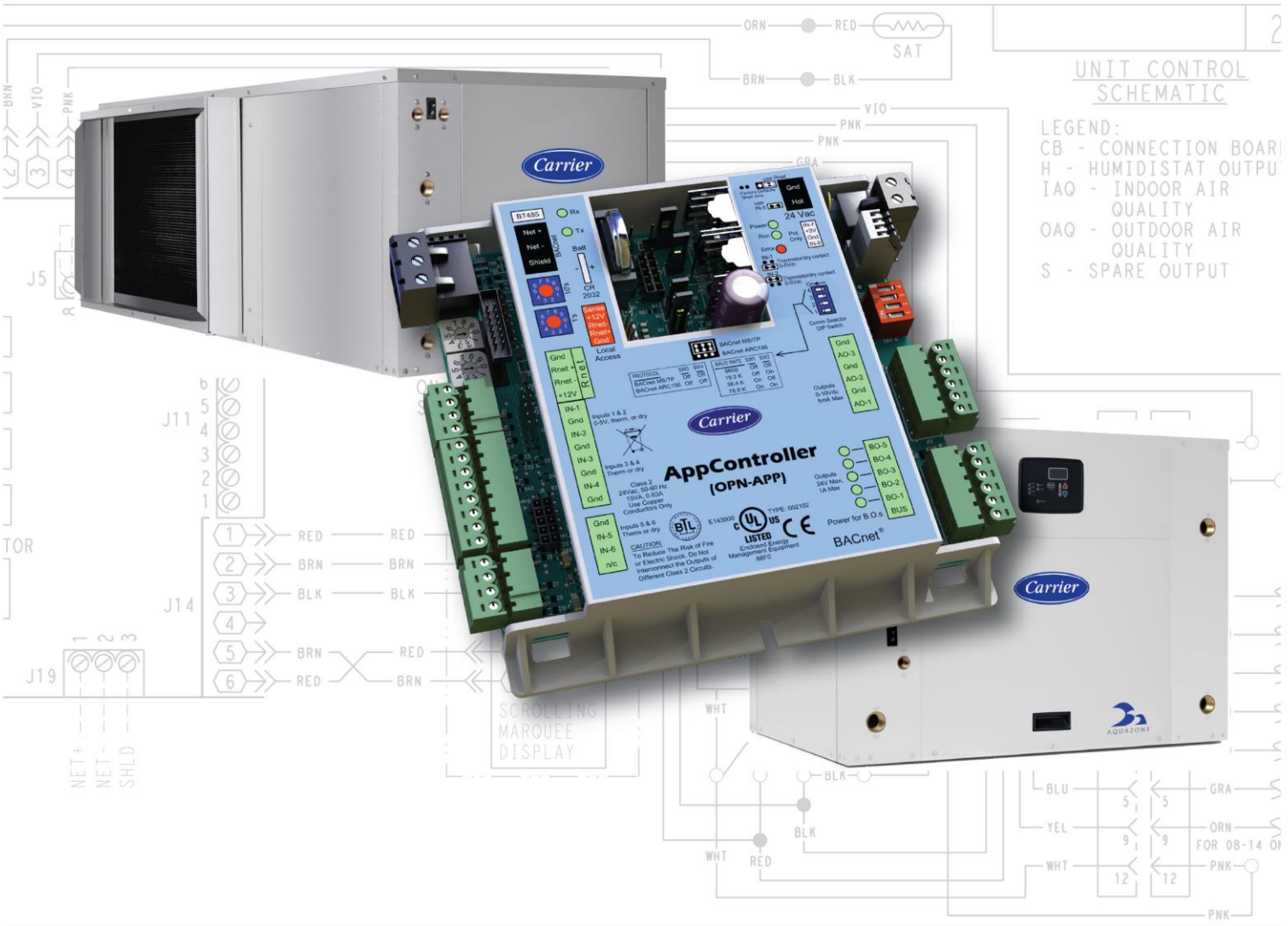
# GSLC for AppController
# Installation and Start-up Guide

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

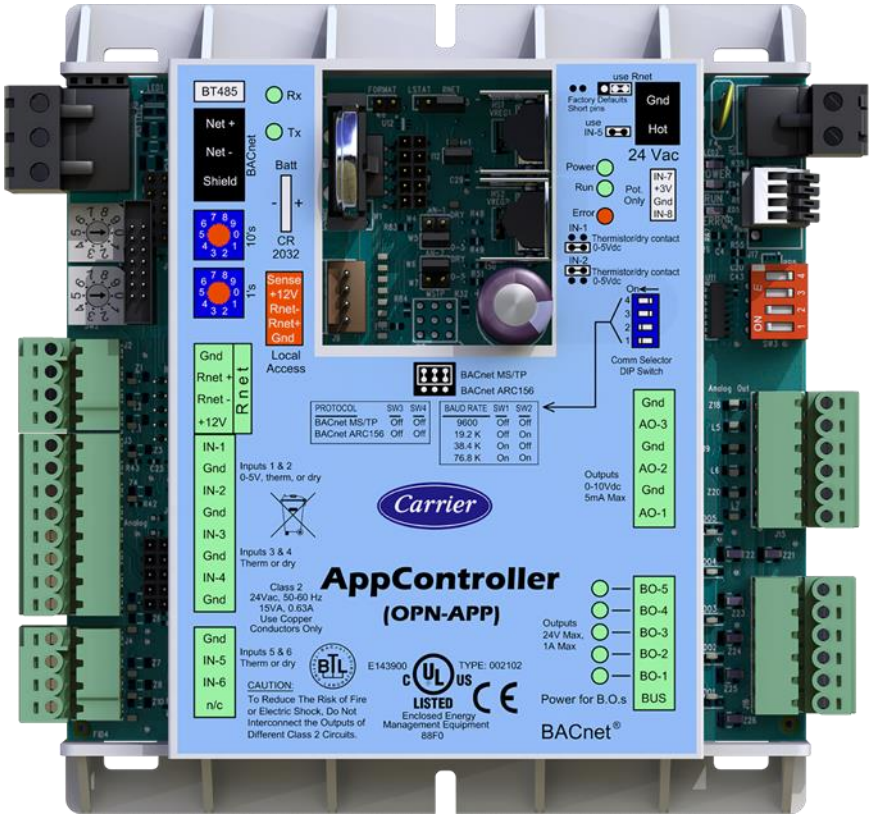
# Contents

# GSLC overview and specifications

## What is the GSLC application?

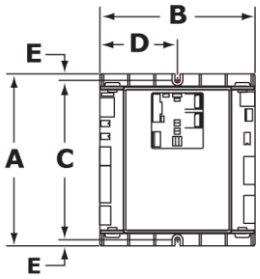
The Ground Source Loop Control (GSLC) is a field-installed application that is designed to be loaded into an AppController that provides control of the pump operation in a ground source heat pump system. The ground source loop control supplies or removes energy from the source water for the heat pumps. The GSLC can control 1 pump or 2 pumps in a constant-flow application, or up to 2 pumps in a variable-flow source water application, maintaining the loop pressure differential setpoint.

The internal application programming provides loop pump operation based on heat pump demand and/or scheduling. This controller can be used in stand-alone mode, communicate to an i-Vu® Control System, or a BACnet Third Party Building Automation System (BAS).



# Specifications

| | |
|---|---|
| Power | 24 Vac ±10%, 50–60 Hz<br>20 VA power consumption<br>26 Vdc (25 V min, 30 V max)<br>Single Class 2 source only, 100 VA or less |
| BACnet Port | For communication with the controller network using BACnet ARC156 (156 kbps) or BACnet MS/TP (9600 bps – 76.8 kbps) |
| Rnet port | Supports one Equipment Touch or one TruVu™ ET Display.<br>**NOTES**<br>• Equipment Touch or TruVu™ ET Display must be powered by an external power source.<br>• The GSLC application does not support the ZS or Wireless sensor. |
| Local Access port | For system start-up and troubleshooting using Field Assistant |
| Inputs | 6 inputs configurable for thermistor or dry contact. 1 and 2 are also configurable for 0–5 Vdc sensors.<br>**NOTE** 7 and 8 are unused. |
| Input resolution | 10 bit A/D |
| Analog outputs | 3 analog outputs, 0–10 Vdc (5 mA max) |
| Binary outputs | 5 binary outputs, dry relay contacts rated at 1 A max. @ 24 Vac/Vdc. Configured normally open |
| Output resolution | 8 bit A/D, using filtered PWM |
| Real time clock | Battery-backed real time clock keeps track of time in the event of a power failure |
| Battery | 10-year Lithium CR2032 battery retains the following data for a maximum of 10,000 hours during power outages: control programs, editable properties, schedules, and trends. |
| Protection | Built-in surge and transient protection for power and communications in compliance with EN61000-6-1.<br>Incoming power and network connections are protected by non-replaceable internal solid-state polyswitches that reset themselves when the condition that causes a fault returns to normal.<br>The power, network, input, and output connections are also protected against transient excess voltage/surge events lasting no more than 10 msec.<br>**CAUTION** To protect against large electrical surges on serial EIA-485 networks, place a PROT485 at each place wire enters or exits the building. |
| Status indicators | LEDs indicate status of communications, running, errors, and power. |
| Environmental operating range | 0 to 130°F (-18 to 54°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 Cycoloy plastic |




| | | |
|---|---|---|
| Overall dimensions | A:<br>B: | 5-5/8 in. (14.3 cm)<br>5-1/8 in. (13 cm) |
| Mounting dimensions | C:<br>D:<br>E: | 5-1/4 in. (13.3 cm)<br>2-9/16 in. (6.5 cm)<br>3/16 in. (.5 cm) |
| Panel depth | 2 in. (5.1 cm) | |
| Weight | 0.44 lbs. (0.20 kg) | |
| BACnet support | Conforms to the BACnet Advanced Application Controller (B-AAC) Standard Device Profile as defined in ANSI/ASHRAE Standard 135-2012 (BACnet) Annex L, Protocol Revision 9 | |
| Listed by | UL-916 (PAZX), cUL-916 (PAZX7), FCC Part 15-Subpart B-Class A, CE | |

## Safety considerations

**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.

# Installing the GSLC

1 *Mount the controller* (page 4).

2 *Wire the controller for power* (page 5).

3 *Set the controller's address* (page 6).

4 *Wire the controller to the BACnet MS/TP or BACnet ARC156 network* (page 6).

5 *Wire inputs and outputs* (page 8).

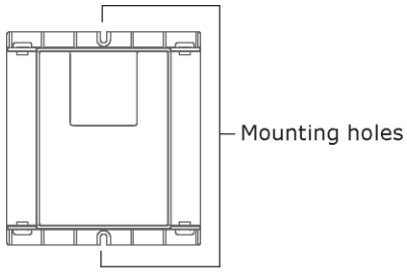
6 *Wire equipment to outputs* (page 15).

## Mounting the controller

**WARNING**

When you handle the controller:
- 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 controller 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 5 9/16" (14.1 cm) between mounting slot center lines.



# Wiring the controller for power

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

**CAUTIONS**

- The controller is powered by a Class 2 power source. Take appropriate isolation measures when mounting it in a control panel where non-Class 2 circuits are present.
- Carrier controllers can share a power supply as long as you:
  - Maintain the same polarity.
  - Use the power supply only for Carrier controllers.

## To wire for power

1. 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 controller'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 controller's power terminals.
7. Verify that the **Power** LED is on and the **Run** LED is blinking.

