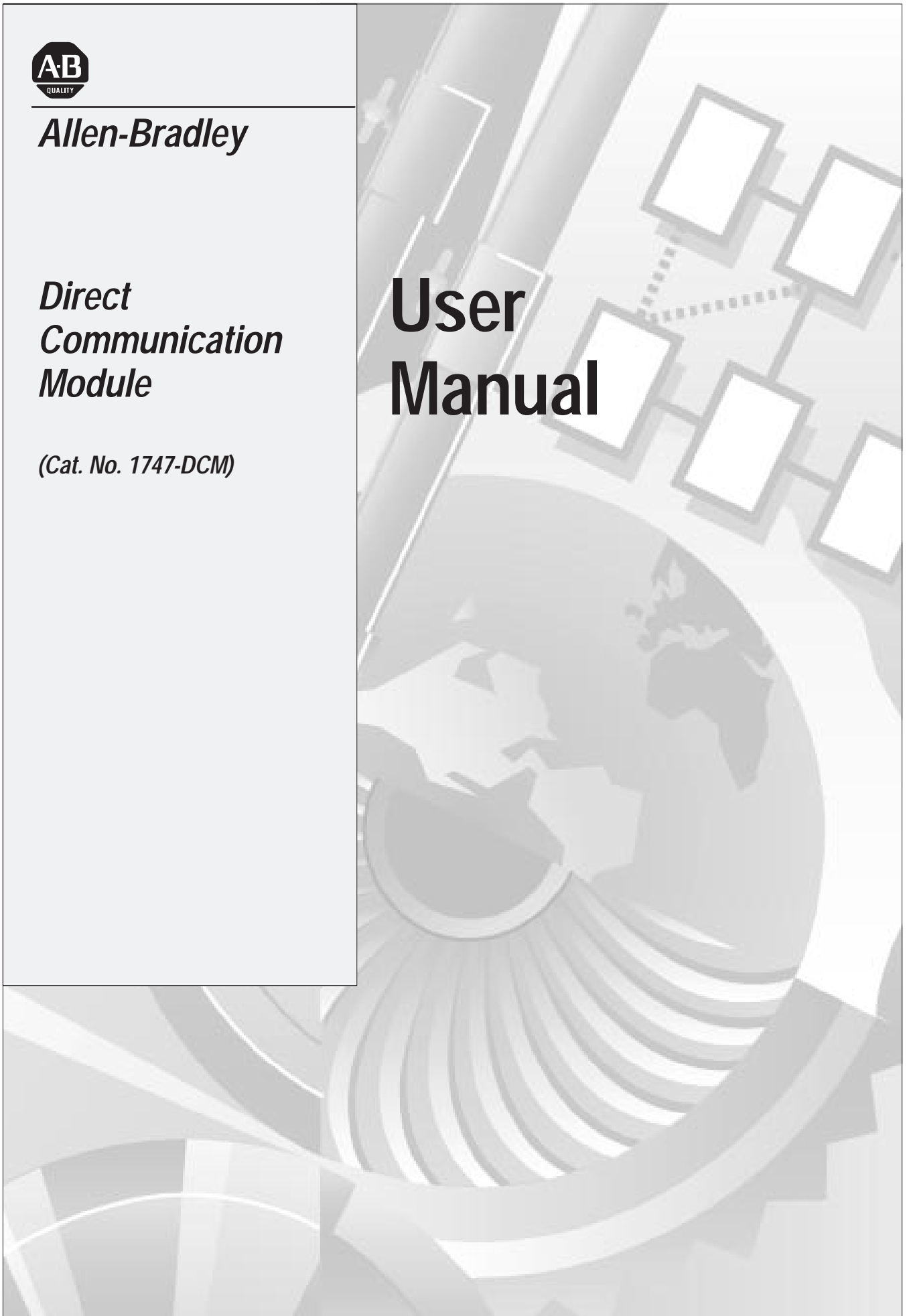**A·B** QUALITY

Allen-Bradley

Direct Communication Module

(Cat. No. 1747-DCM)

User Manual

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. "Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls" (Publication SGI-1.1) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will the Allen-Bradley Company be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, the Allen-Bradley Company cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Allen-Bradley Company with respect to use of information, circuits, equipment, or software described in this manual.

Reproduction of the contents of this manual, in whole or in part, without written permission of the Allen-Bradley Company is prohibited.

Throughout this manual we use notes to make you aware of safety considerations.

ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.

Attentions help you:
- identify a hazard
- avoid the hazard
- recognize the consequences

Important: Identifies information that is especially important for successful application and understanding of the product.

Summary of Changes

The information below summarizes the changes to this manual since the last printing as 1747-NM007–September 1993.

To help you find new information and updated information in this release of the manual, we have included change bars as shown to the right of this paragraph.

New Information

The table below lists sections that document new features and additional information about existing features, and shows where to find this new information.

For This New Information	See
Related documentation updated	preface
Quick Start for Experienced Users	chapter 2
Default DIP switch settings	chapter 4
CE certification	chapter 5, appendix A
DCM clear on fault DIP switch	chapter 6

Overview

**Quick Start
for Experienced Users**

Addressing

Module Configuration

Specifications

**DCM Addressing
Worksheet**

Preface

Read this preface to familiarize yourself with the rest of the manual. This preface covers the following topics:

- who should use this manual
- the purpose of this manual
- terms and abbreviations
- conventions used in this manual
- Allen–Bradley support

Who Should Use this Manual

Use this manual if you are responsible for designing, installing, programming, or troubleshooting control systems that use Allen–Bradley small logic controllers.

You should have a basic understanding of SLC 500™ products. You should understand programmable controllers and be able to interpret the ladder logic instructions required to control your application. If you do not, contact your local Allen–Bradley representative for information on available training courses before using this product. **If using Advanced Programming Software (APS), we recommend that you review *The APS Quick Start for New Users*, Publication 9399-APSQS.**

Purpose of this Manual

This manual is a reference guide for the Direct Communication Module (DCM). It describes the procedures you use to address, configure and program the DCM for application with PLCs and SLCs.

Contents of this Manual

Chapter	Title	Content
	Preface	Describes the purpose, background, and scope of this manual. Also specifies the audience for whom this manual is intended.
1	Overview	Provides a hardware and system overview including physical features, system communication, scanner image division and communications flow.
2	Quick Start for Experienced Users	Serves as a **Quick Start Guide** for using the DCM.
3	Addressing	Explains slot numbering and image mapping.
4	Module Configuration	Provides DIP switch setting information.
5	Installation and Wiring	Provides installation procedures and a wiring diagram.
6	Programming	Shows how to program ladder logic in the PLC® and the SLC 500, including an examination of special programming instructions that affect system response. Also examines the status word and its applications.
7	Troubleshooting	Describes troubleshooting using front panel LEDs.
8	Application Examples	Provides and examines both basic and supplementary applications.
Appendix A	Specifications	Provides module and system specifications and discusses throughput.
Appendix B	DCM Addressing Worksheet	Helps you to work out the image table configuration for DCMs in your system.

Related Documentation

The following documents contain additional information concerning Allen–Bradley SLC™ and PLC products. To obtain a copy, contact your local Allen–Bradley office or distributor.

For	Read This Document	Document Number
An overview of the SLC 500 family of products	SLC 500 System Overview	1747-2.30
A description on how to install and use your *Fixed* SLC 500 programmable controller	Installation & Operation Manual for Fixed Hardware Style Programmable Controllers	1747-6.21
A description on how to install and use your *Modular* SLC 500 programmable controller	Installation & Operation Manual for Modular Hardware Style Programmable Controllers	1747-6.2
A reference manual that contains information regarding the use of the PLC–5® programmable controller	PLC–5 Reference Instruction Set	1785-6.1
A procedural manual for technical personnel who use APS to develop control applications	Rockwell Software Advanced Programming Software (APS) User Manual	9399-APSUM
A reference manual that contains status file data, and instruction set information for the SLC 500 processors and MicroLogix 1000 controllers.	SLC 500™ and MicroLogix 1000™ Instruction Set Reference Manual	1747-6.15
Information regarding the use of the 1747–SN SLC RIO scanner	Remote I/O Scanner User Manual	1747-6.6
An introduction to APS for first–time users, containing basic concepts but focusing on simple tasks and exercises, and allowing the reader to begin programming in the shortest time possible	Quick Start for New Users	9399-APSQS
A training and quick reference guide to APS	SLC 500 Software Programmer's Quick Reference Guide—available on PASSPORT at a list price of $50.00	ABT-1747-TSG001
A common procedures guide to APS.	SLC 500 Common Procedures Guide—available on PASSPORT at a list price of $50.00	ABT-1747-TSJ50
A procedural and reference manual for technical personnel who use an HHT to develop control applications	Allen–Bradley Hand–Held Terminal User Manual	1747-NP002
An introduction to HHT for first–time users, containing basic concepts but focusing on simple tasks and exercises, and allowing the reader to begin programming in the shortest time possible	Getting Started Guide for HHT	1747-NM009
An article on wire sizes and types for grounding electrical equipment	National Electrical Code	Published by the National Fire Protection Association of Boston, MA.
A complete listing of current Allen–Bradley documentation, including ordering instructions. Also indicates whether the documents are available on CD–ROM or in multi–languages.	Allen–Bradley Publication Index	SD499
A glossary of industrial automation terms and abbreviations	Allen–Bradley Industrial Automation Glossary	AG-7.1

Terms and Abbreviations

The following terms and abbreviations are specific to this product. For a complete listing of Allen–Bradley terminology, refer to the *Allen–Bradley Industrial Automation Glossary*, Publication Number ICCG–7.1.

Adapter – Any physical device that is a slave on the RIO link.

Adapter Image – The portion of scanner image assigned to an individual adapter. You configure the adapter image by assigning it a starting logical rack number, starting logical group number and the number of logical groups it uses. In the case of the DCM, this is referred to as the DCM image.

DCM – Refers to the Direct Communication Module.

Distributed Control/Controller – Refers to a control system that employs a number of different hardware controllers/processors, each designed to perform a different subtask on behalf of an overall program or process. In a single processor (non–distributed) system, each task would be done by the single processor controlling the process. In a distributed system, each task is targeted to the specific processor required to perform its needs. Since all processors run simultaneously and independently, the time required to perform each task of the overall process is reduced in comparison to a single processor system. Therefore, overall program or process performance is typically better.

Inhibit – A function by which the scanner stops communicating with a logical device. The logical device will consider itself inhibited if it does not receive communications from the scanner within a certain period of time.

Logical Device – Any portion of a logical rack assigned to a single adapter.

Logical Group – A logical group consists of one input and one output word within a logical rack. A word consists of 16 bits, each bit represents one terminal on a discrete I/O module. Also referred to as an I/O Group.

Logical Rack – A fixed section of the scanner image comprised of eight input words and eight output words. Also referred to as a rack.

Logical Slot – A logical slot consists of one input and one output byte within a logical group. A byte consists of 8 bits, each bit represents one terminal on a discrete I/O module.

Physical Device – The number of devices that the supervisory processor/scanner will support.

PLC Chassis – A physical PLC (Programmable Logic Controller) rack that houses PLC processors and 1771 I/O modules.

Rack Size – The logical rack size of the DCM image.

RIO Link – (Remote Input/Output) Refers to an Allen–Bradley communication system supporting high–speed serial transfer of Remote I/O (RIO) control information.

Scanner – The communication master on the RIO link.

Scanner Image – The data table area within the scanner, used to exchange I/O information between the scanner and all the adapters on the RIO link. The scanner image is a portion of the SLC or PLC processor image.

Slave – In a communication link, a station that cannot initiate communication.

SLC Chassis – A physical SLC (Small Logic Controller) rack that houses SLC processors and 1746 and 1747 I/O modules.

Slot – The physical location in any chassis used to insert I/O (or specialty) modules.

Supervisory Control/Controller – A control system whereby a host (supervisory) controller/processor monitors and intermittently adjusts control parameters, as necessary, of one or several lower level processors while the lower level processor(s) performs the control task continuously in real time.

Common Techniques Used in this Manual

The following conventions are used throughout this manual:
- Bulleted lists such as this one provide information, not procedural steps.
- Numbered lists provide sequential steps or hierarchical information.
- *Italic* type is used for emphasis.

Allen–Bradley Support

Allen–Bradley offers support services worldwide, with over 75 Sales/Support Offices, 512 authorized Distributors and 260 authorized Systems Integrators located throughout the United States alone, plus Allen–Bradley representatives in every major country in the world.

Local Product Support

Contact your local Allen–Bradley representative for:
- sales and order support
- product technical training
- warranty support
- support service agreements

Technical Product Assistance

If you need to contact Allen–Bradley for technical assistance, please review the information in the *Troubleshooting* chapter first. Then call your local Allen–Bradley representative.

Your Questions or Comments on this Manual

If you find a problem with this manual, please notify us of it on the enclosed Publication Problem Report.

If you have any suggestions for how this manual could be made more useful to you, please contact us at the address below:

Allen–Bradley Company, Inc.

Automation Group

Technical Communication, Dept. 602V, T122

P.O. Box 2086

Milwaukee, WI 53201–2086

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.
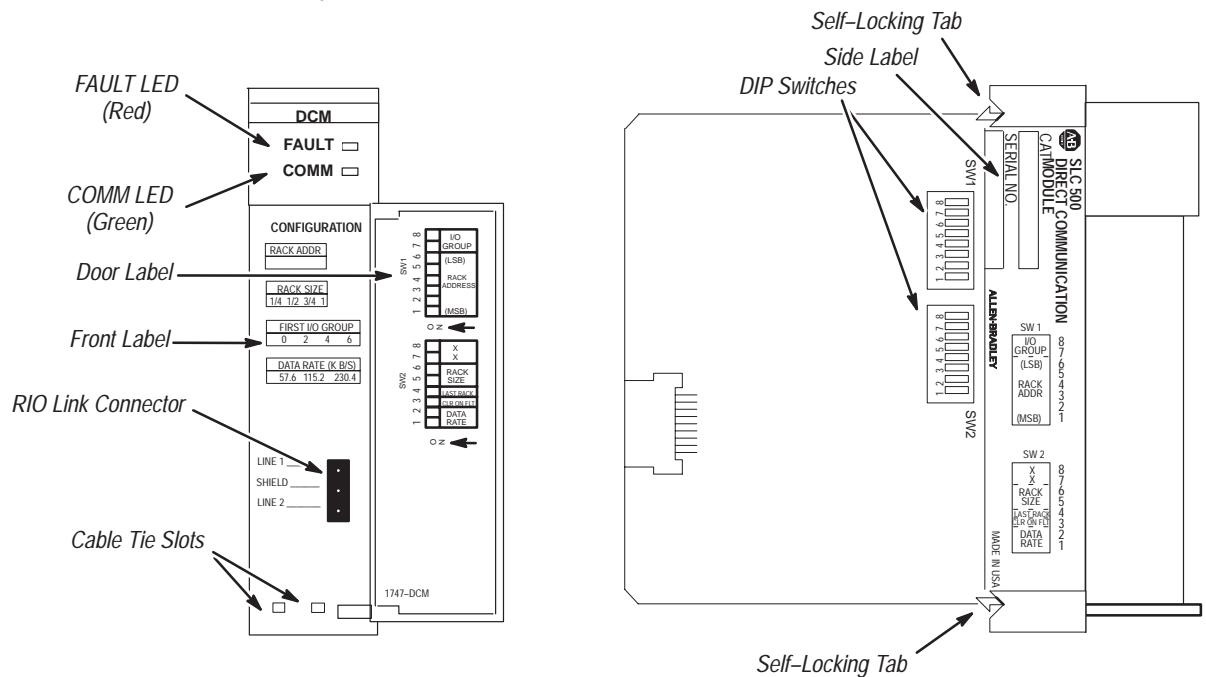
Hardware Features

