

XM-122 gSE Vibration Module



**User Guide
Firmware Revision 5**

1440-VSE02-01RA

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

Introduction	Chapter 1	
	Introducing the XM-122 gSE Vibration Module	1
	XM-122 Module Components.	2
	Using this Manual.	3
	Organization.	3
	Document Conventions	4
Installing the XM-122 gSE Vibration Module	Chapter 2	
	XM Installation Requirements.	6
	Wiring Requirements.	6
	Power Requirements	6
	Grounding Requirements	8
	Mounting the Terminal Base Unit.	13
	DIN Rail Mounting	14
	Interconnecting Terminal Base Units	15
	Panel/Wall Mounting	16
	Connecting Wiring for Your Module	17
	Terminal Block Assignments.	18
	Connecting the Power Supply.	21
	Connecting the Relays	22
	Connecting the Tachometer Signal.	25
	Connecting the Buffered Outputs	27
	Connecting the Transducer	29
	Connecting the Remote Relay Reset Signal	42
	Connecting the Setpoint Multiplication Switch	43
	Connecting the 4-20 mA Outputs	44
	PC Serial Port Connection	45
	DeviceNet Connection	46
	Mounting the Module	48
	Module Indicators	49
	Basic Operations	52
	Powering Up the Module	52
	Manually Resetting Relays	52
Configuration Parameters	Chapter 3	
	XM-122 Measurement Modes	56
	Measurement Time	57
	Channel Transducer Parameters	58
	Channel Signal Processing Parameters	60
	Measurement Parameters.	63
	Overall Measurement Parameters	63
	Sum Harmonics Measurement Parameter	64
	Spectrum/Waveform Parameters	65
	Band Measurement Parameters.	66
	Speed Measurement Parameter	69
	gSE Parameters.	69

- gSE Signal Processing Parameters 70
- gSE Spectrum Parameters 70
- Tachometer Parameters 71
 - Tachometer Transducer Parameters 71
 - Tachometer Signal Processing Parameters 72
- Alarm Parameters 74
- Relay Parameters 78
- 4-20 mA Output Parameters 82
- Triggered Trend Parameters 83
- SU/CD Trend Parameters 85
- I/O Data Parameters 88
- Data Parameters 89
 - Monitor Data Parameters 89
 - Alarm and Relay Status Parameters 92
- Device Mode Parameters 93

Appendix A

Specifications 95

Appendix B

DeviceNet Information

- Electronic Data Sheets 103
- Changing Operation Modes 103
 - Transition to Program Mode 104
 - Transition to Run Mode 104
- XM Services 105
- Invalid Configuration Errors 106
- XM-122 I/O Message Formats 107
 - Poll Message Format 107
 - COS Message Format 114
 - Bit-Strobe Message Format 115
- ADR for XM Modules 116

Appendix C

DeviceNet Objects

- Identity Object (Class ID 01H) 120
 - Class Attributes 120
 - Instance Attributes 120
 - Status 120
 - Services 121
- DeviceNet Object (Class ID 03H) 122
 - Class Attributes 122
 - Instance Attributes 122
- Assembly Object (Class ID 04H) 123
 - Class Attribute 123
 - Instances 123
 - Instance Attributes 124

Assembly Instance Attribute Data Format.....	124
Services.....	133
Connection Object (Class ID 05H).....	133
Class Attributes.....	133
Instances.....	133
Instance Attributes.....	134
Services.....	135
Discrete Input Point Object (Class ID 08H).....	135
Class Attributes.....	135
Instance Attributes.....	135
Services.....	136
Analog Input Point (Class ID 0AH).....	136
Class Attributes.....	136
Instances.....	136
Instance Attributes.....	137
Services.....	137
Parameter Object (Class ID 0FH).....	138
Class Attributes.....	138
Instances.....	139
Instance Attributes.....	146
Services.....	147
Acknowledge Handler Object (Class ID 2BH).....	147
Class Attributes.....	147
Instances.....	148
Instance Attributes.....	148
Services.....	148
Alarm Object (Class ID 31DH).....	148
Class Attributes.....	148
Instances.....	149
Instance Attributes.....	149
Services.....	151
Band Measurement Object (Class ID 31EH).....	151
Class Attributes.....	151
Instance Attributes.....	152
Services.....	152
Channel Object (Class ID 31FH).....	153
Class Attributes.....	153
Instances.....	153
Services.....	155
Auto_Range.....	155
Device Mode Object (Class ID 320H).....	156
Class Attributes.....	156
Instance Attributes.....	157
Services.....	157

Overall Measurement Object (Class ID 322H)	158
Class Attributes	158
Instances.....	158
Instance Attributes.....	158
Services.....	160
Relay Object (Class ID 323H).....	161
Class Attributes	161
Instances.....	161
Instance Attributes.....	161
Services.....	163
Spectrum Waveform Measurement Object (Class ID 324H)	163
Class Attributes	163
Instances.....	163
Instance Attributes.....	164
Services.....	165
Get_Stored_Spectrum_Chunk/Get_Stored_Waveform_Chunk	166
Get_Spectrum_Chunk/Get_Waveform_Chunk	166
Speed Measurement Object (Class ID 325H).....	170
Class Attributes	170
Instance Attributes.....	170
Services.....	171
Tachometer Channel Object (Class ID 326H).....	171
Class Attributes	171
Instance Attributes.....	172
Services.....	172
Transducer Object (Class ID 328H)	173
Class Attributes	173
Instances.....	173
Instance Attributes.....	173
Services.....	174
Vector Measurement Object (Class ID 329H).....	174
Class Attributes	174
Instances.....	175
Instance Attributes.....	175
4-20 mA Output Object (Class ID 32AH).....	176
Class Attributes	176
Instances.....	176
Instance Attributes.....	177
Services.....	177

Wiring Connections for Previous Module Revisions	Appendix D
	Terminal Block Assignments 179
	Connecting the Transducer 182
	Connecting an IEPE Accelerometer 182
	Connecting a Non-Contact Sensor 183
	Connecting a Powered Sensor 185
	Connecting Two Accelerometers and a Non-Contact Sensor . . . 186
	Connecting a Velocity Sensor and Two Non-Contact Sensors . . 188
Guidelines for Setting the Full Scale Value	Appendix E
	XM-122 Full Scale Tables 192
	Example on Using Table 193
Glossary 195
Index 201

Introduction

This chapter provides an overview of the XM-122 gSE Vibration module. It also discusses the components of the modules.

For information about	See page
Introducing the XM-122 gSE Vibration Module	1
XM-122 Module Components	2
Using this Manual	3

Introducing the XM-122 gSE Vibration Module

The XM-122 gSE Vibration module is an intelligent 2-channel special-purpose vibration monitor. It is part 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.

The XM-122 module includes special circuitry and firmware that enables it to measure both conventional vibration (similar to the XM-120) and g's Spike Energy™ (gSE). This makes the module ideal for monitoring machines with rolling element bearings.

gSE is an Entek developed signal processing technique that provides an accurate measure of the energy generated by transient or mechanical impacts. The gSE measurement provides early detection of surface flaws in rolling-element bearings, metal-to-metal contacts, insufficient bearing lubrication, and process-related problems, such as dry running, cavitation, flow change, and internal re-circulation.

The XM-122 alternates collection of conventional vibration measurements and gSE overall and gSE spectra measurements. The time the module spends updating each set of measurements during a monitoring-time is dependant on the configuration. The module continuously monitors transducer bias and speed as well.

The XM-122 can power and accept input from standard eddy current probe systems and Integrated Electronics Piezo Electric (IEPE) accelerometers. It can also accept signals from most standard voltage output measurement devices such as a velocity or pressure transducer. In addition to vibration inputs, the XM-122 accepts one tachometer input to provide speed measurement and order analysis functions.

The XM-122 also includes a single on-board relay, expandable to five, an integral tachometer, two 4-20 mA outputs, and a buffer output for each input. The module can collect data under steady-state and startup/coast-down conditions, capture trend and spectra or waveform data on event, and monitor up to 16 alarms making the module a complete monitoring system.

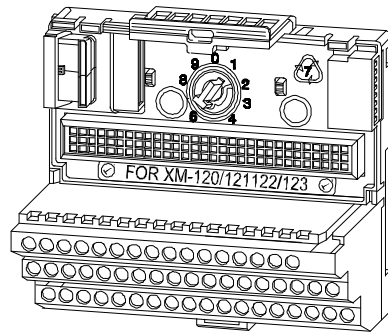
The module can operate stand-alone, or it can be deployed on a standard or dedicated DeviceNet network where it can provide real-time data and status information to other XM modules, PLCs, DCS and Condition Monitoring Systems.

The XM-122 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.

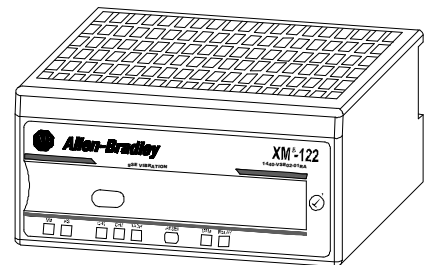
XM-122 Module Components

The XM-122 consists of a terminal base unit and an instrument module. The XM-122 gSE Vibration Module and the XM-940 Terminal Base are shown below.

Figure 1.1 XM-122 Module Components



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



XM-122 gSE Vibration Module
Cat. No. 1440-VSE02-01RA

- 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 modules, including the XM-122.

- XM-122 gSE Vibration Module - The module mounts on the XM-940 terminal base via a keyswitch and a 96-pin connector. The module 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-122 module via the XM-940 terminal base.

When connected to the module, the Expansion Relay module simply “expands” the capability of the XM-122 by adding four additional epoxy-sealed relays. The XM-122 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-122 gSE Vibration module. It is intended for anyone who installs, configures, or uses the XM-122 gSE Vibration 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-122 module.

Chapter 2 "Installing the XM-122 gSE Vibration Module" describes how to install, wire, and use the XM-122 module.

Chapter 3 "Configuration Parameters" provides a complete listing and description of the XM-122 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 XM-122 module.

Appendix B "DeviceNet Information" provides information to help you configure the XM-122 over a DeviceNet network.

Appendix C "DeviceNet Objects" provides information on the DeviceNet objects supported by the XM-122 module.

Appendix D "Wiring Connections for Previous Module Revisions" provides the terminal block assignments and wiring diagrams of earlier revisions of the XM-122 module (before revision D01).

Appendix E "Guidelines for Setting the Full Scale Value" provides guidelines for determining the optimal Channel Transducer Full Scale value in the XM-122 module.

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-122 gSE Vibration module is referred to as XM-122, 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-122 gSE Vibration Module

This chapter discusses how to install and wire the XM-122 gSE Vibration module. It also describes the module indicators and the basic operations of the module.

For information about	See page
XM Installation Requirements	6
Mounting the Terminal Base Unit	13
Connecting Wiring for Your Module	17
Mounting the Module	48
Module Indicators	49
Basic Operations	52

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

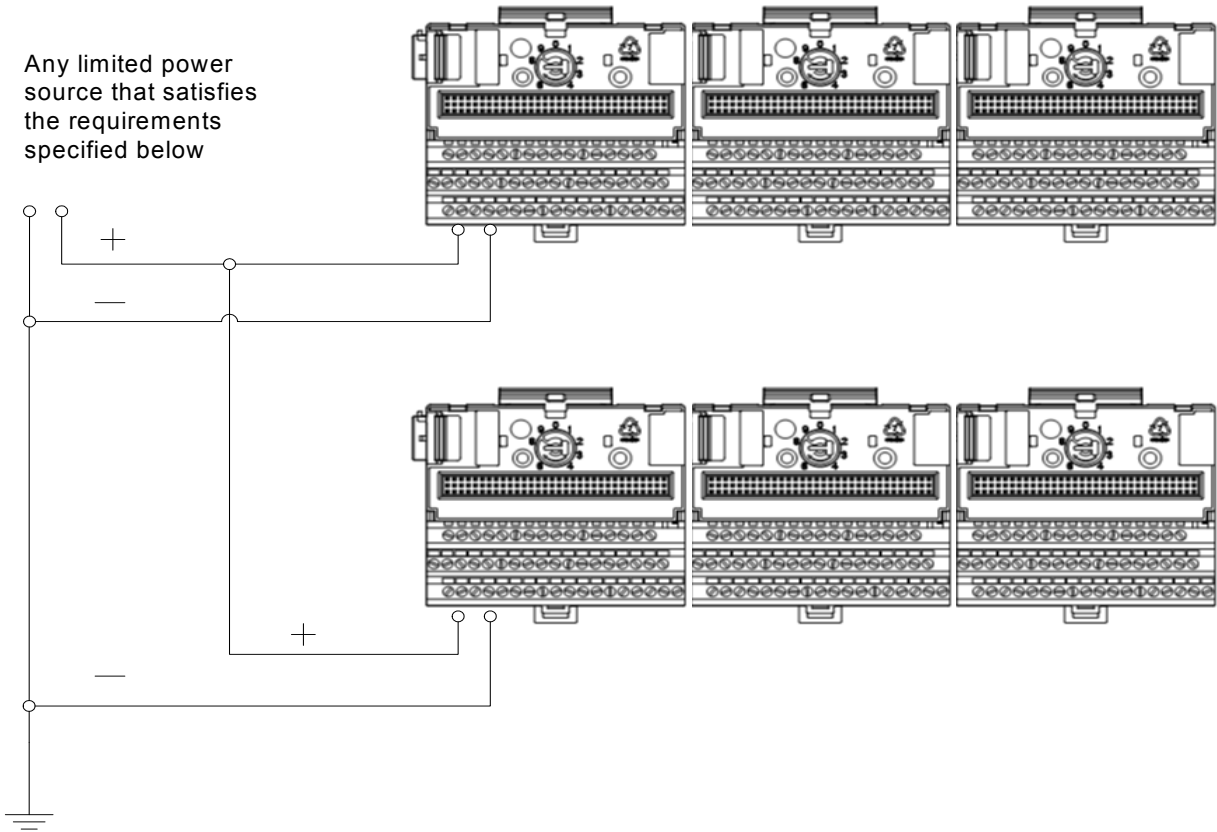
Before installing your module, calculate the power requirements of all modules interconnected via their side connectors. The total current draw through the side connector cannot exceed 3 A. Refer to the specifications for the specific modules for power requirements.

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

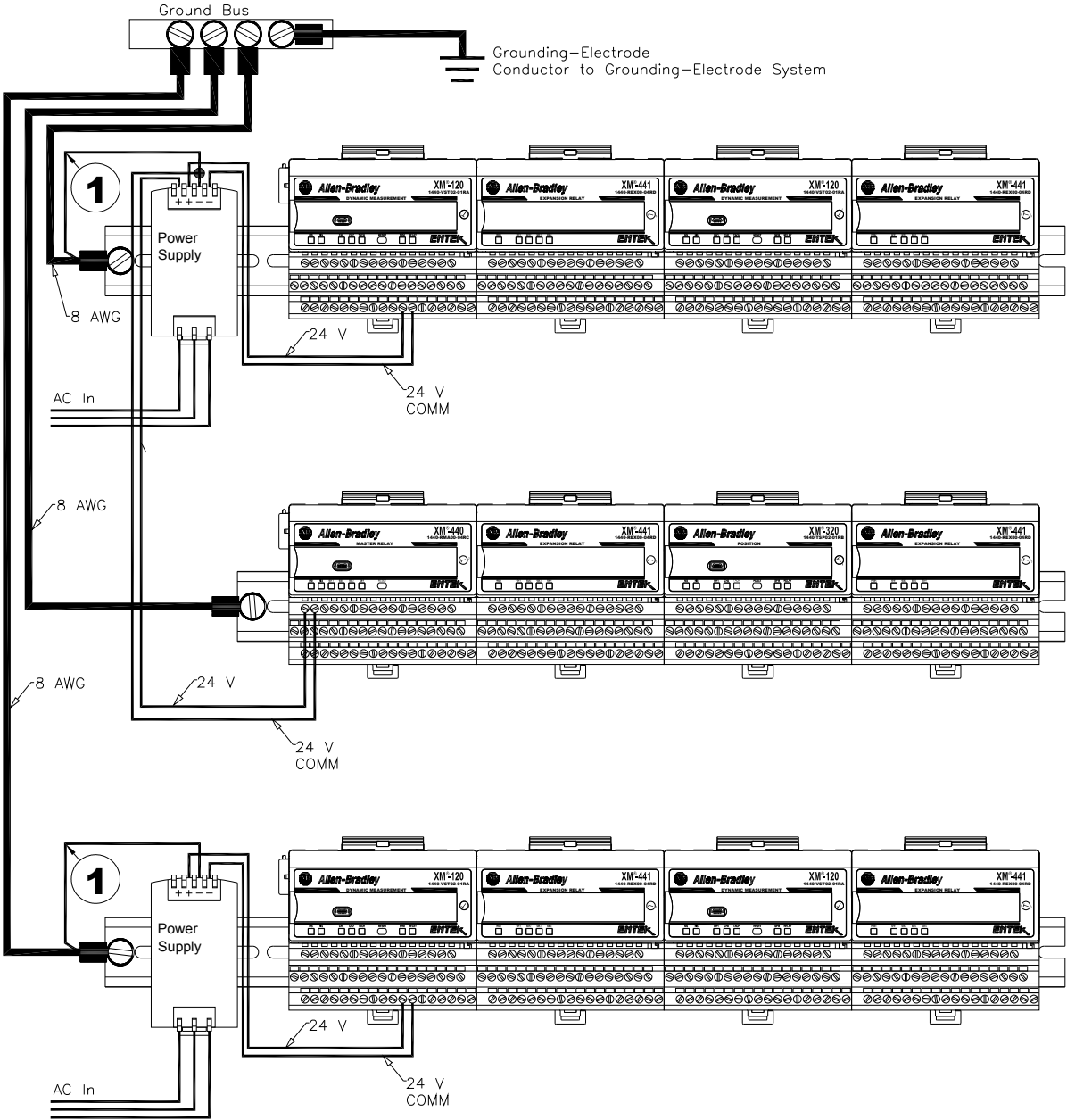
Use these grounding requirements to ensure safe electrical operating circumstances, and to help avoid potential emi and ground noise that can cause unfavorable operating conditions for your XM system.

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.

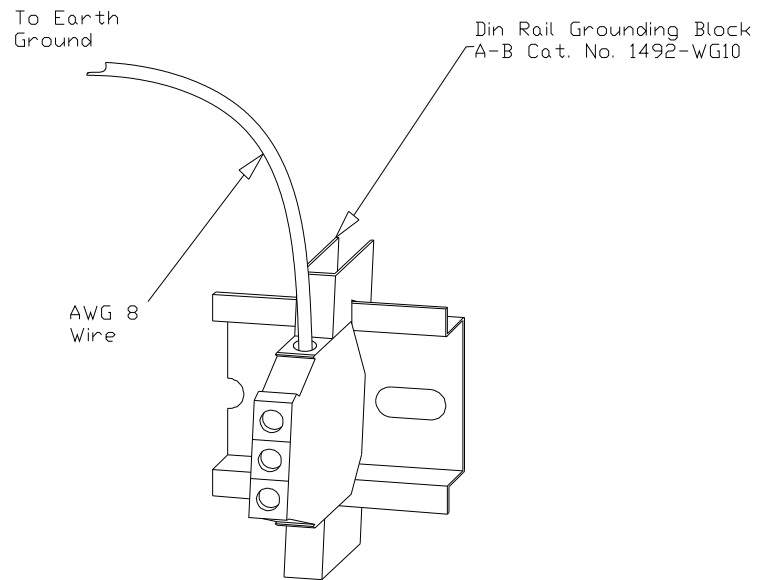
Figure 2.2 XM System DIN Rail Grounding



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

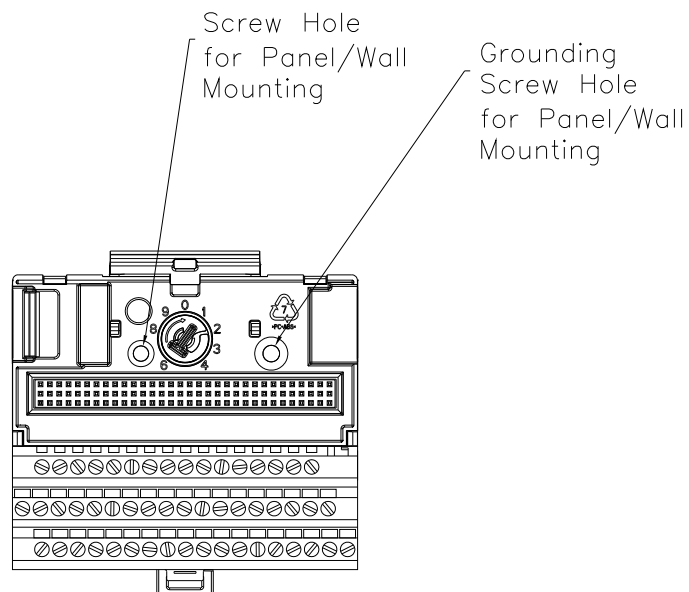
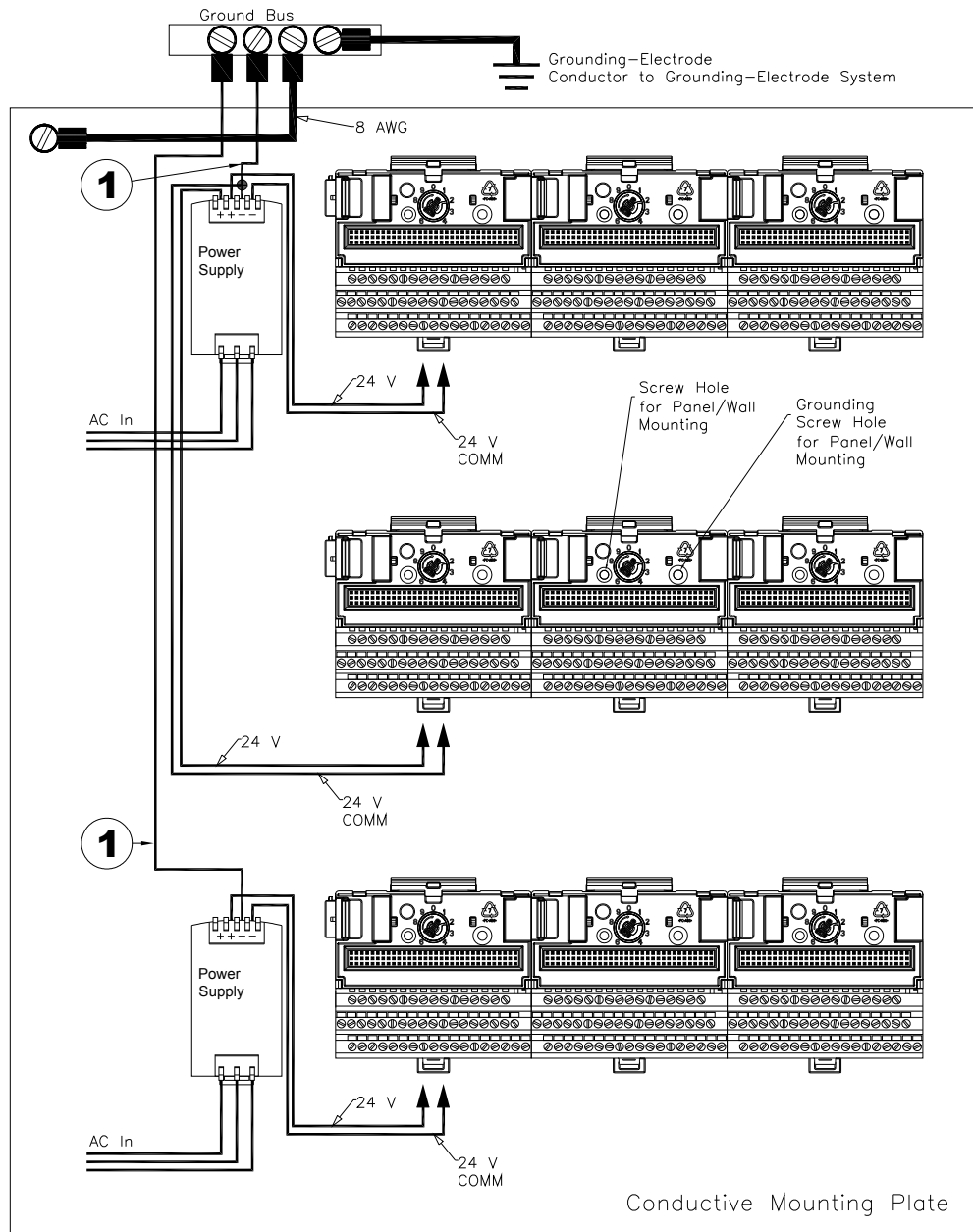


Figure 2.5 Panel/Wall Mount Grounding



1 Use 14 AWG wire.

24 V 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

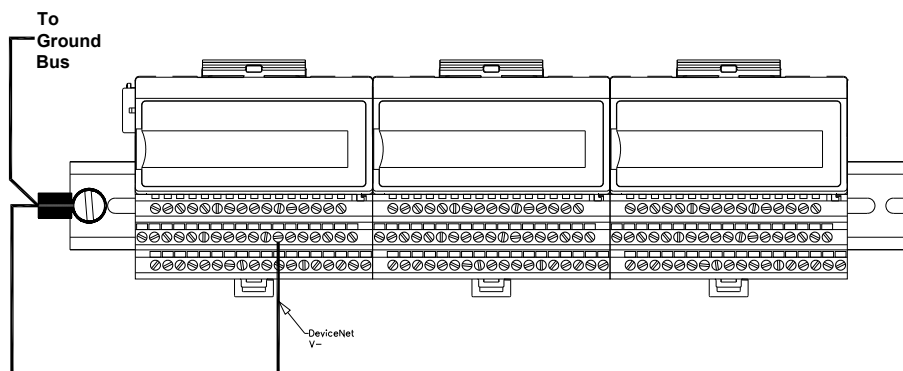
The 24 V Common and Signal Common terminals are internally connected. They are isolated from the Chassis terminals unless they are connected to ground as described in this section. See Terminal Block Assignments on page 18 for more information.

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 XM-122 module.

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

ATTENTION

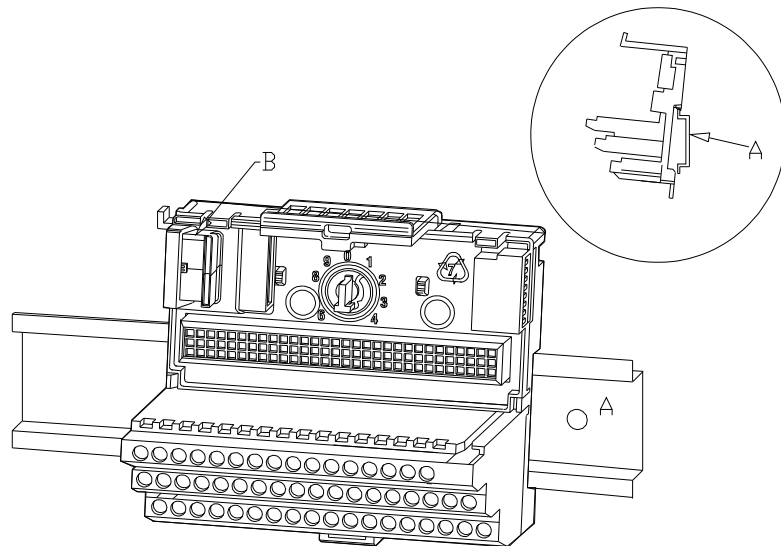

The XM modules make a chassis ground connection through the DIN rail. Use zinc plated, yellow chromated steel DIN rail to assure proper grounding. Using other DIN rail materials (e.g. aluminum, plastic, etc.), which can corrode, oxidize or are poor conductors can result in improper or intermittent platform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

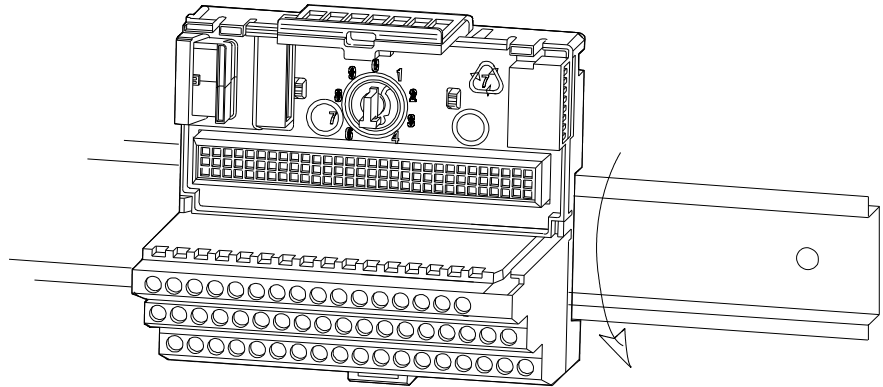
1. Position the terminal base on the 35 x 7.5 mm DIN rail (A).



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

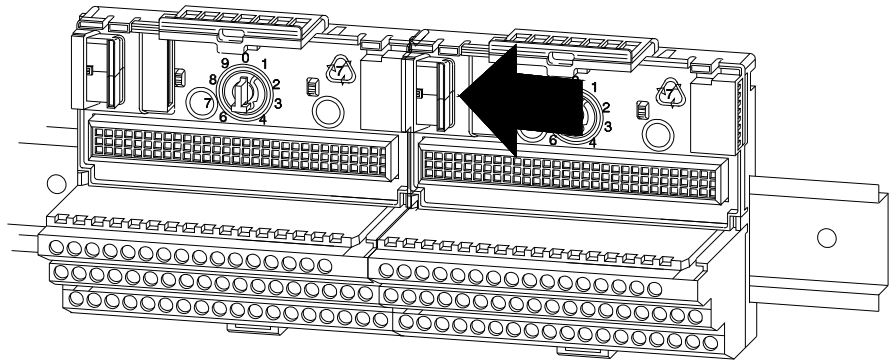
Follow the steps below to install another terminal base unit on the DIN rail.

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.



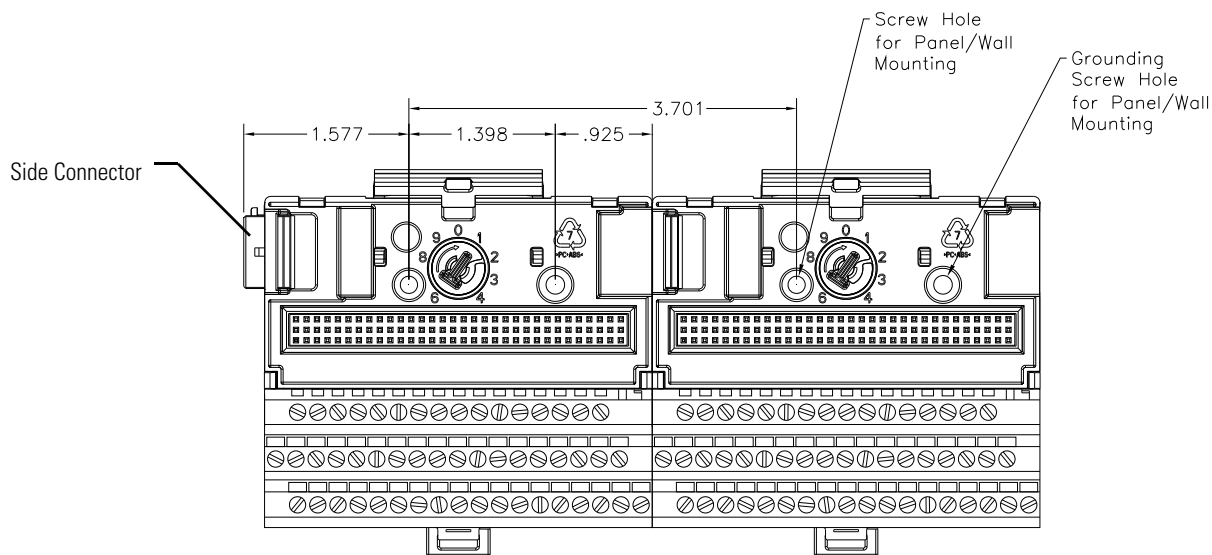
Panel/Wall Mounting

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.

