Serial DHX Driver Help

Serial DF1 Protocol Driver for Allen-Bradley Networks

Version 9

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Version 9

Document last revision date May 26, 2017

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INTRODUCTION

The Serial DHX Driver provides full-duplex connectivity through standard serial COM ports to DF1-compatible devices. These include Data Highway (DH), Data Highway Plus (DH+), DH-485 and ControlNet™ interface modules such as the DL-PCIe, 1784-U2DHP, 1770-KF2, 1785-KE, 1770-KF3 and 1770-KFC15. Direct connection to devices with full-duplex, DF1-compatible ports is also supported.

This driver is part of the DHX Driver Suite, DHX OPC Server Suite, DHX OPC Premier Suite and DHX OPC Enterprise Suite, providing serial DF1 connectivity for these products.

Remote Connectivity

The Serial DHX Driver includes the DHX Gateway Server. When enabled, the DHX Gateway Server allows other computers on your TCP/IP network to access the DHX devices on your system. The remote system, which can be any Windows node running the DHX Gateway Driver, will then have full DHX Driver functionality just as though the DHX device in the server system were installed in the remote system.

Running 16-Bit Software

The Virtual DHX Driver, which is included with all DHX products, allows 16-bit applications to run concurrently with all 32-bit applications on the same computer. It is compatible with all 16-bit DOS/Windows applications that communicate through 1784-KT or 1784-KTX adapter cards, such as 6200 programming software. For more information, refer to the Virtual DHX Driver section.

Compatibility

The Serial DHX Driver is implemented as part of the Cyberlogic DHX architecture, which is the foundation used in other DHX family drivers such as the Ethernet DHX Driver, the DHX Driver and the DHX Gateway Driver. Consequently, these drivers consistently support identical programming interfaces: DHXAPI, DHXAPI.Net and 6001-F1E. Supporting these existing standards protects the software and R&D investments of end-users and OEMs.

Software developers can use the DHX Software Development Kit (DHX SDK) to obtain connectivity to DH, DH+, DH-485, ControlNet and Ethernet TCP/IP networks for their applications. Applications developed with the DHX SDK can be used with all DHX family drivers and can execute under all current Windows operating systems.

Blending DHX Supported Networks

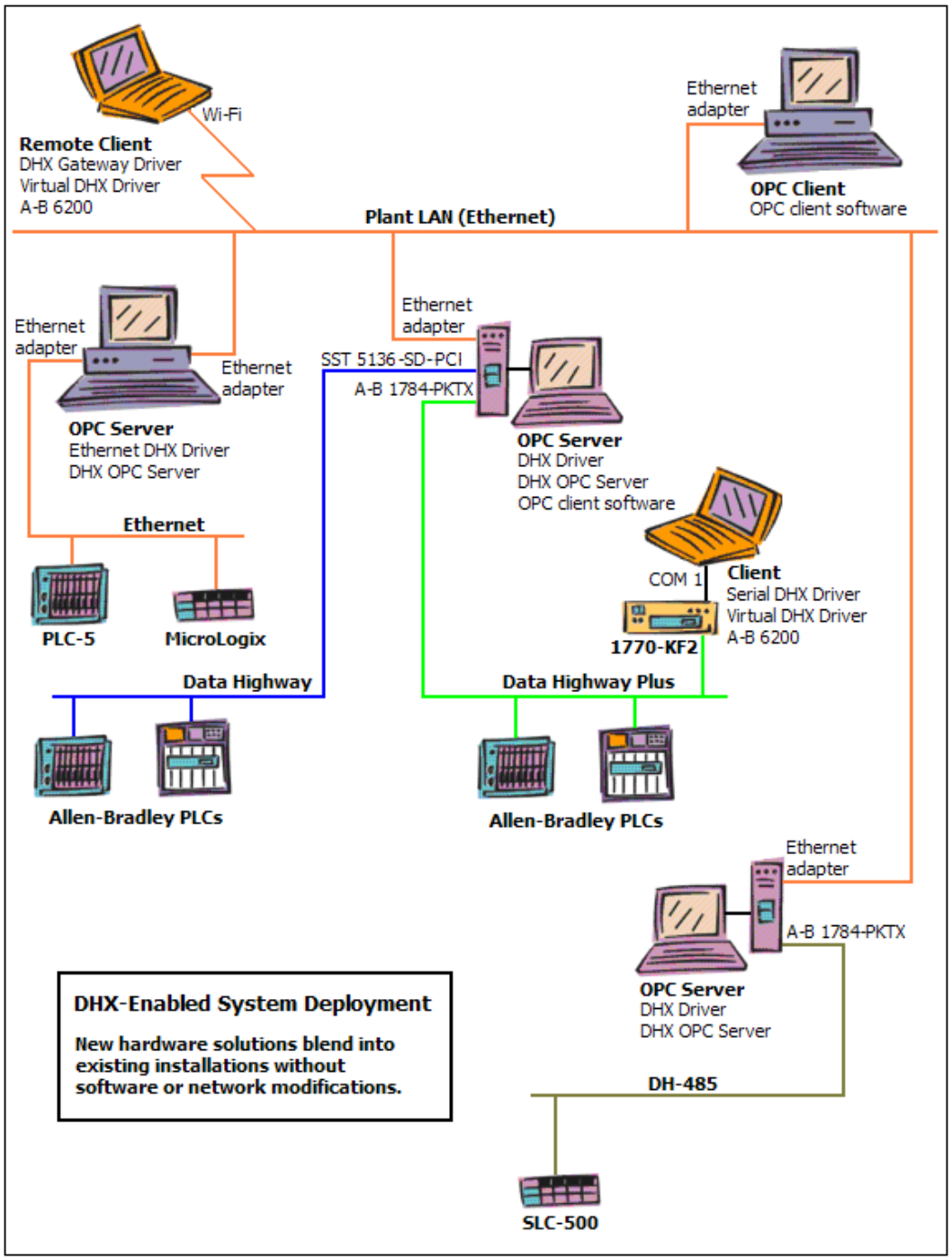
The DHX driver family provides support for all Allen-Bradley networks through a common architecture, with identical programming interfaces. This means that an application that operates with one of the DHX family drivers, such as the DHX Driver, will work with the

rest of them as well. Thus, virtually all Allen-Bradley compatible software programs can operate over all networks supported by A-B with no code modifications. You will find a complete description of the DHX family in the Appendix A: DHX Architecture and Companion Products.

Migration of existing installations to new hardware products does not require the user to discard working, proven software solutions. As depicted in the diagram below, a user can mix Data Highway, Data Highway Plus, DH-485, ControlNet and Ethernet based hardware products in existing installations without losing software, network or integration investment.

The DHX family of products includes:

- DHX Driver is Cyberlogic's device driver for Data Highway, Data Highway Plus and DH-485 adapter cards from Allen-Bradley and SST.
- Ethernet DHX Driver provides Data Highway Plus emulation over TCP/IP.
- Serial DHX Driver is a full-duplex DF1 protocol driver for Data Highway, Data Highway Plus, DH-485 and ControlNet networks over serial COM port connections.
- DHX Gateway Driver works with the other DHX drivers, giving access to Data Highway, Data Highway Plus, DH-485, ControlNet and Ethernet networks from remote locations.
- ControlLogix Gateway Driver provides remote access to Allen-Bradley's Data Highway Plus network by letting you access 1756-DHRIO gateway modules in a ControlLogix chassis from a remote location.
- Virtual DHX Driver works with the other DHX drivers to permit 16-bit legacy software to run in current Windows operating systems.
- DHX OPC Server connects OPC-compliant client software applications to data sources over all Allen-Bradley networks.
- DHX SDK is a software development kit for DHXAPI, DHXAPI.Net and 6001-F1E compliant development.


Wi-Fi
Remote Client
DHX Gateway Driver
Virtual DHX Driver
A-B 6200
Ethernet adapter
OPC Client
OPC client software
Plant LAN (Ethernet)
Ethernet adapter
Ethernet adapter
OPC Server
Ethernet DHX Driver
DHX OPC Server
Ethernet
PLC-5
MicroLogix
Data Highway
Allen-Bradley PLCs
Ethernet adapter
SST 5136-SD-PCI
A-B 1784-PKTX
OPC Server
DHX Driver
DHX OPC Server
OPC client software
COM 1
Client
Serial DHX Driver
Virtual DHX Driver
A-B 6200
1770-KF2
Data Highway Plus
Allen-Bradley PLCs
Ethernet adapter
A-B 1784-PKTX
OPC Server
DHX Driver
DHX OPC Server
DH-485
SLC-500
DHX-Enabled System Deployment
New hardware solutions blend into existing installations without software or network modifications.

WHAT SHOULD I DO NEXT?

The links below will take you directly to the section of this manual that contains the information you need to configure, use and troubleshoot the Serial DHX Driver.

Learn How the Driver Works

If you are not familiar with the way that the Serial DHX Driver handles communication, you should begin by reading Communication Using the Serial DHX Driver.

Read a Quick-Start Guide

First-time users of the Serial DHX Driver will want to read the Quick-Start Guide, which walks through a typical configuration session, step-by-step.

Get Detailed Information on the Configuration Editors

Experienced users who want specific information on features of the configuration editors will find it in the Configuration Editor Reference section.

Verify That It's Working or Troubleshoot a Problem

If you have already configured the driver, you should verify that it operates as expected. Refer to the Validation & Troubleshooting section for assistance. In case of communication problems, this section also provides problem-solving hints.

Get Information on Related Products

The DHX family consists of several well-integrated products, which provide connectivity for Allen-Bradley networks in distributed environments. For more information about these products, refer to the Appendix A: DHX Architecture and Companion Products section.

Print a Copy of This Document

The content of this document is also provided in PDF format. PDF files can be viewed using the Adobe® Reader program, and can also be used to print the entire document.

Contact Technical Support

To obtain support information, open the Windows ***Start*** menu and go to ***Cyberlogic Suites***, and then select ***Product Information***.

COMMUNICATION USING THE SERIAL DHX DRIVER

The Serial DHX Driver provides connectivity to full-duplex, DF1-compatible devices through standard serial COM ports. These include DH, DH+, DH-485 and ControlNet interface modules such as the DL-PCIe, 1784-U2DHP, 1770-KF2, 1785-KE, 1770-KF3 and 1770-KFC15. Direct connection to devices with full-duplex, DF1-compatible ports is also supported. The driver supports all underlying communication network features, including solicited and unsolicited communications.

Each Serial DHX device has an associated serial COM port. The assigned COM port belongs exclusively to a single device and is not shared with other Serial DHX devices or system applications.

The following sections describe various operational features of the driver.

Solicited Communications

Solicited requests are I/O requests that are initiated by an application program. The Serial DHX Driver can handle up to 255 simultaneous solicited transactions for every configured interface module. These transactions are carried over abstract communication ports called solicited channels.

Each solicited channel is capable of carrying out one solicited transaction at a time. Once a command message is sent through a channel, no more command messages are allowed through this channel until a reply message is received, a timeout occurs or the transaction is canceled.

A single solicited channel can be used to communicate to multiple network nodes. Therefore, simple applications can perform all of their solicited communications through a single channel. However, applications can typically achieve much greater performance by using multiple solicited channels, because the transactions carried over these channels are executed simultaneously.

In a multitasking environment such as Windows, multiple applications can operate concurrently and each can carry out I/O requests through the solicited channels. Increasing the number of applications that require concurrent solicited communications may increase the required number of solicited channels. Because each channel allocates various system resources, users may want to limit the number of solicited channels that these applications may use. Refer to the Serial DHX Configuration Editor section for more information on how to configure this limit.

Unsolicited Communications

Unsolicited requests are I/O requests initiated by external devices, such as PLCs. The Serial DHX Driver can handle up to 65535 simultaneous unsolicited subscriptions for every configured interface module. These subscriptions are carried over abstract communication ports called unsolicited channels.

The listening application provides each of its unsolicited channels with a message filter. The channel is then capable of receiving unsolicited command messages that meet the filter criteria. These criteria are based on various characteristics of the command message, such as the source station address, command code, message type and message data signature.

Each unsolicited channel has an associated first-in-first-out (FIFO) buffer. If an unsolicited message arrives while the application is busy processing another message, the new message will be placed in this buffer for later processing. Because each channel allocates various system resources, users may want to limit both the number of unsolicited subscriptions that all applications can issue and the sizes of the FIFO buffers associated with the unsolicited channels. Refer to the Serial DHX Configuration Editor section for more information on how to configure these limits.

Active Node Table

The DHX architecture is modeled on the DH+ architecture, and so the Serial DHX Driver allows applications to read the active node table. This table identifies all active nodes on the local network.

If the underlying network is DH+ or DH-485, the Serial DHX Driver acquires the active node table from the interface module, and the table represents true active node states. However, DH and ControlNet do not maintain active node table information. For these networks, the active node table shows all nodes as active.

Hardware Flow Control

The Serial DHX Driver supports the use of hardware flow control or "handshaking". The two output signals, Data Terminal Ready (DTR) and Request To Send (RTS), are always used as follows:

- DTR is always on.
- RTS is always on.

In addition, when hardware flow control is enabled on a device, the driver uses the two input signals, Data Set Ready (DSR) and Clear To Send (CTS) as follows:

- DSR must be on to permit the device to send or receive data. If DSR is off, no data will be sent and any received data will be ignored.
- CTS must be on to permit the device to send data.

In general, hardware flow control is not needed when you are simply connecting two devices directly using an RS-232 cable. Handshaking should be used if you are using modems to connect several devices in a multi-drop configuration. By default, hardware flow control is enabled.

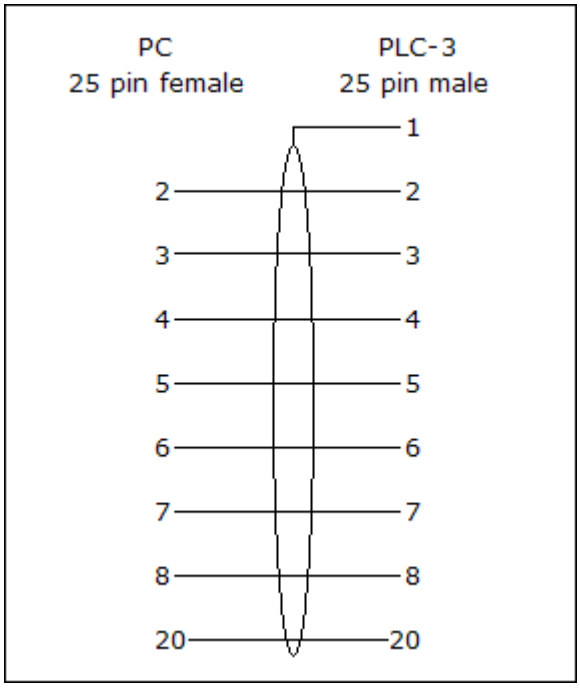
Caution! Not all serial ports support handshaking. When using hardware flow control, always verify that the communication module you are connecting to supports hardware flow control.

Cables

The specific cable requirements for your installation will depend on the type of programmable controller or other equipment you are connecting to. The figures below show some of the more common serial cables for Allen-Bradley devices.

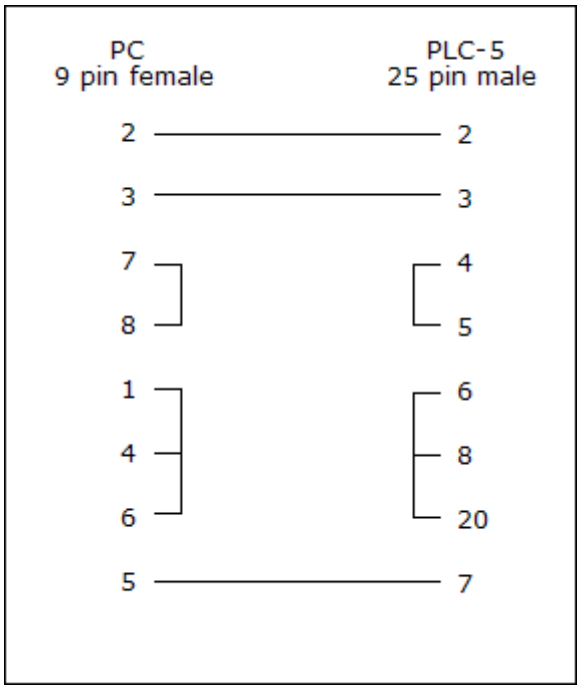
Notice that, for some cables, some or all of the handshaking pins are jumpered back, whereas on others they are connected through. For a discussion of the reasons for this, refer to the preceding section, Hardware Flow Control.

PLC-3 Cable



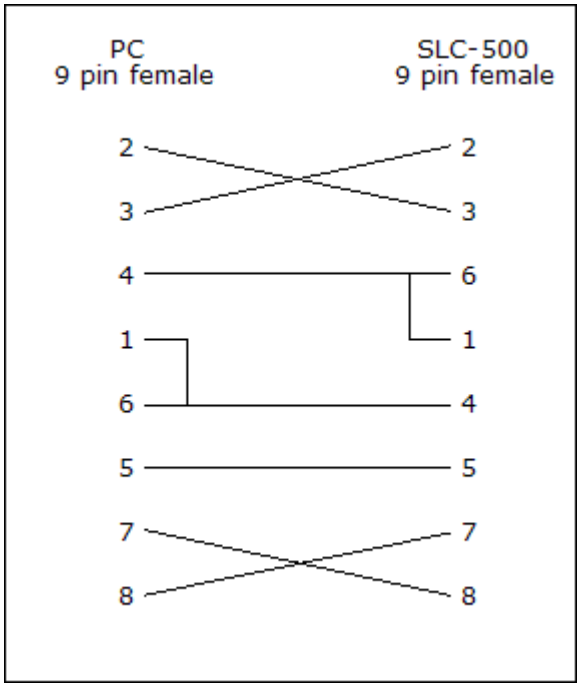
This cable connects to channel 0 or 5 on a PLC-3. The PC connector is a 25 pin female for use with the serial ports on older IBM compatible systems, but you can use a 9 to 25 pin adapter to connect to the serial port on newer systems.

PLC-5 Cable



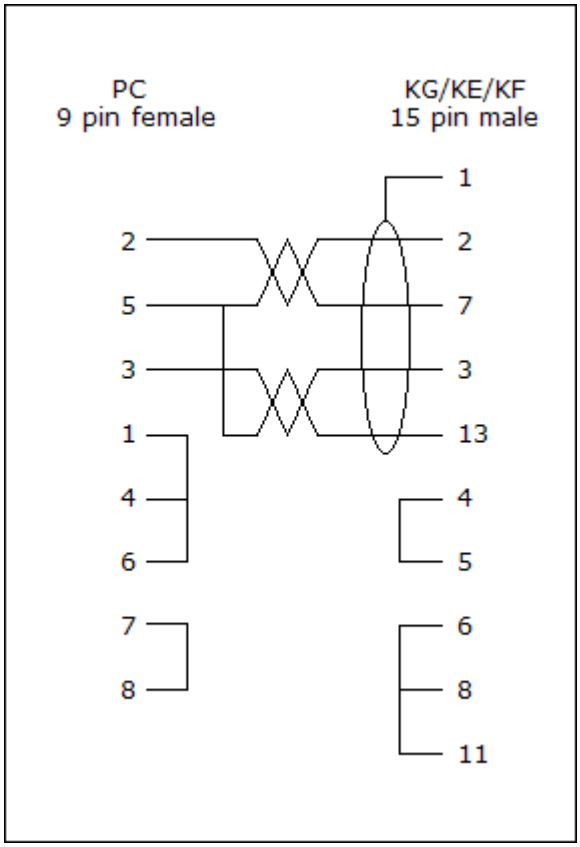
This cable is used to connect a PC to channel 0 of an enhanced PLC-5 processor.

SLC-500



This cable is used for a direct connection to channel 0 on a SLC-500/03.

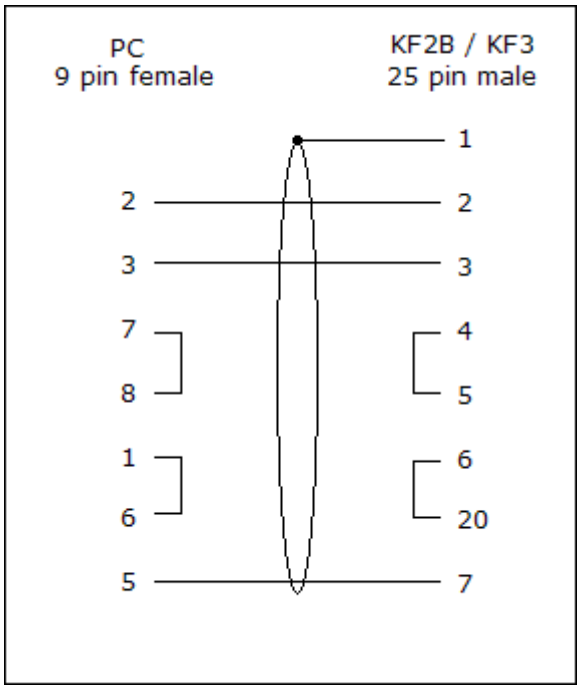
KG, KE, KF Cable



This cable connects a PC serial port to any of the following modules:

- 1771-KG
- 1771-KE
- 1771-KF
- 1785-KE

KF2B or KF3 Cable



This cable connects the serial port of a PC to a 1770-KF2B or 1770-KF3 module.

