AV200 Powerline Ethernet Adapter

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Manual

Corinex

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Declaration of Conformity

CE

Model: **Corinex AV200 Powerline Ethernet Adapter**

Manufacturer: Corinex Communications Corp.
670-789 West Pender Street
Vancouver, BC
Canada V6C 1H2

Directives which Conformity is Declared:

EMC: 89/336/EEC
LVD: 73/23/EEC
R&TTE: 1999/5/EEC

Standards which Conformity is Declared:

EN 55022
EN 55024
EN 60950
EN 61000-3-2
EN 61000-3-3

The undersigned hereby declares the above specified equipment conforms to the above directives and standards.

Printed name / Title: **Peter Sobotka / CEO** Place / Date: **Vancouver / June.08.2005**

Signature: .....

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2006-12-06 ver. 4

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REGISTRATION AND WARRANTY

Please see the included product registration card for details of the standard consumer warranty on this fine Corinex product.

Contents

1 Introduction

1.1 Overview

The *Corinex AV200 Powerline Ethernet Adapter* is a network adapter, connecting your computers and devices to each other, and to your Internet connection, over the electrical circuits already in your home or office. Just plug the adapters into the wall, connect them to your computers, and you have an instant computer network, running at industry-leading speeds of up to 200 Mbps!

The advantages of Powerline include low network maintenance costs and no installation of long network cables. *Corinex AV200 Powerline* networks are simple to set up and instantly provide network connections at every standard electrical outlet.

The *Corinex AV200 Powerline Ethernet Adapter*:

- Enables users to connect individual PCs or other Ethernet devices to a local area network through existing electric power lines (Powerline).
- Enables file- and application-sharing.
- Enables peripheral- and printer sharing.
- Enables shared broadband Internet access.
- Enables sharing of bandwidth for multimedia applications, including voice, data, audio and video.
- Eliminates the need for long network cables throughout your home or office
- Is a cost-effective and reliable solution for high-speed communications in any home or small office.

1.2 About this Manual

This User Guide includes everything you need to know to help you successfully install the *Corinex AV200 Powerline Ethernet Adapter* and meet your networking needs. With the information in this manual, you should be able to:

- Plan the configuration of your *Corinex AV200 Powerline* network.
- Install and configure your *Corinex AV200 Powerline Ethernet Adapters* according to your plan
- Verify and optimize the performance of your *Corinex AV200 Powerline Ethernet Adapter*

2 Installation

2.1 Package Contents

When you receive your *Corinex AV200 Powerline Ethernet Adapter*, check to be sure that your package contains:

- *Corinex AV200 Powerline Ethernet Adapter*
- Standard Ethernet cable
- Standard power cable
- CD with documentation
- Quick Start Guide
- Registration and Warranty Card

We are always working to improve our products. For any hardware/software changes, downloads, and additional information on your device, please visit **www.corinex.com/retail**.

We also advise you to visit the Partners section of our web site at **https://www.corinex.com/web/docx.nsf/w/eng-partners**, where you can find valuable information about complex applications and installations, as well as partners in your area who can provide installation services.

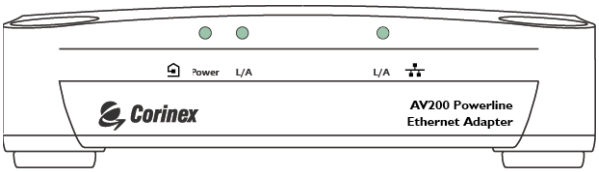
2.2 System Requirements

- IBM compatible PC or a Macintosh
- One available 10/100 Mbps Ethernet port
- Windows 98/ME/2000/NT/XP, Mac OS X or Linux operating system
- Javascript-compatible web browser for configuration (Netscape, Internet Explorer, Opera…)

2.3 Physical Description

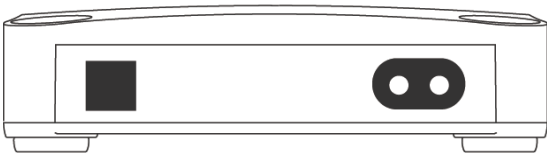
LED Definitions

(LEDs from left to right)



1. POWER	Green	On: Power on Off: Power off
2. PLC	Green	The behavior of this LED is explained in chapter 3.4.7
3. ETHERNET	Green	On: Link on LAN Off: No link on LAN Blinking: receiving/transmitting data

Connector Definitions
(Connectors from left to right)



1. LAN: 1x RJ-45 LAN10/100 Ethernet port

2. Power cord: Power supply & Powerline connector

2.4 Technical Specifications

Standards Compliance	IEEE 802.3u
Speed	Up to 200 Mbps on physical layer
AC Plug Type	US, EU, UK and AUS
LED Status Lights	Power, PLC Link/Activity, Ethernet Link
Interface	10/100BaseT Fast Ethernet, Powerline
Frequency Range used	2 – 34 MHz
Power Input	85 to 265 V AC, 50/60 Hz
Dimensions	148 mm L x 106 mm W x 47 mm H
Transmitted Power spectral density	-56 dBm/Hz
Power Consumption	5W
Safety & EMI	UL/EN 60950, FCC Part 15, EN 55022 EMC limits

2.5 Connecting the AV200 Powerline Adapter

To connect the *Corinex AV200 Powerline Ethernet Adapter* to your computer, follow the steps listed below.

1. Connect the supplied Ethernet cable to the Ethernet (LAN) port on the wall mount, and to an Ethernet port on your computer.
2. Plug the *Corinex AV200 Powerline Ethernet Adapter* unit directly into any standard electrical outlet with the included power cable.

Note: The *Corinex AV200 Powerline Ethernet Adapter* should be plugged directly into a wall outlet, not into a power strip or surge suppressor. Power strips and surge suppressors can weaken or block the Powerline network signal.

3 Adapter Configuration

In order to access the web-based configuration pages, it is necessary to know the adapter's IP address and for your computer to be connected to the adapter (as described in section 2.5). Corinex adapters come with a default IP address **10.10.1.69**.

Open a web browser (Microsoft Internet Explorer v6.0, Mozilla v1.7.2 and Mozilla Firefox v1.0 have been verified for use with these products.), and type the IP address in the address bar – the URL should be **http://10.10.1.69/** unless you have already changed it to something else.

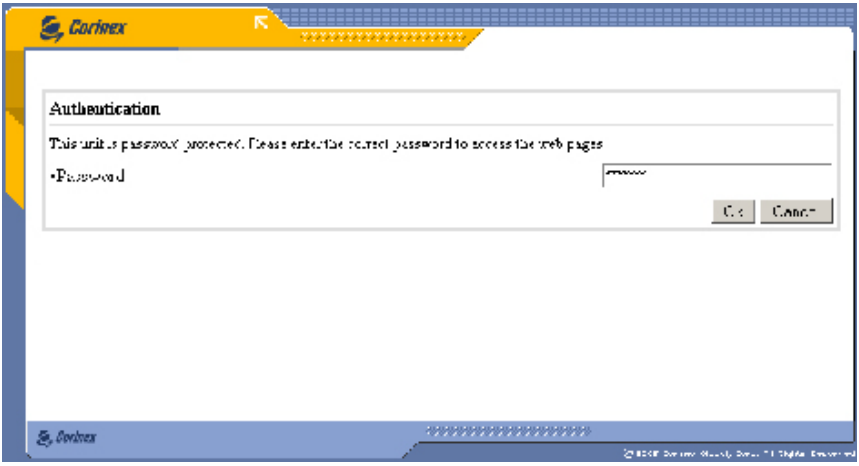
Changing the default IP address is required, so that two or more devices can be on the same network. The IP address is a device's unique identifier on a network, so the adapters would not be able to tell each other apart if they had the same identity, just as a postman wouldn't know which house to deliver to, if two neighbors in a large city had the same street number. Follow the steps below to configure a new IP address for each adapter:

1. In your computer's network settings, enter an address in the range 10.10. X.X (e.g. 10.10.1.2) and set the netmask to 255.255.0.0. This is necessary in order to be compatible with the adapter's default settings. For details on how to set up an IP address on your computer, please see chapter 5.
2. Plug in your *Corinex AV200 Powerline Ethernet Adapter* and connect it to the PC via the supplied Ethernet cable.
3. Open your web browser and type **http://10.10.1.69**. You will then be able to configure the settings for your adapter.

