PL-200AV-3PE

USER MANUAL

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1 Introduction

This PL-200AV-3PE wallmount PLC product for transmitting data up to 200 Mbit/s across the household power line. and every power socket becomes a connection, and no new wire. PL-200AV-3PE is suitable for use in a wide range of both residential (in-home) and commercial (offices, apartments, hotels, warehouses) network applications. No cables, no drilling. These adapters enable the effortless creation of a high-speed network that supports video, voice and data.

1.1 Product Feature

No new wire, every power socket becomes a connection node in the household.

Plug-and-play to your routers, computers and other network devices.

It can provide 3 Ethernet jackets for using at the same time.

1.2 Application

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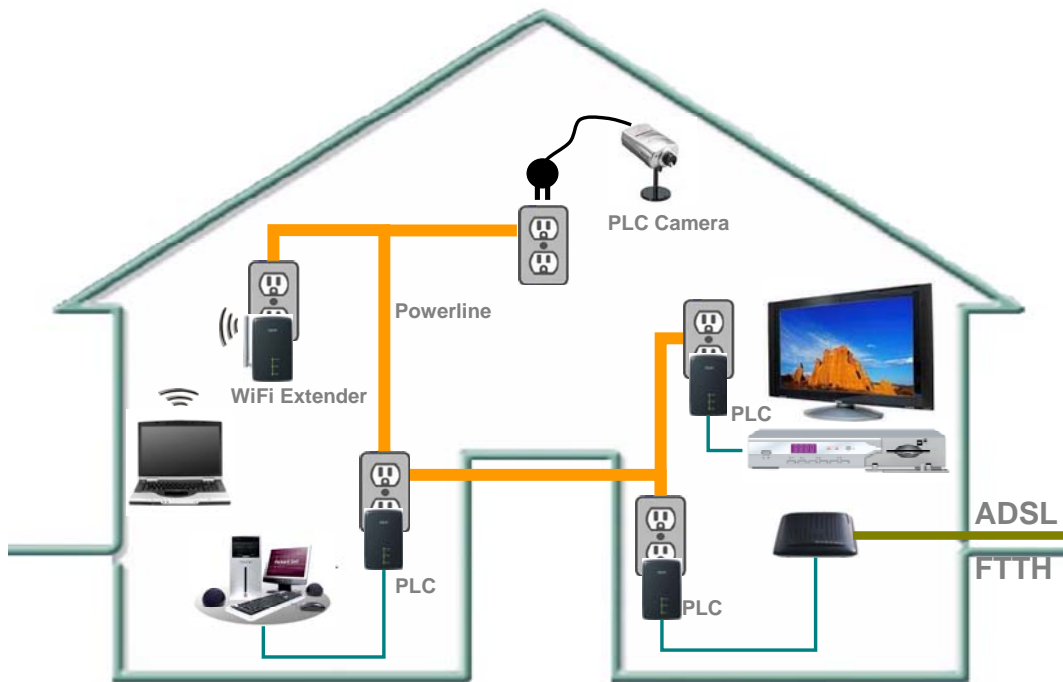
1.3 System Requirements

Operating System	Microsoft Windows 2000 or XP , Vista 32-bit/64-bit
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 Ethernet Cord

1.4 Package Contents

- PL-200AV-3PE x 1
- CD ROM x 1
- RJ45 Ethernet cable x 1

2 Safety Notice:

This device is intended for connection to the AC power line. 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. this 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 1~3: The Ethernet port connects to an Ethernet network cable. The other end of the cable will connect to your computer or other Ethernet-enabled network device.

3.2 The Adapter's Buttons

Reset: The button can restore the factory defaults and reset the device.

Pressing and holding the RST button for 0.3 to 3 seconds to restore the factory defaults;

Security: The button is used to set the private network name.

- Pressing and holding the NMK button for more than 10 seconds randomizes the NMK value.
- Pressing and holding the NMK button for 0.5 to 3 seconds makes the adapter a member of the existing AVLN.

Note: The NMK button user guide please see chap 6.

3.3 The Adapter's LEDs

All adapters' LEDs are located on the front panel; there are 5 LEDs to indicate the adapter's status.

Ethernet 1~3: Green. The **Ethernet** LED flashes to indicate activity over the Ethernet connection.

Power: Green. The **Power** LED lights up when the Adapter is powered on.

Data: Green. The **Data** LED flashes to indicate activity over the powerline connection.

4 How to Installation Utility

First step, you need to verify that there is no any other Powerline Utility installed on your computer before installing this utility. If there is another utility installed, please uninstall it and restart your computer.