Error Detection

The DF1 protocol allows for either BCC or CRC-16 error detection, and the Serial DHX Driver supports both of these algorithms, allowing you to select the method that matches your communication module setting.

The BCC algorithm provides a medium level of data security. The CRC-16 algorithm provides a higher level of data security, and should be used when the likelihood of communication errors is high.

Duplicate Message Detection

The DF1 protocol's provisions for handling communication errors may cause a node to retransmit its last message. If the receiving node had already received the first message, the retransmission will be a duplicate of that message.

Duplicate message detection can be enabled through the Serial DHX Configuration Editor. When this feature is enabled, duplicate messages will be discarded. This is the default setting, and is recommended for most users.

Diagnostic Commands

Other network nodes may send diagnostic commands to the network interface module, which can be configured to execute these commands or pass them through. The Serial DHX Driver does not process diagnostic commands, so most users should configure the interface modules to execute the commands. If the interface module is configured for pass-through mode, a Serial DHX client application must be provided to handle the diagnostic commands.

Embedded Responses

The full-duplex DF1 protocol allows response codes to be sent inside data messages. Because this feature improves performance, most communication modules support it, as does the Serial DHX Driver. To accommodate communication modules that do not support it, the Serial DHX Configuration Editor can be used to disable the sending of embedded responses.

QUICK-START GUIDE

Before the Serial DHX Driver can be used, it must be properly configured. The configuration procedure involves creating one or more Serial DHX devices and configuring them to work on your network. Your software applications will then use this logical device to communicate over the network.

To accomplish this, you must run the DHX Driver Configuration Editor after you install the software. The DHX Driver Configuration Editor is a common component of all drivers in the DHX family. When configuring a Serial DHX device, the DHX Driver Configuration Editor automatically dispatches the Serial DHX Configuration Editor.

The following steps show a typical configuration session. Use it only as a guideline of how to configure the most common features. For detailed descriptions of all of the available features, refer to the Configuration Editor Reference section.

The procedure is broken into several short segments:

- Creating Serial DHX Device
- Configuring a Serial DHX Device
- Configuring the Serial DHX Driver Control
- Configuring the DHX Gateway Server
- Verifying Your Driver Configuration
- Backing Up Your Configuration

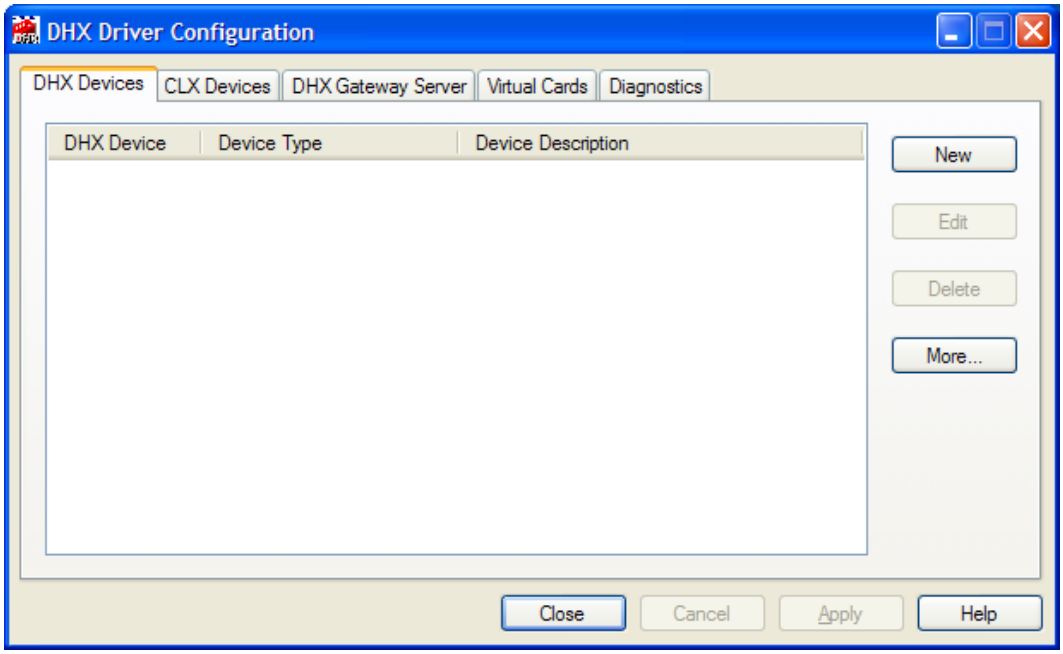
After completing this procedure, you will have a fully-configured Serial DHX device and will be able to confirm that the driver is running and communicating with other nodes on your network.

To begin, go to Creating Serial DHX Device.

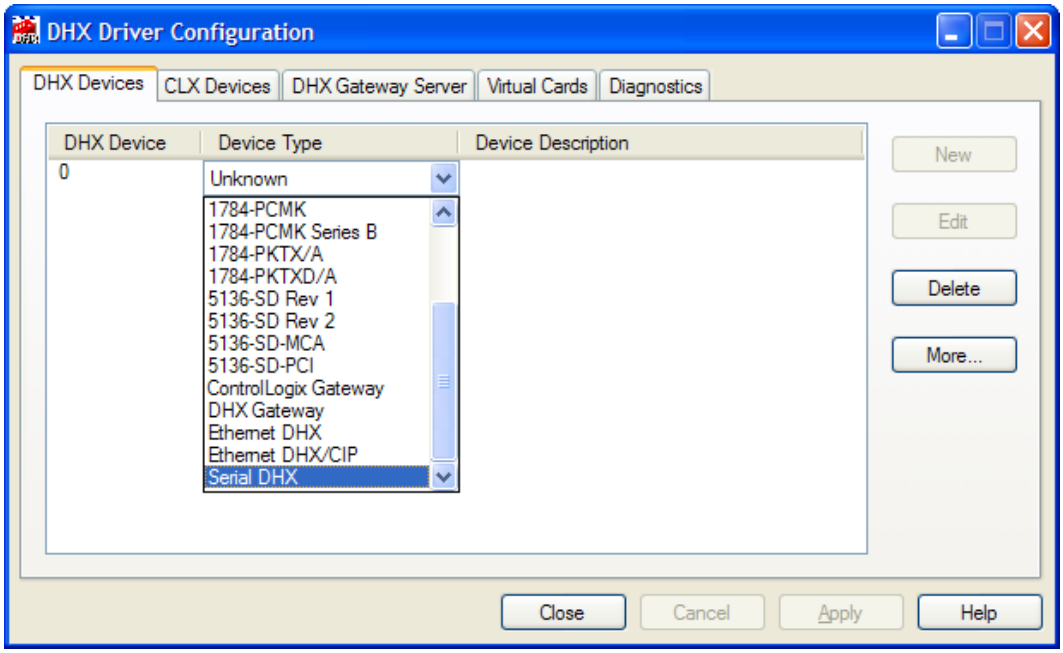
Creating Serial DHX Device

The first step in configuring the Serial DHX Driver is to create a Serial DHX device. This is a logical device that your applications will communicate through.

1. From the Windows ***Start*** menu, go to ***Cyberlogic Suites***, then open the ***Configuration*** sub-menu, and then select ***DHX Device Drivers***.



Running the editor for the first time displays the above screen.



2. Click ***New*** and select ***Serial DHX*** from the Device Type drop-down list.

   This creates a Serial DHX device and launches the Serial DHX Configuration Editor.

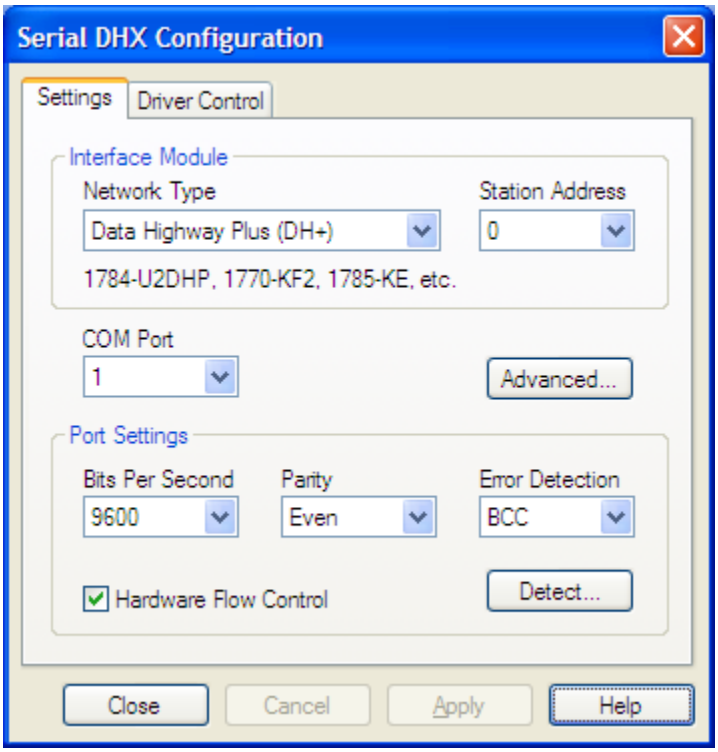
Go to Configuring a Serial DHX Device to continue.

Configuring a Serial DHX Device

The Serial DHX Configuration editor consists of two tabs. In this section, we will configure the parameters on the Settings tab.

Caution!

The configuration values you select on the Settings tab must match the settings used on the interface module or other device you will communicate with. See Appendix B: Using the 1784-U2DHP Adapter for information on configuring and operating the 1784-U2DHP adapter. See Appendix C: Using the DL-PCIe Adapter for information on configuring and operating the DL-PCIe adapter.



1. From the ***Network Type*** drop-down, select the protocol used on your network.

2. Select the device's ***Station Address***.

3. Select the serial ***COM Port*** associated with your Serial DHX device.

   The assigned COM port belongs exclusively to a single device and is not shared with other Serial DHX devices or other applications in the system.

4. Next you must configure the Port Settings, which may be done manually or automatically. To detect the settings automatically, you must have the serial cable connected to the device you will communicate with. Manual configuration does not require the port to be connected, and is quicker, if you know the correct settings to use.

   To configure these settings manually, go to the next step.

To configure these settings automatically, click ***Detect...***.

When the detection is complete, skip the rest of this section and go to Configuring the Serial DHX Driver Control.

5. Select the desired ***Bits Per Second*** data rate.

6. Select the desired ***Parity*** for the port.

7. Choose the ***Error Detection*** method to be used.

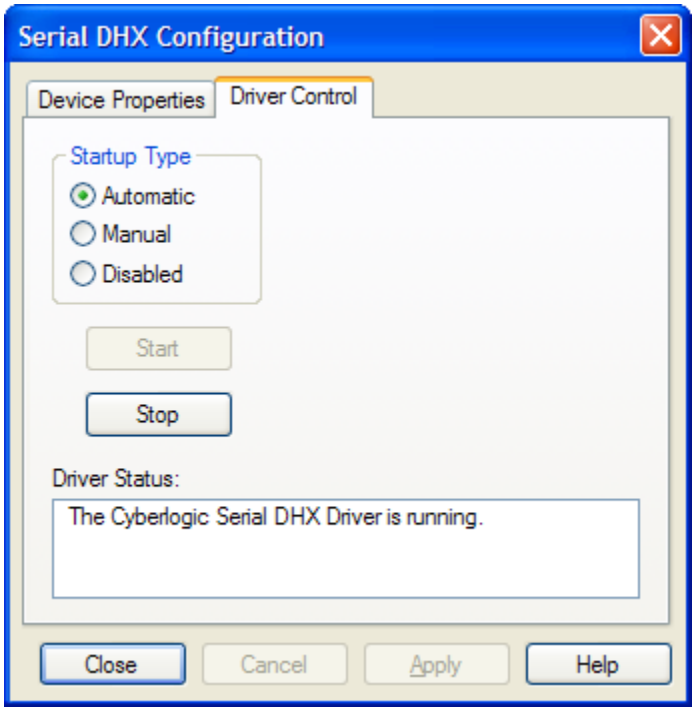
   The CRC-16 algorithm provides a higher level of data security and should be used for all stations on the network when the likelihood of communication errors is high. In any case, all stations that will communicate with each other must use the same method of error detection.

8. Check or clear the ***Hardware Flow Control*** box, as appropriate for your setup.

Go to Configuring the Serial DHX Driver Control to continue.

Configuring the Serial DHX Driver Control

Here, you will determine how the Serial DHX Driver will be started. Most users should select the Automatic startup type. In this mode, the driver starts automatically when the operating system boots.



1. Select the ***Driver Control*** tab.

2. Select the desired mode of operation among the ***Startup Type*** choices.

If you want the driver to start automatically when Windows boots, select ***Automatic***. This is the recommended setting.

If you want to control the driver manually, select ***Manual***.

To prevent the Serial DHX Driver from running, select ***Disabled***.

3. Click ***Close*** to return to the DHX Driver Configuration Editor.

Your Serial DHX device is now fully configured.

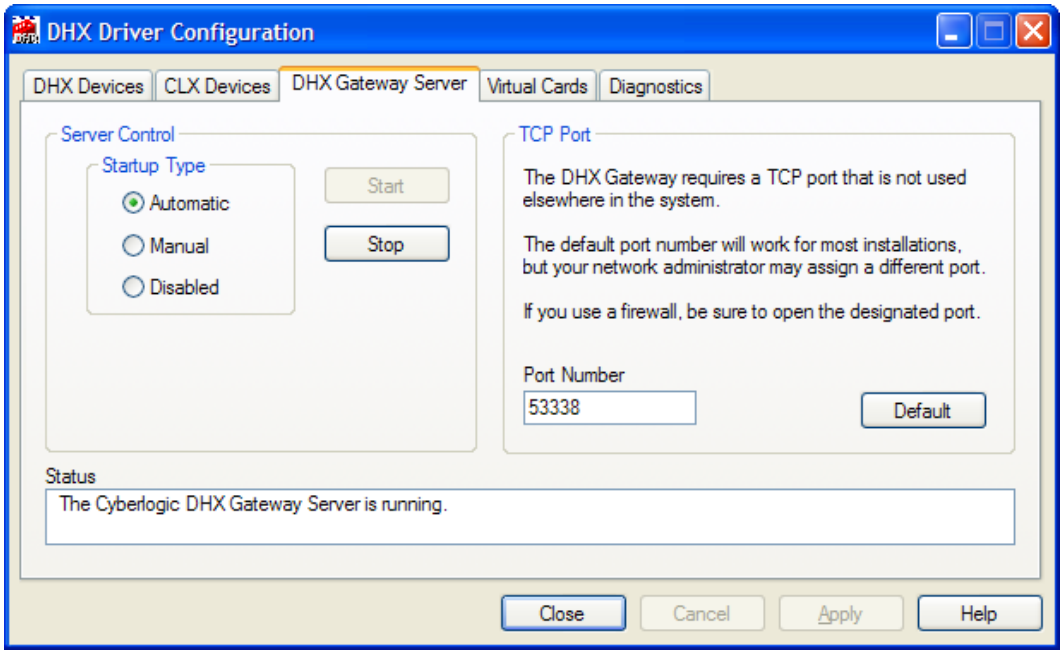
Next, go to Configuring the DHX Gateway Server.

Configuring the DHX Gateway Server

The Serial DHX Driver comes with the DHX Gateway Server. The DHX Gateway Server allows remote nodes to access all configured DHX devices present on the system that is running the DHX Gateway Server. Refer to the DHX Gateway Driver section for more information on this capability.

You must enable and configure the DHX Gateway Server if you plan to use the DHX Gateway Driver on other systems on your network and you want them to be able to access the DHX devices on this system. Otherwise, you should disable the DHX Gateway Server.

1. Select the ***DHX Gateway Server*** tab.



2. Select the desired mode of operation among the ***Startup Type*** choices.

If you want to use the DHX Gateway Server and you want it to start whenever the system is booted, select ***Automatic***. This is the recommended setting for systems that will use the Gateway Server.

If you want to use the DHX Gateway Server and want to control it manually, choose ***Manual***.

If you do not want to use the DHX Gateway Server, choose ***Disabled***. You can then skip the rest of this section and go directly to Verifying Your Driver Configuration.

3. You must enter a TCP port that is not used elsewhere in the system. The default, 53338, will work for most installations, but this port may be taken in some unusual cases. If that applies to your system, the system administrator will assign a different port value that you must enter in the ***Port Number*** field.

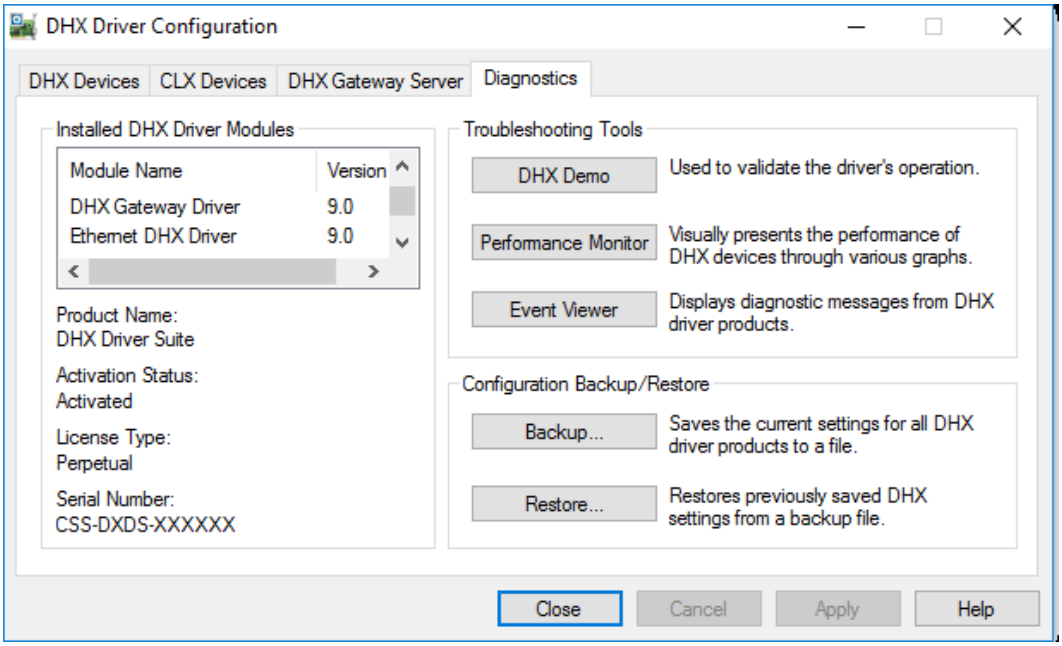
4. If your system uses a firewall, you must configure it to permit DHX Gateway communication. The procedure will depend upon the firewall you are using. Refer to the DHX Gateway Server Tab discussion in the DHX Driver Configuration Editor section for more information.

5. If the DHX Gateway Server is not already running, click ***Start***.

Now go to the Verifying Your Driver Configuration section, which will introduce you to the diagnostic features of the product.

Verifying Your Driver Configuration

The Diagnostics tab features will help you to confirm that the driver is running and is properly configured. They will also provide important help in case troubleshooting or technical support is needed.



1. Select the ***Diagnostics*** tab.

2. The left pane of this screen shows all DHX product components installed on your system. This information, including the version numbers, may be requested if you call for technical support.

   This screen also tells you if the software has been activated or if it is running in the two-hour demo mode.

