

MEx816u Expander

Technical Instructions

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What is the MEx816u expander?

The MEx816u expander connects to an ME line controller to increase the number of inputs and outputs. You can connect up to 5 MEx816u's to the ME line controller.

Specifications

Power	24 Vac $\pm 10\%$, 50–60 Hz, 45 VA 26 Vdc $\pm 10\%$, 21 W
Inputs	16 inputs, configurable for 0–5 Vdc, 0–10 Vdc, 0–20 mA, RTD, thermistor, or dry contact
Input resolution	14 bit A/D
Input pulse frequency	40 pulses per second. Minimum pulse width (on or off time) required for each pulse is 12.5 msec.
Outputs	8 outputs for 24 Vdc relay driver, 0–10 Vdc, or 0–20 mA
Output resolution	12 bit D/A
Microprocessor	8-bit microprocessor with 60 kB Flash memory, 2 kB SRAM, and CAN controller
Protection	Incoming power is protected by 2 replaceable 3 Amp Pico® fuses. The power and network connections are also protected against transient excess voltage/surge events lasting no more than 10 msec.
Status indicators	LED's indicate status of communications, running, errors, and outputs
Environmental operating range	-20 to 140 °F (-29 to 60 °C), 10–90% relative humidity, non-condensing NOTE Install in a UL Listed enclosure only.
Physical	Rugged aluminum cover, removable, screw-type terminal blocks
Overall dimensions	Height: 9 in. (22.9 cm) Width: 5 1/2 in. (14 cm)
Mounting dimensions (in a panel)	Height: 8 9/16 in. (21.8 cm) Width: 3 5/16 in. (8.4 cm)
Recommended panel depth	2 3/4 in. (7cm)
Weight	13.3 oz. (.377 kg)
Listed by	UL-916 (PAZX), cUL-916 (PAZX7), FCC Part 15-Subpart B-Class A, CE

Inputs

The MEx816u has 16 inputs that accept the following signal types.

Signal Type	Description
Thermistor ¹	Precon type 2 (10 kOhm at 77 °F). Input voltages should be from 0.489 Vdc to 3.825 Vdc for thermistors. Accuracy: $\pm 0.5^{\circ}\text{F}$ ($\pm 0.28^{\circ}\text{C}$)
Dry contact	A 5 Vdc wetting voltage detects contact position, resulting in a 1 mA maximum sense current when the contacts are closed.
0–5 Vdc 0–10 Vdc	The output impedance of a 0–5 Vdc or a 0–10 Vdc source must not exceed 200 Ohms. The input impedance of the MEx816u is approximately 20 kOhm.
0–20 mA	The input resistance on the positive (+) terminal is 250 Ohms. The Aux Power Out connector is capable of supplying 24 Vdc to multiple 4–20 mA transducers, but the total current demanded must not exceed 200 mA. If the voltage measured from the Aux Power Out connector to Gnd is less than 18 Vdc, you need to use an external power supply.
RTD ¹	Platinum - 1 kOhm at 32 °F (0 °C) Nickel/Iron - 1 kOhm at 70 °F (21 °C) Balco TS8000 - 1 kOhm at 70 °F (21 °C) Input voltages should be from 0.6–1.2 V NOTE Automated Logic® recommends use of an external current transducer between an RTD and the MEx816u.
Pulse counter ²	Pulse counting up to 40 pulses per second. Minimum pulse width (on or off time) required for each pulse is 12.5 msec.

¹ To use a thermistor or RTD not listed above, you can set up a custom translation table for your sensor.

² The MEx816u 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 10).

NOTE If you have one or more RTD's connected to the inputs, the total current draw of all Thermistor, RTD, and Dry contact devices wired to the inputs should not exceed 10 mA. Exceeding this limit will affect the accuracy of the RTD's. Use the following approximations as a reference:

- 10 kOhm Thermistor draws approximately 0.334 mA
- 1 kOhm RTD draws approximately 0.834 mA
- Dry contact draws approximately 1 mA

For example, if you connect 12 RTD's to the inputs, you cannot use the remaining 4 inputs for Thermistor, RTD, or Dry contact devices. This assumes negligible wiring impedance (<10 Ohms) for each RTD input with up to 100 feet of 22 AWG cable.

