

LONWORKS[®]

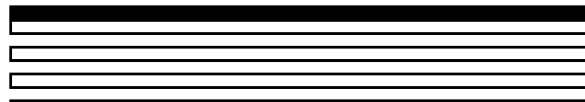
PCLTA-10 PC LonTalk[®] Adapter

User's Guide

Version 2



ECHELON[®]
Corporation



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PCLTA-10 Adapter Introduction

Echelon's PCLTA-10 PC LonTalk® Adapter (Models 73401, 73402, and 73403) is a high-performance LONWORKS® interface for laptop, desktop, and embedded personal computers equipped with a 16-bit Industry Standard Architecture (ISA) interface and a compatible operating system. Designed for use in LONWORKS control networks that require a PC to monitor, manage, or diagnose the network, the PCLTA-10 adapter is ideal for industrial control, building automation, and process control applications. The PCLTA-10 adapter features an integral twisted pair transceiver, downloadable memory, a network management interface, and plug-and-play capability with Microsoft® Windows 95. The software driver for the Windows NT operating system is also available.

The three versions of the PCLTA-10 support the TP/FT-10, TP/XF-78, and TP/XF-1250 channels.

The PCLTA-10 adapter provides both network services interface (NSI) functionality for use with LNS-compliant tools, and network interface functionality for use with LonManager API-based tools.

Introduction

The PCLTA-10 adapter provides any host processor equipped with a 16-bit ISA interface and compatible operating system with access to a LONWORKS network. The adapter is a half-length ISA card, allowing it to fit into laptop and embedded PCs that will not accommodate a full-length ISA card.

Installation software for the PCLTA-10 adapter is provided in the Connectivity Starter Kit (which must be purchased separately), and provides a software-based control panel and a software driver for Microsoft Windows 95 or Windows NT operating systems. The control panel provides a convenient means of setting and modifying installation parameters, as well as displaying error messages. The adapter supports Windows 95 plug-and-play operation, simplifying installation and use.

The PCLTA-10 adapter operates at 10MHz and includes an integral twisted pair transceiver for use with the TP/FT-10 channel (free topology and link power), the TP/XF-78 channel, or the TP/XF-1250 channel. For all three versions, the network connection is made via a removable screw terminal block.

As shown in figure 1.1 below, the LONWORKS Network Services (LNS) architecture allows any number of installation, maintenance, monitoring and control devices to exist in a system and to adapt to network configuration changes automatically. That is, it allows users to reconfigure the system from any user interface device anywhere on the network and ensures that all monitoring and control stations are always up-to-date with respect to the system's configuration. When used with the appropriate software, the network services interface (NSI) functionality of the PCLTA-10 adapter allows the attached host to tap into the LNS infrastructure as a client or server application.

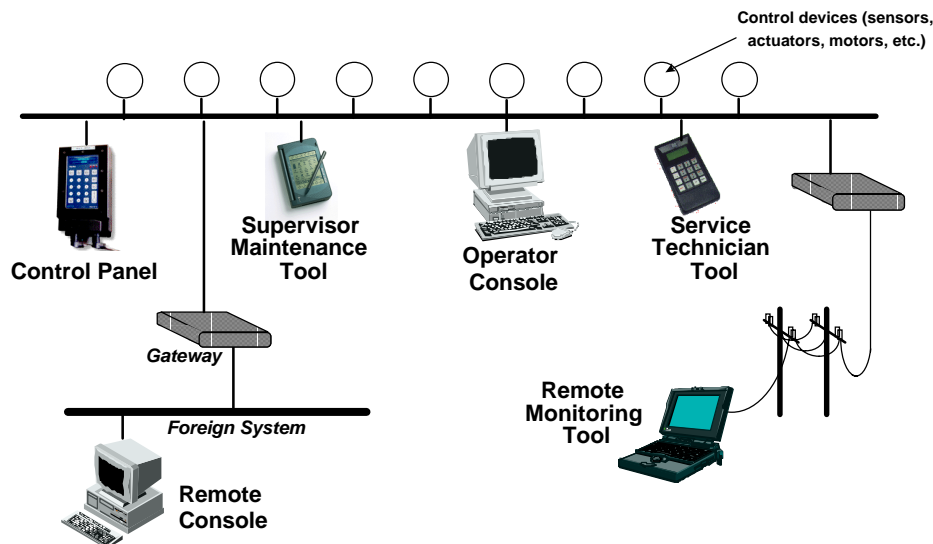


Figure 1.1 Multiple system level tools based on LNS

The adapter also permits the host PC to act as an application node, running application-specific programs while the adapter handles lower layer functions such as media access control, collision avoidance, message validation, authentication, and priority processing. Separating the application layer of the LonTalk protocol from

the lower layers makes the PCLTA-10 adapter independent of its host application. The host application, including its network variables, can be changed at any time without modifying the adapter. The PCLTA-10 adapter combined with the host PC can also be used with nodes that require more processing power, memory, input/output capability, or network variable connections than are provided by the Neuron[®] Chip alone.

Firmware for the adapter is downloaded from the host PC. This allows the adapter to be updated as new versions of the software and firmware are released, without modifying or physically accessing the PCLTA-10 adapter. This feature extends the useful service life of the adapter, and minimizes the cost and time associated with software and firmware updates. The adapter is provided with 32K bytes of off-chip RAM for use as network and application buffers.

Audience

This manual is intended for developers and end users of LONWORKS systems using the PCLTA-10 adapter.

Content

This manual provides detailed technical specifications on the electrical and mechanical interfaces and operating environment characteristics for the PCLTA-10 adapter.

This document has a list of references in Chapter 6. Whenever a reference document is addressed, a superscript number corresponding to the reference has been placed in the text, e.g., *FTT-10A Free Topology Transceiver User's Guide*¹. Whenever a specific chapter or section within a reference has been referred to, the reference is enclosed in brackets and the chapter is addressed by number, e.g., Reference [1], Chapter 8.

Related Documentation

The following Echelon publications are suggested for additional information:

- The Echelon *LONWORKS PCLTA-10 On-Line User's Guide* is a Windows 95 or Windows NT Help file. It is placed on the computer's hard drive by the PCLTA-10 Installation Software. The help file can be accessed via the PCLTA-10 LONWORKS Control Panel (also installed by the PCLTA-10 Installation Software). This guide offers additional last-minute updates and complements, but does not replace, this manual.
- *Neuron Chip Data Book* as published by Motorola and Toshiba
- *LONWORKS FTT-10A Free Topology Transceiver User's Guide* (078-0156-01)
- *LONWORKS TPT Twisted Pair Transceiver Module User's Guide* (078-0025-01)
- *LNS Host API Programmer's Guide* (078-0163-01A)

- *LCA Object and Data Server Programmer's Guide* (078-0162-01A)

2

Installing the PCLTA-10 Adapter

This chapter describes the procedures for installing the PCLTA-10 adapter in a PC or embedded host with a compatible operating system.

PCLTA-10 Adapter Software Installation

The PCLTA-10 installation software for Windows 95 installs the files required by the Windows 95 operating system to recognize the PCLTA-10 adapter. The PCLTA-10 installation software for Windows NT installs the files required by the Windows NT operating system to recognize the PCLTA-10 adapter. Therefore, installation of the software **must** precede insertion of the PCLTA-10 adapter into a PC ISA slot. At this time, the PCLTA-10 software will not operate under DOS or Windows 3.1x. Contact Echelon for additional driver availability.