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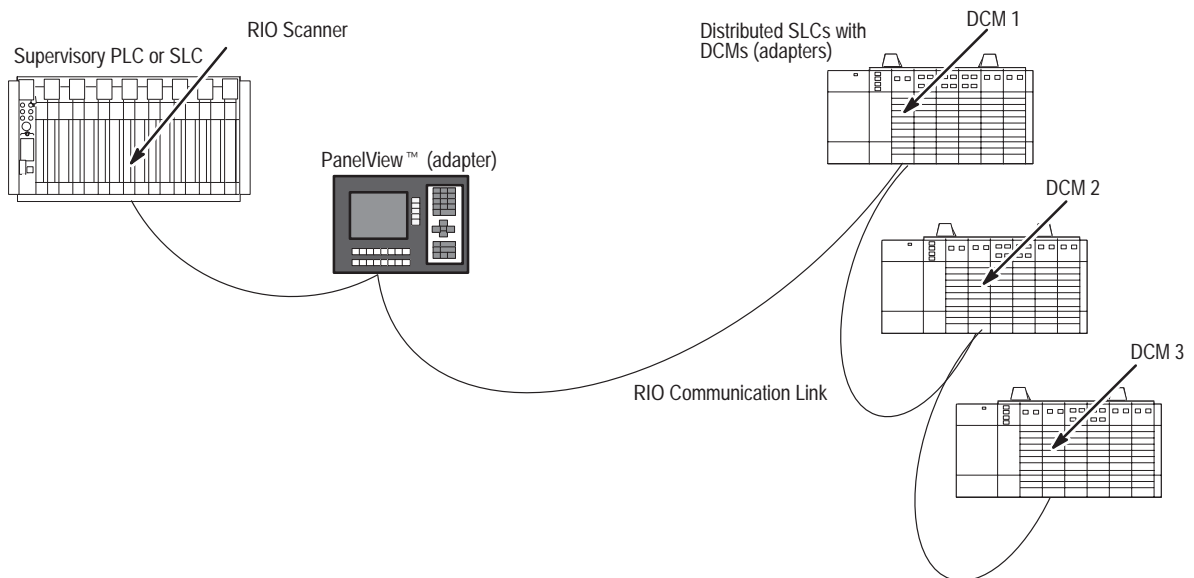
DCM modules are connected in a daisy–chain configuration using Belden 9463 cable.

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.

Compatible Adapters

Catalog Number	Device	Extended Node Capability	Comments
1785-LT/x	PLC-5/15	Yes	In adapter mode
1785-LT2	PLC-5/25	Yes	In adapter mode
1785-LT3	PLC-5/12	Yes	In adapter mode
1785-L30x	PLC-5/30	Yes	In adapter mode
1785-L40x	PLC-5/40	Yes	In adapter mode
1785-L60x	PLC-5/60	Yes	In adapter mode
1771-ASC	Remote I/O Adapter Module	No	
1771-ASB	Remote I/O Adapter Module	Series B and C only	Series A, B, and C
1771-AM1	1-Slot I/O Chassis with Integral Power Supply and Adapter	Yes	
1771-AM2	2-Slot I/O Chassis with Integral Power Supply and Adapter	Yes	
1784-F30D	Plant Floor Terminal Remote I/O Expansion Module	Yes	
1771-RIO	Remote I/O Interface Module	No	
1771-JAB	Single Point I/O Adapter Module	Yes	
1771-DCM	Direct Communication Module	No	
1778-ASB	Remote I/O Adapter Module	Yes	
1747-ASB	Remote I/O Adapter Module	Yes	
2706-xxxx	DL40 Dataliner™	Yes	Must be catalog number 2706-ExxxxxB1.
2705-xxx	RediPANEL™	Yes	
2711-xx	PanelView Terminal	Yes	
1336-RIO	Remote I/O Adapter for 1336 AC Industrial Drives	Yes	
1395-NA	Remote I/O Adapter for 1395 DC Industrial Drives	Yes	
1747-ASB	SLC 500 Remote I/O Adapter Module	Yes	

Extended Node Capability

Both scanners and adapters can have extended node capability. Extended node capability allows you to have up to 32 adapters on the RIO link using an 82 Ohm termination resistor at both ends of the RIO link for all baud rates.

Extended node capability can only be used if the scanner and *all* adapters on the RIO link have extended node capability. *The DCM has extended node capability.*

Scanner Image Division

The scanner allows each adapter to use a fixed amount (user defined) of its input and output image.

The scanner image is divided into logical racks and further divided into logical groups. A full logical rack consists of eight input and eight output image words. A logical group consists of one input and one output word in a logical rack. Each logical group is assigned a number from 0–7. The number of racks available for data and I/O transfer depends on the scanner you are using.

Local I/O

Remote I/O
(Scanner Image)

Logical Rack 0
Logical Rack 1
Logical Rack 2
Logical Rack 3

Logical Group 0
Logical Group 7

Processor I/O Image   **Scanner I/O Image**   **Adapter Image**
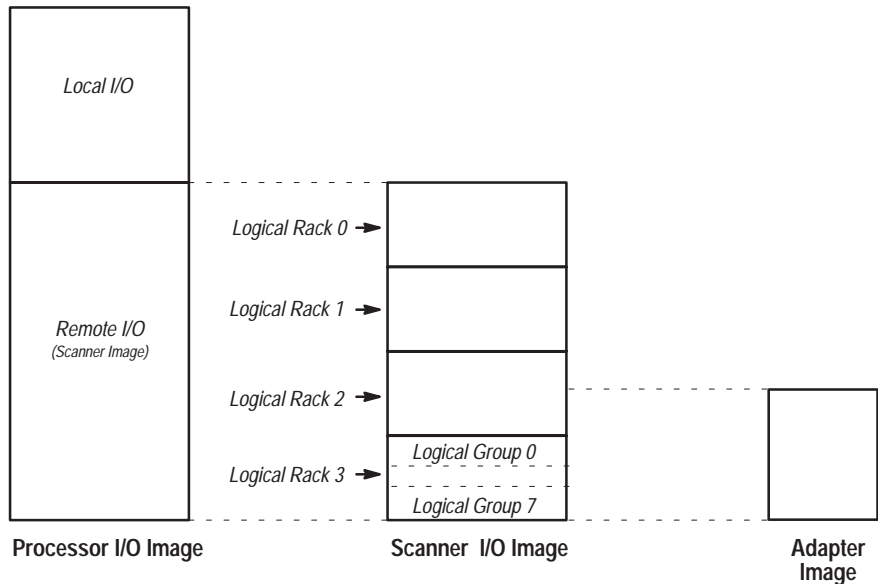
The scanner image also contains the image of each adapter on the RIO link. The adapter is assigned a portion of the scanner image, which is referred to as the adapter image.

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**																	*Device 1 (Full logical rack)*
	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**																	*Device 2 (3/4 logical rack)*
	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**																	*Device 3 (1/4 logical rack)*
	Rack 1 Group 7	Word 15																	
Logical Rack 2	**Rack 2 Group 0**	**Word 16**																	*Device 4 (1/2 logical rack)*
	Rack 2 Group 1	Word 17																	
	Rack 2 Group 2	**Word 18**																	
	Rack 2 Group 3	Word 19																	
	Rack 2 Group 4	**Word 20**																	*Device 5 (1/2 logical rack)*
	Rack 2 Group 5	Word 21																	
	Rack 2 Group 6	**Word 22**																	
	Rack 2 Group 7	Word 23																	

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.
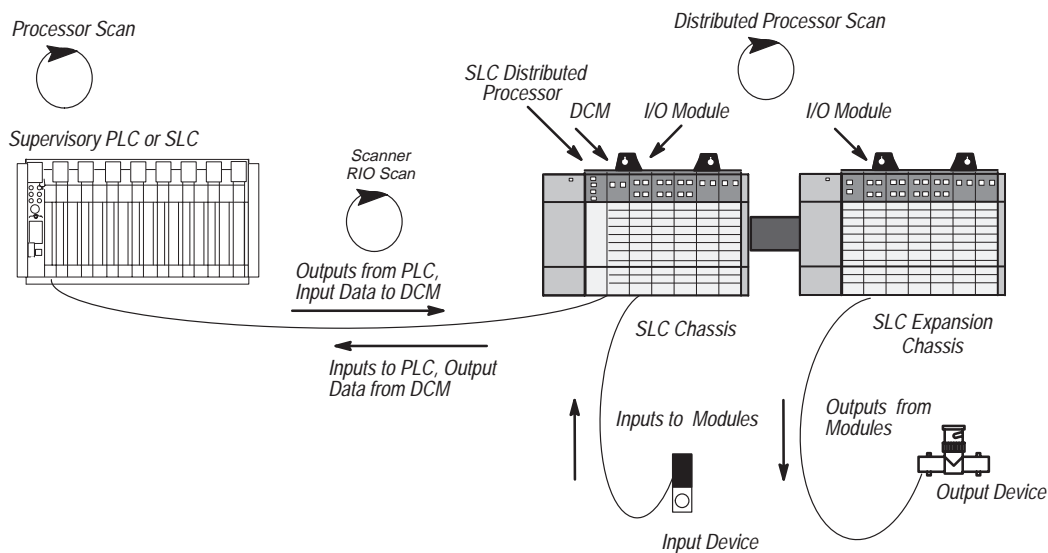
What Is the Status Word?

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.

Quick Start for Experienced Users

This chapter helps you to get started using the Direct Communication Module (DCM). We base the procedures here on the assumption that you have a basic understanding of SLC 500 products.

You must:
- understand electronic process control
- be able to interpret the ladder logic instructions for generating the electronic signals that control your application

Because it is a start-up guide for experienced users, this chapter *does not* contain detailed explanations about the procedures listed. It does, however, reference other chapters in this book where you can get more detailed information. It also references other documentation that may be helpful if you are unfamiliar with programming techniques or system installation requirements.

If you have any questions, or are unfamiliar with the terms used or concepts presented in the procedural steps, *always read the referenced chapters* and other recommended documentation before trying to apply the information.

This chapter:
- tells you what tools and equipment you need
- lists preliminary considerations
- describes when to address, configure and program the module
- explains how to install and wire the module
- discusses system power-up procedures

Required Tools and Equipment

Have the following tools and equipment ready:
- medium blade screwdriver
- (2) 1/2 watt terminating resistors (See chapter 5, Installation and Wiring, for correct size.)
- programming equipment (All programming examples shown in this manual demonstrate the use of Allen-Bradley's Advanced Programming Software [APS] for personal computers.)

Procedures

1.	**Check the contents of the shipping box.**	Reference

Unpack the module making sure that the contents include:

- Direct Communication Module (Catalog Number 1747-DCM)
- removable connector (factory-installed on module)
- cable tie
- user manual (Catalog Number 1747-NM007)

–

If the contents are incomplete, call your local Allen-Bradley representative for assistance.

2.	**Select a scanner.**	Reference

To begin configuration of your RIO system, you should know three things:

- which scanner is compatible with your PLC/SLC controller. Use the table below to select a scanner that is compatible with your processor. The DCM is compatible with all RIO scanners.

The manual for the scanner you select

Catalog Number	Description
1747-SN[1]	SLC Remote I/O Scanner
1771-SN[2]	Sub I/O scanner for Mini–PLC-2® and PLC-5 families
1772-SD, -SD2[3][4]	Remote scanner/distribution panel for PLC-2 family
1775-S4A, -S4B, -S5[1]	I/O scanner-programmer interface module for PLC-3® family
1775-SR, -SR5[1]	Remote scanner/distribution panel for PLC-3/10 family
1785-L11B[1]	PLC 5/11™ (in scanner mode)
1785-LT/x[1][5]	PLC 5/15 (in scanner mode)
1785-L20B[1]	PLC 5/20™ (in scanner mode)
1785-LT2[1][5]	PLC 5/25 (in scanner mode)
1785-L30x[1]	PLC 5/30™ (in scanner mode)
1785-L40x[1]	PLC 5/40™ (in scanner mode)
1785-L60x[1]	PLC 5/60™ (in scanner mode)
5250-RS[1]	Remote scanner for PLC 5/250
6008-SI[1]	IBM® PC I/O Scanner Module
6008-SV[1]	VMEbus I/O Scanner Module
6008-SQH1, -SQH2	Q-bus I/O Scanner Module

[1] *Extended node capability.*

[2] *Revision D or later.*

[3] *Rev. 3 or later.*

[4] *Extended node capability not available with Series A.*

[5] *Rev. 3 or later. PLC 5/15 Series B Revision H or later have partial rack addressing. Earlier versions are limited to 3 devices. PLC 5/25 Series A Revision D or later have partial rack addressing. Earlier versions are limited to 7 devices.*

- the maximum number of physical devices and logical racks your scanner supports.

- the logical rack size of each DCM. This depends on how many I/O data words you need to transfer. The first word is always the status word. The table below shows the number of data words transferred relative to the rack size.

If you configure the DCM as:	Then:	Including the Status Word
1/4 Rack	1 data word (16 bits of I/O data) are transferred.	Total transfer = 2 words
1/2 Rack	3 data words (48 bits of I/O data) are transferred.	Total transfer = 4 words
3/4 Rack	5 data words (80 bits of I/O data) are transferred.	Total transfer = 6 words
Full Rack	7 data words (112 bits of I/O data) are transferred.	Total transfer = 8 words

3.	**Choose the type of slot addressing you will use.**	**Reference**

Select DCM addressing. (A configuration worksheet is included in appendix B to assist you in DCM image table addressing.)

Chapter 3
(Addressing)
Appendix B
(DCM Worksheet)

4.	**Configure the module using the DIP switches.**	**Reference**

Configure your system by setting the DIP switches.

Chapter 4
(Module Configuration)

5.	**Insert the 1747-DCM module into the chassis.**	**Reference**

⚠ **ATTENTION:** Never install, remove, or wire modules with power applied to the chassis or devices wired to the module.

Chapter 5
(Installation and Wiring)

Review SLC/DCM power requirements to ensure your SLC power supply has adequate reserve power.

Make sure system power is off; then insert the DCM into your 1746 chassis. In this example procedure, local slot 1 is selected.

Module Release

Card Guide

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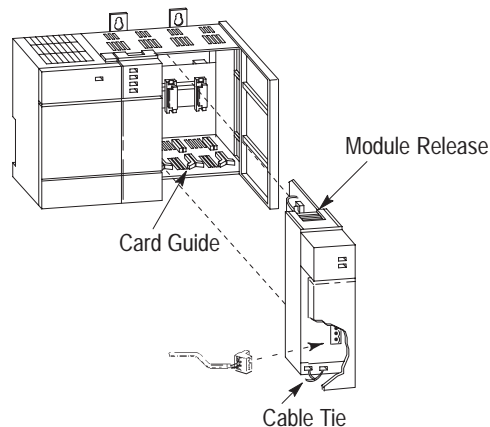
To wire the network, a 1/2 watt terminating resistor must be attached across line 1 and line 2 of the connectors at each end (scanner and last physical device) of the network. The size of the resistor depends on the baud rate and extended node capability, as shown below:

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

6.	**Enter your ladder program.**	Reference

Define the application requirements. Write and enter the ladder logic program.

