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# **PanelMate® Allen-Bradley Communication Driver Manual**

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P/N 01-00447-05

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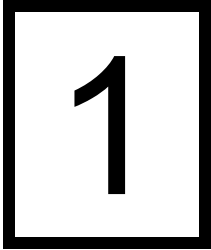
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# Driver Installation



*In this chapter, you will learn:*

- *About driver installation*
- *How to download drivers to a PanelMate unit*

## Installing Drivers

PanelMate Configuration Editor software is installed using a CD-ROM. To install the drivers from the CD-ROM, select the **Install Software** option and then **Install Drivers**. From the dialog box, select the driver you wish to install.

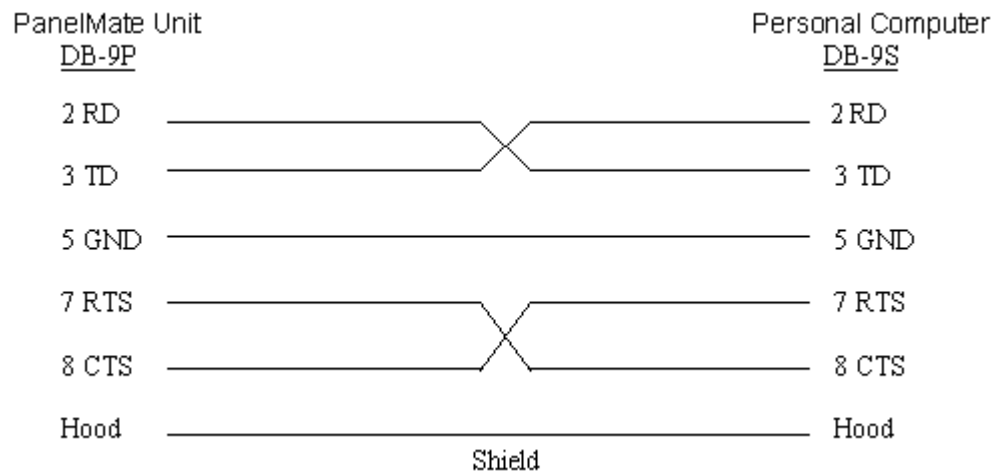


## Downloading Drivers to a PanelMate Unit

- In the VCP Transfer Utility, choose the “Executive” tab and select the proper Executive Firmware to download to the PanelMate unit.
- Click the button labeled “Add to Operation List.”  
**Note:** In order to download to a PanelMate for the first time or to clear the existence of another driver, the PanelMate must first be loaded with Executive Firmware.
- Choose the “Driver” tab.
- Select the appropriate driver to be downloaded to the PanelMate.
- Click the button labeled “Add to Operation List.”
- Place the PanelMate unit in Serial Transfer Mode.
- Connect a serial transfer cable from the correct port on the PC to port 1 on the PanelMate. (See cabling below.)
- Click “Start” at the bottom of the VCP Transfer Utility window.
- **Note:** For a more detailed description of downloading procedures and troubleshooting see *PanelMate Power Series, PowerPro, Pro LT Transfer Utility User’s Guide*.

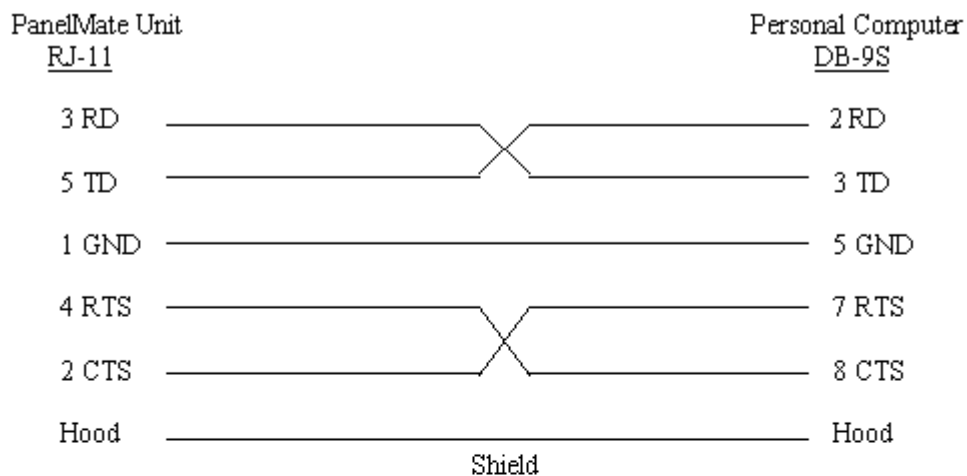
### Serial Transfer Cables

#### Cable P/N 0518

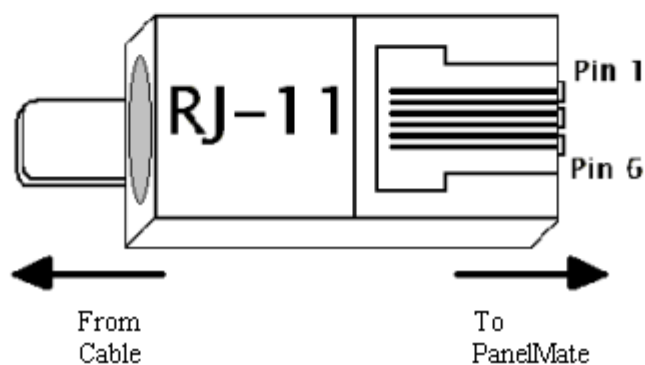


**Cable P/N 0818**

(PanelMate Power Series 1500 and PanelMate 500 only)



RJ-11 pin configuration



# Allen-Bradley PLC-5 PLCs

## 2

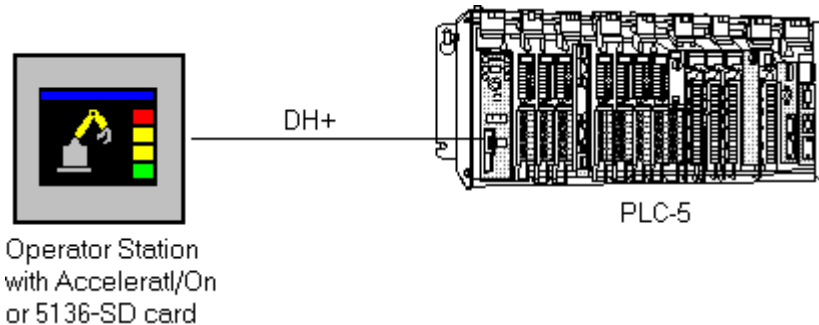
*In this chapter, you will learn:*

- *The different connectivity options*
- *About PLC modules*
- *About operator station setup*
- *About PLC and communication module setup*
- *The different cable diagrams*
- *How to address memory*
- *About the control button reset delay*
- *About unsolicited messages*
- *What is maintenance access*
- *The PLC cabling cross-reference list*
- *The different remote errors*

## Connectivity Options

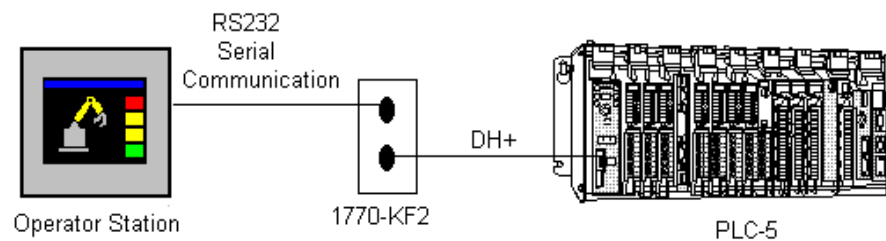
### One Operator Station to One PLC

#### Connecting to Data Highway Plus using AcceleratI/On or 5136-SD Card



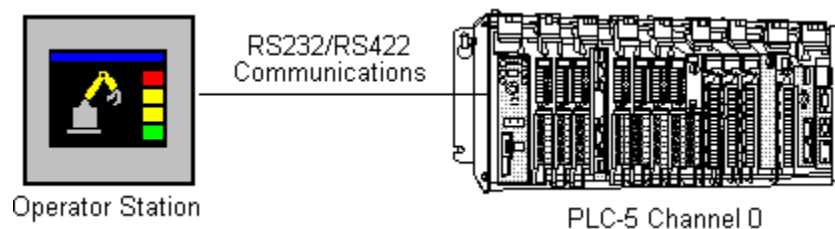
**Note:** The Operator Station can also communicate through an RS232 connection to a 1785-KE module in a PLC-5 rack.

#### Connecting to Data Highway Plus



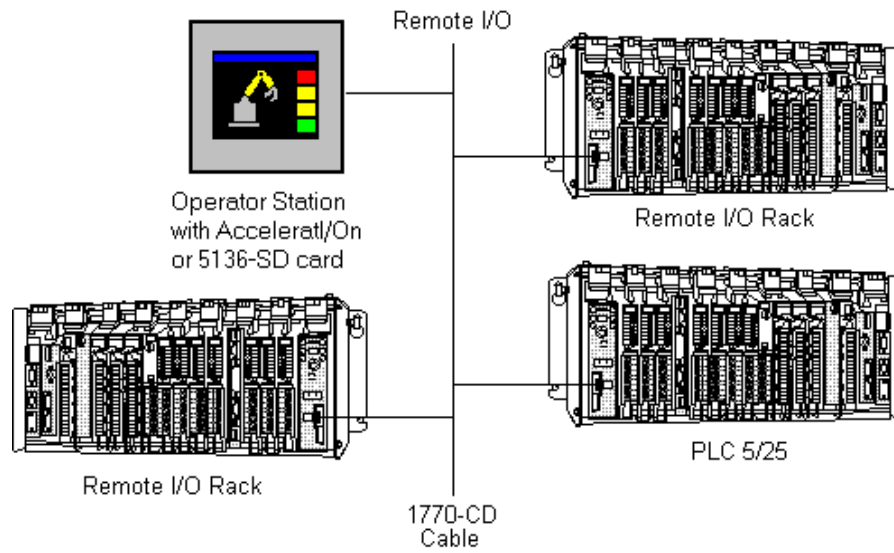
**Note:** The Operator Station can also communicate through an RS232 connection to a 1785-KE module in a PLC-5 rack.

#### Connecting to PLC Channel 0

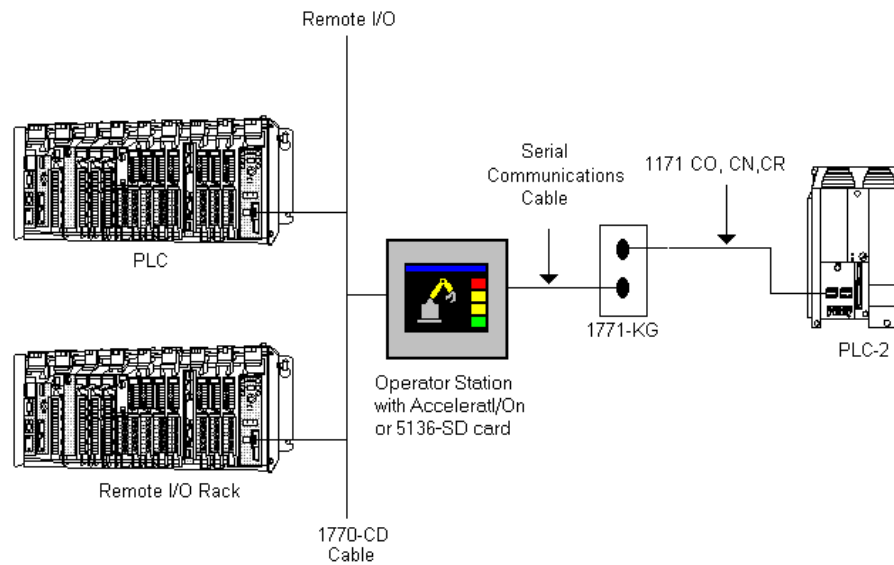


## One Operator Station to Multiple PLCs

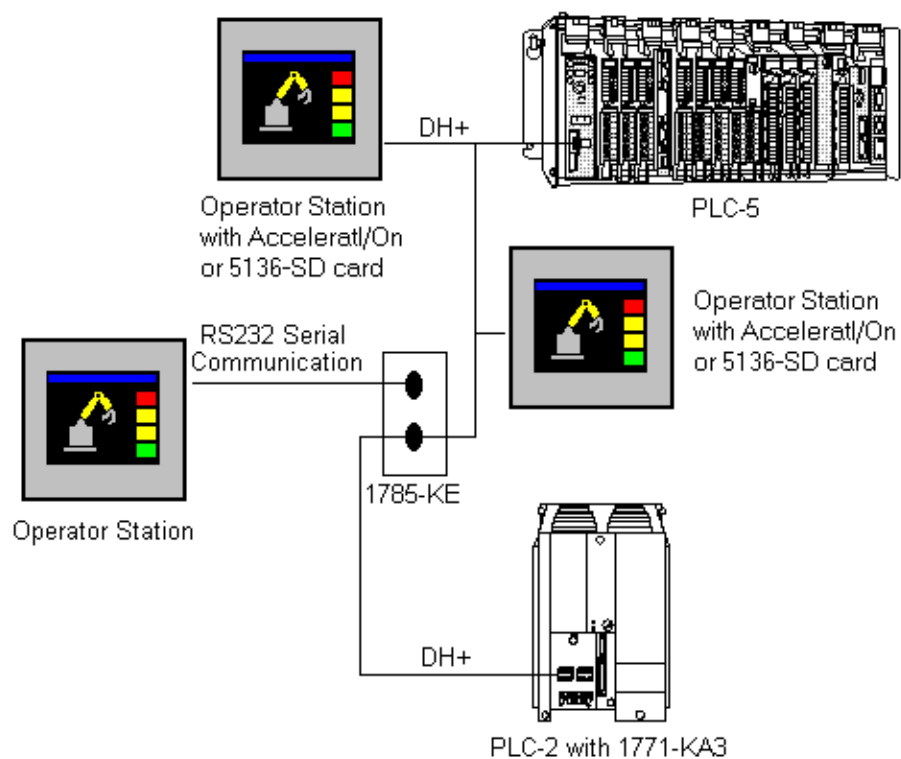
### Connecting to Remote I/O



### Connecting to both Serial and Remote I/O



## Multiple Operator Stations to Multiple PLCs



## PLC Modules

A description of Allen-Bradley modules is given below. Consult the Allen-Bradley Data Highway Module Publications 1771-801, 807, 811, or 822 for more details.

### Allen-Bradley Modules for Serial Connections

PLC Family	All	All	All	PLC-5	PLC-5
Module	1771-KE	1771-KF	1770-KF2A	1770-KF2B	1785-KE
Mounting	Rack	Panel	Desktop	Desktop	Rack
Cable Connector	DA-15P	DA-15P	DB-25S	DB-25S	DA-15P
Connection	Data Hwy	Data Hwy	Data Hwy	Data Hwy/ Data Hwy Plus	Data Hwy Plus
Port Label	RS232C	RS232C	Computer	Computer	Computer (RS232)

### Allen-Bradley Modules for PLC to Data Highway Connections

PLC Family	PLC-5
Module #	1785-KA Bridge

### Allen-Bradley Modules for PLC to Data Highway Plus Connections

PLC Family	PLC-5
Module #	Built-in

## Operator Station Setup

### Operator Station Connection to PLC-5 Channel 0 Port

Configure the following setup in the **PLC Name And Port Table...**

Field	Selection	Comments
Port	1 or 2 if available	On PanelMate Power Series units, selecting Port 2 is recommended (if available) so that Port 1 can be used to upload and download configurations. However, Port 1 must be selected for all PanelMate Power Series 1500 units using RS422 communication.
Device Use	AB Serial	
Local ID		Can be set to any number between 0 and 99. Default is 0.
Data Bits	8	Recommended setting for the Operator Station.
Stop Bits	1	Recommended setting for the Operator Station.
Parity	NONE	
Baud Rate		Set to match the PLC setup (between 1200 and 19.2 KBaud).
Electrical	RS232 or RS422	
Name		Use a six-character name. (Only alphanumeric and underscore)
Port		Must match the Operator Station port selected.
Model		Set to match the processor model type. (Used for range checking on addressing)
Remote ID		Must match the Processor Channel 0 ID#.

**Note:** On Remote ID, the Local ID# must be different than the PLC Remote ID#.



## Operator Station Connection to DH+ Port Using Accelerati/On Or 5136-SD Card

Configure the following setup in the **PLC Name And Port Table...**

Field	Selection	Comments
Port	I/O	Selects communications card.
Device Use	Allen-Bradley Data Highway Plus	Allen-Bradley DH/DH+ driver.
Local ID		Operator Station node number on the highway.
Data Bits		Not selectable. DH+ default.
Stop Bits		Not selectable. DH+ default.
Parity		Not selectable. DH+ default.
Baud Rate		Select 57.6, 115.2, or 230.4 to match the PLC baud rate.
Electrical		Not selectable.
Name		Use a six-character name. (alphanumeric or underscore)
Port	I/O	Denotes connection to communications card.
Model		Set to match the processor model type. (Used for range checking in addressing)
Remote ID		Must match the Processor DH+ Node Number.

**Note:** Processor node number on the highway. Be sure not to duplicate node numbers.

**Note:** Operator Station ID must not match any number on the highway.

## Operator Station Connection to 1770-KF2B For DH/DH+ Port

Configure the following setup in the **PLC Name And Port Table**...

Field	Selection	Comments
<b>Port</b>	1 or 2 if available	Selecting Port 2 is recommended (if available) so that Port 1 can be used to upload and download configurations. However, Port 1 must be selected for all PanelMate Power Series 1500 units using RS422 communication.
<b>Device Use</b>	AB Serial	
<b>Local ID</b>		Must match dipswitch settings on KF2B SW-2, 3, 4.
<b>Data Bits</b>	8	
<b>Stop Bits</b>	1	Recommended setting for the Operator Station.
<b>Parity</b>	NONE	Recommended setting for the Operator Station.
<b>Baud Rate</b>		Must match dipswitch settings on KF2B SW-6.
<b>Electrical</b>	RS232 or RS422	Must match dipswitch settings on KF2B SW-8.
<b>Name</b>		Use a six-character name. (alphanumeric or underscore)
<b>Port</b>		Must match the Operator Station port selected.
<b>Model</b>		Set to match the processor model type. (Used for range checking in addressing)
<b>Remote ID</b>		Must match the Processor Setup Node Number.

**Note:** Processor node number on the highway. Be sure not to duplicate node numbers.

## Operator Station Connection to Remote I/O Port Using Accelerati/On Or 5136-SD Card

Configure the following setup in the **PLC Name And Port Table...**

Field	Selection	Comments
<b>Port</b>	I/O	Selects communications card.
<b>Device Use</b>	Allen-Bradley Remote I/O	Allen-Bradley Remote I/O driver.
<b>Local ID</b>		Not selectable.
<b>Data Bits</b>		Not selectable.
<b>Stop Bits</b>		Not selectable.
<b>Parity</b>		Not selectable.
<b>Baud Rate</b>		Select 57.6, 115.2, or 230.4 to match the PLC baud rate.
<b>Electrical</b>		Not selectable.
<b>Name</b>		Use a six-character name. (alphanumeric or underscore)
<b>Port</b>	I/O	Denotes connection to communications card.
<b>Model</b>		Set to match the processor model type (Used for range checking in addressing)
<b>Remote ID</b>		Must match the Processor ID Number.
<b>Remote I/O</b>		Displays the Remote I/O Active Rack and Block Transfer Setup tables.