Windows 95 Software Installation Procedure

To install the PCLTA-10 software on a Windows 95 PC, follow the instructions below. The PCLTA-10 software cannot be installed from DOS or a DOS shell.

1. Close all open programs.
2. Insert the installation diskette into the PC.
3. Click the Start button on the Windows 95 task bar and select the run command.
4. When prompted for a program name, enter the following:

a:\SETUP.EXE

If necessary, replace a: with the drive letter which corresponds to the drive containing the PCLTA-10 installation diskette.

5. When prompted with a list of languages, click on the desired language. A checkmark will appear to the left of the language to be installed.
6. When prompted for a destination directory, enter the desired installation directory. By default this directory is c:\lonworks, unless previous LONWORKS products have been installed and registered a different path in the Windows Registry. The path may be modified using the Browse button; however, if a directory other than c:\lonworks is chosen, the PCLTA-10 images path will have to be specified to enable use of the PCLTA-10 adapter. This is accomplished during PCLTA-10 Configuration. See Chapter 3, *Configuring and Testing the PCLTA-10 Adapter*.
7. When the 16-bit Application Support prompt appears, select "Yes" to enable the use of 16-bit applications with the PCLTA-10 adapter. This causes the installation program to add references to the DOS CONFIG.SYS file for the "stub" device drivers named PCCLON1 and PCCLON2. This allows existing 16-bit applications to recognize these device names and use the PCLTA-10 adapter as a network interface. If more than two PCLTA-10 adapters are installed in the PC, additional stub drivers can be created manually. To do so, add the following lines to the CONFIG.SYS file:

```
DEVICE=C:\LONWORKS\BIN\LDVSTUB.SYS /D:PCCLON3  
DEVICE=C:\LONWORKS\BIN\LDVSTUB.SYS /D:PCCLON4
```

There is a limit of four (4) PCLTA-10 adapters in a single PC.

Once the driver is installed and active, existing 16-bit Windows applications can access the PCLTA-10 adapter using the `ldv_open()`, `ldv_close()`, `ldv_read()`, and `ldv_write()` functions provided by the `WLDV.DLL` file.

The installation software installs a new `WLDV.DLL` file in `\WINDOWS\SYSTEM`, replacing any pre-existing versions of the file. The updated `WLDV.DLL` is fully backward-compatible with previous versions.

8. If the installation software discovers the `SYSTEM.INI` entry that loads the ISA-bus driver, `ECHLMPA.386`, it will comment out the entry and display the message, "SETUP has modified your SYSTEM.INI file by removing the following entry: device=echlmpa.386." It is not possible to use the ISA-bus protocol analyzer card and the PCLTA-10 card on the same PC.
9. The installation software for the Windows 95 version will issue a prompt to add a DOS virtual-mode device driver file named `LDVVDD.SYS` to the `DOS CONFIG.SYS` file to support DOS applications calling `LON1`. This will allow DOS applications to be used in a Windows 95 DOS shell/window. For more information see Virtual-Mode DOS Driver later in this chapter. The following line is added to the `CONFIG.SYS` file:

`DEVICE=C:\LONWORKS\BIN\LDVVDD.SYS /D1`
10. Software installation is complete. At the prompt to restart the computer, remove the PCLTA-10 installation diskette and restart the computer.

Windows NT Software Installation Procedure

To install the PCLTA-10 software on a Windows NT PC, follow the instructions below. The PCLTA-10 software cannot be installed from DOS or a DOS shell.

1. Close all open programs.
2. Insert the installation diskette into the PC.
3. In Windows NT 4.0 or later, click the Start button on the Windows NT task bar and select the run command. In Windows NT 3.51 select "Run..." from the file menu of the Program Manager.
4. When prompted for a program name, enter the following:

`a:\SETUP.EXE`

If necessary, replace `a:` with the drive letter which corresponds to the drive containing the PCLTA-10 installation diskette.

5. When prompted with a list of languages, click on the desired language. A checkmark will appear to the left of the language to be installed.
6. When prompted for a destination directory, enter the desired installation directory. By default this directory is `c:\lonworks`, unless previous

LONWORKS products have been installed and registered a different path in the Windows Registry. The path may be modified using the Browse button; however, if a directory other than `c:\lonworks` is chosen, the PCLTA-10 images path will have to be specified to enable use of the PCLTA-10 adapter. This is accomplished during PCLTA-10 Configuration. See Chapter 3, *Configuring and Testing the PCLTA-10 Adapter*.

7. When the 16-bit Application Support prompt appears, select “Yes” to enable the use of 16-bit applications with the PCLTA-10 adapter. This causes the installation program to add references to the `DOS CONFIG.NT` file for the “stub” device drivers named `PCCLON1` and `PCCLON2`. This allows existing 16-bit applications to recognize these device names and use the PCLTA-10 adapter as a network interface. If more than two PCLTA-10 adapters are installed in the PC, additional stub drivers can be created manually. To do so, add the following lines to the `CONFIG.NT` file:

```
DEVICE=C:\LONWORKS\BIN\LDVSTUB.SYS /D:PCCLON3
DEVICE=C:\LONWORKS\BIN\LDVSTUB.SYS /D:PCCLON4
```

There is a limit of four (4) PCLTA-10 adapters in a single PC.

Once the driver is installed and active, existing 16-bit Windows applications can access the PCLTA-10 adapter using the `ldv_open()`, `ldv_close()`, `ldv_read()`, and `ldv_write()` functions provided by the `WLDV.DLL` file.

8. The installation software for the Windows NT version will issue a prompt to add a DOS virtual-mode device driver file named `LDVVDD.SYS` to the `DOS CONFIG.NT` file to support DOS applications calling `LON1`. This will allow DOS applications to be used in a Windows NT DOS shell/window. For more information see Virtual-Mode DOS Driver later in this chapter. The following line is added to the `CONFIG.NT` file:

```
DEVICE=C:\LONWORKS\BIN\PCLTDOS.SYS /D1
```

9. Software installation is complete. At the prompt to restart the computer, remove the PCLTA-10 installation diskette and restart the computer.

Software Installation Results

The installation software for the PCLTA-10 adapter loads a selection of new files and updated versions of existing files to different locations on the PC's hard drive. The function and location of these files can be found in the on-line help file.

Windows 95 Software Removal Procedure

To remove the PCLTA-10 software, use the Uninstall control panel, as follows:

1. Choose the Add/Remove Programs icon from the Control Panel folder.
2. Select “LonWorks® PCLTA-10” from the list under the Install/Uninstall tab.
3. Click the “Add/Remove...” button.
4. Confirm file deletion at the prompt. Most of the PCLTA-10 software will be removed automatically.

5. If necessary, edit the `CONFIG.SYS` file to remove any references to the stub driver.

Windows NT Software Removal Procedure

To remove the PCLTA-10 software under Windows NT 4.0 or later, use the Uninstall control panel, as follows:

1. Choose the Add/Remove programs icon from the Control Panel folder.
2. Select "LonWorks PCLTA-10" from the list under the Install/Uninstall tab.
3. Click the "Add/Remove..." button.
4. Confirm the deletion at the prompt. Most of the PCLTA-10 software will be removed automatically.
5. If necessary, edit the `CONFIG.NT` file to remove any references to the `LDVSTUB.SYS` driver.

