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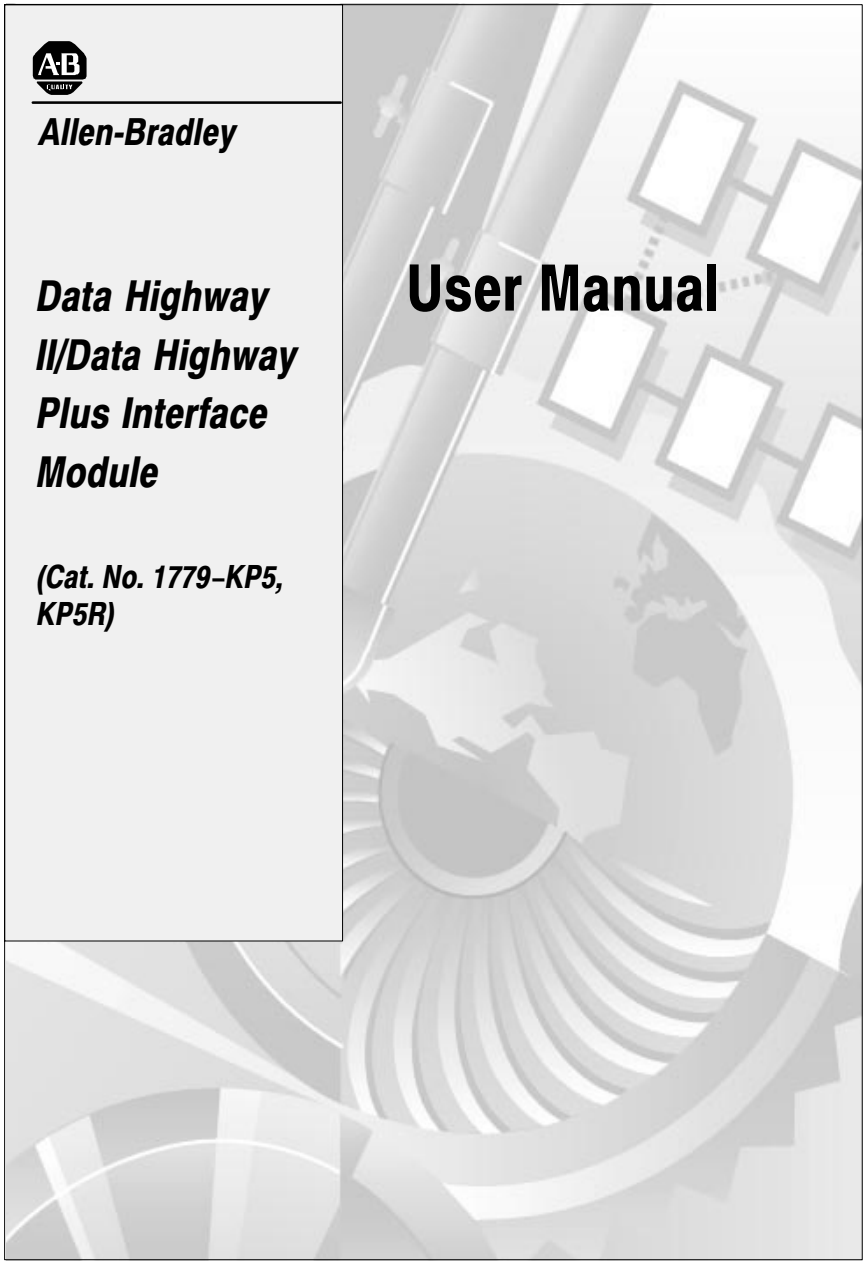
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Allen-Bradley

Data Highway II/Data Highway Plus Interface Module

(Cat. No. 1779–KP5, KP5R)

User Manual

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Chapter 1

Using This Manual

Chapter Objectives

After reading this chapter, you should know:

- Terminology Used throughout This Manual
- Where to Locate Information On Related Products

Purpose of This Manual

This manual describes the Data Highway II/Data Highway Plus Communication Adapter Module (Cat. Nos. 1779-KP5, -KP5R). It gives you instructions for:

- Installing the Module
- Using the Module
- Troubleshooting the Module

Who Should Read This Manual

You should read this manual before you install or use the 1779-KP5 or 1779-KP5R. You should already be familiar with:

- Allen-Bradley Programmable Logic Controllers (PLCs)
- Allen-Bradley Data Highway II and Data Highway Plus Networks

Precautionary Notes

In this manual, you will see:

- **WARNINGS** that indicate where you may be injured if you do not follow procedures properly.
- **CAUTIONS** that indicate where equipment may be damaged if you do not follow procedures properly.
- **Important** notes that stress information that is critical to your understanding and use of the product.

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Frequently Used Terms

In this manual, we use the following terms:

This Term:	Means:
1779-KP5	Both the 1779-KP5 and 1779-KP5R modules unless otherwise noted.
Data Highway Plus	Formerly the Peer Communications Link (PCL)
Node	The point at which devices, such as programmable controllers, interface to the network. Usually, the node is an interface module (except for the PLC-5 and T50 terminal which connect directly to Data Highway Plus). In some Allen-Bradley documentation, you may find the term **station** used in place of the term **node**.
PLC	Programmable Logic Controller: A generic term for any of Allen-Bradley's PLC product lines (such as PLC-2, PLC-3, etc.).
T50	The T50 Industrial Terminal (Cat. No. 1784-T50).

Related Products

Allen-Bradley offers a wide range of products for Data Highway II and Data Highway Plus, including:

Product	Catalog Number
Data Highway II PLC-2 Family Interface Module	1779-KP2, -KP2R
Data Highway II PLC-3 Family Interface Module	1779-KP3, -KP3R
Data Highway II Asynchronous-Device Interface Module	1779-KFL, -KFLR
Data Highway II Synchronous-Device Interface Module	1779-KFM, -KFMR
PLC-5 Family Programmable Controllers	Series 1785
PLC-5 Programming Software	6200 PLC-5
T50 Industrial Terminal System	1784-T50

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Related Publications

For more information on Data Highway II, Data Highway Plus, and related products, refer to:

Publication	Publication Number
Data Highway II Overview Product Data	1779-2.10
Data Highway Cable Assembly and Installation Manual	1770-6.2.1
Data Highway II Cable Assembly and Installation Manual	1779-6.5.7
Data Highway II PLC-2 Family (1779-KP2) Interface Module User's Manual	1779-6.5.3
Data Highway II PLC-3 Family (1779-KP3) Interface Module User's Manual	1779-6.5.5
Data Highway II Asynchronous-Device (1779-KFL) Interface Module User's Manual	1779-6.5.1
Data Highway II Synchronous-Device (1779-KFM) Interface Module User's Manual	1779-6.5.2
PLC-5 Family Installation Manual	1785-6.6.1
PLC-5 Family Processor Manual	1785-6.8.2
PLC-5 Programming Software User's Manual	6200-6.5.5
T50 Industrial Terminal System (1784-T50) User's Manual	1784-6.5.1

These publications are available from Allen-Bradley. Contact your local Allen-Bradley sales office for more information.

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Chapter 2

Overview of the 1779-KP5 Module

Chapter Objectives

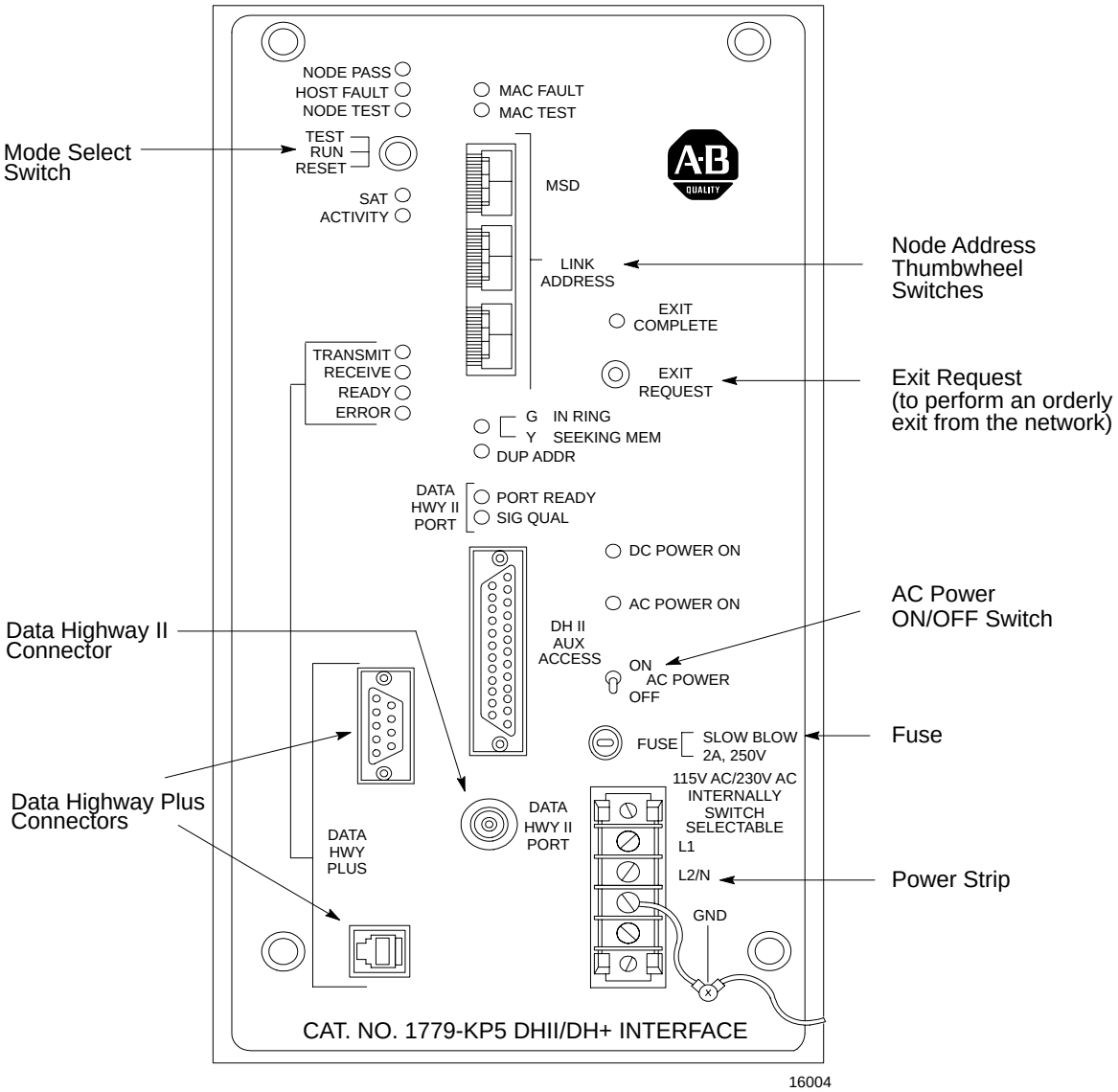
In this chapter, we give you an overview of the 1779-KP5 interface module and how it allows communication between:

- Data Highway II and Data Highway Plus
- Multiple Data Highway II Links

The Front Panel of the 1779-KP5 Module

Figure 2.1 shows the front panel of the 1779-KP5 module.

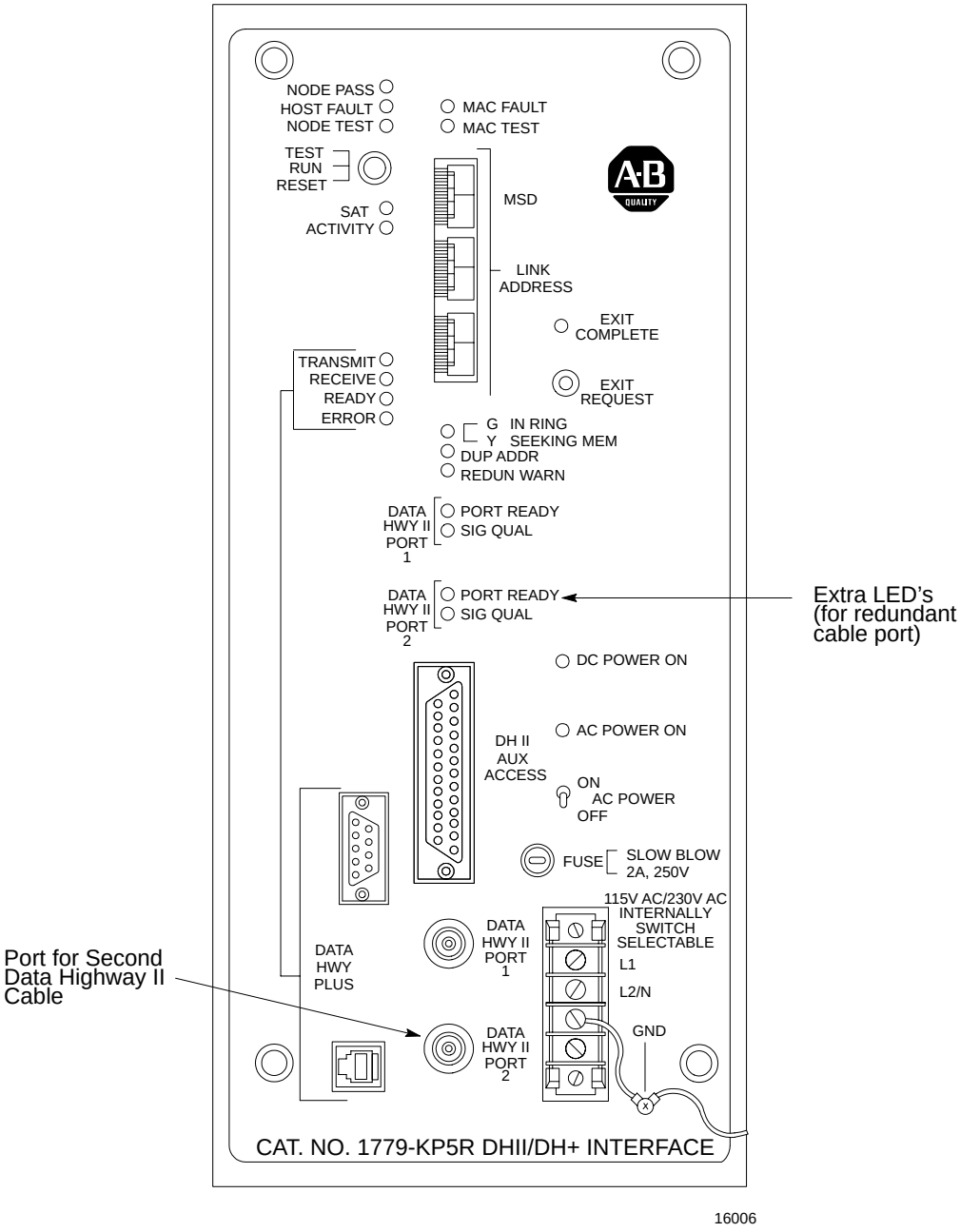
Figure 2.1
The 1779-KP5 Communication Interface Module



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Figure 2.2 shows the front panel of the 1779-KP5R module with the redundant cabling option.

Figure 2.2
The 1779-KP5R Module with Redundant Cabling Option



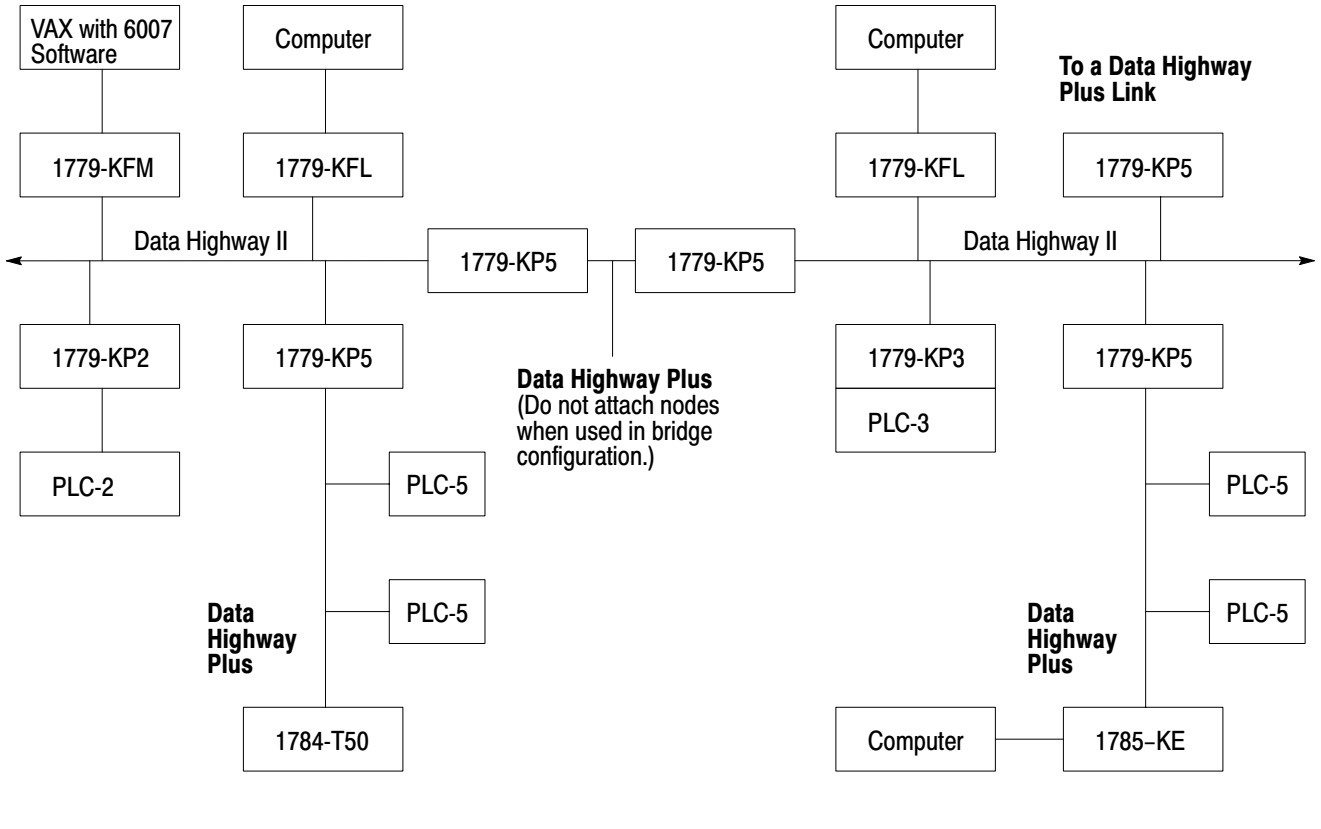
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For More Information on:	Refer to:
Making Connections and Setting Switches on the 1779-KP5	Chapter 3
Using the LED Diagnostic Indicators	Chapter 6
Data Highway II Redundant Cabling	The Data Highway II Cable Planning and Installation Manual (Publication 1779-6.5.7)

Using the 1779-KP5 on Your Network

Figure 2.3 shows an example configuration of a network using the 1779-KP5.

