



turn to the experts

UPC Open

Installation and Integration Guide

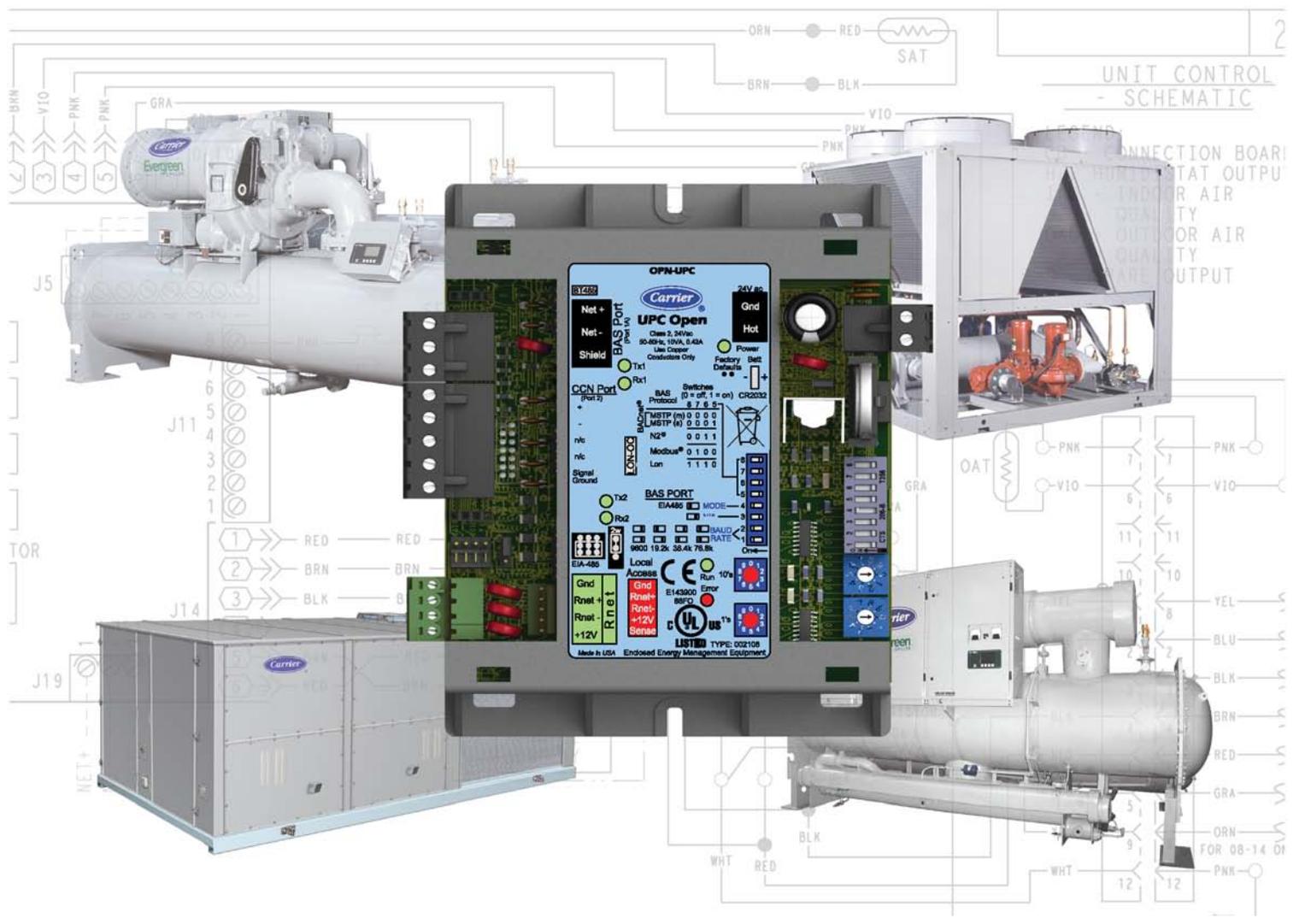


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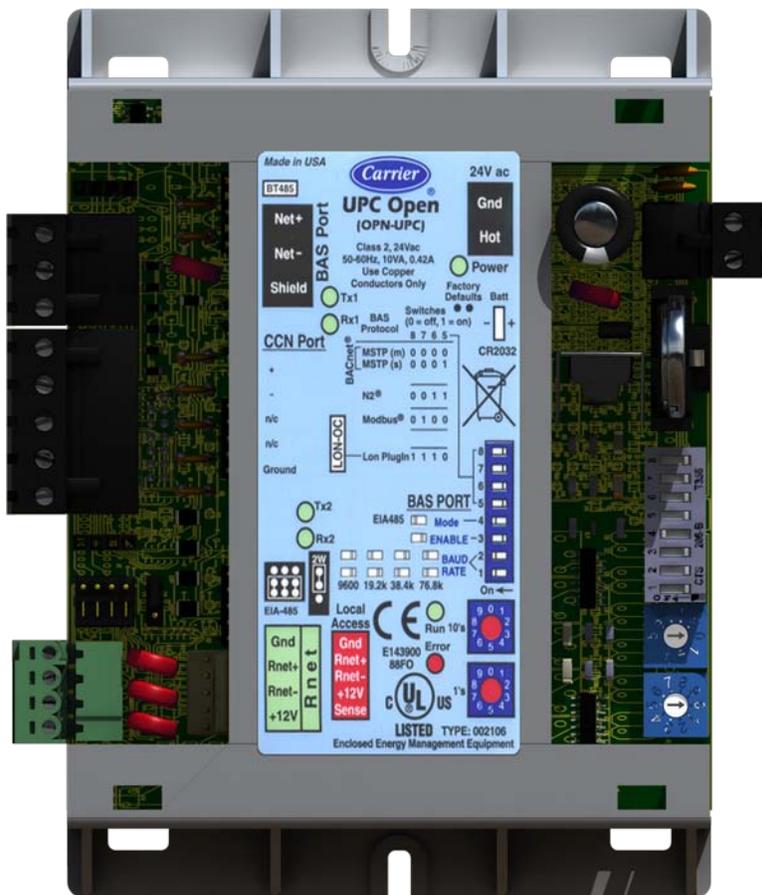
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Introduction

What is the UPC Open?

The UPC Open (Universal Protocol Card) is a general purpose protocol converter. The UPC Open can convert proprietary equipment data into open protocol data, enabling a stand-alone, single piece of equipment to reside on a BACnet network, where it can be monitored or controlled by a Building Automation System (BAS).

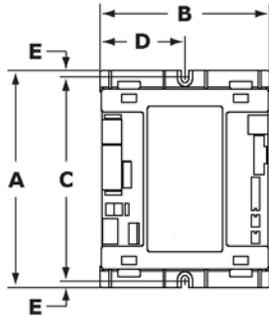
NOTE A future release of the UPC Open will support installation on a Modbus, N2, or LonWorks network.



Specifications

Driver	DRV_UPC
Maximum number of control programs	2
Maximum number of BACnet objects*	1050
* Depends on available memory	Total available memory for application is 551244 bytes. Obtain available memory information by viewing a module status report after the control program is loaded.
Power	24 Vac \pm 10%, 50–60 Hz 10 VA power consumption (16 VA with BACview attached) 26 Vdc (25 V min, 30 V max) Single Class 2 source only, 100 VA or less We highly recommend using a dedicated transformer to power the UPC Open.
