



Allen-Bradley

***Direct
Communication
Module***

(Cat. No. 1747-DCM)

User Manual



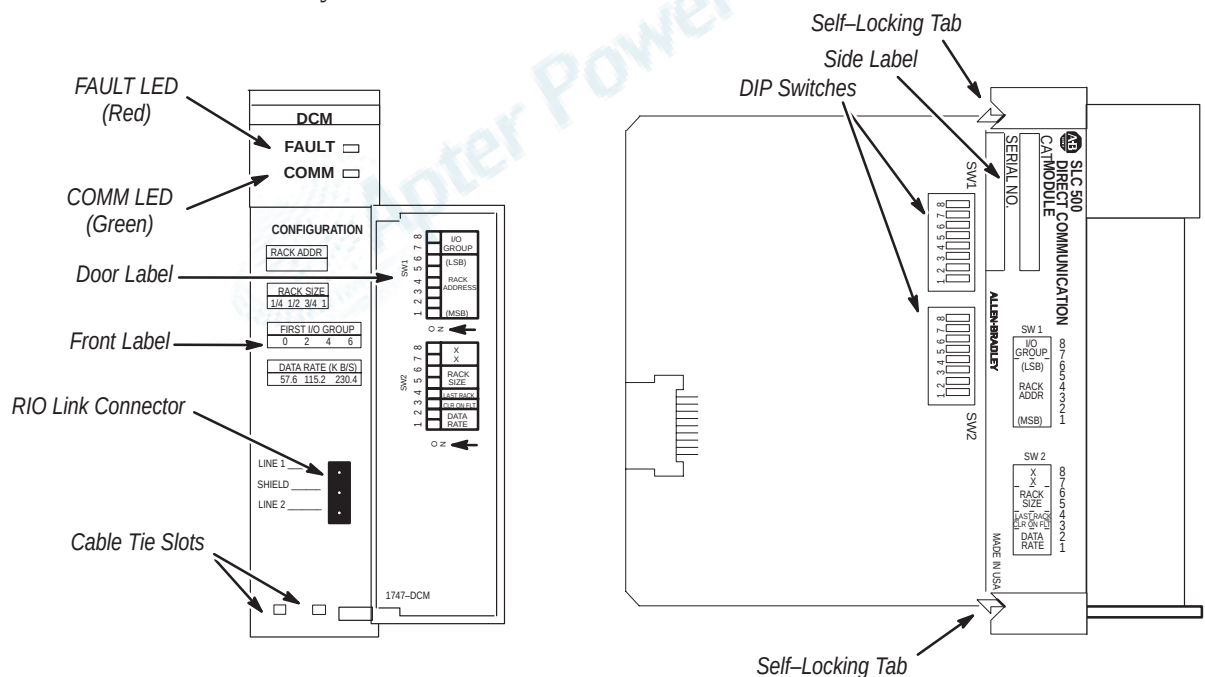
Overview

This chapter provides a hardware and system overview including physical features and connectivity illustrations. It also explains data exchange between processors and discusses rack size. Topics include:

- hardware overview
- system overview
- scanner image division
- communications flow

Hardware Overview

The Direct Communication Module, Catalog Number 1747-DCM, is used to connect an SLC 500 Fixed Programmable Controller with expansion chassis or any SLC 500 Modular Programmable Controller to a supervisory Allen-Bradley Programmable Controller via the RIO Link, thereby providing a distributed processing system. The DCM occupies one slot in any SLC 500 chassis.