Second step, please insert the Utility CD-ROM into the computer's CD-ROM drive. then select the "PLC 200AV Utility Installation" folder and clicks the setup.exe. Follow the steps to install the Utility Program. No password or CD-Key is needed.

The Installation Utility similar to the one shown in Figure 4-1. Click the Next button to continue.
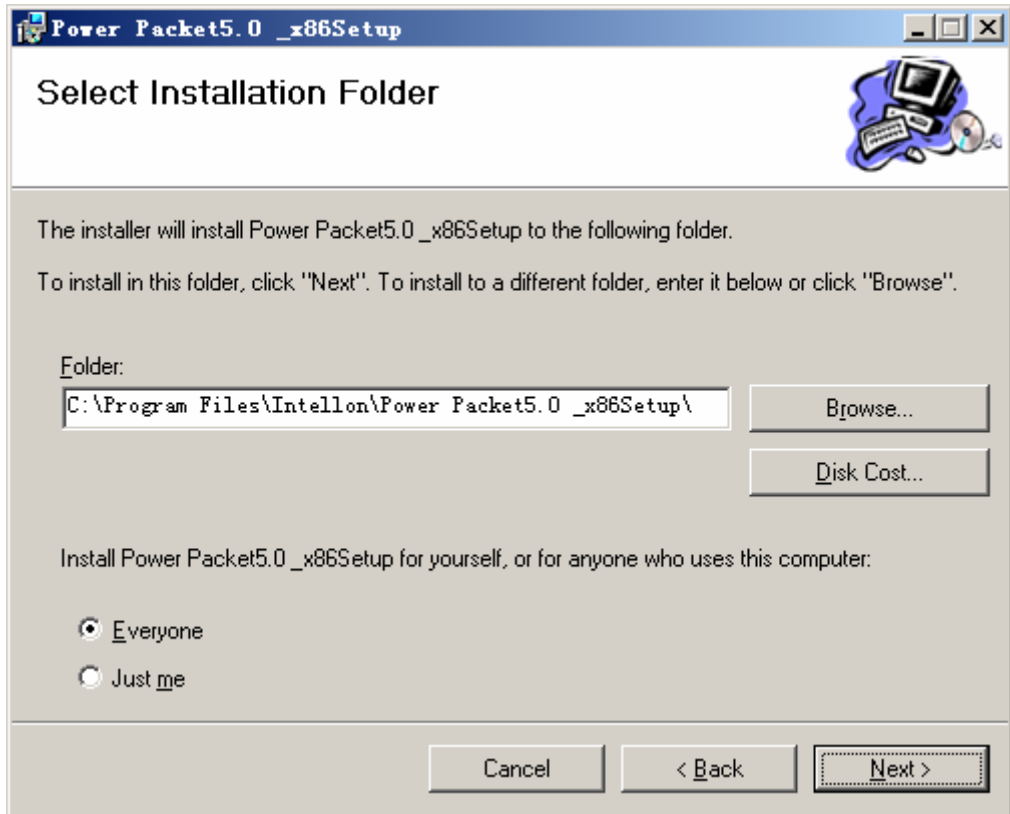

Figure 4-1 Setup Wizard
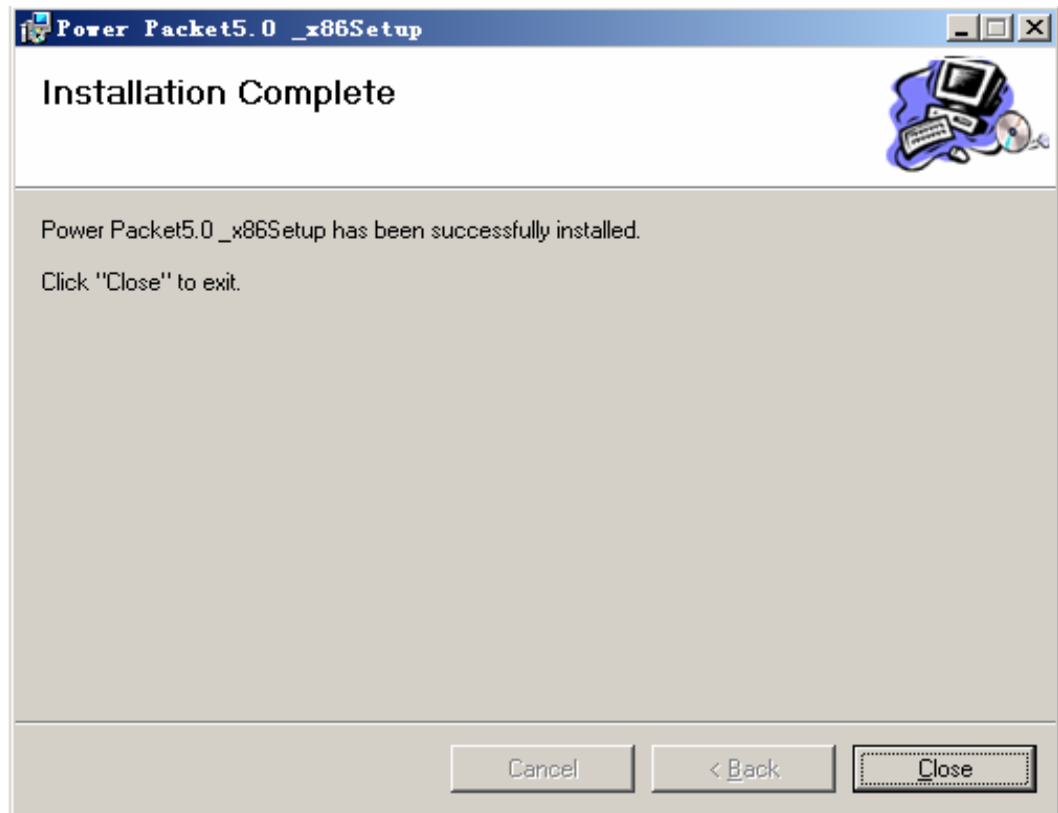
Figure 4-2 Select Installation Folder

