Allen-Bradley

ControlLogix DH-485 Communication Module

1756-DH485

User Manual

Rockwell Automation

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (publication SGI-1.1 available from your local Rockwell Automation sales office or online at http://literature.rockwellautomation.com) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

WARNING ⚠	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION ⚠	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence
SHOCK HAZARD ⚡	Labels may be located on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
BURN HAZARD ♨	Labels may be located on or inside the equipment, for example, a drive or motor, to alert people that surfaces may be dangerous temperatures.

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1756-DH485 Module Overview

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Overview of the DH-485 Network

Purpose of This Manual

This manual describes how to understand, configure, and troubleshoot your ControlLogix Data Highway 485 communication interface module.

This manual also provides step-by-step procedures on how to use the 1756-DH485 module to send DH-485 messages between ControlLogix, PLC, and SLC controllers in DH-485 applications.

Who Should Use This Manual

Use this manual if you program applications that use 1756-DH485 modules. We assume you have a good understanding of the Data Highway 485 protocol. This user manual contains a brief description of the Data Highway 485 network in Chapter 2, Overview of the DH-485 Network.

Other Resources

Refer to the manuals listed in the table Devices that Use the DH-485 Network on page 2-3.

Notes:

1756-DH485 Module Overview

Introduction

This chapter describes the 1756-DH485 module, and what you must know and do before you begin to use it.

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What the Module Does

The 1756-DH485 module supports the following types of communication:

- Data Highway 485 (DH-485) Messaging
- Connectivity to two separate DH-485 networks in one module
- Common Industrial Protocol (CIP) Messaging

Module Requirements

The following are required for using the 1756-DH485 communication module:

- RSLinx Software, version 2.41 or later
- Node address within the range of 0-31
- AIC+ link coupler (1761-NET-AIC) communications adapter
- Compatible with SLC 5/03 controllers or later

Module Features

The 1756-DH-485 module offers the following features:

- Sends messages between devices on DH-485 networks and devices on other networks such as ControlNet, EtherNet/IP, or other DH-485 networks
- Bridges support to other NetLinx networks via the CLX gateway
- Configure channels and ports using RSLinx Classic software, version 2.43 or later
- Accesses other networks by using a routing table editor that lets DH-485 devices use the 1756-DH485 module and ControlLogix chassis
- Supports all benefits and attributes of a ControlLogix communication module
- Supports firmware upgrades

TIP	Download firmware upgrades via the backplane. Do not use DH485 network for downloads.

- Removal and insertion under power (RIUP), can be removed and inserted under power without disrupting power to other modules in the chassis

WARNING ⚠	When you insert or remove the module while backplane power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations.
	Be sure that power is removed or the area is nonhazardous before proceeding. Repeated electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance that can affect module operation.

- 4-character display
- Default Controller Slot feature for local messaging
- Serial Port Configuration
- No limit on number of modules per chassis, up to the number of available slots and the capabilities of the power supply

This figure shows the external features of the 1756-DH485 module.

External Features of the 1756-DH485 Module

Backplane
Connector

Alphanumeric
Status Indicator

Door
Label

DH-485

Channel
and
Module
Status
Indicators

CH A   CH B   OK

Channel A
Connector

Channel B
Connector

43842
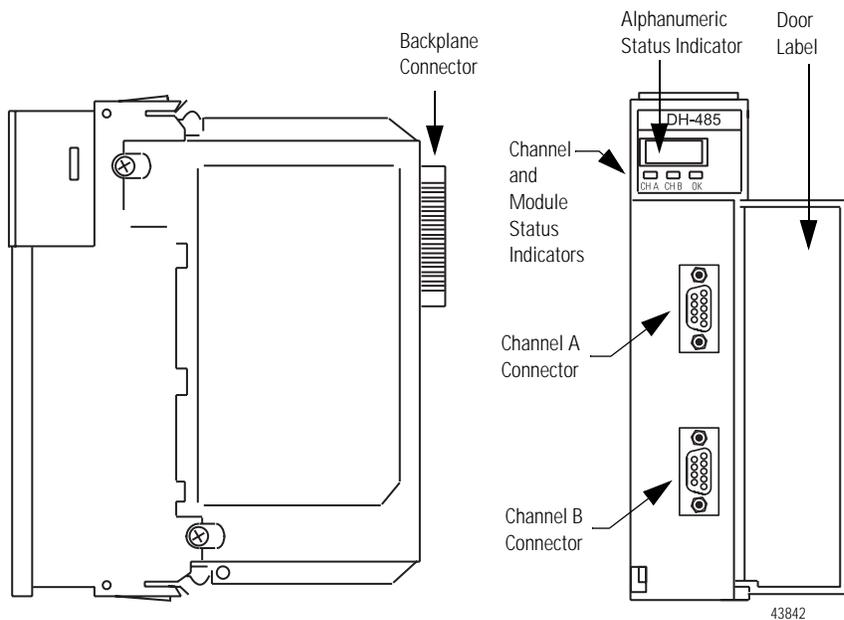
Prevent Electrostatic Discharge

The DH-485 module is sensitive to electrostatic discharge.

ATTENTION

⚠

This equipment is sensitive to electrostatic discharge, which can cause internal damage and affect normal operation. Follow these guidelines when you handle this equipment:

- Touch a grounded object to discharge potential static.
- Wear an approved grounding wriststrap.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the equipment.
- Use a static-safe workstation, if available.
- Store the equipment in appropriate static-safe packaging when not in use,.

Removal and Insertion Under Power

You can install or remove the module while chassis power is applied if you observe the following precautions.

WARNING

When you insert or remove the module while backplane power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations.

Be sure that power is removed or the area is nonhazardous before proceeding. Repeated electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance that can affect module operation.

Typical Applications

The first example is a typical gateway application connecting multiple networks together.

In this example you can:

- upload and download SLC 500 and Panelview display programs.

- seamlessly communicate between SLC controllers.

- connect multiple DH-485 networks together for inter-network communications, for example, messages between SLC 5/03 controllers.

- provide connection to other NetLinx networks, such as EtherNet/IP, to allow a single-point access, for example: upload and download to an SLC controller, MicroLogix controller, and Panelview display.

Connection of Multiple Networks

Computer with RSlogix 500 and RSLogix 5000 Software

1756-ENBT

1756-DH485

AIC+ Link Couplers

AIC Link Coupler

AIC Link Coupler

AIC Link Coupler

SLC 5/03 Controller

SLC 5/03 Controller

PanelView

44137
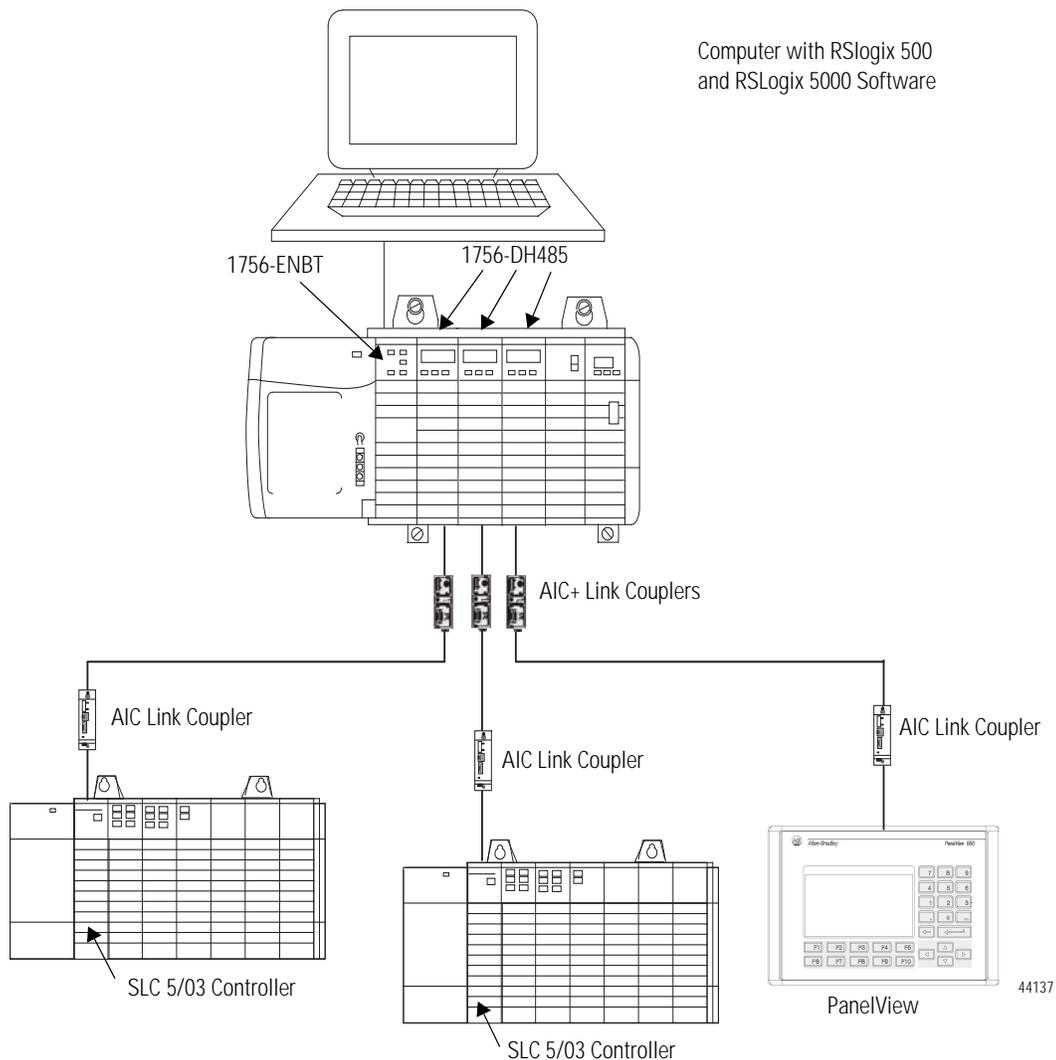
The second example shows how you can connect or migrate a legacy system to a new installation with RSLogix software.

- Connect multiple DH-485 networks together for inter-network communications.

- Message between SLC 5/03 controllers.

- Provide connection to other NetLinx networks.

- Access through a single point and download to an SLC controller, MicroLogix controller, and Panelview display.

- Allow communications between legacy and ControlLogix systems for high integration of control systems (except for fixed SLC controllers).

- Phase SLC systems into ControlLogix architecture by using a migration tool.

Connect or Migrate a Legacy System to a New Installation
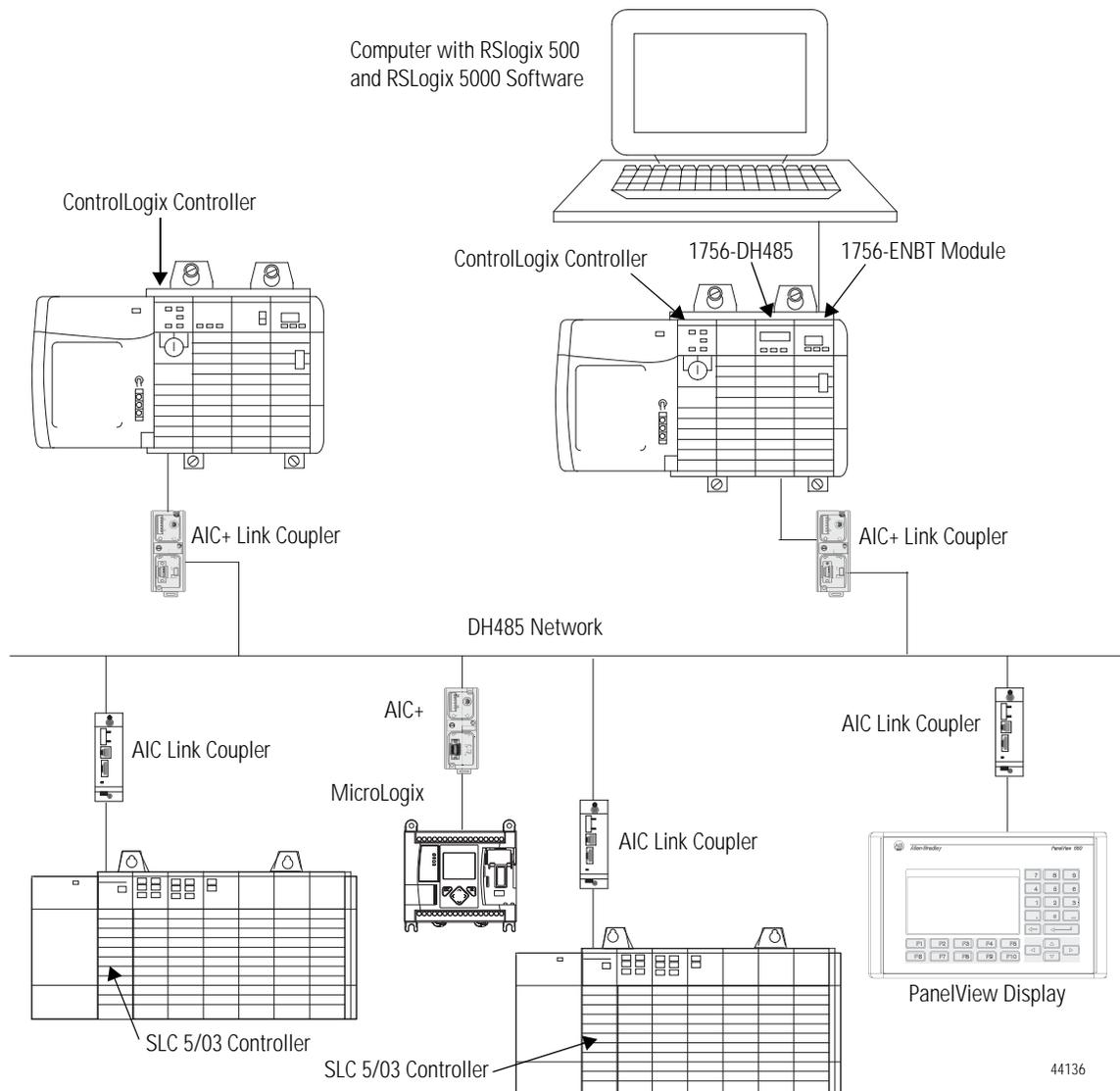
Remote Messaging

The configuration of remote messaging is similar to data highway remote I/O (DHRIO). It is achieved through routing table functions and module configuration. The multi-hop functionality is available in RSLogix 5 and 500 (version 6.3 or later)

Remote Upload and Download

You can bridge EtherNet/IP and ControlNet networks to a DH-485 network using the 1756-DH485 module

You can upload and download:

- all MicroLogix and SLC 500 controllers on DH-485 from NetLinx network by using RSLinx Classic software.

- PanelView Standard terminals on DH-485 from NetLinx network by using RSLinx Classic.

Logix controllers message via a NetLinx network through a ControlLogix gateway to the DH-485 network to all MicroLogix and SLC 5/03 (and above) controllers on DH-485 network. RSLinx Classic software on the DH-485 network can browse through the ControlLogix gateway to any device on a NetLinx network.

IMPORTANT   Logix controllers on a NetLinx network will not be able to initiate messages through the ControlLogix gateway to the DH-485 network to fixed SLC 500, SLC 5/01, or SLC 5/02 controllers on a DH-485 network.

Routing Limitations

The 1756-DH485 module can route a message through up to four communications networks and three chassis. This limit applies only to the routing of a message and not to the total number of networks or chassis in a system.

DH-485 and CIP Messaging

The 1756-DH485 module lets devices, such as ControlLogix, PLC, and SLC controllers exchange information. With the 1756-DH485 module, you may exchange information between the ControlLogix, PLC, or SLC controllers on different networks. Communication between SLC controllers on different networks is accomplished using remote messaging.

Communication Between SLC Controllers on Different Networks
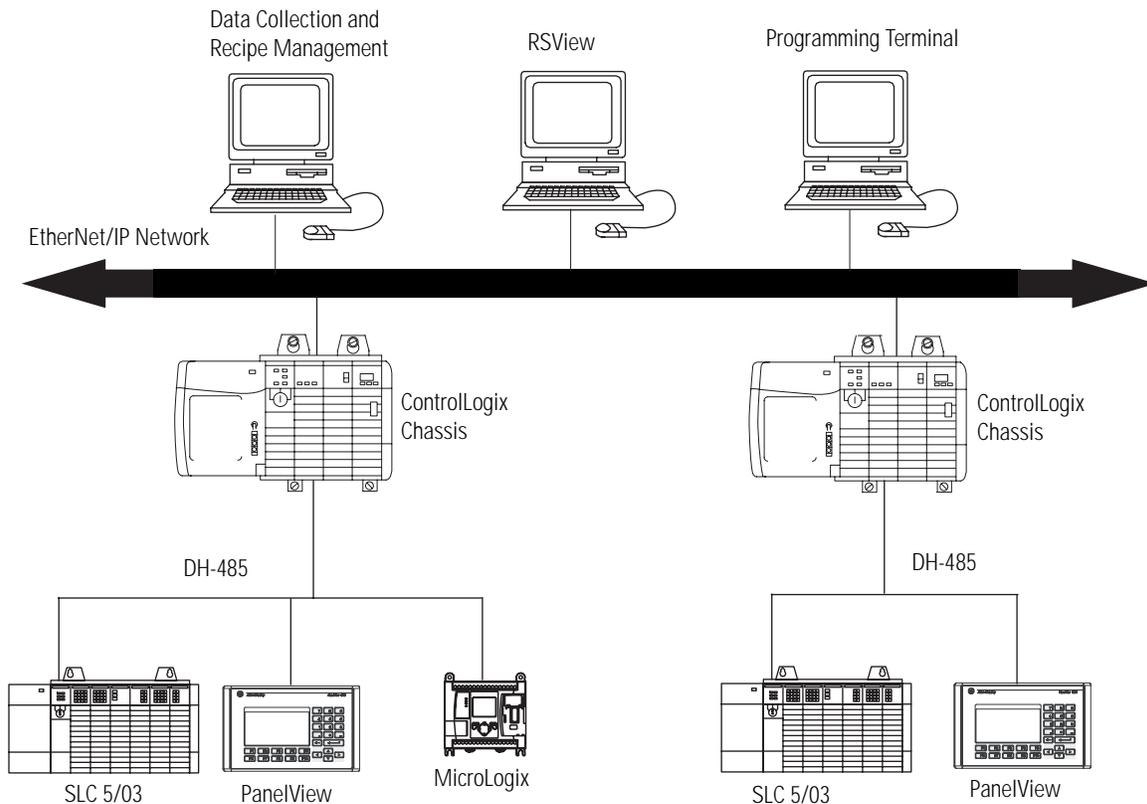
Alphanumeric Indicators

When you apply power to the module, the alphanumeric display begins to cycle through the following sequence.

1. All LEDs flash on then off -CHA, CHB OK

2. OK displays red then changes to green.

3. INIT displays.

4. Firmware Revision flashes on scrolling display: DH-485

5. Channel A and the network used for channel A.

6. Channel A node address.

7. Channel A status.

8. Channel B and the network used for channel.

9. Channel B node address.

10. Channel B status.

This sequence runs continuously during normal module operation.

EXAMPLE	For example, if your module uses the following:

For example, if your module uses the following:

- Channel A for DH-485 with node address 14
- Channel B is not connected

and the channels are operating properly, you see the following sequence:

A DH, A#14, A OK, B DH, B#00, ONLY NODE

Refer to Appendix B, Troubleshoot the 1756-DH485 Module and publication 1756-IN587, the ControlLogix DH-485 Communications Module Installation Instructions, for more information about LEDs and status indicators.

Notes:

Overview of the DH-485 Network

Introduction

The information in this chapter will help you plan, install, and operate devices on a DH-485 network. This chapter also contains information that describes the DH-485 network functions, network architecture, and performance characteristics.

DH-485 Network Description

The DH-485 network passes information between devices on the plant floor. The network monitors process parameters, device parameters, device status, process status, and application programs to support data acquisition, data monitoring, program upload/download, and supervisory control.

The DH-485 network offers:

- interconnection of 32 devices.
- multi-master capability.
- token passing access control.
- the ability to add or remove nodes without disrupting the network.
- maximum network length of 1219 m (4000 ft)[1].

(1) The network can be extended to 2,438 meters (8,000 feet) by connecting two AIC+ Advanced Interface Converters (1761-NET-AIC). Refer to the *AIC+ Advanced Interface Converter User Manual*, publication number 1761-6.4.

The protocol used to control message transfers on the DH-485 network supports two classes of devices: initiators and responders. All initiators on the network get a chance to initiate message transfers. To determine which initiator has the right to transmit, a token passing algorithm is used.

