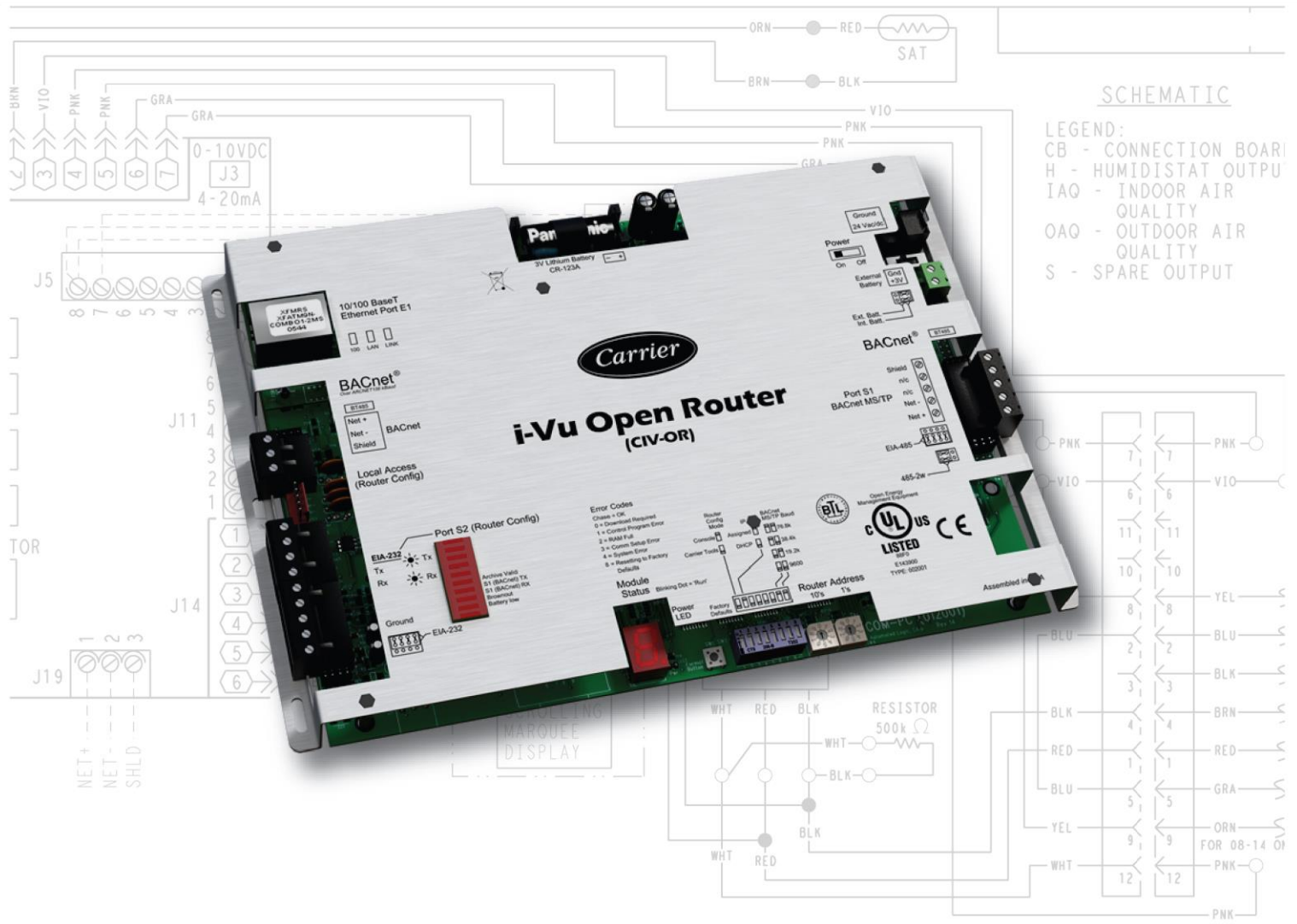


# i-Vu® Open Router Installation and Start-up Guide

*Carrier*





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Important changes are listed in **Document revision history** at the end of this document.

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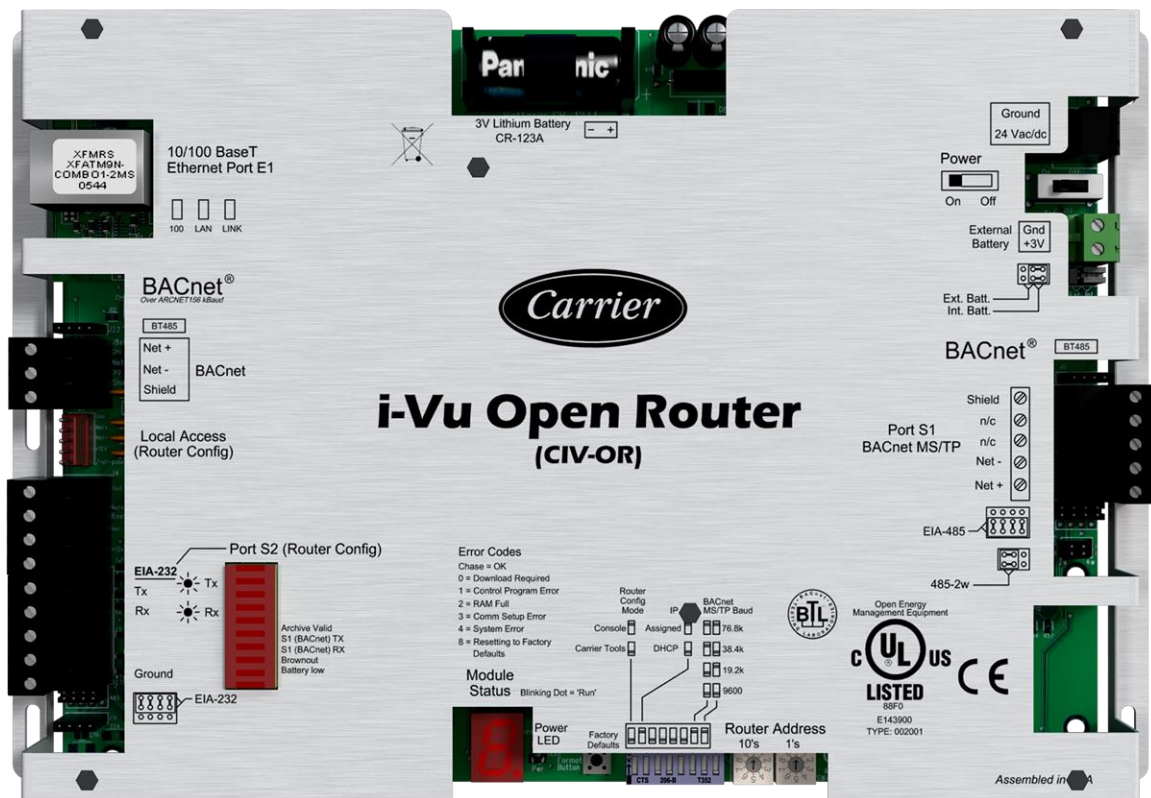




## Introduction

### What is the i-Vu® Open Router?


The i-Vu® Open Router is a controller that acts as a router between the main BACnet IP network and a BACnet MS/TP network segment. The i-Vu® Open Router increases the capacity of an Open system, allowing individual MS/TP network segments (with up to 60 Open controllers each) to be connected via a common BACnet IP backbone.