Figure 4-3 Installation Complete

Click "Close" to complete installation.

5 How to Use the Utility Software

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 local HomePlug devices connected to the computer's NIC (Network Interface Card). The user can click the Connect button to its right. Once connected to the local device, the utility will automatically scan the power line periodically for any other HomePlug devices. If no local HomePlug devices are discovered, the status area above the connect button will indicate with a message 'NO HOMEPLUG ADAPTERS DETECTED'.
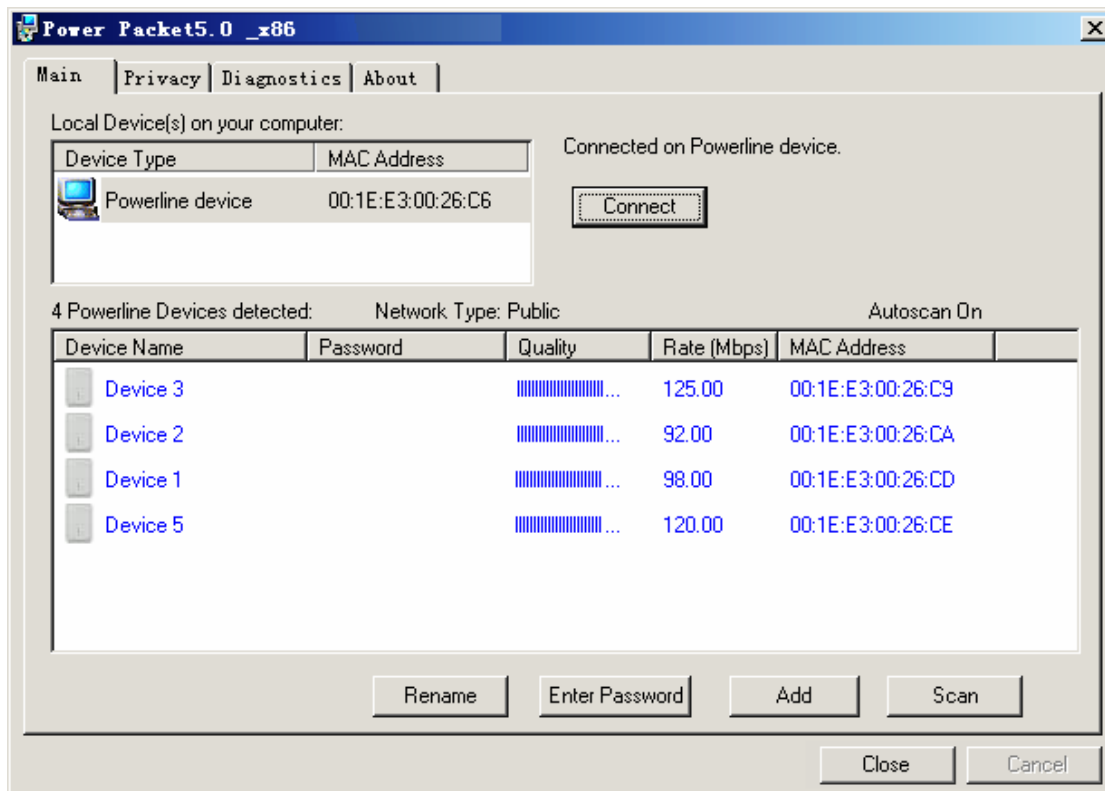

Figure 5-1: Main Tab information

The **lower panel** displays all the HomePlug remote devices, discovered on the current logical network. The total number of remote devices connected on the same network can be found on top of the Remote device panel. The Network type (Public or Private) is also displayed based on the network status of the local device. The scan status option is displayed on the top right corner above the Remote devices panel showing whether the Autoscan functionality is turned ON or OFF. The following information is displayed for all devices that appear in the lower panel.