DH-485 Network Protocol

A node holding the token is able to transmit a configurable number of message packets (plus two retries) onto the network before having to pass the token on to the next node. This configuration parameter is called the Token Hold Factor and has a minimum value of one and a maximum value of four. Once a node holding the token has sent any messages that it has to send, up to its Token Hold Factor maximum allowed, it attempts to pass the token to its successor by sending a token-pass packet.

DH-485 Token Rotation

If no network activity occurs, the initiator sends the token-pass packet again. After two retries (a total of three tries) the initiator will attempt to find a new successor.

IMPORTANT	The maximum address that the initiator will search for before wrapping to zero is the value in the configurable parameter maximum node address. The default value for this parameter is 31 for all initiators and responders.

The allowable range of the node address of an initiator is 0 to 31. The allowable address range for all responders is 1 to 31. There must be at least one initiator on the network.

DH-485 Network Initialization

Network initialization begins when a period of inactivity exceeding the time of a link dead timeout is detected by an initiator on the network. When the time for a link dead timeout is exceeded, usually the initiator with the lowest address claims the token. When an initiator has the token it will begin to build the network. The network requires at least one initiator to initialize it.

Building a network begins when the initiator that claimed the token tries to pass the token to the successor node. If the attempt to pass the token fails, or if the initiator has no established successor (for example, when it powers up), it begins a linear search for a successor starting with the node above it in the addressing.

When the initiator finds another active initiator, it passes the token to that node, which repeats the process until the token is passed all the way around the network to the first node. At this point, the network is in a state of normal operation.

Devices that Use the DH-485 Network

Presently, the following SLC 500 devices support the DH-485 network:

Devices that Use the DH-485 Network

Catalog Number	Description	Installation Requirement	Function	Publication
1756-DH485	ControlLogix DH485 Communication Module	ControlLogix Chassis	Bridge DH485 messages in ControlLogix.	1756-UM532
1747-Lxxx	SLC 500 Programmable Controllers	SLC Chassis	Programmable controllers.	1747-UM011
1747-KE	DH-485/DF1 Interface Module	SLC Chassis	Provides a non-isolated DH-485 interface for SLC 500 devices to host computers over RS-232 using full- or DF1 half-duplex protocol. Enables remote programming to an SLC 500 controller or the DH-485 network through modems. Ideal for low cost RTU/SCADA applications.	1747-IN006
1747-UIC	USB to DH-485 Interface Converter	Standalone	Provides connection to personal computer's USB port and features an RS-232 and an RS-485 port for connection to SLC 500 controllers.	1747-IN063
1747-AIC	Isolated Link Coupler	Standalone	Provided connection to SLC 500 family devices to the DH-485 network. The coupler provides a 6-position removable terminal block for connection to the DH-485 communication cable.	1747-UM011
1761-NET-AIC	Advanced Interface Converter	Standalone	Provides a communication link between various networks devices.	1761-UM004
1770-KF3[1]	DH-485/DF1 Interface Module	Standalone, or desktop	Provides an isolated DH-485 interface for SLC 500 devices to host computers over RS-232 using full- or DF1 half-duplex protocol. Enables remote programming to an SLC 500 controller or the DH-485 network through modems.	1770-6.5.18
1785-KA5	DH+/DH-485 Gateway	(1771) PLC Chassis	Provides communication between stations on the PLC-5 (DH+) and SLC 500 (DH-485) networks. Lets communication and data transfer from PLC to SLC 500 on DH-485 network. Also enables software programming or data acquisition across DH+ to DH-485.	1785-6.5.5 1785-1.21
1785-KA5P		Standalone		
1784-KTX, 1784-KTXD	PC DH-485 Interface Card	ISA Bus	Provides DH-485 or DH+ connection.	1784-6.5.22
1784-PCMK	PCMCIA Interface Card	PCMCIA slot in computer	Provides DH-485 or DH+ connection.	1784-6.5.19
1761-L 1762-L 1763-L 1764-L	MicroLogix Programmable Controllers	Standalone	Programmable Controllers	1761-UM003 1762-UM001 1763-UM001 1764-UM001
1756-L 1769-L 1794-L	Logix Programmable Controllers	1756 Chassis or DIN Rail	Programmable Controllers	1756-UM001 1769-UM011 1794-UM001

Devices that Use the DH-485 Network

Catalog Number	Description	Installation Requirement	Function	Publication
2707-L8P1[1], 2707-L8P2[1], 2707-L40P1[1], 2707-L40P2[1], 2707-V40P1[1], 2707-V40P2[1], 2707-V40P2N[1], 2707-M232P3[1], and 2707-M485P3[1]	DTAM Plus and DTAM Micro Operator Interfaces[1]	Panel Mount	Provides electronic operator interface for SLC 500 controllers.	2707-800, 2707-803
2711-K5A2, 2711-B5A2, 2711-K5A5, 2711-B5A5, 2711-K5A1, 2711-B5A1, 2711-K9A2, 2711-T9A2, 2711-K9A5, 2711-T9A5, 2711-K9A1, and 2711-T9A1	PanelView 550 and PanelView 900 Operator Terminals	Panel Mount	Provides electronic operator interface for SLC 500 controllers.	2711-UM014DF
1784-PKTX, 1784-PKTXD	PC DH-485 Interface Card	PCI Bus	Provides DH-485 or DH+ connection	1784-6.5.27

(1)   This product is no longer available for order.

1747-AIC Isolated Link Coupler for DH-485

Use the isolated link coupler (1747-AIC) to connect SLC 500 family devices to the DH-485 network (as shown on page 2-5). The coupler provides a 6-position removable terminal block for connection to the DH-485 communication cable.

To establish network connections for:

- SLC 500 controllers (SLC 5/03 and below), use a 304.8 mm (12 in.) cable, supplied with the link coupler (catalog number 1747-C11).

If you need to connect a peripheral device that is between 1.8 m (6 ft) and 6.1 m (20 ft) away, use the 1747-C20 cable.

To protect connected devices, the coupler provides 1500V dc isolation between the communications cable and the attached SLC 500 controller and peripheral devices.

You can also use the isolated link coupler to provide connectivity between devices for distances greater than 1.8 m (6 ft) up to a maximum of 1219 m (4000 ft). Below is an example of a remote connection between a computer running your programming software and an SLC 500 controller.

Remote Connection Between a Computer Running Programming Software and an SLC 500 Controller
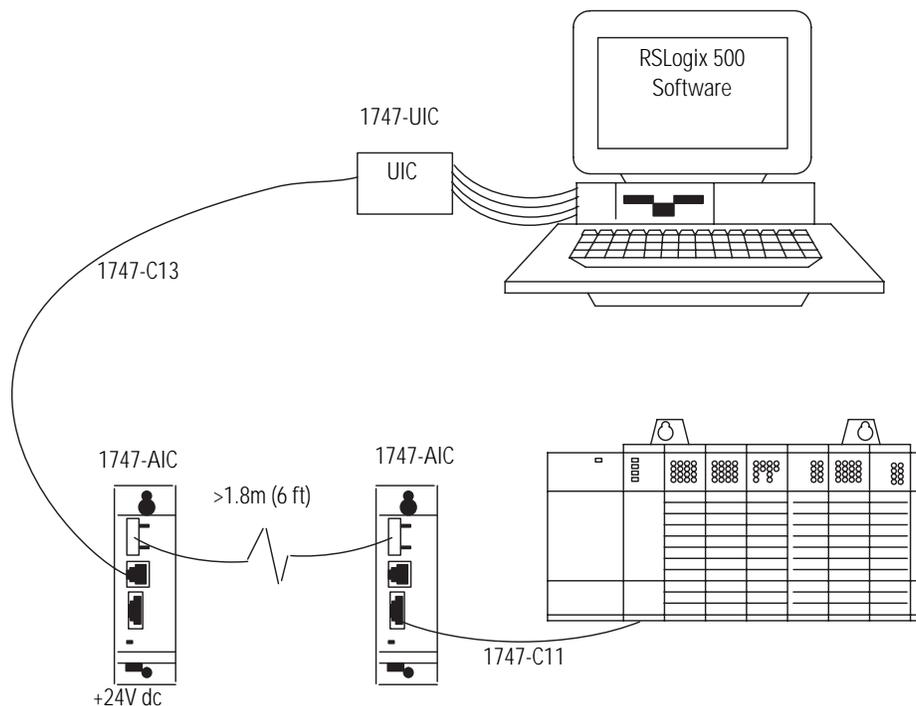
1761-NET-AIC Advanced Interface Converter Product Overview

The AIC+ advanced interface converter provides a communication link between various networks devices. Ports 1, 2, and 3 are used for making the communication connections. The AIC+ is compatible with a variety of SLC and MicroLogix controllers and the 1756-DH485 communications module.

The MicroLogix controllers provide power to the AIC+ via port 2's cable. However, if a controller is not connected to port 2, a 24V dc power supply connected to the converter's external power terminals is required. The DC power source selector switch needs to be set for your particular configuration.

The baud rate selector switch is used to match the baud rate filter of the AIC+ to the network baud rate. This switch **does not** change the network baud rate and is normally left in the AUTO position. In high noise environments, the baud rate selector switch should be taken out of the AUTO mode and set to the same baud rate as the network.

Operating Modes

The AIC+ can be used in the following modes for DH-485:

- point-to-point RS-232 isolator
- RS-232 to RS-485 isolator

Communication is established using hardware handshaking or auto transmit signals.

Device Compatibility

The AIC+ can be used to interconnect the following devices:

- SLC 500, 5/01, 5/02, and 5/03 controllers (channel 1)
- SLC 5/03, 5/04, and 5/05 controllers (channel 0)
- MicroLogix controllers
- Logix Controllers
- Operator interface devices
- PC serial ports (or any 9-pin DTE serial port)
- Logix controller serial port (DH485 mode)
- 1756-DH485 module

> **TIP**   The 1761-HHP-B30 Hand-Held Programmer is not connectable to the AIC+ advanced interface converter.

Node Address Identification

There is no node address associated with the network port (Port 3).

Port 2 Node Address (The node address is configured in the device connected to Port 2.)

Port 1 Node Address (The node address is configured in the device connected to Port 1.)

Use this write-on area to mark the node address of each connection.
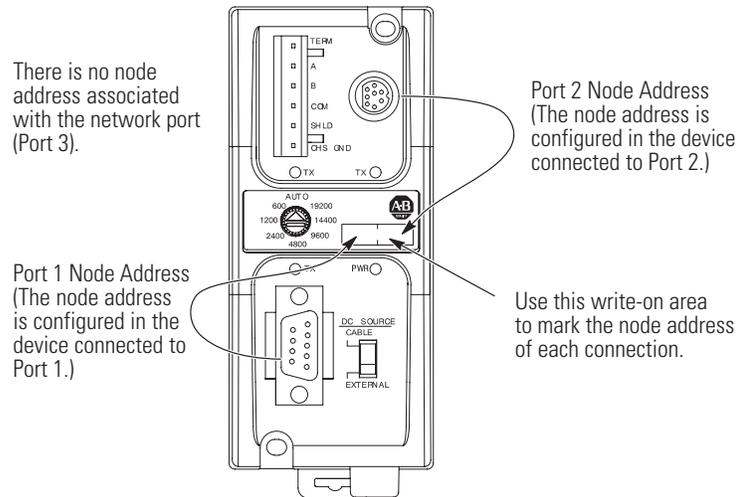
Misconception about the 1761-NET-AIC Converter

The function of the 1761-NET-AIC converter is to accomplish two tasks. The first is to convert RS232 electrical signals to RS485 electrical signals and RS485 electrical signals to RS232 electrical signals.

The second function is to provide electrical isolation between all three communication ports. This protects against ground loops and voltage differences between devices connected to the 1761-NET-AIC converter.

A common misconception is that the 1761-NET-AIC device converts protocol, **this is not true**, it passes the protocol but converts the electrical signals. An example device that would convert protocol and electrical signal is the 1747-KE module.

Refer to the Isolation Interface Converter (AIC+) User Manual, publication 1761-UM004 for complete information.

1747-UIC USB to DH-485 Interface Converter

The 1747-UIC lets you connect DH-485 devices directly to a computer's USB port. It features an RS-232 port for connection to SLC 5/03 and higher controllers, MicroLogix, PanelView 300 and higher terminals, 1761-NET-AIC+, and Logix controllers, as well as an RS-485 port for connection to SLC 5/03 and lower controllers, PanelView 300 and higher terminals, and 1747-AIC. The converter can communicate with devices on the DH-485 network at 19.2K baud.

Example System Configuration

Below is an example of a DH-485 network.

Example DH-485 Network System Configuration

Personal Computer

SLC 5/03, 5/04, or 5/05 Modular Controller

1747-UIC Interface Converter

1761-NET-AIC Advanced Interface Converter

DH-485 Network max. length 1219 m (4,000 ft)

1747-AIC Isolated Link Coupler

1747-AIC

Data Table Access Module

SLC 500 20-Point Fixed Controller

SLC 5/02 Modular Controller

PanelView

SLC 5/01 Modular Controller

ControlLogix Controller and 1756-DH485 Communications Module

1747-AIC

1761-NET-AIC

1747-AIC

SLC 500 20-Point Fixed Controller with 2-Slot Expansion Chassis

Personal Computer

SLC 500 Fixed Controller

44138

Configure the SLC 5/03, SLC 5/04, and SLC 5/05 Controller Channel 0 for DH-485

The RS-232 port (channel 0) of the SLC 5/03, SLC 5/04, and SLC 5/05 controllers can be configured for DH-485 protocol. You can connect channel 0 of the SLC 5/03, SLC 5/04, and SLC 5/05 controllers to a DH-485 network using the 1747-CP3 cable and a 1761-NET-AIC Advanced Interface Converter (AIC+). In this case, the AIC+ must be powered with 24V dc. The 1746-P1, -P2, -P4, -P5, and -P6 power supplies provide 24V dc user power that may be used to power the AIC+

Configure an SLC Controller for DH-485.
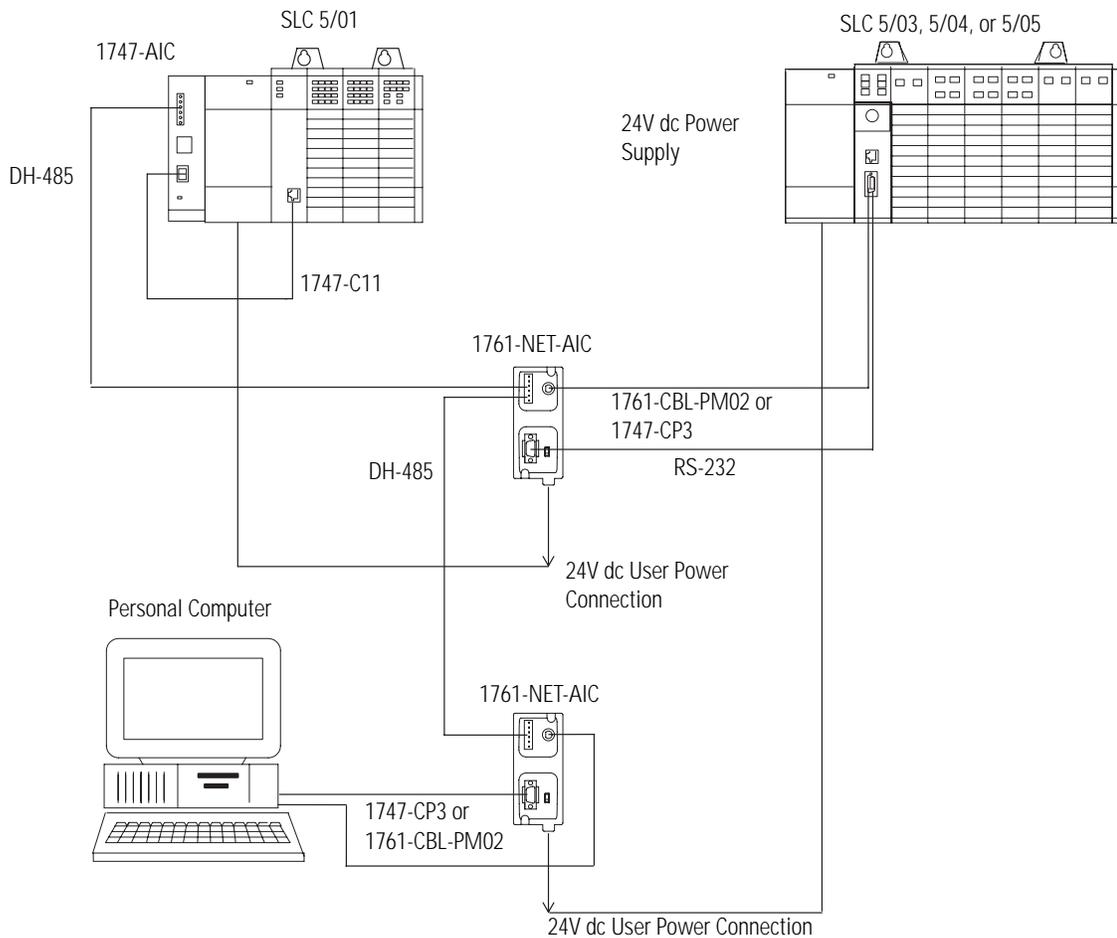
Important Planning Considerations

Carefully plan your network configuration before installing any hardware. Listed below are some of the factors that can affect system performance:

- Amount of electrical noise, temperature, and humidity in the network environment
- Number of devices on the network
- Connection and grounding quality in installation
- Amount of communication traffic on the network
- Type of process being controlled
- Network configuration

The major hardware and software issues you need to resolve before installing a network are discussed in the following sections.

Hardware Considerations

You need to decide the length of the communication cable, where you will route it, and how to protect it from the environment where it will be installed.

Before you install the communication cable, you need to know how many devices are to be connected during installation and how many devices will be added in the future. The following sections will help you understand and plan the network.

Number of Devices and Length of Communication Cable

You must install a link coupler communications adapter (1747-AIC or 1761-NET-AIC) for each node on the network. If you plan to add nodes later, provide additional link couplers during the initial installation to avoid recabling after the network is in operation.

The maximum length of the communication cable is 1219 m (4000 ft). This is the total cable distance from the first node to the last node on the network.

Plan Cable Routes

Follow these guidelines to help protect the communication cable from electrical interference:

- Keep the communication cable at least 1.52 m (5 ft) from any electric motors, transformers, rectifiers, generators, arc welders, induction furnaces, or sources of microwave radiation.
- If you must run the cable across power feed lines, run the cable at right angles to the lines.
- If you do not run the cable through a contiguous metallic wireway or conduit, keep the communication cable at least 0.15 m (6 in.) from ac power lines of less than 20A, 0.30 m (1 ft) from lines greater than 20A, but only up to 100k VA, and 0.60 m (2 ft) from lines of 100k VA or more.
- If you run the cable through a contiguous metallic wireway or conduit, keep the communication cable at least 0.08 m (3 in.) from ac power lines of less than 20A, 0.15 m (6 in.) from lines greater than 20A, but only up to 100k VA, and 0.30 m (1 ft) from lines of 100k VA or more.

  Running the communication cable through conduit provides extra protection from physical damage and electrical interference. If you route the cable through conduit, follow these additional recommendations:

  - Use ferromagnetic conduit near critical sources of electrical interference. You can use aluminum conduit in non-critical areas.
  - Use plastic connectors to couple between aluminum and ferromagnetic conduit. Make an electrical connection around the plastic connector (use pipe clamps and the heavy gauge wire or wire braid) to hold both sections at the same potential.
  - Ground the entire length of conduit by attaching it to the building earth ground.
  - Do not let the conduit touch the plug on the cable.
  - Arrange the cables loosely within the conduit. The conduit should contain only serial communication cables.
  - Install the conduit so that it meets all applicable codes and environmental specifications.

For more information on planning cable routes, see Industrial Automation Wiring and Grounding Guidelines, Publication Number 1770-4.1.

Software Considerations

Software considerations include the configuration of the network and the parameters that can be set to the specific requirements of the network. The following are major configuration factors that have a significant effect on network performance:

- Number of nodes on the network
- Addresses of those nodes
- Baud rate
- Maximum node address selection
- SLC 5/03, SLC 5/04, and SLC 5/05 controllers only: token hold factor
- Maximum number of communicating devices

The following sections explain network considerations and describe ways to select parameters for optimum network performance (speed).

Number of Nodes

The number of nodes on the network directly affects the data transfer time between nodes. Unnecessary nodes (such as a second programming terminal that is not being used) slow the data transfer rate. The maximum number of nodes on the network is 32.

Set Node Addresses

The best network performance occurs when node addresses start at 0 and are assigned in sequential order. Controllers cannot be node 0. Also, initiators such as personal computers should be assigned the lowest numbered addresses to minimize the time required to initialize the network.

Set Controller Baud Rate

The best network performance occurs at the highest baud rate. All devices must be at the same baud rate.