**Note:** For Remote I/O, refer to the Allen-Bradley Remote I/O Setup topic for more information.

## PLC and Communication Module Setup

### PLC Connection to Channel 0 Port

For proper operation with a PLC-5, the default parameters for Channel 0 in the PLC-5 must be changed. The following settings have been tested with the Operator Station. The Channel 0 Configuration Communication Mode should be set to SYSTEM (Point to Point).

Channel 0 System Mode Configuration			
Communication Driver:	DF1(Point to Point)/ FULL-DUPLEX		
Diagnostic File:	Reserved		
Stop Bit:	1 *	Parity:	NONE *
Baud Rate:	19200 *	Error Detect:	BCC
Duplicate Detect:	ON	NAK Receive:	3
ACK Timeout (20 ms):	50	ENQ Retries:	3
		Embedded Responses:	AUTO-DETECT
Control Line:	NO HANDSHAKING		

**Note:** Items marked \* must match the settings made in the PLC Name and Port Table.

Cutler-Hammer suggests the use of a Diagnostic File in the PLC-5. This file can help determine whether communication is active between Channel 0 and the Operator Station. For details about the diagnostic file, refer to your PLC-5 Processor documentation.

### PLC Connection To DH+

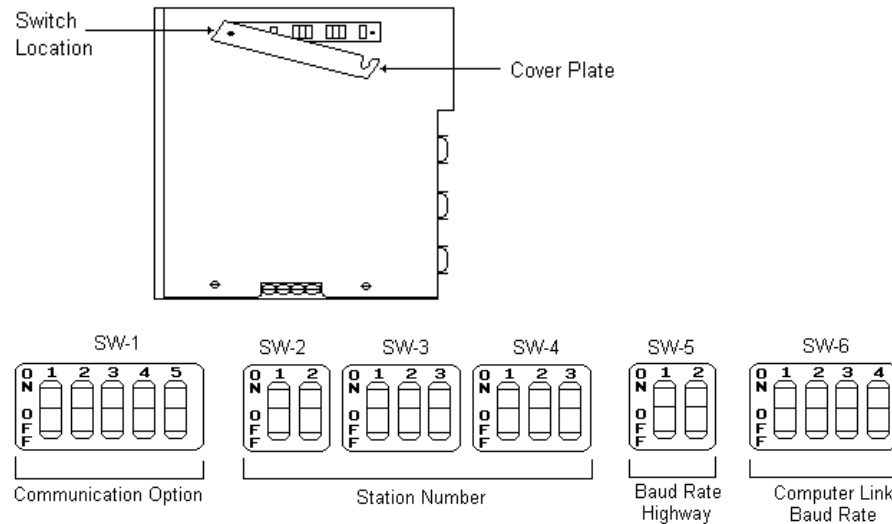
Field	Comments
Baud rate	Accelerat/On default is 57.6K. Ensure PLC setting is 57.6K
Node Address	Processor node number on the highway. Do not duplicate node numbers.

### PLC Connection to Remote I/O

Refer to your Allen-Bradley documentation for information on configuring the Remote I/O Channel.

## Module Setup

### 1771-KE, 1771-KF



### Switch settings for Revision H of 1771-KE, 1771-KF

- SW-1** Switches 1, 2, 4 and 5 OFF. Switch 3 ON.
- SW-2,3,4** These switches should be set as the Network ID# you have established in the PLC Name and Port Editor.
- SW-5** Switches 1 and 2 ON (57.6K Baud)
- SW-6** To use the default communications settings: switches 2, 3 and 4 ON, switch 1 OFF. This will produce the following settings: 9600 baud, module diagnostics are on. If switch 4 is OFF, the module will not execute diagnostics. To use other settings, be sure that the Operator Station and PLC settings match.

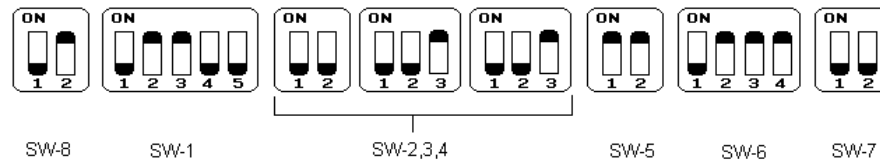
### For Revision levels prior to H, same as above except:

- SW-1** Switches 1, 2 and 4 OFF. Switches 3 and 5 ON.
- SW-6** Switches 2 and 3 ON. Switches 1 and 4 OFF.

### 1770-KF2 Series A, 1770-KF2 Series B

The 1770-KF2 Series A and Series B are desktop modules which can act as interfaces for the Operator Station to the Data Highway. The Series B performs the same function as the Series A, and can alternately act as a direct interface to the PLC-5 through Data Highway Plus.

The layout of the DIP switches for setting communications parameters is identical for the two modules, except that SW-7 is not used on the Series A, but is functional on the Series B.

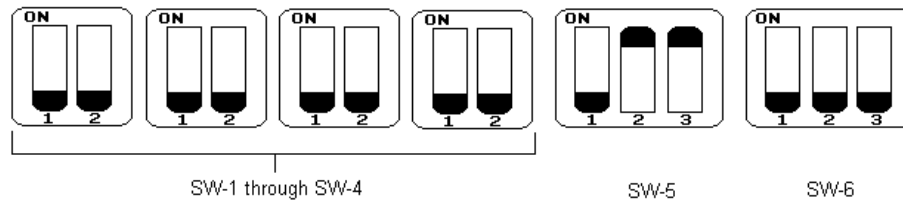


#### Switch Settings

- |            |  |
|------------|--|
| SW-8       | Note that this switch is to the left of the other switches in the previous diagram. For RS232C communication, set switch 1 OFF and switch 2 ON (as shown in the diagram). For RS422 communication, set switch 1 ON and switch 2 OFF.           |
| SW-1       | Switches 1, 4 and 5 OFF. Switches 2 and 3 ON.  |
| SW-2, 3, 4 | These switches represent the three-digit octal station number. They should be set as the Network ID# you have established in the PLC Name and Port Table. The setting illustrated in the above figure is for an address of 11 octal (decimal). |
| SW-5       | Set both switches to ON, for a Data Highway rate of 57.6K baud.  |
| SW-6       | For a communication rate of 9600 baud, set switch 1 OFF and switches 2 and 3 ON. Set switch 4 ON.  |
| SW-7       | For Data Highway operation, set both switches 1 and 2 OFF.   |

### 1785-KA

The 1785-KA module acts as an interface between Data Highway Plus and Data Highway. The station number, set by DIP switches on the module, is its Data Highway address, which must be different from the Operator Station Data Highway address and the PLC-5's Data Highway Plus station number.



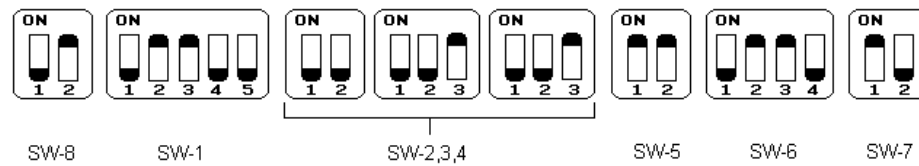
#### Switch Settings

- SW-1      This switch represents the Network Communication Rate. Always set to OFF.
- SW-2, 3, 4      These switches are reserved for future use. Always set to OFF.
- SW-5, 6      These switches represent the lower two digits of the Data Highway node address and Data Highway Plus node address. The setting illustrated in the figure is for an address of 30 octal. (This is not the PLC ID#.)

### 1770-KF2 Series B

The 1770-KF2 Series B module can act as a direct interface to the PLC-5 through Data Highway Plus.

The layout of the DIP switches for setting communications parameters is shown below.



#### Switch Settings

- |            |   |
|------------|---|
| SW-8       | Note that this switch is to the left of the other switches in the previous diagram. For RS232C communication, set switch 1 OFF and switch 2 ON (as shown in the diagram). For RS422 communication, set switch 1 ON and switch 2 OFF.                  |
| SW-1       | Switches 1, 4 and 5 OFF. Switches 2 and 3 ON. These switches control the special features of the KF2 module's asynchronous port.  |
| SW-2, 3, 4 | These switches represent the three-digit octal station number. They should be set the same as the Network ID# you have established for the Operator Station. The setting illustrated in the previous diagram is for an address of 11 octal (decimal). |
| SW-5       | Set both switches to ON, for a Data Highway rate of 57.6K baud.   |
| SW-6       | For a communication rate of 9600 baud, set switch 1 OFF and switches 2 and 3 ON. Set switch 4 OFF.  |
| SW-7       | For Data Highway Plus operation (not functional with KF2A), set switch 1 ON and switch 2 OFF.   |



**1785-KE Series A**

- SW-1 Switches 1, 2, 4 and 5 OFF. Switch 3 ON.
- SW-2 Both switches OFF.
- SW-3, 4 These switches represent the two-digit octal station number. (Network ID#)
- SW-5 Set both switches ON for a Data Highway Plus rate of 57.6K baud.
- SW-6 For a communication rate of 9600 baud, set switch 1 and 4 OFF and set switches 2 and 3 ON.

**1785-KE Series B**

- SW-1 Switches 1, 2, 3, 5 and 6 OFF. Switch 4 ON.
- SW-2 These switches represent the three-digit octal station number. Switches 1 and 2 represent octal digit 0 and are not used. Both switch 1 and 2 should be set to ON. Switches 3, 4 and 5 represent the first octal digit, the most significant bit of the Data Highway Plus node address. Switches 6, 7 and 8 represent the second octal digit, the least significant bit of the Data Highway Plus node address. (Network ID#)
- SW-3 For a communication rate of 9600 baud with a Data Highway Plus rate of 57.6K baud, set switches 1, 2, 4 and 5 ON and switch 3 OFF.
- SW-4 All switches OFF.

## Cable Diagrams

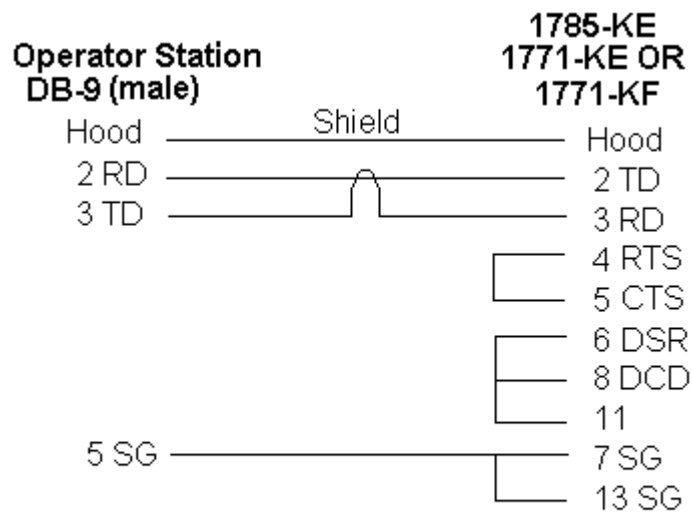
### Operator Stations With DB-9 Connectors To 1785-KE, 1771-KE, Or 1771-KF


**Note:** A 15-foot PLC cable can be purchased from Cutler-Hammer. Contact the Cutler-Hammer Customer Support Group at (614) 882-3282 or your local distributor for more information. Refer to the PLC Cabling Cross-Reference List topic for cabling catalog numbers.

The Operator Stations that have 9-pin connectors (female DB-9S) must have cables configured with male connectors (DB-9P).

**Note:** For PanelMate PC applications, a female 9-pin connector is required for connecting to a male 9-pin port. To quickly convert a Cutler-Hammer cable for PC use, simply attach the 9-pin Gender Changer found in the PanelMate PC Runtime Kit.

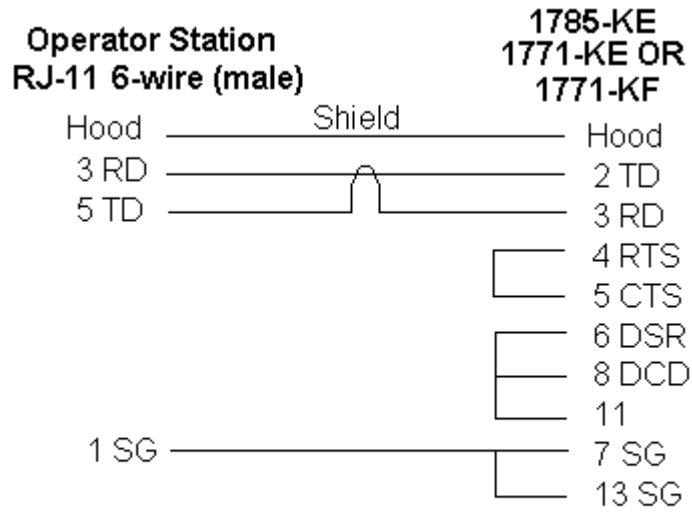
**Cable Part Number: AB21**




 Denotes a twisted pair

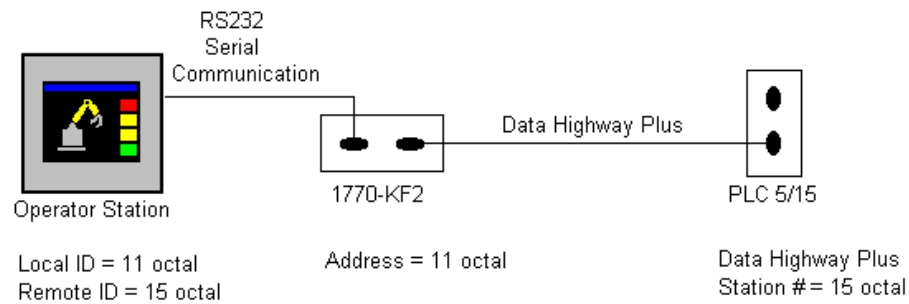
## Operator Stations With RJ-11 Connectors To 1785-KE, 1771-KE, Or 1771-KF

The Operator Stations that have RJ-11 6-wire modular jacks must have cables configured with modular connectors (male).



 Denotes a twisted pair

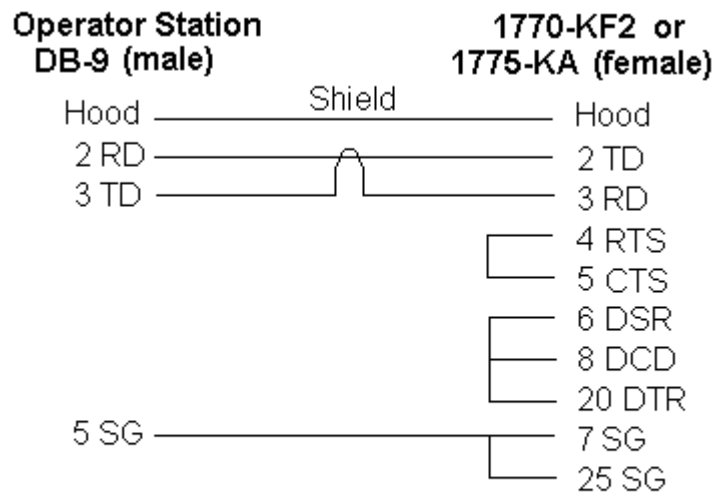
## Operator Stations With DB-9 Connectors To 1770-KF2 Or 1775-KA




The Operator Stations that have 9-pin connectors (female DB-9S) must have cables configured with male connectors (DB-9P).

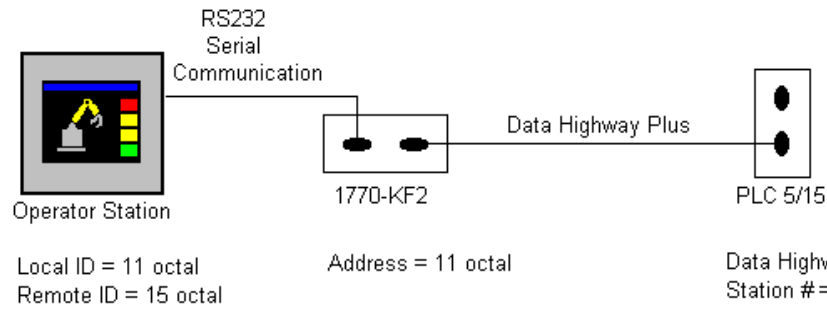
**Note:** For PanelMate PC applications, a female 9-pin connector is required for connecting to a male 9-pin port. To quickly convert a Cutler-Hammer cable for PC use, simply attach the 9-pin Gender Changer found in the PanelMate PC Runtime Kit.

**Cable Part Number: AB22**

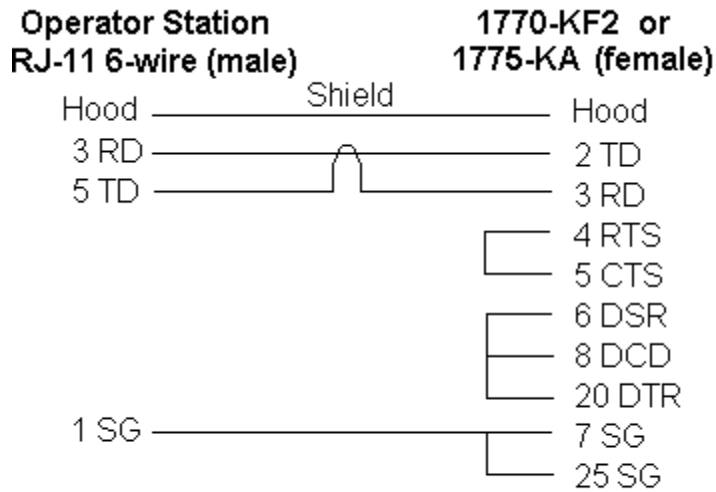



 Denotes a twisted pair

## Operator Stations With RJ-11 Connectors To 1770-KF2 Or 1775-KA



The Operator Stations that have RJ-11 6-wire modular jacks must have cables configured with modular connectors (male).



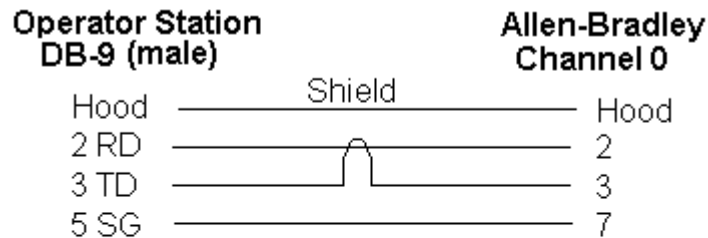
 Denotes a twisted pair

## Operator Stations With DB-9 Connectors To Allen-Bradley Channel 0


The Operator Stations that have 9-pin connectors (female DB-9S) must have cables configured with male connectors (DB-9P).

**Note:** For PanelMate PC applications, a female 9-pin connector is required for connecting to a male 9-pin port. To quickly convert a Cutler-Hammer cable for PC use, simply attach the 9-pin Gender Changer found in the PanelMate PC Runtime Kit.

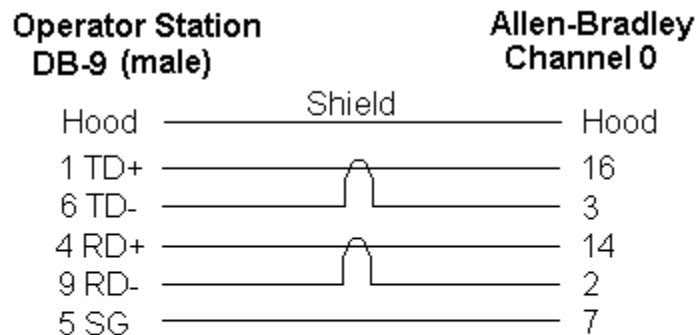
**Cable Part Number: AB26**




\*RS232 Cabling  
(Maximum distance is 50 feet.)

