

XM-120 Eccentricity Module



**User Guide
Firmware Revision 5**

1440-VST02-01RA

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (publication SGI-1.1 available from your local Rockwell Automation sales office or online at <http://literature.rockwellautomation.com>) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.





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

WARNING 	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION 	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence
SHOCK HAZARD 	Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
BURN HAZARD 	Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.

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Safety Approvals

The following information applies when operating this equipment in hazardous locations.		Informations sur l'utilisation de cet équipement en environnements dangereux.	
<p>Products marked "CL I, DIV 2, GP A, B, C, D" are suitable for use in Class I Division 2 Groups A, B, C, D, Hazardous Locations and nonhazardous locations only. Each product is supplied with markings on the rating nameplate indicating the hazardous location temperature code. When combining products within a system, the most adverse temperature code (lowest "T" number) may be used to help determine the overall temperature code of the system. Combinations of equipment in your system are subject to investigation by the local Authority Having Jurisdiction at the time of installation.</p>		<p>Les produits marqués "CL I, DIV 2, GP A, B, C, D" ne conviennent qu'à une utilisation en environnements de Classe I Division 2 Groupes A, B, C, D dangereux et non dangereux. Chaque produit est livré avec des marquages sur sa plaque d'identification qui indiquent le code de température pour les environnements dangereux. Lorsque plusieurs produits sont combinés dans un système, le code de température le plus défavorable (code de température le plus faible) peut être utilisé pour déterminer le code de température global du système. Les combinaisons d'équipements dans le système sont sujettes à inspection par les autorités locales qualifiées au moment de l'installation.</p>	
WARNING 	EXPLOSION HAZARD - <ul style="list-style-type: none"> Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous. Do not disconnect connections to this equipment unless power has been removed or the area is known to be nonhazardous. Secure any external connections that mate to this equipment by using screws, sliding latches, threaded connectors, or other means provided with this product. Substitution of components may impair suitability for Class I, Division 2. If this product contains batteries, they must only be changed in an area known to be nonhazardous. 	AVERTISSEMENT 	RISQUE D'EXPLOSION – <ul style="list-style-type: none"> Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher l'équipement. Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher les connecteurs. Fixer tous les connecteurs externes reliés à cet équipement à l'aide de vis, loquets coulissants, connecteurs filetés ou autres moyens fournis avec ce produit. La substitution de composants peut rendre cet équipement inadapté à une utilisation en environnement de Classe I, Division 2. S'assurer que l'environnement est classé non dangereux avant de changer les piles.

IMPORTANT

Wiring to or from this device, which enters or leaves the system enclosure, must utilize wiring methods suitable for Class I, Division 2 Hazardous Locations, as appropriate for the installation in accordance with the product drawings as indicated in the following table.

Model	Catalog Number	Haz Location Drawings*		Model	Catalog Number	Haz Location Drawings*	
		w/o Barriers	w/ Barriers			w/o Barriers	w/ Barriers
XM-120	1440-VST0201RA	48178-HAZ	48179-HAZ	XM-320	1440-TPS0201RB	48238-HAZ	48239-HAZ
XM-121	1440-VLF0201RA			XM-360	1440-TPR0600RE	48295-HAZ	48299-HAZ
XM-122	1440-VSE0201RA			XM-361	1440-TUN0600RE		
XM-123	1440-VAD0201RA			XM-361	1440-TTC0600RE		
XM-160	1440-VDRS0600RH	51263-HAZ	51264-HAZ	XM-440	1440-RMA0004RC	48240-HAZ	N/A
XM-161	1440-VDRS0606RH			XM-441	1440-REX0004RD	48241-HAZ	N/A
XM-162	1440-VDRP0600RH			XM-442	1440-REX0304RG	48642-HAZ	N/A
XM-220	1440-SPD0201RB			48640-HAZ	48641-HAZ		

* Drawings are available on the included CD

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Introduction

This chapter provides an overview of the XM-120 Eccentricity module. It also discusses the components of the module.

For information about	See page
Introducing the Eccentricity Module	1
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Using this Manual	3

IMPORTANT

This manual only describes how to install and use the XM-120 Eccentricity module. For information about the dynamic measurement and low frequency dynamic measurement modules, refer to the XM-120/121 Dynamic Measurement Module User Guide.

Introducing the Eccentricity Module

The XM-120 Eccentricity module is a 2-channel eccentricity monitor. It is a member of the Allen-Bradley™ XM® Series, a family of DIN rail mounted condition monitoring and protection modules that operate both in stand-alone applications or integrate with Programmable Logic Controllers (PLCs) and control system networks.

Eccentricity is the measure of the amount of bow in a rotor. The lower the eccentricity value the more straight the shaft. Rotor bow can be a fixed mechanical bow, or it can be a temporary bow caused by uneven thermal heating or simply by the weight of the rotor (gravity bow).

The Eccentricity module is suitable for virtually all types of rotating and reciprocating machinery where rotor bow must be measured prior to or during startup. It accepts input from non-contact eddy current probe systems to provide peak-to-peak eccentricity, maximum instantaneous DC voltage (max gap), minimum instantaneous DC voltage (min gap), and instantaneous DC voltage (gap) measurements. In addition to the transducer inputs, the module can accept one tachometer input to provide speed measurement, which can, if desired, be used to disable eccentricity alarms after startup.

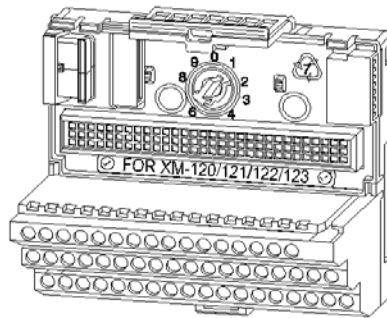
The Eccentricity module includes a single on-board relay, expandable to five, making it a complete monitoring system. It can operate stand-alone, or it can be deployed on a standard or dedicated DeviceNet network where it can provide real-time data and status information to other XM modules, PLCs, distributed control systems (DCS), and Condition Monitoring Systems.

The Eccentricity module can be configured remotely via the DeviceNet network, or locally using a serial connection to a PC or laptop. Refer to Chapter 3 for a list of the configuration parameters.

Eccentricity Module Components

The Eccentricity module consists of a terminal base unit and an instrument module. The XM-120 Dynamic Measurement Module and the XM-940 Terminal Base are shown below.

Figure 1.1 Eccentricity Module Components



XM-940 Dynamic Measurement Module Terminal Base Unit
Cat. No. 1440-TB-A



XM-120 Dynamic Measurement Module
Cat. No. 1440-VST02-01RA

- XM-940 Dynamic Measurement Module Terminal Base - A DIN rail mounted base unit that provides terminations for all field wiring required by XM Dynamic Measurement and Eccentricity modules.
- XM-120 Dynamic Measurement Module - The XM-120 mounts on the XM-940 terminal base via a keyswitch and a 96-pin connector. The XM-120 contains the measurement electronics, processors, relay, and serial interface port for local configuration.

IMPORTANT

The XM-441 Expansion Relay module may be connected to the XM-120 module via the XM-940 terminal base.

When connected to the module, the Expansion Relay module simply “expands” the capability of the XM-120 by adding four additional epoxy-sealed relays. The module controls the Expansion Relay module by extending to it the same logic and functional controls as the on-board relay.

Using this Manual

This manual introduces you to the XM-120 Eccentricity module. It is intended for anyone who installs, configures, or uses the XM-120 Eccentricity module.

Organization

To help you navigate through this manual, it is organized in chapters based on these tasks and topics.

Chapter 1 "Introduction" contains an overview of this manual and the XM-120 Eccentricity module.

Chapter 2 "Installing the XM-120 Eccentricity Module" describes how to install, wire, and use the Eccentricity module. It also provides instructions on how to install the Eccentricity firmware.

Chapter 3 "Configuration Parameters" provides a complete listing and description of the Eccentricity parameters. The parameters can be viewed and edited using the XM Serial Configuration Utility software and a personal computer.

Appendix A "Specifications" lists the technical specifications for the Eccentricity module.

Appendix B "DeviceNet Information" provides information to help you configure the module over a DeviceNet network.

Appendix C "DeviceNet Objects" provides information on the DeviceNet objects supported by the XM-120 Eccentricity module.

Appendix D "Wiring Connections for Previous Module Revisions" provides terminal block assignments and wiring diagrams of earlier revisions of the XM-120 module (before revision D01).

For definitions of terms used in this Guide, see the Glossary at the end of the Guide.

Document Conventions

There are several document conventions used in this manual, including the following:

The XM-120 Eccentricity module is referred to as XM-120, Eccentricity module, device, or module throughout this manual.

TIP

A tip indicates additional information which may be helpful.

EXAMPLE

This convention presents an example.

Installing the XM-120 Eccentricity Module

This chapter discusses how to install and wire the XM-120 Eccentricity module. It also describes the module indicators and the basic operations of the modules.

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ATTENTION**Environment and Enclosure**

This equipment is intended for use in a Pollution Degree 2 Industrial environment, in overvoltage Category II applications (as defined in IED publication 60664-1), at altitudes up to 2000 meters without derating.

This equipment is supplied as “open type” equipment. It must be mounted within an enclosure that is suitably designed for those specific environmental conditions that will be present, and appropriately designed to prevent personal injury resulting from accessibility to live parts. The interior of the enclosure must be accessible only by the use of a tool. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings that are required to comply with certain product safety certifications.

See NEMA Standards publication 250 and IEC publication 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosures.

XM Installation Requirements

This section describes wire, power, and grounding requirements for an XM system.

Wiring Requirements

Use solid or stranded wire. All wiring should meet the following specifications:

- 14 to 22 AWG copper conductors without pretreatment; 8 AWG required for grounding the DIN rail for electromagnetic interference (emi) purposes
- Recommended strip length 8 millimeters (0.31 inches)
- Minimum insulation rating of 300 V
- Soldering the conductor is forbidden
- Wire ferrules can be used with stranded conductors; copper ferrules recommended

ATTENTION

See the XM Documentation and Configuration Utility CD for Hazardous Locations installation drawings. The XM Documentation and Configuration Utility CD is packaged with the XM modules.

Power Requirements

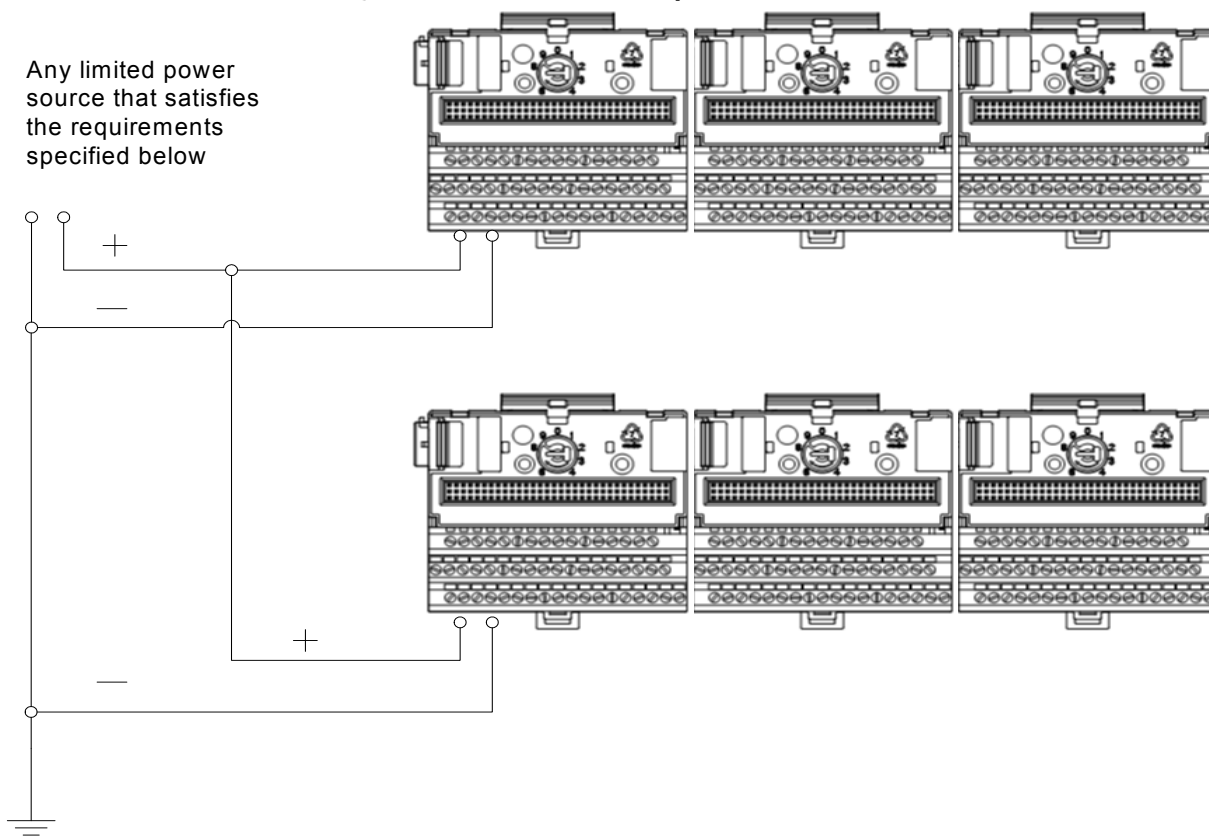
Before installing your module, calculate the power requirements of all modules interconnected via their side connectors. The total current draw through the side connector cannot exceed 3A. Refer to the specifications for the specific modules for power requirements.

ATTENTION

A separate power connection is necessary if the total current draw of the interconnecting modules is greater than 3 A.

Figure 2.1 is an illustration of wiring modules using separate power connections.

Figure 2.1 XM Modules with Separate Power Connections



Power Supply Requirements

XM Power Supply Requirements	
Protection	Listed Class 2 rated supply, or Fused* ITE Listed SELV supply, or Fused* ITE Listed PELV supply
Output Voltage	24 Vdc ± 10%
Output Power	100 Watts Maximum (~4A @ 24 Vdc)
Static Regulation	± 2%
Dynamic Regulation	± 3%
Ripple	< 100mVpp
Output Noise	Per EN50081-1
Overshoot	< 3% at turn-on, < 2% at turn-off
Hold-up Time	As required (typically 50mS at full rated load)

* When a fused supply is used the fuse must be a 5 amp, listed, fast acting fuse such as provided by Allen-Bradley part number 1440-5AFUSEKIT

IMPORTANT

See Application Technique "XM Power Supply Solutions", publication ICM-AP005A-EN-E, for guidance in architecting power supplies for XM systems.

Grounding Requirements

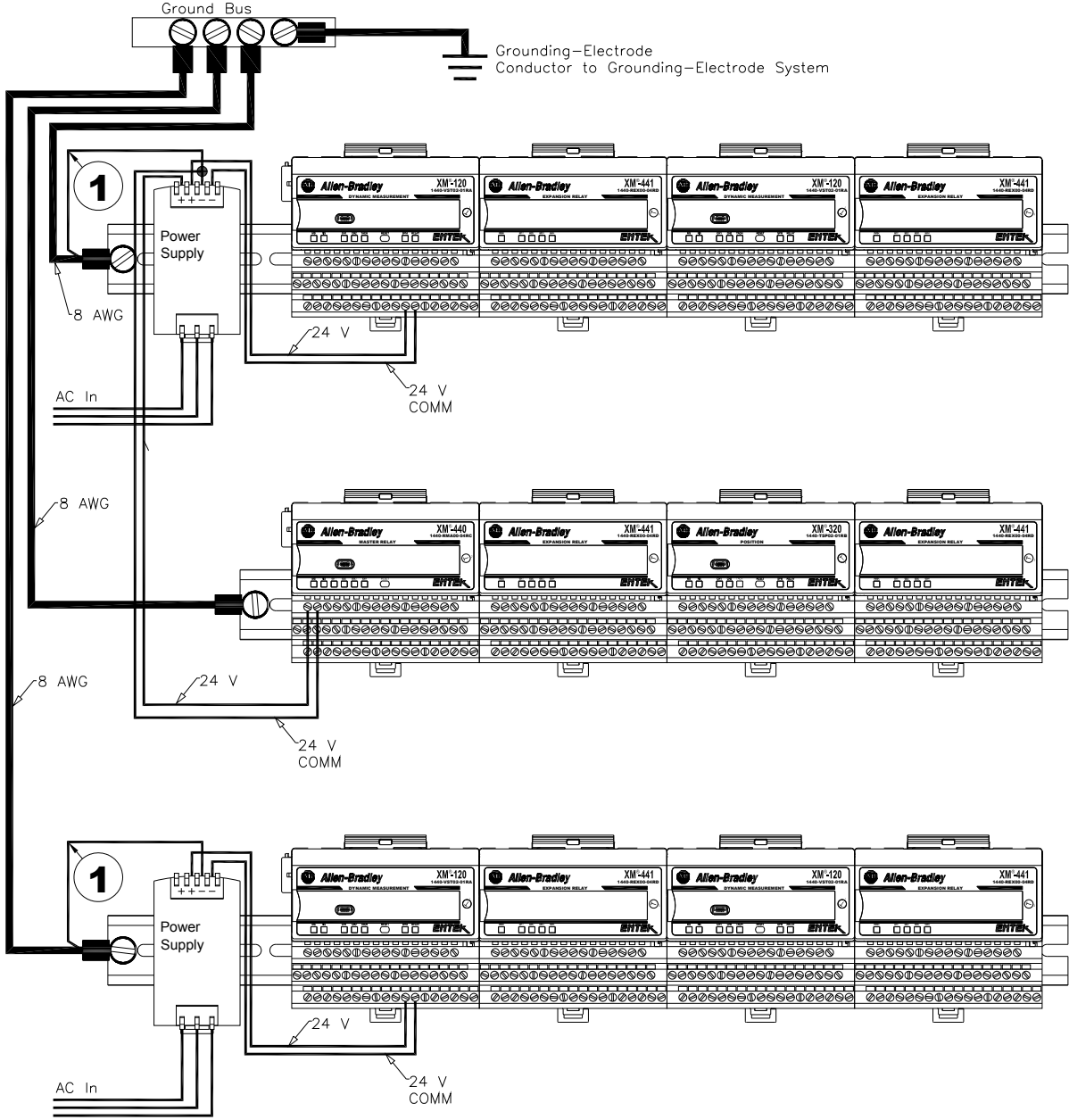
Use these grounding requirements to ensure safe electrical operating circumstances, and to help avoid potential emi and ground noise that can cause unfavorable operating conditions for your XM system.

DIN Rail Grounding

The XM modules make a chassis ground connection through the DIN rail. The DIN rail must be connected to a ground bus or grounding electrode conductor using 8 AWG or 1 inch copper braid. See Figure 2.2.

Use zinc-plated, yellow-chromated steel DIN rail (Allen-Bradley part no. 199-DR1 or 199-DR4) or equivalent to assure proper grounding. Using other DIN rail materials (e.g. aluminum, plastic, etc.), which can corrode, oxidize, or are poor conductors can result in improper or intermittent platform grounding.

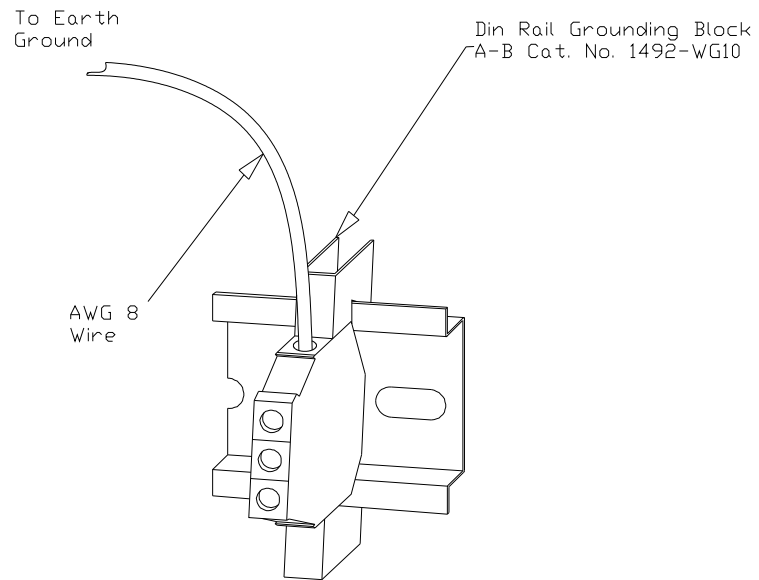
Figure 2.2 XM System DIN Rail Grounding



1 Use 14 AWG wire.

The grounding wire can be connected to the DIN rail using a DIN Rail Grounding Block (Figure 2.3).

Figure 2.3 DIN Rail Grounding Block



Panel/Wall Mount Grounding

The XM modules can also be mounted to a conductive mounting plate that is grounded. See Figure 2.5. Use the grounding screw hole provided on the terminal base to connect the mounting plate the Chassis terminals.

Figure 2.4 Grounding Screw on XM Terminal Base

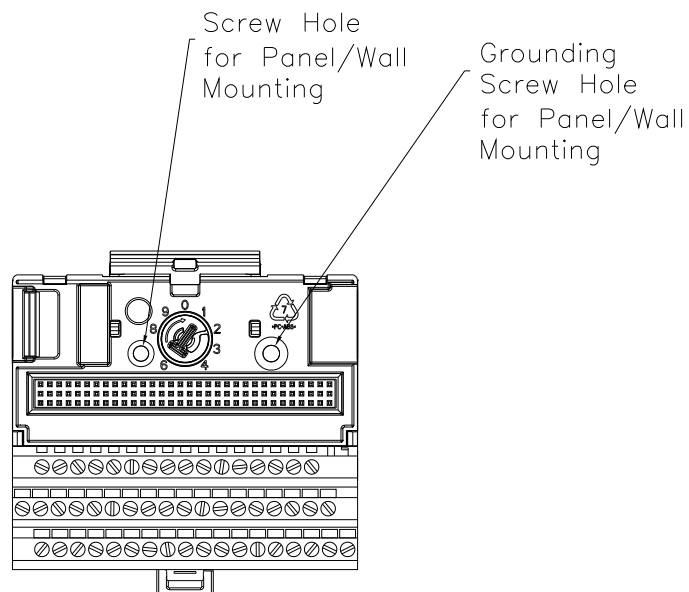
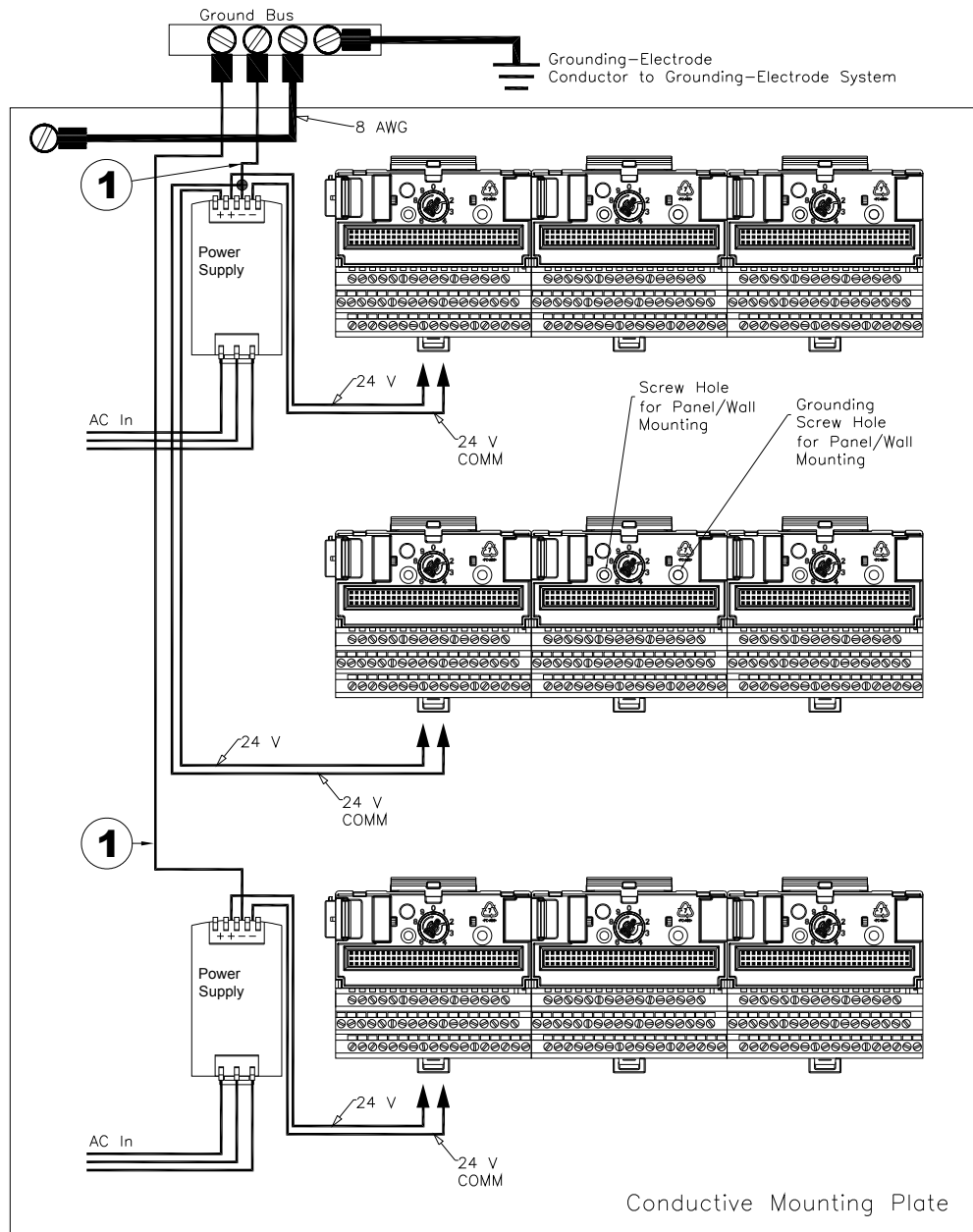


Figure 2.5 Panel/Wall Mount Grounding



1 Use 14 AWG wire.

24V Common Grounding

24 V power to the XM modules must be grounded. When two or more power supplies power the XM system, ground the 24 V Commons at a single point, such as the ground bus bar.

