Modicon
Quantum Automation Series
Hardware Reference Guide

840 USE 100 00 Version 10.0

Schneider Electric

043505765 78

Table of Contents

Safety Information 9

About the Book 11

Part I Quantum Automation System Overview 13

At a Glance 13

Chapter 1 Modicon TSX Quantum Automation System Overview 15

At a Glance 15
Modicon TSX Quantum Automation Series Overview. 16
Quantum Power Supplies 17
Quantum CPU Modules 18
Quantum I/O Modules 19
Quantum Communication Interface Modules 20
Quantum Intelligent/Special Purpose I/O Modules 23
Quantum Simulator Modules (XSM) 24
Quantum Battery, Backplanes, and CableFast Cabling 25
Quantum Programming Packages 26

Part II Quantum System Configurations 27

At a Glance 27

Chapter 2 Quantum Configurations 29

At a Glance 29
Quantum Local I/O, Remote I/O and Distributed I/O Configurations. 30
Quantum Local I/O 32
Quantum Remote I/O (RIO) 33
Quantum Distributed I/O (DIO) 37

Chapter 3 Network Configurations 41

At a Glance 41
Quantum Network Support 42
Quantum Network Interface Techniques. 45
Quantum Modbus and Modbus Plus Communications 49

Part III **Quantum System Specifications 53**
At a Glance 53

Chapter 4 **System Specifications for the Quantum Module 55**
Quantum System Specifications 55

Part IV **Specifications 61**
. . . . 61

Chapter 5 **Hardware Specifications for the Quantum Modules. 63**
Quantum Hardware Specifications 63

Chapter 6 **Power Supply Modules 77**
At a Glance 77
140CPS11100 AC Power Supply 115/230 Vac 3 A Module 78
140CPS11400 AC Power Supply, 115/230 Vac, 8 A Module 82
140CPS11410 AC Summable Power Supply 115/230 Vac, 8 A 85
140CPS11420 AC Summable Power Supply 115/230 Vac, 11 A 88
140CPS12400 AC Redundant Power Supply, 115/230 Vac 8 A Module 91
140CPS12420 AC Redundant Power Supply, 115/230 Vac 11 A Module 94
140CPS21100 DC Power Supply, 24 Vdc, 3 A Module. 97
140CPS21400 DC Summable Power Supply, 24 Vdc, 8 A Module. 100
140CPS22400 DC Redundant Power Supply, 24 Vdc, 8 A Module 103
140CPS41400 DC Summable Power Supply, 48 Vdc, 8 A Module. 106
140CPS42400 DC Redundant Power Supply, 48 Vdc, 8 A Module 109
140CPS51100 DC Power Supply, 125 Vdc, 3 A Module. 113
140CPS52400 DC Standalone/Redundant Power Supply, 125 Vdc, 8 A 116

Chapter 7 **CPU Modules 119**
At a Glance 119
140CPU11302 CPU Module 121
140CPU11303 CPU Module 132
140CPU21304 CPU Module 143
140CPU42402 CPU Module 154
140CPU43412 CPU Module 165
140CPU43412A CPU Module 178
140CPU53414 CPU Module 192
140CPU53414A CPU Module 205

Chapter 8 **Quantum Field Bus Modules 219**
Overview 219
140CRP81100 Profibus DP Master Communications Module. 220
140EIA92100 Quantum AS-i Master Module. 226
140NOA6XXXX Quantum InterBus Communications Modules. 232
140NOL911X0 Quantum LonWorks Network Option Modules 240

Chapter 9 Distributed I/O (DIO) for the Quantum Modules. 247
At a Glance 247
140CRA21X10 Quantum Distributed I/O (DIO) Modules 248
140CRA21X20 Quantum Distributed I/O (DIO) Modules 253

Chapter 10 Quantum Remote I/O Communication Modules 259
At a Glance 259
140CRP93X00 Remote I/O (RIO) Head Single and Dual Channel Module . . . 260
140CRA93X00 Quantum RIO Adapter Drop Single and Dual Channel Module 265

Chapter 11 Quantum Modbus Plus Network Option Modules 271
140NOM21X00 Quantum Modbus Plus Network Option Modules 271

Chapter 12 Quantum Modbus Plus Networking on Fiber Module 281
140NOM25200 Quantum Networking Modbus Plus on Fiber Module 281

Chapter 13 Quantum Ethernet Modules. 305
At a Glance 305
140NOE2X100 Quantum Ethernet TCP/IP Module 306
140NOE3X100 Quantum Ethernet SY/MAX Modules. 311
140NOE5X100 Quantum Ethernet MMS Modules 314
140NOE771xx Ethernet Modules 317

Chapter 14 Intelligent/Special Purpose Modules for the Quantum 333
At a Glance 333
140EHC10500 High Speed Counter Module 334
I/O Configuration for 140EHC20200 340
140EHC20200 High Speed Counter Module 372
140ESI06210 ASCII Interface Module 388
140HLI34000 High Speed Interrupt Module 394
140MSB/MSC10100 Quantum MSX Motion Modules. 399
140XBE10000 Backplane Expander and Cable 410
140CHS11000 Hot Standby Module 415

Chapter 15 Quantum Intrinsically Safe Analog/Digital, Input/Output Modules 421
At a Glance 421
15.1 Intrinsically Safe Modules - General Information. 423
Intrinsically Safe Modules – General Description 423
15.2 Intrinsically Safe Analog Modules 427
At a Glance 427
I/O Configuration for Intrinsically Safe Analog Modules 428
140AII33000 Intrinsically Safe Analog Input Module. 437
140AII33010 Intrinsically Safe Current Input Module 450
140AIO33000 Intrinsically Safe Analog Output Module 457
15.3 Intrinsically Safe Discrete Modules 463
At a Glance 463

I/O Configuration for Intrinsically Safe Discrete Modules. 464
140DII33000 Intrinsically Safe Discrete Input Module 466
140DIO33000 Intrinsically Safe Discrete Output Module. 473

Chapter 16 Quantum Simulator Modules 479
At a Glance 479
140XSM00200 Quantum Point Discrete Simulator Module 480
140XSM01000 Analog Simulator Module 482

Chapter 17 Quantum Battery Module 487
At a Glance 487
I/O Configuration for the 140XCP90000 Battery Module. 488
140XCP90000 Quantum Battery Module. 489

Chapter 18 Quantum I/O Modules 495
At a Glance 495
18.1 Overview of I/O Modules 497
Overview of I/O Modules 497
Quantum I/O Modules 498
I/O Map Status Byte. 510
18.2 Analog Input Modules 512
At a Glance 512
Analog Input Modules 513
140ACI03000 I/O Analog In Module 533
140ACI04000 High Density Analog in I/O Module. 538
140ARI03010 I/O RTD Input 8 Channel Module 543
140ATI03000 I/O Thermocouple Input 8 Channel Module 548
140AVI03000 I/O Analog IN 8 Channel Bipolar Module 553
18.3 Analog Output Modules 558
At a Glance 558
I/O Configuration for Analog Output Modules 559
140ACO02000 Quantum I/O Analog Current Out Module. 563
140ACO13000 High Density Analog Out I/O Module 568
140AVO02000 Quantum I/O Analog Voltage Out Module. 573
18.4 Analog Input/Output Modules 578
At a Glance 578
Configuration of the 140AMM09000 Analog Input/Output Module 579
140AMM09000 Analog Input/Output Module. 584
18.5 Discrete Input Modules 590
At a Glance 590
I/O Configuration for Discrete Input Modules. 591
140DAI34000 Quantum I/O 24 VAC IN Module. 595
140DAI35300 Quantum I/O AC Input 24 Vac Module 600
140DAI44000 Quantum I/O 48 VAC IN Module. 605
140DAI45300 Quantum I/O AC Input 48 Vac 4x8 Module. 610
140DAI54000 Quantum I/O 115 VAC In Module 615

140DAI54300 Quantum I/O AC Input 115 Vac 2x8 Module 620
140DAI55300 Quantum I/O AC Input 115 Vac 4x8 Module 625
140DAI74000 Quantum I/O AC Input 230 Vac 16x1 Module 630
140DAI75300 Quantum I/O AC Input 230 Vac 4x8 Module 635
140DDI15310 Quantum I/O DC Input 5 V TTL 4x8 Source Module 639
140DDI35300 Quantum I/O DC Input 24 Vdc 4x8 Sink Module 643
140DDI35310 Quantum I/O DC Input 24 Vdc True Low 4x8 Input Module. . . . 646
140DDI36400 I/O DC Input 24 VDC 6x16 Telefast Input Module 650
140DDI67300 Quantum I/O DC Input 125 Vdc 3x8 Sink Module 655
140DDI84100 Quantum I/O DC Input 10 ... 60 Vdc 8x2 Sink Module. 662
140DDI85300 Quantum I/O DC Input 10 ... 60 Vdc 4x8 Sink Module. 666
18.6 Discrete Output Modules. 669
At a Glance 669
I/O Configuration for Discrete Output Modules 670
140DAO84000 I/O AC Output 24 ... 230 Vac 16x1 Module 678
140DAO84010 I/O AC Output 24 ... 115 Vac 16x1 Module 684
140DAO84210 Quantum I/O AC Output 100 ... 230 Vac 4x4 Module 690
140DAO84220 Quantum I/O AC Output 24 ... 48 Vac 4x4 Module 696
140DAO85300 Quantum I/O AC Output 24 ... 230 Vac 4x8 Module 702
140DDO15310 I/O DC Output 5 V TTL 4x8 Sink Module 708
140DDO35300 Quantum I/O DC Output 24 Vdc 4x8 Source Module. 712
140DDO35301 I/O DC Output 24 VDC 4x8 Discrete Source Module. 718
140DDO35310 I/O DC Output 24 Vdc 4x8 Sink Module. 723
140DDO36400 I/O DC Output 24VDC 6x16 Telefast Output Module. 729
140DDO84300 Quantum I/O DC Output 10 ... 60 Vdc 2x8 Source Module . . . 735
140DDO88500 Quantum I/O DC Output 24-125 Vdc 2x6 Source Module 739
140DRA84000 Quantum I/O Relay Output 16x1 Normally Open Module. 745
140DRC83000 Quantum I/O Relay Output 8x1 Normally Open/Normally Closed Module. 749
18.7 Discrete Verified Output Module 753
At a Glance 753
I/O Configuration for the Discrete Verified Output Module – 140DVO85300 . . 754
140DVO85300 I/O Verified 10-30 VDC Out Module 759
18.8 Discrete Supervised Input Module 764
At a Glance 764
I/O Configuration for the Discrete Supervised Input Module – 140DSI35300 . . 765
140DSI35300 I/O DC 24V Supervised Input Module 766
18.9 Discrete Input/Output Modules 769
At a Glance 769
I/O Configuration for Discrete Input/Output Modules 770
140DAM59000 Quantum I/O AC Input 115 Vac 2x8 / AC Output 115 Vac 2x4) 774
140DDM39000 I/O DC Input 24 Vdc 2x8 Sink / DC Output 24 Vdc 2x4 Source Module. 782
140DDM69000 I/O 125 VDC Input/High Power Output Module 789

Appendices 795
At a Glance 795

Appendix A **Miscellaneous Components** 797
Miscellaneous Components. 797

Appendix B **Spare Parts** 807
Spare Parts 807

Appendix C **Hardware Installation** 811
At a Glance 811
Hardware Installation – Selecting Backplanes. 812
Hardware Installation – Mounting Brackets 819
Hardware Installation – Space Requirements for the Quantum System 823
Hardware Installation – Mounting Quantum Modules 825

Appendix D **Power and Grounding Guidelines** 831
At a Glance 831
Power and Grounding Considerations for AC and DC Powered Systems. 832
System Design Considerations for Quantum Power Supplies. 844
Grounding 851
Closed System Installation. 853

Appendix E **CableFast Cabling** 857
At a Glance 857
Features of the CableFast Cabling System 858
140CFA04000 CableFast Cabling Block 867
140CFB03200 Quantum CableFast Cabling Block 870
140CFC03200 Quantum CableFast Cabling Block 876
140CFD03200 Quantum CableFast Cabling Block 885
140CFE03200 Quantum CableFast Cabling Block 888
140CFG01600 Quantum CableFast Cabling Block 891
140CFH00800 Quantum CableFast Cabling Block 900
140CFI00800 Quantum CableFast Cabling Block. 909
140CFJ00400 Quantum CableFast Cabling Block 916
140CFK00400 Quantum CableFast Cabling Block 925
CableFast Cables 933
CableFast Accessories 939

Appendix F **Error Stopped Codes** 941
Error Stopped Codes 941

Appendix G **Agency Approvals** 945
Agency Approvals 945

Index 955

Safety Information

Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

DANGER indicates an imminently hazardous situation, which, if not avoided, **will result** in death, serious injury, or equipment damage.

WARNING

WARNING indicates a potentially hazardous situation, which, if not avoided, **can result** in death, serious injury, or equipment damage.

CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, **can result** in injury or equipment damage.

PLEASE NOTE

Electrical equipment should be serviced only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material. This document is not intended as an instruction manual for untrained persons.

About the Book

At a Glance

Document Scope

This manual is a reference guide for the Hardware of the Quantum automation system.

Validity Note

The data and illustrations found in this book are not binding. We reserve the right to modify our products in line with our policy of continuous product development. The information in this document is subject to change without notice and should not be construed as a commitment by Schneider Electric.

Product Related Warnings

Schneider Electric assumes no responsibility for any errors that may appear in this document. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us. No part of this document may be reproduced in any form or by any means, electronic or mechanical, including photocopying, without express written permission of Schneider Electric.

User Comments

We welcome your comments about this document. You can reach us by e-mail at TECHCOMM@modicon.com

Quantum Automation System Overview

I

At a Glance

Overview

This part provides an overview of the Quantum Automation System.

What's in this Part?

This part contains the following chapters:

Chapter	Chapter Name	Page
1	Modicon TSX Quantum Automation System Overview	15

Modicon TSX Quantum Automation System Overview

1

At a Glance

Introduction

This chapter provides an overview of the Quantum TSX Automation System, which includes Quantum software support.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
Modicon TSX Quantum Automation Series Overview	16
Quantum Power Supplies	17
Quantum CPU Modules	18
Quantum I/O Modules	19
Quantum Communication Interface Modules	20
Quantum Intelligent/Special Purpose I/O Modules	23
Quantum Simulator Modules (XSM)	24
Quantum Battery, Backplanes, and CableFast Cabling	25
Quantum Programming Packages	26

Modicon TSX Quantum Automation Series Overview

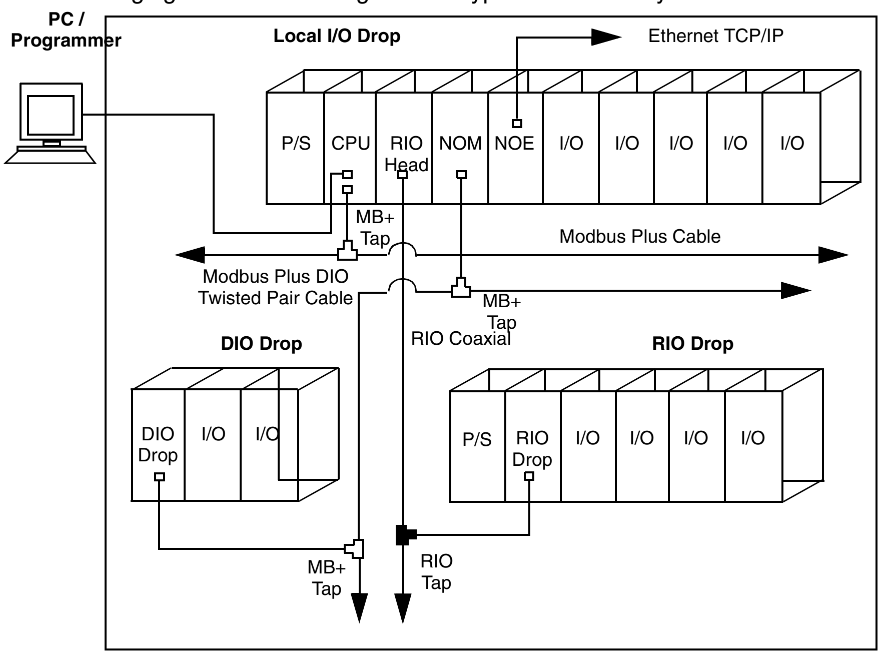
Overview

The Quantum system is a special-purpose computing system with digital processing capabilities. Quantum is designed for real time control in industrial and manufacturing applications in a modular, expandable architecture employing the following modules.

- Power Supply
- CPU
- I/O
- I/O Network Interface
- Intelligent/Special Purpose I/O
- Simulator (XSM)
- Battery
- Backplanes
- CableFast Cabling

Quantum System Block Diagram

The following figure is a block diagram of a typical Quantum system.



Quantum Power Supplies

Overview

Quantum power supplies are used to supply system power to all modules inserted into the backplane, including:

- Quantum CPU modules
- Quantum Interface modules
- Quantum I/O modules

Depending upon the system configuration, the option exists of using the power supply in three different modes.

Power Supply Modes

The following table shows the power supply modes.

Power Supply Type	Usage
Standalone	For 3 A, 8 A or 11 A configurations that do not require fault tolerant or redundant capabilities.
Standalone Summable	For configurations consuming more than the rated current of one supply, two summing power supplies can be installed in the same backplane.
Redundant	For configurations requiring power for uninterrupted system operation. Two redundant power supplies are required for redundancy.

CAUTION

System Safety

Exercise caution when considering a combination of power supplies in a backplane. Use only like power supplies with the exceptions noted in *System Design Considerations for Quantum Power Supplies, p. 844*.

Failure to follow this precaution can result in injury or equipment damage.

Quantum CPU Modules

Overview

The Quantum CPU is a module residing on the Quantum local I/O backplane. The CPU is a digitally operating electronic system, which uses a programmable memory for the internal storage of user instructions. These instructions are used to implement specific functions such as:

- Logic
- Process sequencing
- Timing
- Coupling
- Arithmetic

These instructions allow control through digital and analog outputs, for various types of machines and processes.

The Quantum CPU serves as a bus master controlling the local, remote, and distributed I/O of the Quantum system.

Quantum I/O Modules

Overview

Quantum I/O modules are electrical signal converters that convert signals to and from field devices to a signal level and format, which can be processed by the CPU, such as:

- Limit switches
- Proximity switches
- Temperature sensors
- Solenoids
- Valve actuators

All I/O modules are optically isolated to the bus, ensuring safe and trouble-free operation. All I/O modules are also software configurable.

Quantum Communication Interface Modules

Overview

Nine types of communication interface modules are available and presented in the table below, and are described in the following text.

Network Interface Modules

The following table shows the communication interface modules.

Type	Description
RIO	Single and dual channel Remote I/O interface modules (RIO heads and drops) connected via a coaxial cable network.
DIO	Single and dual channel Distributed I/O interface modules connected via a twisted pair Modbus Plus cable network.
NOM	Single and dual channel Network Option Modules (NOM) connected via a twisted pair Modbus Plus cable network.
Fiber Optic Modbus Plus	Modbus Plus on fiber module connected via a fiber optic Modbus Plus cable network.
Ethernet TCP/IP	Single channel Ethernet TCP/IP interface module connected via a twisted pair or fiber optic cable network.
InterBus	InterBus Interface module connected via a twisted pair network.
SY/MAX Ethernet	SY/MAX Ethernet module connected via a twisted pair or fiber optic cable network.
LonWorks	LonWorks module connected via a twisted-pair network.
MMS Ethernet	MMS Ethernet module connected via a fiber optic cable network.
Profibus	Profibus Master module connected via a Profibus RS-485 port.
AS-i	AS-i module connected via

RIO Modules (CRA/CRP)

Quantum RIO head and drop modules use a S908-based networking I/O configuration. Communication is done via single or dual coaxial cabling up to 15,000 feet away. This configuration supports a mix of the following product lines:
- SY/MAX
- 200 Series
- 500 Series
- 800 Series
- Quantum I/O

When Quantum RIO is required, the Quantum controller may support up to 31 RIO drops. In an RIO configuration, an RIO head module is connected with coaxial cable to RIO drop modules at each remote drop.

DIO Module (CRA)

Quantum DIO is implemented over a Modbus Plus network. The CPU or NOMs module may be the network head via their Modbus Plus ports.
Quantum DIO Modbus Plus drop adaptors are specifically designed to link Quantum I/O modules to the head via twisted pair shielded cable (Modbus Plus). The DIO drop modules also provide the I/O with power (maximum 3A) from a 24 Vdc or a 115/230 Vac source. Each DIO network supports up to 63 distributed drops using repeaters.

Network Option Module (NOM)

Quantum NOM modules provide extended communication capabilities for the Quantum system within a Modbus Plus configuration.

Modbus Plus on Fiber Module (NOM)

Quantum Modbus Plus on Fiber modules provides connectivity to Modbus Plus nodes by fiber cable without fiber optic repeaters, and allows the creation of a pure fiber optic network or a mixed fiber optic/twisted-pair network (with the use of a 490NRP254 Fiber O

Ethernet TCP/IP (NOE) Modules

Quantum Ethernet TCP/IP modules make it possible for a Quantum controller to communicate with devices on an Ethernet network using TCP/IP – the de facto standard protocol. An Ethernet module may be inserted into an existing Quantum system and connected to existing Ethernet networks via fiber optic or twisted pair cabling.

SY/MAX Ethernet Modules (NOE)

Quantum-SY/MAX-Ethernet modules are Quantum CPU network option modules that can be placed in a Quantum backplane to connect Quantum controllers to SY/MAX devices and applications.

MMS-Ethernet Modules (NOE)

Quantum-MMS-Ethernet modules are Quantum CPU network option modules that can be placed in a Quantum backplane to connect Quantum controllers to MMS devices and applications.

InterBus Interface Module (NOA)

The Quantum InterBus is the interface module to the InterBus bus. The InterBus bus is a fieldbus network designed for I/O blocks and intelligent devices used in manufacturing. It offers a master/slave topology that permits deterministic I/O servicing over it's 13 km twisted pair network.

LonWorks Modules (NOL)

Quantum NOL modules provide connectivity between a Quantum controller and a LonWorks network, based on Echelon's LonWorks technology. The NOL module is offered in three models for different transceiver types, and supports three twisted-pair media types with different network topologies or data transfer speeds.

Profibus Interface Module (CRP

Quantum Profibus module is the interface module to Profibus-DP networks.

AS-i Interface Module

Quantum AS-i modules provide connectivity between a quantum controller and AS-i networks.

Quantum Intelligent/Special Purpose I/O Modules

Overview

Quantum Intelligent/Special Purpose I/O modules operate with minimum intervention from the Quantum controller after initially downloading module parameters or programs. The Quantum intelligent/special purpose I/O modules include the following.

- High Speed Counter modules (EHC)
- ASCII Interface module (ESI)
- High Speed Interrupt module (HLI)
- Single Axis Motion Modules (MSx)
- Multi-Axis Motion Modules (MMS)

Quantum Simulator Modules (XSM)

Overview

There are two types of simulator modules, as described below.

Discrete and Analog Simulators

The following table shows discrete and analog simulators.

Type	Description
Discrete 16 Point Simulator (140XSM01000)	The Discrete Simulator (16 points) is used to generate up to 16 binary input signals to the 140DAI54000 and the 140DAI74000 AC input modules.
Analog Simulator (140XSM01000)	The Analog Simulator (2 channels in, 1 channel out) module is used for simulating 4 ... 20 mA field current loops used with current input Quantum modules.

Quantum Battery, Backplanes, and CableFast Cabling

Battery Module (XCP)	The Quantum battery module provides RAM backup power for the Quantum expert module.
Backplanes (XBP)	Quantum backplanes may be used in all locations of local, remote, or distributed I/O. There are six backplanes available in 2, 3, 4, 6, 10, and 16 slot versions. All I/O slots are usable with any module able to be used in any slot.
CableFast Cabling	The Quantum CableFast wiring system consists of pre-wired Quantum field wiring terminal strips and DIN rail-mounted terminal blocks, offered in straight through or special application versions.

Quantum Programming Packages

Overview

Quantum controllers support several editors.

Quantum Editors

The following table shows the editors for the Quantum controllers.

Editor	Where Discussed
Modsoft V2.6	For more information on Modsoft, refer to the Modicon Modsoft Programmer User Manual (890USE11500).
Concept V2.5	For more information on Concept, refer to the Concept User Manual (840USE49300).
ProWORX NXT V2.1	For more information on ProWorX, refer to the ProWorX User Manual (372SPU68001 NMAN)
ProWORX 32 (V 1.0 minimum)	For more information on ProWORX 32, refer to the ProWORX 32 Programming Software for PLCs User Guide (372SPU780 01EMAN)
ProWORX Plus (V 1.0 minimum)	For more information on ProWORX Plus, refer to the ProWORX Plus for Modicon Reference Manual (371SPU68001 PMAN).
Modicon State Language (V1.2 minimum)	For more information on Modicon State Language, refer to the Modicon State Language User Manual (GM-MSL1-001).

Quantum System Configurations

II

At a Glance

Overview

This part provides information on Quantum system configurations.

What's in this Part?

This part contains the following chapters:

Chapter	Chapter Name	Page
2	Quantum Configurations	29
3	Network Configurations	41

Quantum Configurations

2

At a Glance

Introduction

The following chapter provides information on the Quantum configurations, including Local I/O, Remote I/O (RIO), and Distributed I/O (DIO).

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
Quantum Local I/O, Remote I/O and Distributed I/O Configurations	30
Quantum Local I/O	32
Quantum Remote I/O (RIO)	33
Quantum Distributed I/O (DIO)	37

Quantum Local I/O, Remote I/O and Distributed I/O Configurations

Overview

The following information contains a description of the Local I/O, Remote I/O and Distributed I/O and their configurations.

These configurations (see the configuration table below for valid Quantum configurations) can be equipped with a combination of:
- Quantum CPUs
- Power supplies
- I/O interfaces
- Expert modules
- I/O modules

> **Note:** Refer to *System Specifications for the Quantum Module , p. 55* for a complete list of part numbers for all Quantum modules.

Local, RIO, and DIO Configuration

The following table provides valid Quantum configurations, including backplanes and modules.

If Configuration Type Is	Backplane Types (Typical) Are	Required Modules Are	Optional Modules Are	Modules Not Permitted Are
Local	6, 10, 16 slots	Power Supply CPU	RIO Head, I/O, NOx*	RIO Drop, DIO Drop
RIO**	6, 10, 16 slots	Power Supply RIO Drop	I/O	CPU, RIO Head, DIO Drop NOx*
DIO	2, 3, 4, 6 slots	DIO Drop	Power Supply, I/O	CPU, RIO Head, RIO Drop NOx*
*NOM, NOA, and NOE. **Remote I/O is typically used for large (number of modules) drops 6, 10, or 16 slot backplanes. Distributed I/O is typically used for small drops using 2, 3, 4, or 6 slot backplanes.				

> **Note:** Every Quantum module requires power from the backplane (except power supply and DIO modules). For a valid configuration, add up the required backplane current (in mA) for every module, and ensure that this number is less than the available power in the selected power supply.

Local, Remote and Distributed I/O Configuration

Depending on the type of configuration—Local, Remote, or Distributed I/O, a variety of features will apply, as shown in the following table.

Feature	Configuration		
	Local I/O	**Remote I/O**	**Distributed I/O**
Maximum I/O Words			
Per drop	64 in / 64 out	64 in / 64 out	30 in / 32 out
Per network		1,984 in / 1,984 out	500 in / 500 out
Maximum Physical Discretes			
Per drop	*864 any mix	*864 any mix	448 any mix
Maximum drops per network		31	63
Media		Coax	Twisted Pair
Speed		1.5 Mhz	1 MHz
Maximum distance without repeaters		15,000 ft. (4,573 m)	1,500 ft. (457 m)
Scan synched I/O servicing		Yes	No
Momentum I/O support		No	Yes
Hot Standby support		Yes	No
Modbus Plus compatible		No	Yes

*Requires use of backplane expander, Telefast module excepted (27 modules x 32 points = 864). May be limited by bus power requirements.

Quantum Local I/O

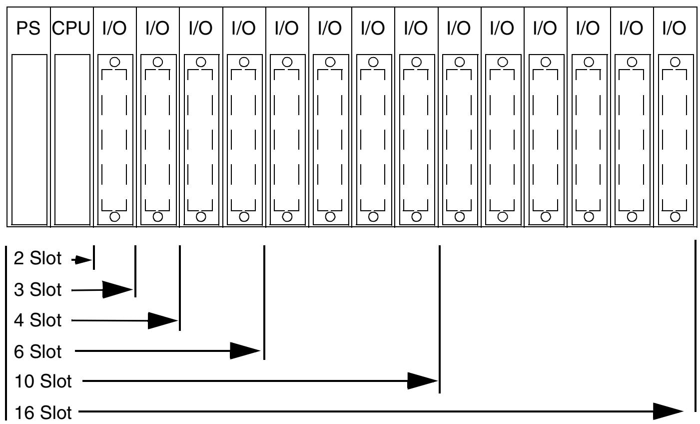
Overview

A local I/O configuration is contained in one rack and includes all Quantum modules mounted in a standard Quantum backplane. Quantum Local I/O can be as few as one I/O module (in a three slot backplane), or as many as 14, along with a CPU and power supply in a single 16 slot backplane.

If required for the application, system interface modules are also included in the Local I/O backplane. These modules could consist of one RIO processor or network option modules.

I/O Configuration

The following figure is an example of a typical local I/O configuration.



Note: A maximum of 448 digital I/O points (14, 4x8 digital I/O modules), or a maximum of 48 analog input channels (six 8-channel analog in modules) and 32 analog output channels (eight 4-channel analog out modules) may be serviced in a single local I/O rack.

Quantum Remote I/O (RIO)

Overview

Quantum RIO can be set up in single or dual cable configurations (refer to the following two figures) and is contained in one rack at each RIO drop. When RIO is used, the Quantum CPU may support several drops (a drop can be either Quantum, SY/MAX, 200, 500, or 800 Series I/O systems).

> **Note:** As stated above, the Quantum provides connectivity to other Modicon I/O products via the same system. It will connect to 800 series I/O via the J890, J892, P890, or P892 remote I/O adapters; 200 series I/O via J290 and J291 remote I/O adapters; 500 series I/O via 29X/J540 remote I/O adapters; and SY/MAX 8030CRM931

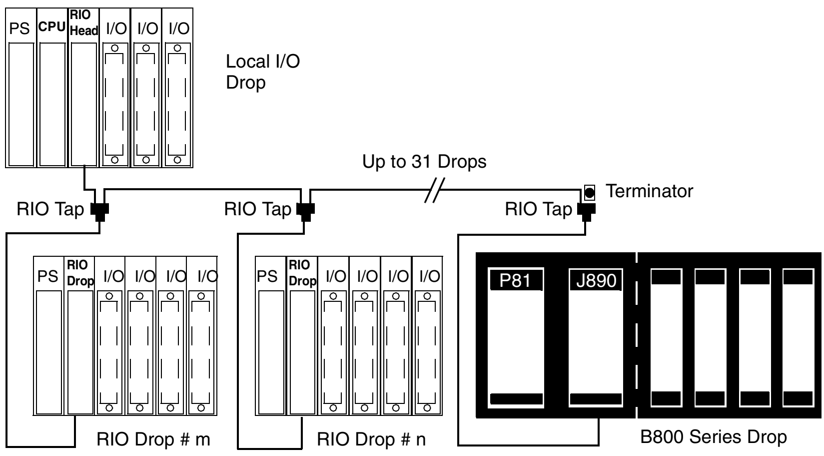
Related Documentation

For more information on use and installation of Quantum RIO, see *Modicon Remote I/O Cable Syustem Planning and Installation Guide*, Part Number 890USE10100

For more information on Hot Standby systems, see the *Quantum Hot Standby Installation and Planning Guide*, Part Number 840USE10600.

Single Cable RIO Configuration

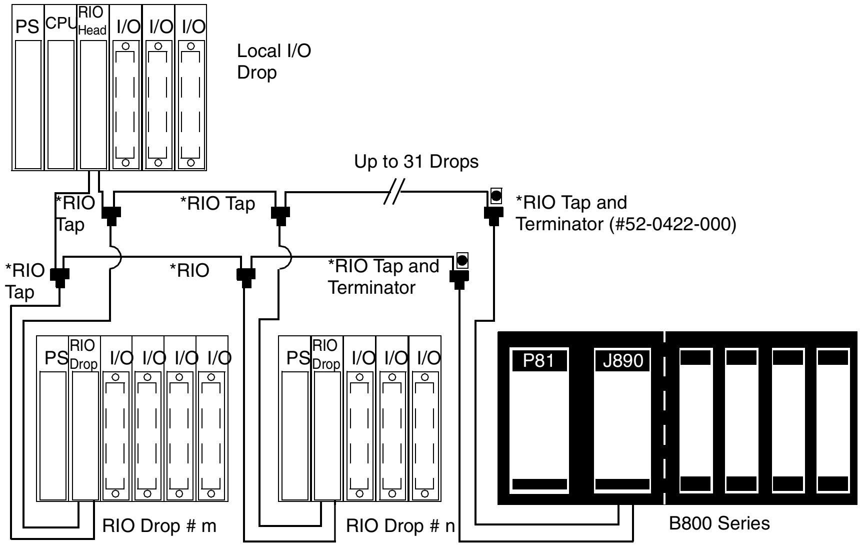
The following figure is an example of a single cable Quantum RIO configuration.



*A RIO tap is required for every RIO drop in the system.

Dual Cable RIO Configuration

The following figure is an example of a dual cable Quantum RIO configuration.



*An RIO tap (# MA-0185-100) is required for every RIO drop in the system.

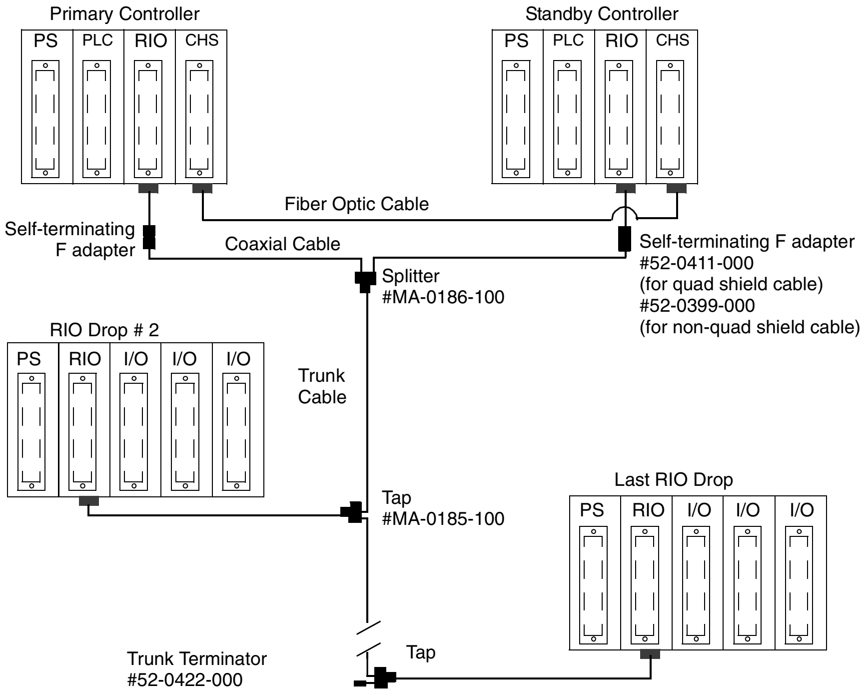
Note: The dual cable option is provided for systems that require added protection against cable breaks or damaged connectors. With two cables connected between the host and each node, no single cable break will disrupt communications.

Hot Standby System

The Quantum Hot Standby system is designed for use with remote I/O networks. A Quantum Hot Standby system may be set-up using single or dual cable configurations (refer to the following two figures).

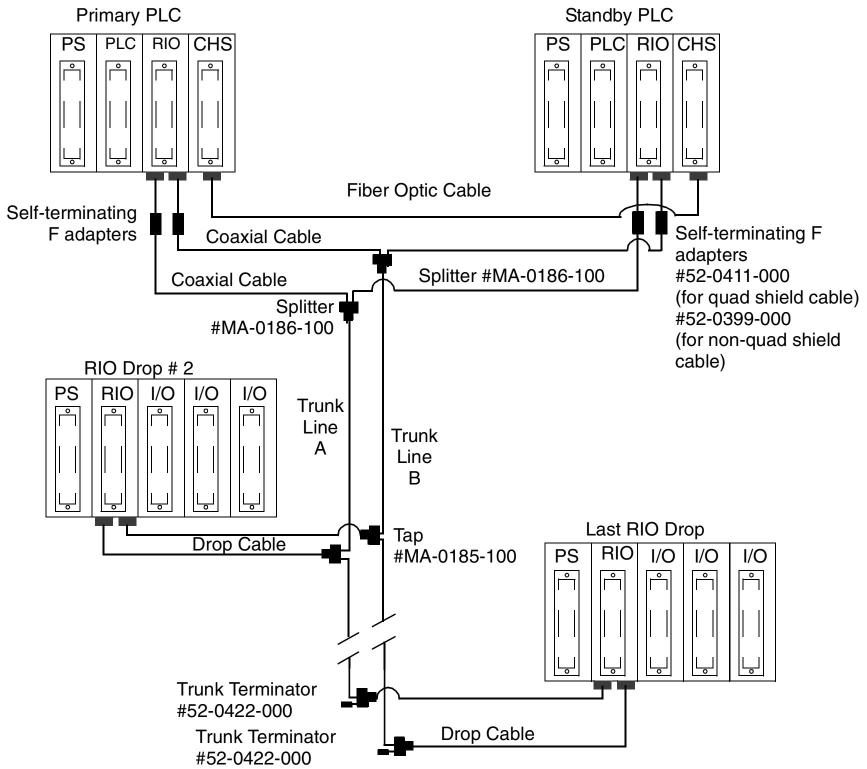
Single Cable Hot Standby Configuration

The following figure is an example of a single cable Quantum hot standby configuration.



Dual Cable Hot Standby Configuration

The following figure is an example of a dual cable Quantum Hot Standby configuration.



Quantum Distributed I/O (DIO)

Overview

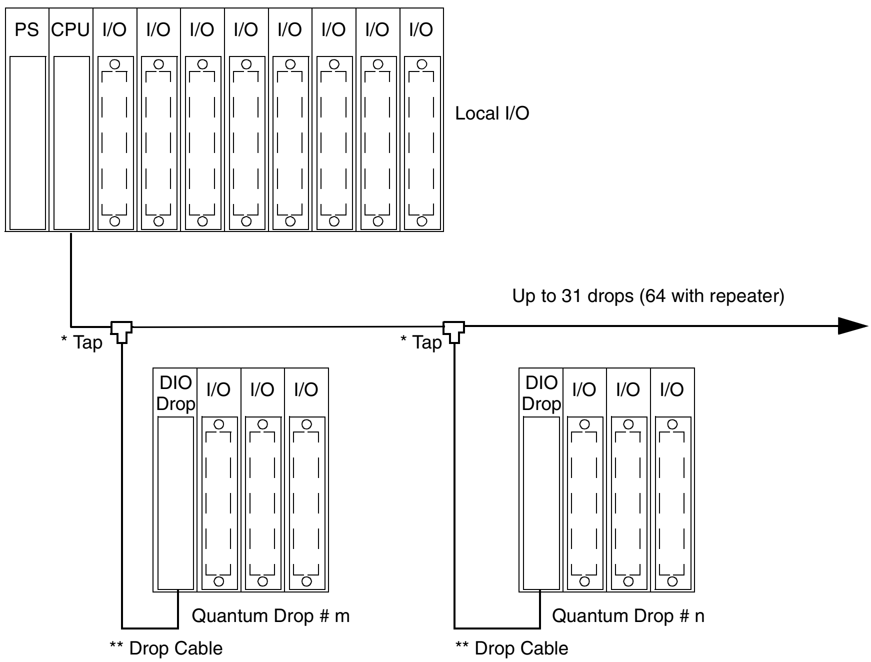
Quantum DIO can be set up in standard single or dual cable configurations (refer to the following two figures). The Quantum DIO architecture is based on Modicon's Modbus Plus technology. When DIO is utilized, the Quantum system may support up to three distributed networks of up to 64 drops (using a repeater) each. Communication between the various nodes and the Modbus Plus head, in both single and dual cable DIO configurations, is done by twisted pair cabling from the head to the DIO adapters at the drops.

Related Documentation

For detailed information concerning the Quantum DIO systems, refer to the *MODBUS Plus I/O Servicing User Guide*, part number 840USE10400.

Single Cable DIO Configuration

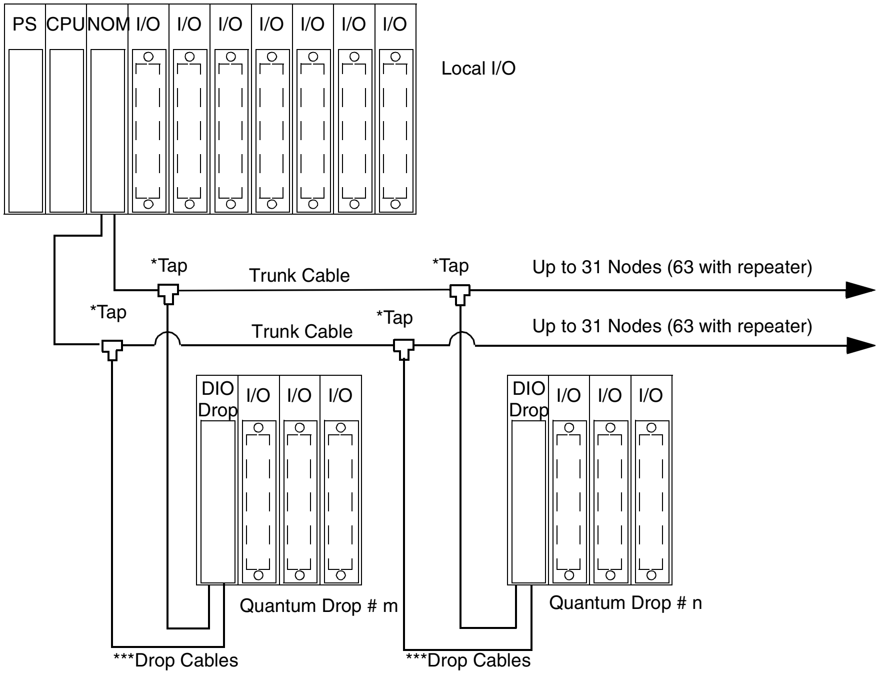
The following figure is an example of a single cable Quantum DIO configuration.



* A MODBUS Plus tap is required for every participant on the network.
** A drop cable is required for each drop from the MODBUS Plus tap.
(Cables are not included with the modpdules and need to be ordered.)

Dual Cable DIO Configuration

The following figure is an example of a dual cable Quantum DIO configuration.



*A MODBUS Plus tap (plastic, Part # 990NAD23000; ruggedized, Part # 990NAD23010) is required for every participant on the network.
***A drop cable (8 ft/2.4 m, Part # 990NAD21110; 20 ft/6 m, Part # 990NAD21130) is required for each drop from the MODBUS Plus tap. Cables are not included with the modules and need to be ordered.

Note: The dual cable option is provided for systems that require added protection against cable breaks or damaged connectors. With two cables connected between the host and each node, no single cable break will disrupt communications.

Part Numbers

MODBUS Plus taps that can be used for single and dual cable DIO configurations include:
- Part Number 990NAD23000, plastic; and
- Part Number 990NAD23010, ruggedized.

The following MODBUS Plus trunk cables can be used with these DIO configurations:
- Part Number 490NAA27101 (100 ft/30 m)
- Part Number 490NAA27102 (500 ft/152 m)
- Part Number 490NAA27103 (1000 ft/304 m)
- Part Number 490NAA27104 (1500 ft/456 m)
- Part Number 490NAA27105 (5000 ft/1520 m)

Drop cables that can be used for these configurations include:
- Part Number 990NAD21110 (8 ft/2.4 m)
- Part Number 990NAD21130 (20 ft/6 m)

Network Configurations

3

At a Glance

Introduction

The following chapter provides information on the Quantum network support, network interface techniques, and Modbus and Modbus Plus communications.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
Quantum Network Support	42
Quantum Network Interface Techniques	45
Quantum Modbus and Modbus Plus Communications	49

Quantum Network Support

Overview

Quantum systems provide multiple choices for open, standards-based networking and fieldbus connectivity requirements. The Quantum supported networks include:

- Modbus
- Modbus Plus
- Remote I/O
- TCP/IP Ethernet
- SY/MAX Ethernet
- MMS Ethernet
- Interbus
- LonWorks
- SERCOS

Combinations of these networks can be used to provide simple, high performance communication architectures which meet the tightly integrated needs of computer and controller connectivity. A summary of the services available on these networks is shown in the following table.

Quantum Supported Networks

The following table shows the Quantum supported networks.

Service Description	Modbus	Modbus Plus	Remote I/O	Ethernet			Interbus	LonWorks	SERCOS	Profibus
				TCP/IP	SY/MAX	MMS				
Native to Quantum CPU	Y	Y	N	N	N	N	N	N	N	N
Available on a Network Module	Y	Y	Y	Y	Y	Y[5]	Y	Y	Y	Y
CPU Programming	Y[1]	Y	N	Y	N	N	N	N	N	N
CPU Executive Firmware Loading Support	Y[1]	Y[1]	N	N	N	N	N	N	N	N
Module Firmware Loaded From CPU	Y	Y	Y	Y	Y	Y	N[6]	N	Y	Y
Report By Exception Communica-tions	Y[2]	Y	N	Y	Y	Y[5]	N	N	N	N
Multi-node Broadcast Communica-tions	N	Y[1]	N	N	N	N	N	N	N	N
Synchronized I/O Scanning	N	N	Y	N	N	N	N	N	Y	Y
NonSynchro-nized I/O Scanning	N	Y[1]	N	N	N	N	Y	Y	N	N
Quantum I/O Drops	N	Y[1]	Y	N	N	N	N	N	N	N
Hot Standby Quantum I/O Drop Support	N	N	Y	N	N	N	N	N	N	N

Service Description	**Modbus**	**Modbus Plus**	**Remote I/O**	**Ethernet**			**Interbus**	**LonWorks**	**SERCOS**	**Profibus**
				TCP/ IP	**SY/ MAX**	**MMS**				
Hot Standby Data Communications Support	Y	Y	N	Y	N	N	N	N	N	N
Optional Dual Cabling	N	Y[1]	Y	N	N	N	N	N	N	N
Optional Fiber Optics	Y[3]	Y[1]	Y	Y	Y	Y[5]	Y[3]	Y[4]	Y[4]	N
Momentum I/O Drops	N	Y[1]	N	N	N	N	Y	N	N	Y
Variable Speed Drives	Y[3]	Y[1]	N	N	N	N	Y[3]	Y[4]	N	Y
Servo Motion Control	N	Y[1]	N	N	N	N	Y[3]	Y[4]	Y	Y
HMI: Displays & Panels	Y	Y[1]	Y	N	N	N	Y[3]	Y[4]	N	N
HMI: Work-stations	Y	Y[1]	N	Y	Y	Y[3, 5]	N	Y[4]	N	N

1. Refer to the Modbus Plus portion of the Quantum Specifier's guide section for details of available services on 140NOM2XXX00 Modbus Plus Network modules
2. Service is only available on the native controller Modbus port when the XMIT loadable is used.
3. Available from third parties.
4. The SERCOS network standard is fiber optics.
5. The software for this module is a modConnect product.
6. Module firmware loaded through serial port on module.

Quantum Network Interface Techniques

Overview

Quantum communication and networking modules use a variety of different techniques to interface to the Quantum controller over the local backplane.

Direct CPU Driver

This technique allows the CPU to control high speed data transfers to and from the communication and networking modules, maximizing throughput and performance.

This technique is used extensively by the Remote I/O network and Hot Standby system to ensure highly deterministic synchronization of the CPU and I/O scans.

Note: Only one Remote I/O Head Interface is supported for each Quantum CPU.

Option Module Interface

This technique allows the communication and networking modules to control data transfers to and from the CPU, maximizing the flexibility of the communications interface.

This technique is used extensively by the Modbus Plus and Ethernet peer-to-peer network modules. The number of option module interfaces supported by each CPU model is described in the following table.

CPU Interface Support

The following table shows the summary of Quantum CPU option module interface support in standalone configurations.

Quantum Controller Model Number	Available Option Module Interfaces Supported Per CPU
140CPU53414(A)	6
140CPU43412(A)	6
140CPU42402	6
140CPU21304	2
140CPU11303	2
140CPU11302	2

Note: Refer to *Quantum Modbus and Modbus Plus Communications, p. 49* for details of available services on 140NOM2XX00 Modbus Plus Network modules.

I/O Map Interface

Some network and communication modules are interfaced to the controller through the standard I/O map configuration tables. In the following table, note that some network and communication modules require a Loadable instruction which enhances the standard controller Executive to support certain unique features of individual modules.

In addition, some loadables allow the communication and networking modules to be controlled by means of user-application code. The number of loadables and associated modules that can be handled by an individual CPU depends upon its memory size, the size of the application program, and the size of the loadables.

Communications and Networking

The following table shows the Quantum communications and networking modules.

Model Number	Description	Module Interface Technique	Loadable Required	Backplane Support			Bus Power mA
				Local	RIO	DIO	
140CRP81100	Profibus	Direct CPU Driver	N	Y	N	N	1200
140CRP93100	Remote I/O Head Interface, single cable	Direct CPU Driver	N	Y	N	N	780
140CRP93200	Remote I/O Head Interface, dual cable	Direct CPU Driver	N	Y	N	N	780
140CHS21000	Hot Standby Processor Kit	Direct CPU Driver	Y	Y	N	N	700
140NOA61110	Interbus Master	Direct CPU Driver	Y	Y	N	N	700
140NOM21100	Modbus Plus Options, single cable	Option Module	N	Y	N	N	780
140NOM21200	Modbus Plus Option, dual cable	Option Module	N	Y	N	N	780
140NOM25200	Modbus Plus Option, single channel fiber	Option Module	N	Y	N	N	900
140NOE21100	Ethernet TCP/IP Twisted Pair	Option Module	N	Y	N	N	1000
140NOE25100	Ethernet TCP/IP Fiber Optic	Option Module	N	Y	N	N	1000
140NOE31100	Ethernet SY/MAX Twisted Pair	Option Module	N	Y	N	N	1000
140NOE35100	Ethernet SY/MAX Fiber Optic	Option Module	N	Y	N	N	1000
140NOE5100[1]	Ethernet MMS Twisted Pair	Option Module	N	Y	N	N	1000
140NOE55100[1]	Ethernet MMS Fiber Optic	Option Module	N	Y	N	N	1000

Model Number	Description	Module Interface Technique	Loadable Required	Backplane Support			Bus Power mA
				Local	RIO	DIO	
140NOE77100/1	Ethernet TCP/IP 10/100 TX/FX	N	N	Y	N	N	750
140NOE77110/1	Ethernet TCP/IP 10/100 TX/FX Factory Cast	N	N	Y	N	N	750
140MMS42500	Multi-Axis Motion Controller w/ SERCOS	Option Module	N	Y	N	N	2500
140NOL91100	LonWorks Interface, twisted pair FTT10	I/O Map (16/ 16)	Y	Y	Y	N	950
140NOL91110	LonWorks Interface, twisted pair TPT/XF-78	I/O Map (16/ 16)	Y	Y	Y	N	950
140NOL91120	LonWorks Interface, twisted pair TPT/XF-1250	I/O Map (16/ 16)	Y	Y	Y	N	950

1. The software for this module is a ModConnect product.

Quantum Modbus and Modbus Plus Communications

Overview

Each Quantum CPU includes both a Modbus and Modbus Plus communications port. The features offered by both these communication protocols are listed in the following table.

Modbus and Modbus Plus Features

The following table shows the Modbus and Modbus Plus features.

Features	Modbus	Modbus Plus
Technique	Slaves polled by a master	Peer-to-peer, token rotation
Speed	19.2K typical	1 M
Electrical	RS-232, various others	RS-485
Distance without repeater	RS-232, 50 ft. (15 m)	1,500 ft. (457 m)
Media	Various	Twisted pair, Fiber optics
Max nodes per network	247	64
Max network traffic	300 registers/sec @ 9.6 Kb	20,000 registers/sec
Programming	Yes	Yes
Read/Write data	Yes	Yes
Global data	No	Yes
Peer Cop	No	Yes

Modbus

Modbus, a master/slave protocol, is a de facto industry standard with support from over 500 industrial suppliers.

On-line programming or data acquisition applications are easily supported directly from the serial port of any computer.

Modbus can be used in either a simple point-to-point manner with a pair of devices, or in a network architecture with up to 247 slave devices.

Modbus Plus

Modbus Plus combines high speed, peer-to-peer communication and easy installation to simplify applications and reduce installation costs.

It allows host computers, controllers and other data sources to communicate as peers throughout the network via low-cost twisted pair cable or optional fiber optic cable.

As a deterministic token-passing network, Modbus Plus communicates at one megabaud for fast access to process data. It’s strength is its ability to control real-time control devices like I/O and drives, without degraded performance due to loading or traffic.

Bridging between Modbus and Modbus Plus is done automatically on CPUs and Modbus Plus network modules.

The bridge mode redirects Modbus messages onto the Modbus Plus network for easy connectivity between Modbus and Modbus Plus devices.

A summary of the available services on Quantum Modbus and Modbus Plus ports is given in the following table.

Modbus and Modbus Plus Services

The following table shows the Quantum Modbus and Modbus Plus services.

Type	Service Description	Native CPU Ports		NOM 1-2 Ports		NOM 3-6 Ports	
		Modbus	Modbus Plus	Modbus	Modbus Plus	Modbus	Modbus Plus
Modbus Services	Default Modbus Port Parameters	Y	-	Y	-	Y	-
	Configurable Modbus Port Parameters	Y	-	Y	-	Y[5]	-
	Modbus to Modbus Plus Bridging	Y[2]	-	Y[3]	-	Y[3]	-
	Local CPU Programming	Y[4]	-	Y[4]	-	N	-
	Remote CPU Programming over Modbus Plus	Y[4]	-	Y[4]	-	Y[2]	-
	Modbus access to local CPU	Y	-	Y	-	N	-
	Modbus access to remote CPU over Modbus Plus	Y	-	Y	-	Y	-
	Modbus Network Slave Support	Y	-	N	-	N	-
	Modbus Master support with XMIT Loadable	Y	-	N	-	N	-
	Executive Firmware Loading Support	Y	-	N	-	N	-
Modbus Plus Services	MSTR read/write register messaging[6]	-	Y	-	Y	-	Y
	MSTR read/write Global Data messaging	-	Y	-	Y	-	Y
	MSTR get/clear local/remote statistics	-	Y	-	Y	-	Y
	Config Extension Global Data Support	-	Y	-	Y	-	N
	Config Extension Peer Cop Support	-	Y	-	Y	-	N
	Distributed I/O Support	-	Y	-	Y	-	N
	CPU Programming	-	Y[4]	-	Y[4]	-	Y[4]
	Executive Firmware Loading Support	-	Y	-	N	-	N

Note:
1. Only supported on the 140CPU42402, 140CPU42412(A) and 140CPU53414(A) Quantum Controllers.
2. The native CPU Modbus port can be disabled from bridge mode operation with the native Modbus Plus Port.
3. Modbus ports on NOMs are always in bridge mode with their associated Modbus Plus port.
4. Only one programmer connection can be logged in at a time to any CPU, and only one program monitor can be attached at a time to any CPU.
5. Modbus port parameters on NOMs 3-6 are defined by Modbus Port 3 in Concept and Modsoft when the comm parameter selector switch is in mem.
6. Up to 4 MSTR read/write register instructions can be serviced per CPU scan per Modbus Plus port.

Quantum System Specifications

III

At a Glance

Overview

This part provides system specifications for the Quantum automation system.

What's in this Part?

This part contains the following chapters:

Chapter	Chapter Name	Page
4	System Specifications for the Quantum Module	55

System Specifications for the Quantum Module

4

Quantum System Specifications

Overview

All modules are designed to the following system specifications, which include:
- Mechanical
- Electrical
- AC/DC power supplies

It shows the I/O modules operating voltages for:
- Less than 24 Vac or Vdc
- Between 24 and 48 Vac or Vdc
- Greater than 48 Vac or Vdc

Also given are the operating and storage conditions as well as agency approvals.

Mechanical Specifications

The following table shows individual Quantum module mechanical specifications.

Weight	2 lbs. (1 kg) max
Dimensions (H x D x W)	9.84 in. x 4.09 in. x 1.59 in. (250 mm x 103.85 mm x 40.34 mm)
Wire Size	1-14 AWG or 2-16 AWG max. 20 AWG min.
Material (Enclosures and Bezels)	Lexan
Space Requirements	1 backplane slot

Electrical Specifications

The following table shows the Quantum electrical specifications.

RFI Immunity (IEC 1000-4-3)	80 ...1000 MHz, 10 V/m
Ground Continuity (IEC 1000-4-5)	2 kV shield to ground
Electrostatic Discharge (IEC 1000-4-2)	8 kV air / 4 kV contact
Flammability	Wiring Connector: 94V-0 Module Enclosure: 94V-1

AC/DC Power Supplies

The following table shows the Quantum AC/DC power supplies.

Fast Transients (IEC 1000-4-4)	2 kV common mode
Damped Ocillatory Transients	2 kV common mode. 1 kV differential mode
Surge Withstand Capability (Transients) (IEC 1000-4-5)	2 kV common mode. 1 kV differential mode
Non Periodic Peak Input Voltage	2.3 times nominal for 1.3 ms (Nominal = DC average or AC peak)

I/O Modules - Table 1

The following table shows the Quantum function I/O modules with operating voltages less than 24 Vac or Vdc.

Fast Transients (IEC 1000-4-4)	0.5 kV common mode
Damped Oscillatory Transients	1 kV common mode. 0.5 kV differential mode
Surge Withstand Capability (Transients) (IEC 1000-4-5)	1 kV common mode. 0.5 kV differential mode

I/O Modules - Table 2

The following table shows the Quantum I/O modules with operating voltages between 24 and 48 Vac or Vdc.

Fast Transients (IEC 1000-4-4)	1 kV
Damped Oscillatory Transients	2 kV common mode. 1 kV differential mode
Surge Withstand Capability (Transients) (IEC 1000-4-5)	1 kV common mode. 0.5 kV differential mode

I/O Modules - Table 3

The following table shows the Quantum I/O modules with operating voltages greater than 48 Vac or Vdc.

Fast Transients (IEC 1000-4-4)	2 kV
Damped Oscillatory Transients	2 kV common mode. 1 kV differential mode
Surge Withstand Capability (Transients) (IEC 1000-4-5)	2 kV common mode. 1 kV differential mode

Operating Conditions

The following table shows the Quantum operating conditions.

Temperature	0 ... 60° C (32 ... 140° F)
Humidity	90 ... 95 percent RH non-condensing at 60° C
Chemical Interactions	Enclosures and bezels are made of Lexan, a polycarbonate. This material can be damaged by strong alkalis and various hydrocarbons, esters, halogens and ketones in combination with heat. Common products containing these include detergents, PVC products, petroleum products, pesticides, disinfectanats, paint removers, and spray paints.
Altitude	2,000 meters. When the altitude exceeds this, reduce the 60°C maximum operating temperature by 6°C per 1000 meters of additional elevation.
Vibration	10 ... 57 Hz at 0.075 mm d.a. 57 ... 150 Hz at 1 g
Shock	+/-15 g peak, 11 ms, half-sine wave

Gas Resistance in Conformally Coated Modules

The following table shows gas resistance data for conformally coated Quantum modules.

Mixed Flowing Gas Test, 22 days exposure			
Standard	**Gas**	**Test Requirment**	**Actual Exposure**
EIA364-65 Level III	CL_2 (Chlorine)	20 PPB, +/- 5 PPB	20 PPB
	NO_2 (Nirtic Oxide)	200 PPB, +/- 50 PPB	1250 PPB
	H_2S (Hydrogen Sulfide)	100 PPB, +/- 20 PPB	100 PPB
	SO_2 (Sulfur Oxide)	N/A	300 PPB
ISA-S71.04 (GX Severe)	CL_2 (Chlorine)	10 PPB	20 PPB
	NO_2 ((Nitric Oxide)	1250 PPB	1250 PPB
	H_2S (Hydrogen Sulfide)	50 PPB	100 PPB
	O_2 (Sulfur Oxide)	300 PPB	300 PPB

Storage Conditions

The following table shows the Quantum storage conditions.

Temperature	-40 ... 85° C (-40 ... 185° F)
Humidity	0 ... 95 percent RH non-condensing at 60° C
Free Fall	3 ft. (1 m)

Agency Approvals

The following table shows the agency approvals.

UL 508
CSA 22.2-142
Factory Mutual Class 1, Div 2
European Directive on EMC 89/336/EEC (CE)

Note: All Quantum system modules contain static-sensitive components. Each module is labeled with the following static-sensitive symbol.
The following figure shows the static sensitive symbol.

Specifications

IV

What's in this Part?

This part contains the following chapters:

Chapter	Chapter Name	Page
5	Hardware Specifications for the Quantum Modules	63
6	Power Supply Modules	77
7	CPU Modules	119
8	Quantum Field Bus Modules	219
9	Distributed I/O (DIO) for the Quantum Modules	247
10	Quantum Remote I/O Communication Modules	259
11	Quantum Modbus Plus Network Option Modules	271
12	Quantum Modbus Plus Networking on Fiber Module	281
13	Quantum Ethernet Modules	305
14	Intelligent/Special Purpose Modules for the Quantum	333
15	Quantum Intrinsically Safe Analog/Digital, Input/Output Modules	421
16	Quantum Simulator Modules	479
17	Quantum Battery Module	487
18	Quantum I/O Modules	495

Hardware Specifications for the Quantum Modules

5

Quantum Hardware Specifications

Overview

This section shows the specifications for Quantum hardware modules including:
- Power Supplies
- CPUs
- Networking
- Intelligent/Special Purpose
- I/O

Power Supply Specifications

The following table shows the power supplies for local and RIO Drops.

Part Number	Source Voltage	Type	Bus Current Provided
140CPS11100	115 ... 230 Vac	Standalone	3 A
140CPS11400	115 ... 230 Vac	Standalone	8 A
140CPS11410	115 ... 230 Vac	Standalone/ Summable	8 A
140CPS11420	115 ... 230 Vac	Standalone/ Summable	11A/16A/20A
140CPS12400	115 ... 230 Vac	Standalone/ Redundant	3 A
140CPS12420	115 ... 230 Vac	Standalone/ Redundant	8A/10A/11A
140CPS21100	24 Vdc	Standalone	3 A
140CPS21400	24 Vdc	Standalone/ Summable	8 A
140CPS22400	24 Vdc	Standalone/ Redundant	8 A
140CPS41400	48 Vdc	Standalone/ Redundant	8 A
140CPS42400	48 Vdc	Standalone/ Redundant	8 A
140CPS51100	100 ... 150 Vdc	Standalone	3 A
140CPS52400	125 Vdc	Standalone/ Redundant	8 A

CPU Specifications

The following table shows specifications for the CPUs.

Part Numbers	Max IEC Program	SRAM Size	Ladder Logic	Available Registers	Bus Current Required
140CPU11302	109 k	256 k	8 k	10 k	780 mA
140CPU11303	368 k	512 k	16 k	10 k	790 mA
140CPU21304	606 k	768 k	32 k or 48 k	64 k or 32 k	900 mA
140CPU42402	570 k	2 M	64 k	64 k	1.8 A
140CPU43412	896 k	2 M	64 k	57 k	1.8 A
140CPU43412A	896 k	2 M	64 k	57 k	1.25 A
140CPU53414	2.5 M	4 M	64 k	57 k	1.8 A
140CPU53414A	2.5 M	4 M	64 k	57 k	1.25A

Networking Modules – RIO

The following table shows specifications for RIO Networking modules.

Part Numbers (RIO)	Drop Location	Communication Channel(s)	Bus Current Provided
140CRA93100	Remote (Drop)	1	600 mA
140CRA93200	Remote (Drop)	2	750 mA
140CRP93100	Local (Head)	1	600 mA
140CRP93200	Local (Head)	2	750 mA

Field Bus Modules

The following table shows specifications for field bus modules.

Part Number	Communication Channel(s)	Bus Current Required
140CRP81100	1 Profibus port, 1 RS-232 port (db 9 pin)	1.2 A
140EIA92100	1 AS-i	250mA
140NOA61100	1InterBus, LED display, gen 3	700 mA
140NOA61110	1 InterBus, 7 segment display, gen 3	700 mA
140NOA62200	1 InterBus, LED, gen 4	800 mA
140NOL91100	2 free topology, twisted pair; 78,000 BPS, LonWorks	400 mA
140NOL91110	2 linear topology, twisted pair, transformer isolated, 78,000 BPS, LonWorks	400 mA
140NOL91120	2 linear topology, twisted pair, transformer isolated, 1.25 BBPS, LonWorks	400 mA

Networking Modules – DIO (Modbus Plus)

The following table shows specifications for DIO Networking modules.

Part Numbers (DIO)	Source Voltage	Communication Channel(s)	Bus Current Provided
140CRA21110	115 Vac	1	3 A
140CRA21210	115 Vac	2	3 A
140CRA21120	24 Vdc	1	3 A
140CRA21220	24 Vdc	2	3 A

Networking Modules – Ethernet

The following table shows specifications for ethernet modules.

Part Numbers	Communication Channels	Bus Current Required
140NOE21100	1 10BASE-T Ethernet network (RJ-45) port	1 A
140NOE25100	1 10BASE-FL Ethernet network (ST-style) port	1 A
140NOE31100	1 10BASE-T Ethernet network (RJ-45) port	1 A
140NOE35100	2 10BASE-FL Ethernet network (ST-style) ports	1 A
140NOE51100	1 10BASE-T Ethernet network (RJ-45) port	1 A
140NOE55100	2 10BASE-FL Ethernet network (ST-style) ports	1 A
140NOE771xx	1 10/100 BASE-TX Ethernet network (RJ-45) port 1 100 BASE-FX (MT-RJ connector) fiber optic port	750 mA

Networking Modules – NOM

The following table shows specifications for Modbus Plus NOM Networking modules.

Part Numbers (NOM)	Communication Channels	Bus Current Required
140NOM21100	1, twisted pair, 1 Modbus, 9-pin D-Sub	780 mA
140NOM21200	2, twisted pair, 1 Modbus, 9-pin D-Sub	780 mA
140NOM25200	2, fiber optic (ST-style); 1 Modbus (RJ-45)	780 mA

Intelligent/ Special Purpose – Hot Standby Module

The following table shows specifications for the Hot Standby module.

Part Number	Communication Channel	Bus Current Required	Special Features
140CHS11000	Fiber Optic	700 mA	Use kit P/N - 140 CHS21000

Counter Modules

The following table shows specifications for the high speed Counter modules.

Part Number	Function	Points/ Channels	Bus Current Required	Special Features
140EHC10500	High Speed Counter (100 kHz)	5	250 mA	35 kHz @ 24 Vdc 100 kHz @ 5 Vdc
140EHC20200	High Speed Counter (500 kHz)	2	650 mA	500 kHz, Incremental or Quadrature

ASCII Interface Module

The following table shows specifications for the ASCII Interface Module.

Part Numbers	Function	Communication Channels	Bus Current Required	Special Features
140ESI06210	Intelligent, Bi-directional, ASCII Interface	2	300 mA	1 Port @ 19.2 kbps

High Speed Interrupt Module

The following table shows specifications for the High Speed Interrupt module.

Part Number	Function	Points/ Channels	Bus Current Required
140HLI34000	High Speed, Latch, and Interrupt	16	400 mA

Single Axis Motion Modules

The following table shows specifications for the Single Axis Motion modules.

Part Numbers	Function	Channels	Bus Current Required	Special Features
140MSB10100	Motion Controller, Single Axis Bi-directional, ASCII Interface	1	750 mA	Dual Encoder Feedback
140MSC10100	Motion Controller, Single Axis	1	1000 mA	Dual Encoder Feedback and Resolver Feedback

I/O Modules – Intrinsic Safe

The folloiwng tables shows specifications for the Intrinsic Safe modules.

Type/Part Number	Function	Points/ Channels	Pints Per Group	Bus Current Required
140DII33000	Discrete In	8	N/A	400 mA
140DIO33000	Discrete Out	8	N/A	2.2 A max
140AII33000	Analog In RTD/TC	8	N/A	400 mA
140AII33010	Analog In 0 ... 20 mA 0 ... 25 mA 4 ... 20 mA	8	N/A	1.5 A
140AIO33000	Analog Out 0 ... 20 mA 0 ... 25 mA 4 ... 20 mA	8	N/A	2.5 A

I/O Modules – Discrete In

The following table shows specifications for the Discrete In modules.

Type/Part Number	Function	Points/ Channels	Points per Group	Bus Current Required	Special Features
140DAI34000	24 Vac	16	N/A	180 mA	Isolated
140DAI35300	24 Vac	32	8	250 mA	Grouped
140DAI44000	48 Vac	16	N/A	180 mA	Isolated
140DAI45300	48 Vac	32	8	250 mA	Grouped
140DAI54000	115 Vac	16	N/A	180 mA	Isolated
140DAI54300	115 Vac	16	8	180 mA	Grouped
140DAI55300	115 Vac	32	8	250 mA	Grouped
140DAI74000	230 Vac	16	N/A	180 mA	Islolated
140DAI75300	230 Vac	32	8	250 mA	Grouped
140DDI15310	5 Vdc	32	8	170 mA	Grouped
140DDI35300	24 Vdc	32	8	330 mA	Grouped
140DSI35300	24 Vdc	32	8	250 mA	Supervised inputs grouped
140DDI35310	24 Vdc	32	8	330 mA	Grouped
140DDI36400	24 Vdc	96	16	270 mA	Grouped
140DDI67300	125 Vdc	24	8	200 mA	Grouped
140DDI84100	10 ... 60 Vdc	16	2	200 mA	Grouped
140DDI85300	10 ... 60 Vdc	32	8	300 mA	Grouped
140DSI35300	24 Vdc	32	8	250 mA	Supervised Inputs Grouped

I/O Modules – Discrete Out

The following table shows specifications for the Discrete Out modules.

Type/Part Number	Function	Points/ Channels	Points per Group	Bus Current Required	Special Features
140DAO84000	24 ... 230 Vac	16	N/A	350 mA	4 A per point, isolated
140DAO84010	24 ... 115 Vac	16	N/A	350 mA	4 A per point, isolated
140DAO84210	115 ... 230 Vac	16	4	350 mA	4 A per point, group fused
140DAO84220	24 ... 48 Vac	16	4	350 mA	4 A per point, group fused
140DAO85300	230 Vac	32	8	1A	1 A per point, group fused
140DDO15310	5 Vdc	32	8	350 mA	0.5 A per point, group fused
140DDO35300	24 Vdc	32	8	330 mA	0.5 A per point, group fused
140DDO35301	24 Vdc	32	8	250 mA	0.5 A per point
140DDO35310	24 Vdc	32	8	330 mA	0.5 A per point, group fused
140DDO36400	24 Vdc	96	16	250 mA	0.5 A per point, group fused
140DDO84300	10 ... 60 Vdc	16	8	160 mA	2 A per point, group fused
140DDO88500	24 ... 125 Vdc	12	6	6 points: 375 mA 12 points: 650 mA	0.5 A per point with short circuit protection, Group fused

Type/Part Number	Function	Points/ Channels	Points per Group	Bus Current Required	Special Features
140DRA84000	N.O. Relay	16	1	1,100 mA	2 A per point
140DRC83000	N.O./N.C. Relay	8	1	560 mA	5 A per point
140DVO85300	10 ... 30 Vdc	32	8	500 mA	0.5 A per point, verified output, group fused

I/O Modules – Discrete In/Out

The following table shows specifications for the Discrete In/Out modules.

Type/Part Number	Type/Part Number	Points/ channels	Points per group	Bus current required	Special features
140DAM59000	115 Vac	16 In 8 Out	8 4	250 mA	0.5 A per point on outputs, grouped fused
140DDM39000	24 Vdc	16 In 8 Out	8 4	330 mA	0.5 A per point on outputs, grouped fused
140DDM69000	125 Vdc	4 In 4 Out	4 N/A	350 mA	Inputs: Grouped Outputs: 4 A per point isolated

I/O Modules – Analog In/Out

The following table shows specifications for the Analog In/Out module.

Type/Part Number	Function	Points/ Channels	Points per group	Bus Current Required	Special Features
140AMM09000	**Inputs** Vdc: +/- 10 +/- 5 0 ... 10 0 ... 5 1 ... 5 mA: +/- 20 0 ... 20 4 ... 20	4 In	N/A	350 mA	Mixed inputs, current or voltage
	Outputs 4 ... 20 mA	2 Out	N/A		Isolated

I/O Modules – Analog In

The following table shows specifications for the Analog In modules.

Type/Part Number	Function	Points/ Channels	Points per Group	Bus Current Required	Special Features
140ACI03000	4 ... 20 mA 1 ... 5 Vdc	8	1	240 mA	Mixed inputs, current or voltage
140ACI04000	0 ...25 mA 0 ... 20 mA 4 ... 20 mA	16	16	360 mA	High density
140ARI03010	RTD: Pt, Ni, Ohms	8	1	200 mA	IEC/American
140AVI03000	0 ... 20 mA, +/- 20 mA +/- 10 Vdc +/- 5 Vdc	8	1	280 mA	Mixed inputs, current or voltage
140ATI03000	T/C: B, E, J, K, R, S, T	8	1	280 mA	CJC INT/EXT

I/O Modules – Analog Out

The following table shows specifications for the Analog Out modules.

Type/ Part Number	Function	Points/ Channels	Points per group	Bus Current Required	Special Features
140ACO02000	4 ... 20 mA	4	N/A	480 mA	Channels isolated
140ACO13000	0 ... 25 mA 0 ... 20 mA 4 ... 20 mA	8	8	550 mA	High density
140AVO02000	0 ... 10 Vdc, +/1 10 Vdc 0 ... 5 Vdc +/- 5 Vdc	4	N/A	700 mA	Mixed outputs

Intrinsic Safe Analog Modules

The following table shows specifications for the Intrinsic Safe analog modules.

Type/Part Number	Function	Points/ Channels	Points per Group	Bus Current Required	Special Features
140AII33000	TC: B, E, J, K, R, S, T RTD: Pt, Ni Ohms	8	1	400 mA	CJC INT/EXT IEC/American
140AII33010	0 ... 25 mA 0 ... 20 mA 4 ... 20 mA	8	8	1.5 A	Mixed inputs, current. Internal power supply.
140AIO33000	0 ... 25 mA 0 ... 20 mA 4 ... 20 mA	8	8	2.5 A	Internal power supply.

Intrinsic Safe Discrete Modules

The following table shows the specifications for the Intrinsic Safe discrete modules.

Type/Part Number	Function	Points/ Channels	Points per Common	Bus Current Required	Special Features
140DII33000	Discrete In	8	8	400 mA	Internal power supply
140DIO33000	Discrete Out	8	8	2.2 A	Internal power supply

Miscellaneous Modules

The following table shows specifications for miscellaneous modules.

Type/Part Number	Function	Bus Current Required
140XBE10000	Backplane expander	500 mA
140XCP90000	Battery backup	None
140XSM01000	Analog simulator	None

Power Supply Modules

6

At a Glance

Overview

The following chapter describes the Quantum power supplies, including: specifications, LED indicators and descriptions, and wiring diagrams. Where applicable, it includes operating curves and hold-up capacitor timing charts.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
140CPS11100 AC Power Supply 115/230 Vac 3 A Module	78
140CPS11400 AC Power Supply, 115/230 Vac, 8 A Module	82
140CPS11410 AC Summable Power Supply 115/230 Vac, 8 A	85
140CPS11420 AC Summable Power Supply 115/230 Vac, 11 A	88
140CPS12400 AC Redundant Power Supply, 115/230 Vac 8 A Module	91
140CPS12420 AC Redundant Power Supply, 115/230 Vac 11 A Module	94
140CPS21100 DC Power Supply, 24 Vdc, 3 A Module	97
140CPS21400 DC Summable Power Supply, 24 Vdc, 8 A Module	100
140CPS22400 DC Redundant Power Supply, 24 Vdc, 8 A Module	103
140CPS41400 DC Summable Power Supply, 48 Vdc, 8 A Module	106
140CPS42400 DC Redundant Power Supply, 48 Vdc, 8 A Module	109
140CPS51100 DC Power Supply, 125 Vdc, 3 A Module	113
140CPS52400 DC Standalone/Redundant Power Supply, 125 Vdc, 8 A	116

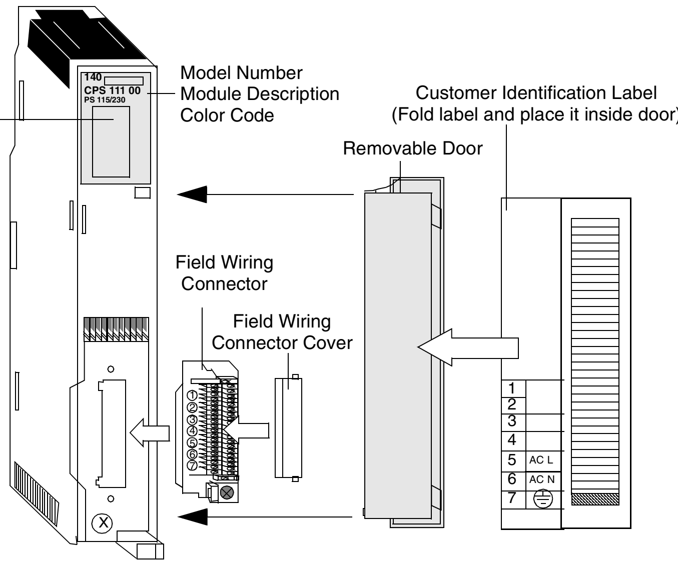
140CPS11100 AC Power Supply 115/230 Vac 3 A Module

Overview

The following provides information on the AC Power Supply, 115/230 Vac, 3 A module.

Power Supply Module

The following figure shows the power supply module components.



Note: When field wiring the power supply module, the maximum wire size that should be used is 1 - 14 AWG or 2 - 16 AWG; the minimum is 20 AWG.

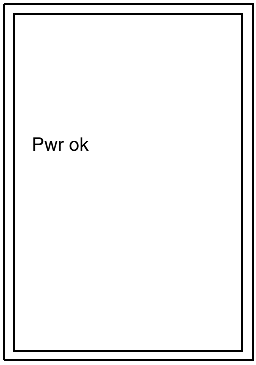
Specifications

The following table shows the specifications for the CPS11100 115/230 VAC power supply module.

Specifications	
Input Requirements	
Input Voltage	100 ... 276 Vac
Input Frequency	47 ... 63 Hz
Input Voltage Total Harmonic Distortion	Less than 10% of the fundamental ms value
Input Current	0.4 A @ 115 Vac. 0.2 A @ 230 Vac
Inrush Current	10 A @ 115 Vac. 20 A @ 230 Vac
VA Rating	50 VA
Input Power Interruption	1/2 cycle @ full load and minimum rated line voltage / frequency. No less than 1 second between interruptions.
Fusing (external)	1.5 A slo-blo recommended (Part # 043502515 or equivalent)
Output to Bus	
Voltage	5.1 Vdc
Maximum Current	3 A
Minimum Current	0.3 A
Protection	Over Current, Over Voltage
General	
Field Wiring Connector (included)	7 point terminal strip (Part # 043506326)
Internal Power Dissipation	2.0 + 3.0 x I_{OUT} = Watts (where I_{OUT} is in Amperes)
Operating Mode	Standalone

LED Indicator and Description

The following figure shows the CPS11100 LED indicator.



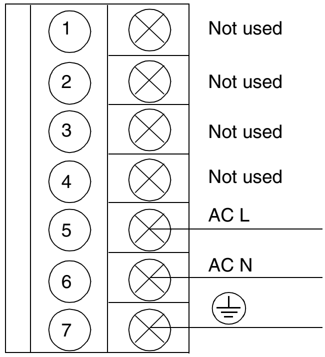
Note: For "Closed System" installations, connector 140XTS00 500 must be used (refer to *Closed System Installation, p. 853*).

The following table shows the CPS11100 LED description.

LED Description		
LEDs	**Color**	**Indication when On**
Pwr ok	Green	Power is supplied to the bus.

Wiring Diagram

The following figure shows the CPS11100 wiring diagram.



> **Note:** See *Power and Grounding Considerations for AC and DC Powered Systems, p. 832* for power and grounding wiring guidelines and operational information.

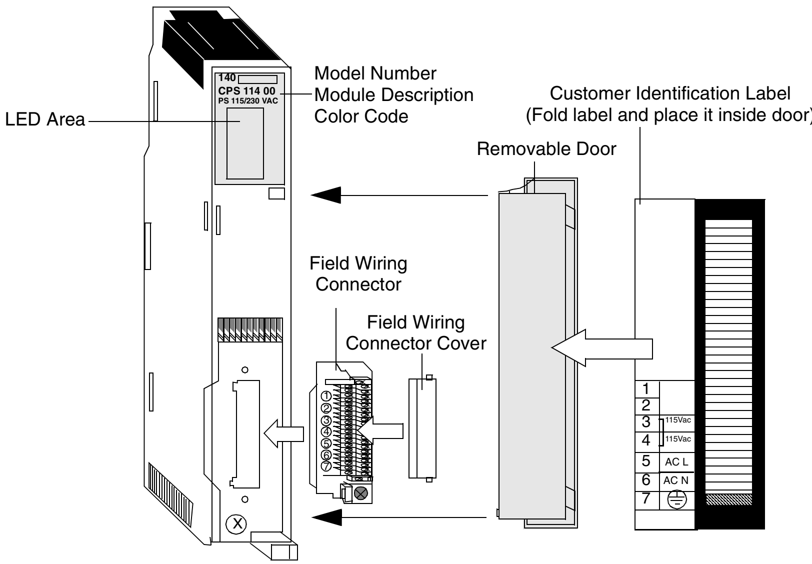
140CPS11400 AC Power Supply, 115/230 Vac, 8 A Module

Overview

The following provides information on the AC Power Supply, 115/230 Vac, 8 A module.

Power Supply Module

The following figure shows the power supply module components.



Note: When field wiring the power supply module, the maximum wire size that should be used is 1 - 14 AWG or 2 - 16 AWG; the minimum is 20 AWG.

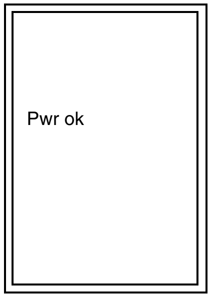
Specifications

The following table shows the specifications for the CPS11400 115/230 VAC power supply module.

Specifications	
Input Requirements	
Input Voltage	93 ... 138 Vac. 170 ... 276 Vac
Input Frequency	47 ... 63 Hz
Input Voltage Total Harmonic Distortion	Less than 10% of the fundamental ms value
Input Current	1.1 A @ 115 Vac. 0.6 A @ 230 Vac
Inrush Current	38 A @ 115 Vac. 19 A @ 230 Vac
VA Rating	130 VA
Input Power Interruption	1/2 cycle @ full load and minimum-rated line voltage / frequency. No less than 1 second between interruptions.
Fusing (external)	2.0 A slo-blo recommended (Part # 57-0089-000 or equivalent)
Output to Bus	
Voltage	5.1 Vdc
Maximum Current	8 A @ 60° C (See the operating curve below)
Minimum Current	None required
Protection	Over Current, Over Voltage
General	
Field Wiring Connector (included)	7 point terminal strip (Part # 043506326)
Internal Power Dissipation	6.0 + 1.5 x I_{out} = Watts (where I_{out} is in Amperes)
Operating Mode	Standalone

LED Indicator and Description

The following figure shows the CPS11400 LED indicator.

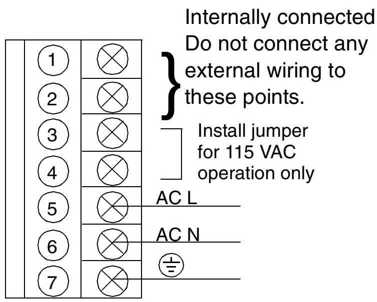


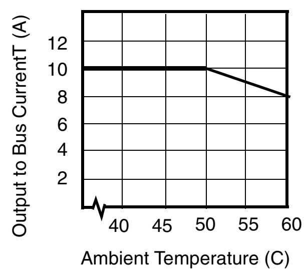
The following table shows the CPS11400 LED description.

LED Description		
LEDs	**Color**	**Indication when On**
Pwr ok	Green	Power is supplied to the bus.

Wiring Diagram and Operating Curve

The following figures show the CPS11400 Wiring Diagram (left) and operating curve (right).





Note: See *Power and Grounding Considerations for AC and DC Powered Systems, p. 832* for power and grounding wiring guidelines and operational information.

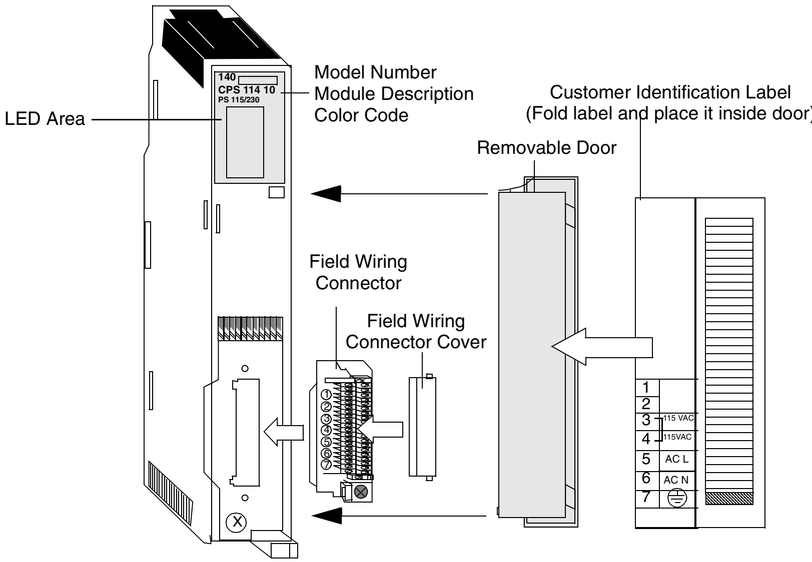
140CPS11410 AC Summable Power Supply 115/230 Vac, 8 A

Overview

The following provides information on the AC power supply, 115/230 Vac, 8 A module.

Power Supply Module

The following figure shows the power supply module and its components.



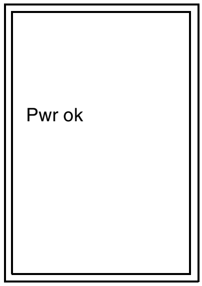
Specifications

The following table shows the specifications for the CPS11410 115/230 VAC power supply module.

Specifications	
Input Requirements	
Input Voltage	93 ... 138 Vac. 170 ... 276 Vac
Input Frequency	47 ... 63 Hz
Input Voltage Total Harmonic Distortion	Less than 10% of the fundamental rms value
Input Current	1.1 A @ 115 Vac. 0.6 A @ 230 Vac
Inrush Current	38 A @ 115 Vac. 19 A @ 230 Vac
VA Rating	130 VA
Input Power Interruption	1/2 cycle @ full load and minimum rated line voltage / frequency. No less than 1 second between interruptions.
Fusing (external)	2.0 A slo-blo recommended (Part # 57-0089-000 or equivalent)
Output to Bus	
Voltage	5.1 Vdc
Maximum Current	8 A @ 60° C
Minimum Current	None required
Protection	Over Current, Over Voltage
General	
Field Wiring Connector (included)	7 point terminal strip (Part # 043506326)
Internal Power Dissipation	6.0 + 1.5 x I_{OUT} = Watts (where I_{OUT} is in Amperes)
Operating Mode	Standalone / Summable

LED Indicator and Description

The following figure shows the CPS11410 LED indicator.

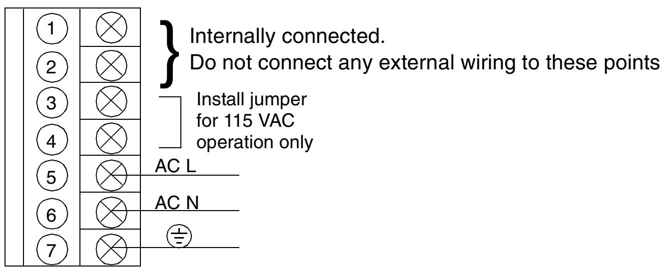


The following table shows the CPS11410 LED description.

LED Descripton		
LEDs	**Color**	**Indication when On**
Pwr ok	Green	Power is supplied to the bus.

Wiring Diagram

The following figures shows the 140CPS11410.



Note: See (See *Power and Grounding Considerations for AC and DC Powered Systems, p. 832*) for power and grounding wiring guidelines and operational information.

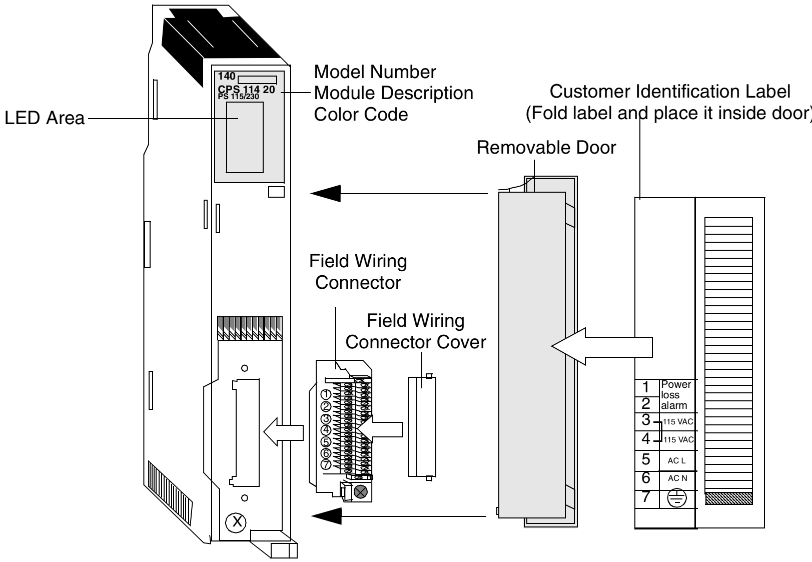
140CPS11420 AC Summable Power Supply 115/230 Vac, 11 A

Overview

The following provides information on the AC power supply, 115/230 Vac, 11 A module.

Power Supply Module

The following figure shows the power supply module and its components.



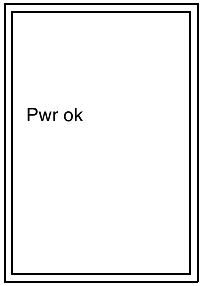
Specifications

The following table shows the specifications for the CPS11420 115/230 VAC power supply module.

Specifications	
Input Requirements	
Input Voltage	93 ... 138 Vac. 170 ... 264 Vac
Input Frequency	47 ... 63 Hz
Input Voltage Total Harmonic Distortion	Less than 10% of the fundamental rms value
Input Current	1.2 A @ 115 Vac. 0.7 A @ 230 Vac
Inrush Current @ 25° C (first power up)	≤ 20 A @ 115 Vac. ≤ 25 A @ 230 Vac
VA Rating	160 VA @ 11 A
Input Power Interruption	1/2 cycle @ full load and minimum rated line voltage / frequency. No less than 1 second between interruptions.
Fusing (external)	2.0 A slo-blo recommended (Part # 57-0089-000 or equivalent)
Output to Bus	
Voltage	5.1 Vdc
Maximum Current	Stand alone configuration: 11 A @ 60° C Summable configuration (Two 140CPS11420): 20 A @ 60° C (Total load capacity) Summable configuration (One 140CPS11420 and one 140CPS11410): 16A @ 60° C (Total load capacity)
Minimum Current	None required
Protection	Over Current, Over Voltage
General	
Field Wiring Connector (included)	7 point terminal strip (Part # 043506326)
Internal Power Dissipation	Less than 12 W at full load
Operating Mode	Standalone / Summable

LED Indicator and Description

The following figure shows the CPS11420 LED indicator.

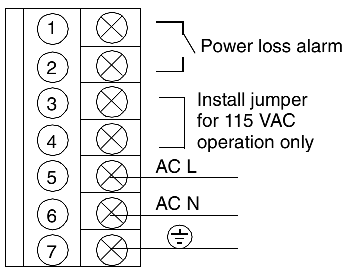


The following table shows the CPS11420 LED description.

LED Description		
LEDs	**Color**	**Indication when On**
Pwr ok	Green	Power is supplied to the bus.

Wiring Diagram

The following figures shows the CPS11420.



Note: A normally closed relay contact rated at 220 Vac, 6A / 30 Vdc, 5A is available on terminals 1 and 2 of the power terminal strip. This contact set may be used to signal input power OFF. The relay will de-energize when input power drops below 8 Vdc.

Note: See (See *Power and Grounding Considerations for AC and DC Powered Systems, p. 832*) for power and grounding wiring guidelines and operational information.

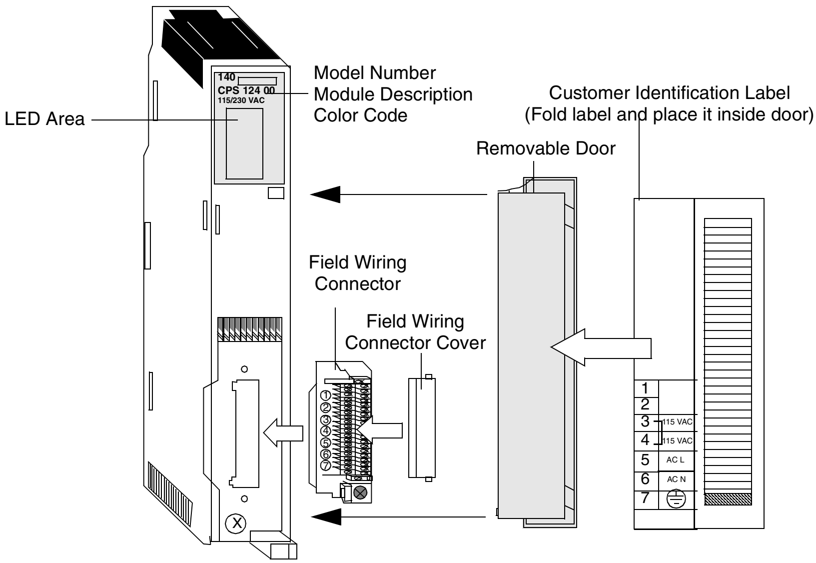
140CPS12400 AC Redundant Power Supply, 115/230 Vac 8 A Module

Overview

The following provides information on the AC redundant power supply, 115/230 Vac, 8 A module.

Power Supply Module

The following figure shows the power supply module components.



Note: When field wiring the power supply module, the maximum wire size that should be used is 1 - 14 AWG or 2 - 16 AWG; the minimum is 20 AWG.

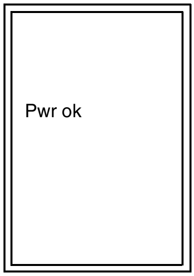
Specifications

The following table shows the specifications for the CPS12400 PS 115/230 VAC power supply module.

Specifications	
Input Requirements	
Input Voltage	93 ... 138 Vac. 170 ... 276 Vac
Input Frequency	47 ... 63 Hz
Input Voltage Total Harmonic Distortion	Less than 10% of the fundamental rms value
Input Current	1.1 A @ 115 Vac. 0.6 A @ 230 Vac
Inrush Current	38 A @ 115 Vac. 19 A @ 230 Vac
VA Rating	130 VA
Input Power Interruption	1/2 cycle @ full load and minimum rated line voltage / frequency. No less than 1 second between interruptions.
Fusing (external)	2.0 A slo-blo recommended (Part # 57-0089-000 or equivalent)
Output to Bus	
Voltage	5.1 Vdc
Maximum Current	8 A @ 60° C
Minimum Current	None required
Protection	Over Current, Over Voltage
General	
Field Wiring Connector (included)	7 point terminal strip (Part # 043506326)
Internal Power Dissipation	6.0 + 1.5 x I_{out} = Watts (where I_{out} is in Amperes)
Operating Mode	Standalone / Redundant

LED Indicator and Description

The following figure shows the CPS12400 LED indicator.

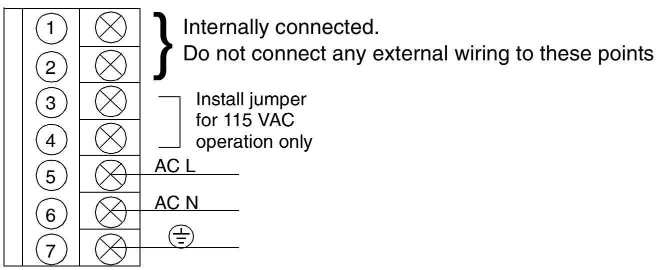


The following table shows the CPS12400 LED description.

LED Description		
LEDs	**Color**	**Indication when On**
Pwr ok	Green	Power is supplied to the bus.

Wiring Diagram

The following figure shows the 140CPS12400 wiring diagram.



Note: See (See *Power and Grounding Considerations for AC and DC Powered Systems, p. 832*) for power and grounding wiring guidelines and operational information.

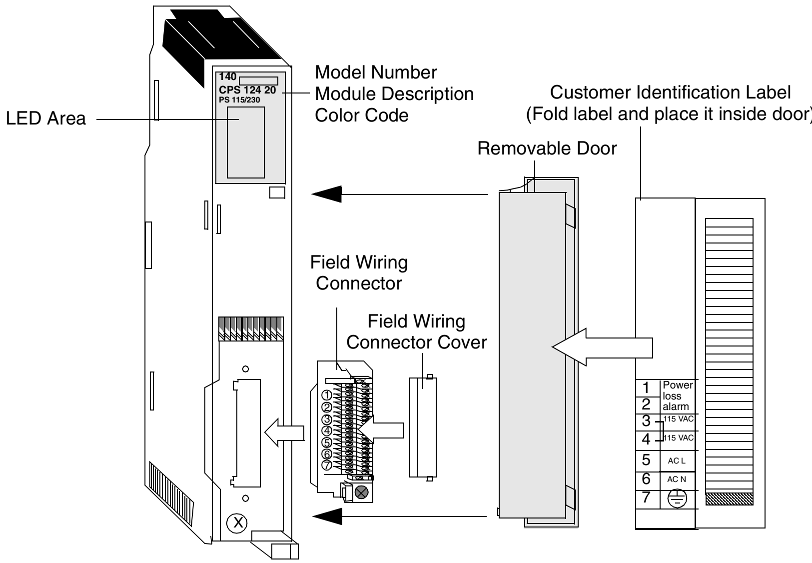
140CPS12420 AC Redundant Power Supply, 115/230 Vac 11 A Module

Overview

The following provides information on the AC redundant power supply, 115/230 Vac, 11 A module.

Power Supply Module

The following figure shows the power supply module components.



Note: When field wiring the power supply module, the maximum wire size that should be used is 1 - 14 AWG or 2 - 16 AWG; the minimum is 20 AWG.

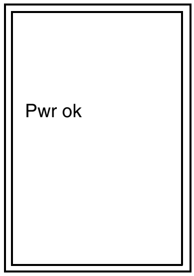
Specifications

The following table shows the specifications for the CPS12420 PS 115/230 VAC power supply module.

Specifications	
Input Requirements	
Input Voltage	93 ... 138 Vac. 170 ... 263 Vac
Input Frequency	47 ... 63 Hz
Input Voltage Total Harmonic Distortion	Less than 10% of the fundamental rms value
Input Current	1.2 A @ 115 Vac 0.7 A @ 230 Vac
Inrush Current	≤ 20 A @ 115 Vac @ 25° C first power up ≤ 25 A @ 230 Vac
VA Rating	160 VA @ 11 A
Input Power Interruption	1/2 cycle @ full load and minimum rated line voltage / frequency. No less than 1 second between interruptions.
Fusing (external)	2.0 A slo-blo recommended (Part # 57-0089-000 or equivalent)
Output to Bus	
Voltage	5.1 Vdc
Maximum Current	Standalone configuration: 11 A @ 60° C Redundant configuration (two 140CPS12420): 10 A @ 60° C (total load capacity) Redundant configuration (one 140CPS12420 and one 140CPS12400): 8A @ 60° C (total load capacity Redundant configuration (one 140CPS12420 and one 140CPS22400): 8 A @ 60° C (total load capacity) Redundant configuration (one 140CPS12420 and one 140CPS42400): 8 A @ 60° C (total load capacity)
Minimum Current	None required
Protection	Over Current, Over Voltage
General	
Field Wiring Connector (included)	7 point terminal strip (Part # 043506326)
Internal Power Dissipation	Less than 12 W at full load
Operating Mode	Standalone / Redundant

LED Indicator and Description

The following figure shows the CPS12420 LED indicator.

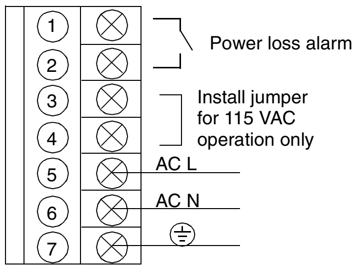


The following table shows the CPS12420 LED description.

LED Description		
LEDs	**Color**	**Indication when On**
Pwr ok	Green	Power is supplied to the bus.

Wiring Diagram

The following figure shows the CPS12420 wiring diagram.



> **Note:** A normally closed relay contact rated at 220 Vac, 6A / 30 Vdc, 5A is available on terminals 1 and 2 of the power terminal strip. This contact set may be used to signal input power OFF. The relay will de-energize when input power drops below 8 Vdc.

> **Note:** See (See *Power and Grounding Considerations for AC and DC Powered Systems, p. 832*) for power and grounding wiring guidelines and operational information.

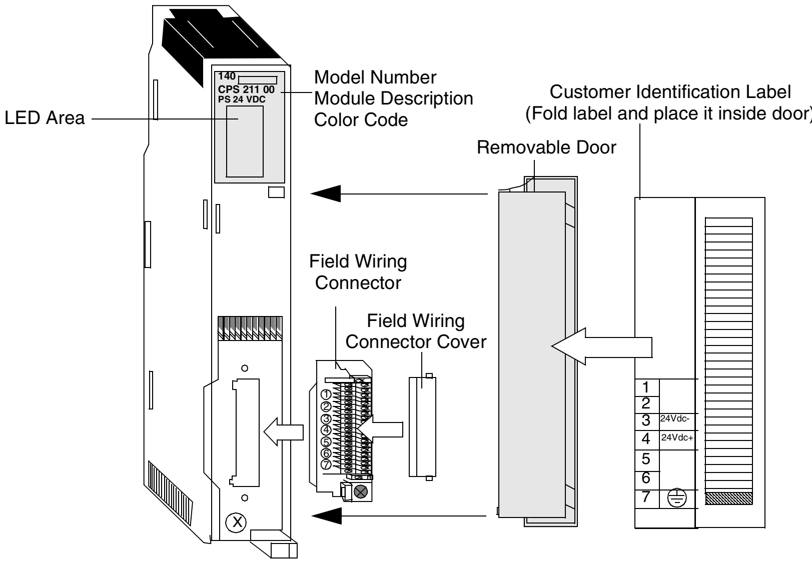
140CPS21100 DC Power Supply, 24 Vdc, 3 A Module

Overview

The following provides information on the DC power supply, 24 Vdc, 3 A module.

Power Supply Module

The following figure shows the power supply module components.



> **Note:** When field wiring the power supply module, the maximum wire size that should be used is 1 - 14 AWG or 2 - 16 AWG; the minimum is 20 AWG.

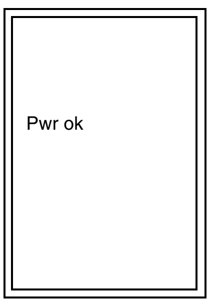
Specifications

The following table shows the specifications for the CPS21100 PS 24 VDC power supply module.

Specifications	
Input Requirements	
Input Voltage	20 ... 30 Vdc
Input Current	1.6 A
Inrush Current	30 A
Input Power Interruption	1.0 ms max @ 20 V. 20.0 ms max @ 24 V
Fusing (external)	2.5 A slo-blo recommended (Part # 043502516 or equivalent)
Output to Bus	
Voltage	5.1 Vdc
Maximum Current	3 A
Minimum Current	0.3 A
Protection	Over Current, Over Voltage
General	
Field Wiring Connector (included)	7 point terminal strip (Part # 043503328)
Internal Power Dissipation	2.0 + 3 x I_{out} = Watts (where I_{out} is in Amperes)
Operating Mode	Standalone

LED Indicator and Description

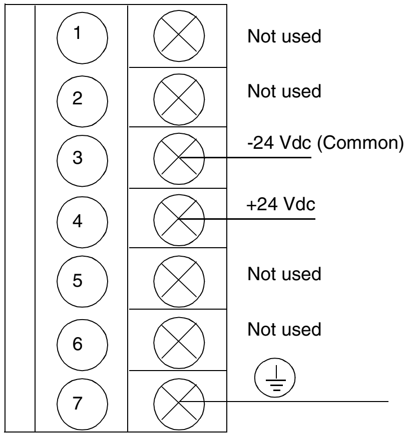
The following figure shows the CPS21100 LED indicator.



The following table shows the CPS21100 LED description.

LED Description		
LEDs	**Color**	**Indication when On**
Pwr ok	Green	Power is supplied to the bus.

Wiring Diagram The following figure shows the 140CPS21100 wiring diagram.



Note: See (See *Power and Grounding Considerations for AC and DC Powered Systems, p. 832*) for power and grounding wiring guidelines and operational information.

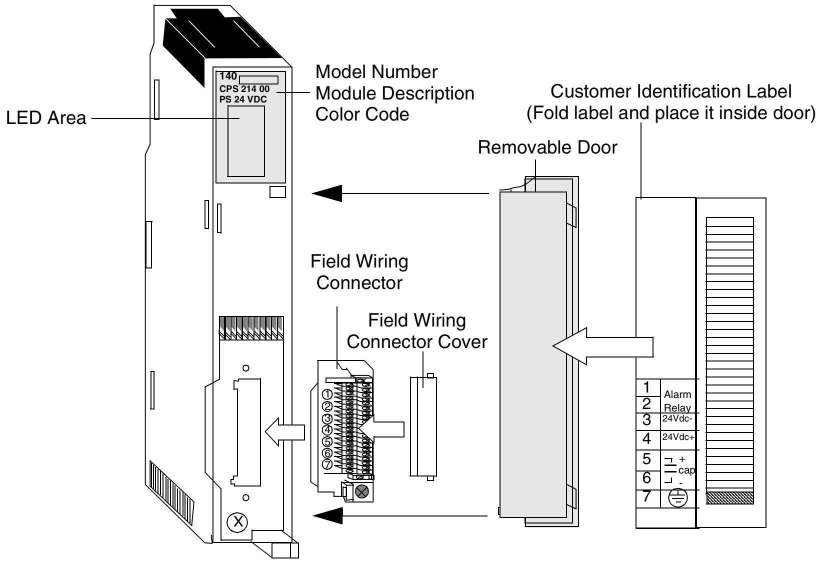
140CPS21400 DC Summable Power Supply, 24 Vdc, 8 A Module

Overview

The following provides information on the DC summable power supply, 24 Vdc, 8 A module.

Power Supply Module

The following figure shows the power supply module components.



> **Note:** When field wiring the power supply module, the maximum wire size that should be used is 1 - 14 AWG or 2 - 16 AWG; the minimum is 20 AWG.

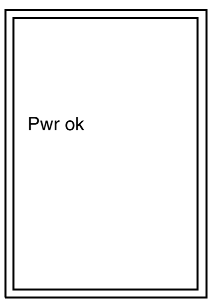
Specifications

The following table shows the specifications for the 140CPS21400 PS 24 Vdc power supply module.

Specifications	
Input Requirements	
Input Voltage	20 ... 30 Vdc
Input Current	3.8 A max
Inrush Current	25 A @ 24 Vdc. 14 A @ 20 Vdc
Input Ripple	2.4 Vdc max, 94 ... 189 Hz
Input Power Interruption	1 ms max @ 24 Vdc (see the hold-up capacitor timing chart)
Fusing (external)	5.0 A slo-blo recommended (Part # 043502405 or equivalent)
Output to Bus	
Voltage	5.1 Vdc
Maximum Current	8 A
Minimum Current	None required
Protection	Over Current, Over Voltage
General	
Field Wiring Connector	7 point terminal strip (Part # 043503328)
Internal Power Dissipation	6.0 + 1.8 x I_{OUT} = Watts (where I_{OUT} is in Amperes
Operating Mode	Standalone / Summable

LED Indicator and Description

The following figure shows the CPS21400 LED indicator.

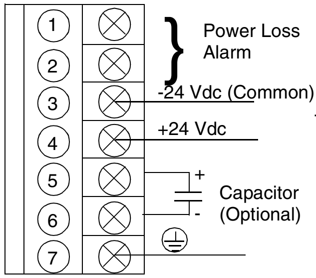


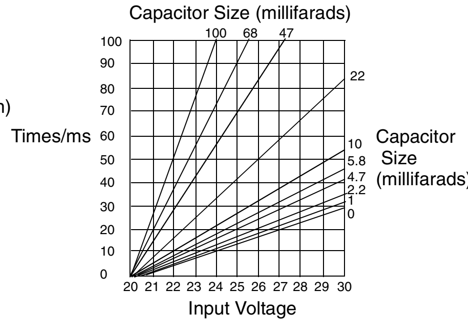
The following table shows the CPS21400 LED description.

LED Description		
LEDs	**Color**	**Indication when On**
Pwr ok	Green	Power is supplied to the bus.

Wiring Diagram and Timing Chart

The following figures show the CPS214 wiring diagram (left) and the hold-up capacitor timing chart (right).





Note:
1. A normally closed relay contact rated at 220 Vac, 6A / 30 Vdc, 5A is available on terminals 1 and 2 of the power terminal strip. This contact set may be used to signal input power OFF. The relay will de-energize when input power drops below 8 Vdc.
2. Tolerance to input interruptions may be increased by adding a ≥ 50 Vdc electrolytic capacitor between 5 and 6 of the power terminal strip. Refer to the hold-up capacitor timing chart for capacitor values.

Note: See (See *Power and Grounding Considerations for AC and DC Powered Systems, p. 832*) for power and grounding wiring guidelines and operational information.

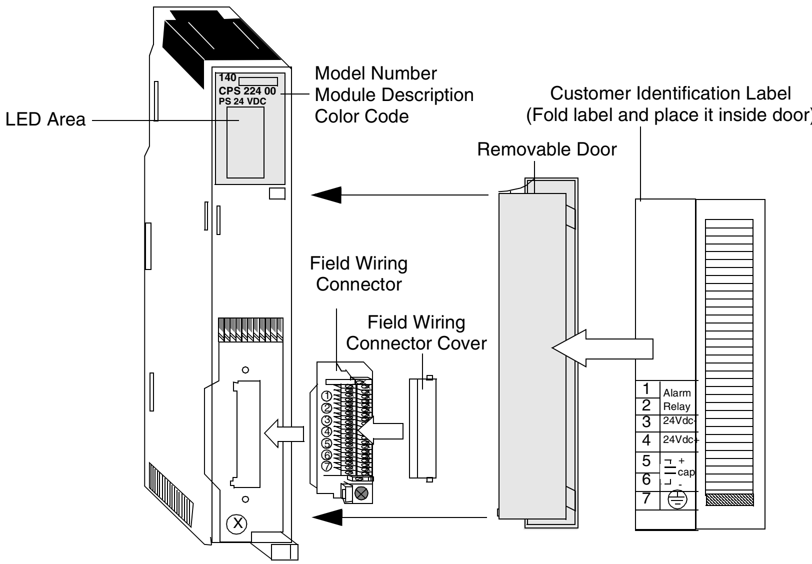
140CPS22400 DC Redundant Power Supply, 24 Vdc, 8 A Module

Overview

The following provides information on the DC Redundant Power Supply, 24 Vdc, 8 A module.

Power Supply Module

The following figure shows the power supply module components.



Note: When field wiring the power supply module, the maximum wire size that should be used is 1 - 14 AWG or 2 - 16 AWG; the minimum is 20 AWG.

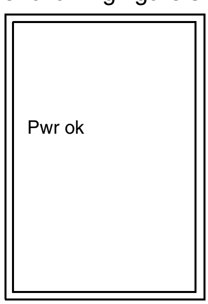
Specifications

The following table shows the specifications for the 24 Vdc, 8 A DC redundant power supply.

Specifications	
Input Requirements	
Input Voltage	20 ... 30 Vdc
Input Current	3.8 A max
Inrush Current	25 A @ 24 Vdc. 14 A @ 20 Vdc
Input Ripple	2.4 Vdc max, 94 ... 189 Hz
Input Power Interruption	1 ms max @ 24 Vdc
Fusing (external)	5.0 A slo-blo recommended (Part # 043502405 or equivalent)
Output to Bus	
Voltage	5.1 Vdc
Current	8 A
Protection	Over Current, Over Voltage
General	
Surge Withstand	2.3 x Maximum Rated Input Voltage for 1.3 ms
Field Wiring Connector	7 point terminal strip (Part # 043503328)
Internal Power Dissipation	6.0 + 1.8 x I_{out} = Watts (where I_{out} is in Amperes
Operating Mode	Standalone / Redundant

LED Indicator and Description

The following figure shows the CPS22400 LED indicator.

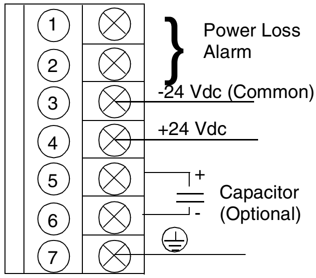


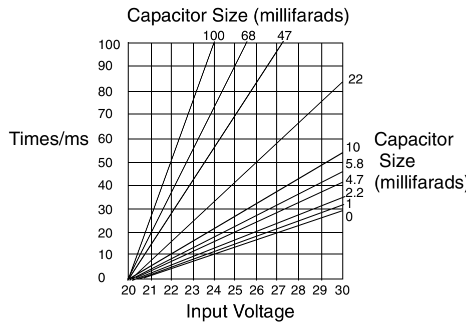
The following table shows the CPS22400 LED description.

LED Description		
LEDs	**Color**	**Indication when On**
Pwr ok	Green	Power is supplied to the bus.

Wiring Diagram and Timing Chart

The following figures show the 140CPS22400 wiring diagram (left) and the 140CPS22400 hold-up capacitor timing chart (right).





Note:

1. A normally closed relay contact rated at 220 Vac, 6A / 30 Vdc, 5A is available on terminals 1 and 2 of the power terminal strip. This contact set may be used to signal input power OFF, or a power supply failure. The relay will de-energize when input power drops below 8 Vdc.
2. Tolerance to input interruptions may be increased by adding a ≥ 50 Vdc electrolytic capacitor between 5 and 6 of the power terminal strip. Refer to the hold-up capacitor timing chart (above) for capacitor values.

Note: See (See *Power and Grounding Considerations for AC and DC Powered Systems, p. 832*) for power and grounding wiring guidelines and operational information.

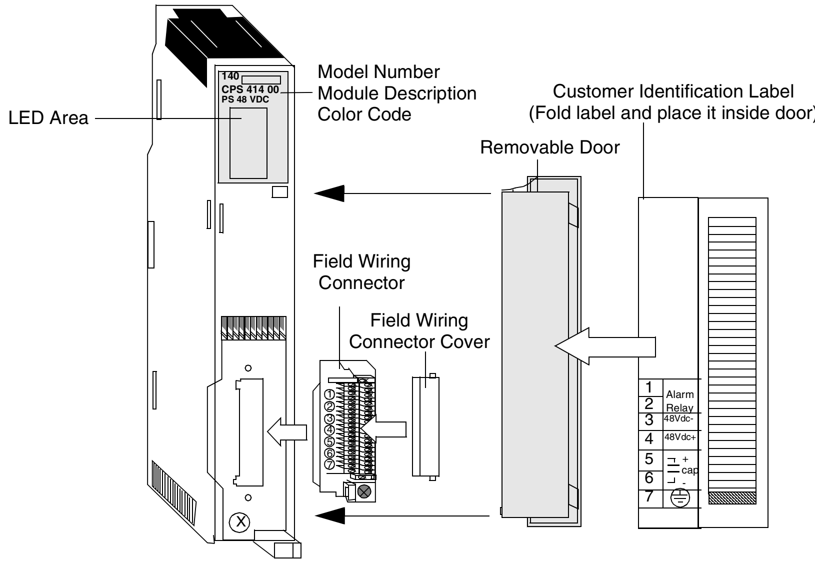
140CPS41400 DC Summable Power Supply, 48 Vdc, 8 A Module

Overview

The following provides information on the DC summable power supply, 48 Vdc, 8 A module.

Power Supply Module

The following figure shows the power supply module components.



> **Note:** When field wiring the power supply module, the maximum wire size that should be used is 1 - 14 AWG or 2 - 16 AWG; the minimum is 20 AWG.

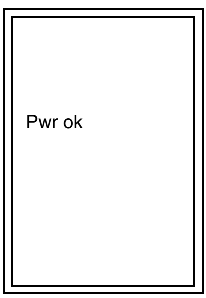
Specifications

The following table shows the specifications for the CPS41400, 48 VDC power supply module.

Specifications	
Input Requirements	
Input Voltage	40 ... 72 Vdc
Input Current	1.2 A @ 48 Vdc
Inrush Current	25 A @ 40 Vdc
Input Power Interruption	13 ms @ 48 Vdc
Fusing (external)	2.0 A medium time-lag recommended (Part # 57-0089-000 or equivalent)
Output to Bus	
Voltage	5.1 Vdc
Current	8 A (see operating curve)
Protection	Over Current, Over Voltage
General	
Field Wiring Connector	7 point terminal strip (Part # 043503328)
Internal Power Dissipation	15.6 W @ 8 A
Operating Mode	Standalone / Summable

LED Indicator and Description

The following figure shows the CPS41400 LED indicator.

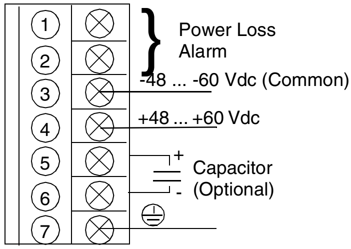


The following table shows the CPS41400 LED description.

LED Description		
LEDs	**Color**	**Indication when On**
Pwr ok	Green	Power is supplied to the bus.

Wiring Diagram

The following figure shows the CPS41400 wiring diagram.

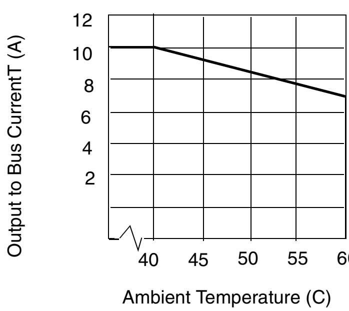


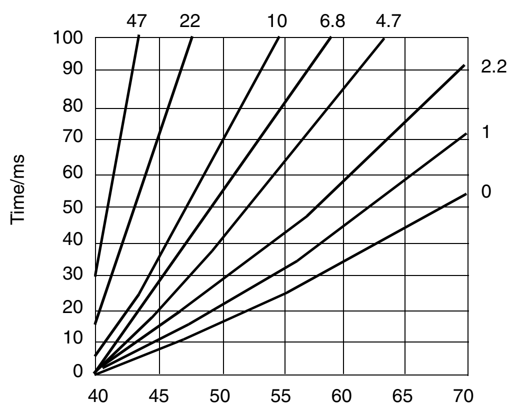
Note: A normally closed relay contact rated at 220 Vac, 6A / 30 Vdc, 5A is available on terminals 1 and 2 of the power terminal strip. This contact set may be used to signal input power OFF, or a power supply failure.

Note: See (See *Power and Grounding Considerations for AC and DC Powered Systems, p. 832*) for power and grounding wiring guidelines and operational information.

Operating Curve and Timing Chart

The following figures show the CPS41400 operating curve (left) and the hold-up capacitor timing chart (right).





Note: Tolerance to input interruptions may be increased by adding a ≥ 80 Vdc electrolytic capacitor between 5 and 6 of the power terminal strip. Refer to the hold-up capacitor timing chart (above) for capacitor values.

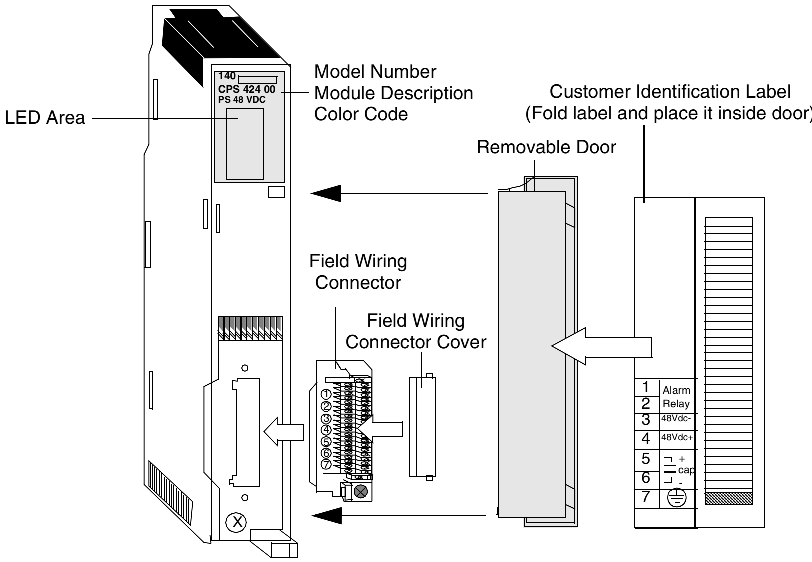
140CPS42400 DC Redundant Power Supply, 48 Vdc, 8 A Module

Overview

The following provides information on the DC redundant power supply, 48 Vdc, 8 A module.

Power Supply Module

The following figure shows the power supply module components.



Note: When field wiring the power supply module, the maximum wire size that should be used is 1 - 14 AWG or 2 - 16 AWG; the minimum is 20 AWG.

Note: Tolerance to input interruptions may be increased by adding an 80 Vdc electrolytic capacitor between 5 and 6 of the power terminal strip. Refer to the hold-up capacitor timing chart (above) for capacitor values.

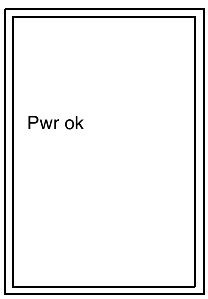
Specifications

The following table shows the specifications for the 140CPS42400 PS 48 VDC RED power supply module.

Specifications	
Input Requirements	
Input Voltage	40 ... 72 Vdc
Input Current	1.3 A @ 48 Vdc
Inrush Current	25 A @ 48 Vdc
Input Power Interruption	13 ms @ 48 Vdc
Fusing (external)	2.0 A medium time-lag recommended (Part # 57-0089-000 or equivalent)
Output to Bus	
Voltage	5.1 Vdc
Current	8 A (see operating curve)
Protection	Over Current, Over Voltage
General	
Field Wiring Connector	7 point terminal strip (Part # 043503328)
Internal Power Dissipation	17.2 W @ 8 A
Operating Mode	Standalone / Redundant

LED Indicator and Description

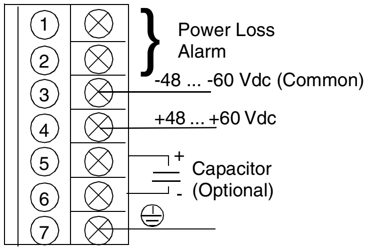
The following figure shows the CPS42400 LED indicator.



The following table shows the CPS42400 LED description.

LED Description		
LEDs	**Color**	**Indication when On**
Pwr ok	Green	Power is supplied to the bus.

Wiring Diagram The following figure shows the CPS42400 wiring diagram.

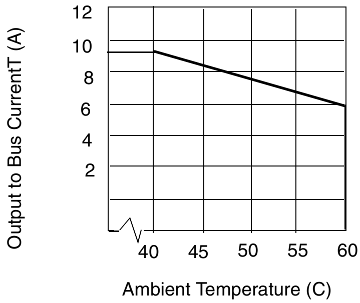


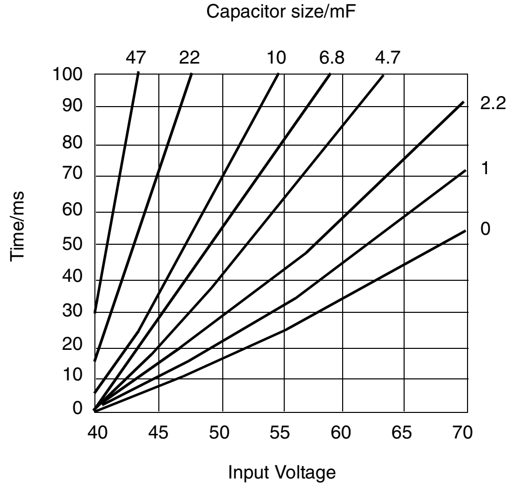
Note: See *Power and Grounding Considerations for AC and DC Powered Systems, p. 832* for power and grounding wiring guidelines and operational information.

Note: A normally closed relay contact rated at 220 Vac, 6A / 30 Vdc, 5A is available on terminals 1 and 2 of the power terminal strip. This contact set may be used to signal input power OFF, or a power supply failure.

Operating Curve and Timing Chart

The following figures show the CPS42400 operating curve (left) and the hold-up capacitor timing chart (right).





Note: Tolerance to input interruptions may be increased by adding a ≥ 80 Vdc electrolytic capacitor between 5 and 6 of the power terminal strip. Refer to the hold-up capacitor timing chart (above) for capacitor values.

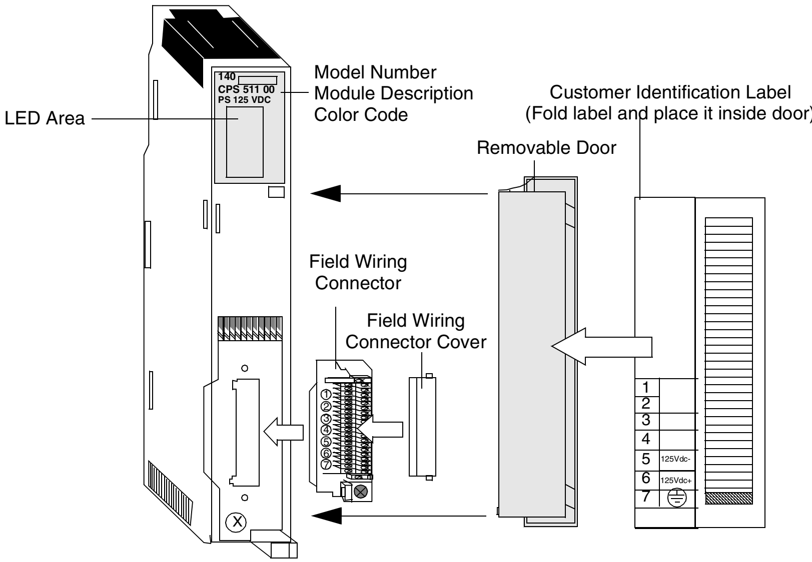
140CPS51100 DC Power Supply, 125 Vdc, 3 A Module

Overview

The following provides information on the DC power supply, 125 Vdc, 3 A module.

Power Supply Module

The following figure shows the power supply module components.



Note: When field wiring the power supply module, the maximum wire size that should be used is 1 - 14 AWG or 2 - 16 AWG; the minimum is 20 AWG.

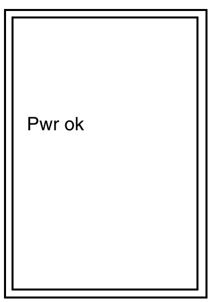
Specifications

The following table shows the specifications for the CPS51100 125 Vdc power supply module.

Specifications	
Input Requirements	
Input Voltage	100 ... 150 Vdc including ripple
Input Current	0.4 A
Inrush Current	10 A
Input Power Interruption	1.0 ms max
Fusing (external)	1.5 A slo-blo recommended (Part # 043502515 or equivalent)
Output to Bus	
Voltage	5.1 Vdc
Maximum Current	3 A
Minimum Current	0.3 A
Protection	Over Current, Over Voltage
General	
Field Wiring Connector (included)	7 point terminal strip (Part # 043506325)
Internal Power Dissipation	2.0 + 3 x I_{out} = Watts (where I_{out} is in Amperes)
Operating Mode	Standalone

LED Indicator and Description

The following figure shows the CPS51100 LED indicator.

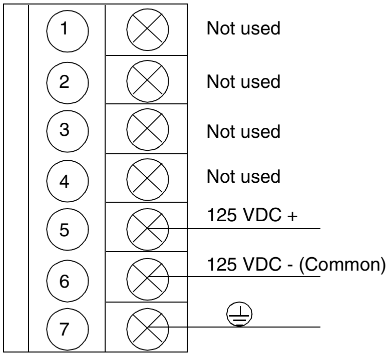


The following table shows the CPS51100 LED description.

LED Description		
LEDs	**Color**	**Indication when On**
Pwr ok	Green	Power is supplied to the bus.

Wiring Diagram

The following figure shows the CPS51100 wiring diagram.



Note: See *Power and Grounding Considerations for AC and DC Powered Systems, p. 832* for power and grounding wiring guidelines and operational information.

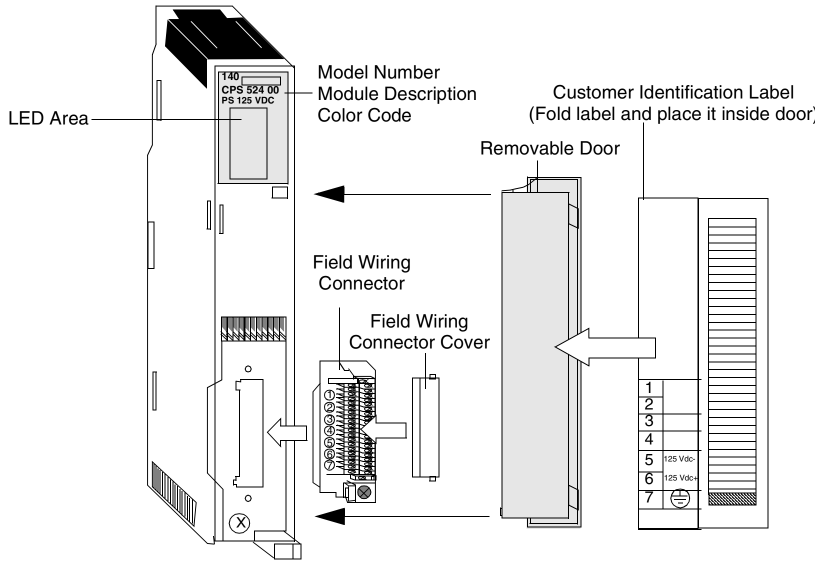
140CPS52400 DC Standalone/Redundant Power Supply, 125 Vdc, 8 A

Overview

The following provides information on the DC Standalone/Redundant power supply, 125 Vdc, 8 A module.

Power Supply Module

The following figure shows the power supply module components.



> **Note:** When field wiring the power supply module, the maximum wire size that should be used is 1 - 14 AWG or 2 - 16 AWG; the minimum is 20 AWG.

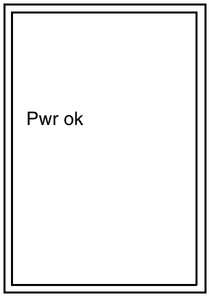
Specifications

The following table shows the specifications for the CPS52400 125 VDC power supply module.

Specifications	
Input Requirements	
Input Voltage	100 ... 150 Vdc including ripple
Input Current	0.5 A @ 125 Vdc
Inrush Current	28 A @ 125 Vdc
Input Power Interruption	1.0 ms max
Fusing (external)	2 A slo-blo recommended (Part # 57-0089-000 or equivalent)
Output to Bus	
Voltage	5.1 Vdc
Maximum Current	8 A @ 60° C
Minimum Current	None required
Protection	Over Current, Over Voltage
General	
Field Wiring Connector (included)	7 point terminal strip (Part # 043506325)
Internal Power Dissipation	6.0 + 1.5 x I_{OUT} = Watts (where I_{OUT} is in Amperes)
Operating Mode	Standalone / Redundant

LED Indicator and Description

The following figure shows the CPS52400 LED indicator.

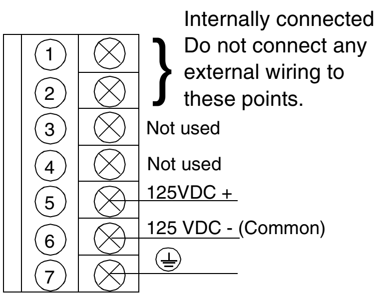


The following table shows the CPS52400 LED description.

LED Description		
LEDs	**Color**	**Indication when On**
Pwr ok	Green	Power is supplied to the bus.

Wiring Diagram

The following figure shows the CPS52400 wiring diagram.



Note: See *Power and Grounding Considerations for AC and DC Powered Systems, p. 832* for power and grounding wiring guidelines and operational information.

CPU Modules

7

At a Glance

Introduction

This chapter provides information on the specifications, LED indicators and description and error codes for the Quantum CPU modules.

The following table shows an overview of the Quantum CPU modules.

CPU	SRAM (bytes)	Ladder	Registers	Extended	984 Ladder Performance	Max IEC Program
140CPU11302	256 k	8 k	10 k	none	0.3 - 1.4 ms/k	109 k
140CPU11303	512 k	16 k	10 k	none	0.3 - 1.4 ms/k	368 k
140CPU21304	768 k	32 k or 48 k	57 k or 28 k *	80 k or 0 k *	0.3 - 1.4 ms/k	606 k
140CPU42402	2 M	64 k	57 k	96 k *	0.1 - 0.5 ms/k	570 k
140CPU43412	2 M	64 K	57 K*	96 k	0.1 - 0.5 ms/k	896 k
140CPU43412A	2 M	64K	57 K*	96 k	0.1 - 0.5 ms/k	896 k
140CPU53414	4 M	64 K	57 K*	96 k	0.9 - 0.45 ms/k	2.5 M
140CPU53414A	4 M	64 K	57 K*	96K	0.1 - 0.5 ms/k	2.5 M
*Refer to the individual specification pages for detailed information.						

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
140CPU11302 CPU Module	121
140CPU11303 CPU Module	132
140CPU21304 CPU Module	143
140CPU42402 CPU Module	154
140CPU43412 CPU Module	165
140CPU43412A CPU Module	178
140CPU53414 CPU Module	192
140CPU53414A CPU Module	205

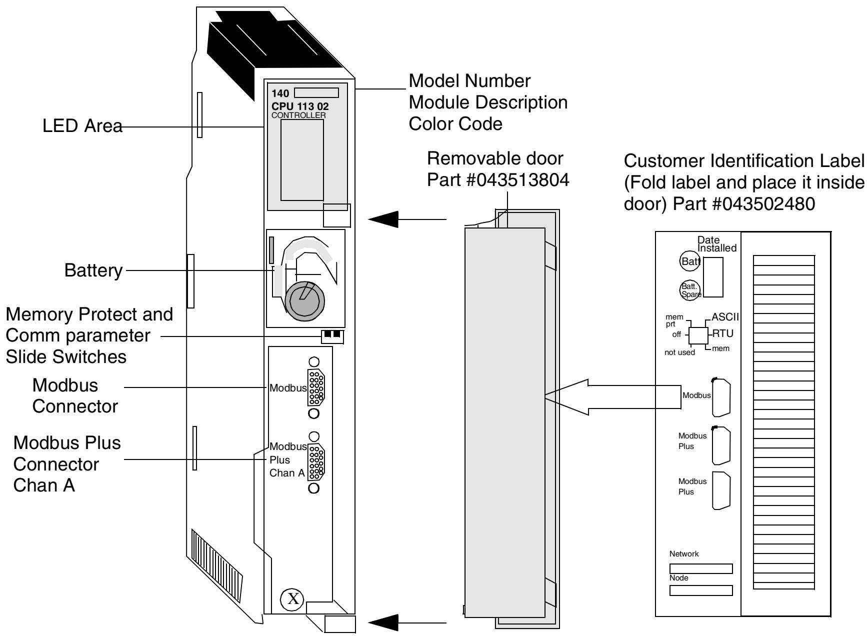
140CPU11302 CPU Module

Overview

The following provides information on the 140CPU11302 Controller module – CPU 256 K, 1xModbus Plus, Max IEC Program 109 K (requires IEC-only Exec.)

CPU Module

The following figure shows the CPU Module and its components.



Specifications

The following table shows the specifications for the 140CPU11302 CONTROLLER module.

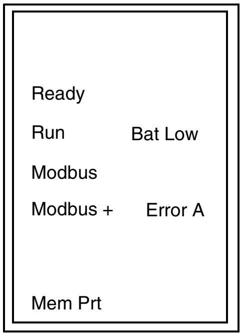
Specifications	
984 Ladder Logic	8 k words max
Reference Capacity	
Discrete	8192 In and 8192 Out max
Register	9999 max
Local I/O (Main Backplane)	
Maximum I/O Words	64 In and 64 Out*
Maximum Number of I/O Racks	2 (Requires expander)
Remote I/O	
Maximum I/O Words per Drop	64 In / 64 Out*
Maximum Number of Remote Drops	31
Distributed I/O	
Maximum Number of Networks per System	3**
Maximum Words per Network (For every DIO drop, there is a minimum of two words input of overhead.)	500 In and 500 Out
Maximum Words per Node	30 In and 32 Out
Watchdog Timer	250 ms (S/W adjustable)
Logic Solve Time	0.3 ms / k to 1.4 ms / k
Battery	3 V Lithium
Service Life	1200 mAh
Shelf Life	10 years with 0.5% loss of capacity per year
Battery Load Current @ Power-off	
Typical	5 µA
Maximum	110 µA
Communication	
Modbus (RS-232)	1 serial port (9-pin D-shelf)
Modbus Plus (RS-485)	1 network port (9-pin D-shell)
General	

Specifications		
Diagnostics	**Power Up**	**Runtime**
	RAM	RAM
	RAM Address	RAM Address
	Executive Checksum	Executive Checksum
	User Logic Check	User Logic Check
	Processor	
Bus Current Required	780 mA	
Power Dissipation	3.9 W	
TOD Clock	+/- 8.0 seconds/day 0 ... 60° C	
Maximum Number of NOM, NOE, and MMS modules (any combination)	2	

* This information can be a mix of Discrete or Register I/O. For each word of register I/O configured, one word of I/O words must be subtracted from the total available. The same holds true for each block of 8 bits or 16 bits of Discrete I/O configured – one word of Register I/O must be subtracted from the total available.
**Requires the use of the 140NOM2x00 Option Processor.–

LED Indicators and Descriptions

The following figure shows the CPU LED indicators.



The following table shows the LED descriptions.

LED Descriptions		
LEDs	**Color**	**Indication when On**
Ready	Green	The CPU has passed powerup diagnostics.
Run	Green	The CPU has been started and is solving logic. (See the following table for Run LED error codes).
Modbus	Green	Communications are active on the Modbus port.
Modbus +	Green	Communications are active on the Modbus Plus port.
Mem Prt	Amber	Memory is write protected (the memory protect switch is on).
Bat Low	Red	The battery needs replacing.
Error A	Red	Indicates a communications error on the Modbus Plus network.

LED Error Codes

The following table show the number of times the Run LED blinks for each type of error, and the crash codes possible for that group (all codes are in hex) for the 140CPU11302 module.

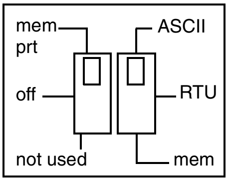
LED Error Codes		
Number of Blinks	**Code**	**Error**
Continuous	0000	requested kernel mode
2	80B	ram error during sizing
	80C	run output active failed
	82E	MB command handler stack error
3	769	bus grant received
	72A	not master asic on cpu
	72B	master config write bad
	72C	quantum bus DPM write failure
	72F	plc asic loopback test
	730	plc asic BAD_DATA

LED Error Codes		
Number of Blinks	**Code**	**Error**
4	604	UPI timeout error
	605	bad UPI response opcode
	606	UPI bus diagnostic error
	607	modbus cmd-buffer overflow
	608	modbus cmd-length is zero
	609	modbus abort command error
	614	mbp bus interface error
	615	bad mbp response opcode
	616	timeout waiting for mbp
	617	mbp out of synchronization
	618	mbp invalid path
	619	page 0 not paragraph aligned
	61E	bad external uart hardware
	61F	bad external uart interrupt
	620	bad receive comm state
	621	bad transmit comm state
	622	bad comm state trn_asc
	623	bad comm state trn_rtu
	624	bad comm state rcv_rtu
	625	bad comm state rcv_asc
	626	bad modbus state tmr0_evt
	627	bad modbus state trn-int
	628	bad modbus state rcv-int
	631	bad interrupt
5	503	ram address test error
	52D	P.O.S.T BAD MPU ERROR
6	402	ram data test error
7	300	EXEC not loaded
	301	EXEC Checksum
8	8001	Kernal prom checksum error
	8002	flash prog / erase error
	8003	unexpected executive return

Front Panel Switches

Two, three-position slide switches are located on the front of the CPU. The left switch is used for memory protection when in the top position and no memory protection in the middle and bottom positions. The three-position slide switch on the right is used to select the communication parameter settings for the Modbus (RS-232) ports.

The following figure shows the three options that are available for the CPU11302.



> **Note:** The CPU hardware defaults to bridge mode when the front panel switch is set to RTU or ASCII mode. When networking controllers, a panel device connected to the CPU Modbus port can communicate with the controller to which it is connected, as well as log into any nodes on the Modbus Plus network.

Setting the slide switch to the top position assigns ASCII functionality to the port; the following communication parameters are set and cannot be changed.

ASCII Communication Port Parameters	
Baud	2,400
Parity	Even
Data Bits	7
Stop Bits	1
Device Address	Rear panel rotary switch setting

Setting the slide switch to the middle position assigns remote terminal unit (RTU) functionality to the port; the following communication parameters are set and cannot be changed.

RTU Communication Port Parameters	
Baud	9,600
Parity	Even
Data Bits	8
Stop Bits	1
Device Address	Rear panel rotary switch setting

Setting the slide switch to the bottom position gives you the ability to assign communication parameters to the port in software; the following parameters are valid.

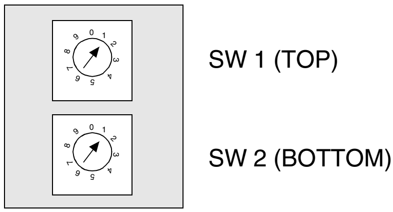
Valid Communication Port Parameters		
Baud	19,200	1,200
	9,600	600
	7,200	300
	4,800	150
	3,600	134.5
	2,400	110
	2,000	75
	1,800	50
Data Bits	7 / 8	
Stop Bits	1 / 2	
Parity	Enable/Disable Odd/Even	
Device Address	1 ... 247	

Rear Panel Switches

Two rotary switches are located on the rear panel of the CPU. They are used for setting the Modbus Plus node and Modbus port addresses.

Note: The highest address that may be set with these switches is 64.

SW1 (the top switch) sets the upper digit (tens) of the address; SW2 (the bottom switch) sets the lower digit (ones) of the address. The illustration below shows the correct setting for an example address of 11.
The following figure shows SW1 and SW2.



The following table shows the SW1 and SW2 address settings.

SW1 and SW2 Address Settings		
Node Address	**SW1**	**SW2**
1 ... 9	0	1 ... 9
10 ... 19	1	0 ... 9
20 ... 29	2	0 ... 9
30 ... 39	3	0 ... 9
40 ... 49	4	0 ... 9
50 ... 59	5	0 ... 9
60 ... 64	6	0 ... 4

Note: If "0" or an address greater than 64 is selected, the Modbus + LED will be "on" steady, to indicate the selection of an invalid address.

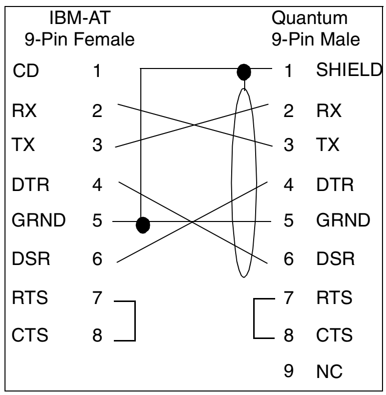
Modbus Connector Pinouts

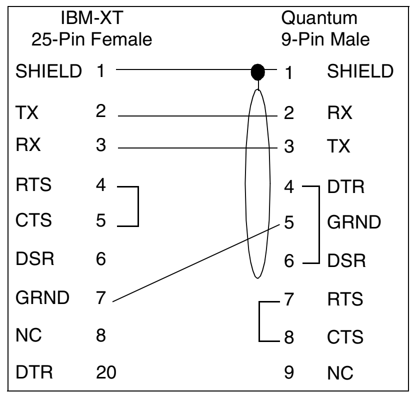
All Quantum CPUs are equipped with a nine-pin RS-232C connector that supports Modicon's proprietary Modbus communication protocol. The following is the Modbus port pinout connections for nine-pin and 25-pin connections.

> **Note:** Although the Modbus ports electrically support existing Modbus cables, it is recommended that a Modbus programming cable (Part # 990NAA2620 or 990NAA26350) be used. This cable has been designed to fit under the door of a Quantum CPU or NOM module.

Modbus Ports Pinout Connections

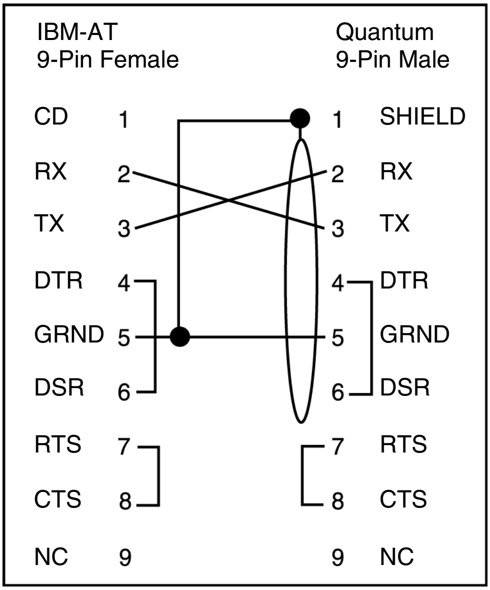
The following figure shows the Modbus port pinout connections for nine-pin and 25-pin connections.





Modbus Ports Pinout Connections for Portable Computers

The following figure shows the Modbus port pinout connections for nine-pin portable (laptop) computers.



The following is the abbreviation key for the above figures.

TX: Transmitted Data	DTR: Data Terminal Ready
RX: Received Data	CTS: Clear to Send
RTS: Request to Send	NC: No Connection
DSR: Data Set Ready	CD: Carrier Detect

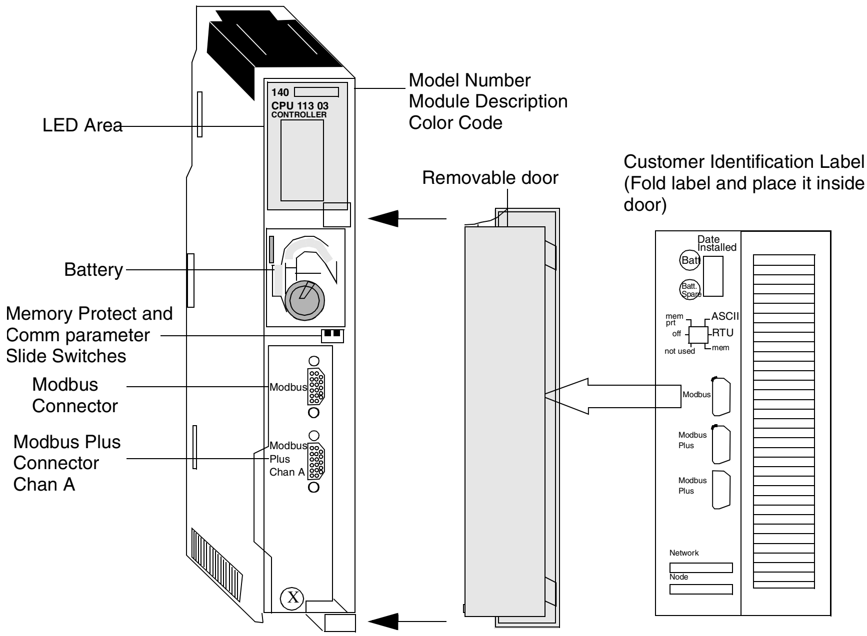
140CPU11303 CPU Module

Overview

The following provides information on the 140CPU11303 Controller module – CPU 512 k, 1xModbus Plus, Max IEC Program 368 K (requires IEC Exec.)

CPU Module

The following figure shows the CPU Module and its components.



Specifications

The following table shows the specifications for the 140CPU11303 CONTROLLER module.

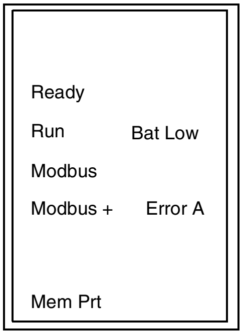
Specifications	
984 Ladder Logic	16 k words max
Reference Capacity	
Discrete	8192 In and 8192 Out max
Register	9999 max
Local I/O (Main Backplane)	
Maximum I/O Words	64 In and 64 Out*
Maximum Number of I/O Racks	2 (Requires expander)
Remote I/O	
Maximum I/O Words per Drop	64 In / 64 Out*
Maximum Number of Remote Drops	31
Distributed I/O	
Maximum Number of Networks per System	3**
Maximum Words per Network (For every DIO drop, there is a minimum of two words input of overhead.)	500 In and 500 Out
Maximum Words per Node	30 In and 32 Out
Watchdog Timer	250 ms (S/W adjustable)
Logic Solve Time	0.3 ms / k to 1.4 ms / k
Battery	3 V Lithium
Service Life	1200 mAh
Shelf Life	10 years with 0.5% loss of capacity per year
Battery Load Current @ Power-off	
Typical	7 µA
Maximum	210 µA
Communication	
Modbus (RS-232)	1 serial port (9-pin D-shell)
Modbus Plus (RS-485)	1 network port (9-pin D-shell)
General	

Specifications		
Diagnostics	**Power Up**	**Runtime**
	RAM	RAM
	RAM Address	RAM Address
	Executive Checksum	Executive Checksum
	User Logic Check	User Logic Check
	Processor	
Bus Current Required	790 mA	
Power Dissipation	3.95 W	
TOD Clock	+/- 8.0 seconds/day 0 ... 60° C	
Maximum Number of NOM, NOE, and MMS modules (any combination)	2	

* This information can be a mix of Discrete or Register I/O. For each word of register I/O configured, one word of I/O words must be subtracted from the total available. The same holds true for each block of 8 bits or 16 bits of Discrete I/O configured - one word of Register I/O must be subtracted from the total available.
**Requires the use of the 140NOM21x00 Option Processor.

LED Indicators and Descriptions

The following figure shows the CPU11303 LED indicators.



The following table shows the CPU11303 LED descriptions.

LED Descriptions		
LEDs	**Color**	**Indication when On**
Ready	Green	The CPU has passed powerup diagnostics.
Run	Green	The CPU has been started and is solving logic (see the following table for Run LED error codes).
Modbus	Green	Communications are active on the Modbus port.
Modbus +	Green	Communications are active on the Modbus Plus port.
Mem Prt	Amber	Memory is write protected (the memory protect switch is on).
Bat Low	Red	The battery needs replacing.
Error A	Red	Indicates a communications error on the Modbus Plus network.

LED Error Codes

The LED Error Codes table shows the number of times the Run LED blinks for each type of error and the crash codes possible for that group (all codes are in hex). The following table shows the blinking run LED error codes.

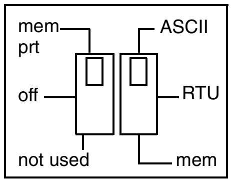
LED Error Codes		
Number of Blinks	**Code**	**Error**
Continuous	0000	requested kernel mode
2	80B	ram error during sizing
	80C	run output active failed
	82E	MB command handler stack error
3	769	bus grant received
	72A	not master asic on cpu
	72B	master config write bad
	72C	quantum bus DPM write failure
	72F	plc asic loopback test
	730	plc asic BAD_DATA

LED Error Codes		
Number of Blinks	**Code**	**Error**
4	604	UPI timeout error
	605	bad UPI response opcode
	606	UPI bus diagnostic error
	607	modbus cmd-buffer overflow
	608	modbus cmd-length is zero
	609	modbus abort command error
	614	mbp bus interface error
	615	bad mbp response opcode
	616	timeout waiting for mbp
	617	mbp out of synchronization
	618	mbp invalid path
	619	page 0 not paragraph aligned
	61E	bad external uart hardware
	61F	bad external uart interrupt
	620	bad receive comm state
	621	bad transmit comm state
	622	bad comm state trn_asc
	623	bad comm state trn_rtu
	624	bad comm state rcv_rtu
	625	bad comm state rcv_asc
	626	bad modbus state tmr0_evt
	627	bad modbus state trn-int
	628	bad modbus state rcv-int
	631	bad interrupt
5	503	ram address test error
	52D	P.O.S.T BAD MPU ERROR
6	402	ram data test error
7	300	EXEC not loaded
	301	EXEC Checksum
8	8001	Kernal prom checksum error
	8002	flash prog / erase error
	8003	unexpected executive return

Front Panel Switches

Two, three-position slide switches are located on the front of the CPU. The left switch is used for memory protection when in the top position and no memory protection in the middle and bottom positions. The three-position slide switch on the right is used to select the communication parameter settings for the Modbus (RS-232) ports.

The following figure shows the three options that are available.



Note: The CPU hardware defaults to bridge mode when the front panel switch is set to RTU or ASCII mode. When networking controllers, a panel device connected to the CPU Modbus port can communicate with the controller to which it is connected, as well as log into any nodes on the Modbus Plus network.

Setting the slide switch to the top position assigns ASCII functionality to the port; the following communication parameters are set and cannot be changed. The following table shows the ASCII communication port parameters.

ASCII Communication Port Parameters	
Baud	2,400
Parity	Even
Data Bits	7
Stop Bits	1
Device Address	Rear panel rotary switch setting

Setting the slide switch to the middle position assigns remote terminal unit (RTU) functionality to the port; the following communication parameters are set and cannot be changed.

RTU Communication Port Parameters	
Baud	9,600
Parity	Even
Data Bits	8
Stop Bits	1
Device Address	Rear panel rotary switch setting

Setting the slide switch to the bottom position gives you the ability to assign communication parameters to the port in software; the following parameters are valid.

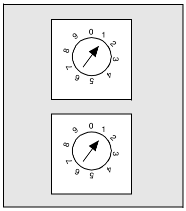
Valid Communication Port Parameters		
Baud	19,200	1,200
	9,600	600
	7,200	300
	4,800	150
	3,600	134.5
	2,400	110
	2,000	75
	1,800	50
Parity	Enable/Disable Odd/Even	
Data Bits	7 / 8	
Stop Bits	1 / 2	
Device Address	1 ... 247	

Rear Panel Switches

Two rotary switches (refer to the illustration and table that follow) are located on the rear panel of the CPU. They are used for setting the Modbus Plus node and Modbus port addresses.

Note: The highest address that may be set with these switches is 64.

SW1 (the top switch) sets the upper digit (tens) of the address; SW2 (the bottom switch) sets the lower digit (ones) of the address. The illustration below shows the correct setting for an example address of 11.
The following figure shows SW1 and SW2 switches.



SW1 (TOP)

SW2 (BOTTOM)

The following table shows the SW1 and SW2 address settings.

SW1 and SW2 Address Settings		
Node Address	**SW1**	**SW2**
1 ... 9	0	1 ... 9
10 ... 19	1	0 ... 9
20 ... 29	2	0 ... 9
30 ... 39	3	0 ... 9
40 ... 49	4	0 ... 9
50 ... 59	5	0 ... 9
60 ... 64	6	0 ... 4

Note: If "0" or an address greater than 64 is selected, the Modbus + LED will be "on" steady, to indicate the selection of an invalid address.

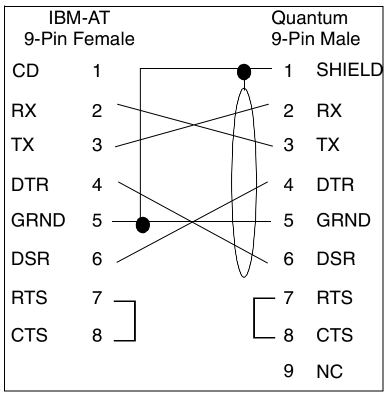
Modbus Connector Pinouts

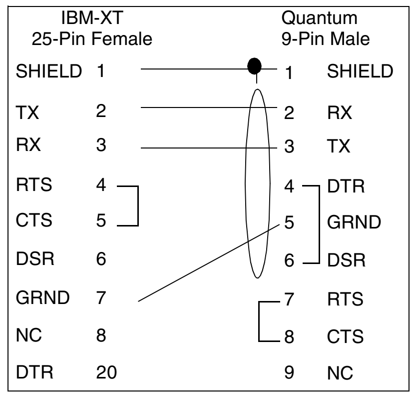
All Quantum CPUs are equipped with a nine-pin RS-232C connector that supports Modicon's proprietary Modbus communication protocol. The following is the Modbus port pinout connections for nine-pin and 25-pin connections.

Note: Although the Modbus ports electrically support existing Modbus cables, it is recommended that a Modbus programming cable (Part # 990NAA26320 or 990NAA26350) be used. This cable has been designed to fit under the door of a Quantum CPU or NOM module.

Modbus Ports Pinout Connections

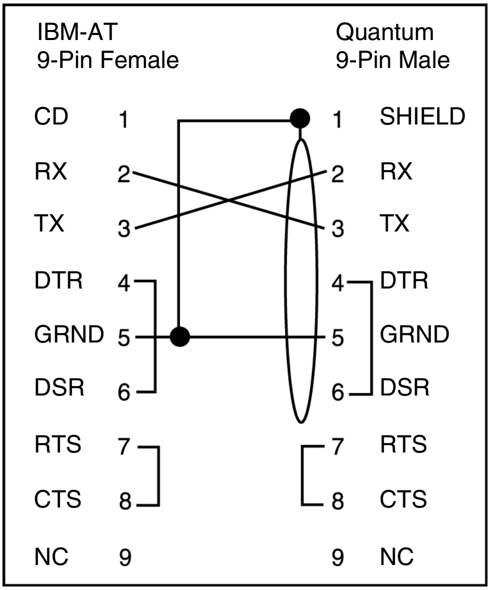
The following figure shows the Modbus port pinout connections for nine-pin and 25-pin connections.





Modbus Ports Pinout Connections for Portable Computers

The following figure shows the Modbus port connections for nine-pin portable computer connections.



The following is the abbreviation key for the above figures.

