Installation Instructions

Part No. 30MP-900---066

CONTENTS

SAFETY CONSIDERATIONS

Installation of this accessory can be hazardous due to electrical components and equipment location. When installing this accessory, observe precautions in the literature, labels attached to the equipment, and other safety precautions that apply.

- Follow all safety codes
- Wear safety glasses and work gloves
- Use care when handling and installing this accessory

⚠ WARNING

Electrical shock can cause personal injury and death. Shut off all power to this equipment before beginning installation of this equipment. Ensure all power to each unit is disconnected and that tags are properly placed to alert others. There may be more than one disconnect switch. Tag all disconnect locations to alert others not to restore power until work is completed.

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

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[1] Compliance

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

1. BACnet is a registered trademark of ASHRAE (American Society of Heating, Refrigeration, and Air-Conditioning Engineers).

requirements of ASHRAE Standard 135 is the responsibility of BACnet International.

GENERAL

The multi-chiller controller is a field-installed accessory kit that is used to control from two to eight 30MP chillers as a single chiller plant. The units are controlled by the AppController board inside the accessory panel. The 30MP multi-chiller controller allows for efficient operation by staging each chiller independently. This reduces system energy consumption at part load operating conditions.

The multi-chiller controller accessory includes Carrier's i-Vu® System Touch™ display, which is an integrated component of the i-Vu Building Automation System.

The multi-chiller controller accessory also contains a power transformer and terminal strip in a NEMA type 1 enclosure, which can be wall mounted. The kit requires field-supplied 120 vac, max 75 va incoming power. The enclosure has multiple knockouts sized from ½ to 1 ½ in. to allow for wiring to the terminal strip.

The following field-supplied items are required for installation:

- Varnish cloth
- Wire (22 AWG [American Wire Gage] or 24 AWG, low capacitance, twisted, stranded, shielded copper wire. Length sufficient to daisy chain all 30MP chillers to the multi-chiller controller panel from their desired location.)

It is not necessary to connect directly to the AppController board or the i-Vu System Touch display. All field wiring should be connected to the terminal strip supplied in the 30MP multi-chiller controller accessory panel.

The AppController board communicates to each 30MP chiller via the UPC Open BACnet Communication Module, which must be installed in each 30MP chiller. It is necessary to connect the 30MP multi-chiller controller accessory panel and each UPC Open module on an MS/TP network segment. The UPC Open module is located behind the low voltage terminal block (LVT) in each 30MP chiller. (All wiring is field supplied.)

For a description of LEDs, switches, jumpers, connection ports, and terminators on the UPC Open Interface, see Fig. 1.

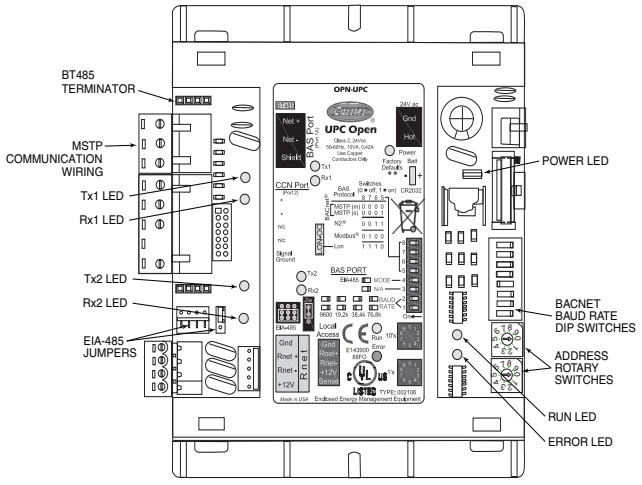


Fig. 1 — UPC Open Interface Details

For an example of how to wire the 30MP multi-chiller accessory panel to the BACnet Communication Module on each 30MP chiller, see Fig. 2.

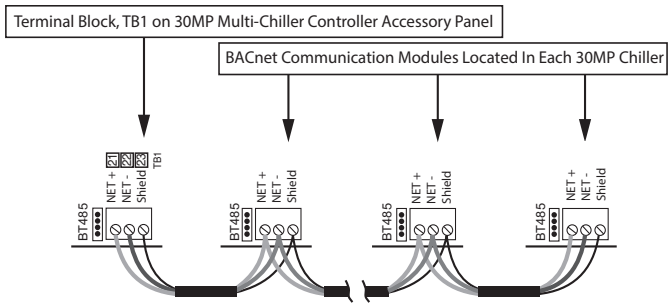


Fig. 2 — MS/TP Network Daisy Chain Configuration

For the location of the UPC Open module on the 30MP chiller control panel, see Fig. 3.

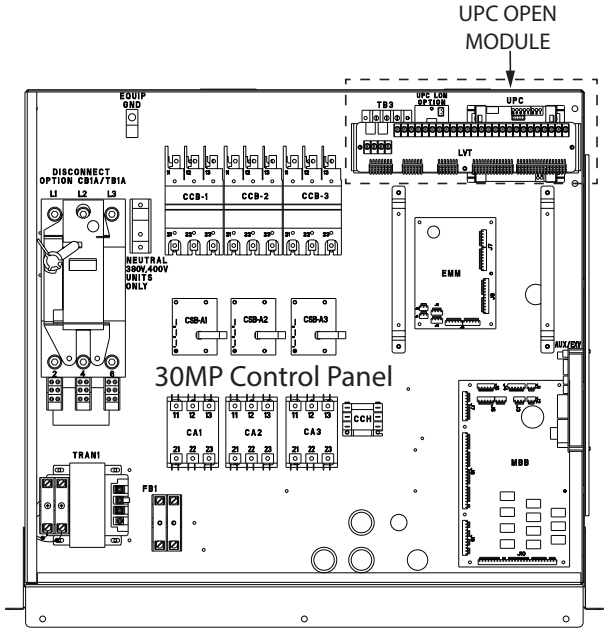


Fig. 3 — Location of the UPC Open Module Within the 30MP Control Panel

INSTALLATION

Prerequisites

Prior to installation ensure that:

- Each 30MP chiller is equipped with a UPC Open module.
- All 30MP chillers are the same type, either all air-cooled or all water-cooled.

Step 1 — Inspect Shipment

Inspect the contents of the accessory package before installing. File a claim with the shipper if shipping damage is found or contact your Carrier representative if any parts are missing. See Table 1 for accessory kit package contents.

Table 1 — Package Contents

DESCRIPTION	QUANTITY	PART NUMBER
Control Box Assembly	1	---
Thermistor	1	HH79NZ029
Well	1	10HB50106802

Step 2 — Position and Mount the Panel

The 30MP multi-chiller controller accessory panel can be wall mounted using (4) ¼ in. screws. Select the proper location for the 30MP multi-chiller controller accessory panel. Ensure the location provides access to the required power wiring, wiring to the common water manifold temperature thermistor, and is able to be

wired to the MS/TP network in a daisy chain with the 30MP chillers. The panel requires 120 vac, max 75 va single phase incoming power.

NOTE: The maximum terminal strip torque is 4.2 in-lb. The terminal strip accepts incoming wire size 12 to 22 AWG.

Step 3 — Make Electrical Connections

To wire for power:

1. Remove power from the power supply.
2. Select the appropriate knockout for incoming power wiring, and connect line side power wiring to the L1 terminal on the fuse block (FU1) and the neutral terminal (NEU) on the terminal block (TB1) (See 30MP multi-chiller controller wiring diagram provided inside the accessory panel). A ground connection is provided on terminal block TB1.
3. Verify that the Power LED is on and the Run LED is blinking on the controller module. See Fig. 4 for Power and Run LED locations.

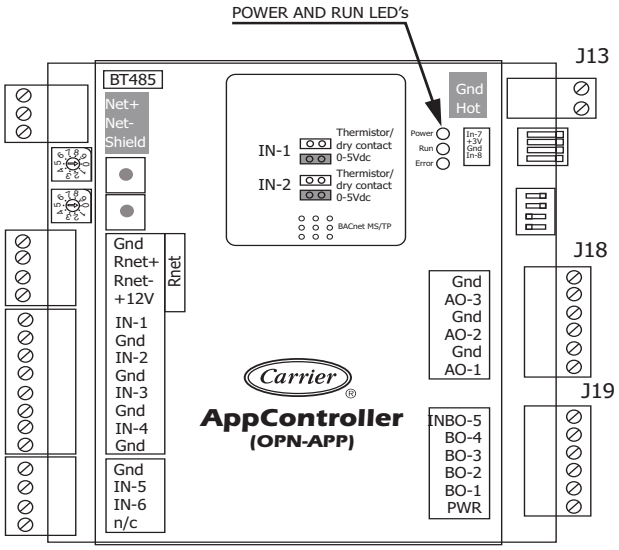


Fig. 4 — LED Locations

Step 4 — Address the Controllers

ADDRESS THE APPCONTROLLER

The user must give the AppController an address that is unique on the network. Address the controller as 09. If power has been applied, open the fuse block in the panel to remove power prior to addressing. The controller reads the address each time power is applied to it therefore, if the address is changed while power is applied power must removed and reapplied for the change to take effect.

NOTE: Chillers should be addressed 01 to 08. Always address the AppController as 09 regardless of how many chillers are being controlled. The factory default address is 00.

Perform the following procedure to assign an address:

Using the rotary switches (see Fig. 5), set the Tens (10's) switch to the tens digit of the address, and set the Ones (1's) switch to the ones digit. For 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 as shown in Fig. 6.

ADDRESS THE UPC OPEN MODULES

Address and configure the chiller system before starting the multi-chiller controller, which supports a maximum of 8 chillers. The steps below enable the controller to communicate with each individual chiller through their corresponding UPC Open module.

Once the system is powered and operating, the AppController reads the type and size of each chiller and automatically configures any additional features, such as hot gas bypass, that could impact machine staging or sequencing. See Fig. 5 and 6 for the location of the rotary switches on the 30MP chillers AppController and UPC Open module.

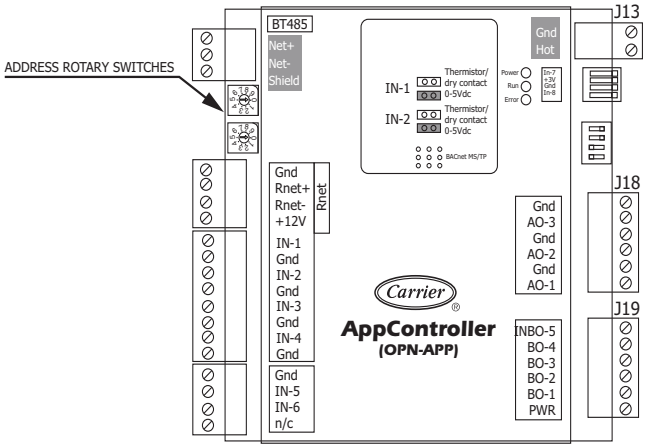


Fig. 5 — Setting the Address Rotary Switch on the AppController

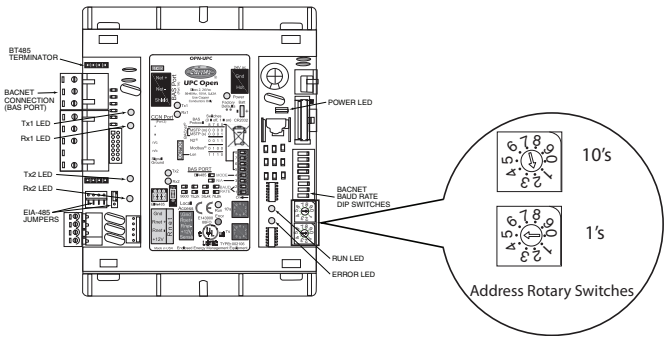


Fig. 6 — Setting the Address Rotary Switches on the UPC Open Module (Inside 30MP Chiller)

NOTES:

- Equal sized chillers: There are no special staging or addressing guidelines.
- Unequal sized chillers: Carefully implement the following staging and addressing instructions for optimal water temperature control and part load efficiency. See Tables 2 and 3 for correct unit ordering.

Table 2 — Chiller Size Ordering

CHILLER ORDER	30MP MODEL SIZES
First Chiller	016
↓	020
↓	040
↓	045
↓	030
↓	032
↓	060
↓	050
↓	055
↓	065
Last Chiller	071

Table 3 — Chiller Addressing

CHILLER ORDER	UPC OPEN ADDRESS
CH-1	01
CH-2	02
CH-3	03
CH-4	04
CH-5	05
CH-6	06
CH-7	07
CH-8	08

Step 5 — Wire the MS/TP Network

When wiring the MS/TP network follow the procedure below:

1. The AppController communicates with each chiller using BACnet communication on an MS/TP network. The network segment communicates at 9600 bps, 19.2 kbps, 38.4 kbps, or 76.8 kbps. The factory default setting for both the AppController and UPC open module is 76.8 kbps. It is recommended to use the default baud rate. The baud rate is set using DIP switches on each module. See Fig. 7 for DIP switch location on the AppController. Table 4 shows DIP switch settings for adjusting the baud rate.

NOTE: The AppController and all UPC Open modules (located in each 30MP chiller) must be set to the same baud rate. Consult Appendix D of this manual for detailed information on setting the baud rate of the UPC Open module in each chiller.

NOTE: The CCN (Carrier Comfort Network®) baud rate (on each 30MP chiller) must also be set to the same baud rate as the AppController and all UPC Open modules in each chiller.