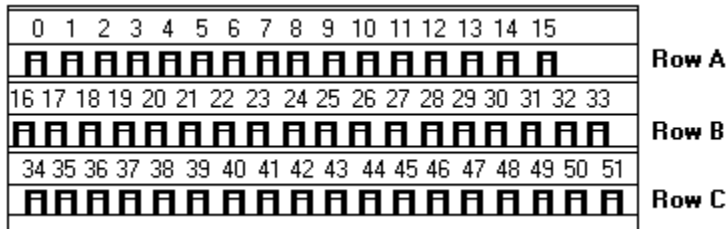


2. Drill the necessary holes for the #6 self-tapping mounting screws.
3. Secure the terminal base unit using two #6 self-tapping screws.
4. To install another terminal base unit, retract the side connector into the base unit. Make sure it is **fully retracted**.
5. Position the terminal base unit up 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-122 is compatible only with the XM-940 terminal base unit, Cat. No. 1440-TB-A.

Figure 2.7 XM-940 Terminal Base Unit



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

Terminal Block Assignments

The terminal block assignments and descriptions for the XM-122 module are shown below.

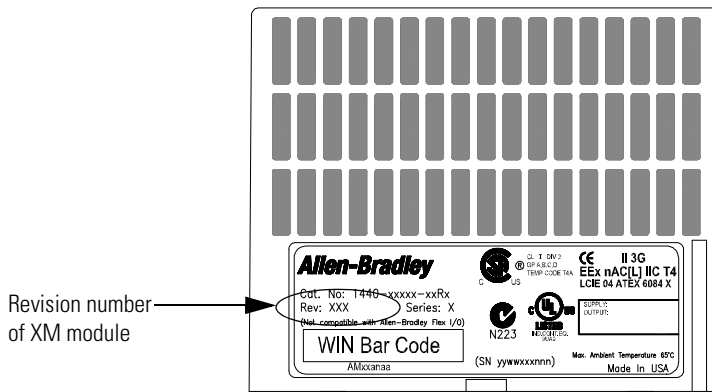
ATTENTION

The terminal block assignments are different for different XM modules. The following table applies only to the XM-122 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) and 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) and 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	+24V Out	Internally connected to 24V In 1 (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	SetPtMult	Switch input to activate Set Point Multiplication (active closed)
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

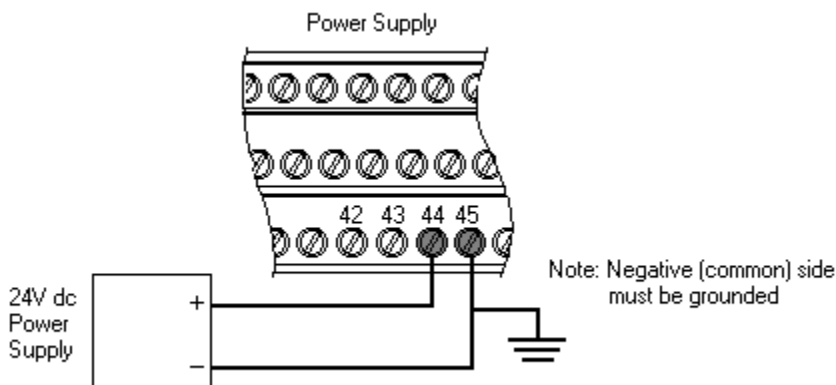
¹ Terminals are internally connected and isolated from the Chassis terminals.

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-122 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 78 for details.

Table 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 on 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.

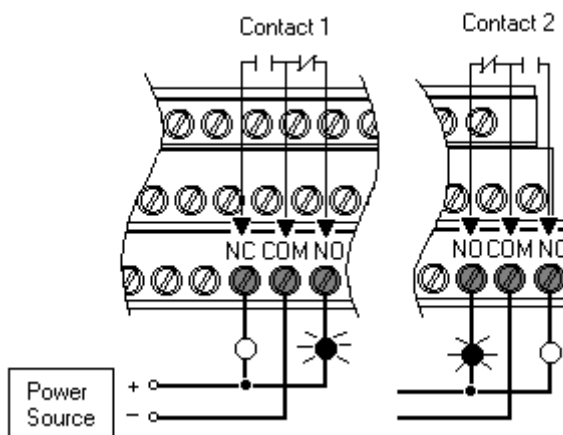
Table 2.1 Relay Connections for XM-122

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

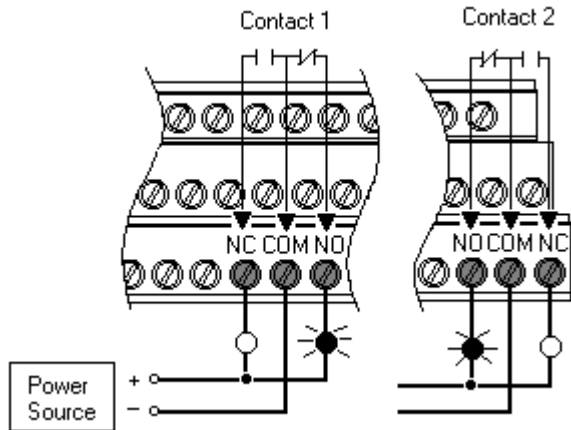
Configured for Non-failsafe Operation		Wire Contacts	Relay 1 Terminals	
Nonalarm	Alarm		Contact 1	Contact 2
Closed	Opened	COM	47	50
		NC	46	51
Opened	Closed	COM	47	50
		NO	48	49

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 illustrate 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**

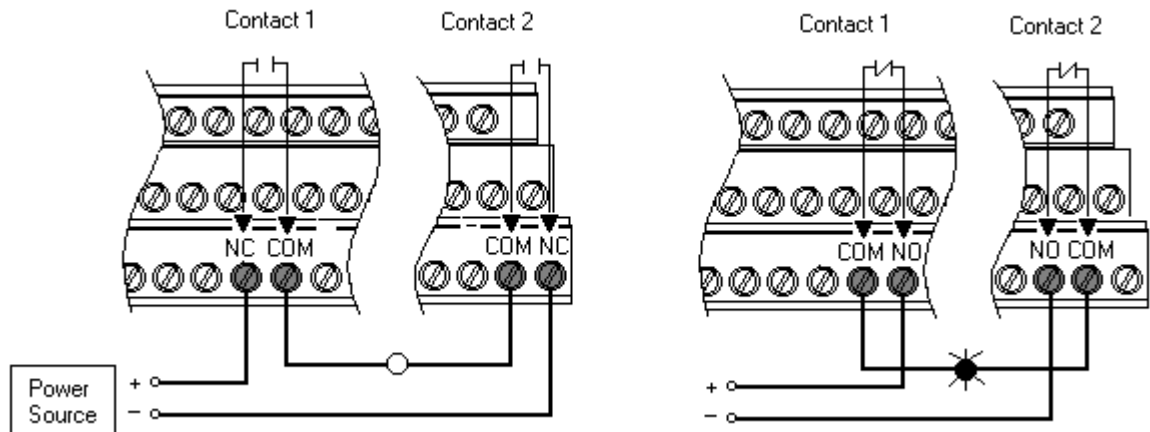
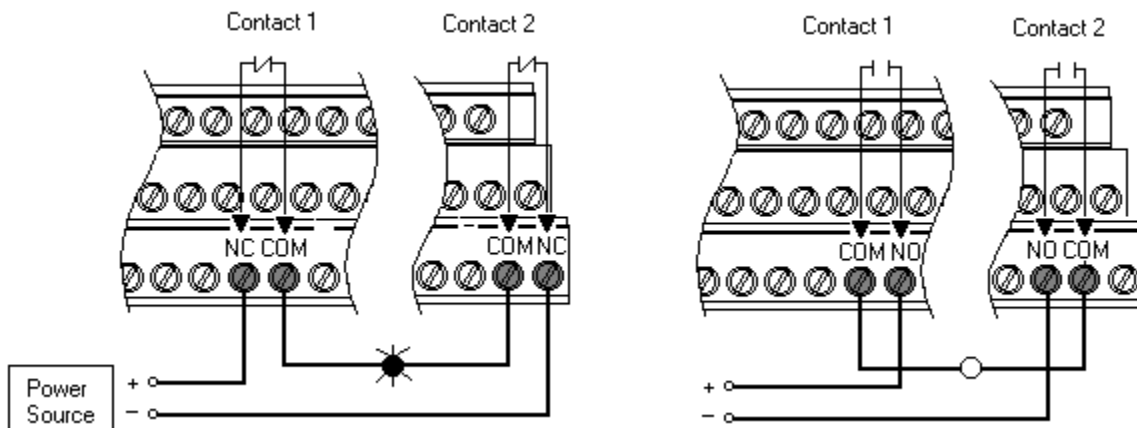


Figure 2.12 Relay Connection - Failsafe, Alarm Condition
Non-failsafe, Nonalarm Condition



Connecting the Tachometer Signal

The XM-122 provides a single tachometer input signal. The signal processing performed on the tachometer signal depends on the configuration of the module. See page 71 for a description of the tachometer parameters.

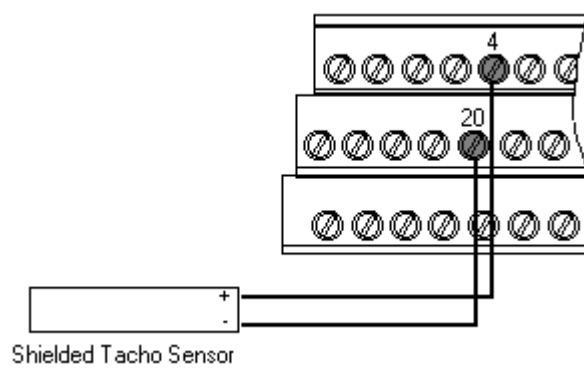
IMPORTANT

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.

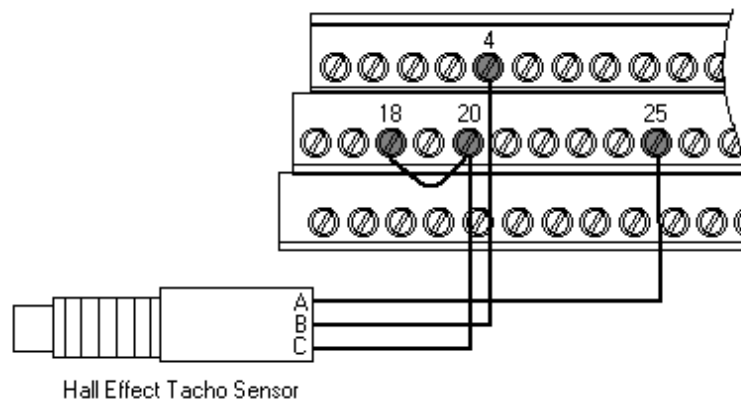
Figure 2.13 Tachometer Signal Connection



Connecting a Hall Effect Tachometer Sensor

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

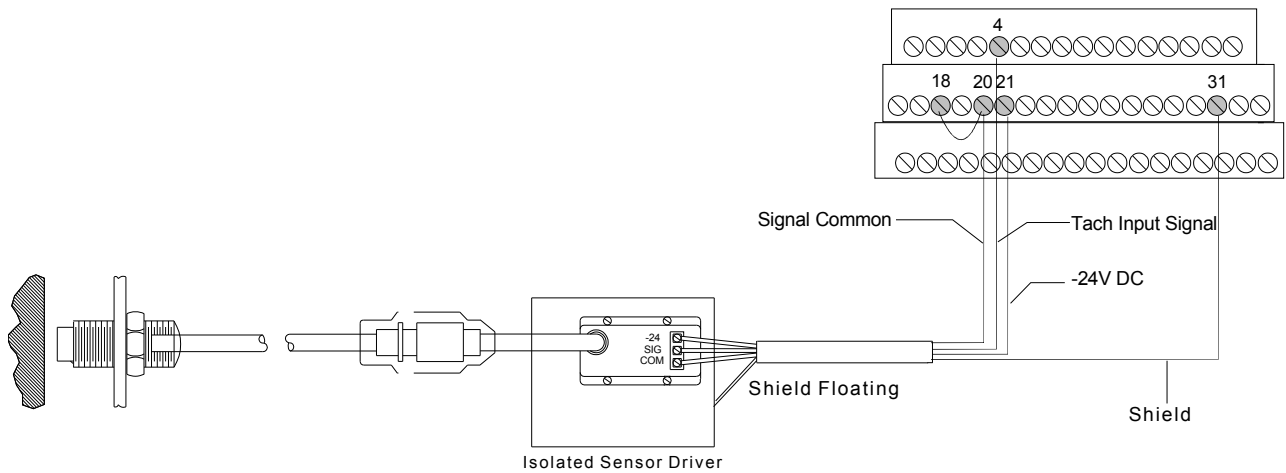
Figure 2.14 Hall Effect Tachometer Signal Connection



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

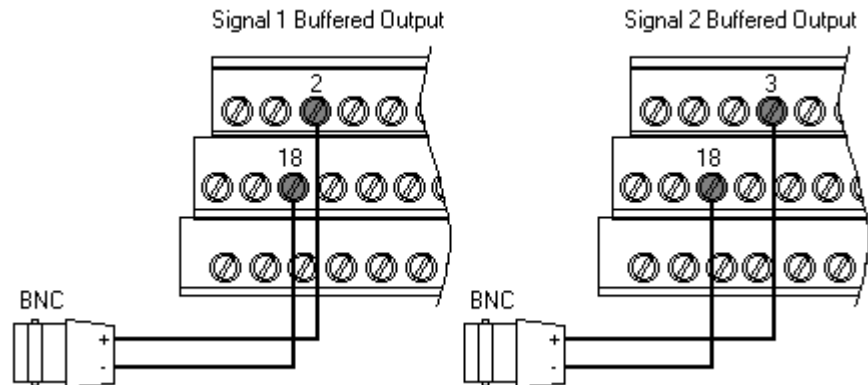


Connecting the Buffered Outputs

The XM-122 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 module.

Figure 2.16 Buffered Output Connections



IMPORTANT

Applies only to XM-122 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. 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 the Transducer

The XM-122 can accept input from any Allen-Bradley non-contact eddy current probe, a standard IEPE accelerometer, a velocity transducer, AC voltage output, or a DC voltage output measurement device.

IMPORTANT

The XM-122 module can produce the gSE measurement only with an IEPE accelerometer or an externally powered sensor.

Connecting an IEPE Accelerometer

The following figures show the wiring of an IEPE accelerometer to the terminal base unit.

IMPORTANT

Figures 2.17 and 2.18 show the wiring to the XM-122 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 IEPE accelerometer. Make certain the **IEPE Power** parameter is enabled. Refer to Channel Transducer Parameters on page 58.

IMPORTANT

A jumper from terminal 5 to terminal 6 is required for channel 1 buffered output. A jumper from terminal 22 to terminal 6 is required for channel 2 buffered output. Refer to Configuring Buffered Output Input Range on page 28.

Figure 2.17 IEPE Accelerometer to Channel 1 Wiring

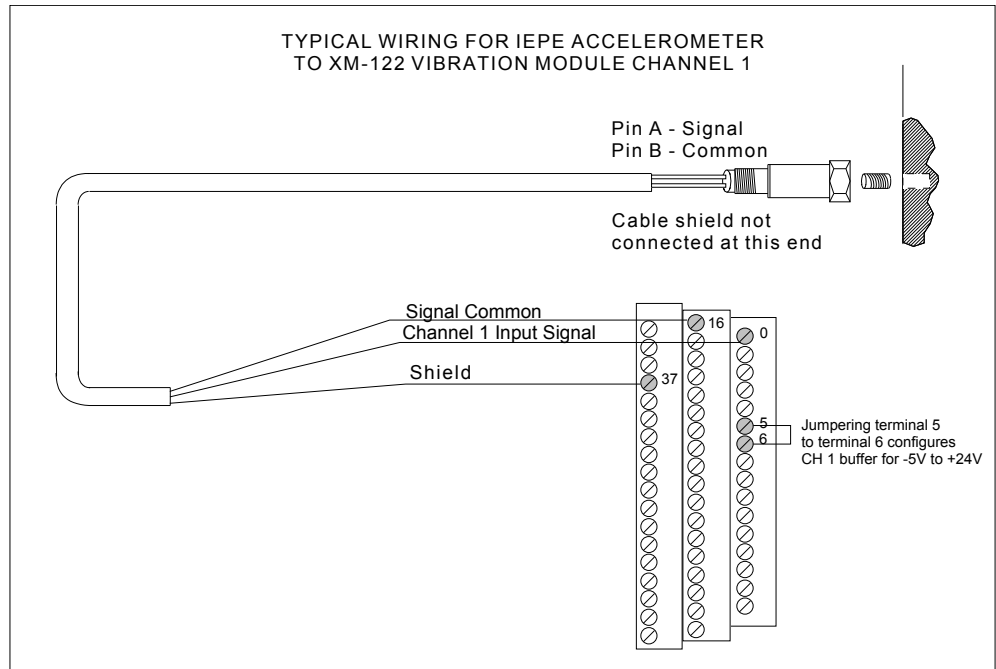
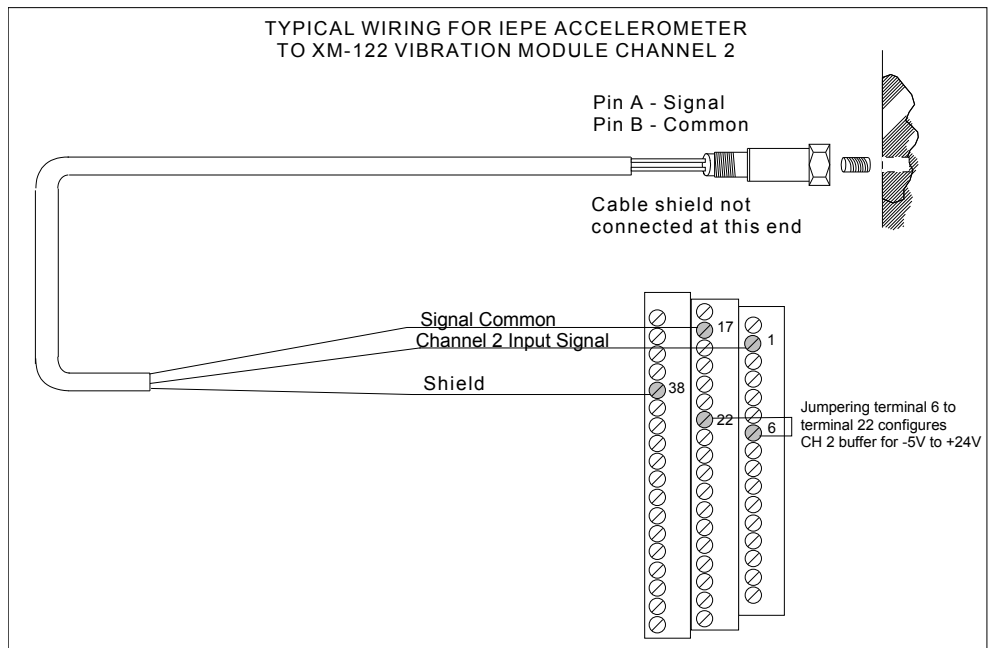


Figure 2.18 IEPE accelerometer to channel 2 wiring



Connecting a Non-contact Sensor

The figures below show the wiring of a non-contact sensor to the terminal base unit.

IMPORTANT

Figures 2.19 and 2.20 show the wiring to the XM-122 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.

IMPORTANT

A jumper from terminal 5 to terminal 21 is required for channel 1 buffered output. A jumper from terminal 22 to terminal 21 is required for channel 2 buffered output. Refer to Configuring Buffered Output Input Range on page 28.

Figure 2.19 Non-contact Sensor to Channel 1 Wiring

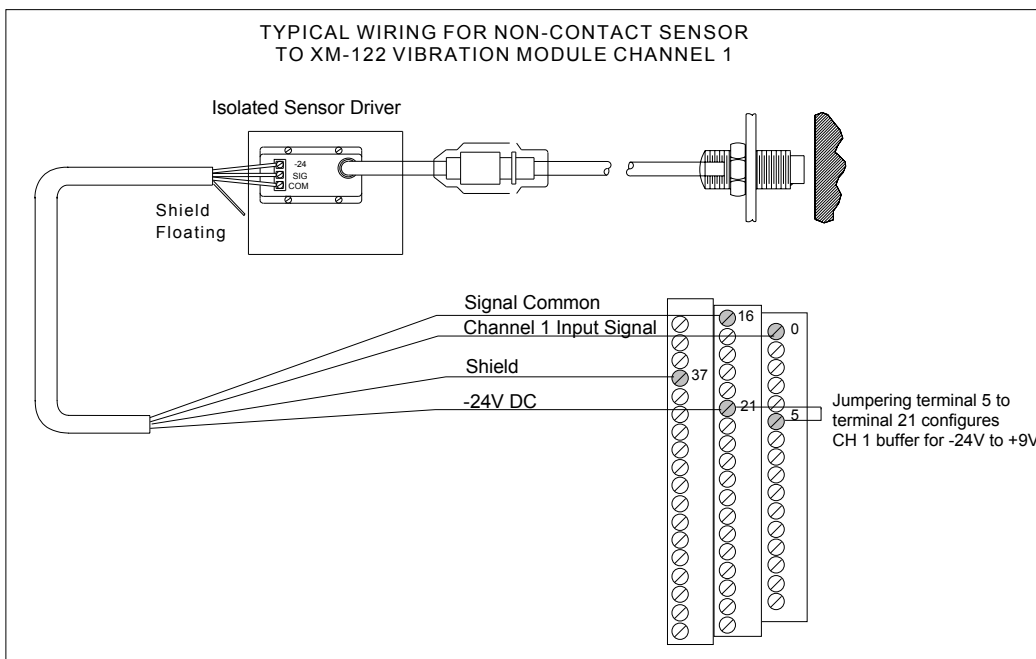
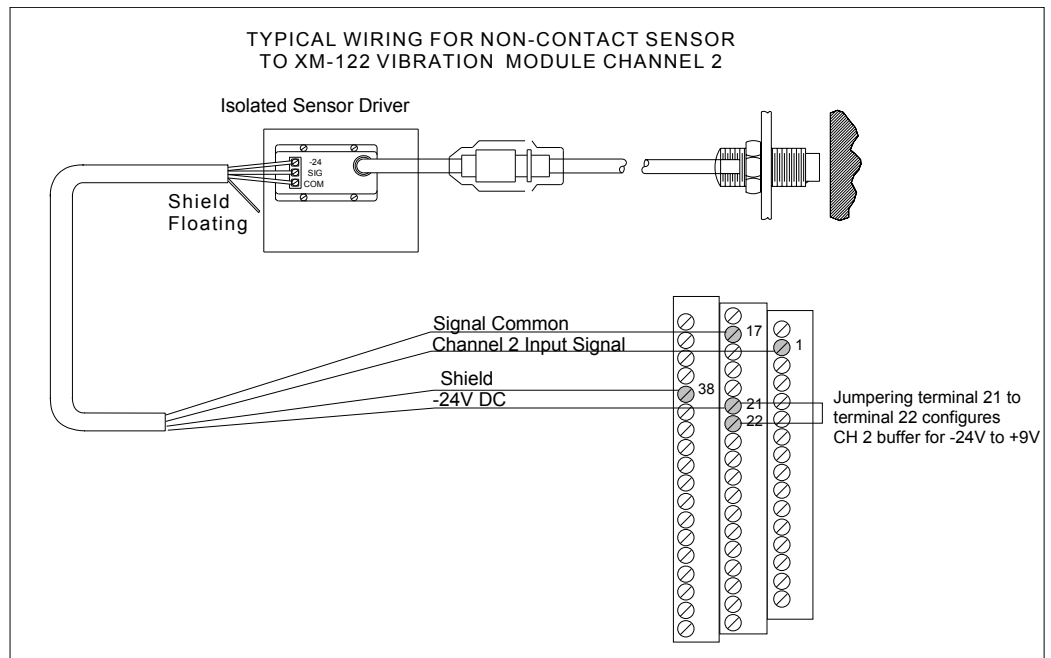


Figure 2.20 Non-contact Sensor to Channel 2 Wiring



Connecting a Passive Transducer

Figures 2.21 and 2.22 show the wiring of a passive transducer, such as a velocity sensor, to the terminal base unit.

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 module does not power the sensor. It measures only the input voltage.

Figure 2.21 Velocity Sensor to Channel 1 Wiring

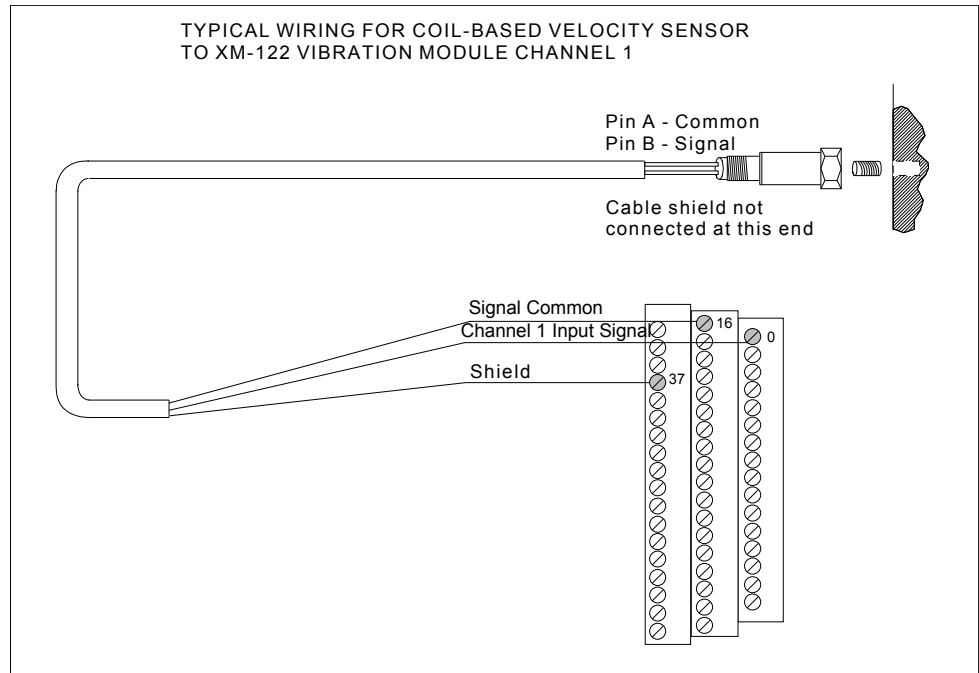
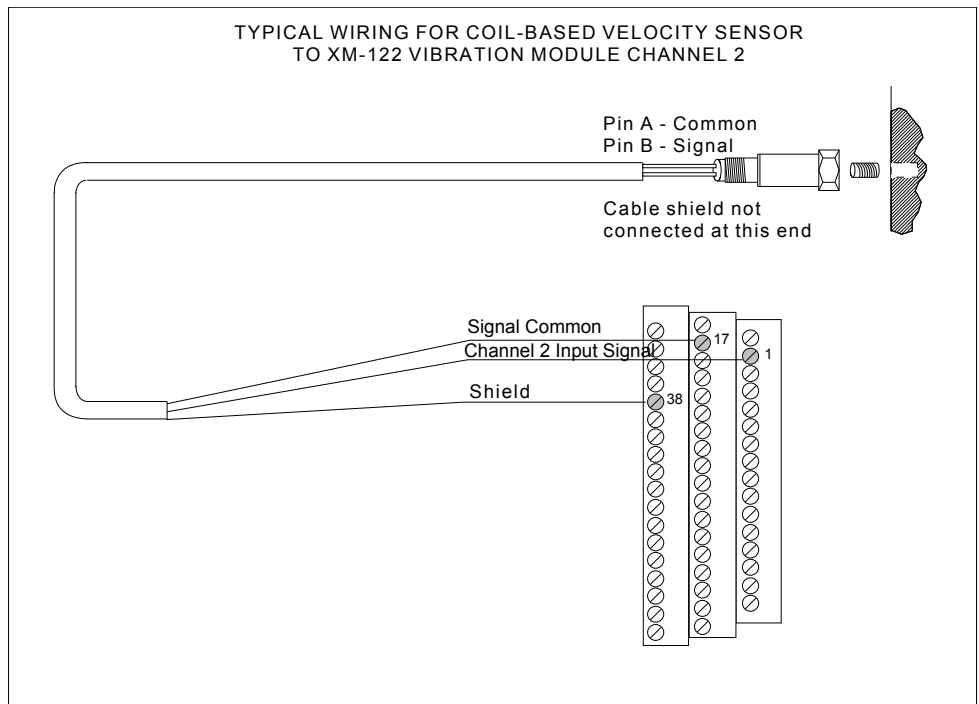


Figure 2.22 Velocity Sensor to Channel 2 Wiring



Connecting a Powered Sensor

The following figures show the wiring of a powered sensor, such as the Model 580 Vibration Pickup, to the terminal base unit.

IMPORTANT

Figures 2.23 and 2.24 show the wiring to the XM-122 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

A jumper from terminal 5 to terminal 6 is required for channel 1 buffered output. A jumper from terminal 22 to terminal 6 is required for channel 2 buffered output. Refer to Configuring Buffered Output Input Range on page 28.

ATTENTION

Figures 2.23 and 2.24 show the wiring of a Model 580 Vibration Pickup, which is a +24 V transducer. The +24 V sensors powered from pin 25 **do not** utilize the redundant power connection to the XM-122. So if primary 24 V power is lost, the +24 V sensor will lose power regardless of whether the XM-122 remains powered through the redundant power terminals.

If redundant power is required then use a redundant power supply (Allen-Bradley 1606-series is recommended).

Figure 2.23 Powered Sensor to Channel 1 Wiring

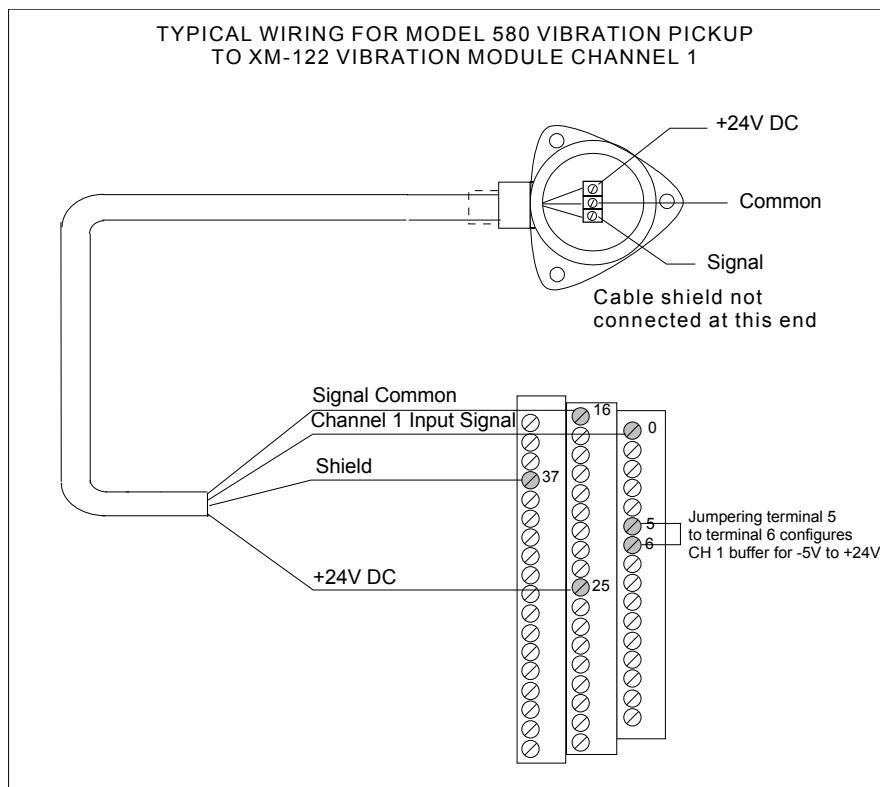
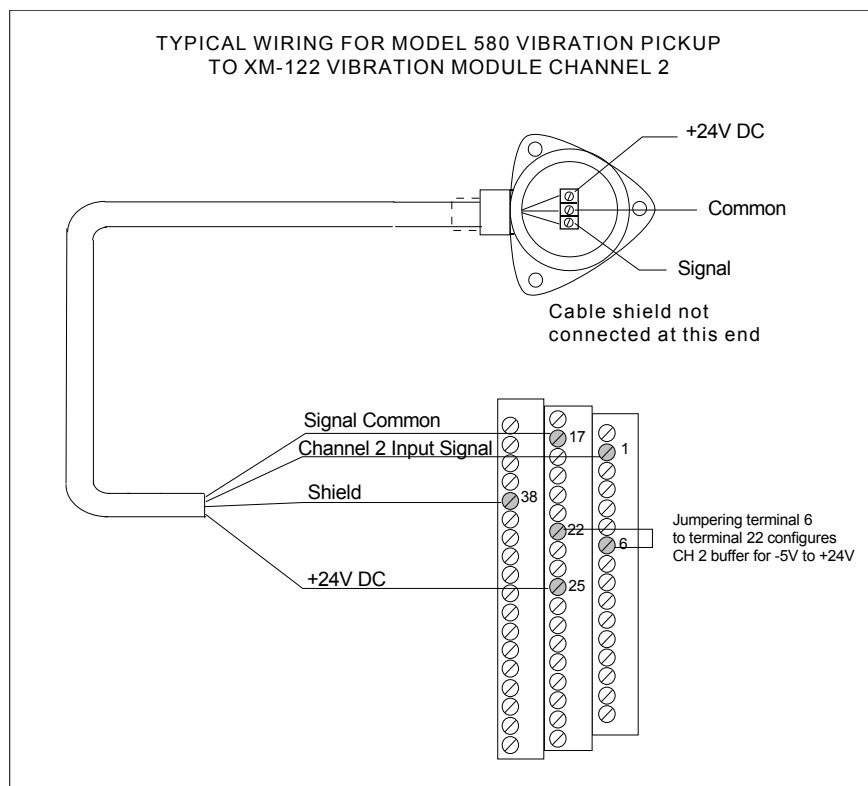


Figure 2.24 Powered Sensor to Channel 2 Wiring



Connecting a Process DC Voltage Signal

The following figures show the wiring from a process DC voltage signal to the terminal base unit.