TX: Transmitted Data	DTR: Data Terminal Ready
RX: Received Data	CTS: Clear to Send
RTS: Request to Send	N/C: No Connection
DSR: Data Set Ready	CD: Carrier Detect

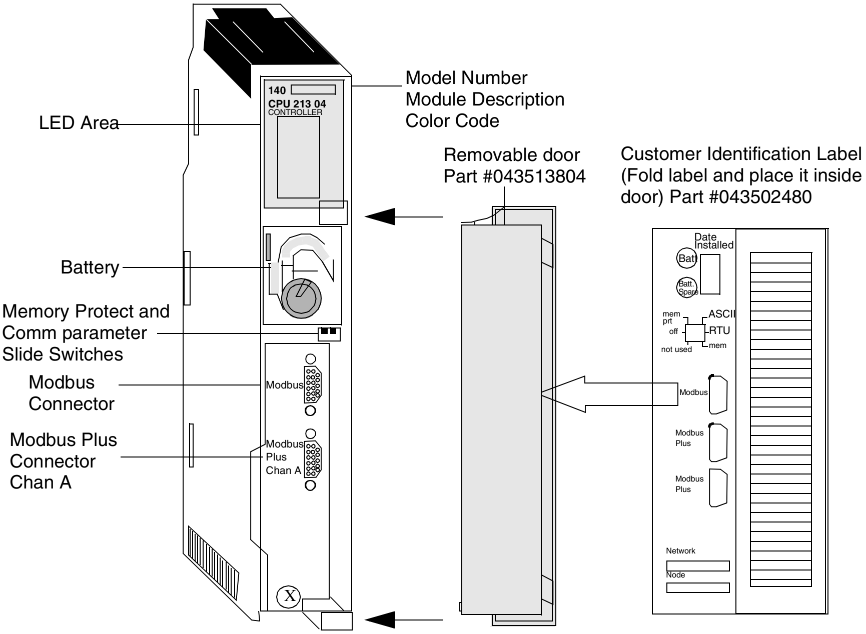
140CPU21304 CPU Module

Overview

The following provides information on the 140CPU21304 Controller module – CPU 768 K, MATH, 1xModbus Plus, Max IEC Program 606 K.

CPU Module

The following figure shows the CPU Module and its parts.



Specifications

The following table shows the specifications for the CPU21304 controller module.

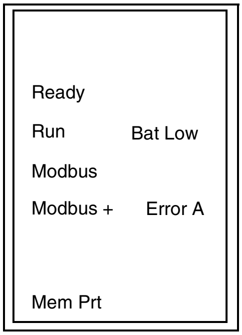
Specifications				
User Logic/Reference Capacity	**984 Ladder Logic**	**Discrete**	**Register**	**Extended Register**
	32 k words	64 k	57 k	80 k
	48 k words	64 k	28 k	0 k
	57,766 4XX registers max Only if: 0XXX = 16 and 1XXX = 16 and 3XXX =16			
Discrete	64 k - any mix			
Local I/O (Main Backplane)				
Maximum I/O Words	64 In and 64 Out*			
Maximum Number of I/O Racks	2 (Requires expander)			
Remote I/O				
Maximum I/O Words per Drop	64 In and 64 Out*			
Maximum Number of Remote Drops	31			
Distributed I/O				
Maximum Number of Networks per System	3**			
Maximum Words per Network (For every DIO drop, there is a minimum of words input of overhead.)	500 In and 500 Out			
Maximum Words per Node	30 In and 32 Out			
Watchdog Timer	250 ms (S/W adjustable)			
Logic Solve Time	0.3 ms / k to 1.4 ms / k			
Battery	3 V Lithium			
Service Life	1200 mAh			
Shelf Life	10 years with 0.5% loss of capacity per year			
Battery Load Current @ Power-off				
Typical	5 µA			
Maximum	110 µA			
Communication				
Modbus (RS-232)	1 serial port (9-pin D-shell)			

Specifications		
Modbus Plus (RS-485)	1 network port (9-pin D-shell)	
General		
Diagnostics	**Power Up**	**Runtime**
	RAM	RAM
	RAM Address	RAM Address
	Executive Checksum	Executive Checksum
	User Logic Check	User Logic Check
	Processor	
Bus Current Required	900 mA	
Power Dissipation	4.5 W	
TOD Clock	+/- 8.0 seconds/day 0 ... 60° C	
Maximum Number of NOM, NOE, and MMS modules (any combination)	2	

*This information can be a mix of Discrete or Register I/Os. For each word of Register I/O configured, one word of I/O words must be subtracted from the total available. The same holds true for each block of 8 bits or 16 bits of Discrete I/O configured - one word of Register I/O must be subtracted from the total available.
**Requires the use of the 140NOM2x00 Option Processor.

LED Indicators and Descriptions

The following figure shows the CPU LED indicators.



The following table shows the CPU LED descriptions.

LED Descriptions		
LEDs	**Color**	**Indication when On**
Ready	Green	The CPU has passed powerup diagnostics.
Run	Green	The CPU has been started and is solving logic (see the following table for Run LED error codes).
Modbus	Green	Communications are active on the Modbus port.
Modbus +	Green	Communications are active on the Modbus Plus port.
Mem Prt	Amber	Memory is write-protected (the memory protect switch is on).
Bat Low	Red	The battery needs replacing.
Error A	Red	Indicates a communications error on the Modbus Plus network.

LED Error Codes

The Blinking Run LED Error Codes table shows the number of times the Run LED blinks for each type of error and the crash codes possible for that group (all codes are in hex).

The following table shows the run LED error codes for the 140CPU21304.

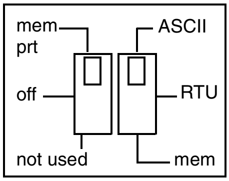
LED Error Codes		
Number of Blinks	**Code**	**Error**
Continuous	0000	requested kernel mode
2	80B	ram error during sizing
	80C	run output active failed
	82E	MB command handler stack error
3	769	bus grant received
	72A	not master asic on cpu
	72B	master config write bad
	72C	quantum bus DPM write failure
	72F	plc asic loopback test
	730	plc asic BAD_DATA

LED Error Codes		
Number of Blinks	**Code**	**Error**
4	604	UPI timeout error
	605	bad UPI response opcode
	606	UPI bus diagnostic error
	607	modbus cmd-buffer overflow
	608	modbus cmd-length is zero
	609	modbus abort command error
	614	mbp bus interface error
	615	bad mbp response opcode
	616	timeout waiting for mbp
	617	mbp out of synchronization
	618	mbp invalid path
	619	page 0 not paragraph aligned
	61E	bad external uart hardware
	61F	bad external uart interrupt
	620	bad receive comm state
	621	bad transmit comm state
	622	bad comm state trn_asc
	623	bad comm state trn_rtu
	624	bad comm state rcv_rtu
	625	bad comm state rcv_asc
	626	bad modbus state tmr0_evt
	627	bad modbus state trn-int
	628	bad modbus state rcv-int
	631	bad interrupt
5	503	ram address test error
	52D	P.O.S.T BAD MPU ERROR
6	402	ram data test error
7	300	EXEC not loaded
	301	EXEC Checksum
8	8001	Kernal prom checksum error
	8002	flash prog / erase error
	8003	unexpected executive return

Front Panel Switches

Two, three-position slide switches are located on the front of the CPU. The left switch is used for memory protection when in the top position and no memory protection in the middle and bottom positions. The three-position slide switch on the right is used to select the communication parameter settings for the Modbus (RS-232) ports.

The following figure shows the three options that are available.



Note: The CPU hardware defaults to bridge mode when the front panel switch is set to RTU or ASCII mode. When networking controllers, a panel device connected to the CPU Modbus port can communicationunicate with the controller to which it is connected, as well as log into any nodes on the Modbus Plus network.

Setting the slide switch to the top position assigns ASCII functionality to the port; the following communication parameters are set and cannot be changed

ASCII Communication Port Parameters	
Baud	2,400
Parity	Even
Data Bits	7
Stop Bits	1
Device Address	Rear panel rotary switch setting

Setting the slide switch to the middle position assigns remote terminal unit (RTU) functionality to the port; the following communication parameters are set and cannot be changed.

RTU Communication Port Parameters	
Baud	9,600
Parity	Even
Data Bits	8
Stop Bits	1
Device Address	Rear panel rotary switch setting

Setting the slide switch to the bottom position gives you the ability to assign communication parameters to the port in software; the following parameters are valid.

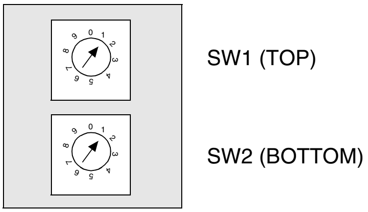
Valid Communication Port Parameters		
Baud	19,200	1,200
	9,600	600
	7,200	300
	4,800	150
	3,600	134.5
	2,400	110
	2,000	75
	1,800	50
Parity	Enable/Disable Odd/Even	
Data Bits	7 / 8	
Stop Bits	1 / 2	
Device Address	1 ... 247	

Rear Panel Switches

Two rotary switches (refer to the illustration and table below) are located on the rear panel of the CPU. They are used for setting Modbus Plus node and Modbus port addresses.

Note: The highest address that may be set with these switches is 64.

SW1 (the top switch) sets the upper digit (tens) of the address; SW2 (the bottom switch) sets the lower digit (ones) of the address. The illustration below shows the correct setting for an example address of 11.
The following figure shows SW1 and SW2.



The following table shows the SW1 and SW2 address settings.

SW1 and SW2 Adress Settings		
Node Address	**SW1**	**SW2**
1 ... 9	0	1 ... 9
10 ... 19	1	0 ... 9
20 ... 29	2	0 ... 9
30 ... 39	3	0 ... 9
40 ... 49	4	0 ... 9
50 ... 59	5	0 ... 9
60 ... 64	6	0 ... 4

Note: If "0" or an address greater than 64 is selected, the Modbus + LED will be "on" steady, to indicate the selection of an invalid address.

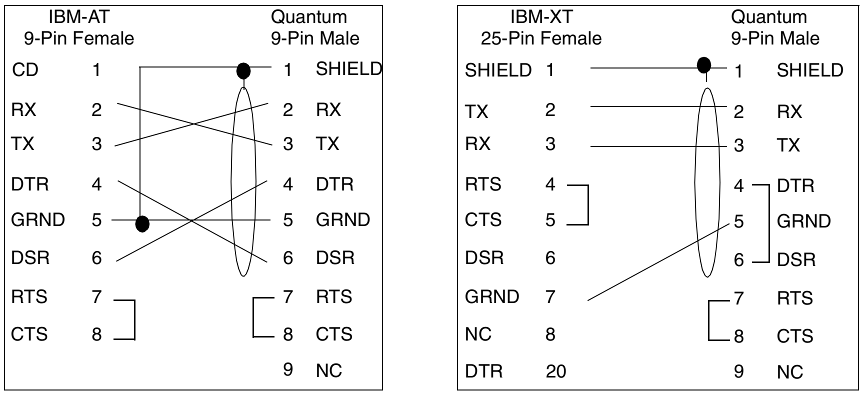
Modbus Connector Pinouts

All Quantum CPUs are equipped with a nine-pin RS-232C connector that supports Modicon's proprietary Modbus communication protocol. The following is the Modbus port pinout connections for nine-pin and 25-pin connections.

Note: Although the Modbus ports electrically support existing Modbus cables, it isrecommended that a Modbus programming cable (Part # 990NAA26320 or 990NAA26350) be used. This cable has been designed to fit under the door of a Quantum CPU or NOM module.

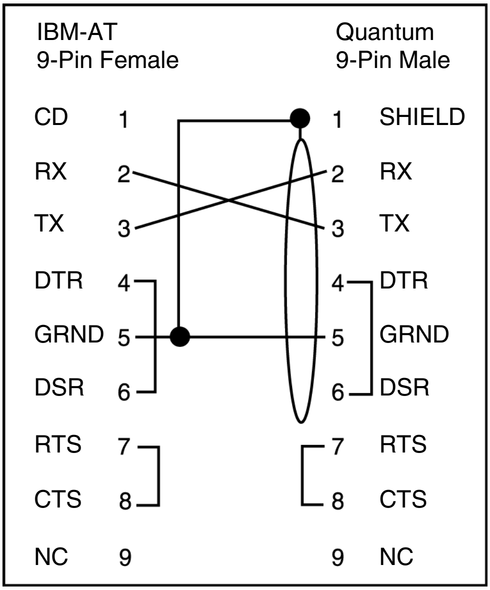
Modbus Ports Pinout Connections

The following figure shows the Modbus port pinout connections for nine-pin and 25-pin connections.



Modbus Ports Pinout Connections for Portable Computers

The follwing figure shows the Modbus port pinout connections for nine-pin portable computers.



The following is the abbreviation key for the above figures.

TX: Transmitted Data	DTR: Data Terminal Ready
RX: Received Data	CTS: Clear to Send
RTS: Request to Send	NC: No Connection
DSR: Data Set Ready	CD: Carrier Detect

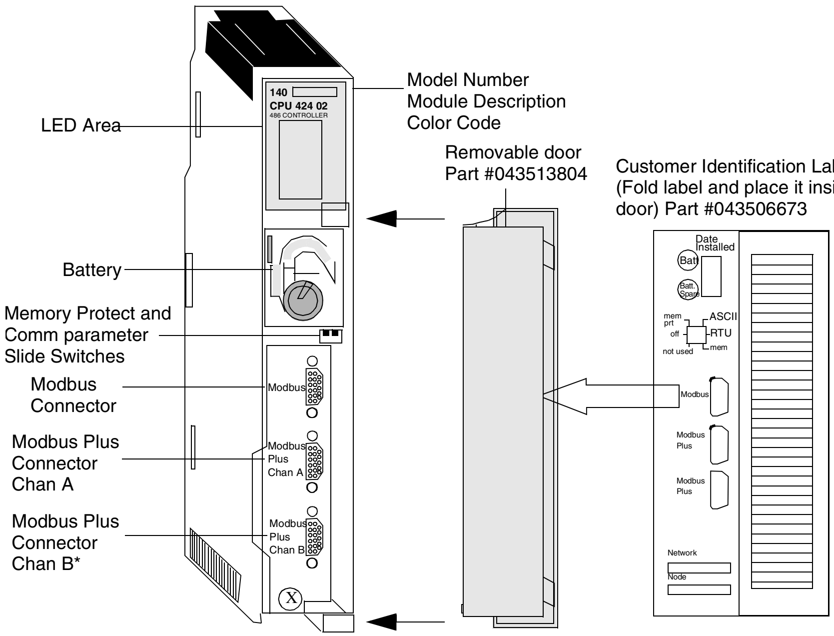
140CPU42402 CPU Module

Overview

The following provides information on the140CPU42402 Controller module – CPU 2 M, MATH, 2xModbus Plus, Max IEC Program 570 K.

CPU Module

The following figure shows the CPU module and its components.



Specifications

The following table shows the specifications for the 140CPU42402 CONTROLLER module.

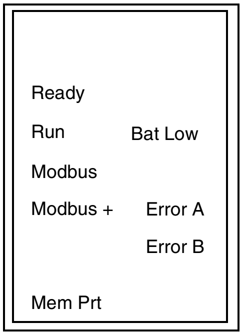
Specifications				
User Logic/Reference Capacity	**984 Ladder Logic**	**Discrete**	**Register**	**Extended Register**
	64 k words	64 k	57 k	96 k
	57,766 4XX registers max Only if: 0XXX = 16 and 1XXX = 16 and 3XXX = 16			
Reference Capacity				
Discrete	64 k - any mix			
Local I/O (Main Backplane)				
Maximum I/O Words	64 In and 64 Out*			
Maximum Number of I/O Racks	2 (Requires expander)			
Remote I/O				
Maximum I/O Words per Drop	64 In and 64 Out*			
Maximum Number of Remote Drops	31			
Distributed I/O				
Maximum Number of Networks per System	3**			
Maximum Words per Network (For every DIO drop, there is a minimum of words input of overhead.)	500 In and 500 Out			
Maximum Words per Node	30 In and 32 Out			
Watchdog Timer	250 ms (S/W adjustable)			
Logic Solve Time	**0.1 ms / k to 0.5 ms / k**			
Battery	3 V Lithium			
Service Life	1200 mAh			
Shelf Life	10 years with 0.5% loss of capacity per year			
Battery Load Current @ Power-off				
Typical	7 µA			
Maximum	210 µA			
Communication				

Specifications		
Modbus (RS-232)	1 serial port (9-pin D-shell)	
Modbus Plus (RS-485)	2 (redundant) network ports (9-pin D-shell)	
General		
Diagnostics	**Power Up**	**Runtime**
	RAM	RAM
	RAM Address	RAM Address
	Executive Checksum	Executive Checksum
	User Logic Check	User Logic Check
	Processor	
Bus Current Required	1.8 A	
Power dissipation	9 W	
TOD Clock	+/- 8.0 seconds/day 0 ... 60 °C	
Maximum Number of NOM, NOE, and MMS modules (any combination)	6	

*This information can be a mix of Discrete or Register I/Os. For each word of Register I/O configured, one word of I/O words must be subtracted from the total available. The same holds true for each block of 8 bits or 16 bits of Discrete I/O configured-one word of Register I/O must be subtracted from the total available.
**Requires the use of the 140NOM2x00 Option Modules.

LED Indicators and Descriptions

The following figure shows the CPU LED indicators.



The following table shows the CPU LED descriptions.

LED Descriptiosn		
LEDs	**Color**	**Indication when On**
Ready	Green	The CPU has passed powerup diagnostics.
Run	Green	The CPU has been started and is solving logic (see the following table for Run LED error codes).
Modbus	Green	Communications are active on the Modbus port.
Modbus +	Green	Communications are active on the Modbus Plus port.
Mem Prt	Amber	Memory is write protected (the memory protect switch is on).
Bat Low	Red	The battery needs replacing.
Error A	Red	Indicates a communications error on the redundant Modbus Plus port A (140CPU42402 only).
Error B	Red	Indicates a communications error on the redundant Modbus Plus port B (140CPU42402 only).

LED Error Codes

The following table shows the run LED error codes for the CPU42402.

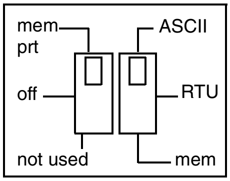
LED Error Codes		
Number of Blinks	**Code**	**Error**
Continuous	0000	requested kernel mode
2	80B	ram error during sizing
	80C	run output active failed
	82E	MB command handler stack error
3	769	bus grant received
	72A	not master asic on cpu
	72B	master config write bad
	72C	quantum bus DPM write failure
	72F	plc asic loopback test
	730	plc asic BAD_DATA

LED Error Codes		
Number of Blinks	**Code**	**Error**
4	604	UPI timeout error
	605	bad UPI response opcode
	606	UPI bus diagnostic error
	607	modbus cmd-buffer overflow
	608	modbus cmd-length is zero
	609	modbus abort command error
	614	mbp bus interface error
	615	bad mbp response opcode
	616	timeout waiting for mbp
	617	mbp out of synchronization
	618	mbp invalid path
	619	page 0 not paragraph aligned
	61E	bad external uart hardware
	61F	bad external uart interrupt
	620	bad receive comm state
	621	bad transmit comm state
	622	bad comm state trn_asc
	623	bad comm state trn_rtu
	624	bad comm state rcv_rtu
	625	bad comm state rcv_asc
	626	bad modbus state tmr0_evt
	627	bad modbus state trn-int
	628	bad modbus state rcv-int
	631	bad interrupt
5	503	ram address test error
	52D	P.O.S.T BAD MPU ERROR
6	402	ram data test error
7	300	EXEC not loaded
	301	EXEC Checksum
8	8001	Kernal prom checksum error
	8002	flash prog / erase error
	8003	unexpected executive return

Front Panel Switches

Two, three-position slide switches are located on the front of the CPU. The left switch is used for memory protection when in the top position and no memory protection in the middle and bottom positions. The three-position slide switch on the right is used to select the comm parameter settings for the Modbus (RS-232) ports.

The following figure shows the three options that are available for the CPU42402 module.



Note: The CPU hardware defaults to bridge mode when the front panel switch is set to RTU or ASCII mode. When networking controllers, a panel device connected to the CPU Modbus port can communicate with the controller to which it is connected, as well as log into any nodes on the Modbus Plus network.

Setting the slide switch to the top position assigns ASCII functionality to the port; the following comm parameters are set and cannot be changed.

ASCII Comm Port Parameters	
Baud	2,400
Parity	Even
Data Bits	7
Stop Bits	1
Device Address	Rear panel rotary switch setting

Setting the slide switch to the middle position assigns remote terminal unit (RTU) functionality to the port; the following comm parameters are set and cannot be changed.

RTU Comm Port Parameters	
Baud	9,600
Parity	Even
Data Bits	8
Stop Bits	1
Device Address	Rear panel rotary switch setting

Setting the slide switch to the bottom position gives you the ability to assign comm parameters to the port in software; the following parameters are valid.

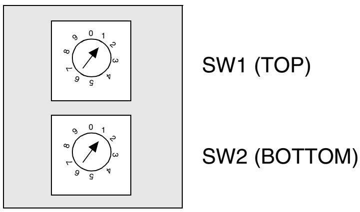
Valid Comm Port Parameters		
Baud	19,200	1,200
	9,600	600
	7,200	300
	4,800	150
	3,600	134.5
	2,400	110
	2,000	75
	1,800	50
Parity	Enable/Disable Odd/Even	
Data Bits	7 / 8	
Stop Bits	1 / 2	
Device Address	1 ... 247	

Rear Panel Switches

Two rotary switches (refer to the following illustration) are located on the rear panel of the CPU. They are used for setting Modbus Plus node and Modbus port addresses.

Note: The highest address that may be set with these switches is 64.

SW1 (the top switch) sets the upper digit (tens) of the address; SW2 (the bottom switch) sets the lower digit (ones) of the address. The illustration below shows the correct setting for an example address of 11.
The following figure shows SW1 and SW2.



The following table shows the SW1 and SW2 address settings.

SW1 and SW2 Address Settings		
Node Address	**SW1**	**SW2**
1 ... 9	0	1 ... 9
10 ... 19	1	0 ... 9
20 ... 29	2	0 ... 9
30 ... 39	3	0 ... 9
40 ... 49	4	0 ... 9
50 ... 59	5	0 ... 9
60 ... 64	6	0 ... 4

Note: If "0" or an address greater than 64 is selected, the Modbus + LED will be "on" steady, to indicate the selection of an invalid address.

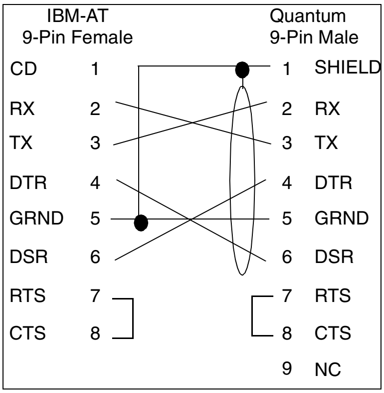
Modbus Connector Pinouts

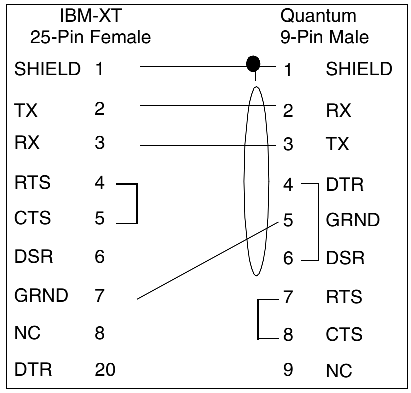
All Quantum CPUs are equipped with a nine-pin RS-232C connector that supports Modicon’s proprietary Modbus communication protocol. The following is the Modbus port pinout connections for nine-pin and 25-pin connections.

Note: Although the Modbus ports electrically support existing Modbus cables, it is recommended that a Modbus programming cable (Part # 990NAA26320 or 990NAA26350) be used. This cable has been designed to fit under the door of a Quantum CPU or NOM module.

Modbus Ports Pinout Connections

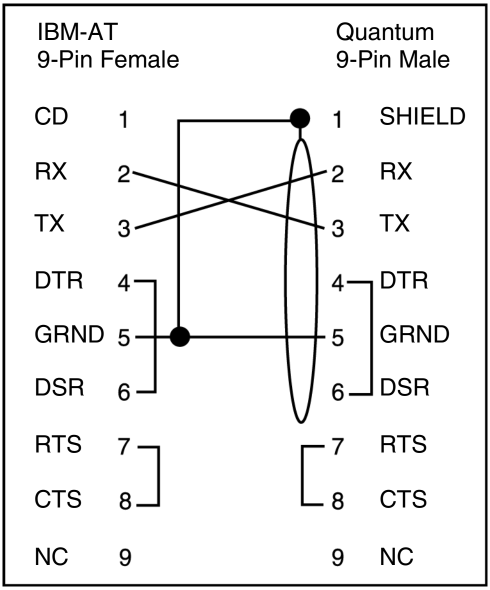
The following figure shows the Modbus port pinout connections for nine-pin and 25-pin connections.





Modbus Ports Pinout Connections for Portable Computers

The following figure shows the Modbus port pinout connections for nine-pin portable computers



The following is the abbreviation key for the above figures.

TX: Transmitted Data	DTR: Data Terminal Ready
RX: Received Data	CTS: Clear to Send
RTS: Request to Send	NC: No Connection
DSR: Data Set Ready	CD: Carrier Detect

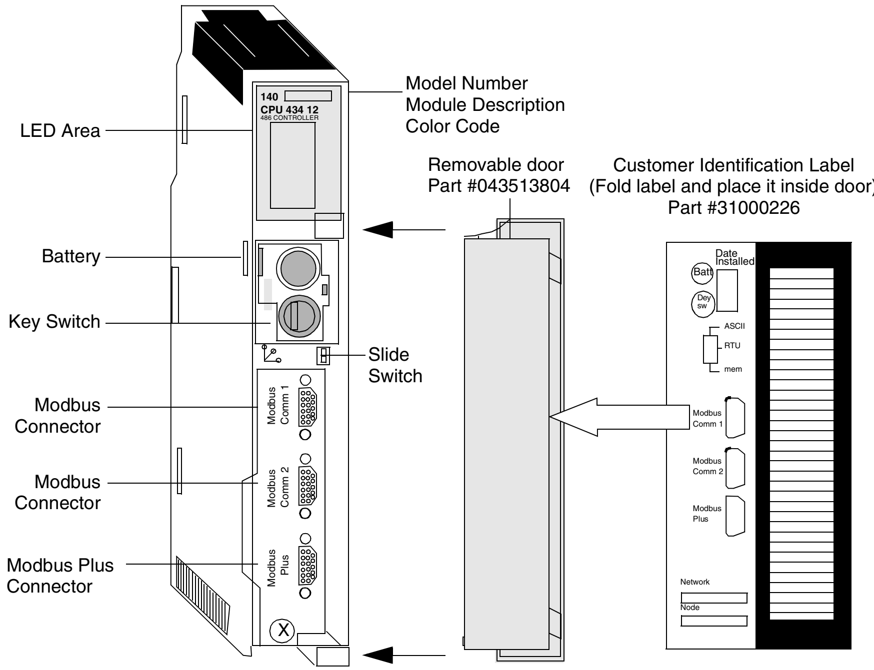
140CPU43412 CPU Module

Overview

The following provides information on the 140CPU43412 Controller module – CPU 2M, 1xModbus Plus, Max IEC Program – 896 k.

CPU Module

The following figure shows the CPU Module and its components.



Specifications

The following table shows the specifications for the CPU43412 CONTROLLER module.

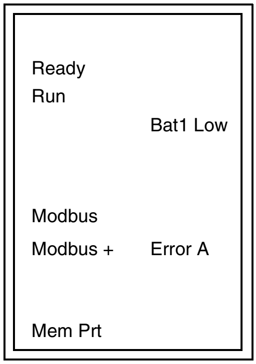
Specifications				
User Logic/Reference Capacity	**984 Ladder Logic**	**Discrete**	**Register**	**Extended Register**
	64 k words	64 k	57 k	96 k
	57,766 4XX registers max Only if: 0XXX = 16 1XXX = 16 and 3XXX = 16			
Reference Capacity				
Discrete	64 k - any mix			
Local I/O (Main Backplane)				
Maximum I/O Words	64 In and 64 Out*			
Maximum Number of I/O Racks	2 (Requires expander)			
Remote I/O				
Maximum I/O Words per Drop	64 In and 64 Out*			
Maximum Number of Remote Drops	31			
Distributed I/O				
Maximum Number of Networks per System	3**			
Maximum Words per Network (for every DIO drop, there is a minimum of words input of overhead.)	500 In and 500 Out			
Maximum Words per Node	30 In and 32 Out			
Maximum Number of Option Module Interfaces	Supports up to six network modules (i.e., Modbus Plus, Ethernet and Multi-Axis Motion option modules) using the option module interface technique (see *Quantum Network Interface Techniques, p. 45*). **Note**: Only two Modbus Plus modules can have full functionality, including Quantum DIO support.			
Watchdog Timer	250 ms (S/W adjustable)			
Logic Solve Time	0.1 ms / k to 0.5 ms / k			
Battery	3 V Lithium			
Service Life	1200 mAh			
Shelf Life	10 years with 0.5% loss of capacity per year			

<table>
<tr><th colspan="3">Specifications</th></tr>
<tr><td colspan="3">Battery Load Current at Power-off</td></tr>
<tr><td>Typical</td><td colspan="2">7 µA</td></tr>
<tr><td>Maximum</td><td colspan="2">210 µA</td></tr>
<tr><td colspan="3">Communication</td></tr>
<tr><td>Modbus (RS-232)</td><td colspan="2">2 serial port (9-pin D-shell)</td></tr>
<tr><td>Modbus Plus (RS-485)</td><td colspan="2">1 network port (9-pin D-shell)</td></tr>
<tr><td colspan="3">General</td></tr>
<tr><td rowspan="6">Diagnostics</td><td>Power Up</td><td>Runtime</td></tr>
<tr><td>RAM</td><td>RAM</td></tr>
<tr><td>RAM Address</td><td>RAM Address</td></tr>
<tr><td>Executive Checksum</td><td>Executive Checksum</td></tr>
<tr><td>User Logic Check</td><td>User Logic Check</td></tr>
<tr><td colspan="2">Processor</td></tr>
<tr><td>Bus Current Required</td><td colspan="2">1.8 A</td></tr>
<tr><td>Power Dissipation</td><td colspan="2">9W</td></tr>
<tr><td>TOD Clock</td><td colspan="2">+/- 8.0 seconds/day 0 ... 60° C</td></tr>
<tr><td>Operating Temperature</td><td colspan="2">0 ... 60° C</td></tr>
</table>

*This information can be a mix of Discrete or Register I/Os. For each word of register I/O configured, one word of I/O words must be subtracted from the total available. The same holds true for each block of 8 bits or 16 bits of Discrete I/O configured – one word of Register I/O must be subtracted from the total available.
**Requires the use of two 140NOM21x00 Option Modules.

LED Indicators and Descriptions

The following figure shows the LED indicators.



The following table shows the LED descriptions.

LEDS	Color	Indication when On
Ready	Green	The CPU has passed power-up diagnostics.
Run	Green	The CPU has been started and is solving logic.
Bat Low	Red	The battery needs replacing or is not present.
Modbus	Green	Communications are active on the Modbus port 1 or 2.
Modbus +	Green	Communications are active on the Modbus Plus port.
Error A	Red	Indicates communications error on the Modbus Plus port.
Mem Prt	Amber	Memory is write-protected (the memory protect switch is on).

LED Error Codes

The following table shows the run LED error codes for the 140CPU43412.

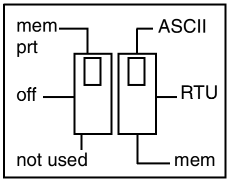
LED Error Codes		
Number of Blinks	**Code**	**Error**
Continuous	0000	requested kernel mode
2	80B	ram error during sizing
	80C	run output active failed
	82E	MB command handler stack error
3	769	bus grant received
	72A	not master asic on cpu
	72B	master config write bad
	72C	quantum bus DPM write failure
	72F	plc asic loopback test
	730	plc asic BAD_DATA

LED Error Codes		
Number of Blinks	**Code**	**Error**
4	604	UPI timeout error
	605	bad UPI response opcode
	606	UPI bus diagnostic error
	607	modbus cmd-buffer overflow
	608	modbus cmd-length is zero
	609	modbus abort command error
	614	mbp bus interface error
	615	bad mbp response opcode
	616	timeout waiting for mbp
	617	mbp out of synchronization
	618	mbp invalid path
	619	page 0 not paragraph aligned
	61E	bad external uart hardware
	61F	bad external uart interrupt
	620	bad receive comm state
	621	bad transmit comm state
	622	bad comm state trn_asc
	623	bad comm state trn_rtu
	624	bad comm state rcv_rtu
	625	bad comm state rcv_asc
	626	bad modbus state tmr0_evt
	627	bad modbus state trn-int
	628	bad modbus state rcv-int
	631	bad interrupt
5	503	ram address test error
	52D	P.O.S.T BAD MPU ERROR
6	402	ram data test error
7	300	EXEC not loaded
	301	EXEC Checksum
8	8001	Kernal prom checksum error
	8002	flash prog / erase error
	8003	unexpected executive return

Front Panel Switches

Two, three-position slide switches are located on the front of the CPU. The left switch is used for memory protection when in the top position and no memory protection in the middle and bottom positions. The three-position slide switch on the right is used to select the comm parameter settings for the Modbus (RS-232) ports.

The following figure shows the three options that are available for the 140CPU43412 module.



Note: The CPU hardware defaults to bridge mode when the front panel switch is set to RTU or ASCII mode. When networking controllers, a panel device connected to the CPU Modbus port can communicate with the controller to which it is connected, as well as log into any nodes on the Modbus Plus network.

Setting the slide switch to the top position assigns ASCII functionality to the port; the following comm parameters are set and cannot be changed.

ASCII Comm Port Parameters	
Baud	2,400
Parity	Even
Data Bits	7
Stop Bits	1
Device Address	Rear panel rotary switch setting

Setting the slide switch to the middle position assigns remote terminal unit (RTU) functionality to the port; the following comm parameters are set and cannot be changed.

RTU Comm Port Parameters	
Baud	9,600
Parity	Even
Data Bits	8
Stop Bits	1
Device Address	Rear panel rotary switch setting

Setting the slide switch to the bottom position gives you the ability to assign comm parameters to the port in software; the following parameters are valid.

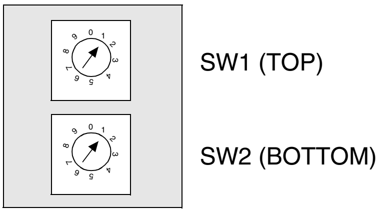
Valid Comm Port Parameters		
Baud	19,200	1,200
	9,600	600
	7,200	300
	4,800	150
	3,600	134.5
	2,400	110
	2,000	75
	1,800	50
Parity	Enable/Disable Odd/Even	
Data Bits	7 / 8	
Stop Bits	1 / 2	
Device Address	1 ... 247	

Rear Panel Switches

Two rotary switches (see the following illustration and table) are located on the rear panel of the CPU. They are used for setting Modbus Plus node and Modbus port addresses.

Note: The highest address that may be set with these switches is 64.

SW1 (the top switch) sets the upper digit (tens) of the address; SW2 (the bottom switch) sets the lower digit (ones) of the address. The illustration below shows the correct setting for an example address of 11.
The following figure shows SW1 and SW2.



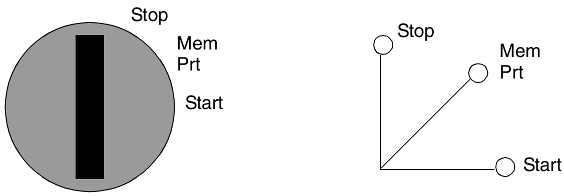
Note: If "0" or an address greater than 64 is selected, the Modbus + LED will be "on" steady, to indicate the selection of an invalid address.

The following table shows the SW1 and SW2 address settings.

SW1 and SW2 Address Settings		
Node Address	**SW1**	**SW2**
1 ... 9	0	1 ... 9
10 ... 19	1	0 ... 9
20 ... 29	2	0 ... 9
30 ... 39	3	0 ... 9
40 ... 49	4	0 ... 9
50 ... 59	5	0 ... 9
60 ... 64	6	0 ... 4

Key Switch

The key switch is used to protect memory from programming changes while the controller is in operation. The following figure shows the key switch.



Note: The key switch positions shown next to the switch (above) are for reference only and are marked on the module as indicated on the right.

The following table shows the key switch information.

Key Switch Description

Key switch Position	Controller Status	Memory Protected From Programmer Changes	Will Accept Programmer Stop or Start	Key switch Transition
Stop	Controller is stopped and disables Programmer changes.	Y	N	From Start or Memory Protect: Stops controller, if running, and disables Programmer changes
Mem Prt	Controller may be either stopped or running and Programmer changes are disabled. User cannot write to unlocated variables.	Y	N	From Stop or Start: Prevents Programmer changes, controller run status is not changed

Key Switch Description				
Key switch Position	**Controller Status**	**Memory Protected From Programmer Changes**	**Will Accept Programmer Stop or Start**	**Key switch Transition**
Start	Controller may be either stopped or running. Programmer may make changes and start/stop the controller	N	Y	From Stop: Enables Programmer changes, starts controller. From Memory Protect: Enables programmer changes, starts controller if stopped.

Modbus Connector Pinouts

All Quantum CPUs are equipped with a nine-pin RS-232C connector that support Modicon's proprietary Modbus communication protocol. The following is the Modbus port pinout connections for nine-pin and 25-pin connections.

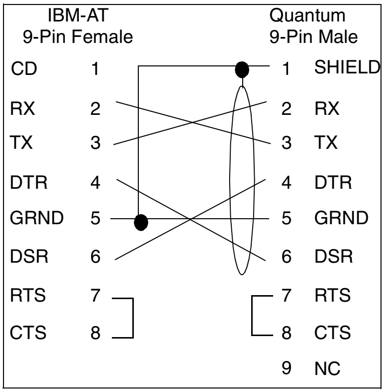
Note: Although the Modbus ports electrically support existing Modbus cables, it is recommended that a Modbus programming cable (Part # 990NAA26320 or 990NAA26350) be used. This cable has been designed to fit under the door of a Quantum CPU or NOM module.

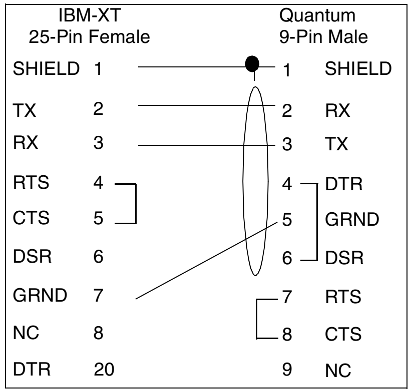
Modbus Port Modem Support

Modbus Port 1 has full modem interfacing ability. Modbus Port 2 RTS/CTS connections function properly for normal non-modem communications but do not support modems.

Modbus Ports Pinout Connections

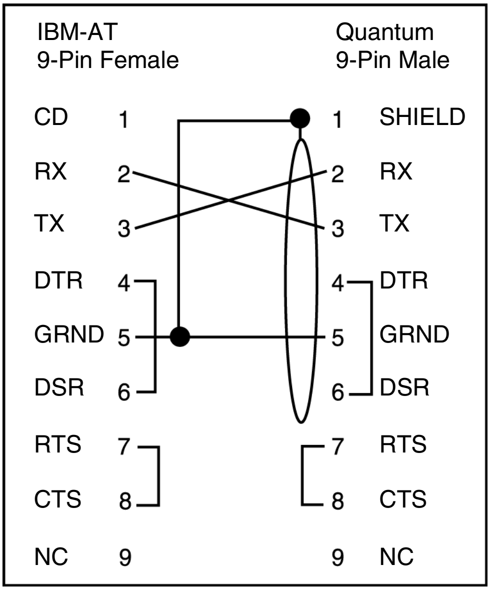
The following figure shows the Modbus port pinout connections for 9-pin and 25-pin connections.





Modbus Ports Pinout Connections for Portable Computers

The following figure shows the Modbus port pinout connections for 9-pin portable computers.



The following is the abbreviation key for the above figures.

TX: Transmitted Data	DTR: Data Terminal Ready
RX: Received Data	CTS: Clear to Send
RTS: Request to Send	NC: No Connection
DSR: Data Set Ready	CD: Carrier Detect

140CPU43412A CPU Module

Overview

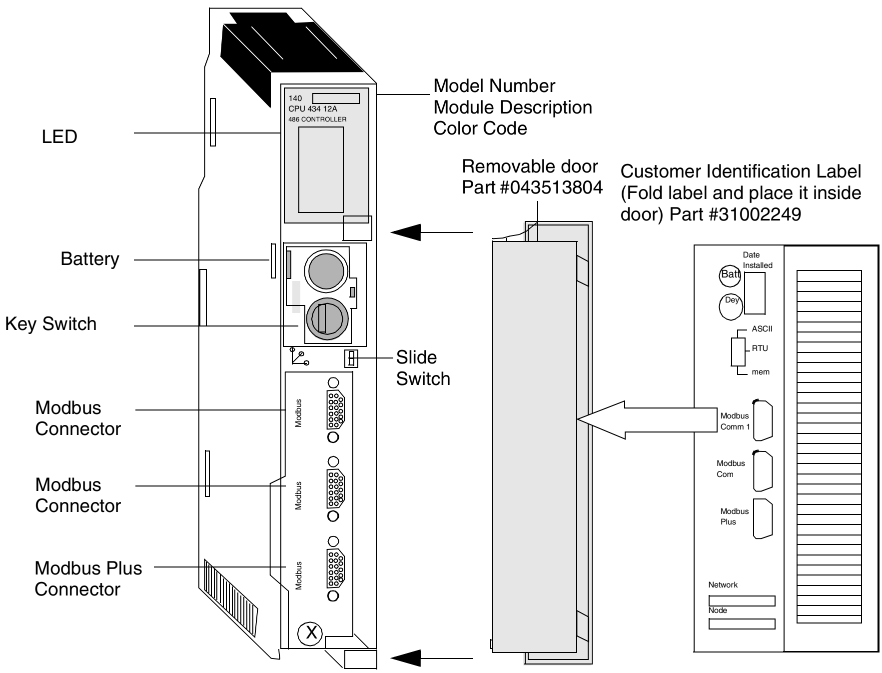
The following provides information on the specifications, LED indicators and description and error codes for the 140CPU43412A Controller Module.

This module is functionally identical to the non-"A" version, however, the following should be considered:

- If you are using the module in a Hot Standby topology, then you **must** use either two non-"A" models or two "A" models.
- The "A" version requires a new flash executive.
- The "A" version and non-"A" flash executives are **not** interchangeable.
- Schneider Automation software (Concept, ProWORX, and Modsoft) supports the "A" version. Any existing or new 140CPU43412 program configuration will load into a 140CPU43412A without any modifications.

CPU Module

The following figure shows the CPU Module and its components.



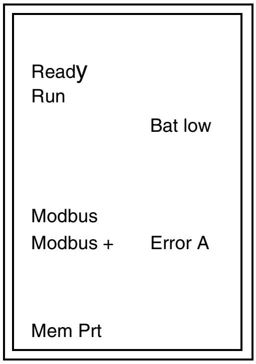
Specifications The following table shows the specifications for the CPU43412A Controller module.

Specifications					
User Logic/Reference Capacity	**984 Ladder Logic**	**Discrete**	**Register**	**Extended Register**	**IEC Application**
	64 k words	64 k	57 k	96 k	896 k
	57,766 4XX registers max Only if: 0XXX = 16 and 1XXX = 16 and 3XXX = 16				
Reference Capacity					
Discrete	64 k - any mix				
Local I/O					
Maximum I/O Words	64 In and 64 Out*				
Maximum Number of I/O Racks	2 (Requires Expander)				
Remote I/O					
Maximum I/O Words per Drop	64 In and 64 Out*				
Maximum Number of Remote Drops	31				
Distributed I/O					
Maximum Number of Networks per System	3**				
Maximum Words per Network (for every DIO drop, there is a minimum of words input of overhead.)	500 In and 500 Out				
Maximum Words per Node	30 In and 32 Out				
*This information can be a mix of Discrete or Register I/O. For each word of register I/O configured, one word must be subtracted from the total available. The same holds true for each block of 8 bits or 16 bits of Discrete I/O configured--one word must be subtracted from the total available. **Requires the use of two140NOM21X00 Option Modules.					
Maximum Number of Network Module Interfaces	6				
Watchdog Timer	250 ms (S/W adjustable)				
Logic Solve Time	0.1 ms / k to 0.5 ms / k				
Battery					
Type	3 V Lithium				
Service Life	1200 mAh				
Shelf Life	10 years with 0.5% loss of capacity per year				
Battery Load Current at Power-off					

Specifications		
Typical	7 µA	
Maximum	210 µA	
Communication		
Modbus (RS-232)	2 serial port (9-pin D-shell)	
Modbus Plus (RS-485)	1 network port (9-pin D-shell)	
Programming Software Capability	Modsoft Version 2.6 minimum Concept version 2.1 with B2.1 patch Concept 2.2 with SR2 ProWORX Nxt version 2.0, minimum ProWORX Plus version 1.05, minimum ProWORX 32 version 1.0, minimum	
General		
Diagnostics	**Power Up**	**Runtime**
	RAM RAM Address Executive Checksum User Logic Check Processor	RAM RAM Address Executive Checksum User Logic Check
Bus Current Required	1.25 A	
Power Dissipation	6.25 W	
TOD Clock	+/- 8.0 seconds/day 0 ... 60° C	
Operating Temperature	0 ... 60° C	

LED Indicators and Descriptions

The following figure shows the LED indicators.



The following table shows the LED error codes for the 140CPU43412A module.

LEDS	Color	Indication when On
Ready	Green	The CPU has passed power-up diagnostics.
Run	Green	The CPU has been started and is solving logic.
Bat Low	Red	The battery needs replacing or is not present.
Modbus	Green	Communications are active on the Modbus port 1 or 2.
Modbus +	Green	Communications are active on the Modbus Plus port.
Error A	Red	Indicates communications error on the Modbus Plus port.
Mem Prt	Amber	Memory is write-protected (the memory protect switch is on).

LED Error Codes

The following table shows the run LED error codes for the 140CPU43412A.

LED Error Codes		
Number of Blinks	**Code**	**Error**
Continuous	0000	requested kernel mode
2	80B	ram error during sizing
	80C	run output active failed
	82E	MB command handler stack error
3	769	bus grant received
	72A	not master asic on cpu
	72B	master config write bad
	72C	quantum bus DPM write failure
	72F	plc asic loopback test
	730	plc asic BAD_DATA

LED Error Codes		
Number of Blinks	**Code**	**Error**
4	604	UPI timeout error
	605	bad UPI response opcode
	606	UPI bus diagnostic error
	607	modbus cmd-buffer overflow
	608	modbus cmd-length is zero
	609	modbus abort command error
	614	mbp bus interface error
	615	bad mbp response opcode
	616	timeout waiting for mbp
	617	mbp out of synchronization
	618	mbp invalid path
	619	page 0 not paragraph aligned
	61E	bad external uart hardware
	61F	bad external uart interrupt
	620	bad receive comm state
	621	bad transmit comm state
	622	bad comm state trn_asc
	623	bad comm state trn_rtu
	624	bad comm state rcv_rtu
	625	bad comm state rcv_asc
	626	bad modbus state tmr0_evt
	627	bad modbus state trn-int
	628	bad modbus state rcv-int
	631	bad interrupt
5	503	ram address test error
	52D	P.O.S.T BAD MPU ERROR
6	402	ram data test error
7	300	EXEC not loaded
	301	EXEC Checksum
8	8001	Kernal prom checksum error
	8002	flash prog / erase error
	8003	unexpected executive return

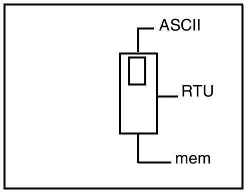
Note: Information in the Code column is visible only with the Flash download utility.

Front Panel Switch

The slide switch is used to select the comm parameter settings for the Modbus (RS232) ports. Three options are available:

1. Setting the switch to the top position assigns ASCII functionality to the port.
2. Setting the switch to the middle position assigns remote terminal unit (RTU) functionality to the port.
3. Setting the switch to the bottom position lets you assign comm parameters to the port in software.

The figure shows the three options that are available on the front panel slide switch.



> **Note:** The CPU hardware defaults to bridge mode when the front panel switch is set to RTU or ASCII mode. When networking controllers, a panel device connected to the CPU Modbus port can communicate with the controller to which it is connected, as well as log into any nodes on the Modbus Plus network.

The following table shows the ASCII comm port parameters.

ASCII Comm Port Parameters	
Baud	2,400
Parity	Even
Data Bits	7
Stop Bits	1
Device Address	Rear panel rotary switch setting

The following table shows the RTU comm port parameters. The comm parameters are set and cannot be changed.

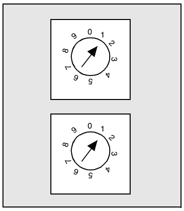
RTU Comm Port Parameters	
Baud	9,600
Parity	Even
Data Bits	8
Stop Bits	1
Device Address	Rear panel rotary switch setting

The following table shows the valid comm port parameters.

Valid Comm Port Parameters		
Baud	19,200	1,200
	9,600	600
	7,200	300
	4,800	150
	3,600	134.5
	2,400	110
	2,000	75
	1,800	50
Parity	Enable/Disable Odd/Even	
Data Bits	7 / 8	
Stop Bits	1 / 2	
Device Address	1 ... 247	

Rear Panel Switches

The following figure shows the SW1 and SW2 settings.



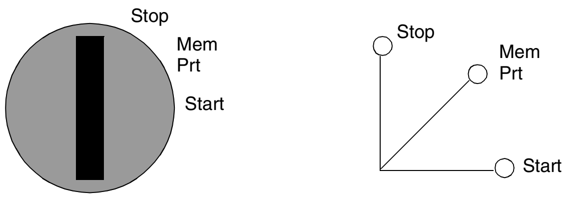
SW1 sets the upper digit (tens) of the address. SW2 sets the lower digit (ones) of the address. The following table shows the SW1 and SW2 address settings.

SW1 and SW2 Address Settings		
Node Address	**SW1**	**SW2**
1 ... 9	0	1 ... 9
10 ... 19	1	0 ... 9
20 ... 29	2	0 ... 9
30 ... 39	3	0 ... 9
40 ... 49	4	0 ... 9
50 ... 59	5	0 ... 9
60 ... 64	6	0 ... 4

Note: If "0" or an address greater than 64 is selected, the Modbus + LED will be "on" steady, to indicate the selection of an invalid address.

Key Switch

The key switch protects memory from programming changes while the controller is in operation. The following figure shows the key switch.



Note: The key switch positions shown next to the switch (above) are for reference only and are marked on the module as indicated on the right.

Key Switch Description

The following table shows the key switch information.

Key Switch Description				
Key switch Position	**Controller Status**	**Memory Protected From Programmer Changes**	**Will Accept Programmer Stop or Start**	**Key switch Transition**
Stop	Controller is stopped and disables Programmer changes.	Y	N	From Start or Memory Protect: Stops controller, if running, and disables Programmer changes
Mem Prt	Controller may be either stopped or running and Programmer changes are disabled. User cannot write to unlocated variables.	Y	N	From Stop or Start: Prevents Programmer changes, controller run status is not changed
Start	Controller may be either stopped or running. Programmer may make changes and start/stop the controller.	N	Y	From Stop: Enables Programmer changes, starts controller. From Memory Protect: Enables programmer changes, starts controller if stopped.

Modbus Connector Pinouts

All Quantum CPUs are equipped with a nine-pin RS-232C connector that support Modicon's proprietary Modbus communication protocol. The following is the Modbus port pinout connections for nine-pin and 25-pin connections.

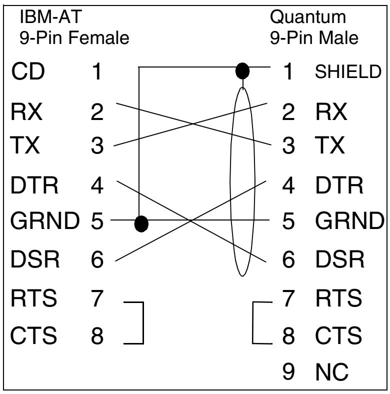
Note: Although the Modbus ports electrically support existing Modbus cables, it is recommended that a Modbus programming cable (Part # 990NAA26320 or 990NAA26350) be used. This cable has been designed to fit under the door of a Quantum CPU or NOM module.

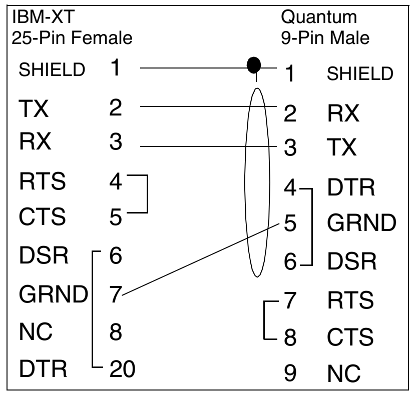
Modbus Port Modem Support

Modbus Port 1 has full modem interfacing ability. Modbus Port 2 RTS/CTS connections function properly for normal non-modem communications but do not support modems.

Modbus Ports Pinout Connections Figure

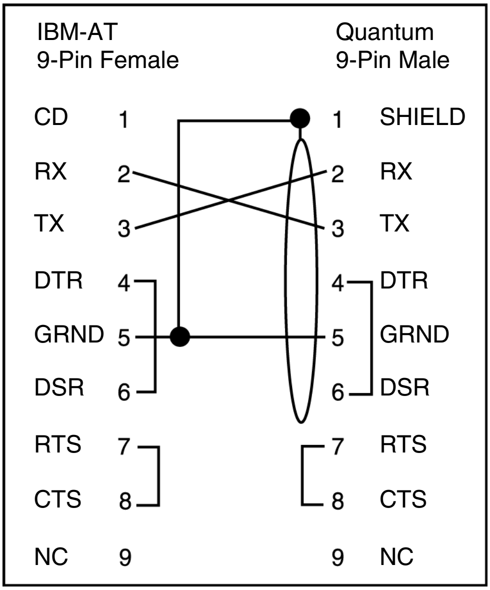
The following figure shows the Modbus port pinout connections for 9-pin and 25-pin connections.





Modbus Ports Pinout Connections for Portable Computers

The following figure shows the Modbus port pinout connections for portable (laptop) computers.



The following is the abbreviation key for the above figures.

TX: Transmitted Data	DTR: Data Terminal Ready
RX: Received Data	CTS: Clear to Send
RTS: Request to Send	NC: No Connection
DSR: Data Set Ready	CD: Carrier Detect

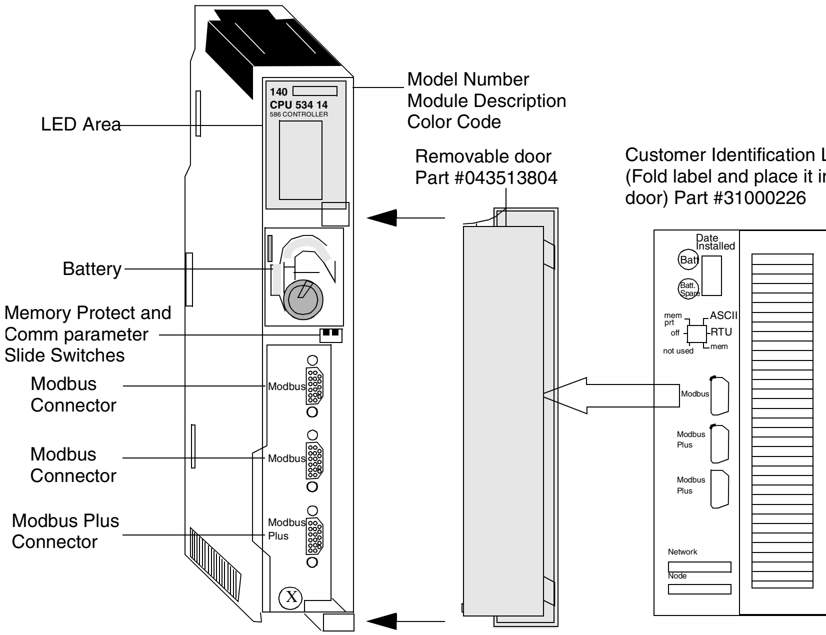
140CPU53414 CPU Module

Overview

The following provides information on the 140CPU53414 Controller module – CPU 4M, 1xModbus Plus, Max IEC Program – 2.5 M.

CPU Module

The following figure shows the CPU Module and its components.



Specifications

The following table shows the specification for the 140CPU53414 CONTROLLER module.

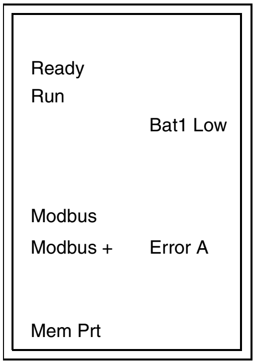
Specifications				
User Logic/Reference Capacity	**984 Ladder Logic**	**Discrete**	**Register**	**Extended Register**
	64 k words	64 k	57 k	96 k
	57,766 4XX registers max Only if: 0XXX = 16 and 1XXX = 16 and 3XXX = 16			
Reference Capacity				
Discrete	64 k - any mix			
Local I/O (Main Backplane)				
Maximum I/O Words	64 In and 64 Out*			
Maximum Number of I/O Racks	2 (Requires Expander)			
Remote I/O				
Maximum I/O Words per Drop	64 In and 64 Out*			
Maximum Number of Remote Drops	31			
Distributed I/O				
Maximum Number of Networks per System	3**			
Maximum Words per Network. (For every DIO drop, there is a minimum of words input of overhead.)	500 In and 500 Out			
Maximum Words per Node	30 In and 32 Out			
Maximum Number of Option Module Interfaces	Supports up to six network modules (i.e., Modbus Plus, Ethernet and Multi-Axis Motion option modules) using the option module interface technique. **Note:** Only two Modbus Plus modules can have full functionality, including Quantum DIO support.			
Watchdog Timer	250 ms (S/W adjustable)			
Logic Solve Time	0.09 ms / k to 0.45 ms / k			
Battery	3 V Lithium			
Service Life	1200 mAh			
Shelf Life	10 years with 0.5% loss of capacity per year			
Battery Load Current @ Power-off				
Typical	14 µA			

Specifications		
Maximum	420 µA	
Communication		
Modbus (RS-232)	2 serial port (9-pin D-shell)	
Modbus Plus (RS-485)	1 network port (9-pin D-shell)	
General		
Diagnostics	**Power Up**	**Runtime**
	RAM	RAM
	RAM Address	RAM Address
	Executive Checksum	Executive Checksum
	User Logic Check	User Logic Check
	Processor	
Bus Current Required	1.8 A	
Power dissipation	9 W	
TOD Clock	+/- 8.0 seconds/day 0 ... 60 °C	
Operating Temperature	0 ... 45 °C	

*This information can be a mix of Discrete or Register I/Os. For each word of Register I/O configured, one word of I/O words must be subtracted from the total available. The same holds true for each block of 8 bits or 16 bits of Discrete I/O configured – one word of Register I/O must be subtracted from the total available.
**Requires the use of two 140NOM21x00 Option Modules.

LED Indicators and Descriptions

The following figure shows the LED indicators.



The following table shows the LED descriptions.

LED Descriptions		
LEDS	**Color**	**Indication when On**
Ready	Green	The CPU has passed power-up diagnostics.
Run	Green	The CPU has been started and is solving logic.
Bat Low	Red	The battery needs replacing or is not present.
Modbus	Green	Communications are active on the Modbus port 1 or 2.
Modbus +	Green	Communications are active on the Modbus Plus port.
Error A	Red	Indicates communications error on the Modbus Plus port.
Mem Prt	Amber	Memory is write-protected (the memory protect switch is on).

LED Error Codes

The following table shows the run LED error codes for the 140CPU53414 module.

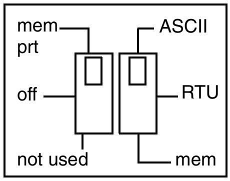
LED Error Codes		
Number of Blinks	**Code**	**Error**
Continuous	0000	requested kernel mode
2	80B	ram error during sizing
	80C	run output active failed
	82E	MB command handler stack error
3	769	bus grant received
	72A	not master asic on cpu
	72B	master config write bad
	72C	quantum bus DPM write failure
	72F	plc asic loopback test
	730	plc asic BAD_DATA

LED Error Codes		
Number of Blinks	**Code**	**Error**
4	604	UPI timeout error
	605	bad UPI response opcode
	606	UPI bus diagnostic error
	607	modbus cmd-buffer overflow
	608	modbus cmd-length is zero
	609	modbus abort command error
	614	mbp bus interface error
	615	bad mbp response opcode
	616	timeout waiting for mbp
	617	mbp out of synchronization
	618	mbp invalid path
	619	page 0 not paragraph aligned
	61E	bad external uart hardware
	61F	bad external uart interrupt
	620	bad receive comm state
	621	bad transmit comm state
	622	bad comm state trn_asc
	623	bad comm state trn_rtu
	624	bad comm state rcv_rtu
	625	bad comm state rcv_asc
	626	bad modbus state tmr0_evt
	627	bad modbus state trn-int
	628	bad modbus state rcv-int
	631	bad interrupt
5	503	ram address test error
	52D	P.O.S.T BAD MPU ERROR
6	402	ram data test error
7	300	EXEC not loaded
	301	EXEC Checksum
8	8001	Kernal prom checksum error
	8002	flash prog / erase error
	8003	unexpected executive return

Front Panel Switches

Two, three-position slide switches are located on the front of the CPU. The left switch is used for memory protection when in the top position and no memory protection in the middle and bottom positions. The three-position slide switch on the right is used to select the communication parameter settings for the Modbus (RS-232) ports.

The following figure shows the three options that are available for the 140CPU53414 module.



> **Note:** The CPU hardware defaults to bridge mode when the front panel switch is set to RTU or ASCII mode. When networking controllers, a panel device connected to the CPU Modbus port can communicate with the controller to which it is connected, as well as log into any nodes on the Modbus Plus network.

Setting the slide switch to the top position assigns ASCII functionality to the port; the following communication parameters are set and cannot be changed.

ASCII Communication Port Parameters	
Baud	2,400
Parity	Even
Data Bits	7
Stop Bits	1
Device Address	Rear panel rotary switch setting

Setting the slide switch to the middle position assigns remote terminal unit (RTU) functionality to the port; the following communication parameters are set and cannot be changed.

RTU Communication Port Parameters	
Baud	9,600
Parity	Even
Data Bits	8
Stop Bits	1
Device Address	Rear panel rotary switch setting

Setting the slide switch to the bottom position gives you the ability to assign communication parameters to the port in software; the following parameters are valid.

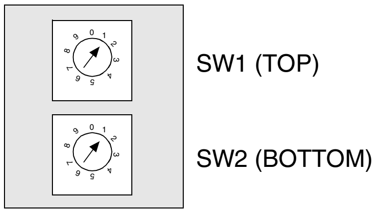
Valid Communication Port Parameters		
Baud	19,200	1,200
	9,600	600
	7,200	300
	4,800	150
	3,600	134.5
	2,400	110
	2,000	75
	1,800	50
Parity	Enable/Disable Odd/Even	
Data Bits	7 / 8	
Stop Bits	1 / 2	
Device Address	1 ... 247	

Rear Panel Switches

Two rotary switches (refer to the illustration and table below) are located on the rear panel of the CPU. They are used for setting Modbus Plus node and Modbus port addresses.

Note: The highest address that may be set with these switches is 64.

SW1 (the top switch) sets the upper digit (tens) of the address; SW2 (the bottom switch) sets the lower digit (ones) of the address. The illustration below shows the correct setting for an example address of 11.
The following figure shows SW1 and SW2.



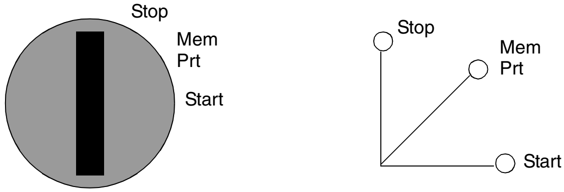
The following table shows the SW1 and SW2 address settings.

Node Address	SW1	SW2
1 ... 9	0	1 ... 9
10 ... 19	1	0 ... 9
20 ... 29	2	0 ... 9
30 ... 39	3	0 ... 9
40 ... 49	4	0 ... 9
50 ... 59	5	0 ... 9
60 ... 64	6	0 ... 4

Note: If "0" or an address greater than 64 is selected, the Modbus + LED will be "on" steady, to indicate the selection of an invalid address.

Key Switch

The key switch is used to protect memory from programming changes while the controller is in operation. The following figure shows the key switch.



> **Note:** The key switch positions shown next to the switch (above) are for reference only and are marked on the module as indicated on the right.

Key Switch Description

The following table provides descriptions of the key switch information.

Key Swich Description				
Key switch Position	**Controller Status**	**Memory Protected From Programmer Changes**	**Will Accept Programmer Stop or Start**	**Key switch Transition**
Stop	Controller is stopped and disables Programmer changes.	Y	N	From Start or Memory Protect: Stops controller, if running, and disables Programmer changes
Mem Prt	Controller may be either stopped or running and Programmer changes are disabled. The user cannot write to unlocated variables.	Y	N	From Stop or Start: Prevents Programmer changes, controller run status is not changed
Start	Controller may be either stopped or running. Programmer may make changes and start/stop the controller	N	Y	From Stop: Enables Programmer changes, starts controller. From Memory Protect: Enables programmer changes, starts controller if stopped.

Modbus Port Modem Support

Modbus Port 1 has full modem interfacing ability. Modbus Port 2 RTS/CTS connections function properly for normal non-modem communications but do not support modems.

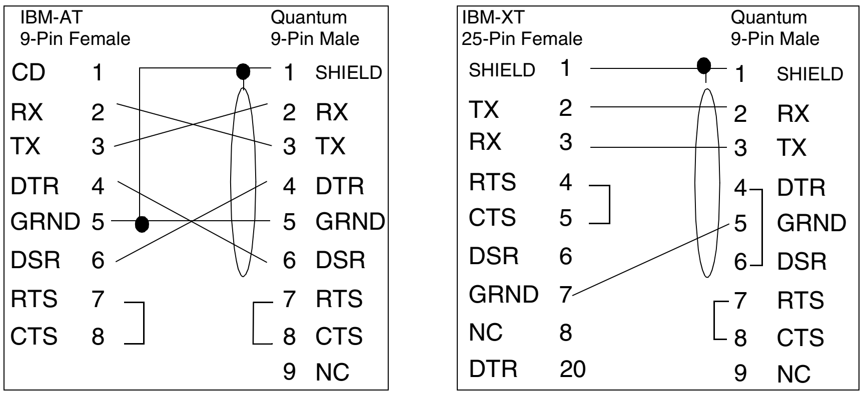
Modbus Connector Pinouts

All Quantum CPUs are equipped with a 9-pin RS-232C connector that supports Modicon's proprietary Modbus communication protocol. The following is the Modbus port pinout connections for 9-pin and 25-pin connections.

Note: Although the Modbus ports electrically support existing Modbus cables, it is recommended that a Modbus programming cable (Part # 990NAA26320 or 990NAA26350) be used. This cable has been designed to fit under the door of a Quantum CPU or NOM module.

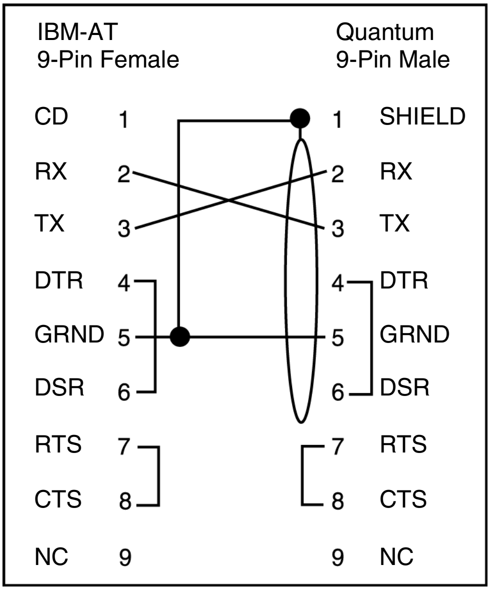
Modbus Ports Pinout Connections

The following figure shows the Modbus port pinout connections for 9-pin and 25-pin connections.



Modbus Ports Pinout Connections for Portable Computers

The following figure shows the Modbus port pinout connections for 9-pin portable (laptop) computers.



The following is the abbreviation key for the above figures.

TX: Transmitted Data	DTR: Data Terminal Ready
RX: Received Data	CTS: Clear to Send
RTS: Request to Send	NC: No Connection
DSR: Data Set Ready	CD: Carrier Detect

140CPU53414A CPU Module

Overview

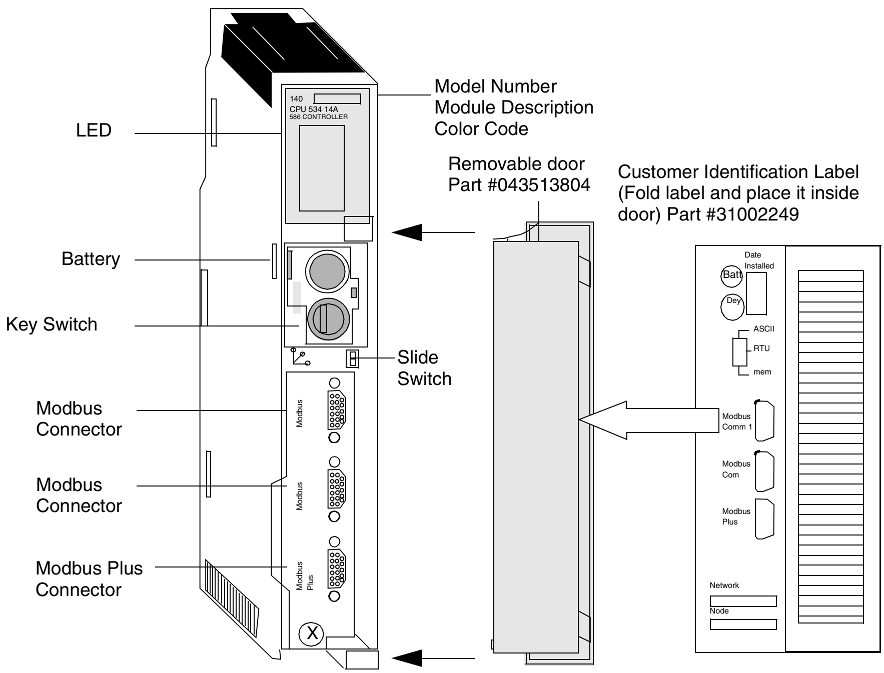
This map provides information on the specifications, LED indicators and description and error codes for the 140CPU53414A Controller Module.

This module is functionally identical to the non-"A" version, however, the following should be considered:

- If you are using the module in a hot standby topology, then you **must** use either two non-"A" models or two "A" models.
- The "A" version requires a new flash executive.
- The "A" version and non-"A" flash executives are **not** interchangeable.
- Schneider Automation software (Concept, ProWORX, and Modsoft) supports the "A" version. Any existing or new 140CPU53414 program configuration will load into a 140CPU53414A without any modifications.

CPU Module

The following figure shows the CPU Module and its components.



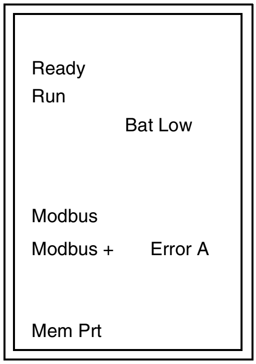
Specifications The following table shows the specifications for the CPU53414A Controller module.

Specifications					
User Logic/Reference Capacity	**984 Ladder Logic**	**Discrete**	**Register**	**Extended Register**	**IEC Application Memory**
	64 k words	64 k	57 k	96 k	2.5M
	57,766 4XX registers max Only if: 0XXX = 16 and 1XXX = 16 and 3XXX = 16				
Reference Capacity					
Discrete	64 k - any mix				
Local I/O)					
Maximum I/O Words	64 In and 64 Out*				
Maximum Number of I/O Racks	2 (Requires Expander)				
Remote I/O					
Maximum I/O Words per Drop	64 In and 64 Out*				
Maximum Number of Remote Drops	31				
Distributed I/O					
Maximum Number of Networks per System	3**				
Maximum Words per Network (for every DIO drop, there is a minimum of words input of overhead.)	500 In and 500 Out				
Maximum Words per Node	30 In and 32 Out				
*This information can be a mix if Discrete or Register I/O. For each word of register I/O configured, one word of I/O words must be subtracted from the total available. The same holds true for each block of 8 bits or 16 bits of Discrete I/O configured---one word Register I/O must be subtracted from the total available. **Requires the use of two 140NOM21X00 Option Modules.					
Maximun Number of Network Option Module Interfaces	Supports up to six network modules (i.e., Modbus Plus, Ehternet and Multi-Axis Motion option modules) using the option module interface technique (see *Quantum Network Interface Techniques, p. 45*). **Note**: Only two Modbus Plus modules can have full functionality, Including Quantum DIO support.				
Watchdog timer	250 ms (S/W adjustable)				
Logic Solve Time	0.1 ms / k to 0.5 ms / k				
Battery					
Type	3 V Lithium				

Specifications		
Service Life	1200 mAh	
Shelf Life	10 years with 0.5% loss of capacity per year	
Battery Load Current at Power-off		
Typical	14 µA	
Maximum	420 µA	
Communication		
Modbus (RS-232)	2 serial port (9-pin D-shell)	
Modbus Plus (RS-485)	1 network port (9-pin D-shell)	
Programming Software Capability	Modsoft Version 2.6 Concept version 2.1 with B2.1 patch exec Concept 2.2 with SR2 ProWorx Nxt version 2.0 ProWorx Plus version 1.05	
General		
Diagnostics	**Power Up**	**Runtime**
	RAM RAM Address Executive Checksum User Logic Check Processor	RAM RAM Address Executive Checksum User Logic Check
Bus Current Required	1.25 A	
Power dissipation	6.25 W	
TOD Clock	+/- 8.0 seconds/day 0 ... 60° C	
Operating Temperature	0 ... 50° C	

LED Indicators and Descriptions

The following figure shows the LED indicators.



The following table shows the LED error codes for the 140CPU53414A module.

LED Descriptions		
LEDS	**Color**	**Indication when On**
Ready	Green	The CPU has passed power-up diagnostics.
Run	Green	The CPU has been started and is solving logic.
Bat Low	Red	The battery needs replacing or is not present.
Modbus	Green	Communications are active on the Modbus port 1 or 2.
Modbus +	Green	Communications are active on the Modbus Plus port.
Error A	Red	Indicates communications error on the Modbus Plus port.
Mem Prt	Amber	Memory is write-protected (the memory protect switch is on).

LED Error Codes

The following table shows the run LED error codes for the 140CPU53414A.

LED Error Codes		
Number of Blinks	**Code**	**Error**
Continuous	0000	requested kernel mode
2	80B	ram error during sizing
	80C	run output active failed
	82E	MB command handler stack error
3	769	bus grant received
	72A	not master asic on cpu
	72B	master config write bad
	72C	quantum bus DPM write failure
	72F	plc asic loopback test
	730	plc asic BAD_DATA

LED Error Codes		
Number of Blinks	**Code**	**Error**
4	604	UPI timeout error
	605	bad UPI response opcode
	606	UPI bus diagnostic error
	607	modbus cmd-buffer overflow
	608	modbus cmd-length is zero
	609	modbus abort command error
	614	mbp bus interface error
	615	bad mbp response opcode
	616	timeout waiting for mbp
	617	mbp out of synchronization
	618	mbp invalid path
	619	page 0 not paragraph aligned
	61E	bad external uart hardware
	61F	bad external uart interrupt
	620	bad receive comm state
	621	bad transmit comm state
	622	bad comm state trn_asc
	623	bad comm state trn_rtu
	624	bad comm state rcv_rtu
	625	bad comm state rcv_asc
	626	bad modbus state tmr0_evt
	627	bad modbus state trn-int
	628	bad modbus state rcv-int
	631	bad interrupt
5	503	ram address test error
	52D	P.O.S.T BAD MPU ERROR
6	402	ram data test error
7	300	EXEC not loaded
	301	EXEC Checksum
8	8001	Kernal prom checksum error
	8002	flash prog / erase error
	8003	unexpected executive return

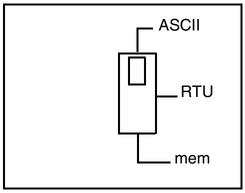
Note: Information in the Code column is visible only with the Flash download utility.

Front Panel Switch

The slide switch is used to select the comm parameter settings for the Modbus (RS232) ports. Three options are available.

1. Setting the switch to the top position assigns ASCII functionality to the port.
2. Setting the switch to the middle position assigns remote terminal unit (RTU) functionality to the port.
3. Setting the switch to the bottom position lets you assign comm parameters to the port in software.

The figure shows the three options that are available on the front panel slide switch.



Note: The CPU hardware defaults to bridge mode when the front panel switch is set to RTU or ASCII mode. When networking controllers, a panel device connected to the CPU Modbus port can communicate with the controller to which it is connected, as well as log into any nodes on the Modbus Plus network.

The following table shows the ASCII comm port parameters.

ASCII Comm Port Parameters	
Baud	2,400
Parity	Even
Data Bits	7
Stop Bits	1
Device Address	Rear panel rotary switch setting

The following table shows the RTU comm port parameters. The comm parameters are set and cannot be changed.

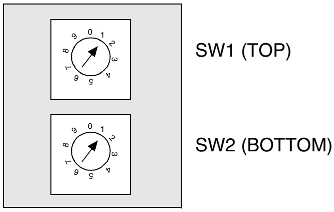
RTU Comm Port Parameters	
Baud	9,600
Parity	Even
Data Bits	8
Stop Bits	1
Device Address	Rear panel rotary switch setting

The following table shows the valid comm port parameters.

Valid Comm Port Parameters		
Baud	19,200	1,200
	9,600	600
	7,200	300
	4,800	150
	3,600	134.5
	2,400	110
	2,000	75
	1,800	50
Parity	Enable/Disable Odd/Even	
Data Bits	7 / 8	
Stop Bits	1 / 2	
Device Address	1 ... 247	

Rear Panel Switches

The following figure shows the SW1 and SW2 settings.



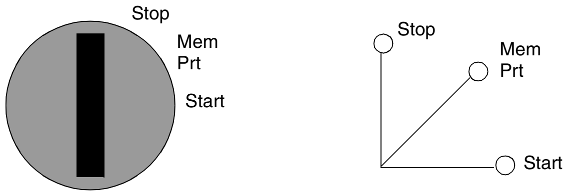
SW1 sets the upper digit (tens) of the address. SW2 sets the lower digit (ones) of the address. The following table shows the SW1 and SW2 address settings.

SW1 and SW2 Address Settings		
Node Address	**SW1**	**SW2**
1 ... 9	0	1 ... 9
10 ... 19	1	0 ... 9
20 ... 29	2	0 ... 9
30 ... 39	3	0 ... 9
40 ... 49	4	0 ... 9
50 ... 59	5	0 ... 9
60 ... 64	6	0 ... 4

Note: If "0" or an address greater than 64 is selected, the Modbus + LED will be "on" steady, to indicate the selection of an invalid address.

Key Switch

The following figure shows the key switch.



Note: The key switch positions shown next to the switch (above) are for reference only and are marked on the module as indicated on the right.

Key Switch Description

The following table provides a description of the key switch information.

Key Switch Description				
Key switch Position	**Controller Status**	**Memory Protected From Programmer Changes**	**Will Accept Programmer Stop or Start**	**Key switch Transition**
Stop	Controller is stopped and disables Programmer changes.	Y	N	From Start or Memory Protect: Stops controller, if running, and disables Programmer changes
Mem Prt	Controller may be either stopped or running and Programmer changes are disabled. The user cannot write to unlocated variables.	Y	N	From Stop or Start: Prevents Programmer changes, controller run status is not changed
Start	Controller may be either stopped or running. Programmer may make changes and start/stop the controller	N	Y	From Stop: Enables Programmer changes, starts controller. From Memory Protect: Enables programmer changes, starts controller if stopped.

Modbus Connector Pinouts

All Quantum CPUs are equipped with a nine-pin RS-232C connector that support Modicon's proprietary Modbus communication protocol. The following is the Modbus port pinout connections for nine-pin and 25-pin connections.

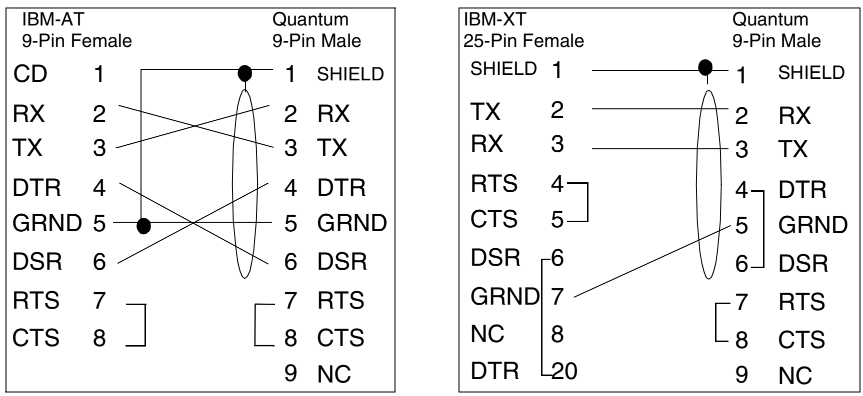
Note: Although the Modbus ports electrically support existing Modbus cables, it is recommended that a Modbus programming cable (Part # 990NAA26320 or 990NAA26350) be used. This cable has been designed to fit under the door of a Quantum CPU or NOM module.

Modbus Port Modem Support

Modbus Port 1 has full modem interfacing ability. Modbus Port 2 RTS/CTS connections function properly for normal non-modem communications but do not support modems.

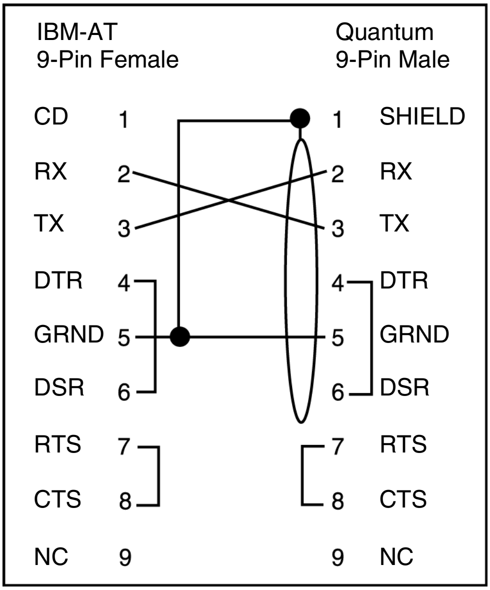
Modbus Ports Pinout Connections

The following figure shows the Modbus port pinout connections for 9-pin and 25-pin connections.



Modbus Ports Pinout Connections for Portable Computers

The following figure shows the Modbus port pinout connections for 9-pin portable computers.



The following is the abbreviation key for the above figures.

TX: Transmitted Data	DTR: Data Terminal Ready
RX: Received Data	CTS: Clear to Send
RTS: Request to Send	NC: No Connection
DSR: Data Set Ready	CD: Carrier Detect

Quantum Field Bus Modules

8

Overview

Field Bus Modules

This chapter contains information on various Quantum Field Bus Modules.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
140CRP81100 Profibus DP Master Communications Module	220
140EIA92100 Quantum AS-i Master Module	226
140NOA6XXXX Quantum InterBus Communications Modules	232
140NOL911X0 Quantum LonWorks Network Option Modules	240

140CRP81100 Profibus DP Master Communications Module

Overview

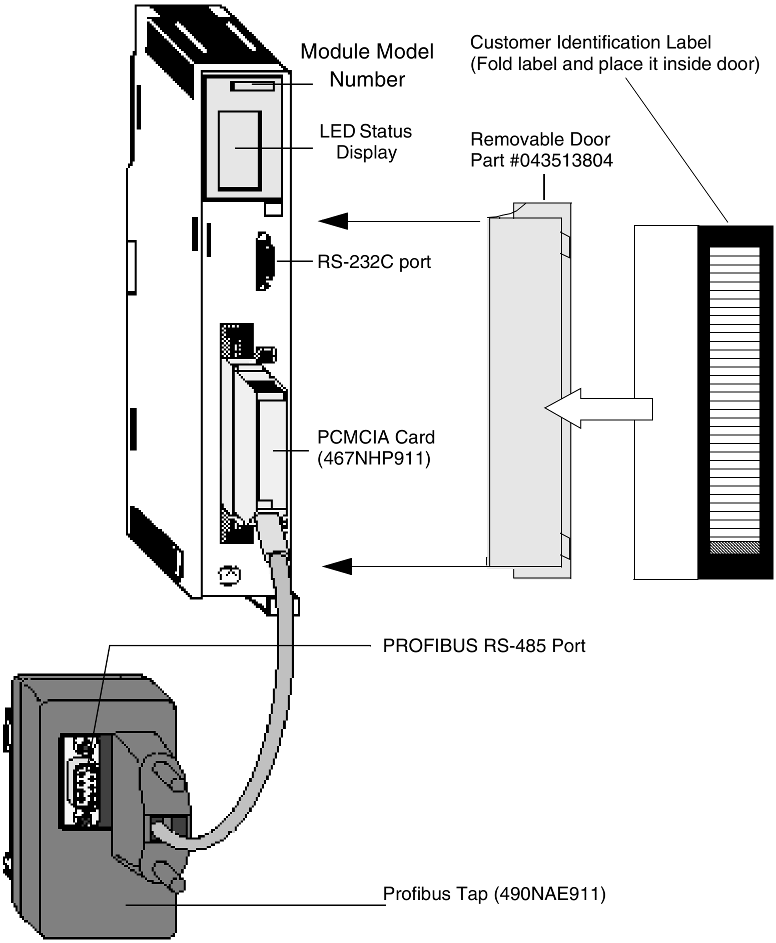
The following information describes the 140CRP81100 Field Bus Communication Module, which provides interface to Profibus-DP networks for the Quantum Automation Series systems.

Related Documentation

For a detailed discussion of the planning, installation and use of a Quantum Profibus system, refer to the *Modicon TSX Quantum Profibus-DP Under Modsoft User Manual*, P/N 840USE46800, *Profibus-DP Under Concept Manual*, P/N 840USE48700, and the *Profibus-DP Configutator for CRP 811*, P/N 840USE46900.

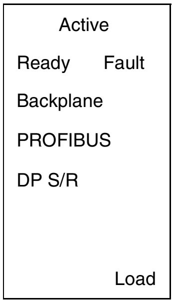
Communicatons Module

View of the 140CRP81100 communications module and the Profibus tap:



LED Status

The following figure shows the LED Status display.



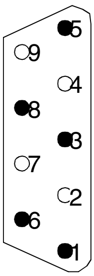
The following table provides descriptions of the Status LEDs.

LEDs	Color	Function	Description
Active	Green	On	Indicates bus communication is present
		Flashing	The flash ram load operation is active
Ready	Green	On	Module is operational
Fault	Red	On	Indicates fault. Refer to LED fault codes in manual 840USE46800.
Backplane	Green	Flashing	Indicates fault. Refer to LED fault codes in manual 840USE46800.
PROFIBUS	Green	Flashing	Erroneous configuration data or PROFIBUS fault
DP S/R	Green	Fast flashing frequency	Sending/receiving DP bus data
		Medium flashing frequency	Slaves are configuring
		Slow flashing frequency	Waiting for configuration data
		Flashing with fault code	Erroneous configuration data
Load	Yellow	Flashing	Configuration data load operation active
		Flashing with fault code	Load operation fault

	CAUTION
⚠	**Possible hardware damage** To reset the fault LED the CRP811 must be power cycled or hot swapped. **Failure to follow this precaution can result in injury or equipment damage.**

PROFIBUS RS-485 Port d-Sub pinouts

Below are the pinouts for the PROFIBUS RS-485 port..

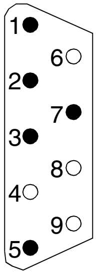


Legend to pinouts for the RS-485 port:

Pin	Signal	Function
1	Shield	Shield, Protective Ground
3	RxD/TxD-P	Receive/Transmit-Data-P (+)
5	DGND	5 V common
6	VP	+5 V
8	RxD/TxD-N	Receive/transmit-data-N(-)

RS-232C Port

Below are pinouts for the RS-232C port



Legend to pinouts for the RS-232C port:

Pin	Signal	Function
2	RXD	Received Data
3	TXD	Transmitted Data
5	GND	Signal Ground
7	RTS	Request to Send
8	CTS	Clear to Send

Specifications

The following table shows the technical specifications for the 140CRP81100 Communication Module:

Specifications	
Programming software	Modsoft version 2.32 or greater Concept version 2.2 or greater
Bus current required	1.2 A
Power dissipation	6.5 W
Data Interface	
RS-232C	9 pin D-shell non-isolated, Shielded cable, 3 m max; 19.2 Kbps default.
RS-485	Profibus, up to 12 Mbps
Installation	Local backplane only
Bus Specifications	
Bus nodes	max. 32
Bus lenths, transmission rates (for 12 Mbps cable)	max. 1.2 km at 9.6 Kbps max 1.2 km at 19.2 Kbps max. 1.2 km at 93.75 Kbps max 1.0 km at 187.5 Kbps max 0.5 km at 500 Kbps max 0.2 km at 1.5 Mbps max 0.1 km at 3 Mbps max 0.1 km at 6 Mbps max 0.1 km at 12 Mbps
Transmission media	shielded twisted pair
Connection interface	EIA RS-485
Node type	Master class 1
Bus access procedure	Master/slave to dP bus slaves
Transmission procedure	half-duplex
Frame length	Max. 255 bytes
Data unit length	Max. 246 bytes
Data security	Hamming distance, HD = 4
Node addresses	1 ... 126

140EIA92100 Quantum AS-i Master Module

Overview

The 140EIA92100 field bus communications module provides communications interface to AS-i networks for the Quantum Automation Series systems.

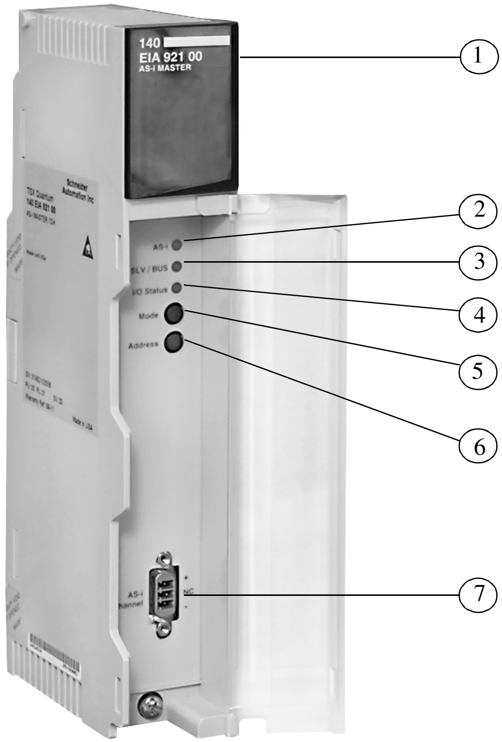
Related Documentation

For more detailed information see *Modicon Quantum AS-i Master Module* manual, part number 840USE11700, or start the newmod.hlp from your Concept CD. To locate it, go to the root of your Concept Installation directory. Example of path: Drive_X:\Concept*.hlp

Note: The newmod help system on your Concept CD contains a hyperlink labeled "Back to Main Content." This link will not return you to Concept 2.5 Help.

Communications Module

The following diagram provides a view of the 140EIA92100 communications module.



1 LED Display

2 AS-i (Red): ON shows the module is not powered. Flashing shows automatic addressing enabled.

3 SLV/BUS (Green): ON when LEDs 0-31 are in bus display mode.

4 I/O Status (Green): ON when LEDs 0-31 are in slave display mode.

5 Mode (Push Button): Press and hold this button to change from slave mode to bus mode.

6 Address (Push Button): Press this button to scroll through the 32 slaves. Hold to reverse direction of the scroll.

7 AS-i Channel Cable Connector: Connects module to AS-i cable and AS-i power supply.

LED Display and Descriptions

Diagram of the LED display:

B	Active		F
0	8	16	24
1	9	17	25
2	10	18	26
3	11	19	27
4	12	20	28
5	13	21	29
6	14	22	30
7	15	23	31

The following table provides LED descriptions.

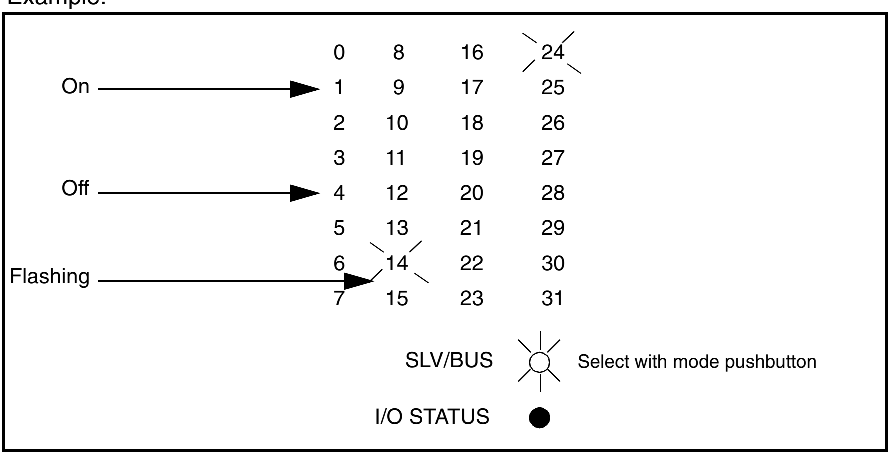
LED Descriptions		
LED	**Color**	**Description**
Active	Green	Bus communication is present.
F	Red	Fault on the AS-i bus. Steady: module fault Flashing: bad bus configuration or slave address
B	Green	Communication exists between master and slaves.
0-31	Green	Slave indicators.

LED Bus Mode

Each indicator lamp 1-31 corresponds to a slave address on the bus.

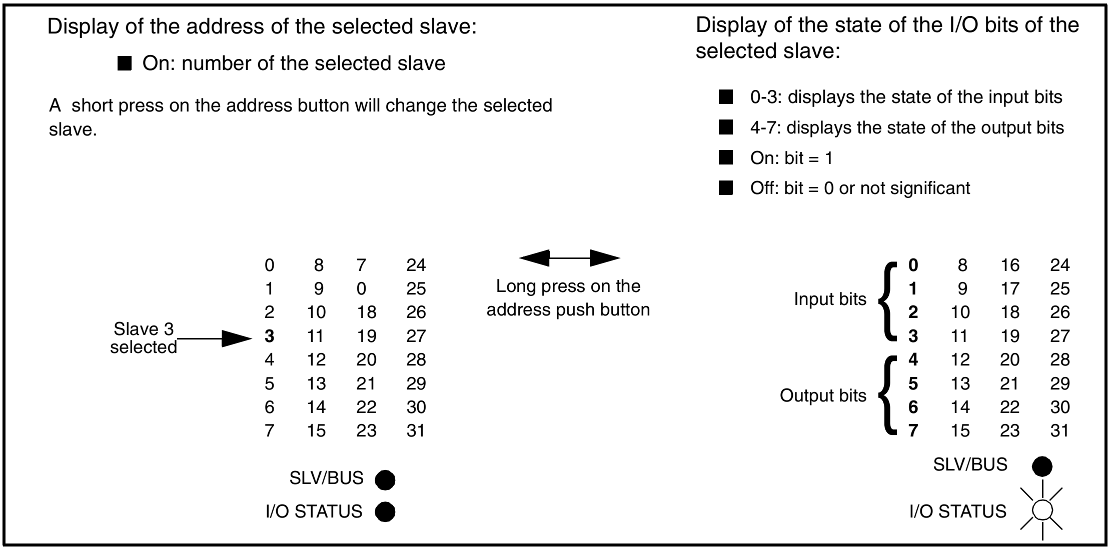
- On: Slave is present.
- Flashing: Slave is mapped but not detected, or detected but not mapped. It may also be projected and detected, but not activated (bad profile or I/O code).
- Off: Slave is neither mapped nor detected.

Example:



LED Slave I/O Mode

Slave mode (SLV) figure:



LED Diagnostics

State of Indicator Lamps:

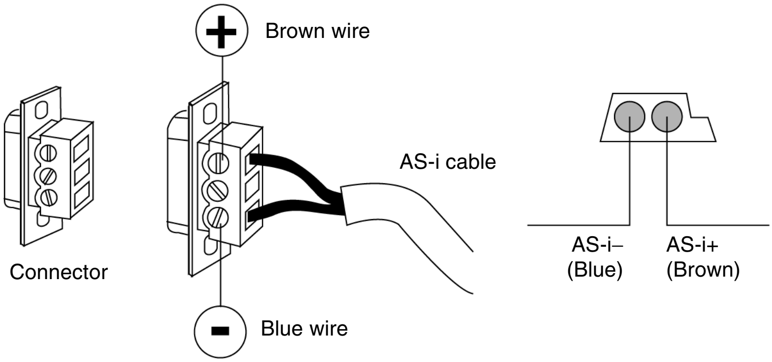
B	Active	F	Meaning	Corrective Action
○	○	○	Module switched off.	Switch the device on.
○	●	○	Operating in Protected Mode (normal). Displaying Outputs.	æ
●	●	○	Operating in Protected Mode (normal). Displaying Inputs.	æ
○	●	ⓧ (1)	Fault on AS-i bus (self-programming possible).	Replace the faulty slave with a new identical slave.
○	●	ⓧ (2)	Fault on AS-i bus (self-programming not possible).	Connect the terminal.
●	○	ⓧ	AS-i power supply fault or no slave on the AS-i bus.	1. Check AS-i power supply. 2. Check the continuity of the AS-i bus cable.
ⓧ	ⓧ	ⓧ	Module self-tests in progress.	æ

●	Indicator lamp is on.	○	Indicator lamp is off.	ⓧ	Indicator lamp is flashing.	**X**	Indicator lamp is in indeterminate state.

(1) Faulty slave ID is flashing.
(2) No slave ID numbers are flashing.

AS-i Cable Connection

The following figure shows the AS-i cable connection:



Specifications

The following table provides specifications for the 140EIA92100 AS-i module:

Specifications	
Master profile Bus length I/O # slaves Power supply Scan time Transmission Polarity reversal	M2 100m max, no repeaters 124IN/124OUT 31 max 30Vdc @ 120mA max 156 msec x (n+2) if n < 31 156 msec x (n+1) if n = 31 167 kbits/sec Non-destructive
Bus current required	250mA max
Power dissipation	2.5W max
Installation	Local, RIO, DIO
Programming software	Concept v2.5 ProWORX Nxt v2.1 Modsoft v2.61

140NOA6XXXX Quantum InterBus Communications Modules

Overview

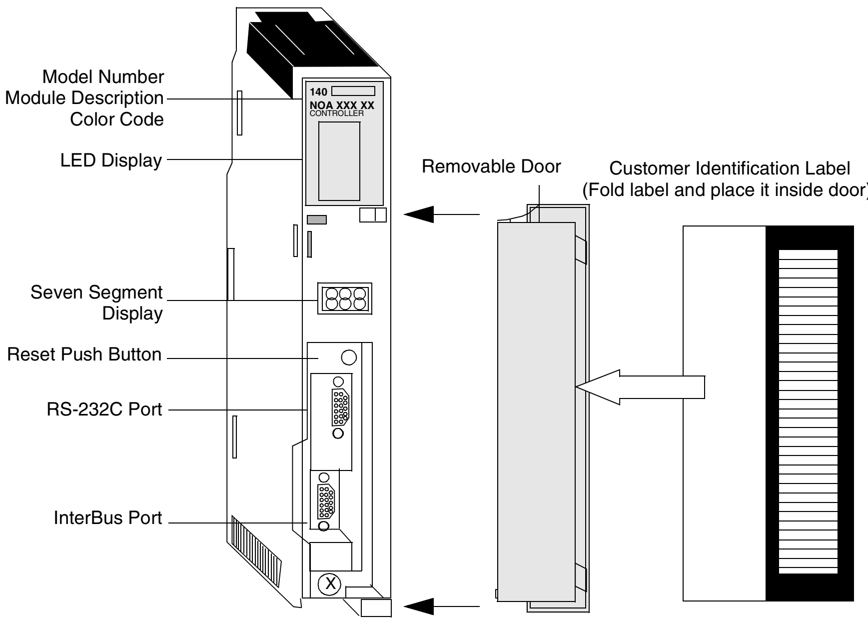
This section includes information for the NOA6XXXX InterBus communications modules which provide interface to InterBus networks for the Quantum Automation Series systems.

Related Documentation

For more detailed information on the installation and use of Quantum InterBus modules, see the *Modicon TSX Quantum 140NOA61110 User Manual*, part number 840USE41900; the *Modicon TSX Quantum 140NOA61100 User Manual*, part number 840USE41800; and the *TSX Quantum 140NOA62200 User Manual*, part number 840USE49700.

InterBus Communications Module

The following figure shows the NOA6XXXX InterBus Communications module.



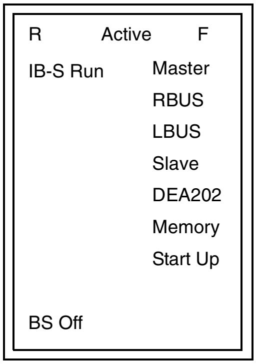
Specifications

The following table shows the InterBus specifications.

Specifications	
Data Interface	
InterBus	RS-485, isolated (500 V test voltage)
RS-232C maximum cable length	As per DIN 66 020, non-isolated 20 m shielded
Data Transfer Frequency	500 kbaud
Connection Styles	Interbus RS-232C (Use cable part number 990NAA26320 or 990NAA26350)
Bus Current Required	700 mA
Power Dissipation	Max. 3.7 W, typically 2.5 W
Installation	Local backplane only

LED Indicators and Descriptions for NOA611X0

The following figure shows the NOA611X0 LED indicators.

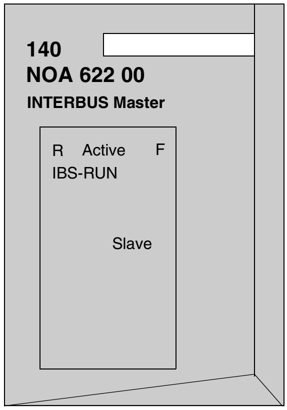


The following table shows the NOA611X0 LED descriptions.

LED Descriptions		
LEDs	**Color**	**Function**
R	Green	Ready. The firmware is running correctly and the module is ready for service.
Active	Green	Bus communication is active.
F	Red	Fault. A fault occurred on the module.
IB-S Run	Green	The InterBus is functioning normally and carrying data.
BS Off	Yellow	One or more bus segments are shut down.
Master	Red	Processor fault. Fault on the InterBus processor or the communications processor has failed.
RBUS	Red	Remote bus fault. The remote bus has been diagnosed as defective.
LBUS	Red	Peripheral bus fault. The peripheral bus has been diagnosed as defective.
Slave	Red	An InterBus node has reported a (module) fault.
DEA202	Red	Initialization fault with the DEA 202.
Memory	Red	Memory fault.
Start Up	Red	The InterBus master is not operational.

LED Indicators and Descriptions for NOA62200

The following figure shows the NOA62200 LED indicators.



The following table shows the NOA62200 LED descriptions.

LED Descriptions			
LEDs	**Color**	**Status**	**Meaning**
R	Green	On	Ready. The switch-on routine was completed successfully. The firmware is running correctly and the module is ready for operations. RAM and checksum are ok.
		Flashing	No firmware; or firmware is being loaded.
		Off	Module error.
Active	Green	On	The communication with the TSX Quantum CPU is active.
F	Red	On	Fault. An error has occurred on the INTERBUS.
IB-S Run	Green	On	The INTERBUS is functioning, normal data transfer.
		Flashing cyclically.	The INTERBUS is ready.
		No cyclic flashing.	No INTERBUS configuration (error message).
Slave	Red	On	An INTERBUS node is indicating a module error.

Seven Segment Display

The seven segment display is only applicable to the NOA61110 module.

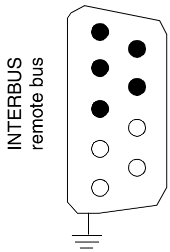
Display	Meaning
0	Interbus is not able to run.
– I I –	Interbus is able to run but stopped.
– –	Interbus is running.
RBUS LED on	Number of the defective remote bus segments.
LBUS LED on	Number of the defective peripheral bus.
RBUS & LBUS LEDs on	Bus segment fault, interbus comm stopped. Faulted bus segment number (or next segment) displayed.
Slave LED on	Bus segment number containing a faulted module.

Front Panel Connections and Controls

The InterBus module is equipped with an InterBus port and a Modbus Plus port, both are female 9-pin D connectors (see below for pinouts), and a reset push button.

InterBus Port

Connect the remote bus cable to the female connector port labeled interbus. The following figure shows the InterBus port connection.

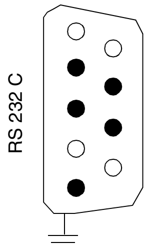


The following table shows the key to the remote bus.

Pin	Signal	Function
1	DO	Data Out (+)
2	DI	Data In (+)
3	GND	Comm
4	GND (NOA622 only)	F/O Interface
5	VCC (NOA622 only)	F/O Interface
6	DO	Data Out (-)
7	DI	Data In (-)
8	VCC (NOA622 only)	Auxiliary Supply for F/O Interface
9	RBST (NOA622 only)	RBST Coupling
Black circle = Pin occupied. White circle = N/C		

RS-232C Port

Use a Modbus data cable, Part Number 990NAA26320 (2.7 m) or Part Number 990NAA26350 (15.5 m). The following figure shows the RS-232C port connection.



The following table shows the key to the RS-232C port.

Pin	Signal	Function
2	D2 (RXD)	Received Data
3	D1 (TXD)	Transmitted Data
5	E2 (GND)	Signal Ground
7	S2 (RTS)	Request to Send
8	M2 (CTS)	Clear to Send
Black circle = Pin occupied. White circle = N/C		

Reset Push Button

The reset push button performs a hardware reset of the module which must be done each time new firmware has been downloaded. This button allows you to reset the module without removing it from the backplane.

Required Loadables

Loadables are accessible from Groupe Schneider's World Wide Web site at http://www.schneiderautomation.com. Click on the appropriate software under the "Control Software" section on the home page.

Note: 140CPU11302 does not support the 140NOA61110 or the 140NOA62200 module.

Comparison of NOA61100, 61110, and 62200 Modules

The following table provides a comparison of the NOA61100, 61110, and 62200 modules.

Characteristics	**NOA61100**	**NOA61110**	**NOA62200**
Physical Addressing	Y	Y	Y
Logical Addressing	N	Y	Y
PCP Channel	N	Y	Y
Startup Check of Configuration	Possible via user-program triggering one of the active bits 10 ... 15	Y	Y
Support of Remote Bus Branch	Y	Y	Y
Support for Hot Standby	N	N	N
Number of NOAs in Local Drop	3	3	2 (140CPU11303) 6 (140CPUX341XA)
Interbus Compatibility	Generation 3	Generation 3	Generation 4
Maximum Slaves	512	512	251
Configuration Tool	Phoenix Contact CMD V1.21 or V1.30	Phoenix Contact CMD V1.21 or V1.30	Sycon TLX L FBC 10M V2.725
Software Versions			
Modsoft Rev. (min.)	2.4	2.4	N/A
Concept Rev. (min.)	2.0	2.1	2.5 SR2
ProWORX (min.)	2.0	2.0	N/A

140NOL911X0 Quantum LonWorks Network Option Modules

Overview

The NOL modules provide connectivity between a Modicon Quantum controller and a control network based on Echelon's LonWorks technology. Once the NOL module has been installed in a Quantum backplane and configured, it can be bound to an existing LonWorks network, and installed as a standard node.

Note: The NOL module requires a valid LonWorks configuration file (.XIF) loaded into it to define the LonWorks network variables to which it will be bound.

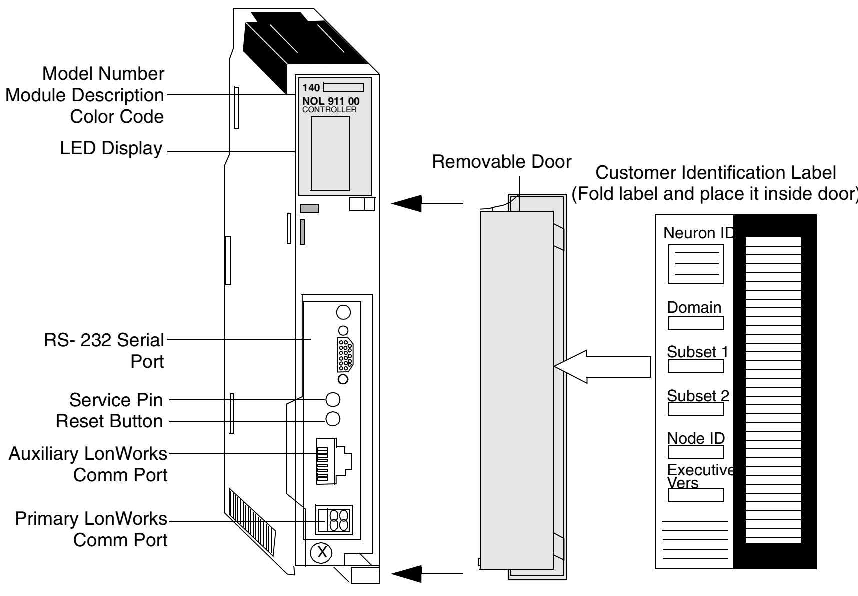
Note: You must have a LonWorks compliant network management tool, such as Metra Vision, to install an NOL module on a LonWorks network.

Related Documentation

For more detailed information, see the *Quantum Automation Series Network Option Module for LonWorks*, part number 840USE10900.

LonWorks Network Option Modules

The following figure shows the NOL911X0 LonWorks Network Option Module.

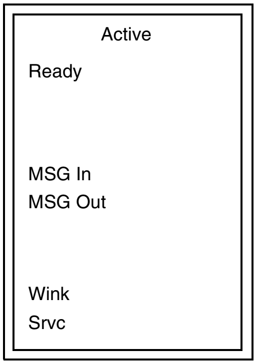


Specifications The following table shows the specifications for the NOL911X0 module.

Specifications	
Data Transfer Frequency	78 Kbps (140 NOL 911 10)
Connection Styles	Screw terminals, telephone jack
Bus Current Required	400 mA
Quantum Controllers Remote I/O	V2.0 at a minimum V2.0 at a minimum

LED Indicators, Descriptions, and Status

The condition of the NOL module is indicated by the status (off, on, or blinking) of the LED indicators. The following figure shows the LED indicators.



The following table shows the LED descriptions.

LED Descriptions	
LEDs	**Function**
Active	Bus communication is present.
Ready	Module has passed internal diagnostics, and is configured.
MSG In	Flashes every 10 ms when an update message for a bound network variable is received by the NOL module from the LonWorks network.
MSG Out	Flashes every 10 ms when an update message for a bound network variable is transmitted by the NOL module to the LonWorks network.
Wink	Flashes briefly when the NOL module receives a wink message from the LonWorks network. Also used to display internal error codes defined in the Wink LED Error Codes table.
Srvc	Indicates status of LonWorks network service.

The following table shows the LED Indicator Status.

LED Indicator Status					
LED	**Color**	**Condition of NOL Module**			**Error Condition**
		Powered Up Not Configured Not Programmed	**Powered Up Configured Not Programmed**	**Normal Operation Configured Programmed**	
Active	Green	Off	Off	On	Off[1]
Ready	Green	Blink	On	On	Off[2]
MSG In	Green	Off	Off	Blink	N/A

LED Indicator Status					
LED	**Color**	**Condition of NOL Module**			**Error Condition**
		Powered Up Not Configured Not Programmed	**Powered Up Configured Not Programmed**	**Normal Operation Configured Programmed**	
MSG Out	Green	Off	Off	Blink	N/A
Wink	Green	Off	Off	Blink on command	Blink[3]
Srvc	Yellow	Off	Blink	Off	N/A

- If not lit, either the LON module requires configuration and mapping or is not communicating with the CPU by way of the DX Loadable.
- If a LON module is inserted into the backplane and the Ready LED does not illuminate, the Wink LED should be observed for an error code.
- See the following Wink LED error codes.

Wink LED Error Codes

The Wink LED is used to display error conditions. The following table shows the number of times the LED blinks for each type of error.

LED Error Codes	
Number of Blinks	**Error Condition**
1	Module is in the bootloader
2	Error in writing to flash memory
3	Error in initializing the Lon Works network
4	Error in the module configuration

Front Panel Push Buttons

Two push buttons are located on the front of the NOL module. The **service pin push button** initiates the LonWorks network installation. When depressed, it causes the Service LED to illuminate, and forces the Neuron Chip in the module to output its unique 48-bit ID and Program ID.

The **reset push button** performs a hardware reset of the module, and must be done each time new firmware has been downloaded.

Note: The Reset push-button is recessed and requires a paper clip or similar tool to activate.

Front Panel Connectors

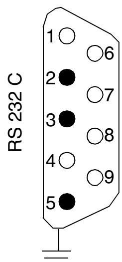
There are three connectors located on the front of the NOL module. These are the RS-232 configuration port; the primary LonWorks communication port; and the auxiliary LonWorks configuration port.

RS-232 Configuration Port

This 9 pin, D-shell, female, RS-232 compatible serial port's attributes are:

- Configured at a fixed rate of 9600 baud, 8 data bits, 1 stop bit, and no parity.
- Used to download configuration and new firmware to the module.
- Supports XMODEM protocol with an ASCII terminal based command processor.
- Can be directly connected to a PC serial communications port.

The following figure shows the 9-pin configuration port.



The following table shows the key to the RS-232C port.

Pin	Signal	Function
2	RXD	Received Data
3	TXD	Transmitted Data
5	GND	Signal Ground
Black circle = Pin occupied. White circle = N/C		

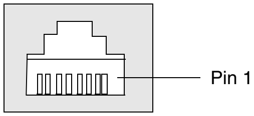
Modbus cables 990NAA26320 and 990NAA26350 are suitable for connection between the PC serial port and NOL module RS-232 port.

Primary LonWorks Communication Port

This is the primary interface for wiring into a LonWorks network. The connector is a two-position 5.08 mm screw terminal.

Auxiliary LonWorks Communication Port

This is the auxiliary interface for wiring into a LonWorks network. The connector is an eight position RJ-45 (phone jack) socket. The figure below shows the Pin 1 connector.



Note: The Auxiliary LonWorks Communications Port is not intended to be connected to any public telecommunications network.
Both the Primary and Secondary ports provide standard interfaces to LonWorks networks and are wired in parallel for flexibility. The connections are not polarity sensitive.

NOL Module Media Types

The NOL module supports three twisted pair media types with different network topologies or data transfer speeds.

- 140NOL91100
- 140NOL91110
- 140NOL91120

The following table shows the transceiver types supported by each module are as follows:

NOL Model Number	Transceiver Type	Configuration	Data Transfer Rate
140NOL91100*	TP/FTT-10	Free topology, twisted pair	78,000 BPS
140NOL91110	TP/XF-78	Linear topology, twisted pair, transformer isolated	78,000 BPS
140NOL91120*	TP/XF-1250	Linear topology, twisted pair, transformer isolated	1.25 MBPS

*Not actively sold after 10/00.

WARNING

Incompatibility

NOL modules are not compatible in Quantum Distributed I/O (DIO) racks.

Failure to follow this precaution can result in death, serious injury, or equipment damage.

Distributed I/O (DIO) for the Quantum Modules

9

At a Glance

Introduction

This chapter provides information on the distributed I/O (DIO) modules. This information includes specifications, LED indicators and descriptions, rear panel switches, and wiring diagrams for the following modules:

- 140CRA21110
- 140CRA21210
- 140CRA21120
- 140CRA21220

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
140CRA21X10 Quantum Distributed I/O (DIO) Modules	248
140CRA21X20 Quantum Distributed I/O (DIO) Modules	253

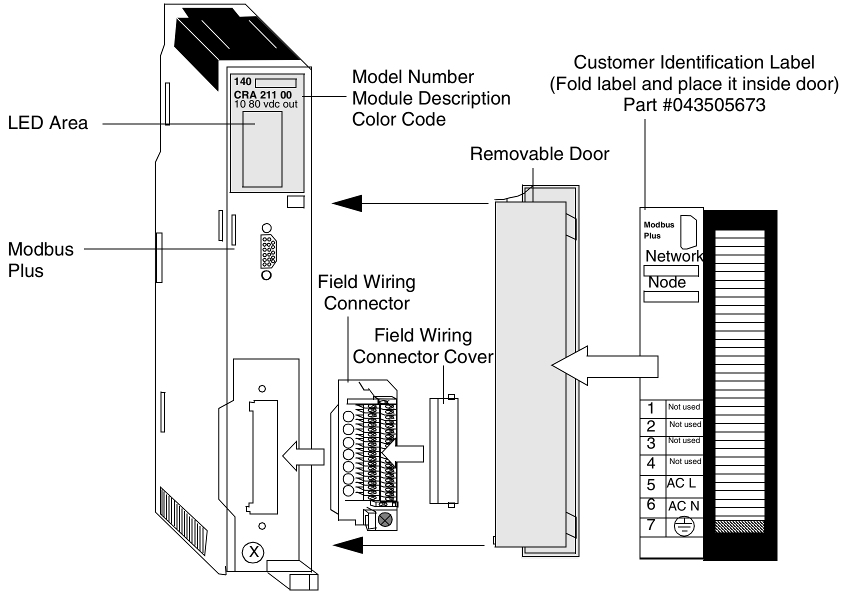
140CRA21X10 Quantum Distributed I/O (DIO) Modules

Overview

This section includes specifications and wiring diagrams for the Modbus Plus Distributed I/O AC powered single (CRA21110) and dual (CRA21210) channel modules.

DIO Module

The following figure shows the parts of the distributed I/O (DIO) module.



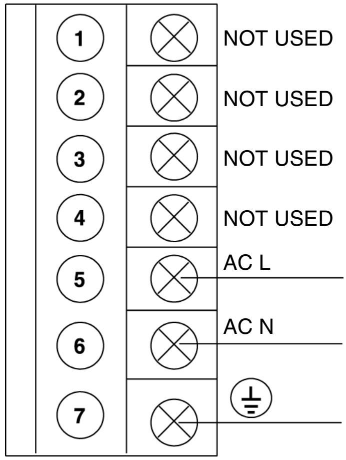
Specifications

The following specifications are for the Modbus Plus CRA21110 and CRA21210 AC powered single and dual channel DIO modules.

Specifications		
Input Requirements		
Input Voltage	85 ... 276 Vac	
Input Frequency	47 ... 63 Hz	
Input Voltage Total Harmonic Distortion	Less than 10% of the fundamental rms value	
Input Current	0.4 A @ 115 Vac. 0.2 A @ 230 Vac	
Inrush Current	10 A @ 115 Vac. 20 A @ 230 Vac	
VA Rating	50 VA	
Input Power Interruption	1/2 cycle at full load and minimum rated line voltage / frequency. No less than 1 second between interruptions.	
Fusing (external)	1.5 A (Part #043502515 or equivalent)	
Operating Mode	Standalone or not powered (see *Power and Grounding Guidelines, p. 831*).	
Output to Bus		
Voltage	5.1 Vdc	
Current	3 A	
Minimum Load	0 A	
Protection	Over Current, Over Voltage	
Communication		
Modbus Plus	1 port (single cable); 2 ports (dual cable)	
General		
Specifications	**I/O Type:**	**Quantum**
	Modules/Drop:	Depends on bus current loading and word count
	Words:	30 In / 32 Out. (Two additional input words are reserved for drop status.)
Diagnostics	Power Up Runtime	
	RAM Data/Address	
	Executive Checksum	
Field Wiring Connector	7 point terminal strip (Part # 043506326)	
Internal Power Dissipation	2.0 V + 3.0 V x I_{BUS} = Watts (where IBUS is in Amperes)	

Wiring Diagram

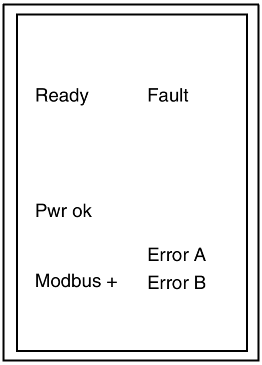
The following figure shows the wiring diagram for the 140CRA21110 and 21210 wiring diagram.



> **Note:** See *Power and Grounding Considerations for AC and DC Powered Systems, p. 832* for power and grounding wiring guidelines and operational information.

LED Indicators and Descriptons

The following figure shows the LED panel.



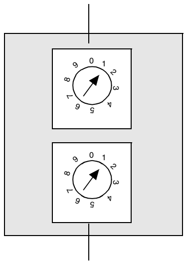
The following table shows the DIO LED indicators and descriptions.

LED Descriptions		
LEDS	**Color**	**Indication when On**
Ready	Green	The module has passed power-up diagnostics.
Fault	Red	A communications error exists between the DIO module and one or more I/O modules, or an output module is not being written to, over the Modbus Plus network.
Pwr ok	Green	Bus power is present.
Modbus +	Green	Communications are active on the Modbus Plus port.
Error A	Red	Communication error on the Modbus Plus Channel A (dual cable only).
Error B	Red	Communication error on the Modbus Plus Channel B (dual cable only).

Rear Panel Switches

Two rotary switches (refer to the following illustration and table) are located on the rear panel of the CPU. They are used for setting Modbus Plus node addresses for the unit.

SW1 (the top switch) sets the upper digit (tens) of the address; SW2 (the bottom switch) sets the lower digit (ones) of the address. The illustration below shows the correct setting for an example address of 11.



The following table shows the node addresses of the SW1 and SW2 switches.

SW1 and SW2 Switches		
Node Address	**SW1**	**SW2**
1 ... 9	0	1 ... 9
10 ... 19	1	0 ... 9
20 ... 29	2	0 ... 9
30 ... 39	3	0 ... 9
40 ... 49	4	0 ... 9
50 ... 59	5	0 ... 9
60 ... 64	6	0 ... 4

Note: If "0" or an address greater than 32 is selected, the RIO module displays a flashing Error A and Error B LED to indicate an error condition. Only addresses 1-32 are valid.

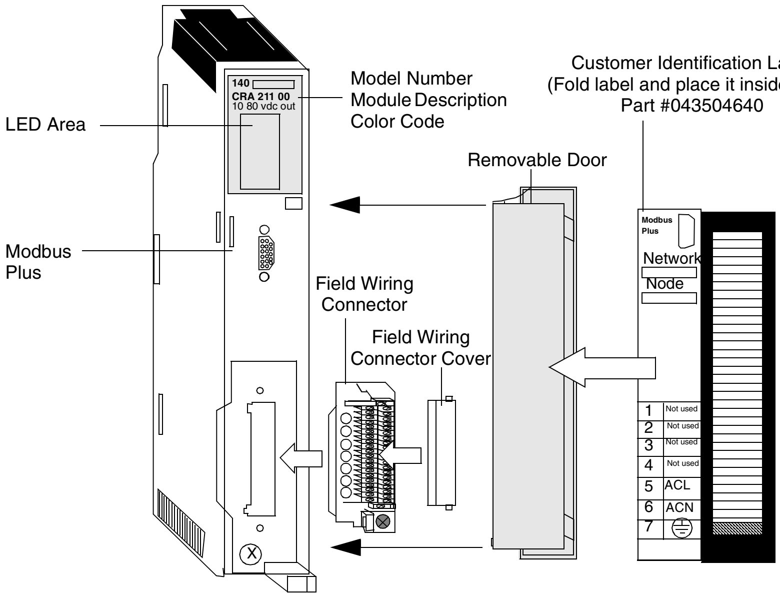
140CRA21X20 Quantum Distributed I/O (DIO) Modules

Overview

This section includes specifications and wiring diagrams for the Modbus Plus Distributed I/O DC powered single (CRA21120) and dual (21220) channel modules.

DIO Module

The following figure shows the parts of the Distributed I/O (DIO) module.



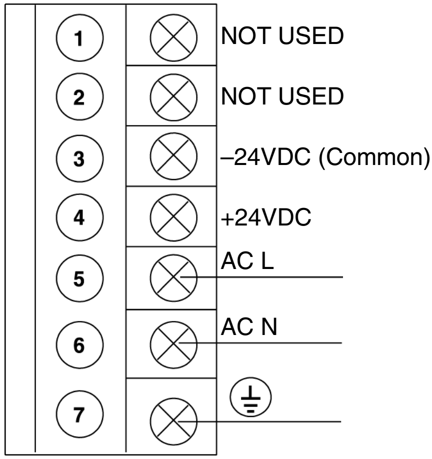
Specifications

The following specifications are for the Modbus Plus CRA21120 and CRA21220 DC powered single and dual channel DIO modules.

<table>
<tr><th colspan="3">Specifications</th></tr>
<tr><th colspan="3">Input Requirements</th></tr>
<tr><td>Input Voltage</td><td colspan="2">20 ... 30 Vdc</td></tr>
<tr><td>Input Current</td><td colspan="2">1.6 A</td></tr>
<tr><td>Inrush Current</td><td colspan="2">30 A</td></tr>
<tr><td>Input Power Interruption</td><td colspan="2">1.0 ms max</td></tr>
<tr><td>Fusing (external)</td><td colspan="2">2.5 A (Part #043503948 or equivalent)</td></tr>
<tr><td>Operating Mode</td><td colspan="2">Standalone or not powered (See Power and Grounding Guidelines, p. 831).</td></tr>
<tr><th colspan="3">Output to Bus</th></tr>
<tr><td>Voltage</td><td colspan="2">5.1 Vdc</td></tr>
<tr><td>Current</td><td colspan="2">3 A</td></tr>
<tr><td>Minimum Load</td><td colspan="2">0 A</td></tr>
<tr><td>Protection</td><td colspan="2">Over Current, Over Voltage</td></tr>
<tr><th colspan="3">Communication</th></tr>
<tr><td>Modbus Plus</td><td colspan="2">1 port (single cable). 2 ports (dual cable)</td></tr>
<tr><th colspan="3">General</th></tr>
<tr><td rowspan="3">Specifications</td><td>I/O Type</td><td>Quantum</td></tr>
<tr><td>Modules/Drop</td><td>Depends on bus current loading and word count</td></tr>
<tr><td>Words</td><td>30 In / 32 Out. (Two additional input words are reserved for drop status)</td></tr>
<tr><td rowspan="3">Diagnostics</td><td colspan="2">Power Up Runtime</td></tr>
<tr><td colspan="2">RAM Data/Address</td></tr>
<tr><td colspan="2">Executive Checksum</td></tr>
<tr><td>Field Wiring Connector</td><td colspan="2">7 point terminal strip (Part #043503328)</td></tr>
<tr><td>Internal Power Dissipation</td><td colspan="2">2.0 V + 3.0 V x I_{BUS} = Watts (where I_{BUS} is in Amperes)</td></tr>
</table>

Wiring Diagram

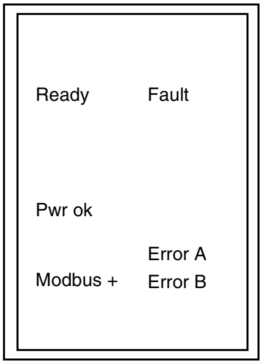
The following figure shows the wiring diagram for the 140CRA21110 and 21210 wiring diagram.



Note: See *Power and Grounding Considerations for AC and DC Powered Systems, p. 832* for power and grounding wiring guidelines and operational information.

LED Indicators and Descriptions

The following figure shows the LED panel.



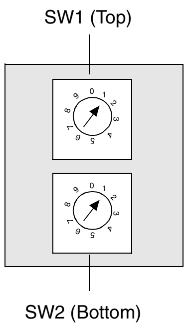
The following table shows the DIO LED indicators and descriptions.

LED Descriptions		
LEDS	**Color**	**Indication when On**
Ready	Green	The module has passed power-up diagnostics.
Fault	Red	A communications error exists between the DIO module and one or more I/O modules or an output module is not being written to over the Modbus Plus network.
Pwr ok	Green	Bus power is present.
Modbus +	Green	Communications are active on the Modbus Plus port.
Error A	Red	Communication error on the Modbus Plus Channel A (dual cable only).
Error B	Red	Communication error on the Modbus Plus Channel B (dual cable only).

Rear Panel Switches

Two rotary switches (refer to the illustration and table that follow) are located on the rear panel of the CPU. They are used for setting Modbus Plus node addresses for the unit.

SW1 (the top switch) sets the upper digit (tens) of the address; SW2 (the bottom switch) sets the lower digit (ones) of the address. The illustration shows the correct setting for an example address of 11.



The following table shows the node addresses of the SW1 and SW2 switches.

SW1 and SW2 Switches		
Node Address	**SW1**	**SW2**
1 ... 9	0	1 ... 9
10 ... 19	1	0 ... 9
20 ... 29	2	0 ... 9
30 ... 39	3	0 ... 9
40 ... 49	4	0 ... 9
50 ... 59	5	0 ... 9
60 ... 64	6	0 ... 4

Note: If "0" or an address greater than 32 is selected, the RIO module displays a flashing Error A and Error B LED to indicate an error condition. Only addresses 1-32 are valid.

Quantum Remote I/O Communication Modules

10

At a Glance

Introduction

Quantum networking modules provide open, standards-based networking and fieldbus connectivity using Modbus, Modbus Plus, Ethernet, InterBus, SY/MAX and LonWorks networks. Specifications for these modules are included below.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
140CRP93X00 Remote I/O (RIO) Head Single and Dual Channel Module	260
140CRA93X00 Quantum RIO Adapter Drop Single and Dual Channel Module	265

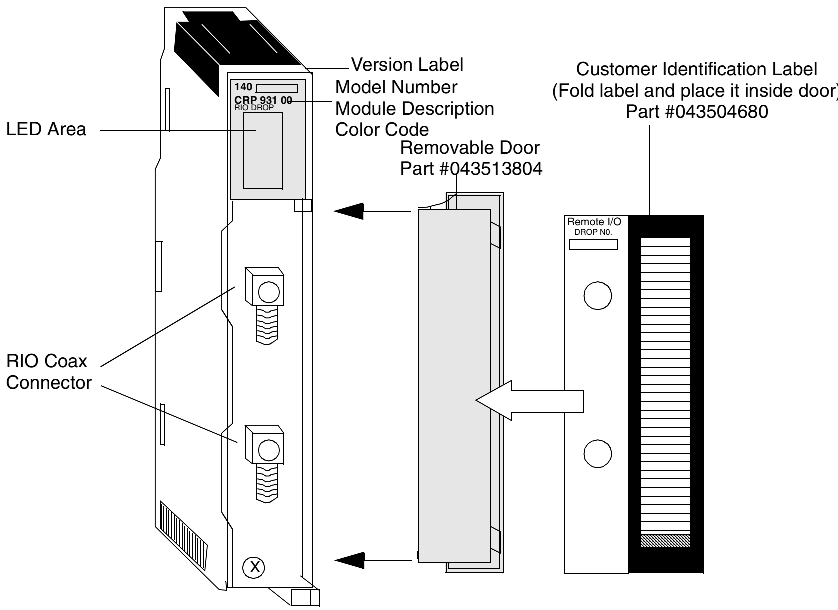
140CRP93X00 Remote I/O (RIO) Head Single and Dual Channel Module

Overview

The Remote I/O Head Single and Dual Channel modules are installed in the same backplane as the system controlling CPU modules. The RIO head is used to transfer data bi-directionally between the CPU and RIO drop modules installed in separate backplanes. A coaxial cable network is used to interconnect the RIO head module and one or more RIO drop modules.

RIO Head Module

The following figure shows the Remote I/O (RIO) module's parts. The specific module illustrated is the 140CRP93200.



Specifications

The following table shows the specifications for the Remote I/O Head Single and Dual Channel modules.

Specifications		
Drop Type	Quantum, 200 Series, 500 Series, 800 Series, or SY/MAX (any mix)	
Drops	31 max	
Words/Drop	64 In / 64 Out	
ASCII	2 ports/drop, 32 ports (16 drops) max	
	Requires the use of AS-P892-000, AS-J892-101/102, or AS-J290-0X0 at the RIO drops.	
Coax Termination	Internal 75Ω	
Coax Shield	Tied to chassis ground	
Data Transfer Rate	1.544 mb	
Dynamic Range	35 dB	
Isolation	500 Vdc coaxial cable center conductor to ground	
External Connections		
One Channel (CRP93100)	One "F" type female connector with a right angle adapter	
Two Channels (CRP93200)	Two "F" type female connectors with a right angle adapter	
General		
Diagnostics	**Power Up**	**Power Up and Runtime**
	Dual Port Memory Check	Executive Checksum
	LAN Controller Check	RAM Address/Data
Maximum Number of CRPs Supported by the Controller	1	
Bus Current Required (Typical)	Single Channel: 600 mA	
	Dual Channel: 750 mA	
Power Dissipation (Typical)	Single Channel: 3 W	
	Dual Channel: 3.8 W	

CAUTION

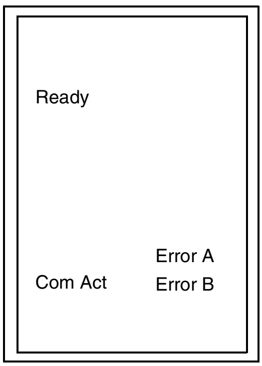
Connectivity Compliance

To maintain CE compliance with the European Directive on EMC (89/336/EEC), the RIO head module must be connected using quad shielded cable (see the Remote I/O Cable System Planning and Installation Guide, 890USE10000, V2.0).

Failure to follow this precaution can result in injury or equipment damage.

LED Indicators and Descriptions

The following figure shows the LED indicators for the RIO Head module.



The following table shows the LED descriptions for the RIO Head module.

LED Descriptions		
LEDS	**Color**	**Indication When On**
Ready	**Green**	**The module has passed powerup diagnostics.**
Com Act	Green	The module is communicating on the RIO network.
Error A	Red	There is a loss of communication on Channel A with one or more of the drops.
Error B	Red	There is a loss of communication on Channel B with one or more of the drops (dual cable only).

LED Error Codes

The Blinking Com Act LED error codes for the RIO Head module table show the number of times the Com Act LED on the RIO Head module blinks for each type of error and the crash codes for each (all codes are in hex).

LED Error Codes		
Number of Blinks	**Code**	**Error**
Slow (steady)	0000	Requested Kernel Mode
2	6820	hcb frame pattern error
	6822	head cntrl blk diag error
	6823	mod personality diag error
	682A	fatal start I/O error
	682B	bad read I/O pers request
	682C	bad execute diag request
	6840	ASCII input xfer state
	6841	ASCII output xfer state
	6842	I/O input comm. state
	6843	I/O output comm. state
	6844	ASCII abort comm. state
	6845	ASCII pause comm. state
	6846	ASCII input comm. state
	6847	ASCII output comm. state
	6849	building 10 byte packet
	684A	building 12 byte packet
	684B	building 16 byte packet
	684C	illegal I/O drop number
3	6729	984 interface bus ack stuck high
4	6616	coax cable initialization error
	6617	coax cable dma xfer error
	6619	coax cable dumped data error
	681A	coax cable DRQ line hung
	681C	coax cable DRQ hung
5	6503	ram address test error
6	6402	ram data test error
7	6300	prom checksum error (Exec not loaded)
	6301	prom checksum error
8	8001	Kernal prom checksum error
	8002	Flash prog / erase error

LED Error Codes		
Number of Blinks	**Code**	**Error**
	8003	Unexpected executive return

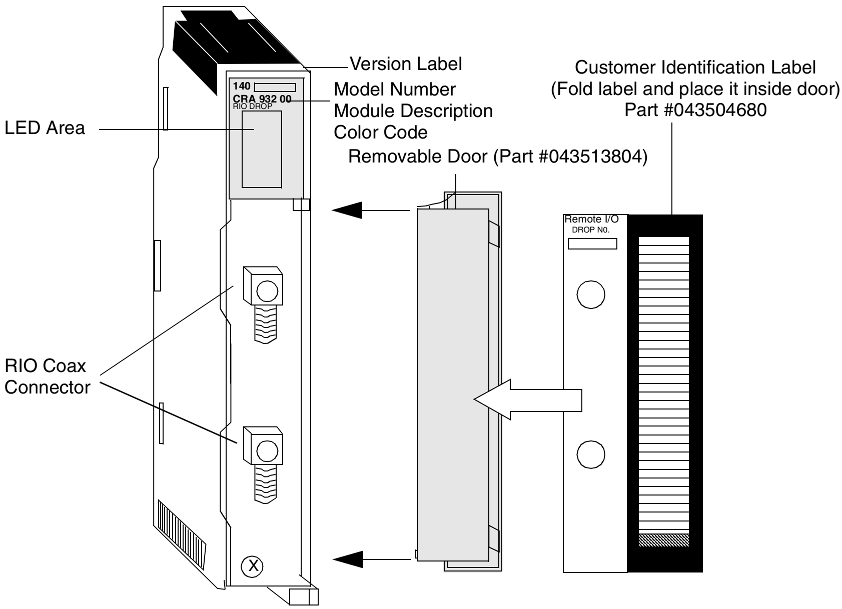
140CRA93X00 Quantum RIO Adapter Drop Single and Dual Channel Module

Overview

The Remote I/O Drop Single and Dual Channel modules are used to transfer data bi-directionally over a coaxial cable network between I/O modules installed in the same (RIO drop) backplane and the RIO head installed in the CPU backplane.

RIO Drop Module

The following figure shows the components of the Remote I/O (RIO) drop module. The specific module shown is the CRA93200.



Specifications

The following table shows the specifications for the Remote I/O Drop Single and Dual Channel modules.

Specifications		
I/O Type	Quantum	
Words/Drop	64 In / 64 Out	
Coax Termination	Internal 75 Ω	
Coax Shield	Capacitor to ground	
Data Transfer Rate	1.544 mb	
Dynamic Range	35 dB	
Isolation	500 Vdc coaxial cable center conductor to ground	
External Connections		
One Channel (CRA93100)	One "F" type female connector with a right angle adapter	
Two Channels (CRA93200)	Two "F" type female connectors with a right angle adapter	
General		
Holdup Time	Software configurable **Note:** In the event of a communication loss with the remote processor, this is the time that output modules will retain their last operating state. Input module data will be held in the system controlling CPU. After this time, output modules will assume their predefined time-out states, and inputs will be zeroed by the CPU.	
Diagnostics	**Power Up**	**Power Up and Runtime**
	Dual Port Memory Check	Executive Checksum
	LAN Controller Check	RAM Address/Data
Bus Current Required (Typical)	Single Channel: 600 mA	
	Dual Channel: 750 mA	
Power Dissipation (Typical)	Single Channel: 3 W	
	Dual Channel: 3.8 W	

CAUTION

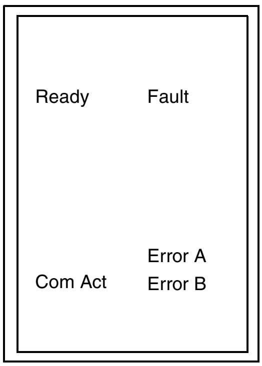
Connection Compliance

To maintain CE compliance with the European Directive on EMC (89/336/EEC), the RIO Head module must be connected using quad shielded cable (see the Remote I/O Cable System Planning and Installation Guide, 890USE10100, V2.0).

Failure to follow this precaution can result in injury or equipment damage.

LED Indicators and Description

The following figure shows the LED indicators for the Drop module.



The following table shows the RIO Drop module LED descriptions.

LED Descriptions		
LEDS	**Color**	**Indication when On**
Ready	Green	The module has passed power-up diagnostics.
Com Act	Green	The module is communicating on the RIO network.
Fault	Red	Unable to communicate with one or more I/O modules.
Error A	Red	Communication error on Channel A.
Error B	Red	Communication error on Channel B (dual cable only).

LED Error Codes

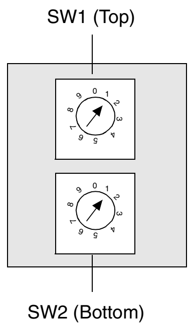
Blinking Com Act LED error codes for the RIO Drop module table show the number of times the Com Act LED on the RIO Drop module blinks for each type of error and the crash codes for each (all codes are in hex).

LED Error Codes		
Number of Blinks	**Code**	**Description of Error**
3	6701H	asic test failure
4	6601H	power down interrupt
	6602H	82588 lan chip test error
	6603H	receive abort timeout
	6604H	transmission loop timeout
	6605H	transmission dma error
	6606H	cable a initialization error
	6607H	cable a dma xfer error
	6608H	cable b dma xfer error
	6609H	cable a dumped data error
	660AH	cable a DRQ line hung
	660BH	cable b DRQ line hung
	660CH	cable a or b DRQ hung
	660DH	power-up lan controller error
5	6501H	ram address test error
6	6401H	ram data test error
7	6301H	prom checksum error

Rear Panel Switches

Two rotary switches are located on the rear panel of the RIO Drop Modules and are used for setting RIO drop addresses (refer to the following illustration and table).

SW1 (top switch) sets the upper digit (tens); SW2 (bottom switch) sets the lower digit (ones). The illustration below shows the correct setting for an example address of 11.



The following table shows the node addresses of the SW1 and SW2 switches.

SW1 and SW2 Address Settings		
Node Address	**SW1**	**SW2**
1 ... 9	0	1 ... 9
10 ... 19	1	0 ... 9
20 ... 29	2	0 ... 9
30 ... 39	3	0 ... 9
40 ... 49	4	0 ... 9
50 ... 59	5	0 ... 9
60 ... 64	6	0 ... 4

Note: If "0" or an address greater than 32 is selected, the module displays a flashing ERROR A and ERROR B LED indicating an error condition. Only addresses 2 - 32 are valid.

Quantum Modbus Plus Network Option Modules

11

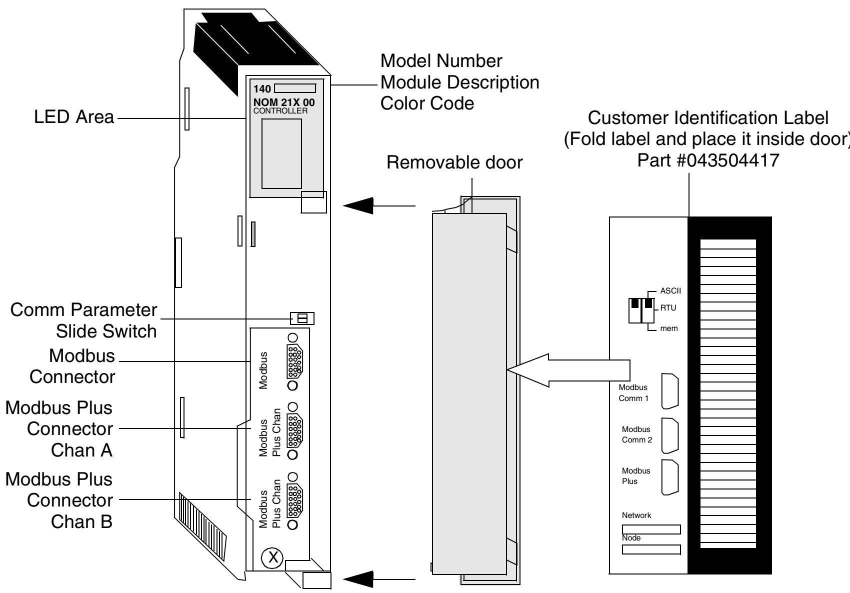
140NOM21X00 Quantum Modbus Plus Network Option Modules

Overview

The following information describes the single and dual channel twisted-pair cable NOM21X00 modules, which provide interface to Modbus Plus networks.

Modbus Plus Module

The following figure shows the components of the Modbus Plus 140NOM21X00 modules.



Specifications

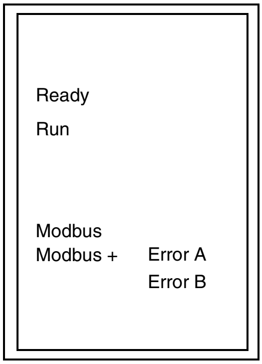
The Modbus Plus Head Single and Dual Channel modules provide extended communication capabilities for the Quantum system within a Modbus Plus configuration. The following table shows the specifications show the Modbus Plus single and dual channel modules.

<table>
<tr><td colspan="3">Specifications</td></tr>
<tr><td colspan="3">Communication Ports</td></tr>
<tr><td>NOM21100</td><td colspan="2">1 Modbus Plus network (RS-485) port (9-pin connector)</td></tr>
<tr><td>NOM21200</td><td colspan="2">2 Modbus Plus network (RS-485) ports (9-pin connectors) for dual connectivity on a single Modbus Plus network. These ports handle identical versions of all inbound and outbound transactions and keep track of the data paths used for these transactions.</td></tr>
<tr><td>Both Modules</td><td colspan="2">1 Modbus (RS-232) serial port (9-pin connector)

A bridge mode capability in the module permits a panel device connected to this port to access nodes on the Modbus Plus network or to access the local PLC directly without having to go out onto the network.</td></tr>
<tr><td rowspan="5">Diagnostics</td><td>Power Up</td><td>Runtime</td></tr>
<tr><td>RAM</td><td>RAM</td></tr>
<tr><td>RAM Address</td><td>RAM Address</td></tr>
<tr><td>Executive Checksum</td><td>Executive Checksum</td></tr>
<tr><td>Processor</td><td></td></tr>
<tr><td>Power Dissipation (Typical)</td><td colspan="2">4 W</td></tr>
<tr><td colspan="3">Bus Current Required</td></tr>
<tr><td>NOM21100</td><td colspan="2">780 mA</td></tr>
<tr><td>NOM21200</td><td colspan="2">780 mA</td></tr>
</table>

LED Indicators and Descriptions

The following figure shows the Modbus Plus NOM LED indicators.



The following table shows the Modbus Plus NOM LED Descriptions.

LED Descriptions		
LEDs	**Color**	**Indication when On**
Ready	Green	The module has passed power-up diagnostics.
Run	Green	Indicates that the unit is in kernel mode–should always be OFF during normal operations.
Modbus	Green	Indicates communication is active on the single RS-232 serial port.
Modbus+	Green	Indicates communication is active on the Modbus Plus port.
Error A	Red	There is an error condition on Cable A of a dual cable Modbus Plus network (140NOM21200 only).
Error B	Red	There is an error condition on Cable B of a dual cable Modbus Plus network (140NOM21200 only).

LED Error Codes

The blinking Run LED error codes for the NOM module shows the number of times the Run LED on the NOM module blinks for each type of error and the crash codes for each (all codes are in hex).

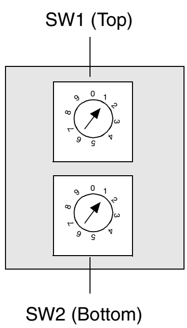
LED Error Codes		
Number of Blinks	**Code**	**Error**
Steady	014H	normal power down event
2	815	ram sequence error
3	49H	illegal data command received by bypass code
	4BH	diagnostics test pattern invalid in the icb block
	4CH	diagnostics test pattern invalid in the page 0
	4DH	icb address not the same as found in hcb
	4EH	bad code selected for mstrout_sel proc
	52H	config table exec_id is different than the sys table exec_id
	53H	got a pupinit hook for neither S985 nor S975 addr
	56H	did not get bus ack form 984 interface within 400 ms
	59H	unexpected modbus port state in send command to 680 proc
	5AH	system table missing
	5BH	bad DPM critical byte write
4	616h	bad or unexpected interrupt
	617h	loopback error on modbus port 1
	618h	parity error
	619h	set port greater than 21
	61AH	controller ram size is less than 8k
	621H	modbus cmd-buffer overflow
	622H	modbus cmd-length is zero
	623H	modbus abort command error
	624H	bad modbus state trn-int
	625H	bad modbus state rcv-int
	626H	bad comm state trn_asc
	627H	transmit underflow error
	628H	bad comm state trn_tru
	629H	bad comm state rcv_asc
	62aH	bad comm state rcv_rtu
	62bH	bad transmit comm state
	62cH	bad receive comm state

LED Error Codes		
Number of Blinks	**Code**	**Error**
	62dH	bad modbus state tmr0_evt
	62eH	bad uart interrupt
	631H	UPI timeout error
	632H	bad UPI response opcode
	633H	UPI bus diagnostic error
	634H	mbp bus interference error
	635H	bad mbp response opcode
	636H	timeout waiting for mbp
	637H	mbp out of synchronization
	638H	mbp invalid path
	639H	peer did not respond with complement of the opcode
	63AH	peer unable to come out of transitions at power-up
	681h	bad master state
	682h	bad slave state
	683h	unknown routing failure to send
	684h	bad port number in set () proc
	685h	bad port number in reset () proc
	686h	bad port number in getport () proc
	687h	bad port number in bitpos () proc
	688h	bad port number in enable_transmit_interrupt () proc
	689h	bad port number in enable_receive_interrupt () proc
	68ah	bad port number in disable_transmit_interrupt () proc
	68bh	bad port number in
	691h	privilege flag is not reset in the session timeout proc
	692h	bad port number in chkmst_hdw () proc
	6AIh	unknown controller type in reset busy flag
	6A2h	unknown function code in generate_poll_cmd () proc
	6A3h	unknown function code in generate_logout_msg () proc
	6A4h	slave link timeout on port other than port #9
	6A5h	illegal bypass command received by bypass code
5	513h	ram address test error
6	412h	ram data test error
7	311h	prom checksum error

Rear Panel Switches

Two rotary switches are located on the rear panel of the modules. They are used together to set the Modbus Plus node and Modbus port address for the unit.

Note: The highest address that may be set with these switches is 64.
Rotary SW1 (top switch) sets the upper digit (tens), and rotary SW2 (bottom switch) sets the lower digit (ones) of the Modbus Plus node address. The illustration below shows the setting for an example address of 11.



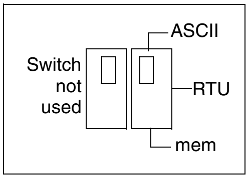
Note: If "0," or an address greater than 64 is selected, the Modbus + LED will be "on" steady, to indicate the selection of an invalid address.

The following table shows the address settings for the SW1 and SW2 switches.

SW1 and SW2 Address Settings		
Node Address	**SW1**	**SW2**
1 ... 9	0	1 ... 9
10 ... 19	1	0 ... 9
20 ... 29	2	0 ... 9
30 ... 39	3	0 ... 9
40 ... 49	4	0 ... 9
50 ... 59	5	0 ... 9
60 ... 64	6	1 ... 4

Front Panel Switches

Two, three-position slide switches are located on the front of the unit. The switch on the left is not used. The three-position slide switch on the right is used to select the comm parameter settings for the Modbus (RS-232) port provided with the Modbus Plus option module. Three options are available, as shown in the following illustration.



Note: The NOM hardware defaults to bridge mode when the front panel switch is set to RTU or ASCII mode. When networking controllers, a panel device connected to the NOM Modbus port can communicate with the controller to which it is conected, as well as log into any nodes on the Modbus Plus network.

Setting the slide switch to the top position assigns ASCII functionality to the port. The following comm parameters are set and cannot be changed.

ASCII Comm Port Parameters	
Baud	2,400
Parity	Even
Data Bits	7
Stop Bits	1
Device Address	Rear panel rotary switch setting

Setting the slide switch to the middle position assigns remote terminal unit (RTU) functionality to the port; the following comm parameters are set and cannot be changed.

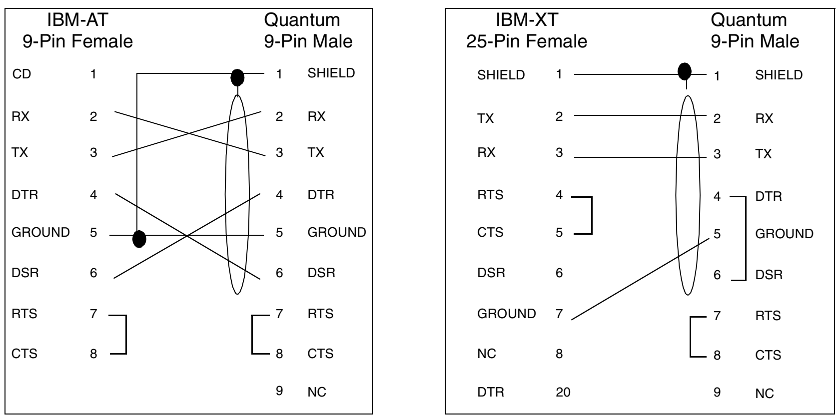
RTU Comm Port Parameters	
Baud	9,600
Parity	Even
Data Bits	8
Stop Bits	1
Device Address	Rear panel rotary switch setting

Setting the slide switch to the bottom position gives you the ability to assign comm parameters to the port in software; the following parameters are valid.

Valid Comm Port Parameters		
Baud	19,200	1,200
	9,600	600
	7,200	300
	4,800	150
	3,600	134.5
	2,400	110
	2,000	75
	1,800	50
Data Bits	7 / 8	
Stop Bits	1 / 2	
Parity	Enable/Disable Odd/Even	
Device Address	Rear panel rotary switch setting	

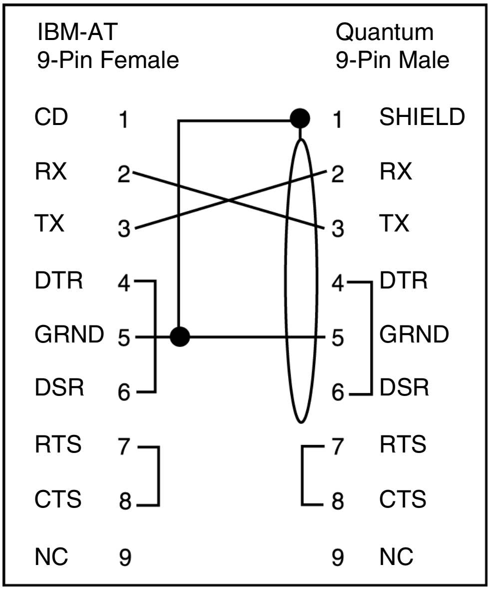
Modbus Connector Pinouts

The NOM modules are equipped with a nine-pin RS-232C connector that supports Modicon's proprietary Modbus communication protocol. The following figure shows the Modbus port pinout connections for 9-pin (left) and 25-pin (right) connections.



Modbus Ports Pinout Connections for Portable Computers

The following figure shows the Modbus port pinout connections for nine-pin portable (laptop) computers.



The following is the abbreviation key for the above figures.

TX: Transmitted Data	DTR: Data Terminal Ready
RX: Received Data	CTS: Clear to Send
RTS: Request to Send	NC: No Connection
DSR: Data Set Ready	CD: Carrier Detect

Quantum Modbus Plus Networking on Fiber Module

12

140NOM25200 Quantum Networking Modbus Plus on Fiber Module

Overview

The following information pertains to the Modbus Plus on Fiber module, 140NOM25200. The Modbus Plus on Fiber module provides connectivity to Modbus Plus nodes by fiber cable.

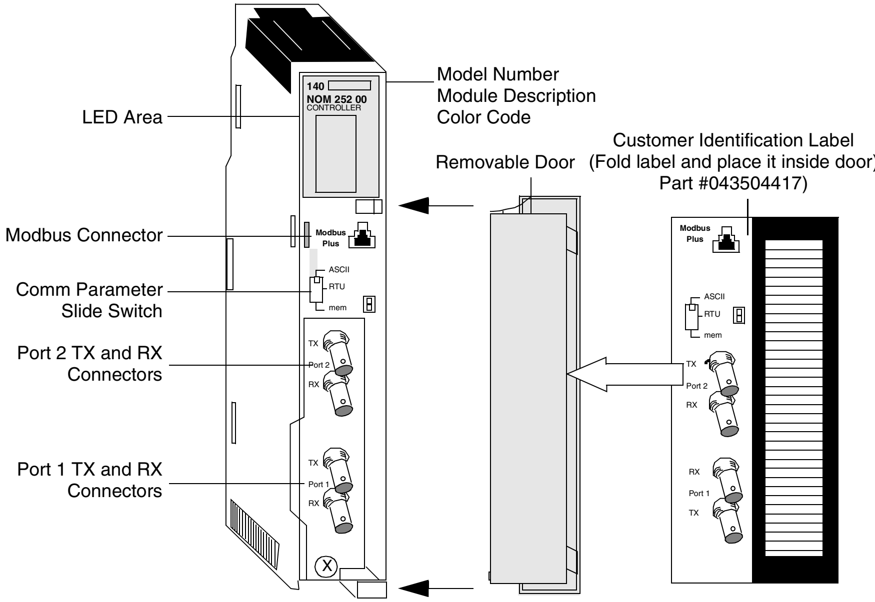
There are many benefits that result from the use of fiber optics. Some of these benefits include:
- Longer distances between nodes (up to 3 km), thereby, increasing the total length of the network.
- Fiber optic medium is not susceptible to the effects of electromagnetic interference, RF interference, and lightning.
- Intrinsically safe links that are required in many hazardous industrial environments.
- Total electrical isolation between terminal points on the link.

Related Documentation

For more detailed information on fiber optic network repeaters, see the *Fiber Repeater User Guide*, part number GM-FIBR-OPT.

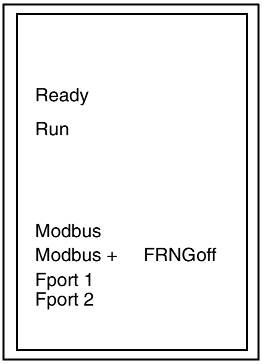
Modbus Plus on Fiber Module

The following figure shows the parts of the Modbus Plus 140NOM25200 module.



LED Indicators and Descriptions

The following figure shows the Modbus Plus on Fiber LED indicators.



The following table shows the Modbus Plus on Fiber LED descriptions.

LED Descriptions		
LEDs	**Color**	**Indication when On**
Ready	Green	The module has passed powerup diagnostics.
Run	Green	Indicates that the unit is in kernel mode – should always be OFF during normal operations. Note: The table for the NOM 21X 00 shows the number of times the RUN LED on the Modbus Plus on Fiber Module blinks for each type of error and the crash codes for each (all codes are in hex).
Modbus	Green	Indicates communication is active on the single RS-232 serial port.
Modbus+	Green	Indicates communication is active on the Modbus Plus port.
Fport1	Green	Indicates an optical signal has been received on fiber optic Port 1.
Fport2	Green	Indicates an optical signal has been received on fiber optic Port 2.
FRNGoff	Red	Indicates the first break in a self healing ring.

Specifications

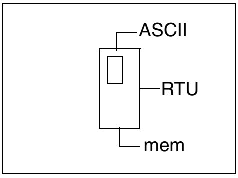
The following table shows the specifications for the NOM25200 module.