3.1 Password Page

If the password is enabled, you'll need to login before you can access the configuration pages. Therefore, you will first be taken to the **Authentication** page for login. If the configuration page is left idle for 5 minutes, the login expires and you will need to login again.

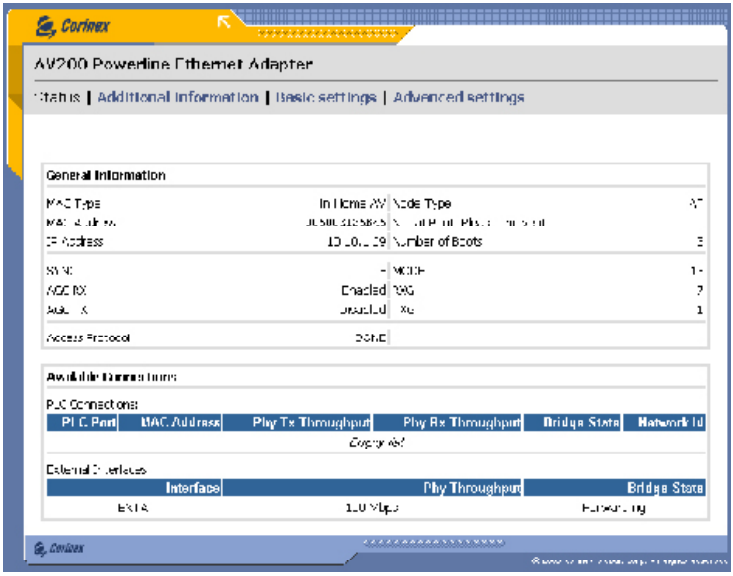
Note: The default password is "**paterna**".



Note: If password protection is disabled, you will be taken straight to the **Main** page, rather than the Authentication page.

3.2 Main Page

This is the first page after login. It shows basic status information about the adapter, a list of available Powerline connections, MAC and IP addresses, MAC type, etc.



At the top of the screen are the main categories, **"Status," "Additional Information," "Basic Settings"** and **"Advanced Settings"**. The menu shows the current category and page. (The current category is shown in black text and does nothing when clicked.)

3.3 Additional Information Page

This page shows more detailed information about the adapter.

System Information	
Uptime	Shows how long the adapter has been running since the last startup.
Firmware Version	Shows the detailed firmware version.

MAC Status	
MAC Address	Displays the unique hardware address (serial number) of the adapter.
MAC Type	This should be **In-Home AV.**
Node Type	Shows the type of device – this can be **EP**, **AP** or **Static AP**. For more information about these types, please see section 3.4.3.1.
Network Identifier	Shows the Network Identifier. Only devices with the same Network Identifier can communicate with each other.
Encryption Key	Shows whether or not the network encryption is enabled.

Network Status	
IP Configuration	Shows **"Fixed"** for set static IP addresses, or **"DHCP"** if the device receives an address from the server.
IP Address	Shows the current IP Address of the adapter.
Subnet Mask	Shows the subnet mask.
Default Gateway IP Address	Shows the Default Gateway.

PHY Status	
Notches	Indicates whether or not frequency notches are enabled. notches should always be enabled, in order to eliminate interference with Radio Amateur bands specified by the local authorities.
Power Control	Indicates status of the power control mechanism (described in chapter 3.4.4).

Multicast Status	
IGMP Aware Multicast Syndication	Shows the status of the IGMP settings (described in chapter 3.4.5).
Multicast Bindings	Shows all multicast bindings between multicast IP Addresses and AV200 Powerline MAC addresses.

VLAN Status	
VLAN Configuration	Indicates whether or not VLAN (virtual networking) is enabled.
VLAN Tag	Shows the selected VLAN Tag. All traffic from the ethernet port carries this tag.
VLAN Priority	Shows the selected priority, which is inserted into the VLAN tag.

Priority Status

Default Priority	Shows the default priority for traffic transmission.
Criterion 1 & 2	Shows which criteria are used to classify traffic. This can be **TOS, 802.1p** or **Custom**. If Custom, the complete parameters are displayed below. Please see chapter 3.4.7 for additional information.

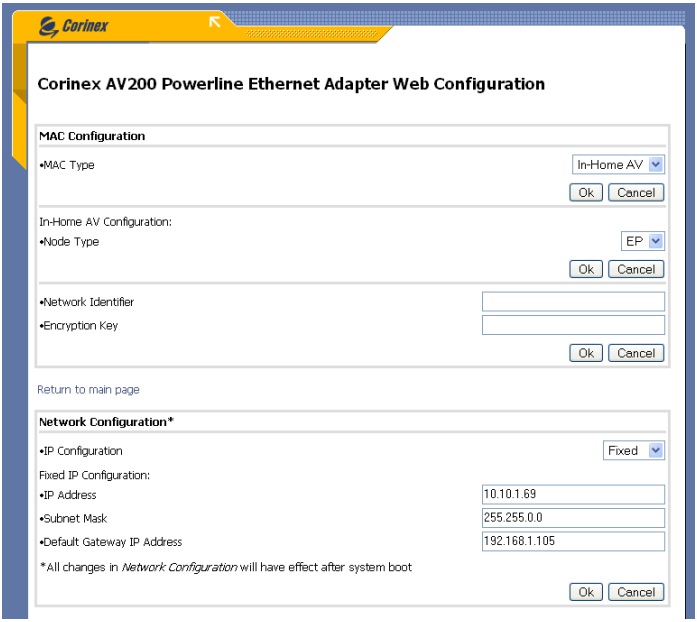
Security Status	
Status	Indicates whether or not the configuration page is password protected.

3.4 Change Configuration Page

3.4.1 Overview

The configuration pages allow you to change the settings on the adapter. Any parameters changed here will be stored in the adapter's permanent memory, and at the next startup, will be activated automatically. Any changes will take effect immediately after startup, with the exception of the Network Configuration settings (these require a restart of the adapter).

The configuration is divided into two sections: **"Basic settings"** and **"Advanced settings."**



Notes :

- A different IP must be set for each adapter on the network. The adapter's IP does not need to be in the same range as the PC, except when trying to change the adapter's settings on the configuration page (10.10.X.X and netmask 255.255.0.0 for an adapter with the default factory settings).

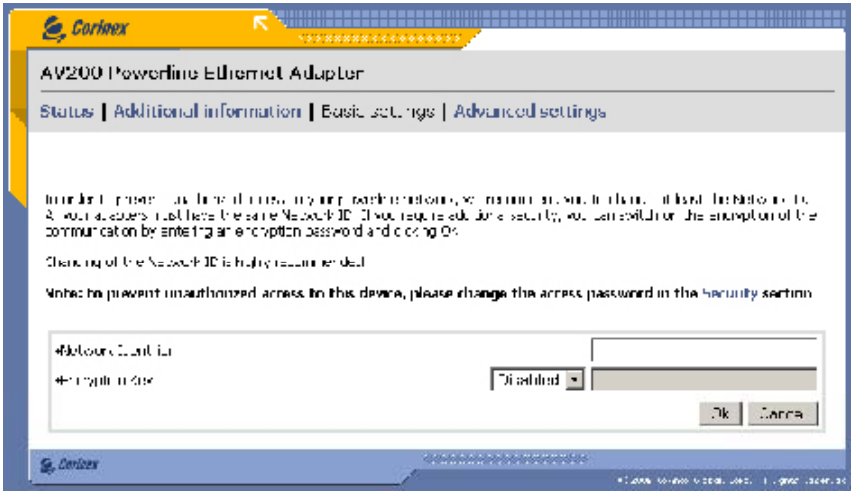
- The adapter's netmask can also be changed, for example to a type C (255.255.255.0) if necessary. This is a more advanced option, which you may ignore if you're not familiar with it.

- If the adapter is to be accessed through a router (e.g., in a large office network), the gateway IP needs to be configured. Otherwise, it can be ignored.

WARNING: CHANGING AN ADAPTER'S IP TAKES EFFECT ONLY AFTER A RESTART. YOU MAY WANT TO PLACE A LABEL ON EACH ADAPTER WITH ITS IP ADDRESS, SO YOU DON'T ACCIDENTALLY LOSE THE ABILITY TO ACCESS IT.

3.4.2 Basic Settings

Most of the time, the only thing that needs to be changed is the Network Identifier and the Encryption, in order to avoid interfering with other networks and protect your information. Most people will not need to enter the Advanced settings section. The AV200 Powerline network is totally secure with these basic settings.