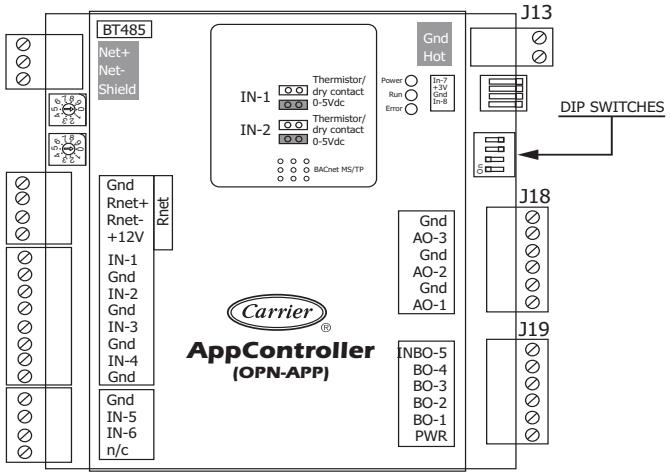


Fig. 7 — DIP Switch Locations

Table 4 — Controller Module Baud Selection Table

DIP SWITCH SETTINGS				
Baud Rate	**SW1**	**SW2**	**SW3**	**SW4**
9,600	OFF	OFF	OFF	OFF
19,200	OFF	ON		
38,400	ON	OFF		
76,800	ON	ON		

2. Wire the multi-chiller controller accessory panel and the UPC Open module in each 30MP chiller on an MS/TP network segment in a daisy-chain configuration (see Fig. 8). It is not necessary to add a BT485 terminator, as it is included on the multi-chiller controller accessory panel. A BT485 terminator is a signal biaser that adds bias and prevents signal distortions due to echoing.
3. In the multi-chiller controller panel, connect the MS/TP communication wires to terminals 21, 22, and 23 on the terminal block.

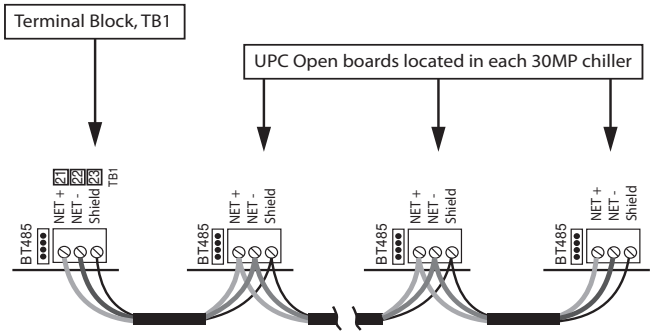


Fig. 8 — Network Wiring

Step 6 — Wire the AppController to the Network

To wire the AppController to the network:

1. Open the fuse block (FU1) to remove power to the controller.
2. Check the communications wiring for shorts and grounds.
3. Connect the communications wiring to terminals 21, 22, and 23 on the terminal block (if not already done).
4. Verify the MS/TP jumper on the AppController is set to MS/TP. See Fig. 9 for MS/TP jumper location on the AppController.

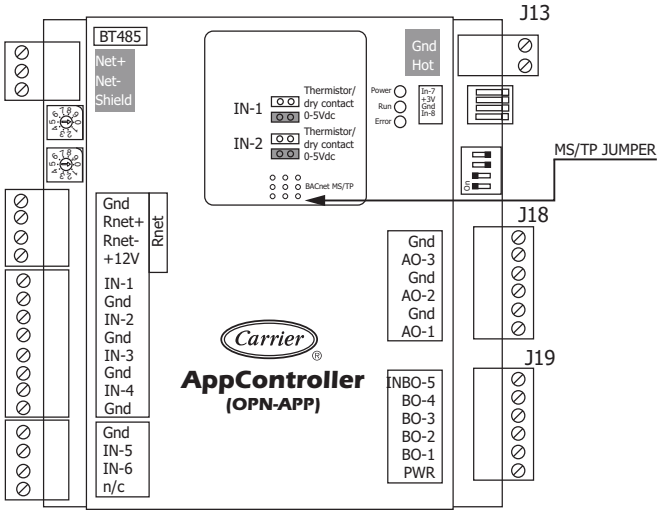
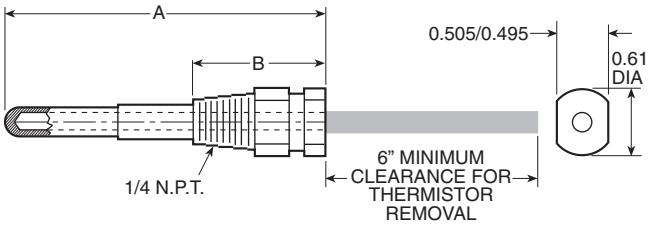


Fig. 9 — Location of MS/TP Jumper

When installation is complete, reinstall the fuse in fuse block 1 (FU1) in the 30MP multi-chiller controller accessory panel.

Step 7 — Wire the Inputs and Outputs

The multi-chiller controller requires a 5k ohm common leaving water temperature thermistor. Included in the accessory package is the 5k ohm thermistor (P/N HH79NZ029) with a 4-in. immersion well (P/N 10HB50106802); see Fig. 10 for dimensions.



PART NUMBER	DIMENSIONS in. (mm)	
	A	B
10HB50106802	4.10 (104.1)	1.28 (32.5)

Fig. 10 — Thermistor Well Dimensions

Install the thermistor well on the chilled water supply, downstream of the last chiller as shown in Fig. 11.

Connect the thermistor leads to terminals 11 and 12 on the terminal block (TB1) in the multi-chiller controller accessory panel.

Tables 5 and 6 show each available output and input in addition to the leaving chilled water header temperature. All connections are made at the terminal block, TB1, as shown in Fig. 12 in the 30MP multi-chiller controller accessory panel.

Table 5 — Available Outputs

AVAILABLE OUTPUT	OUTPUT TERMINAL (TB1)	GND TERMINAL (TB1)	HARDWARE / SIGNAL	NOTE
Tower Fan Speed	4	3	0-10 vdc	Optional
Alarm Lamp	5	6	Relay	Optional

Table 6 — Available Inputs

AVAILABLE INPUT	INPUT TERMINAL (TB1)	GND TERMINAL (TB1)	HARDWARE / SIGNAL	NOTE
Relative Humidity Sensor	18	17	0-5 vdc	Optional, Set IN-1 jumper to 0-5 V (Default)
External Analog Setpoint	16	15	0-5 vdc	Optional, Set IN-2 jumper to 0-5 V (Not Default)
Outdoor Air Temperature Sensor*	14	13	10k Thermistor	Optional
Leaving Chilled Water Header Temperature	12	11	5k Thermistor	Required
External Demand Limit	9	10	Dry Contact	Optional
Remote Occupancy Contact	8	10	Dry Contact	Optional

* Use this input to reset leaving chilled water temperature based on outdoor air.

To wire inputs and outputs, connect to the appropriate landings on the terminal block (TB1) in the 30MP multi-chiller controller accessory panel. Also, see Fig. 12 for the typical wiring schematic and Table 7 for input wiring specifications.

Each output is a dry contact rated at 1 A, 24 V maximum and is normally open. 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

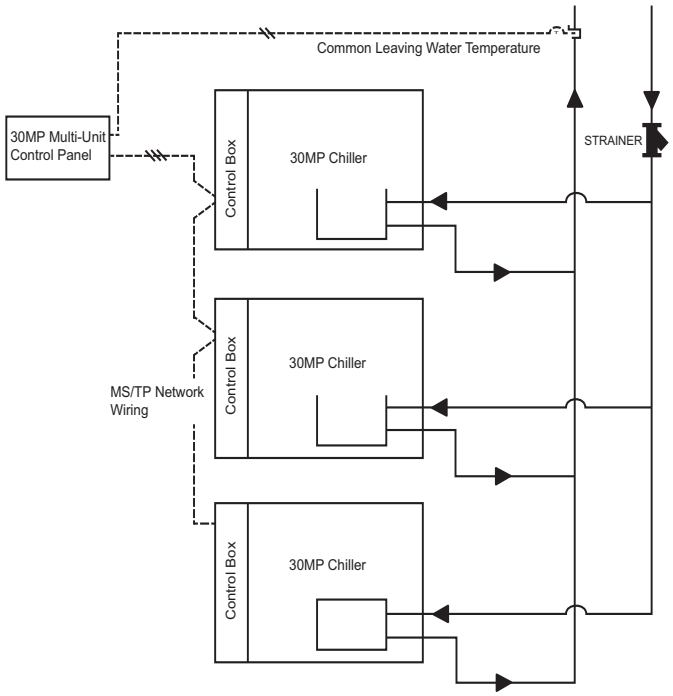


Fig. 11 — Common Leaving Water Temp Sensor Location

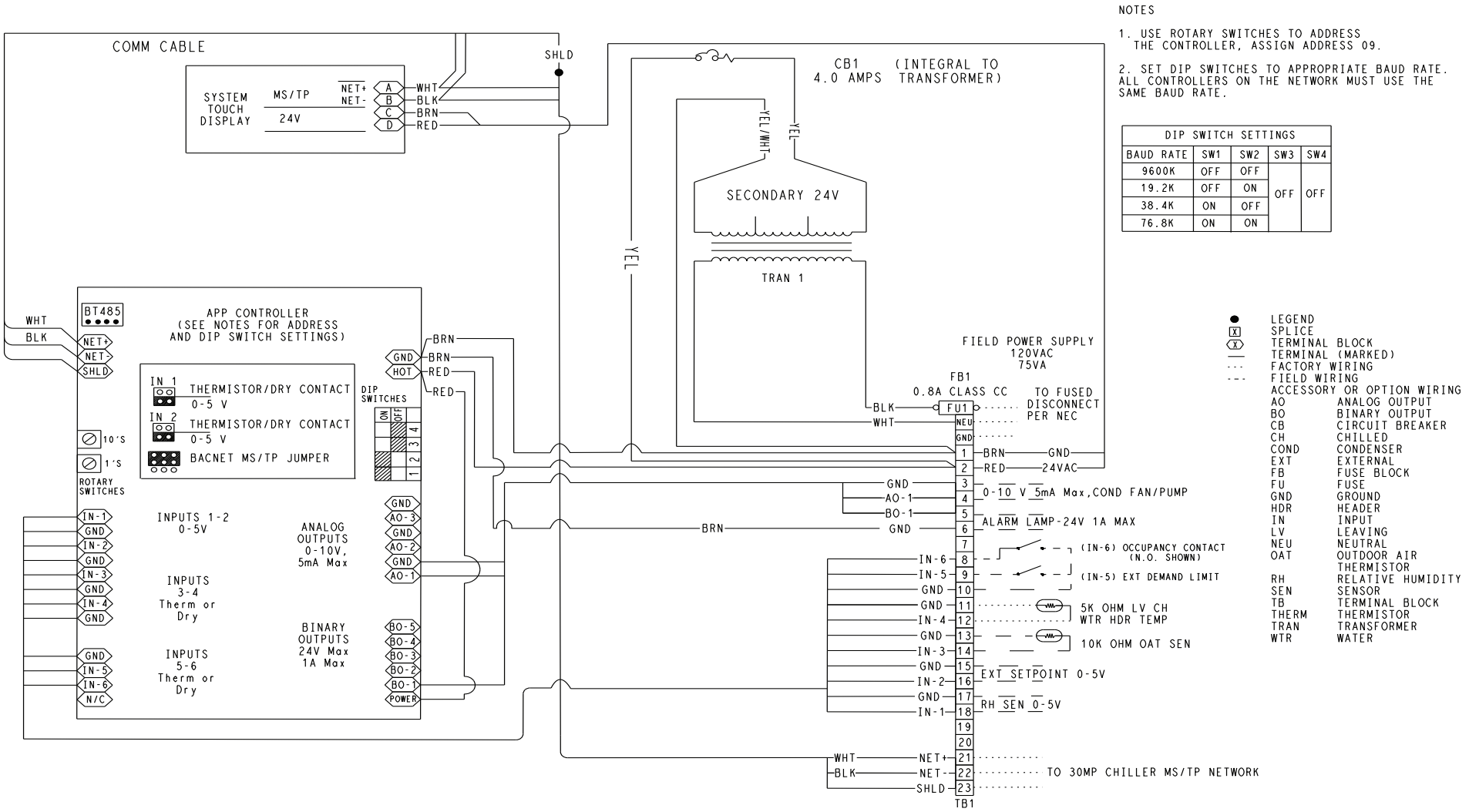


Fig. 12 — Typical Wiring Schematic

Table 7 — Input Wiring Specifications

INPUT	MAXIMUM LENGTH (ft)	MINIMUM GAGE (AWG)	SHIELDING (ft)
0-5 vdc	500	22	100 (unshielded) 100-500 (shielded)
Thermistor Dry Contact Pulse Counter TLO	500	22	100 (unshielded) 100-500 (shielded)
Equipment Touch Device	500	22 (7x0096) bare copper	If shielded, Aluminum/Mylar shield (100% coverage) with TC drain wire

LEGEND

AWG — American Wire Gage
TC — Tinned Copper
TLO — Timed Local Override

NOTE: The two optional analog inputs require the jumpers on the controller module to be set to the bottom position, 0-5 vdc. See Fig. 13 for jumper locations on the AppController.

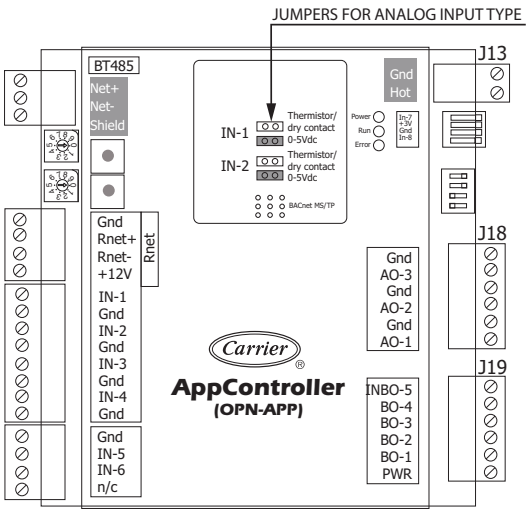


Fig. 13 — Jumper Location to Analog Inputs in the AppController

Step 8 — Wire Sensors to the 30MP Multi-Chiller Controller Accessory Panel

Connect the following sensors:

- Leaving chilled water header temperature (required)
- Outdoor air temperature (optional)
- Relative humidity (optional)

NOTE: This document gives instructions for wiring the sensors to the controller. Table 8 shows the type and gage of wire to use when wiring sensors to the controller. For mounting and wiring the sensors, see the Carrier Sensors Installation Guide.

⚠WARNING

Disconnect electrical power to the controller before wiring it. Failure to follow this warning could cause electrical shock, personal injury, or damage to the controller.

⚠CAUTION

Do not run sensor or relay wires in the same conduit or raceway with Class 1 AC or DC service wiring.

Do not abrade, cut, or nick the outer jacket of the cable.

Do not pull or draw cable with a force that may harm the physical or electrical properties.

Avoid splices in any control wiring.