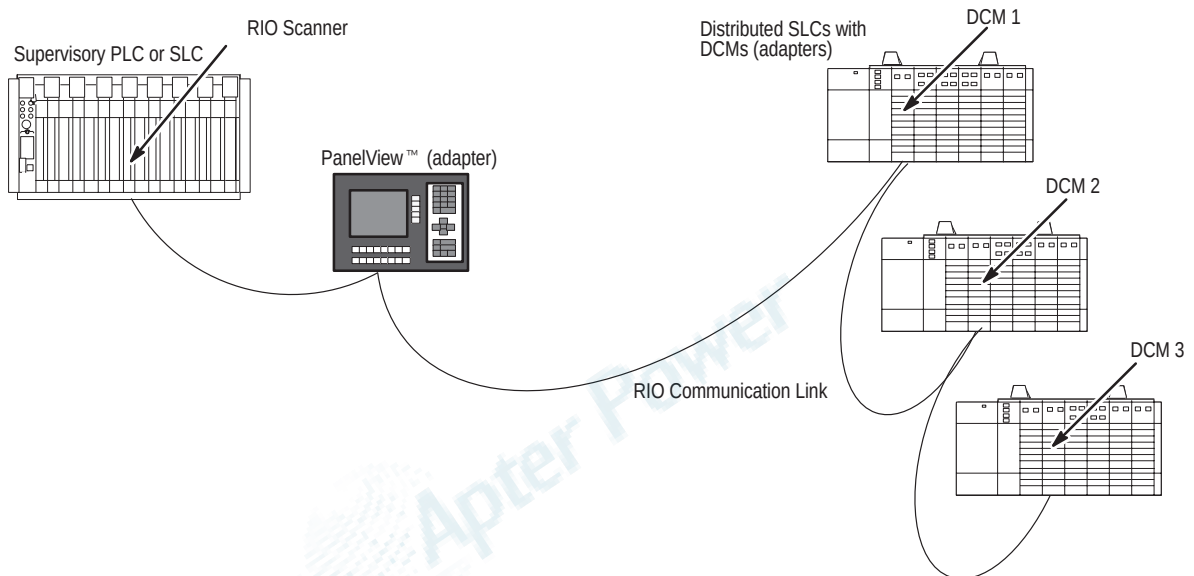
Hardware Features

Hardware	Function
FAULT LED	Displays operating status
COMM LED	Displays communication status
Front, Side and Door Labels	Provide module configuration information
RIO Link Connector	Provides physical connection to RIO network
Cable Tie Slots	Secure and route wiring from module
DIP Switches	Establish configuration parameters for the module
Self-Locking Tabs	Secure module in chassis slot

System Overview

The Direct Communication Module is an SLC 500 family Remote I/O (RIO) adapter. It allows supervisory processors, such as PLC-5s, and distributed SLC-500 processors residing on an Allen-Bradley RIO Communication Link to transfer data between each other. The DCM appears as an RIO adapter to:

- a PLC processor with integral RIO scanner on the RIO Communication Link
- an RIO scanner, Catalog Number 1771-SN or 1747-SN, on the RIO Communication Link



DCM modules are connected in a daisy-chain configuration using Belden 9463 cable.

What Is a Remote I/O Adapter?

A remote I/O adapter (RIO adapter) is any module that acts as a slave to an RIO scanner, the master on the RIO link. The DCM is an RIO adapter.

All RIO scanners have defined physical and logical specifications. **Physical specifications** are the maximum number of adapters that can be connected to the scanner. (See Extended Node Capability on page 1-4.) **Logical specifications** are the maximum number of logical racks the scanner can address, the ways logical racks can be assigned, and the ability of the scanner to perform block transfers. Refer to the appropriate scanner manual for details concerning physical and logical specifications.

The DCM can physically reside on the RIO link with any other adapter. The following table lists the adapters available for use with an RIO link.

Scanner Image Division Configuration Example

The example presented here can help you configure your RIO architecture. Refer to it as necessary.

The following figure shows how a portion of a scanner's input image table might be configured. An output image table would be identically configured.