IMPORTANT

If it is not possible or practical to ground the -24Vdc supply, then it is possible for the system to be installed and operate ungrounded. However, if installed ungrounded then the system must not be connected to a ground through any other circuit unless that circuit is isolated externally. Connecting a floating system to a non-isolated ground could result in damage to the XM module(s) and/or any connected device. Also, operating the system without a ground may result in the system not performing to the published specifications regards measurement accuracy and communications speed, distance or reliability.

IMPORTANT

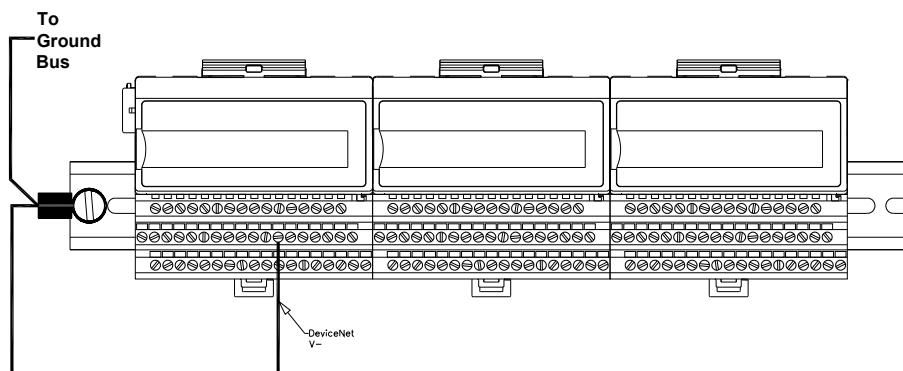
The 24 V Common and Signal Common terminals are internally connected. They are isolated from the Chassis terminals unless they are connected to ground as described in this section. See Terminal Block Assignments on page 18 for more information.

Transducer Grounding

Make certain the transducers are electrically isolated from earth ground. Cable shields must be grounded at one end of the cable, and the other end left floating or not connected. It is recommended that where possible, the cable shield be grounded at the XM terminal base (Chassis terminal) and not at the transducer.

DeviceNet Grounding

The DeviceNet network is functionally isolated and must be referenced to earth ground at a single point. XM modules do not require an external DeviceNet power supply. Connect DeviceNet V- to earth ground at one of the XM modules, as shown in Figure 2.6.

Figure 2.6 Grounded DeviceNet V- at XM Module**ATTENTION**

Use of a separate DeviceNet power supply is not permitted. See Application Technique "XM Power Supply Solutions", publication ICM-AP005A-EN-E, for guidance in using XM with other DeviceNet products.

For more information on the DeviceNet installation, refer to the ODVA Planning and Installation Manual - DeviceNet Cable System, which is available on the ODVA web site (<http://www.odva.org>).

Switch Input Grounding

The Switch Input circuits are functionally isolated from other circuits. It is recommended that the Switch RTN signal be grounded at a single point. Connect the Switch RTN signal to the XM terminal base (Chassis terminal) or directly to the DIN rail, or ground the signal at the switch or other equipment that is wired to the switch.

Mounting the Terminal Base Unit

The XM family includes several different terminal base units to serve all of the XM modules. The XM-940 terminal base, Cat. No. 1440-TB-A, is the only terminal base unit used with the Eccentricity module.

The terminal base can be DIN rail or wall/panel mounted. Refer to the specific method of mounting below.

ATTENTION

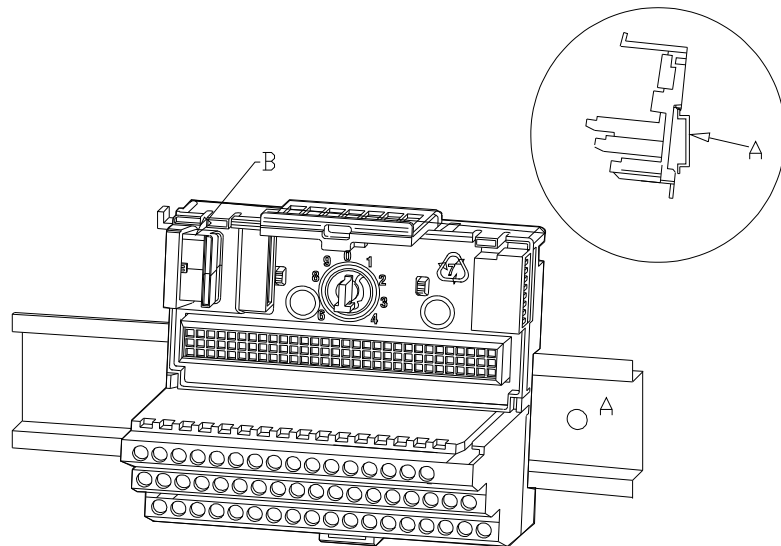

The XM modules make a chassis ground connection through the DIN rail. Use zinc plated, yellow chromated steel DIN rail to assure proper grounding. Using other DIN rail materials (e.g. aluminum, plastic, etc.), which can corrode, oxidize or are poor conductors can result in improper or intermittent platform grounding.

You can also mount the terminal base to a grounded mounting plate. Refer to Panel/Wall Mount Grounding on page 10.

DIN Rail Mounting

Use the following steps to mount the XM-940 terminal base unit on a DIN rail (A-B pt no. 199-DR1 or 199-DR4).

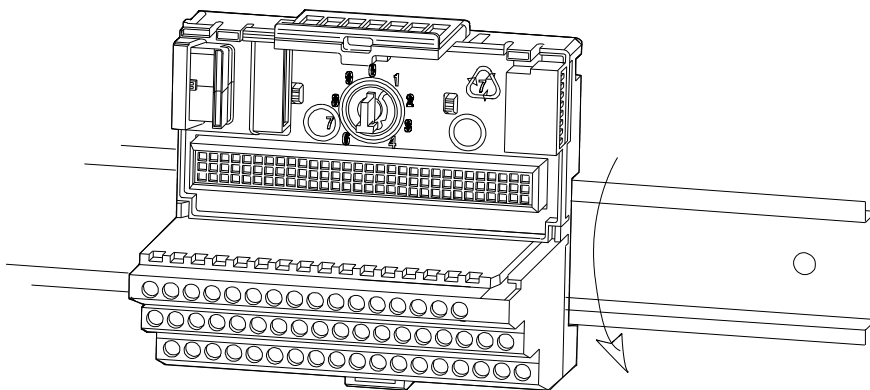
1. Position the terminal base on the 35 x 7.5 mm DIN rail (A).



Position terminal base at a slight angle and hook over the top of the DIN rail.

2. Slide the terminal base unit over leaving room for the side connector (B).

3. Rotate the terminal base onto the DIN rail with the top of the rail hooked under the lip on the rear of the terminal base.



4. Press down on the terminal base unit to lock the terminal base on the DIN rail. If the terminal base does not lock into place, use a screwdriver or similar device to open the locking tab, press down on the terminal base until flush with the DIN rail and release the locking tab to lock the base in place.

Interconnecting Terminal Base Units

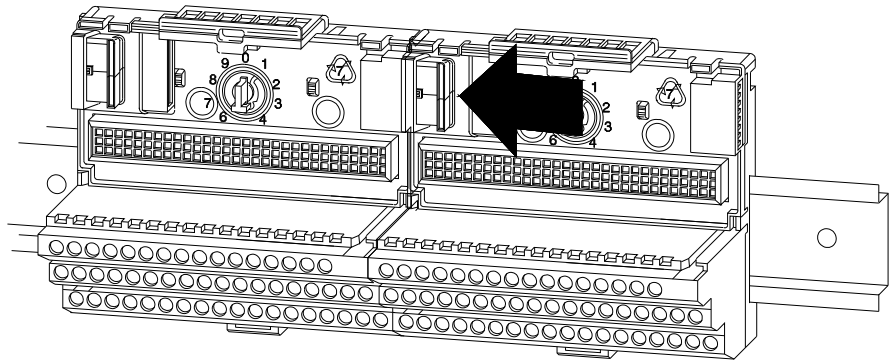
Follow the steps below to install another terminal base unit on the DIN rail.

IMPORTANT

Make certain you install the terminal base units in order of left to right.

1. Position the terminal base on the 35 x 7.5 mm DIN rail (A).
2. Make certain the side connector (B) is **fully retracted** into the base unit.
3. Slide the terminal base unit over tight against the neighboring terminal base. Make sure the hook on the terminal base slides under the edge of the terminal base unit.
4. Press down on the terminal base unit to lock the terminal base on the DIN rail. If the terminal base does not lock into place, use a screwdriver or similar device to open the locking tab, press down on the terminal base until flush with the DIN rail and release the locking tab to lock the base in place.

5. Gently push the side connector into the side of the neighboring terminal base to complete the backplane connection.



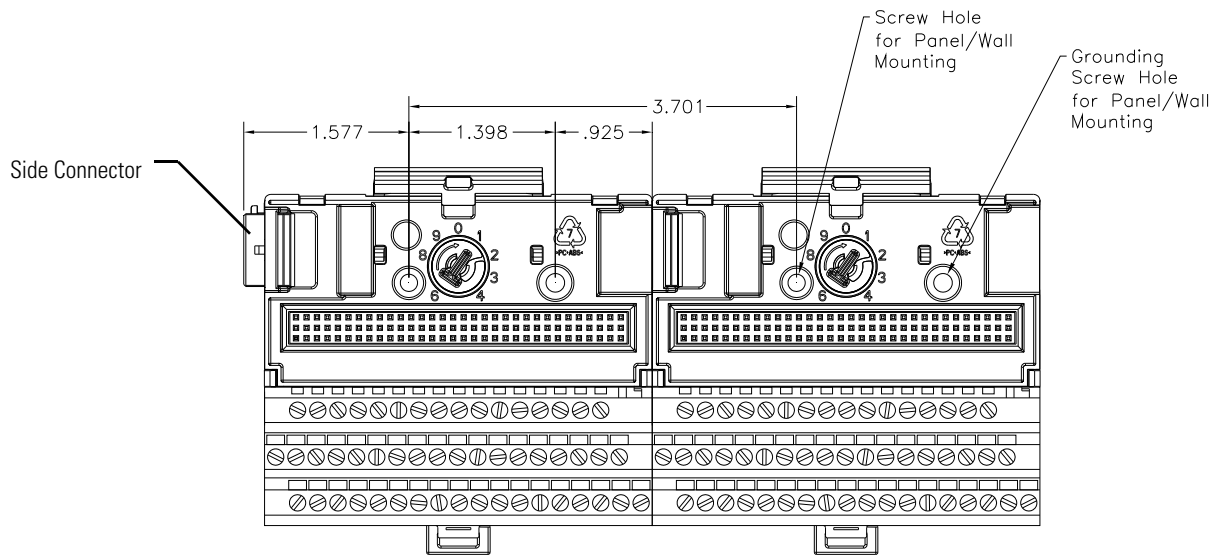
Panel/Wall Mounting

Installation on a wall or panel consists of:

- laying out the drilling points on the wall or panel
- drilling the pilot holes for the mounting screws
- installing the terminal base units and securing them to the wall or panel

Use the following steps to install the terminal base on a wall or panel.

1. Lay out the required points on the wall/panel as shown in the drilling dimension drawing below.



2. Drill the necessary holes for the #6 self-tapping mounting screws.
3. Secure the terminal base unit using two #6 self-tapping screws.
4. To install another terminal base unit, retract the side connector into the base unit. Make sure it is **fully retracted**.
5. Position the terminal base unit up tight against the neighboring terminal base. Make sure the hook on the terminal base slides under the edge of the terminal base unit.
6. Gently push the side connector into the side of the neighboring terminal base to complete the backplane connection.
7. Secure the terminal base to the wall with two #6 self-tapping screws.

Connecting Wiring for Your Module

Wiring to the module is made through the terminal base unit on which the module mounts. The XM-120 is compatible only with the XM-940 terminal base unit, Cat. No. 1440-TB-A.

Figure 2.7 XM-940 Terminal Base Unit

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Row A		
[Terminal Block Row A]																		
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		32	33
[Terminal Block Row B]																		
34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	Row C
[Terminal Block Row C]																		

XM-940 (Cat. No. 1440-TB-A)

Terminal Block Assignments

The terminal block assignments and descriptions for the Eccentricity module are shown below.

ATTENTION

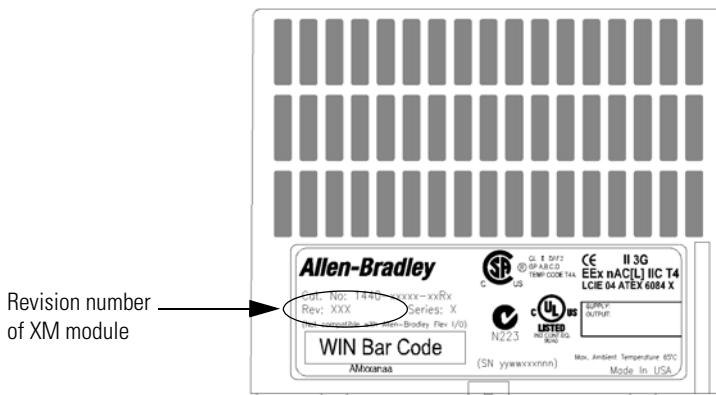


The terminal block assignments are different for different XM modules. The following table applies only to the XM-120 Eccentricity module revision D01 (and later). If you have an earlier revision of the module, refer to Appendix D for its terminal block assignments.

Refer to the installation instructions for the specific XM module for its terminal assignments.

TIP

The XM module's revision number is on the product label (which is located on the front of the XM module, as shown below).



WARNING**EXPLOSION HAZARD**

Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous.

Do not disconnect connections to this equipment unless power has been removed or the area is known to be nonhazardous. Secure any external connections that mate to this equipment by using screws, sliding latches, threaded connectors, or other means provided with this product.

Terminal Block Assignments

No.	Name	Description
0	Xducer 1 (+)	Vibration transducer 1 connection
1	Xducer 2 (+)	Vibration transducer 2 connection
2	Buffer 1 (+)	Vibration signal 1 buffered output
3	Buffer 2 (+)	Vibration signal 2 buffered output
4	Tach/Signal In (+)	Tachometer transducer/signal input, positive side
5	Buffer Power 1 IN	Channel 1 buffer power input Connect to terminal 6 for positive biased transducers or terminal 21 for negative biased transducers
6	Positive Buffer Bias	Provides positive (-5 V to +24 V) voltage compliance to buffered outputs Connect to terminals 5 (CH 1) or 22 (CH 2) for positive bias transducers
7	TxD	PC serial port, transmit data
8	RxD	PC serial port, receive data
9	XRTN ¹	Circuit return for TxD and RxD
10	Chassis	Connection to DIN rail ground spring or panel mounting hole
11	4-20 mA 1 (+)	4-20 mA output 300 ohm maximum load
12	4-20 mA 1 (-)	
13	Chassis	Connection to DIN rail ground spring or panel mounting hole
14	Chassis	Connection to DIN rail ground spring or panel mounting hole
15	Chassis	Connection to DIN rail ground spring or panel mounting hole
16	Xducer 1 (-) ¹	Vibration transducer 1 connection
17	Xducer 2 (-) ¹	Vibration transducer 2 connection
18	Signal Common ¹	Vibration buffered output return
19	TACH Buffer	Tachometer transducer/signal output
20	Tachometer (-)	Tachometer transducer/signal return, TACH Buffer return
21	Buffer/Xducer Pwr (-)	Provides negative (-24 V to +9 V) voltage compliance to buffered outputs Connect to terminals 5 (CH 1) or 22 (CH 2) for negative bias transducers Transducer power supply output, negative side; used to power external sensor (40 mA maximum load)

Terminal Block Assignments

No.	Name	Description
22	Buffer Power 2 IN	Channel 2 buffer power input Connect to terminal 6 for positive biased transducers or terminal 21 for negative biased transducers
23	CAN_High	DeviceNet bus connection, high differential (white wire)
24	CAN_Low	DeviceNet bus connection, low differential (blue wire)
25	+24 V Out	Internally connected to 24 V In (terminal 44) Used to daisy chain power if XM modules are not plugged into each other
26	DNet V (+)	DeviceNet bus power input, positive side (red wire)
27	DNet V (-)	DeviceNet bus power input, negative side (black wire)
28	24 V Common ¹	Internally connected to 24 V Common (terminals 43 and 45) Used to daisy chain power if XM modules are not plugged into each other If power is not present on terminal 44, there is no power on this terminal
29	4-20 mA 2 (+)	4-20 mA output 300 ohm maximum load
30	4-20 mA 2 (-)	
31	Chassis	Connection to DIN rail ground spring or panel mounting hole
32	Chassis	Connection to DIN rail ground spring or panel mounting hole
33	Chassis	Connection to DIN rail ground spring or panel mounting hole
34	Chassis	Connection to DIN rail ground spring or panel mounting hole
35	Chassis	Connection to DIN rail ground spring or panel mounting hole
36	Chassis	Connection to DIN rail ground spring or panel mounting hole
37	Chassis	Connection to DIN rail ground spring or panel mounting hole
38	Chassis	Connection to DIN rail ground spring or panel mounting hole
39	Not Used	
40	Switch RTN	Switch return, shared between SetPtMult and Reset Relay
41	Reset Relay	Switch input to reset internal relay (active closed)
42	Reserved	
43	24 V Common ¹	Internally DC-coupled to circuit ground
44	+24 V In	Connection to primary external +24 V power supply, positive side
45	24 V Common ¹	Connection to external +24 V power supply, negative side (internally DC-coupled to circuit ground)
46	Relay N.C. 1	Relay Normally Closed contact 1
47	Relay Common 1	Relay Common contact 1
48	Relay N.O. 1	Relay Normally Open contact 1
49	Relay N.O. 2	Relay Normally Open contact 2
50	Relay Common 2	Relay Common contact 2
51	Relay N.C. 2	Relay Normally Closed contact 2

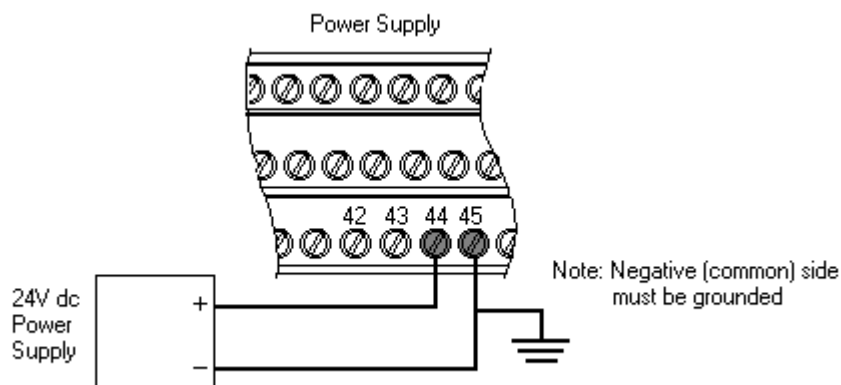
¹ Terminals are internally connected and isolated from the Chassis terminals.

Connecting the Power Supply

Power supplied to the module must be nominally 24 Vdc ($\pm 10\%$) and must be a Class 2 rated circuit.

Wire the DC-input power supply to the terminal base unit as shown in Figure 2.8.

Figure 2.8 DC Input Power Supply Connections



IMPORTANT

A Class 2 circuit can be provided by use of an NEC Class 2 rated power supply, or by using a SELV or PELV rated power supply with a 5 Amp current limiting fuse installed before the XM module(s).

IMPORTANT

24Vdc needs to be wired to terminal 44 (+24 V In) to provide power to the device and other XM modules linked to the wired terminal base via the side connector.

ATTENTION



The power connections are different for different XM modules. Refer to the installation instructions for your specific XM module for complete wiring information.

Connecting the Relays

The XM-120 has both Normally Open (NO) and Normally Closed (NC) relay contacts. Normally Open relay contacts close when the control output is energized. Normally Closed relay contacts open when the control output is energized.

The alarms associated with the relay and whether the relay is normally de-energized (non-failsafe) or normally energized (failsafe) depends on the configuration of the module. Refer to Relay Parameters on page 52 for details.

Table 2.1 shows the on-board relay connections for the module.

IMPORTANT

All XM relays are double pole. This means that each relay has two contacts in which each contact operates independently but identically. The following information and illustrations show wiring solutions for both contacts; although, in many applications it may be necessary to wire only one contact.

TIP

The Expansion Relay module may be connected to the module to provide additional relays. Refer the XM-441 Expansion Relay Module User Guide for wiring details.

IMPORTANT

The NC/NO terminal descriptions (page 20) correspond to a de-energized (unpowered) relay.

When the relay is configured for non-failsafe operation, the relay is normally de-energized.

When the relay is configured for failsafe operation, the relay is normally energized, and the behavior of the NC and NO terminals is inverted.

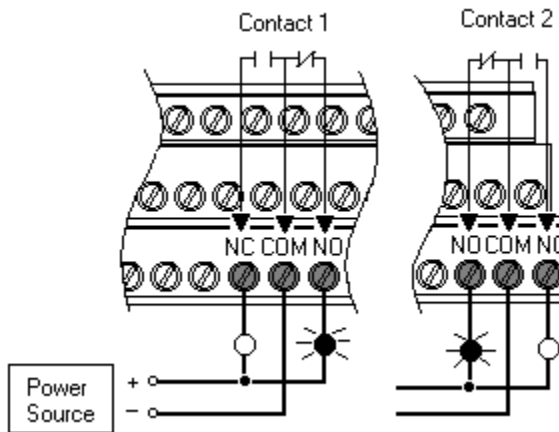
Table 2.1 Relay Connections for XM-120

Configured for Failsafe Operation		Wire Contacts	Relay 1 Terminals	
Nonalarm	Alarm		Contact 1	Contact 2
Closed	Opened	COM	47	50
		NO	48	49
Opened	Closed	COM	47	50
		NC	46	51

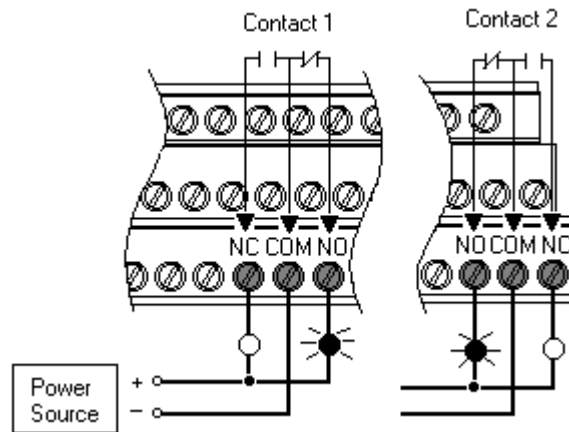
Configured for Non-failsafe Operation		Wire Contacts	Relay 1 Terminals	
Nonalarm	Alarm		Contact 1	Contact 2
Closed	Opened	COM	47	50
		NC	46	51
Opened	Closed	COM	47	50
		NO	48	49

Figures 2.9 and 2.10 illustrate the behavior of the NC and NO terminals when the relay is wired for failsafe, alarm or nonalarm condition or non-failsafe, alarm or nonalarm condition.