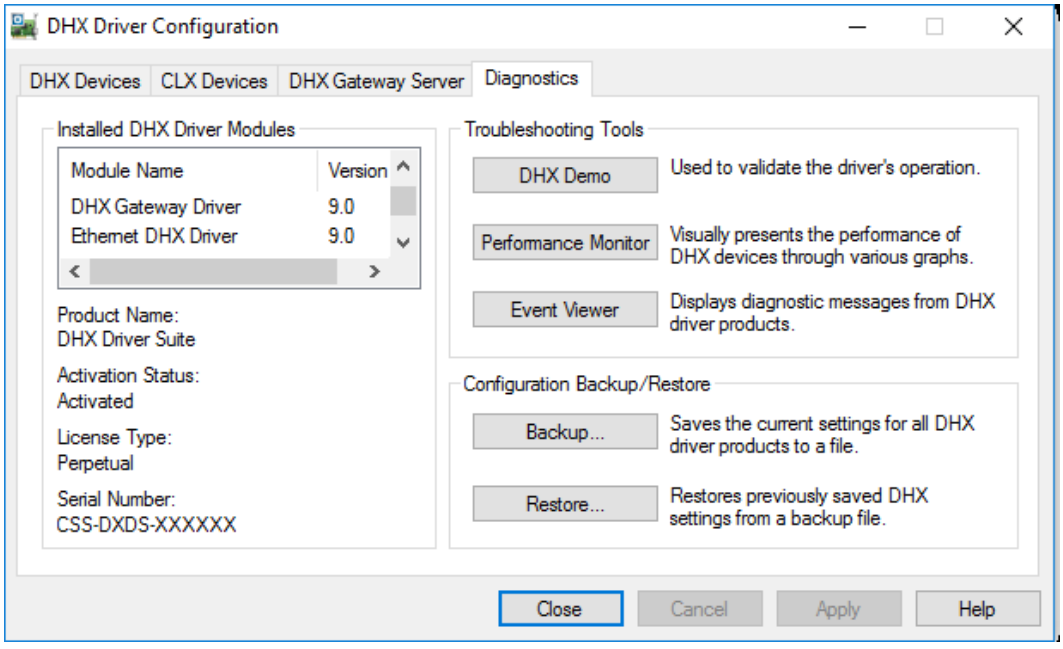
Caution! If you are running in demo mode, the DHX products will stop after two hours of operation and will resume after the system is restarted.

3. The right pane of the screen provides shortcuts to troubleshooting and backup/restore tools. Run the ***DHX Demo*** program after configuring the DHX Driver to verify that the driver is configured and running properly. Detailed instructions for running this utility are included in the Validation & Troubleshooting section.

When you are satisfied that the driver is correctly configured, proceed to Backing Up Your Configuration.

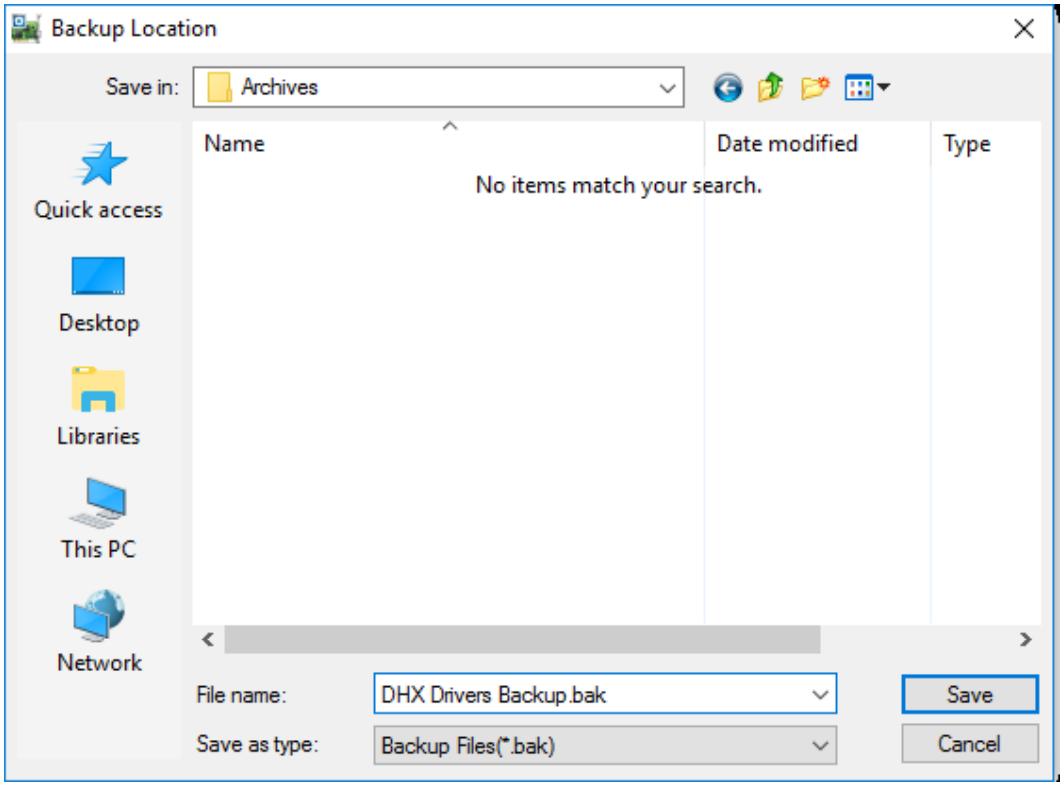
Backing Up Your Configuration

To protect the work that you put into configuring and testing the driver, we strongly recommend that you back up the configuration.



1. Select the ***Diagnostics*** tab of the DHX Driver Configuration editor.

2. Click the ***Backup...*** button.



3. Browse for the desired backup directory. By default, the last-used directory is selected.

4. Enter the ***File name*** you want to use for your configuration backup file, and then click the ***Save*** button to complete the backup operation.

CONFIGURATION EDITOR REFERENCE

Before the Serial DHX Driver can be used, it must be properly configured. The configuration procedure involves creating and configuring one or more Serial DHX devices.

This section provides a detailed description of each of the configuration editor features. If you are a new user and want a procedure to guide you through a typical configuration session, refer to the Quick-Start Guide.

To create a Serial DHX device, you must run the DHX Driver Configuration Editor after you install the software. The DHX Driver Configuration Editor is a common component of all DHX family drivers.

When configuring a Serial DHX device, the DHX Driver Configuration Editor automatically dispatches the Serial DHX Configuration Editor.

In addition to the driver configuration, you must configure the communication module. The section on Communication Module Configuration Guidelines will help you with this process.

DHX Driver Configuration Editor

The DHX Driver Configuration Editor is a common component of all drivers in the DHX family. It is used to create DHX and CLX devices, configure the DHX Gateway Server and provide access to diagnostic information and utilities. When you create or edit a device, the DHX Driver Configuration Editor automatically dispatches the proper device configuration editor.

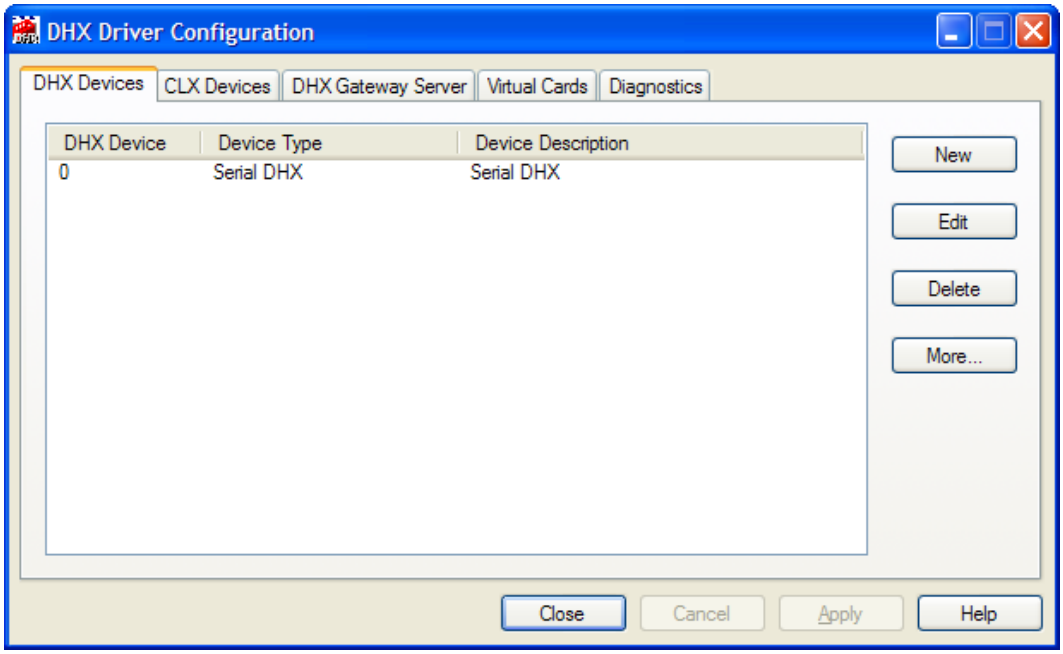
The DHX Driver Configuration editor consists of five tabs:

- DHX Devices Tab
- CLX Devices Tab
- DHX Gateway Server Tab
- Virtual Cards Tab
- Diagnostics Tab

The following sections provide complete descriptions of these tabs.

DHX Devices Tab

DHX devices are logical devices that are used to communicate to Programmable Logic Controllers, such as MicroLogix, SLC-500, PLC-5, PLC-3 and PLC-2. Every DHX device must be configured on the DHX Devices tab before it can be used by client applications, such as the DHX OPC Server. The DHX Devices tab lists all currently configured DHX devices in your system. The information is shown in three columns: DHX Device, Device Type and Device Description.



DHX Device

This column contains a number that the editor assigns to every DHX device installed in the system. This is not the DH/DH+ node address. By default, the editor will try to use consecutive numbers for the devices starting from zero. However, this is not a requirement.

Device Type

This column identifies the type of the DHX device, such as 1784-KTX, Ethernet DHX or DHX Gateway.

Device Description

This is user-assigned text for describing a device. During device creation, a default description text will be assigned. Refer to the Changing Device Description section, below, for information on how to modify this text.

The device description text has no effect on the DHX device operation. However, some applications using this device may be able to show this text.

New

Click this button to create a new DHX device.

Edit

Select a DHX device and click this button to edit it.

Delete

Select a DHX device and click this button to delete it.

More...

Select a DHX device and click this button for additional editing features. You can change the device type or edit the Device Description field.

Creating a New DHX Device

Click the ***New*** button or right-click inside the list window and select ***New*** from the context menu. Then select an adapter card or other device type from the drop-down list.

Upon selecting the device type, the DHX Driver Configuration editor will automatically dispatch the configuration editor that is appropriate for that device.

Deleting an Existing DHX Device

Select the device and click the ***Delete*** button or right-click and select ***Delete*** from the context menu.

Editing an Existing DHX Device Configuration

Select the device, click the ***Edit*** button or right-click and select ***Edit*** from the context menu. The DHX Driver Configuration editor will automatically dispatch the appropriate device configuration editor. The screen that follows will depend on the selected device type.

Changing Device Description

Select the device, click the ***More...*** button or right-click and select ***Edit Description*** from the context menu. Modify the device description and press the ***Enter*** key when you are done.

Changing Device Type

Select the device and click the ***More...*** button or right-click and select ***Change Type*** from the context menu. From the drop-down list, select the new device type for the DHX device. Upon selecting the new device type, the DHX Driver Configuration editor will automatically dispatch the appropriate device configuration editor. The screen that follows will depend upon the device type selected.

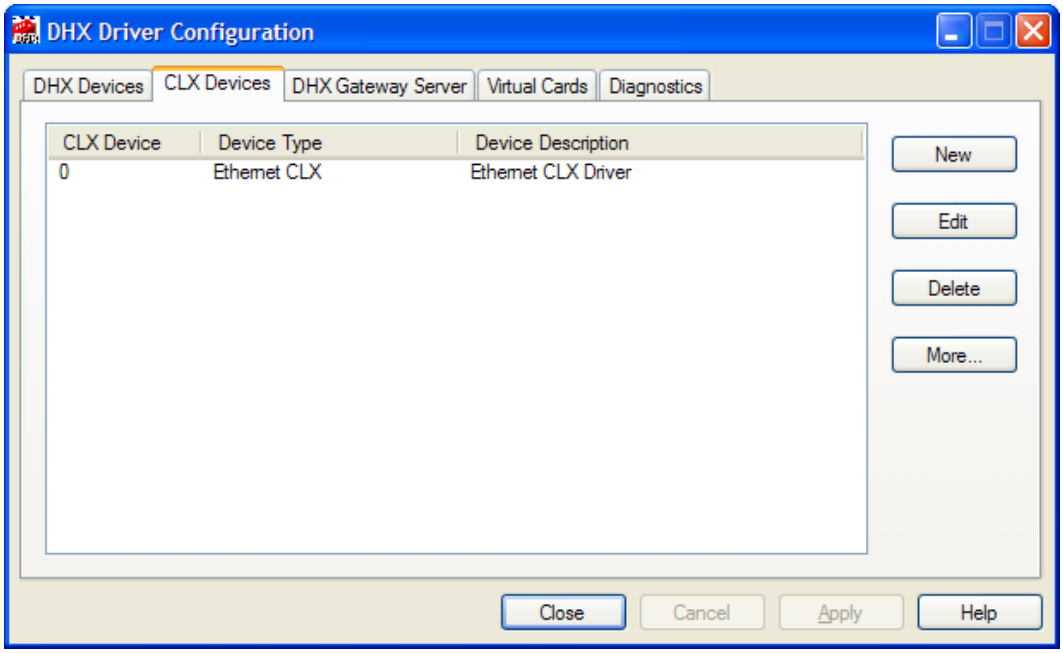
CLX Devices Tab

CLX devices are logical devices that are used to communicate to the Logix family of Programmable Automation Controllers, such as ControlLogix, CompactLogix and FlexLogix. Every CLX device must be configured on the CLX Devices tab before it can be used by client applications, such as the DHX OPC Server. The CLX Devices tab lists all

currently configured CLX devices in your system. The information about each device is shown in three columns: CLX Device, Device Type and Device Description.

Note

Ethernet CLX and CLX over DHX devices are used only with the Cyberlogic DHX OPC Server and are available only if you have installed the DHX OPC Server Suite, DHX OPC Premier Suite or DHX OPC Enterprise Suite. Otherwise, the Ethernet CLX and CLX over DHX device types will not be available, and this tab will not appear in the editor. For more information on CLX devices, refer to the DHX Driver help.



CLX Device

This column contains a number that the editor assigns to every CLX device installed in the system. By default, the editor will try to use consecutive numbers for the devices starting from zero. However, this is not a requirement.

Device Type

This column identifies the type of the CLX device, such as Ethernet CLX or CLX over DHX.

Device Description

This is user-assigned text for describing a device. During device creation, a default description text will be assigned. Refer to the Changing Device Description section, below, for information on how to modify this text.

The device description text has no effect on the CLX device operation. However, some applications using this device may be able to show this text.

New

Click this button to create a new CLX device.

Edit

Select a CLX device and click this button to edit it.

Delete

Select a CLX device and click this button to delete it.

More...

Select a CLX device and click this button for additional editing features. You can change the device type or edit the Device Description field.

Creating a New CLX Device

Click the ***New*** button or right-click inside the list window and select ***New*** from the context menu. Then select the desired device type from the drop-down list.

Upon selecting the device type, the DHX Driver Configuration editor will automatically dispatch the appropriate device editor.

Deleting an Existing CLX Device

Select the device and click the ***Delete*** button or right-click and select ***Delete*** from the context menu.

Editing an Existing CLX Device Configuration

Select the device, click the ***Edit*** button or right-click and select ***Edit*** from the context menu. The DHX Driver Configuration editor will automatically dispatch the appropriate device configuration editor. The screen that follows will depend upon the selected device type.

Changing Device Description

Select the device and click the ***More...*** button or right-click and select ***Edit Description*** from the context menu. Modify the device description and press the ***Enter*** key when you are done.

Changing Device Type

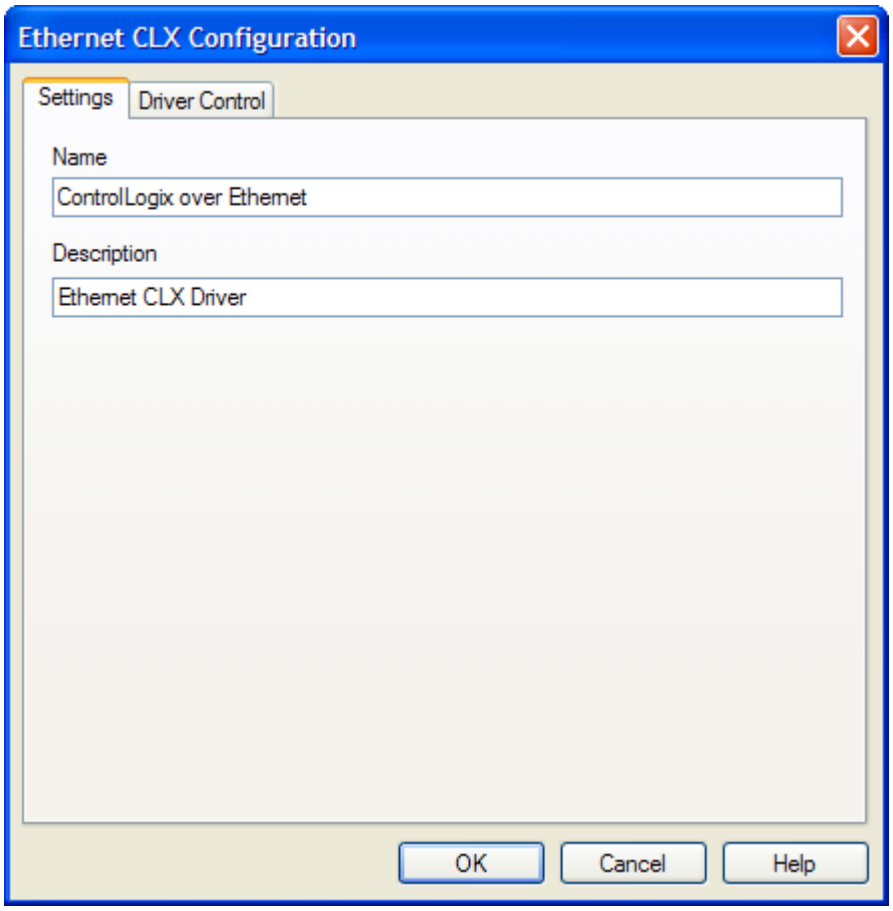
Select the device, click the ***More...*** button or right-click and select ***Change Type*** from the context menu. From the drop-down list, select the new device type for the CLX device. Upon selecting the new device type, the DHX Driver Configuration editor will

automatically dispatch the appropriate device configuration editor. The screen that follows will depend upon the device type selected.

Ethernet CLX Configuration

An Ethernet CLX device allows communications to the Logix family of Programmable Automation Controllers over Ethernet network. This type of a device does not require an Ethernet DHX device to operate.

When you create or edit an Ethernet CLX device, the Ethernet CLX Configuration editor is launched. This editor consists of two tabs, Settings and Driver Control.



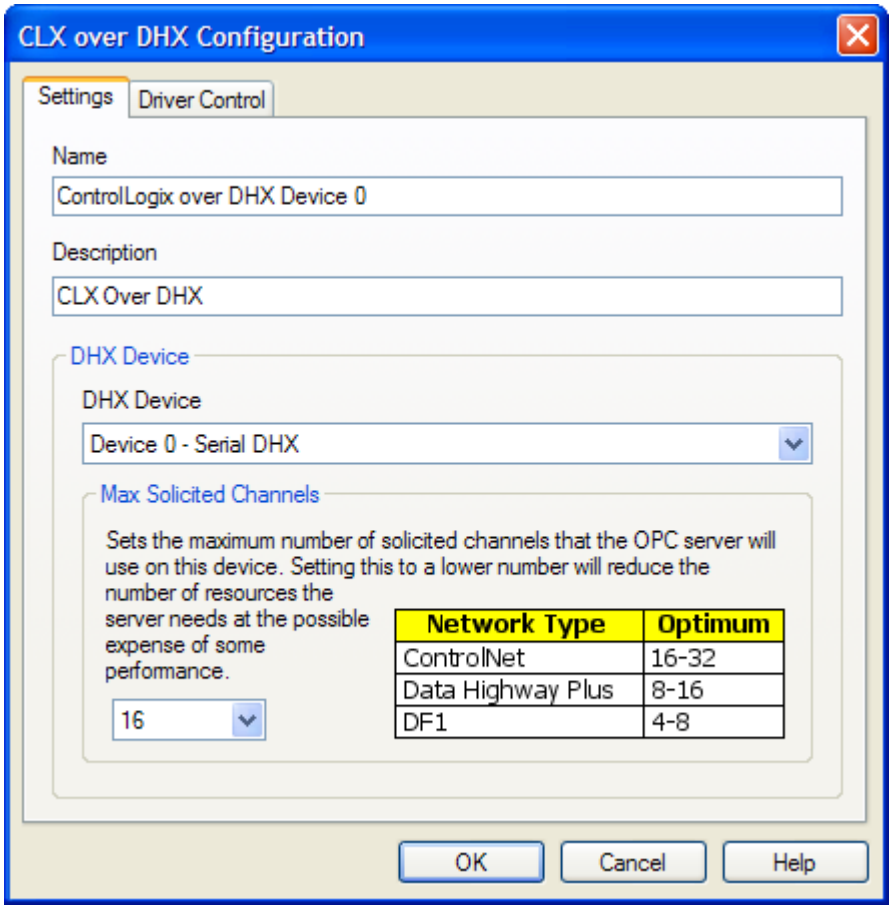
On the Settings tab, you can edit the name and description of the device. No other configuration is needed.

