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Allen-Bradley

Direct Communication Module

(Cat. No. 1771-DCM)

User Manual

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Chapter 1

To Our Customers

To Our Customers

The following information may be helpful when using this manual:

Manual's Purpose

The purpose of this manual is to help you understand the intended application of your Direct Communication Module (cat. no. 1771-DCM) and operate your 1771-DCM correctly in the shortest possible time. We show you how to:

- Select Module Options to Fit your Application — Chapter 3
- Install and Connect Your 1771-DCM — Chapter 4
- Use Status Bits to Detect Faults — Chapter 5
- Program the Transfer of Data between Processors — Chapter 6
- Compute the Transfer Time between Processors — Chapter 7
- Troubleshoot Module or System Malfunctions — Chapter 8

Intended Audience

We assume you are familiar with installing and using Allen-Bradley programmable controllers and that you have written ladder diagram programs. If not, we suggest that you study the Programming and Operations Manual of your processor(s) listed below under Related Publications.

Terminology

We have written this manual using current programmable controller terminology and have attempted to keep it free of jargon. If you encounter terms that you do not understand, we suggest that you obtain the current booklet, Programmable Controller Terms, listed below under Related Publications.

Related Publications

You should be able to install and operate your 1771-DCM without the need for additional publications. If not, the following publications may be of interest to you:

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Title	Publication
1771-ASB Remote I/O Adapter	1771-6.5.37
Programmable Controller Terms	PCGI-7.2
PLC-2/05 Programming Manual	1772-6.8.6
PLC-2/15 Programming Manual	1772-6.8.2
PLC-2/02, -2/16, -2/17 User's Manual	1772-6.5.8
PLC-2/30 Programming Manual	1772-6.8.3
PLC-3 Programming Manual	1775-6.4.1
PLC-5 Family Processor Manual	1785-6.8.2
PLC-5/250 Programmer's Manual	5000-6.4.1

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Chapter 2

Overview of Direct Communication Module

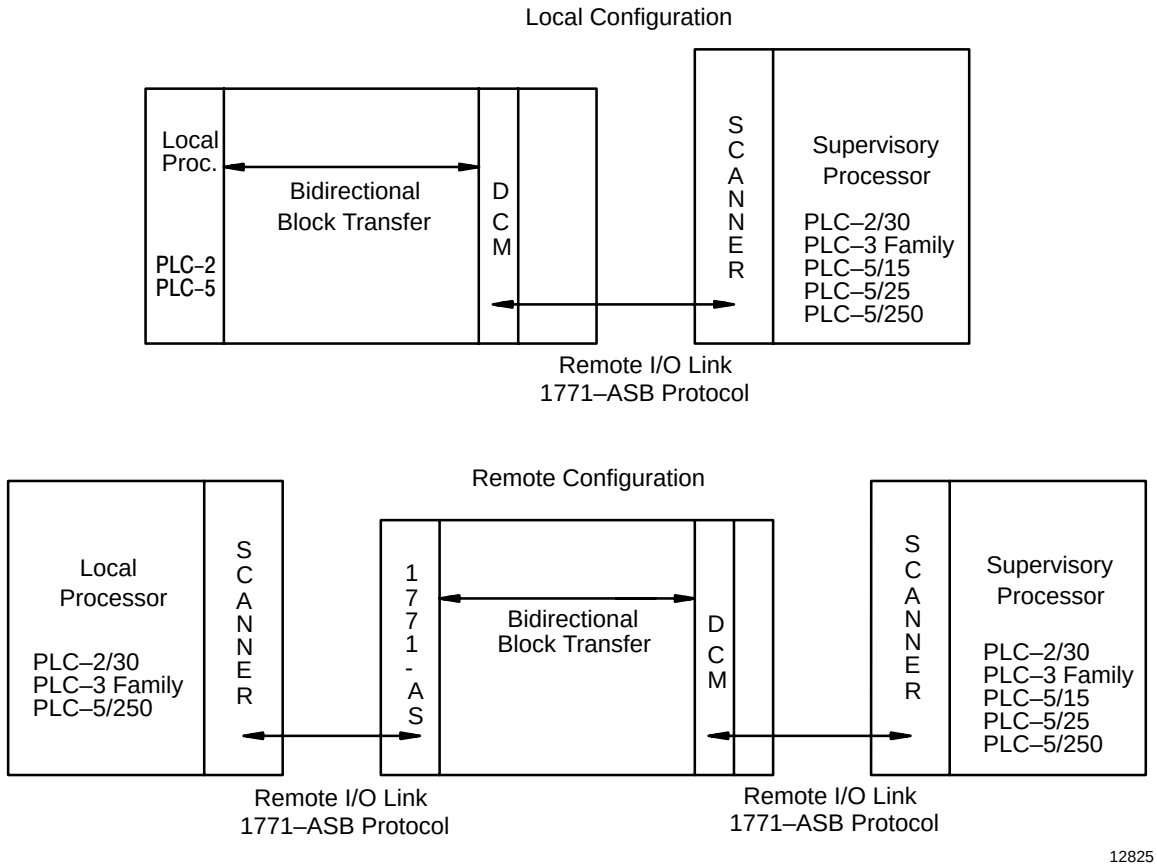
Overview of Direct Communication Module

Allen-Bradley has introduced the Direct Communication Module (cat. no. 1771-DCM) to meet the growing need for communication between PC processors.

Describing the 1771-DCM

The 1771-DCM is a chassis-mounted single-slot I/O module that allows communication between a supervisory processor and local processors (Figure 2.1). The local processor can be chassis-mounted or configured as a local or remote system.

Figure 2.1
Local and Remote Configurations



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The 1771-DCM passes data table values such as command bits, status bits, and data blocks between supervisory and local processors. The supervisory processor typically writes commands and/or data table values to the local processor, and reads resulting status, diagnostic data, and data values from the local processor (or vice versa).

The supervisory processor communicates serially with the 1771-DCM as though it were a 1771-ASB Adapter Module, and addresses the 1771-DCM as though it were addressing a separate I/O chassis. You select the mode of transfer between the supervisory processor and 1771-DCM: discrete transfer (up to eight words) or block transfer (up to 64 words). Either mode includes one status word.

The local processor communicates with the 1771-DCM over the backplane using block transfers and addresses the 1771-DCM as an intelligent I/O module. When the local processor is remotely configured, it communicates with the 1771-DCM via block transfer through its scanner-adapter link.

Choosing 1771-DCM or Data Highway

The 1771-DCM and data highway allow communication between PC processors. Consider the following factors when determining the appropriate choice. Use the 1771-DCM to:

- Transfer data table words
- Obtain predictable transfer times
- Transfer up to eight words when transfer time over a remote I/O channel is adequate, in addition to the transfer time of the local processor and 1771-DCM
- Transfer up to 64 words when transfer time for block transfers over a remote I/O channel is adequate, in addition to the transfer time of the local processor and 1771-DCM
- Decrease data highway traffic

At least one processor must have a remote I/O scanner.

You cannot transfer ladder diagram programs nor messages stored in the message area of memory using the 1771-DCM.

Selecting Options

You can select one or more of the following options depending on your application requirements using switches on the module:

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Baud Rate/Distance	Select the communication rate and distance to the supervisory processor as either 57.6K baud to a distance of 10,000 feet, or 115.2K baud to a distance of 5,000 feet.
Transfer Method	Select block transfer or discrete data transfer between the 1771-DCM and the supervisory processor.
Rack Size	When using discrete data transfer, select the number of slots that determines how the 1771-DCM appears to the scanner of the supervisory processor (the size of the I/O chassis simulated by the 1771-DCM). This also determines the number of words transferred.
Protected Data	Select protected data to prevent block transfers from the local processor until the supervisory processor has received the previous block transfer.
I/O Rack Address	Designate the I/O rack number, the number of the first module group of the I/O chassis simulated by the 1771-DCM, and whether it has the highest starting module group address of two or more chassis assigned to the same rack address.

These options are described in Chapter 3.

Example Applications

You can use the 1771-DCM in a variety of applications where the transfer of data table values is required. For example, consider using it to:

- Call messages stored in the data table of the supervisory processor and outputted through an ASCII I/O module (cat. no. 1771-DA) or BASIC module (cat. no. 1771-DB)
- Download recipe data table values from supervisory to local processor(s) where you want local processor(s) to execute different versions of the same program
- Download commands from the supervisory processor to execute different sections of a ladder diagram program at the local processor

Compatible Processors

Use the 1771-DCM with any Allen-Bradley programmable controller that uses block transfer and the 1771 I/O structure.

Keying

Reserve an I/O slot for this module by placing keying bands on the backplane connector. Position keying bands between the following numbers labeled on the backplane adjacent to the upper backplane connector. The keying bands mate with corresponding slots in the module connector:

- Between 2 and 4
- Between 16 and 18

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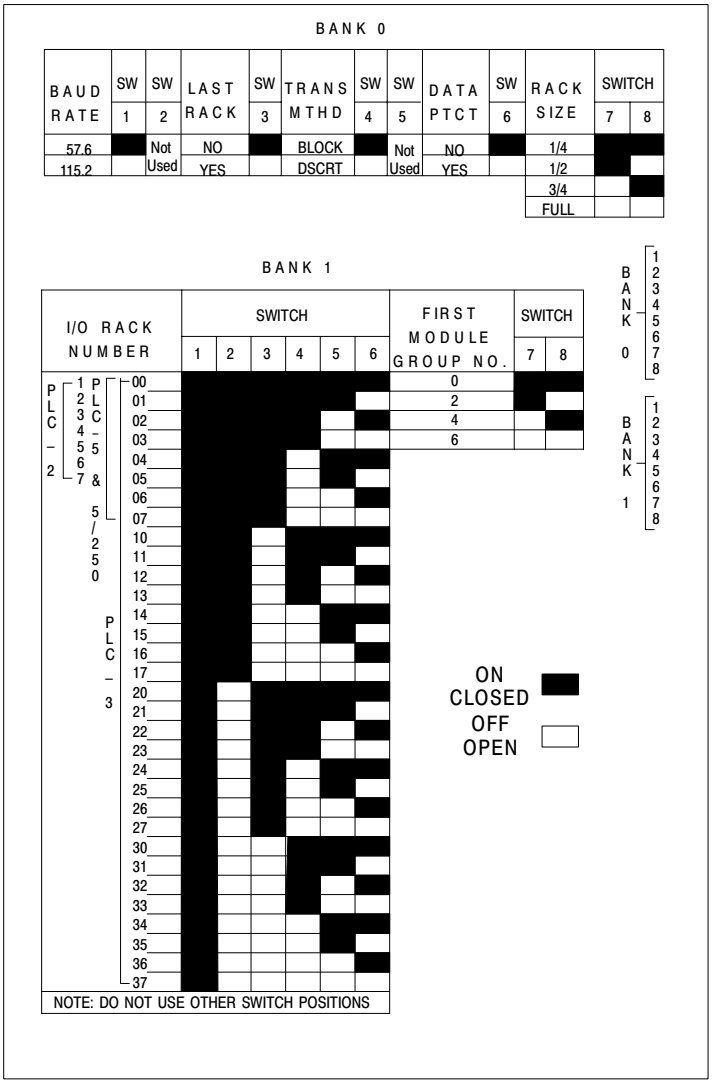
Chapter 3

Selecting Options

Selecting Options

Select one or more of the following options depending on your application requirements. Do this by setting switches in Switch Banks 0 and 1 on the left (metal cover) side of the 1771-DCM. To assist you, we have printed a table of switch settings for each switch bank on the module's cover next to the switches (Figure 3.1).

