



MX4 Thermocouple Inputs, Frequency Input

Interchange™ Comm Control Module, MX4 Series

Installation and Operations Manual

In order to consistently bring you the highest quality, full featured products, we reserve the right to change our specifications and designs at any time. The latest version of this manual can be found at www.fwmurphy.com.

Warranty - A limited warranty on materials and workmanship is given with this FW Murphy product. A copy of the warranty may be viewed or printed by going to <http://www.fwmurphy.com/warranty>



Please read the following information before installing.

BEFORE BEGINNING INSTALLATION OF THIS MURPHY PRODUCT READ AND FOLLOW ALL INSTALLATION INSTRUCTIONS.

EXPLOSION HAZARD: SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS 1, DIVISION 2

EXPLOSION HAZARD: WHEN IN HAZARDOUS LOCATIONS, TURN OFF POWER BEFORE REPLACING OR WIRING MODULES.

EXPLOSION HAZARD: DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.

Please contact FW MURPHY immediately if you have any questions.

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Murphy Interchange Comm Control Module Series

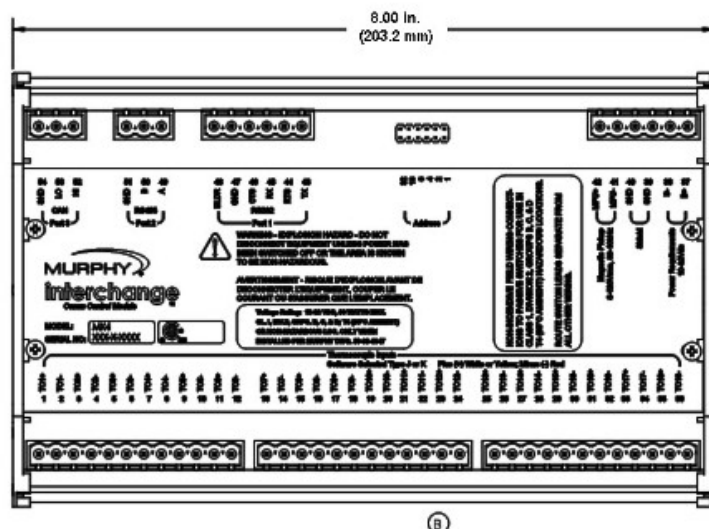
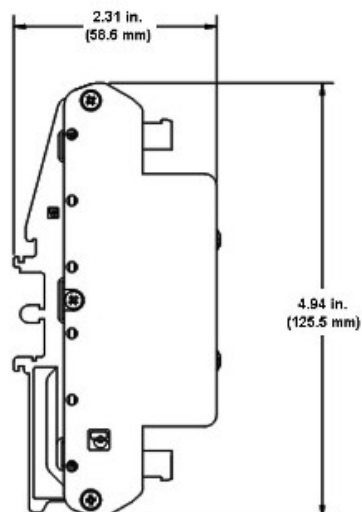
The MX4 expansion module provides temperature and frequency input capability to existing and future Murphy Controllers using CANBUS proprietary communications. Modbus® RTU RS485/RS232 is also provided for other communication requirements. Any mix of MX-Series modules can be added to enable Digital and Analog I/O, and Thermocouple functionality for communication and monitoring by the master controller.

MX4 Thermocouple / MPU

CSA C/US Listed, Class I, Div. 2 Groups B, C & D

The MX4 module adds thermocouple input ability to the master. It can read up to 18 thermocouples and 1 mpu.

Product Dimensions and Mounting



Accessories

MX4 Plug Kit (00030867) Printed Terminal Plugs for MX4 Expansion I/O Module

Specifications

Operating Temperature: -40° to +85°C (185°F)

Storage Temperature: -40° to +85°C (185°F)

Power Input Voltage: 10 to 32 VDC (30W max)

MX4 Installation Instructions

When installing a MX4 Expansion I/O Module, power, I/O (Thermocouples and MPU), and communication wiring must be in accordance with Class 1, Division 2 wiring methods [Article 501-4(b) of the National Electrical Code, NFPA 70] and in accordance with the authority having jurisdiction.

