

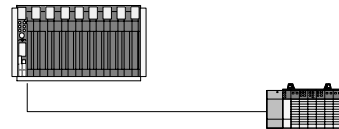
# Connecting PLC-5 Processors and SLC Processors over a DH+ Link

## Using SLC 5/04™ Processors

### Introduction

This document combines available PLC<sup>®</sup> and SLC<sup>™</sup> documentation to show you how you can communicate between these two types of systems over a DH+<sup>™</sup> link.

DH+ link

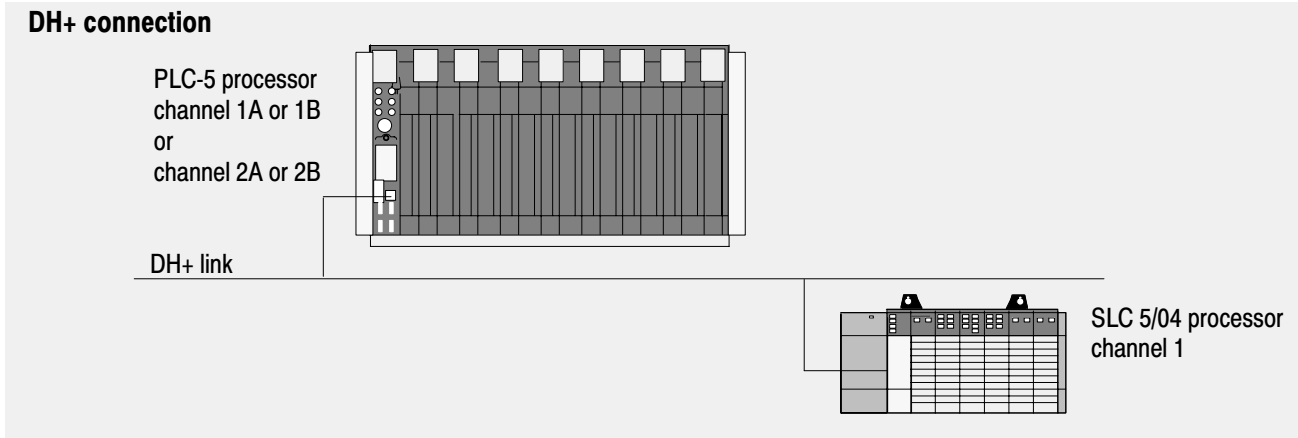


This information is in addition to the user documentation for the processors and communication modules discussed here. You should already have a solid understanding of how to use these processors. Each section in this document lists additional documentation you can refer to for detailed information .

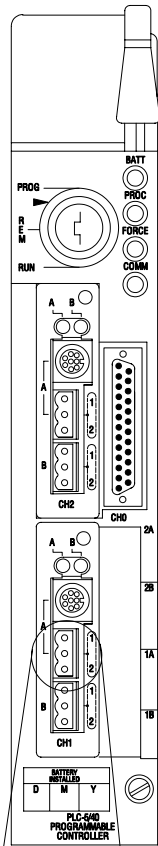
This document is part of a larger set of reference materials to help you better use your PLC-5<sup>®</sup> processor. The 1785-6.8.x series of documents provides individual documents for different applications. This reference set is continually expanding, so see your Allen-Bradley sales representative or distributor for an up-to-date list of available reference documents.

For information about:	See page:
Connecting the processors	
DH+ connection	2
Application requirements	4
Communicating over a DH+ link	5
Programming MSG instructions	6