Chapter 6
(Programming)
Chapter 8
(Application Examples)

7.	**Go through the system start-up procedure.**	Reference

Power up your system by performing standard start-up procedures as indicated in your processor manual. No special start-up procedures are required when using the DCM module.

Addressing

This chapter provides general information about how to address supervisory PLC and distributed SLC ladder logic instructions. It also illustrates image mapping and provides an example of how a PLC output image is mapped into an SLC input image.

Addressing Ladder Logic Instructions

All PLC and SLC processors use 3-part addresses. These three parts include:
- logical rack or physical slot address
- logical group or word address
- bit address

PLC processors use the octal number system for bit addressing. SLC processors use the decimal number system for bit addressing.

PLC Processors/Scanners Address By:		SLC Processors Address By:	
Logical Rack:	PLC/scanner input and output images are organized in logical racks, which consist of eight groups. The rack address does not need to match the SLC slot address.	**Physical Slot:**	The slot address is determined by what slot number you place your DCM. SLC slots are numbered 0–30. The slot address does not need to match the PLC rack address.
Logical Group:	There are eight logical groups per logical rack, numbered 0–7. One group consists of one input and one output word. Each word is made up of 16 bits. The group number does not need to match the SLC word address.	**Word:**	One word is 16 bits in size. The number of words used in input and output images varies according to how many you specify in your setup. Words are numbered consecutively beginning with 0. The word number does not need to match the PLC group number.
Bit:	PLC bits are numbered octally, from 0 to 7 and 10 to 17. The bit number does not need to match the SLC bit number (because SLCs use decimal); however, the position of the bit in the word must be the same.	**Bit:**	SLC bits are numbered decimally, from 0–15. The bit number does not need to match the PLC bit number (because PLCs use octal); however, the position of the bit in the word must be the same.

PLC/Scanner Addresses

The three parts of the PLC address include the:

- logical rack
- logical group (I/O group)
- bit

PLC Input Address   **PLC Output Address**

I:023/10   **O:017/10**

I = Input	O = Output
02 = Logical Rack	01 = Logical Rack
3 = I/O Group	7 = I/O Group
10 = Bit (octal)	10 = Bit (octal)
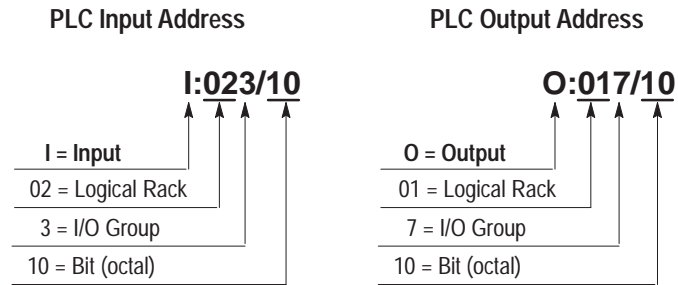
The **rack** address refers to the logical rack assigned to the DCM in the PLC/scanner I/O image table. It is selected using switches 1 through 6 of SW1 on the DCM. This address does not need to match the physical slot address of the DCM. Complete information about DIP switch selection is in chapter 4, Module Configuration.

The **I/O group** address refers to the word in the PLC/scanner image table that contains the referenced I/O data bit. The I/O group address does not need to match the word address of the SLC I/O instruction.

The **bit** address is the bit within the word being addressed. Bits are numbered 0–17 (octal) for the PLC and 0–15 (decimal) for the SLC. The physical position of the bit in the PLC word must match the position of the bit in the SLC word to address the correct bit.

SLC Addresses

The three parts of the SLC address include the:
- physical slot
- word
- bit

SLC Input Address

I:2.3/8

I = Input

2 = Physical Slot

3 = Word

8 = Bit (decimal)

SLC Output Address

O:1.7/8

O = Output

1 = Physical Slot

7 = Word

8 = Bit (decimal)
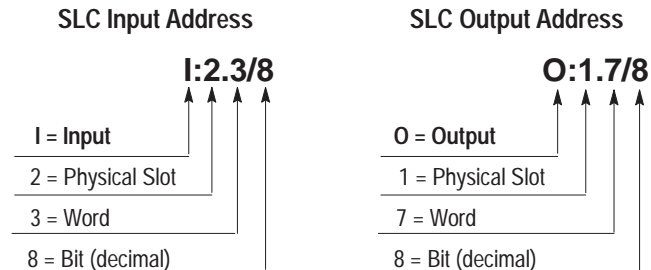
The **slot** address refers to the physical slot (1–30) in the modular SLC chassis or fixed SLC expansion chassis where the DCM is installed. This address does not need to match the logical rack address of the PLC I/O instruction.

The **word** address refers to the word number (0–7) of the slot being addressed. The maximum number of SLC I/O words that a DCM can be assigned is 8.

The **bit** address is the bit within the word being addressed. Bits are numbered 0–15 (decimal) for the SLC and 0–17 (octal) for the PLC. Outputs from the SLC output image are inputs to the supervisory processor input image table. Likewise, outputs from the supervisory processor output image table are inputs to the SLC image table.

As noted, if the supervisory processor is a PLC the I/O image bits are octal and SLC bits are decimal. While the addresses are different, the position of the bit in the SLC word must match the position of the bit in the PLC word. The following diagrams show this relationship.

I/O Image Tables

PLC to DCM/SLC

DCM/SLC configuration: Logical Rack Address = 1   Logical I/O Group = 0

Physical Slot Number = 1   Full Logical Rack

PLC Output Image Table ──────────▶ DCM Input Image Table ──────────▶ SLC Input Image Table

O:011/10

O = Output

01 = Logical Rack

1 = Logical I/O Group

10 = Bit (octal)

I:1.1/8

I = Input

1 = Physical DCM Slot

1 = Word

8 = Bit (decimal)
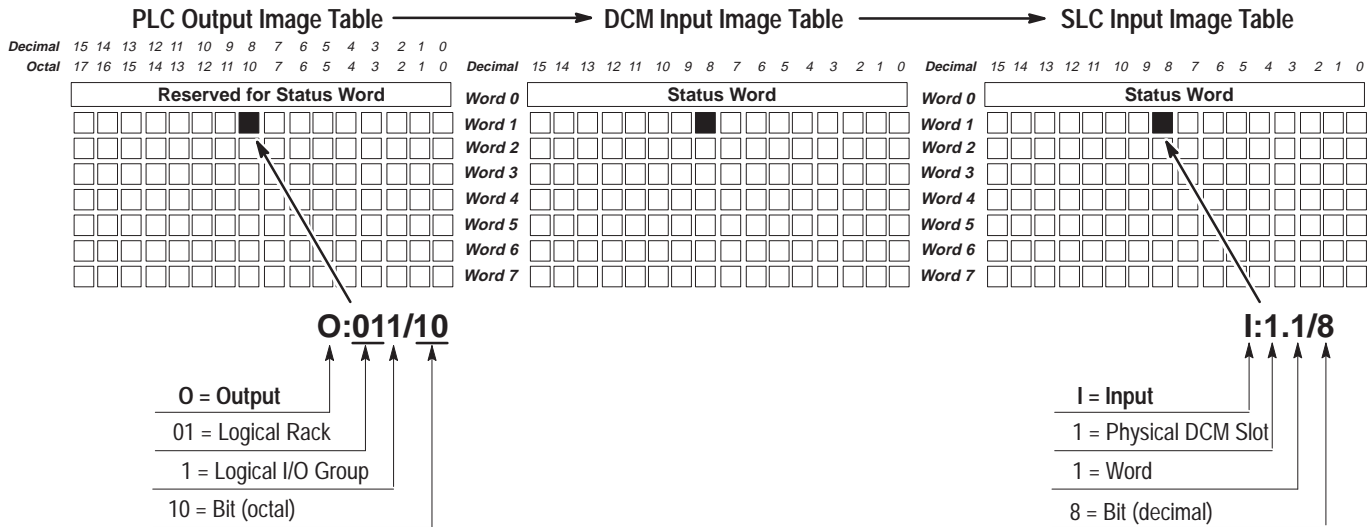
DCM/SLC to PLC

DCM/SLC configuration: Logical Rack Address = 1   Logical I/O Group = 0

Physical Slot Number = 1   Full Logical Rack

PLC Input Image Table ◀────────── DCM Output Image Table ◀────────── SLC Output Image Table

I:016/2

I = Input

01 = Logical Rack

6 = Logical I/O Group

2 = Bit (octal)

O:1.6/2

O = Output

1 = Physical DCM Slot

6 = Word

2 = Bit (decimal)
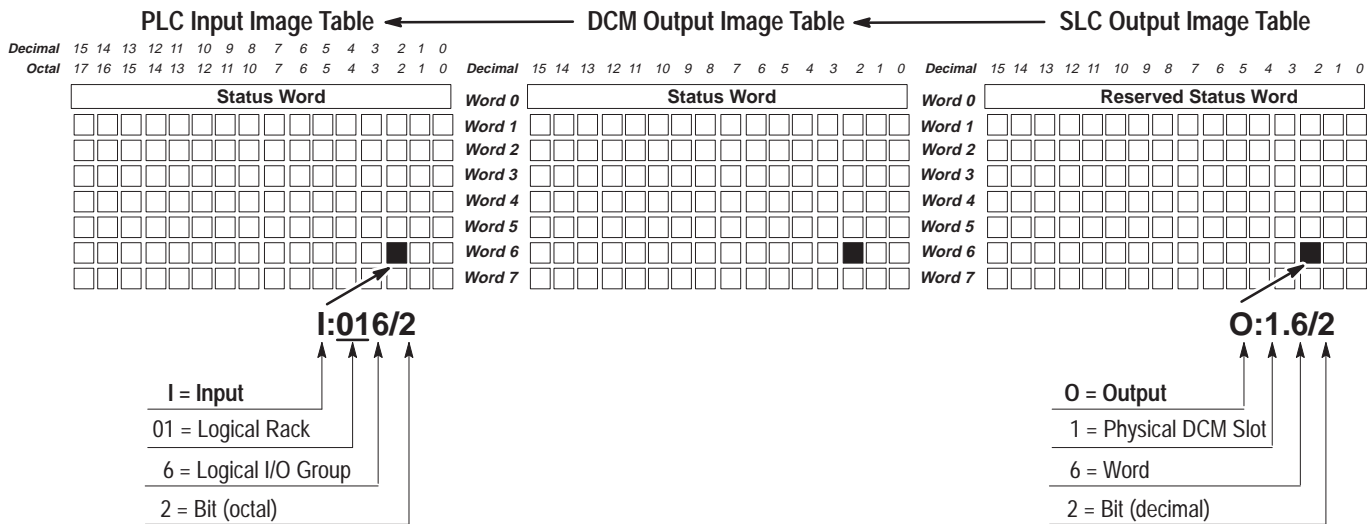
Image Mapping

An image map is a diagram showing how the scanner image is mapped into the image of multiple adapters. The following table and illustration show how an example PLC output image is mapped into the image of multiple SLC processors through the DCM.

PLC Scanner Output Image	To:	DCM	SLC Input Image
O:011/10 Starting Group 0 (Rack 01, Group 1, Bit 10 octal)	→	1	**I:1.1/8** (Slot 1, Word 1, Bit 8 decimal)
O:021/3 Starting Group 0 (Rack 02, Group 1, Bit 3 octal)	→	2	**I:1.1/3** (Slot 1, Word 1, Bit 3 decimal)
O:025/13 Starting Group 2 (Rack 02, Group 5, Bit 13 octal)	→	3	**I:2.3/11** (Slot 2, Word 3, Bit 11 decimal)

Each row in the table represents the address of a data bit being transferred from the PLC scanner output image to the SLC input image via three different DCMs. The figure on the next page illustrates this data transfer.

Appendix B contains a worksheet designed to help you work out your DCM system addressing. Use it if necessary to record I/O addresses.

Scanner Output Image

| Bit Number: | Decimal | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| | Octal | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

DCM 1
- Group 0 — Reserved for Status Word
- Group 1 — O:011/10 (Rack 1, Group 1, Bit 10 Octal)
- Group 2
- Group 3
- Group 4
- Group 5
- Group 6
- Group 7

DCM 2
- Group 0 — Reserved for Status Word
- Group 1 — O:021/2 (Rack 2, Group 1, Bit 3 Octal)

DCM 3
- Group 2 — Reserved for Status Word
- Group 3
- Group 4
- Group 5 — O:025/13 (Rack 2, Group 5, Bit 13 Octal)
- Group 6
- Group 7

Supervisory SLC or PLC Processor

Supervisory SLC or PLC Remote I/O Scanner
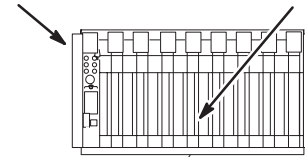
RIO Link

SLC 1 Input Image for DCM 1

| Bit Number: Decimal | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

- Word 0 — Reserved for Status Word
- Word 1 — I:1.1/8 (Slot 1, Word 1, Bit 8 Decimal)
- Word 2
- Word 3
- Word 4
- Word 5
- Word 6
- Word 7
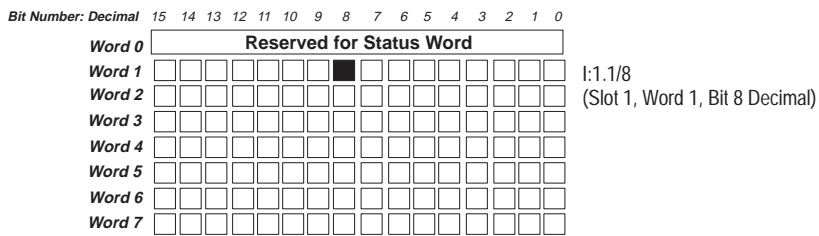
Distributed SLC Processor 1 **DCM 1**
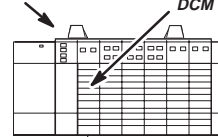
Module 1 Configured As:
Rack Address 1
I/O Group 0
Slot Number 1
Rack Size Full

SLC 2 Input Image for DCM 2

| Bit Number: Decimal | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

- Word 0 — Reserved for Status Word
- Word 1 — I:1.1/3 (Slot 1, Word 1, Bit 3 Decimal)
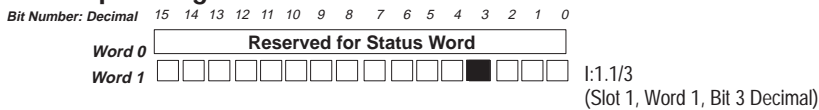
Distributed SLC Processor 2 **DCM 2**
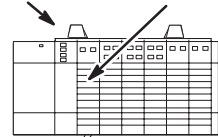
Module 2 Configured As:
Rack Address 2
I/O Group 0
Slot Number 1
Rack Size 1/4

