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# I/O Flex 6126 Installation Guide





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## Introduction

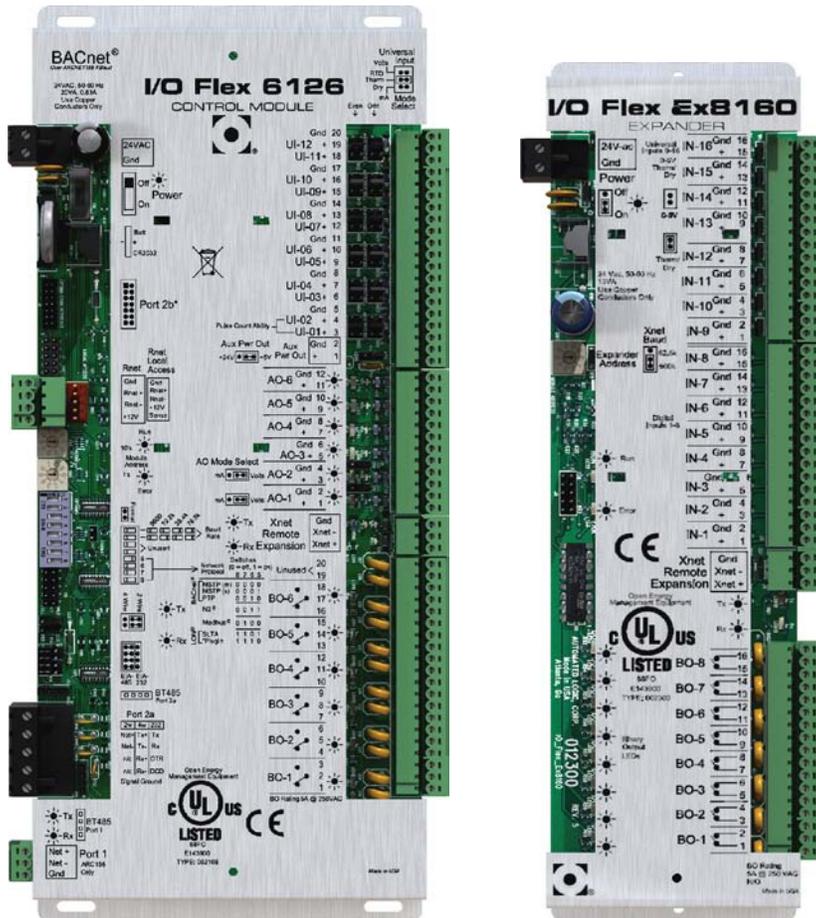
### What is this document about?

Use this document to install and configure the I/O Flex 6126 into the Building Automation System (BAS).

### What is the IO Flex 6126 and I/O Flex Ex8160?

The I/O Flex 6126 is a general purpose controller. It provides the communications circuitry, non-volatile memory, and removable screw terminals for I/O connections.

The I/O Flex 6126 can be connected to the I/O Flex Ex8160 expander to increase the number of inputs and outputs, allowing your system to grow as the size of the job increases.