Maximum Node Address Setting

The maximum node address parameter should be set as low as possible. This minimizes the amount of time used in soliciting successors when initializing the network. If all nodes are addressed in sequence from 0, and the maximum node address is equal to the address of the highest addressed node, the token rotation will improve by the amount of time required to transmit a solicit successor packet plus the slot timeout value.

You cannot add any nodes to the network without affecting the response time. On the other hand, since the time required to hold an open station address is greater than the time required to pass a token, it can be useful to leave a temporary device (such as a personal computer) connected if there is only one such device. A solicit successor packet requires the same transmission time as the token pass, but there is an added slot timeout period.

See your programming software user manual for the procedures to set node addresses, controller baud rate, and maximum node addresses.

IMPORTANT	The SLC 500 Series A (only) controllers set the maximum node address to 31 when power is cycled increasing initialization and response time of the network.

Maximum Number of Communicating Devices

SLC 500 fixed and SLC 5/01 controllers can be selected by two initiators maximum at the same time. Using more than two initiators to select the same SLC 500 fixed and SLC 5/01 controllers at the same time can cause communication timeouts.

Additional Resources

Refer to the manuals listed in the table Devices that Use the DH-485 Network on page 2-3.

Notes:

Use Data Highway 485 Network

Introduction

This chapter describes the basics of the Data Highway 485 system and the operation of a DH-485 network.

What Is Data Highway 485?

On the most basic level, Data Highway 485 is a wire or cable and a protocol that connects computers and peripheral devices so that they can communicate. The wire used for a network is called the network medium.

A DH-485 link transfers data between ControlLogix controllers, SLC controllers, and other devices that use the DH-485 network. These devices are called stations. You can connect a maximum of 32 stations to a single DH-485 link.

Link Design

When you design your DH-485 link, you should use good design practices, including laying out the link before installation. We also recommend you consider the following when designing your DH-485 link:

- All performance requirements
- Maintenance
- Possible future changes to the link

Use a Belden 9842 or a Belden 3106A cable to connect your module to DH-485. Only connect a DH-485 network using a daisy-chain configuration. If you need to know how to install a DH-485 network, refer to publication 1747-UM011, SLC 500 Modular Hardware Style User Manual.

Two Methods of Communication Over a DH-485 Network

The 1756-DH485 module acts as a bridge for two methods of communication. These methods are:

- DH-485 Messaging
- Common Industrial Protocol (CIP) Messaging

The table Types of Communication on the 1756-DH485 Module lists the devices that support each communication method.

Types of Communication on the 1756-DH485 Module

Type of Communication	Devices and Software Support
DH-485 messaging	SLC-500 -5/05, 5/04, 5/03, 5/02, 5/01, MicroLogix
	Logix controllers
	RSLinx and RSLogix 500 software
Common Industrial Protocol (CIP) messaging	Logix controllers
	RSLogix 5000 and RSLinx software

Use DH-485 Messaging

DH-485 Messaging offers the following benefits:

- You can send messages between devices on the same link.
- You can send messages between devices on different links.

DH-485 messaging is divided into two types:

- Local DH-485 Messaging - See page 3-3
- Remote DH-485 Messaging - See page 3-5

Before you can design a control system to meet your application needs, be aware of the difference between Local DH-485 Messaging and Remote DH-485 Messaging.

Local DH-485 Messaging

Devices use local DH-485 messaging to communicate between devices on the same physical link. A device that uses local DH-485 messaging must:

- generate local DH-485 packets.
- support local DH-485 protocol.
- send and receive messages.

| **TIP** | SLC 5/01 controller receives and replies, but does not initiate. |

This figure shows an SLC controller sending a local message to Channel A on the 1756-DH485 module. Because the controller slot for Channel A is configured to 0, the message is forwarded to the ControlLogix controller in slot 0.

SLC Controller Sending a Local Message to Channel A on the 1756-DH485 Module
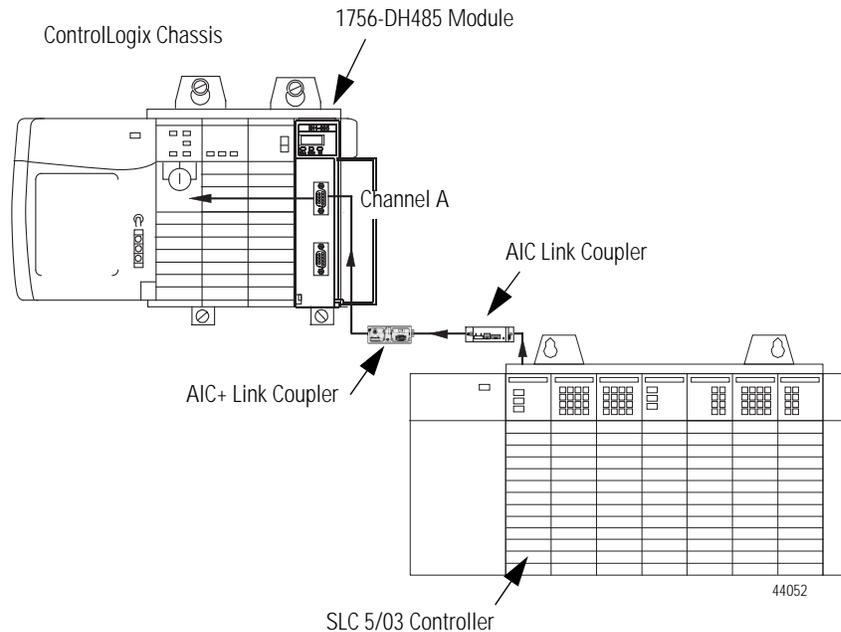
Because a local DH-485 message has only enough address information to get the message to a target node on the same DH-485 network, the 1756-DH485 module that receives this message cannot identify where to send the message. The 1756-DH485 module uses the Controller Slot configuration parameter in RSLinx software to send the message to the local controller.

Local DH-485 messaging **does not** require a populated routing table. Local DH-485 messaging **does** require a default or applied controller slot for each channel configured for a DH-485 network.

IMPORTANT   Local DH-485 Messaging can target only one ControlLogix controller per DH-485 channel. The ControlLogix controller must reside in the same chassis as the 1756-DH485 module receiving the message.

Refer to Remote DH-485 Messaging on page 3-5 for more information.

Limitations of Local DH-485 Messaging

When using Local DH-485 Messaging, you must remember:

- the DH-485 message contains only a node ID for a node on the DH-485 network.

- a local DH-485 message sent to the node ID of a port on the 1756-DH485 module is forwarded to a single user-configured controller slot.

- messages on one DH-485 network cannot be routed to other networks.

Logix controllers message via a NetLinx network through a ControlLogix gateway to DH-485 network to all MicroLogix and SLC 5/03 (and above) controllers on DH-485 network. RSLinx Classic on DH-485 network can browse through ControlLogix gateway to any device on NetLinx network.

IMPORTANT	Logix controllers on NetLinx network will not be able to message through ControlLogix gateway to DH-485 network to fixed SLC 500, SLC 5/01, or SLC 5/02 controllers on DH-485 network.

Remote DH-485 Messaging

Devices use remote DH-485 messaging to communicate between devices on physically separate networks. A device that uses remote DH-485 messaging must be able to:

- generate Remote Data Highway 485 network packets.
- support Remote Data Highway 485 network protocol.
- send and receive messages.

Remote DH-485 messaging should be used when:

- The message originating device or the message target device is one of the supported devices.

    Refer to table Types of Communication on the 1756-DH485 Module on page 3-2.

- There is a DH-485 network link in the message's path from originator to target.
- The originating and the target devices are on separate networks communicating through a ControlLogix gateway.

This figure shows an example of remote DH-485 messaging between SLC/03 (or later) controller A and SLC 5/03 (or later) controller B. In this example, the following information must be included in the remote DH-485 message routing message instruction:

- Local DH-485 node = 020
- Destination link ID = 2
- Remote DH-485 node = 030

**Remote DH-485 Messaging Between
SLC 5/03 Controller A and SLC 5/03 Controller B**
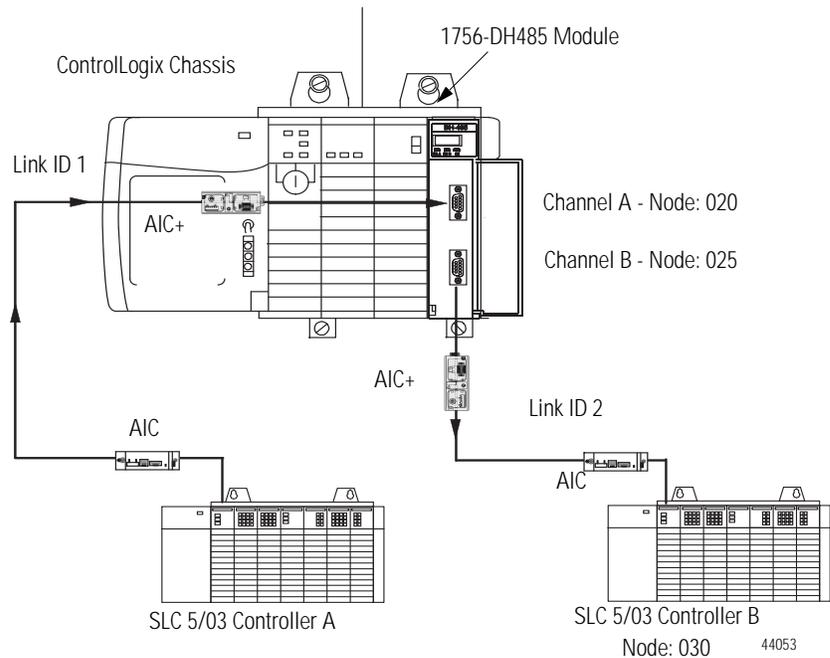
Link IDs

To use remote DH-485 messaging, each network that is an originating network or target network must have a unique link ID. The 1756-DH485 module requires these link IDs to be decimal values between 1-199. Each DH-485 channel on a 1756-DH485 module must have its own unique link ID.

The message originates on the source network. The destination network is the message's target network. This applies to all source and destination networks, including DH-485, ControlNet, EtherNet/IP, and a ControlLogix chassis backplane.

IMPORTANT   For remote DH-485 messaging, the ControlLogix chassis backplane should be considered a separate, independent network. Therefore, a system of 1 DH-485 network and one ControlLogix chassis is a two-link system.

The ControlLogix chassis backplane is **required** to be a separate, independent link for DH-485 messaging if there is more than one message target ControlLogix controller in a ControlLogix chassis.

Routing Tables in Remote DH-485 Messaging

The 1756-DH485 module contains a routing table that you define for your application. The routing table contains information used to steer Remote DH-485 Messages through the system to remote nodes located on separate networks. By using the routing table, the 1756-DH485 module lets existing devices, such as an SLC controller, to use DH-485 Remote Addressing for messaging.

You must use RSLinx software to configure your routing table. Refer to Use RSLinx Software to Create a Routing Table on page 4-2, for more information.

Programming Message Block Instructions in a Controller for Remote DH-485 Messaging

Before programming your message block instructions in your controller, you must:

- determine which links will send and receive remote DH-485 messaging.

- draw a network to make sure you meet the design requirements for remote DH-485 messaging.

If you are using remote DH-485 messaging, you must also:

- assign link numbers.

  The numbers must be a decimal value between 1-199. ControlLogix chassis backplane may also be assigned link IDs.

- assign DH-485 node numbers.

- use RSLinx software to load routing tables into each 1756-DH485 module.

When using remote DH-485 messaging, you must include the following in the message instruction:

- Destination link ID - A user-defined number representing a network in your system.

- Remote node or slot - The node or slot on the remote network with which you want to communicate.

If the message originates on a DH-485 network, you must also include a local DH-485 node. The node on your local DH-485 network is capable of routing the message. If the message originates on EtherNet/IP, ControlNet, or ControlLogix, you must also include a CIP path to the first 1756-DH485 module.

The following table lists what the controllers are capable of on DH-485.

Controllers and the Types of Messaging Capable on a DH-485 Network

Controller Messaging	Respond to Local DH-485	Initiate Local DH-485	Respond to Remote DH-485	Initiate Remote DH-485
MicroLogix 1000	Yes	Yes	Yes	No
MicroLogix 1100	Yes	Yes	Yes	Yes
MicroLogix 1200	Yes	Yes	Yes	Yes
MicroLogix 1500	Yes	Yes	Yes	Yes
SLC 500 fixed	Yes	No	No	No
SLC 5/01	Yes	No	No	No
SLC 5/02	Yes	Yes	No	No
SLC 5/03	Yes	Yes	Yes	Yes
SLC 5/04	Yes	Yes	Yes	Yes
SLC 5/05	Yes	Yes	Yes	Yes
Logix	Yes	Yes	No[1]	Yes

[1]   Yes for CIP remote messaging only.

Limitations of Remote DH-485 Messaging

Remote DH-485 messages are encapsulated in CIP messages and sent on CIP connections when they are sent across ControlNet, EtherNet/IP, and the ControlLogix chassis backplane. Although this is transparent to the user, there are resource limits associated with CIP on the 1756-DH485 module.

The 1756-DH485 module supports up to 32 CIP connections. These connections are made when devices want to send a DH-485 message out of a 1756-DH485 module's DH-485 channel. The 1756-DH485 module makes these connections when it receives DH-485 message traffic. The 1756-DH485 module recovers connections if they are not being used.

Because of the various paths involved, the 1756-DH485 module responds to 'out of connections' in one of the following ways:

- The 1756-DH485 module may generate a Routing Error on DH-485 for DH-485 message requests if there are no connections available.

- The Message Originator may generate an application timeout if a remote 1756-DH485 module has no connections available for a DH-485 Message response.

  For more information on application timeouts, refer to Application Timeout on page 3-12.

- The Message Originator may receive an 'out of connections' error if the path from the originator to the 1756-DH485 module is a ControlLogix chassis, a ControlNet network, or an EtherNet/IP network.

Configuration Information in DH-485 Messaging

When you are doing DH-485 messaging, you must first set up the 1756-DH485 module configuration. The following configuration information is stored in the non-volatile (NVS) memory on your 1756-DH485 module when you configure the module using RSLinx software.

- Any routing table that may be needed to send DH-485 messages through the module. - This information must be applied to the module's configuration separately from other information. Use RSLinx to apply the routing table.

  For more information about routing tables, see the section Use RSLinx Software to Create a Routing Table in Chapter 4.

- Controller slot assignment for each DH-485 channel.

  Refer to Set the Controller Slot on page 4-8 for more information on local messaging.

- The node number of the module.

IMPORTANT	If you restore defaults with RSLinx software, the slot number will remain the 1756-DH485 module's non-volatile memory, but the routing table and the controller slot for both DH-485 channels will be reset.

Application Timeout

When an error occurs while sending a message to a remote link, it appears to the sending station as an application timeout because error messages are not routed back. When an error occurs during routing, it may be dropped.

For example, if an SLC 5/03 controller sends a message to another SLC 5/03 controller, and the second SLC 5/03 controller's buffers are full, three things happen:

- The SLC 5/03 controller refuses the message because the buffers are full.

- The originator detects an application timeout when no reply is received.

- The originator increments its error count.

The SLC 5/03 controller can retry to send the message later. This figure shows an example of an application timeout.

Example of an Application Timeout
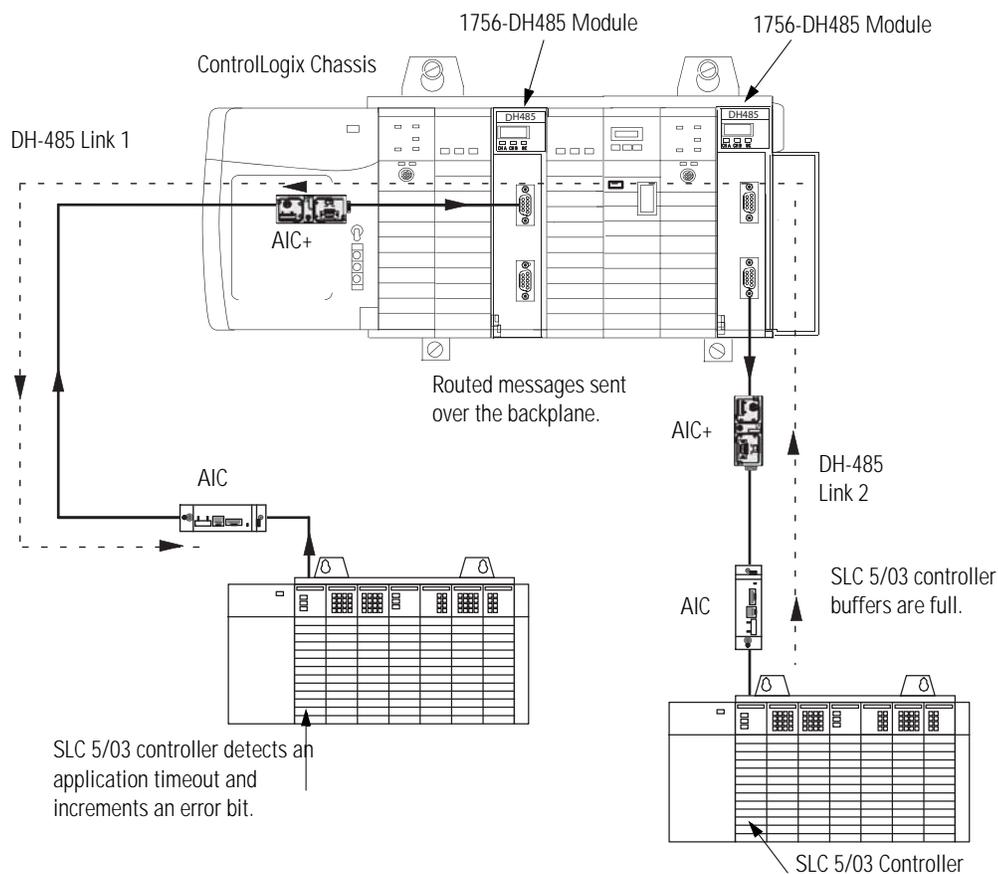
Example DH-485 Network Routing Configuration

The Example of DH-485 Routing Configuration figure below shows an example DH-485 routing configuration. All node numbers on DH-485 are given in decimal. Node numbers on ControlNet and slot numbers in ControlLogix chassis are given in decimal. Links IDs for all networks are given in decimal.

IMPORTANT	Some devices in this figure have the same node number because they are on different networks. Devices on the same network must have unique node numbers. You must assign the node numbers.

Example of DH-485 Routing Configuration
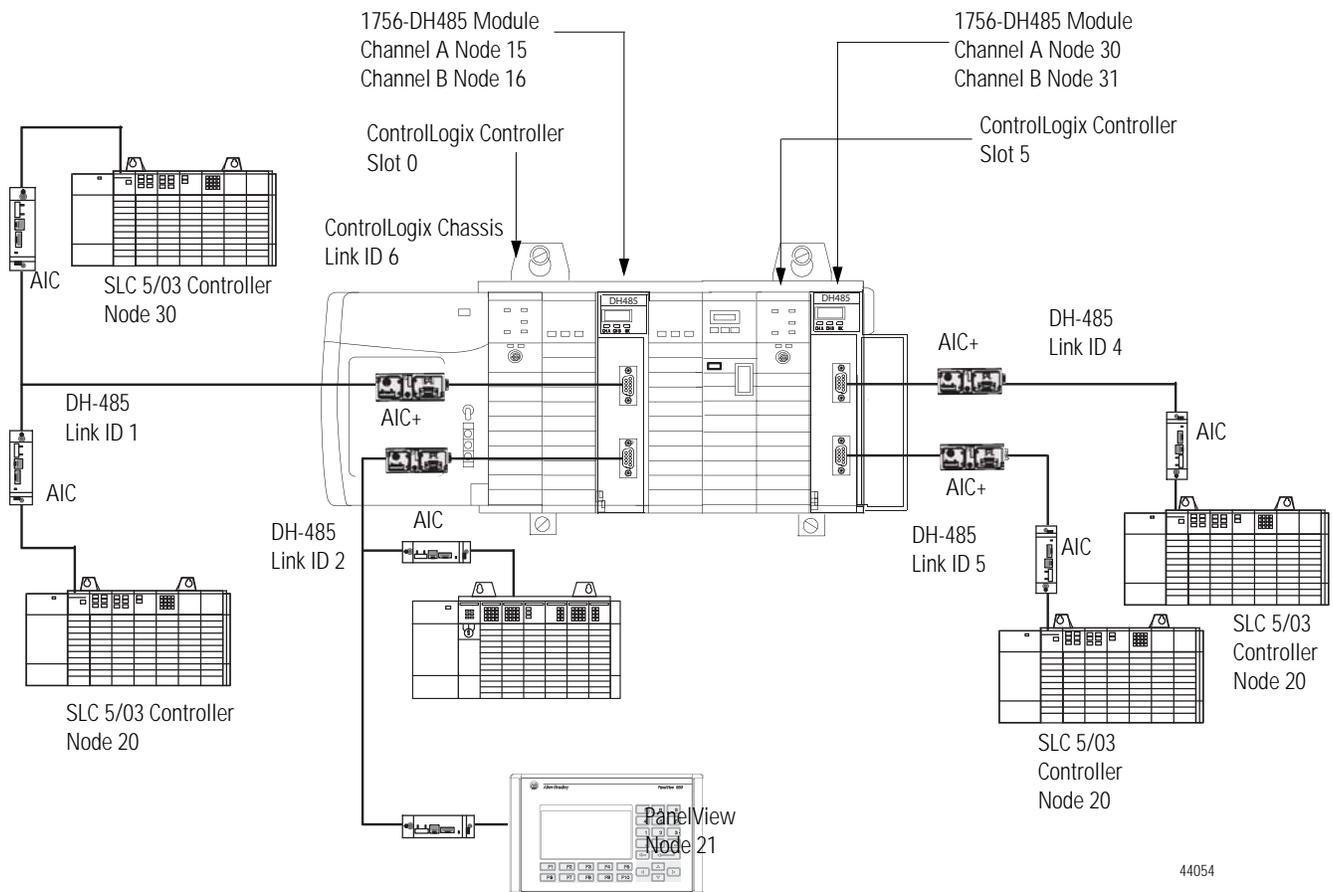
Use the Common Industrial Protocol (CIP) Messaging

Common Industrial Protocol (CIP) is the communication mechanism on ControlLogix chassis, ControlNet, and EtherNet/IP networks with the Encapsulation Protocol (EPIC) protocol.

