MX16160 Expander

Technical Instructions

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What is the MX16160 expander?

The MX16160 expander connects to expandable M and ME line controllers to increase the number of inputs and outputs. Expanders let your system grow as the size of the job increases.

Specifications

Power	24 Vac ±10%, 50–60 Hz, 35 VA power consumption, single Class 2 source only, 100 VA or less
Inputs	16 universal inputs, configurable for 0–5 Vdc, 0–20 mA, thermistor, dry contact, or pulse counter
Input resolution	12 bit A/D
Input pulse frequency	10 pulses per second. Minimum pulse width (on or off time) required for each pulse is 50 msec.
Digital outputs	16 digital outputs, relay contacts rated at 3 A resistive @ 24 Vac. Configurable as normally open or normally closed.
Protection	Incoming power and network connections are protected by non-replaceable internal solid-state polyswitches that reset themselves when the condition that causes a fault returns to normal. The power, network, input, and output connections are also protected against voltage transient and surge events.
Status indicators	LED's indicate status of communications, running, and power
Environmental operating range	0 to 130°F (-17.8 to 54.4°C), 10–90% relative humidity, non-condensing
Physical	Rugged aluminum cover, removable, screw-type terminal blocks
Overall dimensions	Width: 11 5/16 in. (28.7 cm) Height: 11 5/16 in. (28.7 cm)
Mounting dimensions	Width: 10 13/16 in. (27.5 cm) Height: 9 13/16 in. (24.9 cm)
Recommended panel depth	2 3/4 in. (7 cm)
Weight	3.2 lbs (1.45 kg)
Listed by	UL-916 (PAZX), cUL-916 (PAZX7), FCC Part 15-Subpart B-Class A, CE EN50082-1997

Inputs

The MX16160 has 16 universal inputs that accept the following signal types.

Signal Type	Description
Thermistor	Precon type 2 (10 kOhm at 77°F). Input voltages should be from 0.489 Vdc to 3.825 Vdc for thermistors.
Dry contact	A 5 Vdc wetting voltage detects contact position, resulting in a 0.5 mA maximum sense current when the contacts are closed.
0–5 Vdc	The output impedance of a 0–5 Vdc source must not exceed 10 kOhms. The input impedance of the MX16160 is approximately 1 MOhm.
0–20 mA	The input resistance on each A terminal is 250 Ohms. The B terminal supplies a voltage source to power the 4–20 mA transducer. Each B terminal is capable of supplying 18–24 Vdc, but the total current drawn by all B terminals must not exceed 200 mA. If the voltage measured from any B terminal to **Gnd** is less than 18 Vdc, you need to use an additional external power supply.
Pulse counter*	Pulse counting up to 10 pulses per second. Minimum pulse width (on or off time) required for each pulse is 50 msec.

* The MX16160 can perform pulse counting for dry contact or voltage inputs if you assign the input to a Pulse to Analog Input microblock. See *To assign inputs or outputs to points* (page 7).

Digital outputs

The MX16160 has 16 digital outputs. You can connect each output to a maximum of 24 Vac and configure as normally open or normally closed. Each output is a dry contact rated at 3 A.

1 Arrange the controller and the expander(s) in one or two columns, placing the controller anywhere in the columns.

2 Connect the devices' **Expansion** connectors.

NOTE If you use 2 columns, use one expander cable to connect an **Expansion** connector in the first column to an **Expansion** connector in the second column. See "MX expander cable" below.

3 Screw each device into an enclosed panel using the mounting holes on the cover plate. Leave about 2 in. (5 cm) on each side for wiring.

NOTE If you attach an MX16160 to an ME line controller, place spacers behind the MX16160's mounting holes so that the **Expansion** connectors will align. The MX16160 requires 2 large-size spacers (ALC part number 254902).

MX expander cable

You can purchase a 2-foot MX expander cable from ALC (part number GXEXP) or you can make a cable using the following wiring specifications and diagram.

Wiring	Belden 9539 or equivalent
Connectors	DE-9S female connectors DE-9 connector shells
Length	2 feet recommended 6 feet maximum *

* Keep the cable as short as possible to reduce noise and maintain signal integrity.

Controller (DE-9S)		Expander (DE-9S)
1	Red	1
2	Black	2
3	Brown	3
4	Orange	4
5	Yellow	5
6	Violet	6
7	Blue	7
8	Green	8
* 9	White	9 *

* Solder the shield wire to this wire.

Wiring for power

- The MX16160 is powered by a Class 2 power source. Take appropriate isolation measures when mounting it in a control panel where non-Class 2 circuits are present.
- ALC controllers can share a power supply as long as you:
  - Maintain the same polarity.
  - Use the power supply only for ALC controllers.

