Quantum using EcoStruxure™ Control Expert

140 MSB 101 00 /140 MSC 101 00, Single Axis Motion Modules User Manual

Original instructions

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Schneider Electric

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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

Table of Contents

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, service, 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 a hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result** in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

BEFORE YOU BEGIN

Do not use this product on machinery lacking effective point-of-operation guarding. Lack of effective point-of-operation guarding on a machine can result in serious injury to the operator of that machine.

⚠ WARNING

UNGUARDED EQUIPMENT

- Do not use this software and related automation equipment on equipment which does not have point-of-operation protection.
- Do not reach into machinery during operation.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

This automation equipment and related software is used to control a variety of industrial processes. The type or model of automation equipment suitable for each application will vary depending on factors such as the control function required, degree of protection required, production methods, unusual conditions, government regulations, etc. In some applications, more than one processor may be required, as when backup redundancy is needed.

Only you, the user, machine builder or system integrator can be aware of all the conditions and factors present during setup, operation, and maintenance of the machine and, therefore, can determine the automation equipment and the related safeties and interlocks which can be properly used. When selecting automation and control equipment and related software for a particular application, you should refer to the applicable local and national standards and regulations. The National Safety Council's Accident Prevention Manual (nationally recognized in the United States of America) also provides much useful information.

In some applications, such as packaging machinery, additional operator protection such as point-of-operation guarding must be provided. This is necessary if the operator's hands and other parts of the body are free to enter the pinch points or other hazardous areas and serious injury can occur. Software products alone cannot protect an operator from injury. For this reason the software cannot be substituted for or take the place of point-of-operation protection.

Ensure that appropriate safeties and mechanical/electrical interlocks related to point-of-operation protection have been installed and are operational before placing the equipment into service. All interlocks and safeties related to point-of-operation protection must be coordinated with the related automation equipment and software programming.

NOTE: Coordination of safeties and mechanical/electrical interlocks for point-of-operation protection is outside the scope of the Function Block Library, System User Guide, or other implementation referenced in this documentation.

START-UP AND TEST

Before using electrical control and automation equipment for regular operation after installation, the system should be given a start-up test by qualified personnel to verify correct operation of the equipment. It is important that arrangements for such a check be made and that enough time is allowed to perform complete and satisfactory testing.

⚠ WARNING

EQUIPMENT OPERATION HAZARD

- Verify that all installation and set up procedures have been completed.
- Before operational tests are performed, remove all blocks or other temporary holding means used for shipment from all component devices.
- Remove tools, meters, and debris from equipment.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Follow all start-up tests recommended in the equipment documentation. Store all equipment documentation for future references.

Software testing must be done in both simulated and real environments.

Verify that the completed system is free from all short circuits and temporary grounds that are not installed according to local regulations (according to the National Electrical Code in the U.S.A, for instance). If high-potential voltage testing is necessary, follow recommendations in equipment documentation to prevent accidental equipment damage.

Before energizing equipment:

- Remove tools, meters, and debris from equipment.
- Close the equipment enclosure door.
- Remove all temporary grounds from incoming power lines.
- Perform all start-up tests recommended by the manufacturer.

OPERATION AND ADJUSTMENTS

The following precautions are from the NEMA Standards Publication ICS 7.1-1995 (English version prevails):

- Regardless of the care exercised in the design and manufacture of equipment or in the selection and ratings of components, there are hazards that can be encountered if such equipment is improperly operated.
- It is sometimes possible to misadjust the equipment and thus produce unsatisfactory or unsafe operation. Always use the manufacturer's instructions as a guide for functional adjustments. Personnel who have access to these adjustments should be familiar with the equipment manufacturer's instructions and the machinery used with the electrical equipment.
- Only those operational adjustments actually required by the operator should be accessible to the operator. Access to other controls should be restricted to prevent unauthorized changes in operating characteristics.

About the Book

At a Glance

Document Scope

This documentation describes the functionality of the Quantum Automation Series single axis motion (MSx) modules (140 MSB 101 00 and 140 MSC 101 00).

Validity Note

This documentation is valid for EcoStruxure™ Control Expert 14.1 or later.

The technical characteristics of the devices described in the present document also appear online. To access the information online:

Step	Action
1	Go to the Schneider Electric home page *www.schneider-electric.com*.
2	In the **Search** box type the reference of a product or the name of a product range. ● Do not include blank spaces in the reference or product range. ● To get information on grouping similar modules, use asterisks (*).
3	If you entered a reference, go to the **Product Datasheets** search results and click on the reference that interests you. If you entered the name of a product range, go to the **Product Ranges** search results and click on the product range that interests you.
4	If more than one reference appears in the **Products** search results, click on the reference that interests you.
5	Depending on the size of your screen, you may need to scroll down to see the datasheet.
6	To save or print a datasheet as a .pdf file, click **Download XXX product datasheet**.

The characteristics that are presented in the present document should be the same as those characteristics that appear online. In line with our policy of constant improvement, we may revise content over time to improve clarity and accuracy. If you see a difference between the document and online information, use the online information as your reference.

Related Documents

Title of Documentation	Reference Number
EcoStruxure™ Control Expert, Program Languages and Structure, Reference Manual	35006144 (English), 35006145 (French), 35006146 (German), 35013361 (Italian), 35006147 (Spanish), 35013362 (Chinese)
Quantum using EcoStruxure™ Control Expert, Hardware Reference Manual	35010529 (English), 35010530 (French), 35010531 (German), 35013975 (Italian), 35010532 (Spanish), 35012184 (Chinese)
Quantum using EcoStruxure™ Control Expert, Discrete and Analog I/O, Reference Manual	35010516 (English), 35010517 (French), 35010518 (German), 35013970 (Italian), 35010519 (Spanish), 35012185 (Chinese)
Quantum using EcoStruxure™ Control Expert, Experts and Communication, Reference Manual	35010574 (English), 35010575 (French), 35010576 (German), 35014012 (Italian), 35010577 (Spanish), 35012187 (Chinese)
Electrical installation guide	EIGED306001EN (English)
Communication Services and Architectures, Reference Manual	35010500 (English), 35010501 (French), 35006176 (German), 35013966 (Italian), 35006177 (Spanish), 35012196 (Chinese)
Single Axis Software System (SASS) Motion User Guide	
Modicon Motion Development Software (MMDS) User Guide	
Lexium 17D Series Servo Drive User Guide	31001643K04000

You can download these technical publications and other technical information from our website at https://www.se.com/ww/en/download/ .