**Figure 2.9 Relay Connection - Failsafe, Nonalarm Condition
Non-failsafe, Alarm Condition**



**Figure 2.10 Relay Connection - Failsafe, Alarm Condition
Non-failsafe, Nonalarm Condition**



Alternate Relay Wiring

Figures 2.11 and 2.12 show how to wire both ends of a single external indicator to the XM terminal base for failsafe, nonalarm or alarm condition or non-failsafe, nonalarm or alarm condition.

**Figure 2.11 Relay Connection - Failsafe, Nonalarm Condition
Non-failsafe, Alarm Condition**

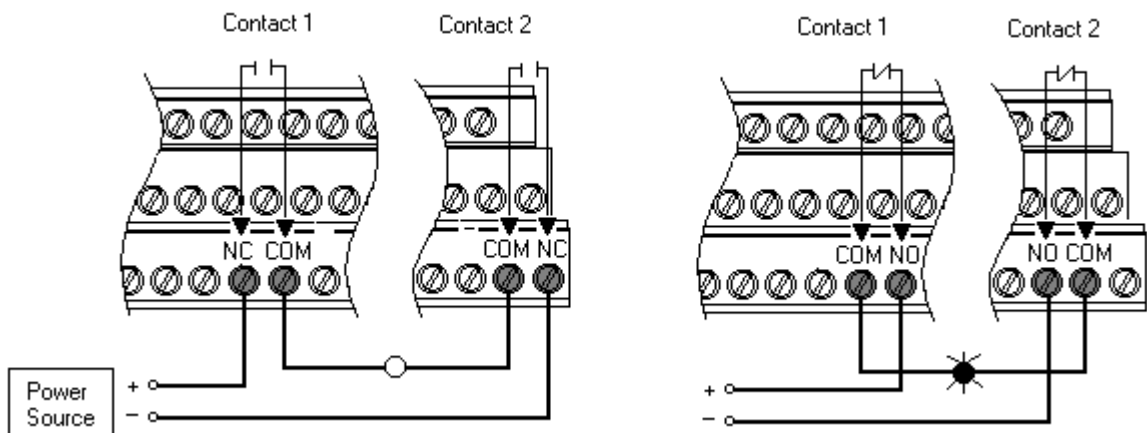
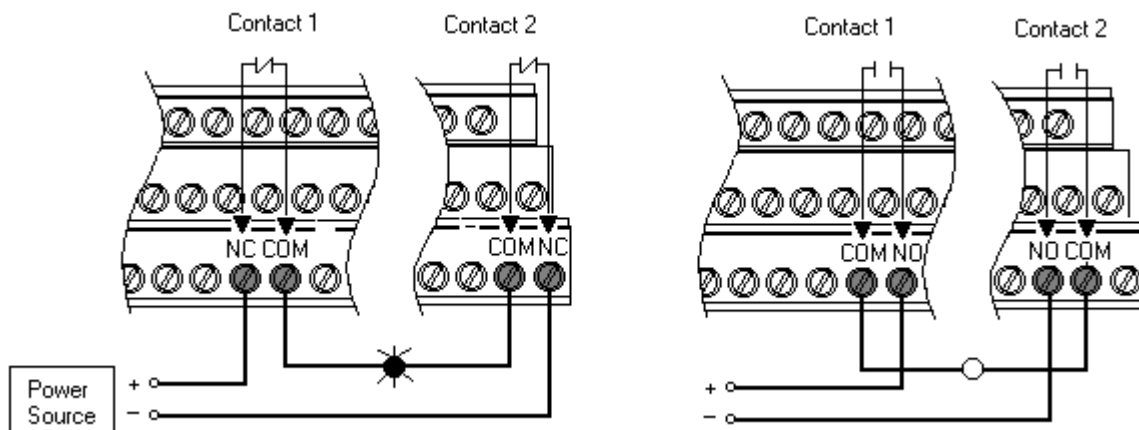


Figure 2.12 Relay Connection - Failsafe, Alarm Condition
Non-failsafe, Nonalarm Condition



Connecting the Tachometer Signal

The XM-120 provides a single tachometer input signal. The signal processing performed on the tachometer signal depends on the configuration of the module. See page 47 for a description of the tachometer parameters.

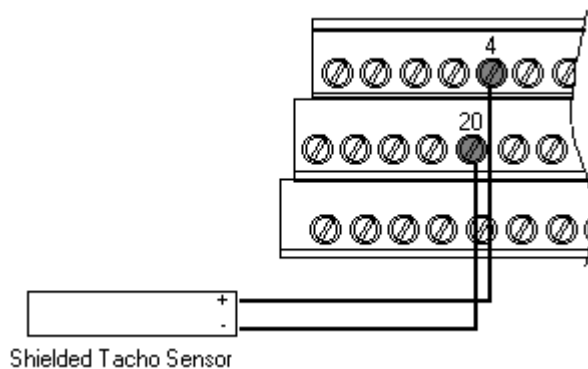
IMPORTANT

If you are not using the tachometer input, set the **Pulses Per Revolution** parameter to zero (0). This will disable the tachometer measurement and prevent the module from indicating a tachometer fault (TACH indicator flashing yellow). A tachometer fault occurs when no signal pulses are received on the tachometer input signal for a relatively long period.

Connecting a Magnetic Pickup Tachometer

Figure 2.13 shows the wiring of a magnetic pickup tachometer to the terminal base unit.

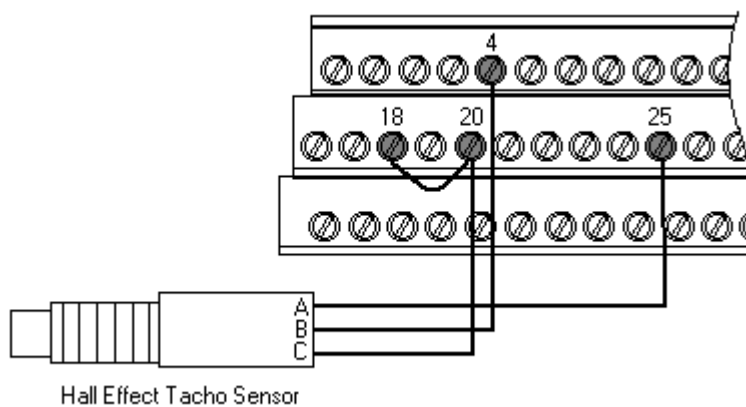
Figure 2.13 Magnetic Pickup Tachometer Signal Connection



Connecting a Hall Effect Tachometer Sensor

Figure 2.14 shows the wiring of a Hall Effect Tachometer Sensor, Cat. No. EK-44395, to the terminal base unit.

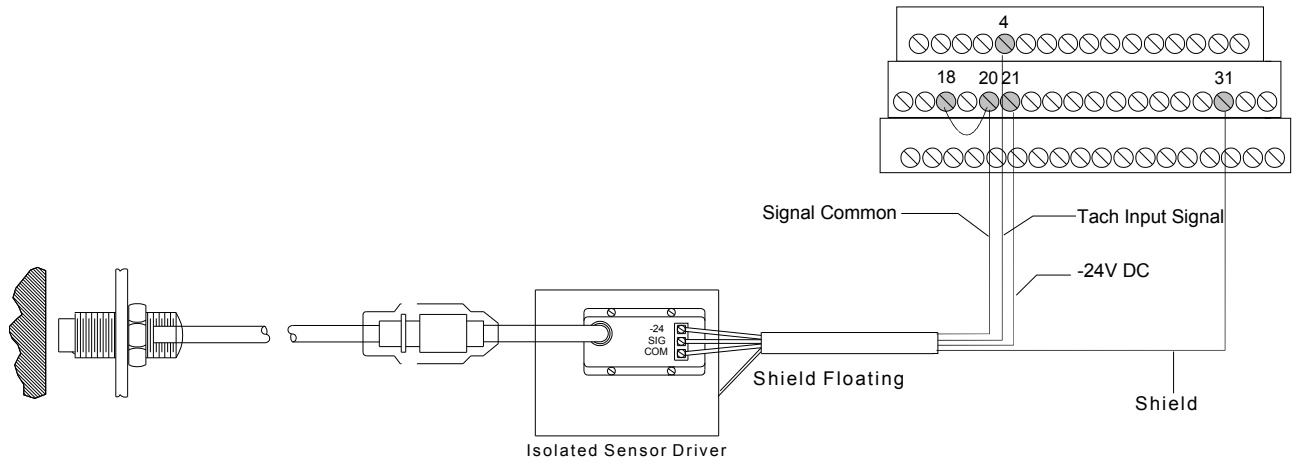
Figure 2.14 Hall Effect Tachometer Signal Connection



Connecting a Non-Contact Sensor to the Tachometer Signal

Figure 2.15 shows the wiring of a non-contact sensor to the tachometer input signal.

Figure 2.15 Non-Contact Sensor to Tachometer Signal Connection

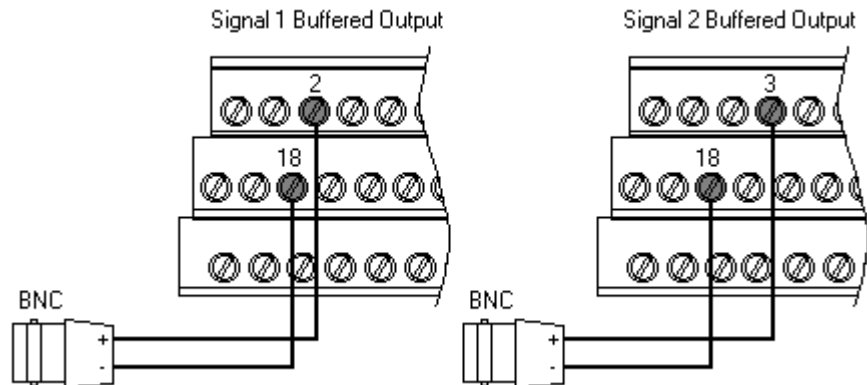


Connecting the Buffered Outputs

The XM-120 provides buffered outputs of all transducer input signals. The buffered output connections may be used to connect the module to portable data collectors or other online systems.

Figure 2.16 shows the buffered output connections for the modules.

Figure 2.16 Buffered Output Connections



IMPORTANT

Applies only to XM-120 module revision D01 (and later).

The voltage operating range of the buffered outputs must be configured to coincide with the corresponding transducer bias range. This operating range is configured by placing a jumper from terminal 5 (channel 1) and terminal 22 (channel 2) to either terminal 6 (Positive Buffer Bias) or terminal 21 (Buffer -), depending on the transducer. See Table 2.2. Note the buffered output operating range is configured independently per channel.

Table 2.2 Configuring Buffered Output Input Range

Transducer	Input Range	Channel	Connect Terminal	To Terminal
Negative Bias	-24 to +9 V	1	5	21
		2	22	21
Positive Bias	-5 to +24 V	1	5	6
		2	22	6
Non-Bias	-5 to +9 V	1	----	----
		2	----	----

Connecting a Non-Contact Sensor

The Eccentricity module accepts input from any Allen-Bradley non-contact eddy current probe. The figures below show the wiring of a non-contact eddy current probe to the terminal base unit.

IMPORTANT

Figures 2.17 and 2.18 show the wiring to the XM-120 module revision D01 (and later). If you have an earlier revision of the module, refer to Appendix D for wiring information.

ATTENTION



You may ground the cable shield at either end of the cable. Do not ground the shield at both ends. Recommended practice is to ground the cable shield at the terminal base and not at the transducer. Any convenient Chassis terminal may be used (see Terminal Block Assignments on page 18).

IMPORTANT

The internal transducer power supply is providing power to the non-contact sensor.

Figure 2.17 Non-contact Sensor to Channel 1 Wiring

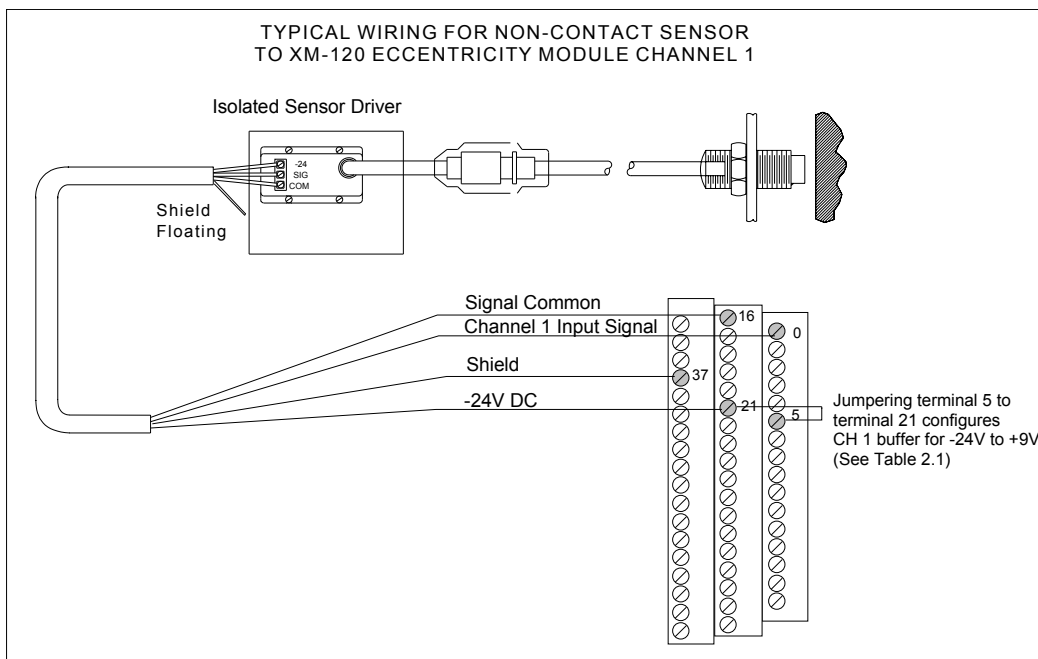
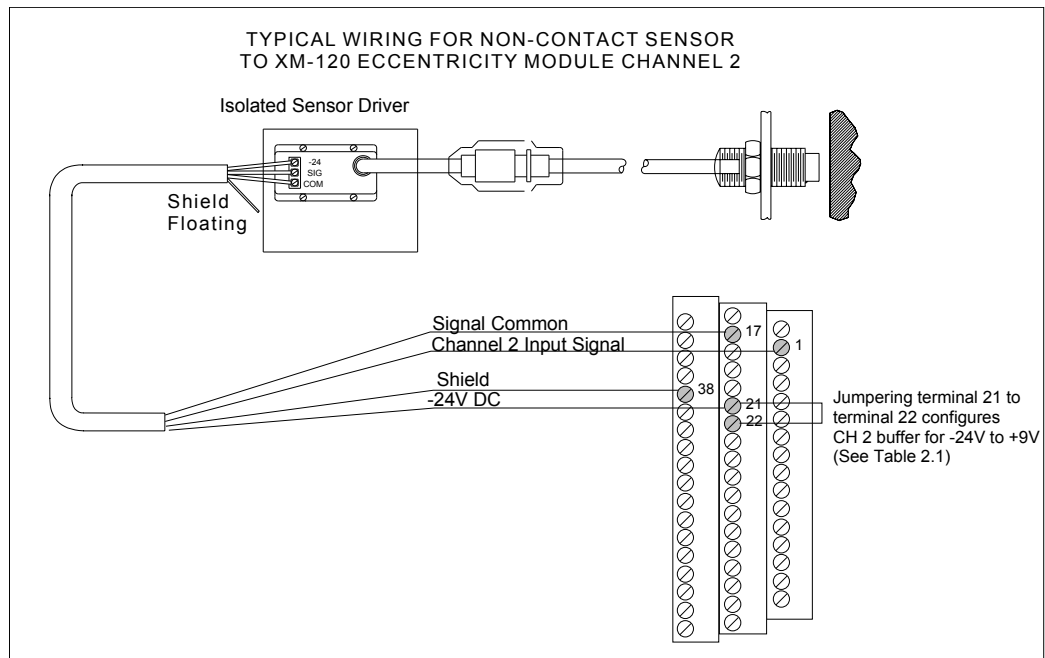


Figure 2.18 Non-contact Sensor to Channel 2 Wiring



Connecting the Remote Relay Reset Signal

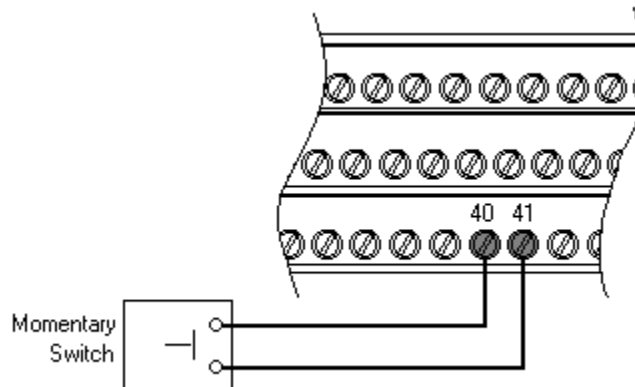
If you set the module relay to latching and the relay activates, the relay stays activated even when the condition that caused the alarm has ended. The remote relay reset signal enables you to reset your module relay remotely after you have corrected the alarm condition. This includes latched relays in the Expansion Relay module when it is attached to the XM-120.

TIP If you set a module relay to latching, make sure that any linked relays, such as relays in an XM-440 Master Relay Module, are **not** configured as latching. When both relays are set to latching, the relay in each module will have to be independently reset when necessary.

TIP You can discretely reset a relay using the serial or remote configuration tool.

Wire the Remote Relay Reset Signal to the terminal base unit as shown in Figure 2.19.

Figure 2.19 Remote Relay Reset Signal Connection



ATTENTION



The Switch Input circuits are functionally isolated from other circuits. It is recommended that the Switch RTN signal be grounded at a signal point. Connect the Switch RTN signal to the XM terminal base (Chassis terminal) or directly to the DIN rail, or ground the signal at the switch or other equipment that is wired to the switch.

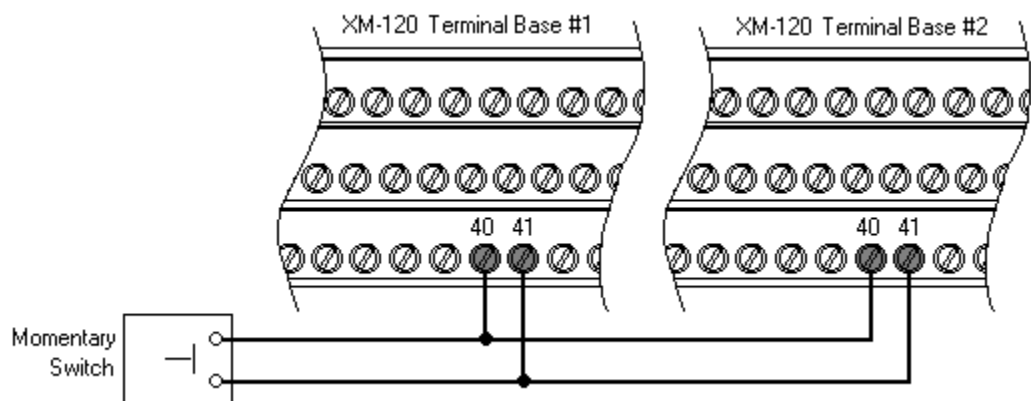
A single switch contact can also be shared by multiple XM modules wired in parallel as shown in Figure 2.20.

ATTENTION



The relay reset connections may be different for different XM modules. Figure 2.20 applies only to the XM-120 module. Refer to the installation instructions for the module for its terminal assignments.

Figure 2.20 Typical Multiple XM Modules Remote Relay Reset Signal Connection

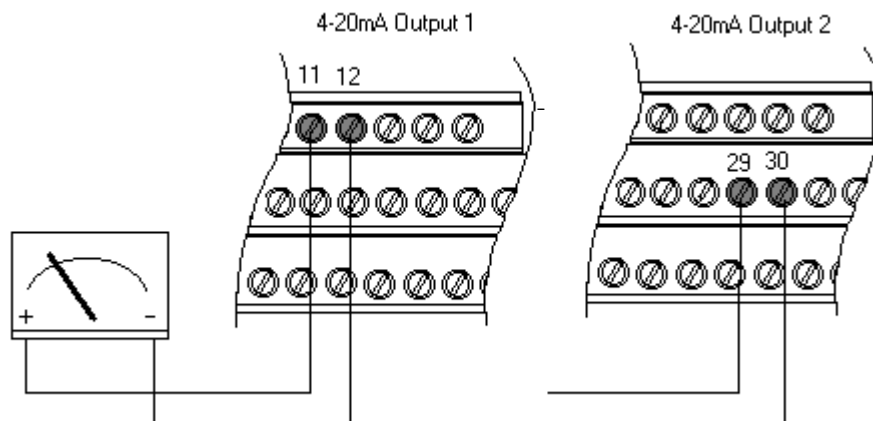


Connecting the 4-20 mA Outputs

The module includes an isolated 4-20 mA per channel output into a maximum load of 300 ohms. The measurements that the 4-20 mA output tracks and the signal levels that correspond to the 4 mA and 20 mA are configurable. Refer to 4-20 mA Output Parameters on page 55 for details.

Wire the 4-20 mA outputs to the terminal base unit as shown in Figure 2.21.

Figure 2.21 4-20mA Output Connections



ATTENTION



The 4-20 mA outputs are functionally isolated from other circuits. It is recommended that the outputs be grounded at a single point. Connect the 4-20 mA (-) to the XM terminal base (Chassis terminal) or directly to the DIN rail, or ground the signal at the other equipment in the 4-20 mA loop.

Serial Port Connection

The XM-120 includes a serial port connection that allows you to connect a PC to it and configure the module's parameters. There are two methods of connecting an external device to the module's serial port.

- **Terminal Base Unit** - There are three terminals on the terminal base unit you can use for the serial port connection. They are TxD, RxD, and RTN (terminals 7, 8, and 9, respectively). If these three terminals are wired to a DB-9 female connector, then a standard RS-232 serial cable with 9-pin (DB-9) connectors can be used to connect the module to a PC (no null modem is required).

The DB-9 connector should be wired to the terminal block as shown.

XM-120 Terminal Base Unit
(Cat. No. 1440-TB-A)

TX Terminal (terminal 7) -----

RX Terminal (terminal 8) -----

RTN Terminal (terminal 9) -----

DB-9 Female Connector

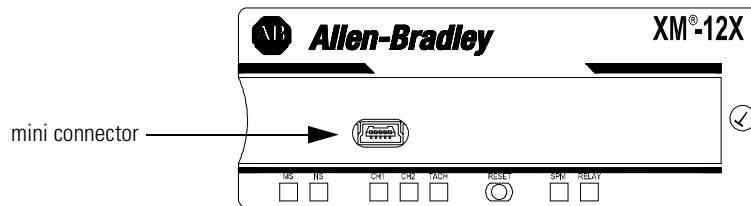
Pin 2 (RD - receive data)

Pin 3 (TD - transmit data)

Pin 5 (SG - signal ground)

- **Mini Connector** - The mini connector is located on the top of the module, as shown below.

Figure 2.22 Mini Connector



A special cable (Cat. No. 1440-SCDB9FXM2) is required for this connection. The connector that inserts into the PC is a DB-9 female connector, and the connector that inserts into the module is a USB Mini-B male connector.

WARNING



If you connect or disconnect the serial cable with power applied to the module or the serial device on the other end of the cable, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

IMPORTANT

If 24 V Common is not referenced to earth ground, we recommend you use an RS-232 isolator, such as Phoenix PSM-ME-RS232/RS232-P (Cat. No. 1440-ISO-232-24), to protect both the XM module and the computer.

DeviceNet Connection

The XM-120 includes a DeviceNet™ connection that allows the module to communicate with a programmable controller, DCS, or another XM module.

DeviceNet is an open, global, industry-standard communications network designed to provide an interface through a single cable from a programmable controller to a smart device such as the XM-120. As multiple XM modules are interconnected, DeviceNet also serves as the communication bus and protocol that efficiently transfers data between the XM modules.