- 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 module does not power the sensor. It measures only the input voltage.

Figure 2.25 DC Voltage Signal to Channel 1 Wiring

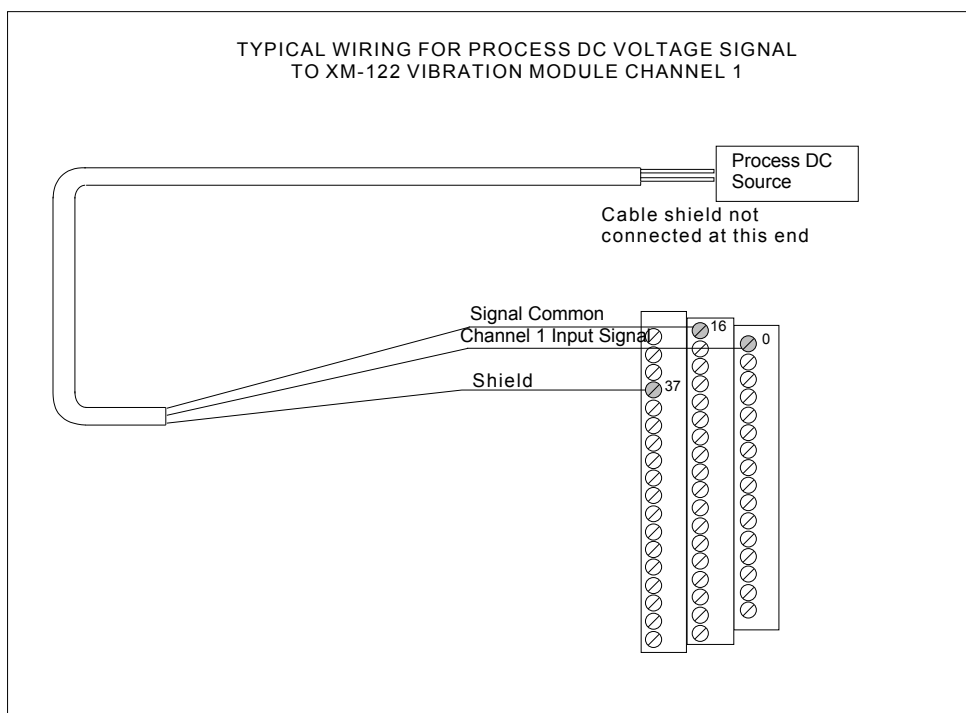


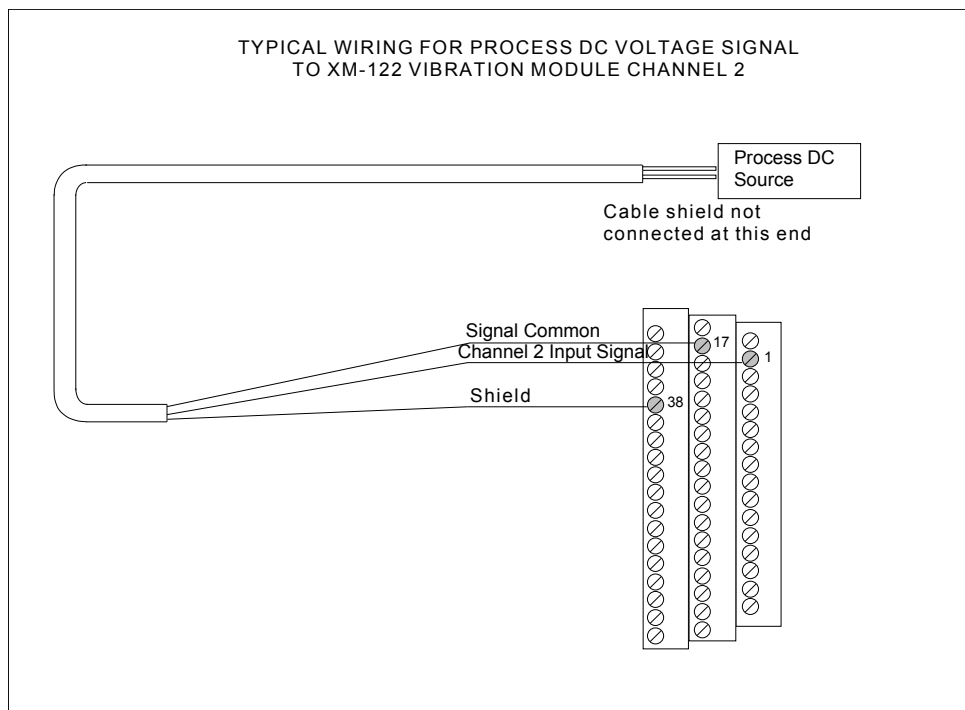
Figure 2.26 DC Voltage Signal to Channel 2 Wiring*Connecting an IEPE Accelerometer and Non-Contact Sensor*

Figure 2.27 shows the wiring of an IEPE accelerometer to channel 1 and the wiring of a non-contact sensor to channel 2.

ATTENTION

Figure 2.27 shows the wiring to the XM-122 module revision D01 (and later). Earlier revisions of the module **do not** support this wiring configuration. Refer to Appendix D for information about wiring earlier revisions.

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

Make certain the **IEPE Power** parameter for channel 1 is enabled so power is provided to the accelerometer. Refer to Channel Transducer Parameters on page 58.

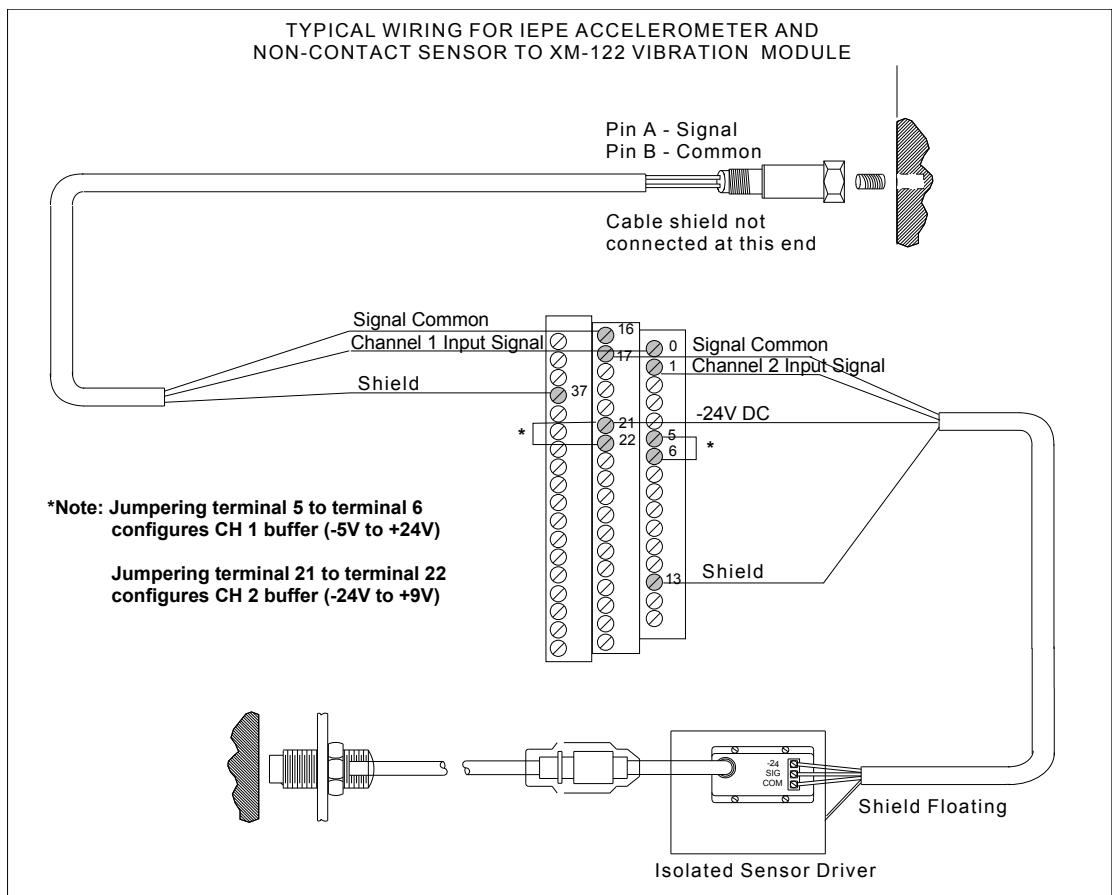
IMPORTANT

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

IMPORTANT

A jumper from terminal 5 to terminal 6 is required for channel 1 buffered output. A jumper from terminal 22 to terminal 21 is required for channel 2 buffered output. Refer to Configuring Buffered Output Input Range on page 28.

Figure 2.27 IEPE Accelerometer and Non-Contact Sensor Wiring



Connecting Two Accelerometers and a Non-Contact Sensor

Figure 2.28 shows the wiring of two IEPE accelerometers and a non-contact sensor to the terminal base. The IEPE accelerometers are wired to channel 1 and channel 2. The non-contact sensor is wired to the tachometer input signal.

ATTENTION

Figure 2.28 shows the wiring to the XM-122 module revision D01 (and later). If you have any earlier revision of the module, refer to Appendix D for wiring information.

ATTENTION

You may ground the cable shield to 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

Make certain the **IEPE Power** parameter is enabled for both channel and channel so power is provided to the accelerometers. Refer to Channel Transducer Parameters on page 58.

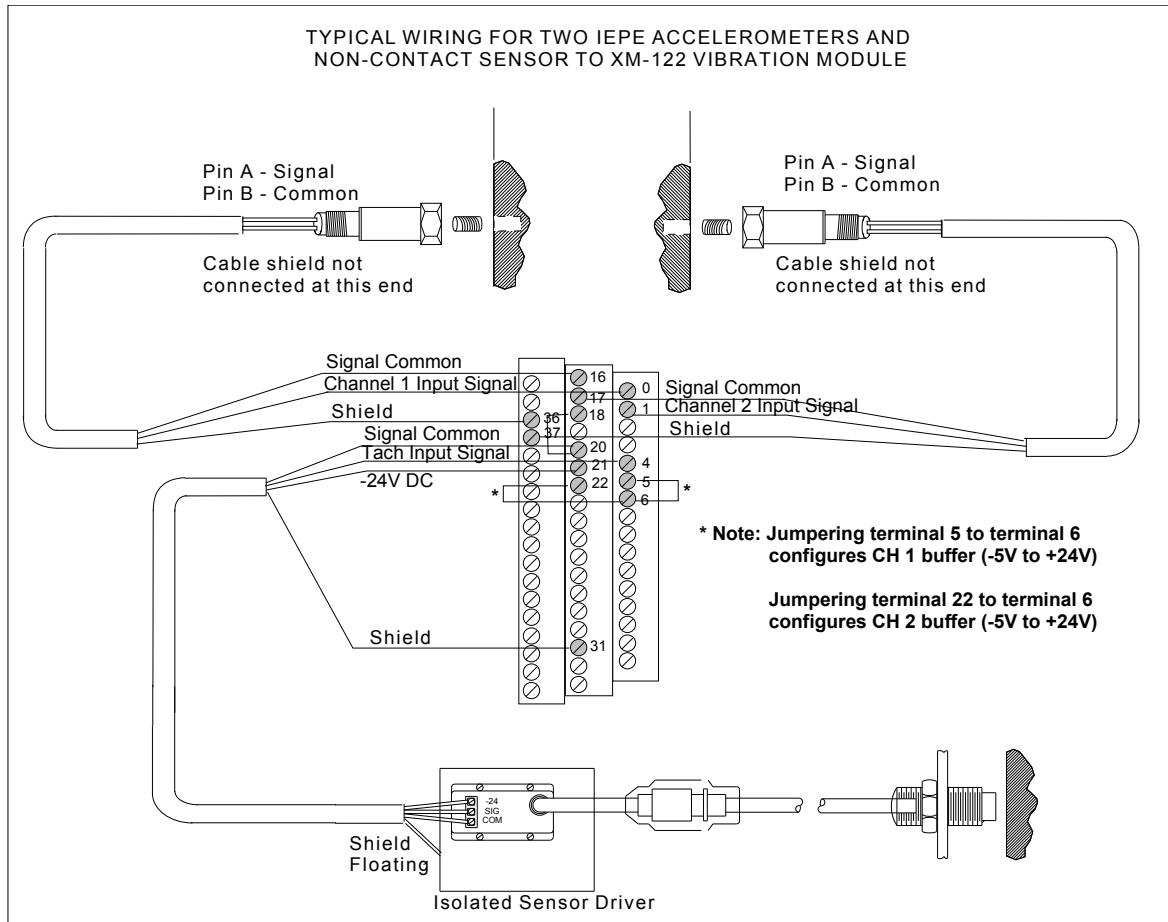
IMPORTANT

Transducer DC bias is monitored on all signals.

IMPORTANT

A jumper from terminal 5 to terminal 6 is required for channel 1 buffered output. A jumper from terminal 22 to terminal 6 is required for channel 2 buffered output. Refer to Configuring Buffered Output Input Range on page 28.

Figure 2.28 Two IEPE Accelerometers and a Non-Contact Sensor Wiring



Connecting a Velocity Sensor and Two Non-Contact Sensors

Figure 2.29 shows the wiring of a velocity sensor and two non-contact sensors to the terminal base unit. The velocity sensor is wired to channel 1. The first non-contact sensor is wired to channel 2, and the other non-contact sensor is wired to the tachometer input signal.

IMPORTANT Figure 2.29 shows the wiring to the XM-122 module revision D01 (and later). If you have any earlier revision of the module, refer to Appendix D for wiring information.

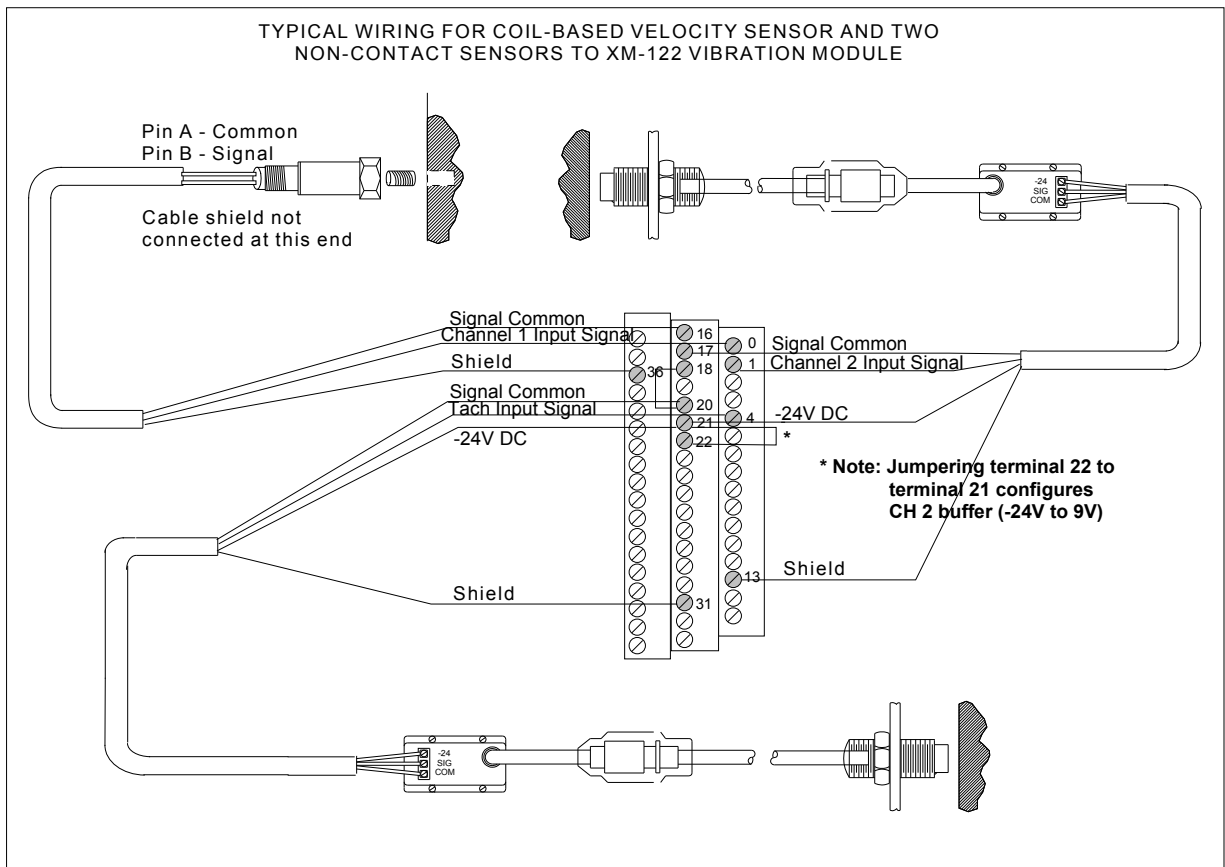
ATTENTION You may ground the cable shield at either end of the cable. Do not ground the shield at both ends. Recommended practice is to ground the cable shield at the terminal base and not at the transducer. Any convenient Chassis terminal may be used (see Terminal Block Assignments on page 18).



IMPORTANT Transducer DC bias is monitored on all signals.

IMPORTANT A jumper from terminal 22 to terminal 21 is required for channel 2 buffered output. Refer to Configuring Buffered Output Input Range on page 28.

Figure 2.29 Velocity Sensor and Two Non-contact Sensor 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-122.

TIP

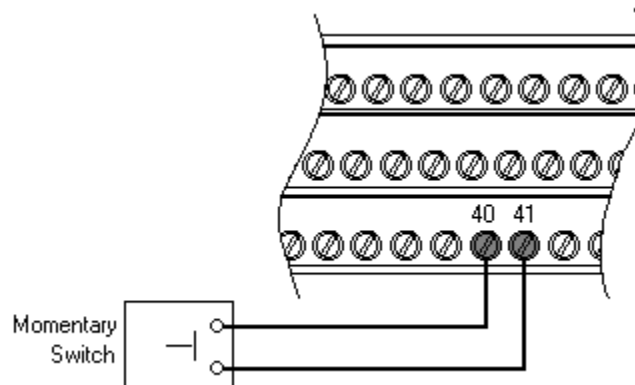
If you set a module relay to latching, make sure that any linked relays, such as relays in an XM-440 Master Relay Module, are **not** configured as latching. When both relays are set to latching, the relay in each module will have to be independently reset when necessary.

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 2.30.

Figure 2.30 Remote Relay Reset Signal Connection



ATTENTION



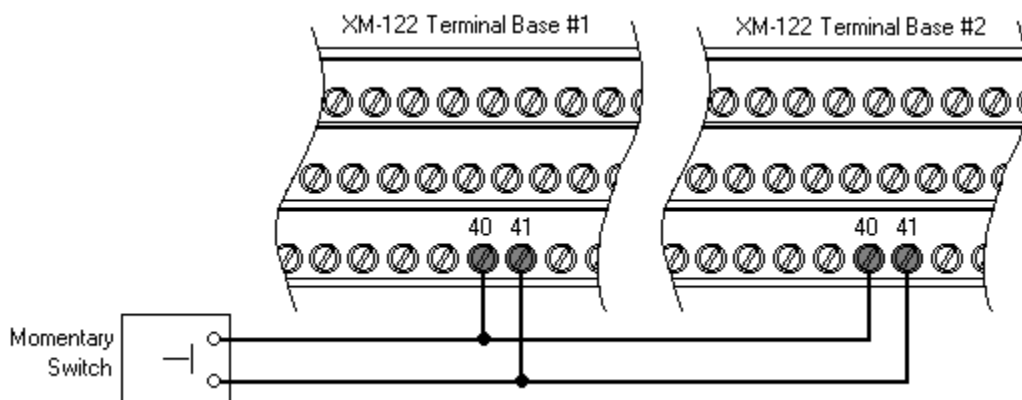
The Switch Input circuits are functionally isolated from other circuits. It is recommended that the Switch RTN signal be grounded at a signal point. Connect the Switch RTN signal to the XM terminal base (Chassis terminal) or directly to the DIN rail, or ground the signal at the switch or other equipment 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 2.31.

ATTENTION


The relay reset connections may be different for different XM modules. Figure 2.31 applies only to the XM-122 module. Refer to the installation instructions for the module for its terminal assignments.

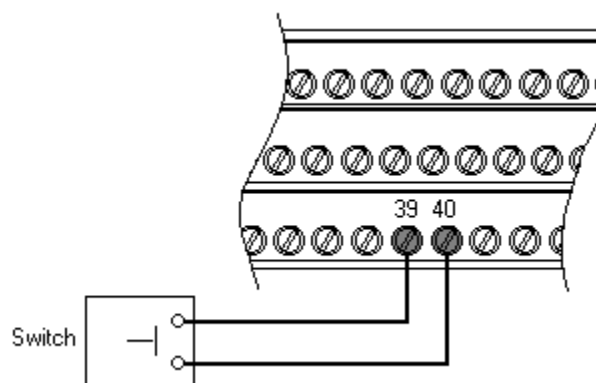
Figure 2.31 Typical Multiple XM Modules Remote Relay Reset Signal Connection



Connecting the Setpoint Multiplication Switch

You can configure the module to multiply the alarm setpoints, or inhibit the alarms during the start-up period. This can be used to avoid alarm conditions that may occur during startup, for example, when the monitored machine passes through a critical speed.

Wire the Setpoint Multiplication switch to the terminal base unit as shown in Figure 2.32.

Figure 2.32 Setpoint Multiplication Connection**ATTENTION**

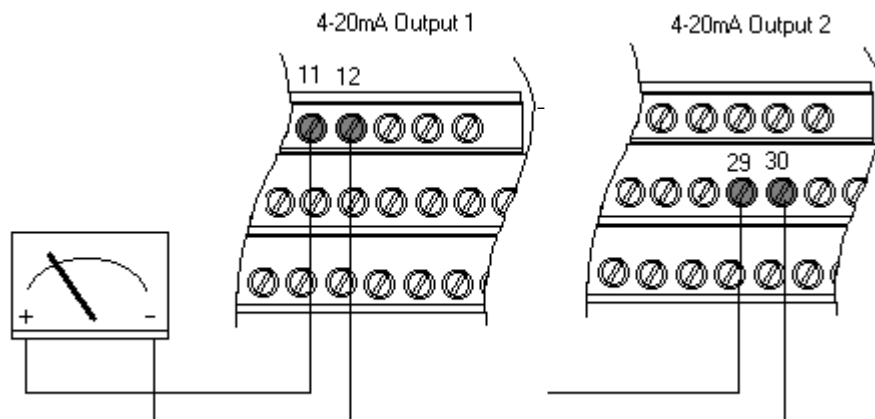
The Switch Input circuits are functionally isolated from other circuits. It is recommended that the Switch RTN signal be grounded at a signal point. Connect the Switch RTN signal to the XM terminal base (Chassis terminal) or directly to the DIN rail, or ground the signal at the switch or other equipment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

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 82 for details.

Wire the 4-20 mA outputs to the terminal base unit as shown in Figure 2.33.

Figure 2.33 4-20 mA 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.

PC Serial Port Connection

The XM-122 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.

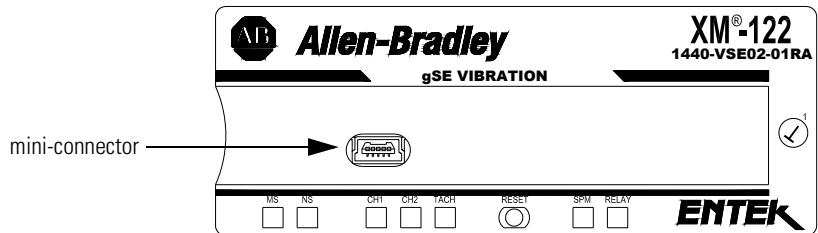
- **Terminal Base Unit** - There are three terminals on the terminal base unit you can use for the serial port connection. They are TxD, RxD, and RTN (terminals 7, 8, and 9, respectively). If these three terminals are wired to a DB-9 female connector, then a standard RS-232 serial cable with 9-pin (DB-9) 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.

<u>XM-122 Terminal Base Unit</u> <u>(Cat. No. 1440-TB-A)</u>	<u>DB-9 Female Connector</u>
TX Terminal (terminal 7) -----	Pin 2 (RD - receive data)
RX Terminal (terminal 8) -----	Pin 3 (TD - transmit data)
RTN Terminal (terminal 9) -----	Pin 5 (SG - signal ground)


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

Figure 2.34 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-122 includes a DeviceNet™ connection that allows the module to communicate with a Programmable Logic Controller (PLC), Distributed Control System (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-122. 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 device is 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-122 is set by way of "baud detection" (Autobaud) at power-up.

Mounting the Module

The XM-122 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-122 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 module.

Do not attempt to install XM-122 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

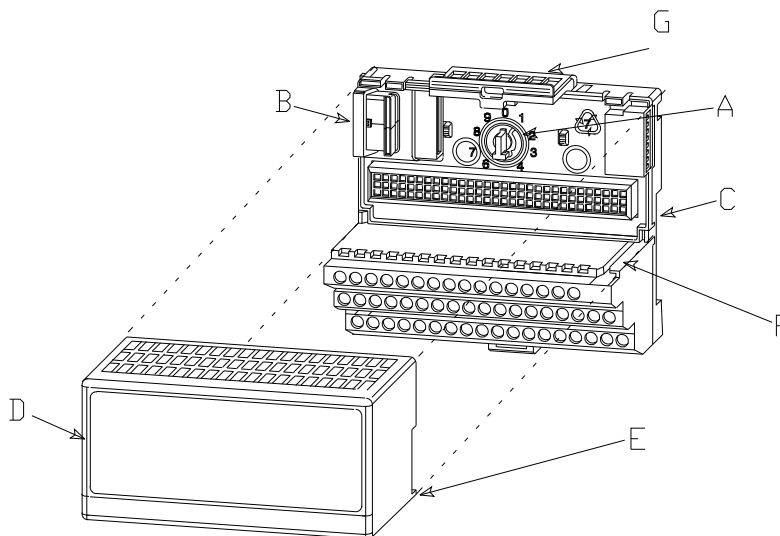


When you insert or remove the module while power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

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 XM-122.

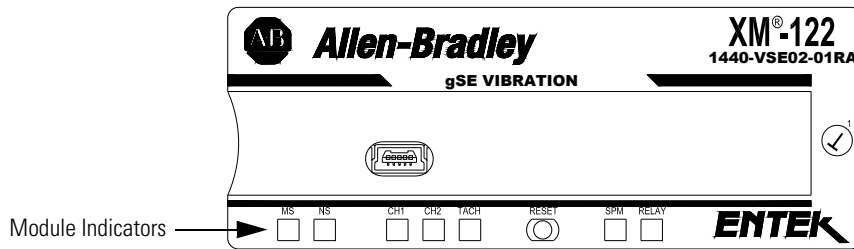


2. Make certain the side connector (B) is pushed all the way to the left. **You cannot install the module unless the connector is fully extended.**
3. Make sure that the pins on the bottom of the module are straight so they will align properly with the connector in the terminal base unit.
4. Position 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 XM-122 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 the Setpoint Multiplier, and a status indicator for the Relay. The LED indicators are located on top of the module.

Figure 2.35 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 only)	Tachometer fault (no transducer fault) condition exists on the channel.
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.

Setpoint Multiplier Indicator

Color	State	Description
Yellow	Off	Setpoint multiplier is not in effect.
	Solid	Setpoint multiplier is in effect.

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 XM-122 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.

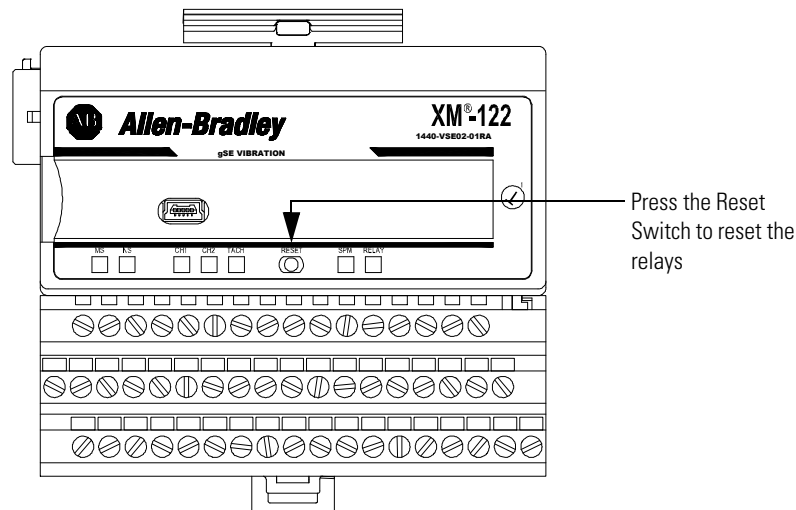
MS Indicator State	Description
Flashing Red and Green	Device self-test is in progress.
Solid Green or Flashing Green	Device self-test completed successfully, and the firmware is valid and running.
Flashing Red	Device self-test completed, the hardware is OK, but the firmware is invalid. Or, the firmware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

Refer to Module Indicators on page 49 for more information about the LED indicators.

Manually Resetting Relays

The XM-122 has an external reset switch located on top of the module, as shown in Figure 2.36.

Figure 2.36 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-122.

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.

Configuration Parameters

This chapter provides a complete listing and description of the XM-122 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
XM-122 Measurement Modes	56
Channel Transducer Parameters	58
Channel Signal Processing Parameters	60
Measurement Parameters	63
gSE Parameters	69
Tachometer Parameters	71
Alarm Parameters	74
Relay Parameters	78
4-20 mA Output Parameters	82
Triggered Trend Parameters	83
SU/CD Trend Parameters	85
I/O Data Parameters	88
Data Parameters	89
Device Mode Parameters	93

IMPORTANT

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

XM-122 Measurement Modes

The XM-122 alternates between two measurement modes while it is actively measuring the channel inputs: conventional mode and gSE mode.