Part I
Functional Overview

Introduction

This part describes the functional overview of the single axis motion modules (140 MSB 101 00 and 140 MSC 101 00).

What Is in This Part?

This part contains the following chapters:

Chapter 1
Overview

Overview

Single Axis Motion Modules

The Quantum Automation Series single axis motion (MSx) modules (140 MSB 101 00 and 140 MSC 101 00) are designed to control a single axis of motion using advanced digital brushless motion control. This capability provides optimal control by eliminating potentiometer adjustments and analog velocity loops. The MSx modules are designed to interface directly to the Schneider Electric Lexium 17D series brushless servo amplifiers as well as other types of dc and brushless drives.

NOTE: These modules are designed to serve your many and varied applications with great accuracy and speed. However, certain applications might be outside the scope of this module. Please consult Schneider Electric for applications information if you intend to use the module specifically for precise velocity control.

The primary feedback used by the direct numeric processing (DNP) servo system is position information from either a resolver or an encoder mounted to the motor. Velocity information is derived from the position information, rather than being received from a velocity transducer. This leads to some inaccuracies when using the DNP servo as a velocity controller. Small speed irregularities may result, particularly at slower speeds.

System Configuration

The Quantum single axis motion (MSx) modules are incremental encoder (140 MSB 101 00) or resolver and encoder (140 MSC 101 00) feedback-only modules contained in a single-width housing. It works with servo motors that use Lexium drives and other types of DC and brushless drives from other manufacturers.

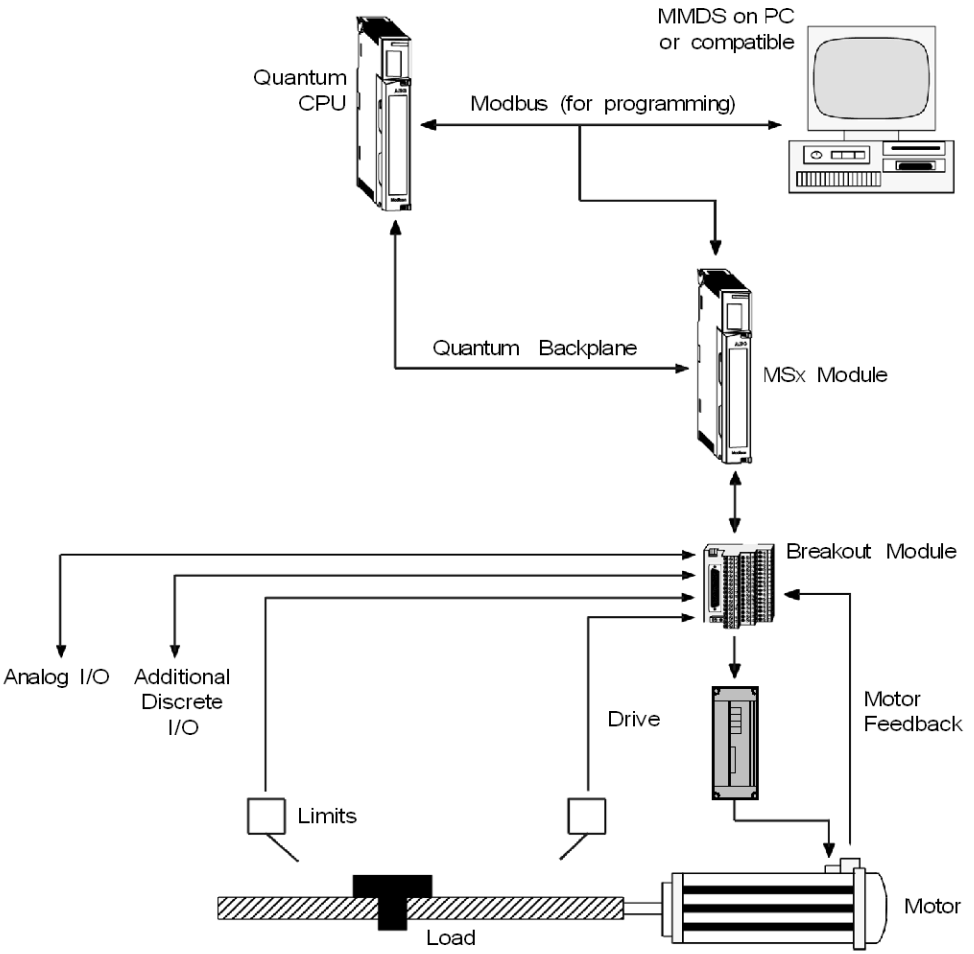
Chapter 2
Specifications and Hardware Overview

140 MSB 101 00 and 140 MSC 101 00 Modules

MSx Modules

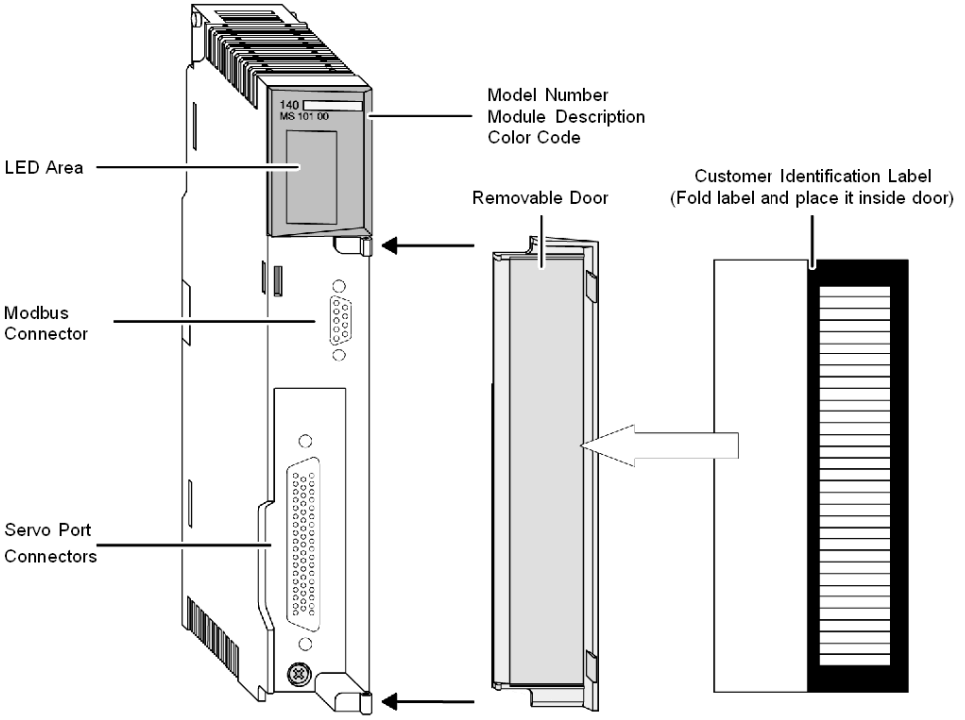
The Quantum single axis motion (MSx) modules are incremental encoder (140 MSB 101 00) or resolver and encoder (140 MSC 101 00) feedback-only modules contained in a single-width housing. It works with servo motors that use Cyberline drives and other types of DC and brushless drives from other manufacturers.