BAS port (Port 1a)	3-pin port supports EIA-485 2-wire communications. Protocols supported (DIP switch selectable): <ul style="list-style-type: none"> ○ BACnet MS/TP ○ Modbus (RTU) (future) ○ Johnson N2 (future) This port must be configured as a BAS port. NOTE Port 1a or LON-OC port can be used, but not both.
LON-OC port	14-pin communication port supports the LonWorks Option Card (future)
CCN port (Port 2)	5-pin port supports EIA-485 3-wire connection to a single Carrier CCN controller
Rnet port	For SPT sensors and a BACview ⁶ in any of the following combinations, wired in a daisy-chain configuration: <ul style="list-style-type: none"> ● 1 SPT Plus or SPT Pro ● 1–4 SPT Standards ● 1–4 SPT Standards, and 1 SPT Plus or SPT Pro Any of the above combinations, plus a BACview ⁶ but no more than 6 devices total
Local Access port	For system start-up and controller troubleshooting, use a PC with Virtual BACview, Field Assistant, or BACview6 (115.2 kbps)
Battery	10-year Lithium CR2032 battery provides a minimum of 10,000 hours of data retention during power outages
Protection	Built-in surge and transient protection circuitry - internal solid state Polyswitches on the incoming power and network connections.
Real time clock	Battery-backed real time clock keeps track of time in the event of a power failure
Status indicators	LED's indicate status of communications, running, errors, and power.