 Denotes a twisted pair

**Cable Part Number: AB27A**



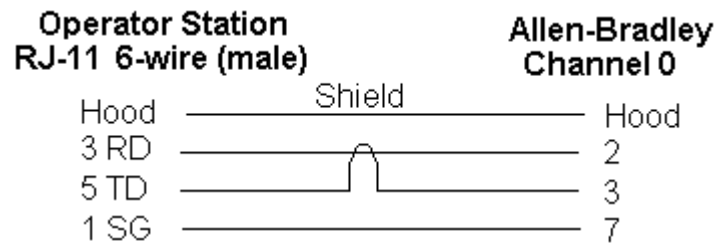
\*RS422 Cabling  
(Maximum distance is 200 feet.)

 Denotes a twisted pair

**Note:** For PanelMate PC applications that require data exchanges between RS232 and RS422/485 ports, a RS232 to RS422/485 converter is required to enable communication.

## Operator Stations With RJ-11 OR RJ-45 Connectors To Allen-Bradley Channel 0

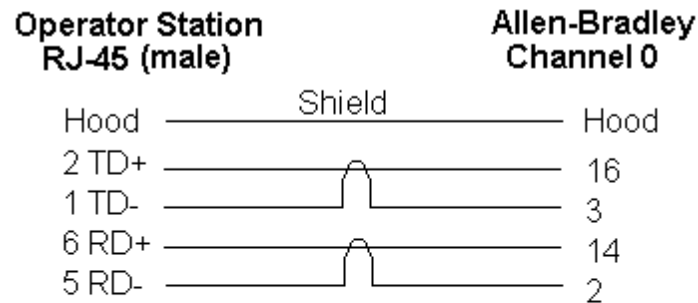
The Operator Stations that have RJ-11 6-wire and RJ-45 modular jacks must have cables configured with modular connectors (male).



\*RS232 Cabling  
(Maximum distance is 50 feet.)



Denotes a twisted pair

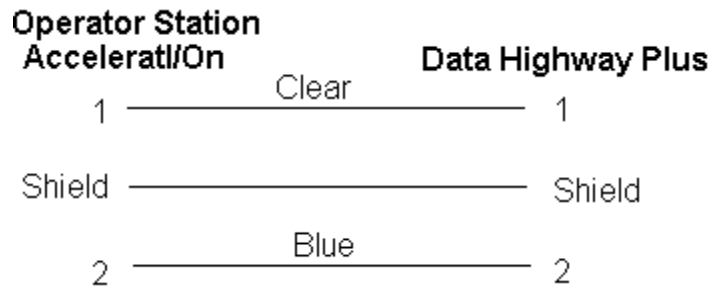


\*RS422 Cabling  
(Maximum distance is 200 feet.)



Denotes a twisted pair

## Operator Station To PLC-5 DH/DH+ Using Acceleratl/On Or 5136-SD Card



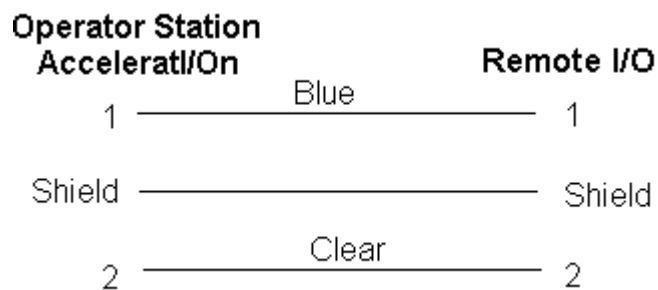
**Note 1:** Standard 1770-CD twinaxial cable or equivalent should be used. A minimum cable length of 20 feet between nodes should be observed. Proper network termination procedures should be observed. Network connections for the Acceleratl/On interface are at the rear of the unit. Network connections to PanelMate PC are located on the 5136-SD communications card.

**Note 2:** Two sets of electrically-common network connections are provided : 1, Shield, 2. A six-position female connector is shipped with each interface. Cabling connections are made to this female connector. The connector is then attached to the Acceleratl/On interface. With the connector attached, a continuous cable path is maintained on the Data Highway Plus, but if the cable is removed, the network link will be severed. If you desire to maintain the network with the connector removed, then connect the wires from the previous station and the next station in the same terminals (effectively jumpering the signals). This will permit wiring continuity even if the connector is removed.

**Note 3:** A 150-Ohm resistor should be attached to the female connector for proper termination when required. Consult Allen-Bradley documentation for information regarding correct termination of Data Highway Plus. In general, the following rules apply: If the Acceleratl/On interface is the end node on a network, the supplied 150-ohm resistor is needed. If the interface is not the end node on the network, the resistor is not needed.

## Operator Station To PLC-5 Remote I/O Using Acceleratl/On Or 5136-SD Card

Standard 1770-CD twinaxial cable or equivalent should be used. Proper network termination procedures should be observed.





## Memory Addressing

### General Format

The Allen-Bradley PLC-5 uses decimal word addresses. The Operator Station default format is S16. The following word and bit addressing descriptions apply to the PLC-5 Command Set.

[xf:e.s/b] - (/b is an optional field.)

**x** File Type

**B** Bit (Signed 16)

**N** Integer (Signed 16)

**D** BCD (BCD 4)

**R** Control\* (Signed 16)

**T** Timer\* (Signed 16)

**C** Counter\* (Signed 16)

**F** Floating point (IEEE single precision floating point)

\* For Control, Timer, and Counter files; word 0 is read only, and words 1 and 2 are read/write.

**f** File Number

**0-2** Reserved

**3** Bit

**4** Timer

**5** Counter

**6** Control

**7** Integer

**8** Floating Point

**9-999** Additional File Storage

**:** Element Delimiter

**e** Element Number (0 to 999, decimal)

**.** Subelement Delimiter

**s** Subelement mnemonic (used with Counter, Timer, and Control files).

Timer (T):

PRE: Preset Value (word 1)

ACC: Accumulated Value (word 2)

Counter (C):

PRE: Preset Value (word 1)

ACC: Accumulated Value (word 2)

Control (R):

LEN: Length (word 1)

POS: Position (word 2)

## / Bit Delimiter

**b** Bit Number (not used in word references)

**0 - 15999** Decimal for Bit type files when the element number is not specified (optional).

**0 - 15** Decimal for all other files types, including Bit type files which specify the element number.

Certain file types allow mnemonics to be used instead of the actual bit number. The mnemonic should be placed after the "." and the "/" is not used in this case. The following is a list of mnemonics that can be used.

<u>Bit</u>	<u>Timer(T)</u>
15	<b>EN</b> enable
14	<b>TT</b> timing
13	<b>DN</b> done
0-12	<b>INVALID</b>

<u>Bit</u>	<u>Counter (C)</u>
15	<b>CU</b> up enable
14	<b>CD</b> down enable
13	<b>DN</b> done
12	<b>OV</b> overflow
11	<b>UN</b> underflow
0-10	<b>INVALID</b>

<u>Bit</u>	<u>Control (R)</u>
15	<b>EN</b> enable
14	<b>EU</b> unload enable
13	<b>DN</b> done
12	<b>EM</b> empty
11	<b>ER</b> error
10	<b>UL</b> unload
9	<b>IN</b> inhibit
8	<b>FD</b> found
0-7	<b>INVALID</b>

## I/O Format

When using the Operator Station to access I/O file types in the Allen-Bradley PLC-5, the following format must be used. The following word and bit addressing descriptions apply to the PLC-5 Command Set.

**[O:rg/b]** or **[I:rg/b]** - (/b is an optional field.)

- I** Input
- O** Output
- :** Rack delimiter
- r** Assigned rack number
  - 0-3 for PLC-5/12 and PLC-5/15
  - 0-7 for PLC-5/25
- g** I/O group number
  - 0-7 for all PLC-5 models
- /** Bit delimiter
- b** Terminal (bit) number
  - 0-17 for all PLC-5 models

**Note:** To address an I/O word, do not include the /b field.

## Status Format

The following word and bit addressing descriptions apply to the PLC-5 Command Set.

**[S:e/b]** - (/b is an optional field.)

- S** Status
- :** Element delimiter
- e** Element number (0-31)
- /** Bit delimiter
- b** Bit number (0-15)

**Note:** To address a status word, do not include the /b field.

## Remote I/O Format

The following subsections describe the reference formats for Input and Output memory and reference formats for monitored and active block transfer memory.

- *Active Block Transfer Referencing*
- *Monitored I/O*
- *Monitored Block Transfer Referencing*
- *Block Transfers*
- *Active Racks*

When the Operator Station is connected to the Remote I/O network, a unique monitor mode permits the Operator Station with an AcceleratI/On or a 5136-SD communications card to read discrete inputs, outputs, or block transfers directly off the I/O link without requiring the PLC to transmit the data to the Operator Station.

*While the Operator Station is communicating to one or more Allen-Bradley PLCs through the AcceleratI/On or 5136-SD communications card, it can still simultaneously communicate to other PLCs using a serial port.*

When an AcceleratI/On or 5136-SD communications card is used as an interface to the Remote I/O network, the Operator Station simulates one or more remote racks. Each rack can be split into a quarter rack or any multiples of a quarter rack (i.e., 1/4, 1/2, 3/4 or full rack). The PLC can use normal I/O scan or block transfer operations to read or write data to or from the Operator Station, as though the interface was a rack. As with any Remote network, the PLC will be the master while the Operator Station will be a slave.

## Control Button Reset Delay

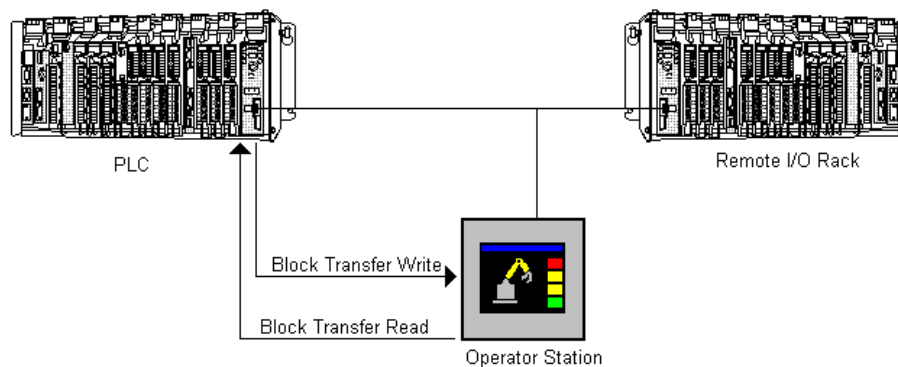
During Run Mode operation, operators can use the Operator Station's control button feature to emulate momentary pushbuttons. When an operator presses a control button, the Operator Station sets the assigned bit on the AcceleratI/On or 5136-SD-communications card so that the bit can be read by the remote I/O scan cycle. When the operator releases the control button, the Operator Station clears the assigned bit on the AcceleratI/On or 5136-SD communications card.

In order to ensure that the bit on the AcceleratI/On or 5136-SD communications card is in a set condition long enough to be read by the I/O scan, the Operator Station provides a method to delay resetting the bit. The Control Bit Reset Delay feature provides a method of delaying bit reset by multiples of 250 milliseconds. Refer to the Control Bit Reset Delay section in the **System Parameters** topic for more information.

## Active Block Transfer Referencing

Active block transfers and monitored block transfers are different in that active block transfers have the ability to move data to and from the PLC from the Operator Station as shown below. Active block transfers must be configured in the Allen-Bradley Remote I/O Configuration Table to avoid any errors. The Operator Station will allow addressing to any word or bit within the referenced active block transfer. Since the active block transfers have been configured beforehand, a slightly different method of referencing will be used, allowing the active block transfer ID to be used much like a macro substitution in place of the rack-group-slot.

**Note:** It is not recommended to use the Operator Station's input or output addresses in a slot where active block transfers have been configured.



The following addressing format will be used:

**[B:D WW/BB]**

<b>B</b>	Active block transfer specifier
<b>:</b>	Type separator
<b>D</b>	Transfer ID ("A-P" character designator from Active Block Transfer Table)
<b>' '</b>	Block separator (only one space is allowed)
<b>WW</b>	Word offset (0-77 octal when Block Transfer Addressing is octal; 0-63 decimal when Block Transfer Addressing is decimal, 2-digit maximum, the maximum value determined by block transfer size)
<b>/</b>	Bit separator
<b>BB</b>	Bit offset (0-17 octal, 2-digit maximum)

**Example: [B:A 1/0]**

The Operator Station will reference bit 0 of word 1 in active block transfer "A" configured in the Remote I/O configuration.

**Note:** The Transfer ID is configured from the Active Block Transfer Table in the Allen-Bradley Remote I/O Configuration Editor accessible from the PLC Name and Port Table.

## Monitored I/O

The monitoring feature allows a Operator Station to reference all I/O data in a remote rack utilizing the PLC's standard I/O scan. This will not affect the I/O scan time nor will it require additional ladder logic to be used.

The following addressing format will be used:

### [T:RG/BB]

<b>T</b>	File type (I=input or O=output)
<b>:</b>	Type separator
<b>R</b>	Rack number (1-7 octal for PLC-2) (0-37 octal for PLC-3) (1-3 octal for PLC-5/15) (1-7 octal for PLC-5/25) (0-3 octal for SLC 5/02)
<b>G</b>	Group number (0-7)
<b>BB</b>	Bit specifier (0-17 octal, 2-digit maximum)

### Example: [I:10/0]

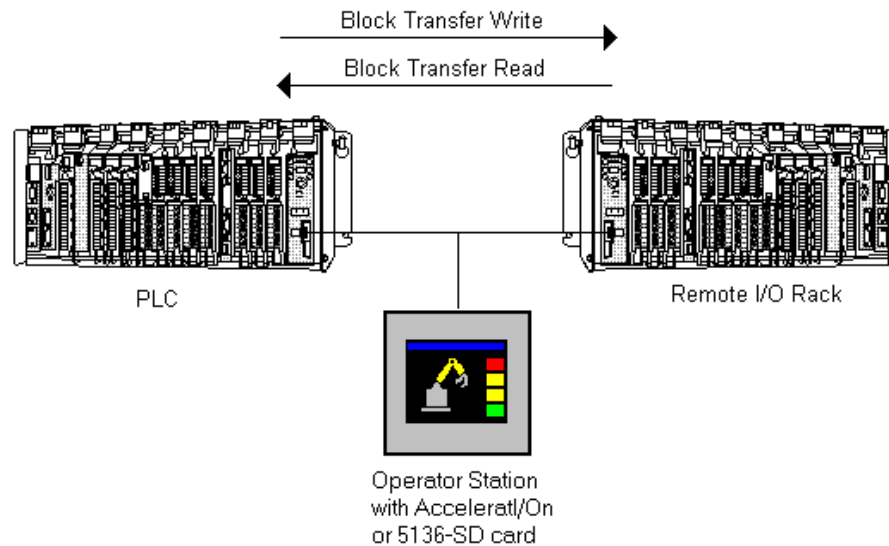
Operator Stations will reference input bit 0 in rack 1, group 0, slot 0.

*For a PLC-2, PLC-5/15, PLC-5/25, and SLC 5/02, the maximum rack number can be contained within one octal digit. The first character after the file type separator character ":" is the rack number. Since a PLC-3 may have more than eight racks, the rack number may be comprised of two octal digits. If two octal digits are entered consecutively after the file type separator, then the rack number is assumed to be the first octal digit and the group number is assumed to be the second octal digit. If three octal digits are entered consecutively after the file type separator, then the rack number is assumed to be the first two octal digits and the group number is assumed to be the third octal digit.*

## Monitored Block Transfer Referencing

A block transfer causes a block of data to move between an I/O module and a PLC data file. On the AcceleratI/On or 5136-SD communications card, all block transfers are stored in data buffers and saved on a rack-group-slot basis. Any block transfer that occurs on remote I/O will be buffered by the AcceleratI/On or 5136-SD communications card, and any word within the monitored block transfer buffer can be read by the Operator Station. There are two sets of block transfer data buffers: one for block transfer reads and one for block transfer writes.

**Note:** Block transfers can only be monitored from remote racks.





The following addressing format will be used:

**[T:RGS WW/BB]**

- T** Type (R = block read, W = block write)
- :** Type separator
- R** Rack number
  - (1-7 octal for PLC-2)
  - (0-37 octal for PLC-3)
  - (1-3 octal for PLC-5/15)
  - (1-7 octal for PLC-5/25)
  - (0-3 octal for SLC 5/02)
- G** Group number (0-7)
- S** Slot number (0 or 1)
- ' '** Block separator (only one space is allowed)
- WW** Word offset (0-77 octal when Block Transfer Addressing is octal; 0-63 decimal when Block Transfer Addressing is decimal; 2-digit maximum)
- /** Bit separator
- BB** Bit offset (0-17 octal, 2-digit maximum)

*Example: [R:100 1]*

The Operator Station will reference word 1 of the block transfer read going to the PLC from the module that is in rack 1, group 0, slot 0.

For a PLC-2, PLC-5/15, PLC-5/25, and SLC 5/02, the maximum rack number can be contained within one octal digit; thus, the first character after the file type separator character ":" is the rack number. Since a PLC-3 may have more than eight racks, the rack number may be comprised of two octal digits. If three octal digits are entered consecutively after the file type separator, then the rack number is assumed to be the first octal digit, the group number is assumed to be the second octal digit and the slot number is assumed to be the third octal digit. If four octal digits are entered consecutively after the file type separator, then the rack number is assumed to be the first two octal digits, the group number is assumed to be the third octal digit, the slot number is assumed to be the fourth octal digit.

## Block Transfers

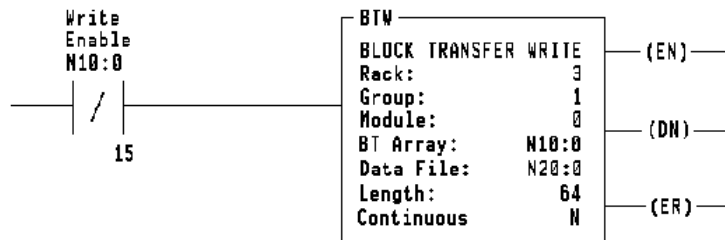
Many of Allen-Bradley's PLC modules support block transfers. These modules generally have more than one word of information per slot, and block transfers are the only convenient way of moving data between these modules and the PLC. The data is moved from the module into a data file within the PLC. One block transfer can move up to 64 words of data, the block transfer specified by giving the rack, group and slot. Block transfers only occur when the PLC is programmed to use them. To implement a block transfer, a block transfer read (BTR) or block transfer write (BTW) instruction is placed on one of the ladder logic rungs. The instruction will specify the rack-group-slot for the transfer as well as the number of words, file and starting element number.

The Operator Station's interface card supports two types of block transfers (monitored and active). For monitored block transfers, the Operator Station will monitor all block transfers being sent from the PLC to the various racks and keep one read and one write per slot. For active block transfers, the Operator Station is capable of sending and receiving block transfer reads and writes for racks that have been made active. To accomplish this, the size and location of all active block transfers to be executed by an active rack must be specified before communications start. Active block transfers must still be programmed into the PLC for any data exchanges to take place.

Monitored and active Block Transfers can be addressed as octal or decimal. To configure the address for the Block Transfers as octal or decimal, refer to the Block Transfer Addressing section in the **Remote I/O Editor** topic.