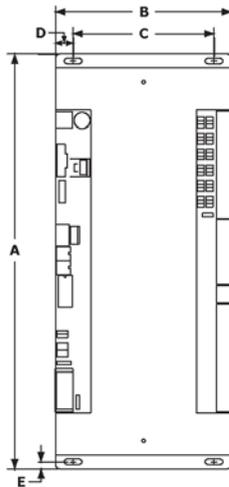


## Specifications

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Driver	drv_ioflex
Maximum number of control programs*	20
Maximum number of BACnet objects*	1000
* Depends on available memory	
Power	24 Vac $\pm$ 10%, 50–60 Hz 20 VA power consumption (26 VA with BACview attached) 26 Vdc (25 V min, 30 V max) Single Class 2 source only, 100 VA or less
Comm Ports	<p><b>Port 1:</b> For communication with the ARC156 networks.</p> <p><b>Port 2a:</b> For communication on EIA-232 or EIA-485 (2-wire or 4-wire). Network protocol selectable for:</p> <ul style="list-style-type: none"> <li>• BACnet (MS/TP or PTP)</li> <li>• Modbus</li> <li>• N2</li> <li>• LonWorks SLTA</li> </ul> <p><b>Port 2b:</b> For LonWorks Option Card</p>
Rnet port	<p>For connecting to RS sensors and/or BACview. Supports any of the following:</p> <ul style="list-style-type: none"> <li>• 1 RS Plus, RS Pro, or RS Pro-F</li> <li>• 1–4 RS Standards</li> <li>• 1–4 RS Standards, and 1 RS Plus, RS Pro, or RS Pro-F</li> </ul> <p>Any of the above combinations, plus up to 2 BACviews, but no more than 6 devices total.</p>
Local Access port	For local communication with a laptop computer running WebCTRL or for communication with a BACview <sup>6</sup> .
Xnet port	For communication with the I/O Flex Ex8160 expander.
Universal inputs	12 inputs configurable for 0-10 V, RTD Therm Dry, or 0-20mA. Inputs 1 and 2 may be used for pulse counting.
Input pulse frequency	<p>Maximum of 10 pulses per second. Minimum pulse width required for each pulse:</p> <ul style="list-style-type: none"> <li>• ON to OFF time (half cycle) is 50 msec</li> <li>• ON to OFF to ON time (full cycle) is 100 msec</li> </ul>
Input resolution	12 bit A/D
Binary outputs	6 binary outputs, relay contacts rated at 5A max @ 250 Vac. Configured normally open or normally closed.
Analog outputs	6 analog outputs. Inputs 1 and 2 are configurable for 0-10 V or 0-20mA, 3 - 6 are 0-10 V only.
Output resolution	8 bit D/A

Memory	1 MB non-volatile battery-backed RAM, 1 MB Flash memory, 16-bit memory bus
Real-time clock	Battery-backed real-time clock keeps track of time in event of power failure
Battery	10-year Lithium CR2032 battery provides a minimum of 10,000 hours of data retention during power outages
Protection	Incoming power and network connections - non-replaceable internal solid-state polyswitches reset themselves when fault clears  Power, network, I/O connections - protected against voltage transient and surge events
Status indicators	LED's indicate status of communications, running, errors, and power. LED indicators for transmit/receive for Port 1 and Port 2a and for each of the 12 outputs.
Environmental operating range	-20° to 140° F (-29° to 60° C), 10–95% relative humidity, non-condensing
Physical	Rugged aluminum housing, removable screw terminals with custom silk-screening available



Overall dimensions	A:	11-13/16 in. (30 cm)
	B:	5 in. (12.7 cm)
Mounting dimensions	C:	4 in. (10.2 cm)
	D:	1/2 in. (1.3 cm)
	E:	13/64 in. (.5 cm)
Depth	1-9/16 in. (4 cm)	
Weight	1.1 lb. (0.5 kg)	
BACnet support	Conforms to the Advanced Application Controller (B-AAC) Standard Device Profile as defined in ANSI/ASHRAE Standard 135-2004 (BACnet) Annex L	
Listed by	UL916 (Canadian Std C22.2 No. 205-M1983, CE, FCC Part 15 - Subpart B - Class A	

## Mounting and Wiring

### To mount the I/O Flex 6126

Screw the I/O Flex 6126 into an enclosed panel using the mounting slots on the coverplate. Leave about 2 in. (5 cm) on each side of the controller for wiring.

See mounting hole dimensions in Specifications.

If using an expander, see the following section before mounting the controller.

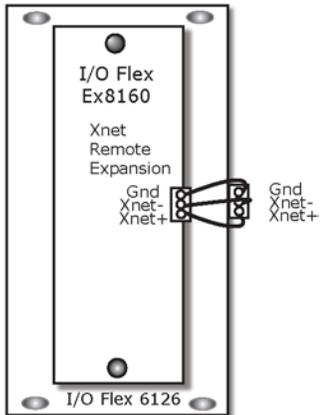
### To connect to an expander

Wiring restrictions for connecting the expander to the controller

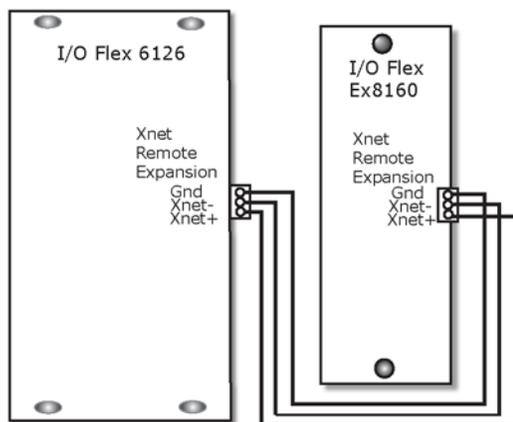
- Maximum length: 100 feet (30 meters)
- 22 AWG, low-capacitance, twisted, stranded, shielded copper wire

The I/O Flex 6126 supports one I/O Flex Ex8160 expander to increase input/output capacity.