The AV200 technology supports multiple networks on a single circuit. The networks are differentiated by Network Identifiers, which can be set in this section. The Network Identifier is a string of characters (Network Identifier field) which simply acts as a name for the network. This Network ID must be identical for all adapters on a network. Adapters with different Network IDs will not be able to communicate with each other.

The Network Identifier string can have up to 20 ASCII characters (lettters and numbers). Quote and double-quote characters are not supported. Extended ASCII characters are not recommended.

If you want to enable 3DES encryption in your network, please select one of the input methods and enter the password.

Input methods:

ASCII	If ASCII is selected, the Encryption Key string can have up to 24 non-extended ASCII characters. Quote and double-quote characters are not supported. Extended ASCII characters are not supported.
HEX	On the other hand, if HEX mode is selected, the Encryption Key string can have up to 42 hexadecimal digits (for example 34AE4F54B38D). This HEX method is more secure than ASCII.

3.4.3 Advanced Configuration

The advanced configuration section is divided into several subsections, which are described here.

3.4.3.1 MAC Configuration

The following parameters relate to the physical network setup, or topology. The current firmware version (Spirit 2.0.21 at the time of this publication) supports only one topology: In-Home AV. In this In-Home AV topology, two different adapter types can be configured, setting an adapter to function as either an **Automatic EP/AP** (End Point or Access Point, depending on the other adapters in the network) or a **Fixed AP** (assigned Access Point). Section 4 (In-Home AV Network Topology) contains more information about the available network topologies.

If you want to configure the adapter to function as an automatic EP/AP, please select **"EP"** from the list. If you want the adapter to behave as a Master, select **"Fixed AP"** from the list. After selecting one, click **"OK"** to confirm your choice.

> **Note**: Fixed AP is available only when a Network ID is set on the adapter (please read below for details on Network Identifiers).

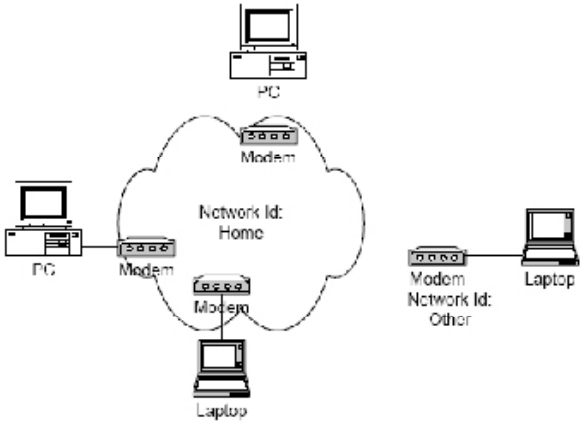
The AV200 technology supports multiple networks on a single circuit. The networks are differentiated by Network Identifiers, which can be set in this section. The Network Identifier is a string of characters (Network Identifier field) which simply acts as a name for the network. This Network ID must be identical for all adapters on a network. Adapters with different Network IDs will not be able to communicate with each other.

> **Note:** Please refer to section 4.2 for more information about the network types and their Network Identifiers.

If the Network Identifier field is left blank, the default, publicly available network is configured, and the adapter can communicate with all other adapters with empty Network Identifier fields. When you enter a Network ID, a private network is configured.

> **Note:** The Network Identifier string can have up to 20 ASCII characters. Quote and double-quote characters are not supported. Extended ASCII characters are not recommended

The following picture shows an example of two AV200 networks with different Network Identifiers:



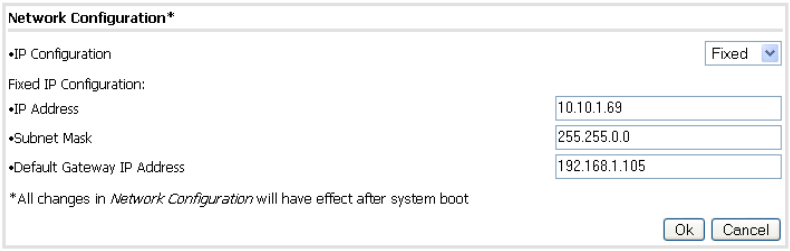
Communication between adapters (called modems in this picture) is encrypted with a Triple-DES algorithm. The Encryption Key can be set to any string of letters and numbers (Encryption Key field, ASCII or HEX). Saving an empty string (leaving it blank) disables the encryption. After selecting ASCII or HEX and then entering a password, click **"OK"** to confirm your choice.

Note: The encryption will be enabled only if a non-empty Network Identifier is set.

Note: If **ASCII** is selected, the Encryption Key string can have up to 24 non-standard ASCII characters. Quote and double-quote characters are not supported. Extended ASCII characters are not supported.
On the other hand, if **HEX** mode is selected, the Encryption Key string can have up to 42 hexadecimal digits (for example 34AE4F54B38D). HEX strings generate stronger keys.

3.4.3.2 Network Configuration

Your *Corinex AV200 Powerline Adapter* can be configured to use either DHCP (automatic IP address assignment), or a fixed IP.
The following parameters are used by the fixed IP configuration. In order for the adapter to correctly communicate with other devices on the network, it is necessary to define a valid IP address, as well as a proper subnet mask and gateway address. These parameters will be saved in the adapter's memory and activated at the next restart.



After changing any of these parameters, click **"OK"** to save your changes.

Note: Any change in the Network Settings requires a restart of the adapter to take effect.

Note: If you forget the IP address of the device, please recover it with the utility "getIP," which is located on the Documentation CD, or download it from the Corinex website at www.corinex.com.

3.4.4 PHY Configuration

By default, the adapter transmits over a frequency range anywhere from 2 to 32 MHz, and when an access network is detected, the adapter transmits over a range from 13.3 to 33.3 MHz, in order to avoid interference. This mode change is done automatically and cannot be configured by the user. It is only possible to enable or disable this "notches" function. The notches pre-defined in the adapter correspond to the IARU (International Amateur Radio Union) band plan for each world region. If the adapter is operating in an environment where it can cause interference to a HAM radio receiver, it is recommended to enable notches, in order to block the Powerline signal from the frequency bands used by radio amateurs.

Note: It is strongly advised to turn on the notching function.

Power Control is an automatic transmission power control which prevents different networks from overpowering each other.

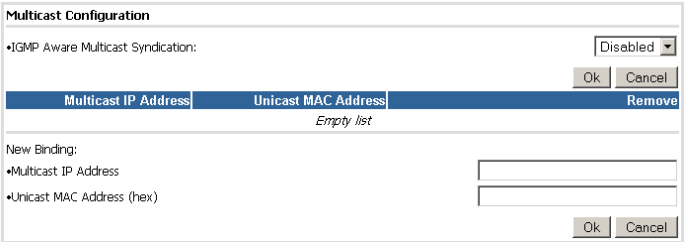
Power Control is turned on only when other networks are detected in the channel. If the transmission strength reaches the isolation point between networks, the transmission power is limited from overpowering the other network. If the isolation point is not reached, the adapters continue transmitting as normal.

3.4.5 Multicast Configuration

In order to optimize multicast traffic (video streams, etc.) between AV200 Powerline adapters, you can specify which adapters should receive the video. Other adapters will then not be able to receive the multicast communication, and therefore the bandwidth will be used only for transmission to the intended recipients, making your broadcast, and your entire network, more efficient.

This form shows the list of multicast bindings, where the IP addresses of adapters are assigned to a unicast (video source) MAC address. This list can be saved to memory on the adapter (**Save in NVRAM**). Bindings can be removed by checking their **"Remove"** checkboxes and clicking **"OK"**. Add a new binding to the list by entering the multicast IP address in decimal format (ddd.ddd.ddd.ddd), and the unicast (source) MAC address, in hexadecimal format (XXXXXXXXXXXX), in the appropriate fields and clicking **"OK."**

The new IGMP Aware Multicast Syndication feature can be enabled via this form. This feature is only available on private networks (those with a valid Network Identifier) and End Points (EP).



3.4.6 VLAN Configuration

When AV200 Powerline adapters are used for ADSL extension, it is important for the operator to be able to distinguish the type of traffic that each adapter is generating. This is usually done by means of VLAN tagging. The AV200 technology includes the ability to tag all traffic that enters the Powerline network through each adapter's Ethernet port. It is only tagging - there is no VLAN filtering on an AV200 Powerline network.