Specifications	
General Communication Ports	
Optical Ports	2 (consisting of an optical receiver and transmitter)
Modbus Port	1 RJ45 (phone jack-type) connector
Transmission/Data Rate	1 Mbit/second for Modbus Plus with Bi-Phase S encoded data
Optical Interface	ST-Type connectors
Pulse Width Distortions and Jitter	5 ns or better
Wavelength	820 nm
Power Loss Budget (includes 3 dB of system margins).	50/125 micron fiber - 6.5 dB
	62.5/125 micron fiber - 11 dB
	100/140 micron fiber - 16.5 dB
Maximum Distance for point-to-point connection	2 km over 50 micron fiber
	3 km over 62.5 micron fiber
	3 km over 100 micron fiber
Maximum System Length in Self Healing Ring Configuration	10 km over 62.5 micron fiber
Optical Transmitter Specifications	
Optical Power (Measured with 1 m test fiber)	-12.8 ... -19.8 dBm average power in 50/125 micron fiber cable
	-9.0 ... -16 dBm average power in 62.5/125 micron fiber cable
	-3,5 ... -10.5 dBm average power in 100/140 micron fiber cable
Rise/Fall Time	20 ns or better
Silence (OFF leakage)	-43 dBm
Optical Receiver Specifications	
Receiver Sensitivity	-30 dBm average power
Dynamic Range	-20 dB
Detected Silence	-36 dBm
Miscellaneous Specifications	

Specifications		
Diagnostics	**Power Up**	**Runtime**
	RAM	RAM
	RAM Address	RAM Address
	Executive Checksum	Executive Checksum
	Processor	
Power Dissipation	4 W	
Bus Current Required	750 mA max	
External Power	Not required for this module	

Front Panel Switch

A three-position slide switch is located on the front of the unit. This switch is used to select the comm parameter settings for the Modbus (RS-232) port. The three options that are available, as shown in the figure below, include setting the slide switch in the top position (ASCII), middle position (RTU), or bottom position (Valid mem comm port parameters).



Setting the slide switch to the top position assigns ASCII functionality to the port. The following table shows the ASCII comm port parameters, which are set and cannot be changed.

ASCII Comm Port Parameters	
Baud	2,400
Parity	Even
Data Bits	7
Stop Bits	1
Device Address	Rear panel rotary switch setting

Setting the slide switch to the middle position assigns remote terminal unit (RTU) functionality to the port; the following RTU comm parameters are set and cannot be changed.

RTU Comm Port Parameters	
Baud	9,600
Parity	Even
Data Bits	8
Stop Bits	1
Device Address	Rear panel rotary switch setting

Setting the slide switch to the bottom position gives you the ability to assign comm parameters to the port in software; the following parameters are valid.

Valid Mem Comm Port Parameters		
Baud	19,200	1,200
	9,600	600
	7,200	300

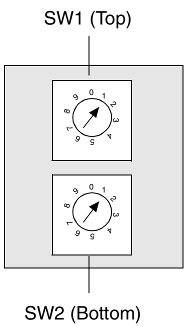
Valid Mem Comm Port Parameters		
	4,800	150
	3,600	134.5
	2,400	110
	2,000	75
	1,800	50
Data Bits	7 / 8	
Stop Bits	1 / 2	
Parity	Enable/Disable Odd/Even	
Device Address	Rear panel rotary switch setting	

Rear Panel Switches

Two rotary switches are located on the rear panel of the modules. They are used together to set the Modbus Plus node and Modbus port address for the unit.

Note: The highest address that may be set with these switches is 64.

Rotary SW1 (top switch) sets the upper digit (tens), and rotary SW2 (bottom switch) sets the lower digit (ones) of the Modbus Plus node address. The following illustration shows the setting for an example address of 11.



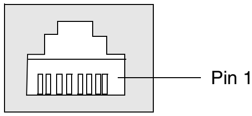
The following figure shows the node address settings for the SW1 and SW2 switches.

SW1 and SW2 Address Settings		
Node Address	**SW1**	**SW2**
1 ... 9	0	1 ... 9
10 ... 19	1	0 ... 9
20 ... 29	2	0 ... 9
30 ... 39	3	0 ... 9
40 ... 49	4	0 ... 9
50 ... 59	5	0 ... 9
60 ... 64	6	1 ... 4

Note: If "0" or an address greater than 64 is selected, the Modbus + LED will be "on" steady, to indicate the selection of an invalid address.

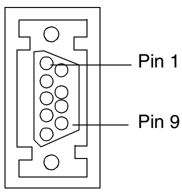
Modbus Connector

The NOM25200 module is equipped with an RS-232 port (see below) located on the front of the module. This port uses an eight-position RJ45 (phone jack-type) connector. The following figure shows the NOM25200 Pin 1 connector.

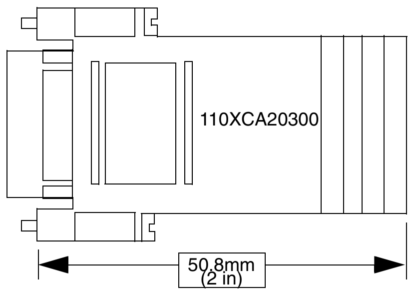


Note: A D-shell adapter is available from Modicon for NOM 252 00-to-computer connections: a (110 XCA 20 300) 9-pin adapter for PC-AT type computers (see the illustration pinout table below).

The following figures show the 9-pin adapter front view (left) and side view (right).

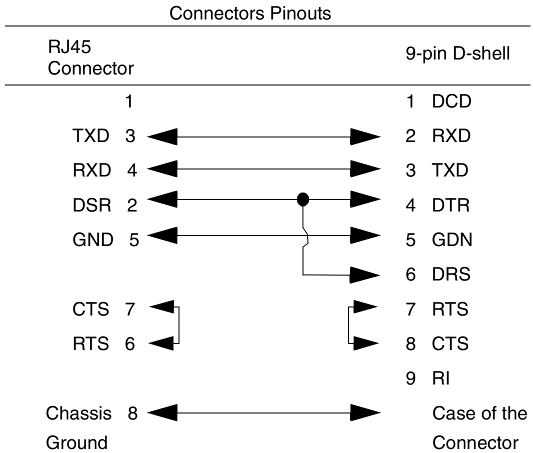


Front View



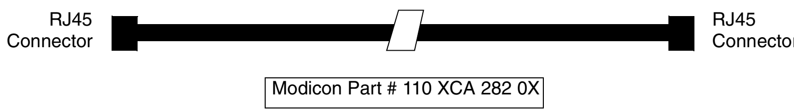
Side View

The following figure shows the 9-pin RJ45 connector schematic.



RJ45 Cable Types

This following figure shows the RJ45 connector, Modicon Part #110XCA2820X cable. The table provides part numbers and cable lengths..

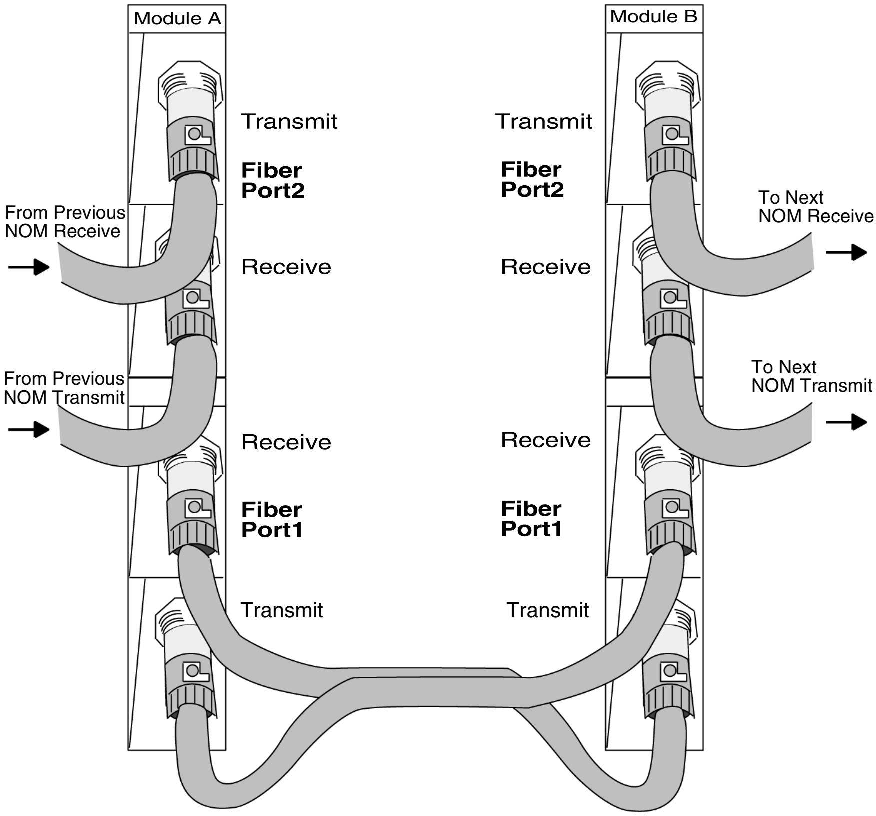


Cable Part Numbers	Cable Lengths
110XCA28201	3 ft. (0.91 m)
110XCA28202	10 ft. (3 m)
110XCA28203	20 ft. (6 m)

Fiber Optic Cable Connections

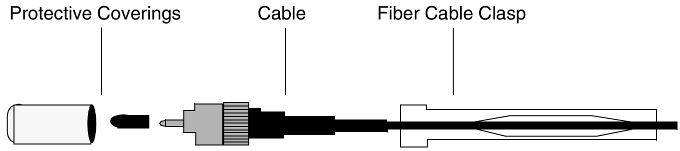
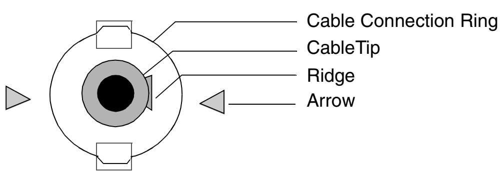
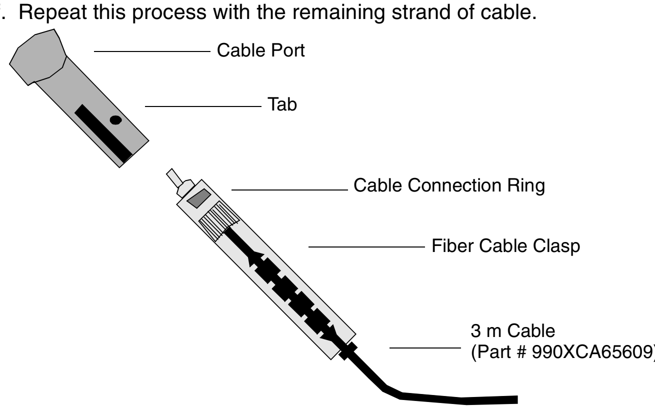
The NOM25200 module is connected in the Quantum system by a fiber optic cable (see the following figure). The cable has two strands. Each module transmits a signal in one direction. For this reason, each strand must be connected to the transmit port on one module and the receive port on the other.

One strand of the fiber optic cable is labelled every 10 inches with the manufacturer's name and the cable specifications. This is the only way to distinguish the two strands.



Connecting the Fiber Optic Cable

The following steps show how to connect the fiber optic cable.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Remove the protective plastic coverings from the cable ports and the tips of the cable. Snap one of the fiber cable clasps (shipped with the module) over the cable so that the wider end of the tool is closest to the cable end.

</td></tr>
<tr><td>2</td><td>Turn the connection ring so that one of the arrows on the side of the ring lines up with the ridge inside.

</td></tr>
<tr><td>3</td><td>a. Slide the tool up to the connection ring.
b. Gripping the cable with the plastic cable clasp, slide the cable end onto the lower cable port. The arrow and the ridge on the connection ring should lineup with the slot on the left of the cable port.
c. Use the clasp to push the cable over the tab on top of the port.
d. Turn the cable to the right, so that the tab locks securely
e. Remove the clasp.
f. Repeat this process with the remaining strand of cable.

</td></tr>
</table>

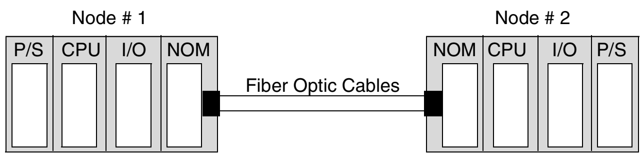
Fiber Optic Configurations

The following represent four typical configurations that show the wide range of the network architecture:
- Point-to-Point connection
- Bus configuration
- Tree and Star configurations
- Self Healing Ring configuration

Point-to-Point Configuration

Point-to-point configuration (see the following figure) allows communication over the distance of up to 3 km through harsh industrial environments. The following figure shows the point-to-point configuration.

Point-to-Point Configuration Example



Bus Configuration

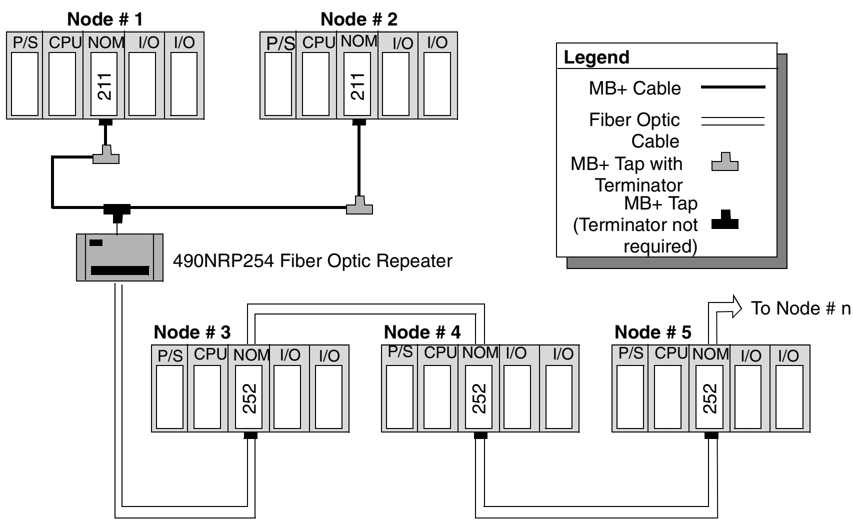
This type of configuration is used when it is required to connect a number of fiber nodes and can be used to increase the distance of a standard Modbus Plus network by changing to a fiber medium. This kind of network allows the connection of up to 32 Quantum NOM252 nodes over the distance of 5 km.

The following illustrations show the NOM25200 module in a mixed fiber optic/twisted pairs bus configuration network and a pure fiber optic bus configuration network.

	CAUTION
⚠	**Equipment Failure** The loss of a single node in this configuration disables the rest of the network. It is suggested that the Self Healing Ring configuration be used to avoid this problem. **Failure to follow this precaution can result in injury or equipment damage.**

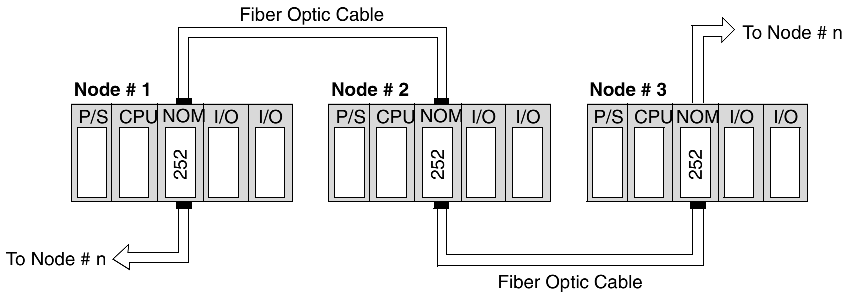
The following figure shows the mixed fiber optic/copper network.

Bus Configuration Example 1 (Mixed Fiber Optic/Copper Network)



The following figure shows the pure fiber optic network.

Bus Configuration Example 2 (Pure Fiber Optic Network)

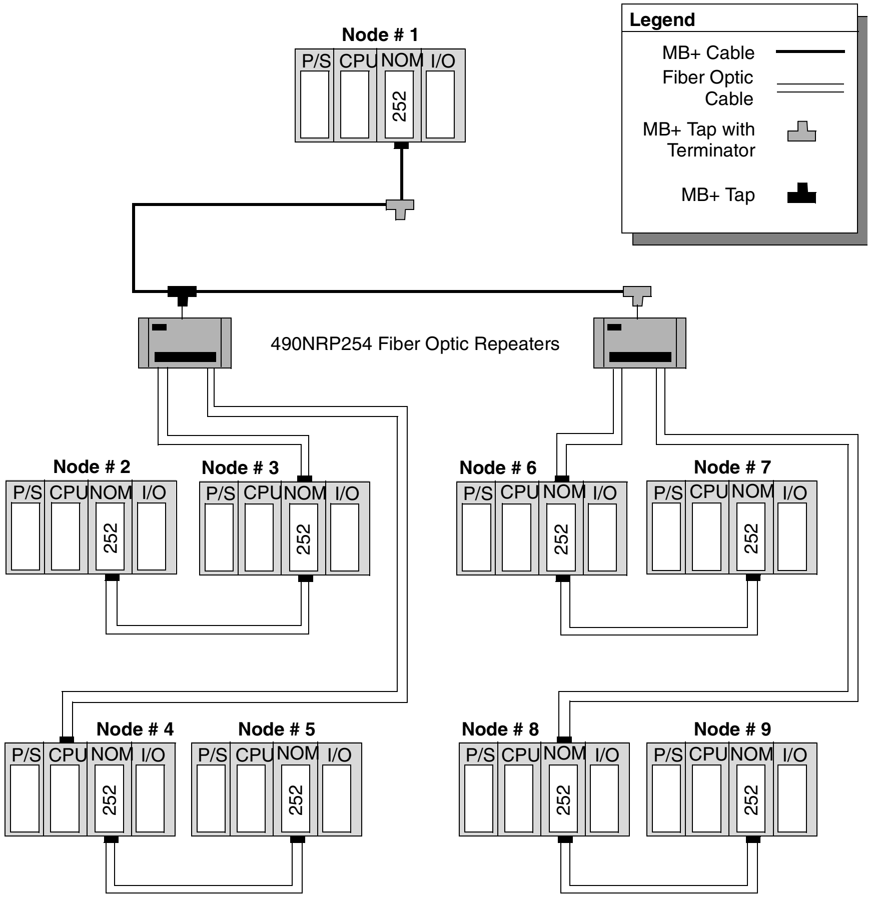


> **Note:** The distance between nodes on fiber is limited by the maximum allowable power loss from end-to-end (3 km over 62.5 mm fiber). Power loss includes the fiber optic cable attenuation, connector losses at the Fiber Optic Receiver and Transmitter ports, and the system margin of 3 dB.
> The end NOM25200 in this configuration will have the FRNGoff LED active and will display the Cable B Framing error in the MBPSTAT (in ladder logic).

Tree and Star Configurations

The use of tree and star configurations can provide flexibility in the layout of Modbus Plus and NOM 25200 networks. The following illustrations show examples of tree and star configurations. Additional repeaters can be connected in order to extend communication between electrical links.

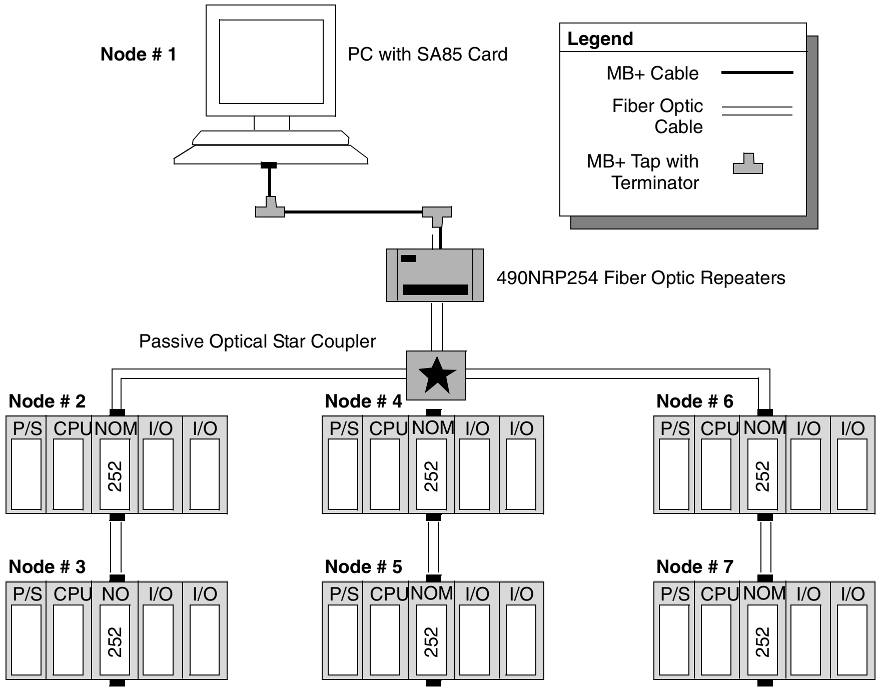
Tree Configuration Example



Star Coupler Configuration

Commercially available passive optical star coupler devices can also be introduced to the optical link to provide added flexibility to the NOM25200 network. A typical four-port star coupler could be used as follows on a NOM25200 optic link.

Star Coupler Configuration Example

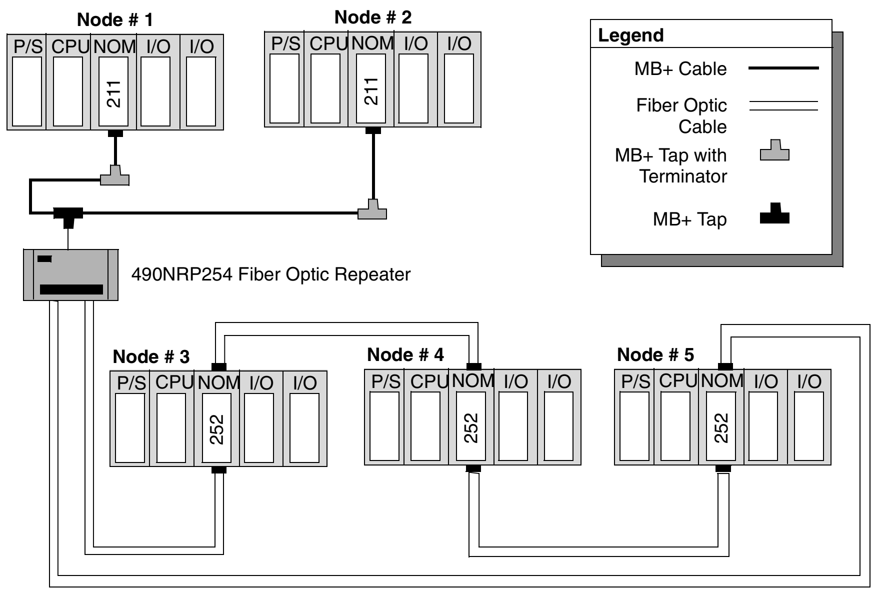


> **Note:** If a passive optical star coupler is used:
> - The number of repeaters and the length of each segment of fiber cable must be calculated separately and cannot exceed a maximum pulse width, distortions of 200 ns, between any nodes at the end of the branches.
> - 100/140 mm fiber cable is recommended because of its higher available optical power.
> - The use of a maximum of four ports of the passive optical star coupler is recommended.

Self Healing Ring Configuration

This configuration can be achieved by connecting the unused fiber optic ports of the first and last NOM25200 directly or through the fiber optic repeater, if a mixed fiber optic/twisted pairs network is used. This type of connection has all the advantages of the previously described configurations, along with built-in redundancy. A broken connection between any two Quantum modules in the ring will automatically reconfigure the network to the Bus Configuration and continue the communication.

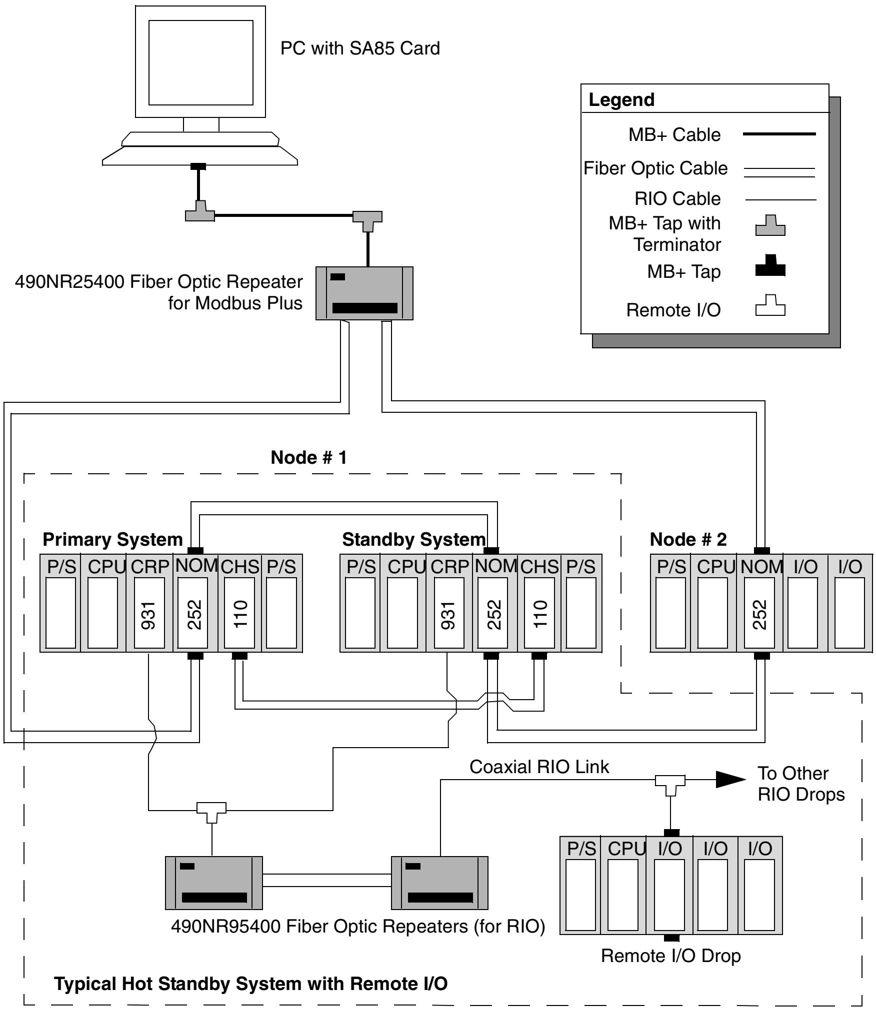
Self-Healing Ring Configuration Example



Hot Standby Systems

The following figure shows the self healing ring configuration for hot standby systems example.

Self Healing Ring Configuration for Hot Standby Systems Example



Network Status

The information about the condition of the network is presented in the form of Network Status. This information indicates the loss of connection (the first break in the self healing ring) and is similar to the way existing 140NOM21200 reports the loss of redundant cable.

The break of the fiber cable will be detected by the module not receiving the signal from the side where the cable is broken and will be reported as a Cable B Framing error by MBPSTAT. This condition will also activate the FRNGoff LED on the front of the module.

Recommended Materials for Fiber Optic Links

Modicon does not manufacture fiber optic products such as cables, connectors, or special tools. However, we have experience with third party suppliers of materials and can give some guidelines on what will work with our products.

Connectors

The following table shows the connector types

Connector Type	Part Number	Operating Temperature
ST Bayonet (Epoxy)	3M 6105	-40 ... +80° C
ST Bayonet (Hot Melt)	3M 6100	-40 ... +60° C
ST Bayonet (Epoxy)	AMP 501380-5 Series	-30 ... +70° C
ST Bayonet (Epoxy)	AMP 503415-1 Series	-20 ... +75° C
Light_Crimp ST Style	AMP 503453-1 Series	-20 ... + 60° C
Mechanical Line Splice (one size fits all)	3M 2529 Fiberlok1 II	-40 ... +80° C

Note: All connectors must have a short boot for strain relief.

Termination Kits

The following table shows the termination kits.

Kit Type	Part Number	Description
Bayonet ST (Epoxy)	AMP 503746-1	For all epoxy type ST style
Light_Crimp XTC	AMP 50330-2	For all Light_Crimp
Mechanical Line Splice	3M 2530	Fiber Splice Prep Kit, complete with cleaving tool
3M Hot Melt	3M 05-00185 3M 05-00187	110 V Termination Kit 220 V Termination Kit

Optical Star Passive Couplers

The AMP Model 95010-4 is a pig-tail option and must be used with an enclosure (use AMP Model 502402-4, a 19 in rack-mount enclosure, 1.7 in high).

Other Tools

The following table shows other tools that may be needed for fiber optic links.

Product	**Part Number**	**Description/Use**
3M (Photodyne) Optical Source Driver	9XT	Hand-held optical source driver (requires a light source)
3M (Photodyne) Optical Light Source	1700-0850-T	850 nm Light Source, ST Connectors for 9XT
3M (Photodyne) Power Meter	17XTA-2041	Hand-held Fiber Optic Power Meter
3M Optical Light Source, 660 nm, visible	7XE-0660-J	Use with 9XT to troubleshoot raw fiber, requires FC/ST patch cord
3M FC/ST Patch Cord	BANAV-FS-0001	Connects FC connector on 7XE to ST
3M Bare Fiber Adapter, ST-compatible	8194	Permits use of above source and meter to test raw fiber (two required)

Cables

It is recommended that you use 62.5/125 µm cable (such as AMP 503016-1, AMP 502986-1, or equivalent) with a maximum attenuation of 3.5 dB/km in most of the configurations.

Note: Modicon recommends using the 990XCA65609 cable.
When passive star couplers are used, 100/140 micron cable (such as AMP503016-3, AMP502986-3, or equivalent) with a maximum attenuation of 5.0 dB/km is recommended because higher optical power can be pumped in 100 µm cable and as a result, greater distance (up to 1 km) between units can be achieved.

Note: All cables must have a maximum cable diameter of not more than 3 mm at the terminal side.

Connections

The following information discusses connecting the NOM25200 on fiber cable, adding a new mode to the network, and repairing the break in the cable.

> **Note:** When a new network is assembled, it is recommended that you connect all cables before powering up the system. Connect fiber optic cables as described previously in this section.

Adding a New Node to the Network

If a new node is added to an existing network in order to extend the network (at the end of any configuration), then a new node may be connected first by fiber cable and then hot-swapped to the backplane to avoid errors to the existing network.

If a new mode is added to the middle of the network, the fiber optic cables need to be disconnected from one side of the existing NOM252 module and connected to port 1 or 2 of a new node. Additional fiber optic cable then needs to be connected to the second port of the new NOM252 and to the next NOM252 in the network, the new NOM252 then has to be hot-swapped to the backplane.

Repairing the Break in the Cable

Because the NOM25200 will stop transmitting in the direction from which it is not receiving the signal, the replacement of a broken fiber optic cable and the reconnection of it will not re-establish communication over that segment. The hot swap of only one NOM252 at the repaired connections is required to complete the connection.

> **Note:** The break of any fiber connectors or fiber optic cables is the equivalent to the break of the trunk cable in a Modbus Plus network on copper.

For the self healing ring configuration, the repair of the first break in the fiber optic network has to be scheduled to the time when one of the units on either side of the repaired break can be hot-swapped without creating the problem by disconnecting the node.

> **Note:** Self healing configurations are not considered redundant networks. High system availability can be achieved with redundant networks.

Calculating Number of Modules in a Fiber Network

Calculate the number of NOM25200 modules in a fiber network using the following table:

Step	Action
1	The total allowable pulse width distortions and jitter are limited to 20% of the bit period and is 200 nsec for the full fiber optic network.
2	The jitter contributed by the NOM252 is 5 nsec max.
3	Jitter contributed by fiber optic repeaters (if used) is 40 nsec.
4	The formula to determine the number (N) of chained repeaters is: $N = \frac{200\text{nsec} - X(L)\text{nsec} - 40\text{nsec}}{5\text{nsec}} + 1$ where "L" is the total cable length (km), and "X" is the jitter (added by the fiber optic cable) in nsec/km: X = 3 ns/km for 50/125 µm 5 ns/km for 62.5/125 µm 7.5 ns/km for 100/140 µm

Quantum Ethernet Modules

13

At a Glance

Introduction

This chapter provides information on the NOE2X1 TCP/IP, NOE3X1 SY/MAX, NOE5X100 MMS, and NOE771xx Ethernet modules.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
140NOE2X100 Quantum Ethernet TCP/IP Module	306
140NOE3X100 Quantum Ethernet SY/MAX Modules	311
140NOE5X100 Quantum Ethernet MMS Modules	314
140NOE771xx Ethernet Modules	317

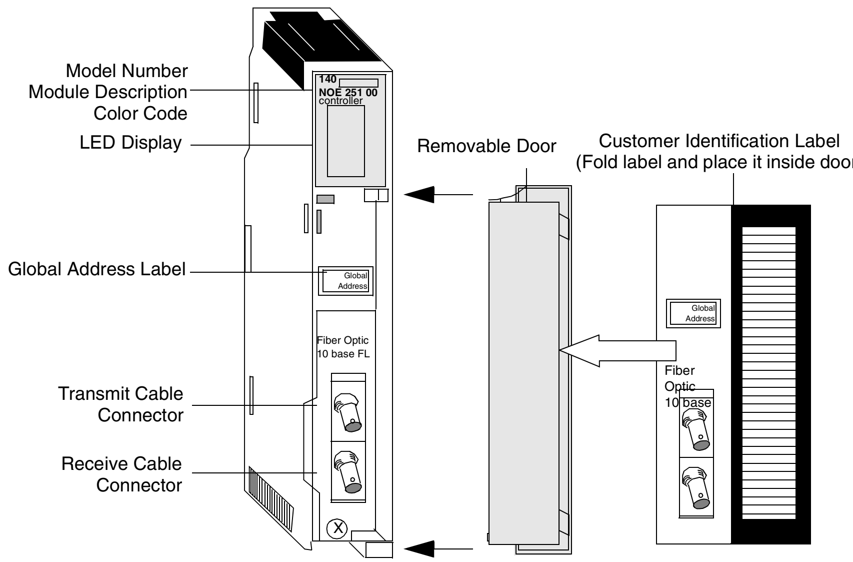
140NOE2X100 Quantum Ethernet TCP/IP Module

Overview

The Quantum NOE2X1TCP/IP is described in this section. This includes specifications for the NOE21100 and NOE25100 modules.

Ethernet TCP/IP Module

The following figure shows the Ethernet TCP/IP NOE2X100 module.



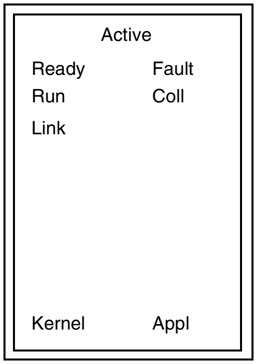
Specifications

The Ethernet TCP/IP modules for twisted pair and fiber optic cabling provide an interface to Ethernet networks for the Quantum Automation Series system.

Specifications	
Communication Ports	
Ethernet ports transmit and receive Modbus commands encapsulated in TCP/IP protocol: NOE 211 00 1, 10BASE-T Ethernet network (RJ-45) port. NOE 251 00 1, 10BASE-FL Ethernet network (ST-style) port	
Data Transfer Frequency	10 mb
Power Dissipation	5 W
Bus Current Required	1 A
Compatibility	
Programming Software	Modsoft V2.32 or Concept 2.0 at a minimum
Quantum Controllers	All, V2.0 at a minimum

LED Indicators and Descriptions

The following figure shows the NOE2X100 LED indicators.



The following table describes the meaning of each NOE2X100 LED indicator.

LED Descriptions		
LEDs	**Color**	**Indication when On**
Active	Green	Module is communicating with backplane.
Ready	Green	Module has passed internal diagnostic tests.
Run	Green	Flashes during normal operation.
Link	Green	Ethernet link to hub is ok.
Kernel	Amber	If steady, module is operating in kernel mode. If flashing, module is waiting for download.
Fault	Red	An error has been detected, a download has failed or a reset is in process.
Coll	Red	If steady, cable is not connected. If flashing, Ethernet collisions are occurring.
Appl	Amber	Entry exists in crash log.

Installing the NOE Module

Quantum Ethernet TCP/IP modules come fully configured. However, before installing your module, you should make sure the default configuration is appropriate for your network.

If the module will be communicating on an open network, consult your network administrator to obtain a unique IP network address. You must enter this address in the Modsoft Ethernet TCP/IP configuration extension screen before installing the module.

If the module will be communicating on a local network, make sure the default IP network address is not already in use on that network. To determine the default IP network address, locate the global address label on the front panel of the module. Convert the rightmost eight digits from hexadecimal to decimal. The result should be a decimal number in the form, 84.xxx.xxx.xxx, where each group of xxx is a number from 0 to 255. This is the default IP network address.

Installation Example: Discovering the Default IP Network Address

The following example shows the steps for discovering the default IP network address.

Step	Action
1	Locate the global address label on the front panel of the module. **IEEE GLOBAL ADDRESS** 0000540B72A8
2	Note the rightmost eight digits. 5 4 0 B 7 2 A 8 84.11.114.168
3	Convert them from hexadecimal to decimal. Each pair of hexadecimal numbers will result in a decimal number between 0 and 255. This is the default IP address.
4	If you use the default IP network address and if your network uses Ethernet II framing and if you do not need to specify the default gateway or a subnet mask, then you may install the module without changing the default configuration.

CAUTION

System Error

Do not connect this module to your network until you have ensured that its IP address will be unique on the network.

Failure to follow this precaution can result in injury or equipment damage.

CAUTION

Hardware Restrictions

The cable for an Ethernet module must be routed through an Ethernet hub for the network to function properly. Do not connect the module directly to another device.

Failure to follow this precaution can result in injury or equipment damage.

140NOE3X100 Quantum Ethernet SY/MAX Modules

Overview

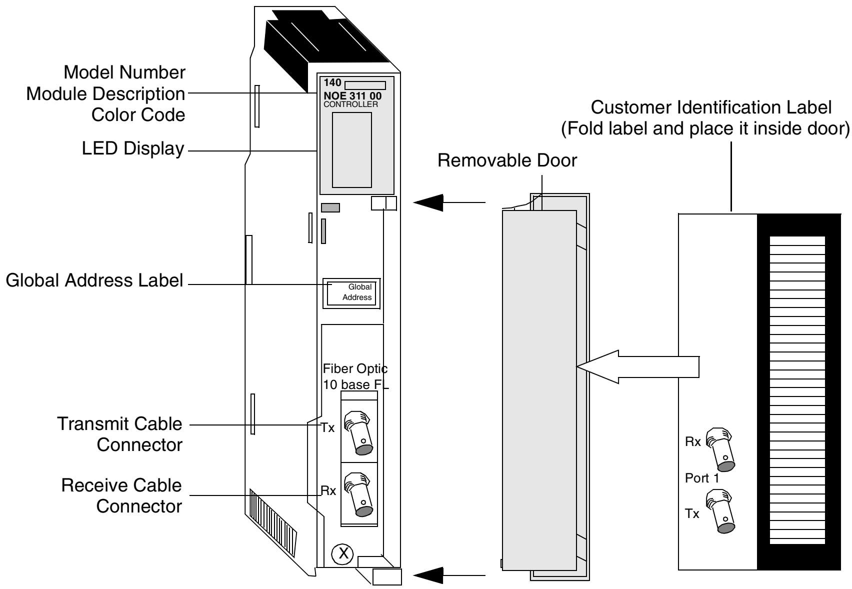
This section includes information for the NOE31100 and 35100 SY/MAX Ethernet modules. The Quantum SY/MAX Ethernet modules for twisted pair and fiber optic cabling provide an interface for the Quantum Automation Series system to SY/MAX devices via Ethernet.

Related Documentation

For more detailed information, see *Quantum-SY/MAX-Ethernet Module User Guide*, 840USE11100, Version 1.0.

Ethernet SY/MAX Module

The following figure shows the NOE3X100 SY/MAX Ethernet modules.



Note: The NOE31100 is equipped with one RJ-45 connector instead of the fiber optic connectors (as shown above on the NOE35100).

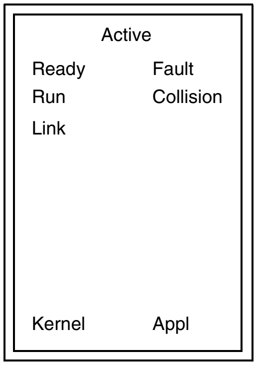
Specifications

The following table shows the specifications for the SY/MAX Ethernet modules NOE31100 and 35100.

Specifications	
Communication Ports	
NOE31100	1 10BASE-T Ethernet network (RJ-45) port
NOE35100	2 10BASE-FL Ethernet network (ST-style) ports
Cable Type	
10Base-2 or ThinWire Ethernet	2, 3, 4, or 6 twisted pairs with a solid copper core
10Base-T (twisted pair)	RG58a/u or RG58C/U coaxial (Belden 9907/82907 or equivalent)
Wire Size	
10Base-2 or ThinWire Ethernet	20 AWG
10Base-T (twisted pair)	22, 24, 26 AWG
Topology	
10Base-2 or ThinWire Ethernet	Bus
10Base-T (twisted pair)	Star
Connector	
10Base-2 or ThinWire Ethernet	BNC (UG-274)
10Base-T (twisted pair)	Modular RJ-45 (4 pins of 8 are used by 10Base-T)
Backplane Compatibility (Requires Quantum CPU)	3, 4, 6, 10, and 16 position backplanes
Compatible SY/MAX 802.3 Devices and Software	Model 450 Model 650 SFI160 SFW390-VAX Streamline Version 1.3
Bus Current Required	1 A

LED Indicators and Descriptions

The following figure shows the NOE3X100 LED indicators.



The following table describes the meaning of each NOE3X100 indicator.

LED Descriptions		
LEDs	**Color**	**Indication when On**
Active	Green	Module is communicating with backplane.
Ready	Green	Module has passed internal diagnostic tests.
Run	Green	Flashes during normal operation.
Link	Green	Ethernet connection is made.
Kernel	Amber	On during download.
Fault	Red	An error condition has occurred.
Collision	Red	If steady, an error condition exists. If flashing, packet collisions are occurring on the network during data transmission.
Appl	Amber	A fatal error has occurred.

SY/MAX Addressing

Be sure that the module is assigned a unique SY/MAX drop number during configuration.

WARNING

Personal injury or equipment damage

Failure to assign a unique SY/MAX drop number during configuration can cause severe personal injury or equipment damage.

Failure to follow this precaution can result in death, serious injury, or equipment damage.

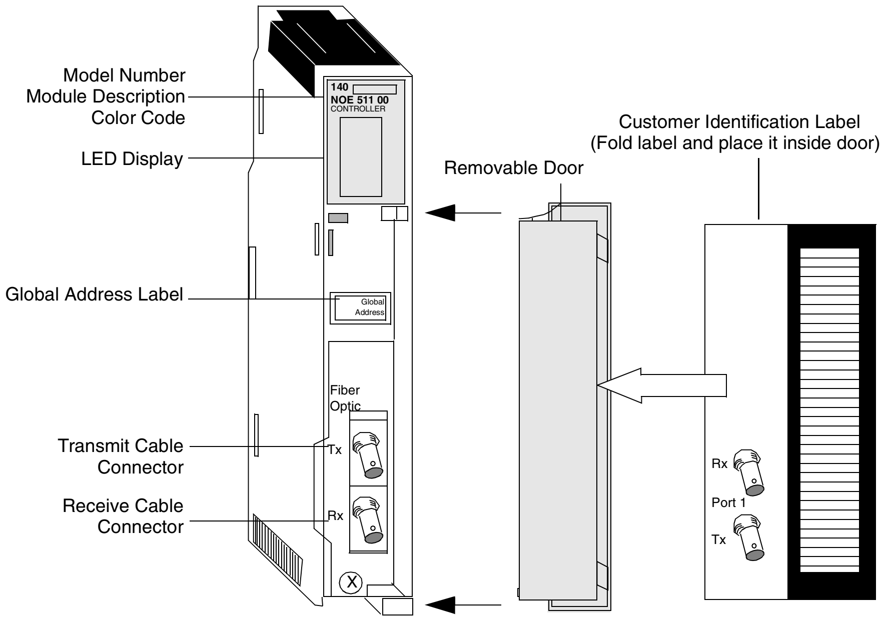
140NOE5X100 Quantum Ethernet MMS Modules

Overview

The section includes information for the NOE5X100 MMS Ethernet modules, NOE51100 and NOE55100. The Quantum MMS Ethernet modules for twisted pair and fiber optic cabling provide an interface for the Quantum Automation Series system to MMS devices via Ethernet.

Ethernet MMS Module

The following figure shows the NOE5X100 MMS Ethernet modules.



Note: The NOE51100 is equipped with one RJ45 connector instead of the fiber optic connectors (as shown above on the NOE55100).

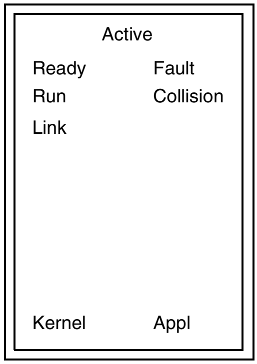
Specifications

The following table shows the MMS Ethernet specifications.

Specifications	
Communication Ports	
NOE51100	1 10BASE-T Ethernet network (RJ-45) port
NOE55100	2 10BASE-FL Ethernet network (ST-style) ports
Cable Type	
10Base-2 or ThinWire Ethernet	2, 3, 4, or 6 twisted pairs with a solid copper core
10Base-T (twisted pair)	RG58a/u or RG58C/U coaxial (Belden 9907/82907 or equivalent)
Wire Size	
10Base-2 or ThinWire Ethernet	20 AWG
10Base-T (twisted pair)	22, 24, 26 AWG
Topology	
10Base-2 or ThinWire Ethernet	Bus
10Base-T (twisted pair)	Star
Connector	
10Base-2 or ThinWire Ethernet	BNC (UG-274)
10Base-T (twisted pair)	Modular RJ-45 (4 pins of 8 are used by 10Base-T)
Backplane Compatibility (Requires Quantum CPU)	3, 4, 6, 10, and 16 position backplanes
Data Transfer Frequency	10 mb
Bus Current Required	1 A

LED Indicators and Descriptions

The following table shows the NOE5X100 LED indicators.



The following table describes the meaning of each NOE5X100 indicator.

LED Descriptions		
LEDs	**Color**	**Indication when On**
Active	Green	Module is communicating with backplane.
Ready	Green	Module has passed internal diagnostic tests.
Run	Green	Flashes during normal operation.
Link	Green	Ethernet connection is made.
Kernel	Amber	On during download.
Fault	Red	An error condition has occurred.
Collision	Red	If steady, an error condition exists. If flashing, packet collisions are occurring on the network during data transmission.
Appl	Amber	A fatal error has occurred.

140NOE771xx Ethernet Modules

Overview

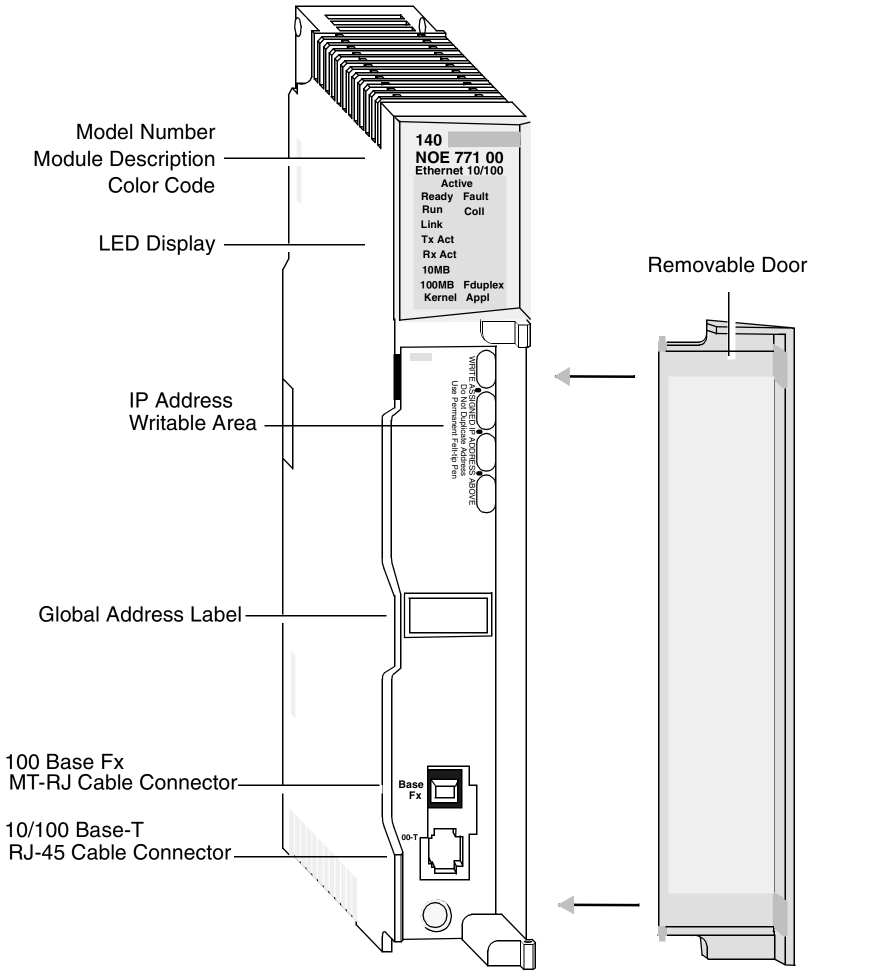
The following provides information on the Quantum ethernet modules 140NOE77100, 140NOE77101, 140NOE77110, and 140NOE77111.

Related Documentation

Refer to *Quantum NOE 771 xx Ethernet Modules User Guide*, 840USE11600 for more detailed information on the installation and use of Quantum ethernet modules.

Ethernet Module

The following figure shows the NOE77100 Ethernet module. The other NOE771xx Ethernet modules are the same in appearance except for the model number.



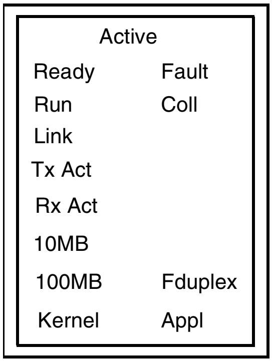
Specifications

The main specifications for the Quantum 140NOE771xx Ethernet Modules are described in the following table

Specifications	
Communication Ports	One auto-sensing 10/100Base-T shielded twisted pair (RJ-45 connector) port and one 100Base-FX (MT-RJ connector) port. Both ports transmit and receive Modbus commands encapsulated in TCP/IP protocol. Only one port can be used at a time.
Bus Current Required	750 mA
Power Dissipation	3.8 W
Fuse	None
Programming Software	
Type and version	Concept, Ver. 2.2 or higher (NOE77100/10)
	Concept, Ver 2.5 or higher (NOE77101/11)
	Modsoft, Ver. 2.6 or higher (NOE77100/10)
	ProWORX NxT, Ver 2.1 or higher (NOE77100/10)
	ProWORX NxT, Ver 2.2 or higher (NOE77101/11)
Firmware	
CPU Type and version	Quantum Executive, Ver. 2.0, or higher
NOE Upgradeable	Field Upgradeable via FTP or Programming Panel.
Operating Conditions	
Temperature	0 to +60° C
Humidity	0 to 95% Rh non-condensing @ 60° C
Altitude	15,000 ft (4500 m)
Vibration	10-57 Hz @ 0.0075 mm d.a
	57-150 Hz @ 1 g
Storage Conditions	
Temperature	-40 to +85°C
Humidity	0 to 95% Rh non condensing @ 60°C
Free Fall	1 m unpackaged
Shock	3 shocks / axis, 15 g, 11 ms

LED Indicators and Descriptions

The following figure shows the NOE771xx LED indicators.



The following table describes the meaning of each NOE771xx LED indicator.

LED Descriptions		
LED	**Color**	**Description**
Active	Green	Indicates the backplane is configured.
Ready	Green	Indicates module is healthy.
Fault	Red	During a crash while going through a reset. If Duplicate IP address is detected. If no link is available. While going through BOOTP sequence.
Run	Green	Flashes to indicate diagnostic code, as described in "Run LED Status" (following table).
Coll.	Red	Flashes when Ethernet collisions occur.
Link	Green	On when Ethernet link is active.
TxAct	Green	Flashes to indicate Ethernet transmission.
RxAct	Green	Flashes to indicate Ethernet reception.
Kernel	Amber	On when in Kernel Mode. Flashing while in download mode.
10MB	Green	On when the module is connected to a 10 Megabit network.
100MB	Green	On when the module is connected to a 100 Megabit network.
Fduplex		On when Ethernet is operating in the full duplex mode.
Appl	Green	On when crash log entry exists.

Run LED Status

The following table lists each available state of the Run LED indicator and provides diagnostic information for that state

Indicator State	Status
On (steady)	Normal operation: The NOE module is ready for network communication.
Number of flashes in sequence	
one	Not used
two	Not used
three	No Link: the network cable is not connected or is defective.
four	Duplicate IP address: The module will stay off-line.
five	No IP address: The module is attempting to obtain an IP address from a BOOTP server.
six	Using default IP address
seven	No valid executive NOE present
eight	Invalid IP configuration. Likely cause: Default gateway is not on the same subnet mask as the NOE>

Key Features

The key features of the **140 NOE 771 (-00, -01, -10, -11)** models are listed below:

	-00	**-01**	**-10**	**-11**
HTTP Server	X	X	X	X
FTP Server	X	X	X	X
Flash File System	X	X	X	X
BOOTP Client	X	X	X	X
BOOTP Server	X	X	X	X
SNMP V2 Agent	X	X	X	X
MODBUS Messaging	X	X	X	X
I/O Scanner	X	X		X
Hot Standby	X	In Version 2.0	X	In Version 2.0
Global Data - Publish / Subscribe		X		X
Bandwidth Monitoring		X		X
Faulty Device Replacement (DHCP Server)		X		X
Enhanced Web Diagnostics		X		X
Schneider Private MIB		X		X
FactoryCast Application			X	X
User Programmable Web Pages			X	X

MODBUS I/O Scanner

The functionality of the NOE771xx module is further enhanced by the addition of a MODBUS I/O Scanner that can be configured with either the Modsoft, Concept, or ProWorx programming panel. This allows the user a means to transfer data between network nodes without using the MSTR instruction.

The NOE771 MODBUS I/O Scanner can be configured by either of the following two methods:
- Peer Cop (Available on NOE77100 only)
- Ethernet I/O Scanner

Note: It is recommended that the enhanced MODBUS I/O Scanner be used for all new installations. Peer Cop functionality is provided only as an easy migration path for an existing installation. The enhanced MODBUS I/O Scanner provides greater functionality than the Peer Cop based I/O scanner.

Peer Cop Based I/O Scanner

The following table lists the characteristics of the Peer Cop based MODBUS I/O Scanner, which is available only on the NOE77100.

Parameter	**Value**
Max. No. of Devices	64
Max. No. of Input Words	500
Max. No. of Output Words	500
HealthTimeout Value	Global Setting (20 Msec to 2 Secs in 20 mSec increments)
Input TimeOutState	Global Setting (Zero or Hold)
IP Address	Derived from MODBUS Address (must be on NOE's Subnet)
Remote Register Reference	Not configurable - 400001 is used

Enhanced Modbus I/O Scanner

The following table lists the characteristics of the Enhanced based MODBUS I/O Scanner, which is available on the NOE77100, NOE77101, and NOE77111.

Parameter	**Value**
Max. No. of Devices	128: NOE77100, NOE77101 and NOE77111.
Max. No. of Input Words	4000
Max. No. of Output Words	4000
HealthTimeout Value	Individual Setting (1 Msec to 2 Secs in 1 mSec increments)
Input TimeOutState	Individually Settable
IP Address	Individually Settable
Remote Register Reference	Configurable
Min. Update Rate	Settable

Refer to the *Quantum NOE 771 xx Ethernet Modules User Guide*, 840USE11600 to learn how to configure the MODBUS I/O Scanner.

MODBUS/TCP Server

The following information describes the functionality of the MODBUS/TCP Server.

Introduction – Client

All NOE771xx Quantum Ethernet TCP/IP modules provide the user with the capability of transferring data to and from nodes on a TCP/IP network through the use of a communication instruction. All PLCs that support networking communication capabilities over Ethernet can use the MSTR Ladder Logic instruction to read or write controller information or can also use IEC communication blocks.

Introduction – Server

All NOE771xx Quantum Ethernet TCP/IP modules provide the user with the ability to access data from the controller using the standard MODBUS/TCP protocol. Any device: PC, HMI package, another PLC, or any MODBUS/TCP compliant device can access data from the PLC. The MODBUS/TCP Server also allows programming panels to log into the controller over Ethernet.

Limitations

The NOE771xx supports up to 64 simultaneous MODBUS/TCP Server connections. The NOE771xx allows only one Programming Panel to be logged in at a time to guarantee consistency of changes to the controller configuration.

The following MODBUS/TCP commands are supported by the NOE:
- Read Data
- Write Data
- Read/Write Data
- Get Remote Statistics
- Clear Remote Statistics
- MODBUS 125 Commands (used by programming panels to download a new Exec to the NOE)

Performance

The following table shows the performance characteristics of the NOE771xx's MODBUS/TCP Server.

Parameter	Value
Typical Response Time (ms)	0.6
Number of MODBUS connections (Client and Server)	64 (-01, -11) 16 (Client -00) 32 (Server -10)
Number of simultaneous login channels	1

Note: NOE771xx MODBUS/TCP performance measurements are made with Quantum 140CPU53414 PLC.

FTP and HTTP Server

The following information describes services provided by the FTP and HTTP servers.

FTP Server

The NOE771xx's File Transfer Protocol (FTP) Server is available as soon as the module receives an IP address. Any FTP client can log on to the module, if the client uses the correct user name and password.

The FTP Server provides the following services:
- Update the NOE's firmware by downloading a new Exec
- Provides error log visibility by uploading error log files
- Upload/download BOOTP Server and SNMP configuration files

The default user name is USER, and the default password is USERUSER. Both the user name and password are case sensitive. Refer to the *Quantum NOE 771 xx Ethernet Modules User Guide* for instructions about how to change the password, and how to add or delete user names to the FTP Server.

There should be only one FTP client per module.

HTTP Server

The NOE771xx's HyperText Transport Protocol (HTTP) Server is available as soon as the module receives an IP address. It can be used with version 4.0 or greater of either the Internet Explorer or Netscape browser.

The NOE771xx's HyperText Transport Protocol (HTTP) Server allows you to view the following information:
- Module's Ethernet statistics
- Controller and I/O information
- BOOTP/DHCP/FDR (Faulty Device Replacement) Server information
- Global Data (Publish / Subscribe)

The HTTP Server's HTML pages allow you to configure the module's BOOTP/ DHCP/FDR Server and SNMP Agent.

The HTTP Server is protected with a default name and password. The default name and password are both USER, and both are case sensitive. They can both be changed via the Configuration page on the NOE 771 0x's Web Embedded Pages (see the *Installing the Module* chapter in the *Quantum NOE 771 xx Ethernet Modules User Guide*).

For the NOE7711x modules, they can be changed via the FactoryCast Configurator.

The NOE771xx supports a maximum of 32 HTTP simultaneous connections.

Note: Browsers may open multiple connections so 32 HTTP connections does not indicate 32 simultaneous users.

Note: The NOE7710x module does not support user downloaded Web pages. You will need to purchase the 140NOE7711x module to support that requirement.

Address Servers

The following information describes the services provided by the Address Servers:
- BOOTP Server
- DHCP Server

BOOTP Server

Note: The BOOTP Server is available on the 140NOE771 -00 and -10 models.

The BOOTstrap Protocol (BOOTP) software, compliant with RFC 951, is used to assign IP addresses to nodes on an Ethernet network. Devices (hosts) on the network issue BOOTP requests during their initialization sequence, and a BOOTP Server that receives the request will extract the required IP address information from its database and place it in BOOTP response messages to the requesting devices. The devices will use the assigned IP addresses, received from the BOOTP Server, for all communication occurring on the network.

Your NOE BOOTP Server

Your NOE x0 module comes supplied with a BOOTP Server. This feature allows you to provide IP addresses to all the I/O devices being serviced by the NOE771x0. Providing a BOOTP Server that is built into your NOE771x0 module eliminates the need for you to have a dedicated PC on your I/O network acting as a BOOTP Server.

Note: The NOE771x0's BOOTP Server cannot be used to provide its own IP address.

You can configure your NOE771x0's BOOTP Server from the module's HTTP Web page. Using this feature allows you to add, remove, and edit devices to the BOOTP Server's database, which is maintained on the modules non-volatile memory.

DHCP Server

Note: The DHCP Server is available on the 140NOE771x1 models.

Dynamic Host Configuration Protocol (DHCP) is a superset of the BOOTP Protocol. Your 140NOE771x1 has a DHCP Server. The DHCP Server is compliant with RFC 1531. The DHCP Server can be used to provide the IP configuration to devices using BOOTP or devices using DHCP.

The DHCP Server has entries that use the MAC address to serve the IP configuration and entries in the Server that use the role name to serve the IP configuration. See the *Address Server Configuration/Faulty Device Replacement* chapter in the *Quantum NOE 771 xx Ethernet Modules User Guide* for details on configuring your NOE's address Server.

If you are migrating a BOOTP configuration from a 140NOE771x0 module to the new 140 NOE 771 x1 module, see the *Address Server Configuration/Faulty Device Replacement* chapter in the *Quantum NOE 771 xx Ethernet Modules User Guide* for details on automatic upgrade of your configuration for the new DHCP Server.

Note: OPERATING ON A CORPORATE NETWORK

Before placing the NOE on a corporate network, Schneider Automation recommends that you discuss the installation with your MIS department. It is likely that your company's corporate network has at least one DHCP Server running already. If the NOE's DHCP Server is running on the same network, it may disturb the network.

To avoid any possible problem related to the NOE's DHCP Server on the corporate network, you must ensure that the DHCP Server is not running in the NOE by not having address entries in the configuration. If there are no configured devices in the address Server configuration page, then the NOE will not start the DHCP Server.

Global Data

Global Data service is a real time Publisher/Subscriber mechanism providing the most efficient data exchange for PLC application coordination.

Devices supporting Global Data are arranged in a distribution group for the purpose of application variable exchange and synchronization. Each Global Data device can publish up to one network (application) variable and subscribe up to 64 network (application) variables.

The Quantum NOE's embedded **Web Global Data Configuration Page** provides a configuration screen to determine which and how many application variables are exchanged with this service. After configuration, the exchanges between all stations belonging to the same distribution group are done automatically.

The Global Data service uses the 4x register space for Global Data exchanges.

Key Features of Global Data

The main features for Global Data are:
- One Publisher and many Subscribers
- A device can publish one network variable of up to 512 registers
- A device can subscribe to several network variables of up to 2048 4x registers
- A device subscribes to the complete network variable
- One distribution group per network IP address
- Application defined publication rate
- Up to 64 Global Data network variables (numbered from 1 to 64) can be part of the data distribution group
- An NOE has only one multicast address; consequently, it can only publish and subscribe inside the group
- A device can participate in several distribution groups by using multiple NOEs in the rack

Global Data has an advantage over Client/Server services when more than one Subscriber is receiving the same data since only one transaction is necessary for all Subscribers to receive the data.

This advantage offers two benefits:
- Reduce overall network traffic
- Ensure tighter synchronization of multiple subscribers

Bandwith Monitoring

Bandwidth Monitoring allows you to monitor the NOE's CPU allocation for each of the following services: Global Data, I/O Scanning, and Messaging. The Bandwidth Monitoring service retrieves workload data and returns one of two pieces of information: whether the module has free resources or whether the module is working at capacity. Knowing the resource allocation helps you:

- Decide about allocating your resources
- Determine the number of NOEs needed in a system

Available Services

The services accessed and monitored are:

- Global Data
- I/O Scanner
- Modbus Messaging

If you use Bandwidth Monitoring, you do not need to develop a new set of access functions. The actual NOE CPU load is computed each second.

Bandwidth Monitoring Load Rates

The Bandwidth Monitoring service checks once a second and computes four (4) values in private data:
- Percentage of NOE’s CPU allocated to **Global Data**
- Percentage of NOE’s CPU allocated to the **I/O Scanner**
- Percentage of NOE’s CPU allocated to **Messaging**
- Percentage of NOE’s CPU allocated to other services and idle

Results are returned as percentages. CPU time spent in other services is shown as "Other" or "Free." Bandwidth Monitoring uses the same functions as used by SNMP.

The three service rates, Global Data, I/O Scanner, and Messaging, are computed using the following formula:

```
(Current load * 100) / Maximum Load
```

Table of **Maximum Load Rates**

Diagnostic Service	Workload Data Returned	Maximum load for NOE 771 x1
Global Data	Number of published variables per second	800
I/O Scanner	Number of transactions per second	4200
Messaging	Number of messages treated per second	410

The current load is computed dynamically.

Note: The loads are dependent on controller scan time. Each application has an expected scan time. Therefore, when evaluating the loads, you should ensure that the controller scan time is set to the expected scan time for the application being modelled.

Enhanced Web Diagnostics

Note: These services are available on the 140NOE771x1 modules.

The embedded Web server provides Web pages that you may use to diagnose Transparent Factory / Real Time services.

Those diagnostic services are listed below:

1. Global Data diagnostics
   - Status of all Global Data services
   - Status of all subscribed and published variables
   - Publication / Subscription rate
2. I/O Scanning diagnostics
   - Status of all I/O Scanning services
   - Status of individual scanned devices
   - Actual I/O scanning rate
3. Messaging diagnostics
   - Diagnostic information for Port 502 messaging
4. Bandwidth Monitoring
   - Throughput measurement of NOE by service

Note: All these pages are protected by the general HTTP password.

Intelligent/Special Purpose Modules for the Quantum

14

At a Glance

Introduction

This chapter provides information on the following intelligent/special purpose modules:

- Five Channel High Speed Counter Module
- Two Channel High Speed Counter Module
- ASCII Interface Module
- High Speed Interrupt Module
- Single Axis Motion Modules
- Hot Standby Module

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
140EHC10500 High Speed Counter Module	334
I/O Configuration for 140EHC20200	340
140EHC20200 High Speed Counter Module	372
140ESI06210 ASCII Interface Module	388
140HLI34000 High Speed Interrupt Module	394
140MSB/MSC10100 Quantum MSX Motion Modules	399
140XBE10000 Backplane Expander and Cable	410
140CHS11000 Hot Standby Module	415

140EHC10500 High Speed Counter Module

Overview

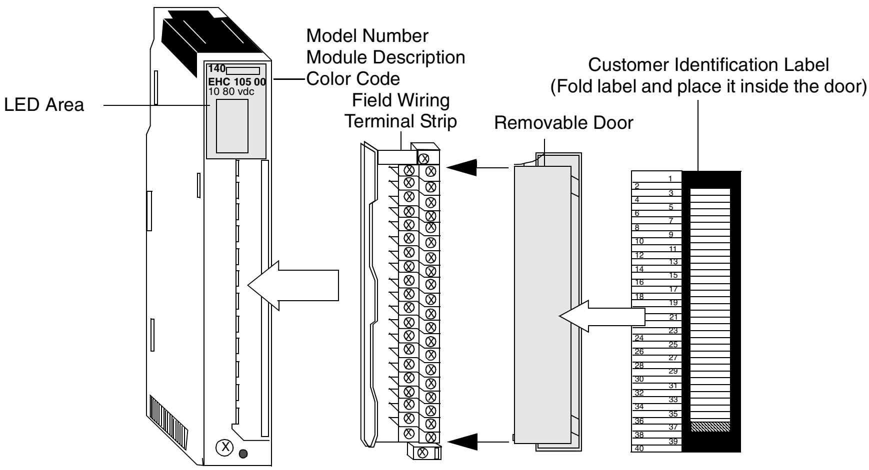
This section provides specifications and descriptions of the high speed counter modules EHC10500, Five Channel Discrete High Speed Counter. The High Speed Counter module is a discrete counter for proximity and magnetic pickups.

Related Documentation

For more detailed information on the planning, installation and use of this module, refer to the *Quantum Automation Series 140EHC10500 Module User Guide*, part number 840USE44300.

EHC10500 Counter Module

The following figure shows the EHC10500 Five Channel Discrete High Speed Counter module.



Specifications

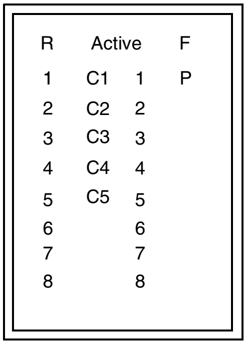
The following table shows the specifications for the EHC10500 high speed counter.

Specifications		
Number of Channels	5 counter inputs, 8 digital inputs, and 8 digital outputs	
LEDs	**Active**	
	F	
	R (Green) -	Module is ready
	1 ... 8 (Green - left column) -	Discrete Inputs (IN1 ... IN8)
	C1 ... C5 (Green - middle column) -	Discrete Counter Inputs (C1 ... C5)
	1 ... 8 (Green - right column) -	Discrete Outputs (OUT1 ... OUT8)
	P (Green) -	24 Vdc is present
Required Addressing	13 Words In 13 Words Out	
Discrete Counter Inputs		
Count Frequency	100 kHz max @ 5Vdc 35 kHz max @ 24Vdc	
Input Thresholds	On +3.1 ... +5V +15 ... +30V	Off 0 ... 1.15V@5 Vdc -3 ... +5V@24 Vdc
Input Current	7 mA	
Duty Cycle	1 : 1	
Data Formats	16 Bit Counter: 65,535 Decimal 32 Bit Counter: 2,147,483,647 Decimal	
Operation Modes	Discrete incremental counter	
Max Continuous Input Voltage	30 Vdc	
Discrete Inputs		
VREF Supply + 24 Vdc	On State (Vdc) -3.0 ... 5.0.	Off State (Vdc) 15.0 ... 30.0
Input Current (typical)	5 mA	
Discrete Outputs		
FET Switch ON	20 ... 30 Vdc	
FET Switch OFF	0 Vdc (ground reference)	
Max Load Current (each output)	210 mA max	
Output Off State Leakage	0.1 mA max @ 30 Vdc	

Specifications	
Output On State Voltage Drop	1.25 Vdc @ 0.5 A
Miscellaneous	
Isolation (Channel to Bus)	500 Vac rms for 1 minute
Fault Detection	Loss of output field power, output short circuit
Power Dissipation	≤ 6 W
Bus Current Required	250 mA
External 24 Vdc Power Supply	19.2 ... 30 Vdc, 24 Vdc nominal, 60 mA required plus the load current for each output
External Fusing	User discretion
Compatibility	Programming Software: Modsoft V2.32 or Concept 2.0 at a minimum Quantum Controllers: All, V2.0 at a minimum

LED Indicators and Descriptions

The following figure shows the LED indicators for the EHC10500 high speed counter.

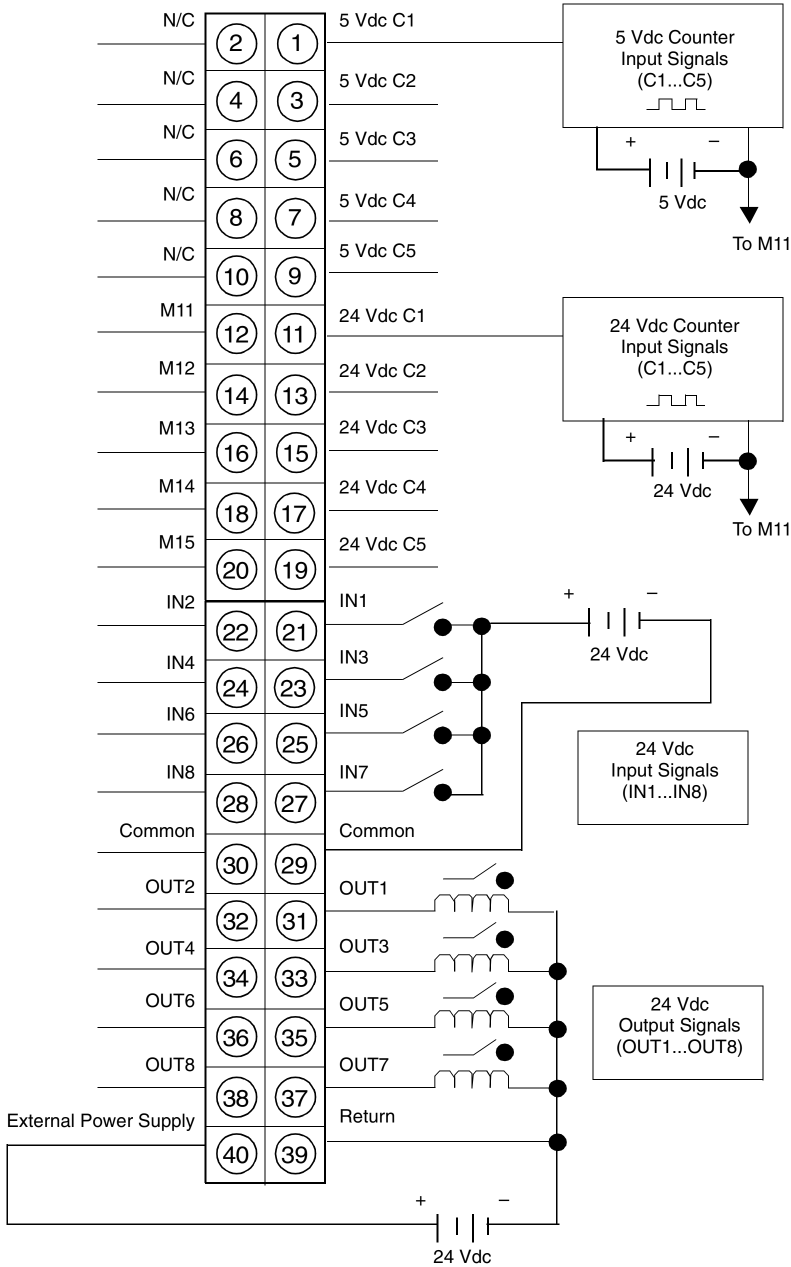


The following table shows the LED descriptions for the EHC10500 high speed counter.

LED Descriptions		
LEDs	**Color**	**Indication when On**
Active	Green	Bus communication is present
F	Red	Lights upon any defined hardware, firmware, and process error.
R	Green	Indicates firmware initialization is complete and the module is ready for service.
1 ... 8 (left column)	Green	Digital inputs IN1 ... IN8
C1 ... C5	Green	Counter inputs xxC1 ... xxC5 (xx=5/24)
1 ... 8 (right column)	Green	Digital outputs OUT1 ... OUT8
P	Green	24 Vdc is present

Wiring Diagram

The following figure show the EHC10500 wiring diagram.



Note:
1. N / C = Not Connected.
2. Terminals 29 and 30 are common and are jumpered together.

I/O Configuration for 140EHC20200

Overview

This section describes configuration of the 140EHC20200 high speed counter module which operates in pulse or quadrature mode and accepts single ended or differentiated inputs.

I/O Map Register Assignment

The 140EHC20200 high speed counter requires six contiguous output (4X) and six contiguous input (3X) registers in the I/O map.

The 4X registers perform the same configuration tasks as the Modzoom screen-assigned parameters. Also, the preset and the enable inputs connected to the field wiring terminal block perform the same functions as those software command control bits. When both methods are used to:
- Preset a counter—the last preset executed has precedence.
- Enable/disable a counter—it will only be enabled when both the hardware enable input and software enable control bit are in the enable state.

For simple applications, the zoom screens rather than the I/O mapped registers can be used to configure the module. Zoom screens are used only while the PLC is stopped. The selected parameters take effect when the PLC is set to run. For applications that require that module parameters be changed while the system is running, user logic can modify the I/O map-assigned registers to override the previously selected zoom parameters.

When using either zoom screens or I/O map registers, the maximum values specified in the Load Values Command section are the largest values that can be used by the module.

The I/O Mapped registers discussed in this section are
4x output registers that:
- Preset and enable/disable input counters.
- Load setpoint and maximum values to define output turn on points.
- Set mode of operation, count, or rate sample.
- Enable output switches and configures their mode of operation.

3X input registers that:
- Hold count or rate sample data.
- Display field power status.
- Echo 4X command data after the command is executed by the module.

EHC20200 Operations

Four operations can be performed:

- Command 1 CONFIGURES the Module
- Command 2 LOADS VALUES
- Command 3 READ INPUT COUNTER
- Command 4 READS RATE SAMPLE or LAST INPUT COUNT BEFORE PRESET

Each operation uses one or more of both types of registers assigned to the module. In addition to the command definition byte, the first 4X register for all commands contain control bits to preset and enable/disable counters of either channel.

Command 1 CONFIGURES the Module

Command 1 uses three 4X registers and six 3X registers as shown in the following figure.

4X
4X+1
4X+2

3X
3X+1
3X+2
3X+3
3X+4
3X+5

This command does the following:

- Sets up the module for pulse or quadrature input.
- Sets up the module for count or rate-sample mode. Counters cannot be separately configured.
- Defines counter register length—16 or 32 bit.
- Enables output assertion including module communication loss state. Output assertion is available if configured for two 16 bit, or one 32 bit counter. No output assertion is available if two 32 bit counters are defined, or in rate-sample mode.
- Defines output assertion point.

Command 2 LOAD VALUES

There are four formats for this command. It uses up to six 4X registers and six 3X registers as shown in the following figure.

4X	3X
4X+1	3X+1
4X+2	3X+2
4X+3	3X+3
4X+4	3X+4
4X+5	3X+5

Values loaded may be:
- Maximum count and setpoint (i.e., output turn on times).
- Output assertion ON time duration (one input only).
- Rate sample time interval.

Command 3 READ INPUT COUNTER

Command 3 uses one 4X register and six 3X registers as shown in the following figure.

4X	3X
	3X+1
	3X+2
	3X+3
	3X+4
	3X+5

Command 4 READS RATE SAMPLE or LAST INPUT COUNT BEFORE PRESET

Command 4 uses one 4X register and six 3X registers as shown in the following figure.

4X

3X
3X+1
3X+2
3X+3
3X+4
3X+5

> **Note:** 4X register formats for the commands are described first. The 3X register contents after issuing Command 1 or 2 are listed after the 4X register description for Command 2, since the responses are the same for both. The 3X responses for Commands 3 and 4 immediately follow those commands.

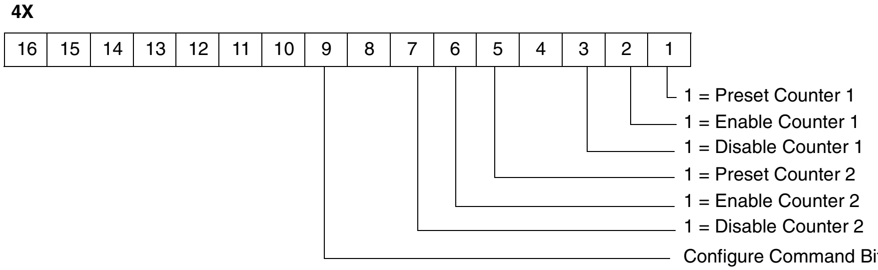
> **Note:** When Command 0 (4X = 00XX) or any other undefined commands are asserted in the 4X register, the 3X registers will contain the count inputs if in count mode (same as Command 3) and the rate sample values when in rate-sample mode (same as Command 4).

Command Words Described

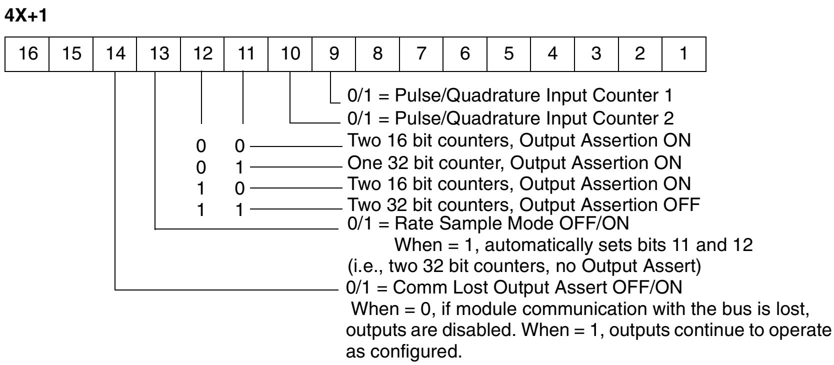
The following describes the command words and responses.

Command 1 - CONFIGURE, Output Register Format (4X = 01XX hex)

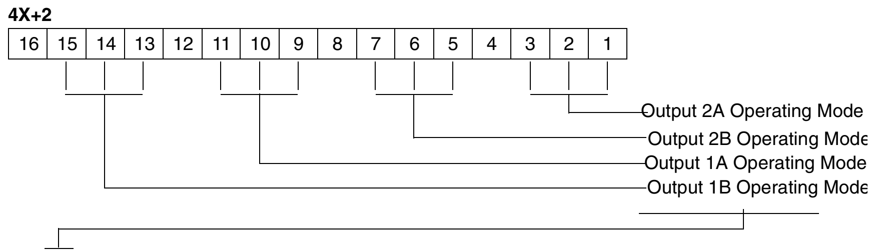
The following figure shows the 4x output register for command 1.



The following figure shows the 4x+1 output register for command 1 (4X+1).



The following figure shows the 4x+2 output register for command 1.



Bits	Mode	Description
000	0	Disable Output
001	1	ON if Count = Setpoint
010	2	Latched ON if Count = Setpoint. Hardware RESET required to turn OFF
011	3	ON if Count = Maximum Count
100	4	Latched ON if Count = Maximum Count. Hardware RESET required to turn OFF
101	5	ON when Count = Setpoint for time specified in Command 2 register
110	6	ON when Count = Maximum Count for time specified in Command 2 register
111	7	Not Used

CAUTION

Module disable possibility

The Output ON time specified in the Command 2 registers may be used by only one of the four outputs. When more than one output is set to mode 5 or 6, the module firmware will operate the first one encountered, and disable the other outputs set to modes 5 or 6.

Failure to follow this precaution can result in injury or equipment damage.

Command 2. LOAD VALUES, Output Register Format (4X = 02XX hex)

The LOAD VALUES 4X register format depends on the Counter/Rate Sample mode selected in Command 1, Register 4X+1, bits 11 and 12.
If configured for two 16 bit Counters, Output Assert ON, the following figures, which shows counters for registers 4X through 4X+5, are displayed.

Configured for two 16 Bit Counters, Output Assert ON

4X

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

1 = Preset Counter 1
1 = Enable Counter 1
1 = Disable Counter 1
1 = Preset Counter 2
1 = Enable Counter 2
1 = Disable Counter 2
Load Values Command Bit

4X+1

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Maximum Count for Counter 1 (max = FFFF hex)

4X+2

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Setpoint for Counter 1 (max = FFFF hex)

4X+3

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Maximum Count for Counter 2 (max = FFFF hex)

4X+4

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Setpoint for Counter 2 (max = FFFF hex)

4X+5

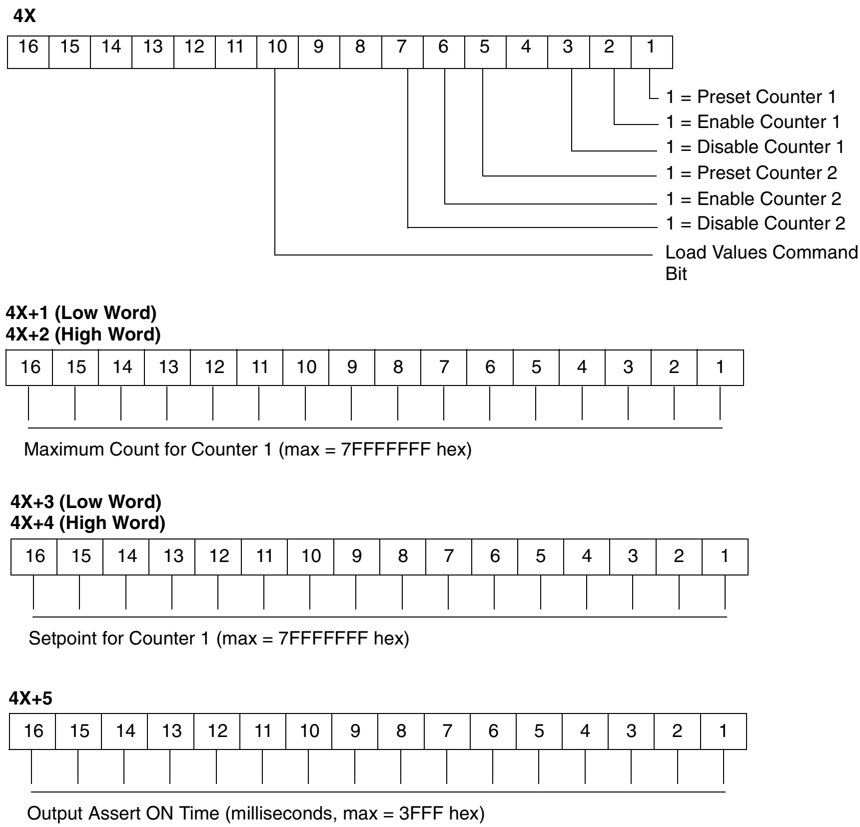
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Output Assert ON Time (milliseconds, max = 3FFF hex)

Note: Zero set into any 4X register means no change.

If configured for one 32 bit Counter, Output Assert ON, the following figures, which show the counters for registers 4X through 4X+5, with low and high word, are displayed.

Configured for One 32 Bit Counter, Output Assert ON

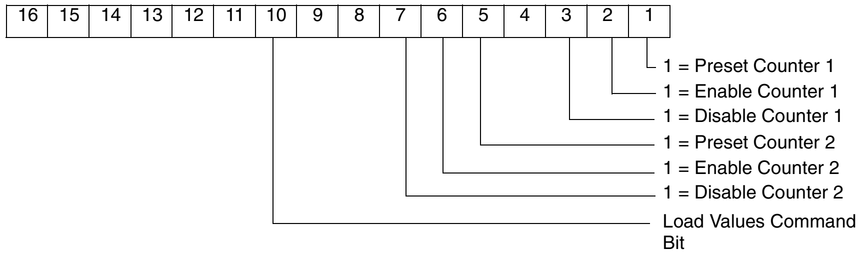


Note: Zero set into any 4X register pair for 32 bit values or any 4X register means no change.

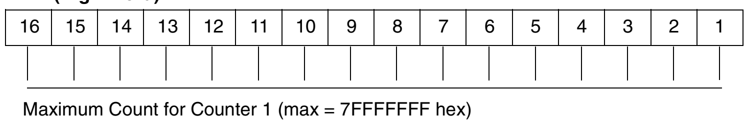
If configured for two 32 bit Counters - NO Output Assert, the following figures, which show the 4X through 4X+4 counters, with low and high word, are displayed.

Configured for two 32 bit Counters - NO Output Assert

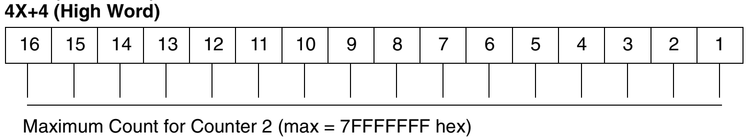
4X



4X+1 (Low Word)
4X+2 (High Word)



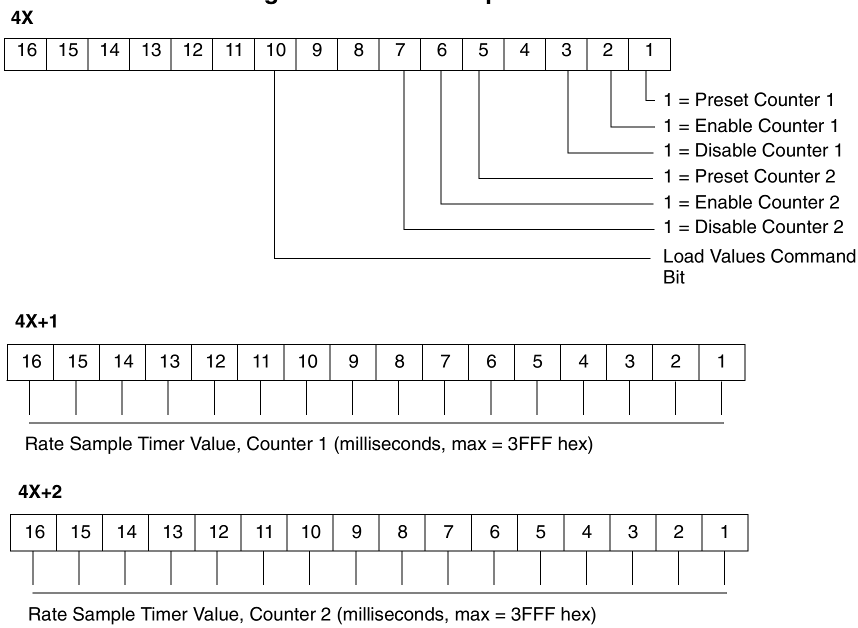
4X+3 (Low Word)
4X+4 (High Word)



> **Note:** Zero set into any 4X register pair for 32 bit values or any 4X register means no change.

If configured for Rate Sample Mode, the following figures, which show the 4X through 4X+2 counters, are displayed.

Configured for Rate Sample Mode

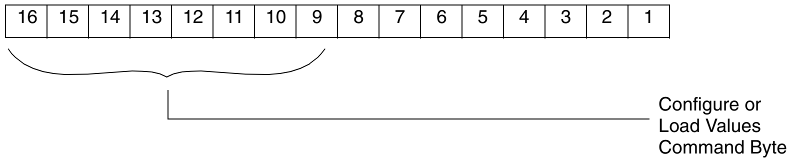


Note: Zero set into any 4X register or any 4X register pair for 32 bit values means no change.

Command 1 and Command 2 Response Formats

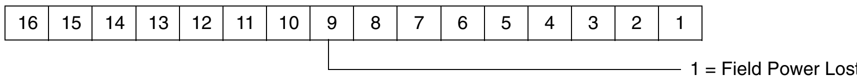
The following figures show the 3X through 3X+5 response formats.

3X



3X+1 to 3X+4 echoes 4X+1 to 4X+4 register contents.

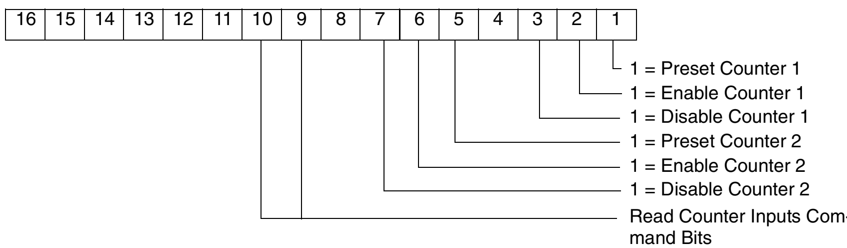
3X+5



Command 3, READ INPUT COUNTER, Output Register Format (4X = 03XX hex)

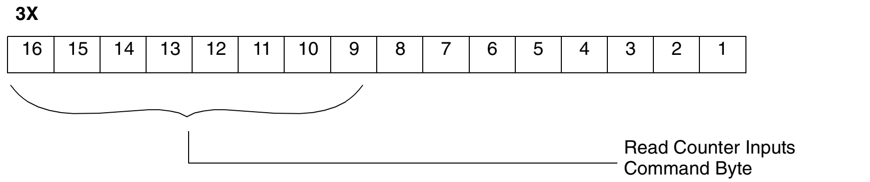
The following figure shows the 4X register for Command 3, READ INPUT COUNTER, output register format.

4X

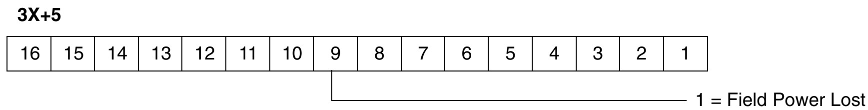


Command 3 Response Format

The following figure shows the Command 3 response format.

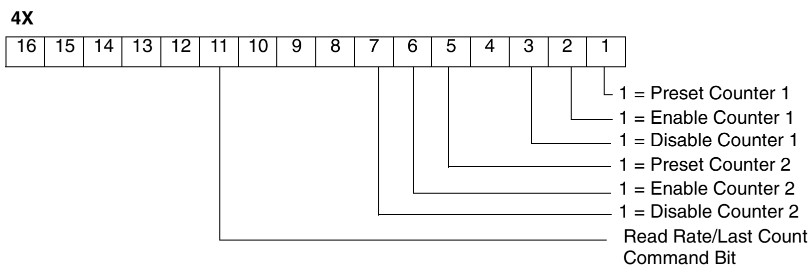


3X+1 and 3X+2 = Counter 1's 16 or 32 bit Current Count.
3X+3 and 3X+4 = Counter 2's 16 or 32 bit Current Count.



Command 4, READ RATE SAMPLE or READ LAST COUNT VALUE BEFORE MOST RECENT PRESET, Output Register Format (4X = 04XX hex)

The following figure shows the 4x counters for Command 4.



Command 4 Response Format

The following figures show the counters for 3X through 3X+5 for command 4.

3X

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Read Rate Sample/
Last Count
Command Byte

3X+1 and 3X+2 = Counter 1's 32 bit Rate Sample / Last Count Before Preset.
3X+3 and 3X+4 = Counter 2's 32 bit Rate Sample / Last Count Before Preset.

3X+5

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

1 = Field Power Lost

I/O Map Status Byte

The most significant bit in the I/O Map status byte is used for the 140EHC20200 High Speed Counter Module. The following figure shows the map status byte register.

8	7	6	5	4	3	2	1

1 = Internal Fuse Blown or External Output Supply Lost

Using I/O Mapped Registers to Operate the High Speed Counter

COUNT UP Example

Field connections for this example are illustrated in the EHC202 wiring diagrams 1–4 in this section. The maximum allowable Vref value is 30 Vdc. Input pulse on-off threshold levels for the 5 ... 24 Vdc Vref range are listed in the module specification table. The minimum differential input is 1.8 V.

The following user logic:
- Configures the module to count up from zero.
- Turns an output on for one count at a setpoint value of 50.
- Continues counting to 100.
- Rolls over to zero and turn on a second output for one count.
- Repeats the operation.

See *140EHC20200 High Speed Counter Module, p. 372* for counter timing diagrams illustrating output on times.

The following table shows the I/O Map register assignments.

Module	Input Ref	Output Ref	Description
140EHC20200	300001-300006	400001-400006	EHC20200 High Speed

In this example, block moves are used to load the operating parameters into the module. This requires pre-defined tables be established. Register values are in HEX format.

Module Configuration

The following table shows the module configurations.

400101	0140	CONFIGURE command, Disable Counter 2
400102	0000	Pulse input, two 16 bit counters, output assert on Rate Sample OFF, disable outputs at bus communication loss
400103	3100	Output 1A on at setpoint, Output 1B on at maximum count +1 Output 2A and 2B are disabled
400104	0000	Not used by this command
400105	0000	
400106	0000	

Load Values

The following table shows the load values.

400201	0243	LOAD VALUES command, disable Counter 2, preset and enable Counter 1
400202	0064	Counter 1 maximum count, count after which Output 1B turns on
400203	0032	Counter 1 setpoint, count when Output 1A turns on
400204	0000	Counter 2 maximum count (not used in this example)
400205	0000	Counter 2 setpoint (not used in this example)
400206	0000	Output Assert Time (Not used in this example, one output only, if used)

Zeros in the 4X registers also mean no change. Setpoint, maximum count and assert time can only be set to zero using the Modzoom screens. When the registers in this example are echoed, zeros will appear but the actual content in the module will be unchanged from previous values. In this example, Counter 2 is disabled and its outputs and timed assert have not been selected. Registers 400204 - 6 have no meaning.

After the module executes the Configure and Load Value's commands, they are echoed in the I/O mapped 3X registers except for the command register's low 8 bits. Command execution time by the module is 1 ms. Actual time between the 4X register block move and the echo response display in the 3X registers is dependent on User Logic and hardware configuration. An echo of the Configuration command registers would appear as follows:

Response for Configuration Command

The following table shows the echo response for the configuration command.

Register	Value
300001	0100
300002	0000
300003	3100
300004	0000
300005	0000
300006	0000

Read Input Counter Command

The following table shows the read input registers.

40301	0300	READ INPUT COUNTER command
40302	0000	Not used by this command
40303	0000	
40304	0000	
40305	0000	
40306	0000	

When this command is issued, the content of the input pulse counter is retrieved. The 3X register content would appear as shown in the following table.

3x Register Content

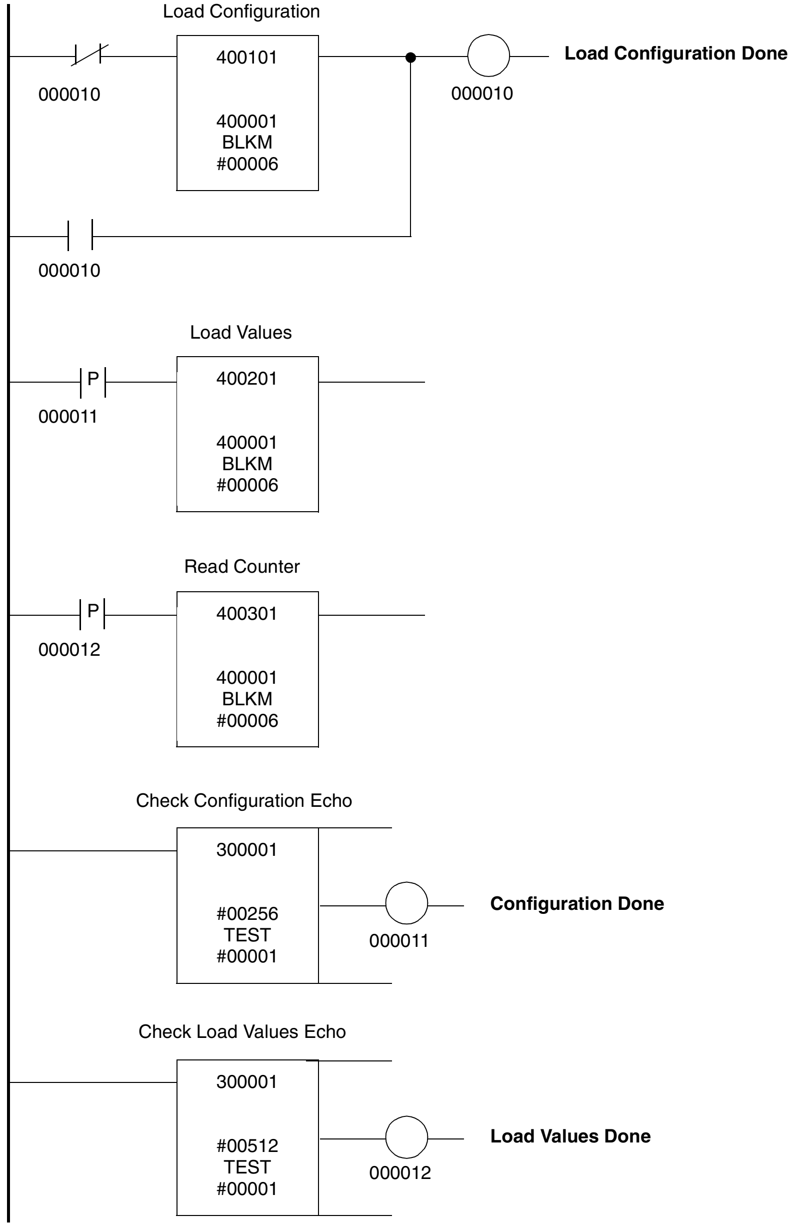
Register	Value	Description
300001	0300	Command echo
300002	XXXX	Current input count
300003	0000	Zeros as the count will not exceed 100. For counts above 65,536, this register is a multiplier. As an example: 30002 has a value of 324 and 30003 a value of 3.The total count is (65,536 x 3) + 324 = 196,932
300004	0000	Counter 2 is disabled
300005	0000	Counter 2 is disabled
300006	0X00	X is the field power indicator

Reset of Latched Outputs

If register 400103 in the Module Configuration Table has been set to 4200, Output 1A would have been latched on at setpoint and Output 1B latched on at maximum count. Wiring Diagrams 2 and 4 show how the encoder Z outputs could be used to reset the latched outputs. The minimum pulse width to **reset** outputs is 1 µs.

User Logic

The User Logic illustrated accomplishes the module's configuration and then causes the input counter to be displayed after the first three successive scans by the PLC when it is in RUN mode.The following figure shows the module's configuration in RUN mode.



COUNT DOWN Example

The COUNT DOWN example uses the same wiring as in the count up example, **except** the Input 1B+ level is changed to common (connected to Vref-) for Pulse Inputs illustrated in Wiring Diagrams 1 and 2. For Quadrature Inputs, no wiring change is required as the count direction is decoded internally by sensing the phase shift change between inputs A and B.

The User Logic is the same as for the count example. The actual operation of the module is different in that the output associated with maximum count turns on after zero count has been reached.

The example configures the module to decrement the input count from the maximum value, turn on an output at a setpoint value of 50, and turn on a second output after the input counter had reached zero and rolled over to the maximum count; the operation is then repeated. The initial loading of the maximum count will not cause its associated output to turn on.

RATE SAMPLE Example for Either Pulse or Quadrature Input

Field connections for this example are illustrated in Wiring Diagrams1–4. The connections on terminals 15 and 16 are optional, depending on the use requirements of the outputs. Terminals 39 and 40 always require the 24 Vdc supply connections. The maximum allowable Vref value is 30 Vdc. Input pulse on-off threshold levels for the 5 ... 24 Vdc Vref range are listed in the module specification table. The minimum differential input is 1.8 V.

As with count examples, tables are set up and transferred to the module using block moves. The User Logic for Rate Sample is the same as that used for Pulse Input Count Up/Down.

Module Configuration

The following table shows the module configurations.

400101	0140	CONFIGURE command, Disable Counter 2
400102	1000	Pulse input, Rate Sample ON, disable outputs at bus communication loss (Note: Bits 11 and 12 were not required.)
400103	0000	Not used by this command
400104	0000	
400105	0000	
400106	0000	

Load Values

The following table shows the load values.

400201	0243	LOAD VALUES command, disable Counter 2, preset and enable Counter 1
400202	XXXX	Counter 1 Rate Sample Time in milliseconds
400203	0000	Counter 2 Rate Sample Time in milliseconds (Not used in this example)
400204	0000	Not used by this command
400205	0000	
400206	0000	

Note: Command echoes are the same as described in the Pulse Input Count Up/Down examples.

Read Rate Sample

The following table shows a read rate sample.

40030	0400	READ INPUT COUNTER command
400302	0000	Not used by this command
400303	0000	
400304	0000	
400305	0000	
400306	0000	

When this command is issued, the input pulse counter content is retrieved. The 3X register content is the count over the time period selected in the Load Values registers 4X + 1 and 4X + 2. The 3X response to the Read-Rate Sample command in register 40301 is as follows.

Response to Read Rate Sample Command

The following table shows the responses to the read rate sample command.

Register	Value	Description
300001	0400	Command echo
300002	XXXX	Counter 1 Input rate low word
300003	XXXX	Counter 1 Input rate high word: this register is a multiplier. As an example: 30002 has a value of 324 and 30003 a value of 3.The total count is (65,536 x 3) + 324 = 196,932
300004	0000	Counter 2 is disabled
300005	0000	Counter 2 is disabled
300006	0X00	X is the field power indicator

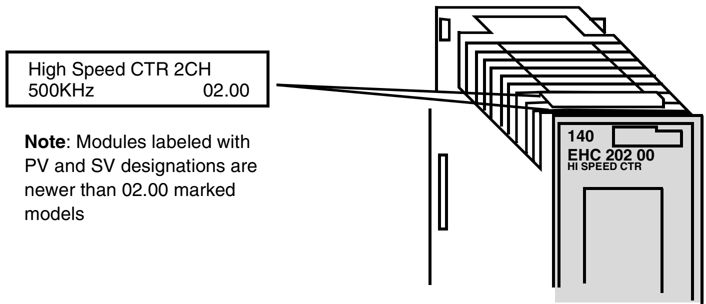
Rate Sample Mode Caution

If a version 02.00 or higher module replaces a module which has a version number less than 02.00 in a Rate Sample mode application, extra software configuration may be required.

Rate Sample mode is set using Command 1, CONFIGURE (01XX), 4X+1 register, bit 13 = 1 (see the description of Command 1 in this section).

Note: To verify the version of the module, reference the indicated label found on the top front of the module.

The following figure shows the module's label.



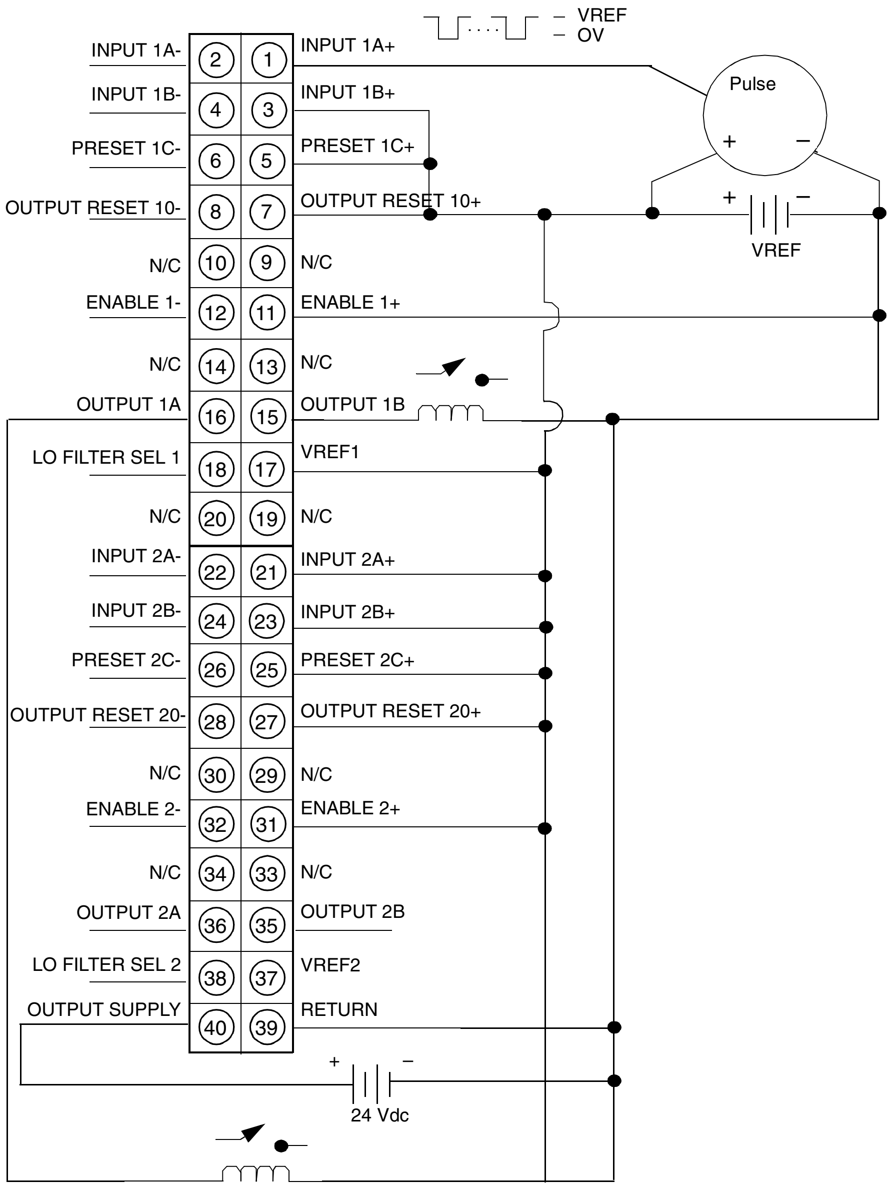
In modules prior to V02.00, when Rate Sample mode was selected, input was always handled as if it were generated by a pulse encoder. For example, 60 count per revolution encoders, either pulse or quadrature types, would give a rate of 60 for a one-second revolution when the interval was set for one second.

Users are cautioned that beginning with V2.00 modules, if a quadrature type encoder is used to provide count input and Pulse/Quadrature Input Counter 1 and 2, bits 9 or 10, are set to 1, the module will detect all edges. The result is four times the rate sample value as would be accumulated with an equivalent pulse encoder input. In the example in the above paragraph, the rate sample would be equal to 240.

Encoder type selection is set using Command 1, CONFIGURE (01XX), 4X+1 register, bits 9 or 10 (see the description of Command 1 in this section).

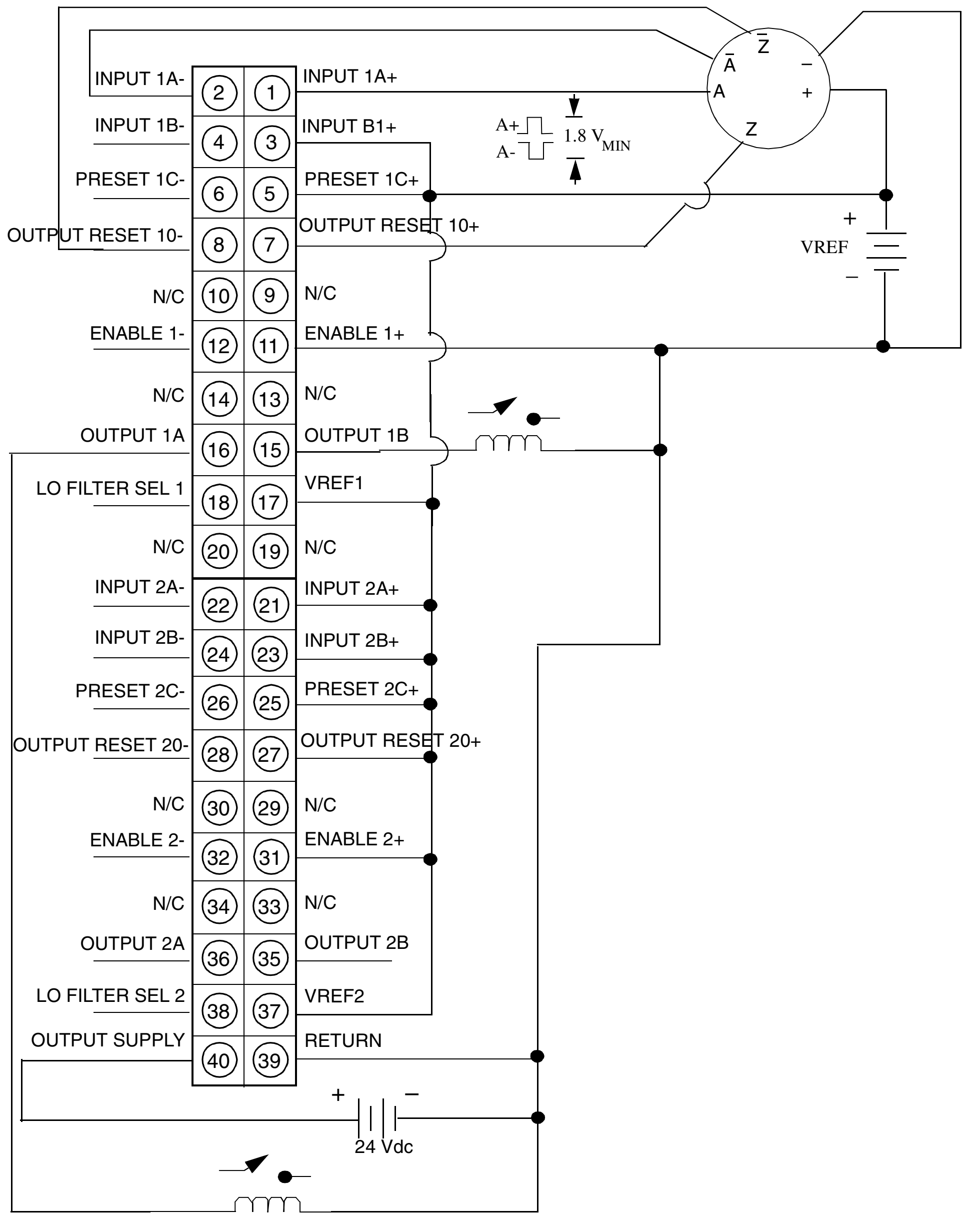
If the Encoder Type select bits are set to 0, either type of encoder will produce the Rate Sample, as did versions of the module that were lower than V02.00.

Wiring Diagram 1 The following figure shows the EHC20200 wiring diagram 1.



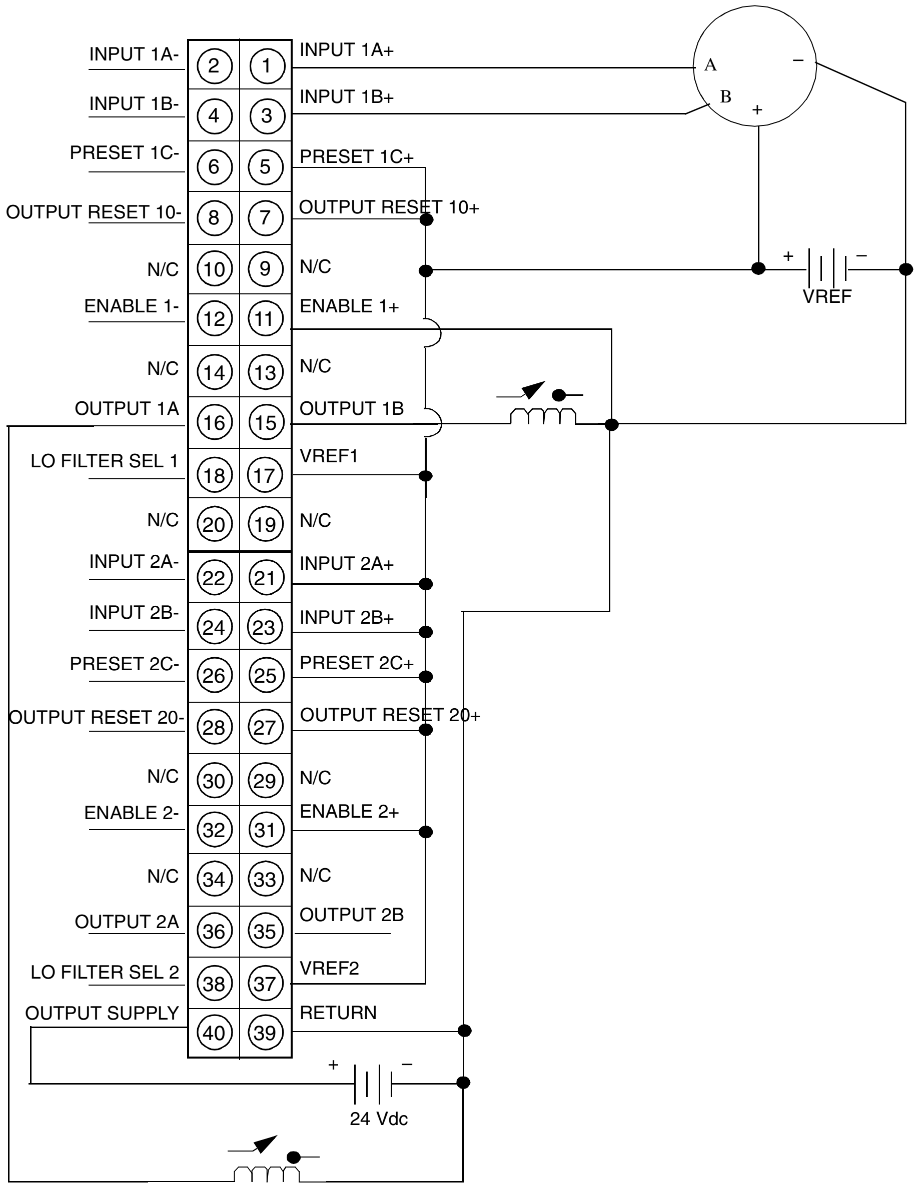
Note: Notes on Wiring Diagram 1.
1. Single ended pulse input.
2. Constant enable.
3. Count up.
4. Outputs 1A and 1B operate relays.
5. Counter 2 not used.
6. N/C = Not Connected.

Wiring Diagram 2 The following figure shows the EHC20200 wiring diagram 2.



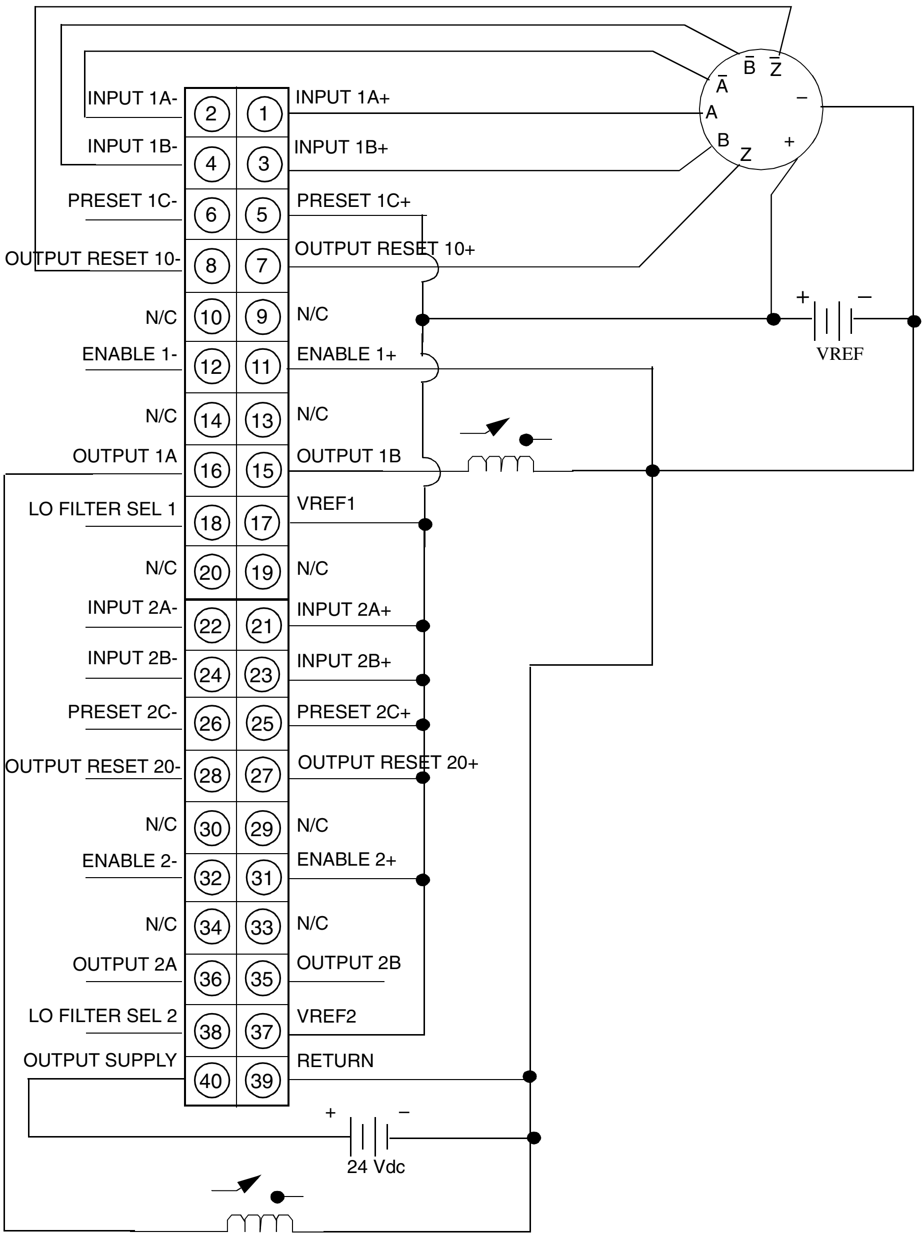
Note: Notes on Wiring Diagram 2
1. Differential pulse input.
2. Constant enable.
3. Zero pulse resets outputs 1A and 1B.
4. Count up.
5. Outputs a and B operate relays.
6. Counter 2 not used.
7. N/C = Not Connected.

Wiring Diagram 3 The following figure shows the EHC20200 wiring diagram 3.



Note: Notes on Wiring Diagram 3
1. Quadrature input.
2. Constant enable.
3. Outputs 1A and 1B operate relays.
4. Counter 2 not used
5. N/C = Not Connected.

Wiring Diagram 4 The following figure shows the EHC20200 wiring diagram 4.



Note: Notes on Diagram 4.
- Differential quadrature input.
- Constant enable.
- Zero pulse reset Output 1A and 1B.
- Output 1A and 1B operate relays.
- Counter 2 not used.
- N/C = Not Connected.

Module Zoom Selections

Push <Enter> to display and select applicable parameters. The following figure shows the module zoom selections.

Counter X mode control:

- Incremental
- Quadrature

Number of counters, output assertion:

- 2x16 w/ Output
- 2x32 w/ Output
- 2x32 No Output
- Rate Sample Mode

Comm lost output assert override:

- Off
- On

Note: When OFF, outputs are disabled when communication with the bus is lost. When ON, outputs continue to operate as configured.

Counter X output mode
Output Coil X mode:

- Setpoint
- Latched Setpoint
- Terminal Count
- Latched Terminal
- Timed Setpoint
- Timed Terminal

Note: Only one output should be configured as timed (Setpoint or Terminal).

Number of counters, output assertion:

- 2x16 Assert Outp
- 2x32 Assert Outp
- 2x32 No Assert
- Rate Sample Mode

The next lines apply **ONLY IF** the counter is in 2x16, Output Assert Mode:

Counter X Maximum Count:	*	0 DEC
Counter X Setpoint (alarm):	*	0 DEC
Time Output On:		0 DEC milliseconds (16383 maximum)

*Refer to Load Values Command section for the maximum values that may be used by the module.

The next lines apply ONLY IF the counter is in 1x32, Output Assert Mode:

Counter 2 Maximum Count:	*	0 DEC	
Counter 2 Setpoint (alarm):	*	0 DEC	
Time Output On:		0 DEC	milliseconds (16383 maximum)

*Refer to Load Values Command section for the maximum values that may be used by the module.

The following figure shows the number of counters in output assertion.

Number of counters, output assertion:

- 2x16 Assert Outp
- 2x32 Assert Outp
- 2x32 No Assert
- Rate Sample Mode

The next lines apply **ONLY IF** the counter is in 2x32, No Output Assert Mode:

Words 2-3: Counter 1 Maximum Count:	* 0 DEC
Words 4-5: Counter 2 Maximum Count:	* 0 DEC

*Refer to Load Values Command section for the maximum values that may be used by the module.

The next line applies **ONLY IF** the counter is in Rate Sample Mode:

Rate Sample Timer X:	0 DEC	milliseconds	(65535 maximum)

Note: Any *Number of counters, output assertion* selection pop-up menu can be used as they reflect each other.

140EHC20200 High Speed Counter Module

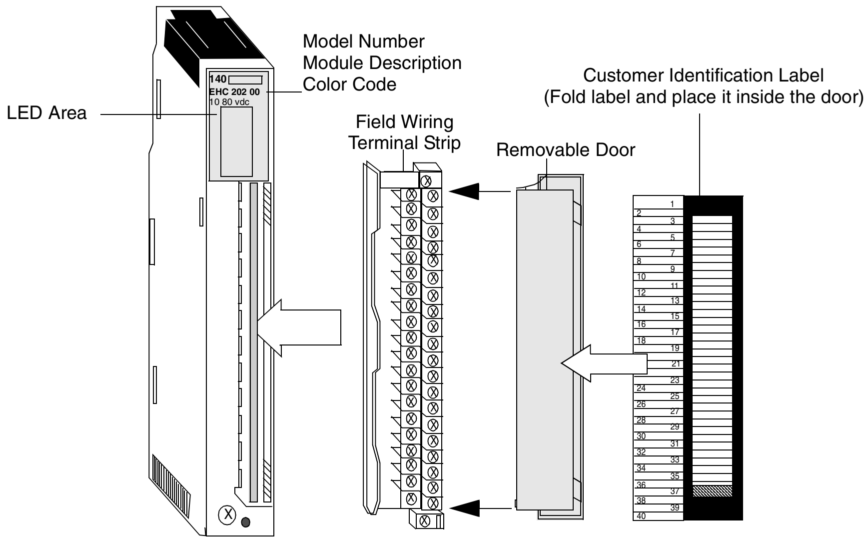
Overview

The EHC20200 offers the following features:
- Two counters that operate in pulse or quadrature mode and accept single- ended or differential inputs.
- Two FET output switches for each counter — turned on when the counter reaches programmed setpoint or maximum values, and turned off by changes in counter values, software commands, or a hard wired reset from the field.

Note: Refer to for configuring and operating the EHC202 with Modsoft.

EHC20200 High Speed Counter Module

The following figure shows the EHC20200 Two Channel High Speed Counter module.



Specifications

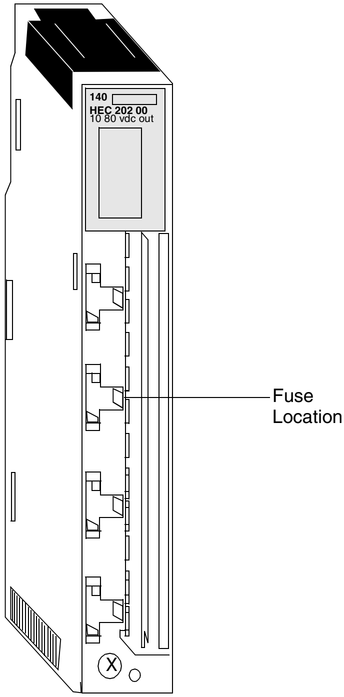
The following table shows the specifications for the EHC20200 High Speed Counter module.

Specifications		
Number of Channels	2 with 2 outputs each	
LEDs	Active	
	F	
	8 Input Status LEDs (Green)	
	4 Output Status LEDs (Green)	
Count Frequency	500 kHz max with differential inputs. 250 kHz max with single-ended inputs.	
Registers Required	6 Words In 6 Words Out	
Data Formats		
16 Bit Counter	65,535 Decimal	
32 Bit Counter	2,147,483,647 Decimal	
Discrete Inputs		
Operation Modes	Incremental Quadrature	
Max Continuous Input Voltage	30 Vdc	
Input Threshold		
Single Ended Mode VREF Supply + 5 Vdc + 12 Vdc + 24 Vdc	 On State (Vdc) 0 ... 2.0 0 ... 5.0 0 ... 11.0	 Off State (Vdc) 3.5 ... 5.0 7.0 ... 12.0 13.0 ... 24.0
Differential Mode (Minimum)	1.8 Vdc	
Input Resistance	10 k	
Discrete Outputs		
Output Levels (1A, 1B, 2A, 2B)		
FET Switch ON	Supply - 0.4 Vdc	
FET Switch OFF	0 Vdc (ground reference)	
Max Load Current (each output)	0.5 A	
Output Off State Leakage	0.4 mA max @ 30 Vdc	
Output On State Voltage Drop	0.4 Vdc @ 0.5 A	
Output Protection	36 V transorb for transient voltage suppression	
Miscellaneous		
Isolation (Channel to Bus)	1780 Vac rms for 1 minute	

Specifications	
Fault Detection	Blown fuse detect, loss of outputs 1A, 1B, 2A, 2B field power
Power Dissipation	4.0 W + 0.4 x total module load current
Bus Current Required	650 mA
External 24 Vdc Power Supply	19.2 ... 30 Vdc, 24 Vdc nominal, 50 mA required, plus the load current for each output
Fusing	Internal: 2.5 A fuse, (Part # 043503948 or equivalent) External: User discretion
Compatibility	Programming Software: Modsoft V2.32 or Concept 2.0 at a minimum Quantum Controllers: All, V2.0 at a minimum

Fuse Location

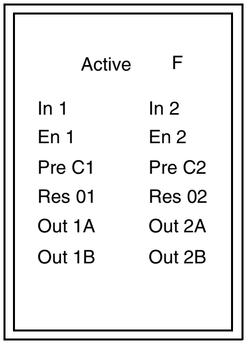
The following figure shows the fuse location.



> **Note:** Turn off power to the module and remove the field wiring terminal strip to gain access to the fuse.

LED Indicators and Descriptions

The following figure shows the LED indicators for the EHC20200 High Speed Counter module.



The following table shows the LED descriptions for the EHC20200 high speed counter.

LED Descriptions		
LEDs	**Color**	**Indication when On**
Active	Green	Bus communication is present
F	Red	Indicates internal fuse blown or loss of output power supply
In 1	Green	Counter 1 input
En 1	Green	Enable Counter 1 input
Pre C1	Green	Preset Counter 1 input
Res 01	Green	Reset Output 1A, 1B
In 2	Green	Counter 2 input
En 2	Green	Enable Counter 2 input
Pre C2	Green	Preset Counter 2 input
Res 02	Green	Reset Output 2A, 2B
Out 1A	Green	Counter 1A output
Out 1B	Green	Counter 1B output
Out 2A	Green	Counter 2A output
Out 2B	Green	Counter 2B output

Controlling the Module

Hardware inputs from the field can be used to:
- Increment/decrement the input counters with serial pulses from encoders or other square wave sources.
- Set direction of count.
- Reset the outputs.

Hardware inputs from the field and software commands are used together to:
- Enable the count input.

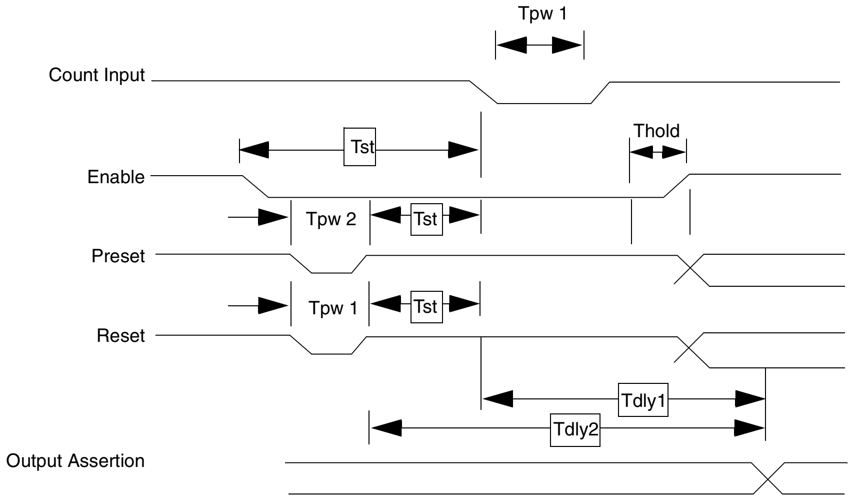
Hardware inputs from the field or software commands can be used to:
- Preset the input counter to zero or maximum count.

Software commands can be used to:
- Configure the counters for pulse (tachometer) or quadrature mode.
- Configure for 16 or 32 bit counters, with or without output assertion.
- Configure the module to operate in either count or rate-sample mode.
- Option for outputs to operate or not operate if backplane bus communication is lost (i.e., a fault condition).
- Option for outputs to switch on when setpoint and/or maximum values are reached.
- Define the setpoint and maximum count values.
- Define ON time for outputs.
- Disable outputs.
- Read the input counter totalizing or rate sample values.
- Retrieve the old (previous) input counter value after the counter has been preset.

Timing Diagrams and Parameters

This section includes timing diagrams and parameters for the 140EHC20200 counter modules. Timing diagrams and a timing parameter table for the 140EHC20200 counter module are shown below.

EHC20200 Timing Diagrams



The following table shows the EHC20200 timing parameters.

Timing Parameters		Limits	
		Filter 200 Hz	**No Filter 500 khz**
Tdly1	Count to Output Assertion Delay (MAX)	4.8 ms	40 µs
Tdly2	Preset/Reset to Output Delay (MAX)	4.8 ms	40 µs
Tpw1	Count/Reset Pulse Width (MIN)	2.5 ms	1 µs
Tpw2	Preset Pulse Width (MIN)	2.5 ms	500 µs
Tst	Enable/Reset/Preset to Count Setup Time (MIN)	2.5 ms	2 µs
Thold	Enable/Reset to Count Hold Time (MIN)	2.5 ms	2 µs

Note: The timing parameter limits are measures at the module field terminal connector at the logic low threshold level.

Module Functions

The following functions apply to the EHC202 high speed counter module.

COUNT UP

The input counter is reset to zero if the count direction input is UP and a preset (hardware or software) or Load Value command is sent to the module.

When counting in the UP direction, the input counter increments to the maximum value, the next input pulse sets the counter to zero and it continues counting back up to the maximum value.

COUNT DOWN

The input counter is set to maximum count if the count direction is down and a preset (hardware or software) or Load Value command is sent to the module.

When counting in the DOWN direction, the input counter is decremented from the maximum value to zero. The next pulse resets the input counter to the Maximum value and the increment down starts again.

REMOVE ENABLE

This function disables the input counter, causing it to stop incrementing and hold the count accumulated prior to disabling.

OUTPUTS

When configured in the count mode, outputs will turn on for defined times when setpoints or maximum values have been reached.

No output assertion in two 32 bit counter mode or rate sample.

Programmed ON time for outputs can be set for one channel, one output and one trigger point only.

In a running controller, latched outputs are turned off only by a hardware RESET input. If no reset is provided, the outputs latched on will turn off when the controller is stopped.

COUNTER PRESET

This is both a hardware and software function. In the event that both methods are used, the last one executed has precedence. An input counter will be automatically preset whenever a new maximum value or rate sample time is loaded.

COUNTER ENABLE

Both hardware and software enables are required for an input counter to operate. An input counter will be automatically software enabled whenever a new maximum value is loaded or a preset (hardware or software) is sent to it.

RATE SAMPLE VALUE

The rate sample value is held and may be accessed during count operations. The value read is from the last configured and completed rate sample interval.

QUADRATURE MODE

When the module is configured for quadrature mode operation, the counter requires encoder pulses on inputs A and B.

In quadrature mode, all input signal edges are counted. A 60 count/revolution encoder will produce a count of 240 for one shaft rotation.

Miscellaneous Information

Field wire to Counter 2 inputs and outputs, when configured for one 32 bit counter with output assertion. The unused Counter 1 must have its + (plus) inputs connected to VREF+.

Input counts and parameters are not maintained in the module at power down. The rewrite of parameters at power up must be done with either user logic or Modzoom-type preset panel selections.

The 200 Hz filter for each counter can be activated by strapping the Lo Filter Sel terminal to the Return terminal. This function provides noise immunity for low frequency applications and can also be used for relay debounce.

Operation

The following information describes the operation of various module functions.

Rate Sample

To rate sample, the module must be:
- Configured for pulse or quadrature mode.
- Configured for Rate Sample mode.
- Loaded with the Rate Sample time value.
- Enabled to count, using hardwired input and software control bits.

Pulse Count

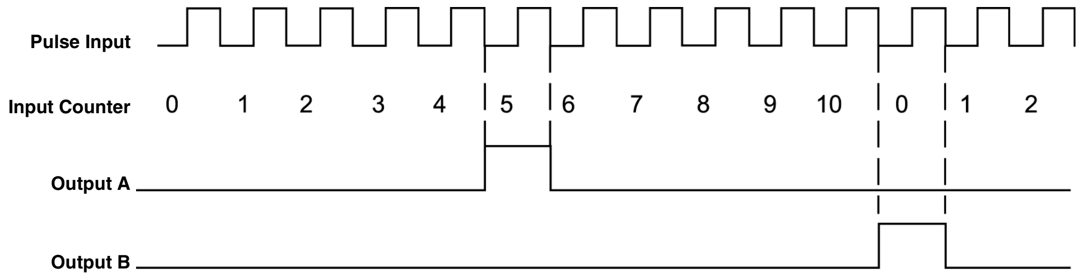
To count pulses, the module must be:
- Configured for pulse or quadrature mode.
- Configured for counter display: two 16 bit, one 32 bit, or two 32 bit counters.
- Loaded with the maximum count.
- Enabled to count, using hardwired input and software control bits.

Pulse Count and Turning Outputs On/Off

To count pulses and turn outputs on and off, the module must be:
- Configured for pulse or quadrature mode.
- Configured for two 16 bit or one 32 bit counter.
- Configured to assert or not assert outputs at the programmed count values when the module loses communication with the bus (fault condition).
- Configured to specify if outputs turn on at a setpoint or maximum count, turn on at those points for a specific amount of time, or remain latched. If latched, outputs can only be reset by a hard wired input.
- Loaded with setpoint values, maximum count values, and output assert time.
- Enabled to count using hardwired input and software control bits.

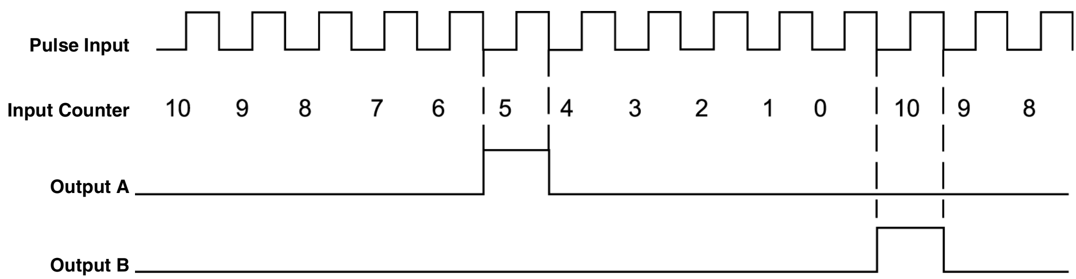
Counter Rollover Examples for Pulse Input

Example 1 - Count Up



Count is from 0 -> 10 (Maximum Count)
Output A turns on at Setpoint = 5
Output B turns on after Input Count = Maximum (Terminal) Count = 10

Example 2 - Count Down

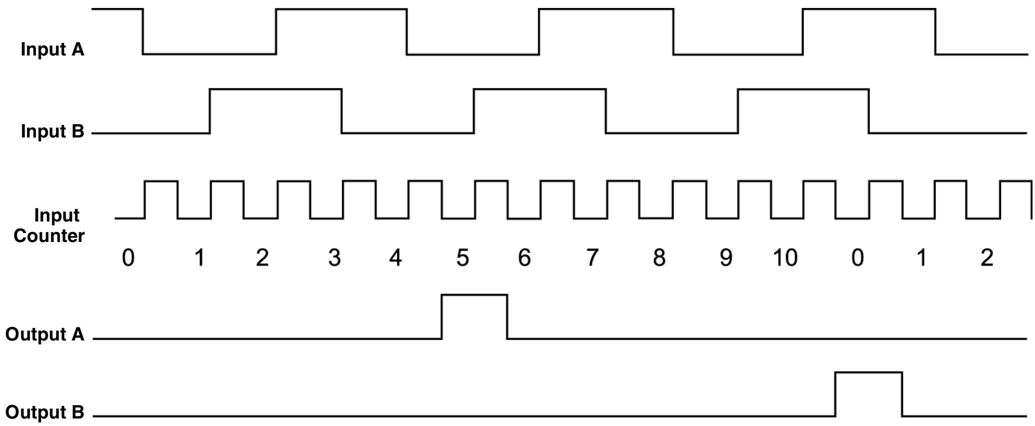


Count is from 10 (Maximum Count) -> 0
Output A turns on at Setpoint = 5
Output B turns on after Input Count = 0

Note: Outputs are not latched.

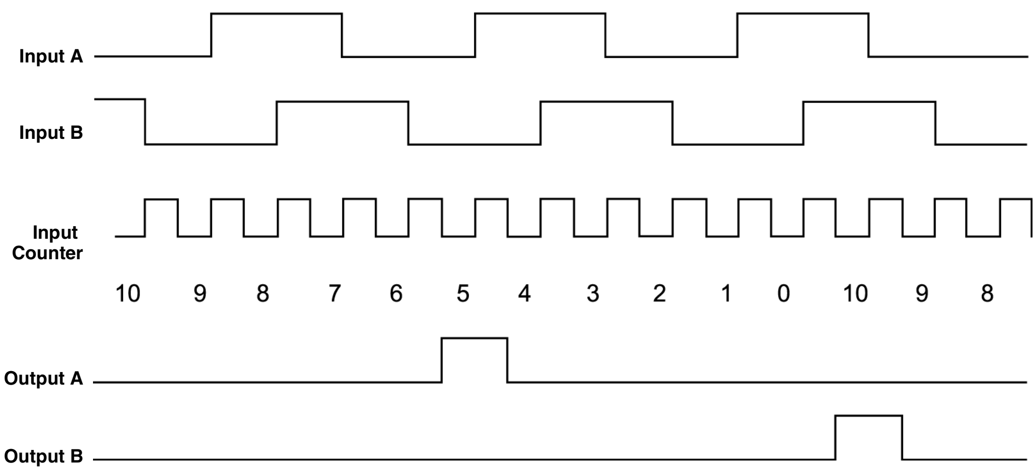
Counter Rollover Examples for Quadrature Input

Example 1 - Count Up



Count is from 0 -> 10 (Maximum Count)
Output A turns on at Setpoint = 5. Output B turns on after Input Count = Maximum (Terminal) Count = 10

Example 2 - Count Down



Count is from 10 (Maximum Count) -> 0
Output A turns on at Setpoint = 5
Output B turns on after Input Count = 0

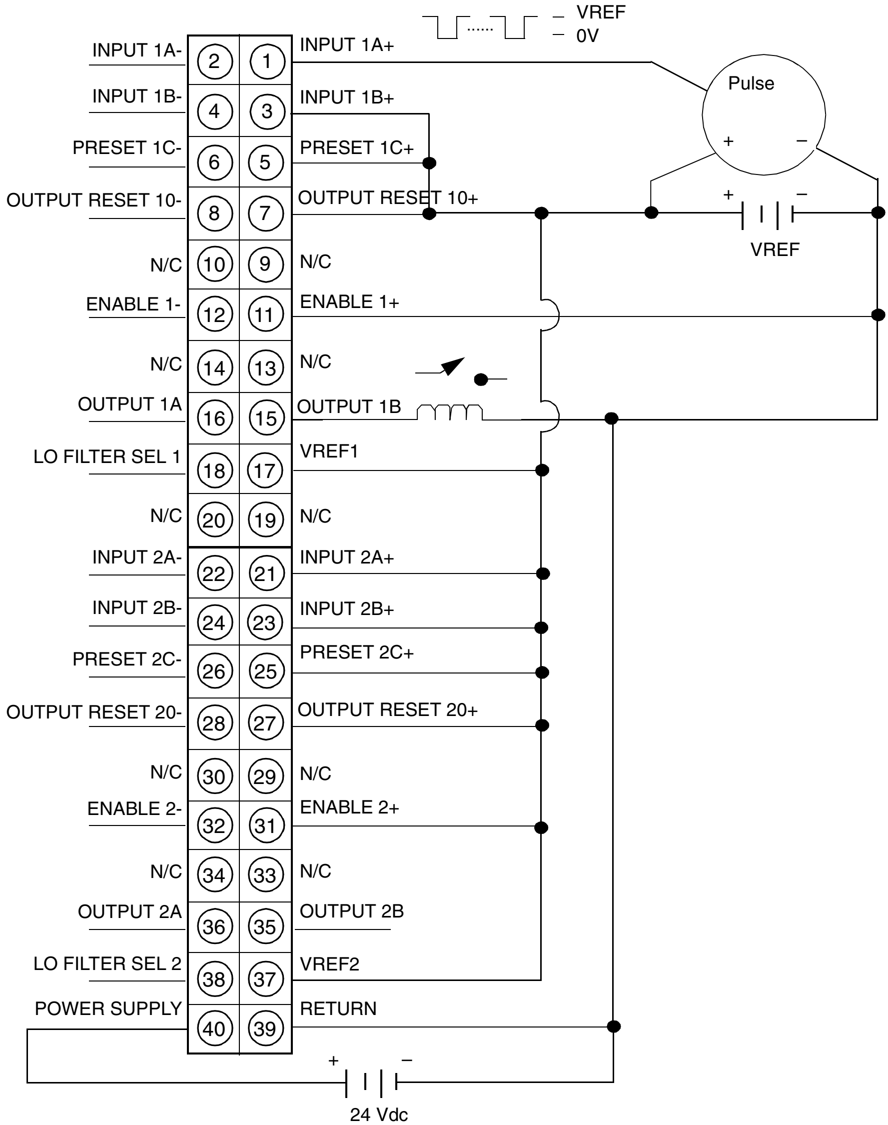
Note: Outputs are not latched.

Wiring Diagram Signal Descriptions

The following table shows the wiring diagram for signal descriptions.

Parameter	Description/Usage
INPUT A	Single ended or differential count input or Phase A for quadrature mode.
	Single ended (active low only) uses Input 1A+ and/or Input 2A+.
	Input 1A- and/or Input 2A- are not connected. Differential input encoders use both plus (+) and minus (-) inputs.
INPUT B	Direction level for non-quadrature devices or Phase B for quadrature mode.
	Direction inputs for non-quadrature input devices are: Count Up = High Voltage Level Count Down = Low Voltage Level
	For single ended Input devices, only Input 1B+ and/or Input 2B+ are used. Input 1B- and 2B- are not connected. Differential input encoders use both plus (+) and minus (-) inputs.
PRESET C	Presets count register(s). Low level causes preset.
	For single ended Preset inputs, only Preset 1C+ and/or Preset 2B+ are used. Preset 1C- and 2C- are not connected. Differential input encoders use both plus (+) and minus (-) inputs.
OUTPUT RESET 0	Low level resets Outputs 1A, 1B, 2A, and 2B to OFF if latched.
	For single ended Reset inputs, only Reset 10+ and/or Reset 20+ are used. Reset 10- and 20- are not connected. Differential input encoders use both plus (+) and minus (-) inputs.
ENABLE	Low level enables counting.
	For single ended Enable inputs, only Enable 1+ and/or Enable 2+ are used. Enable 1- and 2- are not connected. Differential input encoders use both plus (+) and minus (-) inputs.
VREF	Field input device power source connection. Also, connect any unused (+) inputs to the group VREF terminal or the one in use (30 Vdc max). Group A = Terminal 17 Group B = Terminal 37 Group A and Group B VREF supplies can be different voltage levels.
LO FILTER SEL	Enables the internal 200 Hz filter when connected to Return Terminal 39.
OUTPUT	Internal FET switches connect the output supply wired to Terminal 40 to the Output 1A, 1B, 2A, 2B terminals at output assert times.
POWER SUPPLY	External 24 Vdc power supply (+) connection. Required for the module interface and for Outputs 1A, 1B, 2A, and 2B.
RETURN	External 24 Vdc power supply (-) connection. Required for the module interface and for Outputs 1A, 1B, 2A, and 2B.

Wiring Diagram The following figure shows the 140EHC20200 wiring diagram.



The preceding wiring diagram shows single ended connections for:.

Terminal 1	Pulse encoder input (sinking device)
Terminal 3	Input 1B count UP direction

Terminal 5	Unused hardwire Preset tied high
Terminal 7	Output Reset tied high, not required; outputs not used
Terminal 11	Hardware enabled (software enable also required using predefined Modzoom or 4X register
Terminal 17	Required Vref+ connection
Terminal 21 **Terminal 23** **Terminal 25** **Terminal 27** **Terminal 31** **Terminal 37**	Counter 2 not used. These terminals must be connected VREF+.
Terminal 39	Required Output Supply Return
Terminal 40	Required Output Supply

Note: Refer to for both differential pulse encoder input and single ended or differential quadrature encoder input wiring diagrams.

140ESI06210 ASCII Interface Module

Overview

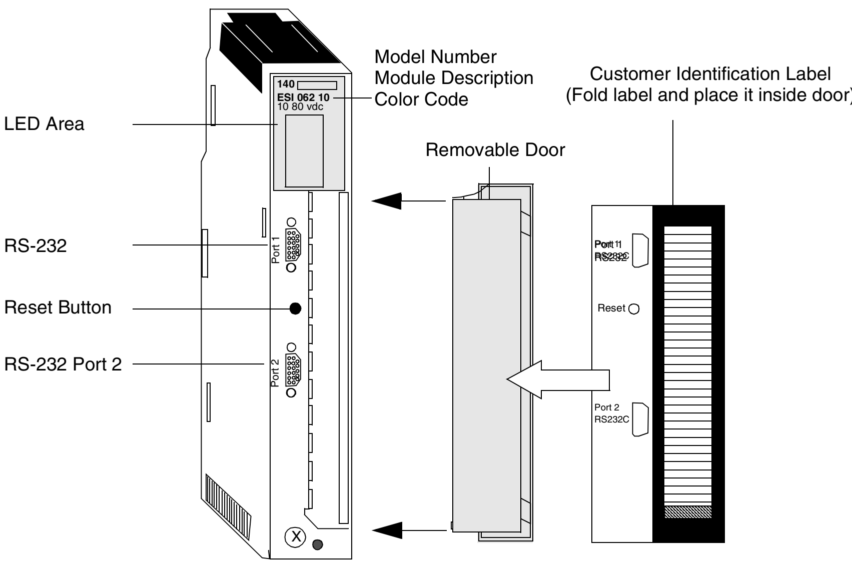
The ASCII Interface Two Channel module is a Quantum communications interface module used to:
- Input messages and/or data from an ASCII device to the CPU.
- Output messages and/or data from the CPU to an ASCII device.
- Bi-directionally exchange messages and/or data between an ASCII device and the CPU.

Related Documentation

For more detailed information on use of the ASCII interface module, refer to the *Quantum Automation Series 140ESI06210 ASCII Interface Module User Guide*, identification number 840USE10800.

ASCII Interface Module

The following figure shows the ESI06210 ASCII interface module components.



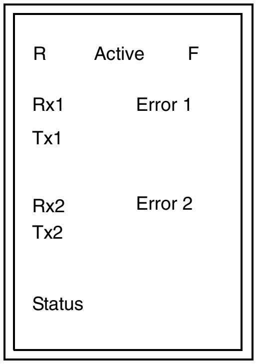
Specifications

The following table shows the specifications for the ASCII interface two channel module.

Specifications	
Data Interface	
RS-232C	2 serial ports (9-pin D-shell), non-isolated
Cabling (Maximum cable length 20 m shielded)	990NAA26320, Modbus Programming Cable, RS-232, 12 ft. (2.7 m)
	990NAA26350, Modbus Programming Cable, RS-232, 50 ft. (15.5 m)
Firmware Specifications	
Port Performance	Burst Speed: 19.2 k baud each port. Continuous Speed: Application dependent
Depth of Nested Messages	8
Buffer Size	255 Input. 255 Output
Number of Messages	255
Maximum Message Length	127 characters plus 1 checksum
Memory	
RAM	256 kb for data and program + 2 kb dual port ram
Flash-ROM	128 kb for program and firmware
Power Dissipation	2 W max
Bus Current Required	300 mA
Fusing	
Internal	None
External	User discretion
Required Addressing	12 Words In 12 Words Out
Compatibility	
Programming Software	Modsoft V2.4 or Concept 2.0 at a minimum
Data Formats Supported	Text, Decimal, Fixed Point, Nested Write Message, Set Register Pointer, Print Time/Date, Repeat, Space, Newline, Control Code, Flush Buffer
Quantum Controllers	All, Executive V2.0 at a minimum
Battery Backup Module	140XCP90000

LED Indicators and Descriptions

The following figure shows the ESI06210 LED indicators.



The following table shows the ESI06210 LED descriptions.

LEDs	Color	Indication when On
R	Green	The module has passed powerup diagnostics
Active	Green	Bus communication is present
F	Red	The module has detected a fault
Rx1	Green	Received data on RS-232C Port 1
Tx1	Green	Transmitted data on RS-232C Port 1
Rx2	Green	Received data on RS-232C Port 2
Tx2	Green	Transmitted data on RS-232C Port 2
Status	Yellow	Status
Error 1	Red	There is an error condition on Port 1
Error 2	Red	There is an error condition on Port 2

LED Blinking Sequence

The following table shows the blinking sequence of the F, Status, Error 1, and Error 2 LEDs.

LEDs and Blinking Sequence				
F	**Status**	**Error 1**	**Error 2**	**Description**
F	Status	Error 1	Error 2	Description
OFF	ON	OFF	OFF	Programming mode
OFF	OFF	ON	N/A	Serial Port 1 incurred a buffer overrun
OFF	OFF	N/A	ON	Serial Port 2 incurred a buffer overrun
N/A	Blinking (See the next table)	OFF	OFF	The ASCII module is in kernal mode and may have an error

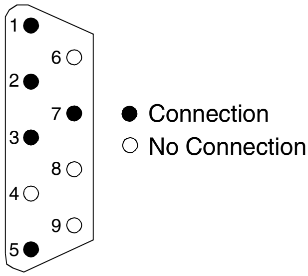
Status LED Crash Codes

The following table shows a table of Status LED crash codes.

Number of Blinks (one per second)	Code (in hex)	Error
Steady	0000	Requested kernal mode
4	6631	Bad micro controller interrupt
5	6503	RAM address test error
6	6402	RAM data test error
7	6300	PROM checksum error (EXEC not loaded)
	6301	PROM checksum error
	630A	Flash-message checksum error
	630B	Executive watchdog timeout error
8	8000	Kernal other error
	8001	Kernal PROM checksum error
	8002	Flash program error
	8003	Unexpected executive return

Front Panel Connectors and Switches

The ESI has two serial ports which it uses to communicate with serial devices. The following is the pinout connections for the ASCII module serial ports.



RS-232C Serial Ports

The following table shows the pin number and description for the RS-232C serial ports.

Pin Number	Signal Name	Description
1	DCD	Carrier Detect
2	RXD	Receive Data
3	TXD	Transmit Data
4	N/A	Not Connected
5	GND	Signal Ground
6	N/A	Not Connected
7	RTS	Request to Send
8	N/A	Not Connected
9	N/A	Not Connected
Shield	N/A	Chassis Ground

The serial port interface allows the user to configure the module and to program the ASCII messages into the module. This is only activated when the module enters into its programming mode via the front panel push button.

Note: The serial port is capable of communicating with either a dumb terminal or a PC using terminal emulation software (i.e., PROCOMM).

Serial Port Setup

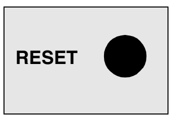
When programming mode is entered, one of the RS-232 serial ports is set to a standard terminal communication's configuration to communicate with the user on the programming terminal via a Modbus. This communication configuration consists of the following.

Baud rate:	**9600**
Data bits:	8
Stop bits:	1
Parity bit:	None (disabled)
Keyboard Mode:	ON (Character echo)
XON/XOFF:	ON

The serial port configuration has been set this way so that the configuration of the port is a known configuration and may or may not be the same configuration that is used when the module is running.

Front Panel Reset Push Button

A recessed push button on the front of the module is used to reset the module.



140HLI34000 High Speed Interrupt Module

Overview

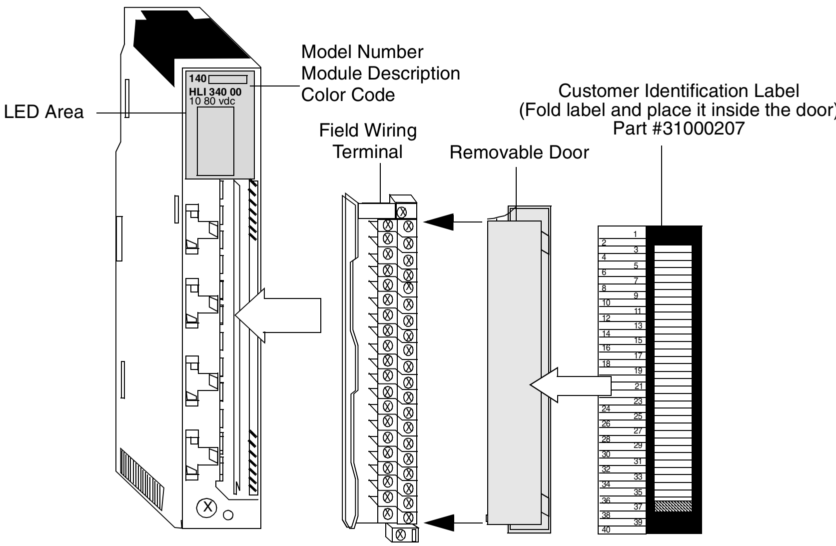
The High Speed Latch and Interrupt 24 Vdc 16x1 Sink/Source Input module accepts 24 Vdc inputs and is for use with 24 Vdc sink/source input devices.

Related Documentation

For more detailed information on the use of a Quantum High Speed Interrupt module, refer to the *Quantum Automation Series 140HLI34000 High Speed Interrupt I/O Module User Guide*, part number 840USE11200.

High Speed Interrupt Module

The following figure shows the components of the HLI34000 high speed interrupt module.



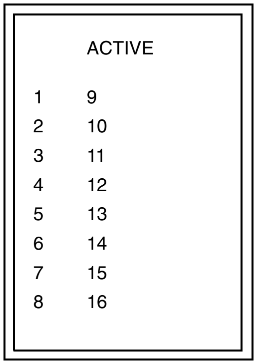
Specifications

The following table shows the specifications for the HLI34000 high speed interrupt module.

Specifications	
Number of Input Points	16 isolated points
LEDs	Active 1 ... 16 (Green) - Indicates point status
Required Addressing	1 Word In
Operating Voltages and Currents	
ON (voltage)	15 ... 30 Vdc
OFF (voltage)	-3 ... +5 Vdc
ON (current)	2.0 ... 8.0 mA
OFF (current)	0 ... 0.5 mA
Absolute Maximum Input	
Continuous	30 Vdc
Response	
OFF - ON	30 µs (max)
ON - OFF	130 µs (max)
Input Protection	30 Vdc reverse polarity
Isolation	
Point to Point	500 Vac rms for 1 minute
Point to Bus	1780 Vac rms for 1 minute
Fault Detection	None
Bus Current Required	400 mA
Power Dissipation	2.0 W + 0.30 W x the number of points on
External Power	Not required for this module
Fusing	
Internal	None
External	User discretion

LED Indicators and Descriptions

The following figure shows the LED indicators for the HLI34000 high speed interrupt module.



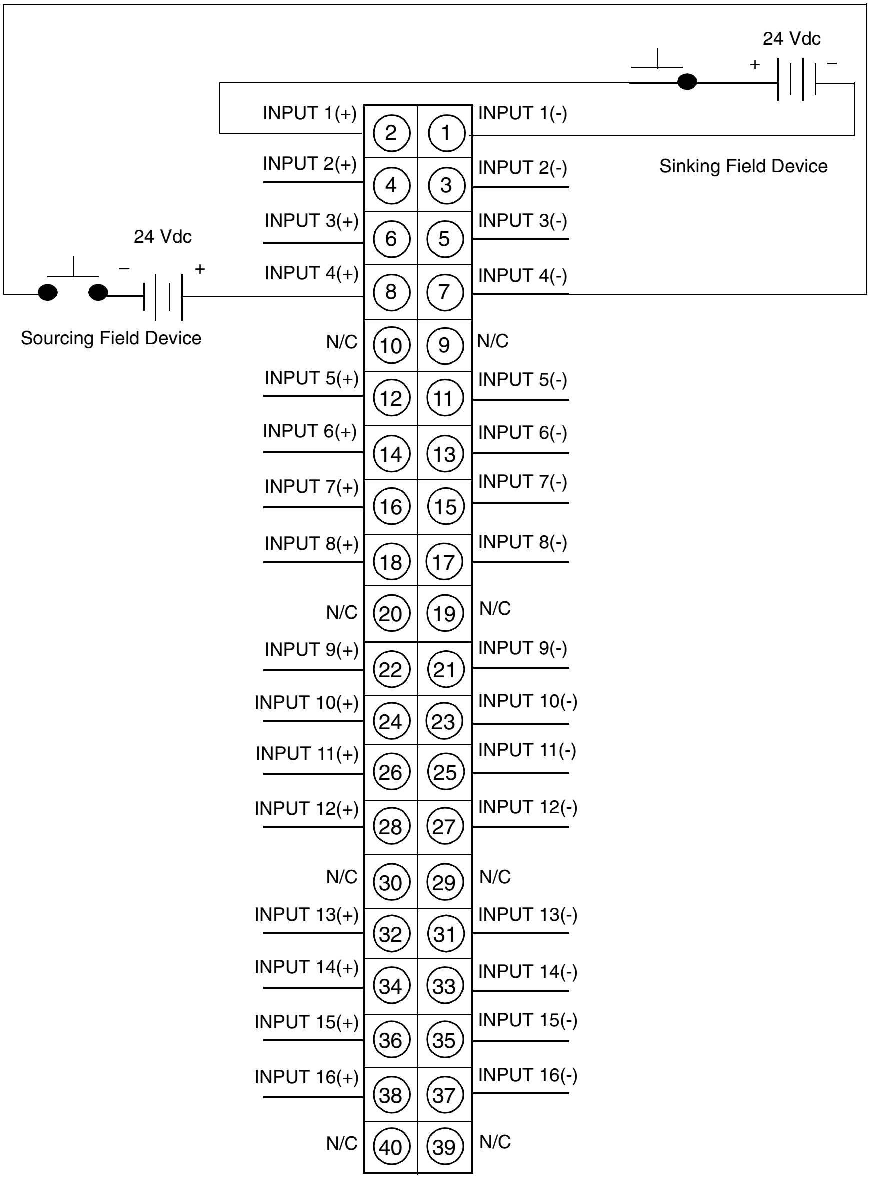
The following table shows the LED descriptions for the HLI34000 high speed interrupt module

LED Descriptions		
LEDs	**Color**	**Indication when On**
Active	Green	Bus communication is present.
1 ... 16	Green	The indicated point or channel is turned on.