The XM-122 operates in conventional vibration mode for a period of time based on the configuration (table 3.A). During conventional mode, the module measures the overall, spectrum, waveform, conventional bands, vectors, Not 1X, and sum harmonics values.

The module then reconfigures itself and transitions to gSE mode for a time period based on the configuration (table 3.B). In gSE mode, the module calculates gSE overall, gSE spectrum and gSE bands. The module then returns to conventional mode, and the cycle repeats.

The most recent measured values are available via the 4-20mA outputs, the XM Serial Configuration Utility, or the network configuration software. During conventional and gSE mode, the module measures speed and transducer bias.

If there is a tachometer fault and the conventional spectrum is configured to be "synchronous," the conventional measurement will timeout and the gSE measurement will take place. When the conventional mode is entered again, the synchronous channel will re-attempt the spectrum/waveform collection.

IMPORTANT

The XM-122 can produce gSE measurements only with an accelerometer. The gSE measurements are only available for the channel when **Eng. Units** is set to "g."

TIP

Only when both **Eng. Units** are **not** set to "g" will the XM-122 remain in conventional mode.

Measurement Time

Conventional Mode

The conventional mode will produce measurements for a period of time according to the following table:

Conventional Mode Time

Signal Detection	Sampling Mode	The greater of the two...	
RMS	Asynchronous	$(\text{Number of Averages}) (\text{Number of Lines}) / \text{FMAX}$	5 x Overall Time Constant (seconds)
RMS	Synchronous	$(\text{Number of Averages}) (\text{Number of Lines}) / (\text{FMAX} \times 100)$	5 x Overall Time Constant (seconds)
True Peak	Asynchronous	$(\text{Number of Averages}) (\text{Number of Lines}) / \text{FMAX}$	1 second + 2 / High Pass Corner Frequency
True Peak	Synchronous	$(\text{Number of Averages}) (\text{Number of Lines}) / (\text{FMAX} \times 100)$	1 second + 2 / High Pass Corner Frequency

gSE Mode

The gSE mode will produce measurements for a period of time according to the following table:

gSE Mode Time

The greater of...	
$(\text{Number of Averages}) (\text{Number of Lines}) / \text{FMAX}$	4 seconds

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, operating range, and power requirements. 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 configuring the channel transducer parameters as follows:

- Set 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.
- Disable the unused channel's transducer power by clearing the **Enable IEPE Power** check box.

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	
XM Configuration Utility	EDS File	Controls whether to provide standard accelerometer (IEPE) power to the transducer. Refer to Connecting the Transducer on page 29 for wiring requirements.	XM Configuration Utility	EDS File
Enable IEPE Power	IEPE Power		Check = Enable	Enabled
			Clear = Disable	Disabled
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.	

Transducer Parameters

Parameter Name	Description	Values/Comments																																		
Eng. Units	<p>Defines the native units of the transducer. Your choice controls the list of possible selections available in the Output Data Units parameter. It also affects other module parameters.</p> <p>Important: The XM-122 can produce gSE measurements only with an accelerometer. The gSE measurements are only available for the channel when Eng. Units is set to "g."</p>	<table border="1"> <thead> <tr> <th>Eng. Units Options</th> <th>Quantity of Measure</th> </tr> </thead> <tbody> <tr> <td>g (gravity)</td> <td>Acceleration</td> </tr> <tr> <td>ips (inch per second)</td> <td rowspan="2">Velocity</td> </tr> <tr> <td>mm/s (millimeters per second)</td> </tr> <tr> <td>mils (1/1000 inch)</td> <td rowspan="2">Displacement</td> </tr> <tr> <td>um (micro meter)</td> </tr> <tr> <td>Volts</td> <td>Voltage</td> </tr> <tr> <td>Pa (pascals)</td> <td rowspan="2">pressure</td> </tr> <tr> <td>psi (pound-force per square inch)</td> </tr> </tbody> </table>	Eng. Units Options	Quantity of Measure	g (gravity)	Acceleration	ips (inch per second)	Velocity	mm/s (millimeters per second)	mils (1/1000 inch)	Displacement	um (micro meter)	Volts	Voltage	Pa (pascals)	pressure	psi (pound-force per square inch)																			
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Pa (pascals)	pressure																																			
psi (pound-force per square inch)																																				
Fault Low	The minimum, or most negative, expected DC bias 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.																																		
DC Bias Time Constant	<p>The time constant used for exponential averaging (low pass filtering) of the transducer DC bias measurement. The corner frequency for the low pass filter is $1 / (2\pi \times \text{DC Bias Time Constant})$. The greater the value entered, the longer the settling time of the measured value to a change in the input signal. See example table below.</p> <table border="1"> <thead> <tr> <th>Time Constant (seconds)</th> <th>-3dB Frequency (Hz)</th> <th>Settling Time (seconds)</th> </tr> </thead> <tbody> <tr><td>1</td><td>0.159</td><td>2.2</td></tr> <tr><td>2</td><td>0.080</td><td>4.4</td></tr> <tr><td>3</td><td>0.053</td><td>6.6</td></tr> <tr><td>4</td><td>0.040</td><td>8.8</td></tr> <tr><td>5</td><td>0.032</td><td>11</td></tr> <tr><td>6</td><td>0.027</td><td>13.2</td></tr> <tr><td>7</td><td>0.023</td><td>15.4</td></tr> <tr><td>8</td><td>0.020</td><td>17.6</td></tr> <tr><td>9</td><td>0.018</td><td>19.8</td></tr> <tr><td>10</td><td>0.016</td><td>22</td></tr> </tbody> </table>	Time Constant (seconds)	-3dB Frequency (Hz)	Settling Time (seconds)	1	0.159	2.2	2	0.080	4.4	3	0.053	6.6	4	0.040	8.8	5	0.032	11	6	0.027	13.2	7	0.023	15.4	8	0.020	17.6	9	0.018	19.8	10	0.016	22	Seconds	
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9	0.018	19.8																																		
10	0.016	22																																		

Transducer Parameters

Parameter Name	Description	Values/Comments
Full Scale	The maximum signal level expected to be processed by the channel. This value is used to determine the programmable gain settings across each stage of the channel's analog signal processing circuit.	Volt Important: See Appendix E for further guidance and recommended Full Scale value settings.
Autoscale (XM Serial Configuration Utility only)	Calculates a new Full Scale value based upon the current input signal level.	Enter a safety factor value greater than or equal to 1.0. The safety factor is a number that will be multiplied to the current signal level to determine the new Full Scale setting.

Channel Signal Processing Parameters

The channel signal processing parameters determine the signal processing that will be performed on the input signals. Use these parameters to select the output data units, the low cutoff frequency, full scale settings, and the relationship of the signal to the tachometer signal for each channel.

In addition, the signal processing parameters affect the data units of the measurement values, the sampling mode of the spectrum/waveform data, and any spectral derived measurement. There are two instances of the signal processing parameters, one for each channel.

Channel Signal Processing Parameters

Parameter Name	Description	Values/Comments																					
Output Data Unit	The data units of the measured values.	<p>The available options depend on the Eng. Units selection. See page 58.</p> <table border="1"> <thead> <tr> <th>Eng. Units</th> <th>Output Data Unit Options</th> </tr> </thead> <tbody> <tr> <td rowspan="5">g</td> <td>g</td> </tr> <tr> <td>ips</td> </tr> <tr> <td>mil</td> </tr> <tr> <td>mm/sec</td> </tr> <tr> <td>um</td> </tr> <tr> <td rowspan="4">ips or mm/sec</td> <td>ips</td> </tr> <tr> <td>mil</td> </tr> <tr> <td>mm/sec</td> </tr> <tr> <td>um</td> </tr> <tr> <td rowspan="2">mils or um</td> <td>mils</td> </tr> <tr> <td>um</td> </tr> <tr> <td>Volt</td> <td>volt</td> </tr> <tr> <td rowspan="2">Pa or psi</td> <td>Pa</td> </tr> <tr> <td>psi</td> </tr> </tbody> </table>	Eng. Units	Output Data Unit Options	g	g	ips	mil	mm/sec	um	ips or mm/sec	ips	mil	mm/sec	um	mils or um	mils	um	Volt	volt	Pa or psi	Pa	psi
Eng. Units	Output Data Unit Options																						
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	mm/sec																						
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mils or um	mils																						
	um																						
Volt	volt																						
Pa or psi	Pa																						
	psi																						
Very Low HPF Frequency (EDS File only)	Shows the corner frequency for the Very Low high pass filter option.																						
Low HPF Frequency (EDS File only)	Shows the corner frequency for the Low high pass filter option.																						
Medium HPF Frequency (EDS File only)	Shows the corner frequency for the Medium high pass filter option.																						
High HPF Frequency (EDS File only)	Shows the corner frequency for the High high pass filter option.																						
Very High HPF Frequency (EDS File only)	Shows the corner frequency for the Very High high pass filter option.																						
High Pass Filter	Sets the high pass filter to apply to the measurements. The high pass filter is useful in removing low frequency signal components that would dominate the signal. The high pass filter attenuates all frequencies below a defined frequency. It allows, or passes, frequencies above the defined frequency.	<p>Important: Select the Bypass option when you want a more accurate representation of dynamic signals at low frequencies. This option reduces the distortion of the waveform at low frequencies and reduces attenuation at lower frequencies.</p> <p>Note: The lowest frequency high pass filter is not available for integrated measurements.</p>																					

Channel Signal Processing Parameters

Parameter Name	Description	Values/Comments
Sampling Mode	Sets the sampling mode. The sampling mode determines whether the signal is synchronized with the tachometer signal and has several effects on the resulting measurements.	Options: Asynchronous Synchronous Note: Synchronous sampling requires a tachometer signal.
	Asynchronous Sampling	Synchronous Sampling
	The waveform measurement is time-based.	The waveform measurement is position-based.
	The spectrum measurement is frequency-based.	The spectrum measurement is order-based and the Number of Lines must be evenly divisible by FMAX (i.e. no remainder).
	When averaging, spectrums are averaged, not waveforms. This has the affect of reducing noise in the spectrum data.	When averaging, waveforms are averaged and the spectrums are calculated from averaged waveforms. This has the affect of removing non-synchronous frequencies from the waveform and spectrum data.
	The Band Minimum and Maximum Frequency must be specified in Hz (or CPM).	The Band Minimum and Maximum Frequency can be specified in Hz (CPM) or Orders.
	The tachometer speed must meet the following criteria, otherwise a tachometer fault will be indicated. 10 Hz < Tach Speed x Gear Ratio* x FMAX < 5000 Hz *Gear Ratio = $\frac{\text{External Gear Teeth}}{\text{Internal Gear Teeth}}$	
Internal Gear Teeth	The number of teeth on the buried shaft gear.	Note: These parameters apply only to synchronous sampling.
External Gear Teeth	The number of teeth on the external shaft gear.	

Measurement Parameters Overall Measurement Parameters

There are two instances of the overall measurement parameters, one for each channel. Use these parameters to configure the measurement type and the filtering performed for each overall measurement.

Overall Measurement Parameters

Parameter Name	Description	Values/Comments						
Signal Detection	<p>The measurement (or calculation) performed on the input signal to produce the Overall Value. See Data Parameters on page 89.</p> <ul style="list-style-type: none"> • RMS - The Overall Value is the root mean squared (RMS) signal level of the input signal. • Calculated Peak - The Overall Value is the measured RMS value multiplied by the square root of two (1.4142). • Calculated Peak-to-Peak - The Overall Value is the measured RMS value multiplied by two times the square root of two (2.8284). • True Peak - The Overall Value is the output of a peak detector applied to the input signal. • True Peak-to-Peak - The Overall Value is the output of a peak-to-peak detector applied to the input signal. 	<p>Options: RMS Calculated Peak Calculated Peak-to-Peak True Peak True Peak-to-Peak</p> <p>Important: When changing the signal detection, make certain to check the Overall Time Constant value.</p>						
Overall Time Constant	<p>For RMS measurements, the Overall Time Constant parameter sets the 3-DB bandwidth for the digital filtering used to calculate the Overall Value. The 3-dB bandwidth is roughly equal to $1 / (2\pi \times \text{Overall Time Constant})$. The greater the Overall Time Constant, the slower the response of the measured Overall Value to change in the input signal.</p> <p>For example, an Overall Time Constant of 0.1 seconds may be appropriate for monitoring the Overall Value of an input signal with a fundamental frequency of 10 Hz and above. Although, the response to a step change in input will take approximately 2.2 times the Overall Time Constant to settle. Therefore, for an Overall Time Constant of 0.1 seconds, the settling time will be approximately 0.22 seconds.</p> <p>For True Peak measurements, the Overall Time Constant sets the decay rate of the peak detection meter. The greater the Overall Time Constant, the slower the Peak is decayed.</p>	<p>Enter a value greater than 0 (zero).</p> <p>Recommended Value: The recommended values are appropriate for a typical 50/60 Hz machine, and may need to be adjusted depending on the application.</p> <ul style="list-style-type: none"> • For True Peak or True Peak-to-Peak measurements, set the Overall Time Constant to 1.5. • For RMS, Calculated Peak, or Calculated Peak-to-Peak measurements, set the Overall Time Constant to one of the following: <table border="1"> <thead> <tr> <th>High Pass Filter</th> <th>Overall Time Constant</th> </tr> </thead> <tbody> <tr> <td>1 Hz</td> <td>0.16</td> </tr> <tr> <td>5 Hz or above</td> <td>0.045</td> </tr> </tbody> </table>	High Pass Filter	Overall Time Constant	1 Hz	0.16	5 Hz or above	0.045
High Pass Filter	Overall Time Constant							
1 Hz	0.16							
5 Hz or above	0.045							

Overall Measurement Parameters

Parameter Name	Description	Values/Comments
Overall Damping Factor	<p>This parameter is used in conjunction with the Overall Time Constant to vary the characteristics of the response of the digital filter used in calculating the Overall Value.</p> <p>An Overall Value for a measurement with a damping factor near 1.0 (critical damping) will slowly rise or fall for the full settling time specified by the Overall Time Constant before reaching the final value. An Overall Value for a measurement with a damping factor near 0.707 will rise or fall quickly and may "overshoot" (measure a value greater or less than the final value) before reaching the final value for a given input signal.</p>	Enter a value from 0.707 to 1.0.
Overall Filter	The filter to be applied to the overall measurement to produce the Overall Value . See Data Parameters on page 89.	Options: None Low Pass Filter
Low Pass Filter	Sets the frequency above which the input signal will be significantly attenuated.	Enter a value from 200 to 20,000 Hz. Note: This value is used only when the Overall Filter is set to "Low Pass Filter." However, the value is ignored when double integration is performed on the signal (Eng. Units is set to "g" and Output Data Units is set to either "mils" or "µm").

Sum Harmonics Measurement Parameter

There are two instances of the sum harmonics parameter, one for each channel .

IMPORTANT

The sum harmonics measurement requires the tachometer to be enabled (**Pulses Per Revolution** is set to 1 or more), and a tachometer signal must be present.

Sum Harmonics Measurement Parameters

Parameter Name	Description	Values/Comments				
<table border="1"> <tr> <td>XM Configuration Utility</td> <td>EDS File</td> </tr> <tr> <td>Order of Sum Harmonics</td> <td>Sum Harmonics Start Order</td> </tr> </table>	XM Configuration Utility	EDS File	Order of Sum Harmonics	Sum Harmonics Start Order	Sets the starting order for the Sum Harmonics measurement. The amplitudes of all harmonics from the specified harmonic through FMAX are included in the sum.	Select a value from 1 to 5. Note: This value should be less than or equal to the FMAX in orders. The sum harmonics start order is automatically rounded down if this value is above the FMAX .
XM Configuration Utility	EDS File					
Order of Sum Harmonics	Sum Harmonics Start Order					

Spectrum/Waveform Parameters

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

TIP Use the gSE Parameters to configure the gSE spectrum measurements.

Spectrum/Waveform Parameters

Parameter Name	Description	Values/Comments																																																						
FMAX	<p>Sets the maximum frequency or order for the spectrum measurement.</p> <p>Note: The Sampling Mode parameter determines whether the measurement is frequency or order.</p>	<p>Note: You can enter any FMAX. The module will automatically use the next higher supported maximum frequency. Supported maximum frequencies in Hz:</p> <table> <tr> <td>Single integrated/ <u>Non-integrated</u></td> <td>Double <u>Integrated</u></td> </tr> <tr> <td>10 to 5000</td> <td>10 to 5000</td> </tr> <tr> <td>6250</td> <td>6250</td> </tr> <tr> <td>7500</td> <td>9375</td> </tr> <tr> <td>8000</td> <td>18750</td> </tr> <tr> <td>9375</td> <td></td> </tr> <tr> <td>10000</td> <td></td> </tr> <tr> <td>12500</td> <td></td> </tr> <tr> <td>15000</td> <td></td> </tr> <tr> <td>18750</td> <td></td> </tr> <tr> <td>20000</td> <td></td> </tr> </table>	Single integrated/ <u>Non-integrated</u>	Double <u>Integrated</u>	10 to 5000	10 to 5000	6250	6250	7500	9375	8000	18750	9375		10000		12500		15000		18750		20000																																	
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20000																																																								
Number of Lines	<p>The number of lines or bins in the spectrum measurement. This determines the frequency or order resolution of the spectrum measurement.</p> <p>Note: When Sampling Mode is set to "Synchronous," the Number of Lines must be evenly divisible by the FMAX value (no remainder). See example table below. Note that the maximum number of orders possible is equal to the Number of Lines.</p> <table border="1"> <thead> <tr> <th rowspan="2">FMAX</th> <th colspan="4">Number of Lines</th> </tr> <tr> <th>100</th> <th>200</th> <th>400</th> <th>800</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> </tr> <tr> <td>5</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> </tr> <tr> <td>8</td> <td></td> <td>√</td> <td>√</td> <td>√</td> </tr> <tr> <td>10</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> </tr> <tr> <td>16</td> <td></td> <td></td> <td>√</td> <td>√</td> </tr> <tr> <td>20</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> </tr> <tr> <td>25</td> <td>√</td> <td>√</td> <td>√</td> <td>√</td> </tr> <tr> <td>32</td> <td></td> <td></td> <td></td> <td>√</td> </tr> <tr> <td>40</td> <td></td> <td>√</td> <td>√</td> <td>√</td> </tr> </tbody> </table>	FMAX	Number of Lines				100	200	400	800	4	√	√	√	√	5	√	√	√	√	8		√	√	√	10	√	√	√	√	16			√	√	20	√	√	√	√	25	√	√	√	√	32				√	40		√	√	√	<p>Options: 100 200 400 800</p>
FMAX	Number of Lines																																																							
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32				√																																																				
40		√	√	√																																																				

Spectrum/Waveform Parameters

Parameter Name	Description	Values/Comments										
Period (XM Serial Configuration Utility only)	Displays the total period of the waveform measurement.	Seconds (asynchronous sampling) Cycles (synchronous sampling)										
Number of Points (XM Serial Configuration Utility only)	Displays the number of samples in the waveform measurement.	<table border="1"> <thead> <tr> <th>Spectral Lines</th> <th>Waveform Samples</th> </tr> </thead> <tbody> <tr> <td>100</td> <td>256</td> </tr> <tr> <td>200</td> <td>512</td> </tr> <tr> <td>400</td> <td>1024</td> </tr> <tr> <td>800</td> <td>2048</td> </tr> </tbody> </table>	Spectral Lines	Waveform Samples	100	256	200	512	400	1024	800	2048
Spectral Lines	Waveform Samples											
100	256											
200	512											
400	1024											
800	2048											
Window Type	<p>Type of window to be applied to the waveform measurement prior to computing the spectrum.</p> <ul style="list-style-type: none"> • Hanning - Most often used in predictive maintenance. Gives fair peak amplitude accuracy, fair peak frequency accuracy. Useful for random type data where energy is at all frequencies. • Rectangular - Also known as Uniform. Gives poor peak amplitude accuracy, good peak frequency accuracy. Useful for impulsive or transient data. • Hamming - Gives fair peak amplitude accuracy, fair peak frequency accuracy. Similar to Hanning. • Flat Top - Also called Sinusoidal window. Gives good peak amplitude accuracy, poor peak frequency accuracy for data with discrete frequency components. • Kaiser Bessel - Gives fair peak amplitude accuracy, fair peak frequency accuracy. 	Options: Rectangular Hamming Hanning Flat Top Kaiser Bessel										
Number of Averages	Sets the number of individual data sets to be incorporated into the average calculation.	1 = no averaging										

Band Measurement Parameters

There are eight instances of the band measurement parameters, four for each channel. Use these parameters to configure the bandwidth for each band measurement.

Band Measurement Parameters

Parameter Name	Description	Values/Comments				
<table border="1"> <tr> <td>XM Configuration Utility</td> <td>EDS File</td> </tr> <tr> <td>Spectrum Option</td> <td>Spectrum</td> </tr> </table>	XM Configuration Utility	EDS File	Spectrum Option	Spectrum	Sets the spectrum measurement to use when calculating band values.	Options: Conventional Spectrum gSE Spectrum Note: The XM-122 can produce gSE measurements only with an accelerometer. The Eng. Units must be set to "g" for the channel to use the gSE Spectrum. See page 58.
XM Configuration Utility	EDS File					
Spectrum Option	Spectrum					

Band Measurement Parameters

Parameter Name	Description	Values/Comments
Measurement	<p>The measurement (or calculation) performed to produce the Band Value. See Data Parameters on page 89.</p> <ul style="list-style-type: none"> • Band Overall - The Band Value is the square root of the sum of the squares (RSS) of the amplitude values for the bins that make up the band. If the band includes all of the spectrum bins then the Band Value is equivalent to the digital or RSS overall value. • Max Peak in Band - The Band Value is equal to the maximum bin amplitude found within the band. 	Options: Band Overall Max Peak in Band
Minimum Frequency	The spectrum bin with the least frequency to be included in the band measurement.	Options (XM Serial Configuration Utility): Hz CPM Orders Note: Order-based bands are supported only when Spectrum Option is set to "Conventional Spectrum."
Maximum Frequency	The spectrum bin with the greatest frequency to be included in the band measurement.	Enter a value greater than or equal to Minimum Frequency . Note: This value must be less than or equal to FMAX . For conventional measurements, see page 65. For gSE measurements, see page 70.
Frequency Units (EDS File only)	Defines the units of the Minimum and Maximum Frequency values.	Options: Hz Orders Note: Order-based bands are supported only when Spectrum Option is set to "Conventional Spectrum."

TIP

The Frequency ranges for each band may overlap. For example, Band 1 **Minimum Frequency** is 500 Hz and **Maximum Frequency** is 1500 Hz, and Band 2 **Minimum Frequency** is 1000 Hz and **Maximum Frequency** is 3000 Hz.

IMPORTANT

For bands specified in Hz or CPM on an orders-based spectrum, the **Band Measurement** value will be zero when the Band **Minimum Frequency** and **Maximum Frequency** fall completely outside of the frequencies represented in the spectrum. If any of the band falls within the spectrum, only that portion will contribute to the Band value.

Example:

Minimum Frequency = 150 Hz

Maximum Frequency = 250 Hz

FMAX = 10 Orders

The following table shows the actual Band Minimum and Maximum Frequencies given different input speeds for this example. Note that when the speed is 10 Hz, the Band Minimum and Maximum Frequencies fall outside the range of the FMAX, so the Band value will be zero. When the speed is 20 Hz, the band will be calculated from 150 to 200 Hz.

Speed (Hz)	Max Frequency Represented in Spectrum (Hz)	Band Min (Hz)	Band Max (Hz)
40	400	150	250
30	300	150	250
20	200	150	200
10	100	n/a	n/a

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 and Acceleration Measured 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 and Acceleration Measured Value to a change in the input signal (less sensitive to noise in the signal). See example table below.																						
	<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)																					
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20	7.9577	44																					
50	3.1831	110																					
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1200	0.1326	2640																					

gSE Parameters

Use the gSE parameters to configure the gSE signal processing and gSE spectrum measurements for channel 1 and channel 2. The gSE parameters are configured independently of the (conventional) channel signal processing and spectrum parameters. There are two instances of the gSE parameters, one for each channel.

IMPORTANT

The XM-122 can produce gSE measurements only with an accelerometer. The gSE measurements are only available for the channel when **Eng. Units** is set to "g." Refer to Channel Transducer Parameters on page 58.

gSE Signal Processing Parameters

gSE Signal Processing Parameters

Parameter Name	Description	Values/Comments
gSE Full Scale	The maximum signal level expected to be processed by the channel for gSE measurements. This value is used to determine the programmable gain settings across each stage of the channel's analog signal processing circuit.	10 Volt Important: Most gSE applications are well matched to the default gSE Full Scale setting of 10 volts. However, if gSE levels in excess of 5 gSE are observed or anticipated, then we recommended you increase the Full Scale setting to 50 Volts to better match the dynamic range for the application.
Output Data Unit (XM Serial Configuration Utility only)	The data units of the measured value.	This value is always set to gSE.
High Pass Filter	Sets the high pass filter to apply to the gSE measurement. The high pass filter is useful in removing low frequency signal components that would dominate the signal. The high pass filter attenuates all frequencies below a defined frequency. It allows, or passes, frequencies above the defined frequency.	Options: 200 Hz 500 Hz 1000 Hz 2000 Hz 5000 Hz

gSE Spectrum Parameters

gSE Spectrum Parameters

Parameter Name	Description	Values/Comments
FMAX	Sets the maximum frequency for the gSE spectrum measurement.	10 to 5000 Hz
Number of Lines	The number of lines or bins in the gSE spectrum measurement. This determines the frequency resolution of the gSE spectrum measurement.	Options: 100 200 400 800

gSE Spectrum Parameters

Parameter Name	Description	Values/Comments
Window Type	Type of window to be applied to the measurement prior to computing the gSE spectrum. <ul style="list-style-type: none"> • Hanning - Most often used in predictive maintenance. Gives fair peak amplitude accuracy, fair peak frequency accuracy. Useful for random type data where energy is at all frequencies. • Rectangular - Also known as Uniform. Gives poor peak amplitude accuracy, good peak frequency accuracy. Useful for impulsive or transient data. • Hamming - Gives fair peak amplitude accuracy, fair peak frequency accuracy. Similar to Hanning. • Flat Top - Also called Sinusoidal window. Gives good peak amplitude accuracy, poor peak frequency accuracy for data with discrete frequency components. • Kaiser Bessel - Gives fair peak amplitude accuracy, fair peak frequency accuracy. 	Options: Rectangular Hamming Hanning Flat Top Kaiser Bessel
Number of Averages	Sets the number of individual data sets to be incorporated into the average calculation for the gSE spectrum.	1 = no averaging

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

Tachometer Transducer Parameters

Parameter Name	Description	Values/Comments																																	
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.																																	
DC Bias Time Constant	The time constant used for exponential averaging (low pass filtering) of the transducer DC bias measurement. The corner frequency for the low pass filter is $1 / (2\pi \times \text{DC Bias Time Constant})$. See example table below.	Seconds																																	
	<table border="1"> <thead> <tr> <th>Time Constant (seconds)</th> <th>-3dB Frequency (Hz)</th> <th>Settling Time (seconds)</th> </tr> </thead> <tbody> <tr><td>1</td><td>0.159</td><td>2.2</td></tr> <tr><td>2</td><td>0.080</td><td>4.4</td></tr> <tr><td>3</td><td>0.053</td><td>6.6</td></tr> <tr><td>4</td><td>0.040</td><td>8.8</td></tr> <tr><td>5</td><td>0.032</td><td>11</td></tr> <tr><td>6</td><td>0.027</td><td>13.2</td></tr> <tr><td>7</td><td>0.023</td><td>15.4</td></tr> <tr><td>8</td><td>0.020</td><td>17.6</td></tr> <tr><td>9</td><td>0.018</td><td>19.8</td></tr> <tr><td>10</td><td>0.016</td><td>22</td></tr> </tbody> </table>	Time Constant (seconds)	-3dB Frequency (Hz)	Settling Time (seconds)	1	0.159	2.2	2	0.080	4.4	3	0.053	6.6	4	0.040	8.8	5	0.032	11	6	0.027	13.2	7	0.023	15.4	8	0.020	17.6	9	0.018	19.8	10	0.016	22	
Time Constant (seconds)	-3dB Frequency (Hz)	Settling Time (seconds)																																	
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10	0.016	22																																	

Tachometer Signal Processing Parameters**IMPORTANT**

The tachometer is required for synchronous sampling and the speed measurement.

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.

Tachometer Signal Processing Parameters

Parameter Name		Description	Values/Comments	
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.	
XM Configuration Utility	EDS File	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). 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.	XM Configuration Utility	EDS File
Auto Trigger	Trigger Mode		Check = Auto Mode	Auto
			Clear = Manual Mode	Manual
Trigger Hysteresis		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%. 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.	% in Auto Trigger mode Volt 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.	
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 XM-122 provides 16 alarms. The alarms are not restricted to a channel, but the maximum number of alarms that can be assigned to any one measurement is eight. Use the parameters to configure which measurement the alarm is associated with, as well as the behavior of the alarm.

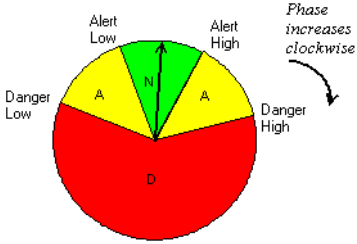
Alarm Parameters

Parameter Name	Description	Values/Comments						
Number (1-16) (XM Serial Configuration Utility only)	Sets the alarm to be configured in the XM Serial Configuration Utility. There are 16 alarms in the XM-122. The alarms are not restricted to a channel.	Select a number from 1 to 16.						
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							
Measurement	The type of measurement and the channel that is associated with the alarm. Note: A maximum of eight alarms can be associated with any one measurement.	Options: Ch1 / Ch2 Overall Ch1 / Ch2 Gap Ch1 / Ch2 Band 1–4 Speed Ch1 / Ch2 1X Mag Ch1 / Ch2 2X Mag Ch1 / Ch2 3X Mag Ch1 / Ch2 Not 1X Ch1 / Ch2 Sum Harmonics Ch1 / Ch2 1X Phase Ch1 / Ch2 2X Phase Acceleration Ch1 / Ch2 gSE Overall						
Alarm Type (EDS File only)	Controls whether the alarm is used as a magnitude or vector (phase) alarm. <ul style="list-style-type: none"> • Magnitude Alarms - The measurement value is compared against the threshold values on a linear scale. • Vector (Phase) Alarms - The measurement value is compared against the threshold values on a circular scale of 0 to 360 degrees. 	Options: Magnitude Vector						

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. 	<p>Options: Greater Than Less Than Inside Range Outside Range</p> <p>Note: This parameter is not applicable for a vector (phase) alarm type or phase measurement.</p>

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," the measurement is a phase measurement (Configuration Utility), or the alarm type is a vector alarm (EDS file).	Same measurement unit as Output Data Unit selection for the specified channel except when measurement/alarm type is phase (vector). Phase Measurements/Vector Alarm Type Requirements:
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," the measurement is a phase measurement (Configuration Utility), or the alarm type is a vector alarm.	<ul style="list-style-type: none"> • The Alert Low, Danger Low, Alert High, and Danger High must define contiguous sections within the set of possible phase values (0 to 360 degrees). • If you were to plot the thresholds on a clock face (illustration below) with phase increasing in the clockwise direction, then <ul style="list-style-type: none"> • Alert Low must be clockwise from or equal to Danger Low. • Alert High must be clockwise from Alert Low. • Danger High must be clockwise from or equal to Alert High. 
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) .	
Startup Period	The length of time that the Threshold Multiplier is applied to the thresholds. The startup period begins when the setpoint multiplier switch is reopened (push button disengaged or toggle switch flipped to off).	Enter a value from 0 to 1092 minutes, adjustable in increments of 0.1 minutes.