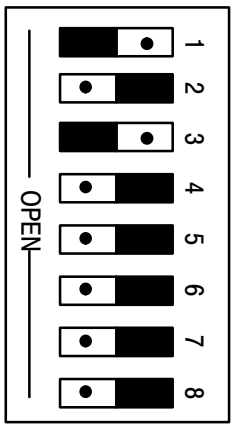
Figure 3.1
Tables for Switch Settings



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Each switch bank has eight switches. Set each switch to the ON (closed) position by depressing the right-hand side of the switch or to the OFF (open) position by depressing the left-hand side of the switch (Figure 3.2).

Figure 3.2
Example Switch Bank



Switches 1 and 3 are OFF (open)

Shading represents the switch position

12826

Switch Bank 0

The options that you select with Switch Bank 0 are as follows:

Switch 1 - Baud Rate

- ON (Closed) for 57.6K Baud
- OFF (Open) for 115.2K Baud

Set the baud rate equal to that of the scanner of your supervisory processor. You can transmit data up to 10,000 feet at a data rate of 57.6K baud or up to 5,000 feet at a data rate of 115.2K baud.

Switch 2 - Not Used

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Switch 3 - Last Rack

- ON (Closed) Not Last Rack
- OFF (Open) Last Rack

If the 1771-DCM is assigned the same I/O rack number as other I/O chassis, designate whether this I/O chassis is the last chassis (has the highest starting module group number) of those assigned the same rack number. (Refer to I/O Rack Number below.)

Switch 4 - Transfer Method

- ON (Closed) for Block Transfer
- OFF (Open) for Discrete Data Transfer

Choose either discrete data transfer or block transfer between the supervisory processor and 1771-DCM. With discrete transfer, the rack size you select determines the number of words transferred as either 2, 4, 6, or 8 words including a status word. Data is transferred between the 1771-DCM and the supervisory processor as serial remote I/O data for each slot of the simulated I/O chassis. The supervisory processor updates the 1771-DCM as if it were an I/O chassis on a remote I/O link.

With block transfer, you can transfer up to 64 words including a status word. The 1771-DCM appears to the supervisory processor as a remote 1/4 rack. Data is transferred between the first I/O slot simulated by the 1771-DCM and the supervisory processor when the supervisory processor's ladder program executes block transfers.

Communication between the 1771-DCM and local processor is always block transfer regardless of the mode of communication between 1771-DCM and supervisory processor.

Switch 5 - Not Used

Switch 6 - Protected Data

- ON (Closed) for Unprotected Data
- OFF (Open) for Protected Data

This option maintains data integrity and maintains the order of data blocks sent from the local processor to the supervisory processor only when you select block transfer. The 1771-DCM does not recognize the start of a

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new write block transfer from the local processor until the supervisory processor has read the previous data from the 1771-DCM.

When you select unprotected data, the local processor updates the 1771-DCM continually, regardless of whether the supervisory processor has read the data from the 1771-DCM.

Switches 7 and 8 - Rack Size

Switch 7	Switch 8	Rack Size
ON	ON	1/4
ON	OFF	1/2
OFF	ON	3/4
OFF	OFF	Full

When your application requires the transmission of discrete data words, the 1771-DCM appears to the scanner of the supervisory processor as a 4-, 8-, 12-, or 16-slot remote I/O chassis for the transfer of either 2, 4, 6, or 8 words respectively. Select the equivalent rack size depending on the number of words of discrete data you want to write or read. One slot is equivalent to eight discrete data bits. One module group is equivalent to a word. A full rack is equivalent to eight data words. The 1771-DCM inserts one status word in the transfer regardless of the equivalent rack size you select.

When you set the 1771-DCM for block transfer, the 1771-DCM appears to the scanner of the supervisory processor as a block transfer module in the first module group of a four-slot chassis (1/4 rack). You can read and write up to 64 words including one status word. Slots 1 through 3 are not used.

Switch Bank 1

The options that you select with Switch Bank 1 are as follows:

Switches 1 through 6 - I/O Rack Number

PLC-2 Family	PLC-3 and PLC-5/250	PLC-5/15	PLC-5/25
1 - 7	0 thru 37 octal	1 - 3	1 - 7

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Designate the I/O rack number that you assign to the 1771-DCM with Switches 1 - 6 of Switch Bank 1 (Table 3.A).

Table 3.A
I/O Rack Number Selection for PLC-2, PLC-3, and PLC-5 Family Processors

I/O Rack Number (Octal)		Switch					
		1	2	3	4	5	6
P L C 2	1	0	ON	ON	ON	ON	ON	ON
	2	1	ON	ON	ON	ON	ON	OFF
	3	2	ON	ON	ON	ON	OFF	ON
	4	3	ON	ON	ON	ON	OFF	OFF
	5	4	ON	ON	ON	OFF	ON	ON
	6	5	ON	ON	ON	OFF	ON	OFF
	7	6	ON	ON	ON	OFF	OFF	ON
		7	ON	ON	ON	OFF	OFF	OFF
		10	ON	ON	OFF	ON	ON	ON
		11	ON	ON	OFF	ON	ON	OFF
		12	ON	ON	OFF	ON	OFF	ON
		13	ON	ON	OFF	ON	OFF	OFF
		14	ON	ON	OFF	OFF	ON	ON
		15	ON	ON	OFF	OFF	ON	OFF
		16	ON	ON	OFF	OFF	OFF	ON
		17	ON	ON	OFF	OFF	OFF	OFF
		20	ON	OFF	ON	ON	ON	ON
		21	ON	OFF	ON	ON	ON	OFF
		22	ON	OFF	ON	ON	OFF	ON
		23	ON	OFF	ON	ON	OFF	OFF
		24	ON	OFF	ON	OFF	ON	ON
		25	ON	OFF	ON	OFF	ON	OFF
		26	ON	OFF	ON	OFF	OFF	ON
		27	ON	OFF	ON	OFF	OFF	OFF

PLC-5/15
PLC-5/25
PLC-3 & PLC5/250

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I/O Rack Number (Octal)	Switch					
	1	2	3	4	5	6
30	ON	OFF	OFF	ON	ON	ON
31	ON	OFF	OFF	ON	ON	OFF
32	ON	OFF	OFF	ON	OFF	ON
33	ON	OFF	OFF	ON	OFF	OFF
34	ON	OFF	OFF	OFF	ON	ON
35	ON	OFF	OFF	OFF	ON	OFF
36	ON	OFF	OFF	OFF	OFF	ON
37	ON	OFF	OFF	OFF	OFF	OFF

Switches 7 and 8 - First (Starting) Module Group Number

First Module Group Number	Switch	
	7	8
0	ON	ON
2	ON	OFF
4	ON	ON
6	OFF	OFF

Assign a unique stating module group number--such as 0, 2, 4, or 6--in accordance with the number of chassis you assigned to the same I/O rack number. You can assign from one to four 1771-DCMs and I/O adapters to the same I/O rack number, provided that the combination does not exceed a full rack. For example, assign starting module group numbers to each I/O chassis or 1771-DCM in the following combinations:

Rack Configuration	Assign Module Group Numbers
• Four 1/4 Racks	0, 2, 4, and 6
• Two 1/2 Racks	0 and 4
• One 1/4 and One 3/4 Rack	0 and 2
• One 3/4 and One 1/4 Rack	0 and 6

You selected the equivalent rack size of your 1771-DCM with Switch Bank 0, Switches 7 and 8, above.

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Chapter 4

Connecting Cables

Connecting Cables

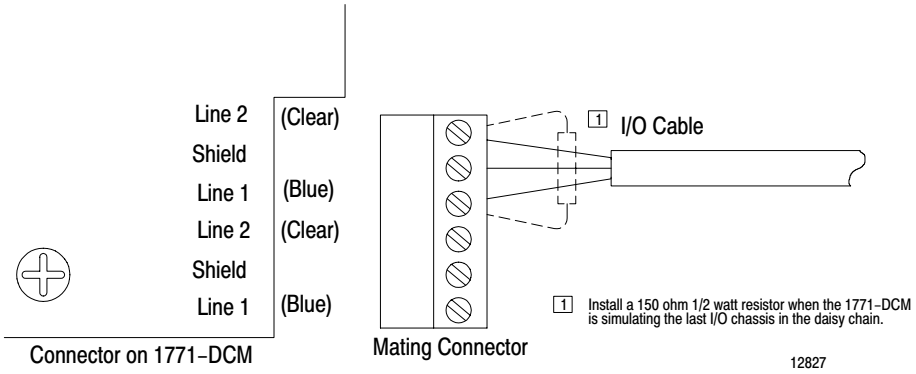
The communications channel between the 1771–DCM and a supervisory processor is the same serial communications channel as used between the 1771–ASB Remote I/O Adapter (Series A) and the scanner of a supervisory processor. You insert the 1771–DCM in a local or remote I/O chassis and configure the 1771–DCM as an I/O chassis unique to the supervisory processor. You can connect the 1771–DCM in a daisy chain or trunkline/dropline hookup with other remote I/O chassis.

Module Connector

Make your connections to the connector at the bottom of the module (Figure 4.1). Connector terminals are labeled at the bottom of the left cover plate. Connector terminals accommodate two cables—one for the incoming line of a daisy chain hookup, the other for the outgoing line. Use either set of connector terminals for the dropline in the trunkline/dropline hookup. Terminal 1 is connected to Terminal 4, Terminal 2 to Terminal 5, and Terminal 3 to Terminal 6 inside the 1771–DCM.

WARNING: Do not disconnect this connector in a daisy chain hookup when the system is operating because you disconnect the remaining I/O chassis in the daisy chain. The connection between terminals is inside the 1771–DCM.