The I/O Flex Ex8160 may be mounted directly onto the I/O Flex 6126, using the screws provided with the I/O Flex Ex8160 and the captive fasteners that are installed into the I/O Flex 6126.



The expander may also be mounted separately within the mounting enclosure. Screw the I/O Flex Ex8160 into an enclosed panel using the mounting holes provided on the coverplate. Be sure to leave about 2 inches (5 cm) on each side for wiring.



**CAUTION!** Connect the I/O Flex Ex8160 to the I/O Flex 6126 before applying power to either one. Turn on the expander before you turn on the controller.

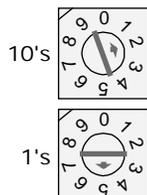
Refer to the *I/O Flex Ex8160 Installation Guide* for further details.

## To address the I/O Flex 6126

The I/O Flex 6126's two rotary switches determine the I/O Flex 6126's MAC address when it is placed on a BACnet/ARC156 or BACnet MS/TP network. The rotary switches define the MAC address portion of the device's BACnet address, which is composed of the network address and the MAC address. They also set the slave address on a Modbus or N2 network, when less than 100.

- 1 If the I/O Flex 6126 has been wired for power, pull the screw terminal connector from its power terminals labeled **Gnd** and **Hot**. The controller reads the address each time you apply power to it.
- 2 Using the rotary switches, set the controller's address. Set the **Tens (10's)** switch to the tens digit of the address, and set the **Ones (1's)** switch to the ones digit.

**EXAMPLE** If the controller's address is 25, point the arrow on the **Tens (10's)** switch to 2 and the arrow on the **Ones (1's)** switch to 5.



**NOTE** The I/O Flex 6126 recognizes its address only after power has been cycled.

## To wire for power

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### CAUTIONS

- The I/O Flex 6126 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.
- Do not power pilot relays from the same transformer that powers the I/O Flex 6126.
- OEMCtrl controllers can share a power supply as long as you:
  - Maintain the same polarity
  - Use the power supply only for OEMCtrl controllers
- The I/O Flex 6126 has an operating range of 21.6 Vac to 26.4 Vac. If voltage measured at the I/O Flex 6126's input terminals is outside this range, the I/O Flex 6126 may not work properly.

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

- 1 Turn off the I/O Flex 6126'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 I/O Flex 6126'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 I/O Flex 6126's power terminals.
- 8 Turn on the I/O Flex 6126's power.
- 9 Verify that the Power LED is on and the Run LED is blinking.

## Wiring inputs and outputs

### Input wiring specifications

Input	Maximum length	Minimum gauge	Shielding
0–5 Vdc	1000 feet (305 meters)	26 AWG	Shielded
0–20 mA	3000 feet (914 meters)	26 AWG	Shielded or unshielded
Thermistor Dry contact Pulse counter TLO	1000 feet (305 meters)	22 AWG	Shielded
RTD	100 feet (30 meters)	22 AWG	Shielded
RS sensor	500 feet (152 meters)	18 AWG, 4 conductor if a BACview is connected to the Rnet  22 AWG, 4 conductor if only RS room sensors are connected	Shielded or unshielded

