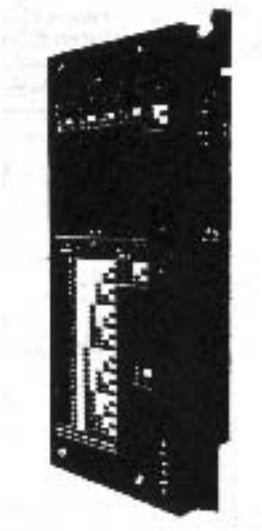
ALLEN-BRADLEY

Allen-Bradley Direct Communication Module (Cat. No.1771-DCM)

Product Data



Concept of Direct Communication

Direct communication refers to communication between a supervisory processor and machine/process level processors. It allows control functions within a plant to be subdivided among individual control stations rather than concentrated at one central processor. Supervisory processors are installed at key locations throughout the process: whether discrete parts manufacturing or continuous batch processing.

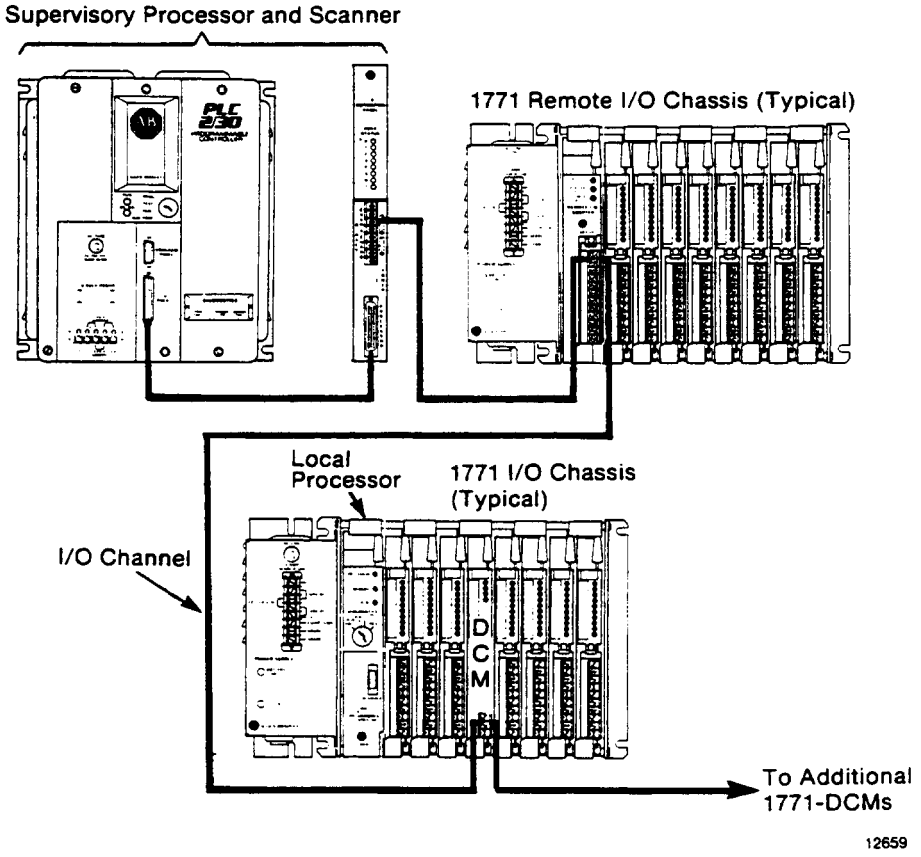
With direct communication between levels, supervisory processors concentrate on sequential control and monitoring, such as adjusting overall line speed as individual machines slow down or speed up. Local machine or process level processors monitor and control their associated I/O. This structure has advantages of faster response time, easier programming, and less costly troubleshooting.

It is easier to program, debug, maintain, troubleshoot, and repair small to medium size PCs as compared with one large PC system. Overall plant downtime can be reduced as a result of simplified troubleshooting and servicing smaller PCs. It is not necessary to shut down the entire system to isolate faults from one remote I/O chassis.