SLC 3 Input Image for DCM 3

| Bit Number: Decimal | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

- Word 0 — Reserved for Status Word
- Word 1
- Word 2
- Word 3 — I:1.3/11 (Slot 2, Word 3, Bit 11 Decimal)
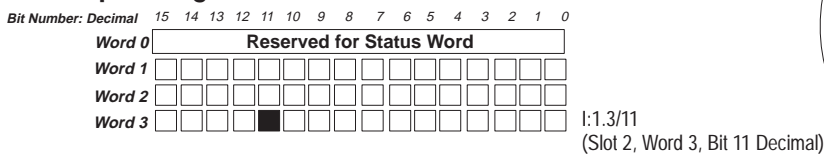
Distributed SLC Processor 3 **DCM 3**
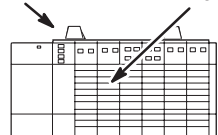
Module 3 Configured As:
Rack Address 2
I/O Group 2
Slot Number 2
Rack Size 1/2

Module Configuration

This chapter provides DIP switch setting information for the DCM. Topics include:

- DIP switches
- DIP switch 1 settings
- DIP switch 2 settings

DIP Switches

To configure the DCM for your application, you must set the DIP switches. These switches enable the DCM to properly interpret the RIO system addressing. The DCM has two banks of DIP switches mounted on its circuit board. Each bank contains eight switches. The default settings are shown below.
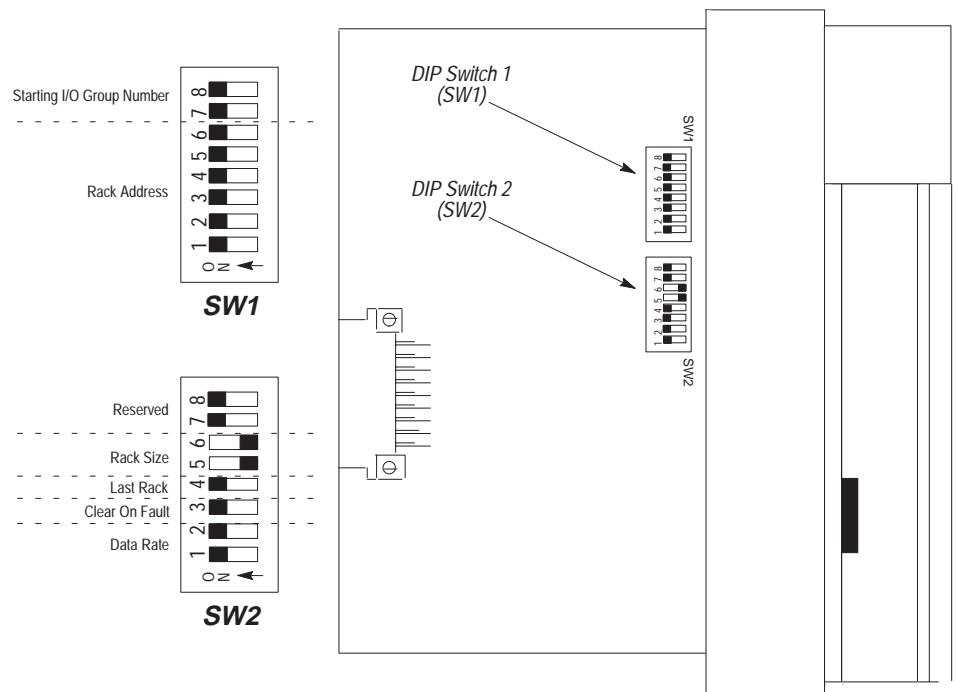
DIP Switch 1 Settings

Starting I/O Group Number (SW1-7 and SW1-8)

The starting I/O group number is the first word assigned to the DCM from the scanner's image table. The starting I/O group number must be an even number from 0 to 6 and is dependent upon whether the DCM has been configured as a full, 3/4, 1/2, or 1/4 rack. The first word transferred is always the status word for the DCM.

Rack Size	Number of RIO Words Transferred	Total Words
1/4 Logical Rack	1 Status and 1 Data	2
1/2 Logical Rack	1 Status and 3 Data	4
3/4 Logical Rack	1 Status and 5 Data	6
Full Logical Rack	1 Status and 7 Data	8

Reference the table below to set the starting I/O group number.

Starting I/O Group Number	SW1-7	SW1-8	Valid Rack Configuration
0	ON	ON	All
2	ON	OFF	3/4, 1/2, 1/4
4	OFF	ON	1/2, 1/4
6	OFF	OFF	1/4

Example of different starting groups:
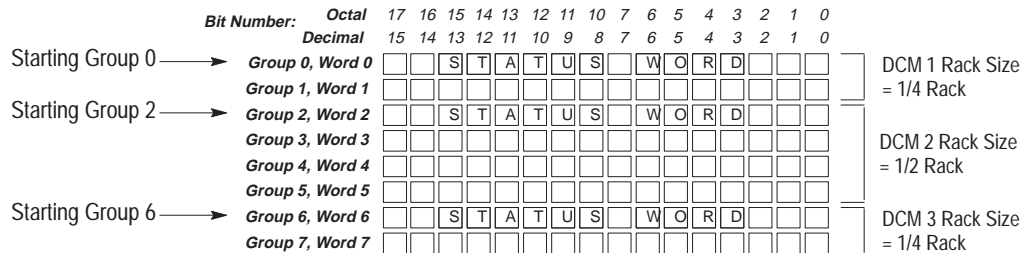
In the above image map example, selecting I/O Group Number 2 instructs the scanner to address Word 2 as the beginning of DCM 2 image. In this example, a half rack is selected for DCM 2 (using SW2 switches 5 and 6). Since Word 2 is the first word assigned, it becomes the Status Word.

Rack Address (SW1-1 through SW1-6)

The rack address refers to the logical rack number from the scanner image that contains a particular DCMs image.

The table on page 4–4 gives the switch settings that define possible rack address choices for all scanners. To use this table, first determine which of the following categories applies to your scanner:

- PLC-2, mini PLCs, PLC-2/30 with 1772-SD, SD2 remote scanner
- PLC-3 and PLC-5/250 processors. (This category includes those with built-in scanners, as well as the following without built-in scanners: catalog numbers 1775-54A, -54B, -S5, -SR, -SR5 and 5250-RS.)
- PLC-5/11, PLC-5/15, PLC-5/20, PLC-5/25, PLC-5/30, PLC-5/40, or PLC-5/60 and 1771-SN. (This category includes all smaller in-rack processors and standalone scanners that have local and remote I/O and begin rack addressing at rack 1.)
- SLC-5/02 (or above) with 1747-SN scanner

After determining which category applies to your DCM application:

1. Find the column for the scanner used in your application.

2. Go down the column to the rack address that you assigned to the DCM.

3. Use the switch settings in the right-most columns of the table that correspond to your rack address.

Use this table to set SW1 – switches 1 through 6.

Logical Rack Number (Octal)								Switch Number (SW1)					
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
0	1	0	–	–	–	–	0	ON	ON	ON	ON	ON	ON
1	2	1	1	1	1	1	1	ON	ON	ON	ON	ON	OFF
2	3	2	2	2	2	2	2	ON	ON	ON	ON	OFF	ON
3	4	3	3	3	3	3	3	ON	ON	ON	ON	OFF	OFF
	5	4		4	4	4	4	ON	ON	ON	OFF	ON	ON
	6	5		5	5	5	5	ON	ON	ON	OFF	ON	OFF
	7	6		6	6	6	6	ON	ON	ON	OFF	OFF	ON
		7		7	7	7	7	ON	ON	ON	OFF	OFF	OFF
		10			10	10	10	ON	ON	OFF	ON	ON	ON
		11			11	11	11	ON	ON	OFF	ON	ON	OFF
		12			12	12	12	ON	ON	OFF	ON	OFF	ON
		13			13	13	13	ON	ON	OFF	ON	OFF	OFF
		14			14	14	14	ON	ON	OFF	OFF	ON	ON
		15			15	15	15	ON	ON	OFF	OFF	ON	OFF
		16			16	16	16	ON	ON	OFF	OFF	OFF	ON
		17			17	17	17	ON	ON	OFF	OFF	OFF	OFF
		20				20	20	ON	OFF	ON	ON	ON	ON
		21				21	21	ON	OFF	ON	ON	ON	OFF
		22				22	22	ON	OFF	ON	ON	OFF	ON
		23				23	23	ON	OFF	ON	ON	OFF	OFF
		24				24	24	ON	OFF	ON	OFF	ON	ON
		25				25	25	ON	OFF	ON	OFF	ON	OFF
		26				26	26	ON	OFF	ON	OFF	OFF	ON
		27				27	27	ON	OFF	ON	OFF	OFF	OFF
		30					30	ON	OFF	OFF	ON	ON	ON
		31					31	ON	OFF	OFF	ON	ON	OFF
		32					32	ON	OFF	OFF	ON	OFF	ON
		33					33	ON	OFF	OFF	ON	OFF	OFF
		34					34	ON	OFF	OFF	OFF	ON	ON
		35					35	ON	OFF	OFF	OFF	ON	OFF
		36					36	ON	OFF	OFF	OFF	OFF	ON
		37					37	ON	OFF	OFF	OFF	OFF	OFF
		40						OFF	ON	ON	ON	ON	ON
		41						OFF	ON	ON	ON	ON	OFF
		42						OFF	ON	ON	ON	OFF	ON
		43						OFF	ON	ON	ON	OFF	OFF
		44						OFF	ON	ON	OFF	ON	ON

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

Remote I/O Scanner

Direct Communications Module 1

Module 1 Configured As:
Logical Rack Address 1
I/O Group 0
Module Rack Size 1/4

Module 2 Configured As:
Logical Rack Address 1
I/O Group 2
Module Rack Size 1/4

Module 3 Configured As:
Logical Rack Address 1
I/O Group 4
Module Rack Size 1/4

Module 4 Configured As:
Logical Rack Address 1
I/O Group 6
Module Rack Size 1/4

SLC Output Image (to the PLC)

		Decimal	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Bit Number:		*Octal*	17	16	15	14	13	12	11	10	7	6	5	4	3	2	1	0

Logical Rack 1

Module 1 — **Group 0, Word 0** / **Group 1, Word 1**
Module 2 — **Group 2, Word 2** / **Group 3, Word 3**
Module 3 — **Group 4, Word 4** / **Group 5, Word 5**
Module 4 — **Group 6, Word 6** / **Group 7, Word 7**

Module 4 is the last device in the logical rack.

Because Module 4 is the last RIO adapter in a logical rack shared by other adapter(s), SW2 switch 4 must be in the OFF position.

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.

Module Release

Card Guide

Cable Tie

19627
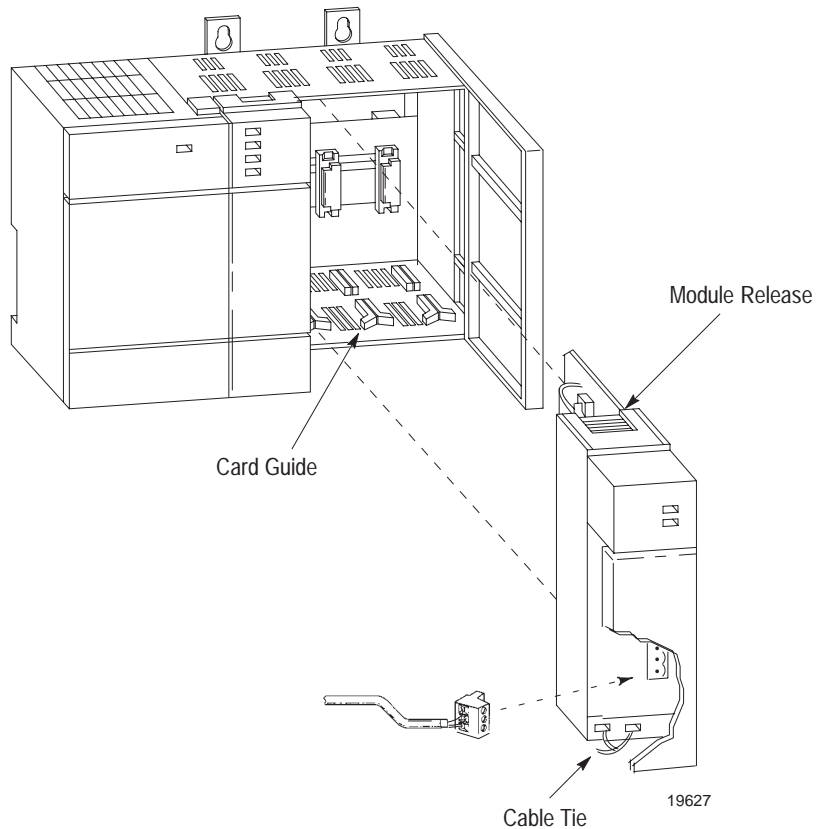
Removal

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)
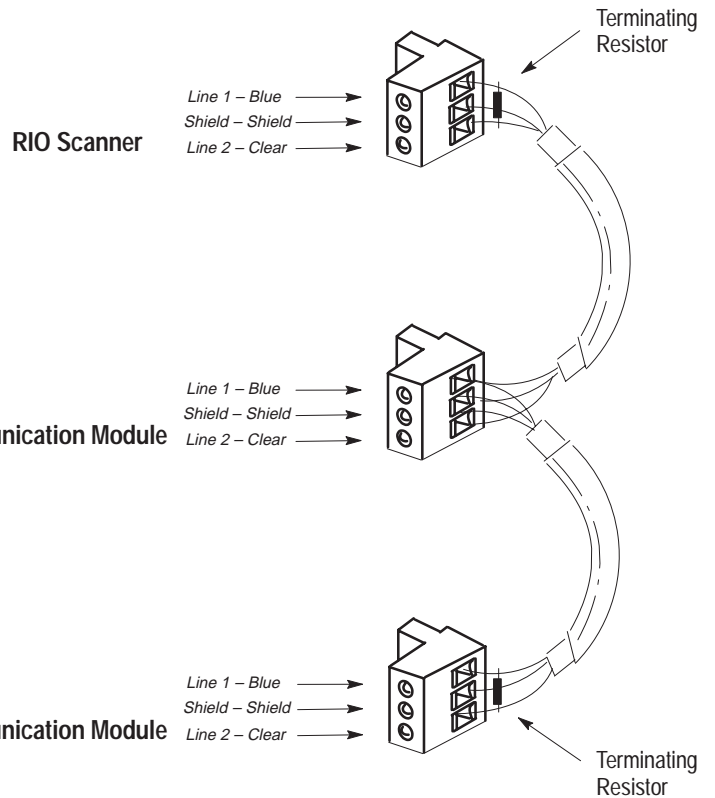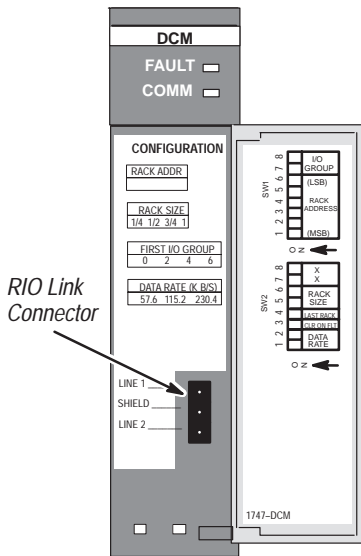
Programming

This chapter shows you how to program ladder logic in the supervisory processor/scanner and the distributed SLC to transfer data via the DCM. Topics include:

- overview
- programming examples
- status words
- applications using status word bits

Overview

Both the supervisory processor/scanner and the distributed SLC transfer data to and from the DCM automatically via their I/O and the RIO scan. The DCM, as a common memory site for both supervisory and distributed processors, has two addresses; one for the supervisory processor/scanner and one for the SLC. The supervisory processor/scanner address is the DCM logical rack address as set by DCM SW-1 switches 1 through 6. The distributed SLC address is determined by the slot where the DCM is physically installed.