The illustration below shows a typical configuration of a single axis motion control system



The modules contain I/O to interface to the drive and the machine, including drive enable, drive fault, and a variety of user-configurable signals. The modules also include a high speed input pin to perform high speed position capture

See the illustration of a Quantum MSx module below.



NOTE: MSx modules are only installed in Quantum backplanes. Refer to the Quantum Automation Series Hardware Reference Guide for detailed specifications of all Quantum modules and associated hardware. (Reference No. see *Related Documents, page 10*).

Chapter 3
System Information

Purpose

This chapter provides system information on Flash memory, communications protocol, and on-line and off-line development with MMDS.

NOTE: Refer to Appendix E in the *Single Axis Software System (SASS) Motion User Guide* for system checkout information.

What Is in This Chapter?

This chapter contains the following topics:

Flash Memory

Flash EEPROM

The MSx comes with a flash EEPROM that allows storage of application programs and configuration parameters such as servo parameters, speed limits, etc. The flash also accepts firmware updates as firmware enhancements become available.

Communications Protocol

Backplane Communications

Backplane communications with the MSx is through six 3x and 4x registers, which must be I/O mapped to the MSx. Modbus communication with the MSx is through six pairs of registers via the Modbus communication link. The register format is very rigid. The first register sent to the module (4X)is always the control register, and the second is always the command register. The first register returned from the module (3X) is always the current status of the module, while the second register returned is always an echo of the command register. All remaining registers, data register 1 ... 4, are reserved for data and are used as necessary. For additional information refer to Single Axis Software System (SASS) Motion User Guide.

On-line and Off-line Development with MMDS

MMDS

The Modicon Motion Development Software (MMDS), Version 4.1 or higher, is an on-line/off-line software package which runs on a user-supplied IBM PC or compatible computer. MMDS is purchased separately. The computer with MMDS can be connected to the MSx through an RS-232 serial interface.

With MMDS, you can set parameters, check module diagnostics, and exercise the motor during initial system setup. You can also write motion programs and download them into the MSx directly.

NOTE: If the module is I/O mapped in a Quantum PLC and the user has a Modbus Plus adaptor card in their PC, it is possible to do on˜line development over the Modbus Plus network. Refer to the Modicon Motion Development Software (MMDS) User Guide for details.

Part II
Module Description

Introduction

The following part provides information on the Quantum Automation Series Single Motion (MSx) Modules, related Hardware and Specifications.

What Is in This Part?

This part contains the following chapters:

Chapter 4
140 MSx 101 00: Single Axis Motion Module

Purpose

The following chapter provides information of the Quantum 140 MSx 101 00 module.

What Is in This Chapter?

This chapter contains the following topics:

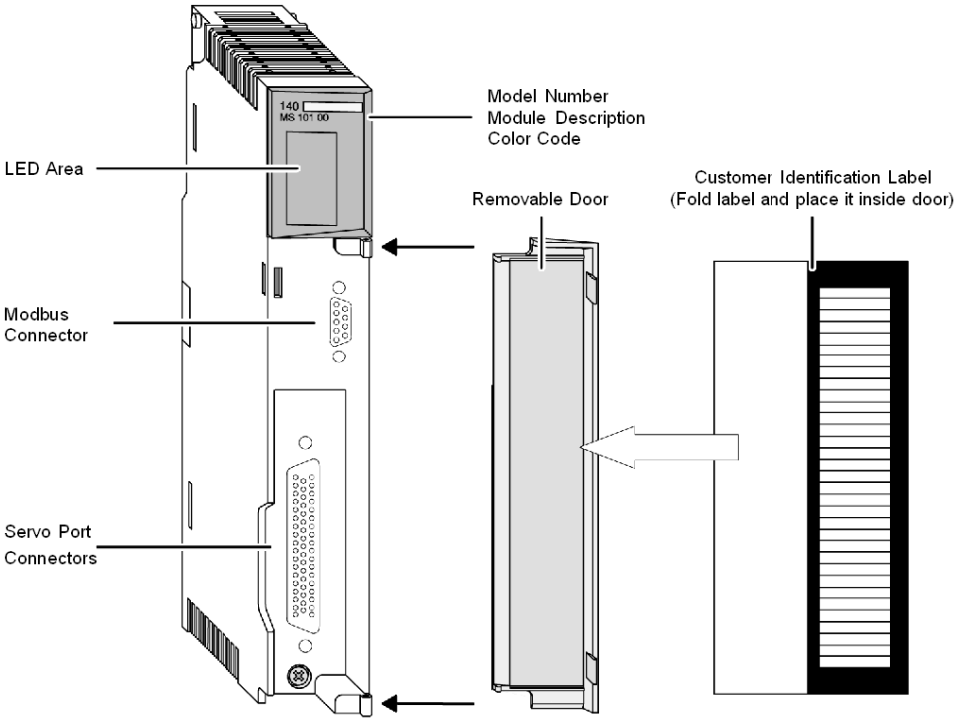
Quantum Single Axis Motion (MSx) Modules

Function

The Quantum single axis motion (MSx) modules are incremental encoder (140 MSB 101 00) or resolver and encoder (140 MSC 101 00) feedback-only modules contained in a single-width housing. It works with servo motors that use Lexium drives and other types of DC and brushless drives from other manufacturers.

Illustration

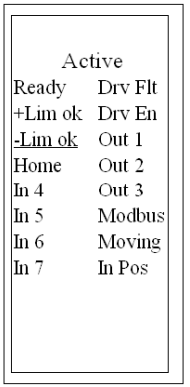
The following figure shows the 140 MSx 101 00 module and its components.



Front Panel Indicators for the 140 MSx 101 00

LED Indicators Panel

The following illustration represents the LED Indicators Panel.



LED Indicators and Descriptions

There are seventeen LED indicators visible on the front panel:

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

General

There are two connectors located on the front of the module.

- A SUB-D 9 connector for RS232 Modbus link
- A SUB-D 50 port for connection to the servo drive.