Failure to follow these cautions may result in damage to the controller.

Table 8 — Sensor Wiring Specifications

CABLE FROM SENSOR TO CONTROLLER	If < 100 ft	22 AWG unshielded
	If > 100 ft	22 AWG shielded
MAXIMUM LENGTH	500 ft	—

WIRING THE LEAVING CHILLED WATER HEADER TEMPERATURE SENSOR TO THE CONTROLLER

1. Strip the outer jacket from the cable for at least 4 inches (10.2 cm). Strip .25 in. (.6 cm) of insulation from each wire.
2. Wire the sensor to the 30MP multi-chiller controller Accessory Panel. See Fig. 12. Sensor must be terminated at Terminals 11 and 12 of TB1.
3. Apply power and verify sensor readings.

WIRING AN OUTDOOR AIR TEMPERATURE SENSOR PART NO. 33ZCSENOAT

An optional outdoor air temperature (OAT) sensor may be used to provide a reset of the chilled water setpoint adjustment based on the OAT reset.

To wire an outdoor air temperature sensor to the controller:

1. Strip the outer jacket from the cable for at least 4 inches. Strip .25 in. (.6 cm) of insulation from each wire.
2. Wire the sensor to the controller. See Fig.12. Sensor must be terminated at terminals 13 and 14.
3. Apply power and verify sensor readings.

WIRING A RELATIVE HUMIDITY SENSOR — WALL AND DUCT SENSOR PART NO. 33ZCSENSRH-02

Use the optional relative humidity (RH) sensor to override the OAT reset in order to provide better humidity control.

NOTE: The RH override requires that the OAT sensor is installed and OAT reset function is enabled and active. Otherwise, there is only the RH sensor monitoring and alarming.

To wire the RH sensor to the controller:

1. Strip the outer jacket from the cable for at least 4 inches (10.2 cm). Strip .25 in. (.6 cm) of insulation from each wire.
2. Wire the sensor to the controller. See Fig. 12. Sensor must be terminated at terminals 17 and 18.
3. When P/N 33ZCSENSRH-02 is configured for 0-5vdc, it must be terminated at terminals 2, 17, and 18.
4. Apply power and verify sensor readings.

Wiring Equipment to Outputs

Use the following wiring specifications and diagram to wire the controller's outputs:

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

CONFIGURING THE CONTROLLER

NOTE: Confirm input 1 and input 2 jumpers are in the 0-5 vdc position.

Configuring Points and Properties

To start up the controller, it is necessary configure certain points and properties. Appendix C is a complete list of all the points and properties, with descriptions, defaults, and ranges. These properties affect the unit operation and/or control. Review and understand the meaning and purpose of each property before changing it.

To start up the controller, configure necessary points and properties in the following order:

1. Set the Unit Configuration.
2. Set the Chilled Water Setpoint.
3. Set the Control Point for entering or leaving water temperature.
4. To start the plant, set the Occupancy Status to Occupied.

NOTE: The controller does not support metric units of measure.

SEQUENCE OF OPERATION

The multi-chiller controller sequences chillers in order to maintain the desired water temperature setpoint. The control can be configured to maintain supply or return water temperature.

Whenever the controller is in an occupied mode, the water temperature sensor is compared to the desired setpoint. If the water temperature sensor value is above the setpoint, then a PID will calculate how much additional capacity is required. The minimum amount of chillers is defined by the parameter Minimum # of Chillers to Run. If the current number of chillers is less than the minimum number, then the chillers are started every 30 seconds until the minimum number is reached. Thereafter, additional stages are added subject to the configured ACR Timer delay time.

As each chiller is started, it is limited to its first stage of capacity until all available chillers are operating. Once all machines are operating at minimum capacity, if additional capacity is required, any 3-stage machine is loaded to 2 stages next, until all 3-stage machines are loaded to that capacity. If that level is reached and still further capacity is needed, then all machines are sequentially loaded until every machine is operating at 100% capacity. This sequence provides the most efficient operation of multiple chillers.

As the load decreases and the required capacity is reduced, the reverse cycle occurs. All machines are reduced by one stage to either 50% or 67%, depending on the number of machine stages. Next, as a further capacity reduction is needed, the second stage of any 3-stage machine is dropped until only one stage is operating per machine. As further reduction is needed, the first stage is dropped on each machine in the opposite order of the chiller sequence. Dropping any stage is subject to the RCR Timer delay time between stages. Additionally, if only one stage is operating per machine and any machines are equipped with hot gas bypass, the hot gas is used to maintain the desired water temperature, while waiting for the RCR Timer delay to expire, in order to further reduce capacity. Hot gas bypass provides improved water temperature control under light load conditions and prevents excessive chiller start/stop cycles.

The controlling setpoint for chilled water is calculated based on the following settings:

- Configure Chilled Water Setpoint for the desired water temperature.
- Use Cooling Setpoint OAT Reset to increase the water temperature setpoint as a function of the outdoor air temperature.

NOTE: An OAT sensor is required to use this feature.

- Use RH Cooling Setpoint Reset to reduce any calculated OA reset if a high humidity condition occurs.This usually happens under light load at lower OAT.

NOTE: An RH sensor is required to use this feature.

Scheduling

To use an occupancy schedule, configure time periods to schedule the transitions from occupied to unoccupied operation. The control maintains the desired chilled water setpoint when occupied and disables the chiller when unoccupied. The controller defaults to using the BAS (Building Automation System) On/Off point, which is factory set to Unoccupied. The unit will stay unoccupied until a Time Schedule is configured or a third party control system Enables/Disables the BAS On/Off point. Set the local time and date for these functions to operate properly.

It is possible to change the occupancy source to one of the following:

OCCUPANCY SCHEDULES

The controller is occupied 24/7 until the time schedule is configured using the Equipment Touch, Field Assistant, or the i-Vu® application, or until a third party control system Enables/Disables the BAS On/Off point. Disable this by going to Configuration > Unit Configuration > Occupancy Schedules and changing the point from Enable to Disable and clicking OK.

NOTE: Enable this point in order for the System Touch, Field Assistant, or the i-Vu® application to assign a time schedule to the controller.

SCHEDULE

The unit operates according to the schedule configured and stored in the unit. The schedule is accessible in the System Touch, Field Assistant, or the i-Vu application. The daily schedule consists of a start and stop time (standard or 24 hour mode) and seven days of the week, starting with Monday and ending on Sunday.

OCCUPANCY INPUT CONTACT (OPTIONAL)

If configured for remote occupancy control (default), the controller can use an external dry contact closure to determine the occupancy status of the unit. Disable the Occupancy Schedules to use the occupancy contact input.

NOTE: Scheduling can only be controlled from one source.

BAS (BUILDING AUTOMATION SYSTEM) ON/OFF

For use with a Building Automation System that supports network scheduling, disable the Occupancy Schedules so the BAS can control the unit through a network communication and the BAS scheduling function.

NOTE: Scheduling can either be controlled from the unit or the BAS, but not both.

SYSTEM OCCUPANCY

Uses the network to obtain an occupancy status value from another controller, which is read over the network and used by this controller. Occupancy Schedules MUST be set to Disable to use this function.

NOTE: Scheduling can only be controlled from one source.

Demand Limiting

The multi-chiller controller can provide up to 3 stages of demand limiting, if connected to an electric metering program indicating that demand limiting is required.

Demand limiting works using 2 different methods. The first connects the BACnet network input point System Cool Demand Level to the electric metering program, to send a value for the demand level. The second method is a binary input point BI-5 Ext Demand Limit that sets the demand level to level 2 when the input is active.

Demand Level 1, called the red line limit, sets the maximum chiller capacity to the current operating capacity, so that no additional capacity can be added. This prevents further increase in demand, although it will not prevent any necessary capacity reduction.

Demand levels 2 and 3 provide an adjustment to the operating setpoint. Demand level 2 occurs when System Cool Demand Level is set to 2 or the Ext Demand Limit input is active. This increases the chilled water setpoint by the configured Demand Level 2 Cool Adj amount. Demand Level 3 occurs when System Cool Demand Level is set to 3. This increases the chilled water setpoint by the configured Demand Level 3 Cool Adj amount. If the System Cool Demand Level is set to 0 and the BI-5 Ext Demand Limit is inactive, then there is no demand limiting.

OA (Outdoor Air) Reset

It is possible to raise the water temperature setpoint as a function of the outdoor air temperature. Set the Cooling Setpoint OA Reset to Enable, then as the OA temperature drops below the OAT CHW Supply Reset High Limit, the water temperature setpoint increases proportionally between OAT CHW Supply Reset High Limit and OAT CHW Supply Reset Low Limit. At OAT CHW Supply Reset Low Limit, the maximum reset amount, Maximum OA CHW Reset, is added to the configured water temperature setpoint.

If Cooling Setpoint OA Reset is set to Disable, then the configured water temperature setpoint is used.

RH Cooling Reset

The multi-chiller controller can reduce any calculated OA reset, if the sensed relative humidity is above the control setpoint. Set the RH Cooling Setpoint Reset to Enable, as the RH increases above the Occ Relative Humidity Setpoint, a PID (Proportional Integral Derivative Loop) calculates the amount of reduction in the OA reset value. RH Cooling Setpoint Reset is only applicable if the OA reset is active, since it can only reduce what is calculated by that algorithm. RH Cooling Setpoint Reset will NOT lower the water temperature setpoint below the user-defined Chilled Water Setpoint value.

If the RH Cooling Setpoint Reset is set to Disable, then the configured Chilled Water Setpoint, plus any calculated OA reset, is the controlling setpoint.

Power Failure Recovery

The controller has a Power Fail Restart Delay after a power loss. The amount of time can be configured in seconds, up to 600. When the power returns, the controller prevents operating and starting any chillers for that amount of time.

The controller can also immediately restart the prior number of operating chillers in their previous capacity, if the duration of a power outage was less than the configured Immediate Restart Time in minutes. The plant returns to capacity quickly if there is a short outage and prevents waiting to load the plant at the ACR rate. This feature adds stages every 30 seconds until the previously operating plant capacity is reached.

Cool Enable

The controller can prevent chiller operation if the OAT is below an adjustable OA temperature. If Cool Enable is set to Enable and there is a valid OA temperature and if the OA temperature is greater than the Cooling Lockout Temperature, the controller actively controls the chillers as required. If the OA temperature falls below the configured lockout value of -2 F, then all chillers are disabled.

Rotation Method

The multi-chiller controller can rotate chillers based on several different methods. Rotation is only available with equal sized units. Set the rotation method using Rotation Method Sequence, and selecting Never, Daily, Weekly, Monthly, Manual, Runtime, or Runtime Equalization. The default and preferred method is Runtime Equalization, as it rotates the least-used machine to the lead position, but only when machines are started or stopped, so that no additional start/stop cycles are incurred.

For unequal-sized chillers, the staging sequence is dependent on the actual machine size and should not be altered, in order to provide the best water temperature control. For unequal-sized machines no rotation method is available, see Appendix C — 30MP Multi-Chiller Points/Properties, Table B — Unit Configuration (page 14).

Analog Setpoint Input

The controller has an analog input channel used for an external setpoint input. The external setpoint input range depends on whether the connected chillers are brine or water. Channel AI-2 is used for external setpoint input and the range is 1 to 5 vdc.

- For water chillers, the range is proportional from 1 to 5 volts where 1 Volt = 40°F and 5 Volts = 65°F.
- For brine chillers, the range is proportional from 1 to 5 volts where 1 Volt = –20°F and 5 volts = 45°F.

NOTE: The lowest allowable setpoint is determined by the highest freeze setpoint of any machine connected to the controller.

Condenser Water Temperature Control

The controller has an analog output channel used to operate a cooling tower fan. The control reads the condenser water temperature from the 30MP chiller UPC Open Controller. To accomplish this, the first chiller (CH1) must have the condenser water temperature sensor option and must have a valid status (Off and Available or CCN Mode and Running). If that chiller status is invalid, the control will check sequentially for the next available chiller (CH2 - CH8). Installing the CWT option on at least the first two chillers is strongly recommended. It is possible to configure channel AO-1 to provide a 2 to 10 vdc or 0 to 10 vdc signal to control a tower fan VFD (variable frequency drive).

If an external control system is available, it can be used with the multi-chiller controller to provide the optimum tower setpoint value to the external control. A network-accessible AV (analog value) point, condenser water setpoint, can provide the desired condenser water temperature setpoint in degrees F.

30MP UPC Open Linkage

The multi-chiller controller receives and sends information through 30MP chiller linkage. It reads the following from each machine, as applicable:

- Compressor sizes
- Entering water temperature
- Leaving water temperature
- Mode
- Freeze setpoint
- Hot gas bypass
- Type of chiller (air-cooled or water-cooled, brine or water)

The display is automatically updated to reflect the actual machine type and the proper setpoint range, if the external analog input is used.

The chiller linkage sends each chiller a control setpoint, enable command, and demand limit value. By transferring data between the multi-chiller controller and each chiller, the controller automatically configures each machine and then sends and receives data. This operates the system properly and meets the desired chilled water setpoint by commanding each individual 30MP chiller to run as necessary. The operating mode, hot gas valve sta-

tus, and entering and leaving water temperatures are displayed on the graphic, along with other information.

TROUBLESHOOTING

LEDs

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

Verify the LED patterns by cycling power to the controller and noting the lights and flashes. Tables 9 and 10 show the LED description and the error status.

Table 9 — LED Description

LEDS	STATUS
Power	Lights when power is being supplied to the controller. **NOTE:** The controller 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 to the network segment; there is an Rx LED for Ports 1 and 2.
Run	Lights based on controller condition.
Error	Lights based on controller condition.

Table 10 — LED Error Status

RUN LED SHOWS...	AND ERROR LED SHOWS...	STATUS IS...
2 flashes per second	On	Exec halted after frequent system errors, due to: • Controller halted • Program memory corrupted • 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: • Turn the controller off, then on. • Download memory to the controller. • Replace the controller.

Serial Number

The controller's serial number is on a sticker on the back of the main controller board.

Replacing the Controller's Battery

The controller contains a 10-year lithium (CR2032) battery that retains control programs, editable properties, schedules, and trends for a maximum of 10,000 hours during power outages.

To determine when to replace the battery, remove power and measure the voltage. If the voltage is below 2.9 volts, replace the battery.