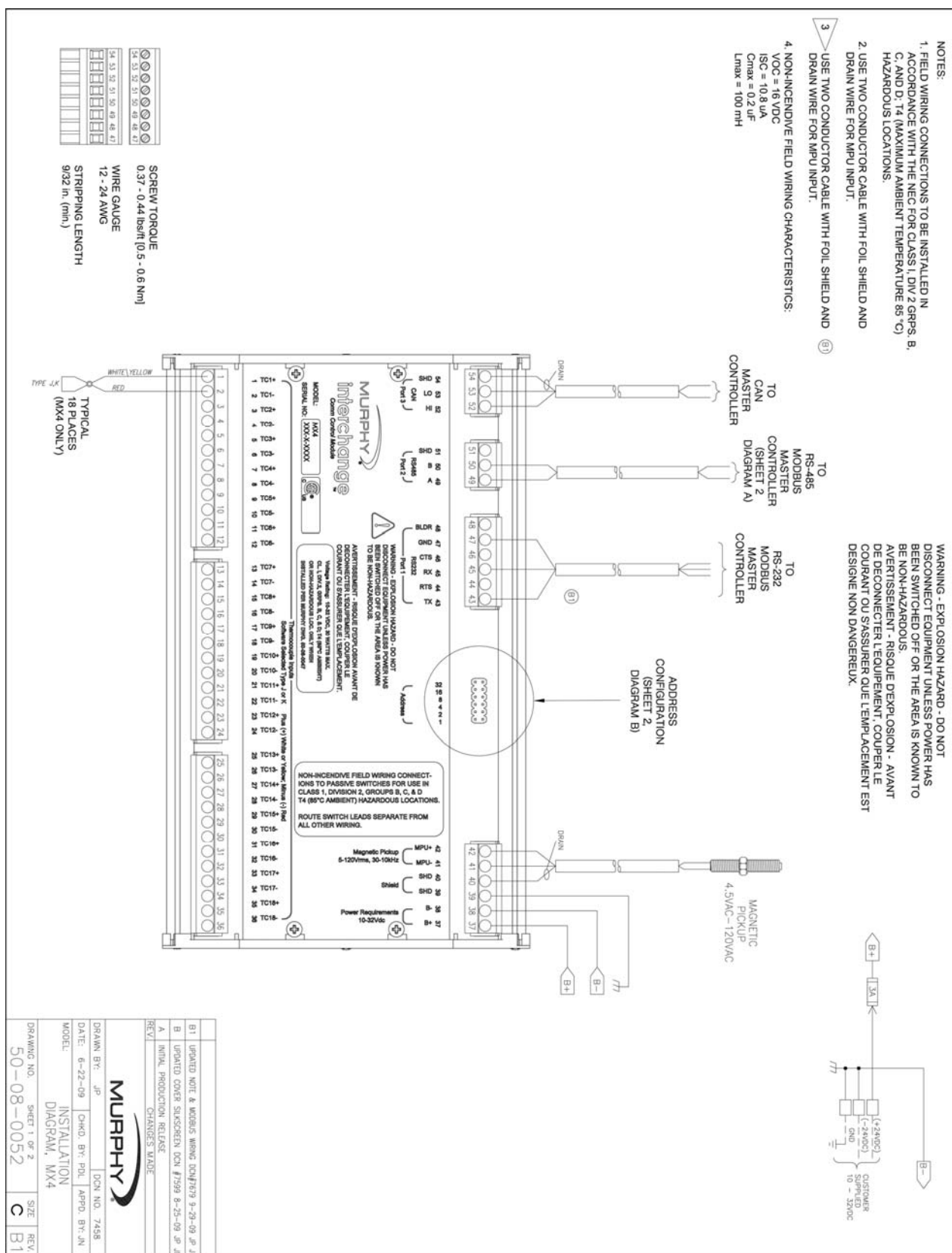


DIAGRAM A - RS-485 TYPICAL CONNECTIONS

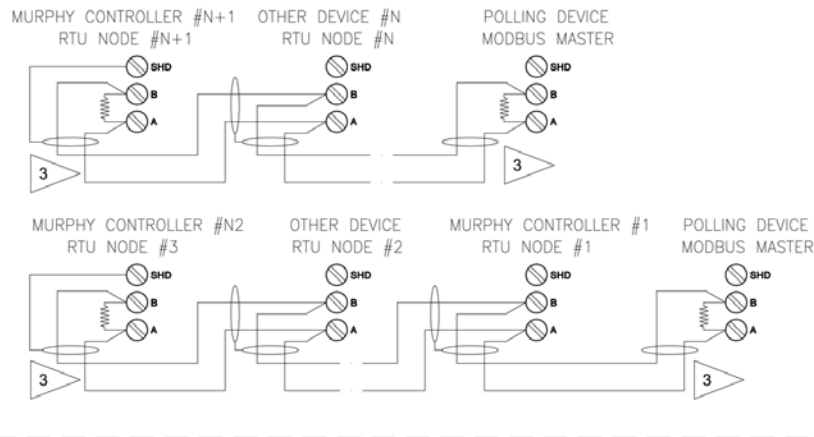
