Device Name

This column shows the default device name, which may be modified. To change the name, click **Rename**, or click the name and edit it in the list.

MAC Address

This column shows the MAC addresses of the remote devices.

Password

By default, this column is blank. You can click **Enter Password** to change it. The steps for setting the password of the device (required when creating a private network) are as follows:

Step1 Click the device name to select the device in the lower panel.

Step2 Click **Enter Password**. A dialog box appears, showing the device name and password. See Figure 7.

Figure 7 Setting the device password

Step3 Click **OK** to verify the password. The password field accepts the device password in any case formats, with or without dash.

A confirmation box appears if the password is entered correctly. If a device is not found, a message appears, providing suggestions to solve the common problems. This process might take a few seconds to get completed.

Add

This button is used to add a remote device to the existing network by entering the device password of the device. A dialog box appears. See Figure 8. You can enter a device name and the password.

If the device is found and the password is entered correctly, a confirmation box appears. If a device is not found, a message appears, providing suggestions to solve the common problems.

Figure 8 Adding the remote device

Note:

The device must be in the powerline (plugged in), so that you can confirm the password and add the device to the network. If the device is not located, a warning message appears.

Scan

This button is used to perform an immediate search for HomePlug devices connected to the powerline network. By default, the utility automatically scans every a few seconds and updates the displayed information.

5.2 Privacy Tab

In the **Privacy** screen, you can maintain security for the logical network and select the device included in the network. See Figure 9.

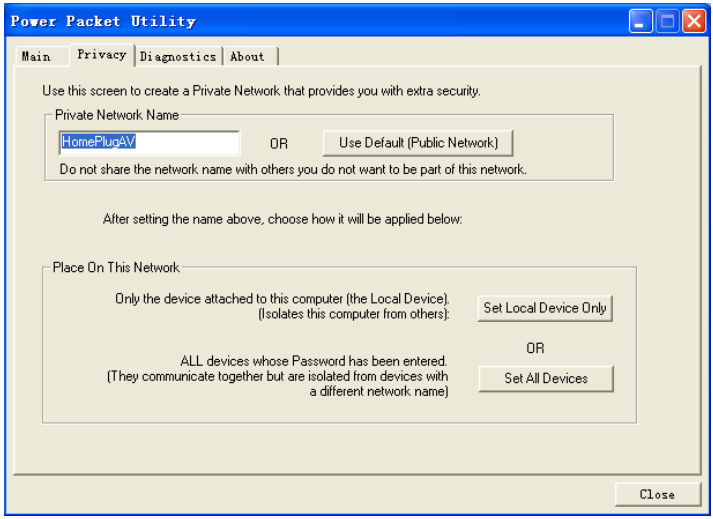


Figure 9 Privacy tab

All HomePlug devices are loaded using a default logical network (network name), which is normally **"HomePlugAV"**. In the **Privacy** screen, you can modify a private network by changing the network names and the passwords of the devices.

You can always reset to the HomePlug network (Public) by entering "HomePlugAV" as the network name or by clicking on the **Use Default** button.

Note:

*If the network name changes to anything other than HomePlug, the network type in the main screen is displayed as **Private**.*

Set Local Device Only

This button is used to change the network name and password of the local device. If a new network password is entered, all the devices appeared in the main panel prior to this are no longer present in the new network, effectively making the local devices not to communicate to the devices which are in the old logical network.

Click **Set Local Device Only**, the devices previously set up with the same logical network (same network name) appears in the device list.

Set All Devices

This button is used to change the logical network of all devices that appear in the main panel. If these devices whose passwords have been entered for the same logical network, a dialog box appears, indicating the success of this operation. For the devices whose passwords are not entered, this operation will fail and it will report a failure message.

5.3 Diagnostics Tab

The **Diagnostics** screen shows the system information and history of all remote devices appeared over a period of time. See Figure 10.

The **Upper panel** shows technical data concerning software and hardware on the host computer that are used to communicate through HomePlug on the powerline network. It includes the following:

- Operating system platform/version
- Host network name
- User name
- MAC address of all NICs (Network interface card) connected to the host
- Identify versions of all driver DLLs and libraries used (NDIS) and optionally
- HomePlug chipset manufacturer name (Turbo Only devices)
- MAC firmware version (Turbo Only devices)
- MAC addresses of all devices connected locally to the host
- Version of the configuration utility
- Vendor name