Environmental operating range	-22 to 150 °F (-30 to 66 °C), 0 to 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 GE C2950HF Cyclooy plastic



Overall dimensions	A: 5-3/16 in. (13.2 cm) B: 4-1/8 in. (10.5 cm)
Mounting hole dimensions	C: 4-7/8 in. (12.4 cm) D: 2-1/20 in. (5.2 cm) E: 3/16 in. (.5 cm)
Panel depth	2 in. (5.1 cm)
Weight	.44 lbs (.2 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	UL-916, (Canadian Std C22.2 No. 205-M1983), CE, FCC Part 15-Subpart B-Class A

Installation

To install the UPC Open:

- 1 *Mount the controller* (page 4).
- 2 *Wire the controller for power*. (page 5)
- 3 *Set the controller's address*. (page 5)
- 4 *Configure the BAS port for BACnet MS/TP*. (page 6)
- 5 *Wire the controller to the MS/TP network*. (page 7)
- 6 *Wire the controller to the CCN network*. (page 8)

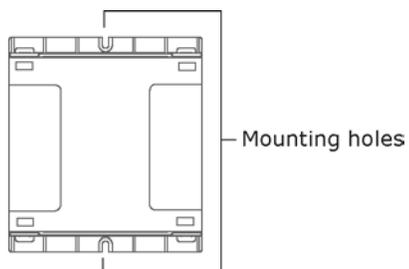
To mount the UPC Open

Warning!

When you handle the UPC Open:

- 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 UPC Open 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. Mounting hole dimensions 4.8 in. (12.2 cm) between mounting slot center lines.



Wiring the UPC Open for power

Caution!

The UPC Open 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. The UPC Open is a half wave device. Half wave and full wave devices **cannot** share power. Examples of a full wave device are a CVC or ICVC in an applied chiller.

Carrier controllers can share a power supply as long as you:

- Maintain the same polarity
- Use the power supply only for Carrier Open controllers

To wire for power

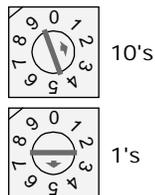
- 1 Remove power from the power supply.
- 2 Pull the screw terminal connector from the controller's power terminals labeled **Gnd** and **Hot**.
- 3 Connect the transformer wires to the screw terminal connector.
NOTE If using a grounded transformer, connect the ungrounded lead to the **Hot** terminal to avoid damaging the transformer.
- 4 Apply power to the power supply.
- 5 Measure the voltage at the UPC Open's power input terminals to verify that the voltage is within the operating range of 21.6–26.4 Vac.
- 6 Insert the screw terminal connector into the UPC Open's power terminals.
- 7 Verify that the **Power** LED is on and the **Run** LED is blinking.

To address the UPC Open

You must give the UPC Open a MAC address that is unique on the MS/TP network. You can address the UPC Open before or after you wire it for power

- 1 If the UPC Open has been wired for power, pull the screw terminal connector from the controller's 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.



CAUTION The factory default setting is **00** and must be changed to successfully install your UPC Open.

BACnet Device Instance Address

The UPC Open also has a BACnet Device Instance address. This Device Instance MUST be unique for the complete BACnet system in which the UPC Open is installed. The Device Instance is auto-generated by default and is derived by adding the MAC address to the end of the Network Number. The Network Number of a new UPC Open is 16101A. Thus, a controller with a MAC address of 20 results in a Device Instance of 16101 + 20, which is a Device Instance of 1610120. Also, using i-Vu Tools or BACView, you can configure a specific address for the Device Instance.

Configuring the BAS Port for BACnet MS/TP

Use the same baud rate and communication settings for all controllers on the network segment. The UPC Open is fixed at 8 data bits, No Parity, and 1 Stop bit for this protocol's communications.