To remove the PCLTA-10 software under Windows NT 3.51, remove all files that were created during installation. See Windows NT Installation Results in the help file for a list of these files and their locations.

Windows 95 Virtual-Mode DOS Driver Installation Results

The Windows 95 PCLTA-10 adapter installation software will prompt the installer to automatically add the virtual-mode DOS driver. This driver is small in size, and allows a DOS session under Windows to have access to the PCLTA-10 through the device driver running as a part of Windows. The driver will not function unless a Windows session is running and the PCLTA-10 device driver is installed.

The following line will be added to the `CONFIG.SYS` file:

```
DEVICE=<directory of file>\LDVVDD.SYS /Dn
```

/Dn where (n) is 1-4. This defines LON1-LON4 and corresponds to devices 1-4 as determined by the PCLTA-10 adapter device driver under Windows.

The following is an example of the line that would be added to the `CONFIG.SYS` file:

```
DEVICE=C:\LONWORKS\BIN\LDVVDD.SYS /D1
```

Windows NT Virtual-Mode DOS Driver Installation Results

The Windows NT PCLTA-10 adapter installation software will prompt the installer to automatically add the virtual-mode DOS driver. This driver is small in size, and allows a DOS session under Windows to have access to the PCLTA-10 through the device driver running as a part of Windows. The driver will not function unless a Windows session is running and the PCLTA-10 device driver is installed.

The following line will be added to the `CONFIG.NT` file:

DEVICE=<directory of file>\PCLTDOS.SYS /Dn

/Dn where (n) is 1-4. This defines LON1-LON4 and corresponds to devices 1-4 as determined by the PCLTA-10 adapter device driver under Windows.

The following is an example of the line that would be added to the CONFIG.NT file:

DEVICE=C:\LONWORKS\BIN\PCLTDOS.SYS /D1

PCLTA-10 Adapter Hardware Installation



ESD Warning

This product contains devices which are sensitive to static electricity. Before installing or removing the PCLTA-10 adapter or the network cables, discharge any static electricity which may have accumulated to earth ground.

1. Turn off the PC and remove the power cord.
2. Open the PC case and locate an empty 16-bit slot with room for a half-length, half-height ISA-card. Remove the corresponding blank panel from the rear of the PC. Set aside the screw.
3. Insert the PCLTA-10 adapter into the slot, ensuring that the edge connectors are fully mated and the slot in the rear panel mounting lug of the PCLTA-10 adapter is aligned with the threaded hole in the PC chassis.
4. Replace the screw to hold the PCLTA-10 adapter firmly in place.
5. Reinsert the power cord and then restart the PC. A "New Hardware Found" window will be displayed briefly when the operating system recognizes the PCLTA-10 adapter.

Troubleshooting

As a "plug and play" type device, the PCLTA-10 adapter should operate as desired following completion of the installation process. If the adapter does not function correctly, the most likely causes are system resource constraints or software incompatibilities. These problems are described in detail in the following sections.

Installing the PCLTA-10 Adapter Before Software Installation

The following section applies to Windows 95 only.

If the PCLTA-10 adapter was inserted into the PC prior to PCLTA-10 software installation, the Windows operating system will be unable to associate a device driver

with the adapter. When Windows 95 starts up, a “New Hardware Found” window will appear. Click the Cancel button, then install the PCLTA-10 software as described above.

If the option “Do not install a driver (Windows will not prompt you again)” was inadvertently selected, the operating system will mark the PCLTA-10 adapter as an unknown device. As a result, the adapter will not function even if the PCLTA-10 software is installed. To correct this problem, “remove” the device using the following steps:

1. Open the System control panel and select the tab labeled “Device Manager.”
2. Double-click the “Other devices” icon.
3. Select “PCLTA-10” device and click the Remove button.
4. Install the PCLTA-10 software and reboot the PC.

System Resources

Each PCLTA-10 adapter requires four contiguous bytes of I/O address space starting on a modulo-4 based address (i.e., an address evenly divisible by 4). A dedicated interrupt request (IRQ) is also required for each PCLTA-10 adapter used.

Solving IRQ and I/O Conflicts under Windows 95

I/O resource problems are rare under Windows 95 for the PCLTA-10 adapter since the adapter can handle a wide range of I/O settings. However, IRQ resource problems may occur more often in “multimedia” computers which may have very few spare IRQs. The Windows 95 operating system handles most allocations of IRQs, but there are some instances where the operating system cannot properly allocate interrupt requests.

When the Windows 95 Device Manager does not locate a free IRQ for a newly inserted PCLTA-10 adapter, it will not assign an IRQ to the adapter. As a result, there may be no indication to the user that a problem has occurred, since no true resource “conflict” has occurred. This is a consequence of the PCLTA-10 adapter’s ability to be assigned any of the system’s 16 IRQs.

IRQ usage in the system can be determined by opening the System icon in the Control Panel window. The tab labeled “Device Manager” allows viewing of devices by type or connection.

The PCLTA-10 LONWORKS Network Interface device icon is found under the “LonWorks Interface” device *type*. If there is a problem with the adapter, there will be a red circle with an exclamation point next to its icon.

IRQ resource problems may generally be resolved by disabling another device in the system. More information can be found in the Hardware Conflict troubleshooting portion of the Windows 95 on-line Help file.

Access the hardware conflict troubleshooter through the procedure outlined below:

1. Open the Windows 95 on-line help by clicking the Windows Start button and selecting “Help.”
2. In the Help Topics window, choose the Contents tab, or from another Help window, choose the Contents button.

3. Double click the Troubleshooting topic, and then select the help topic, "If You Have A Hardware Conflict."

Extensive trouble-shooting documentation can be found in the Microsoft Windows 95 Resource Kit Help File. This help file is part of the Windows 95 Resource Kit, which is available from Microsoft.

If a DOS real-mode driver is in use for a specific device which is installed in the PC, Windows 95 may not know about that device's resource requirements. Unlike Windows driver conflicts, this problem is difficult to diagnose.

There are rare I/O conflict situations of which the Device Manager may be unaware. Such a conflict may occur when an I/O resource is not properly specified for a device, and a new driver overlays onto the true I/O space of that device. In the event of such a conflict, it may become necessary to manually reserve I/O or IRQ resources using the Device Manager. This process is described in the Windows 95 on-line Help.

Once these resources have been reserved, the Device Manager will recognize and attempt to resolve any resource conflicts between the DOS driver and any Windows drivers. If a conflict still occurs, it will be "visible," and may be resolved as described in *Solving IRQ and I/O Conflicts under Windows 95* earlier in this chapter.

If a device resource requirement is "hardwired" into the PC (i.e., configured by a jumper or not modifiable from the system BIOS) then there is little that the Windows 95 operating system can do to free the resources.

Common Resource Problems under Windows 95

The following situations produce an additional drain on system resources that may be hard to manage. Conflicts arising from these situations can generally be resolved by selectively disabling devices to free up the required resources.