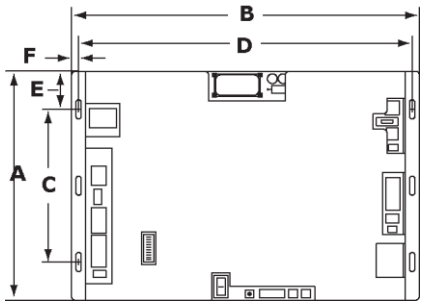


## Specifications

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Driver	drv_ivuopenrouter
Maximum number of Open controllers supported	60
Power	24 Vac $\pm 10\%$ , 50–60 Hz 24 VA power consumption 26 Vdc (25 V min, 30 V max) Single Class 2 source only, 100 VA or less
Port E1 (10/100 BaseT Ethernet)	For Ethernet LAN, BACnet IP, and Modbus TCP/IP communication at 10 or 100 Mbps, half duplex  Both <b>Assigned</b> (default) and <b>DHCP</b> IP addressing are supported and DIP switch selectable
Port S1 (BACnet MS/TP)	For communication with the controller network using BACnet MS/TP at 9600 bps, 19.2 kbps, 38.4 kbps, or 76.8 kbps (DIP switch selectable). Default is 76.8k bps.
BACnet	For communication with the controller network using ARC156 (156 kbps)
Port S2	EIA-232 port (115.2 kbps) for i-Vu® Open Router configuration using PuTTY or Hyperterminal.
Local Access (Router Config)	For system start-up and troubleshooting using Field Assistant
Real time clock	Battery-backed real-time clock keeps track of time in event of power failure
Battery	10-year Lithium CR123A battery ensures the following data is retained for a maximum of 720 hours during power outages: <ul style="list-style-type: none"> <li>• Time</li> <li>• Graphics</li> <li>• Control programs</li> <li>• Editable properties</li> <li>• Schedules</li> <li>• Trends</li> </ul> <p>To conserve battery life, you can set the driver to turn off battery backup after a specified number of days and depend on the archive function to restore data when the power returns.</p> <p>A low battery is indicated by the <b>Battery Low</b> LED or a low battery alarm in the i-Vu® application, a touchscreen device, and Field Assistant.</p>
Protection	Built-in surge and transient protection for power and communications in compliance with EN61000-6-1.  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 and network connections are also protected against transient excess voltage/surge events lasting no more than 10 msec.

 **CAUTION** To protect against large electrical surges on serial EIA-485 networks, place a PROT485 at each place wire enters or exits the building.

Status indicators	LED status indicators for <b>Port S1</b> and <b>S2</b> communication, <b>Ethernet Port E1</b> communication, and low battery status. Seven segment status display for running, error, power status, archive valid, and brownout.	
Environmental operating range	-20 to 140 °F (-29 to 60 °C), 10–90% relative humidity, non-condensing	
Storage temperature range	-24 to 140 °F (-30 to 60 °C), 0 to 90% relative humidity, non-condensing	
Physical	Rugged aluminum cover, removable screw-type terminal blocks	
		
Overall dimensions	A:	7-1/2 in. (19.1 cm)
	B:	11-5/16 in. (28.7 cm)
Mounting dimensions	C:	5 in. (12.7 cm)
	D:	10-7/8 in. (27.6 cm)
	E:	1-1/4 in. (3.2 cm)
	F:	1/4 in. (.6 cm)
	Mount with 6-32 by 1/2 in. mounting screws	
Depth	1-1/4 in. (3.2 cm)	
Weight	1.4 lbs (0.64 kg)	
BACnet support	Conforms to the BACnet Building Controller (B-BC) Standard Device Profile as defined in ANSI/ASHRAE Standard 135-2012 (BACnet) Annex L, Protocol Revision 9	
Listed by	UL916 (Canadian Std C22.2 No. 205-M1983, CE, FCC Part 15 - Subpart B - Class A	

## Safety considerations



**WARNING** Disconnect electrical power to the i-Vu® Open Router before wiring it. Failure to follow this warning could cause electrical shock, personal injury, or damage to the controller.

## Installing the i-Vu® Open Router

- 1 *Mount the i-Vu® Open Router (page 4).*
- 2 *Wire for power (page 5).*
- 3 *Set the i-Vu® Open Router's address and IP address (page 6).*
- 4 *Wire for communications (page 10).*
- 5 *Communicate through the Local Access port (page 12).*
- 6 *Configure BACnet Device Instance and network number (page 15).*

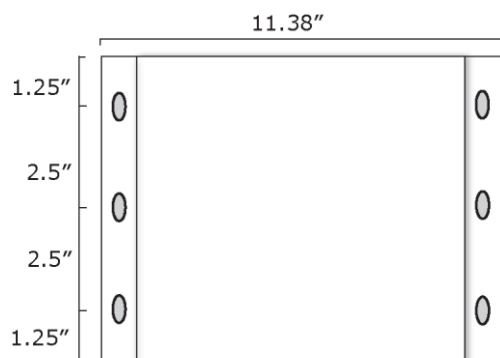
## Mounting the i-Vu® Open Router

### **WARNING**

When you handle the i-Vu® Open Router:

- Do not contaminate the printed circuit board with fingerprints, moisture, or any foreign material.
- Do not touch components or leads.
- Handle the board by its edges.
- Isolate from high voltage or electrostatic discharge.
- Ensure that you are properly grounded.

Screw the i-Vu® Open Router into an enclosed panel using the mounting slots on the cover plate. Leave about 2 in. (5 cm) on each side of the controller for wiring.



## Wiring the i-Vu® Open Router for power

---



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



### CAUTIONS

- The i-Vu® Open Router 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.
- Carrier controllers can share a power supply as long as you:
  - Maintain the same polarity.
  - Use the power supply only for Carrier controllers.

### To wire for power

- 1 Make sure the i-Vu® Open Router's power switch is in the **OFF** position 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 router's power terminals labeled **24 Vac/Vdc** and **Ground**.
- 4 Connect the transformer wires to the screw terminal connector.
- 5 Apply power to the power supply.
- 6 Measure the voltage at the i-Vu® Open Router's power input terminals to verify that the voltage is within the operating range of 21.6 – 26.4 Vac or 23.4 - 28.6 Vdc.
- 7 Insert the screw terminal connector into the i-Vu® Open Router's power terminals.
- 8 Turn **on** the i-Vu® Open Router's power.
- 9 Verify that the Run LED (a dot in the lower right corner of the **Module Status** LED) begins blinking. The **Module Status** LED will display **8** for about 5 seconds and then reverts to **0**, until controllers have been found and downloaded. There is a chase pattern when the router is running with no errors.

## Addressing the i-Vu® Open Router

The i-Vu® Open Router needs two addresses, one for the Open network and one for the IP Network.

The i-Vu® Open Router needs...	That is unique on the...	Notes
A router address	Open network	<p>You set the i-Vu® Open Router address on the rotary switches. (1-99)</p> <p><b>NOTE</b> The i-Vu® Open Router address is also used to auto-generate the BACnet device instance/name for the router and the MS/TP network number for the connected Open network. See <i>Configuring BACnet device instance and network number</i> for more information.</p>
An IP address	IP Network	<p>Use the IP Address DIP switch to choose one of the following:</p> <ul style="list-style-type: none"> <li>• Use DHCP to obtain an IP address</li> <li>• Assign a <b>custom</b> IP address (default)</li> </ul> <p>The default IP settings are:</p> <ul style="list-style-type: none"> <li>• 192.168.168x, where x = router address</li> <li>• subnet mask = 255.255.255.0</li> <li>• default gateway = 192.168.168.254</li> </ul>

### To set the i-Vu® Open Router address on the Open network



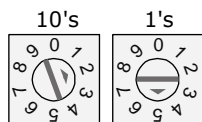
**CAUTION** The i-Vu® Open Router address must be unique on the IP and Open network.