Description of 1771-DCM

The 1771-DCM is a chassis-mounted single-slot I/O module that controls communication between a supervisory processor and chassis-mounted local processors (figure 1). It also provides direct communication between a supervisory processor and remotely configured (local) processors (figure 2). The local processor can be configured in a local or remote system.

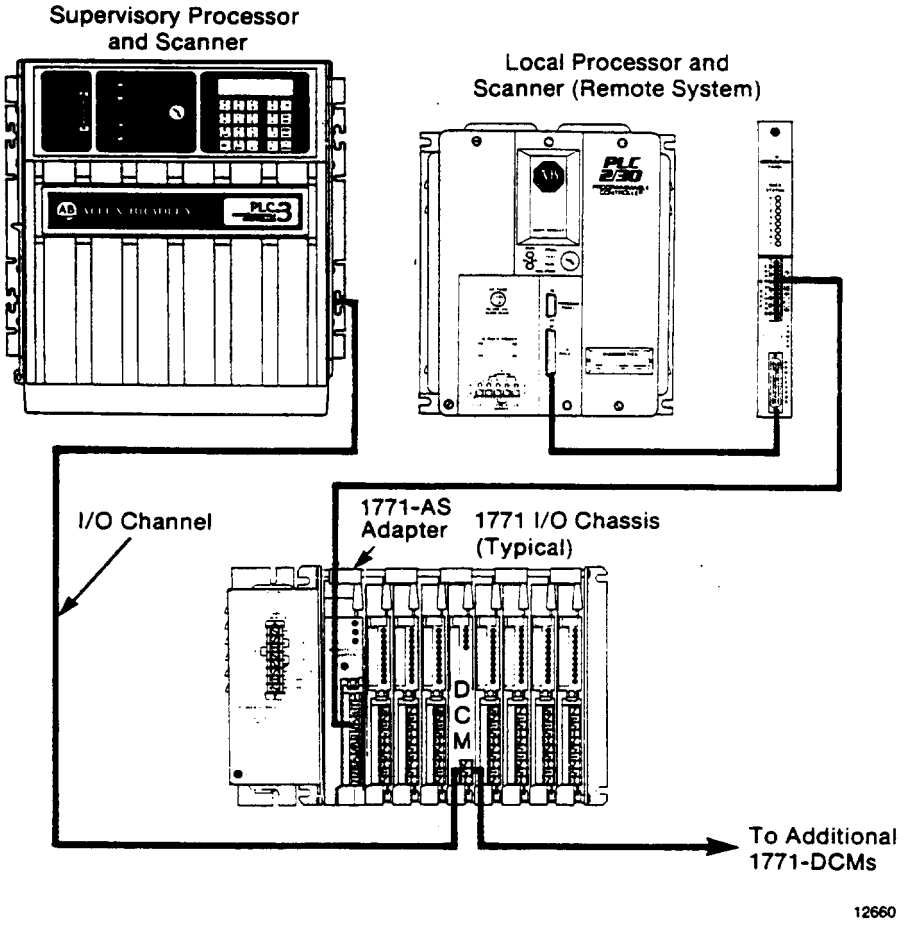
Figure 1
Direct Communications Between Supervisory and Local Processors



The 1771-DCM controls bidirectional communication of 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.

The supervisory processor communicates serially with the 1771-DCM as though it were a 1771-AS 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 data transfer (up to eight words), or block transfer (up to 64 words).

Figure 2
Direct Communication Between a Supervisory Processor and Local Processor in a Remote System



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. A remotely configured (local) processor communicates with the 1771-DCM via backplane and block transfer through its scanner-adapter link.

Choice of 1771-DCM or Data Highway

You can use the 1771-DCM or Allen-Bradley data highway to communicate 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 8 words when the transfer time over a remote I/O channel is adequate, in addition to that of the 1771-DCM and local processor
- transfer up to 64 words when the transfer time for block transfers over a remote I/O channel is adequate, in addition to that of the 1771-DCM and local processor
- decrease highway traffic

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

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

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 8 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 remote I/O system.

When comparing transfer times of the 1771-DCM with the data highway

- the 1771-DCM is faster when you select discrete data transfer
- the 1771-DCM approaches a typical data highway system when you select block transfer.