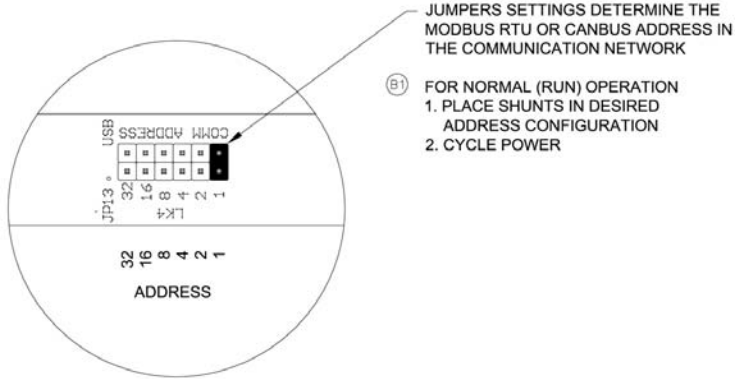
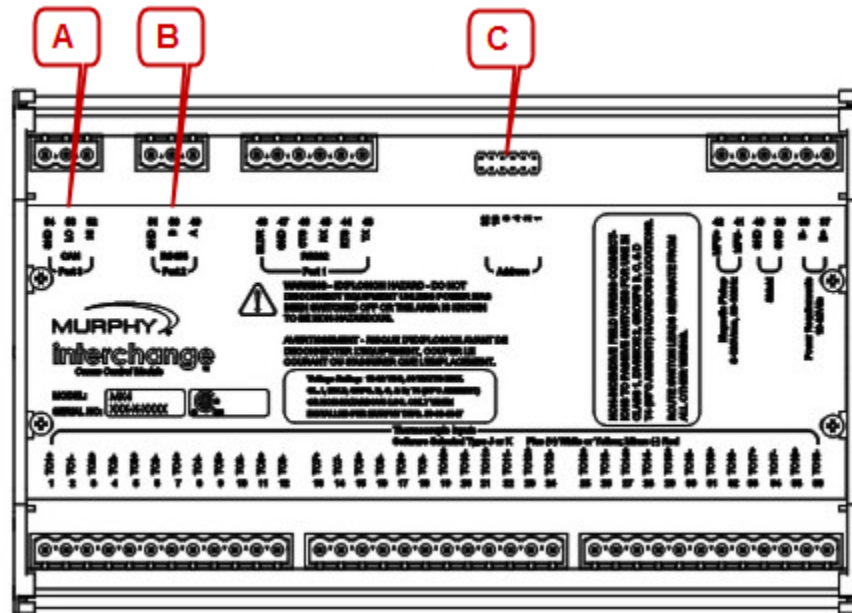