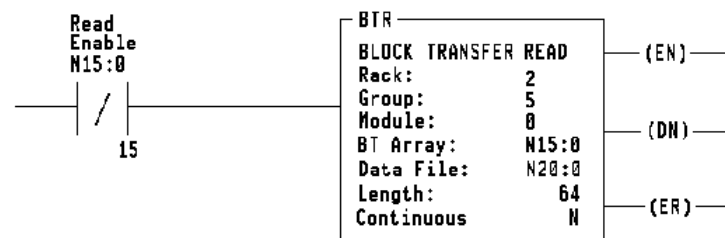
### Possible Block Transfer Write Example (PLC-5/15)

The following rung will continually block transfer write to the Operator Station assigned as active rack #3.

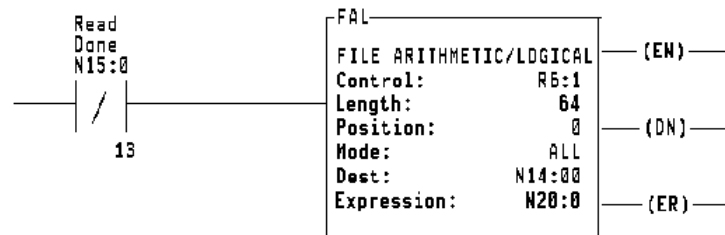


### Possible Block Transfer Read Programming (PLC-5/15)

The following rung will continually block transfer read from the Operator Station assigned as active rack #2.



Move Read File to "Verified" Read File

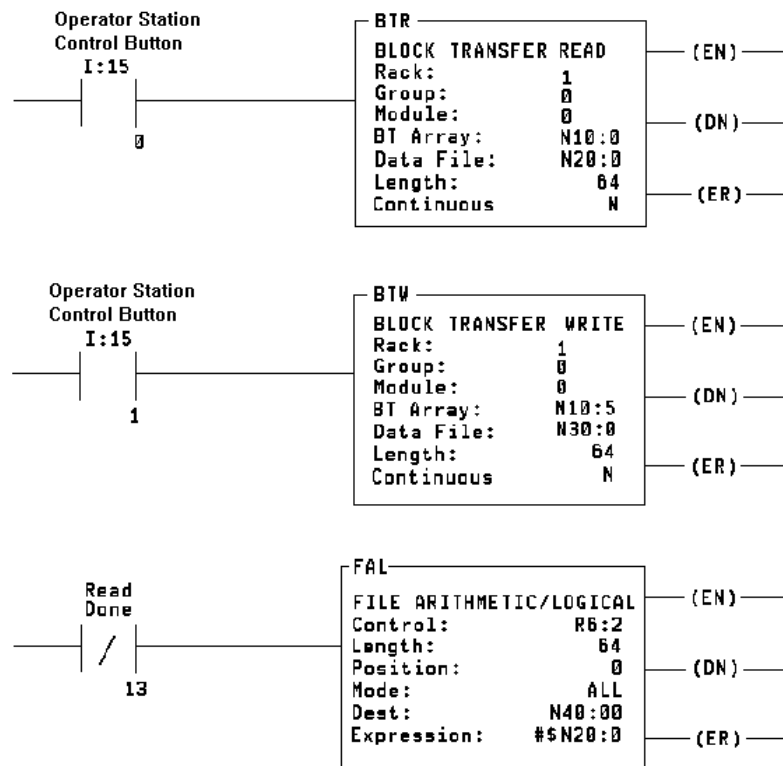


The PLC program should use verified read data. When moving data from one type of data table section to another, the FAL instruction will convert the data format (such as integer to BCD). If this is not desired, use the File Copy instruction.

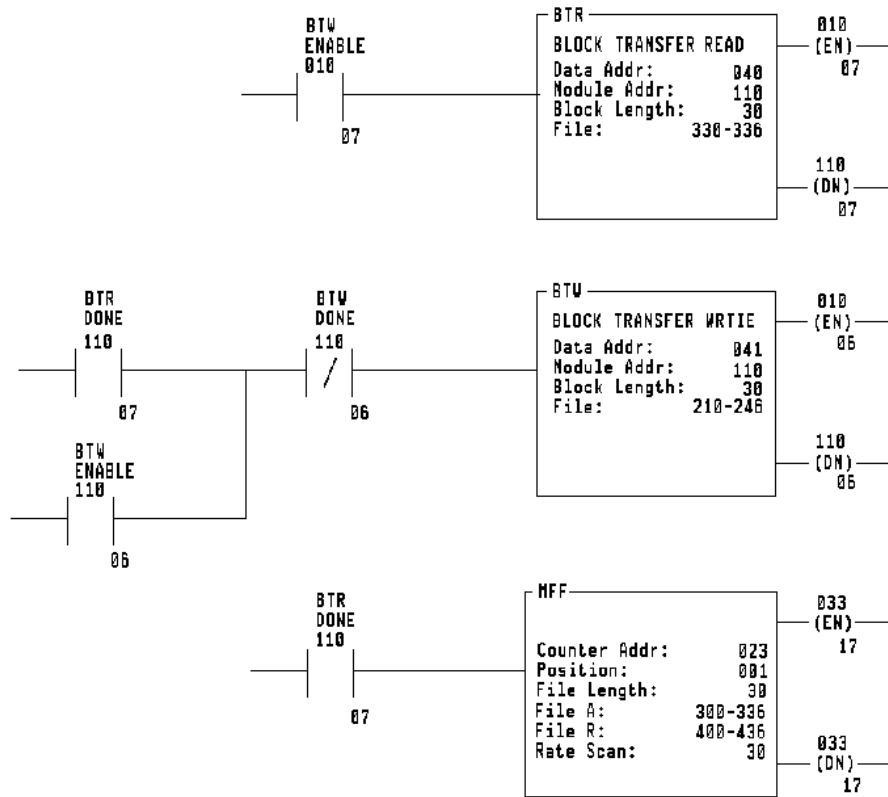
## Possible Recipe Example Using Block Transfers (PLC-5/15)

(Assuming the Operator Station is configured as rack 1, group 0, slot 0, and direction is COMMON.)

In this example a standard recipe is stored in N30. It is block transfer written to a common block transfer area in the Operator Station. Once adjustments are made to the recipe, it is Block Transfer read into N20. The data block transfer is moved to N40 which now contains the modified recipe.



## Possible Continuous Bi-Directional Block Transfer Example (PLC-2)



## Block Transfer Discussions

### Active Block Transfer Sent to Inactive Rack

*If the PLC sent a block transfer to a rack that was not active (and did not physically exist), an error would exist in the PLC since no rack would be responding to the block transfer; the AcceleratI/On or 5136-SD communications card would ignore the block transfer.*

### Active Block Transfer Write Error

*If the Operator Station is configured for a write (or common) block transfer, but has not received one from the PLC, a non-fatal communication error will occur. Once the Operator Station receives the block transfer, the error will cease and no other errors will follow.*

For example, a one-shot block transfer write occurring before the Operator Station is initialized online.

### Active Block Transfer Read Error

*An error will be generated only when a block transfer read is invalid. However, no error will be displayed when the Operator Station is configured for a block transfer read and the PLC does not execute a block transfer read or if the block transfer read occurred before the Operator Station is initialized online.*

### Block Transfer Buffer Allocation

The Operator Station can buffer up to 128 block transfers (both active and monitored). The interface card allocates 128 bytes (64 words) for each monitored block transfer regardless of the size of the actual block transfer. Although it is highly unlikely, it is possible for more than 128 block transfers to be configured or monitored. In this case, any new block transfer (one that has not already been buffered) received after the first 128 block transfers will not be buffered. It is also possible that enough large block transfers could be active and monitored that the interface card may run out of enough memory to store them. In both of these circumstances, if the Operator Station makes a request for data within a block transfer which is not currently stored in the interface board block transfer buffer, then a non-fatal communication error will result. Since block transfer buffers will never be deallocated (the interface board would have to be reconfigured), there is no online recovery from these errors. To recover from the errors, you must re-boot the system.

### Monitored Block Transfer

It may be possible, particularly during the bit initialization or during the initial page display after Run Mode initialization, that various references to monitored block transfers will be in error since the I/O board has not yet monitored the block transfers containing the requested information. Non-fatal communication errors will continue until the AcceleratI/On or 5136-SD card has monitored the required block transfers.

### Active Racks

An active rack is a rack that does not physically exist but rather is being simulated by the Operator Station interface. Simulating a rack or multiples of a quarter rack is the only way for the Operator Station to write data to the PLC. You must define the Operator Station as an Active Rack in order to have control bits read by a PLC.

The Operator Station is capable of simulating racks on the bus as well as monitoring the other racks' data. This is very important since the only way for the Operator Station to write to the PLC is through a simulated rack. The Operator Station interface card can simulate any or all available unused racks, but must not attempt to simulate rack addresses for racks that physically exist. If a physical rack is being simulated, both the Operator Station and the physical rack will respond to any messages, causing invalid data to be sent to the PLC.

The Allen-Bradley Remote I/O Configuration Editor contains a section called the Active Rack Table which will be used when configuring the active racks. Since the maximum number of racks that can be addressed is dependent upon the PLC type, it will be necessary to enter the Remote I/O PLC model first in the PLC Name and Port Table before proceeding to the Allen-Bradley Remote I/O Configuration Editor. Refer to the **Remote I/O Editor** topic for more information on configuring the Operator Station with Remote I/O.

The following table shows the addressable racks for each PLC model.

Number of Racks			
PLC Type	Octal	Decimal	Range
PLC-2	7	7	1-7
PLC-3	37	32	0-37
PLC 5/15	3	3	1-3
PLC 5/25	7	7	1-7
SLC 5/02	3	3	0-3

The following write restrictions will apply:

- *Cannot write to an output reference*
- *Can only write to input references if the reference's rack is active (set as active in Active Rack Table)*
- *Cannot write to monitored block transfers (both read and write)*
- *Can only write to active block transfer references with a direction of READ or COMMON*

## Block Gap and Size

The Operator Station can reference up to 60 contiguous words of data per block read when communicating via the serial port and 100 words when communicating via an AcceleratI/On or 5136-SD communications card to Allen-Bradley PLC's. A different block read is required for different file types regardless of the number of words referenced. In addition, if a gap of 15 or more words exists between references of a given file, a new block read will also be created. The Operator Station will perform all required block reads for the entire page before updating any values. Therefore, update performance and network traffic is directly affected by the number of files read and word gap sizes within these files.

**Note:** Block read calculations should be kept in mind when building configurations if update speed or network loading are important factors in the overall system.

**Note:** Block reads are configured separately for each scan (screen, alarm, message & trend). Total block reads for an individual page will be the addition of all relevant scans.

## Block Gap And Size Examples

*The following examples are made assuming the Operator Station is using an AcceleratI/On or 5136-SD communications card communicating over Data Highway Plus.*

### Example 1:

N7:0  
N7:5  
N7:10  
N7:15  
N7:25    A single block read consisting of 76 words  
N7:35  
N7:45  
N7:55  
N7:65  
N7:75

### Example 2:

N7:0    1st block read of 1 word  
N7:20    2nd block read of 1 word  
N7:40    3rd block read of 1 word  
N7:60    4th block read of 1 word  
N7:80    5th block read of 1 word



**Example 3:**

I:00/0	1st block read of 1 word
O:00/0	2nd block read of 1 word
S:0	3rd block read of 1 word
B3:0	4th block read of 1 word
T4:0.pre	5th block read of 3 words*
C5:0.acc	6th block read of 3 words*
N7:0	7th block read of 1 word
F8:0	8th block read of 2 words*

**Example 4:**

I:03/0	1st block read of 5 words
I:07/0	
O:02/0	2nd block read of 4 words
O:05/15	
S:5	3rd block read of 14 words
S:18	
B3:7	4th block read of 11 words
B3:17	
T4:4.pre	5th block read of 45 words*
T4:18.acc	
C5:23.acc	6th block read of 36 words
C5:32.pre	
N7:2	7th block read of 15 words*
N7:16	
F8:0	8th block read of 16 words*
F8:7	

\* Multiple word elements

## Memory Addressing Examples

### Word References

<u>Reference</u>	<u>Description</u>
[B321:100]	Element 100 of Bit file 321
[N22:15]	Element 15 of Integer file 22
[d10:891]	Element 891 of BCD file 10
[I:02]	Group 2 in rack 0 of reserved Input file 1
[o:27]	Group 7 in rack 2 of reserved Output file 0
[S:22]	Element 22 in reserved Status file 2
[C222:444]	Control value in element 444 of Counter file 222
[C15:29.ACC]	Accumulated value in element 29 of Counter file 15
[c354:2.PRE]	Preset value in element 2 of Counter file 354
[T31:999]	Control value in element 999 of Timer file 31
[t9:52.aCC]	Accumulated value in element 52 of Timer file 9
[T354:2.pre]	Preset value in element 2 of Timer file 354
[r119:272]	Status value in element 272 of Control file 119
[R53:52.len]	Length value in element 52 of Control file 53
[R111:721.PoS]	Position value in element 721 of Control file 111
[b041:581]	Element 581 of Bit file 41
[n421:008]	Element 8 of Integer file 421
[N009:077#s16]	Element 77 of Integer file 9 (signed 16-bit)
[D10:820#U32]	Element 820 of BCD file 10 (unsigned 32-bit)
[F8:23]	Element 23 of Floating point file 8.

**Bit References****Reference****Description**

[B34:17]	Bit 17 of Bit file 34 (bit 1 of element 1)
[b4:091/10]	Bit 10 of element 91 of Bit file 4
[N007:25/06]	Bit 6 of element 25 of Integer file 7
[D22:491/15]	Bit 15 of element 491 of BCD file 22
[I:15/7]	Bit 7 in group 5 of rack 1 of Input file 1
[O:32/1]	Bit 11 in group 2 of rack 3 in Output file 0
[s:06/8]	Bit 8 in element 6 of Status file 2
[T9:71.eN]	Enable bit (15) in control word of element 71 of Timer file 9
[t4:1.DN]	Done bit (13) in control word of element 1 of Timer file 4
[T77:32.acc/01]	Bit 1 of accumulated value of element 32 in Timer file 77
[C005:28.UN]	Underflow bit (11) in control word of element 28 of Counter file 5
[c163:08/14]	Down Enable bit (14) in control word of element 8 of Counter file 163
[C88:02.PRE/9]	Bit 9 of preset value of element 2 in Counter file 88
[R6:954.fd]	Found bit (8) in status word of element 954 in Control file 6
[r46:83/09]	Inhibit bit (9) in status word of element 83 in Control file 46
[r518:7.LeN/14]	Bit 14 of length value of element 7 in Control file 518

## Unsolicited Messages

The PanelMate operator station can accept unsolicited write messages (MSG instructions) from a PLC through the Data Highway or Data Highway Plus networks when using an AcceleratI/On or 5136-SD communications card. The PanelMate operator station supports only protected and unprotected writes.

Unsoliciteds should only be used for priority information transfer. If the PanelMate operator station receives an unsolicited message from a PLC, the normal polling will be interrupted and the unsolicited message will be immediately processed. Once completed, the PanelMate operator station's normal polling will resume.

From the PLC's perspective, the PanelMate operator station will be seen as another PLC on the network.

If you are using a PLC-5, unsolicited messages are referred to as PLC MSG instructions.

The following is an example of unsolicited writes to the PanelMate operator station using a PLC-5.



MSG instructions must be write only because the PanelMate operator station can only receive unsoliciteds, and will not respond to unsolicited reads.

When a PLC-5 model sends unsoliciteds (MSG instructions) to the PanelMate operator station, the PLC provides three pieces of information in the communication packet that is sent: File Number, Element Number, and Data Type. Inputs (I), Outputs (O), Status (S), Bit (B), and Integer (N) file types all have the Integer (signed 16) data type. Timer (T), Counter (C), Control (R), Float (F), and BCD (D) all have their own data types. File types are not sent in the data packet.

The PanelMate operator station cannot determine the validity of the file type of the file number where the PLC is attempting to send data. Since it is valid for the user to enter B10:0, N10:0, F10:0, etc. in the same configuration, the PLC driver must make certain assumptions and will assign the file type based on the data type given in the communication packet. This, in conjunction with the information given in the communication packet, restricts the types of unsolicited writes the PanelMate operator station can accept from a given source file type.

The rules for unsolicited writes from a PLC-5 are listed below.

1. If the destination file number is 0, the data will go to the PanelMate operator station's Output File type (O). In the PanelMate operator station, the file number 0 is reserved for Output only.
2. If the destination file number is 1, the data will go to the PanelMate operator station's Input File type (I). In the PanelMate operator station, the file number 1 is reserved for Input only.
3. If the destination file number is 2, the data will go to the PanelMate operator station's Status File type (S). In the PanelMate operator station, the file number 2 is reserved for Status only.
4. If the source data type is Integer (i.e., file type Output, Input, Status, Bit, or Integer), the unsolicited write will go to the PanelMate operator station's Integer file type (N). Note that the data type is known, not the file type. The PanelMate operator station will reference all signed 16-bit integers as file type N.
5. If the destination is not file 0, 1, or 2 and the source data type is Timer, the data will go to the PanelMate operator station's Timer File type (T).
6. If the destination is not file 0, 1, or 2 and the source data type is Counter, the data will go to the PanelMate operator station's Counter File type (C).
7. If the destination is not file 0, 1, or 2 and the source data type is Control, the data will go to the PanelMate operator station's Control File type (R).
8. If the destination is not file 0, 1, or 2 and the source data type is Float, the data will go to the PanelMate operator station's Float File type (F).
9. If the source data type is BCD, the data will go to the PanelMate operator station's BCD File type (D). If data types are mismatched, data may appear in unexpected unsolicited registers.

For more information about unsoliciteds, refer to the **Unsolicited Write Examples** topic.

## Unsolicited Write Examples

The following are PLC-5 unsolicited write examples.

### Example 1:

Message Instruction Parameters

Source Table Address: N7:0

Destination Table Address: T10:0

Number of Elements: 5

In the PanelMate operator station, the following unsolicited references will be written to:

N10:0

N10:1

N10:2

N10:3

N10:4

The data is written to Integer file type because of the source table file type (Integer data type (N)).

### Example 2:

Message Instruction Parameters

Source Table Address: B10:30

Destination Table Address: R6:0

Number of Elements: 5

In the PanelMate operator station, the following unsolicited references will be written to:

N6:0

N6:1

N6:2

N6:3

N6:4

The data is written to Integer file type because of the source table file type (Integer data type (B)).

### Example 3:

Message Instruction Parameters

Source Table Address: D10:30

Destination Table Address: N76:23

Number of Elements: 5

In the PanelMate operator station, the following unsolicited references will be written to:

D76:23

D76:24

D76:25

D76:26

D76:27

The data is written to BCD file type because of the source table file type (BCD data type (D)).

**Example 4:**

## Message Instruction Parameters

Source Table Address: T4:0

Destination Table Address: O:00

Number of Elements: 2 (Note that each Timer element is 3 words)

In the PanelMate operator station, the following unsolicited references will be written to:

O:00 (T4:0)

O:01 (T4:0.PRE)

O:02 (T4:0.ACC)

O:03 (T4:1)

O:04 (T4:1.PRE)

O:05 (T4:1.ACC)

The data is written to Output file type because of the destination file number is 0.

**Example 5:**

## Message Instruction Parameters

Source Table Address: C5:40

Destination Table Address: T10:23

Number of Elements: 2 (Note that each Counter element is 3 words)

In the PanelMate operator station, the following unsolicited references will be written to:

C10:23

C10:23.PRE

C10:23.ACC

C10:24

C10:24.PRE

C10:24.ACC

The data is written to Counter file type because of the source table file type (Counter data type (C)).