Device Name

This column shows the default device name, which may be user re-defined. A user can change the name by either using the rename button or by clicking on the name and editing in-place.

MAC Address

This column shows the Remote device's MAC address.

Password

This column by default is blank and **"Enter Password"** button can be used to enter it.

To set the **Password** of the device (required when creating a private network), first select the device by clicking on its name in the lower panel and then click on the Enter Password button. A dialog box will appear as shown in Figure 5-2 to type the password. The selected device name is shown above the password field and the password can be verified by hitting the OK button. The Password field accepts the Device password in any case formats, with or without dashed between them.

A confirmation box will appear if the password was entered correctly. If a device was not found, the user will be notified along with the suggestions to resolve common problems. This process might take a few seconds to get completed.

Figure 5-2: Set Device Password

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 will appear as shown below in Figure 6. The dialog box allows the user to enter both a device name and the password.

A confirmation box will appear if the password was entered correctly and if the device was found in the powerline network. If a device was not found, the user will be notified and suggestions to resolve common problems will be presented.

Figure 5-3: Add Remote Device

⚠ *Note: The device must be present on the power line (plugged in) in order for the password to be confirmed and added to the network. If the device could not be located, a warning message will be shown.*

Scan

This button is used to perform an immediate search of the HomePlug devices connected to the Powerline network. By default, the utility automatically scans every few seconds and updates the display screen.

5.2 Privacy Tab

The **Privacy** screen provides the user with an option to maintain security for their logical network and also to select the devices that has to be included in the network. The appearance is shown in Figure 5-4.

All HomePlug devices are shipped using a default logical network (network name), which is normally **"HomePlug"**. The **Privacy** dialog screen allows user to change to a private network by changing the network name (network password) of devices.

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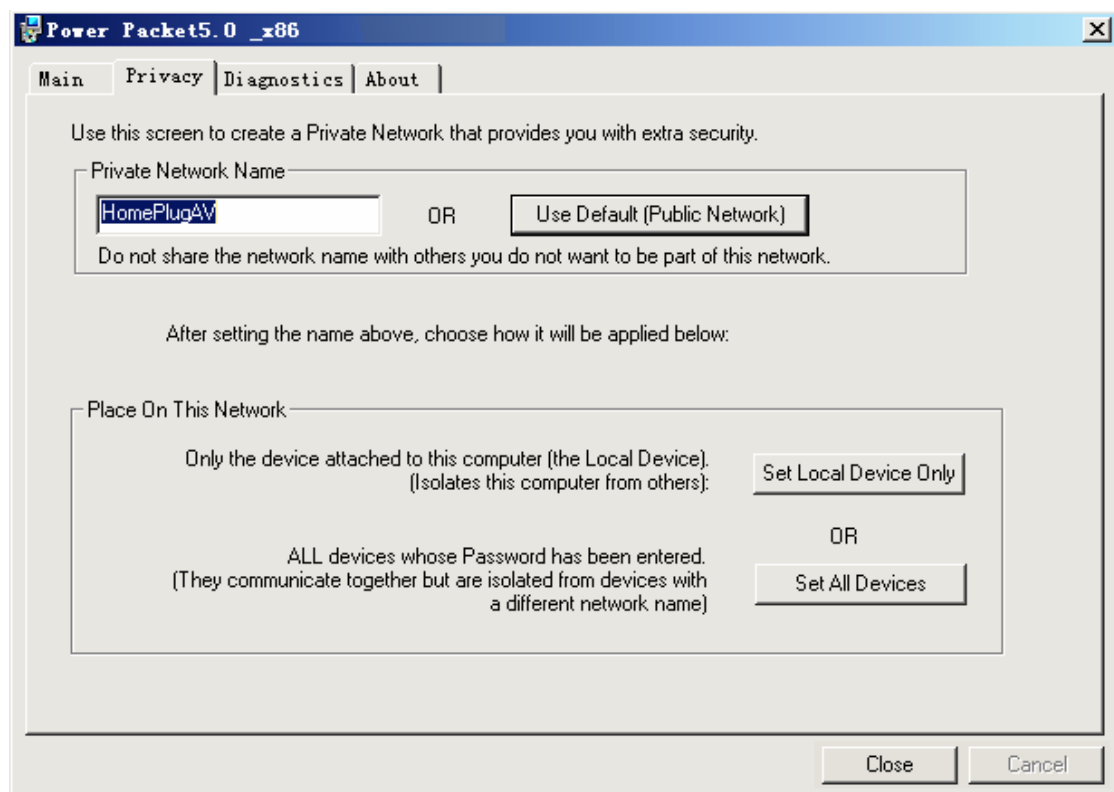