The parameters for VLAN configuration can be set in the form displayed below. First, the Spirit VLAN can be enabled or disabled (**Spirit VLAN Configuration** checkbox). If enabled, the VLAN tag (**Spirit VLAN Tag** field) and priority (**Spirit VLAN Priority** field) can then also be configured.

3.4.7 Priority Configuration

It is possible to configure the PLC LED (in the middle of the front panel). The LED shows the quality of the network connection to other AV200 devices. There are two configurable speed markers. The adapter simply reads the network speed and changes the blink rate of the PLC LED according to these markers. The default values are 25 Mbps and 75 Mbps.

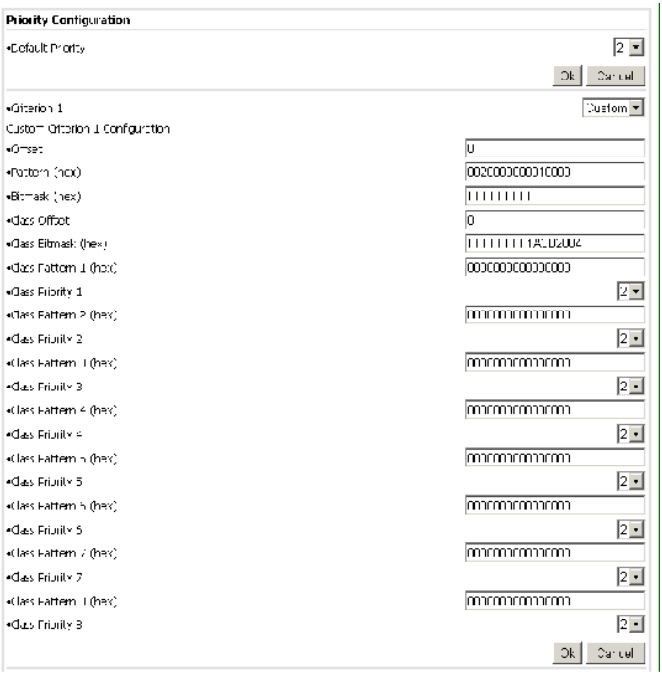
IMPORTANT NOTE: This advanced LED functionality is available only when a Fixed AP (described in section 3.4.3.1) is present on the Powerline network. In order to function correctly, the Fixed AP must be connected to your internet connection or to the first device on your network (i.e. modem or router). If there is no Fixed AP on the Powerline network, the LEDs may not behave as described below.

The behavior of the LED is described in the table below.

LED Status	Master (AP)	Slave (EP)
LED is OFF	no connection	no connection

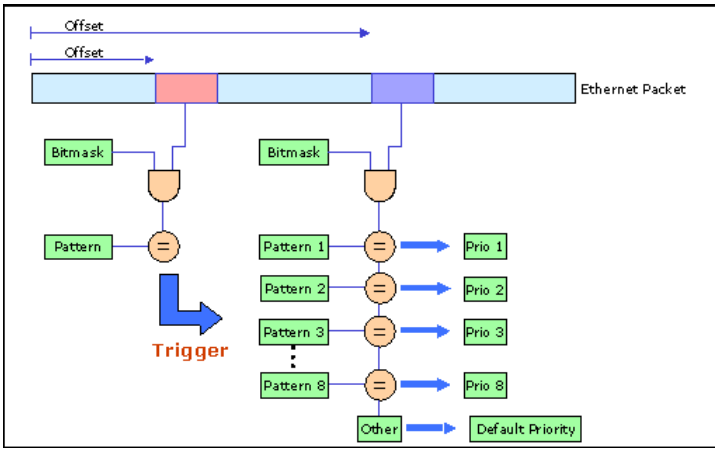
LED is blinking	The average connection to the Slaves is slower than the defined upper limit, but faster than the lower limit.	The average connection to the Master is slower than the defined upper limit, but faster than the lower limit.
LED is ON	The average connection to the Slaves is faster than the defined upper limit.	The average connection to the Master is faster than the defined upper limit.

After setting both values, please click **OK** to save the values to NVRAM. The changes will be applied immediately and the LED behavior may change.



Several options are available in this form. The first, and easiest to understand and use, is the Default Priority value. Output traffic generated by adapters with higher default priority will have preference in the network. The rest of the parameters let you configure two Class of Service criteria (**Criterion 1** and **Criterion 2** check-boxes).

If you select **None, 8021p** or **TOS**, custom parameters are hidden, leaving a pre-defined setting in place.
If you select **Custom** on the other hand, custom parameters are shown as below and can then be configured.
When several traffic flows are sharing the same network, it is sometimes necessary to establish several levels of priority in order to guarantee that bandwidth-sensitive applications like video and telephony function smoothly under network congestion. The traffic classifier is a packet inspector that is able to recognize several patterns in an Ethernet frame, and assign a different priority to each of them. To ensure that the classification is done correctly, there is a trigger mechanism prior to the actual classification. The trigger mechanism is also based on pattern recognition of a given location in each Ethernet packet. The following picture depicts the packet classification mechanism:



There is one offset, and one bitmask and pattern for the trigger condition. The trigger condition is used to make sure that the Ethernet frame contains, for example, an IP frame. To check this condition, the offset must be set to 16 and the bitmask to 0xFFFF. If the resulting pattern is 0x0800, then the Ethernet frame contains an IP packet and the classification can be made to a known field.

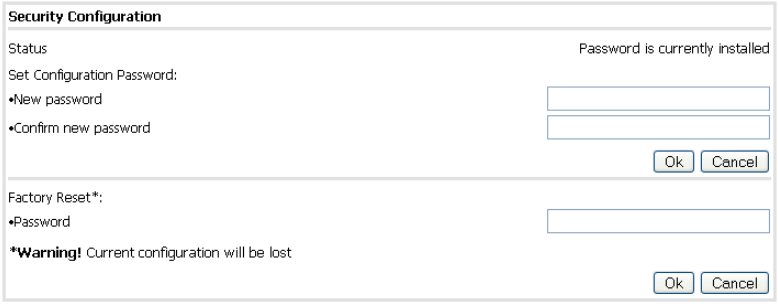
There is another offset and bitmask for the classification condition. The resulting value is compared with a set of patterns. If the value matches a given pattern, the packet will be classified with the specified priority. If the value does not match any

of the patterns, it will get a default priority.

There is a set of pre-defined criteria which classifies traffic based on the **802.1p** field of the Ethernet packet or the **TOS** field of the IP packet.

3.4.8 Security Configuration

The configuration page allows you to change the password. Type your new password and confirm by typing it in a second time. If both fields are left empty, the password will be disabled (the message **'No password installed'** will be shown). You can turn the password protection back on at any time by simply entering a password, as described above..



Factory reset will restore the adapter's default settings. The system will ask for the password, which is "**betera**". Then click **OK**. The adapter will restart with the following configuration:

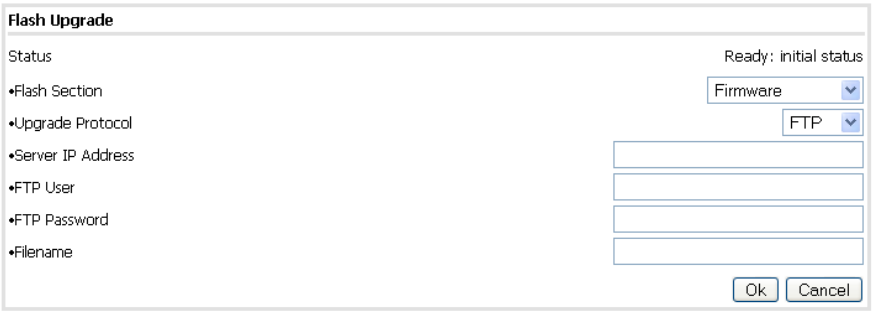
- IP address = 10.10.1.69
- Configuration interface password = paterna
- Factory reset password = betera
- Device type is Automatic EP/AP
- Network Identifier is blank
- No encryption and no VLAN settings

3.4.9 Hardware Reset

Clicking on this button will restart your adapter. The configuration will remain the same, and any changes made in the Network Configuration section will be applied. This means that if you've changed the IP address, the adapter will restart with the new IP address.

3.4.10 Flash Upgrade

The firmware, the loader and the factory settings (default factory configuration) are stored in Flash memory. To upgrade them, first select the Flash section to update (**Firmware, Loader** or **Factory Settings**) and the protocol (**FTP** or **TFTP**). Type the IP address of the FTP or TFTP server (**Server IP Address** field). (If using FTP, type the user name (**FTP User**) and password (**FTP Password**)). Finally, type the name of the firmware file (**File Name**) and click **OK**.