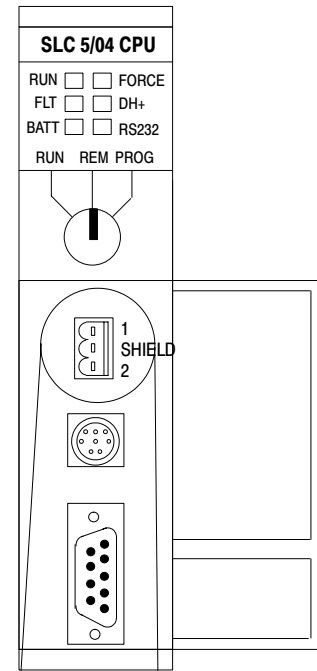
## Connecting the processors



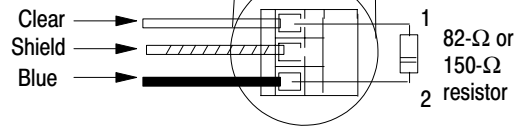
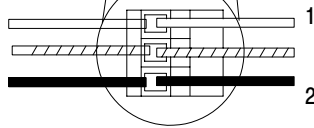
PLC 5 processor



SLC 5/04 processor



1770-CD (Belden 9463)  
 Clear Shield  
 Blue  
 To another DH+ device

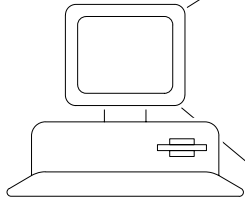


1770-CD (Belden 9463)

Terminate both ends of a DH+ link

**Configuring the processors for the DH+ connection**

use your PLC-5 programming software to configure PLC-5 channel 1A, 1B, 2A, or 2B



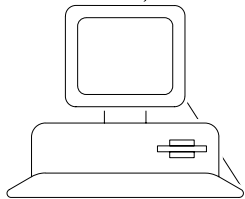
```

Data Highway Plus
Channel 1a Configuration

Diagnostics file:          N14
Baud Rate:                 57.6kB
Global Status flag file:  N12
Link ID:                   0

Press a function key or enter a value.
>
Rem Prog   Forces:None          5/40 File BATCHTES
Accept                               Chan 0 Select
Edits                                           Status Option
F1                                           F9      F10
    
```

use your SLC programming software to configure SLC 5/04 channel 1



```

+----- Channel Configuration -----+
CHANNEL 0 CONFIGURATION
Current Communication Mode: SYSTEM
System Mode Driver: DF1 FULL-DUPLEX
User Mode Driver: SHUTDOWN
Write Protect: DISABLED
Mode Changes: DISABLED
Mode Attention Character: /lb
System Mode Character: S
User Mode Character: U
Edit Resource/File Owner Timeout: 60 (seconds)
Passthru Link ID: 1 (decimal)

CHANNEL 1 CONFIGURATION
System Mode Driver: DH+
Write Protect: DISABLED
Edit Resource/File Owner Timeout: 60 (seconds)
Passthru Link ID: 2 (decimal)
    
```

```

+----- CHANNEL 1 SYSTEM MODE CONFIGURATION -----+
Communication Driver: DH+
Diagnostic File: RESERVED
Baud Rate: 57600
Node Address 1 (octal)

+-----+

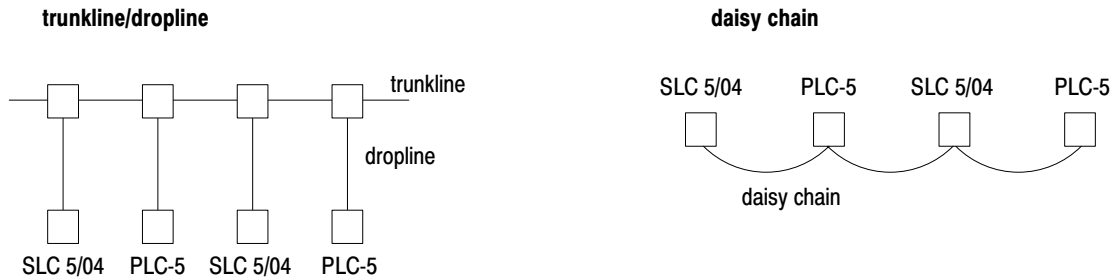
Press a function key

REM PROG

ACCEPT      UNDO      CHANNEL      SELECT
EDITS       EDITS     STATUS       STATUS
F1          F2        F9          F10
    
```