- 1 If the UPC Open has been wired for power, pull the screw terminal connector from the controller's power terminals labeled **Gnd** and **Hot**. The controller reads the DIP Switches and jumpers each time you apply power to it.
- 2 Leave **DS7** and **DS8** in the OFF position. These switches are not applicable to MS/TP.
- 3 Set the BAS Port DIP Switches **DS4** through **DS6** for BACnet MS/TP. See table and example below.

Protocol DIP switch settings for MS/TP

DS8	DS7	DS6	DS5	DS4	DS3
Off	Off	Off	Off	On	Off

NOTE DIP Switch **DS3** is not used in i-Vu Open Control Systems.

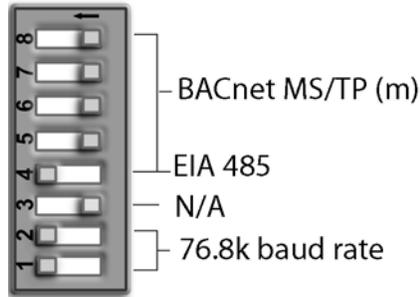
- 4 Set the BAS Port DIP Switches **DS1** and **DS2** for the appropriate communications speed of the MS/TP network (9600, 19.2k, 38.4k, or 76.8k bps).

Baud Selection Table

Baud Rate	DS2	DS1
9,600	Off	Off
19,200	On	Off
38,400	Off	On
76,800	On	On

- 5 Verify that the EIA-485 jumpers below the CCN Port are set to EIA-485 and 2W.

The following example shows the BAS Port DIP Switches set for 76.8k (Carrier default), and MS/TP.

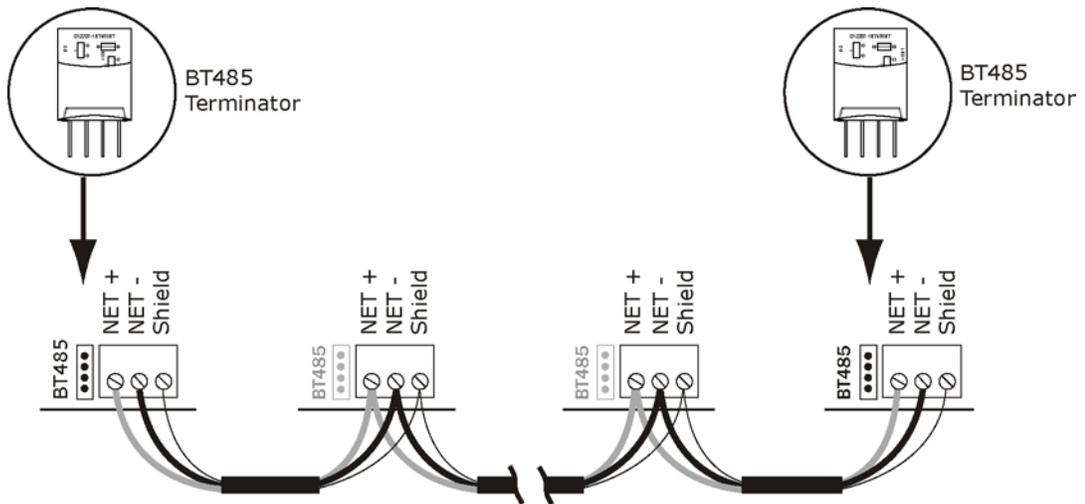


Wiring the UPC Open to the MS/TP network

The UPC Open communicates using BACnet on an MS/TP network segment communications at 9600 bps, 19.2 kbps, 38.4 kbps, or 76.8 kbps.

Wire the controllers on an MS/TP network segment in a daisy-chain configuration.

Install a BT485 on the first and last controller on a network segment to add bias and prevent signal distortions due to echoing.



See the *MS/TP Networking and Wiring Installation Guide* for more details.

Wiring specifications

Cable:	22 AWG or 24 AWG, low-capacitance, twisted, stranded, shielded copper wire
Maximum length:	2000 feet (610 meters)

To wire the UPC Open to the BAS network

- 1 Pull the screw terminal connector from the controller's **BAS Port**.
- 2 Check the communications wiring for shorts and grounds.
- 3 Connect the communications wiring to the BAS port's screw terminals labeled **Net +**, **Net -**, and **Shield**.
NOTE Use the same polarity throughout the network segment.
- 4 Insert the power screw terminal connector into the UPC Open's power terminals if they are not currently connected.
- 5 Verify communication with the network by viewing a module status report.