Connect the DeviceNet cable to the terminal base unit as shown.

Connect	To	Terminal
Red Wire	DNet V+	26 (optional—see note)
White Wire	CAN High	23
Bare Wire	Shield (Chassis)	10
Blue Wire	CAN Low	24
Black Wire	DNet V-	27

IMPORTANT

The DeviceNet power circuit through the XM module interconnect, which is rated at only 300 mA, is not intended or designed to power DeviceNet loads. Doing so could damage the module or terminal base.

To preclude this possibility, even unintentionally, it is recommended that DeviceNet V+ be left unconnected.

ATTENTION



You must ground the DeviceNet shield at only one location. Connecting the DeviceNet shield to terminal 10 will ground the DeviceNet shield at the XM module. If you intend to terminate the shield elsewhere, do not connect the shield to terminal 10.

ATTENTION



The DeviceNet network must also be referenced to earth at only one location. Connect DNet V- to earth or chassis at one of the XM modules.

ATTENTION

The DNet V+ and DNet V- terminals are inputs to the XM module. Do not attempt to pass DeviceNet power through the XM terminal base to other non-XM equipment by connecting to these terminals. Failure to comply may result in damage to the XM terminal base and/or other equipment.

IMPORTANT

Terminate the DeviceNet network and adhere to the requirements and instructions in the ODVA Planning and Installation Manual - DeviceNet Cable System, which is available on the ODVA web site (<http://www.odva.org>).

The devices are shipped from the factory with the network node address (MAC ID) set to 63. The network node address is software settable. You can use the XM Serial Configuration Utility or RSNetWorx™ for DeviceNet (Version 3.0 or later) to set the network node address. Refer to the appropriate documentation for details.

IMPORTANT

The baud rate for the XM-120 is set by way of “baud detection” (Autobaud) at power-up.

Mounting the Module

The XM-120 mounts on the XM-940 terminal base unit, Cat. No. 1440-TB-A. We recommend that you mount the module after you have connected the wiring on the terminal base unit.

ATTENTION

The XM-120 module is compatible only with the XM-940 terminal base unit. The keyswitch on the terminal base unit should be at position 1 for the modules.

Do not attempt to install XM-120 modules on other terminal base units.

Do not change the position of the keyswitch after wiring the terminal base.

ATTENTION

This module is designed so you can **remove and insert it under power**. However, when you remove or insert the module with power applied, I/O attached to the module can change states due to its input/output signal changing conditions. Take special care when using this feature.

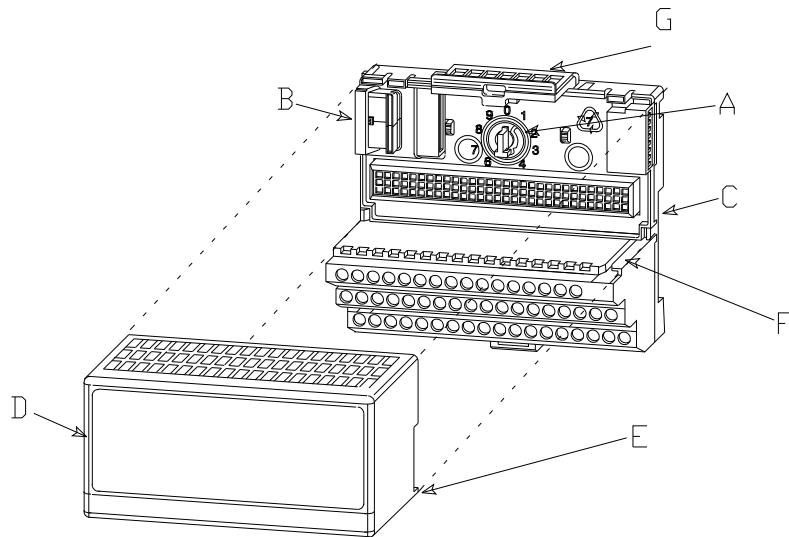
WARNING

When you insert or remove the module while power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

IMPORTANT

Install the overlay slide label to protect serial connector and electronics when the serial port is not in use.

1. Make certain the keyswitch (A) on the terminal base unit (C) is at position 1 as required for the module.

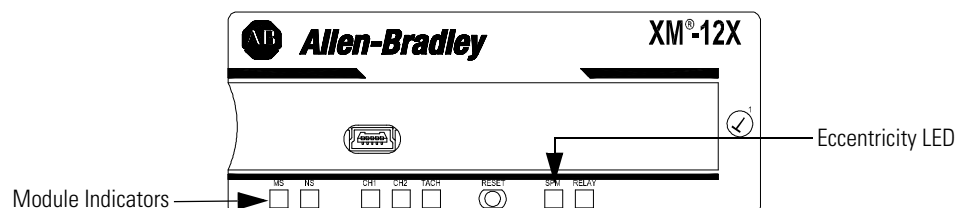


2. Make certain the side connector (B) is pushed all the way to the left. **You cannot install the module unless the connector is fully extended.**
3. Make sure that the pins on the bottom of the module are straight so they will align properly with the connector in the terminal base unit.
4. Position the module (D) with its alignment bar (E) aligned with the groove (F) on the terminal base.
5. Press firmly and evenly to seat the module in the terminal base unit. The module is seated when the latching mechanism (G) is locked into the module.
6. Repeat the above steps to install the next module in its terminal base.

Module Indicators

The Eccentricity module has seven LED indicators, which include a module status (MS) indicator, a network status (NS) indicator, a status indicator for each channel (CH1, CH2, and TACH), an activation indicator for Eccentricity, and a status indicator for the Relay. The LED indicators are located on top of the module.

Figure 2.23 LED Indicators



The following tables describe the states of the LED status indicators.

Module Status (MS) Indicator

Color	State	Description
No color	Off	No power applied to the module.
Green	Flashing Red	Module performing power-up self test.
	Flashing	Module operating in Program Mode ¹ .
	Solid	Module operating in Run Mode ² .
Red	Flashing	<ul style="list-style-type: none"> Application firmware is invalid or not loaded. Download firmware to the module. Firmware download is currently in progress.
	Solid	An unrecoverable fault has occurred. The module may need to be repaired or replaced.

- 1 Program Mode - Typically this occurs when the module configuration settings are being updated with the XM Serial Configuration Utility. In Program Mode, the module does not perform its normal functions. The signal processing/measurement process is stopped, and the status of the alarms is set to the disarm state to prevent a false alert or danger status.
- 2 Run Mode - In Run Mode, the module collects measurement data and monitors each vibration measurement device.

Network Status (NS) Indicator

Color	State	Description
No color	Off	Module is not online. <ul style="list-style-type: none"> • Module is autobauding. • No power applied to the module, look at Module Status LED.
Green	Flashing	Module is online (DeviceNet) but no connections are currently established. ¹
	Solid	Module is online with connections currently established.
Red	Flashing	One or more I/O connections are in the timed-out state.
	Solid	Failed communications (duplicate MAC ID or Bus-off).

¹ Normal condition when the module is not a slave to an XM-440, PLC, or other master device.

Channel 1, Channel 2, and Tachometer Status Indicators

Color	State	Description
No color	Off	<ul style="list-style-type: none"> • Normal operation within alarm limits on the channel. • No power applied to the module, look at Module Status LED.
Yellow	Solid	An alert level alarm condition exists on the channel (and no transducer fault, tachometer fault, or danger level alarm condition exists).
	Flashing Tach LED	A tachometer fault (no transducer fault) condition exists on the tachometer channel
	Flashing CH1/2 LED	A tachometer fault condition exists and the channel's alarm speed range is enabled (and no transducer fault on the channel's transducer).
Red	Solid	A danger level alarm condition exists on the channel (and no transducer fault or tachometer fault condition exists).
	Flashing	A transducer fault condition exists on the channel.

Eccentricity Indicator

Color	State	Description
Yellow	Off	Either alarm is actively monitoring the eccentricity measurement.
	Solid	Neither alarm is actively monitoring the eccentricity measurement. This occurs when both alarms have the status of DISARM (alarms are disabled, the machine speed is outside of the alarm's speed range, or the module is in Program mode).

Relay Indicator

Color	State	Description
Red	Off	On-board relay is not activated.
	Solid	On-board relay is activated.

Basic Operations**Powering Up the Module**

The module performs a self-test at power-up. The self-test includes an LED test and a device test. During the LED test, the indicators will be turned on independently and in sequence for approximately 0.25 seconds.

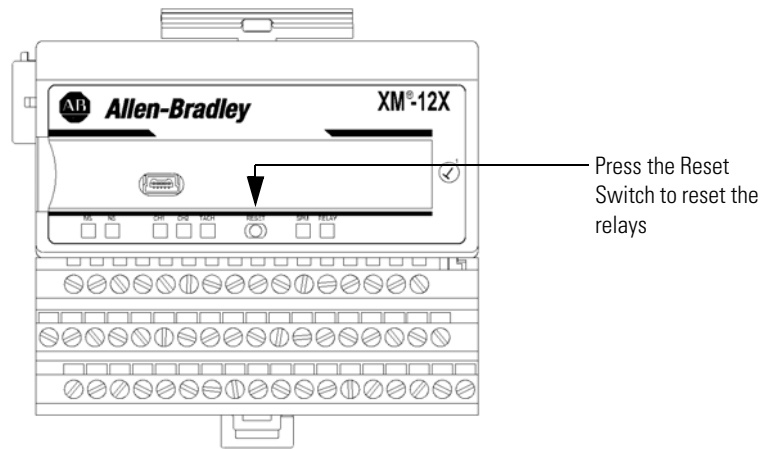
The device test occurs after the LED test. The Module Status (MS) indicator is used to indicate the status of the device self-test.

MS Indicator State	Description
Flashing Red and Green	Device self-test is in progress.
Solid Green or Flashing Green	Device self-test completed successfully, and the firmware is valid and running.
Flashing Red	Device self-test completed, the hardware is OK, but the firmware is invalid. Or, the firmware download is in progress.
Solid Red	Unrecoverable fault, hardware failure, or Boot Loader program may be corrupted.

Refer to Module Indicators on page 37 for more information about the LED indicators.

Manually Resetting Relays

The XM-120 has an external reset switch located on top of the module, as shown in Figure 2.24.

Figure 2.24 Reset Switch

The switch can be used to reset all latched relays in the module. This includes the relays in the Expansion Relay Module when it is attached to the XM-120.

IMPORTANT

The Reset switch resets the relays only if the input is no longer in alarm or the condition that caused the alarm is no longer present.

Installing the XM-120 Eccentricity Firmware

Before you can use the XM-120 Eccentricity module, you must install the Eccentricity firmware onto the XM-120 Dynamic Measurement module. The Eccentricity firmware is provided on the XM Documentation and Configuration Utility CD (version 3.10 or later) that is packaged with the XM modules.

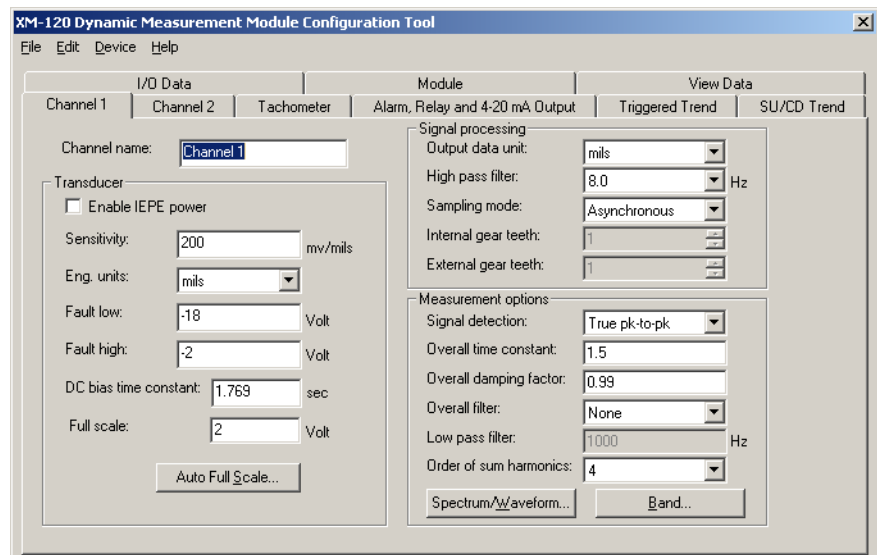
TIP

XM firmware update files are available for download from the XM Firmware Update page at <http://support.rockwellautomation.com>

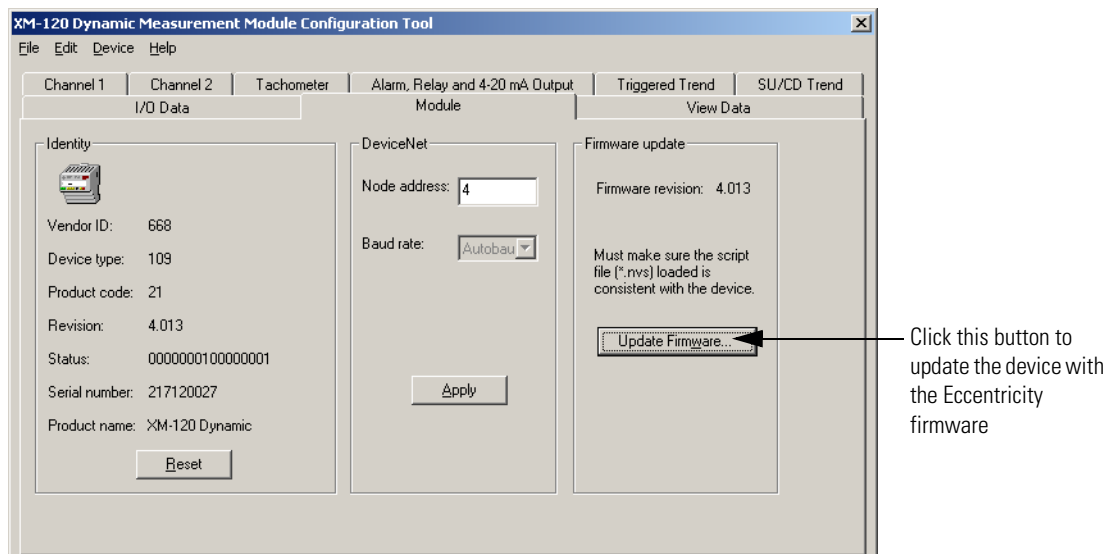
Complete the following steps to install the XM-120 Eccentricity firmware.

1. Make certain you have installed the XM Serial Configuration Utility onto the computer that will be connected directly to the XM-120 module. Refer to the XM-12X Dynamic Measurement Modules Installation Instructions for assistance.
2. Insert the XM Documentation and Configuration Utility CD into the CD-ROM drive of the computer.
3. Connect the computer to the XM-120 module using the special serial cable. Refer to Serial Port Connection on page 32.

4. Power up the XM-120 module if you haven't already done so, and start the XM Serial Configuration Utility program. Click the **Start** program, and then select **Programs > Entek > XM > Serial Config Utility**.
5. Click the **Configure** button on the XM Serial Configuration Utility screen. The XM-120 Dynamic Measurement Module Configuration Tool screen appears.



6. Click the **Module** tab.



7. In the Firmware Update group, click **Update Firmware** to initiate the firmware update. The **Open** dialog box appears.
8. Navigate to the Firmware directory on the CD and select the "xm12E.nvs" file.

9. Click **Open** to start the firmware update and click **Yes** to confirm. The Configuration Tool begins the update and shows its progress in the **Progress** dialog box.
10. When the update completes, the message "The module is configured with the factory defaults. You need to download a configuration." appears. Click **OK**.
11. Click **OK** again to return to the XM Serial Configuration Utility screen. Notice that the XM Module icon displays XM-12E instead of XM-120.
12. You are now ready to configure the Eccentricity module. Click the **Configure** button to display the Eccentricity parameters in the Configuration Tool. Refer to Chapter 3 for a complete list of the Eccentricity configuration parameters.

TIP

Review and edit the Eccentricity parameters as necessary. When you are finished, download the parameters to the module. The module will remain in Program mode until you download a configuration.

TIP

For assistance on how to use the XM Serial Configuration Utility, refer to the online help.

Configuration Parameters

This chapter provides a complete listing and description of the Eccentricity parameters. The parameters can be viewed and edited using the XM Serial Configuration Utility software and a personal computer. If the module is installed on a DeviceNet network, configuring can also be performed using a network configuration tool such as RSNetWorx (Version 3.0 or later). Refer to your configuration tool documentation for instructions on configuring a device.

For information about	See page
Channel Transducer Parameters	44
Measurement Parameters	45
Tachometer Parameters	47
Alarm Parameters	49
Relay Parameters	52
4-20 mA Output Parameters	55
I/O Data Parameters	56
Data Parameters	57
Device Mode Parameters	60

IMPORTANT

The appearance and procedure to configure the parameters may differ in different software.

Channel Transducer Parameters

The channel transducer parameters define the characteristics of the transducers you will be using with the module. Use the parameters to configure the transducer sensitivity, and operating range. There are two instances of the channel transducer parameters, one for each channel.

TIP

The Channel LED will flash red when a transducer fault condition exists on the channel even if you are not using the channel. You can keep the Channel LED from flashing red on unused channels by setting the unused channel's **Fault High** and **Fault Low** to greater than zero and less than zero, respectively. For example, set **Fault High** to +18 volts and set **Fault Low** to -18 volts.

Transducer Parameters

Parameter Name	Description	Values/Comments
Channel Name (XM Serial Configuration Utility only)	A descriptive name to help identify the channel in the XM Serial Configuration Utility.	Maximum 18 characters
Sensitivity	The sensitivity of the transducer in millivolts per Eng. Unit .	The sensitivity value is included with the transducer's documentation or it may be imprinted on the side of the transducer.
Eng. Units	Defines the native units of the transducer.	Options: mils μm
Fault Low	The minimum, or most negative, expected DC voltage from the transducer.	Volts
Fault High	The maximum expected DC bias voltage from the transducer.	Note: A voltage reading outside this range constitutes a transducer fault.
Measured DC Bias (EDS File only)	Shows the measured DC offset of the transducer signal. This value is compared with Fault High and Fault Low to determine whether the transducer is working properly.	
Transducer Status (EDS File only)	States whether a transducer fault exists on the associated channel.	Possible status values: No Fault Fault

Measurement Parameters Eccentricity Measurement Parameters

Use these parameters to configure the engineering units and update rate for the eccentricity measurements. There are two instances of the eccentricity measurement parameters, one for each channel.

TIP

The **Eccentricity Update Rate** parameter is for installations where the tachometer signal is not available.

Eccentricity Measurement Parameters

Parameter Name	Description	Values/Comments
Eccentricity Units	The data units of the measured values.	Options: mils μm
Eccentricity Update Rate	The update rate for the eccentricity, min gap, and max gap measurements.	Enter a value from 1 to 255 seconds. Note: This value is used when the tachometer is disabled (Pulses Per Revolution set to zero) or a fault condition exists on the tachometer channel.

Waveform Parameters

There are two instances of the waveform parameters, one for each channel. Use these parameters to set up the waveform measurements.

Waveform Parameters

Parameter Name	Description	Values/Comments
Waveform Period	The total period of the waveform measurement.	Seconds
Number of Points	The number of samples in the waveform measurement.	Options: 256 512 1024 2048

TIP

The **Waveform Period** and the **Number of Points** must be configured such that the sampling rate (**Number of Points/Waveform Period**) is from 0.32 Hz to 187.5 Hz. The module will automatically use 187.5 Hz when the sampling rate is above 93.75, resulting in waveforms collected with a different period than specified.

The table below shows examples. The entries in the table are the actual sampling rate (samples per second) and period corresponding to the waveform period and number of points.

Requested Period(s)	Number of Points							
	256		512		1024		2048	
	Actual Sampling Rate	Actual Period	Actual Sampling Rate	Actual Period	Actual Sampling Rate	Actual Period	Actual Sampling Rate	Actual Period
5	51.2	5.0	187.5	2.73	187.5	5.46	187.5	10.92
10	25.6	10.0	51.2	10.0	187.5	5.46	187.5	10.92
25	10.24	25.0	20.48	25.0	40.96	25.0	81.92	25.0
100	2.56	100.0	5.12	100.0	10.24	100.0	20.48	100.0
800	0.32	800	0.64	800.0	1.28	800.0	2.56	800.0

Note that the signal processing hardware applies a low pass filter of 20 Hz to the input signal. Therefore the eccentricity measurements taken at sampling rates above 51.2 samples/second will reflect this low pass filter.

Speed Measurement Parameter

Use the speed measurement parameter to configure the filtering performed on the speed measurement.

Speed Measurement Parameter

Parameter Name	Description	Values/Comments																					
Exponential Averaging Time Constant	Sets the 3-dB bandwidth for the digital filter used to calculate the Speed Value . The 3-dB bandwidth is roughly equal to $1 / (2\pi \times \text{Exponential Averaging Time Constant})$. The greater the value entered, the longer the response of the measured Speed Value to a change in the input signal (less sensitive to noise in the signal). See example table below.	Milliseconds																					
	<table border="1"> <thead> <tr> <th>Time Constant (milliseconds)</th> <th>-3dB Frequency (Hz)</th> <th>Settling Time (milliseconds)</th> </tr> </thead> <tbody> <tr> <td>5</td> <td>31.8310</td> <td>11</td> </tr> <tr> <td>10</td> <td>15.9155</td> <td>22</td> </tr> <tr> <td>20</td> <td>7.9577</td> <td>44</td> </tr> <tr> <td>50</td> <td>3.1831</td> <td>110</td> </tr> <tr> <td>100</td> <td>1.5915</td> <td>220</td> </tr> <tr> <td>1200</td> <td>0.1326</td> <td>2640</td> </tr> </tbody> </table>	Time Constant (milliseconds)	-3dB Frequency (Hz)	Settling Time (milliseconds)	5	31.8310	11	10	15.9155	22	20	7.9577	44	50	3.1831	110	100	1.5915	220	1200	0.1326	2640	
Time Constant (milliseconds)	-3dB Frequency (Hz)	Settling Time (milliseconds)																					
5	31.8310	11																					
10	15.9155	22																					
20	7.9577	44																					
50	3.1831	110																					
100	1.5915	220																					
1200	0.1326	2640																					

Tachometer Parameters

The tachometer parameters define the characteristics of the tachometer and determine the signal processing that will be performed on the tachometer signal.

Tachometer Transducer Parameters

Tachometer Transducer Parameters

Parameter Name	Description	Values/Comments
Tachometer Name (XM Serial Configuration Utility only)	A descriptive name to help identify the tachometer in the XM Serial Configuration Utility software.	Maximum 18 characters
Fault Low	The minimum, or most negative, expected DC voltage from the transducer.	Volts
Fault High	The maximum expected DC voltage from the transducer.	Note: A voltage reading outside this range constitutes a transducer fault.
Transducer 3 Status (EDS File only)	States whether a transducer fault condition exists on the tachometer channel. If a fault exists, the speed value may not be accurate.	Possible status values: No Fault Fault

Tachometer Signal Processing Parameters

IMPORTANT

If you are not using the tachometer channel, set the **Pulses per Revolution** to zero. This will disable the tachometer measurement, and prevent the module from indicating a tachometer fault.