# Addressing the controller

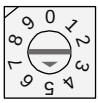
You must give the controller an address that is unique on the network. You can address the controller before or after you wire it for power.

1 If the controller has been wired for power, pull the screw terminal connector from the controller 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 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.

10's



1's

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

# Wiring for communications

The controller communicates using BACnet on the following types of network segments:

- MS/TP communicating at 9600 bps, 19.2 kbps, 38.4 kbps, or 76.8 kbps
- ARC156 communicating at 156 kbps

**NOTE** For more networking details, see the *Open Controller Network Wiring Installation Guide*.

## Wiring specifications for BACnet MS/TP and ARC156

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

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

## To wire the controller to the BACnet network

1. Pull the screw terminal connector from the controller's power terminals labeled **24 Vac** and **Gnd** (**Return**).
2. Check the communications wiring for shorts and grounds.
3. Connect the communications wiring to the controller's screw terminals labeled **Net +**, **Net -**, and **Shield**.

   **NOTE** Use the same polarity throughout the network segment.
4. Set the communication type and baud rate.

| For... | Set Communications Selection jumper to... | Set DIP switches 1 and 2 to... | Set DIP switches 3 and 4 to... |
|---|---|---|---|
| MS/TP | **BACnet MS/TP** | The appropriate baud rate. See the **MS/TP Baud** diagram on the controller. | Off/Off |
| ARC156 | **BACnet ARC156** | N/A. Baud rate will be 156 kbps regardless of the DIP switch settings. | Off/Off |

   **NOTE** Use the same baud rate for all controllers on the network segment.
5. Wire the controllers on a BACnet MS/TP or BACnet ARC156 network segment in a daisy-chain configuration.
6. If the controller is at either end of a network segment, connect a BT485 to the controller.
7. Insert the power screw terminal connector into the controller's power terminals.
8. Verify communication with the network by viewing a Module Status report in the i-Vu® interface.

# Wiring inputs and outputs

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

See *Appendix A* (page 29) to print a blank wire list.

## Inputs and outputs table

Depending on the configuration of the GSLC application, the available I/O points change. For variable flow applications such as the bypass valve control or VFD pump control, the **Source Water Diff. Pressure** (*I/O Points* (page 41)) AI input on Channel #2 is valid and available only if the **Pump Status Type** (*Service Configuration* (page 35)) is set to **None** or **Network**. Otherwise, you must use a network input to obtain the source water differential pressure value.

| I/O | Type | I/O Terminal | Gnd Terminal | Point Name/ Function | Hardware/ Signal | Jumper Position of Pins |
|---|---|---|---|---|---|---|
| Pump 1 Amp Sensor | AI | IN-1* | 2 - Gnd | Pump 1 Motor Amps | 0-5 Vdc | IN-1 Bottom |
| Pump 1 Status | BI | IN-1* | 2 - Gnd | Pump 1 Status Switch | Dry Contact | IN-1 Top |
| Pump 2 Amp Sensor | AI | IN-2* | 4 - Gnd | Pump 2 Motor Amps | 0-5 Vdc | IN-2 Bottom |
| Pump 2 Status | BI | IN-2* | 4 - Gnd | Pump 2 Status Switch | Dry Contact | IN-2 Top |
| Source Water Diff. Pressure | AI | IN-2* | 4 - Gnd | Source Water Differential Pressure | 0-5 Vdc | IN-2 Bottom |
| Source Water Flow | BI | IN-3 | 6 - Gnd | Source Water Flow Switch | Dry Contact | N/A |
| Remote Contact Input | BI | IN-4 | 8 - Gnd | Remote Occupancy Contact | Dry Contact | N/A |
| Source Return Water Temp | AI | IN-5 | 1 - Gnd | Source Return Water Temperature | 10K Thermistor | N/A |
| Source Supply Water Temp | AI | IN-6 | 1 - Gnd | Source Supply Water Temperature | 10K Thermistor | N/A |
| | | | | | | |
| Pump 1 VFD Output | AO | AO-1* | 2 - Gnd | Pump 1 VFD | 0-10 Vdc 2-10 Vdc | N/A |
| Byp Vlv Output | AO | AO-2* | 4 - Gnd | Bypass Valve | 0-10 Vdc 2-10 Vdc | N/A |
| Pump 2 VFD Output | AO | AO-3* | 6 - Gnd | Pump 2 VFD | 0-10 Vdc 2-10 Vdc | N/A |
| | | | | | | |
| Pump 1 S/S | BO | BO-1 | 1 - Pwr | Pump 1 Start/Stop | Relay | N/A |
| Pump 2 S/S | BO | BO-2* | 1 - Pwr | Pump 2 Start/Stop | Relay | N/A |
| WSHP Comp Command | BO | BO-3 | 1 - Pwr | Enable WSHP Compressor Operation | Relay | N/A |
| Alarm | BO | BO-4 | 1 - Pwr | Alarm Indication | Relay | N/A |
| Legend<br>**AI** - Analog Input<br>**BI** - Binary Input | | **AO** - Analog Output<br>**BO** - Binary Output | | | | |
| *Channel use is determined by specific application configuration. | | | | | | |

## Input wiring specifications

| Input | Maximum length | Minimum gauge | Shielding |
|---|---|---|---|
| 0–5 Vdc | 500 feet<br>(152 meters) | 22 AWG | 100 feet<br>(30.4 meters) unshielded<br>100 - 500 feet shielded |
| Thermistor<br>Dry contact<br>Pulse counter TLO | 500 feet<br>(152 meters) | 22 AWG | 100 feet<br>(30.4 meters) unshielded<br>100 - 500 feet shielded |
| Equipment Touch device<br>TruVu™ ET Display | See *Wiring devices to the controller's Rnet port* (page 12). | | |

## Inputs

The controller has 6 inputs that accept the following signal types.

| These inputs... | Support this signal type... | Description |
|---|---|---|
| All | Thermistor | Precon type 2 (10 kOhm at 77°F/25°C)<br>Input voltage for IN-5: 1 to 2.52 Vdc<br>Input voltage for all other inputs: 0.33 to 2.52 Vdc |
| All | Dry contact | A 3.3 Vdc wetting voltage detects contact position, resulting in a 0.3 mA maximum sense current when the contacts are closed. |
| IN-1, IN-2 | 0–5 Vdc | The input impedance of the controller is approximately 30 kOhm. |
| All | Pulse counter | Pulse counting up to 10 pulses per second.<br>Minimum pulse width (on or off time) required for each pulse is 50 msec. |

## Binary outputs

The controller has 5 binary outputs. You can connect each output to a maximum of 24 Vac/26 Vdc. 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

## Analog outputs

The controller has 3 analog outputs that support voltage. The controlled device must share the same ground as the controller and have the following input impedance:

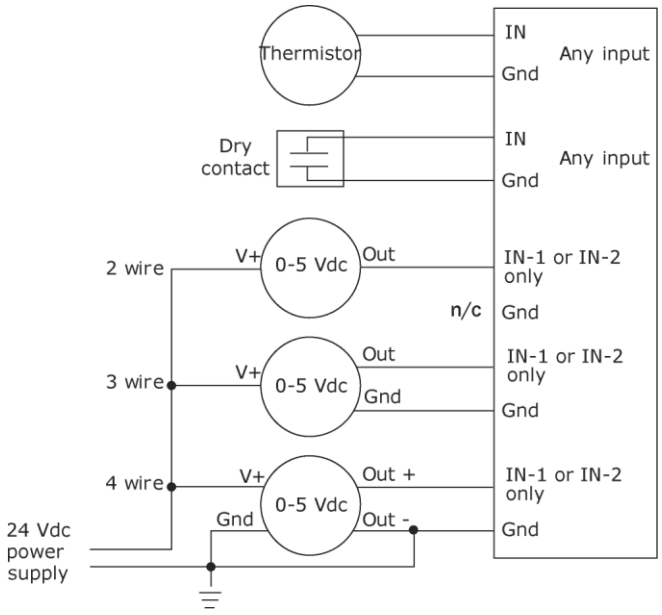
| | |
|---|---|
| 0–10 Vdc | Minimum impedance 2000 Ohms, max 5 mA |
| | **NOTE** Ohm's law: -10V/.005a = 2000 Ohms |

## To wire inputs and outputs

1. Pull the screw terminal connector from the controller's power terminals labeled **Gnd** and **Hot**.
2. Connect the input wiring to the screw terminals on the controller.

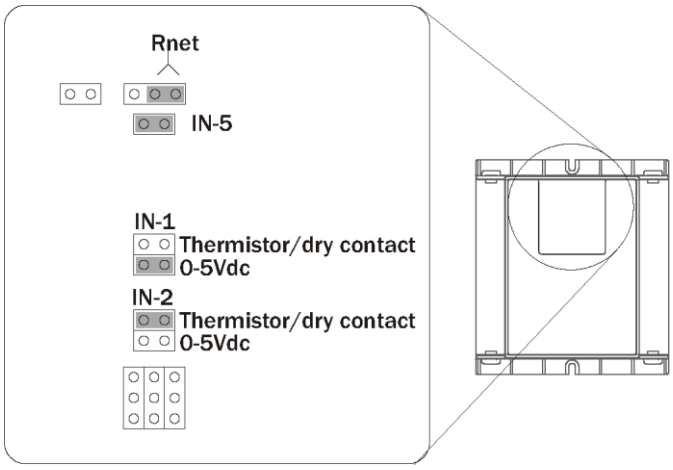
   **NOTES**

   - Connect the shield wire to the **GND** terminal with the ground wire.
   - **IN-5** and **IN-6** share the **GND** terminal above **IN-5**.

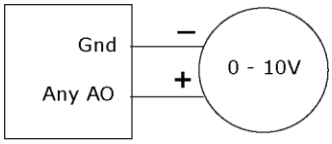


**3** Set the appropriate jumpers on the controller.

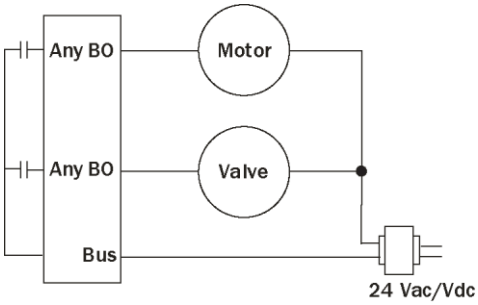
| To use... | For... | |
|---|---|---|
| IN-1 | Thermistor | Set jumpers **IN-1** to the Therm position. |
| IN-1 | 0–5 Vdc | Set jumpers **IN-1** to the 0-5 Vdc position. |
| IN-2 | Thermistor/<br>Dry contact | Set jumpers **IN-2** to the Thermistor/Dry contact position. |
| All | Thermistor<br>Dry contact | Verify the **IN-5** jumper is on. |
| Rnet Port | Equipment Touch<br>TruVu™ ET Display | Set the **Rnet** jumper to **Rnet**. |




**4** Connect the analog output wiring to the screw terminals on the controller and to the controlled device.




**5** Connect the binary output wiring to the screw terminals on the controller and to the controlled device.




**6** Insert the power screw terminal connector into the controller's power terminals.

# Wiring devices to the controller's Rnet port

The Rnet communicates at a rate of 115 kbps and should be wired in a daisy-chain configuration to one Equipment Touch or one TruVu™ ET Display, which must be powered by an external power source.

## To wire an Equipment Touch to the controller

### Power wiring

2-conductor wire 18 AWG for distances up to 100 feet. All transformer secondaries must be grounded. Wiring connections must be in accordance with NEC and local codes.