Example Applications

Consider the following applications for the transfer of data using the 1771-DCM:

- 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) when you want local processor(s) to execute different versions of the same program
- download commands from supervisory to local processor(s) to execute different sections of a ladder diagram program

Selectable Options

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

■ Data 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 Update	Select protected update to prevent block transfers from the local processor until the supervisory processor has received the previous block transfer.
■ Rack Address	Designate the address 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 paragraphs that follow.

Communication Rate/Distance

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. The scanner acts as master, the 1771-DCM as a slave that replies only to commands from the scanner.

Transfer Method

You can choose either discrete data transfer or block transfer as the method of transfer between the supervisory processor and 1771-DCM. With discrete data transfer, you select 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. 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. Data is transferred between the first I/O slot, simulated as a block transfer module 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.

Equivalent Rack Size

When your application requires discrete data transfer, 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. You select the equivalent rack size depending on the number of words you want to transfer. One slot is equivalent to eight command or status bits, or one byte of data.

When you set the 1771-DCM for block transfer, the 1771-DCM appears to the scanner as a 4-slot chassis with slot 0 reserved for bidirectional block transfers. You can read and write up to 64 words. Slots 1 thru 3 are not used.

Protected Update

Protected update maintains data integrity and the order of data blocks sent from the local processor to the supervisory processor. The 1771-DCM does not recognize the start of a new write block transfer operation from the local processor until the supervisory processor has read the previous data from the local processor.

Unprotected Update

When you select unprotected update, the local processor updates the 1771-DCM continually, regardless of whether the data has been transferred to the supervisory processor.

Rack Address

You designate the address of the first module group of the I/O chassis simulated by the 1771-DCM. If the 1771-DCM is simulating an I/O chassis that is assigned the same I/O rack address with other I/O chassis, designate a unique starting module group number for the 1771-DCM. You also designate whether this simulated I/O chassis is the last chassis (has the highest starting module group address).

You can use up to four 1771-DCMs and I/O adapters with the same assigned I/O rack address, one for each (simulated) quarter rack. You can use up to 16 1771-DCMs and I/O adapters on the serial link of one scanner channel.