The supervisory processor/scanner and distributed SLC addresses can be different; however, the bit position part in each word must be the same.

In the programming examples on the following page, an Examine If Open contact similar to the one shown below is used in each output rung:

```
        I:4.0
      ──┤ / ├──
         08
```

This instruction checks that the Logical OR bit of the status word is false.

Whenever any of the status word bits (except the User Status Flag bit) is set, it is indication that a condition has occurred in your logic program that may require inspection. If this happens you would normally want to inhibit some outputs by using a ladder logic instruction. Using an Examine If Open (XIO) instruction examining the Logical OR bit (word 0, bit 8 for SLC; word 0, bit 10 for PLC) is the easiest way of doing this.

Programming Examples

The following programming examples are typical of applications using the DCM. In each example the portion of the scanner image assigned to the DCM is logical rack 2, starting group 0, 1 full rack, and is located in SLC physical slot 3.

	Power Supply	SLC Processor	Output	Input	DCM 1			
Physical Slot #	0	1	2	3	4	5	6	
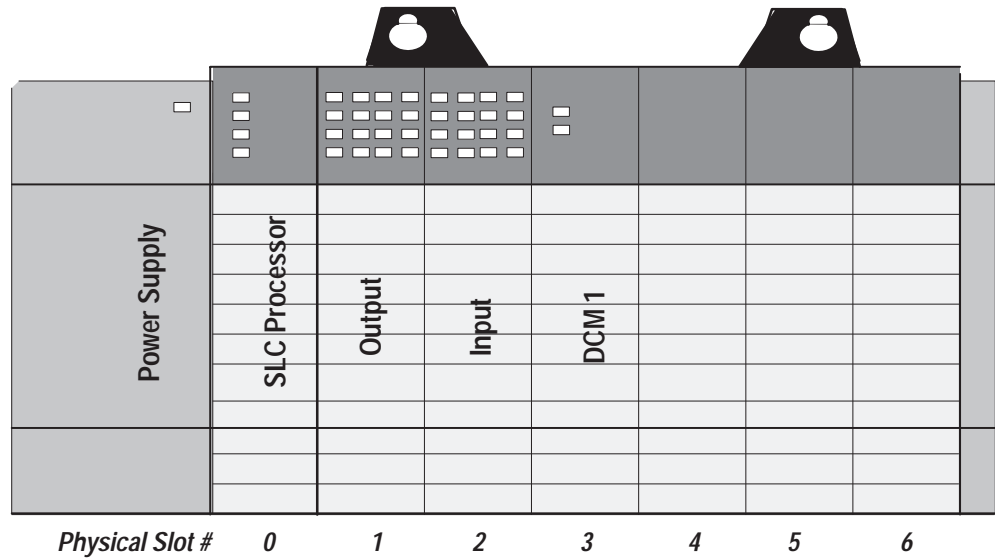
Physical Input into PLC – Physical Output from SLC
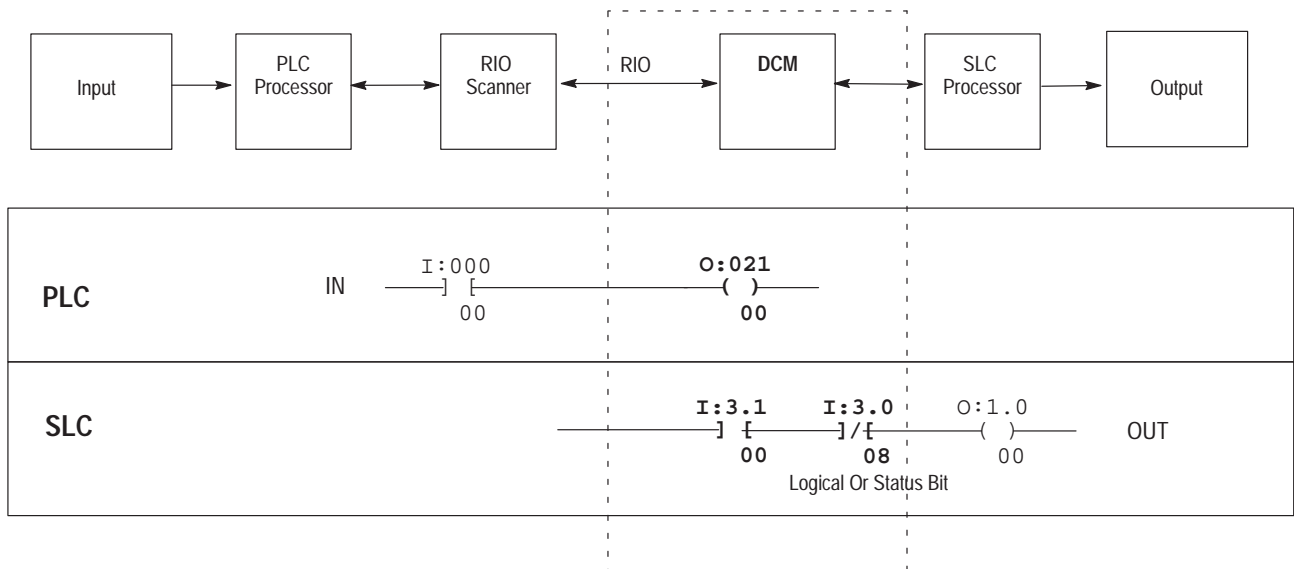
In the example above, PLC output O:021/00 controls the (on/off) status of DCM input I:3.1/00.

I:3.1/00 is used as a conditional ladder logic along with the Logical OR input status bit to control SLC output O:1.0/00.

Physical Input into SLC – Physical Output from PLC
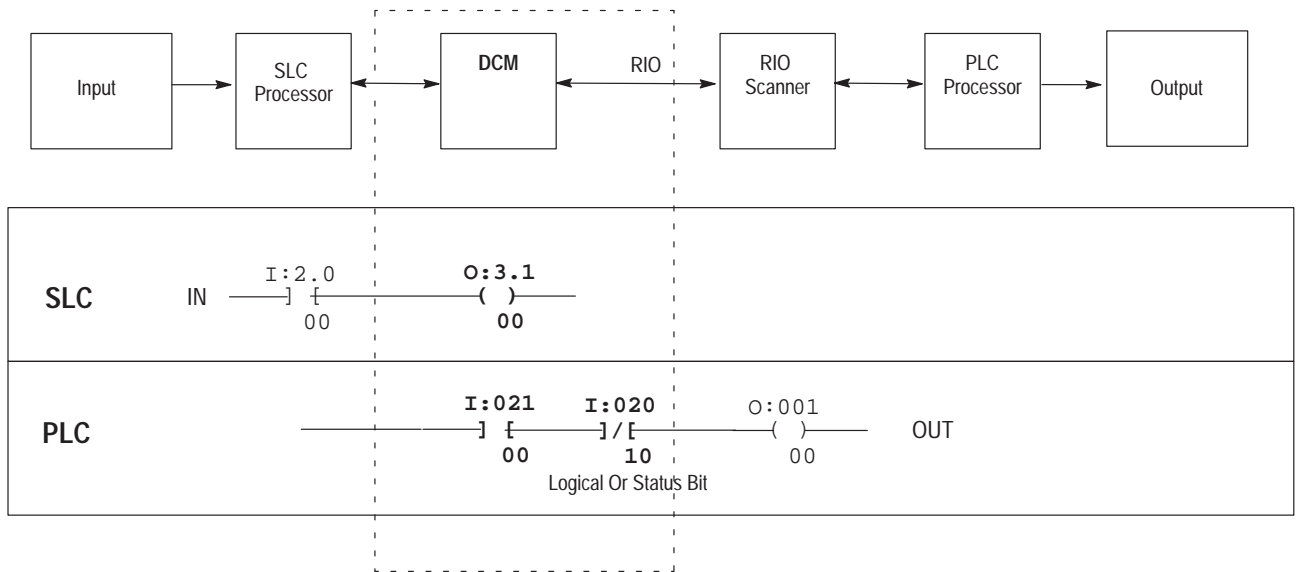
Physical Input into Both PLC and SLC (Logical AND) – Physical Output from SLC
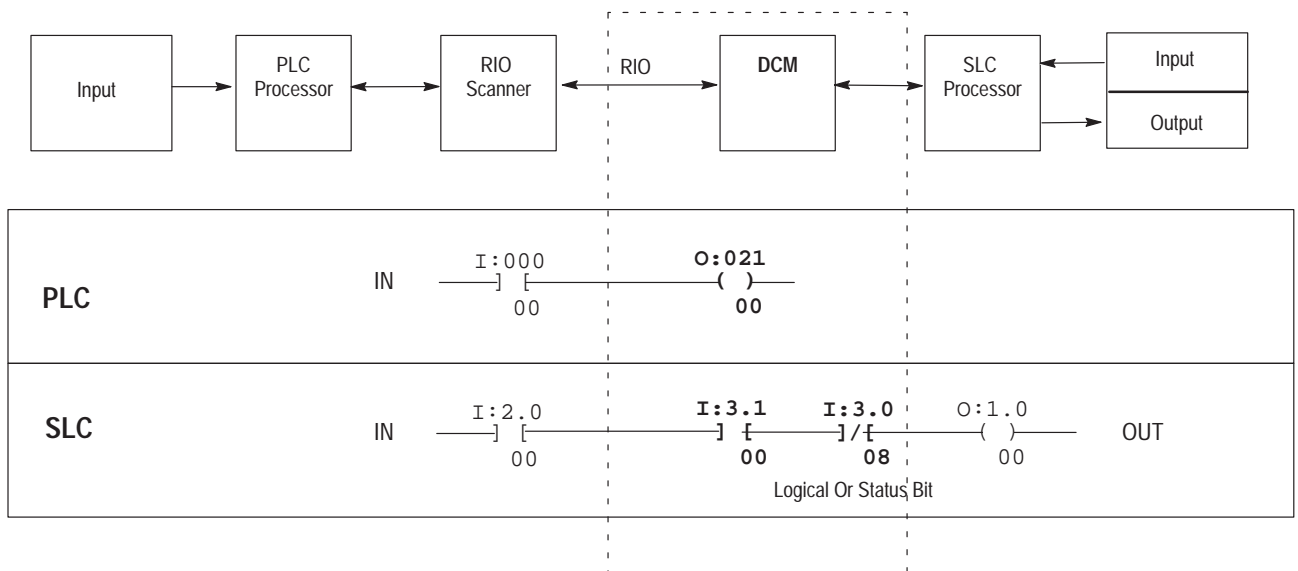
Physical Input into First SLC – Physical Output from Second SLC

For this example the second SLC has a logical PLC rack address of 3 and an SLC slot address of 4.

```
                              ┌──────────┐
                              │ PLC with │
                              │   RIO    │
                              │ scanner  │
                              └──────────┘
```

┌─────────┐   ┌──────────┐   ┌────────┐   ┌────────┐   ┌──────────┐   ┌────────┐
│ Input │──▶│ First   │◀─▶│ DCM   │ RIO │ DCM   │◀─▶│ Second │──▶│ Output │
│   │   │ SLC   │   │   │   │   │   │ SLC   │   │   │
│   │   │ Processor│   │   │   │   │   │ Processor│   │   │
└─────────┘   └──────────┘   └────────┘   └────────┘   └──────────┘   └────────┘

```
                   I:2.0    O:3.1            I:4.1     I:4.0      O:1.0
 SLC      IN    ───┤ [──────( )─────      ───┤ [──────]/[──────────( )──────   OUT
                    00       00                00        08         00
                                                    Logical Or Status Bit
```

```
                   I:021    I:020            O:031
 PLC           ────┤ [──────]/[──────     ────( )────
 (No physical       00       10                00
  input into the PLC)   Logical Or Status Bit
```
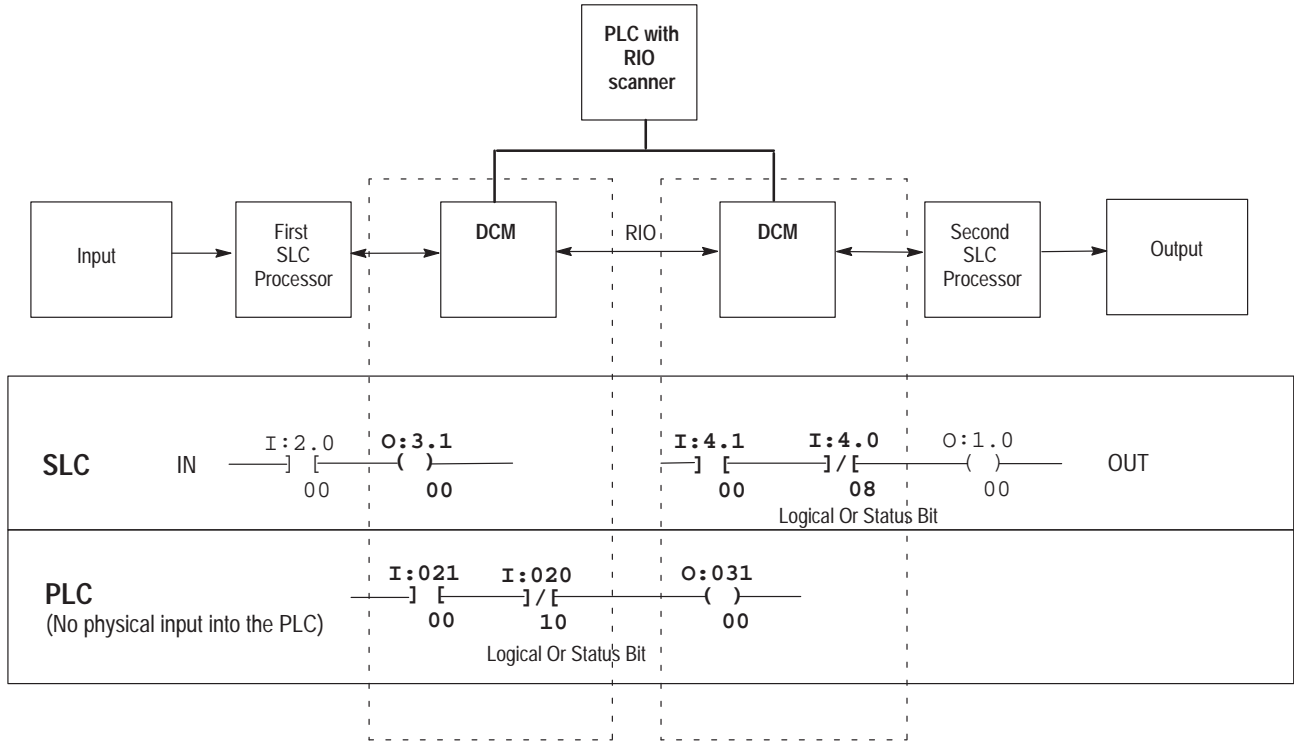
When transmitting data from a PLC to an SLC, if the Clear On Fault (CLR ON FLT) is active (switch is OFF), the instruction to examine the Logical OR bit of the status word can be omitted as long as clearing the DCM input image table puts SLC outputs into a safe state for the specific application.