NOTE: Power must be ON to the controller when replacing the battery, or 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 controller.

APPENDIX A — MULTI-CHILLER WIRE LIST

SYSTEM NETWORK - 30MP MULTI-CHILLER

Project Name:
Location

Controller:
Network Number:
MAC Address:

Thermistor/Dry Contact

0-5 vdc

Point/ Cable	Inputs (+)	(G)	Input Type	Jumper Position of Pins	Sensor Code	Equipment Name	Point Name
	IN-1	Gnd	0-5 vdc	Lower		RH Sensor	
	IN-2	Gnd	0-5 vdc	Lower		AI Setpoint	
	IN-3	Gnd	10,000 Therm.	N/A		OAT Sensor	
	IN-4	Gnd	5,000 Therm.	N/A		Leaving Chilled Water Header Temperature	
	IN-5	Gnd	Dry Contact	N/A		Ext. Demand Limit	
	IN-6	Gnd	Dry Contact	N/A		Remote Occupancy Contact	
	IN-7	Gnd	Unused				
	IN-8	Gnd	Unused				
Point/ Cable	**Outputs (+)**	**(G)**	**Output Type**	**Jumper Position of Pins**	**Sensor Code**	**Equipment Name**	**Point Name**
	AO-1	Gnd.	0-10 vdc			Tower Fan Speed	
	AO-2	Gnd.	N/A				
	AO-3	Pwr.	N.O.				
	BO-1	Pwr.	24 vac			Alarm Lamp	
	BO-2	Pwr.	N.O.				
	BO-3	Pwr.	N.O.				
	BO-4	Pwr.	N.O.				
	BO-5	Pwr.	N.O.				

APPENDIX B — DEVICE ADDRESS BINDING

Device Address Binding (DAB) allows the controller to receive data from other Open controllers when they are connected by a network. The controller receives data from other Open or BACnet controllers when they are installed as part of an i-Vu® control system. The data transfer takes the form of DAB, which must be configured.

Currently, the controller implements DAB for the following variables:

- System Outdoor Air Temperature
- System Occupancy
- System Leaving Load Water Temp
- System Control Setpoint
- System Cool Demand Level
- System Space RH

DAB can be implemented on network points with an undefined BACnet address, displayed in Field Assistant and the i-Vu® interface on the Properties page > Network Points tab. See Fig. A.

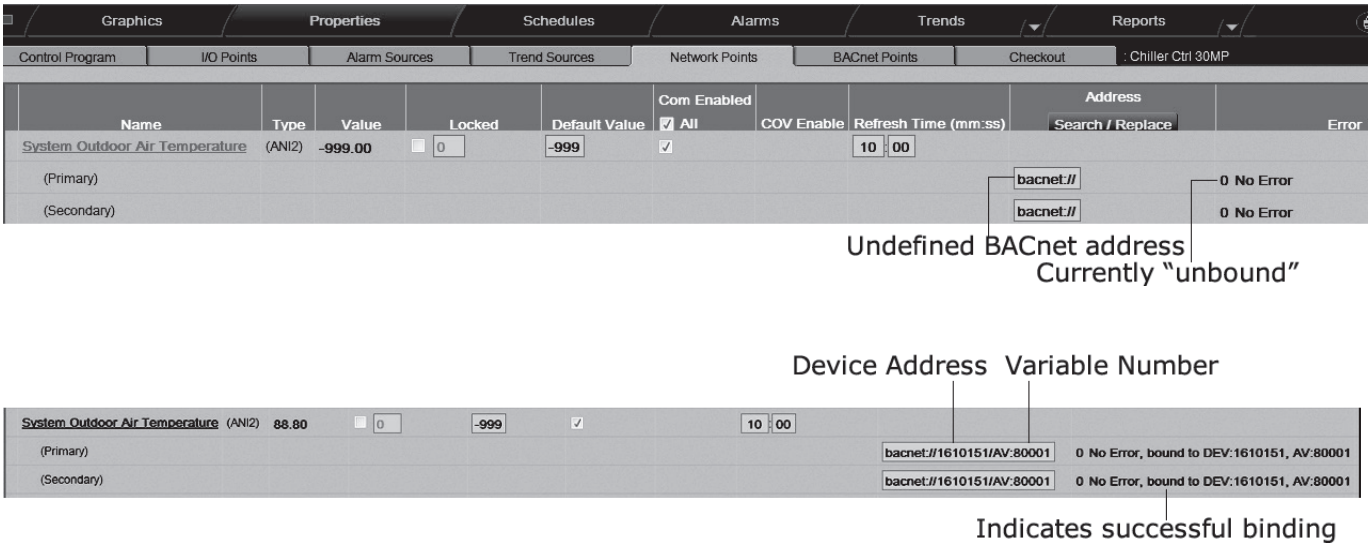


Fig. A — DAB Using Field Assistant and i-Vu® Interface

APPENDIX C — 30MP MULTI-CHILLER POINTS/PROPERTIES

The following tables describe all of the possible settings for the controller on the i-Vu® or Field Assistant Properties tab.

NOTE: Some of the properties are available only when other settings have been enabled. See Appendix D for the points and properties available on the touchscreen interface.

NOTE: Engineering units shown in this document in the defaults and ranges are strictly for reference. Only integers may be used.

Table A — Ranges for i-Vu® / Field Assistant Properties Menu

Navigation: i-Vu® / Field Assistant: **Properties > Control Program > Status**

POINT NAME	DESCRIPTION	DEFAULT (D) / RANGE (R)
Chiller Control Temp	Displays the chilled water's temperature used to control the chiller plant.	R: __ F
Chiller Plant Capacity	Displays the current percent loaded capacity of the chiller plant.	R: 0 to 100%
Chiller Plant Tons	Displays the current tons of cooling from the chiller plant.	R: __ tons
Chiller Water Setpoint	Displays the current percent of the loaded capacity of the chiller plant.	R: __ F
Condenser Water Control Temp	Displays the condenser water's temperature used to control the cooling tower fan.	R: __ F
Condenser Water Setpoint	Displays the current water's setpoint used to control the cooling tower fans.	R: __ F
Equipment Alarm	Indicates the controller has an active alarm. See Service Configuration for causes	R: Normal/Alarm
Outdoor Air Temperature	The outdoor air temperature used for control.	R: -56 to 245 F
Plant Run Command	The plant's current run command	R: Stop/Run
Plant Status	The plant's current run status.	R: Off/Running
Shutdown	When Active, provides a means to stop the chiller plant in an orderly manner. All alarms are reset and only currently active alarms are displayed.	D: Inactive R: Inactive/Active
Space Relative Humidity	Displays the current value of relative humidity sensor, if present. Applicable if Relative Humidity Source is not set to N/A.	R: 0 to 100%
Tower Fan Output	Displays the tower fan's speed.	R: 0 to 100%

APPENDIX C — 30MP MULTI-CHILLER POINTS/PROPERTIES (cont)

Table B — Unit Configuration

Navigation: i-Vu® / Field Assistant: **Properties** > **Control Program** > **Configuration** > **Unit Configuration**

POINT NAME	DESCRIPTION	DEFAULT (D) / RANGE (R)
Cool Enable	Enables or disables cooling operation.	D: Enable R: Disable/Enable
Cooling Lockout Temperature	Cooling is inhibited below this outdoor air temperature.	D: 45 F R: -65 to 80 F
Cooling Setpoint OA Reset	Enables OA reset of the cooling water supply temp's setpoint	D: Disable R: Disable/Enable
OAT CHW Supply Reset Low Limit	The lowest outdoor air temperature which resets the cooling water supply temp.	D: 70 F R: __ F
OAT CHW Supply Reset High Limit	The highest outdoor air temperature which resets the cooling water supply temp. Must be set above the configured OAT CHW Supply Reset Low Limit.	D: 90 F R: __ F
Maximum OA CHW Reset	The highest cooling water supply temp setpoint reset allowed by the OAT.	D: 10 F R: 0° to 25 F
RH Cooling Setpoint Reset	Enables or disables reset of the cooling water supply temp's set-point, based on relative humidity.	D: Disable R: Disable/Enable
Occupancy Schedules	Enables or disables the occupancy schedule function.	D: Disable R: Disable/Enable
Power Failure Recovery		
Power Fail Restart Delay	On initial power up or after recovery from a power failure, the controller delays starting any equipment for the configured value of this delay in seconds. (Max delay time is 600 sec.)	D: 120 seconds R: 0 to 600 seconds
Immediate Restart Time	For a power failure less than this value (in minutes), the control restarts all previous running chiller stages at 30 second intervals. (Max restart delay time is 720 min.)	D: 20 minutes R: 0 to 720 minutes
Sensor Calibration		
Leaving Load Water Temperature	The current leaving load water temperature.	R: __ F
Leaving Source Water Temp Calibration –	A calibration offset value that allows adjusting of the local leaving source water temperature sensor to match a calibrated standard that is measuring the temperature in the same location.	D: 0 F R: -9.9 to 10 F
Outdoor Air Temperature	The current outdoor air temperature.	R: __ F
Outdoor Air Temp Sensor Calibration	A calibration offset value that can be adjusted so the outdoor air temperature sensor matches a calibrated standard that measures the temperature in the same location.	D: 0 F R: -9.9 to 10 F
Space Relative Humidity	Displays the current value of relative humidity sensor, if present. Applicable if Relative Humidity Source is not set to N/A.	R: __%
Space RH Sensor Calibration	A calibration offset value that allows adjusting of the space relative humidity sensor to match a calibrated standard that is measuring the humidity in the same location.	D: 0%rh R: -15 to 15%rh
Chiller Rotation		
Rotation Method Selector — Equal Size	Daily – Rotates the lead chiller daily at a specified time period. Weekly – Rotates the lead chiller weekly on a specified day and time period. Monthly – Rotates the lead chiller monthly on a specified day and time period. Manual Rotation – Manually rotates the lead chiller when the operator commands it. Runtime – Rotates the lead chiller after it reaches a specified number of runtime hours. Runtime Equalization – Rotates the lead chiller when all chillers are on and lead chiller runtime > lag chiller runtime.	D: Runtime Equalization R: Daily Weekly Monthly Manual Rotation Runtime Runtime Equalization
Specify details of the selected Rotation Method		
Method	**Enter...**	
Daily	Time of day to rotate the lead chiller NOTE: Enter the time of day below in Defined Time for Rotation.	
Weekly	Day of the week to rotate the lead chiller	D: Wednesday R: Sunday to Saturday
Monthly	Day of the month to rotate the lead chiller monthly	D: 1 R: 1 to 31

APPENDIX C — 30MP MULTI-CHILLER POINTS/PROPERTIES (cont)

Table B — Unit Configuration (cont)

POINT NAME	DESCRIPTION	DEFAULT (D) / RANGE (R)
Manual Rotation	Manually rotates the lead chiller	D: Do not rotate R: Rotate
Runtime	Number of runtime hours before rotating the lead chiller	D: 360 hrs R: 200-9999 hrs
Runtime Equalization	Rotates the lead chiller when all chillers are on and lead chiller runtime > lag chiller runtime	
Defined Time for Rotation	Specify the time of day (24 hour format) for automatic rotation based on the method and schedule selected. (Not applicable to Runtime Equalization)	D: 8:00 R: 1:00 to 24:00
Runtime Since Last Rotation	**Chiller** **Runtime** CH-1 0.0 hr CH-2 0.0 hr	R: __ hrs
Chiller Order	**Chiller** **Runtime** CH-1 1 CH-2 0	R: 1 to 8 0 = Not Available

APPENDIX C — 30MP MULTI-CHILLER POINTS/PROPERTIES (cont)

Table C — Setpoints

Navigation: i-Vu® / Field Assistant: **Properties** > **Control Program** > **Configuration** > **Setpoints**

POINT NAME	DESCRIPTION	DEFAULT (D) / RANGE (R)
Chilled Water Setpoint	The chilled water temperature setpoint maintained by the chiller plant. The setpoint is internally clamped so it will not exceed the highest freeze point configured in any chiller	D: 44 F R: 40 to 80 F for water -20 to 45 F for brine
Condenser Water Temperature		
CW Min Load Setpoint	The condenser water temperature setpoint at minimum load	D: 65 F R: 50 to 85 F
CW Part Load Setpoint	The condenser water temperature setpoint at partial load	D: 70 F R: 50 to 85 F
CW Full Load Setpoint	The condenser water temperature setpoint at full load	D: 76 F R: 50 to 85 F
Relative Humidity		
Occ Relative Humidity Setpoint	The control setpoint used during occupied periods	D: 60%rh R: 0 to 100%rh
Cooling Demand Limit		
Demand Level 1	Enables Demand Level 1 to limit the maximum stage capacity to the current operating capacity	D: Disable R: Disable/Enable
Demand Level 2 Cool Adj.	The chilled water setpoint is increased by this of degrees when receiving a Demand Level 2 signal.	D: 2 F R: 0° to 10 F
Demand Level 3 Cool Adj.	The chilled water setpoint is increased by this number of degrees when receiving a Demand Level 3 signal.	D: 3 F R: 0° to 10 F

APPENDIX C — 30MP MULTI-CHILLER POINTS/PROPERTIES (cont)

Table D — Alarm Configuration

Navigation: i-Vu® / Field Assistant: **Properties** > **Control Program** > **Configuration** > **Alarm Configuration**