## Application requirements

You can connect a DH+ link in two ways:



**ATTENTION:** Do not mix trunkline/dropline connections with daisy chain connections in one DH+ link.

When installing DH+ communication links **do not**:

- exceed these cable lengths:
  - trunk line-cable length—3,048 m (10,000 cable-ft)
  - drop-cable length—30.4 m (100 cable-ft)
- connect more than 64 stations on a single DH+ link

Use the 3-pin connector on the processor to connect a DH+ link. The connector's port must be configured to support a DH+ communication link.

### DH+ programming cables

The communication cable you use to connect your programming terminal to the DH+ link depends on the communication card in the programming terminal.

When you use this communication card:	Use this cable:
1784-KT, -KT2	• 1784-CP6
1784-KL, -KL/B	• 1784-CP with 1784-CP7 adapter
	• 1784-CP8 adapter
1784-KTX, -KTXD	• 1784-CP12 with 1784-CP7 adapter
1784-PCMK	• 1784-PCM5 with 1784-CP7 adapter

## **Communicating over a DH+ link**

The SLC 5/04 processor accepts PLC-5 type MSG commands to read and write status, bit, timer, counter, control, integer, floating point, string, and ASCII data. The SLC 5/04 processor does not let the PLC-5 processor read from or write to input or output files due to the differences between the PLC-5 rack/group addressing structure and the SLC slot/word addressing structure.

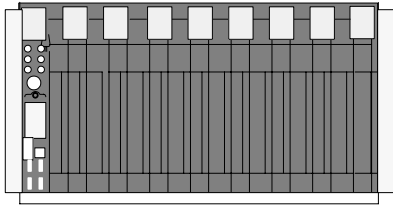
The PLC-5 processor accepts SLC 500 peer-to-peer read and peer-to-peer write MSG commands. The PLC-5 processor does not let the SLC 5/04 processor read from or write to input or output files due to the differences between the PLC-5 rack/group addressing structure and the SLC slot/word addressing structure.

### **Additional documentation**

- 1747-6.2 SLC 500 Modular Hardware Style Installation and Operation Manual
- 1785-6.1 PLC-5 Programming Software Instruction Set Reference Manual
- 1770-6.5.16 Data Highway/Data Highway Plus/DH-485 Protocol and Command Set Reference Manual

## Programming MSG instructions

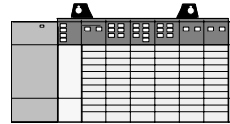
PLC-5 MSG instructions



The MSG instruction transfers data in packets. Each DH+ data packet can contain as many as 120 words. If your message transfer contains more words than fit in one packet, the transfer requires more than one packet of transfer data. The more packets to transfer, the longer the transfer takes.

The PLC-5 processor can queue as many as 16 message instructions at one time – for all channels. The processor channels queue message instructions on a first-come-first-served basis.

SLC 5/04 MSG instructions



Data associated with a message write instruction is buffered when you enable the instruction. The SLC 5/04 processor can queue as many as 14 message instructions per channel.

If a MSG instruction is in one of the four “channel-dependent” transmission buffers and is waiting to be transmitted, its control block has status bits EN and EW set. If more than four MSG instructions for that channel are enabled at one time, a “channel dependent” overflow queue stores the MSG instruction header blocks (not the data for a MSG write) from the fifth instruction to the fourteenth.

This instruction, queued in a FIFO, order has control block status bit EN set. If more than 14 MSG instructions are enabled at one time for any one channel, control block status bit WQ is set, as there may be no room available in the overflow queue. This instruction must be re-scanned until space exists in this queue.

SLC 5/04 processors with OS401 and later support global status bits.

When the SLC 5/04 processor responds to a PLC-5 type message, the SLC processor doesn't allow any reading or writing of its input and output image table. If the SLC 5/04 processor initiates the message, it allows reading and writing of its input and output image table.