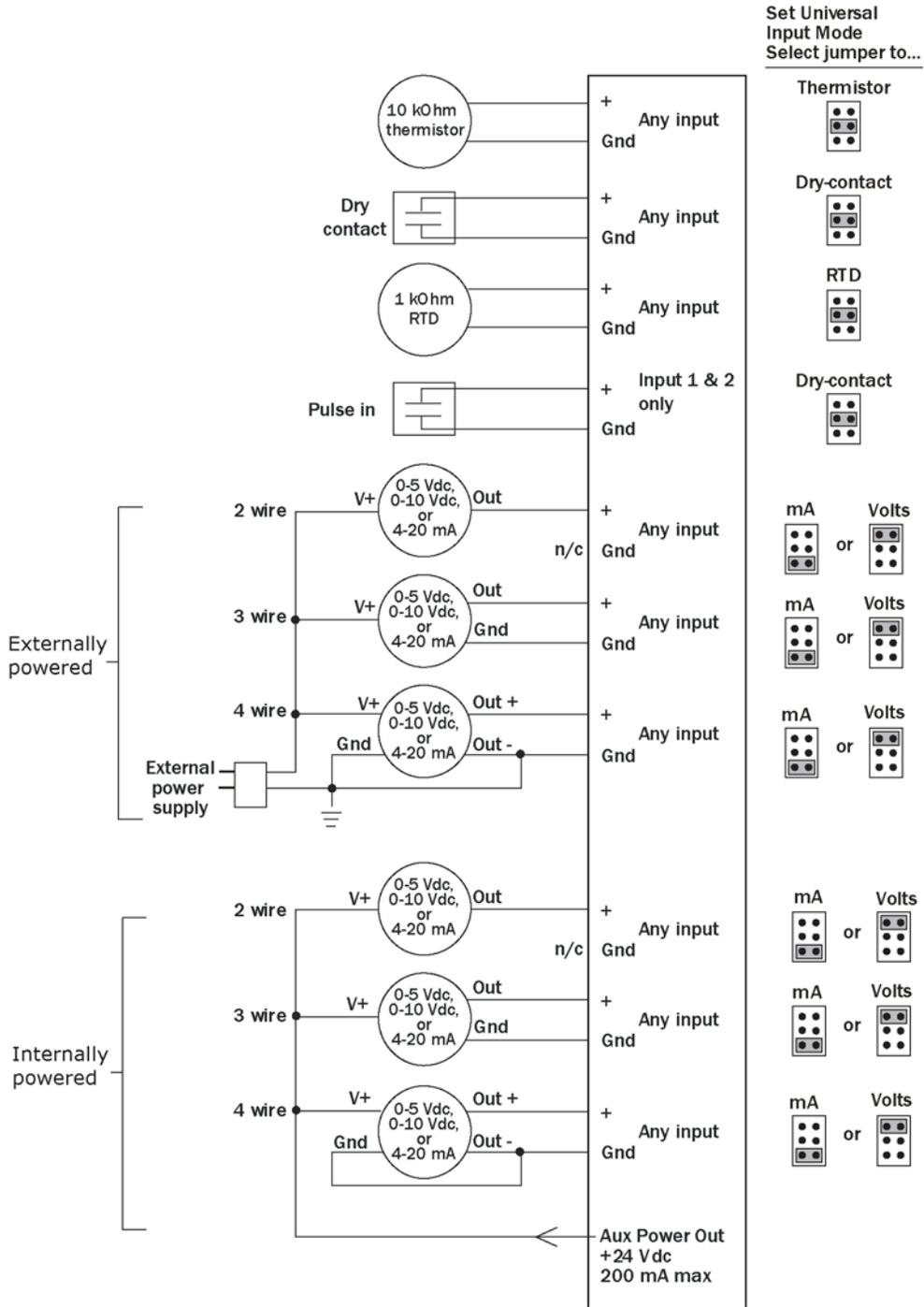
### Inputs

The I/O Flex 6126 has 12 inputs that accept the signal types described below.

These inputs...	Support this signal type...	Description
All	Thermistor RTD 0–20 mA 0–10 Vdc	Precon type 2 (10 kOhm at 77 °F). Input voltages should be from 0.489 Vdc to 3.825 Vdc for thermistors.  The input impedance of the I/O Flex 6126 is approximately 1 MOhm.
All	Dry contact	A 5 Vdc wetting voltage detects contact position, resulting in a 0.5 mA maximum sense current when the contacts are closed.
UI-1, UI-2	Pulse input	Maximum of 10 pulses per second. Minimum pulse width required for each pulse: <ul style="list-style-type: none"> <li>ON to OFF time (half cycle) is 50 msec</li> <li>ON to OFF to ON time (full cycle) is 100 msec</li> </ul>

## To wire inputs

- 1 Turn **off** the I/O Flex 6126's power.
- 2 Connect the input wiring to the screw terminals on the I/O Flex 6126.



**NOTES**

- Connect the shield wire to the **GND** terminal with the ground wire.
- Use only UI-1 or UI-2 for pulse counting or timed local override.
- For a loop-powered 4-20 mA sensor, wire the sensor's positive terminal to the **+** terminal on the I/O Flex 6126's **Aux Power Out** connector. Wire the sensor's negative terminal to an input's **+** terminal.

**3** Set the appropriate jumpers on the I/O Flex 6126.

To use...	For...		Even	Odd	
Any input	Thermistor Dry contact 0-5 Vdc 0-10 Vdc 0-20 mA RTD	Set each input's <b>Universal Input Mode Select</b> jumper to the type of signal the input will receive.	12		11
			10		9
			8		7
			6		5
			4		3
			2		1
Aux Power Out port	Loop-powered 4-20 mA	Set the <b>Select</b> jumper to <b>+5V</b> or <b>+24V</b> as required by the sensor.			