The Driver Control tab controls the startup and shutdown of the Ethernet CLX driver. This configuration is identical to that used for the Serial DHX driver, as explained in Configuring the Serial DHX Driver Control.

CLX over DHX Configuration

A CLX over DHX device allows communications to the Logix family of Programmable Automation Controllers over networks other than Ethernet. This type of a device requires an appropriate DHX device, such as a Serial DHX device, to operate.

When you create or edit a CLX over DHX device, the CLX over DHX Configuration editor is launched. This editor consists of two tabs, Settings and Driver Control.



On the Settings tab, you can edit the name and description of the device. You must also edit the items in the DHX Device section.

DHX Device

Every CLX over DHX device must have an associated DHX device. You may select the desired device from this drop-down box.

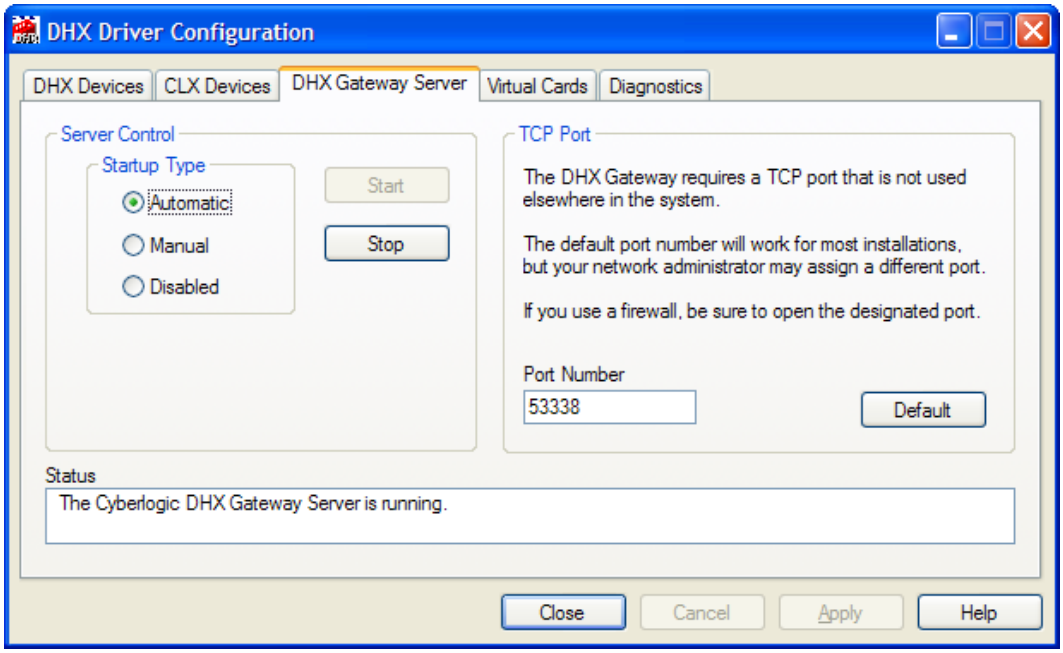
Max Solicited Channels

This setting allows you to select the maximum number of solicited channels that the OPC server will use for this device. This allows you to trade-off speed and system resource usage. The optimum value depends on the network type.

The Driver Control tab controls the startup and shutdown of the CLX driver. This configuration is identical to that used for the Serial DHX driver, as explained in Configuring the Serial DHX Driver Control.

DHX Gateway Server Tab

All DHX suites include the DHX Gateway Server, a remote connectivity component of the DHX family. The DHX Gateway Server allows remote nodes to access all configured DHX devices present on the system that is running the DHX Gateway Server. Refer to the DHX Gateway Driver help file for more information on this capability.



Server Control

This section allows you to designate if and how you want the DHX Gateway Server to start.

Automatic

When this option is selected, the DHX Gateway Server will start when Windows boots.

Manual

When this option is selected, the DHX Gateway Server will not start when Windows boots, but you can control it manually using the Start and Stop buttons.

Disabled

When this option is selected, the DHX Gateway Server will not run.

Start

In Automatic or Manual mode, click this button to start the DHX Gateway Server.

Stop

In Automatic or Manual mode, click this button to stop the DHX Gateway Server.

Status

This tells you whether the DHX Gateway Server is running, stopped, starting or stopping.

TCP Port

The port used here must not be used elsewhere in the system. If your system uses a firewall, the port must be opened in the firewall configuration. For details, refer to the Configuring the Firewall section.

Port Number

Enter the number of the TCP port you wish to use.

Default

Click this button to restore the TCP port value to its default setting of 53338.

Selecting the Startup Type

If you want to use the DHX Gateway Server and want it to start whenever the system is booted, select ***Automatic***. This is the recommended setting for systems that will use the Gateway Server.

If you want to use the DHX Gateway Server and want to control it manually, choose ***Manual***. The Server will not start on boot-up; instead you must use the Start and Stop buttons to control it.

If you do not want to use the DHX Gateway Server, choose ***Disabled***.

Start/Stop the Gateway Server

Click the ***Start*** or ***Stop*** button.

Selecting the TCP Port

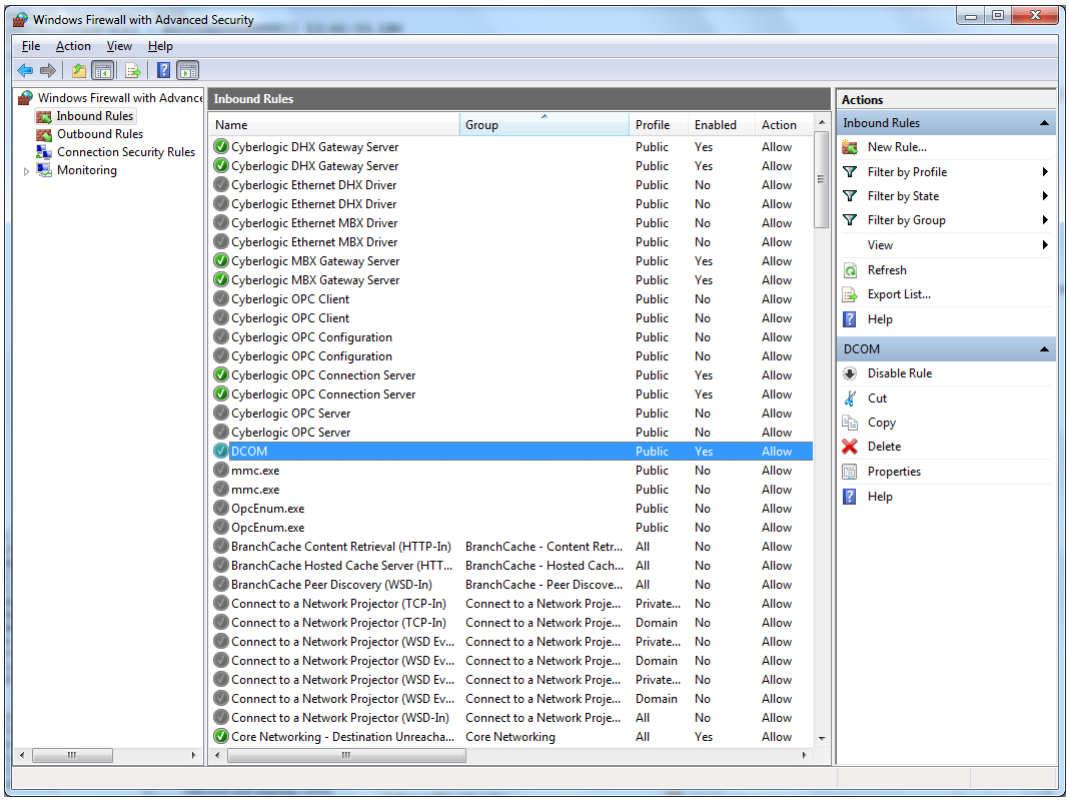
Enter the desired port number in the Port Number field.

You must enter a TCP port that is not used elsewhere in the system. The default, 53338, will work for most installations, but this port may be taken in some unusual cases. If that applies to your system, the system administrator will assign a different port.

Configuring the Firewall

If your system uses a firewall, you must configure it to permit MBX Gateway communication. The procedure shown here is for the Windows 7 firewall. The exact procedure for your system will depend upon the firewall you are using, but the issues are the same for all firewall types.

1. To configure Windows 7's firewall, go to ***Control Panel*** and open ***Windows Firewall*** and select ***Advanced Settings***.



2. Select ***Inbound Rules***.

3. Verify that the rules ***Cyberlogic DHX Gateway Server*** and ***DCOM*** are enabled. If not, enable them.

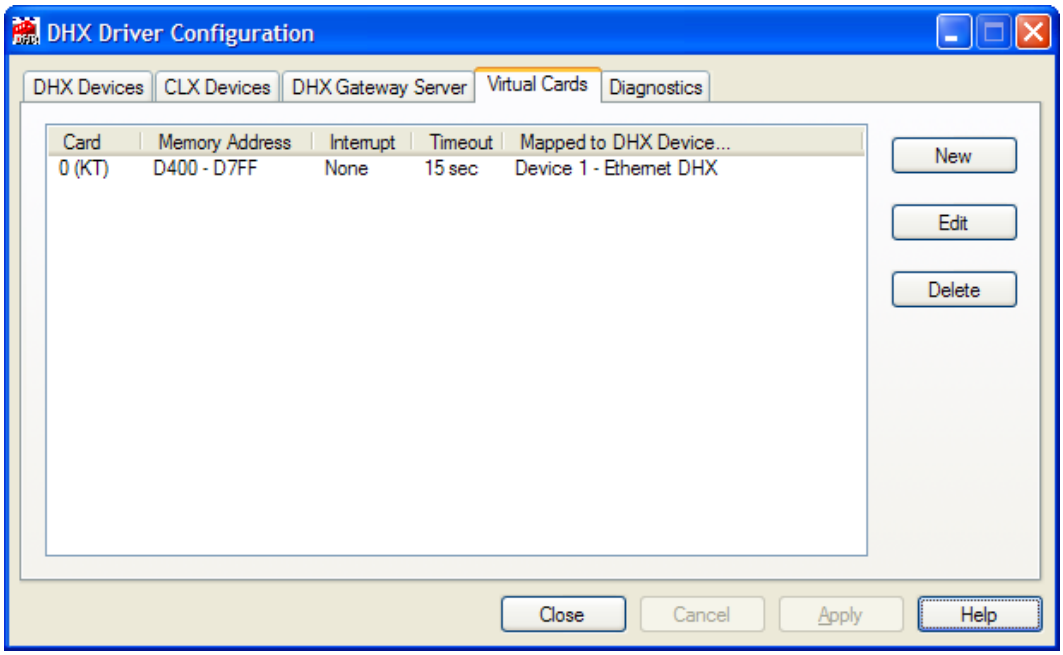
4. Close the window to exit.

Virtual Cards Tab

Virtual cards allow legacy 16-bit DOS and Windows applications to use any of the DHX devices you have configured in your system. They do this by making those devices appear to function as 1784-KT or 1784-KTX cards.

Note The Virtual Cards tab will appear in the editor only if the Virtual DHX Driver option is installed. For more information on Virtual DHX Driver, refer to the Virtual DHX Driver help.

The Virtual Cards tab lists all currently-configured virtual cards. The information is provided in five columns: Card, Memory Address, Interrupt, Timeout and Mapped to DHX Device….



Card

This column displays a number that the editor assigns to every virtual adapter card and also indicates the card type (KT or KTX).

Memory Address

This is the memory address range allocated to the virtual adapter card.

Interrupt

This is the interrupt IRQ line to be emulated by the virtual adapter card. If it is *None*, then the virtual card will operate in polled mode.

Timeout

This is the message timeout value for the virtual adapter card.

Mapped to DHX Device…

This is the actual DHX device used by the virtual adapter card for all of its communications.

New

Click this button to create a new virtual card.

Edit

Select a virtual card and click this button to edit it.

Delete

Select a virtual card and click this button to delete it.

Creating a New Virtual Card

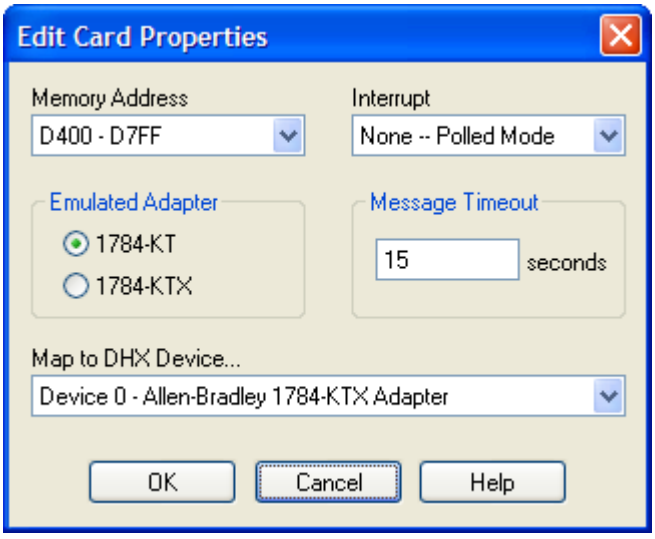
Click the ***New*** button or right-click inside the list window and select ***New*** from the context menu. The Edit Card Properties window will open to allow you to configure the new virtual card.

Deleting an Existing Virtual Card

Select the virtual card and click the ***Delete*** button or right-click and select ***Delete*** from the context menu.

Editing an Existing Virtual Card

Select an existing virtual adapter card and click the ***Edit*** button or right-click and select ***Edit*** from the context menu. In either case, the following dialog will appear.



Memory Address

This is the memory address range allocated to the virtual adapter card. This setting must match your 16-bit software configuration.

Interrupt

This is the interrupt (IRQ) line to be emulated by the virtual adapter card. Most programs do not need interrupt emulation.

Emulated Adapter

This selection determines whether the virtual adapter will emulate the 1784-KT or 1784-KTX card. The choice of adapter will affect the memory addresses and interrupts that can be chosen.

Message Timeout

This is the message timeout value for this virtual adapter card. It specifies the time that the Virtual DHX Driver should wait for reply messages before declaring a timeout condition.

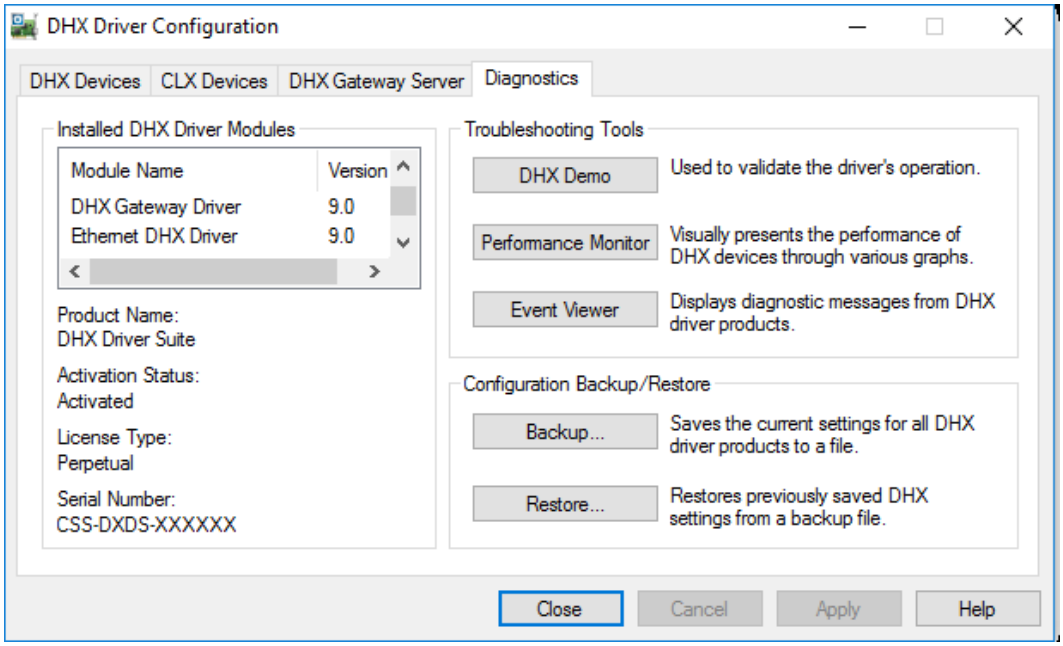
If you encounter communication timeouts, you should increase this value. For most applications, a 15-second timeout value is adequate.

Mapped to DHX Device…

This is the DHX device that is used by this virtual adapter card for all of its communications. The DHX device must already have been configured and tested. If you have not done this, refer to the Configuration section of the appropriate DHX family driver: DHX Driver, Ethernet DHX Driver or DHX Gateway Driver.

Diagnostics Tab

The diagnostic features help confirm that the driver is running and is properly configured. They also provide important help if troubleshooting or technical support is needed.



Installed DHX Driver Products

This area shows all DHX product components installed on your system, along with their version numbers. This information may be requested if you call for technical support. This screen also tells you if the software has been activated or if it is running in demo mode.

Product Package

DHX products are sold and installed as packaged suites, such as the DHX Driver Suite and DHX OPC Server Suite. This field indicates the suite that is installed on your system.

Activation Status

Most Cyberlogic software products operate in a time-limited demonstration mode until they are activated. This field tells you whether or not the installed product has been activated.

If your product requires activation, run the ***Activation*** wizard, which you will find in the Windows ***Start*** menu under ***Cyberlogic Suites***. You will need the serial number and password that were assigned when you purchased your license for the software.

License Type

This field shows the licensing mode that the software is operating under. If the type displayed is *2 Hour Demo*, the software will run for only two hours at a time, after which you must restart the system to obtain another two hours of use. To enable continuous, uninterrupted operation, you must activate the software.

Serial Number

If you have activated the software by entering the serial number and password, the serial number used will be shown here. This will help you to determine which license goes with which of your systems.

Troubleshooting Tools

The Troubleshooting Tools group provides shortcuts to diagnostic tools that help verify that the drivers are operating as expected. In case of communication problems, these tools will help in the diagnosis.

For details on how to use these tools, refer to the Validation & Troubleshooting section.

DHX Demo

Run this program after configuring the driver to confirm that it is configured correctly and running properly.

Performance Monitor

Click this button to launch the Windows Performance Monitor, which will allow you to observe numerous performance parameters in graphical form.

Event Viewer

In case of communication difficulties, the Windows Event Viewer may provide error messages to guide you in troubleshooting problems.

Configuration Backup/Restore

The Backup… and Restore… buttons in this group can be used to backup and restore configurations of all DHX family drivers on your system.

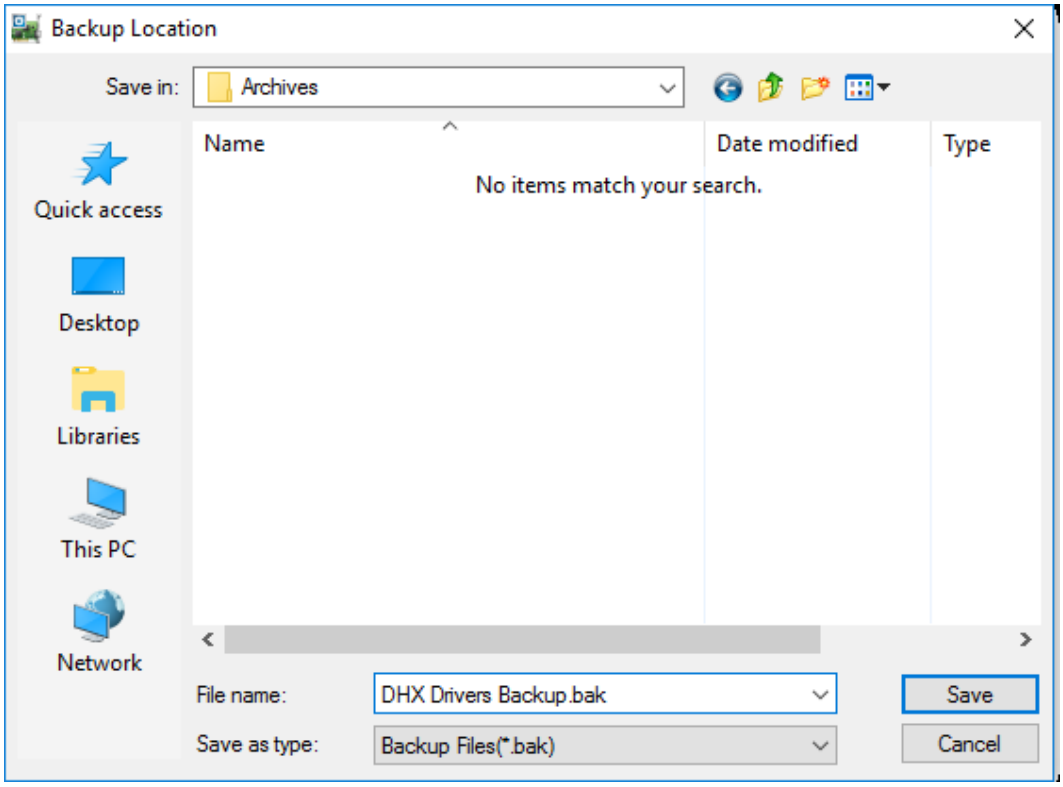
Note

We strongly recommend that you backup your configuration data after the initial configuration and that you maintain up-to-date backups after every configuration change.