> **Note:** Due to the speed of the module, LED indications do not represent the state of the input signal, when the input signal is a short duration pulse.

Wiring Diagram

The following figure shows the wiring diagram for the HLI 340 00 High Speed Interrupt module.



Note:
1. Either shielded or unshielded signal cables may be used (the user should consider using shielded wire in a noisy environment). Shielded types should have a shield tied to earth ground near the signal source end.
2. N / C = Not Connected

140MSB/MSC10100 Quantum MSX Motion Modules

Overview

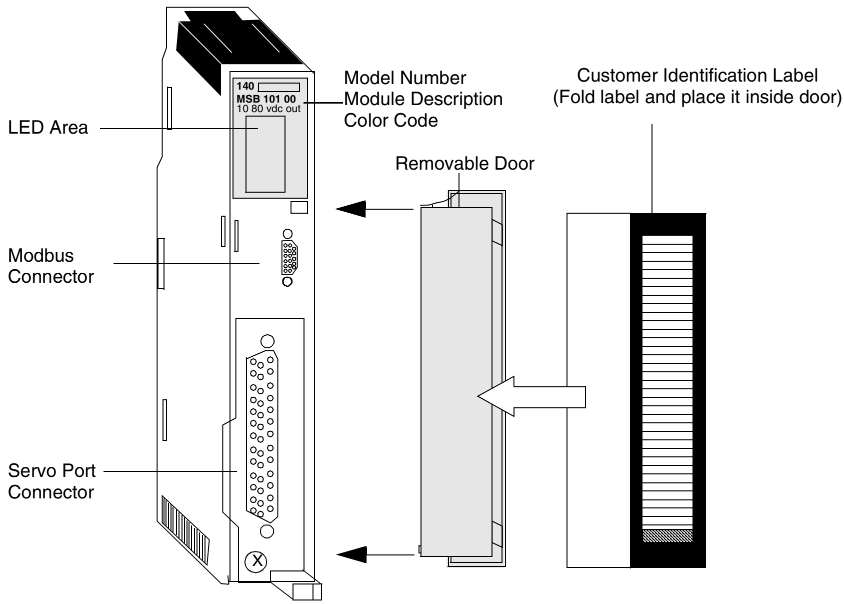
The Quantum single axis motion (MSX) modules are incremental encoder (140MSB10100) or resolver and encoder (140MSB/MSC10100) feedback-only modules contained in a single-width housing. It works with servo motors that use Cyberline drives and other types of DC and brushless drives from other manufacturers.

Related Documentation

For detailed information on the use of MSX motion modules, refer to the *Quantum Automation Series 140MSX10100 Single Axis Motion Module Reference Guide*, part number 840USE10500.

MSX Motion Modules

The following figure shows the components of the MSX motion modules.



Operational Specifications

The following table shows the operational specifications for the servo.

Servo	
Commutation Update Rate	0.25 ms
Velocity Loop Update Rate	0.5 ms
Velocity Loop Bandwidth	> 100 Hz
Velocity Range	0 - 6000 rpm
Position Loop Update rate	1 ms
Position Accuracy - Resolver	+/- 10 arc minutes typical, +/- 15 arc minutes max
Position Repeatability - Resolver	+/- 5 arc minutes max
Position Accuracy - Encoder	Encoder dependent, 0.5 arc minutes max

The following table shows the operations specifications for communication.

Communication	
Protocol	Modbus
Address (set by software)	1 default
Required Addressing	6 Words In, 6 Words Out
Baud Rate (set by software)	300 - 19200 baud, 9600 default

The following table shows the operational specifications for the application program.

Application Program	
Execution Rate	See note below
Storage	650 instructions

Note: A majority of the instructions typically take 1 ms to execute. The execution time of an instruction, though, is not constant. The execution time can increase due to factors such as: if the Sync Ratio Mode is on, how often the position generator must execute to plan out new moves, how many "whenever"s are enabled, and the number of sources requesting commands to be executed (e.g., backplane, internal program, Modbus port), etc. If timing is extremely critical to an application, actual time must be determined experimentally by running the actual application program.

The following table shows the operational specifications for high speed input.

High Speed Input	
Position Capture Time	250 μs max
Isolation	500 V to system bus
Pulse Width	25 μs

High Speed Input	
Minimum Time Between Successive Captures	20 ms

The following table shows the operational specifications for discrete inputs.

Discrete Inputs	
Number	7
Scan Time	1.5 ms
Isolation	500 V to system bus

The following table shows the operational specifications for discrete outputs.

Discrete Outputs	
Number	3
Update Time	10 ms max
Isolation	500 V to system bus
Reset State	0 V, nominal
On State	24 V, nominal
Output Type	Totem pole (sink/source)
Protection	Short circuit, overvoltage
Fault	Overcurrent detected

The following table shows the operational specifications for analog input.

Analog Input	
Number	1
Scan Time	15 ms
Data	User configurable
Range	+/- 10 V
Accuracy	+/- 100 mV, plus offset

The following table shows the operational specifications for analog output.

Analog Output	
Number	1
Scan Time	20 ms
Data	User configurable
Range	+/- 10 V
Accuracy	+/- 50 mV, plus offset

The following table shows the operational specifications for the resolver feedback (fully configured version).

Resolver Feedback (Fully Configured Version)	
Conversion Method	Tracking
Resolver Style	Transmit
Excitation Frequency	5 kHz
Excitation Amplitude	Automatically adjusted
Excitation Current	120 mA
Loss of Feedback	Detected within 40 ms

The following table shows the operational specifications for the incremental encoder feedback.

Incremental Encoder Feedback	
Resolution	4 times line count
Signals	A, B, Mark
Signal Frequency	200 kHz, up to 500 kHz with reduced noise immunity
Encoder Output style	Differential, 5 V
Loss of Feedback	Detected within 40 ms

The following table shows the operational specifications for compatibility.

Compatibility	
Programming Software	Modsoft V2.32 or Concept 2.0 at a minimum
Quantum Controllers	All, V2.0 at a minimum

Electrical Specifications

The following table shows the electrical specifications for discrete inputs and high speed input.

Discrete Inputs and High Speed Input	
Input Impedance	3.5 kΩ
Inputs On	15 Vdc min
Inputs Off	5 Vdc max
Isolation	500 Vac to system bus

The following table shows the electrical specifications for discrete output.

Discrete Output	
Drive Capability	150 mA at user supplied. 19.2 ... 30 Vdc resistive
Protection	Current limit, thermal
Isolation	500 Vac to system bus

The following table shows the electrical specifications for analog input.

Analog Input	
Resolution	10 bits
Input Impedance	30 kΩ
Offset	+/- 50 mV
Accuracy	+/- 100 mV, plus offset

The following table shows the electrical specifications for analog output.

Analog Output	
Resolution	12 bits
Drive Capability	3 mA
Offset	+/- 50 mV
Accuracy	+/- 50 mV, plus offset

The following table shows the electrical specifications for the resolver interface.

Resolver Interface	
Reference	5 +/- 0.05 kHz, 1.6 ... 5.5 V rms. 50 mA drive capability
Sine / Cosine Input Impedance	3 kΩ
Resolution	16 bits to 300 rpm. 14 bits to 1350 rpm. 12 bits to 6000 rpm

Resolver Interface	
Accuracy	10 arc minutes, typical, resolver dependent

The following table shows the electrical specifications for the motor temperature input.

Motor Temperature Input	
Normal State	Short circuit, 2 mA sink max
Fault State	Open circuit
Isolation	500 Vac to system bus

The following table shows the electrical specifications for the encoder feedback interface.

Encoder Feedback Interface	
Input Range	-0.7 ... 7 Vdc
Input Impedance	145 Ω, nominal
Differential Signals, High	+2 V differential, min
Differential Signals, Low	-2 V differential, min
Maximum Encoder Frequency	200 kHz square wave (55% ... 45% with less than 15 degrees of quadrature error)
Isolation	500 Vac to system bus with external power supply
Minimum Encoder Pulse Width	1 ms

The following table shows the electrical specifications for the drive interface.

Drive Interface	
Drive Fault Input	True high, TTL compatible relative to remote common, 10 K internal pull-up resistor
Drive Enable Relay	Form C contacts. 120 Vac @ 0.1 A resistive. 30 Vdc @ 0.5 A resistive
Current Command Voltages	+/- 10 Vdc
Current Command Summing Accuracy	0 +/- 0.1 Vdc
Current Commands	3 mA drive capability

The following table shows the electrical specifications for power requirements.

Power Requirements	
Main Power Input	5 V +/- 5% @ 750 mA (with no encoders or resolvers attached, output off)

Power Requirements	
Main Power Input	5 V +/- 5% @ 1000 mA (with maximum encoder and resolver load, outputs on)
Hot Swap Surge Current	Less than 5 A
Bus Current Required	MSB Module: 700 mA. MSC Module: 1000 mA

Front Panel Indicators and Descriptions

There are 17 LED indicators visible on the front panel. The following figure shows the front panel LED indicators.

Active	
Ready	Drv Flt
+ Lim ok	Drv En
- Lim ok	Out 1
Home	Out 2
In 4	Out 3
In 5	Modbus
In 6	Moving
In 7	In Pos

The following table shows the 140MSX10100 LED descriptions.

LEDs	Color	Indication when On
Active	Green	Bus communication is present.
Ready	Green	The module has passed powerup diagnostics.
+ Lim ok	Green	Digital Input 1 active.
- Lim ok	Green	Digital Input 2 active.
Home	Green	Digital Input 3 active.
In 4	Green	Digital Input 4 active.
In 5	Green	Digital Input 5 active.
In 6	Green	Digital Input 6 active.
In 7	Green	Digital Input 7 active.
Drv Flt	Red	Fault signal from drive.
Drv En	Green	Drive enabled.
Out 1	Green	Digital Output 1 active.
Out 2	Green	Digital Output 2 active.
Out 3	Green	Digital Output 3 active.
Modbus	Green	Communications are active on the Modbus port.
Moving	Amber	Motor is moving.
In Pos	Amber	Motion is within the in position of the final target.

Front Panel Connectors

There are two connectors located on the front of the module: the Modbus Connector and the Servo Connector.

Modbus Connectors

The MSX modules are equipped with a 9-pin, RS-232C connector that supports Modicon's proprietary Modbus communication protocol. The following is the Modbus port pinout connections for 9-pin and 25-pin connections.
The following figure shows the MSX Modbus port pinouts to 9-pin connectors (AS-W956-xxx).

Msx Modbus Port Pinouts to 9-Pin Connectors (AS-W956-xxx)

Signal	MSx Pin		Computer Pin	Signal	Function
	1	No Connection	1		Shield
TXD	2		3	RXD	Serial data
RXD	3		2	TXD	Serial data
GND	4		5	GND	Ground
DTR	5		6	DSR	Control line
DSR	6		4	DTR	Control line
RTS	7		7	RTS	Control line
CTS	8		8	CTS	Control line

The following figure shows the MSX Modbus port pinouts for 25-pin connectors (AS-W955-xxx).

MsxModbus Port Pinouts for 25-Pin Connectors (AS-W955-xxx)

Signal	MSx Pin		Computer Pin	Signal	Function
	1	No Connection	1		Shield
TXD	2		2	RXD	Serial data
RXD	3		3	TXD	Serial data
GND	4		7	GND	Ground
DTR	5		6	DSR	Control line
DSR	6		20	DTR	Control line
RTS	7		4	RTS	Control line
CTS	8		5	CTS	Control line

Servo Connector

The MSX is also equipped with a 50-pin servo connector for communication with feedback devices.

Note: The tables below show the 50-pin servo connector signals. Pin numbers correspond to both the MSB and MSC modules. When the signals differ from each other, they are shown separated by a slash (i.e., Pin Number 34, MSB/MSC).

Server Connector Signals

The following figure shows the server connector signals (from left to right) 50 - 34.

N/C	N/C /Reference Output Low	N/C /Reference Output High	N/C /Sine Input Low	N/C /Sine Input High	N/C /Cosine Input Low	N/C /Cosine Input High	Overtemp Low	Overtemp High	Drive Enable Common	Drive Enable Contact (NC)	Drive Enable Contact (NO)	Drive Fault	Velocity - / Phase Common	N/C / Phase C	N/C / Phase B	Velocity + / Phase A
50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34

The following figure shows the server connector signals (from left to right) 33 - 18.

Analog Input	Analog Common	Analog Output	High Speed Input	Auxiliary Input 7	Auxiliary Input 6	Auxiliary Input 5	Auxiliary Input 4	Home (Auxiliary Input 3)	Limit CCW (Auxiliary Input 2)	Limit CW (Auxiliary Input 1)	Auxiliary Output 3	Auxiliary Output 2	Brake Output (Auxiliary Output 1)	24 V Common	24 Vdc
33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18

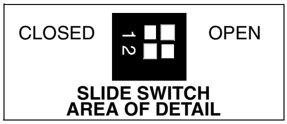
The following figure shows the server connector signals (from left to right) 17 - 1.

N/C (Not Connected)	N/C	N/C	N/C	N/C	Encoder 2 Mark-	Encoder 2 Mark+	Encoder 2 Phase B-	Encoder 2 Phase B+	Encoder 2 Phase A-	Encoder 2 Phase A+	Encoder 1 Mark-	Encoder 1 Mark+	Encoder 1 Phase B-	Encoder 1 Phase B+	Encoder 1 Phase A-	Encoder 1 Phase A-
17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

Rear Panel Switches

The MSX has an RS-232 serial port to connect the module to an IBM PC (or compatible) running the Modicon Motion Development Software (MMDS). A two-position Dip switch is located on the rear panel of the module (see the following illustration). SW1 is used to specify the module's operating mode (984 or MMDS control). SW2 is used to specify the communication characteristics of the Modbus port upon power-up.

The following figure shows the two-position Dip switch.



The following table shows the settings for the Dip switch settings.

Switch	Setting	Function
SW1	*Closed	MMDS control
	Open	PLC control
SW2	Closed	Programmed baud
	*Open	Modbus default
*Factory setting		

Note: SW1 and SW2 are open when they are switched away from the internal PCB of the module.

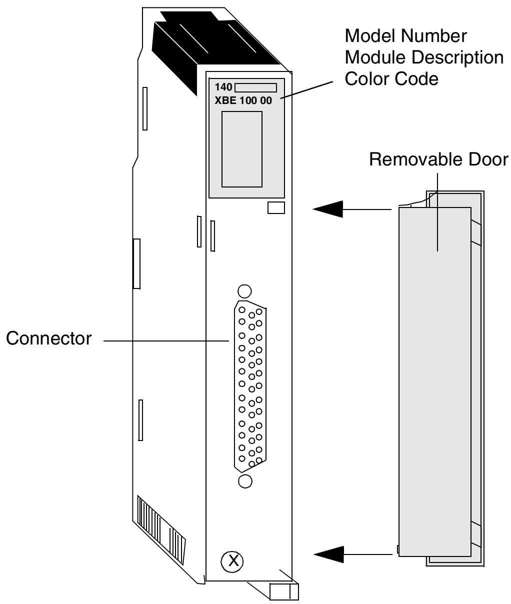
140XBE10000 Backplane Expander and Cable

Backplane Expander

With the 140XBE10000 Backplane Expander you can add a second backplane to a local or remote drop. A custom communications cable, 3.0 meters maximum, provides the data communication transfer.

The Backplane Expander

The following figure shows the components of the backplane expander.



Specifications

Specifications for the 140XBE10000 Backplane Expander are below.

Specifications	
Number of Connected Backplanes	2
Maximum Distance	3 meters
Backplane Requirements	
Size	All backplane sizes – 3, 4, 6, 10 and 16 slot.
Slots used	1
Number of Backplane Expander modules allowed	1 per backplane
LEDs	None.
Required Addressing	The Backplane Expander will look like an unfilled slot in the PLC I/O map.
Power Requirements	
Power Consumption	2.5 watts
Bus Current Required	500 mA
Connector	37 pin D-type
Compatibility	
Primary Backplane	No restrictions
Secondary Backplane	All types of Quantum I/O modules can be used in the secondary backplane, unless otherwise noted in the I/O documentation.
Programming Software	Modsoft V 2.6 or Concept V 2.2 at a minimum
Executive Firmware	140CPUX130X - Version 2.2 140CPUX341X - Version 1.03 140CPUx341xA - Any version 140CPU42402 - Version 2.15 140CRA93X0X - Version 1.2

Words per Drop

The following tables shows Words per drop.

Maximum words per drop	
Local I/O	64 in /64 out
Remote I/O	64 in /64 out

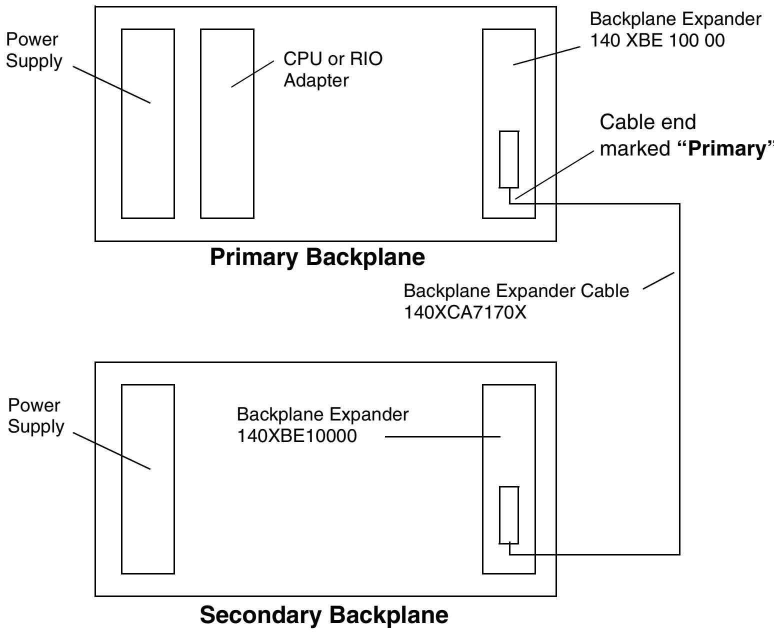
Cable Specifications

Specifications for the the three possible Expander Cables are below.

Part Number	Length
140 XCA 71703	1 meter
140 XCA 71706	2 meters
140 XCA 71709	3 meters

Basic Configuration

The backplane containing the the CPU or RIO drop adapter is designated the 'Primary' backplane and the adjacent backplane is designated the 'Secondary' backplane. Each backplane requires its own power supply.



Note: Cable must be installed before powering up the backplanes.

CAUTION

Possible communications cable failure

Do not Hot Swap a Backplane Expander module into a powered backplane unless the communications cable has first been connected to the module.

Failure to follow this precaution can result in injury or equipment damage.

CAUTION

Possible communications failure.

The cable is polarized. Ensure that the cable end marked "Primary" is connected to the backplane that has the CPU or RIO adapter.

Failure to follow this precaution can result in injury or equipment damage.

Backplane Expander Guidelines

- The same 140XBE10000 Backplane Expander modules are used for the primary and secondary backplanes. The end of the Backplane Expander cable marked Primary" always connects to the Backplane Expander module in the Primary Backplane.
- The system can use any Quantum type power supply. Each backplane can have a different type of power supply.
- Loss of power in the secondary backplane will not shut down the entire drop. Only modules located in the Secondary" backplane will lose power.
- Backplane expander modules can be located in any slot in the backplane and do not have to be placed in corresponding slots in the primary and secondary backplanes.
- I/O modules that have downloadable executive firmware, such as the ESI module, are allowed in the secondary backplane except when downloading their execs. Executive firmware cannot be downloaded to modules in the secondary backplane.
- It may be necessary to update the CPU or RIO drop executive firmware. See firmware section of table above
- The Backplane Expander will not be recognized by the programming panel software. It will look like an unfilled slot in the PLC I/O map.
- The Backplane Expander will allow configuration or I/O mapping of additional modules in the local drop containing a CPU or RIO drop adapter up to the drop word limit or physical slot address limitation.
- Option modules, such as NOMs, NOEs and CHSs must reside in the primary backplane.
- Any Interrupt module can be located in the secondary backplane, but the interrupt mode is not supported.
- The Backplane Expander module can not be Hot Swapped into a powered backplane without first attaching the communications cable. In order to install the Backplane Expander in a powered backplane, first connect the cable to the Backplane Expander module and then mount the module into the powered backplane.

140CHS11000 Hot Standby Module

Overview

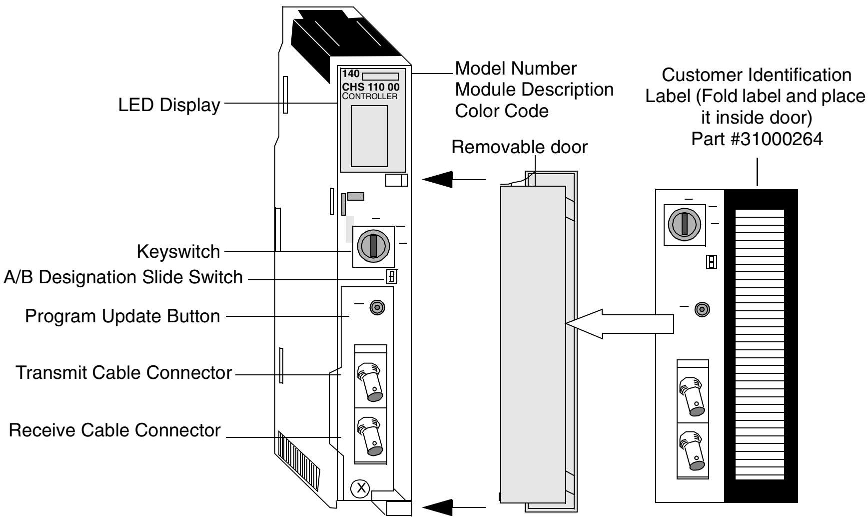
This section describes the Hot Standby Module 140CHS11000. The Quantum Hot Standby system is designed for use with remote I/O networks when downtime cannot be tolerated.

Related Documentation

For more detailed information on the use of the Hot Standby module, refer to the *Quantum Automation Hot Standby System Planning and Installation Guide*, part number 840USE10600.

Hot Standby Module

The following figure shows the Hot Standby Module components.



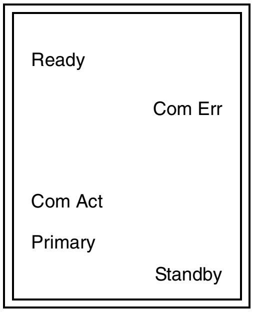
Specifications

The following table shows the specifications for the Quantum Hot Standby system.

Specifications	
I/O Type	Quantum
Fiber Optic Communication Ports	2 (Transmit and Receive)
Compatibility	
Programming Software	Modsoft V2.32 or Concept 2.0 at a minimum
Quantum Controllers	All, V2.0 at a minimum. (Check the version label of the top front of the module for the proper revision level.)
Bus Current Required (Typical)	700 mA

LED Indicators and Descriptions

The following figure shows the LED indicators.



The following table shows the LED descriptions.

LEDs	**Color**	**Indication when On**
Ready	Green	If steady: Power is being supplied to the module and it has passed initial internal diagnostic tests. If blinking: Module is trying to recover from an interface error.
Com Act	Green	If steady: CHS 110 modules are communicating. If blinking: An error has been detected.
Primary	Green	Module is supporting primary controller.
Com Err	Red	Module is retrying communications or communications failure has been detected.
Standby	Amber	If steady: Module is supporting the standby controller, which is ready to assume the primary role if needed. If blinking: Program update is in progress.

Error Codes

The following table shows the number of times the Com Act LED blinks for each type of error and the codes possible for that group (all codes are in hex).

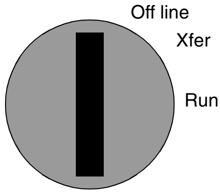
Number of Blinks	Code	Error
1	6900	error in additional transfer calculation
2	6801	ICB frame pattern error
	6802	head control block error
	6803	bad diagnostic request
	6804	greater than 128 MSL user loadables
4	6604	powerdown interrupt error
	6605	UART initialization error
5	6503	RAM address test error
6	6402	RAM data test error
7	6301	PROM checksum error
8	C101	no hook timeout
	C102	read state RAM timeout
	C103	write state RAM timeout
	C200	powerup error

Front Panel Controls

The Hot Standby module has three controls on the front panel: a function keyswitch, a designation slide switch, and an update button.

Keyswitch and Program Update Button

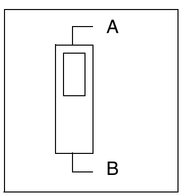
The following figure shows the keyswitch and program update button.



The keyswitch has three positions: off line, xfer, and run:
- **Off line** – Putting the key in this position takes the controller out of service.
- **Xfer** – When the key on the standby unit is in this position, the standby is prepared to receive a full program update from the primary controller. The update is initiated by pressing the program update button, which is located on the front panel between the function keyswitch and the cable connectors. If you turn the key on the primary unit to xfer, the system will ignore your action.
- **Run** – The switch should be in this position except when initiating a full program update or taking the module off line.

A/B Designation Slide Switch

The slide switch is used to designate the controller as A or B. The slide switch on one Hot Standby module in every pair must be set to A; the switch on the other must be set to B. The controller designated A will begin as the primary controller as long as it reaches the ready state before or at the same time as controller B. If the switches are set to the same position, the system will refuse to recognize the second controller at startup.The following figure shows the A/B designation slide switch.



Quantum Intrinsically Safe Analog/Digital, Input/Output Modules

15

At a Glance

Introduction

This chapter provides information on the Intrinsically Safe Analog Input/Output, and Digital Input/Output Modules.

What's in this Chapter?

This chapter contains the following sections:

Section	Topic	Page
15.1	Intrinsically Safe Modules - General Information	423
15.2	Intrinsically Safe Analog Modules	427
15.3	Intrinsically Safe Discrete Modules	463

15.1 Intrinsically Safe Modules - General Information

Intrinsically Safe Modules – General Description

Introduction

The following information is specifically concerned with the application of intrinsic safety with regards to the installation and field wiring of the Quantum Intrinsically Safe series of modules. It provides a general description of intrinsic safety and how it is accomplished in Quantum modules, how they should be installed, precautions that should be observed, and wiring and grounding practices that must be followed.

Intrinsic Safety

Intrinsic safety is a technique for ensuring that electrical energy supplied to circuits in a hazardous area is too low to ignite volatile gases either by spark or thermal means. Intrinsically safe circuits use energy limiting devices known as intrinsically safe barriers to prevent excess electrical energy from being applied to electrical equipment located in the hazardous area.

Module Location

The Quantum Intrinsically Safe family of modules are entity certified to be installed in safe areas to monitor/control intrinsically safe apparatus located In hazardous areas.

Intrinsically Safe Barriers

All Quantum Intrinsically Safe modules use galvanic isolation to provide the intrinsically safe barrier between them and the field devices located in hazardous areas. Opto-isolators are located within the modules between the field side and the Quantum backplane bus circuitry. The maximum agency specified intrinsically safe parameters are:

$$V_{oc} \leq 28 \text{ Vdc and } I_{sc} \leq 100\text{mA}$$

Intrinsically Safe Power Supply

DC/DC converters in Quantum Intrinsically Safe modules provide intrinsically safe power to field devices located in hazardous areas. No external field power is required where these modules are installed.

Installation of Quantum Intrinsically Safe Modules

Quantum Intrinsically Safe modules are designed to fit into a standard 140XBPOXX00 Quantum backplane. The modules can be installed in any slot position in the backplane. (The first slot is normally reserved for the power supply module.)

Hot Swapping

Hot swapping Quantum Intrinsically Safe modules is not allowed per intrinsic safety standards.

	WARNING
	Hot Swap Do not attempt to hot swap a Quantum Intrinsically Safe module. **Failure to follow this precaution can result in death, serious injury, or equipment damage.**

Safe Area Wiring Practices

Intrinsically safe wiring between Quantum Intrinsically Safe modules and the field devices located in the hazardous area must be separated from all other wiring. This can be accomplished by the following methods:
- Separate blue wire ducts, raceways or conduits
- Grounded metal or insulated partitions between the intrinsically safe and non-intrinsically safe wiring
- a separation of two inches (50 mm) of air space between the intrinsically safe and non-intrinsically safe wiring. With this method, the intrinsically safe and non-intrinsically safe wires must be tied down in separate bundles to maintain the required separation.

Identification and Labeling

Intrinsically safe wiring must be properly identified and labeled. Light blue color coding should be used for all intrinsically safe wiring. The terminal strip wiring connector on all Quantum Intrinsically Safe modules is colored blue to distinguish it from all non-intrinsically safe modules.

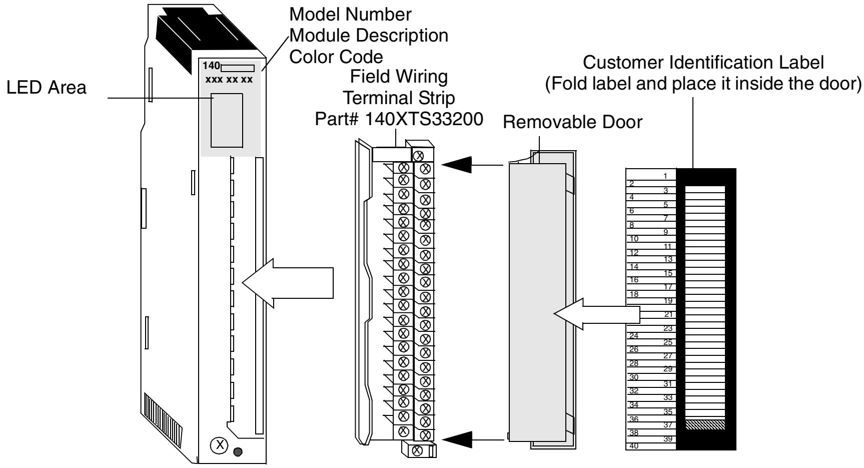
All wire ducts, raceways, cable trays, and open wiring must be labeled "Intrinsically Safe Wiring" with a maximum spacing of 25 ft. between labels.

Wiring Type and Grounding

Shielded twisted pair wires shall be used for each of the input or output pairs connected to the Quantum Intrinsically Safe module blue terminal strip. The wire gauge size can be between AWG 20 and AWG 12. Each twisted pair wire shield must be connected to the ground screws on the backplane, at the module end, and left open at the field device connection end in the hazardous area. The instruction sheet packaged with each Quantum Intrinsically Safe module contains a wiring diagram applicable to that type of module.

Module Figure

The following diagram is a view of a typical input or output module.

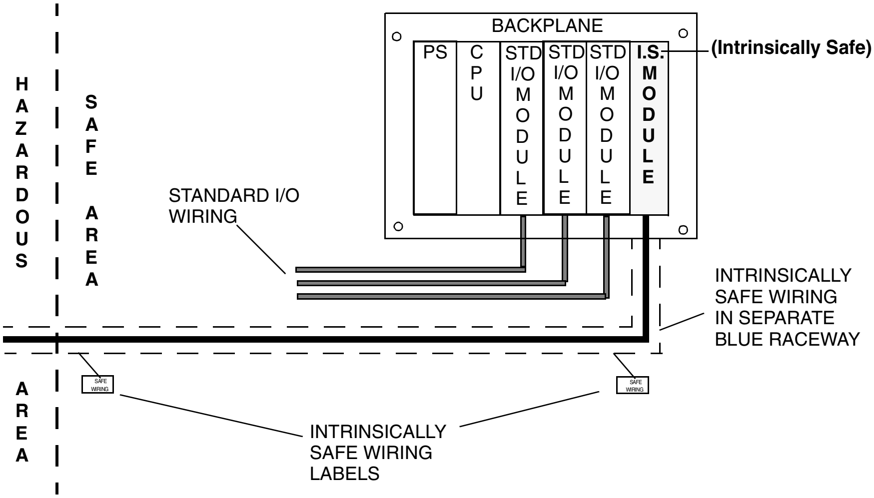


Agency Approvals

- CENELEC Zone 1, Gas Group IIC, IIB, and IIA
- CSA Class 1, Div 1, Gas groups A, B, C, and D
- FM Class 1, Div 1, Gas groups A, B, C, and D
- UL Class 1, Div 1, Gas groups A, B, C and D

Intrinsically Safe Wiring Diagram

The following diagram illustrates a Quantum Intrinsically Safe module using a separate raceway to isolate its external wiring to the hazardous area. This is just one of the possible ways of field wiring the module. Other methods would include bundling and laying the intrinsically safe wires in the same wiring trough with the bundled non-intrinsically safe wires, with each bundle tied down and separated by minimum of two inches of air space through out the wiring runs.



Questions Regarding Intrinsically Safe Wiring Practices

The information concerning intrinsic safety wiring practices, is general in nature and is not intended to cover installation requirements for any specific site. Questions regarding intrinsic safety wiring requirements for your site should be referred to the approval agencies listed.

15.2 Intrinsically Safe Analog Modules

At a Glance

Overview

This section provides information on the intrinsically safe analog modules, 140AII33000, 140AII33010, and 140AIO33000.

What's in this Section?

This section contains the following topics:

Topic	Page
I/O Configuration for Intrinsically Safe Analog Modules	428
140AII33000 Intrinsically Safe Analog Input Module	437
140AII33010 Intrinsically Safe Current Input Module	450
140AIO33000 Intrinsically Safe Analog Output Module	457

I/O Configuration for Intrinsically Safe Analog Modules

Overview

This section provides information on the I/O configuration of the intrinsically safe analog modules, 140AII33000, 140AII33010, and 140AIO33000.

140AII33000

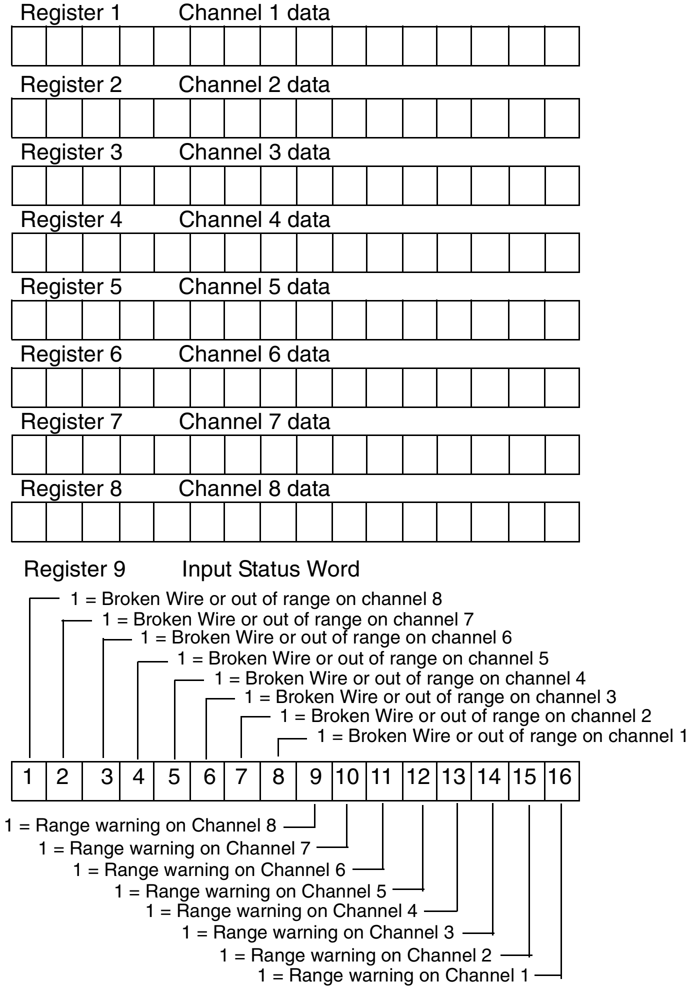
The following information pertains to configuration of the 140AII33000 intrinsically safe analog input module.

I/O Map register Assignment

Register assignments depend on module configuration. This module may be configured as an RTD/Resistance or a Thermocouple input module.

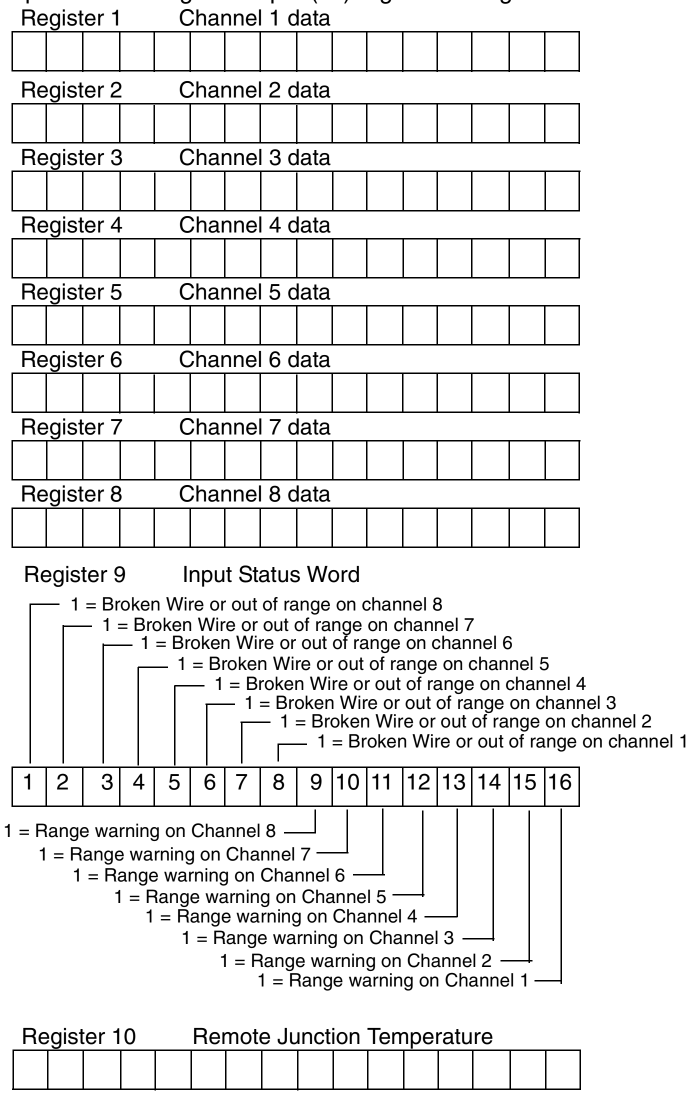
RTD I/O Map Register Assignments

When the 140AII33000 is configured as a RTD/Resistance input module, it requires nine contiguous input (3x) registers assigned as follows.



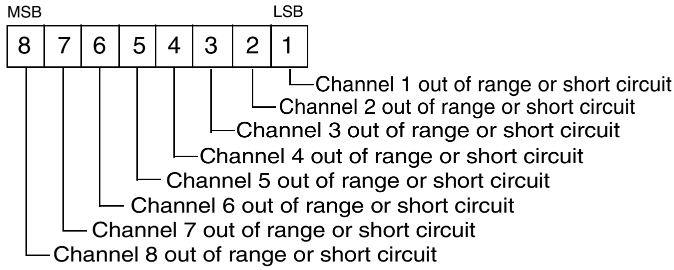
Thermocouple/ Millivolt Map Register Assignments

When the 140AII33000 is configured as a Thermocouple/Millivolt input module, it requires ten contiguous input (3x) registers assigned as follows.



I/O Map Status Byte

The I/O map status byte is used by the 140AII33000 module as follows.



Modsoft Module Zoom Selections

Use Modsoft's Zoom feature to select the module input type and then configure the eight channels appropriate to the input type selected.

RTD/Resistance
TC/mV

For RTD / Resistance Input

Resolution (Temp):	1.0 Deg 0.1 Deg
Output Unit (Temp):	Celsius Fahrenheit
Value Type:	Temperature Raw Value

For TC / mV Input

Resolution (Temp):	1.0 Deg 0.1 Deg
Output Unit (Temp):	Celsius Fahrenheit
Cold Junction Compensator:	On Board Channel 1

Configure each channel (1 through 8) appropriate to the module input type selected.

For RTD Module Input:

Channel Enable/Disable:

- Enable
- Disable

4-Wire /3-Wire /2-Wire:

- 4 Wire
- 3 Wire
- 2 Wire

RTD Type (Pt, Ni, R, A Pt)

Pt100,	-200 to 850
Pt200,	-200 to 850
Pt500,	-200 to 850
Pt1000,	-200 to 850
Ni 100,	-60 to 180
Ni 200,	-60 to 180
Ni 500,	-60 to 180
Ni1000,	-60 to 180
R, 0 to 766.66 OHM	
R, 0 to 4000 OHM	
APt100,	-100 to 450
APt200,	-100 to 450
APt500,	-100 to 450
APt1000,	-100 t0 450

For TC / mV Module Input:

Thermocouple Type:

- Undefined
- J, gain=25
- K, gain=25
- E, gain=25
- T, gain=100
- S, gain=100
- R, gain=100
- B, gain=100

Open circuit test:

- No
- Yes

Raw output, amplifier gain:
(see Note)

- 25
- 100

This channel installed:

- Yes
- No

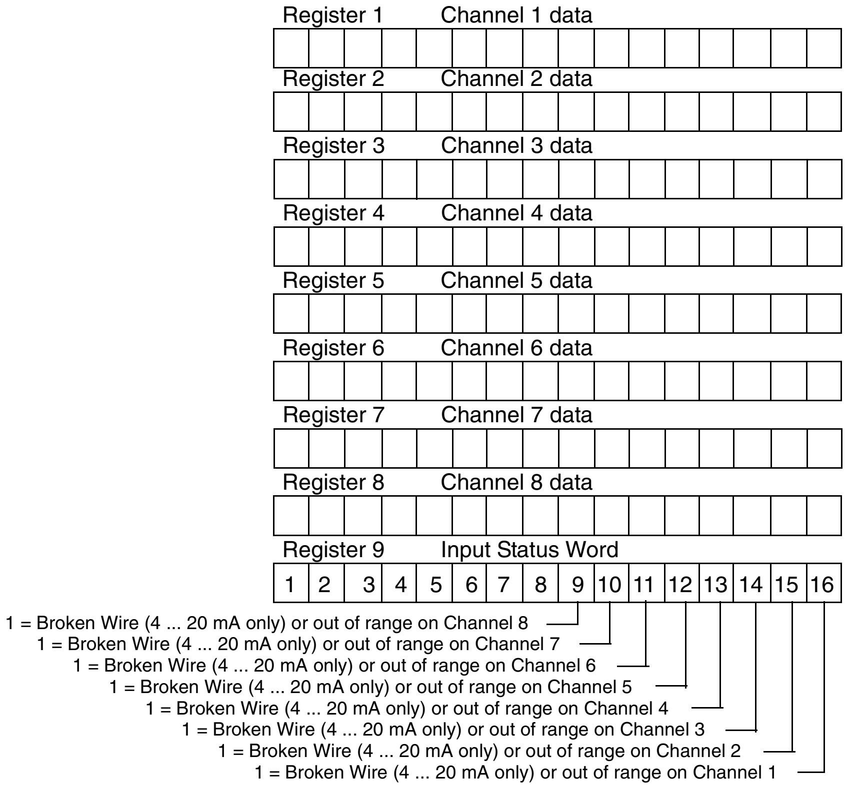
Note: A gain of 25 produces readings with + 100mV.
A gain of 100 produces readings with + 25mV.

140AII33010

The following information pertains to configuration of the 140AII33010 intrinsic safe analog input module.

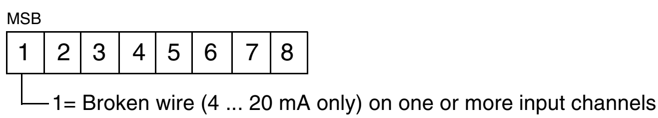
I/O Map Register Assignments

The 140AII33010 module requires nine contiguous input (3x) registers assigned as follows.



I/O Map Status Byte (Inputs)

The most significant bit in the I/O map status byte is used for this module.



Modsoft Module Zoom Selections

Use Modsoft's Module Zoom feature to display and select the input range.

Channel x Range Selection

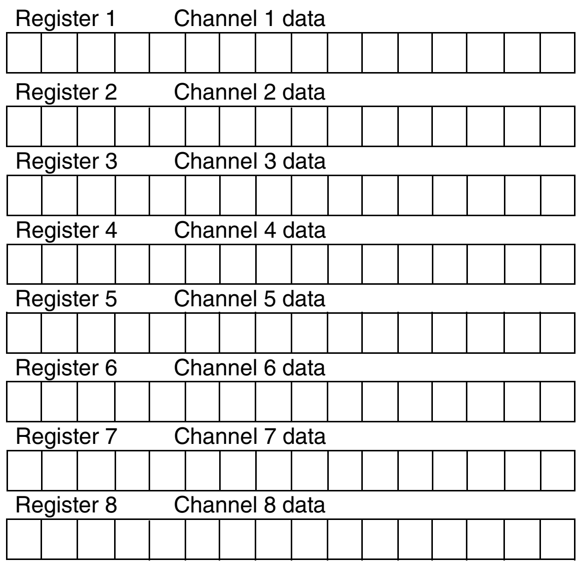
4 to 20mA 0 - 16,000
4 to 20mA 0 - 4095
0 to 20mA 0 - 20,000
0 to 25mA 0 - 25,000

140AIO33000

The following information pertains to configuration of the 140AIO33000 intrinsic safe analog output module.

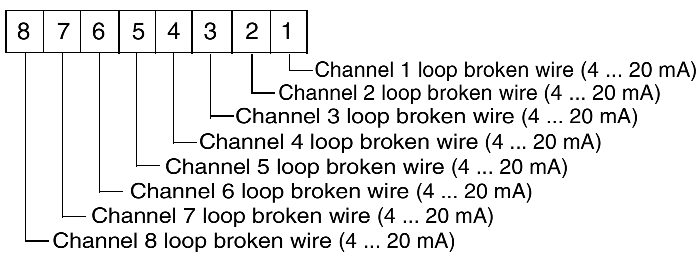
I/O Register Assignments

The 140AIO33000 module requires eight contiguous output (4x) registers assigned as follows:



I/O Map Status Byte

The I/O map status byte for this module is as follows.



Modsoft Module Zoom Selections

Use Modsoft's Module Zoom feature to display and select the module channel ranges and time-out state. Time-out state is assumed when system control of the module is stopped.

The following figure shows the time-out state for the Modsoft module zoom feature.

Channel X Range Selection:

4 to 20 mA	0 - 16,000
4 to 20 mA	0 - 4,095
0 to 20 mA	0 - 20,000
0 to 25 mA	0 - 25,000

Channel X Time-out State:

Disabled
Last Value
User Defined

User Defined Time Out Value is in Percentage:
50.00% should be entered as 5000:

Channel X User Defined Time Out Value: 0 DEC

140AII33000 Intrinsically Safe Analog Input Module

Overview

The Quantum 140AII33000 Intrinsically Safe Analog Input module will interface with eight intrinsically safe analog inputs, which are software-configurable on a module basis with either RTD/Resistance or thermocouple/millivolt inputs.

When it is configured as an RTD/Resistance Input module, it supports 100Ω, 200Ω, 500Ω, and 1000Ω platinum (American or European) and nickel sensors. The module also allows any mix and match of sensor type or resistance inputs that can be configured by the software.

When it is configured as a Thermocouple/Millivolt Input module, it accepts B, J, K, E, R, S and T type thermocouples. The module also allows any mix and match of thermocouple or millivolt inputs that can be configured by the software.

RTD/Resistance Module Specifications

Specifications for the Quantum140AII33000 module configured as an Intrinsically Safe RTD/Resistance input module are as follows.

RTD/Resistance Module Specifications	
Number of Channels	8
LEDs	Active (Green) F (Red) 1 - 8 (Red) Inicated channel is out of range - includes broken wire and short circuit conditions.
RTD Types (Configurable)	
Platinum (American and European) – PT100, PT200, PT500, PT1000	-200° C to +850° C
Nickel – N100, N200, N500, N1000	-60° C to +180° C
Measurement Current	
PT100, PT200, N100, N200 PT500, PT1000, N500, N1000	2.5 mA 0.5 mA
Input Impedance	>10 MΩ
Linearity	+/- 0.003% of full scale (0 ... 60° C)
Resolution	12 bits plus sign (0.1° C)
Absolute Accuracy	+/- 0.5 °C (25° C) +/- 0.9 °C (0 .. 60° C)
Accuracy Error @ 25°C	Typical: +/- 0.05% of full scale Maximum: +/- 0.1% of full scale
Isolation	
Channel to Channel	None
Channel to Bus	> 100 dB @ 50/60 Hz
Input Filter	1780 Vac @ 47-63 Hz or 2500 Vdc for 1 min.
Update Time (All Channels)	
3-wire 2 or 4-wire	1.35 sec. 750 m sec.
Bus Current Required	400 mA
Power Dissipation	2 W
External Power	Not required for this module
Fault Detection	Out of range or broken wire conditions
Hot Swap	Not allowed per intrinsic safety standards
Fusing	Internal-not user accessible
Programming Software	Modsoft Ver. 2.61 or higher

Thermocouple/ Millivolt Module Specifications

The following table shows the specifications for the Thermocouple/Millivolt module.

Thermocouple/Millivolt Module Specifications	
Number of Channels	8
LEDs	Active (Green) F (Red) 1 ... 8 (Red). Indicated channel is out of range - Broken wire condition is detected.
TC Types and Ranges	
Types J K E T S R B	Ranges (°C) -210 ... +760 -270 ... +1370 -270 ... +1000 -270 ... +400 -50 ... +1665 -50 ... +1665 +130 ... +1820
Millivolt Ranges	-100 mV ... +100 mV* -25 mV ... +25 mV* *Open circuit detect can be disabled on these ranges
TC Circuit Resistance/Max Source Resistance	200Ω max for rated accuracy
Input Impedance	>1MΩ
Input Filter	Single low pass @ nominal 20 Hz. Plus notch filter at 50/60 Hz
Normal Noise Rejection	120 dB min @ 50 or 60 Hz
Cold Junction Compensation (CJC)	Internal CJC operates 0 ... 60° C (errors are included in the accuracy specification). The connector door must be closed. Remote CJC can be implemented by connecting the TC (which monitors the external junction block temperature) to channel 1. Types J, K, and T are recommended for best accuracy.
Programming Software	Modsoft Ver. 2.61or higher
Resolution	
TC Ranges	Choice of: 1° C (Default) 0.1° C 1° F 0.1° F
Millivolt Ranges	+/- 100 mV range, 3.05 µV (16 bits) +/- 25 mV range, 0.76 µV (16 bits)
TC Absolute Accuracy (see Note 1)	
Types J, K, E, T (see Note 2)	+/- 2° C +/- 0.1% of reading
Types S, R, B (see Note 3)	+/- 4° C +/- 0.1% of reading

Thermocouple/Millivolt Module Specifications	
Millivolt Absolute Accuracy	
@ 25°C	+/- 20 µV +/- 0.1% of reading
Accuracy Drift w/ Temperature	0.15 µV/°C + 0.0015% of reading/°C max.
Isolation	
Channel to Channel	None
Channel to Bus	1780 Vac @ 47-63 Hz or 2500 Vdc for 1 min.
Update Time	1 sec. (all channels)
Fault Detection	Out of range or broken wire
Bus Current Required	400 mA
Power Dissipation	2 W
External Power	Not required for this module
Hot Swap	Not allowed per intrinsic safety standards
Fusing	Internal - not user accessible
Programming Software	Modsoft Ver. 2.6 or higher or Concept Ver. 2.2 or higher
Notes: 1. Absolute accuracy includes all errors from the internal CJC, TC curvature, offset plus gain, for module temperature of 0 ... 60° C. User-supplied TC errors not included. 2. For type J and K, add 1.5° C inaccuracy for temperatures below -100° C. 3. Type B cannot be used below 130° C. 4. All TC ranges have an open TC detect and upscale output. This results in a reading 7FFFh or 32767 decimal when an open TC is detected.	

Field Wiring

Field wiring to the module shall consist of separate shielded twisted pair wires. The acceptable field wire gauge shall be AWG 20 to AWG 12. In a 2-wire field configuration, the maximum field wire length is a function of the required accuracy. Wiring between the module and the intrinsically safe field device should follow intrinsically safe wiring practices to avoid the transfer of unsafe levels of energy to the hazardous area.

RTD/Resistance Input Wiring

When the Universal Input module is configured as a RTD/Resistance Input module, the maximum wire length (distance to a sensor) for a 3 or 4-wire configuration is 200 meters.

Thermocouple/ Millivolt Input Wiring

When the module is configured as a Thermocouple/Millivolt Input module, the sum of thermocouple source or voltage source impedance and wire resistance should not exceed 200 ohms for rated accuracy.

Fixed Wiring System

The Quantum140AII33000 Intrinsically Safe Analog Input module is designed with a fixed wiring system where the field connections are made to a 40-pin, fixed position, blue terminal strip which is plugged into the module.

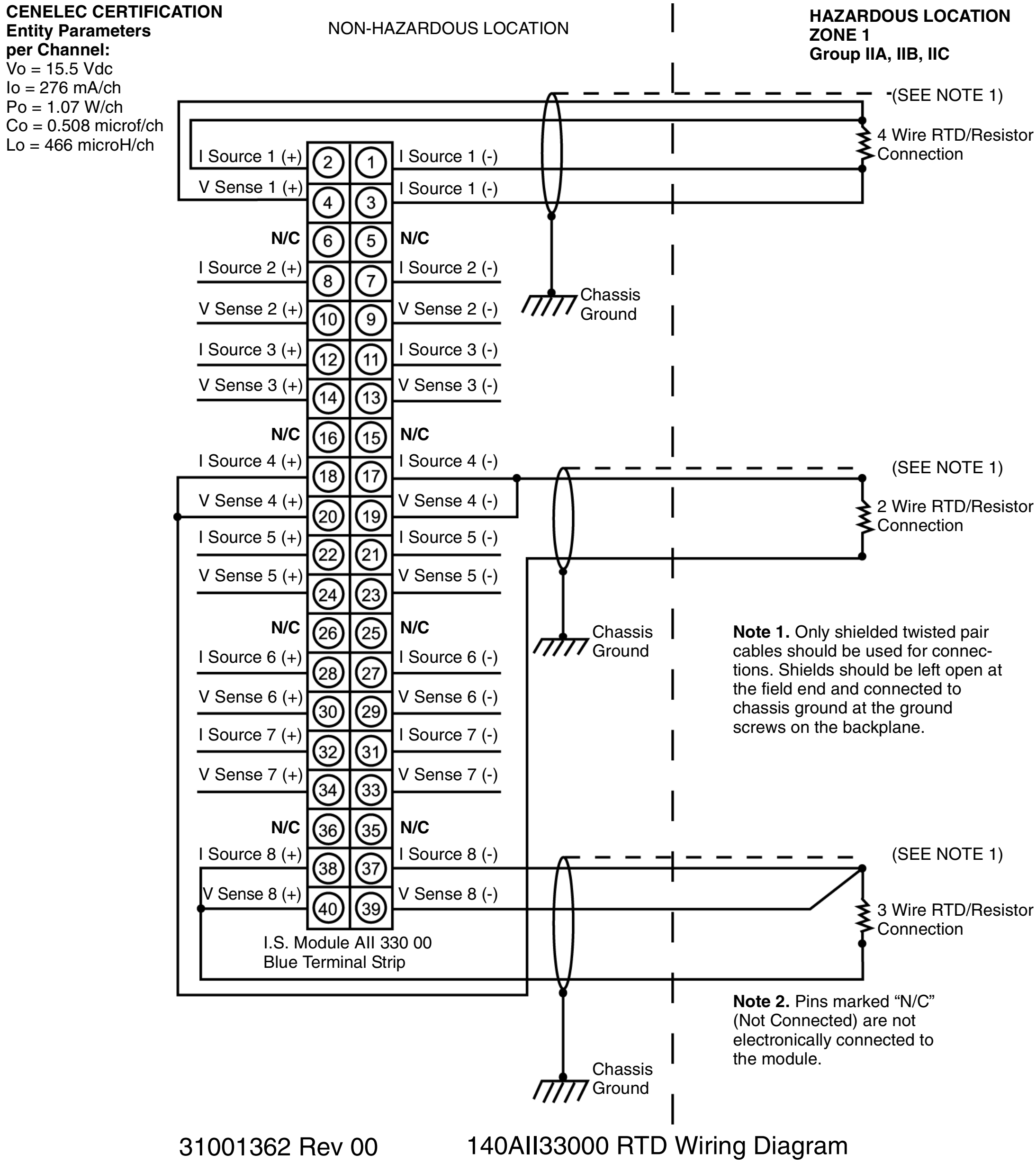
Terminal Strip Color and Keying Assignment

The module's 140XTS33200 field wiring terminal strip is color-coded blue to identify it as an intrinsically safe connector.
The terminal strip is keyed to prevent the wrong connector from being applied to the module. The keying assignment is given below.

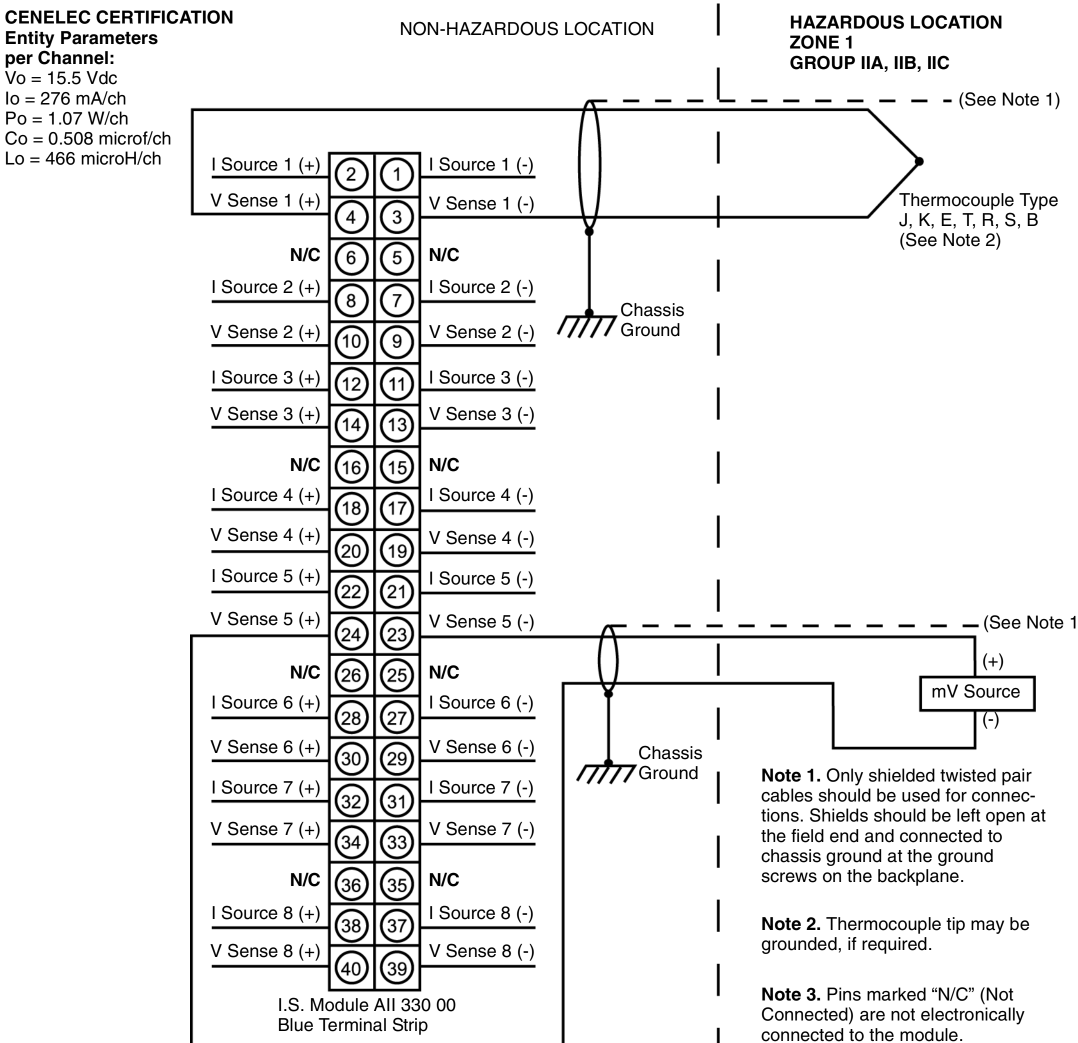
Module Class	Module Part Number	Module Coding	Terminal Strip Coding
Intrinsically Safe	140AII33000	CDF	ABE

Agency Approved Wiring Diagrams

The following is a Cenelec certified wiring diagram for this module configured with an RTD/Resistance connection.



The following is a Cenelec certified wiring diagram for this module when configured with a Thermocouple connection.



Note 1. Only shielded twisted pair cables should be used for connections. Shields should be left open at the field end and connected to chassis ground at the ground screws on the backplane.

Note 2. Thermocouple tip may be grounded, if required.

Note 3. Pins marked “N/C” (Not Connected) are not electronically connected to the module.

31001362 Rev 00 140AII33000 TC Wiring Diagram

The following is a CSA certified wiring diagram for this module when configured with an RTD/resistor connection.

Notes related to CSA certification for this module.

Note 1. Entity parameters per channel: $V_{cc} = 15.5$ V
$I_{sc} = 123$ mA
$C_a = 0.47$ uf
$L_a = 1.0$ mH

Note 2. Maximum non-hazardous area voltage must not exceed 250 V.

Note 3. Install in accordance with Canadian Electrical Code, Part I for installation in Canada.

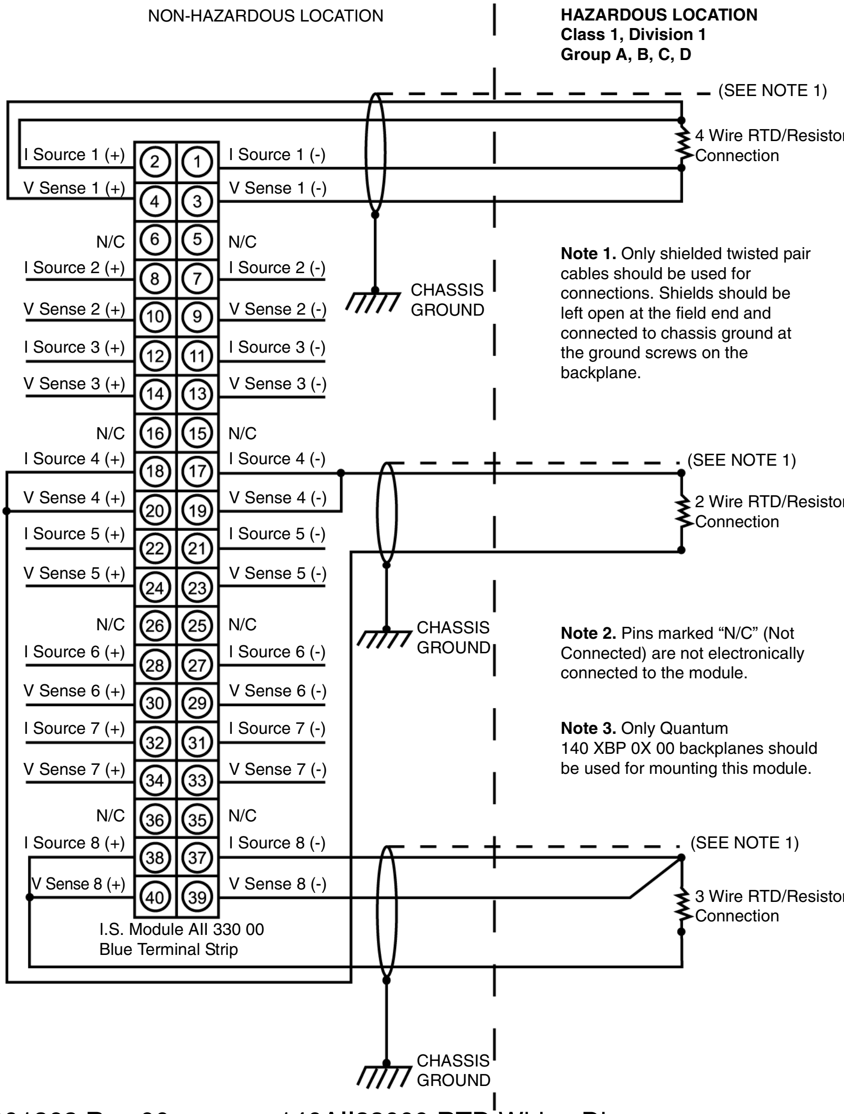
Note 4. Install in accordance with the NEC (ANSI/NFPA 70) and ANSI/ISA RP 12.6 for installation in the United States.

Note 5. To maintain intrinsic safety, shield for each cable must be grounded and must extend as close to the terminals as possible.

Note 6. Intrinsically Safe (I.S) cables of one module must be routed separately from I.S. cables of another module.

Note 7. I.S. devices when connected to I.S. terminals must satisfy the following conditions:
$V_{cc} < V_{max}$
$I_{sc} < I_{max}$
$C_a > C_i + C_{cable}$
$L_a > L_i + L_{cable}$

Note 8. This module is certified as a component for mounting in a suitable enclosure where the suitability of the final combination is subject to acceptance by CSA or an inspection authority having the jurisdiction.



Note 1. Only shielded twisted pair cables should be used for connections. Shields should be left open at the field end and connected to chassis ground at the ground screws on the backplane.

Note 2. Pins marked “N/C” (Not Connected) are not electronically connected to the module.

Note 3. Only Quantum 140 XBP 0X 00 backplanes should be used for mounting this module.

31001362 Rev 00   140AII33000 RTD Wiring Diagram

The following is a CSA certified wiring diagram for this module when configured with a thermocouple connection.

Notes related to CSA certification for this module.

Note 1. Entity parameters per channel: V_{cc} = 15.5 V
I_{sc} = 123 mA
C_a = 0.47 uf
L_a = 1.0 mH

Note 2. Maximum non-hazardous area voltage must not exceed 250 V.

Note 3. Install in accordance with Canadian Electrical Code, Part I for installation in Canada.

Note 4. Install in accordance with the NEC (ANSI/NFPA 70) and ANSI/ISA RP 12.6 for installation in the United States.

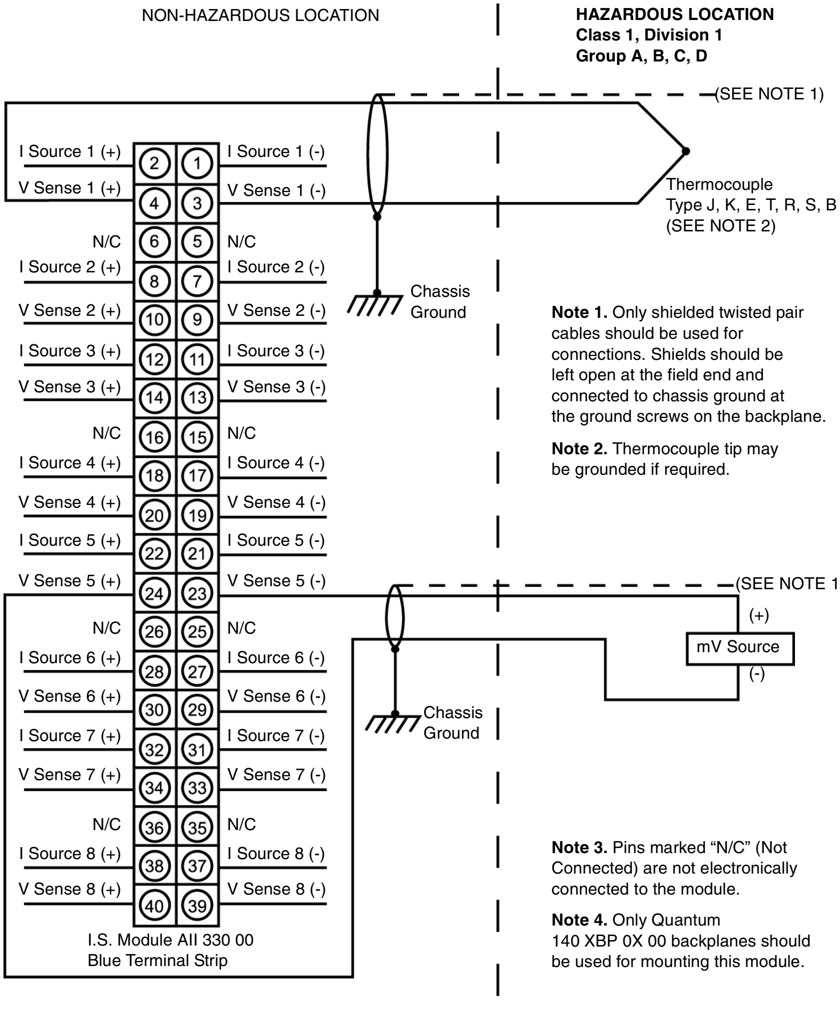
Note 5. To maintain intrinsic safety, shield for each cable must be grounded and must extend as close to the terminals as possible.

Note 6. Intrinsically Safe (I.S) cables of one module must be routed separately from I.S. cables of another module.

Note 7. I.S. devices when connected to I.S. terminals must satisfy the following conditions:

$V_{cc} < V_{max}$
$I_{sc} < I_{max}$
$C_a > C_i + C_{cable}$
$L_a > L_i + L_{cable}$

Note 8. This module is certified as a component for mounting in a suitable enclosure where the suitability of the final combination is subject to acceptance by CSA or an inspection authority having the jurisdiction.



Note 1. Only shielded twisted pair cables should be used for connections. Shields should be left open at the field end and connected to chassis ground at the ground screws on the backplane.

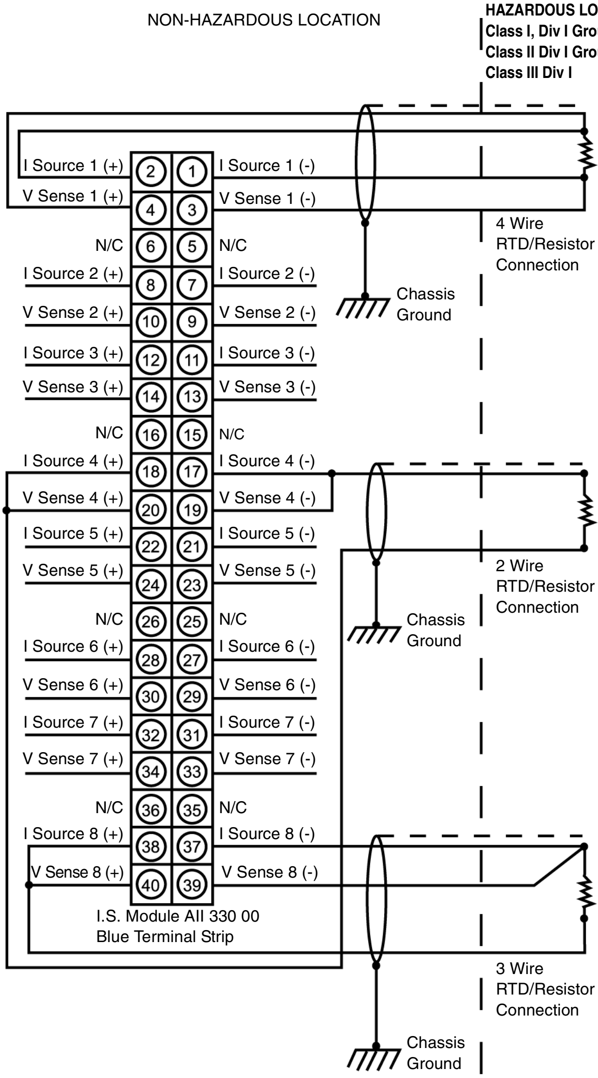
Note 2. Thermocouple tip may be grounded if required.

Note 3. Pins marked “N/C” (Not Connected) are not electronically connected to the module.

Note 4. Only Quantum 140 XBP 0X 00 backplanes should be used for mounting this module.

31001362 Rev 00 140AII33000 TC Wiring Diagram

The following is a FM certified wiring diagram for this module when configured as a RTD/resistor connection.



Notes Related to FM Certification

This IS field device should meet Note 5 or should be FM approved with entity concept in Note 4 appropriate for connection with IS RTD/TC IN Module with Concept Parameters listed below. The entity parameters are per Channel.
Voc = 15.5 VDC
Isc = 276 mA/Ch
Ca = 500 nf/Ch
La = 0.3 mH/Ch
Po = 1070 mW/Ch

Note 1. Only shielded cables should be used for connections. Shields should be left open at the field end and connected to chassis ground at the Module end.

Note 2. Pins marked N/C are not electronically connected to the Module.

Note 3. Only 140XBP0xx00 backplanes should be used for mounting this module.

Note 4. The Entity Concept allows interconnection of intrinsically safe apparatus with associated apparatus not specifically examined in combination as a system when the approved values of Vcc and Isc for the associated apparatus are less than or equal to Vmax and Imax for the intrinsically safe apparatus and the approved values of Ca and La for the associated apparatus must be equal to or are greater than Ci and Li for the intrinsically safe apparatus plus all cable parameters.

Ca > Ci + Ccable; La > Li + Lcable; Vcc < Vmax; Isc < Imax

Note 5. Simple Apparatus is defined as a device which will neither generate nor store more than 1.2V, 0.1A, 20uJ, or 25 mW. For examples, switches, Thermocouples, LEDs and RTDs, etc.

Note 6. Wiring methods must be in accordance with National Electrical Code NFPA 70, Article 504 and ANSI/ISA RP 12.6 “Wiring Practices for Hazardous (classified) Locations Instrumentation Part I: Intrinsic Safety.”

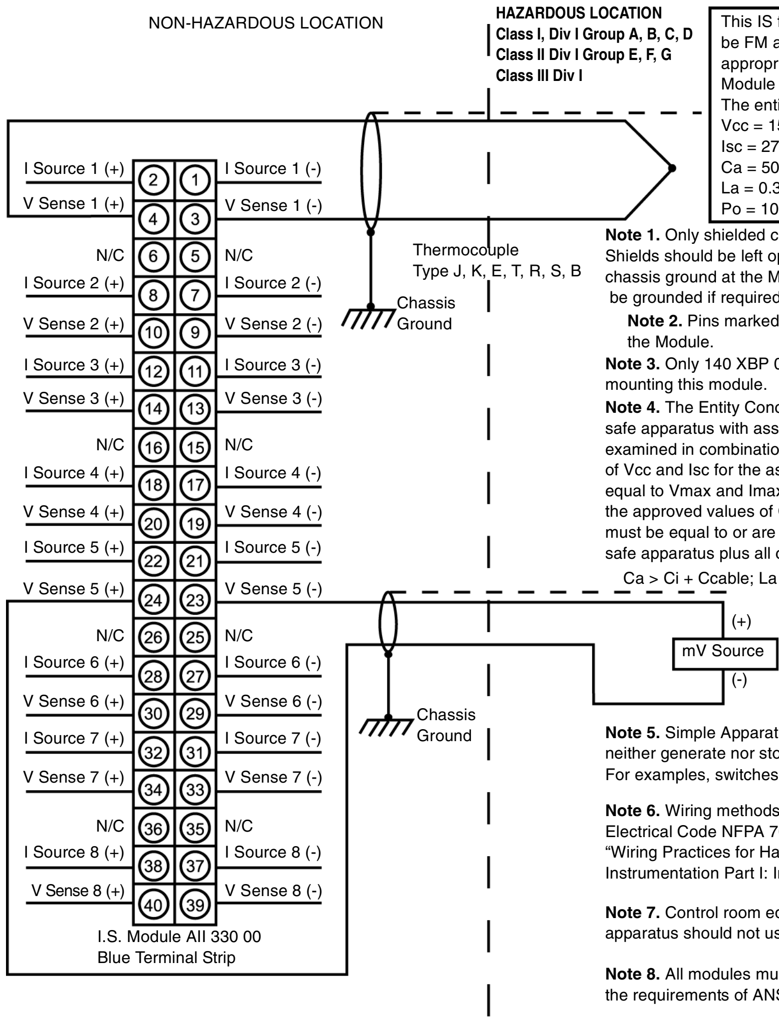
Note 7. Control room eqipment connected to associated apparatus should not use or generate more than 250 Vrms.

Note 8. All modules must be installed in an enclosure that meets the requirements of ANSI/ISA SB2.01.

Note 9. No revision to this drawing without prior FMRC approval.

31001362 Rev 00 140AII33000 RTD Wiring Diagram

The following is a FM certified wiring diagram for this module when configured with a thermocouple connection.



Notes Related to FM Certification

This IS field device should meet Note 5 or should be FM approved with entity concept in Note 4 appropriate for connection with IS RTD/TCIN Module with Concept Parameters listed below.
The entity parameters are per Channel.
Vcc = 15.5 VDC
Isc = 276 mA/Ch
Ca = 500 nf/Ch
La = 0.3 mH/Ch
Po = 1070 mW/Ch

Note 1. Only shielded cables should be used for connections. Shields should be left open at the field end and connected to chassis ground at the Module end. Thermocouple tips may be grounded if required.

Note 2. Pins marked N/C are not electronically connected to the Module.

Note 3. Only 140 XBP 0xx 00 backplanes should be used for mounting this module.

Note 4. The Entity Concept allows interconnection of intrinsically safe apparatus with associated apparatus not specifically examined in combination as a system when the approved values of Vcc and Isc for the associated apparatus are less than or equal to Vmax and Imax for the intrinsically safe apparatus and the approved values of Ca and La for the associated apparatus must be equal to or are greater than Ci and Li for the intrinsically safe apparatus plus all cable parameters.

Ca > Ci + Ccable; La > Li + Lcable; Voc < Vmax; Isc < Imax

Note 5. Simple Apparatus is defined as a device which will neither generate nor store more than 1.2V, 0.1A, 20uJ, or 25 mW. For examples, switches, Thermocouples, LEDs and RTDs, etc.

Note 6. Wiring methods must be in accordance with National Electrical Code NFPA 70, Article 504 and ANSI/ISA RP 12.6 “Wiring Practices for Hazardous (classified) Locations Instrumentation Part I: Intrinsic Safety.”

Note 7. Control room eqipment connected to associated apparatus should not use or generate more than 250 Vrms.

Note 8. All modules must be installed in an enclosure that meets the requirements of ANSI/ISA SB2.01.

Note 9. No revision to this drawing without prior FMRC approval.

31001362 Rev 00 140AII33000 TC Wiring Diagram

The following is a UL certified wiring diagram for this module when configured with an RTD/resistor connection.

Notes related to UL certification for this module.

Note 1. Entity parameters per channel: V_{cc} = 15.5 V
I_{sc} = 123 mA
C_a = 0.47 uf
L_a = 466 uH

Note 2. Maximum non-hazardous area voltage must not exceed 250 V.

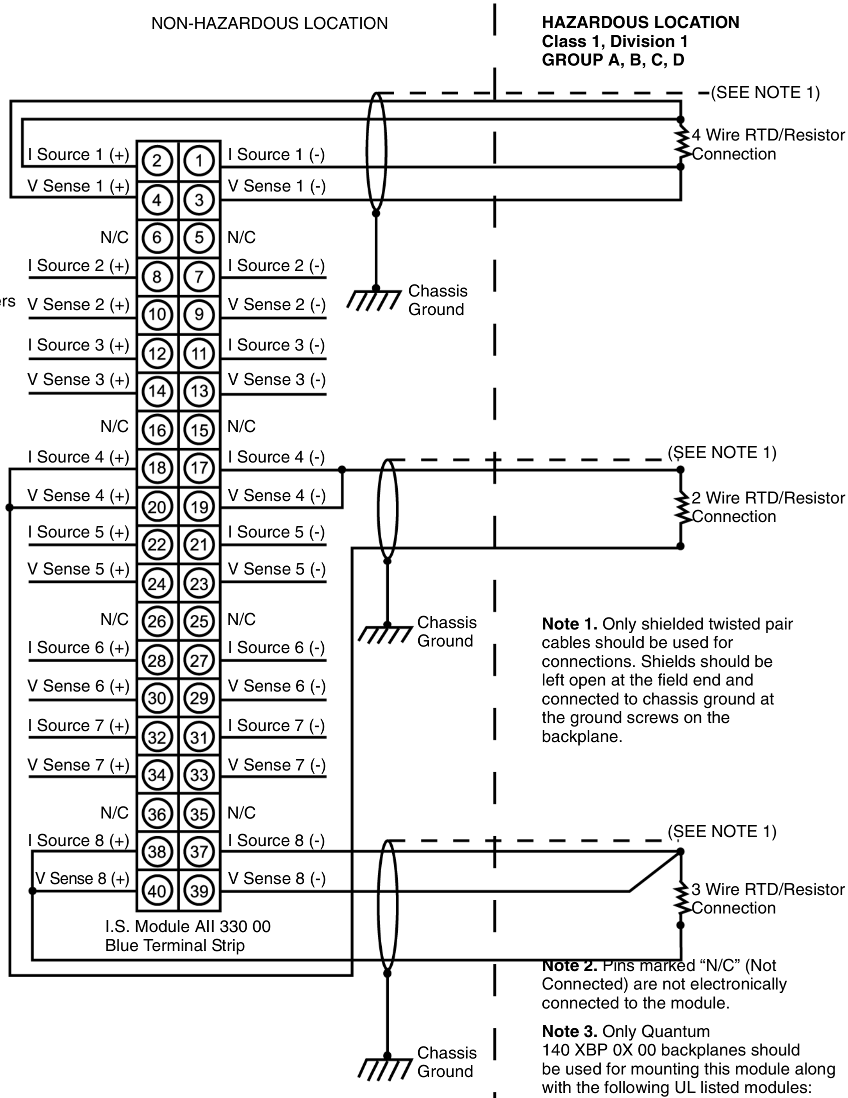
Note 3. If the electrical parameters of the cable are unknown, the following values must be used for Ccable and Lcable:
Capacitance 60 Pf/ft
Inductance 0.20 uH/ft

Note 4. Install in accordance with the NEC (ANSI/NFPA 70) and ANSI/ISA RP 12.6 for installation in the United States.

Note 5. To maintain intrinsic safety, shield for each cable must be grounded and must extend as close to the terminals as possible.

Note 6. Intrinsically Safe (I.S) cables of one module must be routed separately from I.S. cables of another module.

Note 7. I.S. devices when connected to I.S. terminals must satisfy the following conditions:
$V_{cc} < V_{max}$
$I_{sc} < I_{max}$
$C_a > C_i + C_{cable}$
$L_a > L_i + L_{cable}$



Note 1. Only shielded twisted pair cables should be used for connections. Shields should be left open at the field end and connected to chassis ground at the ground screws on the backplane.

Note 2. Pins marked "N/C" (Not Connected) are not electronically connected to the module.

Note 3. Only Quantum 140 XBP 0X 00 backplanes should be used for mounting this module along with the following UL listed modules:
140 CPU xxx xx
140 CPS xxx xx

31001362 Rev 00 140AII33000 RTD Wiring Diagram

The following is a UL certified wiring diagram for this module when configured with a thermocouple connection.

Notes related to UL certification for this module.

Note 1. Entity parameters per channel: V_{cc} = 15.5 V
I_{sc} = 123 mA
C_a = 0.47 uf
L_a = 1.0 mH

Note 2. Maximum non-hazardous area voltage must not exceed 250 V.

Note 3. If the electrical parameters of the cable are unknown, the following values must be used for Ccable and Lcable:

Capacitance	60 Pf/ft
Inductance	0.20 uH/ft

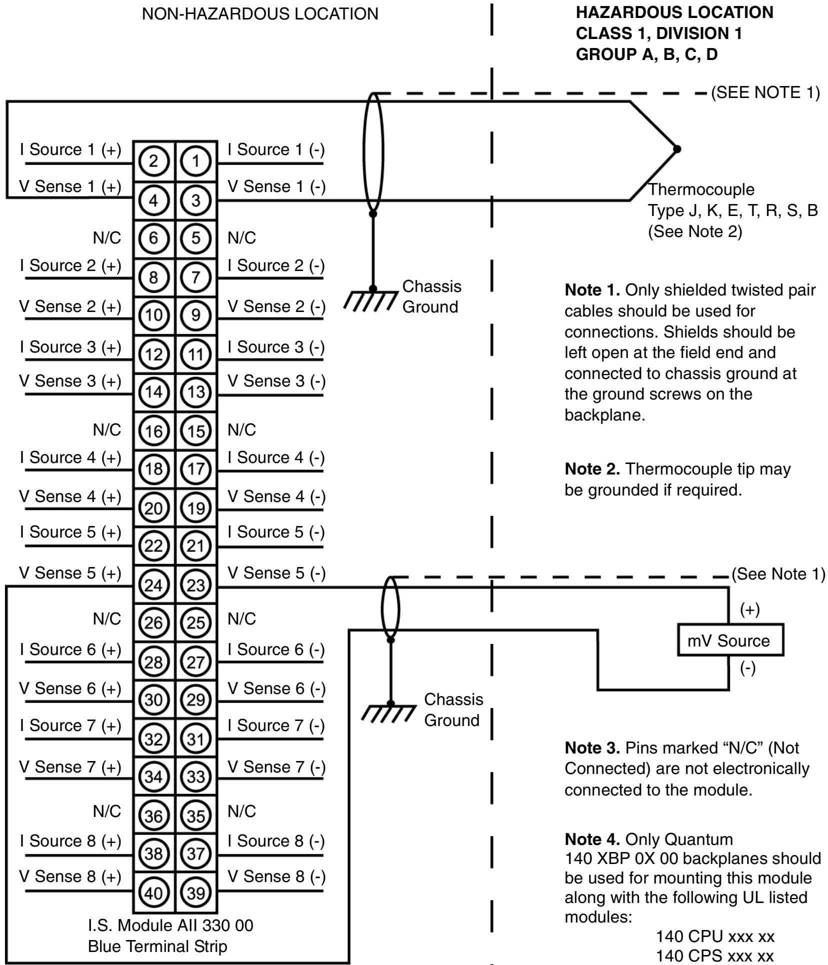
Note 4. Install in accordance with the NEC (ANSI/NFPA 70) and ANSI/ISA RP 12.6 for installation in the United States.

Note 5. To maintain intrinsic safety, shield for each cable must be grounded and must extend as close to the terminal as possible.

Note 6. Intrinsically Safe (I.S) cables of one module must be routed separately from I.S. cables of another module.

Note 7. I.S. devices when connected to I.S. terminals must satisfy the following conditions:

$V_{cc} < V_{max}$
$I_{sc} < I_{max}$
$C_a > C_i + C_{cable}$
$L_a > L_i + L_{cable}$



31001362 Rev 00 140AII33000 TC Wiring Diagram

140AII33010 Intrinsically Safe Current Input Module

Overview

The Quantum 140AII33010 Intrinsically Safe Current Input module interfaces with eight intrinsically safe analog inputs which are software-configurable. The module accepts 0 ... 20 mA, 0 ... 25 mA, and 4 ... 20 mA inputs. The module allows any mix and match of current input ranges that can be configured by the software. The module provides power to intrinsically safe transmitters located in hazardous areas.

Specifications

Specifications for the Quantum 140AII33010 Intrinsically Safe Current Input module are as follows.

Specifications	
Number of Channels	8
LEDs	Active (Green) F (Red) 1 ... 8 (Red), 1 per channel **Note**: This module produces a fault signal F if any one channel detects a broken wire condition or an out-of-range condition (4 ... 20 mA only).
Current Input	
Linear Measuring Range	4 ... 20 mA 0 ... 20 mA 0 ... 25 mA
Absolute Maximum Input	25 mA internally limited
Input Impedance	100 Ω +/- 0.1% between V+ and signal terminals
Resolution	4 ... 20 mA, 0 to 4,095 counts 4 ... 20 mA0 to 16,000 counts 0 ... 20 mA, 0 to 20,000 counts 0 ... 25 mA, 0 to 25,000 counts
Available Voltage	Terminals V+, V-, :~ 14.5 Vdc at 25 mA Terminals V+, Signal :~ 13.6 Vdc at 20 mA
Accuracy Error @ 25°C	Typical: +/- 0.05% of full scale Maximum: +/- 0.1% of full scale
Linearity	+ 0.003% of full scale
Accuracy Drift w/ Temperature	Typical: +/- 0.0025% of full scale /°C Maximum: +/- 0.005% of full scale /°C
Common Mode Rejection	> 100 dB @ 50/60 Hz
Input Filter	Single pole low pass, -3 dB cutoff @ 15 Hz, +/- 20%
Isolation	
Channel to Channel	None
Channel to Bus	1780 Vac @ 47-63 Hz or 2500 Vdc for 1 min.
Update Time	750 ms for all channels
Fault Detection	Broken wire (4 ... 20 mA mode)
Bus Current Required	1.5 A
Power Dissipation	7.5 W
External Power	Not required
Hot Swap	Not allowed per intrinsic safety standards

Specifications	
Fusing	Internal-not user accessible
Programming Software	Modsoft Ver. 2.61 or higher

Field Wiring

Field wiring to the module consists of separate shielded, twisted pair wires. The acceptable field wire gauge is AWG 20 to AWG 12. Wiring between the module and the intrinsically safe field device should follow intrinsically safe wiring practices to avoid the transfer of unsafe levels of energy to the hazardous area.

Fixed Wiring System

The Quantum 140AII33010 Intrinsically Safe Current Input module is designed with a fixed wiring system, where the field connections are made to a 40-pin, fixed position, blue terminal strip which is plugged into the module.

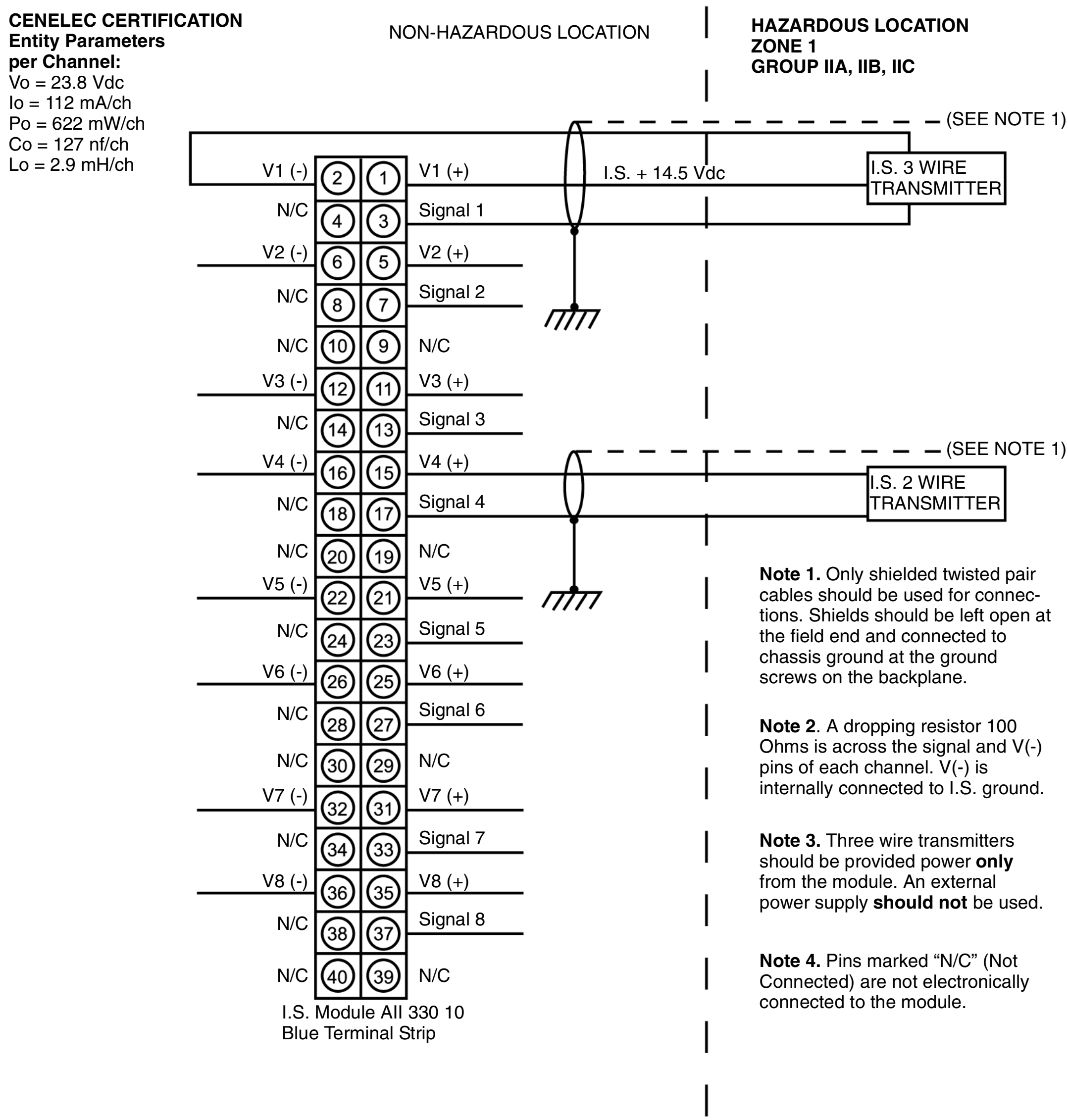
Terminal Strip Color and Keying Assignment

The module's 140XTS33200 field wiring terminal strip is color-coded blue to identify it as an intrinsically safe connector.The terminal strip is keyed to prevent the wrong connector from being applied to the module. The keying assignment is given below.

Module Class	Module Part Number	Module Coding	Terminal Strip Coding
Intrinsically Safe	140AII33010	CEF	ABD

Agency Approved Wiring Diagrams

The following is a Cenelec certified wiring diagram for this module.



31001363 Rev 00 140AII33010 Wiring Diagram

The following is a CSA certified wiring diagram for this module.

Notes related to CSA certification for this module.

Note 1. Entity parameters per channel:
V_{oc} = 23.8 V
I_{sc} = 112 mA
C_a = 127nf
L_a = 1.0 mH

Note 2. Maximum non-hazardous area voltage must not exceed 250 V.

Note 3. Install in accordance with Canadian Electrical Code, Part I for installation in Canada.

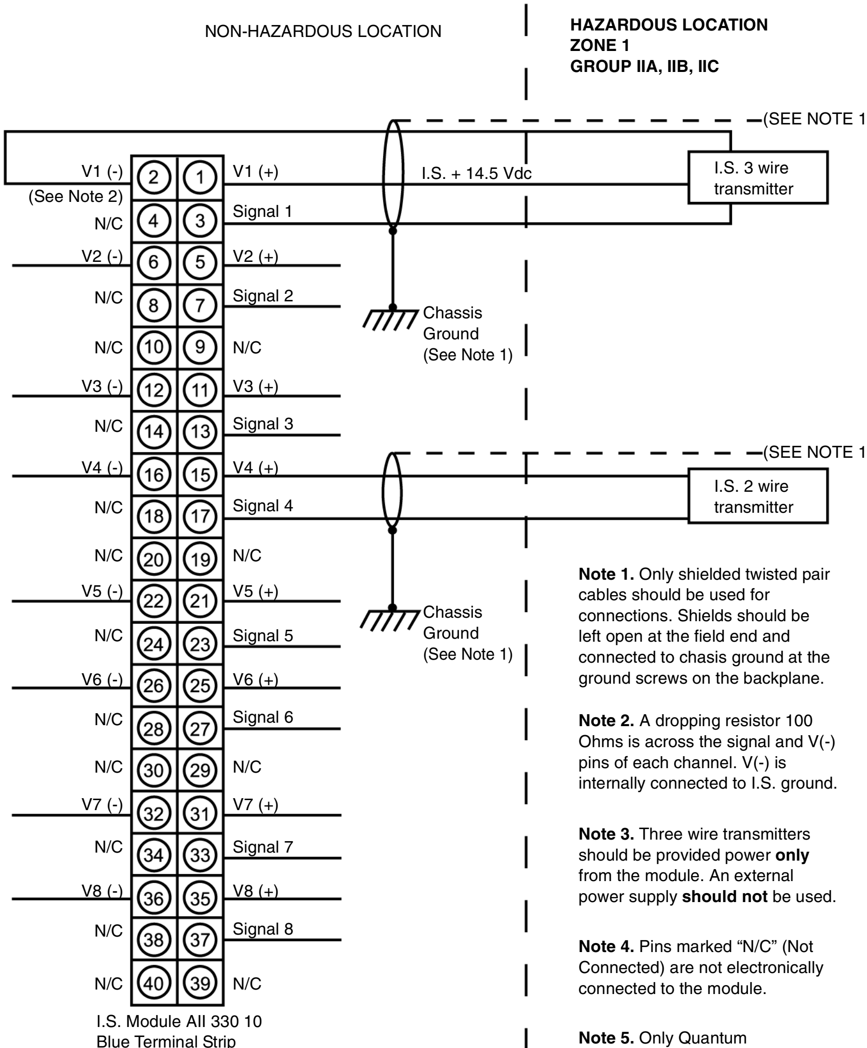
Note 4. Install in accordance with the NEC (ANSI/NFPA 70) and ANSI/ISA RP 12.6 for installation in the United States.

Note 5. To maintain intrinsic safety, shield for each cable must be grounded and must extend as close to the terminals as possible.

Note 6. intrinsically Safe (I.S.) cables of one module must be routed separately from I.S. cables of another module.

Note 7. I.S. devices when connected to I.S. terminals must satisfy the following conditions:
$V_{oc} < V_{max}$
$I_{sc} < I_{max}$
$C_a > C_i + C_{cable}$
$L_a > L_i + L_{cable}$

Note 8. This module is certified as a component for mounting in a suitable enclosure where the suitability of the final combination is subject to acceptance by CSA or an inspection authority having the jurisdiction.



Note 1. Only shielded twisted pair cables should be used for connections. Shields should be left open at the field end and connected to chasis ground at the ground screws on the backplane.

Note 2. A dropping resistor 100 Ohms is across the signal and V(-) pins of each channel. V(-) is internally connected to I.S. ground.

Note 3. Three wire transmitters should be provided power **only** from the module. An external power supply **should not** be used.

Note 4. Pins marked “N/C” (Not Connected) are not electronically connected to the module.

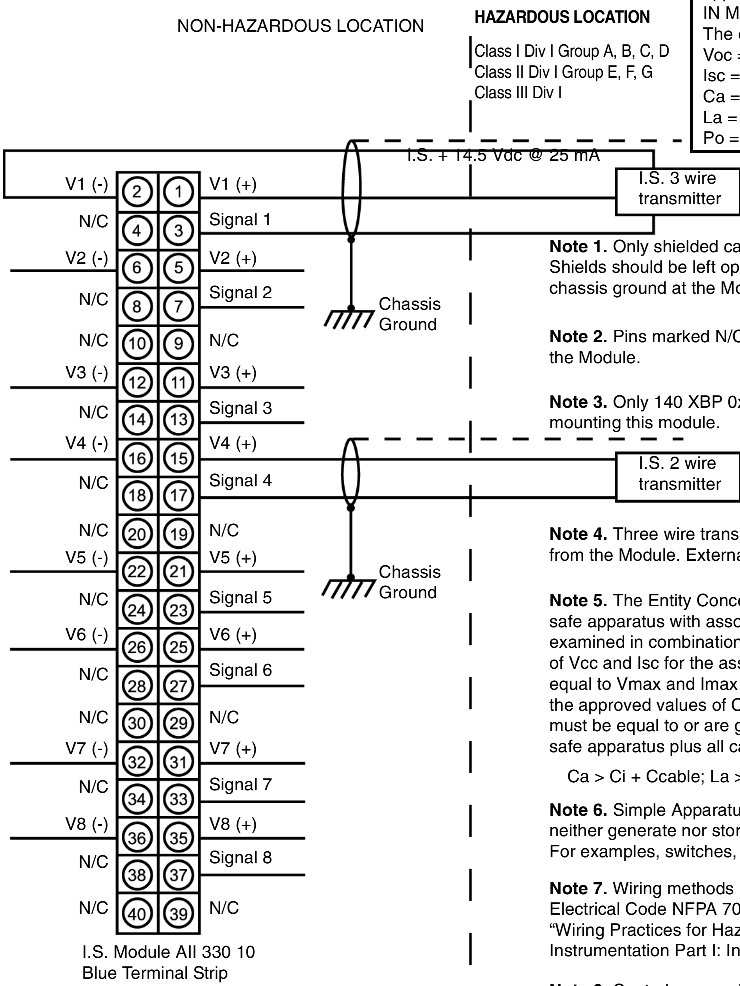
Note 5. Only Quantum 140 XBP 0X 00 backplanes should be used for mounting this module.

31001363 Rev 00 140AII33010 Wiring Diagram

The following is a FM certified wiring diagram for this module.

Notes Related to FM Certification

This IS field device should meet Note 6 or should be FM approved with entity concept in Note 5 appropriate for connection with IS Analog Current IN Module with Concept Parameters listed below. The entity parameters are per Channel.
Voc = 23.8 VDC
Isc = 112 mA/Ch
Ca = 123 nf/Ch
La = 2.9 mH/Ch
Po = 622 mW/Ch



Note 1. Only shielded cables should be used for connections. Shields should be left open at the field end and connected to chassis ground at the Module end.

Note 2. Pins marked N/C are not electronically connected to the Module.

Note 3. Only 140 XBP 0xx 00 backplanes should be used for mounting this module.

Note 4. Three wire transmitters should be provided power only from the Module. External Power Supply should not be used.

Note 5. The Entity Concept allows interconnection of intrinsically safe apparatus with associated apparatus not specifically examined in combination as a system when the approved values of Vcc and Isc for the associated apparatus are less than or equal to Vmax and Imax for the intrinsically safe apparatus and the approved values of Ca and La for the associated apparatus must be equal to or are greater than Ci and Li for the intrinsically safe apparatus plus all cable parameters.

Ca > Ci + Ccable; La > Li + Lcable; Voc < Vmax; Isc < Imax

Note 6. Simple Apparatus is defined as a device which will neither generate nor store more than 1.2V, 0.1A, 20uJ, or 25 mW. For examples, switches, Thermocouples, LEDs and RTDs, etc.

Note 7. Wiring methods must be in accordance with National Electrical Code NFPA 70, Article 504 and ANSI/ISA RP 12.6 “Wiring Practices for Hazardous (classified) Locations Instrumentation Part I: Intrinsic Safety.”

Note 8. Control room eqipment connected to associated apparatus should not use or generate more than 250 Vrms.

Note 9. All modules must be installed in an enclosure that meets the requirements of ANSI/ISA S82.01.

Note 10. No revision to this drawing without prior FMRC approval.

31001363 Rev 00 140AII33010 Wiring Diagram

The following is a UL certified wiring diagram for this module.

Notes related to UL certification for this module.

Note 1. Entity parameters per channel: $V_{cc} = 24.3$ V
$I_{sc} = 112$ mA
$C_a = 127$ nf
$L_a = 1.5$ mH

Note 2. Maximum non-hazardous area voltage must not exceed 250 V.

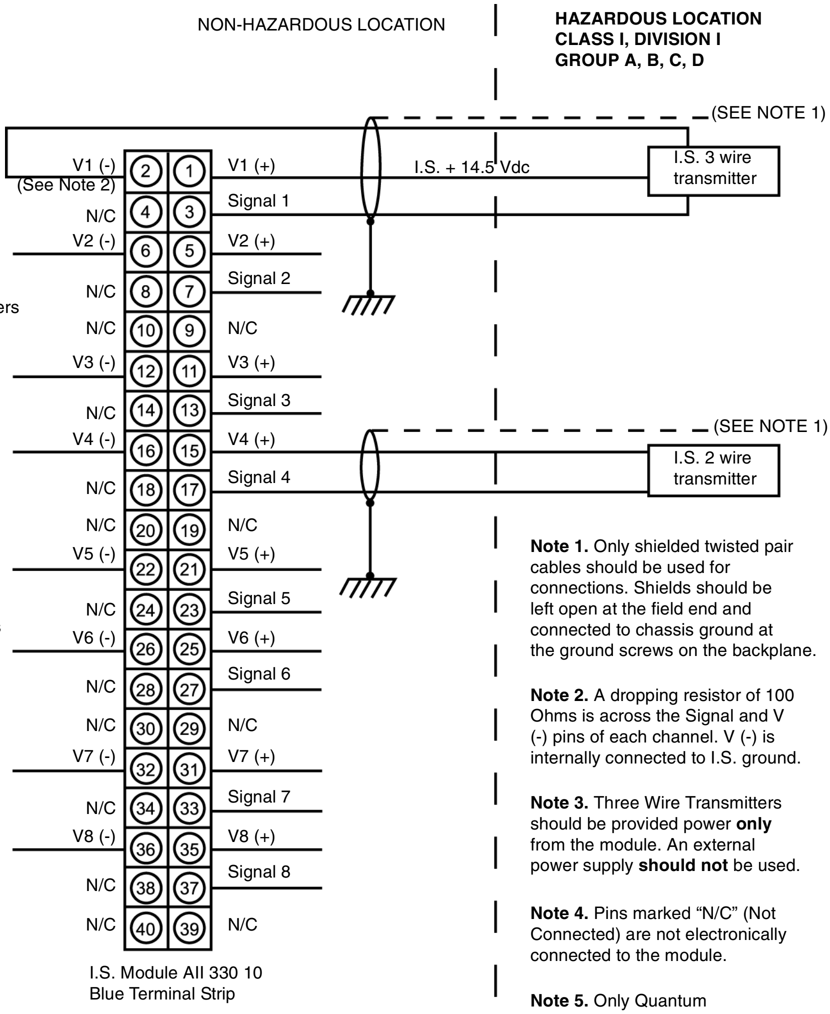
Note 3. If the electrical parameters of the cable are unknown, the following values must be used for Ccable and Lcable:
Capacitance 60Pf/ft
Inductance 0.20 uH/ft

Note 4. Install in accordance with the NEC (ANSI/NFPA 70) and ANSI/ISA RP 12.6 for installation in the United States.

Note 5. To maintain intrinsic safety, shield for each cable must be grounded and must extend as close to the terminals as possible.

Note 6. Intrinsically Safe (I.S) cables of one module must be routed separately from I.S. cables of another module.

Note 7. I.S. devices when connected to I.S. terminals must satisfy the following conditions:
$V_{cc} < V_{max}$
$I_{sc} < I_{max}$
$C_a > C_i + C_{cable}$
$L_a > L_i + L_{cable}$



I.S. Module AII 330 10
Blue Terminal Strip

Note 1. Only shielded twisted pair cables should be used for connections. Shields should be left open at the field end and connected to chassis ground at the ground screws on the backplane.

Note 2. A dropping resistor of 100 Ohms is across the Signal and V (-) pins of each channel. V (-) is internally connected to I.S. ground.

Note 3. Three Wire Transmitters should be provided power **only** from the module. An external power supply **should not** be used.

Note 4. Pins marked “N/C” (Not Connected) are not electronically connected to the module.

Note 5. Only Quantum 140 XBP 0X 00 backplanes should be used for mounting this module along with the following UL listed modules:
140 CPU xxx xx
140 CPS xxx xx

31001363 Rev 00 140AII33010 Wiring Diagram

140AIO33000 Intrinsically Safe Analog Output Module

Overview

The Quantum 140AIO33000 Intrinsically Safe Analog Output module controls and monitors current loops in intrinsically safe applications. The module provides 8 dual-ended output channels that are referenced over sense resistors to a single Common. The output ranges are 4 ... 20 mA, 0 ... 20 mA, and 0 ... 25 mA. This module detects broken wires on a per-channel basis indicates their location on the front panel LEDs, and transmits the status to the PLC.

Specifications

Specifications for the Quantum 140AIO33000 Intrinsically Safe Analog Output module are as follows.

Specifications	
Number of Channels	8
LEDs	Active (Green) F (Red) 1 ... 8 (Green) - Module output switched ON 1 ... 8 (Red) - Broken wire on indicated Channel (4 ... 20 mArange)
Loop Resistance	500 ohms maximum
Ranges	4 ... 20 mA (0 to 4095) 4 ... 20 mA (0 to 16000) 0 ... 20 mA (0 to 20000) 0 ... 25mA (0 to 25000)
Resolution	15 bits within 4 ... 20 mA
Accuracy Drift w/ Temperature	Typical: 40 PPM/°C. Maximum: 70 PPM/°C
Accuracy Error @ 25°C	+/- 0.2% of full scale
Linearity	+/- 1 LSB
Isolation	
Channel to Channel	None
Channel to Bus	1780 Vac RMS for 1 minute
Update Time	4 ms - for all channels
Settling Time	1 ms to +/- 0.1% of the final value
Bus Current Required	2.5 Amp
Power Dissipation	12.5 W
External Power	Not required for this module
Fault Detection	Open circuit in 4 ... 20 mA range
Voltmeter Monitor Specifications	
Range	0.250 ... 1.250 V
Scaling	V_{OUT} (Volts) = I_{LOOP} (mA) x 0.0625
Output Impedance	62.5 W Typical
Wire Length	1 m maximum
Hot Swap	Not allowed per intrinsic safety standards
Fusing	Internal - not user accessible
Programming Software	Modsoft Ver. 2.61or higher

Field Wiring

Field wiring to the module should consist of separate shielded, twisted pair wires. The acceptable field wire gauge should be AWG 30 to AWG 18. Wiring between the module and the intrinsically safe field device should follow intrinsically safe wiring practices to avoid the transfer of unsafe levels of energy to the hazardous area.

Fixed Wiring System

The Quantum140AIO33000 Intrinsically Safe Analog Output module is designed with a fixed wiring system where the field connections are made to a 40-pin, fixed position, blue terminal strip which is plugged into the module.

Terminal Strip Color and Keying Assignment

The module’s 140XTS33200 field wiring terminal strip is color-coded blue to identify it as an intrinsically safe connector.
The terminal strip is keyed to prevent the wrong connector from being applied to the module. The keying assignment is given below.

Module Class	Module Part Number	Module Coding	Terminal Strip Coding
Intrinsically Safe	140AIO33000	CEF	ABD

Agency Approved Wiring Diagrams

The following is a CSA certified wiring diagram for this module.

Notes related to CSA certification for this module.

Note 1. Entity parameters per channel: $V_{oc} = 29.42$ V
$I_{sc} = 93$ mA
$C_a = 71$ nf
$L_a = 2.0$ mH

Note 2. Maximum non-hazardous area voltage must not exceed 250 V.

Note 3. Install in accordance with Canadian Electrical Code, Part I for installation in Canada.

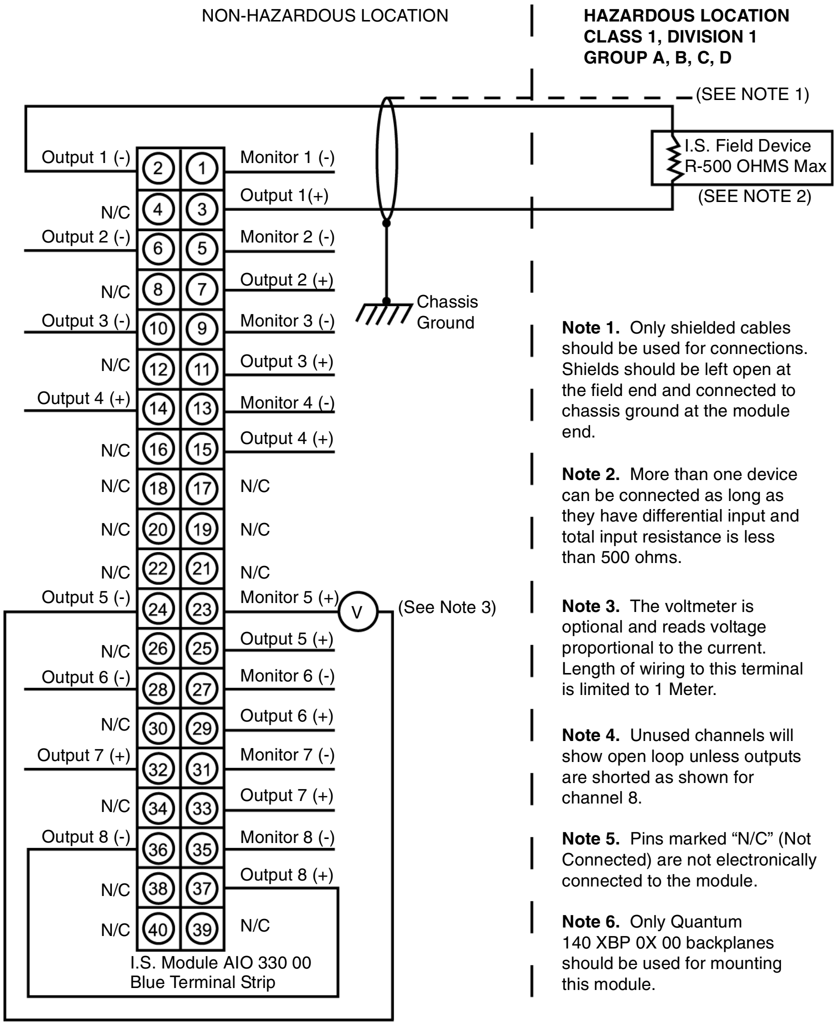
Note 4. Install in accordance with the NEC (ANSI/NFPA 70) and ANSI/ISA RP 12.6 for installation in the United States.

Note 5. To maintain intrinsic safety, shield for each cable must be grounded and must extend as close to the terminals as possible.

Note 6. Intrinsically Safe (I.S.) cables of one module must be routed separately from I.S. cables of another module.

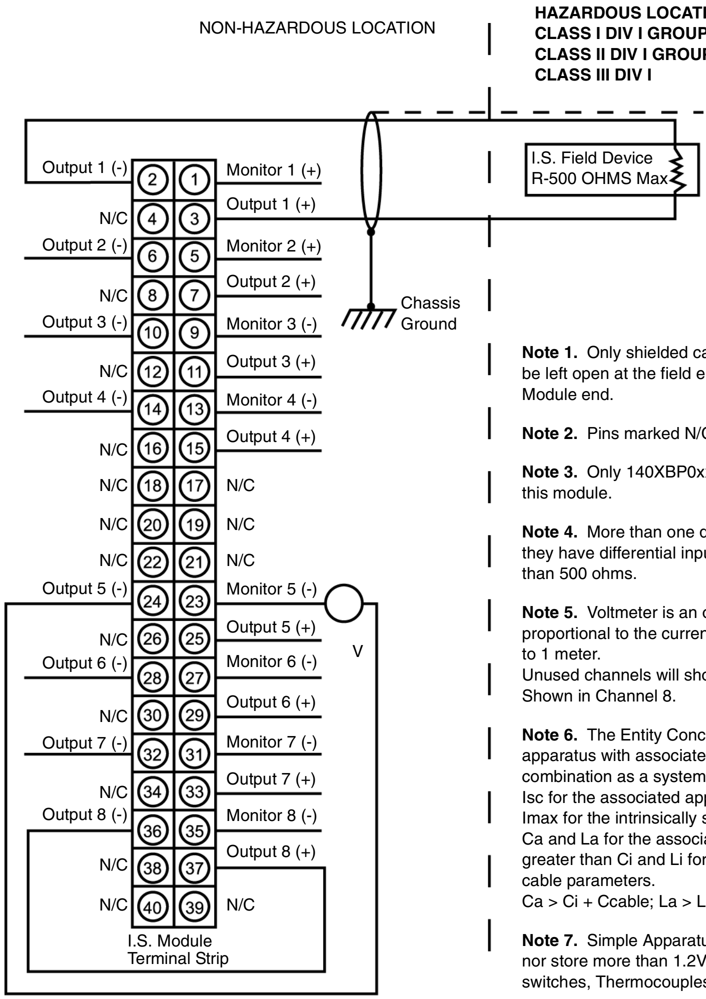
Note 7. I.S. devices when connected to I.S. terminals must satisfy the following conditions:
$V_{cc} < V_{max}$
$I_{sc} < I_{max}$
$C_a > C_i + C_{cable}$
$L_a > L_i + L_{cable}$

Note 8. This module is certified as a component for mounting in a suitable enclosure where the suitability of the final combination is subject to acceptance by CSA or an inspection authority having the jurisdiction.



31001364 Rev 00 140AIO33000 Wiring Diagram

The following is a FM certified wiring diagram for this module.



140AIO33000 Wiring Diagram
31001364 Rev 00

Notes Related to FM Certification

This IS field device should meet Note 7 or should be FM approved with entity concept in Note 6 appropriate for connection with IS RTD/TC IN Module with Concept Parameters Listed below.
The entity parameters are per Channel.
Voc = 29.5 VDC
Isc = 94 mA/Ch
Ca = 58 nf/Ch
La = 4.2 uH/Ch
Po = 520 mW/Ch

Note 1. Only shielded cables should be used for connections. Shields should be left open at the field end and connected to chassis ground at the Module end.

Note 2. Pins marked N/C are not electonically connected to the Module.

Note 3. Only 140XBP0xx00 backplanes should be used for mounting this module.

Note 4. More than one device can be connected in series as long as they have differential input and total load resistance is less than 500 ohms.

Note 5. Voltmeter is an optional Voltmeter shown to read voltage proportional to the current. Wiring to this terminal is limited to 1 meter.
Unused channels will show Open Loop unless shorted as Shown in Channel 8.

Note 6. The Entity Concept allows interconnection of intrinsically safe apparatus with associated apparatus not specifically examined in combination as a system when the approved values of Voc and Isc for the associated apparatus are less than or equal to Vmax and Imax for the intrinsically safe apparatus and the approved values of Ca and La for the associated apparatus must be equal to or are greater than Ci and Li for the intrinsically Safe apparatus plus all cable parameters.
Ca > Ci + Ccable; La > Li + Lcable; Voc < Vmax; Isc < Imax

Note 7. Simple Apparatus is defined as a device which will neither generate nor store more than 1.2V, 0.1A, 20uJ, or 25 mW. For examples switches, Thermocouples, LEDs and RTDs, etc.

Note 8. Wiring methods must be in accordance with National Electrical Code NFPA 70, Article 504 and ANSI/ISA RP12.6, “Wiring Practices for Hazardous (classified) Locations Instrumentation Part I: Intrinsic Safety”.

Note 9. Control room equipment connected to associated apparatus should not use or generate more than 250Vrms.

Note 10. All modules must be installed in an enclosure that meets the requirements of ANSI/ISA S82.01

Note 11. No revisions to this drawing without prior FMRC Approval.

The following is a UL certified wiring diagram for this module.

Notes related to UL certification for this module.

Note 1. Entity parameters per channel: $V_{oc} = 29.5$ V
$I_{sc} = 93$ mA
$C_a = 68$ nf
$L_a = 2.0$ mH

Note 2. Maximum non-hazardous area voltage must not exceed 250 V.

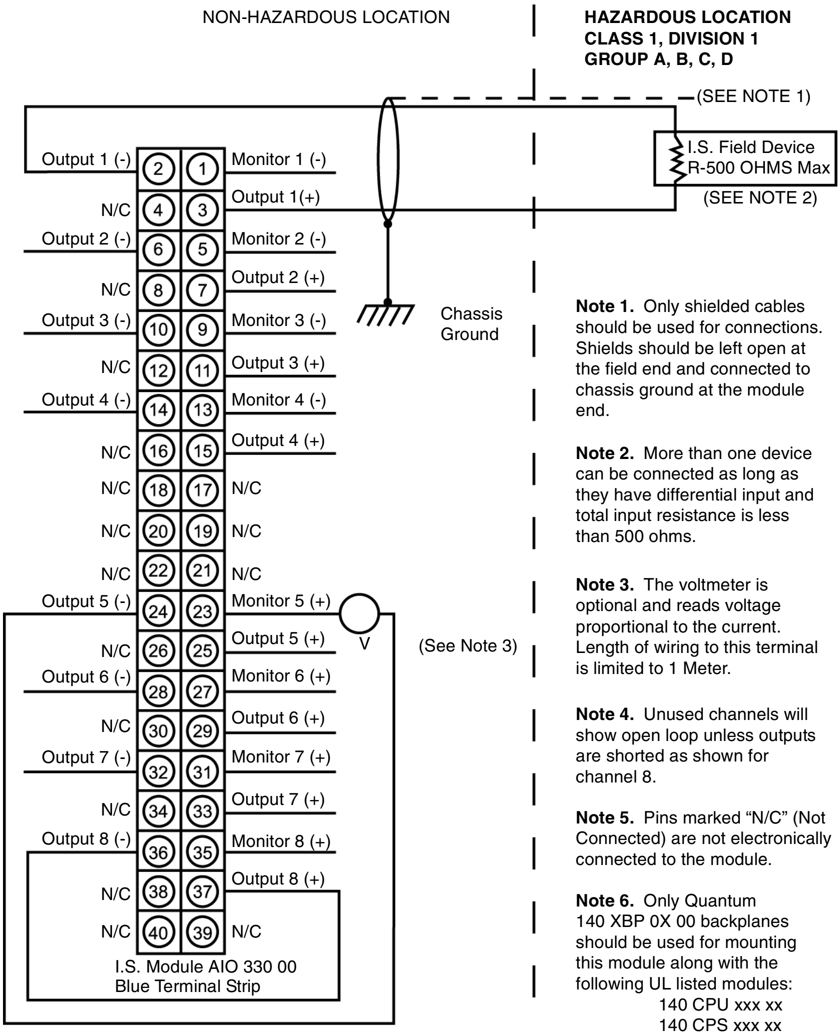
Note 3. If the electrical parameter of the cable are unknown, the following values must be used for Ccable and Lcable:
Capacitance 60 Pf/ft
Inductance 0.20 uH/ft

Note 4. Install in accordance with the NEC (ANSI/NFPA 70) and ANSI/ISA RP 12.6 for installation in the United States.

Note 5. To maintain intrinsic safety, shield for each cable must be grounded and must extend as close to the terminals as possible.

Note 6. Intrinsically Safe (I.S.) cables of one module must be routed separately from I.S. cables of another module.

Note 7. I.S. devices when connected to I.S. terminals must satisfy the following conditions:
$V_{oc} < V_{max}$
$I_{sc} < I_{max}$
$C_a > C_{i} + C_{cable}$
$L_a > L_{i} + L_{cable}$



Note 1. Only shielded cables should be used for connections. Shields should be left open at the field end and connected to chassis ground at the module end.

Note 2. More than one device can be connected as long as they have differential input and total input resistance is less than 500 ohms.

Note 3. The voltmeter is optional and reads voltage proportional to the current. Length of wiring to this terminal is limited to 1 Meter.

Note 4. Unused channels will show open loop unless outputs are shorted as shown for channel 8.

Note 5. Pins marked "N/C" (Not Connected) are not electronically connected to the module.

Note 6. Only Quantum 140 XBP 0X 00 backplanes should be used for mounting this module along with the following UL listed modules:
140 CPU xxx xx
140 CPS xxx xx

31001364 Rev 00 140AIO33000 Wiring Diagram

15.3 Intrinsically Safe Discrete Modules

At a Glance

Overview

This section provides information on the intrinsically safe discrete modules, 140DII33000 and 140DIO33000.

What's in this Section?

This section contains the following topics:

Topic	Page
I/O Configuration for Intrinsically Safe Discrete Modules	464
140DII33000 Intrinsically Safe Discrete Input Module	466
140DIO33000 Intrinsically Safe Discrete Output Module	473

I/O Configuration for Intrinsically Safe Discrete Modules

Overview

This section provides information on the I/O configuration of the intrinsically safe discrete modules, 140DII33000 and 140DIO33000.

Intrinsically Safe Discrete Input Module

The following is the intrinsically safe discrete input module:
- 140DII33000 (DC, intrinsic safe)

I/O Map Register Assignment

This 8-point input module can be configured as either 8 contiguous discrete input (1x) references or as one 3x register. The following figure shows an I/O map register.

								1	2	3	4	5	6	7	8

CAUTION

I/O Mapping Rules

When I/O mapping input modules using discrete (1x) references in remote drops, users should not split discrete words between drops. The lowest discrete reference for a drop should start on a word boundary.

Failure to follow this precaution can result in injury or equipment damage.

I/O Map Status Byte

There is no I/O map status byte associated with this module.

Modsoft Module Zoom Selections

Push <Enter> to display and select the input type. The following figure shows the input type display.

input Type:

BIN

BCD

Intrinsically Safe Discrete Output Module

The following shows the 8-point discrete output module:
- 140DIO33000 (DC, Intrinsic Safe

I/O Map Register Assignment

The ouput modules listed above can be configured as either eight contiguous discrete output (0x) references or as one output (4x) register. The following figure shows the format for the output modules.

								1	2	3	4	5	6	7	8

I/O Map Status Byte

There is no I/O Map status byte associated with this module.

Module Zoom Selections

Push <Enter> to display and select the output type and timeout state for the module. Timeout state isassumed when system control of the module is stopped.

Output Type: $\boxed{\text{BIN}}$ BCD

Timeout State: Last Value $\boxed{\text{User Defined}}$

User Defined Timeout State Points 1- 8: 00000000

140DII33000 Intrinsically Safe Discrete Input Module

Overview

The Quantum 140DII33000 Intrinsically Safe Discrete Input module provides safe power to dry contact closures e.g., push buttons, selector switches, float switches, flow switches, limit switches, etc., in a hazardous area, and receives the proportional current to indicate an on/off state. The received current is converted into digital signals that is transferred to the PLC.

Specifications

The following table provides specifications for the DII33000 Intrinsically Safe Discrete Input module.

Specifications	
Number of Input Points	8
LEDs	Active (Green) 1 ... 8 (Green) – Indicates point status
Operating Voltages and Currents	
No load voltage (between input + and input -)	8 Vdc
Short circuit current	8 mA
Switching point	1.2 mA ... 2.1 mA
Switching hysteresis	0.2 mA
Switching Frequency	100 Hz maximum
Response	
OFF-ON	1 ms
ON-OFF	1 ms
Isolation	
Channel to Channel	None
Channel to Bus	1780 Vac, 47-63 Hz or 2500 Vdc for 1 min.
Internal Resistance	2.5 KΩ
Input Protection	Resistor limited
Fault Detection	None
Bus Current Required	400 mA
Power Dissipation	2 W
External Power	Not required
Hot Swap	Not allowed per intrinsic safety standards
Fusing	Internal - not user accessible
Programming Software	Modsoft Ver. 2.61 or higher

Fixed Wiring System

The DII33000module is designed with a fixed wiring system where the field connections are made to a 40-pin, fixed position, blue terminal strip which is plugged into the module.

Field Wiring

Field wiring to the module consists of separate shielded twisted pair wires. The acceptable field wire gauge is AWG 20 to AWG 12. Wiring between the module and the intrinsically safe field device should follow intrinsically safe wiring practices, to avoid the transfer of unsafe levels of energy to the hazardous area.

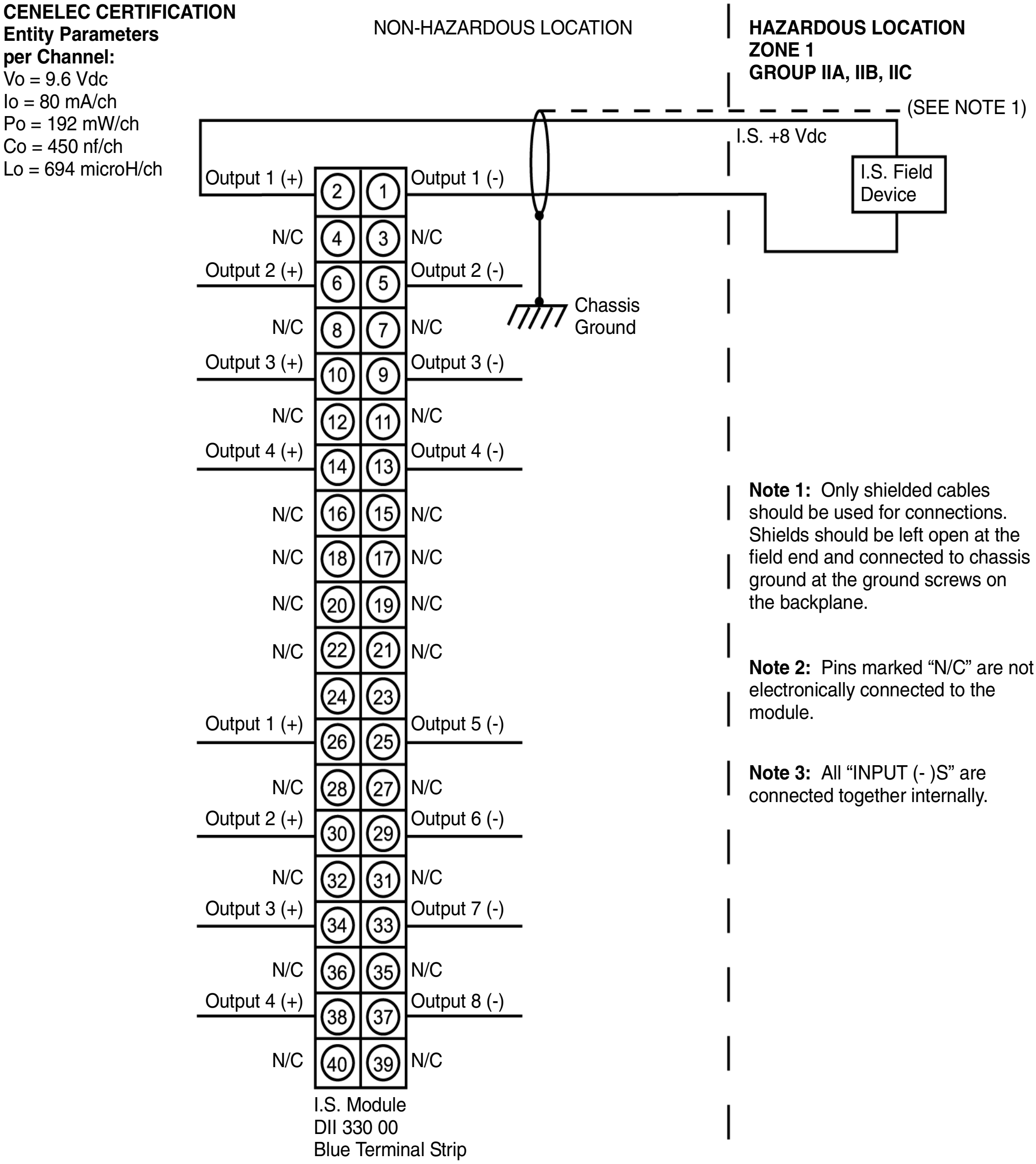
Terminal Strip Color and Keying Assignment

The module's 140XTS33200 field wiring terminal strip is color-coded blue to identify it as an intrinsically safe connector.
The terminal strip is keyed to prevent the wrong connector from being applied to the module. The keying assignment is given below.

Module Class	Module Part Number	Module Coding	Terminal Strip Coding
Intrinsically Safe	140 DII 330 00	CDE	ABF

Agency Approved Wiring Diagrams

The following is a Cenelec certified wiring diagram for this module.



31001365 Rev 00 140DII33000 Wiring Diagram

The following is a CSA certified wiring diagram for this module.

Notes related to CSA certification for this module.

Note 1. Entity parameters per module: $V_{oc} = 9.5$ V
$I_{sc} = 80$ mA
$C_a = 450$ nf
$L_a = 694$ mH

Note 2. Maximum non-hazardous area voltage must not exceed 250 V.

Note 3. Install in accordance with Canadian Electrical Code, Part I, for installation in Canada.

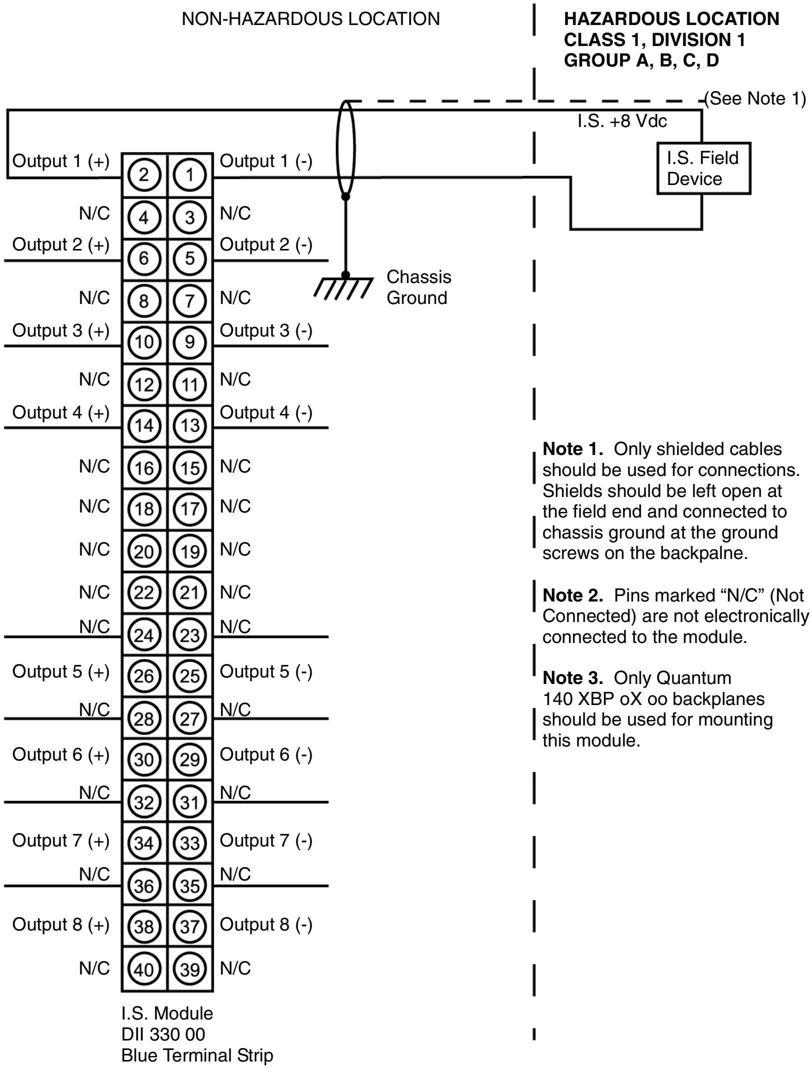
Note 4. Install in accordance with the NEC (ANSI/NFPA 70) and ANSI/ISA RP 12.6 for installation in the United States.

Note 5. To maintain intrinsic safety, shield for each cable must be grounded and must extend as close to the terminals as possible.

Note 6. Intrinsically Safe (I.S.) cables of one module must be routed separately from I.S. cables of another module.

Note 7. I.S. devices when connected to I.S. terminals must satisfy the following conditions:
$V_{oc} < V\text{max}$
$I_{sc} < I\text{max}$
$C_a > C_i + C_{cable}$
$L_a > L_i + L_{cable}$

Note 8. This module is certified as a component for mounting in a suitable enclosure where the suitability of the final combination is subject to acceptance by CSA or an inspection authority having the jurisdiction.



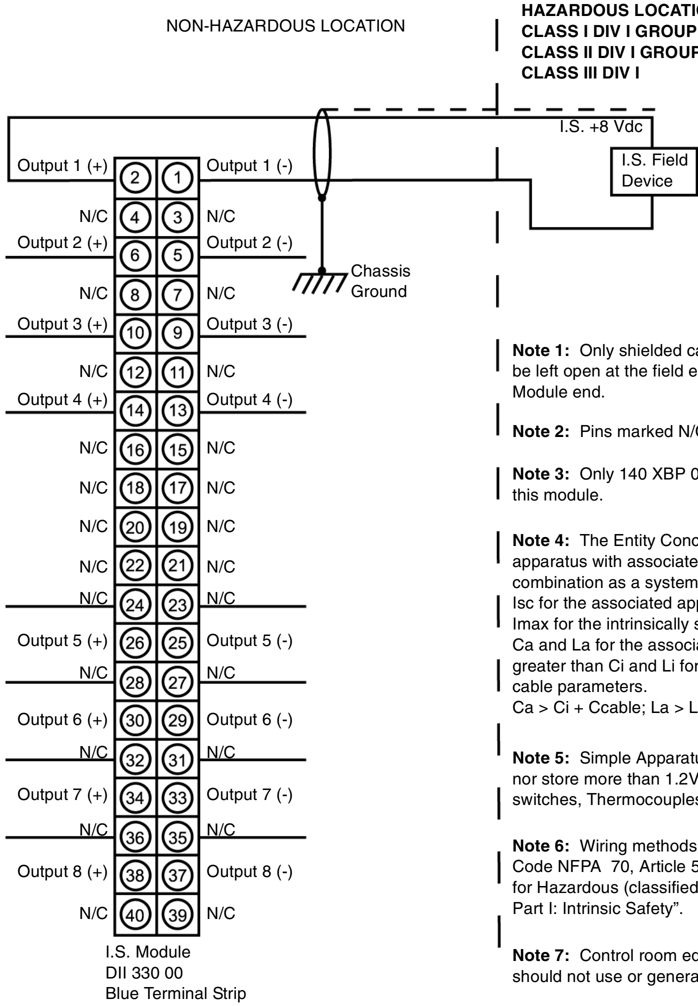
Note 1. Only shielded cables should be used for connections. Shields should be left open at the field end and connected to chassis ground at the ground screws on the backpalne.

Note 2. Pins marked “N/C” (Not Connected) are not electronically connected to the module.

Note 3. Only Quantum 140 XBP oX oo backplanes should be used for mounting this module.

31001365 Rev 00 140DII33000 Wiring Diagram

The following is a FM certified wiring diagram for this module.



Notes Related to FM Certification

This IS field device should meet Note 5 or should be FM approved with entity concept in Note 4 appropriate for connection with IS RTD/TC IN Module with Concept Parameters Listed below.
The entity parameters are:
Voc = 9.6 VDC/Ch
Isc = 80 mA/Module
Ca = 450 nf/Ch
La = 0.694 uH/Ch
Po = 192 mW/Module

Note 1: Only shielded cables should be used for connections. Shields should be left open at the field end and connected to chassis ground at the Module end.

Note 2: Pins marked N/C are not electonically connected to the Module.

Note 3: Only 140 XBP 0xx 00 backplanes should be used for mounting this module.

Note 4: The Entity Concept allows interconnection of intrinsically safe apparatus with associated apparatus not specifically examined in combination as a system when the approved values of Voc and Isc for the associated apparatus are less than or equal to Vmax and Imax for the intrinsically safe apparatus and the approved values of Ca and La for the associated apparatus must be equal to or are greater than Ci and Li for the intrinsically Safe apparatus plus all cable parameters.
Ca > Ci + Ccable; La > Li + Lcable; Voc < Vmax; Isc < Imax

Note 5: Simple Apparatus is defined as a device which will neither generate nor store more than 1.2V, 0.1A, 20uJ, or 25 mW. For examples switches, Thermocouples, LEDs and RTDs, Etc.

Note 6: Wiring methods must be in accordance with National Electrical Code NFPA 70, Article 504 and ANSI/ISA RP12.6, “Wiring Practices for Hazardous (classified) Locations Instrumentation Part I: Intrinsic Safety”.

Note 7: Control room equipment connected to associated apparatus should not use or generate more than 250Vrms.

Note 8: All modules must be installed in an enclosure that meets the requirements of ANSI/ISA S82.01

Note 9: No revision to this drawing without prior FMRC Approval.

31001365 Rev 00

140DII33000 Wiring Diagram

The following is a UL certified wiring diagram for this module.

Notes related to UL certification for this module.

Note 1. Entity parameters per channel: $V_{oc} = 9.5$ V
$I_{sc} = 80$ mA
$C_a = 450$ nf
$L_a = 0.175$ mH

Note 2. Maximum non-hazardous area voltage must not exceed 250 V.

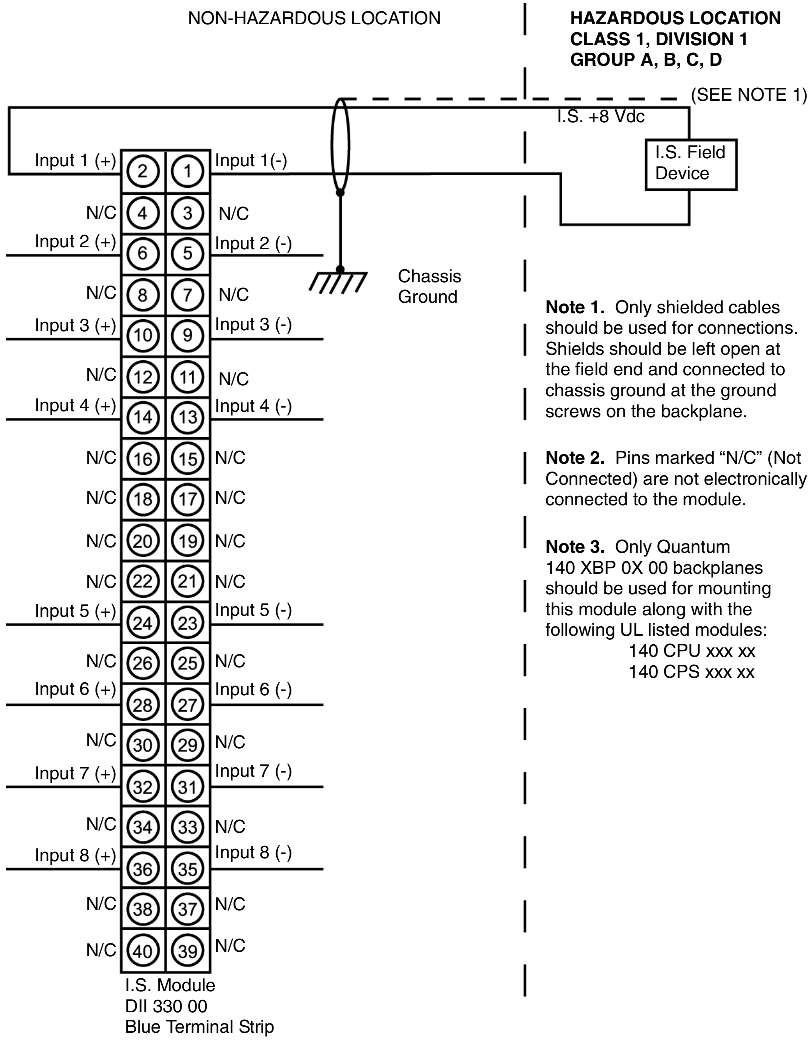
Note 3. If the electrical parameters of the cable are unknown, the following values must be used for Ccable and Lcable:
Capactance 60 Pf/ft
Inductance 0.20 uH/ft

Note 4. Install in accordance with the NEC (ANSI/NFPA 70) and ANSI/ISA RP 12.6 for installation in the United States.

Note 5. To maintain intrinsic safety, shield for each cable must be grounded and must extend as close to the terminals as possible.

Note 6. Intrinsically Safe (I.S.) cables of one module must be routed separately from I.S. cables of another module.

Note 7. I.S. devices when connected to I.S. terminals must satisfy the following conditions:
$V_{oc} < V_{max}$
$I_{sc} < I_{max}$
$C_a > C_{i} + C_{cable}$
$L_a > L_{i} + L_{cable}$



Note 1. Only shielded cables should be used for connections. Shields should be left open at the field end and connected to chassis ground at the ground screws on the backplane.

Note 2. Pins marked “N/C” (Not Connected) are not electronically connected to the module.

Note 3. Only Quantum 140 XBP 0X 00 backplanes should be used for mounting this module along with the following UL listed modules:
140 CPU xxx xx
140 CPS xxx xx

31001365 Rev 00 140DII33000 Wiring Diagram

140DIO33000 Intrinsically Safe Discrete Output Module

Overview

The Quantum 140DIO33000 Intrinsically Safe Discrete Output module switches intrinsically safe power to a variety of components such as solenoid valves, LEDs, etc., that are located in a hazardous area. This module is for use with sink devices only.

Specifications

Specifications for the DIO33000 module are as follows.

Specifications	
Number of Output Points	**8**
LEDs	Active-1 (Green) 1 ... 8 (Green) – Indicates point status
Output Voltage	24 V (open)
Maximum Load Current	
Each Point	45 mA
Per Module	360 mA
Off State Leakage/Point	0.4 mA
Response (Resistive Loads)	
OFF-ON	1 ms
ON-OFF	1 ms
Output Protection (Internal)	Transient voltage suppression
Isolation	
Channel to Channel	None
Channel to Bus	1780 Vac, 47-63 Hz or 2500 Vdc for 1 min.
Fault Detection	None
Bus Current Required	2.2 Amp (full load)
Power Dissipation	5 W (full load)
External Power	Not required
Hot Swap	Not allowed per intrinsic safety requirements
Fusing	Internal - not user accessible
Programming Software	Modsoft Ver. 2.61 or higher

Fixed Wiring System

The DIO33000 module is designed with a fixed wiring system where the field connections are made to a 40-pin, fixed position, blue terminal strip, which is plugged into the module.

Field Wiring

Field wiring to the module consists of separate shielded, twisted pair wires. The acceptable field wire gauge is AWG 20 to AWG 12. Wiring between the module and the intrinsically safe field device should follow intrinsically safe wiring practices, to avoid the transfer of unsafe levels of energy to the hazardous area.

Terminal Strip Color and Keying Assignment

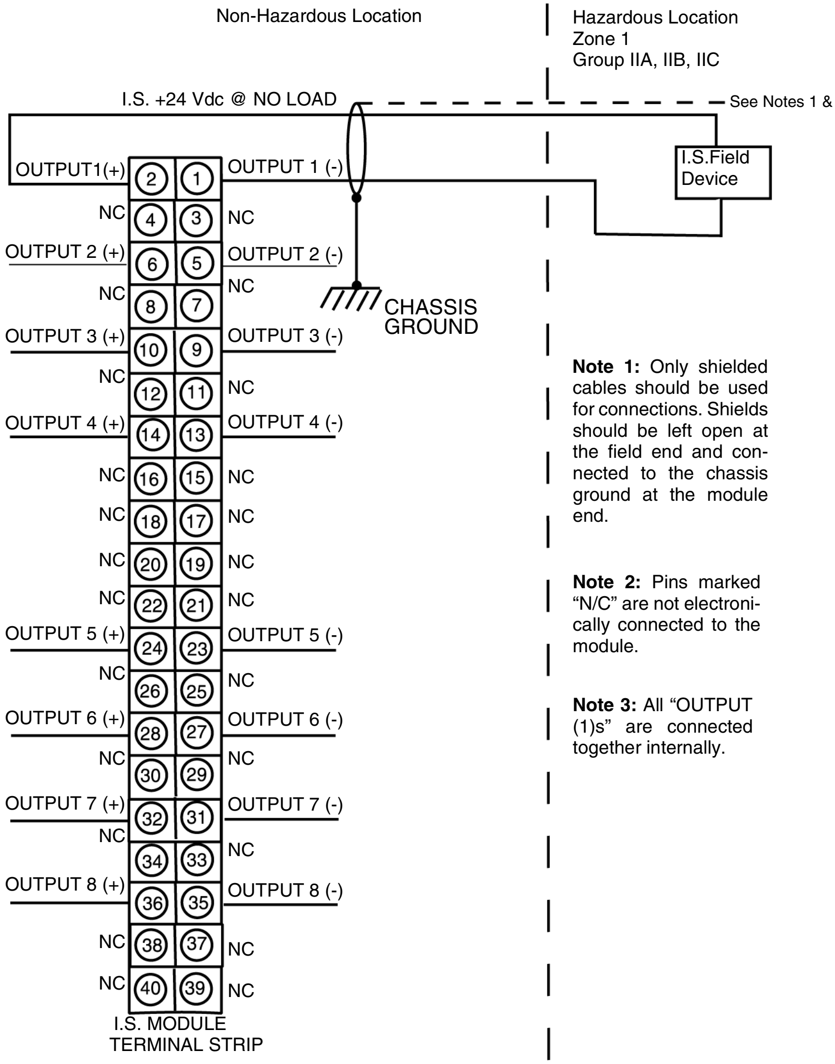
The module's 140XTS33200 field wiring terminal strip is color-coded blue to identify it as an intrinsically safe connector.
The terminal strip is keyed to prevent the wrong connector from being applied to the module. The keying assignment is given below.

Module Class	Module Part Number	Module Coding	Terminal Strip Coding
Intrinsically Safe	140DIO33000	CDE	ABF

Agency Approved Wiring Diagrams

The following is a Cenelec certified wiring diagram for this module.

CENELEC CERTIFICATION
Entity Paramenters
per Channel
V_o = 27.9 Vdc
I_o = 121 mA/ch
P_o = 840 mW/ch
C_o = 84 nf/ch
L_o = 2.2 mH/ch



Note 1: Only shielded cables should be used for connections. Shields should be left open at the field end and connected to the chassis ground at the module end.

Note 2: Pins marked "N/C" are not electronically connected to the module.

Note 3: All "OUTPUT (1)s" are connected together internally.

The following is a CSA certified wiring diagram for this module.

Notes related to CSA certification for this module.

Note 1. Entity parameters per channel: V_{oc} = 27.9 V
I_{sc} = 119 mA
C_a = 84 nf
L_a = 1.0 mH

Note 2. Maximum non-hazardous area voltage must not exceed 250 V.

Note 3. Install in accordance with Canadian Electrical Code, Part I, for installation in Canada.

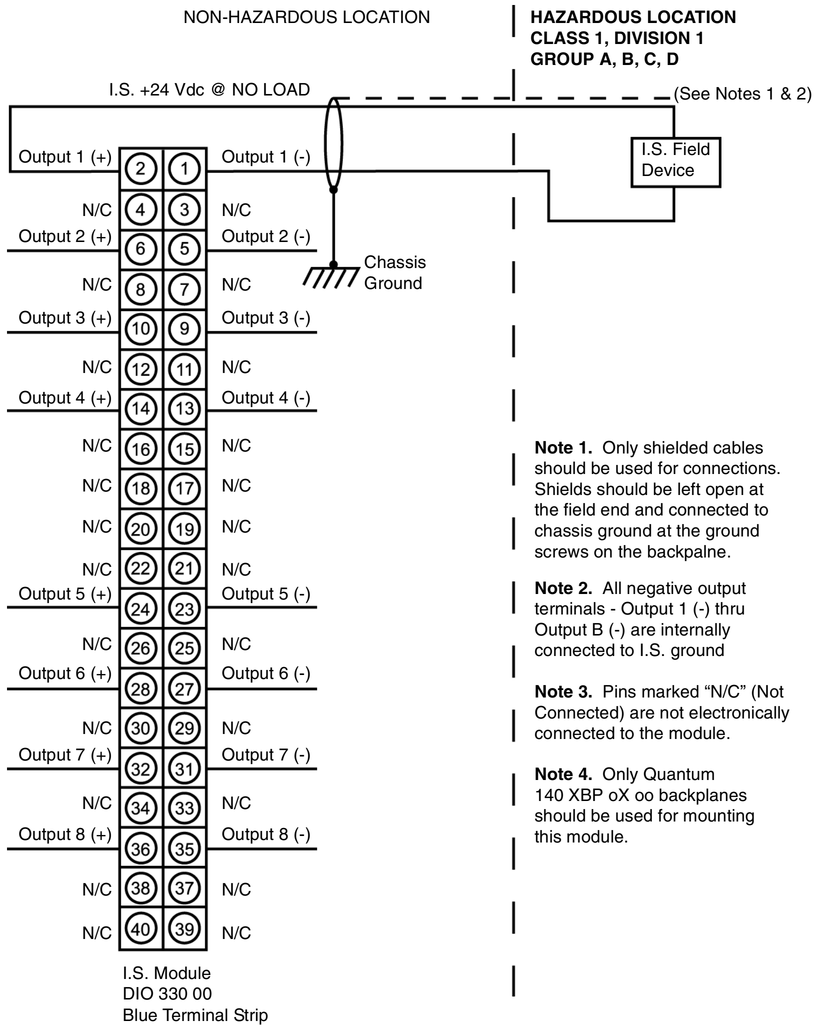
Note 4. Install in accordance with the NEC (ANSI/NFPA 70) and ANSI/ISA RP 12.6 for installation in the United States.

Note 5. To maintain intrinsic safety, shield for each cable must be grounded and must extend as close to the terminals as possible.

Note 6. Intrinsically safe (I.S.) cables of one module must be routed separately from I.S. cables of another module.

Note 7. I.S. devices when connected to I.S. terminals must satisfy the following conditions:
V_{oc} < Vmax
I_{sc} < Imax
$C_a > C_{i} + C_{cable}$
$L_a > L_{i} + L_{cable}$

Note 8. This module is certified as a component for mounting in a suitable enclosure where the suitability of the final combination is subject to acceptance by CSA or an inspection authority having the jurisdiction.



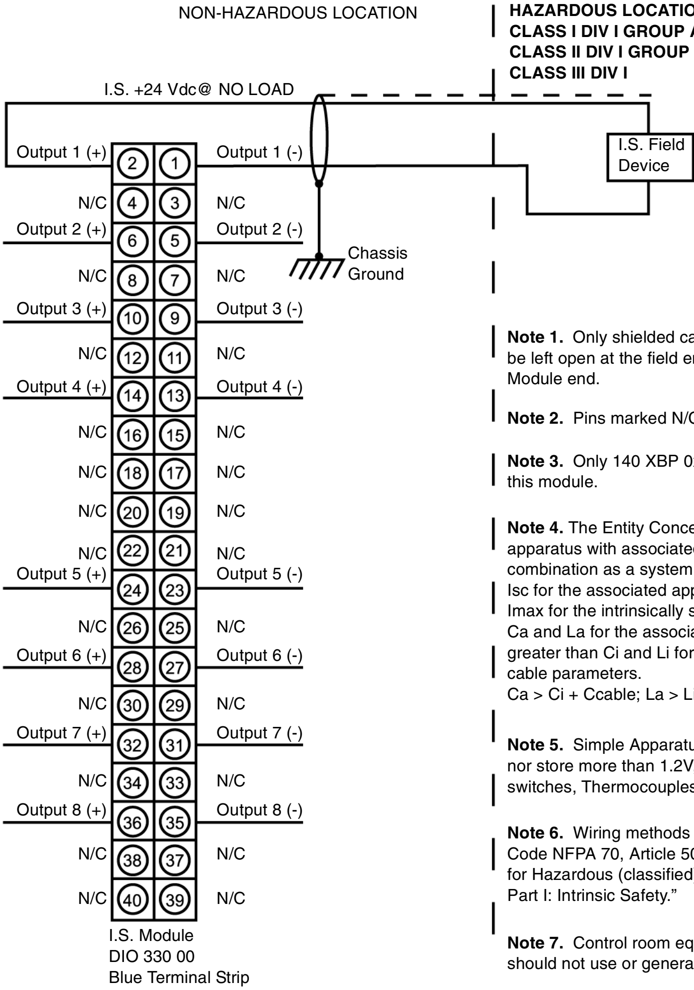
Note 1. Only shielded cables should be used for connections. Shields should be left open at the field end and connected to chassis ground at the ground screws on the backpalne.

Note 2. All negative output terminals - Output 1 (-) thru Output B (-) are internally connected to I.S. ground

Note 3. Pins marked “N/C” (Not Connected) are not electronically connected to the module.

Note 4. Only Quantum 140 XBP oX oo backplanes should be used for mounting this module.

The following is a FM certified wiring diagram for this module.



Notes Related to FM Certification

This IS field device should meet Note 5 or should be FM approved with entity concept in Note 4 appropriate for connection with IS RTD/TC IN Module with Concept Parameters Listed below.
The entity parameters are per Channel.
Voc = 27.9 VDC
Isc = 121 mA/Ch
Ca = 84 nf/Ch
La = 2.2 mH/Ch
Po = 840 mW/Ch

Note 1. Only shielded cables should be used for connections. Shields should be left open at the field end and connected to chassis ground at the Module end.

Note 2. Pins marked N/C are not electronically connected to the Module.

Note 3. Only 140 XBP 0xx 00 backplanes should be used for mounting this module.

Note 4. The Entity Concept allows interconnection of intrinsically safe apparatus with associated apparatus not specifically examined in combination as a system when the approved values of Voc and Isc for the associated apparatus are less than or equal to Vmax and Imax for the intrinsically safe apparatus and the approved values of Ca and La for the associated apparatus must be equal to or are greater than Ci and Li for the intrinsically Safe apparatus plus all cable parameters.
Ca > Ci + Ccable; La > Li + Lcable; Voc < Vmax; Isc < Imax

Note 5. Simple Apparatus is defined as a device which will neither generate nor store more than 1.2V, 0.1A, 20uJ, or 25 mW. For examples switches, Thermocouples, LEDs and RTDs, Etc.

Note 6. Wiring methods must be in accordance with National Electrical Code NFPA 70, Article 504 and ANSI/ISA RP1.2.6, “Wiring Practices for Hazardous (classified) Locations Instrumentation Part I: Intrinsic Safety.”

Note 7. Control room equipment connected to associated apparatus should not use or generate more than 250Vrms.

Note 8. All modules must be installed in an enclosure that meets the requirements of ANSI/ISA S82.01

Note 9. No revision to this drawing without prior FMRC Approval.

31001366 Rev 00 140DIO33000 Wiring Diagram

The following is a UL certified wiring diagram for this module.

Notes related to UL certification for this module.

Note 1. Entity parameters per channel: $V_{oc} = 27.9$ V
$I_{sc} = 119$ mA
$C_a = 84$ nf
$L_a = 1.0$ mH

Note 2. Maximum non-hazardous area voltage must not exceed 250 V.