Decimal Bit Number		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Octal Bit Number		17	16	15	14	13	12	11	10	7	6	5	4	3	2	1	0
Logical Rack 0	Rack 0 Group 0	Word 0															
	Rack 0 Group 1	Word 1															
	Rack 0 Group 2	Word 2															
	Rack 0 Group 3	Word 3															
	Rack 0 Group 4	Word 4															
	Rack 0 Group 5	Word 5															
	Rack 0 Group 6	Word 6															
	Rack 0 Group 7	Word 7															
Logical Rack 1	Rack 1 Group 0	Word 8															
	Rack 1 Group 1	Word 9															
	Rack 1 Group 2	Word 10															
	Rack 1 Group 3	Word 11															
	Rack 1 Group 4	Word 12															
	Rack 1 Group 5	Word 13															
	Rack 1 Group 6	Word 14															
	Rack 1 Group 7	Word 15															
Logical Rack 2	Rack 2 Group 0	Word 16															
	Rack 2 Group 1	Word 17															
	Rack 2 Group 2	Word 18															
	Rack 2 Group 3	Word 19															
	Rack 2 Group 4	Word 20															
	Rack 2 Group 5	Word 21															
	Rack 2 Group 6	Word 22															
	Rack 2 Group 7	Word 23															

Device 1
(Full logical rack)

Device 2
(3/4 logical rack)

Device 3
(1/4 logical rack)

Device 4
(1/2 logical rack)

Device 5
(1/2 logical rack)

Important: The configured image size of a DCM cannot cross logical rack boundaries; it *cannot* use a portion of rack 0 and a portion of rack 1.

Data Exchange Between RIO Scanners and the DCM

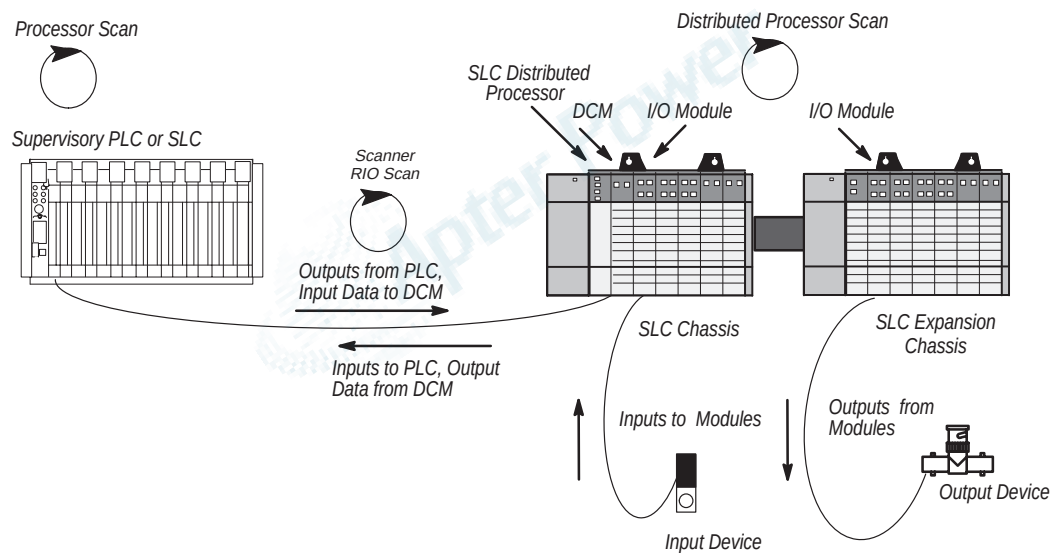
Information is transferred between the RIO scanner and the DCM every RIO scan. RIO transmissions are asynchronous to the processor scans.

Important: The DCM provides word integrity on all words transferred via the SLC backplane.

The DCM communicates with supervisory PLC or SLC controllers through RIO scanners, as if they were addressing a logical rack. However, the DCM does not scan the I/O in its local I/O chassis, rather it passes the supervisory data to the distributed SLC processor.

In the DCM, outputs from the SLC output image table are inputs to the supervisory processor input image table. Likewise, outputs from the supervisory processor output image table are inputs to the SLC input image table.

The diagram that follows depicts the communications flow between an RIO scanner and the DCM.



What Is the Status Word?

The first word of the DCM input and output image is the status word. The status word indicates the status of communication and data between the RIO scanner and the DCM. For more information on status words and their applications, see chapter 6, Programming.