NOTE For the controller to recognize an attached expander, you must turn on the expander before you turn on the controller.

To wire for power

1 Turn off the MX16160's power to prevent it from powering up before you can verify the correct voltage.

2 Remove power from the 24 Vac transformer.

3 Pull the screw terminal connector from the controller's power terminals labeled **Gnd** and **24 Vac**.

4 Connect the transformer wires to the screw terminal connector.

5 Apply power to the transformer.

6 Measure the voltage at the MX16160's power input terminals to verify that the voltage is within the operating range of 21.6–26.4 Vac.

7 Insert the screw terminal connector into the MX16160's power terminals.

8 Turn **on** the MX16160's power.

9 Verify that the **Power** LED is on and the **Run** LED is blinking.

To address the MX16160

You must give the MX16160 an address that is unique on the network. You can address the MX16160 before or after you wire it for power.

1 If wired for power, turn off the MX16160's power and the attached controller's power.

2 Set the MX16160's address on the rotary switch. For example, the switch below shows an address of 5.

3 Turn on the MX16160's power, then turn on the attached controller's power. The controller reads the powered MX16160's address each time you turn on the controller.

Wiring inputs and outputs

Wiring specifications

Input wiring

Input	Maximum length	Minimum gauge	Shielding
Thermistor Dry contact	1000 feet (305 meters)	22 AWG	Shielded
0–5 Vdc	1000 feet (305 meters)	26 AWG	Shielded
0–20 mA	3000 feet (914 meters)	26 AWG	Shielded or unshielded

Output wiring

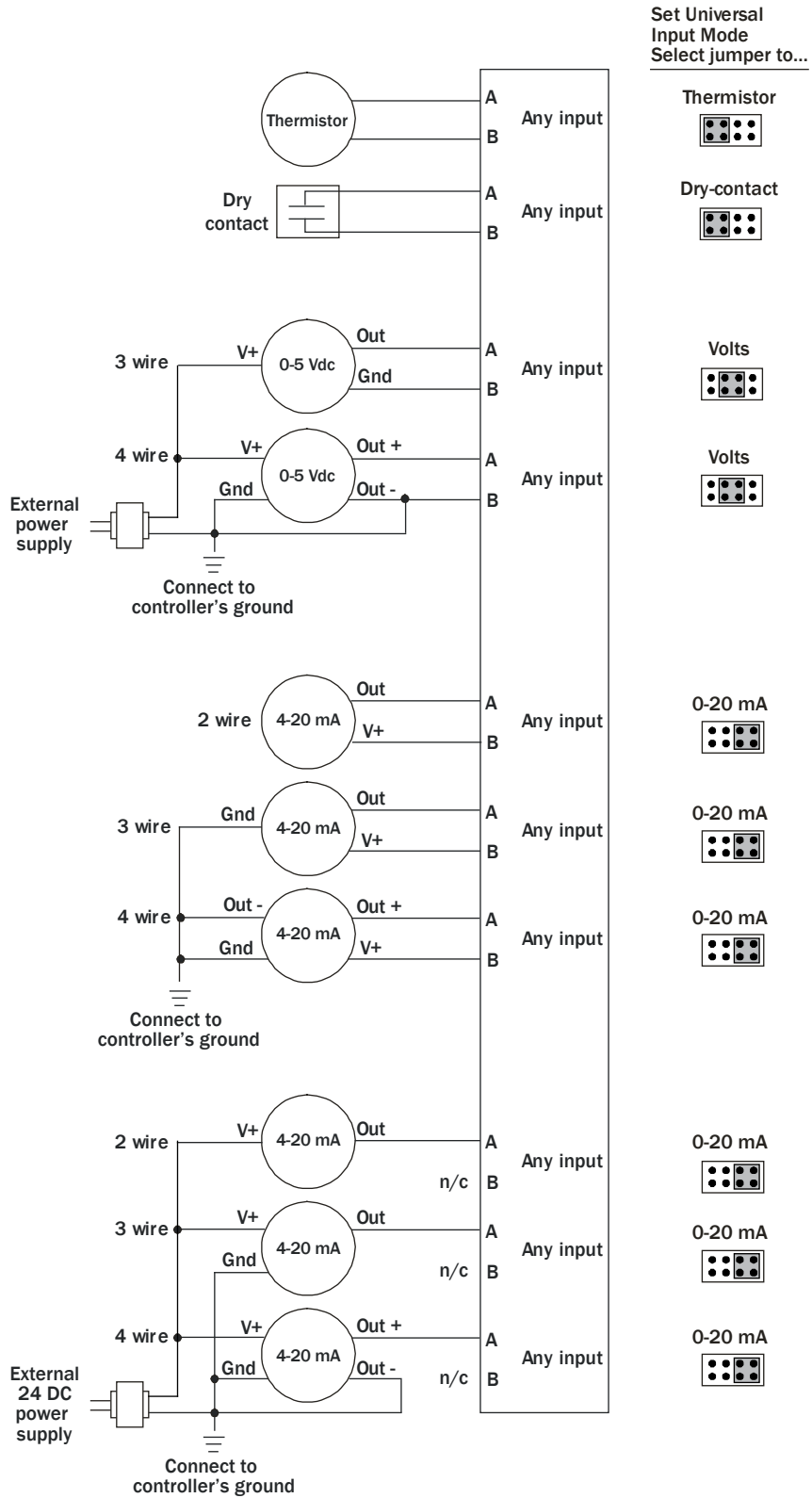To size output wiring, consider the following:

• Total loop distance from the power supply to the controller, and then to the controlled device

   NOTE Include the total distance of actual wire. For 2-conductor wires, this is twice the cable length.

• Acceptable voltage drop in the wire from the controller to the controlled device

• Resistance (Ohms) of the chosen wire gauge

• Maximum current (Amps) the controlled device requires to operate

To wire inputs and outputs

1 Verify that the MX16160's power and communications connections work properly.

2 Turn **off** the MX16160's power.

3 Connect the input wiring to the screw terminals on the MX16160.

   NOTES

   ○ If using shielded wire, connect the shield wire and the ground wire to the **Gnd** terminal.

   ○ If a 4–20 mA sensor uses an external 24 Vac power supply, connect one leg of the 24 Vac supply to the MX16160's ground.

Set Universal
Input Mode
Select jumper to...

Thermistor

Dry-contact

Volts

Volts

0-20 mA

0-20 mA

0-20 mA

0-20 mA

0-20 mA

0-20 mA

4 Set each input's **Universal Input Mode Select** jumper to indicate the type of input. Grip the jumper by the sides only.
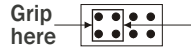
5 Connect the digital output wiring to the screw terminals on the MX16160 and to the controlled device.
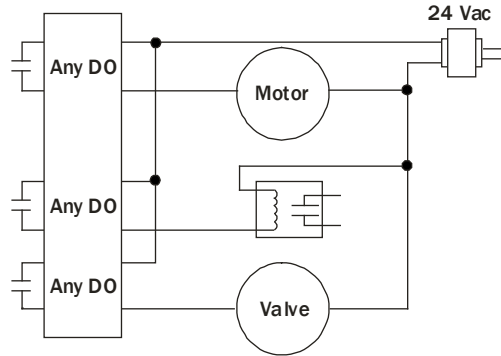
6 Set each output's jumper to normally open (**N/O**) or normally closed (**N/C**).

7 Turn **on** the MX16160's power.

To assign inputs or outputs to points

To use an input or output, you must assign it to its corresponding point in the control program.

1 In WebCTRL's **GEO** tree, select the equipment controlled by the MX16160.

2 On the **Properties** page, select the **I/O Points** tab.

3 For each point, type the expander's rotary switch address in the **Exp** field and the number of the expander's corresponding input or output in the **Num** field.

EXAMPLE If DO1 on the MX16160 (which has a rotary switch address of 5) is used for the point **Fan S/S**, enter 5:1 in the **Exp:Num** column for **Fan S/S**.

NOTE Do not assign the same output number to more than one point.

4 Enter the appropriate values for each input and output in the remaining columns. See *Input values*, *Output values*, *Resolution values* and *Offset/Polarity values* below.

NOTE You can also enter these values in EIKON LogicBuilder.

5 If you have not performed the initial download to the attached controller, you must download now to verify inputs and outputs.

6 To verify each input's operation, force each sensor to a known value, then compare it to the **Value** shown on the **Properties** page on the **I/O Points** tab.

7 To verify each output's operation, lock each output to a known condition on the **I/O Points** tab, then verify that the equipment operates correctly.

Input values

Input	I/O Type[1]	sensor/Actuator Type	Min/Max
Analog (BAI)			
0-5 Vdc	**0–5 Volt**	**Linear Full Range**	Engineering values associated with 0 Vdc (Min) and 5 Vdc (Max)[2]
0-20 mA	**0–20 mA**	**Linear Full Range**	Engineering values associated with 0 mA (Min) and 20 mA (Max)[2]
4-20 mA	**0–20 mA**	**Linear w/Offset, 4–20 mA**	Engineering values associated with 4 mA (Min) and 20 mA (Max)[2]
Thermistor	**Thermistor**	Select your Thermistor type or set up and select a **Non-Linear, Custom Table**[3]	N/A
Pulse to Analog (BPTA)[4]			
Pulse Counter	**Counter Input**	N/A	N/A
Digital (Binary) (BBI)			
Dry Contact	**Dry Contact**	N/A	N/A

[1] If you are using the MX16160 expander with an line controller and its driver is any version before 2.02.022, select **Universal Input** as the **I/O Type** for all inputs.