The Equipment Touch cannot be powered by the Rnet. It requires a 24 Vac (±15%), 5 VA, 50–60 Hz, Class 2 external power supply.

### Rnet wiring

**NOTE** If you wire the Equipment Touch directly to the controller's Rnet port, you can use a 2-conductor cable instead of the standard 4-conductor Rnet cable.

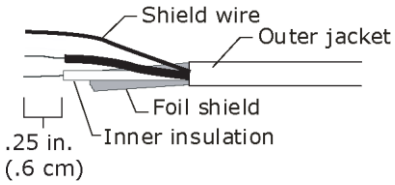
| | |
|---|---|
| Description | 4-conductor, shielded or unshielded, CMP, plenum rated cable |
| Conductor | 22 AWG (7x0096) bare copper |
| Maximum length | 500 feet (152 meters) |
| Insulation | Low-smoke PVC (or equivalent) |
| Color Code | Black, white, green, red |
| Shielding | If shielded, Aluminum/Mylar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

**CAUTION** The controller can share a power supply with the Carrier controller as long as:

- The power supply is AC power.
- You maintain the same polarity.
- You use the power source only for Carrier controllers.

1 Turn **off** the controller's power.

2 Partially cut, then bend and pull off the outer jacket of the cable. Do not nick the inner insulation.




3 Strip about 0.25 inch (0.6 cm) of the inner insulation from each wire.

4 Wire the controller's **Rnet+** and **Rnet-** terminals to the terminals of the same name on the Equipment Touch's connector.

**NOTE** If using shielded wire, connect the shield wire and the ground wire to the **Gnd** terminal.

5 Turn **on** the controller's power.

6 Turn on the Equipment Touch.

For complete Equipment Touch installation instructions including wiring diagrams, see the *Equipment Touch Installation and Setup Guide.*

## To wire the TruVu™ ET Display

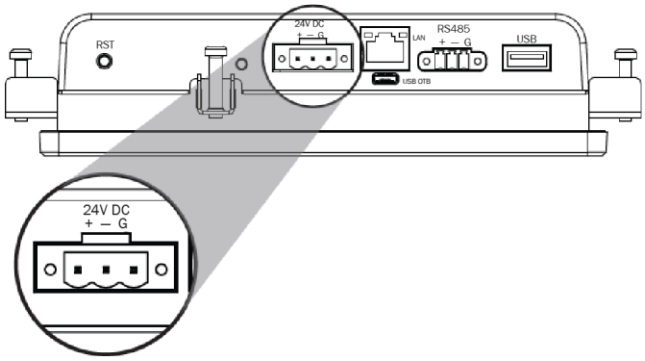
**WARNING** Do not apply line voltage (main) - 24 Vdc power only.

### Wiring power

Wire the TruVu™ ET Display **24V DC** connector to the 24 Vdc power supply using 2-conductor 18 AWG wire. Maximum distance 100 feet (30 meters).

**CAUTION** The TruVu™ ET Display can share a power supply with the Carrier controller as long as:

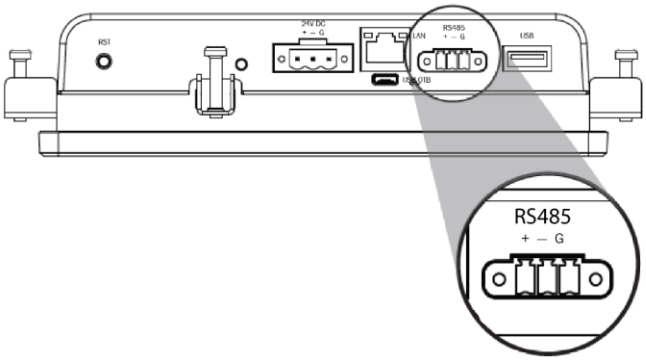
- The power supply is DC power.
- You maintain the same polarity.
- You use the power source only for Carrier controllers.



## Wiring communication

1 Turn off the controller's power.

2 Wire the TruVu™ ET Display's **RS485** connector to the controller's **Rnet** port, **G** to **Gnd**, **+** to **Rnet +**, **-** to **Rnet -** using 2-conductor 22 AWG wire with a maximum distance of 500 feet (152 meters).




3 Turn on the controller's power.

For complete TruVu™ ET Display installation instructions, see the *TruVu™ ET Display Installation and Start-up Guide.*

# Wiring equipment to outputs

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


- *Single pump constant speed with status switch feedback (option)* (page 16)
- *Single pump constant speed with 0-5 Vdc amp status feedback (option)* (page 17)
- *Single pump constant with VFD loop differential control and 0-5 Vdc amp status feedback (option)* (page 17)
- *Single pump with bypass loop differential pressure control and 0-5 Vdc amperage status feedback (option)* (page 18)
- *2 pumps with 2 VFDs, loop differential pressure control and no status feedback* (page 18)


## Wiring specifications

To size output wiring, consider the following:

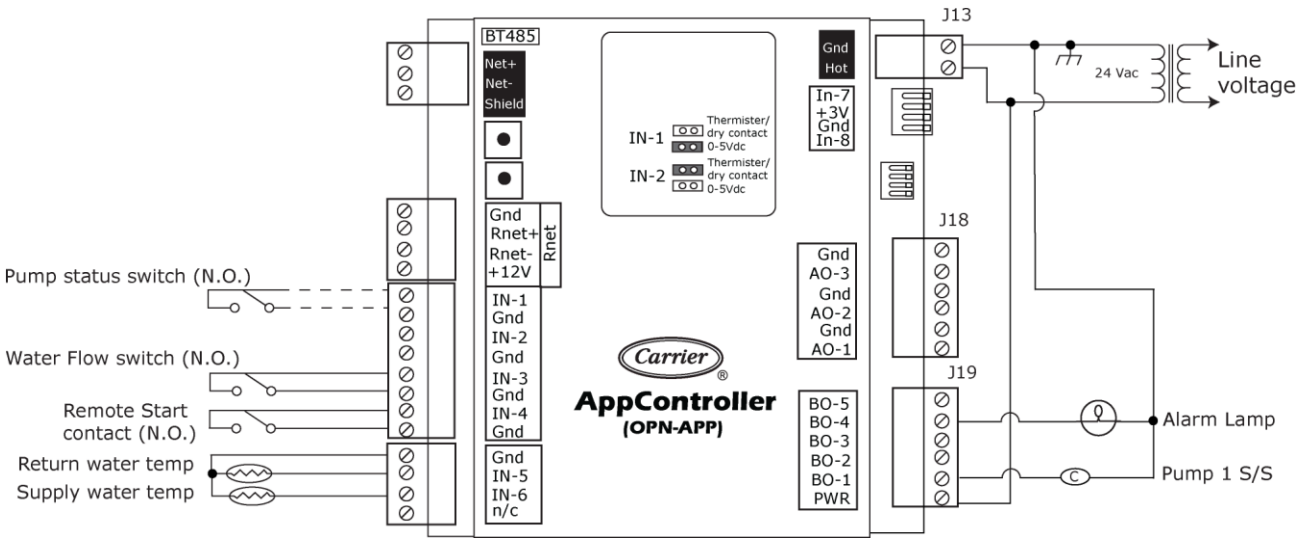
- Total loop distance from the power supply to the controller, and then to the controlled device

  **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

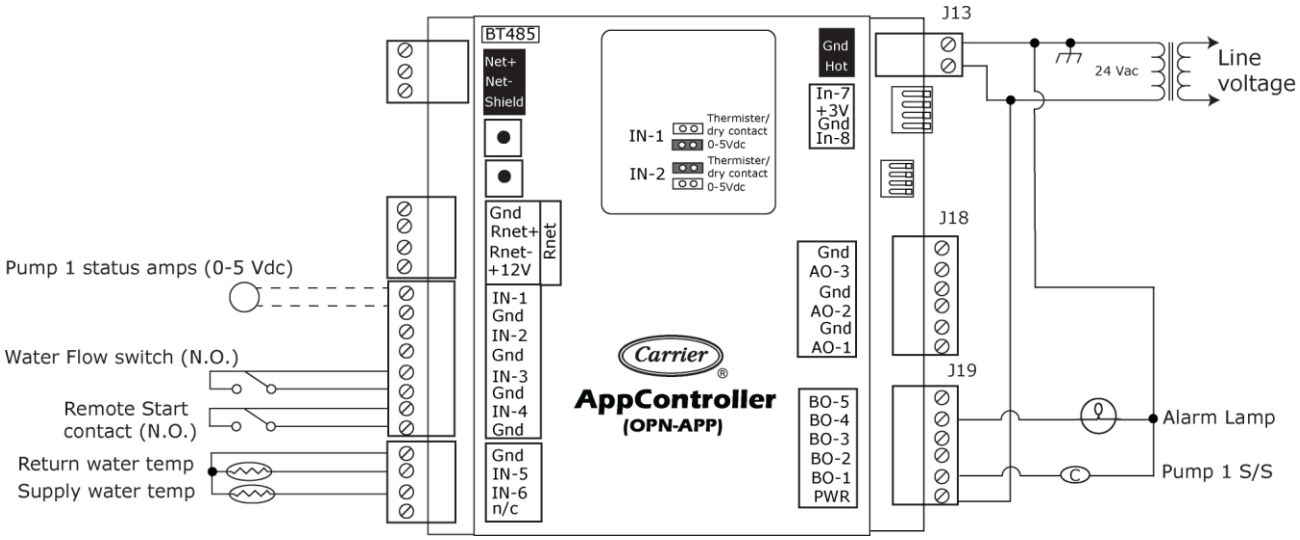
# Wiring diagram legend

| Abbreviations | |
|---|---|
| **AO** | Analog Output |
| **BO** | Binary Output (Discrete) |
| **Gnd** | Ground |
| **Hot** | 24 Vac ungrounded power |
| **IN** | Input |
| **n/c** | No connection |
| **N.C.** | Normally closed |
| **N.O.** | Normally open |
| **S/S** | Start/Stop output |
| **Temp** | Temperature |
| **Vac** | Volts (Alternating Current) |
| **Vdc** | Volts (Direct Current) |
| **VFD** | Variable Frequency Drive |

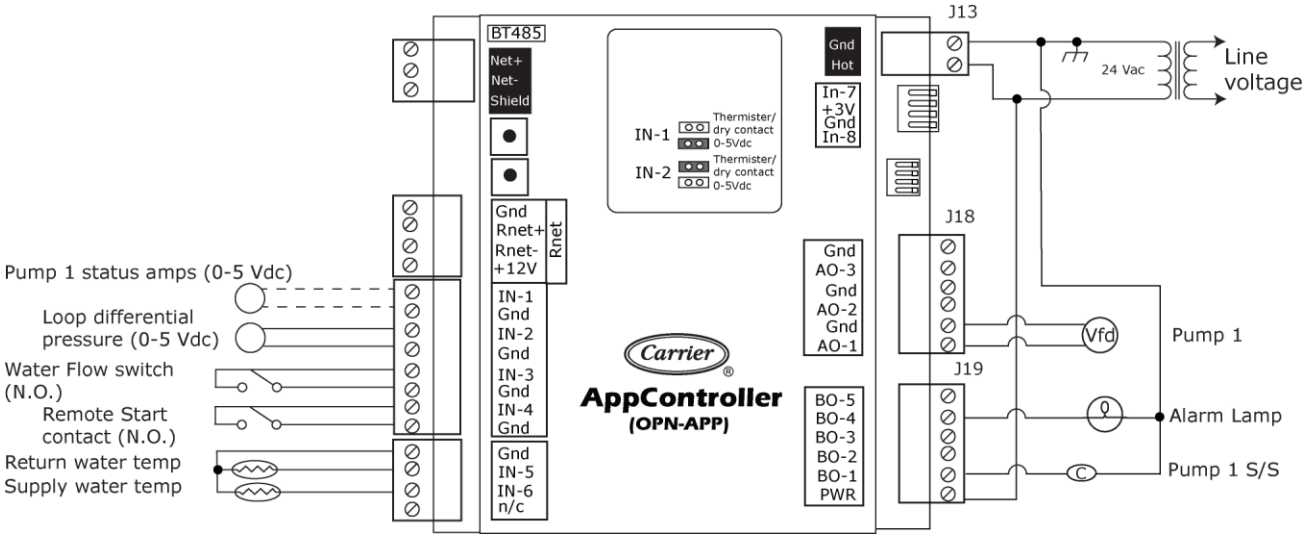
# Single pump constant speed with status switch feedback (option)