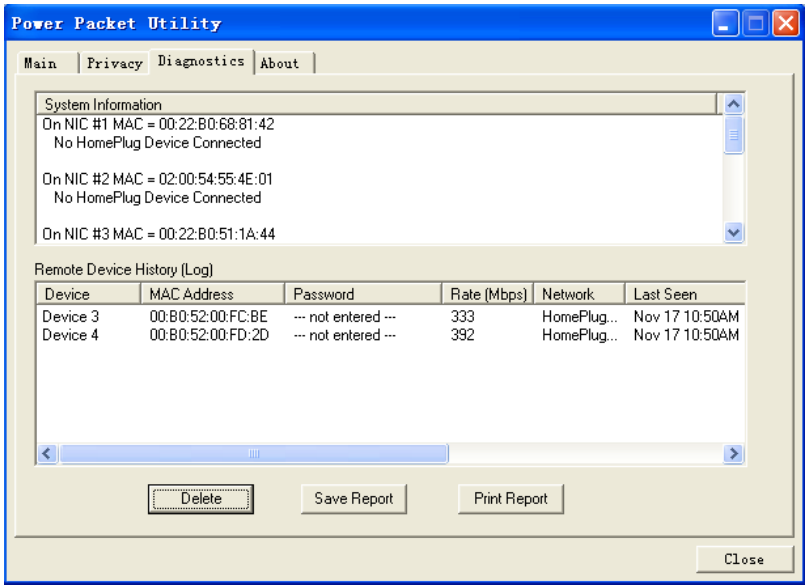


Figure 10 Diagnostics tab

The **Lower panel** displays the history of all remote devices appeared on the computer over a certain period of time. All the devices and the parameters of the devices on the powerline network are listed. Devices that are active on the current logical network show a transfer rate in the rate column. Devices on other networks, or devices that no longer exist are shown with a "?" in the rate column. The following remote device information is available from the diagnostics screen:

- Device alias name
- MAC address
- Password
- Device last known rate
- Device last known network name
- HomePlug chipset manufacturer name
- Date device last seen on the network
- MAC firmware version

The diagnostics information displayed can be saved to a text file for later use, or be printed for reference for a technical support call. Click **Delete** to delete the devices which are no longer part of the network. A dialog window pops up with a confirmation message if the user wants to delete a device whose password has been entered.

5.4 About Tab

The **About** screen shows the software version and provides a html link to a website, such as *www.PowerPacket.com*. Clicking the web address, you can visit the web site.

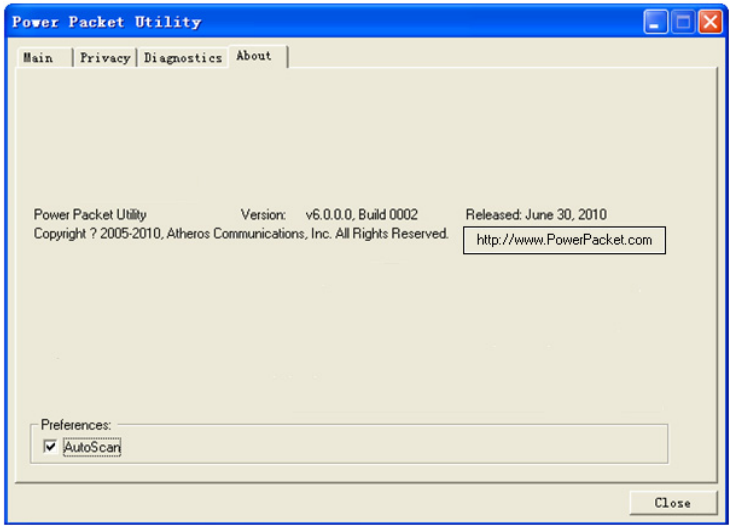


Figure 11 About Tab

Preferences

The lower part of the panel displays options for turning the autoscan function on or off.

6 How to Use the Security Pushbutton

This section describes how to add new devices to, or remove old devices from a HomePlug AV logical network (AVLN). Both can be accomplished by using a **Security** (NMK) pushbutton.

Operation progress and outcome can be monitored by observing the behavior of the power LED.

6.1 Forming a HomePlug AV logical network

When two devices with different NMK values are connected to the same powerline, user wants them to form a logical network. Do as follows:

Step1 Press the NMK button on the first device A for less than 3 seconds.

Step2 Press the NMK button on the second device B for less than 3 seconds. The button on B must be pressed within 1 minute

Step3 Wait for connection to complete.

The power LED on both devices will flash evenly at 1-second intervals until the operation succeeds or fails. It will illuminate steadily on successful completion. If an error occurs, the power LED on the ‘adder’ will flash unevenly until the pushbutton on the ‘adder’ is pressed again or the ‘joiner’ is reset by holding the pushbuttons down for more than 10 seconds.