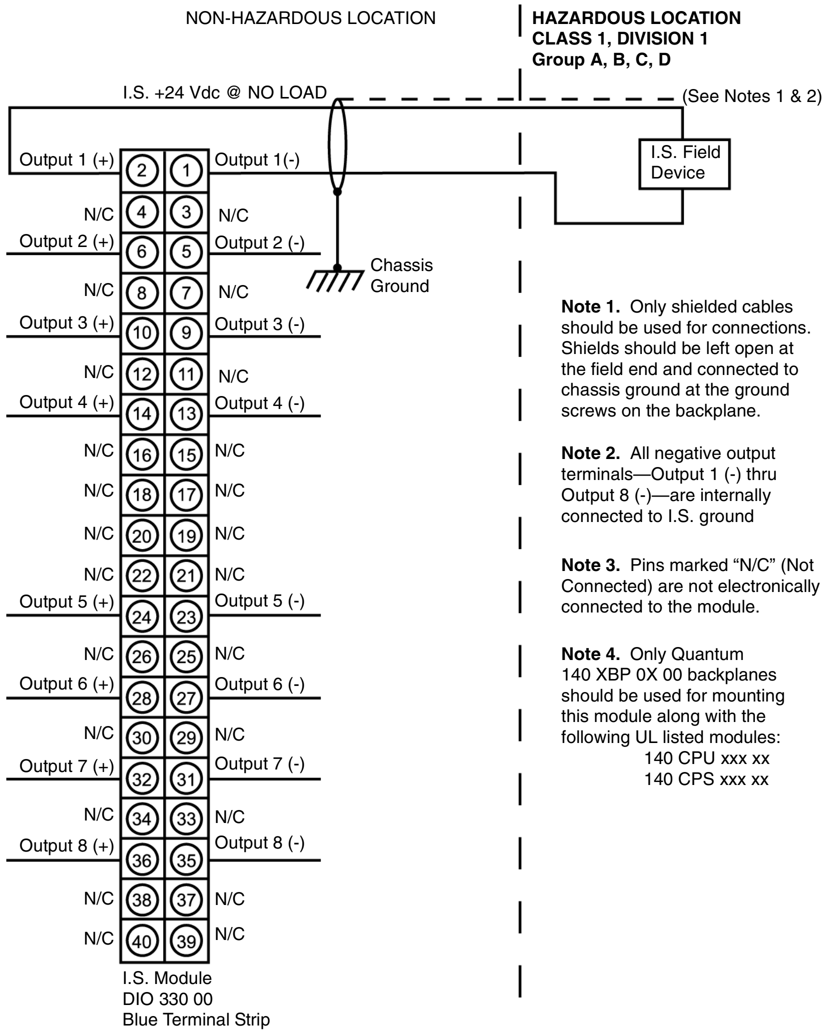
Note 3. If the electrical parameters of the cable are unknown, the following values must be used for Ccable and Lcable:
Capacitance 60 Pf/ft
Inductance 0.20 uH/ft

Note 4. Install in accordance with the NEC (ANSI/NFPA 70) and ANSI/ISA RP 12.6 for installation in the United States.

Note 5. To maintain intrinsic safety, shield for each cable must be grounded and must extend as close to the terminals as possible.

Note 6. Intrinsically Safe (I.S.) cables of one module must be routed separately from I.S. cables of another module.

Note 7. I.S. devices when connected to I.S. terminals must satisfy the following conditions:
$V_{cc} < V_{max}$
$I_{sc} < I_{max}$
$C_a > C_i + C_{cable}$
$L_a > L_i + L_{cable}$



Note 1. Only shielded cables should be used for connections. Shields should be left open at the field end and connected to chassis ground at the ground screws on the backplane.

Note 2. All negative output terminals—Output 1 (-) thru Output 8 (-)—are internally connected to I.S. ground

Note 3. Pins marked “N/C” (Not Connected) are not electronically connected to the module.

Note 4. Only Quantum 140 XBP 0X 00 backplanes should be used for mounting this module along with the following UL listed modules:
140 CPU xxx xx
140 CPS xxx xx

31001366 Rev 00 140DIO33000 Wiring Diagram

Quantum Simulator Modules

16

At a Glance

Introduction

This chapter provides information on discrete and analog simulator modules.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
140XSM00200 Quantum Point Discrete Simulator Module	480
140XSM01000 Analog Simulator Module	482

140XSM00200 Quantum Point Discrete Simulator Module

Overview

The 140XSM00200 module consists of 16 toggle switches which are used to generate up to 16 binary input signals to the 140DAI54000 and the 140DAI74000 AC input modules.

CAUTION

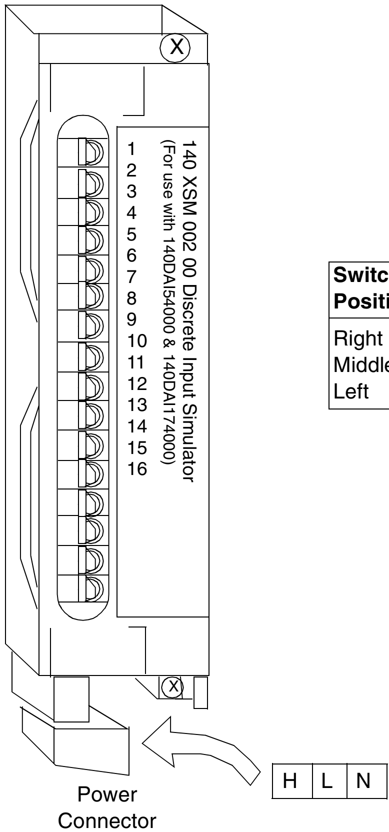
Electrical Shock Hazard

When using this simulator module with the 140DAI74000 input module be careful not to come in contact with the supplied 220 VAC located at the bottom of the simulator module.

Failure to follow this precaution can result in injury or equipment damage.

Point Discrete Simulator Module

The following figure shows the 140XSM00200 16 Point Discrete Simulator module.



Switch Position	Function
Right	Momentary Signal
Middle	Off
Left	Constant Signal

Note: Voltage source range is 24 ... 230 Vac.

140XSM01000 Analog Simulator Module

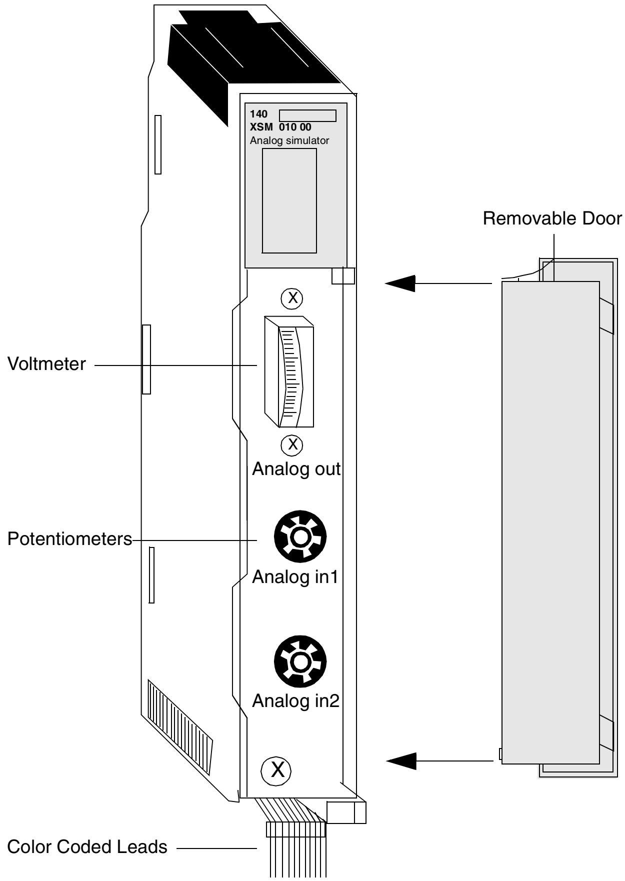
Overview

The 140XSM010module is used for simulating 4 ... 20 mA field current loops used with current input Quantum modules. It provides two adjustable 4 ... 20 mA analog signals and one fixed 24 Vdc output. The simulator also measures and displays voltages from 0 ... 5 Vdc.

The simulator module includes the following:
- An internal 24 Vdc power supply
- A 0 ... 5 Vdc meter
- Two 10-turn potentiometers

Analog Simulator Module

The following figure shows the XSM01000 Analog Simulator module.



Note: The 140XSM01000 can be placed in any slot in the Quantum.

Note: The 140XSM01000 is not a functional module and should be used only for testing, simulating, and calibrating current input Quantum modules.

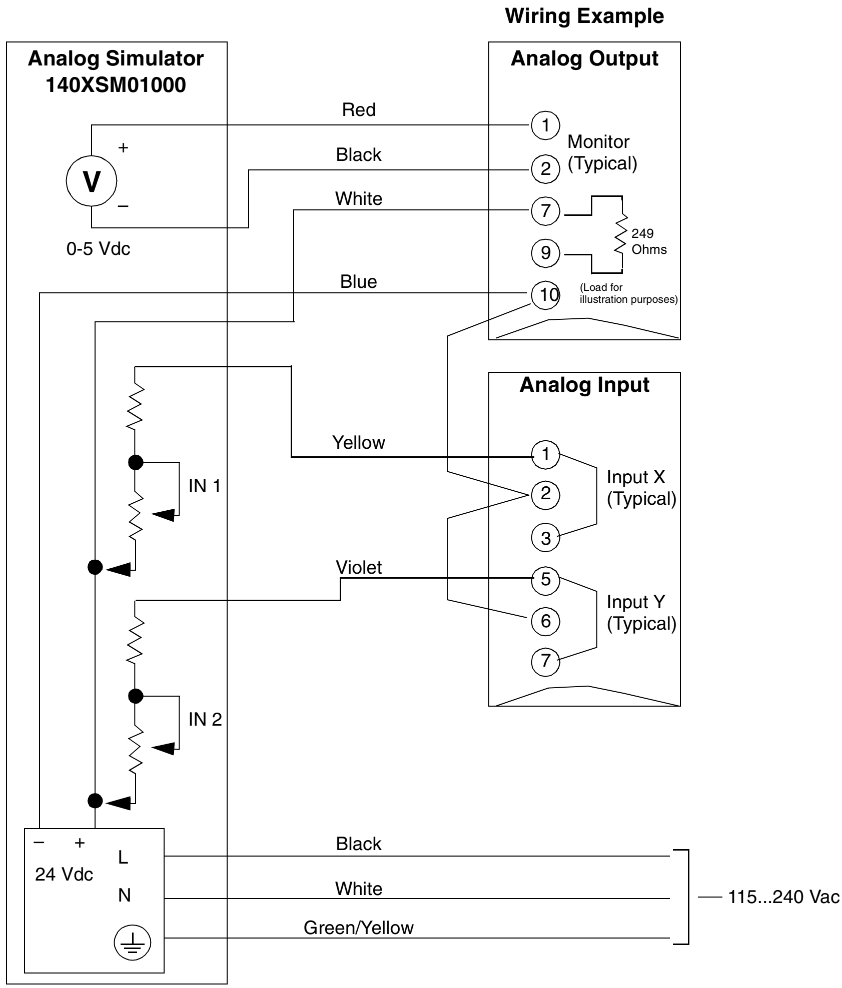
Specifications

The following table shows the specifications for the XSM 010 00 analog simulator module.

Specifications	
Voltage	
Operating Voltage	100 ... 240 Vac, 50/60 Hz
Output Continuous	24 Vdc, 400 mA max
Operating Current	300 mA @ 120 Vac
Voltmeter Range	0 ... 5 Vdc
10-Turn Potentiometer Output Variable Current/Voltage	4 ... 20 mA 1 ... 5 Vdc
Internal Fusing	None
Bus Current Required	None

Wiring Diagram

The following figure shows the 140XSM01000 generic wiring diagram for the 140Axl03000 input modules, 140Ax002000 output modules, and the 140AMM09000 input/output module.



140XSM01000 Generic Wiring Diagram for the 140AxI03000 Input Modules, 140AxO02000 Output Modules, and the 140AMM09000 Input/Output Module

Note: The preceding diagram shows a typical connection between the simulator, a 140ACI03000 input module, and a 140ACO02000 output module. The simulator provides a variable 4 ... 20 mA input to the analog in module. The input can then be read by a Quantum CPU, and, if required, outputted through an analog out module. For the output module to operate properly, the main current loop must be active, and, as shown above, 24 Vdc is supplied between terminals 9 and 10 with a 249 Ohms voltage drop resistor. (For a more detailed description of these modules, refer to *Quantum I/O Modules, p. 495*)

Quantum Battery Module

17

At a Glance

Overview

The following chapter provides information on the battery module, its installations and replacement considerations.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
I/O Configuration for the 140XCP90000 Battery Module	488
140XCP90000 Quantum Battery Module	489

I/O Configuration for the 140XCP90000 Battery Module

Overview

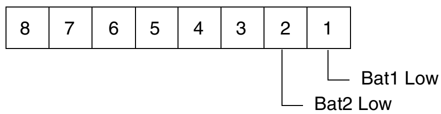
The following provides information on the Battery module, 140XCP90000 (Battery Backup).

I/O Map Register Assignment

There is no I/O Map register assignment associated with this module.

I/O Map Status Byte

The two least significant bits in the I/O Map status byte are used as follows:



Module Zoom Selections

There are no Module Zoom selections required for this module.

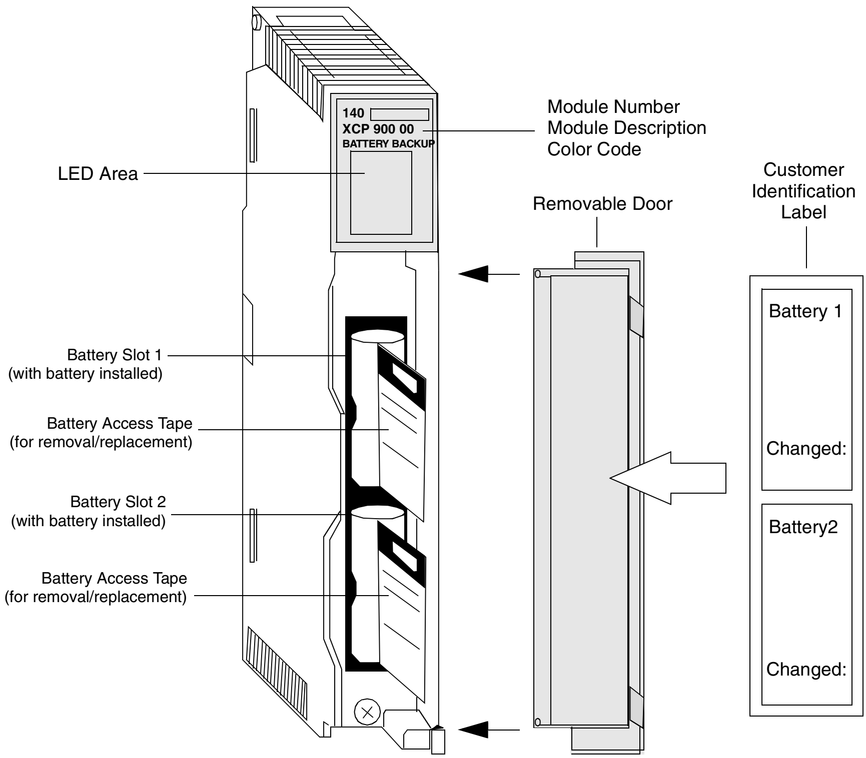
140XCP90000 Quantum Battery Module

Overview

This section describes the battery module, its installation and replacement considerations.

Battery Module

The following figure shows the battery module components.



Battery Backup

The 140XCP90000 provides RAM backup power for expert modules. One non-rechargeable 3.6 V lithium battery is provided and is accessible from the front of the module in Battery Slot 1 (the upper slot) for easy removal when it is necessary to change it.

Note: Extended backup protection is provided when a second battery is installed in Battery Slot 2 (the lower slot).

Specifications

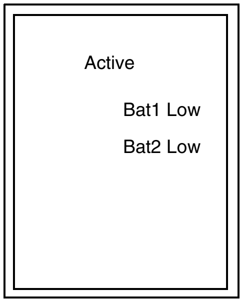
The following table shows the specifications for the battery module.

Specifications	
Battery Type	C, 3 V lithium
Maximum Load Current	100 mA
Service Life	8000 mAh
Shelf Life	10 years with 0.5% loss of capacity per year
Battery Part Number	990XCP99000

Note: The formula to calculate the life cycle of one battery in the battery module is:
Life cycle = 1 / (4 x I) days
where I (in Amps) is the total battery current load of all modules in the backplane.

LED Indicators and Descriptions

The following figure shows the LED indicators.



The following table shows the LED descriptions.

LED Descriptions		
LEDs	**Color**	**Indication when On**
Active	Green	Bus communication is present.
Bat1 Low	Red	Battery 1 voltage is low.
Bat2 Low	Red	Battery 2 voltage is low.

Note: The Bat1 Low and Bat2 Low LEDs turn ON when a battery is not installed, installed backwards, or in need of replacement.

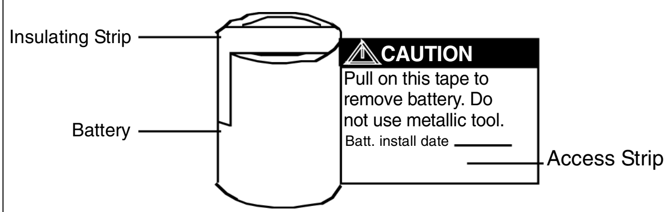
Battery Installation and Replacement Considerations

The following procedure describes the installation of a battery.

Step	Action
1	Remove the insulating strip from the plus (+) pole of the battery before inserting it into the module. This strip is used to insulate the battery when on the shelf. Note: The battery installed in the module, when shipped, has the insulating strip in place. Remove this strip and re-install the battery before operation.
2	When single battery backup is required, install the battery in Battery Slot 1. The circuitry is designed so Battery 1 supplies the current until it is used up. Battery 2 (when installed) then assumes the load requirement without interruption. Battery status is indicated via LEDs and Modsoft status bytes.
3	When the controller is in operation, the batteries can be replaced at any time. Note: When the controller is powered OFF, battery replacement can be done without RAM loss only when a second functioning battery is installed.

Installing/ Removing a Battery

The following procedure describes how to install or remove a battery.

Step	Action
1	Remove the insulating strip from the new battery.
2	If necessary, remove the old battery. Detach it from its housing (on the front of the module), by pulling the battery access strip (see below) until the battery pops out. 
3	Replace it with the new battery using the reverse of the procedure in step 2.

	WARNING
	May cause personal injury or damage to equipment. Do not use any metallic tools (i.e., pliers, screwdriver, etc.) when removing or replacing a battery in this module. Using tools during removal and replacement may cause personal injury and/or damage to the battery and this module. **Failure to follow this precaution can result in death, serious injury, or equipment damage.**

	WARNING
	May cause personal injury of damage to equipment. Ensure that proper polarity is maintained when connecting and inserting new batteries into the XCP90000. Inserting the battery improperly may cause personal injury and/or damage to this module. **Failure to follow this precaution can result in death, serious injury, or equipment damage.**

	CAUTION
	Hazardous waste. Used batteries (hazardous waste) must be disposed of according to local rules and regulations governing hazardous waste. **Failure to follow this precaution can result in injury or equipment damage.**

Quantum I/O Modules

18

At a Glance

Introduction

The following section provides information on the Quantum Input/Output (I/O) modules.

What's in this Chapter?

This chapter contains the following sections:

Section	Topic	Page
18.1	Overview of I/O Modules	497
18.2	Analog Input Modules	512
18.3	Analog Output Modules	558
18.4	Analog Input/Output Modules	578
18.5	Discrete Input Modules	590
18.6	Discrete Output Modules	669
18.7	Discrete Verified Output Module	753
18.8	Discrete Supervised Input Module	764
18.9	Discrete Input/Output Modules	769

18.1 Overview of I/O Modules

Overview of I/O Modules

Overview

This section provides an overview of I/O modules used in Quantum.

What's in this Section?

This section contains the following topics:

Topic	Page
Quantum I/O Modules	498
I/O Map Status Byte	510

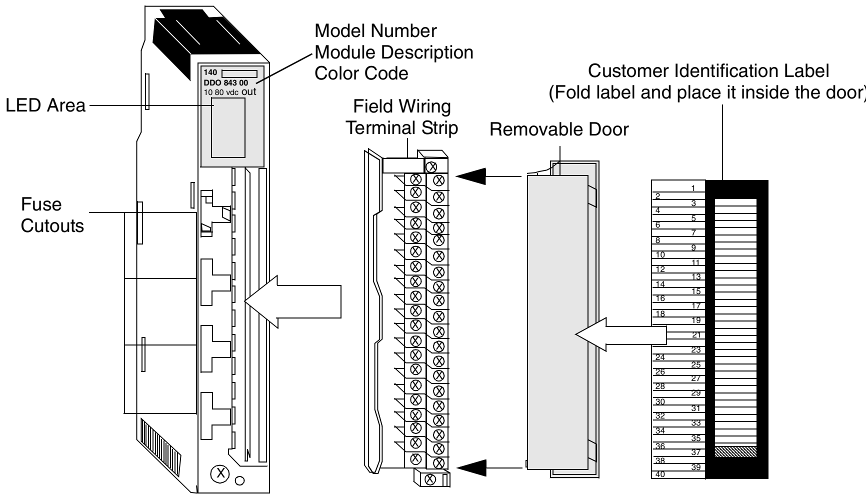
Quantum I/O Modules

Overview

The following section contains specifications for input/output modules. Module descriptions include wiring diagrams, LED indicators and descriptions, illustrations of module figures, and, for discrete modules, true high/true low descriptions.

I/O Module

The following figure shows the I/O modules and its components.



Note: When field wiring the I/O modules, the maximum wire size that should be used on a field wiring terminal is 1-14 AWG or 2-16 AWG; the minimum size is 20 AWG.

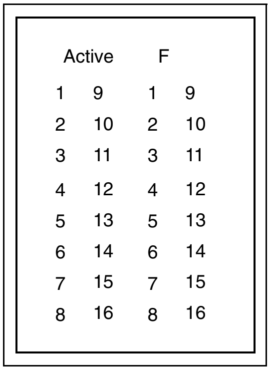
Note: The field wiring terminal strip (Modicon #140XTS00200) must be ordered separately. (The terminal strip includes the removable door and label.)

Quantum I/O LED Descriptions

These tables describe the generic LED blocks used in Quantum I/O modules. Descriptions of each type I/O modules' unique LED configuration are included in the individual I/O module specifications in this section.

LED Indicators and Descriptions for Discrete 16 Point and Analog I/O Modules

The following table shows the LED indicators for discrete 16 point and analog I/O modules.

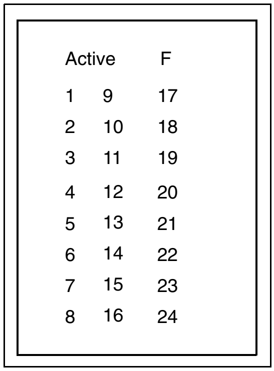


The following table shows the LED descriptions for discrete 16 point and analog I/O modules.

LEDs	Color	Indication when ON
Active	Green	Bus communication is present.
F	Red	A fault (external to the module) has been detected.
1 ... 16	Green	The indicated point or channel is turned ON.
1 ... 16	Red	There is a fault on the indicated point or channel.

LED Indicators and Descriptions for 24 Point Input Modules

The following table shows the LED indicators for the 24 point input modules.

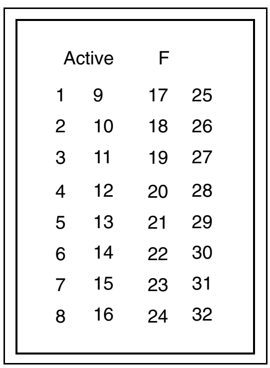


The following table shows the LED descriptions for the 24 point input modules.

LEDs	Color	Indication when ON
Active	Green	Bus communication is present.
F	Red	A fault (external to the module) has been detected.
1 ... 24	Green	The indicated point or channel is turned ON.

LED Indicators and Descriptions for 32 Point I/O Modules

The following table shows the LED indicators for the 32 point I/O modules.

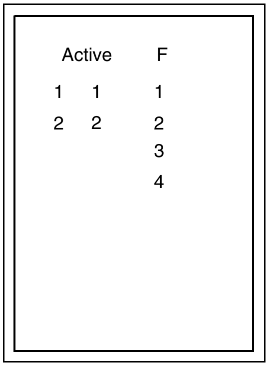


The following table shows the LED descriptions for the 32 point I/O modules.

LEDs	Color	Indication when ON
Active	Green	Bus communication is present.
F	Red	A fault (external to the module) has been detected.
1 ... 32	Green	The indicated point or channel is turned ON.

LED Indicators and Descriptions for Bi-Directional Modules

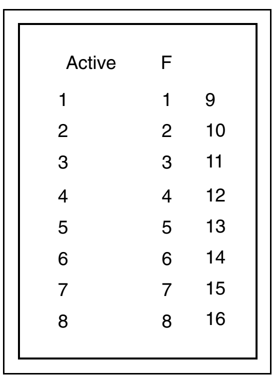
The following table shows the LED indicators for the 140AMM09000 bi-directional module.



The following table shows the LED descriptions for the 140AMM09000 bi-directional module.

LEDs	Color	Indication when ON
Active	Green	Bus communication is present.
F	Red	No power applied to the output group(s) or input out-of-range.
1 and 2 (left column)	Green	Indicates output is active.
1 and 2 (middle column)	Red	Indicates output status: broken wire or bad field supply.
1 ... 4 (right column)	Red	Indicates input status: under/over range.

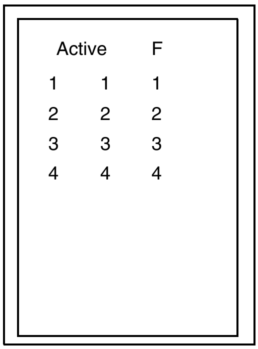
The following table shows the LED indicators for the 140DAM59000 and 140DDM39000 bi-directional modules.



The following table shows the LED descriptions for the 140DAM59000 and 140DDM39000 bi-directional modules.

LEDs	Color	Indication when ON
Active	Green	Bus communication is present.
F	Red	A fault (external to the module) has been detected.
1 and 8 (left columns)	Green	The indicated output point and channel is turned ON.
1 and 16 (right two columns)	Green	The indicated input point and channel is turned ON.

The following table shows the LED indicators for the 140DDM69000 bi-directional module.

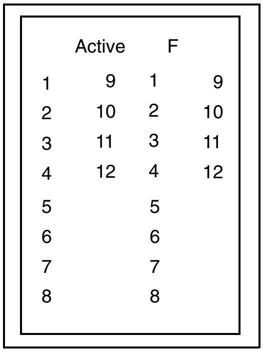


The following table shows the LED descriptions for the 140DDM69000 bi-directional modules.

LEDs	Color	Indication when ON
Active	Green	Bus communication is present.
F	Red	Over current condition on any point.
1 and 4 (left columns)	Green	The indicated output point is turned ON.
1 and 4 (middle columns)	Red	The indicated output point has an over current condition.
1 and 4 (right columns)	Green	The indicated input point is turned ON.

LED Indicators and Descriptions for Discrete 12 Point Modules with Fault Indication

The following table shows the LED indicators for the discrete 12 point 140DDO88500 module with fault indication.



The following table shows the LED descriptions for discrete 12 point modules with fault indication.

LEDs	Color	Indication when ON
Active	Green	Bus communication is present.
F	Red	An over current condition on any point has been detected.
1 ... 12	Green	The indicated point or channel is turned ON.
1 ... 12	Red	The indicated output point has an over current condition.

Field Wiring Terminal Strip/ Module Keying Assignments

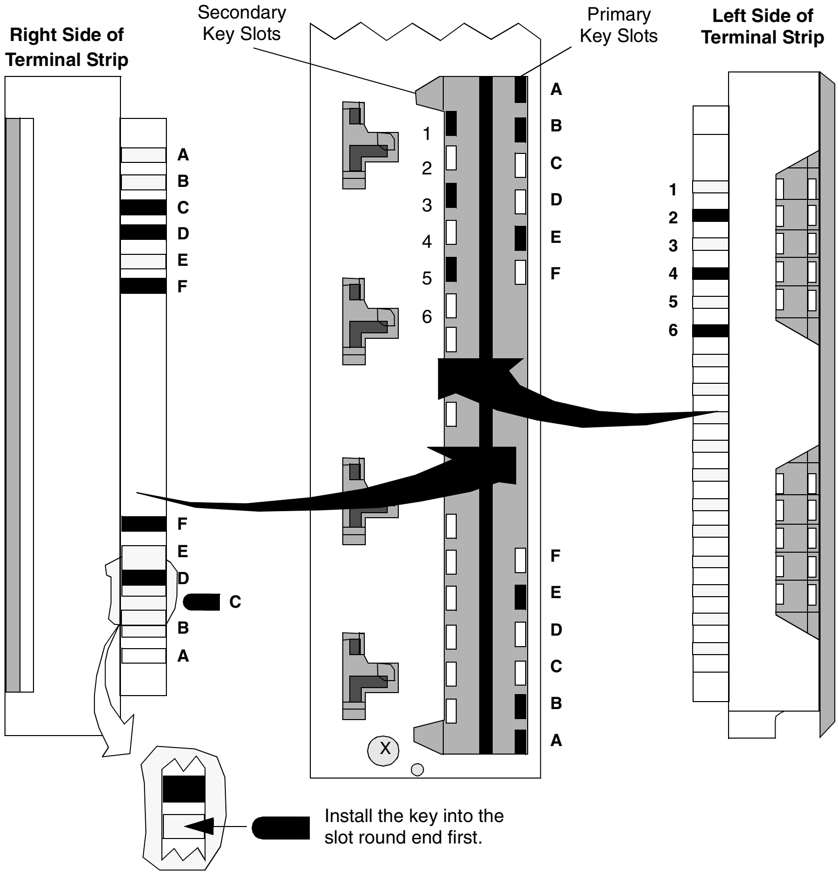
Field wiring terminal strips and module housings are slotted on the left and right sides of the PCB card slot to accept keying pins (see I/O Module figure). The purpose of keying is to prevent plugging the terminal strip into the wrong module, once wiring connections have been made. Keying is implemented at the discretion of the user.

	CAUTION
	Safety precaution For maximum safety and protection, Modicon recommends that module key coding be part of the system installation procedure. **Failure to follow this precaution can result in injury or equipment damage.**

Primary keying is provided on the right side of the module, marked A through F (top and bottom positions are coded the same). Primary keying provides module class coding. Primary codes have been pre-defined (see the following chart).

Secondary keying is provided on the left side of the module, marked 1 through 6. Secondary keying codes are user-definable and may be used to identify module personality within module classes, or other unique site requirements.

The following figure shows the I/O module keying assignments.



Note: The primary/secondary keys shown (in black) in this example reflect the recommended coding of a 24 Vdc module in slot 6 to its field wiring terminal strip.

To support keying, all I/O modules accepting terminal strips come with 12 customer-installable primary keys (six yellow keys each for the module and terminal strip) and six secondary keys (three white keys each for the module and terminal strip). In the following table, check the Primary Module and Terminal Strip Coding columns for key locations.

I/O Module Terminal Strip Keying

The following table shows the primary module and terminal strip keying for the I/O modules.

Primary Module and Terminal Strip Keying			
Module Class	**Module Part Number**	**Module Coding**	**Terminal Strip Coding**
5 Vdc	140DDI15310	ABC	DEF
	140DDO15310		
9 ... 12 Vdc	Unassigned	ABD	CEF
24 Vdc	140DDI35300	ABE	CDF
	140DDI35310		
	140DDM39000		
	140DDO35300		
	140DDO35310		
	140DSI35300		
	140HLI34000		
10 ... 60 Vdc	140DDI84100	ABF	CDE
	140DDI85300		
	140DDO84300		
	140DVO85300		
125 Vdc	140DDI67300	ACD	BEF
	140DDM69000		
	140DDO88500		
24 Vac	140DAI34000	ACE	BDF
	140DAI35300		
48 Vac	140DAI44000	ACF	BDE
	140DAI45300		
	140DAO84220		
115 Vac	140DAI54000	ADE	BCF
	140DAI54300		
	140DAI53300		
	140DAM59000		
	140DAO84010		
230 Vac	140DAI74000	ADF	BCE
	140DAO84000		
	140DAO84210		
	140DRA84000		

Primary Module and Terminal Strip Keying			
Module Class	**Module Part Number**	**Module Coding**	**Terminal Strip Coding**
Relay	140DRC83000	AEF	BCD
Analog I/O	140ACI03000	BCD	AEF
	140AVI03000		
	140ACO02000	BCE	ADF
	140AVO02000	BCF	ADE
TC/RTD	140ARI03010	BDE	ACF
	140ATI03000		
Analog In/Out	140AMM09000	BDF	ACE
Intelligent/ Special Purpose	140EHC10 00	BEF	ACD
	140EHC20200		
Unassigned		CDE	ABF
Unassigned		CDF	ABE
Unassigned		CEF	ABD
Unassigned		DEF	ABC

To implement the user-optional secondary keying code (designed to prevent the mismatching of terminal strips to I/O modules of identical type), 17 slot positions have been provided in modules and terminal strips to support a variety of coding schemes.

In addition (by using the secondary keying code), the user may key the field wiring terminal to the position where the module is installed in a backplane, using the white keys for each code. To determine a unique module code and terminal strip code, refer to the table below.

Secondary Keying and Backplane Positions

The following table shows the secondary keying and backplane positions.

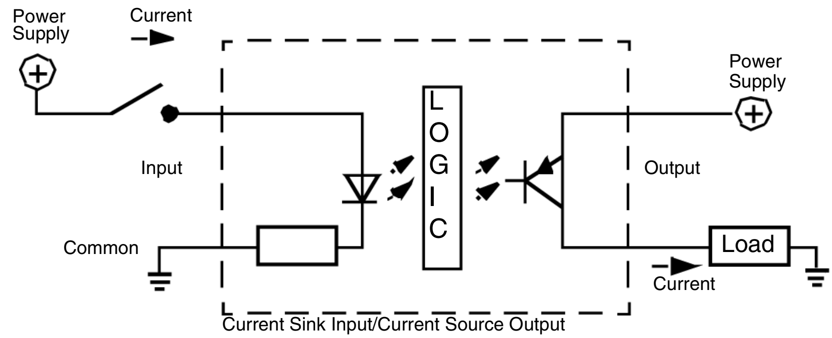
Backplane Position	Module Coding	Terminal Strip Coding
1	123	456
2	124	356
3	125	346
4	126	345
5	134	256
6	135	246
7	136	245
8	145	236
9	146	235
10	156	234
11	234	156
12	235	146
13	236	145
14	245	136
15	246	135
16	256	134

The user may also use personality keying to differentiate between like module types (i.e., DAO84000 and DAO84210 both have the same primary keying pin combinations), using the white keys for each code.

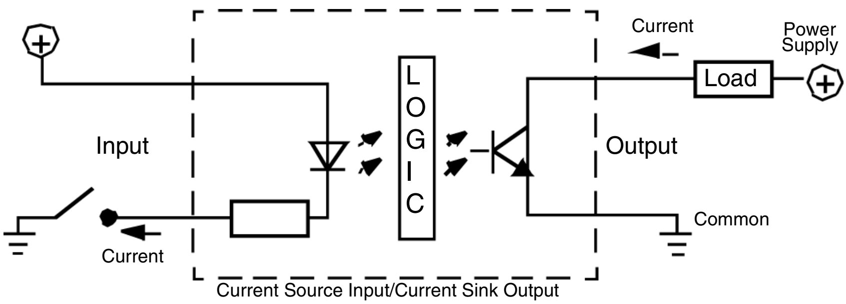
Discrete I/O True High/True Low Circuit Descriptions

The following figures illustrate discrete I/O module true high and true low logic circuits.

True High/Current Sink Input/Current Source Output



True Low/Current Source Input/Current Sink Output



Current Sinking describes a physical implementation of the I/O hardware, which when in the *true state*, sinks current from the external load.

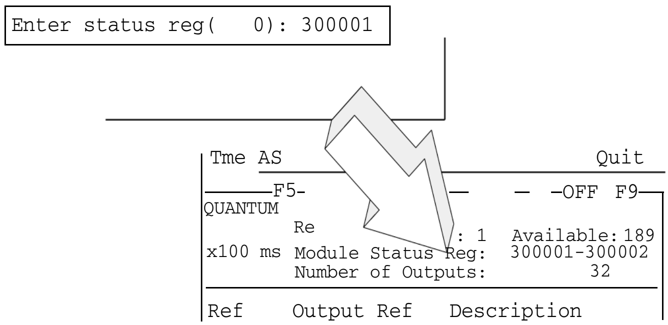
Current Sourcing describes a physical implementation of the I/O hardware, which when in the *true state*, sources current to the external load.

I/O Map Status Byte

Overview

This Quantum I/O map menu entry allows you to assign the 3x register that defines the start of a table in which I/O-mapped module status is available. You may either enter the 3x value, or the value 0 (indicating no choice). The value entered is displayed in the summary information on the top of the Quantum I/O Map. Modules in a backplane report status (and fault) information in an 8-bit byte—therefore, one word of the table conveys the status information for two modules.

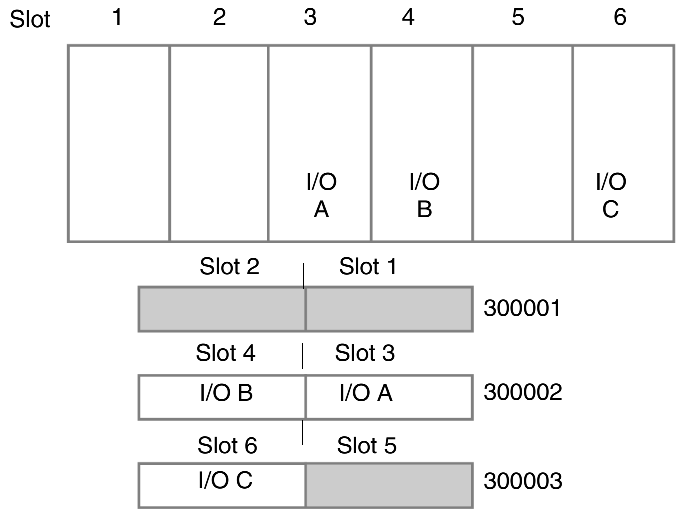
The following figure shows an example of the Quantum report status and fault information.



If you choose to display or develop a program using these values, the table/module relationship is given in the following example:

Table/Module Configuration

The following figure shows the table/module configuration.



Given the above sample configuration, if you select 300001 as the starting address of the status table and there are no I/O modules in the first two locations, the first

I/O module status is found in the least significant byte of the second word (i.e., position 3). The table fills until the last I/O mapped module is found.

> **Note:** The bit pattern reported in each status/error byte is dependent on the module type.

18.2 Analog Input Modules

At a Glance

Overview

This section provides information on Quantum Analog Input Modules.

What's in this Section?

This section contains the following topics:

Topic	Page
Analog Input Modules	513
140ACI03000 I/O Analog In Module	533
140ACI04000 High Density Analog in I/O Module	538
140ARI03010 I/O RTD Input 8 Channel Module	543
140ATI03000 I/O Thermocouple Input 8 Channel Module	548
140AVI03000 I/O Analog IN 8 Channel Bipolar Module	553

Analog Input Modules

Overview

This section provides information on configuration of Analog Input modules. These modules include:
- 140ACI03000
- 140ACI04000
- 140ARI03010
- 140ATI03000
- 140AVI03000

140ACI03000

The following information pertains to configuration of the 140ACI03000 Analog Input module.

I/O Map and Register Assignment

The ACI03000 eight-channel unipolar input module requires nine contiguous input (3x) registers, assigned as follows.

Register 1 Channel 1 data (0 ... 4,095 = 1 ... 5 VDC or 4 ... 20 mA)

Register 2 Channel 2 data (0 ... 4,095 = 1 ... 5 VDC or 4 ... 20 mA)

Register 3 Channel 3 data (0 ... 4,095 = 1 ... 5 VDC or 4 ... 20 mA)

Register 4 Channel 4 data (0 ... 4,095 = 1 ... 5 VDC or 4 ... 20 mA)

Register 5 Channel 5 data (0 ... 4,095 = 1 ... 5 VDC or 4 ... 20 mA)

Register 6 Channel 6 data (0 ... 4,095 = 1 ... 5 VDC or 4 ... 20 mA)

Register 7 Channel 7 data (0 ... 4,095 = 1 ... 5 VDC or 4 ... 20 mA)

Register 8 Channel 8 data (0 ... 4,095 = 1 ... 5 VDC or 4 ... 20 mA)

Register 9 Input status word

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

1 = Broken Wire (4 ... 20 mA only) or Under Voltage on Channel 8 (1 ... 5 V only)
1 = Broken Wire (4 ... 20 mA only) or Under Voltage on Channel 7 (1 ... 5 V only)
1 = Broken Wire (4 ... 20 mA only) or Under Voltage on Channel 6 (1 ... 5 V only)
1 = Broken Wire (4 ... 20 mA only) or Under Voltage on Channel 5 (1 ... 5 V only)
1 = Broken Wire (4 ... 20 mA only) or Under Voltage on Channel 4 (1 ... 5 V only)
1 = Broken Wire (4 ... 20 mA only) or Under Voltage on Channel 3 (1 ... 5 V only)
1 = Broken Wire (4 ... 20 mA only) or Under Voltage on Channel 2 (1 ... 5 V only)
1 = Broken Wire (4 ... 20 mA only) or Under Voltage on Channel 1 (1 .. ... 5 V only)

Note: Count stops at 4095

Note: The undervoltage for this module is 0.5 - 0.7 V

	CAUTION
⚠	**Possible Equipment Failure** When configured for voltage measurement (no jumper installed between INPUT(+) and I SENSE terminals), if a broken field wire occurs, readings will be non-zero and not predictable. **Failure to follow this precaution can result in injury or equipment damage.**

I/O Map Status Byte

The most significant bit in the I/O map status byte is used for the 140ACI03000 Input module.The following figure shows the MSB register.

MSB

1	2	3	4	5	6	7	8

1 = Broken wire/under voltage on one or more input channels

Module Zoom Selections

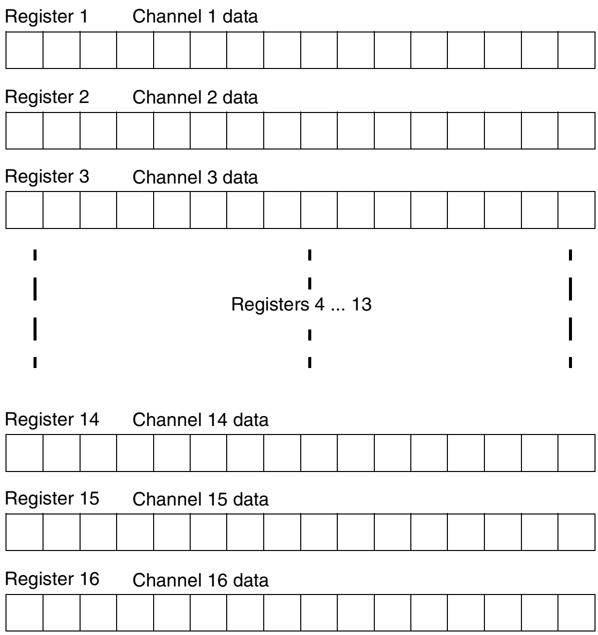
There are no Module Zoom selections required for this module.

140ACI04000

The following information pertains to the 140ACI04000 Analog Input module.

I/O Map Register Assignment

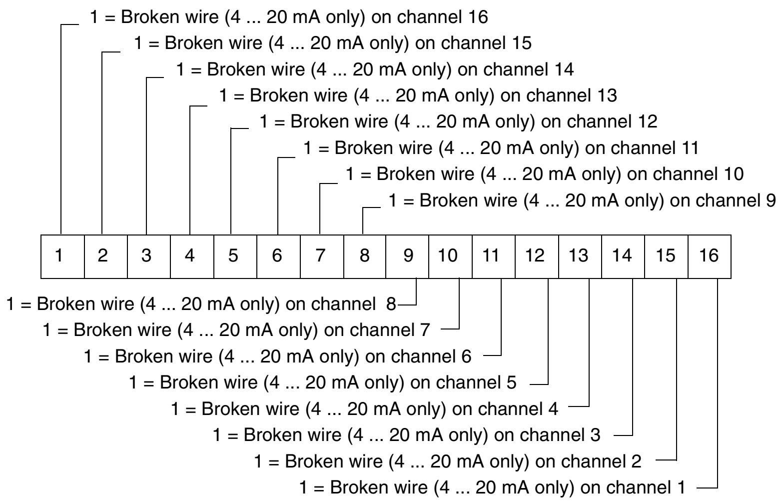
This module requires 17 contiguous input (3x) registers which are assigned as follows:



I/O Map Register Assignments-Register 17

The following figure shows the status warnings for register 17.

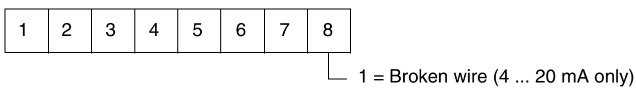
Register 17 **Input Status Word**



Note: The broken wire detect is set at 2.0 mA.

I/O Map Status Byte

I/O map status byte is used as follows:



Modsoft Module Zoom Selections

Push <Enter> to display and select the channel range.

Channel X range selection:

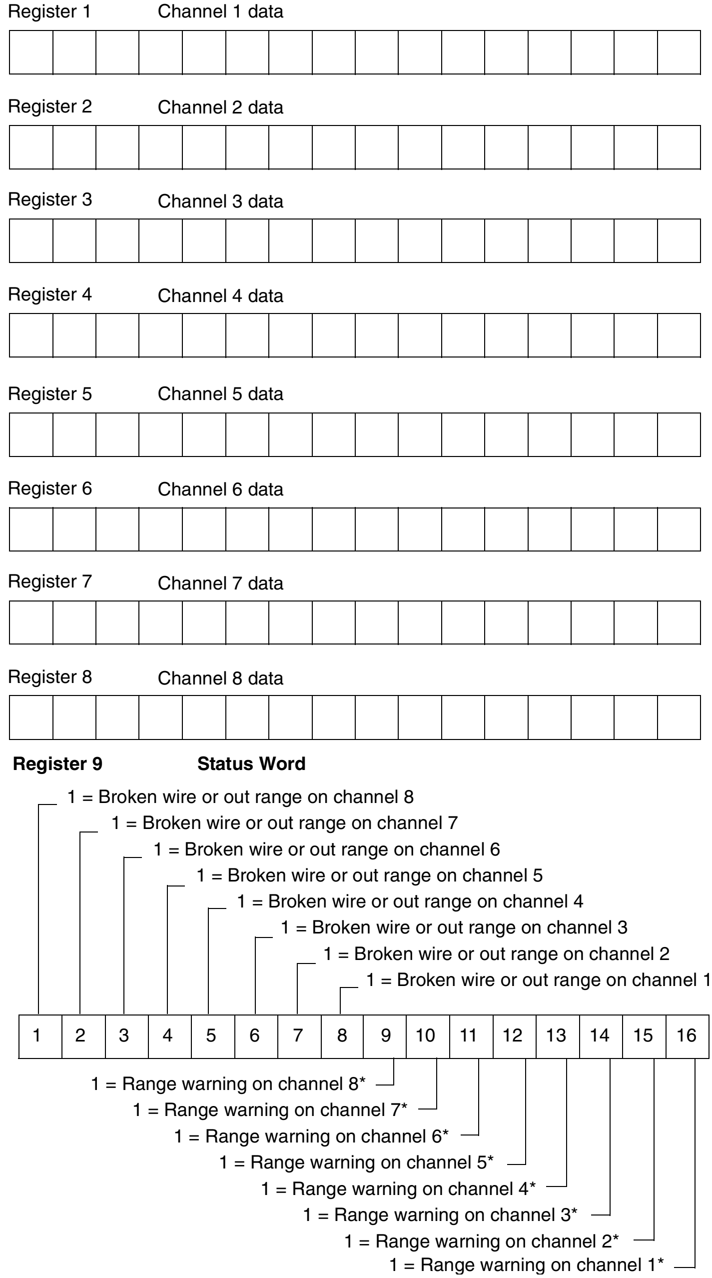
4 to 20mA	0 to 16,000
4 to 20mA	0 to 4095
4 to 20mA	0 to 20,000
0 to 25mA	0 to 25,000

140ARI03010

The following information pertains to configuration of the 140ARI03010 Analog Input module.

I/O Map Register Assignment

This module requires nine contiguous 16-bit (3x) registers—eight for input data and one for input status. The data registers formats are as follows:

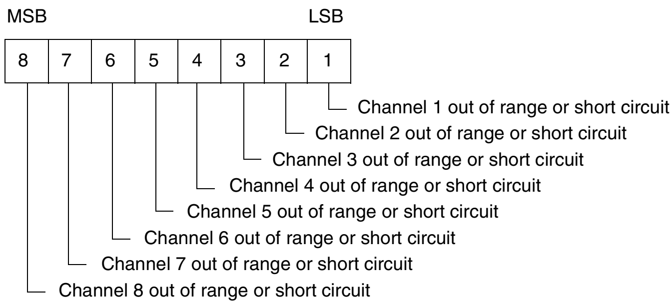


Note: The data format is 16-bit integer values in the positive range and an integer value with the MSB indicating a negative sign in the negative range.

*A range warning is issued when a channel input exceeds the rated input value. An out-of-range bit is set when a channel input exceeds the rated input value by 2.34% or when a broken wire is sensed on the channel. The warning bit is cleared when the out-of-range bit is set.

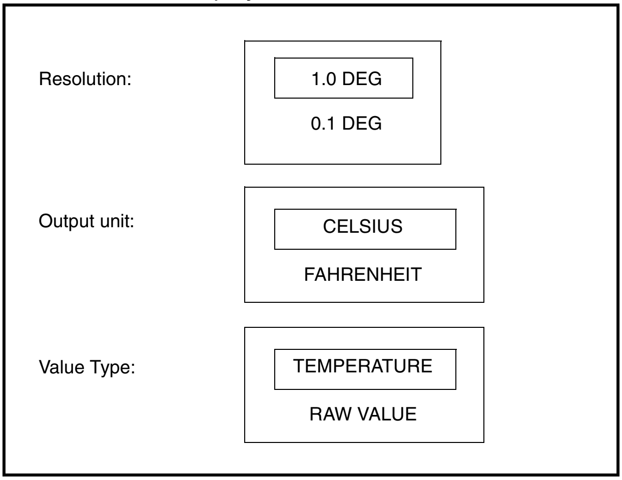
I/O Map Status Byte

The I/O map status byte is used by the 140ARI03010 Input module as follows:



Modsoft Module Zoom Selections

Push <Enter> to display and select the overall module and channel configuration.



The following figure shows the channel X configuration selection.

Channel Enable/Disable:

- ENABLE
- DISABLE

4-Wire/3-Wire/2-Wire:

- 4 WIRE
- 3 WIRE
- 2-WIRE

RTD TYPE (Pt, Ni, R, A Pt):

Pt100,	-200 ...850
Pt200,	-200 ...850
Pt500,	-200 ...850
Pt1000,	-200 ...850
Ni100,	-60 ... 180
Ni200,	-60 ... 180
Ni500,	-60 ... 180
Ni1000,	-60 ... 180
R, 0 ... 766.66	OHM
R, 0 ... 4000	OHM
APt100,	-100 ... 450
APt200,	-100 ... 450
APt500,	-100 ... 450
APt1000,	-100 ... 450

140ATI03000

The following information pertains to configuration of the 140ATI03000 Analog Input module.

I/O Map Register Assignments

This module requires ten contiguous, 16-bit words—eight for input data, one for channel status, and one for internal temperature of the module. The data words formats are as follows.

Word 1 Channel 1 data

Word 2 Channel 2 data

Word 3 Channel 3 data

Word 4 Channel 4 data

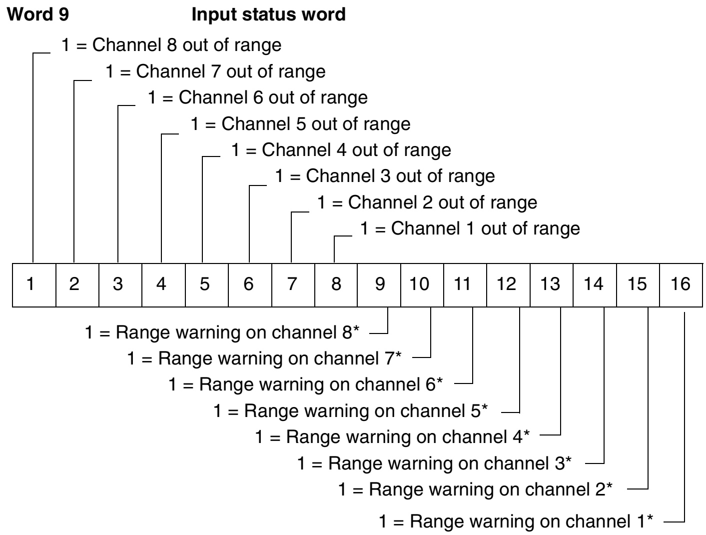
Word 5 Channel 5 data

Word 6 Channel 6 data

Word 7 Channel 7 data

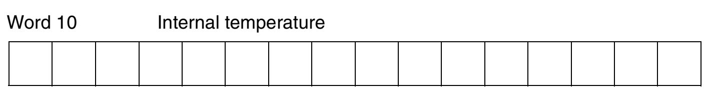
Word 8 Channel 8 data

The following shows the word 9 register.



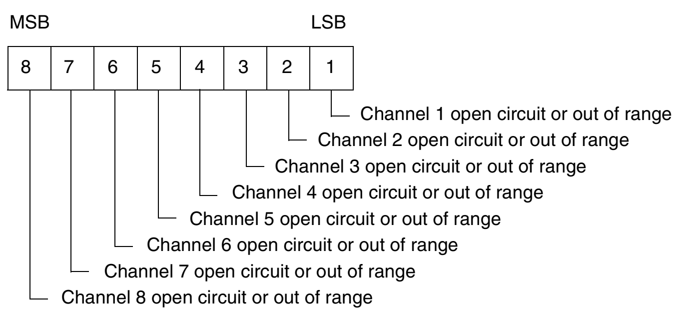
* A range warning is issued when a channel input exceeds the rated input value, as shown in the following table. An out-of-range bit is set when a channel input exceeds the rated input value by 2.4% or when a broken wire is sensed on the channel. The warning bit is cleared when the out-of-range bit is set.

The following figure shows the word 10 register.



I/O Map Status Byte

The I/O map status byte is used by the 140ATI03000 Input Module as follows.



Measurement Ranges

Ranges in the following table are expressed in degrees C. The user can select either 0.1 or 1.0° (C or F) for the output data format.

If the 0.1° format is selected, the decimal point is implied (i.e., a reading of 1234 should be interpreted as 123.4°). The internal CJC data is reported in the same units as the TC output.

All TC output data is in signed integer format except as noted for Type B (see below).

Note: If the TC is open, then the warning bit is cleared and the out-of-range bit is set. If it is over range, then the channel's output data word is always 7FFFH; if it is under range, the channel's output data word is always 8001H. These are the possible highest and lowest values.

Measurement Ranges

This table shows thermocouple ranges.

Thermocouple Ranges					
Data Format	**Input**	**Minimum Reading**	**Normal**	**Over Range Warning**	**Out-of-Range Set**
Modsoft Signed Format	J Type TC	-228.5	-210 to +760	760.1 to 778.6	>778.7
	K Type TC	-302.9	-270 to +1370	1370.1 to 1405.0	>1405.1
	E Type TC	-293.8	-270 to +1000	1000.1 to 1023.9	>1024.0
	T Type TC	-279.5	-270 to +400	400.1 to 409.6	>409.7
	S Type TC	-89.9	-50 to +1665	1665.1 to 1705.0	>1705.1
	R Type TC	-89.6	-50 to +1665	1665.1 to 1704.7	>1704.8
	B Type TC (See Note 3)	+86.4	+130 to +1820	1820.1 to 1863.7	>1863.8

This table shows millivolt ranges.

Millivolt Ranges					
Offset Binary	-100 mV 0 + 100 mV Gain = 25	0	0 8000h FFFFh	None	See Note 2
	-25 mV 0 +25 mV Gain = 100	0	0 8000h FFFFh	None	See Note 2

Note:

1. Open Circuit Detect is always enabled for all TC types and may be disabled for linear ranges.
2. On millivolt ranges, if Open Circuit Detect is enabled, this bit is set on Open Circuit Detect or input FFFFh
3. Data format changes to unsigned if the output is requested in units of 0.1° F to accommodate readings above 3276.8° F.

Module Zoom Selections

Push <Enter> to display and select the configuration parameters.

Resolution:

1.0 DEG
0.1 DEG

Output Unit:

CENTIGRADE
FAHRENHEIT

Cold Junction Compensator:

On board
Channel 1

CHANNEL X CONFIGURATION

Thermocouple Type:

Undefined	
J,	gain=25
K,	gain=25
E,	gain=25
T,	gain=100
S,	gain=100
R,	gain=100
B,	gain=100

Note:
Undefined = Linear Range

The next two entries are for undefined type:

Open Circuit Test:

NO
YES

Millivolt Range:

25
100

This channel installed:

YES
NO

140AVI03000

The following information pertains to configuration of the 140AVI03000 Analog Input module.

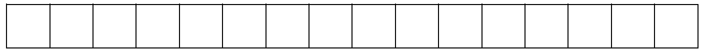
I/O Map Register Assignments

This module requires nine contiguous input (3x) registers.

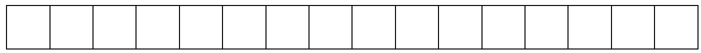
Map Register Assignment

The following figures shows the assignment registers and the input status warnings.

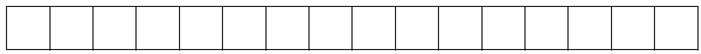
Register 1 Channel 1 data



Register 2 Channel 2 data

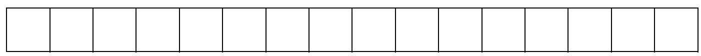


Register 3 Channel 3 data

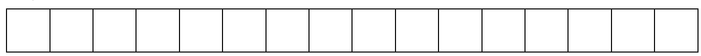


Register 4 Channel 4 data

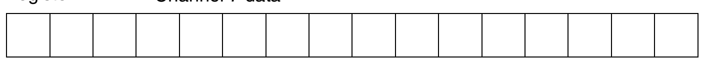
Register 5 Channel 5 data



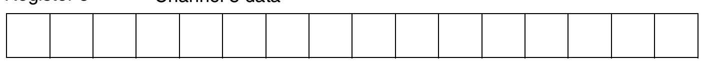
Register 6 Channel 6 data



Register 7 Channel 7 data

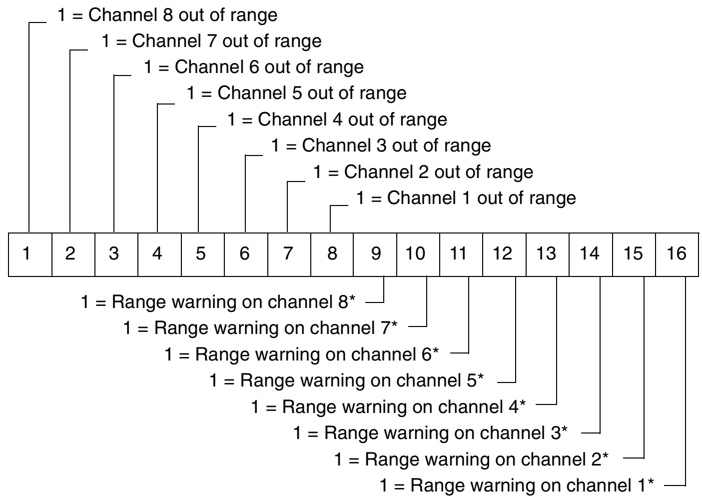


Register 8 Channel 8 data



The following figure shows Register 9.

Register 9 **Input status word**



*A range warning is issued when a channel input is outside the rated input value, as shown in the following table. Warning bits stay on after out of range bits are set. An out-of-range bit is set when a channel input exceeds the rated input value by 2.4%. Out of range bits are also set if inputs drop below 0.5 V (1 ... 5 V mode) or 2.08 mA (4 ... 20 mA mode).

When configured for current inputs (jumper installed between INPUT(+) and ISENSE terminals), a broken field wire results in a zero current reading. If 4 ... 20 mA is selected, fault LEDs and warning/out of range and I/O Map Status Byte bits are displayed

CAUTION

Possible Equipment Failure

When configured for voltage inputs (no jumper installed between INPUT(+) and ISENSE terminals), if a broken field wire occurs, readings will be non-zero and not predictable.

Failure to follow this precaution can result in injury or equipment damage.

Linear Measuring Ranges

The following table shows the linear measuring ranges for the 140AVI03000 Analog Input module.

Data Format	Input	Under Warning	Normal	Over Warning
16-bit Format	+/- 10 V	< 768	768 ... 64,768	> 64,768
	+/- 5 V, +/- 20 mA	<16,768	16,768 ... 48,768	> 48,768
	0 ... 10 V		0 ... 64,000	> 64,000
	0 ... 5 V, 0 ... 20 mA		0 ... 32,000	> 32,000
	1 ... 5 V, 4 ... 20 mA	<6,400	6,400 ... 32,000	> 32,000
Voltmeter Format*	+/- 10 V	< –10,000	–10,000 ...10,000	> 10,000
	+/- 5 V	< –5,000	–5,000 ... 5,000	> 5,000
	0 ... 10 V		0 ... 10,000	> 10,000
	0 ... 5 V		0 ... 5,000	> 5,000
	1 ... 5 V	< 1,000	1,000 ... 5,000	> 5,000
	+/- 20 mA	< –20,000	–20,000... 20,000	> 20,000
	0 ... 20 mA		0 ... 20,000	> 20,000
	4 ... 20 mA	< 4,000	4,000 ... 20,000	> 20,000
12-bit Format	+/- 10 V	0	0 ... 4,095	4,095
	+/- 5 V, +/- 20 mA	0	0 ... 4,095	4,095
	0 ... 10 V		0 ... 4,095	4,095
	0 ... 5 V, 0 ... 20 mA		0 ... 4,095	4,095
	1 ... 5 V, 4 ... 20 mA	0	0 ... 4,095	4,095

*The Voltmeter ranges are listed in Modsoft signed format.

I/O Map Status Byte

The most significant bit in the I/O map status byte is used for the 140AVI03000 Input module.
The following figure shows the input register.

1	2	3	4	5	6	7	8

1 = Out of range or broken field wire on one or more channels (4 .. 20 mA)

Module Zoom Selections

Push <Enter> to display and select data format for the module and the ranges for the individual input channels.
The following figures show the module data format and Channel X range (per channel) options.

Data Formats (per module)	
	16-bit Format
	Voltmeter
	12-bit Format

Channel X Range (per channel)	
	-10V to +10V
	0V to +10V
	-5V to +5V
	0V to +5V
	1V to +5V
	-20mA to +20mA
	0mA to +20mA
	+4mA to +20mA

140ACI03000 I/O Analog In Module

Overview

The Analog Input 8 Channel Unipolar module accepts mixed current and voltage inputs. Required jumpers between the input and sense terminals for current input measuring are included with the module.

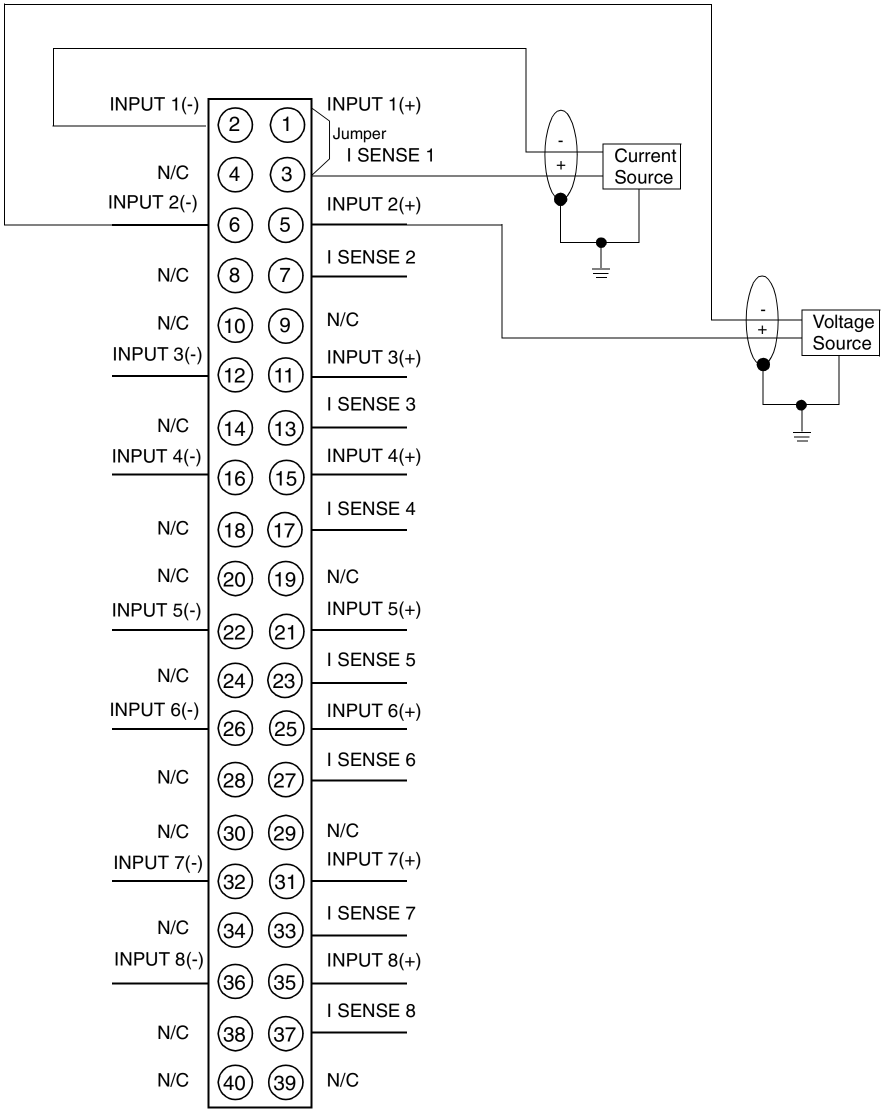
Specifications

The following table shows the specifications for the ACI03000 analog input module.

Specifications	
Number of Channels	8 Differential
LEDs	Active: Indicates bus communication present.
	F: Indicates channel fault. **NOTE**: This module produces a fault signal F if any one channel detects a broken wire condition in the 4 ... 20 mA range.
Required Addressing	9 Words In
Voltage Input	
Linear Measuring Range	1 ... 5 Vdc
Absolute Maximum Input	50 Vdc
Input Impedance	> 20 MΩ
Current Input	
Linear Measuring Range	4 ... 20 mA
Absolute Maximum Input	25 mA
Input Impedance	250 Ω +/- 0.03%
Resolution	12 Bits
Accuracy Error @ 25° C	Voltage Mode Typical: +/- 0.05% of full scale Maximum: +/- 0.1% of full scale
	Current Mode Add +/- 0.03% to voltage specification
Linearity	+/- 0.04%
Accuracy Drift w/ Temperature	Typical: +/- 0.0025% of full scale / °C Maximum: +/- 0.005% of full scale / °C
Common Mode Rejection	> -72 dB @ 60Hz
Input Filter	Single pole low pass, -3 dB cutoff @ 15 Hz, +/- 20%
Isolation	
Channel to Bus	1000 Vdc, 3000 Vpp, for 1 minute
Operating Voltage	
Channel to Channel	30 Vdc max
Update Time	5 ms for all channels
Fault Detection	Broken wire (4 ... 20 mA mode) or under voltage range (1 ... 5 V)
Bus Current Required	240 mA
Power Dissipation	2 W
External Power	Not required for this module

Note: Calibration is not required for this module.

Wiring Diagram The following figure shows the wiring diagram for the ACI030 module.



Note:
1. The current and voltage sources are supplied by the user (fusing is at the discretion of the user).
2. Either a shielded or unshielded signal cable may be used. Shielded types should have a shield tied to earth ground near the signal source end.
3. Unused inputs may cause the activation of the F LED. To avoid this occurrence, wire unused channels in voltage mode to a channel that is in use.
4. N / C = Not connected.

140ACI04000 High Density Analog in I/O Module

Overview

The 140ACI04000 is a 16 channel analog input module which accepts mixed current inputs.

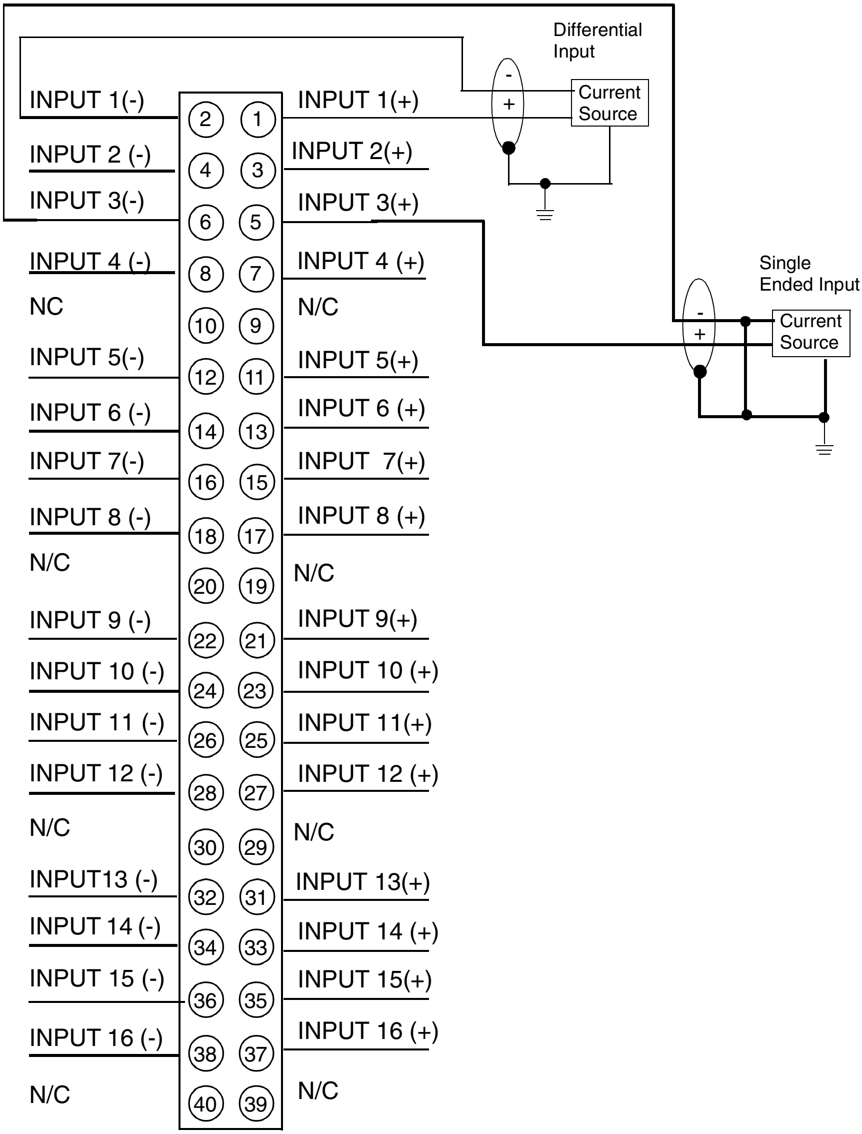
Specifications

The following table shows the specifications for the ACI04000 analog input module.

Specifications	
Number of Channels	16 Differential or 16 externally tied single ended
LEDs	Active: Indicates Bus communication is present F: Indicates channel fault. NOTE: This module produces a fault signal F if any one channel detects a broken wire condition in the 4 ... 20 mA range.
Required Addressing	17 Words In
Current Input	
Linear Measuring Range	0 ... 25 mA, 0 ... 25,000 counts 0 ... 20 mA, 0 ... 20,000 counts 4 ... 20 mA, 0 ...16,000 counts 4 ... 20 mA, 0 ... 4,095 counts
Absolute Maximum Input	30 mA
Input Impedance	250 Ω nominal
Accuracy Error @ 25° C	+/- 0.125% of full scale
Linearity (0 to 60°C)	+/- 6µA max, 0 ... 25 mA, 0 ... 25,000 counts +/- 6µA max, 0 ... 20 mA, 0 ... 20,000 counts +/- 6µA max, 4 ... 20 mA, 0 ... 16,000 counts +/- 12µA max, 4 ... 20 mA, 0 ... 4,095 counts
Accuracy Drift w/ Temperature	Typical: +/- 0.0025% of full scale / °C Maximum: +/- 0.005% of full scale / °C
Common Mode Rejection	> -90 dB @ 60Hz
Input Filter	Single pole low pass, -3 dB cutoff @ 34 Hz, +/- 25%
Isolation	
Field to bus	1780 Vac for 1 minute
Operating Voltage	
Channel to Channel	30 Vdc max
Update Time	15ms for all 16 channels
Fault Detection	Broken wire in 4 ... 20 mA mode
Bus Current Required	360 mA
Power Dissipation	5 W
External Power	Not required for this module
Fusing	
Internal	None
External	User discretion

Wiring Diagram

Wiring diagram for the 140ACI04000 module.



Note:

1. The current sources are supplied by the user (fusing is at the discretion of the user.)
2. Either shielded or unshielded cables may be used. In noisy environments, twisted shielded cable is recommended. Shielded cable should have a shield tied to earth ground near the signal source end.
3. Unused inputs may cause the activation of the F LED. To avoid this occurrence the unused channels should be configured in the 0 ... 25 mA range.
4. The maximum channel to channel working voltage cannot exceed 30 Vdc.
5. N/C = Not connected

140ARI03010 I/O RTD Input 8 Channel Module

Overview

The RTD Input 8 Channel module accepts input from up to eight 2-, 3-, and 4-wire RTD sensors, and provides temperature measurement data to the Quantum CPU.

Specifications

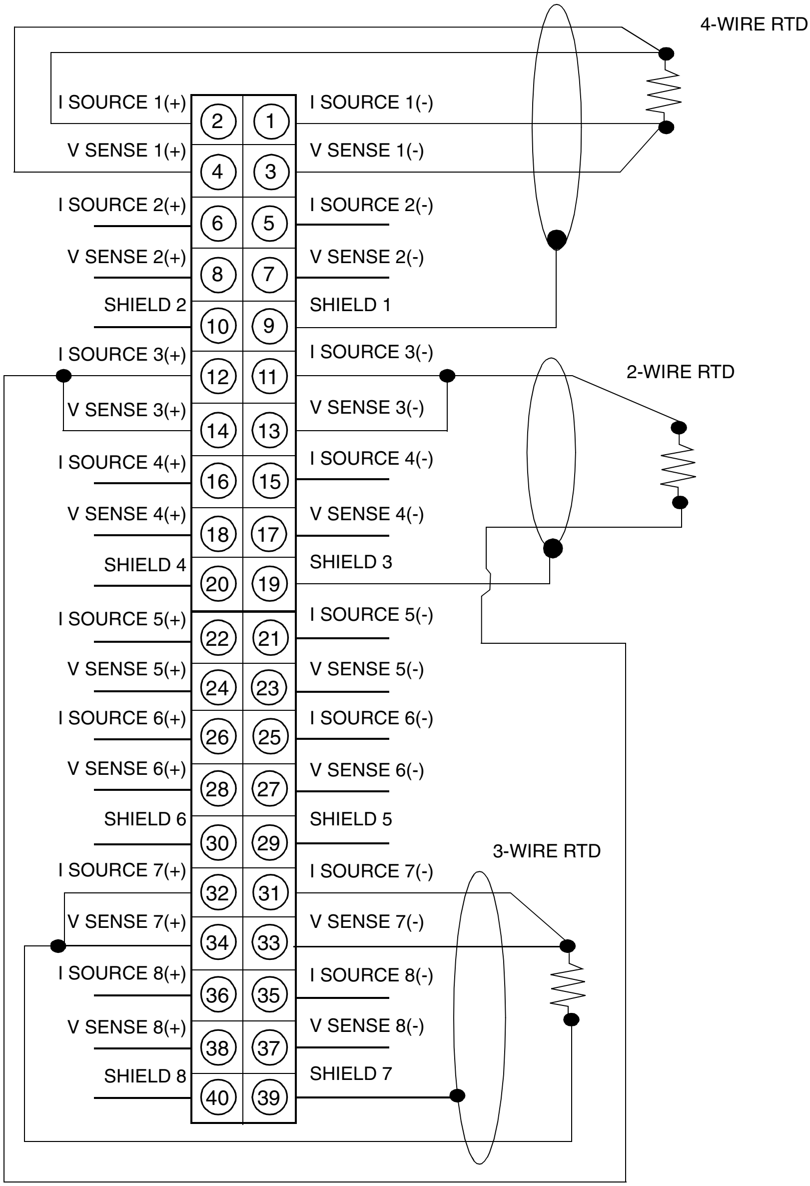
The following table shows the ARI030010 RTD IN specifications.

Specifications	
Number of Channels	8
LEDs	Active F 1 ... 8 (Red) - Indicated channel is out of range. (This includes broken wire and short circuit conditions.) R - Module has passed power-up diagnostics
Required Addressing	10 Words In
RTD Types	**Range (degrees C)**
<u>IEC Platinum</u> PT 100, PT200, PT500, PT1000	- 200 to + 850
<u>American Platinum</u> PT 100, PT200, PT500, PT1000	- 100 to + 450
<u>Nickel</u> N100, N200, N500, N1000	- 60 to + 180
Measurement Current	
PT100, PT200, N100, N200	2.5 mA
PT500, PT1000, N500, N1000	0.5 mA
Input Impedance	> 10 MΩ
Linearity	+/- 0.01% of full scale (0 ... 60° C)
Resolution	0.1° C
Absolute Accuracy	+/- 0.5 degrees C (25° C) +/- 0.9 degrees C (0 ... 60° C)
Isolation	
Channel to Channel	300 V peak-to-peak
Channel to Bus	1780 Vac @ 47 ... 63 Hz for 1 minute or 2500 Vdc for 1 minute
Update Time (All Channels)	
2-wire 4-wire	640 ms
3-wire	1.2 s
Fault Detection	Out of range or 8 red LEDs to indicate broken wire conditions
Bus Current Required	200 mA
Power Dissipation	1 W

Specifications	
External Power	Not required for this module

Wiring Diagram Figure

The following figure shows the ARI03010 wiring diagram.



Note:
1. The module is calibrated per:
   IEC Publication 751 for platinum RTDs: 100Ω @ 0 degrees C, TCR (α) = 0.00385Ω/Ω/degrees C.
   DIN 43760 for nickel RTDs
   American Platinum RTDs: 100Ω @ 0 degrees C, TCR (α) = 0.00392Ω/Ω/degrees C
2. Terminals labeled shield are not connected internally. Shields should be grounded at the field device end.
3. When using **2-wire configurations**, the temperature equivalent of **twice** the lead resistance of one leg must be subtracted from the temperature reading.

140ATI03000 I/O Thermocouple Input 8 Channel Module

Overview

The Thermocouple Input 8 Channel is an eight-channel thermocouple input module.

Specifications

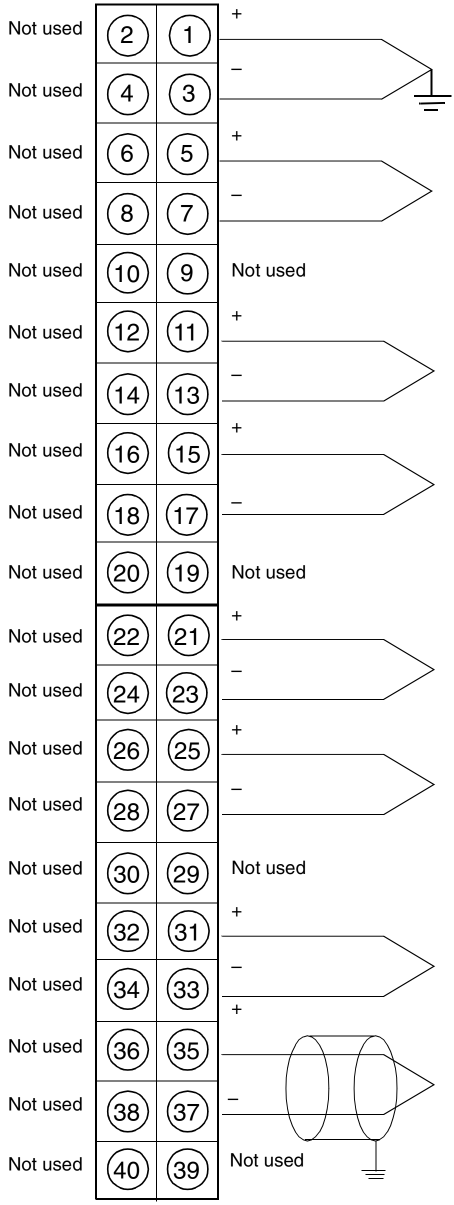
The following table shows the specifications for the TC IN module.

Specifications	
Number of Channels	8
LEDs	Active F 1 ... 8 (Red) - Indicated channel is out of range - or Broken wire condition is detected
Required Addressing	10 Words In
TC Types and Ranges	Range (degrees C)
J K E T S R B	- 210 ... + 760 - 270 ... + 1370 - 270 ... + 1000 - 270 ... + 400 - 50 ... + 1665 - 50 ... + 1665 + 130 ... + 1820
Millivolt Ranges	- 100 mV ... +100 mV* - 25 mV ... +25 mV* *Open circuit detect can be disabled on these ranges.
TC Resistance / Max Source Resistance	200Ω max for rated accuracy
Input Impedance	> 1 MΩ
Input Filter	Single low pass @ nominal 20 Hz, plus notch filter at 50/ 60 Hz
Normal Noise Rejection	120 dB min @ 50 or 60 Hz
Cold Junction Compensation (CJC)	Internal CJC operates 0 ... 60° C (errors are included in the accuracy specification). The connector door must be closed. Remote CJC can be implemented by connecting a TC (which monitors the external junction block temperature) to channel 1. Types J, K, and T are recommended for remote CJC.
Resolution	
TC Ranges	Choice of: 1.0° C (default) 0.1° C 1.0° F 0.1° F

Specifications	
Millivolt Ranges	100 mV range, 3.05 mV (16 bits) 25 mV range, 0.76 mV (16 bits)
TC Absolute Accuracy (see Note 1)	
Types J, K, E, T (see Note 2)	+/- 2° C plus +/- 0.1% of reading
Types S, R, B (see Note 3)	+/- 4° C plus +/- 0.1% of reading
Millivolt Absolute Accuracy	
@ 25° C	+/- 20 µV plus +/- 0.1% of reading
Accuracy Drift w /Temperature	0.15 µV / °C plus 0.0015% of reading / °C max
Operating Voltage	
Channel to Channel	220 Vac @ 47 ... 63 Hz or 300 Vdc max
Isolation	
Channel to Bus	1780 Vac @ 47 ... 63 Hz or 2500 Vdc for 1 minute
Update Time	1 s (all channels)
Fault Detection	8 red LEDs to indicate out of range or broken wire conditions
Bus Current Required	280 mA
Power Dissipation	1.5 W
External Power	Not required for this module

Note:
1. Absolute accuracy includes all errors from the internal CJC, TC – curvature, offset plus gain, for module temperature of 0 ... 60° C. User supplied TC errors not included.
2. For Type J and K, add 1.5° C inaccuracy for temperatures below -100° C.
3. Type B cannot be used below 130° C.
4. All TC ranges have an open TC detect and upscale output. This results in a reading of 7FFFh or 32767 decimal when an open TC is detected.

Wiring Diagram The following figure shows the ATI03000 wiring diagram.



Note:
1. Either shielded or unshielded TCs may be used. (The user should consider using shielded wire in a noisy environment.) Shielded types should have a shield tied to earth ground near the signal source end.
2. Connections marked **Not Used** are not electrically connected within the module. These points are used as a thermal link to ambient air. They are not recommended as electrical tie points as this could affect the accuracy of cold junction compensation.

140AVI03000 I/O Analog IN 8 Channel Bipolar Module

Overview

The Analog In 8 Channel Bipolar module accepts a mix of current and voltage inputs. Jumpers are required between the input and sense terminals for current inputs.

Specifications

The following table shows the specifications for the AVI03000 ANALOG IN module.

Specifications			
Number of Channels	8 Differential		
LEDs	Active F 1 ... 8 (Red) – Indicated channel is out of range or broken wire condition is detected (4 ... 20mA)		
Required Addressing	9 Words In		
Input Ranges (Selectable on a per-channel basis)			
Bipolar	+/- 10 Vdc	+/- 5 Vdc	+/- 20 mA
Unipolar	0 ... 10 Vdc	0 ...5 Vdc	0 ... 20 mA
Unipolar w/Offset	1 ... 5 Vdc	4 ... 20 mA	
Voltage Input			
Linear Measuring Range	(Input range) x 1.024		
Absolute Maximum Input	50 Vdc		
Input Impedance	>20 MΩ		
Current Input			
Linear Measuring Range	(Input range) x 1.024		
Absolute Maximum Input	25 mA		
Input Impedance	250Ω + 0.03%		
Resolution			
16 Bit	+/- 10 Vdc, 0 ... 10 Vdc		
15 Bit	+/- 5 Vdc, 0 ... 5 Vdc, +/- 20 mA, 0 ... 20 mA		
14 Bit	1 ... 5 Vdc, 4 ... 20 mA		
Absolute Accuracy Error @ 25° C Voltage Mode (Add +/- 0.03% in Current Mode)	Typical: +/- 0.03% Maximum: +/- 0.05% of full scale		
Linearity	+/- 0.008%		
Accuracy Drift w/Temperature	Typical: +/- 0.0015% of full scale / °C Maximum: +/- 0.004% of full scale / °C		
Common Mode Rejection	> -80 dB @ 60Hz		
Input Filter	Single pole low pass, -3dB cutoff @ 847Hz, +/- 20%		
Isolation			
Channel to Bus	750 Vdc, 500 Vac rms, for 1 minute		
Channel to Channel	200 Vdc, 135 Vac rms max		
Update Time	10 ms for all channels		

Specifications	
Fault Detection	Broken wire in 4 ... 20 mA mode, out of range in 1 ... 5 V mode
Bus Current Required	280 mA
Power Dissipation	2.2 W
External Power	Not required for this module

Note: Calibration is not required for this module.

Linear Measuring Ranges

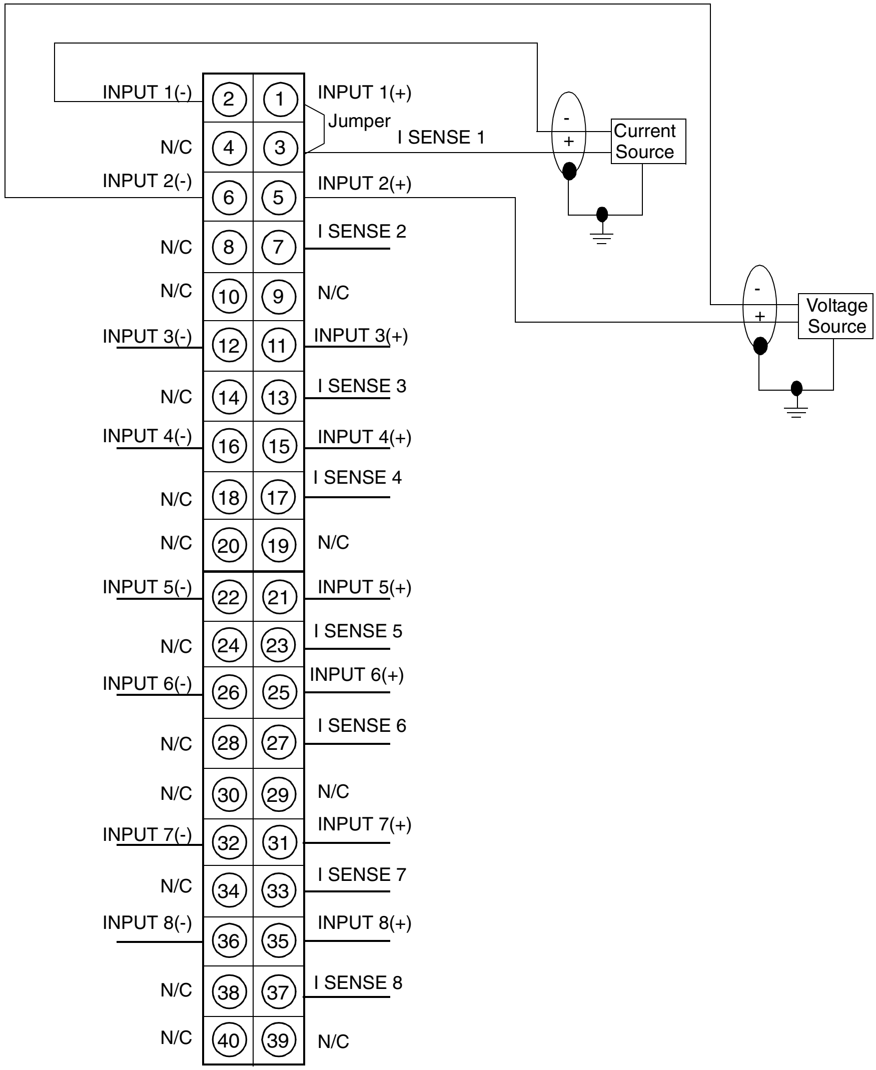
The following table shows the linear measuring ranges for the 140AVI03000 Analog Input Module.

Data Format	Input Range	Under Warning	Normal	Over Warning
16-bit Format	+/- 10 V	< 768	768 ... 64,768	> 64,768
	+/- 5 V, +/- 20 mA	< 16,768	16,768 ... 48,768	> 48,768
	0 ... 10 V		0 ... 64,000	> 64,000
	0 ... 5 V, 0 ... 20 mA		0 ... 32,000	> 32,000
	1 ... 5 V, 4 ... 20 mA	<6,400	6,400 ... 32,000	> 32,000
Voltmeter* Format	+/- 10 V	< -10,000	-10,000 ... 10,000	> 10,000
	+/-5 V, +/- 20 mA	< -5,000	-5,000 ... 5,000	> 5,000
	0 ... 10 V		0 ... 10,000	> 10,000
	0 ... 5 V, 0 ... 20 mA		0 ... 5,000, 0 20,000	> 5,000
	1 ... 5 V, 4 ... 20 mA	< 1,000	1,000 ... 5,000, 4,000 ... 20,000	> 5,000
	+/- 20 mA	< -20,000	-20,000 ... 20,000	> 20,000
	0 ... 20 mA		0 ... 20,000	> 20,000
	4 ... 20 mA	< 4,000	4,000 ... 20,000	> 20,000
12-bit Format	+/- 10 V	0	0 ... 4,095	4,095
	+/- 5 V, +/- 20 mA	0	0 ... 4,095	4,095
	0 ... 10 V		0 ... 4,095	4,095
	0 ... 5 V, 0 ... 20 mA		0 ... 4,095	4,095
	1 ... 5 V, 4 ... 20 mA	0	0 ... 4,095	4,095

*The Voltmeter ranges are listed in signed integer format.

Wiring Diagram

The following figure shows the AVI03000 wiring diagram.



Note:

1. The current and voltage sources are supplied by the user (fusing is at the discretion of the user).
2. Either shielded or unshielded signal cables may be used. Shielded types should have a shield tied to earth ground near the signal source end.
3. To prevent improper fault indications, unused inputs should have the + (plus) and – (minus) inputs tied together and be configured for a bipolar input range.
4. N / C = Not Connected.

18.3 Analog Output Modules

At a Glance

Overview

This section provides information on Quantum analog output modules.

What's in this Section?

This section contains the following topics:

Topic	Page
I/O Configuration for Analog Output Modules	559
140ACO02000 Quantum I/O Analog Current Out Module	563
140ACO13000 High Density Analog Out I/O Module	568
140AVO02000 Quantum I/O Analog Voltage Out Module	573

I/O Configuration for Analog Output Modules

Overview

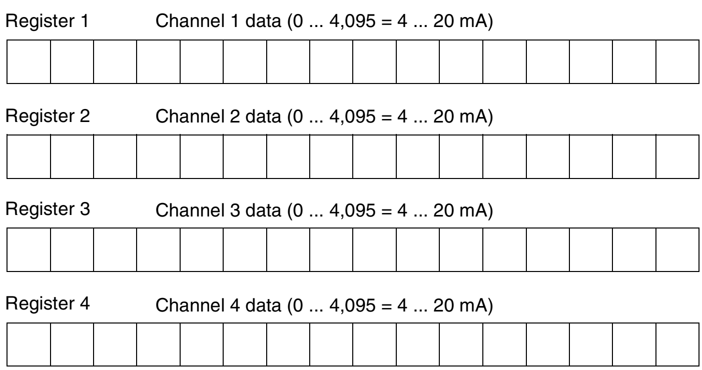
This section provides information on the configuration of analog output modules. These modules are:
- 140ACO02000
- 140ACO13000
- 140AIO33000
- 140AVO02000

140ACO02000

The following information pertains to configuration of the 140ACO02000 Analog Output module.

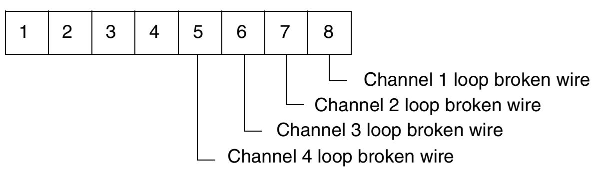
I/O Map Register Assignment

This module requires four contiguous output (4x) registers, which are assigned as follows. The following figure shows the register assignments.



I/O Map Status Byte

The four least significant bits in the I/O map status byte are used for the 140ACO02000 Output module. The following figure shows the status byte register.



Modsoft Module Zoom Selections

Push <Enter> to display and select the timeout states for each channel. Timeout state is assumed when system control of the module is stopped.

Channel X Timeout State (per channel)

Disabled
Last Value
User Defined

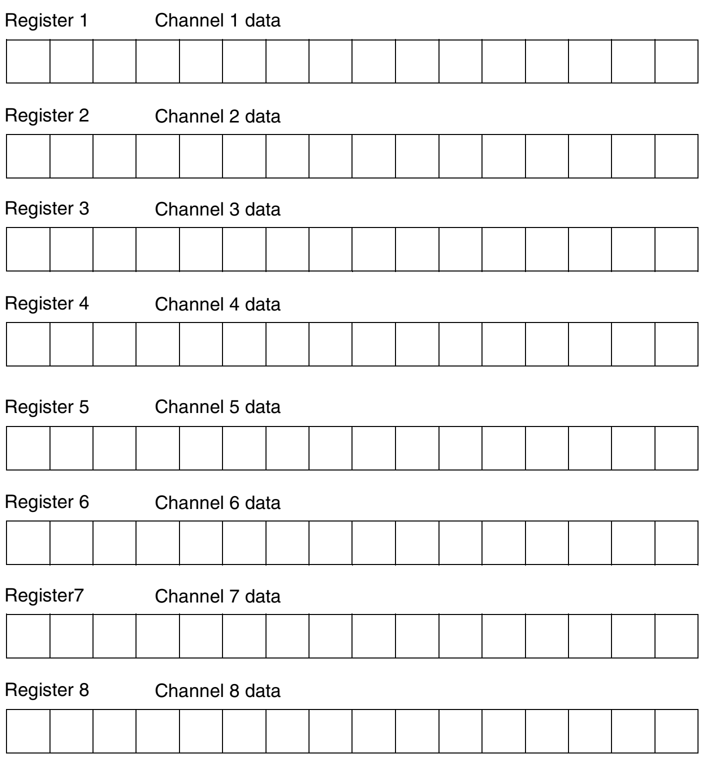
Channel X User Defined Timeout Value: 0 DEC

140ACO13000

The following information
pertains to configuration of the 140ACO13000 analog current sink output module.

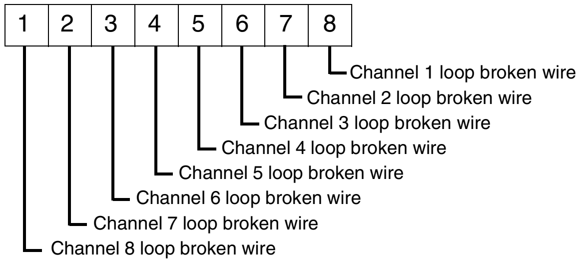
I/O Map Register Assignment

This module requires eight contiguous output (4x) registers, which are assigned as follows. The following figure shows the map register assignment.



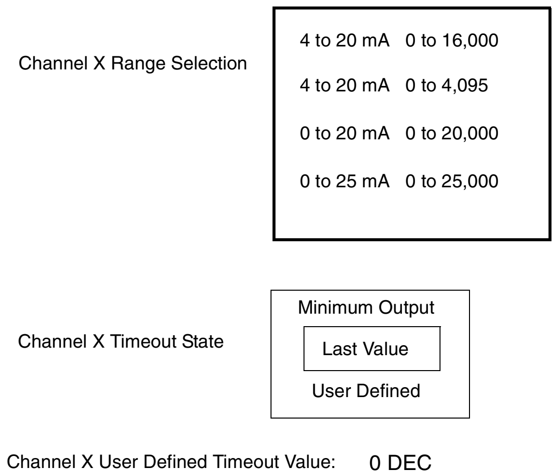
I/O Map Status Byte

The I/O map status is used for the 140ACO13000 output module as follows:



Modsoft Module Zoom Selections

Push <Enter> to display and select channel ranges and timeout states for each channel. Time out state is assumed when system control of the module is stopped. The following figure shows the Channel X timeout state options.

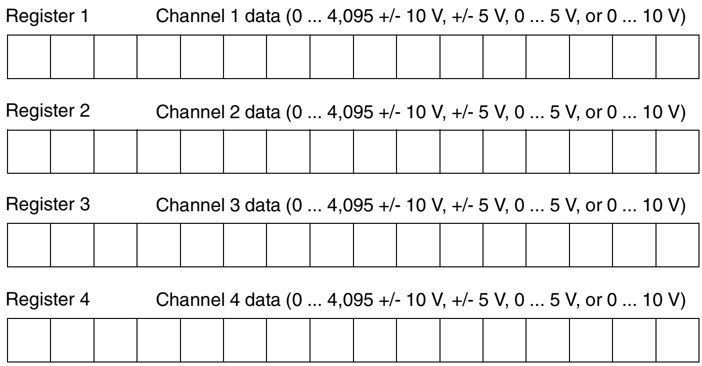


140AVO02000

The following information pertains to configuration of the 140AVO02000 Analog Output module.

I/O Map Register Assignment

This module requires four contiguous output (4x) registers, which are assigned as follows .

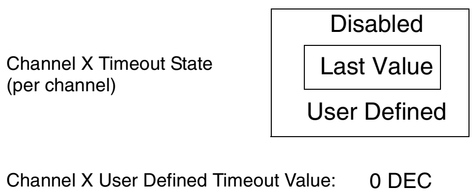


I/O Map Status Byte

There is no I/O map status byte associated with this module.

Modsoft Module Zoom Selections

Push <Enter> to display and select the timeout states for each channel. Timeout state is assumed when system control of the module is stopped.
The following figure shows the Channel X timeout state options.



Note: Selecting "Disabled" for any channel causes all others to default to that state. Output will be what is connected to the module master override terminals, either common or an external voltage. Output LEDs 1-4 will go out when Disabled is selected and the module goes to the inactive state.

140ACO02000 Quantum I/O Analog Current Out Module

Overview

The Analog Output 4 Channel Current module controls and monitors current in 4 ... 20 mA loops.

Specifications

The following table shows the module specifications.

Specifications	
Number of Channels	4
LEDs	Active F 1 ... 4 (Green) - Module outputs switched on 1 ... 4 (Red) - Broken wire on indicated channels NOTE: When the green channel status LEDs are off, the loop current is 0 mA.
Required Addressing	4 Words Out
Loop Voltage	12 ... 30 Vdc. Up to 60 Vdc with an external loop resistor. Outputs are short circuit proof up to 30 Vdc (up to 60 Vdc with external loop resistor).
Loop Resistance	$R_{MIN}{}^{*} = \frac{V_{loop} - 30Vdc}{0.02A}$ *For a loop supply less than 30 volts, R_{MIN} is 0Ω. $R_{MAX} = \frac{V_{loop} - 7Vdc}{0.02A}$ No external resistor is required for loop voltage supply less than 30 volts.
Internal Voltage Drop	7 Vdc min, 30 Vdc max @ 20 mA
Resolution	12 Bits
Accuracy Error @ 25° C	+/- 0.20% of full scale
Linearity	+/- 1 LSB
Accuracy Drift w/Temperature	Typical: 0.004% of full scale / °C. Maximum:0.007% of full scale / °C
Isolation	
Channel to Channel	500 Vac @ 47 ... 63 Hz or 750 Vdc for 1 minute
Channel to Bus	1780 Vac @ 47 ... 63 Hz, or 2500 Vdc for 1 minute
Update Time	3 ms for all channels (simultaneous update)
Settling Time	900 μs to +/- 0.1% of the final value
Fault Detection	Open circuit in 4 ... 20 mA mode. Specific channel is identified when an open circuit is detected through the red channel LED.
Bus Current Required	480 mA

Specifications	
Power Dissipation	5.3 W max
External Power Supply	See Loop Voltage in this table.
Fusing	
Internal	None

WARNING

Possible injury to personnel or equipment.

Before removing the connector, ensure that it is safe to have field wiring in an open circuit condition.

Failure to follow this precaution can result in death, serious injury, or equipment damage.

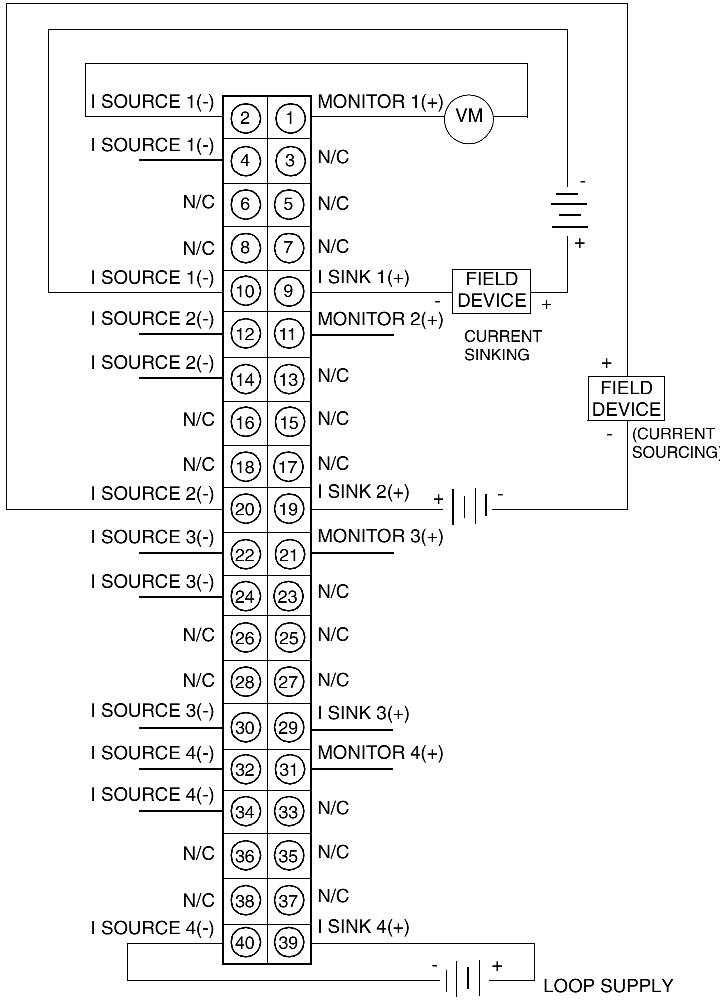
Voltmeter Monitor Specifications

The following table shows the voltmeter monitor specifications.

Voltmeter Monitor Specifications	
Range	1 ... 5 V (Main current loop must be active)
Scaling	V_{OUT} (Volts) = I_{LOOP} (mA) x 0.25
Output Impedance	300Ω Typical
Wire Length	1 m max

ACO02000 Wiring Diagram

The following figure shows the wiring diagram for the 140ACO02000 module.



Note:

1. Unused channels will indicate broken wire status unless wired to the loop supply, as shown on Channel 4. In this example, loop supply must be 30 V or less.
2. VM is an optional voltmeter that can be connected to read voltage that is proportional to the current. Wiring to this terminal is limited to 1 meter maximum.
3. The wiring example shows Channel 1 acting as a current sink and Channel 2 acting as a current source for their respective field devices.
4. N / C = Not Connected.

Note: At power up, the channel outputs are all disabled (current = 0). Configuring any channel as disabled will cause all channels to be disabled when a communication loss occurs.

140ACO13000 High Density Analog Out I/O Module

Overview

The 140ACO13000 is an eight channel analog output module used to control and monitor current in 4 ... 20 mA, 0 ... 20 mA, and 0 ... 25 mA loops.

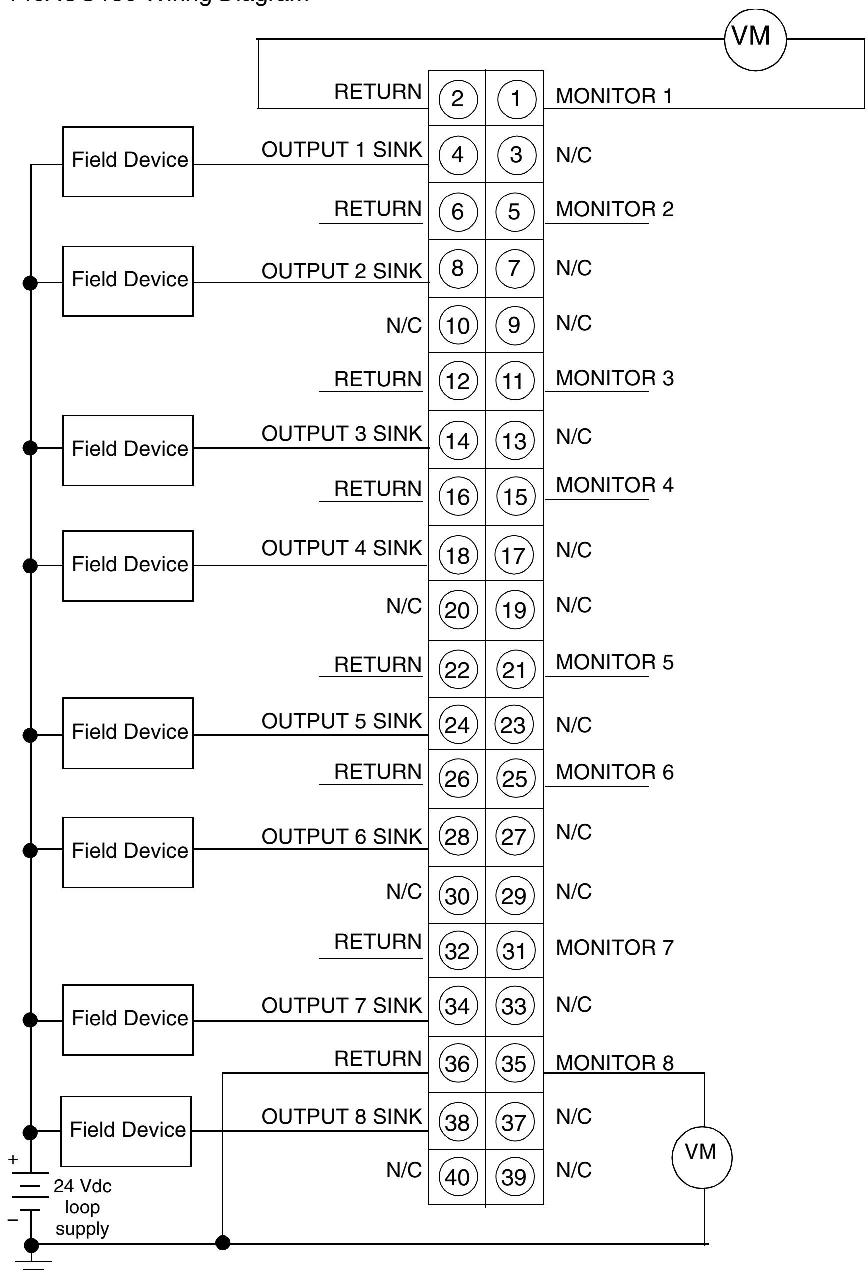
Specifications

The following table shows the technical specifications for the ACO13000 module.

Specifications	
Number of Channels	8
LEDs	Active, indicates bus communication present F, indicates a fault on a channel 1 ... 8 (Green) - Module outputs active 1 ... 8 (Red) - Broken wire on indicated channels
Required Addressing	8 Words Out
Module Ranges and Resolution	0 ... 25 mA, 0 ... 25,000 counts 0 ... 20 mA, 0 ... 20,000 counts 4 ... 20 mA, 0 ...16,000 counts 4 ... 20 mA, 0 ...4,095 counts
Loop Voltage	6 ... 30 Vdc maximum
Internal Voltage Drop	6 Vdc min, 30 Vdc max @ 25 mA
Accuracy Error @ 25 ° C	+/- 0.2% of full scale
Linearity	+/-12 µA, 4 ... 20 mA, 0 ... 4,095 counts +/-4 µA, 0 ... 25 mA, 0 ... 25,000 counts +/-4 µA, 0 ... 20 mA, 0 ... 20,000 counts +/-4 µA, 4 ... 20 mA, 0 ... 16,000 counts
Accuracy Drift w/Temperature	Typical: 0.004% of full scale / °C. Maximum: 0.007% of full scale / °C
Isolation	
Channel to Channel	none
Field to Bus	1780 Vac for 1 minute
Update Time	5 ms for all 8 channels
Settling Time Full Scale Step Change	1.6 ms to 5% of the final value 3.2 ms to 0.1% of the final value
Fault Detection	Broken wire in 4 ... 20 mA mode.
Bus Current Required	550 mA
Power Dissipation	5.0 W
External Power Supply	See Loop Voltage above
Fusing	
Internal	None
External	None
Voltmeter Monitor	
Scaling	V_{OUT} (Volts) = I_{LOOP} (mA) x 0.10
Accuracy @ 25° C	+/- 0.2% of full scale

Specifications	
Output Impedance	300 Ω
Maximum Cable Length	1 meter
Programming Software	Modsoft Ver 2.6 or Concept 2.2

Wiring Diagram 140ACO130 Wiring Diagram



Notes on Wiring Diagram

1. At power up, channel outputs are all at zero current (0 mA).
2. VM is an optional voltmeter that can be connected to read voltage that is proportional to the current. Wiring to this terminal is limited to 1 meter maximum.
3. Either shielded or unshielded cables may be used. In noisy environments, twisted shielded cable is recommended. Shielded cable should have a shield tied to earth ground near the signal source end.
4. Unused outputs may cause the activation of the F (fault) LED. To avoid this occurrence the unused channels should be configured in the 0 ... 25 mA range.
5. All terminals labeled ‘RETURN" are common inside the module.
6. N/C = Not connected

140AVO02000 Quantum I/O Analog Voltage Out Module

Overview

The Analog Out 4 Channel module outputs voltages in mixed modes and levels. These are selected using jumpers on the field-wiring connector.

Specifications

The following table shows the specifications for the AVO02000 Analog Out 4 channel module.

Specifications	
Number of Channels	4
LEDs	Active 1 ... 4 (Green) - Indicates module outputs switched on NOTE: When the green channel status LEDs are off, the module is not generating outputs, however, an output may still be present if the master override signal is used.
Required Addressing	4 words out
Voltage Output Ranges	
Bipolar	+/- 10 Vdc (Min load resistance = 1 kΩ) (Jumper between Reference - Control terminals)
	+/- 5 Vdc (Min load resistance = 500Ω) (Jumper between Reference - Control and Output - R terminals)
Unipolar	0 ... 10 Vdc (Min load resistance = 1 kΩ) (Jumper between Output - R terminals)
	0 ... 5 Vdc (Min load resistance = 500Ω) (Jumper between Output - R and Control - R terminals)
Output Current	+/- 10 mA max any range (outputs are short-circuit proof)
Source Resistance	0.1 Ω
Resolution	12 bits
Accuracy Error @ 25 degrees	+/- 0.15% of full scale
Accuracy Drift w/Temperature	
Unipolar Ranges	0.003% of full scale / °C typical 0.005% of full scale / °C max
Bipolar Ranges	0.004% of full scale / °C typical 0.007% of full scale / °C max
Linearity	+/- 1 LSB
Isolation	
Channel to Channel	500 Vac @ 47 ... 63 Hz for 1 minute
Channel to Bus	1780 Vac @ 47 ... 63 Hz for 1 minute
Maximum Settling Time	700 µs to +/- 0.1% of the final value
Update Time	3 ms for all channels
Fault Detection	None
Wire Length	400 m max

Specifications	
Bus Current Required	700 mA
Power Dissipation	4.5 W max
External Power	Not required for this module
Fusing	
Internal	None
External	An external fuse is required on the master override signal when it is connected to an external source. The required fuse is 1/16 A or 0.063 A fuse. Fuse Type: 3AG Fast Acting 1/16 A, 250 V Fuse Holder: 3AG Fuse Type The external fuse is not required if master override is connected to common.

WARNING

Possible injury to personnel or equipment

Before removing the connector, ensure that it is safe to have field wiring in an open circuit condition.

Failure to follow this precaution can result in death, serious injury, or equipment damage.

WARNING

Malfunction of equipment

Master override must be connected to an external source through 1/16 A in line fuse, or strapped to common to avoid erroneous outputs in this module.

Failure to follow this precaution can result in death, serious injury, or equipment damage.

Note: The output levels of this module are either those generated within the module based on data inputs from the system, or from the master override inputs on the field-wiring terminal strip.

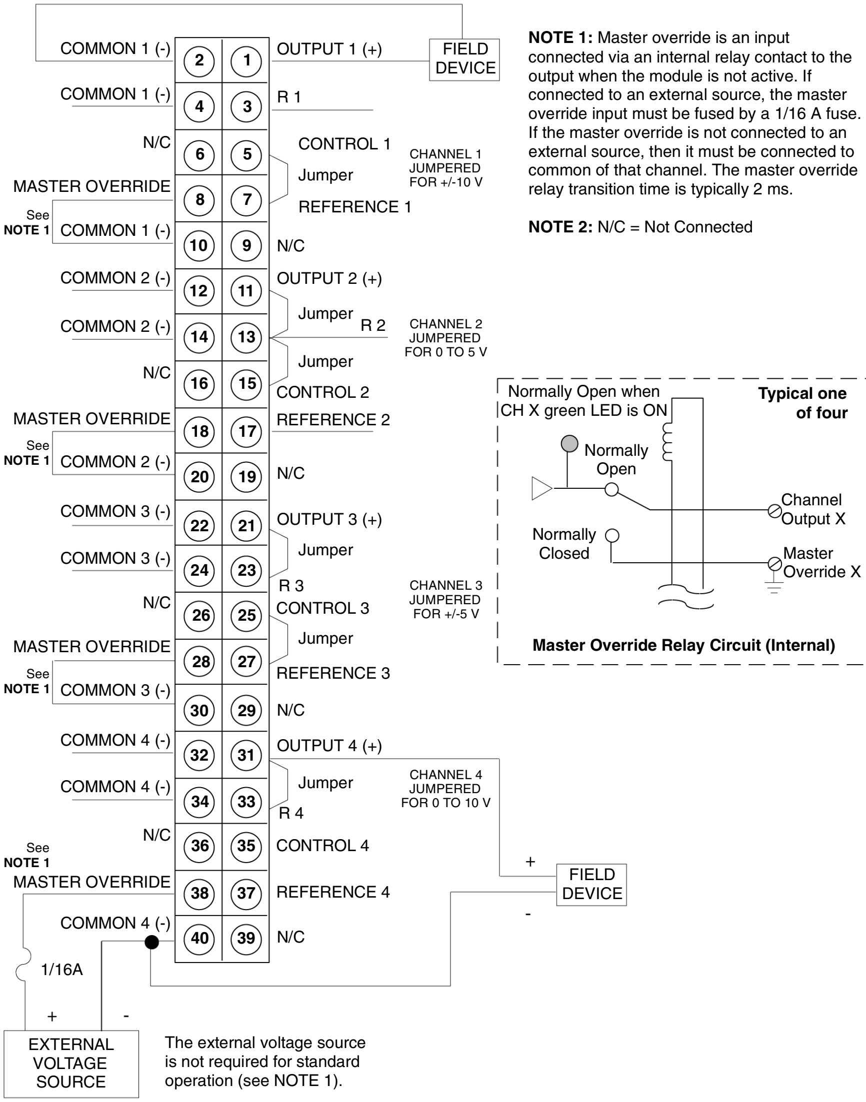
During normal operation, the front panel Active and 1 ... 4 green LEDs are ON. If bus communication to the module stops for any reason, the Active LED will go off and, depending on panel software configuration:

- when LEDs 1 ... 4 are ON, the channel output levels will be as predetermined and held by the module.
- when LEDs 1 ... 4 are OFF, the master override levels are output on each channel.

If module power is lost or the module fails, the master override levels will be output.

The master override inputs must be from an external supply with a source impedance of <200Ω or tied to system common. These inputs for channels that are in use should not be allowed to float and may be unique for each.

Wiring Diagram The following figure shows the wiring diagram for the 140AVO02000 module.



NOTE 1: Master override is an input connected via an internal relay contact to the output when the module is not active. If connected to an external source, the master override input must be fused by a 1/16 A fuse. If the master override is not connected to an external source, then it must be connected to common of that channel. The master override relay transition time is typically 2 ms.

NOTE 2: N/C = Not Connected

The external voltage source is not required for standard operation (see NOTE 1).

18.4 Analog Input/Output Modules

At a Glance

Overview

This section provides information on Quantum Analog input/output modules.

What's in this Section?

This section contains the following topics:

Topic	Page
Configuration of the 140AMM09000 Analog Input/Output Module	579
140AMM09000 Analog Input/Output Module	584

Configuration of the 140AMM09000 Analog Input/Output Module

Overview

This section provides information on configuration of the analog input/output module 140AMM09000.

Note: Modsoft V2.2 or above is required to set up your Quantum I/O configuration.

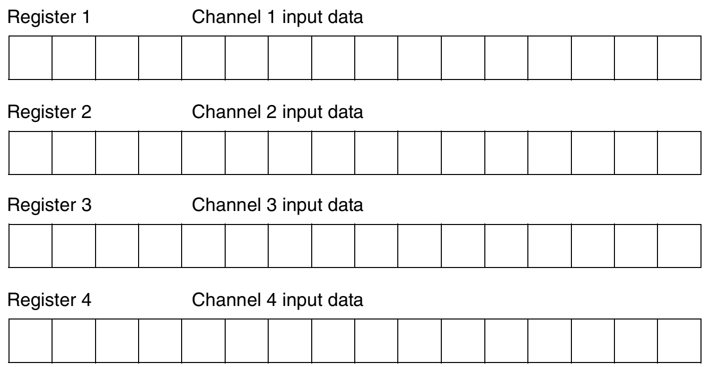
I/O Map Register Assignment

This module requires five contiguous input (3x) registers and two output (4x) registers.

3X Registers

The following figure shows the 3x registers.

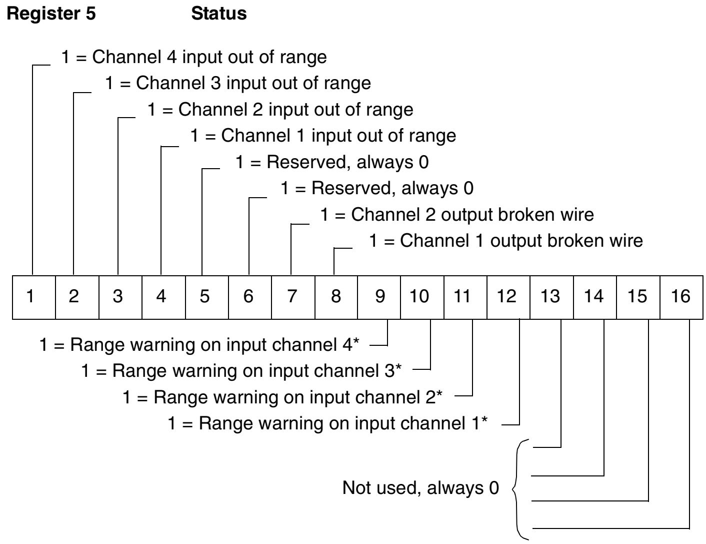
3x Registers



Note: The input data format and resolution are selected in Zoom screen. Voltmeter mode is recommended for bipolar ranges with signed decimal numbers.

Status Warning

The following figure shows the status warnings for register 5.



*A range warning is issued when a channel input is outside the rated input value, as shown in the following table. Warning bits stay on after out of range bits are set. An out-of-range bit is set when a channel input exceeds the rated input value by 2.4%. Out of range bits are also set if inputs drop below 0.5V (1 ... 5V mode) or 2.08 mA (4 ... 20 mA mode).

When configured for current inputs (jumper installed between IN(+) and SENSE terminals), a broken field wire results in a zero current reading. If 4 ... 20 mA is selected, fault LEDs and warning/out of range and I/O Map Status Byte bits are displayed.

CAUTION

Possible Equipment Failure

When configured for voltage inputs (no jumper installed between In(+) and sense terminals), if a broken field wire occurs, readings will be non-zero and not predictable.

Failure to follow this precaution can result in injury or equipment damage.

Linear Measuring Ranges

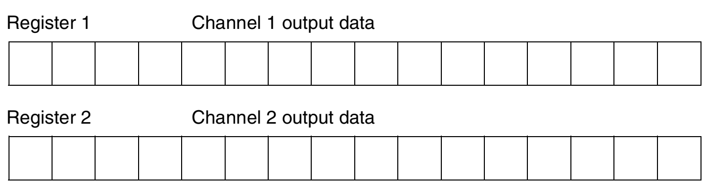
The following table shows the linear measuring ranges for the 140AMM09000 combination Analog module.

Data Format	Input	Under Warning	Normal	Over Warning
16-bit Format	+/- 10 V	< 768	768 ... 64,768	> 64,768
	+/- 5 V, +/- 20 mA	< 16,768	16,768 ... 48,768	> 48,768
	0 ... 10 V		0 ... 64,000	> 64,000
	0 ... 5 V, 0 ... 20 mA		0 ... 32,000	> 32,000
	1 ... 5 V, 4 ... 20 mA	< 6,400	6,400 ... 32,000	> 32,000
Voltmeter Format*	+/- 10 V	< -10,000	-10,000 ... 10,000	> 10,000
	+/- 5 V	< -5,000	-5,000 ... 5,000	> 5,000
	0 ... 10 V		0 ... 10,000	> 10,000
	0 ... 5 V		0 ... 5,000	> 5,000
	1 ... 5 V	< 1,000	1,000 ... 5,000	> 5,000
	+/- 20mA	< -20,000	-20,000 ... 20,000	> 20,000
	0 ... 20mA		0 ... 20,000	> 20,000
	4 ... 20mA	< 4,000	4000 ... 20,000	>20,000
12-bit Format	+/- 10 V	0	0 ... 4,095	4,095
	+/- 5 V, +/- 20 mA	0	0 ... 4,095	4,095
	0 ... 10 V		0 ... 4,095	4,095
	0 ... 5 V, 0 ... 20 mA		0 ... 4,095	4,095
	1 ... 5 V, 4 ... 20 mA	0	0 ... 4,095	4,095

4x Registers

The following figure shows the 4X registers.

4x Registers



Note: The data format is always 0 ... 4095 decimal (in Modsoft).

I/O Map Status Byte

The I/O map status byte is used for the 140AMM09000 Combination module as follows.

1	2	3	4	5	6	7	8

- 8 — Channel 1 output broken wire
- 7 — Channel 2 output broken wire
- 6 — Not used
- 5 — Not used
- 4 — Channel 1 input out of range or broken wire (4-20 mA)
- 3 — Channel 2 input out of range or broken wire (4-20 mA)
- 2 — Channel 3 input out of range or broken wire (4-20 mA)
- 1 — Channel 4 input out of range or broken wire (4-20 mA)

Module Zoom Selections

Module Zoom selection screens for selecting input ranges and output timeout states are as follows.

Module Zoom Selections (Inputs)

Push <Enter> to display and select the data format for the module and the ranges for the individual input channels.

Data Formats (per node)
(Inputs)

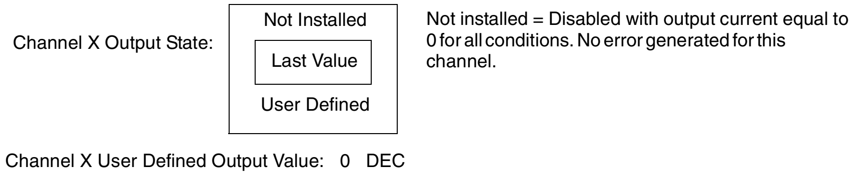
- 16-bit Format
- Voltmeter
- 12-bit Format

Channel X Range
(per channel)
(Inputs)

- Not installed
- -10V to +10V
- 0V to +10V
- -5V to +5V
- 0V to +5V
- 1V to +5V
- -20mA to +20mA
- 0mA to +20mA
- +4mA to +20mA

Module Zoom Selections (Outputs)

Push <Enter> to display and select the mode for the outputs after a communication's timeout. This mode is selected for each channel. The following figure shows the module zoom selections (outputs).



140AMM09000 Analog Input/Output Module

Overview

The Analog In/Out 4/2 bi-directional module combines four analog inputs which accept a mix of current and voltage, with two isolated analog outputs that control and monitor current in 4 ... 20 mA loops.

Topology Specifications

The following table shows the topology specifications for the analog input/output module.

Topology Specifications	
Number of Input Channels	4 channels
Number of Output Channels	2 isolated channels
LEDs	Active F (red) - No power applied to the output group(s) or channel fault 1 ... 2 (Green - left column) - Indicates output is active 1 ... 2 (Red - middle column) - Indicates output status: broken wire 1 ... 4 (Red- right column) - Indicates input status: under/over range, broken wire 4 ... 20 mA

Input Specifications

The following table shows the input specifications for the analog input/output module.

Input Specifications				
Operating Ranges				
Bipolar	+/- 10 Vdc	+/-5 Vdc	+/- 20 mA	
Unipolar	0 ... 10 Vdc	0 ... 5 Vdc	0 ... 20 mA	
Unipolar w/Offset	1 ... 5 Vdc	4 ... 20 mA		
Voltage Input				
Linear Measuring Range	2.4% over and under range			
Absolute Maximum Input	+/- 50 Vdc			
Input Impedance In Range	>10 MΩ			
Input Impedance Over Range	> 0.5 MΩ			
Current Input				
Linear Measuring Range	+2.4% over range, and -9.6% under range			
Absolute Maximum Input	+/- 25 mA			
Input Impedance	250Ω			
Resolution				
16 Bit	+/- 10 Vdc	0 ...10 Vdc		
15 Bit	+/- 5 Vdc	0 ... 5 Vdc	+/-20 mA	0 ... 20 mA
14 Bit	1 ... 5 Vdc	4 ... 20 mA		
Absolute Accuracy Error @ 25° C (Voltage Mode)	Typical: Maximum:	+/- 0.03% +/- 0.05% of full scale		
Linearity	Monotonic +/- 1 LSB			
Offset 0 ... 60° C **Gain Shift 0 ... 60° C**	+/- 0.0014%/°C of full scale max +/- 0.002%/°C of full scale max			
Common Mode Rejection	Better than 80 dB @ 50 or 60 Hz			
Input Filter	Single pole low pass, -3dB @ 21 Hz, +/- 20%			
Operating Voltage				
Channel to Channel	+/- 40 Vdc max			
Isolation				
Channel to Bus	500 Vac, 750 Vdc, for 1 minute			
Input Channel to Output Channel	500 Vac, 750 Vdc, for 1 minute			
Update Time	320 ms for 4 channels			
Fault Detection	Open circuit in 4 ... 20 mA range, or over range, or under range in bipolar modes only			

Output Specifications

The following table shows the output specifications for the analog input/output module.

Output Specifications	
Loop Voltage	7 ... 30 Vdc, up to 60 Vdc with an external resistor
Loop Resistance	$R_{MIN}{}^{*} = \frac{V_{loop} - 30Vdc}{0.02A}$ $R_{MAX} = \frac{V_{loop} - 7Vdc}{0.02A}$ *No R_{MIN} is required for loop voltage less than 30 Vdc.
Internal Voltage Drop	7 Vdc min, 30 Vdc max @ 20 mA
Resolution (bits)	12
Accuracy Error @ 25° C	+/- 0.20% of full scale
Linearity	Monotonic +/- 1 LSB
Accuracy Error 0 ... 60° C	Typical: +/- 0.004%/°C of full scale. Maximum:+/- 0.007%/°C of full scale
Isolation	
Channel to Channel	500 Vac, 750 Vdc, for 1 minute
Channel to Bus	500 Vac, 750 Vdc, for 1 minute
Output Channel to Input Channel	500 Vac, 750 Vdc, for 1 minute
Update Time	15 ms for 2 channels
Settling Time	900 µs to +/- 0.1% of final value
Fault Detection	Open circuit indicator light and status byte
External Power Supply	See loop voltage above

Voltmeter Monitor Specifications

The following table shows the specifications for the voltmeter monitor for the analog input/output module.

Voltmeter Monitor Specifications	
Range	1 ... 5 V (Loop current must be active)
Scaling	I_{OUT} (mA) x 0.250 = V_{OUT} (volts)
Output Impedance	300Ω typical
Maximum Wire Length	1 meter

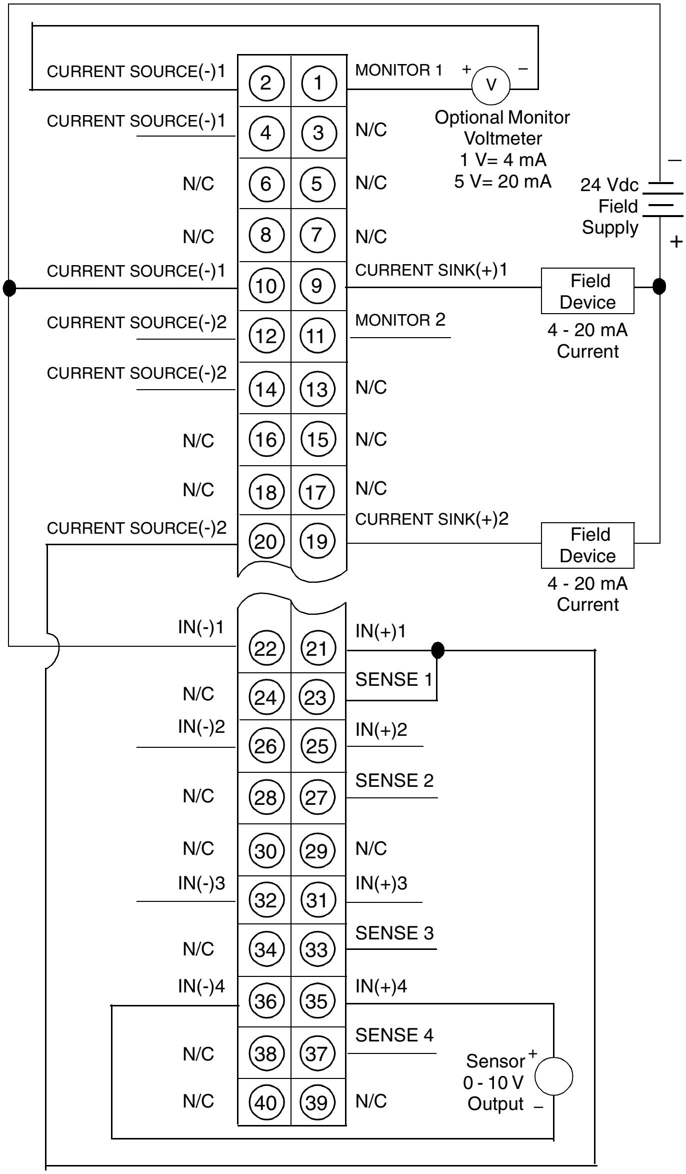
Common Specifications

The following table shows the common specifications for the analog input/output module.

Common Specifications	
Required Addressing	5 Words In 2 Words Out
Bus Current Required (module)	350 mA
Fusing	
Internal	None required
External	User discretion

Wiring Diagram

The following figure shows the wiring diagram for the 140AMM09000 analog input/output module.



The following information pertains to the wiring diagram above.

Output Section 2 Channels

Typical Wiring Outputs	
Channel 1	The output shows a connection to an external field device and optional monitor.
Channel 2	The output shows a connection to an external field device and the input of channel 1.

Input Section 4 Channels

Typical Wiring Inputs	
Channel 1	Channel 1 shows 4 - 20 mA current input controlled by output section Channel 2.
Channel 4	The input shows a connection to a voltage output sensor.

Note:

1. Pins 1 ... 20 are outputs
   Pins 21 ... 40 are inputs
2. N / C = Not Connected
3. Jumpers are required between IN (+) and SENSE terminals for all current input ranges.

18.5 Discrete Input Modules

At a Glance

Overview

This section provides information on Quantum discrete input modules.

What's in this Section?

This section contains the following topics:

Topic	Page
I/O Configuration for Discrete Input Modules	591
140DAI34000 Quantum I/O 24 VAC IN Module	595
140DAI35300 Quantum I/O AC Input 24 Vac Module	600
140DAI44000 Quantum I/O 48 VAC IN Module	605
140DAI45300 Quantum I/O AC Input 48 Vac 4x8 Module	610
140DAI54000 Quantum I/O 115 VAC In Module	615
140DAI54300 Quantum I/O AC Input 115 Vac 2x8 Module	620
140DAI55300 Quantum I/O AC Input 115 Vac 4x8 Module	625
140DAI74000 Quantum I/O AC Input 230 Vac 16x1 Module	630
140DAI75300 Quantum I/O AC Input 230 Vac 4x8 Module	635
140DDI15310 Quantum I/O DC Input 5 V TTL 4x8 Source Module	639
140DDI35300 Quantum I/O DC Input 24 Vdc 4x8 Sink Module	643
140DDI35310 Quantum I/O DC Input 24 Vdc True Low 4x8 Input Module	646
140DDI36400 I/O DC Input 24 VDC 6x16 Telefast Input Module	650
140DDI67300 Quantum I/O DC Input 125 Vdc 3x8 Sink Module	655
140DDI84100 Quantum I/O DC Input 10 ... 60 Vdc 8x2 Sink Module	662
140DDI85300 Quantum I/O DC Input 10 ... 60 Vdc 4x8 Sink Module	666

I/O Configuration for Discrete Input Modules

Overview

This section provides information on configuration of 16-, 24-, 32-, and 96-point input modules.

16-Point Input Modules

The 16-point input modules are:
- 140DAI34000 (AC Input 24 Vac 16x1)
- 140DAI44000 (AC Input 48 Vac 16x1)
- 140DAI54000 (AC Input 115 Vac 16x1)
- 140DAI54300 (AC Input 115 Vac 8x2)
- 140DAI74000 (AC Input 230 Vac 16x1)
- 140DDI84100 (DC Input 10 ... 60 Vdc 8x2 Sink)

I/O Map Register Assignment

The input modules listed above can be configured as either 16 contiguous 1x references or as one 3x register.The following figure shows the 16-point register.

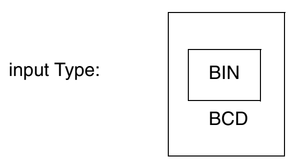
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

I/O Map Status Byte

There is no I/O map status byte associated with these modules.

Modsoft Module Zoom Selections

Push <Enter> to display and select the input type. This selection appears if the module is I/O mapped to a 3x register. The following figure shows the input type display.



24-Point Input Module

There is only one 24-point input module: 140 DDI 673 00 (DC Input 125 VDC 3x8 Sink).

I/O Map Register Assignment

The input module listed above can be configured as either 24 contiguous discrete input (1x) reference, or as two contiguous input (3x) registers in the following format. The following figures show the input point for Register 1 and Register 2.

Register 1

Input Point 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

MSB - First Word

Register 2

Input Point 17									17	18	19	20	21	22	23	24

MSB - Second Word

I/O Map Status Byte

There is no input I/O map status byte associated with this module.

Modsoft Module Zoom Selections

Push <Enter> to display and select the Input Type and the Filter Select options. The following figures show the input type and the filter select option.

Input Type:

BIN

BCD

The input Type selection only appears if the module is I/O mapped to a 3x register.

Group X
Filter Select on:

.7 msec

1.5 msec

The Filter Select option is made on a group-by-group basis and defaults to the .7 msec filter,

32-Point Input Modules

The 32-point input modules are as follows:

- 140DAI35300 (AC Input 24 Vac 4x8)
- 140DAI45300 (AC Input 48 Vac 4x8)
- 140DAI55300 (AC Input 115 Vac 4x8)
- 140DAI75300 (AC Input 230 Vac 4x8)
- 140DDI15310 (DC Input 5 V TTL 4x8 Source)
- 140DDI35300 (DC Input 24 Vdc 4x8 Sink)
- 140DDI35310 (DC Input 24 Vdc 4x8 Source)
- 140DDI85300 (DC Input 10 ... 60 Vdc 4x8 Sink)

I/O Map Register Assignment

The input modules listed above can be configured as either 32 contiguous discrete input (1x) references or as two contiguous input (3x) registers in the following format. The following figure shows the input points for Register 1 and Register 2.

Register 1

Input Point 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

MSB - First Word

Register 2

Input Point 17	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

MSB - Second Word

I/O Map Status Byte

There is no I/O map status byte associated with these modules.

Modsoft Module Zoom Selections

Push <Enter> to display and select the input type. This selection appears if the module is I/O mapped to a 3x register. The following figure shows the input type.

Input Type:

BIN

BCD

96-Point Input modules

The following is the only 96 point input module:

- 140DDI36400 - DC input 6 x 16 sink

140DDI36400 Register Assignment

The following information pertains to the 140DDI36400 Input module. The following figures show the output points for register 1 through 6.

Register 1

Input Point 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

MSB - First Word

Register 2

Input Point 17	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

MSB - Second Word

Register 3

Input Point 33	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48

MSB - Third Word

Register 4

Input Point 49	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64

MSB - Fourth Word

Register 5

Input Point 65	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80

MSB - Fifth Word

Register 6

Input Point 81	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96

MSB - Sixth Word

I/O Map Status Byte

There is no I/O map status byte associated with this module.

Modsoft Module Zoom Selections

Push <Enter> to display and select the input type. This selection appears if the module is I/O mapped to a 3x register. The following figure shows the input type.

Input Type: $\boxed{\text{BIN}}$ BCD

140DAI34000 Quantum I/O 24 VAC IN Module

Overview

The AC Input 24 Vac 16x1 module accepts 24 Vac inputs.

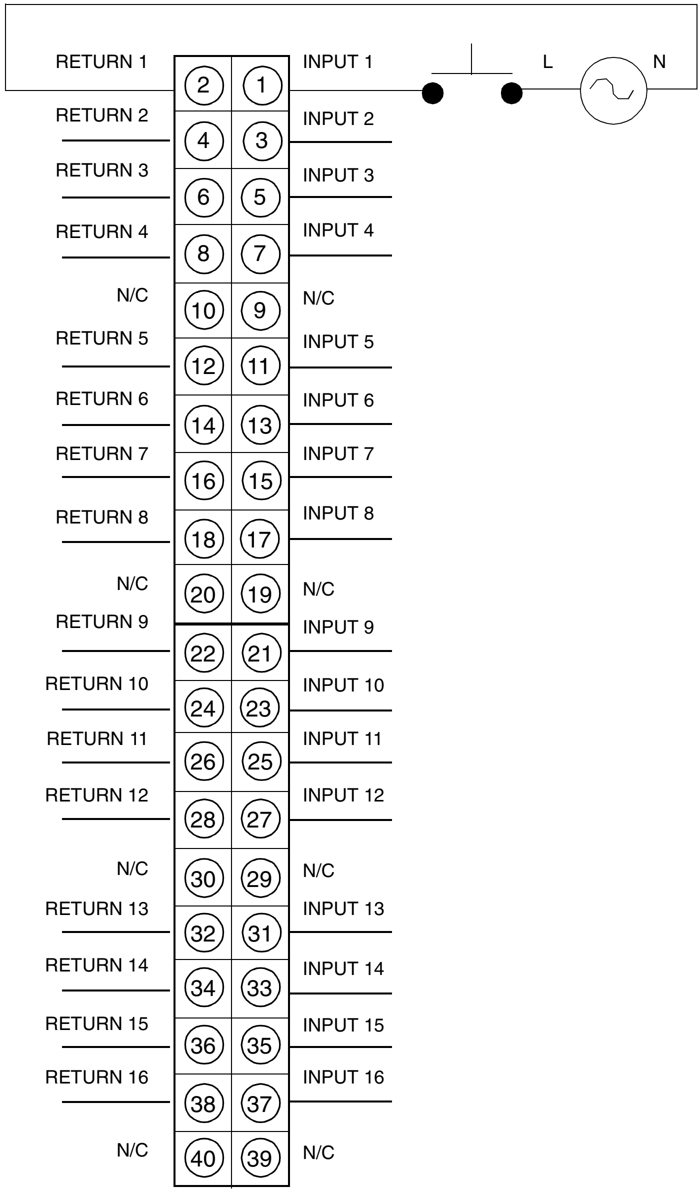
Specifications

The following table shows the specifications for the DAI34000 24 VAC IN module.

Specifications	
Number of Input Points	16 Individually Isolated
LEDs	Active 1 ... 16 (Green) - Indicates point status
Required Addressing	1 Word In
Operating Voltages and Input Currents*	
50 Hz Typical Input Impedance	ON: 14 ... 30 Vac (11.1 mA max) OFF: 0 ... 5 Vac 3.1 kΩ capacitive
60 Hz Typical Input impedance	ON: 12 ... 30 Vac (13.2 mA max) OFF: 0 ... 5 Vac 2.6 kΩ capacitive
*Do not use outside the 47 ... 63 Hz range.	
Maximum Allowable Leakage Current from an External Device to be Recognized as an OFF Condition	1.9 mA
Absolute Maximum Input	
Continuous	30 Vac
10 s	32 Vac
1 cycle	50 Vac
Response	
OFF - ON	Min 4.9 ms., Max 0.75 line cycle
ON - OFF	Min 7.3 ms., Max 12.3 ms
Isolation	
Input to Input	1780 Vac for 1 minute
Input to Bus	1780 Vac for 1 minute
Fault Detection	None
Bus Current Required	180 mA
Power Dissipation	5.5 W max
External Power	Not required for this module
Fusing	
Internal	None
External	User discretion

Note: Input signals must be sinusoidal with less than 6% THD (Total Harmonic Distortion) and 63 Hz maximum frequency.

Wiring Diagram The following figure shows the DAI34000 wiring diagram.



Note:
1. This module is not polarity sensitive.
2. N / C = Not Connected.

140DAI35300 Quantum I/O AC Input 24 Vac Module

Overview

The AC Input 24 Vac 4x8 module accepts 24 Vac inputs.

Specifications

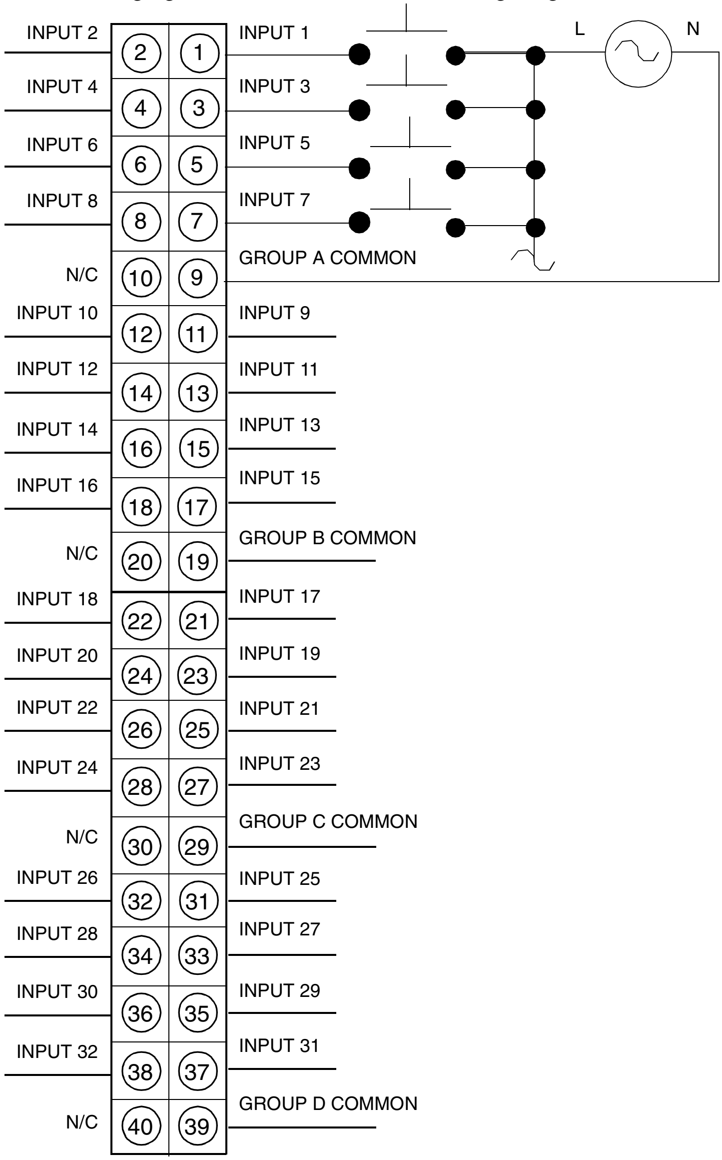
The following table shows the specifications for the DAI35300 AC input 24 VAC IN module.

Specifications	
Number of Input Points	32 in four 8 point groups
LEDs	Active 1 ... 32 (Green) - Indicates point status
Required Addressing	2 words in
Operating Voltages and Input Currents*	
50 Hz Typical Input Impedance	ON: 14 ... 30 Vac (11.1 mA max) OFF: 0 ... 5 Vac 3.1 kΩ capacitive
60 Hz Typical Input Impedance	ON: 12 ... 30 Vac (13.2 mA max) OFF: 0 ... 5 Vac 2.6 kΩ capacitive
*Do not use outside the 47 ... 63 Hz range.	
Maximum Allowable Leakage Current from an External Device to be Recognized as an OFF Condition	1.9 mA
Input Frequency	47 ... 63 Hz
Absolute Maximum Input	
Continuous	30 Vac
10 s	32 Vac
1 cycle	50 Vac
Response	
OFF - ON	Min: 4.9 ms., Max: 0.75 line cycle
ON - OFF	Min: 7.3 ms., Max: 12.3 ms
Isolation	
Group to Group	1780 Vac for 1 minute
Input to Bus	1780 Vac for 1 minute
Fault Detection	None
Bus Current Required	250 mA
Power Dissipation	10.9 W max
External Power	Not required for this module
Fusing	
Internal	None
External	User discretion

Note: Input signals must be sinusoidal with less than 6% THD and 63 Hz maximum frequency.

Wiring Diagram

The following figure shows the DAI35300 wiring diagram.



Note:
1. This module is not polarity sensitive.
2. N / C = Not Connected.

140DAI44000 Quantum I/O 48 VAC IN Module

Overview

The AC Input 48 Vac 16x1 module accepts 48 Vac inputs.

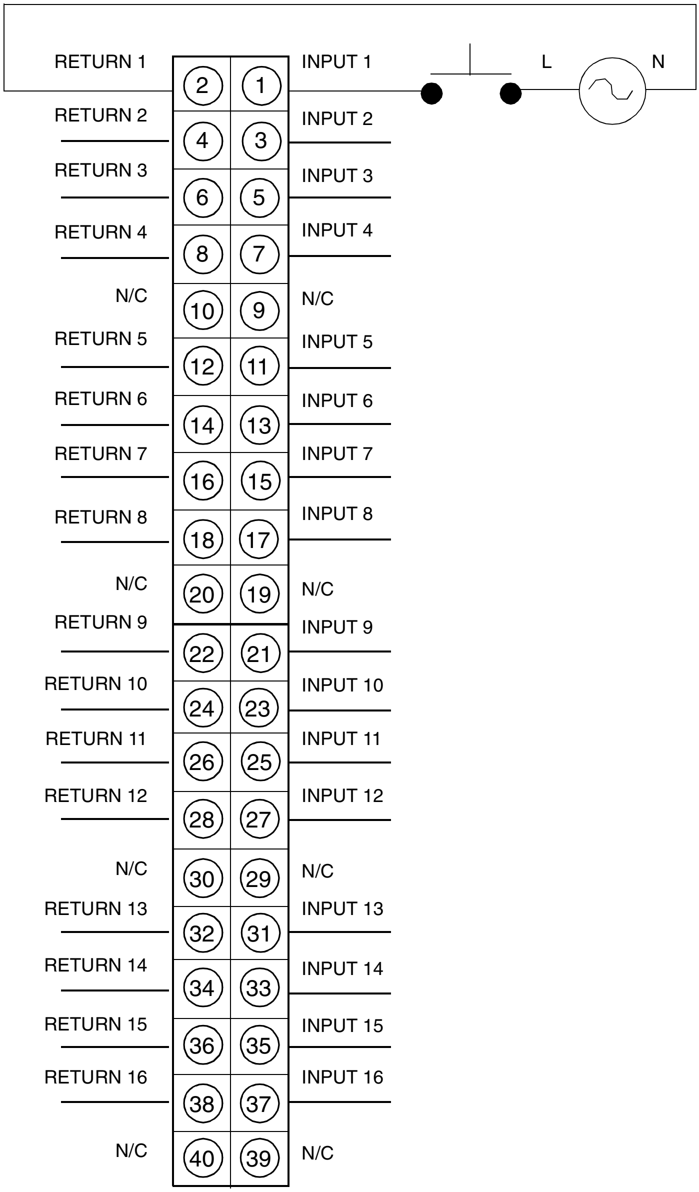
Specifications

The following table shows the specifications for the DAI44000 48 VAC IN module.

Specifications	
Number of Input Points	16 individually isolated
LEDs	Active 1 ... 16 (Green) - Indicates point status
Required Addressing	1 word in
Operating Voltages and Input Currents*	
50 Hz Typical Input impedance	ON: 34 ... 56 Vac (9.8 mA max) OFF: 0 ... 10 Vac 6.8 kΩ capacitive
60 Hz Typical Input impedance	ON: 29 ... 56 Vac (11.7 mA max) OFF: 0 ... 10 Vac 5.6 kΩ capacitive
*Do not use outside the 47 ... 63 Hz range.	
Maximum Allowable Leakage Current from an External Device to be Recognized as an OFF Condition	1.7 mA
Absolute Maximum Input	
Continuous	56 Vac
10 s	63 Vac
1 cycle	100 Vac
Response	
OFF - ON	Min: 4.9 ms., Max: 0.75 line cycle
ON - OFF	Min: 7.3 ms., Max: 12.3 ms
Isolation	
Input to Input	1780 Vac for 1 minute
Input to Bus	1780 Vac for 1 minute
Fault Detection	None
Bus Current Required	180 mA
Power Dissipation	5.5 W max
External Power	Not required for this module
Fusing	
Internal	None
External	User discretion

Note: Input signals must be sinusoidal with less than 6% THD and 63 Hz maximum frequency.

Wiring Diagram The following figure shows the DAI44000 wiring diagram.



Note:
1. This module is not polarity sensitive.
2. N / C = Not Connected.

140DAI45300 Quantum I/O AC Input 48 Vac 4x8 Module

Overview

The AC Input 48 Vac 4x8 module accepts 48 Vac inputs.

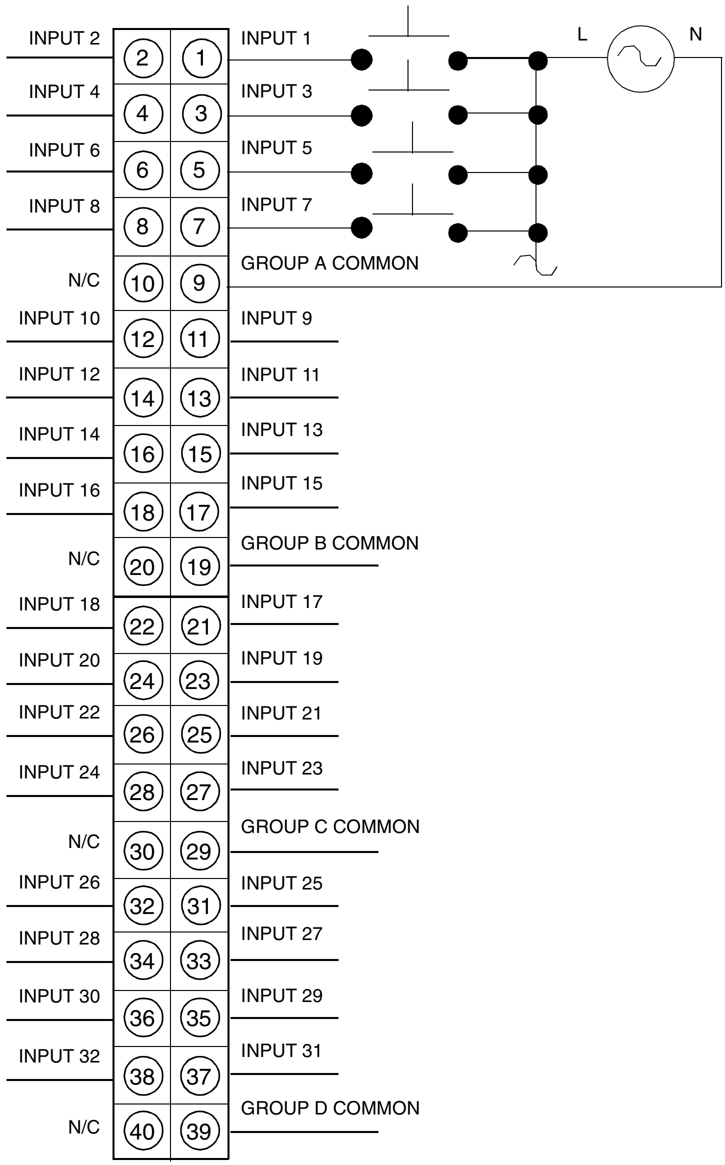
Specifications

The following table shows the specifications for the DAI45300 AC input 48 VAC IN module.

Specifications	
Number of Input Points	32 in four 8 point groups
LEDs	Active 1 ... 32 (Green) - Indicates point status
Required Addressing	2 words in
Operating Voltages and Input Currents*	
50 Hz Typical Input impedance	ON: 34 ... 56 Vac (9.8 mA max) OFF: 0 ... 10 Vac 6.8 kΩ capacitive
60 Hz Typical Input impedance	ON: 29 ... 56 Vac (11.7 mA max) OFF: 0 ... 10 Vac 5.6 kΩ capacitive
*Do not use outside the 47 ... 63 Hz range.	
Maximum Allowable Leakage Current from an External Device to be Recognized as an OFF Condition	1.7 mA
Input Frequency	47 ... 63 Hz
Absolute Maximum Input	
Continuous	56 Vac
10 s	63 Vac
1 cycle	100 Vac
Response	
OFF - ON	Min: 4.9 ms., Max: 0.75 line cycle
ON - OFF	Min: 7.3 ms., Max: 12.3 ms
Isolation	
Group to Group	1780 Vac for 1 minute
Input to Bus	1780 Vac for 1 minute
Fault Detection	None
Bus Current Required	250 mA
Power Dissipation	10.9 W max
External Power	Not required for this module
Fusing	
Internal	None
External	User discretion

Note: Input signals must be sinusoidal with less than 6% THD and 63 Hz maximum frequency.

Wiring Diagram The following figure shows the DAI45300 wiring diagram.



Note:
1. This module is not polarity sensitive.
2. N / C = Not Connected.

140DAI54000 Quantum I/O 115 VAC In Module

Overview

The AC Input 115 Vac 16x1 module accepts 115 Vac inputs.

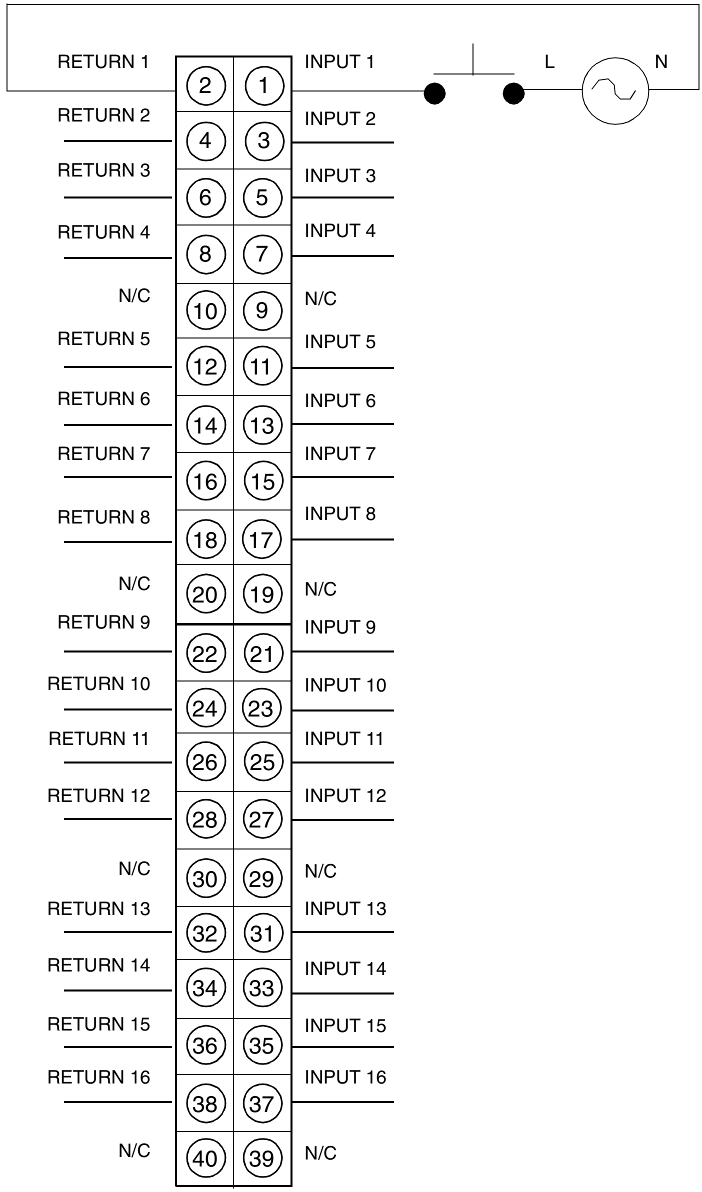
Specifications

The following table shows the specifications for the DAI54000 115 VAC IN module.

Specifications	
Number of Input Points	16 individually isolated
LEDs	Active 1 ... 16 (Green) - Indicates point status
Required Addressing	1 word in
Operating Voltages and Input Currents*	
50 Hz Typical Input impedance	ON: 85 ... 132 Vac (11.1 mA max) OFF: 0 ... 20 Vac 14.4 kΩ capacitive
60 Hz Typical Input impedance	ON: 79 ... 132 Vac (13.2 mA max) OFF: 0 ... 20 Vac 12 kΩ capacitive
*Do not use outside the 47 ... 63 Hz range.	
Maximum Allowable Leakage Current from an External Device to be Recognized as an OFF Condition	2.1 mA
Absolute Maximum Input	
Continuous	132 Vac
10 s	156 Vac
1 cycle	200 Vac
Response	
OFF - ON	Min: 4.9 ms., Max: 0.75 line cycle
ON - OFF	Min: 7.3 ms., Max: 12.3 ms
Isolation	
Input to Input	1780 Vac for 1 minute
Input to Bus	1780 Vac for 1 minute
Fault Detection	None
Bus Current Required	180 mA
Power Dissipation	5.5 W max
External Power	Not required for this module
Fusing	
Internal	None
External	User discretion

Note: Input signals must be sinusoidal with less than 6% THD and 63 Hz maximum frequency.

Wiring Diagram The following figure shows the 140DAI54000 wiring diagram.