### Considerations when configuring MSG control blocks

Keep these considerations in mind when configuring messages to communicate over a DH+ link between PLC-5 and SLC 5/04 processors.

- The SLC processor can only address words 0 to 255 in a PLC-5 data table.
- In an SLC 5/04 MSG instruction, the maximum number of words you can read from or write to a PLC-5 processor is 100 words.

**SLC 5/04 MSG commands**

Choose from the following MSG commands when sending MSG instructions from an SLC 5/04 processor to a PLC-5 processor. These commands simplify sending messages by eliminating the need for creating a PLC-2<sup>®</sup> compatibility file for both the PLC-5 processor and the SLC 5/04 processor.

If you want the instruction to:	On this type of network:	Select these MSG command parameters:	
read data from a PLC-5 processor	local DH+	Type: Peer-to-Peer Read/Write: Read Target Device: PLC5 Local/Remote: Local	
	remote DH+	Type: Peer-to-Peer Read/Write: Read Target Device: PLC5 Local/Remote: Remote	
write data to a PLC-5 processor	local DH+	Type: Peer-to-Peer Read/Write: Write Target Device: PLC5 Local/Remote: Local	
	remote DH+	Type: Peer-to-Peer Read/Write: Write Target Device: PLC5 Local/Remote: Remote	

Use 14 words of bit or integer data for the control block. This is the control block layout if you select a PLC-5 as the target device:

**Control block for an SLC MSG instruction to a PLC-5 processor**

15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00	Word
EN ST DN ER CO EW NR TO   error code														0		
node number																1
reserved for length in words																2
file number																3
file type (S, B, T, C, R, N, O, I, M0, M1)																4
element number																5
subelement number																6
reserved (internal messaging bits)														WQ	7	
message timer preset																8
reserved (internal use only)																9
message timer accumulator																10
reserved (internal use only)																11
reserved (internal use only)																12
reserved (internal use only)																13

**PLC-5 MSG commands**

Choose from the following MSG commands when sending MSG instructions from a PLC-5 processor to an SLC 5/04 processor. These MSG command types are only available with enhanced PLC-5 processors.

<b>If you want the instruction to:</b>	<b>On this type of network:</b>	<b>Select these MSG command parameters:</b>	
read data from an SLC processor without specifying the actual word length of the message	local DH+	<b>Communication Command:</b>	PLC-5 Typed Read From SLC
		<b>Local/Remote:</b>	Local
		<b>Local Node Address:</b>	address of SLC processor
		<b>Destination Data Table Address:</b>	address to read in SLC data table
	remote DH+	<b>Communication Command:</b>	PLC-5 Typed Read From SLC
		<b>Local/Remote:</b>	Remote
		<b>Local Node Address:</b>	address of SLC processor
		<b>Destination Data Table Address:</b>	address to read in SLC data table
write data to an SLC processor without specifying the actual word length of the message	local DH+	<b>Communication Command:</b>	PLC-5 Typed Write To SLC
		<b>Local/Remote:</b>	Local
		<b>Local Node Address:</b>	address of SLC processor
		<b>Destination Data Table Address:</b>	address to write to in SLC data table
	remote DH+	<b>Communication Command:</b>	PLC-5 Typed Write To SLC
		<b>Local/Remote:</b>	Remote
		<b>Local Node Address:</b>	address of SLC processor
		<b>Destination Data Table Address:</b>	address to write to in SLC data table
read a specific number of words of data from an SLC processor	local DH+	<b>Communication Command:</b>	SLC Typed Logical Read
		<b>Local/Remote:</b>	Local
		<b>Local Node Address:</b>	address of SLC processor
		<b>Destination Data Table Address:</b>	address to read in SLC data table
	remote DH+	<b>Communication Command:</b>	SLC Typed Logical Read
		<b>Local/Remote:</b>	Remote
		<b>Local Node Address:</b>	address of SLC processor
		<b>Destination Data Table Address:</b>	address to read in SLC data table
write a specific number of words of data to an SLC processor	local DH+	<b>Communication Command:</b>	SLC Typed Logical Write
		<b>Local/Remote:</b>	Local
		<b>Local Node Address:</b>	address of SLC processor
		<b>Destination Data Table Address:</b>	address to write to in SLC data table
	remote DH+	<b>Communication Command:</b>	SLC Typed Logical Write
		<b>Local/Remote:</b>	Remote
		<b>Local Node Address:</b>	address of SLC processor
		<b>Destination Data Table Address:</b>	address to write to in SLC data table