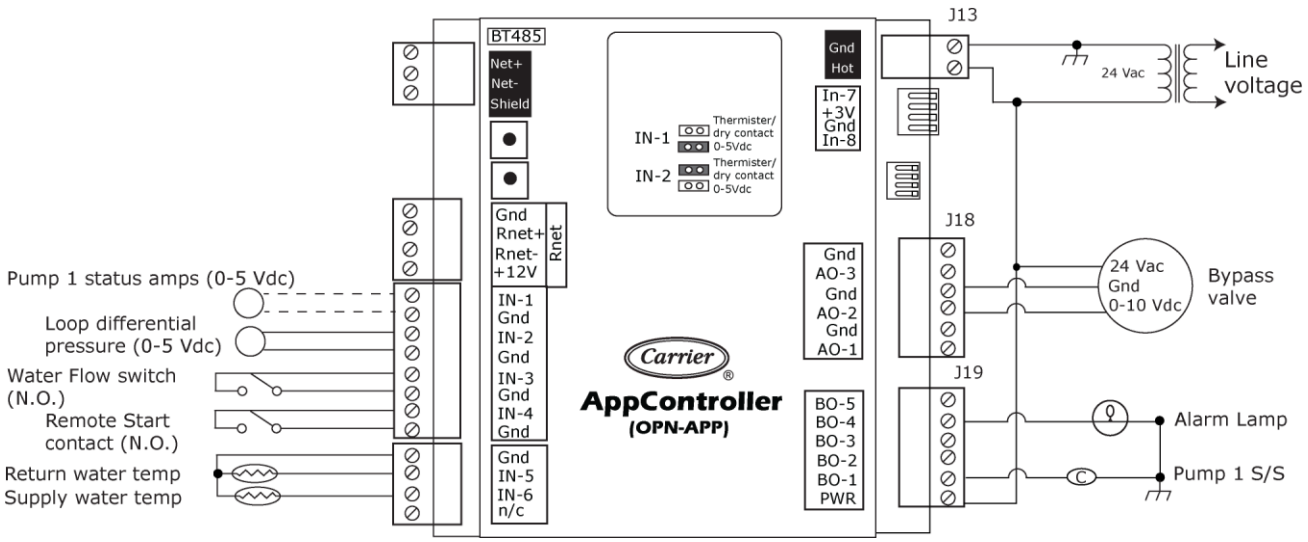
## Single pump constant speed with 0-5 Vdc amp status feedback (option)



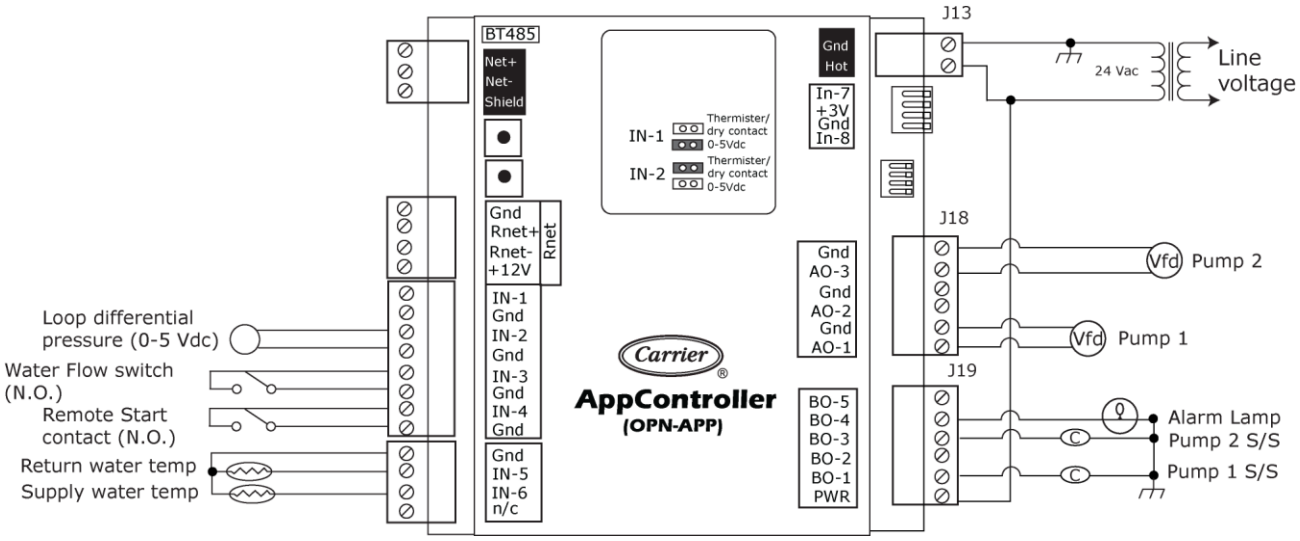

## Single pump with VFD loop differential pressure control and 0-5 Vdc amp status feedback (option)



## Single pump with bypass loop differential pressure control and 0-5 Vdc amp status feedback (option)




## 2 pumps with 2 VFDs, loop differential pressure control and no status feedback



# Start-up

Use one of the following interfaces to start up, access information, read sensor values, and test the controller.

| This interface... | Provides a... |
|---|---|
| **Field Assistant** application -<br>Runs on a laptop that connects to controller's Local Access port [1] | Temporary interface |
| **Equipment Touch** device -<br>Connects to controller's Rnet port [2] | Temporary or permanent interface |
| **i-Vu®** application<br>Available for BACnet systems only | Permanent interface |
| **System Touch** device<br>Available only for BACnet MS/TP systems.<br>Wire to a BACnet MS/TP network connector and a 24 Vac power supply [3] | Temporary or permanent interface |

[1] Requires a USB Link (Part #USB-L).
[2] See the *Equipment Touch Installation and Setup Guide* for detailed instructions.
[3] See the *System Touch Installation and Setup Guide* for detailed instructions.

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

## Select the GSLC control program and graphic

The field-installed AppController 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 and commissioning. You can select the GSLC control program and graphic from EquipmentBuilder. All the configurations that are currently available for the GSLC are included in a single download file for both the equipment and graphic.

After selecting the control program and graphic files, save and download them to the AppController. If desired, you can create a custom graphic using ViewBuilder. See ViewBuilder Help for details.

## Configure the controller's properties

You must configure certain points and properties. *Appendix C* (page 31) 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 your necessary points/properties in the following:

- Unit Configuration
- Setpoints
- Service Configuration

Examples of some settings that you need to configure for start-up are the **Number of Pumps**, **Pump Control**, and **Pump Staging**, found in the **Service Configuration** (page 35) section of *Appendix C* (page 31).

# Sequence of Operation

The Ground Source Loop Control (GSLC) is an application that is designed to control the pump operation in a ground source heat pump system. The pumps provide water loop circulation while the ground source loop supplies or removes energy from the source water for the heat pumps. The GSLC can control one pump or two pumps in a constant-flow application, or up to two pumps in a variable-flow source water application, maintaining the loop pressure differential setpoint.

The GSLC supports Carrier Condenser Water Linkage between Carrier Open WSHP units and the GSLC. When Linkage is active, the loop controller responds to the demands for heating or cooling from the Open WSHPs and will operate the pump(s) when required. The system provides closed loop feedback to the individual WSHPs by confirming source water availability prior to operating any compressors in the Carrier Open WSHPs. Also the GSLC receives the acceptable range of the source water temperature from the Carrier Open WSHPs and verifies that the water provided is within the required operating temperature range.

The GSLC may also be used as a standalone loop control without Carrier Linkage and utilize a third party BACnet system for control or operate in a standalone mode providing a hardwire binary input to command the loop pump operation and a hardwire binary output (WSHP Comp Command) to confirm successful loop operation.

The following sections describe the GSLC's functionality. All points in this sequence of operation refer to the Equipment Touch, i-Vu®, or Field Assistant interface.

## Scheduling without Condenser Water Linkage

### Scheduling

The GSLC MUST be occupied for loop pump operation. The occupied time periods define when the pump(s) operate. The GSLC operates the pumps continuously during the occupied period.

You must provide a source for occupancy by:

- configuring a **Time Schedule**
- mapping **System Occupancy** to a BACnet point
- utilizing the **Remote Contact Input**
- using a third party control system that **Enables/Disables** the **BAS On/Off** point
- setting the local time and date for the schedule to function and operate properly

You can change the occupancy source to one of the following:

- **Occupancy Schedules**

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

  **NOTE** You must **Enable** this point in order for the Equipment 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 Equipment Touch, Field Assistant, or the i-Vu® application. The daily schedule consists of a start and stop time (standard or 24-hour mode) and 7 days of the week, starting with Monday and ending on Sunday. Enable the **Occupancy Schedules** to use the occupancy scheduling.

- **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 GSLC. 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, you must 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. See *Device Address Binding* (page 6) to configure the **System Occupancy** point.

  **NOTE** Scheduling can only be controlled from one source.

# Scheduling with Condenser Water Linkage

When the GSLC is part of a Carrier Open WSHP system and **Condenser Water Linkage** is active, you can configure how the loop pumps operate. The system can be configured to start the pumps only on a heating or cooling demand from any of the Carrier WSHPs linked to the GSLC by setting the **Pump Start** to **Demand**.

You can configure it to operate the loop pumps on any demand and/or continuously during the occupied period, as defined by the Open WSHPs' schedules that are connected through Linkage. No local occupancy scheduling is available when Linkage is active.

# Constant flow pump control

You can configure the GSLC to operate 1 or 2 constant speed loop pumps.

When power is reapplied after a power outage, there is a user-configurable delay of 5 - 600 seconds (default 5) before starting any pump. You must configure **Power Fail Restart Delay** to define the delay time (0 - 600 seconds, default 5) before the pump begins to operate after power has been restored to the controller.

If the **Shutdown** input is active, the pump is shut down after the **Pump Stop Delay** expires, regardless of occupancy state. Otherwise, the pump will operate whenever the occupancy state is determined to be occupied.

**Pump Status** (**Option**) - An optional hardware input is available for each pump. You can configure it as either an analog input to detect pump status by measuring the pump current or as a binary input to measure pump state as a discrete input (on/off). Configure each pump separately. Also, there is a Network Status input to read the pump status, if available (See Device Address Binding).