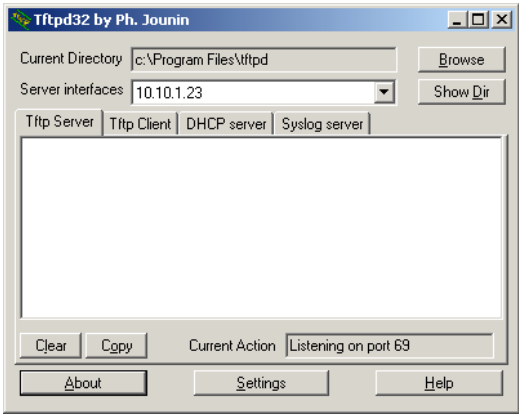


3.4.11 Firmware upgrade using a TFTP Server

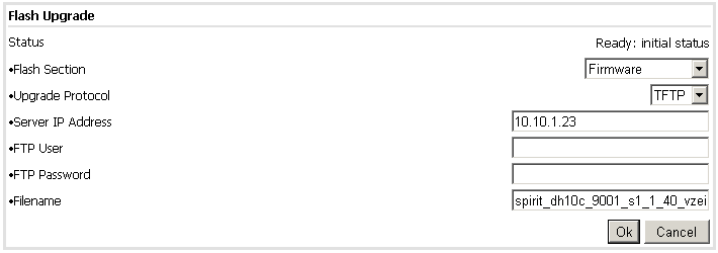
To upgrade the firmware of the adapter using TFTP, a TFTP server must be running on a computer. We recommend a freeware tool called **TFTPD32**. This tool can be downloaded at the following address: **http://tftpd32.jounin.net/**. Download the new firmware file from the Corinex web site at **http://www.corinex.com**.

Follow the steps below to update the firmware:

1. Open **TFTPD32**.



2. Save the firmware file in the folder specified in **"Current Directory"** or click **"Browse"** and find where the file is saved.
3. Open the Web browser and enter the IP of the adapter to be upgraded.
4. When the page comes up, click on **Change configuration**.
5. In the **Firmware Update** window, select TFTP and enter the IP of the TFTP server and the name of the file, as shown in the following picture :

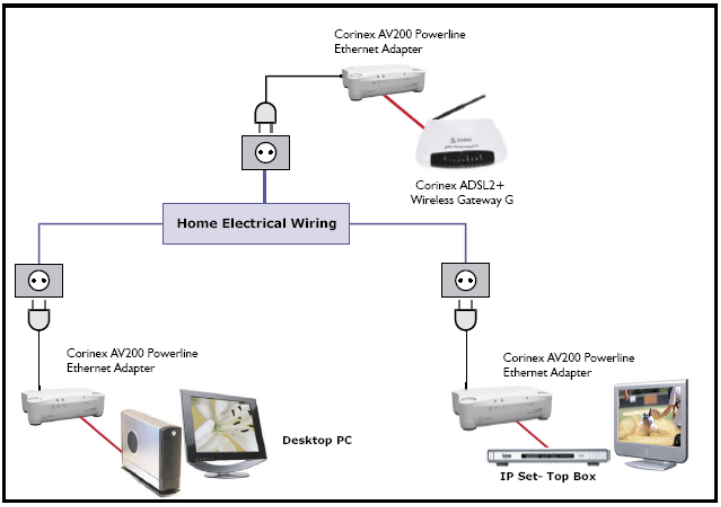


6. Click **"OK"** to start the process. The progress is shown every 30 seconds.
7. The adapter will first download the file and then calculate the CRC.
8. If the CRC is correct, the **Hardware Reset** button will be highlighted. The adapter must be restarted for the new firmware to be activated.

3.4.12 Configuring Video Applications

On a network where real-time traffic must co-exist with massive data transfers, the service classifier must be used to prioritize the more sensitive traffic above the other types of traffic.

As an example, consider the network shown below :



The adapter connected to the ADSL adapter is the access point. Data and video are delivered through ADSL. The access point must prioritize the video higher than other data, to avoid a jittery image whenever there is a heavy data download.

First of all, the **Criterion** field must be set to **Custom**, in order to create custom rules for traffic classification.

To prioritize UDP traffic, first the Ethernet packets containing IP packets must be detected. This requires detecting the pattern 0x0800 at offset 16. Because the field to inspect is two bytes, the bitmask must also cover the same space. Therefore, 0xFFFF is used as the bitmask. These values are introduced in the fields **Custom Criterion Offset**, **Custom Criterion Pattern** and **Custom Criterion Bitmask**.

Once the trigger condition is entered, the classification rules must be specified. Only the fields that are actually changed will take effect. The rest will be ignored. IP packets have a one-byte field at offset 27 that indicates the Protocol Type. UDP protocol is pattern 0x11. Because the field to inspect is only one byte, the bitmask is also one byte. The values are entered in the first available rule (1) as **Class Pattern 1** and **Class Priority 1**.

The rest of the traffic (FTP, web browsing, etc.) will receive default priority 2. On the other side of the network, the adapter connected to the computer will also classify outgoing data traffic with default priority 2 because no rule has been programmed.

> **Note:** While the offset value is assumed to be decimal, the patterns and the bitmasks are in hexadecimal format by default.

3.5 Firmware Update Page

This page appears when a firmware update is requested from the **Change Configuration** page, and it shows the status of the current firmware update. The **Firmware Update** page is reloaded automatically every 30 seconds. When the status line shows **Ready: finished correctly**, the adapter can be restarted, and the new firmware will be activated.

If the update process fails, an error message will be shown. In this situation, the adapter can be reset without any risk, but the old firmware will still be present on the adapter.

4 Video Network Setups

4.1 Introduction

An *In-Home AV* network is made up of an access point (AP) adapter and several end points (EPs). In-Home AV networks can have only one AP. However, several In-Home AV networks can be created in the same space, each of them with its own AP, because each network is isolated by a unique network identifier. An adapter can be configured as a Fixed AP (i.e. it always will be an AP) or an automatic EP/AP. When set to automatic, the In-Home AV protocol decides which adapter will function as an AP. This means that if no Access Point (AP) has been defined, an End Point (EP) will be automatically set to function as an AP.

Note: It is recommended to configure a Fixed AP. This provides increased stability for future reconfigurations and in multi-network environments.

Note: It is not necessary to have full connectivity between all the adapters on a network. The network topology will be configured automatically, allowing for the use of repeaters if the connectivity between two adapters fails.

The necessary steps for setting up a basic In-Home AV network are, for each adapter, as follows:

- Set its **IP address**. It should be a unique **IP** address (e.g. private address like 10.10.1.<*pick a number*>).
- Select the spectral configuration (**notches** enabled or disabled).
- Set the **Network Identifier**. It should be the same value for all adapters on the network.
- Configure the **Encryption Key**. It should also be the same value for all adapters on the network.
- It is not necessary to configure the **In-Home AV** MAC, since there is only one available network topology in the current firmware version. To configure a **Fixed AP** is optional.

4.2 Network Scenarios

This section contains a few network scenarios, explaining the application and necessary configuration.

There are two types of In-Home AV network.

- **Public Network** - This is the default configuration of an In-Home network. If you do not want to change the settings on your network, the network configuration protocol will configure all the adapters automatically. By default, all adapters are EPs and have a public (empty) network ID. If the protocol does not detect an AP in the channel, it will change an EP to act as an AP. All EPs will connect directly to the automatic AP if they can, or to an EP that will act as a repeater. Then the network will be established.

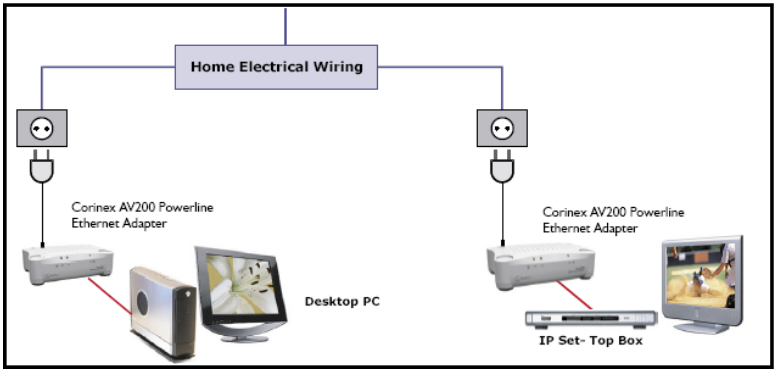
- **Private Network** - To configure a private network (to ensure data privacy), a network ID must be assigned to all adapters on the network using the configuration tool. It is recommended to configure a fixed AP (for example the adapter with the video server or Internet access). If the fixed AP is turned off or is not defined, the network configuration protocol will select an EP to change to function as an AP (automatic), in order to configure the network.