Figure 5-4: Privacy Screen

⚠ *Note: Changing the network name to anything other than HomePlug will show the network type on the main screen as Private.*

Set Local Device Only
This button can be used to change the network name (network password) of the local device. If a new network password is entered, all the devices seen on the Main panel prior to this will be no longer present in the new network, effectively making the local devices not to communicate to the devices that were in the old logical network. Devices previously set up with the same logical network (same network name) will appear in the device list afterward selecting this option.

Set All Devices

This button is used to change the logical network of all devices that appear on the Main panel whose Device's Password had been entered for the same logical network. A dialog window will appear to report the success of this operation. For devices whose device passwords were not entered, this operation will fail and will report a failure message.

5.3 Diagnostics Tab

The **Diagnostics** screen shows System information and a history of all remote devices seen over a period of time. The appearance is shown in Figure 5-5.

The **Upper panel** shows technical data concerning software and hardware present on the host computer which were used to communicate over HomePlug on the Powerline network. It shall include 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
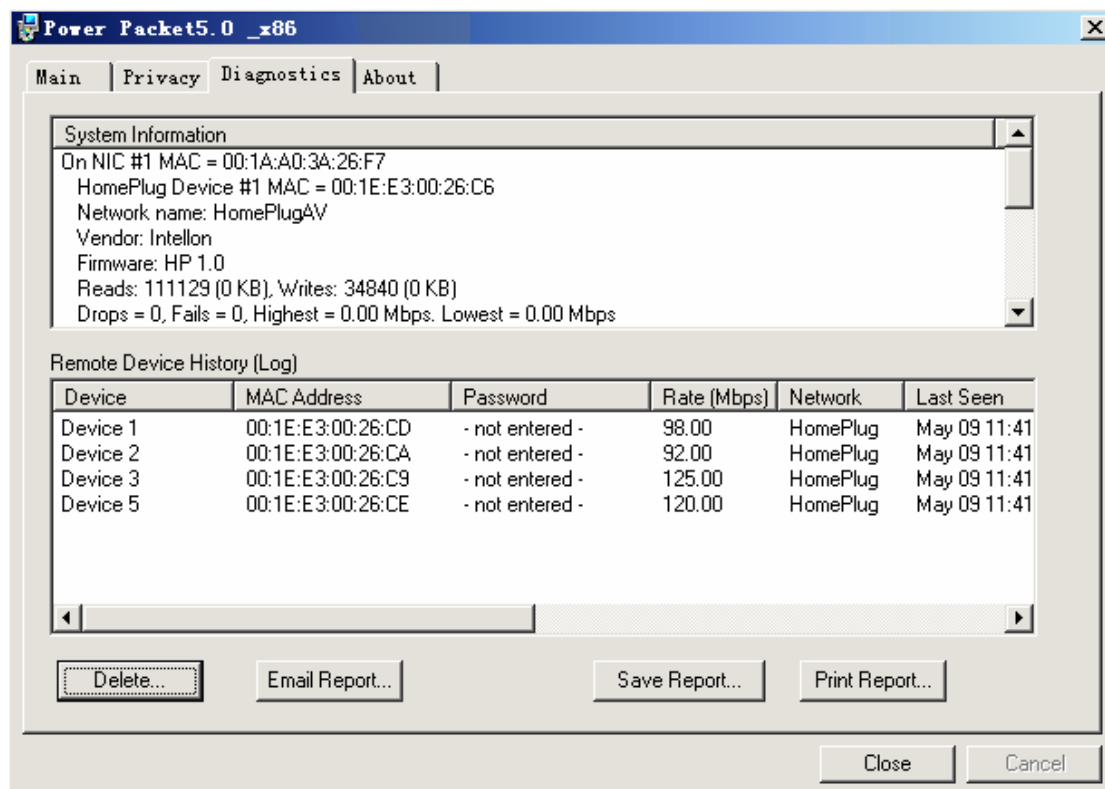
Figure 5-5: Diagnostics Screen