Figure 2.3
An Example Network Configuration



You can use a 1779-KP5 on your network for either:

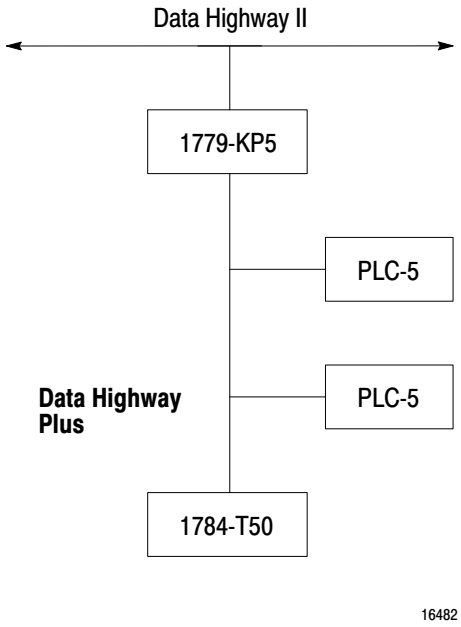
- Connecting a Data Highway Plus link to a Data Highway II link.
- In conjunction with a second 1779-KP5, to form a bridge between two Data Highway II links.

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Connecting Data Highway Plus to Data Highway II

Figure 2.4 shows an example of using a 1779-KP5 to connect a Data Highway Plus link to a Data Highway II link.

Figure 2.4
Connecting Data Highway Plus to Data Highway II



Important: When you connect a Data Highway Plus link to a Data Highway II link, you must observe the following limitations:

- A computer connected to a Data Highway Plus (through a 1785-KE or 1770-KF2 module) cannot access nodes on a Data Highway II through a 1779-KP5 module.
- Nodes on Data Highway II cannot access a computer connected to Data Highway Plus.
- A 1784-T50 on a Data Highway Plus link cannot program devices on another Data Highway Plus link through the 1779-KP5.

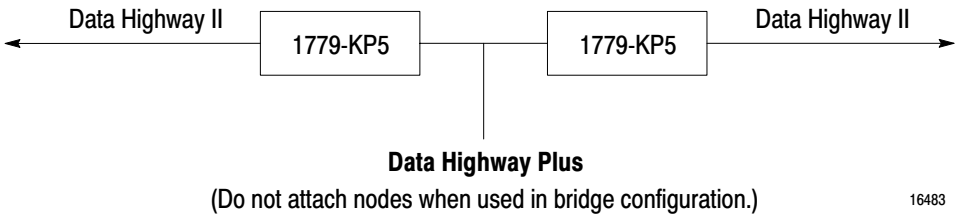
A computer on a Data Highway II, however, can access a PLC on Data Highway Plus through a 1779-KP5.

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Connecting Two Data Highway II Links

Figure 2.5 shows an example of using two 1779-KP5 modules as a bridge between two Data Highway II links.

Figure 2.5
Connecting Two Data Highway II Links



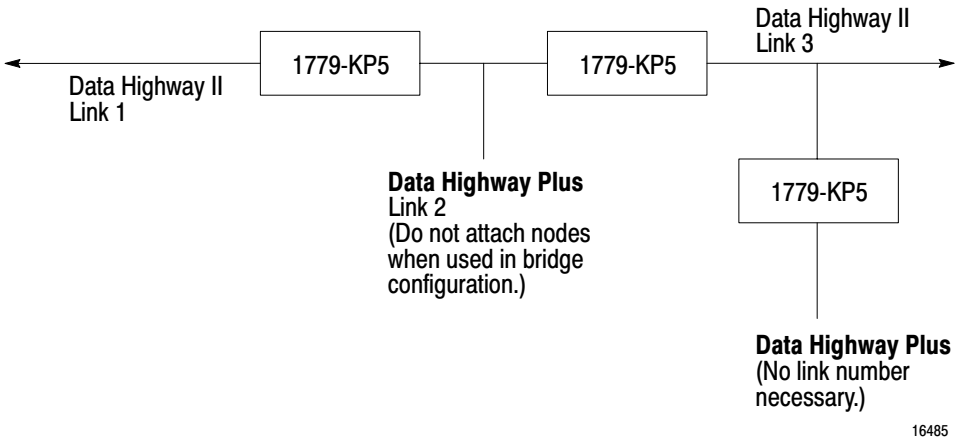
Assigning Link Numbers

You must assign a link number to each link on your network (Figure 2.6). This includes:

- Each Data Highway II Link
- Each Data Highway Plus Link in a Bridge Configuration

Data Highway Plus links that are not part of a bridge configuration do not need a link number. The Data Highway Plus nodes can be treated as users attached to the 1779-KP5.

Figure 2.6
Assigning Link Numbers



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You cannot connect nodes to Data Highway Plus links that are part of a bridge configuration. Also, make sure that both 1779-KP5 modules in a bridge configuration assign the same link number to the Data Highway Plus link.

You can also assign a link number to a Data Highway Plus link that is not part of a bridge configuration. This would allow you to address up to 64 nodes on the Data Highway Plus link, instead of the 15 node limitation when you do not assign a link number. If you choose to assign a link number, however, you must also use station-management commands to set communication routes on your network. For more information on addressing, refer to Chapters 4 and 5.

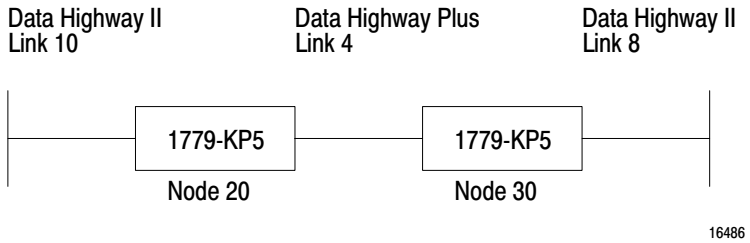
You set the address for a link using switches on the 1779-KP5. For information on how to set the link number on a 1779-KP5, refer to the switch-setting information in Chapter 3.

How the 1779-KP5 Routes Messages to Other Data Highway II Links

When you use a 1779-KP5 in a bridge configuration, you must set switches on the module to enable route updates.

When you enable route updates, the 1779-KP5 module sends a route update message onto the network. This update message tells other Series B modules on the network which links are accessible through the 1779-KP5 that sent the message. The route update also specifies the number of "hops" or bridges that a message must travel through to reach each link.

The following example shows a typical bridge configuration example:



In the previous example, the 1779-KP5 on Link 8 (Node 30) broadcasts a route update to the 1779-KP5 on Link 10 (Node 20). This route update tells Node 20 where to forward all messages bound for Link 8. Node 20 forwards this route update information to any other Series B modules on Link 10. By forwarding the route information, the other Series B modules

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on Link 10 know that in order to reach a device on Link 8, they must route the message through Node 20.

Node 20 also broadcasts its route update message to Node 30. Node 30 broadcasts the message to Series B modules on Link 8. This tells the Series B modules on Link 8 that in order to reach a device on Link 10, they must route the message through Node 30.

Once your system is running, your Series B 1779-KP5 modules (in bridge configuration) will automatically forward route updates to all remote Data Highway II links.

Important: Data Highway II PLC-2 Family interfaces (Cat. Nos. 1779-KP2, -KP2R) and PLC-3 Family Interfaces (Cat. Nos. 1779-KP3, -KP3R) do not currently support communication between Data Highway II links. Data Highway II Asynchronous-Device Interfaces (Cat. Nos. 1779-KFL, -KFLR) and Synchronous-Device Interfaces (Cat. Nos. 1779-KFM, -KFMR) must be Series B, Revision A or later to support communication between Data Highway II links.

Asynchronous-Device Interfaces and Synchronous-Device Interfaces provide station-management and node-management commands for the network layer. For more information, refer to your 1779-KFM, -KFMR or 1779-KFL, -KFLR documentation.

1779-KP5 Diagnostic Tools

The 1779-KP5 provides the following types of troubleshooting tools:

- LEDs for diagnosing the 1779-KP5.
- Replaceable circuit boards for testing and repairing the module.
- Diagnostic counters and status bytes you can access from a computer to help monitor the performance on your network.

For more information on the 1779-KP5 diagnostic tools, refer to Chapter 6.

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Chapter 3

Installing the 1779-KP5 Module

Chapter Objectives

This chapter provides procedures for:

- Mounting the 1779-KP5
- Setting the Data Highway II Node Address for the 1779-KP5
- Setting Option Switches on the 1779-KP5
- Connecting Communication Cables to the 1779-KP5
- Connecting Power and Ground to the 1779-KP5
- Powering Up the 1779-KP5

Guidelines for Mounting the 1779-KP5

You mount the 1779-KP5 in an enclosure. The temperature of the air at any point directly below the module must not exceed 60°C (140°F). Otherwise, the failure rate of semiconductor devices may increase significantly.

The temperature tends to be higher toward the top of the enclosure. In addition, the following factors affect the temperature in an enclosure:

- The Size of the Enclosure (Smaller enclosures heat up faster.)
- How Much Heat Is Being Dissipated in the Enclosure
- The Temperature of the Air Surrounding the Enclosure

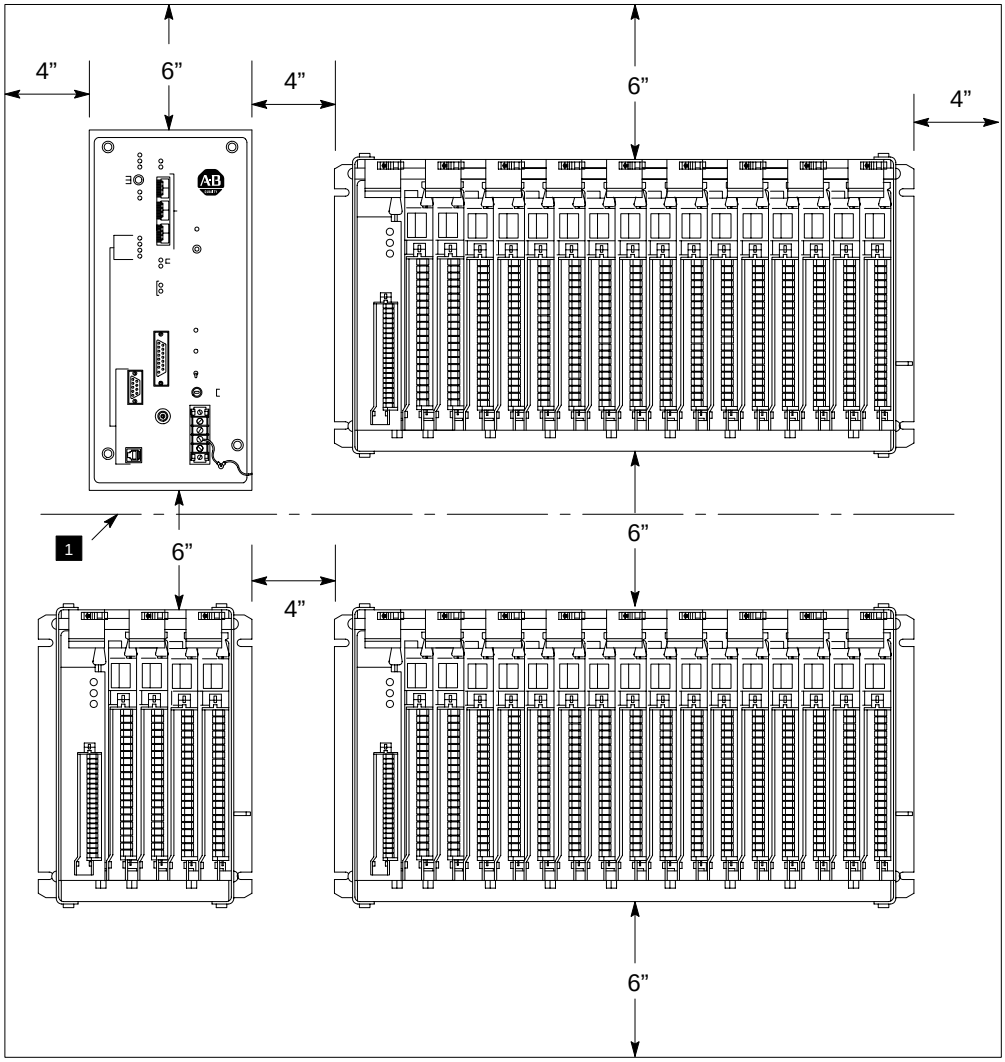
Heat dissipation includes not only the heat dissipated through the power supplies for your equipment but also the heat dissipated through input and output circuits.

To allow necessary air flow for cooling of components, refer to the example shown in Figure 3.1 and follow these rules:

- Provide six inches minimum vertical separation and four inches horizontal separation between components.
- Provide six inches minimum vertical separation between a chassis and the top or bottom of the enclosure.
- Provide four inches minimum horizontal separation between chassis and to enclosure sides.
- If you have excess space in the enclosure, leave it at the top of the enclosure where the temperature is higher.
- Mount wiring ducts, taps, and terminal strips no closer than two inches from any chassis.

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Figure 3.1
Example of Minimum Spacing for Necessary Air Flow



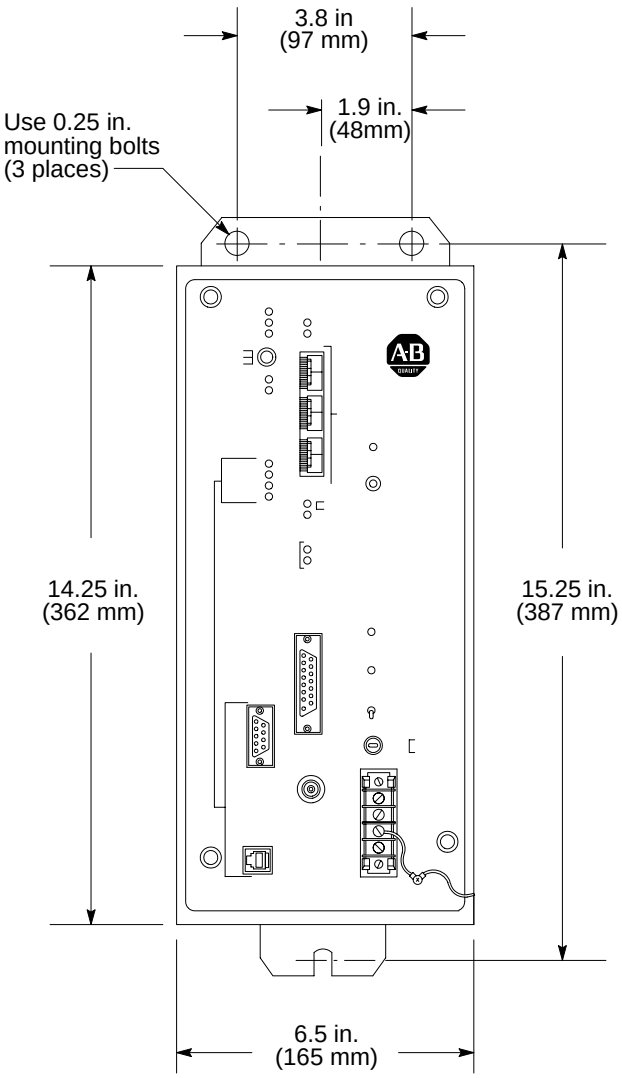
1 The temperature of the air must not exceed 60°C (140°F) at any point immediately below any chassis. This may limit how high chassis can be mounted in an enclosure.

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Figure 3.2 shows the mounting dimensions for the 1779-KP5 interface.

Figure 3.2
Mounting Dimensions



Clearance depth including cable connectors is 11 inches (280 mm).