When deciding how to send data through MSG instructions, keep these requirements in mind:

- The maximum message size for PLC-5 processors is 100 words (200 bytes).
- The maximum message size for SLC 5/04 processors is 112 words (224 bytes).

**Important:** The PLC5 Typed Write to SLC and PLC5 Typed Read from SLC commands are accessible only with release 5.0 and later 6200 programming software.

The MG control block is fixed at 56 words. You must use the MG control block if you send messages to an SLC processor using the SLC read and write commands, or if you send a message out any port other than channel 1A. This is the control block layout for a PLC-5 MSG instruction:

**Control block for a PLC-5 MSG instruction**

15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00	Word
EN ST DN ER CO EW NR TO																0
error code (.ERR)																1
requested length (.RLEN)																2
done length (.DLEN)																3
modifiers (.DATA [0])																4
module class										push wheel						5
port ID										command type						6
command										function						7
station ID (6 words) .DATA [4] - .DATA [9]																8
local data table address (9 words) .DATA [10] - .DATA [18]																14
length remote address										parameters length						23
remote data table address (15 words) .DATA [20] - .DATA [34]																24
logical address of parameters file (9 words) .DATA [35] - .DATA [43]																39
reply class										reply pushwheel						48
reply mailbox										spare						49
port ID (6 words) .DATA [46] - .DATA [51]																50

**ATTENTION:** Use care when addressing PLC-5 MG.DATA structures. The information in these structures is vital to your control program. Changing MG.DATA values could severely affect the operation of your process.



## Sending SLC Typed Logical Read and Typed Logical Write commands

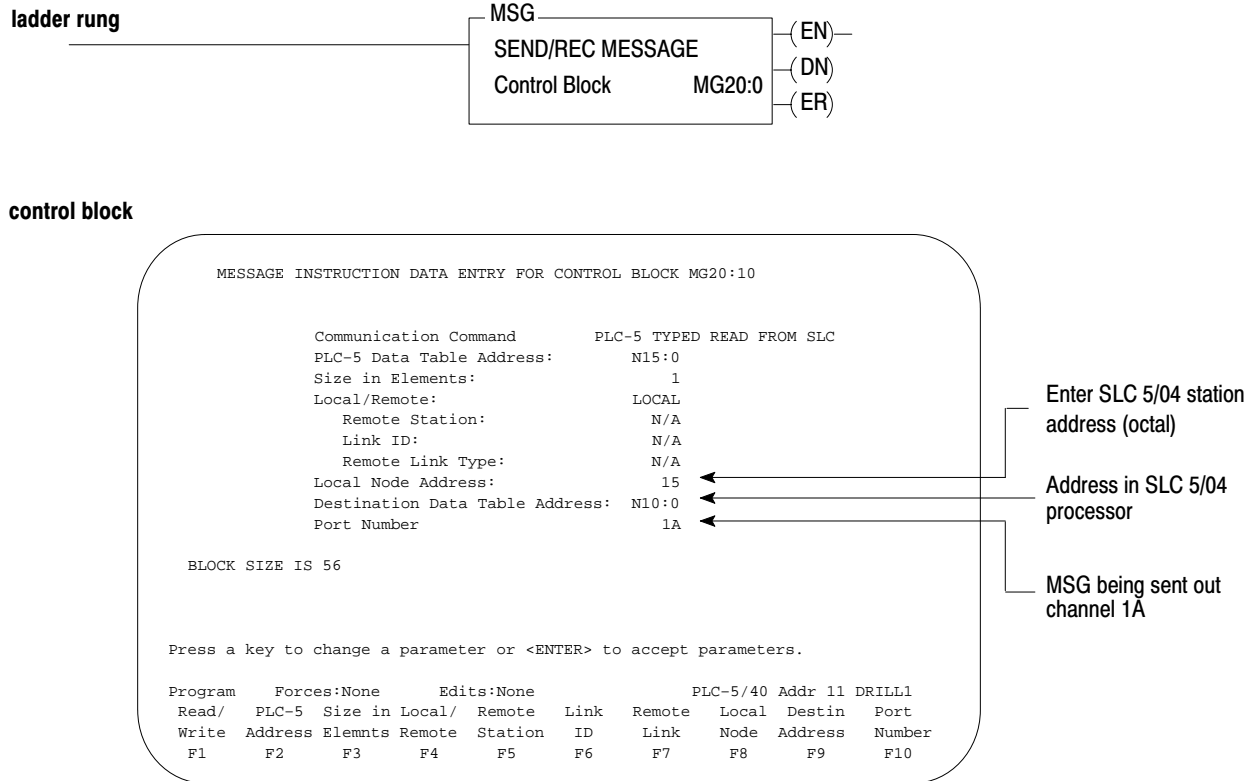
Follow these guidelines when programming SLC Typed Logical Read and SLC Typed Logical Write commands:

- You must use the MG data type for the MSG control block.
- The PLC-5 data table address and the destination address types should match when the data type is supported by the PLC-5 and SLC processors. If you want to send a data type that the SLC processor does not support, the SLC processor interprets that data as integer. This table maps the data types from the PLC-5 processor to the SLC processor.

This PLC-5 data type:	Is interpreted by the SLC 5/04 processor as:	This PLC-5 data type:	Is interpreted by the SLC 5/04 processor as:
Binary (B)	bit	String (ST)	string
Integer (N)	integer	BT control (BT)	integer
Output (O)	integer	Timer (T)	timer
Input (I)	integer	Counter (C)	counter
Status (S)	integer	Control (R)	control
ASCII (A)	ASCII	Float (F)	float
BCD (D)	integer	MSG control (MG)	integer
SFC status (SC)	integer	PID control (PD)	integer

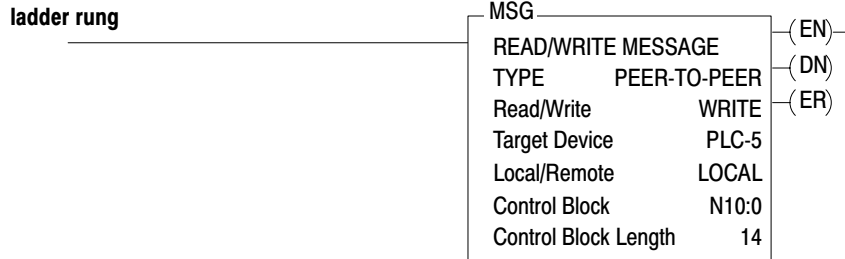
- To read/write from the SLC input, output (read only), or status file, specify an integer PLC-5 data table address and specify the address of the SLC input, output, or status file. For example, S:37 for word 37 of the SLC status file. Specify SLC input/output addresses by logical format, i.e., O:001 references slot 1.
- PLC-5 ASCII data is byte data (1/2 word) whereas, an SLC ASCII data element is one word. Therefore, if you request a PLC 5 Typed Read of 10 elements, the SLC processor sends a packet containing 20 bytes (10 words).
- PLC-5 processors allow 1000 elements per file for most data types whereas SLC processors allow 256 elements per file.