4.2.1 Single-Network Scenarios

The following two sections show examples of a single In-Home AV network.

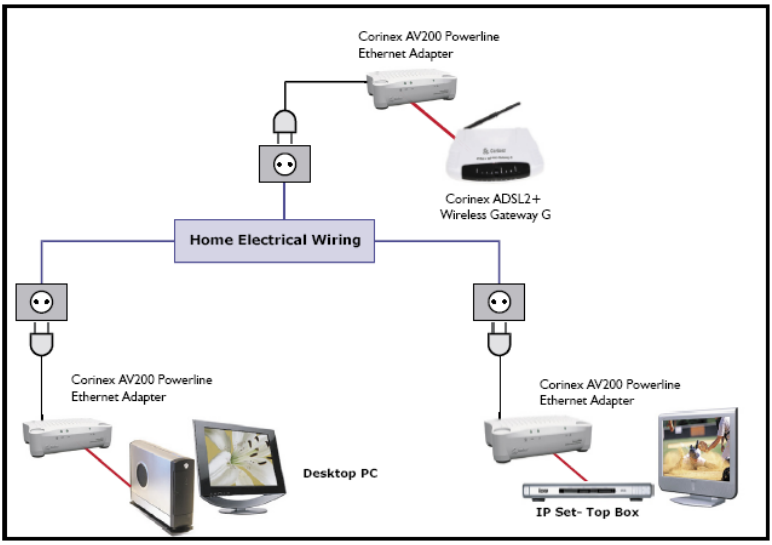
4.2.1.1 Local Area Network Using Two AV200 Powerline Ethernet Adapters

The picture below shows a simple PLC (Powerline) network where two adapters are used to make a local area connection available to all outlets of the house. This is the simplest type of network, where no QoS (Quality of Service) configuration is required.



4.2.1.2 Extending the Internet Connection to an AV200 Powerline Network

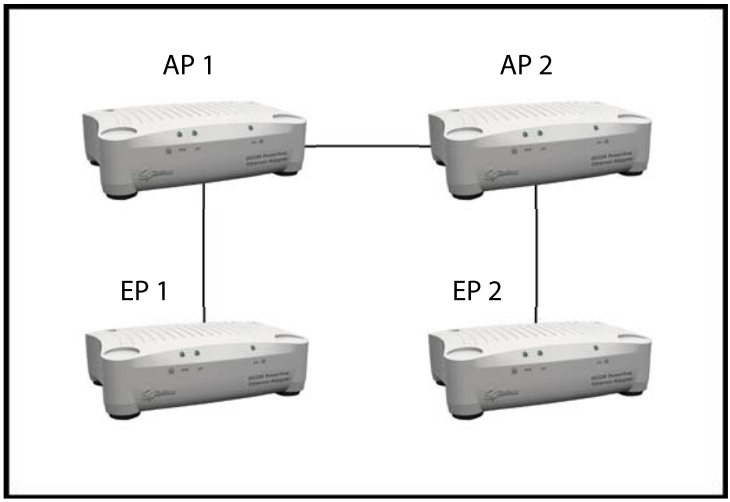
The next picture shows a more advanced Powerline network with three *Corinex AV200 Powerline Ethernet Adapters*. This is a common network configuration, where Internet access and digital video are delivered through the same ADSL line. This configuration requires some QoS (Quality of Service) settings to guarantee video quality when the network is carrying large amounts of data from the Internet connection.



Note: Any of these two basic scenarios can be enlarged, adding more adapters, computers and set-top-boxes.

4.2.2 Multi-Network Scenarios

A multi-network scenario occurs whenever there are two or more adapters from different networks (different network IDs) on the same circuit. In this case, a coexistence mechanism is included, which allows a secure form of communication without interference from adapters from other networks.



In multi-network scenarios, such as the one depicted in the picture above, there is a new entity, called the QoS controller. The QoS controller's role is to assign channel access to the different networks. The QoS controller acts at the same time as the AP of one of the networks. In the presence of several networks, the coexistence protocol automatically selects one of the APs as the QoS controller.

4.2.2.1 Two Networks on Different Circuits

If two In-Home AV networks are configured, with no direct visibility between any of the adapters belonging to different networks, then these two networks will behave as two independent networks. Both APs will act as QoS controllers.

4.2.2.2 Two Networks on the Same Circuit

Different networks are defined by different network IDs.

If two In-Home AV networks are configured as public networks, the coexistence protocol will act as if there were only one network. The network ID is transmitted by every adapter to communicate the existence of its network. If an adapter with network ID A receives network ID B, then it knows that there are at least two networks sharing the channel.

For example, one In-Home AV network is configured and running. A second network is configured and becomes active. Then the second network will notify the first network of its existence in some specified access slots, and both networks will automatically be reconfigured and will share the channel. If both networks are configured at the same time, the QoS controller will be selected from all available APs.

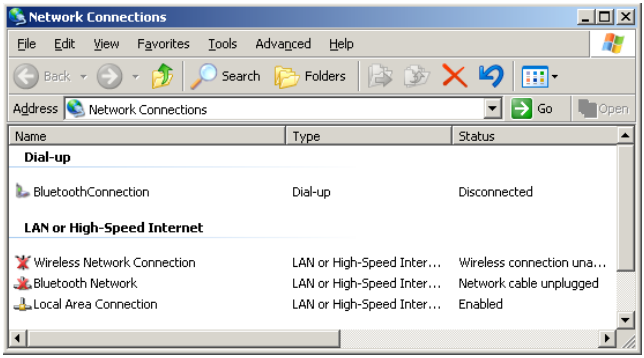
5 Network Configuration

5.1 Setting an IP Address on your Computer

This section explains how to set a static IP on your computer, in order to connect to the *Corinex AV200 Powerline Ethernet Adapter* and configure it.

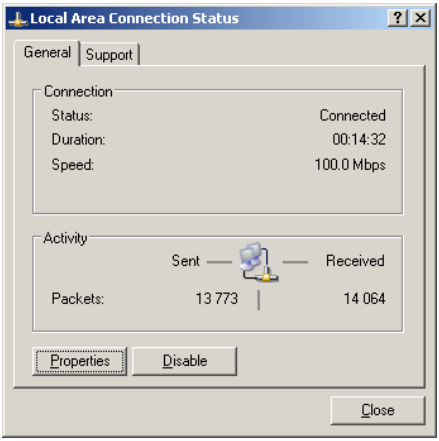
5.1.1 Setting Up a Static IP in Windows XP

1. Click the **Start** button, open the **Control Panel**. From there, click the **Network Connections** icon and then the **Network Connections** window appears.

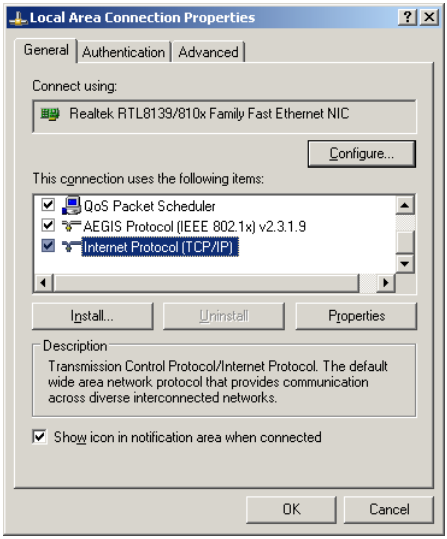


2. Select the **Local Area Connection** icon for the applicable adapter (Ethernet adapter or Powerline - usually the first adapter listed). Double-click the **Local Area Connection**.