16008

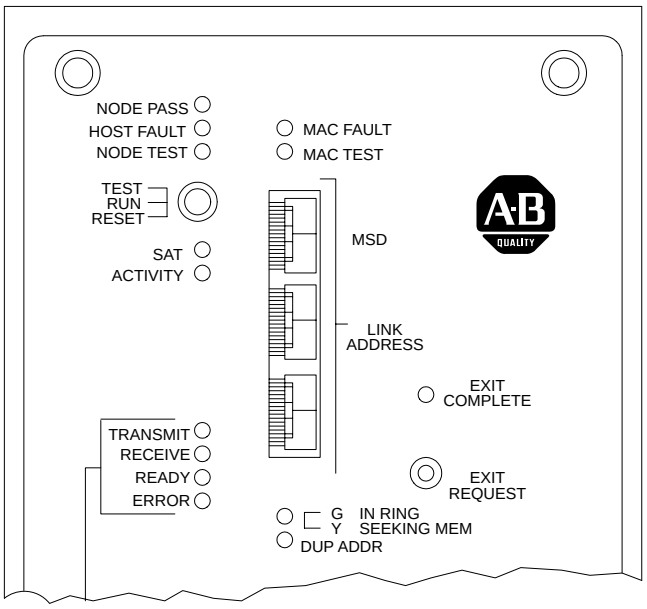
Drill and tap the three holes in the enclosure back panel for mounting the module. Insert the mounting bolt into the bottom hole. You can then hold the interface in place, resting it on the bottom bolt, while you insert the top mounting bolts.

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Setting the Node Address

Set the node address for your module using the three thumbwheels on the front panel of your module (Figure 3.3).

Figure 3.3
Address Thumbwheels on the Front Panel of the Module



Set these thumbwheels to designate the node address of the 1779-KP5 for both Data Highway II and Data Highway Plus. The top thumbwheel represents the most significant digit (MSD). Set this digit to zero, since the highest address available to a Data Highway Plus node is 077 (octal). The bottom two thumbwheels do not go past the digit seven because the address must be an octal number. Each node on your network must have a unique address.

Important: The 1770-T3 industrial terminal (for the PLC-2) cannot communicate with Addresses 000 through 007 and Addresses 100 through 107 (octal). If you have PLC-2s on your Data Highway II network, you may not want to use these node addresses.

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Setting the Option Switches

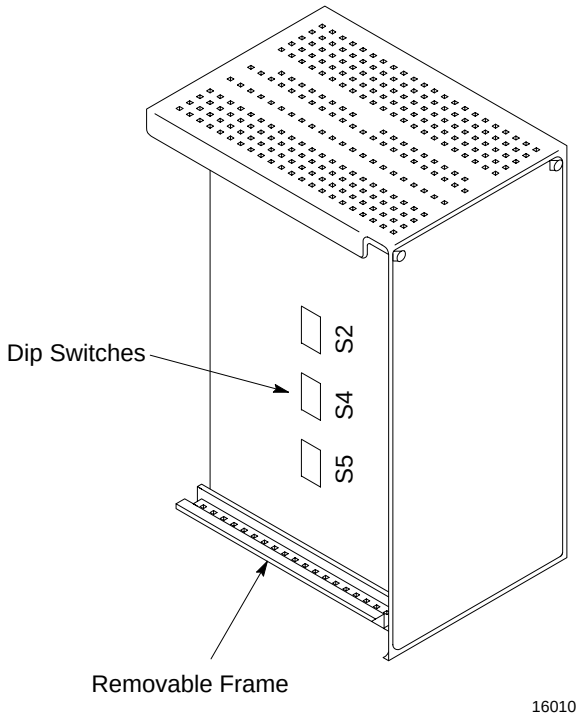
There are three sets of switches (labeled S-2, S-4, and S-5) on the 1779-KP5 host board. Use the following procedure to access these switches:

CAUTION: Electrostatic discharge can degrade performance or cause permanent damage to the module. To minimize or prevent electrostatic discharge damage, handle the module at a static-safe workstation.

If a static-safe workstation is not available, touch and remain in contact with a grounded object to discharge yourself while handling the module.

1. Make sure that you remove all power to the module. Usually, you remove power to the 1779-KP5 by locking open the main disconnect switch on your enclosure.

2. Loosen the four fasteners on the front panel of the module. Pull the removable frame out to the switch-setting position. This exposes the switch assemblies.

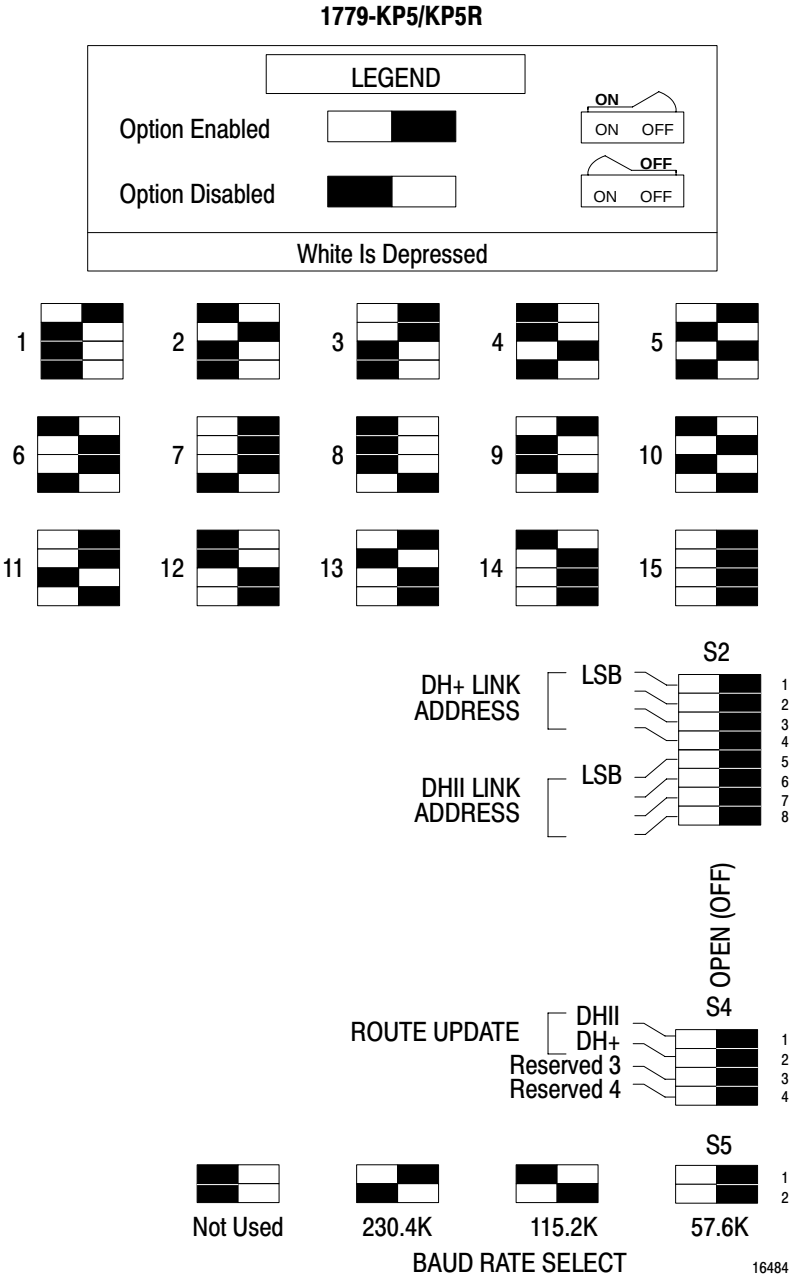


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3. After you finish setting switches, push the removable frame back to the operating position and tighten the four fasteners on the front of the module. The fasteners must be tight to ensure that AC power is not interrupted by the interlock switch on the power-supply board.

Figure 3.4 shows the switch-setting label on the side of the 1779-KP5.

Figure 3.4
Switch-Setting Label on the 1779-KP5



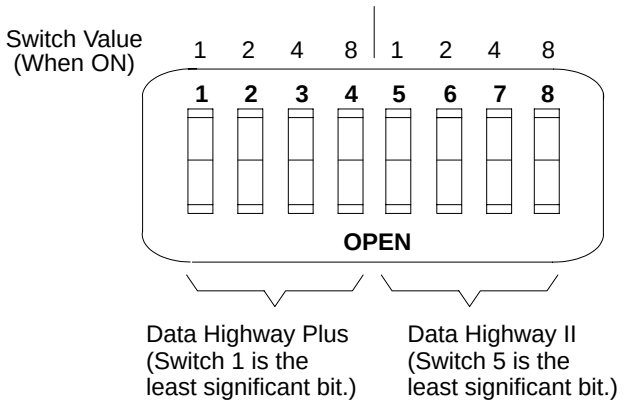
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Switch Assembly S-2: Link Address

You use Switch Assembly S-2 to set a unique link address (between 1 and 15) for both the Data Highway II and Data Highway Plus links connected to the 1779-KP5 in a bridge configuration. The 1779-KP5 uses these link addresses to route messages. Refer to the following table:

If You Are Using:	Then:
A 1779-KP5 in a Bridge Configuration to Connect Two Data Highway II Links	You need to assign link addresses (using DIP switches).
A 1779-KP5 as a Data Highway II/Data Highway Plus Interface Using Local Addressing	You do not assign link addresses.
A 1779-KP5 as a Data Highway II/Data Highway Plus Interface Using Remote Addressing	You need to assign link addresses (using station-management commands).

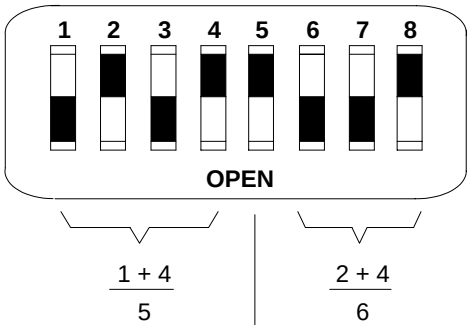
Refer to Chapters 4 and 5 for more information on addressing.



Important: Do not set the link number to zero unless you only have one Data Highway II link on the network. The 1779-KP5 uses link zero to signify the local link message.

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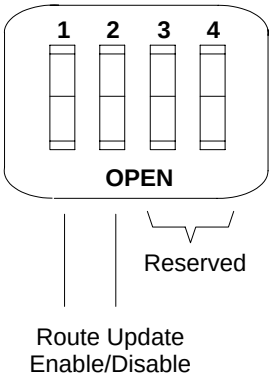
For example, to set a Data Highway Plus link address of 5 and a Data Highway II link address of 6, you would set the switches as follows:



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Switch Assembly S-4: Enable/Disable Route Update

You use Switch Assembly S-4 to enable or disable the route update message on your network.



When you press a switch towards the word OPEN, you turn the switch ON.

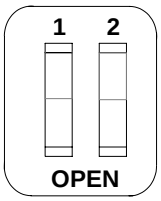
16500

If You Are Using:	Then:
A 1779-KP5 as an Interface between a Data Highway Plus Link and Data Highway II	Disable Route Updates (Both Switches OFF — Closed)
A 1779-KP5 in a Bridge Configuration	Enable Route Updates (Both Switches ON — Open)

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Switch Assembly S-5: Data Highway Plus Communication Rate

You use the set of switches labeled S-5 to set the Data Highway Plus communication rate. You must set both these switches ON (toward the word OPEN) for a communication rate of 57.6 Kbits per second.



Set both switches ON (toward the word OPEN) for 57.6K baud.

Set Switch 1 ON and Switch 2 OFF for 115.2K baud. (This setting can be used only when you are using two modules in bridge mode.)

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Setting the Power-Selection Switch

Before connecting power, make sure the power-selection switch on the power-supply board is set properly by following these steps:



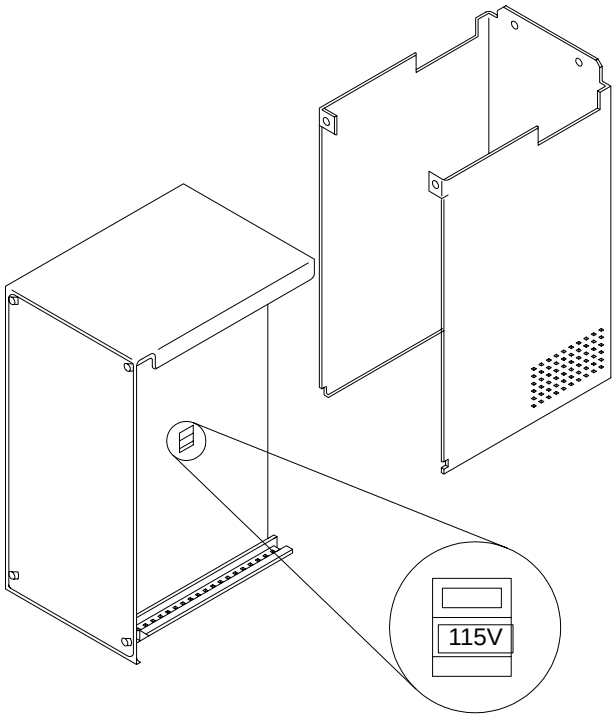
CAUTION: Electrostatic discharge can degrade performance or cause permanent damage to the module. To minimize or prevent electrostatic discharge damage, handle the module at a static-safe workstation.

If a static-safe workstation is not available, touch and remain in contact with a grounded object while handling the module.

1. If you are resetting the switch, make sure that you remove all power to the module. Usually, you remove power to the 1779-KP5 by locking open the main disconnect switch on your enclosure.

2. Loosen the four fasteners on the front panel of the module. Pull the removable frame out to the switch-setting position. This exposes the power-selection switch on the power-supply board.

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Push switch down for 230V operation.

16011

3. Set the voltage-selection switch to correspond to the level (115V/230V) of your AC power source. The module is factory set to 115V AC.

4. Push the removable frame back to the operating position and tighten the four fasteners on the front of the module. The fasteners must be tight to ensure that AC power is not interrupted by the interlock switch on the power-supply board.

Setting the Data Highway Plus Terminating Resistor

The 1779-KP5 provides a jumper which sets a terminating resistor for Data Highway Plus. If you are using two 1779-KP5 modules in a bridge configuration, set this jumper on each module. The jumper terminates the Data Highway Plus link that runs between the two modules.

Use the following procedure to set the resistor:

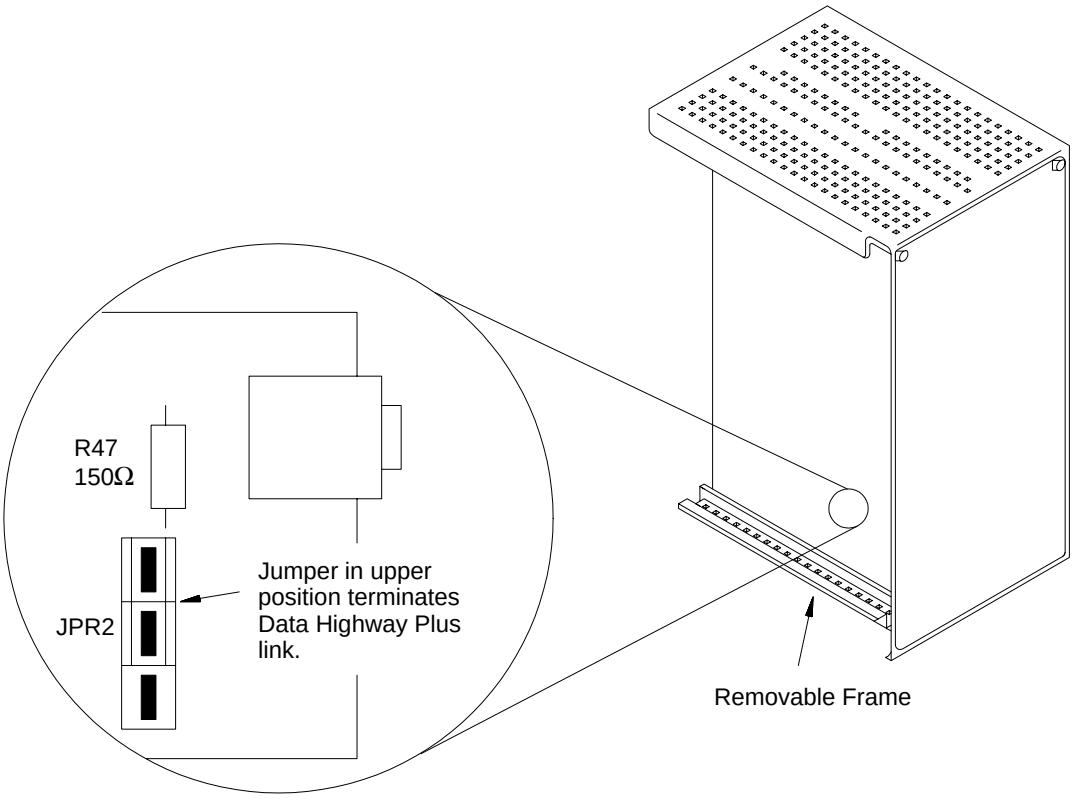
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CAUTION: Electrostatic discharge can degrade performance or cause permanent damage to the module. To minimize or prevent electrostatic discharge damage, handle the module at a static-safe workstation.

If a static-safe workstation is not available, touch and remain in contact with a grounded object to discharge yourself while handling the module.

1. Make sure that you remove all power to the module. Usually, you remove power to the 1779-KP5 by locking open the main disconnect switch on your enclosure.

2. Loosen the four fasteners on the front panel of the module. Pull the removable frame out to the switch-setting position. This exposes the resistor.



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3. After you finish setting the resistor, push the removable frame back to the operating position and tighten the four fasteners on the front of the module. The fasteners must be tight to ensure that AC power is not interrupted by the interlock switch on the power-supply board.