Tachometer Signal Processing Parameters

Parameter Name	Description	Values/Comments										
Pulses Per Revolution	The number of tachometer signal pulses per revolution of the shaft (number of gear teeth). This setting is useful if a proximity probe located over a gear or shaft with a multi-toothed speed sensing surface is used to generate the input signal.	Enter zero if you are not using the tachometer channel to disable the tachometer measurement. Note: The Eccentricity , Min Gap , and Max Gap measurements will be updated after the number of Pulses per Revolution has occurred on the tachometer channel. If Pulses Per Revolution is set to zero, the measurements will be updated after the Eccentricity Update Rate has elapsed.										
Fault Time-Out	The number of seconds the module should wait after the last valid tach pulse before it indicates a tachometer fault.	Enter a value from 1 to 64 seconds.										
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">XM Configuration Utility</td> <td style="width: 50%;">EDS File</td> </tr> <tr> <td>Auto Trigger</td> <td>Trigger Mode</td> </tr> </table>	XM Configuration Utility	EDS File	Auto Trigger	Trigger Mode	<p>Sets the trigger mode. In Auto Trigger mode, the minimum signal amplitude for triggering is 2 volts peak-to-peak and minimum frequency is 6 CPM (0.1 Hz).</p> <p>In Manual Trigger mode, the value entered in Trigger Threshold is used as the trigger point. Minimum signal amplitude for triggering is 500 millivolts peak-to-peak and minimum frequency is 1 CPM.</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">XM Configuration Utility</td> <td style="width: 50%;">EDS File</td> </tr> <tr> <td>Check = Auto Mode</td> <td>Auto</td> </tr> <tr> <td>Clear = Manual Mode</td> <td>Manual</td> </tr> </table>	XM Configuration Utility	EDS File	Check = Auto Mode	Auto	Clear = Manual Mode	Manual
XM Configuration Utility	EDS File											
Auto Trigger	Trigger Mode											
XM Configuration Utility	EDS File											
Check = Auto Mode	Auto											
Clear = Manual Mode	Manual											
Trigger Hysteresis	<p>The amount of hysteresis around the trigger threshold. In Auto Trigger mode, the value entered is a percentage of the peak-to-peak input signal. This value can range from 0 to 50%.</p> <p>In Manual Trigger mode, the value entered is a voltage level. The hysteresis voltage is added to or subtracted from the threshold voltage to determine the hysteresis range. The minimum value is 0.12 volts.</p>	% in Auto Trigger mode Volts in Manual Trigger mode										
Trigger Threshold	The signal level to be used as the trigger value when in Manual Trigger mode.	Enter a value from +16 to -16 volts dc. Note: This value is not used in Auto Trigger mode.										

Tachometer Signal Processing Parameters

Parameter Name	Description	Values/Comments
Trigger Slope	The input signal slope to be used as the trigger value when in Manual Trigger mode.	Options: Positive Negative Note: This value is not used in Auto Trigger mode.

Alarm Parameters

The Alarm parameters control the operation of the alarms (alert and danger level) and provide alarm status. The Eccentricity module provides two alarms, one per eccentricity channel. Use the parameters to configure which eccentricity measurement the alarm is associated with, as well as the behavior of the alarm.

Alarm Parameters

Parameter Name	Description	Values/Comments						
Number (1-2) (XM Serial Configuration Utility only)	The alarm to be configured in the XM Serial Configuration Utility. There are two alarms in the Eccentricity module, one for each eccentricity channel.	Options: 1 (Channel 1 alarm) 2 (Channel 2 alarm)						
Name (XM Serial Configuration Utility only)	A descriptive name to identify the alarm in the XM Serial Configuration Utility.	Maximum 18 characters						
Enable	Enable/disable the selected alarm. Note: The Alarm Status is set to "Disarm" when the alarm is disabled.	<table border="1"> <thead> <tr> <th>XM Configuration Utility</th> <th>EDS File</th> </tr> </thead> <tbody> <tr> <td>Check to Enable</td> <td>Enabled</td> </tr> <tr> <td>Clear to Disable</td> <td>Disabled</td> </tr> </tbody> </table>	XM Configuration Utility	EDS File	Check to Enable	Enabled	Clear to Disable	Disabled
XM Configuration Utility	EDS File							
Check to Enable	Enabled							
Clear to Disable	Disabled							

Alarm Parameters

Parameter Name	Description	Values/Comments
Condition	<p>Controls when the alarm should trigger.</p> <ul style="list-style-type: none"> • Greater than - Triggers the alarm when the measurement value is greater than or equal to the Alert and Danger Threshold values. The Danger Threshold value must be greater than or equal to the Alert Threshold value for the trigger to occur. • Less than - Triggers the alarm when the measurement value is less than or equal to the Alert and Danger Threshold values. The Danger Threshold value must be less than or equal to the Alert Threshold value for the trigger to occur. • Inside range - Triggers the alarm when the measurement value is equal to or inside the range of the Alert and Danger Threshold values. The Danger Threshold (High) value must be less than or equal to the Alert Threshold (High) value AND the Danger Threshold (Low) value must be greater than or equal to the Alert Threshold (Low) value for the trigger to occur. • Outside range - Triggers the alarm when the measurement value is equal to or outside the range of the Alert and Danger Threshold values. The Danger Threshold (High) value must be greater than or equal to the Alert Threshold (High) value, AND the Danger Threshold (Low) value must be less than or equal to the Alert Threshold (Low) value for the trigger to occur. 	Options: Greater Than Less Than Inside Range Outside Range

Alarm Parameters

Parameter Name	Description	Values/Comments						
Alert Threshold (High)	The threshold value for the alert (alarm) condition. Note: This parameter is the greater threshold value when Condition is set to "Inside Range" or "Outside Range."	Same measurement unit as the Eccentricity Unit selection for the specified channel.						
Danger Threshold (High)	The threshold value for the danger (shutdown) condition. Note: This parameter is the greater threshold value when Condition is set to "Inside Range" or "Outside Range."							
Alert Threshold (Low)	The lesser threshold value for the alert (alarm) condition. Note: This parameter is not used when Condition is set to "Greater Than" or "Less Than."							
Danger Threshold (Low)	The lesser threshold value for the danger (shutdown) condition. Note: This parameter is not used when Condition is set to "Greater Than" or "Less Than."							
Hysteresis	The amount that the measured value must fall (below the threshold) before the alarm condition is cleared. For example, Alert Threshold = 120 and Hysteresis = 2. The alarm (alert) activates when the measured value is 120 and will not clear until the measured value is 118. Note: The Alert and Danger Thresholds use the same hysteresis value. Note: For the Outside Range condition, the hysteresis value must be less than Alert Threshold (High) – Alert Threshold (Low) .							
Speed Range Enable	Controls whether the alarm is enabled only when the measured speed is within a machine speed range. Enter the machine speed range in Speed Range High and Speed Range Low .		<table border="1"> <thead> <tr> <th>XM Configuration Utility</th> <th>EDS File</th> </tr> </thead> <tbody> <tr> <td>Check to Enable</td> <td>Enabled</td> </tr> <tr> <td>Clear to Disable</td> <td>Disabled</td> </tr> </tbody> </table> <p>Note: The tachometer must be enabled (Pulses Per Revolution set to 1 or more) and a tachometer signal must be provided at the tachometer input when Speed Range Enable is enabled.</p>	XM Configuration Utility	EDS File	Check to Enable	Enabled	Clear to Disable
XM Configuration Utility	EDS File							
Check to Enable	Enabled							
Clear to Disable	Disabled							

Alarm Parameters

Parameter Name	Description	Values/Comments
Speed Range Low	The lesser threshold of the machine speed range. This value must be less than the Speed Range High value. This parameter is not used when Speed Range Enabled is disabled.	RPM
Speed Range High	The greater threshold of the machine speed range. This value must be greater than the Speed Range Low value. This parameter is not used when Speed Range Enabled is disabled.	

Relay Parameters

The Relay parameters control the operation of the on-board relay, as well as the relays on the Expansion Relay (XM-441) module. Use these parameters to configure which alarm(s) the relay is associated with, as well as the behavior of the relay.

IMPORTANT

A relay can be defined, regardless of whether or not it is physically present. A non-physical relay is a virtual relay. When a relay (physical or virtual) activates, the module sends a Change of State (COS) message to its master, which acts on the condition as necessary. An XM-440 Master Relay Module can activate its own relays in response to a relay (physical or virtual) activation at any of its slaves.

Relay Parameters

Parameter Name	Description	Options/Comments
Number (XM Serial Configuration Utility only)	Sets the relay to be configured in the XM Serial Configuration Utility.	Relay Number 1 is the on-board relay. Numbers 2 through 5 are either relays on the Expansion Relay module when it's connected to the module or virtual relays. Virtual relays are non-physical relays. Use them when you want the effect of the relay (monitor alarms, delay, and change status) but do not need an actual contact closure. For example, a PLC or controller monitoring the relay status. Note: The Relay Installed parameter indicates whether a relay is a virtual relay or a physical relay on a module.

Relay Parameters

Parameter Name		Description	Options/Comments										
Name (XM Serial Configuration Utility only)		A descriptive name to help identify the relay in the XM Serial Configuration Utility.	Maximum 18 characters										
Enable		Enable/disable the selected relay. Note: The Relay Current Status is set to "Not Activated" when the relay is disabled. See page 57.	<table border="1"> <thead> <tr> <th>XM Configuration Utility</th> <th>EDS File</th> </tr> </thead> <tbody> <tr> <td>Check to Enable</td> <td>Enabled</td> </tr> <tr> <td>Clear to Disable</td> <td>Disabled</td> </tr> </tbody> </table>	XM Configuration Utility	EDS File	Check to Enable	Enabled	Clear to Disable	Disabled				
XM Configuration Utility	EDS File												
Check to Enable	Enabled												
Clear to Disable	Disabled												
<table border="1"> <thead> <tr> <th>XM Configuration Utility</th> <th>EDS File</th> </tr> </thead> <tbody> <tr> <td>Latching</td> <td>Latching Option</td> </tr> </tbody> </table>	XM Configuration Utility	EDS File	Latching	Latching Option	<table border="1"> <thead> <tr> <th>XM Configuration Utility</th> <th>EDS File</th> </tr> </thead> <tbody> <tr> <td>Check means latching (relay must be explicitly reset)</td> <td>Latching</td> </tr> <tr> <td>Clear means non-latching (relay is reset once the alarm condition has passed)</td> <td>Nonlatching</td> </tr> </tbody> </table>	XM Configuration Utility	EDS File	Check means latching (relay must be explicitly reset)	Latching	Clear means non-latching (relay is reset once the alarm condition has passed)	Nonlatching	Controls whether the relay must be explicitly reset after the alarm subsides.	
XM Configuration Utility	EDS File												
Latching	Latching Option												
XM Configuration Utility	EDS File												
Check means latching (relay must be explicitly reset)	Latching												
Clear means non-latching (relay is reset once the alarm condition has passed)	Nonlatching												
Activation Delay		Enter the length of time for which the Activation Logic must be true before the relay is activated. This reduces nuisance alarms caused by external noise and/or transient vibration events.	Enter a value from 0 to 25.5 seconds, adjustable in increments of 0.1 seconds. Default is 1 second										
<table border="1"> <thead> <tr> <th>XM Configuration Utility</th> <th>EDS File</th> </tr> </thead> <tbody> <tr> <td>Activation Logic</td> <td>Logic</td> </tr> </tbody> </table>	XM Configuration Utility	EDS File	Activation Logic	Logic	Sets the relay activation logic. <ul style="list-style-type: none"> • A or B - Relay is activated when either Alarm A or Alarm B meets or exceeds the selected Alarm Status condition(s). • A and B - Relay is activated when both Alarm A and Alarm B meet or exceed the selected Alarm Status condition(s). • A Only - Relay is activated when Alarm A meets or exceeds the selected Alarm Status condition(s). 	Options: A only A or B A and B							
XM Configuration Utility	EDS File												
Activation Logic	Logic												
<table border="1"> <thead> <tr> <th>XM Configuration Utility</th> <th>EDS File</th> </tr> </thead> <tbody> <tr> <td>Alarm A/B</td> <td>Alarm Identifier A/B</td> </tr> </tbody> </table>	XM Configuration Utility	EDS File	Alarm A/B	Alarm Identifier A/B	Sets the alarm(s) that the relay will monitor. The alarm must be from the same device as the relay. When the Activation Logic is set to "A and B" or "A or B," you can select an alarm in both Alarm A and Alarm B . The system monitors both alarms. When the Activation Logic is set to "A Only," you can select an alarm only in Alarm A .	Alarm Number 1 or 2 Note: You can only select an alarm that is enabled.							
XM Configuration Utility	EDS File												
Alarm A/B	Alarm Identifier A/B												

Relay Parameters

Parameter Name		Description	Options/Comments	
XM Configuration Utility	EDS File	Sets the alarm conditions that will cause the relay to activate. You can select more than one. <ul style="list-style-type: none"> • Normal - The current measurement is not within excess of any alarm thresholds. • Alert - The current measurement is in excess of the alert level threshold(s) but not in excess of the danger level threshold(s). • Danger - The current measurement is in excess of the danger level threshold(s). • Disarm-The alarm is disabled or the device is in Program mode. • Xdcr Fault - A transducer fault is detected on the associated transducer. • Module Fault - Hardware or firmware failure, or an error has been detected and is preventing proper operation of the device. • Tacho Fault - A required tachometer signal has not been detected. Note that there is no transducer fault either. 	Options: Normal Danger Xdcr Fault Tacho Fault Alert Disarm Module Fault Check to enable. Clear to disable.	
Alarm Status to Activate On	Alarm Levels			
Relay Installed		Indicates whether the relay is a physical relay on a module or a virtual relay. If the relay is a physical relay, then you can set the Failsafe parameter. If the relay is a virtual relay, the Failsafe parameter is not used or it is disabled.	XM Configuration Utility	EDS File
			Check = Physical Relay	Installed = Physical Relay
			Clear = Virtual Relay	Not Installed = Virtual Relay

Relay Parameters

Parameter Name		Description	Options/Comments	
XM Configuration Utility	EDS File	<p>Determines whether the relay is failsafe or non-failsafe.</p> <p>Failsafe operation means that when in alarm, the relay contacts are in their "normal," de-energized, or "shelf-state" positions. In other words, normally closed relays are closed in alarm, and normally open relays are open in alarm. With failsafe operation, a power failure equals an alarm.</p> <p>The following are true of a relay in failsafe operation:</p> <ul style="list-style-type: none"> • The relay is energized when power is applied to the module. • The relay in a nonalarmed condition has power applied to the coil. • In alarm condition, power is removed from the relay coil, causing the relay to change state. <p>For non-failsafe operation, the following are true:</p> <ul style="list-style-type: none"> • Under nonalarm conditions, the relay closes the circuit between the common and the N.C. (normally closed) terminals. • Under alarm conditions, the relay changes state to close the circuit between the common and the N.O. (normally open) terminals. <p>For failsafe operation, the following are true:</p> <ul style="list-style-type: none"> • Under nonalarm (with power applied to the unit) conditions, the relay closes the circuit between the common and the N.O. terminals. • Under alarm or loss-of-power conditions, the relay changes state to close the circuit between the common and the N.C. terminals. 	XM Configuration Utility	EDS File
Failsafe Relay	Failsafe Option		Check means failsafe	Failsafe
			Clear means non-failsafe	Nonfailsafe

4-20 mA Output Parameters

The 4-20 mA output parameters define the characteristics of the two 4-20 mA output signals. The parameters are the same for each output.

4-20 mA Parameters

Parameter Name		Description	Options/Comments	
Enable		Enables/disables the 4-20 mA output.	XM Configuration Utility	EDS File
			Check to enable	Enabled
			Clear to disable	Disabled
Min Range		The measured value associated with the 4 mA.	Same measurement unit as the Eccentricity Unit selection for the specified channel.	
Max Range		The measured value associated with the 20 mA.		

IMPORTANT

Measured values between **Min Range** and **Max Range** are scaled into the range from 4.0 to 20.0 to produce the output value. The **Min Range** value does not have to be less than the **Max Range** value. If the **Min Range** value is greater than the **Max Range** value, then the output signal is effectively inverted from the input signal.

IMPORTANT

The 4-20 mA outputs are either on or off. When they are on, the 4-20 mA outputs overshoot the 4 and 20 mA limits by 10% when the measurement exceeds the minimum and maximum range. This means the minimum current produced is 3.6 mA and the maximum current produced is 22 mA.

When the 4-20 mA outputs are off, they produce a current approximately 2.9 mA. The 4-20 mA outputs are off under the following conditions:

- The 4-20 mA outputs are set to "Disable" (see **Enable** on the previous page).
- The module is in Program mode.
- A transducer fault or tachometer fault occurs that affects the corresponding measurement.

I/O Data Parameters

The I/O data parameters are used to configure the content and size of the DeviceNet I/O Poll response message.

IMPORTANT

The XM-120 must be free of Poll connections when configuring the **Poll Output (Poll Response Assembly)** and **Poll Size**. Any attempt to download the parameters while a master device has established the Poll connection with the Eccentricity module will result in an error.

To close an existing Poll connection with an XM-440, switch the XM-440 from Run mode to Program mode. Refer to Changing Operation Modes on page 67.

To close an existing Poll connection with other master devices, remove the module from the scan list or turn off the master device.

I/O Data Parameters

Parameter Name	Description	Values/Comments
COS Size (XM Serial Configuration Utility only)	The size (number of bytes) of the Change of State (COS) message.	The COS Size cannot be changed.

I/O Data Parameters

Parameter Name		Description	Values/Comments
COS Output (XM Serial Configuration Utility only)		The Assembly instance used for the COS message. The COS message is used to produce the Alarm and Relay status for the module.	The COS Output cannot be changed. Refer to COS Message Format on page 73 for more information.
Poll Size		Sets the size (number of bytes) of the Poll response message. Decreasing the maximum size will truncate data from the end of the Assembly structure. Important: If you set the Poll Output to "Custom Assembly," the poll size is automatically set to the actual size of the customized Poll response.	The minimum size is 4 bytes and the maximum size is 124 bytes.
XM Configuration Utility	EDS File	Sets the Assembly instance used for the Poll response message. Each Assembly instance contains a different arrangement of the Poll data.	Options: Assembly Instance 101 Assembly Instance 102 Assembly Instance 103 Assembly Instance 104 Custom Assembly Refer to Poll Message Format on page 71 for more information.
Poll Output	Poll Response Assembly	The Poll response message is used by the XM module to produce measured values. It can contain up to 31 REAL values for a total of 124 bytes of data.	
Assembly Instance Table (XM Serial Configuration Utility only)		Displays the format of the currently selected COS or Poll Assembly instance.	The highlighted (yellow) Assembly structure bytes are included in the I/O message.
Custom Assembly (XM Serial Configuration Utility only)		Defines a custom data format for the Poll response. The custom assembly can contain any of the measurement parameters included in Assembly instance 101, as well as alarm and relay configuration parameters.	You can select up to 20 parameters. Refer to Poll Message Format on page 71 for the more information.

Data Parameters

The Data parameters are used to view the measured values of the input channels, as well as to monitor the status of the channels, alarms, and relays.

TIP

To view all the data parameters in the XM Serial Configuration Utility, click the **View Data** tab.

Monitor Data Parameters

Monitor Data Parameters

Parameter Name		Description	Values/Comments
Channel Status (XM Serial Configuration Utility only)		States whether a fault condition exists on the associated channel. If a fault exists, the eccentricity measurement may not be accurate. The following conditions can cause a fault: <ul style="list-style-type: none"> • a transducer fault on the associated channel • no tachometer signal or a transducer fault exists on the tachometer channel • the module is in Program mode 	Possible status values: No Fault Fault
Eccentricity		Shows the measured eccentricity value.	These values get updated after: <ul style="list-style-type: none"> • the number of Pulses per Revolution has occurred, or • the Eccentricity Update Rate has elapsed
Maximum Gap		The maximum measured transducer gap value.	
Minimum Gap		The minimum measured transducer gap value.	
Gap Value		Shows the measured transducer gap value. This value is compared with Fault High and Fault Low to determine whether the transducer is working properly.	
Speed Status (XM Serial Configuration Utility only)		States whether a fault condition (no tachometer signal or transducer fault) exists on the tachometer channel. If a fault exists, the speed and DC Bias values may not be accurate.	Possible status values: No Fault Fault
XM Configuration Utility	EDS File	Shows the measured average DC offset of the tachometer signal. This value is compared with Fault High and Fault Low to determine whether the tachometer is working properly.	
Xdcr DC Bias	Transducer 3 Measured DC Bias		
Speed Value		Shows the measured speed value.	

Alarm and Relay Status Parameters

Alarm and Relay Status Parameters

Parameter Name		Description	Values/Comments
XM Configuration Utility	EDS File	States the current status of the alarm.	Possible status values: <ul style="list-style-type: none"> • Normal - The alarm is enabled, the device is in Run mode, there is no transducer fault, and the current measurement is not within the Alert or Danger Threshold value(s). • Alert - The alarm is enabled, the device is in Run mode, there is no transducer fault, and the current measurement is in excess of the Alert Threshold value(s) but not in excess of the Danger Threshold value(s). • Danger - The alarm is enabled, the device is in Run mode, there is no transducer fault, and the current measurement is in excess of the Danger Threshold value(s). • Disarm-The alarm is disabled or the device is in Program mode. • Transducer Fault - The alarm is enabled, the device is in Run mode, and a transducer fault is detected on the associated transducer. • Tachometer Fault - The alarm is enabled, the device is in Run mode, a tachometer fault exists, but there is no transducer fault. • Module Fault - Hardware or firmware failure, or an error has been detected and is preventing proper operation of the device.
Alarm	Alarm Status		
Relay Status		States the current status of the relay.	Possible status values: Activated Not Activated

Device Mode Parameters

The Device Mode parameters are used to control the functions and the behavior of the device.

IMPORTANT

The XM Serial Configuration Utility handles these parameters automatically and transparently to the user.

Device Mode Parameters

Parameter Name	Description	Values/Comments
Device Mode	Sets the current operation mode of the device. Refer to Changing Operation Modes on page 67 for more information.	Options: Run Mode Program Mode
Autobaud	Enables/disables autobaud. When autobaud is set to "Enabled," the module will listen to other devices on the network to determine the correct baud rate to use for communications. When autobaud is set to "Disabled," the module baud rate must be set manually.	Options: Enabled Disabled

XM-120 Eccentricity Technical Specifications

Product Feature	Specification
Inputs	
2 Channels	Eddy current transducer signals
Transducer Power	Constant voltage (+24V dc)* None (voltage input) <i>*Tachometer may be powered, constant voltage, or configured as voltage input.</i>
Voltage Range	Selectable in software as 0 to ± 20 V (min) 40 V max. peak-to-peak
Sensitivity	User configurable in software
Input Impedance	Greater than 100kohms
Tachometer	
1 Tachometer Input	± 25 V (50 V max. peak to peak) 1 to 50,000 events per revolution
Input Impedance	120 kohms minimum
Speed/Frequency Range	1 to 1,200,000 RPM 0.0167 to 20,000 Hz
Speed Measurement Error	1 to 12,000 RPM* +/- 1 RPM 12,001 to 120,000 RPM* +/- 6 RPM 120,001 to 1,200,000 RPM* +/- 50 RPM <i>* Exponential Averaging Time Constant parameter set to ≥ 120ms</i>
Outputs	
4-20 mA Outputs	Two isolated outputs (one per eccentricity channel) 300 ohm max load
Buffered Outputs	1 active buffer per vibration input channel Resistive buffer for tachometer
Indicators	
7 LEDs	Module Status - red/green Network Status - red/green Channel 1 Status - yellow/red Channel 2 Status - yellow/red Tachometer Status - yellow/red Eccentricity -yellow Relay - red

XM-120 Eccentricity Technical Specifications

Product Feature		Specification
Signal Conditioning		
Frequency Response		Peak-to-peak Eccentricity, Max Gap, Min Gap: 0.0039 to 20 Hz (0.235 to 1200 cpm) Gap: 0 to 20 Hz (0 to 1200 cpm)
Accuracy		±1% of measurement Noise Floor: 8 mV RMS Specified at ambient temperature of +25°C (+77°F)
Gap Resolution		5.2mV
Waveform		Block Size: 256, 512, 1024, 2048 Periods: 5 to 800 seconds
Amplitude Range		±21 V
Complex Data		Waveform (asynchronous)
Measured Parameters		
Speed		RPM
Peak-to-peak eccentricity		Peak-to-peak eccentricity is the difference between the positive and the negative extremes of the rotor bow. µm or mils
Gap (or transducer bias voltage)		Volts
Min Gap		Volts
Max Gap		Volts
Alarms		
Number		2 alarm and danger pairs (one each for the eccentricity measurements)
Operators		Greater than Less than Inside range Outside range
Hysteresis		User configurable in software
Speed Inhibit		A speed range may be specified for each alarm. When applied, the alarm is disabled when speed is outside of the defined range.