**4** Turn **on** the I/O Flex 6126's power.

## Output wiring specifications

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

## Binary outputs

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The I/O Flex 6126 has 6 binary outputs. You can connect each output to a maximum of 250 Vac.

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

## Analog outputs

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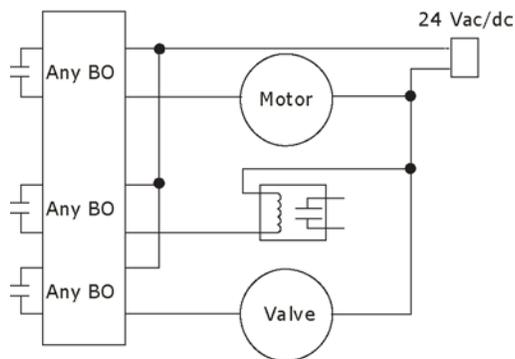
The I/O Flex 6126 has 6 analog outputs that support voltage or current devices. The controlled device must share the same ground as the controller and have the following input impedance:

0–10 Vdc      min 500 Ohms  
0–20 mA      max 800 Ohms

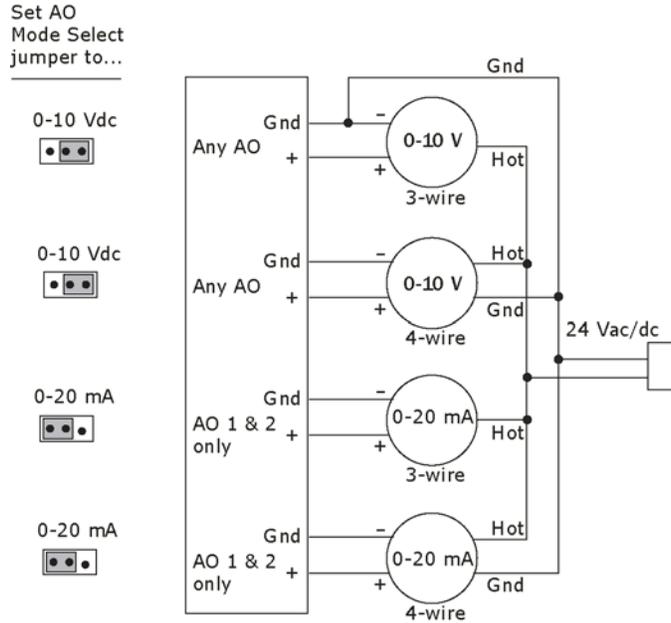
## To wire outputs

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- 1 Turn **off** the I/O Flex 6126's power.
- 2 Connect the binary output wiring to the screw terminals on the I/O Flex 6126 and to the controlled device.



- 3 Connect the analog output wiring to the screw terminals on the I/O Flex 6126 and to the controlled device.



- 4 Set the **AO Mode Select** jumper to the type of device you are wiring the output to.
- 5 Turn **on** the I/O Flex 6126's power.

## Local Access

### To communicate through the local access port

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Using a computer and a USB Link Kit, you can communicate locally with the I/O Flex 6126 to download or to troubleshoot.

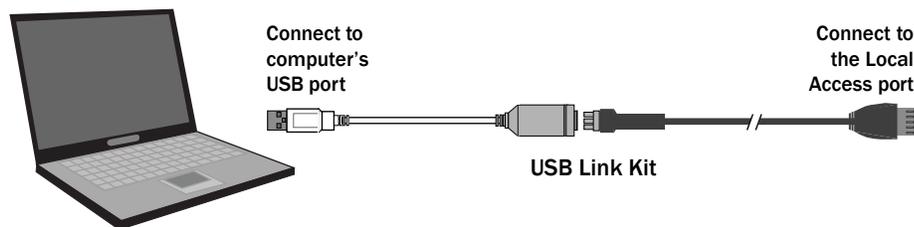
#### PREREQUISITES

- A computer with a USB port
- A USB Link Kit

#### CAUTIONS

- Maintain polarity when controllers share power.
- Failure to maintain polarity while using the USB Link on a computer that is grounded via its AC adapter may damage the USB Link and the controller.
- If you are wary of the integrity of electrical work, and the computer is running on AC power, you can purchase a USB isolator online from a third-party manufacturer. First, plug the USB isolator into your computer's USB port, then connect the USB Link to the isolator.