Backup Configuration

Use this procedure to backup your configuration.

1. Click the ***Backup...*** button.



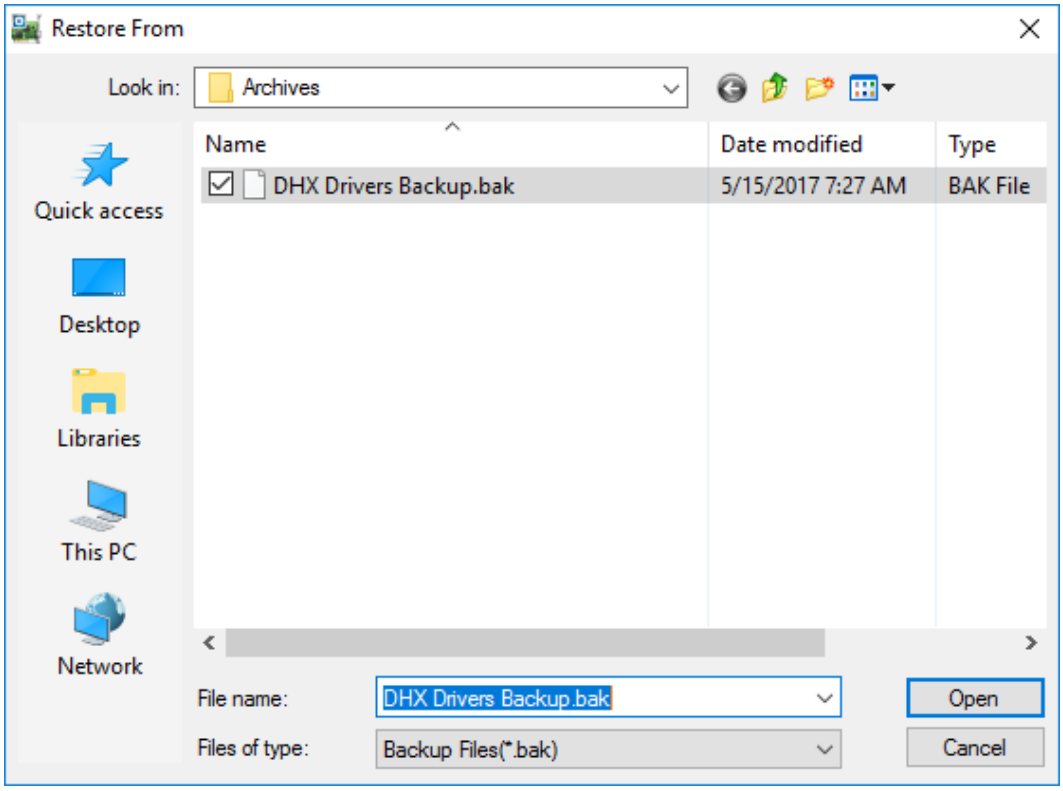
2. Browse for the backup directory. By default, the last-used directory will be selected.

3. Enter the ***File name*** you want to use for your configuration backup file, and then click the ***Save*** button to complete the backup operation.

Restore Configuration

To restore a configuration that was previously backed up, use this procedure.

1. Click the ***Restore...*** button.



2. Browse for your configuration backup file. By default, the last used directory will be selected.

3. Select the backup file and click the ***Open*** button to complete the restore operation.

Caution! After you finish restoring the configuration, restart the system to ensure proper operation of the restored devices.

Configuration Backup/Restore Utility

The DHX driver products also provide a utility program, ClDhxCfg.exe, that you can use to backup and restore DHX device configurations. The program is located in the \Program Files\Common Files\Cyberlogic Shared\ directory.

The utility accepts the following command line switches:

/Save *FileName*	Save configuration
/Restore *FileName*	Restore configuration
/Q	Quiet operation (No error or warning messages)
/?	Help
/H	Help

For example, to backup the configuration of all DHX devices to a file named DhxCfg.bak, located in the directory C:\Program Files\Common Files\Cyberlogic Shared\, use the following command line:

> ClDhxCfg /Save C:\Program Files\Common Files\Cyberlogic Shared\DhxCfg.bak

To restore the configuration that the previous command saved, use the following command:

> ClDhxCfg /Restore C:\Program Files\Common Files\Cyberlogic Shared\DhxCfg.bak

You can use different file names to maintain different versions of your backups. However, for most users, a single backup is sufficient.

Serial DHX Configuration Editor

When editing Serial DHX devices, the DHX Driver Configuration editor dispatches the Serial DHX Configuration editor.

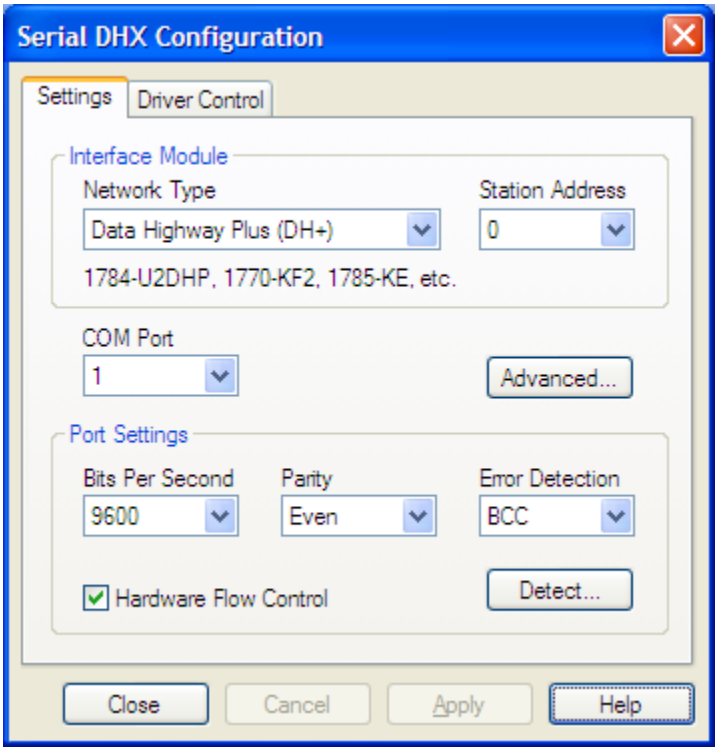
The Serial DHX Configuration editor consists of two tabs:

- Settings Tab
- Driver Control Tab

The following sections provide complete descriptions of these tabs.

Settings Tab

The Settings tab allows you to select the network protocol and the station address, configure the serial port settings, and choose the error detection method.



Note For information on configuring and operating the 1784-U2DHP adapter, see Appendix B: Using the 1784-U2DHP Adapter. For information on configuring and operating the DL-PCIe adapter, see Appendix C: Using the DL-PCIe Adapter.

Interface Module

Network Type

Chooses the type of network to which this device will be connected. Be sure your selection matches the setting of your interface module. The default network type is Data Highway Plus (DH+).

Note If Network Type is set to Direct Connection, the driver will always report only two nodes in the Active Node Table: 0 and 1. Node 0 is the Station Address of this DHX device, while node 1 is the address of the directly connected device.

Although the driver will accept command messages with the destination address set to any value, Cyberlogic recommends that you always set the destination node address in your application to 1.

Station Address

This is the DH/DH+/DH-485/ControlNet network node address for this Serial DHX device. It must match the station address of your communication module. This station address must be unique on the network.

The default station number is 1 for ControlNet and 0 otherwise.

COM Port

The COM Port setting selects the serial COM port that is associated with this device.

The assigned COM port belongs exclusively to a single device, and is not shared with other Serial DHX devices or other applications in the system.

Port Settings

These settings may be configured manually or may be detected automatically.

- To use automatic detection, the serial cable must be connected from the computer to at least one device that it will communicate with, and that device must be running.
- To configure the settings manually, you must know the correct values, but it is not necessary to be connected to any other device.

Bits Per Second

The Bits Per Second is also referred to as baud rate. This rate indicates how fast the data bytes are transmitted and received by a COM port and must match the setting of your communication module.

The default is 9600.

Parity

The Parity controls how the COM port checks for errors, which may occur in transmission of the data. Selecting Even or Odd parity allows detection of these errors. Selecting None disables parity checking.

The default is Even.

Error Detection

The DF1 protocol allows for either BCC or CRC-16 error detection. The CRC-16 algorithm provides a higher level of data security and should be used when the likelihood of communication errors is high. However, all stations that will communicate with each other must be set to the same type of error detection.

By default, BCC is selected.

Hardware Flow Control

Check this box if your setup requires Hardware Flow Control, and clear it otherwise.

Detect...

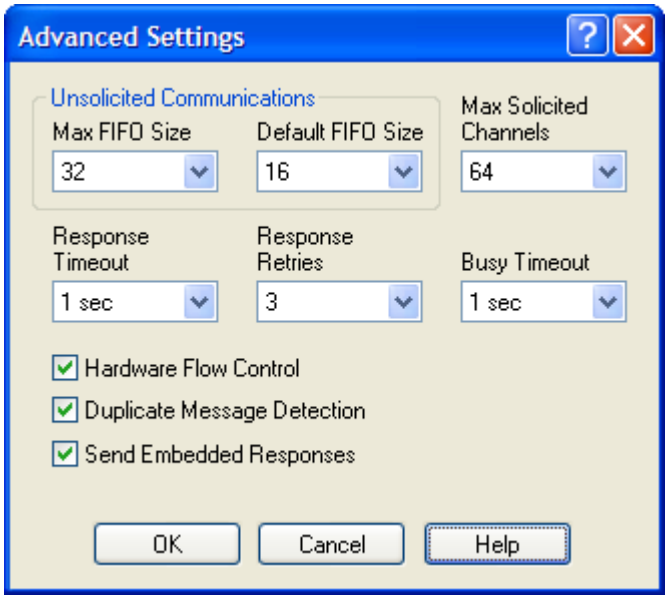
If you do not know the correct Port Settings, connect the serial cable to the network and click the ***Detect...*** button.

The detection works by sending a test message to each of the stations in the address range you specify. If the node fails to respond, a different combination of port settings is tried on the same station. If all combinations fail, the process is repeated on another station. This continues until communication is established with a station or all possibilities have been exhausted.

Caution! For the port settings detection to work, your system must be connected to a network that has at least one other working station.

Advanced...

Clicking the ***Advanced...*** button brings up the Advanced Settings screen.



The default settings will typically provide optimum driver operation, so they need not be changed. However, some situations may require these parameters to be modified.

Unsolicited Communications

Each unsolicited channel has an associated FIFO buffer. For more information on these buffers, refer to the Unsolicited Communications section.

Max FIFO Size

This parameter specifies the maximum buffer size that your applications can request.

The default value is 32.

Default FIFO Size

This parameter specifies the default size for this buffer.

The default value is 16.

Other Advanced Settings

Max Solicited Channels

This number defines how many solicited message requests the driver can process simultaneously. The valid range is 1 - 255.

The default value is 64.

Response Timeout

Every time the Serial DHX Driver transmits a message, the interface module must acknowledge it with an ACK or NAK. The Response Timeout, also referred to as an ACK timeout, specifies how long the driver will wait for a response before it decides that a valid response was not received.

The default value is 1 sec.

Response Retries

If the Serial DHX Driver fails to receive a valid response to its last message, it may send an enquiry (ENQ), which prompts the retransmission of the last response. The Response Retries specifies how many consecutive ENQs the driver will send before a communication error is declared.

The default value is 3.

Busy Timeout

Under certain conditions, the communication module sends a negative response code (NAK) to the driver, indicating that it is busy and unable to process the last message received. The driver must retransmit this message and wait for a new response. The Busy Timeout specifies how long the driver will attempt to retransmit the last message before a communication error is declared.

The default value is 1 sec.

Hardware Flow Control

When the receiving communication module is temporarily unable to accept data, it needs a way to tell the driver to suspend its transmissions. Hardware flow control, also referred to as "handshaking", is the method by which a communication module can accomplish this. For more information, refer to the Hardware Flow Control section.

By default, the Hardware Flow Control box is checked.

Duplicate Message Detection

Due to communication errors, the communication module may retransmit its last message. In some cases, this will result in a duplicate message. For more information, refer to the Duplicate Message Detection section.

By default, the Duplicate Message Detection box is checked.

Send Embedded Responses

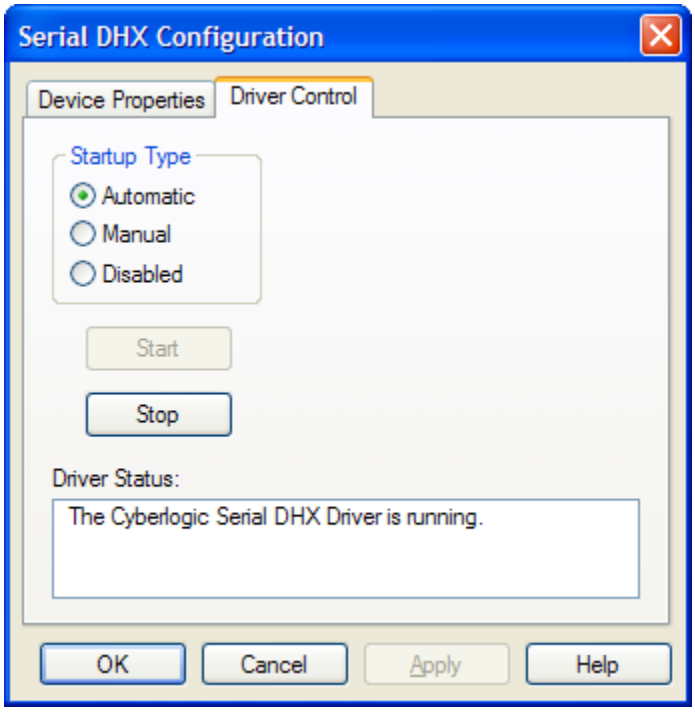
The full-duplex DF1 protocol allows response codes to be sent inside data messages. Because this feature improves performance, most communication modules support it. To accommodate communication modules that do not support it, clear the Send Embedded Responses box. For more information, refer to the Embedded Responses section.

By default, the Send Embedded Responses box is checked.

Driver Control Tab

The Driver Control tab allows you to set the startup type and monitor the current driver status.

Caution! These settings are global and are common to all Serial DHX devices.



Automatic

When this option is selected, the Serial DHX Driver will start when Windows boots.

Manual

When this option is selected, the Serial DHX Driver will not start when Windows boots, but you can control it manually using the Start and Stop buttons.

Disabled

When this option is selected, the Serial DHX Driver will not run.

Start

In Automatic or Manual mode, click this button to start the Serial DHX Driver.

Stop

In Automatic or Manual mode, click this button to stop the Serial DHX Driver.

Driver Status

This tells you whether or not the Serial DHX Driver is running, stopped, starting or stopping.

Selecting the Startup Type

Select the desired mode among the Startup Type choices.

If you want the Serial DHX Driver to start whenever the system is booted, select ***Automatic***. This is the recommended setting for systems that will use the Serial DHX Driver.

If you want to use the Serial DHX Driver and want to control it manually, choose ***Manual***. The driver will not start on boot-up; instead you must use the Start and Stop buttons to control it.

If you do not want to use the Serial DHX Driver, choose ***Disabled***.

Start/Stop the Ethernet DHX Driver

Click the ***Start*** or ***Stop*** button.

Communication Module Configuration Guidelines

The Serial DHX Driver can operate with a variety of DF1-compatible devices. These include DH, DH+, DH-485 and ControlNet interface modules such as the DL-PCIe, 1784-U2DHP, 1770-KF2, 1785-KE, 1770-KF3 and 1770-KFC15. Each Serial DHX device must be configured to match the configuration of its communication module. This is typically accomplished through the configuration DIP switch settings.

The following sections provide guidelines for communication module configuration that will assure proper operation with the Serial DHX Driver. Refer to the Serial DHX Configuration Editor for details on how to set each of these parameters.

Interface Standard

Some communication modules support more than one asynchronous communication standard. For example, the 1770-KF2 supports both RS-232-C and RS-422. However, the COM ports on most computers support only the RS-232-C standard. Therefore, most users should configure the communication module for RS-232-C. This setting does not affect the configuration of your Serial DHX device.

Asynchronous Baud Rate

Configure the communication module's baud rate to match your Serial DHX device configuration. Higher baud rates provide better performance.

Parity

The default parity setting for the Serial DHX Driver is Even. Configure the communication module's parity to match your Serial DHX device's configuration.

Hardware Flow Control/Handshaking

Hardware flow control, or "handshaking", prevents data overruns and should be used, if possible. By default, the Serial DHX Driver uses hardware flow control. Configure the communication module's flow control to match your Serial DHX device's configuration.

Full-Duplex (DF1) / Half-Duplex (Polled-Mode)

Allen-Bradley communication modules may support two types of serial protocols: full-duplex and half-duplex. The full-duplex protocol is also referred to as the DF1 protocol, while the half-duplex protocol is also called the polled-mode protocol.

The Serial DHX Driver supports only the full-duplex DF1 protocol, so you must configure the communication module for that protocol.

Error Detection

The DF1 protocol allows for either BCC or CRC-16 error detection. The default error detection for the Serial DHX Driver is BCC. Configure the communication module's error detection to match your Serial DHX device's configuration.

Diagnostic Commands

Network interface modules can be configured to either execute or pass through diagnostic commands. The Serial DHX Driver does not process the diagnostic commands. Therefore, most users should configure their interface module to execute the diagnostic-commands.

Duplicate Message Detection

For most users, duplicate message detection should be enabled.

Embedded Responses

If the communication module supports embedded responses, this feature should be enabled.

Network Selection

Some communication modules support more than one network type. For example, the 1770-KF2 supports both DH and DH+. Configure your communication module to match the network type.

Network Baud Rate

Some communication modules support more than one baud rate for the selected network type. Configure your communication module to match the network's baud rate. This setting does not affect the configuration of your Serial DHX device.

Station/Node Address

Each node on the DH/DH+/DH-485/ControlNet network must have a unique station (or node) address. Select an address that does not conflict with other nodes on the network.

VALIDATION & TROUBLESHOOTING

The following sections describe how the DHX Demo and Performance Monitor are used to verify that the DHX devices are configured correctly.

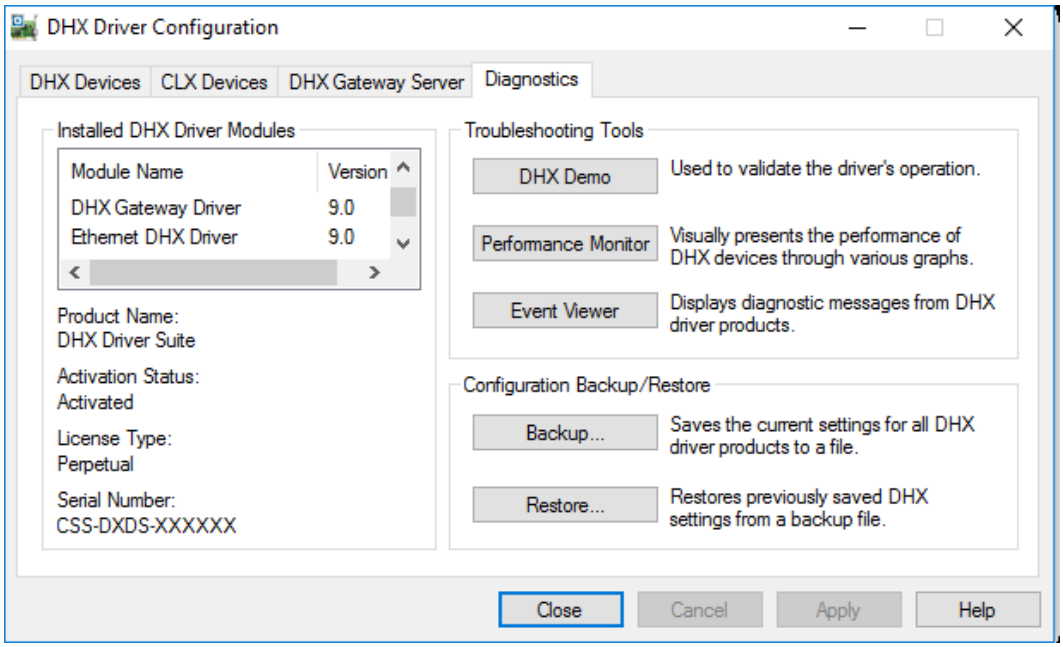
If you are having difficulties communicating through a DHX device, the Event Viewer may help you to determine the nature of the problem.