The **Lower panel** contains a history of all remote devices seen on the computer over a certain period of time. All devices that were on the powerline network are listed here along with a few other parameters. Devices that are active on the current logical network will show a transfer rate in the Rate column; devices on other networks, or devices that may 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
- Device MAC Address
- Device 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 may be saved to a text file for later use, or can be printed for reference for a technical support call. Devices, which are not part of the network anymore, can be deleted using the delete button. A dialog window pops up with a confirmation message if we try 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 on the web address field will open a web
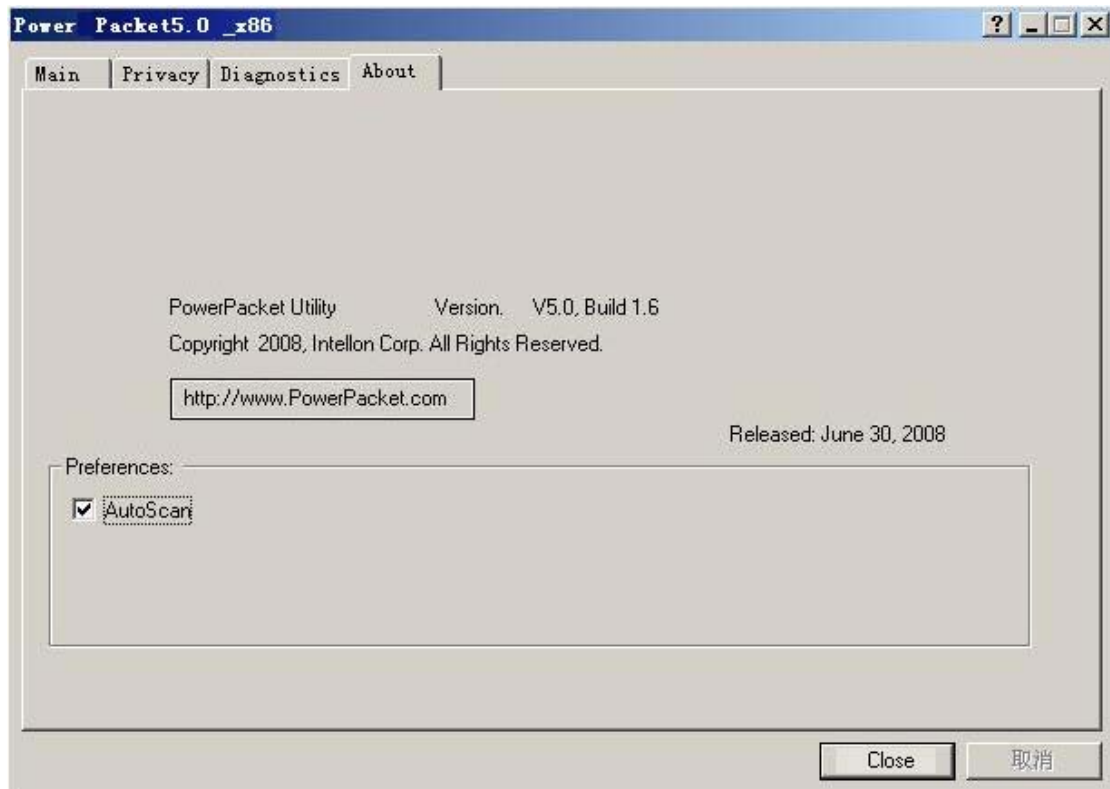browser and take the user directly to the web site.

Figure 5-6: About Dialog Tab

Preferences

The lower part of the panel may display options for turning the auto-scan feature on
or off.

6 How to use the NMK 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 using a NMK pushbutton press.

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, and want them to form a logical network:

1. Press the NMK button on the first device A for less than 3 seconds.
2. Press the NMK button on the second device B for less than 3 seconds. The button on B must be pressed within 1 minute
3. 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.
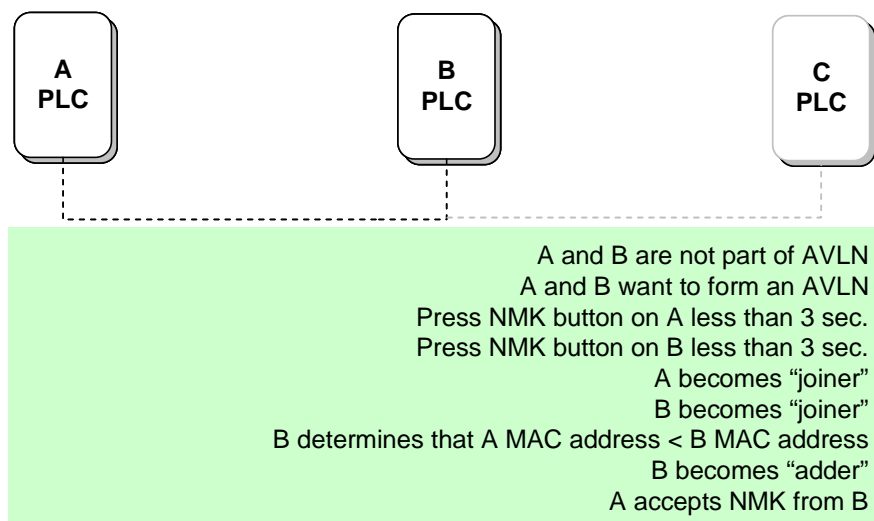
A PLC	B PLC	C PLC

A and B are not part of AVLN
A and B want to form an AVLN
Press NMK button on A less than 3 sec.
Press NMK button on B less than 3 sec.
A becomes "joiner"
B becomes "joiner"
B determines that A MAC address < B MAC address
B becomes "adder"
A accepts NMK from B

Figure 6-1: 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'.

1. Press the pushbutton on the 'joiner' for at least 3 seconds.
2. Press the pushbutton on any network device for less than 3 seconds, making it the 'adder'. Please press this pushbutton within 1 minute.
3. 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.
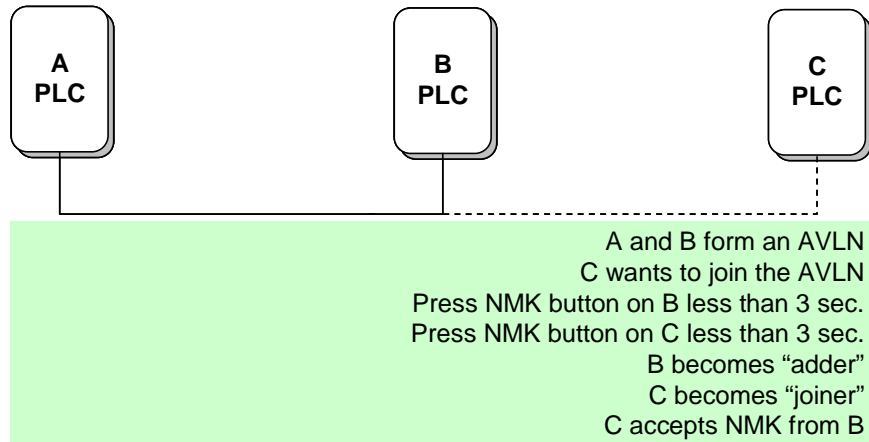

A and B form an AVLN
C wants to join the AVLN
Press NMK button on B less than 3 sec.
Press NMK button on C less than 3 sec.
B becomes "adder"
C becomes "joiner"
C accepts NMK from B

Figure 6-2: 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.

1. Press the pushbutton on the 'leaver' for at least 10 seconds. The device will reset and restart with a random NMK.
2. 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.
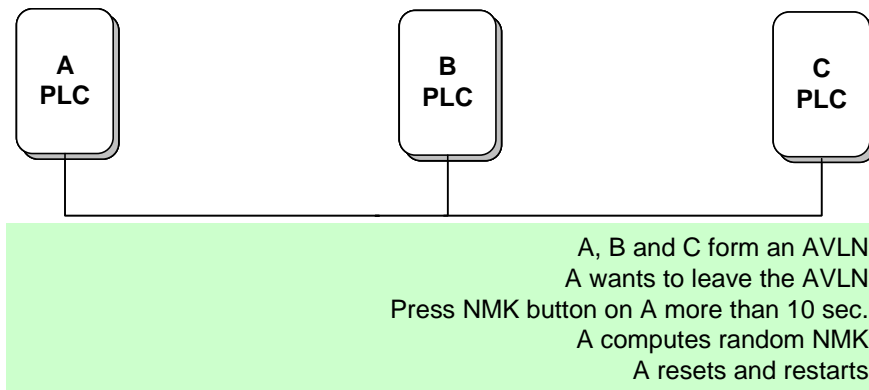

A, B and C form an AVLN
A wants to leave the AVLN
Press NMK button on A more than 10 sec.
A computes random NMK
A resets and restarts