Like DH-485 messaging, CIP supports communication between devices on the same link and physically separate links. However, CIP messaging uses a different method to route messages than DH-485 messaging.

CIP uses a relative path concept for routing messaging. Because the message itself, or the connection the message is sent on, contains all the information required to route the message, CIP messages do not require any routing table or link IDs.

Devices such as ControlLogix devices, devices that use the ControlNet network, and devices that use CIP protocol support this new type of communication.

IMPORTANT   Your 1756-DH485 module supports bridging CIP messaging over a DH-485 link. However, your 1756-DH485 module does not support bridging CIP I/O data from a ControlLogix controller to an 1756-I/O module.

Use RSLinx Software to Create a Routing Table

Introduction

This chapter describes how to configure your 1756-DH485 module in DH-485 applications. For more information on the configuration software, refer to the online help in each.

For	See
Choose the Correct Software	4-1
Use RSLinx Software to Create a Routing Table	4-2
Create the Routing Table	4-3

Choose the Correct Software

The programming software you need is dependent on what products you are using with the 1756-DH485 module. The table below explains what software is needed for your application.

Software Needed for 1756-DH485 Applications

If you are using this product with the 1756-DH485 module to read/write data in a DH-485 application	You must use this software
SLC Controllers	RSLinx, version 2.43 or later RSLogix 500, version 6.3 or later
ControlLogix Controllers	RSLinx, version 2.43 or later RSLogix 5000

Use RSLinx Software to Create a Routing Table

DH-485 protocols do not use the Common Industrial Protocol (CIP), the communication protocol used in the ControlLogix architecture. The 1756-DH485 module is the transition point from the DH-485 network to ControlLogix. In this capacity, the 1756-DH485 module serves as the DH-485 message source and requires a full message route, or path, to deliver the message. A routing table, using link IDs and node addresses, provides the full path.

What Is a Routing Table?

Before you can create a routing table for your 1756-DH485 module, you must assign link IDs to all networks (including ENET and CNET) that route information through the module. Link IDs are numbers from 1 to 199.

DH-485 module addressing provides the link IDs and node addresses. The routing table translates link IDs and node address information into path, or routing, information. Thus, the routing table specifies a 'map' to other links in the system. Routing tables are set up at each node to build accurate connections.

ControlLogix Routing

The ControlLogix routing protocols use CIP, a message-based protocol that implements a relative path to send a message from the source device in a system to the destination device. In this way, the source device in a networks system contains the path information that steers the message along the proper route to reach its destination. Since the source device holds this information, other devices along the path simply pass this information; they do not need to store it. ControlLogix routing has two significant benefits:

- You do not need to configure routing tables in the bridging module, greatly simplifying maintenance and module replacement.

- You maintain full control over the route taken by each message, enabling you to select alternative paths for the same end device.

Create the Routing Table

To create a routing table for your application, follow these steps:

1. Start RSLinx.

2. Browse the network.

3. Right-click on the 1756-DH485 module.

4. Use the left-side navigation bar to see your DH-485 application, as shown in the example below.

A. Expand the configuration tree until the module appears.

B. Right-click on the 1756-DH485 module.

C. Select Module Configuration.
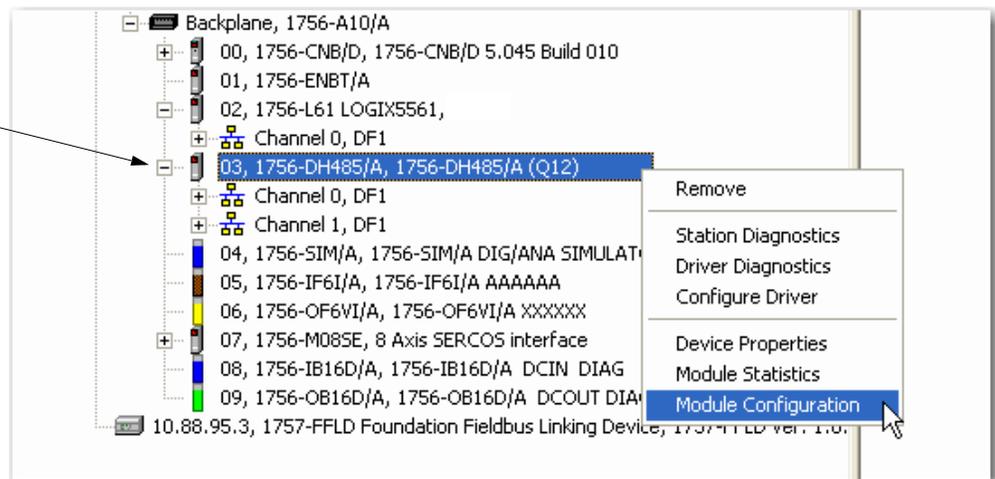
5. Select the DH-485 Routing Table tab.
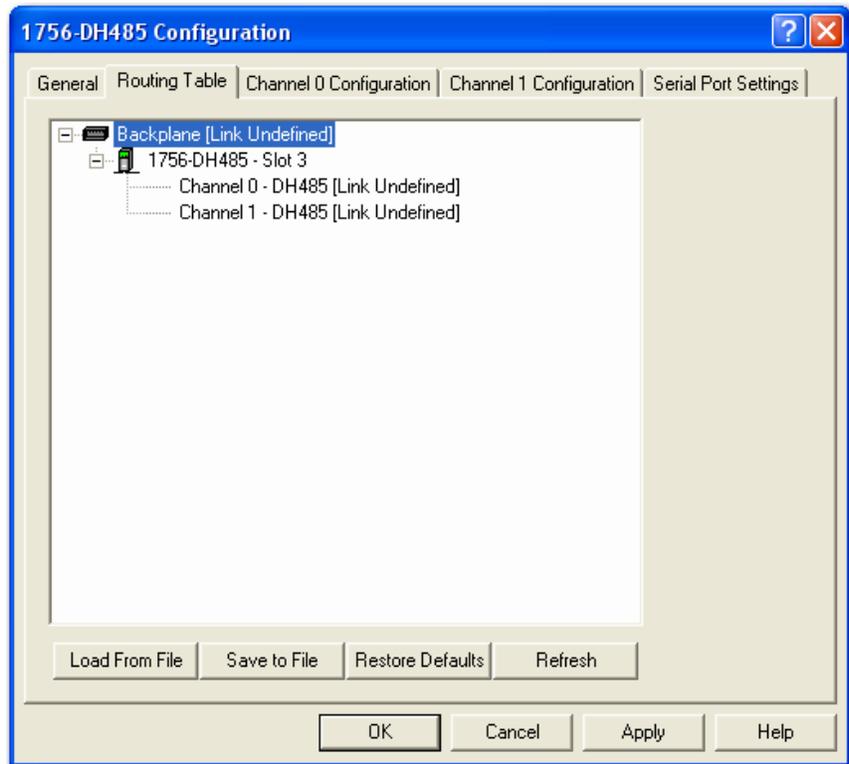
You must build the routing table based on the 1756-DH485 modules in the ControlLogix chassis. Each link ID (for example: chassis backplane, channels A and B of any 1756-DH485 module in the chassis) is initially undefined.

6. You must assign link IDs, as shown below.

A. Right-click on the
1756-DH485 module.

B. Click Edit Module.

C. Assign Link IDs and click OK.
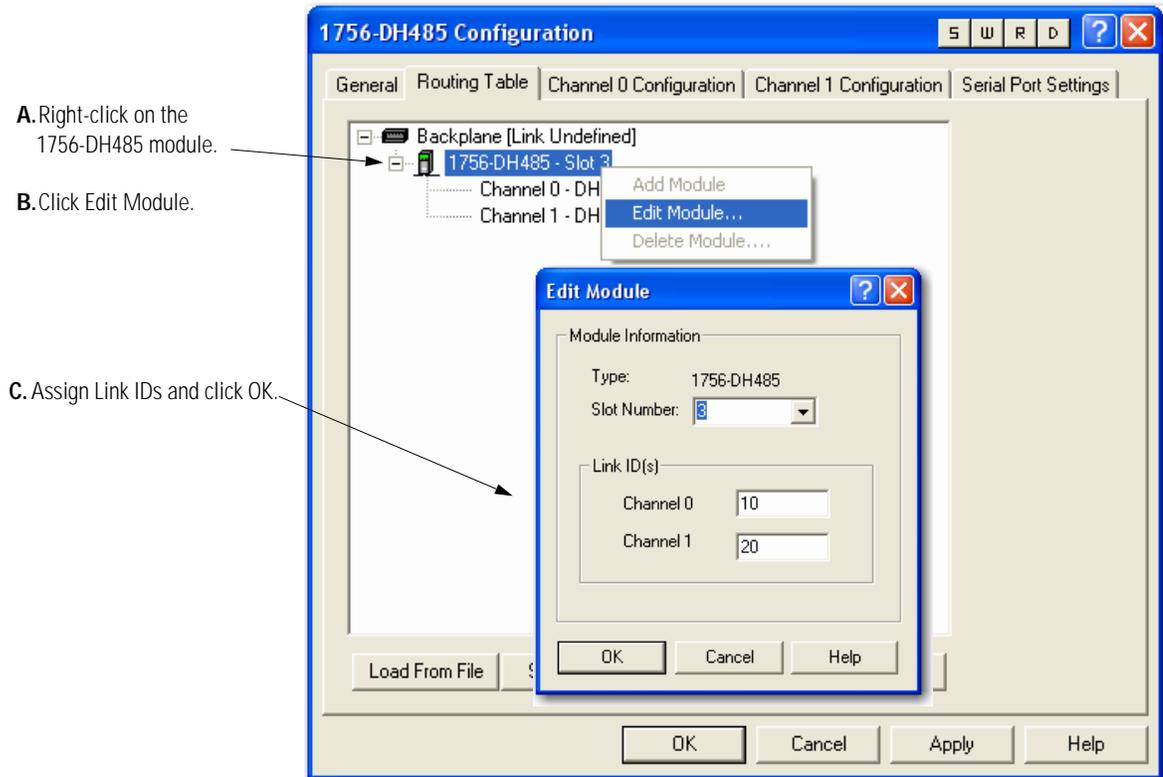
IMPORTANT	Keep track of your Link ID assignments. You need the Link ID values when you send messages via RSLogix 500 and RSLogix 5000 software.

The 1756-DH485 routing table displays with the link IDs defined.
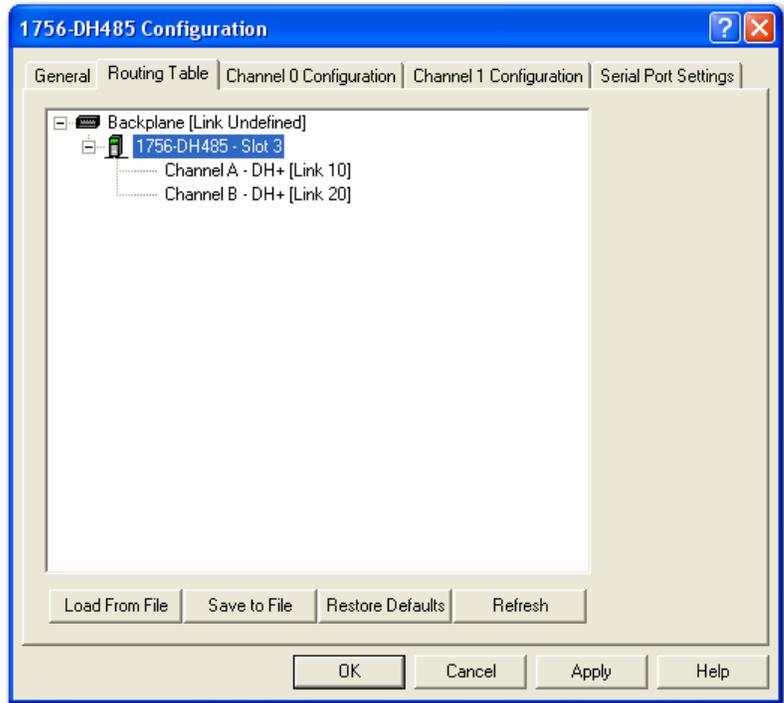
7. Assign a Link ID for the chassis backplane.

A. Right-click on the Backplane.

B. Click Edit Module.

C. Assign Link IDs and click OK.
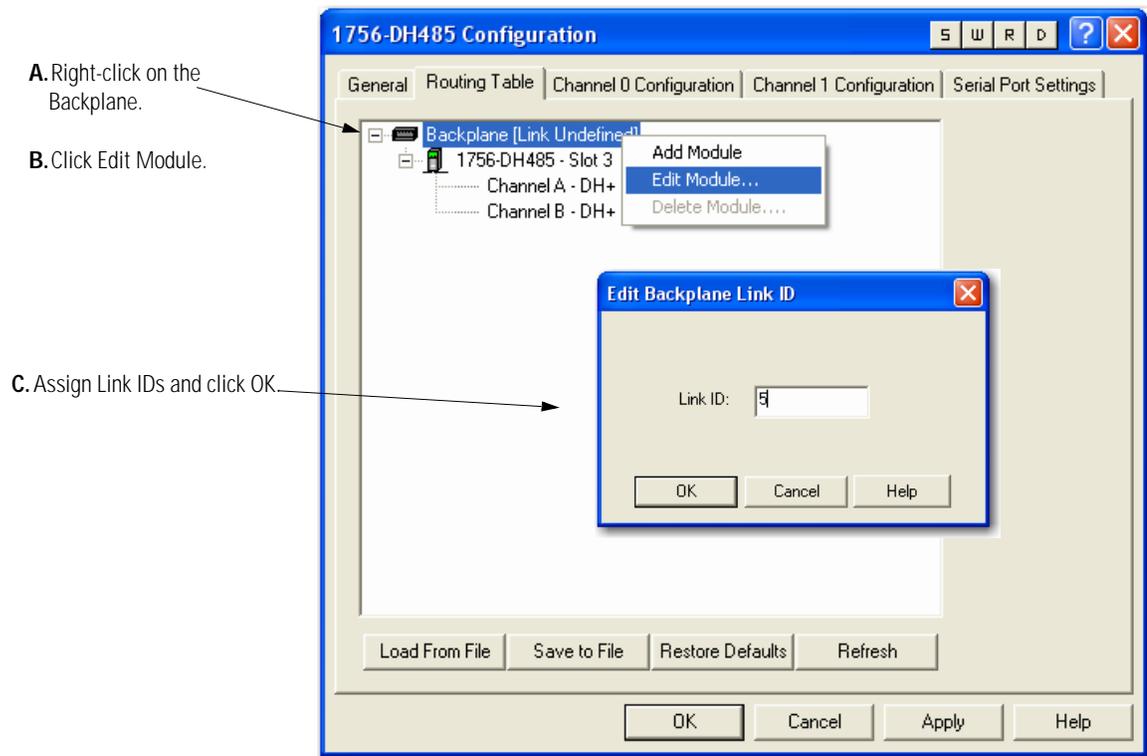
8. Click OK

The software prompts you to download routing table changes.

9. Click Yes.

This completes the routing table creation process.

Set the Controller Slot

Setting the controller slot location creates a simple way for the SLC controllers to exchange data with the ControlLogix controller as long as the SLC controller is on the same DH-485 network as the module. The SLC controller can use local messaging to send data to a ControlLogix controller with this feature. No routing table is required.

| IMPORTANT | This is not the slot location of the 1756-DH485 module, it is the slot location of the ControlLogix controller where you want to send the local message. |

The controller slot is the physical location of a ControlLogix controller in a DH-485 application. The default setting is slot 0. If necessary, use the Channel Configuration tabs to change the controller slot number.

A. Change the controller slot, if needed.

B. Click OK.
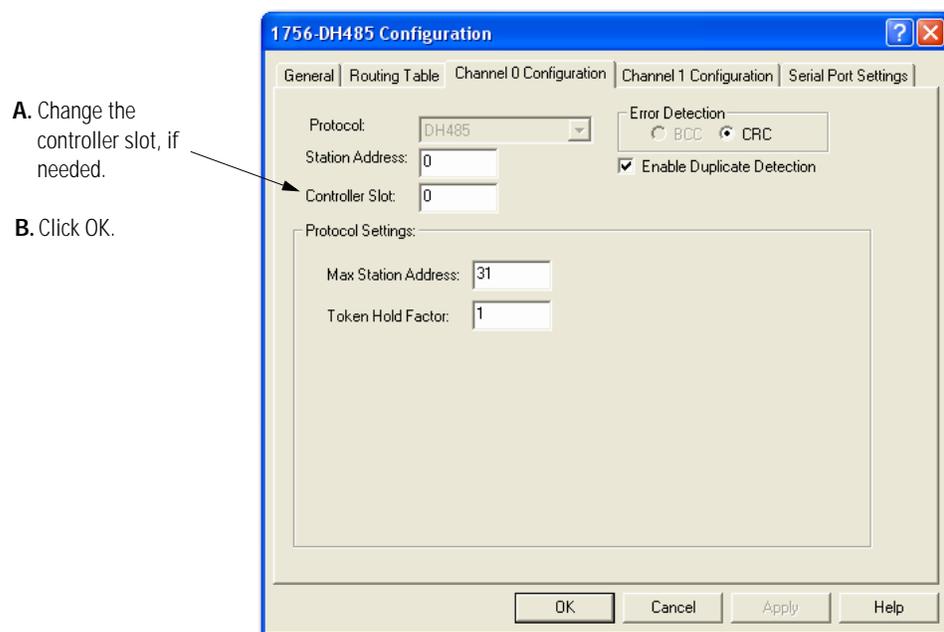
For more information about using the DH-485 network, refer to Chapter 3, Use Data Highway 485 Network.

Communicate from an SLC 5/03 Controller to a Logix Controller over a DH-485 Network

Introduction

This chapter describes how to set up the communications initiated by an SLC 5/03 controller through a 1756-DH485 module to a 1756-Lx controller.

For	See
Hardware Configuration	5-2
Use the Controller Slot to Route the Local Message	5-3
Create a Local Message in RSLogix 500	5-4
Configure the Message	5-5
Create a Logic Map for the Local Message in RSLogix 5000 Software	5-6

IMPORTANT   The examples use SLC 5/03 modules to send DH-485 messages. In each case, the use of these devices is strictly for example purposes and not an indication of restrictions on the 1756-DH485 module.

Hardware Configuration

In this hardware configuration, the communications are initiated by an SLC 5/03 controller. The message is sent to a 1756-DH485 module and the 1756-Lx controller is located in slot 11.