- 1 If wired for power, turn off the power.

**NOTE** The i-Vu® Open Router only reads the rotary switch positions during power up or upon reset.

- 2 Use the rotary switches to set the 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. Valid addresses are 1 - 99.

**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.



- 3 Turn on the i-Vu® Open Router's power.



**CAUTION** The factory default setting is **00** and must be changed to successfully install your i-Vu® Open Router.

## To choose an IP addressing scheme

Carefully plan your addressing scheme to avoid duplicate IP addresses.

- If there is a DHCP server on the network, and, if you have a single i-Vu® Open Router or multiple i-Vu® Open Routers that exist on the SAME subnet, use DHCP addressing. Skip to the section *To obtain an IP address using DHCP* (page 7).
- If you have multiple i-Vu® Open Routers that reside on different subnets, you cannot use DHCP addressing. Instead, give each i-Vu® Open Router an assigned IP address. Skip to the section *To assign a custom IP address* (page 7).

**NOTE** This network configuration also requires that you configure IP Broadcast Management Devices (BBMDs). See *To set up BACnet Broadcast Management Devices*.

## To obtain an IP address using DHCP

- 1 Turn the i-Vu® Open Router's power off.
- 2 Set the **IP Addr** DIP switch **DHCP** to **On**.
- 3 Turn the i-Vu® Open Router's power on. The DHCP server assigns an IP address to the i-Vu® Open Router.



**CAUTION** If the DHCP server is not found, the following default IP address settings will be used:

- IP address = 192.168.168.xx, where xx = i-Vu® Open Router address (rotary switch settings)
- Subnet Mask = 255.255.255.0
- Default Gateway = 192.168.168.254

## To assign a custom IP address

- 1 Obtain the IP address, subnet mask, and default gateway address for the router from the facility network administrator.
- 2 Turn the i-Vu® Open Router's power off.
- 3 Set the i-Vu® Open Router's **IP Addr** DIP switch **Assigned** to **On**.
- 4 Configure the i-Vu® Open Router by setting the **Router Config Mode** DIP switch **Console** to **On** using a terminal program such as PuTTY or Hyperterminal.
- 5 Turn the i-Vu® Open Router's power on.

### PREREQUISITES

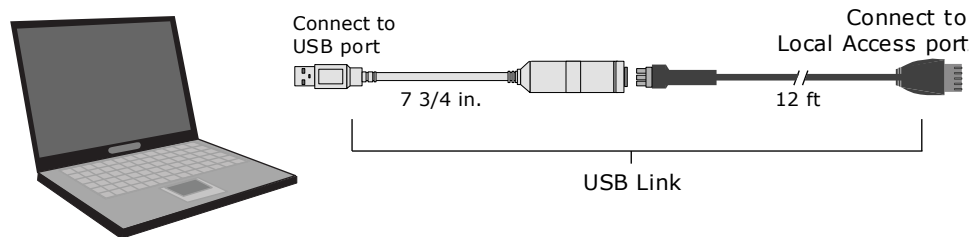
- A computer with a USB port
- A USB Link cable — See *To communicate through the Local Access port with a USB Link* (page 12)



**CAUTION** If multiple controllers share power but polarity was not maintained when they were wired, the difference between the controller's ground and the computer's AC power ground could damage the USB Link and the controller. If you are not sure of the wiring polarity, use a USB isolator between the computer and the USB Link. Purchase a USB isolator online from a third-party manufacturer.

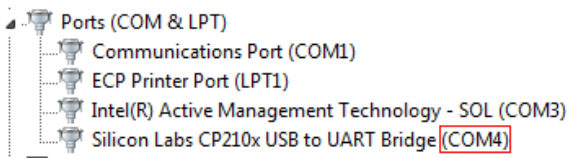
## Using PuTTY

- 1 Download and install PuTTY from the *PuTTY* website (<http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html>).
- 2 Connect the laptop to the local access port of the router, ZS sensor, or an SPT sensor using the USB Link cable(s).

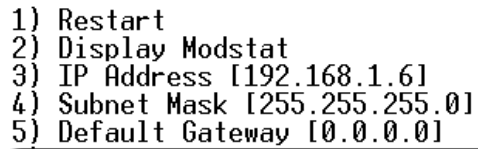


**NOTE** If using a USB isolator, plug the isolator into your computer's USB port, and then plug the USB Link cable into the isolator.

- 3 To change a router's IP address, subnet mask, or default gateway, set its **IP Address** DIP switch to **Assigned**.
- 4 Start PuTTY.
- 5 Under **Category > Connection**, select **Serial**.
- 6 Under **Options controlling local serial lines**, enter the following settings:

Field	Value
<b>Serial line to connect to</b>	<p>Replace X with the computer's port number that the USB Link cable is connected to.</p> <p><b>NOTE</b> To find the port number, select <b>Start &gt; Control Panel &gt; System &gt; Device Manager &gt; Ports (Com &amp; LPT)</b>. The COM port number is beside <b>Silicon Labs CP210x USB to UART Bridge</b>.</p> 
<b>Speed (baud)</b>	115200
<b>Data Bits</b>	8
<b>Stop Bits</b>	1
<b>Parity</b>	None
<b>Flow Control</b>	None

- 7 Click **Open**. A window similar to the one below appears.



```
1) Restart
2) Display Modstat
3) IP Address [192.168.1.6]
4) Subnet Mask [255.255.255.0]
5) Default Gateway [0.0.0.0]
```

- 8 Do one of the following:

- To change a property value:
  - a. Type the number of the property, then press **Enter**.
  - b. Type the new value, then press **Enter**.
- To take an action, type number of the action, then press **Enter**.

- 9 If you changed a value, type 1, then press **Enter** to restart the controller.

- 10 Close PuTTY.

- 11 Verify that you can communicate with the i-Vu® Open Router by issuing a PING command to the IP address specified in step 12.

**NOTE** Your computer must be on the same subnet as the i-Vu® Open Router for the PING command to work.

- 12 When finished, set the i-Vu® Open Router's **Router Config Mode** DIP switch to **OFF** to restore normal functionality to the Local Access port.

- 13 Cycle the i-Vu® Open Router's power to accept the **Router Config Mode** changes.

## Wiring for communications

The i-Vu® Open Router has multiple ports. See table below for port descriptions.

Port	Protocol	Port type(s)	Baud rate(s)	Use for
<b>Ethernet Port E1</b>	BACnet/IP	Ethernet	10 Mbps 100 Mbps	LAN connection
<b>BACnet</b>	ARC156	EIA-485 (2-wire)	156 kbps	Open network connection
<b>S1</b>	BACnet MS/TP	EIA-485 (2-wire)	DIP Switch selectable: 9600 bps 19.2 kbps 38.4 kbps 76.8 kbps (default)	Open network connection
<b>S2</b>	N/A	EIA-232	115.2 kbps	Router configuration
<b>Local Access</b>	N/A	Rnet	115.2 kbps	<ul style="list-style-type: none"> <li>Router configuration</li> <li>System start-up and troubleshooting with Carrier Tools</li> </ul>

## Ethernet, BACnet MS/TP, and ARC156 wiring specifications

For...	Use...	Maximum Length
Ethernet	CAT5e or higher Ethernet cable	328 feet (100 meters)
BACnet MS/TP*	22 or 24 AWG, low-capacitance, twisted, stranded, shielded copper wire	2000 feet (610 meters)
BACnet ARC156*		

\*For details see the *Open Controller Network Wiring Guide*.