1747-SN	PLC-2	PLC-3	PLC-5/15	PLC-5/25	PLC-5/40	PLC-5/60	PLC-5/250	1	2	3	4	5	6
		45						OFF	ON	ON	OFF	ON	OFF
		46						OFF	ON	ON	OFF	OFF	ON
		47						OFF	ON	ON	OFF	OFF	OFF
		50						OFF	ON	OFF	ON	ON	ON
		51						OFF	ON	OFF	ON	ON	OFF
		52						OFF	ON	OFF	ON	OFF	ON
		53						OFF	ON	OFF	ON	OFF	OFF
		54						OFF	ON	OFF	OFF	ON	ON
		55						OFF	ON	OFF	OFF	ON	OFF
		56						OFF	ON	OFF	OFF	OFF	ON
		57						OFF	ON	OFF	OFF	OFF	OFF
		60						OFF	OFF	ON	ON	ON	ON
		61						OFF	OFF	ON	ON	ON	OFF
		62						OFF	OFF	ON	ON	OFF	ON
		63						OFF	OFF	ON	ON	OFF	OFF
		64						OFF	OFF	ON	OFF	ON	ON
		65						OFF	OFF	ON	OFF	ON	OFF
		66						OFF	OFF	ON	OFF	OFF	ON
		67						OFF	OFF	ON	OFF	OFF	OFF
		70						OFF	OFF	OFF	ON	ON	ON
		71						OFF	OFF	OFF	ON	ON	OFF
		72						OFF	OFF	OFF	ON	OFF	ON
		73						OFF	OFF	OFF	ON	OFF	OFF
		74						OFF	OFF	OFF	OFF	ON	ON
		75						OFF	OFF	OFF	OFF	ON	OFF
		76						OFF	OFF	OFF	OFF	OFF	ON
77	77	77	77	77	77	77	77	Reserved					

DIP Switch 2 Settings

Rack Size (SW2-5 and SW2-6)

The logical rack size allocates image space in the scanner for each DCMs I/O data. The DCM allows 1/4, 1/2, 3/4, and full rack addressing. SW2 switches 5 and 6 define the rack size.