Connecting Communication Cables

After you have set the switches and the terminator, you can connect the communication cables necessary for your application.

The following sections provide information for connecting the 1779-KP5 to:

- Data Highway II
- Data Highway Plus
- 1784-T50 Industrial Terminal

CAUTION: The DHII AUX ACCESS connector on the front panel of the module is for future product enhancement. To help protect this connector from electrostatic discharge, make sure that the conductive cap (shipped with the module) remains on the connector.

Connecting the Data Highway II and Data Highway Plus

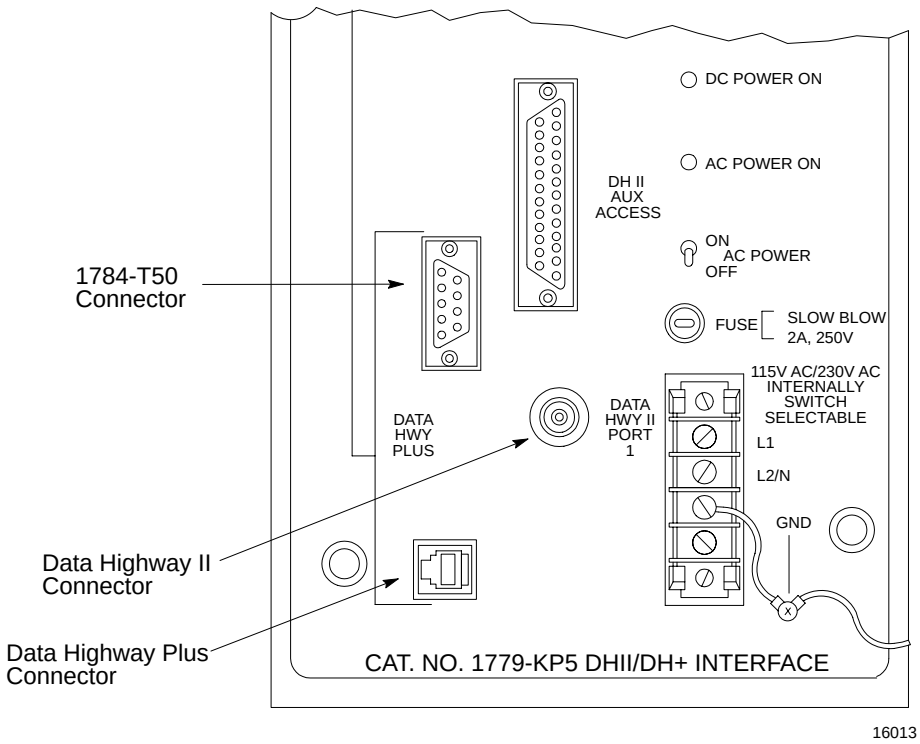
The 1779-KP5 has a connector for the Data Highway II network and a connector for the Data Highway Plus network. You must connect a drop cable from each network to the 1779-KP5 (Figure 3.5).

If you have a 1779-KP5R, you must connect a drop cable for each Data Highway II cable system.

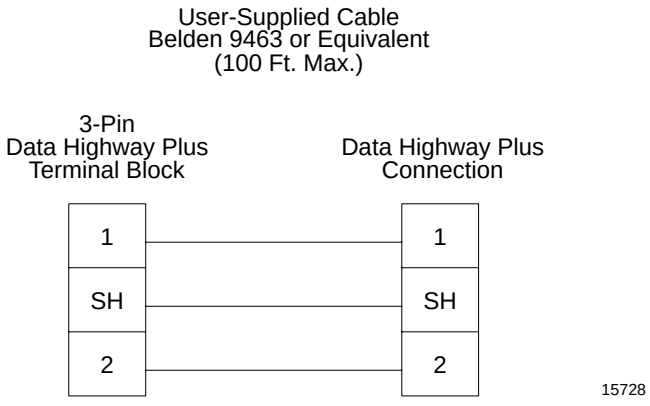
The drop cable for Data Highway II is provided with the Data Highway II tap (Cat. No. 1779-XP). For more information on Data Highway II cabling, refer to the Data Highway II Cable Planning and Installation Manual (Publication 1779-6.5.7).

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Figure 3.5
Connections to the Networks on the 1779-KP5



You must construct a Data Highway Plus drop cable using the following pinout information:

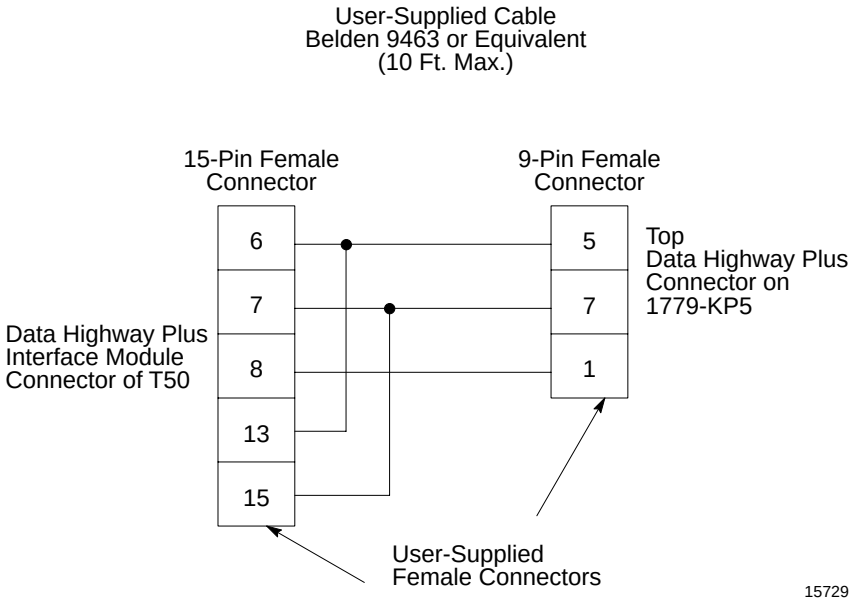


For more information on Data Highway Plus cabling, refer to the Data Highway Cable Assembly and Installation Manual (Publication 1770-6.2.1).

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Connecting a T50 Industrial Terminal

You can connect a T50 Industrial Terminal (Cat. No. 1784-T50) to the 1779-KP5 for use on the Data Highway Plus network. To connect the T50 to the 1779-KP5, you can use a 1784-CP5 cable, or you can construct a cable using the following pinout:



Connecting Power and Ground

After you mount the 1779-KP5 module and set the switches and jumper, you connect the module to power and ground. The following sections contain:

- Guidelines for Power Distribution
- A Procedure for Connecting Power and Ground to the Terminal Block

Power-Distribution Guidelines

Allen-Bradley power supplies have circuits that suppress electromagnetic interference from other equipment. For installations near particularly bad electrical noise generators, an isolation transformer can provide further suppression of electromagnetic interference from other equipment.

In applications where the AC power source is subject to unusual variations, a constant-voltage transformer can stabilize the AC power source to the interface, thereby minimizing shutdowns.

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To provide AC power isolation between the 1779-KP5 and other equipment, connect a separate transformer between the module's power supply and the AC power source. Connect the:

- Transformer primary to the AC source.
- High side of the transformer secondary to the L1 terminal of the power supply.
- Low side of the transformer secondary to the L2/N terminal of the power supply.

The 1779-KP5 consumes 50 watts of power. To determine the required rating of the transformer, multiply the power requirements of the Allen-Bradley power supplies by 2.5 and add all other power requirements (input circuits, output circuits). Take into consideration the surge currents of devices controlled by the controller when determining power requirements. The minimum transformer rating requirement for the 1779-KP5 interface is 125 VA.

The 115V AC power supplies on Allen-Bradley modules are designed to shut down whenever the AC line voltage drops below 85V. The power supply allows the interface to resume operation when the line voltage reaches 85V again. The 230V AC power supplies on Allen-Bradley modules shut down at 170V AC.

If the transformer is too small, it clips the peak of the sine wave before the voltage drops below 85 volts. The power supply senses this as a low voltage and shuts down the interface prematurely.

Connecting Power and Ground to the Terminal Strip

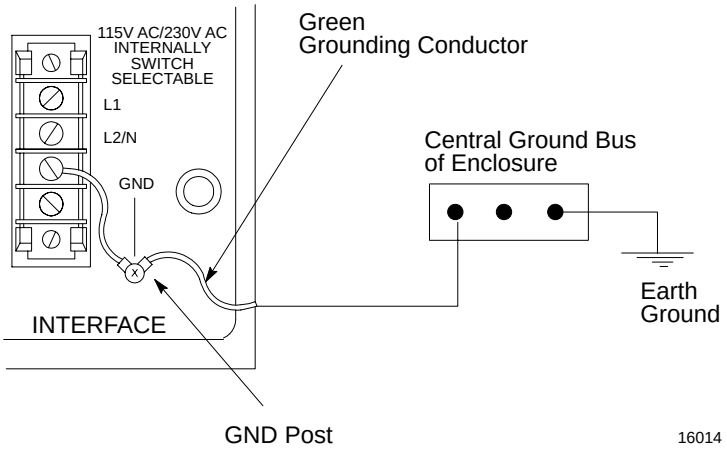
1. Make sure that you remove all power to the enclosure. Usually, you remove power by locking open the main disconnect switch on your enclosure.



WARNING: Do not connect power to the power terminals without first removing power from the enclosure. Otherwise, you may be injured by electrical shock.

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2. Connect the GND post on the module to the central ground bus of your enclosure.



The interface is shipped to you with a wire connecting the post to the stationary frame and another wire connecting the post to the GND terminal of the terminal block. When you ground the post on the removable frame, you thereby also ground the stationary frame and the power-supply board.

Follow all applicable codes and standards when you ground the module. Refer to the National Electric Code published by the National Fire Protection Association of Boston for more information. Refer to Article 250 of the code for sizes and types of conductors and methods of safely grounding electrical components.

3. Connect the L2/N terminal to the low side of the transformer supplying the AC power. Then connect the L1 terminal to the high side of the transformer supplying the AC power.

4. Install the terminal cover (supplied with your module) over the terminal block.

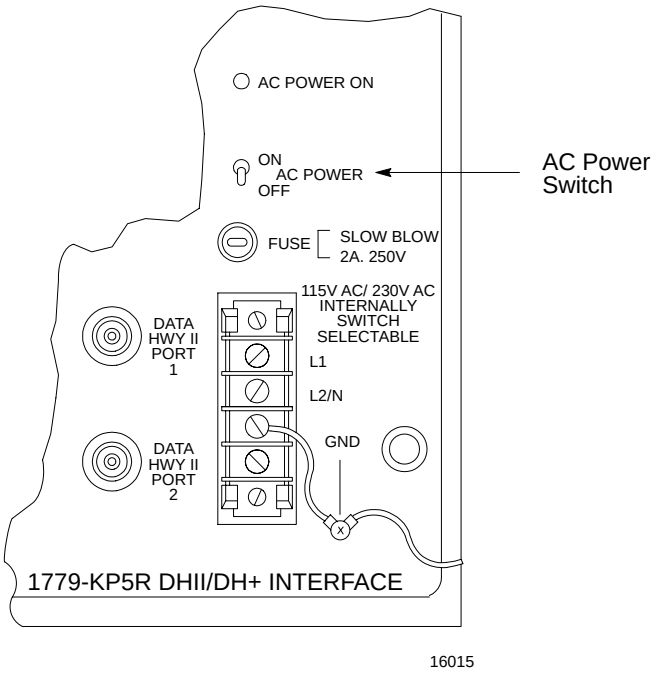
WARNING: Do not leave the terminal block exposed. Otherwise, you may touch these terminals and be injured by an electrical shock.

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Powering Up the 1779-KP5 Interface

To power up the 1779-KP5, use the following procedure:

1. Set the AC POWER switch on the front panel of the module to OFF.



2. Restore power to the 1779-KP5. Usually, this means you must close the main disconnect switch on the enclosure containing the 1779-KP5.

3. Set the AC POWER switch to ON.

   When you power up the 1779-KP5, all the diagnostic LEDs on the interface flash briefly as the module executes power-up diagnostics. The LEDs should then switch to normal operation.

   Refer to Chapter 6 for:

   - A More Complete Description of the LED Indicators
   - A Description of Troubleshooting Tools You Have Available

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Chapter 4

Addressing from Data Highway II

Chapter Objectives

In this chapter, we provide a description of how to address the following links from a node on Data Highway II:

- A Data Highway Plus Link Using Local Link Addressing (Link = 0)
- Another Data Highway II Link Using Remote Link Addressing (Link > 0)
- A Data Highway Plus Link Using Remote Link Addressing (Link > 0)

Limitations on Sending Commands

The 1779-KP5 does not support Data Highway II time-critical commands because these commands are not supported by Data Highway Plus. The 1779-KP5 rejects time-critical commands and returns an error reply to the initiating node. For more information on error codes, refer to your interface manual and Chapter 6 of this manual.

The 1779-KP5 replies to the following diagnostic commands from a Data Highway II node:

- Diagnostic Status
- Diagnostic Loop

The 1779-KP5 does not contain Data Highway II diagnostic counters. This is because Data Highway II counters are application layer counters and the 1779-KP5 does not provide application layer functions.

Refer to Chapter 6 for a list of 1779-KP5 diagnostic status bytes.

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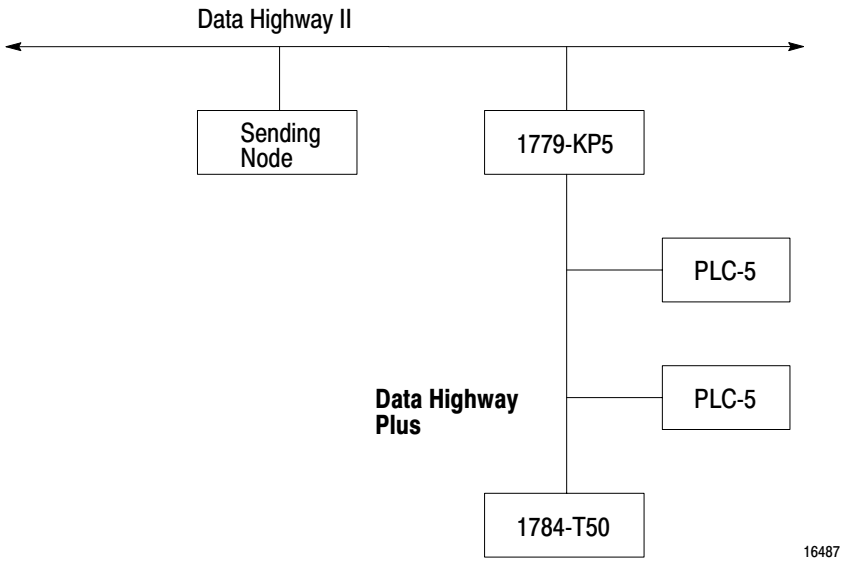
Addressing a Data Highway Plus Node Using Local Addressing

You use local addressing to communicate with a node on a local Data Highway Plus link. A local Data Highway Plus link:

- Is directly connected to the Data Highway II link you are communicating from.
- Has a link value of zero.

Figure 4.1 shows an example of a configuration which uses local addressing.

Figure 4.1
Local Addressing Configuration



Important: A computer on Data Highway Plus cannot address a node on a remote link such as Data Highway II.

When you use local addressing to address a Data Highway Plus node, you can only use Addresses 01 through 20 (octal) on the Data Highway Plus link.

When you use local addressing, you use the LINK, NODE, and USER fields to specify the node address.

The **LINK value** is always zero for local commands.

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The **NODE value** for each Data Highway Plus node is the same as the node address of the 1779-KP5 it is connected to (between 01 and 77 octal). Refer to Chapter 3 for information on setting the node address of a 1779-KP5 using the thumbwheels on the front panel.

For example, if the NODE value of the 1779-KP5 is 50 (octal), the NODE value of each Data Highway Plus node connected to it is also 50.

The **USER value** is the Data Highway Plus node address. The USER value must be between two and 20 (octal).

The 1779-KP5 reserves USER 01 to identify itself to nodes on Data Highway II. You can still use Data Highway Plus Address 01 (the 1784-T50 default address), but Data Highway II nodes will not be able to communicate to this Data Highway Plus node.

For example, a Data Highway Plus node, Address 15 (octal), connected to the 1779-KP5 at:

LINK	NODE
00	50

would have the Data Highway II address:

LINK	NODE	USER
00	50	15

Important: Due to PLC-2 address limitations, the USER value you use when sending a command from a 1779-KP2 does not equal the Data Highway Plus address. For more information, refer to the following section on PLC-2 addressing. If you are using a 1779-KP2 to communicate to Data Highway Plus, make sure that the 1779-KP5 node address is not 00 to 07. The 1770-T3 terminal cannot communicate to these addresses.

The following sections provide guidelines for addressing Data Highway Plus nodes from Data Highway II using local addressing.

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Addressing Data Highway Plus from a PLC-2

To send a message from a PLC-2 (1779-KP2) on Data Highway II to a Data Highway Plus node, you use the following address format in the communication zone of your ladder-logic program (NNN = Node, UUU = User):



The 1779-KP2 does not support the network layer. The **LINK value** is automatically 00 (local link).

The **NODE value** is the node address of the 1779-KP5 that connects you to the destination Data Highway Plus link (the link that contains the node you want to communicate with).

The PLC-2 **USER value** is determined differently than for other nodes on Data Highway II. Since a PLC-2 cannot send to Addresses 00 to 07 octal (these addresses are defined by the PLC-2 for processor work area), a PLC-2's access to other node addresses would be extremely limited (only Stations 10 through 20 octal). To solve this problem, the PLC-2 uses a formula to convert the node addresses. This allows the PLC-2 to access all allowable addresses (02 through 20 octal) on Data Highway Plus.