Pump status options include:

- **Switch**
- **Amperage**
- **Network**
- **None**

If the pump status is not configured as None, the controller compares the status of the pump to the desired commanded state. When the pump is commanded to run (ON), the pump status is checked and verified to match the commanded state. If the pump status is not on, then a **Pump 'n' Fail** Alarm ('n' indicates the pump number) is generated after 30 seconds. When the pump is commanded OFF, if the pump status is still on, then a **Pump 'n' in Hand Alarm** is generated after 30 seconds.

# Loop pump(s) constant flow

The GSLC operates one or two pumps in constant flow mode to provide source water for the water source heat pumps. For a single pump application, the pump operates as a lead pump whenever the GSLC is in an occupied mode. For two-pump systems, the GSLC is automatically configured to operate the pumps as lead/standby, where the second pump is available as a spare if the lead pump fails.

The following conditions must be true in order for the cooling algorithm to run:

- GSLC is occupied (standalone) or a pump requirement is received from Linkage
- The Shutdown input is not active

If the above conditions are met, the pump is energized, otherwise it is disabled. After the pump output is enabled, if a pump status type is configured, then the pump status will be checked to verify that the actual pump operation matches the commanded state. For two-pump systems, if a pump failure is detected, the GSLC energizes the standby pump and verifies its operation if a pump status type has been selected. An alarm is generated for any pump that has failed.

## Loop Pump(s) with bypass valve differential pressure control

The GSLC operates 1 or 2 constant speed pumps in variable flow mode using a bypass valve to control the loop differential pressure and provide source water for the water source heat pumps. For a single pump application, the pump operates as a lead pump whenever the GSLC is in an occupied mode. For 2-pump systems, the GSLC is automatically configured to operate the pumps as lead/standby, where the second pump is available as a spare if the lead pump fails. When the pumps are required to operate, the GSLC monitors the differential loop pressure input and adjusts the bypass valve position to maintain the required loop pressure to meet the desired setpoint.

The following conditions must be true in order for the cooling algorithm to run:

- GSLC is occupied (standalone) or a pump requirement is received from Linkage.
- The **Shutdown** input is not active
- The loop differential pressure input is valid

If the above conditions are met, the pump is energized, otherwise it is disabled. After the pump output is enabled, if a pump status type is configured, then the pump status will be checked to verify that the actual pump operation matches the commanded state. For 2-pump systems, if a pump failure is detected, the GSLC will energize the standby pump and verify its operation if a pump status type has been selected. An alarm is generated for any pump that has failed.

After enabling the pump, the bypass is commanded to the full bypass position. The loop differential pressure is then compared to the desired loop pressure setpoint and a PID calculates the bypass valve position required to meet the loop pressure setpoint.

## Loop Pump(s) with VFD loop differential pressure control

The GSLC operates 1 or 2 pumps in variable flow mode using a VFD to control pump speed and provide source water for the water source heat pumps. For a single pump application, the pump operates as a lead pump whenever the GSLC is in an occupied mode. For 2-pump systems, when the GSLC is configured to operate the pumps as lead/standby, the second pump is available as a spare if the lead pump fails. When the pumps are required to operate, the GSLC monitors the differential loop pressure input and adjusts the speed of the lead pump to provide the required loop pressure to meet the desired setpoint.

The following conditions must be true in order for the cooling algorithm to run:

- GSLC is occupied (standalone) or a pump requirement is received from Linkage
- The **Shutdown** input is not active
- The loop differential pressure input is valid

If the above conditions are met, the pump is energized. Otherwise, it is disabled. After the pump output is enabled, if a pump status type is configured, then the pump status is checked to verify that the actual pump operation matches the commanded state. For 2-pump systems, if a pump failure is detected, the GSLC energizes the standby pump and verifies its operation, if a pump status type has been selected. An alarm is generated for any pump that has failed.

After enabling the pump, the VFD is commanded to the user-configured **Min VFD Output** speed. The loop differential pressure is then compared to the desired loop pressure setpoint and a PID calculates the required pump speed to meet the setpoint.

# Two loop pumps with VFDs, lead/lag operation for loop differential pressure control

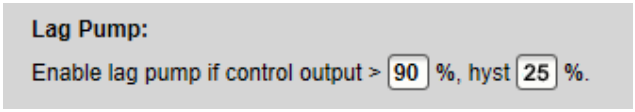
The GSLC operates 2-staged pumps in variable flow mode using a VFD to control pump speed and provide source water for the water source heat pumps. For staged operation, the GSLC Pump Staging must be set to lead/lag, which uses the second pump as a lag pump for additional flow capacity. When the pumps are required to operate, the GSLC monitors the differential loop pressure input and adjusts the number of operating pumps and the speed of the pumps to provide the required loop pressure to meet the desired setpoint.

The following conditions must be true in order for the cooling algorithm to run:

- GSLC is occupied (standalone) or a pump requirement is received from Linkage
- The **Shutdown** input is not active
- The loop differential pressure input is valid

If the above conditions are met, the lead pump is energized, otherwise all pumps are disabled. After the lead pump output is enabled, if a pump status type is configured, then the pump status will be checked to verify the actual pump operation matches the commanded state. If a pump failure is detected, the GSLC will energize the lag pump and verify its operation if a pump status type has been selected. An alarm is generated for any pump that has failed.

After enabling the lead pump, the VFD is commanded to the user-configured **Min VFD Output** speed. The loop differential pressure is then compared to the desired loop pressure setpoint and a PID calculates the required pump speed to meet the setpoint. If the lead pump speed increases above the user-configured setpoint to enable the lag pump (90% default), then the lag pump starts and slowly begins to ramp up to the current VFD commanded output speed. The PID monitors the loop pressure and, as the lag pump increases speed and the loop pressure increases, the PID output is reduced, as necessary, until both pumps achieve the same operating speed.




If the loop flow requirement is reduced, and if both pumps are operating and the VFD speed drops below 65% (the user-configured setpoint minus the configured hysteresis), then the lag pump is disabled.

# Pump rotation

The ability to rotate pumps is available for any application with 2 pumps. Pump rotation is user-configured. The following options are available:

- Daily
- Weekly
- Monthly
- Manual Rotation
- Runtime
- Never Rotate

If you select daily, weekly, or monthly, the lead and standby or lag pump rotates as scheduled and on the configured day and time. If you select manual rotation, you must rotate the pumps manually by selecting **Rotate** from the drop-down menu. If you select **Runtime**, the pumps automatically rotate after the lead pump operating hours reach the configured number of hours.

## Alarm lamp output

The controller has a binary output that can be connected to a local alarm lamp to indicate a problem with loop flow, the loop pumps, or the source water supply temperature.

If Linkage is inactive, the alarm output is activated whenever the source water supply temperature exceeds the configured **Maximum Source Water Temp** or drops below the configured **Minimum Source Water Temp**. It will also be activated whenever the pumps are commanded to operate and loop flow is not detected or if any pump fails.

If Linkage is active, the alarm output is activated using the same criteria as above, except the source water supply temperature is compared to the minimum and maximum allowable source water temperature limits received from the Open WSHPs through Linkage, rather than the configured values.

## WSHP compressor enable command output

The GSLC has a binary output that can be used to interlock the operation of the connected WSHP equipment in standalone application without Linkage. The output determines when the individual WSHP units can safely operate.

The output is activated whenever the pumps are commanded to run and flow has been detected via the Source Water Flow binary input or the Network Flow input.

## Condenser Water Linkage

The GSLC receives and sends information through Condenser Water Linkage to operate the source water loop pumps in order to supply water for all the connected water source heat pumps. The GSLC receives the WSHP equipment operating water temperature limits, occupancy, and the total demand for both heating and cooling from all the system equipment.

# Troubleshooting

If you have problems mounting, wiring, or addressing the controller, contact Carrier Control Systems Support.

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

## 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.

Verify the LED patterns by cycling power to the controller and noting the lights and flashes.

| LEDs | Status |
|---|---|
| Power | Lights when power is being supplied to the controller.<br>**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 from the network segment; there is an Rx 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 | 4 flashes, then pause | Two or more devices on this network have the same 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:<br>• Controller halted<br>• Program memory corrupted<br>• 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:<br>• Turn the controller off, then on.<br>• Download memory to the controller.<br>• Replace the controller. |

**NOTE** If you resolve the issue but the **Error** LED does not turn off, cycle power to the controller.

## Serial number

If you need the controller's serial number when troubleshooting, the number is on a sticker on the back of the main controller board.

## To replace the controller's battery

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

**CAUTION** Power must be **ON** to the controller 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 controller.

# 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

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

# Appendix A: GSLC wire list

| Open System Network - GSLC | |
|---|---|
| Project Name:<br>Location: | Controller:<br>Network Number:<br>MAC Address: |

 Thermistor/dry contact  0-5Vdc

| Point/ Cable# | Inputs (+) | (G) | Input Type | Jumper Position of Pins | I/O | Sensor code | Equipment Name | Point Name |
|---|---|---|---|---|---|---|---|---|
| | IN-1 | Gnd | Therm/Dry Contact | Upper | IN-1 | | | |
| | IN-1 | Gnd | 0-5Vdc | Lower | | | | |
| | IN-2 | Gnd | Therm/Dry Contact | Upper | IN-2 | | | |
| | IN-2 | Gnd | 0-5Vdc | Lower | | | | |
| | IN-3 | Gnd | Therm/Dry Contact | N/A | IN-3 | | | |
| | IN-4 | Gnd | Therm/Dry Contact | N/A | IN-4 | | | |
| | IN-5 | Gnd | Therm/Dry Contact | N/A | IN-5 | | | |
| | IN-6 | Gnd | Therm/Dry Contact | N/A | IN-6 | | | |
| | IN-7 | | Unused | | | | | |
| | IN-8 | | Unused | | | | | |

| Point/ Cable# | Outputs (+) | COM | B-Output Type | Jumper Position of Pins | I/O | Sensor code | Equipment Name | Point Name |
|---|---|---|---|---|---|---|---|---|
| | AO-1 | Gnd | N/A | N/A | AO-1 | | | |
| | AO-2 | Gnd | N/A | N/A | AO-2 | | | |
| | AO-3 | Gnd | N/A | N/A | AO-3 | | | |
| | BO-1 | Pwr | N.O. | N/A | BO-1 | | | |
| | BO-2 | Pwr | N.O. | N/A | BO-2 | | | |
| | BO-3 | Pwr | N.O. | N/A | BO-3 | | | |
| | BO-4 | Pwr | N.O. | N/A | BO-4 | | | |
| | BO-5 | Pwr | N.O. | N/A | BO-5 | | | |

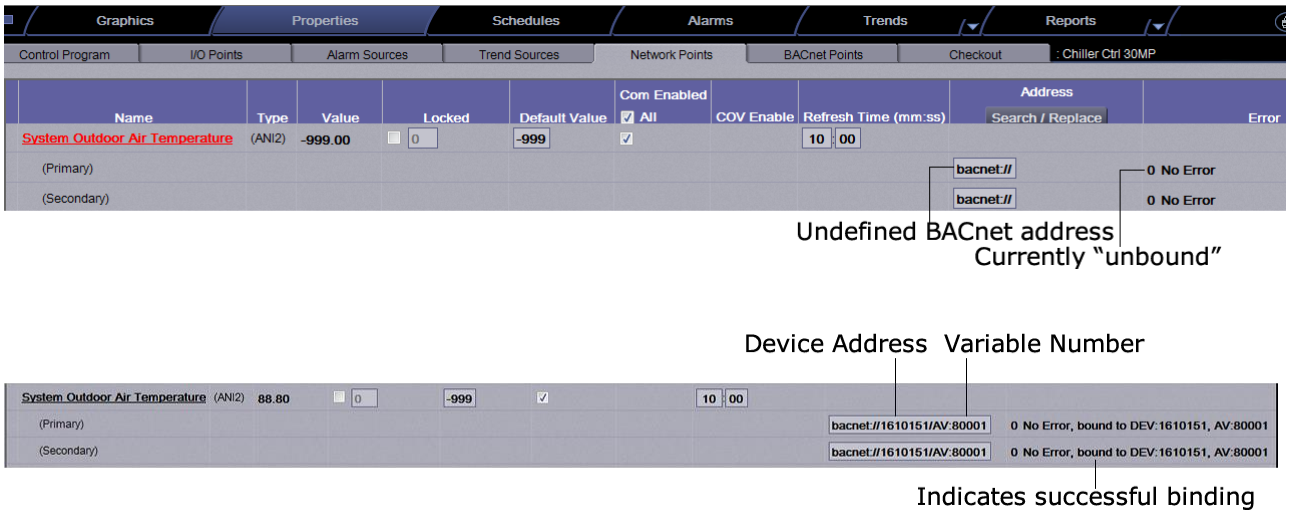
# Appendix B: Device Address Binding

**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 you must configure.

Currently, the controller implements DAB for the following variables:

- **System Outdoor Air Temperature**
- **System Occupancy**
- **System Water Differential Pressure**
- **Network Flow Input**
- **Pump 1 Network Status**
- **Pump 2 Network Status**

You can implement DAB 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 example below.