POINT NAME	DESCRIPTION	DEFAULT (D) / RANGE (R)
Leaving Load Water Temperature Alarm		
Low Leaving Load Water Temp Alarm Limit	The Leaving Load Water Temp must drop below this value to generate a Leaving Load Water Temperature Alarm. There is a fixed hysteresis of 2°F for return to normal. NOTE: This value should be set to at least 4°F below the configured cooling setpoint.	D: 42 F R: -45 to 45 F
High Leaving Load Water Temp Alarm Limit	The Leaving Load Water Temp must exceed this value to generate a Leaving Load Water Temperature Alarm. There is a fixed hysteresis of 2°F for return to normal. NOTE: This value should be set to at least 10°F above the configured cooling setpoint.	D:125 F R: -20 to 150 F
Entering Load Water Temperature Alarm		
Low Entering Load Water	The Entering Load Water Temp must drop below this value to generate an Entering Load Water Temperature Alarm. There is a fixed hysteresis of 2°F for return to normal.	D: 42 F R: -45 to 45 F
High Entering Load Water Temp Alarm Limit	The Entering Load Water Temp must exceed this value to generate an Entering Load Water Temperature Alarm. There is a fixed hysteresis of 2°F for return to normal.	D: 125 F R: 90 to 150 F
Outdoor Air Temperature Alarm		
Low OAT Alarm Limit	The Outdoor Air Temperature must drop below this value to generate an Outdoor Air Temp Alarm. There is a fixed hysteresis of 1°F for return to normal.	D: -65 F R: -65 to 40 F
High OAT Alarm Limit	The Outdoor Air Temperature must exceed this value to generate an Outdoor Air Temp Alarm. There is a fixed hysteresis of 1°F for return to normal.	D: 245 F R: 100 to 245 F
Space Humidity Alarm		
Occupied High RH Alarm Limit	The relative humidity sensor must exceed this value to generate a Space Relative Humidity alarm in the occupied mode if RH Cooling Setpoint Reset (Unit Configuration) is set to Enable. There is a fixed hysteresis of 5%rh for return to normal.	D: 100%rh R; 45 to 100%rh
Alarm Delay (min/%RH)	Determines the amount of delay before an occupied RH alarm is generated when the controller transitions to the occupied mode. The delay time equals this value multiplied by the difference between the sensor RH value and the occupied RH setpoint plus 15 minutes.	D: 5 minutes R: 0 to 30 minutes
Unocc High RH Alarm Limit	The value that the relative humidity sensor must exceed to generate a Space Humidity Alarm in the unoccupied mode if RH Control is set to Enable. There is a fixed hysteresis of 5%rh for return to normal.	D: 100%rh R: 45 to 100%rh

APPENDIX C — 30MP MULTI-CHILLER POINTS/PROPERTIES (cont)

Table E — Service Configuration

Navigation: i-Vu® / Field Assistant: **Properties > Control Program > Configuration > Service Configuration**

POINT NAME	DESCRIPTION	DEFAULT (D) / RANGE (R)
Control Point	Defines whether the control monitors and uses Leaving Water Temp or Entering Water Temp to control this equipment.	D: Leaving Water Temp R; Leaving Water Temp Entering Water Temp
Minimum # of Chillers to Run	The least number of chillers that can run at the same time.	D: 1 R: 1 to 8
ACR Timer	(Additional Capacity Required) Determines the time delay before an additional compressor stage can be added.	D: 5:00 minutes R: 2:00 - 20:00 minutes
RCR Timer	(Reduced Capacity Required) Determines the time delay before an additional compressor stage can be removed.	D: 3:00 minutes R: 1:00 to 5:00 minutes
Cool PID	This BACnet Object calculates the amount of capacity required to satisfy the Chilled Water Setpoint and allows access to the control loop's tuning parameters. NOTE: The following default values should be changed only by a technician trained in PID Loop algorithms: **Action**: direct **Update Interval**: 00:30 (mm:ss) **Proportional**: 100 **Integral**: 0 **Derivative**: 0 **Deadband**: 0 **Bias**: 0	
Tower Fan Output Type	Defines the type of fan output control	D: 0-10 V R: 0-10 V 2-10 V
Tower Fan PID	This BACnet Object calculates the fan speed required to achieve the desired condenser water temperature setpoint. NOTE: The following default values should be changed only by a technician trained in PID Loop algorithms. **Action**: direct **Update Interval**: 00:30 (mm:ss) **Proportional**: 100 **Integral**: 0 **Derivative**: 0 **Deadband**: 0 **Bias**: 0	
Occ Contact Normal Logic State	Specifies the occupancy contact's normal logic state	D: Open R: Open/Closed
RH Sensor Min Input Volts	The lowest voltage that should be read from the hardwired relative humidity (RH) sensor.	D: 0.00 V R: 0 to 2.00 V
RH Sensor Max Input Volts	The highest voltage that should be read from the hardwired RH sensor.	D: 5.00 V R: 0 to 5.00 V
RH Sensor Value @ Min Volts	The % relative humidity that correlates to the hardwired RH sensor's low voltage reading.	D: 0% R: 0 to 40%
RH Sensor Value @ Max Volts	The % relative humidity that correlates to the hardwired RH sensor's high voltage reading.	D: 100% R: 60 to 100%
System Space RH	Allows using another controller's relative humidity value over the network. The remote controller must be equipped with a network-accessible relative humidity sensor value.	D: -999 R: 2 to 100%
System Cool Demand Level	The system cool demand level being received over the network	D: 0.00 R: 0 to 3
System Outdoor Air Temperature	Allows the controller to use an outdoor air temperature value from the network. The remote controller must have a network accessible outdoor air temperature sensor value	D: -999.00 F R: -50 to 150 F
System Leaving Load Water Temperature	Allows using another controller's leaving load water temperature sensor value (system water temperature), to be read over the network. The remote controller must have a network-accessible leaving load water temperature sensor value.	D: -999.00 F R: 0 to 250 F
System Control Setpoint	Allows using another controller's Control Setpoint value to be read over the network. The remote controller must have a network-accessible point.	D: -999.00 F R: 0 to 250 F

APPENDIX C — 30MP MULTI-CHILLER POINTS/PROPERTIES (cont)

Table E — Service Configuration (cont)

POINT NAME	DESCRIPTION	DEFAULT (D) / RANGE (R)
System Occupancy	Allows reading and using another controller's occupancy status value over the network. The remote controller must have a network-accessible Occupancy Status point.	D: Unoccupied R: Unoccupied/Occupied
The following is a list of available points used to set the alarm output to an alarm state if the alarm condition is true. Set the alarm condition to Enable to turn this feature on for any individual alarm.		
CH-1 Linkage Failure Alarm	Enables Chiller #1 Linkage failure alarm.	D: Enable R: Disable
CH-2 Linkage Failure Alarm	Enables Chiller #2 Linkage failure alarm.	D: Enable R: Disable
CH-3 Linkage Failure Alarm	Enables Chiller #3 Linkage failure alarm.	D: Enable R: Disable
CH-4 Linkage Failure Alarm	Enables Chiller #4 Linkage failure alarm.	D: Enable R: Disable
CH-5 Linkage Failure Alarm	Enables Chiller #5 Linkage failure alarm.	D: Enable R: Disable
CH-6 Linkage Failure Alarm	Enables Chiller #6 Linkage failure alarm.	D: Enable R: Disable
CH-7 Linkage Failure Alarm	Enables Chiller #7 Linkage failure alarm.	D: Enable R: Disable
CH-8 Linkage Failure Alarm	Enables Chiller #8 Linkage failure alarm.	D: Enable R: Disable
Lvg Load Water Temp Alarm	Enables leaving load water temperature failure alarm.	D: Enable R: Disable/Enable
Lvg Load Wtr Sensor Alarm	Enables leaving load water temperature alarm.	D: Enable R: Disable/Enable
Ent Load Water Temp Alarm	Enables entering load water temperature alarm.	D: Enable R: Disable/Enable
Ent Load Wtr Sensor Fail Alarm	When set to Enable, any Entering Load Water Sensor Failure Alarm indicated by the controller also initiates an Equipment Alarm and energizes the Alarm Lamp binary output.	D: Enable R: Disable/Enable
OA Temperature Alarm	When set to Enable, any Outdoor Air Temperature Alarm indicated by the controller also initiates an Equipment Alarm and energizes the Alarm Lamp binary output.	D: Enable R: Disable/Enable
OA Sensor Failure Alarm	When set to Enable, an Outdoor Air Temperature Sensor Failure Alarm indicated by the controller also initiates an Equipment Alarm and energizes the Alarm Lamp binary output.	D: Enable R: Disable/Enable
High RH Alarm	High RH Alarm – When set to Enable, a High Space Relative Humidity Alarm indicated by the controller also initiates an Equipment Alarm and energizes the Alarm Lamp binary output.	D: Enable R: Disable/Enable
RH Sensor Fail Alarm	When set to Enable, a Relative Humidity Sensor Failure Alarm indicated by the controller also initiates an Equipment Alarm and energizes the Alarm Lamp binary output.	D: Enable R: Disable/Enable

APPENDIX C — 30MP MULTI-CHILLER POINTS/PROPERTIES (cont)

Table F — Maintenance

Navigation: i-Vu® / Field Assistant: **Properties > Control Program > Maintenance**

POINT NAME	DESCRIPTION	RANGE (R)
	UNIT	
Unit Type	The type of equipment that the controller is controlling.	R: Air/Water
Controlling Point	Displays the point used to control this equipment.	R: Leaving Water Temperature/ Entering Water Temp
Chiller Size Compare	Indicates whether chillers are equal or unequal size.	R: Equal/Unequal
Ext. Demand Limit Status	The external demand limit input status.	R: Off/On
Number of Chillers	The total number of chillers in the chiller plant.	R: 0 to 8
Number of Stages	The total number of chiller plant stages - compressors, not including hot gas bypass.	R: 0 to 24
Chiller Plant Size	The chiller plant's total size in tons.	R: __ tons
Active Compressor Stages	The number of compressor stages currently operating.	R: 0 to 24
Leaving Load Water Temperature	The current leaving load water temperature sensor's temperature.	R: __ F
Entering Load Water Temperature	The current entering load water temperature.	R: __ F
External AI Setpoint	The external analog input's setpoint scaled value.	R: __ F
Leaving Load Water Temperature Source	The source of the Leaving Load Water Temp value. States: • N/A - No sensor value associated with this device • Local - A physical sensor is wired and connected to the appropriate input channel of this controller • Network - A network sensor value provided to this controller • Linkage - The sensor value from a linked device, obtained through air or water linkage • Locked Value - The controller's sensor input is manually locked to a specific value	R: N/A Local Network Linkage Locked Value
Entering Load Water Temperature Source	The source of the Entering Load Water Temp value. States: • N/A - No sensor value associated with this device • Local - A physical sensor is wired and connected to the appropriate input channel of this controller • Network - A network sensor value provided to this controller • Linkage - The sensor value from a linked device, obtained through air or water linkage • Locked Value - The controller's sensor input is manually locked to a specific value	R: N/A Local Network Linkage Locked Value
Control Setpoint Source	The control setpoint value's source. States: • N/A - No sensor value associated with this device • Local - A physical sensor is wired and connected to the appropriate input channel of this controller • Network - A network sensor value provided to this controller • Linkage - The sensor value from a linked device, obtained through air or water linkage • Locked Value - The controller's sensor input is manually locked to a specific value • Configuration - The controller uses the equipment's configuration (water/brine) and the analog input channel's value to determine the appropriate setpoint conversion range. (1-5 Volts = 40 to 65 F for water / 1-5 Volts = 20 to 45 F for brine)	R: N/A Local Network Linkage Locked Value Configuration
Condenser Water Temp Source	The control setpoint value's source. States: • N/A - No sensor value associated with this device • Local - A physical sensor is wired and connected to the appropriate input channel of this controller • Network - A network sensor value provided to this controller • Linkage - The sensor value from a linked device, obtained through air or water linkage • Locked Value - The controller's sensor input is manually locked to a specific value	R: N/A Local Network Linkage Locked Value
Outdoor Air Temperature Source	The source of the Outdoor Air Temperature value. States: • N/A - No sensor value associated with this device • Local - A physical sensor is wired and connected to the appropriate input channel of this controller • Network - A network sensor value provided to this controller • Linkage - The sensor value from a linked device, obtained through air or water linkage • Locked Value - The controller's sensor input is manually locked to a specific value	R: N/A Local Network Linkage Locked Value

APPENDIX C — 30MP MULTI-CHILLER POINTS/PROPERTIES (cont)

Table F — Maintenance (cont)

Navigation: i-Vu® / Field Assistant: **Properties > Control Program > Maintenance**

POINT NAME	DESCRIPTION	DEFAULT (D) / RANGE (R)
	UNIT	
Relative Humidity Source	The source of the Space Relative Humidity value. • N/A - No sensor value associated with this device • Local - A physical sensor is wired and connected to the appropriate input channel of this controller • Network - A network sensor value provided to this controller • Linkage - The sensor value from a linked device, obtained through air or water linkage • Locked Value - The controller's sensor input is manually locked to a specific value	R: N/A Local Network Linkage Locked Value
	OCCUPANCY	
Occupancy Status	The chiller plant's occupancy status.	R: Unoccupied/Occupied
BAS On/Off	BAS On/Off – Determines the occupancy state of the controller and can be set over the network by another device or third party BAS. Options: • Inactive – Occupancy is determined by a configured schedule • Occupied – The controller is always in the occupied mode • Unoccupied – The controller is always in the unoccupied mode NOTE If BAS On/Off is set to either Unoccupied or Occupied, the Optimal Start routine is automatically disabled.	D: Unoccupied R: Inactive Occupied Unoccupied
Schedules	The controller's occupancy status based on the local schedule.	R: Unoccupied/Occupied
Occupancy Contact	The current status of Input Channel #5 when configured as a Remote Occupancy contact input.	R: Inactive
Global Occupancy	The System Occupancy network input's current state.	D: Unoccupied R: Unoccupied/Occupied
	RESET	
Cooling Supply Setpoint Reset	The Chilled Water Supply Setpoint's current reset method.	Inactive OAT Reset \ RH Override Demand Limit
Calculated OA Clg Reset	Based on outdoor air temperature, the amount of cooling reset.	__ F
Calculated RH Clg Reset	Based on relative humidity, the amount of cooling reset that will be subtracted from the Calculated OA Clg Reset.	__ F
	DEMAND LIMIT	
System Cooling Demand Level	System Cooling Demand Level – This unit's system cool demand level currently in effect.	R: 0 to 3
Ext Demand Limit	Ext Demand Limit – The current chiller plant's demand limit capacity received from an external source.	R: 0 to 100%

APPENDIX C — 30MP MULTI-CHILLER POINTS/PROPERTIES (cont)