Compatible Processors

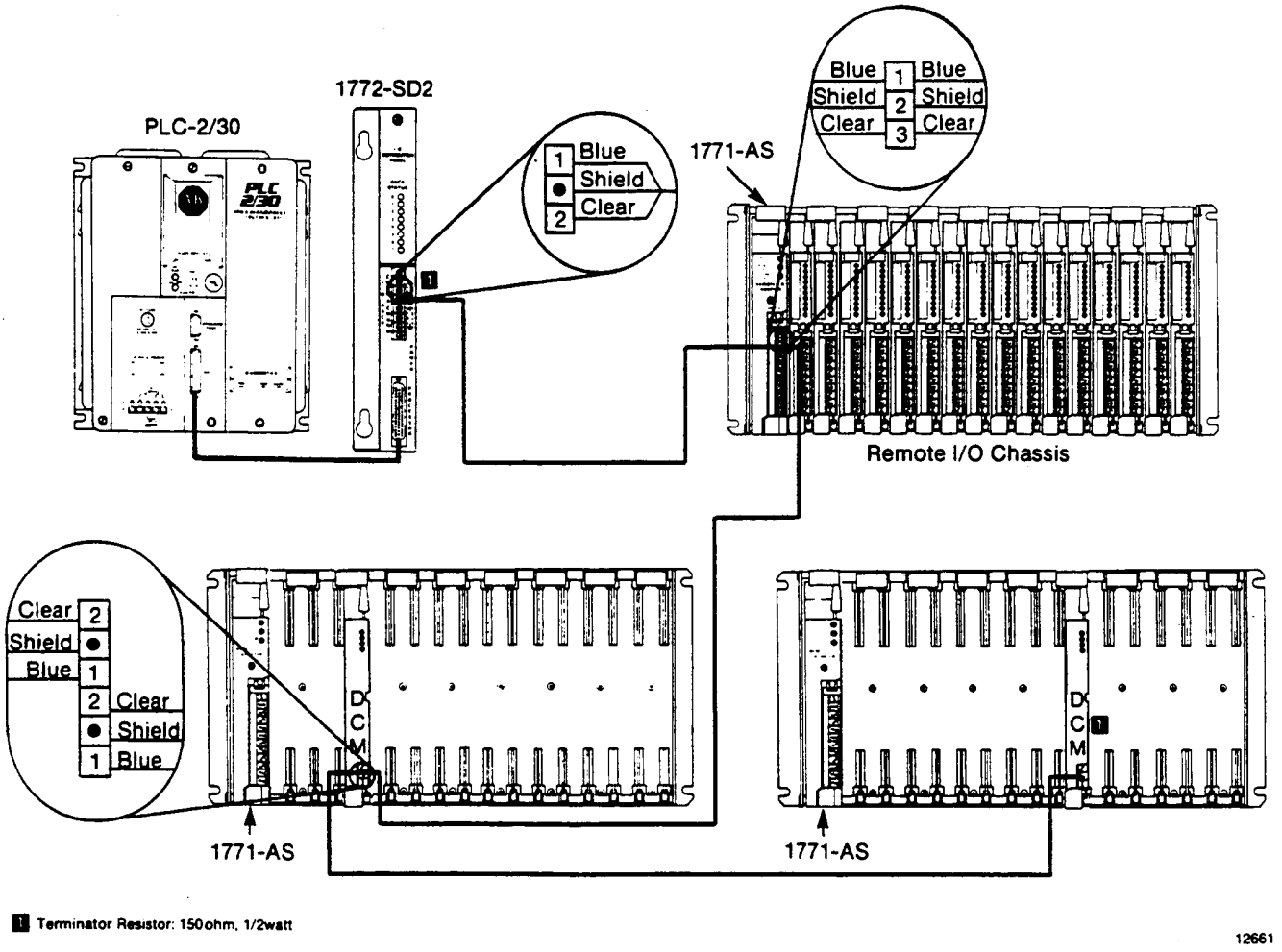
Use the 1771-DCM with any Allen-Bradley programmable controller that uses block transfer and the 1771 I/O structure.

Cable Connections

The communications channel between the 1771-DCM and a supervisory processor is the same serial communications channel as used between the 1771-AS Remote I/O Adapter and a scanner. You insert the 1771-DCM in a local or remote I/O chassis and configure the 1771-DCM as a unique I/O chassis in respect to the supervisory processor. You can connect the 1771-DCM in a daisy chain or trunkline/dropline hook-up with other remote I/O chassis.