XM-120 Eccentricity Technical Specifications

Product Feature		Specification
Relays	Number	Single on-board relay, two sets of contacts - DPDT (2 Form C) Four additional relays when interconnected to an XM-441 Expansion Relay module, or Four virtual relays whose status can be used by remote Control Systems or the XM-440 Master Relay module
	On-board Relay Rating	Maximum Voltage: 120V dc, 125V ac Maximum Current: 3.5 A* Minimum Current: 0 Maximum Power: 60 W, 62.5 VA <i>*Max current is up to 40°C, then derates to 2 A at 65°C</i> Agency Rating: 120V ac @ 0.5 A 110V dc @ 0.3 A 30V dc @ 1.0 A
	Failsafe	Normally energized (failsafe), or Normally de-energized (non-fail-safe)
	Latching	Latching, or Non-latching
	Time Delay	0 to 25.5 seconds, adjustable in 100msec increments
	Voting Logic	Single or paired "And" or "Or" logic applied to any alarm
	Reset	Local reset switch on top of module Remote reset switch wired to terminal base Digital reset command via serial or DeviceNet interface
	Activation On	Alarm Status: Normal Alert Danger Disarm Transducer fault Module fault Tacho fault

XM-120 Eccentricity Technical Specifications

Product Feature		Specification
Non-Volatile Configuration		A copy of the module configuration is retained in non-volatile memory from where it is loaded upon power up*. <i>*The configuration stored in non-volatile memory can be deleted only by a module-reset command sent via the serial interface, using the Serial Configuration Utility, or via DeviceNet from any compliant software application.</i>
Accuracy (minimum)		±1% of full scale range for the channel ±1% of alarm setpoint for speed
Power	Module	+21.6 to +26.4V dc
	Consumption	Maximum: 300 mA Typical: 175 mA
	Heat Production	Maximum: 7 Watts (24 BTU/hr) Typical: 4 Watts (14 BTU/hr)
	Transducer	Isolated 24V dc, user configurable with wiring
Environmental	Operating Temperature	-20 to +65°C (-4 to +149°F)
	Storage Temperature	-40 to +85°C (-40 to +185°F)
	Relative Humidity	95% non-condensing
	Conformal Coating	All printed circuit boards are conformally coated in accordance with IPC-A-610C.
Physical	Dimensions	Height: 3.8 in (97 mm) Width: 3.7 in (94 mm) Depth: 3.7 in (94 mm)
	Terminal Screw Torque	7 pound-inches (0.6 Nm)

XM-120 Eccentricity Technical Specifications

Product Feature	Specification
Approvals (when product or packaging is marked)	UL UL Listed for Ordinary Locations
	UL UL Listed for Class I, Division 2 Group A, B, C, and D Hazardous Locations
	CSA CSA Certified Process Control Equipment
	CSA CSA Certified Process Control Equipment for Class I, Division 2 Group A, B, C, and D Hazardous Locations
	EEX* European Union 94/9/EEC ATEX Directive, compliant with EN 50021; Potentially Explosive Atmospheres, Protection "n"
	CE* European Union 89/336/EEC EMC Directive
	C-Tick* Australian Radiocommunications Act, compliant with: AS/NZS 2064, Industrial Emissions
* See the Product Certification link at www.rockwellautomation.com for Declarations of Conformity, Certificates and other certification details.	

DeviceNet Information

Electronic Data Sheets

Electronic Data Sheet (EDS) files are simple text files used by network configuration tools such as RSNetWorx (Version 3.0 or later) to help you identify products and easily commission them on a network. The EDS files describe a product's device type, product revision, and configurable parameters on a DeviceNet network.

The EDS files for the XM modules are installed on your computer with the XM configuration software. The latest EDS files can also be obtained at <http://www.ab.com/networks/eds/> or by contacting your local Rockwell Automation representative.

Refer to your DeviceNet documentation for instructions on registering the EDS files.

Changing Operation Modes

XM modules operate in two modes.

Mode	Description
Run	The XM measurement modules collect measurement data and monitor each measurement device. The XM-440 establishes I/O connections with the XM measurement modules in its scan list and monitors their alarms, and controls its own relay outputs accordingly.
Program	The XM module is idle. The XM measurement modules stop the signal processing/measurement process, and the status of the alarms is set to the disarm state to prevent a false alert or danger status. The XM-440 closes the I/O connections with the XM measurement modules in its scan list and stops monitoring their alarms, relays are deactivated unless they are latched. Configuration parameters can be read, updated and downloaded to the XM module.

To change the operation mode of the module, use the Device Mode parameter in the EDS file. Note that the Stop and Start services described on page 69 can also be used to change the operation mode.

IMPORTANT

The XM Serial Configuration Utility software automatically puts XM modules in Program mode and Run mode without user interaction.

Transition to Program Mode

Parameter values can only be downloaded to an XM module while the module is in Program mode. Any attempt to download a parameter value while the module is in Run mode will result in a Device State Conflict error.

To transition an XM module from Run mode to Program mode on a DeviceNet network, set the **Device Mode** parameter to "Program mode" and click **Apply**. Note that you cannot change any other parameter until you have downloaded the Program mode parameter.

TIP

The Module Status indicator flashes green when the module is in Program mode.

Refer to your DeviceNet documentation for specific instructions on editing EDS device parameters.

TIP

You can also use the Stop service described on page 69 to transition XM modules to Program mode.

Transition to Run Mode

In order to collect data and monitor measurement devices, XM modules must be in Run mode. To transition an XM module from Program mode to Run mode on a DeviceNet network, set the **Device Mode** parameter to "Run mode" and click **Apply**.

TIP

The Module Status indicator is solid green when the module is in Run mode.

Refer to your DeviceNet documentation for specific instructions on editing EDS device parameters.

TIP

You can also use the Start service described on page 69 to transition XM modules to Run mode.

XM Services

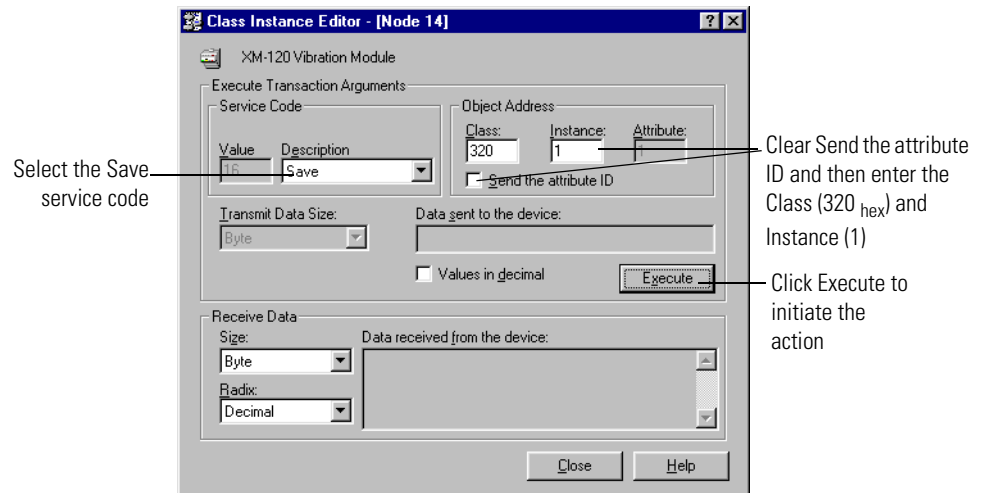
The table below defines services supported by the XM modules. The table includes the service codes, classes, instances, and attributes by their appropriate hexadecimal codes. Use the Class Instance Editor in RSNetWorx to execute these services, as illustrated in the example below.

XM Services

Action	Service Code (Hex)	Class (Hex)	Instance	Attribute	Data
Transition to Run Mode	Start (06)	Device Mode Object (320)	1	None	None
Transition to Program Mode	Stop (07)	Device Mode Object (320)	1	None	None
Save configuration to non-volatile memory (EEPROM)	Save (16)	Device Mode Object (320)	1	None	None
Delete saved configuration from non-volatile memory (EEPROM)	Delete (09)	Device Mode Object (320)	1	None	None
Reset a specific latched relay	Reset (05)	Relay Object (323)	Relay number 1-C for XM-440, 1-5 for XM-12X, XM-320 and XM-220, 1-8 for XM-36X and XM-16X	None	None
Reset all latched relays	Reset (05)	Relay Object (323)	0	None	None
Reset the Peak Speed (XM-12X only)	Reset (05)	Speed Measurement Object (325)	1, 2 for XM-220	None	None
Close the virtual setpoint multiplier switch to activate the alarm setpoint multipliers (not applicable to all XM modules)	Other (33)	Discrete Input Point Object (08)	1	None	None
Open the virtual setpoint multiplier switch to start the setpoint multiplier timers and eventually cancel alarm setpoint multiplication (not applicable to all XM modules)	Other (32)	Discrete Input Point Object (08)	1	None	None

Example

To save the configuration parameters to the non-volatile memory (EEPROM), fill in the Class Instance Editor as shown below.



Invalid Configuration Errors

A Start or Save service request to an XM module may return an Invalid Device Configuration error when there is a conflict amongst the configuration settings.

The general error code for the Invalid Device Configuration error is $D0_{\text{hex}}$. An additional error code is returned with the general error code to specify which configuration settings are invalid. The table below lists the additional error codes associated with the Invalid Device Configuration error.

Additional Error Codes returned with the Invalid Device Configuration Error (0xD0)

Error Code (Hex)	Description
01	No specific error information is available.
02	Mismatched transducer, channel, and/or measurement unit.
03	Inverted transducer fault high/low values.
04	Alarm thresholds conflict with the alarm condition.
05	Alarm speed range is invalid.
06	Band minimum frequency is greater than maximum frequency. Or, maximum frequency is greater than FMAX.
07	Relay is associated with an alarm that is not enabled.
08	Tachometer must be enabled for alarm or channel settings.
09	A senseless speed range is enabled on a speed alarm.

Additional Error Codes returned with the Invalid Device Configuration Error (0xD0)

Error Code (Hex)	Description
0A	Too many alarms associated with a single measurement.
0B	Invalid node address in the alarm list.
0C	Too many alarms in the alarm list. Or, no alarms in the alarm list.
0D	Alarm levels cannot be zero for alarms that are enabled.
0E	Too many slaves in the scanner's input data table.
0F	The FMAX and Number of Lines do not yield correct vector calculations.
10	Phase (vector) alarms prohibited with synchronous sampling and more than 1 tachometer pulse per revolution.
11	Can't have order based band on asynchronous channel.
12	Unsupported Sensor Type and Channel ID combination.
13	Invalid Alarm Type for the associated measurement ID.
14	Synchronous sampling is required for alarm on synchronous measurements.
15	Integration is not supported with the Bypass High Pass Filter option.

Eccentricity I/O Message Formats

The Eccentricity module supports Poll and Change of State (COS) I/O messages. The Poll response message is used by the XM module to produce measured values and the COS message is used to produce the Alarm and Relay Status.

Poll Message Format

The Eccentricity module Poll request message contains no data. The Poll response message can contain up to 31 REAL values for a total of 124 bytes.

The Eccentricity module provides four pre-defined (static) data formats of the Poll response, as defined in Assembly instance 101–104. It also provides a dynamic Assembly instance, instance 199, with which you can define a custom data format for the Poll response. The dynamic Assembly instance can contain any of the measurement parameters included in Assembly instance 101, as well as several of the alarm and relay configuration parameters.

The default Assembly instance is 101 and the default size is 36 bytes. You can change the Assembly instance and define the custom Assembly instance using the configuration software. Refer to I/O Data Parameters on page 56 for details.

The Poll response data can also be requested explicitly through Assembly Object (Class ID 0x4), Instance 101 (0x65), Data Attribute (3).

The following tables show the static data format of Assembly instances 101–104.

Eccentricity Assembly Instance 101 Data Format

Byte	Definition
0–3	Speed
4–7	Channel 1 Eccentricity value
8–11	Channel 2 Eccentricity value
12–15	Channel 1 Gap value
16–19	Channel 2 Gap value
20–23	Channel 1 Maximum Gap value
24–27	Channel 2 Maximum Gap value
28–31	Channel 1 Minimum Gap value
32–35	Channel 2 Minimum Gap value

Eccentricity Assembly Instance 102 Data Format

Byte	Definition
0–3	Channel 1 Gap value
4–7	Channel 2 Gap value
8–11	Channel 1 Maximum Gap value
12–15	Channel 2 Maximum Gap value
16–19	Channel 1 Minimum Gap value
20–23	Channel 2 Minimum Gap value
24–27	Channel 1 Eccentricity value
28–31	Channel 2 Eccentricity value
32–35	Speed

Eccentricity Assembly Instance 103 Data Format

Byte	Definition
0–3	Channel 1 Eccentricity value
4–7	Channel 2 Eccentricity value
8–11	Channel 1 Minimum Gap value
12–15	Channel 2 Minimum Gap value
16–19	Speed
20–23	Channel 1 Gap value

Eccentricity Assembly Instance 103 Data Format

Byte	Definition
24–27	Channel 2 Gap value
28–31	Channel 1 Maximum Gap value
32–35	Channel 2 Maximum Gap value

Eccentricity Assembly Instance 104 Data Format

Byte	Definition
0–3	Channel 1 Eccentricity value
4–7	Channel 1 Gap value
8–11	Channel 1 Minimum Gap value
12–15	Channel 1 Maximum Gap value
16–19	Speed
20–23	Channel 2 Eccentricity value
24–27	Channel 2 Gap value
28–31	Channel 2 Minimum Gap value
32–35	Channel 2 Maximum Gap value

COS Message Format

The Eccentricity COS message contains five bytes of data as defined in the table below. The COS data can also be requested explicitly through Assembly Object (Class ID 0x4), Instance 100 (0x64), Data Attribute (3).

XM-120 COS Message Format

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Relay 1 Status	Reserved	Alarm 2 Status			Alarm 1 Status		
1	Relay 2 Status	Reserved	Reserved			Reserved		
2	Relay 3 Status	Reserved	Reserved			Reserved		
3	Relay 4 Status	Reserved	Reserved			Reserved		
4	Relay 5 Status	Reserved	Reserved			Reserved		

XM Status Values

The following tables describe the XM Status values that are included in the COS messages.

Alarm Status Descriptions

Alarm Status Value	Description
0	Normal
1	Alert
2	Danger
3	Disarm
4	Transducer Fault (Sensor OOR)
5	Module Fault
6	Tachometer Fault
7	Reserved

Relay Status Descriptions

Relay Status Value	Description
0	Not Activated
1	Activated

ADR for XM Modules

Automatic Device Replacement (ADR) is a feature of an Allen-Bradley DeviceNet scanner. It provides a means for replacing a failed device with a new unit, and having the device configuration data set automatically. Upon replacing a failed device with a new unit, the ADR scanner automatically downloads the configuration data and sets the node address.

IMPORTANT

It is recommended that ADR not be used in safety related applications. If the failure of the ADR server, and a subsequent power cycle, would result in the loss of protection for a machine, then ADR should not be implemented.

ADR can be used with XM modules but keep the following in mind when setting up the XM modules.

- The ADR scanner can not download the configuration data to an XM module if the module has a saved configuration in its non-volatile memory. This happens because the saved configuration is restored and the module enters Run mode when the power is cycled. (Configuration parameters cannot be downloaded while an XM module is in Run mode.) XM modules must be in Program mode for the ADR configuration to be downloaded and this occurs only when there is no saved configuration.

TIP

To delete a saved configuration from non-volatile memory, use the Delete service in RSNetWorx for DeviceNet or perform the following steps in the XM Serial Configuration Utility.

1. Save the current configuration to a file. From the **File** menu, click **Save As** and enter a file name for the configuration.
 2. Reset the module to factory defaults. Click the **Module** tab and click the **Reset** button.
 3. Reload the saved configuration. From the **File** menu, click **Open** and select the configuration file.
 4. Make certain to disable auto save. From the **Device** menu, clear the **Auto Save Configuration** check mark.
- An XM module will enter Run mode automatically after the ADR scanner restores the module's configuration only if the module is in Run mode at the time the configuration is saved to the scanner. If the module is in Program mode when the configuration is saved, then the module will remain in Program mode after the configuration is downloaded by the ADR scanner.
 - The ADR scanner saves and restores only the configuration parameters contained in the module's EDS file. Some XM parameters are not included in the EDS file because they are not supported by either the EDS specification or the tools that read the EDS files, for example RSNetWorx for DeviceNet. These configuration parameters will not be restored with ADR.

Below is a list of the configuration parameters that are not included in the EDS file and can not be saved or restored with ADR.

- Channel Name
- Tachometer Name
- Alarm Name
- Relay Name
- All Triggered Trend related parameters

- All SU/CD Trend related parameters
- Custom Assembly structure (see page 56)
- The ADR and trigger group functions cannot be used together. A module can have only one primary master so a module cannot be both configured for ADR and included in a trigger group. The ADR scanner must be the primary master for the modules configured for ADR. The XM-440 Master Relay module must be the primary master for modules included in a trigger group.

DeviceNet Objects

Appendix C provides information on the DeviceNet objects supported by the Eccentricity module.

For information about	See page
Identity Object (Class ID 01H)	78
DeviceNet Object (Class ID 03H)	80
Assembly Object (Class ID 04H)	81
Connection Object (Class ID 05H)	86
Analog Input Point Object (Class ID 0AH)	88
Parameter Object (Class ID 0FH)	90
Acknowledge Handler Object (Class ID 2BH)	93
Alarm Object (Class ID 31DH)	94
Device Mode Object (Class ID 320H)	96
Relay Object (Class ID 323H)	97
Spectrum Waveform Measurement Object (Class ID 324H)	99
Speed Measurement Object (Class ID 325H)	102
Tachometer Channel Object (Class ID 326H)	103
Transducer Object (Class ID 328H)	105
4-20 mA Output Object (Class ID 32AH)	106

TIP

Refer to the DeviceNet specification for more information about DeviceNet objects. Information about the DeviceNet specification is available on the ODVA web site (<http://www.odva.org>).

Identity Object (Class ID 01_H)

The Identity Object provides identification and general information about the device.

Class Attributes

The Identity Object provides no class attributes.

Instance Attributes

Table C.1 Identity Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Default Value
1	Get	Vendor ID	UINT	668 = Entek
2	Get	Device Type	UINT	109 (Specialty I/O)
3	Get	Product Code	UINT	33 (0x21)
4	Get	Revision: Major Minor	STRUCT OF USINT USINT	Value varies with each firmware revision. Value varies with each firmware revision.
5	Get	Status	WORD	
6	Get	Serial Number	UDINT	
7	Get	Product Name	SHORT_ STRING	"XM-120 Eccentricity Module"

Status

The **Status** is a 16 bit value. The following bits are implemented.

Table C.2 Identity Object Status

Bit	Name	Description
0	Owned	TRUE indicates that the module has an owner. More specifically, the Predefined Master/Slave Connection Set has been allocated to a master.
1		Reserved, set to 0
2	Configured	This bit is set whenever a saved configuration is successfully loaded from non-volatile memory. This bit is cleared whenever the default configuration is restored or loaded.
3		Reserved, set to 0

Table C.2 Identity Object Status

Bit	Name	Description
4	Boot Program	Vendor-specific, indicates that the boot program is running. The Main Application must be corrupt or missing.
5 - 7		Vendor-specific, not implemented
8	Minor Recoverable Fault	Set whenever there is a transducer or tachometer fault.
9	Minor Unrecoverable Fault	Not implemented
10	Major Recoverable Fault	Set when the module detects a major problem that the user may be able to recover from. The Module Status LED will flash red. An example of this condition is when the boot program is running.
11	Major Unrecoverable Fault	Set when there is a module status fault (Module Status LED is solid red).
12 - 15		Reserved, set to 0

Services

Table C.3 Identity Object Services

Service Code	Class/Instance Usage	Name
01 _h	Instance	Get_Attributes_All
05 _h	Instance	Reset
0E _h	Instance	Get_Attribute_Single
10 _h	Instance	Set_Attribute_Single ¹

¹ Attributes can only be set while the device is in Program Mode. See the description of the Device Mode Object for more information.

DeviceNet Object (Class ID 03_H)

The DeviceNet Object is used to provide the configuration and status of a physical attachment to DeviceNet.

Class Attributes

Table C.4 DeviceNet Object Class Attributes

Attr ID	Access Rule	Name	Data Type	Default Value
1	Get	Revision	UINT	2

Instance Attributes

Table C.5 DeviceNet Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Default Value
1	Get/Set	MAC ID ¹	USINT	63
2	Get/Set	Baud Rate ²	USINT	0
3	Get	Bus-Off Interrupt	BOOL	0
4	Get/Set	Bus-Off Counter	USINT	0
5	Get	Allocation Information	STRUCT of BYTE USINT	0 255
100	Get/Set	Autobaud Disable	BOOL	0 (Ignore attribute 2 and always autobaud)

- 1 Setting the MAC ID causes the device to reset automatically, after which it will go online with the new MAC ID.
- 2 The Baud Rate setting can not be set while **Autobaud Disable** is equal to 0. Applying the Baud Rate does not occur until the Reset service to the Identity Object.

The **MAC ID**, **Baud Rate**, and **Autobaud Disable** settings are stored in non-volatile memory so they do not reset to the default with each power cycle. The **Baud Rate** attribute supports the following settings:

- 0 = 125 kbps
- 1 = 250 kbps
- 2 = 500 kbps

The **Baud Rate** setting is used only when automatic baud rate detection is disabled (**Autobaud Disable** = 1). When **Autobaud Disable** is set to zero (0), the module ignores its **Baud Rate** setting and performs automatic baud

rate detection instead. This means that the module will determine the network baud rate by listening for network traffic before attempting to go online.

Services

Table C.6 DeviceNet Object Services

Service Code	Class/Instance Usage	Name
0E _h	Class/Instance	Get_Attribute_Single
10 _h	Instance	Set_Attribute_Single ¹
4B _h	Instance	Allocate_Master/Slave_Connetion_Set
4C _h	Instance	Release_Group_2_Identifier_Set

¹ Attributes can only be set while the device is in Program Mode. See the description of the Device Mode Object for more information.

Assembly Object (Class ID 04H)

The Assembly Object binds attributes of multiple objects to allow data to or from each object to be sent or received in a single message.

The Eccentricity module provides both static and dynamic assemblies.

Class Attribute

Table C.7 Assembly Object Class Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
1	Get	Revision	UINT	Revision of the implemented object.	2

Instances

Table C.8 Assembly Object Instances

Instance	Name	Type	Description
100	Default COS Message	Input	Alarm and Relay Status values

Table C.8 Assembly Object Instances

Instance	Name	Type	Description
101	Default Poll Response Message	Input	Measurement values
102 - 106	Alternate Poll Response Message	Input	Measurement values
199	Alternate Dynamic Poll Response Message	Input	User configurable measurement values and configuration parameters

Instance Attributes

Table C.9 Assembly Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Value
1	Get	Number of Members in list	UINT	Only supported for Dynamic Assembly instance
2	Set	Member List	Array of STRUCT:	Only supported for Dynamic Assembly instance
		Member Data Description	UINT	Size of member data value in bits
		Member Path Size	UINT	
		Member Path	Packed EPATH	
3	Get	Data	Defined in tables on the following pages.	

Assembly Instance Attribute Data Format

Instance 100 - Eccentricity Module Alarms

This assembly is sent using COS messaging when any of the Alarm or Relay Status values change.

Table C.10 Instance 100 Data Format (Alarm and Relay Status Values Assembly)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Relay 1 Status	0	Alarm 2 Status			Alarm 1 Status		
1	Relay 2 Status	0	0			0		

Table C.10 Instance 100 Data Format (Alarm and Relay Status Values Assembly)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
2	Relay 3 Status	0	0			0		
3	Relay 4 Status	0	0			0		
4	Relay 5 Status	0	0			0		

Instance 101 - Eccentricity Module Measurements

This is the default assembly that is sent within the I/O Poll Response message when an I/O Poll Request is received from a DeviceNet master.

Table C.11 Instance 101 Data Format (Measurement Values Assembly)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0 - 3	Speed							
4 - 7	Channel 1 Eccentricity value							
8 - 11	Channel 2 Eccentricity value							
12 - 15	Channel 1 Gap value							
16 - 19	Channel 2 Gap value							
20 - 23	Channel 1 Max Gap value							
24 - 27	Channel 2 Max Gap value							
28 - 31	Channel 1 Min Gap value							
32 - 35	Channel 2 Min Gap value							

Instance 102 - Eccentricity Module Measurements

This is an alternate assembly for the I/O Poll Response message.

Table C.12 Instance 102 Data Format (Measurement Values Assembly)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0 - 3	Channel 1 Gap value							
4 - 7	Channel 2 Gap value							
8 - 11	Channel 1 Max Gap value							
12 - 15	Channel 2 Max Gap value							
16 - 19	Channel 1 Min Gap value							
20 - 23	Channel 2 Min Gap value							
24 - 27	Channel 1 Eccentricity value							
28 - 31	Channel 2 Eccentricity value							
32 - 35	Speed							

Instance 103 - Eccentricity Module Measurements

This is an alternate assembly for the I/O Poll Response message.