Table G — Alarms

Navigation: i-Vu® / Field Assistant: **Properties > Control Program > Alarms**

POINT NAME	DESCRIPTION	RANGE (R)
Equipment Alarm	Indicates if the unit is in a general equipment alarm.	R: Normal/Alarm
Plant Power Failure	Indicates if the unit is in a Plant Power Failure alarm.	R: Normal/Alarm
Leaving Load Water Temperature	Indicates if the leaving load water temperature exceeds the high or low limits.	R: Normal/Alarm
Entering Load Water Temperature	Indicates if the entering load water temperature exceeds the high or low limits.	R: Normal/Alarm
Outdoor Air Temperature	Indicates an alarm if the outdoor air temperature exceeds the high or low alarm limits.	R: Normal/Alarm
Space Relative Humidity	Indicates if the relative humidity exceeds the high RH alarm limit.	R: Normal/Alarm
Leaving Load Water Temp Sensor	Indicates if the leaving load water temperature sensor fails.	R: Normal/Alarm
Entering Load Water Temp Sensor	Indicates if the entering load water temperature sensor fails.	R: Normal/Alarm
Outdoor Air Temp Sensor	Indicates if the controller is no longer receiving a valid outdoor air temperature value either through the network or from a local sensor.	R: Normal/Alarm
Space Relative Humidity Sensor	Indicates that a valid space relative humidity sensor or sensor value is no longer available to the controller.	R: Normal/Alarm
Chiller #1 Linkage	Indicates Chiller #1 Linkage has failed.	R: Normal/Alarm
Chiller #2 Linkage	Indicates Chiller #2 Linkage has failed.	R: Normal/Alarm
Chiller #3 Linkage	Indicates Chiller #3 Linkage has failed.	R: Normal/Alarm
Chiller #4 Linkage	Indicates Chiller #4 Linkage has failed.	R: Normal/Alarm
Chiller #5 Linkage	Indicates Chiller #5 Linkage has failed.	R: Normal/Alarm
Chiller #6 Linkage	Indicates Chiller #6 Linkage has failed.	R: Normal/Alarm
Chiller #7 Linkage	Indicates Chiller #7 Linkage has failed.	R: Normal/Alarm
Chiller #8 Linkage	Indicates Chiller #8 Linkage has failed.	R: Normal/Alarm

APPENDIX C — 30MP MULTI-CHILLER POINTS/PROPERTIES (cont)

Table H — Linkage

Navigation: i-Vu® / Field Assistant: **Properties > Control Program > Linkage**

POINT NAME	DESCRIPTION	RANGE (R)
CH-1 Linkage Provider	Open each Provider and enter the correct **Network Number** and **Collector MS/TP Address** NOTE: If the Network Number or Address is changed, use the i-Vu application or Field Assistant to cycle power to the controller for the changes to take	R: Not Active/Active
CH-2 to CH-8 Linkage Provider	Same as above	
Linkage Configuration Reset	Reset the Linkage Configuration NOTE: Use if Linkage was configured incorrectly	R: Checked or Unchecked
CHILLER #1		
Chiller #1 Linkage Status	The linkage connections status	R: Active/Not Active
Chiller #1 Status	Chiller #1's status	R: Not Configured CCN Mode and Running Low Load Recycle Local Mode or Wait Power Fail Restart Fault Shutdown Communication Failure
Chiller #1 Size	Chiller #1's capacity	R: __ tons
Chiller #1 Stages	Chiller #1's available number of stages	R: 1 to 3
Chiller #1 Demand	The percentage of demand of Chiller #1	R: 0 to 100%
Chiller #1 EWT	Chiller #1's entering water temperature	R: __ F
Chiller #1 LWT	Chiller #1's leaving water temperature	R: __ F
Chiller #1 CWT	Chiller #1's condenser water temperature	R: __ F
Chiller #2 to 8	Same information is available as above	

APPENDIX C — 30MP MULTI-CHILLER POINTS/PROPERTIES (cont)

Table I — I/O Points

Navigation: i-Vu® / Field Assistant: **Properties > Control Program > I/O Points**

⚠ CAUTION

Do not change the Value, Offset/Polarity, Exp: Num, I/O Type, Sensor/Actuator Type, Min/Max, or Resolution I/O configuration parameter for the points listed below. Changing these parameters could cause improper control and/or equipment damage.

Use extreme caution if locking a point as this may also cause improper control and/or equipment damage.

POINT NAME	DESCRIPTION	RANGE (R)
RH Sensor	The current voltage of the controller's RH input.	R: 0 to 5 vdc
AI Setpoint	The current voltage of the controller's external chilled water setpoint sensor input. Allowable input range is 1-5 vdc.	R: 0 to 5 vdc
OAT Sensor	The value of the controller's outdoor air temperature sensor input, prior to any operator-configured Calibration Offset.	R: -56 to 245°F
Leaving Chilled Water Header Temp	The value of the controller's leaving chilled water header temperature sensor input, prior to any operator-configured Calibration Offset.	R: -56 to 245°F
Ext Demand Limit	The external demand limit input's current state.	R: Off/On
Remote Occupancy Contact	The remote occupancy contact input's current state.	R: Open/Closed
Tower Fan Speed	The assigned output channel's current commanded, configuration-dependent, fan output.	R: 0 to 100%
Alarm Lamp	The assigned output channel's current commanded, configuration-dependent, output.	R: Off/On

APPENDIX D — 30MP MULTI-CHILLER SYSTEM TOUCH™ NAVIGATION SCREEN SETTINGS

The image below displays the menus and sub menus which are accessible with different logins.

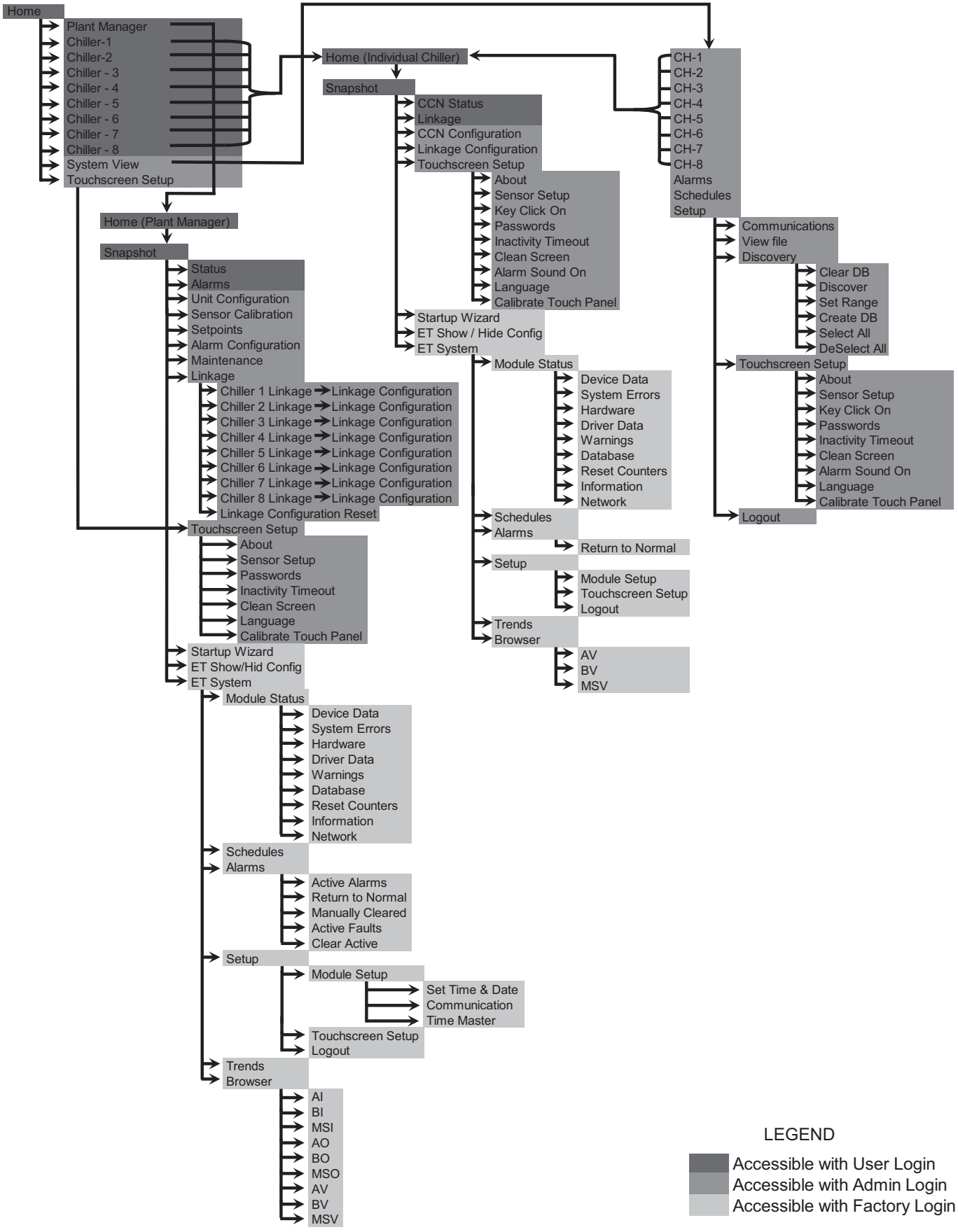


Fig. B — Menu Map

APPENDIX D — 30MP MULTI-CHILLER SYSTEM TOUCH™ NAVIGATION SCREEN SETTINGS (cont)

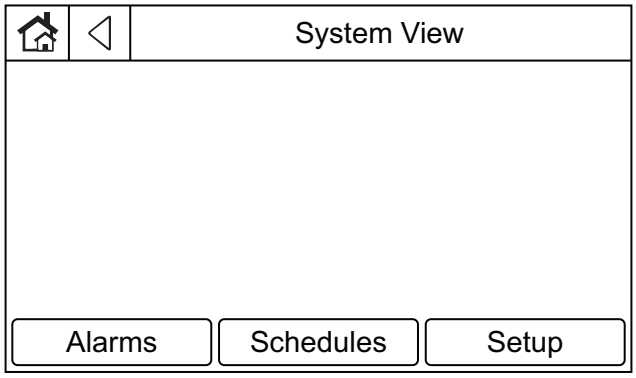
General

There are multiple screens titled "Home." It is possible to distinguish which home screen is displayed by looking in the upper left hand corner of the screen:

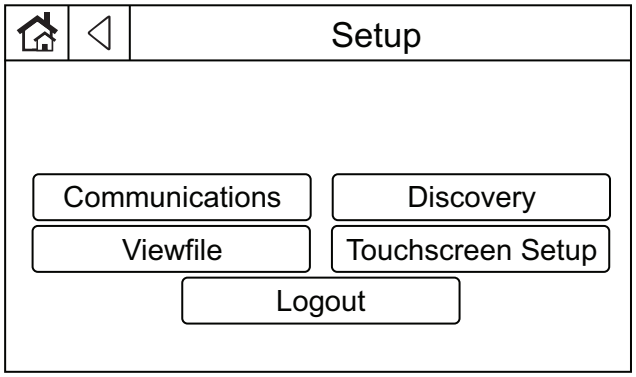
1. The Chiller Plant home screen is identifiable by the following icon displayed in the upper left hand corner of the screen:
2. The Plant Manager home screen and Individual Chiller home screens are identifiable by the following icon displayed in the upper left hand corner of the screen:

Set Up the Communication Baud Rate

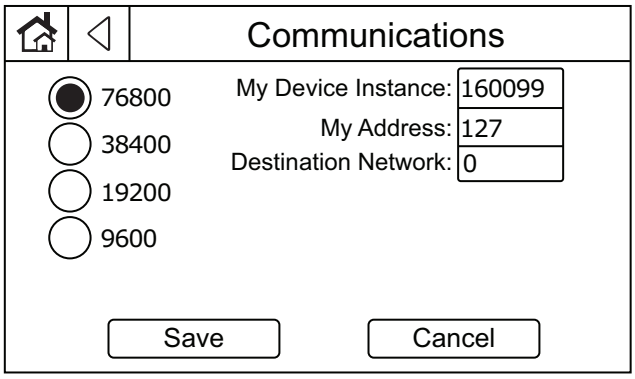
On the System View screen, click Setup.



On the Setup screen, tap Communications.



Tap the radio button for the correct baud rate. Ensure My Device Instance is set to 160099 and My Address is set to 127 as displayed below and then click Save.

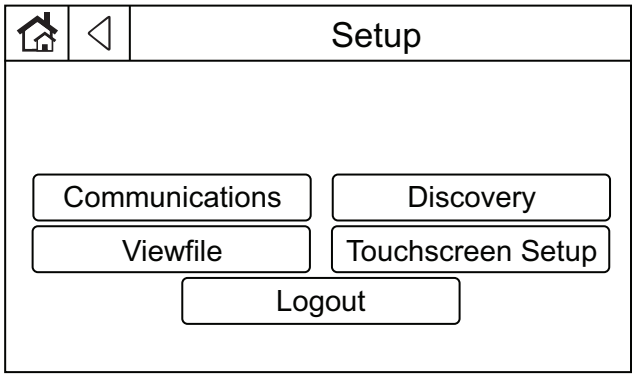


Create a Database

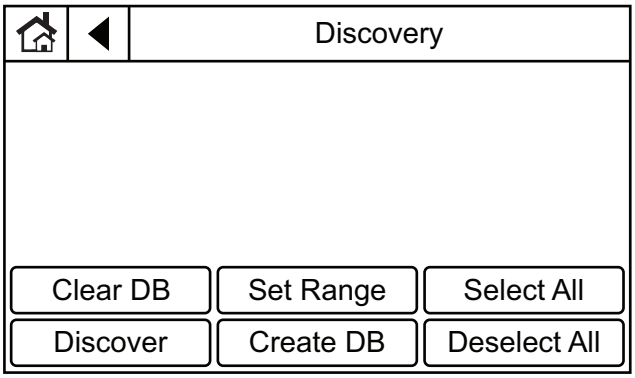
The System Touch™ device discovers the devices on the attached MS/TP network.

NOTE: Discovery time can be optimized by defining an address range.

On the Setup screen, tap Discovery.