To determine the PLC-2 USER value of a Data Highway Plus node, add 10 (octal) to the Data Highway Plus address. For example, Data Highway Plus Node 12 (octal) has a PLC-2 USER value of 22:

$$12 + 10 = 22 \text{ (octal)}$$

For more information on addressing a PLC-2 on Data Highway II, refer to the PLC-2 Family Interface (1779-KP2, -KP2R) User's Manual (Publication 1779-6.5.3).

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Addressing Data Highway Plus from a PLC-3

To send a message from a PLC-3 (1779-KP3) on Data Highway II to a Data Highway Plus node, you use the following address format in the message instruction of your ladder-logic program (NNN = Node, UUU = User):

:NNN.UUU

The 1779-KP3 does not support the network layer. The **LINK value** is automatically 00 (local link).

The **NODE value** is the node address of the 1779-KP5 that connects you to the destination Data Highway Plus link (the link that contains the node you want to communicate with).

The **USER value** is the Data Highway Plus address of the node you want to communicate with.

For example, a PLC-3 message instruction to read a file from a PLC-5:

- with Data Highway Plus Address 012 (octal)
- connected to the 1779-KP5 with a Data Highway II address of 045 (octal)

would look like this:

MOVE FROM **:45.12**$E0.10.0.0 TO $N10:0,20

If you are communicating to a PLC-5, you need to send a PLC-5 four-level address instead of a six-level address:

Address Level	PLC-3	PLC-5
1	Major Section 3 = Data Table	Major Section 0 = Data Table
2	Context	File Number (Must Be 0 - 15)
3	Section	Element
4	File	Sub-Element
5	Structure	--
6	Word	--

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Important: If you use a file value of greater than 15, the value wraps around to zero. For example, a value of 16 specifies File 0, a value of 17 specifies File 1, etc.

You must enter the PLC-5 address in the following address format:

$ E [Major Section] . [File #] . [Element] . [Sub-Element]

If you send a full PLC-3 six-level address to a PLC-5, the PLC-5 will return an error.

Addressing Data Highway Plus from a 1779-KFL or 1779-KFM Device

To address a Data Highway Plus node from a programmable device connected to a 1779-KFL, -KFLR or 1779-KFM, -KFMR, the device must enter the appropriate LINK, NODE, and USER values in the message packet.

The **LINK value** is always 00 for local addressing.

The **NODE value** is the node address of the 1779-KP5 that connects you to the destination Data Highway Plus link (the link that contains the node you want to communicate with).

The **USER value** is the Data Highway Plus address of the node you want to communicate with.

For example, if you send a message to:

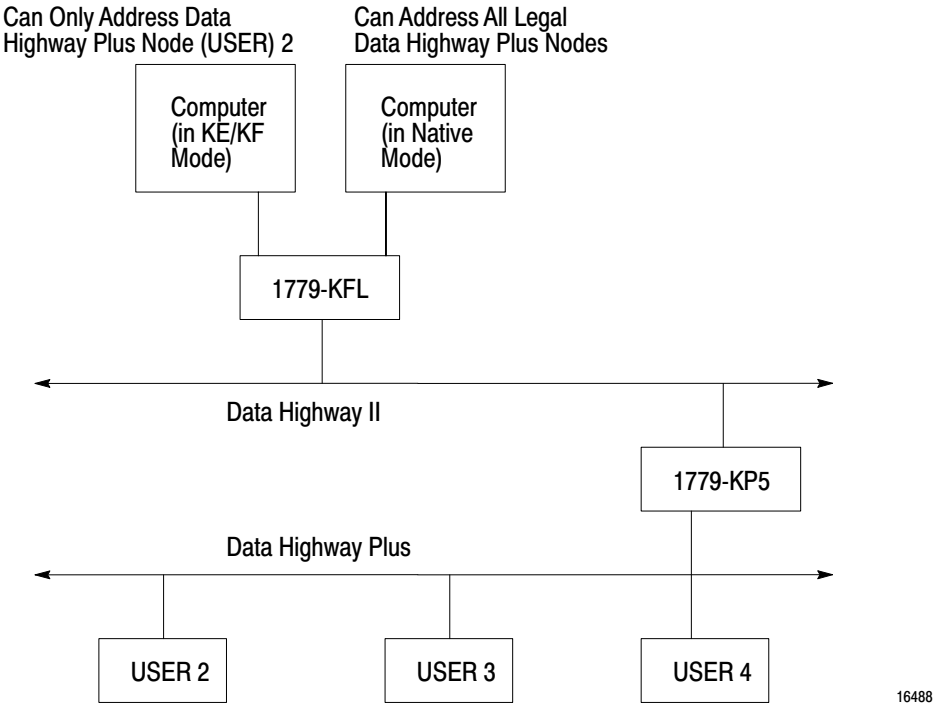
- a PLC-5 at Address 13 (octal)
- on a Data Highway Plus connected to a 1779-KP5 with the Data Highway II Node Address 16 (octal)

your message packet looks similar to this:

SEL	EXT	FF	LINK 00	NODE 16	USER 13	CMD	STS	TNS	TNS

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A computer with Data Highway (DF1) driver connected to a 1779-KFL in KE/KF emulation mode will only be able to address a single Data Highway Plus node. This Data Highway Plus node must have a Data Highway Plus address of 002.

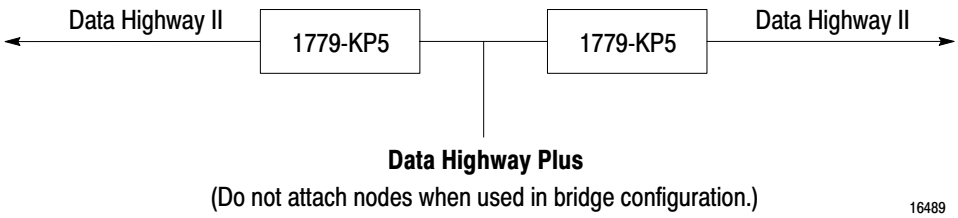


Addressing a Remote Data Highway II Node Using Remote Addressing

Figure 4.2 shows an example configuration showing two 1779-KP5 modules used as a bridge between two Data Highway II links.

Important: Only Series B modules support communication between two Data Highway II links. The PLC-2 Family Interface (1779-KP2, -KP2R) and the PLC-3 Family Interface (1779-KP3, -KP3R) do not offer a Series B version.

Figure 4.2
Bridging between Two Data Highway Ii Networks



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When you send a message from a node on your Data Highway II link to a node on a remote Data Highway II link, you address the node using the LINK, NODE, and USER fields.

Use the **LINK** field to specify what link the remote node is on. The LINK value of a remote link can be between 1 and 15. You set the link value of a remote link using switches on the remote link's 1779-KP5 (Chapter 3).

Use the **NODE** and **USER** fields the same way as normal Data Highway II addressing. The NODE field specifies the node address on the remote link. The USER field specifies the user on the remote node.

For example, if you want to send a message to:

- User 1
- on a 1779-KFL with Node Address 17
- on Remote Link 13

your address fields would like like this:

LINK	NODE	USER
13	17	01

Addressing a Remote Data Highway Plus Using Remote Addressing

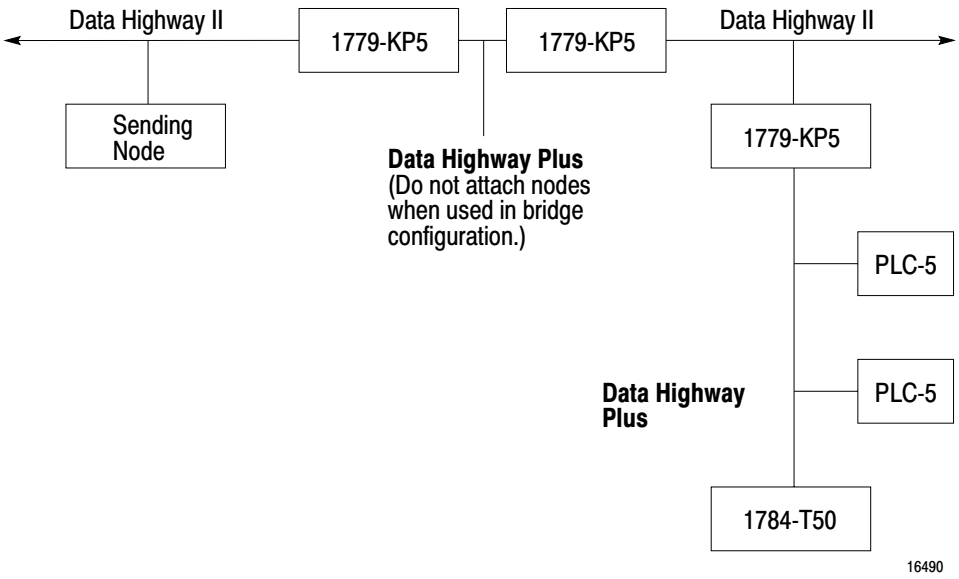
You use remote addressing to communicate with a node on a remote Data Highway Plus link. A remote Data Highway Plus link has a link value greater than zero.

Important: Only Series B Data Highway II modules support communication to a remote Data Highway Plus link. The PLC-2 Family Interface (1779-KP2, -KP2R) and the PLC-3 Family Interface (1779-KP3, -KP3R) do not offer a Series B version.

Figure 4.3 shows an example of a configuration which uses remote addressing.

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Figure 4.3
Remote Addressing Configuration



There are two ways to communicate to a remote Data Highway Plus link:

- Using a Remote Data Highway II Link Number
- Using a Remote Data Highway Plus Link Number

The following sections show these two methods.

Using a Data Highway II Link Number

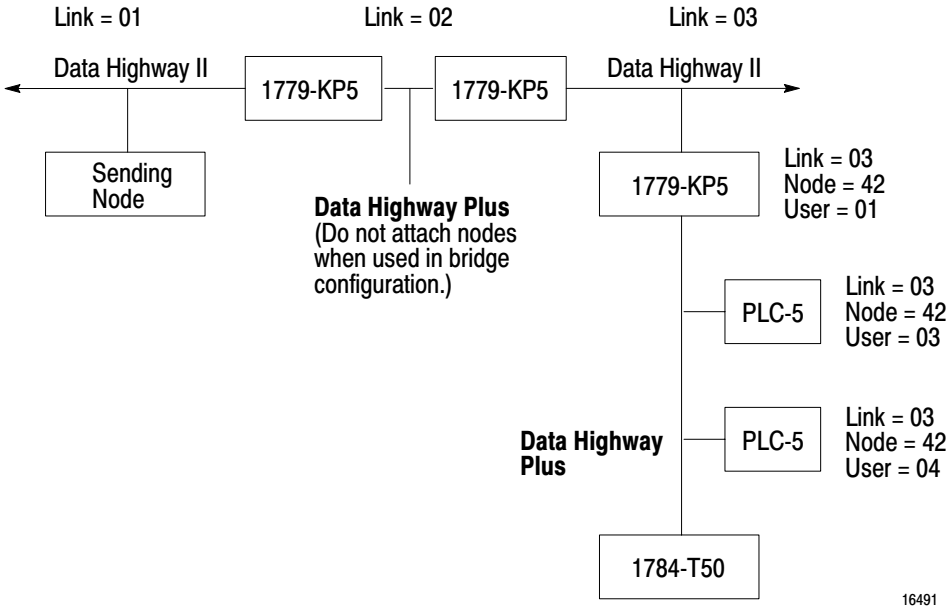
When you use the Data Highway II link number, you can only address Nodes 02 through 20 (octal) on the Data Highway Plus link.

You use the LINK, NODE, and USER fields to specify the Data Highway Plus node address.

Figure 4.4 shows an example address using the Data Highway II link number.

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Figure 4.4
Addressing a Remote Data Highway Plus Node Using a Data Highway II Link Number



The **LINK value** is the link value of the remote Data Highway II link to which the Data Highway Plus link is attached. The LINK value of a remote link can be between 1 and 15. You set the link value of a Data Highway II link using switches on the remote link's 1779-KP5 (Chapter 3).

The **NODE value** for each Data Highway Plus node is the same as the Data Highway II node address of the 1779-KP5 it is connected to. Refer to Chapter 3 for information on setting the node address of a 1779-KP5 using the thumbwheels on the front panel.

For example, if the NODE value of the 1779-KP5 is 42 (octal), the NODE value of each Data Highway Plus node connected to it is also 42.

The **USER value** is the Data Highway Plus node address. The USER value must be between 1 and 20 (octal).

The 1779-KP5 reserves USER 01 to identify itself to nodes on Data Highway II. You can still use Data Highway Plus Address 001 (the 1784-T50 default address), but Data Highway II nodes will not be able to communicate to this Data Highway Plus node.

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Using a Data Highway Plus Link Number

When you use a Data Highway Plus link number, you can address up to 64 nodes to your Data Highway Plus link.

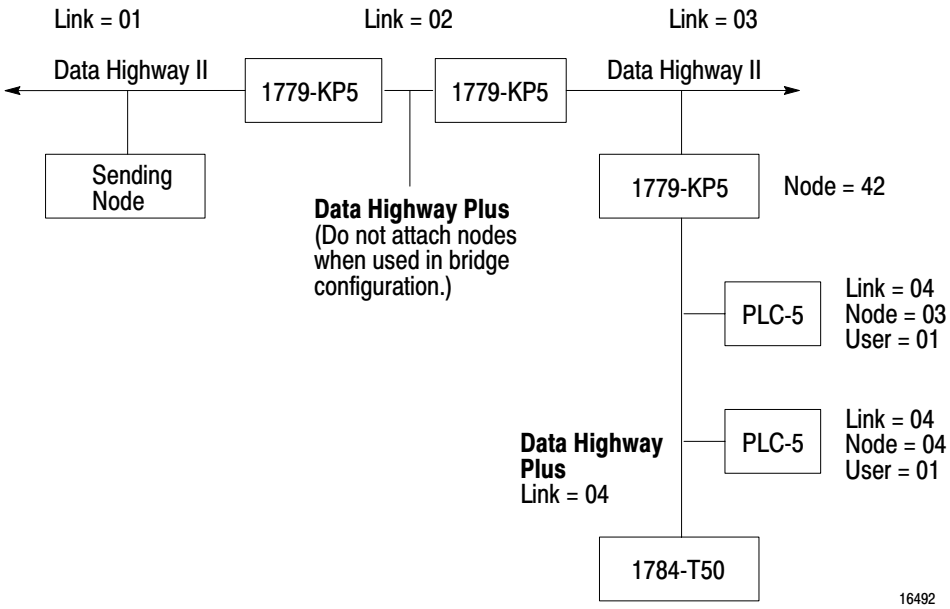
To use a Data Highway Plus link number to address a Data Highway Plus node, you must:

- Not enable the route update messages. This means that your 1779-KP5 can receive route updates, but it cannot send a route update to inform other 1779-KP5 modules on where to find the Data Highway Plus link.
- Use station-management commands to send the routes from an intelligent device on your network to the other 1779-KP5 modules. When your device sends the FIXED ROUTE to all local 1779-KP5 modules, these modules will update the route for all other links on the network. For more information, refer to your 1779-KFL, -KFLR or 1779-KFM, -KFMR documentation.

You use the LINK, NODE, and USER fields to specify the Data Highway Plus node address.

Figure 4.5 shows an example address using the Data Highway Plus link number.

Figure 4.5
Addressing a Remote Data Highway Plus Node Using a Data Highway Plus Link Number



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The **LINK number** is the LINK number you have set on your 1779-KP5 for the Data Highway Plus link (Chapter 3).

The **NODE number** is the destination node's Data Highway Plus address.

The **USER number** must be 1.

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Chapter 5

Addressing from Data Highway Plus

Chapter Objectives

In this chapter, we provide a description of how to address nodes on:

- Data Highway II from nodes from Data Highway Plus.
- Another Data Highway Plus connected to the same Data Highway II network.
- Another Data Highway Plus connected to a remote Data Highway II network.

Limitations on Sending Commands

The 1779-KP5 replies to the following diagnostic commands from a Data Highway Plus node:

- Diagnostic Status
- Diagnostic Read
- Reset Diagnostic Counters
- Diagnostic Loop

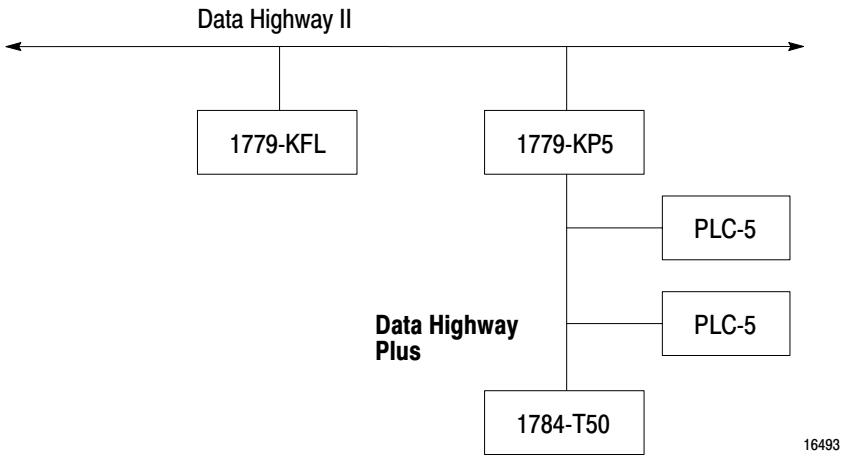
Refer to Chapter 6 for a list of 1779-KP5 diagnostic counters and diagnostic status bytes.