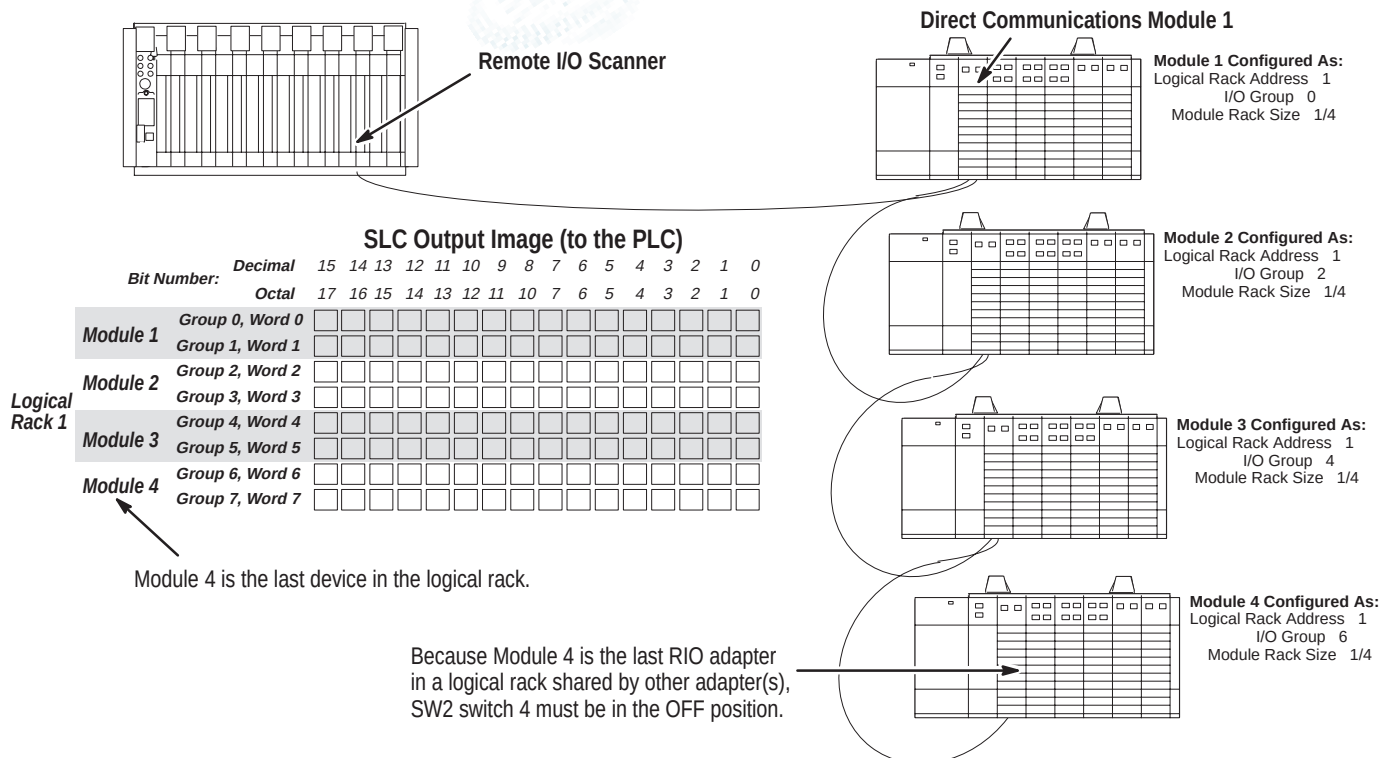
Rack Size	SW2-5	SW2-6
1/4 Logical Rack	ON	ON
1/2 Logical Rack	ON	OFF
3/4 Logical Rack	OFF	ON
Full Logical Rack	OFF	OFF

Important: The DCM image cannot cross logical rack boundaries. Therefore, as an example, configuring the module for 1/2 logical rack with starting group 6 will cause a configuration error. Refer to Starting I/O Group Number on page 4–2.

Last Rack (SW2-4)

Switch 4 of SW2 must be set to the OFF position if the DCM shares its logical rack with at least one other adapter and has been assigned the highest I/O group number in that logical rack.

Last Rack	SW2-4
Yes	OFF
No	ON



Clear On Fault (SW2-3)



ATTENTION: Before setting SW2-3 to ON, make sure that holding all DCM input bits in their last state, in the event a communication error occurs, does not create an unsafe condition in the distributed SLC processor.

Clear On Fault	SW2-3
Yes	OFF
No	ON

Turn switch to OFF position if you want the DCM to clear and hold clear all data bits in its input image table, in the event of an RIO communication failure or when the supervisory processor enters Program/Test/Fault Mode. *Status bits will not be cleared.*

Turn switch to ON position if you want the DCM to hold all input data bits in their last state when an RIO communication failure occurs or when the supervisory processor enters Program/Test/Fault Mode.

Data Rate (SW2-1 and SW2-2)

Data Rate	SW2-1	SW2-2	Cable Length (Belden 9463)
57.6K baud	ON	ON	3048 meters (10,000 feet)
115.2K baud	ON	OFF	1524 meters (5,000 feet)
230.4K baud	OFF	ON	762 meters (2,500 feet)
	OFF	OFF	

Installation and Wiring

This chapter explains how to install the DCM into the SLC chassis and provides information about terminal wiring. Topics include:

- DCM installation
- network wiring

Compliance to European Union Directives

If this product has the CE mark it is approved for installation within the European Union and EEA regions. It has been designed and tested to meet the following directives.

EMC Directive

This product is tested to meet Council Directive 89/336/EEC Electromagnetic Compatibility (EMC) and the following standards, in whole or in part, documented in a technical construction file:

- EN 50081-2
EMC – Generic Emission Standard, Part 2 – Industrial Environment
- EN 50082-2
EMC – Generic Immunity Standard, Part 2 – Industrial Environment

This product is intended for use in an industrial environment.