In addition, there is a list of Serial DHX Driver Messages and a Frequently Asked Questions section.

DHX Demo

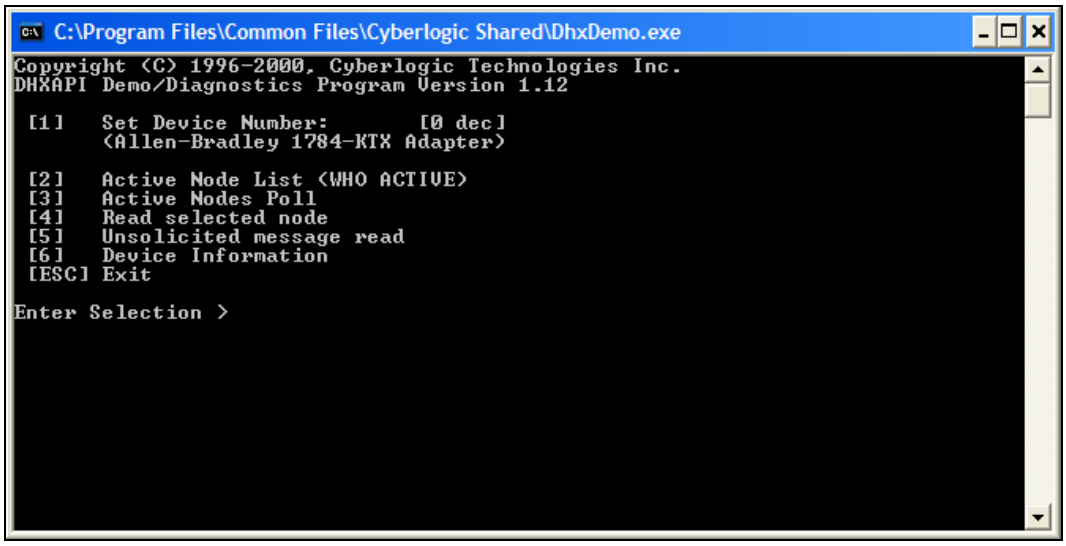
The DHX Demo program can be used to test all configured DHX devices in a system for proper operation. To run the program, open the Windows ***Start*** menu and locate the ***Cyberlogic Suites*** sub-menu. From there, go to the ***Diagnostics*** sub-menu and select ***DHX Demo***.

Alternatively, open the ***DHX Driver Configuration Editor***, go to the ***Diagnostics*** tab and click ***DHX Demo***.



Main Menu

The DHX Demo will quickly access all available features of the configured DHX devices in your system, allowing you to verify their operation.



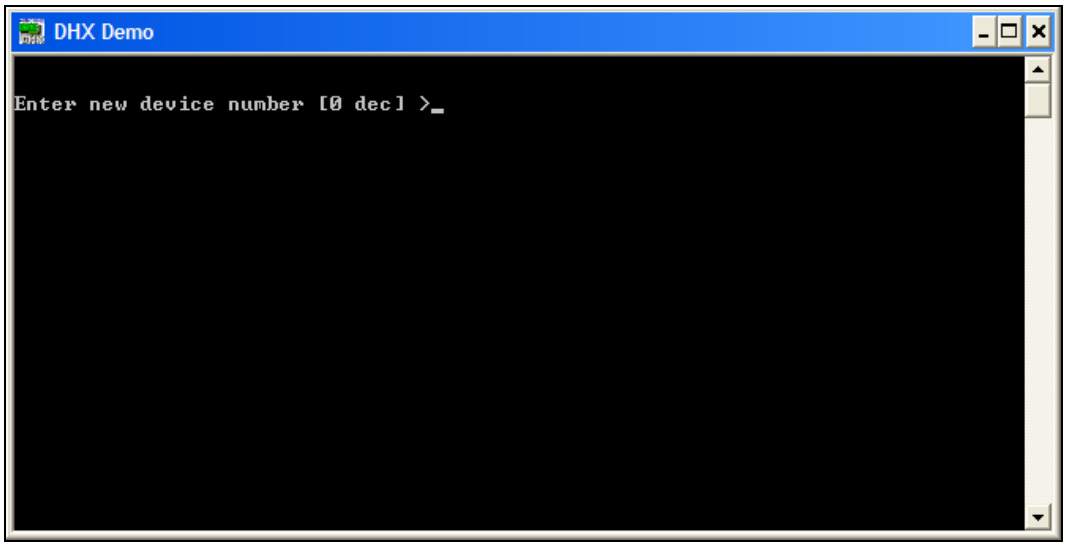
The simple command-line interface displays menu choices that take the user to secondary level screens.

Press ***Esc*** at any screen to return to the main menu shown above.

Press ***Esc*** in the main window to exit the program.

[1] Set Device Number

When the DHX Demo program starts, the device number defaults to 0. To change it, press ***1***.

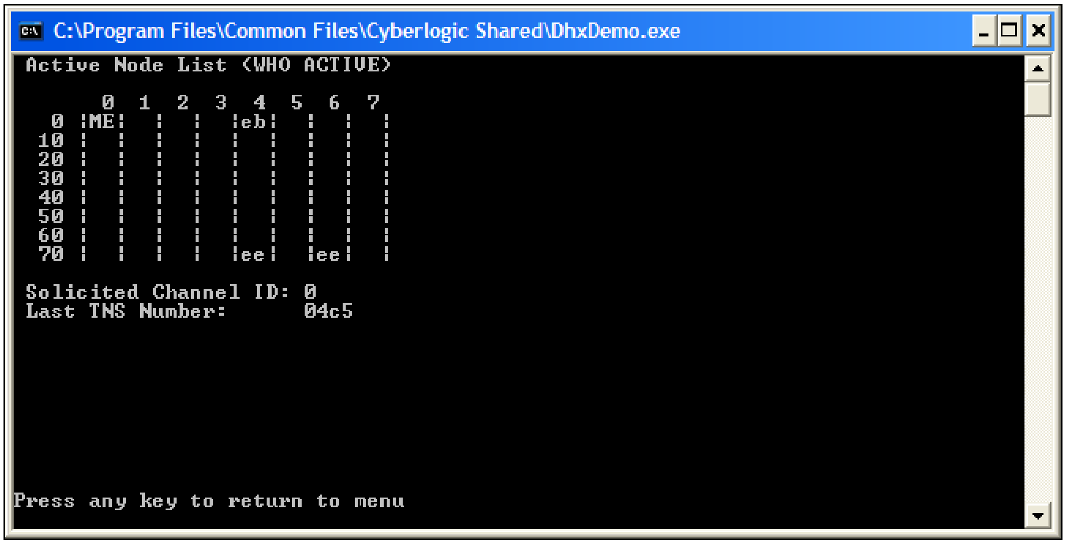


At the prompt, enter the desired device number and press the ***Enter*** key to change the selected device and return to the main menu.

Verify that the device type shown on the main menu matches the type you configured for the selected device number.

[2] Active Node List (WHO ACTIVE)

From the main menu, press ***2***. This launches the Active Node List (WHO ACTIVE) screen, which shows all active nodes on the network.

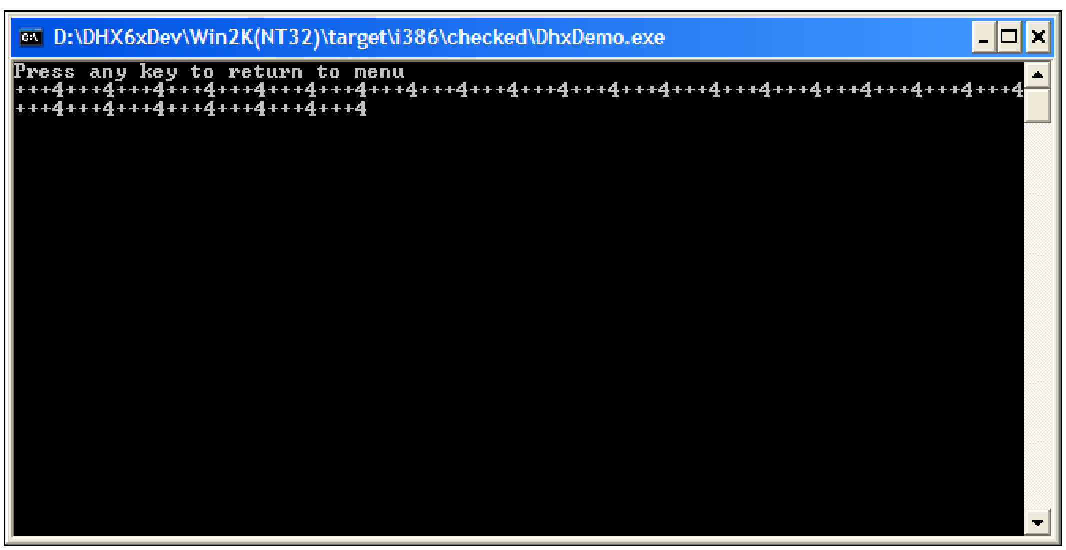


In the Active Node List grid, ME designates the node you are working from, and the identifier codes are shown for other nodes found on the network.

Verify that all expected nodes are shown and that the node addresses are correct, then press ***Esc*** to return to the main menu.

[3] Active Nodes Poll

Press ***[3]*** to poll the nodes on the network.



The software will continuously send diagnostic status commands to each of the other nodes on the network. If they respond properly, the software displays "+", otherwise it

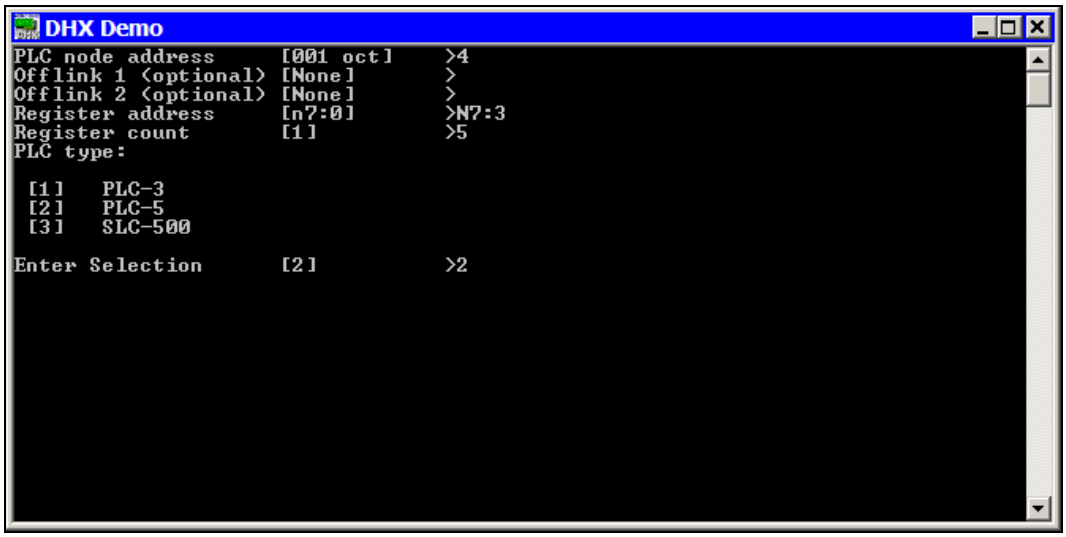
displays "?". After polling each node, the software displays the total number of active nodes, including the local node.

In the example shown, the three remote nodes have responded correctly, so there are three + signs followed by a 4 to indicate that there are four nodes—three remote and one local.

This function continuously interrogates the nodes with no delays between nodes or repetitions. Therefore, it is useful if you need a simple way to put a high load on the network.

[4] Read Selected Node

To read data from registers on a specific node, press ***4***.



Enter the ***PLC node address*** you want to read from. Note that this value is entered in octal.

If you are using offlink addressing, enter the values for ***Offlink 1*** and ***Offlink 2***.

Enter the ***Register address*** for the register you want to read. If you want to read from more than a single register, enter the first register's address.

Enter the ***Register count***, which is the number of consecutive registers you want to read.

Enter your selection for the ***PLC type*** you are reading from.

In the example shown, we want to read from the PLC-5 at node address 4, without offlink addressing. We will read five consecutive registers beginning with N7:3, that is, registers N7:3 through N7:7.

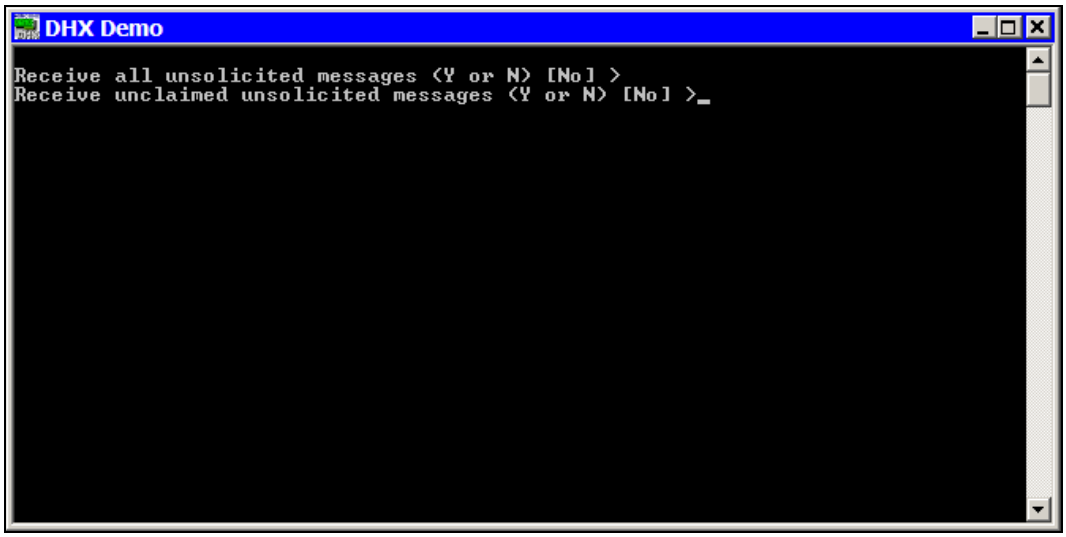
Press ***Enter*** to initiate the read. The requested data will be displayed on the screen. Press ***Esc*** to return to the main menu.

[5] Unsolicited Message Read

To read unsolicited messages, press ***5***.

This is an advanced feature of DHX Demo and is primarily intended for use by software developers. Only the most basic operation is shown here.

To receive all unsolicited messages, press ***Y***. If you want to receive only unclaimed messages, press N



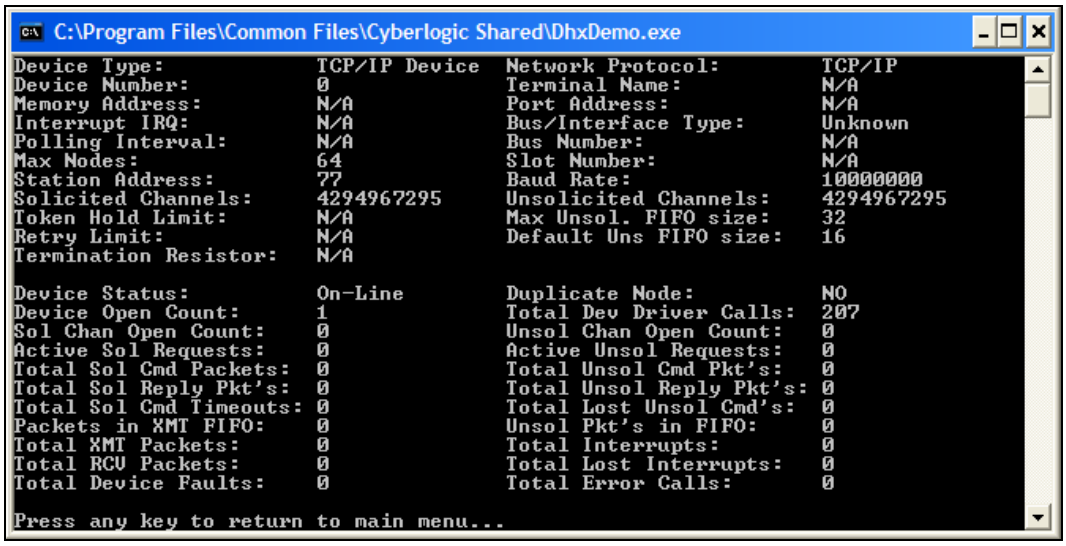
To receive all unsolicited messages, answer ***Y*** for the first question. The software will immediately begin receiving messages.

If you want to receive only unclaimed messages, answer ***N*** for the first question, then ***Y*** for the second. Again, the software will immediately begin receiving messages.

When an unsolicited message arrives, it will be displayed on the screen and the software will send a "success" response to the originating node. You may then press ***N*** to see the next message or ***Esc*** to return to the main menu.

[6] Device Information

From the main menu, press ***6*** to launch the Device Information screen.



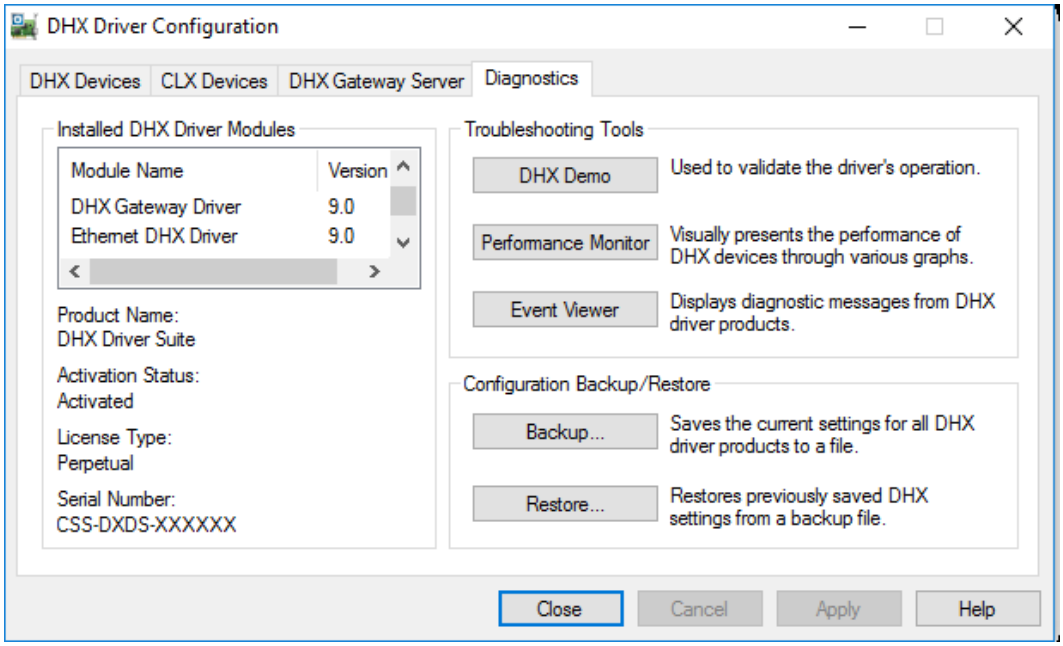
This screen shows configuration, statistical and diagnostic information about the driver, the device and the network.

After viewing the information, press ***Esc*** to return to the main menu.

Performance Monitor

Microsoft provides a diagnostic tool, the Performance Monitor, as part of the Windows operating system. Applications supporting the Performance Monitor, including the DHX driver family, allow users to monitor relevant performance information. Multiple devices can be monitored simultaneously for comparison.