Alarm Parameters

Parameter Name	Description	Values/Comments							
Threshold Multiplier	<p>The action to take when the setpoint multiplier switch is closed (push button engaged or toggle switch flipped to on) and during the startup period once the switch is reopened. The module applies the multiplier to the alarm thresholds during this time to avoid false alarms at resonance frequencies.</p> <p>Note: The multiplication may have the opposite of the intended effect under certain circumstances. For example, if the Condition is set to "Less Than" and the thresholds are positive, then multiplication of the threshold values increases the likelihood of the measured value being within the alarm range. Therefore, you may want to set Threshold Multiplier to zero to disable the alarm during the startup period.</p>	<p>Enter a floating point value in the range of 0 to 10.</p> <p>Enter 0 (zero) to disabled the alarm during the startup period.</p>							
Inhibit Tachometer Fault	<p>Controls whether to inhibit the tachometer fault during the startup period.</p> <p>During startup, the machine may be turning very slowly and cause the XM module to detect a tachometer fault. The Alarm status will state that a tachometer fault condition exists unless the tachometer fault is inhibited.</p>	<table border="1"> <thead> <tr> <th data-bbox="1097 827 1308 898">XM Configuration Utility</th> <th data-bbox="1317 827 1474 898">EDS File</th> </tr> </thead> <tbody> <tr> <td data-bbox="1097 898 1317 970">Check means inhibit tachometer fault</td> <td data-bbox="1317 898 1474 970">Inhibit Tach Fault</td> </tr> <tr> <td data-bbox="1097 970 1317 1077">Clear means do not inhibit tachometer fault</td> <td data-bbox="1317 970 1474 1077">Do not inhibit</td> </tr> </tbody> </table>	XM Configuration Utility	EDS File	Check means inhibit tachometer fault	Inhibit Tach Fault	Clear means do not inhibit tachometer fault	Do not inhibit	
XM Configuration Utility	EDS File								
Check means inhibit tachometer fault	Inhibit Tach Fault								
Clear means do not inhibit tachometer fault	Do not inhibit								
Speed Range Enable	<p>Controls whether the selected 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.</p>	<table border="1"> <thead> <tr> <th data-bbox="1097 1119 1308 1190">XM Configuration Utility</th> <th data-bbox="1317 1119 1474 1190">EDS File</th> </tr> </thead> <tbody> <tr> <td data-bbox="1097 1190 1317 1236">Check to Enable</td> <td data-bbox="1317 1190 1474 1236">Enabled</td> </tr> <tr> <td data-bbox="1097 1236 1317 1283">Clear to Disable</td> <td data-bbox="1317 1236 1474 1283">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> <p>Note: You cannot enable the Speed Range parameter when alarm Measurement is set to "Speed." See page 74.</p>	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
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.	RPM

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 89.	<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	Controls whether the relay must be explicitly reset after the alarm subsides.	<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	
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. Important: True Peak and True Peak-to-Peak signal detection is more sensitive to transients and noise. To avoid false relay trips, it is strongly recommended that the Activation Delay value is greater than the Overall Time Constant value when Signal Detection is set to "True Peak" or "True Peak-to-Peak." Refer to Overall Measurement Parameters on page 63.	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.	Options: A only A or B A and B							
XM Configuration Utility	EDS File												
Activation Logic	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). 											

Relay Parameters

Parameter Name		Description	Options/Comments						
XM Configuration Utility	EDS File	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 No. 1 to 16 Note: You can only select an alarm that is enabled.						
Alarm A/B	Alarm Identifier A/B								
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.	<table border="1"> <thead> <tr> <th>XM Configuration Utility</th> <th>EDS File</th> </tr> </thead> <tbody> <tr> <td>Check = Physical Relay</td> <td>Installed = Physical Relay</td> </tr> <tr> <td>Clear = Virtual Relay</td> <td>Not Installed = Virtual Relay</td> </tr> </tbody> </table>	XM Configuration Utility	EDS File	Check = Physical Relay	Installed = Physical Relay	Clear = Virtual Relay	Not Installed = Virtual Relay
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		<p>Check means failsafe</p> <p>Clear means non-failsafe</p>	Failsafe

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.	<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							
Measurement	Sets the type of measurement and the channel that the 4-20 mA output signal will track.	Options: Ch1 / Ch2 Overall Ch1 / Ch2 Gap Ch1 / Ch2 Band 1–4 Speed Ch1 / Ch2 1X Mag Ch1 / Ch2 2X Mag Ch1 / Ch2 3X Mag Ch1 / Ch2 Not 1X Ch1 / Ch2 Sum Harmonics Acceleration Ch1 / Ch2 gSE Overall						
Min Range	The measured value associated with the 4 mA.	Same measurement unit as Output Data 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 output overshoots the 4 and 20mA 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, the 4-20 mA output produces 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** above).
- The module is in Program mode.
- A transducer fault or tachometer fault occurs that affects the corresponding measurement.

Triggered Trend Parameters

The XM-122 module can collect a triggered trend. A triggered trend is a time-based trend that is collected when a relay on the XM module is activated, or the module receives a trigger event.

Once the triggered trend is configured, the XM-122 continuously monitors the trended measurements. When a trigger occurs, the XM module collects additional data as specified by the **Post Trigger** parameter. The XM-122 can also store the spectrum or waveform at the time of the trigger.

The XM-122 can only store one triggered trend. Unless the triggered trend is latched, the trend data is overwritten with new data when the next trigger occurs.

The triggered trend parameters define the trend data that is collected by the module. Use these parameters to select the measurements included in the

trend records, the interval between trend records, and which relay triggers (activates) the collection of the trend data.

IMPORTANT

The Triggered Trend parameters are not included in the EDS file and cannot be edited using generic configuration tools such as RSNetWorx for DeviceNet.

Triggered Trend Parameters

Parameter Name	Description	Values/Comments
Enable Triggered Trend Measurements	Enables/disables the triggered trend measurements. Select to configure the triggered trend measurements.	Check to enable. Clear to disable.
Select Measurements	Sets the measurements to be collected and stored in the module.	1 to 16 measurements can be selected.
Number of Records	The maximum number of measurement sets that can be collected in the trend buffer. The measurement sets make up the trend data.	The Number of Records is automatically calculated based upon the number of Trended Measurements selected.
Latch Enable	Determines whether the trigger trend is latched or unlatched. Latched means that subsequent triggers are ignored after the initial trigger. This prevents the trend data from being overwritten with new data until the trigger is manually reset (click Reset Trigger button). Unlatched means that the trend data is overwritten with new data every time a trigger occurs.	Check means latched Clear means unlatched
Relay Number	Sets the relay that triggers the trend to be collected.	None means that the trend can only be triggered manually or by a trigger event (for example, XM-440). 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. Note: The relay must be enabled. Refer to Relay Parameters on page 78.
Record Interval	The amount of time between consecutive trend records. Note: If you enter a Record Interval, the Trend Span is automatically updated.	1 to 3600 seconds

Triggered Trend Parameters

Parameter Name	Description	Values/Comments
Trend Span	The total amount of time that can be covered by the trend data (Number of Records x Record Interval). Note: If you edit the Trend Span, the Record Interval is automatically updated.	Seconds
Post Trigger	The percentage of records to be collected once the trigger occurs. For example, if you set Post Trigger to 20%, then 80% of the records in the trend are before the trigger occurs, and 20% of the records in the trend are after the trigger occurs. This allows you to evaluate what happened after the trigger occurred.	0 to 100 Percent
Status	Shows the status of the trend data.	Possible status values: <ul style="list-style-type: none"> • Not collected - No trend data is currently collected. • Collecting - A trigger has occurred and data (including post-trigger data) is being collected. • Collected - A trend has been saved to the buffer and is available to view and upload.
Store Spectrum	Stores the current spectrum data for both Channel 1 and Channel 2 when the trigger occurs.	
Store Waveform	Stores the current waveform data for both Channel 1 and Channel 2 when the trigger occurs.	
View Trend Data	Displays a plot of the collected trend data.	
Reset Trigger	Resets the trigger if Latch enabled is selected. This allows the module to overwrite the previous trend data when the next trigger occurs.	
Manual Trigger	Triggers the module to collect the trend data without relay activation.	
View Collected Data	Displays a plot of the collected spectrum or waveform data.	

SU/CD Trend Parameters

The XM-122 module can collect startup or coast-down trend data when the machine speed passes into a defined speed range. A tachometer input is required to collect the startup/coast-down trend.

The XM-122 collects a startup trend when the machine speed rises through the **Minimum Speed + 8 RPM**, and stops when the machine speed crosses either the **Minimum Speed** or the **Maximum Speed**. The module collects data only when machine speed is increasing. It does not collect data if the machine speed is constant or decreasing.

The XM-122 collects a coast-down trend when the machine speed falls through the **Maximum Speed** - 8 RPM, and stops when the machine speed crosses either the **Minimum Speed** or the **Maximum Speed**. The module collects data when the machine speed is decreasing or increasing during the coast-down trend (for example, a coast-down restart).

The XM-122 can only store one startup/coast-down trend. Unless the startup/coast-down trend is latched, the trend data is overwritten with new data when the next trigger occurs.

The SU/CD trend parameters define the trend data that is collected by the module during the startup or coast-down of a machine. Use these parameters to configure the measurements included in the startup and coast-down trend records, the interval between trend records, and the minimum and maximum speed limits at which record collection starts and stops.

IMPORTANT

The SU/CD Trend parameters are not included in the EDS file and cannot be edited using generic configuration tools such as RSNetWorx for DeviceNet.

SU/CD Trend Parameters

Parameter Name	Description	Values/Comments
Enable SU/CD Trend	Enable/disable the SU/CD trend measurements. Select to configure the SU/CD trend measurements.	Check to enable. Clear to disable.
Select Measurements	Sets the measurements to be collected and stored in the module. Note: The Speed measurement is always included in the startup/coast-down trend.	1 to 16 measurements can be selected.
Number of Records	The maximum number of measurement sets that can be collected in the trend buffer. The measurement sets make up the trend data.	The Number of Records is automatically calculated based upon the number of Trended Measurements selected.
Latch Enable	Determines whether the startup/coast-down trend is latched or unlatched. Latched means that subsequent startup/coast-down trends are ignored after the initial startup/coast-down. This prevents the trend data from being overwritten with new data until the trigger is manually reset (click Reset Trigger button). Unlatched means that the startup/coast-down trend data is overwritten with new data every time the machine speed crosses into the speed range.	Check means latched Clear means unlatched
Record Interval	The change in speed between consecutive records. Note: If you enter a Record Interval, the Maximum Trend Span is automatically updated.	1 to 3600 RPM

SU/CD Trend Parameters

Parameter Name	Description	Values/Comments
Maximum Trend Span	The maximum change in speed that can be covered by the trend data (Number of Records x Record Interval). Note: If you edit the Trend Span, the Record Interval is automatically updated.	RPM
Minimum Speed	The lesser limit of the speed range in which records are collected in the startup/coast-down trend. This value must be less than the Maximum Speed value.	RPM Startup/Coast-down Trend Considerations:
Maximum Speed	The greater limit of the speed range in which records are collected in the startup/coast-down trend. This value must be greater than the Minimum Speed value.	<ul style="list-style-type: none"> The XM module collects a startup trend when the machine speed rises through the Minimum Speed + 8 RPM, and stops when the machine speed crosses either the Minimum Speed or the Maximum Speed. The module collects data only when the machine is increasing. It does not collect data if the machine speed is constant or decreasing. The XM module collects a coast-down trend when the machine speed falls through the Maximum Speed - 8 RPM, and stops when the machine speed crosses either the Minimum Speed or the Maximum Speed. The module collects data when the machine speed is decreasing or increasing during a coast-down trend (for example, a coast-down restart).
Status	Shows the status of the trend data.	Possible status values: <ul style="list-style-type: none"> Not collected - No trend data is currently collected. Collecting - A trigger has occurred and data is being collected. Collected - A trend has been saved to the buffer and is available to view or upload.
View Trend Data	Displays a plot of the collected trend data.	
Reset Trigger	Resets the trigger if Latch enabled is selected. This allows the module to overwrite the previous trend data when the machine speed crosses into the speed range.	

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-122 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 has established the Poll connection with the XM-122 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 103.

To close an existing Poll connection with other master devices, remove the XM-122 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.
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 114 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 Assembly Instance 105 Assembly Instance 106 Custom Assembly Refer to Poll Message Format on page 107 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 107 for more information.

Data Parameters

The Data parameters are used to view the measured values of the input channels and the 4–20 mA outputs, 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
XM Configuration Utility	EDS File	States whether a transducer fault exists on the associated channel. If a fault exists, the overall and gap values may not be accurate.	Possible status values: No Fault Fault
Transducer Fault	Transducer Status		
XM Configuration Utility	EDS File	Shows the measured average DC offset of the transducer signal. This value is compared with Fault High and Fault Low to determine whether the transducer is working properly.	
DC Gap Voltage	Measured DC Bias		
Gap Value (EDS File only)		Shows the measured transducer gap value.	
XM Configuration Utility	EDS File	Shows the measured sum harmonics value.	Sum Harmonics Requirements: <ul style="list-style-type: none"> • The tachometer must be enabled (Pulses Per Revolution set to 1 or more), and a tachometer signal must be present. • Sampling Mode must be set to "Synchronous."
Sum Harmonics	Sum Harmonics Value		
Overall		Shows the measured overall value.	
Band Measurement Status (XM Serial Configuration Utility only)		States whether a fault condition exists on the associated channel. If a fault exists, the band measurements may not be accurate.	Possible status values: No Fault Fault
XM Configuration Utility	EDS File	Shows the measured band value.	
Band Measurement	Band Measured Value		

Monitor Data Parameters

Parameter Name		Description	Values/Comments
Not 1X and Vector Status (XM Serial Configuration Utility only)		States whether a fault condition exists on the associated channel. If a fault exists, the not 1X and vector measurements 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 machine speed changes too fast for the tracking algorithm to keep up or if the frequency of FMAX goes outside the range of 10 to 5000Hz 	Possible status values: No Fault Fault
Not 1X Value		Shows the magnitude of the vibration excluding the vibration at the machine speed.	The tachometer must be enabled (Pulses Per Revolution set to 1 or more), and a tachometer signal must be present.
1X Magnitude		The magnitude of the vibration at the machine speed.	
1X Phase		The phase of the vibration at the machine speed.	
2X Magnitude		The magnitude of the vibration at two times the machine speed.	
2X Phase		The phase of the vibration at two times the machine speed.	
3X Magnitude		The magnitude of the vibration at three times the machine speed.	
Ch1/Ch2 Spectrum/Waveform Status (XM Serial Configuration Utility only)		States whether a fault condition exists on the associated channel. If a fault exists, the spectrum/waveform data may not be accurate. The following conditions can cause a fault: <ul style="list-style-type: none"> • a transducer fault on the associated channel • Sampling Mode set to "Synchronous" and there is no tachometer signal or there is a fault on the tachometer channel 	Possible status values: No Fault Fault
Get Waveform Data Only (XM Serial Configuration Utility only)		Controls whether the spectrum is calculated by the Configuration Utility or the Vibration module.	Check to upload only waveform data from the module. The Configuration Utility calculates and displays the spectrum using the collected waveform data. Clear to upload both the waveform and spectrum data from the module.
XM Configuration Utility	EDS File	States whether a fault condition (no tachometer signal or transducer fault) exists on the tachometer channel. If a fault exists, the speed value may not be accurate.	Possible status values: No Fault Fault
Speed Status	Transducer 3 Status		

Monitor Data Parameters

Parameter Name		Description	Values/Comments
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.	The tachometer must be enabled (Pulses Per Revolution set to 1 or more).
Xdcr DC Bias	(Transducer 3 Measured DC Bias		
Speed Value		Shows the measured speed value.	
Peak Speed		Shows the greatest measured Speed Value (positive or negative) since the most recent reset.	
Acceleration Measured Value		Show the measured acceleration value. The acceleration is the rate of change of the Speed Value .	
4–20 mA Output A and B (XM Serial Configuration Utility only)		Shows the current output value in the range of 4.0 to 20.0 mA.	
gSE Status (XM Serial Configuration Utility only)		States whether a fault condition exists on either channel. If a fault exists, the gSE overall value may not be accurate.	Possible status values: No Fault Fault
gSE Overall		Shows the measured gSE overall value.	

Alarm and Relay Status Parameters

Alarm and Relay Status Parameters

Parameter Name	Description	Values/Comments
Alarm Status	States the current status of the alarm.	<p>Possible status values:</p> <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.
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 103 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

Specifications

The Appendix lists the technical specifications for the XM-122 module.

XM-122 Technical Specifications

Product Feature	Specification
<p>Communications</p> <p style="text-align: right;">DeviceNet</p> <p style="text-align: right;">Side Connector</p> <p style="text-align: right;">Serial</p>	<p>Standard DeviceNet protocol for all functions <i>NOTE: The XM-122 uses only the DeviceNet protocol, not power. Module power is provided independently.</i> Available Electronic Data Sheet (EDS) file provides support for most DeviceNet compliant systems Baud rate automatically set by bus master to 125kb, 250kb, 500kb Configurable I/O Poll Response message helps optimize space utilization within scanner input tables Selectable Poll Response Assembly Selectable Poll Response Size (bytes)</p> <p>All XM measurement and relay modules include side connectors that allow interconnecting adjacent modules, thereby simplifying the external wiring requirements. The interconnect provides primary power, DeviceNet communication, and the circuits necessary to support expansion modules, such as the XM-441 Expansion Relay module.</p> <p>RS-232 via mini-connector or terminal base unit Baud rate fixed at 19200. <i>NOTE: Local configuration via Serial Configuration Utility.</i></p>

XM-122 Technical Specifications

Product Feature		Specification
Inputs	2 Channels	Eddy current transducer signals Accelerometer signals Voltage signals from any dynamic measurement device, such as a velocity or pressure transducer
	Transducer Power	Constant voltage (+24V dc)* Constant current (4.5 mA ± 20% from +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 100 kohms
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	Each output is independently programmed to represent any measured parameter, from either channel. Two isolated outputs 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 Setpoint Multiplier -yellow Relay - red

XM-122 Technical Specifications

Product Feature	Specification
Signal Conditioning	
Sampling Mode	Asynchronous Synchronous
Frequency Range	1 Hz to 20 kHz
Resolution	A/D Conversion: 24 bits Dynamic Range: <80 dBfs (0.01% fs), -90 dBfs (typical) FFT Lines / Waveform block size: 100 / 256 200 / 512 400 / 1024 800 / 2048
Amplitude Range	Dependent on sensitivity
Integration	Two levels provided, first in hardware, second in firmware
Averaging	Any number of averages may be specified If sampling mode is Asynchronous: Averaging performed on the spectra Synchronous: Averaging performed on the waveforms
Low Pass Filters	Independently configured per channel Spectra FMAX: 10 to 2000 Hz gSE Spectra FMAX: 10 to 5000 Hz Optional Overall Measurement LP filter: 200 to 2000 Hz Roll Off: -24 dB per octave
High Pass Filters	Independently configured per channel Integration Off: 1, 5, 10, 40, 1000 Hz Roll Off: -30 dB per octave for the 1 Hz HPF, otherwise -24 dB per octave Integration On: 5, 10, 40, 1000 Hz Roll Off: Single Integration: -30 dB per octave for the 5Hz HPF, otherwise -24 dB per octave Double Integration: -42 dB per octave for the 5 Hz HPF, otherwise -24 dB per octave gSE HPF: 200, 500, 1000, 2000, 5000 Hz Roll Off: -12 dB per octave
Measured Units	g um ips volt mm/s psi mils Pa

XM-122 Technical Specifications

Product Feature		Specification
Complex Data		Spectra (synchronous or asynchronous) gSE Spectra Waveform (synchronous or asynchronous) Simultaneous Waveforms (synchronous)
Measured Parameters	Overall	gSE Overall RMS Peak (true or calculated) Peak to Peak (true or calculated)
	4 (overlapping) Bands Per Channel (Hz or Order based)	Band overall, or Max peak in band
	Gap (or transducer bias voltage)	
	Speed	
	Acceleration	
	Orders	Magnitude: 1x, 2x, 3x Phase: 1x, 2x
	Not 1x	
	Sum Harmonics	Sum Harmonics is the sum of all harmonics from a user-defined first order to the maximum order in the spectra.
Data Buffers		
	Delta Time Buffer	Number of Records: 2048 Delta Time Interval: 1 to 3600 seconds Trigger Mode: Relay on the XM-122 module is activated, or by a trigger signal (for example, DeviceNet command from a controller or host).
	Delta RPM Buffer	Number of Records: 512 Delta Speed Interval: 1 to 3600 RPM Trigger Mode: Startup collects data in increasing rpm direction only; Coast-down collects data in both increasing and decreasing directions. <i>Note: The data collected in the buffer is user defined and may contain up to 16 of the Measured Parameters specified above.</i>
	Spectra or Waveform	Saved upon same trigger as Delta Time Buffer

XM-122 Technical Specifications

Product Feature	Specification
Alarms	
Number	16 alarm and danger pairs
Alarm Parameters	Any measured parameter
Operators	Greater than Less than Inside range Outside range
Hysteresis	User configurable in software
Startup Inhibit/Setpoint Multiplication	Period: 0 to 1092 minutes, adjustable in 0.1 minute increments Inhibit/multiplication function: Multiply by N (0 to 10, 0 = Disarm)
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-122 Technical Specifications

Product Feature	Specification
Relays	
Number	Single on-board relay, two sets of contacts - DPDT (2 Form C) Four additional relays when connected 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, 62.5V A <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
Peak Speed Capture	The XM-122 retains the value of the greatest speed observed since the module power was cycled or the "peak speed" value was manually reset.

XM-122 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-122 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 105 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 105 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 105 to transition XM modules to Run mode.

XM Services

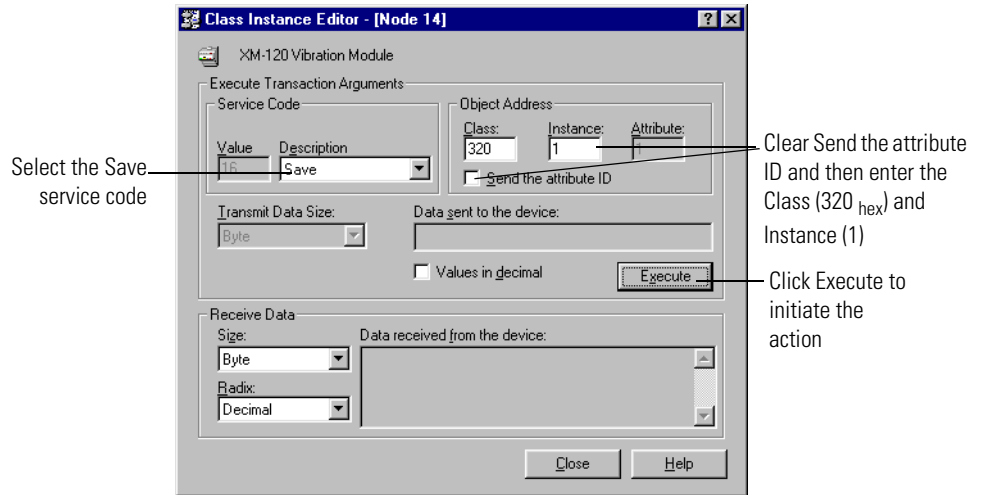
The table below defines the services supported by the XM modules. The table includes the service codes, classes, instances, and attributes by their appropriate hexadecimal codes. Use the Class Instance Editor in RSNetWorx to execute these services, as illustrated in the example below.

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_{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	Order-base bands are prohibited 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.

XM-122 I/O Message Formats

The XM-122 module supports Poll, Change of State (COS), and Bit-Strobe 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. The Bit-Strobe message is used by a master device to send a trigger event to all the XM slaves on the network.

Poll Message Format

The XM-122 Poll request message contains no data. The Poll response message can contain up to 31 REAL values for a total of 124 bytes of data.

The XM-122 module provides six different pre-defined (static) data formats of the Poll response, as defined in Assembly instance 101–106. 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 124 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 88 for details.

The Poll response data can also be requested explicitly through Assembly Object (Class ID 0x4), Instance 101 (0x65) - 106 (0x6A), Data Attribute (3).

The following tables show the static data format of Assembly instances 101–106.

XM-122 Assembly Instance 101 Data Format

Byte	Definition
0–3	Channel 1 Overall measurement value
4–7	Channel 2 Overall measurement value
8–11	Channel 1 Gap measurement value
12–15	Channel 2 Gap measurement value
16–19	Current Speed measurement value
20–23	Peak Speed measurement value
24–27	Channel 1 Band 1 measurement value
28–31	Channel 2 Band 1 measurement value
32–35	Channel 1 Band 2 measurement value
36–39	Channel 2 Band 2 measurement value
40–43	Channel 1 Band 3 measurement value
44–47	Channel 2 Band 3 measurement value
48–51	Channel 1 Band 4 measurement value
52–55	Channel 2 Band 4 measurement value
56–59	Channel 1 1X Vector Magnitude measurement value
60–63	Channel 1 1X Vector Phase measurement value
64–67	Channel 2 1X Vector Magnitude measurement value
68–71	Channel 2 1X Vector Phase measurement value
72–75	Channel 1 2X Vector Magnitude measurement value
76–79	Channel 1 2X Vector Phase measurement value
80–83	Channel 2 2X Vector Magnitude measurement value
84–87	Channel 2 2X Vector Phase measurement value
88–91	Channel 1 3X Vector Magnitude measurement value
92–95	Channel 2 3X Vector Magnitude measurement value
96–99	Channel 1 Not 1X measurement value
100–103	Channel 2 Not 1X measurement value
104–107	Channel 1 gSE Overall measurement value
108–111	Channel 2 gSE Overall measurement value
112–115	Channel 1 Sum Harmonics measurement value
116–119	Channel 2 Sum Harmonics measurement value
120–123	Acceleration measurement value

XM-122 Assembly Instance 102 Data Format

Byte	Definition
0–3	Current Speed measurement value
4–7	Channel 1 Overall measurement value
8–11	Channel 1 gSE Overall measurement value
12–15	Channel 1 Band 1 measurement value
16–19	Channel 1 Band 2 measurement value
20–23	Channel 1 1X Vector Magnitude measurement value
24–27	Channel 1 2X Vector Magnitude measurement value
28–31	Channel 1 3X Vector Magnitude measurement value
32–35	Channel 1 Band 3 measurement value
36–39	Channel 1 Band 4 measurement value
40–43	Channel 1 1X Vector Phase measurement value
44–47	Channel 1 2X Vector Phase measurement value
48–51	Channel 1 Gap measurement value
52–55	Channel 1 Not 1X measurement value
56–59	Channel 1 Sum Harmonics measurement value
60–63	Acceleration measurement value
64–67	Channel 2 Overall measurement value
68–71	Channel 2 gSE Overall measurement value
72–75	Channel 2 Band 1 measurement value
76–79	Channel 2 Band 2 measurement value
80–83	Channel 2 1X Vector Magnitude measurement value
84–87	Channel 2 2X Vector Magnitude measurement value
88–91	Channel 2 3X Vector Magnitude measurement value
92–95	Channel 2 Band 3 measurement value
96–99	Channel 2 Band 4 measurement value
100–103	Channel 2 1X Vector Phase measurement value
104–107	Channel 2 2X Vector Phase measurement value
108–111	Channel 2 Gap measurement value
112–115	Channel 2 Not 1X measurement value
116–119	Channel 2 Sum Harmonics measurement value
120–123	Peak Speed measurement value

XM-122 Assembly Instance 103 Data Format

Byte	Definition
0–3	Channel 1 Band 1 measurement value
4–7	Channel 2 Band 1 measurement value
8–11	Channel 1 Band 2 measurement value
12–15	Channel 2 Band 2 measurement value
16–19	Channel 1 Overall measurement value
20–23	Channel 2 Overall measurement value
24–27	Channel 1 Band 3 measurement value
28–31	Channel 2 Band 3 measurement value
32–35	Channel 1 Band 4 measurement value
36–39	Channel 2 Band 4 measurement value
40–43	Channel 1 Gap measurement value
44–47	Channel 2 Gap measurement value
48–51	Channel 1 gSE Overall measurement value
52–55	Channel 2 gSE Overall measurement value
56–59	Channel 1 Sum Harmonics measurement value
60–63	Channel 2 Sum Harmonics measurement value
64–67	Channel 1 Not 1X measurement value
68–71	Channel 2 Not 1X measurement value
72–75	Channel 1 1X Vector Phase measurement value
76–79	Channel 2 1X Vector Phase measurement value
80–83	Channel 1 2X Vector Phase measurement value
84–87	Channel 2 2X Vector Phase measurement value
88–91	Channel 1 1X Vector Magnitude measurement value
92–95	Channel 2 1X Vector Magnitude measurement value
96–99	Channel 1 2X Vector Magnitude measurement value
100–103	Channel 2 2X Vector Magnitude measurement value
104–107	Channel 1 3X Vector Magnitude measurement value
108–111	Channel 2 3X Vector Magnitude measurement value
112–115	Current Speed measurement value
116–119	Peak Speed measurement value
120–123	Acceleration measurement value

XM-122 Assembly Instance 104 Data Format

Byte	Definition
0–3	Acceleration measurement value
4–7	Current Speed measurement value
8–11	Channel 1 Overall measurement value
12–15	Channel 2 Overall measurement value
16–19	Channel 1 1X Vector Magnitude measurement value
20–23	Channel 2 1X Vector Magnitude measurement value
24–27	Channel 1 Gap measurement value
28–31	Channel 2 Gap measurement value
32–35	Channel 1 2X Vector Magnitude measurement value
36–39	Channel 2 2X Vector Magnitude measurement value
40–43	Channel 1 1X Vector Phase measurement value
44–47	Channel 2 1X Vector Phase measurement value
48–51	Channel 1 Band 1 measurement value
52–55	Channel 2 Band 1 measurement value
56–59	Channel 1 Band 2 measurement value
60–63	Channel 2 Band 2 measurement value
64–67	Channel 1 Not 1X measurement value
68–71	Channel 2 Not 1X measurement value
72–75	Channel 1 Band 3 measurement value
76–79	Channel 2 Band 3 measurement value
80–83	Channel 1 Band 4 measurement value
84–87	Channel 2 Band 4 measurement value
88–91	Channel 1 gSE Overall measurement value
92–95	Channel 2 gSE Overall measurement value
96–99	Channel 1 3X Vector Magnitude measurement value
100–103	Channel 2 3X Vector Magnitude measurement value
104–107	Channel 1 2X Vector Phase measurement value
108–111	Channel 2 2X Vector Phase measurement value
112–115	Channel 1 Sum Harmonics measurement value
116–119	Channel 2 Sum Harmonics measurement value
120–123	Peak Speed measurement value

XM-122 Assembly Instance 105 Data Format

Byte	Definition
0–3	Channel 1 gSE Overall measurement value
4–7	Channel 2 gSE Overall measurement value
8–11	Channel 1 Overall measurement value
12–15	Channel 2 Overall measurement value
16–19	Current Speed measurement value
20–23	Acceleration measurement value
24–27	Channel 1 1X Vector Magnitude measurement value
28–31	Channel 2 1X Vector Magnitude measurement value
32–35	Channel 1 2X Vector Magnitude measurement value
36–39	Channel 2 2X Vector Magnitude measurement value
40–43	Channel 1 Band 1 measurement value
44–47	Channel 2 Band 1 measurement value
48–51	Channel 1 Band 2 measurement value
52–55	Channel 2 Band 2 measurement value
56–59	Channel 1 Band 3 measurement value
60–63	Channel 2 Band 3 measurement value
64–67	Channel 1 Band 4 measurement value
68–71	Channel 2 Band 4 measurement value
72–75	Channel 1 3X Vector Magnitude measurement value
76–79	Channel 2 3X Vector Magnitude measurement value
80–83	Channel 1 1X Vector Phase measurement value
84–87	Channel 2 1X Vector Phase measurement value
88–91	Channel 1 Not 1X measurement value
92–95	Channel 2 Not 1X measurement value
96–99	Channel 1 Sum Harmonics measurement value
100–103	Channel 2 Sum Harmonics measurement value
104–107	Channel 1 2X Vector Phase measurement value
108–111	Channel 2 2X Vector Phase measurement value
112–115	Peak Speed measurement value
116–119	Channel 1 Gap measurement value
120–123	Channel 2 Gap measurement value

XM-122 Assembly Instance 106 Data Format

Byte	Definition
0–3	Channel 1 1X Vector Magnitude measurement value
4–7	Channel 2 1X Vector Magnitude measurement value
8–11	Channel 1 2X Vector Magnitude measurement value
12–15	Channel 2 2X Vector Magnitude measurement value
16–19	Current Speed measurement value
20–23	Channel 1 Overall measurement value
24–27	Channel 2 Overall measurement value
28–31	Channel 1 Band 1 measurement value
32–35	Channel 2 Band 1 measurement value
36–39	Channel 1 Band 2 measurement value
40–43	Channel 2 Band 2 measurement value
44–47	Channel 1 Band 3 measurement value
48–51	Channel 2 Band 3 measurement value
52–55	Channel 1 Band 4 measurement value
56–59	Channel 2 Band 4 measurement value
60–63	Channel 1 Sum Harmonics measurement value
64–67	Channel 2 Sum Harmonics measurement value
68–71	Channel 1 Not 1X measurement value
72–75	Channel 2 Not 1X measurement value
76–79	Channel 1 1X Vector Phase measurement value
80–83	Channel 2 1X Vector Phase measurement value
84–87	Channel 1 2X Vector Phase measurement value
88–91	Channel 2 2X Vector Phase measurement value
92–95	Channel 1 3X Vector Magnitude measurement value
96–99	Channel 2 3X Vector Magnitude measurement value
100–103	Channel 1 Gap measurement value
104–107	Channel 2 Gap measurement value
108–111	Peak Speed measurement value
112–115	Channel 1 gSE Overall measurement value
116–119	Channel 2 gSE Overall measurement value
120–123	Acceleration measurement value

COS Message Format

The XM-122 COS message contains eight 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-122 COS Message Format

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Relay 1 Status	Setpoint Multiplier Status	Alarm 2 Status		Alarm 1 Status			
1	Relay 2 Status	Reserved	Alarm 4 Status		Alarm 3 Status			
2	Relay 3 Status	Reserved	Alarm 6 Status		Alarm 5 Status			
3	Relay 4 Status	Reserved	Alarm 8 Status		Alarm 7 Status			
4	Relay 5 Status	Reserved	Alarm 10 Status		Alarm 9 Status			
5	Reserved	Reserved	Alarm 12 Status		Alarm 11 Status			
6	Reserved	Reserved	Alarm 14 Status		Alarm 13 Status			
7	Reserved	Reserved	Alarm 16 Status		Alarm 15 Status			

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

Setpoint Multiplier Status Descriptions

Setpoint Multiplier Status Value	Description
0	Not Activated
1	Activated

Relay Status Descriptions

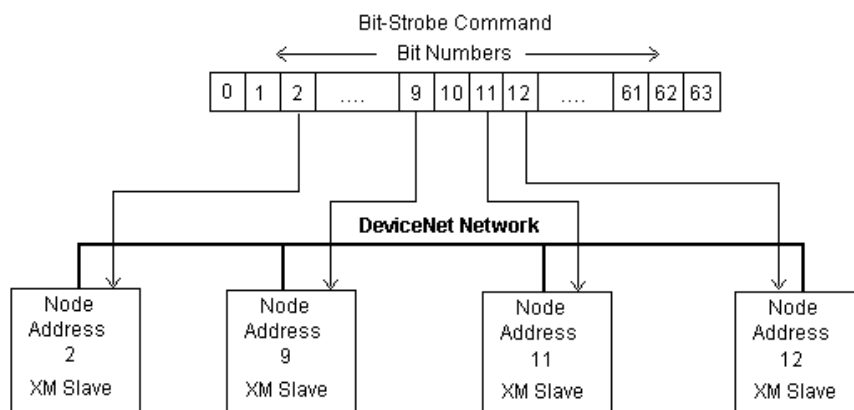
Relay Status Value	Description
0	Not Activated
1	Activated

Bit-Strobe Message Format

The Bit-Strobe command sends one bit of output data to each XM slave whose node address appears in the master's scanlist.