**Note:** Refer to the proper Allen-Bradley manual for further unsolicited message configuration.**Note:** This product incorporates patented technology which is licensed by Allen-Bradley Company, Inc. Allen-Bradley has not technically approved, nor does it warrant or support this product. All warranty and support for this product is provided by Cutler-Hammer.

## Maintenance Access

The Maintenance Template will access all memory locations supported by the PLC driver as defined in the **Memory Addressing** topic. When running online, you may change the PLC reference. The Maintenance Template is designed to assist you in specifying the PLC reference by scrolling through a list of mnemonics which are used to enter the PLC word reference. When online in the PLC reference change mode, the following list is available

O:"	"I:"	"S:"	"B"	"T"	"C"	"R"	"N"
	"D"	"F"	"."	"/"	".ACC"	".PRE"	".POS"
	".LEN"	".ER"	".DN"	".EN"	".TT"	".CU"	".CD"
	".OV"	".UN"	".EU"	".EM"	".UL"	".IN"	".FD"

You must enter the correct mnemonics and numeric values and create a legal reference to change a PLC reference.

**Note:** When a new reference is entered on an Operator Station, the Maintenance Template will remain in a paused state until the **Start Monitor** control button or the **Chng** soft function key is pressed. If correct, the template begins updating.

**Note:** A Maintenance Template cannot be used to monitor unsolicited references.



## Remote STS Errors

The most common remote errors reported by the Allen-Bradley PLC are listed in the following table. If you are using Allen-Bradley PLCs for Data Highway or Data Highway Plus, a complete set of errors codes can be found in the Allen-Bradley Publication 1770-6.5.16, November 1991. Take note of the hexadecimal error codes and consult the Allen-Bradley publication.

The Remote STS error codes are found in the following Remote STS Error Codes table. Note that you will have an EXT STS byte if your STS code is F0 (hex).

<b>Error 00</b>	Success -- no error.
<b>Error 10</b>	Illegal command or format.
<b>Error 20</b>	Host has a problem and will not communicate.
<b>Error 30</b>	Remote node host is missing, disconnected, or shut down.
<b>Error 40</b>	Host could not complete function due to hardware fault.
<b>Error 50</b>	Addressing problem or memory protect rungs.
<b>Error 60</b>	Function disallowed due to command protection selection.
<b>Error 70</b>	Processor is in program mode.
<b>Error 80</b>	Compatibility mode file missing or communication zone problem.
<b>Error 90</b>	Remote node cannot buffer command.
<b>Error A0</b>	Not used.
<b>Error B0</b>	Remote node problem due to download.
<b>Error C0</b>	Cannot execute command due to active IPBs.
<b>Error D0</b>	Not used.
<b>Error E0</b>	Not used.
<b>Error F0</b>	There is an error code in the EXT STS byte.

## Remote EXT STS Errors

The most common remote errors reported by the Allen-Bradley PLC are listed in the following table. If you are using Allen-Bradley PLCs for Data Highway or Data Highway Plus, a complete set of errors codes can be found in the Allen-Bradley Publication 1770-6.5.16, November 1991. Take note of the hexadecimal error codes and consult the Allen-Bradley publication.

If the remote error code is F0XX (hex), then the XX represents the Allen-Bradley EXT STS (extended status) error code. The EXT STS error codes are found in the following EXT STS Codes for Command Code 0F (hex) table.

The EXT STS has different definitions depending on the command code (type of command) in your message packet. If the command code is:

<b>00 to 08 (hex)</b>	There is not an EXT STS byte.
<b>0E or 0F (hex)</b>	These are Data Highway/Data Highway Plus codes.
<b>0B, 1A, or 1B (hex)</b>	These are DH-485 codes.
<b>Error 0</b>	Not used.
<b>Error 1</b>	A field has an illegal value.
<b>Error 2</b>	Less levels specified in address than minimum for any address.
<b>Error 3</b>	More levels specified in address than system supports.
<b>Error 4</b>	Symbol not found.
<b>Error 5</b>	Symbol is of improper format.
<b>Error 6</b>	Address does not point to something usable.
<b>Error 7</b>	File is wrong size.
<b>Error 8</b>	Cannot complete request, situation has changed since the start of the command.
<b>Error 9</b>	Data or file is too large.
<b>Error A</b>	Transaction size plus word address is too large.
<b>Error B</b>	Access denied, improper privilege.
<b>Error C</b>	Condition cannot be generated.
<b>Error D</b>	Condition already exists -- resource is already available.
<b>Error E</b>	Command cannot be executed.
<b>Error F</b>	Histogram overflow.

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<b>Error 10</b>	No access.
<b>Error 11</b>	Illegal data type.
<b>Error 12</b>	Invalid parameter or invalid data.
<b>Error 13</b>	Address reference exists to deleted area.
<b>Error 14</b>	Command execution failure for unknown reason; possible PLC-3 histogram.
<b>Error 15</b>	Data conversion error.
<b>Error 16</b>	Scanner not able to communicate with 1771 rack adapter.
<b>Error 17</b>	Adapter cannot communicate with module.
<b>Error 18</b>	1771 module response was not valid.
<b>Error 19</b>	Duplicated label.
<b>Error 1A</b>	File is open; another node owns it.
<b>Error 1B</b>	Another node is the program owner.
<b>Error 1C to FF</b>	Not used.

# Allen-Bradley SLC 500 PLCs

## 3

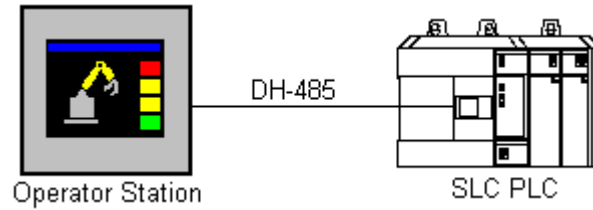
*In this chapter, you will learn:*

- *The different connectivity options*
- *About operator station setup*
- *About PLC and communication module setup*
- *The different cable diagrams*
- *How to address memory*
- *What is maintenance access*
- *The PLC cabling cross-reference list*
- *The different remote errors*

## Connectivity Options

### One Operator Station To One PLC

#### Connecting To DH-485 through the DH-485 Channel

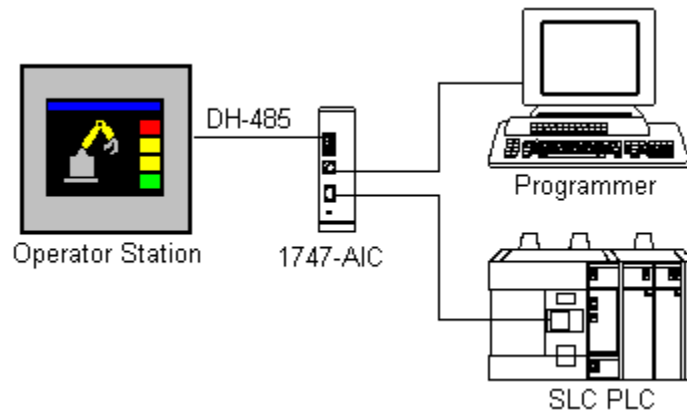


**Note:** End nodes must be terminated. Refer to the Hardware Installation Guide for information on terminating your connections.

**Note:** A DH-485 option is required for this configuration.

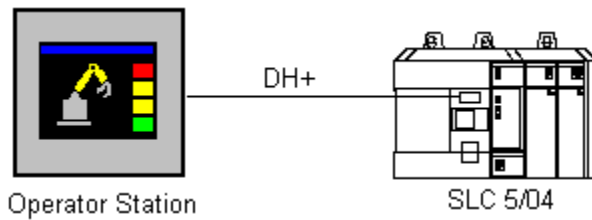
**Note:** The SLC 500, SLC 5/01, SLC 5/02, and SLC 5/03 are equipped with a DH-485 Port.

#### Connecting To DH-485 through an AIC Module



**Note:** A DH-485 option is required for this configuration.

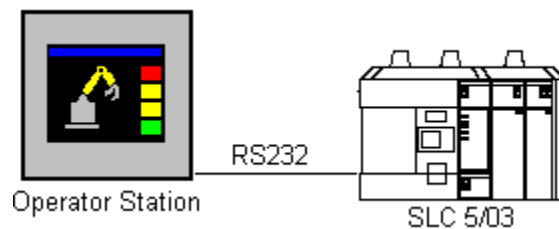
### Connecting To DH+ through Channel 1



**Note:** An AcceleratI/On or 5136-SD communications card is required for this configuration.

**Note:** The DH+/Channel 1 Port is available on the SLC 5/04 PLC only.

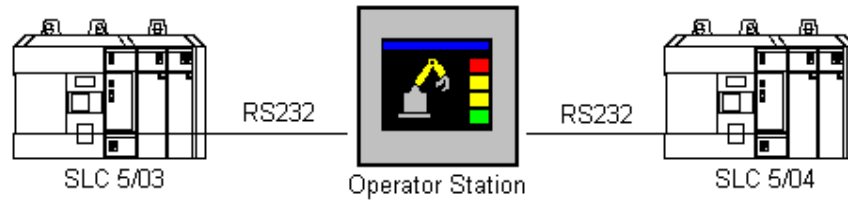
### Connecting Serially through Channel 0



**Note:** The Serial/Channel 0 Port is available on the SLC 5/03 and SLC 5/04 PLCs only.

## One Operator Station To Multiple PLCs

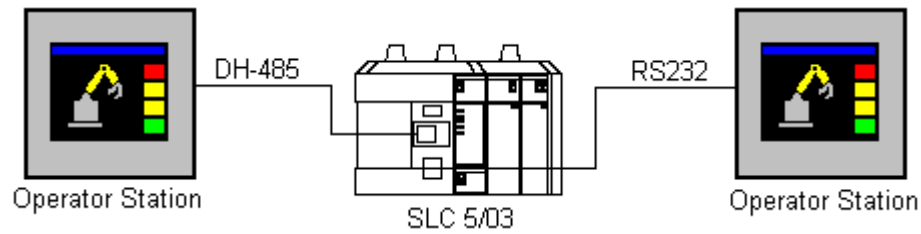
### Connecting Serially through Channel 0



**Note:** The Serial Channel 0 Port is available on the SLC 5/03 and SLC 5/04 PLCs only.

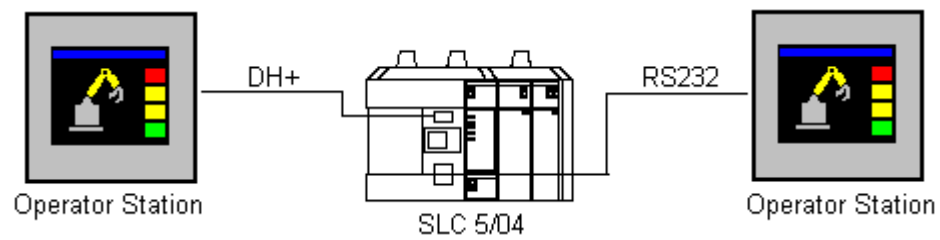
## Multiple Operator Stations To One PLC

### Connecting To DH-485 through Channel 1 and Serially through Channel 0



**Note:** A DH-485 option is required for the Operator Station connected to DH-485.

**Note:** The combination of a DH-485 port and a serial port is available on the SLC 5/03 PLC only.

**Connecting To DH+ through Channel 1 and Serially through Channel 0**

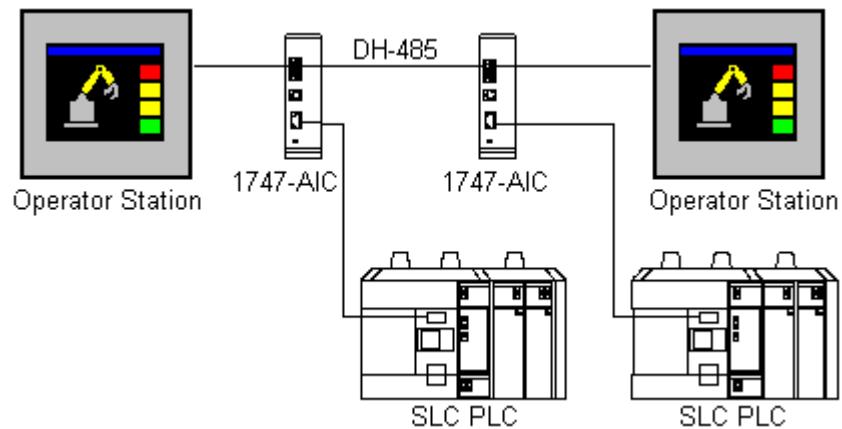
**Note:** An AcceleratI/On or 5136-SD communications card is required for the Operator Station connected to Channel 1.

**Note:** The combination of a DH+ port and a serial port is available on the SLC 5/04 PLC only.



## Multiple Operator Stations To Multiple PLCs

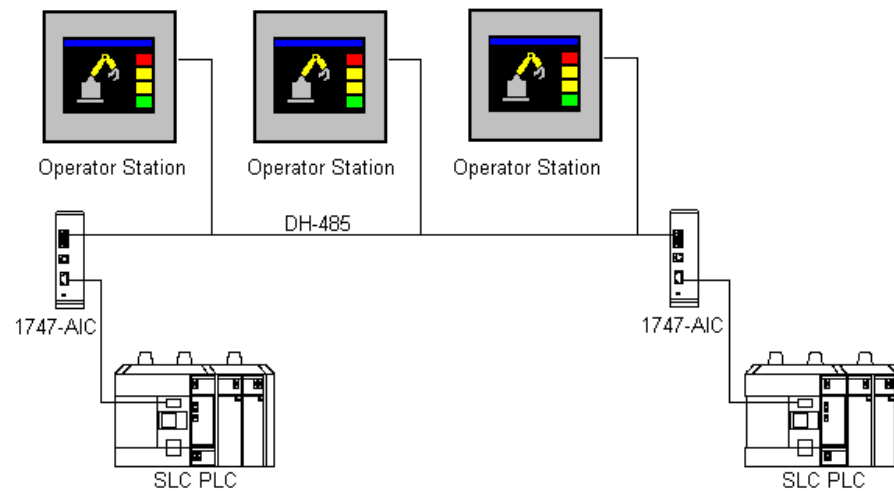
### Connecting To DH-485 through an AIC Module



**Note:** A DH-485 option is required for each Operator Station for this configuration.

**Note:** No more than two initiators (two Operator Stations or one Operator Station and a programmer) can access an Allen-Bradley SLC 500 or SLC 5/01 PLC. Later models do not have this limitation. Refer to the Allen-Bradley reference manual for information on DH-485 termination. Refer to the Hardware Installation Guide for information on configuring the port termination.

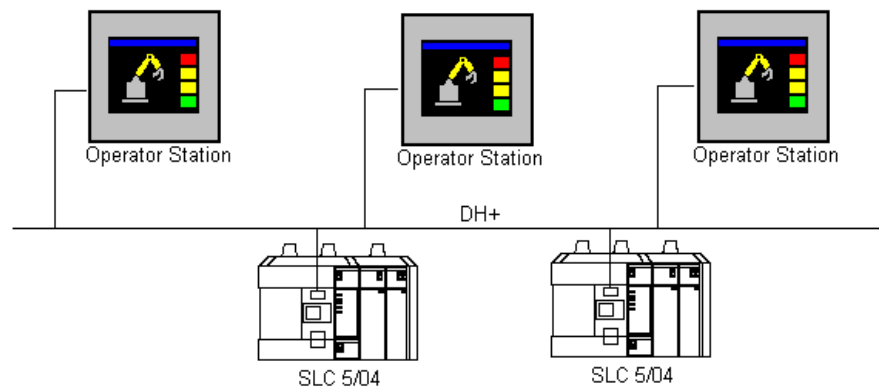
### Connecting directly to a DH-485 Network



**Note:** For operator stations with RS-45 ports, use the multi-drop adapter option (#1511).

**Note:** A DH-485 option is required for each operator station in this configuration.

### Connecting To DH+ through Channel 1



**Note:** An AcceleratI/On or 5136-SD communications card is required for each Operator Station for this configuration.

**Note:** The DH+/Channel 1 Port is available on the SLC 5/04 PLC only.

## Operator Station Setup

### Operator Station Connection To DH-485

Configure the following setup in the **PLC Name And Port Table...**

Field	Selection	Comments
Port	1 or 2 if available	Selecting Port 2 is recommended (if available) so that Port 1 is available to upload and download configurations. However, Port 1 must be selected for the PanelMate Power Series 1500 units.
Device Use	DH-485	Allen-Bradley Data Highway 485 driver.
Local ID		Operator Station node number on the DH-485 network.
Data Bits	8	Recommended setting for the Operator Station.
Stop Bits	1	Recommended setting for the Operator Station.
Parity	EVEN	Must be EVEN.
Baud Rate		Set to match the PLC setup (between 1200 and 19.2 KBaud).
Electrical	RS485	Will be set automatically when "DH-485" is chosen for device use.
Name		Use a six-character name. (Alphanumeric or underscore)
Port		Must match the Operator Station port selected.
Model		Set to match the processor model type. ((Used for range checking in addressing)
Remote ID		Must match the Processor DH-485 node number.
DH-485		Click to display the Max Node Setup.

**Note:** On local ID, be sure not to duplicate node numbers on the DH-485 network.

**Note:** Most DH-485 devices have a parameter which sets the maximum node address of the network. The maximum node address should be set the same in all devices on the network. It should be set as high as the highest node address used on the network.

## Operator Station Connection To DH+

Configure the following setup in the **PLC Name And Port Table...**

Field	Selection	Comments
Port	I/O	Selects communication card
Device Use	Allen-Bradley Data Highway Plus	Allen-Bradley DH+ driver.
Local ID		Operator Station node number on the highway.
Data Bits		Not selectable. DH+ default.
Stop Bits		Not selectable. DH+ default.
Parity		Not selectable. DH+ default.
Baud Rate		Select 57.6, 115.2, or 230.4 to match the PLC baud rate.
Electrical		Not selectable.
Name		Use a six-character name. (alphanumeric or underscore)
Port	I/O	Denotes connection to communications card.
Model		Set to match the processor model type. (Used for range checking in addressing)
Remote ID		Must match the Processor DH+ Node Number.

**Note:** Be sure not to duplicate node numbers on the DH+ network.

## Operator Station Connection To Serial Port

Configure the following setup in the **PLC Name And Port Table**...

Field	Selection	Comments
Port	1 or 2 if available	Selecting Port 2 is recommended (if available) so that Port 1 is available to upload and download configurations.
Device Use	AB Serial	
Local ID		Can be set to any number between 0 and 99. Default is 0.
Data Bits	8	Recommended setting for the Operator Station.
Stop Bits	1	Recommended setting for the Operator Station.
Parity	NONE	
Baud Rate		Set to match the PLC setup (between 1200 and 19.2 KBaud).
Electrical	RS232	RS232 only.
Name		Use a six-character name. (alphanumeric or underscore)
Port		Must match the Operator Station port selected.
Model		Set to match the processor model type. (Used for range checking in addressing)
Remote ID		Must match the Processor Channel 0 ID#.

**Note:** The local ID# must be different than the PLC Remote ID#.

## PLC and Communications Module Setup

### Channel Configurations For DH-485/Channel 1

The **Channel Configuration** dialog box is shown with the **Chan. 1 - System** tab selected. It contains two main sections: **Channel 1** and **Channel 0**.