# Appendix C: GSLC Points/Properties

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

**NOTE** Some of the properties are available only when other settings have been enabled. For example, **Service Configuration** > **Pump 2 Network Status** is visible only when **Service Configuration** > **Number of Pumps** is set to **Two** and **Service Configuration** > **Pump Status Type** is set to **Network (3)**.

See *Appendix D* (page 43) for the points and properties available on the Equipment Touch interface.

**NOTE** Engineering units shown in this document in the defaults and ranges are strictly for reference. You must enter an integer only.

## Status

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

| Point Name/Description | Range |
|---|---|
| **Run Status** – The controller's status. | R: Off/On |
| **Source Water Supply Temp –** The water temperature entering the WSHP. | R: -56 to 245 °F |
| **Source Water Return Temp –** The water temperature returning from the WSHP. | R: -56 to 245 °F |
| **Pump 1 Operation Status** – Pump 1's status. | R: Off - OK to Run<br>On as Lead<br>Waiting in Standby<br>On as Replacement<br>Running as Lag<br>Failed |
| **Pump 1 VFD Speed** – The current commanded speed of the VFD. | R: 0 to 100% |
| **Pump 2 Operation Status** – Pump 2's status. | R: Off - OK to Run<br>On as Lead<br>Waiting in Standby<br>On as Replacement<br>Running as Lag<br>Failed |
| **Pump 2 VFD Speed** – The current commanded speed of the VFD. | R: 0 to 100% |
| **Delta Pressure** – The differential pressure between the supply and return pipes. | R: 0 to 100% |
| **Bypass Valve Percent** – The percent the bypass value is open or closed. | R: 0 to 100% |
| **Outdoor Air Temperature** – The outdoor air temperature used for control. | R: -56 to 245 °F |
| **Shutdown** – When **Active**, provides a means to stop the operation of the control in an orderly manner. All alarms are reset and current active alarms are displayed. | R: Inactive/Active |

# Unit Configuration

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

| Point Name/Description | Range |
|---|---|
| **On** – **Off** – **Auto** – HOA switch<br><br>**Auto** – The pumps cycle on and off based on demand or occupancy<br>**Off** – Unit is locked off.<br>**On** – Unit is locked on. | D: Auto<br><br>R: Auto<br>Off<br>On |
| **Pump Start** – Enables or disables the pumps based on demand only or on occupancy-or-demand. This parameter is only applicable to systems using Carrier Condenser Water Linkage and when Linkage is active. | D: Demand Only<br><br>R: Demand Only<br>Occ or Demand |
| **Minimum Heat Pump Demand** – Number of requests required to start the pumps. This parameter is only applicable to systems using Carrier Condenser Water Linkage and when Linkage is active. | D: 0<br><br>R: 0 - 100 |
| **Power Fail Restart Delay** – How long the controller delays normal operation after the power is restored. Typically used to prevent excessive demand when recovering from a power failure. | D: 5 seconds<br><br>R: 0 to 600 seconds |
| **Pump Stop Delay** – The number of minutes the pump continues to run after the system goes unoccupied (w/ Condenser Water Linkage - and/or all heating or cooling demands have been satisfied). | D: 15 minutes<br><br>R: 0 to 9999 minutes |
| **Occupancy Schedules** – If enabled, the unit runs as occupied 24/7 until either the occupancy schedule or another occupancy control is configured. Enables or disables the occupancy schedule function. | D: Enable<br><br>R: Disable/Enable |
| **Rotation Method** | |
| **Rotation Method**<br><br>**Daily** – Rotates the pumps daily at a specified time.<br>**Weekly** – Rotates the pumps weekly on a specified day and time.<br>**Monthly** – Rotates the pumps monthly on a specified day and time.<br>**Manual Rotation** – Manually rotates the pumps when the operator commands it.<br>**Runtime** – Rotates the pumps after the lead pump reaches a specified number of runtime hours.<br>**Never Rotate** – Does not allow the pumps to rotate. | D: Daily<br><br>R: Daily<br>Weekly<br>Monthly<br>Manual Rotation<br>Runtime<br>Never Rotate |

<table>
<tr><th>Point Name/Description</th><th>Range</th></tr>
<tr><td>Rotation Method Parameters – Specify further details of the selected method.
<table>
<tr><th>Method</th><th>Enter...</th><th></th><th></th></tr>
<tr><td>Daily</td><td>time of the day to rotate the lead pump<br>NOTE Enter the time of day in Defined Time for Rotation. The time of day you specify is used during a weekly or monthly rotation.</td><td>D:<br>R:</td><td>13:00<br>00:00 to 23:59</td></tr>
<tr><td>Weekly</td><td>day of the week to rotate the lead pump performed at the time of day specified in Defined Time for Rotation</td><td>D:<br>R:</td><td>3 (Wednesday)<br>1 to 7 (Monday to Sunday)</td></tr>
<tr><td>Monthly</td><td>day of the month to rotate the lead pump performed at the time of day specified in Defined Time for Rotation</td><td>D:<br>R:</td><td>1<br>1 to 31</td></tr>
<tr><td>Manual Rotation</td><td>manually rotate the lead pump</td><td>D:<br>R:</td><td>Do not Rotate<br>Rotate<br>Do Not Rotate</td></tr>
<tr><td>Runtime</td><td>number of runtime hours before rotating the lead pump</td><td>D:<br>R:</td><td>360 hrs<br>24 - 9999 hrs</td></tr>
<tr><td></td><td>Runtime since last rotation:<br>- Pump 1<br>- Pump 2</td><td><br>R:<br>R:</td><td><br>0 - 360 hrs<br>0 - 360 hrs</td></tr>
</table>
</td><td></td></tr>
</table>

# Setpoints

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

| Point Name/Description | Range |
|---|---|
| **Source Loop Diff Press. Setpoint –** The differential pressure setpoint maintained by the bypass valve or the pump's VFD (Variable Frequency speed Drive). | D: 15 psi<br>R: 0 to 9999 psi |
| **Lag Pump** | |
| Enables lag pump if VFD is greater than this setpoint. | D: 90%<br>R: 0 to 100% |
| Disables lag pump when VFD output falls below. | D: 25%<br>R: 10 to 65% |

# Alarm Configuration

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

| Point Name/Description | Range |
|---|---|
| **Maximum Source Water Temp** – The value that the source water temperature must exceed to generate a **High Source Water Temp Alarm**. | D: 90°F<br>R: 0 to 999°F |
| **Minimum Source Water Temp** – The value that the source water temperature must drop below to generate a **Low Source Water Temp Alarm**. | D: 60°F<br>R: 0 to 999°F |
| **Differential Pressure Alarm Hysteresis** – The value that the differential pressure must change from the alarm setpoint to release a **High or Low Differential Pressure Alarm**. | D: 5 psi<br>R: 0 to 999 psi |
| **Pump 1 Status Alarm(s)** – Generates a **Pump Fail Alarm** if the feedback status of pump 1 has not turned on after it has been enabled. If the status is on, and the pump has not been enabled, it will enable the **Pump in Hand Alarm**. | D: 30 seconds<br>R: 0 to 9999 seconds |
| **Pump 1 Runtime Alarm** – The value that the runtime must exceed to generate a Runtime Alarm. | D: 10000 hr<br>R: 0 to 99999 hr |
| **Pump 2 Status Alarm(s)** – Generates a **Pump Fail Alarm** if the feedback status of pump 2 has not turned on after it has been enabled. If the status is on and the pump has not been enabled, it will enable the **Pump in Hand Alarm**. | D: 30 seconds<br>R: 0 to 9999 seconds |
| **Pump 2 Runtime Alarm** – The value that the runtime must exceed to generate a Runtime Alarm. | D: 10000 hr<br>R: 0 to 99999 hr |
| **Main Loop Flow Status Alarm(s)** – If the pumps have been enabled to run, and the flow does not turn on after the specified time, it will generate a **No Water Flow & Shutdown Alarm**. | D: 180 seconds<br>R: 0 to 9999 seconds |
| **Disabled Pumps should the loop lose main CW flow** – Will disable all pumps if there is no flow. You must manually reset the system. | D: Yes<br>R: No/Yes |

# Service Configuration

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

| Point Name/Description | Range |
|---|---|
| **Number Of Pumps** – The number of pumps in the system. | D: One<br>R: One<br>Two |
| **Pump Status Type** – The type of status that the pumps deliver to the loop controller to indicate they are on. | D: Switch<br>R: Switch<br>Amperage<br>Network<br>None |
| **Pump Control** – This is the type of pump being controlled.<br>**Constant Volume** – Turns the pump on and leaves it on until scheduled to turn off or the demand has been satisfied.<br>**Constant Vol w/Bypass** – Turns the pump on and then maintains a differential pressure with the bypass valve.<br>**Vfd** – Turns the pump on and maintains a differential pressure by modulating the speed of the Vfd. | D: Constant Volume<br>R: Constant Volume<br>Constant Volume w/Bypass<br>Vfd |
| **Pump Staging** – If there are 2 pumps, this type of staging enables or disables the pumps, based on **Demand Only** or **Occ or Demand** (set in **Unit Configuration**).<br>**Lead/Standby** - One pump runs as the lead pump and the other pump waits in standby.<br>**Lead/Lag** – One pump runs as the lead pump and, if the pressure is not maintained, brings the second pump on as the lag pump. (Only available if **Pump Control** is set to **Two VFDs**) | D: Lead/Standby<br>R: Lead/Standby<br>Lead/Lag |
| **Remote Contact Unocc Logic State** – Sets the remote contact's normal logic state. | D: Open<br>R: Open/Closed |
| **Flow Type** – Sets the flow input's normal logic state. | D: Normal<br>R: Normal<br>Inverted |
| **Pressure Sensor Min Input Volts** – The lowest voltage that should be read from the pressure sensor. | D: 0.00 V<br>R: 0 to 5.00 V |
| **Pressure Sensor Max Input Volts** – The highest voltage that should be read from the pressure sensor. | D: 5.00 V<br>R: 0 to 5.00 V |
| **Pressure Sensor Value @ Min Volts** – The psi value that correlates to the pressure sensor's low voltage. | D: 0.00 psi<br>R: 0 to 9999.00 psi |
| **Pressure Sensor Value @ Max Volts** – The psi value that correlates to the pressure sensor's high voltage. | D: 30.00 psi<br>R: 0 to 9999.00 psi |
| **Pump 1 Trip Point** – Determines when Pump 1 is on.<br>**Configuration** > **Service Configuration** > **Pump Status Type** must be set to **Amps**. | D: 3.00 A<br>R: 0 to 9999.00 A |