DIAGRAM B - PORT 2 ADDRESS JUMPER FUNCTION

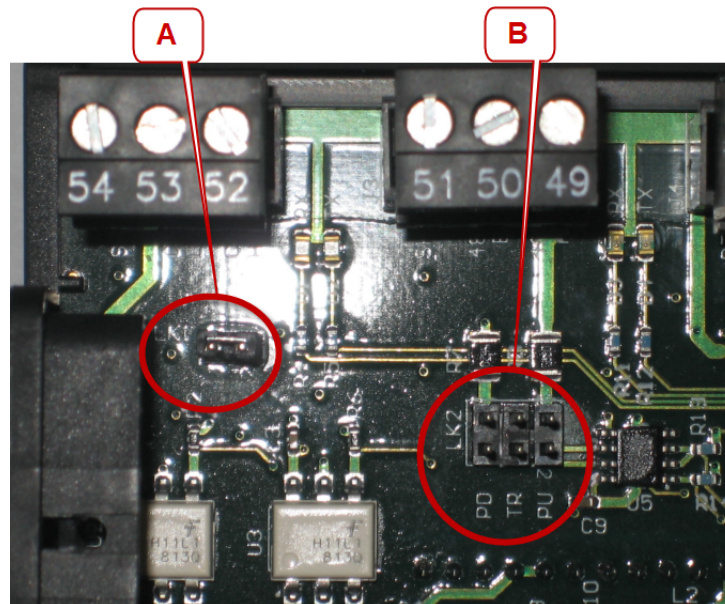


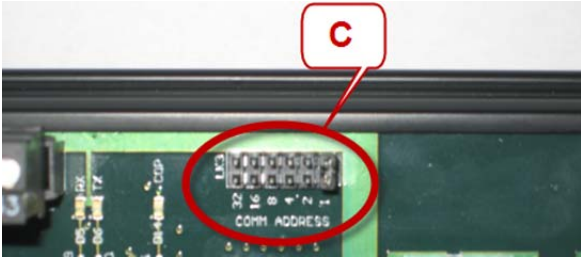
MX4 Jumper Configuration



A **CANBUS:** Communication Link to Main I/O Module

- LK1:** This jumper provides a termination resistor for the CAN communication chain. This jumper must be in place only when the I/O module is the last in the communication chain. See control panel drawings for designation. The cover of the MX4 must be removed to access this jumper link (LK1). (Refer to the **Communications** chapter in this document)



B	<p>RS485 Communication Port: Slave Comm. Port. (See Pictorial Above)</p> <ul style="list-style-type: none"> • LK2: These jumpers provide a termination, pick-up, and pull-down resistors for RS485 communication chain. The PU/PD jumpers should only be in one place on the communication chain. The TR jumper must be in place only when the I/O module is the last in the communication chain. See control panel drawings for designation. The cover of the MX4 must be removed to access this jumper link (LK2). (Refer to the Communications chapter in this document)
C	<p>Communication Address Select Shunts: Comm Address</p> <ul style="list-style-type: none"> • LK3: These jumpers allow you to assign a unique address to each MX4 that may be in the system. This allows the master controller to differentiate between the modules. For example, to name the controller address 5, place the shunts on LK1 and LK4. (Refer to the Communications chapter in this document) 

Communications

Physical Layer: The MX4 module features one asynchronous RS232 serial communication port, one asynchronous RS485 serial communication port, and one CANBUS 2.0B proprietary communication port.

RS232 Interconnect: The module is equipped with screw terminals called Port 1. This connection is typically used to poll the information for a specific module using twisted shielded pair cable suitable for RS232 networks. The simplest form of these networks are 3-wire, half-duplex, using RX, TX and GND terminals. The TX terminal is the “TRANSMIT DATA” signal, the RX terminal is the “RECEIVE DATA” signal, and the GND is the “COMMON GROUND” signal for the communication line. These signal lines will take turns transmitting and receiving depending on the device using the RS232 network at any given instant. The MX4 also provides connections for CTS and DTR signals if required for 5 wire RS232 connections.

RS485 Interconnect: The module is equipped with screw terminals called Port 2. This connection is typically used to poll the information for a specific module using twisted shielded pair cable with 120 ohm impedance suitable for RS485 networks. These networks are 2-wire, half-duplex, and feature an “A” terminal 49, “B” terminal 50, and “SHD” shielded ground connection. The A terminal is the + or non-inverting signal, and the B terminal is the – or inverting signal. These signal lines will take turns transmitting and receiving depending on the device using the RS485 network at any given instant.

Baud Rate: 9600 fixed (RS232/RS485)

Protocol: Modbus RTU. This is a binary communication protocol. All data will be contained in unsigned 16-bit Modbus Holding Registers (addressed starting at 40001). Following the Modbus RTU specification, the Most Significant Byte in a 16-bit word is broadcast first, followed by the Least Significant Byte.