Addressing a Local Data Highway II Node Using Local Addressing

This section describes how you address a local Data Highway II node. A local Data Highway II node is a node on the Data Highway II link directly connected to the Data Highway Plus link through a 1779-KP5. Figure 5.1 shows an example configuration.

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Figure 5.1
Data Highway II and Data Highway Plus Configuration



When you send a message to a Data Highway II node from Data Highway Plus, you specify the address using the LINK, NODE, and USER fields the same way as the normal Data Highway II addressing.

The **LINK value** for local addressing is always zero.

The **NODE value** of a Data Highway II node is the node address you set on the module using the thumbwheels on the front panel.

The default **USER value** for all Data Highway II devices is 01. For a 1779-KFL module, the devices will have USER values of 01 and 02.

For example, a Data Highway II node, Address 15, connected to a 1779-KFL User 2, would have the address:

LINK	NODE	USER
00	15	02

Important: The address of the initiating Data Highway Plus node must be between 02 and 20 (octal) so that the reply message can be returned. A computer on Data Highway Plus cannot address a node on a remote link, such as Data Highway II or another Data Highway Plus link.

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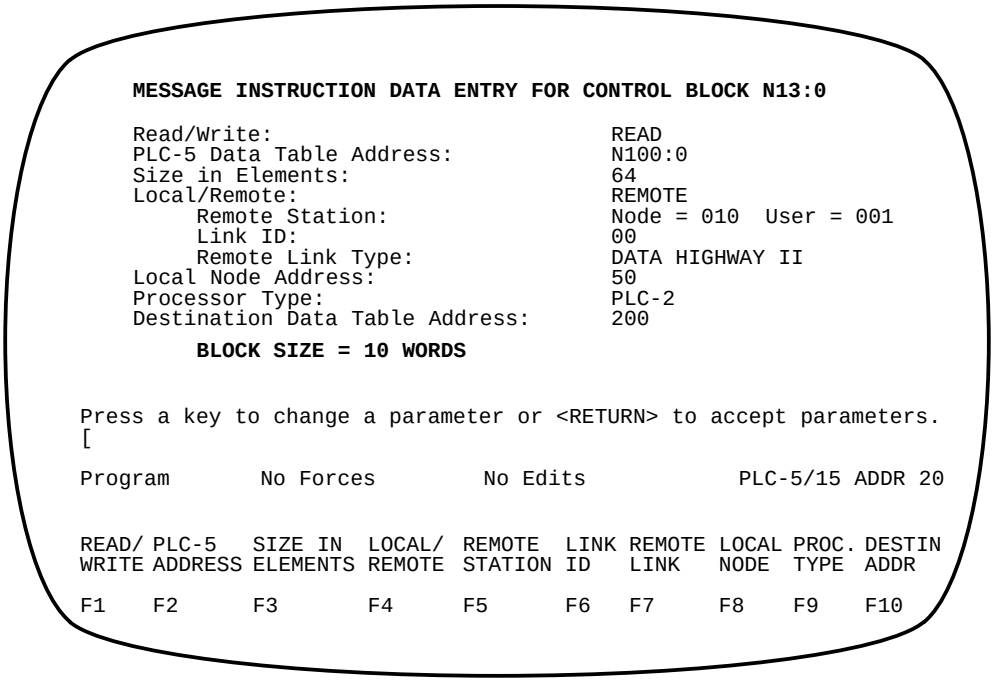
You can send commands to Data Highway II from Data Highway Plus Addresses 002 through 020 (octal). You may still assign Address 001 (the default address for the 1784-T50) and Addresses 021 through 077 (octal) on your Data Highway Plus network, but these nodes are unable to initiate messages to nodes on your Data Highway II network.

In our examples, we use a 1784-T50 Industrial Terminal and Version 2.2 software to display PLC-5 commands. For more information on how to use Version 2.1 software (or earlier), refer to Appendix B.

The following sections provide guidelines for addressing various types of PLC and computer nodes.

Data Highway Plus to a PLC-2 (1779-KP2, -KP2R)

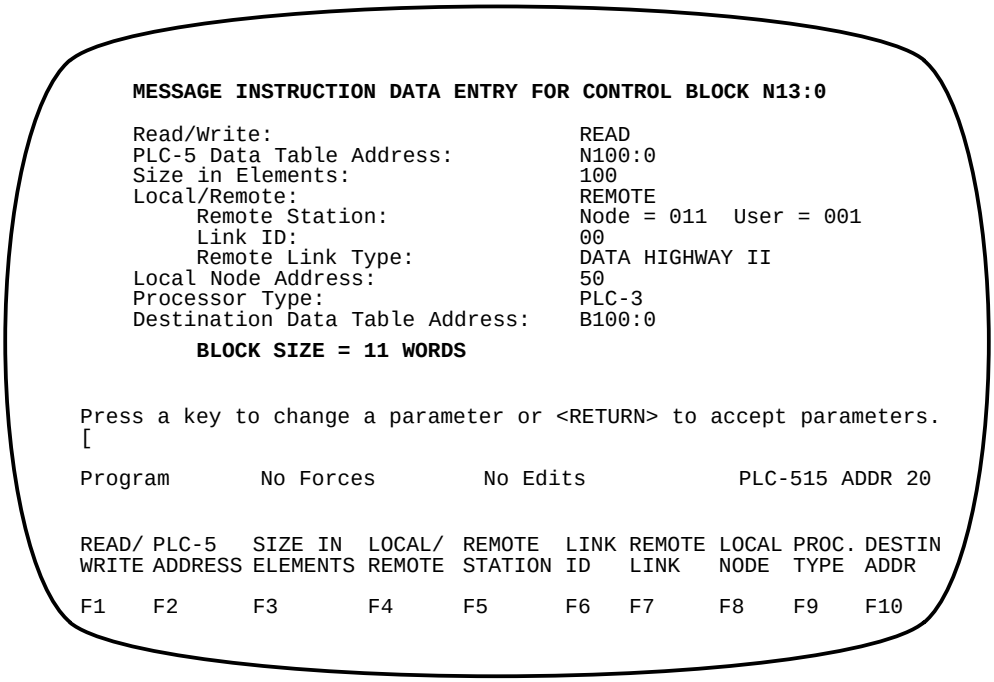
The following example shows a PLC-5 message instruction that reads 64 words of data from a PLC-2 (Data Highway II Link 00, Node 010), starting at Memory Location 200. The command stores the data at Memory Location N100:0 in the initiating PLC-5.



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Data Highway Plus to a PLC-3 (1779-KP3, -KP3R)

The following example shows a PLC-5 message instruction that reads 100 words of data from a PLC-3 (Data Highway II Link 00, Node 11), starting at Memory Location B100:0. The command stores the data at Memory Location N100:0 in the initiating PLC-5.



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Data Highway Plus to a Synchronous-Device Interface (1779-KFM, -KFMR)

The following example shows a PLC-5 message instruction (displayed by the T50) that writes 100 words of data from the PLC-5, starting at Memory Location N100:0. The command is a PLC-2-type command and stores the data at Memory Offset 010 in the computer.

```
     MESSAGE INSTRUCTION DATA ENTRY FOR CONTROL BLOCK N13:0

     Read/Write:                          WRITE
     PLC-5 Data Table Address:            N100:0
     Size in Elements:                    100
     Local/Remote:                        REMOTE
          Remote Station:                 Node = 012  User = 001
          Link ID:                        00
          Remote Link Type:               DATA HIGHWAY II
     Local Node Address:                  50
     Processor Type:                      PLC-2
     Destination Data Table Address:      010
          BLOCK SIZE = 10 WORDS


Press a key to change a parameter or <RETURN> to accept parameters.
[

Program       No Forces         No Edits            PLC-5/15 ADDR 20


READ/ PLC-5   SIZE IN  LOCAL/  REMOTE  LINK REMOTE LOCAL PROC. DESTIN
WRITE ADDRESS ELEMENTS REMOTE  STATION ID   LINK   NODE  TYPE  ADDR

F1    F2      F3       F4      F5      F6   F7     F8    F9    F10
```


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Data Highway Plus to an Asynchronous-Device Interface (1779-KFL, -KFLR)

The following is an example of PLC-5 message instruction that writes 100 words of data from the PLC-5, starting at Memory Location N100:0, to the first port (USER = 01) of the 1779-KFL. The command is a PLC-2-type command and stores the data at Memory Offset 010 in the computer.

```
     MESSAGE INSTRUCTION DATA ENTRY FOR CONTROL BLOCK N13:0

     Read/Write:                          WRITE
     PLC-5 Data Table Address:            N100:0
     Size in Elements:                    100
     Local/Remote:                        REMOTE
          Remote Station:                 Node = 013  User = 001
          Link ID:                        00
          Remote Link Type:               DATA HIGHWAY II
     Local Node Address:                  50
     Processor Type:                      PLC-2
     Destination Data Table Address:      010
          BLOCK SIZE = 10 WORDS


Press a key to change a parameter or <RETURN> to accept parameters.
[

Program       No Forces        No Edits            PLC-5/15 ADDR 20


READ/ PLC-5   SIZE IN  LOCAL/  REMOTE  LINK REMOTE LOCAL PROC. DESTIN
WRITE ADDRESS ELEMENTS REMOTE  STATION ID   LINK   NODE  TYPE  ADDR

F1    F2      F3       F4      F5      F6   F7     F8    F9    F10
```

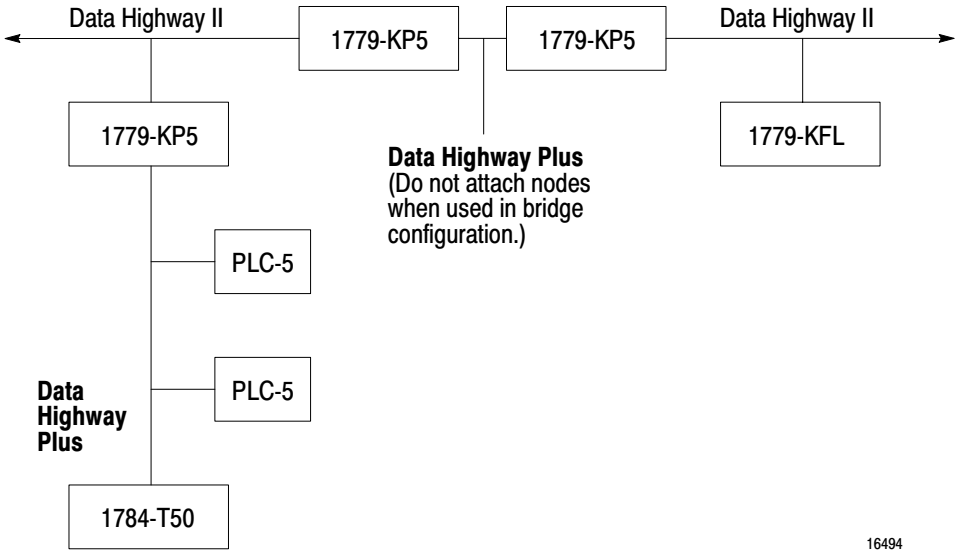
Communicating to a Remote Data Highway II Using Remote Addressing

This section describes communicating to a node on a remote Data Highway II link. To address a remote Data Highway II link, you must send the message over a 1779-KP5 bridge. Figure 5.2 shows an example configuration.

You can send commands to Data Highway II from Data Highway Plus Addresses 002 through 020 (octal). You may still assign Address 001 (the default address for the 1784-T50) and Addresses 021 through 077 (octal) on your Data Highway Plus network, but these nodes are unable to initiate messages to nodes on your Data Highway II network.

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Figure 5.2
Data Highway Plus to Remote Data Highway II Configuration



The **LINK value** is the link value of the remote Data Highway II link. You set this number with switches on the 1779-KP5 (refer to Chapter 3).

The **NODE value** of a Data Highway II node is the node address you set on the module using the thumbwheels on the front panel.

The default **USER value** for all Data Highway II devices is 01. For a 1779-KFL module, the devices will have USER values of 01 and 02.

For example, a node on Data Highway II Link 03, Address 15, connected to a 1779-KFL User 2, would have the address:

LINK	NODE	USER
03	15	02

Important: The address of the initiating Data Highway Plus node must be between 02 and 20 (octal) so that the reply message can be returned. A computer on Data Highway Plus cannot address a node on a remote link, such as Data Highway II or another Data Highway Plus link.

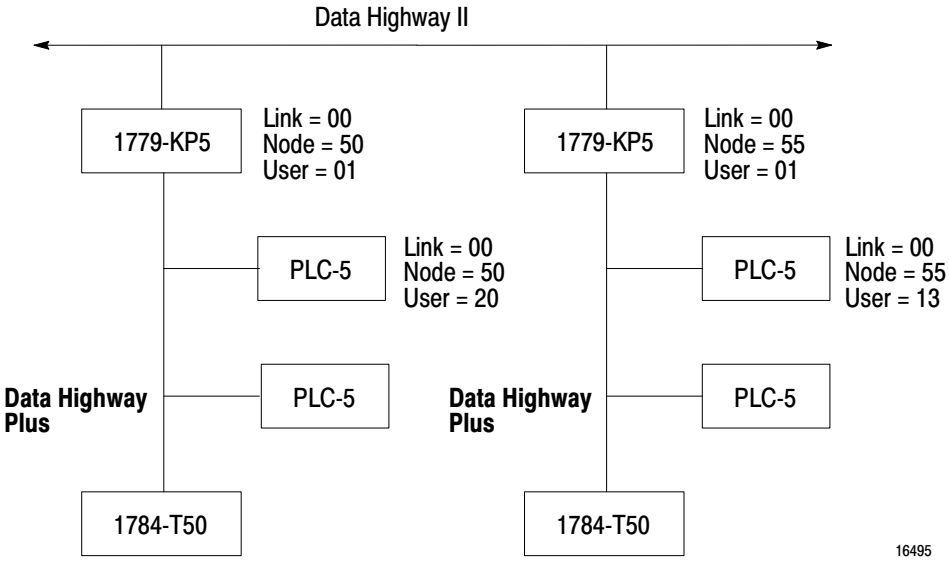
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Communicating to a Local Data Highway Plus Link Using Local Addressing

Two Data Highway Plus links are considered local to each other if they are connected to the same Data Highway II link.

Figure 5.3 shows an example configuration using local Data Highway Plus links.

Figure 5.3
A Local Data Highway Plus Configuration



When you address a local Data Highway Plus link from another Data Highway Plus link, you are limited to addressing a total of 15 nodes (02 through 20 octal) on a Data Highway Plus link.

The **LINK number** is always zero for a local link.

The **NODE number** is the NODE address of the 1779-KP5 that connects the other Data Highway Plus link to Data Highway II.

The **USER number** is the address of the node on Data Highway Plus.

For example, the following message instruction is an example of communicating from a PLC-5 to a PLC-5 on a remote Data Highway Plus using local addressing. This message instruction reads 1,000 words from a PLC-5, Node 013 on a remote Data Highway Plus link. It reads these

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words from Memory Location N100:0 of the remote PLC-5 and stores them in Memory Location N100:0 in the initiating PLC-5.

```
MESSAGE INSTRUCTION DATA ENTRY FOR CONTROL BLOCK N13:0

Read/Write:                          READ
PLC-5 Data Table Address:            N100:0
Size in Elements:                    1000
Local/Remote:                        REMOTE
     Remote Station:                 Node = 055  User = 013
     Link ID:                        00
     Remote Link Type:               DATA HIGHWAY II
Local Node Address:                  50
Processor Type:                      PLC-5
Destination Data Table Address:      N100:0
     BLOCK SIZE = 11 WORDS


Press a key to change a parameter or <RETURN> to accept parameters.
[

Program       No Forces         No Edits            PLC-5/15 ADDR 20


READ/ PLC-5   SIZE IN  LOCAL/  REMOTE  LINK REMOTE LOCAL PROC. DESTIN
WRITE ADDRESS ELEMENTS REMOTE  STATION ID   LINK   NODE  TYPE  ADDR

F1    F2      F3       F4      F5      F6   F7     F8    F9    F10
```

Communicating to a Remote Data Highway Plus

There are two ways to communicate to a remote Data Highway Plus link:

- Using a Data Highway II Link Number
- Using a Data Highway Plus Link Number

The following sections show these two methods.

Using a Data Highway II Link Number

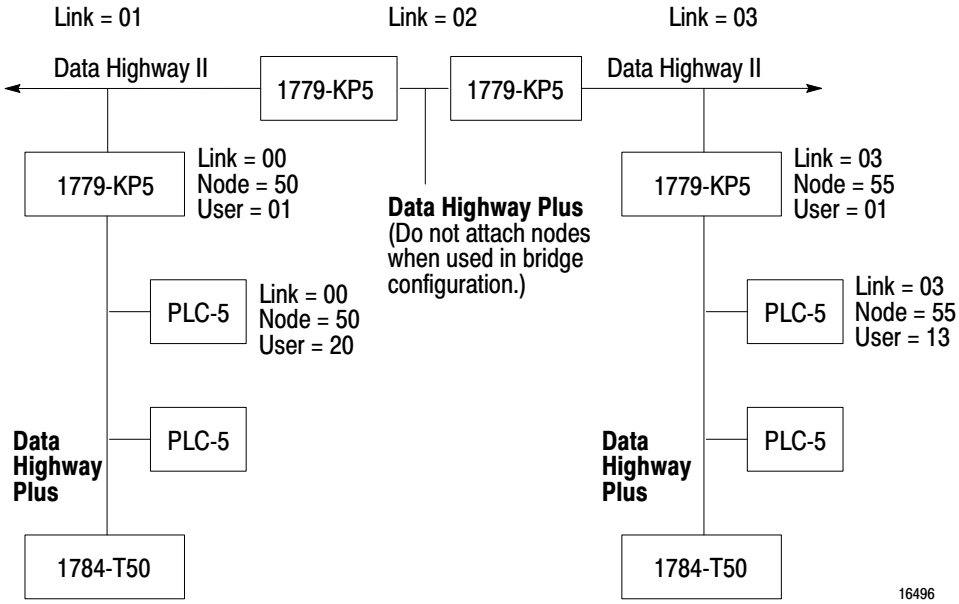
This method limits you to addressing a total of 15 nodes (02 through 20 octal) on a Data Highway Plus link, but it is also easier to implement.