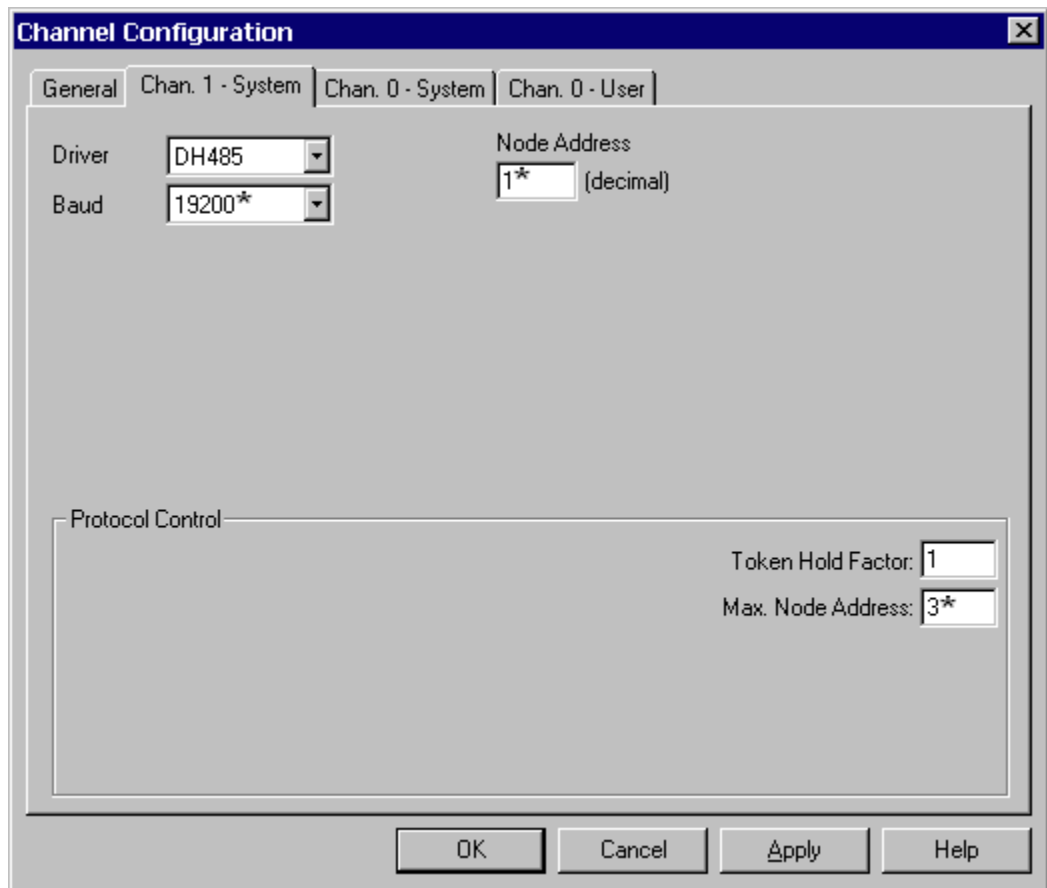
**Channel 1 Settings:**

- Driver:
- ☐ Write Protected
- Passthru Link ID (dec):
- Edit Resource/Owner Timeout (x1 sec):
- Diagnostics File:

**Channel 0 Settings:**

- System Driver:
- Mode:
- ☐ Write Protected
- Passthru Link ID (dec):
- Edit Resource/Owner Timeout (x1 sec):
- Diagnostics File:
- User Driver:
- ☐ Mode Change Enabled
- Mode Attention Character:
- System Mode Character:
- User Mode Character:

Buttons at the bottom: **OK**, **Cancel**, **Apply**, **Help**.



The image shows a 'Channel Configuration' dialog box with a blue title bar and a close button. It has four tabs: 'General', 'Chan. 1 - System', 'Chan. 0 - System', and 'Chan. 0 - User'. The 'General' tab is selected. Inside the dialog, there are two rows of settings. The first row has 'Driver' set to 'DH485' and 'Node Address' set to '1\*' (decimal). The second row has 'Baud' set to '19200\*' and 'Node Address' set to '1\*' (decimal). Below these settings is a 'Protocol Control' section with a large empty box. To the right of this box are two settings: 'Token Hold Factor' set to '1' and 'Max. Node Address' set to '3\*'. At the bottom of the dialog are four buttons: 'OK', 'Cancel', 'Apply', and 'Help'.

Tab	Driver	Baud	Node Address	Token Hold Factor	Max. Node Address
General	DH485	19200*	1* (decimal)	1	3*
Chan. 1 - System					
Chan. 0 - System					
Chan. 0 - User					

**Note:** PLC setup parameters marked \* must match the settings in the PLC Name and Port Parameters Table.

**Note:** To maximize response time, it is recommended to set the programmer's node address to 0, the PLC's node address to 1, and all other devices on the network in sequential order starting with a node address of 2.

## Channel Configurations For DH+/Channel 1

The **Channel Configuration** dialog box contains the following settings:

**General** | **Chan. 1 - System** | **Chan. 0 - System** | **Chan. 0 - User**

**Channel 1**

- Driver:
- ☐ Write Protected
- Passthru Link ID (dec)
- Edit Resource/Owner Timeout (x1 sec)
- Diagnostic File

**Channel 0**

**System Driver:**  **User Driver:**

**Mode:**  ☐ Mode Change Enabled

☐ Write Protected

**Mode Attention Character**

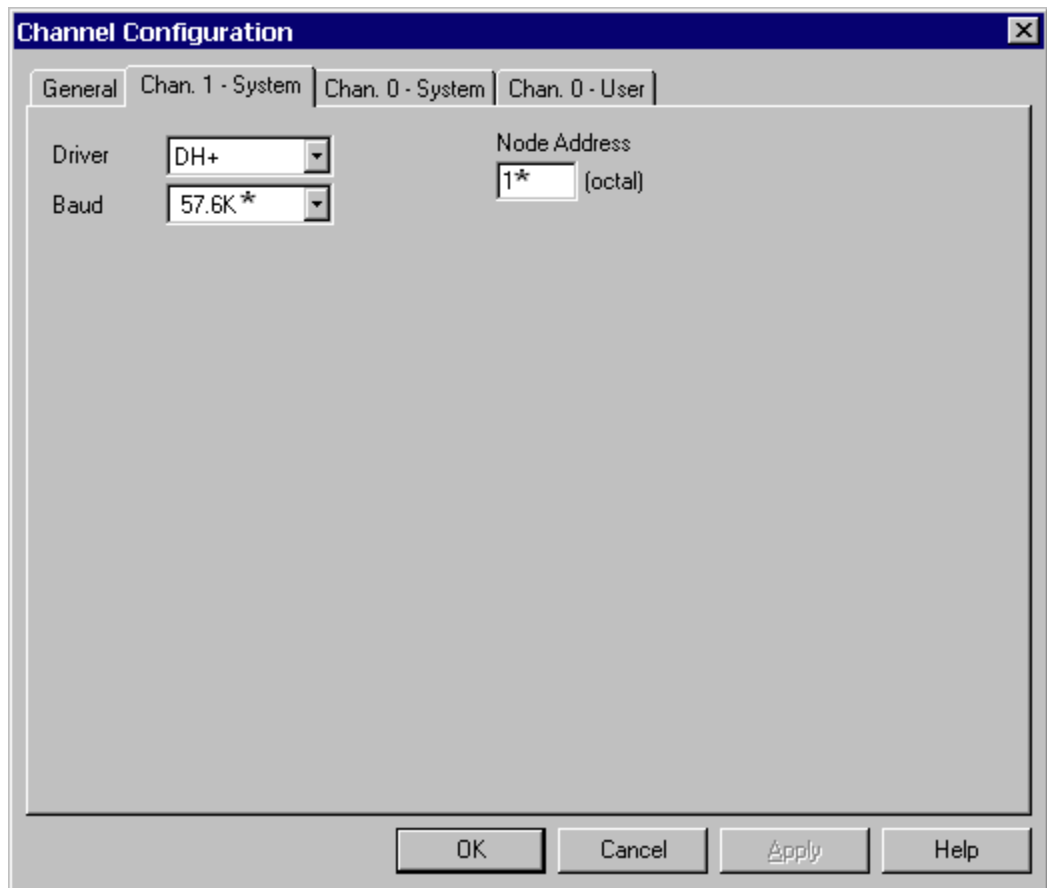
**Passthru Link ID (dec)**  **System Mode Character**

**Edit Resource/Owner Timeout (x 1sec)**  **User Mode Character**

**Diagnostic File**

**Buttons:** OK, Cancel, Apply, Help





The image shows a 'Channel Configuration' dialog box with a blue title bar and a close button (X) in the top right corner. It features four tabs: 'General', 'Chan. 1 - System', 'Chan. 0 - System', and 'Chan. 0 - User'. The 'General' tab is selected. Inside the dialog, there are two rows of settings. The first row has 'Driver' on the left and 'Node Address' on the right. The 'Driver' dropdown menu is set to 'DH+'. The 'Node Address' is a text field containing '1\*' followed by '(octal)'. The second row has 'Baud' on the left and is empty on the right. The 'Baud' dropdown menu is set to '57.6K \*'. At the bottom of the dialog, there are four buttons: 'OK', 'Cancel', 'Apply', and 'Help'.

Tab	Driver	Baud	Node Address
General	DH+	57.6K *	1* (octal)
Chan. 1 - System			
Chan. 0 - System			
Chan. 0 - User			

**Note:** PLC setup parameters marked \* must match the settings in the PLC Name and Port Parameters Table.

## Channel Configurations For Serial/Channel 0

The **Channel Configuration** dialog box contains the following settings:

**General** | **Chan. 1 - System** | **Chan. 0 - System** | **Chan. 0 - User**

**Channel 1**

- Driver: Ethernet
- ☐ Write Protected
- Passthru Link ID (dec): 2
- Edit Resource/Owner Timeout (x1 sec): 60
- Diagnostic File: 0

**Channel 0**

**System Driver:** DF1 Full Duplex

**Mode:** System

☐ Write Protected

Passthru Link ID (dec): 1

Edit Resource/Owner Timeout (x 1sec): 60

Diagnostic File: 0

**User Driver:** ASCII

☐ Mode Change Enabled

Mode Attention Character: \1b

System Mode Character: S

User Mode Character: U

Buttons: OK, Cancel, Apply, Help

**Channel Configuration**

General | Chan. 1 - System | Chan. 0 - System | Chan. 0 - User

Driver: **DF1 Full Duplex** Source ID: 0 (decimal)

Baud: 19200

Parity: NONE

Stop Bits: 1

Protocol Control:

Control Line: No Handshaking ACK Timeout (x20 ms): 50

Error Detection: BCC NAK Retries: 3

Embedded Responses: Auto Detect ENQ Retries: 3

☒ Duplicate Packet Detect

OK Cancel Apply Help

**Note:** PLC setup parameters marked \* must match the settings made in the PLC Name and Port Parameters Table.

**Note:** For SLC PLC's, the error detection must be set to BCC.

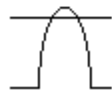
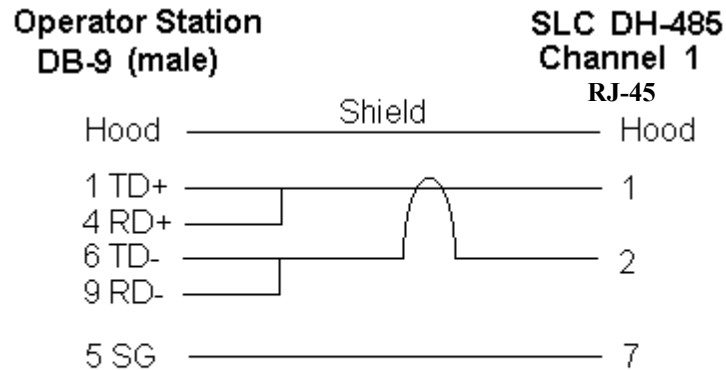
## Cable Diagrams

**Note:** A 6-foot PLC cable can be purchased from Cutler-Hammer. Contact the Cutler-Hammer Customer Support Group at (614) 882-3282 or your local distributor for more information. Refer to the **PLC Cabling Cross-Reference List** topic for cabling catalog numbers.

### Operator Stations With DB-9 Connectors To DH-485/Channel 1

The Operator Stations that have 9-pin female connectors (DB-9S) must have cables configured with male connectors (DB-9P).

**Cable Part Number: AB24A**

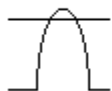
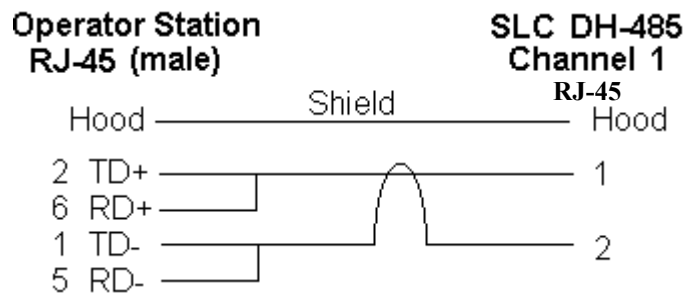


Denotes a twisted pair

**Note:** It is recommended to keep this cable at a maximum of 6 feet.

### Operator Stations With RJ-45 Connectors To DH-485/Channel 1

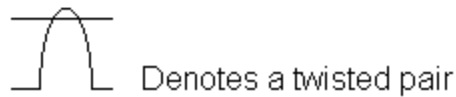
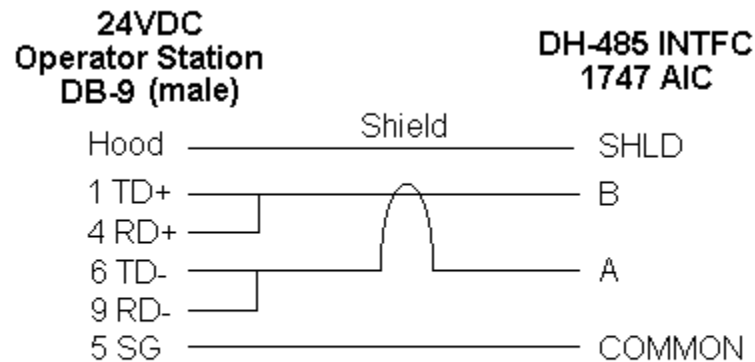
The Operator Stations that have RJ-45 modular jacks must have cables configured with male modular connectors.



Denotes a twisted pair

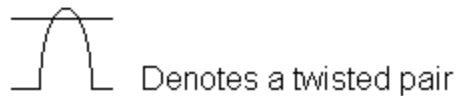
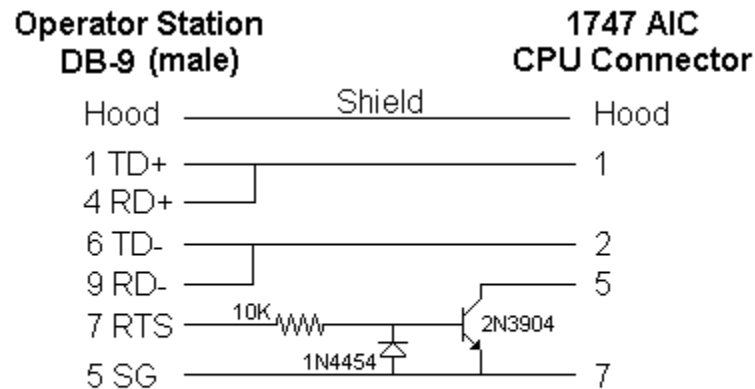
## Operator Stations With DB-9 Connectors To AIC Module

The Operator Stations that have 9-pin female connectors (DB-9S) must have cables configured with male connectors (DB-9P).



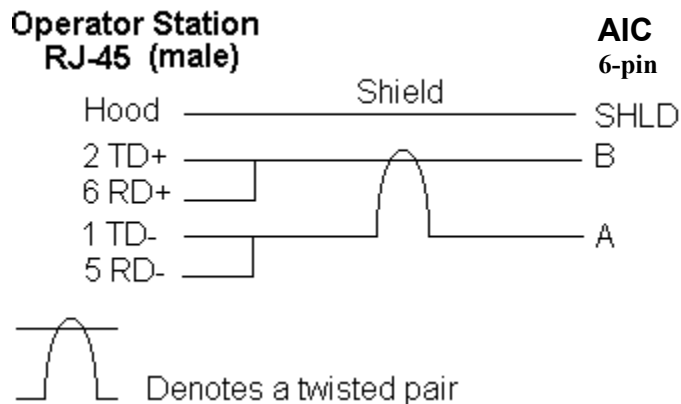
**Note:** The DH-485 INTFC connection should be used for all 24VDC PanelMate Power Series units except models 500 and 1500. All other PanelMate Power Series units should use the CPU connection.

**Cable: Part Number: AB28A**



## Operator Stations With RJ-45 Connectors To AIC Module

The Operator Stations that have RJ-45 modular jacks must have cables configured with male modular connectors.



**Note:** DH-485 communication has a maximum cable length limitation of 4000 feet.

**Note:** If the AIC module is the end node, tie together 5A and 6 TERM.

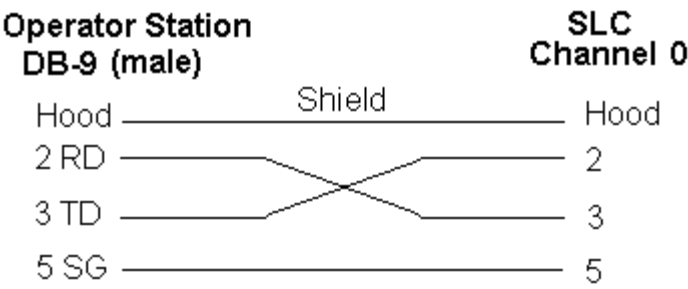
**Note:** Tie together 2 SHIELD and 1 CHS GND on one end of the network only.

### Operator Stations With DB-9 Connectors To SLC 5/03 Or SLC 5/04 Serial/Channel 0 DF1

The Operator Stations that have 9-pin female connectors (DB-9S) must have cables configured with male connectors (DB-9P).

**Note:** For PanelMate PC applications, a female 9-pin connector is required for connecting to a male 9-pin port. To quickly convert a Cutler-Hammer cable for PC use, simply attach the 9-pin Gender Changer found in the PanelMate PC Runtime Kit.

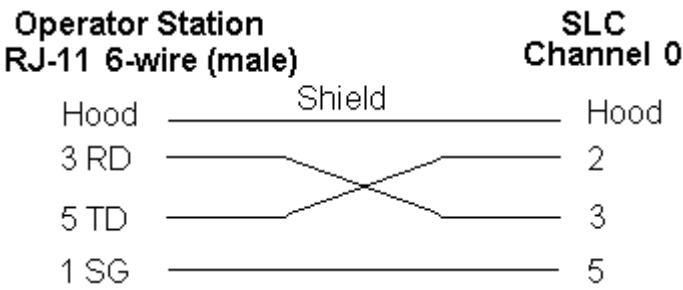
Cable Part Number: AB25



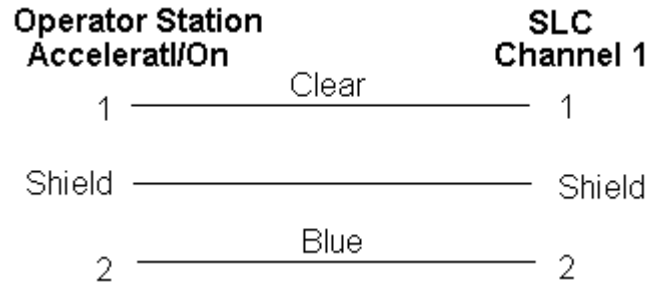
**Note:** RS232 communications has a maximum cable length limitation of 50 feet.