Modbus Connector

The following table shows the Modbus port pinout connectors.

PIN	Signal	Function
1		Shield
2	TXD	Serial data
3	RXD	Serial data
4	GND	Ground
5	DTR	Control Line
6	DSR	Control Line
7	RTS	Control Line
8	CTS	Control Line

Servo Connector

The following table shows the Servo Connector Signals 34 trough 50.

PIN	Signals 140 MSB 101 00	Signals 140 MSC 101 00
34	Velocity+	Phase A
35	N/C	Phase B
36	N/C	Phase C
37	Velocity-/Phase common	Velocity-/Phase common
38	Drive fault	Drive fault
39	Drive enable contact (NO)	Drive enable contact (NO)
40	Drive enable contact N/C	Drive enable contact N/C
41	Drive enable common	Drive enable common
42	Overtemp high	Overtemp high
43	Overtemp low	Overtemp low
44	Cosine input high	Cosine input high
45	Cosine input low	Cosine input low
46	Sine input high	Sine input high
47	N/C	Sine input low
48	N/C	Reference output high
49	N/C	Reference output low
50	N/C	N/C

The following table shows the Servo Connector Signals 18 trough 33.

PIN	Signals 140 MSB 101 00	Signals 140 MSC 101 00
18	24 VDC	24 VDC
19	24 V common	24 V common
20	Brake output (Auxiliary output 1)	Brake output (Auxiliary output 1)
21	Auxiliary output 2	Auxiliary output 2
22	Auxiliary output 3	Auxiliary output 3
23	Limit CW (Auxiliary input 1)	Limit CW (Auxiliary input 1)
24	Limit CCW (Auxiliary input 2)	Limit CCW (Auxiliary input 2)
25	Home (Auxiliary input 3)	Home (Auxiliary input 3)
26	Auxiliary input 4	Auxiliary input 4
27	Auxiliary input 5	Auxiliary input 5
28	Auxiliary input 6	Auxiliary input 6
29	Auxiliary input 7	Auxiliary input 7

PIN	Signals 140 MSB 101 00	Signals 140 MSC 101 00
30	High speed input	High speed input
31	Analog output	Analog output
32	Analog common	Analog common
33	Analog input	Analog input

The following table shows the Servo Connector Signals 1 trough 17.

PIN	Signals 140 MSB 101 00	Signals 140 MSC 101 00
1	Encoder 1 Phase A+	Encoder 1 Phase A+
2	Encoder 1 Phase A-	Encoder 1 Phase A-
3	Encoder 1 Phase B+	Encoder 1 Phase B+
4	Encoder 1 Phase B-	Encoder 1 Phase B-
5	Encoder 1 Mark+	Encoder 1 Mark+
6	Encoder 1 Mark-	Encoder 1 Mark-
7	Encoder 2 Phase A+	Encoder 2 Phase A+
8	Encoder 2 Phase A-	Encoder 2 Phase A-
9	Encoder 2 Phase B+	Encoder 2 Phase B+
10	Encoder 2 Phase B-	Encoder 2 Phase B-
11	Encoder 2 Mark+	Encoder 2 Mark+
12	Encoder 2 Mark-	Encoder 2 Mark-
13	N/C	N/C
14	N/C	N/C
15	N/C	N/C
16	N/C	N/C
17	N/C (Not connected)	N/C (Not connected)

Rear Panel Switches

Introduction

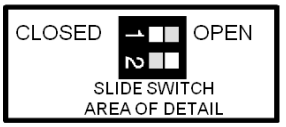
The MSx has an RS-232 serial port to connect the module to an IBM PC (or compatible) running the Modicon Motion Development Software (MMDS). A two-position DIP switch is located on the rear panel of the module (below).

- 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.

NOTE: SW1 and SW2 are open when they are switched away from the internal PCB of the module.

Illustration

The following figure shows the two-position DIP switch.



Description

The following table shows the settings and functions for DIP switches.

Switch	Setting	Function
SW1	*Closed	MMDS control
	Open	PLC control
SW2	Closed	Programmed baud
	*Open	Modbus default
*Factory setting		

Operational Specifications

Servo

Commutation Update Row	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

Communication

Protocol	Modbus
Address (set by software)	1 default
Baud Rate (set by software)	300 – 19200 baud, 9600 default

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 whenevers are enabled, the number of sources requesting commands 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.

High Speed Input

Position Capture Time	250 ms max
Isolation	500 V to system bus
Pulse Width	25 ms
Minimum Time Between Successive Captures	20 ms

Discrete Inputs

Number	7
Scan Time	1.5 ms
Isolation	500 V to system bus

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

Analog Input

Number	1
Scan Time	15 ms
Data	User configurable
Range	10 V
Accuracy	100 mV, plus offset

Analog Output

Number	1
Scan Time	20 ms
Data	User Configurable
Range	10V
Accuracy	50 mV, plus offset

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

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

Electrical Specifications

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

Discrete Output

Drive Capability	150 mA at user supplied 19.2 ... 30 Vdc resistive
Protection	Current limit, thermal
Isolation	500 Vac to system bus

Analog Input

Resolution	10 bits
Input Impedance	30 kΩ
Offset	50 mV
Accuracy	100 mV, plus offset

Analog Output

Resolution	12 bits
Drive Capability	3 mA
Offset	50 mV
Accuracy	50 mV, plus offset

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
Accuracy	10 arc minutes, typical, resolver dependent

Motor Temperature Input

Specifications

Normal State	Short circuit, 2 mA sink max
Fault State	Open circuit
Isolation	500 Vac to system bus

Encoder Feedback Interface

Input Range	-0.7 ... 7Vdc
Input Impedance	145Ω, 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° of quadrature error)
Isolation	500 Vac to system bus with external power supply
Minimum Encoder Pulse Width	1 ms

Drive Interface

Drive Fault Input	True high, TTL compatible relative to 10K internal pull-up resistor
Drive Enable Relay	Form C contacts 120 Vac@0.1A resistive 30 Vdc@0.5A resistive
Current Command Voltages	10 Vdc
Current Command Summing Accuracy	0 0.1 Vdc
Current Commands	3 mA drive capability

Power Requirements

Main Power Input	5 V 5% @750 mA (with no encoders or resolvers attached, output off)
Main Power Input	5 V 5% @1000 mA (with maximum encoder and resolver load, outputs on)
Hot Swap Surge Current	Less than 5 A

Parts List

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Parts List

Part Number	Description
140 MSB 101 00	Quantum Motion Module
140 MSC 101 00	Quantum Motion Module
690 MCB 000 00	Breakout Module, 50 Signal
690 MCB 101 00	CE Compliant Breakout Module Cover
690 MCI 000 01	Low profile DB50/DB50 cable, 1 ft
690 MCI 000 03	Low profile DB50/DB50 cable, 3 ft
690 MCI 000 06	Low profile DB50/DB50 cable, 6 ft

Chapter 5
Connection accessories

Purpose

The following chapter provides information of the connection accessories for the 140 MSx 101 00 module.