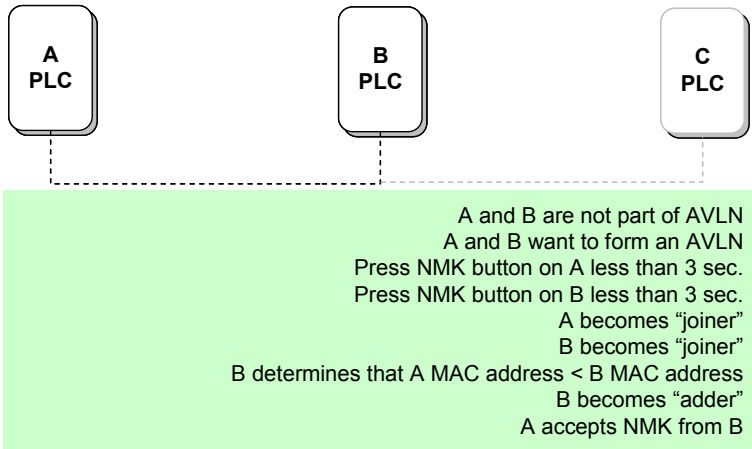


Figure 12 Forming a HomePlug AV logical network

6.2 Joining a Network

In this scenario a network exists, a new device, the ‘joiner’, wants to join the network. Any device on the existing network can become the ‘adder’.

Step1 Press the pushbutton on the ‘joiner’ for less than 3 seconds.

Step2 Press the pushbutton on any network device for less than 3 seconds, making it the ‘adder’. Please press this pushbutton within 1 minute.

Step3 Wait for connection to complete.

The power LED on both devices will flash at 1-second intervals until the process succeeds or fails. It will illuminate steadily on success. If an error occurs, the power LED on the ‘adder’ will flash unevenly until the pushbutton on the ‘adder’ is pressed again or the ‘joiner’ is reset by pressing the pushbutton for more than 10 seconds.

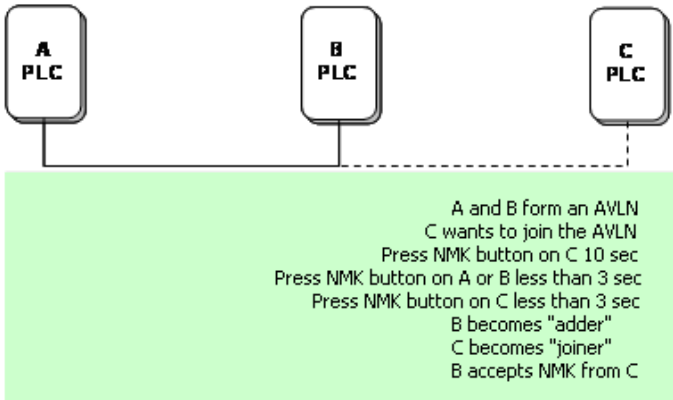


Figure 13 Joining a Network

6.3 Leaving a Network

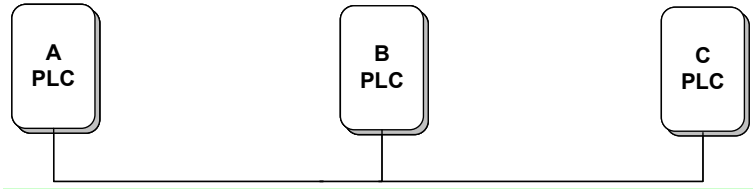
A network exists. The user wants to remove one device, the 'leaver', from that network, for whatever reason. He may want to remove the device from service altogether or have it join another logical network.

Step1 Press the pushbutton on the 'leaver' for at least 10 seconds. The device will reset and restart with a random NMK.

Step2 Wait for reset to complete.

The power LED on the 'leaver' will momentarily extinguish during reset, flash during restart then illuminate steadily. No errors can occur.

Once the process completes, the user may disconnect the device from the medium or join it to another logical network on the same medium.



A, B and C form an AVLN
A wants to leave the AVLN
Press NMK button on A more than 10 sec.
A computes random NMK
A resets and restarts

Figure 14 leaving a Network

7 How to Improve the Transmission Capacity

It is important to use the PLC product complying with the following "correct rules", because it can significantly improve the transmission capacity of the network.

For the PLC device without female socket, it is recommended to plug the device directly into a wall socket, not to power stripe.