Figure 4.1
Cable Connections

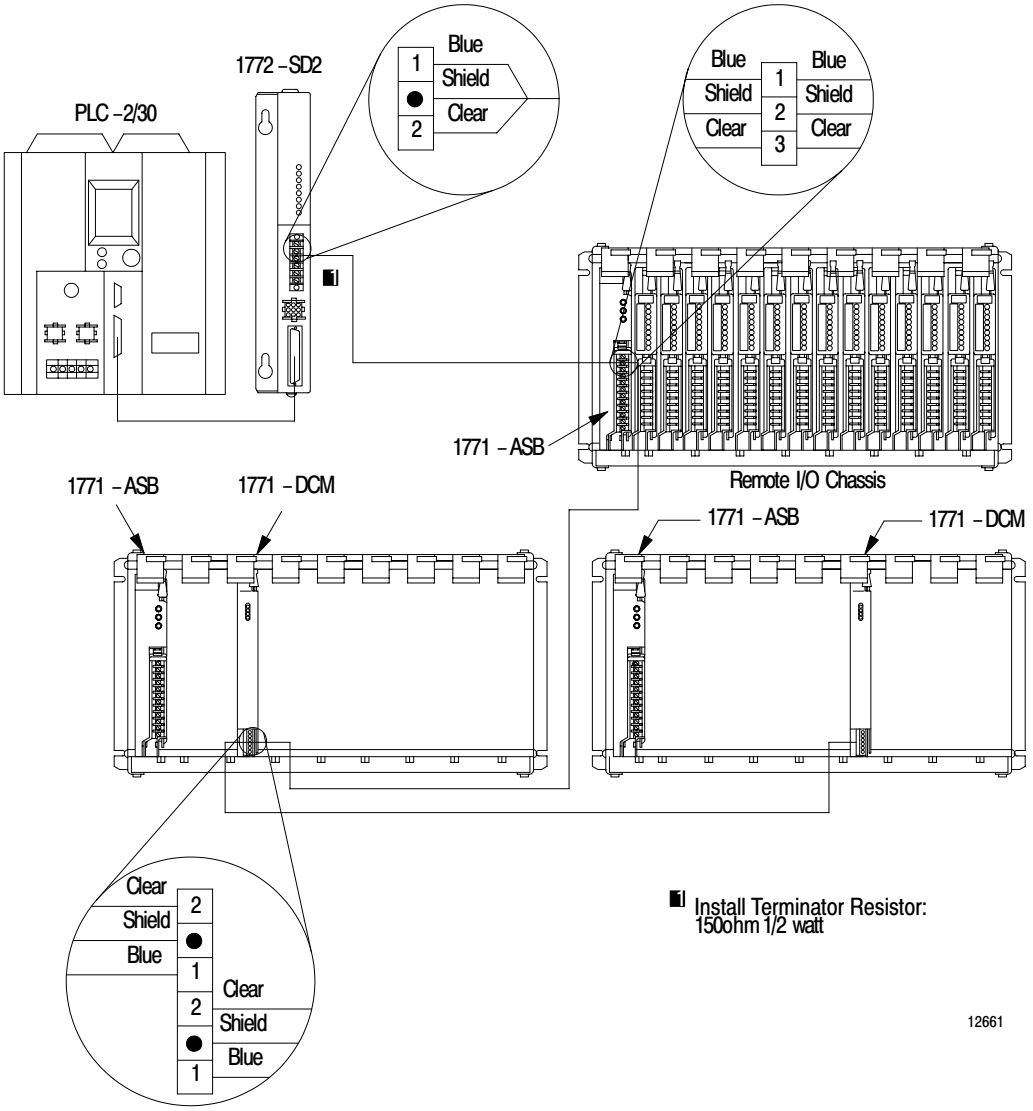


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Daisy Chain Hookup

When using the daisy chain hookup (Figure 4.2), splice each I/O chassis into the main communication line (serial I/O channel). Install a 150 ohm terminator resistor between the terminals of Lines 1 and 2 at the scanner and at the last hookup on the main communications line to terminate both ends of the line.

Figure 4.2
Example Daisy Chain Hookup

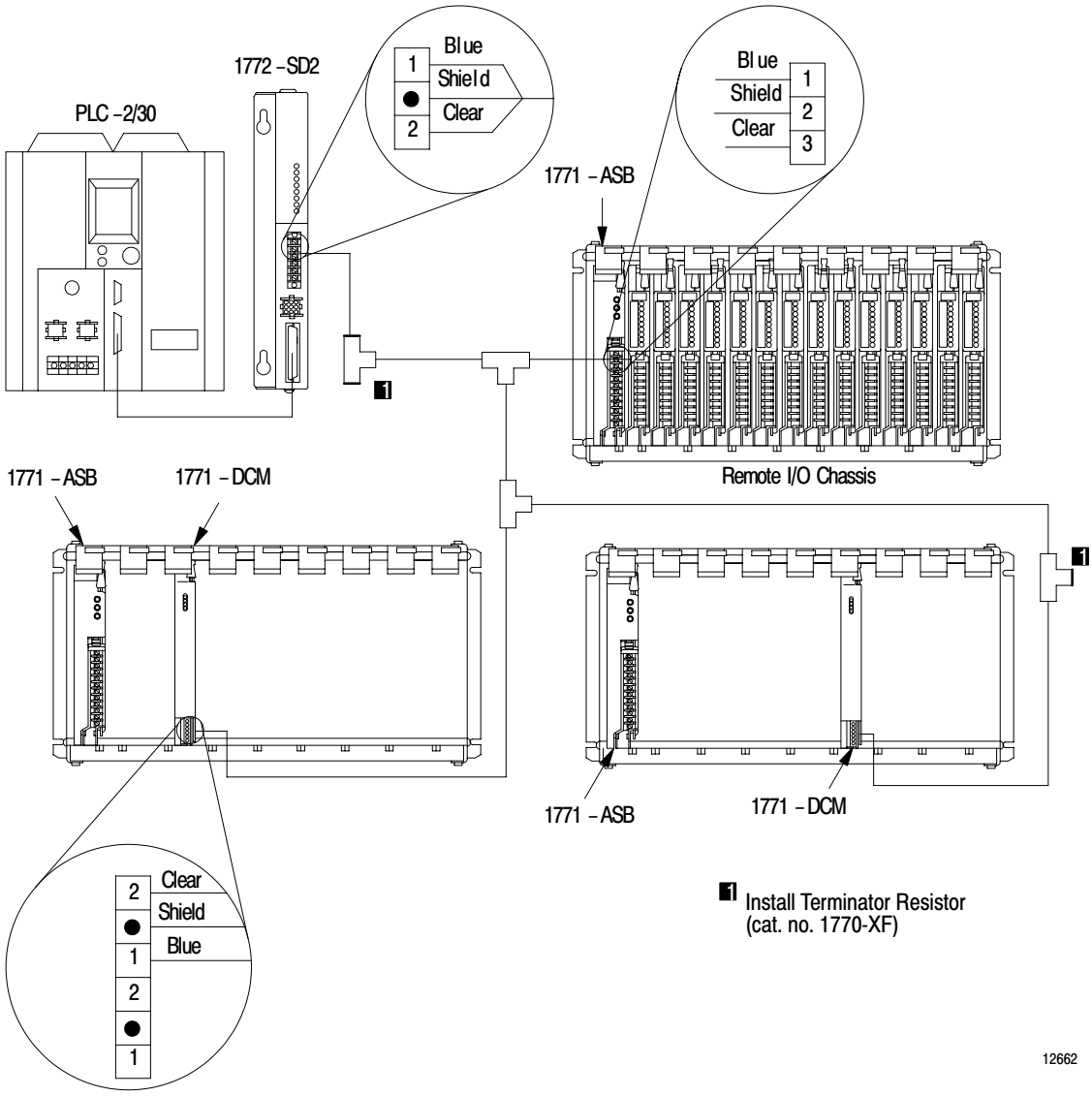


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Trunkline/Dropline Hookup

When using the trunkline/dropline hookup, connect the 1771–DCM to the serial I/O channel trunkline using a dropline that does not exceed 100 feet in length (Figure 4.3). Connect the dropline to the trunkline using a T connector (cat. no. 1770–XG) or a station connector (cat. no. 1770–SC). There are no restrictions as to the spacing between station connectors or T connectors if you do not exceed the maximum cable distance. Terminate the open port at the first and last T connector or station connector using a Terminator Set (cat. no. 1770–XF).

Figure 4.3
Example Trunkline/Dropline Hookup with T Connectors



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Chapter 5

Using the Status Word

Using the Status Word

The 1771-DCM sets status/alarm bits in the upper byte of the first word transferred to either processor, regardless of whether you select block transfer or discrete data transfer. In block transfer operation, the status word is the first word of the read data block. In discrete data transfer, the status word is found in the equivalent of the first module group of the I/O chassis simulated by the 1771-DCM.

Important: Reserve the first transferred word for status data inserted by the 1771-DCM. Be sure this word contains zeros when you initialize the ladder program for either processor. The upper byte contains status data. The lower byte is not available for transferring data under any circumstances.

When you select discrete data transfer and set your rack size for the number of words required for your application, keep in mind that the number of words available for your data is one less than the number of words transferred.

Rack Size	Number of Transfer Words	Words Available For Your Data
1/4	2	1
1/2	4	3
3/4	6	5
Full	8	7

Examining Status Bits

Examine bits in the upper byte of the status word using your ladder program so it can take appropriate action when the 1771-DCM detects an error or change in status. Upon detecting an error or change in status, the 1771-DCM sets an invalid data bit along with one or more bits that indicate the nature of the error or change in status. These bits are non-retentive.

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Bits in the status word read by the supervisory processor differ from those read by the local processor. Some bits apply only when the 1771-DCM is communicating with the supervisory processor by block transfer.

Status Bits Read by the Local Processor

When the 1771-DCM detects an error in its communication with the supervisory processor, it indicates this condition in the status word read by the local processor as follows:

17	16	15	14	13	12	11	10
Insuf Data	Excess Data	Scanner Comm Error	0	No Data	0	Inhibit Outputs	Invalid Data

Bit 17 - Insufficient Data Available

Set by the 1771-DCM when data received from the supervisory processor is less than that requested by the local processor. It appends zeroed data words to provide the requested number of words.

Bit 16 - Excessive Data Available

Set by the 1771-DCM when the data received from the supervisory processor is more than that requested by the local processor. It truncates the data and returns only the number of words requested.

Important: In block transfer mode, the 1771-DCM sets Bit 17 or 16 (defined above) when it detects that the length of a read block transfer request from one processor differs from the number of words previously written by the other processor. In discrete data transfer, the 1771-DCM sets Bit 17 or 16 when it detects that the number of words read by one processor differs from the number of words that the 1771-DCM temporarily stored. This depends on the equivalent rack size that you set, such as eight slots for four words.

Bit 15 - Scanner Communications Error

Set by the 1771-DCM when it detects a loss in communications with the scanner of the supervisory processor followed by a request for a read block transfer from the local processor. The 1771-DCM returns the last data received from the scanner, or zeroed data words if communications had not been established. The 1771-DCM turns off the serial communications LED until communications are restored.

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Bit 14 - Not Used

Bit 13 - No Data Available

Set by the 1771-DCM at power-up. The 1771-DCM rests this bit when it receives data from the supervisory processor.

Bit 12 - Not Used

Bit 11 - Inhibit Outputs

Set by the 1771-DCM to inform the local processor that the supervisory processor has been switched to program or test mode, has switched itself to program mode because of a dependent I/O fault (PLC-2 family), or that the 1771-DCM has lost communication with the supervisory processor.

Bit 10 - Invalid Data

Set by the 1771-DCM whenever it sets any other status bit. As long as this bit is reset, the 1771-DCM has detected no error condition or change in status.