What Is in This Chapter?

This chapter contains the following topics:

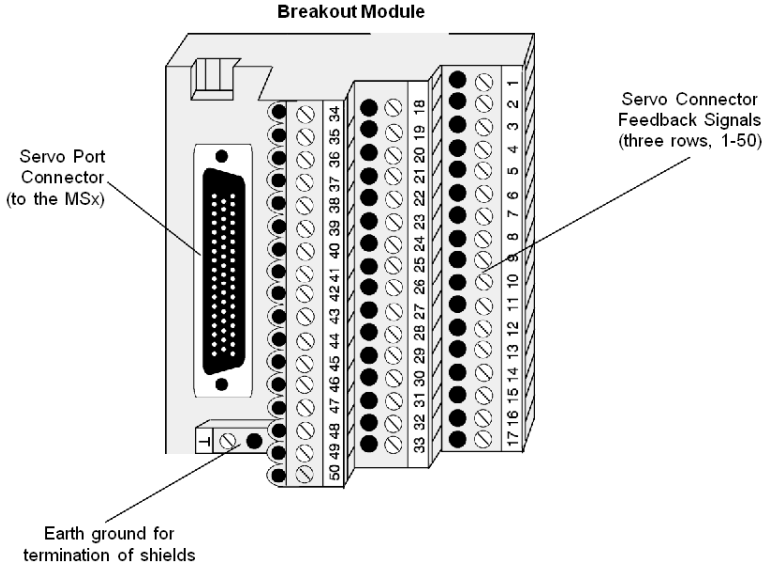
The Breakout Module 690 MCB 000 00

Breakout Module

The Breakout Module (see below) is the I/O wiring block connector for the 140 MSx 101 00 Single Axis Motion Module servo connections. It is connected to the MSx via a Breakout Module cable (690 MCI 000 xx) at the 50-pin servo connector.

Illustration

The following figure shows the Breakout Module, with its Earth ground and Servo Port Connectors.



Reference Labels

Provided with the Breakout Module are labels for the MSB and MSC modules. These labels are a reference for the Breakout Module signal names. Attach the applicable label near this Breakout Module in your cabinet or rack.

Reference Label for the MSB

The following figure represents the reference label for the MSB Breakout Module connection names.

	Modicon 140 MSB 101 00 Connections				
1	CH2 A+	18	24 VDC	34	VEL+
2	CH2 A-	19	24 Com	35	N/C
3	CH2 B+	20	Brake	36	N/C
4	CH2 B-	21	OUT 2	37	VEL-
5	CH2 M+	22	OUT 3	38	Drv Fit
6	CH2 M-	23	CW Lim	39	EN NO
7	CH3 A+	24	CCW Lim	40	EN NC
8	CH3 A-	25	Home	41	EN Com
9	CH3 B+	26	IN 4	42	OTemp+
10	CH3 B-	27	IN 5	43	OTemp-
11	CH3 M+	28	IN 6	44	N/C
12	CH3 M-	29	IN 7	45	N/C
13	N/C	30	HSI	46	
14		31		47	N/C
15	N/C	32	AN Com	48	
16		33		49	N/C
17	N/C				

Reference Label for the MSC

The following figure represents the reference label for the MSC Breakout Module connection names.

Modicon 140 MSC 101 00 Connections					
1	CH2 A+	18	24 VDC	34	∅A
2	CH2 A-	19	24 Com	35	∅B
3	CH2 B+	20	Brake	36	∅C
4	CH2 B-	21	OUT 2	37	∅COM
5	CH2 M+	22	OUT 3	38	Drv Fit
6	CH2 M-	23	CW Lim	39	EN NO
7	CH3 A+	24	CCW Lim	40	EN NC
8	CH3 A-	25	Home	41	EN Com
9	CH3 B+	26	IN 4	42	OTemp+
10	CH3 B-	27	IN 5	43	OTemp-
11	CH3 M+	28	IN 6	44	COS+
12	CH3 M-	29	IN 7	45	COS-
13	N/C	30	HSI	46	SIN+
14	N/C	31	AN OUT	47	SIN-
15	N/C	32	AN Com	48	REF+
16	N/C	33	AN IN	49	REF-
17	N/C			50	N/C

Wiring Information

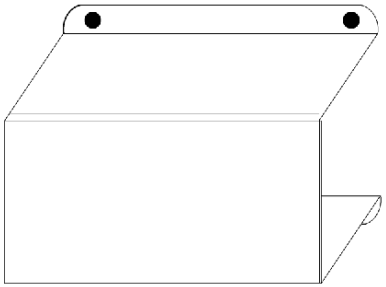
Refer to the Lexium 17D User's Guide, Appendix C, Drive-to-Controller Wiring Diagrams to obtain cabling informations.

Breakout Module Cover 690 MCB 101 00

Breakout Module Cover

A Breakout Module cover (below), Modicon # 690 MCB 101 00, is also available, which shields the termination points of the breakout module from electrostatic discharge. It is a metal plate that is screwed down to the same panel as the DIN rail that holds the Breakout Module. This cover is required to make the system CE* compliant (refer to *Mounting and Connecting the MSx Modules, page 56* for installation instructions).

The Breakout Module cover protects against electrostatic discharge.



* The CE mark indicates compliance with the European Directive on Electromagnetic Compatibility (EMC) (89/336/EEC). In order to maintain compliance, the Quantum system must be installed per the installation instructions.

Part III
Configuration

Introduction

The following part provides information about the configuration of the 140 MSx 101 00 module.

What Is in This Part?

This part contains the following chapters:

Chapter 6
Quantum Addressing Modes

Overview

In the functional description of this expert module, the %IW/%MW (3x/4x) register addressing mode established in the Quantum world is widely used. This chapter describes the different modes used in Control Expert to address the data from a Quantum module.

NOTE: Topological addresses overlapping (%IWr.m.c) is not supported by Quantum application, use flat addressing (%IWx) when memory overlapping control is needed.

What Is in This Chapter?