- COM ports that may not have a connector, but are consuming resources and cannot be disabled through the BIOS
- Unused IDE controllers that can not be disabled through the BIOS
- Unused/nonexistent PS/2 mouse ports
- Sound cards that support both 8-bit and 16-bit compatibility modes, consuming two IRQs

An additional problem often associated with sound cards is the improper reporting of I/O resource usage. This problem may be recognized by examining a device's I/O address allocation for unusual one-byte assignments (since devices typically use more). For example, if a device's stated I/O range is 0x201-0x201 but its actual range is 0x201-0x204, a conflict will occur if the PCLTA-10 adapter is assigned an I/O range of 0x204-0x207. If this problem is suspected, manually move the PCLTA-10 adapter's I/O range to a safer location to prevent I/O overlap.

Solving Conflicts under Windows NT

The device driver PNPLON.SYS implements the Plug and Play card isolation algorithm in order to locate PCLTA-10 cards. The driver is also completely plug and play, and uses the internals of NT to determine a useable I/O port and IRQ setting. If either of these resources is not being managed correctly by the NT OS there can be problems.

Usually system I/O port resources are managed correctly. Often the IRQ resources are not. The most typical IRQ problems arise from the systems that use a SCSI controller to interface to all drive media. In these machines the IDE controllers are not used, but are still controlling IRQs 14 and 15. The NT OS does not know this and considers these valid, usable IRQs. Usually this problem can be solved by entering the BIOS setup and assuring that both the IDE controllers are disabled and that all IRQs not used by motherboard hardware are available to the ISA bus. From within the NT OS you can check to see what the operating system believes to be used IRQ resources by starting the "Windows NT Diagnostics" application under "Administrative Tools". IRQ resources that are considered "in use" are listed here.

If more control is required over the choice of IRQs used for the PCLTA-10 there is an optional system setting that can be used. From the LonWorks Plug 'n Play Control Panel's main dialog there is a hidden dialog which may be accessed by typing Alt-I. This will bring up a self-explanatory dialog which allows the setting of the preferred and alternative IRQ list.

This hidden dialog also allows a choice of the numeric base for the device naming convention, i.e, the value of x in LONx. By default this will start at "LON1". This could create a conflict if another device driver is also trying to create a device named "LON1" (such as a PCNSS/PCNSI driver). In this case choose another value.

If other values are chosen for the device naming convention then you may want to assure that the DOS driver defined in your CONFIG.NT file reflects this setting. It is this DOS driver in the CONFIG.NT file that defines the device name used by 16-bit Windows applications running under NT, so such an application will refer to devices named "LON1", "LON2", and so on.

The first place to go for information if problems arise should be the Event Log under System Events. Usually the messages there are self-explanatory.

Software Compatibility

The PCLTA-10 adapter software is designed to be compatible with LONWORKS-based software. However, the following issues may arise when using the PCLTA-10 adapter with some software.

Device Name Aliasing under Windows 95

The PCLTA-10 adapter should operate with most third party LONWORKS-based software. However, some 16-bit Windows applications which use the services of Echelon's WLDV dynamic link library are limited in the device names that can be selected. For example, only the names "LON1" through "LON9" may be available, preventing the use of a PCLTA-10 adapter. This problem can be corrected through the use of device name aliasing. To create a device alias, follow the instructions below:

1. Open the file named ECHELON.INI, which should reside in the WINDOWS directory. If this file does not exist, then create one with a text editor.
2. Create a driver alias section in the file, by adding the following line:

[DRIVERALIAS]

3. On the following line, add the driver alias:

aliasname=*devicename*

where *aliasname* is the device name accessed by the software, such as "LON1", and *devicename* is the device to be used.

4. Add additional aliases, as necessary.

The following example creates a device alias that routes all service requests for LON1 to the PCLTA-10 adapter PCCLON1.

```
[DRIVERALIAS]  
LON1=PCCLON1
```

LonManager Protocol Analyzer Compatibility

The device driver for the PCLTA-10 adapter and the driver for the LonManager Protocol Analyzer ISA-bus card share the same Windows VxD identifier. As a result, both types of cards cannot run on a PC at the same time. So, the PCLTA-10 installation software will comment out the `SYSTEM.INI` entry that loads the ISA-bus driver.

The LonManager Protocol Analyzer does not run under Windows NT.

PCC-10 Compatibility

The LONWORKS plug-and-play control panel can only support one type of downloadable-image network adapter at a time. As a result, PCC-10 cards and PCLTA-10 adapters may not both be used or installed in the same PC.

At this time, the PCC-10 runs under Windows 95, Windows 3.1x, and DOS operating systems only. Contact Echelon for additional driver availability.

WLDV Versions (Windows 95 only)

Older versions of Echelon's `WLDV.DLL` file do not support the PCLTA-10 adapter. If an older version (version 2.54 or earlier) of the file is inadvertently copied into the `WINDOWS\SYSTEM` directory, the PCLTA-10 adapter will be unable to operate. Should this occur, reinstall the PCLTA-10 software to update `WLDV.DLL`.

Under Windows NT, older versions of `WLDV.DLL` will still work via DPML.

3

Configuring and Testing the PCLTA-10 Adapter

This chapter explains how to configure and test the PCLTA-10 adapter using the Control Panel installed in Chapter 2.

PCLTA-10 Configuration

PCLTA-10 configuration is accomplished by using the LONWORKS PCLTA-10 control panel. Open the control panel by selecting the “LonWorks® Plug ‘n Play” icon in the Control Panel.

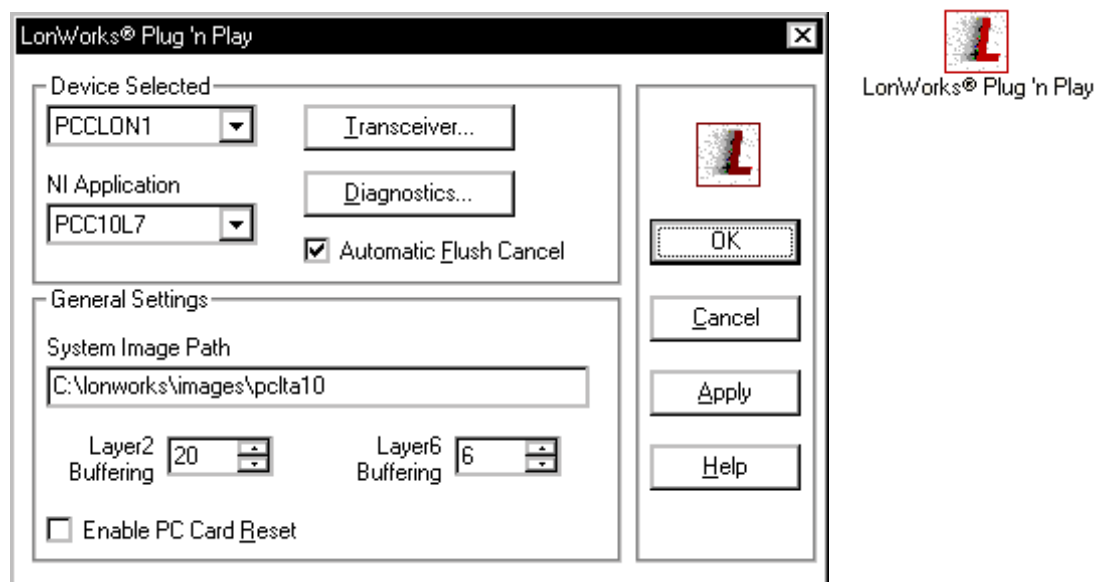


Figure 3.1 PCLTA-10 control panel and icon

The LONWORKS PCLTA-10 control panel is divided into three parts: a device selection area, a general settings area, and a control section. The device selection area contains configuration settings and diagnostic controls that are specific to an individual PCLTA-10 adapter and its device driver. The general settings area contains settings for all PCLTA-10 adapters used with the PC. The control section contains buttons for accepting or canceling the changes made in the control panel, as well as a Help button.