Outputs

The MEx816u has 8 universal outputs that you can use as digital outputs or analog outputs. The outputs support:

- driving external 24 Vdc relays
- 0-10 Vdc devices
- 0-20 mA devices



WARNING Do not apply 24 Vac to these universal outputs.

If output controls a...	Resistance to ground must be...
0–10 Vdc device	500 Ohms minimum
0–20 mA device	800 Ohms maximum

NOTES

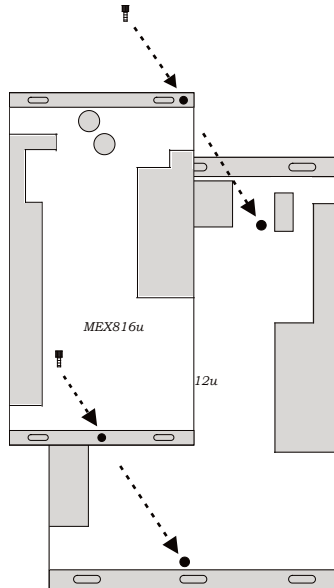
- The device must share the same ground as the controller.
- The total output current from all outputs and the **Aux Power Out** connector must not exceed:
500 mA at 115 °F
300 mA at 140 °F
For temperatures above 115 °F, use the following equation to calculate the total current at 8 mA per degree:

$$500\text{mA} - ((\text{max. expected temp.} - 115^{\circ}\text{F}) * 8\text{mA})$$

To mount the MEx816u

You can mount an MEx816u in one of the following locations:

- On an ME812u, ME812u-E, or ME812u-LGR controller using the 2 provided 7/64 socket head cap screws, 6-32 thread.



- In an enclosed panel. Screw the MEx816u to the panel using the four mounting holes on the cover plate. Leave about 2 in. (5 cm) on each side for wiring.

See *Wiring for communications* (page 6) to wire the MEx816u to the controller.

Wiring for power



WARNING Do not apply line voltage (mains voltage) to the controller's ports and terminals.



CAUTIONS

- The MEx816u 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.
- Automated Logic® controllers can share a power supply as long as you:
 - Maintain the same polarity.
 - Use the power supply only for Automated Logic® 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 MEx816u's power to prevent it from powering up before you can verify the correct voltage.
- 2 Remove power from the power supply.
- 3 Pull the screw terminal connector from the MEx816u's power terminals labeled **24 Vac** and **Gnd (Return)**.
- 4 Connect the transformer wires to the screw terminal connector.
- 5 Apply power to the power supply.
- 6 Measure the voltage at the MEx816u'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 MEx816u's power terminals.
- 8 Turn **on** the MEx816u's power.
- 9 Verify that the **Power** LED is on and the **Run** LED is blinking.

To address the MEx816u

You must give the MEx816u an address that is unique on the network. You can address the MEx816u before or after you wire it for power.

- 1 If wired for power, turn off the MEx816u's power and the attached controller's power.
- 2 Set the MEx816u's address on the rotary switch. For example, the switch below shows an address of 5.



- 3 Turn on the MEx816u's power, then turn on the attached controller's power. The controller reads the powered MEx816u's address each time you turn on the controller.

Wiring for communications

Use ARC156 wiring to wire the MEx expander to the controller. Do not exceed 100 feet total wire length.

ARC156 wiring specifications

Below are the specifications for ARC156 wiring. The wire jacket and UL temperature rating specifications list two acceptable alternatives. Halar has a higher temperature rating and a tougher outer jacket than SmokeGard, and it is appropriate for use in applications where you are concerned about abrasion. Halar is also less likely to crack in extremely low temperatures.