DCM Installation

Installation procedures for this module are the same as for any other discrete I/O or specialty module. Refer to the illustration on page 5–2 to identify chassis and module components listed in the procedures below.



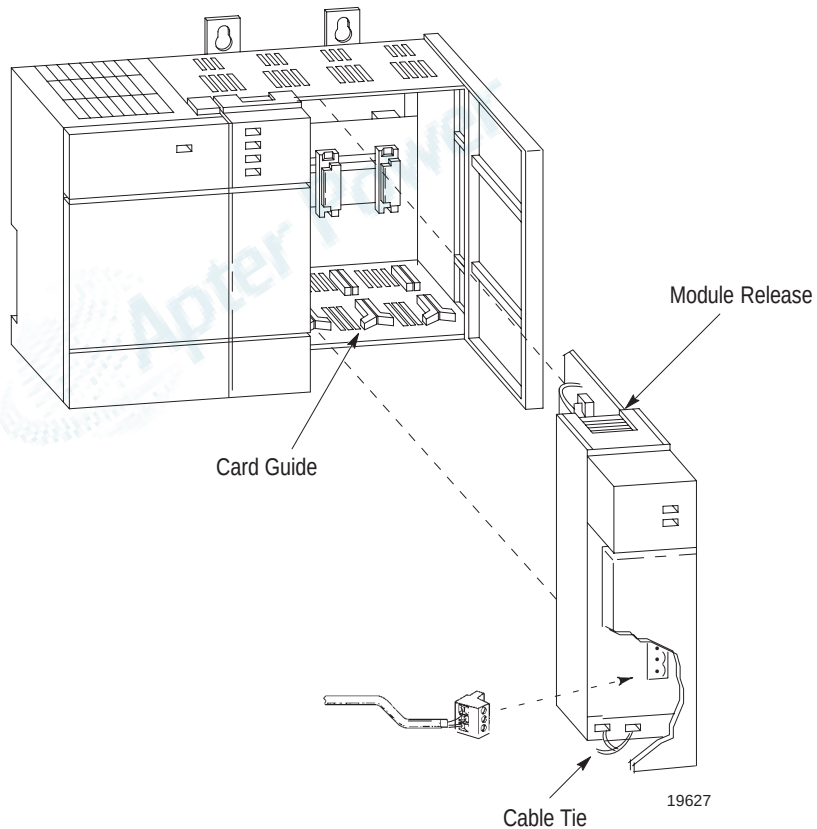
ATTENTION: Disconnect power before attempting to install, remove, or wire the DCM.

Important: Make sure you have set the DIP switches properly before installing the DCM.

Before installation make sure your modular SLC power supply has adequate reserve current capacity. The DCM requires 360mA @ 5 volts. Each Fixed SLC 500 controller can support up to one DCM in a 2-slot expansion chassis, depending on which I/O module is in the second slot. Refer to the Discrete I/O Modules Product Data, Publication Number 1746-2.35.

Installation

1. Disconnect power.
2. Align the full-sized circuit board with the chassis card guides. The first slot (slot 0) of the first rack is reserved for the CPU.
3. Slide the module into the chassis until the top and bottom latches are latched.
4. Attach the RIO link cable to the connector on the front of the module behind the door.
5. Insert the cable tie in the slots.
6. Route the cable down and away from module, securing it with the cable tie.
7. Cover all unused slots with the Card Slot Filler, Catalog Number 1746-N2.