Status Words

The first word of the DCM I/O image is the status word. The status word indicates the status of communication and data between the RIO scanner and the DCM. Depending on what logical rack size the DCM is configured for, it will transfer the following number of I/O words:

Rack Size	Number of RIO Words Transferred	Total Words
1/4 Logical Rack	One (plus one Status Word)	2
1/2 Logical Rack	Three (plus one Status Word)	4
3/4 Logical Rack	Five (plus one Status Word)	6
Full Logical Rack	Seven (plus one Status Word)	8

The figure below shows how I/O bits are transferred from the scanner to two DCMs, each configured as a 1/2 logical rack device.

R = Reserved for future use
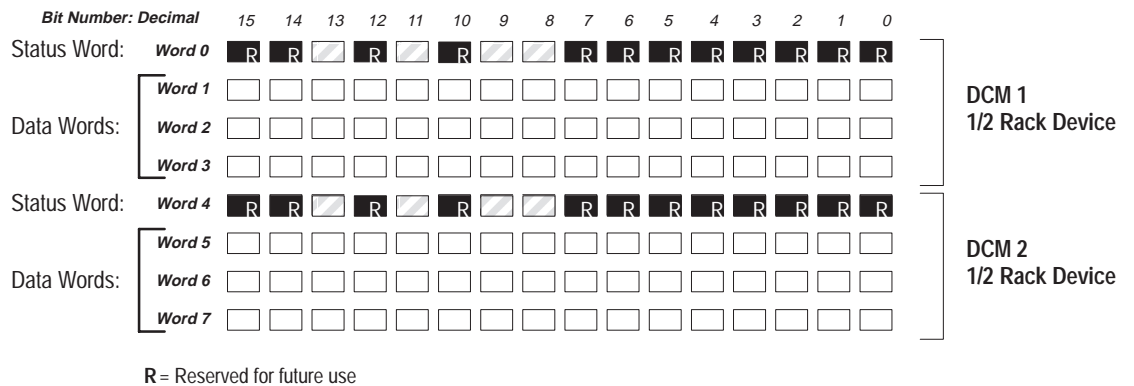
RIO Scanner Input Status Word Examination (Decimal)

This is the input status word sent in a data transfer from a supervisory processor/RIO scanner to a DCM. These bits can be used as conditional logic in your SLC program to flag DCM, RIO, or supervisory processor system errors and/or status. Scanner status bits not defined below are reserved for future use.

Logical OR of other Status Word bits. It is set when any other bit is set. It is cleared when all other bits are cleared.

Program/Test/Fault Mode bit. This bit is set whenever the supervisory processor is in the Program, Test, or Fault Mode.

DCM Initialization bit. This bit is set when the DCM is in its power-up initialization. It will be cleared when valid data is received from the supervisory processor output image table.

Communication Error bit. This bit is set whenever the DCM detects an RIO communication error. It is cleared when the Communication error is cleared.

DCM/SLC Output Status Word Examination (Octal)

This is the output image status word sent in a data transfer from a DCM to a supervisory processor/scanner. These bits can be used as conditional logic in your supervisory processor program to flag DCM or SLC system errors and/or status. DCM/SLC status bits not defined below are reserved for future use.

Both the decimal and octal bit addresses are shown below to assist you in programming your supervisory (PLC) processor and distributed SLC processor.

SLC | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0

PLC | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0

Reserved Bits

Status Bits

Logical OR of Status Word bits 11 and 12 (9 and 10 for SLC). It is set when either 11 or 12 (9 or 10) is set. It is cleared when 11 or 12 (9 or 10) is cleared.

Program/Test/Fault Mode bit. This bit is set whenever the SLC controlling the DCM is in the Program, Test, or Fault Mode.

DCM Output Data Invalid bit.[1] This bit is set when DCM output image data could be invalid.

User Status Flag bit. This status bit is available for you to use in your application.

[1] *Always use the **DCM Output Data Invalid bit** to determine the validity of SLC data sent from the DCM to the scanner. If you use the Program/Test/Fault Mode bit you may incorrectly receive an indication that the SLC data being sent from the DCM to the scanner is valid. This occurs because for a brief period after the Program/Test/Fault mode bit is cleared the data sent from the DCM to the scanner will not be valid.*

Applications Using I/O Status Word Bits

You can use the status bits in your ladder logic to monitor various conditions of the remote processor and the RIO network. Some examples for using the status word bits are given here. Each of the examples shows how ladder logic rungs could be programmed in the SLC processor to respond to the condition of a status bit from the RIO scanner.

Important: The application examples assume the portion of the scanner image assigned to the DCM is logical rack 2, starting group 0, 1 full rack, and is located in SLC physical slot 3.

RIO Scanner Status Word

Using the Program/Test/Fault Mode Bit

When the RIO scanner's supervisory processor is in Program, Test, or Fault Mode, its outputs are automatically inhibited (reset off) unless Hold Last State is used. However, outputs sent to the DCM (DCM inputs) are not automatically inhibited. If you want to inhibit any one SLC output controlled by a DCM input, you can use an Examine If Open (XIO) instruction addressed to the Program/Test/Fault Mode bit (I:3.0/9 in the example below). This assumes an SLC output is being driven by an input (I:3.1/0) from the scanner to the DCM, as shown below.

	DCM Conditional	Program/Test/Fault	SLC
SLC Rung to Monitor RIO Scanner Status Bit 09	I:3.1] [00 Input	**I:3.0**]/[**09** Status Bit	O:1.0 ( ) 00 Output
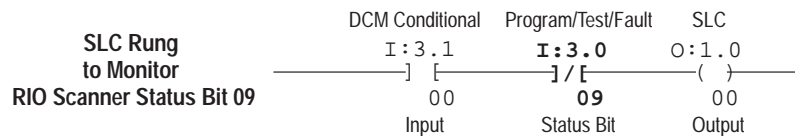
If you want to clear the DCM's entire input image (data from the RIO scanner when the RIO scanner's supervisory processor is in Program/Test/Fault Mode), you can set the DCM Clear On Fault DIP switch to the OFF position. Please refer to chapter 4, Module Configuration, for more information on this DIP switch.

DCM/SLC Output Status Word

Using the Data Invalid Bit

Whenever the distributed SLC leaves Program/Test/Fault Mode and enters Run Mode, there is a time period after the Program/Test/Fault Mode bit is cleared when the data sent from the DCM/SLC to the RIO scanner is invalid. For this reason, the Program/Test/Fault Mode bit should *not* be used by the RIO scanner's supervisory processor to determine the validity of data sent from the DCM. Instead, both processors' programs should use the DCM output Data Invalid bit (12 octal).

To ensure that the DCM output Data Invalid bit is cleared (signifying to the RIO scanner's supervisory processor that data is valid), the SLC ladder logic rung shown below must be included as the *last* rung in your SLC ladder logic program.

```
          SLC Rung                                              O:3.0
   addresses bit 10 (decimal);          ─────────────────────────(U)─────────────
     RIO Scanner's supervisory                                    10
  processor receives bit 12 (octal).
```

The RIO scanner's supervisory processor ladder logic program should use the DCM output Data Invalid bit to condition any supervisory processor outputs whose state is dependent upon valid data from the DCM/distributed SLC. An example of a PLC-5 processor rung that requires this conditioning is shown below.

```
          PLC-5 Rung               I:021     I:020      O:000
  SLC addresses bit 10 (decimal);  ──────┤ ├───────┤/├──────( )──────
     PLC receives bit 12 (octal).       00         12        00
```
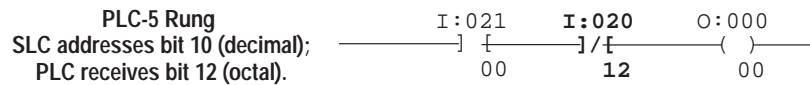
This rung uses data from the DCM (word 1, bit 0 PLC address I:021/00) to energize a PLC-5 output: bit 0, of rack 0, module group 0. It is conditioned with the Data Invalid bit. By using the DCM output Data Invalid bit in this example, the PLC-5 will not energize the output shown above unless the data received from the SLC/DCM is valid.

Using the User Status Flag Bit

This status bit (13) is available for your particular application. It is cleared on powerup and thereafter is never operated on by the DCM. After powerup this bit is only set (1) or cleared (0) by your SLC ladder logic program.

A typical application using this bit would be to inform the RIO scanner's supervisory processor that the SLC is disabling the slot where the DCM is located. If the DCM slot is disabled while the SLC is in the Run Mode, data sent to the RIO scanner will be last state data (invalid). Without using the User Status Flag bit, no indication that data is not being updated would be sent to the RIO scanner (that is, neither the Program/Test/Fault Mode bit nor the Invalid Data bit would be set). If your SLC ladder logic program sets the User Status Flag bit *prior* to disabling the DCM slot, the supervisory processor can use this bit in its ladder logic where appropriate.

> ⚠ **ATTENTION:** Make certain that you have thoroughly examined the effects of disabling the DCM slot before doing so in your application.

An example of how rungs might be programmed in the two processors to indicate disabling of the DCM slot is shown on the next page.

SLC Rungs

User Status Flag Bit

Set User Status Flag Bit ──────── Condition(s) ① ─────── O:13.0
                                                          ─(L)─
                                                           11 ③
                                                      ┌ IOM ──────────────────┐
                                                      │ IMMEDIATE OUT w MASK   │
                                                      │ Slot   0:3.0 │
                                                      │ Mask   0800 │
                                                      └────────────────────────┘

                                                                    ④
Disable DCM ──────── Condition(s) ① ─────── S2:11
                                            ─(U)─
                                             03

                                                                    ④
Enable DCM ──────── Condition(s) ② ─────── S2:11
                                           ─(L)─
                                            03

Clear User Status Flag Bit ──────── Condition(s) ② ─────── O:3.0
                                                           ─(U)─
                                                            11 ③
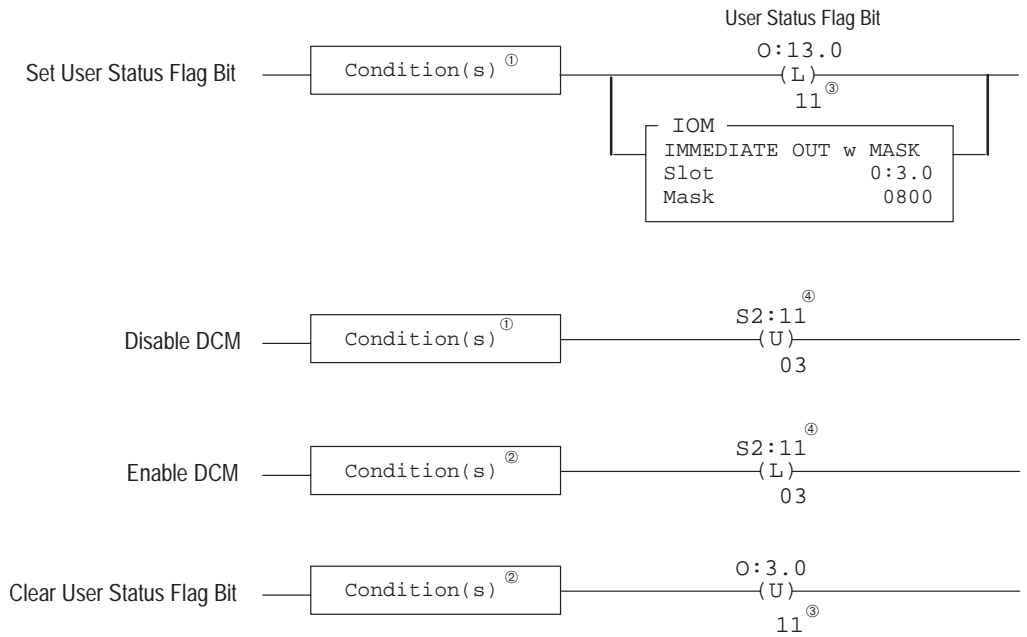
① *Condition(s) to set User Status Flag bit is the same condition(s) to disable the DCM slot. When setting the User Status Flag bit, an Immediate I/O (IOM) instruction must be used.*

② *Condition(s) to clear User Status Flag bit is the same condition(s) to enable the DCM slot.*

③ *The SLC addresses this bit as bit 11 (decimal); the PLC-5 receives this bit as bit 13 (octal).*

④ *$S2:11$-$S2:12$ – These two words are bit mapped to represent the 30 possible I/O slots in an SLC system. S2:11/0 represents I/O slot 0 up through S2:12/14 which represents slot 30. S2:12/15 is unused.*

After programming the SLC to set and clear the User Status Flag bit, this bit can be used to condition any PLC-5 output in this example whose state is dependent upon the data from the distributed SLC being valid.

PLC-5 Rung

```
        I:021   I:020   O:000
───────┤ ├─────┤/├──────( )──────
        00     13      00
```
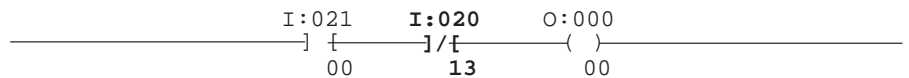
The PLC-5 rung uses data from the DCM (word 1, bit 0) to energize PLC-5 output 0. It is conditioned on the User Status Flag bit being cleared. If the SLC is programmed to set the User Status Flag bit prior to disabling the DCM slot, the PLC-5 will never energize output 0 when data from the SLC is invalid. For more information on how to enter PLC ladder logic, see your PLC-5 programming manual.

RIO Scanner Input Status and DCM/SLC Output Status

Using the Logical OR Bit

Whenever any of the status word bits (except the User Status Flag bit) are set, the Logical OR bit is set. Using an Examine If Open (XIO) instruction examining the Logical OR bit (word 0, bit 8 for SLC; word 0, bit 10 for PLC-5) in your ladder logic, you could inhibit any outputs or processors when this bit is set.

```
                                    I:3.1      I:3.0     O:1.0
SLC Rung
to Monitor              ─────────────] [────────]/[─────────( )──────
PLC-5 Status Bit 08                   00         08         00
```
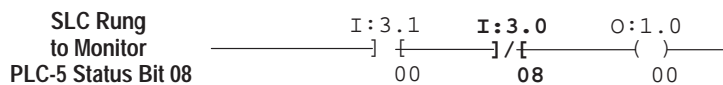
Troubleshooting

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.
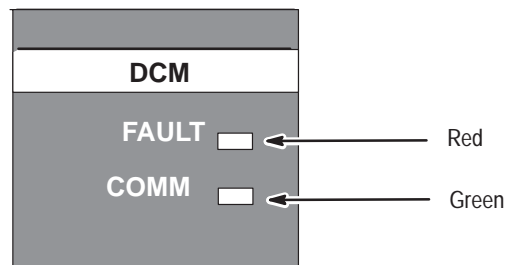
Troubleshooting Using the FAULT LED (Red)

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.

Application Examples

This chapter provides and examines two applications of the DCM.