This chapter contains the following topics:

Flat Addressing—800 Series I/O Modules

Introduction

800 series I/O modules follow a system of flat address mapping in Control Expert. To work properly. each module requires a determinate number of bits and/or words. The IEC addressing system is equivalent to the 984LL register addressing. Use the following assignments:

- 0x is now `%Mx`
- 1x is now `%Ix`
- 3x is now `%IWx`
- 4x is now `%MWx`

The following table shows the relationship between 984LL notation and IEC notation.

Outputs and Inputs	984LL Notation Register Addresses	IEC Notation		
		System Bits and Words	Memory Addresses	I/O Addresses
output	0x	System Bit	%Mx	%Qx
input	1x	System Bit	%Ix	%Ix
input	3x	System Word	%IWx	%IWx
output	4x	System Word	%MWx	%QWx

To access the I/O data of a module,

Step	Action
1	Enter the address range in the configuration screen.

Examples

The following examples show the relationship between 984LL register addressing and IEC addressing:

000001 is now `%M1`

100101 is now `%I101`

301024 is now `%IW1024`

400010 is now `%MW10`

Topological Addressing—800 Series I/O Modules with Control Expert

Accessing I/O Data Values

Use topological addressing to access I/O data items. Identify the topological location of the module within an 800 series I/O module with Control Expert using the following notation:

```
%<Exchangetype><Objecttype>[\b.e\]r.m.c[.rank]
```

where:

- **b** = bus
- **e** = equipment (drop)
- **r** = rack
- **m** = module slot
- **c** = channel

NOTE: When addressing,

1. The [\b.e\] defaults to \1.1\ in a local rack and does not need to be specified.
2. The rank is an index used to identify different properties of an object with the same data type (value, warning level, error level).
3. The rank numbering is zero-based, and if the rank is zero, omit the entry.

For detailed information on I/O variables, please refer to the *EcoStruxure™ Control Expert, Program Languages and Structure, Reference Manual*.

Reading Values: An Example

To read	Action
input value (rank = 0) from channel 7 of an analog module located in slot 6 of a local rack:	Enter `%IW1.6.7[.0]`
input value (rank = 0) from channel 7 of an analog module located in slot 6 of drop 3 of RIO bus 2:	Enter `%IW\2.3\1.6.7[.0]`
'out of range' value (rank = 1) from channel 7 of an analog module located in slot 6 of a local rack:	Enter `%I1.6.7.1[.0]`

Addressing Example

Comparing the 3 Addressing Modes

The following example compares the 3 possible addressing modes. An 8-channel thermocouple 140 ATI 030 00 module with the following configuration data is used:

- mounted in slot 5 of the CPU rack (local rack)
- starting input address is 201 (input word `%IW201`)
- end input address is 210 (input word `%IW210`)

To access the I/O data from the module you can use the following syntax:

Module data	Flat Addressing	Topological Addressing	IODDT Addressing	Concept Addressing
Channel 3 temperature	%IW203	%IW1.5.3	My_Temp.VALUE	300203
Channel 3 out of range	%IW209.5	%I1.5.3.1	My_Temp.ERROR	300209 Bit 5 to be extracted by user logic
Channel 3 range warning	%IW209.13	%I1.5.3.2	My_Temp.WARNING	300209 Bit 13 to be extracted by user logic
Module internal temperature	%IW210	%IW1.5.10	not accessible through IODDT	300210

NOTE: For the IODDT the data type `T_ANA_IN_VWE` is used and the variable `My_Temp` with the address `%CH1.5.10` was defined.

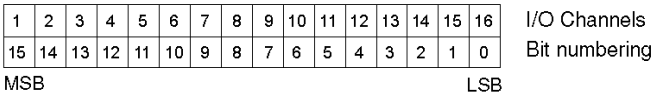
For comparison, the register addressing as used with Concept is added in the last column. As Concept does not support direct addressing of a bit in a word, the bit extraction has to be performed in the user program.

Discrete I/O Bit Numbering

Introduction

The numbering of channels of an I/O module usually starts with 1 and counts up to the maximum number of supported channels. The software however starts numbering with a 0 for the least significant bit in a word (LSB). The Quantum I/O modules have their lowest channel mapped to the most significant bit (MSB).

The following figure shows the mapping of I/O channels related to the bits in a word:.



Word Addressing Versus Bit Addressing

Mainly discrete I/O modules can be configured to deliver their I/O data either in word format or in bit format. This can be selected during configuration by selecting either `%IW` (`%MW`) or `%I` (`%M`). If you need to access a single bit from an I/O module configured to use an I/O word, you can use the syntax `%word.bit`. The following table gives you the connection between I/O point number and the associated I/O address in bit and word addressing.

The table shows a 32-point input module in the main rack, slot 4 configured with starting address `%I1` or `%IW1`:

I/O channel	Bit address (flat addressing)	Bit address (topological addressing)	Bit address extracted from word (flat addressing)	Bit address extracted from word (topological addressing)
1	%I1	%I1.4.1[.0]	%IW1.15	%IW1.4.1.1.15
2	%I2	%I1.4.2[.0]	%IW1.14	%IW1.4.1.1.14
3	%I3	%I1.4.3[.0]	%IW1.13	%IW1.4.1.1.13
• • •				
15	%I15	%I1.4.15[.0]	%IW1.1	%IW1.4.1.1.1
16	%I16	%I1.4.16[.0]	%IW1.0	%IW1.4.1.1.0
17	%I17	%I1.4.17[.0]	%IW2.15	%IW1.4.1.2.15
18	%I18	%I1.4.18[.0]	%IW2.14	%IW1.4.1.2.14
• • •				
31	%I31	%I1.4.31[.0]	%IW2.1	%IW1.4.1.2.1
32	%I32	%I1.4.32[.0]	%IW2.0	%IW1.4.1.2.0

Addressing

Flat Addressing

This module requires 6 contiguous, 16-bit input words (%IW), and 6 contiguous, 16-bit output words (%QW).

Topological Addressing

Topological addresses for the 140MS•10100 modules:

Point	I/O Object	Comment
Input 1	%IW[\b.e\]r.m.1.1	Module Status
Input 2	%IW[\b.e\]r.m.1.2	Command Echo
Input 3	%IW[\b.e\]r.m.1.3	Data
• • •		
Input 6	%IW[\b.e\]r.m.1.6	Data
Output 1	%QW[\b.e\]r.m.1.1	Control Register
Output 2	%QW[\b.e\]r.m.1.2	Command Register
Output 3	%QW[\b.e\]r.m.1.3	Data
• • •		
Output 6	%QW[\b.e\]r.m.1.6	Data

Used abbreviations: **b** = bus, **e** = equipment (drop), **r** = rack, **m** = module slot.