The Bit-Strobe command message contains a bit string of 64 bits (8 bytes) of output data, one output bit per node address on the network. One bit is assigned to each node address supported on the network (0...63) as shown in Figure B.1.

Figure B.1 Bit-Strobe Command



The XM modules use the bit received in a Bit-Strobe connection as a trigger event. When the bit number corresponding to the XM module's node address is set, the XM module will collect the triggered trend data.

Note that the XM modules do not send data in the Bit-Strobe response.

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 (see page 83)
 - All SU/CD Trend related parameters (see page 85)
 - Custom Assembly structure (see page 88)
- 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 XM-122 module.

For information about	See page
Identity Object (Class ID 01H)	120
DeviceNet Object (Class ID 03H)	122
Assembly Object (Class ID 04H)	123
Connection Object (Class ID 05H)	133
Discrete Input Point Object (Class ID 08H)	135
Analog Input Point (Class ID 0AH)	136
Parameter Object (Class ID 0FH)	138
Acknowledge Handler Object (Class ID 2BH)	147
Alarm Object (Class ID 31DH)	148
Band Measurement Object (Class ID 31EH)	151
Channel Object (Class ID 31FH)	153
Device Mode Object (Class ID 320H)	156
Overall Measurement Object (Class ID 322H)	158
Relay Object (Class ID 323H)	161
Spectrum Waveform Measurement Object (Class ID 324H)	163
Speed Measurement Object (Class ID 325H)	170
Tachometer Channel Object (Class ID 326H)	171
Transducer Object (Class ID 328H)	173
Vector Measurement Object (Class ID 329H)	174
4-20 mA Output Object (Class ID 32AH)	176

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	18 (0x12)
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-122 gSE Vibration 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 04_H)

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 XM-122 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 - Alarm and Relay Status

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	Set Point Multiplier	Alarm 2 Status			Alarm 1 Status		
1	Relay 2 Status	0	Alarm 4 Status			Alarm 3 Status		
2	Relay 3 Status	0	Alarm 6 Status			Alarm 5 Status		

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
3	Relay 4 Status	0	Alarm 8 Status			Alarm 7 Status		
4	Relay 5 Status	0	Alarm 10 Status			Alarm 9 Status		
5	0	0	Alarm 12 Status			Alarm 11 Status		
6	0	0	Alarm 14 Status			Alarm 13 Status		
7	0	0	Alarm 16 Status			Alarm 15 Status		

Instance 101 - Measurement Values

This assembly instance can be selected to be sent in response to an I/O Poll Request from a Master. This instance is the default Poll response selection for firmware revision 3 or later, and it is the only available Poll response for firmware revisions 1 and 2.

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	Channel 1 Overall value							
4 - 7	Channel 2 Overall value							
8 - 11	Channel 1 Gap value (Analog Input Point (AIP) Object Instance #1)							
12 - 15	Channel 2 Gap value (AIP Object Instance #2)							
16 - 19	Speed value							
20 - 23	Maximum Speed value							
24 - 27	Channel 1 Band 1 value							
28 - 31	Channel 2 Band 1 value							
32 - 35	Channel 1 Band 2 value							
36 - 39	Channel 2 Band 2 value							
40 - 43	Channel 1 Band 3 value							
44 - 47	Channel 2 Band 3 value							
48 - 51	Channel 1 Band 4 value							
52 - 55	Channel 2 Band 4 value							
56 - 59	Channel 1 Vector 1 Magnitude value							
60 - 63	Channel 1 Vector 1 Phase value							
64 - 67	Channel 2 Vector 1 Magnitude value							
68 - 71	Channel 2 Vector 1 Phase value							
72 - 75	Channel 1 Vector 2 Magnitude value							
76 - 79	Channel 1 Vector 2 Phase value							
80 - 83	Channel 2 Vector 2 Magnitude value							

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
84 - 87	Channel 2 Vector 2 Phase value							
88 - 91	Channel 1 Vector 3 Magnitude value							
92 - 95	Channel 2 Vector 3 Magnitude value							
96 - 99	Channel 1 Not 1X value (AIP Object Instance #3)							
100 - 103	Channel 2 Not 1X value (AIP Object Instance #4)							
104 - 107	Channel 1 gSE Overall value (AIP Object Instance #5)							
108 - 111	Channel 2 gSE Overall value (AIP Object Instance #6)							
112 - 115	Channel 1 Sum Harmonics value (AIP Object Instance #7)							
116 - 119	Channel 2 Sum Harmonics (AIP Object Instance #8)							
120 - 123	Acceleration value							

Instance 102 - Measurement Values

This assembly instance can be selected to be sent in response to an I/O Poll request from a Master. This instance includes all of the channel 1 parameters first.

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	Speed value							
4 - 7	Channel 1 Overall value							
8 - 11	Channel 1 gSE Overall value (AIP Object Instance #5)							
12 - 15	Channel 1 Band 1 value							
16 - 19	Channel 1 Band 2 value							
20 - 23	Channel 1 Vector 1 Magnitude value							
24 - 27	Channel 1 Vector 2 Magnitude value							
28 - 31	Channel 1 Vector 3 Magnitude value							
32 - 35	Channel 1 Band 3 value							
36 - 39	Channel 1 Band 4 value							
40 - 43	Channel 1 Vector 1 Phase value							
44 - 47	Channel 1 Vector 2 Phase value							
48 - 51	Channel 1 Gap value (AIP Object Instance #1)							
52 - 55	Channel 1 Not 1X value (AIP Object Instance #3)							
56 - 59	Channel 1 Sum Harmonics value (AIP Object Instance #7)							
60 - 63	Acceleration value							
64 - 67	Channel 2 Overall value							
68 - 71	Channel 2 gSE Overall value (AIP Object Instance #6)							

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
72 - 75	Channel 2 Band 1 value							
76 - 79	Channel 2 Band 2 value							
80 - 83	Channel 2 Vector 1 Magnitude value							
84 - 87	Channel 2 Vector 2 Magnitude value							
88 - 91	Channel 2 Vector 3 Magnitude value							
92 - 95	Channel 2 Band 3 value							
96 - 99	Channel 2 Band 4 value							
100 - 103	Channel 2 Vector 1 Phase value							
104 - 107	Channel 2 Vector 2 Phase value							
108 - 111	Channel 2 Gap value (AIP Object Instance #2)							
112 - 115	Channel 2 Not 1X value (AIP Object Instance #4)							
116 - 119	Channel 2 Sum Harmonics value (AIP Object Instance #8)							
120 - 123	Maximum Speed value							

Instance 103 - Measurement Values

This assembly instance can be selected to be sent in response to an I/O Poll request from a Master. This instance includes all of the non-speed related measurements first.

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 Band 1 value							
4 - 7	Channel 2 Band 1 value							
8 - 11	Channel 1 Band 2 value							
12 - 15	Channel 2 Band 2 value							
16 - 19	Channel 1 Overall value							
20 - 23	Channel 2 Overall value							
24 - 27	Channel 1 Band 3 value							
28 - 31	Channel 2 Band 3 value							
32 - 35	Channel 1 Band 4 value							
36 - 39	Channel 2 Band 4 value							
40 - 43	Channel 1 Gap value (AIP Object Instance #1)							
44 - 47	Channel 2 Gap value (AIP Object Instance #2)							
48 - 51	Channel 1 gSE Overall value (AIP Object Instance #5)							
52 - 55	Channel 2 gSE Overall value (AIP Object Instance #6)							
56 - 59	Channel 1 Sum Harmonics value (AIP Object Instance #7)							

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
60 - 63	Channel 2 Sum Harmonics value (AIP Object Instance #8)							
64 - 67	Channel 1 Not 1X value (AIP Object Instance #3)							
68 - 71	Channel 2 Not 1X value (AIP Object Instance #4)							
72 - 75	Channel 1 Vector 1 Phase value							
76 - 79	Channel 2 Vector 1 Phase value							
80 - 83	Channel 1 Vector 2 Phase value							
84 - 87	Channel 2 Vector 2 Phase value							
88 - 91	Channel 1 Vector 1 Magnitude value							
92 - 95	Channel 2 Vector 1 Magnitude value							
96 - 99	Channel 1 Vector 2 Magnitude value							
100 - 103	Channel 2 Vector 2 Magnitude value							
104 - 107	Channel 1 Vector 3 Magnitude value							
108 - 111	Channel 2 Vector 3 Magnitude value							
112 - 115	Speed value							
116 - 119	Maximum Speed value							
120 - 123	Acceleration value							

Instance 104 - Measurement Values

This assembly instance can be selected to be sent in response to an I/O Poll request from a Master. This instance prioritizes gap and various speed measurements.

Table C.14 Instance 104 Data Format (Measurement Values Assembly)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0 - 3	Acceleration value							
4 - 7	Speed value							
8 - 11	Channel 1 Overall value							
12 - 15	Channel 2 Overall value							
16 - 19	Channel 1 Vector 1 Magnitude value							
20 - 23	Channel 2 Vector 1 Magnitude value							
24 - 27	Channel 1 Gap value (AIP Object Instance #1)							
28 - 31	Channel 2 Gap value (AIP Object Instance #2)							
32 - 35	Channel 1 Vector 2 Magnitude value							
36 - 39	Channel 2 Vector 2 Magnitude value							
40 - 43	Channel 1 Vector 1 Phase value							
44 - 47	Channel 2 Vector 1 Phase value							

Table C.14 Instance 104 Data Format (Measurement Values Assembly)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
48 - 51	Channel 1 Band 1 value							
52 - 55	Channel 2 Band 1 value							
56 - 59	Channel 1 Band 2 value							
60 - 63	Channel 2 Band 2 value							
64 - 67	Channel 1 Not 1X value (AIP Object Instance #3)							
68 - 71	Channel 2 Not 1X value (AIP Object Instance #4)							
72 - 75	Channel 1 Band 3 value							
76 - 79	Channel 2 Band 3 value							
80 - 83	Channel 1 Band 4 value							
84 - 87	Channel 2 Band 4 value							
88 - 91	Channel 1 gSE Overall value (AIP Object Instance #5)							
92 - 95	Channel 2 gSE Overall value (AIP Object Instance #6)							
96 - 99	Channel 1 Vector 3 Magnitude value							
100 - 103	Channel 2 Vector 3 Magnitude value							
104 - 107	Channel 1 Vector 2 Phase value							
108 - 111	Channel 2 Vector 2 Phase value							
112 - 115	Channel 1 Sum Harmonics value (AIP Object Instance #7)							
116 - 119	Channel 2 Sum Harmonics value (AIP Object Instance #8)							
120 - 123	Maximum Speed value							

Instance 105 - Measurement Values

This Assembly instance can be selected to be sent in response to an I/O Poll request from a Master.

Table C.15 Instance 105 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 gSE Overall value (AIP Object Instance #5)							
4 - 7	Channel 2 gSE Overall value (AIP Object Instance #6)							
8 - 11	Channel 1 Overall value							
12 - 15	Channel 2 Overall value							
16 - 19	Speed value							
20 - 23	Acceleration value							
24 - 27	Channel 1 Vector 1 Magnitude value							
28 - 31	Channel 2 Vector 1 Magnitude value							
32 - 35	Channel 1 Vector 2 Magnitude value							
36 - 39	Channel 2 Vector 2 Magnitude value							

Table C.15 Instance 105 Data Format (Measurement Values Assembly)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
40 - 43	Channel 1 Band 1 value							
44 - 47	Channel 2 Band 1 value							
48 - 51	Channel 1 band 2 value							
52 - 55	Channel 2 Band 2 value							
56 - 59	Channel 1 Band 3 value							
60 - 63	Channel 2 Band 3 value							
64 - 67	Channel 1 Band 4 value							
68 - 71	Channel 2 Band							
72 - 75	Channel 1 Vector 3 Magnitude value							
76 - 79	Channel 2 Vector 3 Magnitude value							
80 - 83	Channel 1 Vector 1 Phase value							
84 - 87	Channel 2 Vector 1 Phase value							
88 - 91	Channel 1 Not 1X value (AIP Object Instance #3)							
92 - 95	Channel 2 Not 1X value (AIP Object Instance #4)							
96 - 99	Channel 1 Sum Harmonics value (AIP Object Instance #7)							
100 - 103	Channel 2 Sum Harmonics value (AIP Object Instance #8)							
104 - 107	Channel 1 Vector 2 Phase value							
108 - 111	Channel 2 Vector 2 Phase value							
112 - 115	Maximum Speed value							
116 - 119	Channel 1 Gap value (AIP Object Instance #1)							
120 - 123	Channel 2 Gap value (AIP Object Instance #2)							

Instance 106 - Measurement Values

This Assembly instance can be selected to be sent in response to an I/O Poll request from a Master. This instance includes some Vector Magnitude measurements first.

Table C.16 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 Vector 1 Magnitude value							
4 - 7	Channel 2 Vector 1 Magnitude value							
8 - 11	Channel 1 Vector 2 Magnitude value							
12 - 15	Channel 2 Vector 2 Magnitude value							
16 - 19	Speed value							
20 - 23	Channel 1 Overall value							
24 - 27	Channel 2 Overall value							

Table C.16 Instance 103 Data Format (Measurement Values Assembly)

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
28 - 31	Channel 1 Band 1 value							
32 - 35	Channel 2 Band 1 value							
36 - 39	Channel 1 Band 2 value							
40 - 43	Channel 2 Band 2 value							
44 - 47	Channel 1 Band 3 value							
48 - 51	Channel 2 Band 3 value							
52 - 55	Channel 1 Band 4 value							
56 - 59	Channel 2 Band 4 value							
60 - 63	Channel 1 Sum Harmonics value (AIP Object Instance #7)							
64 - 67	Channel 2 Sum Harmonics value (AIP Object Instance #8)							
68 - 71	Channel 1 Not 1X value (AIP Object Instance #3)							
72 - 75	Channel 2 Not 1X value (AIP Object Instance #4)							
76 - 79	Channel 1 Vector 1 Phase value							
80 - 83	Channel 2 Vector 1 Phase value							
84 - 87	Channel 1 Vector 2 Phase value							
88 - 91	Channel 2 Vector 2 Phase value							
92 - 95	Channel 1 Vector 3 Magnitude value							
96 - 99	Channel 2 Vector 3 Magnitude value							
100 - 103	Channel 1 Gap value (AIP Object Instance #1)							
104 - 107	Channel 2 Gap value (AIP Object Instance #2)							
108 - 111	Maximum Speed value							
112 - 115	Channel 1 gSE Overall value (AIP Object Instance #5)							
116 - 119	Channel 2 gSE Overall value (AIP Object Instance #6)							
120 - 123	Acceleration 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.17 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 - 16	Alarm Enable	4	BOOL
21 1D 03 24 ii 30 05	Alarm	31D _h	1 - 16	Type	5	USINT
21 1D 03 24 ii 30 07	Alarm	31D _h	1 - 16	Condition	7	USINT
21 1D 03 24 ii 30 08	Alarm	31D _h	1 - 16	Alert Threshold (High)	8	REAL
21 1D 03 24 ii 30 09	Alarm	31D _h	1 - 16	Danger Threshold (High)	9	REAL
21 1D 03 24 ii 30 0A	Alarm	31D _h	1 - 16	Alert Threshold Low	10	REAL
21 1D 03 24 ii 30 0B	Alarm	31D _h	1 - 16	Danger Threshold Low	11	REAL
21 1D 03 24 ii 30 0C	Alarm	31D _h	1 - 16	Hysteresis	12	REAL
21 1D 03 24 ii 30 0D	Alarm	31D _h	1 - 16	Threshold (Set Point) Multiplier	13	REAL
21 1D 03 24 ii 30 0E	Alarm	31D _h	1 - 16	Startup Period	14	UINT
21 1D 03 24 ii 30 0F	Alarm	31D _h	1 - 16	Speed Range Enable	15	BOOL
21 1D 03 24 ii 30 10	Alarm	31D _h	1 - 16	Speed Range High	16	REAL
21 1D 03 24 ii 30 11	Alarm	31D _h	1 - 16	Speed Range Low	17	REAL
21 0F 00 24 ii 30 01	Param	0F _h	10 - 25	Measurement Identifier	1	USINT
21 1D 03 24 ii 30 14	Alarm	31D _h	1 - 16	Inhibit Tach Fault	20	BOOL
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	26 - 30	Parameter Value (Alarm Identifier A)	1	USINT
21 0F 00 24 ii 30 01	Param	0F _h	31 - 35	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.18 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.19 Connection Object Instances

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

Instance Attributes

Table C.20 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.
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.21 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

Discrete Input Point Object (Class ID 08_H)

The Discrete Input Point Object stores information about the value of the Setpoint Multiplier signal.

Class Attributes

Table C.22 Discrete Input Object Class Attributes

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

Instance Attributes

Table C.23 Discrete Input Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get	Value	BOOL	Setpoint Multiplier	0 = Off 1 = On
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: 0x32 = Open 0x33 = Close

Services

Table C.24 Discrete Input 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.
32 _h	Instance	Open	Opens the virtual Setpoint Multiplier switch.
33 _h	Instance	Close	Closes the virtual Setpoint Multiplier switch.

Analog Input Point (Class ID 0A_H)

The Analog Input Point Object models simple analog measurements performed by the XM-122 module.

Class Attributes

Table C.25 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.26 Analog Input Point Object Instances

Instance	Name	Description
1	Gap Measurement 1	Gap measurement for Channel 1
2	Gap Measurement 2	Gap measurement for Channel 2
3	Not 1X Measurement 1	Not 1X measurement for Channel 1
4	Not 1X Measurement 2	Not 1X measurement for Channel 2
5	gSE Overall Measurement 1	gSE Overall measurement for Channel 1

Table C.26 Analog Input Point Object Instances

Instance	Name	Description
6	gSE Overall Measurement 2	gSE Overall measurement for Channel 2
7	Sum Harmonics Measurement 1	Sum Harmonics measurement for Channel 1
8	Sum Harmonics Measurement 2	Sum Harmonics measurement for Channel 2

Instance Attributes

Table C.27 Analog Input Point Object Class Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get	Value	REAL		
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.

Services

Table C.28 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 XM-122 configuration data. There are 47 Parameter Object instances implemented in the XM-122 module.

Instances 1-4 and 7-37 are implemented to provide an alternate method of setting the configuration parameters with EPATH or ENGUNIT data types. And Parameter Object instances 46 and 47 provide an alternate method of 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 starting order for the Sum Harmonics measurements. And Parameter Object instances 38-45 determine whether to use a standard spectrum or gSE spectrum when calculating band values.

Class Attributes

Table C.29 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 47 instances of this object.

Table C.30 Parameter Object Instances

Instance	Read Only	Name	Data Type	Valid Values	Default Value
1	No	Transducer 1 Sensitivity Units	USINT	0 = mils 1 = ips 2 = g 3 = psi 4 = volts 5 = mm/s 6 = μm 7 = Pa	0
2	No	Transducer 2 Sensitivity Units	USINT	0 = mils 1 = ips 2 = g 3 = psi 4 = volts 5 = mm/s 6 = μm 7 = Pa	0
3	No	Channel 1 Measurement Units	USINT	0 = mils 1 = ips 2 = g 3 = psi 4 = volts 5 = mm/s 6 = μm 7 = Pa	0
4	No	Channel 2 Measurement Units	USINT	0 = mils 1 = ips 2 = g 3 = psi 4 = volts 5 = mm/s 6 = μm 7 = Pa	0
5	No	Starting Order for Channel 1 Sum Harmonics meas.	USINT	1-5	2
6	No	Starting Order for Channel 2 Sum Harmonics meas.	USINT	1-5	2

Table C.30 Parameter Object Instances

Instance	Read Only	Name	Data Type	Valid Values	Default Value
7	No	4-20mA Output 1 Measurement Identifier	USINT	0 = CH 1 Overall 1 = CH 2 Overall 2 = CH 1 Gap 3 = CH 2 Gap 4 = CH 1 Band 1 5 = CH 2 Band 1 6 = CH 1 Band 2 7 = CH 2 Band 2 8 = CH 1 Band 3 9 = CH 2 Band 3 10 = CH 1 Band 4 11 = CH 2 Band 4 12 = Speed 14 = CH 1 1X Mag. 15 = CH 2 1X Mag. 16 = CH 1 2X Mag. 17 = CH 2 2X Mag. 18 = CH 1 3X Mag. 19 = CH 2 3X Mag. 20 = CH 1 Not 1X 21 = CH 2 Not 1X 22 = CH 1 Sum Harmonics 23 = CH 2 Sum Harmonics 29 = Acceleration 30 = CH1 gSE Overall 31 = CH2 gSE Overall	0
8	No	4-20mA Output 2 Measurement Identifier	USINT	(same as above)	1
9	No	Transducer 3 (Tachometer) Sensitivity Units	USINT	0 = mils 1 = ips 2 = g 3 = psi 4 = volts 5 = mm/s 6 = μm 7 = Pa	0

Table C.30 Parameter Object Instances

Instance	Read Only	Name	Data Type	Valid Values	Default Value
10	No	Alarm 1 Measurement Identifier	USINT	0 = CH 1 Overall 1 = CH 2 Overall 2 = CH 1 Gap 3 = CH 2 Gap 4 = CH 1 Band 1 5 = CH 2 Band 1 6 = CH 1 Band 2 7 = CH 2 Band 2 8 = CH 1 Band 3 9 = CH 2 Band 3 10 = CH 1 Band 4 11 = CH 2 Band 4 12 = Speed 14 = CH 1 1X Mag. 15 = CH 2 1X Mag. 16 = CH 1 2X Mag. 17 = CH 2 2X Mag. 18 = CH 1 3X Mag. 19 = CH 2 3X Mag. 20 = CH 1 Not 1X 21 = CH 2 Not 1X 22 = CH 1 Sum Harmonics 23 = CH 2 Sum Harmonics 24 = CH 1 1X Phase 25 = CH 2 1X Phase 26 = CH 1 2X Phase 27 = CH 2 2X Phase 29 = Acceleration 30 = CH1 gSE Overall 31 = CH2 gSE Overall	0
11	No	Alarm 2 Measurement Identifier	USINT	(same as above)	1
12	No	Alarm 3 Measurement Identifier	USINT	(same as above)	0
13	No	Alarm 4 Measurement Identifier	USINT	(same as above)	1
14	No	Alarm 5 Measurement Identifier	USINT	(same as above)	0
15	No	Alarm 6 Measurement Identifier	USINT	(same as above)	1
16	No	Alarm 7 Measurement Identifier	USINT	(same as above)	0
17	No	Alarm 8 Measurement Identifier	USINT	(same as above)	1
18	No	Alarm 9 Measurement Identifier	USINT	(same as above)	0
19	No	Alarm 10 Measurement Identifier	USINT	(same as above)	1

Table C.30 Parameter Object Instances

Instance	Read Only	Name	Data Type	Valid Values	Default Value
20	No	Alarm 11 Measurement Identifier	USINT	(same as above)	0
21	No	Alarm 12 Measurement Identifier	USINT	(same as above)	1
22	No	Alarm 13 Measurement Identifier	USINT	(same as above)	0
23	No	Alarm 14 Measurement Identifier	USINT	(same as above)	1
24	No	Alarm 15 Measurement Identifier	USINT	(same as above)	0
25	No	Alarm 16 Measurement Identifier	USINT	(same as above)	1
26	No	Relay 1 Alarm Identifier A	USINT	0 = Alarm 1 1 = Alarm 2 2 = Alarm 3 3 = Alarm 4 4 = Alarm 5 5 = Alarm 6 6 = Alarm 7 7 = Alarm 8 8 = Alarm 9 9 = Alarm 10 10 = Alarm 11 11 = Alarm 12 12 = Alarm 13 13 = Alarm 14 14 = Alarm 16	0
27	No	Relay 2 Alarm Identifier A	USINT	0 = Alarm 1 1 = Alarm 2 2 = Alarm 3 3 = Alarm 4 4 = Alarm 5 5 = Alarm 6 6 = Alarm 7 7 = Alarm 8 8 = Alarm 9 9 = Alarm 10 10 = Alarm 11 11 = Alarm 12 12 = Alarm 13 13 = Alarm 14 14 = Alarm 16	0

Table C.30 Parameter Object Instances

Instance	Read Only	Name	Data Type	Valid Values	Default Value
28	No	Relay 3 Alarm Identifier A	USINT	0 = Alarm 1 1 = Alarm 2 2 = Alarm 3 3 = Alarm 4 4 = Alarm 5 5 = Alarm 6 6 = Alarm 7 7 = Alarm 8 8 = Alarm 9 9 = Alarm 10 10 = Alarm 11 11 = Alarm 12 12 = Alarm 13 13 = Alarm 14 14 = Alarm 16	0
29	No	Relay 4 Alarm Identifier A	USINT	0 = Alarm 1 1 = Alarm 2 2 = Alarm 3 3 = Alarm 4 4 = Alarm 5 5 = Alarm 6 6 = Alarm 7 7 = Alarm 8 8 = Alarm 9 9 = Alarm 10 10 = Alarm 11 11 = Alarm 12 12 = Alarm 13 13 = Alarm 14 14 = Alarm 16	0
30	No	Relay 5 Alarm Identifier A	USINT	0 = Alarm 1 1 = Alarm 2 2 = Alarm 3 3 = Alarm 4 4 = Alarm 5 5 = Alarm 6 6 = Alarm 7 7 = Alarm 8 8 = Alarm 9 9 = Alarm 10 10 = Alarm 11 11 = Alarm 12 12 = Alarm 13 13 = Alarm 14 14 = Alarm 16	0

Table C.30 Parameter Object Instances

Instance	Read Only	Name	Data Type	Valid Values	Default Value
31	No	Relay 1 Alarm Identifier B	USINT	0 = Alarm 1 1 = Alarm 2 2 = Alarm 3 3 = Alarm 4 4 = Alarm 5 5 = Alarm 6 6 = Alarm 7 7 = Alarm 8 8 = Alarm 9 9 = Alarm 10 10 = Alarm 11 11 = Alarm 12 12 = Alarm 13 13 = Alarm 14 14 = Alarm 16	0
32	No	Relay 2 Alarm Identifier B	USINT	0 = Alarm 1 1 = Alarm 2 2 = Alarm 3 3 = Alarm 4 4 = Alarm 5 5 = Alarm 6 6 = Alarm 7 7 = Alarm 8 8 = Alarm 9 9 = Alarm 10 10 = Alarm 11 11 = Alarm 12 12 = Alarm 13 13 = Alarm 14 14 = Alarm 16	0
33	No	Relay 3 Alarm Identifier B	USINT	0 = Alarm 1 1 = Alarm 2 2 = Alarm 3 3 = Alarm 4 4 = Alarm 5 5 = Alarm 6 6 = Alarm 7 7 = Alarm 8 8 = Alarm 9 9 = Alarm 10 10 = Alarm 11 11 = Alarm 12 12 = Alarm 13 13 = Alarm 14 14 = Alarm 16	0

Table C.30 Parameter Object Instances

Instance	Read Only	Name	Data Type	Valid Values	Default Value
34	No	Relay 4 Alarm Identifier B	USINT	0 = Alarm 1 1 = Alarm 2 2 = Alarm 3 3 = Alarm 4 4 = Alarm 5 5 = Alarm 6 6 = Alarm 7 7 = Alarm 8 8 = Alarm 9 9 = Alarm 10 10 = Alarm 11 11 = Alarm 12 12 = Alarm 13 13 = Alarm 14 14 = Alarm 16	0
35	No	Relay 5 Alarm Identifier	USINT	0 = Alarm 1 1 = Alarm 2 2 = Alarm 3 3 = Alarm 4 4 = Alarm 5 5 = Alarm 6 6 = Alarm 7 7 = Alarm 8 8 = Alarm 9 9 = Alarm 10 10 = Alarm 11 11 = Alarm 12 12 = Alarm 13 13 = Alarm 14 14 = Alarm 16	0
36	Yes	Channel 1 Vector Measurement Speed Data Units	USINT	0 = CPM 1 = Orders	0
37	Yes	Channel 2 Vector Measurement Speed Data Units	USINT	0 = CPM 1 = Orders	0
38	No	Channel 1 Band 1 Spectrum Option	USINT	0 = Standard Spectrum 1 = gSE Spectrum	0
39	No	Channel 2 Band 1 Spectrum Option	USINT	0 = Standard Spectrum 1 = gSE Spectrum	0
40	No	Channel 1 Band 2 Spectrum Option	USINT	0 = Standard Spectrum 1 = gSE Spectrum	0
41	No	Channel 2 Band 2 Spectrum Option	USINT	0 = Standard Spectrum 1 = gSE Spectrum	0
42	No	Channel 1 Band 3 Spectrum Option	USINT	0 = Standard Spectrum 1 = gSE Spectrum	0
43	No	Channel 2 Band 3 Spectrum Option	USINT	0 = Standard Spectrum 1 = gSE Spectrum	0

Table C.30 Parameter Object Instances

Instance	Read Only	Name	Data Type	Valid Values	Default Value
44	No	Channel 1 Band 4 Spectrum Option	USINT	0 = Standard Spectrum 1 = gSE Spectrum	0
45	No	Channel 2 Band 4 Spectrum Option	USINT	0 = Standard Spectrum 1 = gSE Spectrum	0
46	No	Poll Connection Produced Connection Path ¹	USINT	101-106, 199 (Assembly Object instance number)	101
47	No	Poll Connection Produced Connection Size ¹	UINT	4 - 124	124

- 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 allocates the connection).