PCLTA-10 Initialization

In most cases, PCLTA-10 adapter initialization occurs automatically upon installation of the adapter card and subsequent power-up of the computer. Manual initialization will be required following software installation to a directory other than `c:\lonworks`, or following the moving of the PCLTA-10 system images.

To manually initialize the PCLTA-10 adapter, verify that the control panel's System Image Path entry is correct, then click the Apply button.

An error will be reported if an attempt is made to view the transceiver type before the PCLTA-10 adapter is initialized. Testing the card with the Diagnostics button, as suggested by the error message, produces the diagnosis: “Image file not found.”

In this case, return to the control panel's main dialog box and manually initialize the PCLTA-10 adapter.

Device Specific Settings

The PCLTA-10-specific options consist of five separate controls (figure 3.2). These controls are defined as follows:

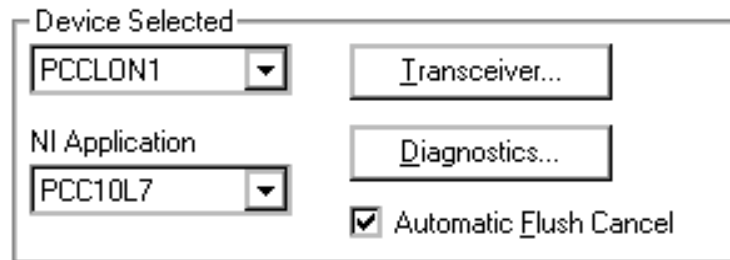


Figure 3.2 PCLTA-10-specific controls

Device Selected

Controls which PCLTA-10 adapter is selected for configuration. The PCCLON1 and PCCLON2 drivers are installed by the installation software. If additional drivers have been manually installed, PCCLON3 and/or PCCLON4 will also be available.

Automatic Flush Cancel

Controls whether the device driver will automatically force the network interface for the selected PCLTA-10 adapter to leave the post-reset flush state whenever it is reset. The post-reset flush state prevents any inbound or outbound network traffic following a reset. If this box is not checked, it is up to the client application to manage this state. If it is checked, the device driver will automatically allow network traffic to resume. The default is checked.

NI Application

Controls the type of image or application to be used. A PCLTA-10 adapter can only hold one image at a time. Loading a new image will replace the currently loaded image. The choices for these images are determined by the image files (.NBI extension) found in the system image path specified under General Settings. Some of the possibilities include the following:

- *PCC10L7*, the basic network interface application image
- *PCCNSI*, the Network Services Interface application image

Transceiver...

Opens the PCLTA-10 Transceiver dialog box (figure 3.3). Choosing this option will retrieve the transceiver configuration of the selected PCLTA-10 adapter. If there is no PCLTA-10 adapter currently installed in an ISA-bus slot, a message appears under Windows 95 stating that the operating system has removed, or has not loaded, the PCLTA-10 device driver.

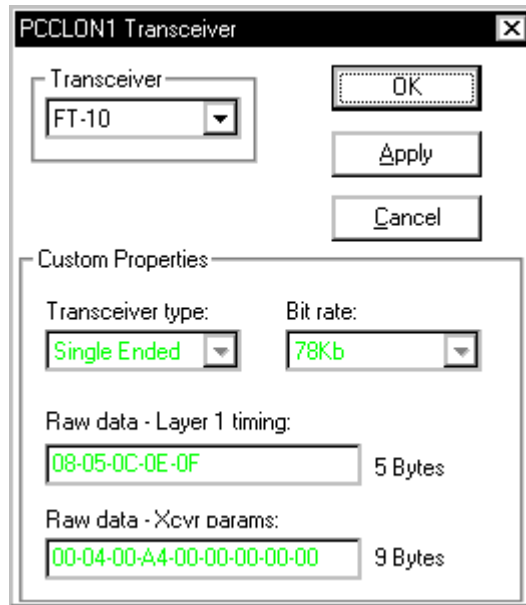


Figure 3.3 PCLTA-10 Transceiver dialog box

The Transceiver selection box specifies the transceiver type for the selected PCLTA-10 adapter. The default transceiver is an FT-10-compatible transceiver. Other standard transceiver configurations, and a custom configuration may be chosen using this selection box. The Custom Properties controls are not accessible unless the Custom transceiver type is selected. If an error is received while modifying the transceiver type, choose the Apply button, then proceed to modify the transceiver type.

The Custom Properties area contains controls for entering custom transceiver properties. The information in this area reflects the current configuration within the PCLTA-10 adapter. It will not change until a transceiver is selected, and then configured using the OK or Apply buttons.

When configuring a custom transceiver or adding custom parameters for a standard transceiver, the values used in the Custom Properties Raw Data edit boxes must be entered as hexadecimal values separated by dashes. Further explanation of Raw Data values can be found in the *LonBuilder® User's Guide* ².

Diagnostics...

Opens the PCLTA-10 Diagnostics dialog box. For more information, see the section on PCLTA-10 Diagnostics.

General Settings

The PCLTA-10-generic options consist of four controls (figure 3.8). These controls are defined as follows:

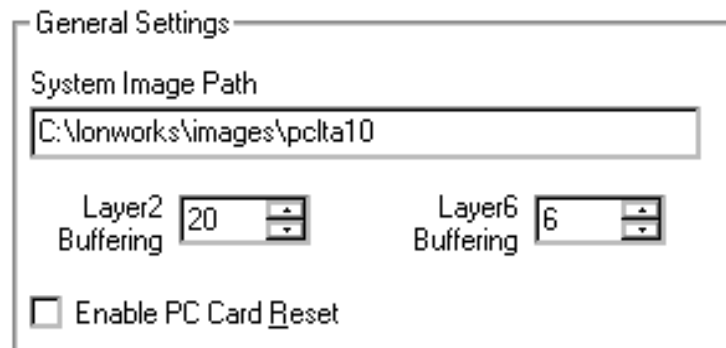


Figure 3.8 PCLTA-10 generic controls

System Image Path

Specifies the full directory path for the PCLTA-10 system images. This path is set by the PCLTA-10 Installation Software but may be modified by the user.

Layer2 and Layer6 Buffering

Controls the number of 4Kbyte operating system pages that are allocated for message buffering within the driver. The **Layer2** setting is reserved for future use and should not be modified from the default of 20 pages. The **Layer6** setting is used for system images. The default setting of Layer6 Buffering is 6 pages. This value should be appropriate for most applications; embedded systems may need to change the number of buffering pages.