Status Bits Read by the Supervisory Processor

When the 1771-DCM detects an error in its communication with the local processor, it indicates this condition in the status word read by the supervisory processor as follows:

17	16	15	14	13	12	11	10
Insuf Data	Excess Data	Backplane Reset	Backplane Error	No Data	Old Data	0	Invalid Data

Bits 17, 16, 13, and 10 - Same as Local Processor

Bit 15 - Backplane Reset

Set by the 1771-DCM to inform the supervisory processor that the local processor has reset the backplane. The local processor typically resets the backplane when switched to program/test mode, or when it detects a fault condition and turns off outputs. The 1771-DCM cannot detect a backplane reset due to a fault condition resulting in outputs remaining in last state. You determine the last state condition (hold last state or turn off) by a DIP switch on the I/O chassis.

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Bit 14 - Backplane Error

Set by the 1771-DCM whenever it detects that a block transfer operation by the local processor was not completed on time, was out of sequence, or contained a checksum error. The 1771-DCM returns the last valid data received from the local processor. It returns zeroed data words if communications had not been established. It inhibits block transfers to the local processor until it detects a backplane reset or a scan from the local processor.

Bit 12 - Old Data

Set by the 1771-DCM whenever it detects that it has not received data from the local processor after a delay of 14 read scans by the supervisory processor (discrete data transfer), or since the last read block transfer by the supervisory processor. The 1771-DCM passes old data to the supervisory processor until it detects new data, passes it, and resets this bit.

Bit 11 - Not Used

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Chapter 6

Programming the 1771–DCM

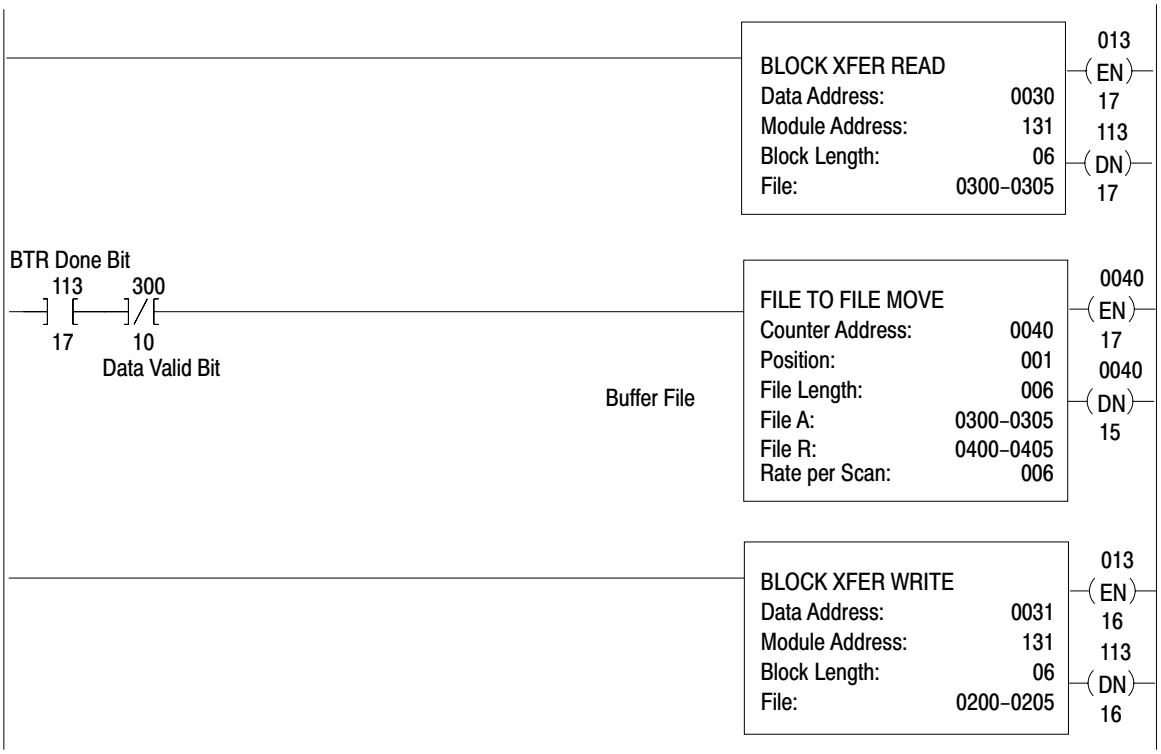
Programming the 1771–DCM

We assume that you are familiar with block transfer programming, that you can allocate data table areas for read and write data blocks, and that you can manipulate data to and from these data blocks. We will confine this discussion to programming characteristics unique to the 1771–DCM.

Local Processor Logic

The local processor, typically a PLC–2 family mini–processor or PLC–5 family processor, reads and writes data to the 1771–DCM using block transfers. Programming examples (Figure 6.1, Figure 6.2) assume that the 1771–DCM is set for six–word block transfers.

Figure 6.1
Local Processor Programming Example (PLC–2)



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Block Transfer and File Move Instructions

Enter these instructions using the following information:

BTR/BTW Module Address

The module address of BTR and BTW instructions in the local processor's program is the physical location of the 1771–DCM. It is the I/O rack, module group, and slot number (RGS) of the 1771–DCM:

- In the same I/O chassis with the local processor
- In an I/O chassis connected to a processor configured for local or remote I/O operation

Block Length/File Length

Generally, set them to the number of words that you set for the 1771–DCM. If you have reason to set the read block length different from the write block length (PLC–2 family processors), be sure that both the BTR and BTW instructions cannot be enabled in the same scan. When moving or transferring words into the BTW file for transfer to the 1771–DCM, be sure to avoid placing data in the first word because the 1771–DCM inserts status in this word.

File–to–File Move (FFM)

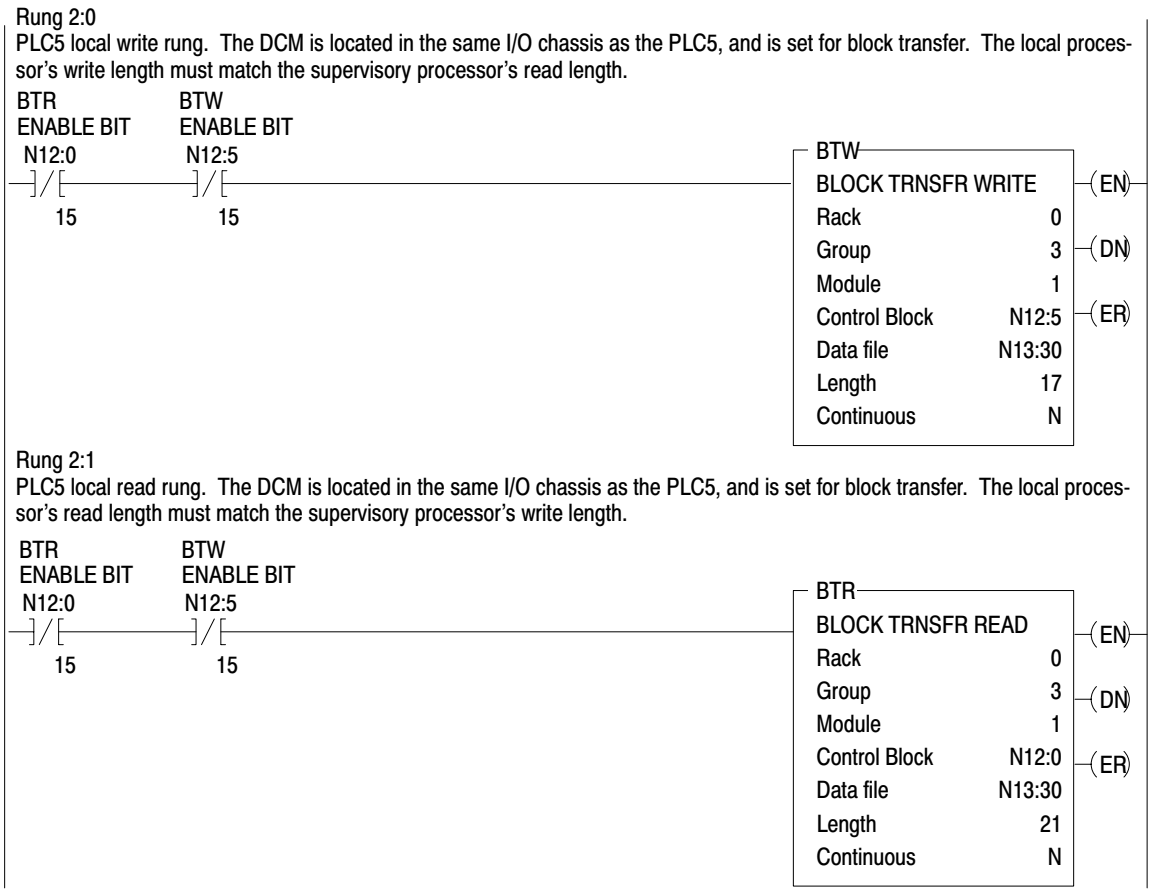
Use this instruction to store data received from the 1771–DCM. File A address of the FFM is the same as the BTR file address. File R address is a storage file for data received from the 1771–DCM.

Your ladder program must place data into the BTW file for transfer to the 1771–DCM. We leave this ladder logic to you because your application and processor's set of instructions determine how you would do this.

Examine the status word received from the 1771–DCM as a condition for using the read block transfer data. Zero the status word at power–up and be sure that your program does not use this word for any other purpose.

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Figure 6.2
Local Processor Programming Example (PLC–5)



1771–DCM Switch Settings

Select module operating conditions by setting switches on the module for discrete data transfer or block transfer as follows:

Discrete Data Transfer	Block Transfer
• Transfer Method	• Transfer Method
• Rack Size	• Data Protect (If Applicable)

Set other switches as required by your application.

Supervisory Processor Logic

The addresses that you use for the 1771–DCM in the supervisory processor's ladder program are the addresses (RGS) to which you configure your 1771–DCM using Switch Banks 0 and 1:

- I/O Rack Number (Switch Bank 1, Switches 1 through 6).

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- First (Starting) Module Group Number (Switch Bank 1, Switches 7 and 8)
- The slot number will always be zero for block transfer only.
- Equivalent rack size for discrete data transfer only (Switch Bank 0, Switches 7 and 8). The equivalent rack size for block transfer mode is fixed at 1/4 rack.

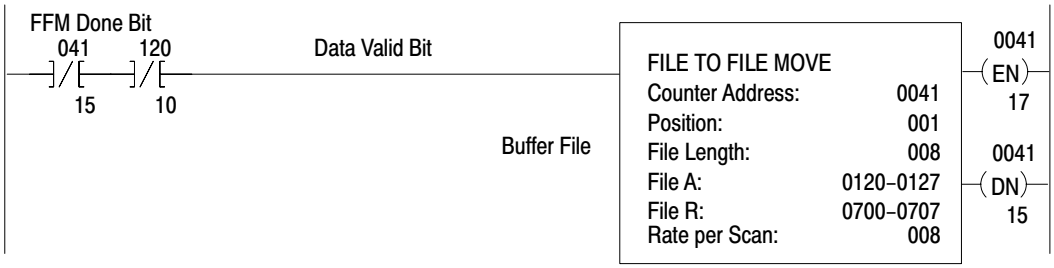
Discrete Data Transfer

The supervisory processor transfers discrete data to and from the 1771–DCM automatically via its I/O scan. You do not program these transfers.