### Operator Stations With RJ-11 Connectors To SLC 5/03 Or SLC 5/04 Serial/Channel 0 DF1

The Operator Stations that have RJ-11 6-wire modular jacks must have cables configured with male modular connectors.



## Operator Station AcceleratI/On Or 5136-DC Card To SLC 5/04 DH+/Channel 1



**Note:** Standard 1770-CD twinaxial cable or equivalent should be used. A minimum cable length of 20 feet between nodes should be observed. Proper network termination procedures should be observed. Network connections for the AcceleratI/On interface are at the rear of the unit. Network connections for PanelMate PC are located on the 5136-SD card.

**Note:** Two sets of electrically-common network connections are provided : 1, Shield, 2. A six-position female connector is shipped with each interface. Cabling connections are made to this female connector. The connector is then attached to the AcceleratI/On interface. With the connector attached, a continuous cable path is maintained on the Data Highway Plus, but if the cable is removed, the network link will be severed. If you desire to maintain the network with the connector removed, then connect the wires from the previous station and the next station in the same terminals (effectively jumpering the signals). This will permit wiring continuity even if the connector is removed.

**Note:** 150-Ohm resistor should be attached to the female connector for proper termination when required. Consult Allen-Bradley documentation for information regarding correct termination of Data Highway Plus. In general, the following rules apply: If the AcceleratI/On interface is the end node on a network, the supplied 150-ohm resistor is needed. If the interface is not the end node on the network, the resistor is not needed.



## Memory Addressing

### General Format

The Allen-Bradley SLC 500 family of PLCs uses decimal word addresses. The Operator Station's default format for addresses is signed 16. The following word and bit addressing descriptions apply to the SLC 500 family Command Set.

**[xf:e.s/b]** - (.s and /b are optional fields.)

- x** File Type
  - B** Bit
  - N** Integer
  - R** Control (read only)
  - T** Timer
  - C** Counter
  - F** Floating Point

**Note:** Floating Point is available in the SLC 5/03 Series C and later models.

**f** = File Number

- 0 to 2** Reserved
- 3** Bit
- 4** Timer
- 5** Counter
- 6** Control
- 7** Integer
- 8** Floating Point

**Note:** File Number 8 is reserved in all SLC PLCs with the exception of the SLC 5/03 Series C and later models.

**9 to 255** Additional File Storage

- :** Element Delimiter
- e** Element Number (0 to 255)
- .** Subelement Delimiter
- s** Subelement mnemonic

<b>ACC</b>	(Accumulated Value)	Word 2	Associated File Type C & T
<b>CD</b>	(Down Enable)	Bit 14	Associated File Type C
<b>CU</b>	(Up Enable)	Bit 15	Associated File Type C
<b>DN</b>	(Done)	Bit 13	Associated File Type C, R, & T
<b>EM</b>	(Empty)	Bit 12	Associated File Type R
<b>EN</b>	(Enable)	Bit 15	Associated File Type R & T
<b>ER</b>	(Error)	Bit 11	Associated File Type R
<b>EU</b>	(Unload Enable)	Bit 14	Associated File Type R
<b>FD</b>	(Found)	Bit 8	Associated File Type R
<b>IN</b>	(Inhibit)	Bit 9	Associated File Type R

<b>LEN</b>	(Length)	Word 1	Associated File Type R
<b>OV</b>	(Overflow)	Bit 12	Associated File Type C
<b>POS</b>	(Position)	Word 2	Associated File Type R
<b>PRE</b>	(Preset Value)	Word 1	Associated File Type C & T
<b>TT</b>	(Timing)	Bit 14	Associated File Type T
<b>UA</b>	(Update Accumulator)	Bit 10	Associated File Type C
<b>UL</b>	(Unload)	Bit 10	Associated File Type R
<b>UN</b>	(Underflow)	Bit 11	Associated File Type C

**Note:** Certain file types allow mnemonics to be used instead of the actual bit number. The mnemonic should be placed after the subelement delimiter ("."). The bit delimiter ("/") is not used in this case.

/ Bit Delimiter

**b** Bit Number (not used in word references)

- 0 - 4095** Decimal for Bit type files when the element number is not specified (optional).
- 0 - 15** Decimal for Bit and Integer file types
- 13 - 15** Decimal for Timer file types
- 10 - 15** Decimal for Counter file types
- 8 - 15** Decimal for Control file types

## I/O Format

The Operator Station reads the I/O configuration when going online and must be placed online or turned on after all other nodes are on the network. If changes are made to the I/O in the PLC, power to the Operator Station must be cycled in order to update the I/O configuration. Due to a limitation of Allen-Bradley PLCs, the Operator Station can only write to an output file of the SLC 5/02 and later models. An error occurs if you try to write to an output file using a SLC 500 or SLC 5/01 PLC. See the **Communication Errors** topic for more information. The following word and bit addressing descriptions apply to the SLC 500 family Command Set.

### [O:e.s/b] or [I:e.s/b]

- I** Input
- O** Output
- :** Slot delimiter
- e** Slot number
  - 0-2 for SLC 500 model
  - 1-30 for SLC 5/01 or later models
- .** Word delimiter
- s** Word number
  - 0-255 for all SLC 500 models
- /** Bit delimiter
- b** Terminal (bit) number
  - 0-15 output bits for SLC 500 model
  - 0-23 input bits for slot 0 for SLC 500 model
  - 0-15 input bits for slot 1 or 2 for SLC 500 model
  - 0-15 input and output bits for SLC 5/01 and later models

**Note:** A word number is not required if the number of inputs or outputs does not exceed 16 for the slot. If a word number is not given, word zero is assumed.

## Status Format

The following word and bit addressing descriptions apply to the SLC 500 family Command Set.

- [S:e/b]** - (/b is an optional field.)
- S** Status
- :** Element delimiter
- e** Element number
  - (0-15 for SLC 500 and SLC 5/01)
  - (0-85 for SLC 5/02 and later models)
- /** Bit number
- b** Bit number
  - (0-15)

## Block Gap and Size

The Operator Station can reference up to 40 contiguous words of data per block read when communicating via the serial port and when communicating via AcceleratI/On to Allen-Bradley SLC 500 PLC's. A different block read is required for different file types regardless of the number of words referenced. In addition, if a gap of 15 or more words exists between references of a given file, a new block read will also be created. The Operator Station will perform all required block reads for the entire page before updating any values. Therefore, update performance and network traffic is directly affected by the number of files read and word gap sizes within these files.

**Note:** Block read calculations should be kept in mind when building configurations if update speed or network loading are important factors in the overall system.

**Note:** Block reads are configured separately for each scan (screen, alarm, message & trend). Total block reads for an individual page will be the addition of all relevant scans.

## Block Gap And Size Examples

The following examples are made assuming the Operator Station is communicating over DH-485 to a SLC 5/02 PLC.

### Example 1:

N7:0  
N7:5  
N7:10 A single block read consisting of 36 words  
N7:15  
N7:25  
N7:35

### Example 2:

N7:0 1st block read of 1 word  
N7:20 2nd block read of 1 word  
N7:40 3rd block read of 1 word  
N7:60 4th block read of 1 word  
N7:80 5th block read of 1 word

### Example 3:

I:0.0/5 1st block read of 1 word  
O:0.0/4 2nd block read of 1 word  
S:0 3rd block read of 1 word  
B3:0 4th block read of 1 word  
T4:0.pre 5th block read of 3 word\*  
C5:0.acc 6th block read of 3 word\*  
N7:0 7th block read of 1 word

**Example 4:**

I:0.3/0	1st block read of 5 words
I:0.7/0	
O:0.2/0	2nd block read of 4 words
O:0.5/15	
S:5	3rd block read of 14 words
S:18	
B3:7	4th block read of 11 words
B3:17	
T4:4.pre	5th block read of 45 words*
T4:18.acc	
C5:23.acc	6th block read of 36 words*
C5:32.pre	
N7:2	7th block read of 15 words
N7:16	

\* Multiple word elements

## Memory Addressing Examples

### Word References

<u>Reference</u>	<u>Description</u>
[B202:100]	Element 100 of Bit file 202
[N22:15]	Element 15 of Integer file 22
[d10:141]	Element 141 of BCD file 10
[I:1.3]	Word 3 of slot 1 of Input file 0
[O:2.1]	Word 1 of slot 2 of Output file 1
[S:22]	Element 22 in reserved Status file 2
[C222:144]	Control value in element 144 of Counter file 222
[C15:29.ACC]	Accumulated value in element 29 of Counter file 15
[c254:2.PRE]	Preset value in element 2 of Counter file 254
[T31:199]	Control value in element 199 of Timer file 31
[t9:52.aCC]	Accumulated value in element 52 of Timer file 9
[T154:2.pre]	Preset value in element 2 of Timer file 154
[r119:172]	Status value in element 172 of Control file 119
[R53:52.len]	Length value in element 52 of Control file 53
[R111:121.PoS]	Position value in element 121 of Control file 111
[b041:81]	Element 81 of Bit file 41
[n21:008]	Element 8 of Integer file 21
[N009:077#s16]	Element 77 of Integer file 9 (signed 16-bit)
[D10:120#U32]	Element 120 of BCD file 10 (unsigned 32-bit)
[F8:23]	Element 23 of Floating point file 8

**Bit References**

<u>Reference</u>	<u>Description</u>
[B34:17]	Bit 17 of Bit file 34 (bit 1 of element 1)
[b4:091/10]	Bit 10 of element 91 of Bit file 4
[N007:25/06]	Bit 6 of element 25 of Integer file 7
[D22:191/15]	Bit 15 of element 191 of BCD file 22
[I:1.1/5]	Bit 5 of word 1, slot 1 of Input file 0
[O:2.3/1]	Bit 1 of word 3, slot 2 of Output file 1
[s:06/8]	Bit 8 in element 6 of Status file 2
[T9:71/eN]	Enable bit (15) in control word of element 71 of Timer file 9
[t4:1/DN]	Done bit (13) in control word of element 1 of Timer file 4
[T77:32.acc/01]	Bit 1 of accumulated value of element 32 in Timer file 77
[C005:28/UN]	Underflow bit (11) in control word of element 28 of Counter file 5
[c163:08/14]	Down Enable bit (14) in control word of element 8 of Counter file 163
[C88:02.PRE/9]	Bit 9 of preset value of element 2 in Counter file 88
[R6:154/fd]	Found bit (8) in status word of element 154 in Control file 6
[r46:83/09]	Inhibit bit (9) in status word of element 83 in Control file 46
[r118:7.LeN/14]	Bit 14 of length value of element 7 in Control file 118

## Maintenance Access

The Maintenance Template will access all memory locations supported by the PLC driver as defined in the **Memory Addressing** topic. When running online, you may change the PLC reference. The Maintenance Template is designed to assist you in specifying the PLC reference by scrolling through a list of mnemonics which are used to enter the PLC word reference. When online in the PLC reference change mode, the following list is available.

“O.”	“I.”	“S.”	“B”	“T”	“C”	“R”	“N”
	“F”	“.”	“/”	“.ACC”	“.PRE”	“.POS”	
	“.LEN”	“/ER”	“/DN”	“/EN”	“/TT”	“/CU”	
	“/CD”	“/OV”	“/UN”	“/UA”	“/EU”	“/EM”	
	“/UL”	“/IN”	“/FD”				

You must enter the correct mnemonics and numeric values and create a legal reference to change a PLC reference.

**Note:** When a new reference is entered on an Operator Station, the Maintenance Template will remain in a paused state until the **Start Monitor** control button or the **Chng** soft function key is pressed. If correct, the template begins updating.

**Note:** A Maintenance Template cannot be used to monitor unsolicited references.



## Remote STS Errors

The most common remote errors reported by the Allen-Bradley PLC are listed in the following table. If you are using Allen-Bradley PLCs for Data Highway or Data Highway Plus, a complete set of errors codes can be found in the Allen-Bradley Publication 1770-6.5.16, November 1991. Take note of the hexadecimal error codes and consult the Allen-Bradley publication.

The Remote STS error codes are found in the following Remote STS Error Codes table. Note that you will have an EXT STS byte if your STS code is F0 (hex).

<b>Error 00</b>	Success -- no error.
<b>Error 10</b>	Illegal command or format.
<b>Error 20</b>	Host has a problem and will not communicate.
<b>Error 30</b>	Remote node host is missing, disconnected, or shut down.
<b>Error 40</b>	Host could not complete function due to hardware fault.
<b>Error 50</b>	Addressing problem or memory protect rungs.
<b>Error 60</b>	Function disallowed due to command protection selection.
<b>Error 70</b>	Processor is in program mode.
<b>Error 80</b>	Compatibility mode file missing or communication zone problem.
<b>Error 90</b>	Remote node cannot buffer command.
<b>Error A0</b>	Not used.
<b>Error B0</b>	Remote node problem due to download.
<b>Error C0</b>	Cannot execute command due to active IPBs.
<b>Error D0</b>	Not used.
<b>Error E0</b>	Not used.
<b>Error F0</b>	There is an error code in the EXT STS byte.

## Remote EXT STS Errors

The most common remote errors reported by the Allen-Bradley PLC are listed in the following table. If you are using Allen-Bradley PLCs for Data Highway or Data Highway Plus, a complete set of errors codes can be found in the Allen-Bradley Publication 1770-6.5.16, November 1991. Take note of the hexadecimal error codes and consult the Allen-Bradley publication.

If the remote error code is F0XX (hex), then the XX represents the Allen-Bradley EXT STS (extended status) error code. The EXT STS error codes are found in the following EXT STS Codes for Command Code 0F (hex) table.

The EXT STS has different definitions depending on the command code (type of command) in your message packet. If the command code is:

<b>00 to 08 (hex)</b>	There is not an EXT STS byte.
<b>0E or 0F (hex)</b>	These are Data Highway/Data Highway Plus codes.
<b>0B, 1A, or 1B (hex)</b>	These are DH-485 codes.
<b>Error 0</b>	Not used.
<b>Error 1</b>	A field has an illegal value.
<b>Error 2</b>	Less levels specified in address than minimum for any address.
<b>Error 3</b>	More levels specified in address than system supports.
<b>Error 4</b>	Symbol not found.
<b>Error 5</b>	Symbol is of improper format.
<b>Error 6</b>	Address does not point to something usable.
<b>Error 7</b>	File is wrong size.
<b>Error 8</b>	Cannot complete request, situation has changed since the start of the command.
<b>Error 9</b>	Data or file is too large.
<b>Error A</b>	Transaction size plus word address is too large.
<b>Error B</b>	Access denied, improper privilege.
<b>Error C</b>	Condition cannot be generated.
<b>Error D</b>	Condition already exists -- resource is already available.
<b>Error E</b>	Command cannot be executed.
<b>Error F</b>	Histogram overflow.

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<b>Error 10</b>	No access.
<b>Error 11</b>	Illegal data type.
<b>Error 12</b>	Invalid parameter or invalid data.
<b>Error 13</b>	Address reference exists to deleted area.
<b>Error 14</b>	Command execution failure for unknown reason; possible PLC-3 histogram.
<b>Error 15</b>	Data conversion error.
<b>Error 16</b>	Scanner not able to communicate with 1771 rack adapter.
<b>Error 17</b>	Adapter cannot communicate with module.
<b>Error 18</b>	1771 module response was not valid.
<b>Error 19</b>	Duplicated label.
<b>Error 1A</b>	File is open; another node owns it.
<b>Error 1B</b>	Another node is the program owner.
<b>Error 1C to FF</b>	Not used.

# Allen-Bradley MicroLogix Family PLCs

## 4

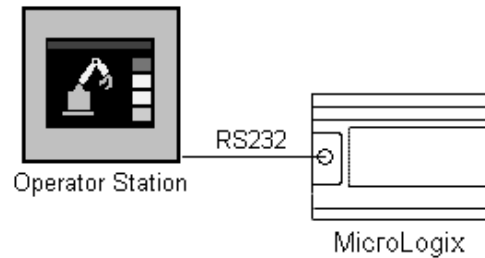
*In this chapter, you will learn:*

- *Connectivity Diagrams*
- *About operator station setup*
- *PLC and communications module setup*
- *Cabling options*
- *How to address memory*
- *What is maintenance access*

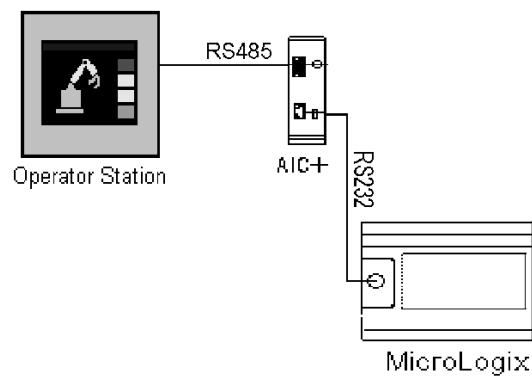
## Connectivity Diagrams

### One Operator Station To One PLC

#### Serial connection to the MicroLogix



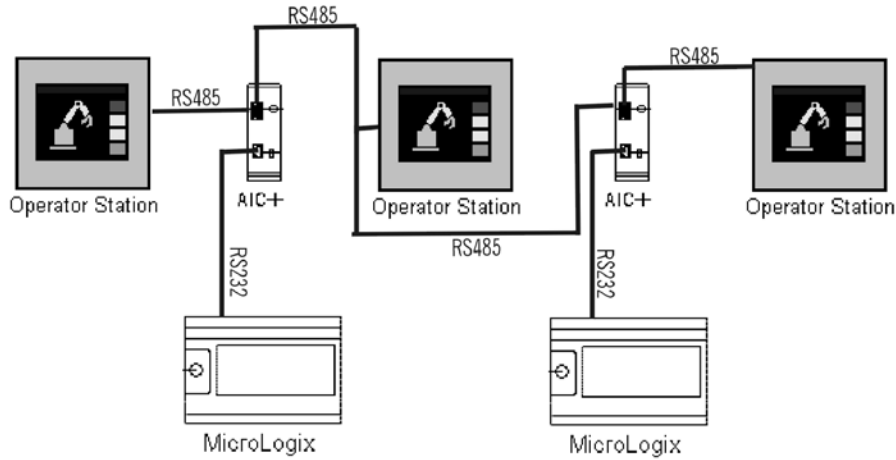
#### DH-485 connection to the MicroLogix



**Note:** A DH-485 option is required for the operator station in this configuration.

## Multiple Operator Stations to Multiple PLCs

### DH-485 connections to multiple MicroLogix PLCs



**Note:** A DH-485 option is required for each operator station in this configuration.

## Operator Station Setup

### Operator Station Connection To Serial Port

Configure the following setup in the **PLC Name And Port Table...**

Field	Selection	Comments
Port	1 or 2 if available	Selecting Port 2 is recommended (if available) so that Port 1 is available to upload and download configurations.
Device Use	AB Serial	
Local ID		Can be set to any number between 0 and 99. Default is 0.
Data Bits	8	Recommended setting for the Operator Station.
Stop Bits	1	Recommended setting for the Operator Station.
Parity	NONE	
Baud Rate		Set to match the PLC setup (between 1200 and 19.2 Kbaud).
Electrical	RS232/485	RS232 or RS485.
Name		Use a six-character name. (alphanumeric or underscore)
Port		Must match the Operator Station port selected.
Model		Select MicroLogix
Remote ID		Must match the Processor Channel 0 ID#.