Enable PC Card Reset

This control is not used with the PCLTA-10 adapter. It is provided for owners of the PCC-10 PC Card (PCMCIA card) and controls whether the hardware reset line is enabled. The state of this checkbox is irrelevant to the operation of the PCLTA-10 adapter.

PCLTA-10 Diagnostics

A number of diagnostic and testing services are provided by the PCLTA-10 control panel. Clicking the Diagnostics button in the main control panel window displays the PCLTA-10 Diagnostics dialog box. This dialog box contains buttons for the diagnostic commands and displays the version number and current status of the PCLTA-10 device driver. If no PCLTA-10 adapter is installed in an ISA-bus slot, the Diagnostics window will display “(no driver found)”.

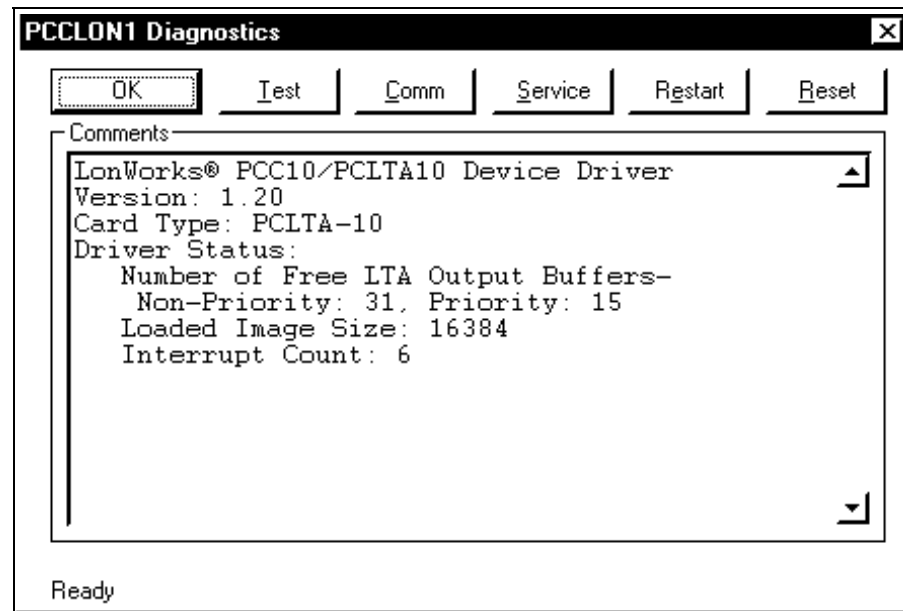


Figure 3.4 PCLTA-10 Diagnostics dialog box

Driver Status

The content of the device driver status is as follows:

- Number of Free PCLTA-10 Output Buffers:
 - Non-Priority: the non-priority application output buffer count, as calculated by the driver based on information retrieved from the PCLTA-10 adapter's non-volatile EEPROM.
 - Priority: the priority application output buffer count, as calculated by the driver based on information retrieved from the PCLTA-10 adapter's non-volatile EEPROM.
- Loaded Image Size: the size, in bytes, of the currently loaded PCLTA-10 system image. This may be zero if the PCLTA-10 adapter is in the initial “boot” state.
- Interrupt Count: the number of interrupts the driver has processed for this device. This value is set to zero when the device is physically reset.

Diagnostic Commands

The diagnostic commands are invoked by selecting one of the buttons displayed in figure 3.5. If a diagnostic command results in the “Image file not found” error message, close the Diagnostics dialog box by selecting the OK button, then click the Apply button in the PCLTA-10 control panel. This re-initializes the adapter and allows use of the diagnostic commands.



Figure 3.5 Diagnostics dialog box commands

Test

The Test button retrieves status and error counts from the PCLTA-10 adapter. The results of this message will be displayed in the format shown in figure 3.6.

```
----- PCLTA-10 Node Status -----
CRC Errors:                [00000]
TX Timeouts:               [00000]
Lost (APP) Messages:      [00000]
Missed (NET) Messages:    [00000]
Node State:                Unconfigured
Most recent error:         0
Reset Cause:               External
```

Figure 3.6 Example Network Diagnostics Status Response

Comm

The Comm button verifies communications between the PCLTA-10 adapter and another node on the network. When this function is chosen, a dialog will appear asking for confirmation of this command, as follows:

This procedure will configure the Network Interface for a zero-length domain if it is not already configured. Do you want to proceed?

Choosing OK causes the control panel to first check the network interface for the configured state. If it is already in the configured state, it will not be modified further. If it is not in the configured state it will install the network interface with a zero-length domain on index 0, a subnet of 1, and a node ID of 126, and then change its state to configured.

Once the node is in the configured state, the control panel enters the receive-ready state and displays the following message while waiting for a service pin message from another node on the network:

Now waiting for a service pin message.

Once the service pin is activated on the other node and a service pin message is received, the control panel sends a request/response diagnostic message to the other node using Neuron ID addressing. It will repeat this message, referred to as a “ping,” once per second until either the ‘OK’ or the ‘Quit’ button is chosen (the Quit button will appear in place of the Comm button).

This series of tests confirms that the device can be configured and can communicate with a node on the network. The Comm function is intended to eliminate the PCLTA-10 adapter, the card drivers, the network connection, the hardware of the other node, and the topology configuration from the list of possible problem points or points of failure during network troubleshooting. It does not eliminate the possibility that the wrong type of medium has been used. Be sure that the medium is suitable for use in the intended channel topology. The Comm function also does not eliminate the possibility of poor network termination. The network wiring may work for this test but may fail if multiple nodes are communicating. Be sure to verify proper termination when troubleshooting communication problems.

This feature was not designed to work across routers.

Service

The Service button will cause the PCLTA-10 adapter to broadcast a service pin message on the network. The service pin message will not be sent if the adapter is in the post-reset flush state (see **Automatic Flush Cancel**).

Restart

The Restart button clears the adapter’s Neuron Chip image and places the device into the “boot” state. This is the device state found following a re-boot of the Windows operating system. When this function is chosen a dialog box will appear asking for confirmation of this command.

Reset

The Reset button causes a reset of the adapter’s Neuron Chip, but does not clear its system image.

4

Developing with the PCLTA-10 Adapter

This chapter provides an overview of issues that arise when developing or using host software with the PCLTA-10 adapter.

Initializing the PCLTA-10 Adapter

Once a PCLTA-10 adapter and PC are powered, the host application must initialize the PCLTA-10 adapter. If you are using a LonManager or LNS software product, you may skip to the next section.

When a PCLTA-10 adapter is initially powered, it disables network communications by entering the `FLUSH`, unconfigured state. The `FLUSH` state prevents the adapter from responding to network management messages before the host application has had a chance to initialize the adapter. The unconfigured state prevents the PCLTA-10 adapter from responding to application messages before the node has been installed in a network. The host application will not be able to send or receive application messages until after it cancels the `FLUSH` state and the PCLTA-10 adapter leaves the unconfigured state.

To initialize a PCLTA-10 adapter, follow the steps below (these steps are described in more detail in the *LONWORKS Host Application Programmer's Guide*⁴).

Canceling the Flush State

By default, the PCLTA-10 adapter automatically leaves the `FLUSH` state upon reset. If the Automatic Flush Cancel option has been disabled in the PCLTA-10 Control Panel, the flush cancel must be performed by the host application. If the host application attempts to send a message while the PCLTA-10 adapter is in the `FLUSH` state, the adapter will return a failed response for acknowledged messages and a success response for unacknowledged messages. The message will not be sent in either case.