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

## To connect the i-Vu® Open Router to the Ethernet

Connect an Ethernet cable to the **Ethernet Port E1**.

## To wire the BACnet MS/TP network

- 1 Turn the i-Vu® Open Router's power off.
- 2 Check the communications wiring for shorts and grounds.
- 3 Verify that the **Port S1** jumpers are set to **485-2w**.
- 4 Set the MS/TP baud rate DIP switches **7** and **8** to match the baud rate of the Open network. The default is 76.8k.
- 5 Connect the i-Vu® Open Router's **Port S1** to the Open MS/TP network. Use the same polarity throughout the network segment.

Wire the Port S1 terminal...	To this Open controller terminal...
Shield (Pin 1)	<b>Shield</b>
Net- (Pin 4)	<b>Net-</b>
Net+ (Pin 5)	<b>Net+</b>

- 6 Turn the i-Vu® Open Router's power on.

## To wire to a BACnet ARC156 network

- 1 Turn **off** the i-Vu® Open Router's power.
- 2 Check the communications wiring for shorts and grounds.
- 3 Connect the communications wiring to the controller's screw terminals labeled **Net +**, **Net -**, and **Shield** on the **BACnet** port.  
**NOTE** Use the same polarity throughout the network segment.
- 4 If the i-Vu® Open Router is at either end of a network segment, connect a BT485 to the i-Vu® Open Router.
- 5 Turn **on** the i-Vu® Open Router's power.
- 6 Verify communication with the network by viewing a Module Status report in the i-Vu® interface.

## Communicating through the Local Access port with a USB Link

Using a computer and a USB Link, you can communicate locally with the i-Vu® Open Router to download or to troubleshoot.



### CAUTIONS

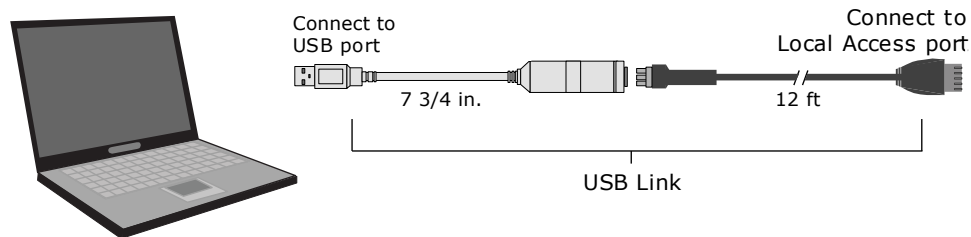
- Maintain polarity when controllers share power.
- Failure to maintain polarity while using the USB Link on a computer that is grounded via its AC adapter may damage the USB Link and the controller.
- If multiple controllers share power but polarity was not maintained when they were wired, the difference between the controller's ground and the computer's AC power ground could damage the USB Link and the controller. If you are not sure of the wiring polarity, use a USB isolator between the computer and the USB Link. Purchase a USB isolator online from a third-party manufacturer. Plug the isolator into your computer's USB port, and then plug the USB Link cable into the isolator.

### PREREQUISITES

- For the i-Vu® application to communicate with the controller, the controller must have been downloaded with at least its driver.
- Laptop with USB port
- USB Link (Part #USB-L)

### Using a USB Link

- 1 The USB Link driver is installed with an i-Vu® v5 or later system. But if needed, you can get the latest driver from <http://www.silabs.com/products/mcu/Pages/USBtoUARTBridgeVCPDrivers.aspx>. Install the driver before you connect the USB Link to your computer.
- 2 Connect the laptop to the controller or sensor using the appropriate USB Link cable(s).



**NOTE** If using a USB isolator, plug the isolator into your computer's USB port, and then plug the USB Link cable into the isolator.

- 3 Set the controller's **Router Config Mode** DIP switch.

To communicate in...	Set switch to...
The i-Vu® application	Off
PuTTY	On
<b>NOTE</b> See <i>To communicating using PuTTY</i> (page 13)	

- 4 Turn the controller's power off, then on again.

## To communicate using PuTTY

You can connect a computer to a controller's Local Access port and use PuTTY, a free open source terminal emulation program, to:

- Set the baud rate for Port S1 on the i-Vu® Open Router
- Set controller properties, such as IP address and network information
- Retrieve a Modstat

### PREREQUISITES

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

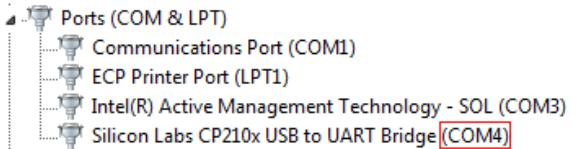
**NOTE** The USB Link driver is installed with an i-Vu® v5 or later system. But if needed, you can get the latest driver from <http://www.silabs.com/products/mcu/Pages/USBtoUARTBridgeVCPDrivers.aspx>. Install the driver before you connect the USB Link to your computer.



**CAUTION** If multiple controllers share power but polarity was not maintained when they were wired, the difference between the controller's ground and the computer's AC power ground could damage the USB Link and the controller. If you are not sure of the wiring polarity, use a USB isolator between the computer and the USB Link. Purchase a USB isolator online from a third-party manufacturer.

## Using PuTTY

- 1 Download and install PuTTY from the *PuTTY website* (<http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html>).
- 2 Connect the laptop to the controller or sensor using the appropriate USB Link cable(s), as described above.
- 3 To change a router's IP address, subnet mask, or default gateway, set its **IP Address** DIP switch to **Assigned**.
- 4 Start PuTTY.
- 5 Under **Category > Connection**, select **Serial**.
- 6 Under **Options controlling local serial lines**, enter the following settings:

Field	Value
<b>Serial line to connect to</b>	<p>Replace X with the computer's port number that the USB Link cable is connected to.</p> <p><b>NOTE</b> To find the port number, select <b>Start &gt; Control Panel &gt; System &gt; Device Manager &gt; Ports (Com &amp; LPT)</b>. The COM port number is beside <b>Silicon Labs CP210x USB to UART Bridge</b>.</p> 
<b>Speed (baud)</b>	115200
<b>Data Bits</b>	8
<b>Stop Bits</b>	1
<b>Parity</b>	None
<b>Flow Control</b>	None

- 7 Click **Open**. A window similar to the one below appears.

```

1) Restart
2) Display Modstat
3) IP Address [192.168.1.6]
4) Subnet Mask [255.255.255.0]
5) Default Gateway [0.0.0.0]

```

- 8 Do one of the following:
  - o To change a property value:
    - a. Type the number of the property, then press **Enter**.
    - b. Type the new value, then press **Enter**.
  - o To take an action, type number of the action, then press **Enter**.
- 9 If you changed a value, type 1, then press **Enter** to restart the controller.
- 10 Close PuTTY.

## Configuring BACnet Device Instance and network number

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All BACnet Open controllers must have a unique Device Instance and Name. These BACnet addresses are automatically generated and usually do not require modification. However, sometimes you need to override the automatic addressing assignments.

### Autogenerated addressing scheme:

The i-Vu® Open Router's rotary address setting determines the automatic BACnet addressing scheme for the connected Open network.