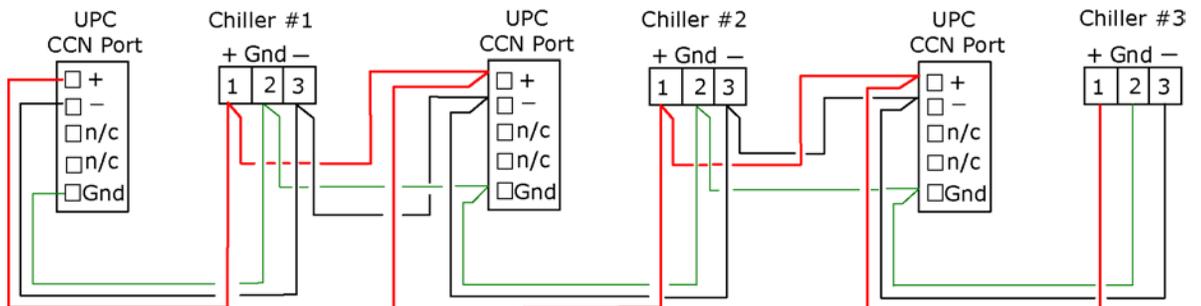
Wiring the UPC Open to the CCN network

The UPC Open's CCN Port communicates using EIA RS-485 and supports 9600 bps. Future versions will support baud rates of 19.2 and 38.4 kbps.

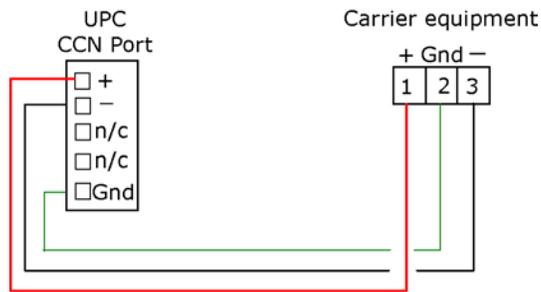
NOTES

- The UPC Open is intended to be wired directly to one piece of Carrier equipment.
NOTE The exception is a Multiple Chiller Application, which consists of two or three chillers configured for Lead/Lag, with a potential third chiller as a standby chiller. In this application, wire the CCN network between the UPC Open and chillers in a daisy-chain configuration. All other applications have one network segment between the UPC Open and the interfaced Carrier equipment.
- Refer to the *CCN Installation and Start-up Guide* for more details on wiring the CCN bus.

Multiple chiller application only (Lead/Lag, and, possibly, a standby chiller)



Single unit application



Wiring specifications for CCN

Cable:	20 AWG, general purpose, 3-conductor, foil shielded copper wire
Maximum length:	1000 feet (305 meters)

To wire the CCN equipment to the UPC Open

- 1 Pull the screw terminal connector from the UPC Open's **CCN Port**.
- 2 Check the communications wiring for shorts and grounds.
- 3 Connect the communications wiring to the CCN Port's screw terminals labeled **Net +**, **Net -**, and **Shield**.
NOTE Maintain the same polarity.
- 4 Insert the power screw terminal connector into the UPC Open's CCN Port's terminals.
- 5 Verify the LED lights **TX2** and **RX2** are flashing to indicate the UPC Open is communicating on the CCN Port.

NOTE If the CCN target address differs from what the UPC Open is configured for (default 0, 1), then only the transmit LED flashes about 1 time per second.

Select or create a custom control program and graphic for the UPC Open

The field-installed UPC Open does not come from the factory with a control program or graphic. You must load a control program and graphic as part of the installation/commissioning of the UPC Open. You can select a control program and graphic from ApplicationBuilder that has all the configurations that are currently available on a factory-installed UPC Open. You can also create a custom control program using Snap. See the Snap Help files for details.

NOTE Third party mapping information for current Carrier PIC products, whether on a factory-installed UPC Open or selected from ApplicationBuilder, can be found on the *Carrier Control Systems Support Site* <http://www.hvacpartners.com/> under **Control System Support > I-Vu Open System > UPC Open**.