To transfer discrete data words to and from the 1771–DCM, you must use I/O image table addresses in the supervisory processor's ladder program starting with the addresses (RGS) to which you configured your 1771–DCM. Use the number of image table words equal to the equivalent I/O rack size that you set for the 1771–DCM.

The ladder program of your supervisory processor must move discrete data, read from the 1771–DCM, from input image table words to a storage location (Figure 6.3).

Figure 6.3
Supervisory Processor Programming Example for Discrete Data Transfer (PLC–2/30)



Your ladder program must place data into output image table words for transfer to the 1771–DCM. Avoid placing data in the first word because the 1771–DCM inserts status in this word. We leave this ladder logic to you because your application and processor's set of instructions determine how you would do this.

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Example 1:

Suppose you want to transfer six words, and you have configured the 1771–DCM to simulate a 3/4 I/O rack with the following address: Rack Number = 2, First Module Group = 0. Also, suppose that the 1771–DCM is located in the same chassis with the local processor, that the 1771–DCM's actual location (RGS) is 131, that the local processor's block transfer read block is 300 through 305, and that the block transfer write block is 200 through 205.

Data transfers would occur as follows:

Supervisory Processor	To	Local Processor
Output Image Table Words Match the I/O Chassis Slots Simulated by the 1771–DCM		BTR Instruction Reads Data from the 1771–DCM into Words 300 through 305
020 Status Word (Zeroed)	→	300 Status Word (Inserted by DCM)
021 First Data Word	→	301 First Data Word
022 Second Data Word	→	302 Second Data Word
:		:
:		:
025 Fifth Data Word	→	305 Fifth Data Word

Local Processor	To	Supervisory Processor
BTW Instruction Writes Data to the 1771–DCM from Words 200 through 205		Input Image Table Words Match the I/O Chassis Slots Simulated by the 1771–DCM
200 Status Word (Zeroed)	→	120 Status Word (Inserted by DCM)
201 First Data Word	→	121 First Data Word
202 Second Data Word	→	122 Second Data Word
:		:
:		:
205 Fifth Data Word	→	125 Fifth Data Word

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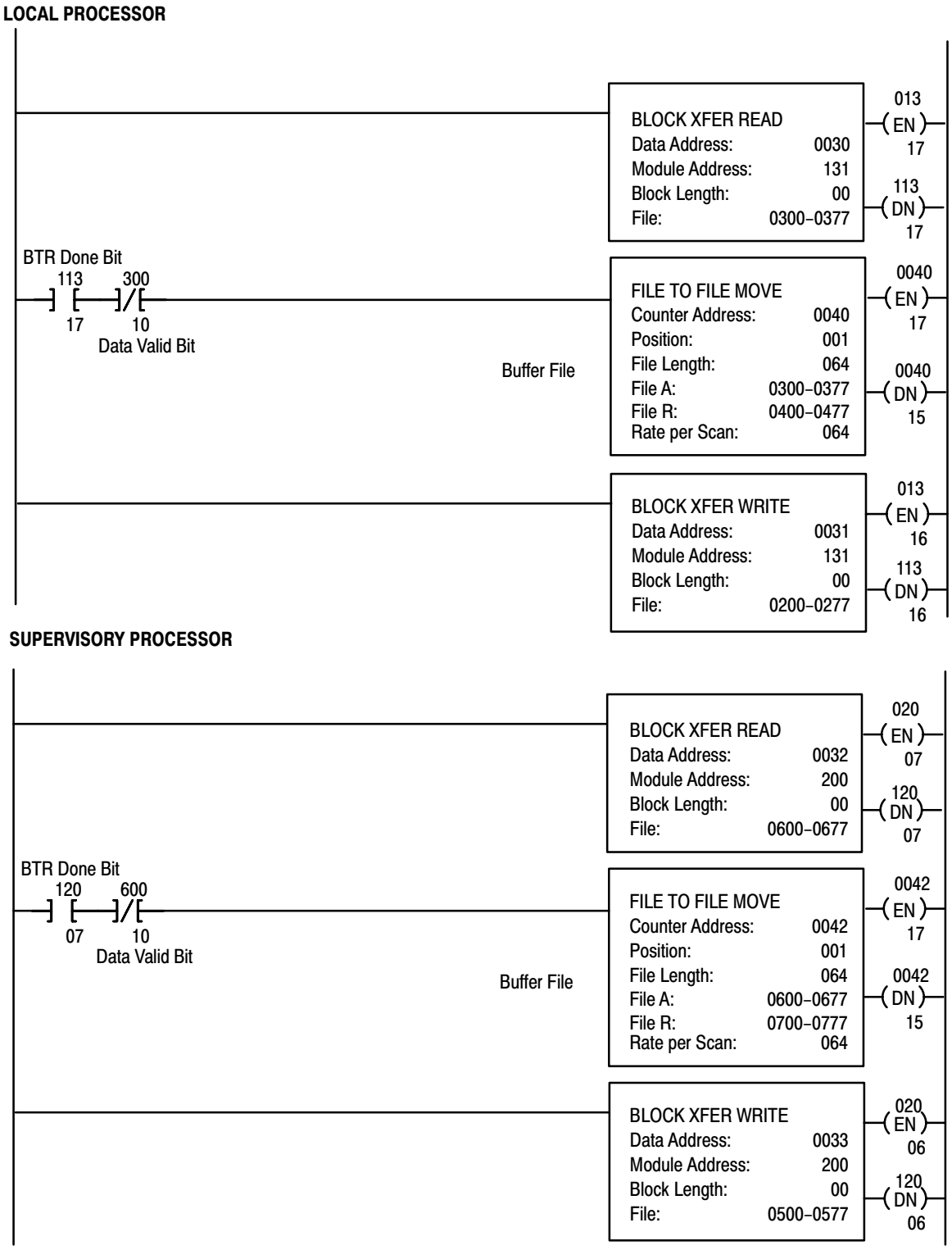
Your ladder program for the supervisory processor must place data in output image table word addresses for transfer to the 1771–DCM and move data from input image table word addresses as needed by your application. We leave this ladder logic to you because your application and processor's set of instructions determine how you would do this.

Block Transfer

We present block transfer rungs for the supervisory processor when the 1771–DCM is operating in block transfer mode (Figure 6.4 for a PLC–2/30 supervisory processor, Figure 6.5 for PLC–3, and Figure 6.6 for a PLC–5 family processor).

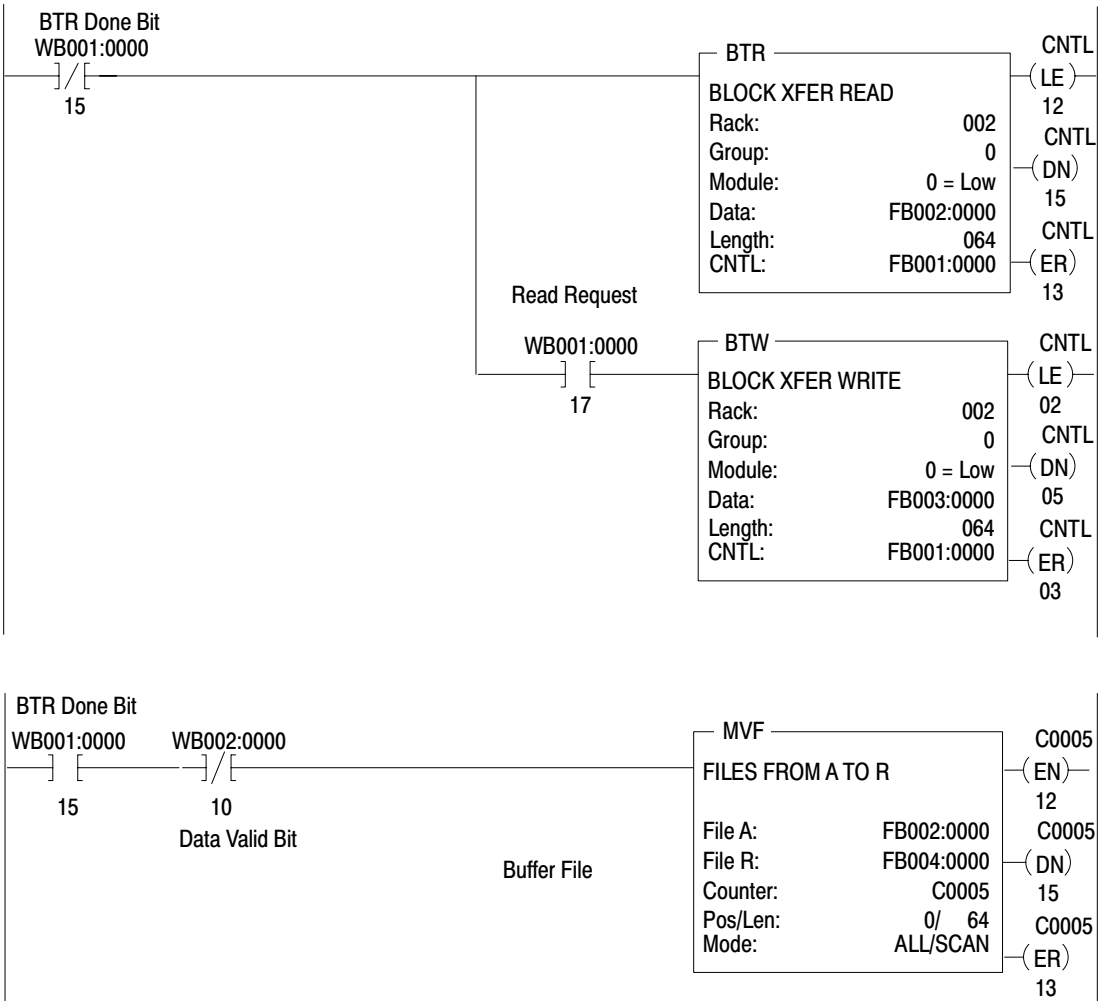
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Figure 6.4
Block Transfer Programming Example for PLC–2 Family Local and Supervisory Processor