Important: The address of the initiating Data Highway Plus node must be between 02 and 20 (octal) so that the reply message can be returned. The address of the initiating Data Highway Plus node must be between 02 and 20 (octal) so that the reply message can be returned.

Figure 5.4 shows an example configuration using a remote Data Highway Plus link.

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Figure 5.4
A Remote Data Highway Plus Configuration



This method treats the nodes on your Data Highway Plus link as users connected to the 1779-KP5.

The **LINK number** is the LINK number of the Data Highway II link that the remote Data Highway Plus link is connected to.

The **NODE number** is the NODE address of the 1779-KP5 that connects the Data Highway Plus link to Data Highway II.

The **USER number** is the address of the node on the Data Highway Plus.

For example, the following message instruction is an example of communicating from a PLC-5 to a PLC-5 on a remote Data Highway Plus across a bridge. This message instruction reads 1,000 words from a PLC-5, Node 013 on a remote Data Highway Plus link. It reads these words from Memory Location N100:0 of the remote PLC-5 and stores them in Memory Location N100:0 in the initiating PLC-5.

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```
MESSAGE INSTRUCTION DATA ENTRY FOR CONTROL BLOCK N13:0

Read/Write:                          READ
PLC-5 Data Table Address:            N100:0
Size in Elements:                    1000
Local/Remote:                        REMOTE
     Remote Station:                 Node = 055  User = 013
     Link ID:                        03
     Remote Link Type:               DATA HIGHWAY II
Local Node Address:                  50
Processor Type:                      PLC-5
Destination Data Table Address:      N100:0
     BLOCK SIZE = 11 WORDS


Press a key to change a parameter or <RETURN> to accept parameters.
[

Program       No Forces        No Edits            PLC-5/15 ADDR 20


READ/ PLC-5   SIZE IN  LOCAL/  REMOTE  LINK REMOTE LOCAL PROC. DESTIN
WRITE ADDRESS ELEMENTS REMOTE  STATION ID   LINK   NODE  TYPE  ADDR