**Note:** The local ID# must be different than the PLC Remote ID#.

### Operator Station Connection To DH-485

Configure the following setup in the **PLC Name And Port Table...**

Field	Selection	Comments
Port	1 or 2 if available	Selecting Port 2 is recommended (if available) so that Port 1 is available to upload and download configurations. However, Port 1 must be selected for the PanelMate Power Series 1500 units.
Device Use	DH-485	Allen-Bradley Data Highway 485 driver.
Local ID		Operator Station node number on the DH-485 network.
Data Bits	8	Recommended setting for the Operator Station.
Stop Bits	1	Recommended setting for the Operator Station.
Parity	EVEN	Must be EVEN.
Baud Rate		Set to match the PLC setup (between 1200 and 19.2 Kbaud).
Electrical	RS485	Will be set automatically when "DH-485" is chosen for device use.
Name		Use a six-character name. (Alphanumeric or underscore)
Port		Must match the Operator Station port selected.
Model		Set to match the processor model type. ((Used for range checking in addressing)
Remote ID		Must match the Processor DH-485 node number.
DH-485		Click to display the Max Node Setup.

**Note:** On local ID, be sure not to duplicate node numbers on the DH-485 network.

**Note:** Most DH-485 devices have a parameter which sets the maximum node address of the network. The maximum node address should be set the same in all devices on the network. It should be set as high as the highest node address used on the network.



## PLC and Communications Module Setup

### Channel Configurations For MicroLogix PLC Family Channel 0

The image displays two screenshots of the 'Channel Configuration' dialog box for MicroLogix PLC Family Channel 0. The top screenshot shows the 'General' tab with the following settings: Driver: DF1 Full Duplex, Memory Module Over-Write Protected: unchecked, Passthru Link ID (dec): 1, Edit Resource/Owner Timeout (x 1sec): 60, Comms Servicing Selection: unchecked, and Message Servicing Selection: unchecked. The bottom screenshot shows the same dialog box with additional settings: Baud: 19200, Parity: NONE, Source ID: 1 (decimal), Control Line: No Handshaking, Error Detection: CRC, Embedded Responses: Auto Detect, ACK Timeout (x20 ms): 50, NAK Retries: 3, and ENQ Retries: 3. The 'Duplicate Packet Detect' checkbox is also checked.

**Note:** PanelMate units connected to the MicroLogix PLC family must have the error detect set to CRC.

**Note:** The PLC baud rate and Parity must match the settings in the PLC Name and Port Parameters Table.

**Note:** When configuring a MicroLogix 1000, only the baud rate is user-selectable.

**Note:** Error detection must be set to CRC for MicroLogix communications to a PanelMate.

## Cabling Options

Two communications cabling options are available to MicroLogix PLC users.

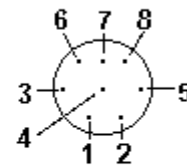
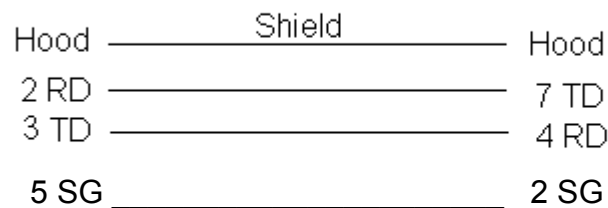
- Use the A-B PLC programming cable (1761-CBC-PM2 Series B or C, or 2707-NC8-Series A) supplied the PLC unit, combined with a Cutler-Hammer AB29 Micro Cable Adapter.
- Fabricate a communications cable using the wiring diagram shown below.

### Operator Stations With DB-9 Connectors To MicroLogix PLC

The Operator Stations that have 9-pin female connectors (DB-9S) must have cables configured with male connectors (DB-9P).

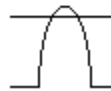
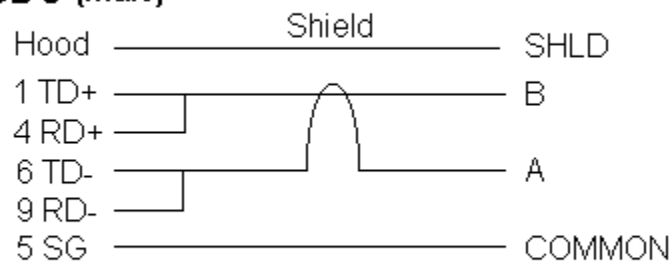
#### Operator Station DB-9 (male)

#### MicroLogix 8-pin Mini Din



#### Operator Station DB-9 (male)

#### DH-485 INTFC 1747 AIC +



Denotes a twisted pair

## Memory Addressing

### General Format

The Allen-Bradley MicroLogix Family of PLCs uses decimal word addresses. The Operator Station's default format for addresses is signed 16. The following Command Set is supported for the MicroLogix PLC family.

[**xf:e.s/b**] - (.s and /b are optional fields.)

**x** File Type

<b>B</b>	Bit
<b>N</b>	Integer
<b>R</b>	Control (read only)
<b>T</b>	Timer
<b>C</b>	Counter
<b>S</b>	Status
<b>O</b>	Output
<b>I</b>	Input (read only)

**f** = File Number

<b>0</b>	Output
<b>1</b>	Input
<b>2</b>	Status
<b>3</b>	Bit (default)
<b>4</b>	Timer (default)
<b>5</b>	Counter (default)
<b>6</b>	Control (default)
<b>7</b>	Integer (default)

## I/O Format

The Operator Station reads the I/O configuration when going online. It must be placed online or turned on after all other nodes are on the network. If changes are made to the I/O in the PLC, power to the Operator Station must be cycled in order to update the I/O configuration. The following word and bit addressing descriptions apply to the MicroLogix family Command Set.

### [O:e.s/b] or [I:e.s/b]

- I** Input
- O** Output
- :** Slot delimiter
- e** Slot number 0-2
- .** Word delimiter
- s** Word number
  - 0-255 for all MicroLogix models
- /** Bit delimiter
- b** Terminal (bit) number
  - 0-7 input and output bits for MicroLogix 1000
  - 0-15 input and output bits for MicroLogix 1200 & 1500 models

**Note:** A word number is not required if the number of inputs or outputs does not exceed 16 for the slot. If a word number is not given, word zero is assumed.

## Status Format

The following word and bit addressing descriptions apply to the MicroLogix family Command Set.

### [S:e/b] - (/b is an optional field.)

- S** Status
- :** Element delimiter
- e** Element number
- /** Bit delimiter
- b** Bit number
  - (0-15)

## Memory Addressing Examples

### Word References

<u>Reference</u>	<u>Description</u>
[B202:100]	Element 100 of Bit file 202
[N22:15]	Element 15 of Integer file 22
[I:1.3]	Word 3 of slot 1 of Input file 0
[O:2.1]	Word 1 of slot 2 of Output file 1
[S:22]	Element 22 in reserved Status file 2
[C222:144]	Control value in element 144 of Counter file 222
[C15:29.ACC]	Accumulated value in element 29 of Counter file 15
[c254:2.PRE]	Preset value in element 2 of Counter file 254
[T31:199]	Control value in element 199 of Timer file 31
[T9:52.ACC]	Accumulated value in element 52 of Timer file 9
[T154:2.PRE]	Preset value in element 2 of Timer file 154
[R119:172]	Status value in element 172 of Control file 119
[R53:52.LEN]	Length value in element 52 of Control file 53
[R111:121.POS]	Position value in element 121 of Control file 111
[B041:81]	Element 81 of Bit file 41
[N21:008]	Element 8 of Integer file 21
[N009:077#S16]	Element 77 of Integer file 9 (signed 16-bit)

**Bit References**

<u>Reference</u>	<u>Description</u>
[B34:17]	Bit 17 of Bit file 34 (bit 1 of element 1)
[B4:091/10]	Bit 10 of element 91 of Bit file 4
[N007:25/06]	Bit 6 of element 25 of Integer file 7
[I:1.1/5]	Bit 5 of word 1, slot 1 of Input file 0
[O:2.3/1]	Bit 1 of word 3, slot 2 of Output file 1
[S:06/8]	Bit 8 in element 6 of Status file 2
[T9:71/EN]	Enable bit (15) in control word of element 71 of Timer file 9
[T4:1/DN]	Done bit (13) in control word of element 1 of Timer file 4
[T77:32.ACC/01]	Bit 1 of accumulated value of element 32 in Timer file 77
[C005:28/UN]	Underflow bit (11) in control word of element 28 of Counter file 5
[C163:08/14]	Down Enable bit (14) in control word of element 8 of Counter file 163
[C88:02.PRE/9]	Bit 9 of preset value of element 2 in Counter file 88
[R6:154/fd]	Found bit (8) in status word of element 154 in Control file 6
[R46:83/09]	Inhibit bit (9) in status word of element 83 in Control file 46
[R118:7.LEN/14]	Bit 14 of length value of element 7 in Control file 118

## Maintenance Access

The Maintenance Template will access all memory locations supported by the PLC driver as defined in the **Memory Addressing** topic. When running online, you may change the PLC reference. The Maintenance Template is designed to assist you in specifying the PLC reference by scrolling through a list of mnemonics which are used to enter the PLC word reference. When online in the PLC reference change mode, the following list is available.

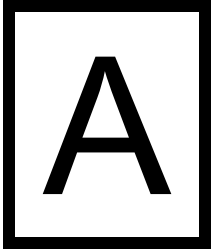
"O."	"I."	"S."	"B"	"T"	"C"	"R"	"N"
	"."	"/"	".ACC"	".PRE"	".POS"		
	".LEN"	"/ER"	"/DN"	"/EN"	"/TT"	"/CU"	
	"/CD"	"/OV"	"/UN"	"/UA"	"/EU"	"/EM"	
	"/UL"	"/IN"	"/FD"				

You must enter the correct mnemonics and numeric values and create a legal reference to change a PLC reference.

**Note:** When a new reference is entered on an Operator Station, the Maintenance Template will remain in a paused state until the **Start Monitor** control button or the **Chng** soft function key is pressed. If correct, the template begins updating.

**Note:** A Maintenance Template cannot be used to monitor unsolicited references.

# 5136-SD ISA Interface Card



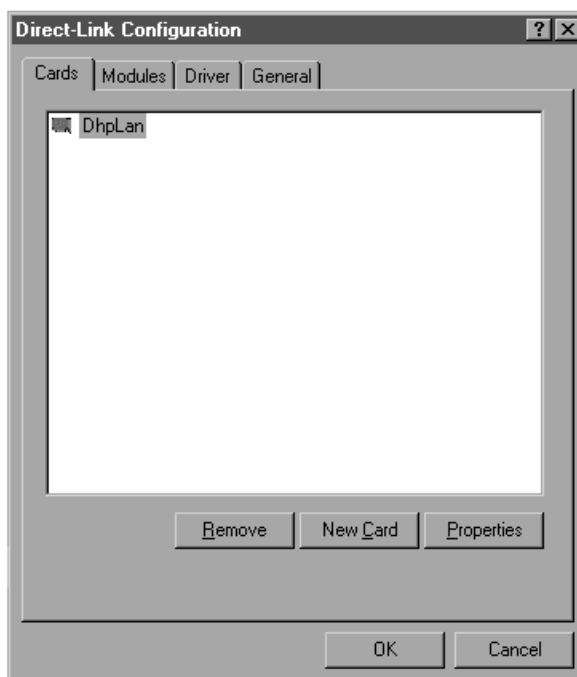
*In this chapter, you will learn:*

- *About installation and setup*

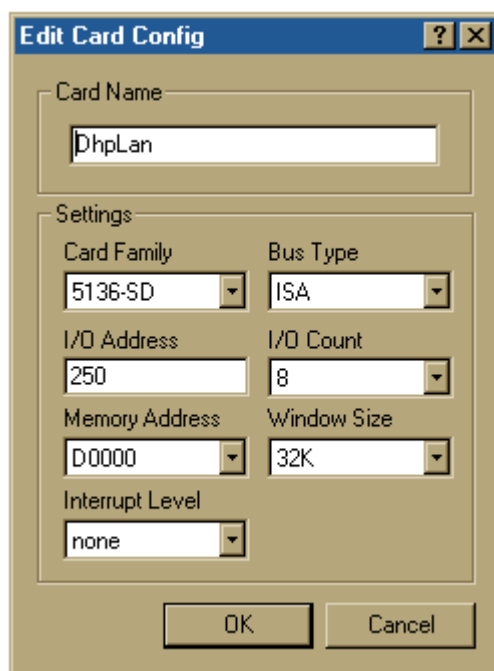


## Installation and Setup

1. Install the ISA card in any open slot in the PC following standard grounding precautions.
2. Place the disk labeled “Direct-Link 5136-SD, 32-bit Windows Software, Disk 1 of 2” into your floppy drive and run `a:\setup`.
3. Follow the prompts using the default directory of `c:\Dlink32\5136-SD`. Use the remaining defaults including “typical installation”. When prompted, insert Disk 2 and continue the installation.
4. When prompted to modify the default configuration, answer **YES**. The following dialog box will be displayed.



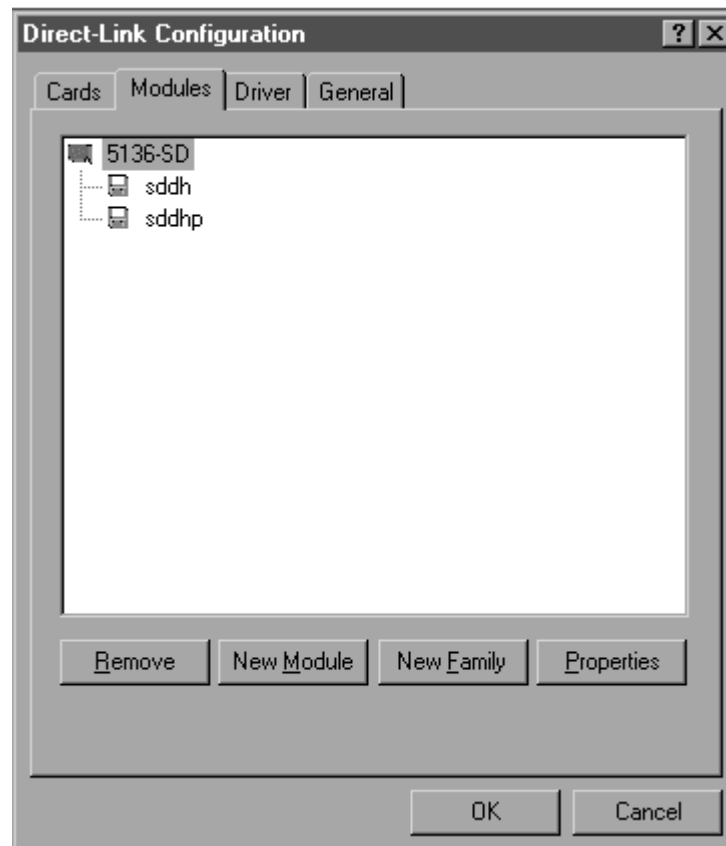
5. Select **Properties** and change the settings as shown below:



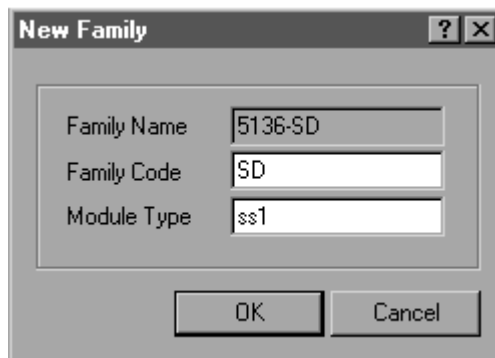
The image shows a Windows-style dialog box titled "Edit Card Config". It has a blue title bar with a question mark icon and a close button. The dialog is divided into two main sections. The top section is labeled "Card Name" and contains a text box with the value "DhpLan". The bottom section is labeled "Settings" and contains several fields: "Card Family" (a dropdown menu showing "5136-SD"), "Bus Type" (a dropdown menu showing "ISA"), "I/O Address" (a text box showing "250"), "I/O Count" (a dropdown menu showing "8"), "Memory Address" (a dropdown menu showing "D0000"), "Window Size" (a dropdown menu showing "32K"), and "Interrupt Level" (a dropdown menu showing "none"). At the bottom of the dialog are two buttons: "OK" and "Cancel".

6. After filling in the above information, click **OK**.

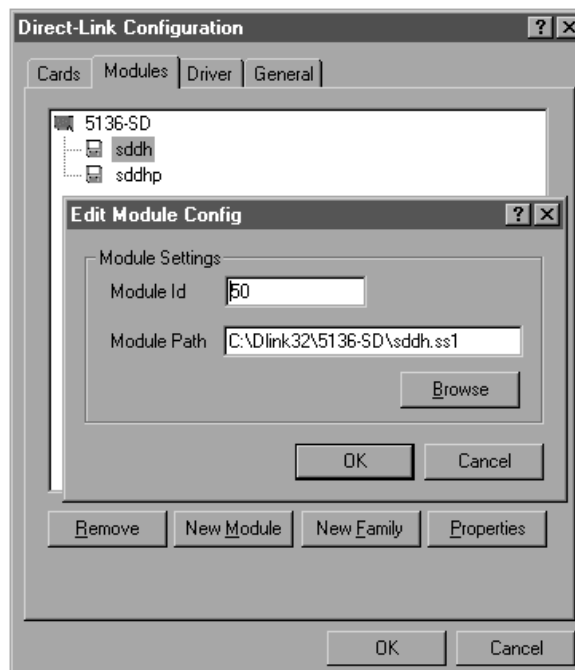
7. Select the **Modules** tab. The following display will appear:



8. Select “5136-SD”, then click **Properties**. The following dialog box should appear:

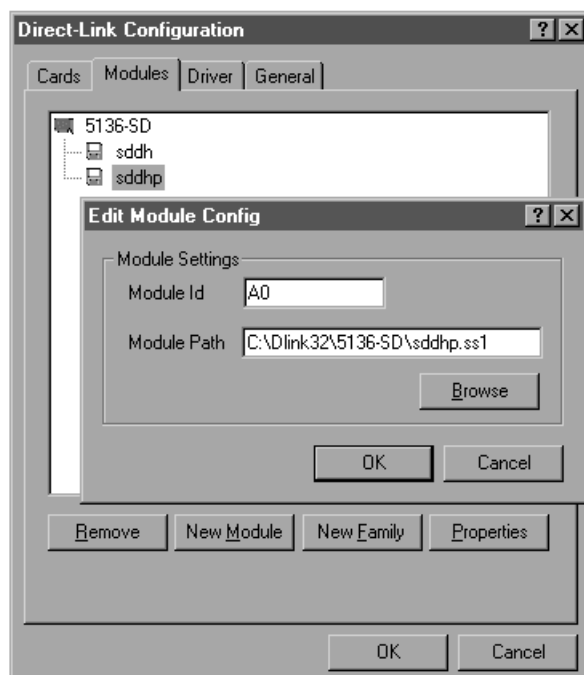


9. Click **OK**, then select the “sddh” as shown below and click **Properties**. The following dialog box will appear:



**Note:** Module Path may differ based on SST installation version, but file name should be identical.

10. Click **OK**, then select the “sddhp” as shown below and click **Properties**. The following dialog box will appear:



**Note:** Module Path may differ based on SST installation version, but file name should be identical.

11. Click **OK**, then click **OK** in the Direct-Link Configuration dialog box.

The software installation of the 5136-SD card is complete at this point. Reboot the PC before using the configured settings.

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