Instance Attributes

Table C.31 Parameter Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
1	Set	Parameter Value		Actual value of parameter	See Table C.30 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.	

Table C.31 Parameter Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
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.32 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.33 Acknowledge Handler Object Instance Attributes

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

Services

Table C.34 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

Table C.35 Alarm Object Class Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
1	Get	Revision	USINT	Revision of the implemented object.	2 (indicates that Threshold Multiplier is a REAL instead of USINT)

Instances

There are 16 instances of this object.

Instance Attributes

Table C.36 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
5	Get/Set	Type	USINT	Type of Alarm	0 = Magnitude 1 = Vector
6	Get	Threshold Units	USINT	Indicates whether the threshold and hysteresis value are specified in units of measure. Not applicable to vector alarms.	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. Not applicable to vector alarms.	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.	
11	Get/Set	Danger Threshold Low (Counterclockwise)	REAL	The lesser threshold value for the danger (shutdown) condition for the range condition types.	

Table C.36 Alarm Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
12	Get/Set	Hysteresis	REAL	The amount on the safe side of a threshold by which the value must recover to clear the alarm.	
13	Get/Set	Threshold (Setpoint Multiplier)	REAL	Indicates how the thresholds should be adjusted when the setpoint multiplication function is invoked.	0 = Disable alarm > 0 = Multiply the thresholds by the value
14	Get/Set	Startup Period	UINT	The amount of time that the Threshold (Setpoint) Multiplier is applied after the startup signal is received.	Seconds
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 only enabled 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.	
19	Get/Set	Measurement Identifier	EPATH	Identifies the measurement object to which this alarm is applied.	See Parameter Object instances 10 to 25.
20	Get/Set	Inhibit Tach Fault	BOOL	Determines whether the Tach Fault status is prohibited during the startup period.	0 = Tach Fault allowed 1 = Tach Fault inhibited

Services

Table C.37 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.

Band Measurement Object (Class ID 31E_H)

The Band Measurement Object models the measurement of the amplitude of a signal within a narrow frequency range.

Class Attributes

The Band Measurement Object provides no class attributes.

Instances

There are 8 instances of this object.

Table C.38 Band Measurement Object Instances

Instance	Description
1	Channel 1 Band Measurement #1
2	Channel 2 Band Measurement #1
3	Channel 1 Band Measurement #2
4	Channel 2 Band Measurement #2
5	Channel 1 Band Measurement #3
6	Channel 2 Band Measurement #3
7	Channel 1 Band Measurement #4
8	Channel 2 Band Measurement #4

Instance Attributes

Table C.39 Band Measurement Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get	Band Value	REAL	The measured band value.	See Data Units
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 Band Value attribute may not represent the actual field value.
5	Get	Data Units	ENGUNIT	The units context of the Band Value attribute.	This attribute is read only. It is set according to the Output Data Units attribute of the associated Channel Object instance. See page 153.
6	Get/Set	Measurement	USINT	The measurement (or calculation) performed to produce the Band Value .	0 = RSS 1 = Peak
7	Get/Set	Minimum Frequency	REAL	The minimum frequency that is included in the band measurement.	
8	Get/Set	Maximum Frequency	REAL	The maximum frequency that is included in the band measurement.	The Maximum Frequency must be greater than or equal to Minimum Frequency .
9	Get/Set	Frequency Units	USINT	The units of Minimum Frequency and Maximum Frequency .	0 = Hz 1 = Orders Order based bands are only supported when the corresponding channel is configured for synchronous sampling. Selecting an order based band on an asynchronous channel will result in an invalid configuration.

Services

Table C.40 Band 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.

Channel Object (Class ID 31F_H)

The Channel Object models "front-end" processing performed on an input signal before specific measurements are performed. This processing typically includes gain, filtering, and/or integration.

Class Attributes

The Channel Object provides no class attributes.

Instances

There are 4 instances of this object. Instance 1 and 2 correspond to the standard Channels 1 and 2, respectively. Instance 3 and 4 correspond to the gSE variety of Channels 1 and 2, respectively.

Table C.41 Channel Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get/Set	Output Data Units	ENGUNIT	The data units of the signal resulting from the signal processing performed in the channel.	See DeviceNet Specification Volume 1 Appendix K. Also see Parameter Object instances 3 and 4. Valid values: g = 1504 hex in/sec = 2B07 hex mils = 0800 hex psi = 1300 hex volt = 2D00 hex mm/s = 0900 hex µm = 2204 hex Pa = 1309 hex For instances 3 and 4, this value is fixed at gSE = 0A00. This setting is directly related to the Sensitivity Units of the associated transducer and the Level of Integration performed on the channel.
4	Get	Integration Level of Integration	USINT	The level of integration to perform on the signal.	0 = None 1 = Single 2 = Double For instances 3 and 4, this value is fixed at 0 = None.

Table C.41 Channel Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
5	Get/Set	Low Cutoff Frequency	USINT	The effective high pass filter (low frequency corner) selection.	0 = Very low 1 = Low 2 = Medium 3 = High 4 = Very high 5 = Bypass See attributes 100 to 104.
6	Get/Set	Synchronous	BOOL	Indicates whether this channel is synchronized with the tachometer signal.	0 = Asynchronous 1 = Synchronous For instances 3 and 4, this value is fixed at 0 = Asynchronous.
7	Get/Set	Internal Gear Teeth	UINT	The number of gear teeth on the shaft of interest.	The Internal/External Gear Teeth values are used when synchronous operation is selected but there is a known speed difference between the shaft of interest and the shaft used as the tachometer source.
8	Get/Set	External Gear Teeth	UINT	The number of gear teeth on the shaft used as the tachometer source.	
9	Get/Set	Name	STRING2	A name to help identify this channel.	
10	Get/Set	Full Scale	REAL	The maximum signal expected to be processed by the channel.	Volts peak Setting the Full Scale to a greater value allows the channel to handle greater input signals without saturating or clipping. Setting the Full Scale to a lesser value allows the signal to be measured with greater resolution.
100	Get	Very Low HPF Corner Frequency	REAL	The frequency, in Hz, of the "Very low" Low Cutoff Frequency option for attribute 5.	Hz
101	Get	Low HPF Corner Frequency	REAL	The frequency, in Hz, of the "Low" Low Cutoff Frequency option for attribute 5.	Hz
102	Get	Medium HPF Corner Frequency	REAL	The frequency, in Hz, of the "Medium" Low Cutoff Frequency (low frequency corner) option for attribute 5.	Hz

Table C.41 Channel Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
103	Get	High HPF Corner Frequency	REAL	The frequency, in Hz, of the "High" Low Cutoff Frequency option for attribute 5.	Hz
104	Get	Very High HPF Corner Frequency	REAL	The frequency, in Hz, of the "Very high" Low Cutoff Frequency option for attribute 5.	Hz

Services

Table C.42 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
4B _h	Instance	Auto_Range	Automatically determines the optimal analog hardware range and sets the Full Scale value accordingly. 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.

Auto_Range

The Auto_Range service calculates a new **Full Scale** value based upon the current input signal level. The caller can specify the maximum signal level that must be handled by the new hardware range in terms of a multiple of the current signal level. The Auto_Range service determines the new **Full Scale** value, sets the **Full Scale** attribute, and returns the new value in the response.

The XM-122 must be in Run mode to perform the Auto_Range service. Otherwise the "Object State Conflict" (General Error code 0x0C) is returned.

The "Busy" (object specific General Error code 0xD0) error response may be returned if the Auto_Range service cannot be completed successfully.

Table C.43 Auto_Range Request Parameters

Name	Data Type	Description of Request Parameters	Semantics of Values
Safety Factor	REAL	Specifies a multiple that, when applied to the current signal level, determines the maximum signal level that must be handled by the hardware.	Must be greater than or equal to 1.0.

Table C.44 Auto_Range Response Parameters

Name	Data Type	Description of Response Parameters	Semantics of Values
Full Scale	REAL	The new Full Scale value.	Specifies the maximum signal level expected to be processed by the channel. This value is used to determine the analog hardware range when the hardware supports programmable gain settings. Setting the Full Scale to a greater value allows the channel to handle greater input signals without saturating or clipping. Setting Full Scale to a lesser value allows the signal to be measured with greater resolution. The units of the Full Scale value is Volts peak.

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.45 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.46 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.
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.

Table C.46 Device Mode Object Services

Service Code	Class/Instance Usage	Name	Description
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.

Overall Measurement Object (Class ID 322_H)

The Overall Measurement Object models the measurement of the amplitude of a signal including a wide frequency range.

Class Attributes

The Overall Measurement Object provides no class attributes.

Instances

There are 2 instances of this object.

Instance Attributes

Table C.47 Overall Measurement Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get	Overall Value	REAL	Measured value	The output value of the measurement performed by the Overall Measurement Object on the input signal. The result of the measurement process specified by Measurement is converted to the units specified by Data Units to produce the Overall Value.

Table C.47 Overall Measurement Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
4	Get	Status	BOOL	Indicates if a fault or alarm has occurred.	0 = Operating without alarms or faults. 1 = Alarm of fault condition exists. The Overall Value attribute may not represent the actual field value.
5	Get	Data Units	ENGUNIT	The units context of the Overall Value attribute.	This setting is determined by the Channel Object's Output Data Units attribute (see page 153).
6	Get/Set	Measurement	USINT	The measurement (or calculation) performed to produce the Overall Value .	0 = RMS 1 = RMS peak 2 = RMS pk-to-pk 3 = Peak 4 = Peak-to-peak 5-255 Reserved
7	Get/Set	Time Constant	REAL	The detection time constant associated with the output smoothing filter (for the RMS and DC meters) or the decay rate of the peak meters.	Must be greater than zero. For RMS type measurements, the Time Constant attribute specifies the 3-db bandwidth for the digital filtering used to calculate the Overall Value . The 3-db bandwidth is roughly equal to (1/Time Constant). The greater the value of the Time Constant, the longer the response of the measured Overall Value to change in the input signal. For Peak type measurements, the Time Constant value specifies the decay rate of the peak detection meter. The greater the Time Constant value, the slower the Peak is decayed.

Table C.47 Overall Measurement Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
8	Get/Set	Damping Factor	REAL	The damping factor associated with output smoothing filter for the RMS and DC meters (not used with peak meters).	0.7072 to 1.0 The Damping Factor is used in conjunction with the Time Constant to vary the characteristics of the response of the filter used in calculating the Overall Value . An Overall Value for a measurement with Damping Factor near 1.0 will slowly rise or fall for the full settling time specified by the Time Constant before reaching the final value. An Overall Value for a measurement with a Damping Factor near 0.7072 will rise or fall quickly and may overshoot the final value before reaching the final value for a given input signal. The Damping Factor is only used in conjunction with RMS measurement types.
9	Get/Set	Overall Filter	USINT	Overall filter type applied to the input signal before the measurement is performed.	0 = None 1 = Low Pass Filter 2-255 Reserved
10	Get/Set	Low Pass Corner Frequency	UINT	The corner frequency of the low pass filter.	200 to 20000 Hz The Low Pass Corner Frequency only has meaning while Overall Filter is set to Low Pass Filter and single integration is performed on the signal (see page 64).

Services

Table C.48 Overall 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.

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.49 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.50 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)

Table C.50 Relay Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
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 26 to 30.
11	Get/Set	Alarm Identifier B	EPATH	Identifies the second alarm status the relay monitors.	See Parameter Object instances 31 to 35.
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.51 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.

Class Attributes

The Spectrum/Waveform Measurement Object provides no class attributes.

Instances

There are 4 instances of this object. Instance 1 and 2 are the conventional measurements for Channels 1 and 2, respectively. Instance 3 and 4 are the gSE measurements for Channels 1 and 2, respectively. Instance 3 and 4 only support a gSE spectrum, and not a waveform. A "resource unavailable" error is returned in response to the Get_Waveform_Chunk service to instances 3 and 4. Also note that the gSE spectrums in instances 3 and 4 have a **Data Format** of "real data." This is different from instances 1 and 2, which have "complex data."

Instance Attributes

Table C.52 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 Spectrum and Waveform data may not represent the actual field value.
4	Get	Data Units	ENGUNIT	The units context of the Data attributes.	This setting is determined by the Channel Object's Output Data Units attribute (see page 153.
5	Get	Domain	USINT	The domain used for the spectrum and waveform measurements.	0 = Frequency/Time 1 = Order/Position
6	Get/Set	FMAX	REAL	The maximum frequency or order of the spectrum data.	0-20000 Hz if Domain = 0. There are several predetermined FMAX settings for which spectrum data can be produced. If you select an unsupported value, then the next greater supported FMAX value will be used for the spectrum data. 4-40 Orders if Domain = 1. The Number of Lines value must be evenly divisible by the FMAX value or an Invalid Device Configuration error will be returned during the Device Mode Object Start and Save services.
7	Get/Set	Number of Spectrum Lines	UDINT	Number of lines or bins in the spectrum data.	100, 200, 400, or 800
8	Get/Set	Window Type	USINT	The window function to be applied to the waveform data prior to computing the spectrum.	0 = Rectangular 1 = Hamming 2 = Hanning 3 = Flat Top 4 = Kaiser Bessel
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
11	Get	Overlap	USINT	The percent overlap applied to the waveform data sets used for calculating the spectrum.	Only 0% supported.

Table C.52 Spectrum Waveform Measurement Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
12	Get	Data Format	USINT	The format of the spectrum data.	0 = Complex data For instances 3 and 4, this value equals 1, which is Real data
13	Get	Average Type	USINT	The type of averaging performed.	0 = Asynchronous (spectrum) 1 = Synchronous (waveform) Determined by the Synchronous attribute of the Channel Object. When set to Asynchronous, consecutive spectrum measurements are averaged together to produce the Spectrum data. When set to asynchronous, synchronized waveforms are averaged together to produce the Waveform data, and the Spectrum data is produced from the averaged waveform. A trigger source from a tachometer, for example, is required to obtain the synchronized waveforms.
14	Get/Set	Number of Averages	UINT	The number of individual data sets to be incorporated into the average calculation.	0 = Invalid 1 = No averaging > 1 = Averaging

Services

Table C.53 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
4B _h	Instance	Get_Spectrum_Chunk	Upload a portion of the current Spectrum data.

Table C.53 Spectrum Waveform Measurement Object Services

Service Code	Class/Instance Usage	Name	Description
4C _h	Instance	Get_Waveform_Chunk	Upload a portion of the current Waveform data.
4D _h	Instance	Get_Stored_Spectrum_Chunk	Upload a portion of the stored Spectrum data.
4E _h	Instance	Get_Stored_Waveform_Chunk	Upload a portion of the stored 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_Stored_Spectrum_Chunk/Get_Stored_Waveform_Chunk

These services function just like Get_Spectrum_Chunk and Get_Waveform_Chunk (described below) except they operate on the stored spectrum or waveform data rather than the current spectrum or waveform data. A spectrum or waveform data set is stored in conjunction with the triggered trend's trigger event if the triggered trend is enabled. The **Storage Option** attribute determines whether the spectrum or waveform data is stored.

IMPORTANT

The gSE spectrum is not stored (these services will return a "resource unavailable" error for instances 3 and 4).

Get_Spectrum_Chunk/Get_Waveform_Chunk

These services return a portion of the respective data structure. It is likely that the spectrum and waveform data structures will be too large to transfer over the network in one message. These services allow 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 Spectrum Data structure contains an array of values that, taken together, are the output of the spectrum measurement performed by the Spectrum/Waveform Measurement Object on the input signal. The size of the Spectrum Data structure and format of the data array depends on the **Data**

Format attribute. In all cases, the spectrum data array values are normalized and must be converted to floating point to obtain the true values.

Table C.54 Spectrum Data Structure

Byte (DWORD) offset within structure	Structure Member	Data Type	Description
0 (0)	Number of Spectrum Lines	UDINT	Number of lines or bins in the spectrum data. This should be equal to the Number of Spectrum Lines attribute setting. It is provided within this structure to assist in determining the size of the structure.
4 (1)	FMAX	REAL	The maximum frequency or order of the spectrum data. This is the actual FMAX of the spectrum data and may vary from the FMAX 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 or UINT	The normalized spectrum data points These must be converted to floating point values using the Amplitude Reference value. The Data Format attribute determines whether these are INT or UINT and exactly what conversion should be applied.

The total size of the Spectrum Data structure in DWORD is:

- For Real or Power Data Format: 3 + (**Number of Spectrum Lines** / 2)
- For Complex Data Format: 3 + (**Number of Spectrum Lines**)

If the data format is Real Data or Power Data then the **Normalized Value Array** is an array of UINT (16-bit unsigned integers ranging from 0 to 65535). The number of UINTs in the spectrum data array is equal to the **Number of Spectrum Lines**. To convert the normalized spectrum data into floating point values, use the following equation:

$$\text{Float Data}_n = \text{Amplitude Reference} \frac{\text{Normalized Data}_n}{65536}$$

Where **Float Data_n** is the value for the nth spectrum bin, and $0 \leq n \leq$ **Number of Spectrum Line**.

The **Float Data** value represents an amplitude value if Data Format is real data. The **Float Data** represents a power value if Data Format is power data.

If the data format is Complex Data then the **Normalized Value Array** is an array of INT (16-bit signed integers ranging from -32768 to 32767). There are two INTs (real and imaginary values) in the array for each spectrum bin (the array size is twice the **Number of Spectrum Lines**). To convert the

normalized spectrum data into real and imaginary values, use the following equations:

$$\text{Real Data}_n = \text{Amplitude Reference} \frac{\text{Normalized Data}_{2n}}{32768}$$

$$\text{Imaginary Data}_n = \text{Amplitude Reference} \frac{\text{Normalized Data}_{(2n + 1)}}{32768}$$

Where **Real Data_n** and **Imaginary Data_n** are the real and imaginary values for the nth spectrum bin, and $0 \leq n \leq \text{Number of Spectrum Line}$.

The **Real Data** and **Imaginary Data** values are converted into magnitude and phase values with the following equations:

$$\text{Magnitude Data}_n = \sqrt{\text{Real Data}_n^2 + \text{Imaginary Data}_n^2}$$

$$\text{Phase Data}_n = \arctan\left(\frac{\text{Imaginary Data}_n}{\text{Real Data}_n}\right)$$

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.55 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 DWORDs 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_Spectrum_Chunk and Get_Waveform_Chunk services use the same request and response parameters.

Table C.56 Get_Spectrum_Chunk/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.	<p>$0 \leq \text{offset} < \text{size of the data structure in DWORDs}$.</p> <p>For example:</p> <ul style="list-style-type: none"> 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) <p>....</p>
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.57 Get_Spectrum_Chunk/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.58 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.

Table C.58 Speed Measurement Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
5	Get	Maximum Speed	REAL	The maximum (peak) measured speed value (positive or negative) since the most recent reset.	CPM
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
13	Get	Acceleration	REAL	The rate of change of the Speed Value .	CPM/min

Services

Table C.59 Speed Measurement Object Services

Service Code	Class/Instance Usage	Name	Description
05 _h	Instance	Reset	Clears Maximum (Peak) speed to 0.
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.60 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 characters 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

Table C.61 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 vibration channel 1. Transducer Object instance 2 is for vibration channel 2, and Transducer Object instance 3 is for the tachometer channel.

Instance Attributes

Table C.62 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: g = 1504 hex in/sec = 2B07 hex mils = 0800 hex psi = 1300 hex volt = 2D00 hex mm/s = 0900 hex µm = 2204 hex Pa = 1309 hex

Table C.62 Transducer Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
7	Get/Set	Fault High	REAL	The maximum expected DC Bias voltage from the transducer in volts.	Volts
8	Get/Set	Fault Low	REAL	The minimum expected DC Bias voltage from the transducer in volts.	Volts
9	Get/Set	Power Type	USINT	Indicates the type of power supplied to the transducer.	0 = No power supplied 1 = Constant current (IEPE accelerometer) 2 = Constant voltage (IRD 941)
13	Get/Set	DC Bias Time Constant	REAL	The time constant value used for exponential averaging of the DC Bias value (a low pass filter/output smoothing filter).	Seconds

Services

Table C.63 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.

Vector Measurement Object (Class ID 329_H)

The Vector Measurement Object models the measurement of the amplitude and phase of the input signal at a specific multiple of the machine speed.

Class Attributes

The Vector Measurement Object provides no class attributes.

Instances

There are 6 instances of this object.

Table C.64 Vector Measurement Object Instances

Instance	Description
1	Channel 1 1X Vector Measurement
2	Channel 2 1X Vector Measurement
3	Channel 1 2X Vector Measurement
4	Channel 2 2X Vector Measurement
5	Channel 1 3X Vector Measurement
6	Channel 2 3X Vector Measurement

Instance Attributes

Table C.65 Vector Measurement Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get	Magnitude Value	REAL	The measured magnitude value.	
4	Get	Phase Value	REAL	The measured phase value.	Degrees Note: Note valid for instances 5 and 6.
5	Get	Status	BOOL	Indicates if a fault or alarm has occurred.	0 = Operating without alarms of faults. 1 = Alarm or fault condition exists. The Value attributes may not represent the actual field value.

Table C.65 Vector Measurement Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
6	Get	Magnitude Data Units	ENGUNIT	The units context of the Magnitude Value attribute.	This setting is determined by the Channel Object's Output Data Units setting (see page 153).
7	Get	Speed Value	REAL	The speed at which the magnitude and phase are measured.	Instances 1 and 2 use 1X machine speed. Instances 3 and 4 use 2X machine speed. Instances 5 and 6 use 3X machine speed. The value is only valid when synchronous sampling mode is selected for the corresponding channel.
8	Get	Speed Data Units	ENGUNIT	The units context of the Speed Value attribute.	See DeviceNet Specification Volume 1 Appendix K. This is set to Orders (0x0B00).

Services

Table C.66 Vector Measurement Object Services

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

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.

Instance Attributes

Table C.67 4-20 mA Output Object Instance Attributes

Attr ID	Access Rule	Name	Data Type	Description	Semantics
3	Get/Set	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.	
7	Get/Set	Measurement Identifier Path	EPATH	Identifies the class, instance, and attribute of a measurement value that this 4-20 mA output is tracking.	See Parameter Object Instances 7 and 8. See DeviceNet Specification Volume 1 Appendix I.

Services.

Table C.68 4-20mA 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.

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
23	CAN_High	DeviceNet bus connection, high differential (white wire)

Terminal Block Assignments

No.	Name	Description
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	SetPtMult	Switch input to activate Set Point Multiplication (active closed)
40	Switch RTN	Switch return, shared between SetPtMult and Reset Relay
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 XM-122 can accept input from any Allen-Bradley non-contact eddy current probe, a standard IEPE accelerometer, or a DC voltage output measurement device such as a velocity or pressure transducer.

Connecting an IEPE Accelerometer

Figures D.2 and D.3 show the wiring of an IEPE accelerometer to an earlier revision of the XM-122 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 179).

IMPORTANT

The internal transducer power supply is providing power to the IEPE accelerometer. Make certain the **IEPE Power** parameter is enabled. Refer to Channel Transducer Parameters on page 58.

Figure D.2 IEPE Accelerometer to Channel 1 Wiring

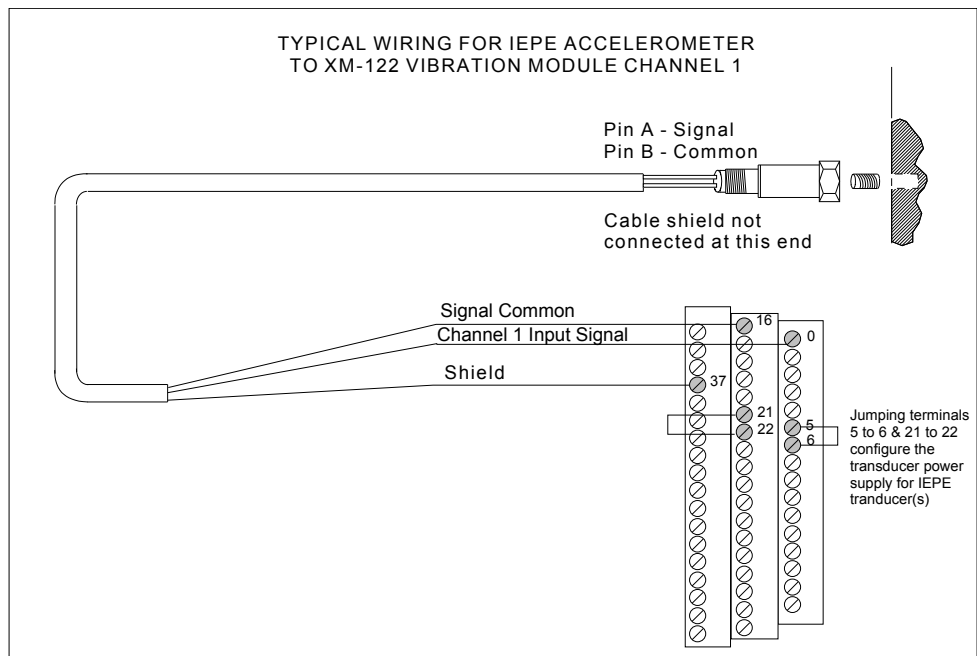
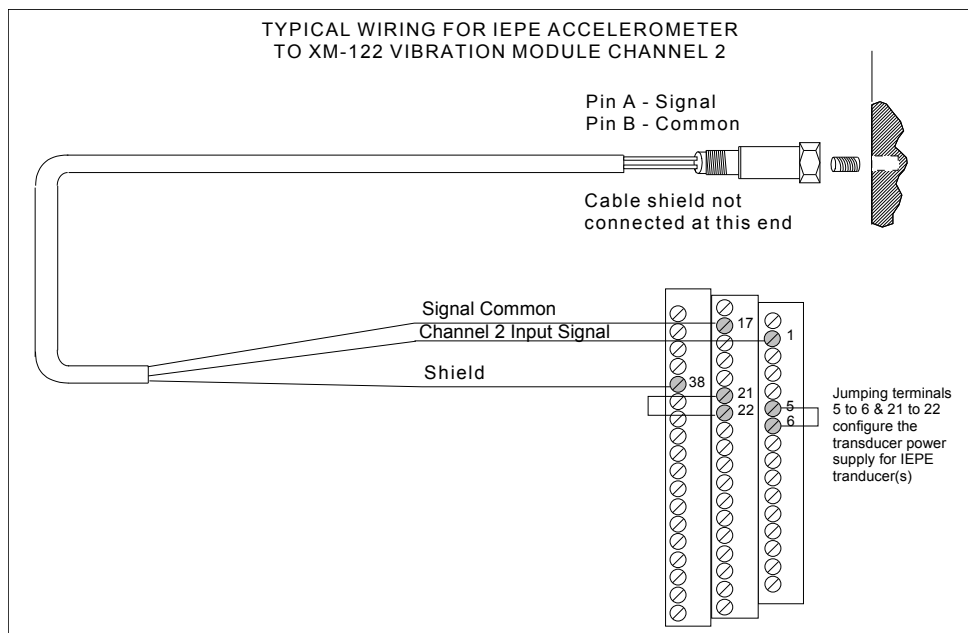


Figure D.3 IEPE Accelerometer to Channel 2 Wiring



Connecting a Non-Contact Sensor

Figures D.4 and D.5 show the wiring of a non-contact sensor to an earlier revision of the XM-122 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 179).

IMPORTANT

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

Figure D.4 Non-Contact Sensor to Channel 1 Wiring

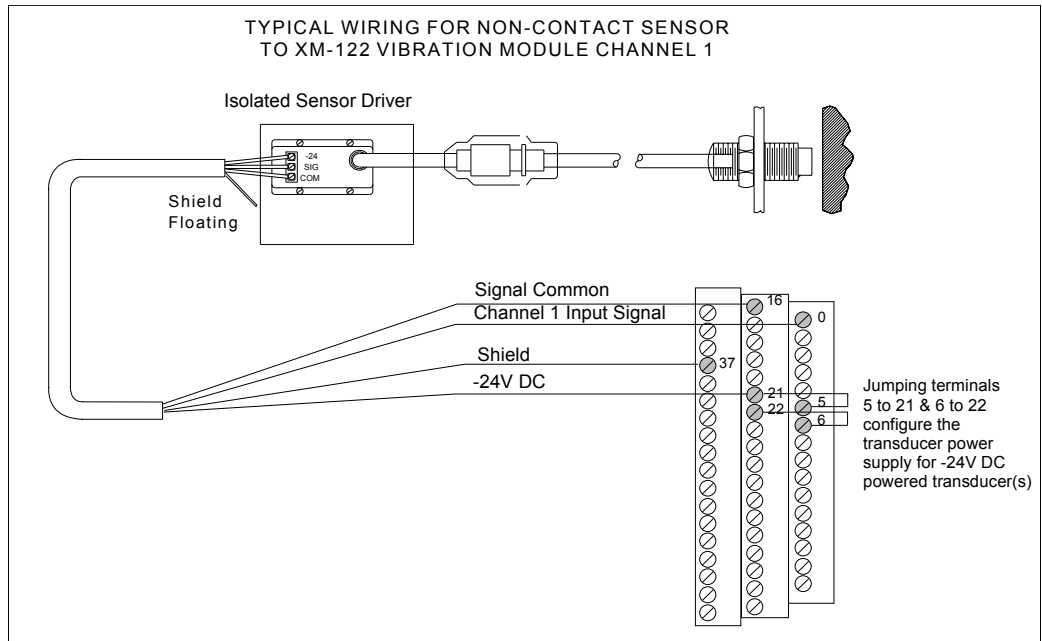
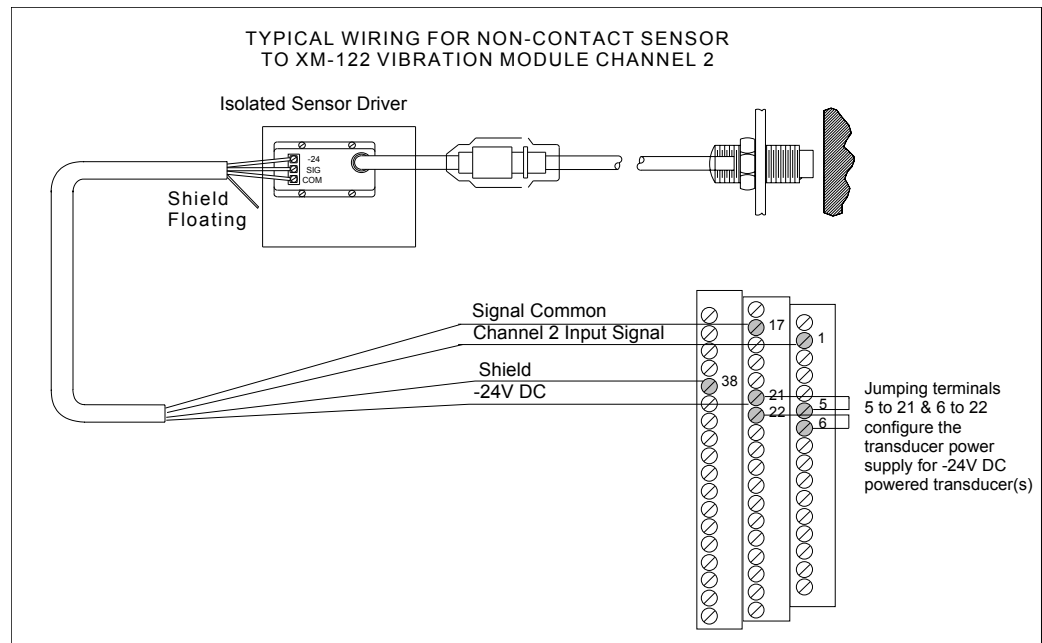


Figure D.5 Non-Contact Sensor to Channel 2 Wiring



Connecting a Powered Sensor

Figures D.6 and D.7 show the wiring of a powered sensor, such as the Model 580 Vibration Pickup, to an earlier version of the XM-122 module (before 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 179).