Note

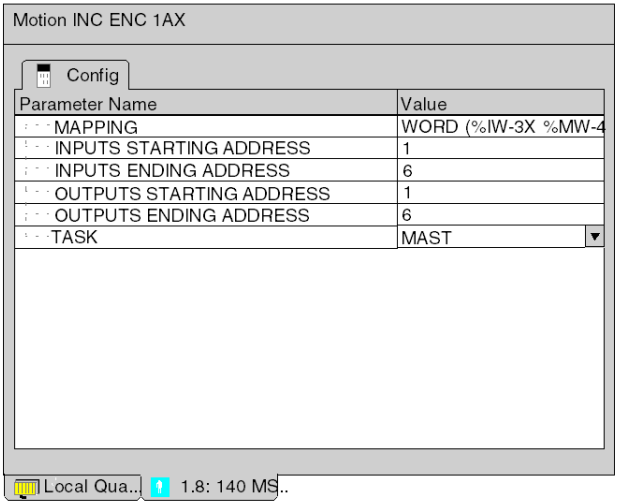
The Input/Output words 3 ... 6 are used for data exchange between the module and the CPU, depending on the active command.

Chapter 7
IO Mapping Configuration

Parameter Configuration

Parameter and Default values

Parameter Configuration Window



Name	Default Value	Options	Description
Mapping	WORD (%MW-4X)	-	-
Inputs Starting Address	1	-	-
Inputs Ending Address	6	-	-
Outputs Starting Address	1	-	-

Name	Default Value	Options	Description
Outputs Ending Address	6	-	-
Task (Grayed if module in other than local)	MAST	FAST AUX0, AUX1, AUX2, AUX3	fixed to MAST if module in other than local MAST = Master Task is attached FAST = Fast Task is attached AUX... = Aux Task is attached

Chapter 8
Hardware Installation

Purpose

This appendix describes the process of mounting and connecting the MSx Modules, as well as adherence to International standards, and types of cabling needed.

What Is in This Chapter?

This chapter contains the following topics:

Mounting and Connecting the MSx Modules

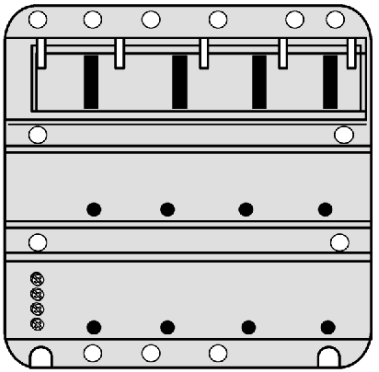
Introduction

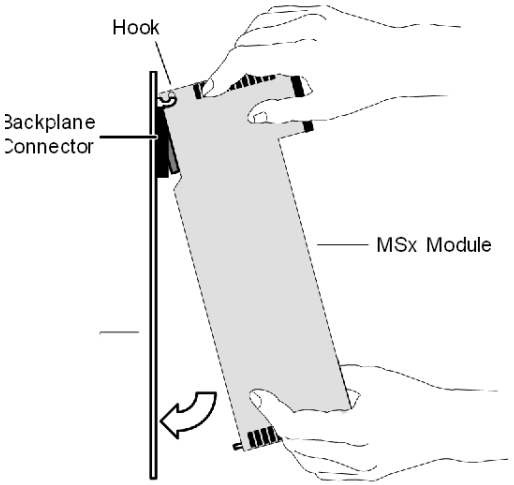
The MSx modules can be inserted into any slot of any backplane and removed under power (hot swapped) without damaging modules or the backplane (Quantum power supply modules must be installed in the first or last slots of the backplane). Refer to the following procedure when mounting modules.

NOTE: For the required grounding configurations for the single axis motion modules, refer to the Quantum Automation Series Hardware Reference Guide. (Reference No. see *Related Documents, page 10*).

Working with the Backplane

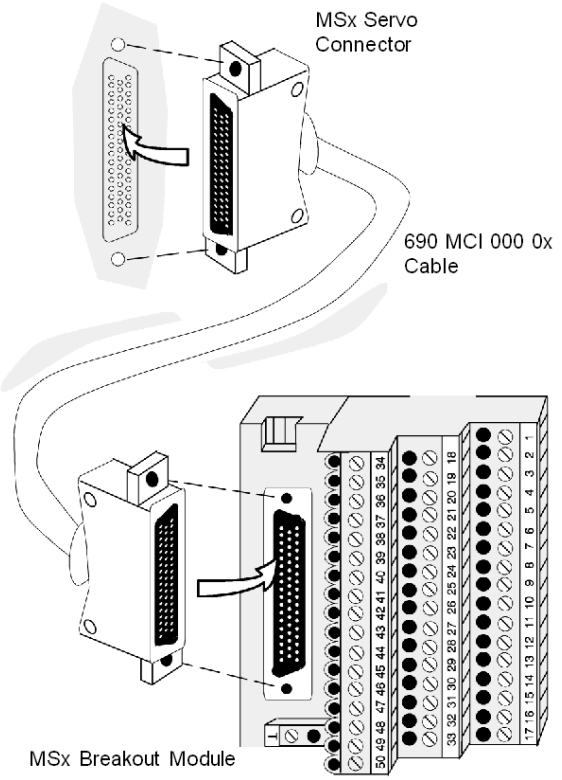
The procedure illustrates the proper handling of the Backplane for the MSx Module:

Step	Action
1	Select a Quantum backplane. 
2	Remove the backplane connector cover(s). 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.

Step	Action
3	Mount the MSx at an angle on to the two hooks located near the top of the backplane. The following figure illustrates the actual mounting process, and involves Steps 3 through 5.  Note: To meet vibration/shock specifications, the backplane must be mounted using all specified mounting holes. 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).
4	Swing the MSx down to make an electrical connection with the backplane I/O bus connector.
5	Tighten the screw at the bottom of the MSx to fasten it to the backplane. (**The maximum tightening torque for these screws is 2-4 in-lbs.**)

Connecting the MSx Modules

The following procedure indicates the proper connection between the MSx Module and the Breakout Module.

Step	Action
1	Once installed, connect the MSx, using a 690 MCI 000 0x breakout cable to the breakout module as follows. Reverse the order of these steps to remove breakout cable. The following is an illustration of the connections between: the MSx Servo Connector; the 690 MCI 000 0x Cable; and the MSx Breakout Module: 
2	As shown in this illustration, line up the connector on the MSx and push the cable firmly into the connector.
3	Once the cable is secured to the connector, tighten the screws onto the connector.
4	Plug the other end of the cable into the breakout module using the same procedure as above.