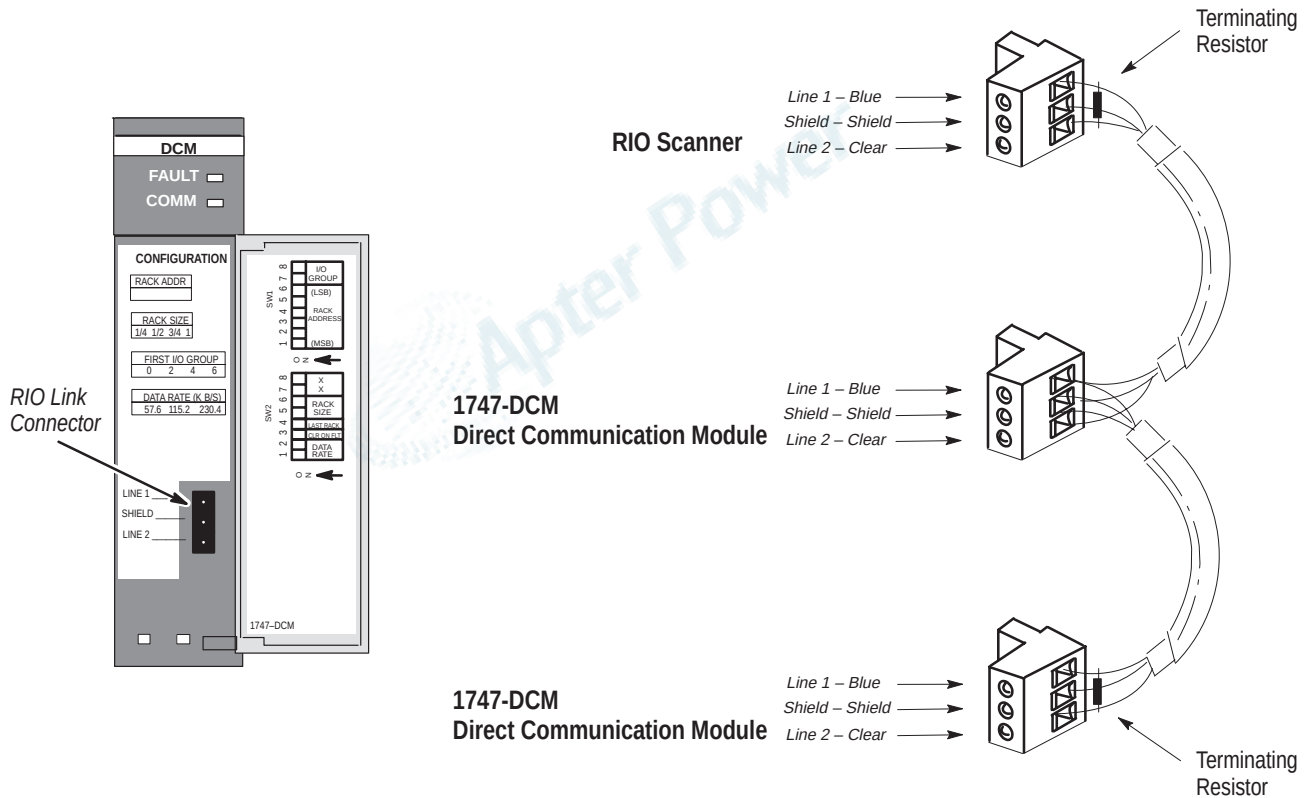
Removal

1. Disconnect power.
2. Press the releases at the top and bottom of the module and slide the module out of the chassis slot.
3. Cover all unused slots with the Card Slot Filler, Catalog Number 1746-N2.

Network Wiring

A 1/2 watt terminating resistor must be attached across line 1 and line 2 of the connectors at each end (scanner and last physical device) of the network. The size of the resistor depends upon the baud rate and extended node capability, as shown below:

Baud Rate		Terminating Resistor Size	Maximum Cable Distance (Belden 9463)
Using Extended Node Capability	All Baud Rates	82Ω 1/2 Watt	10,000 feet at 57.6K baud
			5,000 feet at 115.2K baud
			2,500 feet at 230.4K baud
Not Using Extended Node Capability	57.6K baud	150Ω 1/2 Watt	3048 meters (10,000 feet)
	115.2K baud	150Ω 1/2 Watt	1524 meters (5,000 feet)
	230.4K baud	82Ω 1/2 Watt	762 meters (2,500 feet)