### Legend

16 = Carrier's BACnet Vendor ID

xx = i-Vu® Open Router's rotary switch address (BACnet Device Instance address)

yy = Open controller's rotary switch address (MS/TP MAC address)

### For the i-Vu® Open Router:

- BACnet Device Instance Number = 1600xx
- BACnet Device Instance Name = device1600xx
- BACnet IP Network Number = 1600
- BACnet MS/TP Network Number = 161xx
- BACnet ARC156 Network Number = 163xx
- Port S1 MS/TP MAC Address = 0 (fixed)

### For the Open controllers connected to the i-Vu® Open Router

- BACnet MS/TP Device Instance Number = 161xxyy
- BACnet ARC156 Device Instance Number = 163xxyy
- BACnet MS/TP Device Instance Name = device161xxyy
- BACnet ARC156 Device Instance Name = device163xxyy
- BACnet MS/TP or ARC156 MAC Address = yy
- BACnet MS/TP Network Number = 161xx (learned from the router, defaults to 16101 if no i-Vu® Open Router is operating)

If the BACnet automatic settings need to be changed, launch the **Router Configuration** utility using a terminal program. See *To assign a custom IP address* (page 7) for instructions on connecting to and using a terminal program.

### To change the BACnet settings:

- 1 Enter the BACnet selection# from the menu. Type the new setting and click **Enter**. The new setting will appear on the **Router Configuration** screen.
- 2 Cycle power to the router for the new settings to take effect.

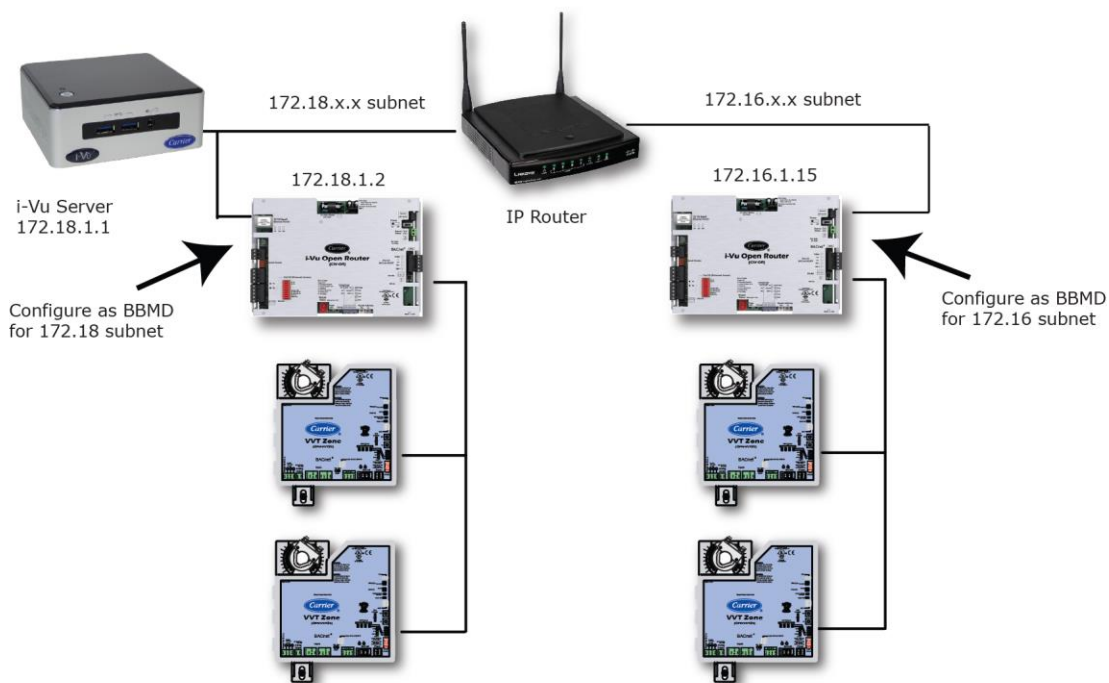
**NOTE** If the BACnet MS/TP or ARC156 network number of the router is assigned and not auto-generated, and the Open controllers connected to that router are set such that their BACnet settings are auto-generated, then the Open controller BACnet settings will be auto-generated based on the assigned MS/TP network number in the router:

**Example** A router's BACnet MS/TP or ARC156 network has been assigned to 200.

**If the connected Open controllers are using autogenerate, then their settings will be:**

- BACnet MS/TP Network Number = 200
- BACnet Device Instance Number = 200yy
- BACnet Device Instance Name = device200yy
- BACnet MS/TP MAC Address = yy

## To set up BACnet Broadcast Management Devices (BBMDs)



If your system has multiple routers that reside on different IP subnets, you must set up one router on each IP subnet as a BACnet/IP Broadcast Management Device (BBMD).

Every subnet with a router must have a BBMD configured in order for broadcasts from routers on that subnet to reach the rest of the routers on the network.

### NOTES

- The i-Vu® Standard or Plus application - If the i-Vu® web server is on a separate subnet than the rest of the routers, the internal router must be assigned a routable IP address and configured as a BBMD.
- The i-Vu® Pro application - If the i-Vu® Pro server is on a separate subnet than the rest of the routers, you must register it as a foreign device to a router acting as a BBMD device.

Use the **BBMD Configuration Tool** to:

- Write/read the **Broadcast Distribution Table** (BDT) of each BBMD device
- Allow controllers on one subnet to communicate with controllers on other subnets
- Enable the i-Vu® application to see, upload, or configure controllers on different subnets

#### To set up BBMDs using the BBMD Configuration Tool

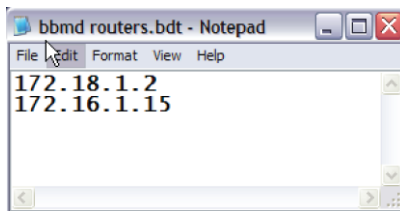
- 1 Assign an IP address, subnet mask, and default gateway for each i-Vu® Open Router on the IP network. See *Addressing the i-Vu® Open Router* (page 6).
- 2 Acquire the **BBMD Configuration Tool** from the Tech Tools USB drive or from either of the *Carrier Control Systems Support Sites* <http://www.hvacpartners.com/>, <https://accounts.ivusystems.com/>. This is a stand-alone executable file and no installation is necessary.
- 3 Make a list of the IP addresses for each router that will function as a BBMD in your system.

In the above illustration, the Carrier router, address 172.18.1.2, must be configured as a BBMD for the 172.18 subnet, while the Carrier router, address 172.16.1.15, must be configured as a BBMD for the 172.16 subnet.



#### CAUTIONS

- Define only one BBMD per subnet. Multiple BBMDs on an IP subnet disrupt network communications.
  - Unless explicitly modified, the UDP Port for BACnet/IP is 0xBACO (47808). Do not change this parameter unless you made a change in the router.
- 4 In a text editor such as Notepad, create a list of the routers that will be BBMDs. List each IP address on a separate line. (Maximum of 50 IP addresses per file)



- 5 Save the file to your folder of choice with a .bdt extension instead of .txt.