NOTE Use the specified type of wire and cable for maximum signal integrity.

Description	Single twisted pair, low capacitance (12pF), CL2P, 22 AWG (7x30), TC foam FEP, plenum rated cable
Conductor	22 AWG (7x30) stranded copper (tin plated) 0.030 in. (0.762 mm) O.D. NOTE 24 AWG can be used for segments <200 ft. (6.7 m).
Insulation	Foamed FEP 0.015 in. (0.381 mm) wall 0.060 in. (1.524 mm) O.D.
Color code	Black/white
Twist lay	2 in. (50.8 mm) lay on pair 6 twists/foot (20 twists/meter) nominal
Shielding	Aluminum/Mylar shield with 24 AWG (7x32) TC drain wire
Jacket	SmokeGard (SmokeGard PVC) 0.021 in. (0.5334 mm) wall 0.175 in. (4.445 mm) O.D. Halar (E-CTFE) 0.010 in. (0.254 mm) wall 0.144 in. (3.6576 mm) O.D.
DC resistance	15.2 Ohms/1000 feet (50 Ohms/km) nominal
Capacitance	12.5 pF/ft (41 pF/meter) nominal conductor to conductor
Characteristic impedance	100 Ohms nominal
Weight	12 lb/1000 feet (17.9 kg/km)
UL temperature rating	SmokeGard 167 °F (75 °C) Halar -40 to 302 °F (-40 to 150 °C)
Voltage	300 Vac, power limited
Listing	UL: NEC CL2P, or better

To wire the MEx816u to the controller

 **WARNING** Do not apply line voltage (mains voltage) to the controller's ports and terminals.

- 1 Wire the MEx816u's **Xnet Remote Expansion** port to the same port on the controller.
NOTE To use more than one expander, wire their **Xnet Remote Expansion** ports together in a daisy-chain configuration. The controller must be the first device on the expander network.
- 2 Set the MEx816u's **Baud Select** jumper to 500k.
- 3 If the expander network has more than one expander, place the **Term** jumper in the down position or remove it from all expanders except the one at the end of the expander network. The **Term** jumper must be in the up position on the expander at the end of the network.

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 0–10 Vdc	1000 feet (305 meters)	26 AWG	Shielded
0–20 mA	3000 feet (914 meters)	26 AWG	Shielded or unshielded
RTD	100 feet (30 meters)	22 AWG	Shielded

NOTE Automated Logic® recommends use of an external current transducer between an RTD and the MEx816u.

Output wiring

To size output wiring, consider the following:

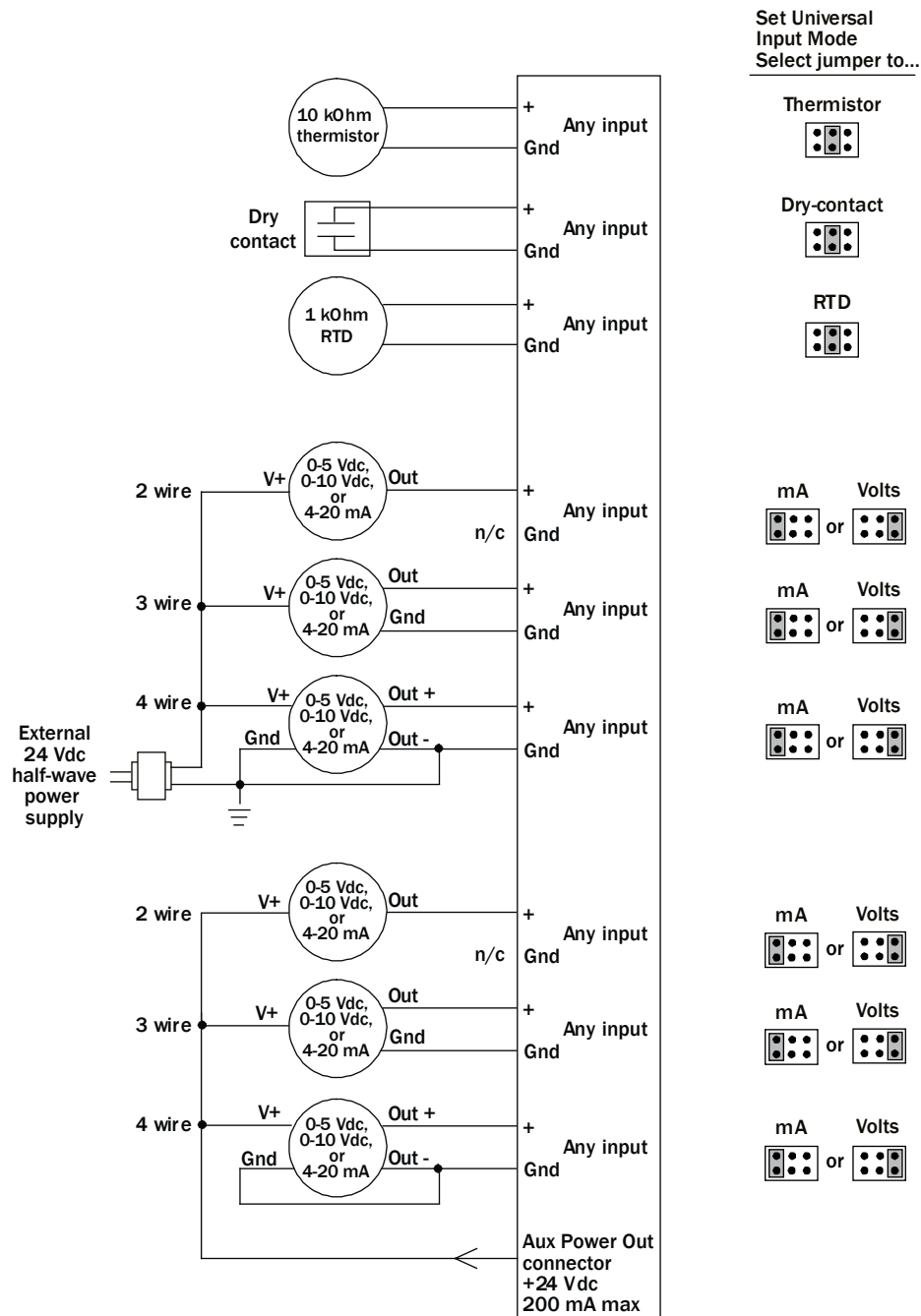
- Total loop distance from the power supply to the controller, and then to the controlled device
NOTE Include the total distance of actual wire. For 2-conductor wires, this is twice the cable length.
- Acceptable voltage drop in the wire from the controller to the controlled device
- Resistance (Ohms) of the chosen wire gauge
- Maximum current (Amps) the controlled device requires to operate

To wire inputs and outputs

WARNING Do not apply line voltage (mains voltage) to the controller's ports and terminals.

- 1 Verify that the MEx816u's power and communications connections work properly.
- 2 Turn **off** the MEx816u's power.
- 3 Connect the input wiring to the screw terminals on the MEx816u.

NOTE Connect the shield wire to the **GND** terminal with the ground wire.