- 1 If using the USB Link Kit with your computer for the first time, install the USB Link Kit's driver before you connect the cable to the computer.
  - a) Put the USB Link Driver CD or WebCTRL install DVD into your computer.
  - b) Install the USB Link Driver. Accept all of the wizard's default settings.
- 2 Connect the USB Link Kit to the computer and to the controller's Local Access port.



## Rnet wiring specifications

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

Description	4 conductor, shielded or unshielded, CMP, plenum rated cable
Conductor	22 AWG (7x0096) bare copper if Rnet has only RS sensors. 18 AWG (7x0152) bare copper if Rnet has a BACview.
Maximum length	500 feet (152 meters)
Insulation	Low-smoke PVC (or equivalent)
Color Code	Black, white, green, red
Shielding	If shielded, Aluminum/Mylar shield (100% coverage) with TC drain wire
UL temperature rating	32–167 °F (0–75 °C)
Voltage	300 Vac, power limited
Listing	UL: NEC CL2P, or better

## Wiring an RS room sensor to the I/O Flex 6126

The I/O Flex 6126 supports up to 5 RS sensors on its BACview/RS sensor port.

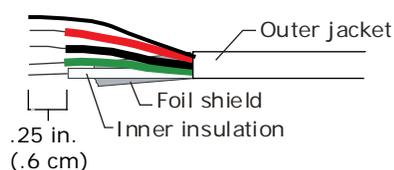
You can wire RS sensors to the I/O Flex 6126's **Rnet** port in any of the following combinations:

- 1 RS Plus, RS Pro, or RS Pro-F
- 1–4 RS Standards
- 1–4 RS Standards, and 1 RS Plus, RS Pro\*, or RS Pro-F

\*The RS Pro is a thermistor-based temperature sensor.

### To wire an RS room sensor

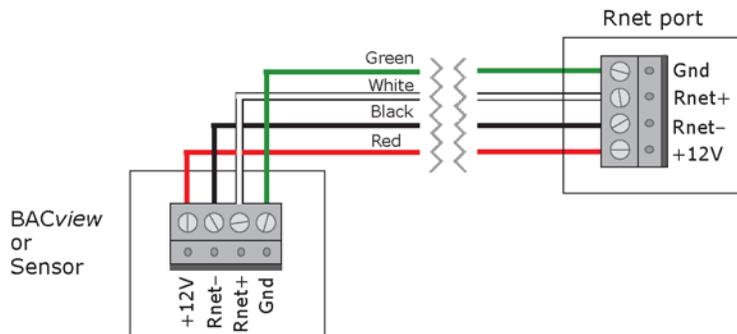
- 1 Turn **off** the I/O Flex 6126's power.
- 2 Pull the screw terminal connector from the RS sensor.
- 3 Pull the screw terminal connector from the Rnet port.
- 4 Partially cut, then bend and pull off the outer jacket of the Rnet cable(s). Do not nick the inner insulation.



- 5 Strip about .25 inch (.6 cm) of the inner insulation from each wire.
- 6 Wire each terminal on the I/O Flex 6126's **Rnet** port to the terminal of the same name on the RS room sensor.

**NOTES**

- If using shielded wire, connect the shield wire and the ground wire to the **Gnd** terminal.
- Maintain same polarity.



- 7 Turn **on** the I/O Flex 6126's power.

## What is the BACview6?

The BACview<sup>6</sup> is a keypad/display unit that you connect to the I/O Flex 6126 controller to let you view or edit certain property values and the controller's real time clock.

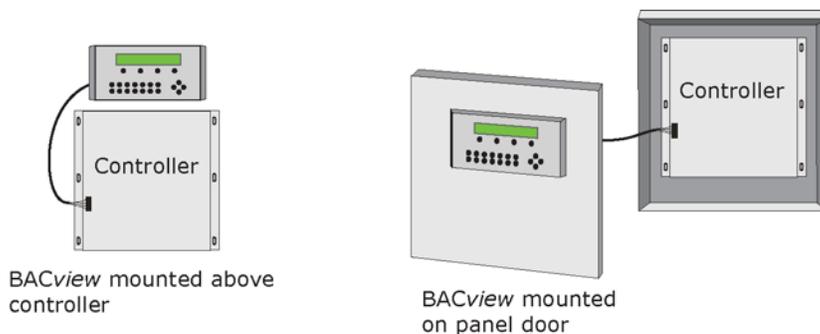
You connect the BACview<sup>6</sup> to the I/O Flex 6126's Rnet port. The I/O Flex 6126 can share the Rnet with RS sensors and a second I/O Flex 6126, with no more than 6 devices total on the Rnet. Wire the devices in a daisy-chain or hybrid configuration.