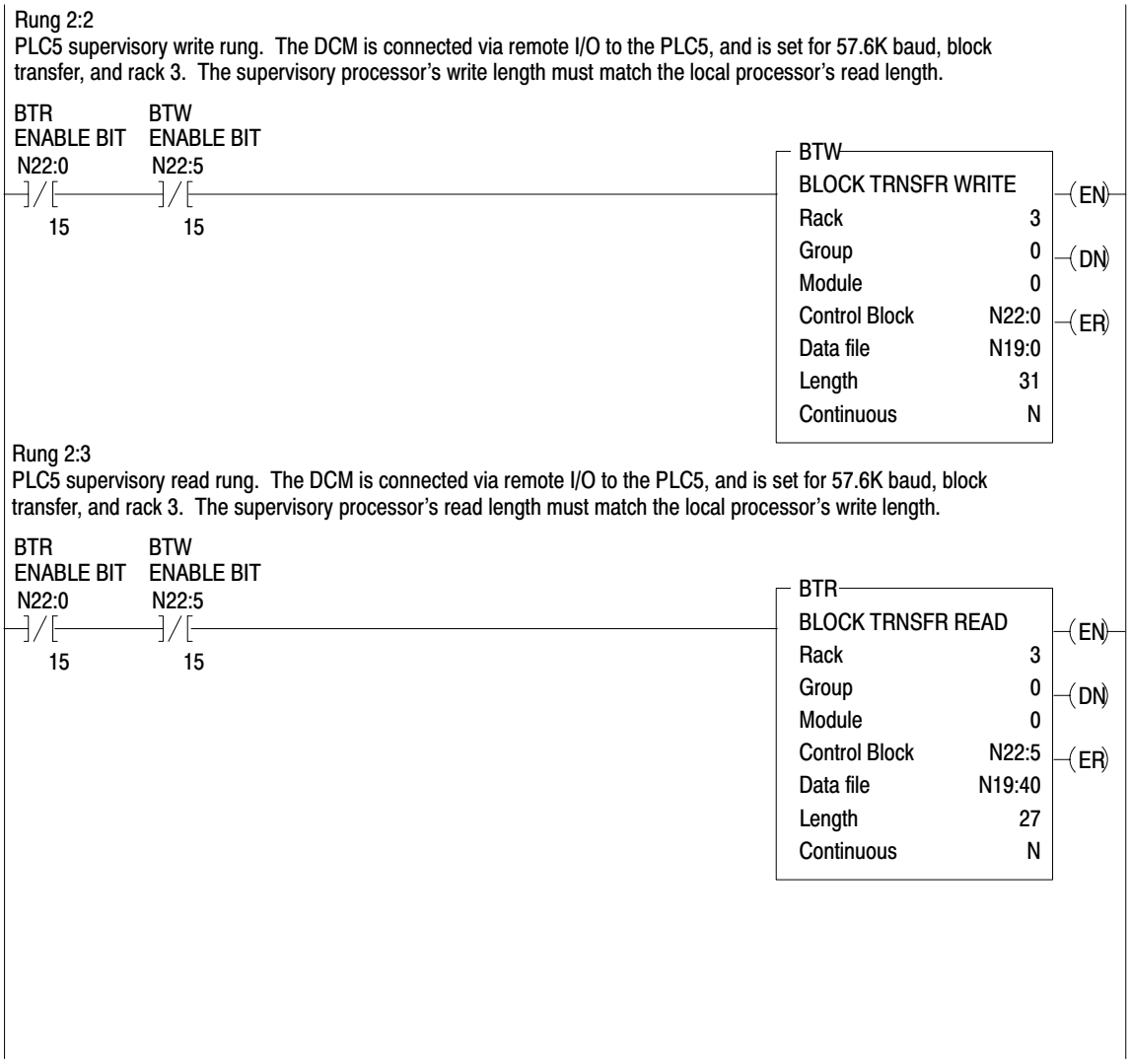
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Figure 6.5
Block Transfer Programming Example for PLC–3 Supervisory Processor



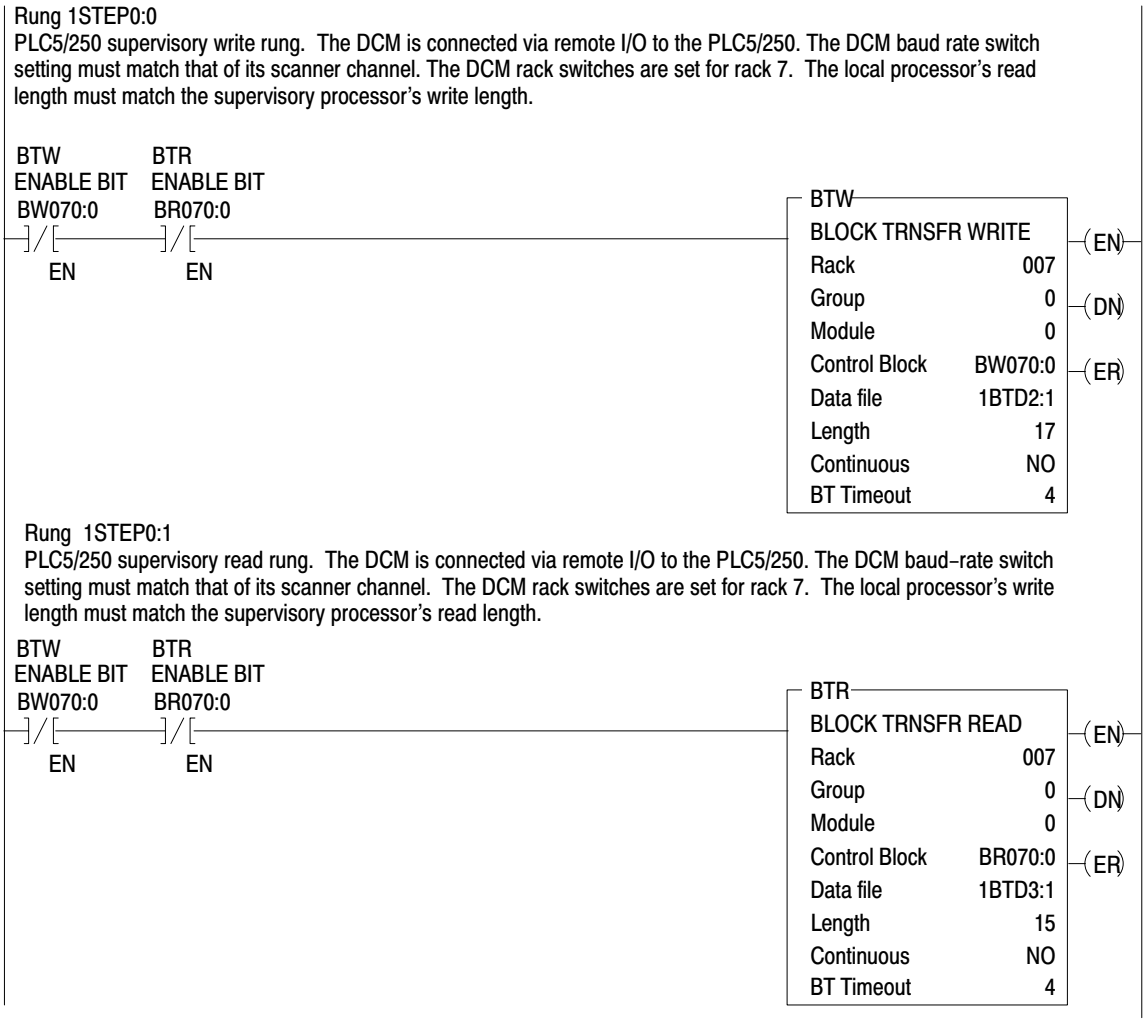
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Figure 6.6
Block Transfer Programming Example for PLC–5 Family Supervisory Processor



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Figure 6.7
Block Transfer Programming Example for PLC–5/250 Supervisory Processor



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BTR/BTW Module Address

The module address of BTR and BTW instructions in the supervisory processor's program is the configured address of the 1771–DCM. It is the I/O rack number and starting module group number (its slot number is always zero for block transfer) that you set using Switch Banks 0 and 1).

Block Length/File Length

Generally, set them to the number of words that you set for the 1771–DCM. If you have reason to set the read block length different from the write block length (PLC–2 family processors), be sure that both the BTR and BTW instructions cannot be enabled in the same scan. When moving or transferring words into the BTW file for transfer to the 1771–DCM, be sure to avoid placing data in the first word because the 1771–DCM inserts status in this word.

File–to–File Move (FFM) or (MVF)

Use this instruction to store data received from the 1771–DCM. File A address of the FFM or MVF is the same as the BTR file address. File R address of the FFM or MVF is a storage file for data from the 1771–DCM.

Your ladder program for the supervisory processor must place data into the BTW file for transfer to the 1771–DCM. We leave this ladder logic to you because your application and processor's set of instructions determine how you would do this.

Examine the status word received from the 1771–DCM as a condition for using the read block transfer data. Zero the status word at power–up and be sure that your ladder program does not use this word for any other purpose.

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Example 2:

Suppose you want to transfer 64 words, and you have configured the 1771–DCM to simulate a block transfer module in Rack 2, First Module Group = 0. Also suppose that the 1771–DCM is located in the same chassis with the local processor, and that the 1771–DCM's actual location (RGS) is 131. In this example, you allocated data blocks for block transfer as follows: (Refer to Figure 6.4 for PLC–2/30, or Figure 6.5 for PLC–3 Programming)

Data Block	Supervisory Processor	Local Processor
Read	600 through 677	300 through 377
Write	500 through 577	200 through 277

Data transfers would occur as follows for PLC–2 family processors:

Supervisory Processor	To	Local Processor
BTW Instruction Writes Data to the 1771–DCM from Words 500 through 577		BTR Instruction Reads Data from the 1771–DCM into Words 300 through 377
500 Status Word (Zeroed)	→	300 Status Word (Inserted by DCM)
501 First Data Word	→	301 First Data Word
502 Second Data Word	→	302 Second Data Word
:		:
:		:
577 Last Data Word	→	377 Last Data Word

Local Processor	To	Supervisory Processor
BTW Instruction Writes Data to the 1771–DCM from Words 200 through 277		BTR Instruction Reads Data from the 1771–DCM into Words 600 through 677
200 Status Word (Zeroed)	→	600 Status Word (Inserted by DCM)
201 First Data Word	→	601 First Data Word
202 Second Data Word	→	602 Second Data Word
:		:
:		:
277 Last Data Word	→	677 Last Data Word

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Processor/Module Compatibility

Your 1771–DCM must have the following revision (or later) for compatible block transfer operation with your processor.

Processor Family	1771–DCM Revision
PLC–3	F
PLC–5	E
PLC–5/250	E

Data transfers would occur as follows when the supervisory processor is a PLC–3:

Supervisory Processor	To	Local Processor
BTW Instruction Writes Data to the 1771–DCM from Binary File 3, Words 0 through 63		BTR Instruction Reads Data from the 1771–DCM into Words 300 through 377
FB003:0000 Status Word (Zeroed)	→	300 Status Word (Inserted by DCM)
FB003:0001 First Data Word	→	301 First Data Word
FB003:0002 Second Data Word	→	302 Second Data Word
:		:
:		:
FB003:0063 Last Data Word	→	377 Last Data Word

Local Processor	To	Supervisory Processor
BTW Instruction Writes Data to the 1771–DCM from Words 200 through 277		BTR Instruction Reads Data from the 1771–DCM into Binary File 2, Words 0 through 63
200 Status Word (Zeroed)	→	FB002:0000 Status Word (Inserted by DCM)
201 First Data Word	→	FB002:0001 First Data Word
202 Second Data Word	→	FB002:0002 Second Data Word
:		:
:		:
277 Last Data Word	→	FB002:0063 Last Data Word

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Chapter 7

Calculating Transfer Time

Calculating Transfer Time

The time required for the transfer of data from supervisory to local processor (and vice versa) is the sum of three events:

- Supervisory Processor and Remote I/O Scan Time
- Transfer Time through the 1771-DCM
- Local Processor Scan Time

The time required for the supervisory processor to communicate with the 1771-DCM depends on whether you select discrete data transfer (up to eight words) or block transfer (up to 64 words), the number of other remote I/O chassis, and the number of block transfer modules in the local and remote I/O systems.