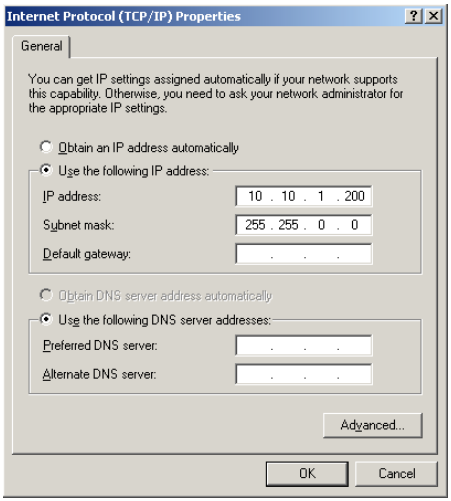
3. The **Local Area Connection Status** screen will appear. Click **Properties**.



4. Select **Internet Protocol (TCP/IP)** and click the **Properties** button.



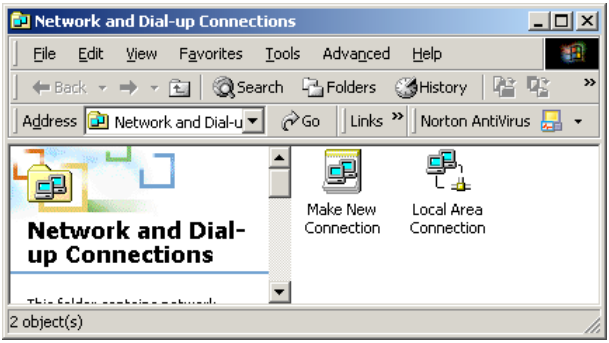
5. Select **Use the following IP address**. Set the **IP address** manually in the format 10.10.1.X (for example 10.10.1.200) and mask 255.255.0.0 of local TCP/IP settings. The **Default gateway** box can be left blank.



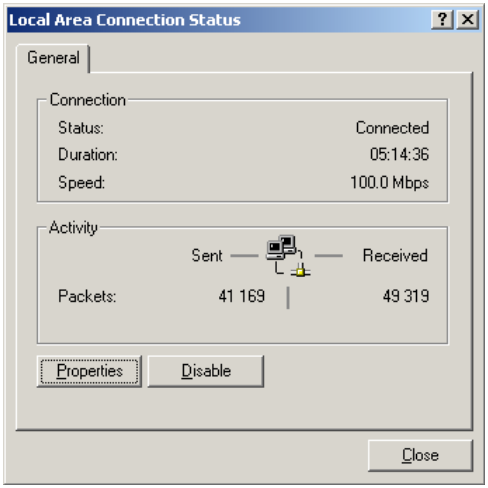
6. Click **OK** in the TCP/IP Properties window to complete the PC configuration, and click **Close** or the **OK** button to close the Network window.

5.1.2 Setting up a static IP in Windows 2000

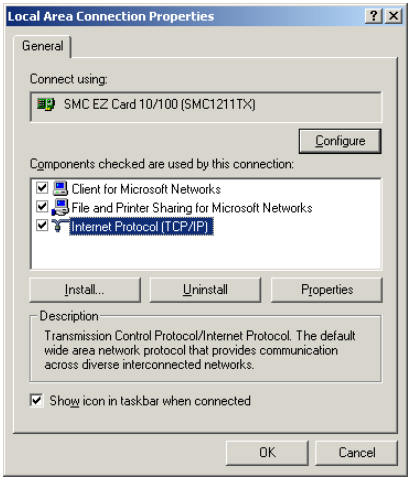
1. Go to the **network** screen by clicking the **Start** button. Click **Settings** and then **Control Panel**. From there, double-click the **Network** and **Dial-up Connections** icon.



2. Select the **Network and Dial-up Connections** icon for the applicable Ethernet adapter (usually it is the first Local Area Connection listed). Do not choose a TCP/IP entry which name mentions DUN, PPPoE, VPN, or AOL. Double click the **Local Area Connection**. The following window will appear.

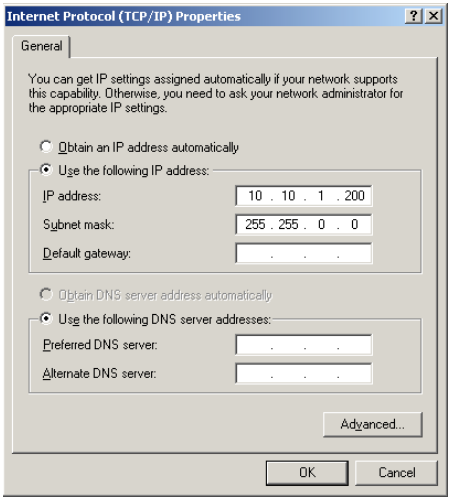


3. Click the **Properties** button to get to the Local Area Connection Properties.



4. Select **Internet Protocol (TCP/IP)** and click the **Properties** button.

5. Select **Use the following IP address**. Set the **IP address** manually in the format 10.10.1.X (for example 10.10.1.200) and mask 255.255.0.0 of local TCP/IP settings. The **Default gateway** box can be left blank.



6. Click the **OK** button in the TCP/IP Properties window to complete the PC configuration, and click **Close** or **OK** to close the Network window.

5.1.3 Setting Up a Static IP in Windows 98

1. Go to the **network** screen by clicking the **Start** button. Click **Settings** and then **Control Panel**. From there, double-click the **Network** icon.

2. On the **Configuration tab**, select the **TCP/IP** line for the applicable Ethernet adapter. Do not choose a TCP/IP entry that mention DUN, PPPoE, VPN, or AOL names. If the word TCP/IP appears by itself, select this line. If there is no TCP/IP line listed, please refer to your Ethernet Adapter's User Guide on how to install TCP/IP protocol. Click the **Properties** button.

3. If you do not have DHCP server on the network, then select **Use the following IP address**. Set the **IP address** manually in the format 10.10.1.X (e.g. 10.10.1.200) and mask 255.255.0.0 of local TCP/IP settings and click the **OK** button.

4. Click the **OK** button again. Windows may ask you for the original Windows installation disk or additional files. Supply them by pointing to the correct file location, e.g., D:\win98, D:\win9x, c:\windows\options\cabs, etc. (if "D" is the letter of your CD-ROM drive).

5. Windows may ask you to restart your PC. Click the **Yes** button. If Windows does not ask you to restart, restart your computer anyway.

5.1.4 Setting Up a Static IP in Linux

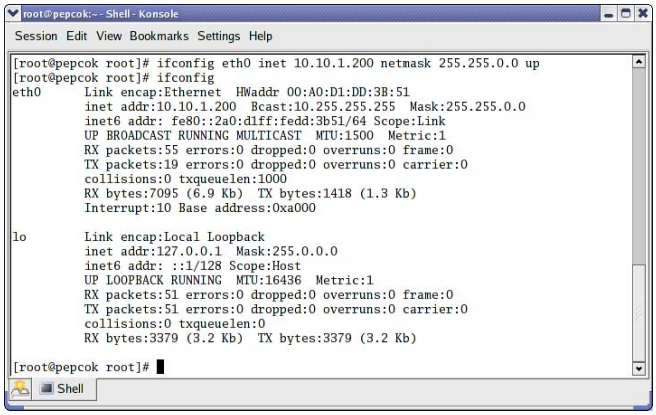
1. You have to be logged in as *root* in order to change the IP address in your Linux system.

2. Enter the console if you are using a graphical user interface (KDE, Gnome).

3. To change the IP address to 10.10.1.200, enter the command:

   ifconfig eth0 inet 10.10.1.200 netmask 255.255.0.0 up

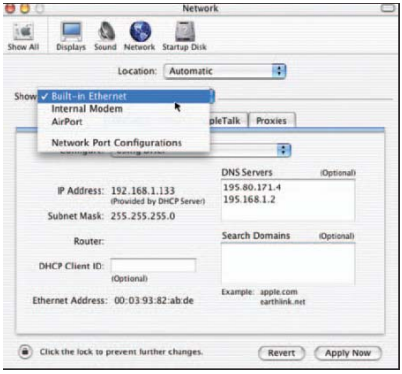
   and press **Enter**. The previous command takes eth0 as the name of the Ethernet interface and may be different on your system. You can check the status of all network interfaces by executing the command **ifconfig** on the console.