Table C.13 Instance 103 Data Format (Measurement Values Assembly)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0 - 3	Channel 1 Eccentricity value							
4 - 7	Channel 2 Eccentricity value							
8 - 11	Channel 1 Min Gap value							
12 - 15	Channel 2 Min Gap value							
16 - 19	Speed							
20 - 23	Channel 1 Gap value							
24 - 27	Channel 2 Gap value							
28 - 31	Channel 1 Max Gap value							
32 - 35	Channel 2 Max Gap value							

Instance 104 - Eccentricity Module Measurements

This is an alternate assembly for the I/O Poll Response message.

Table C.14 Instance 103 Data Format (Measurement Values Assembly)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0 - 3	Channel 1 Eccentricity value							
4 - 7	Channel 1 Gap value							
8 - 11	Channel 1 Min Gap value							
12 - 15	Channel 1 Max Gap value							
16 - 19	Speed							
20 - 23	Channel 2 Eccentricity value							
24 - 27	Channel 2 Gap value							
28 - 31	Channel 2 Min Gap value							
32 - 35	Channel 2 Max Gap value							

Instance 199 - Dynamic Assembly

This Assembly instance can be created and configured with the XM Serial Configuration Utility or RSMACC Enterprise Online Configuration Utility. Using the configuration software, you determine the format of the data. This assembly instance can be selected to be sent in response to an I/O Poll request from a Master.

The dynamic Assembly can include all of the measurement values included in Assembly instance 101. In addition, the dynamic Assembly can include the following configuration parameters.

Table C.15 Instance 199 Component Mapping

EPATH (where ii = instance number)	Class Name	Class Number	Instance Number	Attribute Name	Attribute Number	Data Type
21 1D 03 24 ii 30 04	Alarm	31D _h	1 - 2	Alarm Enable	4	BOOL
21 1D 03 24 ii 30 07	Alarm	31D _h	1 - 2	Condition	7	USINT
21 1D 03 24 ii 30 08	Alarm	31D _h	1 - 2	Alert Threshold (High)	8	REAL
21 1D 03 24 ii 30 09	Alarm	31D _h	1 - 2	Danger Threshold (High)	9	REAL
21 1D 03 24 ii 30 0A	Alarm	31D _h	1 - 2	Alert Threshold Low	10	REAL
21 1D 03 24 ii 30 0B	Alarm	31D _h	1 - 2	Danger Threshold Low	11	REAL
21 1D 03 24 ii 30 0C	Alarm	31D _h	1 - 2	Hysteresis	12	REAL
21 1D 03 24 ii 30 0F	Alarm	31D _h	1 - 2	Speed Range Enable	15	BOOL
21 1D 03 24 ii 30 10	Alarm	31D _h	1 - 2	Speed Range High	16	REAL
21 1D 03 24 ii 30 11	Alarm	31D _h	1 - 2	Speed Range Low	17	REAL
21 23 03 24 ii 30 04	Relay	323 _h	1 - 5	Relay Enable	4	BOOL
21 23 03 24 ii 30 05	Relay	323 _h	1 - 5	Latch Enable	5	BOOL
21 23 03 24 ii 30 06	Relay	323 _h	1 - 5	Failsafe Enable	6	BOOL
21 23 03 24 ii 30 07	Relay	323 _h	1 - 5	Delay	7	UINT
21 23 03 24 ii 30 09	Relay	323 _h	1 - 5	Alarm Level	9	BYTE
21 0F 00 24 ii 30 01	Param	0F _h	7 - 11	Parameter Value (Alarm Identifier A)	1	USINT
21 0F 00 24 ii 30 01	Param	0F _h	12 - 16	Parameter Value (Alarm Identifier B)	1	USINT
21 23 03 24 ii 30 0C	Relay	323 _h	1 - 5	Logic	12	USINT
21 23 03 24 ii 30 0E	Relay	323 _h	1 - 5	Relay Installed	14	BOOL

The dynamic Assembly instance must be instantiated with a call to the class level Create service. Then the structure can be defined with the Set_Attribute_Single service for the Member List attribute. Only one dynamic Attribute instance is supported so subsequent calls to the Create service will return a Resource Unavailable (0x02) error. The Delete service can be used to destroy the dynamic Assembly instance so that it can be re-created.

Services

Table C.16 Assembly Object Services

Service Code	Class/Instance Usage	Name
0E _h	Class/Instance	Get_Attribute_Single
10 _h	Instance	Set_Attribute_Single
08 _h	Class	Create
09 _h	Instance	Delete

Connection Object (Class ID 05_H)

The Connection Object allocates and manages the internal resources associated with both I/O and Explicit Messaging Connections.

Class Attributes

The Connection Object provides no class attributes.

Instances

Table C.17 Connection Object Instances

Instance	Description
1	Explicit Message Connection for pre-defined connection set
2	I/O Poll Connection
4	I/O COS (change of state) Connection
11 - 17	Explicit Message Connection

Instance Attributes

Table C.18 Connection Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description
1	Get	State	USINT	State of the object.
2	Get	Instance Type	USINT	Indicates either I/O or Messaging Connection.
3	Get	Transport Class Trigger	BYTE	Defines behavior of the Connection.

Table C.18 Connection Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description
4	Get	Produced Connection ID	UINT	Placed in CAN Identifier Field when the Connection transmits.
5	Get	Consumed Connection ID	UINT	CAN Identifier Field value that denotes message to be received.
6	Get	Initial Comm Characteristics	BYTE	Defines the Message Group(s) across which productions and consumptions associated with this Connection occur.
7	Get	Produced Connection Size	UINT	Maximum number of bytes transmitted across this Connection.
8	Get	Consumed Connection Size	UINT	Maximum number of bytes received across this Connection.
9	Get/Set	Expected Packet Rate	UINT	Defines timing associated with this Connection.
12	Get/Set	Watchdog Time-out Action	USINT	Defines how to handle Inactivity/Watchdog timeouts.
13	Get	Produced Connection Path Length	UINT	Number of bytes in the production_connection_path attribute.
14	Get	Produced Connection Path	Array of USINT	Specifies the Application Object(s) whose data is to be produced by this Connection Object. See DeviceNet Specification Volume 1 Appendix I.
15	Get	Consumed Connection Path Length	UINT	Number of bytes in the consumed_connection_path attribute.
16	Get	Consumed Connection Path	Array of USINT	Specifies the Application Object(s) that are to receive the data consumed by this Connection Object. See DeviceNet Specification Volume 1 Appendix I.
17	Get	Production Inhibit Time	UINT	Defines minimum time between new data production.

Services

Table C.19 Connection Object Services

Service Code	Class/Instance Usage	Name
05 _h	Instance	Reset
0E _h	Instance	Get_Attribute_Single
10 _h	Instance	Set_Attribute_Single

Analog Input Point Object (Class ID 0A_H)

The Analog Input Point Object is used to model the Eccentricity measurements made by the Eccentricity module.

Class Attributes

Table C.20 Analog Input Point Object Class Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
1	Get	Revision	UINT	Revision of the implemented object.	2

Instances

Table C.21 Analog Input Point Object Instances

Instance	Name	Description
1	Eccentricity 1	Eccentricity measurement for Channel 1
2	Eccentricity 2	Eccentricity measurement for Channel 2
3	Min Gap 1	Min Gap for Channel 1
4	Min Gap 2	Min Gap for Channel 2
5	Max Gap 1	Max Gap for Channel 1
6	Max Gap 2	Max Gap for Channel 2

Instance Attributes

Table C.22 Analog Input Point Object Class Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get	Value	REAL	Measurement value	The measured value in units specified by the Data Units attribute.
4	Get	Status	BOOL	Indicates if a fault or alarm has occurred.	0 = Operating without alarms or faults 1 = Alarm or fault condition exists. The Value attribute may not represent the actual field value.
8	Get	Value Data Type	USINT	Determines the data type of the Value .	1 = REAL
147	Get	Data Units	ENGUNIT	The units context of the Value attribute.	See DeviceNet Specification Volume 1 Appendix K. Valid values for eccentricity: mils = 0800 hex µm = 2204 hex Fixed for Min/Max Gap Volt = 2D00 hex

Services

Table C.23 Analog Input Point Object Services

Service Code	Class/Instance Usage	Name	Description
0E _h	Class/Instance	Get_Attribute_Single	Returns the contents of the specified attribute.
10 _h	Instance	Set_Attribute_Single	Sets the contents of the specified attribute. ¹

¹ Attributes can only be set while the device is in Program Mode. See the description of the Device Mode Object for more information.

Parameter Object (Class ID 0F_H)

The Parameter Object provides the interface to the Eccentricity configuration data. There are 18 Parameter Object instances implemented in the Eccentricity module.

Instances 1-4 and 7-16 are implemented to provide an alternate method of setting the configuration parameters with ENGUNIT or EPATH data type. And Parameter Object instances 17 and 18 provide an alternate method for setting the Produced Connection Size and Produced Connection Path attributes for the Poll Connection because these attributes can be difficult to get/set directly through the Connection Object.

Parameter Object instances 5 and 6 are for setting the update rate of the eccentricity measurements. The eccentricity update rate is used in place of the tachometer when no tachometer is available.

Table C.24 Parameter Object Class Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
2	Get	Max Instance	UINT	Maximum instance number of an object in this class.	Total number of parameter object instances.
8	Get	Parameter Class Descriptor	WORD	Bits that describe the parameter.	Bit 0 Supports Parameter Instances Bit 1 Supports Full Attrib. Bit 2 Must do non-volatile store Bit 3 Params in non-volatile
9	Get	Config. Assembly Instance	UINT		Set to 0

Instances

There are 18 instances of this object.

Table C.25 Parameter Object Instances

Instance	Read Only	Name	Data Type	Valid Values	Default Value
1	No	Transducer 1 Sensitivity Units	USINT	0 = mils 1 = μm	0
2	No	Transducer 2 Sensitivity Units	USINT	0 = mils 1 = μm	0
3	No	Eccentricity Measurement 1 Units	USINT	0 = mils 1 = μm	0
4	No	Eccentricity Measurement 2 Units	USINT	0 = mils 1 = μm	0

Table C.25 Parameter Object Instances

Instance	Read Only	Name	Data Type	Valid Values	Default Value
5	No	Eccentricity 1 Update Rate	USINT	1-255 seconds	60
6	No	Eccentricity 2 Update Rate	USINT	1-255 seconds	60
7	No	Relay 1 Alarm Identifier A	USINT	0 = Alarm 1 1 = Alarm 2	0
8	No	Relay 2 Alarm Identifier A	USINT	0 = Alarm 1 1 = Alarm 2	0
9	No	Relay 3 Alarm Identifier A	USINT	0 = Alarm 1 1 = Alarm 2	0
10	No	Relay 4 Alarm Identifier A	USINT	0 = Alarm 1 1 = Alarm 2	0
11	No	Relay 5 Alarm Identifier A	USINT	0 = Alarm 1 1 = Alarm 2	0
12	No	Relay 1 Alarm Identifier B	USINT	0 = Alarm 1 1 = Alarm 2	0
13	No	Relay 2 Alarm Identifier B	USINT	0 = Alarm 1 1 = Alarm 2	0
14	No	Relay 3 Alarm Identifier B	USINT	0 = Alarm 1 1 = Alarm 2	0
15	No	Relay 4 Alarm Identifier B	USINT	0 = Alarm 1 1 = Alarm 2	0
16	No	Relay 5 Alarm Identifier B	USINT	0 = Alarm 1 1 = Alarm 2	0
17	No	Poll Connection Produced Connection Path ¹	USINT	101-104 (Assembly Object instance number)	101
18	No	Poll Connection Produced Connection Size ¹	UINT	4 - 124	36

- 1 The Poll Connection Produced Connection Path and Size parameters cannot be set while the Poll connection is already established with a master/scanner. Attempting to do so will result in an "Object State Conflict" error (error code 0xC). These Parameter instances are a little more flexible than the actual Connection Object attributes because they can be set while the connection is in the NON=EXISTENT state (before the master/scanner allocated the connection).

Instance Attributes

Table C.26 Parameter Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
1	Set	Parameter Value		Actual value of parameter	See Table C.25 for a list of valid values for each instance.
2	Get	Link Path Size	USINT	Size of Link Path	0 (These Parameter instances do not link directly to another object attribute.)
3	Get	Link Path	ARRAY of DeviceNet path	DeviceNet path to the object for the Parameter value.	
		Segment Type/Port	BYTE	See DeviceNet Specification Volume 1 Appendix I for format.	
		Segment Address		See DeviceNet Specification Volume 1 Appendix I for format.	
4	Get	Descriptor	WORD	Description of Parameter	Bit 0 = Settable Path support Bit 1 = Enum Strings support Bit 2 = Scaling support Bit 3 = Scaling Links support Bit 4 = Read Only Bit 5 = Monitor Bit 6 = Ext. Prec. scaling
5	Get	Data Type	EPATH	Data Type Code	See DeviceNet Specification Volume 1 Appendix J, Section J-6.
6	Get	Data Size	USINT	Number of Bytes in Parameter value.	

Services

Table C.27 Parameter Object Services

Service Code	Class/Instance Usage	Name	Description
0E _h	Class/Instance	Get_Attribute_Single	Returns the contents of the specified attribute.
10 _h	Class	Set_Attribute_Single	Sets the contents of the specified attribute. ¹

¹ Attributes can only be set while the device is in Program Mode. See the description of the Device Mode Object for more information.

Acknowledge Handler Object (Class ID 2B_H)

The Acknowledge Handler Object is used to manage the reception of message acknowledgments. This object communicates with a message producing Application Object within a device. The Acknowledge Handler Object notifies the producing application of acknowledge reception, acknowledge timeouts, and production retry limit errors.

Class Attributes

The Acknowledge Handler Object provides no class attributes.

Instances

A module provides only a single instance (instance 1) of the Acknowledge Handler Object. This instance is associated with instance 4 of the Connection Object, the slave COS connection to a higher level master.

Instance Attributes

Table C.28 Acknowledge Handler Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Default Value
1	Get/Set	Acknowledge Timer	UINT	16 ms
2	Get/Set	Retry Limit	USINT	1
3	Get	COS Producing Connection Instance	UINT	4

Services

Table C.29 Acknowledge Handler Object Services

Service Code	Class/Instance Usage	Name
0E _h	Instance	Get_Attribute_Single
10 _h	Instance	Set_Attribute_Single

Alarm Object (Class ID 31D_H)

The Alarm Object models a two-stage (alert and danger levels) alarm.

Class Attributes

The Alarm Object provides no class attributes.

Instances

There are 2 instances of this object.

Instance Attributes

Table C.30 Alarm Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get	Alarm Status	3 BITS	The current status of the alarm.	0 = Normal 1 = Alert (alarm) 2 = Danger (shutdown) 3 = Disarm 4 = Xdcr Fault 5 = Module Fault 6 = Tachometer Fault
4	Get/Set	Alarm Enable	BOOL	Indicates whether this alarm object is enabled.	0 = Disabled 1 = Enabled
6	Get	Threshold Units	USINT	Indicates whether the threshold and hysteresis value are specified in units of measure.	Set to 1 1 = Measurement units
7	Get/Set	Condition	USINT	Indicates on which side of the threshold values the alarm and danger conditions exist.	0 = Greater than 1 = Less than 2 = Inside range 3 = Outside range
8	Get/Set	Alert Threshold (High) (Clockwise)	REAL	The threshold value for the alert (alarm) condition (greater threshold for range types).	
9	Get/Set	Danger Threshold (High) (Clockwise)	REAL	The threshold value for the danger (shutdown) condition (greater threshold for range types).	
10	Get/Set	Alert Threshold Low (Counterclockwise)	REAL	The lesser threshold value for the alert (alarm) condition for the range condition types.	

Table C.30 Alarm Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
11	Get/Set	Danger Threshold Low (Counterclockwise)	REAL	The lesser threshold value for the danger (shutdown) condition for the range condition types.	
12	Get/Set	Hysteresis	REAL	The amount on the safe side of a threshold by which the value must recover to clear the alarm.	
15	Get/Set	Speed Range Enable	BOOL	Indicates whether this alarm is enabled only within a certain machine speed range.	0 = No speed range (alarm is always enabled) 1 = Speed range (alarm enabled only within speed range)
16	Get/Set	Speed Range High	REAL	Indicates the greater threshold of the machine speed range for which the alarm is enabled (disabled at greater speeds).	CPM (Must be greater than Speed Range Low)
17	Get/Set	Speed Range Low	REAL	Indicates the lesser threshold of the machine speed range for which the alarm is enabled (disabled at lesser speeds).	CPM (Must be less than Speed Range High)
18	Get/Set	Name	STRING2	A name to help identify this alarm.	

Services

The settable attributes of this object are not affected by the status of the Device Mode Object.

Table C.31 Alarm Object Services

Service Code	Class/Instance Usage	Name	Description
0E _h	Instance	Get_Attribute_Single	Returns a single attribute.
10 _h	Instance	Set_Attribute_Single	Sets a single attribute. ¹

¹ Attributes can only be set while the device is in Program Mode. See the description of the Device Mode Object for more information.

Device Mode Object (Class ID 320_H)

The Device Mode Object is used to control access to the configuration parameters in the module. This object's Device Mode attribute must be in PROGRAM mode to allow the module's configuration parameters to be "Set" (see Services). Attempts to set the configuration parameters while the Device Mode is in RUN mode will return an error. Note that the module collects measurements while in RUN mode but not while it is in PROGRAM mode.

Class Attributes

The Device Mode Object provides no class attributes.

Instance Attributes

Table C.32 Device Mode Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get/Set	Device Mode	UINT	The operating mode of the module.	0 = Power Up 1 = RUN 2 = PROGRAM
199	Set	Backdoor Service	USINT	Setting this attribute is equivalent to requesting the specified service.	Set to one of the following values to perform the specified service: 0x05 = Reset 0x09 = Delete 0x15 = Restore 0x16 = Save

Setting the **Device Mode** attribute to "1" (RUN) is equivalent to executing the **Start** service. Setting the **Device Mode** attribute to "2" (PROGRAM) is equivalent to executing the **Stop** service.

Services

Table C.33 Device Mode Object Services

Service Code	Class/Instance Usage	Name	Description
0E _h	Instance	Get_Attribute_Single	Return the value of a single attribute.
10 _h	Instance	Set_Attribute_Single	Set the value of a single attribute.
07 _h	Instance	Stop	Transitions from Run to the Program state.

Table C.33 Device Mode Object Services

Service Code	Class/Instance Usage	Name	Description
06 _h	Instance	Start	Validate the device configuration settings and transition to the Run state if OK.
05 _h	Instance	Reset	Transition to the Power Up state. Load the non-volatile configuration and transition to the Run state if saved configuration restored.
16 _h	Instance	Save	Validate the device configuration settings if necessary and save them to non-volatile memory.
09 _h	Instance	Delete	Delete the saved configuration from non-volatile memory.
15 _h	Instance	Restore	Load the saved configuration or the factory default configuration from non-volatile memory.

Relay Object (Class ID 323_H)

The Relay Object models a relay (actual or virtual). A relay can be activated or deactivated based on the status of one or more alarms.

Class Attributes

Table C.34 Relay Object Class Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get	Number of Instances	UINT	Number of Instances in this class.	5
100	Set	Reset All	USINT	Setting this attribute is equivalent to executing the Class Reset service	Reset All is an attribute that provides a way to perform a Class level Reset service via the Set_Attribute_Single service. Setting this attribute to any value is equivalent to performing the Class level Reset service. Reading the Reset All attribute always returns zero.

Instances

There are 5 instances of this object.

Instance Attributes

Table C.35 Relay Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get	Relay Status	BOOL	The current status of the relay.	0 = Off 1 = On
4	Get/Set	Relay Enable	BOOL	Indicates whether this relay object is enabled.	0 = Disabled 1 = Enabled
5	Get/Set	Latch Enable	BOOL	Indicates whether this relay latches (requires a reset command to deactivate).	0 = Nonlatching 1 = Latching
6	Get/Set	Failsafe Enable	BOOL	Indicates whether this relay is normally energized (activated during power loss).	0 = Non-failsafe (not normally energized) 1 = Failsafe (normally energized)
7	Get/Set	Delay	USINT	The time period that the voting logic must be true before the relay is activated.	0 to 25.5 seconds (specified in tenths of seconds)
8	Get/Set	Name	STRING2	A name to help identify the relay.	18 characters maximum
9	Get/Set	Alarm Level	BYTE	Specifies what alarm status values will cause the relay to activate.	0 = Normal 1 = Alert 2 = Danger 3 = Disarm 4 = Xdcr Fault 5 = Module Fault 6 = Tachometer Fault
10	Get/Set	Alarm Identifier A	EPATH	Identifies the first alarm status the relay monitors.	See Parameter Object instances 7 to 11.

Table C.35 Relay Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
11	Get/Set	Alarm Identifier B	EPATH	Identifies the second alarm status the relay monitors.	See Parameter Object instances 12 to 16.
12	Get/Set	Logic	USINT	Indicates the number of associated alarms that must have a status value specified by Alarm Level in order to activate the relay.	0 = Ignore Alarm Identifier B and activate the relay based on the status of Alarm Identifier A . 1 = Activate the relay if the status of either Alarm Identifier A or B matches any of the statuses specified by Alarm Level . 2 = Activate the relay if the status of both Alarm Identifier A and B match any of the statuses specified by Alarm Level .
14	Get	Relay Installed	BOOL	Indicates whether an actual relay is associated with this instance.	0 = Not installed 1 = Installed

Services

Table C.36 Relay Object Services

Service Code	Class/Instance Usage	Name	Description
05 _h	Class/Instance	Reset	Resets latched relay(s).
0E _h	Class/Instance	Get_Attribute_Single	Returns a single attribute.
10 _h	Class/Instance	Set_Attribute_Single	Sets a single attribute. ¹

¹ Attributes can only be set while the device is in Program Mode. See the description of the Device Mode Object for more information.

Spectrum Waveform Measurement Object (Class ID 324_H)

The Spectrum/Waveform Measurement Object models a spectrum and waveform measurement. The Eccentricity module implements only the waveform measurement and not the spectrum measurement.

Class Attributes

The Spectrum/Waveform Measurement Object provides no class attributes.

Instances

There are 2 instances of this object.

Instance Attributes

Table C.37 Spectrum Waveform Measurement Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get	Status	BOOL	Indicates if a fault or alarm has occurred.	0 = Operating without alarms or faults. 1 = Alarm or fault condition exists. The waveform data may not represent the actual field value.
4	Get	Data Units	ENGUNIT	The units context of the Data attributes.	See DeviceNet Specification Volume 1 Appendix K.
9	Get/Set	Period	REAL	The period of the waveform.	Seconds if Domain = 0. Cycles if Domain = 1.
10	Get	Number of Waveform Points	UDINT	Number of points in the waveform data.	256, 512, 1024, or 2048

Services

The Device Mode Object controls the settable attributes of this object.

Table C.38 Spectrum Waveform Measurement Object Services

Service Code	Class/Instance Usage	Name	Description
0E _h	Instance	Get_Attribute_Single	Returns a single attribute.
10 _h	Instance	Set_Attribute_Single	Sets a single attribute. ¹
4C _h	Instance	Get_Waveform_Chunk	Upload a portion of the current Waveform data.

¹ Attributes can only be set while the device is in Program Mode. See the description of the Device Mode Object for more information.

Get_Waveform_Chunk

This service returns a portion of the respective data structure. It is likely that the waveform data structure will be too large to transfer over the network in one message. This service allows the data structures to be transferred over the network in smaller portions so that the explicit message buffer does not need to be so large.

The Waveform Data structure contains an array of values that, taken together, are the output of the sampling performed by the Spectrum/Waveform Measurement Object on the input signal. The Waveform Data array values are normalized and must be converted to floating point to obtain the true values.

Table C.39 Waveform Data Structure

Byte (DWORD) offset within structure	Structure Member	Data Type	Description
0 (0)	Number of Waveform Points	UDINT	Number of points in the waveform data. This should be equal to the Number of Waveform Points attribute setting. It is provided within this structure to assist in determining the size of the structure.
4 (1)	Period	REAL	The period of the waveform. This is the actual period of the waveform and may vary from the Period attribute setting.
8 (2)	Amplitude Reference	REAL	Normalization factor This factor is used to convert the normalized array data into floating point values.
12 (3)	Normalized Value Array	Array of INT	The normalized waveform data points These must be converted to floating point values using the Amplitude Reference value.