Note:
1. This module is not polarity sensitive.
2. N / C = Not Connected.

140DAI54300 Quantum I/O AC Input 115 Vac 2x8 Module

Overview

The AC Input 115 Vac 2x8 module accepts 115 Vac inputs.

Specifications

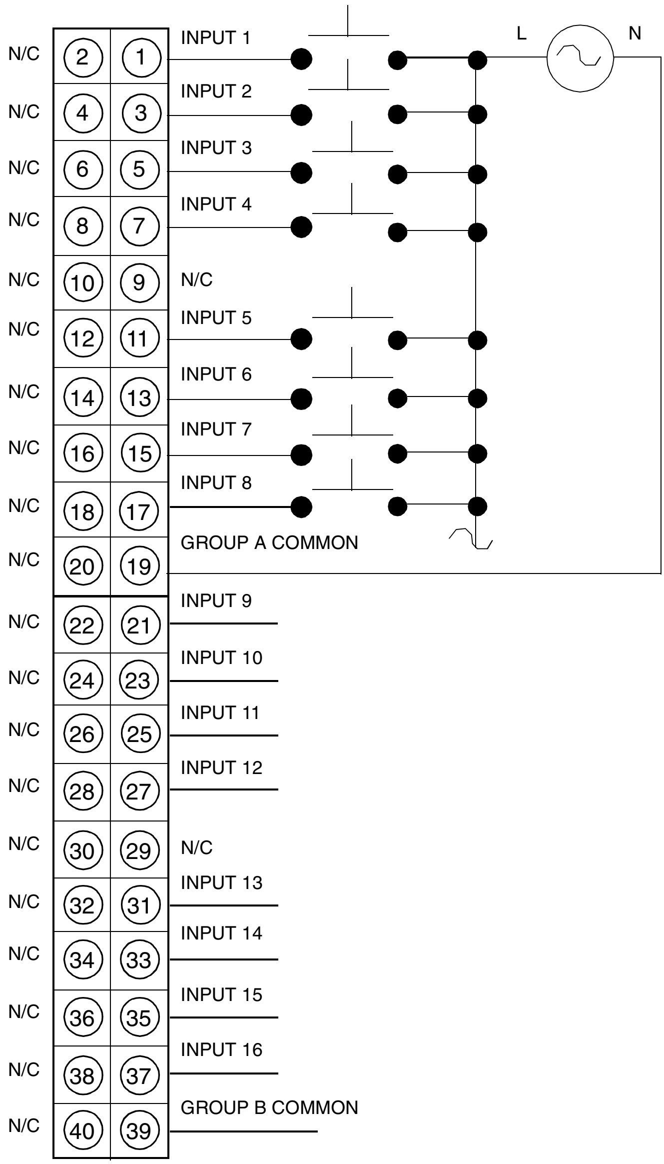
The following table shows the specifications for the DAI54300 AC input 115 VAC IN module.

Specifications	
Number of Input Points	16 in two 8 point groups
LEDs	Active 1 ... 16 (Green) - Indicates point status
Required Addressing	1 word in
Operating Voltages and Input Currents*	
50 Hz Typical Input Impedance	ON: 85 ... 132 Vac (11.1 mA max) OFF: 0 ... 20 Vac 14.4 kΩ capacitive
60 Hz Typical Input Impedance	ON: 79 ... 132 Vac (13.2 mA max) OFF: 0 ... 20 Vac 12 kΩ capacitive
*Do not use outside the 47 ... 63 Hz range.	
Maximum Allowable Leakage Current from an External Device to be Recognized as an OFF Condition	2.1 mA
Input Frequency	47 ... 63 Hz
Absolute Maximum Input	
Continuous	132 Vac
10 s	156 Vac
1 cycle	200 Vac
1.3 ms	276 Vac
Response	
OFF - ON	Min: 4.9 ms., Max: 0.75 line cycle
ON - OFF	Min: 7.3 ms., Max: 12.3 ms
Isolation	
Input to Input	All inputs in a group must be from the same phase of line input voltage
Group-to-Group	1780 Vac rms for 1 minute
Input to Bus	1780 Vac rms for 1 minute
Fault Detection	None
Bus Current Required	180 mA
Power Dissipation	5.5 W max
External Power	Not required for this module
Fusing	

Specifications	
Internal	None
External	User discretion

Note: Input signals must be sinusoidal with less than 6% THD and 63 Hz maximum frequency.

Wiring Diagram The following figure shows the DAI54300 wiring diagram.



Note:
1. All inputs in a group must be from the same phase of line input voltage.
2. This module is not polarity sensitive.
3. N / C = Not Connected.

	CAUTION
	Voltage Compatibility All inputs in a group must be from the same phase of line input voltage. **Failure to follow this precaution can result in injury or equipment damage.**

140DAI55300 Quantum I/O AC Input 115 Vac 4x8 Module

Overview

The AC Input 115 Vac 4x8 module accepts 115 Vac inputs.

Specifications

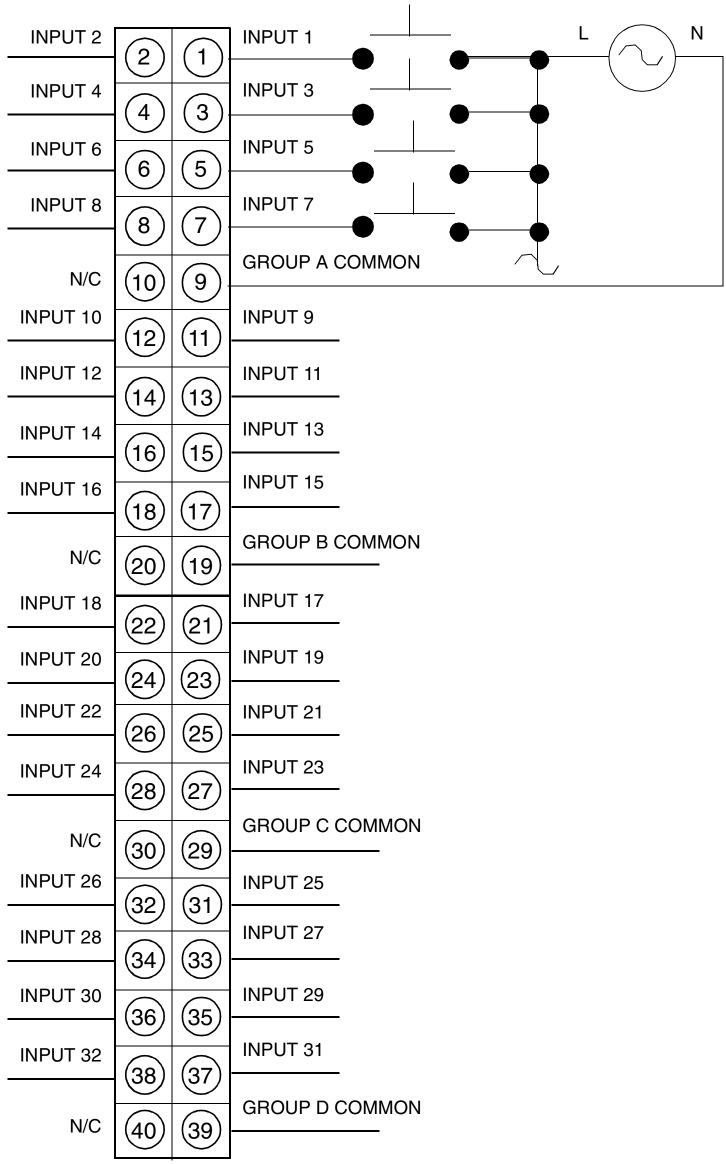
The following table shows the technical specifications for the DAI55300 115 VAC IN module.

Specifications	
Number of Input Points	32 in four 8 point groups
LEDs	Active
	1 ... 32 (Green) - Indicates point status
Required Addressing	2 words in
Operating Voltages and Input Currents*	
50 Hz Typical Input Impedance	ON: 85 ... 132 Vac (11.1 mA max) OFF: 0... 20 Vac 14.4 kΩ capacitive
60 Hz Typical Input Impedance	ON: 79 ... 132 Vac (13.2 mA max) OFF: 0 ... 20 Vac 12 kΩ capacitive
*Do not use outside the 47 ... 63 Hz range.	
Maximum Allowable Leakage Current from an External Device to be Recognized as an OFF Condition	2.1 mA
Input Frequency	47 ... 63 Hz
Absolute Maximum Input	
Continuous	132 Vac
10 s	156 Vac
1 cycle	200 Vac
Response	
OFF - ON	Min: 4.9 ms., Max: 0.75 line cycle
ON - OFF	Min: 7.3 ms., Max: 12.3 ms
Isolation	
Input to Input	All inputs in a group must be from the same phase of line input voltage.
Group to Group	1780 Vac for 1 minute
Input to Bus	1780 Vac for 1 minute
Fault Detection	None
Bus Current Required	250 mA
Power Dissipation	10.9 W max
External Power	Not required for this module
Fusing	
Internal	None

Specifications	
External	User discretion

Note: Input signals must be sinusoidal with less than 6% THD and 63 Hz maximum frequency.

Wiring Diagram The following figure shows the DAI55300 wiring diagram.



Note:
1. All inputs in a group must be from the same phase of line input voltage.
2. This module is not polarity sensitive.
3. N/C = Not Connected

	CAUTION
	Voltage Compatibility All inputs in a group must be from the same phase of line input voltage. **Failure to follow this precaution can result in injury or equipment damage.**

140DAI74000 Quantum I/O AC Input 230 Vac 16x1 Module

Overview

The AC Input 230 Vac 16x1 module accepts 230 Vac inputs.

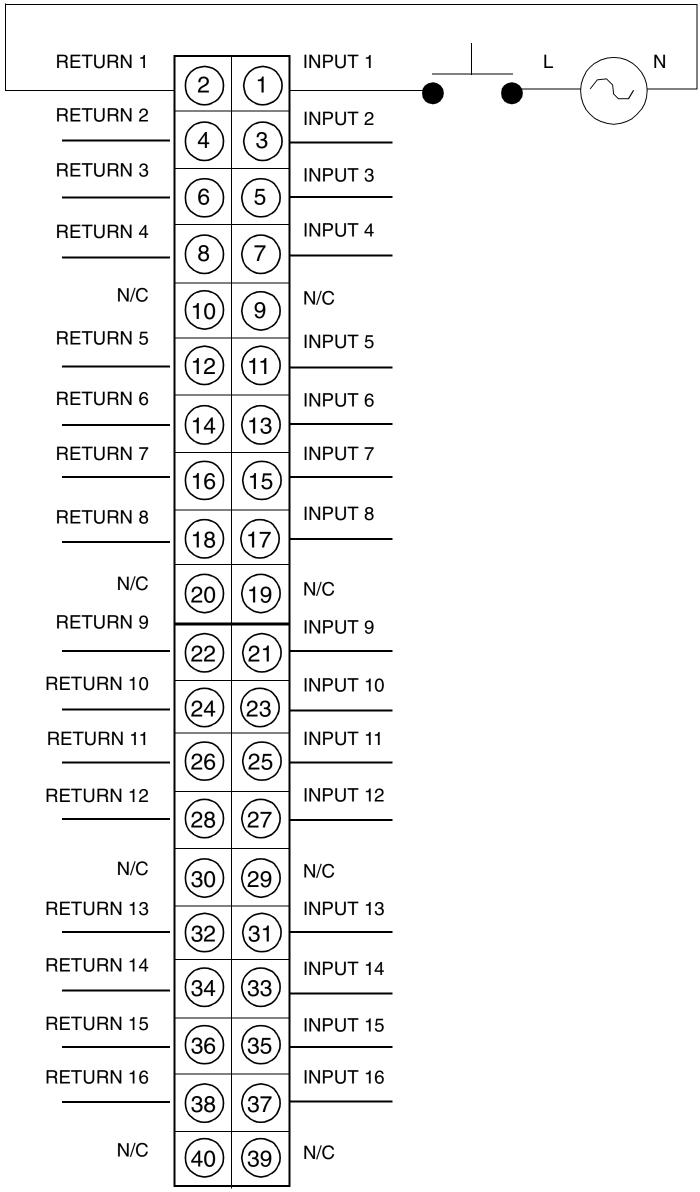
Specifications

The following table shows the specifications for the 230 VAC IN module.

Specifications	
Number of Input Points	16 individually isolated
LEDs	Active 1 - 16 (Green) - Indicates point status
Required Addressing	1 word in
Operating Voltages and Input Currents*	
50 Hz Input Impedance	ON: 175 ... 264 Vac (9.7 mA max) OFF: 0 ... 40 Vac 31. 8 kΩ capacitive
60 Hz Input Impedance	ON: 165 ... 264 Vac (11.5 mA max) OFF: 0 ... 40 Vac 26.5 kΩ capacitive
*Do not use outside the 47 ... 63 Hz range.	
Maximum Allowable Leakage Current from an External Device to be Recognized as an OFF Condition	2.6 mA
Absolute Maximum Input	
Continuous	264 Vac
10 s	300 Vac
1 cycle	400 Vac
Response	
OFF - ON	Min: 4.9 ms., Max: 0.75 line cycle
ON - OFF	Min: 7.3 ms., Max: 12.3 ms
Isolation	
Input to Input	1780 Vac for 1 minute
Input to Bus	1780 Vac for 1 minute
Fault Detection	None
Bus Current Required	180 mA
Power Dissipation	5.5 W max
External Power	Not required for this module
Fusing	
Internal	None
External	User discretion

Note: Input signals must be sinusoidal with less than 6% THD and 63 Hz maximum frequency.

Wiring Diagram The following figure shows the DAI74000 wiring diagram.



Note:
- This module is not polarity sensitive.
- N / C = Not Connected.

140DAI75300 Quantum I/O AC Input 230 Vac 4x8 Module

Overview

The AC Input 230 Vac 4x8 module accepts 230 Vac inputs.

Specifications

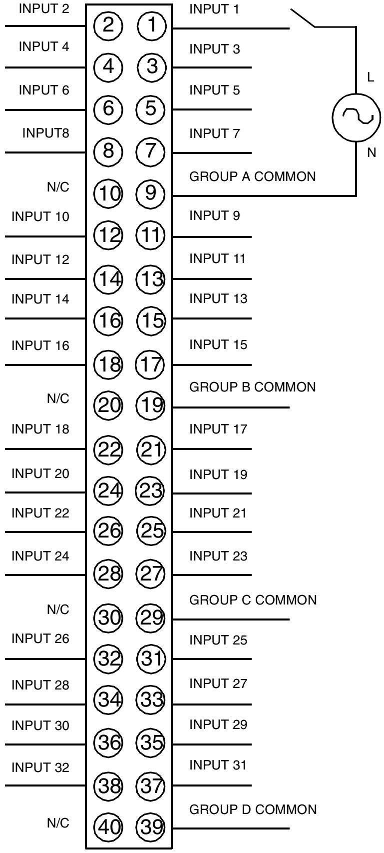
The following table shows the specifications for the DAI75300 AC 230 VAC IN module.

Specifications	
Number of Input Points	32 in four 8 point groups
LEDs	Active 1 - 32 (Green) - Indicates point status
Required Addressing	2 words in
Operating Voltages and Input Currents*	
50 Hz Typical Input Impedance	ON: 175... 264 Vac (9.7 mA max) OFF:.. 40 Vac 32 kΩ capacitive
60 Hz Typical Input Impedance	ON: 165 ... 264 Vac (11.5 mA max OFF: 0 ... 40 Vac 27 kΩ capacitive
*Do not use outside the 47 ... 63 Hz range.	
Maximum Allowable Leakage Current from an External Device to be Recognized as an OFF Condition	2.6 mA
Absolute Maximum Input	
Continuous	264 Vac
10 s	300 Vac
1 cycle	400 Vac
Response	
OFF - ON	Min: 4.9 ms., Max: 0.75 line cycle
ON - OFF	Min: 7.3 ms., Max: 12.3 ms
Isolation	
Group to Group	1780 Vac for 1 minute
Input to Bus	1780 Vac for 1 minute
Fault Detection	None
Bus Current Required	250 mA
Power Dissipation	9 W max
External Power	Not required for this module
Fusing	
Internal	None
External	User discretion

Note: Input signals must be sinusoidal with less than 6% THD and 63 Hz maximum frequency.

Wiring Diagram

The following figure shows the DAI75300 wiring diagram.



Note: N / C = Not Connected.

CAUTION

Voltage Compatibility

All inputs in a group must be from the same phase of line input voltage.

Failure to follow this precaution can result in injury or equipment damage.

140DDI15310 Quantum I/O DC Input 5 V TTL 4x8 Source Module

Overview

The DC Input 5 V TTL 4x8 Source module accepts 5 Vdc inputs, and is for use with sink output devices and is compatible with LS, S, TTL, and CMOS logic.

Specifications

The following table shows the specifications for the DDI15310 5 V TTL IN module.

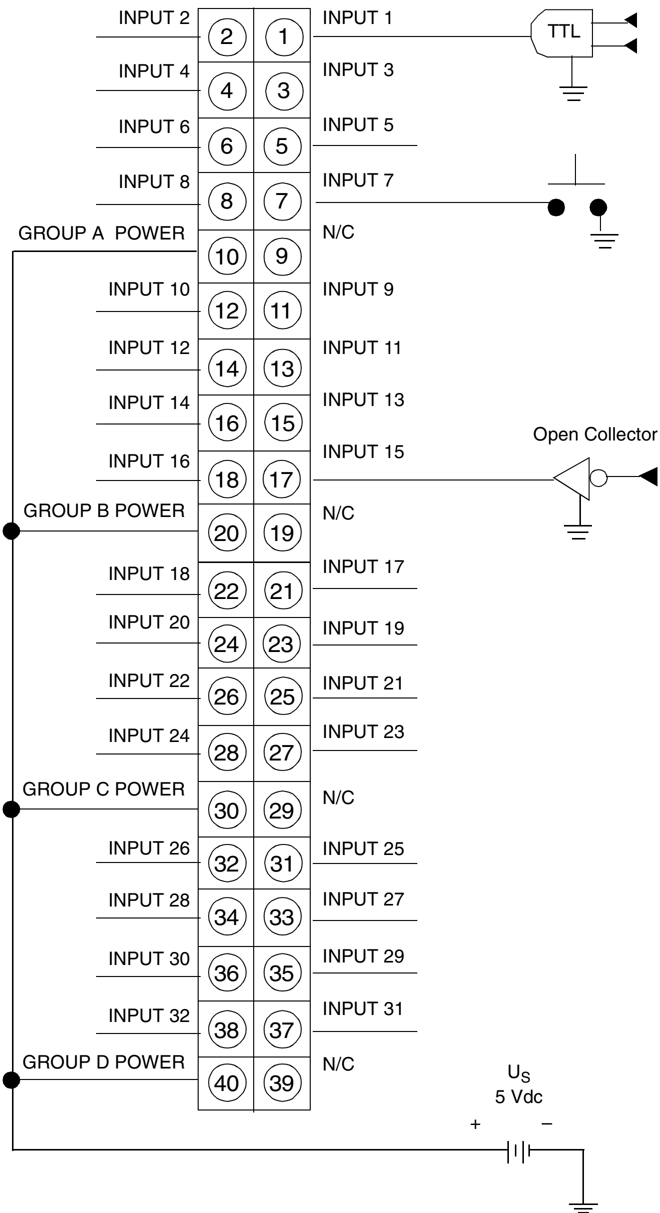
Specifications	
Number of Input Points	32 in four 8 point groups
LEDs	Active 1 ... 32 (Green) - Indicates point status
Required Addressing	2 words in
Input Ratings	
ON Level	0.8 Vdc maximum 4.0 mA at U_S = 5.5 and U_{IN} = 0
OFF Level	4 Vdc (min) @ U_S = 5.5 V 3 Vdc (min) @ U_S = 4.5 V
OFF Leakage	200 µA @ U_S = 5.5 V and U_{IN} = 4 Vdc
Internal Pullup Resistor	7.5 k
Absolute Maximum Input	
Continuous	5.5 Vdc
1.3 ms	15 Vdc decaying pulse
Response	
OFF - ON	250 µs (max)
ON - OFF	500 µs (max)
Input Protection	Resistor limited
Isolation	
Group to Group	500 Vac rms for 1 minute
Group to Bus	1780 Vac rms for 1 minute
Fault Detection	None
Bus Current Required	170 mA
Power Dissipation	5 W
External Power (U_S)	4.5... 5.5 Vdc
Module Supply	150 mA
Fusing	
Internal	None
External	User discretion

Logic States

The following table shows the logic states for the DDI15310 module.

Input Voltage	Input State	LED
<= 0.8 Vdc	ON	ON
>= 4.0 Vdc @ 5.5 U_S >= 3.0 Vdc @ 4.5 U_S	OFF	OFF
No Connection	OFF	OFF

Wiring Diagram The following figure shows the DDI15310 wiring diagram.



140DDI35300 Quantum I/O DC Input 24 Vdc 4x8 Sink Module

Overview

The DC Input 24 Vdc 4x8 Sink module accepts 24 Vdc inputs and is for use with source output devices.

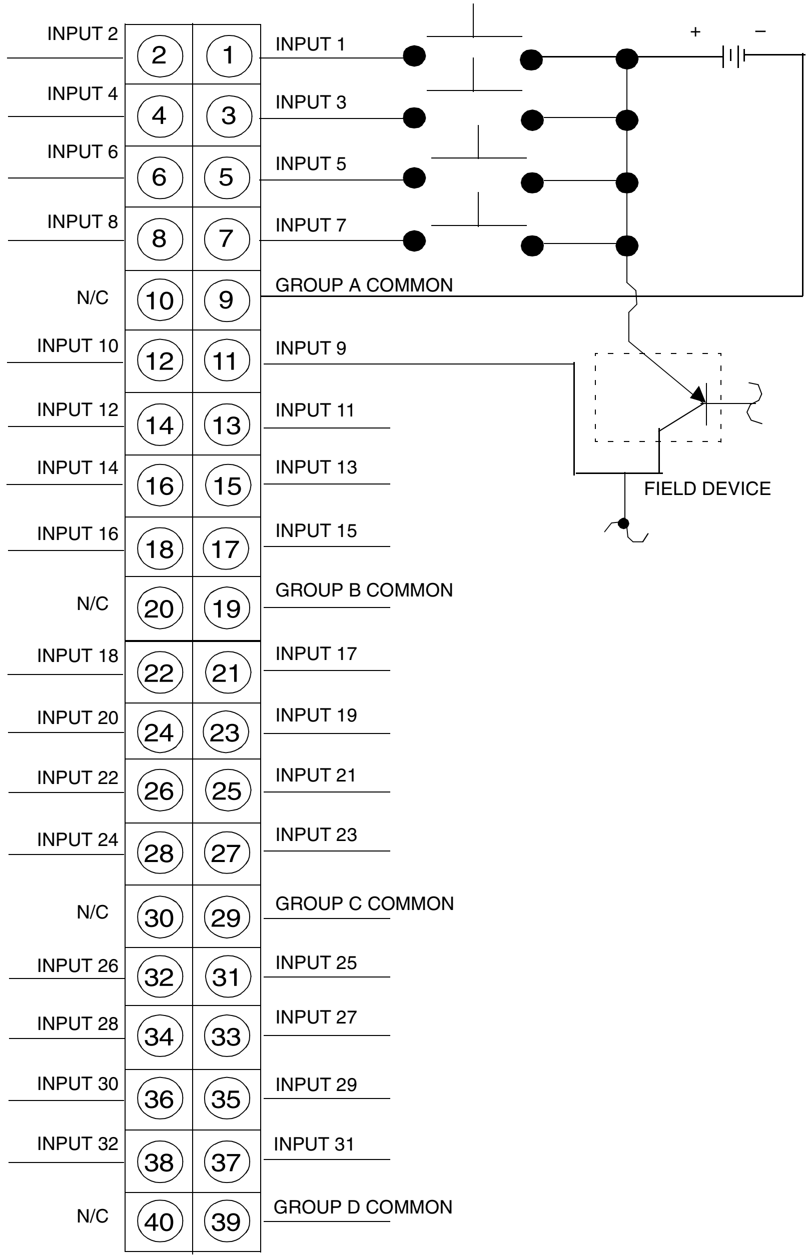
Specifications

The following table shows the specifications for the DDI35300 24 VDC IN module.

Specifications	
Number of Input Points	32 in four 8 point groups
LEDs	Active 1 ... 32 (Green) - Indicates point status
Required Addressing	2 words in
Operating Voltages and Currents	
ON (voltage)	+15 ... +30 Vdc
OFF (voltage)	-3 ... +5 Vdc
ON (current)	2.0 mA min
OFF (current)	0.5 mA max
Absolute Maximum Input	
Continuous	30 Vdc
1.3 ms	56 Vdc decaying pulse
Response	
OFF - ON	1 ms (max)
ON - OFF	1 ms (max)
Internal Resistance	2.5 k
Input Protection	Resistor limited
Isolation	
Group to Group	500 Vac rms for 1 minute
Group to Bus	1780 Vac rms for 1 minute
Fault Detection	None
Bus Current Required	330 mA
Power Dissipation	1.7 W + 0.36 W x the number of points on
External Power	Not required for this module
Fusing	
Internal	None
External	User discretion

Wiring Diagram

The following figure shows the DDI35300 wiring diagram.



Note: N / C = Not Connected

140DDI35310 Quantum I/O DC Input 24 Vdc True Low 4x8 Input Module

Overview

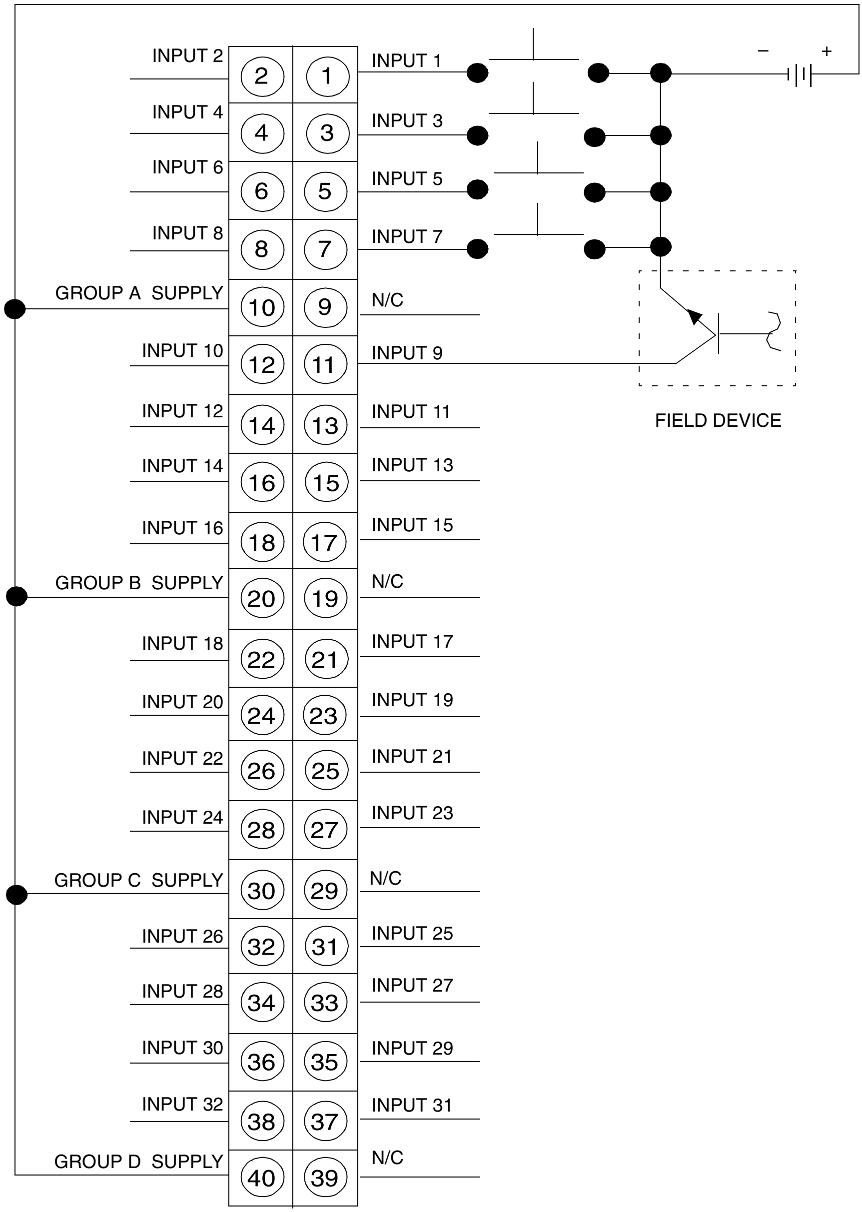
The 24 Vdc True Low 4x8 Input module accepts 24 Vdc inputs and is for use with sink output devices.

Specifications

The following table shows the specifications for the DDI35310 24 VDC IN SOURCE module.

Specifications	
Number of Input Points	32 input points in four 8 point groups
LEDs	Active 1 ... 32 (Green) - Indicates point status
Required Addressing	2 words in
Voltage	
ON (Voltage)	-15 ... -30 Vdc (reference from group supply)
OFF (Voltage)	0 ... -5 Vdc (reference group supply)
ON (Current)	2 mA min; 14 mA max
OFF (Current)	0.5 mA max
Absolute Maximum Input	
Continuous	30 Vdc
1.0 ms	50 Vdc decaying pulse
Response (Resistive Loads)	
OFF - ON	1 ms (max)
ON - OFF	1 ms (max)
Fault Detection	None
Isolation	
Group to Group	500 Vac rms for 1 minute
Input to Bus	1780 Vac rms for 1 minute
Internal Resistance	2.4 k
Input Protection	Resistor limited
Bus Current Required	330 mA max
Power Dissipation	1.5 W + 0.26 W x the number of points ON
External Power	19.2 ... 30 Vdc
Fusing	
Internal	None
External	User discretion

Wiring Diagram The following figure shows the DDI35310 wiring diagram.



Note: N / C = Not Connected

140DDI36400 I/O DC Input 24 VDC 6x16 Telefast Input Module

Overview

The Telefast input module accepts 24 Vdc inputs, and has 6 groups with 16 sink ports each.

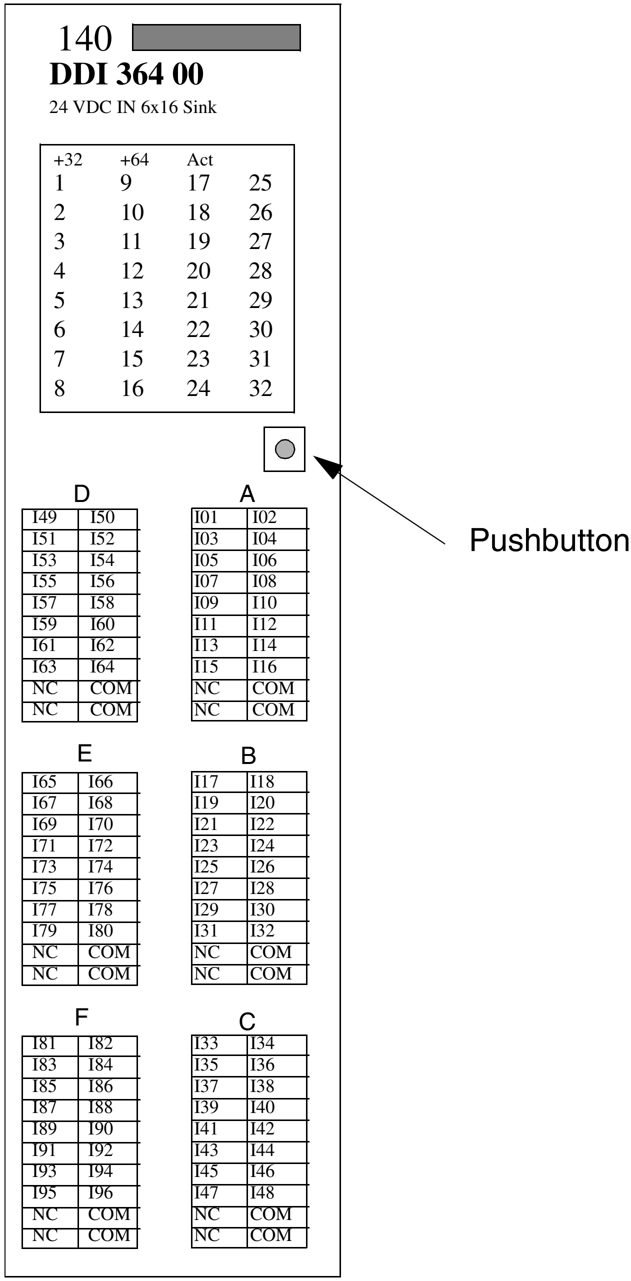
Specifications

The following table provides detailed specifications for the DDI36400 input module.

Specifications		
Number of input points	96 in six 16 point groups	
LEDs	ACT (green)	Bus communication is present
	+32 (green)	Points 33 to 64 displayed on LED matrix
	+ 64 (green)	Points 65 to96 displayed on LED matrix
	1 ... 32 (green)	Indicates point status
Required addressing	6 words in	
Operating voltages and currents		
ON (voltage)	+15 VDC	
ON (current)	2.5 mA minimum	
OFF (voltage)	+5VDC	
OFF (current)	0.7 mA	
Absolute maximum input		
Continuous	30 VDC	
1.0 ms	50 VDC	
Response (resistive load)		
OFF - ON	2.0 ms maximum	
ON - OFF	3.0 ms maximum	
Internal resistance	6.7 KW	
Input protection	Resistor limited	
Isolation		
Group to group	500 Vac rms for 1 minute	
Bus current required	270 mA	
Power dissipation	1.35 W + 0.13 W for each ON input	
External power	19.2 ... 30 VDC	
Fusing	User discretion for field power	

Front view of DDI36400 Module

The front view of the DDI36400 input module including terminal assignment numbers:



Selecting Point Status Indicator LEDs

Use the pushbutton to select input points displayed.

LED	+32	+64
Inputs 1 to 32	OFF	OFF
Inputs 33 to 64	ON	OFF
Inputs 65 to 96	OFF	ON

Recommended Cables

The following table shows recommended cables, description, and their length in meters.

Cable Part Number	Description	Length (M)
TSXCDP301	(1) HE 10 - flying leads	3
TSXCDP501	(1) HE 10 - flying leads	5
TSXCDP102	(2) HE 10 - ribbon cable	1
TSXCDP202	(2) HE 10 - ribbon cable	2
TSXCDP302	(2) HE 10 - ribbon cable	3
TSXCDP053	(2) HE 10 - round cable	0.5
TSXCDP103	(2) HE 10 - round cable	1
TSXCDP203	(2) HE 10 - round cable	2
TSXCDP303	(2) HE 10 - round cable	3
TSXCDP503	(2) HE 10 - round cable	5

Color Codes for Input groups

Table indicating cable color coding for all input groups:

1	white	2	brown
3	green	4	yellow
5	gray	6	pink
7	blue	8	red
9	black	10	purple
11	gray/pink	12	red/blue
13	white/green	14	brown/green
15	white/yellow	16	yellow/brown
17	white/gray	18	gray/brown
19	white/pink	20	pink/brown

Compatible Connection Sub-Bases

The following tables shows the compatible connections sub-bases. See *Quantum Modicon Telemecanique Automation Platform, Discrete I/O Chapter, Telefast 2 pre-wire system: connector cables FOR Quantum PLCs* section, for more detailed information.

Channels	Type
8	ABE-7H08Rxx[1]
8	ABE-7H08S21[1]
16	ABE-7H16Rxx/H16Cxx
16	ABE-7H16S21
16	ABE-7H16R23
16	ABE-7H16S43
[1]With the splitter sub-base ABE-7ACC02	

Compatible Input Adapter Sub-Base

16 Channels, ABE-7S16E2xx/7P16F3xx

140DDI67300 Quantum I/O DC Input 125 Vdc 3x8 Sink Module

Overview

The DC Input 125 VDC 3x8 Sink module accepts 125 Vdc inputs and is for use with source output devices. The module has software-selectable response time to provide additional input filtering.

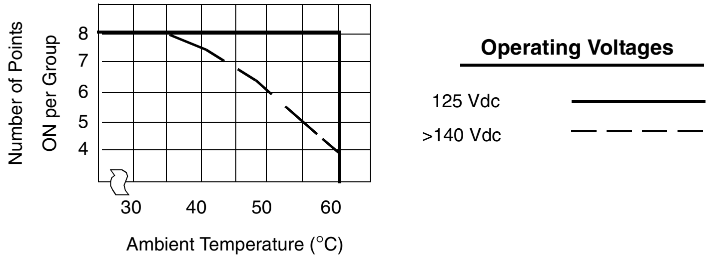
Specifications

The following table shows the specifications for the DDI67300 125 VDC IN module.

Specifications	
Number of Input Points	24 in three 8 point groups
LEDs	Active 1 ... 24 (Green) - Indicates point status
Required Addressing	2 words in
Continuous Operating Voltages and Currents	
ON (voltage)	+88 ... +150 Vdc
OFF (voltage)	0 ... +36 Vdc
ON (current)	2.0 mA min
OFF (current)	0.5 mA max
Absolute Maximum Input	
Continuous	156.25 Vdc including ripple
Input Response (OFF-ON, ON-OFF)	
Default Filter	0.7 ms
Non-default Filter	1.5 ms
Internal Resistance	
OFF State	73.8 kΩ (nominal)
ON State	31.6 kΩ (nominal)
Input Protection	Resistor limited
Isolation	
Group to Bus	2500 Vac rms for 1 minute
Group to Group	1780 Vac rms for 1 minute
Fault Detection	None
Bus Current Required	200 mA
Power Dissipation	1.0 W + (0.62 W x the number of points on)
External Power	Not required for this module
Fusing	
Internal	None
External	User discretion

Operating Curve

The following figure shows the DDI67300 operating curve.



Note: The following information baselines minimum version levels that will support this module.

Minimum Version Levels

The following table shows the minimum version levels required.Modules marked SV/PV/RL rather than V0X.0X0 exceed the minimum version levels in this table.

Products	**Minimum Version Level (see label illustration**	**User Action Required**
CPUs and NOMs	< V02.20	Executive upgrade to ≥ V02.10
	≥ V02.20	None
RIOs	< V02.00	Module upgrade
	≥ V02.00 and < V02.20	Executive upgrade to ≥ V01.10
	> V02.20	None
DIOs	< V02.10	Module upgrade
	≥ V02.10	None
Modsoft	< V02.40	Upgrade to V02.40
	≥ V02.40	None
ProWORX NxT	>=V02.00	
Concept	>=V02.00	None

CAUTION

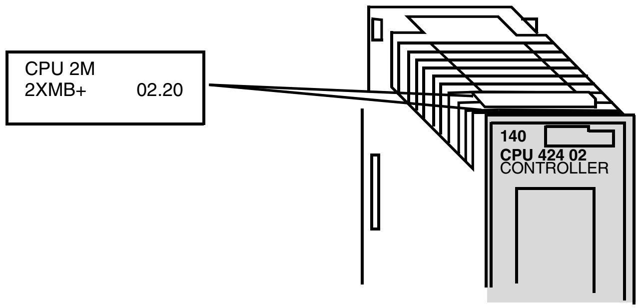
Software compatibility

When using a DIO drop and the CPU and the NOM executive software is not per the compatibility chart, channels 17 ... 24 of this module will be seen as zeroes in the controller when configured as discretes.

Failure to follow this precaution can result in injury or equipment damage.

Version Label

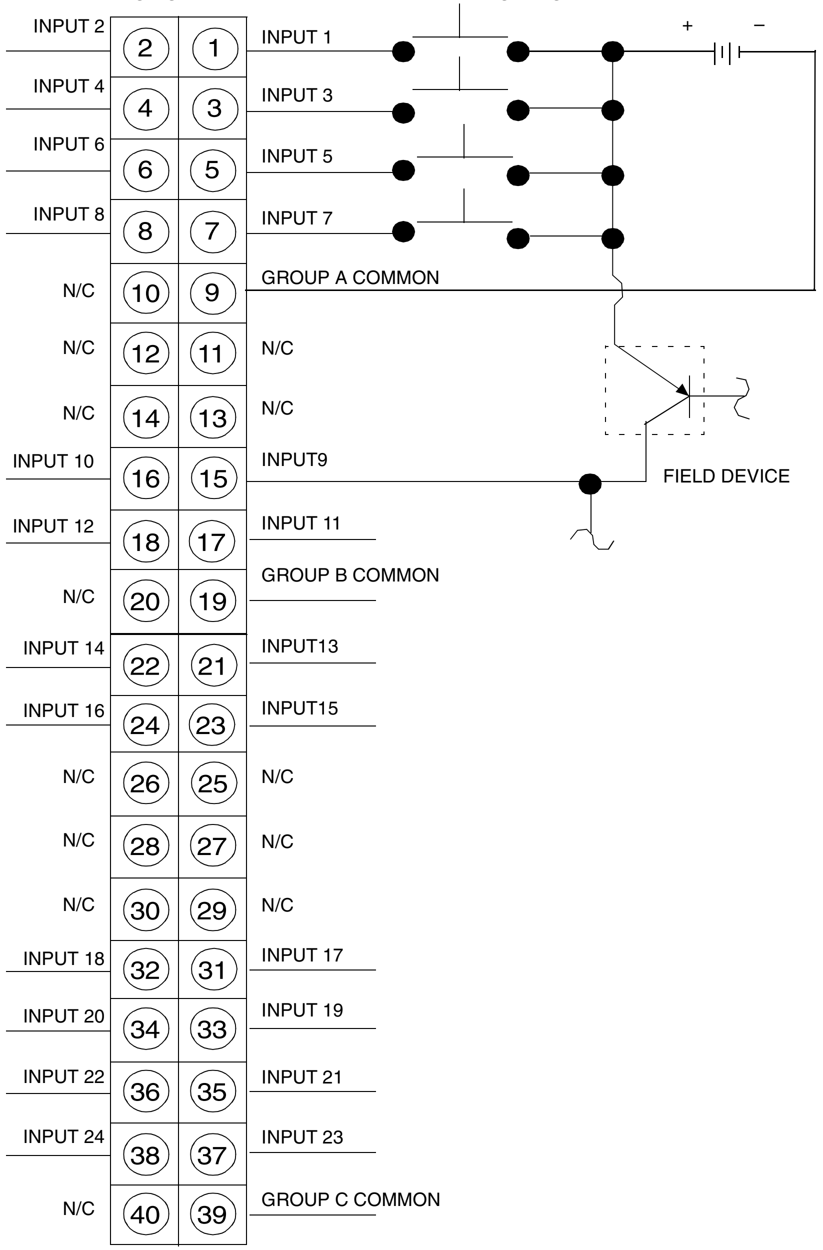
The following figure shows the version label.



Note: The version label is found on the top front of the module.

Wiring Diagram

The following figure shows the DDI67300 wiring diagram.



Note: N / C = Not Connected

140DDI84100 Quantum I/O DC Input 10 ... 60 Vdc 8x2 Sink Module

Overview

The DC Input 10 ... 60 Vdc 8x2 Sink module accepts 10 ... 60 Vdc inputs and is for use with source output devices. ON-OFF levels are dependent on the reference voltage selected. Different reference voltages may be used for different groups.

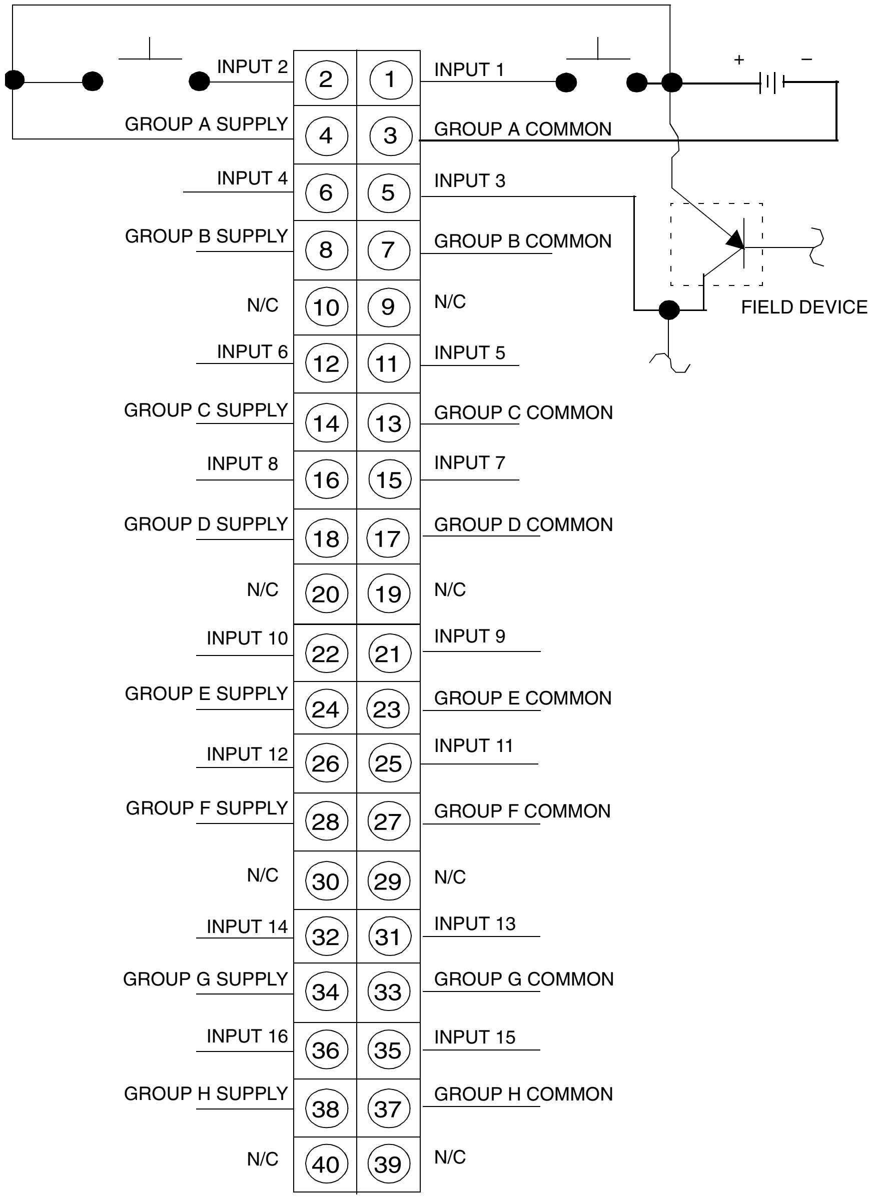
Specifications

The following table shows the specifications for the DDI84110 10-60 VDC IN module.

Specifications		
Number of Input Points	16 in eight 2 point groups	
LEDs	Active 1 ... 16 (Green) - Indicates point status	
Required Addressing	1 Word in	
Group Supply / Tolerance	**ON State***	**OFF State***
12 Vdc / +/-5% 24 Vdc / -15% ... +20% 48 Vdc / -15% ... +20% 60 Vdc / -15% ... +20%	9 ... 12 11 ... 24 34 ... 48 45 ... 60	0 ...1.8 IEC 57 Class2 0 ... 5 IEC 65A Type2 0 ... 10 IEC 65A Type1 0 ... 9 IEC 57 Class1 *ON/OFF state ranges are specified at normal reference voltages.
Absolute Maximum Input	75 Vdc	
ON State Current (mA)		
@ 12 Vdc	5 ... 10 mA	
@ 24 Vdc	6 ... 30 mA	
@ 48 Vdc	2 ... 15 mA	
@ 60 Vdc	1 ... 5 mA	
Response		
OFF - ON	4 ms	
ON - OFF	4 ms	
Switching Frequency	<100 Hz	
Input Protection	Resistor limited	
Isolation		
Group to Group	700 Vdc for 1 minute	
Group to Bus	2500 Vdc for 1 minute	
Bus Current Required	200 mA	
Power Dissipation	1 W + 0.25 W x the number of points on	
External Power	10 ... 60 Vdc (group supply)	
Fusing		
Internal	None	
External	User discretion	

Wiring Diagram

The following figure shows the DDI84100 wiring diagram.



Note: N / C = Not Connected

140DDI85300 Quantum I/O DC Input 10 ... 60 Vdc 4x8 Sink Module

Overview

The DC Input 10 ... 60 Vdc 4x8 Sink module accepts 10 ... 60 Vdc inputs and is for use with source output devices. ON-OFF levels are dependent on the reference voltage selected. Different reference voltages may be used for different groups.

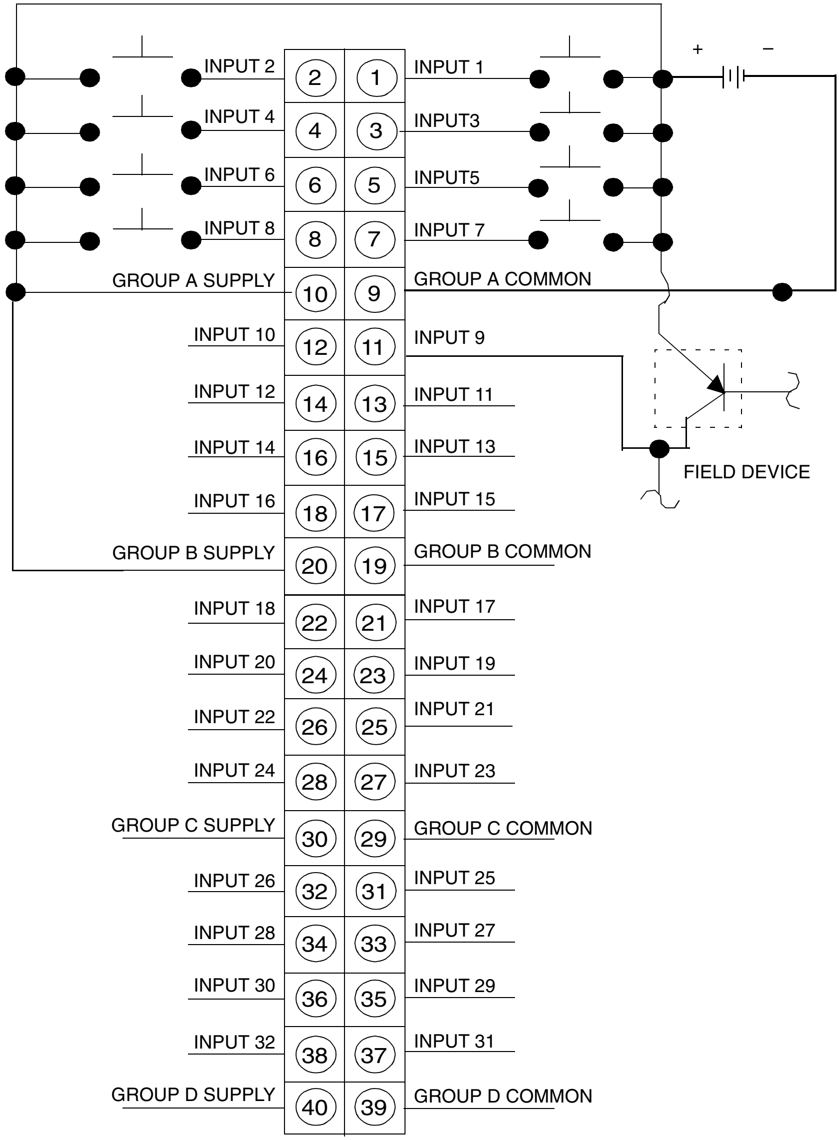
Specifications

The following table shows the specifications for the 10-60 VDC IN module.

Specifications		
Number of Input Points	32 in four 8 point groups	
LEDs	Active 1 ... 32 (Green) - Indicates point status	
Required Addressing	2 Words In	
Group Supply / Tolerance	**ON State ***	**OFF State ***
12 Vdc / +/- 5%	9 ... 12	0 ... 1.8 IEC 57 Class 2
24 Vdc / -15% ... +20%	11 ... 24	0 ... 5 IEC 65A Type 2
48 Vdc / -15% ... +20%	34 ... 48	0 ... 10 IEC 65A Type 1
60 Vdc / -15% ... +20%	45 ... 60	0 ... 12.5 IEC 57 Class1
	*ON/OFF state ranges are specified at nominal reference voltages.	
Absolute Maximum Input	75 Vdc	
ON State Current (mA)		
@ 12 Vdc	5 ... 10 mA	
@ 24 Vdc	6 ... 30 mA	
@ 48 Vdc	2 ... 15 mA	
@ 60 Vdc	1 ... 5 mA	
Response		
OFF - ON	4 ms	
ON - OFF	4 ms	
Switching Frequency	<100 Hz max	
Input Protection	Resistor limited	
Isolation		
Group to Group	700 Vdc for 1 minute	
Group to Bus	2500 Vdc for 1 minute	
Fault Detection	None	
Bus Current Required	300 mA	
Power Dissipation	1 W + 0.25 W x the number of points on	
External Power	10 ... 60 Vdc (group supply)	
Fusing		
Internal	None	
External	User discretion	

Wiring Diagram

The following figure shows the DDI85300 wiring diagram.



18.6 Discrete Output Modules

At a Glance

Overview

This section provides information on Quantum discrete output modules.

What's in this Section?

This section contains the following topics:

Topic	Page
I/O Configuration for Discrete Output Modules	670
140DAO84000 I/O AC Output 24 ... 230 Vac 16x1 Module	678
140DAO84010 I/O AC Output 24 ... 115 Vac 16x1 Module	684
140DAO84210 Quantum I/O AC Output 100 ... 230 Vac 4x4 Module	690
140DAO84220 Quantum I/O AC Output 24 ... 48 Vac 4x4 Module	696
140DAO85300 Quantum I/O AC Output 24 ... 230 Vac 4x8 Module	702
140DDO15310 I/O DC Output 5 V TTL 4x8 Sink Module	708
140DDO35300 Quantum I/O DC Output 24 Vdc 4x8 Source Module	712
140DDO35301 I/O DC Output 24 VDC 4x8 Discrete Source Module	718
140DDO35310 I/O DC Output 24 Vdc 4x8 Sink Module	723
140DDO36400 I/O DC Output 24VDC 6x16 Telefast Output Module	729
140DDO84300 Quantum I/O DC Output 10 ... 60 Vdc 2x8 Source Module	735
140DDO88500 Quantum I/O DC Output 24-125 Vdc 2x6 Source Module	739
140DRA84000 Quantum I/O Relay Output 16x1 Normally Open Module	745
140DRC83000 Quantum I/O Relay Output 8x1 Normally Open/Normally Closed Module	749

I/O Configuration for Discrete Output Modules

Overview

This section provides information on configuration of 8-, 12-, 16-, 32- and 96-point output modules.

8-Point Output Modules

The following shows the 8-point output module:
- 140DRC83000 (Relay Ouput 8x1 Normally Open/Normally Closed)

I/O Map Register Assignment

The ouput modules listed above can be configured as either eight contiguous discrete output (0x) references or as one output (4x) register. The following figure shows the format for the output modules.

								1	2	3	4	5	6	7	8

I/O Map Status Byte

There is no I/O Map status byte associated with these modules.

Module Zoom Selections

Push <Enter> to display and select the output type and timeout state for the module. Timeout state isassumed when system control of the module is stopped.

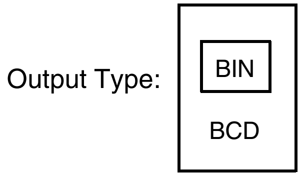
Output Type: BIN / BCD

Timeout State: Last Value / User Defined

User Defined Timeout State Points 1- 8: 00000000

Module Zoom Selections (Outputs)

Push <Enter> to display and select the output type and the timeout state for the module. Timeout state is assumed when sytem control of the module is stopped.



12-Point Output Module

The 12-point output module is:
- 140DDO88500

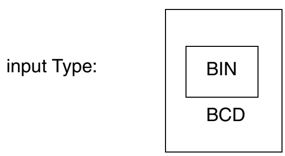
I/O Map Register Assignment (Fault Inputs)

The 140DDO88500 can be configured as either 16 contiguous 1x references or as one 3x register.
The following figure shows the inputs configuration.

1	2	3	4	5	6	7	8	9	10	11	12				

Module Zoom Selections (Inputs)

Push <Enter> to display and select the input type. This selection appears if the module is I/O mapped to a 3x register. The following figure shows the input type.



Note: Do not use the BCD selection, as it will incorrectly display fault conditions.

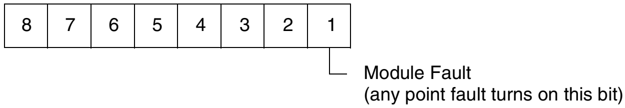
I/O Map Register Assignment (Outputs)

The 140DDO88500 can be configured as one output (4x) register in the following format. The following figure shows the register format for outputs.

1	2	3	4	5	6	7	8	9	10	11	12				

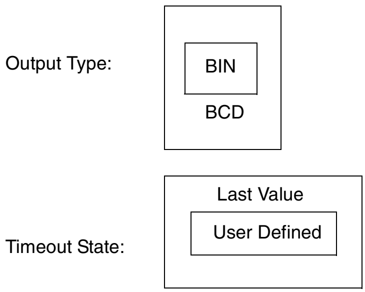
I/O Map Status Byte (Outputs)

The least significant bit in the output I/O map status byte is used as follows. The following figure shows the status byte output register.



Modsoft Module Zoom Selections (Outputs)

Push <Enter> to display and select the output type and the timeout state for the module. Timeout state is assumed when system control of the module is stopped. The following figure shows the output type and timeout state.



User Defined Timeout State Points 1-12: 000000000000

Note: To clear a fault, the point must be commanded OFF in user logic.

16-Point Output Modules

The 16-point output modules are as follows:

- 140DAO84000 (AC Output 24 ... 230 Vac 16x1)
- 140DAO84010 (AC Output 24 ... 115 Vac 16x1)
- 140DAO84210 (AC Output 100 ... 230 Vac 4x4)
- 140DAO84220 (AC Output 48 Vac 4x4)
- 140DDO84300 (DC Output 10 ... 60 VDC 2x8 Source)
- 140DRA84000 (Relay Output 16x1 Normally Open)

I/O Map Register Assignment

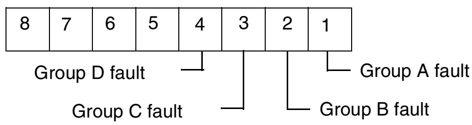
The output modules listed above can be configured as either 16 contiguous discrete output (0x) references, or as one output (4x) register in the following formats. The following figures show the formats for the output modules.

For the 140DAO84000, 140DAO84010, 140DAO84210, 140DAO84220, 140DDO84300, and the 140DRA84000 modules.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

I/O Map Status Byte

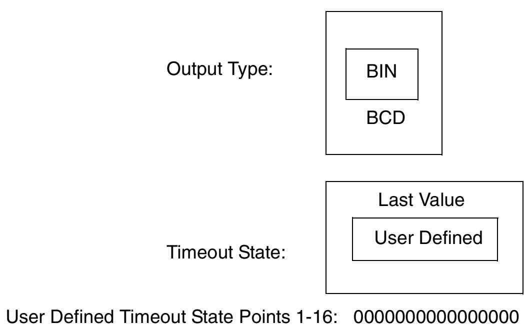
The I/O map status byte is used by the 140DAO84210 and 140DAO84220 output modules. The following figure shows I/O map status bytes use.



There is no I/O map status byte associated with the 140DAO84000, 140DAO84010, 140DDO84300, or 140DRA84000 module.

Module Zoom Selections

Push <Enter> to display and select the output type and the timeout state for the module. Timeout state is assumed when system control of the module is stopped. The following figures show the output type and timeout state.



32-Point Output Modules

The following list shows the 32-point output modules:
- 140DAO85300 (AC Output 230 Vac 4x8 Sink)
- 140DDO15310 (DC Output 5 V TTL 4x8 Sink)
- 140DDO35300 (DC Output 24 Vdc 4x8 Source)
- 140DDO35301 (DC Output 24 Vdc 4x8 Source)
- 140DDO35310 (DC Output 24 Vdc True Low 4x8 Sink)

I/O Map Register Assignment

The output modules listed above can be configured as either 32 contiguous 0x references, or as two 4x registers in the following format.
The following figures show the formats for the output modules.

Output Point 1

Register 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

MSB - First Word

Output Point 17

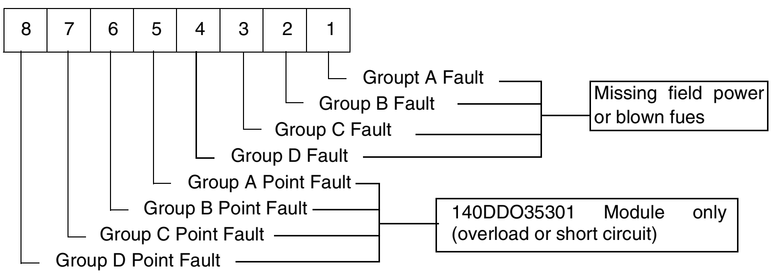
Register 2

17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

MSB - Second Word

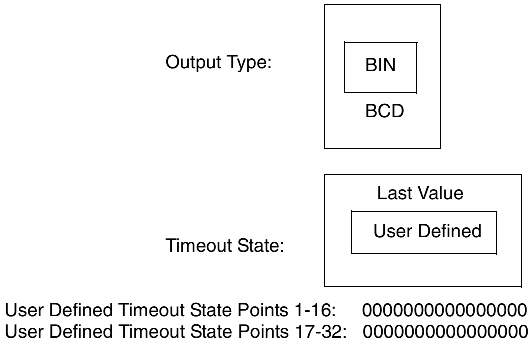
I/O Map Status Byte

The I/O map status byte is used by the modules as follows:



Module Zoom Selections

Push <Enter> to display and select the output type and the timeout state for the module. Timeout state is assumed when system control of the module is stopped. The following figure shows the output type and timeout state.



96-Point Output Module

The 96 point output module is:
- 140DDO36400 - DC out 24VDC 6x16 Source

I/O Map Register Assignment

The following figures show the register 1 through 6 format for the 140DDO36400 output module.

Register 1

Output Point 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

MSB - First Word

Register 2

Output Point 17	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

MSB - Second Word

Register 3

Output Point 33	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48

MSB - Third Word

Register 4

Output Point 49	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64

MSB - Fourth Word

Register 5

Output Point 65	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80

MSB - Fifth Word

Register 6

Output Point 81	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96

MSB - Sixth Word

I/O Map Status Byte

The I/O map status byte is used by the module as follows:.

8	7	6	5	4	3	2	1

- 1: Output 1 to 16 Fault
- 2: Output 17 to 32 Fault
- 3: Output 33 to 48 Fault
- 4: Output 49 to 64 Fault
- 5: Output 65 to 80 Fault
- 6: Output 80 to 96 Fault

Module Zoom Selections

Push <Enter> to display and select the output type and the timeout state for the module. Timeout state is assumed when system control of the module is stopped. The following figure shows the output type and timeout state.

Output Type: BIN / BCD

Timeout State: Last Value / User Defined

User Defined Timeout State Points 1-16: 0000000000000000
User Defined Timeout State Points 17-32: 0000000000000000
User Defined Timeout State Points 33-48: 0000000000000000
User Defined Timeout State Points 49-64: 0000000000000000
User Defined Timeout State Points 65-80: 0000000000000000
User Defined Timeout State Points 81-96: 0000000000000000

140DAO84000 I/O AC Output 24 ... 230 Vac 16x1 Module

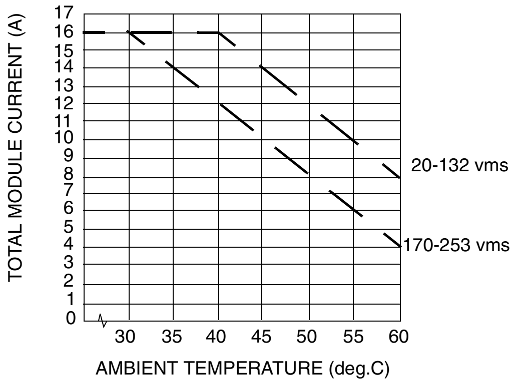
Overview

The AC Output 24 ... 230 Vac 16x1 module switches 24 ... 230 Vac powered loads.

Specifications

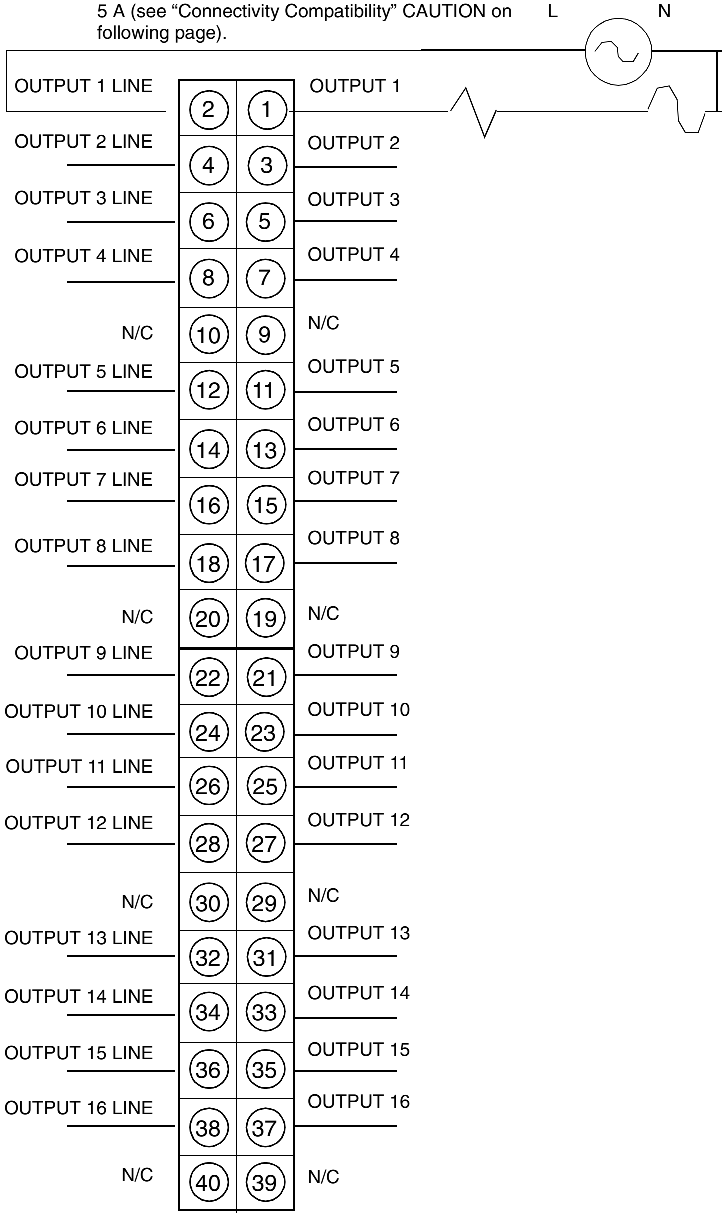
The following table shows the specifications for the AC Output 24 ... 230 VAC OUT module.

Specifications	
Number of Output Points	16 isolated
LEDs	Active 1 ... 16 (Green) - Indicates point status
Required Addressing	1 word out
Voltage (rms)	
Working	20 ... 253 Vac
Absolute Maximum	300 Vac for 10 s 400 Vac for 1 cycle
Frequency	47 ... 63 Hz
ON State Drop / Point	1.5 Vac
Minimum Load Current (rms)	5 mA
Maximum Load Current (rms)	
Each Point*	4 A continuous, 20 ... 132 Vac rms 3 A continuous, 170 ... 253 Vac rms
Any Four Contiguous Points	4 A max continuous for the sum of the four points
Per Module*	16 A continuous (See the derating chart)
Off State Leakage / Point (max)	2.5 mA @ 230 Vac 2 mA @ 115 Vac 1 mA @ 48 Vac 1 mA @ 24 Vac

Specifications	
The following figure shows the DAO84000 derating chart.  *The specifications stated are pending UL/CSA approval. This module was originally approved at 2 A each point; and 12 A, 0 ... 50° C (115 Vac) and 0 ... 50° C (230 Vac) per module.	
Surge Current Maximum (vms)	Per Point
One Cycle	30 A
Two Cycles	20 A
Three Cycles	10 A
Applied DV / DT	400 V/µs
Response	
OFF - ON	0.50 of one line cycle max
ON - OFF	0.50 of one line cycle max
Output Protection	RC snubber suppression (internal)
Isolation (rms)	
Output to Output	1500 Vac for 1 minute
Output to Bus	1780 for 1 minute
Bus Current Required	350 mA
Power Dissipation	1.85 W + 1.1 x Total Module Load Current
External Power	Not required for this module
Fusing	
Internal	None
External	Each output point must be fused with an external fuse. The recommended fuse is a 5 A fuse (Part # 043502405 or equivalent) or any other fuse with an I^2T rating of less than 87.

Wiring Diagram

The following figure shows the DAO84000 wiring diagram.



Note:
1. This module is not polarity sensitive.
2. N / C = Not Connected.

CAUTION

Agency Compliance

1. Voltages up to 133V may be different phases on adjacent output points.
2. Voltages over 133V of different phases must have an output point separation between them. For example: Output 1 and 2 - Phase A, Skip Output 3, Output 4 - Phase B.

Failure to follow this precaution can result in injury or equipment damage.

CAUTION

Connectivity Compatibility

Each output point must be fused with an external fuse. The recommended fuse is a 5 A fuse (Part # 043502405) or any other fuse with an I2T rating of less than 87.

Failure to follow this precaution can result in injury or equipment damage.

CAUTION

Wiring Compatibility

If an external switch is wired to control an inductive load in parallel with the module output, then an external varistor (Harris V390ZA05 or equivalent) must be wired in parallel with the switch.

Failure to follow this precaution can result in injury or equipment damage.

140DAO84010 I/O AC Output 24 ... 115 Vac 16x1 Module

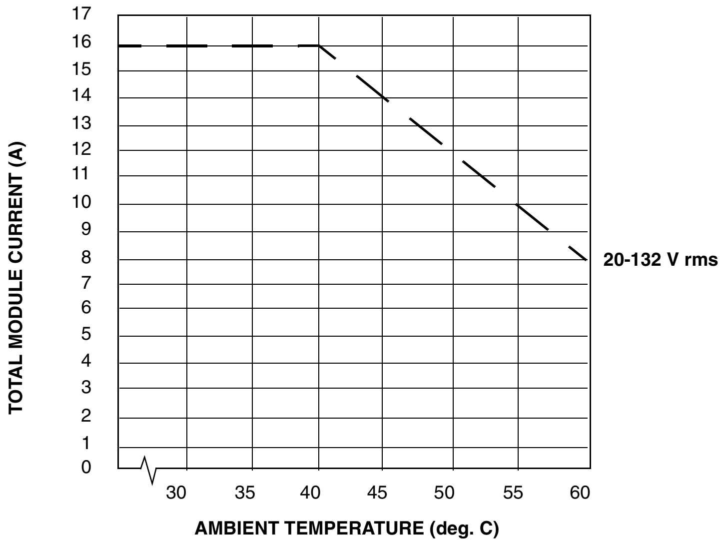
Overview

The AC Output 24 ... 115 Vac 16x1 module switches 24 ... 115 Vac powered loads.

Specifications

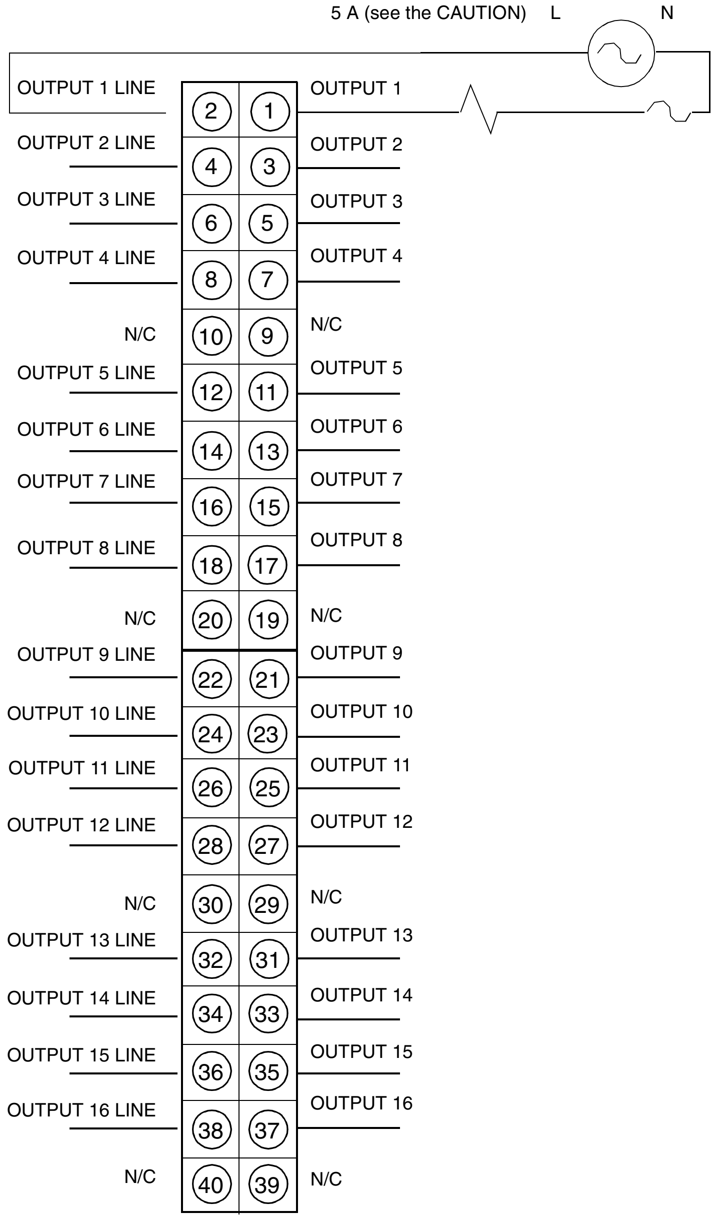
The following table shows the specifications for the DAO84010 AC Output 24-115 VAC OUT module.

Specifications	
Number of Output Points	16 isolated
LEDs	Active 1 ... 16 (Green) – Indicates point status
Required Addressing	1 word out
Voltage (rms)	
Working	20 ... 132 Vac
Absolute Maximum	156 Vac for 10 s 200 Vac for 1 cycle
Frequency	47 ... 63 Hz
ON State Drop / Point	1.5 Vac
Minimum Load Current (rms)	5 mA
Maximum Load Current (rms)	
Each Point	4 A continuous, 20 ... 132 Vac rms
Any Four Contiguous Points	4 A max continuous for the sum of the four points
Per Module	16 A continuous (See the derating chart)
Off State Leakage / Point (max)	2 mA @ 115 Vac 1 mA @ 48 Vac 1 mA @ 24 Vac

Specifications	
The following figure shows the DAO84010 derating chart.	
	
Surge Current Maximum (rms)	Per Point
One Cycle	30 A
Two Cycles	20 A
Three Cycles	10 A
Applied DV / DT	400 V/µs
Response	
OFF - ON	0.50 of one line cycle max
ON - OFF	0.50 of one line cycle max
Output Protection	RC snubber suppression (internal)
Isolation (rms)	
Output to Output	1500 Vac for 1 minute
Output to Bus	1780 for 1 minute
Bus Current Required	350 mA
Power Dissipation	1.85 W + 1.1 x Total Module Load Current
External Power	Not required for this module
Fusing	
Internal	None

Specifications	
External	Each output point must be fused with an external fuse. The recommended fuse is a 5 A fuse (Part # 043502405 or equivalent) or any other fuse with an I^2T rating of less than 87.

Wiring Diagram The following figure shows the DAO84010 wiring diagram.



Note:
1. This module is not polarity sensitive.
2. N / C = Not Connected

	CAUTION
	Connectivity Compatibility Each output point must be fused with an external fuse. The recommended fuse is a 5 A fuse (Part # 043502405), or any other fuse with an I^2T rating of less than 87. **Failure to follow this precaution can result in injury or equipment damage.**

140DAO84210 Quantum I/O AC Output 100 ... 230 Vac 4x4 Module

Overview

The AC Output 100 ... 230 Vac 4x4 module switches 100 ... 230 Vac powered loads.

Specifications

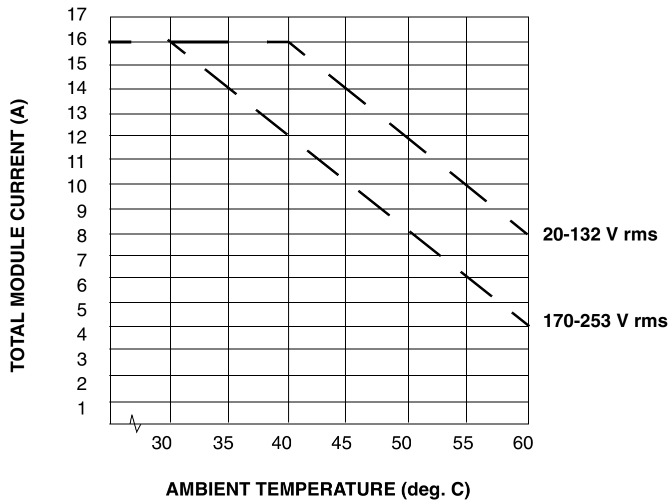
The following table shows the specifications for the 100 ... 230 VAC OUT module.

Specifications	
Number of Output Points	16 in four 4 point groups
LEDs	Active F 1 ... 16 (Green) - Indicates point status 1 - 4, 5 - 8, 9 - 12, 13 - 16 (Red) - Indicated group has a blown fuse or no field power
Required Addressing	1 word out
Voltage (rms)	
Working	85 ... 253 Vac
Absolute Maximum	300 Vac for 10 s 400 Vac for 1 cycle
Frequency	47 ... 63 Hz
ON State Drop / Point	1.5 Vac
Minimum Load Current (rms)	5 mA
Maximum Load Current (rms)	
Each Point *	4 A continuous, 85 ... 132 Vac rms, 3 A continuous, 170 ... 253 Vac rms
Each Group	4 A continuous
Per Module*	16 A continuous (See the derating chart)
Off State Leakage / Point (max)	2.5 mA @ 230 Vac 2.0 mA @ 115 Vac

Specifications

The following figure shows the DAO84210 derating chart.

DAO84210 Operating Curve*



*The specifications stated are pending UL/CSA approval. This module was originally approved at 2 A each point; and 12 A, 0 ... 50° C (115 Vac) and 0 ... 50° C (230 Vac) per module.

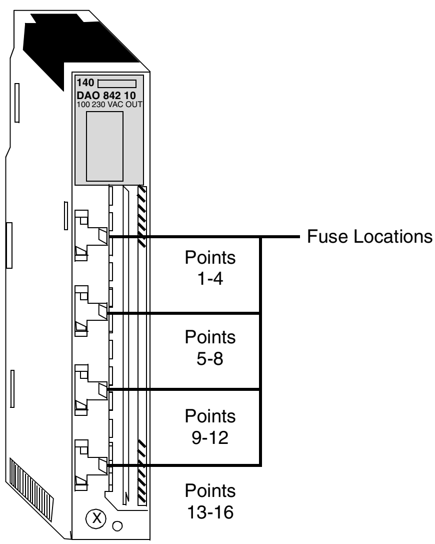
Surge Current Maximum (rms)	Per Point Per Group
One Cycle	30 A 45A
Two Cycles	20 A 30 A
Three Cycles	10 A 25 A
Applied DV / DT	400 V/µs
Response	
OFF - ON	0.50 of one line cycle max
ON - OFF	0.50 of one line cycle max
Output Protection	RC snubber suppression (internal)
Isolation (rms)	
Group to Group	1000 Vac rms for 1 minute, galvanically isolated
Output to Bus	1780 Vac rms for 1 minute
Fault Detection	Blown fuse detect, loss of field power
Bus Current Required	350 mA
Power Dissipation	1.85 W + 1.1 V x Total Module Load Current
External Power (rms)	85 ... 253 Vac
Fusing	

Specifications	
Internal	5 A fuse for each group. (Part # 043502405 or equivalent). For the location of the fuses see figure below.
External	User discretion

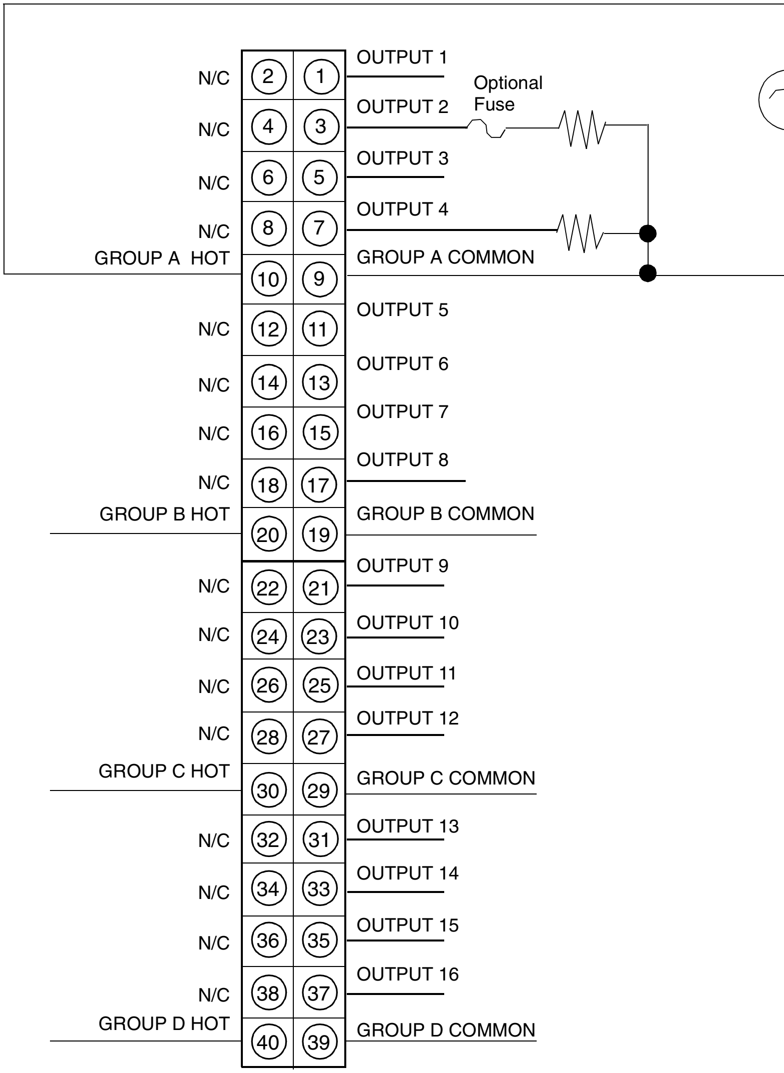
	WARNING
⚠	**Possible injury to personnel or equipment** First turn off the power to the module to remove the field wiring terminal strip to gain access to the fuses. **Failure to follow this precaution can result in death, serious injury, or equipment damage.**

Fuse Locations

The following figure shows the fuse locations for the DAO84210 module.



Wiring Diagram The following figure shows the wiring diagram for the DAO84210 module.



Note:
1. This module is not polarity sensitive.
2. N / C = Not Connected

	CAUTION
	Power Compatibility The AC power energizing each group must be from a common, single-phase AC power source. **Failure to follow this precaution can result in injury or equipment damage.**

	CAUTION
	Wiring Compatibility If an external switch is wired to control an inductive load in parallel with the module output, then an external varistor (Harris V390ZA05 or equivalent) must be wired in parallel with the switch. **Failure to follow this precaution can result in injury or equipment damage.**

140DAO84220 Quantum I/O AC Output 24 ... 48 Vac 4x4 Module

Overview

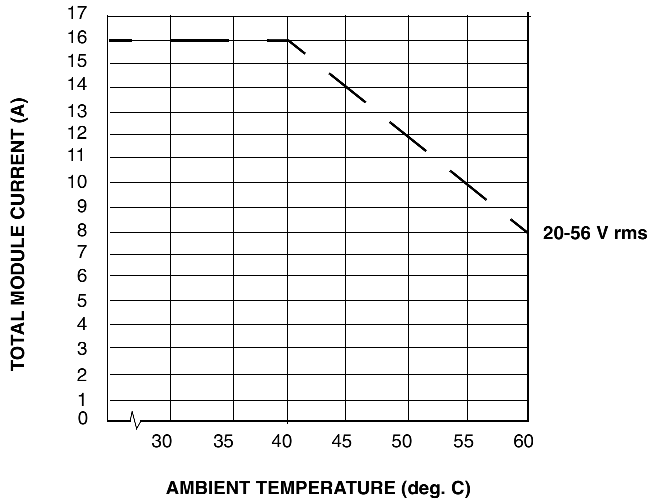
The AC Output 24 ... 48 Vac 4x4 module switches 24 ... 48 Vac powered loads.

Specifications

The following table shows the specifications for the DAO84220 24 - 48 VAC OUT module.

Specifications	
Number of Output Points	16 in four 4 point groups
LEDs	Active F 1 ... 16 (Green) - Indicates point status 1 - 4, 5 - 8, 9 - 12, 13 - 16 (Red) - Indicates group has a blown fuse or no field power
Required Addressing	1 word out
Voltage (rms)	
Working	20 ... 56 Vac
Absolute Maximum	63 Vac for 10 s 100 Vac for 1 cycle 111 Vac peak for 1.3 ms
Frequency	47 ... 63 Hz
ON State Drop / Point	1.5 Vac
Minimum Load Current (rms)	5 mA
Maximum Load Current (rms)	
Each Point*	4 A continuous, 20 ... 56 Vac rms
Each Group	4 A continuous
Per Module*	16 A continuous (See the derating chart)
Off State Leakage / Point	1 mA max
*The specifications stated are pending UL/CSA approval. This module was originally approved at 2 A each point; 12 A, 0 ... 50° C per group.	

Specifications	
The following figure shows the DAO84220 derating chart.	

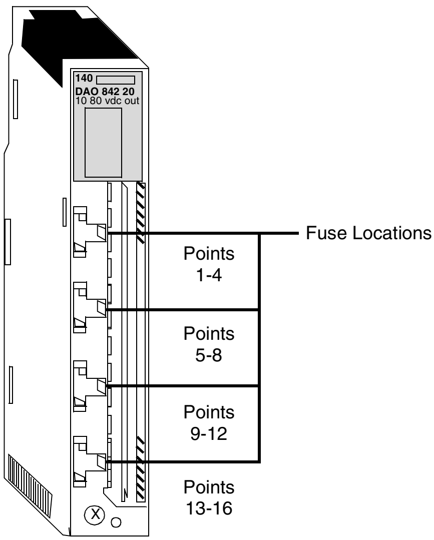


Surge Current Maximum (rms)	Per Point Per Group
One Cycle	30 A 45 A
Two Cycles	20 A 30 A
Three Cycles	10 A 25 A
Applied DV/DT	400 V/µs
Output Protection	RC snubber suppression (internal)
Isolation (rms)	
Group to Group	1000 Vac for 1 minute. Galvanically Isolated.
Input to Bus	1780 for 1 minute
Fault Detection	Blown fuse detect, loss of field power
Bus Current Required	350 mA
Power Dissipation	1.85 W + 1.1 V x Total Module Load Current
External Power Supply (rms)	20 ... 56 Vac
Fusing	
Internal	5 A fuse for each group (Part # 043502405 or equivalent) For the location of the fuses see *Fuse Locations, p. 699*.
External	User discretion

	CAUTION
	Possible injury to personnel or equipment First turn off power to the module and remove the field wiring terminal strip to gain access to fuses. **Failure to follow this precaution can result in injury or equipment damage.**

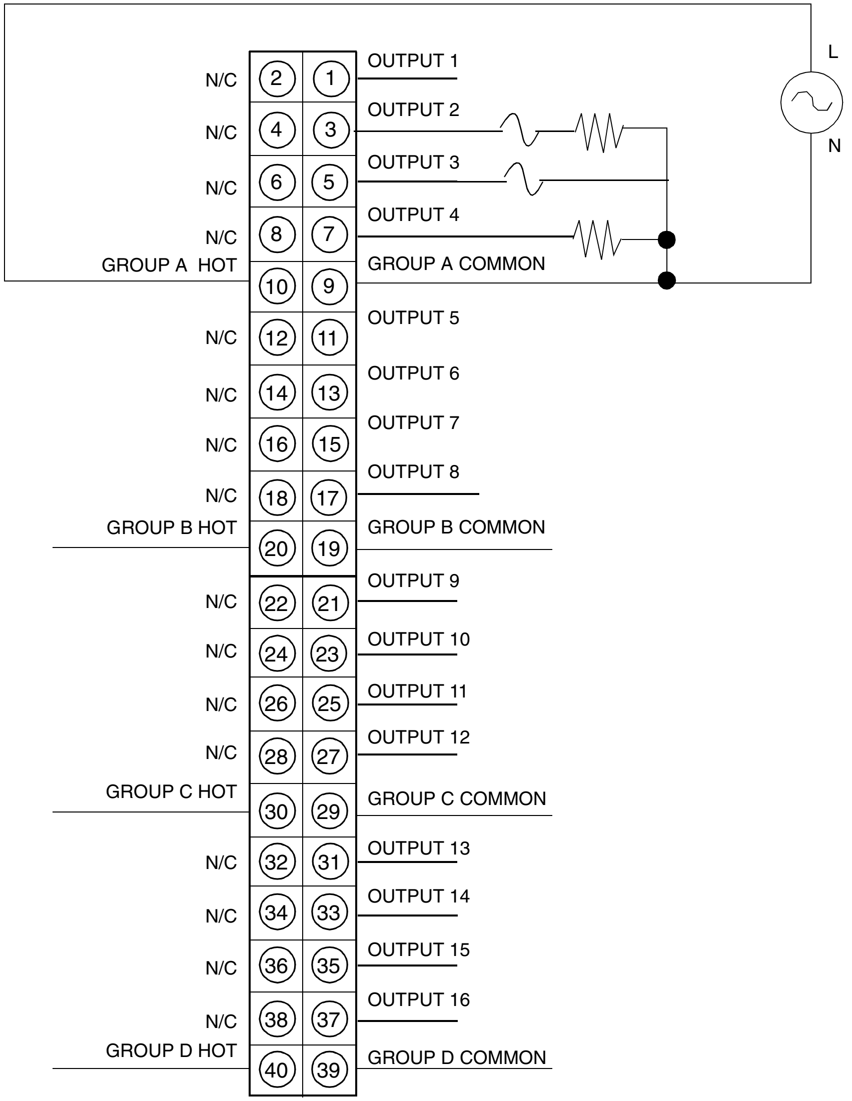
Fuse Locations

The following figure shows the DAO84220 fuse locations.



Wiring Diagram

The following figure shows the DAO84220 wiring diagram.



Note:
1. This module is not polarity sensitive.
2. N/C = Not Connected.

CAUTION

Power Compatibility

The AC power energizing each group must be from a common, single-phase AC power source.

Failure to follow this precaution can result in injury or equipment damage.

CAUTION

Wiring Compatibility

If an external switch is wired to control an inductive load in parallel with the module output, then an external varistor (Harris V390ZA05 or equivalent) must be wired in parallel with the switch.

Failure to follow this precaution can result in injury or equipment damage.

140DAO85300 Quantum I/O AC Output 24 ... 230 Vac 4x8 Module

Overview

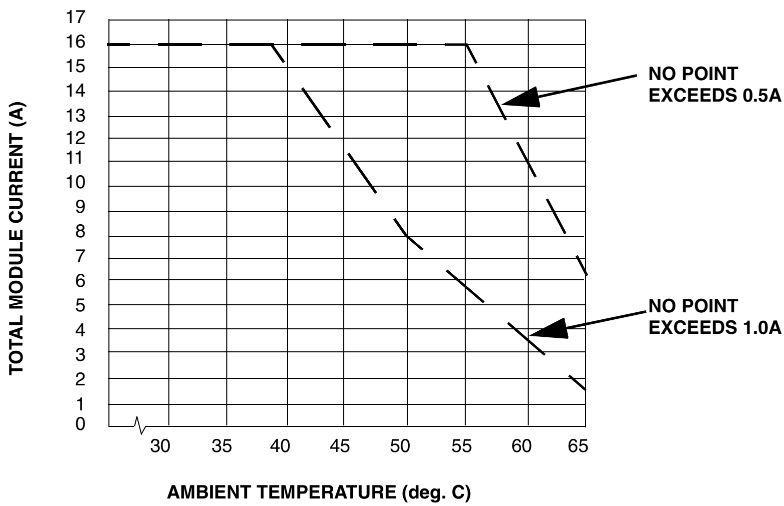
The AC Output 230 Vac 4x8 module switches 24 ... 230 Vac powered loads.

Specifications

The following table shows the specifications for the 230 VAC OUT module.

Specifications	
Number of Output Points	32 in four 8 point fused groups
LEDs	Active 1 - 32 (Green) - Indicates point status
Required Addressing	2 words out
Operating Voltages (rms)	
Working	20 ... 253 Vac
Absolute Maximum	300 Vac for 10 sec 400 Vac for 1 cycle
Frequency	47 ... 63 Hz
On State Drop / Point	1.5 Vac
Minimum Load Current (rms)	10 mA resistive
Maximum Load Current (rms)	
Each Point	1 A continuous, 20 ... 253 Vac rms
Each Group	4 A max
Per module	16 A continuous (See derating chart)

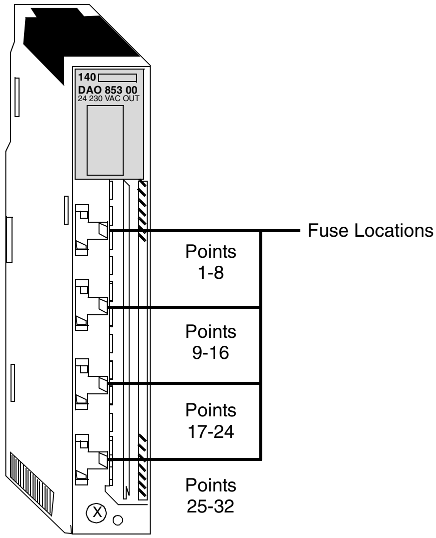
The following figure shows the DAO85300 derating chart.



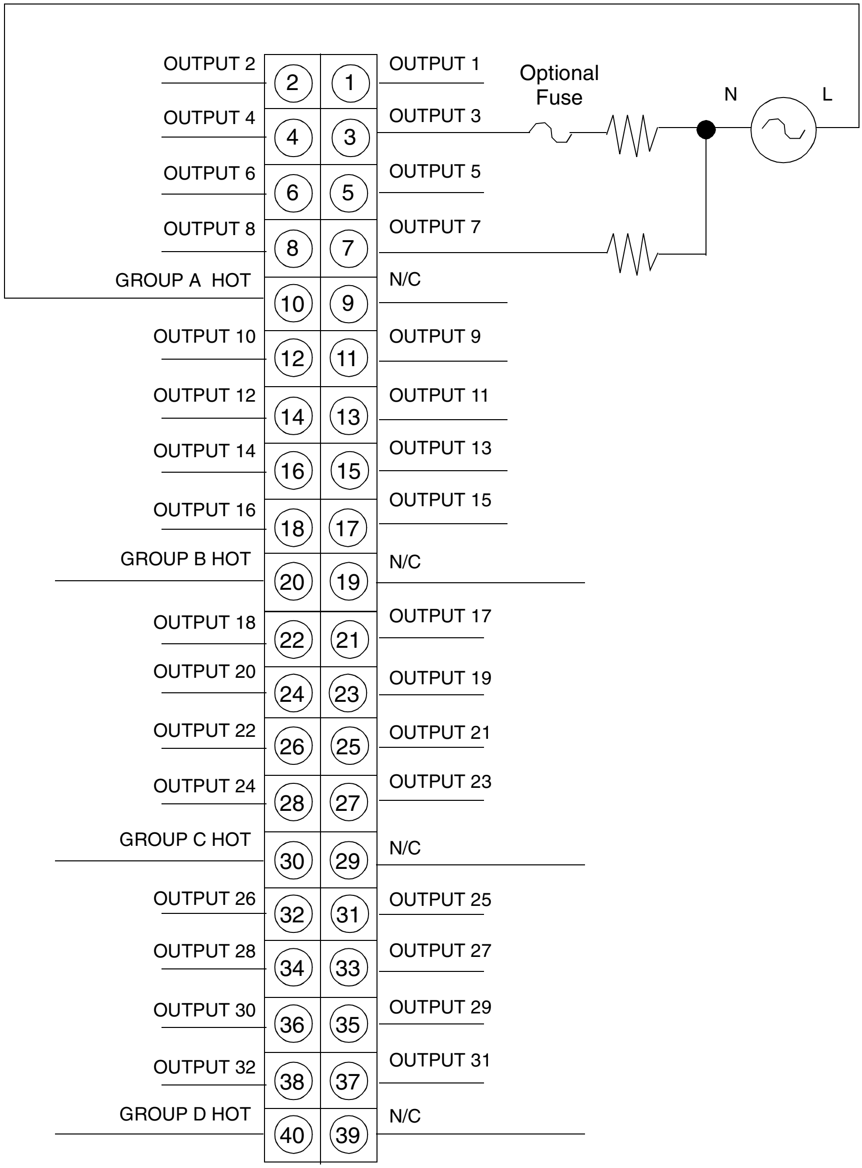
Specifications	
Off State Leakage / Point (max)	2.0 mA @ 230 Vac 1.1 mA @ 115 Vac 0.4 mA @ 48 Vac 0.2 mA @ 24 Vac
Surge Current Maximum (rms)	
One Cycle	15 A per point
Two Cycles	12 A per point
Three Cycles	8 A per point
Applied DV/DT	400 V/µs
Response	
OFF - ON	0.50 of one line cycle max
ON - OFF	0.50 of one line cycle max
Output Protection	RC snubber protection (internal)
Isolation (rms)	
Group to Group	1780 Vac for 1 minute
Output to Bus	1780 Vac for 1 minute
Bus Current Required	320 mA
Power Dissipation	1.60W+1.0 x Total Module Load Current
External Power	Not required
Fusing	
Internal	4 A, 250 V fuse (Little Fuse 217004) for each group. For location of fuses see the Fuse Locations Figure.
External	User discretion

Fuse Locations

The following figure shows the fuse locations for the DAO85300 module.



Wiring Diagram The following figure shows the DAO85300 wiring diagram.



	CAUTION
	Power Compatibility The AC power energizing each group must be from a common, single-phase AC power source. **Failure to follow this precaution can result in injury or equipment damage.**

	CAUTION
	Wiring Compatibility If an external switch is wired to control an inductive load in parallel with the module output, then an external varistor (Harris V390ZA05 or equivalent) must be wired in parallel with the switch. **Failure to follow this precaution can result in injury or equipment damage.**

140DDO15310 I/O DC Output 5 V TTL 4x8 Sink Module

Overview

The DC Output 5 V TTL 4x8 Sink module switches 5 Vdc loads and is for use with source devices and is compatible with LS, S, TTL, and CMOS logic.

Specifications

The following table shows the specifications for the 5 V TTL OUT module.

Specifications	
Number of Output Points	32 in four 8 point groups
LEDs	Active F 1 ... 32 (Green) - Indicates point status
Required Addressing	2 words out
Output Ratings	
ON Level	0.2 Vdc (max) @ 75 mA sinking
OFF Level	$V_{OUT} = U_S - 1.25$ V @ 1 mA source $V_{OUT} = 3.2$ V (min) @ 1 mA, $U_S = 4.5$ V
Internal Pullup Resistor	440 Ω
Maximum Load Current	
Each Point	75 mA (sinking)
Each Group	600 mA
Per Module	2.4 A
Surge Current Maximum	
Each Point	750 mA @ 500 µs duration (no more than 6 per minute)
Response (Resistive Loads)	
OFF - ON	250 µs (max)
ON - OFF	250 µs (max)
Output Protection (internal)	Transient voltage suppression
Isolation	
Group to Group	500 Vac rms for 1 minute
Output to Bus	1780 Vac rms for 1 minute
Fault Detection	Blown fuse detect, loss of field power
Bus Current Required	350 mA
Power Dissipation	4 W
External Power (U_S)	4.5 ... 5.5 Vdc continuous
Absolute Voltage (U_S) max	15 Vdc for 1.3 ms decaying voltage pulse
External Power Supply Current	400 mA + Load current per point
Fusing	
Internal	1A fuse for each group. Modicon # 043508953. For the location of the fuses *Fuse Locations, p. 710.*
External	None

Module States

The following table shows the module states for the DDO15310 module.

External Power	Command	Active	Output	LED	Fault
ON	OFF	ON	>3.2	OFF	OFF
ON	ON	ON	<0.2	ON	OFF
OFF	X	X	*	OFF	ON
OFF	ON	ON	*	ON	ON
*440 Ω pullup resistor to the power rail X = OFF or ON state					

CAUTION

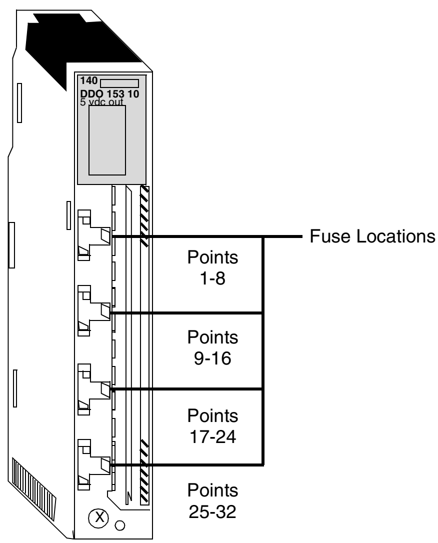
Possible danger to equipment or personnel.

Turn off power to the module and remove the field wiring terminal strip to gain access to fuses.

Failure to follow this precaution can result in injury or equipment damage.

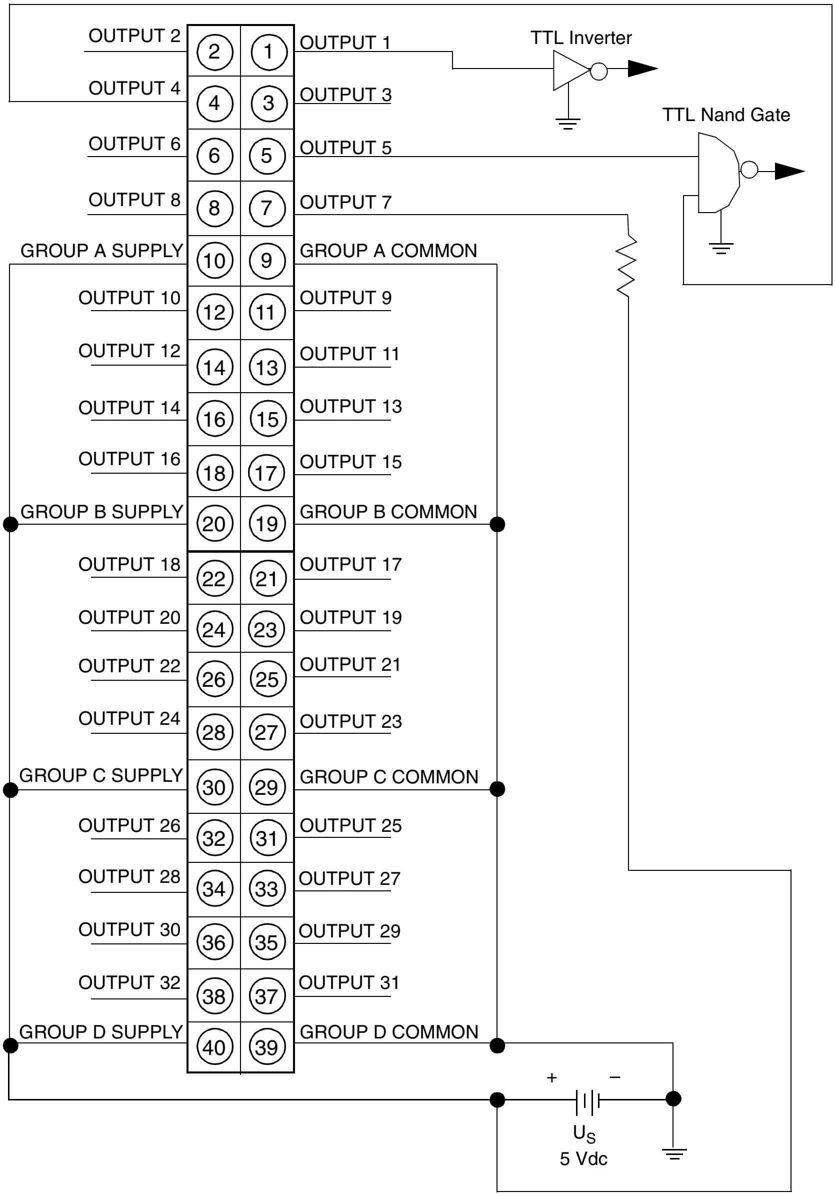
Fuse Locations

The following figure shows the locations of the fuses for the DDO15310 module.



Wiring Diagram

The following figure shows the DDO15310 wiring diagram.



140DDO35300 Quantum I/O DC Output 24 Vdc 4x8 Source Module

Overview

The DC Output 24 Vdc 4x8 Source module switches 24 Vdc powered loads and is for use with sink devices.

Specifications

The following table shows the specifications for the DDO35300 24 VDC OUT module.

Specifications	
Number of Output Points	32 in four 8 point groups
LEDs	Active F 1 ... 32 (Green) - Indicates point status
Required Addressing	2 words out
Voltage	
Operating (max)	19.2 ... 30 Vdc
Absolute (max)	56 Vdc for 1.3 ms decaying voltage pulse
ON State Drop / Point	0.4 Vdc @ 0.5 A
Maximum Load Current	
Each Point	0.5 A
Each Group	4 A
Per Module	16 A
Off State Leakage / Point	0.4 mA @ 30 Vdc
Surge Current Maximum	
Each Point	5 A @ 500 μs duration (no more than 6 per minute)
Response (Resistive Loads)	
OFF - ON	1 ms (max)
ON - OFF	1 ms (max)
Output Protection (internal)	Transient voltage suppression
Load Inductance Maximum	0.5 Henry @ 4 Hz switch frequency or $L = \frac{0.5}{I^2F}$ where: L = Load Inductance (Henry) I = Load Current (A) F = Switching Frequency (Hz)
Load Capacitance Maximum	50 μf
Isolation	
Group to Group	500 Vac rms for 1 minute
Output to Bus	1780 Vac rms for 1 minute
Fault Detection	Blown fuse detect, loss of field power
Bus Current Required	330 mA
Power Dissipation	1.75 W + 0.4 V x Total Module Load Current

Specifications	
External Power	19.2 ... 30 Vdc
Fusing	
Internal	5A fuse for each group. Modicon Part # 043502405. For the location of the fuses see *Fuse Locations, p. 715*.
External	Each group is protected with a 5A fuse to protect the module from catastrophic failure. The group fuse is not guaranteed to protect each output switch for all possible overload conditions. It is recommended that each point be protected with a 3/4 A, 250 V fuse, (Part # 57-0078-000).

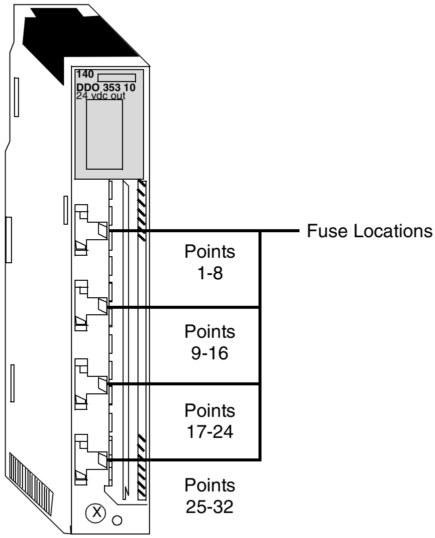
CAUTION

Possible danger to equipment or personnel.

Turn off power to the module and remove the field wiring terminal strip to gain access to fuses.

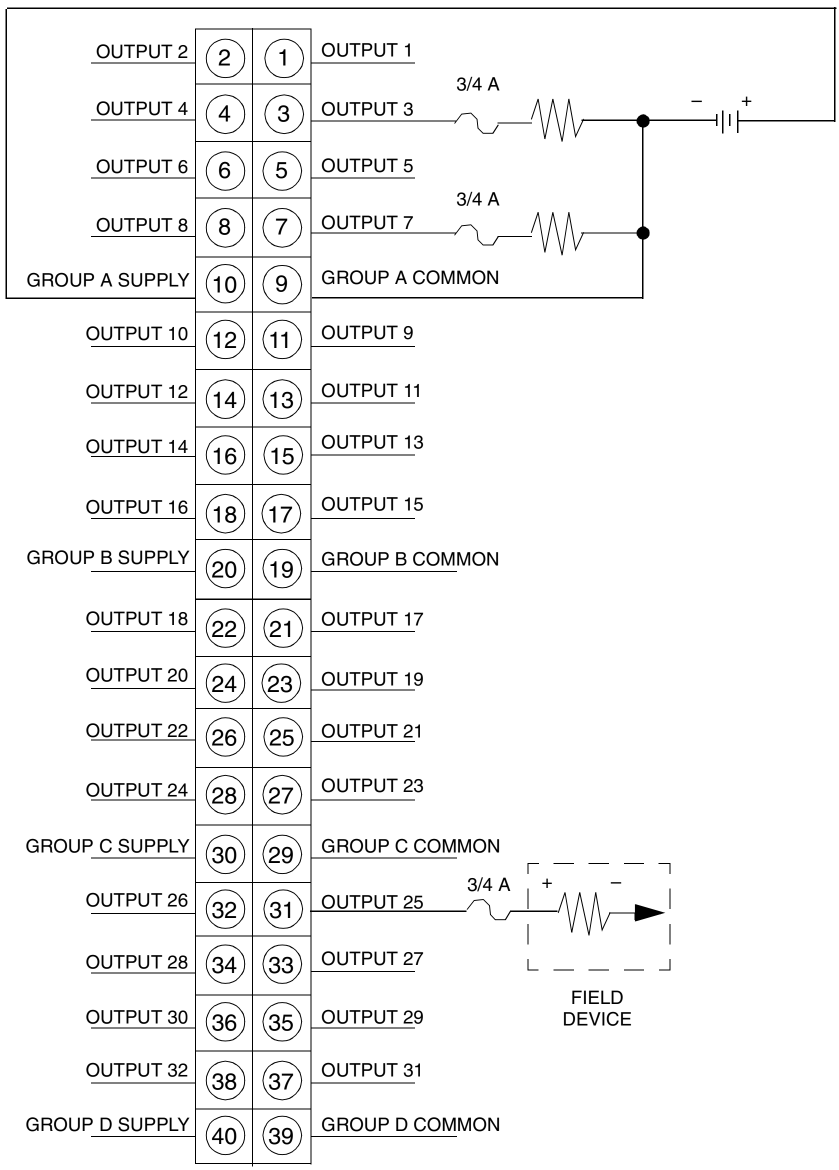
Failure to follow this precaution can result in injury or equipment damage.

Fuse Locations The following figure shows the fuse locations for the DDO35300 module.



Wiring Diagram

The following figure shows the DDO35300 wiring diagram.



	CAUTION
	Possible Equipment Failure Each group is protected with a 5 A fuse to protect the module from catastrophic failure. The group fuse will not be guaranteed to protect each output switch for all possible overload conditions. It is recommended that each point be protected with a 3/4 A, 250 V fuse (Part # 57-0078-000). **Failure to follow this precaution can result in injury or equipment damage.**

140DDO35301 I/O DC Output 24 VDC 4x8 Discrete Source Module

Overview

The 140DDO35301 source module switches 24 Vdc powered loads, and is short circuit and overload resistant.

Specifications

The following table shows the specifications for the DDO35301 24 VDC OUT module.

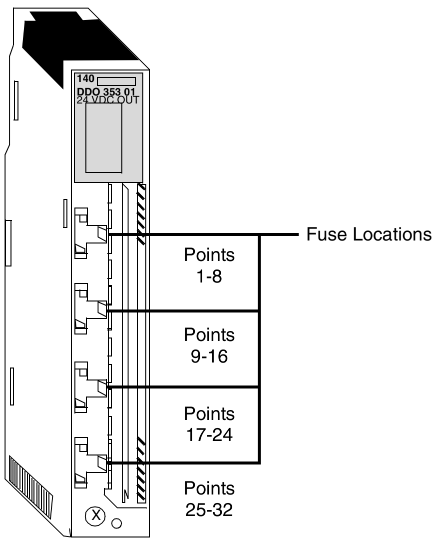
Specifications	
Number of Output Points	32 in four 8-point groups
LEDs	Active (Green) Bus communication is present F (Red) Group power missing or point faulted 1 ... 32 (Green) - Indicates point status
Required Addressing	2 words out
Voltage	
Operating	19.2 ... 30 Vdc
ON State Drop / Point	0.5 Vdc @ 0.5 A
Maximum Load Current	
Each Point	0.5 A
Each Group	4 A
Per Module	16 A
Off State Leakage / Point	<1 mA @ 24 Vdc
Surge Current Maximum	
Each Point	2 A (Internally limited)
Response (Resistive Loads)	
OFF - ON	< 0.1 ms
ON - OFF	< 0.1 ms
Output Protection (internal)	Thermal overload and short circuit
Load Inductance Maximum	0.5 Henry @ 4 Hz switch frequency, or: $L = \frac{0.5}{I^2 F}$ where: L = Load inductance (Henry) I = Load current (A) F = Switching Frequency (Hz)
Load Capacitance Maximum	50 µf
Isolation	
Group to Group	500 Vac rms for 1 minute
Output to Bus	500 Vac rms for 1 minute
Fault Detection	Group indication: Loss of field power/faulted point
Bus Current Required	250 mA max.
Power Dissipation	5 W (all points on)
External Power	19.2 ... 30 Vdc
Fusing	

Specifications	
Internal	5A fuse for each group. Modicon Part # 043502405. For the location of the fuses see *Fuse Locations, p. 720*.
External	User discretion

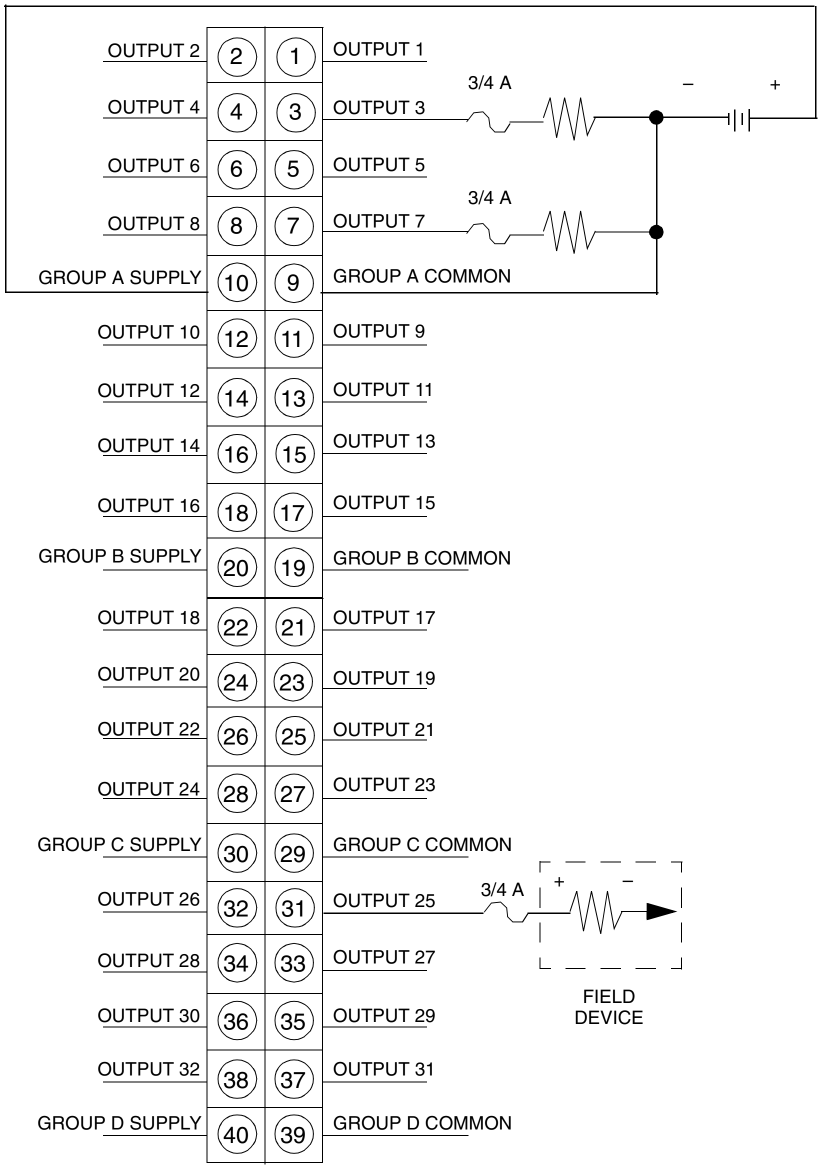
	CAUTION
	Possible danger to equipment or personnel. Disconnect the supply voltage to the module and remove the field wiring terminal strip to gain access to fuses. **Failure to follow this precaution can result in injury or equipment damage.**

Fuse Locations

The following figure shows the fuse locations for the DDO35301 module.



Wiring Diagram The following figure shows the DDO35301 wiring diagram.



	CAUTION
	Possible Equipment Failure Each group is protected with a 5 A fuse to protect the module from catastrophic failure. **Failure to follow this precaution can result in injury or equipment damage.**

140DDO35310 I/O DC Output 24 Vdc 4x8 Sink Module

Overview

The 24 Vdc True Low 4x8 Sink module switches 24 Vdc, and is capable of driving displays, logic, and other loads up to 500 mA sinking, in the ON state.

Specifications

The following table shows the specifications for the DDO35310 24 VDC OUT SINK module.

Specifications	
Number of Output Points	32 output points in four 8 point groups
LEDs	Active F 1 ... 32 (Green) - Indicates point status
Required Addressing	2 words out
Voltage	
Operating (max)	19.2 ... 30 Vdc
1.0 ms	50 Vdc decaying pulse
ON State Drop / Point	0.4 Vdc @ 0.5 A
Maximum Load Current	
Each Point	0.5 A
Each Group	4 A
Per Module	16 A
OFF State Leakage/Point	0.4 mA @ 30 Vdc
Surge Current Maximum	
Each Point	5 A@ 1 ms duration (no more than 6 per minute).
Response (Resistive Loads)	
OFF - ON	1 ms (max)
ON - OFF	1 ms (max)
Fault Detection	Blown fuse detect, loss of field power
Isolation	
Group to Group	500 Vac rms for 1 minute
Output to Bus	1780 Vac rms for 1 minute
Load Inductance Maximum	0.5 Henry @ 4 Hz switch frequency or $L = \frac{0.5}{I^2 F}$ where: L = Load Inductance (Henry) I = Load Current (A) F = Switching Frequency (Hz)
Load Capacitance Maximum	50 µf
Tungsten Load Maximum	12 W @ 24 Vdc
Output Protection (internal)	Transient voltage suppression: 36 V

Specifications	
Bus Current Required	330 mA max
Power Dissipation	2.0 W + (0.4 V x Total Load Current)
External Power	19.2 ... 30 Vdc
Fusing	
Internal	5.0 A fuse per group. Part # 043502405. For the location of the fuses see *Fuse Locations, p. 726*.
External	Each group is protected with a 5 A fuse to protect the module from catastrophic failure. The group fuse is not guaranteed to protect each output switch for all possible overload conditions. It is recommended that each point be protected with a 3/4 A, 250 V fuse, Part # 57-0078-000.

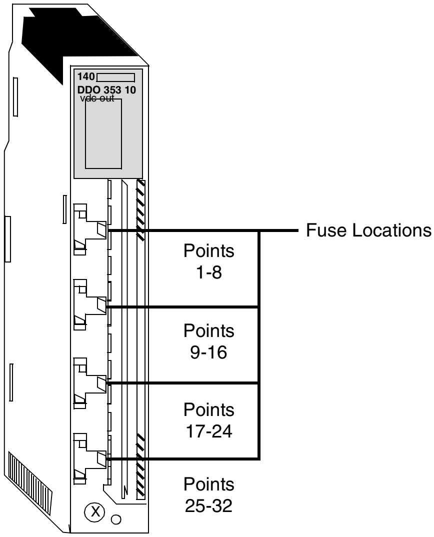
CAUTION

Possible danger to equipment or personnel.

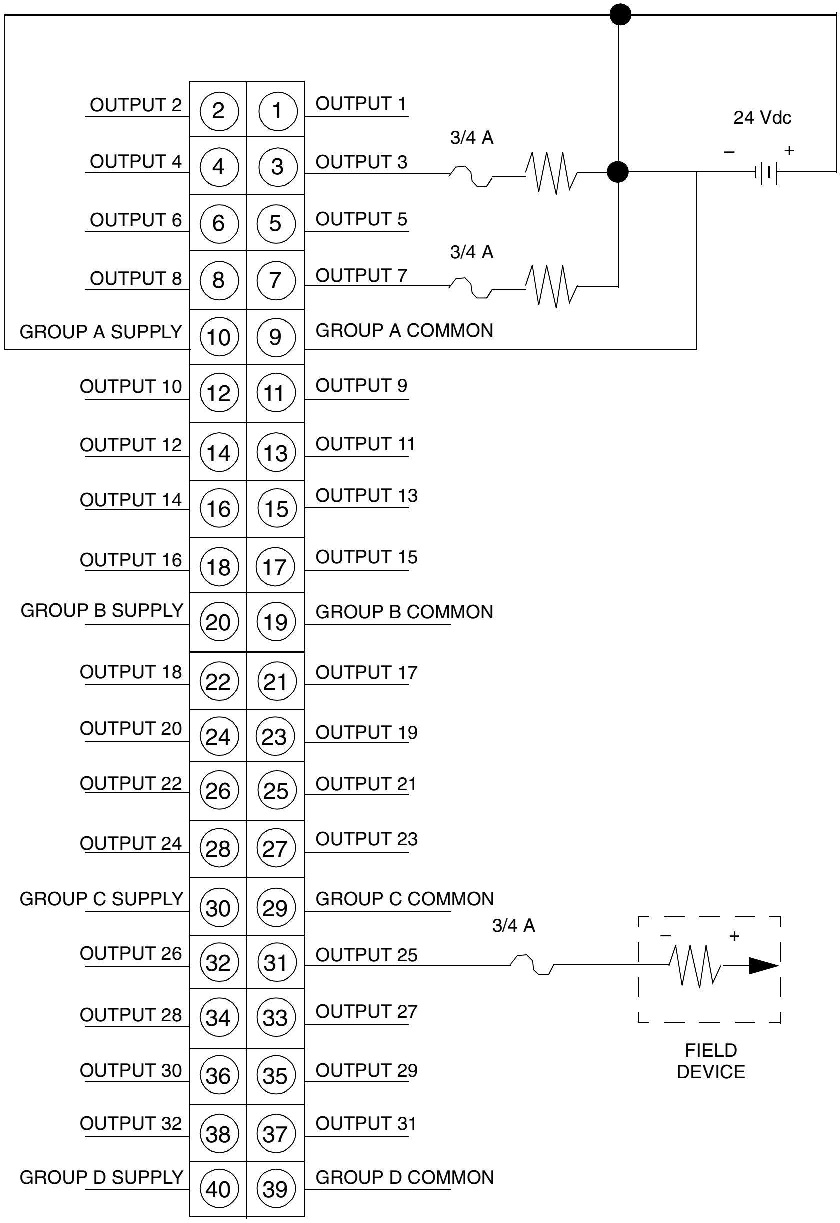
Turn off power to the module and remove the field wiring terminal strip to gain access to fuses.

Failure to follow this precaution can result in injury or equipment damage.

Fuse Locations The following figure shows the locations of the fuses for the DDO35310 module.



Wiring Diagram The following shows the DDO35310 wiring diagram.



	CAUTION
	Possible Equipment Failure Each group is protected with a 5 A fuse to protect the module from catastrophic failure. The group fuse will not be guaranteed to protect each output switch for all possible overload conditions. It is recommended that each point be fused with a 3/4 A, 250 V fuse Part # 57-0078-000. **Failure to follow this precaution can result in injury or equipment damage.**

140DDO36400 I/O DC Output 24VDC 6x16 Telefast Output Module

Overview

The Telefast Output Source module switches 24 Vdc powered loads. Outputs are thermally protected.

Specifications

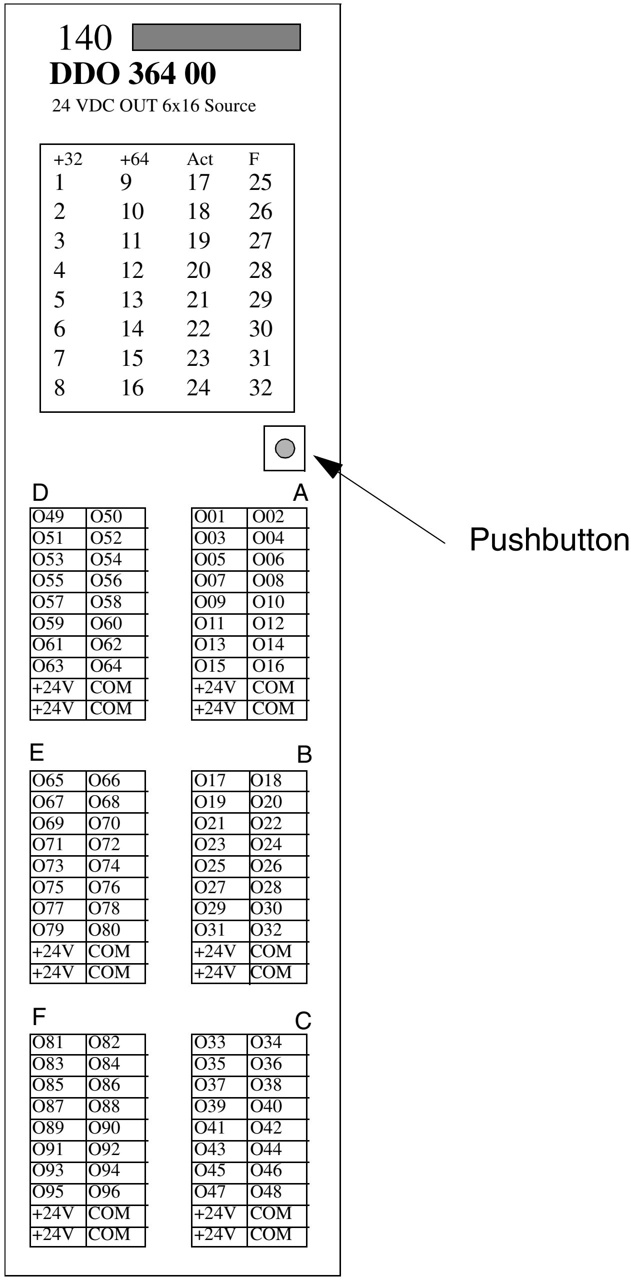
The following table shows the specifications for the 140DDO36400 output module:

Specifications	
Number of Output Points	96 in six 16 point groups
LEDs	ACT (Green) Bus communications are present F (Red) Group power missing or point faulted +32 (Green) Points 33 to 64 displayed on LED matrix +64 (Green) Points 65 to 96 displayed on LED matrix 1 ... 32 (Green) - Indicates point status
Required Addressing	6 words out
Voltage	
Operating	19.2 ... 30 Vdc
ON State Drop / Point	0.5 Vdc @ 0.5 A
Maximum Load Current	
Each Point	0.5 A
Each Group	3.2 A
Per Module	19.2 A
Off State Leakage / Point	<1 mA @ 24 Vdc
Surge Current Maximum	
Each Point	2 A (Internally limited)
Response (Resistive Loads)	
OFF - ON	<.1 ms
ON - OFF	<.1 ms
Output Protection (internal)	Thermal overload and short circuit
Load Inductance Maximum	0.5 Henry @ 4 Hz switch frequency, or: $L = \frac{0.5}{I^2 F}$ where: L = Load inductance (Henry) I = Load current (A) F = Switching frequency (Hz)
Load Capacitance Maximum	50 µf
Isolation	
Output to Bus	500 Vac rms for 1 minute
Fault Detection	Group indication: loss of field power/faulted point (short circuit or overload)
Bus Current Required	250 mA max.
Power Dissipation	7 W (all points on)

Specifications	
External Power	19.2 ... 30 Vdc. 19.2 A maximum (depends on load)
Fusing	
External	User discretion for field power

Front view of 140DDO36400 Module

The front view of the 140DDO36400 output module including terminal assignment numbers:



Selecting Point Status Indicator LEDs

Use the pushbutton to select output points to be displayed as per the following table:

LED	+32	+64
Out 1 to 32	Off	Off
Out 33 to 64	On	Off
Out 65 to 96	Off	On

Recommended Cables

The following table shows recommended cables, description, and their length in meters.

Cable Part Number	Description	Length (M)
TSXCDP301	(1) HE 10 - flying leads	3
TSXCDP501	(1) HE 10 - flying leads	5
TSXCDP053	(2) HE 10 - round cable	0.5
TSXCDP103	(2) HE 10 - round cable	1
TSXCDP203	(2) HE 10 - round cable	2
TSXCDP303	(2) HE 10 - round cable	3
TSXCDP503	(2) HE 10 - round cable	5

Color Codes for Input Groups

The following table shows the color codes for all groups.

1. White	2. Brown
3. Green	4. Yellow
5. Gray	6. Pink
7. Blue	8. Red
9. Black	10. Purple
11. Gray/pink	12 Red/blue
13. White/green	14. Brown/green
15. White/yellow	16. Yellow/brown
17. White/gray	18. Gray/brown
19. White/pink	20. Pink/brown

Compatible Output Adapter Sub-Bases

The following tables shows the compatible output adapter sub-bases. See *Quantum Modicon Telemecanique Automation Platform, Discrete I/O Chapter, Telefast 2 pre-wired system: connector cables FOR Quantum PLCs* section for more detailed informaton.

Channels	**Type**
8	ABE-7S08S2xx[1]
8	ABE-7R08Sxxx/7P08T330[1]
16	ABE-7R16Sxxx
16	ABE-7R16Txxx/7P16Txxx
[1]With the splitter sub-base ABE-7ACC02	

140DDO84300 Quantum I/O DC Output 10 ... 60 Vdc 2x8 Source Module

Overview

The DC Output 10 ... 60 Vdc 2x8 Source module switches 10 ... 60 Vdc powered loads and is for use with sink devices. External power supplies may be mixed between groups.

Specifications

The following table shows the specifications for the DDO84300 10 ... 60 VDC OUT module.

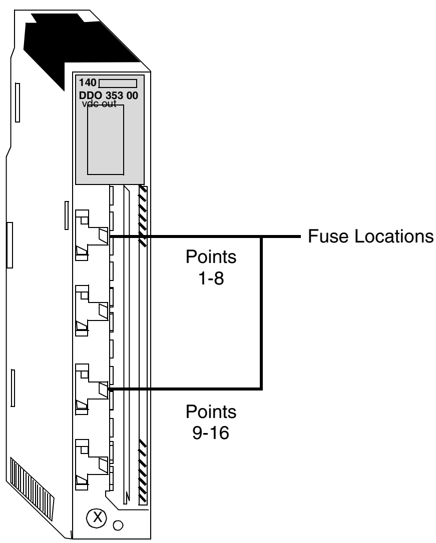
Specifications	
Number of Output Points	16 in two 8 point groups
LEDs	Active 1 ... 16 (Green) - Indicates point status
Required Addressing	1 word out
Voltage	
Operating	10.2 ... 72 Vdc
Absolute Maximum	72 Vdc (continuous)
ON State Drop / Point	1 V max @ 2 A
Maximum Load Current	
Each Point	2 A
Each Group	6 A
Per Module	12 A
Off State Leakage / Point	1 mA @ 60 Vdc max
Surge Current Maximum	
Each Point	7.5 A @ 50 ms duration (no more than 20 per minute)
Response (Resistive Loads)	
OFF - ON	1 ms
ON - OFF	1 ms
Output Protection (internal)	Over voltage (suppression diode)
Isolation	
Group to Group	700 Vdc for 1 minute
Group to Bus	2500 Vdc for 1 minute
Bus Current Required	160 mA
Power Dissipation	1 W + 1 V x Total Module Load Current
External Power	10 ... 60 Vdc (module inrush at power up approximately 0.75A, < 1 msec)
Fusing	
Internal	8A fuse time-lag for each group (Part # 042701994 or equivalent).For location of fuses, see *Fuse Locations, p. 737*.

Specifications	
External	Each group is protected with an 8 A fuse to protect the module from catastrophic failure. The group fuse is not guaranteed to protect each output switch for all possible overload conditions. It is recommended that each point be fused with a 2 A fuse: Little Fuse 312-002 or equivalent.

	CAUTION
⚠	**Possible danger to equipment or personnel.** Turn off power to the module and remove the field wiring terminal strip to gain access to fuses. **Failure to follow this precaution can result in injury or equipment damage.**

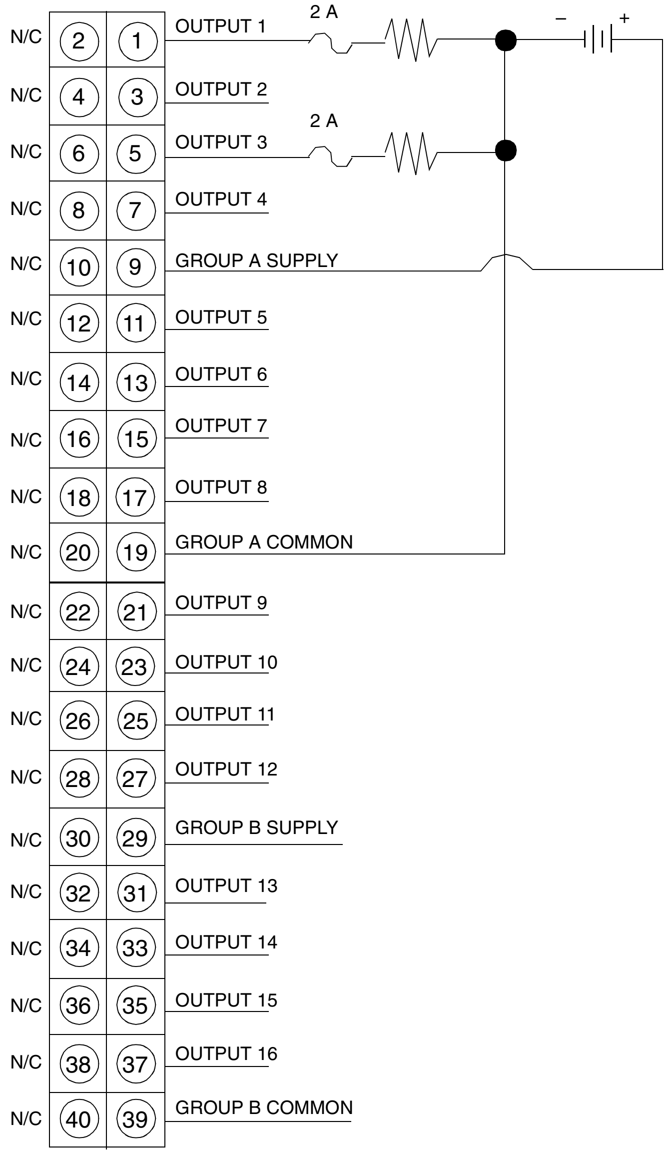
Fuse Locations

The following figure shows fuse locations for the DDO84300 module.



Wiring Diagram

The following figure shows the DDO84300 wiring diagram.



Note: N / C = Not Connected

140DDO88500 Quantum I/O DC Output 24-125 Vdc 2x6 Source Module

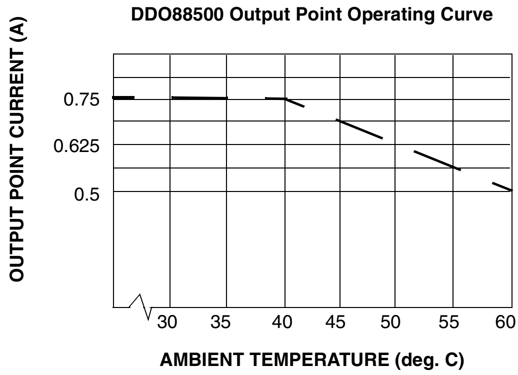
Overview

The DC Output 24-125 Vdc 2x6 Source module switches 24-125 VDC powered loads and is for use with sink devices.

Specifications

The following table shows the specifications for the DDO88500 24-125 VDC OUT module.

Specifications		
Number of Output Points		12 in two 6 point groups
LEDs		Active F (Red) - An over current condition on any point has been detected 1 - 12 (Green) - The indicated point or channel is turned ON 1 - 12 (Red) - The indicated output point has an over current condition
Required Addressing		1 word in
		1 word out
Voltages		
Working		19.2 to 156.2 Vdc including ripple
ON State Voltage Drop		0.75 Vdc @ 0.5 A
Maximum Load Current		
Each Point		0.75 A, < 40° C (see the operating curve below)
Each Group		3 A, 0 ... 60° C
Per Module		6 A, 0 ... 60° C
Surge Current Maximum		4 A, 1 ms pulse, no more than 6 per minute
OFF State Leakage		0.5 mA @ 150 Vdc
Maximum Tungsten	@ 130 Vdc	46 W per point
	@ 115 Vdc	41 W per point
	@ 24 Vdc	8 W per point

Specifications	
	
NOTE: Each group: 3 A, 0 ... 60° C. Per module: 6 A, 0 ... 60° C	
Inductance	Internal diode protected, no limit on inductance
Output Response (OFF - ON, ON - OFF)	1.0 ms, resistive
Switching Frequency	50 Hz maximum
Output Protection (internal)	Group varistor and individual point over current sense
Isolation	
Field to Bus	2500 Vac for 1 minute
Group-to-Group	1200 Vac for 1 minute
Fault Detection	Over current (see note below)
Bus Current Required	
6 points ON	375 mA
12 points ON	650 mA
Power Dissipation	1.0 W + 0.77 W x number of points ON
External Power	None
Fusing	
Internal	4 A (Part # 043511382 or equivalent) See below for the location of the fuses.
External	Not required for this module.

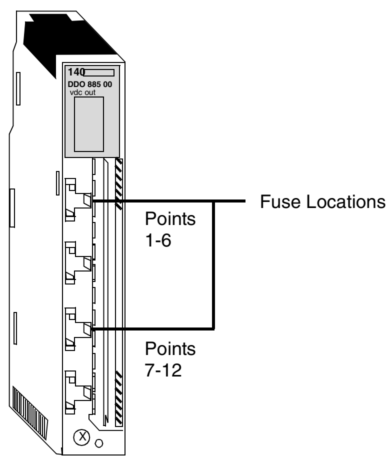
Note: Each output point is protected by an over current sense circuit. When an over current condition is detected, the point is turned OFF, its LED fault indicator is turned ON, and the appropriate bit is set in the module fault register.

The output point will be turned OFF after a short is detected. A fault greater than 9.4 A will guarantee that the point will be turned OFF and will latch the output point in the OFF state. To clear a fault, the point must be commanded OFF in user logic.

	CAUTION
	Possible danger to equipment or personnel. Turn off power to the module and remove the field wiring terminal strip to gain access to fuses. **Failure to follow this precaution can result in injury or equipment damage.**

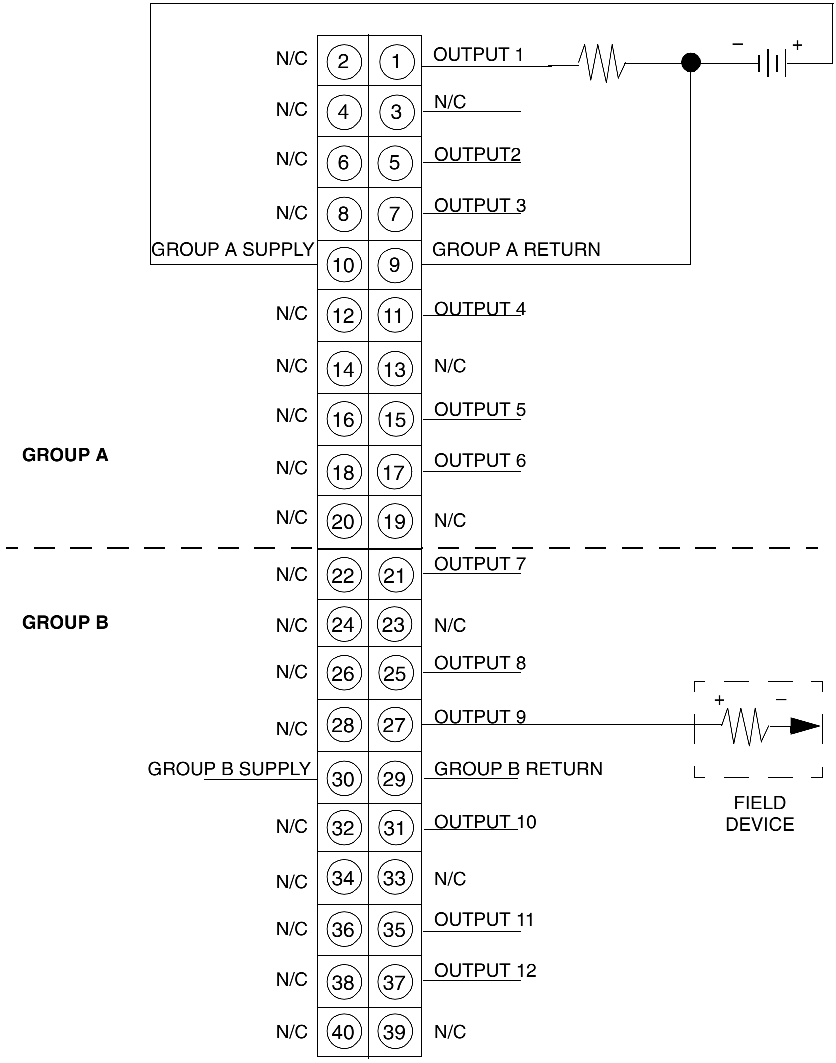
Fuse Locations

The following figure shows the fuse locations for the DDO88500 module.



Note: At a minimum, Modsoft V2.40, ProWorX NxT V2.0, or Concept V2.0, is required to configure this module.

Wiring Diagram The following figure shows the DDO885 wiring diagram.



Note: N / C = Not Connected.

	CAUTION
	Reverse Polarity Possibility This module is not protected against reverse polarity. If you want to protect against polarity miswiring, an external diode in series with each group supply line is recommended. This diode must be able to support the group load current. **Failure to follow this precaution can result in injury or equipment damage.**

140DRA84000 Quantum I/O Relay Output 16x1 Normally Open Module

Overview

The Relay Output 16x1 Normally Open module is used to switch a voltage source using 16 relays with normally open contacts.

Specifications

The following table shows the specifications for the RELAY OUT module.

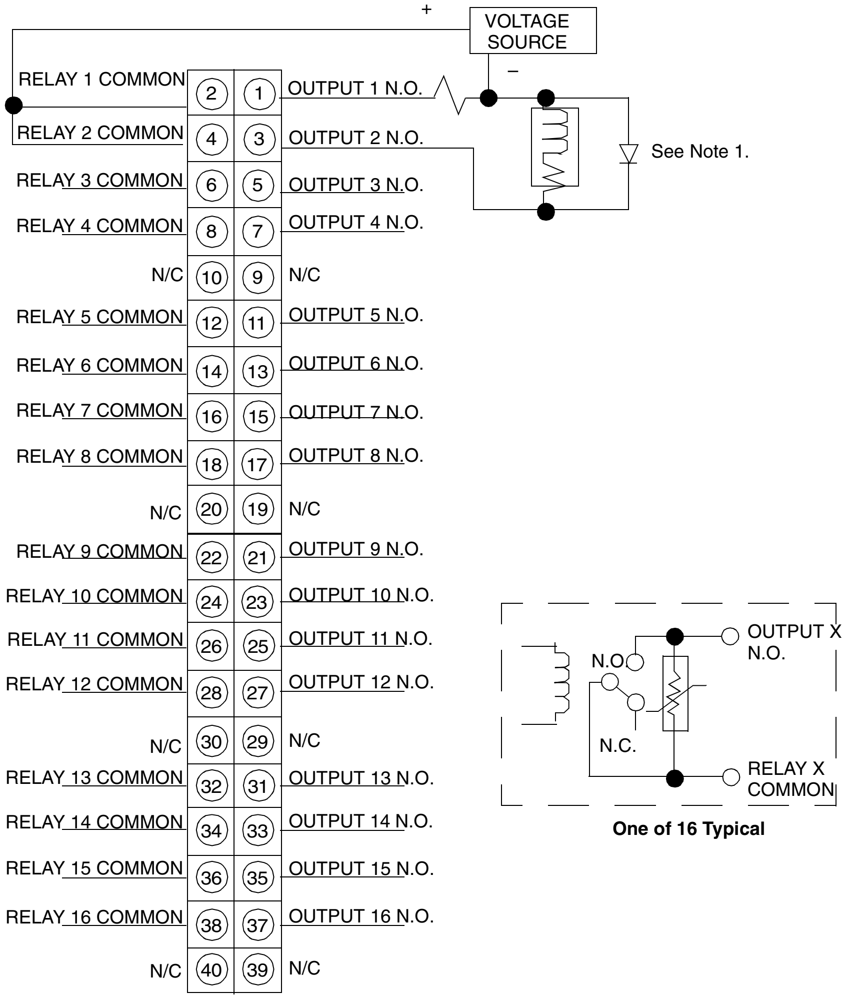
Specifications	
Number of Output Points	16 normally open
LEDs	Active 1 ... 16 (Green) - Indicates point status
Required Addressing	1 word out
Voltage	
Working	20 ... 250 Vac 5 ... 30 Vdc 30 ... 150 Vdc (reduced load current)
Maximum Load Current	
Each Point	2 A max, at 250 Vac or 30 Vdc @ 60° C ambient, resistive load 1 A Tungsten lamp load 1 A @ a power factor of 0.4 1/8 hp @ 125/250 Vac
Each Point (30 ... 150 Vdc)	300 mA (resistive load) 100 mA (L/R = 10 msec)
Minimum Load Current	50 mA Note: Minimum load current if the contact is used at rated loads of 5 ... 150 Vdc or 20 ... 250 Vac
Each Point	2 A max, at 250 Vac or 30 Vdc @ 60° C ambient resistive load
Surge Current Maximum	
Each Point	10 A capacitive load @ τ = 10 ms
Switching Capability	500 VA resistive load
Response	
OFF - ON	10 ms max
ON - OFF	20 ms max
Off State Leakage	< 100 μA
Relay Contact Life	
Mechanical Operations	10,000,000
Electrical Operations	200,000 (resistive load @ max voltage and current)
Electrical Operations (30 ... 150 Vdc) (see note below)	100,000, 300 mA (resistive load) 50,000, 500 mA (resistive load) 100,000, 100 mA (L/R = 10 msec) 100,000 Interposing Relay (Westinghouse Style 606B, Westinghouse type SG, Struthers Dunn 219 x 13 XP)

Specifications	
Relay Type	Form A
Contact Protection	Varistor, 275 V (internal)
Isolation	
Channel to Channel	1780 Vac rms for one minute
Field to Bus	1780 Vac rms for one minute 2500 Vdc for one minute
Bus Current Required	1100 mA
Power Dissipation	5.5 W + 0.5 x N = Watts (where N = the number of points on)
External Power	Not required for this module
Fusing	
Internal	None
External	User discretion

Note: Relay contact life for inductive loads may be significantly increased by using external contact protection such as a clamping diode across the load.

Wiring Diagram

The following figure shows the DRA84000 wiring diagram.



One of 16 Typical

Note:
1. For 125 Vdc inductive loads, external clamping is recommended to extend relay contact life. (1N 4004 or equivalent).
2. N/C = Not Connected. N.O. = Normally Open. N.C. = Normally Closed.

140DRC83000 Quantum I/O Relay Output 8x1 Normally Open/Normally Closed Module

Overview

The Relay Output 8x1 Normally Open/Normally Closed module is used to switch voltage sources using eight relays with normally open and normally closed contacts.

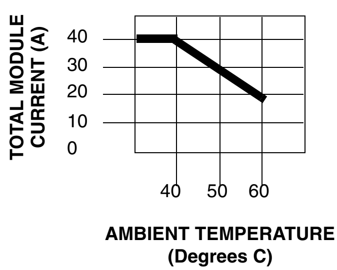
Specifications

The following table shows the specifications for the DRC83000 RELAY OUT module.

Specifications	
Number of Output Points	8 normally open / normally closed pairs
LEDs	Active 1 ... 8 (Green) - Indicates point status
Required Addressing	0.5 word out
Voltage	
Working	20 ... 250 Vac 5 ... 30 Vdc 30 ... 150 Vdc (reduced load current)
Maximum Load Current	
Each Point	5 A max at 250 Vac, 30 Vdc @ 60° C ambient, resistive load 2 A Tungsten lamp load 3 A @ power factor 0.4 1/4 hp @ 125/250 Vac
Each Point (30 ... 150 Vdc)	300 mA resistive 100 mA (L/R = 10 msec)
Maximum Module Current	40 A (see the derating curve below)

The following figure shows the relay derating curve.

Relay Derating Curve



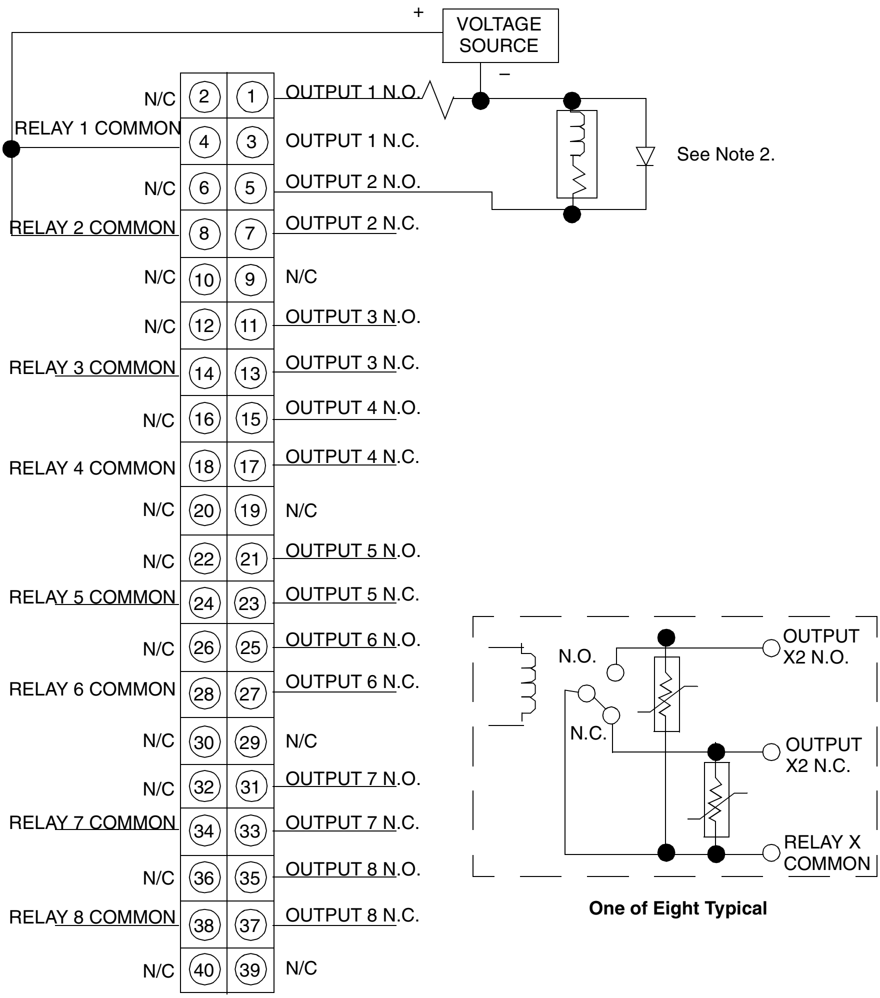
Minimum Load Current	50 mA Note: Minimum load current if the contact is used at rated loads of 5 ... 150 Vdc or 20 ... 250 Vac
Maximum Frequency (F)	30 Hz resistive loads, or: $F = \frac{0.5}{I^2 L}$ where: L = Load Inductance (Henry) I = Load Current (A)

Specifications	
Surge Current Maximum	
Each Point	20 A capacitive load @ τ = 10 ms
Switching Capability	1250 VA resistive load
Response (Resistive Loads)	
OFF - ON	10 ms max
ON - OFF	20 ms max
Off State Leakage	< 100 µA
Relay Contact Life	
Mechanical Operations	10,000,000
Electrical Operations	100,000 (Resistive load @ max voltage and current)
Electrical Operations (30 ... 150 Vdc) (see note)	100,000, 300 mA (resistive load) 50,000, 500 mA (resistive load) 100,000, 100 mA (L/R = 10 msec) 100,000 Interposing Relay (Westinghouse Style 606B, Westinghouse type SG, Struthers Dunn 219 x 13 XP)
Relay Type	Form C, NO / NC contacts
Contact Protection	Varistor, 275 V (internal)
Isolation	
Channel to Channel	1780 Vac rms for one minute
Field to Bus	1780 Vac rms for one minute, 2500 Vdc for one minute
Bus Current Required	560 mA
Power Dissipation	2.75 W + 0.5 x N = Watts (where N is the number of points on)
External Power	Not required for this module
Fusing	
Internal	None
External	User discretion

Note: Relay contact life for inductive loads may be significantly increased by using external contact protection such as a clamping diode across the load.

Wiring Diagram

The following figure shows the DRC83000 wiring diagram.



One of Eight Typical

Note:
1. When switching DC voltages, it is recommended that the source be connected to the common pin and the load be connected to the N.O. or N.C. contact.
2. For 125 Vdc inductive loads, external clamping is recommended to extend relay contact life (1N 4004 or equivalent).
3. N / C = Not Connected. N.O. = Normally Open. N.C. - Normally Closed.

18.7 Discrete Verified Output Module

At a Glance

Overview

This section provides information on the discrete verified output module, the 140DVO85300, a 32-point output module.

What's in this Section?

This section contains the following topics:

Topic	Page
I/O Configuration for the Discrete Verified Output Module – 140DVO85300	754
140DVO85300 I/O Verified 10-30 VDC Out Module	759

I/O Configuration for the Discrete Verified Output Module – 140DVO85300

Overview

The following provides information on the 140DVO85300 DC verified output 10 - 30 Vdc 32 point module.

Verified Output Module

The following is the verified output module:
- 140DVO85300 (DC Output 10-30 Vdc 4x8 Source)

I/O Map Register Assignment (Outputs)

The 140DVO85300 is configured as two output (4x) registers. The following diagram shows the register formats:

Output Point 1

Register 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

MSB - First Word

Output Point 17

Register 2

17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

MSB - Second Word

I/O Map Register Assignment (Inputs)

The 140DVO85300 is configured using 32 contiguous 1x references or two 3x registers assigned as follows:

Input Sense Point 1

Register 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

MSB - First Word

Input Sense Point 17

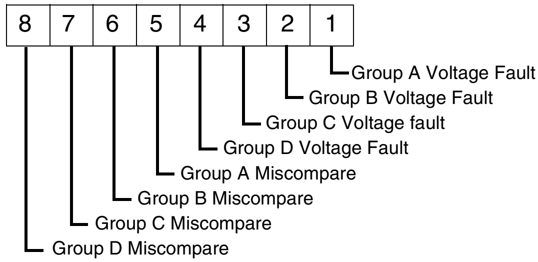
Register 2

17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

MSB - Second Word

I/O Map Status Byte

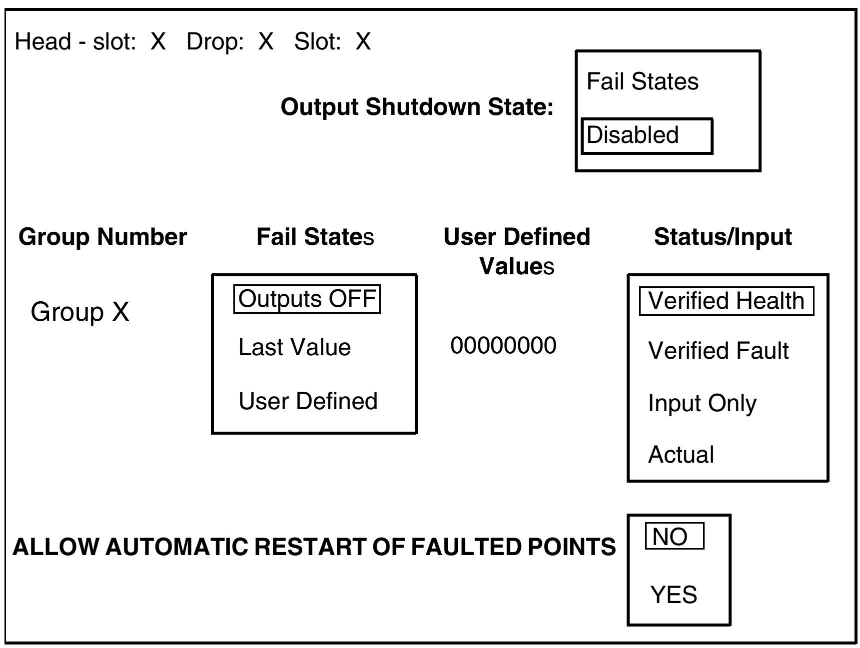
The eight bits in the I/O map status byte are used as follows:



The voltage fault bit is set when the field supply is not present, or the group fuse is blown.
The miscompare bit is set when any point within the group does not match its commanded state.

Modsoft Zoom Screens Selections

The module zoom screen selections are shown below.



Zoom Screen Selection Descriptions

Output Shutdown State - Determines the module output states if backplane communication is lost (i.e., no "Active" LED on module).

Output Shutdown State:

Fail States

Disabled

Fail States: Group outputs are per the selection made in the “Fail States” column.

Disabled: Forces all outputs to be in the OFF state.

Fail States - Module output state choices if selected in "Output Shutdown State" menu.

Fail States

Outputs OFF

Last Value

User Defined

Outputs OFF: Group outputs turn OFF

Last Value: Group outputs remain in the state they were in.

User Defined: Group output states may be individually selected in the “User Defined Values” column to be ON or OFF.

Choices If Selected: 00000000

0 = OFF
1 = ON

Lowest Numbered
Group Output (Ch 1, 9, 17, 25)

Highest Numbered
Group Output (Ch 8, 16, 24, 32)

Status/Input - RE: I/O map register assignments (Inputs).

Status/Input

Verified Health
Verified Fault
Input Only
Actual

Verified Health: The associated bit = 1 when the point output command and module output state agree

Verified Fault: The associated bit = 1 when the point output command and module output state disagree.

Input Only: Input module operation for diagnostic purposes only. When an output point has a high applied, the associated 1x bit or 3x register location = 1.There are no specifications for output terminals read as inputs and the DVO should not be operated as an input module in a system.
If the corresponding 4x register point is turned OFF, a high will also cause the LED display red F to appear and a group miscompare bit will set in the I/O Map status byte. If the corresponding 4x point is turned ON, no LED ref F or group miscompare will be displayed when a high is applied to the output point.
The status byte voltage fault bits work in this mode.