- basic example
- supplementary example

Basic Example

In the following application, the 1747-DCM in the remote rack 2 will monitor the 1747-SN data from the local rack 1. The program examples in both local and remote rack CPUs consist of 1 rung each. When input I:1/0 is enabled in the local rack, the output O:3.1/0 condition is transferred to the 1747-DCM input image via the 1747-SN output image. This condition enables O:2/0 in the remote rack output card.

Rack 1   **Rack 2**

Input Switch

RIO

(Belden 9463)

= slot not used
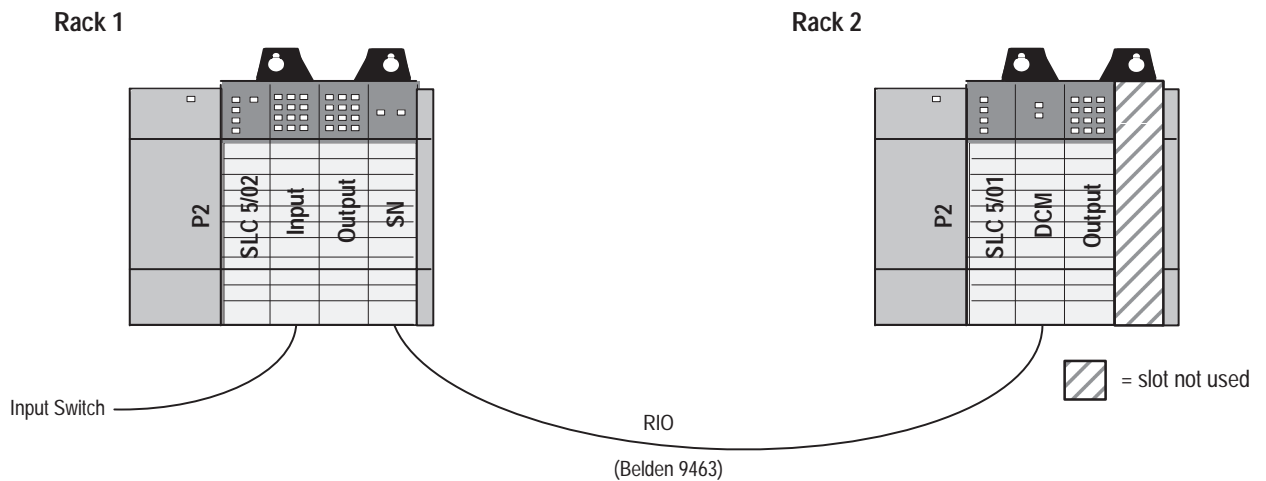
1747-SN Module Configuration[1]

Baud Rate =   57.6K baud

G-file Size =   3 words

G-File

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Word 0	Reserved																
Word 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	= **Starting Address 0**
Word 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	= **1/4 Rack Size**

[1]   *See SN manual for further details on configuration.*

DCM configuration:

Rack Address =   1

I/O Group =   0

Baud Rate =   57.6K baud

Clear On Fault =   no

Last Rack =   no

Rack Size =   1/4

DIP Switch Settings

	Switch 1								Switch 2							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
ON	X	X	X	X	X		X	X	X	X	X	X	X	X		
OFF						X										

☐ = Not used

System Configuration for Rack 1

Amount	Device	Catalog Number
1	Power Supply	1746-P2
1	SLC 5/02 Processor	1747-L524
1	4-Slot Rack	1746-A4
1	AC Input, 16 Inputs	1746-IA16
1	Relay Output, 16 Outputs	1746-OW16
1	Scanner	1747-SN

System Configuration for Rack 2

Amount	Device	Catalog Number
1	Power Supply	1746-P2
1	SLC 5/01 Processor	1747-L511
1	4-Slot Rack	1746-A4
1	Relay Output, 16 Outputs	1746-OW16
1	DCM	1747-DCM

Image Table Configuration

		Output Image														
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
SN	O:3.1/0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

		Input Image														
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
DCM	I:1.1/0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

Program Listing

When I:1/0 is set, enabling O:3.1/0 in the SN output image, the data is sent to the input image of the DCM I:1.1/0. The output in rack 2 is then set to output module O:2/0.

Rack 1, Program 1


```
        I:1                                      O:3.1
       ─┤ ├─────────────────────────────────────( )──
         0                                          0
    From Input Switch                    To SN Output
                                         Word 1, Bit 0
```

Rack 2, Program 2


```
        I:1.1                                    O:2
       ─┤ ├─────────────────────────────────────( )──
         0                                          0
    From DCM Input
    Word 1, Bit 0
```

Supplementary Example

In the following application, the PLC-5/15, via its integrated RIO scanner and the DCM, will monitor the analog data from an SLC 500. This case is unique in that the data to be monitored is twice what the DCM can transfer. The program in the SLC 500 will multiplex the data into four, 4-word packets with a start and end of data word attached. The start and end of data word is also used to designate which module the data is coming from. This is also used by the PLC-5/15 to indicate that the data was transferred successfully.

RIO
(Belden 9463)

☒ = slot not used
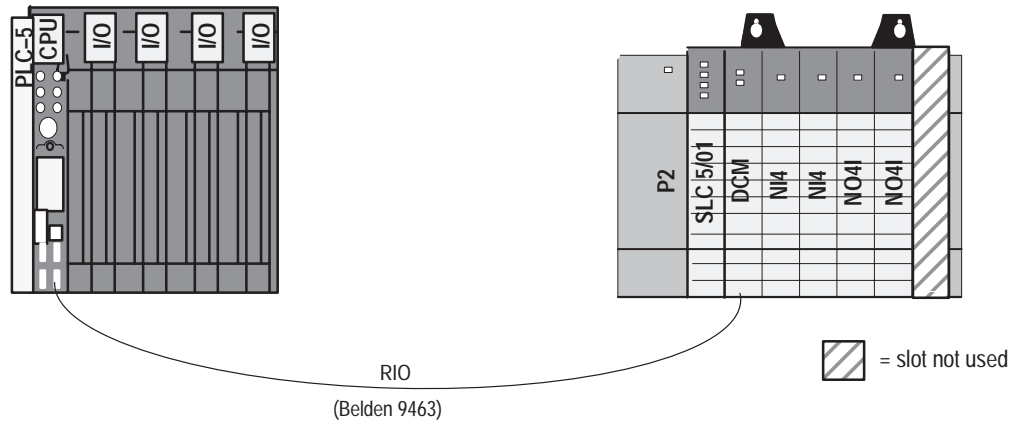
Module Configuration

PLC-5 configuration for scanner I/O status, inhibit bits:

S:27/0 =   *

S:27/1 =   0

S:27/2 =   1

S:27/3 =   1

* = Don't care

DCM configuration:

Rack Address =   1

I/O Group =   0

Baud Rate =   57.6K baud

Clear on Faults = No

Last Rack =   No

Rack Size =   Full Rack

DIP Switch Settings

	Switch 1								Switch 2							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
ON	X	X	X	X	X		X	X	X	X	X	X				
OFF						X							X	X		

▢ = Not used

System Configuration

Amount	Device	Catalog Number
1	Power Supply	1746-P2
1	SLC 5/01 Processor	1747-L511
1	7-Slot Rack	1746-A7
2	Analog Input, 4 point	1746-NI4
2	Analog Output, 4 point	1746-NO4I
1	DCM	1747-DCM

Image Table Configuration

		Output Image															
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
DCM	O:1.0	Status Word to PLC-5 from SLC															
	O:1.1	Counter ACC word denotes module being read															
	O:1.2	Word 0 of analog module being read															
	O:1.3	Word 1 of analog module being read															
	O:1.4	Word 2 of analog module being read															
	O:1.5	Word 3 of analog module being read															
	O:1.6	Counter ACC word denotes module being read															
	O:1.7	Not used															
NO4I	O:4.0	NO4I word 0															
	O:4.1	NO4I word 1															
	O:4.2	NO4I word 2															
	O:4.3	NO4I word 3															
NO4I	O:5.0	NO4I word 0															
	O:5.1	NO4I word 1															
	O:5.2	NO4I word 2															
	O:5.3	NO4I word 3															

		Input Image															
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
DCM	I:1.0	Status Word to SLC from PLC-5															
	I:1.1	Not used															
	I:1.2	Not used															
	I:1.3	Not used															
	I:1.4	Not used															
	I:1.5	Not used															
	I:1.6	Not used															
	I:1.7	Not used															
NI4	I:2.0	NI4 word 0															
	I:2.1	NI4 word 1															
	I:2.2	NI4 word 2															
	I:2.3	NI4 word 3															
NI4	I:3.0	NI4 word 0															
	I:3.1	NI4 word 1															
	I:3.2	NI4 word 2															
	I:3.3	NI4 word 3															

Program Listing for 5/01

Processor File: MULTPLX1.ACH

Rung 0 sets the starting point of the C5:0 counter. This is done on the first scan of the program S:1/15 (first scan bit) and C5:0/DN (done bit 0) of the counter, ensuring that only the analog modules in slots 2 through 5 are read.

```
               C5:0                                    ┌─ MOV ──────────────┐
RUNG      ──┬──┤ ├──┬──────────────────────────────────┤ MOVE               │
2.0         │   DN  │                                   │ Source          2  │
            │       │                                   │                    │
            │       │                                   │ Dest      C5:0.ACC │
            │  S:1  │                                   └────────────────────┘
            └──┤ ├──┘
                15
```
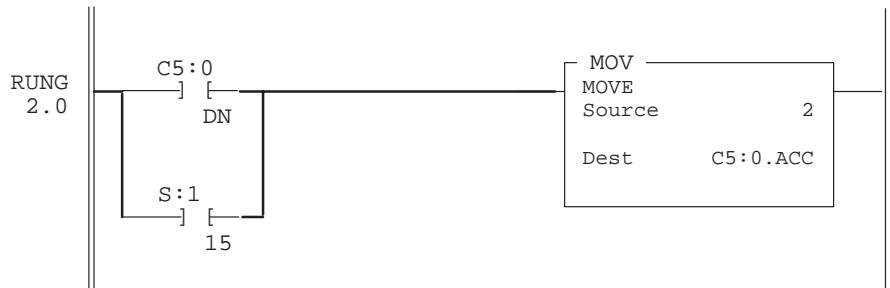
Rung 1 increments the C5:0 every 5.12 seconds. The value in the ACC is referenced to the slot that the DCM will send the data from, starting at slot 2.

```
               S:4                                      ┌─ CTU ──────────────┐
RUNG      ─────┤ ├──────────────────────────────────────┤ Countup            │
2.1             8                                       │ Counter     C5:0   │
                                                        │ Preset         6   │
          5.12 Seconds Time Bit                         │ Accum          0   │
                                                        └────────────────────┘
```
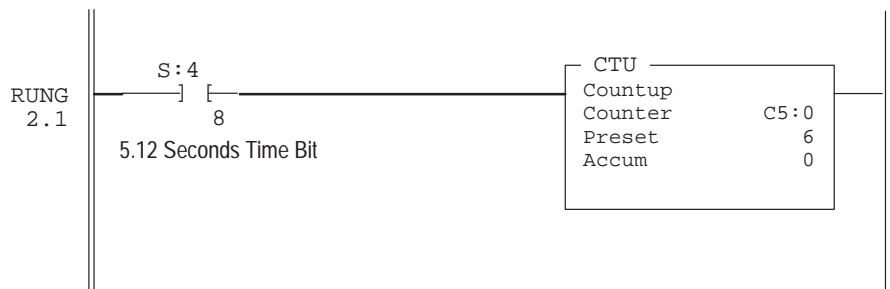
For rungs 2.2 through 2.5 the module number being monitored is shown above each example. For each rung, when SOURCE A = C5:0.ACC equals the value in SOURCE B = MODULE #, the rung moves the module number to word 1 of the DCM output file. This verifies the start of the data and the module number it's coming from. Then it copies the four words of analog data to the DCM output words 2 through 5, followed by the module number at word 6 to indicate the end of data.