Communications Between an SLC 5/03 Controller and a 1756-DH485 Module
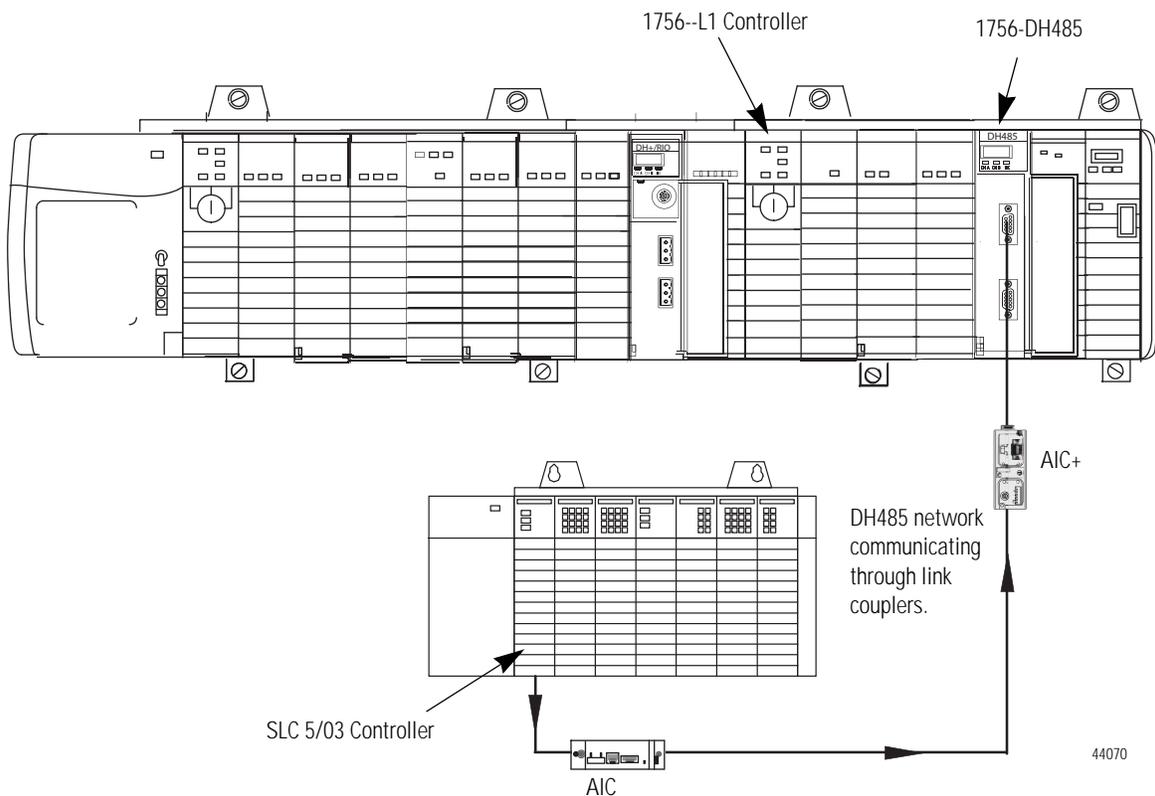
Use the Controller Slot to Route the Local Message

When a local DH485 message is received, the message will automatically be routed to the controller based on the configured slot number. In this case, the 1756-Lx controller is in slot 11. A routing table is not needed.

Enter the slot number of the controller.

Create a Local Message in RSLogix 500

This is an example of a local message being initiated by the SLC 5/03 controller.

Configure the Message

This is the Setup dialog for the example message.

Create a Logic Map for the Local Message in RSLogix 5000 Software

You must logically map the SLC data address to the ControlLogix tag. To get to the Logix Map in RSLogix 5000 software go to: Logic > Map PLC/SLC Messages.

This is the logic map needed for the example message.
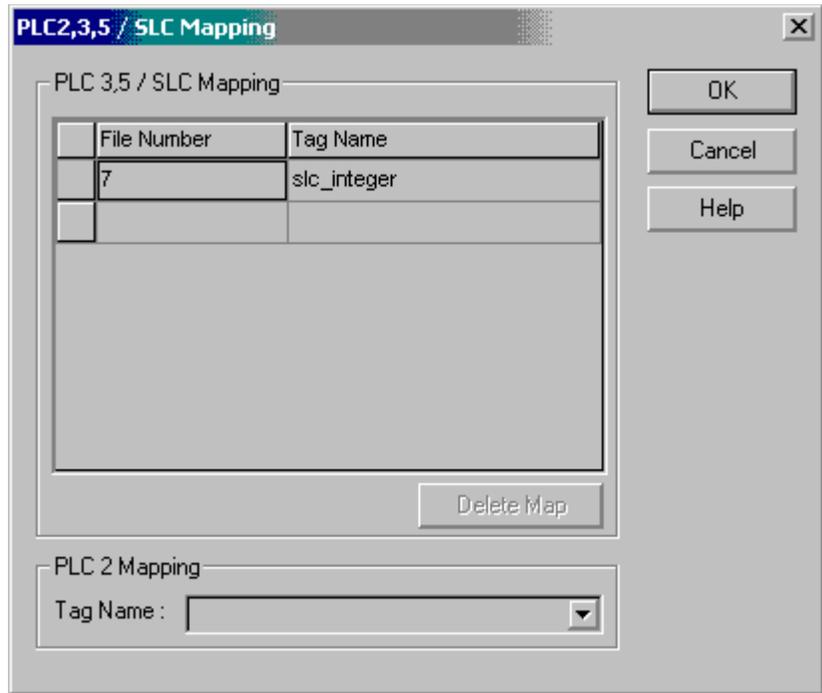
Communicate Between SLC Controllers over DH+ and DH485 Networks

Introduction

This chapter describes how to set up the message communications between two SLC controllers.

For	See
SLC 5/04 Controller Sends a Remote Message	6-2
Hardware Configuration	6-2
Create the Routing Table in RSLinx Software	6-3
Create a Message in RSLogix 500	6-6
Configure the Message	6-7
SLC 5/03 Controller Sends a Remote Message	6-8
Hardware Configuration	6-8
Create the Routing Table in RSLinx Software	6-9
Create a Remote Message in RSLogix 500	6-10
Configure the Message	6-11

IMPORTANT The examples use SLC 5/03 and SLC 5/04 controllers to send DH-485 messages. In each case, the use of these devices is strictly for example purposes and not an indication of restrictions on the 1756-DH485 module.

SLC 5/04 Controller Sends a Remote Message

In this example an SLC 5/04 controller initiates a remote message and sends it to an SLC 5/03 Controller.

Hardware Configuration

In this hardware configuration, an SLC 5/04 controller sends a remote message to an SLC 5/03 controller.

- The SLC 5/04 controller is on a DH+ network **(1)**.

- The SLC 5/04 controller connects to Channel B on the 1756-DHRIO module **(2)**.

- The SLC 5/03 controller connects to Channel A of the 1756-DH485 module in the same rack as the 1756-DHRIO module **(3)**.

- The SLC 5/04 controller sends a remote message to the SLC 5/03 controller on a DH485 network **(4)**.
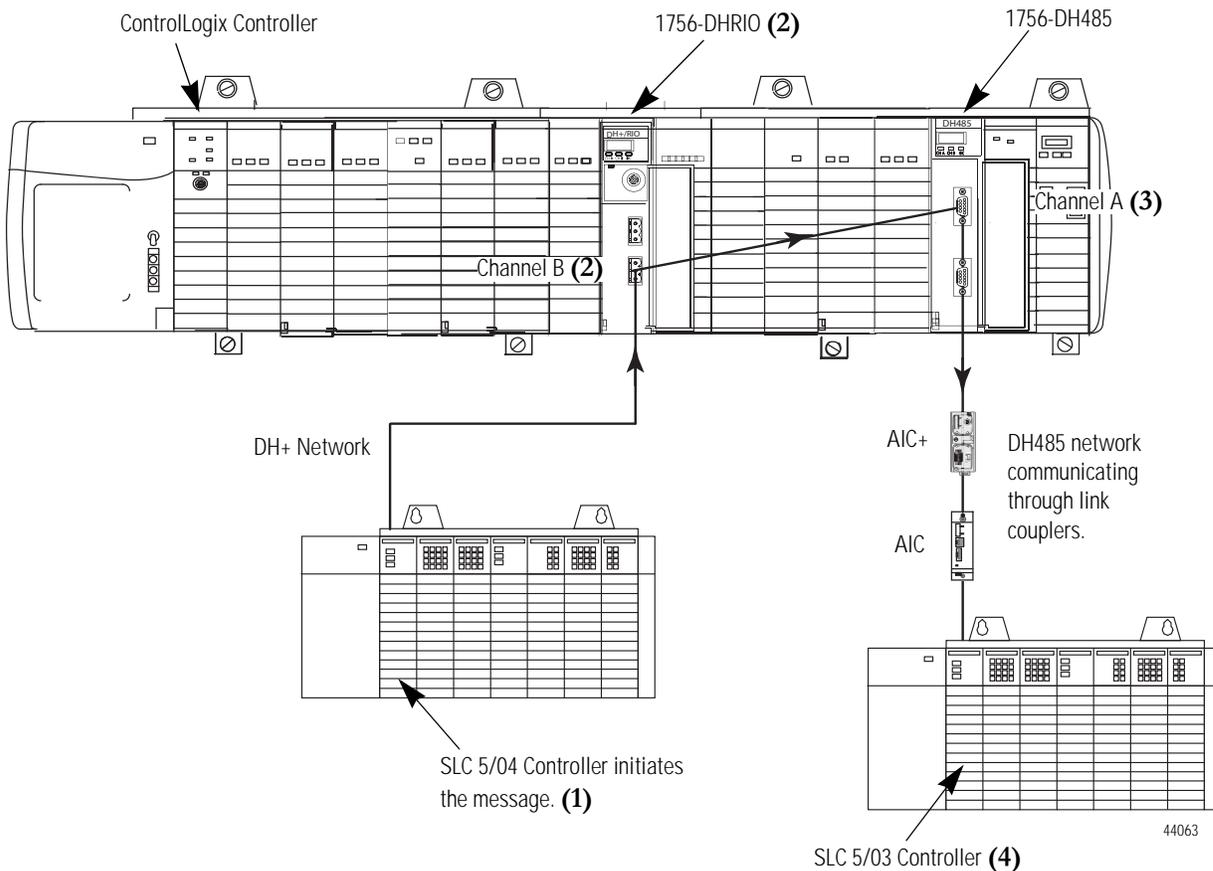
ControlLogix Controller

1756-DHRIO **(2)**

1756-DH485

Channel A **(3)**

Channel B **(2)**

DH+ Network

AIC+

DH485 network communicating through link couplers.

AIC

SLC 5/04 Controller initiates the message. **(1)**

44063

SLC 5/03 Controller **(4)**

Create the Routing Table in RSLinx Software

These are the routing tables needed for the example configuration.

This is the routing table for the 1756-DH485 module.

In this example, the:

- SLC 5/04 controller is on the DH+ network.

- SLC 5/04 controller is node 10 octal.

- SLC 5/04 controller connects to a 1756-DHRIO module at node 56 octal or 46 decimal.

- connection is on Channel B of the 1756-DHRIO.

- SLC 5/04 controller sends a remote message to the SLC 5/03 controller that is on a DH485 network. The SLC 5/03 controller is located at node 1.

- SLC 5/03 controller is connected to Channel A of the 1756-DH85 module.

- 1756-DHRIO module is in slot 8 of the 1756 rack and is in the same rack is a 1756-DH485 module. The 1756-DH485 module is in slot 14.

1756-DH485 Configuration   ? X

General | Routing Table | Channel 0 Configuration | Channel 1 Configuration | Serial Port Settings |

```
Backplane [Link 5]
  1756-DH485 - Slot 14
      Channel 0 - DH485 [Link 1]
      Channel 1 - DH485 [Link Undefined]
  1756-DHRIO - Slot 8
      Channel A - DH+ [Link 2]
          DH+ Bridge - Node 46
              Bridge [Link 12]
      Channel B - DH+ [Link 20]
```

Load From File | Save to File | Restore Defaults | Refresh

OK | Cancel | Apply | Help

1756-DHRIO Configuration   ? X

General | Routing Table | Channel Configuration |

```
Backplane [Link 5]
  1756-DHRIO - Slot 8
      Channel A - DH+ [Link 2]
          DH+ Bridge - Node 46
              Bridge [Link 12]
      Channel B - DH+ [Link 20]
  1756-DH485 - Slot 14
      Channel 0 - DH485 [Link 1]
      Channel 1 - DH485 [Link Undefined]
```

This is the routing table for the 1756-DHRIO module.

Load From File | Save to File | Restore Defaults | Refresh

OK | Cancel | Apply | Help

Configure the SLC 5/03 Controller Channel 1 Link ID

The SLC 5/03 remote link ID needs to be programmed to match the link IDs configured into the 1756-DH485 module. These are labeled in the channel configuration as the Channel 1 Passthru Link ID.
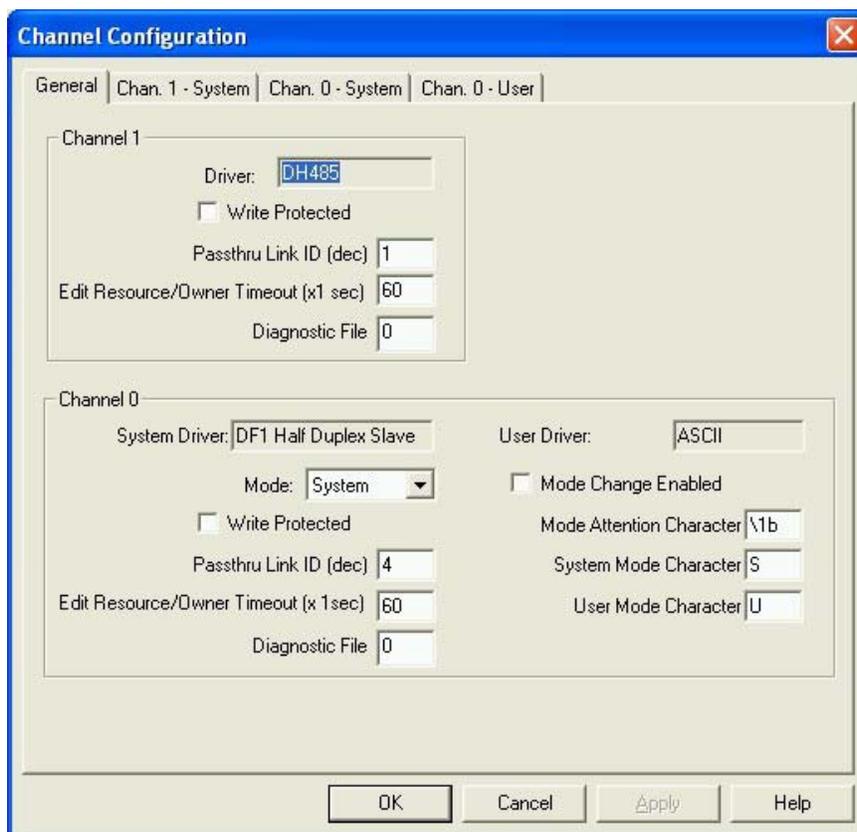
Configure the SLC 5/04 Channel 1 Link ID

The SLC 5/04 controller remote link ID needs to be programmed to match the link IDs configured into the 1756-DH485 module. These are labeled in the channel configuration as the Channel 1 Passthru Link ID.

Create a Message in RSLogix 500

This is the message for the example configuration.

Configure the Message

This is the Setup dialog for the example message.

The SLC 5/04 controller connects to a 1756-DHRIO module at node 56 octal or 46 decimal.

The SLC 5/04 controller sends a remote message to the SLC 5/03 controller that is on a DH485 network.

The SLC 5/03 controller is located at node 1. The DH485 network is assigned as link 1.

MSG - N7:0 : (14 Elements)

General

This Controller
Communication Command: 500CPU Read
Data Table Address: N16:0
Size in Elements: 1
Channel: 1

Target Device
Message Timeout : 5
Data Table Address: N7:0
Local Bridge Addr (dec): 46   (octal): 56
Local / Remote : Remote
Remote Bridge Addr (dec): 0
Remote Station Address (dec): 1
Remote Bridge Link ID: 1

Control Bits
Ignore if timed out (TO): 0
To be retried (NR): 0
Awaiting Execution (EW): 0
Continuous Run (CO): 0
Error (ER): 0
Message done (DN): 1
Message Transmitting (ST): 0
Message Enabled (EN): 1
Waiting for Queue Space : 0

Error
Error Code(Hex): 0

Error Description
No errors

SLC 5/03 Controller Sends a Remote Message

In this example an SLC 5/03 controller initiates a remote message and sends it to an SLC 5/04 controller.

Hardware Configuration

In this hardware configuration, an SLC 5/03 controller initiates a message to an SLC 5/04 controller on a DH-485 network. **(1)**

- This SLC 5/03 controller connects to Channel A on the 1756-DH485 module. **(2)**

- The SLC 5/04 controller is connected to Channel B of the 1756-DHRIO module in the same rack as the 1756-DH485 module. **(3)**

- The SLC 5/04 controller receives a remote message from the SLC 5/03 controller through the 1756-DHRIO on the DH+ network. **(4)**

Communication Between Two SLC Controllers Over DH-485 and DH+ Networks
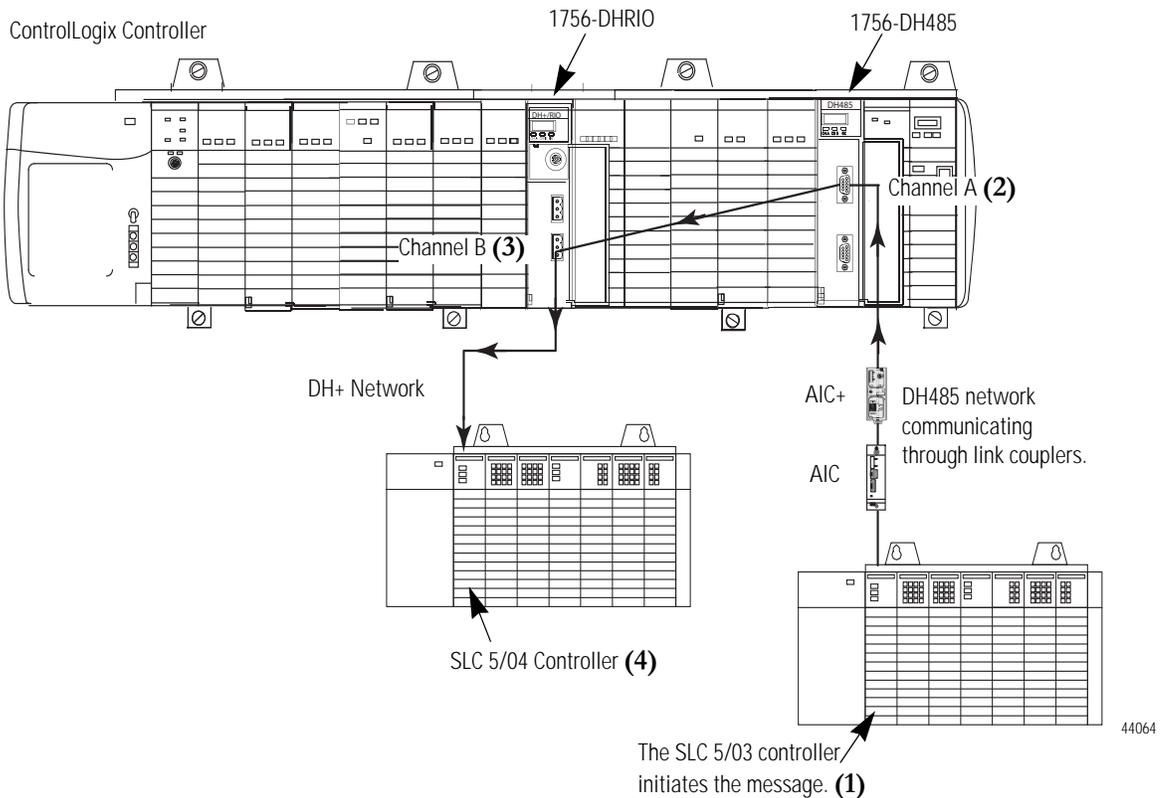
Create the Routing Table in RSLinx Software

These are the routing tables needed for the example configuration.

In this example, the:

- SLC 5/03 controller is connected to Channel A of the 1756-DH485 module. The 1756-DH485 node address on the DH-485 network is node 0.

- 1756-DHRIO and the 1756-DH485 modules are on the same backplane.

- 1756-DH485 module is in slot 14.

- 1756-DHRIO module is in slot 8.

- Link ID of Channel B of the 1756-DHRIO is Link 20.

- SLC 5/04 controller is connected to Channel B of the 1756-DHRIO.

- node address of the SLC 5/04 controller on DH+ is 10 octal or 8 decimal.