Refer to the Modbus RTU map provided in this manual for a detailed mapping of the available data and data scaling.

CANBUS 2.0 B Interconnect: The module is equipped with screw terminals called Port 3. This connection is typically used to provide the interconnections between the main control module which polls the information for a specific module using twisted shielded pair cable with 120 ohm impedance suitable for CAN networks. This network protocol is proprietary CANBUS, and features a “HI”(CAN H) terminal 52, “LO”(CAN L) terminal 53 connection, and “SHD” shielded ground connection.

Communication Address Select Shunts: A jumper shunt header is provided to assign a unique Modbus RTU and/or CANBUS address to each expansion module that may be in the network. This allows the master controller to differentiate between the modules. Addressing is done in binary format, and each incrementing jumper increases the weight by a factor of 2.

For example, to name the controller address 5, place the shunts on LK1 and LK4. The sum makes 5 (4+1).

NOTE: RS485/RS232 Communication is 9600-N-8-1 for Address 0-31 and 9600-N-8-2 for Address 32-63. Registers start at 40,001.

Stop Bits: The module will respond with 1 stop bit for Modbus RTU addresses 1 through 31 and 2 stop bits for addresses 32 through 63. This maintains flexibility for systems requiring 2 stop bits.

Modbus RTU Polling Frequency: The module should be polled by the Modbus RTU Master with a delay of 30-50mS between packets, and typical response times will be < 100mS. This may vary depending on the amount of data requested on each module. Typical Modbus RTU timeout settings should be set to >= 400mS.

PC Connection: Most commercial PC's are equipped with one RS232 serial port in the form of a 9 pin D-Sub connection. If not, USB to RS232 adapters are also readily available. Testing for RS485 traffic can be done using a PC equipped with any Modbus RTU Master software and a serial interface converter that can convert RS232 traffic to RS485. The PC in this case would serve as the Modbus RTU master in lieu of an external controller.

MX4 Expansion Module - Modbus RTU Description

Modbus Register	Description	Read/Write	Range	Data Units	Definitions
40001 - 40020	Factory Use	R			
40021	Raw count system voltage	R	0 - 1023	A/D count	0 = 0.0 VDC, 1023 = 5 VDC
40022	Raw count Thermocouple input 0	R	0 - 4095	A/D count	0 = 0.0 VDC, 4095 = 4.096 VDC
40023	Raw count Thermocouple input 1	R	0 - 4095	A/D count	0 = 0.0 VDC, 4095 = 4.096 VDC
40024	Raw count Thermocouple input 2	R	0 - 4095	A/D count	0 = 0.0 VDC, 4095 = 4.096 VDC
40025	Raw count Thermocouple input 3	R	0 - 4095	A/D count	0 = 0.0 VDC, 4095 = 4.096 VDC
40026	Raw count Thermocouple input 4	R	0 - 4095	A/D count	0 = 0.0 VDC, 4095 = 4.096 VDC
40027	Raw count Thermocouple input 5	R	0 - 4095	A/D count	0 = 0.0 VDC, 4095 = 4.096 VDC
40028	Raw count Thermocouple input 6	R	0 - 4095	A/D count	0 = 0.0 VDC, 4095 = 4.096 VDC
40029	Raw count Thermocouple input 7	R	0 - 4095	A/D count	0 = 0.0 VDC, 4095 = 4.096 VDC
40030	Raw count Thermocouple input 8	R	0 - 4095	A/D count	0 = 0.0 VDC, 4095 = 4.096 VDC
40031	Raw count Thermocouple input 9	R	0 - 4095	A/D count	0 = 0.0 VDC, 4095 = 4.096 VDC
40032	Raw count Thermocouple input 10	R	0 - 4095	A/D count	0 = 0.0 VDC, 4095 = 4.096 VDC