**Figure 1**  
**Sending a read MSG instruction from a PLC-5 processor to an SLC 5/04 processor**

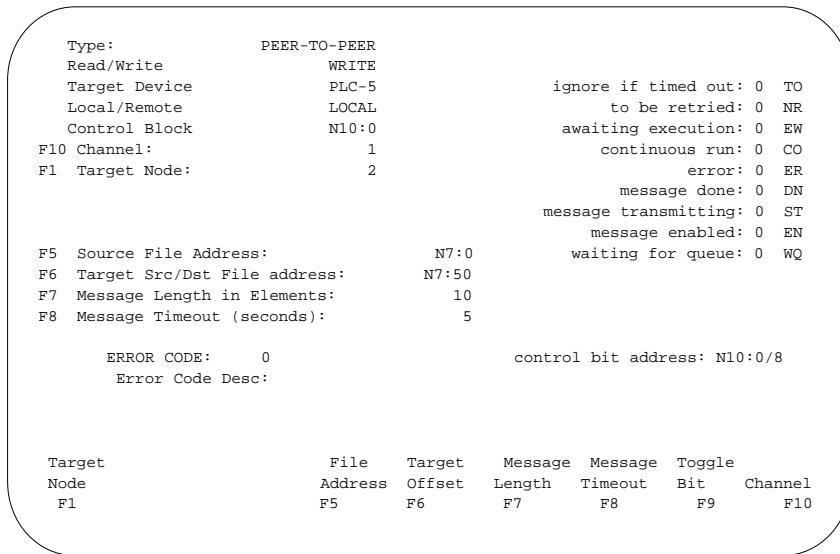


This MSG example tells the PLC-5 processor (station 11<sub>8</sub>) to read the information from N10:0 in an SLC 5/04 processor station 15<sub>8</sub> and place the information in N15:0 in the PLC-5 processor.

**Figure 2**  
**Sending a write MSG instruction from an SLC 5/04 processor to a PLC-5 processor**



**control block**



The SLC 5/04 processor writes 10 elements to Target Node 2's N7 file, starting at word N7:50. The words are from the SLC integer file starting at word N7:0. If 5 seconds elapse without a reply, error bit N10:0/12 is set and error code 37h is displayed, indicating that the instruction timed out.

When you program a PLC-5 type MSG command in an SLC 5/04 processor, the source and destination data types should match. The destination type determines the number of words per element to transfer.

DH+, PLC-2, PLC, PLC-5, SLC, and SLC 5/04 are trademarks of Allen-Bradley Company, Inc.



Allen-Bradley, a Rockwell Automation Business, has been helping its customers improve productivity and quality for more than 90 years. We design, manufacture and support a broad range of automation products worldwide. They include logic processors, power and motion control devices, operator interfaces, sensors and a variety of software. Rockwell is one of the worlds leading technology companies.



## Worldwide representation.

Argentina • Australia • Austria • Bahrain • Belgium • Brazil • Bulgaria • Canada • Chile • China, PRC • Colombia • Costa Rica • Croatia • Cyprus • Czech Republic • Denmark • Ecuador • Egypt • El Salvador • Finland • France • Germany • Greece • Guatemala • Honduras • Hong Kong • Hungary • Iceland • India • Indonesia • Ireland • Israel • Italy • Jamaica • Japan • Jordan • Korea • Kuwait • Lebanon • Malaysia • Mexico • Netherlands • New Zealand • Norway • Pakistan • Peru • Philippines • Poland • Portugal • Puerto Rico • Qatar • Romania • Russia-CIS • Saudi Arabia • Singapore • Slovakia • Slovenia • South Africa, Republic • Spain • Sweden • Switzerland • Taiwan • Thailand • Turkey • United Arab Emirates • United Kingdom • United States • Uruguay • Venezuela • Yugoslavia

Allen-Bradley Headquarters, 1201 South Second Street, Milwaukee, WI 53204 USA, Tel: (1) 414 382-2000 Fax: (1) 414 382-4444