The BACview<sup>6</sup> can be used with the I/O Flex 6126 with a 4-pin Rnet port. For instructions on using/programming the BACview<sup>6</sup>, refer to BACview<sup>6</sup> technical documentation.

## Specifications for mounting the BACview6

You can mount the BACview<sup>6</sup>:

- In the panel above the controller
- On the panel door
- On a wall up to 500 feet from the controller



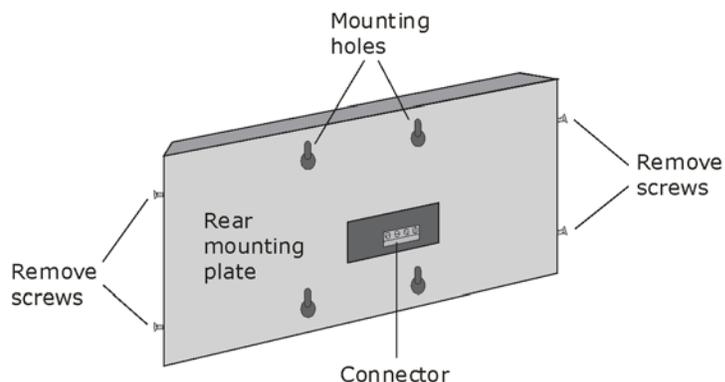
## To mount the BACview6



### CAUTIONS

- The BACview<sup>6</sup> is powered by a Class 2 power source. Properly isolate the BACview<sup>6</sup> from non-Class 2 circuits in the same control panel.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

What is the BACview6?



- 1 Remove the 4 screws on the sides of the BACview<sup>6</sup> to remove the rear mounting plate.
- 2 Using the rear mounting plate as a template, drill 4 holes in the surface that you are mounting the BACview<sup>6</sup> to, then insert 4 screws in the holes.
- 3 If mounting the BACview<sup>6</sup> on a panel door, use the cutout in the rear mounting plate as a template to cut a hole in the panel door for the cable to pass through.
- 4 Reattach the BACview<sup>6</sup>'s rear mounting plate.
- 5 Wire the BACview<sup>6</sup> to the I/O Flex 6126.
- 6 Hang the BACview<sup>6</sup> on the 4 mounting screws.

**NOTE** If mounting above the I/O Flex 6126 or on a wall, pull the cable out to the side of the BACview<sup>6</sup> without bending or pinching the cable beneath the BACview<sup>6</sup>.

## To wire the BACview

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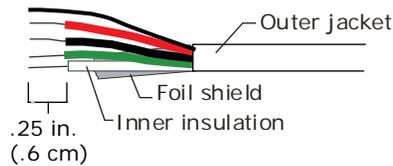
**NOTE** Use 18 gauge wire for the BACview<sup>6</sup> to be up to 500 feet from the controller.



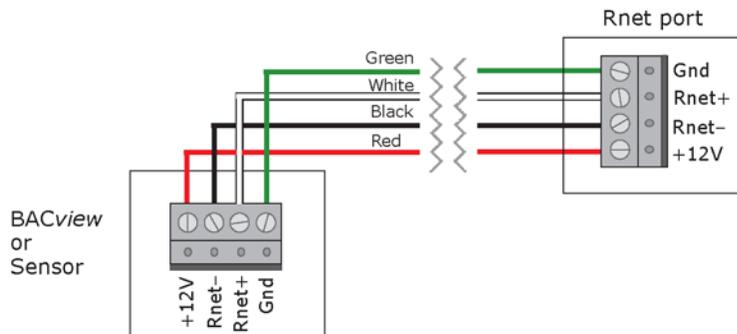
### CAUTIONS

- Maintain the same polarity throughout the Rnet.
- Wiring the 12V power incorrectly can damage the components.