Modbus Register	Description	Read/Write	Range	Data Units	Definitions
40033	Raw count Thermocouple input 11	R	0 - 4095	A/D count	0 = 0.0 VDC, 4095 = 4.096 VDC
40034	Raw count Thermocouple input 12	R	0 - 4095	A/D count	0 = 0.0 VDC, 4095 = 4.096 VDC
40035	Raw count Thermocouple input 13	R	0 - 4095	A/D count	0 = 0.0 VDC, 4095 = 4.096 VDC
40036	Raw count Thermocouple input 14	R	0 - 4095	A/D count	0 = 0.0 VDC, 4095 = 4.096 VDC
40037	Raw count Thermocouple input 15	R	0 - 4095	A/D count	0 = 0.0 VDC, 4095 = 4.096 VDC
40038	Raw count Thermocouple input 16	R	0 - 4095	A/D count	0 = 0.0 VDC, 4095 = 4.096 VDC
40039	Raw count Thermocouple input 17	R	0 - 4095	A/D count	0 = 0.0 VDC, 4095 = 4.096 VDC
40040	Raw count cold junction input 1	R	0 - 4095	A/D count	0 = 0.0 VDC, 4095 = 4.096 VDC
40041	Raw count cold junction input 2	R	0 - 4095	A/D count	0 = 0.0 VDC, 4095 = 4.096 VDC
40042	Frequency input (hertz)	R	30 – 10,000	Hz	
40043	Modbus CTS	R	0 - 1	state of signal	
40044	Factory Use	R			
40045	Filtered Temperature thermocouple 1	R	-2000 to +25000	deg F X10	
40046	Filtered Temperature thermocouple 2	R	-2000 to +25000	deg F X10	
40047	Filtered Temperature thermocouple 3	R	-2000 to +25000	deg F X10	
40048	Filtered Temperature thermocouple 4	R	-2000 to +25000	deg F X10	
40049	Filtered Temperature thermocouple 5	R	-2000 to +25000	deg F X10	
40050	Filtered Temperature thermocouple 6	R	-2000 to +25000	deg F X10	
40051	Filtered Temperature thermocouple 7	R	-2000 to +25000	deg F X10	
40052	Filtered Temperature thermocouple 8	R	-2000 to +25000	deg F X10	
40053	Filtered Temperature thermocouple 9	R	-2000 to +25000	deg F X10	
40054	Filtered Temperature thermocouple 10	R	-2000 to +25000	deg F X10	
40055	Filtered Temperature thermocouple 11	R	-2000 to +25000	deg F X10	
40056	Filtered Temperature thermocouple 12	R	-2000 to +25000	deg F X10	
40057	Filtered Temperature thermocouple 13	R	-2000 to +25000	deg F X10	
40058	Filtered Temperature thermocouple 14	R	-2000 to +25000	deg F X10	
40059	Filtered Temperature thermocouple 15	R	-2000 to +25000	deg F X10	
40060	Filtered Temperature thermocouple 16	R	-2000 to +25000	deg F X10	
40061	Filtered Temperature thermocouple 17	R	-2000 to +25000	deg F X10	
40062	Filtered Temperature thermocouple 18	R	-2000 to +25000	deg F X10	
40063	Cold junction 1 temperature	R	-400 to +1850 F	deg F X10	