**NOTE** ".bdt" is a **Broadcast Distribution Table** file.

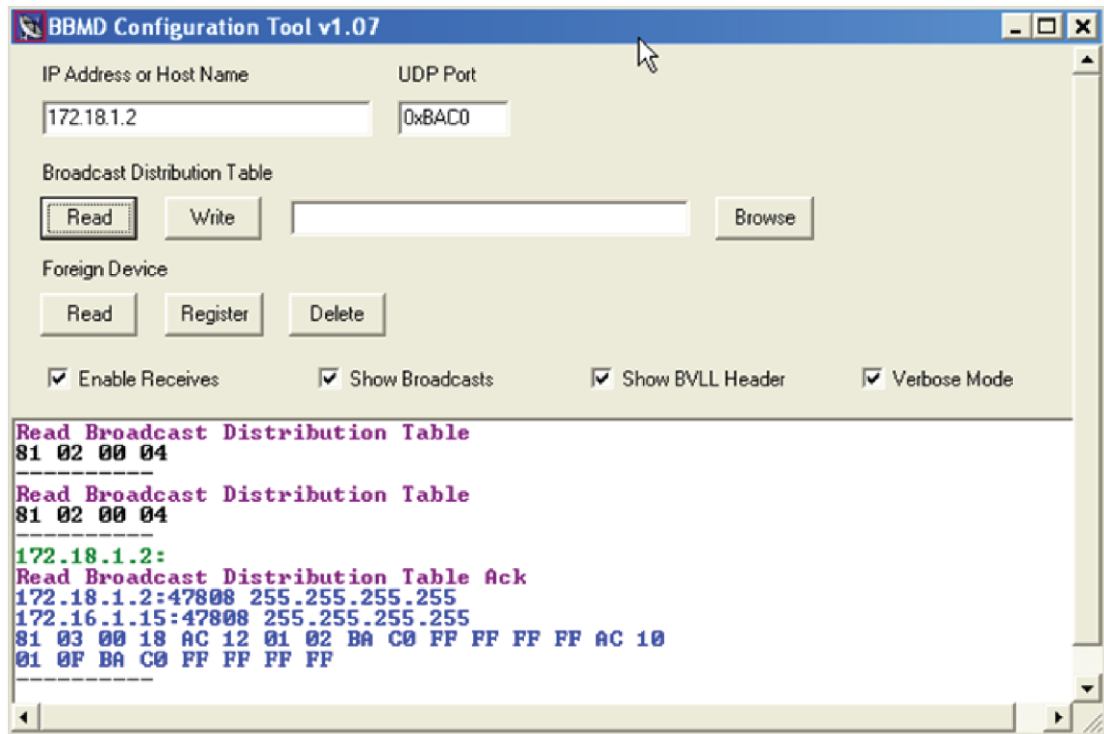
- 6 Open the **BBMD Configuration Tool**.
- 7 In the **IP Address** or **Host Name** field, type the IP address of the router that functions as the BBMD (BACnet Broadcast Management Device) for its subnet.
- 8 To check if the router has an existing BBMD table, click the **Broadcast Distribution Table Read** button.
- 9 If the **Broadcast Distribution Table** contains IP addresses that are not in your .bdt file, verify that they are valid BBMDs and, if so, add them to your .bdt file.

#### NOTES

- The BDTs in each BBMD should be identical. Repeat this entire process whenever a BBMD is added.
  - If needed, disable the checkbox next to **Show Broadcast** to limit the amount of scrolling text that is displayed.
- 10 Click the **Broadcast Distribution Table Browse** button and select the .bdt file that you made in step 4.
  - 11 Verify that the appropriate IP address is still in the **IP Address** or **Host Name** field.
  - 12 Click the **Broadcast Distribution Table Write** button.

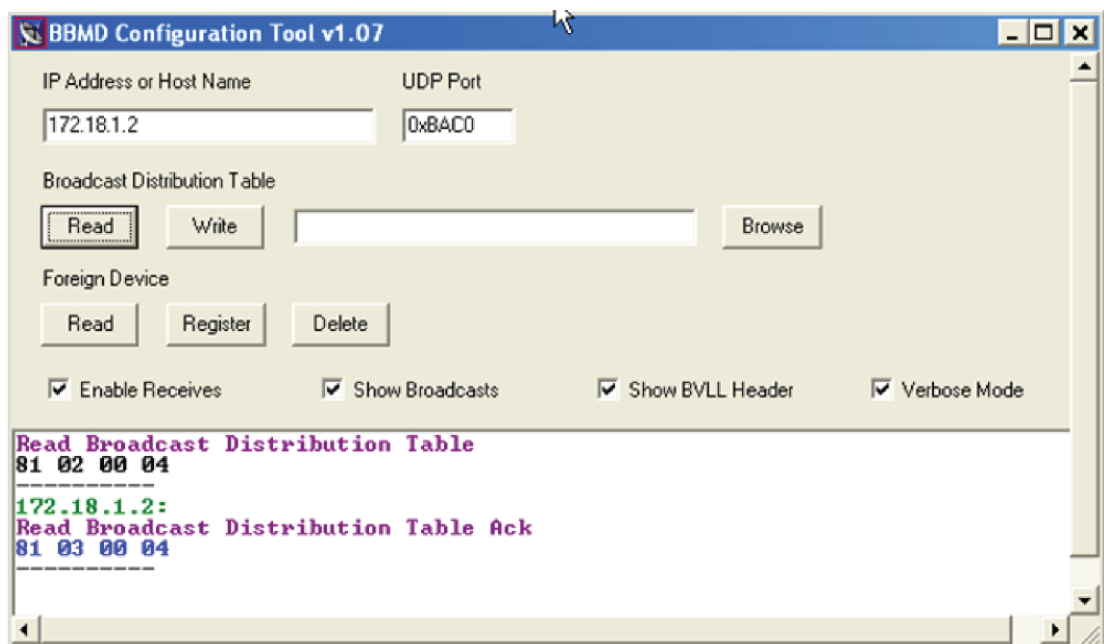
- 13 Click **Read** again to verify that the new .bdt file was written to the router. See example below.

**NOTE** If you have a large BDT, you may have to re-size the **BBMD Configuration Tool** window to see the **Broadcast Distribution Table**.



- 14 Using the next IP address in the .bdt file, repeat steps 7 through 14 until every file has been updated.

**NOTE** To clear the BBMD entries from a router, follow the steps above using an empty (blank) .bdt file. A cleared BBMD table contains just the router's IP address without entries in the BBMD table, as shown below.



## Adjusting the i-Vu® Open Router driver properties

After you find and upload the i-Vu® Open Router in the i-Vu® interface, you may want to customize the i-Vu® Open Router's settings for your applications. You can change settings on the **Driver Properties** page.

- 1 In the i-Vu® interface, right-click the i-Vu® Open Router in the navigation tree and select **Driver Properties**.
- 2 Adjust the driver as desired.

### Driver

On the **Driver** page, you can change the following properties:

- Backup battery conservation settings. See table below.
- BACview® inactivity timeout and user password. See table below.
- Module clock synchronization and failure. See table below.

#### Backup Battery

**Turn off internal backup battery after \_\_\_\_ days to conserve battery life (shutoff date/time)**

How long backup battery should run after power loss.

**TIP** Downloading memory activates the battery backup. This conserves battery life when you know the i-Vu® Open Router will be without power for an extended period after downloading (for example, during shipment):

Verify the **Archive Valid** LED is lit, then set this field to 0.

After you install the i-Vu® Open Router and apply power, enter a number greater than 0.

#### BACview Device Control

**Overwrite Daylight Saving parameters set in a BACview device?**

**Yes**—Every memory download includes **Daylight Saving Time** properties from the **System Options** tab and overwrites changes to these properties made from the BACview® device.

**No**—Download **Daylight Saving Time** properties during first download. You must make subsequent changes from the BACview® device.

**Keypad Inactivity timeout (minutes)**

Log out the user (if a user-level password is required), turn off the backlight, and display the standby screen after this period of inactivity.

**Keypad user-level password**

Numeric password user must enter to access system through a BACview® device.