| Point Name/Description | Range |
|---|---|
| **Pump 1 Sensor Min Input Volts** – The lowest voltage that should be read from the pump feedback.<br>**Configuration** > **Service Configuration** > **Pump Status Type** must be set to **Amps**. | D: 0.00 V<br>R: 0 to 5.00 V |
| **Pump 1 Sensor Max Input Volts** – The highest voltage that should be read from the pump feedback.<br>**Configuration** > **Service Configuration** > **Pump Status Type** must be set to **Amps**. | D: 5.00 V<br>R: 0 to 5.00 V |
| **Pump 1 Sensor Value @ Min Volts** – The amps value that correlates to the pump feedback's low voltage.<br>**Configuration** > **Service Configuration** > **Pump Status Type** must be set to **Amps**. | D: 0.00 A<br>R: 0 to 9999.00 A |
| **Pump 1 Sensor Value @ Max Volts** – The amps value that correlates to the pump feedback's high voltage.<br>**Configuration** > **Service Configuration** > **Pump Status Type** must be set to **Amps**. | D: 60.00 A<br>R: 0 to 9999.00 A |
| **Pump 2 Trip Point** – Determines when Pump 2 is on.<br>**Configuration** > **Service Configuration** > **Pump Status Type** must be set to **Amps**. | D: 3.00 A<br>R: 0 to 9999.00 A |
| **Pump 2 Sensor Min Input Volts** – The lowest voltage that should be read from the pump feedback.<br>**Configuration** > **Service Configuration** > **Pump Status Type** must be set to **Amps**. | D: 0.00 V<br>R: 0 to 5.00 V |
| **Pump 2 Sensor Max Input Volts** – The highest voltage that should be read from the pump feedback.<br>**Configuration** > **Service Configuration** > **Pump Status Type** must be set to **Amps**. | D: 5.00 V<br>R: 0 to 5.00 V |
| **Pump 2 Sensor Value @ Min Volts** – The amps value that correlates to the pump feedback's low voltage. | D: 0.00 A<br>R: 0 to 9999.00 A |
| **Pump 2 Sensor Value @ Max Volts** – The amps value that correlates to the pump feedback's high voltage. | D: 60.00 A<br>R: 0 to 9999.00 A |
| **Pump 1 VFD Output** – Used to determine VFD output signal range. | D: 0-10 Vdc<br>R: 0-10 Vdc<br>2-10 Vdc |
| **Pump 2 VFD Output** – Used to determine VFD output signal range. | D: 0-10 Vdc<br>R: 0-10 Vdc<br>2-10 Vdc |
| **Bypass Output** – Used to determine Bypass output signal range. | D: 0-10 Vdc<br>R: 0-10 Vdc<br>2-10 Vdc |
| **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<br>R: N/A |
| **Source Water Diff. Pressure –** Allows using another controller's differential pressure sensor from the network. The remote controller must have a network-accessible differential pressure sensor value. | D: -999.00 psi<br>R: N/A |

| Point Name/Description | Range |
|---|---|
| **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<br>R: Unoccupied/Occupied |
| **Network Flow Input** – Allows using another controller's flow sensor value over the network. The remote controller must have a network-accessible flow sensor value. | D: No Flow<br>R: No Flow/Flow |
| **Pump 1 Network Status** – Allows using another controller's Pump 1 status value over the network. The remote controller must have the point network-accessible. | D: Off<br>R: Off/On |
| **Pump 2 Network Status** – Allows using another controller's Pump 2 status value over the network. The remote controller must have the point network-accessible. | D: Off<br>R: Off/On |
| **Pump 1 Network S/S** – Provides the ability to transfer the desired state of Pump 1 to an external controller or the pump directly. The remote point to receive this state must have network-accessibility. | D: Off<br>R: Off/On |
| **Pump 2 Network S/S** – Provides the ability to transfer the desired state of Pump 2 to an external controller or the pump directly. The remote point to receive this state must have network-accessibility. | D: Off<br>R: Off/On |
| **Pump 1 VFD Network Output** – Provides the ability to transfer the desired speed of the Pump 1 VFD to an external controller or the VFD directly. The remote point to receive this state must have network-accessibility. | D: 0%<br>R: 0 to 100% |
| **Pump 2 VFD Network Output** – Provides the ability to transfer the desired speed of the Pump 2 VFD to an external controller or the VFD directly. The remote point to receive this state must have network-accessibility. | D: 0%<br>R: 0 to 100% |
| **Byp Vlv Network Output** – Provides the ability to transfer the desired position of the bypass valve to an external controller or the valve directly. The remote point to receive this state must have network-accessibility. | D: 0%<br>R: 0 to 100% |

| Point Name/Description | Range |
|---|---|
| **Lockout** | |
| **Lockout** – If disabled, allows pumps to continue to cycle until either pump status is attained. If enabled it will lockout out the pumps after they have failed 3 (default value) consecutive times | D: Disabled<br>R: Enabled/Disabled |
| **Manually release lockout?** – If the pump lockout is enabled and the pumps are locked out, you can manually release the lockout. | D: Off<br>R: Off/On |
| **Loop Bypass PID** – This Bacnet Object determines what the bypass valve target setpoint should be. **Configuration** > **Service Configuration** > **Pump Control** must be set to **Constant Volume w/Bypass**.<br>**NOTE** The default values should be changed only by a technician trained in PID Loop algorithms<br>**Action**<br>**Update Interval**<br>**Proportional**<br>**Integral**<br>**Derivative**<br>**Deadband**<br>**Bias** | R: direct<br>1.00<br>10<br>2<br>0<br>0<br>30 |
| **Bypass Valve Type** – Defines the normal position of the Bypass valve with no signal. Configuration > **Service Configuration** > **Pump Control** must be set to **Constant Volume w/Bypass**. | D: Normally Closed<br>R: Normally Closed<br>Normally Open |
| **VFD PID** – This Bacnet Object determines what the variable frequency drive target setpoint should be. **Configuration** > **Service Configuration** > **Pump Control** must be set to **Constant Volume w/Bypass**.<br>**NOTE** The default values should be changed only by a technician trained in PID Loop algorithms<br>**Action**<br>**Update Interval**<br>**Proportional**<br>**Integral**<br>**Derivative**<br>**Deadband**<br>**Bias** | R: direct<br>1.00<br>10<br>5<br>0<br>0<br>30 |
| **Minimum VFD Output** – The minimum output signal the control supplies to the VFD as a percentage of its range. The balancer can set this to adjust the unit's minimum flow. | D: 20%<br>R: 0 to 50% |

# Maintenance

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

| Point Name/Description | Default/Range |
|---|---|
| **Unit** | |
| **Pump 1 Status –** Pump 1's status. | R: On/Off |
| **Pump 2 Status –** Pump 2's status. | R: On/Off |
| **Pump 1 Amps –** The amps from pump 1 entering the loop controller. | R: 0 to 60.0 A |
| **Pump 2 Amps –** The amps from pump 2 entering the loop controller. | R: 0 to 60.0 A |
| **Loop Status / Cmpr Operation –** Displays if the loop conditions are conducive for the WSHP units to run their compressors. | R: Not OK to run WSHP compressors / OK to run WSHP compressors |
| **Outdoor Air Temperature** | |
| **Outdoor Air Temperature Source** – The source of the OAT value.<br>States:<br>**N/A** – No sensor value associated with this device<br>**Local** – A physical sensor is wired and connected to the appropriate input channel of this controller<br>**Network** – A network sensor value provided to this controller<br>**Linkage** – The sensor value from an active Linkage connection, such as Airside Linkage.<br>**Locked Value** –The controller's sensor input is manually locked to a specific value | R: N/A<br>Local<br>Network<br>Linkage<br>Locked Value |
| **System Outdoor Air Temperature** – Allows another controller or third party BAS to write the value of the OAT to this controller. Requires that the controller is equipped with an the outdoor air temperature sensor. This point is written to by the BACnet network every 10 to 15 minutes. | D: -999.00°F<br>R: N/A |
| **Outdoor Air Temperature** – The outdoor air temperature used for control. | R: -56 to 245°F |
| **Occupancy** | |
| **Remote Contact Input –** The current status of **Input Channel #4**. | R: Open/Closed |
| **BAS On/Off** – Determines the controller's occupancy state and can be set over the network by another device or third party BAS.<br>Options:<br>**Inactive** – Occupancy is determined by a configured schedule<br>**Occupied** – The controller is always in the occupied mode<br>**Unoccupied** – The controller is always in the unoccupied mode | D: Inactive<br>R: Inactive<br>Occupied<br>Unoccupied |
| **System Occupancy** – The status of the **System Occupancy** network BNI2 point. | D: Unoccupied<br>R: Inactive<br>Unoccupied<br>Occupied |
| **Occupancy Contact –** The current status of **Input Channel #4** when configured as a **Remote Contact Input**. | R: Inactive<br>Active Occupied |
| **Schedules** – The current state of the controller's local occupancy schedule. | R: Unoccupied/Occupied |

# Alarms

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

| Point Name/Description | Default/Range |
|---|---|
| **Pump 1 in Hand** – Pump 1's status on, but the commanded state is off. | R: Normal/Hand |
| **Pump 1 Fail** – Pump 1's commanded state is on, but the status is off and has exceeded the feedback delay timer. | R: Normal/Hand |
| **Pump 1 Runtime** – Pump 1's runtime has been exceeded. | R: Accumulating<br>Exceeds Limit |
| **Pump 2 in Hand** – Pump 2's status is on, but the commanded state is off. | R: Normal/Hand |
| **Pump 2 Fail** – Pump 2's commanded state is on, but the status is off and has exceeded the feedback delay timer. | R: Normal/Alarm |
| **Pump 2 Runtime** – Pump 2's runtime has been exceeded. | R: Accumulating<br>Exceeds Limit |
| **Pump 1 and 2 Failed** – Pump 1 and 2 have been locked out by exceeding the attempts to start the pumps. You must manually reset them. | R: Normal/Alarm |
| **High Source Water Temperature** – Source water temperature has exceeded the high limit. | R: Normal/Alarm |
| **Low Source Water Temperature** – Source water temperature has dropped below the low limit. | R: Normal/Alarm |
| **No Water Flow** – Indicates there is no water flow detected in the system. | R: Normal/Alarm |
| **High Differential Pressure** – Differential pressure has exceeded the high limit. | R: Normal/Alarm |
| **Low Differential Pressure** – Differential pressure has dropped below the low limit. | R: Normal/Alarm |
| **Outdoor Air Temperature** – Indicates the controller is no longer receiving a valid network outdoor air temperature value. | R: Normal/Alarm |
| **Condenser Water Linkage** – Indicates if **Condenser Waterside Linkage** has failed. | R: Normal/Alarm |

# Linkage

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

| Point Name/Description | Range |
|---|---|
| **Linkage** | |
| **Linkage Equip** – (Collector) Shows the linkage information that is being sent from the WSHP to the Loop Controller. | N/A |
| **Condenser Water Linkage** – If **Active**, the controller is part of a linked system. If **Not Active**, the controller is a stand-alone device. | R: Active/Not Active |
| **Min Allowable Loop Temperature** – The minimum loop temperature that the WSHP is sending to the Loop Controller. | R: 0 to 999°F |
| **Max Allowable Loop Temperature** – The maximum loop temperature that the WSHP is sending to the Loop Controller. | R: 0 to 999°F |
| **Water Loop Temp –** The source water supply temperature of the loop. | R: °F |
| **Loop Pump Status** – The actual state of the source water loop pump(s). | R: Off/On |
| **Heat Pumps in Cool Mode –** The number of WSHP's that are currently calling for cooling operation. | R: 0 to 999 |
| **Heat Pumps in Heat Mode –** The number of WSHP's that are currently calling for heating operation. | R: 0 to 999 |

# I/O Points

The values shown on the **I/O Points Properties** page are the raw values at the I/O objects and may not match values shown on status displays that are affected by control program logic.

i-Vu® users logged in as **Power User** and above are able to edit various parameters associated with the input channels and the display names for all channels.