Consider the following before creating your program in Snap:

- Is the equipment already available in ApplicationBuilder?
- Which points from the Carrier equipment are to be mapped in the UPC Open?
- The type of Carrier microblock does each point require?
- Do you need to create custom **Property** pages for the equipment?
- Are there any special microblocks you may need, such as **Communication Device, Schedule, Alarms**?

To create your control program in Snap, you must:

- Obtain your CCN points list from the equipment or CCN database.
- Know what points need to be mapped in the control program to the equipment.
- Load a separate control program if Airside Linkage is needed and the UPC Open is used on a rooftop unit. An Airside Linkage equipment file can be selected in ApplicationBuilder.

After creating your control program, save and download it to the controller. If desired, create a custom graphic using ViewBuilder. See ViewBuilder Help files for details.

Local access to the UPC Open

You can use the following items as a local user interface to an Open controller. These items let you access the controller information, read sensor values, and test the controller.

NOTE At the present time, Field Assistant is the required local access user interface for UPC Open start-up, commissioning, operation, and troubleshooting. The 3 versions of BACview only provide rudimentary driver information.

Connect...	To the controller's...	For...
BACview6 Handheld keypad/display unit	Local Access port	Temporary user interface for driver parameter access
Virtual BACview software running on a laptop	Local Access port*	Temporary user interface for driver parameter access
BACview6 keypad/display unit	Rnet port	Permanent user interface for driver parameter access
Field Assistant	Local Access port*	Temporary user interface for start-up, commissioning, troubleshooting, etc..

* Requires a USB Link (USB-L)

These are accessory items that do not come with the controller.

See the *BACview Installation and User Guide* for instructions on connecting and using the BACview display.

Start-up

To start up the UPC Open, use one of the following interfaces. They allow you to access and configure controller information, read sensor values, and test the controller.

This Interface...	Provides a...
I-Vu Open software	Permanent interface
Field Assistant software - runs on a laptop connected to controller's Local Access port ¹	Temporary interface

¹ Requires a USB Link (USB-L).

Configuring the UPC Open's properties

To start up the UPC Open, set the following properties:

Navigation: i-Vu / Field Assistant: **Properties > Equipment > Status**
 BACview: **CCN**

Point Name/Description	Default/Range
<p>Element Comm Stat - The UPC Open's current status of communication to the CCN equipment. Click the Element Comm Stat microblock link to change the CCN equipment target address - bus and element number.</p> <p>NOTE If more than one UPC Open is connected to a CCN bus for a Multiple Chiller Application, you must change the CCN controller's address in this object's Summary tab.</p>	<p>D: 0, 1</p> <p>R: Bus: 0.1 - 239 Element: 1 - 239</p>

Navigation: i-Vu / Field Assistant: **Driver Properties > Communications > CCN**

Point Name/Description	Default/Range
<p>CCN Address - Configuration of the UPC Open's CCN element number.</p>	<p>D: 0, 200</p> <p>R: 1 - 239</p>

NOTES

If the UPC Open is used in a Multiple Chiller Application, then you must change the address of the chillers and the CCN address of all the UPC Open controllers to ensure they are all unique. In this application, the maximum number of UPC Open controllers allowed on the CCN bus is **3**.

- **CCN Alarm Acknowledger** - The UPC Open defaults as the **CCN Acknowledger**. In a Multiple Chiller Application, you must configure only one of the UPC Open controllers as the **CCN Acknowledger**.
- **CCN Time Broadcaster** - The UPC Open can be a **CCN Time Broadcaster**. In a Multiple Chiller Application, you must configure only one of the UPC Open controllers as the **CCN Time Broadcaster**.

- In chiller applications, verify the chiller is configured in CCN mode. If the chiller is not in CCN mode, then the UPC Open is not able to force points or write to the chiller. Refer to the specific chiller's documentation for information on how to setup the chiller to be in CCN mode.

Troubleshooting

If you have problems mounting, wiring, or addressing the UPC Open, contact Carrier Technical Support.