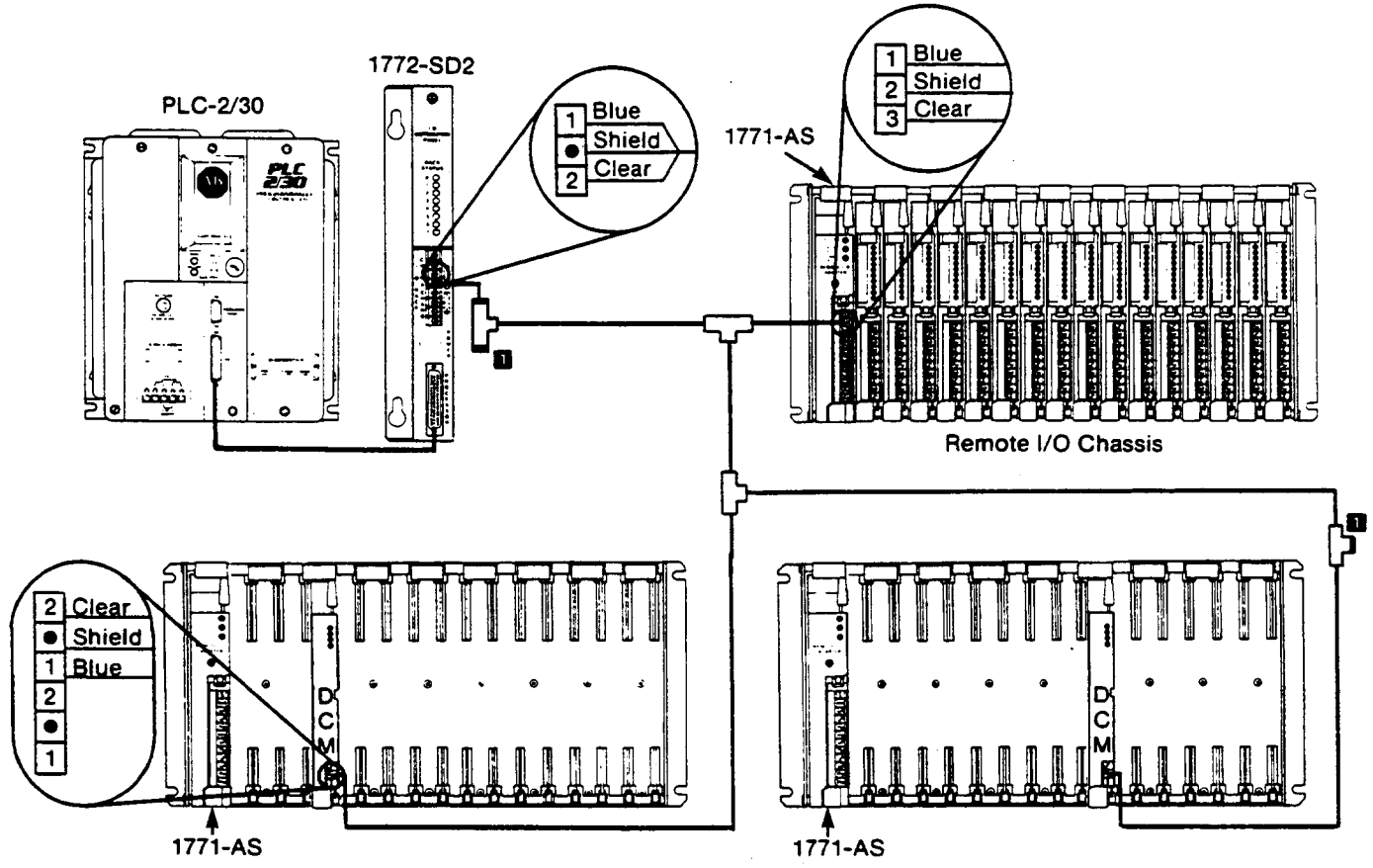
Daisy Chain Hook-Up—When using the daisy chain hook-up (figure 3), splice each I/O chassis into the main communication line (serial I/O channel). You install a 150 ohm terminator resistor between the terminals for line 1 and 2 at the scanner, and at the last hook-up on the main communication line to terminate both ends of the line.

Figure 3
Example Daisy Chain Hook-Up



Trunkline/Dropline Hook-up—When using the trunkline/dropline hook-up, you connect the 1771-DCM to the serial I/O channel trunkline using a dropline that does not exceed 100 feet in length (figure 4). You 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. You terminate the open port at the first and last T connector or station connector using a Terminator Set (cat. no. 1770-XF).

Figure 4
Example Trunkline Dropline Hook-Up With T Connectors



Reporting Errors and Status

The 1771-DCM adds a status word to read block transfers requested by either processor. The 1771-DCM sets specific bits in its status word according to status or errors that it detects. Status and errors reported in block transfer mode differ somewhat from those reported in discrete transfer mode.

Error Conditions for Block Transfer

The 1771-DCM detects the following error or status conditions.

Invalid Data

The 1771-DCM sets this bit whenever it detects one or more error or status conditions. It latches this bit and the error or status bits until conditions are corrected.

Insufficient Data Available

When the block length of a read block transfer request from either processor exceeds the data temporarily stored in the 1771-DCM, the module detects the lack of data. It sets a status bit and appends zeroed data words to provide the requested number of words.

Excessive Data Available

When the block length of a read block transfer request from either processor is less than the data temporarily stored in the 1771-DCM, the module detects an excess of its data. It sets a status bit, truncates the data, and returns only the number of words requested.

No Data Available

When using block transfer, the 1771-DCM resets a status bit when it first receives data from the local processor at power-up. Thereafter,the 1771-DCM sets this bit whenever it detects that the local processor has stopped transferring data.