[2] The sensor reads a value and sends a corresponding signal (Volt, mA, or psi) to the MX16160's physical input. The Analog Input microblock uses the **Min** and **Max** values to linearly translate the signal into the engineering value used in subsequent control logic. For example, set **Min** to 0 and **Max** to 10 for a 4–20 mA sensor that measures velocity from 0.0 to 10.0 inches/second so that when the input reads 4 mA, the microblock outputs a value of 0. Similarly, when the input reads 8 mA, the microblock outputs a value of 2.5.

[2] You can set up a custom translation table on the driver's **Custom Translation Tables** pages in WebCTRL.

[4] The control program must have one Pulse to Analog Input microblock for each pulse counting input.

Output values

Output	I/O Type	Sensor/Actuator Type	Min/Max
Relay	Relay/Triac Output	N/A	N/A

Resolution values

Resolution is not particular to a type of input or output, but the driver handles analog and digital (binary) inputs and outputs differently. To set these values appropriately, you should understand how the driver uses them.

Resolution	Notes
Analog Input (BAI)	The driver truncates the microblock's present value according to the resolution. **EXAMPLE** If the calculated present value is 13.789 and you set the **Resolution** to 0.1, the control program uses 13.7 for any calculations downstream from the microblock.
Digital Inputs and Outputs	N/A

Offset/Polarity values

Offset/Polarity is not particular to a type of input or output, but the driver handles analog and digital (binary) inputs and outputs differently. To set these values appropriately, you should understand how the driver uses them.

Offset/Polarity	Notes
Analog Input (BAI)	**Offset** value (positive or negative) adds a fine adjustment to a sensor reading after all scaling for calibration. **EXAMPLE** If a sensor reads 74.9°F when the actual measured value is 73.6°F, enter an **Offset** of -1.3 to calibrate the sensor to the measured value.
Digital (Binary) Input (BBI)	**Polarity** determines the microblock's present value when no signal is received from the equipment. When no signal is received from the equipment, if **Polarity** is set to: **normal**—present value is **off** **reversed**—present value is **on**
Digital (Binary) Output (BBO)	**Polarity** determines the MX16160's output based on the control program's signal to the microblock. When the control program's signal to the microblock is **on**, if **Polarity** is set to: **normal**—output is **on** **reversed**—output is **off** **NOTE** Regardless of **Polarity**, the output will be off if the MX16160 loses power. You can set the relay contact for each output on the MX16160 to be open or closed if the MX16160 loses power. **EXAMPLE** To set up an output for on/off heat in a cold climate: Output jumper—NC (normally closed) Polarity—reversed If the MX16160 loses power, the jumper causes the contact to close and the heat turns on. When the signal to the microblock is on, the MX16160 output is off, the relay is closed, and the heat is on.

To use the Auto-Off-On switches

You can control a digital output using the **Auto-Off-On** switch.

If switch position is...	Normally open output contacts are..	Normally closed output contacts are..
Auto	Determined by control program	Determined by control program
Off	Locked open	Locked closed
On	Locked closed	Locked open

The control program can monitor the status of an **Auto-Off-On** switch and display the status on the control program's **Point Checkout** page in WebCTRL. The **Value** of the point monitoring the **Auto-Off-On** switch shows **Off** if the switch is set to **Auto**, and **On** if the switch is set to **Off** or **On**.

To monitor an Auto-Off-On switch

1   Insert a BACnet Binary Input microblock in the control program.

2   On the microblock's **Properties** page in WebCTRL, set the **I/O Type** field to **H-O-A Status Feedback**.

3   In the **Input Number** field, type the number of the output you want to monitor.

Troubleshooting

If you have problems mounting, wiring, or addressing the MX16160, contact ALC Technical Support.

LED's

The LED's on the MX16160 show the status of certain functions.

If this LED...	Is...	Status is...
Power	On	Expander has power
Run	Flashing or on	Normal
Expander I/O	Flashing	Expansion bus communications are valid

Serial number

If you need the MX16160's serial number when troubleshooting, the number is on a sticker on the back of the main controller board.

To monitor expander communication

You can add an analog input in a control program that will provide the communication status of the MX16160. If the input reads a value of 139, the expander is communicating. If the input reads 0, the expander is not communicating.

To have the input provide the MX16160's status, define the following properties for the input.

Expander: The expander number you want to read
Input Number: 1
Input Type: Special

Compliance

FCC Compliance

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

CAUTION Changes or modifications not expressly approved by the responsible party for compliance could void the user's authority to operate the equipment.

CE Compliance

WARNING This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.