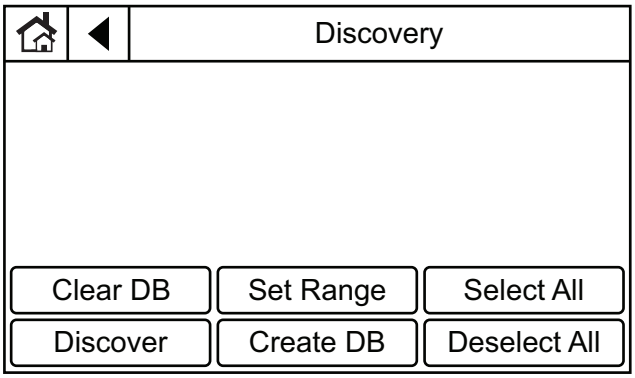


Tap Set Range.



On the Set Range screen, enter 10 for the High Address Limit. Tap Save. The System Touch returns to the Discovery screen.

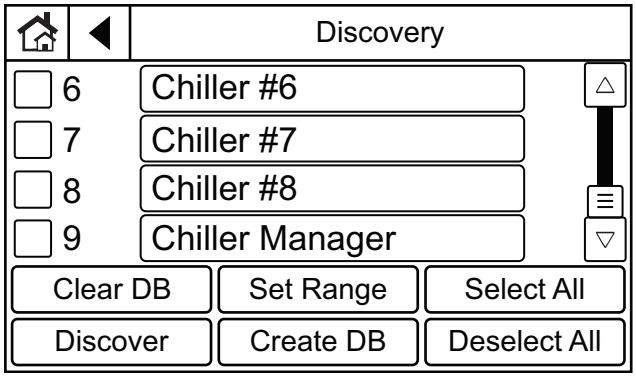
On the Discovery screen, tap Discover.



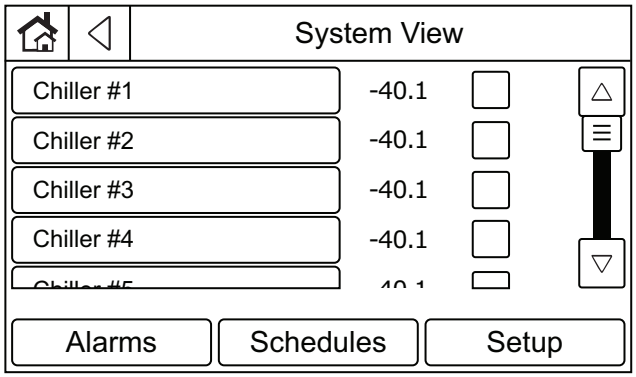
After discovery is complete, the Discovery screen shows the list of controllers.

Tap Select All.

Tap Create DB to add and save the controllers to the touchscreen's database.



The System View should show the controller names, prime variables, and color.



Assign a File with Custom Touchscreens

1. Prepare a USB drive that:
   - is formatted as FAT 32
   - contains a folder named Touch
   - has an .stv file in the Touch folder
2. From the Setup screen, click Viewfile.
3. Plug a USB drive into the System Touch device.
4. Click OK.

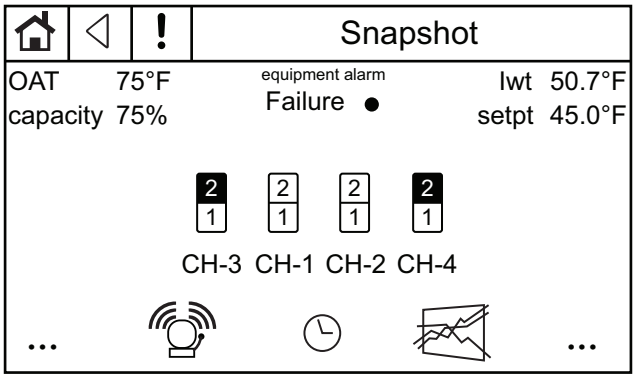
NOTE: The System Touch device indicates the upload progress.

5. If the customer screens are not displayed, reload the firmware by going to the SETUP screen —> Touchscreen Setup —> Reload Firmware.

Address the Chillers

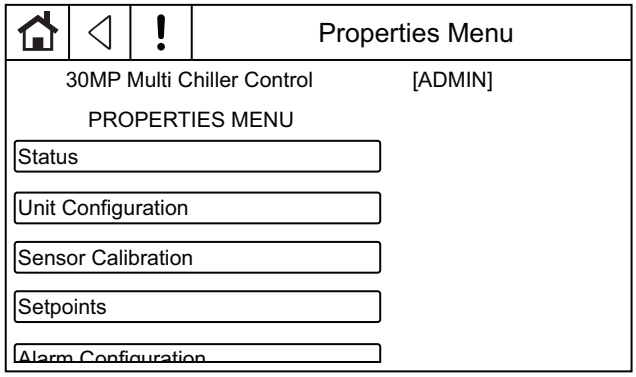
The controller has now discovered the chillers in the 30MP modular chiller water plant. The next step is to ensure all chillers are addressed appropriately. Follow the steps below to address a chiller:

1. Press the Home icon in the top left corner to return to the home screen.
2. Login as an Administrator (refer to Table J of this section).
3. Select Plant Manager.
4. Press ". . ." in the lower right hand corner of the screen to enter the Snapshot screen.

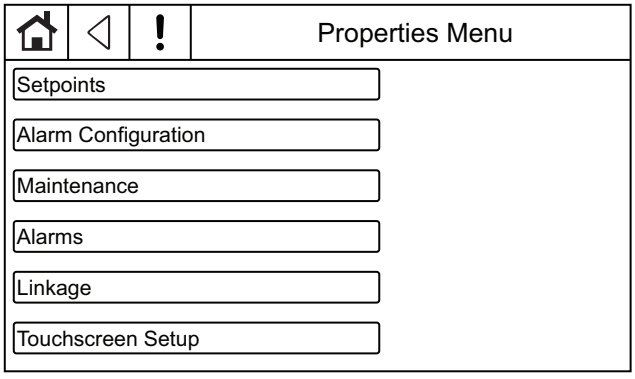


5. Press ". . ." in the lower right hand corner of the screen again to enter Properties menu.

IMPORTANT: At this point it may be necessary to login as an administrator again to access the Linkage menu.

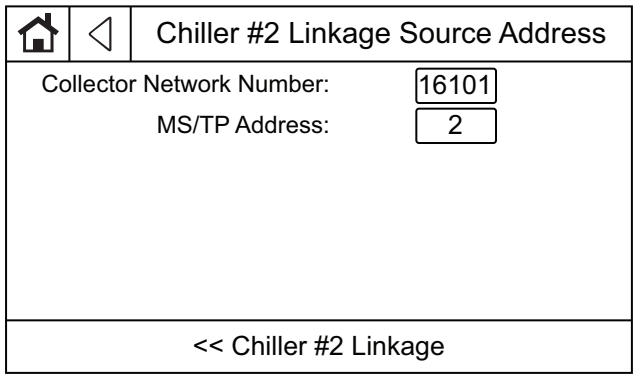


6. Scroll to the bottom and select Linkage from the menu.



7. Select a chiller to address, i.e. Chiller #1 Linkage, Chiller #2 Linkage, Chiller #3 Linkage, etc.
8. Scroll to the bottom and press Linkage Configuration. The collector network number should be 16101.

9. The MS/TP Address should match the chiller number. For example, the image below is showing the Linkage Configuration for Chiller #2 therefore, the MS/TP Address shows 2.



10. Press the back button twice to return to the Linkage menu and repeat steps 6 through 8 to ensure each chiller is addressed properly.

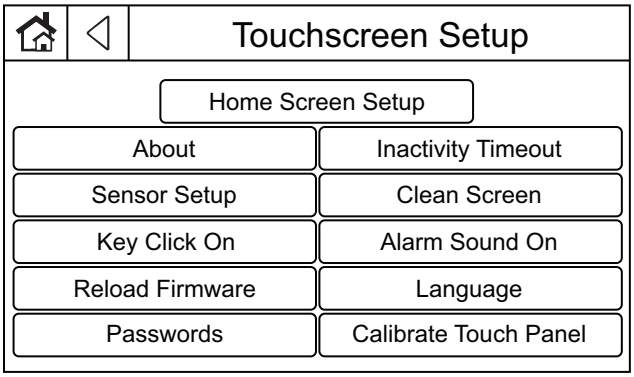
NOTE: If the linkage source address does not match the chiller check that the UPC Open Controller for the chiller is addressed properly. See Step 4 — Address the Controllers, on page 3.

11. To return to the main Home screen press the Home icon in the upper left hand corner once to return to the Chiller Home screen and press the icon again to return to the main Home screen.
12. Press the Menu button ". . ." in the lower right hand corner of the screen and select a chiller from the menu.
13. Press the Menu button once to enter Snapshot and again to enter the Properties Menu.
14. Login as an Administrator.
15. Press Link Configuration and ensure that the Application Instance matches the chiller number i.e. Chiller #3 should have 3 as an Application instance.

Change the Default Home Screen

To show a particular chiller's home and standby screens instead of the System Touch device's home and standby screens:

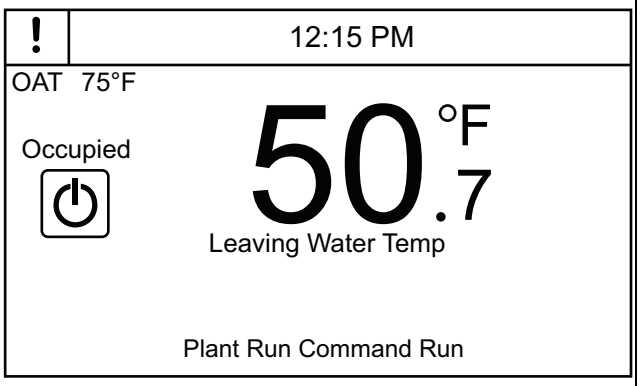
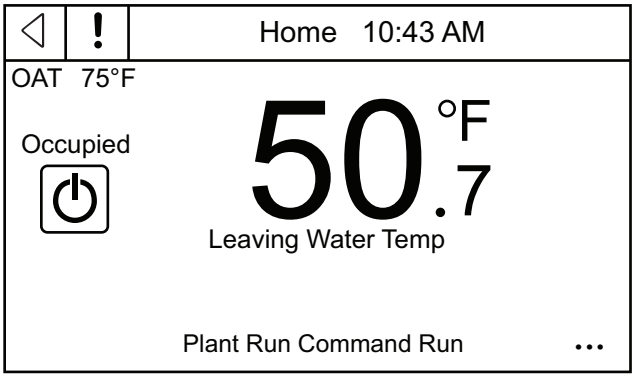
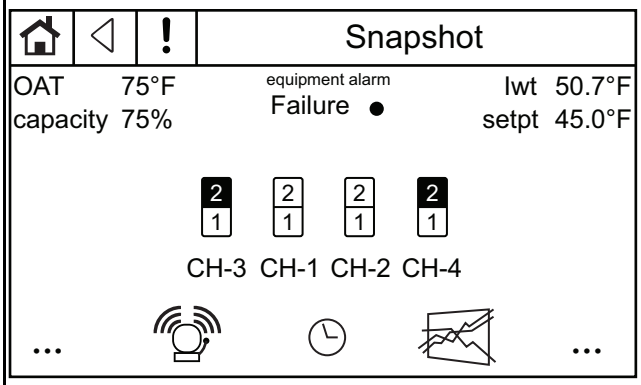
1. From the main home screen go to the properties menu.
2. Login as using an administrator or factory login to access the Touchscreen Setup.
3. Press Touchscreen Setup.
4. Press Home Screen Setup



5. Press View System Tree and select a device to use as the default standby/home screen.
6. Press Save.
7. Let the device time out.

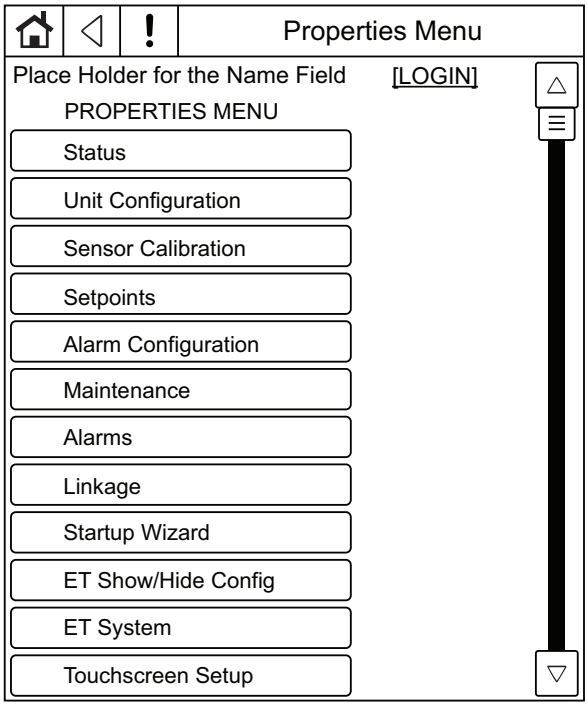
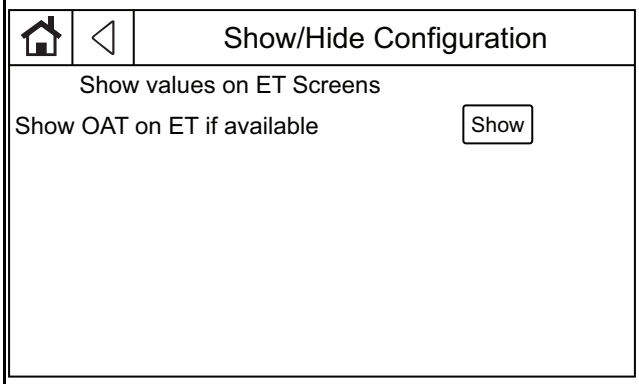
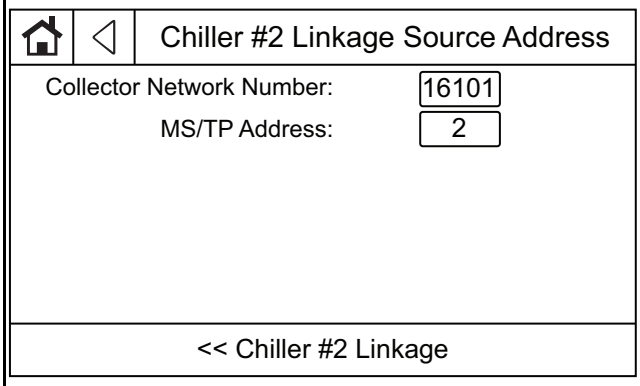
APPENDIX D — 30MP MULTI-CHILLER SYSTEM TOUCH™ NAVIGATION SCREEN SETTINGS (cont)