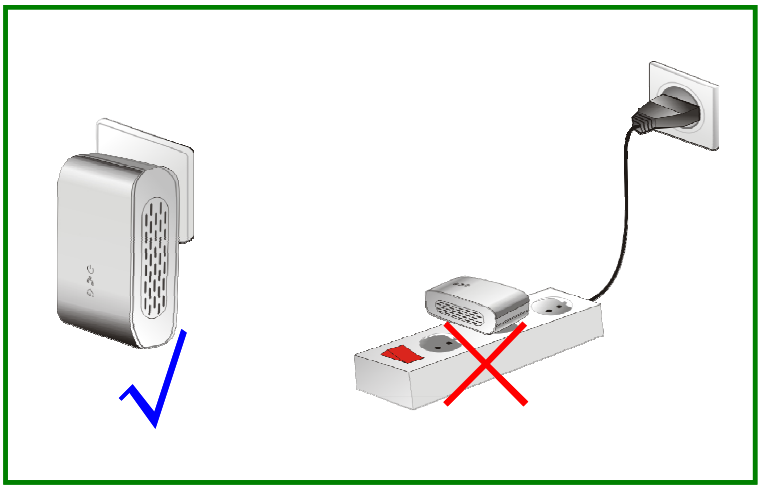


Figure 15 Connecting the PLC device without the female socket

Appendix A Specifications

Chipset	Atheros AR7400
Protocol	HomePlug AV, IEEE1901 Co-exists with existing HomePlug 1.0
System Support	Windows 98SE, 2000, ME, XP 32/64 bit and Vista 32/64bit
PLC PHY Rate	500Mbps (Max)
Modulation Band	2~68MHz
Modulation Schemes	Supports1024/256/64/16/8-QAM, QPSK, BPSK and ROBO
Encryption	128 AES
LED's	Power Ethernet: Ethernet ink and activity Data: PLC link and activity
Push Button	Reset: Restore the factory default settings Security: Set the network password automatically
Consumption	6W
Operating Temperature	0ºC to 40ºC
Storage Temperature	-20ºC to 70ºC
Operating Humidity	10% to 90%, non-condensing
Storage Humidity	5% to 95%, non-condensing
Input Rating	100-240 VAC, 50/60Hz

Certifications	CE, UL, FCC Part 15 Class B
Green Standard	RoHS
Physical Dimension	L×W×H: 90 mm × 55 mm × 34 mm
Weight	120g

Appendix B Acronyms and Abbreviations

AVLN	AV In-home Logical Network, the AVLAN is the set of STAs that possess the same network membership key. Every AVLN is managed by a single CCo.
CCo	Central Coordinator
CSMA/CA	Carrier Sense Multiple Access / Collision Avoidance
DAK	Device Access Key
DM	Device Manager
IGMP	Internet Group Management Protocol
NEK	Network Encryption Key
NID	Network ID (Identification)
NMK	Network Membership Key
PLC	Powerline Communication
PIB	Parameter Information Block
STA	Station, a STA in the network with a connection to the powerline and being able to source or sink traffic
TDMA	Time Division Multiple Access
TEI	Terminal Equipment Identifier

TOS	Type Of Service
VLAN	Virtual Local Area Network

Appendix C About QoS

PLC 200AV allows for 4 levels of Channel Access Priority (CAP (0 – 3)). The 8 levels of VLAN Ethernet tags must be mapped to the 4 levels of CAP priority, where CAP 3 is the highest priority and CAP 0 is the lowest. CAP 3 priority might be used for voice and network management frames, and CAP 2 is used for streaming video and music while CAP 1 and CAP 0 are used for data.

Default CAP

The 'Default CAP' group allows for default priority mapping of packets that do not have a VLAN TAG. The settings are available for Unicast (directed to a host).

- IGMP - (default CAP 3) - sets the channel access priority for IGMP frames - these are the group management frames, not the stream data.
- Unicast - (default CAP 1) - sets the default channel access priority for unicast frames not matching any other classification or mapping.
- IGMP managed Multicast Stream (Fixed to CAP 2) - sets the default channel access priority for stream data belonging to a snooped IGMP multicast group.
- Multicast/Broadcast - sets the default CAP for multicast frames not in a snooped group and for broadcast frames.

The following are the factory default settings for VLAN Tags and TOS Bits:

VLAN Tag User Priority	Default CAP Priority	TOS Bit User Priority	Default CAP Priority
0	CAP1	0	CAP1
1	CAP0	1	CAP0
2	CAP0	2	CAP0
3	CAP1	3	CAP1

VLAN Tag User Priority	Default CAP Priority	TOS Bit User Priority	Default CAP Priority
4	CAP2	4	CAP2
5	CAP2	5	CAP2
6	CAP3	6	CAP3
7	CAP3	7	CAP3