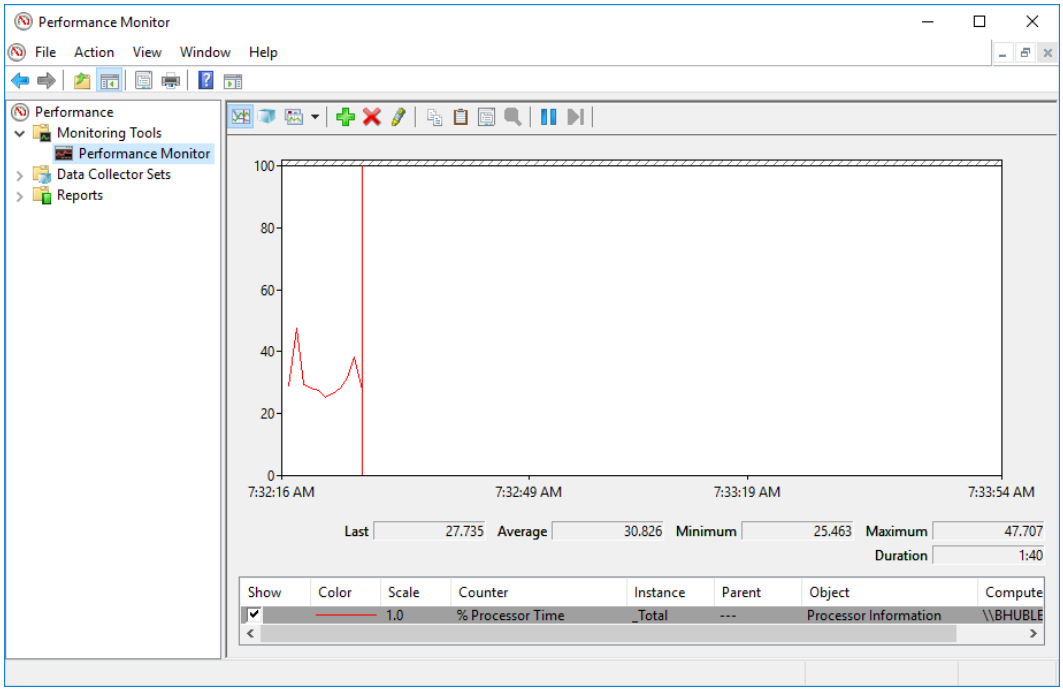
To run the program, open the Windows ***Start*** menu and locate the ***Cyberlogic Suites*** sub-menu. From there, go to the ***Diagnostics*** sub-menu and select ***Performance Monitor***.



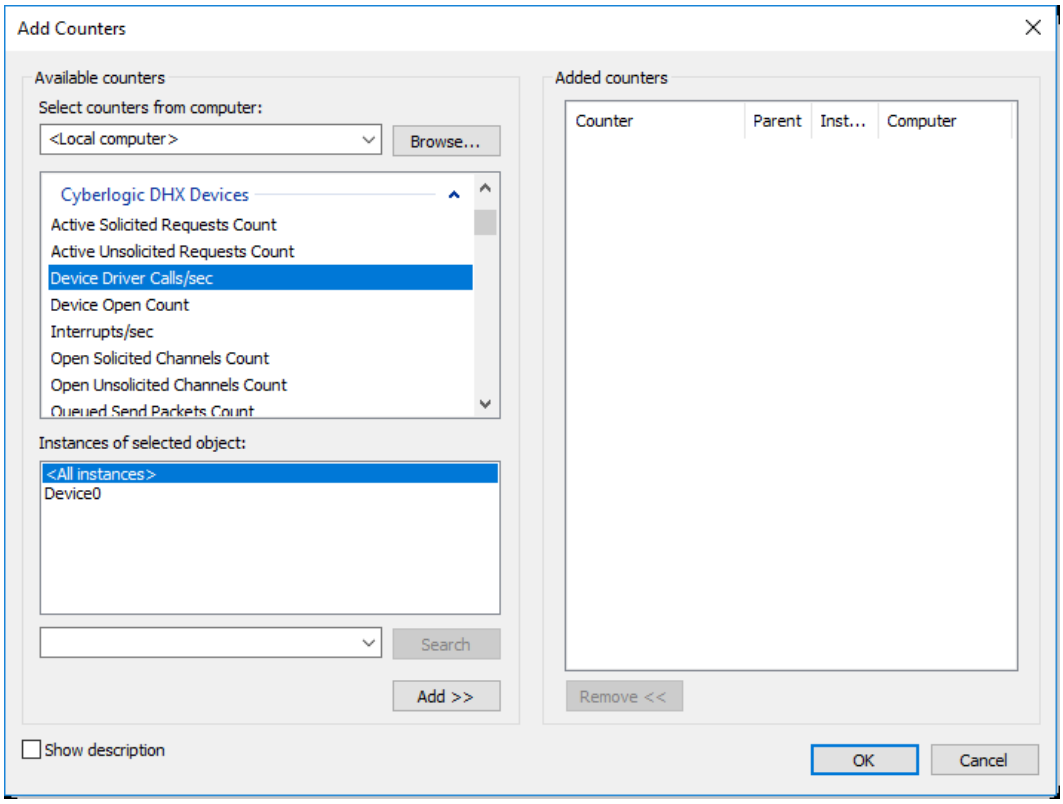
Alternatively, go to the Diagnostics tab of the DHX Driver Configuration Editor and click the ***Performance Monitor*** button.

How to Use the Performance Monitor

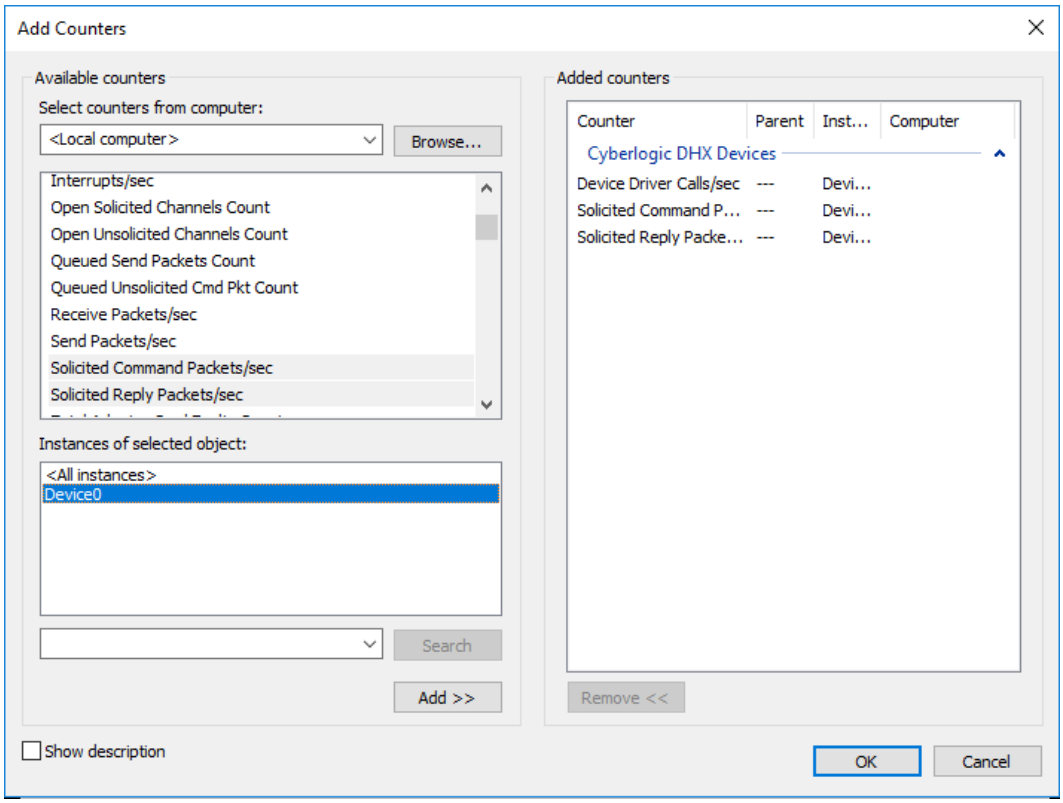
Since extensive help is provided for this program by Microsoft, only a few points relevant to the DHX Driver products are shown here.



1. When the Performance Monitor program starts, click the **+** button on the tool bar.

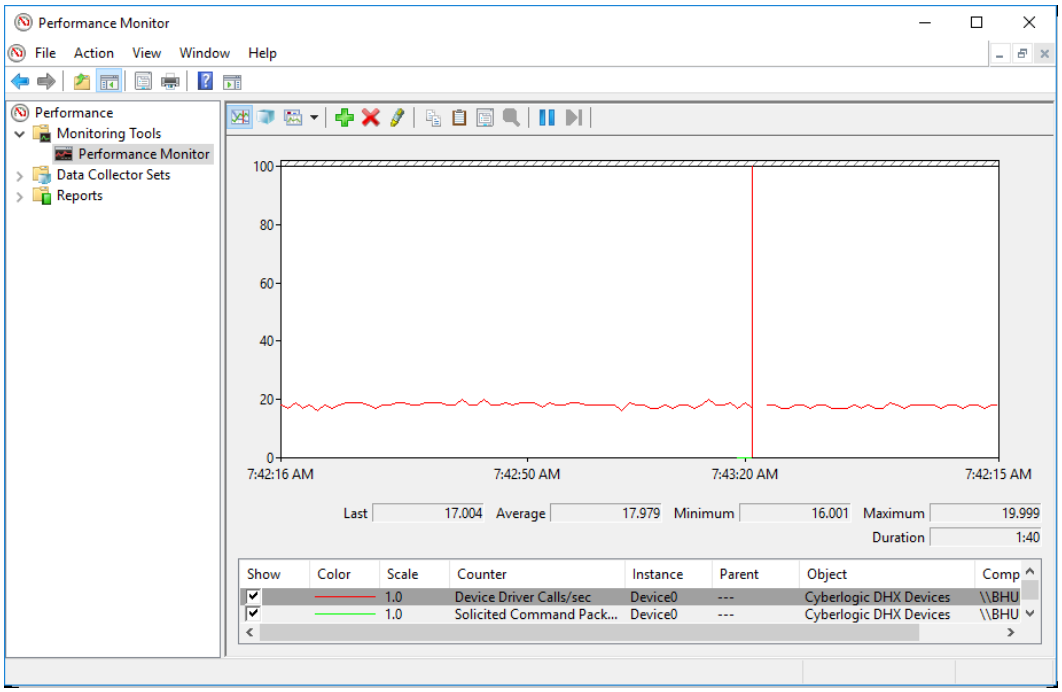


2. Select ***Cyberlogic DHX Devices*** from the ***Available counters*** list.



3. Choose a counter and the DHX device, and click ***Add***. Repeat this for all the counters you want to view.

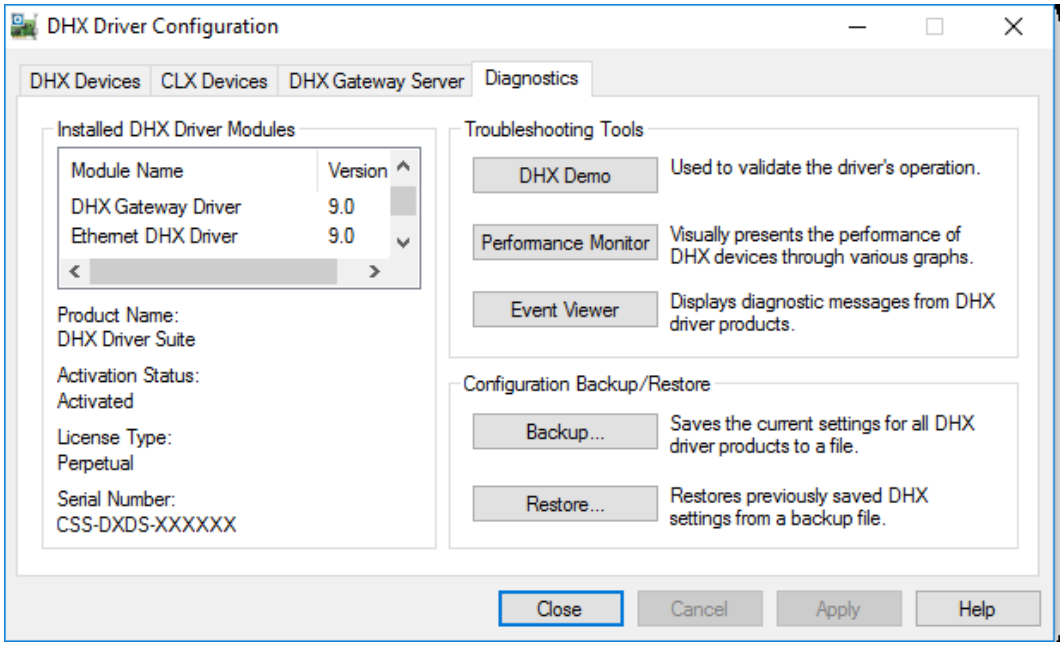
4. Click ***Close***. The counters you chose will then be displayed in graphical format.



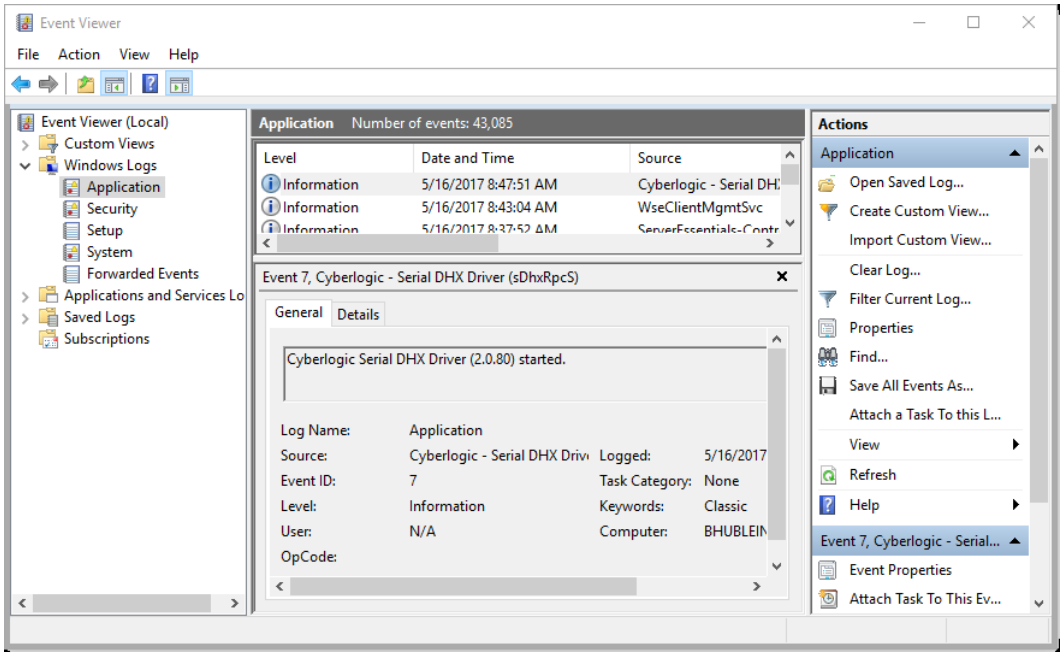
Event Viewer

During startup and operation, the DHX drivers may detect problems or other significant events. When a noteworthy event is detected, the driver sends an appropriate message to the Windows Event Logger. You can view these messages using the following procedure.

1. Open the Windows ***Start*** menu and locate the ***Cyberlogic Suites*** sub-menu. From there, go to the ***Diagnostics*** sub-menu and select ***Event Viewer***.



Alternatively, click the ***Event Viewer*** button on the Diagnostics tab of the DHX Driver Configuration Editor.



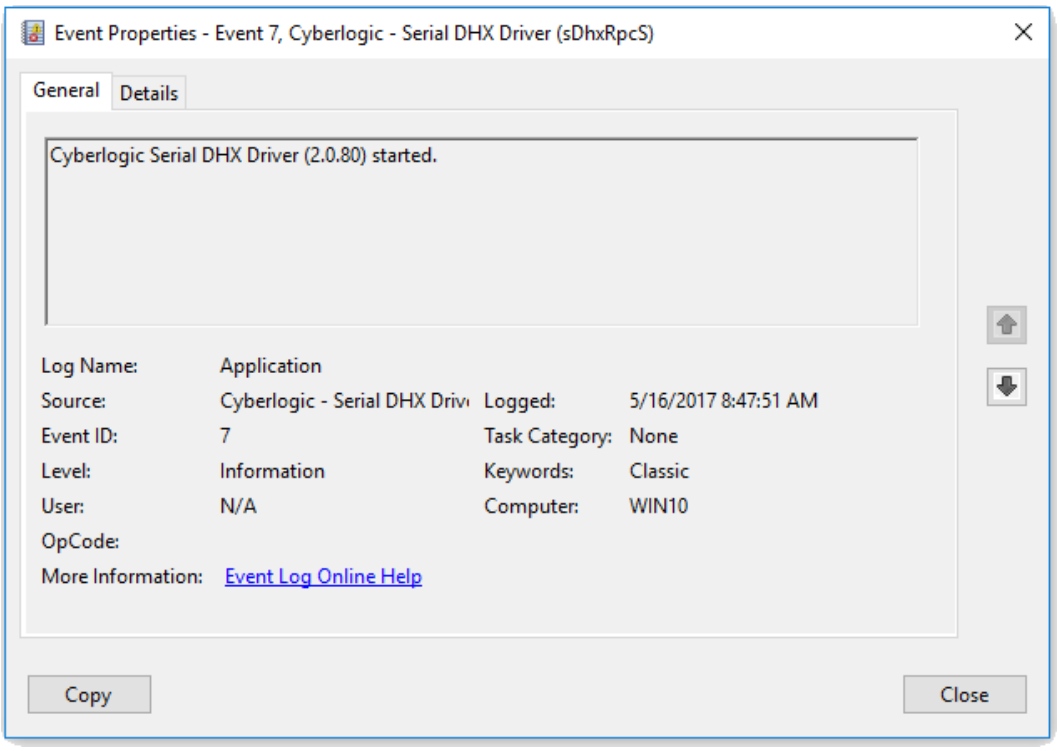
2. If you are looking for entries relating to the DHX Driver, select ***System*** from the Event Viewer tree. For other drivers, such as the Ethernet DHX Driver or Serial DHX Driver, select ***Application***.

3. Look for entries with the name of the driver you are using in the ***Source*** column.

Caution!

The Event Viewer does not clear itself after rebooting. Check the time stamps of the messages to be sure that you are not looking at an old error message.

4. Double-click on the desired entry to display a complete event message.



5. For further descriptions of the error log messages, refer to the Serial DHX Driver Messages section.

Serial DHX Driver Messages

SDHXAPIM.DLL failed to load. Reinstall the product.

A necessary DLL could not be loaded. This may indicate a corrupted installation. Repair the existing installation, or remove and reinstall the software.

Cyberlogic Serial DHX Driver is already running! Server start operation has been aborted.

The driver could not start because another copy of it is already running.

Cyberlogic Serial DHX Driver (<Version Number>) started.

The driver successfully started. The driver's version number may be requested if you call Cyberlogic Tech Support.

Unable to initialize global system resources.

The driver was unable to allocate enough memory to start. Close other open applications, or add more memory to the system and then try to restart the driver.

Invalid or missing configuration parameters for Serial DHX device <DHX Device Number>. Re-configure the device.

The driver was unable to create the Serial DHX device because of problems reading all the necessary configuration parameters. Use the DHX Driver Configuration editor to re-save the device settings, or, if that doesn't work, to delete and re-create the device. Restart the driver to use the new settings.

Unable to open COM<COM Port Number> for Serial DHX device <DHX Device Number>. Port may be in use.

The driver will be unable to communicate on the specified COM port because it is in use by another application. Stop the application using the COM port or use the DHX Driver Configuration editor to use a different COM port. Restart the driver to use the new settings.

Cyberlogic Serial DHX Driver service stopped because there are no Serial DHX devices configured.

The driver shut down because there were no devices configured. To run the driver, create at least one Serial DHX device in the DHX Driver Configuration editor and restart the driver.

Registration DLL failed to load. The I/O operations of the Serial DHX Driver have been disabled. Reinstall the product.

A necessary registration DLL could not be loaded. This may indicate a corrupted installation. Repair the existing installation or remove and reinstall the software.

Product license verification failed. The I/O operations of the Serial DHX Driver have been disabled. Reinstall the product.

A registration check indicated that the software's evaluation time has expired. Run the Activation Wizard to authorize further use of the software.

This is a <Number of Hours>-hour promotional copy of the Serial DHX Driver. The application started at <Start Time> and the driver will stop at <Stop Time>.

This is a time-limited installation of the software. After the stop time, the driver will not allow any further I/O operations.

This is a promotional copy of the Serial DHX Driver. The allowed operation time has expired. The I/O operations of the Serial DHX Driver have been disabled.

This is a time-limited installation of the software. The stop time has been reached or exceeded, so the driver will not allow any further I/O operations.

The Cyberlogic License Server failed to respond with valid license information. The I/O operations of the Serial DHX Driver have been disabled. Contact the manufacturer's technical support.

The driver experienced a problem when it tried to contact the Cyberlogic License Server. If the license server is not running, start it and then try restarting the driver. If the license server is already running, contact Cyberlogic Tech Support.

Frequently Asked Questions

Helpful Hints

- After installing the Serial DHX Driver software, run the DHX Demo program to verify driver configuration and operation.
- Check for error messages in the Event Viewer. They may aid in detecting configuration problems and hardware conflicts.
- Be sure your DHX device configuration matches the configuration of the communication module that your device uses. Refer to the Communication Module Configuration Guidelines section for details.
- Be sure you are communicating through the correct DHX device.

I've installed the software. What's next?