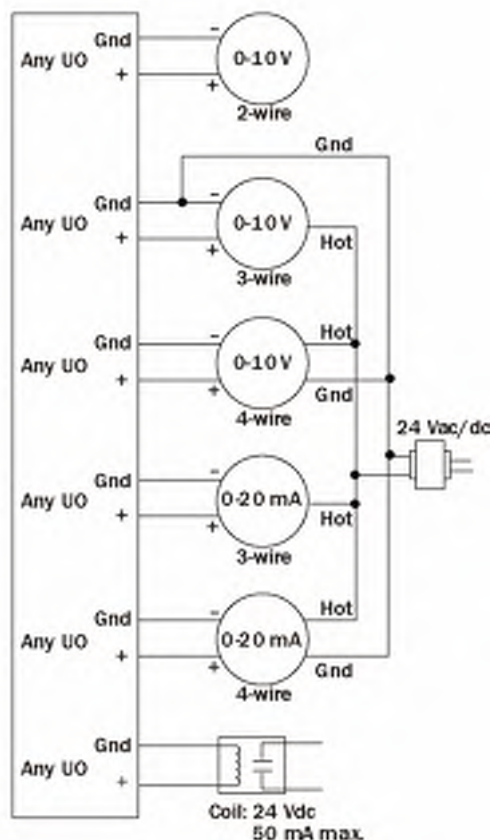
NOTE For a loop-powered 4-20 mA sensor, wire the sensor's positive terminal to the **+** terminal on the MEx816u's **Aux Power Out** connector. Wire the sensor's negative terminal to an input's **+** terminal.

- 4 Set each input's **Universal Input Mode Select** jumper to indicate the type of input.
- 5 Connect digital and analog output wiring to the **UO** screw terminals on the MEx816u and to the controlled device. Connect the ground wire to the UO's **Gnd** terminal.



WARNING Do not apply 24 Vac to these universal outputs.

Set output's jumper to...



- 6 Set each output's jumper to the type of device wired to the output.
- 7 For each digital output, turn the output's potentiometer clockwise until it stops (maximum output).
- 8 Turn **on** the MEx816u'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 the WebCTRL® **Geographic**  tree, select the equipment controlled by the MEx816u.
- 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 MEx816u (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 the EIKON® LogicBuilder application.
- 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	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) ¹
0-10 Vdc	0-10 Volt	Linear Full Range	Engineering values associated with 0 Vdc (Min) and 10 Vdc (Max) ¹
2-10 Vdc	0-10 Volt	Linear w/Offset, 2-10 Volts	Engineering values associated with 2 Vdc (Min) and 10 Vdc (Max) ¹
0-20 mA	0-20 mA	Linear Full Range	Engineering values associated with 0 mA (Min) and 20 mA (Max) ¹
4-20 mA	0-20 mA	Linear w/Offset, 4-20 mA	Engineering values associated with 4 mA (Min) and 20 mA (Max) ¹
RTD	RTD Input	Select your RTD type or set up and select a Non-Linear, Custom Table ²	N/A
Thermistor	Thermistor	Select your Thermistor type or set up and select a Non-Linear, Custom Table ²	N/A
Pulse to Analog (BPTA) ³			
Pulse Counter	Counter Input	N/A	N/A

Input	I/O Type	Sensor/Actuator Type	Min/Max
Digital (Binary) (BBI)			
Dry Contact	Dry Contact	N/A	N/A

- ¹ The sensor reads a value and sends a corresponding signal (Volt, mA, or psi) to the MEx816u'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 the WebCTRL® interface.
- ³ 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
Analog (BAO)			
0–10 Vdc	Electrical 0–10 Volt	Linear Full Range	Engineering values associated with 0 Vdc (Min) and 10 Vdc (Max) ¹
2–10 Vdc	Electrical 0–10 Volt	Linear w/Offset, 2–10 Volts	Engineering values associated with 2 Vdc (Min) and 10 Vdc (Max) ¹
0–20 mA	Electrical 0–20 mA	Linear Full Range	Engineering values associated with 0 mA (Min) and 20 mA (Max) ¹
4–20 mA	Electrical 0–20 mA	Linear w/Offset, 4–20 mA	Engineering values associated with 4 mA (Min) and 20 mA (Max) ¹
Digital (Binary) (BBO)			
Relay	Relay/Triac Output	N/A	N/A

- ¹ The Analog Output microblock uses the **Min** and **Max** values to linearly translate its EIKON® LogicBuilder wire value into a physical output signal (Volt, mA, or psi) sent from the MEx816u to an actuator. For example, set **Min** to 0 and **Max** to 100 for an Analog Output microblock that receives a 0 to 100% open signal from a PID microblock and that controls a 0–10 Vdc actuator so that when the PID signal is 100%, the MEx816u output is 10 Vdc. Similarly, when the PID signal is 50%, the MEx816u output is 5 Vdc.