F1    F2      F3       F4      F5      F6   F7     F8    F9    F10
```

Using a Data Highway Plus Link Number

When you use a Data Highway Plus link number, you can address up to 64 nodes to your Data Highway Plus link.

To use a Data Highway Plus link number to address a Data Highway Plus node, you must:

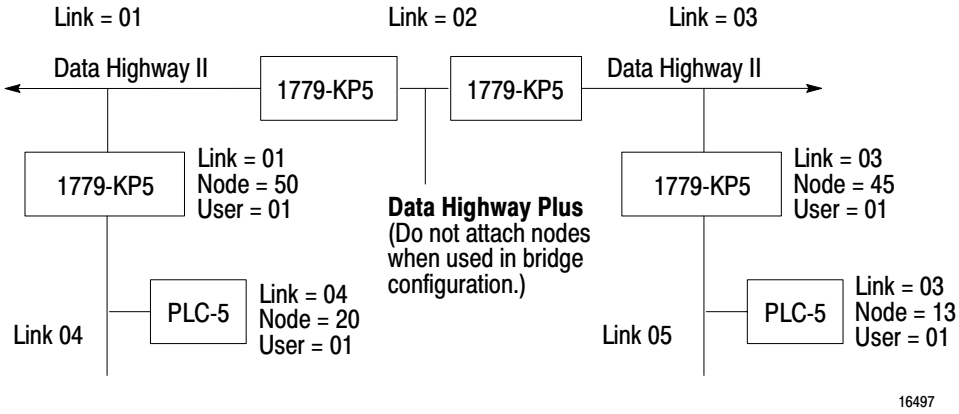
- Not enable the route update messages. This means that your 1779-KP5 can receive route updates, but it cannot send a route update to inform other 1779-KP5 modules on where to find the Data Highway Plus link.
- Use station-management commands to send the routes from an intelligent device on your network to the other 1779-KP5 modules. When your device sends the FIXED ROUTE to all local 1779-KP5 modules, these modules will update the route for all other links on the network. For more information, refer to your 1779-KFL, -KFLR or 1779-KFM, -KFMR documentation.

Important: The address of the initiating Data Highway Plus node must be between 02 and 20 (octal) so that the reply message can be returned.

Figure 5.5 shows an example configuration using a remote Data Highway Plus link.

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Figure 5.5
A Remote Data Highway Plus Configuration

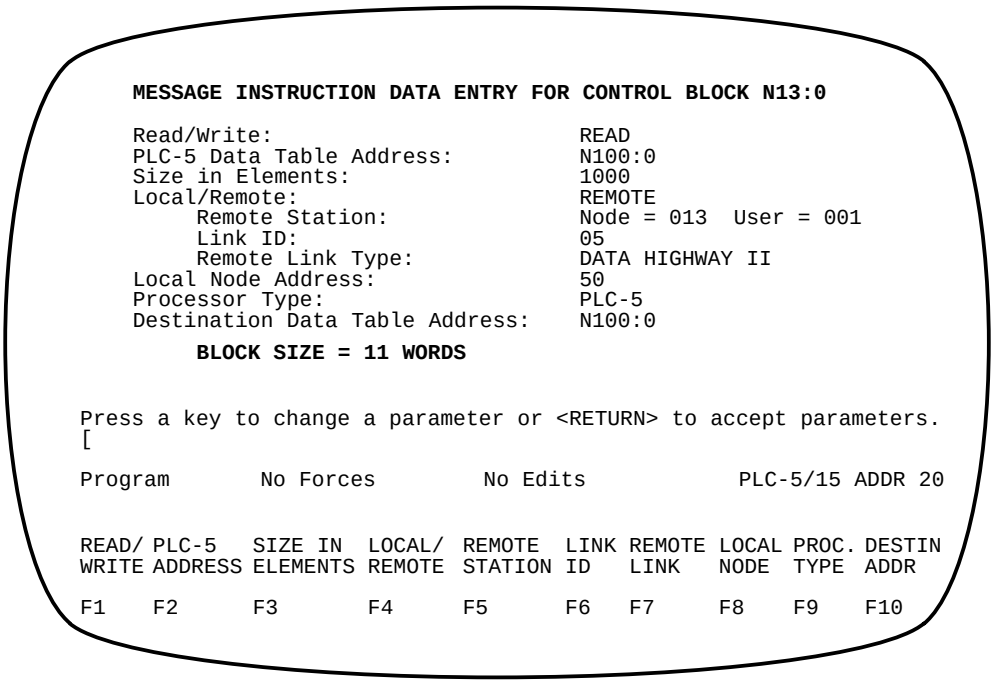


Since your Data Highway Plus link has a LINK number, the addressing will work as follows:

- The **LINK number** is the LINK number you have set on your 1779-KP5 for the Data Highway Plus link.
- The **NODE number** is the destination node's Data Highway Plus address.
- The **USER number** must be 1.

For example, the following message instruction is an example of communicating from a PLC-5 to a PLC-5 on a remote Data Highway Plus across a bridge. This message instruction reads 1,000 words from a PLC-5, Node 013 on a remote Data Highway Plus link. It reads these words from Memory Location N100:0 of the remote PLC-5 and stores them in Memory Location N100:0 in the initiating PLC-5.

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Chapter 6

1779-KP5 Troubleshooting Tools

Chapter Objectives

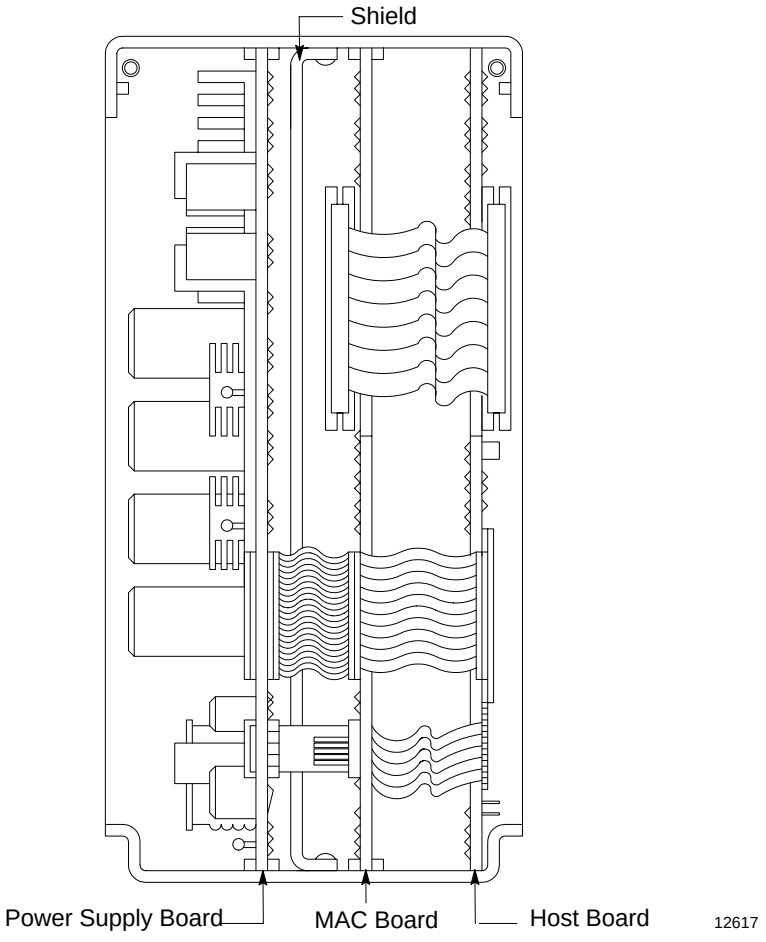
In this chapter, we provide information on:

- Replacing circuit boards in your 1779-KP5.
- Using LED indicators on the front of the 1779-KP5.
- Using the 1779-KP5 diagnostic status bytes and a list of the status information.
- Using the 1779-KP5 diagnostic counters and a list of the counters.
- Error codes that may be sent to your node when communicating with the 1779-KP5.

Replacing Circuit Boards

The 1779-KP5 and 1779-KP5R have three replaceable circuit boards (Figure 6.1).

Figure 6.1
Replaceable Circuit Boards Inside the 1779-KP5



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This Board:	Catalog Number:	Provides a Link to:
Power Supply	1779-PH2	The Power Source for Your Module
MAC	1779-JMA/1779-JMAR	The Data Highway II Network
Host	1779-JP5	The Data Highway Plus Network

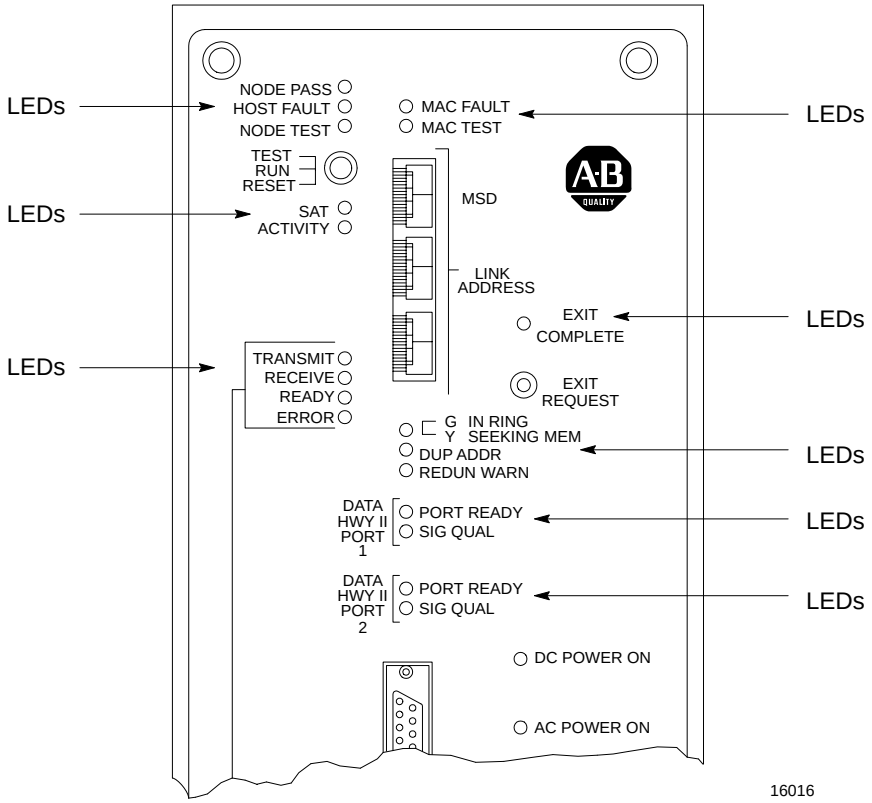
The Power-Supply Board and MAC board are the same boards that you use for the other Data Highway II modules (except the 1779-KP3). This means that you do not need to keep a different type of spare Power-Supply Board or MAC board for each interface on your network.

For more information on replacing the circuit boards inside your 1779-KP5, refer to the Data Highway II Replacement Boards Product Data (Publication 1779-2.8).

Using the LED Indicators

Figure 6.2 shows the LED indicators on the front panel of the 1779-KP5 module. These indicators can help you in diagnosing problems with the module's installation and operation.

Figure 6.2
The LED Indicators



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The 1779-KP5 has 19 indicators on its front panel. The 1779-KP5R has three additional indicators:

- A Redundant-Warning Indicator
- Port-Ready and Signal-Quality Indicators for the Redundant Port

These indicators provide you with the following diagnostic information:

When This Indicator:	Is:	Then:
NODE PASS	On Green	The host and MAC boards have passed self-diagnostic tests.
HOST FAULT	On Red	The host board has either failed the self-diagnostic test or faulted while in operation.
NODE TEST	On Yellow	The host and MAC board are performing self-diagnostic tests.
MAC FAULT	On Yellow	The MAC board has either failed the self-diagnostic test, faulted while in operation, or there is another module with the same node address on the network. A MAC fault also causes the HOST FAULT indicator to light.
MAC TEST	On Yellow	The MAC board is performing a self-diagnostic test.
SAT	On Yellow	The node has reached the peak of its ability to process messages.
ACTIVITY	On Green	The 1779-KP5 is active on the Data Highway II network.
TRANSMIT	On Yellow	The 1779-KP5 is sending messages to Data Highway Plus. The transmit light usually appears to flicker.
RECEIVE	On Yellow	The 1779-KP5 is receiving messages from Data Highway Plus. The receiving light usually appears to flicker or remain solid.
READY	On Green	The 1779-KP5 has a message stored in its transmit buffer and is waiting to acquire the Data Highway Plus token.
ERROR	On Red	An error has occurred while transmitting a message.
EXIT COMPLETE	On Yellow	This node has left the logical ring of the Data Highway II link.
IN RING	On Green	This node is a member of the logical ring on the Data Highway II link and can send messages.
SEEKING MEM	On Yellow	This node is trying to become a member of the logical ring, or trying to build a logical ring in the case that a ring does not already exist. A node must be a member of the ring to send messages.
	Off	This node is not a member of a logical ring and is not seeking membership. It cannot send messages on the highway.
DUP ADDR	On Red	Another node has the same address on the Data Highway II link. This condition also places this node into the disconnect state and turns on the MAC FAULT indicator.
REDUN WARN (1779-KP5R Only)	On Yellow	A valid signal is being received at only one of the two Data Highway II ports on the redundant module.
PORT READY (Redundant modules have one for each port.)	On Green	The on-board relay connecting the MAC board to the dropline is ready for messages.
SIG QUAL (Redundant modules have one for each port.)	On Green	A valid signal is being received at this Data Highway II port.
	On Red	No signal or an invalid signal is being received at this Data Highway II port.
AC POWER ON	On Orange	The interface is receiving AC power through the fuse and the AC power switch.
DC POWER ON	On Green	The power-supply board is generating DC power within specification.

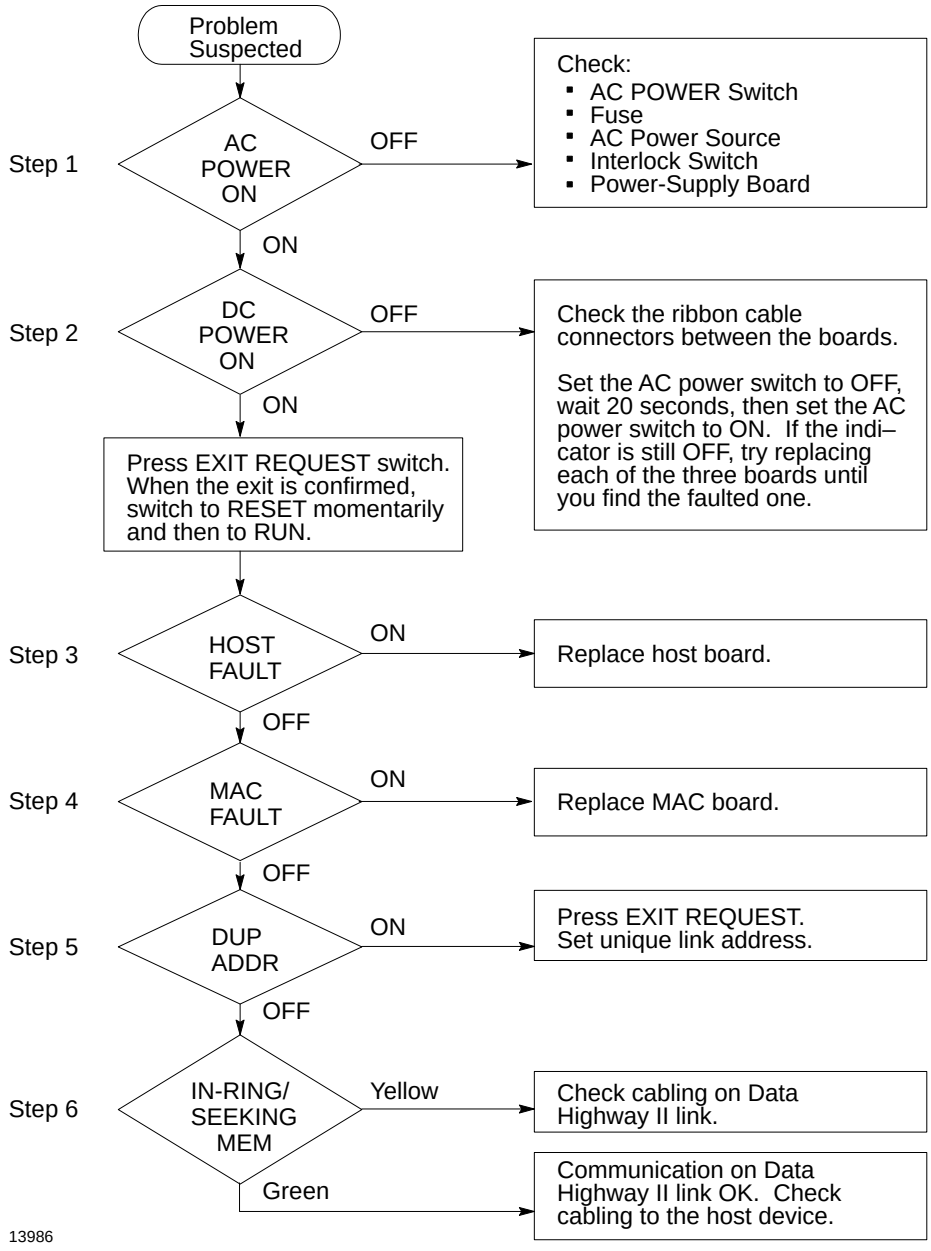
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When the module is passing the token or sending messages on a small network, the RECEIVE LED appears to remain lit and the TRANSMIT LED flickers.

Using the LEDs to Troubleshoot the Module

When you suspect that the 1779-KP5 is not functioning properly, use the following troubleshooting flowchart (Figure 6.3).

Figure 6.3
Troubleshooting Flowchart



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1779-KP5 Diagnostic Status Bytes

Diagnostic status bytes contain information about the module, Data Highway II, and Data Highway Plus.

To read the status bytes, you send a Diagnostic Status command from a computer on your Data Highway II or Data Highway Plus network. For information on how to read diagnostic status bytes, refer to the Data Highway/Data Highway Plus Protocol and Command Set Reference Manual (Publication 1770-6.5.16).

Diagnostic Status Bytes for Data Highway II

Data Highway II diagnostic status bytes can be read from an intelligent device (computer) connected to your Data Highway II network. The following table contains a list of the 1779-KP5's diagnostic status bytes for Data Highway II:

Byte Number	Description	
1		00 = Not Used
2	**Interface/Processor Type**	EE = See Expansion Bytes (Bytes 3 and 4)
3	**Interface Type Expansion Byte**	1A = 1779-KP5
4	**Processor Type Expansion Byte**	16 = Data Highway II Information
5		00 = Not Used
6	**Data Highway Plus Link Number**	01 = Link 1 02 = Link 2 Etc.
7	**Data Highway II Link Number**	01 = Link 1 02 = Link 2 Etc.
8		00 = Not Used
9, 10		00 = Not Used
11	**Series and Revision**	Bits 0-4 0 = Revision A 1 = Revision B Etc. Bits 5-7 0 = Series A 1 = Series B Etc.
12	**Option Switches**	Bits 0-3: SW-5 Data Highway Plus Baud Rate 02 = 230 Kb 04 = 115 Kb 06 = 57.6 Kb Bits 4-7: SW-4 Route Updates 00 = Route Updates Disabled 03 = Route Updates Enabled

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Diagnostic Status Bytes for Data Highway Plus

Data Highway Plus diagnostic status bytes can be read from an intelligent device (computer) connected to your Data Highway Plus network. The following table contains a list of the 1779-KP5's diagnostic status bytes for Data Highway Plus:

Byte Number	Description	
1		00 = Not Used
2	**Interface/Processor Type**	EE = See Expansion Bytes (Bytes 3 and 4)
3	**Interface Type Expansion Byte**	1A = 1779-KP5
4	**Processor Type Expansion Byte**	17 = Data Highway Plus Information
5, 6		00 = Not Used
7, 8	**Address of Active Node Table**	Byte 7 = Low Byte Byte 8 = High Byte
9, 10	**Diagnostic Counter Address**	Byte 9 = Low Byte Byte 10 = High Byte
11	**Series and Revision**	Bits 0-4 0 = Revision A 1 = Revision B Etc. Bits 5-7 0 = Series A 1 = Series B Etc.
12	**Option Switches**	Bits 0-3: SW-5 Data Highway Plus Baud Rate 02 = 230 Kb 04 = 115 Kb 06 = 57.6 Kb Bits 4-7: SW-4 Route Updates 00 = Route Updates Disabled 03 = Route Updates Enabled

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1779-KP5 Diagnostic Counters

The following sections tell you:

- What a Diagnostic Counter Is
- How to Read Diagnostic Counters
- What 1779-KP5 Diagnostic Counters Contain

What is a Diagnostic Counter?

A diagnostic counter records an event of interest for debugging the module and for longer term reliability analysis.

Since Data Highway II uses application layer diagnostic counters, the 1779-KP5 does not have diagnostic counters for Data Highway II. However, the 1779-KP5 does have counters for Data Highway Plus.

The diagnostic counters occupy a block of the module's internal scratch RAM. Most are single byte counters that reset to zero when they overflow.

These counters provide a useful tool for diagnosing problems.

How to Read Diagnostic Counters

To read diagnostic counters, you must issue a **Diagnostic Read** command. This command can only be sent from a device:

- Connected to a Data Highway Plus with an interface module that supports an asynchronous port.
- That can format the diagnostic commands.

Therefore, a PLC user program is unable to initiate a Diagnostic Read command.

Important: The location of the diagnostic counters in a Data Highway Plus module varies:

- From module to module.
- Between revision levels of the same type module.

You must first request the location of these counters by transmitting a **Diagnostic Status** command to the module. Based on the address returned, you can use the number of the counters which follow as an offset to calculate:

- The location of a particular counter.
- How many counter values you want returned.

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You can then use this information to format a **Diagnostic Read** command. The reply from the Diagnostic Read command contains the data stored in the counters.

For more information on the Diagnostic Status and Diagnostic Read commands, refer to the Data Highway/Data Highway Plus Protocol and Command Set Reference Manual (Publication 1770-6.5.16).

1779-KP5 Data Highway Plus Diagnostic Counters

The 1779-KP5 stores 28 Data Highway Plus counters in 35 bytes. These counters can only be read from an intelligent device (computer) connected to the same Data Highway Plus as the 1779-KP5. The following table contains a list of 1779-KP5 Data Highway Plus diagnostic counter bytes and what they contain (all two byte counters are read low byte first).

Counter Byte:	Counts the Number of Times:
0	Received ACK with Bad CRC
1	Timeout Expired with No ACK Received
2	Transmit Retries Exhausted
3	NAK/Illegal Protocol Operation Received
4	NAK/Bad LSAP Received
5	NAK/No Memory Received
6	Received ACK/NAK Too Short
7	Received ACK/NAK Too Long
8	Something Other than an ACK or NAK Received
9	Token Pass Timeout
10	Token Pass Retries Exhausted
11	Claim Token Entered
12	Token Claimed
13	Bad CRC in Received Frame
14	NAK/Illegal Protocol Operation Sent
15	NAK/Bad LSAP Sent
16	NAK/No Memory Sent
17	Received Frame Too Short
18	Received Frame Too Long
19	Received a Retransmission of a Frame
20	Received Frame Aborted (Line Noise)
21, 22	Message Successfully Sent
23, 24	Message Successfully Received
25, 26	Command Successfully Sent
27, 28	Reply Successfully Received
29, 30	Command Successfully Received
31, 32	Reply Successfully Sent
33	Reply Could Not be Sent
34	Number of Active Nodes

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1779-KP5 Error Codes

When you send a message to a 1779-KP5, it may return one of the errors listed in the table below. The error code will be returned in the EXT STS byte of a packet.

Error Code:	Is Returned When:
90 NO_MEM	The Data Highway Plus node that you addressed has no memory to buffer the message.
F7 ERR_BAD_USER	The Data Highway Plus node that you addressed is not an active node.

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Appendix A

Specifications

Function
- Interface a Data Highway Plus network with a Data Highway II network.

Communication Ports
- Data Highway II: BNC Connector
- Data Highway Plus: 3-Screw Terminal Block
- 1784-T50 Terminal: 9-Pin Male D-Shell Connector
- DHII AUX ACCESS Connector: For Future Product Enhancement (Keep covered with conductive cap provided to avoid electrostatic discharge.)

Communication Rates
- Data Highway II: 1 Mb
- Data Highway Plus: 57.6 Kb, 115.2 Kb

Cabling
- To Data Highway II: User-Supplied Cable (Refer to Publication 1779-6.57)
- To Data Highway Plus: User-Supplied Cable (Refer to Publication 1770-6.2.1)

Power Requirements
- Voltage: 115/230V AC Selectable
- Voltage Range: 85 - 132V AC or 170 - 264V AC
- Current: 1.5A or 0.75A
- Frequency: 47-63 Hz
- Fuse: Slow Blow 2A 250V Type 3AG
- Power: 50W

Mounting Dimensions (H x W x D)
- 15.75” x 6.5” x 11.0”
- 400 mm x 165 mm x 280 mm

Environmental Conditions
- Operating Temperature: 32ºF to 140ºF (0ºC to 60ºC)
- Storage Temperature: -40ºF to 185ºF (-40ºC to 85ºC)
- Humidity: 5% to 95% Non-Condensing

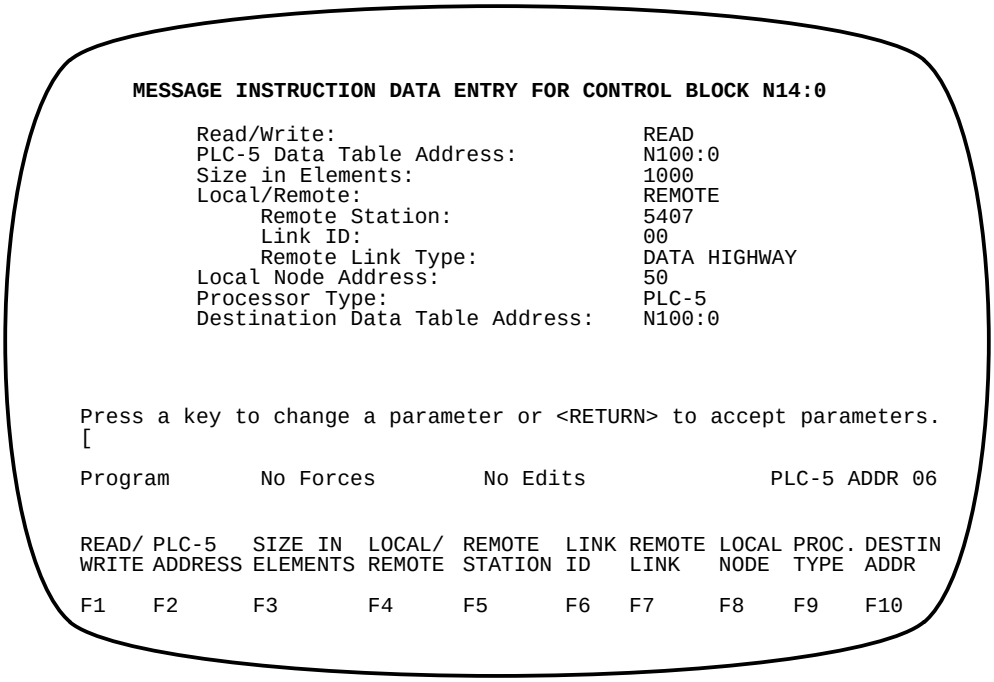
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Appendix B

Using 6200 Series Software Version 2.1 and Earlier

Version 2.1 Display

The following screen shows a message instruction for communicating from a PLC-5 to a PLC-5 on a remote Data Highway Plus network:



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The following table tells you what information you must enter at each prompt:

At This Prompt:	You:
Read/Write	Toggle between READ for a read command and WRITE for a write command.
PLC-5 Data Table Address	Enter the local data table address where data starts for the WRITE command or data will be stored for the READ command.
Size in Elements	Enter the message size in elements.
Local/Remote	Select REMOTE (through the 1779-KP5).
Remote Station	Enter the destination NODE number. If the USER number is not the default (01), then you will need to manually enter it in the control file as described later in this appendix.
Link ID	Enter the destination LINK value.
Remote Link Type	Select DATA HIGHWAY for Data Highway II or Data Highway Plus.
Local Node Address	Enter the address of the 1779-KP5.
Processor Type	Select the destination processor type (toggle between PLC-2, PLC-3, and PLC-5).
Destination Data Table Address	Enter the destination processor's data table address.

If the USER number you use is not the default (01), you need to manually enter the USER number in the message control file. The following section provides a procedure for entering a USER number into the control file.

Important: When you manually enter a USER number, the remote station number appears to be incorrectly displayed due to how the 1784-T50 interprets the USER number.

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Entering the User Number into the Message Control File

When you use 6200 Series software Version 2.1 (or earlier) to communicate from a node on Data Highway Plus to a:

- computer/1779-KFL on Data Highway II
- node on a remote Data Highway Plus network

you must manually enter the USER number into the message control file.

After you have entered a message instruction, enter the USER number byte into the message control file using the following procedure:

1. Make sure the cursor is not on an instruction, then press **[F8]** - Data Monitor.

2. Enter the control block address (for example, N13:0) and press the ENTER key. The following type of display will appear:

```
Address   0    1    2    3    4    5    6    7    8    9

N13:0     0000 2728 0064 0407 0064 0000 000B 0002 1000 0400
N13:10    0000



Press a key or enter value.
N13:0 = [

Program   No Forces    Hex/BCD Data   Decimal ADDR   PLC-5 ADDR 13



CHANGE    SPECIFY      NEXT      PREV      NEXT      PREV
RADIX     ADDRESS      FILE      FILE      PAGE      PAGE

F1        F5           F7        F8        F9        F10
```

The control file is displayed in words, not bytes.

The default radix for the display is in decimal. When you want to change only the single byte for the user number, it is easier to select hex/BCD as the radix of the display.

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3. Determine the location of the USER number byte based on the following information.

The message control file is a variable length file with the following layout:

Type of Data	Number of Bytes
Status Value	1
Error Value	1
Link Type	1
Local Destination Address (1779-KP5 Address)	1
Number of Bytes in Source Address	1
Source Address	Variable
Link ID	2
Remote Destination Address	1
USER Number	1
Number of Bytes in Destination Address	1
Destination Address	Variable
1784-T50 Information	2

The USER number always follows the Remote DST address in this file.

4. Use the right cursor [>] key to move to the word containing the USER number byte. Enter the USER number (in hex) on the display line, as well as the value for the other byte in the word, and press the [ENTER] key. This changes the value in the specified word to include the USER number.

Important: When you enter the value for the word containing the USER byte, do not change the value of the other byte in the word.

The following screens show the control file during the change and after the change:

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During the Change:

```
Address   0    1    2    3    4    5    6    7    8    9

N13:0     0000 2728 0064 0407 0064 0000 000B 0002 1000 0400
N13:10    0000



Press a key or enter value.
N13:7 = 0102[

Program   No Forces    Hex/BCD Data   Decimal ADDR   PLC-5 ADDR 13



CHANGE    SPECIFY     NEXT      PREV      NEXT      PREV
RADIX     ADDRESS     FILE      FILE      PAGE      PAGE

F1        F5          F7        F8        F9        F10
```

After the Change:

```
Address   0    1    2    3    4    5    6    7    8    9

N13:0     0000 2728 0064 0407 0064 0000 000B 0102 1000 0400
N13:10    0000



Press a key or enter value.
N13:7 = [

Program   No Forces    Hex/BCD Data   Decimal ADDR   PLC-5 ADDR 13



CHANGE    SPECIFY     NEXT      PREV      NEXT      PREV
RADIX     ADDRESS     FILE      FILE      PAGE      PAGE

F1        F5          F7        F8        F9        F10
```


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