Configure at least one DHX device. Refer to the Quick-Start Guide. After this is done, run the DHX Demo to test the driver.

I've configured a Serial DHX device. How do I know that it's working?

To test the Serial DHX Driver, take note of two options in the Validation & Troubleshooting section. First, use the DHX Demo to confirm that the device is operating properly. Then, use the Performance Monitor as a benchmark reference.

In DHX Demo, when I select "Active Node List" or "Device Information" I get an error that says "The system cannot find the file specified (Error code 1806)."

- **Cause 1.** Be sure at least one Serial DHX device has been configured. If not, refer to the Quick-Start Guide section for details on setting up a Serial DHX device.

- **Cause 2.** The Serial DHX Driver could not find the DHX device specified under Device Number. Refer to the Configuration Editor Reference section for details on finding and entering this information.

I have two Serial DHX devices configured in the system. How do I communicate through the second one?

DHX Demo uses the device number to determine which card to use. The menu item *[1] Set device number* lets you choose which configured Serial DHX device the demo will use.

If you are using some other software product, contact the manufacturer for more information on using multiple devices.

I changed the station address of my 1784-U2DHP, but I'm not seeing any other nodes on the network. What happened?

The 1784-U2DHP sets its station address using the first message that passes through it. The address is then fixed until the adapter is powered down or unplugged and then powered up or plugged back in. See Appendix B: Using the 1784-U2DHP Adapter for the correct procedure to unplug the 1784-U2DHP and plug it back in.

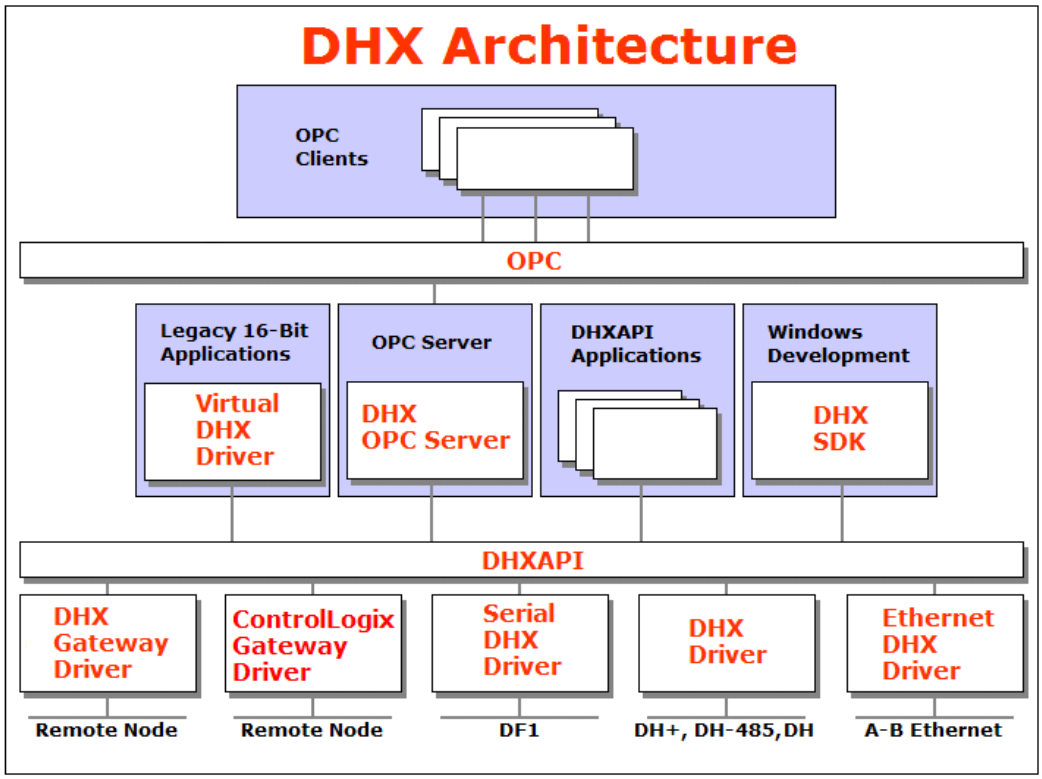
I unplugged my 1784-U2DHP, and when I plugged it back in, it wouldn't communicate properly. What happened?

The Serial DHX Driver needs to be stopped before the 1784-U2DHP is removed. If it isn't, the system needs to be rebooted for the 1784-U2DHP to work correctly. See Appendix B: Using the 1784-U2DHP Adapter for the correct procedure to unplug the 1784-U2DHP and plug it back in.

APPENDIX A: DHX ARCHITECTURE AND COMPANION PRODUCTS

The Serial DHX Driver is part of the Cyberlogic DHX family. This family consists of several well-integrated products that provide connectivity for Data Highway, Data Highway Plus, DH-485, ControlNet and Ethernet networks in distributed environments.

This section illustrates the layout of the DHX architecture. It includes a description of each DHX component along with suggested methods for employing them to support Allen-Bradley networks.



The DHX architecture presents a consistent framework to address different connectivity needs.

DHX Driver

The DHX Driver provides connectivity between Windows-based applications and interface adapter cards from Allen-Bradley and SST. A few of the many cards supported are the 1784-PKTX and 1784-PCMK from Allen-Bradley, as well as the SST DHP-PCI and 5136-SD-PCI from SST. These provide communication over Data Highway, Data Highway Plus and DH 485.

The kernel mode device driver of the DHX Driver has exceptional performance and stability. It operates in either interrupt or polled mode and fully implements all network features, including solicited and unsolicited communication. The high performance native API (DHXAPI) of the DHX Driver takes full advantage of the event-driven, multitasking, multithreaded features of Windows operating systems.

The driver includes the DHX Gateway Server for remote access by the DHX Gateway Driver and is fully compatible with all other components of the DHX family.

The DHX Driver is included in the following products:

- DHX OPC Enterprise Suite
- DHX OPC Premier Suite
- DHX OPC Server Suite
- DHX Driver Suite

Ethernet DHX Driver

The Cyberlogic Ethernet DHX Driver emulates Data Highway Plus over the Ethernet TCP/IP protocol. It supports most DHXAPI and 6001-F1E-compatible software, providing instant access to Ethernet TCP/IP compatible devices without code modifications. It is compatible with all Ethernet cards supported by Windows.

The driver includes the DHX Gateway Server for remote access by the DHX Gateway Driver and is fully compatible with all other components of the DHX family.

The Ethernet DHX Driver is included in the following products:

- DHX OPC Enterprise Suite
- DHX OPC Premier Suite
- DHX OPC Server Suite
- DHX Driver Suite

Serial DHX Driver

The Cyberlogic Serial DHX Driver provides connectivity to full-duplex DF1-compatible devices through standard serial COM ports. These devices include the 1770-KF2, 1785-KE, 1770-KF3 and 1770-KFC15 interface modules for Data Highway, Data Highway Plus, DH-485 and ControlNet, as well as direct connection to devices with full-duplex DF1-compatible ports. The Serial DHX Driver supports both the DF1 BCC and DF1 CRC-16 protocols.

The driver includes the DHX Gateway Server for remote access by the DHX Gateway Driver and is fully compatible with all other components of the DHX family.

The Serial DHX Driver is included in the following products:

- DHX OPC Enterprise Suite
- DHX OPC Premier Suite
- DHX OPC Server Suite
- DHX Driver Suite

DHX Gateway Driver

The DHX Gateway Driver lets applications use DHX devices on remote DHX Gateway Server nodes as though they were on the local system. The client system running the DHX Gateway Driver must be a Windows node connected over a standard LAN to another system running the DHX Gateway Server. It can then access the Data Highway, Data Highway Plus, DH-485 and ControlNet networks that are connected to the server node.

For example, the DHX Gateway Driver provides complete DHX Driver functionality to the client node applications. An interface adapter, such as a 1784-PCMK card, is not required on the client node. DHX Gateway Driver nodes can communicate with multiple remote servers and all Windows-compatible TCP/IP networks are supported.

The DHX Gateway Driver is compatible with all other components of the DHX family.

The DHX Gateway Driver is included in the following products:

- DHX OPC Enterprise Suite
- DHX OPC Premier Suite
- DHX OPC Server Suite
- DHX Driver Suite

ControlLogix Gateway Driver

The ControlLogix Gateway Driver lets applications access Data Highway Plus networks from a remote location through a ControlLogix gateway module. With this driver, a remote system can communicate over a standard Ethernet network to a ControlLogix chassis containing a 1756-DHRIO module. That module then acts as a gateway to a Data Highway Plus network. This allows the remote system to access the PLC-5s, SLC-500s and any other devices on the Data Highway Plus network as though it were connected directly to that network.

The ControlLogix Gateway Driver is fully compatible with all other components of the DHX family.

The ControlLogix Gateway Driver is included in the following products:

- DHX OPC Enterprise Suite
- DHX OPC Premier Suite
- DHX OPC Server Suite
- DHX Driver Suite

Virtual DHX Driver

The Virtual DHX Driver allows 16-bit DOS and Windows applications using 1784-KT/KTX interface adapters to run concurrently with 32-bit applications on the same computer. It allows multiple 16-bit applications and multiple instances of a single 16-bit application to run under the latest Windows operating systems. By emulating the physical 1784-KT/KTX

adapters, the Virtual DHX Driver will work with all legacy software, regardless of which DOS driver is used.

If your computer uses Windows 7 or the 64-bit edition of any Windows version, refer to Cyberlogic Knowledge Base article *KB2010-02 Running 16-Bit Applications* for important information on using the Virtual DHX Driver on your system.

The Virtual DHX Driver is fully compatible with all DHX components and requires at least one of these drivers to operate:

- DHX Driver
- Ethernet DHX Driver
- Serial DHX Driver
- DHX Gateway Driver
- ControlLogix Gateway Driver

The Virtual DHX Driver is included in the following products:

- DHX OPC Enterprise Suite
- DHX OPC Premier Suite
- DHX OPC Server Suite
- DHX Driver Suite

DHX OPC Server

The Cyberlogic DHX OPC Server connects OPC-compliant clients to Data Highway, Data Highway Plus, DH-485, ControlNet and Ethernet networks. It supports the latest OPC Data Access and OPC Alarms and Events specifications and uses the DHX drivers for connectivity to Allen-Bradley networks.

The DHX OPC Server supports multiple, priority-based access paths for reliable, redundant communications. It also supports both solicited and unsolicited communications and uses an advanced transaction optimizer to guarantee minimum load on your networks. With only a couple of mouse clicks, the DHX OPC Server will automatically detect and configure the attached networks and node devices. Other noteworthy features include DirectAccess, Data Write Protection and Health Watchdog.

The DHX OPC Server is included in the following products:

- DHX OPC Enterprise Suite
- DHX OPC Premier Suite
- DHX OPC Server Suite

DHX SDK

Software developers can use the DHX Software Development Kit to provide connectivity to Data Highway, Data Highway Plus, DH-485, Ethernet and ControlNet networks from their 32-bit and 64-bit C/C++/C# applications.

The SDK supports 6001-F1E and Cyberlogic's high-performance DHXAPI and DHXAPI.Net interfaces. The 6001-F1E interface is an excellent bridge for developers who would like to port their 16-bit applications to the latest Windows environments. Developers of new applications can use any of the three interfaces. For a complete 6001-F1E specification, contact any Allen-Bradley distributor.

Since all DHX family drivers are built on the same DHX architecture, applications developed with the DHX SDK can be used with all DHX family drivers and can execute under all current Windows operating systems.

APPENDIX B: USING THE 1784-U2DHP ADAPTER

Installing 1784-U2DHP Adapter Support

DHX Suites newer than version 8.0 + Update 201303

All DHX Suites newer than version 8.0 + Update 201303 already have built-in support for the 1784-U2DHP adapter.

DHX Suites 7.0 – DHX Suites 8.0 + Update 201303

Support for the 1784-U2DHP adapter can be installed for these versions of the DHX Suites. Download then run the SerialU2DHPPatch.exe from the Cyberlogic Download page (http://www.cyberlogic.com/download.html).

DHX Suites older than version 7.0

There is no support for 1784-U2DHP adapters available in DHX Suites earlier than 7.0. Upgrade to the latest version of the appropriate DHX Suite to add support for the 1784-U2DHP adapter.

COM Port Assignment

The first time the 1784-U2DHP is plugged into the system, Windows will install the appropriate low-level driver and then assign a COM port to the device.

To see the COM port Windows assigned to the 1784-U2DHP, right click on My Computer, select Manage, and then choose Device Manager. In the Device Manager, expand the entry named Ports. The COM port for the 1784-U2DHP should now be displayed.

This COM port is required for Configuring the Serial DHX Device.

Removing and Reinserting the Adapter

Removing the Adapter

Before the 1784-U2DHP is removed from the system, the Serial DHX Driver must be stopped. If the adapter is unplugged without stopping the Serial DHX Driver, the adapter will not be recognized the next time it is reinserted in the system, and a reboot of the system will be necessary to get things working again.

See Driver Control Tab for information on starting and stopping the Serial DHX Driver.

Removing the adapter from the system also clears the Data Highway Plus station address from the adapter.

Reinserting the Adapter

When the 1784-U2DHP adapter is initially inserted into the system, it will have no Data Highway Plus station address, and the DH+ light will be off. Once the first message is sent through the adapter, the station address will be set, and the DH+ light will be solid green.

Configuring the Serial DHX Device

Network Type

Chooses the type of network to which this device will be connected. Set this to Data Highway Plus (DH+) for the 1784-U2DHP adapter.

Station Address

When the 1784-U2DHP adapter is inserted into the system, it has no Data Highway Plus station address (as indicated by the DH+ light on the adapter which will be turned off).

The station address will be set the first time a message is sent through the adapter. A solid green DH+ light indicates the station address is set. The station address is then fixed until the adapter is powered down.

This is the DH+ network node address for the 1784-U2DHP adapter. This station address must be unique on the network.

Note Once the DH+ light on the 1784-U2DHP adapter is solid green, its station address is fixed. Changes to the station address will not take effect until the adapter is removed and reinserted into the system. See Removing and Reinserting the Adapter for more information.

COM Port

The COM Port setting must match the COM port that Windows assigned to the 1784-U2DHP.

Error Detection

The 1784-U2DHP adapter requires this value to be set to CRC-16.

Note All other configuration fields, such as bits per second and parity, are not used by the 1784-U2DHP adapter and can be left at their default values.

APPENDIX C: USING THE DL-PCIE ADAPTER

Installing DL-PCIe Adapter Support

DHX Suites newer than version 8.0 + Update 201303

All DHX Suites newer than version 8.0 + Update 201303 already have built-in support for the DL-PCIe adapter.

DHX Suites 7.0 – DHX Suites 8.0 + Update 201303

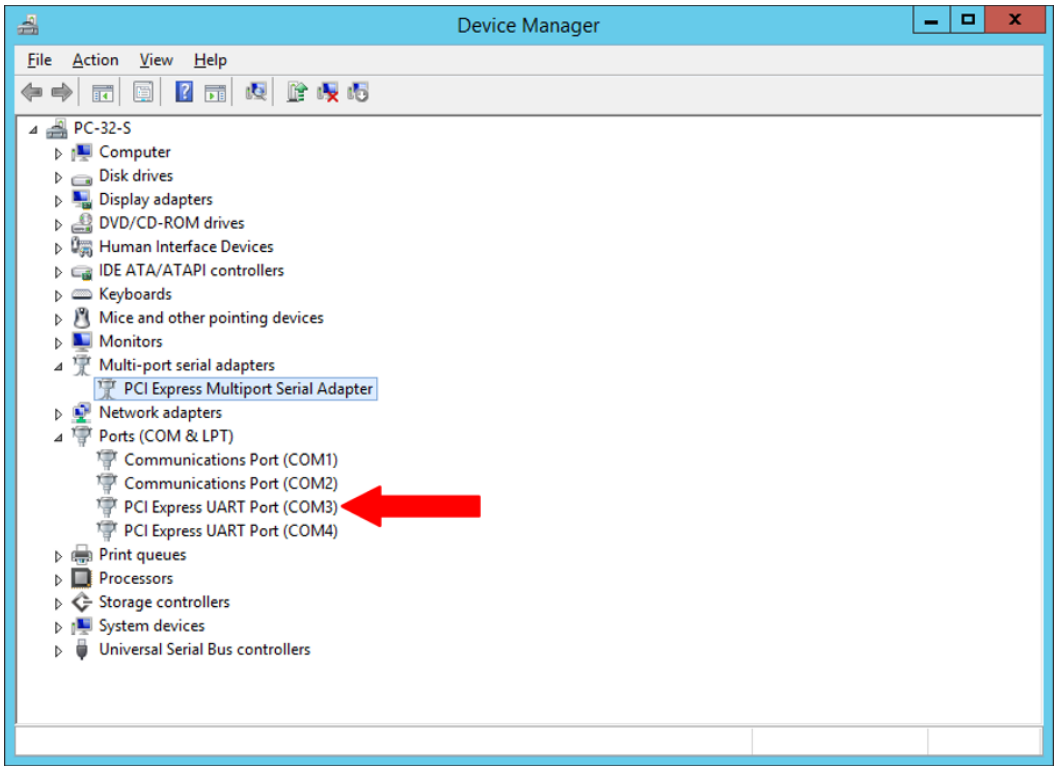
Support for the DL-PCIe adapter can be installed for these versions of the DHX Suites. Download then run the SerialU2DHPPatch.exe from the Cyberlogic Download page (http://www.cyberlogic.com/download.html).

DHX Suites older than version 7.0

There is no support for DL-PCIe adapters available in DHX Suites earlier than 7.0. Upgrade to the latest version of the appropriate DHX Suite to add support for the DL-PCIe adapter.

Configuring the DL-PCIe Adapter

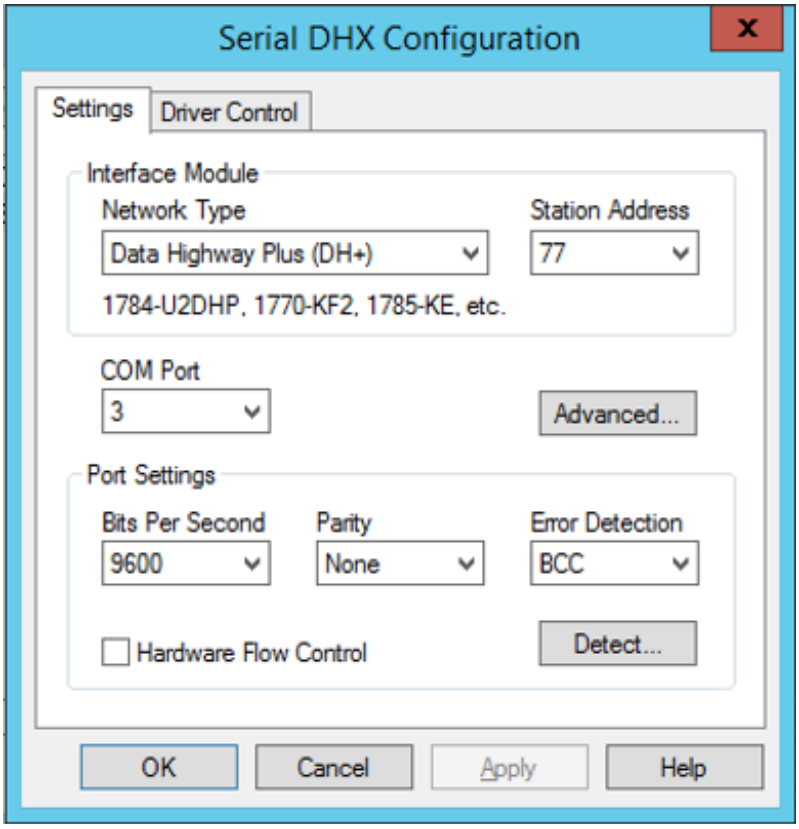
Install and configure the DL-PCIe card according to the instructions that you received with the adapter. You will need to know the COM port number assigned by the software. There will be 2 PCI Express UART Ports in the Device Manager (right click on My Computer, select Manage, and then choose Device Manager) under the "Ports (COM & LPT)" branch. You will need to use the lower of the two ports for DF1 communication. You will also need to know the Data Highway Plus or Data Highway 485 station address that you assigned.



Configuring the Serial DHX Device

This section describes the configuration required on the Serial DHX Device to make the adapter work properly.

Settings Tab



Network Type

Chooses the type of network to which this device will be connected. Set this to Data Highway Plus (DH+) or Data Highway 485 (DH-485) for the DL-PCIe adapter.

Station Address

Select the address that was assigned to the DL-DHPe adapter during the installation and configuration of the adapter.

COM Port

The COM Port setting must be the lower of the two COM ports that Windows assigned to the DL-DHPe adapter. In this example, we will use COM 3.

Port Settings

Click the Detect… button to discover the settings and complete your configuration.