#### Module Clock

**Clock Fail Date and Time**

Date and time the control program uses when controller's real-time clock is invalid.



**TIP** Use an occupied date and time (such as a Tuesday at 10 a.m.) so the equipment does not operate in unoccupied mode if the controller loses power during occupancy.

**Time Sync Sensitivity (seconds)**

When the controller receives a time sync request, if the difference between the controller's time and the time sync's time is greater than this field's value, the controller's time is immediately changed. If the difference is less than this field's value, the controller's time is slowly adjusted until the time is correct.

**BACnet COV Throttling****Enable COV Throttling**

Under normal circumstances, COV Throttling should be enabled to prevent excessive network traffic if an object's COV Increment is set too low. See EXCEPTION below.

When enabled, if an object generates excessive COV broadcasts (5 updates in 3 seconds), the module driver automatically throttles the broadcasts to 1 per second. Also, if the object's value updates excessively for 30 seconds, an alarm is sent to the i-Vu® application listing all objects that are updating excessively. A Return-to-normal alarm is sent only after all objects have stopped updating excessively.

**EXCEPTION** In rare circumstances, such as process control, a subscribing object may require COV updates more frequently than once per second. For these situations, clear this checkbox, but make sure that your network can support the increased traffic. You also need to disable the **Excessive COV** alarms under the driver's **Common Alarms**.

## Device

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On the **Driver > Device** page, you can change the following properties:

- BACnet device object properties for the i-Vu® Open Router
- i-Vu® Open Router communication

**Configuration**

**NOTE** The three APDU fields refer to all networks over which the i-Vu® Open Router communicates.

**Max Masters and Max Info Frames**

**Max Masters** - defines the highest MS/TP Master MAC address on the MS/TP network.

For example, if there are 3 master nodes on an MS/TP network, and their MAC addresses are 1, 8, and 16, then Max Masters would be set to 16 (since this is the highest MS/TP MAC address on the network).

This property optimizes MS/TP network communications by preventing token passes and "poll for master" requests to non-existent Master nodes.


In the above example, MAC address 16 knows to pass the token back to MAC address 1, instead of counting up to MAC address 127. Each MS/TP master node on the network must have their Max Masters set to this same value. The default is 127.

**Max Info Frames** - defines the maximum number of responses that will be sent when the i-Vu® Open Router receives the token. The default is 10 and should be ideal for the majority of applications. In cases where the i-Vu® Open Router is the target of many requests, this number could be increased as high as 100 or 200.

## Notification Classes

Alarms in the i-Vu® application use Notification Class #1. A BACnet alarm's Notification Class defines:

- Alarm priority for Alarm, Fault, and Return to Normal states
- Options for BACnet alarm acknowledgment
- Where alarms should be sent (recipients)

Priorities	<b>NOTE</b> BACnet defines the following Network message priorities for Alarms and Events.										
	<table> <tr> <th>Priority range</th><th>Network message priority</th></tr> <tr> <td>00–63</td><td>Life Safety</td></tr> <tr> <td>64–127</td><td>Critical Equipment</td></tr> <tr> <td>128–191</td><td>Urgent</td></tr> <tr> <td>192–255</td><td>Normal</td></tr> </table>	Priority range	Network message priority	00–63	Life Safety	64–127	Critical Equipment	128–191	Urgent	192–255	Normal
Priority range	Network message priority										
00–63	Life Safety										
64–127	Critical Equipment										
128–191	Urgent										
192–255	Normal										
<b>Priority of Off-Normal</b>	BACnet priority for Alarms.										
<b>Priority of Fault</b>	BACnet priority for Fault messages.										
<b>Priority of Normal</b>	BACnet priority for Return-to-normal messages.										
<b>Ack Required for Off-Normal, Fault, and Normal</b>	<p>Specifies whether alarms associated with this Notification Class require a BACnet Acknowledgment for Off-Normal, Fault, or Normal alarms.</p> <p> <b>TIP</b> You can require operator acknowledgment for an Alarm or Return-to-normal message (stored in the i-Vu® database). In the i-Vu® interface on the <b>Alarm &gt; Enable/Disable</b> tab, change the acknowledgment settings for an alarm source or an alarm category.</p>										
Recipient List											
<b>Recipients</b>	The first row in this list is the i-Vu® application. Do not delete this row. Click <b>Add</b> if you want other BACnet devices to receive alarms associated with this Notification Class.										
<b>Recipient Description</b>	Name that appears in the <b>Recipients</b> table.										
<b>Recipient Type</b>	<p>Use <b>Address</b> (static binding) for either of the following:</p> <ul style="list-style-type: none"> <li>• Third-party BACnet device recipients that do not support dynamic binding</li> <li>• When you want alarms to be broadcast (you must uncheck <b>Issue Confirmed Notifications</b>). This use is rare.</li> </ul>										
Days and times	The days and times during which the recipient will receive alarms.										
<b>Recipient Device Object Identifier</b>	Type the <b>Device Instance</b> from the network administrator for third-party devices) in the <b>#</b> field.										
<b>Process Identifier</b>	Change for third-party devices that use a BACnet Process Identifier other than 1. The i-Vu® application processes alarms for any 32-bit Process Identifier.										
<b>Issue Confirmed Notifications</b>	Select to have a device continue sending an alarm message until it receives delivery confirmation from the recipient.										
<b>Transitions to Send</b>	Uncheck the types of alarms you do not want the recipient to get.										

## Calendars

Calendars are provided in the driver for BACnet compatibility only. Instead, use the **Schedules** feature in the i-Vu® interface.

## Common and Specific Alarms

On these pages, you can enable/disable, change BACnet alarm properties, or set delays for the following BACnet alarms:

### Common alarms:

- All Programs Stopped
- Control Program
- Duplicate Address
- Excessive COV
- Locked I/O
- Module Halted
- Program Stopped

### Specific Alarms:

- Dead Module Timeout
- Low Battery Alarm

**NOTE** To set up alarm actions for controller-generated alarms, see *Set up alarm actions* in i-Vu® Help.

Controller-generated Alarm	
<b>Description</b>	Short message shown on i-Vu®'s Alarm page or in an alarm action when this type of alarm is generated.
<b>Events</b>	
<b>Enable</b>	Clear these checkboxes to disable Alarm or Return to normal messages of this type from this controller.
<b>Notification Class</b>	Do not change this field.

## BACnet router properties

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On the **BACnet router properties** page, you can change the following properties:

- BACnet routing settings
- Color and prime variable caching settings

### BACnet Router Options

#### Ignore all Reject-Message-to-Network, Reason=1 messages

Clear to delete and redownload a router if a network's router indicates that the network is no longer present (reason=1).

Select to continue routing messages to a network even if its router indicates that the network is no longer present.

### Color/Prime Variable Caching

#### Disable Color Cache

Clear (enable) to improve responsiveness in retrieving colors.

Select (disable):

- To reduce network traffic to third-party (non-color-supporting) devices
- If using the i-Vu® Open Router on the controller network, but not as a router

**NOTE** Selecting this checkbox also disables dead controller alarms.

#### Dead Module Timeout

After this period (minutes:seconds) of non-response from an Open controller, the router sends an alarm to the server.

## BACnet firewall

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Requires v6-02 or later driver

If this IP controller is accessible from the Internet, you can increase security by enabling its BACnet firewall. When enabled, this feature prevents the controller from responding to BACnet messages from unidentified sources and allows communication only with IP addresses that you define. These can be all private IP addresses and/or a list of IP addresses. Follow the instructions in the i-Vu® interface to set up the BACnet firewall.