If the host application attempts to send a message while the adapter is in the `NORMAL`, unconfigured state, the PCLTA-10 adapter will always return a success response even though the message was not sent.

To cancel the `FLUSH` state, follow these steps:

1. Reset the PCLTA-10 adapter from the host application by sending the `niRESET` command. If installed correctly, the PCLTA-10 adapter will respond with an uplink `niRESET` message upon completion of the reset. The first message from an adapter after the network driver has been opened will also be an uplink `niRESET` command informing the host that the PCLTA-10 adapter has been released from reset.
2. Cancel the `FLUSH` state in the PCLTA-10 adapter. This is done automatically by the device driver after an open command or uplink `niRESET` depending on the setting for `FLUSH` state in the Plug 'n Play Control Panel. The `FLUSH` state can be manually canceled by sending the `niFLUSH_CANCEL` message.

Configuring the PCLTA-10 Adapter with a Network Address

The PCLTA-10 adapter leaves the unconfigured state when it is installed in a network and is assigned an address in one or two domains on that network. There are two ways this can happen. If the PCLTA-10 adapter is used as a network interface for a network tool, then the tool's application may configure the network interface. In this case the PC running the network application sends a local message to the PCLTA-10 adapter to change its state to configured.

Alternately, the PCLTA-10 adapter may be installed in a network by some other network tool or a Network Services Server (NSS). In this case, the network tool or server sends a message to the PCLTA-10 adapter across the network to change its state and to assign it an address.

Once the PCLTA-10 adapter enters the configured state, it retains both the configured state and its address assignment across power-cycles, because that information is stored in the internal EEPROM.

To configure the PCLTA-10 adapter follow these steps:

1. Install the PCLTA-10 adapter in one or two domains using the *Update Domain* network management message. This may be done by a network tool across the network, or may be done directly by the host application by sending the *Update Domain* message as a local network management command.
2. Change the state of the network interface to *configured*. This may be done by a network tool across the network, or may be done directly by the host application by sending the *Set Node Mode* network management message.

For LNS applications with a local NSS, both steps are performed by the LNS API `NsInit()` function, or the LCA System object's `Open` method. For remote LNS applications, these steps are performed by the LNS API `NsInit()` and `NsIssueAddMyNsi()` functions, or by setting the `ActiveRemoteNI` property of the LCA Object Server OCX.

For other applications, both steps are performed locally using the LonManager API `lxt_open()` function, while remote configuration is accomplished using an appropriate network tool.

Installing a PCLTA-10 Adapter on a LONWORKS Network

A PCLTA-10 adapter with a host that is attached to a network appears as a standard LONWORKS node to other nodes on the same network. The PCLTA-10-based node is logically installed on a network using pre-installation, self-installation, or field installation with a network tool. These installation scenarios are described in the *LONWORKS Installation Overview* engineering bulletin (number 005-0006-01). Unique installation requirements of host applications are described in Chapter 3 of the *LONWORKS Host Application Programmer's Guide*⁴.

Installing with an LNS Tool

When a PCLTA-10 adapter is used as a Network Services Interface (NSI) for a PC running an LNS tool, its installation is automatically handled when the LNS tool is initialized.

Installing with the LonBuilder Tool

If the PCLTA-10 adapter is not used as an NSI, it can be installed on a development network using the LonBuilder Network Manager. Chapter 6 of the *LonBuilder User's Guide*² describes how to define and install nodes in a development network using the LonBuilder Network Manager. A prerequisite to creating application node target hardware and node specifications is to define the channel that will be included in the network as defined under *Defining Channels* in Chapter 10 of the *LonBuilder User's Guide*². Be sure to correctly set the minimum clock rate field. If this field is

set incorrectly, excessive collisions will occur. If a channel includes nodes with a slower clock rate or less accurate clocks, the channel definition must meet this lowest common denominator for optimal performance. Additionally, if the priority configured for the PCLTA-10 adapter is different from the default, then the Number of Priority Slots needs to be set correctly.

Create a hardware properties definition for a custom node to represent the PCLTA-10-based node. Set the input clock rate to 10MHz and then create a hardware definition for the custom node specifying these hardware properties. If an incorrect clock rate is specified in the hardware properties, the PCLTA-10 adapter may be rendered unusable and will need to be reset. This may occur, for example, if the `default_hw_props` option is specified. To install the PCLTA-10 adapter in a LonBuilder network using the service pin, open the network driver (for example, by using the installed Control Panel) and use the command to send a service pin message.

When installing the PCLTA-10-based node, the channel definition must match the transceiver on the PCLTA-10 adapter. If it does not, the PCLTA-10 adapter could lose its ability to communicate.

WARNING: DO NOT respond “Yes” to the prompt: Do you want to install communications parameters? unless the channel and hardware definitions are compatible with the transceiver and 10MHz input clock on the PCLTA-10 adapter. Doing so may cause loss of communications with the adapter.

When defining the application image, the App Image Origin field should be set to Interface File. The App Image Name should be set to the name of an interface file, created as described under *Binding to a Host Node* in chapter 3 of the *LONWORKS Host Application Programmer's Guide*⁴.

If the PCLTA-10 adapter is accidentally configured with the wrong communications parameters, the adapter will reload the correct parameters upon reset. The adapter may be reset using the Reset command in the PCLTA-10 Control Panel's Diagnostics dialog box.

Installing with Other Network Tools

If the PCLTA-10 adapter is not used as an NSI, the PCLTA-10-based node can be installed on a network with any LONWORKS-compliant network tool. For example, the LonMaker tool can install a PCLTA-10-based node. Consult the network tool's documentation for installation instructions.

Rebooting a PCLTA-10 Adapter

During development, a programming or installation error may cause a host application to corrupt the EEPROM memory within a PCLTA-10 adapter.

If an error occurs, indicating that the PCLTA-10 adapter has detected a fatal error or is experiencing watchdog resets, then the adapter firmware must be forced to reboot its internal state. In most cases, it will be possible to reboot the PCLTA-10 adapter over the network by using a network tool to zero the adapter's Boot ID. The address of the Boot ID is 0xF1FE. The contents of this location may be easily changed during

development by using the LonBuilder memory browser. See Chapter 13 of the *LonBuilder User's Guide*².

If the error is serious enough, the reboot message may not be able to get into the PCLTA-10 adapter. In this case, the PCLTA-10 adapter's EEPROM may be cleared from the host. Open the PCLTA-10 control panel, click the Diagnostics button to open the Diagnostics dialog box, and type **Alt=-**. A dialog box will appear prompting for confirmation of the EEBLANK operation. Click "Yes" to clear the PCLTA-10 adapter's EEPROM.

Default Configuration

The PCLTA-10 adapter is manufactured with a default configuration in the on-chip EEPROM of the Neuron Chip. Tables 4.1 and 4.2 show the default settings.