- SLC 5/03 controller initiates a remote message to the SLC 5/04 controller.
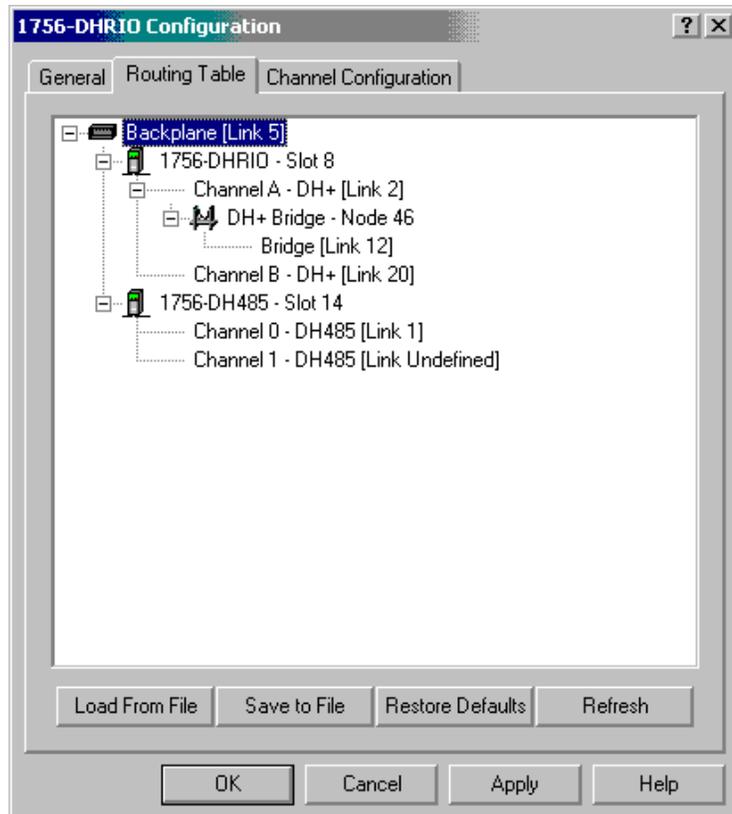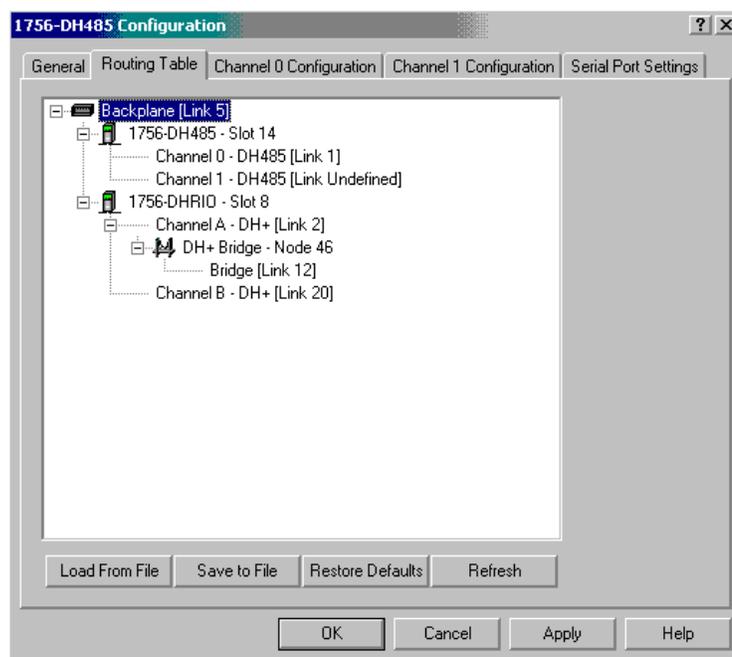
Create a Remote Message in RSLogix 500

This is the example message for the hardware configuration.

Click on Setup Screen to configure the message.
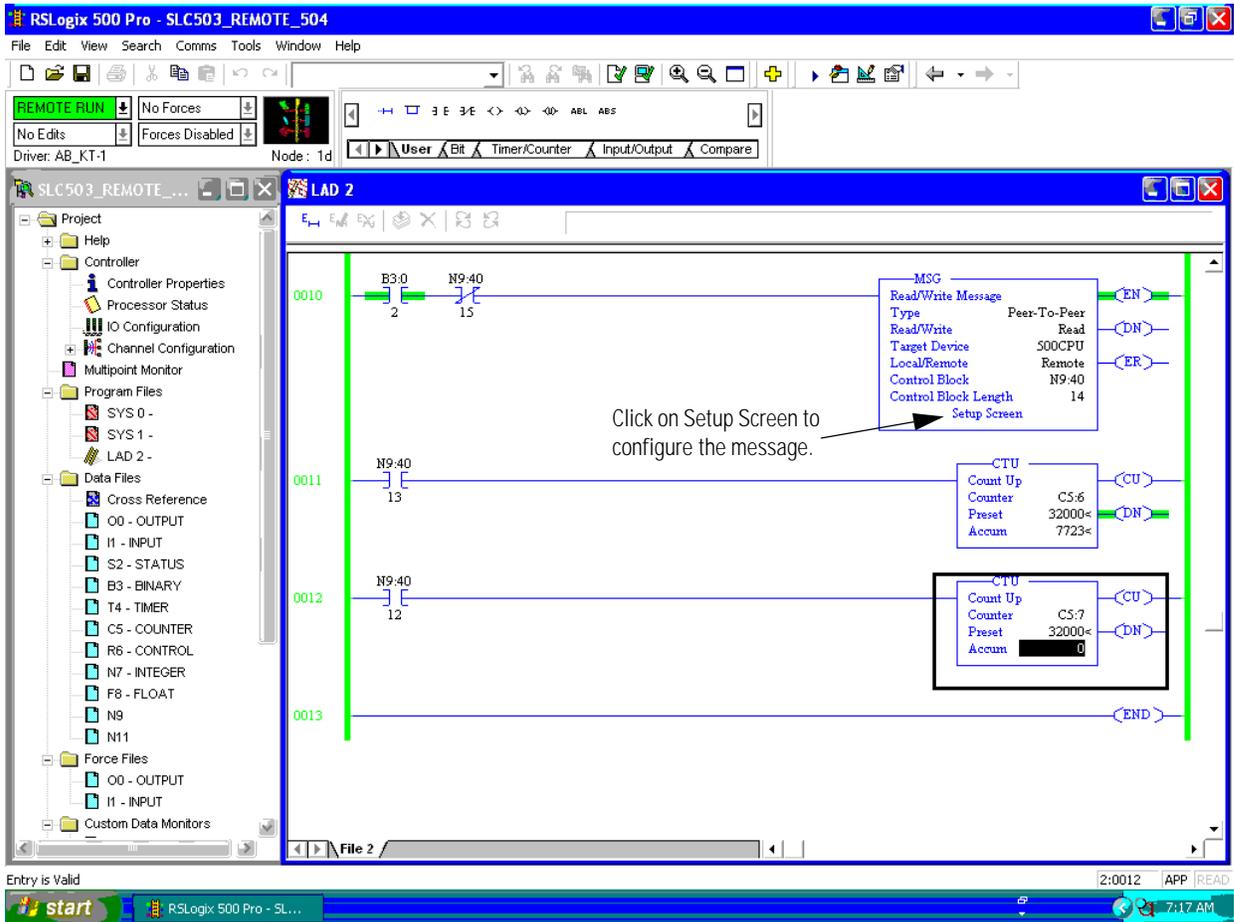
Configure the Message

This is the Setup Screen for the example message.

In this example, the SLC 5/03 controller is connected to Channel A of the 1756-DH485 module. The 1756-DH485 node address on the DH-485 network is node 0.

```
MSG - N9:40 : (14 Elements)

General

This Controller
    Communication Command:  500CPU Read
         Data Table Address:  N7:22
            Size in Elements:  1
                   Channel:  1

Target Device
         Message Timeout :  5
         Data Table Address:  N9:0
      Local Bridge Addr (dec):  0        (octal):  0
            Local / Remote :  Remote
      Remote Bridge Addr (dec):  0
   Remote Station Address (dec):  8
        Remote Bridge Link ID:  20

Control Bits
            Ignore if timed out (TO):  0
               To be retried (NR):  0
          Awaiting Execution (EW):  1
              Continuous Run (CO):  0
                      Error (ER):  0
              Message done (DN):  0
         Message Transmitting (ST):  0
            Message Enabled (EN):  1
          Waiting for Queue Space :  0

Error
    Error Code(Hex):  0

Error Description
    No errors
```

Notes:

Communicate Between a PLC-5 Controller and a Remote SLC 5/03 Controller over Multiple DH-485 Networks

Introduction

This chapter describes how to set up the communications for a remote PLC-5 controller to send a message to a remote SLC 5/03 controller over multiple DH-485 Networks.

For	See
Hardware Configuration	7-4
Create a Message in RSLogix 5	7-4
Configure the Message	7-5
Create the Routing Table	7-3

IMPORTANT The examples use SLC 5/03 modules to send DH-485 messages. In each case, the use of these devices is strictly for example purposes and not an indication of restrictions on the 1756-DH485 module.

Hardware Configuration

In this hardware configuration, a remote PLC-5 controller sends a message to an SLC 5/03 controller.

Communications Between a PLC-5 and a Remote SLC 5/03 Controller on a DH-485 Network

ControlLogix Controller

1756-DHRIO

1756-DH485

DH485

Channel A **(2), (3)**

Channel A **(4)**

DH+ Network

The 1756-DHRIO and the 1756-DH485 are on the same backplane.

AIC+

DH485 network communicates through link couplers.

AIC

PLC-5 controller sends a message to an SLC 5/03 controller. **(1)**

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SLC 5/03 Controller **(5)**
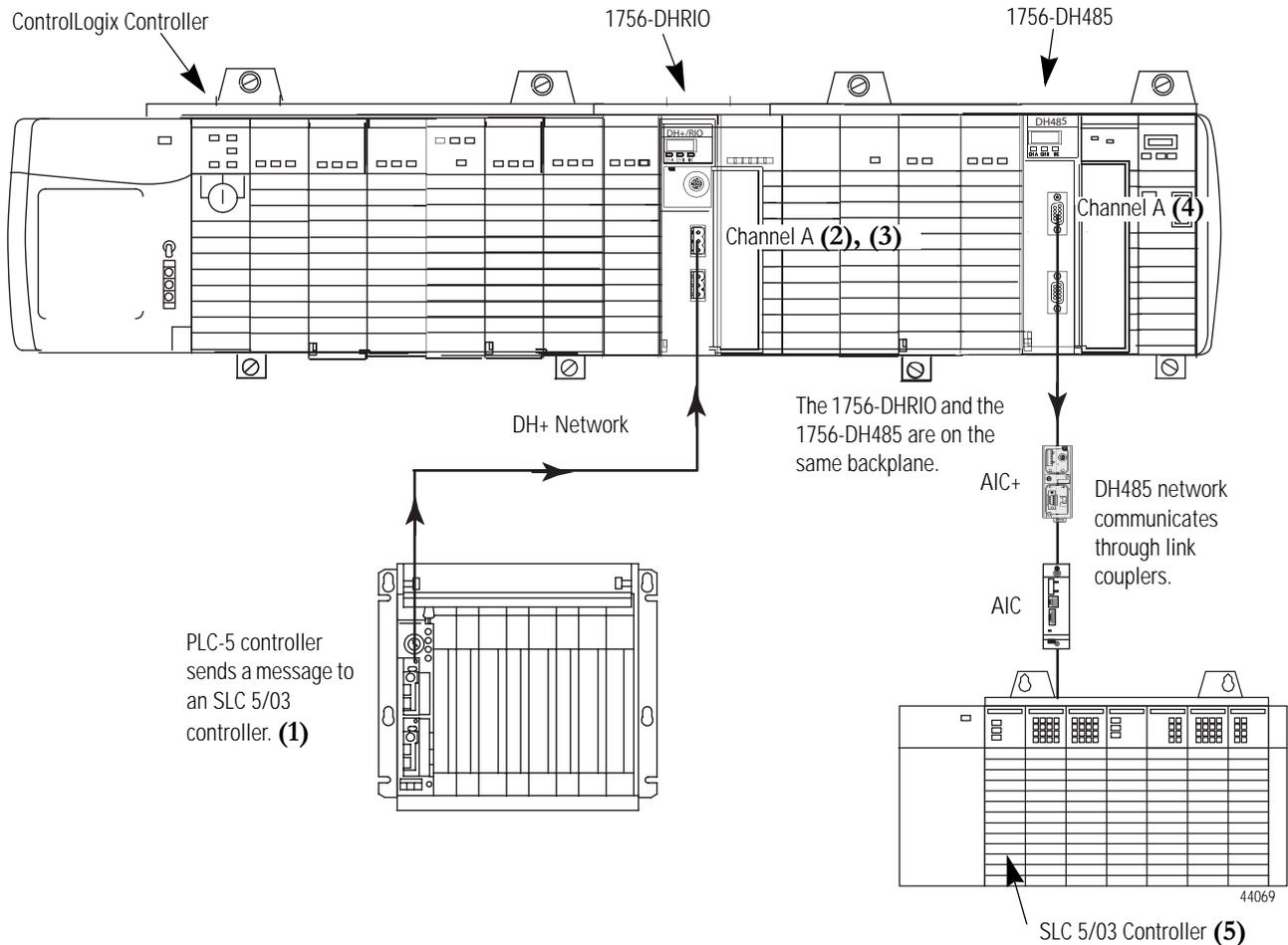
The PLC-5 controller sends a message to an SLC 5/03 controller located on a DH-485 network.

- The PLC-5 controller is located on a DH+ network. **(1)**

- The PLC-5 controller is connected to channel A on a 1756-DHRIO module located at node 12. **(2)**

- The 1756-DHRIO is on the same backplane as the 1756-DH485 module and is located in slot 8 of the chassis. **(3)**

- The 1756-DH485 module is located in slot 14 of the chassis. **(4)**

- The 1756-DH485 module uses channel A to connect to the SLC/03 controller located at node 1 over the DH-485 network. **(5)**

Create the Routing Table

These are the routing tables for the message in the example configuration.

This is the routing table for the 1756-DH485 module.
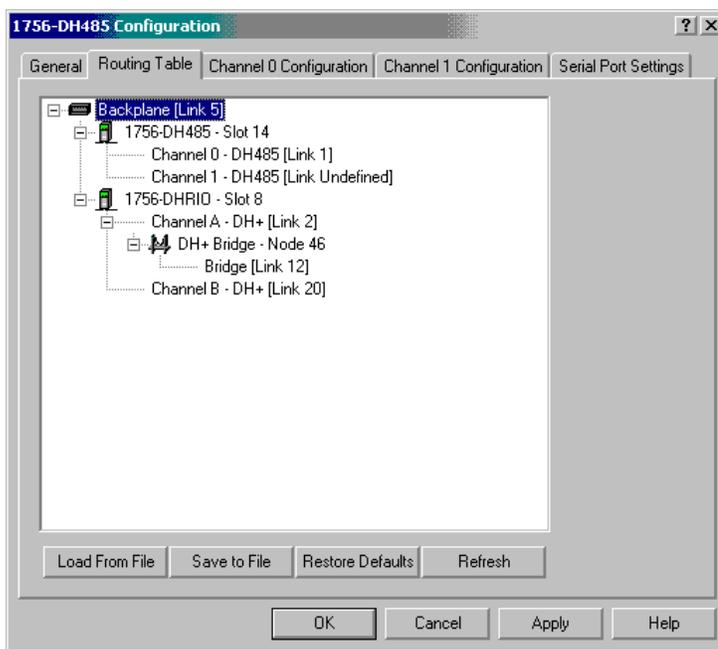
This is the routing table for the 1756-DHIRO module.
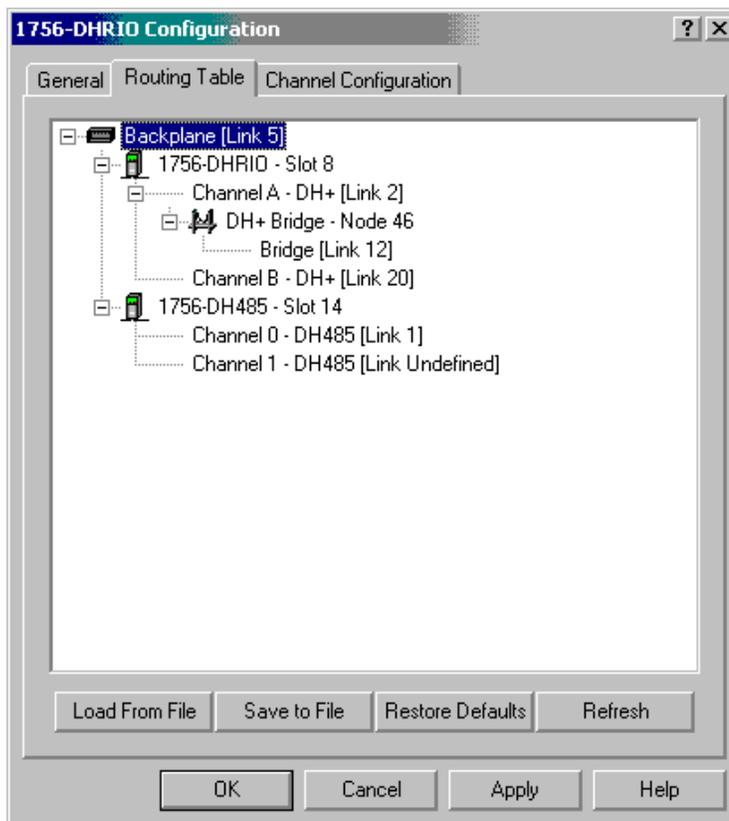
Configure the PLC-5 DH+ Channel 1A Link ID

The PLC-5 DH+ Channel 1A Link ID needs to be configured. This is an example of the channel properties.
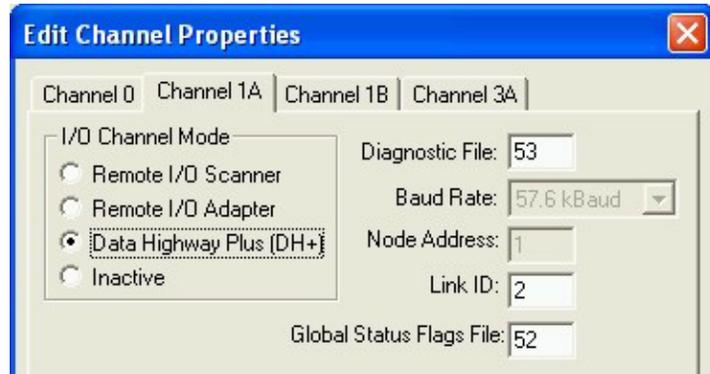
Create a Message in RSLogix 5

This is an example of a remote message for the example configuration.
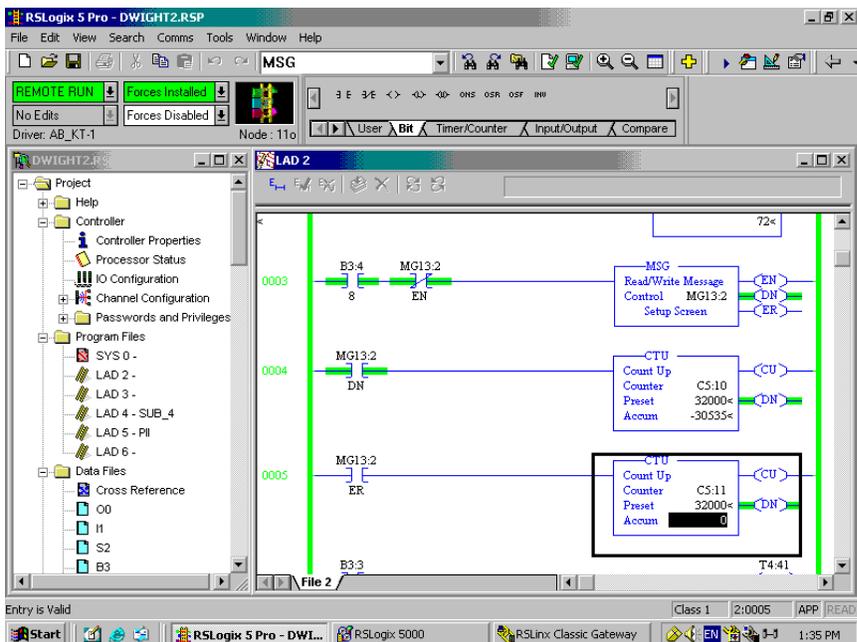
Configure the Message

This is the Setup dialog for the message in the example configuration.

```
┌─ MSG - MG13:2 : (1 Elements)                                    _ □ ×
│ ┌─────────┐
│ │ General │
│ └─────────┘
│  ┌─ This PLC-5 ──────────────────────────┐  ┌─ Control Bits ──────────────────┐
│  │  Communication Command : │PLC-5 Typed Read│ │        Ignore if timed out (TO): │0│ │
│  │      Data Table Address : │N62:0│          │         To be retried (NR): │0│    │
│  │        Size in Elements : │10│              │   Awaiting Execution (EW): │0│     │
│  │           Port Number: │1A│                 │      Continuous Run (CO): │0│      │
│  │                                             │                Error (ER): │0│     │
│  ┌─ Target Device ───────────────────────┐  │          Message done (DN): │0│    │
│  │      Data Table Address: │N11:0│           │  Message Transmitting (ST): │1│    │
│  │  Local DH+ Node (Octal): │12│              │    Message Enabled (EN): │1│       │
│  │         Local / Remote : │Remote│         └──────────────────────────────────┘
│  │      Remote Link Type: │Data Highway│
│  │   Remote Station Address: │1│             ┌─ Error ──────────────────────────┐
│  │     Remote Bridge Link ID: │1│            │                                  │
│  │                                           │   Error Code(Hex):  0            │
│  └───────────────────────────────────────┘  └──────────────────────────────────┘
│  ┌─ Error Description ───────────────────────────────────────────┐
│  │   No errors                                                    │
│  └────────────────────────────────────────────────────────────────┘
```

Notes:

Communicate from an SLC 5/05 Controller to an SLC 5/03 Controller over an EtherNet/IP Network

Introduction

This chapter describes the communications from an SLC 5/05 controller to an SLC 5/03 controller over an EtherNet/IP network.