## Alarm Store/Forward

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On the **Alarm Store and Forward** page, you can change alarm delivery settings for the i-Vu® Open Router used to store and forward alarms from a remote dial-up site.

## Configuring Properties using the Equipment Touch

View or configure the i-Vu® Open Router using the Equipment Touch touchscreen device. Refer to the Equipment Touch *Installation and Setup Guide* for details.

## Troubleshooting

If you have problems mounting, wiring, or addressing the i-Vu® Open Router, contact Carrier Control Systems Support.

**NOTE** To help you troubleshoot, obtain a Module Status (Modstat) from the controller and review the System Error and Warning details.

## Communication LED's

The **Module Status** LED can display the following error codes. Verify the LED patterns by cycling power to the controller and noting the lights and flashes.

Error Code...	Indicates...	Possible solutions
0	The control program or driver has not been downloaded.	Download All Content to the i-Vu® Open Router.
1	A control program error	Obtain a Module Status Report (Modstat) and look for error messages. See i-Vu® Help for instructions on obtaining a Modstat.  If you cannot determine the error from the Modstat, contact Carrier Control Systems Support.
2	The controller's memory is full	In the i-Vu® interface, reduce the amount of trend data and/or control programs stored in the controller.
3	A setup error	Verify: <ul style="list-style-type: none"> <li>• The address has been set on the rotary switches. See Addressing the i-Vu® Open Router.</li> <li>• The address is unique on the network</li> <li>• DIP switches are set correctly</li> </ul>
4	A system error	Obtain a Module Status Report (Modstat) and look for error messages. See i-Vu® Help for instructions on obtaining a Modstat.  If you cannot determine the error from the Modstat, contact Carrier Control Systems Support.
8	Factory defaults are being restored	The number 8 should display only during the short restoring period. If this number displays continuously or flashes intermittently with another number, try each of the following: <ul style="list-style-type: none"> <li>• Turn the i-Vu® Open Router's power off, then on.</li> <li>• Restore factory defaults. See Restore factory defaults.</li> <li>• Download the controller.</li> <li>• Replace the i-Vu® Open Router.</li> </ul>

Other LED's show the status of certain functions.

If this LED is on...	Status is...
<b>Power</b>	The i-Vu® Open Router has power.
<b>Link</b>	The i-Vu® Open Router is connected to the Ethernet
<b>LAN</b>	The Ethernet port is transmitting or receiving data
<b>100</b>	The connection speed is 100 Mbps. If LED is not lit, the connection speed is 10 Mbps.
<b>S2 Tx</b>	The i-Vu® Open Router is transmitting data on the Port S2 network
<b>S2 Rx</b>	The i-Vu® Open Router is receiving data from the Port S2 network
<b>Archive Valid</b>	The i-Vu® Open Router's memory backup is valid
<b>S1 (BACnet) Tx</b>	The i-Vu® Open Router is transmitting data to the MS/TP (Open) network
<b>S1 (BACnet) Rx</b>	The i-Vu® Open Router is receiving data to the Open network
<b>Brownout</b>	Low-level incoming power
<b>Battery low</b>	The battery is low

## To get the serial number

If you need the i-Vu® Open Router's serial number when troubleshooting, the number is on:

- A laser-etched number and QR code on the inside circuit board
- a sticker on the back of the main controller board (prior to 2019)
- a Module Status report (Modstat) under **Core** (or **Main**) **board hardware**



Core board hardware:  
 Type=178, Board=7, manufactured on 06/27/2013 S/N 021362247P  
 RAM: 512 kBytes; FLASH: 1024 kBytes, type = 3

To obtain a modstat in the i-Vu® interface:

- 1 Select the i-Vu® Open Router in the navigation tree.
- 2 Right-click and select **Module Status**.

## To restore factory defaults

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**CAUTION** This erases all archived information and user-configuration settings. You will have to reconfigure all custom settings. We highly recommend that you restore the factory defaults only under the guidance of Carrier Control Systems Support.

To erase volatile memory data and restore factory default configuration settings:

- 1 Turn off the i-Vu® Open Router's power switch.
- 2 Make sure the address switches are not set to 0, 0.
- 3 Hold down the controller's **Factory Defaults** button while you turn its power on.
- 4 Continue to hold down the **Factory Defaults** button until the controller displays **8** and then the chase pattern, then release the button.
- 5 Turn on the i-Vu® Open Router's power switch.

## To replace the i-Vu® Open Router's battery

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The i-Vu® Open Router's 10-year Lithium CR123A battery retains the following data for a maximum of 720 hours during power outages: time, control programs, editable properties, schedules, and trends.

To conserve battery life, you can set the driver to turn off battery backup after a specified number of days and depend on the archive function to restore data when the power returns.

A low battery is indicated by the **Battery low** LED or a low battery alarm in the i-Vu® application. You can purchase replacement batteries from any retailer that sells a CR-123A battery.

- 1 Verify that the i-Vu® Open Router's power is on.
- 2 Using a small flathead screwdriver, pry up each side of the black battery clip until it is free and you can remove it.
- 3 Remove the battery from the controller, making note of the battery's polarity.
- 4 Insert the new battery into the controller, matching the polarity of the battery you removed.
- 5 Push the black clip back onto the battery until you hear both sides click in place.
- 6 Download the i-Vu® Open Router.

## To take the i-Vu® Open Router out of service

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If needed for troubleshooting or start-up, you can prevent the i-Vu® application from communicating with the i-Vu® Open Router by shutting down communication from the i-Vu® Open Router to the i-Vu® application. When **Out of Service**, i-Vu® no longer communicates properties, colors, trends, etc.

- 1 On the i-Vu® navigation tree, select the i-Vu® Open Router.
- 2 On the **Properties** page, check **Out of Service**.
- 3 Click **Accept**.

## 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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Compliance of listed products to requirements of ASHRAE Standard 135 is the responsibility of BACnet International. BTL® is a registered trademark of BACnet International.

## Appendix A: BACnet Protocol Implementation Conformance Statement

The PIC statements are updated regularly. Please refer to the *BACnet website*  
<http://www.bacnetinternational.net/catalog/index.php?m=28> for the latest information.

## 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*
9/10/2020	Cover	Updated logo	X-D
1/24/19	BACnet firewall	Changed "prevents the controller from receiving BACnet messages" to "prevents the controller from responding to BACnet messages".	X-PM-KC-O
	Specifications	Added surge CAUTION to Protection specification.	X-TS-AK-E-CC
10/29/18	Specifications	Reworded Protection specification and added first paragraph.	X-H-JS-O
2/6/18	BACnet firewall	New topic.	C-D-RD-BL
1/17/17	To communicate using PuTTY	Screen capture updated	C-FW-DE-O
	To wire a BACnet/ARC156 network	New topic	C-D
	Ethernet, BACnet MS/TP, and ARC156	Added BACnet ARC156. Changed wiring guide to Open Controller Network Wiring Guide	C-D
	Wiring for communications	Added BACnet ARC156.	C-D
	Specifications	Added BACnet ARC156 connection.	C-D
	Cover What is the i-Vu® Open Router?	Changed to latest controller image.	C-D
9/16/16	Communication LEDs	Corrected 0 and added 8.	C-D
	To take the i-Vu® Open Router out of service	Added for v6.5	C-D
	Configuring i-Vu® Open Router Driver Properties	error - changed download to upload - driver...	C-D
8/6/14	Restore factory defaults	Added information on using the Factory Defaults button	C-D-LJ-E-RD

\* For internal use only





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