Modbus Register	Description	Read/Write	Range	Data Units	Definitions
40064	Cold junction 2 temperature	R	-400 to +1850 F	deg F X10	
40065	Factory Use	R			
40066	Factory Use	R			
40067	Temperature thermocouple 1	R	-2000 to +25000	deg F X10	
40068	Temperature thermocouple 2	R	-2000 to +25000	deg F X10	
40069	Temperature thermocouple 3	R	-2000 to +25000	deg F X10	
40070	Temperature thermocouple 4	R	-2000 to +25000	deg F X10	
40071	Temperature thermocouple 5	R	-2000 to +25000	deg F X10	
40072	Temperature thermocouple 6	R	-2000 to +25000	deg F X10	
40073	Temperature thermocouple 7	R	-2000 to +25000	deg F X10	
40074	Temperature thermocouple 8	R	-2000 to +25000	deg F X10	
40075	Temperature thermocouple 9	R	-2000 to +25000	deg F X10	
40076	Temperature thermocouple 10	R	-2000 to +25000	deg F X10	
40077	Temperature thermocouple 11	R	-2000 to +25000	deg F X10	
40078	Temperature thermocouple 12	R	-2000 to +25000	deg F X10	
40079	Temperature thermocouple 13	R	-2000 to +25000	deg F X10	
40080	Temperature thermocouple 14	R	-2000 to +25000	deg F X10	
40081	Temperature thermocouple 15	R	-2000 to +25000	deg F X10	
40082	Temperature thermocouple 16	R	-2000 to +25000	deg F X10	
40083	Temperature thermocouple 17	R	-2000 to +25000	deg F X10	
40084	Temperature thermocouple 18	R	-2000 to +25000	deg F X10	
40085 - 40087	Factory Use	R			
40088	Temperature input 1 type	R/W	0 - 2	0 = J, 1 = K	
40089	Temperature input 2 type	R/W	0 - 2	0 = J, 1 = K	
40090	Temperature input 3 type	R/W	0 - 2	0 = J, 1 = K	
40091	Temperature input 4 type	R/W	0 - 2	0 = J, 1 = K	
40092	Temperature input 5 type	R/W	0 - 2	0 = J, 1 = K	
40093	Temperature input 6 type	R/W	0 - 2	0 = J, 1 = K	
40094	Temperature input 7 type	R/W	0 - 2	0 = J, 1 = K	
40095	Temperature input 8 type	R/W	0 - 2	0 = J, 1 = K	
40096	Temperature input 9 type	R/W	0 - 1	0 = J, 1 = K	
40097	Temperature input 10 type	R/W	0 - 1	0 = J, 1 = K	
40098	Temperature input 11 type	R/W	0 - 1	0 = J, 1 = K	
40099	Temperature input 12 type	R/W	0 - 1	0 = J, 1 = K	
40100	Temperature input 13 type	R/W	0 - 1	0 = J, 1 = K	
40101	Temperature input 14 type	R/W	0 - 1	0 = J, 1 = K	
40102	Temperature input 15 type	R/W	0 - 1	0 = J, 1 = K	

Modbus Register	Description	Read/Write	Range	Data Units	Definitions
40103	Temperature input 16 type	R/W	0 - 1	0 = J, 1 = K	
40104	Temperature input 17 type	R/W	0 - 1	0 = J, 1 = K	
40105	Temperature input 18 type	R/W	0 - 1	0 = J, 1 = K	
40106	Cold junction 1 temperature offset	R/W	-32768 to +32767	deg F	
40107	Cold junction 2 temperature offset	R/W	-32768 to +32767	deg F	
40108	Factory Use	R			
40109	Communication timeout	R/W	0 – 65535	time in seconds	
40110	Modbus DTR	R/W	0 - 1	set state of signal	
40111-40115	Factory Use	R			

Register 40001 Value Description

Register 40,001 is a read-only register. This register holds the model number of the hardware. If you are using multiple Comm modules, it is sometimes helpful to confirm that you are communicating with the expected module type. In this case, it will return 279.

Register 40042 Value Description

Register 40,042 is a read-only register. This register displays the readings of the frequency input (magnetic pickup) in hertz (Hz).

Register 40045 – 40064 Value Description

Registers 40,045 – 40,064 are read-only registers. The values returned in these registers are signed 16 bit data. These channels are the actual readings from the source device. Thermocouple channels are shown in degF x 10. For example, a read value of 1200 means 120°F is being read.

NOTE: These values are not averaged before they are updated in the MX4. The device reading these values must perform some sort of averaging to filter out sporadic erroneous reading.

Register 40067 – 40084 Value Description

Registers 40,067 – 40,084 are read-only registers. The values returned in these registers are signed 16 bit data. These channels are the median average readings from the source device. This will require approximately 400ms for an accurate reading on initial power. Thermocouple channels are shown in degF x 10. For example, a read value of 1200 means 120°F is being read.

NOTE: These values are averaged in the MX4. These readings are used for the displayed temperatures as they eliminate the sporadic readings typically delivered by thermocouple devices.

Register 40088 – 40105 Value Description

Registers 40,088 – 40,105 are read/write registers. This will allow you to configure what type of sensor is attached to each channel. The module will return a value in engineering units. Use the list below to determine what value you should write based on the sensor installed.

- 0 – Type J thermocouple
- 1 – Type K thermocouple

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