Module Number Monitored = 2

```
              ┌─ EQU ──────────────────┐            ┌─ MOV ──────────────────┐
RUNG          │ EQUAL                  │            │ MOVE                   │
 2.2          │ Source A   C5:0.ACC    │            │ Source      C5:0.ACC   │
              │                   0    │            │                   0    │
              │ Source B          2    │            │ Dest          0:1.1    │
              │                        │            │                   0    │
              └────────────────────────┘            └────────────────────────┘

                                                    ┌─ COP ──────────────────┐
                                                    │ COPY FILE              │
                                                    │ Source        #I:2.0   │
                                                    │ Dest          #0:1.2   │
                                                    │ Length             4   │
                                                    └────────────────────────┘

                                                    ┌─ MOV ──────────────────┐
                                                    │ MOVE                   │
                                                    │ Source      C5:0.ACC   │
                                                    │                   0    │
                                                    │ Dest          0:1.6   │
                                                    │                   0    │
                                                    └────────────────────────┘
```
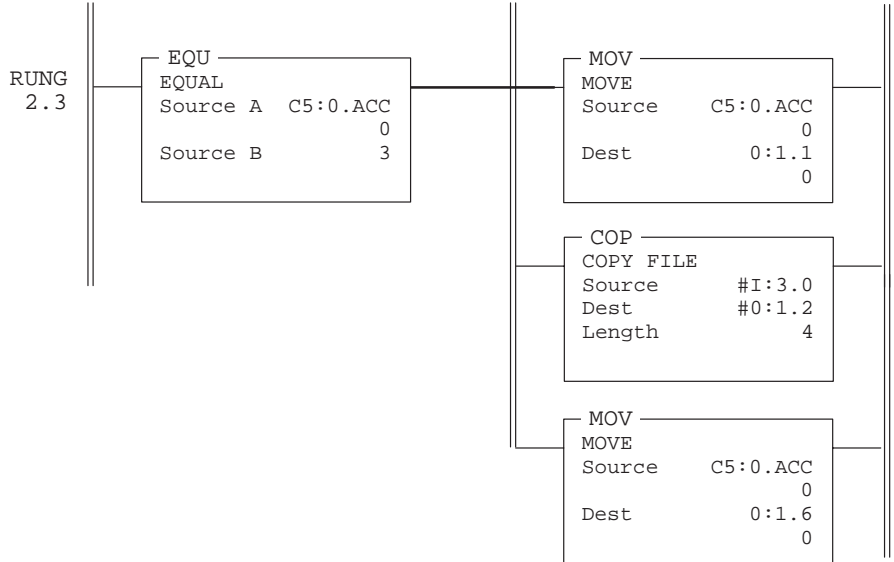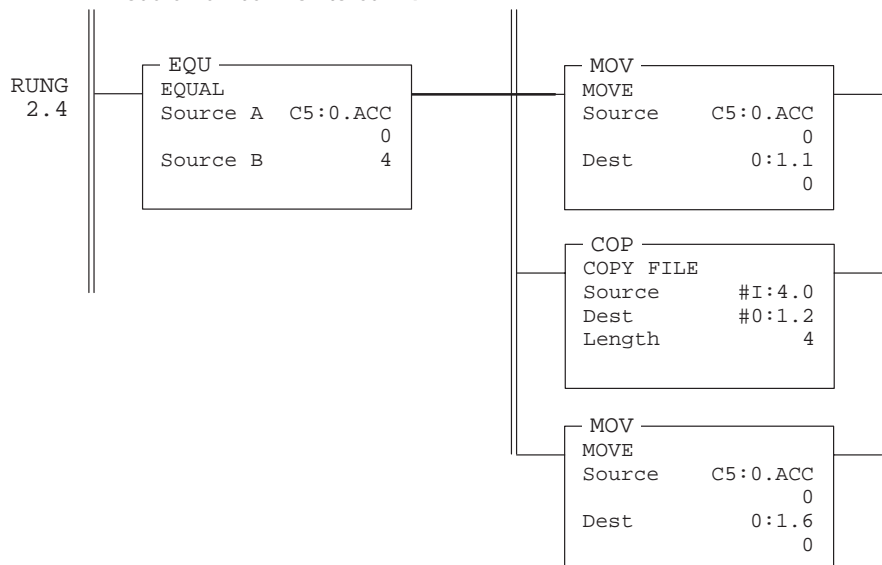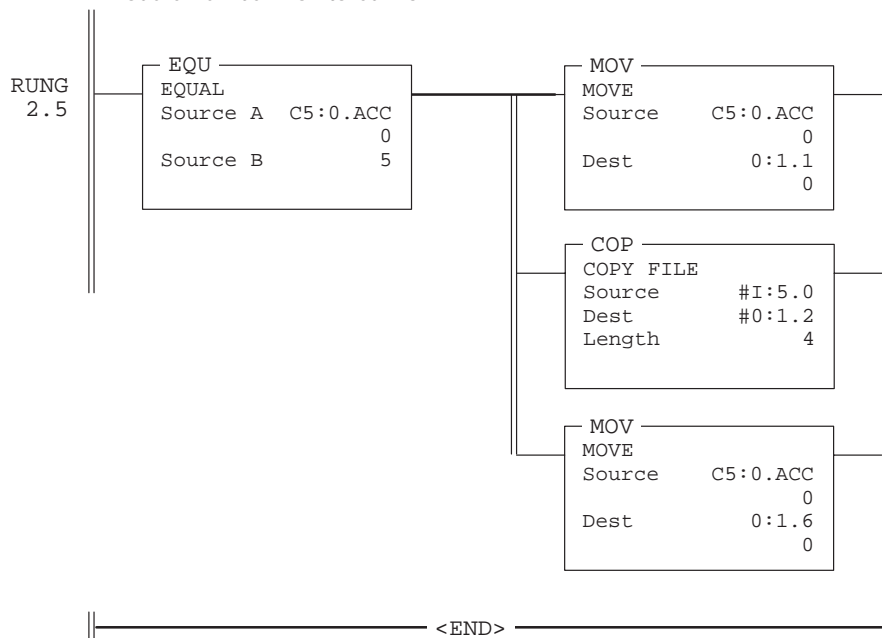
Module Number Monitored = 3

```
              ┌─ EQU ──────────────────┐            ┌─ MOV ──────────────────┐
RUNG          │ EQUAL                  │            │ MOVE                   │
 2.3          │ Source A   C5:0.ACC    │            │ Source      C5:0.ACC   │
              │                   0    │            │                   0    │
              │ Source B          3    │            │ Dest          0:1.1    │
              │                        │            │                   0    │
              └────────────────────────┘            └────────────────────────┘

                                                    ┌─ COP ──────────────────┐
                                                    │ COPY FILE              │
                                                    │ Source        #I:3.0   │
                                                    │ Dest          #0:1.2   │
                                                    │ Length             4   │
                                                    └────────────────────────┘

                                                    ┌─ MOV ──────────────────┐
                                                    │ MOVE                   │
                                                    │ Source      C5:0.ACC   │
                                                    │                   0    │
                                                    │ Dest          0:1.6   │
                                                    │                   0    │
                                                    └────────────────────────┘
```

Module Number Monitored = 4

```
            ┌─ EQU ──────────────┐       ┌─ MOV ──────────────┐
RUNG        │ EQUAL              │       │ MOVE               │
2.4         │ Source A  C5:0.ACC │       │ Source    C5:0.ACC │
            │                  0 │       │                  0 │
            │ Source B         4 │       │ Dest        0:1.1  │
            │                    │       │                  0 │
            └────────────────────┘       └────────────────────┘

                                         ┌─ COP ──────────────┐
                                         │ COPY FILE          │
                                         │ Source     #I:4.0  │
                                         │ Dest       #0:1.2  │
                                         │ Length          4  │
                                         └────────────────────┘

                                         ┌─ MOV ──────────────┐
                                         │ MOVE               │
                                         │ Source    C5:0.ACC │
                                         │                  0 │
                                         │ Dest        0:1.6  │
                                         │                  0 │
                                         └────────────────────┘
```

Module Number Monitored = 5

```
            ┌─ EQU ──────────────┐       ┌─ MOV ──────────────┐
RUNG        │ EQUAL              │       │ MOVE               │
2.5         │ Source A  C5:0.ACC │       │ Source    C5:0.ACC │
            │                  0 │       │                  0 │
            │ Source B         5 │       │ Dest        0:1.1  │
            │                    │       │                  0 │
            └────────────────────┘       └────────────────────┘

                                         ┌─ COP ──────────────┐
                                         │ COPY FILE          │
                                         │ Source     #I:5.0  │
                                         │ Dest       #0:1.2  │
                                         │ Length          4  │
                                         └────────────────────┘

                                         ┌─ MOV ──────────────┐
                                         │ MOVE               │
                                         │ Source    C5:0.ACC │
                                         │                  0 │
                                         │ Dest        0:1.6  │
                                         │                  0 │
                                         └────────────────────┘

            ┤├──────────────── <END> ────────────────┤├
```

Program Listing for PLC5/15

The following examples are for rungs 2.0 through 2.3. The module number
being monitored is shown above the examples. For each rung, the first EQU
monitors the module number and the start of the data transfer, while the
second EQU monitors the module number and the end of the data transfer.
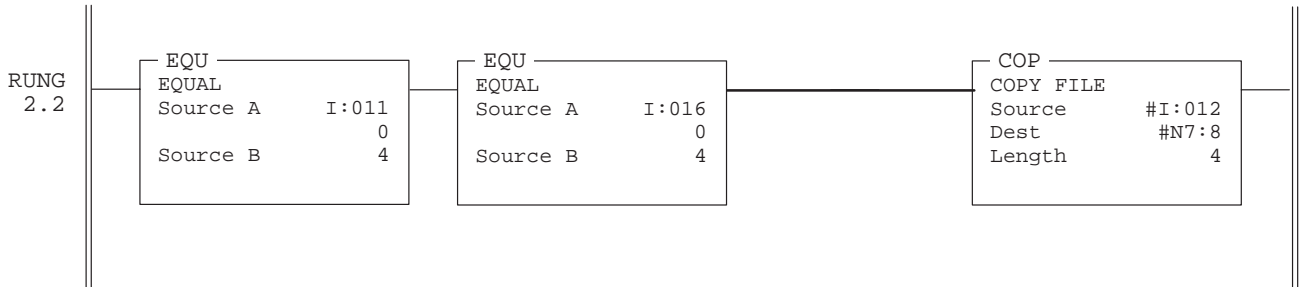The COP then moves the four words of analog data to an integer file.
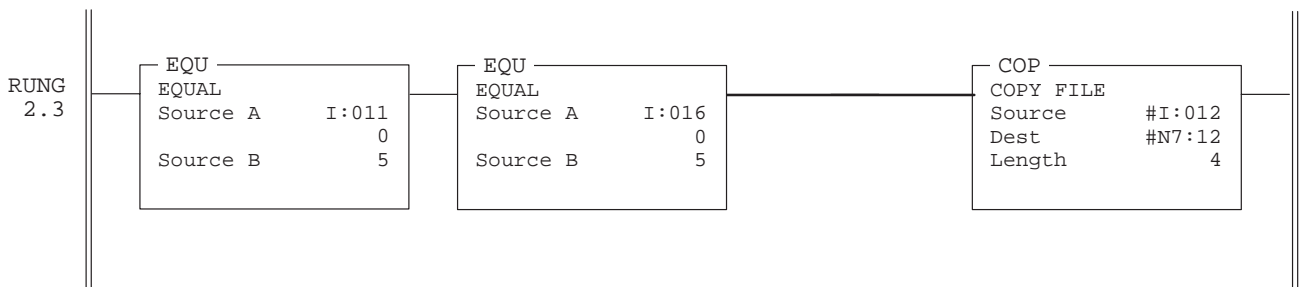
Module Number Monitored = 2

```
                 ┌── EQU ──────────────┐   ┌── EQU ──────────────┐          ┌── COP ──────────────┐
RUNG             │ EQUAL               │   │ EQUAL               │          │ COPY FILE           │
2.0              │ Source A     I:011  │   │ Source A     I:016  │          │ Source       #I:012 │
                 │                  0  │   │                  0  │          │ Dest         #N7:0  │
                 │ Source B         2  │   │ Source B         2  │          │ Length           4  │
                 └─────────────────────┘   └─────────────────────┘          └─────────────────────┘
```

Module Number Monitored = 3

```
                 ┌── EQU ──────────────┐   ┌── EQU ──────────────┐          ┌── COP ──────────────┐
RUNG             │ EQUAL               │   │ EQUAL               │          │ COPY FILE           │
2.1              │ Source A     I:011  │   │ Source A     I:016  │          │ Source       #I:012 │
                 │                  0  │   │                  0  │          │ Dest         #N7:4  │
                 │ Source B         3  │   │ Source B         3  │          │ Length           4  │
                 └─────────────────────┘   └─────────────────────┘          └─────────────────────┘
```

Module Number Monitored = 4

```
                 ┌── EQU ──────────────┐   ┌── EQU ──────────────┐          ┌── COP ──────────────┐
RUNG             │ EQUAL               │   │ EQUAL               │          │ COPY FILE           │
2.2              │ Source A     I:011  │   │ Source A     I:016  │          │ Source       #I:012 │
                 │                  0  │   │                  0  │          │ Dest         #N7:8  │
                 │ Source B         4  │   │ Source B         4  │          │ Length           4  │
                 └─────────────────────┘   └─────────────────────┘          └─────────────────────┘
```

Module Number Monitored = 5

```
                 ┌── EQU ──────────────┐   ┌── EQU ──────────────┐          ┌── COP ──────────────┐
RUNG             │ EQUAL               │   │ EQUAL               │          │ COPY FILE           │
2.3              │ Source A     I:011  │   │ Source A     I:016  │          │ Source       #I:012 │
                 │                  0  │   │                  0  │          │ Dest         #N7:12 │
                 │ Source B         5  │   │ Source B         5  │          │ Length           4  │
                 └─────────────────────┘   └─────────────────────┘          └─────────────────────┘

                                             <END>
```

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

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: = [ ]

DCM Addressing Worksheet

This appendix provides a worksheet for keeping track of the elements of each I/O address for your system's DCMs. Topics include:

- directions
- addressing review

Directions

In the table on the next page, enter the elements of each I/O address for each DCM in your system. All DCM inputs and outputs are addressed with respect to the SLC.

Make sufficient copies of this worksheet to cover all DCMs in your system.

Addressing Review

PLC Addresses

PLC Input Address

I:023/10

I = Input
02 = Logical Rack
3 = I/O Group
10 = Bit (octal)

PLC Output Address

O:017/10

O = Output
01 = Logical Rack
7 = I/O Group
10 = Bit (octal)
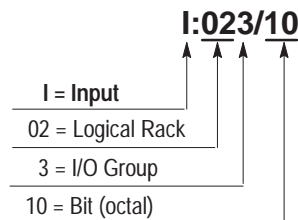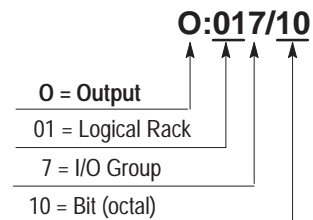
SLC Addresses

SLC Input Address
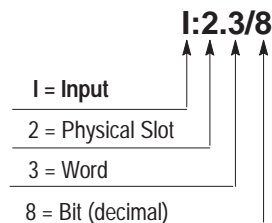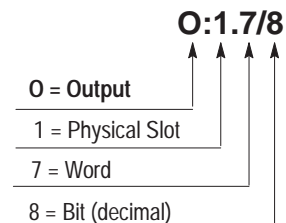
I:2.3/8

I = Input
2 = Physical Slot
3 = Word
8 = Bit (decimal)

SLC Output Address

O:1.7/8

O = Output
1 = Physical Slot
7 = Word
8 = Bit (decimal)

If you configure the DCM as:	Then:	Including the Status Word
1/4 Rack	1 data word (16 bits of I/O data) is transferred.	Total transfer = 2 words
1/2 Rack	3 data words (48 bits of I/O data) are transferred.	Total transfer = 4 words
3/4 Rack	5 data words (80 bits of I/O data) are transferred.	Total transfer = 6 words
Full Rack	7 data words (112 bits of I/O data) are transferred.	Total transfer = 8 words

DCM Input Image Table

PLC Output	Rack #	I/O Group	Bit (octal)	SLC Input	Slot #	Word	Bit (decimal)
O:				I:			
O:				I:			
O:				I:			
O:				I:			
O:				I:			
O:				I:			
O:				I:			
O:				I:			
O:				I:			
O:				I:			
O:				I:			
O:				I:			
O:				I:			
O:				I:			
O:				I:			
O:				I:			
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O:				I:			
O:				I:			
O:				I:			
O:				I:			
O:				I:			
O:				I:			
O:				I:			
O:				I:			
O:				I:			
O:				I:			
O:				I:			
O:				I:			

1/4 Logical Rack (rows 1–16)

1/2 Logical Rack (rows 17–32)

DCM Input Image Table (continued)

	PLC Output	Rack #	I/O Group	Bit (octal)	SLC Input	Slot #	Word	Bit (decimal)
	O:				I:			
	O:				I:			
	O:				I:			
	O:				I:			
	O:				I:			
	O:				I:			
	O:				I:			
	O:				I:			
3/4 Logical Rack	O:				I:			
	O:				I:			
	O:				I:			
	O:				I:			
	O:				I:			
	O:				I:			
	O:				I:			
	O:				I:			
	O:				I:			
	O:				I:			
	O:				I:			
	O:				I:			
	O:				I:			
	O:				I:			
	O:				I:			
Full Logical Rack	O:				I:			
	O:				I:			
	O:				I:			
	O:				I:			
	O:				I:			
	O:				I:			
	O:				I:			
	O:				I:			

DCM Output Image Table

PLC Input	Rack #	I/O Group	Bit (octal)	SLC Output	Slot #	Word	Bit (decimal)
I:				O:			
I:				O:			
I:				O:			
I:				O:			
I:				O:			
I:				O:			
I:				O:			
I:				O:			
I:				O:			
I:				O:			
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I:				O:			
I:				O:			
I:				O:			

1/4 Logical Rack

1/2 Logical Rack

DCM Output Image Table (continued)

PLC Input	Rack #	I/O Group	Bit (octal)	SLC Output	Slot #	Word	Bit (decimal)
I:				O:			
I:				O:			
I:				O:			
I:				O:			
I:				O:			
I:				O:			
I:				O:			
I:				O:			
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I:				O:			

3/4
Logical
Rack

Full
Logical
Rack

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