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.
Analog Output (BAO)	The driver truncates the wire input value to the microblock before performing any scaling calculations. EXAMPLE If the wire input value is 13.789 and you set the Resolution to 0.1, the microblock uses 13.7 for any scaling calculations.
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.
Analog Output (BAO)	You can use the Offset value (positive or negative) to calibrate an output, but you generally do not need to. If used, the driver adds the offset value to the wire input value before performing any scaling calculations to determine the MEx816u's output.
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 MEx816u'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 MEx816u loses power.

To use the Auto-Off-On switches

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

Set the switch to...	To...
On	Turn on the output.
Off	Turn off the output
Auto	Let the control program control the output

The potentiometer, located between the **Auto-Off-On** switch and the jumper, allows you to manually control the output level of an analog output. Place the **Auto-Off-On** switch in the **On** position, then turn the potentiometer counterclockwise to reduce the output, or clockwise to increase the output.



For a digital output, turn the potentiometer clockwise until it stops (maximum output) and leave it in this position.

The control program can monitor the status of an **Auto-Off-On** switch and display the status on the control program's **Properties** page > **I/O Points** tab in the WebCTRL® interface. 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 the WebCTRL® interface, 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 MEx816u, contact ALC Technical Support.

LED's

The LED's on the MEx816u show the status of certain functions.

If this LED is on...	Status is...
Power	The MEx816u has power
Rx	The MEx816u is receiving data from the network segment
Tx	The MEx816u is transmitting data over the network segment
DO#	The digital output is active

The **Run** and **Error** LED's indicate controller and network status.

If Run LED shows...	And Error LED shows...	Status is..
2 flashes per second	Off	Normal
5 flashes per second	2 flashes per second	Boot is running
5 flashes per second	On	Fatal error. Replace expander or return for repair.

To get the MEx816u's serial number

If you need the MEx816u'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 MEx816u. If the input reads a value of 55, the expander is communicating. If the input reads 0, the expander is not communicating.

To have the input provide the MEx816u's status, define the following properties for the input.

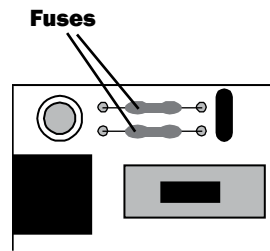
Expander: The expander number you want to read

Input Number: 1

Input Type: Special

To replace the MEx816u's fuses

If you turn on the MEx816u's power switch and the Power LED is not lit, use a multimeter to see if either of the 3 Amp Pico fuses that protect the incoming power is blown.

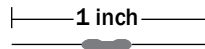


Before replacing the fuse, try to determine why the fuse blew.

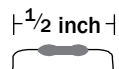
- Check the power wiring polarity of the MEx816u, the controller that the MEx is attached to, and any other controllers that share the power supply. Use the same polarity for all of them.
- Verify that outputs are wired to the appropriate types of devices. See *Outputs* (page 3). For example, you cannot wire a 24 Vac device to an output.

To replace the fuse:

- 1 Turn **off** the MEx816u's power.
- 2 Remove the MEx816u's coverplate.
- 3 Using needle-nose pliers, pull the bad fuse from the MEx816u.
- 4 Cut the wires on the new fuse so that the total length is approximately 1 inch and the fuse is centered.



- 5 Bend the wire ends so that the length is approximately 1/2 inch.



- 6 Use the pliers to grip one wire end of the fuse and push into a fuse socket on the MEx816u.
- 7 Grip the other wire end of the fuse and push into the other fuse socket.
- 8 Replace the MEx816u's coverplate.
- 9 Turn on the power and verify that the Power LED is lit.

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.