Actual: Module output state, 1 = ON

Allow Automatic Restart of Faulted Points:

ALLOW AUTOMATIC RESTART OF FAULTED	NO
	YES

NO: Module outputs that fault during the on state are latched off until the user clears the point bit to the OFF (0) state, and then sets it back to the ON (1) state.

State of output point, Status bits, LEDs and Fault Bit for the three operating states are as follows:

Mode	**Fault Occurs (Point commanded ON shuts OFF)**	**Off command sent**	**On command sent (After fault is removed)**
Verified health	Output point=OFF Status bit=0 Output LED=OFF Fault LED=ON Group fault flag=1	Output point=OFF Status bit=0 Output LED=OFF Fault LED=ON Group fault flag=1	Output point=ON Status bit=1 Output LED=ON Fault LED=OFF Group fault flag=0
Verified fault	Output point=OFF Status bit=1 Output LED=OFF Fault LED=ON Group fault flag=1	Output point=OFF Status bit=1 Output LED=OFF Fault LED=ON Group fault flag=1	Output point=ON Status bit=0 Output LED=ON Fault LED=OFF Group fault flag=0
Actual	Output point=OFF Status bit=0 Output LED=OFF Fault LED=ON Group fault flag=1	Output point=OFF Status bit=0 Output LED=OFF Fault LED=ON Group fault flag=1	Output point=ON Status bit=1 Output LED=ON Fault LED=OFF Group fault flag=0

YES: Module outputs that fault during the ON state are controlled by a thermal protection mechanism. At shutdown the appropriate fault/status indications will be present.
After shutdown, the output device will cool and try to turn itself back on. If the fault has been removed, the output will function normally and fault/status indications will be removed. If the fault is still present. the point will again shut down and repeat the cycle until the fault is removed or the point is commanded off.
When a faulted point is commanded off, all fault indications will no longer be present because the miscompare will no longer exist.

WARNING

Possible Safety Hazard

When choosing "YES", the use of thermally protected output devices with the 140DVO85300 module can produce safety concerns.
In the event of an enabled output sensing an overcurrent condition, the output will disable, until the overcurrent condition is removed. The output will then re-enable itself, if still set ON in the logic program.

Failure to follow this precaution can result in death, serious injury, or equipment damage.

140DVO85300 I/O Verified 10-30 VDC Out Module

Overview

The Quantum Verified Output module is a 10 ... 30 Vdc, 32 point output module with diagnostic capability. The module will detect and report the output state sensed at the field connector and, depending on the selected configuration, will verify that the output point is in the state commanded by the PLC. The module is configured in four groups of eight source outputs.

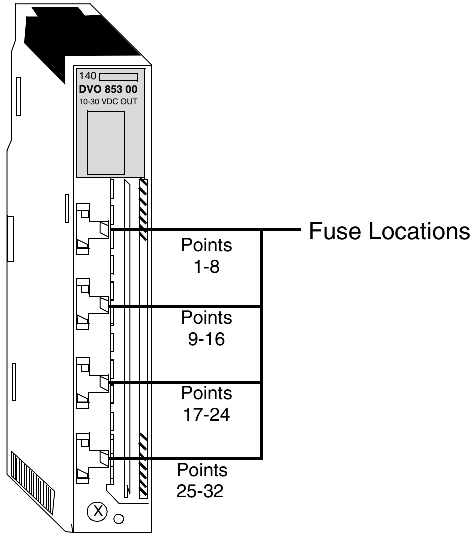
Specifications

Key specifications for the Quantum 140DVO85300 module are as follows:

Specifications	
Number of Output Points	32 in four 8 point groups
LEDs	Active (Green): Bus communication present. 1 ... 32 (Green): Indicates output point status. F (Red): Indicates incorrect output state on a channel, loss of field power, or blown fuse.
Required addressing	2 words in, 2 words out
Voltage	
Operating	10.0 ... 30 Vdc
Absolute Maximum	50 Vdc for 1.0 ms decaying voltage pulse
On state Drop/Point	0.4 Vdc @ 0.5 A
Maximum Load Current	
Each Point	0.5 A
Each Group	4 A
Per Module	16 A
Off State Leakage/Point	0.4 mA @ 30 Vdc
Surge Current Maximum	
Each Point	2.5 A @ 1 ms duration (no more than 6 per minute)
Response (Resistive Loads)	
OFF - ON	1 ms (typical), 2 ms (max)
ON - OFF	1 ms (typical), 2 ms (max)
Load Inductance Maximum	0.5 Henry @ 4 Hz switching frequency, or: $L = \frac{0.5}{I^2F}$ where: L = Load inductance I = Load current (A) F = Switching frequency (Hz)
Tungsten Load Maximum	2.5 W @ 10 Vdc 3 W @ 12 Vdc 6 W @ 24 Vdc
Load Capacitance Maximum	75 µf
Isolation	
Group to Bus	1780 Vac RMS for 1 minute
Group to Group	500 Vac for 1 minute
Output Protection (internal)	Transient voltage suppression, overload (short circuit) protection

Specifications	
Fault Detection	Blown fuse detect, loss of power, incorrect output state
Bus Current Required	500 mA
Power Dissipation	[2.5 + (0.1 x No. of points ON) + (total load current x 0.4)] watts
External Power	10 ... 30 Vdc
Fusing	
Internal External	5.0 Amp fuse per group, P/N 0043502405 Not required. If desired, a 3/4 A, 250 V fuse (P/N 57-0078-00) may be used
Programming Software	
Type and version	Concept, Version 2.2 or higher Modsoft, Version 2.6.1 or higher

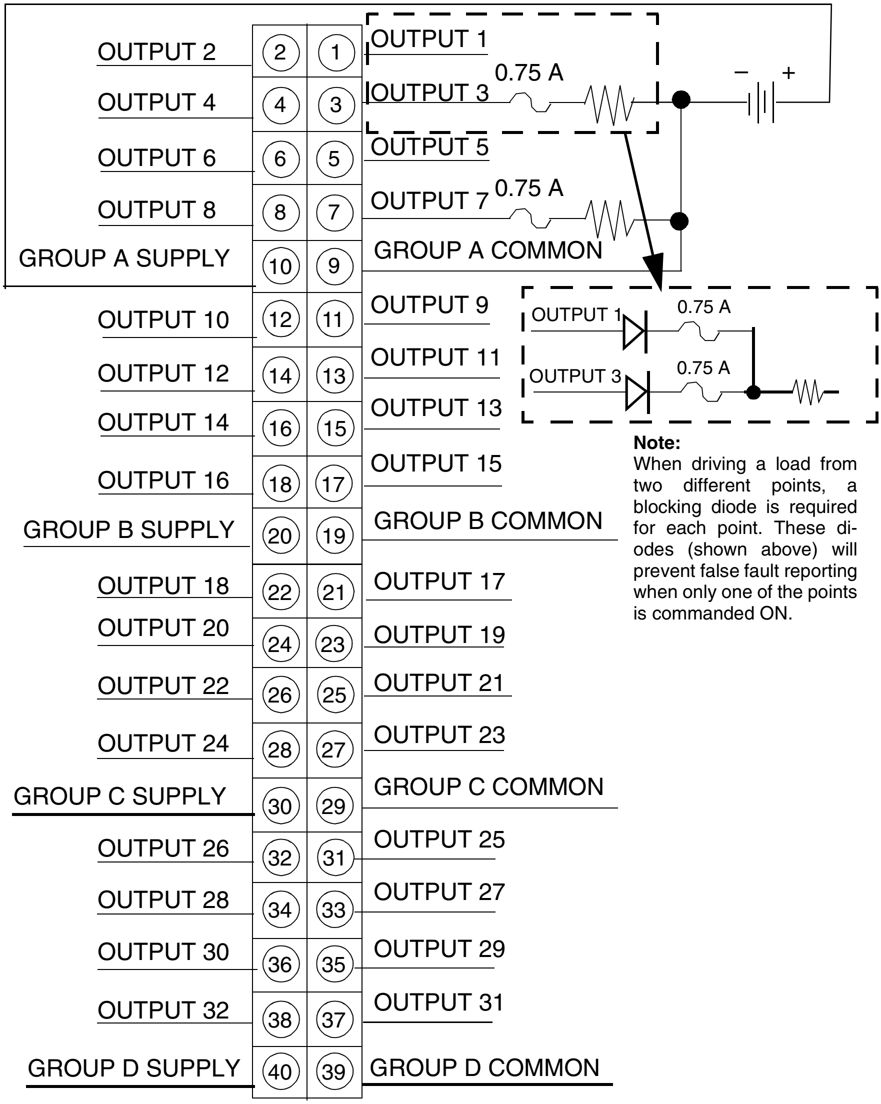
Fuse Locations A view of fuse locations on the module is shown below.



	CAUTION
⚠	**Possible danger to equipment or personnel.** Turn off power to the module and remove the field wiring terminal strip to gain access to fuses. **Failure to follow this precaution can result in injury or equipment damage.**

Wiring Diagram

A wiring diagram for the Quantum 140DVO85300 module is shown below.



Note:
When driving a load from two different points, a blocking diode is required for each point. These diodes (shown above) will prevent false fault reporting when only one of the points is commanded ON.

18.8 Discrete Supervised Input Module

At a Glance

Overview

This section provides information on the discrete supervised input module, the 140DSI35300, a 32-point input module.

What's in this Section?

This section contains the following topics:

Topic	Page
I/O Configuration for the Discrete Supervised Input Module – 140DSI35300	765
140DSI35300 I/O DC 24V Supervised Input Module	766

I/O Configuration for the Discrete Supervised Input Module – 140DSI35300

Overview

The following provides information on the 140DSI35300 supervised input 24 Vdc 32-point module.

Supervised Input Module

The following is the supervised input module:
- 140DSI35300 (DC input, 24 Vdc, 4x8 sink)

I/O Map Register Assignment (Input)

The DSI35300 is configured as four input (3x) registers. The following diagram shows the register formats:

Register 1

Input Point 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Register 2

Input Point 17	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

Register 3

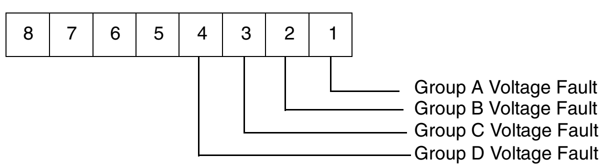
Broken Wire 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Register 4

Broken Wire 17	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

I/O Map Status Byte

The eight bits in the I/O map status byte are used as follows:



Modsoft Module Zoom Selections

There are no Modsoft Zoom selections.

140DSI35300 I/O DC 24V Supervised Input Module

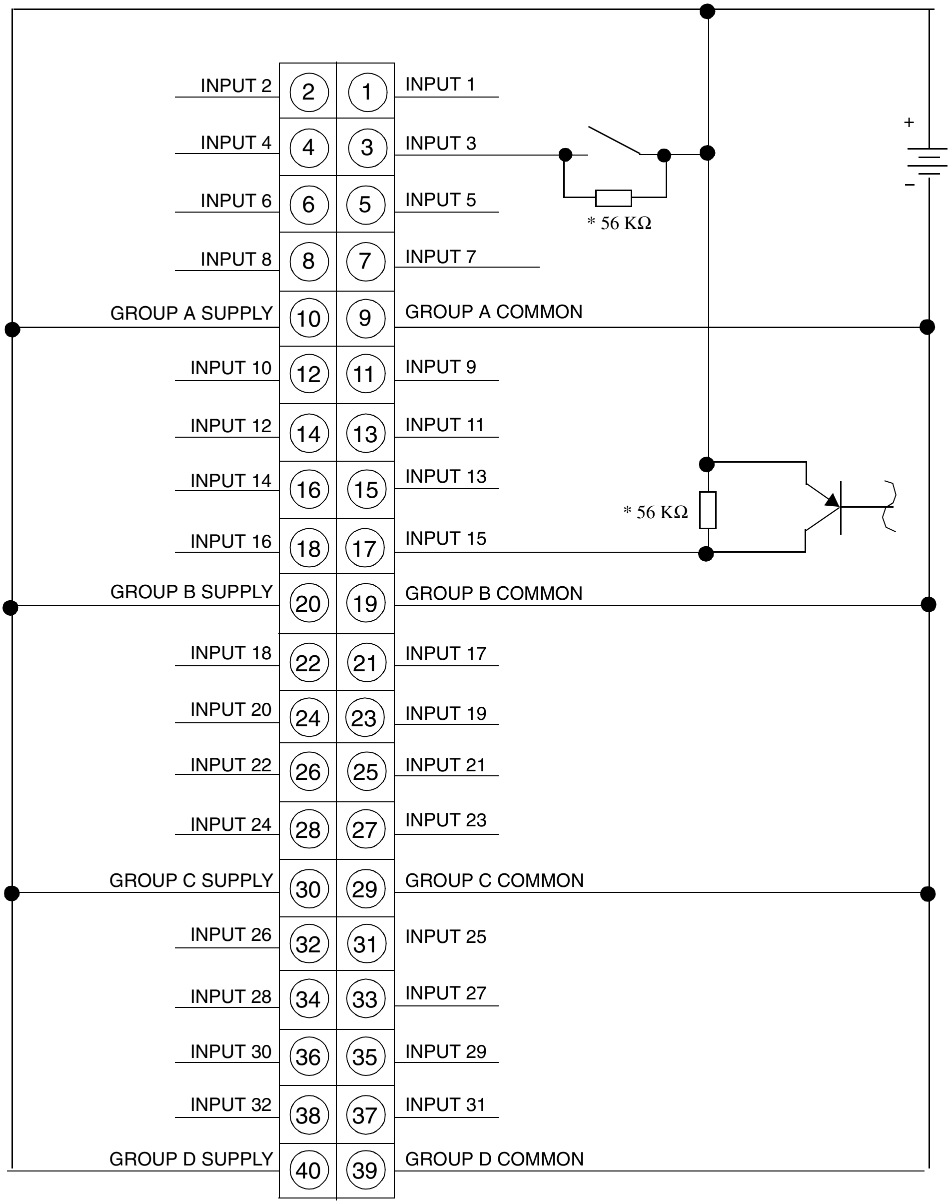
Overview

The Supervised Input module is used with source output devices. It accepts 24 Vdc inputs. It has 32 Sink input points (four groups of 8), each with broken wire detection.

Specifications The following table shows the technical specifications for the 140DSI35300 module:

Specifications	
Number of Input Points	32 in four 8 point groups‘
LEDs	
Active (Green)	Indicates bus communication present
1 ... 32 (Green)	Indicates point status
F (Red)	External Supply missing
Required addressing	4 words in
Operating Voltage and Current	
ON (voltage)	+11 Vdc
ON (current)	2.5 mA min.
OFF (voltage)	+5 Vdc
OFF (current)	min. 0.3 mA ...1.2 mA
Absolute Maximum Input	
Continious	30 Vdc
10 ms	45 Vp
Response time	
OFF - ON	2.2 ms
ON - OFF	3.3 ms
Internal Resistance	4.3k
Input Protection	Resistor limited
Isolation	
Group to Group	500 VAC rms for 1 minute
Group to Bus	1780 VAC rms for 1 minute
Bus Current Required	250 mA
Power Dissipation	7 W (all points on)
External Power Supply	+20 ... 30 VDC, 20 mA/group
Open–Circuit Monitoring	
Broken–wire detection	OFF current < 0.15 mA
Shunt resistor	Recommended 56 kΩ with 24 Vdc external power supply
Fusing	
Internal	None
External	User discretion

Wiring Diagram Wiring diagram for the 140DSI35300 Module:



* Recommended resistor value for 24 Vdc.

18.9 Discrete Input/Output Modules

At a Glance

Overview

This section provides information on the Quantum discrete input/output modules: the 140DDM39000 and the 140DDM69000.

What's in this Section?

This section contains the following topics:

Topic	Page
I/O Configuration for Discrete Input/Output Modules	770
140DAM59000 Quantum I/O AC Input 115 Vac 2x8 / AC Output 115 Vac 2x4)	774
140DDM39000 I/O DC Input 24 Vdc 2x8 Sink / DC Output 24 Vdc 2x4 Source Module	782
140DDM69000 I/O 125 VDC Input/High Power Output Module	789

I/O Configuration for Discrete Input/Output Modules

Overview

This section provides information on configuration of 4 In/4 Out and 16 In/8 Out modules.

4-Point Input/4-Point Output Module

The following shows the 4 In/4 Out module:
- 140DDM69000 (125 Vdc Input/High Power Output)

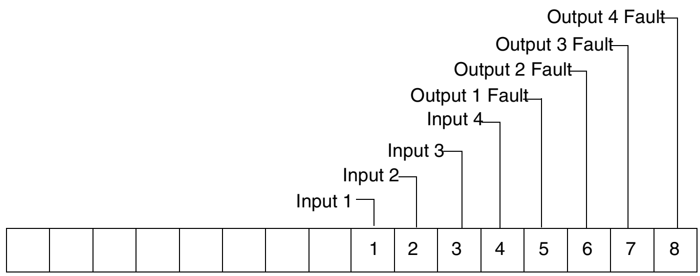
I/O Map Register Assignments

The 140DDM69000 input/output module can be configured as either eight contiguous 1x references; or as one 3x register and either eight contiguous 0x references or one 4x register.

	CAUTION
⚠	**I/O Mapping** When I/O mapping module inputs using discrete (1x) references in remote drops, users should not split discrete words between drops. The lowest discrete reference for a drop should start on a word boundary. **Failure to follow this precaution can result in injury or equipment damage.**

I/O Map Register (Inputs)

The following figure shows the 3x input register.



I/O Map Status Byte (Inputs)

There is no input I/O map status byte associated with the inputs.

Modsoft Module Zoom Selection (Inputs)

Push <Enter> to display and select the Dual Mode and Filter Select options.

Dual Mode:

Disabled

Enabled

When Dual Mode Is Enabled

1. Output 1 is turned ON when Input 1 and Input 2 are ON and when both “Fast Trip 1 Enable” and “Fast Trip 2 Enable” are enabled; or by directly turning ON the Output 1 bit.
2. Output 2 is controlled by the Output 2 bit.
3. Output 3 is turned On when Input 3 and Input 4 are ON and when both “Fast Trip 3 Enable” and “Fast Trip 4 Enable” are enabled; or by directly turning ON the Output 1 bit.
4. Output 4 is controlled by the Output 4 bit.

Filter Select:

.5 msec

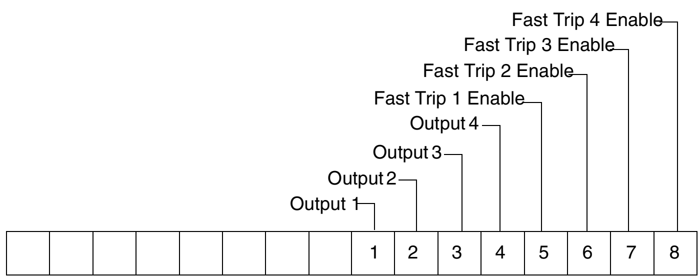
1.5 msec

Filter Select

This entry selects which filter response time to use for the input circuits.

I/O Map Register (Outputs)

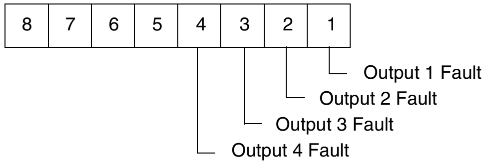
The following figure shows the 4x output register.



In Fast Trip Mode, each output can be turned ON by the Command Bit (e.g., Output 1) or by the corresponding Input Bit plus the Fast Trip Enable Bit (e.g., last order Input 1 controls Output 1 directly).

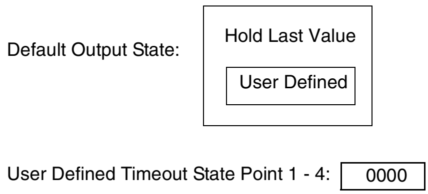
I/O Map Status Byte (Outputs)

The four least significant bits in the I/O map status are used as follows:



Modsoft Module Zoom Selections (Outputs)

Push <Enter> to display and select the timeout state for the module. Timeout state is assumed when the system control of the module is stopped.



16-Point Input/8-Point Output Modules

The following information pertains to the 140DAM59000 (AC Input 115 Vac 2x8 / AC Output 115 Vac 2x4) and the 140DDM39000 (DC Input 24 Vdc 2x8 / DC Output 24 Vdc 2x4) modules.

- 140DAM59000 (AC Input 115 Vac 2x8 / AC Output 115 Vac 2x4)
- 140DDM3900 (DC Input 24 Vdc 2X8 / DC Output 24 Vdc 2x4)

I/O Map Register Assignments

The modules listed above can be configured as either 16 contiguous 1x references or as one 3x register and as one 4x register.

I/O Map Register (Inputs)

The following figure shows the 3x input register.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

I/O Map Status Byte (Inputs)

There is no input I/O map status byte associated with these modules.

Module Zoom Selections (Inputs)

Push <Enter> to display and select the input type. This selection appears if the module is I/O mapped to a 3x register and one 4x register.

input Type:

BIN
BCD

I/O Map Assignment (Outputs)

The modules listed above can be configured as 8 0x references or as 1 output (4x) register in the following format.

								1	2	3	4	5	6	7	8

I/O Map Status Byte (Outputs)

The two least significant bits in the output I/O map status byte are used as follows.

8	7	6	5	4	3	2	1

Group B fault
Group A fault

Modsoft Module Zoom Selections (Outputs)

Push <Enter> to display and select the output type and the timeout state for the module. Timeout state is assumed when system control of the module is stopped.

Output Type:

BIN
BCD

Timeout State:

Last Value
User Defined

User Defined Timeout State Points 1-8: 00000000

140DAM59000 Quantum I/O AC Input 115 Vac 2x8 / AC Output 115 Vac 2x4)

Overview

The AC Input 115 Vac 2x8 / AC Output 115 Vac 2x4 module accepts 115 Vac inputs and switches 115 Vac loads.

Topology Specifications

The following table shows the specifications for the 115 VAC and AC IN/OUT module for the Topology.

Topology	
Number of Input Points	16 in two 8 point groups
Number of Output Points	8 in two 4 point groups
LEDs	Active F (red) - No power applied to the group(s) or blown fuse 1 ... 16 (Green - right two columns) - Indicates input status 1 ... 8 (Green - left column) - Indicates output status
Required Addressing	1 word in 0.5 words out

Input Specifications

The following table shows the Input specifications.

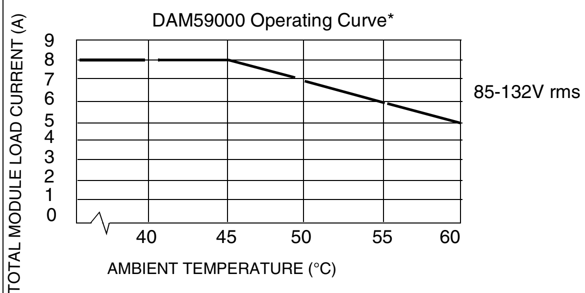
Input Specifications	
Operating Voltages and Input (Wetting) Currents*	
50 Hz Typical Input Impedance	ON: 85 ... 132 Vac (11.1 mA max) OFF: 0 ... 20 Vac 14.4 kΩ capacitive
60 Hz Typical Input Impedance	ON: 79 ... 132 Vac (13.2 mA max) OFF: 0 ... 20 Vac 12 kΩ capacitive
*Do not use outside the 47 ... 63 Hz range.	
Maximum Allowable Leakage Current from an External Device to be Recognized as an OFF Condition	2.1 mA
Absolute Maximum Input Voltages	
Continuous	132 Vac
10 s	156 Vac
1 cycle	200 Vac
Response (Inputs)	
OFF - ON	Min 4.9 ms/max 0.75 line cycle
ON - OFF	Min 7.3 ms/max 12.3 ms

Note: Input signals must be sinusoidal with less than 6% THD and 63 Hz maximum frequency.

Output Specifications

The following table shows the Output specifications.

Output Specifications	
Absolute Maximum Output Voltages	
Continuous	85 ... 132 Vac
10 seconds	156 Vac
1 cycle	200 Vac
On State Drop / Point	1.5 Vac
Minimum Load Current (rms)	5 mA
Maximum Load Current (rms)	
Each Point*	4 A continuous
Each Group	4 A continuous
Per Module*	8 A continuous (see the derating chart below)



*The specifications stated are pending UL/CSA approval. This module was originally approved at 2 A each point; 7 A, 0 ... 50° C per group.

Off State Leakage / Point (max)	2 mA @ 115 Vac
Surge Current Maximum (rms) One Cycle Two Cycles Three Cycles	**Per Point** **Per Group** 30 A 45 A 20 A 30 A 10 A 25 A
Response	
OFF - ON, ON - OFF	0.50 of one line cycle max
Applied DV / DT	400 V/µs
Output Protection	RC snubber suppression (internal)

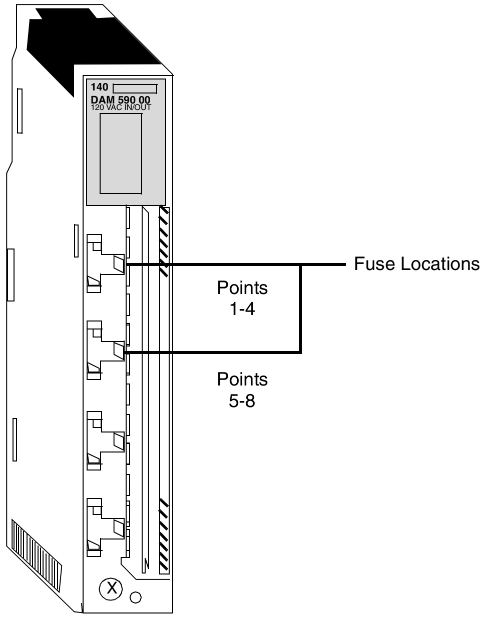
Common Specifications

The following table shows the Common specifications.

Common Specifications	
Frequency	47 ... 63 Hz
Isolation	
Group to Group	1000 Vac for 1 minute
Input or Output to Bus	1780 Vac for 1 minute
Fault Detection	
Input	None
Output	Blown fuse detect, loss of field power
Bus Current Required	250 mA
Power Dissipation	5.5 W + 1.1 V x Total module load current
External Power	85 ... 132 Vac required for output groups
Fusing	
Input	Internal – None External – User discretion
Output	Internal – 5 A fuse for each group (Part # 043502405 or equivalent). For the location of the fuses, see *Fuse Locations, p. 778*. External – User discretion

Note: Turn off power to the module and remove the field wiring terminal strip to gain access to the fuses.

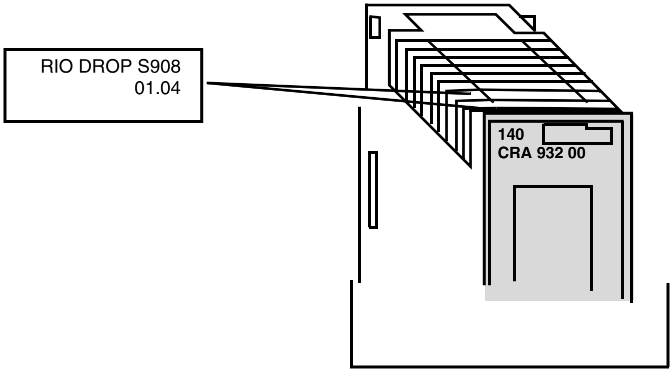
Fuse Locations The following figure shows the fuse locations for the DAM59000 module.



> **Note:** If the 140DAM59000 module is used in a RIO drop, the 140CRA93X00 RIO Drop must be Version 1.04 at a minimum. Check the version label (see below) on the top front of the 140CRA93X00 module and ensure that it is at the proper revision level

Revision Numbr Location for RIO Drop

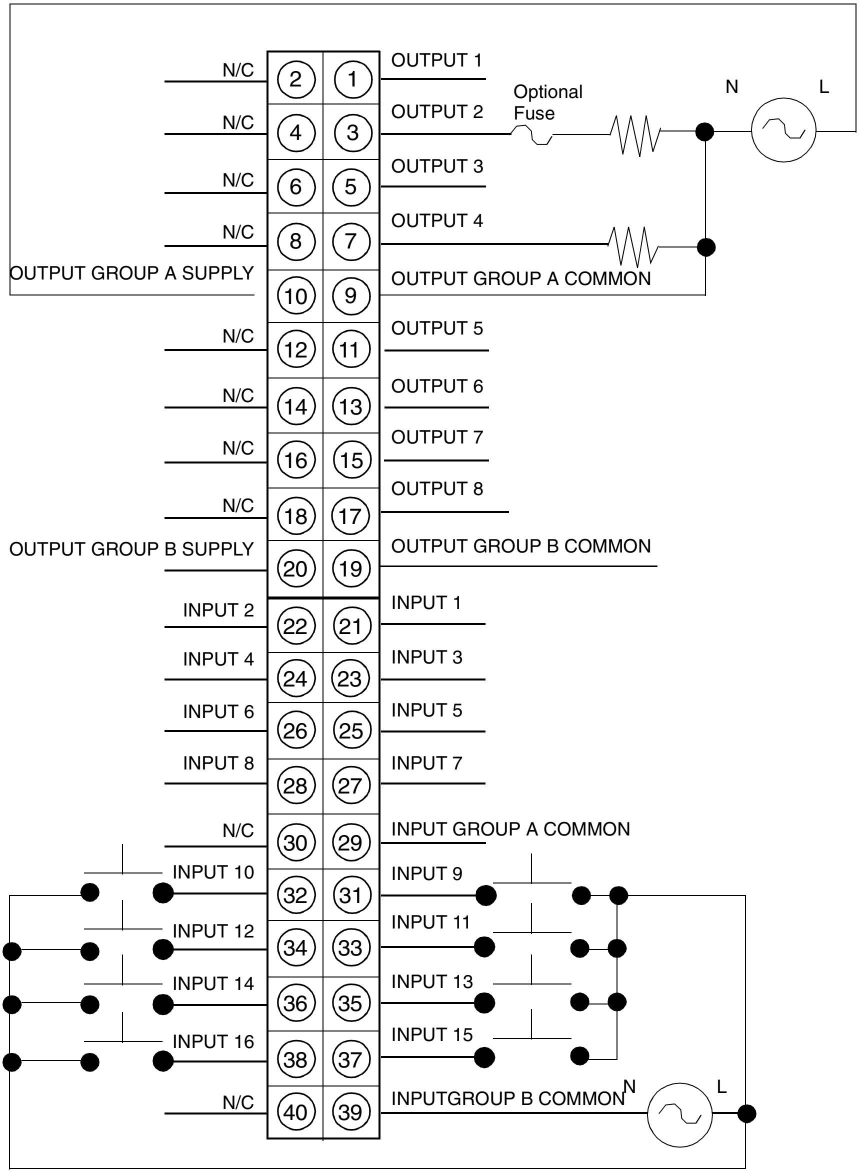
The following figure shows the revision number location.



> **Note:** Since this original note, revision marking format has changed. Any RIO drop module with PV/RL/SV formatted labeling is acceptable.

Wiring Diagram

The following figure shows the DAM590wiring diagram.



Note:
1. This module is not polarity sensitive.
2. N / C = Not Connected.

⚠	**CAUTION**
	AC Power Compatibility The AC power energizing each group must be from a common single phase AC power source. **Failure to follow this precaution can result in injury or equipment damage.**

⚠	**CAUTION**
	Wiring Compatibility If an external switch is wired to control an inductive load in parallel with the module output, then an external varistor (Harris V390ZA05 or equivalent) must be wired in parallel with the switch. **Failure to follow this precaution can result in injury or equipment damage.**

140DDM39000 I/O DC Input 24 Vdc 2x8 Sink / DC Output 24 Vdc 2x4 Source Module

Overview

The DC Input 24 Vdc 2x8 Sink / DC Output 24 Vdc 2x4 Source module accepts and switches 24 Vdc inputs/outputs and is for use with sink input and source output devices.

Topology

The following table shows the topology for the DDM39000 module.

Topology	
Number of Input Points	16 in two 8 point groups
Number of Output Points	8 in two 4 point groups
LEDs	Active F (red) - No power applied to the group(s) or blown fuse 1 ... 16 (Green - right two columns) - Indicates input status 1 ... 8 (Green - left column) - Indicates output status
Required Addressing	1 Word In 0.5 Word Out

Input Specifications

The following table shows input specifications for the DDM39000 module.s

Input Specifications	
Operating Voltages and Currents (Input)	
ON (voltage)	+15 ... +30 Vdc
OFF (voltage)	-3 ... +5 Vdc
ON (current)	2.0 mA min
OFF (current)	0.5 mA max
Absolute Maximum Input	
Continuous	30 Vdc
1.3 ms	56 Vdc decaying pulse
Internal Resistance (Input)	2.5 kΩ

Output Specifications

The following table shows the output specifications for the DDM39000 module.

Output Specifications	
Voltage (Output)	
Operating (max)	19.2 ... 30 Vdc
Absolute (max)	56 Vdc for 1.3 ms decaying voltage pulse
ON State Drop / Point	0.4 Vdc @ 0.5 A
Maximum Load Current	
Each Point	0.5 A
Each Group	2 A
Per Module	4 A
Off State Leakage / Point	0.4 mA @ 30 Vdc
Surge Current Maximum	
Each Point	5 A @ 500 µs duration (no more than 6 per minute)
Load Inductance Maximum (Output)	0.5 Henry @ 4 Hz switch frequency or: $L = \frac{0.5}{I^2 F}$ where: L= Load Inductance (Henry) I = Load Current (A) F = Switching Frequency (Hz)
Load Capacitance Maximum	50 µf

Common Specifications

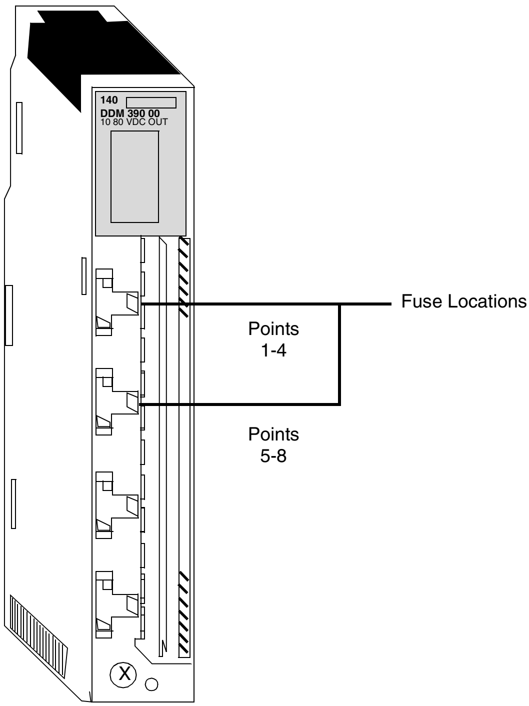
The following table shows the common specifications for the DDM39000 module.

Common Specifications	
Response (Input and Output)	
OFF - ON	1 ms (max) - (resistive load output)
ON - OFF	1 ms (max) - (resistive load output)
Module Protection	
Input Protection	Resistor limited
Output Protection	Transient voltage suppression (internal)
Isolation (Input and Output)	
Group to Group	500 Vac rms for 1 minute
Group to Bus	1780 Vac rms for 1 minute
Fault Detection	
Input	None
Output	Blown fuse detect, loss of field power
Bus Current Required (Module)	330 mA
Power Dissipation	1.75 W + 0.36 x input points on + 1.1 V x total outputs load currents
External Power (Module)	Not required for this module
Fusing	
Input	**Internal** – None **External** – User discretion
Output	**Internal** - 5 A fuse for each group (Part # 043502405 or equivalent). For the location of the fuses, see (See *Fuse Locations, p. 785*). **External** - Each group is protected with a 5 A fuse to protect the module from catastrophic failure. The group fuse is not guaranteed to protect each output for all possible overload conditions. It is recommended that each point be fused with a 1.25 A fuse, Part # 043508930 (Littlefuse 3121.25, 1.25 A, 250 V).

	CAUTION
⚠	**Possible injury to personnel or equipment.** Turn off power to the module and remove the field wiring terminal strip to gain access to fuses. **Failure to follow this precaution can result in injury or equipment damage.**

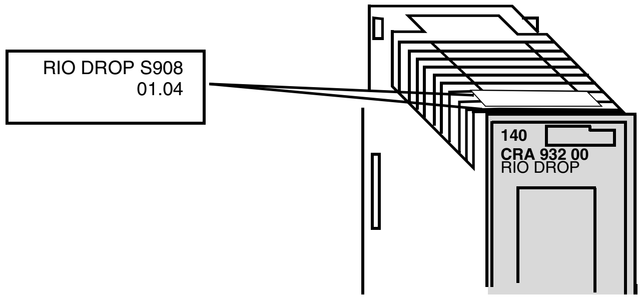
Fuse Locations

The following figure shows the fuse locations of the DDM39000 module.

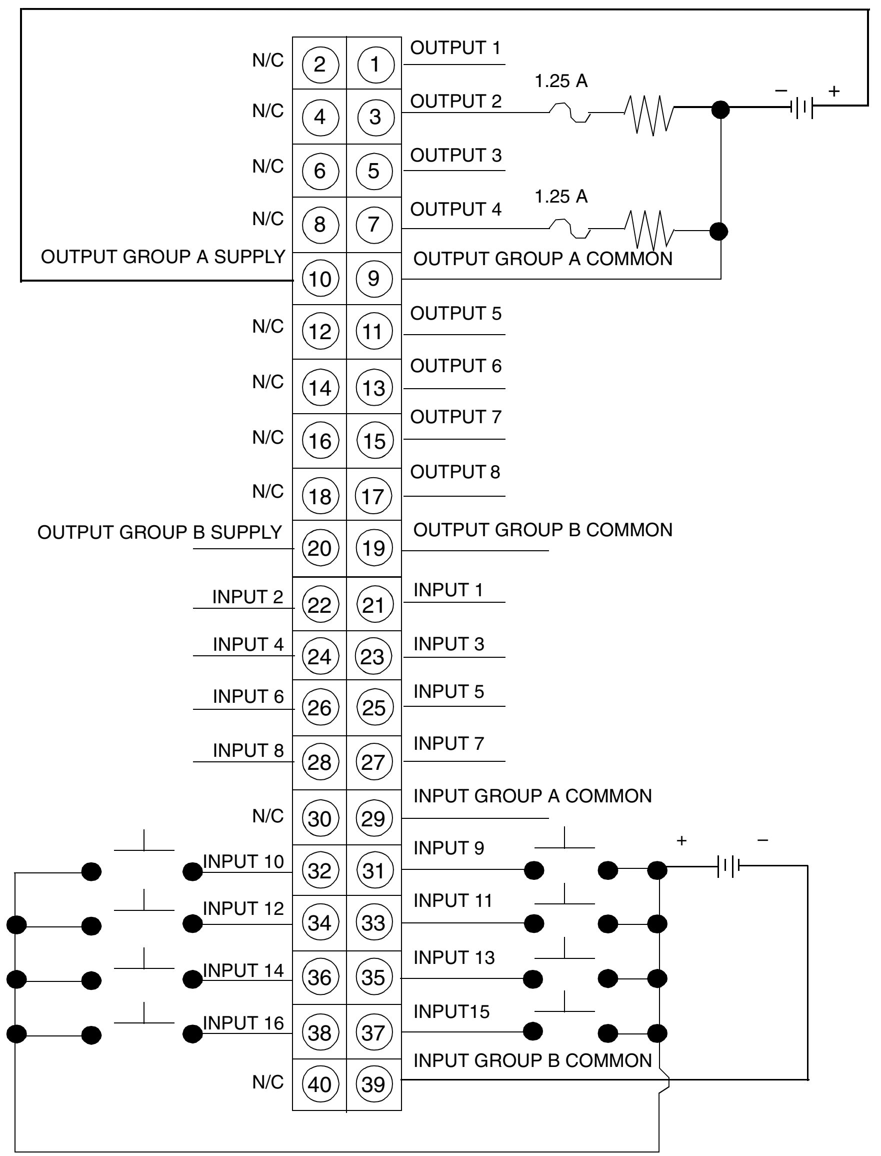


Note: If the 140DDM39000 module is used in an RIO drop, the 140CRA93X00 RIO Drop must be Version 1.04 at a minimum. Check the version label (see (See *Version Label, p. 786*)) on the top front of the 140CRA93X00 module and ensure that it is at the proper revision level.

Version Label The following figure shows the location of the version label.



Wiring Diagram The following figure shows the DDM39000 wiring diagram.



Note: N / C = Not Connected

CAUTION

Possible Equipment Failure

Each group is protected with a 5 A fuse to protect the module from catastrophic failure. The group fuse will not be guaranteed to protect each output switch for all possible overload conditions. It is recommended that each point be fused with a 1.25 A fuse, Part # 043508930 (Littlefuse 3121.25, 1.25 A, 250 V).

Failure to follow this precaution can result in injury or equipment damage.

140DDM69000 I/O 125 VDC Input/High Power Output Module

Overview

The 125 VDC Input/High Power Output module provides four isolated outputs and four grouped inputs. The outputs switch 24 to 125 Vdc powered loads and are for use with sink and source devices. The outputs also have short-circuit sense, indication, and shutdown circuitry. The inputs accept 125 Vdc inputs and are for use with source output devices. The inputs have software-selectable response times to provide additional input filtering.

Topology

The following table shows the topology for the DDM69000 module.

Topology	
Number of Input Points	4 in 1 group
Number of Output Points	4 isolated
LEDs	Active F (red) - Over current condition on any point 1 ... 4 (Green - left column) - Indicated output point is turned ON 1 ... 4 (Red - middle column) - Indicated output point has an over current condition 1 ... 4 (Green - right column) - Indicated input point is turned ON
Required Addressing	1 word in, 1 word out

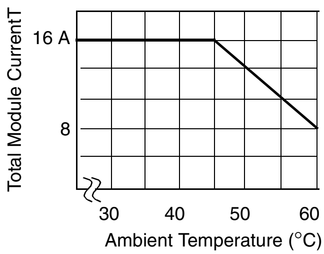
Input Specifications

The following table shows the input specifications for the DDM69000 module.

Input Specifications	
Operating Voltages and Currents (Input)	
ON (voltage)	+88 ... +156.2 Vdc including ripple
OFF (voltage)	0 ... +36 Vdc
ON (current)	2.0 mA min
OFF (current)	1.2 mA max
Absolute Maximum Input	Continuous, 156.2 Vdc including ripple
Input Response (OFF-ON, ON-OFF)	Default Filter: 0.5 ms Non-default Filter: 1.5 ms
Internal Resistance (Input)	24 kΩ (nominal)

Output Specifications

The following table shows the output specifications for the DDM69000 module.

<table>
<tr><td colspan="2">Output Specifications</td></tr>
<tr><td colspan="2">Voltage (Output)</td></tr>
<tr><td>Operating (max)</td><td>19.2 ... 156.2 Vdc including ripple</td></tr>
<tr><td>ON State Drop / Point</td><td>0.75 Vdc @ 4 A</td></tr>
<tr><td colspan="2">Maximum Load Current</td></tr>
<tr><td>Each Point</td><td>4 A continuous</td></tr>
<tr><td>Per Module</td><td>16 A continuous (see the derating curve below)</td></tr>
<tr><td>Off State Leakage / Point</td><td>1.2 mA @ 150 Vdc</td></tr>
<tr><td>Output Response (OFF-ON, ON-OFF)</td><td>0.2 ms, max (resistive load output)</td></tr>
<tr><td colspan="2">The following figure shows the DDM69000 Derating Curve.

</td></tr>
<tr><td colspan="2">Surge Current Maximum</td></tr>
<tr><td>Each Point</td><td>30 A @ 500 ms duration</td></tr>
<tr><td>Load Inductance Maximum (Output)</td><td>For switching intervals ≥ 15 secondsper ANSI/IEEE C37.90- 1978/1989):
$L \le \frac{9}{I^2}$
For repetitive switching:
$L \le \frac{0.7}{I^2F}$
where:
L = Load Inductance (Henry)
I = Load Current (A)
F = Switching Frequency (Hz)</td></tr>
<tr><td>Load Capacitance Maximum</td><td>0.1 µf @ 150 Vdc
0.6 µf @ 24 Vdc</td></tr>
</table>

Common Specifications

The following table shows the common specifications for the DDM69000 module.

Common Specifications	
Module Protection	
Input Protection	Resistor limited
Output Protection	Transient voltage suppression (internal)
Isolation (Input and Output)	
Input Group-to-Output	1780 Vac rms for 1 minute
Output-to-Output	
Group to Bus	2500 Vac rms for 1 minute
Fault Detection	
Input	None
Output	Over current - each point
Bus Current Required (Module)	350 mA
Power Dissipation	0.4 W x (1.0) x number of input points ON + (0.75) x total module output current
External Power (Module)	Not required for this module
Fusing	
Input	Internal - None External - User discretion
Output	Each output is protected by an electronic shutdown: For current output surges between 4 A and 30 A, the outpoint point will shutdown after 0.5 s. For current surges greater than 30 A, the output will shutdown immediately.

Version Levels

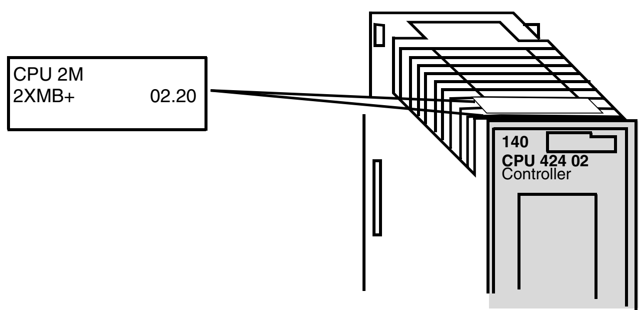
The following table shows the required version levels. Modules marked with SV/PV/RL rather than V0X.X0 exceed the minimum version levels in this table

Products	Minimum Version Level (see lable illustration)	User Action Required
CPUs and NOMs	< V02.20	Executive upgrade to ≥ V02.10
	≥ V02.20	None
RIOs	< V02.00	Module upgrade
	≥ V02.00 and < V02.20	Executive upgrade to ≥ V01.10
	≥ V02.20	None
DIOs	< V02.10	Module upgrade
	≥ V02.10	None
Modsoft	< V02.40	Upgrade to V02.40
	≥ V02.40	None
ProWORX NxT	≥ V02.00	
Concept	≥ V02.00	None

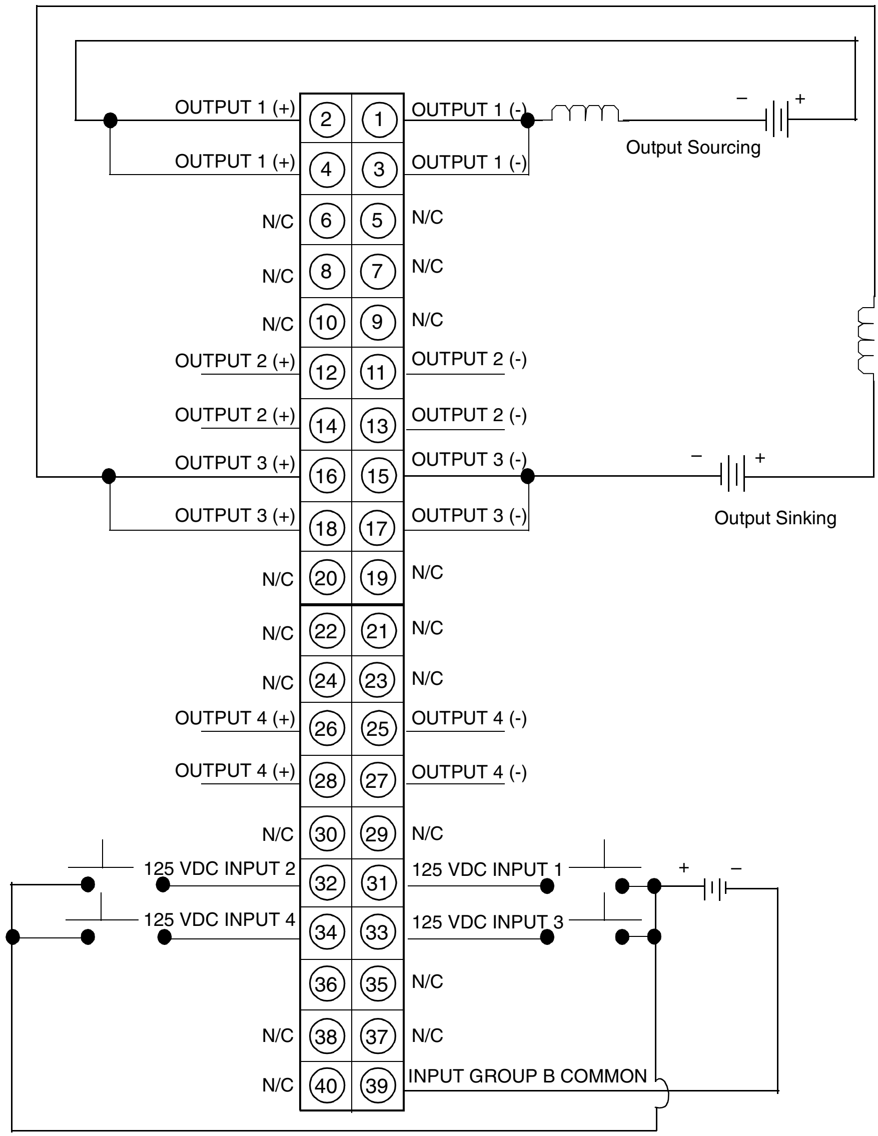
Note: See (See *Version Label, p. 792*). This figure is found on the top front of the module.

Version Label

The following figure shows the version number location.



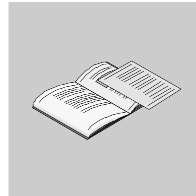
Wiring Diagram The following figure shows the DDM69000 wiring diagram.



Note:
1. Each output has two terminals for multiple wire connections.
2. N / C = Not Connected.

	CAUTION
	Polarity awareness The output points are not protected against reverse polarity. Reverse polarity will turn an output point ON. **Failure to follow this precaution can result in injury or equipment damage.**

Appendices



At a Glance

Overview

These appendices provide information on miscellaneous components and spare parts; hardware installation instructions; power and grounding considerations; the CableFast cabling system; error stopped codes; agency approvals of Quantum products; and troubleshooting tools and resources.

What's in this Appendix?

The appendix contains the following chapters:

Chapter	Chapter Name	Page
A	Miscellaneous Components	797
B	Spare Parts	807
C	Hardware Installation	811
D	Power and Grounding Guidelines	831
E	CableFast Cabling	857
F	Error Stopped Codes	941
G	Agency Approvals	945

Miscellaneous Components

A

Miscellaneous Components

Overview

This appendix contains information on cabling and illustrations of miscellaneous components.

For more detailed information on Modbus Plus components, see the *Modbus Plus Network Planning and Installation Guide*, Part Number 890USE10000.

For more detailed information on Remote I/O components, see the *Remote I/O Cable Planning and Installation Guide*, Part Number 890USE10100.

Cables

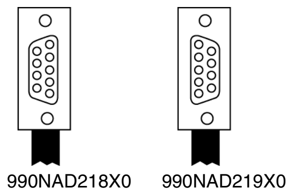
The following table shows the available cables.

Part Number	Description
990NAA26320	Modbus Programming Cable, RS-232, 12 ft. (2.7 m)
990NAA26350	Modbus Programming Cable, RS-232, 50 ft. (15.5 m)
990NAD21110	Modbus Plus Drop Cable, 8 ft. (2.4 m)
990NAD21130	Modbus Plus Drop Cable, 20 ft. (6 m)
990NAD21810	Modbus Plus Drop Cable (left side drop), 8 ft (2.4 m)
990NAD21830	Modbus Plus Drop Cable (left side drop), 20 ft. (6 m)
990NAD21910	Modbus Plus Drop Cable (right side drop), 8 ft (2.4 m)
990NAD21930	Modbus Plus Drop Cable (right side drop), 20 ft. (6 m)
AS-MBII-003	Prefabricated S908 RIO drop cable, RG-6 cable, 50 ft. (14 m)
AS-MBII-004	Prefabricated S908 RIO drop cable, RG-6 cable, 140 ft. (43 m)

Modbus Plus Cable Connector Orientation

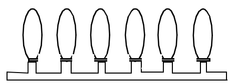
The following figure shows the connector orientation for the 990NAD21XX0.

990NAD218/219X0 Connector Orientation



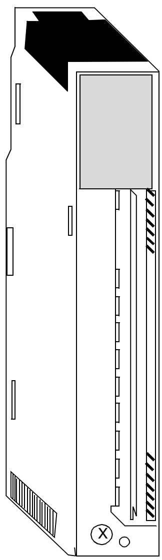
Coding Kit, 140XCP20000

The following figure shows the coding kit – a typical 1 set of 18 (Plastic Keys: 6 white sets, 12 yellow sets), part number 140XCP20000.



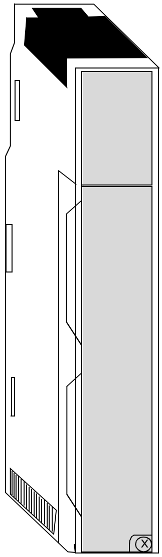
Empty Module, 140XCP50000

The following figure shows an empty module without a terminal strip, part number 140XCP50000.



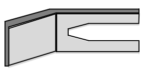
Empty Module with Door Cover, 140XCP51000

The following figure shows an empty module without the terminal strip and with a door cover, part number 140XCP51000.



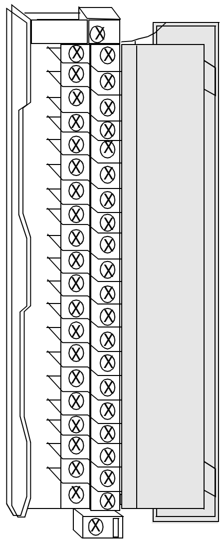
Terminal Strip Jumper Kit, 140XCP60000

The following figure shows the terminal strip jumper kit (qty: 12), part number 140XCP60000.

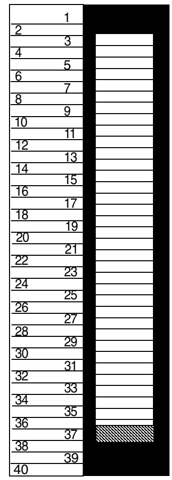


Field Wiring Terminal Strip, 140XTS00200

The following figure shows the 40-pin field wiring terminal strip, part number 140XTS00200.

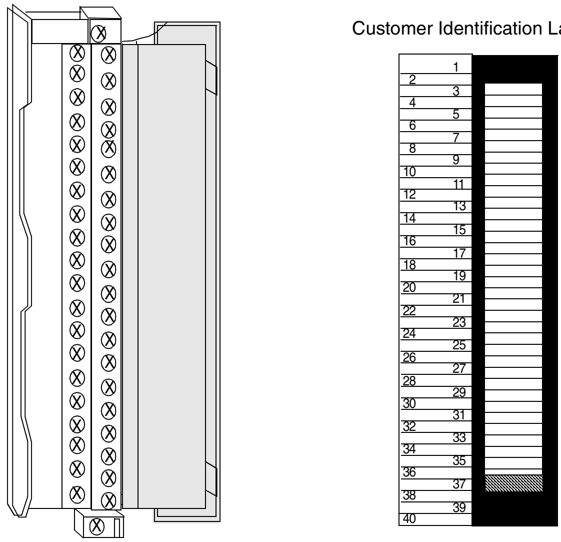


Customer Identification Label

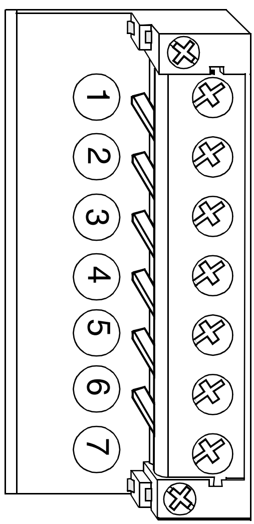


IP 20 Compliant Field Wiring Terminal Strips, 140XTS00100 and 140XTS00500

The following figure shows the 40-pin field wiring terminal strip with IP 20 compatible, finger-safe, fixed terminal screw shield, part number 140XTS00100.



The following figure shows the 7-pin field wiring I/O power connector with IP 20 compatible, finger-safe, fixed terminal screw shield, part number 140XTS00500.

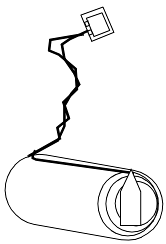


Battery, 990XCP90000

The following figure shows the battery for the Battery Module, part number 990XCP90000.

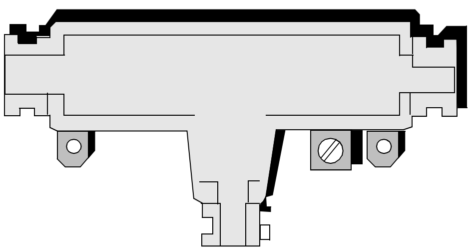
CPU Battery, 990XCP98000

The following figure shows the CPU battery, part number 990XCP98000.



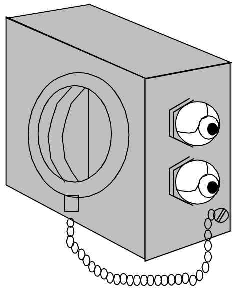
Modbus Plus Tap

The following figure shows the Modbus Plus Network tap, part number 990NAD23000.



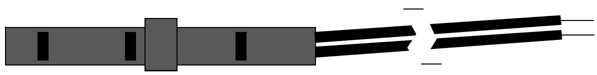
Modbus Plus Ruggedized Tap

The following figure shows the Modbus Plus Network ruggedized tap, part number 990NAD23010.This tap is mounted on the ruggedized Modbus Plus tap din rail mounting bracket, part number 990NAD23012.



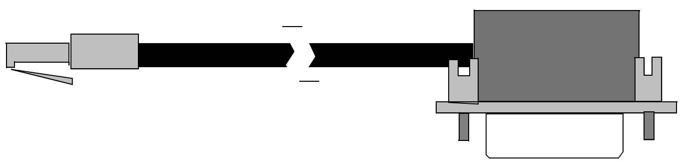
Modbus Plus Ruggedized Tap Terminator

The following figure shows the Modbus Plus network terminator plug, part number 990NAD23011, for the ruggedized Modbus Plus tap.



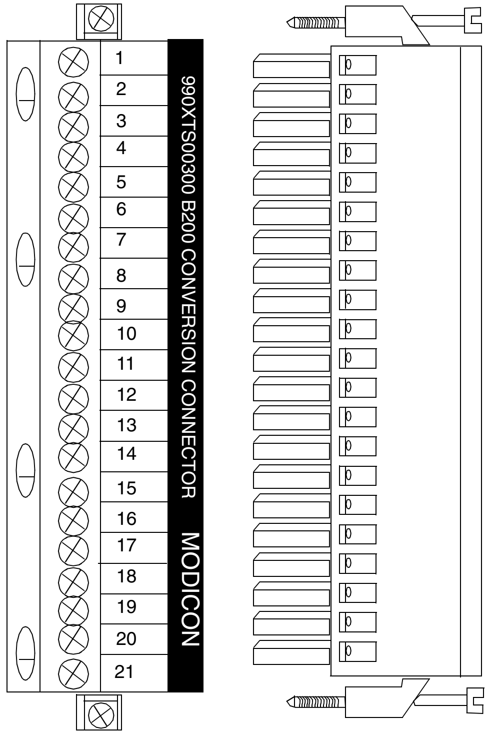
Modbus Plus Ruggedized Tap Programming Cable

The following figure shows the Modbus Plus programming cable, part number 990NAA21510, for the ruggedized network tap.



I/O Conversion Connector

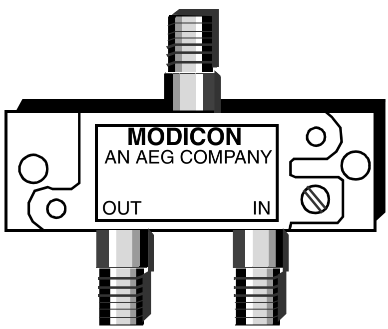
The following figure shows the 200 series I/O conversion connector, part number 990XTS00300.



Front View Side View

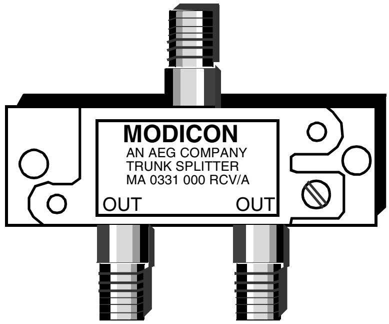
Remote I/O Tap

The following figure shows the remote I/O network tap, part number MA-0185-100.



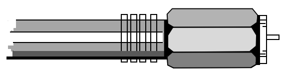
Remote I/O Splitter

The following figure shows the remote network I/O splitter, part number MA-0186-100.



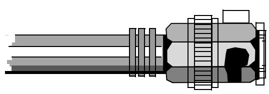
RG-6 Remote I/O F Connector

The following figure shows the remote I/O network F connector, part number MA-0329-001. This is the F connector for quad shield RG 6 cable.



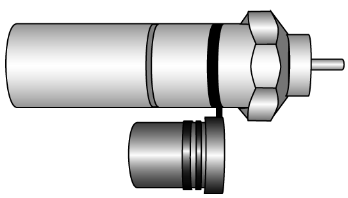
Remote I/O BNC Connectors

The following figure shows the remote I/O network BNC connectors: part number 043509446–BNC connector for quad shield RG-6 cable, and 52-0487-000 BNC connector for non-quad shield RF-6 cable.



RG-11 Remote I/O F Connector

The following figure shows the remote I/O network F connector, part number 490RIO00211. This is the F connector for the quad shield RG-11 cable.



Spare Parts

B

Spare Parts

Overview

This section provides information on miscellaneous spare parts and fuses.

Miscellaneous Spare Parts

The following table shows the miscellaneous spare parts for the Quantum modules.

Spare Part Number	Description
043502480	X13 CPU Door Label
043502952	Universal Module Door (smoked, obsolete)
043503019	1X4 AC Power Supply Door Label
043503328	24 Vdc, 7 Position (includes safety cover) Field Wiring Terminal Block
043503381	Module Ground Clip
043504417	NOM Door Label
043505673	AC DIO Door Label
043504639	2X4 DC Power Supply Door Label
043504640	DC DIO Door Label
043504680	RIO Door Label
043504708	111 AC Power Supply Door Label
043504710	211 DC Power Supply Door Label
043506326	115/230 Vac, 7 Position (includes safety cover) Field Wiring Terminal Block
043506673	424 CPU Door Label
043513804	Universal Module Door (clear)
043509695	200 Series I/O Conversion Connector Label
043503242	Yellow Safety Keys (6)
043503243	White Safety Keys (6)
043503020	Backplane Connector Dust Cover
043503356	Field Wiring Terminal Block Jumpers
043503416	Module Mounting Screw
043505125	Field Wiring Terminal Block, Terminal Screw
31000207	40 Position Wiring Terminal Block Door Label
31000221	NOE Door Label
31000226	x34 1x CPU Door Label
31000264	Hot Standby Door Label
31002249	x34 1xA CPU Door Label

Fuses

The following table shows the fuses for the Quantum modules.

Part Number/Fuse Type	Fuse Value	Fuse Holder
042701994	8 A SloBlo	Not required
043502405	5 A SloBlo	Wickman 19627-19628
043502515	1.5 A SloBlo	Wickman 19570-19575
043502516	2.5 A SloBlo	Wickman 19570-19575
043503948	2.5 A	Not required
043508930	1.25 A	57-001-000
57-0078-000	3/4 A	57-001-000
57-0089-000	2 A SloBlo	57-001-000
3 AG Fast Acting 1/16 A, 250 V	1/16 A	3 AG Fuse Type

Hardware Installation

C

At a Glance

Introduction

This section provides information on selecting backplanes, selecting mounting brackets, space requirements for the Quantum system and mounting Quantum modules.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
Hardware Installation – Selecting Backplanes	812
Hardware Installation – Mounting Brackets	819
Hardware Installation – Space Requirements for the Quantum System	823
Hardware Installation – Mounting Quantum Modules	825

Hardware Installation – Selecting Backplanes

Overview

Backplanes are designed to mechanically secure and electrically connect all modules used in drops. The backplane contains a passive circuit board which permits modules to communicate with each other and to identify their slot numbers without further switch settings.

Refer to the following tables for front view illustrations and dimensions of the backplanes (all backplane dimensions are nominal).

Note: To meet vibration/shock specifications, the backplane must be mounted using all specified mounting holes. The mounting surface should be flat to within +/- 1.0 mm. The backplane is mounted using standard hardware (described below).

The recommended length for the mounting screws should be within the following range: 0.24 in. (6 mm) - 0.52 in. (13 mm)

The head height of the screws should not exceed 0.14 in. (3.5 mm). 1/4' X 20 screws are recommended.

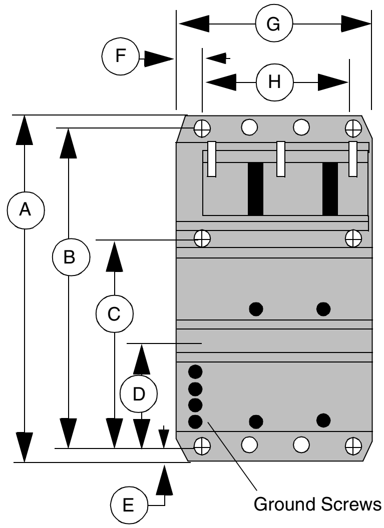
Backplanes

The following table shows the backplanes.

Part Number	Module Slots	Weight (Old Model)	Weight (New Model)
140 XBP 002 00	2	0.5 lbs (0.23 kg)	0.9 lbs (0.41 kg)
140 XBP 003 00	3	0.75 lbs (0.34 kg)	1.35 lbs (0.62 kg)
140 XBP 004 00	4	1.0 lbs. (0.45 kg)	1.8 lbs (0.82 kg)
140 XBP 006 00	6	1.4 lbs (0.64 kg)	2.7 lbs (1.23 kg)
140 XBP 010 00	10	2.2 lbs (1.0 kg)	4.5 lbs (2.04 kg)
140 XBP 016 00	16	3.5 lbs (1.58 kg)	7.2 lbs (3.27 kg)

Two Position Backplane Figure

The following figure shows the two position backplane.



⊕ =Mounting Hole
Diameter: 8mm/0.31 inches.

○ =Optional locations for Modbus Plus communication cable grounding.
Diameter: 8 mm/0.31 inches

● =Threaded mounting holes for half and full height modules.
Diameter: 4mm/0.16 inches

A 290 mm / 11.42 inches

B 270 mm / 10.63 inches

C 175.5 mm / 6.91 inches

D 94.5 mm / 3.72 inches

E 10 mm / 0.39 inches

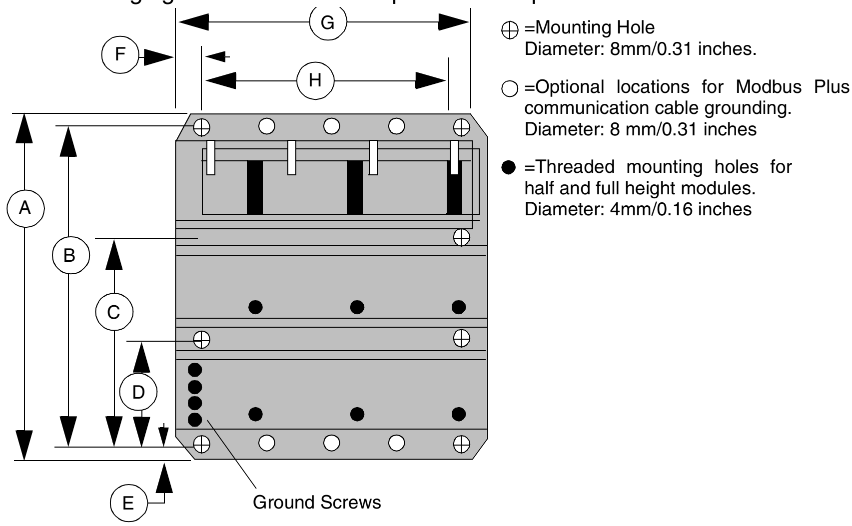
F 15 mm / 0.59 inches

G 102.61 mm / 4.04 inches

H 72.44 mm / 2.85 inches

Three Position Backplane Figure

The following figure shows the three position backplane.



A 290 mm / 11.42 inches

B 270 mm / 10.63 inches

C 175.5 mm / 6.91 inches

D 94.5 mm / 3.72 inches

E 10 mm / 0.39 inches

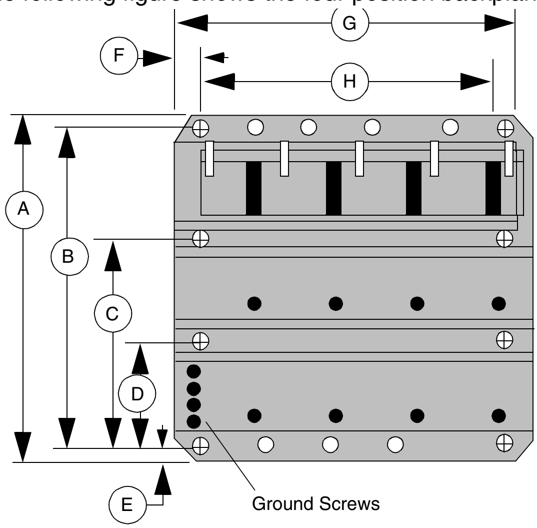
F 15 mm / 0.59 inches

G 143.13 mm / 5.64 inches

H 113.08 mm / 4.45 inches

Four Position Backplane Figure

The following figure shows the four position backplane.



⊕ =Mounting Hole
Diameter: 8mm/0.31 inches.

○ =Optional locations for Modbus Plus communication cable grounding.
Diameter: 8 mm/0.31 inches

● =Threaded mounting holes for half and full height modules.
Diameter: 4mm/0.16 inches

A 290 mm / 11.42 inches

B 270 mm / 10.63 inches

C 175.5 mm / 6.91 inches

D 94.5 mm / 3.72 inches

E 10 mm / 0.39 inches

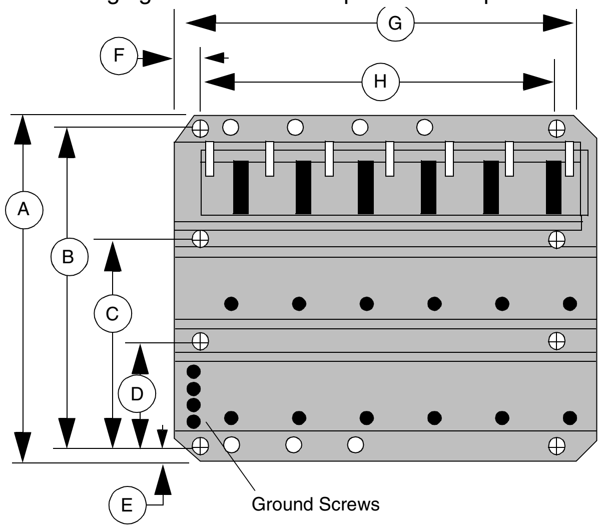
F 15 mm / 0.59 inches

G 183.69 mm / 7.23 inches

H 153.72 mm / 6.05 inches

Six Position Backplane Figure

The following figure shows the six position backplane.



⊕ =Mounting Hole
Diameter: 8mm/0.31 inches.

○ =Optional locations for Modbus Plus communication cable grounding.
Diameter: 8 mm/0.31 inches

● =Threaded mounting holes for half and full height modules.
Diameter: 4mm/0.16 inches

A 290 mm / 11.42 inches

B 270 mm / 10.63 inches

C 175.5 mm / 6.91 inches

D 94.5 mm / 3.72 inches

E 10 mm / 0.39 inches

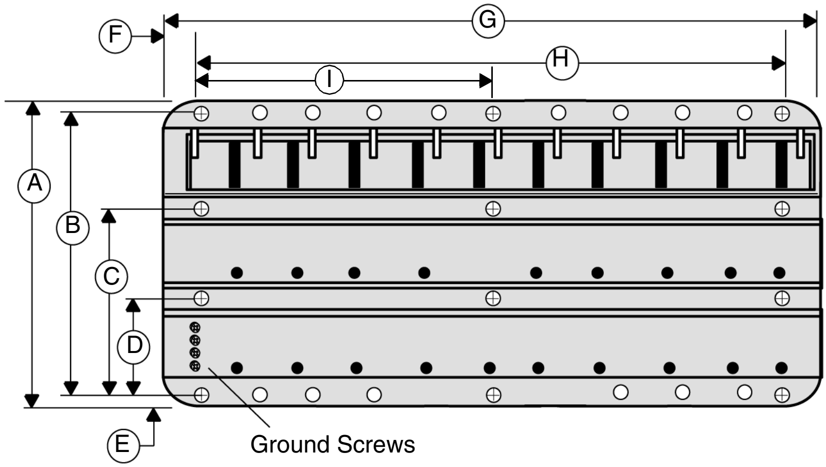
F 15 mm / 0.59 inches

G 265.1 mm / 10.44 inches

H 235 mm / 9.25 inches

Ten Position Backplane Figure

The following figure shows the ten position backplane.



=Mounting Hole
Diameter: 8mm/0.31 inches.

=Optional locations for Modbus Plus communication cable grounding.
Diameter: 8 mm/0.31 inches

=Threaded mounting holes for half and full height modules.
Diameter: 4mm/0.16 inches

A 290 mm / 11.42 inches

B 270 mm / 10.63 inches

C 175.5 mm / 6.91 inches

D 94.5 mm / 3.72 inches

E 10 mm / 0.39 inches

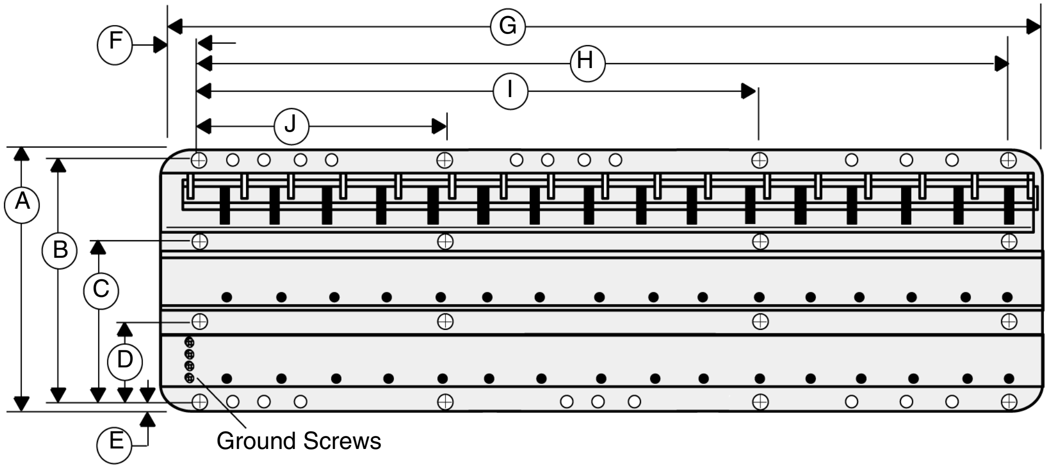
F 15 mm / 0.59 inches

G 427.66 mm / 16.84 inches

H 397.56 mm / 15.65 inches

Sixteen Position Backplane Figure

The following figure shows the sixteen position backplane.



⊕ =Mounting Hole
Diameter: 8mm/0.31 inches.

○ =Optional locations for Modbus Plus communication cable grounding.
Diameter: 8 mm/0.31 inches

● =Threaded mounting holes for half and full height modules.
Diameter: 4mm/0.16 inches

A	290 mm / 11.42 inches
B	270 mm / 10.63 inches
C	175.5 mm / 6.91 inches
D	94.5 mm / 3.72 inches
E	10 mm / 0.39 inches
F	15 mm / 0.59 inches
G	670.74 mm / 26.41 inches
H	641.4 mm / 25.25 inches
I	427.6 mm / 16.83 inches
J	213.8 mm / 8.42 inches

Hardware Installation – Mounting Brackets

Overview

Brackets are required when mounting backplanes in 19 inch NEMA cabinets. These brackets support the 2 through 10 position backplanes. The bracket mounts to rails using standard NEMA hardware.

Mounting brackets are offered in two sizes: 20 mm for back rail mounting, and 125 mm for front rail mounting (refer to the following illustrations).

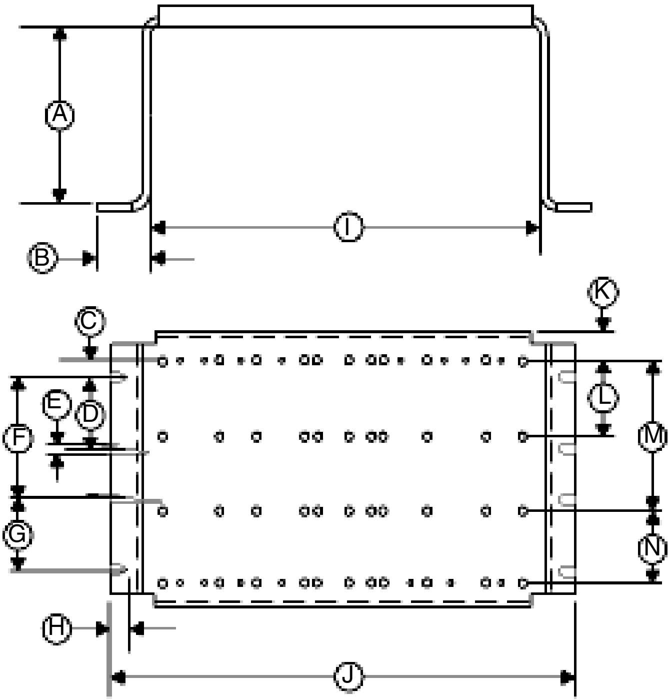
Backplane Mounting Brackets

The following table shows the mounting brackets.

Part Number	Description
140XCP40100	125 mm Bracket
140XCP40200	20 mm Bracket

125 mm Mounting Bracket

The following figure shows the 125 mm mounting bracket.



Diameter of the mounting holes: 6.6 mm / 0.26 inches

A 125 mm / 4.92 inches

B 22.83 mm / 0.90 inches

C 17.5 mm / 0.69 inches

D 88.9 mm / 3.50 inches

E 7.1 mm / 0.28 inches

F 146.1 mm / 5.75 inches

G 88.9 mm / 3.50 inches

H 14.7 mm / 0.58 inches

I 436.6 mm / 17.19 inches

J 482.25 mm / 18.99 inches

K 20.2 mm / 0.79 inches

L 94.5 mm / 3.72 inches

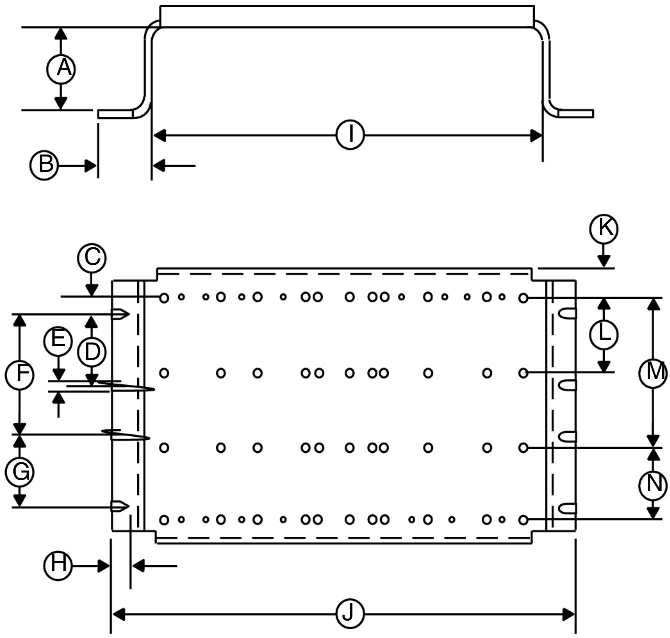
M 175.5 mm / 6.91 inches

N 94.5 mm / 3.72 inches

Note: Before installing a Quantum backplane to a mounting bracket, ensure that the mounting holes of the bracket and backplane are properly aligned.

20 mm Mounting Bracket

The following figure shows the 20 mm mounting bracket.



Diameter of the mounting holes: 6.6 mm / 0.26 inches

A 20 mm / 0.79 inches

B 22.83 mm / 0.90 inches

C 17.5 mm / 0.69 inches

D 88.9 mm / 3.50 inches

E 7.1 mm / 0.28 inches

F 146.1 mm / 5.75 inches

G 88.9 mm / 3.50 inches

H 14.7 mm / 0.58 inches

I 436.6 mm / 17.19 inches

J 482.25 mm / 18.99 inches

K 20.2 mm / 0.79 inches

L 94.5 mm / 3.72 inches

M 175.5 mm / 6.91 inches

N 94.5 mm / 3.72 inches

Hardware Installation – Space Requirements for the Quantum System

Overview

When mounting Quantum systems in a cabinet, a 4 in. (101.60 mm) space should be maintained above and below the modules. Side spacing should be 1 in. (25.40 mm) minimum. Wiring ducts up to 2 in. (50.80 mm) square may be centered horizontally between backplanes.

Duct work or similar items mounted in this manner that extend further out than 2 in. require a 4 in. space (instead of 1 in.) between them and the upper and lower modules, to allow for air movement. (Refer to the *Spacing Requirements Figure, p. 824* for the spacing required when installing Quantum systems.) There is no front clearance restriction regarding heat. Only sufficient mechanical clearance is required.

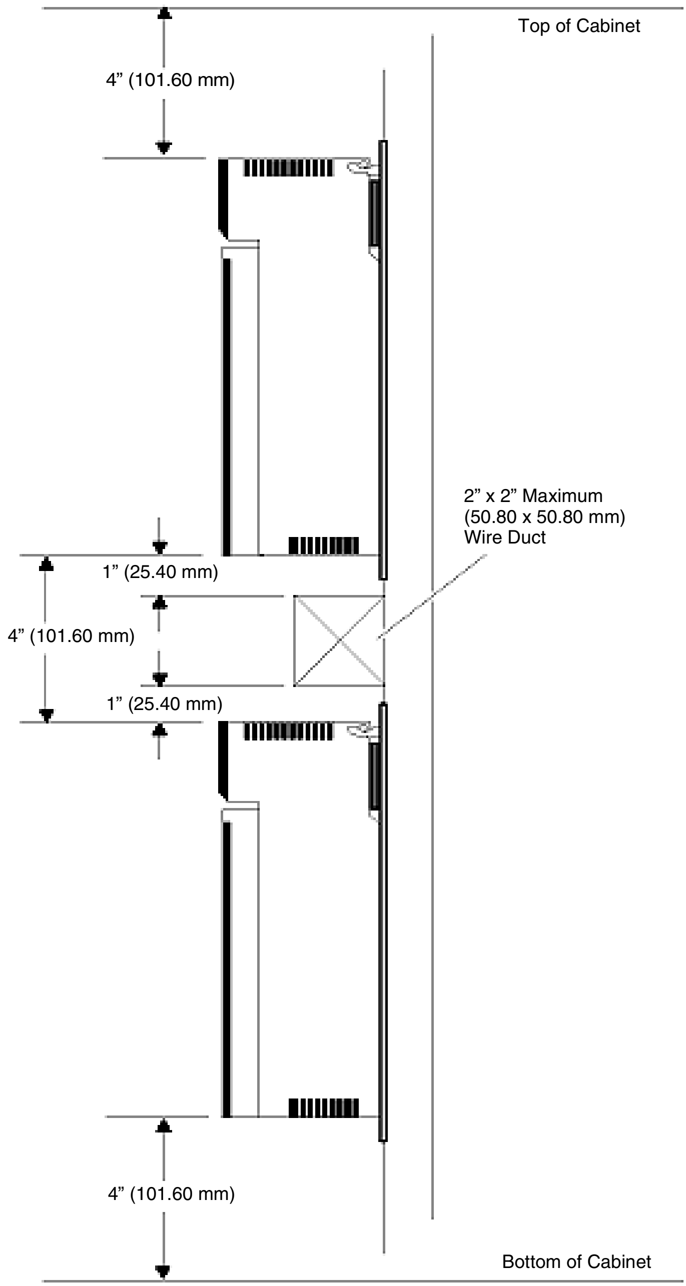
Spacing Requirements

The following table gives a summary of the spacing requirements for a Quantum system.

Minimum Spacing	Location
4 in. (101.60 mm)	Between the top of the cabinet and the top of the modules in the upper backplane.
4 in.	Between the cabinet bottom and the bottom of the lower modules in the lower backplane.
4 in.	Between the upper and lower modules when the backplanes are mounted one above the other.
1 in. (25.40 mm)	On either side between the cabinet walls and end modules.
Note: Wiring ducts up to 2 in. x 2 in. (50.80 mm x 50.80 mm) may be centered between back planes. If the duct extends further than 2 in. out from the mounting panel, there must be a 4 in. space between the modules and duct on the top and bottom.	

Spacing Requirements Figure

The following figure shows the Quantum system spacing requirements.



Hardware Installation – Mounting Quantum Modules

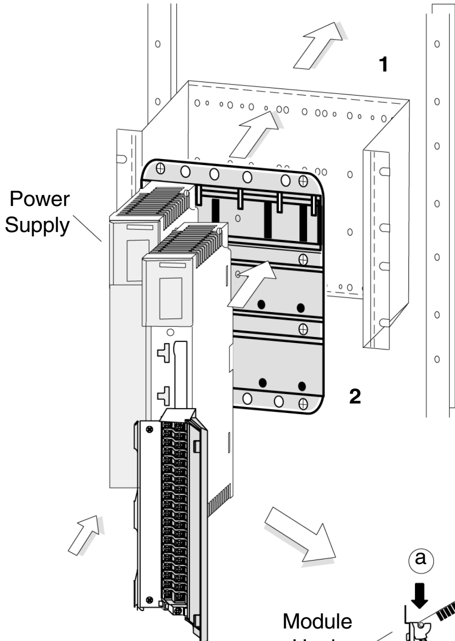
Overview

Quantum modules, with the exception of power supply modules, can be inserted into any slot of any backplane, and, with the added exception of CPU modules, can be removed under power (hot swapped) without damaging modules or the backplane; power supply modules must be installed in the first or last slots of the backplane. Refer to the following figures and procedure when mounting modules.

	CAUTION
⚠	**Possible danger to personnel or equipment.** An I/O module can only be hot swapped with the field side terminal strip removed. **Failure to follow this precaution can result in injury or equipment damage.**

Mounting Quantum Modules

The following figure shows a step-by-step procedure for mounting Quantum modules.

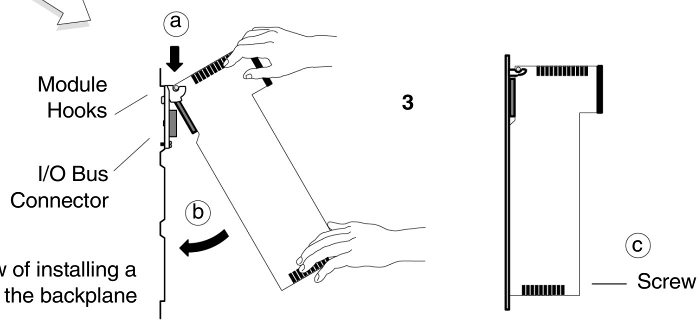


1 If required for the application, select and install a 20 mm or 125 mm mounting bracket to the rack using standard hardware.

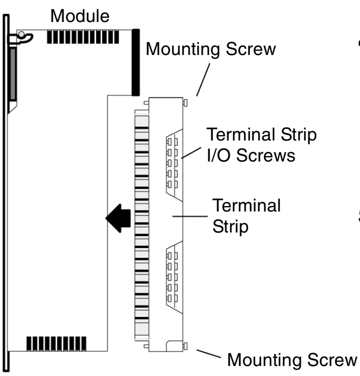
2 Select and install the appropriate backplane to the mounting bracket using standard hardware and remove the plastic backplane connector dust covers.

3 **a.** Mount the module at an angle on to the two hooks located near the top of the backplane.
b. Swing the module down to make an electrical connection with the backplane I/O bus connector.
c. Tighten the screw at the bottom of the module to fasten it to the backplane.

The maximum tightening torque for this screw is 2-4 in-lbs (0.23 - 0.45 Nm).



Side view of installing a module to the backplane



4 Install the appropriate terminal strip (if required) on the module, and with a philips screwdriver tighten the mounting screws at the top and bottom of the terminal.

The maximum tightening torque for the mounting screws is 10 in-lbs (1.13 Nm).

5 With a philips screwdriver, make all I/O connections to the terminal strip as shown in the individual Quantum module wiring diagrams.

The maximum tightening torque for the terminal strip field wiring screws is 10 in-lbs (1.13 Nm).

Installing Module Terminal Strip Jumper Clips

Terminal strip jumper clips (see below) are installed when contiguous I/O points need to be jumpered (i.e., the AVO 020 00 Analog Voltage Out module). Follow the procedure below for installing jumper clips.

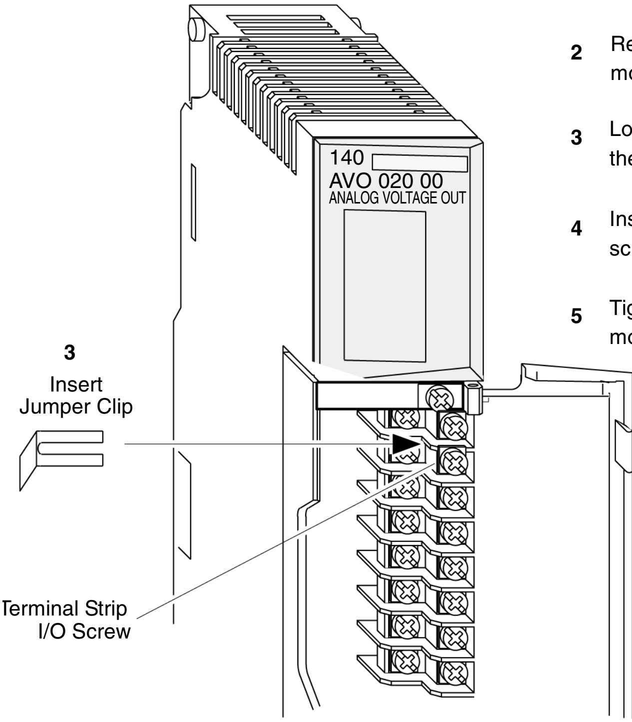
1 Turn power off to the system.

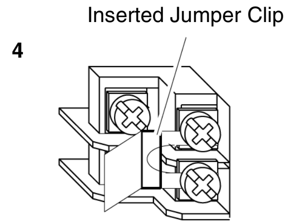
2 Remove the terminal strip from the module (see next page).

3 Loosen the terminal strip I/O screws of the points that you want jumpered.

4 Insert the jumper clip under the loosened screws (see exploded view below).

5 Tighten the screws and reinstall the module (see previous page).

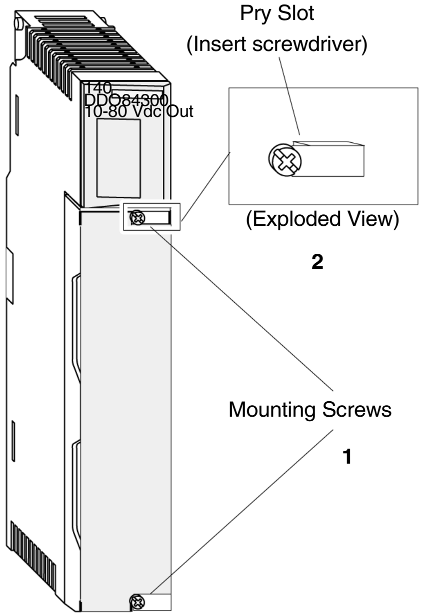




Exploded view of an inserted jumper clip

Removing a Quantum I/O Terminal Strip

The Quantum Automation Series I/O terminal strips have been designed with a pry slot to assist in their removal. Follow the procedure below to remove the terminal strip.



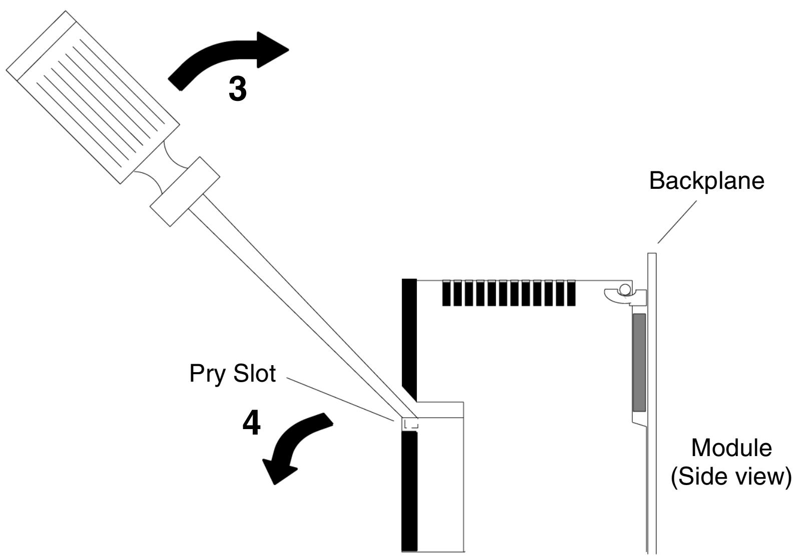
1 Loosen the terminal strip mounting screws located at the top and bottom of the terminal strip.

2 Located the pry slot at the top of the terminal strip near the top mounting screw.

3 From the front and at an angle, insert a flat edge screwdriver into the pry slot and lever the top of the terminal strip away from the module.

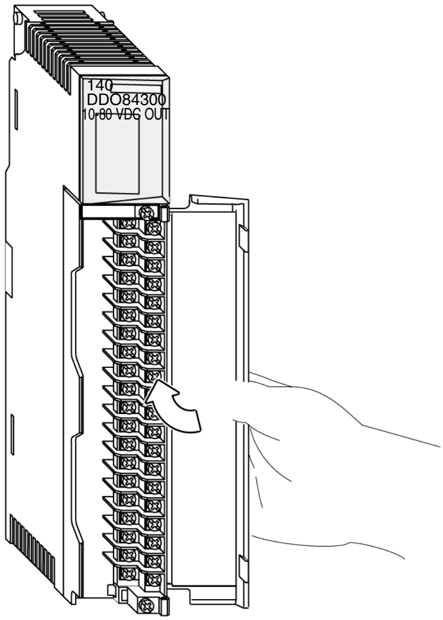
4 Once the top of the terminal strip has been loosened, the terminal strip may be completely removed by continuous outward pressure with the screwdriver.

5 To reinstall the terminal strip into the module, follow the procedure previously described.



Removing a Quantum Module Door

The Quantum Automation Series module terminal strips have been designed with a flexible, removable door to allow for easier wiring and access to the terminal strip. Follow the procedure below to remove the module door.



1. Open the module door.
2. Place your thumb near the middle of the door (as illustrated).
3. With your thumb, apply pressure until the door bends and the door hinge pins pop out of the retaining holes at the top and bottom of the terminal strip.
4. After wiring the module, reinstall the door using the reverse of the above procedure.

Power and Grounding Guidelines

D

At a Glance

Introduction

This section provides information of power and grounding considerations for AC and DC powered systems, system design considerations for Quantum power supplies, grounding and closed system installation.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
Power and Grounding Considerations for AC and DC Powered Systems	832
System Design Considerations for Quantum Power Supplies	844
Grounding	851
Closed System Installation	853

Power and Grounding Considerations for AC and DC Powered Systems

Overview

The required power and grounding configurations for AC powered and DC powered systems are shown in the following illustrations.

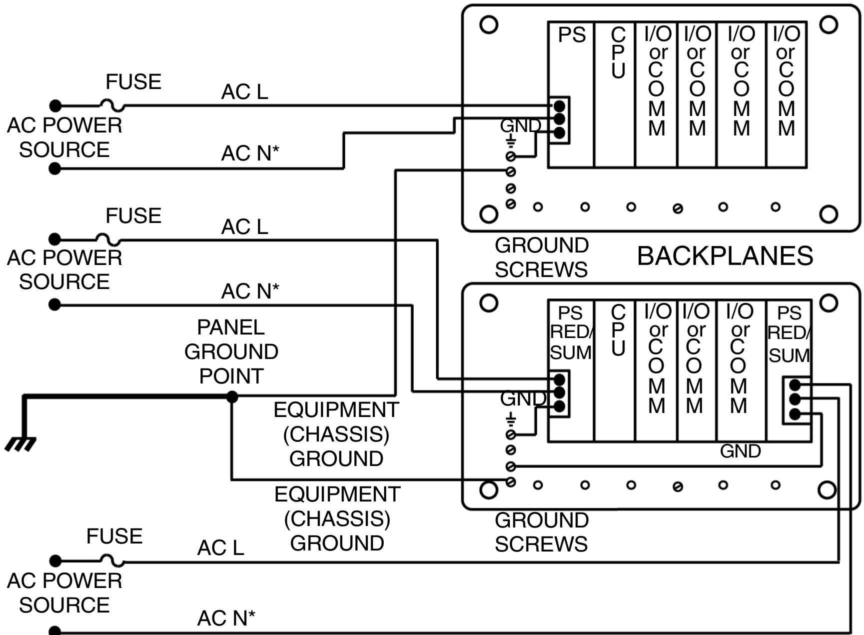
Each backplane shown has its own ground connection; that is, a separate wire returning to the main grounding point, rather than "daisy chaining" the grounds between power supplies or mounting plates.

The main grounding point is the local common connection of the panel ground, equipment ground, and earth grounding electrode.

Also shown are power and grounding configurations of AC and DC systems required for CE compliance. The CE mark indicates compliance with the European Directive on Electromagnetic Compatibility (EMC) (89/336/EEC) and the Low Voltage Directive (73/23/EEC). In order to maintain compliance, the Quantum system must be installed per the installation instructions.

AC Powered Systems

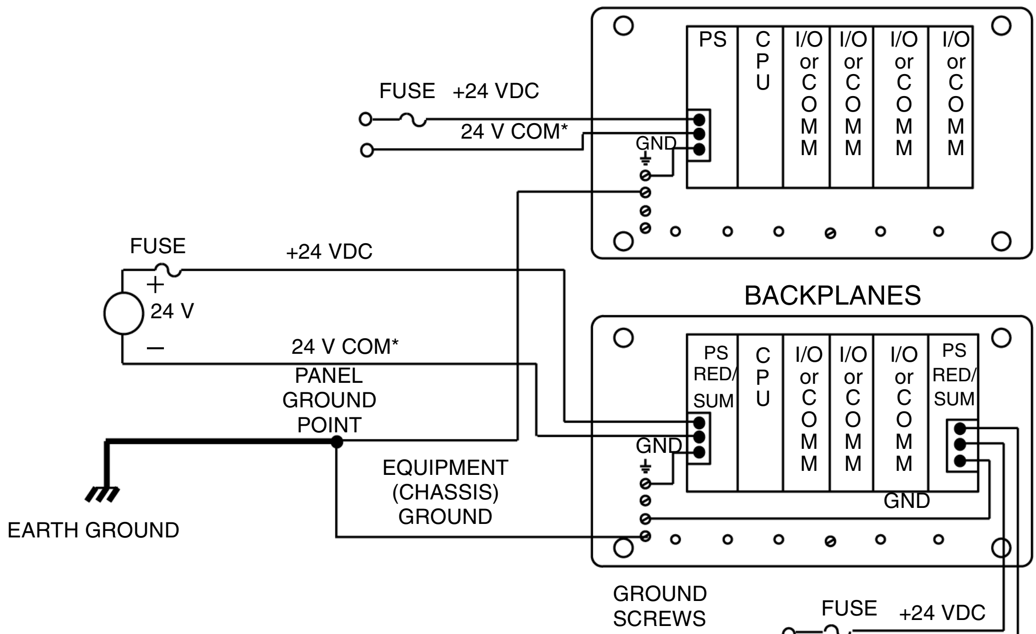
The following figure shows the AC powered systems.



*AC N should be earth grounded. If it is not earth grounded, it must be fused (refer to local codes).

DC Powered Systems

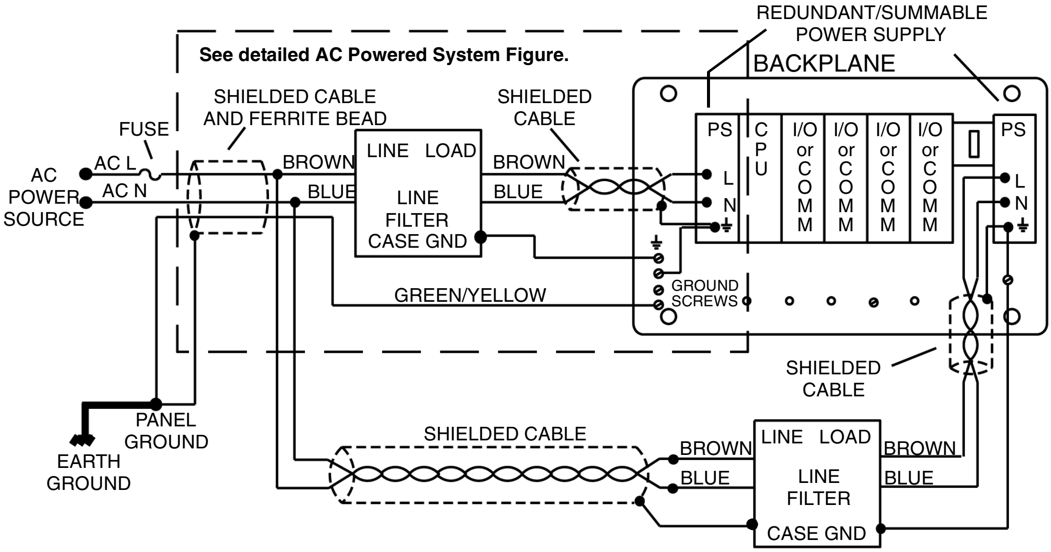
The following figure shows the DC powered systems.



*It is recommended that the 24 V power be earth grounded.

AC Powered Systems for CE Compliance

The following figure shows the AC powered systems for CE compliance.

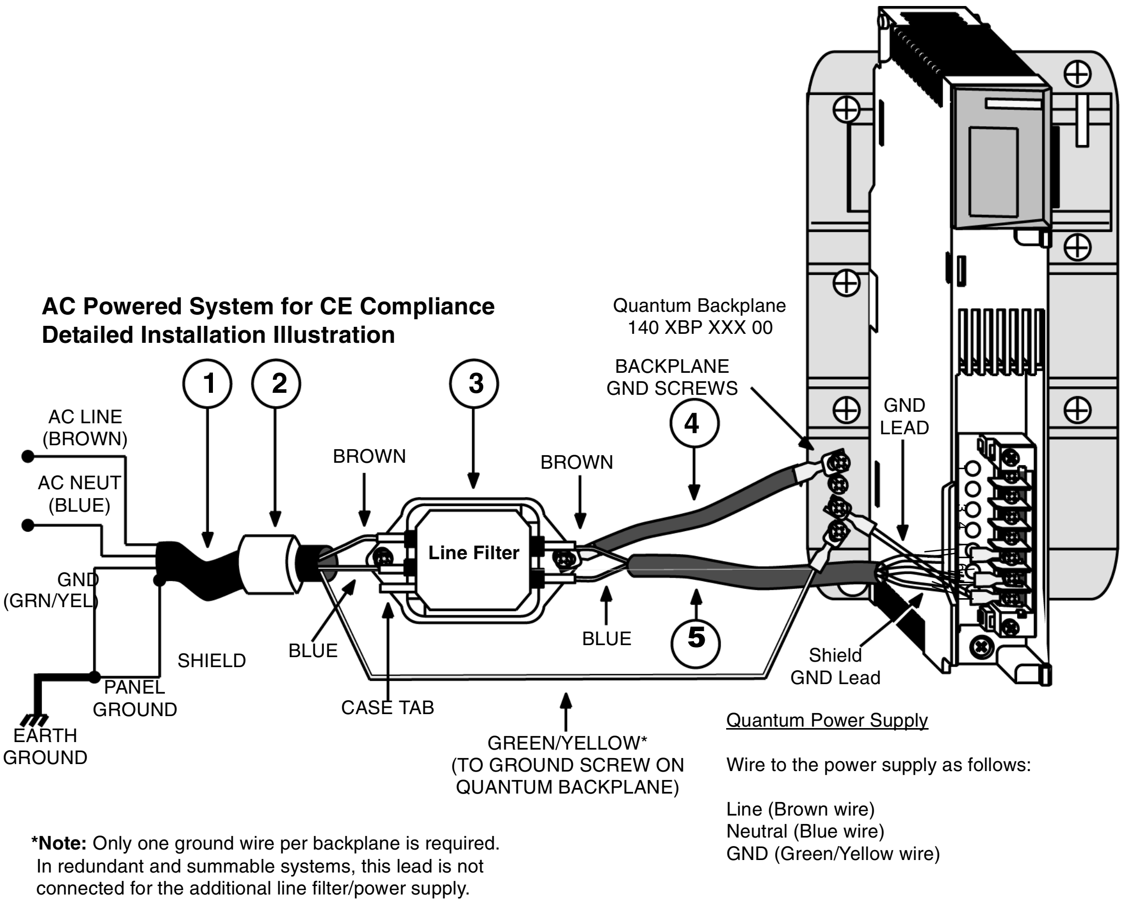


	CAUTION
	**European Compliance** To maintain CE compliance with the European Directive on EMC (89/336/EEC), the 140CPS11100, 140CPS11400, 140CPS11410, and 140CPS12400 power supplies must be installed in accordance with these instructions. **Failure to follow this precaution can result in injury or equipment damage.**

	CAUTION
	Requirements Compliance For installations that must meet "Closed System" requirements, as defined in EN 61131-2 (without relying upon an external enclosure), connector models 140 XTS 00100 and 140 XTS 00500 are required. Also, if an external Line Filter is used, it must be protected by a separate enclosure which meets the "finger safe" requirements of IEC 529, Class IP20. See *Closed System Installation, p. 853* **Failure to follow this precaution can result in injury or equipment damage.**

Detailed AC Powered System

The following figure shows the details for the AC powered system for CE compliance.



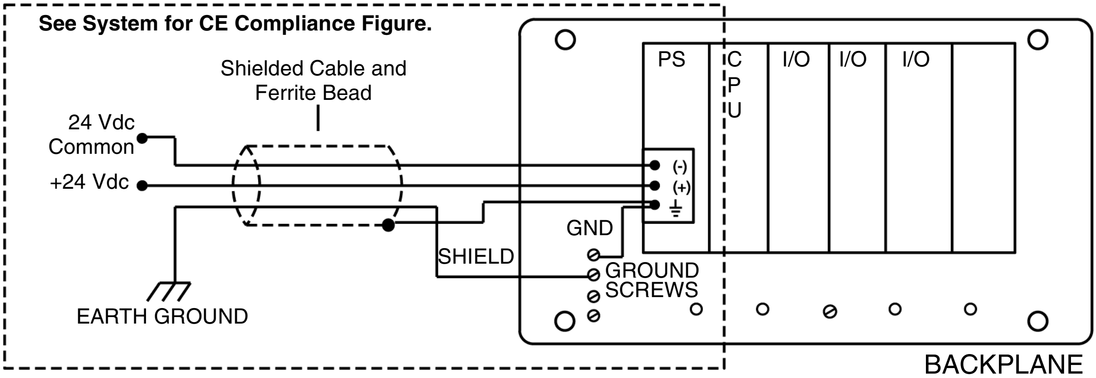
The following table shows the list of parts for the AC Powed System Figure.

Callout	Vendor (or equivalent)	Part Number	Description	Instruction
1	Offlex Series 100cy	35005	Line Cord	Terminate the shield at panel ground; the filter end of the shield is not terminated.
2	Steward	28 B 0686-200	Ferrite Bead	Install next to the filter and secure with tie wraps at both ends of the ferrite bead.
	Fair Rite	2643665702		

Callout	Vendor (or equivalent)	Part Number	Description	Instruction
3	Schaffner	FvN670-3/06	Line Filter (fast on terminals) Dimensions: Length: 3.4" (85 mm) Width: 2.2" (55 mm) Height: 1.6" (40 mm) Mounting Holes: 0.2 in (5.3 mm) dia., 3 in (75 MM) centerline mounted. Fast on terminals: 0.25 in (6.4 mm)	Install next to the power supply.
4	N/A	N/A	Ground Braid Flat braid 0.5 in (134 mm) with a maximum length of 4" (100 mm)	N/A
5	Offlex Series 100cy	35005	Line Cord The maximum length is 8.5" (215 mm)	Third lead (green/yellow) is not used; terminate the shield at the power supply ground terminal.

24 Vdc Powered Systems for CE Compliance

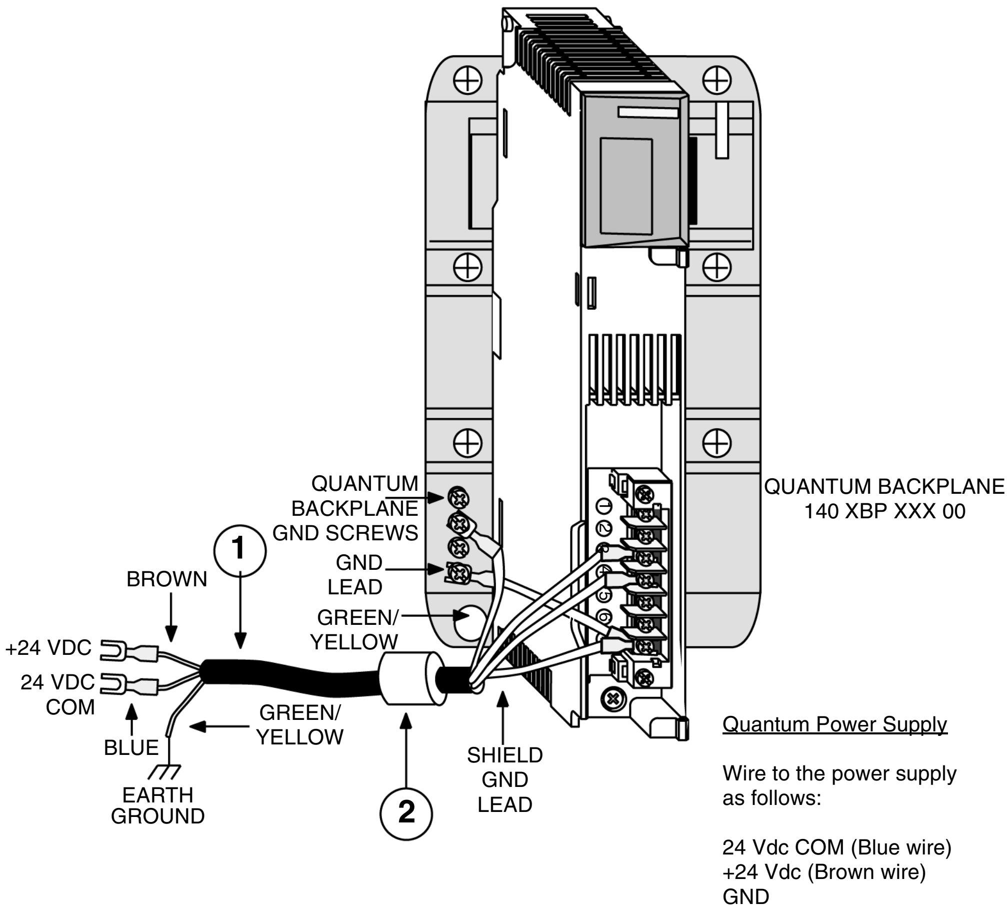
The following figure shows the 3 A, 24 Vdc powered systems for CE compliance.



	CAUTION
⚠	**European compliance** To maintain CE compliance with the European Directive on EMC (89/336/EEC) and the Low Voltage Directive (73/23/EEC), the 140CPS21100, the 140CRA21120, and the 140CRA21220 must be installed in accordance with these instructions. **Failure to follow this precaution can result in injury or equipment damage.**

Detailed System for CE Compliance

The following figure shows the detailed installation for the CE compliance system and the parts list callouts.

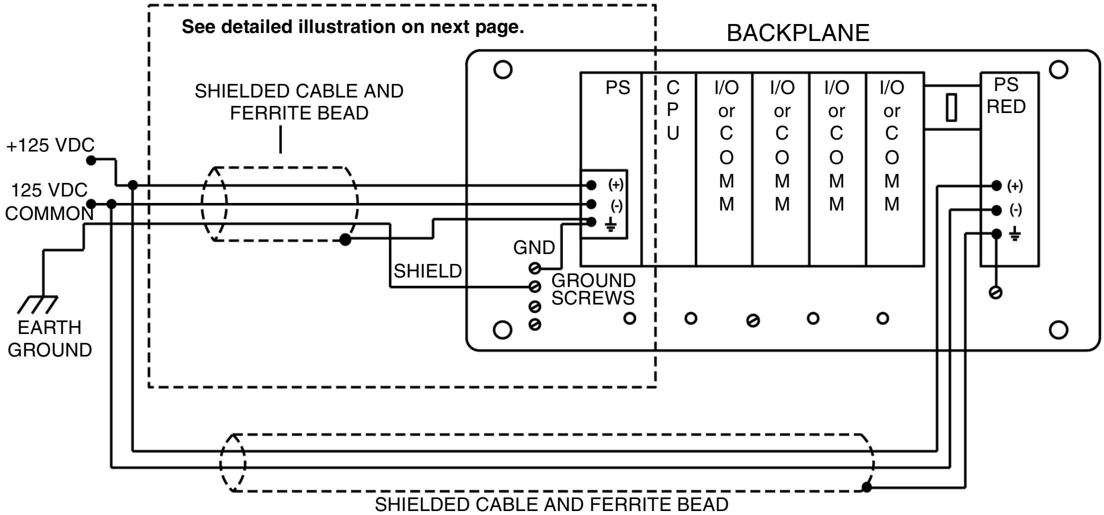


The following table provides a list of parts for the CE Compliance Figure.

Callout	Vendor (or equivalent)	Part Number	Description	Instruction
1	Offlex Series 100cy	35005	Line Cord	Terminate the shield at the power supply ground terminal
2	Steward	28 BO686-200	Ferrite Bead	Install next to the filter and secure with tie wraps at Both ends of the ferrite bead.
	Fair Rite	2643665702		

125 Vdc Powered System

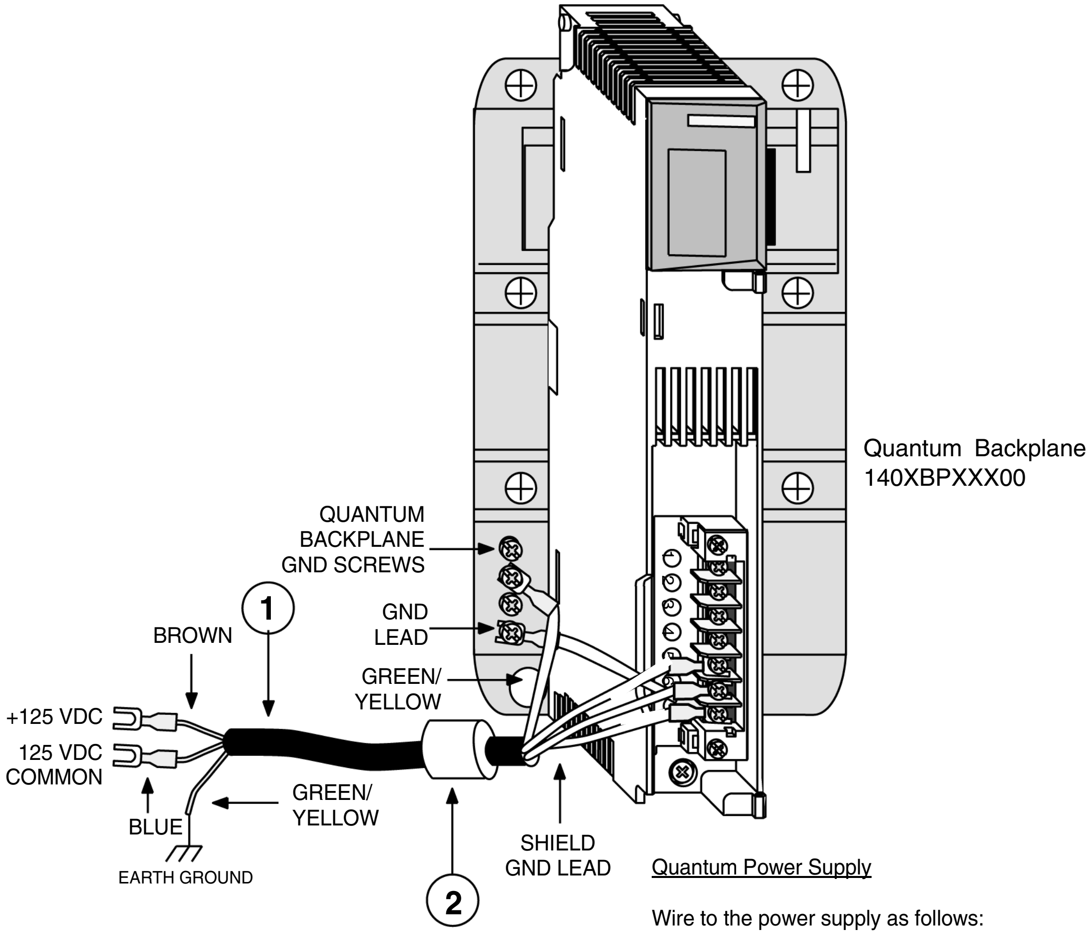
The following figure shows the 125 Vdc powered system for CE compliance.



	CAUTION
⚠	**European compliance** To maintain CE compliance with the European Directive on EMC (89/336/EEC) and the Low Voltage Directive (73/23/EEC), the 140CPS51100 and the 140CPS52400 must be installed in accordance with these instructions. **Failure to follow this precaution can result in injury or equipment damage.**

125 Vdc Powered Installation

The following figure shows the detailed installation for the 125 Vdc powered system for CE compliance with parts list callouts.



Quantum Power Supply

Wire to the power supply as follows:

+125 Vdc (Brown wire)
125 Vdc COM (Blue wire)
GND

The following table provides a list of parts for the 125 Vdc Powered Installation Figure..

Callout	Vendor (or equivalent)	Part Number	Description	Instruction
1	Offlex Series 100cy	35005	Line Cord	Terminate the shield at the power supply ground terminal

Callout	Vendor (or equivalent)	Part Number	Description	Instruction
2	Steward	28 BO686-200	Ferrite Bead	Install next to the filter and secure with tie wraps at Both ends of the ferrite bead.
	Fair Rite	2643665702		

CAUTION

European compliance

To maintain CE compliance with the European Directive on EMC (89/336/EEC) and the Low Voltage Directive (73/23/EEC), the 140CPS51100 and the 140CPS52400 must be installed in accordance with these instructions.

Failure to follow this precaution can result in injury or equipment damage.

System Design Considerations for Quantum Power Supplies

Overview

There exist some important design differences between various models of Quantum power supplies that require careful consideration by the system designer in order to achieve maximum system performance. The principal difference lies in the generation within the power supply of important backplane signals related to the health of the power supply and the status of the input power.

All Quantum power supplies include on-board early power fail detection logic which is used to signal all other modules on the backplane that input power has failed. This signal is called POK (power OK) and is active high (i.e., when the signal is high, power is OK).

There is both an internal (to the power supply) and an external (as seen by the backplane and all other modules) version of the POK signal. The internal POK signal is represented by the Pwr ok LED (light emitting diode) on the front panel of all power supplies.

The system POK signal is generated so that there is sufficient time between the negative going edge of system POK (power has failed) and the actual interruption of power to the backplane. This early warning of power failure is necessary for the Quantum executive to perform an orderly system shutdown.

Standalone Power Supplies

Three models of standalone power supplies are offered:

• 140CPS11100	115...230 Vac input	3 A output
• 140CPS21100	24 Vdc input	3 A output
• 140CPS51100	125 Vdc input	3 A output

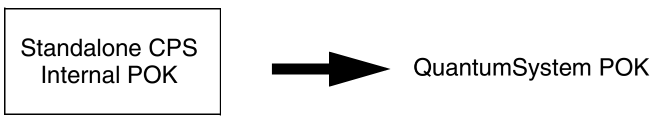
CAUTION

Equipment compatibility.

Standalone units must be the only power supply installed in a backplane. No fault tolerant or redundant capability exists in systems powered by standalone power supplies.
In systems powered by a standalone power supply, the internal power supply POK is provided directly to the Quantum system POK.

Failure to follow this precaution can result in injury or equipment damage.

The following figure shows the single internal POK that relates directly to the Quantum system POK.



Summable Power Supplies

Four summable power supply models are offered:

• 140CPS11410	115...230 Vac input	8 A output
• 140CPS11420	115...230 Vac input	11 A output
• 140CPS21400	24 Vdc input	8 A output
• 140CPS41400	48 Vdc input	8 A output

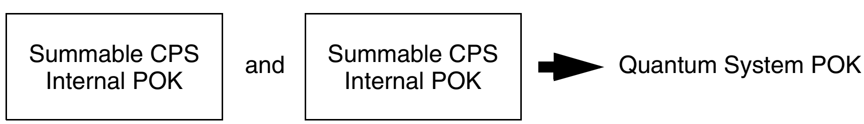
A summable power supply may be used as a standalone power supply without reservation in any Quantum system.

For systems configured with a mix of CPS, NOM, expert, and I/O modules, whose total current consumption from the backplane exceeds the current provided by one summable supply, two summable supplies may be used in a single backplane. In such a system, the total current available on the backplane is the sum of the capability of both supplies:
- 16 A for two 140CPS11410
- 16 A for two 140CPS21400
- 16 A for two 140CPS41400
- 20 A for two 140CPS11420
- 16 A for one 140CPS11410 and one 140CPS11420

Use only like summable power supplies (same product reference) except for 140CPS11410 and 140CPS11420, which can be summed.

The summable supplies are designed so that they split the current supplied to the load almost equally, which also has the added benefit of increasing total system MTBF, and to distribute the thermal load across the backplane. Summable supplies should be installed at opposite ends of in the Quantum backplane to maximize the system thermal performance.

The Quantum system POK signal in systems powered by two summable power supplies is only true (power is OK) when both internal POK signals (in the 140CPSX14X0) are true. Quantum summable power supplies are not hot-swappable.
The following figure shows that the internal summable supply Quantum POKs are ANDed to create the Quantum System POK.



The proper method for starting systems powered by summable power supplies is to insert both supplies in the backplane in an unpowered state, and then apply power to each supply. For 140CPS11410, 140CPS21400, and 140CPS414 models, there is no requirement to power each supply simultaneously. For 140CPS11420, or wherever this module is operated with a 140CPS11410, the delay between the two powering times should not be greater than five seconds. The system designer must realize that the operation of the summable supply described above is independent of total backplane load, i.e., even if the total load on the backplane is less than 8 A, if there are two summable supplies installed in the backplane, the system POK is generated as shown in this section.

For the special case of a single summable supply used as a standalone, the system POK generation reverts to the standalone case as shown previously in this section.

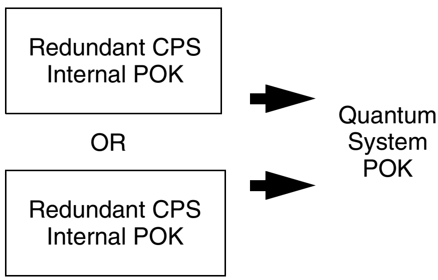
Redundant Power Supplies

Five redundant power supply models are offered:

• 140CPS12400	115 ... 230 Vac input	8 A output
• 140CPS12420	115 ... 230 Vac input	8 A output
• 140CPS22400	24 Vdc input	8 A output
• 140CPS42400	48 Vdc input	8 A output
• 140CPS52400	125 Vdc input	8 A output

Similar to the summable supplies, the Quantum redundant power supplies also contain circuitry which forces the installed power supplies to share output current almost equally. An important difference between the summable and the redundant supply lies in the system POK generation circuitry.

The Quantum system POK signal in systems powered by redundant power supplies is true (power is OK) if either or both internal POK is true. The following figure shows the internal Quantum redundant supply POKs are ORed to create the Quantum System POK.



> **Note:** Redundant power supply module health may be monitored in an I/O module health status word. (Refer to the STAT Block description in *Modicon Ladder Logic Block Library User Guide*, 840USE10100.)

Another important difference from the summable system is the total available system backplane loading. If there are N redundant power supplies installed in a backplane, the total backplane load must not exceed the capability of N – 1 supplies.

For example:
- If three 8 A redundant power supplies are installed (N = 3), the maximum backplane load available for redundant operation is the current sourced by N – 1 (= 2) supplies, which is 16 A.
- if two 8 A power supplies are installed in the backplane (N = 2), the maximum backplane load available for redundant operation is the current sourced by N – 1 (= 1) supplies, which is 8 A.

	CAUTION
	Limits to Backplane Load ● If two 140CPS12420 power supplies are installed in the backplane, the maximum backplane load available for redundant operation is 10 A. ● If three 140CPS12420 power supplies are installed in the backplane, the maximum backplane load available for redundant operation is 20 A. Use only like redundant power supplies except for 140CPS12420 which can be mixed with one 140CPS22400 or one 140CPS42400. ● If one CPS12420 is installed with one 140CPS22400 or one 140CPS42400 in the backplane, the maximum backplane load available for redundant operation is 8 A. ● If one 140CPS12420 is installed with two 140CPS22400 or two 140CPS42400 in the backplane, the maximum backplane load available for redundant operation is 16 A. ● If two 140CPS12420 are installed with one 140CPS22400 or one 140CPS42400 in the backplane, the maximum backplane load available for redundant operation is 16 A. **Failure to follow this precaution can result in injury or equipment damage.**

If these constraints are observed, then in a system of two or three redundant supplies, one supply (it doesn’t matter which one) is hot-swappable. This is possible because there is excess capacity in the N – 1 remaining supplies to source the backplane current while the Nth supply is being swapped.

An obvious extension to this argument is that a single redundant power supply may be used as a standalone supply (but the lowest cost solution will be achieved by using a summable or standalone supply for this application).

Compatibility Issues

Power supplies:

- With the exception of standalone models, power supplies with the same model number are always compatible when installed in the same backplane.
- Do not mix different models of power supplies on the same backplane, except in the following combinations:
  - One 140CPS11420 and one 140CPS11410 power supply may be installed for configurations consuming more than the rated current of one supply. In this case the total load capacity is 16 A @ 60° C.
  - One 140CPS12420 and one 140CPS22400 power supply may be used for configurations requiring power for uninterrupted system operation with redundancy between an AC voltage source and a 24 Vdc voltage source. In this case, the total load capacity is 8 A @ 60° C. Three redundant supplies can also be mixed in a backplane. See *Redundant Power Supplies, p. 848* for details.
  - One 140CPS12420 and one 140CPS42400 power supply may be used for configurations requiring power for uninterrupted system operation, with redundancy between an AC voltage source and a 48 Vdc voltage source. In this case the total load capacity is 8 A @ 60° C. Three redundant supplies can also be mixed on a backplane. See *Redundant Power Supplies, p. 848* for details.
- Do not mix DC input power supplies into the same backplane as the corresponding AC version.
- Do not use a standalone power supply in combination with any other supply in the same backplane.

DIO:

- While it is possible to use a standalone or a summable power supply with a DIO drop (as long as the DIO input is left unpowered), it is not possible to use a redundant supply with the DIO drop.
- The added power supply must not be included in the system I/O map.
- The added power supply need not be of the same type as the DIO adapter. AC powered supplies may be used with DC type adapters and vice-versa.
- DIO module current load with an added power supply is typically 200 mA.

Grounding

Overview

This appendix provides information on grounding issues for the chassis, power supply Modbus Plus, and other equipment and system requirements.

Chassis Grounding

A chassis ground wire is required for each backplane. The wire is connected between one of four ground screws (located on the backplane) and the main ground point of the power system. This wire should be green (or green with a yellow stripe) and the AWG rating must be (at a minimum) sized to meet the fuse rating of the supply circuit.

Power Supply Grounding

On each power supply connector there is a ground connection. This connection must be made for safety reasons. The preferred connection is between the power supply connector ground terminal and one of the backplane ground screws. This wire should be green (or green with a yellow stripe) and at a minimum the same AWG rating as the power connections to the supply.

In backplanes with multiple power supplies, each supply should have a ground connection between its input connector and the backplane ground screws.

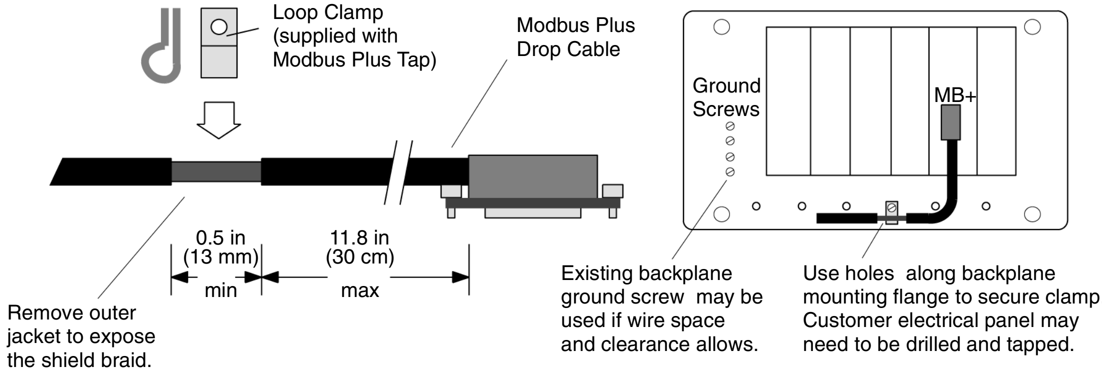
Note: It is recommended that the power supplying the I/O modules be grounded at the main ground point.

Modbus Plus (MB+) Communication Tap Grounding

Modbus Plus network drop cables require a ground connection to the backplane. The connection is made by means of a metal loop clamp that grounds the cable shield to the ground point. The maximum allowable distance from the ground point to the drop cable's connector is 30 cm (11.8 in).

Modbus Plus Grounding Figure

The following figure shows Modbus Plus grounding information.



	CAUTION
⚠	**European compliance** To maintain CE compliance with the European Directive on EMC (89/336/EEC), the Modbus Plus drop cables must be installed in accordance with these instructions. **Failure to follow this precaution can result in injury or equipment damage.**

Other Equipment Grounding

Other equipment in the installation should not share the grounding conductor of the system. Each piece of equipment should have its own grounding conductor returning to the main grounding point from which the equipment power originates.

Systems with Multiple Power Feeds

In systems with multiple power feeds, the grounding should proceed in the same manner as single feed systems. However, a zero volt potential difference must be maintained between the equipment grounding conductors of the separate systems to prevent current flow on communication cables.

Closed System Installation

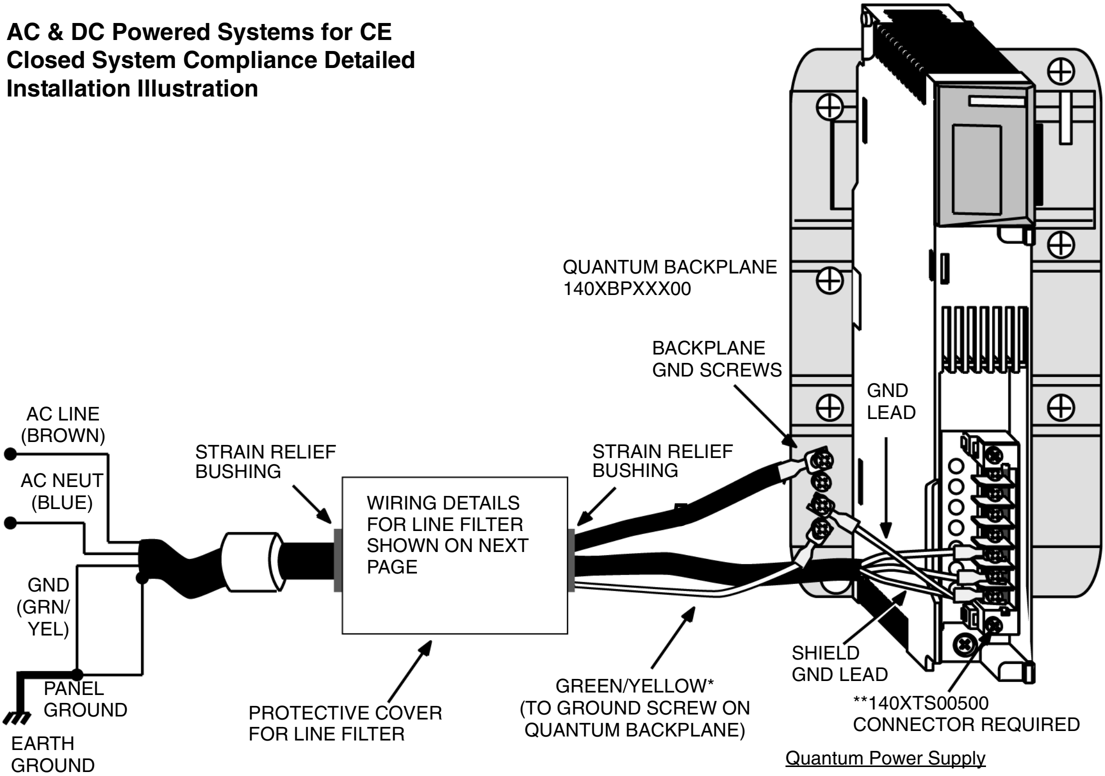
Overview

For installations that must meet "Closed System" requirements, as defined in EN 61131-2 (without relying upon an external enclosure) in which an external Line Filter is used, it must be protected by a separate enclosure which meets the "finger safe" requirements of IEC 529, Class IP20.

AC/DC Installation

The following figure shows the detailed installation for the AC and DC powered systems for CE closed system compliance.

AC & DC Powered Systems for CE Closed System Compliance Detailed Installation Illustration



Quantum Power Supply

Wire to the power supply as follows:

Line (Brown wire)
Neutral (Blue wire)
GND (Green/Yellow wire)

* **Note:** Only one ground wire per backplane is required. In redundant and summable systems, this lead is not connected for the additional line filter/power supply.

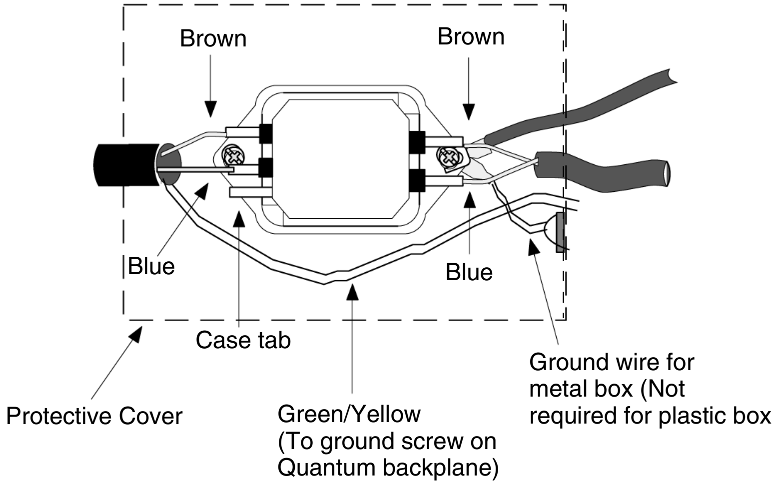
** **Note:** Connectors 140 XTS 005 00 (for all power supplies) and 140 XTS 001 00 (for all I/O modules) must be ordered separately.

Protective Cover

The protective cover must completely enclose the line filter. Approximate dimensions for the cover are 12.5 cm by 7.5 cm. Wire entry/exit shall be through strain relief bushings.

Line Filter Connections

The following figure shows the wiring connections to the enclosed line filter.



CableFast Cabling

E

At a Glance

Introduction

The following information pertains to the CableFast cabling system.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
Features of the CableFast Cabling System	858
140CFA04000 CableFast Cabling Block	867
140CFB03200 Quantum CableFast Cabling Block	870
140CFC03200 Quantum CableFast Cabling Block	876
140CFD03200 Quantum CableFast Cabling Block	885
140CFE03200 Quantum CableFast Cabling Block	888
140CFG01600 Quantum CableFast Cabling Block	891
140CFH00800 Quantum CableFast Cabling Block	900
140CFI00800 Quantum CableFast Cabling Block	909
140CFJ00400 Quantum CableFast Cabling Block	916
140CFK00400 Quantum CableFast Cabling Block	925
CableFast Cables	933
CableFast Accessories	939

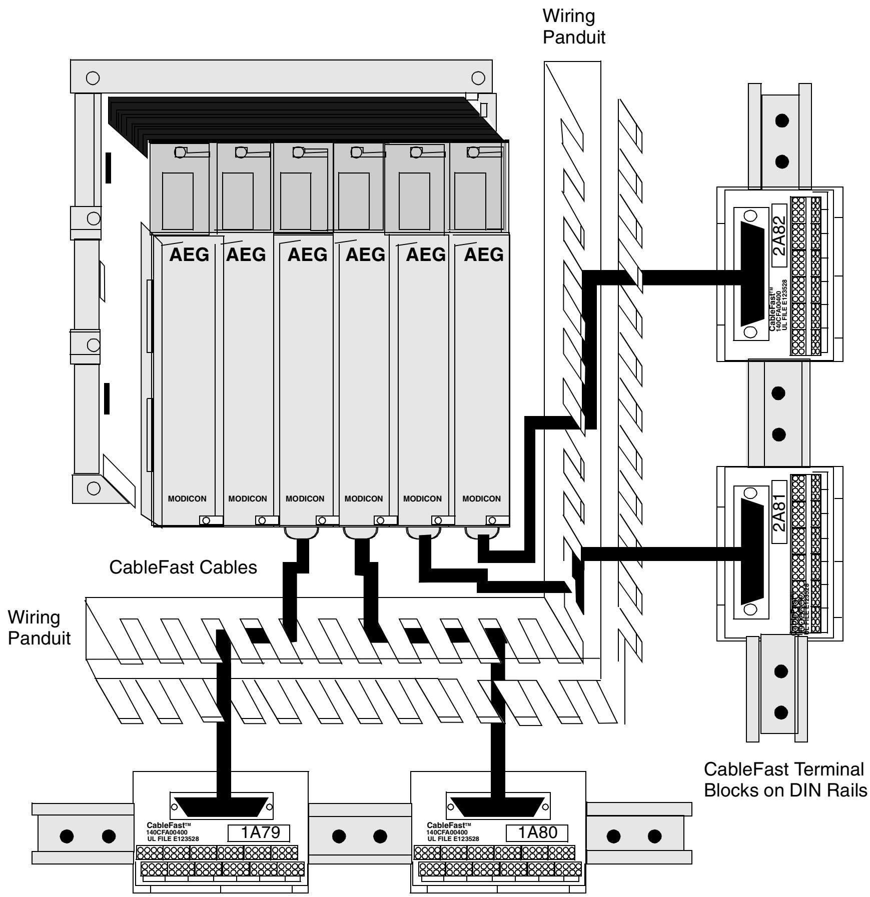
Features of the CableFast Cabling System

Overview

The CableFast wiring system consists of pre-wired Quantum field wiring terminal strips, available in various cable lengths that are terminated with "D" type connectors. The "D" connectors plug into DIN rail-mounted terminal blocks offered in straight through or special application versions. Cables and terminal blocks are ordered separately and all terminal blocks may be used with any cable length. Pigtail cable versions are also available.

Quantum Modules and Backplane

The following figure shows the Quantum modules and backplane components.



Note: Ensure that the wiring panduits are large enough to support 12 ft. cables.

Specifications

All CableFast systems are designed to the following specifications.

Specifications	
Power Ratings	150 Vac/Vdc @ 0.5 A per point
	150 Vac/Vdc @ 2.0 A per point * *Requires the 140CFG01600 Terminal Block and the 140XTS012XX Cable
Dielectric Withstanding Voltage	1060 Vac and 1500 Vdc
Creepage and Clearance	per IEC 1131, UL 508, CSA 22.2 #142-1987
Terminal Block Wire Sizes per Terminal	One wire - #12 AWG (2.5 mm2)
	Two wires - #16 AWG (1.0 mm2) and above (See below for the maximum number of wires allowed per terminal.)
	Note: It is recommended that no more than two wires be used at one time.
	Wire Size Number of Wires
	#24 4 #22 4 #18 3 #16 2 #14 1 #12 1
Terminal Screw Size	M3
Screwdriver Head Size	0.13" (3.3 mm) flat head min.
Terminal Screw Type	Captive
Terminal Screw Finish	Tin plate (197 µin min.)
Terminal Screw Tightening Torque	7.2 lb.-in (0.8 Nm)
System Flammability Rating	94 V-2
Temperature	
Operating	0 ... 60° C (32 ... 140° F)
Storage	-40 ... +65° C (-40 ... +149° F)
Humidity	0 ... 95% RH noncondensing
Altitude	6,666 ft. (2000 m) full operation
Shock	+/- 15 g peak, 11 ms, half sine wave
Vibration	10 ... 57 Hz @ 0.075 mm displacement 57 ... 150 Hz @ 1 g, total 10 sweeps
Mounting Configuration	DIN rail mount, NS35/7.5 and NS32

Terminal Block Selection Guide

Use this table to select valid combinations of Quantum I/O modules and CableFast terminal blocks.

	140CFA04000	140CFB03200	140CFC03200	140CFE03200	140CFE03200	140CFG01600	140CFH00800	140CFI00800	140CFJ00400	140CFK00400
140ACI03000	X						X	X		
140ACO02000	X								X	X
140ACI04000	X									
140ACO13000	X									
140ARI03010	X									
140ATI03000	X (See Note 3)									
140AMM09000	X									
140AVI03000	X						X	X		
140AVO02000	X									X
140DAI34000	X					X				
140DAI35300	X	X	X	X						
140DAI44000	X					X				
140DAI45300	X	X	X	X						
140DAI54000	X					X				
140DAI54300	X									
140DAI55300	X	X	X	X						
140DAI74000	CableFast Not Allowed									
140DAI75300	CableFast Not Allowed									
140DAM59000	X (See Note 1)									
140DAO84000						X (See Note 2)				
140DAO84010						X (See Note 2)				
140DAO84210						X (See Note 2)				
140DAO84220						X (See Note 2)				

	140CFA04000	140CFB03200	140CFC03200	140CFE03200	140CFE03200	140CFG01600	140CFH00800	140CFI00800	140CFJ00400	140CFK00400
140DAO85300	X (See Note 1)									
140DDI15310	X		X							
140DDI35300	X	X	X							
140DDI35310	X									
140DDI36400	Not compatible with CableFast. See *140DDI36400 I/O DC Input 24 VDC 6x16 Telefast Input Module, p. 650* for recommended cables									
140DDI67300	X									
140DDI84100	X									
140DDI85300	X	X	X	X						
140DDM39000	X									
140DDM69000	X (See Note 1)									
140DDO15310	X									
140DDO35300	X		X		X					
140DDO35301	X		X		X					
140DDO35310	X									
140DDO36400	Not compaitble with CableFast. See *140DDO36400 I/O DC Output 24VDC 6x16 Telefast Output Module, p. 729* for recommended cables.									
140DDO84300						X (See Note 2)				
140DDO88500	X (See Note 1)									
140DRA84000	X (See Note 1)									
140DRC83000	X (See Note 1)									
140DSI35300	X									
140DVO85300	X									
X = Valid Selections.										

Note: These are the maximum load current capacities of the 140CFA04000 and CFG01600 terminal blocks:

1. When using the 140CFA04000 terminal block, the indicated module outputs are limited to 0.5 A per point, 150 Vac maximum and 0.5 A per point, 150 Vdc maximum.
2. When using the 140CFG01600 terminal block and either the 140XTS012xx or 140XTS102XX high power cables, the indicated module output ratings are 2 A per point, 150 Vac maximum, and 2 A per point, 150 Vdc maximum.
3. The 140CFA04000 block does not incorporate an isometric barrier and is not recommended for use with the 140ATI03000 TC module. Without such a barrier, temperature readings may vary up to 2 degrees from one end of the block to the other. If the application can tolerate this temperature error, the block (and module remote CJC) may be used.

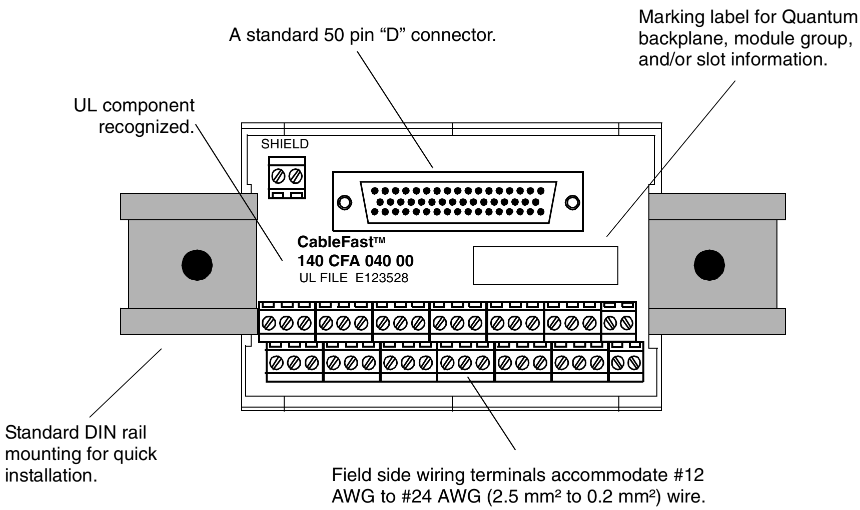
CableFast Terminal Blocks

This table includes descriptions for the following terminal blocks.

Block Number	Block Description
140CFA04000	The A block is a straight through point to point connection on the terminal block. Wiring of this block is identical to wiring the Quantum I/O connector (140XTS00200).
140CFB03200	The B block is used for individually fused 2-wire digital inputs. This terminal block is designed to prevent a single point failure from affecting the remaining inputs. It is not recommended for sourced 1-wire inputs (powered from the field).
140CFC03200	The C block provides connection for 32 group fused input or output points. The block may be used for 1- or 2-wire inputs or outputs, and features a fuse per group, four groups total. Users select input or output mode via four switches located on the module. (The default is input mode.)
140CFD03200	The D block is used for sensors requiring either 2- or 3-wire electrical interface. A fuse per group is supplied to accommodate the I/O module (4) groups.
140CFE03200	The E block provides connection for 32 individually fused 24 Vdc outputs. 1- and 2-wire interfacing may be selected. Field power must be supplied to the four groups.
140CFG01600	The G block is a high power output block used on both AC and DC circuits requiring up to 2 A. Individual fusing is provided and may be used in both 1- and 2-wire installations. It is also used for isolated AC modules.
140CFH00800	The H block is used for analog inputs, with individual fusing provided per channel. This interface provides plus, minus, shield, and power supply interface for both field and loop power configurations.
140CFI00800	The I block is used for analog inputs. This interface provides plus, minus, shield, and power supply interface for both field and loop power configurations.
140CFJ00400	The J block is used for analog outputs, with individual fusing provided per channel. This interface provides plus, minus, shield, and power supply interface for both field and loop power configurations.
140CFK00400	The K block is used for analog outputs. This interface provides plus, minus, shield, and power supply interface for both field and loop power configurations.

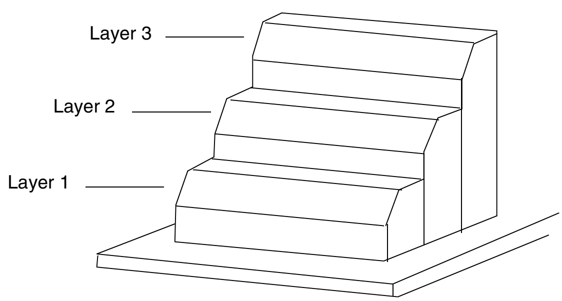
CableFast Terminal Block Features

All CableFast terminal blocks have the following features.



CableFast Terminal Block Stacking Convention

The following figure and table show the stacking convention used by CableFast terminal blocks.



Signal			Layer 3
Positive	Signal	Signal	Layer 2
Negative	Positive	Negative	Layer 1

140CFA04000 CableFast Cabling Block

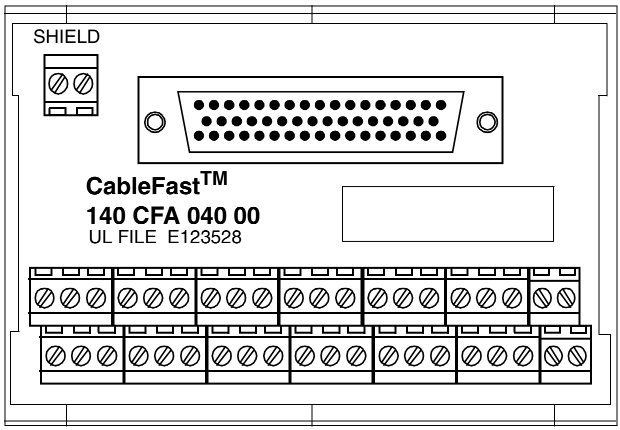
Overview

The A block is a straight through point-to-point connection on the terminal block. Wiring of this block is identical to wiring the Quantum I/O connector (140XTS00200).

See *Features of the CableFast Cabling System, p. 858* for a description of the common features and specifications of CableFast Cabling blocks.

CFA04000 Terminal Block

The following terminal block is unique to the CFA04000 module.



Application Notes

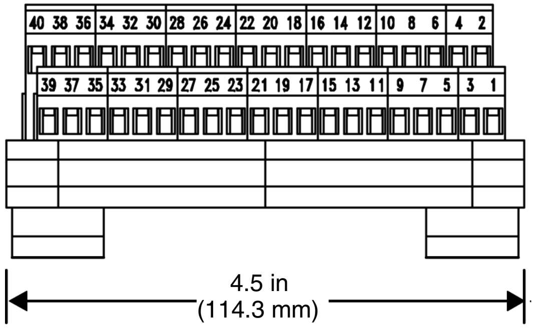
The following are the application notes for the 140CFA04000 terminal block.

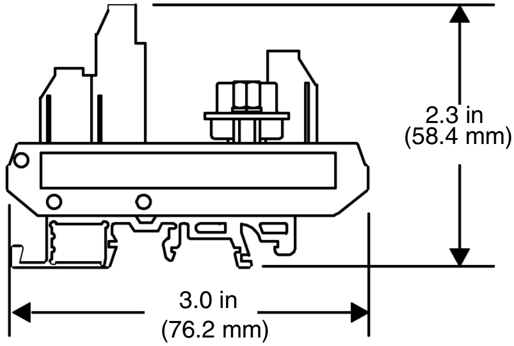
1. **Configuration** – Two columns
2. **Compatibility** – This terminal block provides straight through (point-to-point) connection.

Note: This terminal block can be used with all Quantum I/O modules with the exception of the 140ATI03000 Thermocouple Module.

Dimensions of the Terminal Block

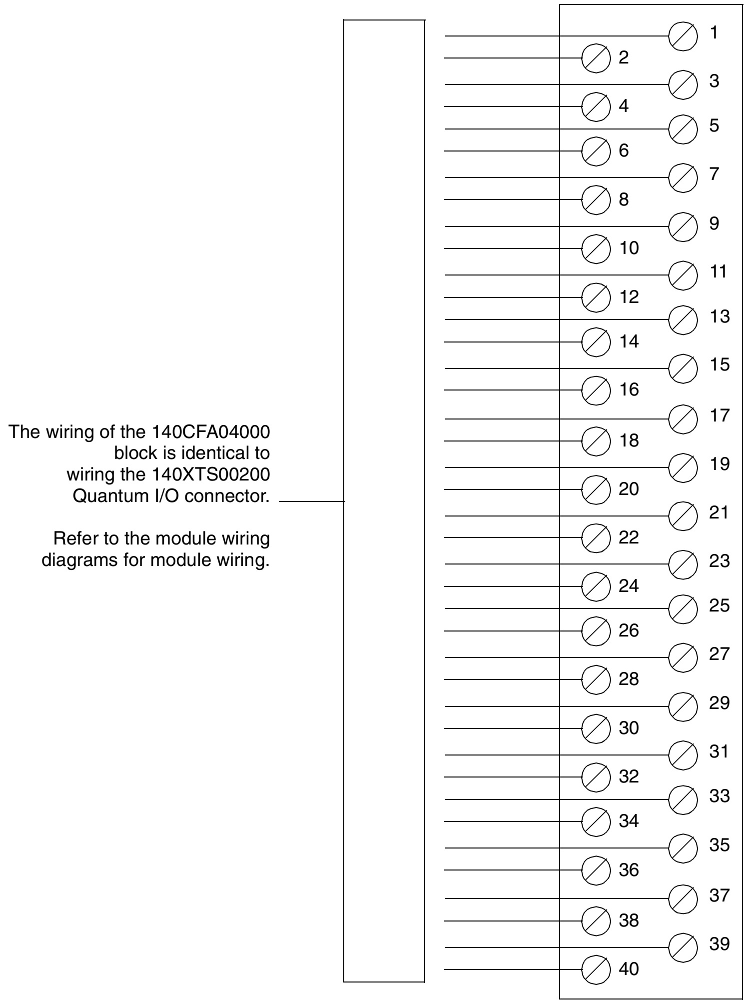
The following figures show the dimensions of the 140CFA04000 terminal block.





Wiring Figure

The following figure shows the wiring for the CFA04000 module.



140CFB03200 Quantum CableFast Cabling Block

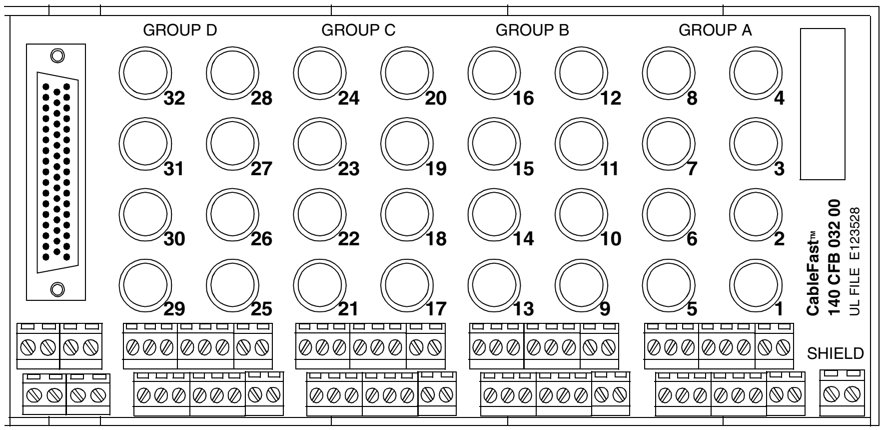
Overview

The B block is used for individually fused 2-wire digital inputs. This terminal block is designed to prevent a single point failure from affecting the remaining inputs. It is not recommended for sourced 1-wire inputs (powered from the field).

See *Features of the CableFast Cabling System, p. 858* for information on common specifications and features of CableFast cabling blocks.

Terminal Block

The following figure shows the terminal block for the 140CFB03200 module.



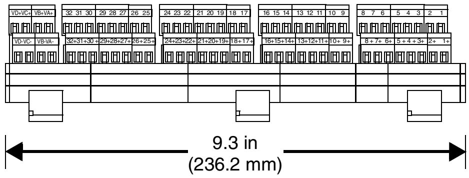
Application Notes

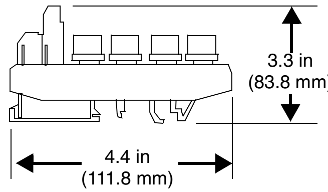
The following are the application notes for the 140CFB03200 terminal block.

1. **Configuration** – Arranged in four groups of eight I/O points. Two terminals per point prevent disruption of service due to a single point failure.
2. **Compatibility** – This terminal block provides individual 32 point 0.8 A fusing for the following input modules:140DAI35300, 140DAI45300, 140DAI55300, 140DDO15310, 140DDI35300, and 140DDI85300.

Dimensions

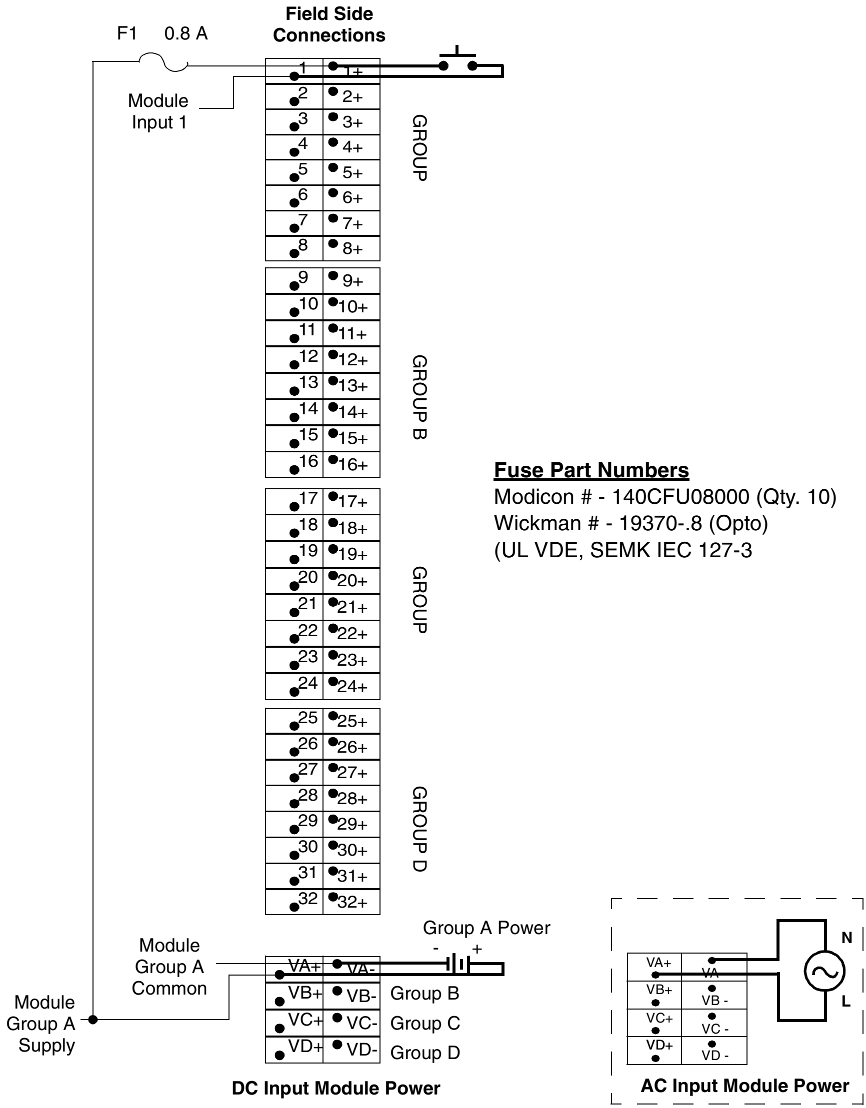
The following figures show the dimensions for the 140CFB03200 terminal block.