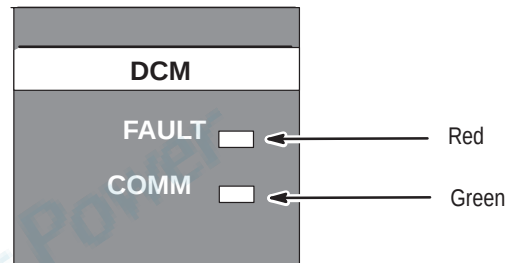
Troubleshooting

This chapter shows you how to identify and correct errors that you may encounter using LEDs. The topics include:

- DCM status indicators
- troubleshooting using the FAULT LED (red)
- troubleshooting using the COMM LED (green)

DCM Status Indicators

Two LEDs indicate the status of the DCM.



Troubleshooting Using the FAULT LED (Red)

If LED is:	Cause:	Corrective action:
On	Internal Fault	Cycle power to the I/O chassis containing the DCM. Replace DCM if red LED remains lit after powerup.
Blinking	Configuration Error	Check that the DIP switch settings are correct. Make sure that I/O group and rack size settings are compatible. ^① Also see that the setting for rack address is correct. Refer to chapter 4, Module Configuration, for help with DIP switches.
Off	Normal State	No action required.

^① The DCM cannot cross logical rack boundaries. Therefore, as an example, configuring the module for 1/2 logical rack with starting group 6 will cause a configuration error.

Troubleshooting Using the COMM LED (Green)

If LED is:	Cause:	Corrective action:
On	Normal State	No action required.
Blinking	RIO scanner's processor in Program/Test Fault Mode	Check for RIO scanner's processor error, correct condition, and cycle power to DCM.
Off	RIO scanner's processor not connected to scanner	Check that the scanner is properly installed in rack (RIO scanner's processor–2, #3).
	RIO scanner's processor rack inhibited	Check RIO scanner's processor rack integrity, correct any problem, and cycle power to DCM.
	No communication between RIO scanner's processor and DCM	Check that the baud rate of the DCM matches the baud rate of the scanner.
		Check cable connections from the RIO scanner's processor or scanner to the DCM.
		Check that the DCM connector is properly installed.



Specifications

This appendix provides the following module and system specifications.

- electrical specifications
- environmental specifications
- network specifications

It also discusses throughput time for the DCM.

Electrical Specifications

Backplane Current Consumption	360mA at 5V
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Environmental Specifications

Operating Temperature	0°C to 60°C (32°F to 140°F)
Storage Temperature	–40°C to +85°C (–40°F to +185°F)
Humidity Rating	5% to 95% noncondensing
Agency Certification (when product or packaging is marked)	• CSA certified • CSA Class I, Division 2 Groups A, B, C, D certified • UL listed • CE marked for all applicable directives

Network Specifications

	Baud Rate	Maximum Cable Distance (Belden 9463)	Resistor Size
Using Extended Node Capability	57.6K baud	10,000 feet at 57.6K baud	82Ω 1/2 Watt
	115.2K baud	5,000 feet at 115.2K baud	
	230.4K baud	2,500 feet at 230.4K baud	
Not Using Extended Node Capability	57.6K baud	3048 meters (10,000 feet)	150Ω 1/2 Watt
	115.2K baud	1524 meters (5,000 feet)	
	230.4K baud	762 meters (2,500 feet)	82Ω 1/2 Watt

Throughput Timing

Use the following steps to determine the maximum throughput time in your application.

1. Determine and record the PLC and SLC delay by following these instructions:

	PLC	SLC
I/O circuit delay:		
I/O scan time:	+	+
Program scan time:	+	+
PLC Delay:	=	SLC Delay: =

2. Record the remote I/O delay:

Remote I/O delay:

3. Record the DCM delay. This should be <10 msec.:

DCM delay:

4. Using your recorded values above, determine the maximum throughput time for your application as shown below:

PLC Delay:

Remote I/O delay: +

DCM delay: +

SLC Delay: +

Maximum throughput time: =