The UPC Open 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. NOTE The UPC Open is protected by internal solid state Polyswitches on the incoming power and network connections. These Polyswitches are not replaceable, but they 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 from the network segment; there is an Tx LED for Ports 1 and 2.
Run	Lights based on controller health.
Error	Lights based on controller health.

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 Run LED	The controller files are archiving. Archive is complete when Error LED stops flashing.
2 flashes per second	Off	Normal
2 flashes per second	2 flashes, alternating with Run 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

If Run LED shows...	And Error LED shows...	Status is...
2 flashes per second	On	Exec halted after frequent system errors, due to: <ul style="list-style-type: none"> • Controller halted • Program memory corrupted • Address conflicts - duplicate MS/TP MAC addresses • One or more programs stopped
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 Run LED	Ten second recovery period after brownout
14 flashes per second	14 flashes per second, alternating with Run LED	Brownout
On	On	Failure. Try the following solutions: <ul style="list-style-type: none"> • Turn the UPC Open off, then on. • Download memory to the UPC Open. • Replace the UPC Open.

Serial number

If you need the UPC Open'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 your user interface

Replacing the UPC Open's battery

The UPC Open's 10-year Lithium CR2032 battery provides a minimum of 10,000 hours of data retention during power outages.

CAUTION Power must be **ON** to the UPC Open when replacing the battery, or your date, time, and trend data will be lost.

- 1 Remove the battery from the controller, making note of the battery's polarity.
- 2 Insert the new battery, matching the battery's polarity with the polarity indicated on the UPC Open.

Appendix A: Single Point Linkage and Device Address Binding

Single Point Linkage

The UPC Open receives data from other Open controllers when they are installed as part of an Open system. The data transfer may take the form of Single Point Linkage (SPL), which is automatic, or Device Address Binding, which you must configure.

Currently, the UPC Open implements Single Point Linkage (SPL) for 3 variables:

- **System Cool Demand Level**
- **System Heat Demand Level**
- **System Outside Air Temperature**

Network Points for which SPL has been implemented are displayed in i-Vu and Field Assistant on the **Properties** page > **Network Points** tab.

The following example involves outside air temperature. **System Heat & Cool Demand Level** behaves similarly, except that their usage involves a specific application loaded on a Universal Controller Open. See *UC Open Installation Guide* for additional information. In either case, note that the BACnet type and instance numbers specified in the **Address** field of these variables have been predefined.

Network variables for which SPL is used are easily identified on the **Properties** page > **Network Points** tab. The asterisk in the BACnet address invokes the SPL function. These addresses cause the controller to issue a BACnet “who has” command for this variable. The controller binds to the closest of the first 5 devices from which it receives a valid response.

Name	Type	Value	Locked	Default Value	Com Enabled	COV Enable	Refresh Time (min:sec)	Address	Error
System Cool Demand Level	(ANI)	3.00	<input type="checkbox"/>	0	<input checked="" type="checkbox"/>		1:00	bacnet://AV:80004	0 No Error, bound to DEV:1610907, AV:80004
System Heat Demand Level (Primary)	(ANI2)	0.00	<input type="checkbox"/>	0	<input checked="" type="checkbox"/>		1:00	bacnet://AV:80005	7 Binding in progress
(Secondary)								bacnet://AV:80005	7 Binding in progress

Address containing * (asterisk) denotes Single Point Linkage

Predefined Type and Instance Number

Indicates successful binding

Device Address Binding

As described previously, **Device Address Binding** allows the UPC Open to receive data from other Open controllers when they are connected by a network. You must configure this method.

Currently, the UPC Open allows **Device Address Binding** (DAB) only for **System Space Temperature**.

You can implement DAB on network points with an undefined BACnet address, displayed in i-Vu and Field Assistant on the **Properties** page > **Network Points** tab. See example below.

Name	Type	Value	Locked	Default Value	Com Enabled	COV Enable	Refresh Time (mm:ss)	Address	Error	Present Value
System Space Temperature	(AN/2)	-999.00	<input type="checkbox"/>	-999	<input checked="" type="checkbox"/>		1:00	Search / Replace bacnet://	0 No Error	-999
(Primary)								bacnet://	0 No Error	-999
(Secondary)								bacnet://	0 No Error	-999

Undefined BACnet Address

Currently "Unbound"

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.

BACnet Compliance

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