Figure D.6 Powered Sensor to Channel 1 Wiring

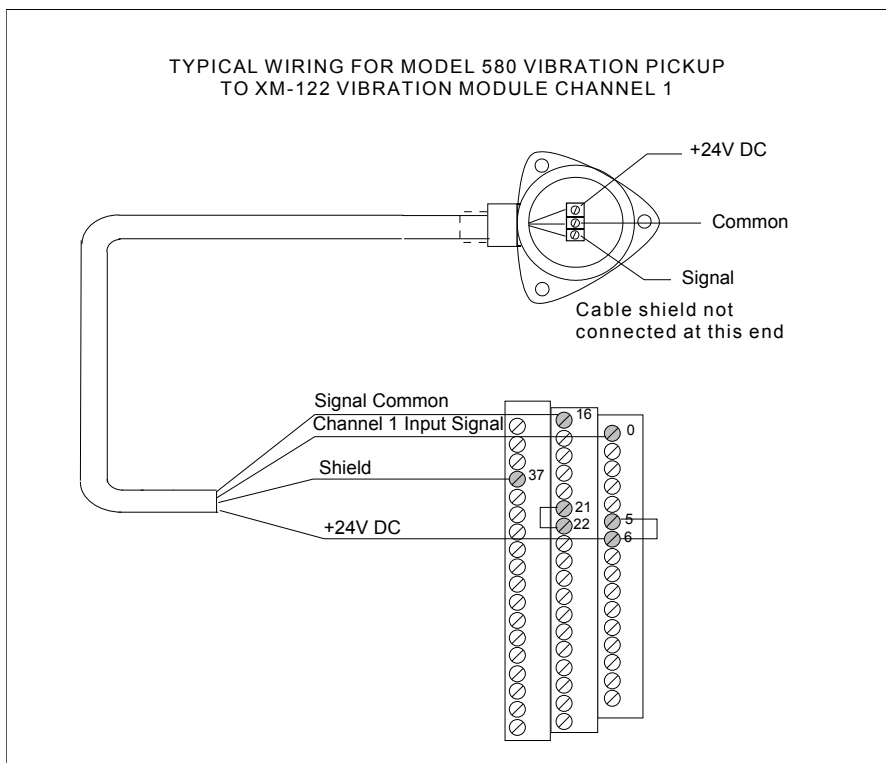
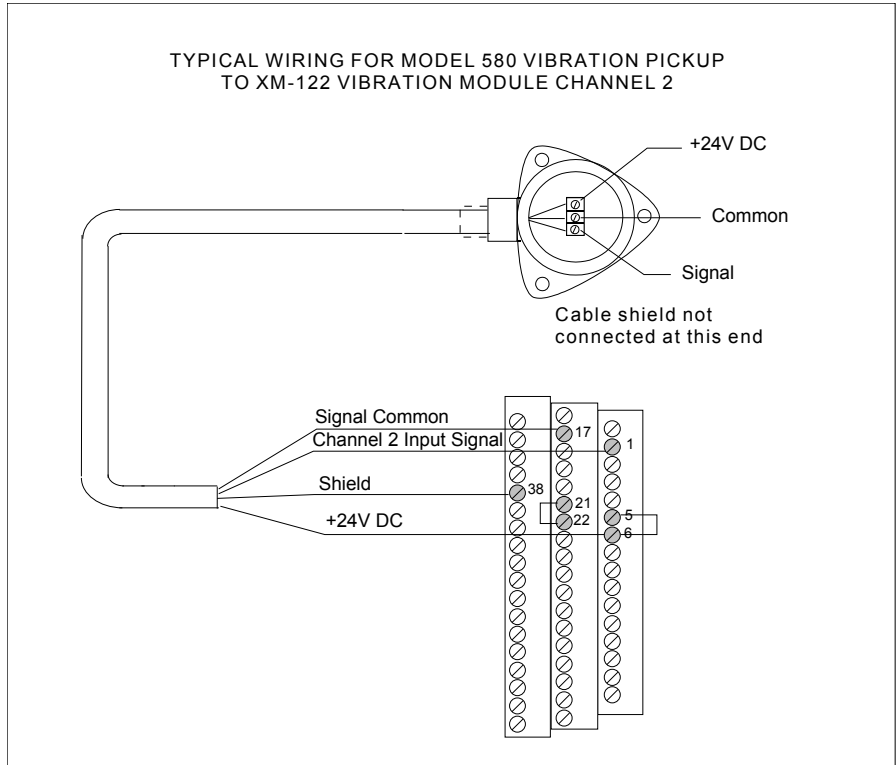


Figure D.7 Powered Sensor to Channel 2 Wiring



Connecting Two Accelerometers and a Non-Contact Sensor

Figure D.8 shows the wiring of two IEPE accelerometers and a non-contact sensor to an earlier revision of the XM-122 module (before revision D01). The IEPE accelerometers are wired to channel 1 and channel 2. The non-contact sensor is wired to the tachometer input signal.

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 179).

IMPORTANT

The buffered outputs are valid for all signals in this wiring scheme.

IMPORTANT

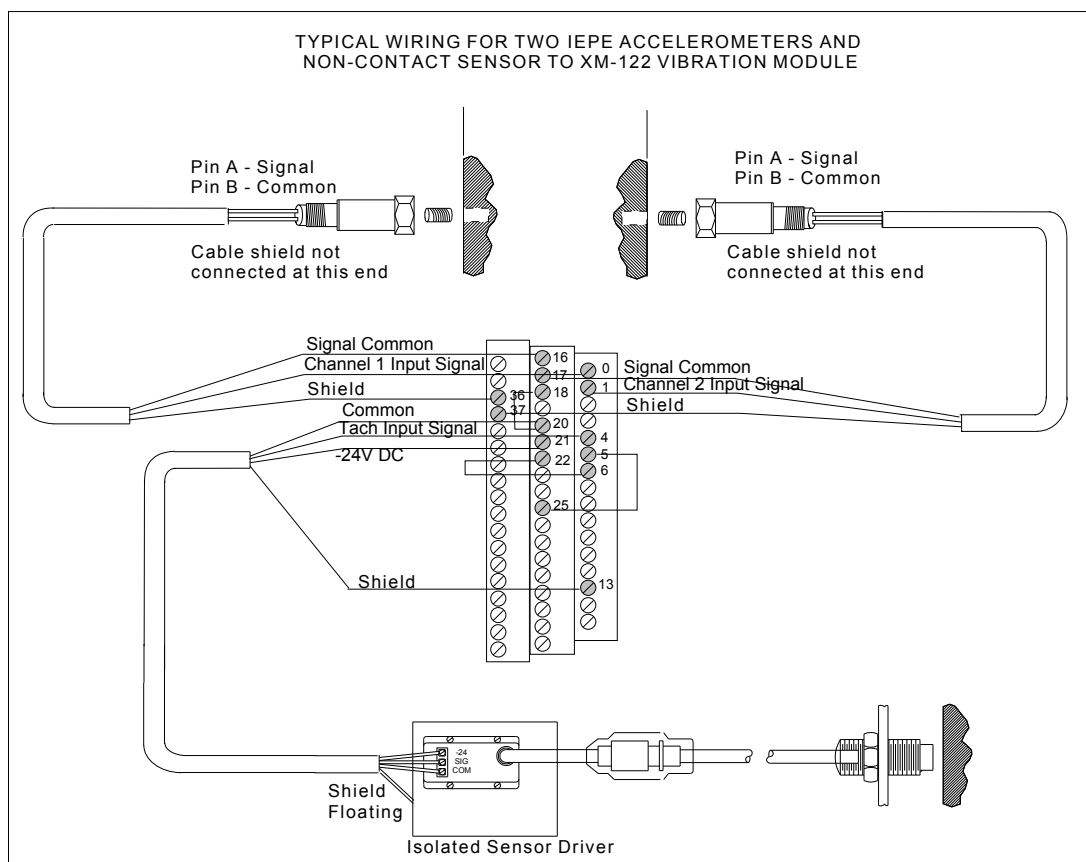
The module's 24 V power supply (terminal 25) is providing 24 V power to the IEPE accelerometer constant current diodes. Refer to Appendix A for power specifications.

Make certain the **IEPE Power** parameter is enabled for both channel 1 and channel 2. Refer to Channel Transducer Parameters on page 58.

IMPORTANT

Transducer DC bias is monitored on all signals.

Figure D.8 Two IEPE Accelerometers and a Non-Contact Sensor Wiring



Connecting a Velocity Sensor and Two Non-Contact Sensors

Figure D.9 shows the wiring of a velocity sensor and two non-contact sensors to an earlier revision of the XM-122 module (before revision D01). The velocity sensor is wired to channel 1. The first non-contact sensor is wired to channel 2, and the other non-contact sensor is wired to the tachometer signal.

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 179).

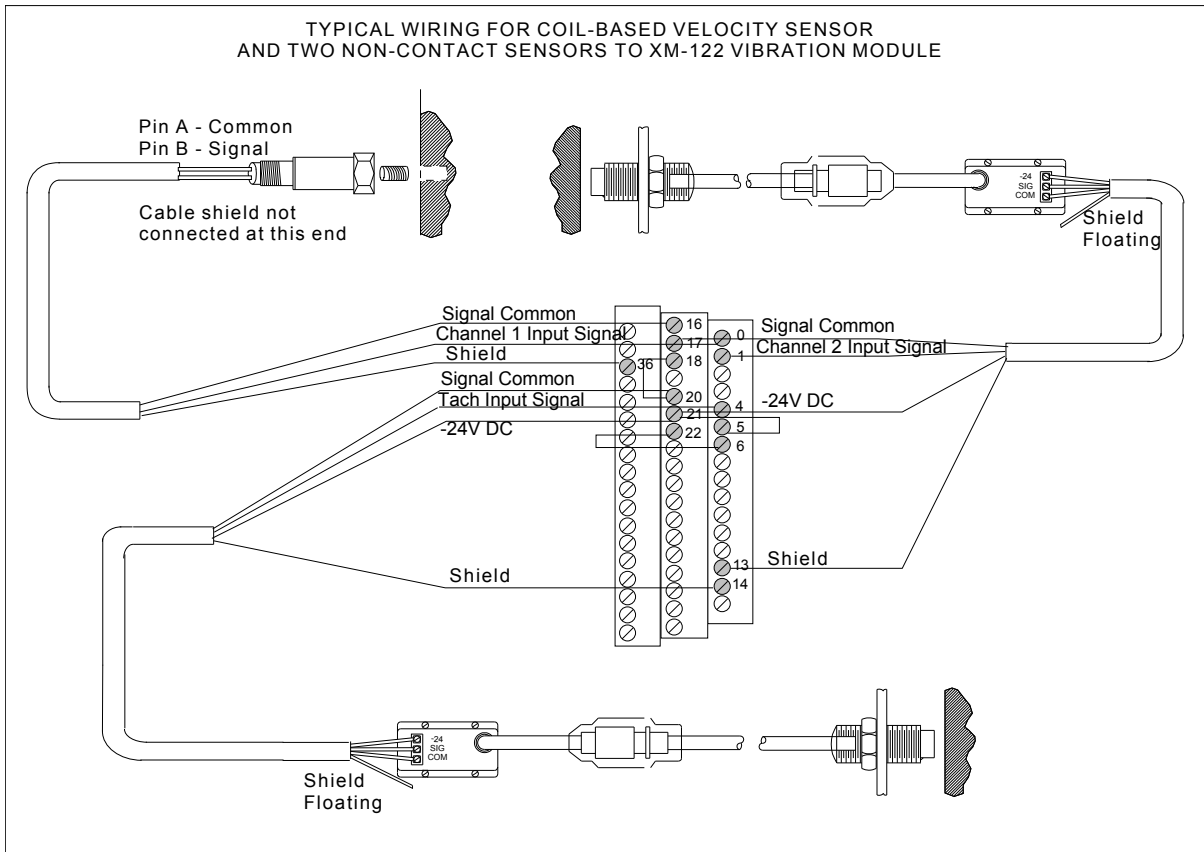
IMPORTANT

The buffered outputs are valid for all signals in this wiring scheme. Note that buffered output for channel 1 is limited to one diode drop above -24 V to one diode below +5 V.

IMPORTANT

Transducer DC bias is monitored on all signals.

Figure D.9 Velocity Sensor and Two Non-Contact Sensor Wiring



Guidelines for Setting the Full Scale Value

Appendix E provides tables to help you determine the optimal value to use for the Channel Transducer **Full Scale** setting in the XM-122 module. The signal conditioning circuitry in the module adjusts its dynamic range based upon the value entered in this setting. The full scale value is a voltage level that is dependent upon your monitoring application and other XM configuration settings.

In order to use these tables and to properly select the Full Scale value, you need to know the following information.

- **Maximum Vibration Level** - This is the maximum instantaneous peak vibration level that can be expected at the sensor location (under any monitoring condition) in the units of vibration that will be used for monitoring. For example, if monitoring will be done in velocity then you must know the maximum vibration in ips or mm/s that can exist at the machine.
- **High Pass Filter (HPF) Setting** - In applications that require integration of the native units, the high pass filter setting impacts the full scale signal range. For example, an application that uses an accelerometer whose native units is g's, and is integrated to provide a velocity output in ips or mm/s, requires you to know what high pass filter setting is used in order to best select the Full Scale value.
- **Maximum High Frequency Peak Amplitude (in g's)** - This variable must be considered in applications where an acceleration input is integrated to velocity (ips, mm/s) or displacement (mils, μm) and where high frequency (>5 kHz) acceleration signals are likely present. Such signals are most common in machinery such as gear sets and any machine that is fitted with rolling element bearings. This variable can be measured with a portable instrument or it can be measured using the XM module and associated configuration tool.

TIP

Refer to Channel Transducer Parameters on page 58 for more information on the Channel Transducer Full Scale parameter.

TIP

Refer to gSE Parameters on page 69 for configuring the **gSE Full Scale** parameter.

XM-122 Full Scale Tables

Use the following tables to help you determine the optimal Full Scale value for the XM-122 module. Refer to the table that corresponds to the units of vibration that will be used for monitoring.

Table E.1 XM-122 Measuring Acceleration with Accelerometer (100 mV/g)

Max Vibration Level g's peak	Full Scale Setting				
	1Hz HPF	5Hz HPF	10Hz HPF	40Hz HPF	1000Hz HPF
1	0.1				
5	0.75				
10	1				
30	3				
40	4				
50	5				

Table E.2 XM-122 Measuring Velocity with Accelerometer (100 mV/g)

Max Vibration Level		Full Scale Setting					Max High Frequency Peak Amplitude (g pk)				
ips peak	mm/s RMS	1Hz HPF	5Hz HPF	10Hz HPF	40Hz HPF	1000Hz HPF					
0.3	10	N/A	0.005	0.01	0.03	0.75	4				
1	40						4				
3	100						0.009	0.018	0.072	N/A	4
10	360						0.085	0.17	0.67	12	
30	1000						0.25	0.5	2.2	40	
100	3600						0.83	1.66	6.66	120	

Table E.3 XM-122 Measuring Displacement with Accelerometer (100 mV/g)

Max Vibration Level		Full Scale Setting					Max High Frequency Peak Amplitude (g pk)
mils pp	micrometers pp	1Hz HPF	5Hz HPF	10Hz HPF	40Hz HPF	1000Hz HPF	
10	250	N/A	0.01	0.02	0.07	N/A	4
20	500		0.03	0.06	0.25		
30	750		0.04	0.07	0.3		
50	1250		0.05	0.09	0.4		

Table E.4 XM-122 Measuring Velocity with Velocimeter (100 mV/ips)

Max Vibration Level		Full Scale Setting				
ips peak	mm/s RMS	1Hz HPF	5Hz HPF	10Hz HPF	40Hz HPF	1000Hz HPF
3	100	0.75				
10	360	1				
20	700	2				
30	1000	3				

Table E.5 XM-122 Measuring Displacement with Velocimeter (100 mV/ips)

Max Vibration Level		Full Scale Setting				
mils pp	micrometers pp	1Hz HPF	5Hz HPF	10Hz HPF	40Hz HPF	1000Hz HPF
5	125	N/A	0.05	0.1	0.35	N/A
10	250		0.1	0.2	0.7	
50	1250		0.15	0.3	1.05	

Table E.6 XM-122 Measuring Displacement with Displacement Sensor (200 mV/mil)

Max Vibration Level		Full Scale Setting				
mils pp	micrometers pp	1Hz HPF	5Hz HPF	10Hz HPF	40Hz HPF	1000Hz HPF
5	1250	1.5				N/A
50	1250	10				

Example on Using Table

The following example shows you how to use the Full Scale table to determine the optimal Full Scale value.

EXAMPLE

Application: XM-122 with 100 mV/g accelerometer

Units used for monitoring: velocity, ips

High Pass Filter: 10 Hz

Maximum vibration level: 5 ips pk (360 mm/s RMS)

To determine the optimal Full Scale value, follow these steps.

1. Refer to Table E.2 XM-122 Measuring Velocity with Accelerometer (100 mV/g) on page 192.
2. Under the Maximum Vibration Level column, select the row that corresponds to 10 ips.

TIP

Since the maximum vibration level of 5 ips is greater than 3 ips, it is necessary to refer to the next higher level in the table, which in this case is 10 ips.

3. Under the 10 Hz High Pass Filter (HPF) column, find the recommended **Full Scale Setting**. The recommended Full Scale Setting for the 10 Hz High Pass Filter is 0.17.
4. Refer to the value under the Max High Frequency Peak Amplitude column to verify that there are not any signals present at the sensor that exceed this value. For the example above, the Max High Frequency Peak Amplitude value is 12 g's.

If there are signals in excess of this level then increase the Full Scale value to the next higher value, 0.5 in this example. If there are no extraneous signals that exceed this value then proceed with setting the Full Scale at the selected value, 0.17 in this example.

IMPORTANT

Step 4 is necessary only in applications where an acceleration input is integrated to velocity (ips, mm/s) or displacement (mils, μm) and where high frequency (>5 kHz) acceleration signals are likely present.

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.

Bit-Strobe

A multicast transfer of data sent by a master device to all the XM slaves on the network. The bit-strobe command message contains a bit string of 64 bits (8 bytes) of output data, one output bit per node address on the network.

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.

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.

gSE measurement

A special type of signal processing. gSE, or Spike Energy, is useful for detecting low amplitude, high frequency signals characteristic of bearing and gearbox defects.

gSE spectrum

A special type of spectrum measurement using gSE signal processing. gSE, or Spike Energy, is useful for detecting low amplitude, high frequency signals characteristic of bearing and gearbox defects.

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.

high pass filter

A filter that excludes all frequencies below a defined frequency. It allows, or passes, frequencies above the defined frequency. It is useful for removing low frequency signal components that would dominate the signal.

low pass filter

A low pass filter excludes frequencies above a defined frequency. It allows, or passes, frequencies below the defined frequency. It is useful as an anti-aliasing filter.

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."

orders

Multiples of the operating speed of a piece of equipment. The first order is the operating speed. The second order is two times the operating speed, and so on.

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.

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.

setting time

The amount of time it takes a measurement to reach 90% of the final value given a step change in the input signal.

signal detection

Defines the method of conditioning or measuring a dynamic input signal. Peak (0 to the peak voltage), Peak-Peak (minimum peak to maximum peak), and RMS (square root of the mean of the square of the values) are the most common methods of signal detection.

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 Dynamic Measurement module and the XM-320 Position module.

Spike Energy

Spike Energy is a measure of the intensity of energy generated by transient or mechanical impacts. These impacts or pulses typically occur as a result of surface flaws in rolling-element bearings, gear teeth, or other metal-to-metal contacts, such as rotor rub, insufficient bearing lubrication, etc.

Spike Energy measurement utilizes an accelerometer to detect the vibration energy over a pre-determined high frequency range. The mechanical impacts tend to excite the mounted natural frequencies of the accelerometers as well as the natural frequencies of machine components and structures in this high frequency range. These resonant frequencies act as carrier frequencies and the bearing defect frequency modulates with the carriers. The intensity of impact energy is a function of pulse amplitude and repetition rate. The signal induced by such impacts can be measured by accelerometers and processed by a unique filtering and detection circuitry. The measured magnitude of the signal is expressed in "gSE" units (acceleration units of Spike Energy).

startup/coast-down trend

A speed-base trend that is collected in an XM module during the startup or coast-down of a machine when the measured machine speed crosses into a defined speed range.

strobe

See Bit-Strobe.

transducer

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

trend

A set of records of one or more measurement parameter(s) collected at regular intervals based on time or speed.

trigger

An event that prompts the collection of trend data.

triggered trend

A time-base trend that is collected in an XM module when a relay on the XM is activated, or when the module receives a trigger event.

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.

Numerics

- 24V common grounding requirements** 12
- 4-20mA Output Object** 176
- 4-20mA output parameters** 82
 - Enable 82
 - Max Range 82
 - Measurement 82
 - Min Range 82
- 4-20mA outputs, wiring** 44

A

- Acknowledge Handler Object** 147
- Alarm Object** 148
- alarm parameters** 74
 - Alarm Number 74
 - alarm type 74
 - Alert Threshold (High) 76
 - Alert Threshold (Low) 76
 - Condition 75
 - Danger Threshold (High) 76
 - Danger Threshold (Low) 76
 - Enable 74
 - Hysteresis 76
 - Inhibit Tachometer Fault 77
 - Measurement 74
 - Name 74
 - Speed Range Enable 77
 - Speed Range High 78
 - Speed Range Low 78
 - Startup Period 76
 - Threshold Multiplier 77
- Analog Input Point Object** 136
- Assembly Object** 123
- Automatic Device Replacement (ADR)** 116

B

- Band Measurement Object** 151
- band measurement parameters** 66
 - Maximum Frequency 67
 - Measurement 67
 - Minimum Frequency 67
 - Spectrum Option 66
- baud rate** 48
- bit-strobe message format** 115
- buffered outputs, wiring** 27

C

- Channel Object** 153
- Channel Status indicator** 51
- channel transducer parameters** 58
 - DC Bias Time Constant 59
 - Eng. Units 59
 - Fault High 59
 - Fault Low 59
 - IEPE Power 58
 - Sensitivity 58
- Class Instance Editor** 105
- components**
 - XM-122 gSE Vibration module 3
 - XM-441 Expansion Relay module 3
 - XM-940 terminal base 2
- configuration parameters** 55
 - 4-20mA output parameters 82
 - alarm parameters 74
 - band measurement parameters 66
 - channel transducer parameters 58
 - data parameters 89
 - device mode parameters 93
 - gSE parameters 69
 - I/O data parameters 88
 - overall measurement parameters 63
 - relay parameters 78
 - signal processing parameters 60
 - spectrum/waveform parameters 65
 - speed measurement parameters 69
 - SU/CD trend parameters 85
 - sum harmonics measurement parameters 64
 - tachometer parameters 71
 - triggered trend parameters 83
- connecting wiring** 17
 - 4-20mA outputs 44
 - buffered outputs 27
 - DeviceNet 46
 - power supply 21
 - relays 22
 - remote relay reset signal 42
 - serial port 45
 - setpoint multiplication switch 43
 - tachometer 25
 - terminal base XM-940 17
 - transducers 29, 182
- Connection Object** 133
- conventional mode** 56
- COS message format** 114

D**data parameters** 89

- 1X Magnitude Value 90
- 1X Phase Value 90
- 2X Magnitude Value 90
- 2X Phase Value 90
- 3X Magnitude Value 90
- 4-20mA Output A 91
- 4-20mA Output B 91
- Acceleration 91
- Alarm Status 92
- Band Measured Value 89
- Band Measurement 89
- Band Measurement Status 89
- DC Gap Voltage 89
- Gap Value 89
- Get Waveform Data Only 90
- gSE Overall value 91
- gSE Status 91
- Measured DC Bias 89
- Not 1X and Vector Status 90
- Not 1X Value 90
- Overall Value 89
- Peak Speed 91
- Relay Status 92
- Spectrum/Waveform Status 90
- Speed Status 90
- Speed Value 91
- Sum Harmonics Value 89
- Transducer 3 Measured DC Bias 91
- Transducer 3 Status 90
- Transducer Fault 89
- Transducer Status 89
- Xdcr DC Bias 91

description

- configuration parameters 55
- XM-122 module 3
- XM-441 module 3
- XM-940 terminal base 2

Device Mode Object 156**Device Mode parameter** 93, 103**Device Mode parameters**

- Autobaud 93
- Device Mode 93, 103

DeviceNet connection

- baud rate 48
- node address 47
- wiring 46

DeviceNet grounding requirements 12**DeviceNet information**

- automatic device replacement (ADR) 116
- EDS files 103
- I/O message formats 107
- invalid device configuration errors 106
- setting the Device Mode parameter 103
- XM services 105

DeviceNet Object 122**DeviceNet objects**

- 4-20mA Output 176
- Acknowledge Handler 147
- Alarm 148
- Analog Input Point 136
- Assembly 123
- Band Measurement 151
- Channel 153
- Connection 133
- Device Mode 156
- DeviceNet 122
- Discrete Input Point 135
- Identity 120
- Overall Measurement 158
- Parameter 138
- Relay 161
- Spectrum Waveform Measurement 163
- Speed Measurement 170
- Tachometer Channel 171
- Transducer 173
- Vector Measurement 174

DIN Rail Grounding Block 9**DIN rail grounding requirements** 8**Discrete Input Point Object** 135**document conventions** 4**E****Electronic Data Sheet (EDS) files** 103**F****Full Scale**

- guidelines for setting 191
- XM-122 tables 192

G**grounding requirements** 8

- 24V common 12
- DeviceNet 12
- DIN rail 8
- panel/wall mount 10

grounding requirements *(continued)*

- switch input 13
- transducers 12

gSE mode 56**gSE parameters** 69

- FMAX 70
- gSE Full Scale 70
- High Pass Filter 70
- Number of Averages 71
- Number of Lines 70
- Output Data Unit 70
- Window Type 71

guidelines for setting full scale 191**I****I/O data parameters** 88

- Assembly Instance Table 88
- COS Output 88
- COS Size 88
- Custom Assembly 88
- Poll Output 88
- Poll Response Assembly 88
- Poll Size 88

I/O message formats

- bit-strobe messages 115
- change of state (COS) messages 114
- poll messages 107
- XM status values 114

Identity Object 120**indicators** 49

- Channel Status 51
- Module Status 50
- Network Status 51
- Relay 51
- Setpoint Multiplier 51
- Tachometer Status 51

installation requirements

- grounding 8
- power 6
- wiring 6

interconnecting terminal base units 15**introduction** 1**invalid device configuration errors** 106**K****keyswitch** 48**M****measurement modes** 56

- conventional mode 56
- gSE mode 56

Module Status (MS) indicator 50**mounting**

- terminal base unit on DIN rail 13
- terminal base unit on panel/wall 16
- XM-122 module on terminal base 48

N**Network Status (NS) indicator** 51**node address** 47**normally closed relay contacts** 22**normally open relay contacts** 22**Not1X measurements** 90**O****operating mode**

- program mode 50, 103
- run mode 50, 103

Overall Measurement Object 158**overall measurement parameters** 63

- Low Pass Filter 64
- Overall Damping Factor 64
- Overall Filter 64
- Overall Time Constant 63
- Signal Detection 63

P**panel/wall mount grounding requirements** 10**Parameter Object** 138**poll message format** 107

- Assembly instance 101 108
- Assembly instance 102 109
- Assembly instance 103 110
- Assembly instance 104 111
- Assembly instance 105 112
- Assembly instance 106 113

power requirements 6**power supply, wiring** 21**program mode** 50, 103**R****relay contacts**

- normally closed 22
- normally open 22

Relay indicator 51
Relay Object 161
relay parameters 78
 Activation Delay 79
 Activation Logic 79
 Alarm A 80
 Alarm B 80
 Alarm Identifier A 80
 Alarm Identifier B 80
 Alarm Levels 80
 Alarm Status to Activate On (Alarm Levels) 80
 Enable 79
 Failsafe 81
 Latching 79
 Name 79
 Number 78
 Relay Installed 80
relays
 resetting 42, 52
 wiring 22
remote relay reset signal, wiring 42
reset switch 52
run mode 50, 103

S

self-test, status 52
serial port connection
 mini-connector 46
 terminal base unit 45
setpoint multiplication switch, wiring 43
Setpoint Multiplier indicator 51
signal processing parameters 60
 Autoscale 60
 Channel Name 58
 External Gear Teeth 62
 Full Scale 60
 High HPF Frequency 61
 High Pass Filter 61
 Internal Gear Teeth 62
 Low HPF Frequency 61
 Medium HPF Frequency 61
 Output Data Unit 61
 Sampling Mode 62
 Very High HPF Frequency 61
 Very Low HPF Frequency 61
specifications 95
Spectrum Waveform Measurement Object 163

spectrum/waveform parameters 65
 FMAX 65
 Number of Averages 66
 Number of Lines 65
 Number of Points 66
 Period 66
 Window Type 66
Speed Measurement Object 170
speed measurement parameters 69
 Exponential Averaging Time Constant 69
SU/CD trend parameters 85
 Enable SU/CD Trend 86
 Latch Enable 86
 Maximum Speed 87
 Maximum Trend Span 87
 Minimum Speed 87
 Number of Records 86
 Record Interval 86
 Reset Trigger 87
 Select Measurements 86
 Status 87
 View Trend Data 87
sum harmonics measurement parameters 64
 Order of Sum Harmonics 64
 Sum Harmonics Start Order 64
switch input grounding requirements 13

T

Tachometer Channel Object 171
tachometer parameters 71
 Auto Trigger 73
 DC Bias Time Constant 72
 Fault High 72
 Fault Low 72
 Fault Time-Out 73
 Pulses Per Revolution 72
 Tachometer Name 71
 Trigger Hysteresis 73
 Trigger Mode 73
 Trigger Slope 73
 Trigger Threshold 73
Tachometer Status indicator 51
tachometer, wiring 25
terminal base
 interconnecting units 15
 mounting on DIN rail 13
 mounting on panel/wall 16

terminal block assignment 18
transducer grounding requirements 12
Transducer Object 173
transducer wiring 29, 182
 IEPE accelerometer 29, 182
 non-contact sensor 31, 183
 other configurations 37, 39, 40, 186, 188
 passive transducer 32
 powered sensor 34, 185
 process DC voltage signal 36
transition to program mode, DeviceNet 104
transition to run mode, DeviceNet 104
triggered trend parameters 83
 Enable Triggered Trend Measurements 84
 Latch Enable 84
 Manual Trigger 85
 Number of Records 84
 Post Trigger 85
 Record Interval 84
 Relay Number 84
 Reset Trigger 85
 Select Measurements 84
 Status 85
 Store Spectrum 85
 Store Waveform 85
 Trend Span 85
 View Collected Data 85
 View Trend Data 85

V

Vector Measurement Object 174
vector measurements 90

W

wiring
 to separate power connections 6
 to terminal base 17
wiring connections
 4-20mA outputs 44
 buffered outputs 27
 DeviceNet 46
 power supply 21
 relays 22
 remote relay reset signal 42
 serial port 45
 setpoint multiplication switch 43
 tachometer 25
 transducers 29, 182
wiring requirements 6

X

XM Services 105
XM status values 114
XM-122 gSE Vibration Module
 components 2
 configuration parameters 55
 grounding requirements 8
 indicators 49
 introduction 1
 measurement modes 56
 mounting 48
 power requirements 6
 reset switch 52
 self-test 52
 specifications 95
 wiring requirements 6
XM-122 I/O message formats 107
XM-441 Expansion Relay Module 3, 53, 78
XM-940 terminal base
 description 2
 mounting 13
 wiring 17

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