Table J — 30MP Multi-Chiller System Touch™ Navigation Screens

SCREEN NAME	DISPLAY	DETAILS
Standby	 Not an interactive screen. Touch anywhere to advance to Home screen.	Screen displays after the Inactivity Timer expires (default is 5 minutes). Displays: • Controlling temperature • Control type • Plant Run Command • Occupancy • Outdoor air temperature, if available
Home	 Press • • • in the lower right hand corner of the screen to navigate to the Snapshot screen.	Displays: • Controlling temperature • Control type • Plant Run Command • Occupancy • Outdoor air temperature, if available
Snapshot	 Press • • • in the lower left hand corner of the screen to return to the Home screen. Press • • • in the lower right hand corner of the screen to navigate to the Properties Menu.	Navigates to: • Alarm Status - press the red alarm icon • Schedules - press the clock icon • Trends - press the graph icon Displays: • Current Plant Capacity • Controlling temperature • Control setpoint • Outdoor air temperature, if available and allowed • Alarms, if present Chiller Stage Color Codes: • Black - Stage Off • Green - Stage On • Half-Green & Half Black - Stage in Hot Gas Bypass • Light Red - Comm. Error • Solid Red - Alarm

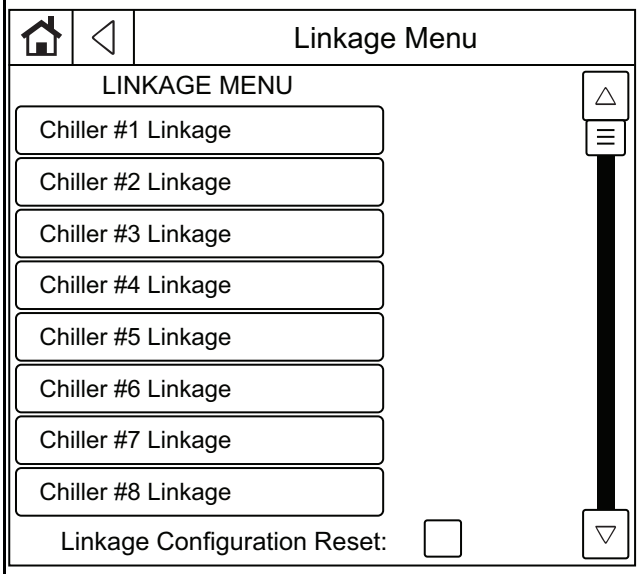
APPENDIX D — 30MP MULTI-CHILLER SYSTEM TOUCH™ NAVIGATION SCREEN SETTINGS (cont)

Table J — 30MP Multi-Chiller System Touch™ Navigation Screens (cont)

SCREEN NAME	DISPLAY	DETAILS
Properties Menu		Navigates to Property pages Login with one of the following passwords: • "User" level - type user • "Admin" level - type admin • "Factory" level - type Touch NOTE: 1. Passwords are case sensitive. 2. Only the buttons that are authorized for a specific password level are visible. 3. See Fig. B on page 25 to see which menus are available to specific logins.
Show/Hide Configuration		Configure Show/Hide conditions for values on the following screens: • Standby • Home • Snapshot NOTE Only displayed for the Factory or Admin password. (See above.)
Linkage Source Address		Set up Linkage using the following properties: • Collector Network Number • Address type: IP / MSTP • MSTP Address of the Collector • IP Address of Collector (to set an IP address, the MSTP address must be set to "0")

APPENDIX D — 30MP MULTI-CHILLER SYSTEM TOUCH™ NAVIGATION SCREEN SETTINGS (cont)

Table J — 30MP Multi-Chiller System Touch Screens (cont)

SCREEN NAME	DISPLAY	DETAILS
Linkage Menu		Navigate to the following Linkage details for each chiller: • Linkage Status • Linkage Configuration • Linkage Configuration Reset

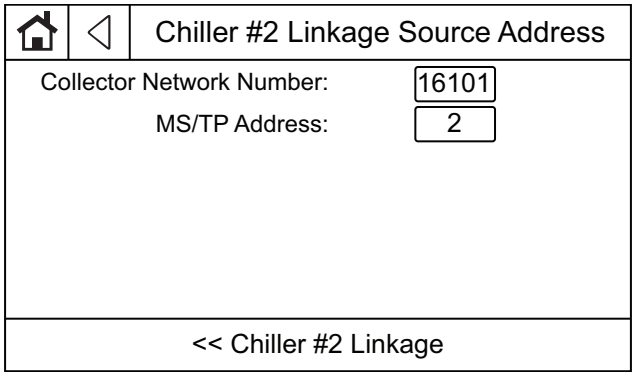
APPENDIX D — 30MP MULTI-CHILLER SYSTEM TOUCH™ NAVIGATION SCREEN SETTINGS (cont)

Table K — 30MP Multi-Chiller Start-Up Wizard

POINT NAME	DESCRIPTION	DEFAULT (D)/RANGE (R)
Control Point	Defines whether the control monitors and uses Leaving Water Temp or Entering Water Temp to control this equipment.	D: Leaving Water Temp R: Leaving Water Temp Entering Water Temp
Minimum # of Chillers to Run	The least number of chillers that can run at the same time.	D: 1 R: 1 to 8
ACR (Additional Capacity Required) Timer	Determines the time delay before an additional compressor stage can be added.	D: 5:00 minutes R: 2:00 - 20:00 minutes
RCR (Reduced Capacity Required) Timer	Determines the time delay before an additional compressor stage can be removed.	D: 3:00 Minutes R: 1:00 - 5:00 minutes
Cool Enable	Enables or disables cooling operation.	D: Enable R: Disable/Enable
Cooling Lockout Temperature	Cooling is inhibited below this outdoor air temperature.	D: 45 F R: 65 to 80 F
Chilled Water Setpoint	The chilled water temperature setpoint maintained by the chiller plant. The setpoint is internally clamped so it will not exceed the highest freeze point configured in any chiller.	D: 44 F R: 40 - 80 F for water -20 - 45 F for brine
Occ Contact Normal Logic State	Specifies the occupancy contact's normal logic state.	D: Open R: Open/Closed
Tower Fan Output Type	Defines the type of fan output control.	R: 0 to 100%
Cooling Setpoint OA Reset	Enables OA reset of the cooling water supply temp's setpoint.	D: Disable R: Disable/Enable
Maximum OA CHW Reset	The highest cooling water supply temp setpoint reset allowed by the OAT.	D: 10 F R: 0 to 25 F
RH Cooling Setpoint Reset	Enables or disables reset of the cooling water supply temp's set-point, based on relative humidity.	D: Disable R: Disable/Enable

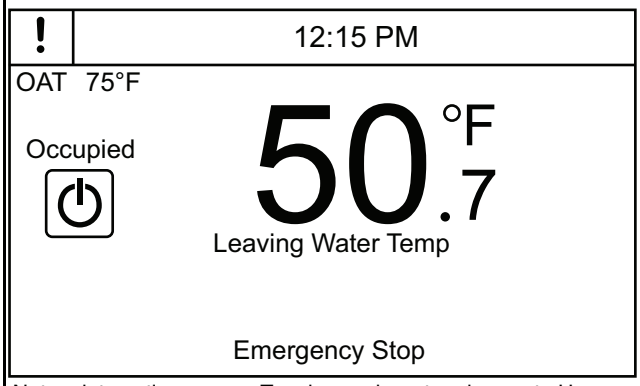
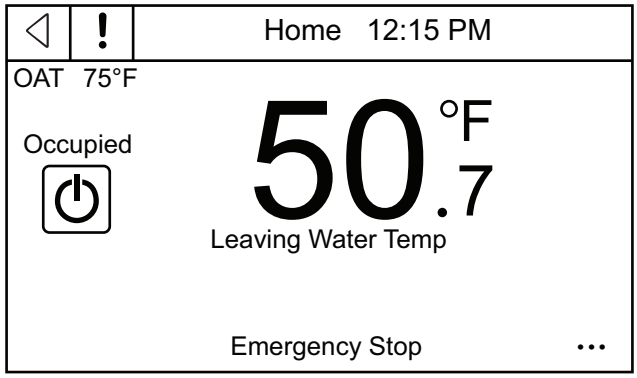
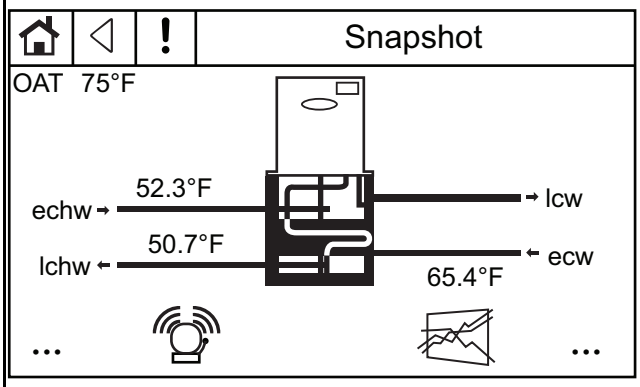
APPENDIX D — 30MP MULTI-CHILLER SYSTEM TOUCH™ NAVIGATION SCREEN SETTINGS (cont)

Table L — 30MP Multi-Chiller Linkage Source Address

POINT NAME	DESCRIPTION	DEFAULT (D) / RANGE (R)
	 Set up each Chiller #x Linkage Source Address using the following properties: Navigate to the Linkage screen by pressing on the bottom of the screen.	
Collector Network Number	The chiller's MS/TP network number	D: 0 R: 0 to 65,534
MSTP Address	Set the MAC address of the chiller UPC Open controller	D: 0 R: 0 to 99

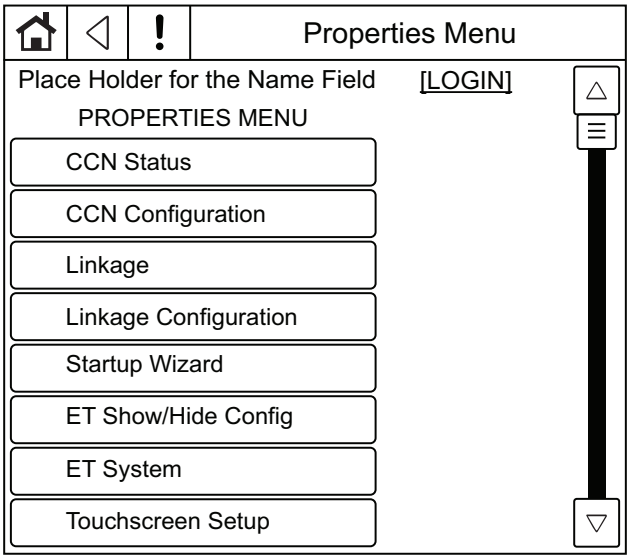
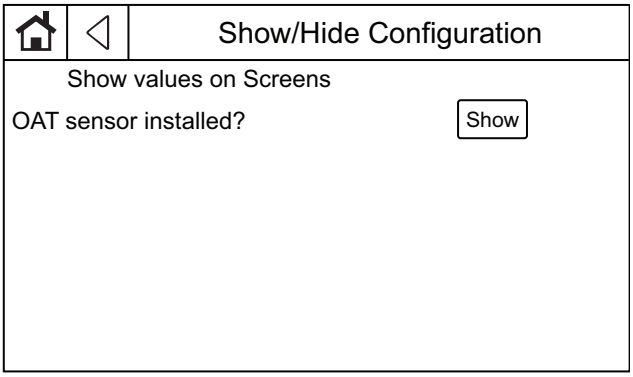
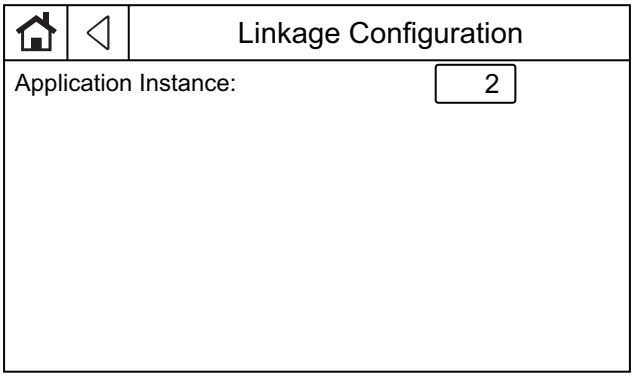
APPENDIX D — 30MP MULTI-CHILLER SYSTEM TOUCH™ NAVIGATION SCREEN SETTINGS (cont)

Table M — UPC Open's System Touch™ Navigation Screens

SCREEN NAME	DISPLAY	DETAILS
Standby	 Not an interactive screen. Touch anywhere to advance to Home screen.	Screen displays after the Inactivity Timer expires (default is 5 minutes). Displays: • Leaving water temperature • Mode • Occupancy • Outdoor air temperature
Home	 Click • • • in the lower right hand corner of the screen to navigate to the Snapshot screen.	Displays: • Leaving water temperature • Mode • Occupancy • Outdoor air temperature, if available
Snapshot	 To return to the Home screen press • • • in the lower left hand corner of the screen. To move forward to the Properties Menu press • • • in the lower right hand corner of the screen.	Displays: • Entering chilled water temperature • Leaving chilled water temperature • Entering condenser water temperature, if present • Outdoor air temperature, if available • Machine type, air or water • Alarms, if present

APPENDIX D — 30MP MULTI-CHILLER SYSTEM TOUCH™ NAVIGATION SCREEN SETTINGS (cont)

Table M — UPC Open Modules System Touch™ Navigation Screens (cont)

SCREEN NAME	DISPLAY	DETAILS
Properties Menu		Navigates to Property pages Login with one of the following passwords: • User level - type user • Admin level - type admin • Factory level - type Touch NOTE Only the buttons that are authorized for a specific password level are visible.
Show/Hide Configuration		Configure Show/Hide conditions for values on the following screens: • Standby • Home • Snapshot NOTE Only displayed for the Factory or Admin password. (See above.)
Linkage Configuration		Set up Linkage by entering the Application Instance

Manufacturer reserves the right to discontinue, or change at any time, specifications or designs without notice and without incurring obligations.

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