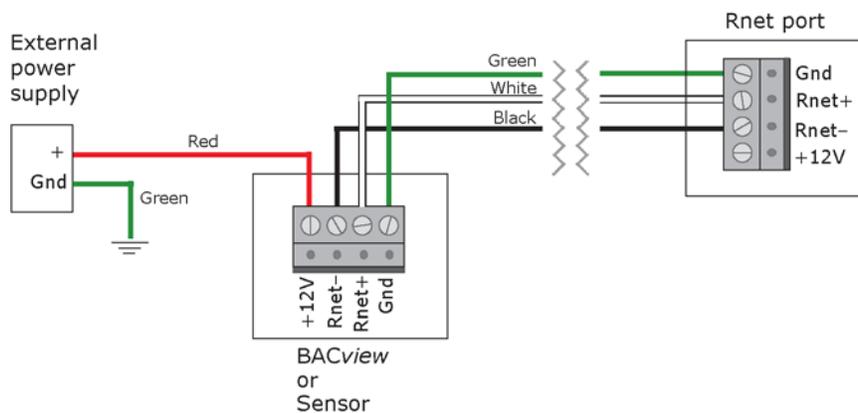
- 1 Pull the screw terminal connector from the controller's power terminals labeled **Gnd** and **Hot**.
- 2 Pull the screw terminal connector from the BACview.
- 3 Partially cut, then bend and pull off the outer jacket of the Rnet cable(s). Do not nick the inner insulation.



- 4 Strip about .25 inch (.6 cm) of the inner insulation from each wire.
- 5 Insert the wires into both of the screw terminal connectors.



- 6 If connecting more than one BACview<sup>6</sup>, the first one on an Rnet is powered by the controller. You must provide an external power supply for a second BACview<sup>6</sup>. When wiring two BACview<sup>6</sup> devices together on the same Rnet, set the J1 jumper to the down position on the first BACview<sup>6</sup> device.



- 7 Insert the screw terminal connector into the BACview<sup>6</sup> with the screw heads facing out.
- 8 Insert the screw terminal connector into the I/O Flex 6126's power terminals.

## Troubleshooting

If you have problems mounting, wiring, or addressing the I/O Flex 6126, contact OEMCtrl Technical Support.

### Communication LED's

The LED's indicate if the controller is speaking to the devices on the network. The LED's should reflect communication traffic based on the baud rate set. The higher the baud rate the more solid the LED's become.

LEDs	Status
Power	Lights when power is being supplied to the controller.  <b>NOTE</b> The I/O Flex 6126 is protected by internal solid state Polyswitches on the incoming power and network connections. These Polyswitches are not replaceable and will reset themselves if the condition that caused the fault returns to normal.
Rx	Lights when the controller receives data from the network segment; there is an Rx LED for Ports 1 and 2.
Tx	Lights when the controller transmits data to the network segment; there is an Rx LED for Ports 1 and 2.
Run	Lights based on controller health. See table below.
Error	Lights based on controller health. See table below.

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

If Run LED shows...	And Error LED shows...	Status is...
1 flash per second	1 flash per second, alternating with the <b>Run</b> LED	The controller files are archiving. Archive is complete when <b>Error</b> LED stops flashing.
2 flashes per second	Off	Normal
2 flashes per second	2 flashes, alternating with <b>Run</b> LED	Five minute auto-restart delay after system error
2 flashes per second	3 flashes, then off	The controller has just been formatted
2 flashes per second	On	Two or more devices on this network have the same MS/TP network address
2 flashes per second	1 flash per second	The controller is alone on the network

<b>If Run LED shows...</b>	<b>And Error LED shows...</b>	<b>Status is...</b>
2 flashes per second	On	Exec halted after frequent system errors, due to: <ul style="list-style-type: none"> <li>• Controller halted</li> <li>• Program memory corrupted</li> <li>• Address conflicts - duplicate MS/TP MAC addresses</li> <li>• One or more programs stopped</li> </ul>
5 flashes per second	On	Exec start-up aborted, Boot is running
5 flashes per second	Off	Firmware transfer in progress, Boot is running
7 flashes per second	7 flashes per second, alternating with <b>Run</b> LED	Ten second recovery period after brownout
14 flashes per second	14 flashes per second, alternating with <b>Run</b> LED	Brownout
On	On	Failure. Try the following solutions: <ul style="list-style-type: none"> <li>• Turn the I/O Flex 6126 off, then on.</li> <li>• Download memory to the I/O Flex 6126.</li> <li>• Replace the I/O Flex 6126.</li> </ul>

## Serial number

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If you need the I/O Flex 6126's serial number when troubleshooting, the number is on:

- a sticker on the back of the main controller board
- a Module Status report (modstat) from WebCTRL

## Compliance

### FCC Compliance

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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

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**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.

### BACnet Compliance

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BACnet® is a registered trademark of ASHRAE. ASHRAE does not endorse, approve or test products for compliance with ASHRAE standards. Compliance of listed products to requirements of ASHRAE Standard 135 is the responsibility of the BACnet manufacturers Association (BMA). BTL® is a registered trademark of the BMA.



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5/5/2011