Figure 6-3: 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 no female socket, it is recommended to Plug the device directly into a wall socket, not to power stripe.
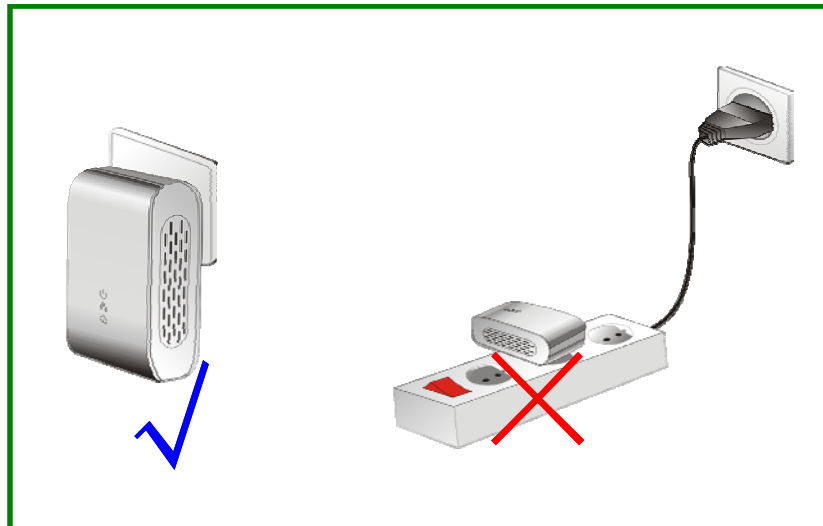
For the PLC device with female socket, you should connect all additional network devices that are connected to a multiple socket to the mains power supply via the electrical socket integrated into the PLC device with female socket. To take full advantage of the filter function, to improve data transmission in the network, always plug the power stripe into the female socket.
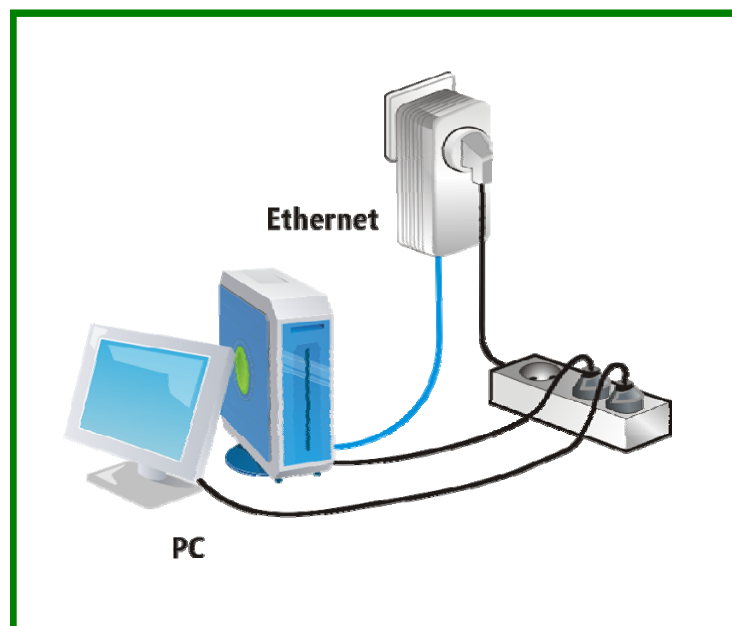
Appendix A   Specifications

Chipset	Intellon INT6400
Protocol	HomePlug AV 1.0 Co-exists with existing HomePlug 1.0
System Support	Windows, 2000, XP 32/64 bit and Vista 32/64bit
PLC Rate	Up to 200Mb
Modulation Band	2-30MHz
Modulation Schemes	Supports1024/256/64/16/8-QAM, QPSK,BPSK and ROBO
Encryption	128 AES
LED's	Power Ethernet 1~3: Ethernet Link and Activity Data: PLC Link and Activity
Push Button	Reset: Restore the default factory parameter Security: Set up network password automatically
Consumption	7W
Operating Temperature	0º to 40º C
Storage Temperature	-20 º to 70 º C
Operating Humidity	10% to 90% Non-condensing
Storage Humidity	5% to 90% Non-Condensing
Input Rating	100-240 VAC, 50/60Hz
Certifications	CE, UL, FCC Part 15 Class B
Green Standard	RoHS
Physical Characteristics	L×W×H: 115mm×42mm×76mm
Weight	170g

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, the CCo is a superset of a STA which provisioning of terminal equipment identifiers and global link identifiers

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, security key

PLC　　　Power Line Communication

PIB　　　Parameter Information Block

STA　　　Station, a STA in the network with a connection to the power line 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, 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. 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 riority	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
4	CAP2	4	CAP2
5	CAP2	5	CAP2
6	CAP3	6	CAP3
7	CAP3	7	CAP3