We strongly recommend that you leave these parameters at their defaults. I/O can only be used for the purpose designed in the equipment control program. Modifying these parameters may result in unpredictable equipment control.

**NOTES**

- Depending on the configuration of the GSLC application, the available I/O points change. For variable flow applications such as the bypass valve control or VFD pump control, the **Source Water Diff. Pressure** AI input on Channel #2 is valid and available only if the **Pump Status Type** (in *Service Configuration* (page 35)) is set to **None** or **Network**. Otherwise, you must use a network input to obtain the source water differential pressure value.
- See *Inputs and outputs table* (page 8) for more information. This table lists each of the I/O channels, their functions, associated hardware, and terminal numbers.

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

**WARNINGS**

- 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.

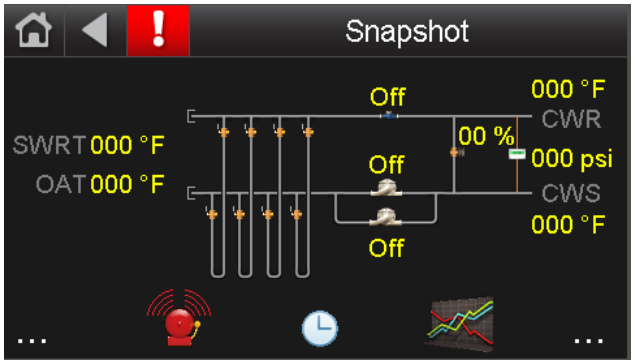
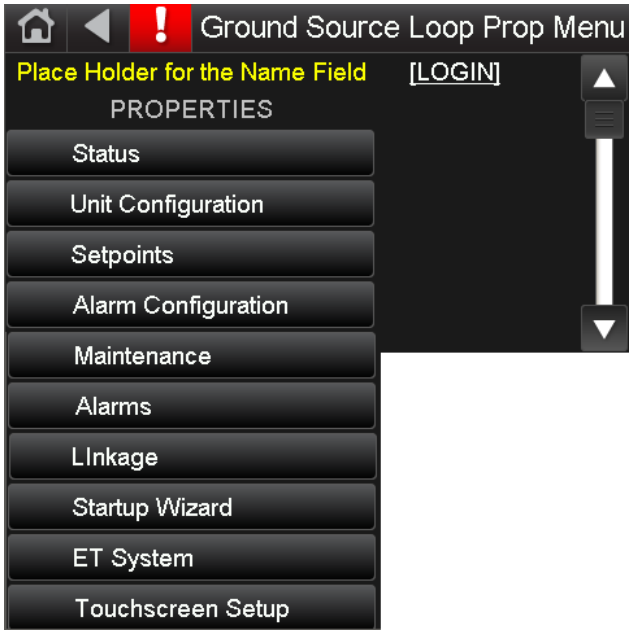
| **Point Name/Description** | |
|---|---|
| **Pump 1 Amp Sensor –** The current voltage of the controller's pump 1 amp input. | R: 0 to 5 Volt |
| **Pump 2 Amp Sensor –** The current voltage of the controller's pump 1 amp input. | R: 0 to 5 Volt |
| **Source Water Diff. Pressure –** The current reading of the controller's differential pressure input. | R: 0 to 5 Volt |
| **Source Return Water Temp –** The temperature of the return water loop. | R: -56 to 245°F |
| **Source Supply Water Temp –** The temperature of the supply water loop used for control. | R: -56 to 245°F |
| **Pump 1 Status** – The current state of pump 1's status input. | R: Off/On |
| **Pump 2 Status** – The current state of pump 2's status input. | R: Off/On |
| **Source Water Flow –** The current state of the flow input. | R: No Flow/Flow |
| **Remote Contact Input** – The current state of the input connected to the remote contact input. | R: Off/On |
| **Pump 1 VFD Ouput** – The current commanded output to the pump 1 VFD. | R: 0 to 100% |
| **Byp Vlv Output** – The current commanded output to the Bypass Valve. | R: 0 to 100% |
| **Pump 2 VFD Ouput** – The current commanded output to the pump 2 VFD. | R: 0 to 100% |
| **Pump1 S/S** – The current commanded output to start or stop pump 1. | R: Off/On |
| **Pump2 S/S** – The current commanded output to start or stop pump 2. | R: Off/On |
| **WSHP Comp Command** – The WSHP Compressor Command is set to **On** (enabled output) if the loop controller is running, has flow, and the loop temperature is suitable for compressor operation. | R: Off/On |
| **Alarm** – If an alarm is present in the loop controller, the alarm output is turned on. | R: Off/On |

# Appendix D: GSLC Points/Properties on the Equipment Touch

**NOTE** Engineering units shown in this document in the defaults and ranges are strictly for reference. You must enter an integer only.

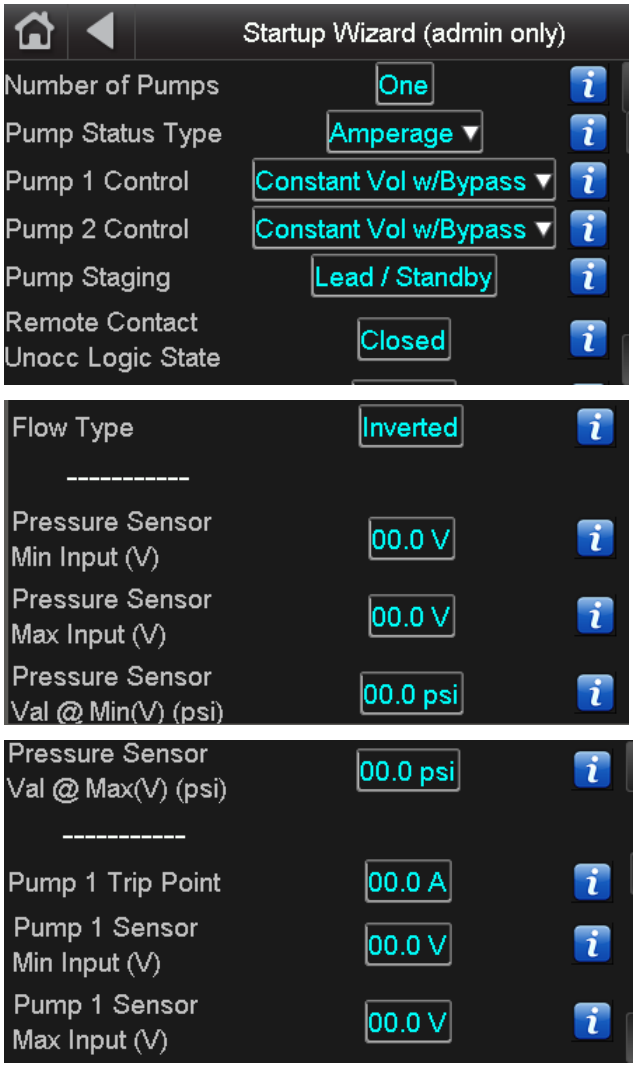
## Navigation screens

| Screen Names | Display | Details |
|---|---|---|
| **Standby** |  <br>Not an interactive screen. Touch anywhere to advance to **Home** screen. | Screen displays after the **Inactivity Timer** expires (default is 5 minutes).<br>Displays:<br>• Source water supply temperature<br>• Status - On/Off<br>• Occupancy |
| **Home** |  <br>Click ... on the right to navigate to **Snapshot** screen. | Displays:<br>• Source water supply temperature<br>• Status - On/Off<br>• Occupancy<br>Allows:<br>• Pushbutton Override |

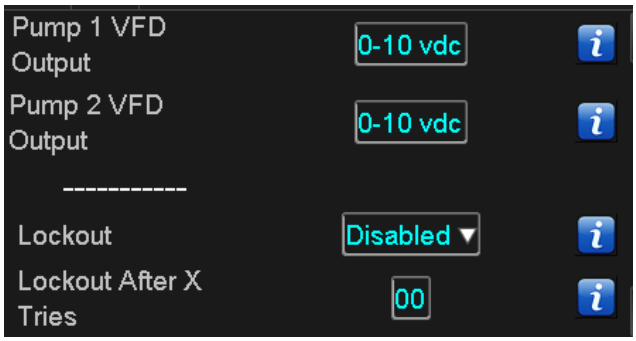
| Screen Names | Display | Details |
|---|---|---|
| **Snapshot** |  <br>Forward to **Ground Source Loop App Properties Menu** screen - click ... on the right<br>Displays:<br>• CWS, CWR, and SWRT<br>• Diff Press, if available and allowed<br>• Number of pumps and their corresponding control type<br>• Bypass Valve Position, if available and allowed<br>• OAT, if available and allowed<br>• Number of pumps and corresponding status<br>• Coil & Dampers' positions and % open | Navigates to:<br>• Alarm status<br>• Schedules<br>• Trends<br>• Back to the **Home** screen - click ... on the left<br>• |
| **Ground Source Loop Properties Menu** |  | Navigates to **Property** pages<br>Login with one of the following passwords:<br>○ User level - type `user`<br>○ Admin level - type `admin`<br>○ Factory level - type `Touch`<br>**NOTE** Only the buttons that are authorized for a specific password level are visible. |

# Startup Wizard

You can easily configure the GSLC using the **Start-up Wizard**, which gives you access to the Properties without having to change views between several different screens.








# Document revision history

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

| Date | Topic | Change description | Code* |
|---|---|---|---|
| 9/21/21 | Wiring devices to the controller's Rnet port | Removed hybrid wiring configuration for Rnet port | X-TS-AK-E |
| 8/18/20 | Cover, What is the GSLC application | Updated company logo | C-D |
| 1/24/19 | Wiring devices to the controller's Rnet port | Removed star configuration from the first paragraph. | X-TS-TS-O |
| | Specifications | Added surge CAUTION to Protection specification. | X-TS-AK-E-CC |
| 10/26/18 | Wiring inputs and outputs > Input wiring specifications | Added TruVu™ ET Display and referred user to Wiring the Rnet port section. | C-D |
| | Wiring devices to the controller's Rnet port | Added TruVu™ ET Display. | C-D |
| | Specifications | Added TruVu™ ET Display.<br>Reworded Protection specification and added first paragraph. | X-H-JS-O |
| 12/14/17 | Analog Outputs | Corrected impedance from 500 Ohms to 2000 Ohms | C-AE-ZL-E-WB |

* For internal use only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