Table 4.1 Miscellaneous PCLTA-10 Configuration Parameters

Configuration Parameters	Default Setting
Neuron Chip state	Unconfigured
Explicit addressing	Enabled
Network variable processing	Host Selection
Program ID string	"PCCLON"

The Neuron Chip state is normally modified by a network tool as part of the installation process. The program ID string may be modified from the host by sending a Write Memory network management message, specifying the Program ID field of the Read-only Data Structure. The application checksum must be updated. For more details on network management messages, and the Neuron Chip data structures, see the *Neuron Chip Data Book*, Reference [3], Appendices A and B.

Table 4.2 Default PCLTA-10 Buffer Configuration

Buffer Type	Default Count	Default Size	Number of Bytes
Application input buffers	15	255	3,825
Application output buffers	31	255	7,905
Application priority output buffers	15	255	3,825
Network input buffers	63	255	16,065
Network output buffers	2	255	510
Network priority output buffers	2	255	510
Receive transaction buffers	16	13	208
Transmit transaction buffers	2	28	56
TOTAL USED			32,904

The buffer configuration may be modified from the host by sending Write Memory network management messages, specifying the appropriate fields of the Read-only Data Structure. The application checksum must be updated. For more details on network management messages, and the Neuron Chip data structures, see the *Neuron Chip Data Book*, Reference [3], Appendices A and B.

5

Electrical and Mechanical Interfaces

This chapter describes the hardware interfaces and mechanical layout of the PCLTA-10 adapter.

PCLTA-10 Adapter Board Layout

The following figure shows the layout of the PCLTA-10 adapter. There are no jumpers or switches on the adapter.

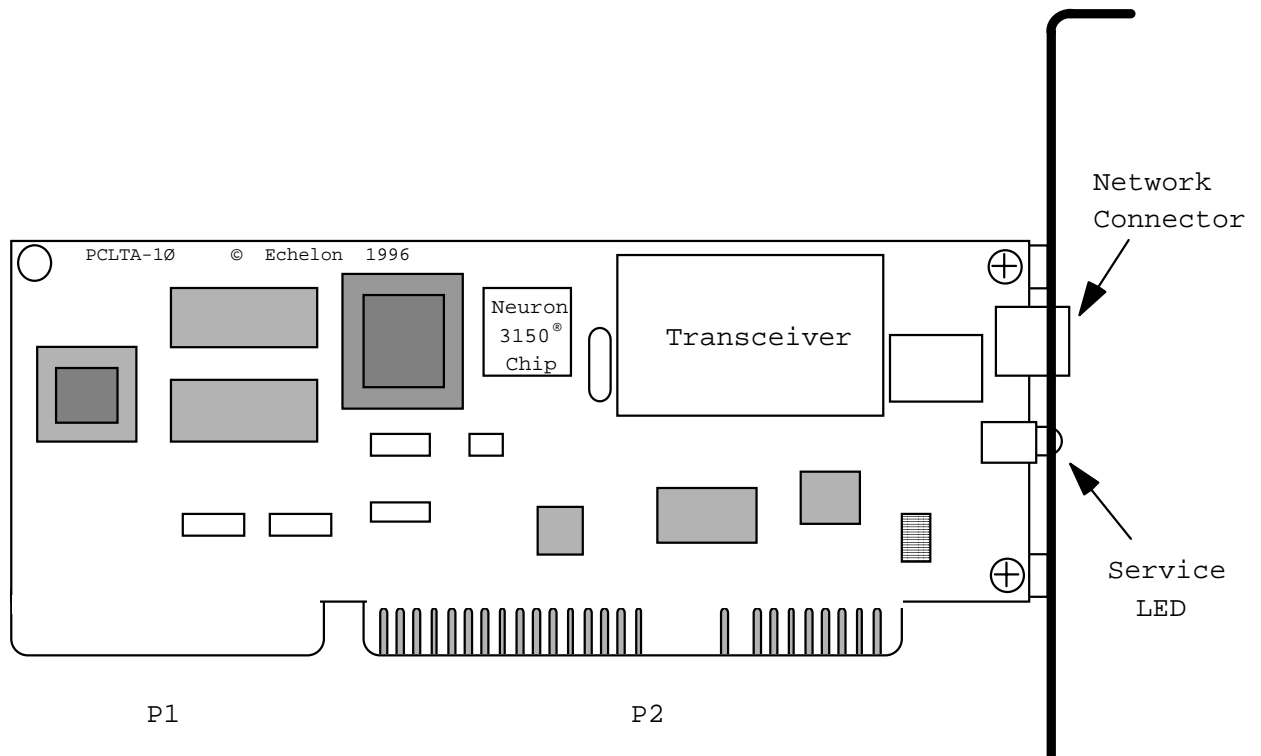


Figure 5.1 PCLTA-10 Mechanical Layout and Interfaces

P1 and P2 ISA Bus Connector

The pinout of the P1 and P2 connector terminals is the standard pinout for the ISA bus used in IBM-compatible PCs. The PCLTA-10 must be installed in a 16-bit slot, which has a mating connector for P1 and P2. The power drawn from the host is 250mA @ 5VDC, typical.

Network Connector

The PCLTA-10 adapter is supplied with a removable two terminal, Weidmüller BLA connector (BLA 2B OG) for the network connection. The wiring to the twisted pair channel is polarity insensitive. The connector will accept AWG 26 to AWG 12 wire. See the *FTT-10A Free Topology Transceiver User's Guide*¹ or the *LonWorks TPT Twisted Pair Transceiver Module User's Guide*² for information on suitable cables and cable distances.

Mechanical Considerations

The PCLTA-10 is a half-height, half-length ISA-bus card measuring 6.10" x 2.45" with a full-height chassis bracket.

6

References

This chapter provides a list of the documents referenced in this manual.

Reference Documentation

- [1] *LONWORKS® FTT-10A Free Topology Transceiver User's Guide*, Echelon Corporation.
- [2] *LonBuilder User's Guide*, Echelon Corporation.
- [3] *Neuron® Chip Data Book*, as published by Motorola and Toshiba.
- [4] *LONWORKS® Host Application Programmer's Guide*, Echelon Corporation.
- [5] *NodeBuilder® User's Guide*, Echelon Corporation.
- [6] *LONWORKS TPT Twisted Pair Transceiver Module User's Guide*, Echelon Corporation

ECHELON®

DECLARATION OF CONFORMITY

PC LonTalk® Adapter, PCLTA-10

Application of Council Directive : 73/23/EEC; 89/336/EEC; 93/68/EEC

Manufacturer's Name: Echelon Corporation

Manufacturer's Address: 4015 Miranda Avenue
Palo Alto, CA 94304
USA

Manufacturer's Address:
in Europe Echelon Europe LTD.
Elsinore House, 77 Fulham Palace Road
London, Hammersmith W6 8JA
United Kingdom

Product Model Number: 73401, 73402, 73403

Type of Equipment: Information Technology Equipment

Standards to which:	EN 60950:1992;	EN 50082-1:1992
Conformity is	EN 55022:1987	IEC 801-
2:1984/1991		
Declared	IEC 801-3:1984	ENV 50141:1994
	IEC 801-4:1988	ENV 50204:1996
	EN 61000-4-5:1995	EN 61000-4-8:1994
	EN 61000-4-11:1994	

I, Paul Smith, hereby declare that the equipment specified above conforms to the above Directives and Standards.

Place: London, England Date: August, 1996

Position: Controller, Echelon Europe