The total size of the Waveform Data structure in DWORD is: $3 + (\text{Number of Waveform Points} / 2)$

The Waveform Data is an array of INT (16-bit signed integers ranging from -32768 to 32767). The number of INTs in the Waveform Data array is equal to the **Number of Waveform Points**. To convert the normalized Waveform Data into floating point values, use the following equations:

$$\text{Float Data}_n = \text{Amplitude Reference} \frac{\text{Normalized Data}_n}{32768}$$

Where **Float Data_n** is the value for the nth waveform point, and $0 \leq n \leq \text{Number of Waveform Points}$.

The Get_Waveform_Chunk service uses the following request and response parameters.

Table C.40 Get_Waveform_Chunk Request Parameters

Name	Data Type	Description of Request Parameters	Semantics of Values
Initial DWORD Offset	UINT	The offset of the first 32-bit value within the data structure to be returned.	0 <= offset < size of the data structure in DWORDs. For example: offset = 0 refers to bytes 0-3 (the number of lines or points value) offset = 1 refers to bytes 4-7 (the FMAX or period values) offset = 2 refers to bytes 8-11 (the amplitude reference value) offset = 3 refers to bytes 12-15 (the first pair of normalized values) offset = 4 refers to bytes 16-19 (the second pair of normalized values)
Number of DWORDs	USINT	The number of 32-bit values from the data structure to be returned.	This should be small enough to fit in the explicit message buffer. This will likely be less than the total size of the data structure so that several calls to the service will be required to get the entire data structure.

Table C.41 Get_Waveform_Chunk Response Parameters

Name	Data Type	Description of Response Parameters	Semantics of Values
Number of DWORDs	USINT	The number of 32-bit values actually returned in the Data Chunk array of the response. (Can be less than the number of DWORDs requested.)	If less DWORDs are returned than were requested, the end of the data structure has been reached (the request went beyond the end of the array).
Data Chunk	Array of DWORD	The requested portion of the data structure.	

Speed Measurement Object (Class ID 325_H)

The Speed Measurement Object models a speed measurement of a tachometer signal.

Class Attributes

The Speed Measurement Object provides no class attributes.

Instance Attributes

Table C.42 Speed Measurement Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get	Speed Value	REAL	The measured speed value.	CPM
4	Get	Status	BOOL	Indicates if a fault or alarm has occurred.	0 = Operating without alarms or faults 1 = Alarm or fault condition exists. The Speed Value attribute may not represent the actual field value.
12	Get/Set	Time Constant	UINT	The time constant value used for exponential averaging of the Speed Value (a low pass filter/output smoothing filter).	Milliseconds

Services

Setting the attributes of this object are not affected by the status of the Device Mode Object.

Table C.43 Speed Measurement Object Services

Service Code	Class/Instance Usage	Name	Description
0E _h	Instance	Get_Attribute_Single	Returns a single attribute.
10 _h	Instance	Set_Attribute_Single	Sets a single attribute. ¹

¹ Attributes can only be set while the device is in Program Mode. See the description of the Device Mode Object for more information.

Tachometer Channel Object (Class ID 326_H)

The Tachometer Channel Object models "front end" processing performed on a tachometer signal before specific measurements are performed.

Class Attributes

The Tachometer Channel Object provides no class attributes.

Instance Attributes

Table C.44 Tachometer Channel Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get/Set	Number of Pulses per Revolution	UINT	The number of signal pulses per revolution of the shaft (number of gear teeth).	0 = Tachometer disabled > 0 = Tachometer enabled
4	Get/Set	Auto Trigger	BOOL	Indicates whether the trigger level is determined automatically from the signal.	0 = Use specified Trigger Level and Hysteresis 1 = Determine trigger level and hysteresis automatically
5	Get/Set	Trigger Level	REAL	The signal level to be used as the trigger.	Volts
6	Get/Set	Trigger Slope	USINT	The slope of the signal at the threshold crossing to be used as the trigger.	0 = Positive 1 = Negative
7	Get/Set	Trigger Hysteresis	REAL	The amount of hysteresis around the trigger level.	In Auto Trigger mode, this value is a percentage of the peak-to-peak input signal and can range from 0 to 50%. In Manual Trigger mode, this value is a voltage level (the hysteresis voltage is added or subtracted to the threshold voltage to determine the hysteresis range).
8	Get/Set	Name	STRING2	A name to help identify this channel	18 character maximum
10	Get/Set	Fault Time-out	USINT	Number of seconds with no pulses before a Tach Fault is indicated.	1 to 64 seconds

Services

The Device Mode Object controls the setting of attributes in this object.

Table C.45 Tachometer Channel Object Services

Service Code	Class/Instance Usage	Name	Description
0E _h	Instance	Get_Attribute_Single	Returns a single attribute.
10 _h	Instance	Set_Attribute_Single	Sets a single attribute. ¹

¹ Attributes can only be set while the device is in Program Mode. See the description of the Device Mode Object for more information.

Transducer Object (Class ID 328_H)

The Transducer Object models a transducer.

Class Attributes

The Transducer Object provides no class attributes.

Instances

There are 3 instances of this object. Transducer Object instance 1 is for Eccentricity Channel 1. Transducer Object instance 2 is for Eccentricity Channel 2. And Transducer Object instance 3 is for the tachometer channel.

Instance Attributes

Table C.46 Transducer Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get	DC Bias	REAL	The measured average DC bias of the transducer signal in volts.	Volts
4	Get	Status	BOOL	Indicates whether a transducer fault exists (the measured DC Bias is outside the range specified by Fault High and Low).	0 = No fault 1 = A transducer fault exists
5	Get/Set	Sensitivity Value	REAL	Value of the sensitivity of the transducer in millivolts per Sensitivity Units .	
6	Get/Set	Sensitivity Units	ENGUNIT	Units of the denominator of the Sensitivity Value .	See DeviceNet Specification Volume 1 Appendix K. Also see Parameter Object instances 1 and 2. Valid values: mils = 0800 hex µm = 2203 hex
7	Get/Set	Fault High	REAL	The maximum expected DC Bias voltage from the transducer in volts.	Volts

Table C.46 Transducer Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
8	Get/Set	Fault Low	REAL	The minimum expected DC Bias voltage from the transducer in volts.	Volts
14	Get/Set	Name	STRING2	A name to help identify this transducer or channel.	

Services

Table C.47 Transducer Object Services

Service Code	Class/Instance Usage	Name	Description
0E _h	Instance	Get_Attribute_Single	Returns a single attribute.
10 _h	Instance	Set_Attribute_Single	Sets a single attribute. ¹

¹ Attributes can only be set while the device is in Program Mode. See the description of the Device Mode Object for more information.

4-20 mA Output Object (Class ID 32A_H)

The 4-20 mA Output Object models the configuration of a 4-20 mA output signal.

Class Attributes

The 4-20 mA Output Object provides no class attributes.

Instances

There are 2 instances of this object. The 4-20 mA Output Object instance 1 is associated with the Channel 1 Eccentricity measurement and 4-20 mA Output Object instance 2 is associated with the Channel 2 eccentricity measurement.

Instance Attributes

Table C.48 4-20 mA Output Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get	Value	REAL	The current output value.	mA
4	Get/Set	Enable	BOOL	Indicates whether this 4-20 mA output is enabled.	0 = Disabled 1 = Enabled
5	Get/Set	Max Range	REAL	The measured value associated with 20 mA.	
6	Get/Set	Min Range	REAL	The measured value associated with 4 mA.	

Services

Table C.49 4-20 mA Output Object Services

Service Code	Class/Instance Usage	Name	Description
0E _h	Instance	Get_Attribute_Single	Returns a single attribute.
10 _h	Instance	Set_Attribute_Single	Sets a single attribute. ¹

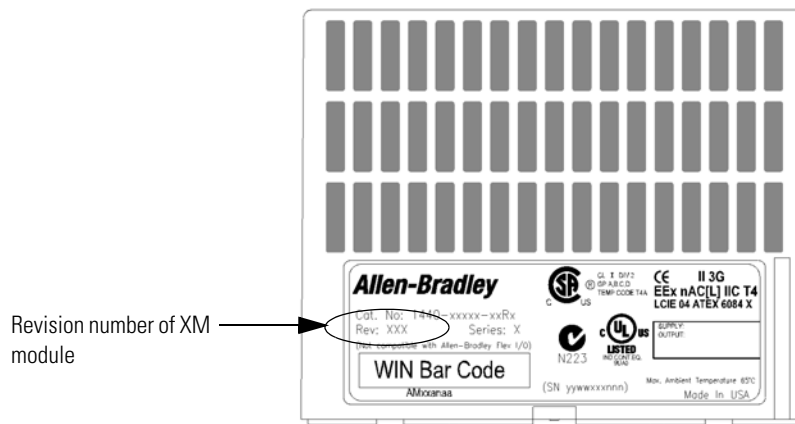
¹ Attributes can only be set while the device is in Program Mode. See the description of the Device Mode Object for more information.

Wiring Connections for Previous Module Revisions

Appendix D provides the terminal block assignments and wiring connections of earlier revisions of the XM-120 module (before revision D01). If you have a later revision of the module, refer to Chapter 2 for wiring information.

The revision number can be found on the product label which is located on the front of the XM module (see Figure D.1).

Figure D.1 Location of Revision Number on Product Label



Terminal Block Assignments

The terminal block assignments and descriptions of an earlier revision of the XM-120 module are shown on page 110

ATTENTION



The terminal block assignments are different for different XM modules. The following table applies only to the XM-120 Eccentricity module (before revision D01).

WARNING**EXPLOSION HAZARD**

Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous.

Do not disconnect connections to this equipment unless power has been removed or the area is known to be nonhazardous. Secure any external connections that mate to this equipment by using screws, sliding latches, threaded connectors, or other means provided with this product.

Terminal Block Assignments

No.	Name	Description
0	Xducer 1 (+)	Vibration transducer 1 connection
1	Xducer 2 (+)	Vibration transducer 2 connection
2	Buffer 1 (+)	Vibration signal 1 buffered output
3	Buffer 2 (+)	Vibration signal 2 buffered output
4	Tach/Signal In (+)	Tachometer transducer/signal input, positive side
5	Xducer Vin	Vibration transducer power input
6	Xducer V (+)	Vibration transducer power supply output, positive side connect to Xducer Vin for positive biased transducers or Xducer RTN for negative biased transducers
7	TxD	PC serial port, transmit data
8	RxD	PC serial port, receive data
9	XRTN ¹	Circuit return for TxD and RxD
10	Chassis	Connection to DIN rail ground spring or panel mounting hole
11	4-20 mA 1 (+)	4-20 mA output 300 ohm maximum load
12	4-20 mA 1 (-)	
13	Chassis	Connection to DIN rail ground spring or panel mounting hole
14	Chassis	Connection to DIN rail ground spring or panel mounting hole
15	Chassis	Connection to DIN rail ground spring or panel mounting hole
16	Xducer 1 (-) ¹	Vibration transducer 1 connection
17	Xducer 2 (-) ¹	Vibration transducer 2 connection
18	Signal Common ¹	Vibration buffered output return
19	TACH Buffer	Tachometer transducer/signal output
20	Tachometer (-)	Tachometer transducer/signal input, negative side and TACH Buffer return
21	Xducer V (-)	Vibration transducer power supply output, negative side connect to Xducer RTN for positive biased transducer or Xducer Vin for negative biased transducers and power
22	Xducer RTN	Vibration transducer power return

Terminal Block Assignments

No.	Name	Description
23	CAN_High	DeviceNet bus connection, high differential (white wire)
24	CAN_Low	DeviceNet bus connection, low differential (blue wire)
25	+24 V Out	Internally connected to 24 V In 1 (terminal 44) Used to daisy chain power if XM modules are not plugged into each other
26	DNet V (+)	DeviceNet bus power, positive side (red wire)
27	DNet V (-)	DeviceNet bus power, negative side (black wire)
28	24 V Common ¹	Internally connected to 24 V Common (terminals 43 and 45) Used to daisy chain power if XM modules are not plugged into each other If power is not present on terminal 44, there is no power on this terminal
29	4-20 mA 2 (+)	4-20 mA output 300 ohm maximum load
30	4-20 mA 2 (-)	
31	Chassis	Connection to DIN rail ground spring or panel mounting hole
32	Chassis	Connection to DIN rail ground spring or panel mounting hole
33	Chassis	Connection to DIN rail ground spring or panel mounting hole
34	Chassis	Connection to DIN rail ground spring or panel mounting hole
35	Chassis	Connection to DIN rail ground spring or panel mounting hole
36	Chassis	Connection to DIN rail ground spring or panel mounting hole
37	Chassis	Connection to DIN rail ground spring or panel mounting hole
38	Chassis	Connection to DIN rail ground spring or panel mounting hole
39	Not Used	
40	Switch RTN	Reset relay switch return
41	Reset Relay	Switch input to reset internal relay (active closed)
42	+24 V In 2	Connection to secondary external +24 V power supply, positive side; used when redundant power supplies are required
43	24 V Common ¹	Connection to external +24 V power supply, negative side (internally DC-coupled to circuit ground)
44	+24 V In 1	Connection to primary external +24 V power supply, positive side
45	24 V Common ¹	Connection to external +24 V power supply, negative side (internally DC-coupled to circuit ground)
46	Relay N.C. 1	Relay Normally Closed contact 1
47	Relay Common 1	Relay Common contact 1
48	Relay N.O. 1	Relay Normally Open contact 1
49	Relay N.O. 2	Relay Normally Open contact 2
50	Relay Common 2	Relay Common contact 2
51	Relay N.C. 2	Relay Normally Closed contact 2

¹ Terminals are internally connected and isolated from the Chassis terminals.

Connecting the Transducer

The Eccentricity module accepts input from any Allen-Bradley non-contact eddy current probe. Figures D.2 and D.3 show the wiring of a non-contact eddy probe to an earlier revision of the XM-120 module (before revision D01).

ATTENTION



You may ground the cable shield at either end of the cable. Do not ground the shield at both ends. Recommended practice is to ground the cable shield at the terminal base and not at the transducer. Any convenient Chassis terminal may be used (see Terminal Block Assignments on page 110).

IMPORTANT

The internal transducer power supply is providing power to the non-contact sensor.

Figure D.2 Non-Contact Sensor to Channel 1 Wiring

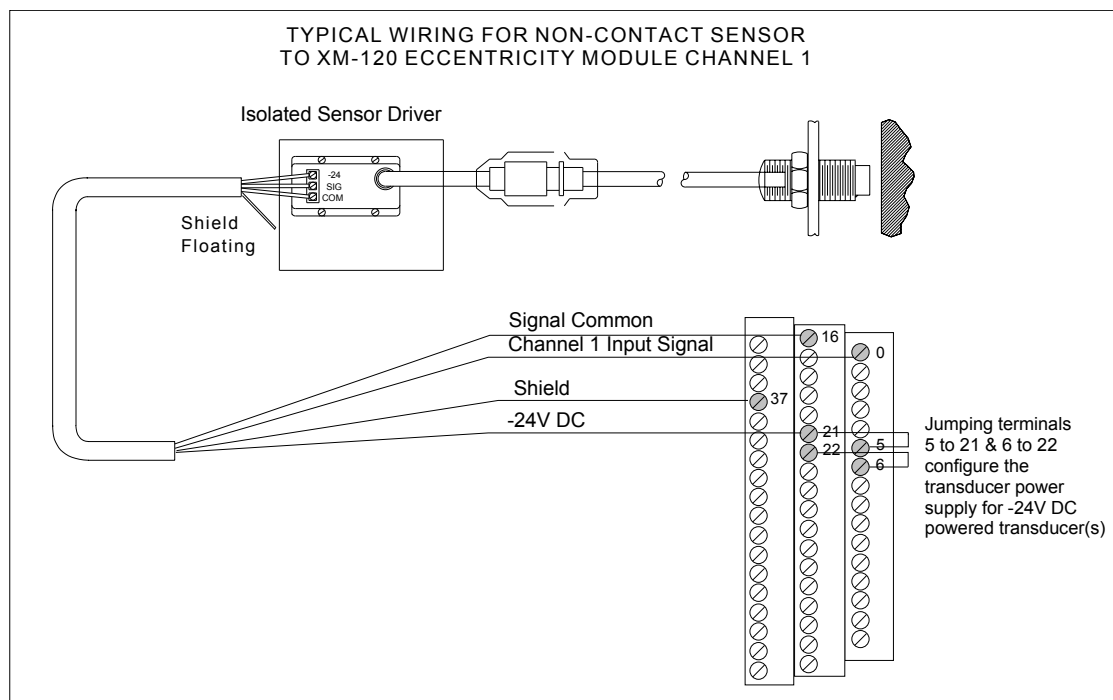
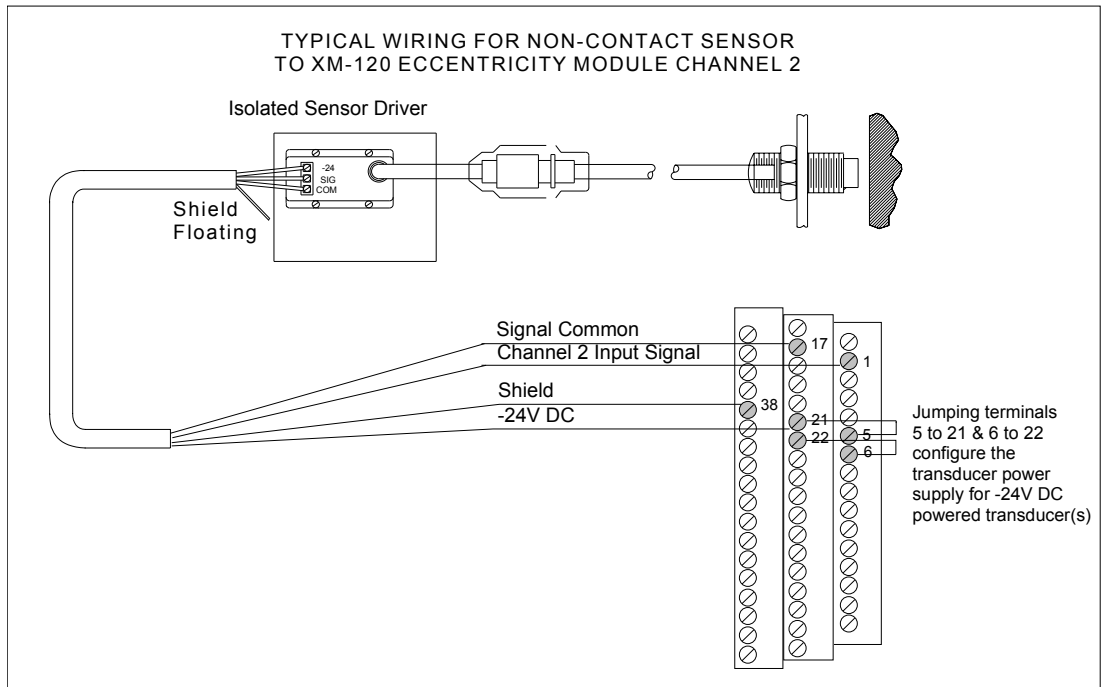


Figure D.3 Non-Contact Sensor to Channel 2 Wiring



alarm

An alarm alerts you to a change in a measurement. For example, an alarm can notify you when the measured vibration level for a machine exceeds a pre-defined value.

Automatic Device Replacement (ADR)

A means for replacing a malfunctioning device with a new unit, and having the device configuration data set automatically. The ADR scanner uploads and stores a device's configuration. Upon replacing a malfunctioning device with a new unit (MAC ID 63), the ADR scanner automatically downloads the configuration data and sets the MAC ID (node address).

band

A frequency range, such as the frequency range between 1,800 and 3,200 Hz.

baud rate

The baud rate is the speed at which data is transferred on the DeviceNet network. The available data rates depend on the type of cable and total cable length used on the network:

Cable	Maximum Cable Length		
	125 K	250 K	500 K
Thick Trunk Line	500 m (1,640 ft.)	250 m (820 ft.)	100 m (328 ft.)
Thin Trunk Line	100 m (328 ft.)	100 m (328 ft.)	100 m (328 ft.)
Maximum Drop Length	6 m (20 ft.)	6 m (20 ft.)	6 m (20 ft.)
Cumulative Drop Length	156 m (512 ft.)	78 m (256 ft.)	39 m (128 ft.)

The XM measurement modules' baud rate is automatically set by the bus master. You must set the XM-440 Relay module's baud rate. You set the XM-440 Master Relay to 125 kb, 250 kb, 500 kb, or Autobaud if another device on the network has set the baud rate.

bus off

A bus off condition occurs when an abnormal rate of errors is detected on the Control Area Network (CAN) bus in a device. The bus-off device cannot receive or transmit messages on the network. This condition is often caused by corruption of the network data signals due to noise or baud rate mismatch.

Change of State (COS)

DeviceNet communications method in which the XM module sends data based on detection of any changed value within the input data (alarm or relay status).

current configuration

The current configuration is the most recently loaded set of configuration parameters in the XM module's memory. When power is cycled, the current configuration is loaded with either the saved configuration (in EEPROM) or the factory defaults (if there is no saved configuration). In addition, the current configuration contains any configuration changes that have been downloaded to the module since power was applied.

DeviceNet network

A DeviceNet network uses a producer/consumer Controller Area Network (CAN) to connect devices (for example, XM modules). A DeviceNet network can support a maximum of 64 devices. Each device is assigned a unique node address (MAC ID) and transmits data on the network at the same baud rate.

A cable is used to connect devices on the network. It contains both the signal and power wires. General information about DeviceNet and the DeviceNet specification are maintained by the Open DeviceNet Vendor's Association (ODVA). ODVA is online at <http://www.odva.org>.

disarm state

See Program mode.

eccentricity

Eccentricity is the measurement of shaft bow at slow-roll speed, which can be caused by any or a combination of:

- Fixed mechanical bow
- Temporary thermal bow
- Gravity bow

EEPROM

See NVS (Non-Volatile Storage).

Electronic Data Sheet (EDS) Files

EDS files are simple text files that are used by network configuration tools such as RSNetWorx for DeviceNet to describe products so that you can easily commission them on a network. EDS files describe a product device type, revision, and configurable parameters.

Help window

A window that contains help topics that describe the operation of a program. These topics may include:

- An explanation of a command.
- A description of the controls in a dialog box or property page.
- Instructions for a task.
- Definition of a term.

MAC ID

See node address.

master device

A device which controls one or more slave devices. The XM-440 Master Relay module is a master device.

Node Address

A DeviceNet network can have as many as 64 devices connected to it. Each device on the network must have a unique node address between 0 and 63. Node address 63 is the default used by uncommissioned devices. Node address is sometimes called "MAC ID."

NVS (Non-Volatile Storage)

NVS is the permanent memory of an XM module. Modules store parameters and other information in NVS so that they are not lost when the module loses power (unless Auto Save is disabled). NVS is sometimes called "EEPROM."

online help

Online help allows you to get help for your program on the computer screen by pressing **F1**. The help that appears in the Help window is context sensitive, which means that the help is related to what you are currently doing in the program.

peak-to-peak eccentricity

Measurement that measures the difference between the positive and the negative extremes of the rotor bow.

Polled

DeviceNet communications method in which module sends data in response to a poll request from a master device.

Program mode

The XM module is idle. Typically this occurs when the module configuration settings are being updated with the XM Configuration program. In Program mode, the signal processing/measurement process is stopped. The status of the alarms is set to the disarm state to prevent a false alert or danger status.

Run mode

In Run mode, the module collects measurement data and monitors each measurement device.

slave device

A device that receives and responds to messages from a Master device but does not initiate communication. Slave devices include the XM measurement modules, such as the XM-120 Eccentricity module and the XM-320 Position module.

transducer

A transducer is a device for making measurements. These include accelerometers, velocity pickups, displacement probes, and temperature sensors.

virtual relay

A virtual relay is a non-physical relay. It has the same capabilities (monitor alarms, activation delay, change status) as a physical relay only without any physical or electrical output. The virtual relay provides additional relay status inputs to a controller, PLC, or an XM-440 Master Relay module (firmware revision 5.0 and later).

XM configuration

XM configuration is a collection of user-defined parameters for XM modules.

XM Serial Configuration Utility software

XM Serial Configuration Utility software is a tool for monitoring and configuring XM modules. It can be run on computers running Windows 2000 service pack 2, Windows NT 4.0 service pack 6, or Windows XP operating systems.

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Power, Control and Information Solutions Headquarters

Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444

Europe/Middle East/Africa: Rockwell Automation, Vorstlaan/Boulevard du Souverain 36, 1170 Brussels, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640

Asia Pacific: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

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