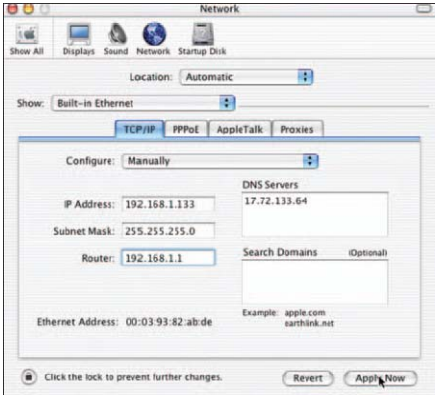
5.1.5 Setting up a static IP in Mac OS

1. Open the **Network** Control Panel in **System Preferences**.

2. Select **Built-in Ethernet** from the pop-up menu.



3. Set the **IP address** manually in the format 10.10.1.X (e.g. 10.10.1.200) and **Subnet Mask** 255.255.0.0.



4. Click on **Apply Now** and close the **Network** panel, saving your settings.

5.2 Improving Network Performance

The latency (delay) of a Powerline network is higher than that of an Ethernet network. Most operating systems have a default setting of the network latency based on Ethernet figures. To obtain the maximum performance using TCP traffic (FTP download, for example) the operating system has to be tuned to the new network conditions.
For improving the network performance, we provide scripts for Windows and Linux operating systems. The scripts can be found on the enclosed CD, in the folder **scripts**. The scripts will set the TCP window size to 512 kB.

With a Windows PC, simply double-click on the file **tcpwin.reg**, provided on the documentation CD in the "scripts" folder. You can also run the script using the autorun feature on the CD.

```
Windows Registry Editor Version 5.00

[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters]
"TcpWindowSize"=dword:00080000
"GlobalMaxTcpWindowSize"=dword:00080000
"Tcp1323Opts"=dword:00000003
```

tcpwin.reg for use with Windows operating systems

With a Linux PC running kernel 2.4 or higher, open the console and execute the command **./tcpwin.sh 512** logged in as *root*.

```
#!/bin/sh

#
# Corinex TCP Window Size Tweak
#

if [ "$#" -eq 0 ]
then
        echo "Usage: $0 <window size in KB>"
        exit
fi

WIND=`expr $1 \* 1024`

echo $WIND > /proc/sys/net/core/rmem_default
echo 8388608 > /proc/sys/net/core/rmem_max
echo $WIND > /proc/sys/net/core/wmem_default
echo 8388608 > /proc/sys/net/core/wmem_max

echo 4096 $WIND 8388608 > /proc/sys/net/ipv4/tcp_rmem
```

tcpwin.sh for use with Linux operating systems

After applying the script, please restart the system. This applies to both Windows and Linux.

5.3 Checking Network Performance

On the **Main** page, under the heading **Available PLC Connections**, is a list of the MAC addresses of all of the neighboring adapters that have a connection with that adapter. The list also indicates the physical throughput (actual data rate), in terms of both transmission and reception, that the adapter is achieving with each adapter on the network.

Available PLC Connections

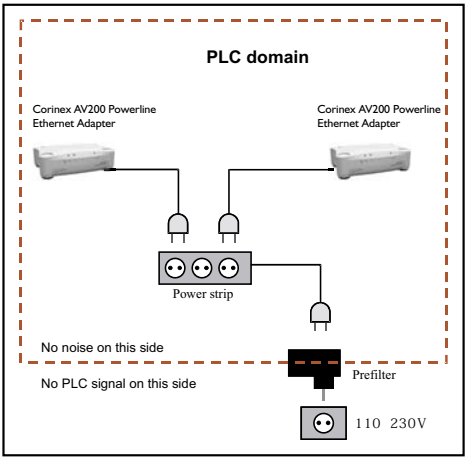
PLC Port	MAC Address	Phy Tx Throughput	Phy Rx Throughput	Bridge State
10	0050C22CF6B8	116 Mbps	114 Mbps	Forwarding
9	0050C22CF6C6	112 Mbps	110 Mbps	Forwarding

5.4 Using Powerline Filters

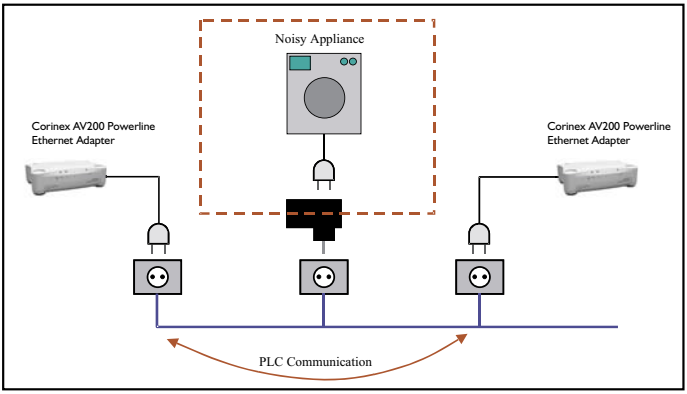
A PLC (Powerline) filter is a low-pass filter that will only allow the 50/60 Hz main voltage through. This filter blocks the Powerline signal.

When to use this filter:

- When you want to isolate a Powerline test network from the rest of the electrical grid, either because you don't want the Powerline signal from the test network to go out and disrupt other adapters, or because you want to isolate this network from the noise, or other traffic, in the rest of the electrical grid. This setup is illustrated in the picture below.



- When you want to isolate the electrical noise produced by some household appliance, because this noise falls in the PLC band and disrupts the signal from the adapters. This setup is illustrated in the picture below.



6 Troubleshooting Guide

The *Corinex AV200 Powerline Ethernet Adapter* has been designed to be a reliable and easy-to-use network connection device. Please refer to the list below to aid in troubleshooting or visit **www.corinex.com/retail** and go to the appropriate section for information on your product. There you will find news, manuals and software updates, as well as frequently asked questions (FAQ).

The POWER LED is off.

1. Make sure the adapter is properly plugged directly into the electrical outlet, and that the outlet has power.
2. Try another outlet.

The Powerline Act LED is off.

1. Make sure the adapter is plugged directly into the outlet, rather than into a surge suppressor or power strip. The current model of the *Corinex AV200 Powerline Ethernet Adapter* is not designed to function through a surge suppressor.

The Ethernet LED is off.

1. Make sure the adapter is connected to an Ethernet-enabled device by a standard RJ-45 cable, and that both the device and the adapter are on.

Weak network connection

1. If any power-draining devices are being used, such as hair dryers, try plugging them into a *Powerline Noise Filter* (sold separately).
2. Your network may be spread across different circuits. Try plugging in a *Corinex PowerPhase Coupler* to bridge the Powerline signal across the phases in your home or office (sold separately, US only).
3. Try another outlet.

To avoid personal injury and damage to the system:

1. The principal method to disconnect the device completely from the electrical power network (mains) is to unplug the power cord from the mains socket.
2. Never install the unit in wet areas or next to radiators/heaters.
3. Never use the unit outside.
4. Unplug the unit during severe storms.
5. Never open the equipment enclosure.

To verify that your equipment is connected and working correctly, use the standard **Ping** utility. In Windows, click on menu **Start -> Run**, then type the command

ping IPADDRESS -t, where IPADDRESS is the IP address of the computer to which the adapter is connected, e.g. **ping 192.168.4.1 -t** (this process can be interrupted by pressing **CTRL+C**).

1. Ping the IP address of the computer to which the adapter is connected. If this fails, there is a problem with the Ethernet network card or with the TCP/IP protocol.
2. Repeat the same process with the other computers on your AV200 Powerline network.
3. If all the computers can ping themselves, try pinging another computer on your AV200 Powerline network. If this fails, then there is a problem with the connection across your AV200 Powerline network or with the configuration of the adapters. Check the connection to the outlet, or try a different outlet. Verify the configuration of your adapters, especially the network number, as only adapters in the same network can see each other. Please see chapter 3 for details on configuration.
4. When a connection is made to another AV200 Powerline device, the PLC LED (in the middle) will be on or blinking, depending on the connection speed. This is explained in more detail under QoS Settings in section 3.4.7.

If the problem persists after consulting the information sources mentioned above, please send us the problem description via **http://www.corinex.com/web/com.nsf/Doc**. When you contact us, we will need all available information about your devices and your network. This includes the following:

- Types of devices you have, if possible with serial numbers (printed on the safety labels).
- Which of these devices are working incorrectly or don't work at all (indicate the problems).
- If possible, send us a scheme of your network setup, including the IP addresses of computers/routers/access points. This can speed up the problem-solving process. If you use any non-Corinex equipment, please specify what kind.
  A drawing can be made in any graphics editor, exported to one of the standard graphic formats (JPEG, GIF). Or you can just draw it on paper and scan it.
- Specify operating systems used with the devices.
- Please send us the firmware version and configuration of these devices. Please see the user guide for more detailed instructions.