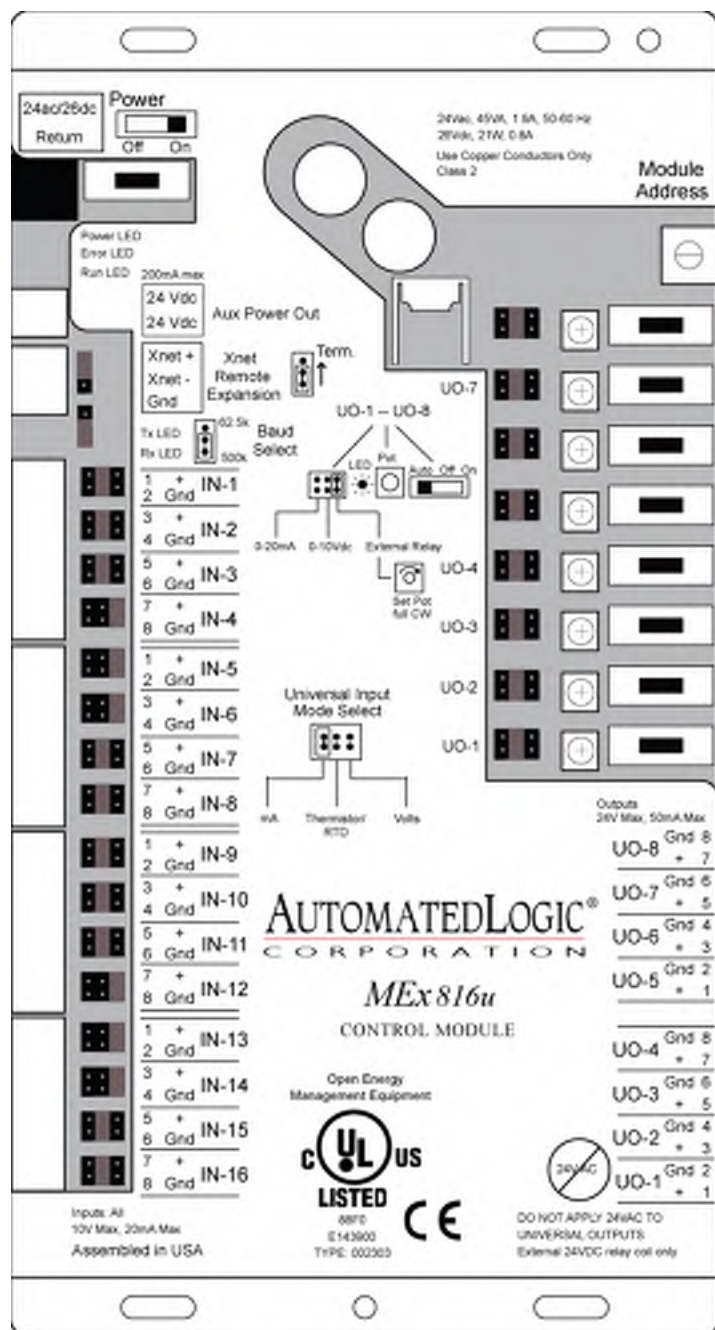
CAUTION Changes or modifications not expressly approved by the responsible party for compliance could void the user's authority to operate the equipment.

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.

Appendix - MEx816u coverplate



Document revision history

Important changes to this document are listed below. Minor changes such as typographical or formatting errors are not listed.

Date	Topic	Change description	Code*
9/28/16	Appendix - MEx816u coverplate	Updated coverplate	A-D
	To wire the MEx816u to the controller	Clarified final step in connecting multiple expanders.	X-TS-RD-E-BR
9/23/15	Specifications	Removed "(Replacement fuses available from Automated Logic, Part #FUSEPKG.)" from the Protection specification.	X-TS-JM-F
	To replace the MEx816u's fuse	Removed sentence, "You can order replacement fuses from Automated Logic, Part #FUSEPKG."	
4/20/15	Entire document	New look, no content changes	A-D

* For internal use only