Scanner Communications Error

The 1771-DCM sets a status bit 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 of the supervisory processor or zeroed data words if communications had not been established. The 1771-DCM turns off the serial communications LED until communications are restored.

Backplane Error

The 1771-DCM sets a status bit whenever it detects that a block transfer operation by the local processor is not completed on time, is out of sequence, or contains a checksum error. If the supervisory processor requests a read block transfer after the 1771-DCM detects a backplane error, the 1771-DCM sets this bit and 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 that the local processor has scanned it.

Backplane Reset

The 1771-DCM sets a status bit 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 deenergizes outputs. The 1771-DCM cannot detect a backplane reset due to a fault condition where outputs remain in last state.

Inactive Outputs

The 1771-DCM sets a status bit to inform the local processor that the supervisory processor is not controlling outputs. This occurs when you switch the supervisory processor to program or test mode, when the supervisory processor cannot communicate with its scanner, or when a dependent fault occurs.

Old Data

The 1771-DCM sets a status bit whenever it detects that it has not received data from the local processor since the last time it was read 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.

Error Conditions for Discrete Data Transfer

The 1771-DCM detects error or status conditions similar to those described for block transfer with the following exceptions.

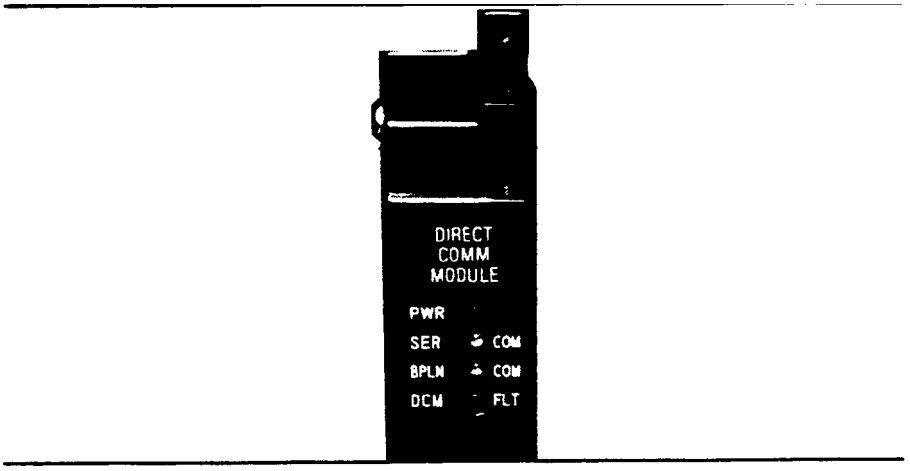
- no data and old data are not reported
- the 1771-DCM reports insufficient or excessive data when the number of words read by either processor differs from the number of words stored temporarily in the 1771-DCM. The amount of data that it stores depends on the equivalent rack size that you set, such as 8 slots for 128 data bits

Diagnostic Indicators

The 1771-DCM has four diagnostic indicators (figure 5). Their functions are summarized as follows:

Indicator	On	Blinking	Off
Power (PWR)	Normal operation	N/A	No power
Serial Communications (SER COM)	Communicating with supervisory PC in run mode	Communicating with supervisory PC in program or test mode	No communications No block transfers
Backplane Communications (BPLN COM)	Normal operation	Time between block transfers from supervisory PC exceeds 500ms (in protected mode)	
Module Fault (DCM FLT)	DCM hardware fault	N/A	Normal operation

Figure 5
Diagnostic Indicators



Module Response Time

The 1771-DCM requires 15ms from the time it receives data until it is ready for data transfer. During this time, it detects errors and/or status and formats data for the next transfer.

Specifications

Function

- Provides direct communication between supervisory and local processors

Serial Communication

- Discrete Data Transfer: up to 7 words plus one status word
- Block Transfer: up to 63 words plus one status word

Transmission

- 10,000 cable-ft at 57.6k baud
- 5,000 cable-ft at 115.2k baud

Response Time

- less than 15ms 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)
- Realtive humidity:5% to 95% (without condensation)

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Publication 1771–2.70 — May, 1985

PN955096-01
Printed in USA