For	See
Hardware Configuration	8-2
Create a Message in RSLogix 500	8-3
Configure the Message	8-4
Review the Multihop Feature in RSLogix 500	8-5

IMPORTANT	The examples use SLC 5/05 controllers to send DH-485 messages. In each case, the use of these devices is strictly for example purposes and not an indication of restrictions on the 1756-DH485 module.

Hardware Configuration

In this hardware configuration, an SLC 5/05 controller communicates to an SLC 5/03 controller over an EtherNet/IP network.

- The SLC 5/05 controller initiates a message. **(1)**

- The message is sent over an EtherNet/IP network to a 1756-ENBT module. **(2)**

- The message is then sent over the backplane to a 1756-DH485 module. **(3)**

- The 1756-DH485 module then sends the message through channel A and link couplers to the SLC 5/03 controller. **(4)**

ControlLogix Controller

1756-ENBT **(3)**

1756-DH485 **(3)**

Channel A **(4)**

EtherNet/IP Network **(2)**

AIC+   1756-DH485 communicates through link couplers. **(4)**

AIC

SLC 5/05 controller initiates the message. **(1)**

SLC 5/03 Controller **(4)**
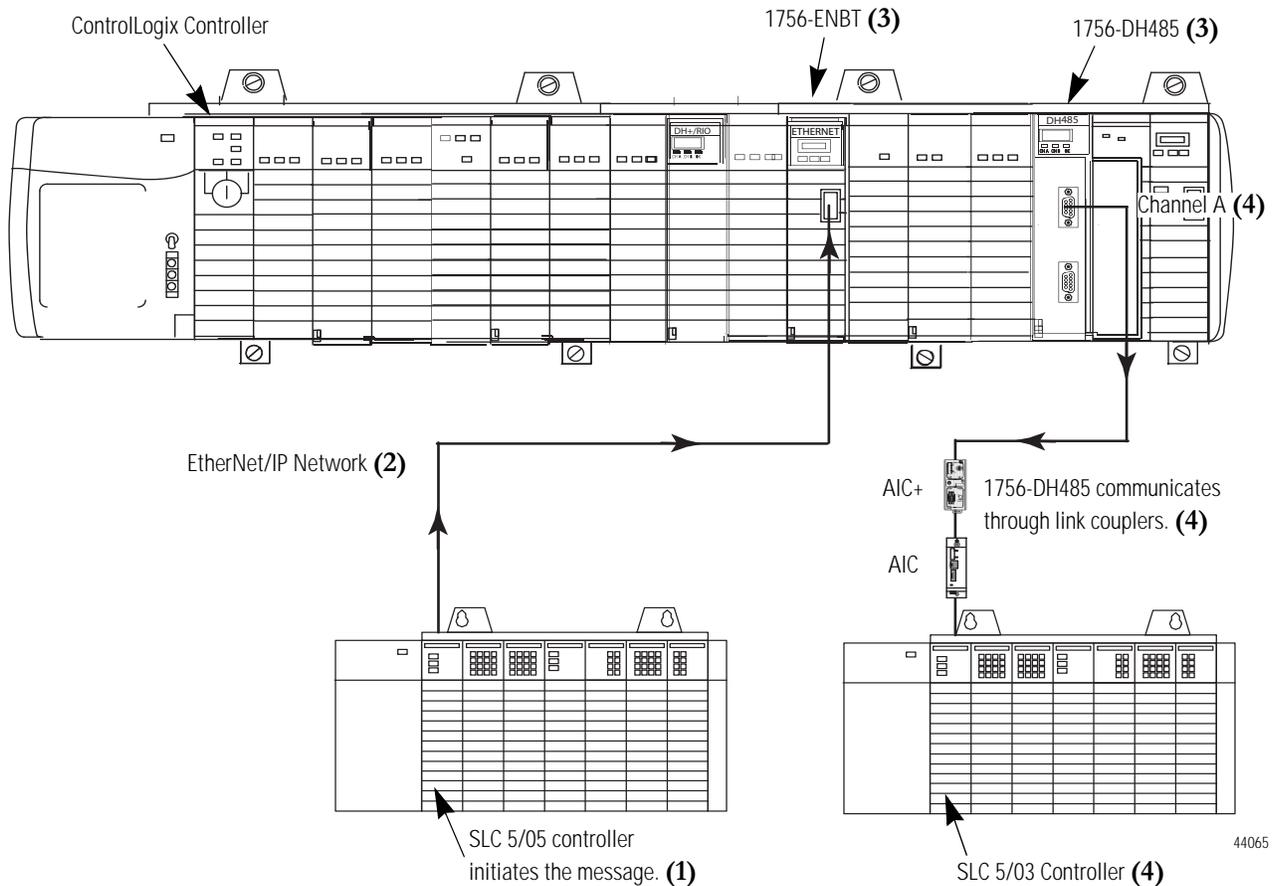
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Create a Message in RSLogix 500

This is the message for the example configuration. Click on Setup Screen to configure the message.
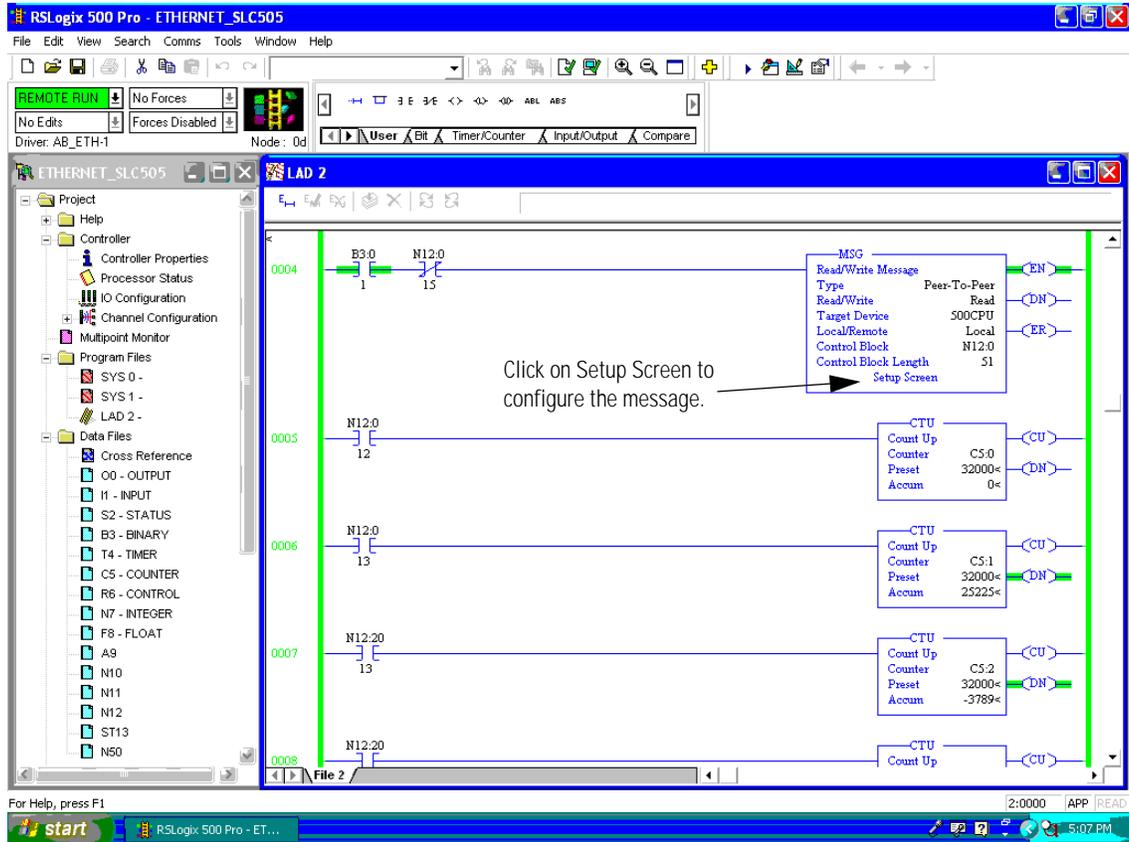
Configure the Message

This is the setup screen for the example configuration.

In this example, the:

- The SLC 5/05 controller on an EtherNet/IP network with it's IP address at 100.100.100.8.

- The SLC 5/05 controller sends the message to an SLC 5/03 controller on a DH-485 network via the 1756-ENBT module at IP address 100.100.100.7 over the backplane to a 1756-DH485 module.

- The 1756-ENBT module is in slot 10 and the 1756-DH485 is in slot 14 of the ControlLogix rack.

- The SLC 5/03 controller is connected to Channel A of the 1756-DH485 module and is communicating through link couplers.

The firmware in the SLC 5/05 controller must be capable of handling CIP protocol. CIP protocol is what the 1756-ENBT module supports. The firmware for the SLC 5/05 controller has been upgraded to handle both CSP and CIP protocols. Refer to Knowledgebase document G16915 for minimum firmware revisions needed for the SLC 5/05 controller to communicate to a 1756-ENBT controller. The SLC 5/05 controller needs to be at a minimum, Series A, 0S501 Firmware 5.

Review the Multihop Feature in RSLogix 500

The multihop feature of RSLogix 500 takes care of routing this remote message. No routing table is required.

This is the multihop dialog for the example configuration.
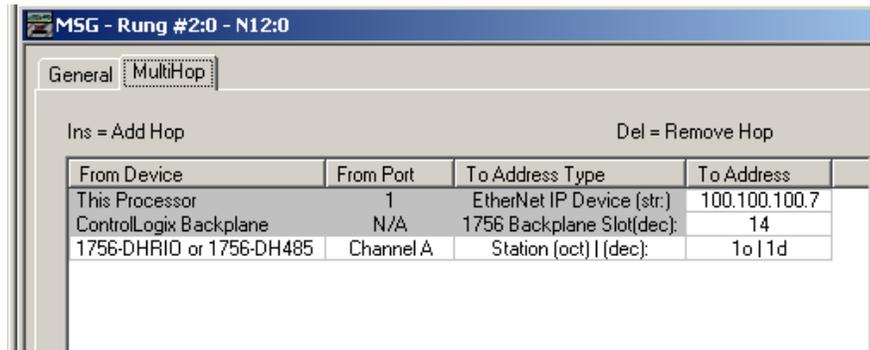
Notes:

Communicate to a SLC 5/03 Controller on a DH-485 Network

Introduction

This chapter describes how to configure remote CIP communication from a 1756-L55 controller to an SLC 5/03 controller through DH+ and DH485 networks.

For	See
Hardware Configuration	9-2
Create a Message in RSLogix 5000	9-3
Configure the Message	9-4

IMPORTANT The examples use the 1756-DH485 module to initiate the message to the SLC 5/03 module. In each case, the use of these devices is strictly for example purposes and not an indication of restrictions on the 1756-DH485 module.

Hardware Configuration

In this hardware configuration, the ControlLogix controller initiates a CIP message from the 1756-DHRIO module to an SLC 5/03 controller located on a DH-485 network.

ControlLogix Controller   1756-DHRIO **(1)**

DH+ Network

ControlLogix Controller   1756-DHRIO **(2)**   1756-DH485 **(3)**

Channel A **(4)**

AIC+

AIC

DH-485 network communicates through link couplers. **(5)**

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The SLC 5/03 controller receives the message. **(6)**
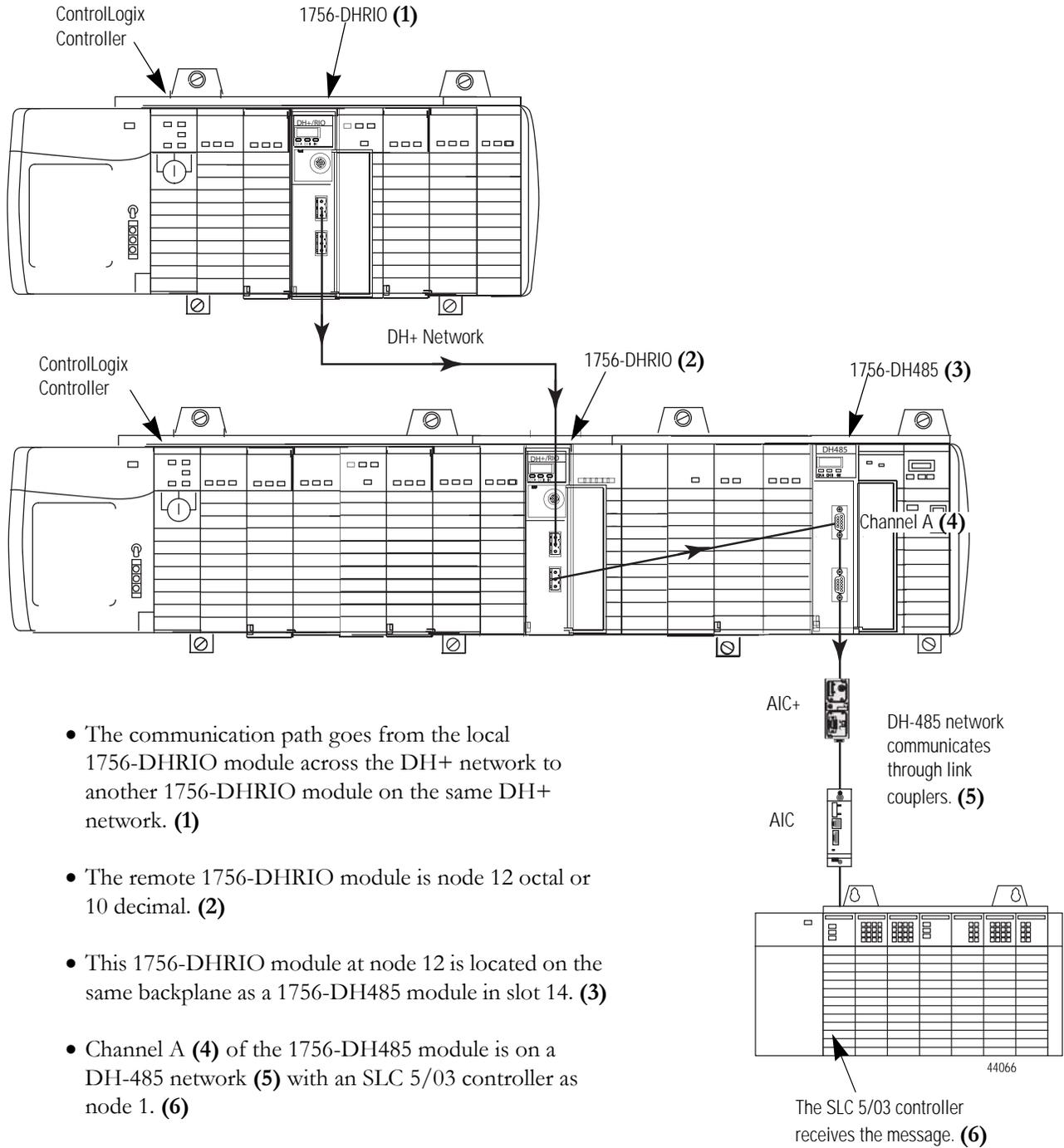
- The communication path goes from the local 1756-DHRIO module across the DH+ network to another 1756-DHRIO module on the same DH+ network. **(1)**

- The remote 1756-DHRIO module is node 12 octal or 10 decimal. **(2)**

- This 1756-DHRIO module at node 12 is located on the same backplane as a 1756-DH485 module in slot 14. **(3)**

- Channel A **(4)** of the 1756-DH485 module is on a DH-485 network **(5)** with an SLC 5/03 controller as node 1. **(6)**

Create a Message in RSLogix 5000

This is the message for the example configuration.

Click to configure the message.
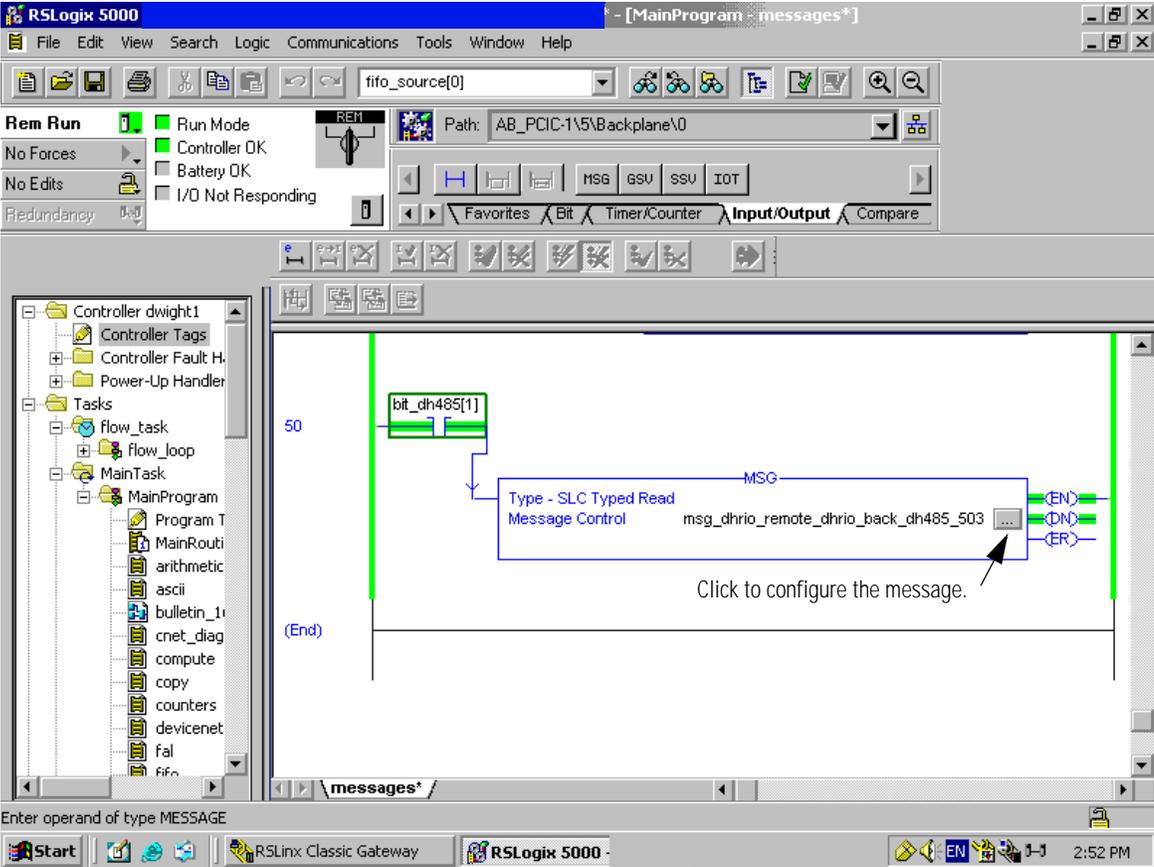
Configure the Message

These are the configuration dialogs for the example message.
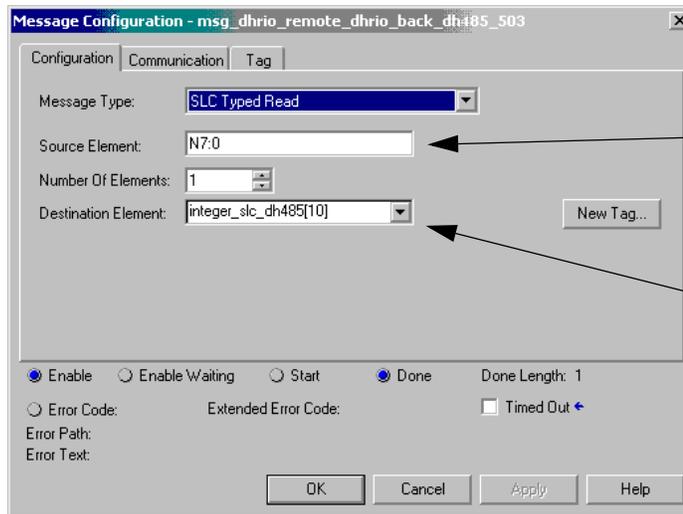
Data table memory is in the SLC 5/03 controller. The message is coming from the ControlLogix controller.