Discrete Transfer Time

You select the mode of transfer between the supervisory processor and the 1771-DCM as either discrete data transfer or block transfer. Discrete data transfer is faster than block transfer.

Calculate the transfer time between processors when the 1771-DCM is transferring discrete data by calculating the times associated with the supervisory processor, 1771-DCM, and the local processor. Assume the supervisory and local processor systems contain no other block transfer modules.

Supervisory Processor

The supervisory processor reads discrete input data or writes discrete output data to/from its I/O through its remote I/O scanner. Calculate the total scan time of the supervisory processor as the sum of the program scan, processor I/O scan if applicable, and the remote I/O scan using values in the table as follows:

Scan	PLC-2/30	PLC-3
Program	5 ms/K Words	2.5 ms/K Words
Processor I/O	0.5 ms/Rack	N/A
Remote I/O	7 ms/Chassis	6 ms/Chassis

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Total Scan (PLC-2) = Program + Processor I/O + Remote I/O

Total Scan (PLC-3) = Program + Remote I/O

1771-DCM

The delay from the time the 1771-DCM receives data until it is ready for data transfer is 15 ms. During this time, it detects errors and changes in status and formats data.

Local Processor

The local processor reads data from or writes data to the 1771-DCM using block transfer instructions, regardless of how data is transferred between 1771-DCM and supervisory processor. The time required is equal to the program scan plus block transfer time which depends on the number of words transferred.

Time for	PLC-2/05	PLC-2/15	PLC-2/30 (Local)
Program Scan	15 ms/K	18 ms/K	5 ms/K
I/O Scan	1 ms	4 ms	0.7 ms
Block Transfer	0.08 ms/W	0.08 ms/W	0.08 ms/W

W = Number of Words Transferred

Total Scan = Program and I/O Scan + (Multiplier) x (Number of Words Transferred)

See the appropriate processor manual for times for other processors.

Addition of Block Transfer Modules

Block transfer modules in the local I/O chassis can lengthen the I/O scan time by the time required for each to perform a block transfer (worst case). The delay depends on the number of block transfer modules waiting to transfer and the number of words each will transfer. Calculate the additional block transfer time for your processor as follows for each block transfer module:

Time (Local) = Multiplier x (Number of Words Transferred)

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Processor	Multiplier
PLC-2/05, -2/15	0.08
PLC-2/30 (Local)	0.08

PLC-2 Family Example Computation

Suppose that a PLC-2/30 supervisory processor has a 6K program and seven assigned rack numbers and the PLC-2/05 local processor has a 2K program. There are no other block transfer modules in either the supervisory or local systems.

1. Calculate the time required to transfer eight words from supervisory to local processor.

2. Calculate the total time required if there are two additional block transfer modules in the local chassis, transferring 64 words each. Assume worst case.

Solution Part 1:

PLC-2/30 Supervisory Processor Scan Time:

Scan	PLC-2/30
Program	5 ms/K Words
Processor I/O	0.5 ms/Rack
Remote I/O	7 ms/Chassis

Time (PLC-2/30) = Program + Processor I/O + Remote I/O
= (5 ms)(6) + (0.5 ms)(7) + (7 ms)(7)
= 30 ms + 3.5 ms + 49 ms
= 82.5 ms

1771-DCM Delay: 15 ms

Local Processor Scan Time:

Time for	PLC-2/05
I/O Scan	1 ms
Program Scan	15 ms/K
Block Transfer	0.08 ms/W

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W = Number of Words Transferred

Scan = Program Scan + I/O Scan + (Multiplier) x (Number of Words Transferred)
= (15 ms)(2) + 1 ms + (0.08)(8) ms
= 30 ms + 1 ms + 0.64 ms
= 31.6 ms

Transfer Time = Supervisory + 1771-DCM + Local
= 82.5 ms + 15 ms + 31.6 ms
= 129 ms

Solution Part 2:

Additional time for two block transfer modules in the local chassis:

Time (PLC-2/05) = 2(0.08 ms) x (Number of Words Transferred)
= 2(0.08 ms)(64) 1
= 10.2 ms

Total Transfer Time = Discrete Transfer + Block Transfer
= 129 ms + 10.2 ms
= 139 ms (Worst Case)

Block Transfer Time

When you select block transfer as the mode of transfer between the supervisory processor and 1771-DCM, you can transfer up to 64 words but the transfer time increases.

The time required for the transfer of data from supervisory to local processor (and vice versa) is the sum of three events:

- Supervisory Processor and Remote I/O Scan Time
- Transfer Time through the 1771-DCM
- Local Processor Scan Time

1771-DCM and Local Processor

Refer to Discrete Data Transfer, above, for the time required by the 1771-DCM and the local processor. These times are the same for either method of transfer between the supervisory processor and the 1771-DCM.

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PLC-2 Family Supervisory Processor

The time required by the supervisory processor is the sum of the program scan, processor I/O scan, and remote I/O scan. The time is lengthened by the number of enabled block transfer modules transferring data, one module after the other, and on the number of words that each module transfers. Calculate the time for a read or write operation for each enabled block transfer module as follows:

Scan	PLC-2/30
Program	5 ms/K Words
Processor I/O	0.5 ms/Rack
Remote I/O	7 ms/Chassis

Time (1 Module) = Program + Processor I/O + 2(Remote I/O) + 0.5W + 10

Where W = number of words transferred and 10 is an average constant (typically, this constant is 4 for a read and 13 for a write).

If it is possible that all block transfer modules in the supervisory system could be enabled at the same time, the worst case time for any one transfer would include the waiting time for all other other block transfers.

PLC-2 Family Example Computation

Suppose there are four block transfer modules in addition to the 1771-DCM that could be enabled simultaneously in a PLC-2/30 supervisory system. The local system has no additional block transfer modules. Assume that the program has 4.8K words, there are six assigned rack numbers in the remote I/O link, and that each block transfer is 64 words.

1. Calculate the worst case time for the five modules to block transfer their data.

2. Calculate the worst case time for a block transfer from the supervisory to the local processor.

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Solution Part 1:

Time (1 Module) = (5 ms)(4.8) + (0.5 ms)(6) + 2(7 ms)(6) + (0.5)(64) + 10
= 24 ms + 3 ms + 84 ms + 32 ms + 10 ms
= 153 ms

Total Time (All Five Modules) = 5(153)
= 765 ms (Worst Case)

Solution Part 2:

To calculate the worst case time for block transfer from supervisory to local processor via the 1771-DCM, add times for the 1771-DCM and local processor: 15 ms and 31.6 ms, respectively, assuming no other block transfer modules in the local chassis.

Total Time = 765 ms + 15 ms + 31 ms
= 811 ms

Block Transfer with a PLC-3 Supervisory Processor

The time required to complete a read or write block transfer depends on factors that include the number of:

- Words of user program
- Active I/O channels on the scanner
- I/O chassis entries in the rack list for the channel
- I/O channels on the scanner that contain block transfer modules
- Block transfer modules on the channel (if the I/O chassis containing a block transfer module appears more than once in the I/O chassis rack list, count the module once each time the chassis appears in the rack list)

Typical time required to complete a read or write block transfer depends on the program scan and the scanner scan as follows:

Time (Read or Write) = Program Scan + 2(Scanner Scan)

Program Scan

The program scan is approximately 2.5 ms per 1K words of user program when using a mix of examine ON/OFF and block instructions.

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Scanner Scan

The time required for the scanner to complete a read or write block transfer depends on the number of other block transfer modules on the same scanner channel that are enabled simultaneously. Use the following procedure to calculate the time required for the PLC-3 processor to perform all block transfers on the channel.

1. Determine the number of active I/O channels on the scanner.

2. Determine the number of I/O channels with block transfer modules.

3. Use these tables to determine the nominal block transfer time using the numbers from Steps 1 and 2.

Nominal Block Transfer Times (ms) for a BTW

Channels with Block Transfer Modules	1 Active Channel	2 Active Channels	3 Active Channels	4 Active Channels
1	45	50	60	65
2	--	70	70	75
3	--	--	85	95
4	--	--	--	100

Nominal Block Transfer Times (ms) for a BTR

Channels with Block Transfer Modules	1 Active Channel	2 Active Channels	3 Active Channels	4 Active Channels
1	35	50	50	60
2	--	60	60	65
3	--	--	70	80
4	--	--	--	90

Block transfer times typically are similar regardless of the type of block transfer module or the number of words transferred. Nominal read block transfer times typically are faster than nominal write block transfer times by approximately 10 ms. In this example, consider them the same.

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4. Count the number of block transfer modules on the channel. If a chassis containing block transfer modules is repeated in the rack list, count chassis and modules as often as listed.

5. Count the number of I/O chassis entries in the rack list for the channel.

6. Calculate the block transfer time for the scanner as follows:

$$\text{Scanner Time} = \left[\text{Nominal Time}\right] \times \left[\text{\# BT Modules on the Channel}\right] + \left[\text{\# I/O Chassis-1 in Rack List}\right] \times 9\ \text{ms}$$

PLC-3 Example Computation

As an example, we will compute the read or write block transfer time between the supervisory processor and a 1771-DCM in an I/O channel with no other block transfer modules and in an I/O channel with two other block transfer modules in the following system:

- User program contains 20K words.
- Channel 1 contains four I/O chassis, with a total of three block transfer modules including one 1771-DCM.
- Channel 2 contains two I/O chassis with no block transfer modules.
- Channel 3 contains two I/O chassis with one 1771-DCM.
- Channel 4 is made inactive through processor LIST.

You can compute the read or write block transfer times for the supervisory processor in this example in four steps. Each of the following steps is explained by an accompanying figure:

1. Diagram the I/O channels of your PLC system (Figure 7.1), showing the number of:

   - Block transfer modules in each I/O chassis
   - Block transfer I/O channels
   - I/O chassis entries in the rack list for each block transfer I/O channel
   - Active I/O channels per scanner

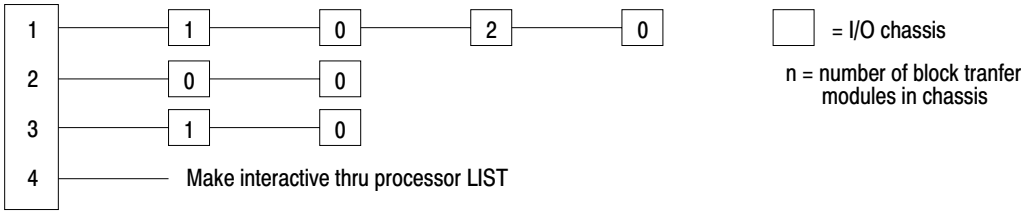
   A block transfer I/O channel is a channel that contains one or more block transfer modules located in any chassis connected to the channel.