Step	Action
5	Apply the applicable label (MSB or MSC shown below) to the cabinet or rack as a reference for breakout module connection names. The following figure represents the reference label for the MSB Breakout Module connection names.

Modicon 140 MSB 101 00 Connections

1	CH2 A+	18	24 VDC	34	VEL+
2	CH2 A-	19	24 Com	35	N/C
3	CH2 B+	20	Brake	36	N/C
4	CH2 B-	21	OUT 2	37	VEL-
5	CH2 M+	22	OUT 3	38	Drv Fit
6	CH2 M-	23	CW Lim	39	EN NO
7	CH3 A+	24	CCW Lim	40	EN NC
8	CH3 A-	25	Home	41	EN Com
9	CH3 B+	26	IN 4	42	OTemp+
10	CH3 B-	27	IN 5	43	OTemp-
11	CH3 M+	28	IN 6	44	N/C
12	CH3 M-	29	IN 7	45	N/C
13	N/C	30	HSI	46	
14		31		47	N/C
15	N/C	32	AN Com	48	
16		33		49	N/C
17	N/C				

Step	Action
6	The following is the reference label for the MSC Breakout Module connection names.

Modicon 140 MSC 101 00 Connections

1	CH2 A+	18	24 VDC	34	∅A
2	CH2 A-	19	24 Com	35	∅B
3	CH2 B+	20	Brake	36	∅C
4	CH2 B-	21	OUT 2	37	∅COM
5	CH2 M+	22	OUT 3	38	Drv Fit
6	CH2 M-	23	CW Lim	39	EN NO
7	CH3 A+	24	CCW Lim	40	EN NC
8	CH3 A-	25	Home	41	EN Com
9	CH3 B+	26	IN 4	42	OTemp+
10	CH3 B-	27	IN 5	43	OTemp-
11	CH3 M+	28	IN 6	44	COS+
12	CH3 M-	29	IN 7	45	COS-
13	N/C	30	HSI	46	SIN+
14	N/C	31	AN OUT	47	SIN-
15	N/C	32	AN Com	48	REF+
16	N/C	33	AN IN	49	REF-
17	N/C			50	N/C

Conforming to European CE Approval Standards

General

When a system must be installed according to the European CE* Approval Standards special wiring techniques are required.

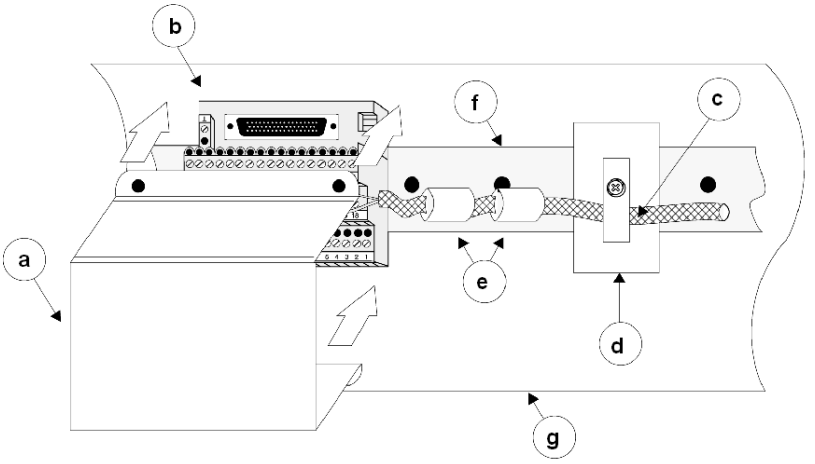
Installing a System

Follow the table below to install a system according to the European CE* Approval Standards:

Step	Action
1	The Breakout Module Cover (**Modicon # 690 MCB 101 00**) must be installed over the Breakout Module after field wiring has been completed in order to shield the termination points from electrostatic discharge.
2	The cover should be placed over the Breakout Module so as to completely cover the terminals and should be screwed down on the same panel as the DIN rail that supports the Breakout Module.
3	If the analog input is used, the twisted shielded pair (**Belden 8451, Alpha 2462**, or equivalent) for the analog input signal should be stripped about 12 inches back from the Breakout Module to expose the shield.
4	The exposed shield should then be attached to the grounded mounting panel using a Grounding Cable Rail (**Modicon # 043509693**).
5	In addition, two ferrite beads (**Steward # 2880686˜200** or equivalent) should be placed over the analog input cable between the grounding cable rail and the Breakout Module.

Special wiring parts

The following figure shows the parts used for special wiring according to the European CE* Approval Standards



a Breakout Module Cover
b Breakout Module
c Twisted shielded pair
d Grounding Cable Rail
e Two ferrite beads
f DIN rail
g Panel

Chapter 9
Setting the Rear Panel Switches

Introduction

The following chapter provides information of the rear panel switch settings for the 140 MSx 101 00 module.

What Is in This Chapter?

This chapter contains the following topics:

Setting the Operating Mode with SW1

SW1 Setting

The SW1 setting determines which device can write to the MSx. The setting is read at power-up and selects either the MMDS or the Quantum PLC to control the operation of the module. This mode selection is a safety feature that prevents you from accidentally issuing commands to the MSx using MMDS while it is being controlled by the Quantum PLC.

The control priority (SW1) is as follows:

1. When only MMDS is attached to the module, it has write privilege regardless of the setting on SW1.
2. When only the Quantum PLC is communicating via the I/O Map to the module, it has write privilege regardless of the setting of SW1.
3. When the Quantum PLC has issued the Set Local Lockout command, it has write privileges regardless of the setting of SW1 and whether or not MMDS is attached.
4. When the Set Local Lockout command is not issued and both the Quantum PLC and MMDS are communicating to the module, the setting of SW1 controls which device has write privilege.

NOTE: Either device may read—that is, issue a GET command—at any time. However, reading the error log (a system command) is not allowed without write privilege because the log is lost once it has been read. See the Single Axis Software System (SASS) Motion User Guide for details.

Setting Modbus Comm Characteristics with SW2

SW2 Setting

The SW2 setting determines the Modbus communication characteristics. When the module is powered up, SW2 is read. When the switch is open, the default characteristics are used. When the switch is closed then the communication characteristics last saved in the

Once communication characteristics are initialized, they may be changed at any time under software control only if SW2 is in the open position. See the Single Axis Software System (SASS) Motion User Guide for details.

When SW2 is open, these Modbus port default characteristics are used:

- One start bit
- Seven data bits
- One stop bit
- Even parity checking
- 9600 baud

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