Destination storage is in the 1756-L55 controller.

Path Item	Description
dhrio_ser_B	When you browse to the local 1756-DHRIO module appears if you have it configured in the I/O configuration tree in RSLogix 5000 software.
2	Channel A of the 1756-DHRIO module.
10	The remote 1756-DHRIO is node 12 octal or 10 decimal.
1	Backplane
14	1756-DH485 module in slot 14.
2	Channel A of the 1756-DH485 module.
1	SLC 5/03 Controller Node Address
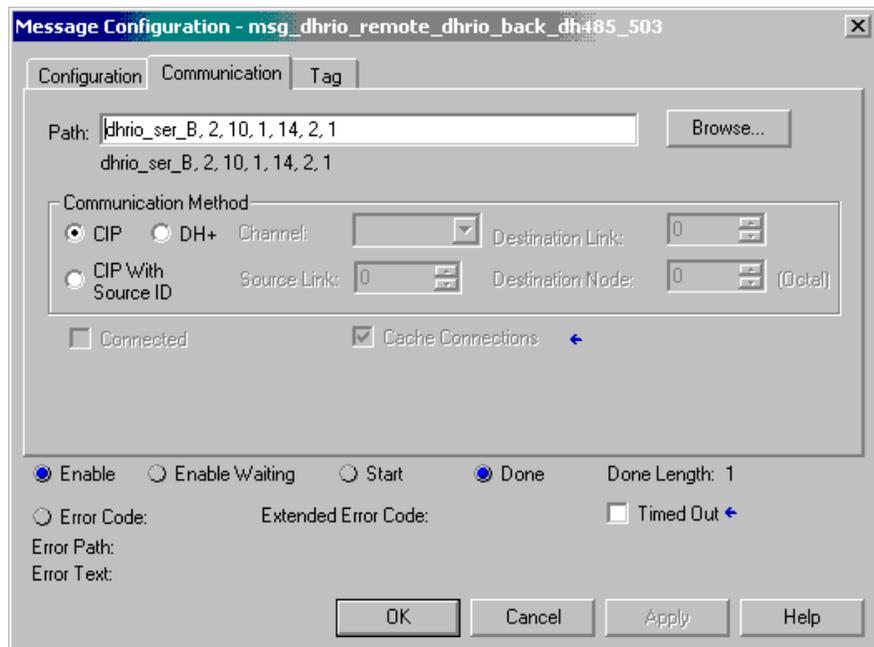
TIP   You do not need to create a routing table when your communication method is CIP messaging.

Communicate from a Logix Controller to an SLC 5/03 Controller over EtherNet/IP and DH-485 Networks

Introduction

This chapter describes how to set up communication from a Logix controller to an SLC controller over an EtherNet/IP network.

For	See
Hardware Configuration	10-2
Create a Remote 1756-ENBT Message in RSLogix 5000	10-3
Configure the Message	10-4

IMPORTANT	The examples use SLC 5/03 modules to send DH-485 messages. In each case, the use of these devices is strictly for example purposes and not an indication of restrictions on the 1756-DH485 module.

Hardware Configuration

In this hardware configuration, a Logix controller communicates to an SLC 5/03 controller over EtherNet/IP.

- The 1756-ENBT module **(1)** to communicate to a remote 1756-ENBT module **(2)** over the EtherNet/IP network backplane

- The 1756-DH485 module **(3)** then communicates through Channel A to the SLC 5/03 **(4)** controller through link couplers over a DH-485 Network.
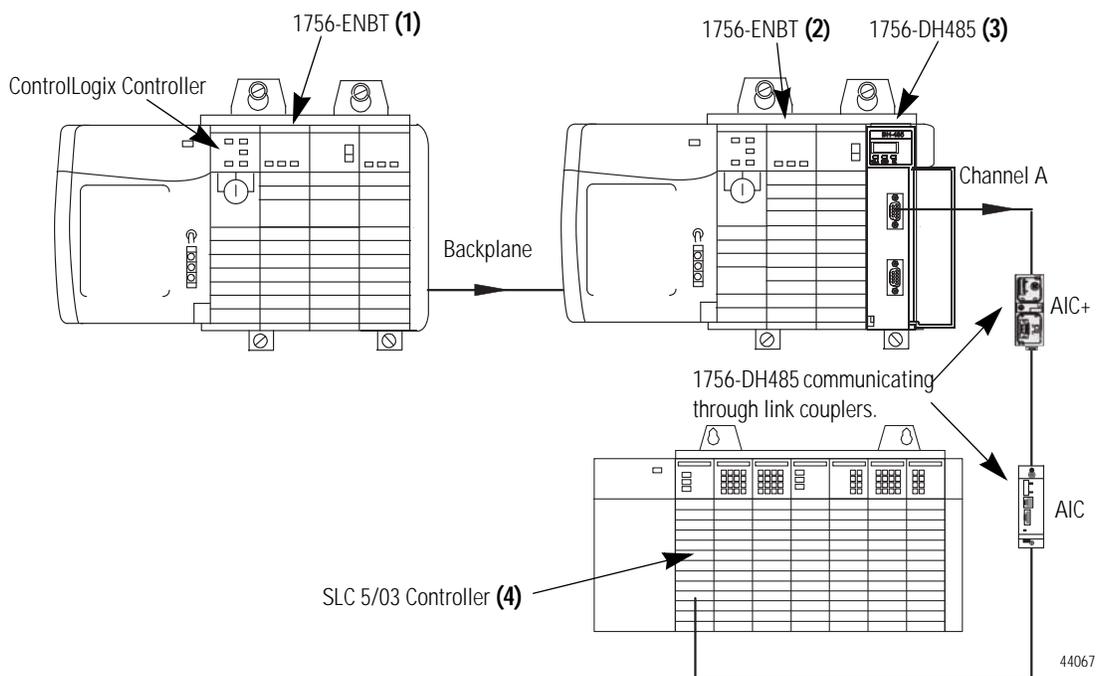
Create a Remote 1756-ENBT Message in RSLogix 5000

This is an example remote 1756-ENBT message.

Click the ▣ button to configure the message.
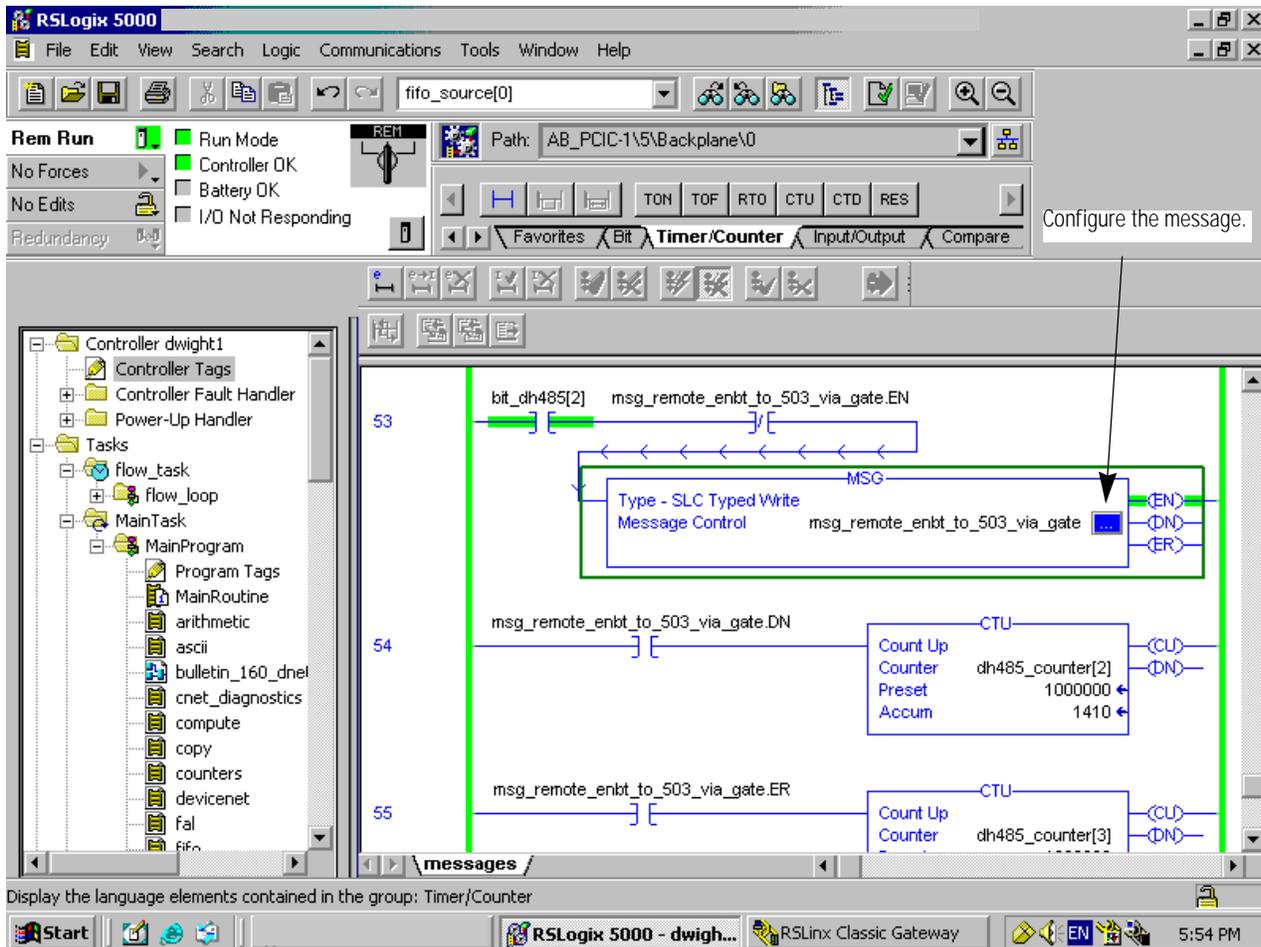
Configure the Message

This dialog shows example values on the Configuration tab for the remote message.

Message Type: SLC Typed Write

Source Element: interger_slc_dh485[20]
Make sure you specify the starting array element, for example [20].

Number of Elements: 1

Destination Element: N7:20

Message Configuration - msg_remote_enbt_to_503_via_gate   ✕

Configuration | Communication | Tag

Message Type: SLC Typed Write

Source Element: integer_slc_dh485[20]   New Tag...

Number Of Elements: 1

Destination Element: N7:20

● Enable   ○ Enable Waiting   ● Start   ○ Done   Done Length: 0

○ Error Code: Extended Error Code: ☐ Timed Out ←
Error Path:
Error Text:

OK   Cancel   Apply   Help

This is the Communication tab for the remote message.

Path Item	Description
series_A	This means go to the backplane to slot 5 where the 1756-ENBT named Series_A is located. Series A is defined as backplane 1, slot 5.
2	EtherNet/IP port.
100.100.100.7	The remote 1756-ENBT.
1	Go to the backplane of the remote 1756 chassis.
14	Go to the slot location of the 1756-DH485 module.
2	Go out Channel A of the 1756-DH485 module.
1	Go to Node 1 or the location of the SLC 5/03 controller.
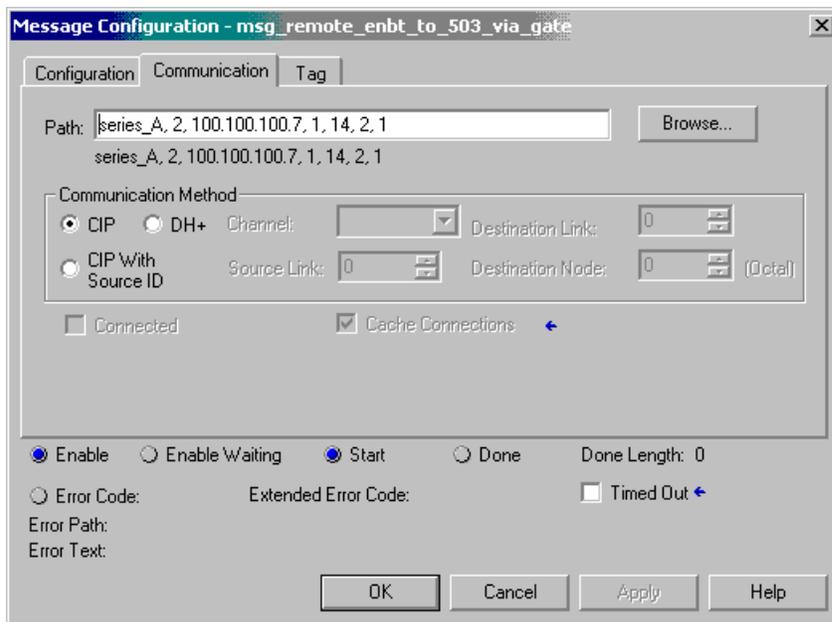
TIP You do not need to create a routing table when your communication method is CIP messaging.

Notes:

Specifications

ControlLogix DH-485 Communications Module 1756-DH485

Attribute	Value
Module Location	ControlLogix chassis
Maximum Backplane Current Load	850 mA @ +5.1V dc and 1.7mA @ 24V dc from I/O chassis backplane
Power Dissipation	4.5 W
Thermal Dissipation, Max	15.4 BTU/hr
Isolation Voltage	50V Tested to withstand 750V dc for 60 s
Available Communication Rates	19.2 Kbps (default) and 9600 Kbps
Wiring Category[1]	2 - on communications ports

[1] Use this Conductor Category information for planning conductor routing. Refer to Publication 1770-4.1, Industrial Automation Wiring and Grounding Guidelines.

Environmental Specifications

Attribute	Value
Operational Temperature	IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock): 0...60 °C (32...140 °F)
Storage Temperature	IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock): -40...85 °C (-40...185 °F)
Relative Humidity	IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat): 5...95% noncondensing
Vibration	IEC 60068-2-6 (Test Fc, Operating): 2 g @ 10...500 Hz
Operating Shock	IEC 60068-2-27 (Test Ea, Unpackaged Shock): 30 g
Non-operating Shock	IEC 60068-2-27 (Test Ea, Unpackaged Shock): 50 g
Emissions	CISPR 11: Group 1, Class A
ESD Immunity	IEC 61000-4-2: 4 kV contact discharges 8 kV air discharges
Radiated RF Immunity	IEC 61000-4-3: 10 V/m with 1 kHz sine-wave 80%AM from 80...2000 MHz 10 V/m with 200 Hz 50% Pulse 100% AM at 900 Mhz

Environmental Specifications

Attribute	Value
EFT/B Immunity	IEC 61000-4-4: +/-2 kV at 5 kHz on communications ports
Surge Transient Immunity	IEC 61000-4-5: +/-1 kV line-earth (CM) on communications ports
Conducted RF Immunity	IEC 61000-4-6: 10 Vrms with 1 kHz sine-wave 80%AM from 150 kHz...80 MHz
Magnetic Field Immunity	IEC 61000-4-8: 30 A/m at 50 Hz
Enclosure Type Rating	None (open-style)

Certifications

Attribute	Value	
Certifications (when product is marked)[1]	c-UL-us	UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810.
	CE	European Union 89/336/EEC EMC Directive, compliant with: EN 50082-2; Industrial Immunity EN 61326; Meas./Control/Lab., Industrial Requirements EN 61000-6-2; Industrial Immunity EN 61000-6-4; Industrial Emissions
	C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions

[1] See the Product Certification link at www.ab.com for Declarations of Conformity, Certificates, and other certification details.

Troubleshoot the 1756-DH485 Module

Introduction

This chapter describes diagnostics and methods of troubleshooting the module.

For	See
Check Power Supply and Module Status	B-1
Interpret the LED Status Indicators	B-2
Interpret the Alphanumeric Indicators	B-3
Interpret the OK Status Indicator	B-4
Routing Errors in DH-485 Messaging	B-4

Check Power Supply and Module Status

When you apply power to the module, three events take place simultaneously. Alphanumeric status indicator on the module illuminates and cycles through the following sequence of messages:

– INIT
– Channel A and the network used for channel A
– Channel A node address
– Channel A status
– Channel B and the network used for channel B
– Channel B node address
– Channel B status

This channel sequences run continuously during normal module operation.

EXAMPLE

For example, if your module uses the following:

• Channel A for DH485 with node address 14
• Channel B for DH485 with node address 0, but being the only node on the network.
• A DH, A#14, A OK, B DH, B#0, ONLY NODE

Module OK status indicator flashes red, then goes solid green.

If the alphanumeric indicator on the 1756-DH485 module does not cycle through these messages when you apply power, refer to the following table and to the troubleshooting section that follows.

Power Cycle Indicators

If the POWER Indicator is	Power Supply Status is	Recommended Action
Off	Not operating.	Turn power ON. Check power wiring connections. Check fuse.
On	Operating.	None, normal operation.

Interpret the LED Status Indicators

The LED status indicators on the module provide information about your module and the status of each channel. The following tables outline the indicator condition and the corresponding status, and explain what each condition means.

Interpret the LED Status Indicators

Module OK Indicator	Module Status	Recommended Action
Off	Not operating.	Apply chassis power. Verify module is completely inserted into chassis and backplane.
Green flashing	Operating but not routing messages.	None, if no messages are actively being routed through the module. To route messages, configure module with RSLinx software.
Solid Red, then Off	Performing self-test.	None, normal operation.
Solid Green	Operating and routing messages.	Verify module configuration.
Solid Red	In major fault.	Reboot module. If red reoccurs, then replace module.
Red flashing	In major fault or configuration fault.	Check alphanumeric indicator and take action described in the Alphanumeric Display Descriptions table.

Interpret the Alphanumeric Indicators

Your 1756-DH485 module displays alphanumeric codes that provide diagnostic information about your module. The alphanumeric display flashes the codes at approximately one-second intervals. This table summarizes the codes.

Alphanumeric Display Descriptions

Message	Description	Recommended Action
ONLY NODE	Only node on DH-485 link.	Check the cables.
OFF LINE	DH-485 link is in STOP state.	Correct the configuration.
DUPL NODE	DH-485 Duplicate node address.	Choose another node address.
ONLY NODE	Only node on DH-485 link.	Check the cables.
OFF_LINE	Not trying to communicate.	None. Normal state if controller is not controlling remote I/O.
OK	Normal operation.	None.

Interpret the OK Status Indicator

The three LED status indicators on the module provide information about your module and the status of each channel. The following tables outline the indicator condition and the corresponding status, and explain what each condition means.

Interpreting the OK Status Indicator

If the Module OK Indicator is	Module Status	Recommended Action
Off	Not operating.	Apply chassis power. Verify module is completely inserted into chassis and backplane.
Red, then Off	Performing self-test.	None, normal operation.
Green	Operating and routing messages.	Verify module configuration.
Red	In major fault	Reboot module. If red reoccurs, then replace module.

Routing Errors in DH-485 Messaging

This section describes routing errors in local and remote messaging.

Routing Errors in Local DH-485 Messaging

If the 1756-DH485 module has a problem with routing a DH-485 message, it may return a response with an error status of D0 hex. A PLC-5 controller displays this error as D000 hex when monitoring the message instruction. If you receive this error message, take the following actions:

- Check your message instruction to make sure a valid destination node was entered.

- Check your default slot configuration to make sure that it matches the location of the ControlLogix controller in the chassis.

- Make sure the 1756-DH485 module is turned on and verify chassis power is recognized by the 1756-DH485 module.

Routing Errors in Remote DH-485 Messaging

If the 1756-DH485 module has a problem with routing a Remote DH-485 Message, it may return a response with an error status of D0 hex. An SLC controller displays this error as D000 hex when monitoring the message instruction. If you receive this error message, take the following actions:

- Check your message instruction to make sure a valid local node destination, link ID and destination node were entered.

- Check your routing table in each 1756-DH485 module that the message passes through.

- Connect and apply power to all 1756-DH485 modules.

Interpret the Channel Status Indicators

If the Channel A or B Indicator is	In This Channel Mode	Then the Channel Status is	Take This Action
Off	All	Not online.	Place channel online.
	DH485	No other node on the network.	Check cables.
Green	DH485	Operating.	None, normal operation.

Notes:

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Cat. No. 1756-DH485   Pub. No. 1756-UM532A-EN-P   Pub. Date May 2006   Part No. 957988-29

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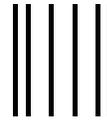
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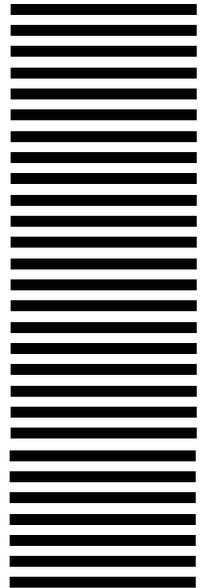
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