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An I/O chassis can appear more than once in a rack list of I/O chassis. Count it and the block transfer module(s) that it contains as often as it is listed.

Figure 7.1
Diagramming I/O Channels

Step 1 - Diagram the chassis connected in series to each channel (up to 4) of your scanner module. Then, fill in the information called fo below. Example values have been added.



Description	Number	Ch 1	Ch 2	Ch 3	Ch 4
Active I/O channels	3				
Block–transfer I/O channels	2				
Block–transfer modules on each I/O block transfer channel		3	0	1	0
I/O chassis on each block transfer I/O channel (I/O chassis in rack list)		4	0	2	0

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2. Using information from the diagram of I/O channels (Figure 7.1), look up the nominal time from the table in Figure 7.2.

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Figure 7.2
Nominal Time Table

Step 2 - Determine a time from the table. Example values have been added for a BTW instruction.

Number of Active I/O Channels

Active I/O channels containing one or more block-transfer modules	1	2	3	4
1	45	50	60	65
2		70	70	75
3			85	95
4				100
Time (ms)				

Number of active I/O channels: 3

Number of active I/O channels containing one or more block-transfer module: 2

Time from table: 70 ms

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3. Compute the approximate transfer time for each block transfer I/O channel. Use values from your channel diagram (Figure 7.1), a value from the table (Figure 7.2), and the formula from Step 6 above. We make these calculations for you in Figure 7.3.

Figure 7.3
Computing Channel Times

STEP 3: Compute the scanner time for each block transfer channel. Example values have been added.

CT = Channel Time

$$CT = \left[\begin{array}{c}\text{Nominal}\\ \text{Time}\end{array}\right] \times \left[\begin{array}{c}\text{\# BT Modules}\\ \text{on BT Channel}\end{array}\right] + \left[\begin{array}{c}\text{I/O Chassis}\\ \text{on BT Channel}\end{array} - 1\right] \times 9\text{ ms}$$

CT1 = [70 ms] x [3] + [4-1] x 9 ms
210 ms + 3 x 9 ms
237 ms

CT2 = Not a Block Transfer Channel

CT3 = [70 ms] x [1] + [2-1] x 9 ms
70 ms + 9 ms
79 ms

CT4 = Not an Active Channel

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4. Compute the approximate read or write block transfer time for Channel 1 and Channel 3 (Figure 7.4).

Figure 7.4
Computing Block Transfer for Each Channel

STEP 4:	Compute the read or write block transfer time. Example values have been added.		
Program Scan	Time (Program)	=	2.5 ms/K Words x 20K Words
		=	2.5 ms x 20
		=	50 ms
Scanner Scan	Time (Read or Write)	=	237 ms for Channel 1 and 79 ms for Channel 3 (from Step 3)
Block Transfer Time Per Channel	Channel 1	=	Program Scan + 2 [Scanner Scan]
			50 ms + 2 [237 ms]
			50 ms + 474 ms
			524 ms
	Channel 3	=	Program Scan + 2 [Scanner Scan]
			50 ms + 2 [79 ms]
			50 ms + 158 ms
			208 ms

Reducing PLC-3 Scan Time

Due to the asynchronous scan relationship between program and scanner and the serial operation of each channel in the scanner, we suggest that you optimize the overall scan time. Although recommendations are application dependent, we make the following recommendations as general guidelines:

- Whenever possible, control the manner in which block transfer instructions are enabled. For example, if only a few block transfer modules require frequent transfer of data, program them to run continually. Inhibit block transfer instructions of those modules that require less frequent transfer until enabled by a timer and/or some application dependent condition.
- Program the read and write block transfer instructions of your 1771-DCM in the same rung (Figure 6.5).
- Distribute your block transfer modules equally between all four scanner channels.

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- Distribute block transfer instructions equally throughout your program. Place an equal number of non-block transfer rungs between block transfer rungs.
- For large numbers of block transfer instructions, distribute groups of block transfer rungs equally throughout your program. Place no more than four block transfer rungs consecutively in one group. Within each group, condition the next rung using the done bit of the previous block transfer instruction.
- Consider an additional I/O scanner module (cat. no. 1775-S4A) if you cannot otherwise reduce the block transfer times to meet your timing requirements.

Special Timing Considerations

When using one 1775-S4A I/O scanner with thumbwheel switch set to 1, only part of its data handling capacity is available for handling block transfers. This scanner can store and transfer a maximum of 72 words at any one time. This scanner can do four block transfer modules across any of the active channels.

If a block transfer read instruction is enabled but the scanner's buffer cannot accept the instruction's block length (the scanner is processing other blocks of data), the block transfer instruction must wait for a subsequent scan when the scanner's buffer can accept all the words that the module has to transfer. The same applies for a write block transfer instruction. We suggest that you add an additional scanner if necessary.

Block Transfer Errors

Once enabled, a block transfer instruction in a PLC-3 ladder program will set either a done bit or an error bit. The instruction indicates an error when it illuminates the -(ER)- symbol. Typical block transfer errors occur when:

- You do not correctly enter the instruction:
  - The rack, group, and module numbers do not match the location of the installed module.
  - You entered a file length greater than 64.
  - You did not create the data file or the address that you entered does not match the file you created.

Read and write error bits illuminate at the same time when the error source is the module address entry or the file length entry in the instruction block.

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- You have a communications problem.
- You did not correctly connect the twin-axial cable to the scanner.
- You did not connect a terminator resistor to each end of the twin-axial cable.

When the scanner encounters a communication fault, it tries twice to complete the transfer. It sets the error bit after the second unsuccessful try.

When the scanner and/or processor detects a block transfer error, the transfer is halted. Transfers from that module are prevented until:

- Your program clears the instruction's control word (clears the error, Figure 7.5).
- You locate and correct the error.

Figure 7.5
Resetting the Control Word after a Block Transfer Error



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Chapter 8

Troubleshooting Your 1771–DCM

Troubleshooting Your 1771–DCM

When troubleshooting your 1771–DCM, check each of the following sources in the order given for the cause of the fault:

- LEDs on the 1771–DCM
- Block transfer rungs in the ladder program of your local or supervisory processor
- Status bits in the status word read by the local or supervisory processor

LED Display for Normal Operation

Under normal operating conditions, the LEDs are lit as follows:

Power (PWR)	ON
Serial Communication (SER COM)	ON
Backplane Communications (BCKPLN COM)	ON
Module Fault (DCM FLT)	OFF

LED Display for Fault Conditions

If a fault should occur, the LED display changes to indicate the source of the fault which you diagnose as follows:

LED	Status	Diagnosis
PWR	OFF	The 1771–DCM is not getting +5V DC. Check the backplane power supply.
SER COM	Blinking	Supervisory processor is in program or test mode. Check mode selection. Supervisory processor is not connected to the scanner. Check the cable between processor and scanner (PLC–2/30 processor). Supervisory processor detected a fault and turned off outputs. Check processor LEDs and status of outputs.
	OFF	The supervisory processor is not communicating with the 1771–DCM. Check cable connections in the remote I/O link to the 1771–DCM.

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LED	Status	Diagnosis
BCKPLN COM	Blinking	The 1771–DCM turns on this LED for half a second at the completion of a read or write block transfer. This LED blinks when: • The local processor performs block transfers at a rate slower than once every 1/2 second. • With the 1771–DCM in protected data mode, the supervisory processor performs block transfers at a rate slower than once every 1/2 second. Reduce program scan and/or I/O scan time if possible in either processor.
	OFF	No block transfers are occurring across the backplane between the local processor and 1771–DCM. Refer to Block Transfer Errors for the local processor, below.
DCM FLT	ON	The 1771–DCM has detected an internal fault and is not operating. Cycle power to the I/O chassis containing the 1771–DCM. Replace it if the LED remains lit when you restore power. If the 1771–DCM is the only thing connected to a supervisory PLC–3, and the scanner baud is 115.2K, the DCM will stop communicating and turn on the red fault light after approximately 20 minutes of communication.

Causes of Block Transfer Errors

Observe block transfer rungs in the ladder diagram program of the processor not performing block transfers. You have a block transfer error when you observe one or both of the following:

- The block transfer error bit is intensified (PLC–3 processor).
- Enable and done bits of block transfer instructions either do not intensify or remain intensified. They should alternately turn ON (intensify) and turn OFF.

Block transfer errors are caused if one more more of the following are incorrect:

- The 1771–DCM's location (RGS) in the local I/O chassis must match the RGS of block transfer instructions in the local processor's ladder program.
- The address of the I/O chassis simulated by the 1771–DCM (RGS) must match the module address (RGS) of block transfer instructions in the supervisory processor's ladder program.
- The block lengths of read and write block transfer instructions should be equal (PLC–2 family processors); or if different, do not enable BTR and BTW instructions in the same scan.

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- You assigned valid areas of data table for read and write blocks. For example, if operating in discrete data transfer mode, I/O image table addresses of the supervisory processor's ladder program match the RGS to which you configured the 1771–DCM.
- Your conditioning instructions in block transfer rungs allow the rungs to turn ON and OFF.
- If using a PLC–2/30 supervisory processor, set the scanner for block transfer operation.
- If using a PLC–3 supervisory processor, create block transfer data files.

Errors Indicated by Status Bits

Display status bits in the status word read by either processor by displaying the read block of the read block transfer instruction. Refer to your processor's manual for the procedure.

The first word in the data block is the status word. Hex codes of some typical fault conditions are tabulated below:

Hex Code	Fault Condition
Read by Local Processor	
0300	Supervisory processor is in program or test mode.
2300	No communication between the supervisory processor and its scanner.
0900 or 2B00	1771–DCM has not received data from the supervisory processor since power–up.
4100 or 8100	Number of words transferred between the supervisory processor and 1771–DCM is not equal to the number read by the local processor.
Read by Supervisory Processor	
0500	1771–DCM has not received data from the local processor since the last time it was read by the supervisory processor.
0900 or 0D00	1771–DCM has not received data from the local processor since power–up.
1100	Local processor is not performing block transfers due to a time-out, out–of–sequence transfer, or checksum error.
2300	Local processor is not performing block transfers because it reset the backplane.
4100 or 8100	Number of words transferred between the local processor and 1771–DCM is not equal to the number read by supervisory processor.

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Specifications

Function
- Provides Direct Communication Between Supervisory and Local Processors

Serial Communication
- Discrete Data Transfer: Up to Seven Words Plus One Status Word
- Block Transfer: Up to 63 Words Plus One Status Word

Transmission
- 10,000 Cable Feet at 57.6K Baud
- 5,000 Cable Feet at 115.2K Baud

Response Time
- Less than 15 ms

Interconnect Cable
- 1770–CD (Belden 9463 or Equivalent)

Backplane Current
- 1.2A

Keying
- Top Connector:
  Between 2 and 4
  Between 16 and 18

Environmental
- Operational Temperature:
  0° to 60°C (32° to 140°F)
- Storage Temperature:
  –40° to 85°C (–40° to 185°F)
- Relative Humidity:
  5% to 95% (Without Condensation)

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