Wiring for the Imput Modules

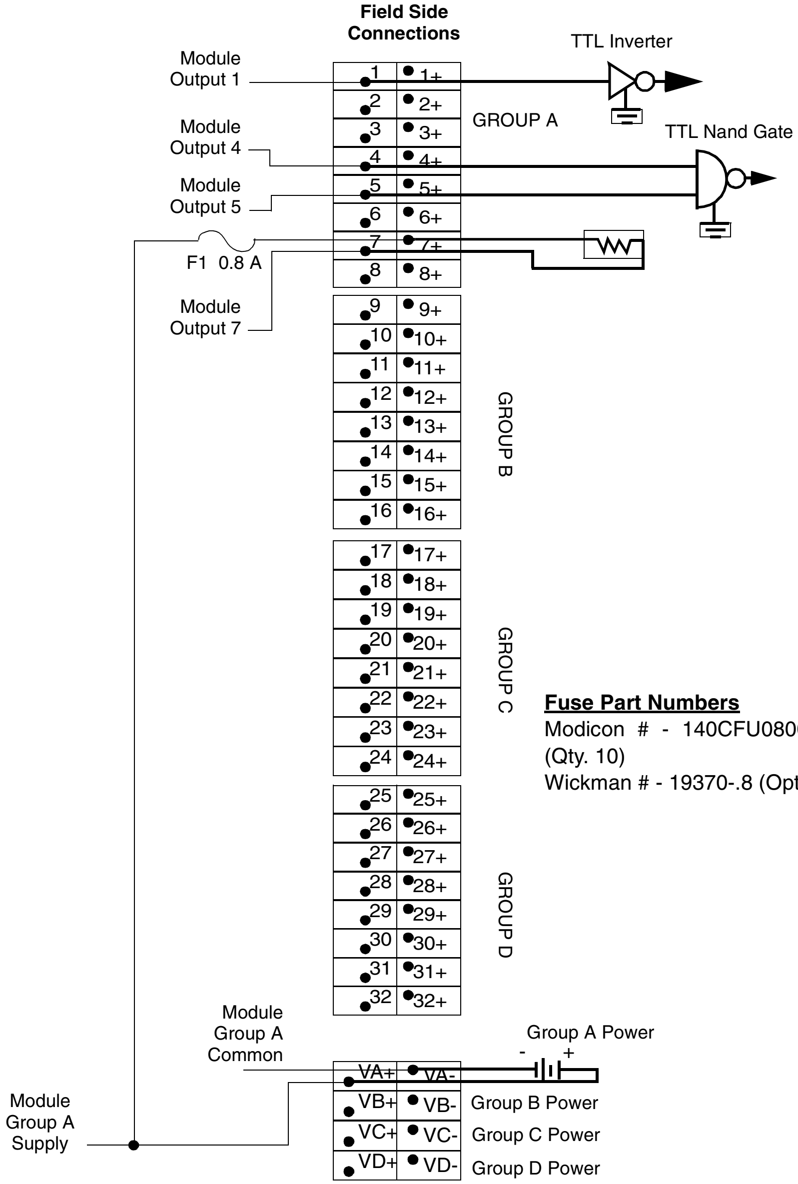
The following figure shows the 140CFB03200 wiring for the following input modules: 140DAI35300, 140DAI45300, 140DAI55300, 140DDI35300, and 140DDI85300.



Note: The terminal block commoning strip, Modicon # 140CFX00110 (Qty. 10) can be used to jumper the power between groups.

Wiring for the Output Module

The following figure shows the 140CFB03200 wiring for the 140DDO15310 output module.



Fuse Part Numbers
Modicon # - 140CFU08000 (Qty. 10)
Wickman # - 19370-.8 (Opto)

Note: The terminal block commoning strip, Modicon # 140CFX00110 (Qty. 10) can be used to jumper the power between groups.

140CFC03200 Quantum CableFast Cabling Block

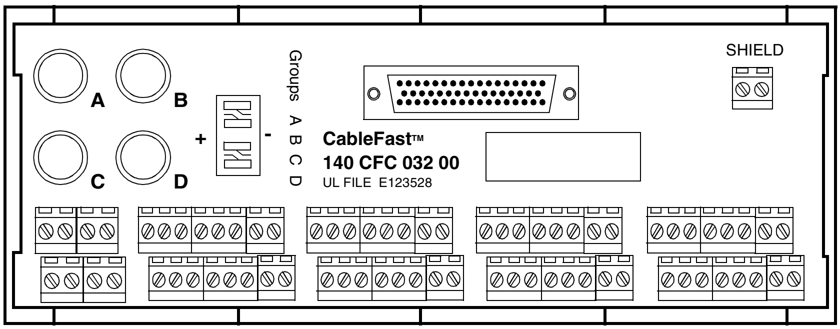
Overview

The C block provides connections for 32 group fused input or output points. The block may be used for 1- or 2-wire inputs or outputs, and features a fuse per group – four groups total. Users select input or output mode via four switches located on the module. (The default is input mode.)

See *Features of the CableFast Cabling System, p. 858* for information on common specifications and features of CableFast cabling blocks.

Terminal Block

The following figure shows the terminal block for the 140CFC03200 module.



Application Notes

The following are the application notes for the 140CFC03200 module.

1. **Configuration** – Arranged in four groups of eight I/O points (two terminals per point). This block may be used for one- and two-wire inputs or outputs. The input and output mode is selected via four switches located on the block.
2. **Compatibility** – This terminal block provides 0.8 A group fusing for the following discrete modules:

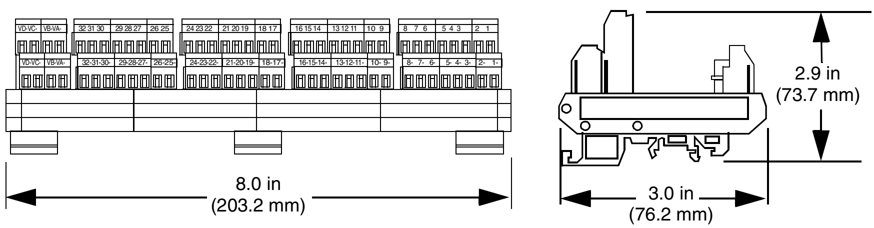
The following table shows the modules provided with 0.8 A group fusing.

Module	Mode	Switch Setting	Fuse Rating
140 DAI 353 00	Input	+	0.8 A
140 DAI 453 00	Input	+	0.8 A
140 DAI 553 00	Input	+	0.8 A
140 DDI 153 10	Input	-	0.8 A
140 DDI 353 00	Input	+	0.8 A
140 DDI 853 00	Input	+	0.8 A
140 DDO 153 10	Output	+	4 A
140 DDO 353 00	Output	-	4 A

Note: Select input or output mode with the four switches located on the terminal.

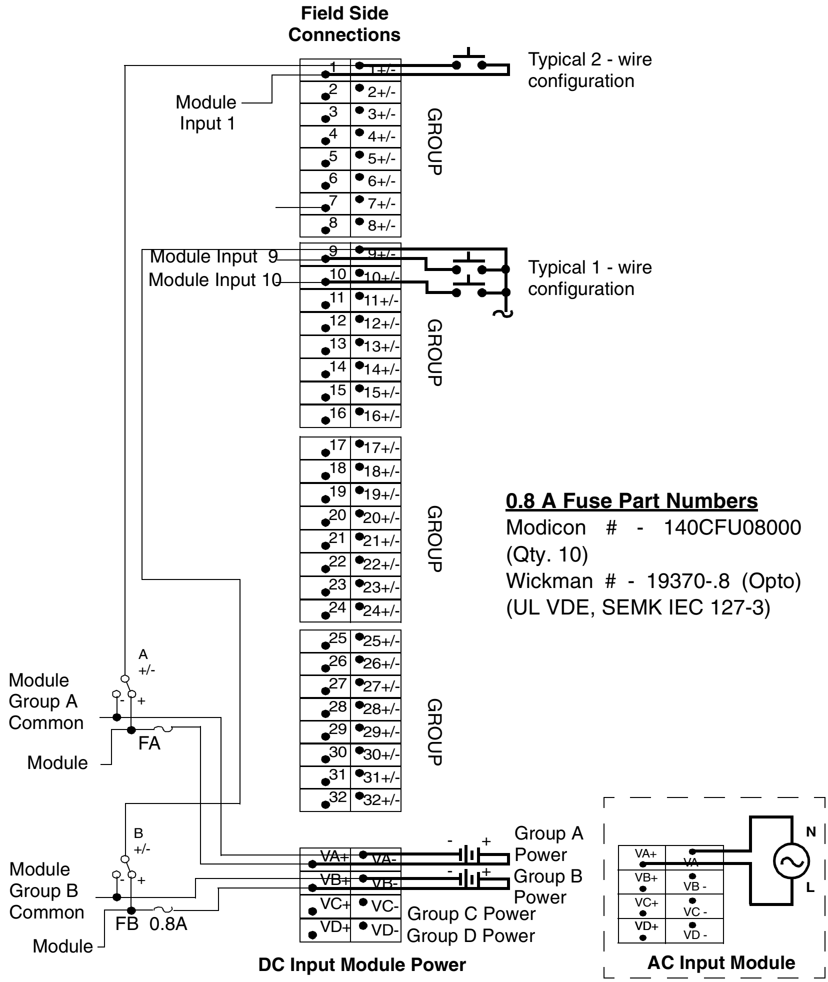
Dimensions

The following figures show the dimensions for the 140CFC03200 terminal block block. All four switches must be set to the same position.



Wiring Diagram for Input Modules

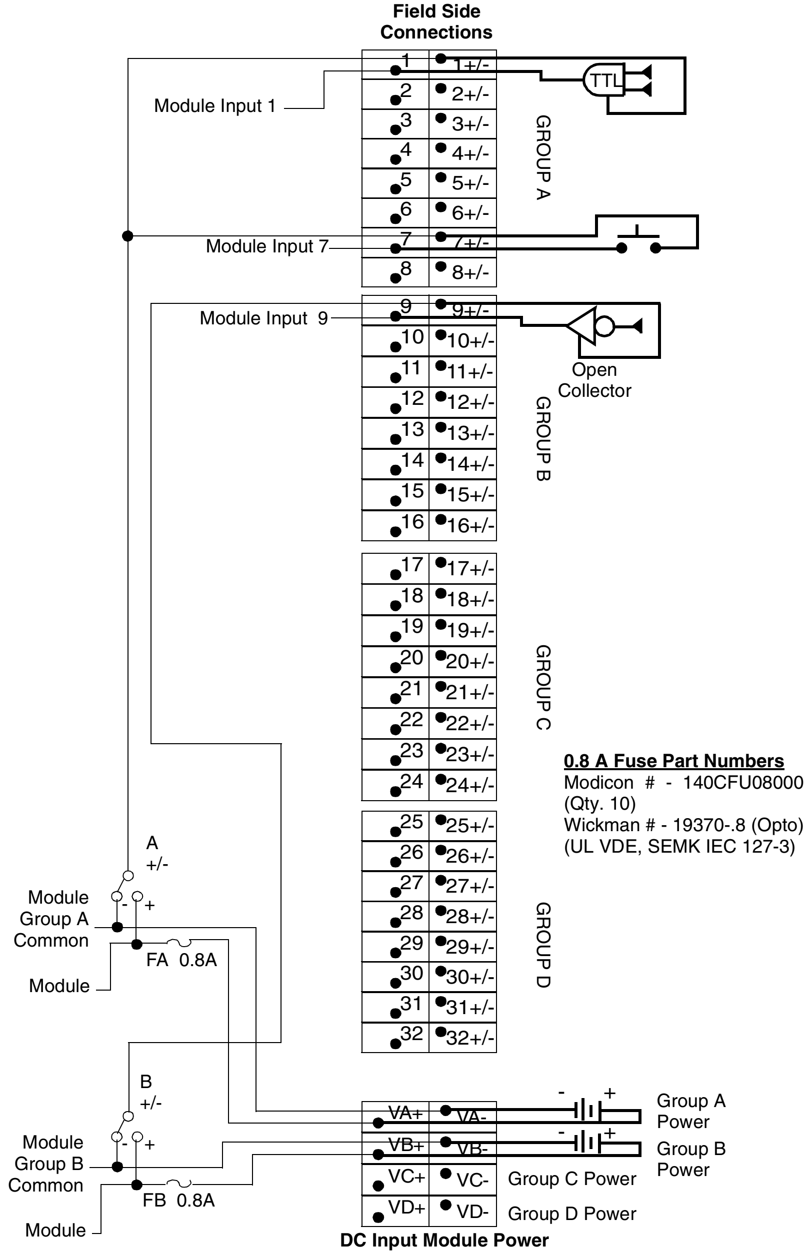
The following shows the 140CFC03200 wiring for the following input modules: 140DAI35300, 140DAI45300, 140DAI55300, 140DDI35300, and 140DDI85300.



Note: The terminal block commoning strip, Modicon # 140CFX00110 (Qty. 10), can be used to jumper the power between groups.

Wiring Diagram for DDI15310 Input Module

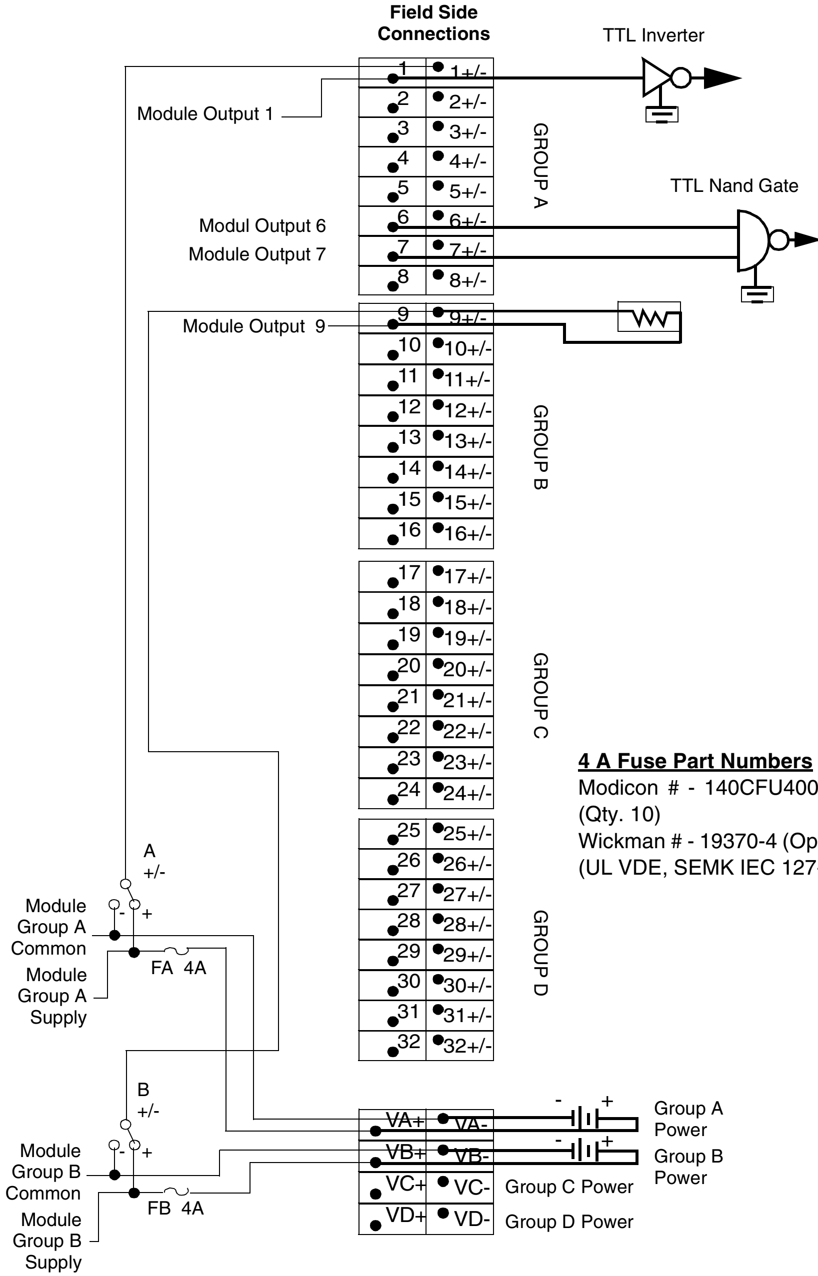
The following figure shows the 140CFC03200 wiring for the 140DDI15310 input module.



Note: The terminal block commoning strip, Modicon # 140CFX00110 (Qty. 10), can be used to jumper the power between groups.

Wiring Diagram for DDO15310 Output Module

The following figure shows the 140CFC03200 wiring for the 140DDO15310 output module.

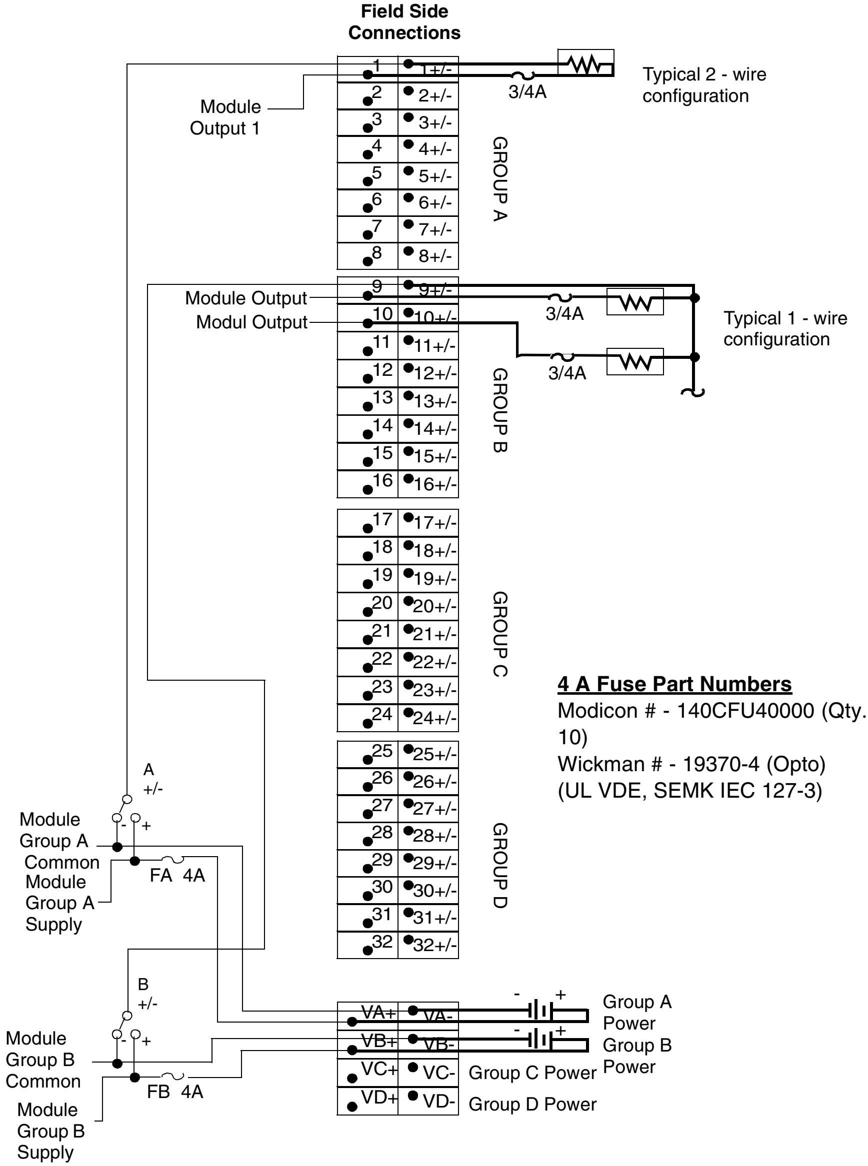


4 A Fuse Part Numbers
Modicon # - 140CFU40000 (Qty. 10)
Wickman # - 19370-4 (Opto) (UL VDE, SEMK IEC 127-3)

Note:
1. The 140CFC03200 is shipped with Modicon 140CFU08000 (0.8 A fuse) installed. Ensure that the Modicon 140CFU40000 (4 A fuse) is installed when the 140CFC03200 and the 140DDO15300 are wired together.
2. The terminal block commoning strip, Modicon 140CFX00110 (Qty. 10), can be used to jumper the power between groups.

Wiring Diagram for DDO3530X Output Module

The following figure shows the 140CFC03200 wiring for the 140DDO35300 and 140DDO35301 output modules.



Note:

1. The 140CFC03200 is shipped with Modicon 140CFU08000 (0.8 A fuse) installed. Ensure that the Modicon 140CFU40000 (4 A fuse) is installed when the 140CFC03200 and the 140DDO35300 are wired together.
2. The terminal block commoning strip, Modicon 140CFX00110 (Qty. 10), can be used to jumper the power between groups.

140CFD03200 Quantum CableFast Cabling Block

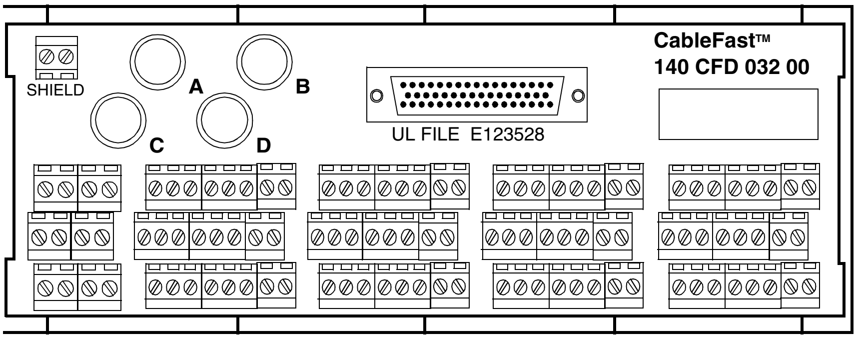
Overview

The D block is used for sensors requiring either 2- or 3-wire electrical interfaces. A fuse per group is supplied to accommodate the I/O module (4) groups.

See *Features of the CableFast Cabling System, p. 858* for information on common specifications and features of CableFast cabling blocks.

Terminal Block

The following figure shows the 140CFD03200 terminal block.



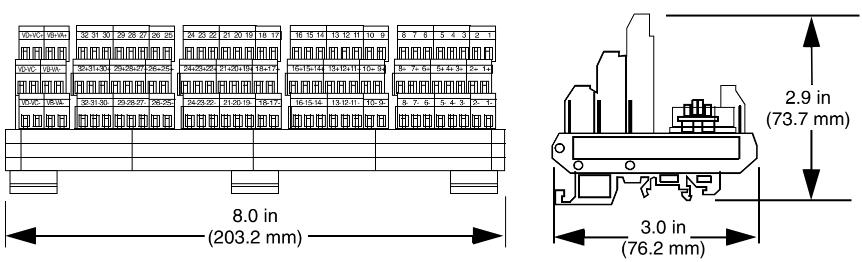
Application Notes

The following are the application notes for the 140CFD03200 module.

1. **Configuration** – Arranged in four groups of eight I/O points. Each input is allocated three terminals.
2. **Compatibility** – This terminal block provides 0.8 A group fusing connection points for 3-wire and 2-wire proximity switches and is used with the following modules: 140DAI35300, 140DAI45300, 140DAI55300, 140DDI35300, and 140DDI85300.

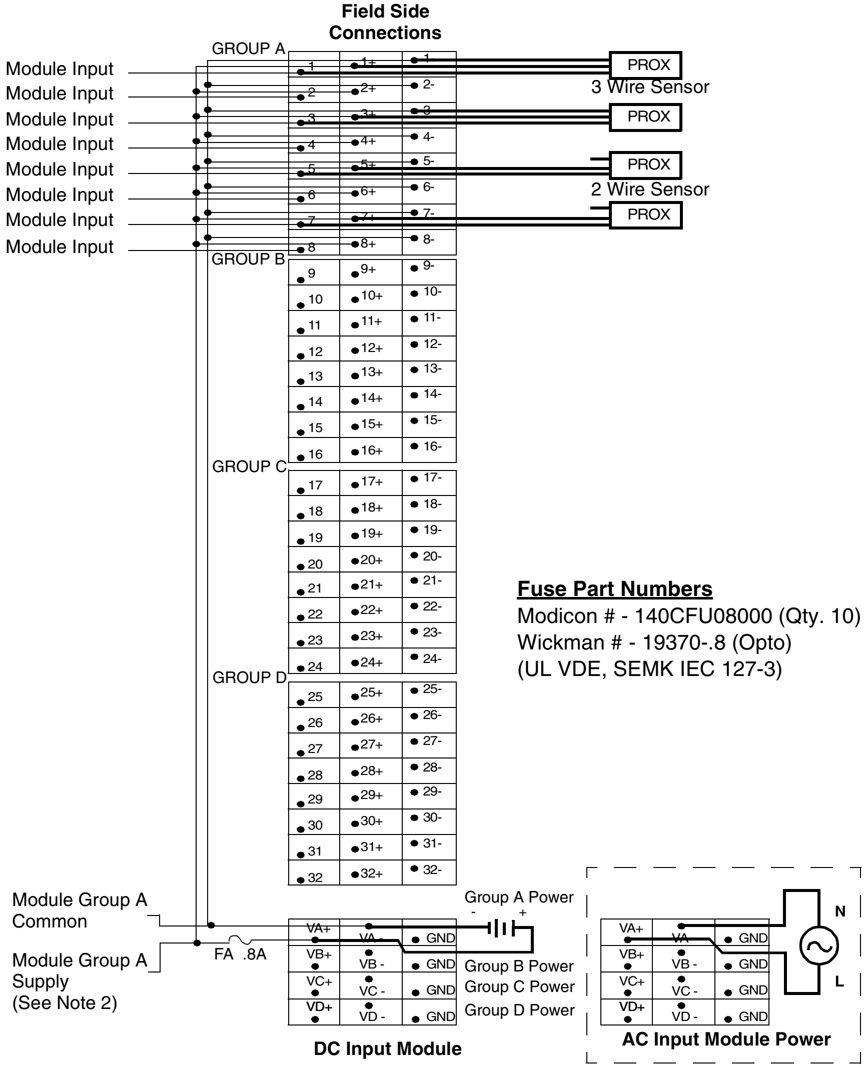
Dimensions

The following shows the dimensions for the 140CFD03200 module.



Wiring Diagram

The following figure shows the wiring for the 140CFD03200 module.



Fuse Part Numbers

Modicon # - 140CFU08000 (Qty. 10)
Wickman # - 19370-.8 (Opto)
(UL VDE, SEMK IEC 127-3)

Note:
1. The GND (ground) terminal points are not connected.
2. The terminal block commoning strip, Modicon # 140CFX00110 (Qty. 10), can be used to jumper the power between groups.

140CFE03200 Quantum CableFast Cabling Block

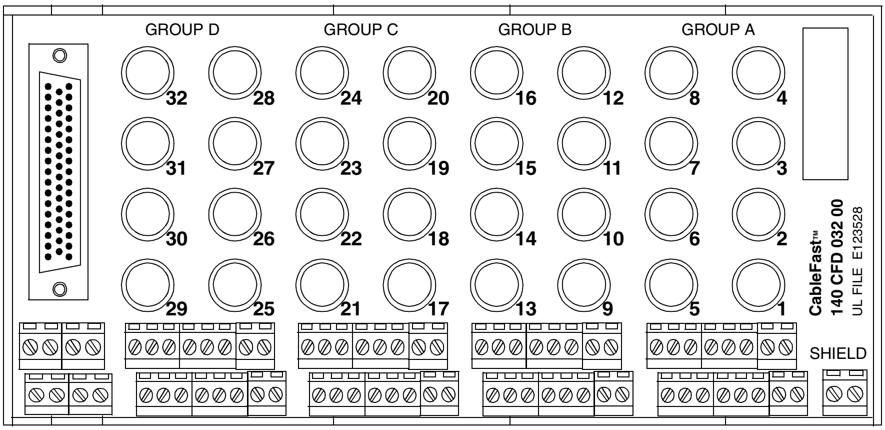
Overview

The E block provides connections for 32 individually fused 24 Vdc outputs. 1- and 2-wire interfacing may be selected. Field power must be supplied to the four groups.

See *Features of the CableFast Cabling System, p. 858* for information on common specifications and features of CableFast cabling blocks.

Terminal Block

The following figure shows the 140CFE03200 terminal block.



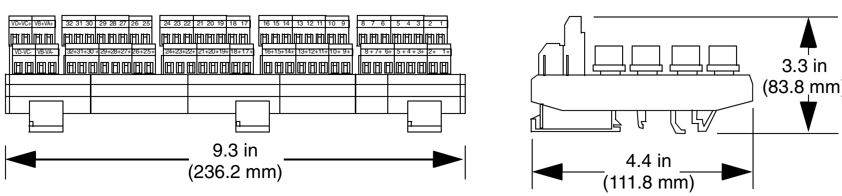
Application Notes

The following are the application notes for the 140CFE03200 module.

1. **Configuration** – Arranged in four groups of eight I/O points. Two terminals per point prevent disruption of service due to a single point failure.
2. **Compatibility** – This terminal block provides individual 32 point 0.8 A fusing for the 140DDO35300 and the 140DDO35301 modules.

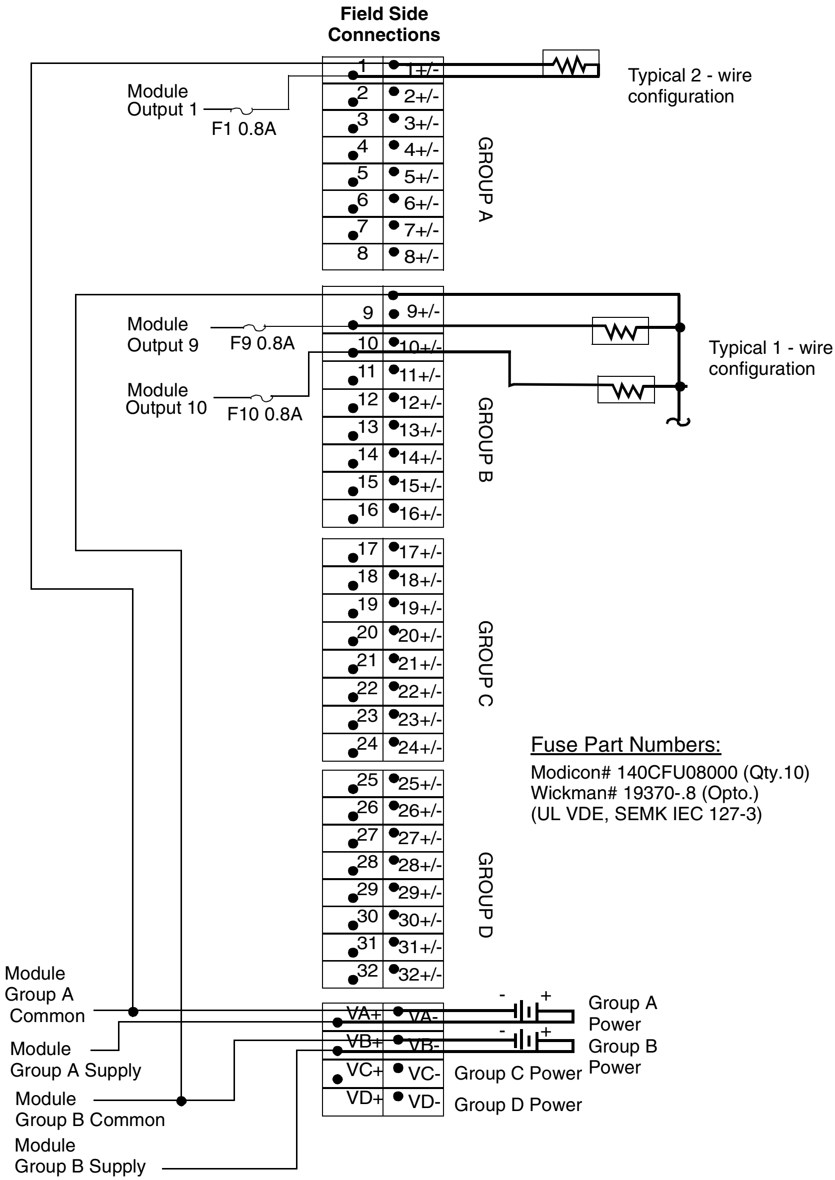
Dimensions

The following shows the dimensions for the 140CFE03200 module.



Wiring Diagram

The following figure shows the wiring for the 140CFE03200 module.



> **Note:** The terminal block commoning strip, Modicon #140CFX00110 (QTY. 10), can be used to jumper the power between groups.

140CFG01600 Quantum CableFast Cabling Block

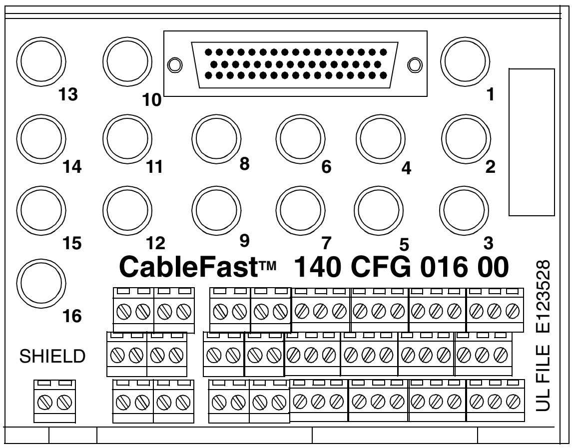
Overview

The G block is a high-power output block used on both AC and DC circuits requiring up to 2 A. Individual fusing is provided and may be used in both 1- and 2-wire installations. It is also used for isolated AC modules.

See *Features of the CableFast Cabling System, p. 858* for information on common specifications and features of CableFast cabling blocks.

Terminal Block

The following figure shows the 140CFG01600 terminal block.



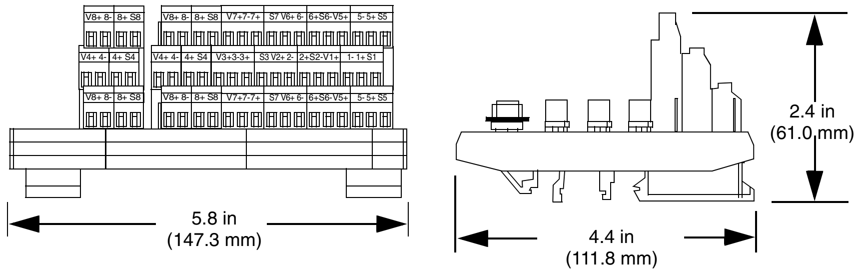
Application Notes

The following are the application notes for the 140CFG01600 module.

1. **Configuration** – Arranged in 16 isolated I/O points.
2. **Compatibility** – This terminal block provides individual 16 point 4 A fused connection points for the following modules: 140DAI34000, 140DAI44000, 140DAI54000, 140DAO84000, 140DAO84010, 140DAO84210, 140DAO84220, and 140DDO84300.

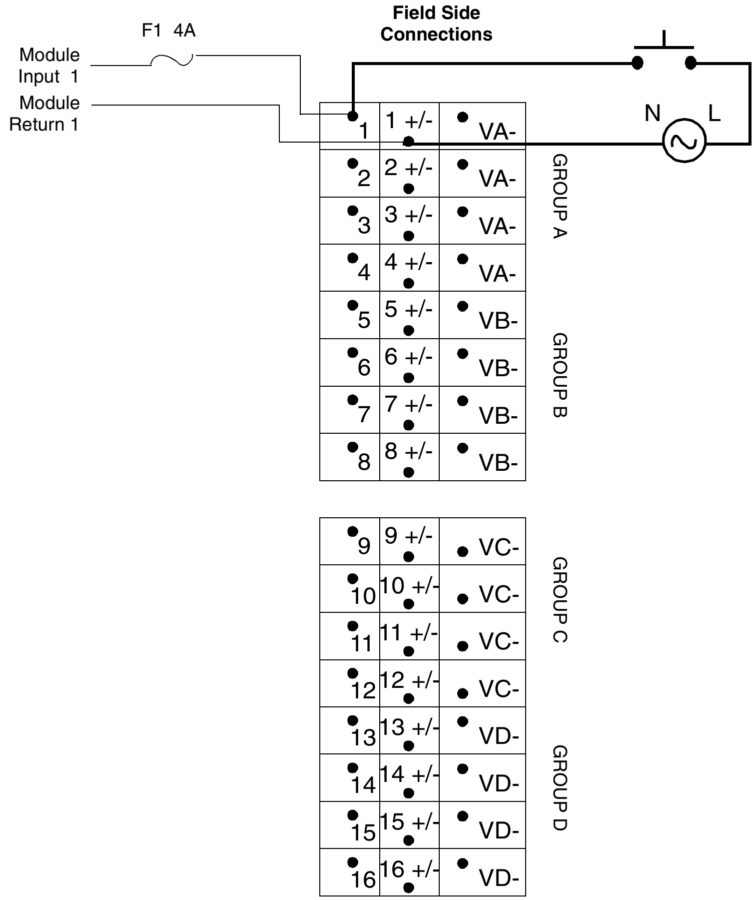
Dimensions

The following figures show the dimensions for the 140CFG01600 module.



Wiring Diagram for Isolated AC Input Mode

The following figure shows the 140CFG01600 wiring for the input (isolated AC input mode) modules: 140DAI34000, 140DAI44000, and 140DAI54000.



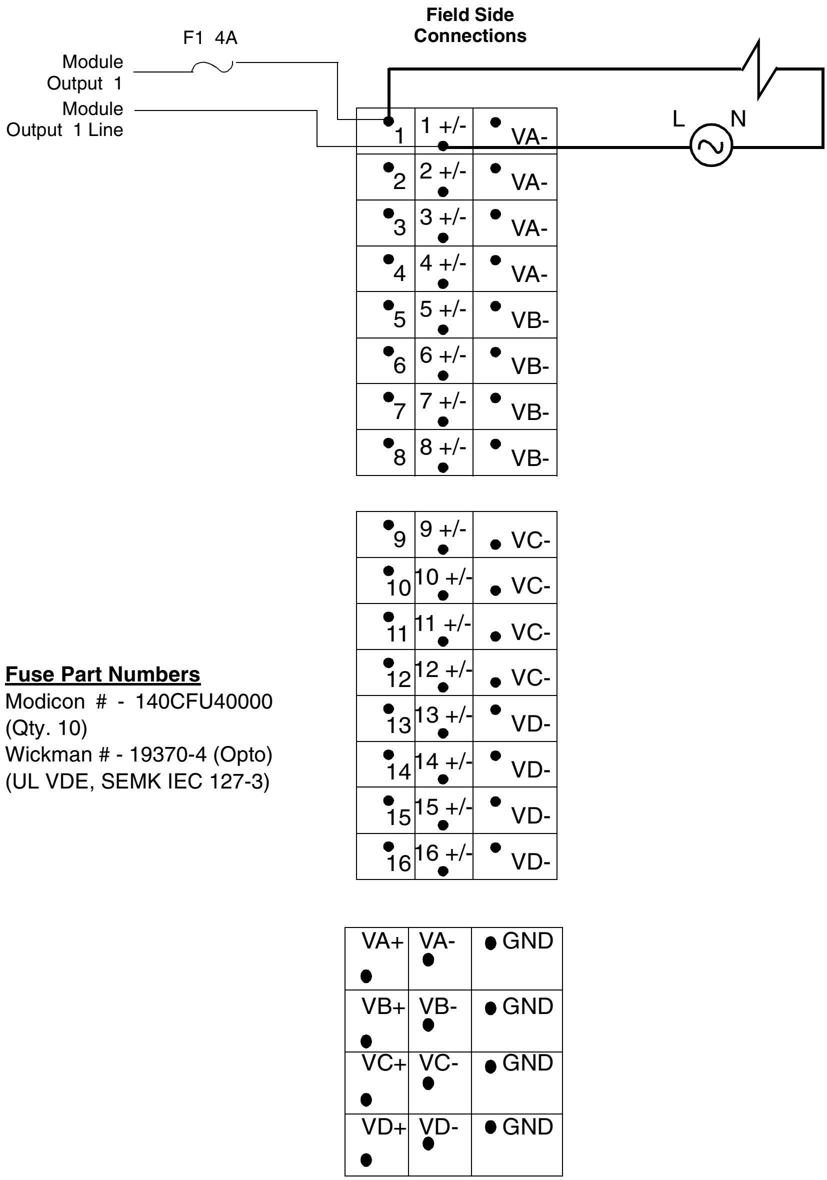
Fuse Part Numbers
Modicon # - 140CFU40000 (Qty. 10)
Wickman # - 19370-4 (Opto) (UL VDE, SEMK IEC 127-3)

VA+	VA-	GND
VB+	VB-	GND
VC+	VC-	GND
VD+	VD-	GND

Note:
1. The terminal block commoning strip, Modicon # 140CFX00110 (Qty. 10), can be used to jumper the power between groups.
2. The GND (ground) terminal points are not connected.

Wiring Diagram for Isolated Output Mode

The following shows the 140CFG01600 wiring for the 140DAO84000 and 140DAO84010 output modules (isolated output mode).

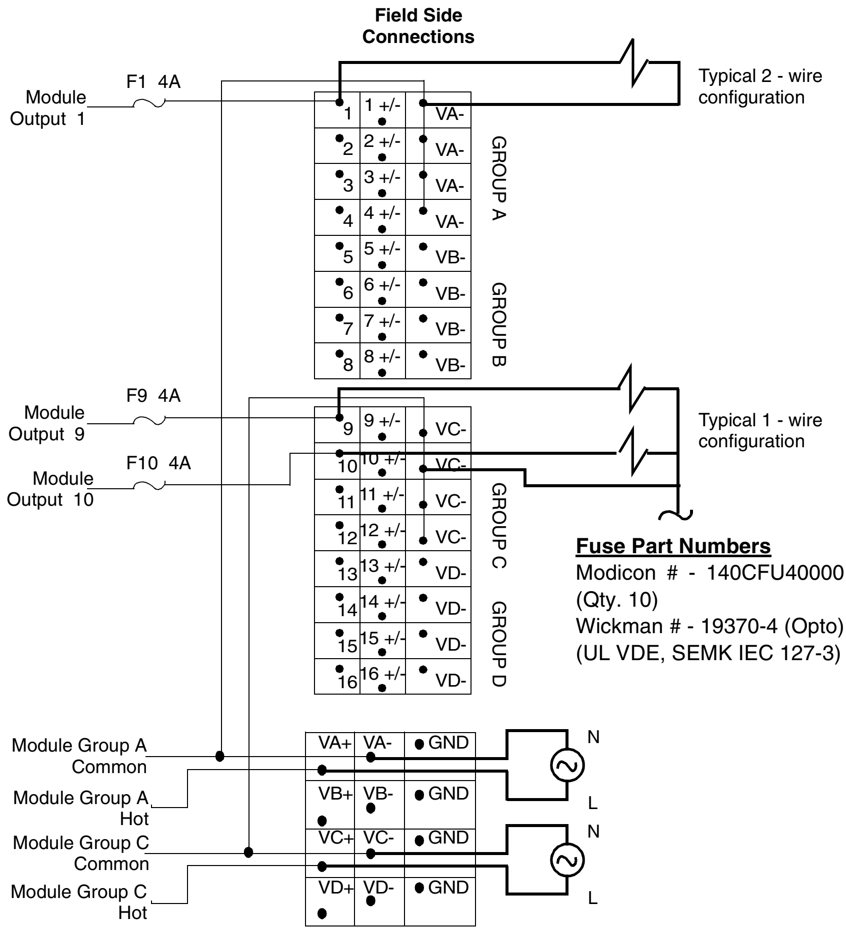


Fuse Part Numbers
Modicon # - 140CFU40000 (Qty. 10)
Wickman # - 19370-4 (Opto) (UL VDE, SEMK IEC 127-3)

Note:
1. The terminal block commoning strip, Modicon # 140CFX00110 (Qty. 10), can be used to jumper the power between groups.
2. The GND (ground) terminal points are not connected

Wiring Diagram for Grouped AC Output Mode

The following figure shows the 140CFG01600 wiring for the 140DA084210 and 140DAO84220 output modules (grouped AC output mode).



Fuse Part Numbers

Modicon # - 140CFU40000 (Qty. 10)

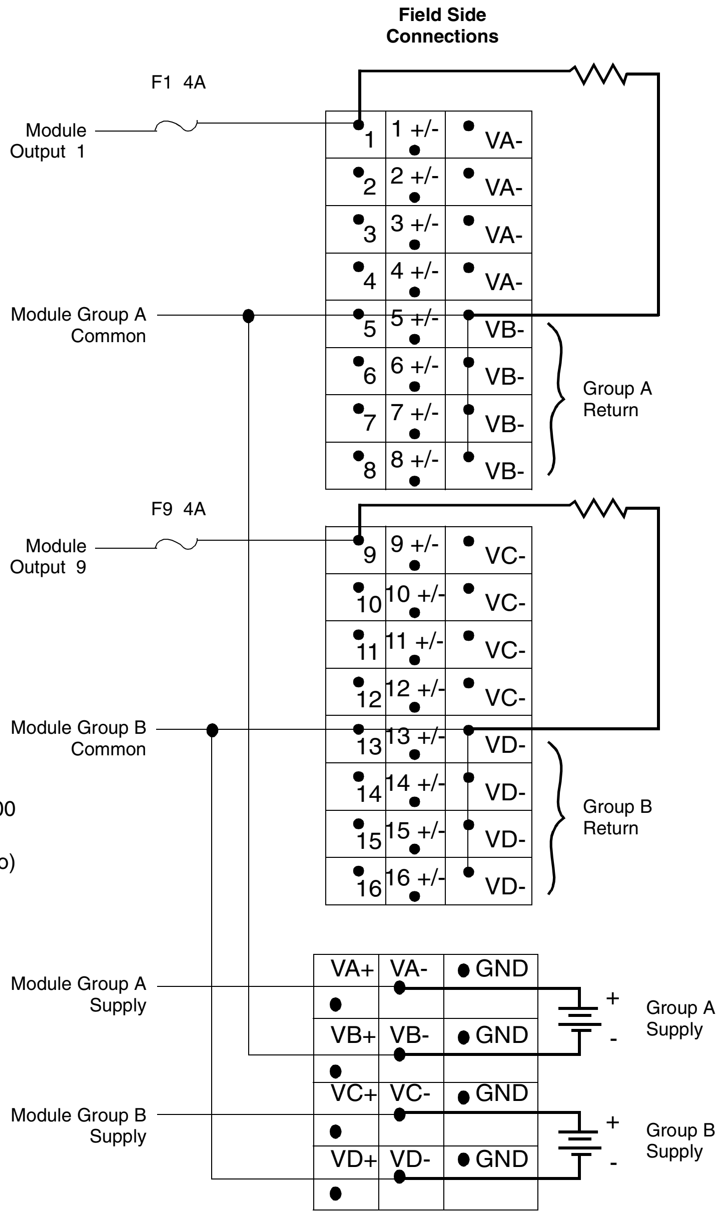
Wickman # - 19370-4 (Opto) (UL VDE, SEMK IEC 127-3)

Note:

1. The terminal block commoning strip, Modicon # 140CFX00110 (Qty. 10), can be used to jumper the power between groups.
2. The GND (ground) terminal points are not connected.

Wiring Diagram for Grouped DC Output Mode

The following figure shows the 140CFG01600 wiring for the 140DDO84300 (grouped DC output mode) module.



Fuse Part Numbers

Modicon # - 140CFU40000 (Qty. 10
Wickman # - 19370-4 (Opto)
(UL VDE, SEMK IEC 127-3)

Note:
1. The terminal block commoning strip, Modicon # 140CFX00110 (Qty. 10), can be used to jumper the power between groups.
2. The GND (ground) terminal points are not connected.

140CFH00800 Quantum CableFast Cabling Block

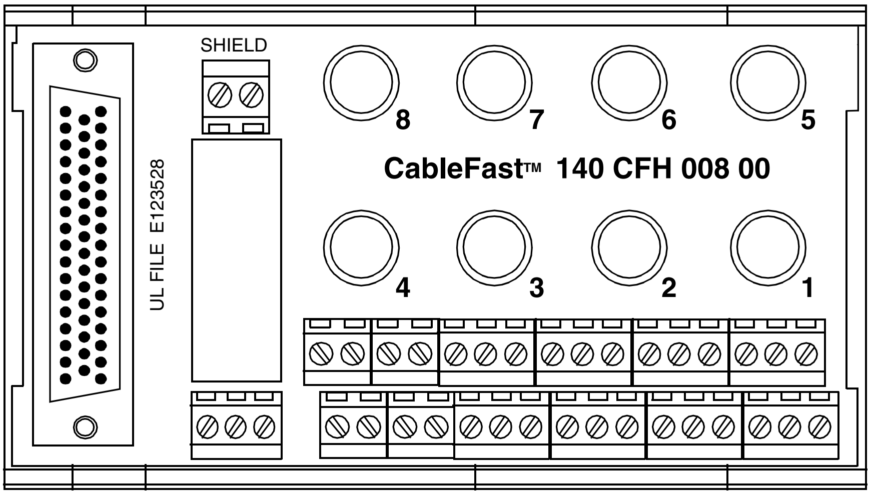
Overview

The H block is used for analog inputs, with individual fusing provided per channel. This interface provides plus, minus, shield, and power supply interface for both field and loop power configurations.

See *Features of the CableFast Cabling System, p. 858* for information on common specifications and features of CableFast cabling blocks.

Terminal Block

The following figure shows the 140CFH00800 terminal block.



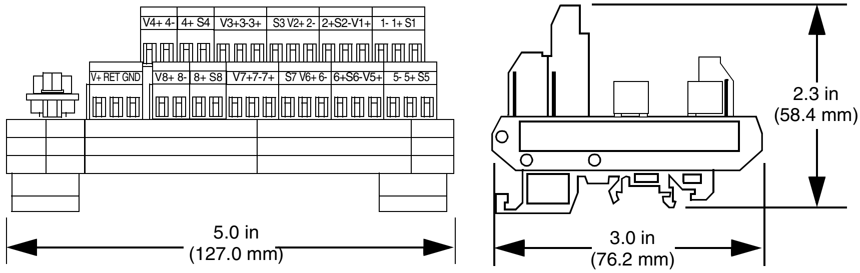
Application Notes

The following are the application notes for the 140CFH00800 module.

1. **Configuration** – Eight analog inputs with a common loop supply. Each point is allocated four terminals.
2. **Compatibility** – This terminal block provides individually 0.063 A fused connection point sets for the 140ACI03000 and 140AVI03000 analog input modules.

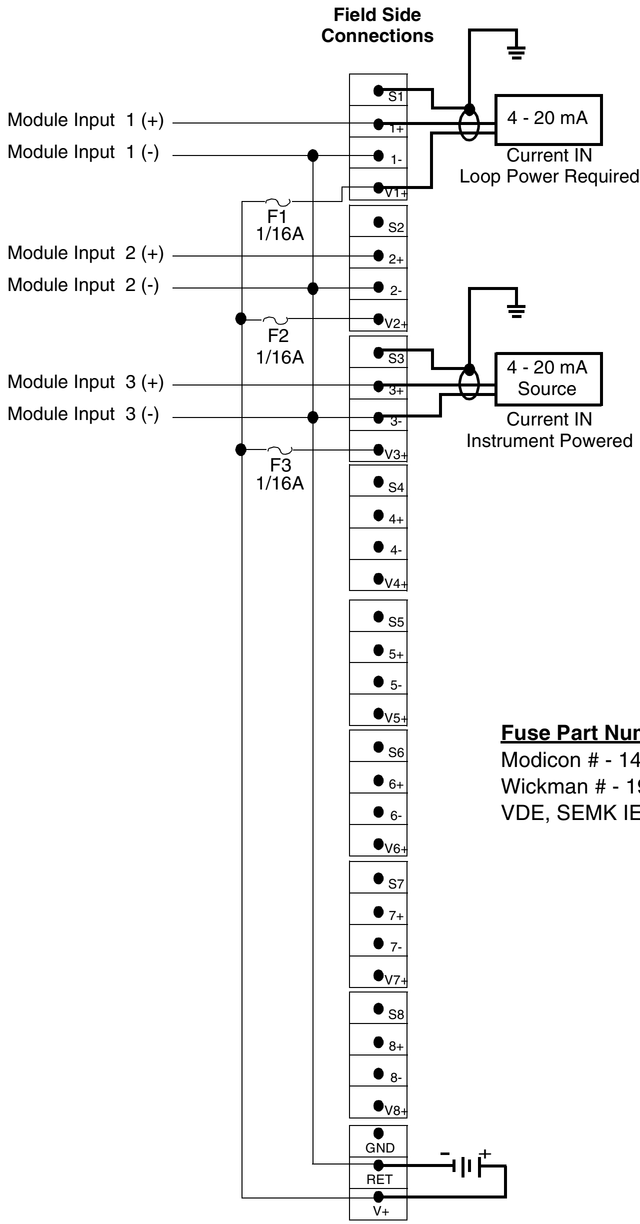
Dimensions

The following figures show the dimensions for the 140CFH00800 module.



Wiring Diagram (Source Grounding)

The following figure shows the wiring for the 140CFH00800 (source grounding) module.



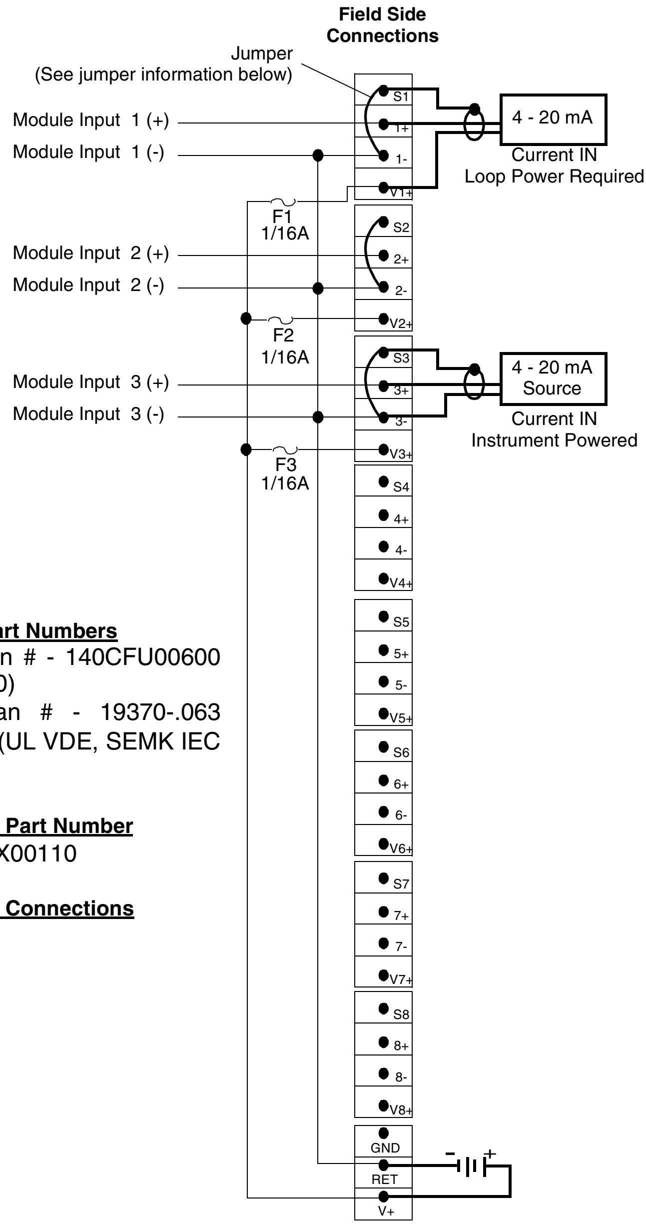
Fuse Part Numbers
Modicon # - 140CFU00600 (Qty. 10)
Wickman # - 19370-.063 (Opto) (UL VDE, SEMK IEC 127-3)

Note:

1. When using a single power supply, there will be no channel-to-channel isolation of input points.
2. For the required jumper options for the 140ACI03000 and the 140AVI03000, see the wiring diagrams in *140ACI03000 I/O Analog In Module, p. 533* and *140AVI03000 I/O Analog IN 8 Channel Bipolar Module, p. 553*.
3. The GND (ground) terminal point is not connected.

Wiring Diagram (Instrument Grounding)

The following figure shows the wiring (instrument grounding) for the 140CFH00800 module.



Fuse Part Numbers

Modicon # - 140CFU00600 (Qty. 10)

Wickman # - 19370-.063 (Opto) (UL VDE, SEMK IEC 127-3)

Jumper Part Number

140CFX00110

Jumper Connections

S1 to 1-

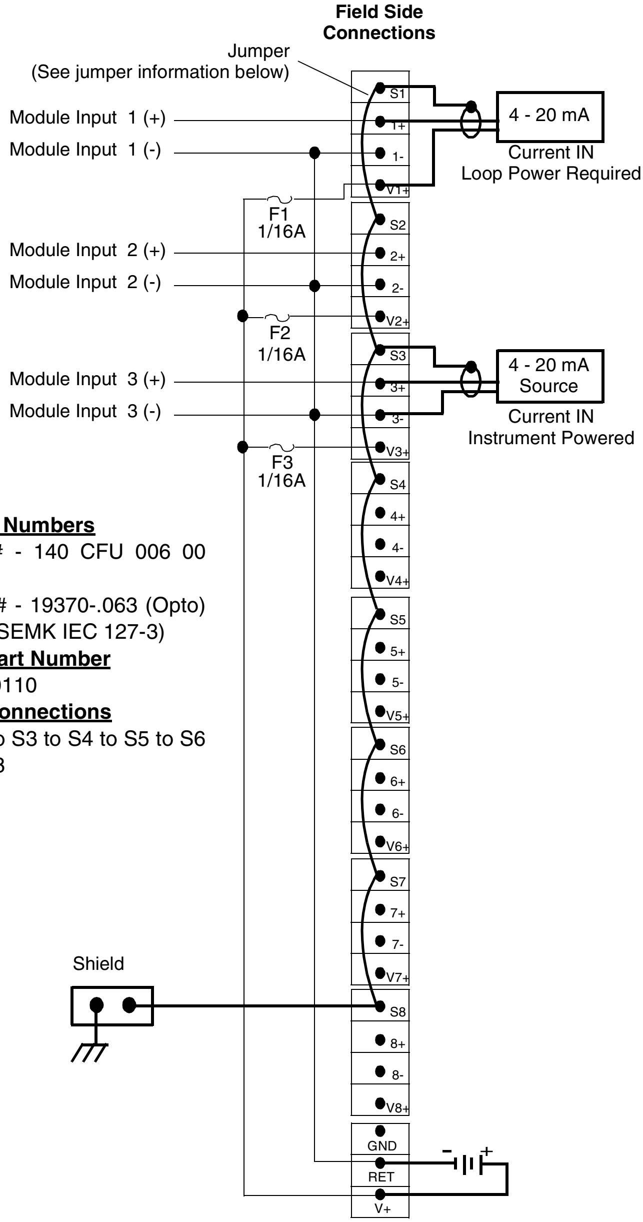
S2 to 2-

S3 to 3-

Note:
- When using a single power supply, there will be no channel-to-channel isolation of input points.
- For the required jumper options for the 140ACI03000 and the 140AVI03000, see the wiring diagrams in *140ACI03000 I/O Analog In Module, p. 533*. and *140AVI03000 I/O Analog IN 8 Channel Bipolar Module, p. 553*.
- The GND (ground) terminal point is not connected.

Wiring Diagram (Chassis Grounding)

The following figure shows the wiring (chassis grounding) for the 140CFH00800 module.



Fuse Part Numbers
Modicon # - 140 CFU 006 00 (Qty. 10)
Wickman # - 19370-.063 (Opto) (UL VDE, SEMK IEC 127-3)

Jumper Part Number
140CFX00110

Jumper Connections
S1 to S2 to S3 to S4 to S5 to S6 to S7 to S8

Note:
1. When using a single power supply, there will be no channel-to-channel isolation of input points.
2. For the required jumper options for the 140ACI03000 and the 140AVI03000, see the wiring diagrams in *140ACI03000 I/O Analog In Module, p. 533*. and *140AVI03000 I/O Analog IN 8 Channel Bipolar Module, p. 553*.
3. The GND (ground) terminal point is not connected.

140CFI00800 Quantum CableFast Cabling Block

Overview

The I block is used for analog inputs. This interface provides plus, minus, shield, and power supply interfaces for both field and loop power configurations.

See *Features of the CableFast Cabling System, p. 858* for information on common specifications and features of CableFast cabling blocks.

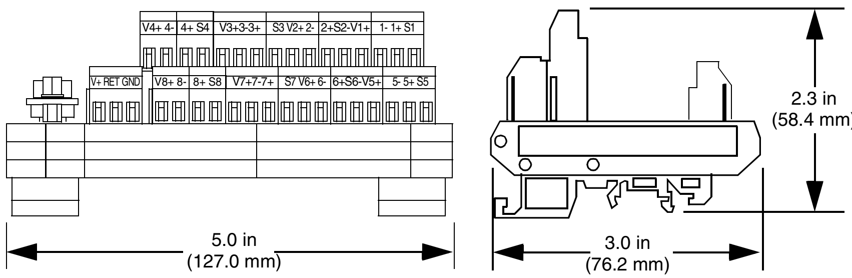
Application Notes

The following are the application notes for the 140CFI00800 module.

1. **Configuration** – Eight analog inputs with a common loop supply. Each point is allocated four terminals.
2. **Compatibility** – This terminal block provides eight connection point sets for the 140ACI03000 and 140AVI03000 analog input modules.

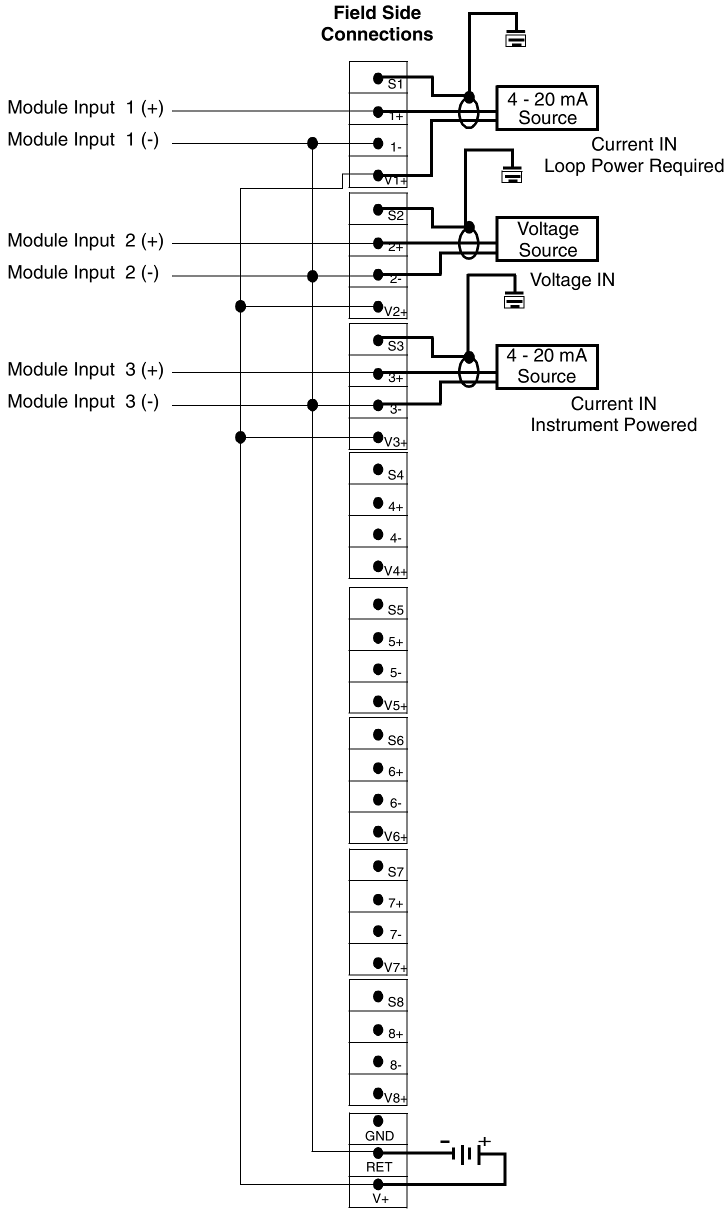
Dimensions

The following figures show the dimensions for the 140CFI00800 module.



Wiring Diagram (Source Grounding)

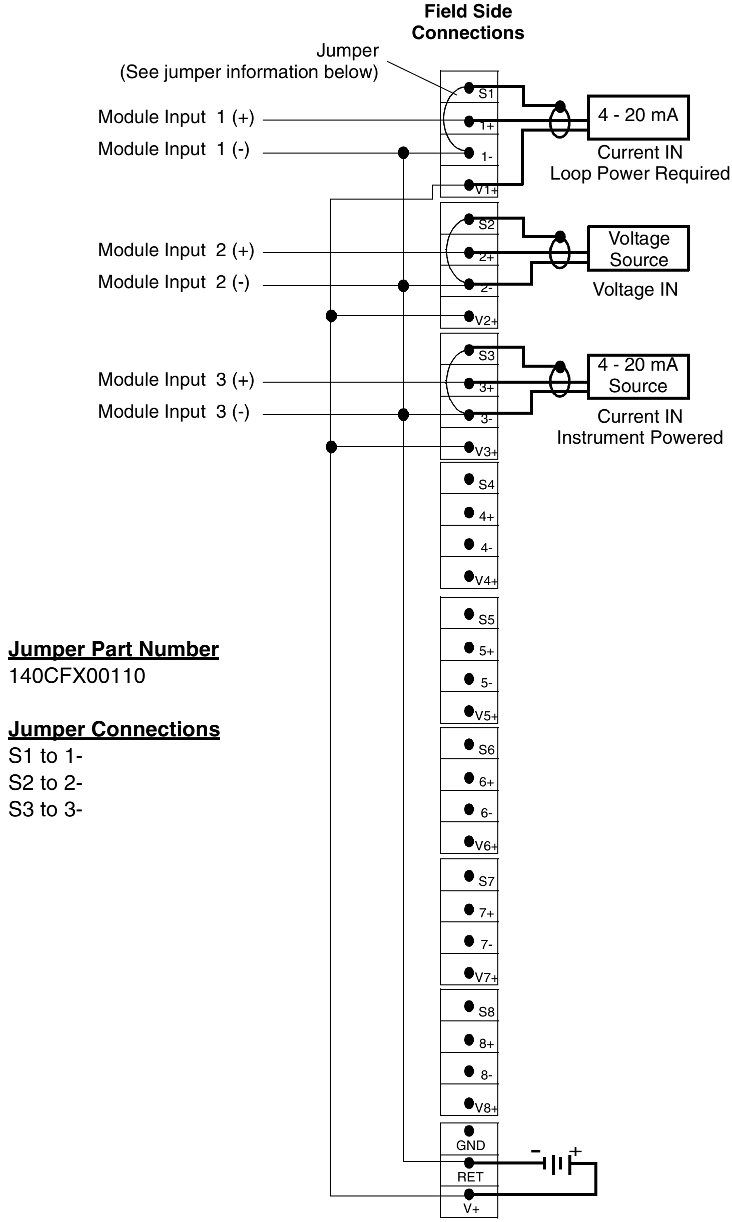
The following figure shows the wiring for the140CFI00800 (source grounding) module.



Note:
1. When using a single power supply, there will be no channel-to-channel isolation of input points.
2. For the required jumper options for the 140ACI03000 and the 140AVI03000, see the wiring diagrams in *140ACI03000 I/O Analog In Module, p. 533* and *140AVI03000 I/O Analog IN 8 Channel Bipolar Module, p. 553*.
3. The GND (ground) terminal point is not connected.

Wiring Diagram (Instrument Grounding)

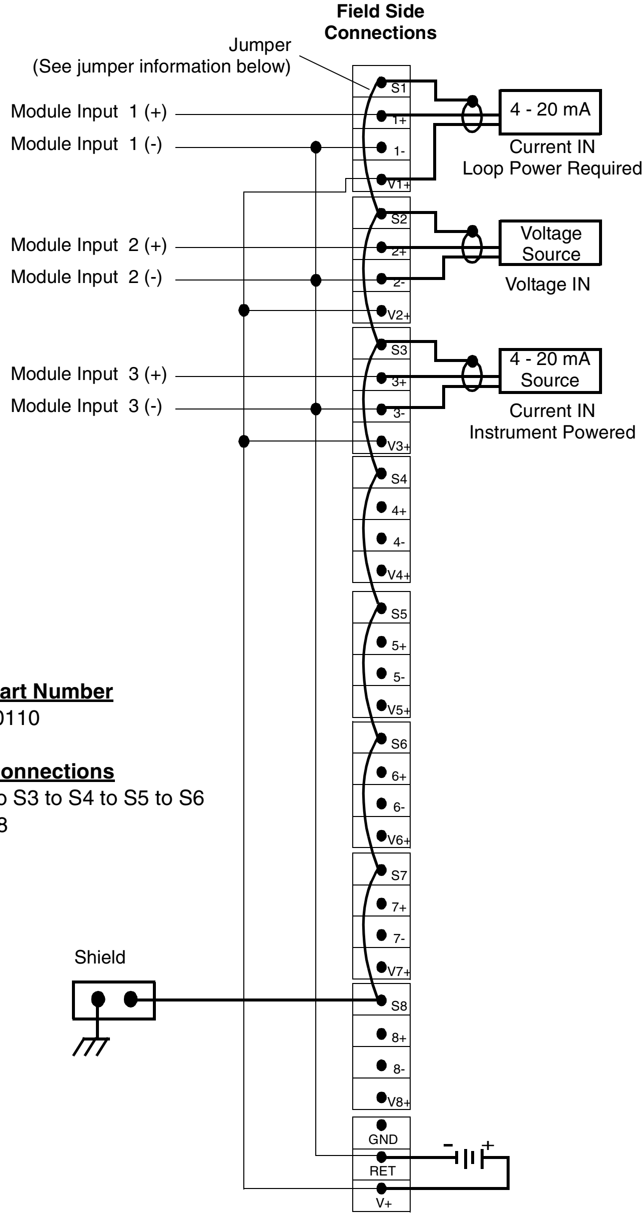
The following figure shows the wiring for the140CFI00800 (instrument grounding) module.



Note:
1. When using a single power supply, there will be no channel-to-channel isolation of input points.
2. For the required jumper options for the 140ACI03000 and the 140AVI03000, see the wiring diagrams in *140ACI03000 I/O Analog In Module, p. 533* and *140AVI03000 I/O Analog IN 8 Channel Bipolar Module, p. 553*..
3. The GND (ground) terminal point is not connected.

Wiring Diagram (Chassis Grounding)

The following figure shows the wiring for the 140CFI00800 (chassis grounding) module.



Jumper Part Number
140CFX00110

Jumper Connections
S1 to S2 to S3 to S4 to S5 to S6 to S7 to S8

Note:
1. When using a single power supply, there will be no channel-to-channel isolation of input points.
2. For the required jumper options for the 140ACI03000 and the 140AVI03000, see the wiring diagrams in *140ACI03000 I/O Analog In Module, p. 533* and *140AVI03000 I/O Analog IN 8 Channel Bipolar Module, p. 553* .
3. The GND (ground) terminal point is not connected.

140CFJ00400 Quantum CableFast Cabling Block

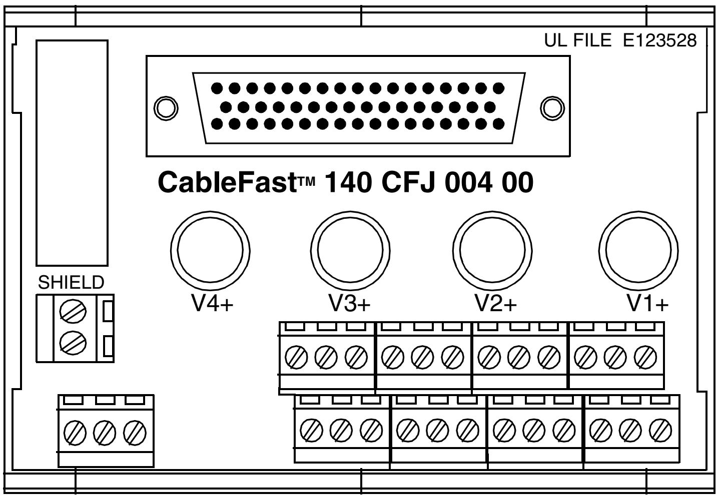
Overview

The J block is used for analog outputs, with individual fusing provided per channel. This interface provides plus, minus, shield, and power supply interfaces for both field and loop power configurations.

See *Features of the CableFast Cabling System, p. 858* for information on common specifications and features of CableFast cabling blocks.

Terminal Block

The following figure shows the 140CFJ00400 terminal block.



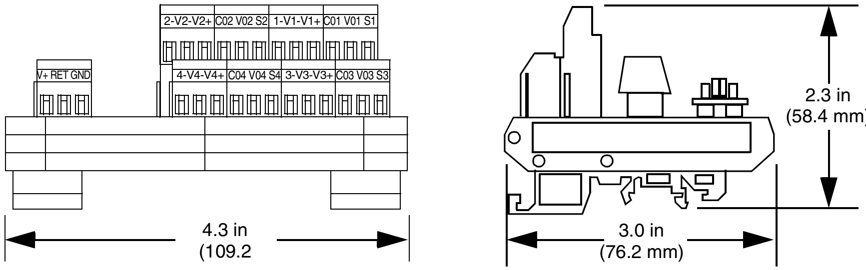
Application Notes

The following are the application notes for the 140CFJ00400 module.

1. **Configuration** – Four analog outputs with a common loop supply. Each point is allocated six terminals.
2. **Compatibility** – This terminal block provides four individually 0.063 A fused connection point sets for the 140ACO02000 analog output module.

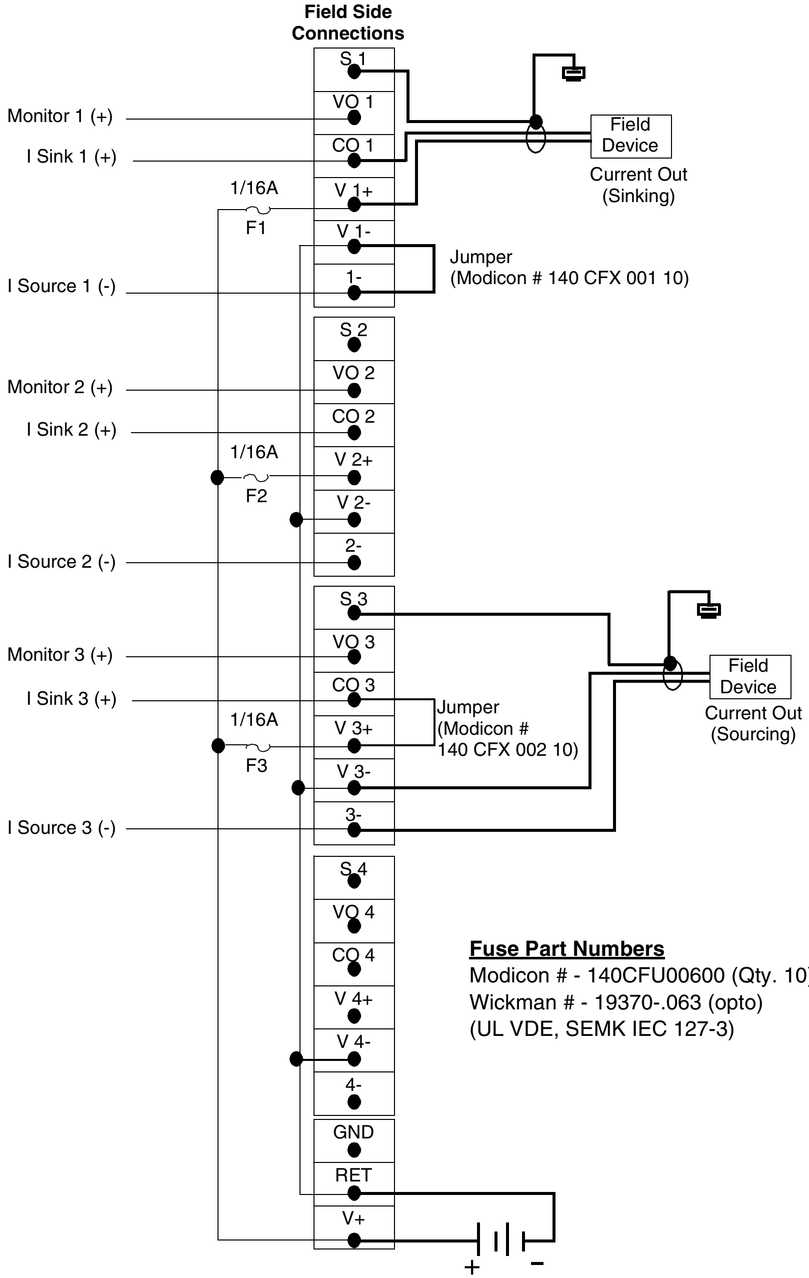
Dimensions

The following figures show the dimensions for the 140CFJ00400 module.



Wiring Diagram (Source Grounding)

The following figure shows the wiring for the 140CFJ00400 (source grounding) module.



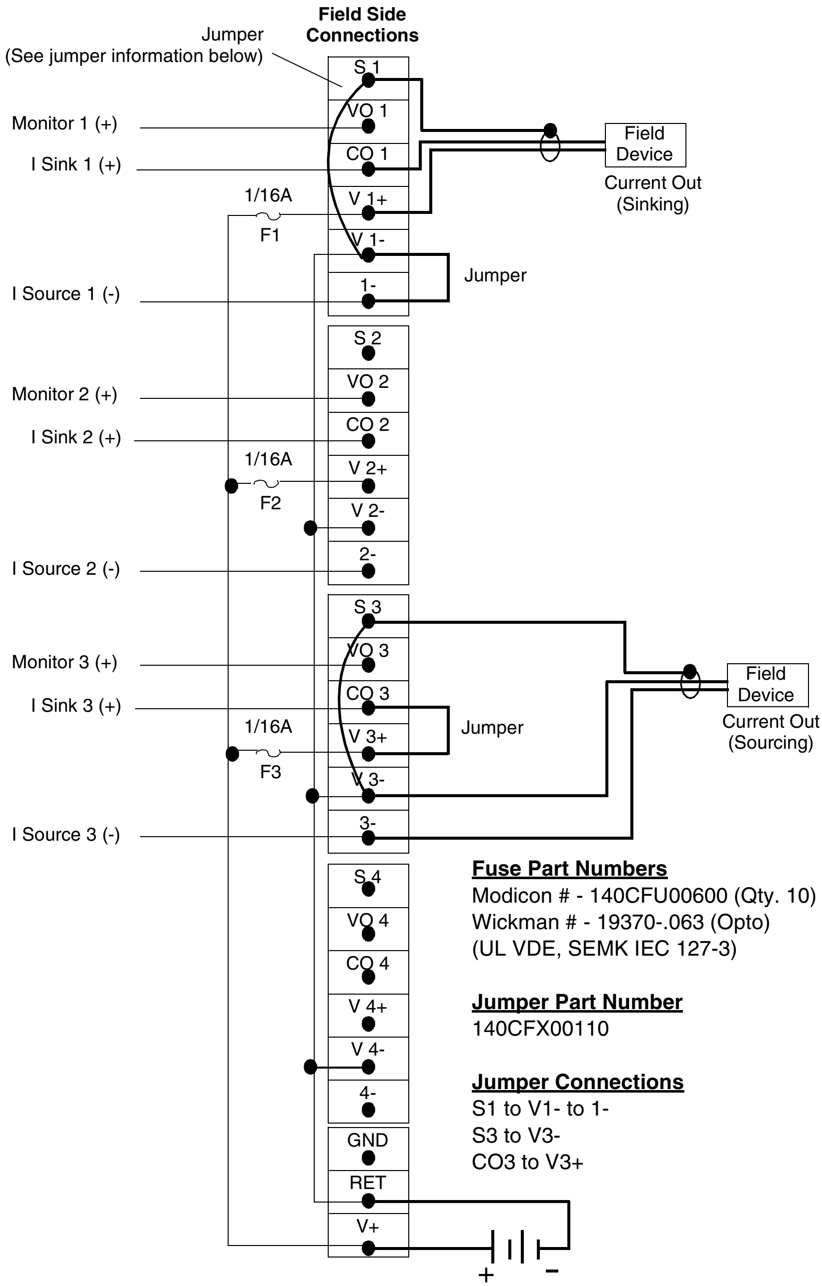
Fuse Part Numbers

Modicon # - 140CFU00600 (Qty. 10)
Wickman # - 19370-.063 (opto)
(UL VDE, SEMK IEC 127-3)

Note:
1. When using a single power supply, there will be no channel-to-channel isolation of input points.
2. For the required jumper options for the 140ACO02000, see the wiring diagrams in *ACO02000 Wiring Diagram, p. 566*.
3. The GND (ground) terminal point is not connected.

Wiring Diagram (Instrument Grounding)

The following figure shows the wiring for the140CFJ00400 (instrument grounding) module.



Fuse Part Numbers
Modicon # - 140CFU00600 (Qty. 10)
Wickman # - 19370-.063 (Opto)
(UL VDE, SEMK IEC 127-3)

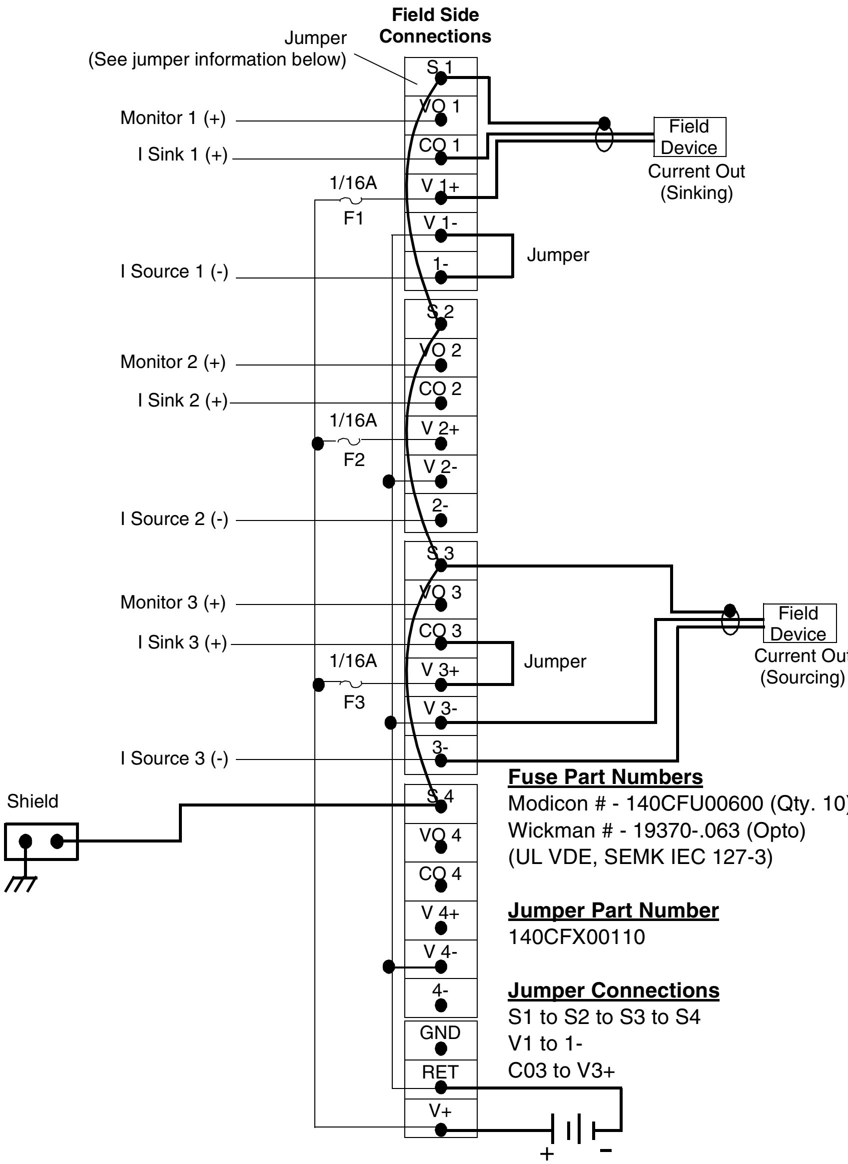
Jumper Part Number
140CFX00110

Jumper Connections
S1 to V1- to 1-
S3 to V3-
CO3 to V3+

Note:
1. When using a single power supply, there will be no channel-to-channel isolation of input points.
2. For the required jumper options for the 140ACO02000, see the wiring diagrams in *ACO02000 Wiring Diagram, p. 566*.
3. The GND (ground) terminal point is not connected.

Wiring Diagram (Chassis Grounding)

The following figure shows the wiring for the 140CFJ00400 (chassis grounding) module.



Fuse Part Numbers
Modicon # - 140CFU00600 (Qty. 10)
Wickman # - 19370-.063 (Opto)
(UL VDE, SEMK IEC 127-3)

Jumper Part Number
140CFX00110

Jumper Connections
S1 to S2 to S3 to S4
V1 to 1-
C03 to V3+

Note:

1. When using a single power supply, there will be no channel-to-channel isolation of input points.
2. For the required jumper options for the 140ACO02000, see the wiring diagrams in *ACO02000 Wiring Diagram, p. 566*.
3. The GND (ground) terminal point is not connected.

140CFK00400 Quantum CableFast Cabling Block

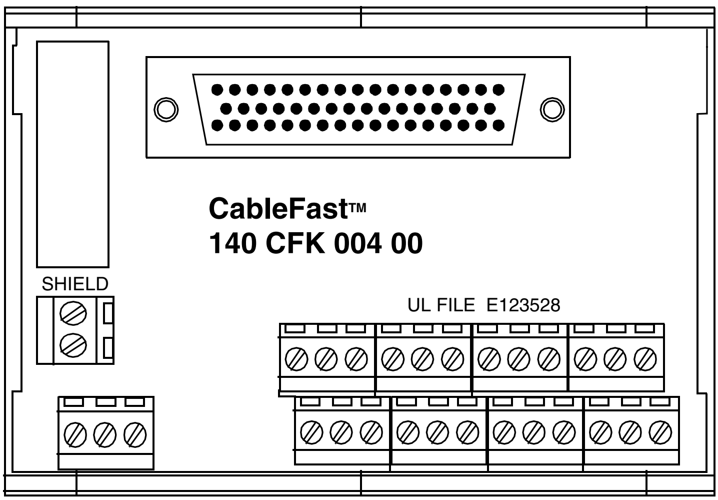
Overview

The K block is used for analog outputs. This interface provides plus, minus, shield, and power supply interface for both field and loop power configurations.

See *Features of the CableFast Cabling System, p. 858* for information on common specifications and features of CableFast cabling blocks.

Terminal Block

The following figure shows the 140CFK00400 terminal block.



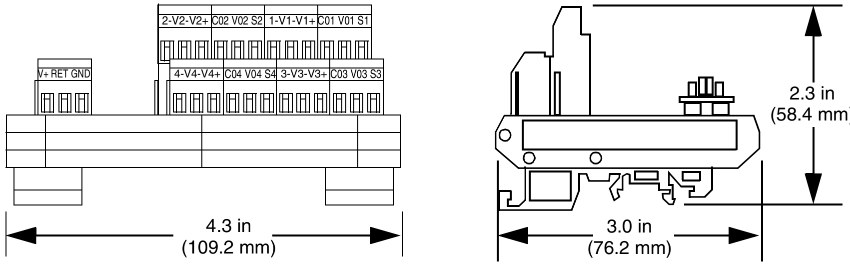
Application Notes

The following are the application notes for the 140CFK00400 module.

1. **Configuration** – Four analog outputs with a common loop supply. Each point is allocated four terminals.
2. **Compatibility** – This terminal block provides four individually unfused connection point sets for the 140ACO02000 and 140AVO02000 analog output modules.

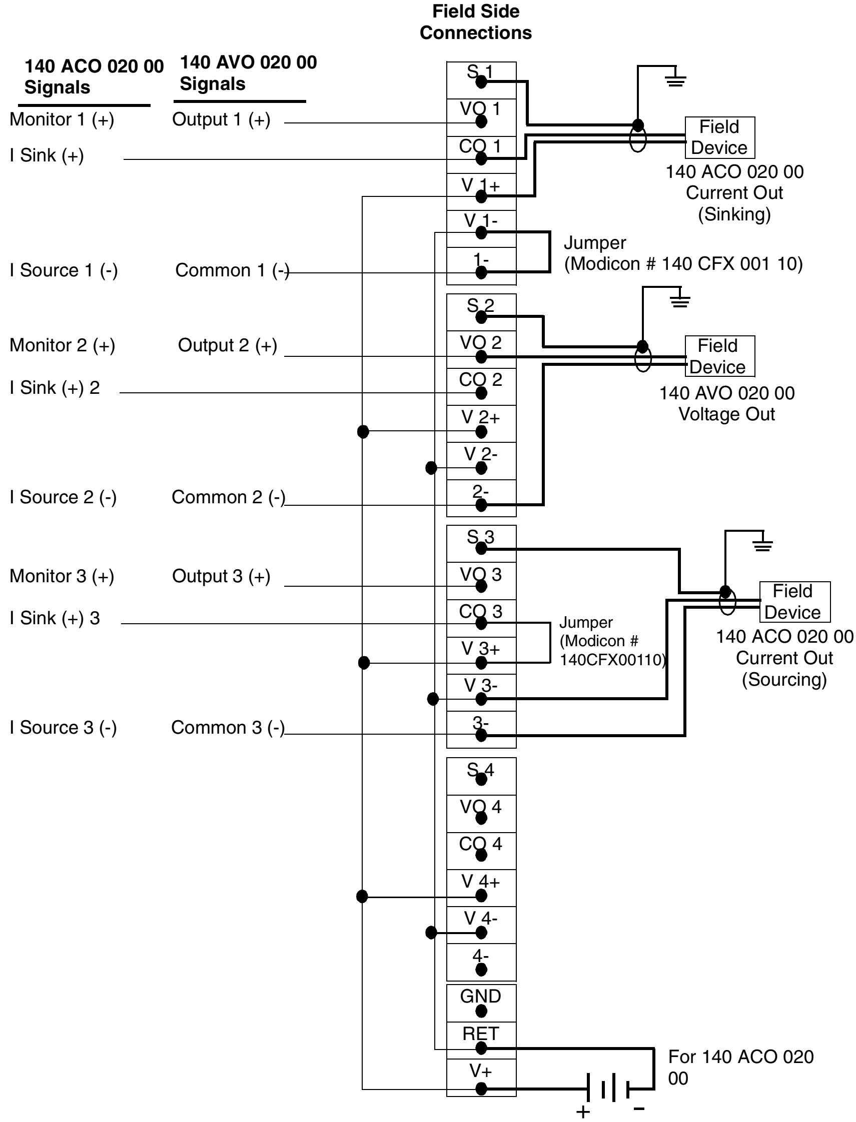
Dimensions

The following figures show the dimensions for the 140CFK00400 module.



Wiring Diagram (Source Grounding)

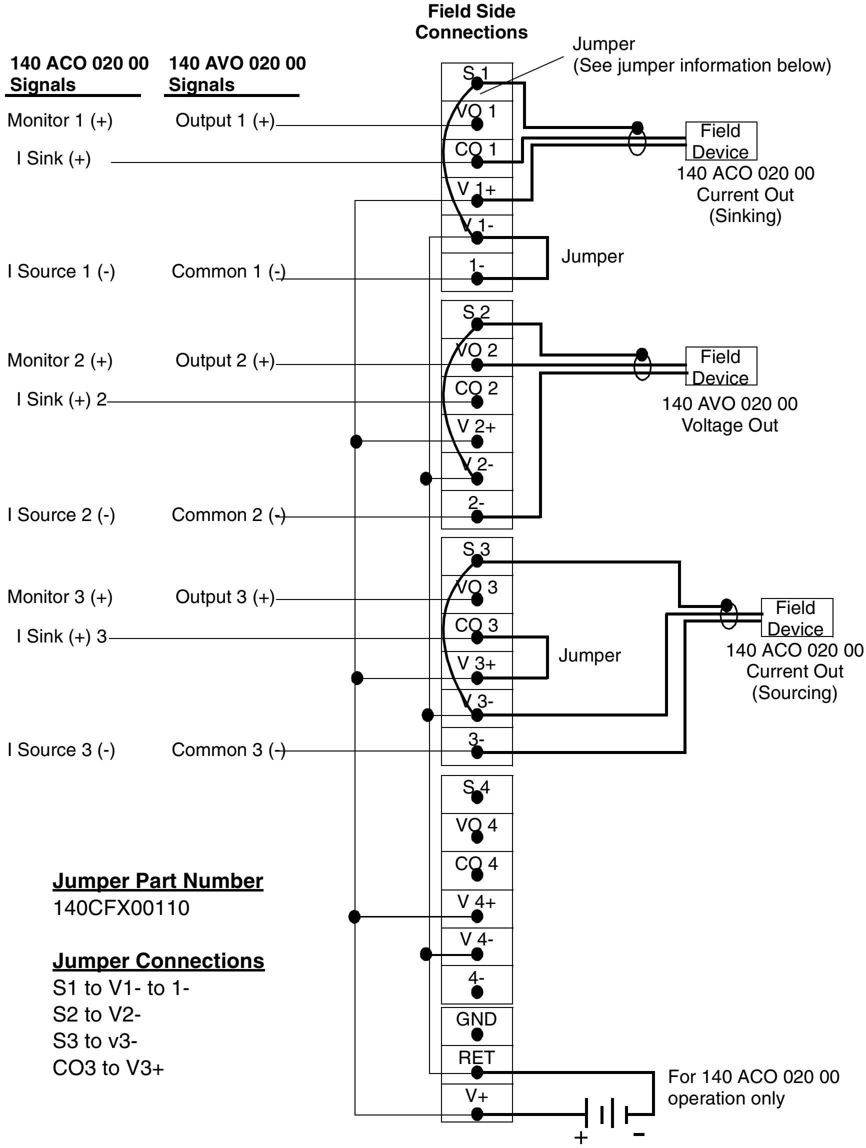
The following shows the wiring for the 140CFK00400 (source grounding) module.



Note:
1. When used with the 140AVO02000 analog voltage out module, the master override connections and range select must be made on the Quantum I/O connector.
2. When using a single power supply, there will be no channel-to-channel isolation of input points.
3. For the required jumper options for the 140ACO02000, see wiring diagram in *140ACO02000 Quantum I/O Analog Current Out Module, p. 563*.
4. The GND (ground) terminal point is not connected.

Wiring Diagram (Instrument Grounding)

The following figure shows the wiring for the 140CFK00400 (instrument grounding) module.



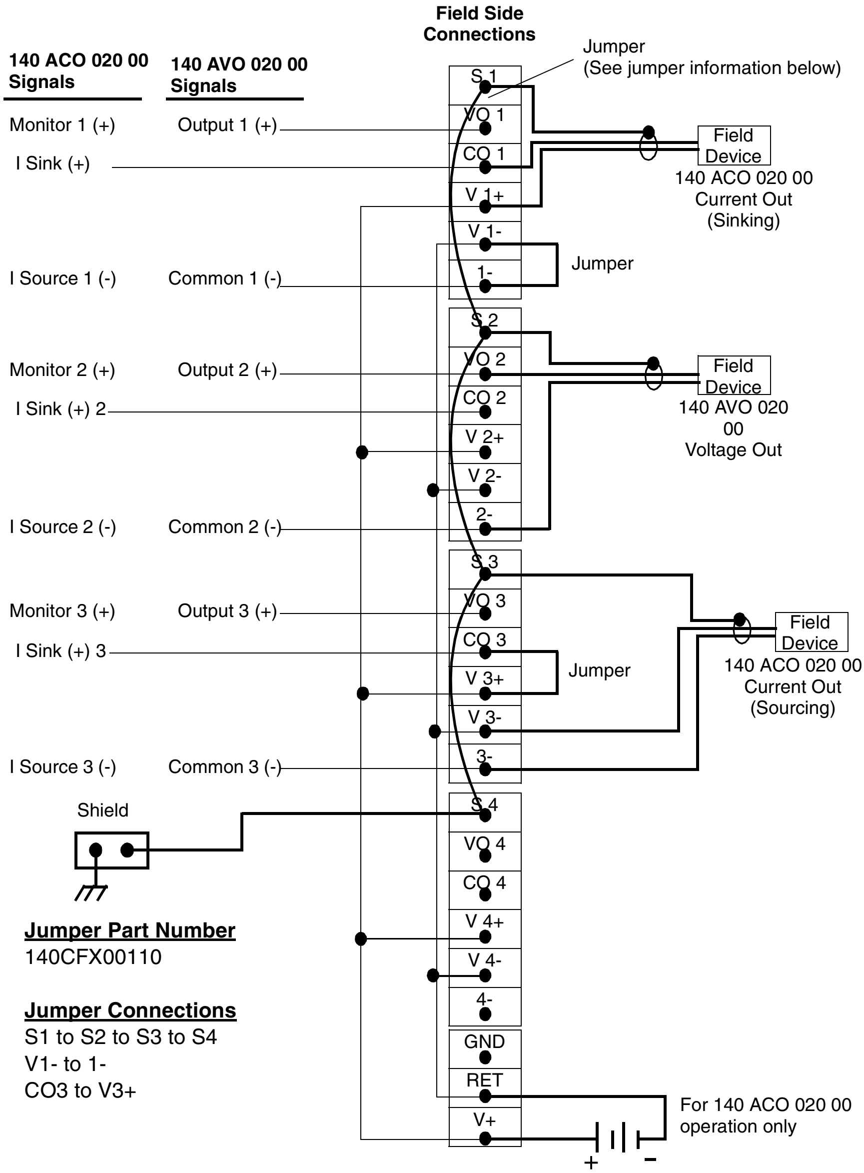
Jumper Part Number
140CFX00110

Jumper Connections
S1 to V1- to 1-
S2 to V2-
S3 to v3-
CO3 to V3+

Note:
1. When used with the 140AVO02000 analog voltage out module, the master override connections and range select must be made on the Quantum I/O connector.
2. When using a single power supply, there will be no channel-to-channel isolation of input points.
3. For the required jumper options for the 140ACO02000 and the AVO02000, see wiring diagrams in *140ACO02000 Quantum I/O Analog Current Out Module, p. 563* and the *140AVO02000 Quantum I/O Analog Voltage Out Module, p. 573*.
4. The GND (ground) terminal point is not connected.

Wiring Diagram (Chassis Grounding)

The following shows the wiring for the 140CFK00400 (chassis grounding) module.



Jumper Part Number
140CFX00110

Jumper Connections
S1 to S2 to S3 to S4
V1- to 1-
CO3 to V3+

Note:

1. When used with the 140AVO02000 analog voltage out module, the master override connections and range select must be made on the Quantum I/O connector.
2. When using a single power supply, there will be no channel-to-channel isolation of input points.
3. For wiring the 140ACO02000 and the 140AVO02000, see the wiring diagrams in *140ACO02000 Quantum I/O Analog Current Out Module, p. 563* and *140AVO02000 Quantum I/O Analog Voltage Out Module, p. 573*.
4. The GND (ground) terminal point is not connected.

CableFast Cables

Overview

This section provides CableFast cable specifications, cable lengths, inner wire color codes (for standard and high power cables), cable selections, and accessories.

Cable Specifications

The following table shows the CableFast cable specifications.

Cable Specifications	
Standard Power	
Cable Diameter	0.43 in. nominal (10.9 mm)
Number of Conductors	8-#20 AWG (0.8 mm), 7/28 tinned annealed copper; semi rigid PVC 32-#26 AWG (0.4 mm), 7/34 tinned annealed copper; semi rigid PVC
Bend Radius (I.D.)	0.75 in. min. (19.0 mm)
High Power	
Cable Diameter	0.55 in. nominal (14.0 mm)
Number of Conductors	8-#18 AWG (1.0 mm), 16/30 tinned annealed copper; semi rigid PVC 32-#20 AWG (0.8 mm), 10/30 tinned annealed copper; semi rigid PVC
Bend Radius (I.D.)	1.50 in. min. (38.1 mm)
Common Specifications	
Cable Jacket	Jacket color: black, 0.040 in wall min, flexible PVC
Wire Strip Length	0.32 in. (8 mm)
Wire Marking	See the wire color coding table (next page)
Wire Rating	300 V, 105° C UL rated 2517, CSA Type AWM 1/2 FT1
Cable Rating	300 V, 105° C rated
Shielding	Aluminum/polyester tape (aluminum side out) attached at connector body (360°). #22 AWG, 7/30 drain wire.Shield resistance 16.55 Ohms/Mft nominal
Agency Approval	UL-758; AWM style 2517 VW-1 and CSA C22:210.2; AWM I/II A/B FT1

Cable Lengths

The following table shows the cable lengths for the CableFast system.

Cable Lengths	Terminated		Pigtail
	Standard Power	**High Power**	**High Power**
3 ft. (0.91 m)	X	X	
6 ft. (1.82 m)	X	X	X
9 ft. (2.73 m)	X	X	
12 ft. (3.64 m)	X	X	
15 ft. (4.6 m)			X

Inner Wire Color Codes

The following table provides the wire color codes for standard power and high power cables.

Wire/ Pin #	AWG for Standard Power Cable	AWG for High Power Cable	Color	Wire/ Pin #	AWG for Standard Power Cable	AWG for High Power Cable	Color
1	26	20	Black	21	26	20	White/ Blue
2	26	20	Brown	22	26	20	White/ Violet
3	26	20	Red	23	26	20	White/ Gray
4	26	20	Orange	24	26	20	White/ Black/ Brown
5	26	20	Yellow	25	26	20	White/ Black/ Red
6	26	20	Green	26	26	20	White/ Black/ Orange
7	26	20	Blue	27	26	20	White/ Black/ Yellow
8	26	20	Violet	28	26	20	White/ Black/ Green
9	20	18	Black	29	20	18	Yellow
10	20	18	Brown	30	20	18	Green
11	26	20	Gray	31	26	20	White/ Black/ Blue
12	26	20	White	32	26	20	White/ Black/ Violet
13	26	20	White/ Black	33	26	20	White/ Black/ Gray
14	26	20	White/ Brown	34	26	20	White/ Brown/ Red

Wire/ Pin #	AWG for Standard Power Cable	AWG for High Power Cable	Color	Wire/ Pin #	AWG for Standard Power Cable	AWG for High Power Cable	Color
15	26	20	White/ Red	35	26	20	White/ Brown/ Orange
16	26	20	White/ Orange	36	26	20	White/ Brown/ Yellow
17	26	20	White/ Yellow	37	26	20	White/ Brown/ Green
18	26	20	White/ Green	38	26	20	White/ Brown/ Blue
19	20	18	Red	39	20	18	Blue
20	20	18	Orange	40	20	18	Violet

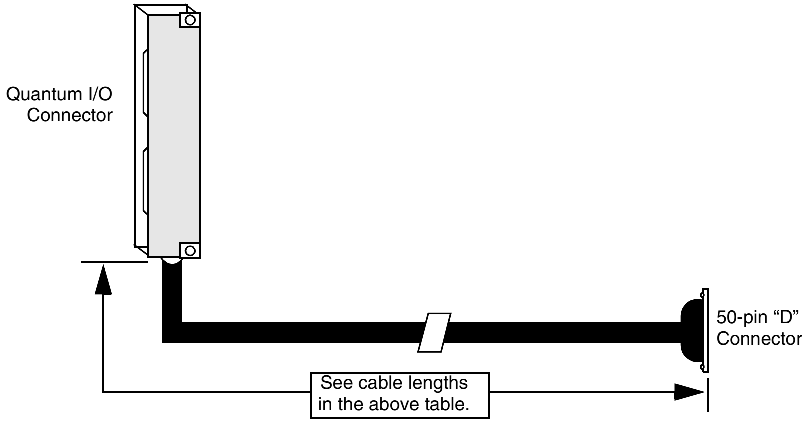
Cable Selections (XTS)

The following table shows the 140XTS0xx terminated cables.

Part Number	Cable Type		Cable Description
	Standard Power	High Power	
140XTS00203	X		CableFast system cable with Quantum I/O connector, 3 ft. (0.9 m) and "D" sub connector
140XTS01203		X	
140XTS00206	X		CableFast system cable with Quantum I/O connector, 6 ft. (1.8 m) and "D" sub connector
140XTS01206		X	
140XTS00209	X		CableFast system cable with Quantum I/O connector, 9 ft. (2.7 m) and "D" sub connector
140XTS01209		X	
140XTS00212	X		CableFast system cable with Quantum I/O connector, 12 ft. (3.7 m) and "D" sub connector
140XTS01212		X	

I/O Connector for Quantum

The following figure shows the I/O Connector for the Quantum system.



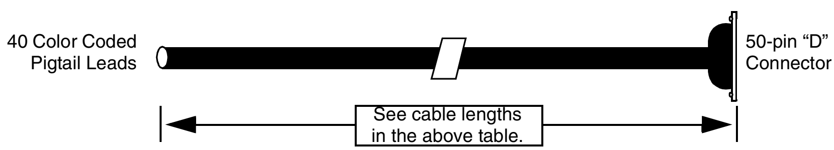
XCA102xx Pigtail

The following table shows the 140XCA102xx Pigtail cable description.

Part Number	Cable Type		Cable Description
	Standard Power	High Power	
140XCA10206		X	CableFast system cable, 6 ft (1.8 m), with "D" sub connector and pigtails
140XCA10215		X	CableFast system cable, 15 ft (4.6 m), with "D" sub connector and pigtails

Pigtail Leads

The following figure shows the color coded pigtail leads.



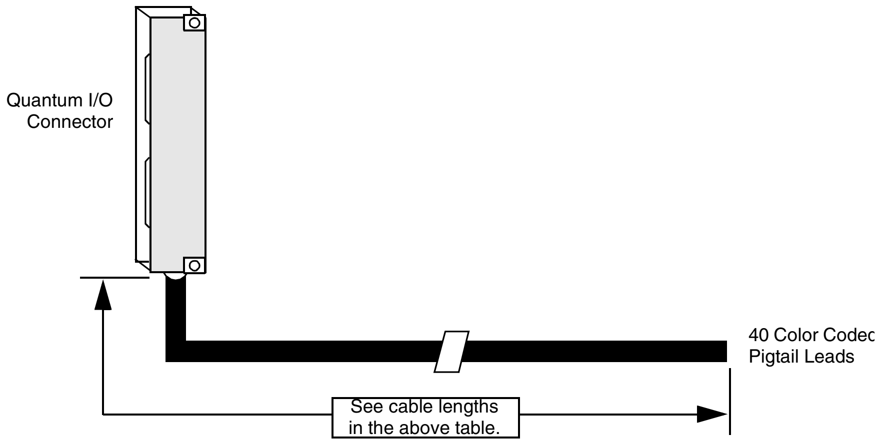
XTS102xx Pigtail

The following table shows the 140XTS102xx Pigtail cables.

Part Number	**Cable Type**		**Cable Description**
	Standard Power	**High Power**	
140XTS10206		X	CableFast system cable with Quantum I/O connector, 6 ft. (1.8 m), and pigtail cable
140 XTS10215		X	CableFast system cable with Quantum I/O connector, 15 ft. (4.6 m), and pigtail cable

I/O Connector for Pigtail Leads

The following figure shows the I/O connector for pigtail leads.



CableFast Accessories

Overview

The following information pertains to the CableFast accessories.

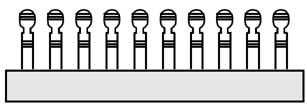
Accessories

The following table shows the part numbers and descriptions for CableFast Accessories.

Part Number	Description	Quantity
140CFU40000	Fuse Kit, Wickmann 4 A	10
140CFU08000	Fuse Kit, Wickmann 0.8 A	10
140CFU00600	Fuse Kit, Wickmann 0.063 A	10
140CFX00110	Terminal Block Common Strip, 10 Position (see below)	10

Terminal Block Common Strip

The following figure shows the terminal block common strip.

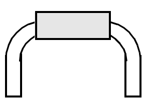


Jumper, Fuse Replacement

Fuse replacement information is given in the following table.

Part Number	Description	Quantity
140 CFX 002 10	Jumper, Fuse Replacement (see below)	10

The following figure shows a jumper.



Note: The jumper is used instead of fuses as a disconnect device.

Error Stopped Codes

F

Error Stopped Codes

Overview

The following is a list of error stopped codes and their definitions.

Error Stopped Codes

The following is a list of error stopped codes for the Quantum system.

Stop Bit Code (hex)	Description
7FFF	PLC unhealthy
8000	PLC stopped
4000	Bad I/O map
2000	PLC unconfigured
1000	Bad Modbus port intervention
0800	Bad segment scheduler
0400	Start-of-network (SON) did not start a segment
0200	Bad power-down checksum
0100	No end of logic detected
0080	Watchdog timer has expired
0040	Real time clock has failed
0020	Bad coil used table
0010	RIO option has failed
0008	Illegal node type found
0004	User logic checksum error
0002	Discrete disable table error
0001	Bad configuration

Definitions for Error Stopped Codes

The following are definitions for Error Stopped Codes.

- **PLC unhealthy:** This condition indicates that the CPU has failed one or more of its health diagnostics. In all probability the CPU will have to be replaced.
- **PLC stopped:** By itself, an 8000 hex is not an error but a CPU state. If, for example, a user issues a CPU stop command, the status register would indicate "8000" hex. An error condition exists when "8000" is anded with one or more of the previously defined errors (bits 0-14). An example would be an error code of "8100"; this suggests a PLC stopped with No End of Logic Node detected.
- **Bad I/O map:** This error will occur if the user declares more than one I/O drop in his configuration but does not have an RIO Head installed. This error may also occur if a drop has been configured in such a way so as to exceed the maximum number of inputs/outputs allowable per drop.
- **PLC unconfigured:** The user should expect this condition if he is trying to log into the CPU for the first time. This error indicates that the CPU has not been configured. The user should write a configuration offline and transfer it to the CPU prior to attempting to login to the CPU. If this error appears while seeking to coomunicate to a previously running CPU, this would suggest a corrupted state memory in the CPU. The usr should clear memory and attempt to reload the user logic program.
- **Bad modbus port intervention:** This error will most likely appear in conjunction with another error. The CPU would in all likelihood be stopped when this error occurs. This error may also appear upon the user’s attempt to clear the system stop state. The user should try to clear user logic and reload.
- **Bad segment scheduler:** This error indicates improper programming of the segment scheduler.
- **Start-of-network (SON) did not start a segment:** This error is most often caused by improper programming. It can also be caused by a corrupted program and can be detected by issuing a start command to the CPU.
- **Bad power-down checksum:** This error indicates that continuous run time ram diagnostic has failed. Reload the user logic program. If this error persists, replace the CPU.
- **No end of logic detected:** This error is usually caused by an incomplete or unsuccessful load of the program. Try another reload.
- **Watchdog timer has expired:** This error indicates that the CPU has taken too much time to complete its current scan. This error will sometimes occur with ambitious DX programming techniques. The user may want to increase the Watchdog Timer value. This error may also point to a failure of the CPU.
- **Real time clock has failed:** Replace the CPU.
- **Bad coil used table:** This error means that the coil used table does not match user logic. Possible causes include:
  1. This error is often seen when a program is altered offline by non-Modsoft users and then reloaded. It may be neccesary to update the coil used table manually in order to recover from this error.

2. The battery coil is not configured or configured in correctly. This error is not uncommon if the program is being relocated from another PLC.
3. There may be a hardware failure of the CPU.

- **RIO option has failed:** The RIO option board (140CRP93x00) has been determined to be unhealthy. Replace the board.
- **Illegal node type found:** This error is usually seen when downloading a program to the CPU. Some of the things a user should look for include:
  1. The user is loading/relocating logic from a CPU that supported a loadable function block to another CPU that hasn't been configured for the same function block. (ie HSBY or XMIT)
  2. A constant or reference is outside the range of that particular CPU's instruction set. This may occur when relocating logic from a 24 bit CPU to a 16 bit CPU. This error is generally not seen as a hardware failure and the user is advised to examine his user logic for incompatibility with the target PLC. RIO Option Has Failed.
- **User logic checksum error:** The calculated user logic checksum does not agree with the stored checksum. It can be caused by an illegal change in memory. The user should try to reload his user logic program. If the error persists, replace the CPU.
- **Discrete disable table error:** This error occurs when the user attempts to run the CPU in Optimize mode with disabled coils in user logic.
- **Bad configuration:** The most probable cause would be that the memory has been modified through the MODBUS/MODBUS PLUS ports. If this error occurs during a program download, check configuration data for values greater than the CPU's specified addressable range. This error can also appear if the CPU's memory is defective.

Agency Approvals

G

Agency Approvals

Overview

The following tables provide the agency approvals and also include the conformal coating availability of the indicated Quantum products.

Power Supplies

The following table provides the agency approvals and conformal coating availability for the power supplies of the indicated Quantum products.

Quantum Part Numbers	Conformally Coated Version Availabilty	Agency Approval Status				
		UL 508	CSA 22.2-142	C-UL	Factory Mutual Class I, Div 2	CE
140CPS11100	√	√	√	√	√	√
140CPS11400	√	√	√	√	√	√
140CPS11410	√	√	√	√	√	√
140CPS11420	√	√	√	√	√	√
140CPS12400	√	√	√	√	√	√
140CPS12420	√	√	√	√	√	√
140CPS21100	√	√	√	√	√	√
140CPS21400	√	√	√	√	√	√
140CPS22400	√	√	√	√	√	√
140CPS41400	√	√	√	√	√	√
140CPS42400	√	√	√	√	√	√
140CPS51100	√	√	√	√	√	√
140CPS52400	√	√	√	√	√	√

CPUs

The following table provides the agency approvals and conformal coating availability for the CPUs of the indicated Quantum products.

Quantum Part Numbers	Conformally Coated Version Availabilty	Agency Approval Status				
		UL 508	CSA 22.2-142	C-UL	Factory Mutual Class I, Div 2	CE
140CPU11302	√	√	√	√	√	√
140CPU11303	√	√	√	√	√	√
140CPU21304	√	√	√	√	√	√
140CPU42402	√	√	√	√	√	√
140CPU43412	√	√	√	√	√	√
140CPU43412A	√	√	√	√	√	√
140CPU53414	√	√	√	√	√	√
140CPU53414A	√	√	√	√	√	√

DIO Drops

The following table provides the agency approvals and conformal coating availability for the DIO drops of the indicated Quantum products.

Quantum Part Numbers	Conformally Coated Version Availabilty	Agency Approval Status				
		UL 508	CSA 22.2-142	C-UL	Factory Mutual Class I, Div 2	CE
140CRA21110	√	√	√	√	√	√
140CRA21210	√	√	√	√	√	√
140CRA21120	√	√	√	√	√	√
140CRA21220	√	√	√	√	√	√

RIO Heads and Drops

The following table provides the agency approvals and conformal coating availability for the RIO Heads and Drops of the indicated Quantum products.

Quantum Part Numbers	Conformally Coated Version Availabilty	Agency Approval Status				
		UL 508	CSA 22.2-142	C-UL	Factory Mutual Class I, Div 2	CE
140CRA93100	√	√	√	√	√	√
140CRA93200	√	√	√	√	√	√
140CRP93100	√	√	√	√	√	√
140CRP93200	√	√	√	√	√	√
140CRA93101					√	

Field Bus Modules

The following table provides the agency approvals and conformal coating availability for the Field Bus modules of the indicated Quantum products.

Quantum Part Numbers	Conformally Coated Version Availabilty	Agency Approval Status				
		UL 508	CSA 22.2-142	C-UL	Factory Mutual Class I, Div 2	CE
140CRP81100					√	
140EIA92100					√	
140NOA61100	√	√		√	√	√
140NOA61110		√	√	√	√	√
140NOL91100		√		√		√
140NOL91110		√		√		√
140NOL91120		√		√		√

NOEs

The following table provides the agency approvals and conformal coating availability for the NOEs of the indicated Quantum products.

Quantum Part Numbers	Conformally Coated Version Availabilty	Agency Approval Status				
		UL 508	CSA 22.2-142	C-UL	Factory Mutual Class I, Div 2	CE
140NOE21100	√	√	√	√	√	√
140NOE25100	√	√	√	√	√	√
140NOE31100	√	√	√	√	√	√
140NOE35100	√	√	√	√	√	√
140NOE51100	√	√	√	√	√	√
140NOE55100	√	√	√	√	√	√
140NOE77100	√	√	√	√	√	√
140NOE77110	√	√	√	√	√	√

NOMs

The following table provides the agency approvals and conformal coating availability for the NOMs of the indicated Quantum products.

Quantum Part Numbers	Conformally Coated Version Availabilty	Agency Approval Status				
		UL 508	CSA 22.2-142	C-UL	Factory Mutual Class I, Div 2	CE
140NOM21100	√	√	√	√	√	√
140NOM21200	√	√	√	√	√	√
140NOM25200	√	√	√	√	√	√

Hot Standby

The following table provides the agency approvals and conformal coating availability for the Hot Standby of the indicated Quantum products.

Quantum Part Numbers	Conformally Coated Version Availabilty	Agency Approval Status				
		UL 508	CSA 22.2-142	C-UL	Factory Mutual Class I, Div 2	CE
140CHS11000	√	√	√	√	√	√

Counters

The following table provides the agency approvals and conformal coating availability for the Counters of the indicated Quantum products

Quantum Part Numbers	Conformally Coated Version Availabilty	Agency Approval Status				
		UL 508	CSA 22.2-142	C-UL	Factory Mutual Class I, Div 2	CE
140EHC10500	√	√	√	√	√	√
140EHC20200	√	√	√	√	√	√

ASCII Interface

The following table provides the agency approvals and conformal coating availability for the ASCII Interface of the indicated Quantum products

Quantum Part Numbers	Conformally Coated Version Availabilty	Agency Approval Status				
		UL 508	CSA 22.2-142	C-UL	Factory Mutual Class I, Div 2	CE
140ESI06210	√	√	√	√	√	√

High Speed Interrupts

The following table provides the agency approvals and conformal coating availability for the High Speed Interrupt of the indicated Quantum products

Quantum Part Numbers	Conformally Coated Version Availabilty	Agency Approval Status				
		UL 508	CSA 22.2-142	C-UL	Factory Mutual Class I, Div 2	CE
140HLI34000	√	√	√	√	√	√

Single Axis Motion

The following table provides the agency approvals and conformal coating availability for the Single Axis Motion of the indicated Quantum products

Quantum Part Numbers	Conformally Coated Version Availabilty	Agency Approval Status				
		UL 508	CSA 22.2-142	C-UL	Factory Mutual Class I, Div 2	CE
140MSB10100	√	√	√	√	√	√
140MSC10100	√	√	√	√	√	√

Simulators

The following table provides the agency approvals and conformal coating availability for the Simulators of the indicated Quantum products

Quantum Part Numbers	Conformally Coated Version Availabilty	Agency Approval Status				
		UL 508	CSA 22.2-142	C-UL	Factory Mutual Class I, Div 2	CE
140XSM002	√	√	√	√		
140XSM010	√	√	√	√		

Intrinsically Safe Modules

The following table provides the agency approvals and conformal coating availability for the intrinsically safe I/O modules of the indicated Quantum products.

Quantum Part Numbers	Conformally Coated Version Availabilty	Agency Approval Status				
		UL 508	CSA 22.2-142	C-UL	Factory Mutual Class I, Div 1	CE
140AII33000	√	√	√	√	√	√
140AII33010	√	√	√	√	√	√
140AIO33000	√	√	√	√	√	√
140DII33000	√	√	√	√	√	√
140DIO33000	√	√	√	√	√	√

Battery Module

The following table provides the agency approvals and conformal coating availability for the Battery module of the indicated Quantum products

Quantum Part Numbers	Conformally Coated Version Availabilty	Agency Approval Status				
		UL 508	CSA 22.2-142	C-UL	Factory Mutual Class I, Div 2	CE
140XCP90000	√	√	√	√	√	√

I/O

The following table provides the agency approvals and conformal coating availability for the I/O of the indicated Quantum products

Quantum Part Numbers	Conformally Coated Version Availabilty	Agency Approval Status				
		UL 508	CSA 22.2-142	C-UL	Factory Mutual Class I, Div 2	CE
140ACI03000	√	√	√	√	√	√
140ACI04000	√	√	√	√	√	√
140ACO02000	√	√	√	√	√	√
140ACO13000	√	√	√	√	√	√
140AMM09000	√	√	√	√	√	√
140ARI03010	√	√	√	√	√	√
140ATI03000	√	√	√	√	√	√
140AVI03000	√	√	√	√	√	√
140AVO02000	√	√	√	√	√	√
140DAI34000	√	√	√	√	√	√
140DAI35300	√	√	√	√	√	√
140DAI44000	√	√	√	√	√	√
140DAI45300	√	√	√	√	√	√
140DAI54000	√	√	√	√	√	√
140DAI54300	√	√	√	√	√	√
140DAI55300	√	√	√	√	√	√
140DAI74000	√	√	√	√	√	√
140DAI75300	√	√	√	√	√	√
140DAM59000	√	√	√	√	√	√
140DAO84000	√	√	√	√	√	√
140DAO84010	√	√	√	√	√	√
140DAO84210	√	√	√	√	√	√
140DAO84220	√	√	√	√	√	√
140DAO85300	√	√	√	√	√	√
140DDI15310	√	√	√	√	√	√
140DDI35300	√	√	√	√		√
140DDI35310	√	√	√	√	√	√
140DDI36400	√	√	√	√	√	√
140DDI67300	√	√	√	√	√	√
140DDI84100	√	√	√	√		√

Quantum Part Numbers	Conformally Coated Version Availabilty	Agency Approval Status				
		UL 508	CSA 22.2-142	C-UL	Factory Mutual Class I, Div 2	CE
140DDI85300	√	√	√	√		√
140DDM39000	√	√	√	√	√	√
140DDM69000	√	√	√	√	√	√
140DDO15310	√	√	√	√	√	√
140DDO35300	√	√	√	√	√	√
140DDO35301	√	√	√	√	√	√
140DDO35310	√	√	√	√	√	√
140DDO36400	√	√	√	√	√	√
140DDO84300	√	√	√	√	√	√
140DDO88500	√	√	√	√	√	√
140DRA84000	√	√	√	√	√	√
140DRC83000	√	√	√	√	√	√
140DSI35300	√	√	√	√	√	√
140DVO85300	√	√	√	√	√	√

Backplanes

The following table provides the agency approvals and conformal coating availability for the I/O of the indicated Quantum products

Quantum Part Numbers	Conformally Coated Version Availabilty	Agency Approval Status				
		UL 508	CSA 22.2-142	C-UL	Factory Mutual Class I, Div 2	CE
140XBP00200	√	√	√	√	√	√
140XBP00300	√	√	√	√	√	√
140XBP00400	√	√	√	√	√	√
140XBP00600	√	√	√	√	√	√
140XBP01000	√	√	√	√	√	√
140XBP01600	√	√	√	√	√	√

Backplane Expander

The following table provides the agency approvals and conformal coating availability for the backplane expander of the indicated Quantum products

Quantum Part Numbers	Conformally Coated Version Availabilty	Agency Approval Status				
		UL 508	CSA 22.2-142	C-UL	Factory Mutual Class I, Div 2	CE
140XBE10000	√	√	√	√	√	√

Index

A

ACI03000
- configuration, 513
- description, 533
- I/O map status byte, 515
- register assignment, 514
- specifications, 534
- wiring diagram, 536

ACI04000
- description, 538
- I/O map status byte, 517
- module zoom selections, 517
- register assignment, 516
- specifications, 539
- wiring diagram, 541

ACO02000
- configuration, 559
- description, 563
- I/O map status byte, 559
- module zoom selections, 560
- register assignments, 559
- specifications, 564
- voltmeter monitor specifications, 565
- wiring diagram, 566

ACO13000
- configuration, 560
- description, 568
- I/O map status byte, 561
- module zoom selections, 561
- register assignments, 560
- specifications, 569
- wiring diagram, 571

Agency approvals
- ASCII interface, 949
- backplane expander, 953
- backplanes, 952
- battery module, 950
- counters, 949
- CPUs, 946
- DIO drops, 946
- field bus modules, 947
- high speed interrupts, 949
- Hot Standby, 948
- I/O, 951
- intrinsically safe modules, 950
- NOEs, 948
- NOMs, 948
- power supplies, 945
- RIO heads and drops, 947
- simulators, 950
- single axis motion, 949

AII33000
- configuration, 428
- description, 437
- field wiring, 440
- I/O map register assignment, 428
- I/O map status byte, 431
- module zoom selections, 432
- register assignment, 429
- RTD/resistance module specifications, 438
- terminal color and keying assignment, 441
- thermocouple/millivolt map register

assignment, 430
Thermocouple/Millivolt module
specification, 439
wiring diagram (Cenelec/RTD), 442
wiring diagram (Cenelec/TC), 443
wiring diagram (CSA/RTD), 444
wiring diagram (CSA/TC), 445
wiring diagram (FM/RTD), 446
wiring diagram (FM/TC), 447
wiring diagram (UL/RTD), 448
wiring diagram (UL/TC), 449

AII33010
- configuration, 433
- description, 450
- field wiring, 452
- fixed wiring, 452
- map status byte (inputs), 434
- module zoom selections, 434
- register assignment, 434
- specifications, 451
- terminal strip color and keying assignment, 452
- wiring diagram (Cenelec), 453
- wiring diagram (CSA), 454
- wiring diagram (FM), 455
- wiring diagram (UL), 456

AIO33000
- configuration, 435
- description, 457
- I/O map status byte, 435
- module zoom selections, 436
- register assignments, 435
- specifications, 458
- wiring diagram (FM), 477

AMM09000
- 3x registers, 579
- 4x registers, 581
- common specifications, 587
- configuration, 579
- description, 584
- I/O map status byte, 582
- input specifications, 585
- linear measuring ranges, 581
- module zoom selections, 582
- output specifications, 586
- register assignments, 579
- status warning, 580
- topology specifications, 584
- wiring diagram, 588

analog input modules
- configuration, 513

analog input/output module AMM09000, 584

analog output modules
- configuration, 559

analog simulator module XSM01000, 482

ARI03010
- configuration, 518
- description, 543
- I/O map status byte, 520
- module zoom selections, 521
- register assignment, 519
- specifications, 544
- wiring diagram, 546

ASCII interface module ESI06210, 388

AS-i master module EAI92100, 226

ATI03000
- configuration, 522
- description, 548
- I/O map status byte, 524
- measurement ranges, 525, 526
- module zoom selections, 527
- register assignment, 523
- specifications, 549
- wiring diagram, 551

AVI03000
- configuration, 528
- description, 553
- I/O map status byte, 531
- linear measuring ranges, 531, 555
- module zoom selections, 532
- register assignment, 528
- specifications, 554
- wiring diagram, 556

AVO02000
- configuration, 561
- description, 573
- module zoom selections, 562
- register assignments, 562
- specifications, 574
- wiring diagram, 577

B

backplane expander XBE10000, 410
backplanes
- four position, 815
- mounting hardware specifications, 812
- part numbers, 812
- selecting, 812
- six position, 816
- sixteen position, 818
- ten position, 817
- three position, 814
- two positions, 813

battery module XCP90000, 489

C

CableFast
- cable lengths, 934
- cable selections (XTS), 936
- cable specifications, 933
- description, 858
- I/O connector for Quantum, 937
- I/O connector illustration, 938
- inner wire color codes, 935
- quantum modules and backplane
- illustration, 859
- specifications, 860
- terminal block descriptions, 865
- terminal block features, 866
- terminal block selection, 862
- terminal block stacking convention, 866
- XCA102xx pigtail, 937
- XTS102xx pigtail, 938

CableFast accessories
- jumper, fuse replacement, 939
- part numbers, 939
- terminal block common strip, 939

cables
- part numbers, 797

CE closed system installation
- AC & DC powered systems, 853
- AC/DC installation illustration, 854
- line filter connections, 855
- protective cover, 854

CFA04000
- application notes, 867
- description, 867
- dimensions, 868
- terminal block illustration, 867
- wiring diagram, 869

CFB03200
- application notes, 870
- description, 870
- terminal block dimensions, 871
- terminal block illustration, 870
- wiring for input modules, 872

CFC03200
- application notes, 877
- description, 876
- dimensions, 877
- terminal block illustration, 876
- wiring diagram for DAI35300, 878
- wiring diagram for DAI45300, 878
- wiring diagram for DAI55300, 878
- wiring diagram for DDI15310, 879
- wiring diagram for DDI35300, 878
- wiring diagram for DDI85300, 878
- wiring diagram for DDO15310, 881
- wiring diagram for DDO3530X, 883
- wiring for output module, 874

CFD03200
- application notes, 885
- description, 885
- dimensions, 885
- terminal block illustration, 885
- wiring diagram, 886

CFE03200
- application notes, 888
- description, 888
- dimensions, 888
- terminal block illustration, 888
- wiring diagram, 889

CFG01600
- application notes, 891
- description, 891
- dimensions, 892
- terminal block illustration, 891
- wiring diagram (grouped AC output mode), 897
- wiring diagram (grouped DC output mode), 898
- wiring diagram (isolated AC input mode), 893
- wiring diagram (isolated output mode), 895

CFH00800
- application notes, 900
- description, 900
- dimensions, 901
- terminal block illustration, 900
- wiring diagram (chassis grounding), 907
- wiring diagram (instrument grounding), 904
- wiring diagram (source grounding), 902

CFI00800
- application notes, 909
- description, 909
- dimensions, 909
- wiring diagram (chassis grounding), 914
- wiring diagram (instrument grounding), 912
- wiring diagram (source grounding), 910

CFJ00400
- application notes, 916
- description, 916
- dimensions, 917
- terminal block illustration, 916
- wiring diagram (chassis grounding), 923
- wiring diagram (instrument grounding), 921
- wiring diagram (source grounding), 918

CFK00400
- application notes, 925
- description, 925
- dimensions, 926
- terminal block illustration, 925
- wiring diagram (chassis grounding), 931
- wiring diagram (instrument grounding), 929
- wiring diagram (source grounding), 927

CHS11000
- A/B designation slide switch, 419
- blinking Com Act LED error codes, 418
- description, 415
- illustration, 415
- keyswitch and update button, 418
- LED descriptions, 417
- LED indicators, 417
- specifications, 416

communication interface modules
- Ethernet TCP/IP module, 21
- InterBus interface modules, 22
- LonWorks modules, 22
- Modbus Plus on Fiber, 21
- SY/MAX-Ethernet, 21
- twisted-pair wiring, 21
- types, 20

CPS11100
- description, 78
- illustration, 78
- LED description, 80
- LED indicator, 80
- wiring diagram, 81

CPS11400
description, 82
illustration, 82
LED description, 84
LED indicators, 84
specifications, 83
wiring diagram, 84
CPS11410
description, 85
illustration, 85
LED description, 87
LED indicator, 87
specifications, 86
wiring diagram, 87
CPS11420
description, 88
illustration, 88
LED description, 90
LED indicator, 90
specifications, 89
wiring diagram, 90
CPS12400
description, 91
illustration, 91
LED description, 93
LED indicator, 93
specifications, 92
wiring diagram, 93
CPS12420
description, 94
illustration, 94
LED description, 96
LED indicator, 96
specifications, 95
wiring diagram, 96
CPS21100
description, 97
illustration, 97
LED description, 98
LED indicator, 98
specifications, 98
wiring diagram, 99
CPS21400
description, 100
illustration, 100
LED description, 101
LED indicator, 101
specifications, 101
wiring diagram, 102
CPS22400
description, 103
illustration, 103
LED description, 104
LED indicator, 104
specifications, 104
wiring diagram, 105
CPS41400
description, 106
illustration, 106
LED description, 107
LED indicator, 107
operating curve and timing chart, 108
specifications, 107
wiring diagram, 108
CPS42400
illustration, 109
LED description, 110
LED indicator, 110
operating curve and timing chart, 112
specifications, 110
wiring diagram, 111
CPS51100
description, 113
illustration, 113
LED description, 114
LED indicator, 114
specifications, 114
wiring diagram, 115
CPS52400
description, 116
illustration, 116
LED description, 118
LED indicators, 118
specifications, 117
wiring diagram, 118

CPU
- description, 18
- hardware specifications, 65
- part numbers, 65

CPU11302
- ASCII communication port parameters, 127
- description, 132
- front panel switches, 127
- illustration, 121
- LED descriptions, 124
- LED error codes, 125
- LED indicators, 124
- Modbus connector pinouts, 130
- Modbus ports pinout connections, 130
- Modbus ports pinout connections for portable computers, 131
- rear panel rotary switches, 129
- RTU communication port parameters, 127
- specifications, 122
- SW1 and SW2 address settings, 129
- SW1 and SW2 switches, 129
- valid communication port parameters, 128

CPU11303
- ASCII communication port parameters, 138
- illustration, 132
- LED descriptions, 135
- LED error codes, 136
- LED indicators, 135
- Modbus connector pinouts, 141
- Modbus ports pinout connections, 141
- Modbus ports pinout connections for portable computers, 142
- rear panel switches, 140
- RTU communication port parameters, 138
- specifications, 133
- SW1 and SW2 address settings, 140
- SW1 and SW2 switches, 140
- valid communication port parameters, 139

CPU21304
- ASCII communication port parameters, 149
- description, 143
- front panel switches, 149
- illustration, 143
- LED descriptions, 146
- LED error codes, 147
- LED indicators, 146
- Modbus connector pinouts, 152
- Modbus ports pinout connections, 152
- Modbus ports pinout connections for portable computers, 153
- rear panel switches, 151
- RTU communication port parameters, 149
- specifications, 144
- SW1 and SW2 address settings, 151
- SW1 and SW2 switches, 151
- valid communication port parameters, 149

CPU42402
- ASCII communication port parameters, 160
- description, 154
- front panel switches, 160
- illustration, 154
- LED descriptions, 157
- LED error codes, 158
- LED indicators, 157
- Modbus connector pinouts, 163
- Modbus ports pinout connections, 163
- Modbus ports pinout connections for portable computers, 164
- rear panel switches, 162
- RTU communication port parameters, 160
- specifications, 155
- SW1 and SW2 address settings, 162
- SW1 and SW2 switches, 162
- valid communication port parameters, 161

CPU43412, 171
ASCII comm port parameters, 171
description, 165
key switch, 174
LED description, 168
LED error codes, 169
LED indicators, 168
Modbus connector pinouts, 175
Modbus ports pinout connections, 176
Modbus ports pinout connections for portable computers, 177
rear panel rotary switches, 173
RTU comm port parameters, 171
specifications, 166
SW1 and SW2 address settings, 173
SW1 and SW2 switches, 173
valid comm port parameters, 172
CPU43412A
ASCII communication port parameters, 185
description, 178
front panel slide switch, 185
key switch, 188
LED descriptions, 181
LED error codes, 182
LED indicators, 181
Modbus connector pinouts, 190
Modbus pinout connections for portable computers, 191
Modbus ports pinout connections, 190
rear panel switches, 187
RTU communication port parameters, 185
specifications, 179
SW1 and SW2 address settings, 187
valid communication port parameters, 186
CPU53414
ASCII communicaton port parameters, 198
CPU front panel switches, 198
description, 192
key switch, 201
LED descriptions, 195
LED error codes, 196
LED indicators, 195
Modbus ports pinout connections, 203
Modbus ports pinout connections for portable computers, 204
rear panel switches, 200
RTU communication port parameters, 198
specifications, 193
SW1 and SW2 address settings, 200
SW1 and SW2 switches, 200
valid communication port parameters, 199
CPU53414A
ASCII communication port parameters, 212
description, 205
front panel slide switch, 212
illustration, 205
key switch, 215
LED descriptions, 208
LED error codes, 209
LED indicators, 208
Modbus connector pinouts, 217
Modbus ports pinout connections, 217
Modbus ports pinout connections for portable computers, 218
rear panel switches, 214
RTU communication port parameters, 212
specifications, 206
SW1 and SW2 address settings, 214
valid communication port parameters, 213

CRA21X10
- description, 248
- illustration, 248
- LED descriptions, 251
- LED indicators, 251
- rear panel switches, 252
- specifications, 249
- wiring diagram, 250, 255

CRA21X20
- description, 253
- illustration, 253
- LED descriptions, 256
- LED indicators, 256
- rear panel switches, 257
- specifications, 254

CRA93200
- illustration, 265

CRA93X00
- address settings, 269
- description, 265
- error codes, 268
- LED descriptions, 267
- LED indicators, 267
- rear panel switches, 269
- specifications, 266
- SW1 and SW2 address settings, 269

CRP81100
- description, 220
- illustration, 221
- LED descriptions, 222
- LED status, 222
- RS-232C port, 224
- RS-485 port, 223
- specifications, 225

CRP93X00
- description, 260
- error codes, 263
- LED descriptions, 262
- LED indicators, 262
- specifications, 261

D

DAI34000
- description, 595
- specifications, 596
- wiring diagram, 598

DAI35300
- description, 600
- specifications, 601
- wiring diagram, 603

DAI44000
- description, 605
- specifications, 606
- wiring diagram, 608

DAI45300
- description, 610
- specifications, 611
- wiring diagram, 613

DAI54000
- description, 615
- specifications, 616
- wiring diagram, 618

DAI54300
- description, 620
- specifications, 621
- wiring diagram, 623

DAI55300
- description, 625
- specifications, 626
- wiring diagram, 628

DAI74000
- description, 630
- specifications, 631
- wiring diagram, 633

DAI75300
- description, 635
- specifications, 636
- wiring diagram, 638

DAM59000
- common specifications, 777
- description, 774
- fuse locations, 778
- input specifications, 775
- output specifications, 776
- topology specifications, 774
- wiring diagram, 780

DAO84000
- description, 678
- specifications, 679
- wiring diagram, 682

DAO84010
- description, 684
- specifications, 685
- wiring diagram, 688, 694

DAO84210
- description, 690
- specifications, 691

DAO84220
- description, 696
- fuse locations, 699
- specifications, 697
- wiring diagram, 700

DAO85300
- description, 702
- fuse locations, 705
- specifications, 703
- wiring diagram, 706

DD035301
- fuse locations, 720

DD036400
- recommended cables, 733

DDI15310
- description, 639
- logic states, 641
- specifications, 640
- wiring diagram, 642

DDI35300
- description, 643
- specifications, 643
- wiring diagram, 644

DDI35310
- description, 646
- specifications, 647
- wiring diagram, 648

DDI36400
- color codes for input groups, 653
- compatible connection sub-bases, 654
- description, 650
- front view illustration, 652
- LEDs, 653
- recommended cables, 653
- specifications, 650

DDI67300
- description, 655
- minimum version levels, 658
- specifications, 656
- wiring diagram, 660

DDI84100
- description, 662
- specifications, 663
- wiring diagram, 664

DDI85300
- description, 666
- specifications, 667
- wiring diagram, 668

DDM39000
- common specifications, 784
- description, 782
- fuse locations, 785
- input specifications, 782
- output specifications, 783
- topology, 782
- wiring diagram, 787

DDM69000
- common specifications, 791
- description, 789
- I/O map register (outputs), 771
- I/O map status byte (outputs), 772
- input specifications, 789
- module zoom selections (inputs), 771
- module zoom selections (outputs), 772
- output specifications, 790
- register assignments, 770
- topology, 789
- version levels, 792
- wiring diagram, 793

DDO15310
- description, 708
- fuse locations, 710
- specifications, 709
- wiring diagram, 711

DDO35300
- description, 712
- fuse locations, 715
- specifications, 713
- wiring diagram, 716

DDO35301
description, 718
specifications, 719
wiring diagram, 721
DDO35310
description, 723
fuse locations, 726
specificatons, 724
wiring diagram, 727
DDO36400
color codes for input groups, 733
compatible output adapter sub-bases, 734
description, 729
front view illustration, 732
selecting point status indicator LEDs, 733
specifications, 730
DDO84300
description, 735
fuse locations, 737
specifications, 736
wiring diagram, 738
DDO88500
description, 739
fuse locations, 742
specifications, 740
wiring diagram, 743
DII33000
description, 466
specifications, 467
terminal strip color and keying assignment, 468
wiring diagram (Cenelec), 469
wiring diagram (CSA), 470
wiring diagram (FM), 471
wiring diagram (UL), 472
DIO configuration
description, 37
dual cable illustration, 38
part numbers, 39
single cable illustration, 37
DIO modules CRA21X10 or CRA21X20, 248
DIO33000
description, 473
specifications, 473
terminal strip color and keying assignment, 474
wiring diagram (Cenelec), 475
wiring diagram (CSA), 476
wiring diagram (UL), 478
direct CPU driver
network interface techniques, 45
discrete I/O true high
illustration, 509
discrete I/O true low
illustration, 509
discrete input (16-point) modules
description, 591
module zoom selections, 591
register assignments, 591
discrete input (24-point) modules
description, 591
I/O map register assignment, 592
module zoom selections, 592
discrete input (32-point) modules
description, 592
I/O map register assignment, 593
module zoom selections, 593
discrete input (8-point) module
module zoom selections, 464
register assignments, 464
discrete input (96-point) modules
description, 593
module zoom selections, 594
register assignments, 594
discrete input modules
description, 591
discrete input/output (16/8 point) modules
I/O map assignments (outputs), 773
module zoom selections (inputs), 773
module zoom selections (outputs), 773
register assignments, 772
discrete input/output modules
configuration, 770
discrete output (12-point) module
description, 671
register assignments, 671

discrete output (16-point) modules
- description, 672
- module zoom selections, 673
- register assignments, 673

discrete output (32-point) modules
- description, 674
- module zoom selections, 675
- register assignments, 674

discrete output (8-point) modules
- description, 465, 670
- I/O map register assignment, 465, 670
- module zoom selections, 465, 670
- module zoom selections (outputs), 671

discrete output (96-point) module, 675
- module zoom selections, 677
- register assingment, 676

discrete simulator module XSM00200, 480

discrete verified output module DVO85300, 759

distributed I/O
- Quantum configuations, 30

DRA84000
- description, 745
- specifications, 746
- wiring diagram, 748

DRC83000
- description, 749
- specifications, 750
- wiring diagram, 752

DSI35300
- description, 766
- specifications, 767
- wiring diagram, 768

dual cable configuration
- RIO configuration, 34
- RIO in a Hot Standby configuration, 36

DVO85300
- configuration, 754
- description, 759
- Modsoft zoom screen selections, 755
- register assignments, 754
- specifications, 760
- wiring diagram, 763

E

EHC10500
- description, 334
- illustration, 334
- LED descriptions, 337
- LED indicators, 337
- specifications, 335
- wiring diagram, 338

EHC20200
- 3x register content, 355
- Command 1, 341
- Command 1 and Command 2 response formats, 350
- Command 2, 342
- Command 3, 342
- Command 3 read input counter, 350
- Command 3 response format, 351
- Command 4, 343
- Command 4 output register format, 351
- Command 4 response format, 352
- command words, 343
- configuration, 340
- COUNT DOWN example, 358
- counting pulses, 380
- description, 372
- fuse location, 375
- I/O map register assignment, 340
- I/O map status byte, 352
- illustration, 372
- LED descriptions, 376
- load values, 354, 359
- module configuration, 353, 358
- module functions, 378
- module zoom selections, 370
- one 32 bit counter, 347
- operations, 341
- RATE SAMPLE example, 358
- rate sample mode, 349
- rate sample mode caution, 361
- rate sampling, 380
- read input counter command, 355
- read rate sample, 359
- reset latched outputs, 355
- response for configuration command,

354
response to read rate sample command, 360
signal descriptions, 384
specifications, 373
timing diagrams, 378
timing parameters, 378
two 16 bit counters, 346
two 32 bit counters, 348
user logic, 357
using I/O mapped registers, 353
wiring diagram, 386
wiring diagram 1, 362
wiring diagram 2, 364
wiring diagram 3, 366
wiring diagram 4, 368
EIA92100
AS-i cable connection illustration, 231
description, 226
illustration, 227
LED bus mode, 228
LED descriptions, 228
LED diagnostics, 230
LED display, 228
LED slave I/O mode, 229
specifications, 231
error stopped codes
definitions, 942
list, 941
ESI06210
description, 388
front panel connectors and switches, 392
front panel push button, 393
illustration, 388
LED blinking sequence, 391
LED descriptions, 390
LED indicators, 390
RS-232 serial port setup, 393
RS-232C serial port, 392
specifications, 389
Status LED crash codes, 391
Ethernet MMS modules NOE5X100, 314
Ethernet SY/MAX modules NOE3X100, 311
Ethernet TCP/IP module NOE2X100, 306

F

fiber optic cable
bus configuration, 294
connecting, 292
point-to-point configuration, 293
ports, 291
fiber optic network
adding nodes, 302
calculating number of modules, 303
fuses
description, 809

H

hardware specifications
ASCII interface module, 68
counter modules, 68
CPU, 65
description, 63
DIO heads/drops, 66
Ethernet modules, 67
field bus modules, 66
high speed interrupt module, 68
Hot Standby module, 67
I/O modules (analog out), 74
I/O modules (discrete in), 70
I/O modules (discrete in/out), 72
I/O modules (discrete out), 71
intrinsic safe analog modules, 74
intrinsic safe discrete modules, 74
miscellaneous modules, 75
NOM modules, 67
power supplies for local and RIO drops, 64
RIO heads/drops, 65
single axis motion modules, 69
high speed counter (5 channel) EHC10500, 334
high speed counter module (2 channel) EHC20200, 372
high speed interrupt modules HLI34000, 394

HLI34000
description, 394
illustration, 394
LED descriptions, 396
specifications, 395
wiring diagram, 397
Hot Standby configuration
description, 34
Hot Standby module CHS11000, 415

I

I/O map interface
network interface techniques, 46
I/O map status byte
description, 510
illustration, 510
table/module configuration, 511
I/O modules
description, 19, 498
discrete I/O true high/true low circuit, 509
illustration, 498
LED descriptions, 498
LED descriptions for 16 point modules, 499
LED descriptions for 24 point input modules, 500
LED descriptions for 32 point I/O modules, 500
LED descriptions for bi-directional modules, 501
LED descriptions for discrete 12 point modules with fault indication, 503
LED indicators for 16 point modules, 499
LED indicators for 24 point input modules, 500
LED indicators for 32 point I/O modules, 500
LED indicators for bi-directional modules, 501
LED indicators for discrete 12 point modules with fault indication, 503
primary keys, 505
secondary keying and backplane position codes, 507
terminal strip key codes, 505
terminal strip/module keying, 504
intelligent/special purpose I/O modules
description, 23
InterBus communication module NOA6XXXX, 232
InterBus interface modules
communication interface modules, 22
Intrinsically safe analog input module AII33000, 437
intrinsically safe analog output module AIO33000, 457
intrinsically safe current input module AII33010, 450
intrinsically safe discrete input module DII33000, 466
intrinsically safe discrete output module DIO33000, 473
intrinsically safe modules
description, 423
identification and labeling, 424
illustration, 425
installation, 423
intrinsic safety, 423
safe barriers, 423
safe wiring practices, 424
wiring and grounding, 424
wiring diagram, 426

L

local I/O
Quantum configurations, 30
local I/O configuration
description, 32
illustration, 32
LonWorks modules
communication interface modules, 22
LonWorks NOL911X0, 240

M

miscellaneous components
 battery, 802
 cable connector orientation, 798
 cables, 797
 coding kit, 798
 CPU battery, 802
 description, 797
 empty module, 798
 empty module with door cover, 799
 field wiring terminal strip, 800
 I/O conversion connector, 804
 IP 20 compliant field wiring terminal strips, 801
 Modbus Plus ruggedized tap, 803
 Modbus Plus tap, 802
 remote I/O BNC connector, 805
 remote I/O splitter, 805
 remote I/O tap, 804
 RG-11 remote I/O F connector, 805
 RG-6 remote I/O F connector, 805
 terminal strip jumper kit, 799
MMS interface
 network modules, 21
Modbus and Modbus Plus communications
 features, 49
Modbus communications
 description, 49
Modbus connector
 25-pin, 407
 9-pin, 407
Modbus connector pinouts
 25-point connections, 203
 nine-pin connections, 203
MODBUS I/O Scanner
 functionality, 322
Modbus Plus communications
 description, 50
Modbus Plus network option modules NOM21X00, 271
Modbus Plus on Fiber NOM25200, 281
module mounting procedure
 description, 825
 I/O terminal strip mounting procedure, 829
 illustration, 827
 installing jumper clips, 828
 removing Quantum module door, 830
mounting brackets
 125 mm, 820
 20 mm, 822
 description, 819
 part numbers, 819
MSB10100 MSX10100, 399
MSC10100 MSX10100, 399
MSX motion modules MSX10100, 399
MSX10100
 analog input (electrical specifications), 403
 analog input (operational specifications), 401
 analog output (electrical specifications), 403
 analog output (operational specifications), 401
 application program (operational specifications), 400
 communications (operational specifications), 400
 compatibility (operational specifications), 402
 description, 399
 DIP switch settings, 409
 discrete inputs (operational specifications), 401
 discrete inputs and high speed input (electrical specifications), 403
 discrete output (electrical specifications), 403
 discrete outputs (operational specifications), 401
 drive interface (electrical specifications), 404
 electrical specifications, 403
 encoder feedback interface (electrical specifications), 404
 front panel indicators, 406
 high speed input (operational

specifications), 400
illustration, 399
incremental encoder feedback, 402
LED descriptions, 406
Modbus connectors, 407
motor temperature input (electrical specifications), 404
operational specifications, 400
power requirements (electrical specifications), 404
rear panel switches, 409
resolver feedback (fully configured version), 402
resolver interface (electrical specifications), 403
servo, 400
servo connector, 407
servo connector signals, 408

N

network interface techniques
CPU interface support, 45
description, 45
direct CPU driver, 45
I/O map interface, 46
option module interface, 45
network modules
MMS interface, 21
NOA61110
seven segment display, 236
NOA611X0
LED descriptions, 234
LED indicators, 234
required loadables, 238
reset push button, 238
RS-232C port, 238
NOA62200
LED descriptions, 235
LED indicators, 235
NOA6XXXX
comparison of features, 239
description, 232
front panel conncections, 236
illustration, 232
InterBus port, 237
specifications, 233
NOE2X100
description, 306
illustration, 306
installation, 309
installation example, 310
LED descriptions, 308
LED indicators, 308
specifications, 307
NOE3X100
description, 311
illustration, 311
LED descriptions, 313
specifications, 312
SY/MAX addressing, 313
NOE5X100
description, 314
illustration, 314
LED descriptions, 316
LED indicators, 316
specifications, 315
NOE77100
peer cop based I/O scanner, 323
NOE771x0
BOOTP server, 327
NOE771x1
Enhanced Web Diagnostics, 332

NOE771xx
Bandwith Monitoring, 330
DHCP server, 328
enhanced MODBUS I/O scanner, 323
FTP server, 325
Global Data, 329
HTTP server, 326
illustration, 318
key features, 322
LED descriptions, 320
LED indicators, 320
MODBUS I/O scanner, 322
MODBUS/TCP server, 324
Quantum Ethernet TCP/IP modules, 324
run LED status, 321
services, 330
specifications, 319
NOL911X0
auxiliary LonWorks communication port, 245
description, 240
front panel connectors, 244
front panel push buttons, 243
illustration, 240
LED descriptions, 242
LED error codes, 243
LED indicator status, 242
LED indicators, 242
media types, 246
primary LonWorks communication port, 244
RS-232 configuration port, 244
specifications, 241
NOM modules
Modbus Plus on Fiber, 21
twisted-pair wiring, 21
NOM21X00
ASCII comm port parameters, 277
description, 271
front panel switches, 277
LED descriptions, 273
LED error codes, 274
LED indicators, 273
Modbus connector pinouts, 278
Modbus ports pinout connections for portable computers, 279
rear panel switches, 276
RTU comm port parameters, 277
specifications, 272
SW1 and SW2 address settings, 276
valid comm port parameters, 278
NOM25200
adding nodes, 302
address settings, 288
ASCII comm port parameters, 286
bus configuration, 294
cables, 301
calculating modules in a fiber network, 303
comm port parameters, 286
connecting, 292, 302
description, 281
fiber optic cable ports, 291
fiber optic configurations, 293
front panel switches, 286
hot standby systems example, 299
illustration, 282
LED descriptions, 283
LED topology and descriptions, 283
materials for fiber optic links, 300
mixed fiber optic/copper network, 294
Modbus connector pinouts, 289
network status, 300
optical star passive couplers, 301
point-to-point configuration, 293
rear panel switches, 288
repairing cable breaks, 302
RJ45 cable parts, 290
RJ45 connector, 290
RTU comm port parameters, 286
self healing ring configuration, 298
specifications, 284
star topology, 297
termination kits, 300
tree and star configurations, 296

O

option module interface
network interface techniques, 45

P

part numbers
- ASCII interface module, 68
- counter modules, 68
- CPU, 65
- DIO heads/drops, 66
- Ethernet modules, 67
- high speed interrupt module, 68
- Hot Standby module, 67
- I/O modules, 70
- NOM modules, 67
- power supplies, 64
- RIO heads/drops, 65
- single axis motion modules, 69

Peer Cop
- MODBUS I/O Scanner characteristics, 323

power and grounding considerations
- 125 Vdc powered systems, 841
- AC powered systems, 833
- AC powered systems for CE compliance, 837
- CE compliance installation instructions for AC systems, 835
- CE compliance installation instructions for Vdc systems, 839
- DC powered systems, 834
- description, 832

power and grounding guidelines
- chassis grounding, 851
- Modbus Plus communication tap installation for CE compliance, 851
- other equipment grounding, 852
- power supply ground connection, 851
- systems with multiple power feeds, 852

power supplies
- compatibility issues, 850
- description, 17, 844
- modes, 17
- redundant, 17

Profibus CRP81100, 220

Q

Quantum Automation Series
- block diagram, 16
- capabilities, 16

Quantum configurations
- description, 30
- distributed I/O, 30
- local I/O, 30
- remote I/O, 30

Quantum editors
- description, 26

Quantum network support
- description, 42
- supported networks, 43

Quantum simulator modules
- description, 24

R

redundant power supplies
- description, 848

register assignment
- ACI03000, 514
- ACI04000, 516
- AII33000, 429
- AII33010, 434
- ARI03010, 519
- ATI03000, 523
- AVI03000, 528

remote I/O
- Quantum configurations, 30

RIO configuration
- description, 33
- dual cable illustration, 34
- Hot Standby, 34
- single cable illustration, 33

RIO drop modules CRA93X00, 265

RIO head modules CRP93X00, 260

RIO in a Hot Standby configuration
- dual cable configuration illustration, 36
- single cable configuration illustration, 35

RIO modules
- communication interface modules, 21

S

signal descriptions
EHC20200, 384
single cable configuration
RIO, 33
RIO in a Hot Standby configuration, 35
spare parts
description, 808
specifications
ACI03000, 534
ACI04000, 539
ACO02000, 564
ACO13000, 569
AII33010, 451
AIO33000, 458
ARI030010, 544
ATI03000, 549
AVI03000, 554
AVO02000, 574
CableFast, 860
CHS11000, 416
CPS11100, 79
CPS11400, 83, 107
CPS11410, 86
CPS11420, 89
CPS12400, 92
CPS12420, 95
CPS21100, 98
CPS21400, 101
CPS22400, 104
CPS42400, 110
CPS51100, 114
CPS52400, 117
CPU11302, 122
CPU11303, 133
CPU21304, 144
CPU42402, 155
CPU43412, 166
CPU43412A, 179
CPU53414, 193
CPU53414A, 206
CRA21X10, 249
CRA21X20, 254
CRP81100, 225
CRP93X00, 261
DAI34000, 596
DAI35300, 601
DAI44000, 606
DAI45300, 611
DAI54000, 616
DAI54300, 621
DAI55300, 626
DAI74000, 631
DAI75300, 636

DAO84000, 679
DAO84010, 685
DAO84210, 691
DAO84220, 697
DAO85300, 703
DDI15310, 640
DDI35300, 643
DDI35310, 647
DDI36400, 650
DDI67300, 656
DDI84110, 663
DDI85300, 667
DDM39000, 782
DDM69000, 789
DDO15310, 709
DDO35300, 713
DDO35301, 719
DDO35310, 724
DDO36400, 730
DDO84300, 736
DDO88500, 740
DII33000, 467
DIO33000, 473
DRA84000, 746
DRC83000, 750
DSI35300, 767
DVO85300, 760
EHC10500, 335
EHC20200, 373
EIA92100, 231
ESI06210, 389
HLI34000, 395
NOA6XXX0, 233
NOE2X100, 307
NOE3X100, 312
NOE771xx, 319
NOL911X0, 241
NOM21X00, 272
NOM25200, 284
XCP90000, 490
XSM01000, 484

standalone power supplies
models, 845

summable power supplies
description, 846

system configurations
local, RIO, and DIO, 30

system space requirements
dimensions, 823
illustration, 824
locations, 823
minimum spacing, 823

system specifications
AC/DC power supplies, 56
agency approvals, 59
description, 55
electrical, 56
I/O modules (between 24 and 48 Vac or Vdc), 56
I/O modules (greater than 48 Vac or Vdc), 57
I/O modules (less than 24 Vac or Vdc), 56
mechanical, 55
operating conditions, 57
storage conditions, 58

T

Telefast Input DDI36400, 650
Telefast Output DDO36400, 729

terminal strip/module keying
description, 504
illustration, 505
primary keying, 504
secondary keying, 504

V

version levels
DDM69000, 792

W

wiring diagram
- ACI03000, 536
- ACI04000, 541
- ACO02000, 566
- ACO13000, 571
- AII33000, 442
- AII33010, 453
- AMM09000, 588
- ARI03010, 546
- ATI03000, 551
- AVI03000, 556
- AVO02000, 577
- CFA04000, 869
- CFB03200, 872
- CFC03200, 878
- CFD03200, 886
- CFG01600, 893, 895, 897, 898
- CFH00800, 902
- CFI00800, 910
- CFJ00400, 918
- CFK00400, 927, 929, 931
- CPS11100, 81
- CPS11400, 84
- CPS11410, 87
- CPS11420, 90
- CPS12400, 93
- CPS12420, 96
- CPS21100, 99
- CPS21400, 102
- CPS22400, 105
- CPS41400, 108
- CPS42400, 111
- CPS51100, 115
- CPS52400, 118
- CRA21X10, 250, 255
- DAI34000, 598
- DAI35300, 603
- DAI44000, 608
- DAI45300, 613
- DAI54000, 618
- DAI54300, 623
- DAI55300, 628
- DAI74000, 633
- DAI75300, 638
- DAM59000, 780
- DAO84000, 682
- DAO84010, 688, 694
- DAO84220, 700
- DAO85300, 706
- DDI15310, 642
- DDI35300, 644
- DDI35310, 648
- DDI67300, 660
- DDI84110, 664
- DDI85300, 668
- DDM39000, 787
- DDM69000, 793
- DDO15310, 711
- DDO35300, 716
- DDO35301, 721
- DDO35310, 727
- DDO84300, 738
- DDO88500, 743
- DII33000, 469
- DIO33000, 475
- DRA84000, 748
- DRC83000, 752
- DSI35300, 768
- DVO85300, 763
- EHC10500, 338
- EHC20200, 362, 386
- HLI34000, 397
- intrinsically safe modules, 426
- XSM01000, 485

X

XBE10000
- configuration illustration, 413
- description, 410
- expander cables, 412
- guidelines, 414
- illustration, 410
- specifications, 411

XCP90000
- battery backup, 490
- configuration, 488
- description, 489
- illustration, 489
- installing and removing a battery, 491
- LED descriptions, 491
- LED indicators, 491
- specifications, 490

XSM00200
- description, 480
- illustration, 481

XSM01000
- description, 482
- illustration, 483
- specifications, 484
- wiring diagram, 485